

FCC PART 27  
MEASUREMENT AND TEST REPORT  
For  
**CHENGDU VANTRON TECHNOLOGY, LTD.**  
NO. 5 GAOPENG ROAD, HI-TECH ZONE, CHENGDU, SICHUAN 610045, CHINA

**FCC ID: 2AAGEVTM2M-TC**

<b>Report Type:</b> Original Report	<b>Product Type:</b> M2M Gateway
<b>Test Engineer:</b> Leon Chen	<i>leon chen</i>
<b>Report Number:</b> R2SC130723050-00C	
<b>Report Date:</b> 2013-12-04	
<b>Reviewed By:</b> Jerry Zhang EMC Manager	<i>Jerry Zhang</i>
<b>Test Laboratory:</b> Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>	

**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP\*, or any agency of the Federal Government.  
\* This report may contain data that are not covered by the NVLAP accreditation and shall be marked with an asterisk "★" (Rev.2)  
This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

## TABLE OF CONTENTS

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
OBJECTIVE .....	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY .....	4
TEST FACILITY .....	4
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>5</b>
JUSTIFICATION .....	5
EQUIPMENT MODIFICATIONS .....	5
SUPPORT EQUIPMENT LIST AND DETAILS .....	5
CONFIGURATION OF TEST SETUP .....	5
BLOCK DIAGRAM OF TEST SETUP .....	6
<b>SUMMARY OF TEST RESULTS .....</b>	<b>7</b>
<b>§1.1310 &amp; §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE).....</b>	<b>8</b>
APPLICABLE STANDARD .....	8
<b>FCC § 2.1046 &amp; § 27.50 - RF OUTPUT POWER.....</b>	<b>9</b>
APPLICABLE STANDARDS.....	9
TEST PROCEDURE .....	9
TEST EQUIPMENT LIST AND DETAILS.....	9
TEST DATA .....	9
<b>FCC §2.1053 &amp; §27.53 - SPURIOUS RADIATED EMISSIONS .....</b>	<b>11</b>
APPLICABLE STANDARDS.....	11
TEST PROCEDURE .....	11
TEST EQUIPMENT LIST AND DETAILS.....	11
TEST DATA .....	12

## GENERAL INFORMATION

---

### Product Description for Equipment under Test (EUT)

The *Chengdu Vantron Technology, Ltd.*'s product, model number: *VT-M2M-TC (FCC ID: 2AAGEVTM2M-TC)* (the "EUT") in this report was a *M2M Gateway*, which was measured approximately: 16.0 cm (L) x 10.2 cm (W) x 5.2 cm (H), rated input voltage: DC 12V from adapter.

Adapter Information: GPE  
MODEL: GPE652-120500D  
INPUT: 100-240Vac, 50/60Hz, 1.5A  
OUTPUT: DC 12V, 5000mA

*\* All measurement and test data in this report was gathered from production sample serial number: 130723050 (Assigned by BACL.Dongguan). The EUT was received on 2013-07-26.*

### Objective

This type approval report is prepared on behalf of *CHENGDU VANTRON TECHNOLOGY, LTD.* in accordance with Part 2, Part 27 of the Federal Communication Commissions rules.

The objective is to determine the compliance of EUT with FCC rules for output power, modulation characteristic, occupied bandwidth, and spurious emission at antenna terminal, spurious radiated emission, frequency stability, and band edge.

### Related Submittal(s)/Grant(s)

FCC Part 15C DTS submissions with FCC ID: *2AAGEVTM2M-TC* for Wifi.  
FCC Part 15C DTS submissions with FCC ID: *2AAGEVTM2M-TC* for Zigbee.  
FCC Part 22H&24E PCB submissions with FCC ID: *2AAGEVTM2M-TC*.

## **Test Methodology**

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 27 – Miscellaneous wireless communications services

Applicable Standards: TIA-1037, TIA/EIA 603-D.

All radiated and conducted emissions measurements were performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

## **Test Facility**

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

## SYSTEM TEST CONFIGURATION

### Justification

The test items were performed with the EUT operating at testing mode.

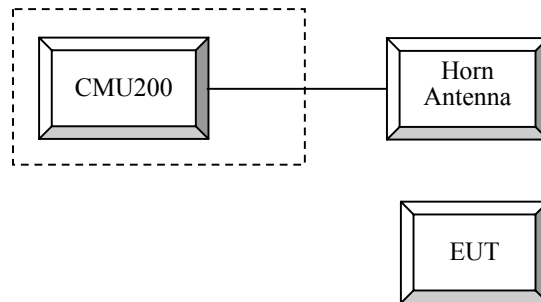
### Equipment Modifications

No modifications were made to the EUT.

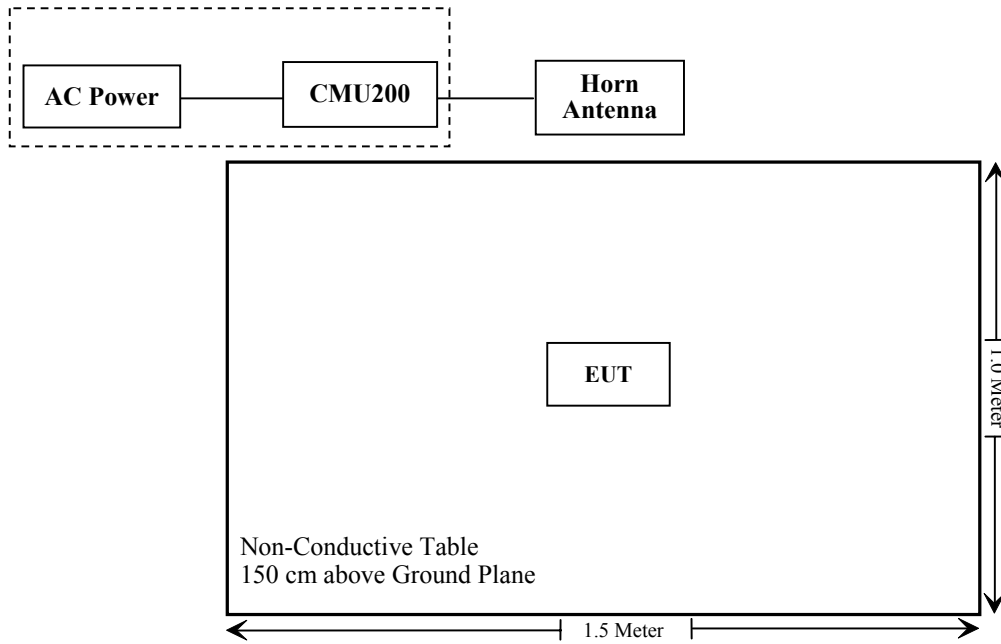
### Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
R & S	Universal Radio Communication Tester	CMU200	109038

### Configuration of Test Setup



**Block Diagram of Test Setup**



**SUMMARY OF TEST RESULTS**

FCC Rules	Description of Test	Result
§1.1310, §2.1091	RF Exposure	Compliance
§2.1046; §27.50 (d)	RF Output Power	Compliance*
§ 2.1047	Modulation Characteristics	Not Applicable**
§ 2.1049; §27.53	Occupied Bandwidth	Not Applicable**
§ 2.1051; §27.53	Spurious Emissions at Antenna Terminal	Not Applicable**
§ 2.1053; §27.53	Spurious Radiated Emissions	Compliance
§27.53	Band Edge	Not Applicable**
§ 2.1055; §27.54	Frequency stability	Not Applicable**

Note: \* EIRP.

\*\* Please refer to certified 3G module with FCC ID: RI7HE910.

**§1.1310 & §2.1091- MAXIMUM PERMISSIBLE EXPOSURE (MPE)**

**Applicable Standard**

According to subpart §1.1310, systems operating under the provisions of this 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.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm <sup>2</sup> )	Averaging Time (minutes)
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	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;

According to §1.1310 and §2.1091 RF exposure is calculated.

**Per 447498 D01 General RF Exposure Guidance v05r01**, 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.

**Calculated Formulary:**

Predication of MPE limit at a given distance

S = PG/4πR<sup>2</sup> = power density (in appropriate units, e.g. mW/cm<sup>2</sup>);

P = power input to the antenna (in appropriate units, e.g., mW);

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain;

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm);

**Calculated Data:**

RF module	Frequency band	Antenna Gain		Conducted Power		Duty cycle (%)	Evaluation distance (cm)	Power Density (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	MPE Ratios (%)
	(MHz)	(dBi)	(numeric)	(dBm)	(mW)					
WIFI	2412-2462	2.5	1.78	20.68	117	100	20	0.041	1	4.14
Zigbee	2405-2480	2.5	1.78	7.99	6.3	100	20	0.002	1	0.22
3G	1850.2-1909.8	2.4	1.74	29.20	832	50	20	0.144	1.00	14.38
Total sum of MPE ratios (%)										18.74

**Note:**

\* For 3G module, the worst case for MPE was chosen.

**Result:** 18.74 % < 1, the device meet FCC MPE at 20 cm distance.



## FCC § 2.1046 & § 27.50 - RF OUTPUT POWER

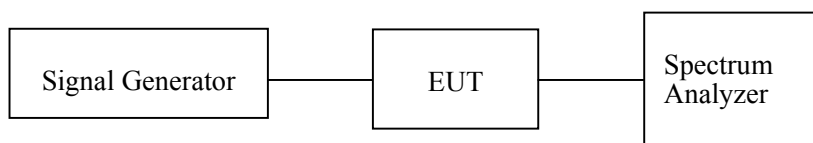
### Applicable Standards

According to §27.50, the maximum effective radiated power (ERP) must not exceed 1 Watts.

### Test Procedure

#### Conducted method:

The RF output of the transmitter was connected to the Signal Generator and the spectrum analyzer through sufficient attenuation.



#### Radiated method:

TIA603-D section 2.2.17

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI TEST RECEIVER	ESCI	100224	2013-5-6	2014-5-5
Sunol Sciences	Antenna	JB3	A060611-1	2011-9-6	2014-9-5
R&S	Spectrum analyzer	FSEM	DE31388	2013-5-7	2014-5-6
ETS LINDGREN	horn antenna	3115	000 527 35	2012-9-6	2015-9-5
Giga	Signal Generator	1026	320408	2013-5-9	2014-5-8
TDK RF	horn antenna	HRN-0118	130 084	2012-9-6	2015-9-5
EMCO	Adjustable dipole antenna	3121C	9109-753	N/A	N/A

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

### Test Data

#### Environmental Conditions

Temperature:	25.4 °C
Relative Humidity:	62 %
ATM Pressure:	100.8 kPa

The testing was performed by Leon Chen on 2013-10-20.

**Radiated Power:**

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
WCDMA BAND IV								
1712.400	V	88.05	14.5	10.8	1.5	23.8	30.0	6.2
1732.600	V	88.81	15.5	10.9	1.5	24.9	30.0	5.1
1752.600	V	87.99	14.8	10.9	1.5	24.2	30.0	5.8

## FCC §2.1053 & §27.53 - SPURIOUS RADIATED EMISSIONS

### Applicable Standards

FCC § 2.1053 and § 27.53.

### Test Procedure

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT. The test was performed by placing the EUT on 3-orthogonal axis.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

Remove the EUT and replace it with substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 lg (TX pwr in Watts/0.001) – the absolute level

Spurious attenuation limit in dB = 43 + 10 Log<sub>10</sub> (power out in Watts)

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI TEST RECEIVER	ESCI	100224	2013-5-6	2014-5-5
Sunol Sciences	Antenna	JB3	A060611-1	2011-9-6	2014-9-5
HP	AMPLIFIER	8447E	2434A02181	N/A	N/A
R&S	Spectrum analyzer	FSEM	DE31388	2013-5-7	2014-5-6
ETS LINDGREN	horn antenna	3115	000 527 35	2012-9-6	2015-9-5
Mini-Circuit	Amplifier	ZVA-213-S+	054201245	N/A	N/A
Giga	Signal Generator	1026	320408	2013-5-9	2014-5-8
TDK RF	horn antenna	HRN-0118	130 084	2012-9-6	2015-9-5
EMCO	Adjustable dipole antenna	3121C	9109-753	N/A	N/A

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed, traceable to National Primary Standards and International System of Units (SI).

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25.4 °C
<b>Relative Humidity:</b>	62 %
<b>ATM Pressure:</b>	100.8 kPa

The testing was performed by Leon Chen on 2013-10-20.

Test mode: Transmitting (Pre-scan with all the bandwidth, and worse case as below)

Frequency (MHz)	Polar (H/V)	Receiver Reading (dBμV)	Substituted Method			Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			S.G. Level (dBm)	Antenna Gain (dBd/dBi)	Cable Loss (dB)			
<b>frequency: 1712.4 MHz</b>								
3424.800	H	38.11	-59.2	14.0	1.8	-47.0	-13.0	34.0
3424.800	V	44.29	-52.6	14.0	1.8	-40.4	-13.0	27.4
725.060	H	40.36	-49.2	0.0	0.9	-50.1	-13.0	37.1
725.060	V	41.68	-46.1	0.0	0.9	-47.0	-13.0	34.0
<b>frequency: 1732.6 MHz</b>								
3465.200	H	40.52	-56.4	13.9	1.9	-44.4	-13.0	31.4
3465.200	V	46.91	-49.2	13.9	1.9	-37.2	-13.0	24.2
725.010	H	40.06	-49.5	0.0	0.9	-50.4	-13.0	37.4
725.010	V	41.67	-46.1	0.0	0.9	-47.0	-13.0	34.0
<b>frequency: 1752.6 MHz</b>								
3505.200	H	37.18	-59.4	13.8	1.9	-47.5	-13.0	34.5
3505.200	V	40.61	-54.9	13.8	1.9	-43.0	-13.0	30.0
725.070	H	40.36	-49.2	0.0	0.9	-50.1	-13.0	37.1
725.070	V	41.87	-45.9	0.0	0.9	-46.8	-13.0	33.8

**Note:**

- 1) Absolute Level = SG Level - Cable loss + Antenna Gain
- 2) Margin = Limit- Absolute Level

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