

FCC Co-Location Test Report

FCC ID : 2AV5ZGTG21
Equipment : Gen 2.1 Tracker
Model No. : GTG21
Brand Name : Cox2M
Applicant : Cox Communications, Inc.
Address : 6205 Peachtree Dunwoody Rd Attn Legal
Regulatory, Atlanta, Georgia United States.
30328
Standard : 47 CFR FCC Part 15.247
Received Date : Dec. 10, 2021
Tested Date : Jan. 06, 2022

We, International Certification Corporation, would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:

Approved by:



Along Chen / Assistant Manager



Gary Chang / Manager

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Release Record

Report No.	Version	Description	Issued Date
FR1D1001CO	Rev. 01	Initial issue	Jan. 27, 2022

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 753.62MHz 41.78 (Margin -4.22dB) - PK	Pass

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

1.1.1 Specification

BLE	
Operating Frequency	2402-2480
Modulation Type	Bluetooth 5.0 LE: GFSK
LoRa	
Operating Frequency	902.3 MHz ~ 914.9 MHz
Modulaton Type	LoRa

1.1.2 Antenna Details

BLE

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	Monopole	No	0.79	---

LoRa

Ant. No.	Type	Connector	Gain (dBi)
1	FPC	UFL	-3.92

1.1.3 Accessories

Accessories		
No.	Equipment	Description
1	Battery	Brand: EVE Model: ER14505 I/P: 3.6V/2.7Ah O/P: 3.6V

1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber3 / (03CH03-WS)				
Tested Date	Jan. 06, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 12, 2021	Mar. 11, 2022
Spectrum Analyzer	R&S	FSV40	101499	Mar. 02, 2021	Mar. 01, 2022
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	May 06, 2021	May 05, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Dec. 20, 2021	Dec. 19, 2022
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2021	Nov. 03, 2022
Preamplifier	EMC	EMC02325	980187	Jul. 26, 2021	Jul. 25, 2022
Preamplifier	Agilent	83017A	MY39501309	Sep. 06, 2021	Sep. 05, 2022
Preamplifier	EMC	EMC184045B	980192	Jul. 14, 2021	Jul. 13, 2022
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 05, 2021	Oct. 04, 2022
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Sep. 24, 2021	Sep. 23, 2022
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Sep. 24, 2021	Sep. 23, 2022
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Sep. 24, 2021	Sep. 23, 2022
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Sep. 24, 2021	Sep. 23, 2022
RF cable-8M	EMC	EMC104-SM-SM-8000	181107	Sep. 24, 2021	Sep. 23, 2022
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.3 Test Standards

47 CFR FCC Part 15.247

ANSI C63.10-2013

1.4 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

FCC KDB 412172 D01 Determining ERP and EIRP v01r01

FCC KDB 789033 D02 General UNII Test Procedures New Rules v02r01

1.5 Deviation from Test Standard and Measurement Procedure

None

1.6 Measurement Uncertainty

The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor (k=2)).

Measurement Uncertainty	
Parameters	Uncertainty
Radiated emission \leq 1GHz	± 3.96 dB
Radiated emission $>$ 1GHz	± 4.51 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, TH01-WS
Address of Test Site	No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 33381, Taiwan (R.O.C.)
Test Site	03CH03-WS
Address of Test Site	No.14-1, Lane 19, Wen San 3rd St., Kwei Shan Dist., Tao Yuan City 333, Taiwan (R.O.C.)

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- ISED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Test Mode	Test Configuration
Radiated Emissions	Lora 125K 902.3MHz + BLE 1Mbps CH0	--
NOTE:		
<ol style="list-style-type: none"> 1. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The Y-plane results were found as the worst case and were shown in this report. 2. The EUT comes in two sources of buck-boost regulator (Ricoh, and TI), and found that Ricoh was the worst case and was selected for final test. 		

3 Transmitter Test Results

3.1 Unwanted Emissions into Restricted Frequency Bands

3.1.1 Limit of Unwanted Emissions into Restricted Frequency Bands

Restricted Band Emissions Limit			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Quasi-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.1.2 Test Procedures

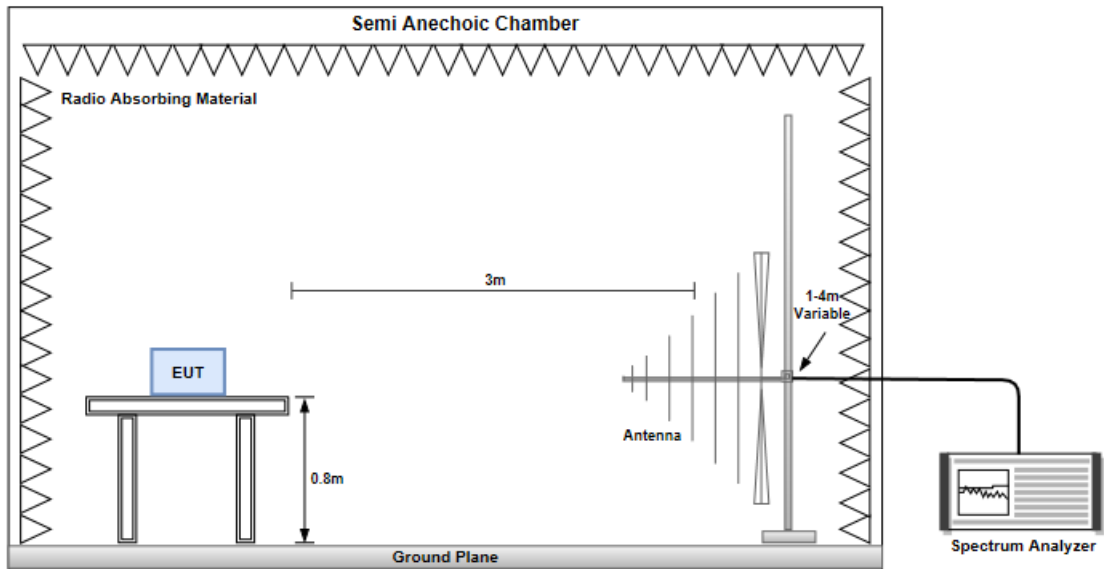
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m.
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

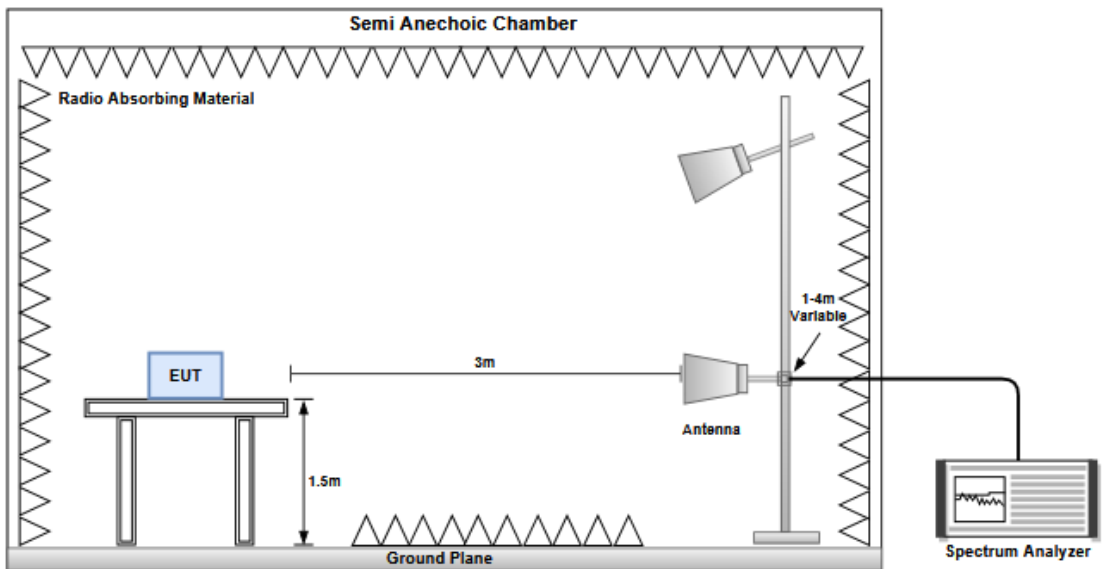
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above 1GHz.

3.1.3 Test Setup

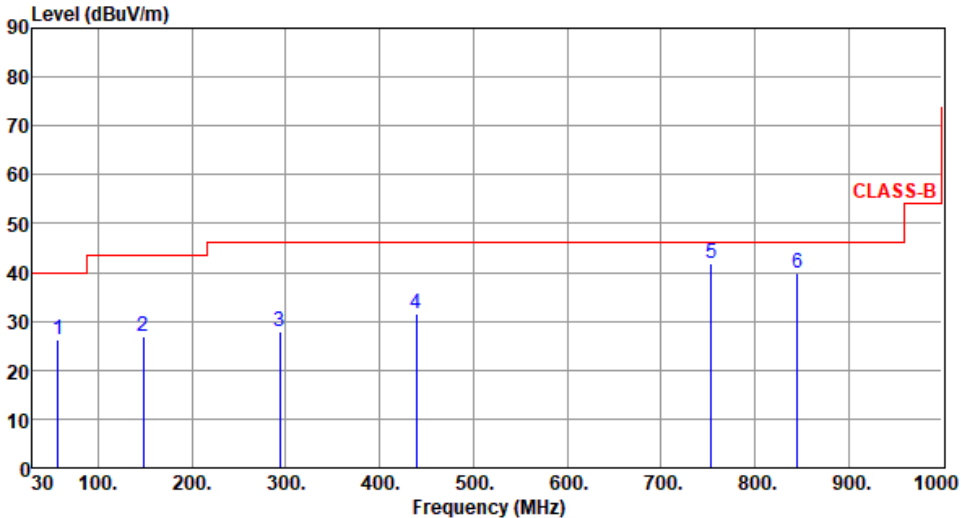
Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

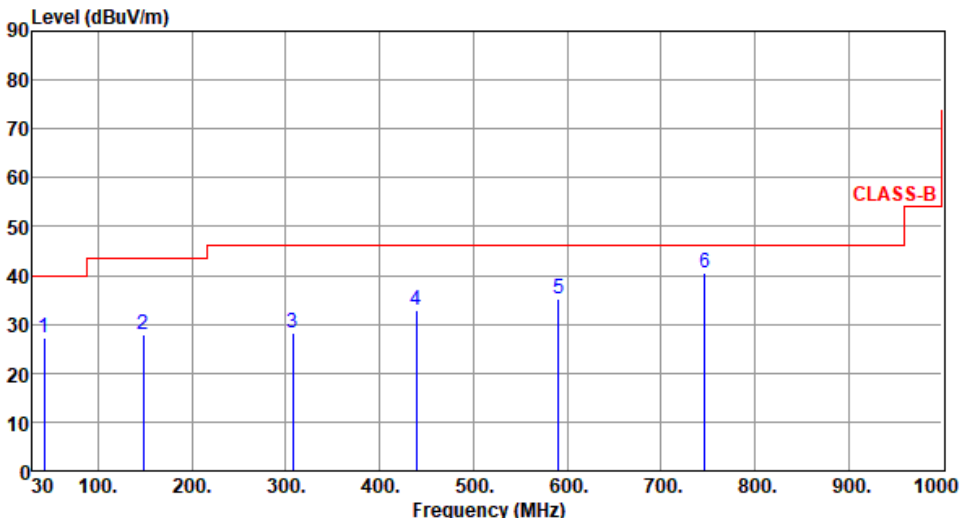
Test Mode	Lora 125K 902.3MHz + BLE 1Mbps CH0									
Polarization	Horizontal									
Test By : Roger Lu			Temperature(°C): 24			Humidity(%): 65				
 <p>The graph displays the radiated unwanted emissions. The y-axis represents the emission level in dBuV/m, ranging from 0 to 90. The x-axis represents the frequency in MHz, ranging from 30 to 1000. A red line indicates the CLASS-B emission limit, which is 40 dBuV/m from 30 MHz to 100 MHz, 45 dBuV/m from 100 MHz to 200 MHz, and 50 dBuV/m from 200 MHz to 1000 MHz. Six peaks are identified and labeled with blue numbers 1 through 6. Peak 1 is at 57.16 MHz, peak 2 at 148.34 MHz, peak 3 at 293.84 MHz, peak 4 at 439.34 MHz, peak 5 at 753.62 MHz, and peak 6 at 845.77 MHz.</p>										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
					dBuV			cm	deg	
1	57.16	26.17	40.00	-13.83	35.54	-9.37	Peak	---	---	
2	148.34	27.00	43.50	-16.50	35.67	-8.67	Peak	---	---	
3	293.84	27.86	46.00	-18.14	36.13	-8.27	Peak	---	---	
4	439.34	31.55	46.00	-14.45	35.59	-4.04	Peak	---	---	
5	753.62	41.78	46.00	-4.22	38.89	2.89	Peak	---	---	
6	845.77	39.91	46.00	-6.09	35.74	4.17	Peak	---	---	

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

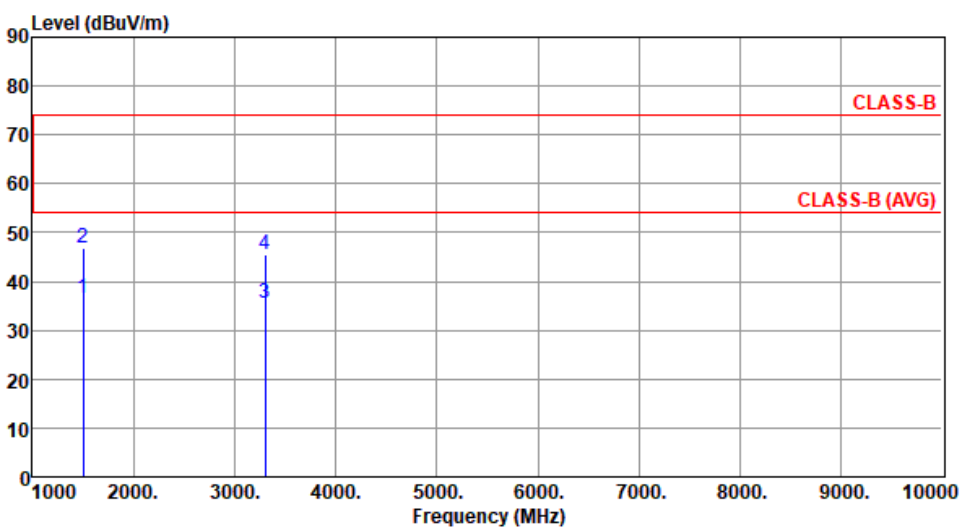
*Factor includes antenna factor , cable loss and amplifier gain

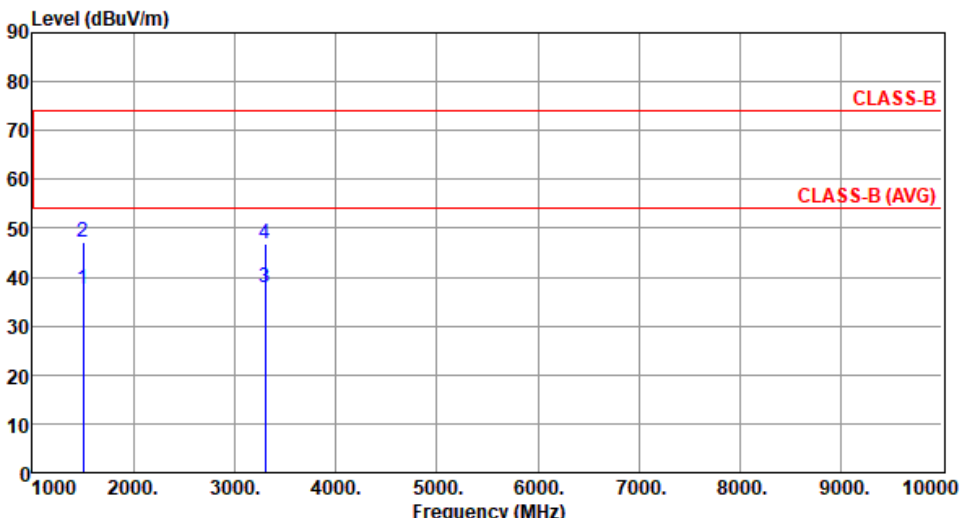
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Test Mode	Lora 125K 902.3MHz + BLE 1Mbps CH0									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):24			Humidity(%):65				
 <p>The graph displays the emission spectrum with a red step-like limit line labeled 'CLASS-B'. The y-axis represents Level (dBuV/m) from 0 to 90, and the x-axis represents Frequency (MHz) from 30 to 1000. Six peaks are identified and numbered 1 through 6.</p>										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m			dBuV			cm	deg	
1	42.61	27.12	40.00	-12.88	36.02	-8.90	Peak	---	---	
2	148.34	27.81	43.50	-15.69	36.48	-8.67	Peak	---	---	
3	307.42	28.22	46.00	-17.78	36.22	-8.00	Peak	---	---	
4	439.34	32.88	46.00	-13.12	36.92	-4.04	Peak	---	---	
5	590.66	35.06	46.00	-10.94	35.56	-0.50	Peak	---	---	
6	746.83	40.37	46.00	-5.63	37.51	2.86	Peak	---	---	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m). Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.</p>										

3.1.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Test Mode	Lora 125K 902.3MHz + BLE 1Mbps CH0								
Polarization	Horizontal								
Test By : Akun Chung		Temperature(°C): 24			Humidity(%): 65				
 <p>The graph displays the radiated unwanted emissions. The y-axis represents the level in dBuV/m, ranging from 0 to 90. The x-axis represents the frequency in MHz, ranging from 1000 to 10000. Two horizontal red lines indicate the limits: CLASS-B at approximately 75 dBuV/m and CLASS-B (AVG) at approximately 55 dBuV/m. Two vertical blue lines mark the frequencies of the measured peaks: peak 2 at 1499.70 MHz and peak 4 at 3304.30 MHz. Peak 2 is an average reading, and peak 4 is a peak reading.</p>									
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table
								cm	deg
1	1499.70	36.45	54.00	-17.55	42.29	-5.84	Average	100	205
2	1499.70	46.86	74.00	-27.14	52.70	-5.84	Peak	100	205
3	3304.30	35.61	54.00	-18.39	35.07	0.54	Average	166	255
4	3304.30	45.57	74.00	-28.43	45.03	0.54	Peak	166	255
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>									

Test Mode	Lora 125K 902.3MHz + BLE 1Mbps CH0									
Polarization	Vertical									
Test By :Akun Chung			Temperature(°C):24			Humidity(%):65				
										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m			dBuV			cm	deg	
1	1499.70	37.57	54.00	-16.43	43.41	-5.84	Average	100	158	
2	1499.70	47.29	74.00	-26.71	53.13	-5.84	Peak	100	158	
3	3304.30	37.95	54.00	-16.05	37.41	0.54	Average	136	160	
4	3304.30	46.91	74.00	-27.09	46.37	0.54	Peak	136	160	
<p>Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m) *Factor includes antenna factor , cable loss and amplifier gain Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).</p>										

4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corporation (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

Linkou

Tel: 886-2-2601-1640

No.30-2, Ding Fwu Tsuen, Lin Kou
District, New Taipei City, Taiwan
(R.O.C.)

Kwei Shan

Tel: 886-3-271-8666

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City 33381, Taiwan (R.O.C.)
No.2-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 33381, Taiwan (R.O.C.)

Kwei Shan Site II

Tel: 886-3-271-8640

No.14-1, Lane 19, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
City 333, Taiwan (R.O.C.)

If you have any suggestion, please feel free to contact us as below information.

Tel: 886-3-271-8666

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Email: ICC_Service@icertifi.com.tw

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