



中认信通

CHINA CERTIFICATION ICT CO., LTD (DONGGUAN)



RF EXPOSURE EVALUATION REPORT

Applicant: Chengdu Vantron Technology Co., Ltd.

Address: No.5 GaoPeng Road, Hi-Tech Zone, Chengdu, SiChuan, P.R. China

FCC ID: 2AAGEVTC335L

IC: 11152A-VTC335L

HVIN: VT-M2M-C335L

Product Name: M2M Gateway

Model Number: VT-M2M-C335L

Standard(s): 47 CFR §1.1307, 47 CFR §15.247(i), 47 CFR §15.407(f)
RSS-102 Issue 5 March 2015, Amendment 1
(February 2, 2021)

The above equipment has been tested and found compliant with the requirement of the relative standards by China Certification ICT Co., Ltd (Dongguan)

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Reviewed By: Sun Zhong

Sun Zhong

Title: Manager

Test Laboratory: China Certification ICT Co., Ltd (Dongguan)

No. 113, Pingkang Road, Dalang Town, Dongguan,
Guangdong, China
Tel: +86-769-82016888

Test Facility

The Test site used by China Certification ICT Co., Ltd (Dongguan) to collect test data is located on the No. 113, Pingkang Road, Dalang Town, Dongguan, Guangdong, China.

The lab has been recognized as the FCC accredited lab under the KDB 974614 D01 and is listed in the FCC Public Access Link (PAL) database, FCC Registration No. : 442868, the FCC Designation No. : CN1314.

The lab has been recognized by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements, the CAB identifier: CN0123.

Declarations

China Certification ICT Co., Ltd (Dongguan) is not responsible for the authenticity of any test data provided by the applicant. Data included from the applicant that may affect test results are marked with a triangle symbol “▲”. Customer model name, addresses, names, trademarks etc. are not considered data.

Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

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CONTENTS

TEST FACILITY	2
DECLARATIONS.....	2
1.1 SAR-BASED EXEMPTION.....	4
1.1.1 APPLICABLE STANDARD.....	4
1.1.2 PROCEDURE.....	4
1.1.3 MEASUREMENT RESULT.....	6
1.2 MAXIMUM PERMISSIBLE EXPOSURE (MPE)	7
1.2.1 APPLICABLE STANDARD.....	7
1.2.2 PROCEDURE.....	7
1.2.3 EUT WWAN INFORMATION▲:	8
1.2.3 CALCULATED RESULT:.....	8

1.1 SAR-Based Exemption

1.1.1 Applicable Standard

FCC §15.247 (i) & §15.407 (f) & §1.1307

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 levels in excess of the Commission's guidelines. See §1.1307(b)(1) of this chapter.

1.1.2 Procedure

According to §1.1307(b)(3)(ii)(B)

Simultaneous Transmission with both SAR-based and MPE-Based Test Exemptions

This case is described in detail in § 1.1307(b)(3)(ii)(B) and covers the situations where both SAR-based and MPE-based exemption may be considered for test exemption in fixed, mobile, or portable device exposure conditions. For these cases, a device with multiple RF sources transmitting simultaneously will be considered an RF exempt device if the condition of Formula (1) is satisfied.

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1 \quad (1)$$

Where:

a = number of fixed, mobile, or portable RF sources claiming exemption using [paragraph \(b\)\(3\)\(i\)\(B\)](#) of this section for P_{th} , including existing exempt transmitters and those being added.

b = number of fixed, mobile, or portable RF sources claiming exemption using [paragraph \(b\)\(3\)\(i\)\(C\)](#) of this section for Threshold ERP, including existing exempt transmitters and those being added.

c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.

P_i = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).

$P_{th,i}$ = the exemption threshold power (P_{th}) according to [paragraph \(b\)\(3\)\(i\)\(B\)](#) of this section for fixed, mobile, or portable RF source i .

ERP_j = the ERP of fixed, mobile, or portable RF source j .

$ERP_{th,j}$ = exemption threshold ERP for fixed, mobile, or portable RF source j , at a distance of at least $\lambda/2\pi$ according to the applicable formula of [paragraph \(b\)\(3\)\(i\)\(C\)](#) of this section.

$Evaluated_k$ = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.

$Exposure\ Limit_k$ = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k , as applicable from [§ 1.1310 of this chapter](#).

1.1.3 Measurement Result

Radio	Frequency (MHz)	Distance (mm)	P _{th} (mW)	Maximum Conducted Power including Tune-up Tolerance (dBm)	Antenna Gain (dBi)	Conducted Power or ERP	
						dBm	mW
2.4G WLAN	2412-2462	250	3060	22	1.76	22	158.49
BLE	2402-2480	250	3060	4	1.76	4	2.51
BDR/EDR	2402-2480	250	3060	5	1.76	5	3.16
5.2G WLAN	5150-5250	250	3060	12	3.12	12.97	19.82
5.8G WLAN	5725-5850	250	3060	13	4.03	14.88	30.76
LTE B2	1850-1910	250	3060	23	5.65	26.5	446.68
LTE B4	1710-1755	250	3060	23	3.47	24.32	270.40
LTE B5	824-849	250	1681	25	5.03	27.88	613.76
LTE B12	699-716	250	1426	24	2.77	24.62	289.73
LTE B13	777-787	250	1585	23	3.77	24.62	289.73
LTE B14	788-798	250	1608	22	3.77	23.62	230.14
LTE B25	1850-1915	250	3060	23	5.65	26.5	446.68
LTE B26	814-849	250	1661	25	5.03	27.88	613.76
LTE B41	2496-2690	250	3060	25	4.29	27.14	517.61
LTE B66	1710-1780	250	3060	23	3.47	24.32	270.40
LTE B71	663-698	250	1353	22	2.60	22.45	175.79

Note:

The devices may contain certified WWAN Module, FCC ID: 2AJYU-8PYA005

The WLAN or Bluetooth and WAAN can transmit simultaneously.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k}$$

$$= P_{WLAN} / P_{th} + P_{WAAN} / P_{th}$$

$$= 158.49/3060 + 613.76/1661$$

$$= 0.421$$

$$< 1.0$$

Result: The device compliant the SAR-Based Exemption at 25cm distances.

1.2 MAXIMUM PERMISSIBLE EXPOSURE (MPE)

1.2.1 Applicable Standard

According to RSS-102 § 4Table 4, RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i> ^{0.3417}	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}
Note: <i>f</i> is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

1.2.2 Procedure

Prediction of power density at the distance of the applicable MPE limit

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. W/m²);

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

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., m);

For simultaneously transmit system, the calculated power density should comply with:

$$\sum_i \frac{S_i}{S_{Limit,i}} \leq 1$$

1.2.3 EUT WWAN Information ▲:

Operation Modes	Operation Frequency (MHz)	Conducted output power including Tune-up Tolerance (dBm)	Antenna Gain (dBi)	ERP or EIRP (dBm)	Limit (dBm)
LTE B2	1850-1910	23	5.65	28.65	33
LTE B4	1710-1755	23	3.47	26.47	30
LTE B5	824-849	25	5.03	27.88	38.45
LTE B12	699-716	24	2.77	24.62	34.77
LTE B13	777-787	23	3.77	24.62	34.77
LTE B14	788-798	22	3.77	23.62	34.77
LTE B25	1850-1915	23	5.65	28.65	33
LTE B41	2570-2620	25	4.29	29.29	33
LTE B66	1710-1780	23	3.47	26.47	30
LTE B71	663-698	22	2.6	22.45	34.77

Note:

The devices may contain certified WWAN Module, IC: 23761-8PVA006

The WLAN or BLE and WWAN can transmit simultaneously

1.2.3 Calculated Result:

Radio	Frequency (MHz)	Antenna Gain		Conducted output power including Tune-up Tolerance		Evaluation Distance (cm)	Power Density (W/m ²)	MPE Limit (W/m ²)
		(dBi)	(numeric)	(dBm)	(mW)			
2.4G WLAN	2412-2462	1.76	1.5	22	158.49	25	0.30	5.37
BLE	2402-2480	1.76	1.5	4	2.51	25	0.01	5.35
BDR/EDR	2402-2480	1.76	1.5	5	3.16	25	0.01	5.35
5.2G WLAN	5150-5250	3.12	2.05	12	15.85	25	0.04	9.01
5.8G WLAN	5725-5850	4.03	2.53	13	19.95	25	0.06	9.69
LTE B2	1850-1910	5.65	3.67	23	199.53	25	0.93	4.48
LTE B4	1710-1755	3.47	2.22	23	199.53	25	0.56	4.24
LTE B5	824-849	5.03	3.18	25	316.23	25	1.28	2.58
LTE B12	699-716	2.77	1.89	24	251.19	25	0.60	2.30
LTE B13	777-787	3.77	2.38	23	199.53	25	0.60	2.47
LTE B14	788-798	3.77	2.38	22	158.49	25	0.48	2.50
LTE B25	1850-1915	5.65	3.67	23	199.53	25	0.93	4.48
LTE B41	2570-2620	4.29	2.69	25	316.23	25	1.08	5.60
LTE B66	1710-1780	3.47	2.22	23	199.53	25	0.56	4.24
LTE B71	663-698	2.6	1.82	22	158.49	25	0.37	2.22

Transmit simultaneously:

$$\sum_i \frac{S_i}{S_{Limit,i}}$$

$$=S_{WLAN}/S_{limit-WLAN}+S_{WWAN}/S_{limit-WWAN}$$

$$=0.30/5.37+1.28/2.58$$

$$=0.55$$

$$< 1.0$$

Result: The device meet ISED MPE at 25 cm distance

===== END OF REPORT =====