

FCC Co-Location Test Report

FCC ID : IPH-C3958
Equipment : Smart Watch
Model No. : AC3958
Brand Name : GARMIN
Applicant : Garmin International, Inc.
Address : 1200 E. 151st Street Olathe, KS 66062 United States
Standard : 47 CFR FCC Part 15.247
47 CFR FCC Part 15.249
47 CFR FCC Part 15.225
Received Date : Apr. 16, 2021
Tested Date : May 11, 2021

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
FR141602CO	Rev. 01	Initial issue	Jun. 21, 2021

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 38.73MHz 23.17 (Margin -16.83dB) - 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 of the Equipment under Test (EUT)

Bluetooth	
Operating Frequency	2402 MHz ~ 2480 MHz
Antenna Type	Slot
Modulation Type	Bluetooth LE: GFSK
ANT+	
Operating Frequency	2402 MHz ~ 2480 MHz
Antenna Type	Slot
Modulation Type	GFSK
NFC	
Operating Frequency	13.56 MHz
Antenna Type	Loop antenna
Modulation Type	ASK

1.1.2 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	5Vdc from host 3.87Vdc from battery
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1.1.3 Accessories

Accessories		
No.	Equipment	Description
1	Battery	Brand: GARMIN Model: 361-00136-10 Power Rating: 3.87Vdc, 195mAh
2	USB cable	Brand: GARMIN Model: 320-01069-10 Power line: 0.52m shielded without core

1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	May 11, 2021				
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	101498	Dec. 04, 2020	Dec. 03, 2021
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 17, 2020	Nov. 16, 2021
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 10, 2020	Jul. 09, 2021
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 11, 2020	Dec. 10, 2021
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 06, 2020	Nov. 05, 2021
Preamplifier	EMC	EMC02325	980225	Jul. 03, 2020	Jul. 02, 2021
Preamplifier	Agilent	83017A	MY39501308	Sep. 26, 2020	Sep. 25, 2021
Preamplifier	EMC	EMC184045B	980192	Jul. 21, 2020	Jul. 20, 2021
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 06, 2020	Oct. 05, 2021
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 06, 2020	Oct. 05, 2021
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 06, 2020	Oct. 05, 2021
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 06, 2020	Oct. 05, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 06, 2020	Oct. 05, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Oct. 06, 2020	Oct. 05, 2021
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
47 CFR FCC Part 15.249
47 CFR FCC Part 15.225
ANSI C63.10-2013

1.4 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

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	± 3.41 dB
Radiated emission $>$ 1GHz	± 4.59 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	03CH01-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.)

- FCC Designation No.: TW2732
- FCC site registration No.: 181692
- ISED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Test Mode
Radiated Emissions	Mode 1: NFC 13.56MHz + BT LE CH00 Mode 2: NFC 13.56MHz + ANT+ 2441MHz
NOTE:	
1. The selected channel is the maximum power channel of LE and ANT+ mode	
2. The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The Z-plane result was found as the worst case and was shown in this report.	

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:
Qusai-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

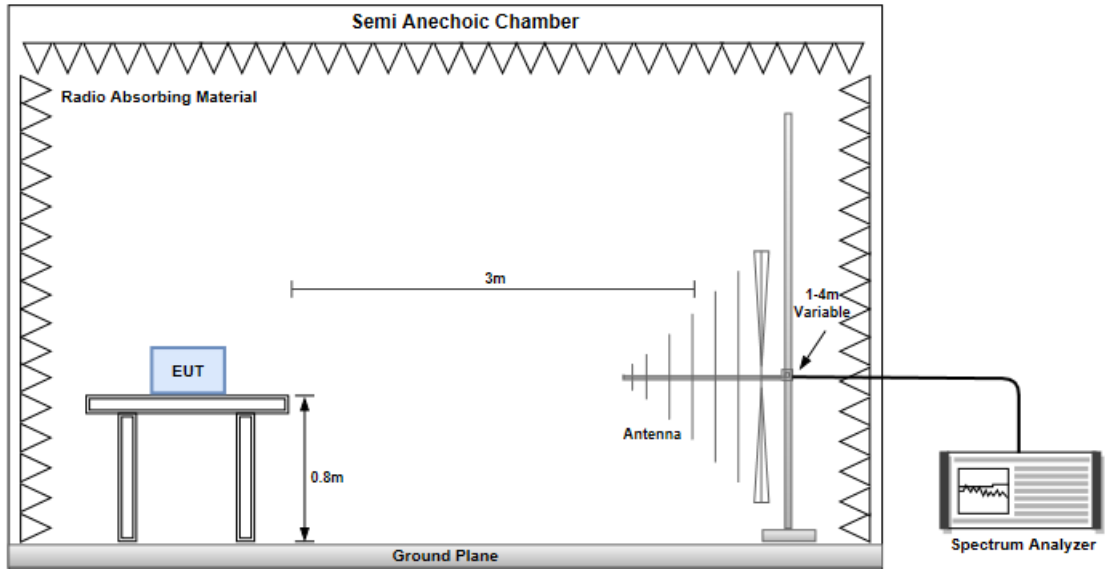
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission 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:

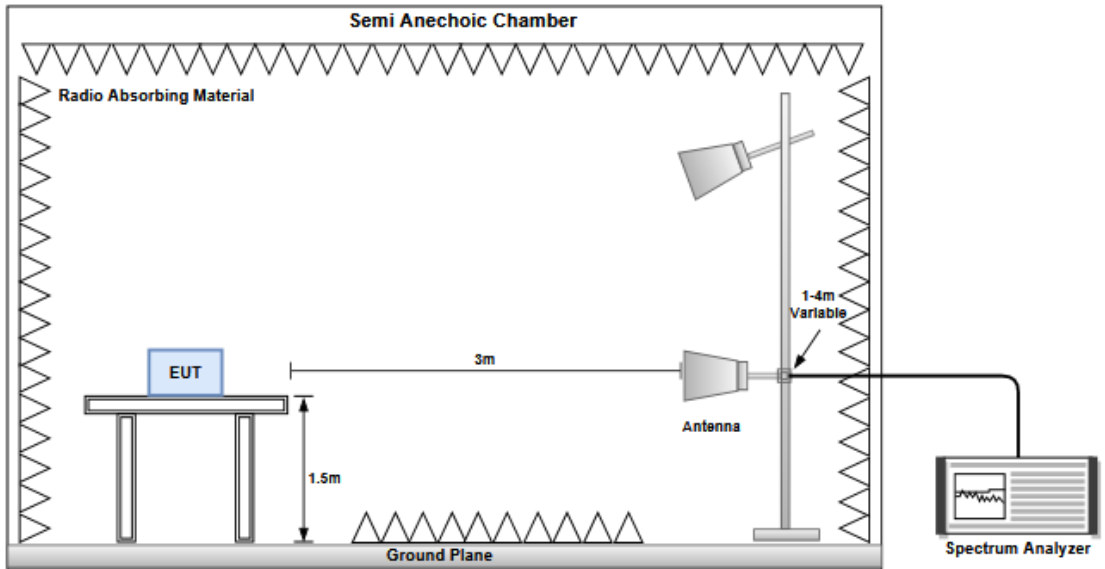
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.1.3 Test Setup

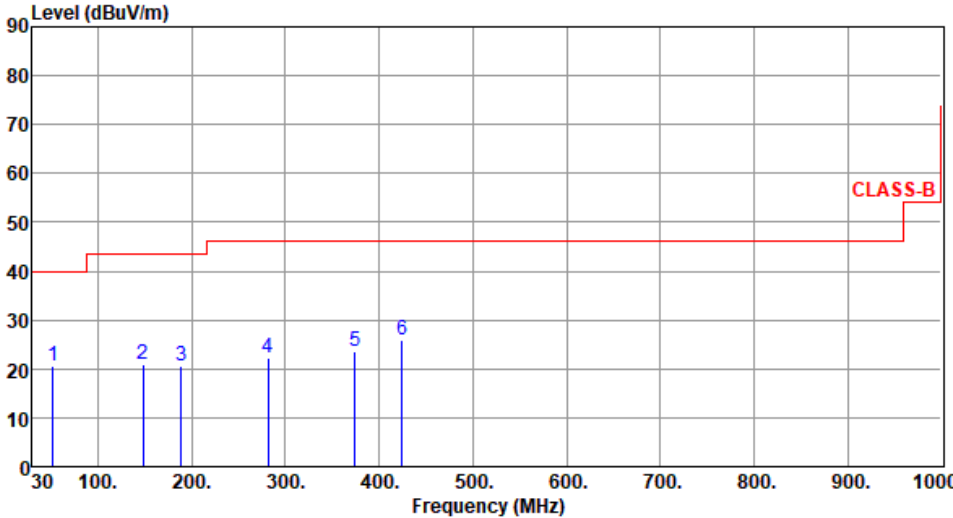
Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz

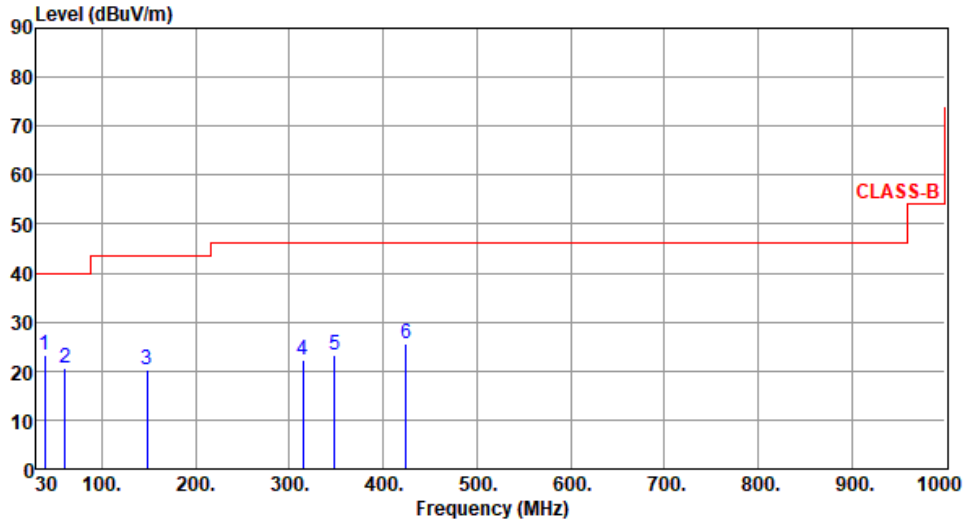


3.1.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Test Mode	Mode 1: NFC 13.56MHz + BT LE CH00									
Polarization	Horizontal									
Test By : Roger Lu			Temperature(°C): 25			Humidity(%): 62				
 <p>The graph plots Level (dBuV/m) on the y-axis (0 to 90) against Frequency (MHz) on the x-axis (30 to 1000). A red line represents the CLASS-B limit, which is constant at 40 dBuV/m from 30 MHz to 100 MHz, then steps up to 45 dBuV/m from 100 MHz to 200 MHz, and finally to 50 dBuV/m from 200 MHz to 1000 MHz. Six blue vertical lines indicate measured peaks at 52.31 MHz, 148.34 MHz, 189.08 MHz, 281.23 MHz, 374.35 MHz, and 424.79 MHz. The emission levels at these peaks are 20.70, 20.79, 20.74, 22.19, 23.58, and 25.83 dBuV/m respectively.</p>										
	1	2	3	4	5	6				
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
								cm	deg	
	1	52.31	20.70	40.00	-19.30	29.31	-8.61	Peak	---	---
	2	148.34	20.79	43.50	-22.71	29.71	-8.92	Peak	---	---
	3	189.08	20.74	43.50	-22.76	32.11	-11.37	Peak	---	---
	4	281.23	22.19	46.00	-23.81	30.82	-8.63	Peak	---	---
	5	374.35	23.58	46.00	-22.42	29.79	-6.21	Peak	---	---
	6	424.79	25.83	46.00	-20.17	30.86	-5.03	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>										

Test Mode	Mode 1: NFC 13.56MHz + BT LE CH00
Polarization	Vertical

Test By :Roger Lu Temperature(°C):25 Humidity(%):62



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	38.73	23.17	40.00	-16.83	31.94	-8.77	Peak	---	---
2	61.04	20.49	40.00	-19.51	29.65	-9.16	Peak	---	---
3	148.34	20.34	43.50	-23.16	29.26	-8.92	Peak	---	---
4	314.21	22.26	46.00	-23.74	29.83	-7.57	Peak	---	---
5	348.16	23.08	46.00	-22.92	29.94	-6.86	Peak	---	---
6	424.79	25.43	46.00	-20.57	30.46	-5.03	Peak	---	---

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

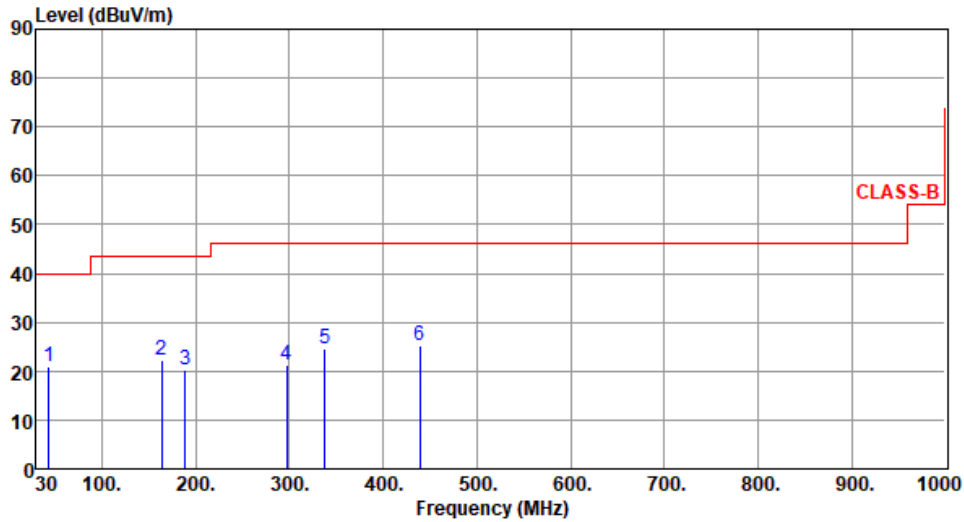
*Factor includes antenna factor , cable loss and amplifier gain

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	Mode 2: NFC 13.56MHz + ANT+ 2441MHz
Polarization	Horizontal

Test By :Roger Lu Temperature(°C):25 Humidity(%):62



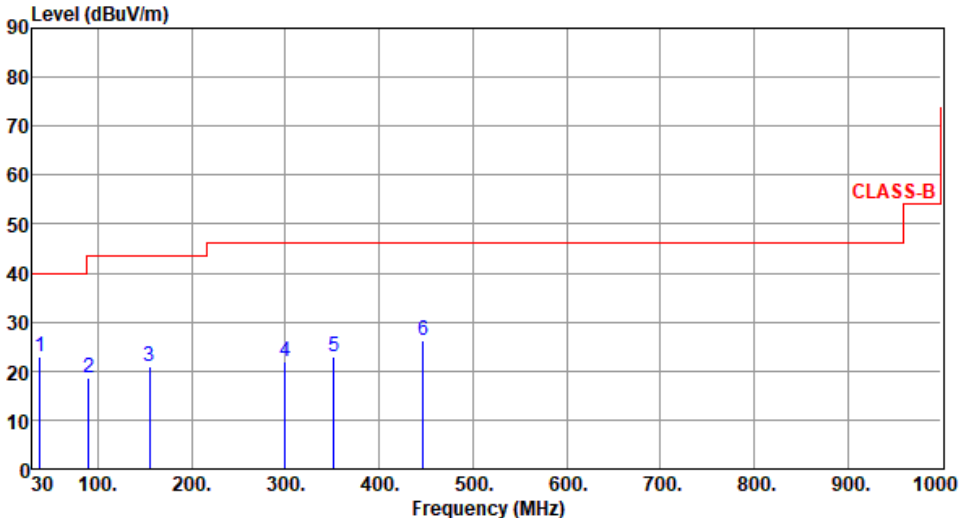
	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	43.58	20.95	40.00	-19.05	29.36	-8.41	Peak	---	---
2	163.86	22.11	43.50	-21.39	31.12	-9.01	Peak	---	---
3	189.08	20.21	43.50	-23.29	31.58	-11.37	Peak	---	---
4	296.75	21.10	46.00	-24.90	29.36	-8.26	Peak	---	---
5	337.49	24.73	46.00	-21.27	31.74	-7.01	Peak	---	---
6	439.34	25.08	46.00	-20.92	29.66	-4.58	Peak	---	---

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

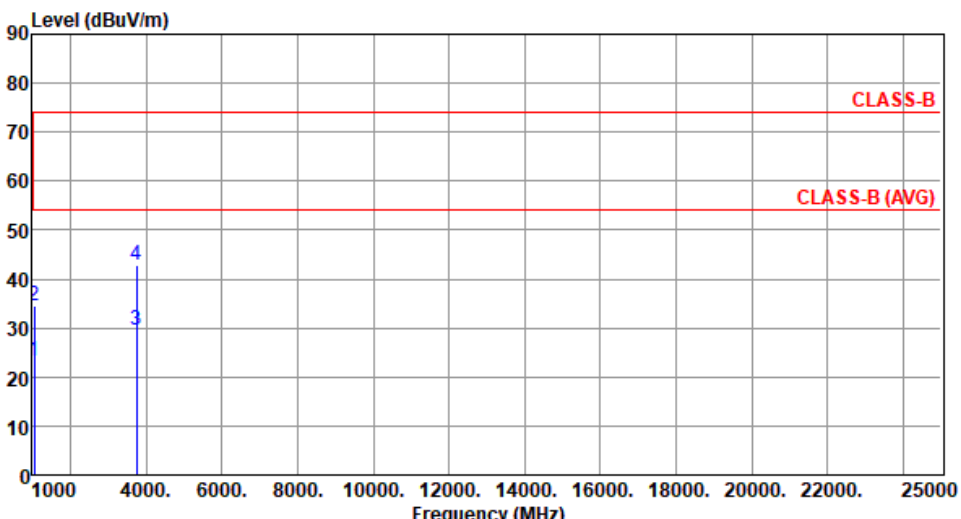
*Factor includes antenna factor , cable loss and amplifier gain

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	Mode 2: NFC 13.56MHz + ANT+ 2441MHz									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):25			Humidity(%):62				
										
	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	37.76	22.99	40.00	-17.01	31.85	-8.86	Peak	---	---	
2	90.14	18.46	43.50	-25.04	33.03	-14.57	Peak	---	---	
3	155.13	20.92	43.50	-22.58	29.67	-8.75	Peak	---	---	
4	299.66	21.89	46.00	-24.11	30.09	-8.20	Peak	---	---	
5	352.04	22.98	46.00	-23.02	29.71	-6.73	Peak	---	---	
6	447.10	26.38	46.00	-19.62	30.80	-4.42	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	Mode 1: NFC 13.56MHz + BT LE CH00									
Polarization	Horizontal									
Test By : Roger Lu			Temperature(°C): 25			Humidity(%): 62				
										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
		dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	1046.00	23.28	54.00	-30.72	32.64	-9.36	Average	100	50	
2	1046.00	34.40	74.00	-39.60	43.76	-9.36	Peak	100	50	
3	3758.00	29.66	54.00	-24.34	29.21	0.45	Average	100	55	
4	3758.00	43.00	74.00	-31.00	42.55	0.45	Peak	100	55	
<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	Mode 1: NFC 13.56MHz + BT LE CH00									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):25			Humidity(%):62				
	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	1046.00	23.42	54.00	-30.58	32.78	-9.36	Average	100	20	
2	1046.00	34.50	74.00	-39.50	43.86	-9.36	Peak	100	20	
3	3758.00	29.61	54.00	-24.39	29.16	0.45	Average	100	40	
4	3758.00	42.70	74.00	-31.30	42.25	0.45	Peak	100	40	
<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	Mode 2: NFC 13.56MHz + ANT+ 2441MHz									
Polarization	Horizontal									
Test By :Roger Lu			Temperature(°C):25			Humidity(%):62				
	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	1085.00	23.39	54.00	-30.61	32.63	-9.24	Average	100	30	
2	1085.00	34.67	74.00	-39.33	43.91	-9.24	Peak	100	30	
3	3797.00	30.11	54.00	-23.89	29.46	0.65	Average	100	60	
4	3797.00	43.33	74.00	-30.67	42.68	0.65	Peak	100	60	

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).

Test Mode	Mode 2: NFC 13.56MHz + ANT+ 2441MHz									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):25			Humidity(%):62				
	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	1085.00	23.58	54.00	-30.42	32.82	-9.24	Average	100	40	
2	1085.00	34.85	74.00	-39.15	44.09	-9.24	Peak	100	40	
3	3797.00	30.22	54.00	-23.78	29.57	0.65	Average	100	70	
4	3797.00	43.53	74.00	-30.47	42.88	0.65	Peak	100	70	
<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

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City 33381, Taiwan (R.O.C.)
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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

Fax: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

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