



Garmin International, Inc.
1200 East 151st Street
Olathe, Kansas 66062
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03-Feb-26

Manufacturer: Garmin International, Inc.
Address: 1200 E. 151st St.
Olathe, KS 66062-3426
U.S.A.
Chile Representative: Matías Rodríguez Correa
Rosario Norte 660 piso 24, Las Condes Santiago
Province CP 7550083, Chile
Contact Email: matias.rodriguez@garmin.com
Subject: SUBTEL, Chile (Resolution 737) Certification Compliance 2026
Commercial Name: Venu Sq 2 Music

	Información (Information)
Tipo de equipo (Equipment type)	Portable Digital Transceiver
Marca (Brand)	Garmin 
Modelo (Model)	A04390
Tecnología o modulación (Technology or modulation)	ASK for NFC / GFSK for ANT/ GFSK for BLE / GFSK for BTBR / $\pi/4$ -DQPSK, 8DPSK for BTEDR / DSSS for 802.11b / OFDM for 802.11g/n
Frecuencias (Frequencies)	13.56 MHz / 2402-2480 MHz / 2402-2480 MHz / 2402-2480 MHz / 2402-2480 MHz / 2412-2462 MHz
Ganancia de antena (dBi) (Antenna gain (dBi))	ANT -2.08 dBi / 802.15.1 -2.08 dBi / 802.15.1 -2.08 dBi / BLE -2.08 dBi / 802.11b/g/n -2.08 dBi
P.i.r.e. (E.I R P.)	-49.75 dBm, 0.00 mW / -0.43 dBm, 0.90 mW / -1.99 dBm, 0.63 mW / 9.34 dBm, 8.59 mW / 5.88 dBm, 3.84 mW / 13.81 dBm, 24.04 mW
Módulos (Modules)	NFC, ANT, BLE, BTBR, BTEDR, WiFi

As all measurements for NFC are made in radiated mode to comply with the field strength limits, gain information is not required to be noted in the reports or any additional documentation.

Declaration of Conformity Statement: the equipment previously identified complies with the provisions established in the Technical Standard for Small Range Equipment, approved by Exempt Resolution No.1,985 of 2017, of the Undersecretary of Telecommunications.

Declaración de conformidad: El equipo anteriormente identificado cumple con las disposiciones establecidas en la Norma Técnica para Equipos de Corto Alcance, aprobada mediante la Resolución Exenta N° 1.985 de 2017, de la Subsecretaría de Telecomunicaciones.

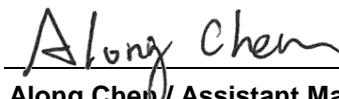
FCC Test Report

FCC ID : IPH-04390
Equipment : Smart Watch
Model No. : A04390
Brand Name : GARMIN
Applicant : Garmin International, Inc.
Address : 1200 E. 151st Street Olathe, KS 66062 United States
Standard : 47 CFR FCC Part 15.249
Received Date : Apr. 07, 2022
Tested Date : Apr. 22 ~ May 09, 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 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
FR240702AF	Rev. 01	Initial issue	Jun. 01, 2022

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.788MHz 25.45 (Margin -20.55dB) - AV	Pass
15.249(a)	Field Strength of Fundamental	Meet the requirement of limit	Pass
15.249(a)(d)	Field Strength of Harmonics and Emissions Radiated outside of the Specified Frequency Bands	Meet the requirement of limit	Pass
15.215(c)	20dB bandwidth	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	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)

RF General Information				
Frequency Range (MHz)	Modulation	Ch. Freq. (MHz)	Channel Number	Data Rate
2402-2480	GFSK	2402-2480	1-79 [79]	1 Mbps

1.1.2 Antenna Details

Ant. No.	Brand	Model	Type	Connector	Gain (dBi)
1	Garmin	117-01806-0X	PIFA	No	-2.08

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Type	5Vdc from adapter 3.87Vdc from battery
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1.1.4 Accessories

No.	Equipment	Description
1	Battery	Brand: Garmin Model: 361-00136-20 Power Rating: 3.87V, 205mAh
2	USB cable	Brand: GARMIN Model: 320-01069-10 Line: 0.52m shielded without core

1.1.5 Channel List

Frequency band (MHz)				2400~2483.5			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2402	21	2422	41	2442	61	2462
2	2403	22	2423	42	2443	62	2463
3	2404	23	2424	43	2444	63	2464
4	2405	24	2425	44	2445	64	2465
5	2406	25	2426	45	2446	65	2466
6	2407	26	2427	46	2447	66	2467
7	2408	27	2428	47	2448	67	2468
8	2409	28	2429	48	2449	68	2469
9	2410	29	2430	49	2450	69	2470
10	2411	30	2431	50	2451	70	2471
11	2412	31	2432	51	2452	71	2472
12	2413	32	2433	52	2453	72	2473
13	2414	33	2434	53	2454	73	2474
14	2415	34	2435	54	2455	74	2475
15	2416	35	2436	55	2456	75	2476
16	2417	36	2437	56	2457	76	2477
17	2418	37	2438	57	2458	77	2478
18	2419	38	2439	58	2459	78	2479
19	2420	39	2440	59	2460	79	2480
20	2421	40	2441	60	2461	---	---

1.1.6 Test Tool and Duty Cycle

Test Tool	ANT Tests, Version: 8.02	
Duty Cycle and Duty Factor	Duty Cycle (%)	Duty Factor (dB)
	100.00%	0.00

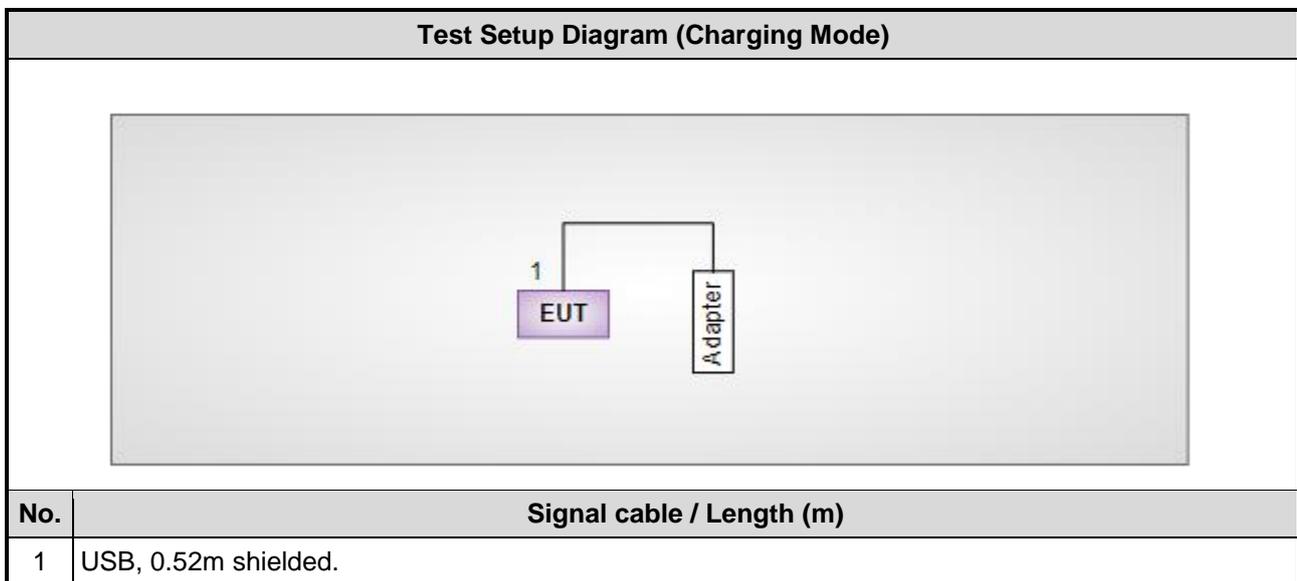
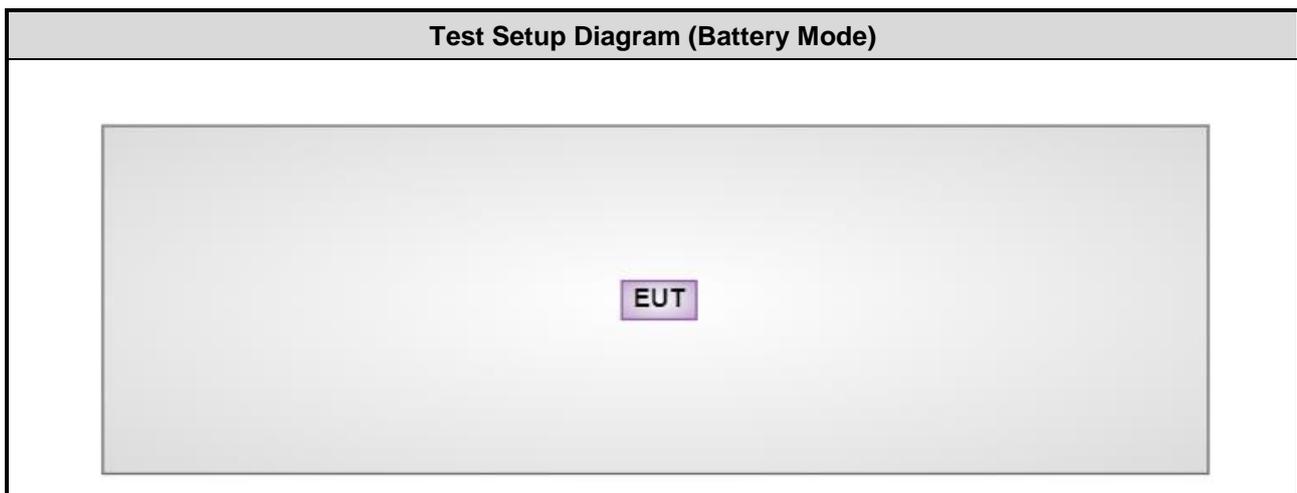
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)		
	2402	2441	2480
ANT+	Default	Default	Default

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Adapter	samsung	ETA-U90JWS	---	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	May 09, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Feb. 16, 2022	Feb. 15, 2023
LISN	R&S	ENV216	101579	Apr. 21, 2022	Apr. 20, 2023
LISN (Support Unit)	SCHWARZBECK	NSLK 8127	8127667	Jan .07, 2022	Jan .06, 2023
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 19, 2021	Oct. 18, 2022
50 ohm terminal (Support Unit)	NA	50	04	May 25, 2021	May 24, 2022
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Apr. 22 ~ Apr. 23, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 15, 2022	Mar. 14, 2023
Spectrum Analyzer	R&S	FSV40	101498	Nov. 29, 2021	Nov. 28, 2022
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jun. 30, 2021	Jun. 29, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 03, 2021	Dec. 02, 2022
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Jan. 11, 2022	Jan. 10, 2023
Preamplifier	EMC	EMC02325	980225	Jun. 29, 2021	Jun. 28, 2022
Preamplifier	Agilent	83017A	MY39501308	Sep. 28, 2021	Sep. 27, 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 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 05, 2021	Oct. 04, 2022
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 05, 2021	Oct. 04, 2022
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 05, 2021	Oct. 04, 2022
RF Cable	EMC	EMC104-35M-35M-8000	210920	Oct. 05, 2021	Oct. 04, 2022
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 05, 2021	Oct. 04, 2022
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

47 CFR FCC Part 15.249
ANSI C63.10-2013

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 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
Bandwidth	± 34.130 Hz
AC conducted emission	± 2.92 dB
Radiated emission ≤ 1 GHz	± 3.41 dB
Radiated emission > 1 GHz	± 4.59 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, 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	Mode	Test Frequency (MHz)	Data Rate	Test Configuration
AC Power Line Conducted Emissions	Charging	---	---	1
Field Strength of Fundamental	GFSK	2402, 2441, 2480	1 Mbps	2
Radiated Emissions ≤ 1GHz	GFSK	2480	1 Mbps	2
	Charging	---	---	1
Radiated Emissions > 1GHz	GFSK	2402, 2441, 2480	1 Mbps	2
20dB bandwidth	GFSK	2402, 2441, 2480	1 Mbps	2

NOTE:

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** result was found as the worst case and was shown in this report.
2. The test configurations are listed as follows:
 - 1) Configuration 1: Charging mode
 - 2) Configuration 2: Battery mode

3 Transmitter Test Results

3.1 Radiated Emission

This section includes field strength of fundamental, field strength of harmonics and emissions radiated outside of the operating frequency bands.

3.1.1 Limit of field strength of fundamental and field strength of harmonics

Fundamental Frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
2400–2483.5 MHz	50	500

3.1.2 Limit of Unwanted Emissions

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in below table, whichever is the lesser attenuation.

Radiated emission limits			
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.

3.1.3 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:

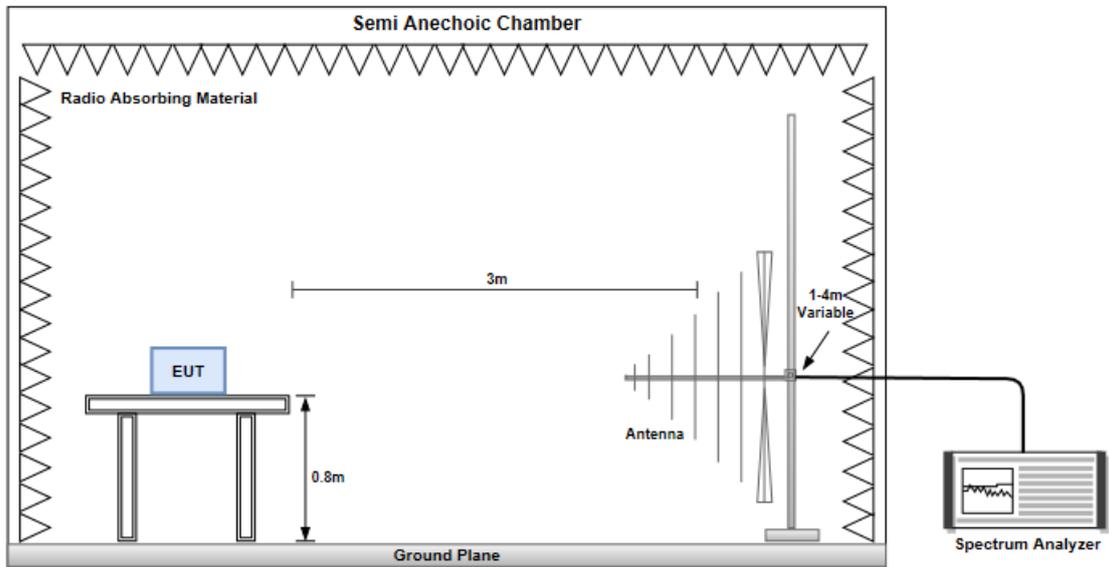
1. Radiated emission below 1GHz
120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission
2. Radiated emission above 1GHz / Peak value except fundamental
RBW=1MHz, VBW=3MHz and Peak detector
3. Radiated emission above 1GHz / Average value for field strength of fundamental and harmonics
The average value is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

$$20\log(\text{Duty cycle}) = 20\log \frac{0.1971 \times 1\text{ms}}{100\text{ms}} = -54.11\text{dB}$$

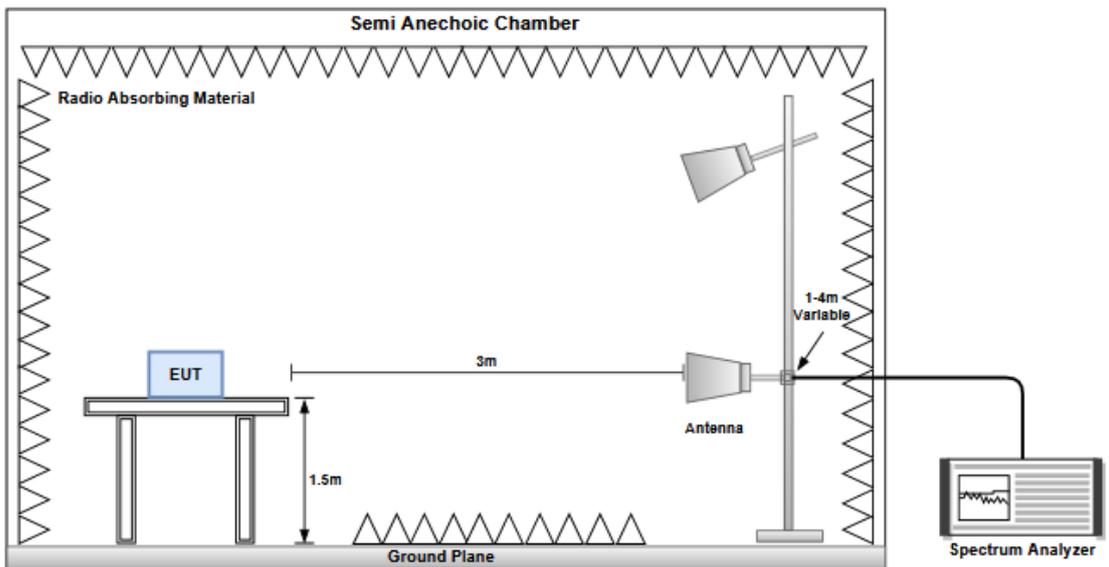
4. Radiated emission above 1GHz / Average value for other emissions
RBW=1MHz, VBW=1/T and Peak detector
5. Radiated emission Peak value for fundamental
RBW=1MHz, VBW=3MHz and Peak detector

3.1.4 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



3.1.5 Test Results

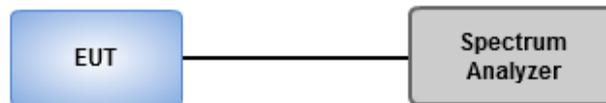
Refer to Appendix A.

3.2 20dB and Occupied Bandwidth

3.2.1 Test Procedures

1. Set resolution bandwidth (RBW) = 20 kHz, Video bandwidth = 100 kHz.
2. Detector = Peak(20 dB bandwidth) / Sample(Occupied bandwidth), Trace mode = max hold
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20dB relative to the maximum level measured in the fundamental emission.
5. Use the occupied measurement function of spectrum analyzer to measure 99% occupied bandwidth.

3.2.2 Test Setup



3.2.3 Test Results

Ambient Condition	24°C / 61%	Tested By	Roger Lu
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Refer to Appendix B.

3.3 AC Power Line Conducted Emissions

3.3.1 Limit of AC Power Line Conducted Emissions

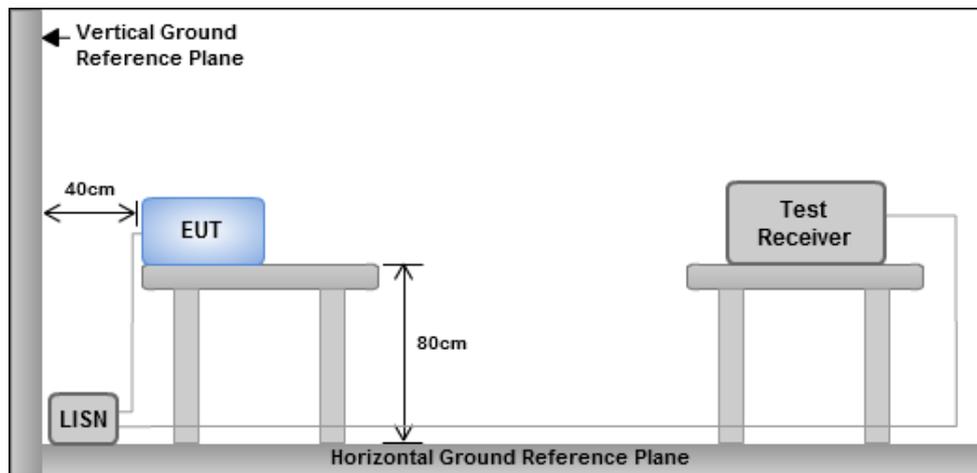
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.3.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

3.3.3 Test Setup



- Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.3.4 Test Results

Refer to Appendix C.

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

No.3-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
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

Fax: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

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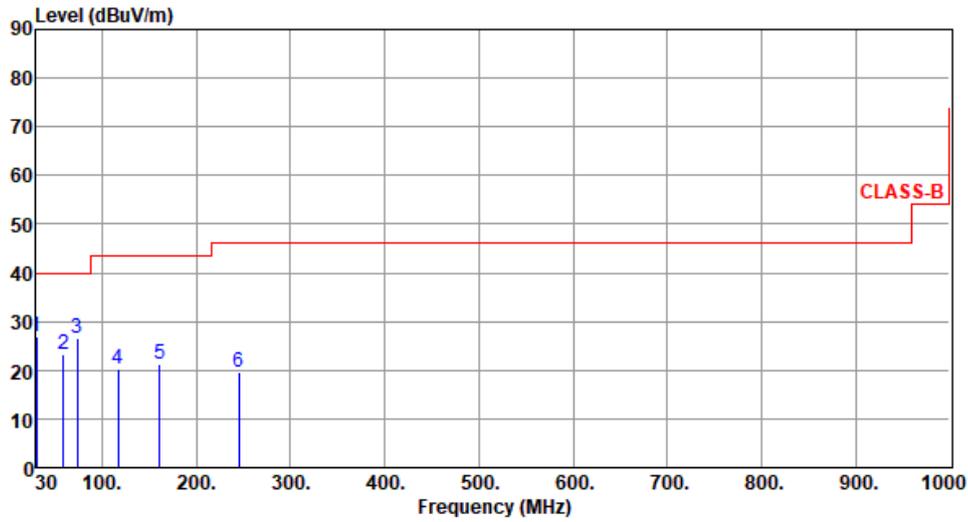


Configuration 2: Battery mode

Unwanted Emissions (Below 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):22 Humidity(%):68



	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	30.00	26.82	40.00	-13.18	36.76	-9.94	Peak	---	---
2	59.10	23.29	40.00	-16.71	32.64	-9.35	Peak	---	---
3	73.65	26.57	40.00	-13.43	38.43	-11.86	Peak	---	---
4	117.30	20.23	43.50	-23.27	31.14	-10.91	Peak	---	---
5	160.95	21.13	43.50	-22.37	29.91	-8.78	Peak	---	---
6	245.34	19.65	46.00	-26.35	29.81	-10.16	Peak	---	---

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

*Factor includes antenna factor , cable loss and amplifier gain

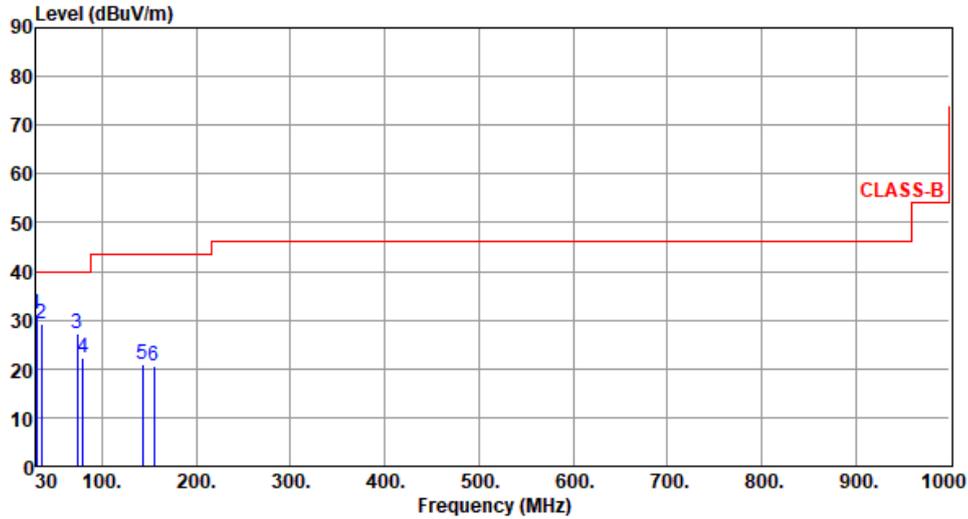
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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



Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):22 Humidity(%):68



	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	30.00	31.24	40.00	-8.76	41.18	-9.94	Peak	---	---
2	35.82	29.32	40.00	-10.68	38.75	-9.43	Peak	---	---
3	73.65	27.10	40.00	-12.90	38.96	-11.86	Peak	---	---
4	79.47	22.38	40.00	-17.62	35.64	-13.26	Peak	---	---
5	142.52	21.02	43.50	-22.48	30.10	-9.08	Peak	---	---
6	155.13	20.62	43.50	-22.88	29.32	-8.70	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).

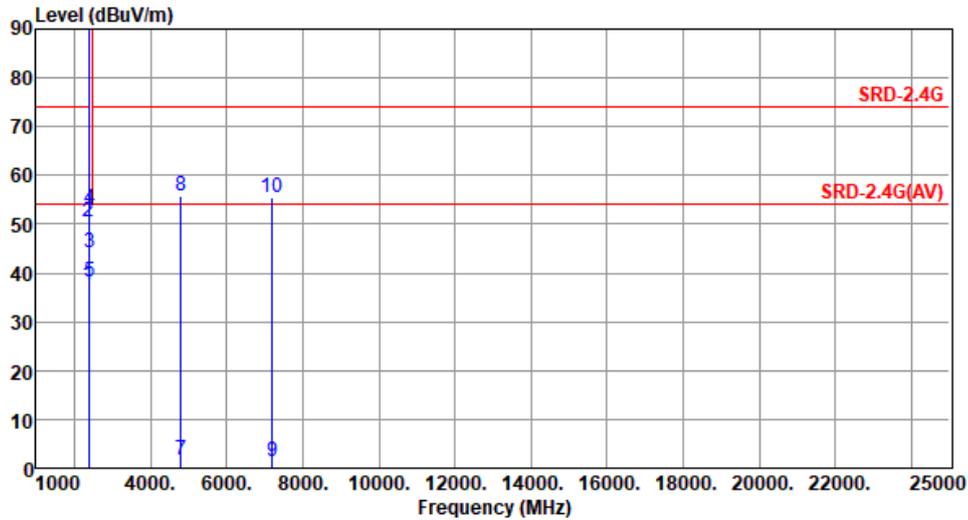
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.



Unwanted Emissions (Above 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		

Test By :Roger Lu Temperature(°C):24 Humidity(%):61



	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	2390.00	37.50	54.00	-16.50	40.25	-2.75	Average	100	139
2	2390.00	50.47	74.00	-23.53	53.22	-2.75	Peak	100	139
3	2400.00	44.24	54.00	-9.76	47.01	-2.77	Average	100	139
4	2400.00	53.05	74.00	-20.95	55.82	-2.77	Peak	100	139
5	2402.00	38.33	94.00	-55.67			Average	100	139
6	2402.00	92.44	114.00	-21.56	95.21	-2.77	Peak	100	139
7	4804.00	1.65	54.00	-52.35			Average	102	161
8	4804.00	55.76	74.00	-18.24	51.63	4.13	Peak	102	161
9	7206.00	1.25	54.00	-52.75			Average	100	40
10	7206.00	55.36	74.00	-18.64	46.30	9.06	Peak	100	40

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

*Factor includes antenna factor , cable loss and amplifier gain

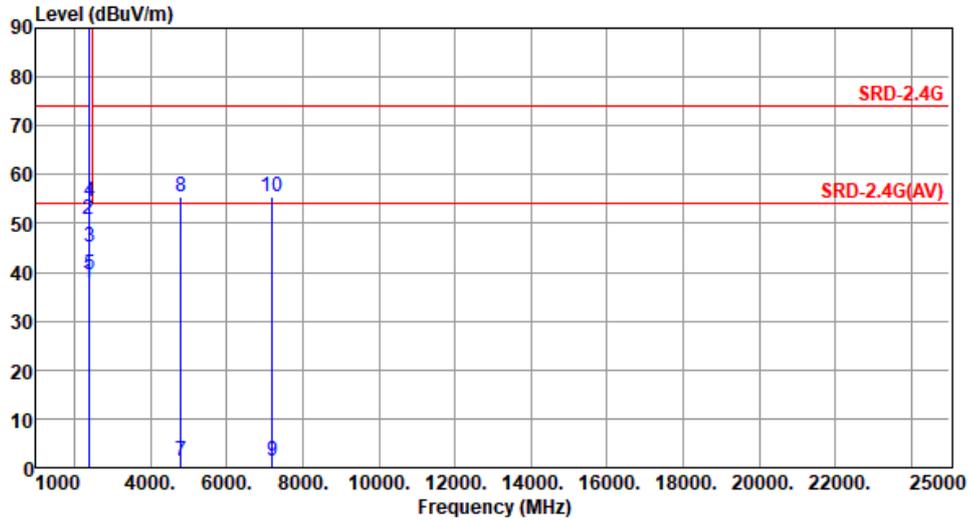
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		

Test By : Roger Lu Temperature(°C):24 Humidity(%):61



	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	2390.00	37.81	54.00	-16.19	40.56	-2.75	Average	236	183
2	2390.00	50.70	74.00	-23.30	53.45	-2.75	Peak	236	183
3	2400.00	45.04	54.00	-8.96	47.81	-2.77	Average	236	183
4	2400.00	54.31	74.00	-19.69	57.08	-2.77	Peak	236	183
5	2402.00	39.48	94.00	-54.52			Average	236	183
6	2402.00	93.59	114.00	-20.41	96.36	-2.77	Peak	236	183
7	4804.00	1.21	54.00	-52.79			Average	100	105
8	4804.00	55.32	74.00	-18.68	51.19	4.13	Peak	100	105
9	7206.00	1.45	54.00	-52.55			Average	100	30
10	7206.00	55.56	74.00	-18.44	46.50	9.06	Peak	100	30

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: When average value is calculated not measured, no SA reading and factor value are listed.

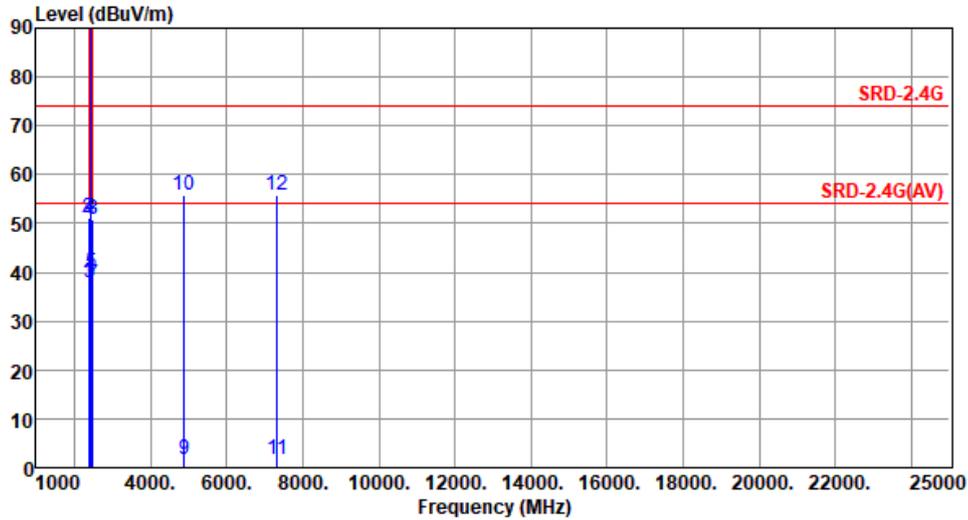


Modulation	GFSK	Test Freq. (MHz)	2442																																																																																																																																																																																							
Polarization	Horizontal																																																																																																																																																																																									
Test By : Roger Lu Temperature(°C):24 Humidity(%):61																																																																																																																																																																																										
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Modulation	GFSK	Test Freq. (MHz)	2442
Polarization	Vertical		

Test By : Roger Lu Temperature(°C): 24 Humidity(%): 61



	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	2390.00	37.73	54.00	-16.27	40.48	-2.75	Average	223	185
2	2390.00	51.14	74.00	-22.86	53.89	-2.75	Peak	223	185
3	2400.00	37.82	54.00	-16.18	40.59	-2.77	Average	223	185
4	2400.00	51.25	74.00	-22.75	54.02	-2.77	Peak	223	185
5	2441.00	39.91	94.00	-54.09			Average	223	185
6	2441.00	94.02	114.00	-19.98	96.82	-2.80	Peak	223	185
7	2483.50	37.58	54.00	-16.42	40.28	-2.70	Average	223	185
8	2483.50	50.95	74.00	-23.05	53.65	-2.70	Peak	223	185
9	4882.00	1.52	54.00	-52.48			Average	100	108
10	4882.00	55.63	74.00	-18.37	51.51	4.12	Peak	100	108
11	7323.00	1.73	54.00	-52.27			Average	100	60
12	7323.00	55.84	74.00	-18.16	46.57	9.27	Peak	100	60

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

*Factor includes antenna factor , cable loss and amplifier gain

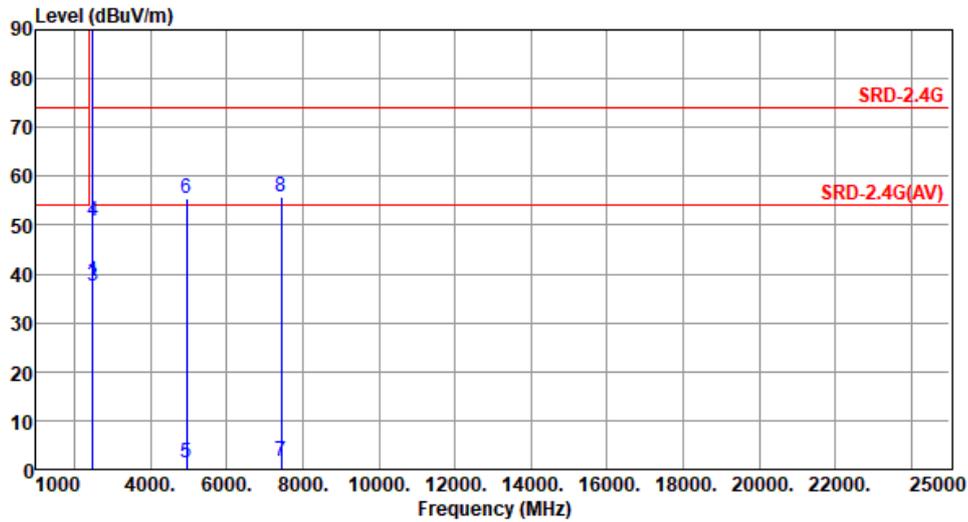
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		

Test By : Roger Lu Temperature(°C):24 Humidity(%):61



	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	2480.00	38.60	94.00	-55.40			Average	100	136
2	2480.00	92.71	114.00	-21.29	95.42	-2.71	Peak	100	136
3	2483.50	37.42	54.00	-16.58	40.12	-2.70	Average	100	136
4	2483.50	50.72	74.00	-23.28	53.42	-2.70	Peak	100	136
5	4960.00	1.34	54.00	-52.66			Average	103	155
6	4960.00	55.45	74.00	-18.55	51.42	4.03	Peak	103	155
7	7440.00	1.55	54.00	-52.45			Average	100	20
8	7440.00	55.66	74.00	-18.34	46.29	9.37	Peak	100	20

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

*Factor includes antenna factor , cable loss and amplifier gain

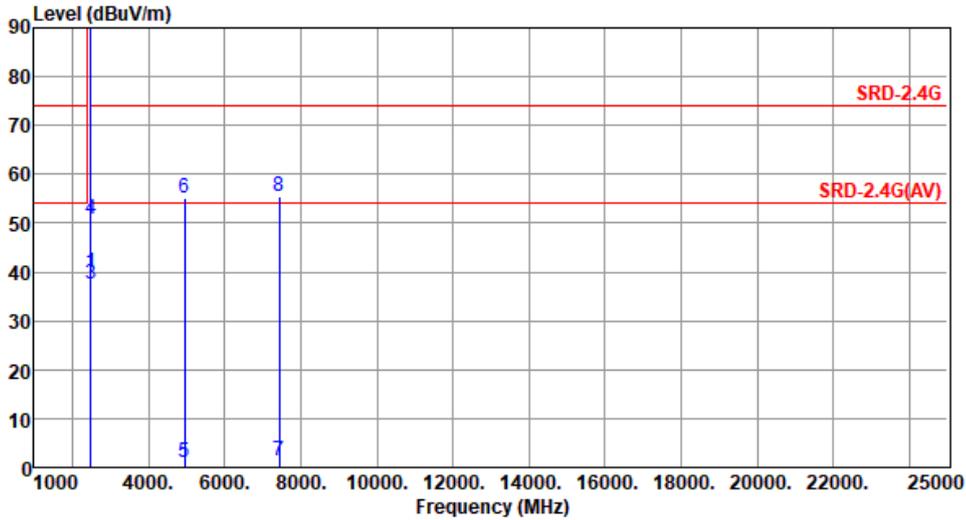
Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		

Test By : Roger Lu Temperature(°C):24 Humidity(%):61



	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	2480.00	39.83	94.00	-54.17			Average	223	187
2	2480.00	93.94	114.00	-20.06	96.65	-2.71	Peak	223	187
3	2483.50	37.68	54.00	-16.32	40.38	-2.70	Average	223	187
4	2483.50	50.88	74.00	-23.12	53.58	-2.70	Peak	223	187
5	4960.00	1.16	54.00	-52.84			Average	100	102
6	4960.00	55.27	74.00	-18.73	51.24	4.03	Peak	100	102
7	7440.00	1.26	54.00	-52.74			Average	100	90
8	7440.00	55.37	74.00	-18.63	46.00	9.37	Peak	100	90

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: When average value is calculated not measured, no SA reading and factor value are listed.



Configuration 1: Charging mode

Unwanted Emissions (Below 1GHz)

Modulation	Charging									
Polarization	Horizontal									
Test By : Akun Chung			Temperature(°C): 22			Humidity(%): 68				
<p>The graph displays the unwanted emission levels in dBuV/m across a frequency range from 30 MHz to 1000 MHz. A red step function represents the CLASS-B emission limit. The limit starts at 40 dBuV/m from 30 MHz to 100 MHz, rises to 45 dBuV/m from 100 MHz to 200 MHz, and then to 50 dBuV/m for the remainder of the frequency range. Six specific peaks are identified and numbered 2 through 6, with their corresponding emission levels and margins listed in the table below.</p>										
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	30.00	26.38	40.00	-13.62	36.32	-9.94	Peak	---	---	
2	38.73	28.59	40.00	-11.41	37.46	-8.87	Peak	---	---	
3	66.86	26.28	40.00	-13.72	36.60	-10.32	Peak	---	---	
4	135.73	25.24	43.50	-18.26	34.69	-9.45	Peak	---	---	
5	144.46	27.88	43.50	-15.62	36.96	-9.08	Peak	---	---	
6	160.95	22.40	43.50	-21.10	31.18	-8.78	Peak	---	---	

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

*Factor includes antenna factor , cable loss and amplifier gain

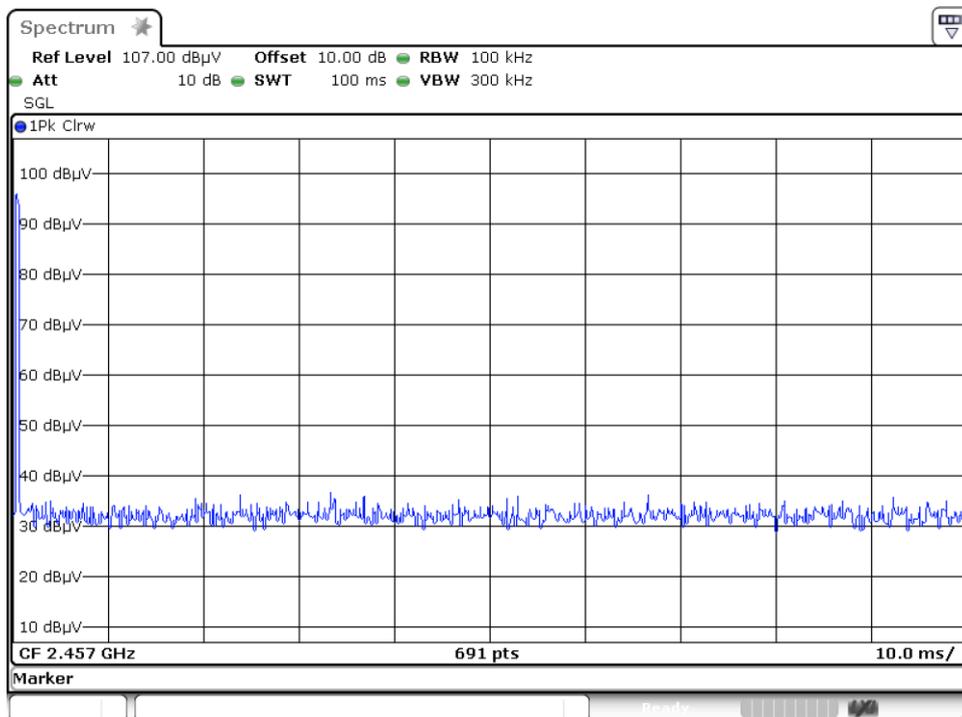
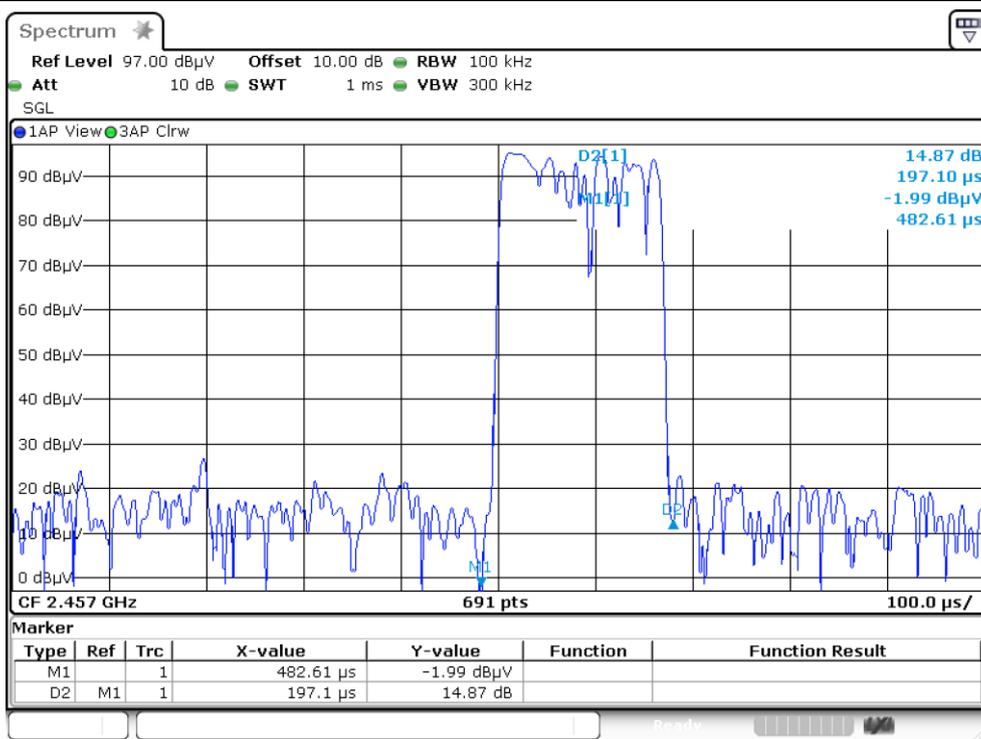
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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



Modulation	Charging									
Polarization	Vertical									
Test By : Akun Chung			Temperature(°C): 22			Humidity(%): 68				
<p>The graph displays the emission level in dBuV/m across a frequency range from 30 MHz to 1000 MHz. A red step function represents the CLASS-B limit, starting at 40 dBuV/m from 30 MHz to 100 MHz, rising to 45 dBuV/m from 100 MHz to 200 MHz, and then to 50 dBuV/m for the remainder of the spectrum. Six blue vertical lines indicate measured peaks at 30.00, 45.52, 73.65, 135.73, 154.16, and 160.95 MHz. The peak at 160.95 MHz is the highest, reaching approximately 24.21 dBuV/m.</p>										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
								cm	deg	
1	30.00	33.77	40.00	-6.23	43.71	-9.94	Peak	---	---	
2	45.52	29.80	40.00	-10.20	38.30	-8.50	Peak	---	---	
3	73.65	30.73	40.00	-9.27	42.59	-11.86	Peak	---	---	
4	135.73	21.46	43.50	-22.04	30.91	-9.45	Peak	---	---	
5	154.16	27.79	43.50	-15.71	36.58	-8.79	Peak	---	---	
6	160.95	24.21	43.50	-19.29	32.99	-8.78	Peak	---	---	

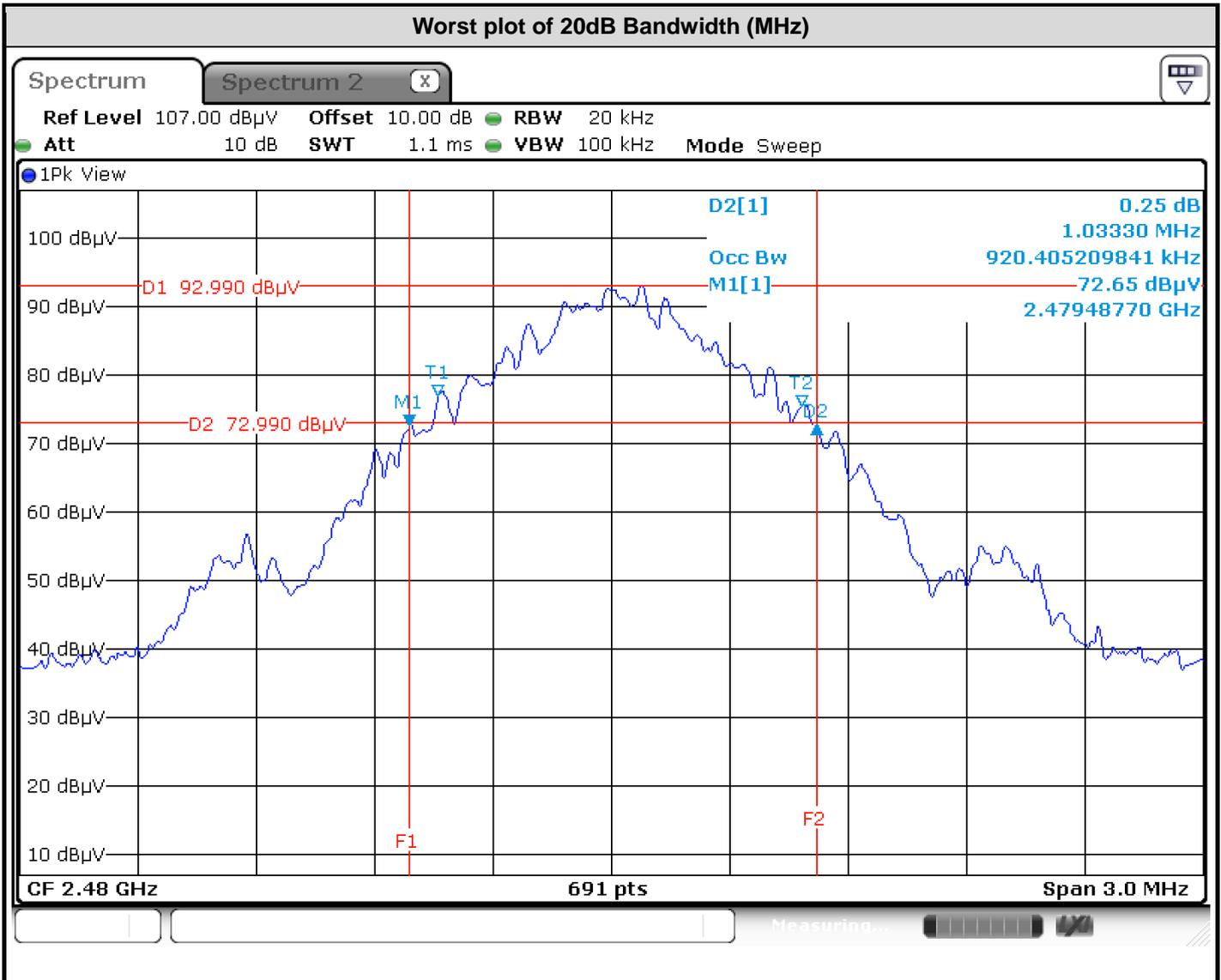
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)
 *Factor includes antenna factor , cable loss and amplifier gain
 Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
 Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

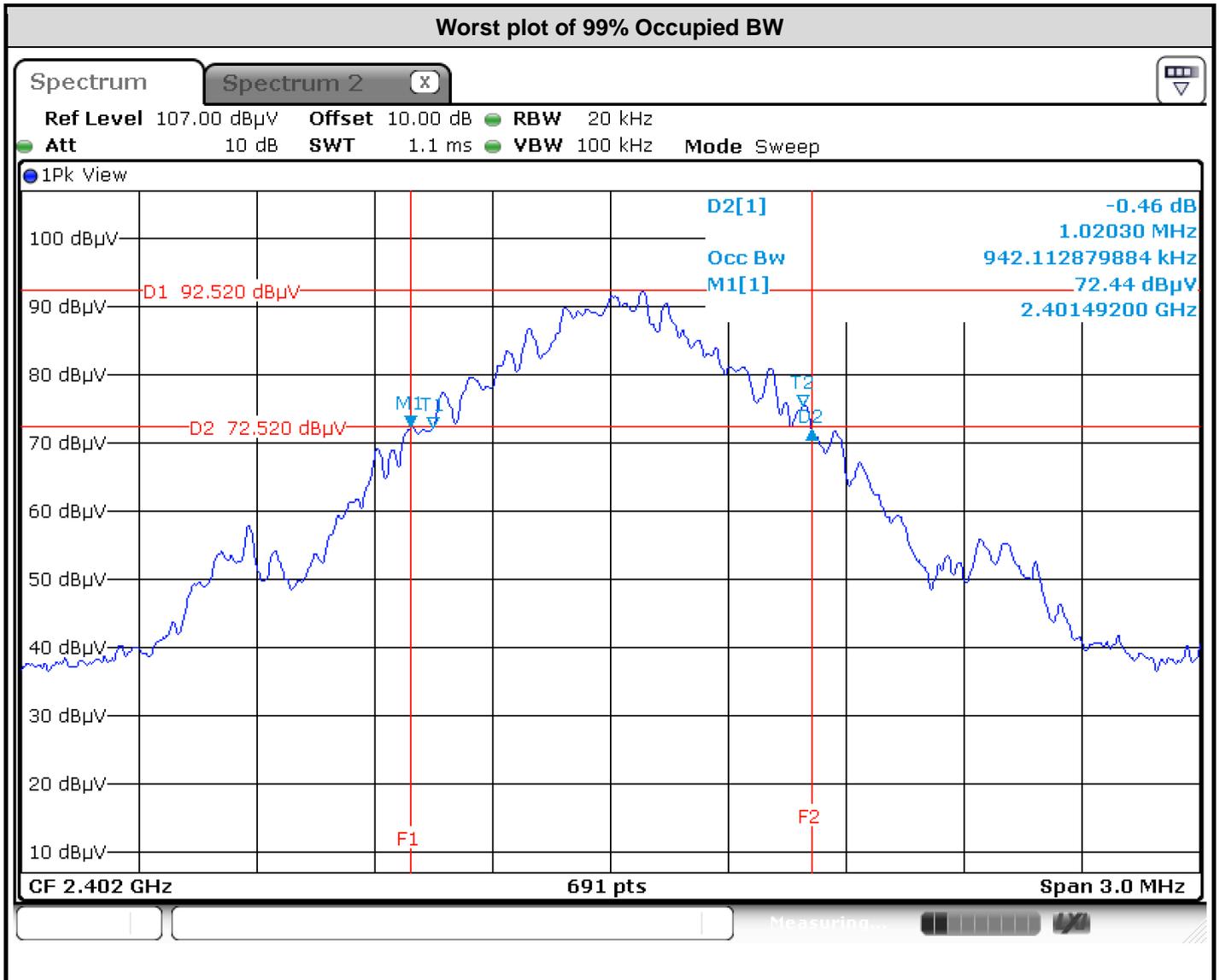


$$20\log(\text{Duty cycle}) = 20\log \frac{0.1971 \times 1 \text{ ms}}{100 \text{ ms}} = -54.11\text{dB}$$



Frequency (MHz)	20dB Bandwidth (MHz)	99% Occupied BW
2402.0	1.020	0.942
2441.0	1.016	0.933
2480.0	1.033	0.920

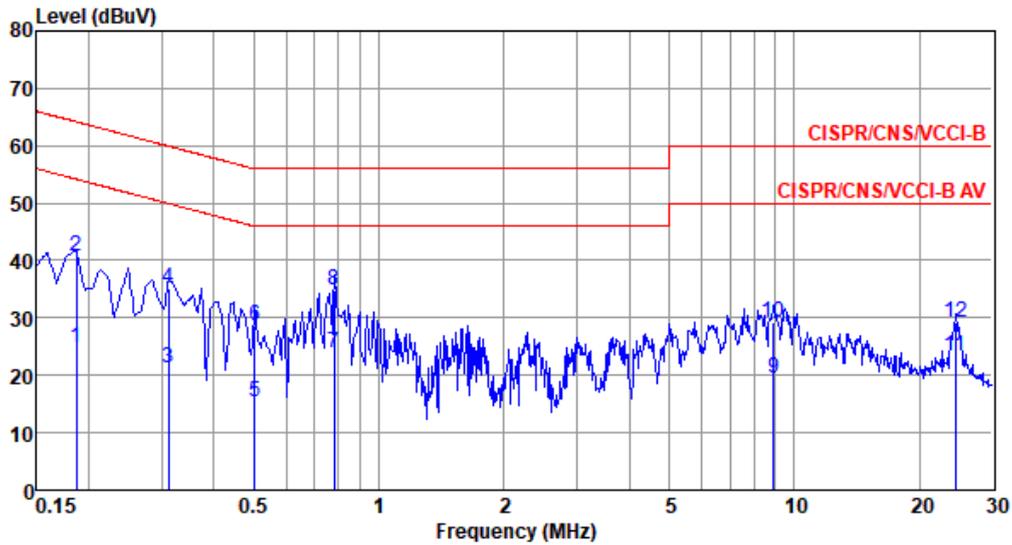






Modulation	Charging
Power Phase	Line

Test by : Joe Liao Temperature: 22°C Humidity: 61%



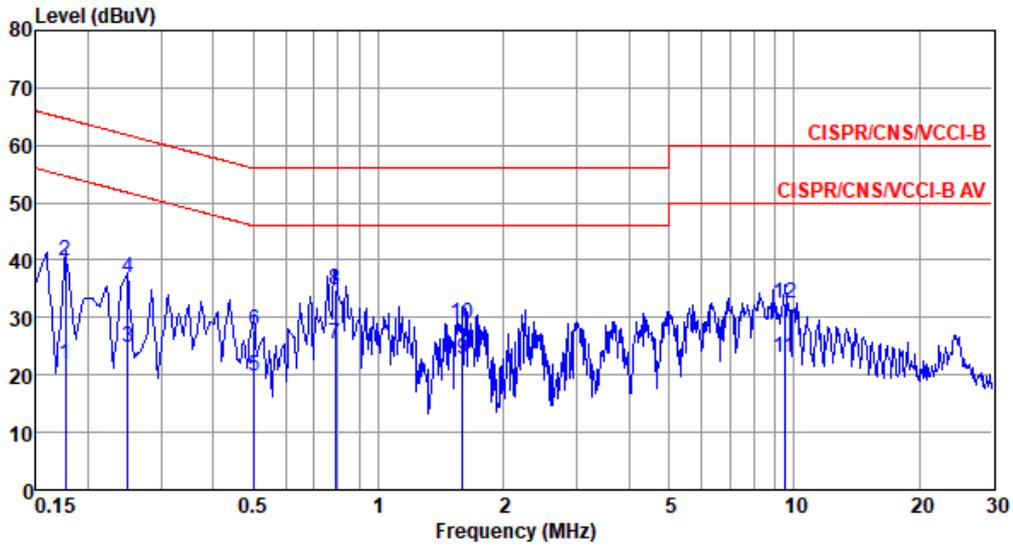
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.186	24.71	54.20	-29.49	14.74	9.68	0.08	0.21	Average
2	0.186	40.71	64.20	-23.49	30.74	9.68	0.08	0.21	QP
3	0.312	21.15	49.93	-28.78	11.09	9.67	0.08	0.31	Average
4	0.312	35.05	59.93	-24.88	24.99	9.67	0.08	0.31	QP
5	0.502	15.34	46.00	-30.66	5.21	9.67	0.10	0.36	Average
6	0.502	28.61	56.00	-27.39	18.48	9.67	0.10	0.36	QP
7	0.779	23.98	46.00	-22.02	13.79	9.68	0.14	0.37	Average
8*	0.779	34.96	56.00	-21.04	24.77	9.68	0.14	0.37	QP
9	8.916	19.60	50.00	-30.40	9.01	9.73	0.42	0.44	Average
10	8.916	29.30	60.00	-30.70	18.71	9.73	0.42	0.44	QP
11	24.400	23.35	50.00	-26.65	12.28	9.70	0.69	0.68	Average
12	24.400	29.12	60.00	-30.88	18.05	9.70	0.69	0.68	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 Note 2: Over Limit (dB) = Level (dBuV) - Limit Line (dBuV).



Modulation	Charging
Power Phase	Neutral

Test by : Joe Liao Temperature: 22°C Humidity: 61%



	Freq MHz	Level dBUV	Limit Line dBUV	Over Limit dB	Read Level dBUV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.177	21.73	54.64	-32.91	11.87	9.61	0.08	0.17	Average
2	0.177	39.75	64.64	-24.89	29.89	9.61	0.08	0.17	QP
3	0.249	24.81	51.78	-26.97	14.94	9.61	0.08	0.18	Average
4	0.249	36.84	61.78	-24.94	26.97	9.61	0.08	0.18	QP
5	0.502	19.89	46.00	-26.11	9.97	9.61	0.10	0.21	Average
6	0.502	27.88	56.00	-28.12	17.96	9.61	0.10	0.21	QP
7*	0.788	25.45	46.00	-20.55	15.44	9.61	0.14	0.26	Average
8	0.788	34.87	56.00	-21.13	24.86	9.61	0.14	0.26	QP
9	1.593	22.80	46.00	-23.20	12.70	9.62	0.19	0.29	Average
10	1.593	28.99	56.00	-27.01	18.89	9.62	0.19	0.29	QP
11	9.502	23.03	50.00	-26.97	12.53	9.69	0.44	0.37	Average
12	9.502	32.41	60.00	-27.59	21.91	9.69	0.44	0.37	QP

Note 1: Level (dBUV) = Read Level (dBUV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 2: Over Limit (dB) = Level (dBUV) – Limit Line (dBUV).

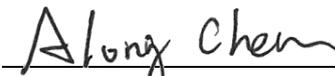
FCC Test Report

FCC ID : IPH-04390
Equipment : Smart Watch
Model No. : A04390
Brand Name : GARMIN
Applicant : Garmin International, Inc.
Address : 1200 E. 151st Street Olathe, KS 66062 United States
Standard : 47 CFR FCC Part 15.247
Received Date : Apr. 07, 2022
Tested Date : Apr. 21 ~ May 09, 2022

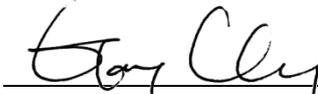
We, International Certification Corporation, would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It shall not be reproduced except in full without the 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
FR240702AE	Rev. 01	Initial issue	Jun. 01, 2022

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.788MHz 25.45 (Margin -20.55dB) - AV	Pass
15.247(d) 15.209	Unwanted Emissions	[dBuV/m at 3m]: 30.00MHz 33.77 (Margin -6.23dB) - PK	Pass
15.247(b)(3)	Conducted Output Power	Power [dBm]: 0.21	Pass
15.247(a)(2)	6dB Bandwidth	Meet the requirement of limit	Pass
15.247(e)	Power Spectral Density	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	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)

RF General Information				
Frequency Range (MHz)	Bluetooth Mode	Ch. Freq. (MHz)	Channel Number	Data Rate
2400-2483.5	V5.0 LE	2402-2480	0-39 [40]	1 Mbps
		2404-2478	0-37 [38]	2 Mbps

Note: Bluetooth LE (Low energy) uses GFSK modulation.

1.1.2 Antenna Details

Ant. No.	Brand	Model	Type	Connector	Gain (dBi)
1	Garmin	117-01806-0X	PIFA	No	-2.08

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Type	5Vdc from adapter 3.87Vdc from battery
------------	---

1.1.4 Accessories

No.	Equipment	Description
1	Battery	Brand: Garmin Model: 361-00136-20 Power Rating: 3.87V, 205mAh
2	USB cable	Brand: GARMIN Model: 320-01069-10 Line: 0.52m shielded without core

1.1.5 Channel List

Frequency band (MHz)				2400~2483.5			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
37	2402	9	2422	18	2442	28	2462
0	2404	10	2424	19	2444	29	2464
1	2406	38	2426	20	2446	30	2466
2	2408	11	2428	21	2448	31	2468
3	2410	12	2430	22	2450	32	2470
4	2412	13	2432	23	2452	33	2472
5	2414	14	2434	24	2454	34	2474
6	2416	15	2436	25	2456	35	2476
7	2418	16	2438	26	2458	36	2478
8	2420	17	2440	27	2460	39	2480

1.1.6 Test Tool and Duty Cycle

Test Tool	BLE Test, Version: 0.20	
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)
BT-LE(1Mbps)	43.06%	3.66
BT-LE(2Mbps)	25.35%	5.96

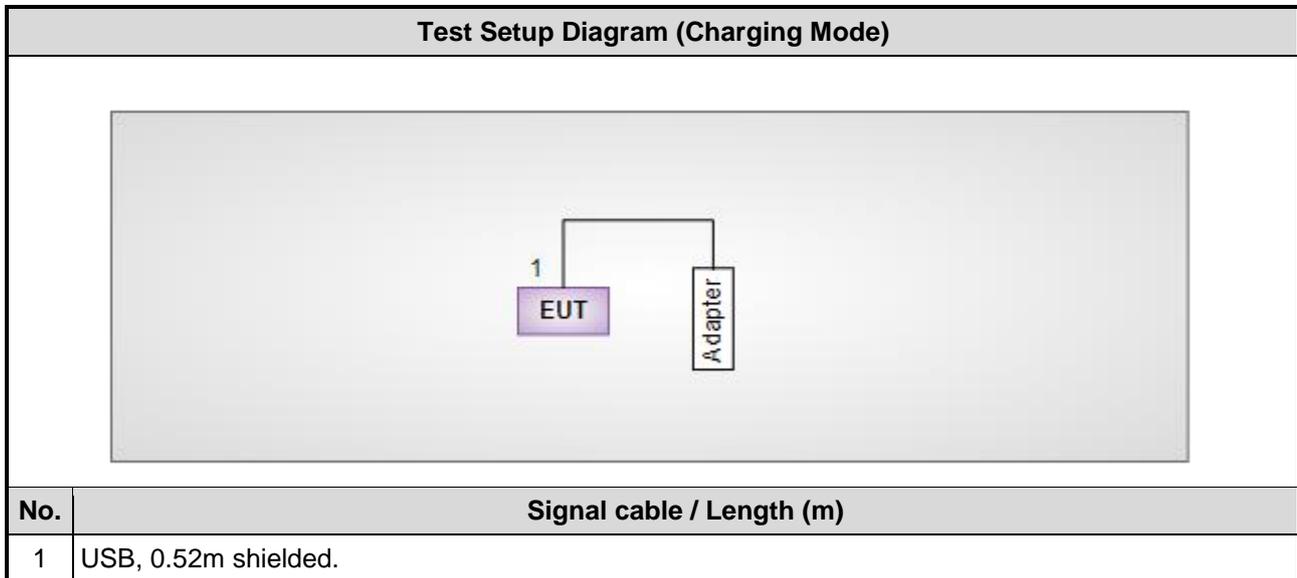
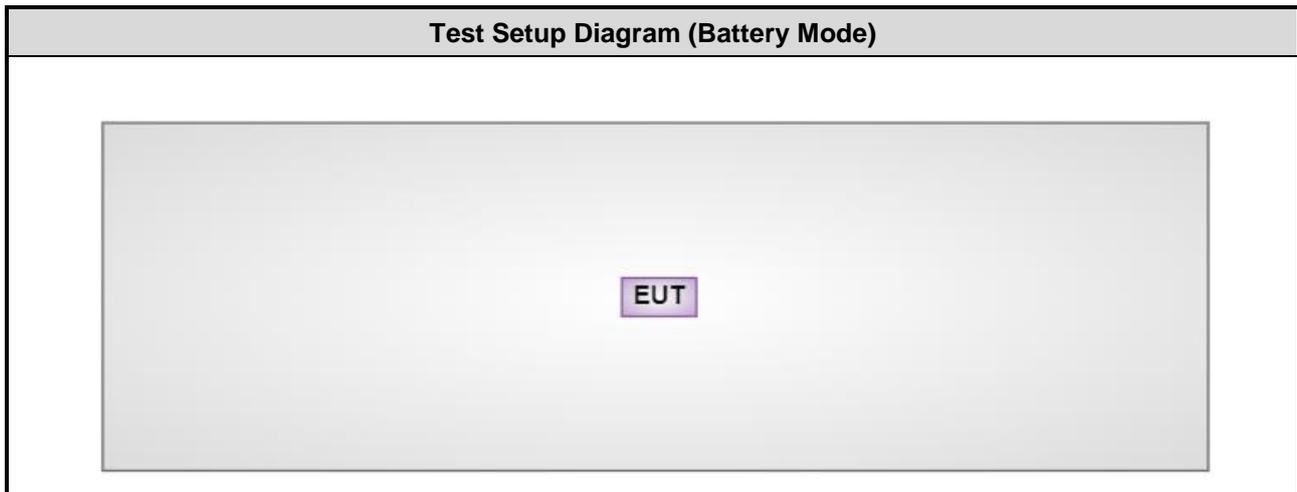
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)		
	2402	2440	2480
BT-LE(1Mbps)	default	default	default
Modulation Mode	2404	2440	2478
BT-LE(2Mbps)	default	default	default

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Adapter	samsung	ETA-U90JWS	---	---

1.3 Test Setup Chart



1.4 Test Equipment List and Calibration Data

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	May 09, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Feb. 16, 2022	Feb. 15, 2023
LISN	R&S	ENV216	101579	Apr. 21, 2022	Apr. 20, 2023
LISN (Support Unit)	SCHWARZBECK	NSLK 8127	8127667	Jan .07, 2022	Jan .06, 2023
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 19, 2021	Oct. 18, 2022
50 ohm terminal (Support Unit)	NA	50	04	May 25, 2021	May 24, 2022
Measurement Software	AUDIX	e3	6.120210k	NA	NA

Note: Calibration Interval of instruments listed above is one year.

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Apr. 21 ~ Apr. 23, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 15, 2022	Mar. 14, 2023
Spectrum Analyzer	R&S	FSV40	101498	Nov. 29, 2021	Nov. 28, 2022
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jun. 30, 2021	Jun. 29, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 03, 2021	Dec. 02, 2022
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Jan. 11, 2022	Jan. 10, 2023
Preamplifier	EMC	EMC02325	980225	Jun. 29, 2021	Jun. 28, 2022
Preamplifier	Agilent	83017A	MY39501308	Sep. 28, 2021	Sep. 27, 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 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 05, 2021	Oct. 04, 2022
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 05, 2021	Oct. 04, 2022
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 05, 2021	Oct. 04, 2022
RF Cable	EMC	EMC104-35M-35M-8000	210920	Oct. 05, 2021	Oct. 04, 2022
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 05, 2021	Oct. 04, 2022
Measurement Software	AUDIX	e3	6.120210g	NA	NA

Note: Calibration Interval of instruments listed above is one year.

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	May 03, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101910	Apr. 18, 2022	Apr. 17, 2023
Power Meter	Anritsu	ML2495A	1241002	Nov. 07, 2021	Nov. 06, 2022
Power Sensor	Anritsu	MA2411B	1207366	Nov. 07, 2021	Nov. 06, 2022
Measurement Software	Sporton	SENSE-15247_FS	V5.10.7.11	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

47 CFR FCC Part 15.247
ANSI C63.10-2013

1.6 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

1.7 Deviation from Test Standard and Measurement Procedure

None

1.8 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
Bandwidth	± 34.130 Hz
Conducted power	± 0.808 dB
Power density	± 0.583 dB
Conducted emission	± 2.715 dB
AC conducted emission	± 2.92 dB
Unwanted Emission ≤ 1 GHz	± 3.41 dB
Unwanted Emission > 1 GHz	± 4.59 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, 03CH01-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.)

- 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	Mode	Test Frequency (MHz)	Test Configuration
AC Power Line Conducted Emissions	Charging	---	1
Unwanted Emissions ≤ 1GHz	BT-LE(1Mbps)	2480	2
	Charging	---	1
Unwanted Emissions > 1GHz	BT-LE(1Mbps) BT-LE(2Mbps)	2402, 2440, 2480 2404, 2440, 2478	2
Conducted Output Power 6dB bandwidth Power spectral density	BT-LE(1Mbps)	2402, 2440, 2480	2
	BT-LE(2Mbps)	2404, 2440, 2478	

NOTE:

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 had been tested by following test configurations.
 - 1) Configuration 1: Charging mode
 - 2) Configuration 2: Battery mode

3 Transmitter Test Results

3.1 6dB and Occupied Bandwidth

3.1.1 Limit of 6dB Bandwidth

The minimum 6dB bandwidth shall be at least 500 kHz.

3.1.2 Test Procedures

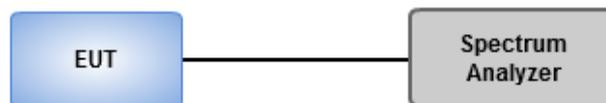
6dB Bandwidth

1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

1. Set resolution bandwidth (RBW) = 1% ~ 5 % of OBW, Video bandwidth = 3 x RBW
2. Detector = Sample, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Use the OBW measurement function of spectrum analyzer to measure the occupied bandwidth.

3.1.3 Test Setup



3.1.4 Test Results

Ambient Condition	23°C / 64%	Tested By	Brad Wu
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Refer to Appendix A.

3.2 Conducted Output Power

3.2.1 Limit of Conducted Output Power

Conducted power shall not exceed 1Watt.

Antenna gain $\leq 6\text{dBi}$, no any corresponding reduction is in output power limit.

3.2.2 Test Procedures

A broadband RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

3.2.3 Test Setup



3.2.4 Test Results

Ambient Condition	23°C / 64%	Tested By	Brad Wu
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Refer to Appendix B.

3.3 Power Spectral Density

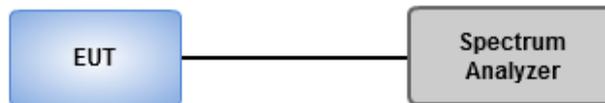
3.3.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band.

3.3.2 Test Procedures

1. Set the RBW = 3 kHz, VBW = 10 kHz.
2. Detector = Peak, Sweep time = auto couple.
3. Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

3.3.3 Test Setup



3.3.4 Test Results

Ambient Condition	23°C / 64%	Tested By	Brad Wu
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Refer to Appendix C.

3.4 Unwanted Emissions in Restricted Frequency Bands

3.4.1 Limit of Unwanted Emissions in 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.

3.4.2 Test Procedures

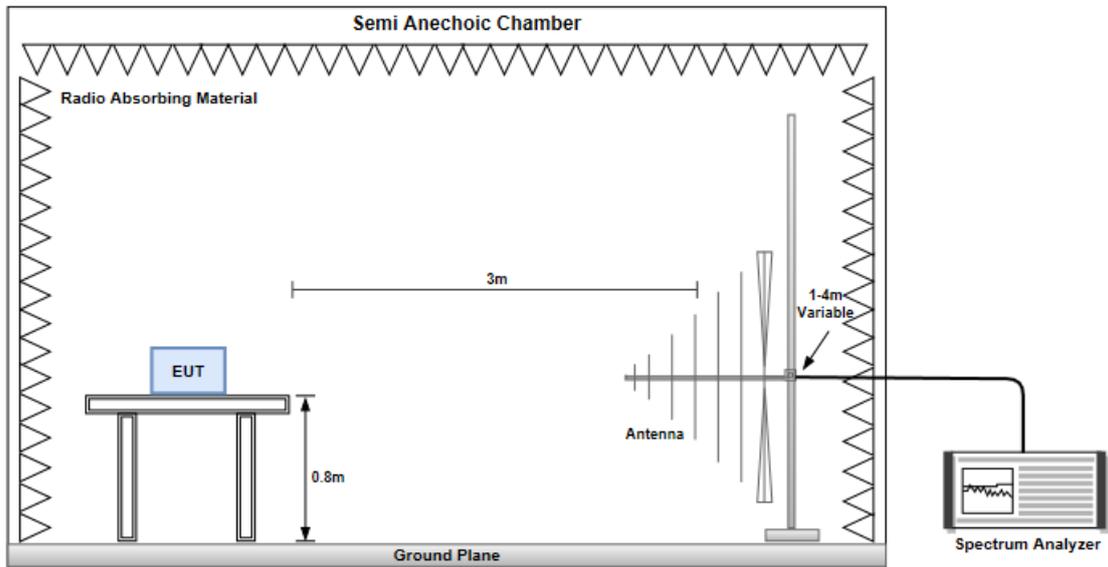
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

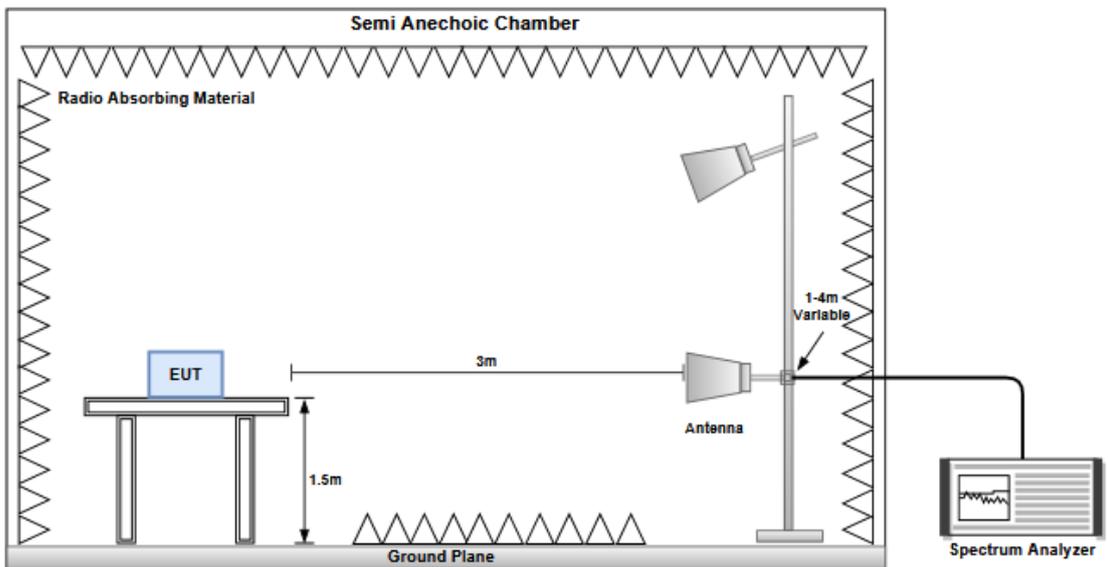
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.4.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



3.4.4 Test Results

Refer to Appendix D.

3.5 Emissions in non-restricted Frequency Bands

3.5.1 Emissions in non-restricted frequency bands limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.5.2 Test Procedures

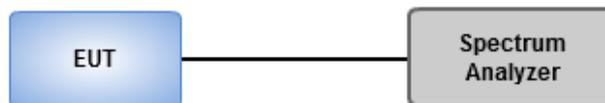
Reference level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.5.3 Test Setup



3.5.4 Test Results

Ambient Condition	23°C / 64%	Tested By	Brad Wu
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Refer to Appendix E.

3.6 AC Power Line Conducted Emissions

3.6.1 Limit of AC Power Line Conducted Emissions

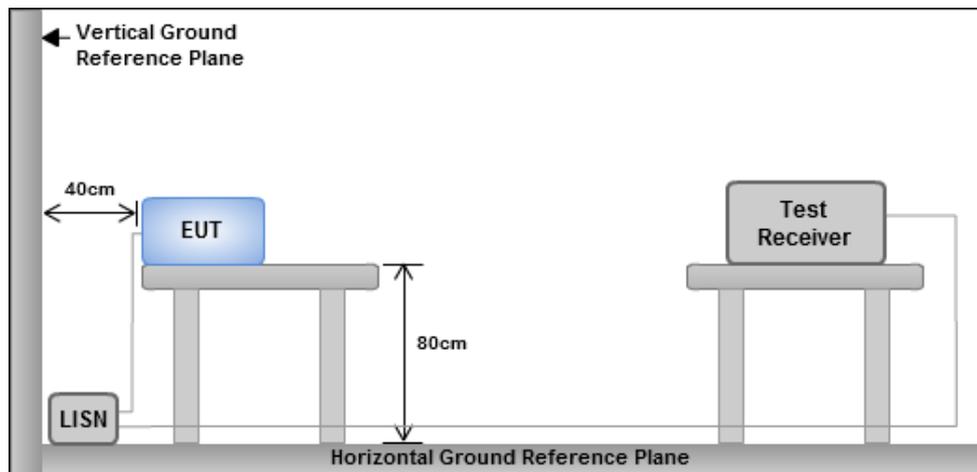
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.6.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V/60Hz

3.6.3 Test Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.6.4 Test Results

Refer to Appendix F.

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

No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan 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

Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==



Summary

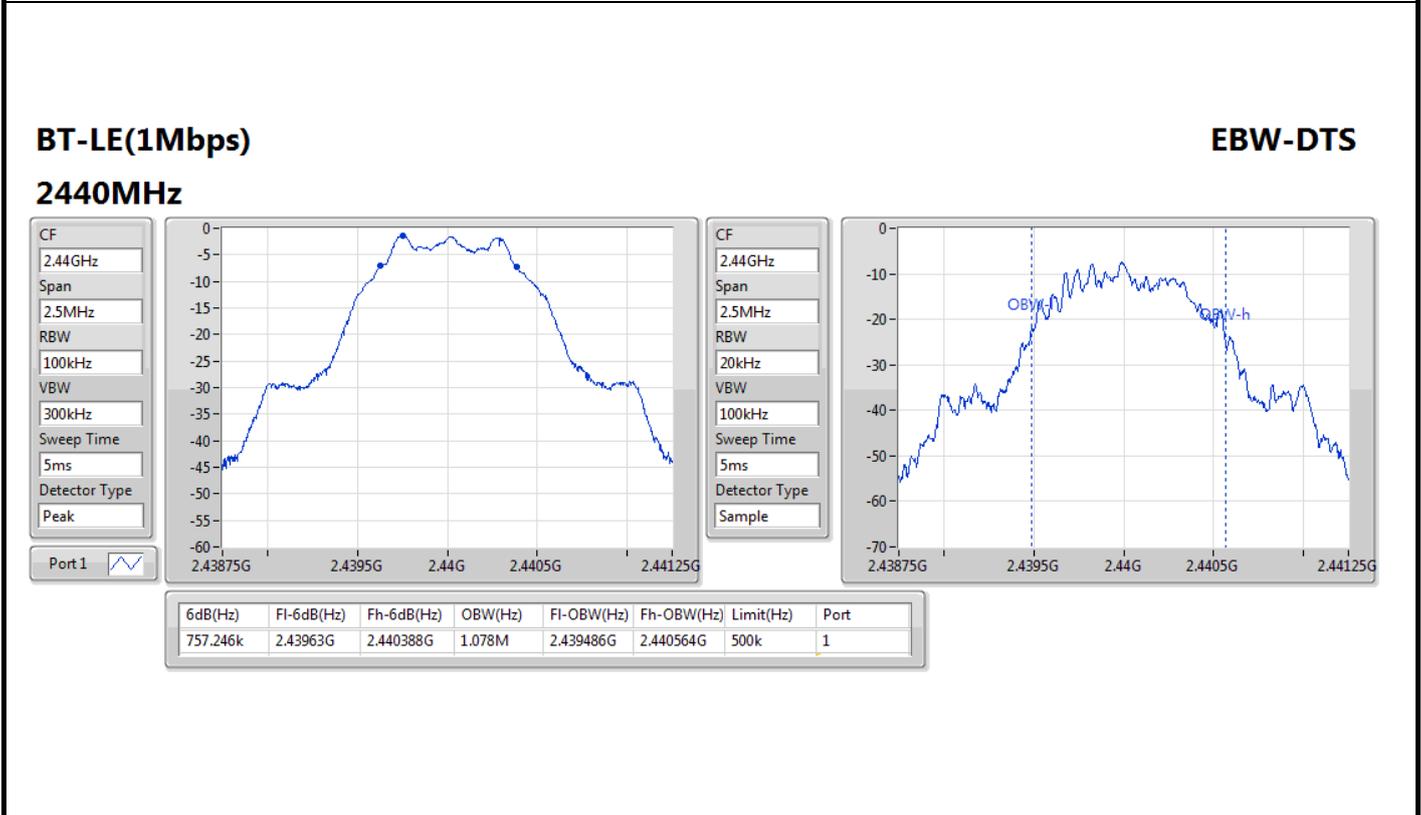
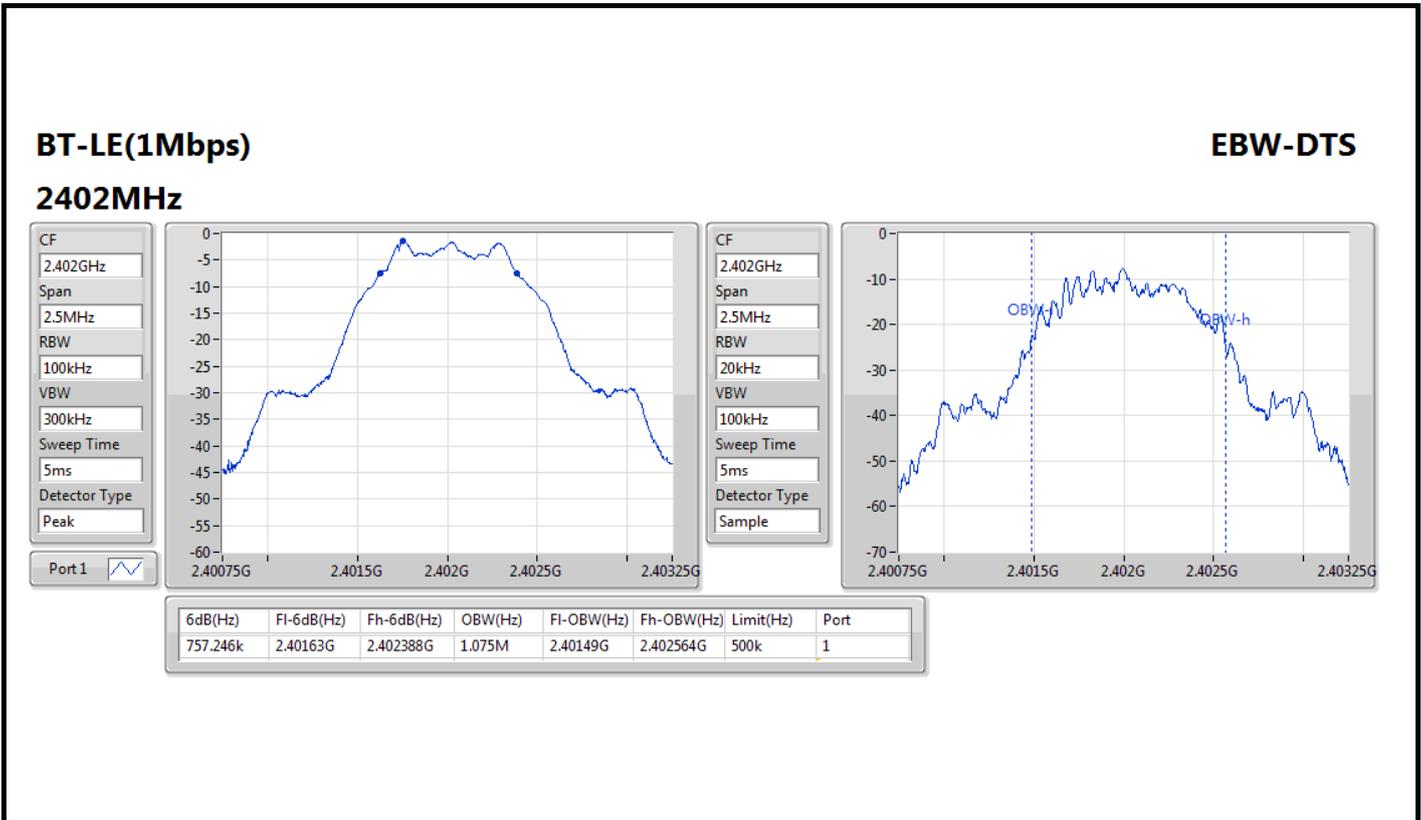
Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-LE(1Mbps)	757.246k	1.078M	1M08F1D	757.246k	1.071M
BT-LE(2Mbps)	1.087M	2.062M	2M06F1D	1.087M	2.055M

Max-N dB = Maximum 6dB down bandwidth; Max-OBW = Maximum 99% occupied bandwidth;
Min-N dB = Minimum 6dB down bandwidth; Min-OBW = Minimum 99% occupied bandwidth

Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	500k	757.246k	1.075M
2440MHz	Pass	500k	757.246k	1.078M
2480MHz	Pass	500k	757.246k	1.071M
BT-LE(2Mbps)	-	-	-	-
2404MHz	Pass	500k	1.087M	2.062M
2440MHz	Pass	500k	1.087M	2.055M
2478MHz	Pass	500k	1.087M	2.062M

Port X-N dB = Port X 6dB down bandwidth;
Port X-OBW = Port X 99% occupied bandwidth

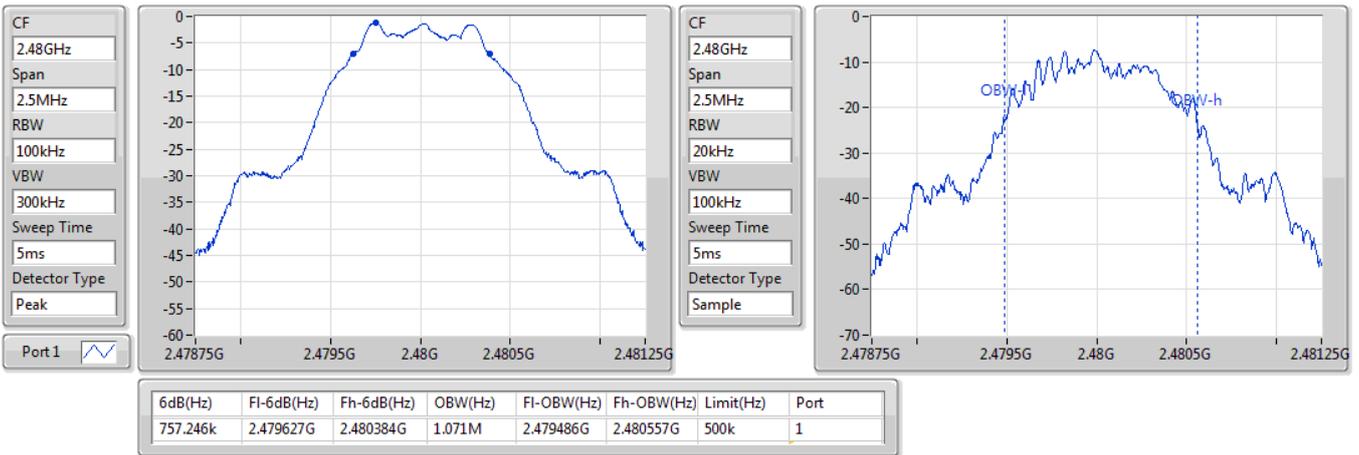




BT-LE(1Mbps)

EBW-DTS

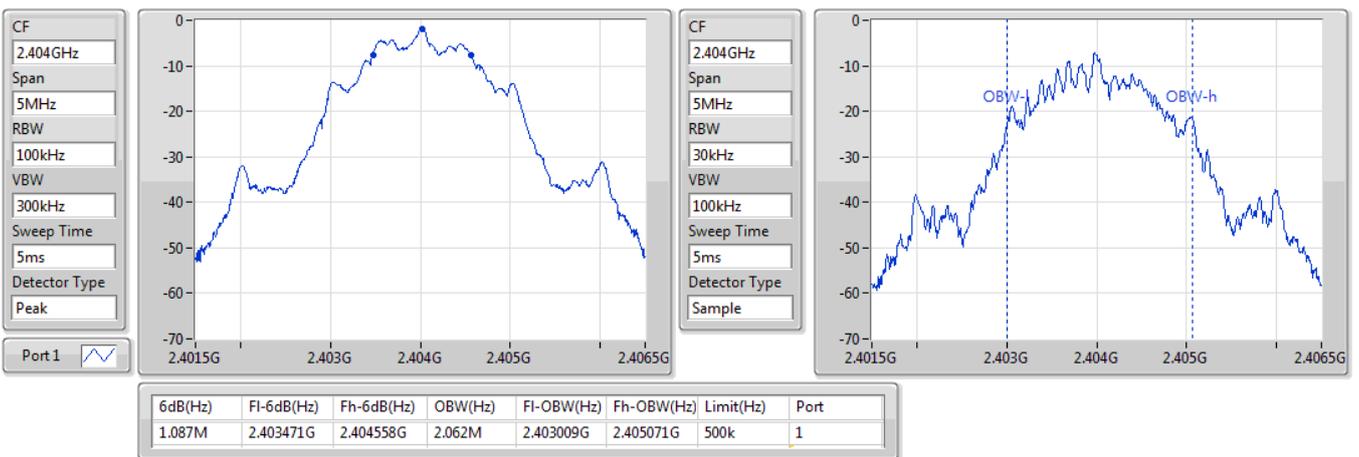
2480MHz



BT-LE(2Mbps)

EBW-DTS

2404MHz

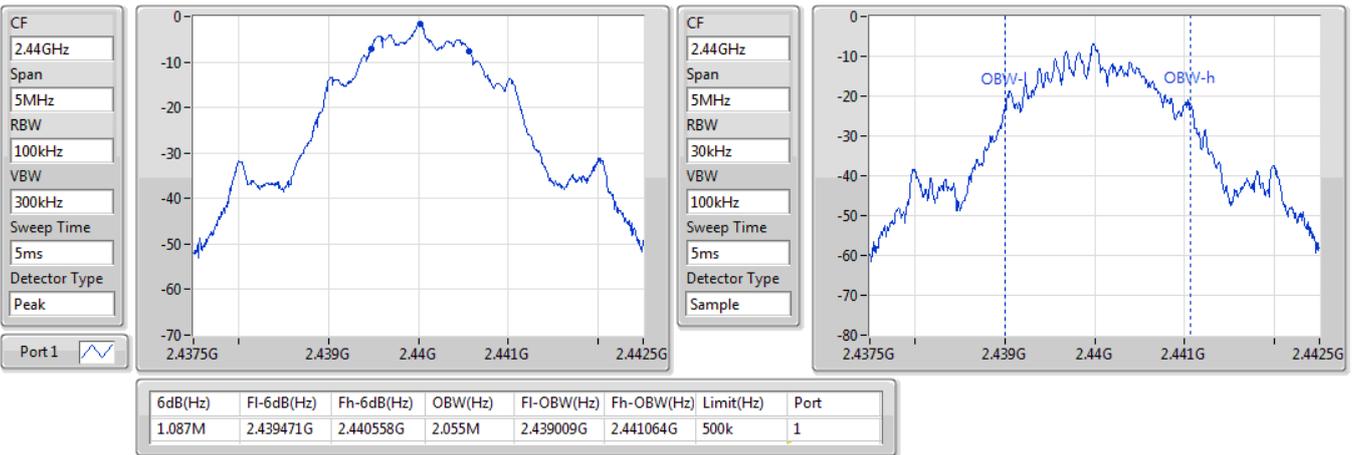




BT-LE(2Mbps)

EBW-DTS

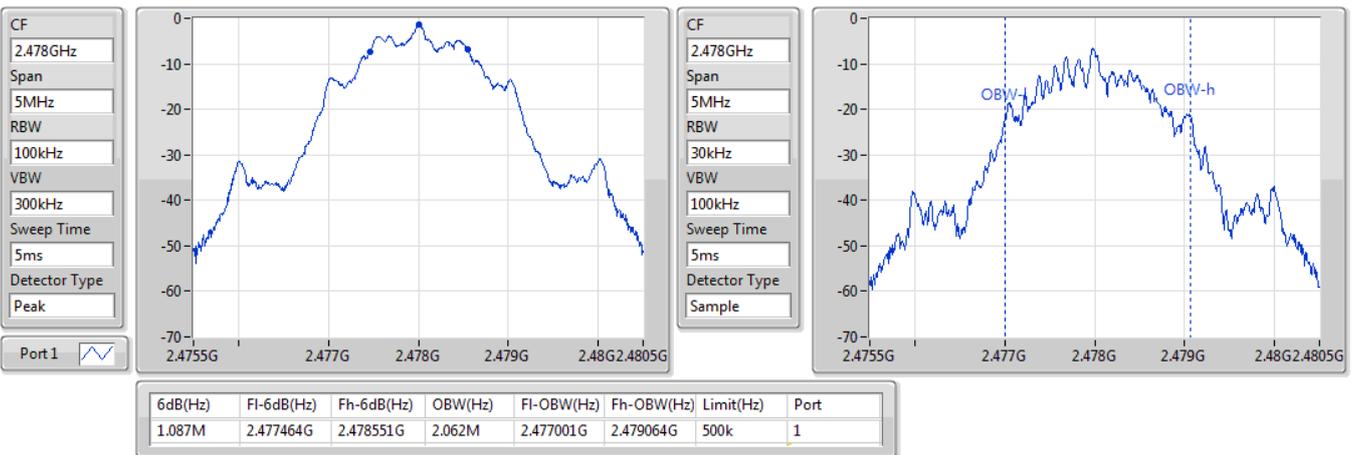
2440MHz



BT-LE(2Mbps)

EBW-DTS

2478MHz





Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	0.07	0.00102
BT-LE(2Mbps)	0.09	0.00102

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	-2.08	-0.29	-
2440MHz	Pass	-2.08	-0.11	-
2480MHz	Pass	-2.08	0.07	-
BT-LE(2Mbps)	-	-	-	-
2404MHz	Pass	-2.08	-0.31	-
2440MHz	Pass	-2.08	-0.01	-
2478MHz	Pass	-2.08	0.09	-

Note: Average power is for reference only.



Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-LE(1Mbps)	0.21	0.00105
BT-LE(2Mbps)	0.20	0.00105

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	-2.08	-0.13	30.00
2440MHz	Pass	-2.08	0.05	30.00
2480MHz	Pass	-2.08	0.21	30.00
BT-LE(2Mbps)	-	-	-	-
2404MHz	Pass	-2.08	-0.02	30.00
2440MHz	Pass	-2.08	0.02	30.00
2478MHz	Pass	-2.08	0.20	30.00



Summary

Mode	PD (dBm/3kHz)
2.4-2.4835GHz	-
BT-LE(1Mbps)	-16.89
BT-LE(2Mbps)	-19.32

Result

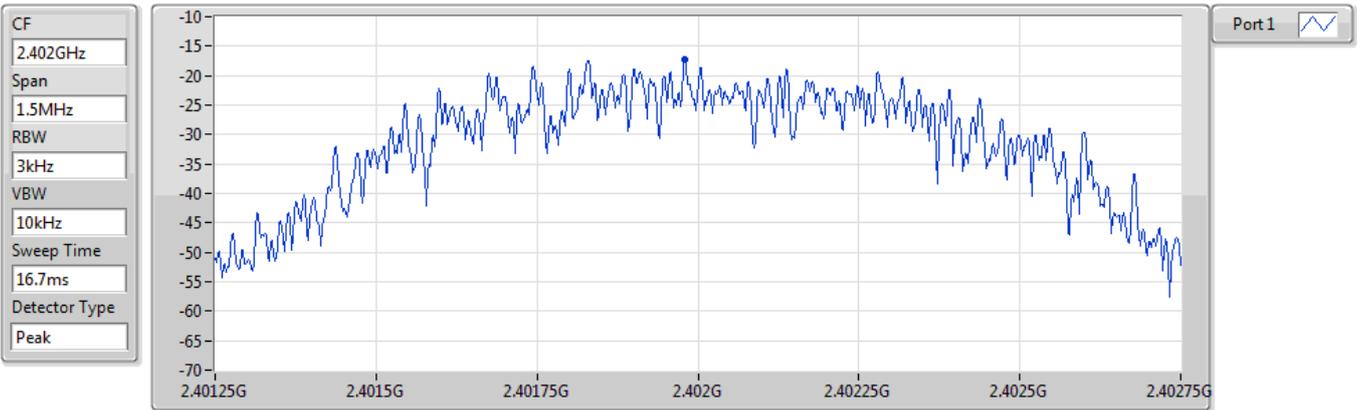
Mode	Result	Antenna Gain (dBi)	Power Density (dBm/3kHz)	Power Density Limit (dBm/3kHz)
BT-LE(1Mbps)	-	-	-	-
2402MHz	Pass	-2.08	-17.28	8.00
2440MHz	Pass	-2.08	-17.04	8.00
2480MHz	Pass	-2.08	-16.89	8.00
BT-LE(2Mbps)	-	-	-	-
2404MHz	Pass	-2.08	-19.88	8.00
2440MHz	Pass	-2.08	-19.61	8.00
2478MHz	Pass	-2.08	-19.32	8.00



BT-LE(1Mbps)

PSD

2402MHz

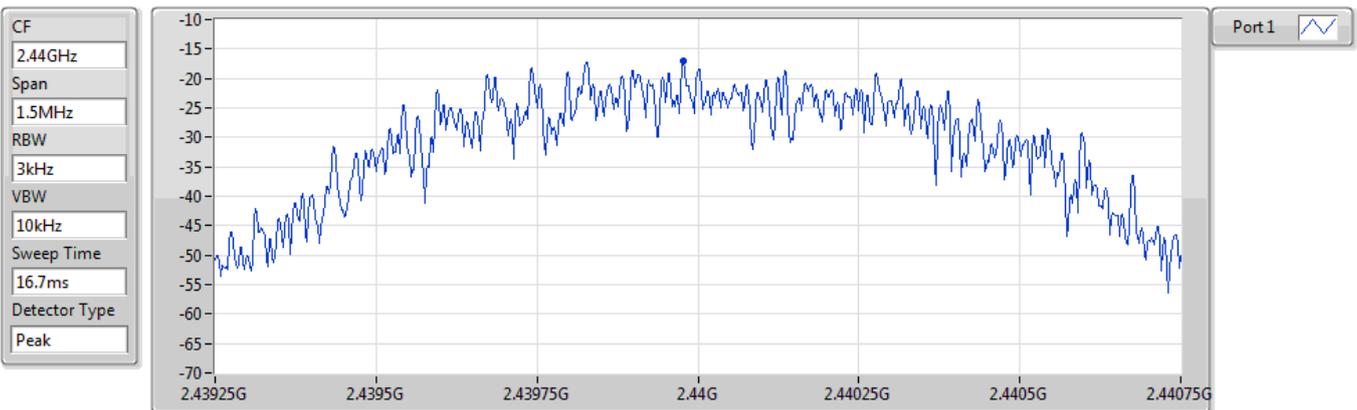


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-17.28	-17.28	-17.28

BT-LE(1Mbps)

PSD

2440MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-17.04	-17.04	-17.04

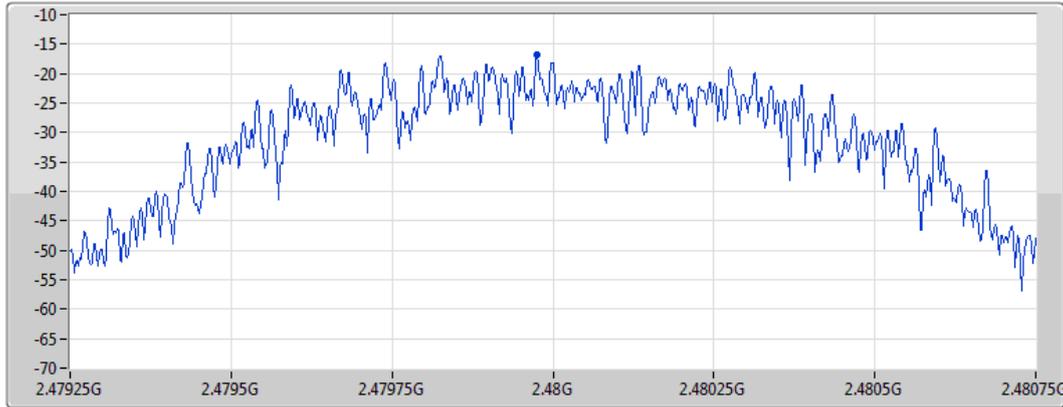


BT-LE(1Mbps)

PSD

2480MHz

CF
2.48GHz
Span
1.5MHz
RBW
3kHz
VBW
10kHz
Sweep Time
16.7ms
Detector Type
Peak



Port 1

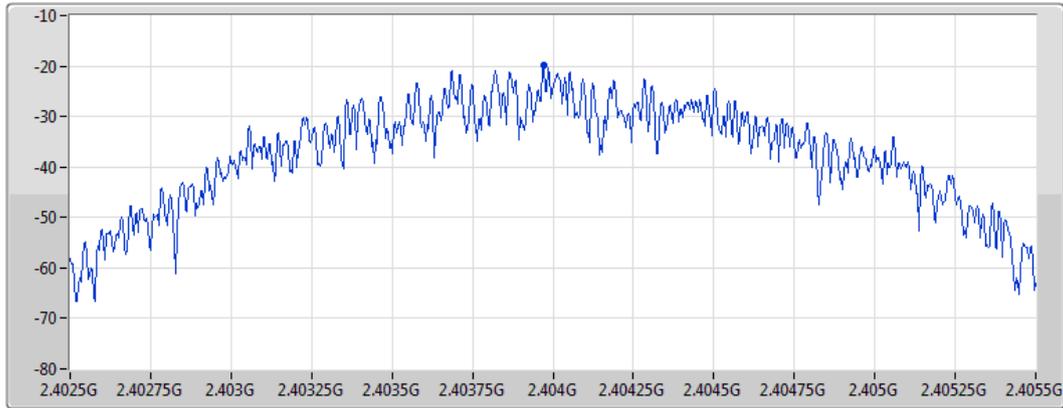
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-16.89	-16.89	-16.89

BT-LE(2Mbps)

PSD

2404MHz

CF
2.404GHz
Span
3MHz
RBW
3kHz
VBW
10kHz
Sweep Time
33.4ms
Detector Type
Peak



Port 1

Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-19.88	-19.88	-19.88

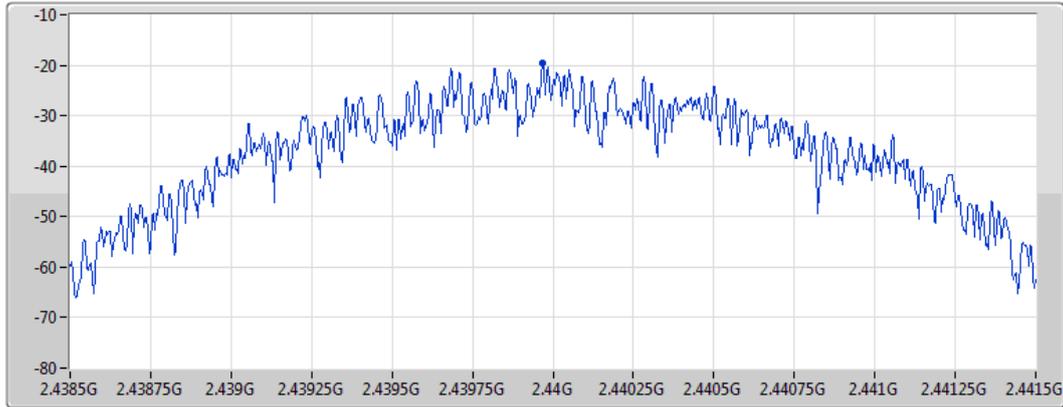


BT-LE(2Mbps)

PSD

2440MHz

CF
2.44GHz
Span
3MHz
RBW
3kHz
VBW
10kHz
Sweep Time
33.4ms
Detector Type
Peak



Port 1

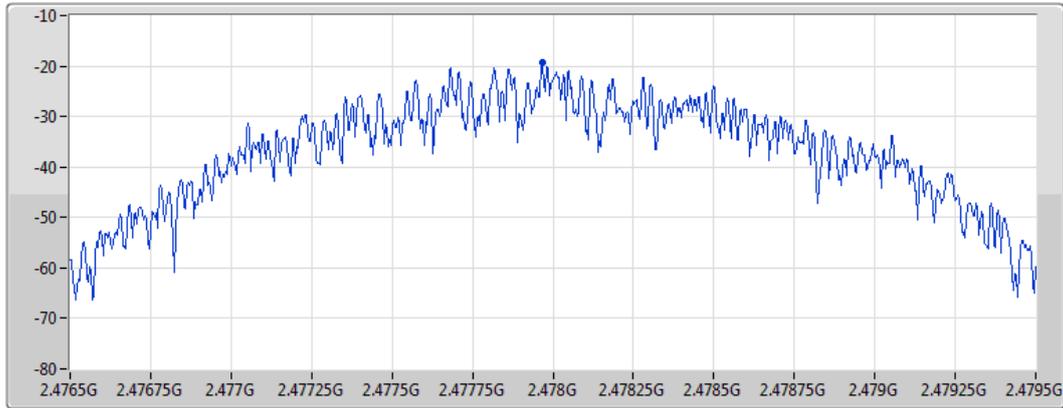
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-19.61	-19.61	-19.61

BT-LE(2Mbps)

PSD

2478MHz

CF
2.478GHz
Span
3MHz
RBW
3kHz
VBW
10kHz
Sweep Time
33.4ms
Detector Type
Peak



Port 1

Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-19.32	-19.32	-19.32

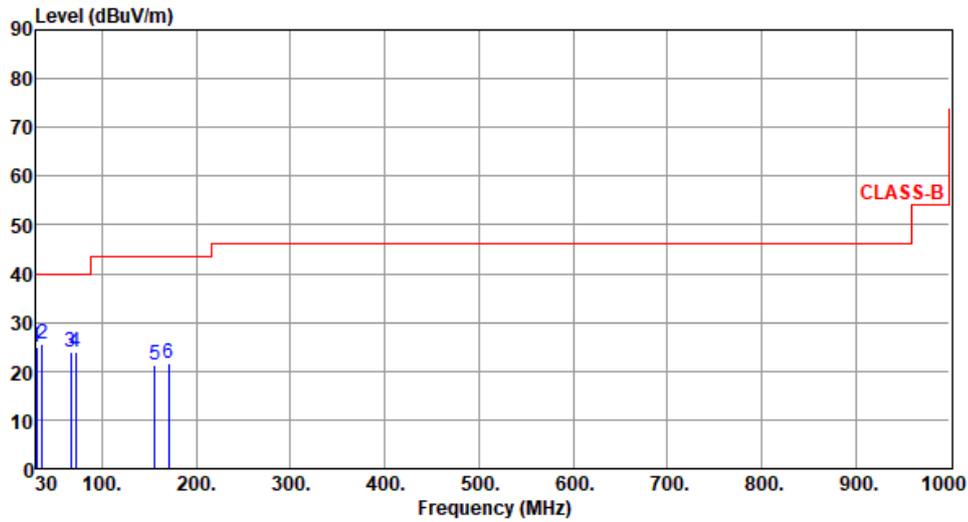


Configuration 2: Battery mode

Unwanted Emissions (Below 1GHz)

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):22 Humidity(%):68



	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	30.00	24.89	40.00	-15.11	34.83	-9.94	Peak	---	---
2	36.79	25.67	40.00	-14.33	34.83	-9.16	Peak	---	---
3	66.86	23.78	40.00	-16.22	34.10	-10.32	Peak	---	---
4	71.71	23.76	40.00	-16.24	34.93	-11.17	Peak	---	---
5	156.10	21.25	43.50	-22.25	29.95	-8.70	Peak	---	---
6	170.65	21.51	43.50	-21.99	30.64	-9.13	Peak	---	---

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

*Factor includes antenna factor , cable loss and amplifier gain

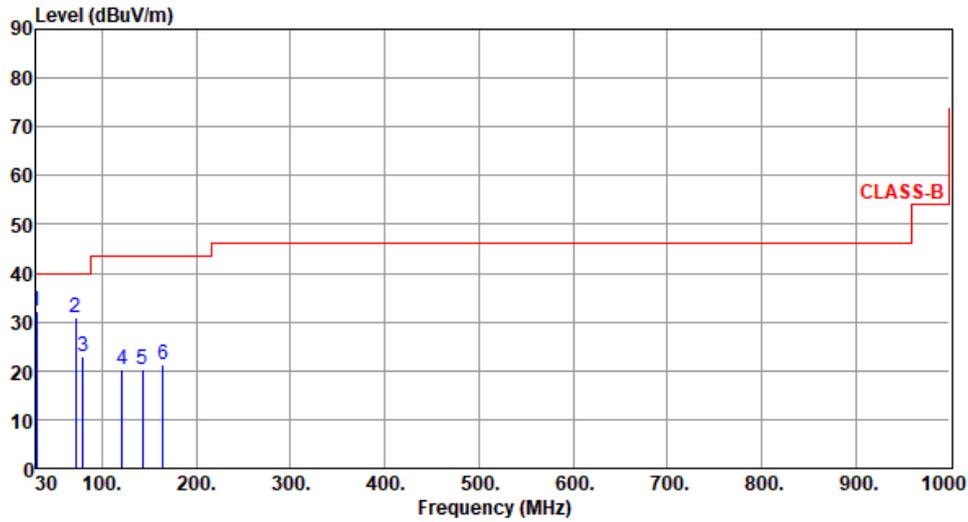
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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



Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 22 Humidity(%): 68



	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	30.00	32.11	40.00	-7.89	42.05	-9.94	Peak	---	---
2	71.71	30.77	40.00	-9.23	41.94	-11.17	Peak	---	---
3	79.47	22.94	40.00	-17.06	36.20	-13.26	Peak	---	---
4	121.18	20.19	43.50	-23.31	30.77	-10.58	Peak	---	---
5	142.52	20.38	43.50	-23.12	29.46	-9.08	Peak	---	---
6	164.83	21.12	43.50	-22.38	29.97	-8.85	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).

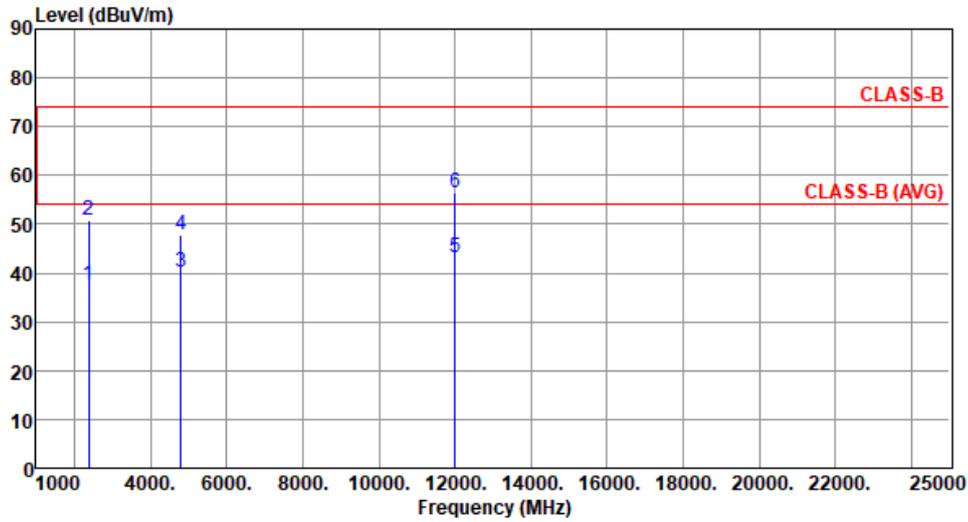
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.



Unwanted Emissions (Above 1GHz)

Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402
Polarization	Horizontal		

Test By : Roger Lu Temperature(°C):24 Humidity(%):68



	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	2390.00	37.46	54.00	-16.54	40.21	-2.75	Average	100	135
2	2390.00	50.81	74.00	-23.19	53.56	-2.75	Peak	100	135
3	4804.00	40.32	54.00	-13.68	36.19	4.13	Average	305	123
4	4804.00	47.80	74.00	-26.20	43.67	4.13	Peak	305	123
5	12010.00	43.28	54.00	-10.72	29.66	13.62	Average	100	30
6	12010.00	56.40	74.00	-17.60	42.78	13.62	Peak	100	30

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

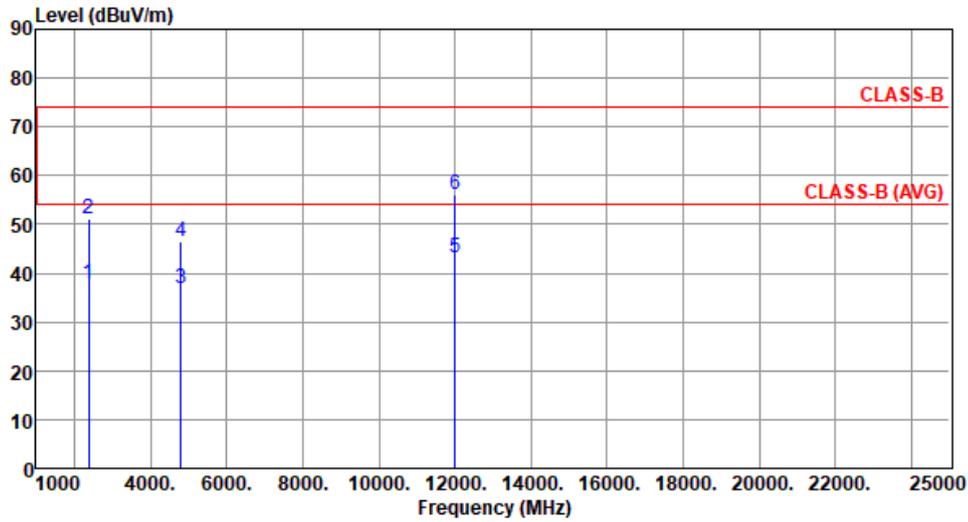
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2402
Polarization	Vertical		

Test By : Roger Lu Temperature(°C):24 Humidity(%):68



	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	2390.00	37.73	54.00	-16.27	40.48	-2.75	Average	148	199
2	2390.00	51.12	74.00	-22.88	53.87	-2.75	Peak	148	199
3	4804.00	36.78	54.00	-17.22	32.65	4.13	Average	135	179
4	4804.00	46.47	74.00	-27.53	42.34	4.13	Peak	135	179
5	12010.00	43.20	54.00	-10.80	29.58	13.62	Average	100	50
6	12010.00	56.26	74.00	-17.74	42.64	13.62	Peak	100	50

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

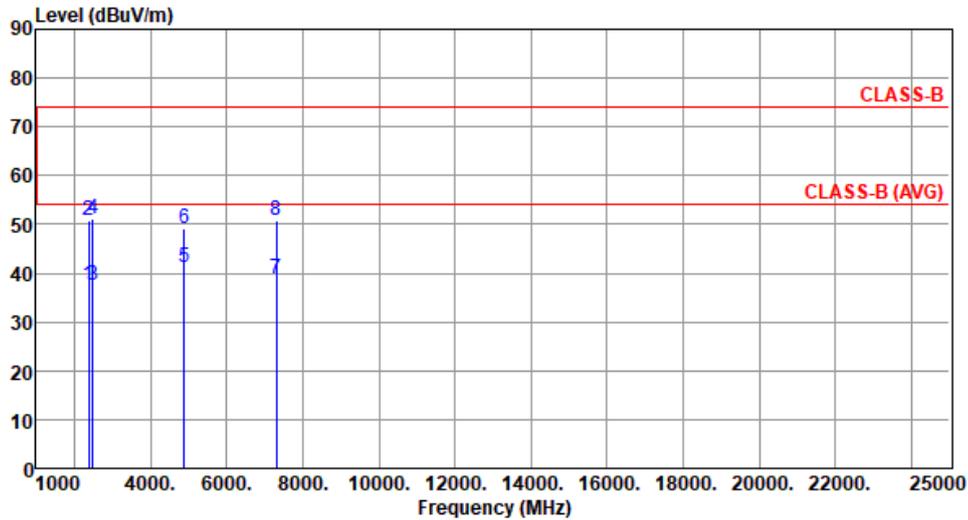
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2440
Polarization	Horizontal		

Test By : Roger Lu Temperature(°C):24 Humidity(%):68



	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	2390.00	37.40	54.00	-16.60	40.15	-2.75	Average	100	137
2	2390.00	50.84	74.00	-23.16	53.59	-2.75	Peak	100	137
3	2483.50	37.59	54.00	-16.41	40.29	-2.70	Average	100	137
4	2483.50	50.98	74.00	-23.02	53.68	-2.70	Peak	100	137
5	4880.00	41.14	54.00	-12.86	37.02	4.12	Average	309	122
6	4880.00	48.99	74.00	-25.01	44.87	4.12	Peak	309	122
7	7320.00	38.92	54.00	-15.08	29.64	9.28	Average	100	80
8	7320.00	50.73	74.00	-23.27	41.45	9.28	Peak	100	80

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

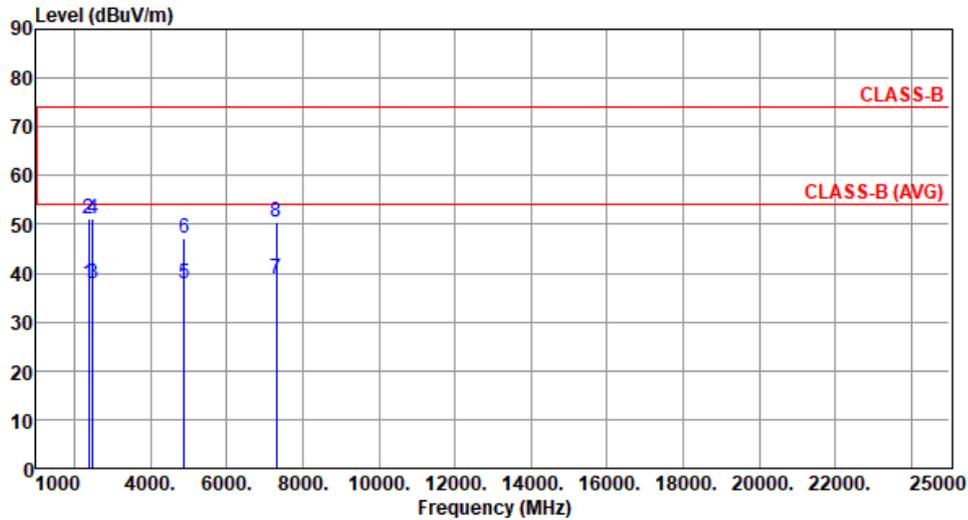
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2440
Polarization	Vertical		

Test By : Roger Lu Temperature(°C):24 Humidity(%):68



	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	2390.00	37.81	54.00	-16.19	40.56	-2.75	Average	129	195
2	2390.00	51.14	74.00	-22.86	53.89	-2.75	Peak	129	195
3	2483.50	37.75	54.00	-16.25	40.45	-2.70	Average	129	195
4	2483.50	51.24	74.00	-22.76	53.94	-2.70	Peak	129	195
5	4880.00	37.91	54.00	-16.09	33.79	4.12	Average	136	182
6	4880.00	47.12	74.00	-26.88	43.00	4.12	Peak	136	182
7	7320.00	38.73	54.00	-15.27	29.45	9.28	Average	100	60
8	7320.00	50.40	74.00	-23.60	41.12	9.28	Peak	100	60

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

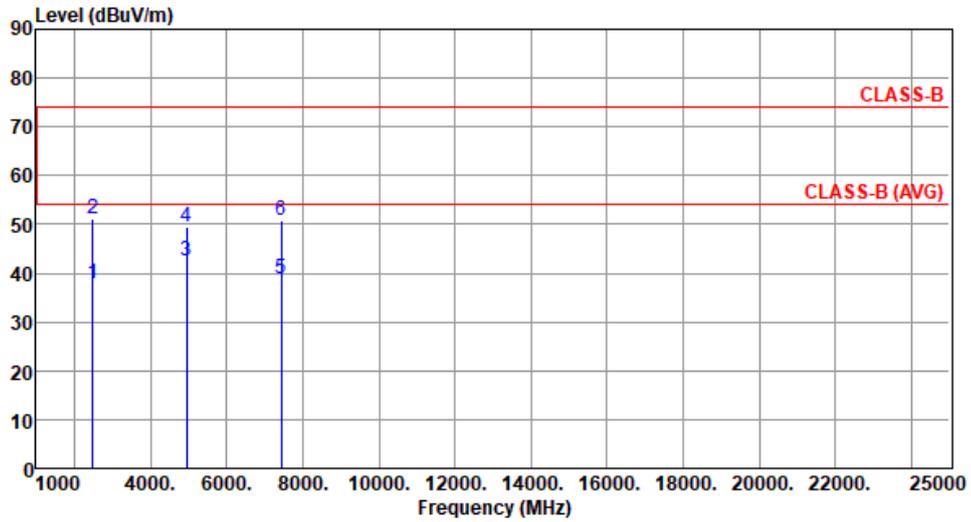
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Horizontal		

Test By : Roger Lu Temperature(°C):24 Humidity(%):68



	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	2483.50	37.85	54.00	-16.15	40.55	-2.70	Average	100	141
2	2483.50	51.09	74.00	-22.91	53.79	-2.70	Peak	100	141
3	4960.00	42.57	54.00	-11.43	38.54	4.03	Average	310	126
4	4960.00	49.61	74.00	-24.39	45.58	4.03	Peak	310	126
5	7440.00	38.83	54.00	-15.17	29.46	9.37	Average	100	60
6	7440.00	50.65	74.00	-23.35	41.28	9.37	Peak	100	60

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

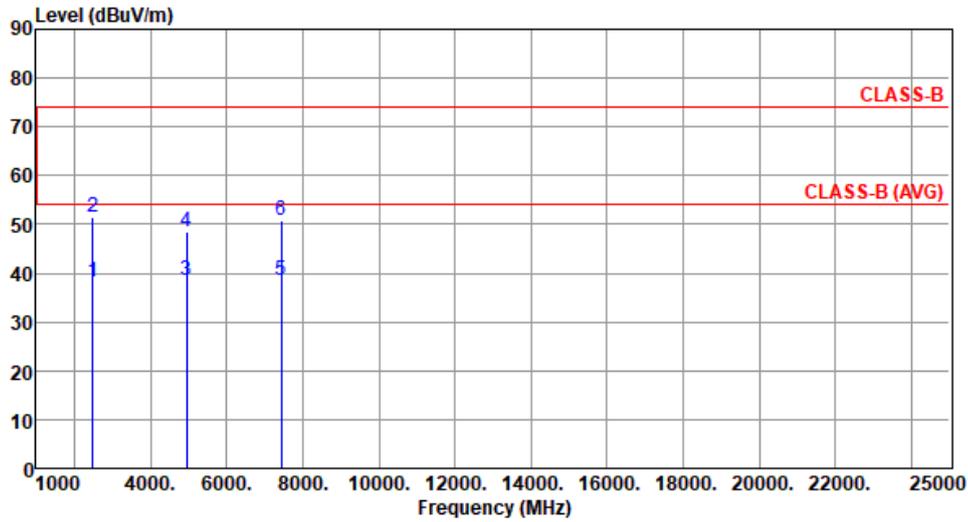
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	BT-LE (1Mbps)	Test Freq. (MHz)	2480
Polarization	Vertical		

Test By : Roger Lu Temperature(°C):24 Humidity(%):68



	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	2483.50	38.16	54.00	-15.84	40.86	-2.70	Average	124	198
2	2483.50	51.42	74.00	-22.58	54.12	-2.70	Peak	124	198
3	4960.00	38.62	54.00	-15.38	34.59	4.03	Average	135	179
4	4960.00	48.51	74.00	-25.49	44.48	4.03	Peak	135	179
5	7440.00	38.59	54.00	-15.41	29.22	9.37	Average	100	40
6	7440.00	50.67	74.00	-23.33	41.30	9.37	Peak	100	40

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).



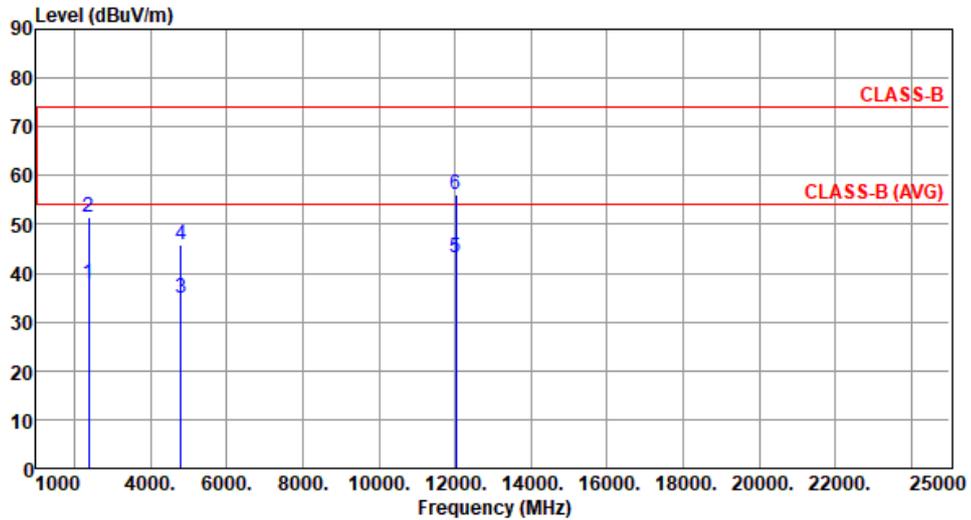
Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402						
Polarization	Horizontal								
Test By : Roger Lu Temperature(°C):24 Humidity(%):68									
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	37.67	54.00	-16.33	40.42	-2.75	Average	100	135
2	2390.00	50.93	74.00	-23.07	53.68	-2.75	Peak	100	135
3	4808.00	38.15	54.00	-15.85	34.02	4.13	Average	309	121
4	4808.00	46.61	74.00	-27.39	42.48	4.13	Peak	309	121
5	12020.00	43.10	54.00	-10.90	29.44	13.66	Average	100	20
6	12020.00	56.10	74.00	-17.90	42.44	13.66	Peak	100	20

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).



Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2402
Polarization	Vertical		

Test By : Roger Lu Temperature(°C):24 Humidity(%):68



	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	2390.00	37.83	54.00	-16.17	40.58	-2.75	Average	151	195
2	2390.00	51.41	74.00	-22.59	54.16	-2.75	Peak	151	195
3	4808.00	34.71	54.00	-19.29	30.58	4.13	Average	132	175
4	4808.00	45.72	74.00	-28.28	41.59	4.13	Peak	132	175
5	12020.00	43.07	54.00	-10.93	29.41	13.66	Average	100	40
6	12020.00	56.11	74.00	-17.89	42.45	13.66	Peak	100	40

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

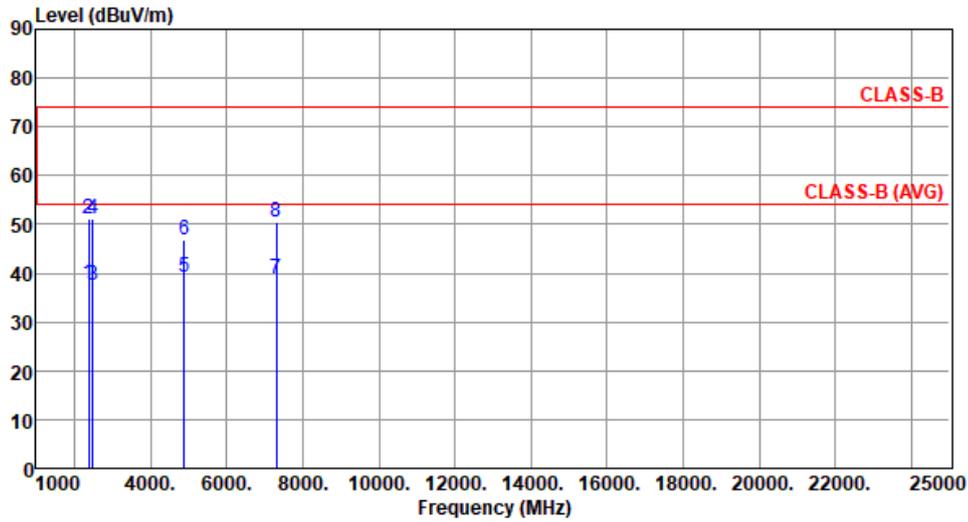
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2440
Polarization	Horizontal		

Test By : Roger Lu Temperature(°C):24 Humidity(%):68



	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	2390.00	37.70	54.00	-16.30	40.45	-2.75	Average	100	142
2	2390.00	51.22	74.00	-22.78	53.97	-2.75	Peak	100	142
3	2483.50	37.58	54.00	-16.42	40.28	-2.70	Average	100	142
4	2483.50	51.25	74.00	-22.75	53.95	-2.70	Peak	100	142
5	4880.00	39.10	54.00	-14.90	34.98	4.12	Average	312	120
6	4880.00	46.97	74.00	-27.03	42.85	4.12	Peak	312	120
7	7320.00	38.73	54.00	-15.27	29.45	9.28	Average	100	60
8	7320.00	50.53	74.00	-23.47	41.25	9.28	Peak	100	60

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

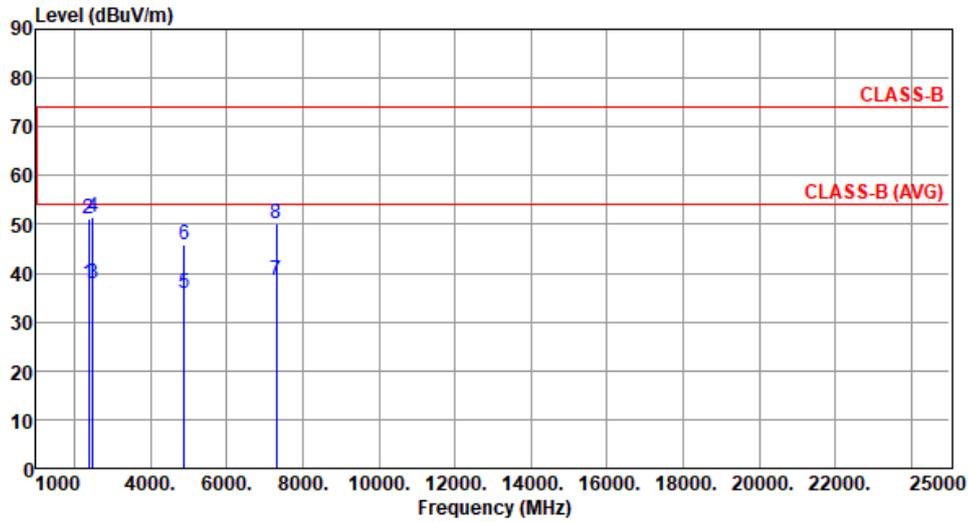
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2440
Polarization	Vertical		

Test By : Roger Lu Temperature(°C):24 Humidity(%):68



	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	2390.00	37.91	54.00	-16.09	40.66	-2.75	Average	125	198
2	2390.00	51.28	74.00	-22.72	54.03	-2.75	Peak	125	198
3	2483.50	37.84	54.00	-16.16	40.54	-2.70	Average	125	198
4	2483.50	51.46	74.00	-22.54	54.16	-2.70	Peak	125	198
5	4880.00	35.80	54.00	-18.20	31.68	4.12	Average	135	183
6	4880.00	45.71	74.00	-28.29	41.59	4.12	Peak	135	183
7	7320.00	38.50	54.00	-15.50	29.22	9.28	Average	100	40
8	7320.00	50.31	74.00	-23.69	41.03	9.28	Peak	100	40

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

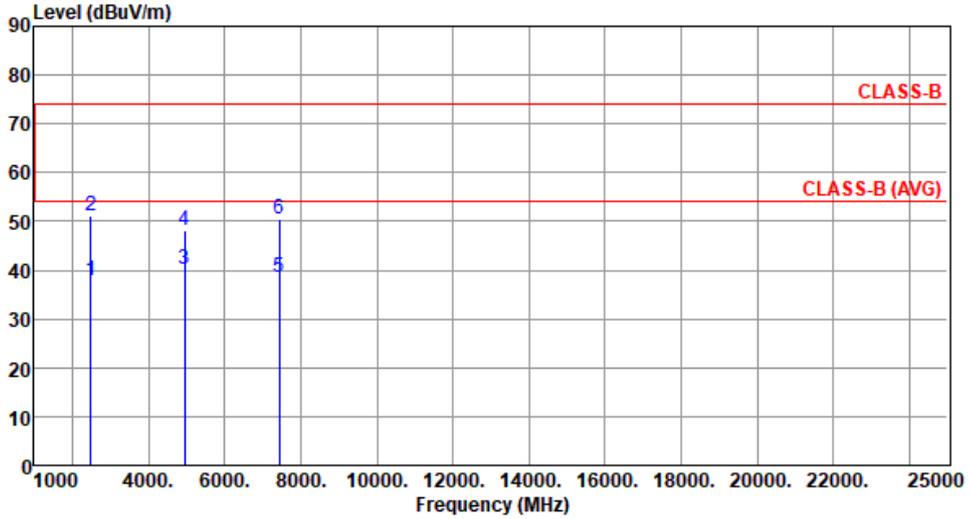
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2480
Polarization	Horizontal		

Test By : Roger Lu Temperature(°C):24 Humidity(%):68



	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	2483.50	37.95	54.00	-16.05	40.65	-2.70	Average	100	138
2	2483.50	51.08	74.00	-22.92	53.78	-2.70	Peak	100	138
3	4956.00	40.28	54.00	-13.72	36.25	4.03	Average	311	123
4	4956.00	48.21	74.00	-25.79	44.18	4.03	Peak	311	123
5	7434.00	38.57	54.00	-15.43	29.21	9.36	Average	100	40
6	7434.00	50.49	74.00	-23.51	41.13	9.36	Peak	100	40

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

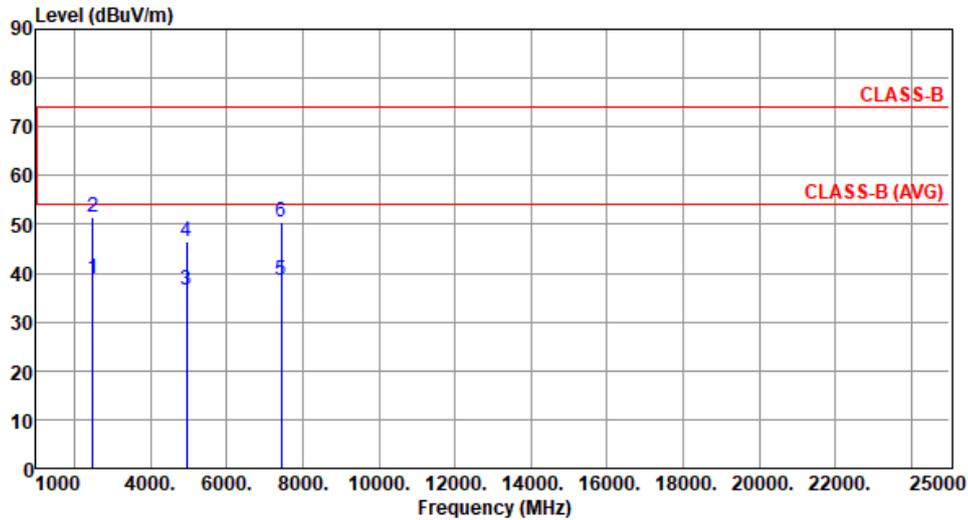
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	BT-LE (2Mbps)	Test Freq. (MHz)	2480
Polarization	Vertical		

Test By : Roger Lu Temperature(°C):24 Humidity(%):68



	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	2483.50	39.00	54.00	-15.00	41.70	-2.70	Average	148	197
2	2483.50	51.49	74.00	-22.51	54.19	-2.70	Peak	148	197
3	4956.00	36.48	54.00	-17.52	32.45	4.03	Average	133	175
4	4956.00	46.45	74.00	-27.55	42.42	4.03	Peak	133	175
5	7434.00	38.51	54.00	-15.49	29.15	9.36	Average	100	30
6	7434.00	50.51	74.00	-23.49	41.15	9.36	Peak	100	30

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).



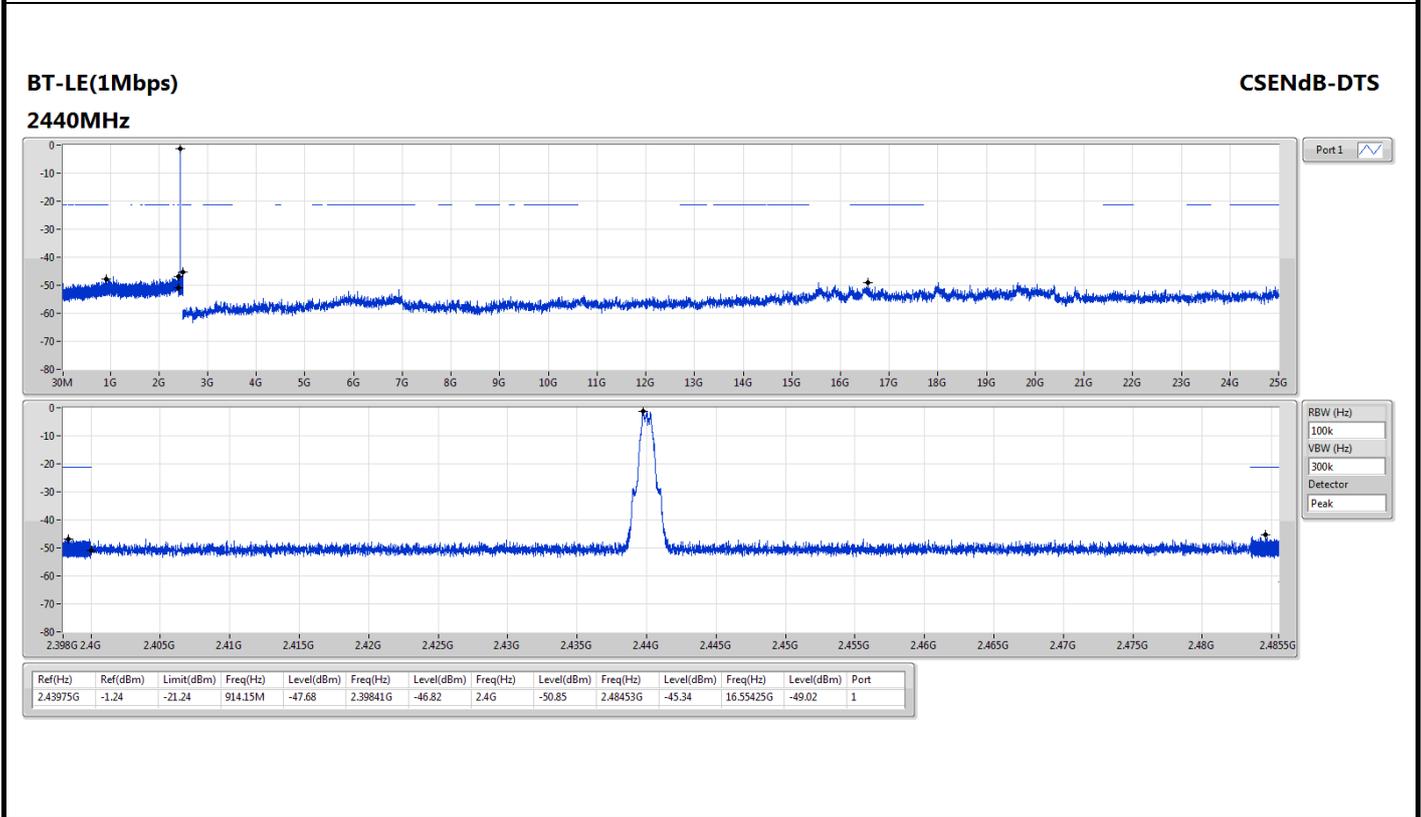
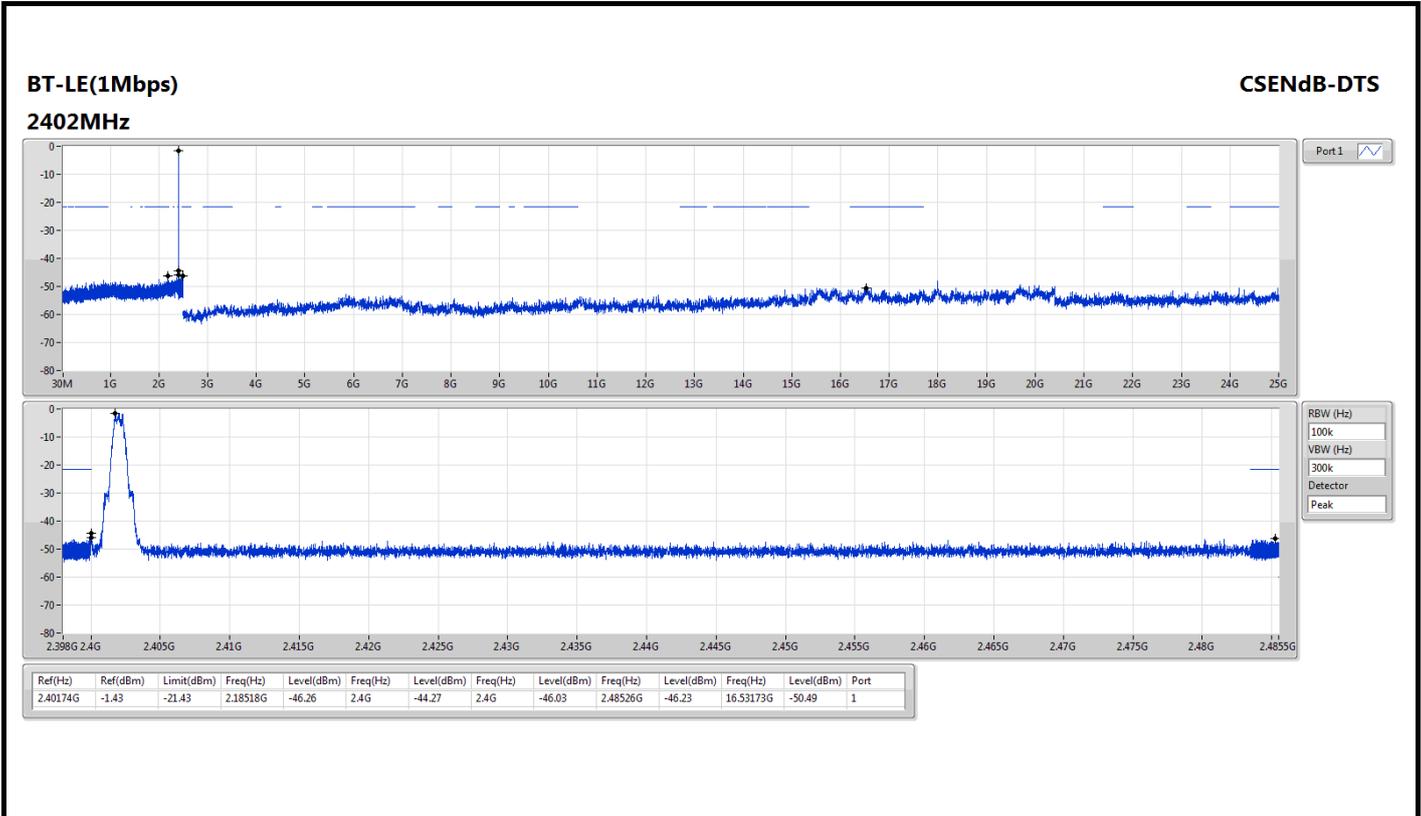
Configuration 1: Charging mode

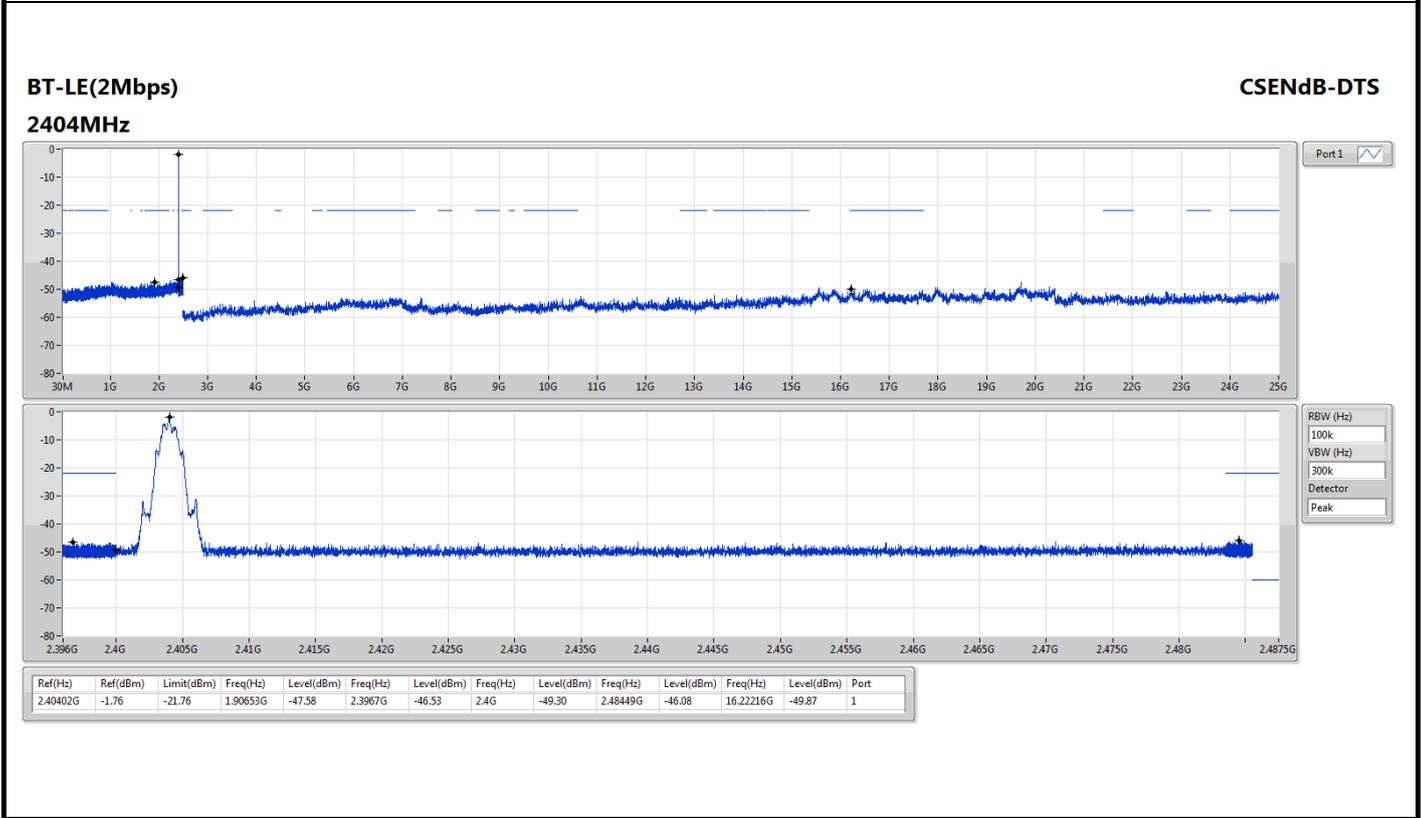
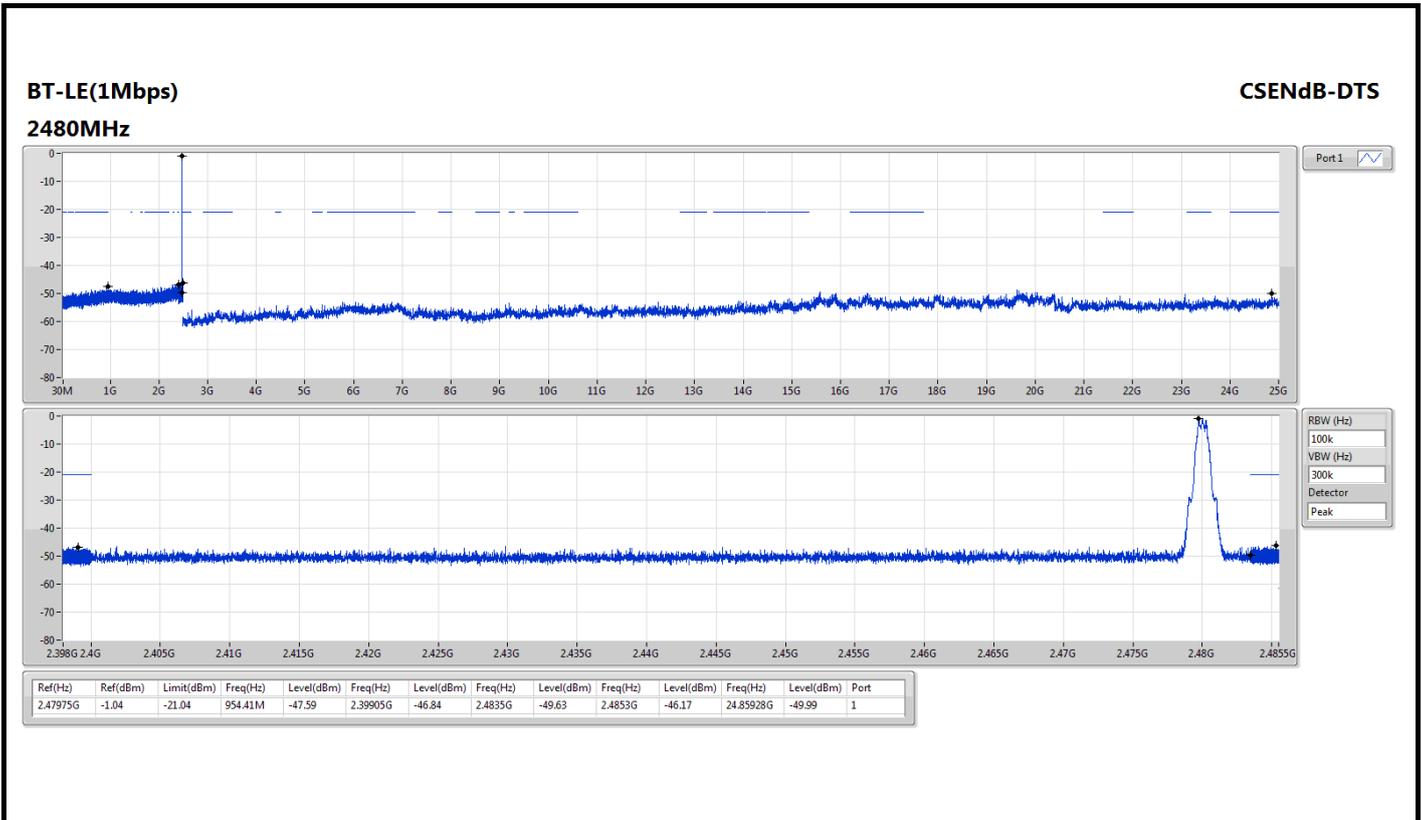
Emissions (Below 1GHz)

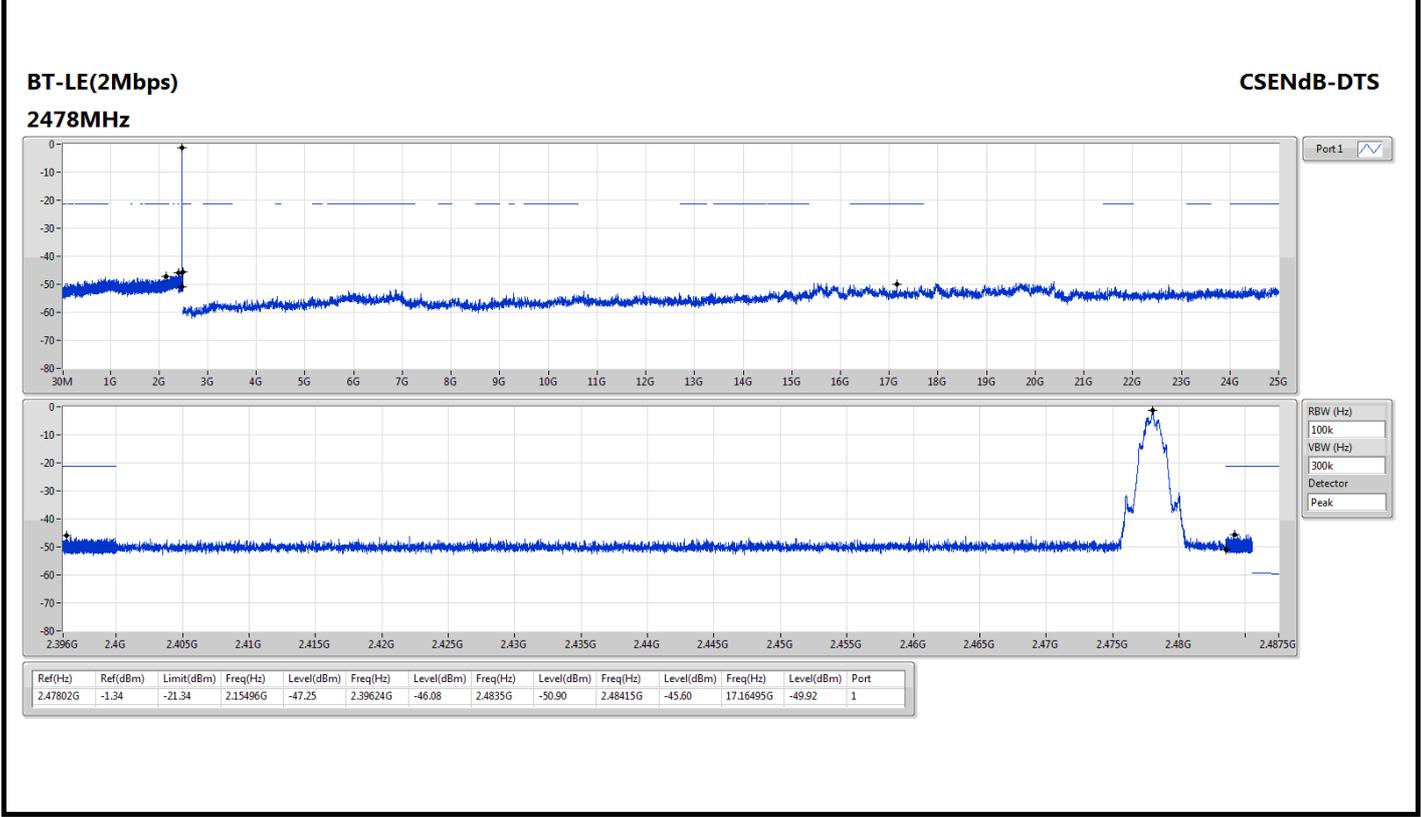
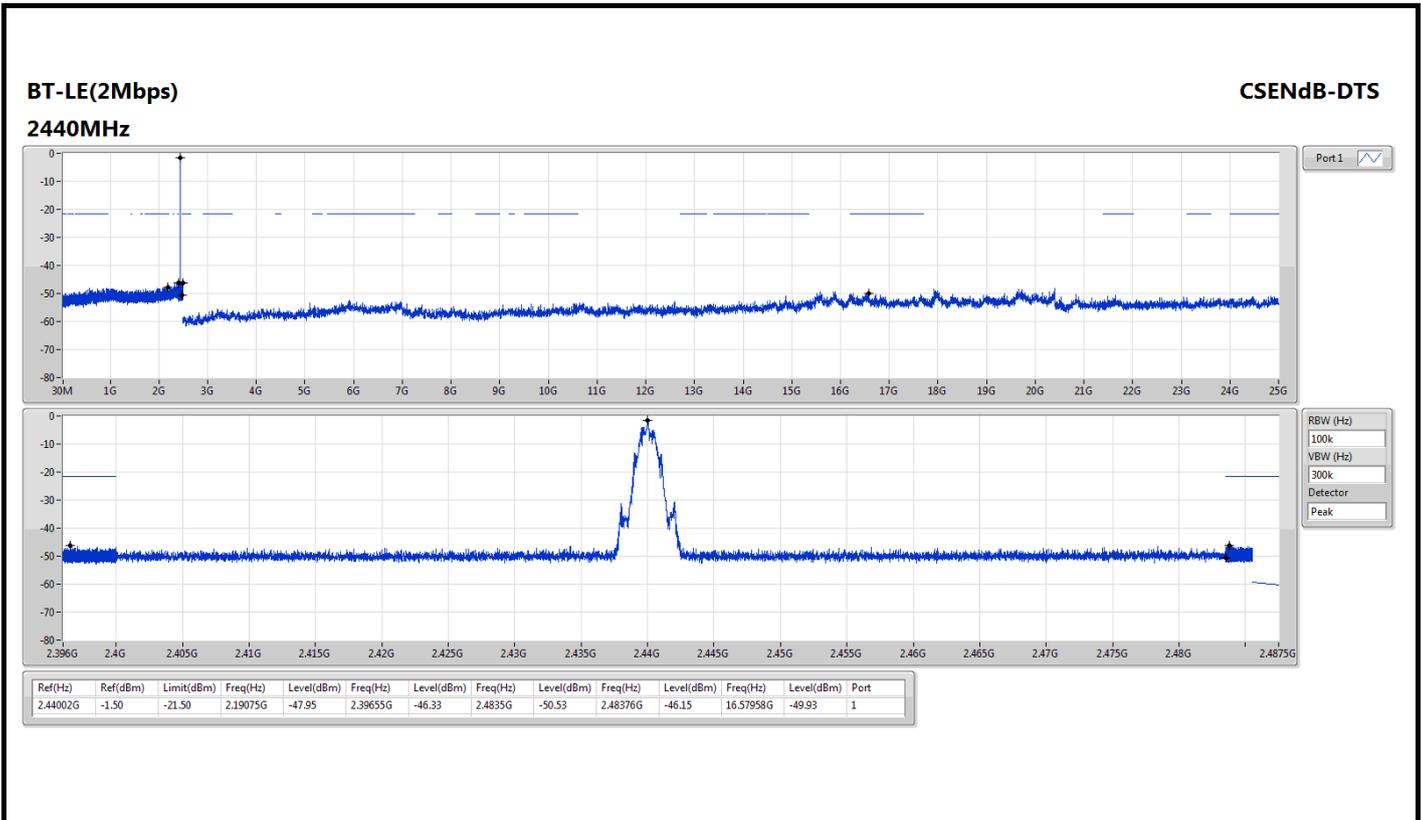
Modulation	Charging									
Polarization	Horizontal									
Test By : Akun Chung			Temperature(°C): 22			Humidity(%): 68				
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	30.00	26.38	40.00	-13.62	36.32	-9.94	Peak	---	---	
2	38.73	28.59	40.00	-11.41	37.46	-8.87	Peak	---	---	
3	66.86	26.28	40.00	-13.72	36.60	-10.32	Peak	---	---	
4	135.73	25.24	43.50	-18.26	34.69	-9.45	Peak	---	---	
5	144.46	27.88	43.50	-15.62	36.96	-9.08	Peak	---	---	
6	160.95	22.40	43.50	-21.10	31.18	-8.78	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>										



Modulation	Charging									
Polarization	Vertical									
Test By : Akun Chung			Temperature(°C): 22			Humidity(%): 68				
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
								cm	deg	
1	30.00	33.77	40.00	-6.23	43.71	-9.94	Peak	---	---	
2	45.52	29.80	40.00	-10.20	38.30	-8.50	Peak	---	---	
3	73.65	30.73	40.00	-9.27	42.59	-11.86	Peak	---	---	
4	135.73	21.46	43.50	-22.04	30.91	-9.45	Peak	---	---	
5	154.16	27.79	43.50	-15.71	36.58	-8.79	Peak	---	---	
6	160.95	24.21	43.50	-19.29	32.99	-8.78	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>										



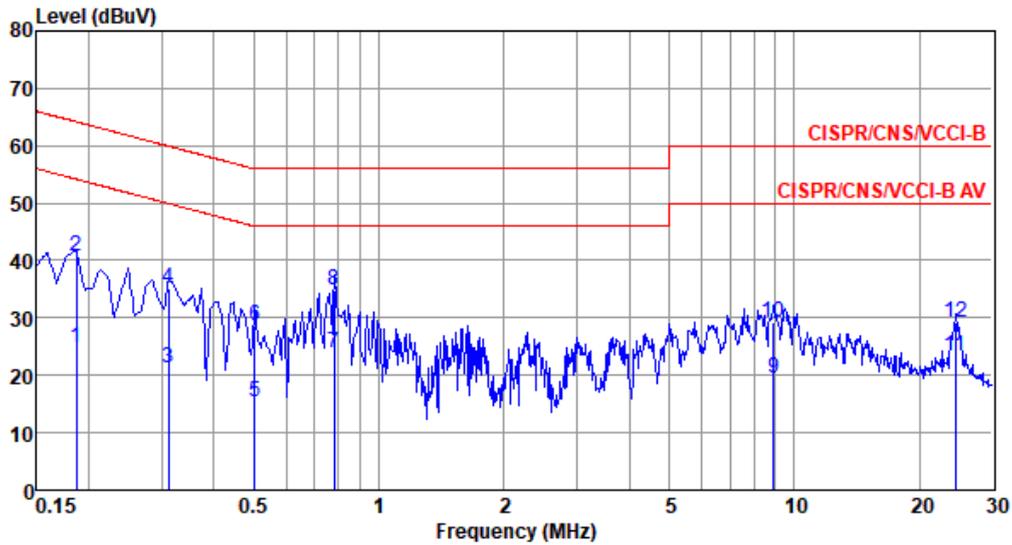






Modulation	Charging
Power Phase	Line

Test by : Joe Liao Temperature: 22°C Humidity: 61%



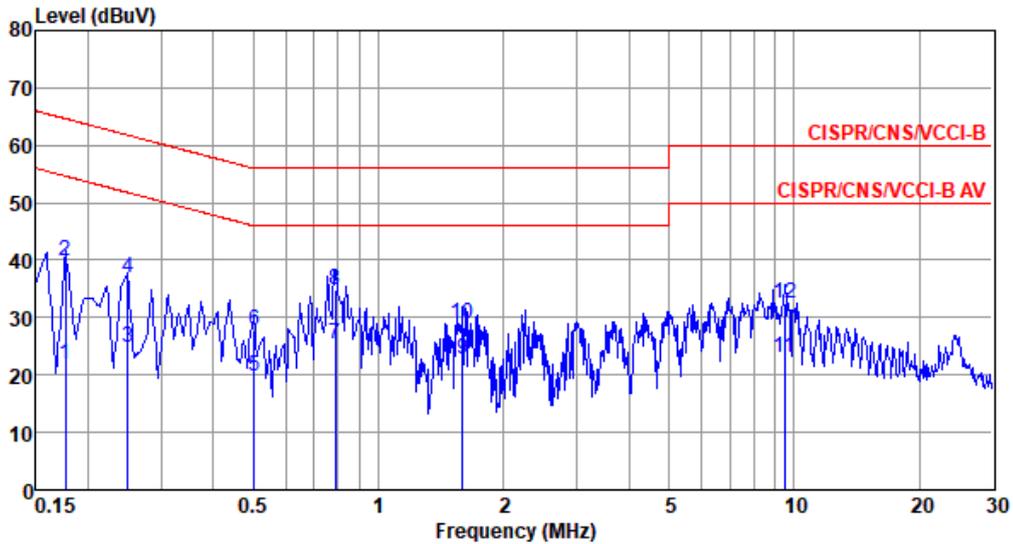
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.186	24.71	54.20	-29.49	14.74	9.68	0.08	0.21	Average
2	0.186	40.71	64.20	-23.49	30.74	9.68	0.08	0.21	QP
3	0.312	21.15	49.93	-28.78	11.09	9.67	0.08	0.31	Average
4	0.312	35.05	59.93	-24.88	24.99	9.67	0.08	0.31	QP
5	0.502	15.34	46.00	-30.66	5.21	9.67	0.10	0.36	Average
6	0.502	28.61	56.00	-27.39	18.48	9.67	0.10	0.36	QP
7	0.779	23.98	46.00	-22.02	13.79	9.68	0.14	0.37	Average
8*	0.779	34.96	56.00	-21.04	24.77	9.68	0.14	0.37	QP
9	8.916	19.60	50.00	-30.40	9.01	9.73	0.42	0.44	Average
10	8.916	29.30	60.00	-30.70	18.71	9.73	0.42	0.44	QP
11	24.400	23.35	50.00	-26.65	12.28	9.70	0.69	0.68	Average
12	24.400	29.12	60.00	-30.88	18.05	9.70	0.69	0.68	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 Note 2: Over Limit (dB) = Level (dBuV) - Limit Line (dBuV).



Modulation	Charging
Power Phase	Neutral

Test by : Joe Liao Temperature: 22°C Humidity: 61%



	Freq MHz	Level dBUV	Limit Line dBUV	Over Limit dB	Read Level dBUV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.177	21.73	54.64	-32.91	11.87	9.61	0.08	0.17	Average
2	0.177	39.75	64.64	-24.89	29.89	9.61	0.08	0.17	QP
3	0.249	24.81	51.78	-26.97	14.94	9.61	0.08	0.18	Average
4	0.249	36.84	61.78	-24.94	26.97	9.61	0.08	0.18	QP
5	0.502	19.89	46.00	-26.11	9.97	9.61	0.10	0.21	Average
6	0.502	27.88	56.00	-28.12	17.96	9.61	0.10	0.21	QP
7*	0.788	25.45	46.00	-20.55	15.44	9.61	0.14	0.26	Average
8	0.788	34.87	56.00	-21.13	24.86	9.61	0.14	0.26	QP
9	1.593	22.80	46.00	-23.20	12.70	9.62	0.19	0.29	Average
10	1.593	28.99	56.00	-27.01	18.89	9.62	0.19	0.29	QP
11	9.502	23.03	50.00	-26.97	12.53	9.69	0.44	0.37	Average
12	9.502	32.41	60.00	-27.59	21.91	9.69	0.44	0.37	QP

Note 1: Level (dBUV) = Read Level (dBUV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 2: Over Limit (dB) = Level (dBUV) – Limit Line (dBUV).

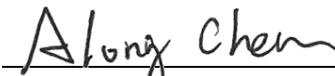
FCC Test Report

FCC ID : IPH-04390
Equipment : Smart Watch
Model No. : A04390
Brand Name : GARMIN
Applicant : Garmin International, Inc.
Address : 1200 E. 151st Street Olathe, KS 66062 United States
Standard : 47 CFR FCC Part 15.247
Received Date : Apr. 07, 2022
Tested Date : Apr. 22 ~ May 13, 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 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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Appendix A. Unwanted Emissions into Restricted Frequency Bands

Appendix B. Unwanted Emissions into Non-Restricted Frequency Bands

Appendix C. Conducted Output Power

Appendix D. Number of Hopping Frequency

Appendix E. 20dB and Occupied Bandwidth

Appendix F. Channel Separation

Appendix G. Number of Dwell Time

Appendix H. AC Power Line Conducted Emissions

Release Record

Report No.	Version	Description	Issued Date
FR240702AD	Rev. 01	Initial issue	Jun. 01, 2022

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emission	[dBuV]: 0.788MHz 25.45 (Margin -20.55dB) - AV	Pass
15.247(d) 15.209	Unwanted Emissions	[dBuV/m at 3m]: 30.00MHz 33.77 (Margin -6.23dB) - PK	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(1)	Conducted Output Power	Power [dBm]: 11.47	Pass
15.247(a)(1)(iii)	Number of Hopping Channels	Meet the requirement of limit	Pass
15.247(a)(1)	Hopping Channel Separation	Meet the requirement of limit	Pass
15.247(a)(1)(iii)	Dwell Time	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	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)

RF General Information				
Frequency Range (MHz)	Bluetooth Mode	Ch. Frequency (MHz)	Channel Number	Data Rate
2400-2483.5	BR V5.0	2402-2480	0-78 [79]	1 Mbps
2400-2483.5	EDR V5.0	2402-2480	0-78 [79]	2 Mbps
2400-2483.5	EDR V5.0	2402-2480	0-78 [79]	3 Mbps

Note 1: RF output power specifies that Maximum Peak Conducted Output Power.
 Note 2: Bluetooth BR uses a GFSK.
 Note 3: Bluetooth EDR uses a combination of $\pi/4$ -DQPSK and 8DPSK.

1.1.2 Antenna Details

Ant. No.	Brand	Model	Type	Connector	Gain (dBi)
1	Garmin	117-01806-0X	PIFA	N/A	-2.08

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Type	5Vdc from adapter 3.87Vdc from battery
------------	---

1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	Battery	Brand: Garmin Model: 361-00136-20 Power Rating: 3.87V, 205mAh
2	USB cable	Brand: GARMIN Model: 320-01069-10 Line: 0.52m shielded without core

1.1.5 Channel List

Frequency band (MHz)				2400~2483.5			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	20	2422	40	2442	60	2462
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	78	2480
19	2421	39	2441	59	2461	---	---

1.1.6 Test Tool and Duty Cycle

Test Tool	BT Test, Version: V8.02 Bluetooth Simulator, Brand: R&S / Model : CMW270	
Modulation Mode	Duty Cycle Of Test Signal (%)	Duty Factor (dB)
DH5	79.54%	0.99
2DH5	79.15%	1.02
3DH5	79.54%	0.99

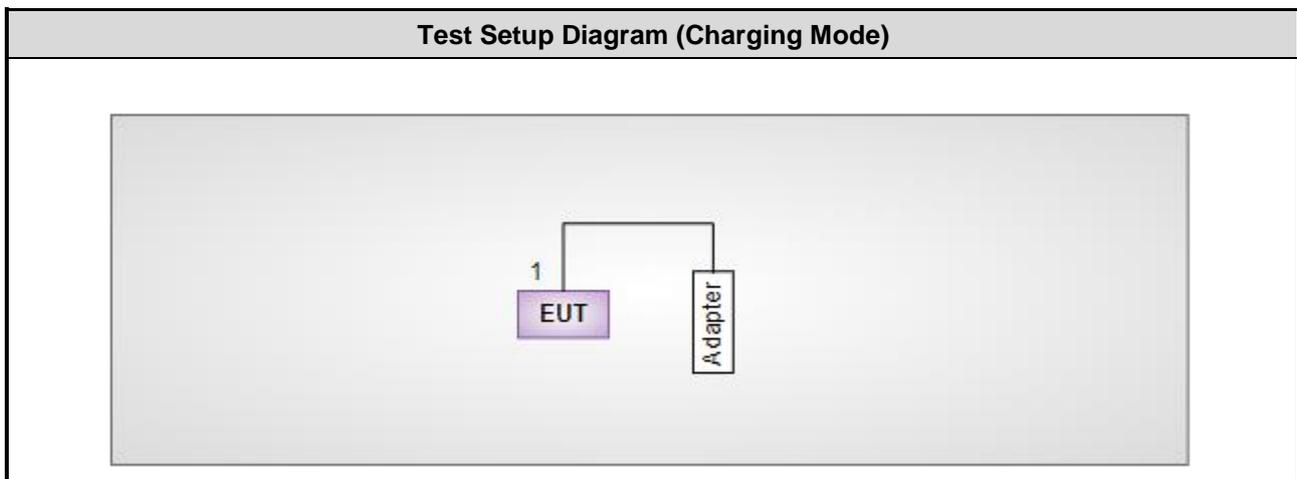
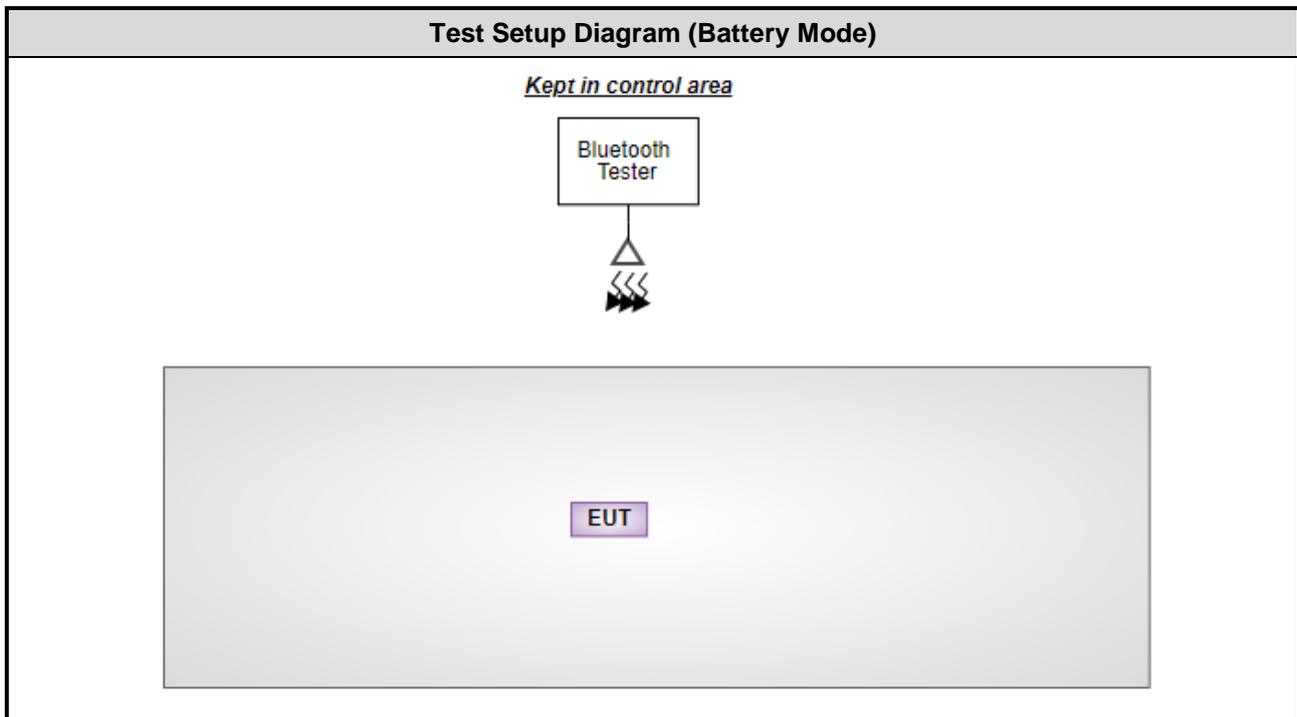
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)		
	2402	2441	2480
GFSK / 1Mbps	default	default	default
$\pi/4$ -DQPSK / 2Mbps	default	default	default
8DPSK / 3Mbps	default	default	default

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Adapter	samsung	ETA-U90JWS	---	---
2	Bluetooth Tester	R&S	CBT	---	

1.3 Test Setup Chart



No.	Signal cable / Length (m)
1	USB, 0.52m shielded.

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	May 09, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Feb. 16, 2022	Feb. 15, 2023
LISN	R&S	ENV216	101579	Apr. 21, 2022	Apr. 20, 2023
LISN (Support Unit)	SCHWARZBECK	NSLK 8127	8127667	Jan .07, 2022	Jan .06, 2023
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 19, 2021	Oct. 18, 2022
50 ohm terminal (Support Unit)	NA	50	04	May 25, 2021	May 24, 2022
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Apr. 22 ~ Apr. 23, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 15, 2022	Mar. 14, 2023
Spectrum Analyzer	R&S	FSV40	101498	Nov. 29, 2021	Nov. 28, 2022
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jun. 30, 2021	Jun. 29, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 03, 2021	Dec. 02, 2022
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Jan. 11, 2022	Jan. 10, 2023
Preamplifier	EMC	EMC02325	980225	Jun. 29, 2021	Jun. 28, 2022
Preamplifier	Agilent	83017A	MY39501308	Sep. 28, 2021	Sep. 27, 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 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 05, 2021	Oct. 04, 2022
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 05, 2021	Oct. 04, 2022
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 05, 2021	Oct. 04, 2022
RF Cable	EMC	EMC104-35M-35M-8000	210920	Oct. 05, 2021	Oct. 04, 2022
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 05, 2021	Oct. 04, 2022
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Bluetooth Tester	R&S	CBT	100959	Nov. 30, 2021	Nov. 29, 2022
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	May 03 ~ May 13, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101910	Apr. 18, 2022	Apr. 17, 2023
Power Meter	Anritsu	ML2495A	1241002	Nov. 07, 2021	Nov. 06, 2022
Power Sensor	Anritsu	MA2411B	1207366	Nov. 07, 2021	Nov. 06, 2022
Measurement Software	Sporton	SENSE-15247_FS	V5.10.7.11	NA	NA
Bluetooth Tester	R&S	CBT	100959	Nov. 30, 2021	Nov. 29, 2022
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

47 CFR FCC Part 15.247
ANSI C63.10-2013

1.6 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

1.7 Deviation from Test Standard and Measurement Procedure

None

1.8 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
Bandwidth	± 34.130 Hz
Conducted power	± 0.808 dB
Power density	± 0.583 dB
Conducted emission	± 2.715 dB
AC conducted emission	± 2.92 dB
Unwanted Emission ≤ 1 GHz	± 3.41 dB
Unwanted Emission > 1 GHz	± 4.59 dB
Time	$\pm 0.1\%$

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, 03CH01-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.)

- 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	Mode	Test Frequency (MHz)	Data Rate (Mbps)	Test Configuration
AC Power Line Conducted Emissions	Charging	---	---	1
Unwanted Emissions ≤ 1GHz	GFSK	2402	1Mbps	2
Unwanted Emissions ≤ 1GHz	Charging	---	---	1
Unwanted Emissions > 1GHz	GFSK 8DPSK	2402, 2441, 2480 2402, 2441, 2480	1Mbps 3Mbps	2
Conducted Output Power	GFSK π/4 DQPSK 8DPSK	2402, 2441, 2480 2402, 2441, 2480 2402, 2441, 2480	1Mbps 2Mbps 3Mbps	2
Number of Hopping Channels	GFSK π/4 DQPSK 8DPSK	2402~2480 2402~2480 2402~2480	1Mbps 2Mbps 3Mbps	2
Hopping Channel Separation 20dB and Occupied bandwidth	GFSK π/4 DQPSK 8DPSK	2402, 2441, 2480 2402, 2441, 2480 2402, 2441, 2480	1Mbps 2Mbps 3Mbps	2
Dwell Time	GFSK π/4 DQPSK 8DPSK	2402 2402 2402	1Mbps 2Mbps 3Mbps	2

NOTE:

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 had been tested by following test configurations.
 - 1) Configuration 1: Charging mode
 - 2) Configuration 2: Battery mode

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. Radiated emission above 1GHz / Peak value
RBW=1MHz, VBW=3MHz and Peak detector

Radiated emission above 1GHz / Average value for harmonics

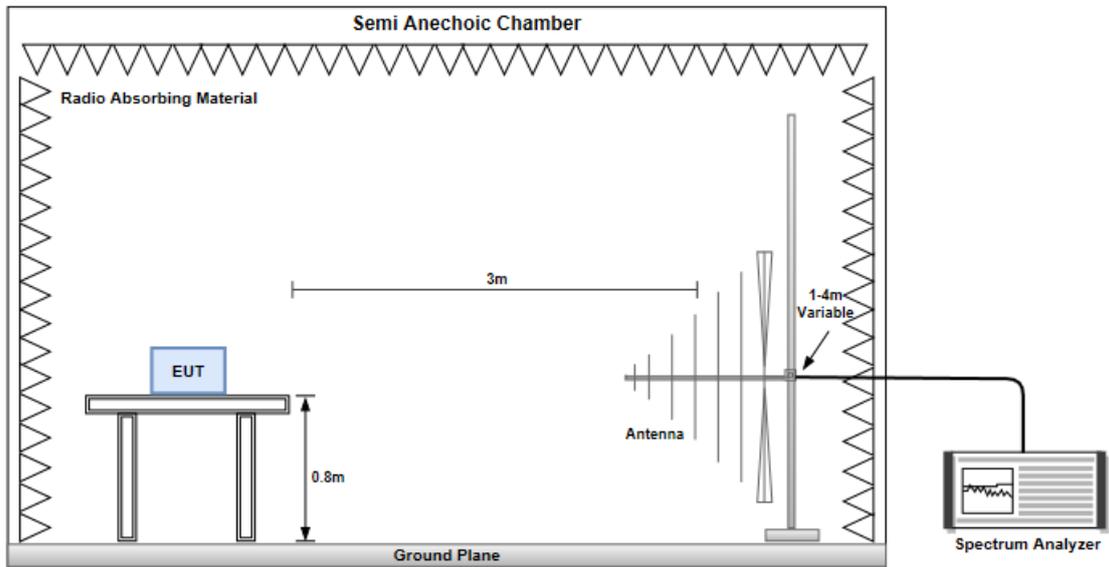
The average value is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula for DH5 packet type which has worst duty factor:

3.
$$20\log(\text{Duty cycle}) = 20\log \frac{1\text{s} / 1600 * 5}{100\text{ ms}} = -30.1\text{dB}$$

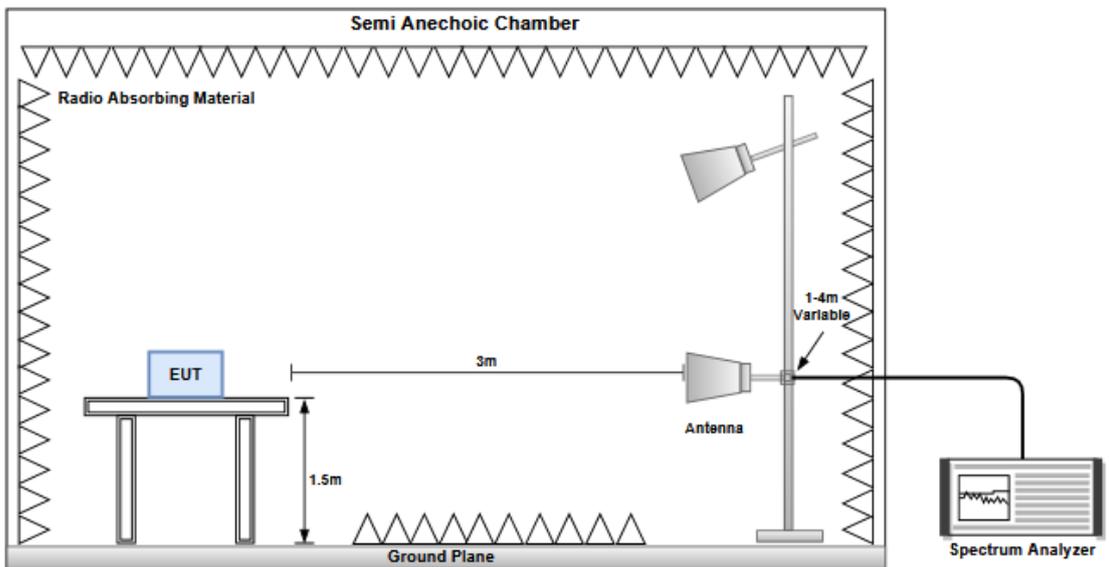
4. Radiated emission above 1GHz / Average value for other emissions
RBW=1MHz, VBW=1/T and Peak detector

3.1.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



3.1.4 Test Results

Refer to Appendix A.

3.2 Unwanted Emissions into Non-Restricted Frequency Bands

3.2.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.2.2 Test Procedures

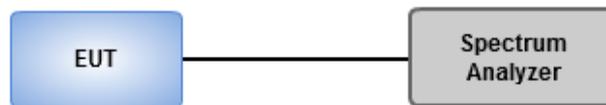
Reference level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.2.3 Test Setup



3.2.4 Test Results

Ambient Condition	23-24°C / 64-66%	Tested By	Brad Wu
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Refer to Appendix B.

3.3 Conducted Output Power

3.3.1 Limit of Conducted Output Power

- 1 Watt
For frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non overlapping hopping channels, and all frequency hopping systems in the 5725–5850 MHz band.
- 0.125 Watt
For all other frequency hopping systems in the 2400–2483.5 MHz band.
- 0.125 Watt
For Frequency hopping systems operating in the 2400–2483.5 MHz band have hopping channel carrier frequencies that are separated by two-thirds of the 20 dB bandwidth of the hopping channel.

3.3.2 Test Procedures

1. A wideband power meter is used for power measurement. Bandwidth of power sensor and meter is 50MHz
2. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power

3.3.3 Test Setup



3.3.4 Test Results

Ambient Condition	23-24°C / 64-66%	Tested By	Brad Wu
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Refer to Appendix C.

3.4 Number of Hopping Frequency

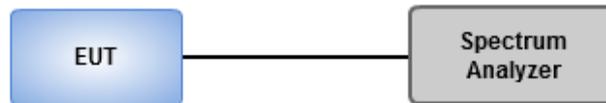
3.4.1 Limit of Number of Hopping Frequency

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels.

3.4.2 Test Procedures

1. Set RBW = 100kHz, VBW = 300kHz, Sweep time = Auto, Detector = Peak Trace max hold.
2. Allow trace to stabilize.

3.4.3 Test Setup



3.4.4 Test Results

Ambient Condition	23-24°C / 64-66%	Tested By	Brad Wu
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Refer to Appendix D.

3.5 20dB and Occupied Bandwidth

3.5.1 Test Procedures

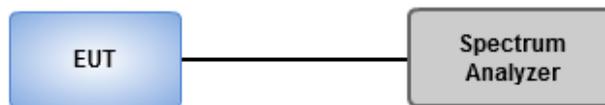
20dB Bandwidth

1. Set RBW=20kHz, VBW=100kHz, Sweep time = Auto, Detector=Peak , Trace max hold
2. Allow trace to stabilize
3. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

1. Set RBW=20kHz, VBW=100kHz, Sweep time = Auto, Detector=Sample , Trace max hold
2. Allow trace to stabilize
3. Use Occupied bandwidth function of spectrum analyzer to measuring 99% occupied bandwidth

3.5.2 Test Setup



3.5.3 Test Results

Ambient Condition	23-24°C / 64-66%	Tested By	Brad Wu
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Refer to Appendix E.

3.6 Channel Separation

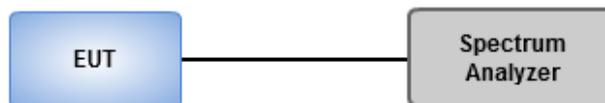
3.6.1 Limit of Channel Separation

- Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.
- Frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater.

3.6.2 Test Procedures

1. Set RBW=30kHz, VBW=100kHz, Sweep time = Auto, Detector=Peak Trace max hold
2. Allow trace to stabilize
3. Use the marker-delta function to determine the separation between the peaks of the adjacent channels. The EUT shall show compliance with the appropriate regulatory limit

3.6.3 Test Setup



3.6.4 Test Results

Ambient Condition	23-24°C / 64-66%	Tested By	Brad Wu
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Refer to Appendix F.

3.7 Number of Dwell Time

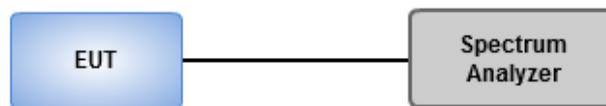
3.7.1 Limit of Dwell time

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

3.7.2 Test Procedures

1. Set RBW=300 kHz, VBW=1 MHz, Sweep time=8 ms, Detector=Peak, Span=0 Hz, Trace max hold.
2. Enable gating and trigger function of spectrum analyzer to measure burst on time.
3. Set RBW=300 kHz, VBW=1 MHz, Sweep time=5 s / 2 s, Detector=Peak, Span=0 Hz, Trace max hold.
4. Enable gating and trigger function of spectrum analyzer to measure burst on number of transmission.
5. Set RBW=300 kHz, VBW=1 MHz, Sweep time=31.6 s / 8 s, Detector=Peak, Span=0 Hz, Trace max hold.
6. Enable gating and trigger function of spectrum analyzer to measure burst on number of transmission of entire time cycle.

3.7.3 Test Setup



3.7.4 Test Results

Ambient Condition	23-24°C / 64-66%	Tested By	Brad Wu
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Refer to Appendix G.

3.8 AC Power Line Conducted Emissions

3.8.1 Limit of AC Power Line Conducted Emissions

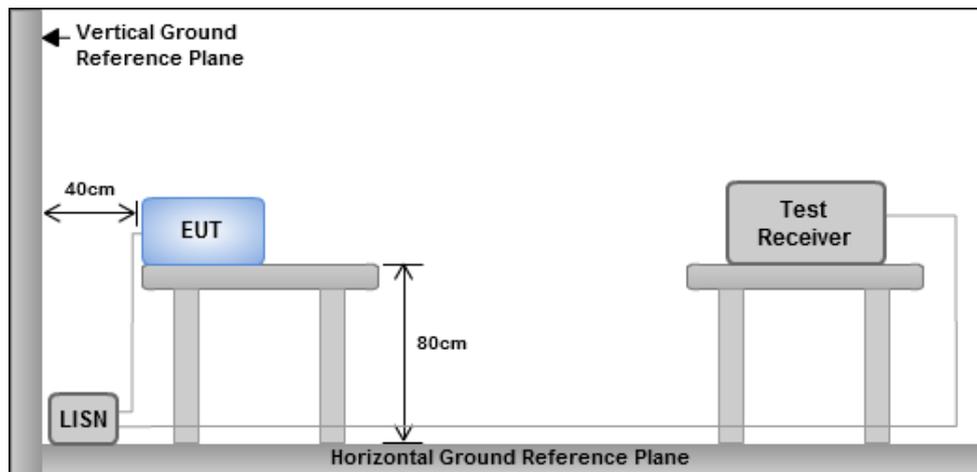
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.8.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V/60Hz

3.8.3 Test Setup



Note: 1. Support units were connected to second LISN.

2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.8.4 Test Results

Refer to Appendix H.

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

No.3-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
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

Fax: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

==END==



Configuration 2: Battery mode

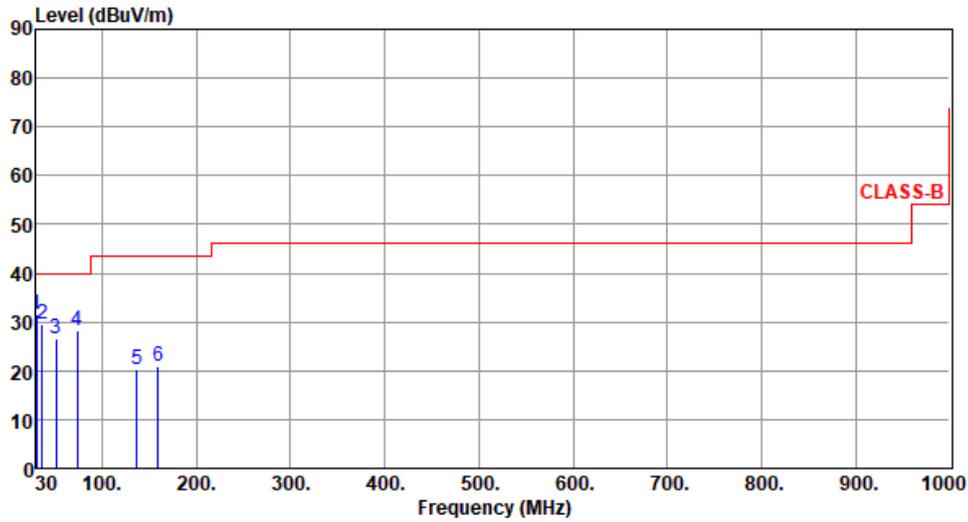
Emissions (Below 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402																																																																
Polarization	Horizontal																																																																		
Test By : Akun Chung Temperature(°C):22 Humidity(%):68																																																																			
	<table border="1"> <thead> <tr> <th>Freq. MHz</th> <th>Emission level dBuV/m</th> <th>Limit dBuV/m</th> <th>Margin dB</th> <th>SA reading dBuV</th> <th>Factor dB/m</th> <th>Remark</th> <th>ANT High cm</th> <th>Turn Table deg</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>30.00</td> <td>25.83</td> <td>40.00</td> <td>-14.17</td> <td>35.77</td> <td>-9.94</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>2</td> <td>35.82</td> <td>25.47</td> <td>40.00</td> <td>-14.53</td> <td>34.90</td> <td>-9.43</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>3</td> <td>73.65</td> <td>27.74</td> <td>40.00</td> <td>-12.26</td> <td>39.60</td> <td>-11.86</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>4</td> <td>135.73</td> <td>19.94</td> <td>43.50</td> <td>-23.56</td> <td>29.39</td> <td>-9.45</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>5</td> <td>148.34</td> <td>21.29</td> <td>43.50</td> <td>-22.21</td> <td>30.27</td> <td>-8.98</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>6</td> <td>161.92</td> <td>22.38</td> <td>43.50</td> <td>-21.12</td> <td>31.07</td> <td>-8.69</td> <td>Peak</td> <td>---</td> </tr> </tbody> </table>	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	30.00	25.83	40.00	-14.17	35.77	-9.94	Peak	---	2	35.82	25.47	40.00	-14.53	34.90	-9.43	Peak	---	3	73.65	27.74	40.00	-12.26	39.60	-11.86	Peak	---	4	135.73	19.94	43.50	-23.56	29.39	-9.45	Peak	---	5	148.34	21.29	43.50	-22.21	30.27	-8.98	Peak	---	6	161.92	22.38	43.50	-21.12	31.07	-8.69	Peak	---			
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Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 22 Humidity(%): 68



	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	30.00	31.62	40.00	-8.38	41.56	-9.94	Peak	---	---
2	36.79	29.54	40.00	-10.46	38.70	-9.16	Peak	---	---
3	51.34	26.67	40.00	-13.33	35.45	-8.78	Peak	---	---
4	73.65	28.09	40.00	-11.91	39.95	-11.86	Peak	---	---
5	136.70	20.40	43.50	-23.10	29.85	-9.45	Peak	---	---
6	159.01	20.78	43.50	-22.72	29.47	-8.69	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.



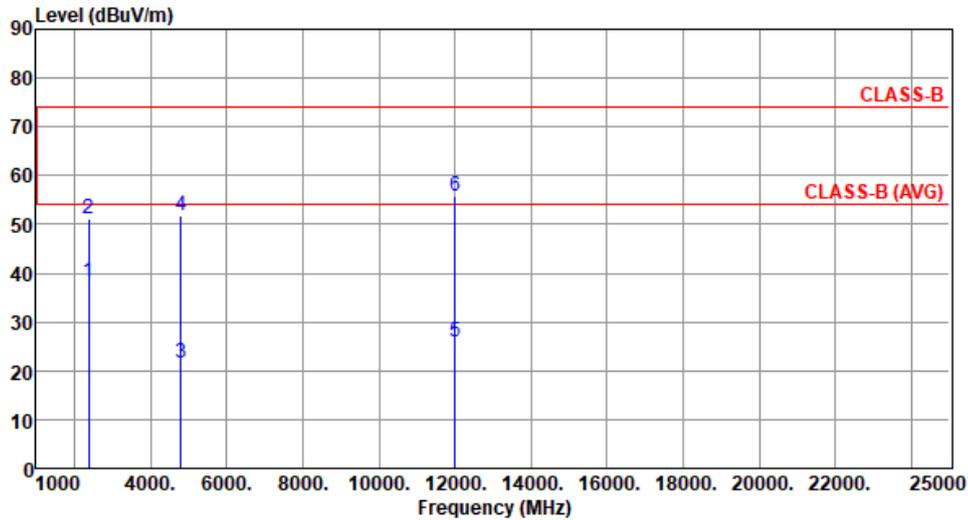
Emissions (Above 1GHz) for GFSK

Modulation	GFSK	Test Freq. (MHz)	2402						
Polarization	Horizontal								
Test By :Akun Chung Temperature(°C):23 Humidity(%):66									
<p>The graph plots Level (dBuV/m) on the y-axis (0 to 90) against Frequency (MHz) on the x-axis (1000 to 25000). Two horizontal red lines represent limits: CLASS-B at approximately 74 dBuV/m and CLASS-B (AVG) at approximately 54 dBuV/m. Six vertical blue lines with markers represent emission peaks at various frequencies, labeled 1 through 6. Peak 1 is at 2390 MHz, peak 2 at 2390 MHz, peak 3 at 4804 MHz, peak 4 at 4804 MHz, peak 5 at 12010 MHz, and peak 6 at 12010 MHz.</p>									
	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	2390.00	37.47	54.00	-16.53	40.22	-2.75	Average	175	173
2	2390.00	50.13	74.00	-23.87	52.88	-2.75	Peak	175	173
3	4804.00	23.69	54.00	-30.31			Average	115	205
4	4804.00	53.79	74.00	-20.21	49.66	4.13	Peak	115	205
5	12010.00	27.40	54.00	-26.60			Average	100	215
6	12010.00	57.50	74.00	-16.50	43.88	13.62	Peak	100	215
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: When average value is calculated not measured, no SA reading and factor value are listed.									



Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 23 Humidity(%): 66



	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	2390.00	38.03	54.00	-15.97	40.78	-2.75	Average	115	175
2	2390.00	51.10	74.00	-22.90	53.85	-2.75	Peak	115	175
3	4804.00	21.58	54.00	-32.42			Average	100	154
4	4804.00	51.68	74.00	-22.32	47.55	4.13	Peak	100	154
5	12010.00	25.78	54.00	-28.22			Average	100	150
6	12010.00	55.88	74.00	-18.12	42.26	13.62	Peak	100	150

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

*Factor includes antenna factor , cable loss and amplifier gain

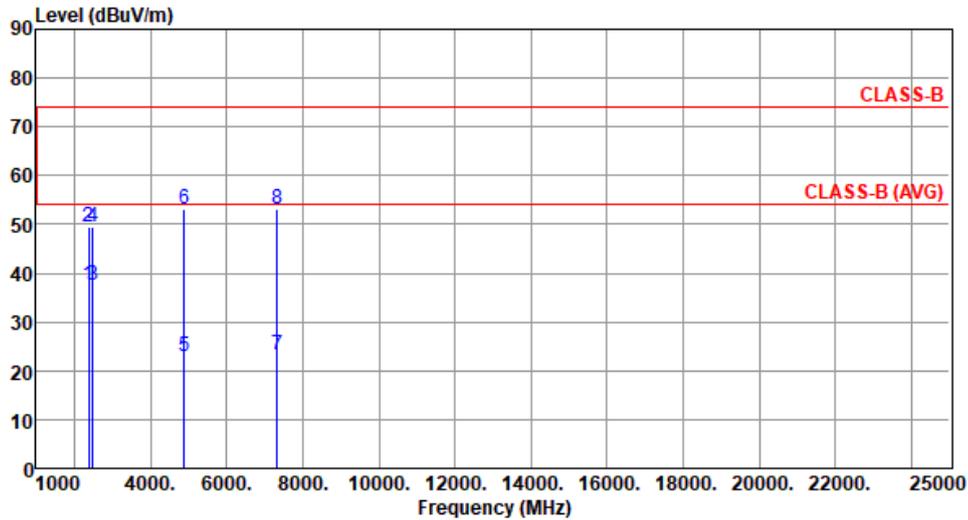
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	GFSK	Test Freq. (MHz)	2441
Polarization	Horizontal		

Test By : Akun Chung Temperature(°C): 23 Humidity(%): 66



	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	2390.00	37.43	54.00	-16.57	40.18	-2.75	Average	170	174
2	2390.00	49.51	74.00	-24.49	52.26	-2.75	Peak	170	174
3	2483.50	37.60	54.00	-16.40	40.30	-2.70	Average	170	174
4	2483.50	49.58	74.00	-24.42	52.28	-2.70	Peak	170	174
5	4882.00	22.97	54.00	-31.03			Average	111	198
6	4882.00	53.07	74.00	-20.93	48.95	4.12	Peak	111	198
7	7323.00	23.14	54.00	-30.86			Average	100	185
8	7323.00	53.24	74.00	-20.76	43.97	9.27	Peak	100	185

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

*Factor includes antenna factor , cable loss and amplifier gain

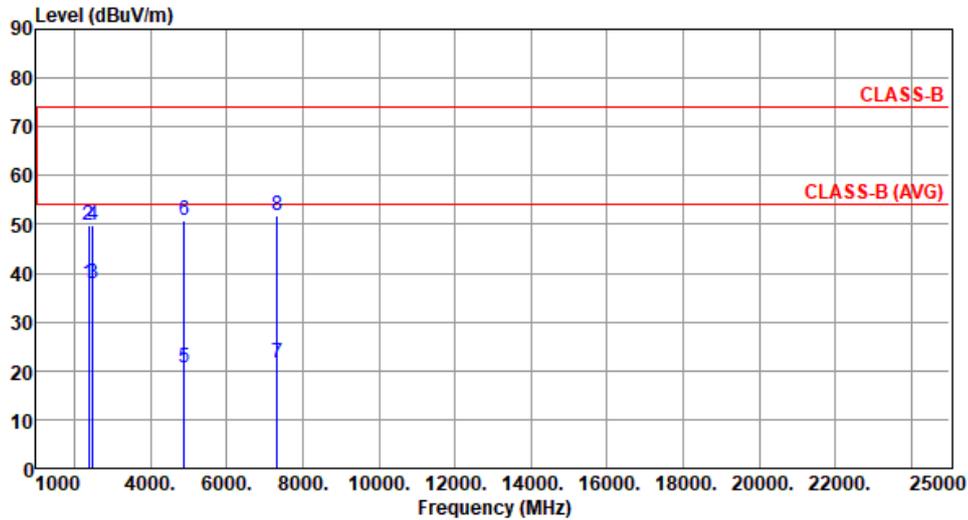
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	GFSK	Test Freq. (MHz)	2441
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 23 Humidity(%): 66



	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	2390.00	37.70	54.00	-16.30	40.45	-2.75	Average	107	189
2	2390.00	49.83	74.00	-24.17	52.58	-2.75	Peak	107	189
3	2483.50	37.72	54.00	-16.28	40.42	-2.70	Average	107	189
4	2483.50	49.77	74.00	-24.23	52.47	-2.70	Peak	107	189
5	4882.00	20.70	54.00	-33.30			Average	111	156
6	4882.00	50.80	74.00	-23.20	46.68	4.12	Peak	111	156
7	7323.00	21.63	54.00	-32.37			Average	100	156
8	7323.00	51.73	74.00	-22.27	42.46	9.27	Peak	100	156

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

*Factor includes antenna factor , cable loss and amplifier gain

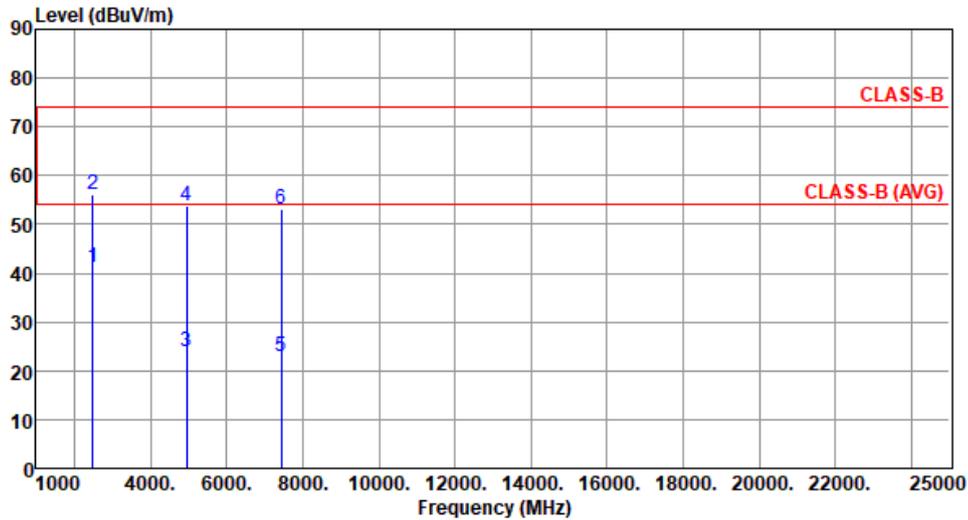
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		

Test By : Akun Chung Temperature(°C): 23 Humidity(%): 66



	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	2483.50	41.18	54.00	-12.82	43.88	-2.70	Average	152	180
2	2483.50	56.08	74.00	-17.92	58.78	-2.70	Peak	152	180
3	4960.00	23.81	54.00	-30.19			Average	104	196
4	4960.00	53.91	74.00	-20.09	49.88	4.03	Peak	104	196
5	7440.00	22.97	54.00	-31.03			Average	104	196
6	7440.00	53.07	74.00	-20.93	43.70	9.37	Peak	104	196

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

*Factor includes antenna factor , cable loss and amplifier gain

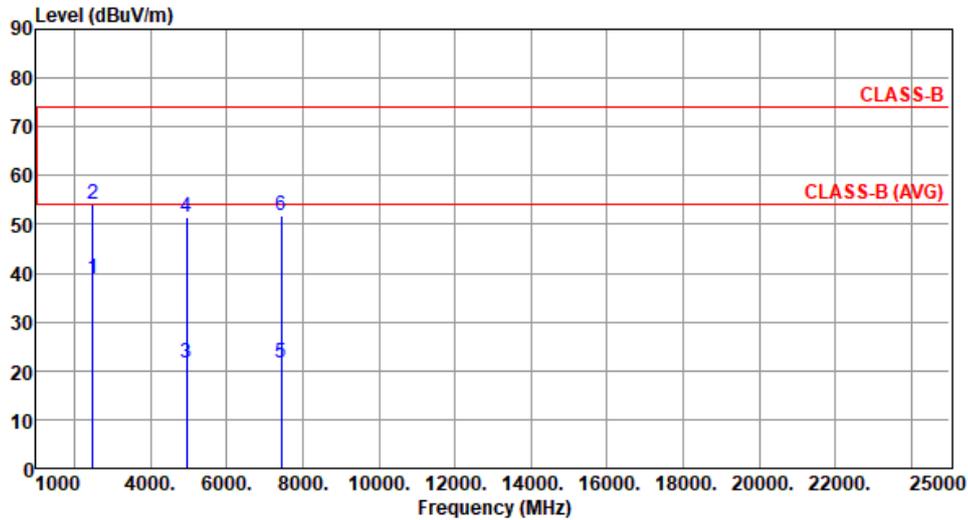
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 23 Humidity(%): 66



	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	2483.50	38.96	54.00	-15.04	41.66	-2.70	Average	110	187
2	2483.50	54.15	74.00	-19.85	56.85	-2.70	Peak	110	187
3	4960.00	21.47	54.00	-32.53			Average	115	145
4	4960.00	51.57	74.00	-22.43	47.54	4.03	Peak	115	145
5	7440.00	21.58	54.00	-32.42			Average	100	142
6	7440.00	51.68	74.00	-22.32	42.31	9.37	Peak	100	142

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).

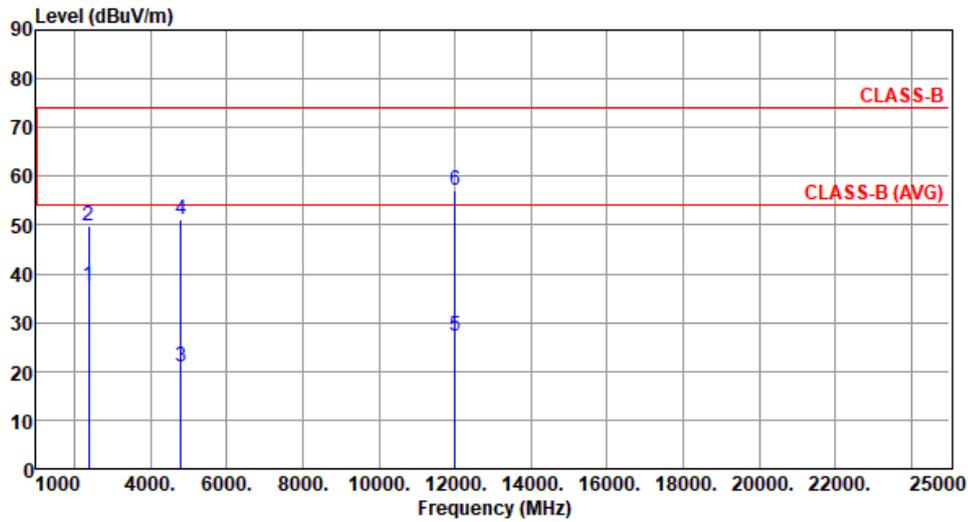
Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Emissions (Above 1GHz) for 8DPSK

Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):23 Humidity(%):66



	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	2390.00	37.64	54.00	-16.36	40.39	-2.75	Average	173	172
2	2390.00	49.70	74.00	-24.30	52.45	-2.75	Peak	173	172
3	4804.00	20.89	54.00	-33.11			Average	120	186
4	4804.00	50.99	74.00	-23.01	46.86	4.13	Peak	120	186
5	12010.00	27.07	54.00	-26.93			Average	100	189
6	12010.00	57.17	74.00	-16.83	43.55	13.62	Peak	100	189

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

*Factor includes antenna factor , cable loss and amplifier gain

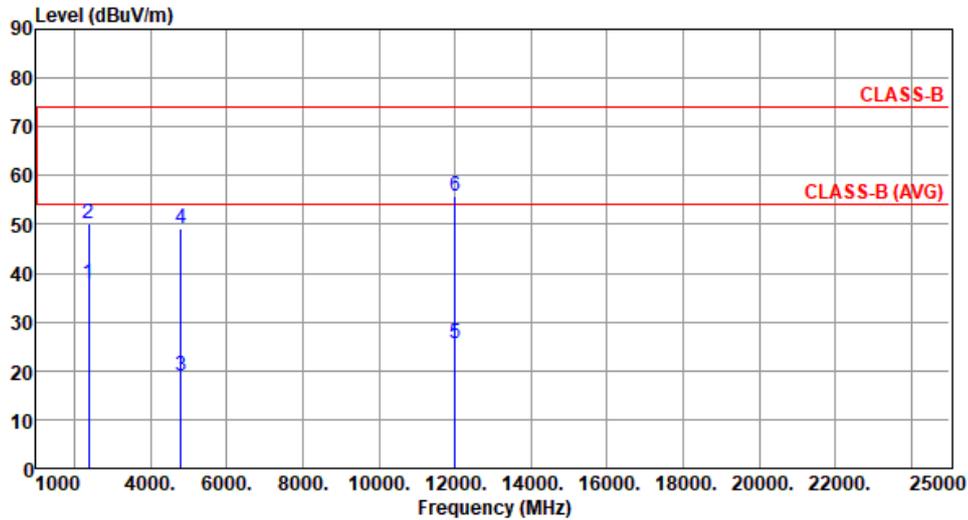
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	8DPSK	Test Freq. (MHz)	2402
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 23 Humidity(%): 66



	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	2390.00	37.91	54.00	-16.09	40.66	-2.75	Average	111	177
2	2390.00	50.05	74.00	-23.95	52.80	-2.75	Peak	111	177
3	4804.00	18.91	54.00	-35.09			Average	117	159
4	4804.00	49.01	74.00	-24.99	44.88	4.13	Peak	117	159
5	12010.00	25.70	54.00	-28.30			Average	100	160
6	12010.00	55.80	74.00	-18.20	42.18	13.62	Peak	100	160

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

*Factor includes antenna factor , cable loss and amplifier gain

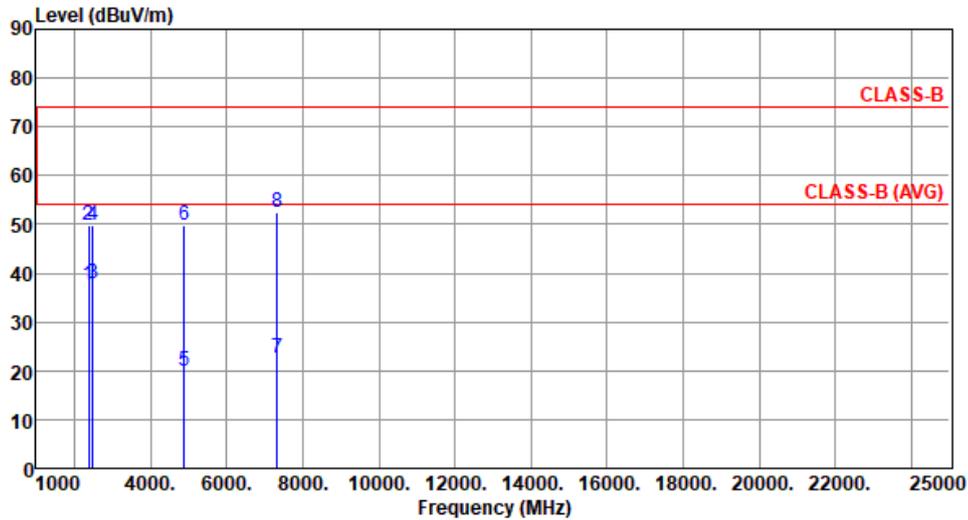
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	8DPSK	Test Freq. (MHz)	2441
Polarization	Horizontal		

Test By : Akun Chung Temperature(°C): 23 Humidity(%): 66



	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	2390.00	37.64	54.00	-16.36	40.39	-2.75	Average	166	169
2	2390.00	49.67	74.00	-24.33	52.42	-2.75	Peak	166	169
3	2483.50	37.78	54.00	-16.22	40.48	-2.70	Average	166	169
4	2483.50	49.79	74.00	-24.21	52.49	-2.70	Peak	166	169
5	4882.00	19.87	54.00	-34.13			Average	100	185
6	4882.00	49.97	74.00	-24.03	45.85	4.12	Peak	100	185
7	7323.00	22.43	54.00	-31.57			Average	100	178
8	7323.00	52.53	74.00	-21.47	43.26	9.27	Peak	100	178

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

*Factor includes antenna factor , cable loss and amplifier gain

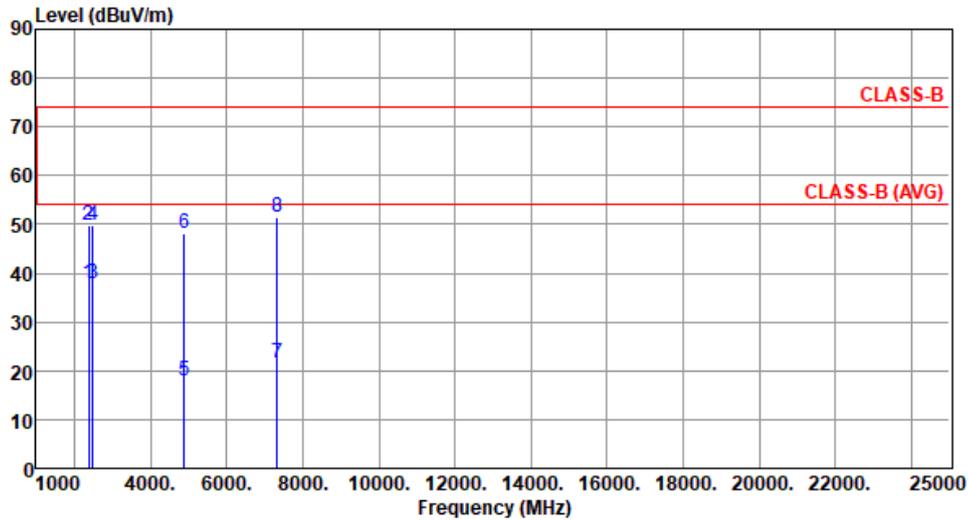
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	8DPSK	Test Freq. (MHz)	2441
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 23 Humidity(%): 66



	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	2390.00	37.80	54.00	-16.20	40.55	-2.75	Average	115	185
2	2390.00	49.79	74.00	-24.21	52.54	-2.75	Peak	115	185
3	2483.50	37.90	54.00	-16.10	40.60	-2.70	Average	115	185
4	2483.50	49.88	74.00	-24.12	52.58	-2.70	Peak	115	185
5	4882.00	17.98	54.00	-36.02			Average	114	152
6	4882.00	48.08	74.00	-25.92	43.96	4.12	Peak	114	152
7	7323.00	21.51	54.00	-32.49			Average	100	153
8	7323.00	51.61	74.00	-22.39	42.34	9.27	Peak	100	153

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

*Factor includes antenna factor , cable loss and amplifier gain

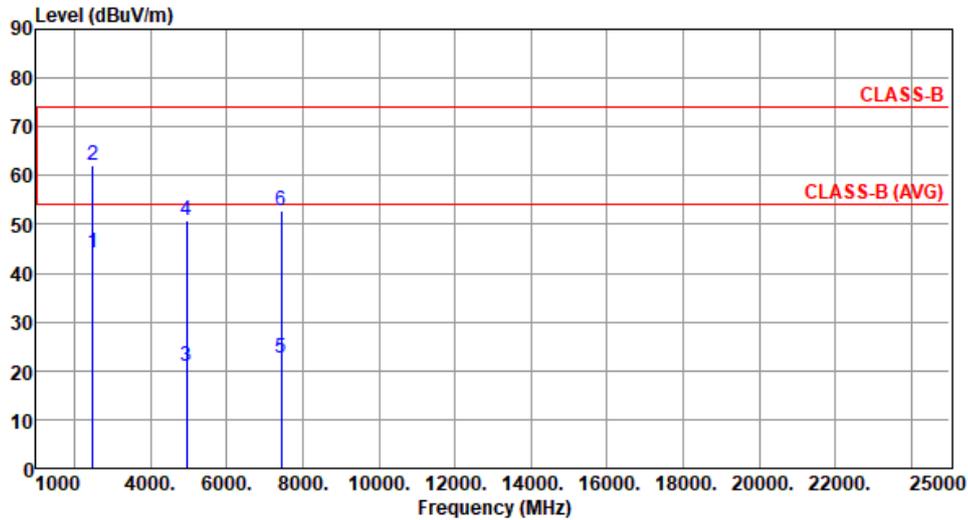
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Horizontal		

Test By : Akun Chung Temperature(°C): 23 Humidity(%): 66



	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	2483.50	44.18	54.00	-9.82	46.88	-2.70	Average	156	179
2	2483.50	62.18	74.00	-11.82	64.88	-2.70	Peak	156	179
3	4960.00	20.82	54.00	-33.18			Average	114	200
4	4960.00	50.92	74.00	-23.08	46.89	4.03	Peak	114	200
5	7440.00	22.57	54.00	-31.43			Average	100	203
6	7440.00	52.67	74.00	-21.33	43.30	9.37	Peak	100	203

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

*Factor includes antenna factor , cable loss and amplifier gain

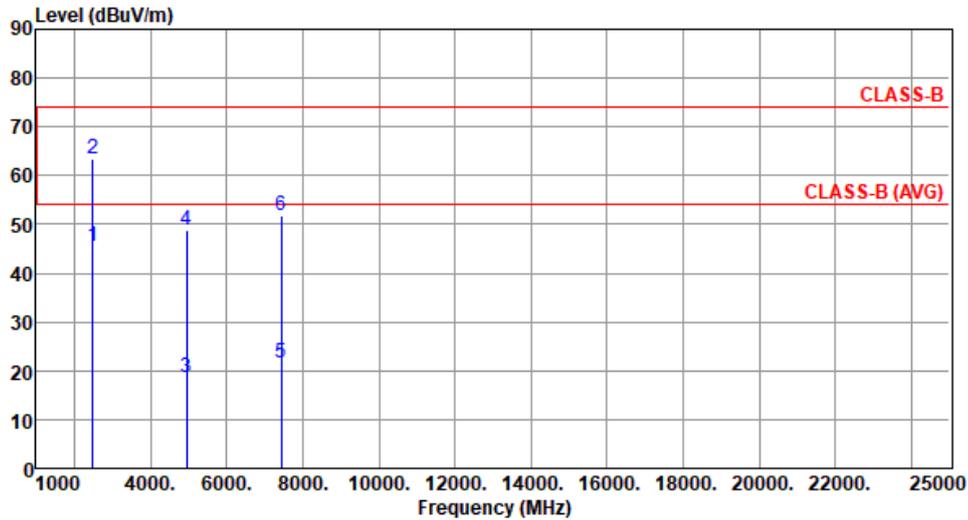
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: When average value is calculated not measured, no SA reading and factor value are listed.



Modulation	8DPSK	Test Freq. (MHz)	2480
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 23 Humidity(%): 66



	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	2483.50	45.61	54.00	-8.39	48.31	-2.70	Average	111	188
2	2483.50	63.56	74.00	-10.44	66.26	-2.70	Peak	111	188
3	4960.00	18.64	54.00	-35.36			Average	117	163
4	4960.00	48.74	74.00	-25.26	44.71	4.03	Peak	117	163
5	7440.00	21.58	54.00	-32.42			Average	100	168
6	7440.00	51.68	74.00	-22.32	42.31	9.37	Peak	100	168

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: When average value is calculated not measured, no SA reading and factor value are listed.



Configuration 1: Charging mode

Emissions (Below 1GHz)

Modulation	Charging									
Polarization	Horizontal									
Test By : Akun Chung			Temperature(°C): 22			Humidity(%): 68				
<p>The graph displays the emission level in dBuV/m across a frequency range from 30 MHz to 1000 MHz. A red step function represents 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 55 dBuV/m from 200 MHz to 1000 MHz. Six blue vertical lines indicate specific emission peaks, labeled 1 through 6, with their corresponding frequencies and levels listed in the table below.</p>										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
					dBuV			cm	deg	
1	30.00	26.38	40.00	-13.62	36.32	-9.94	Peak	---	---	
2	38.73	28.59	40.00	-11.41	37.46	-8.87	Peak	---	---	
3	66.86	26.28	40.00	-13.72	36.60	-10.32	Peak	---	---	
4	135.73	25.24	43.50	-18.26	34.69	-9.45	Peak	---	---	
5	144.46	27.88	43.50	-15.62	36.96	-9.08	Peak	---	---	
6	160.95	22.40	43.50	-21.10	31.18	-8.78	Peak	---	---	

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

*Factor includes antenna factor , cable loss and amplifier gain

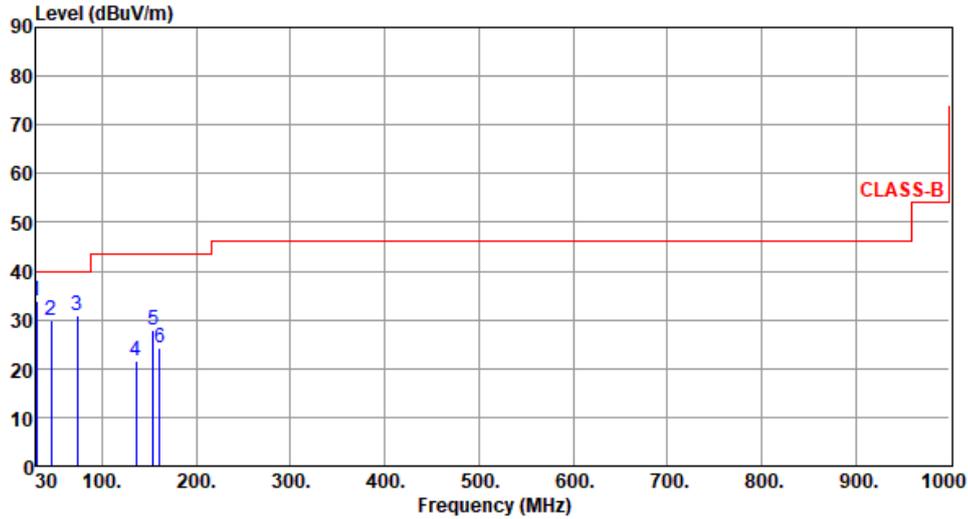
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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



Modulation	Charging
Polarization	Vertical

Test By :Akun Chung Temperature(°C):22 Humidity(%):68



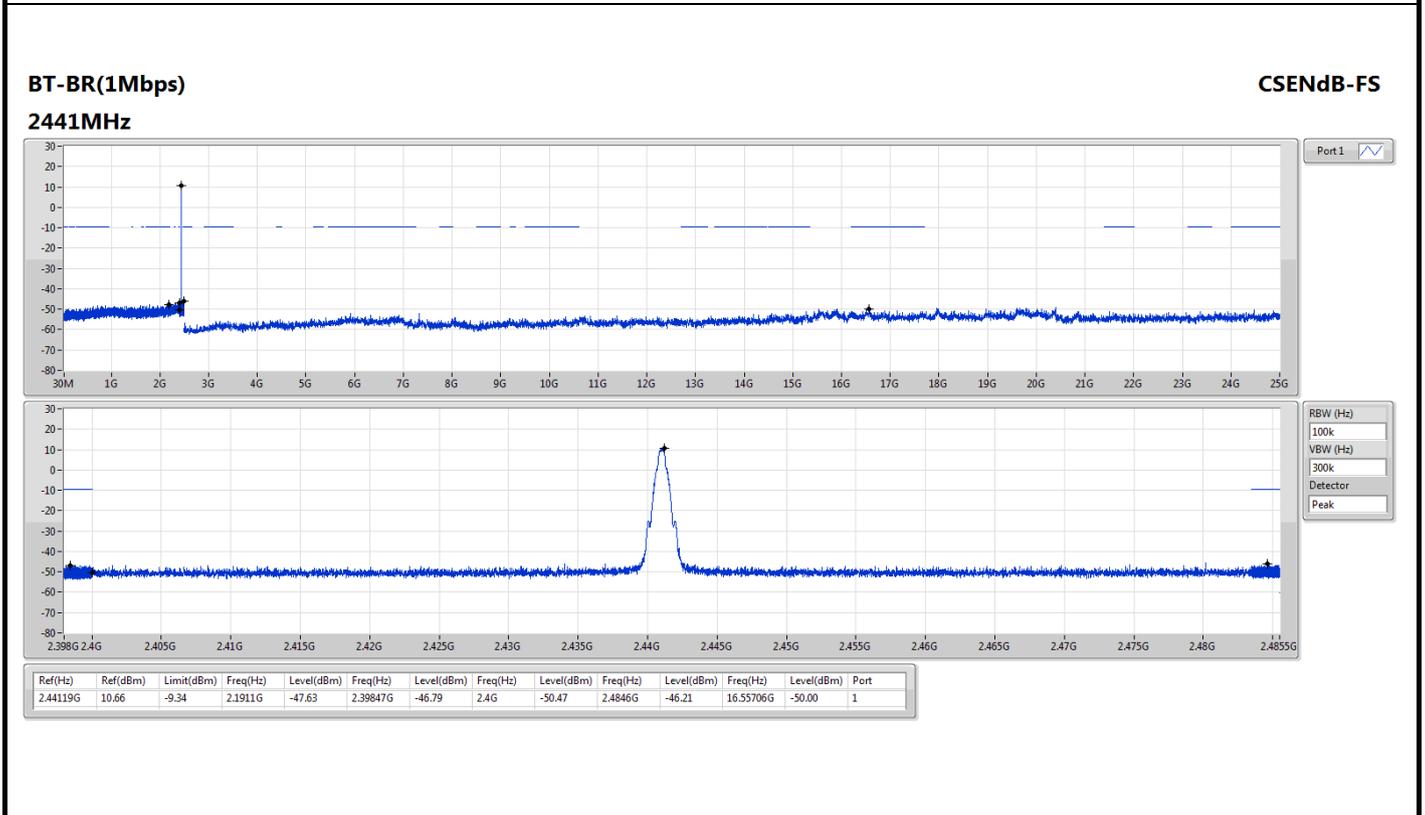
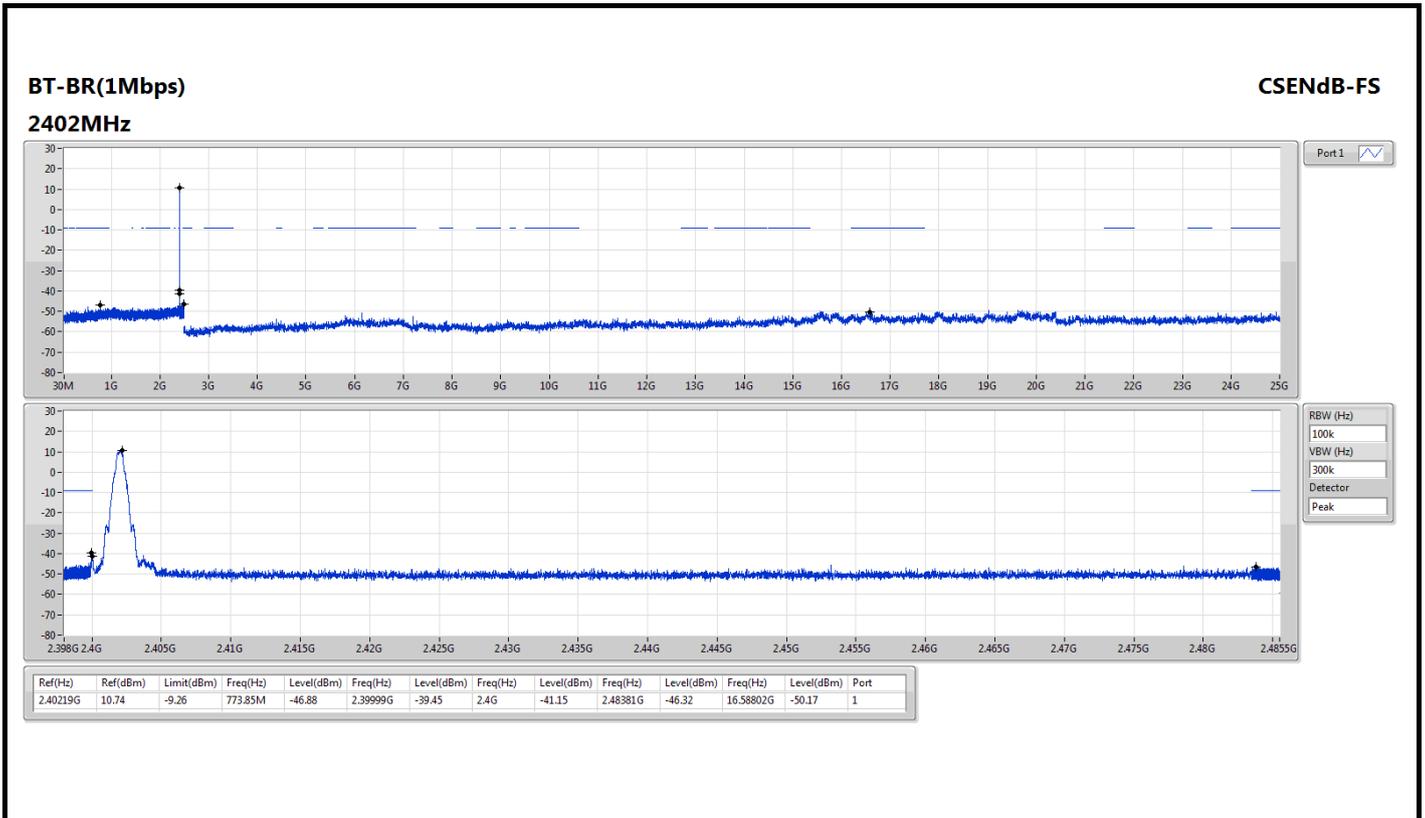
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	30.00	33.77	40.00	-6.23	43.71	-9.94	Peak	---	---
2	45.52	29.80	40.00	-10.20	38.30	-8.50	Peak	---	---
3	73.65	30.73	40.00	-9.27	42.59	-11.86	Peak	---	---
4	135.73	21.46	43.50	-22.04	30.91	-9.45	Peak	---	---
5	154.16	27.79	43.50	-15.71	36.58	-8.79	Peak	---	---
6	160.95	24.21	43.50	-19.29	32.99	-8.78	Peak	---	---

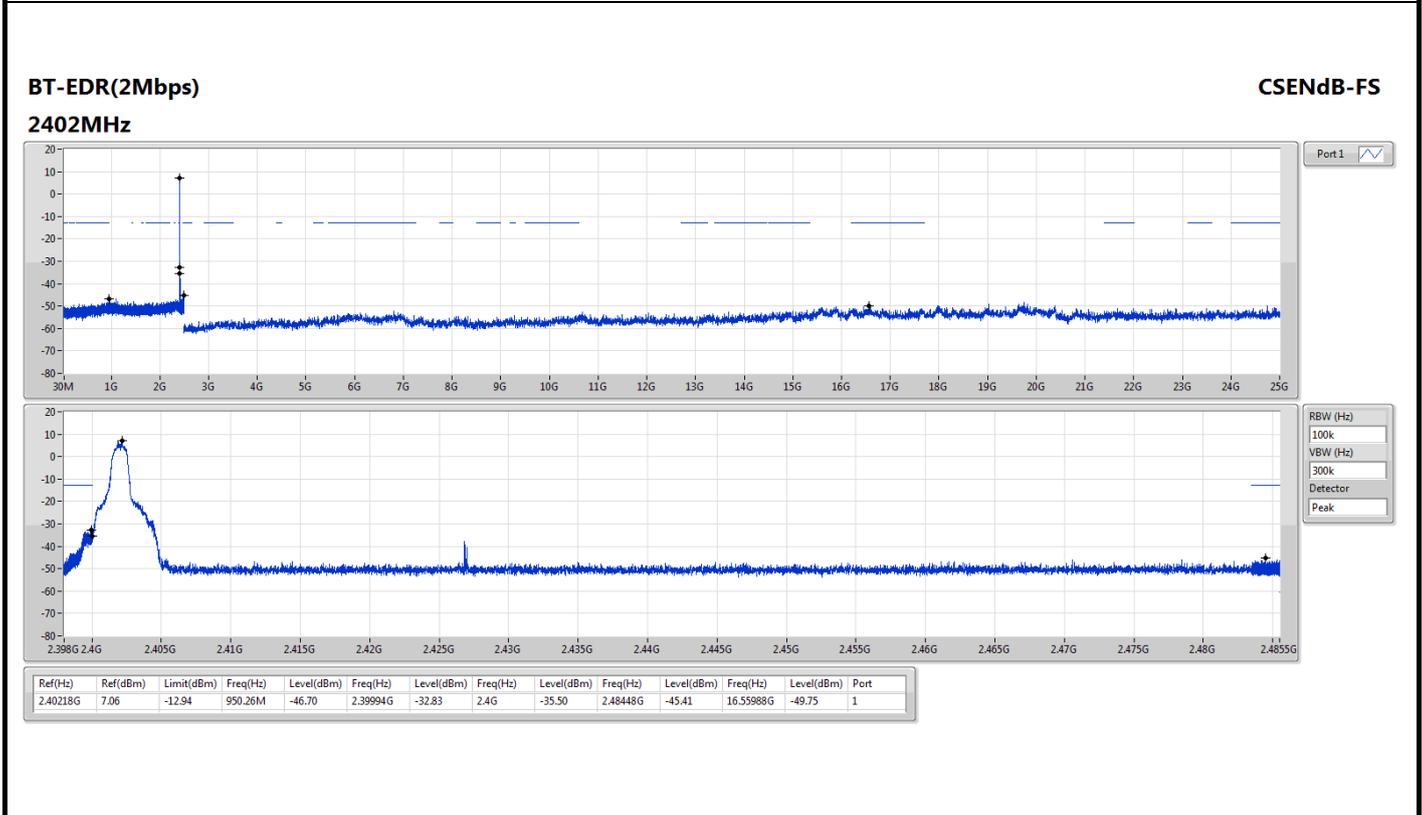
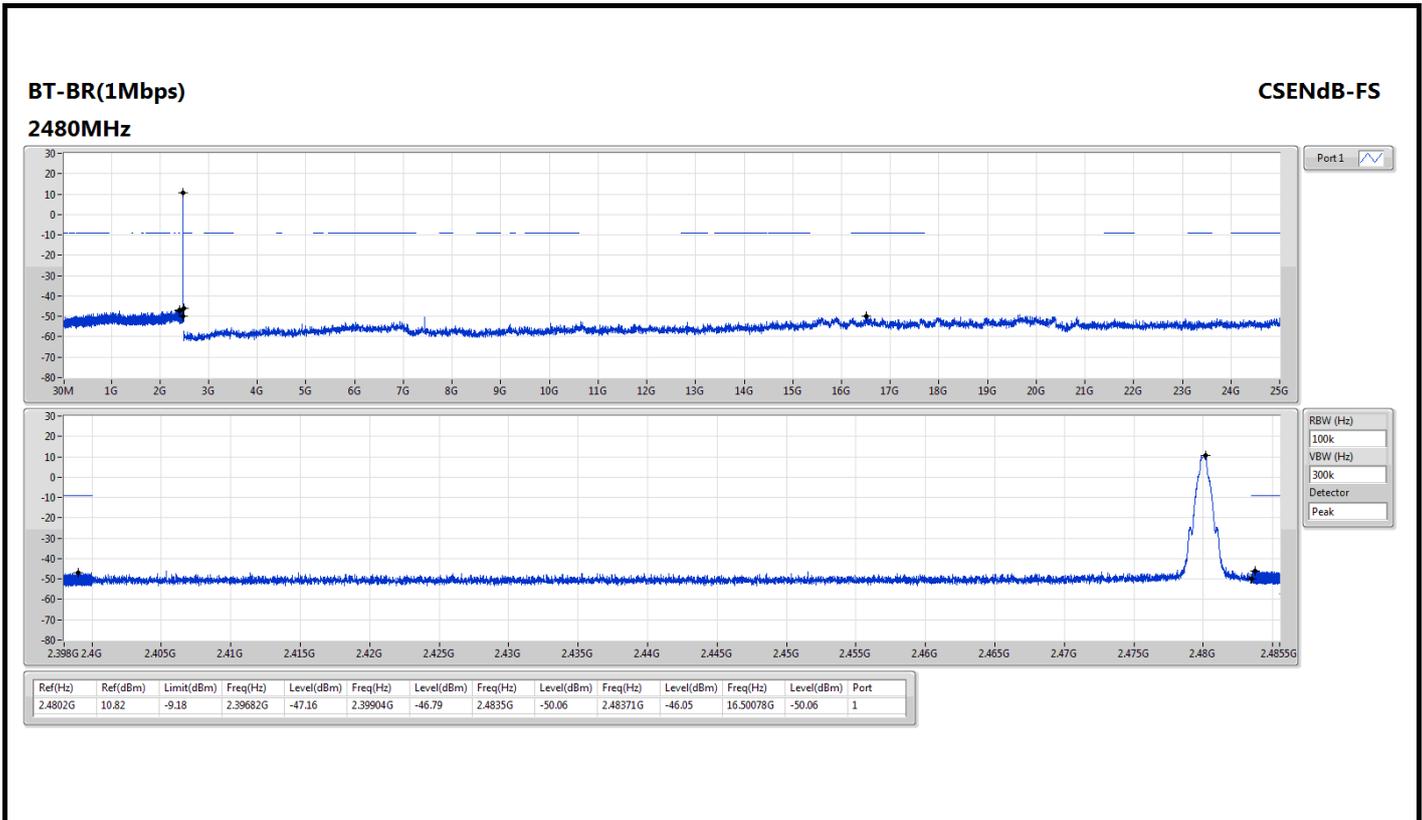
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

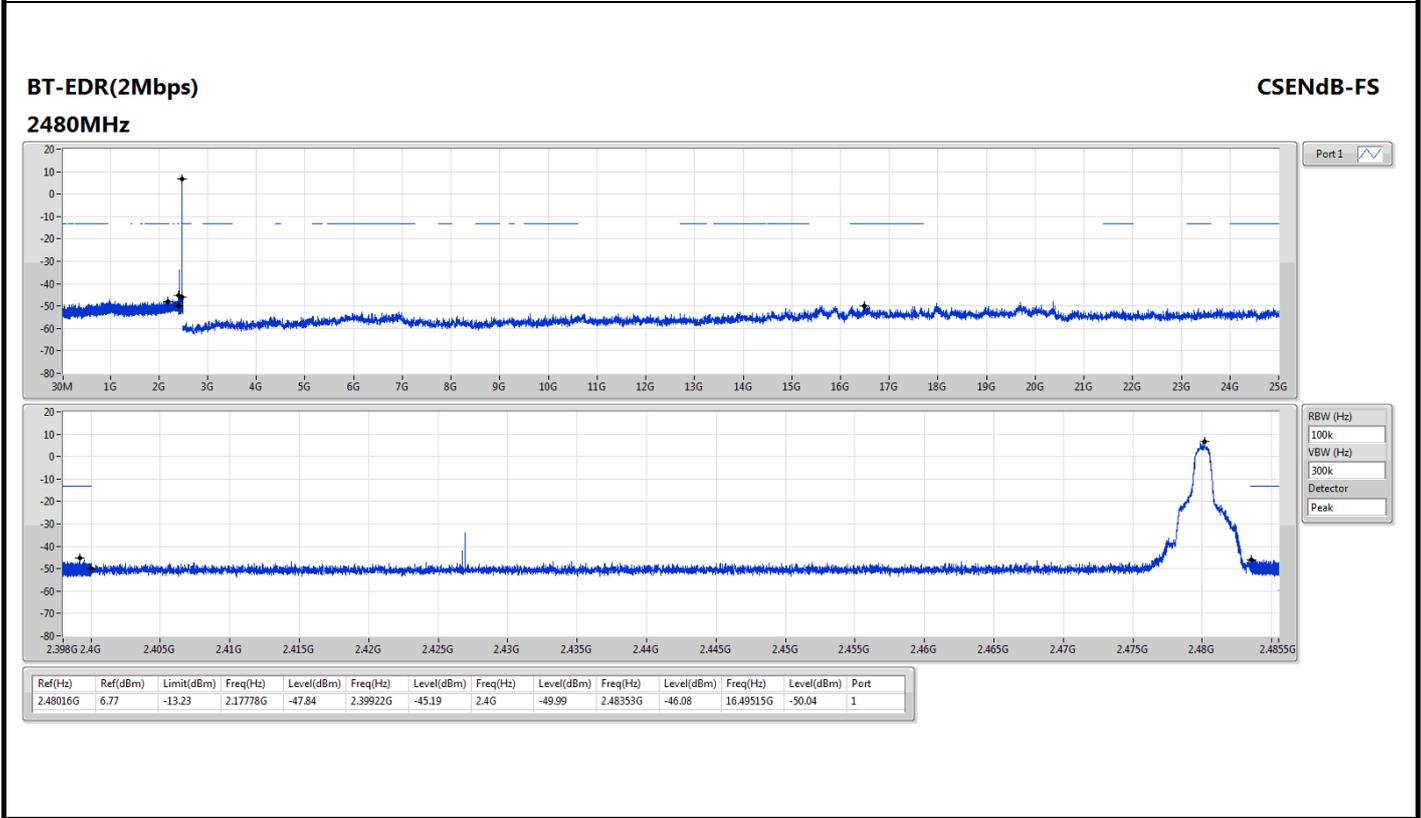
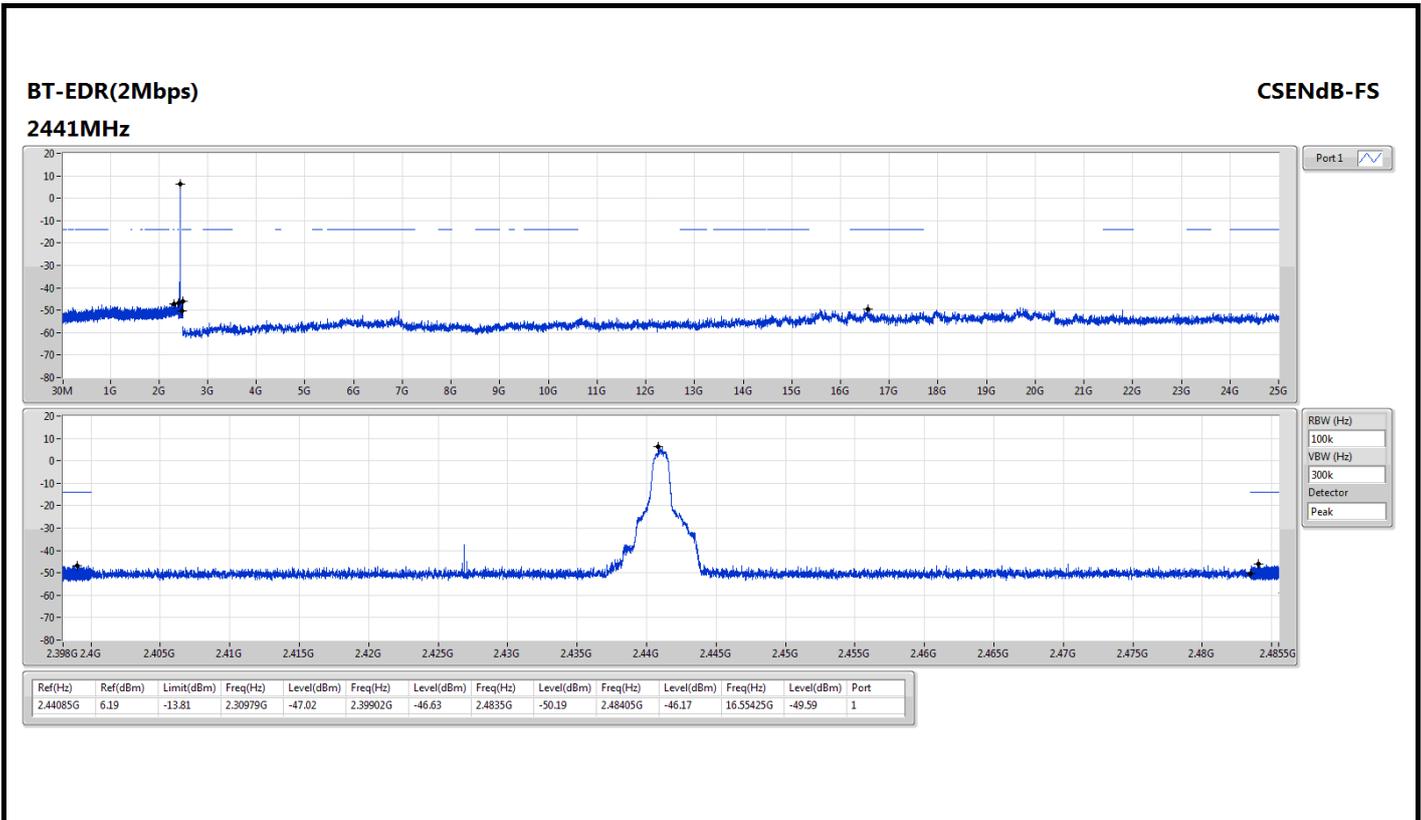
*Factor includes antenna factor , cable loss and amplifier gain

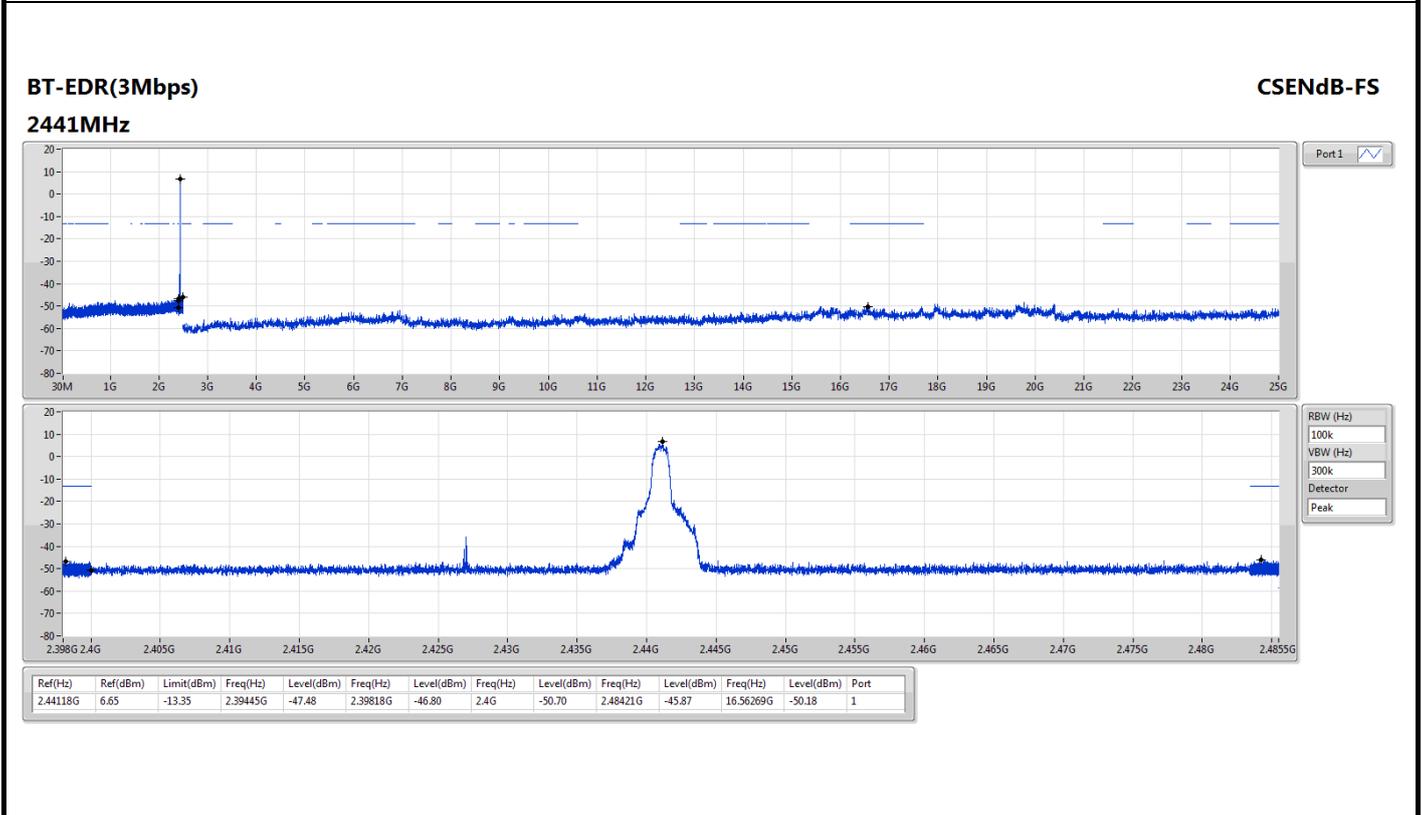
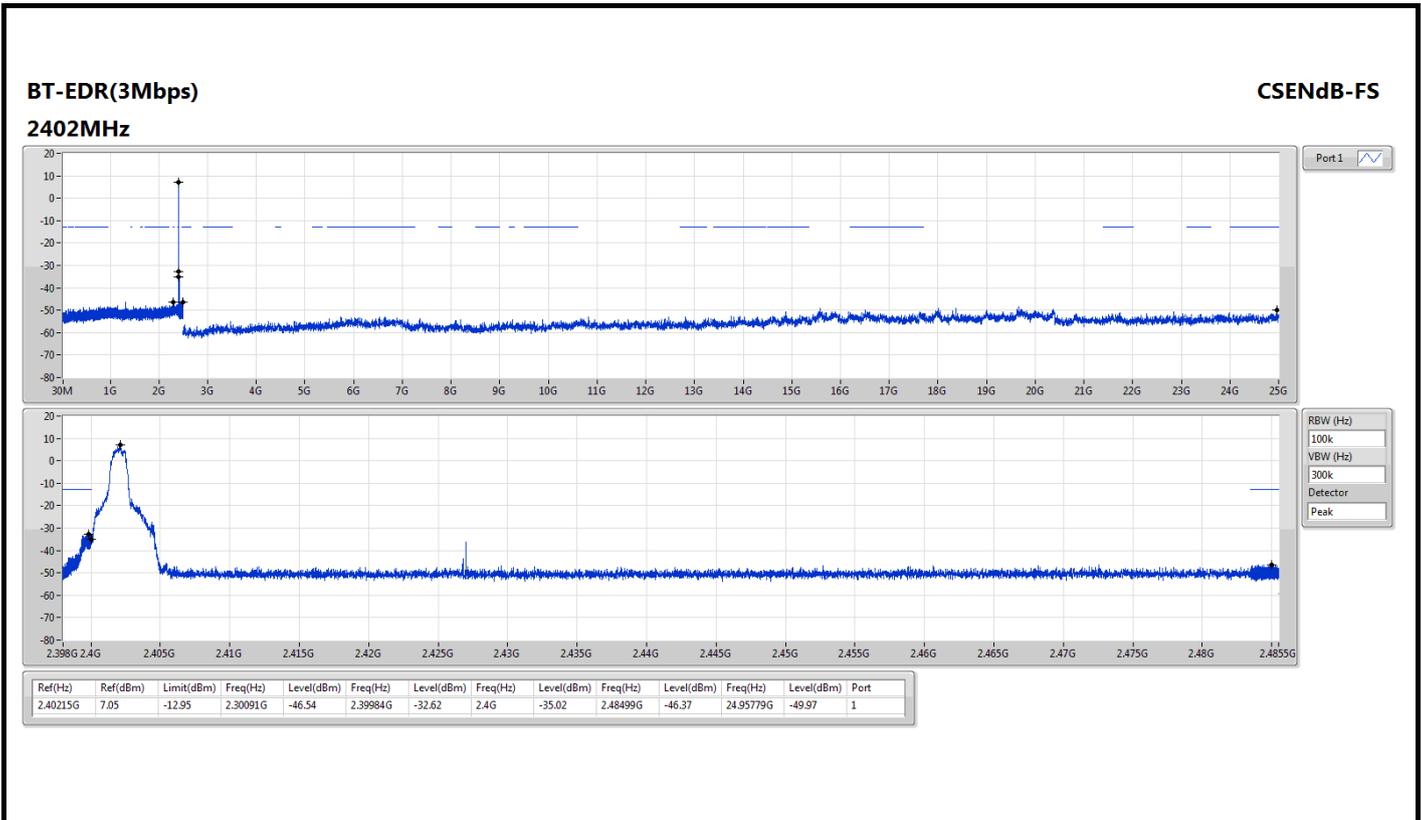
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

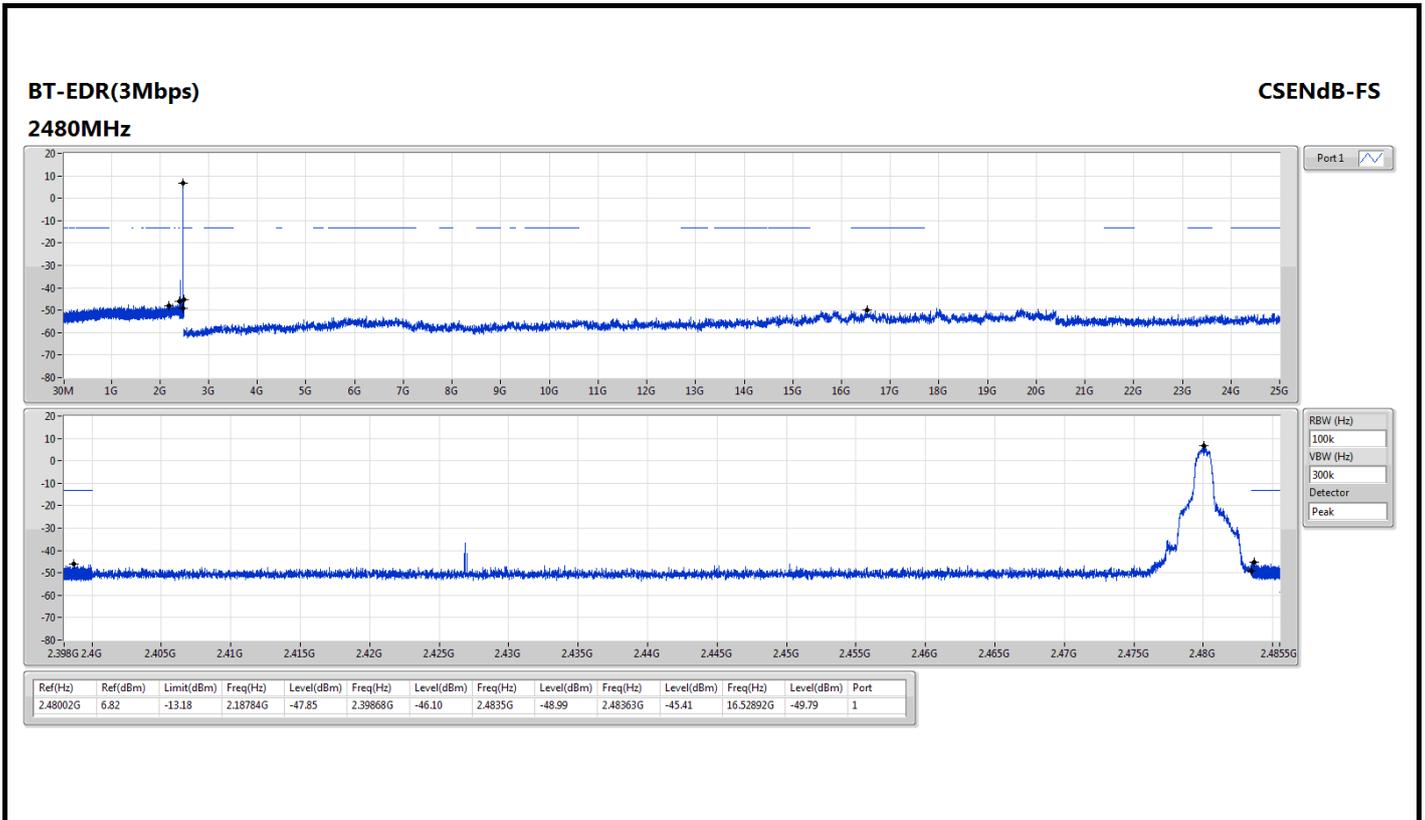
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.



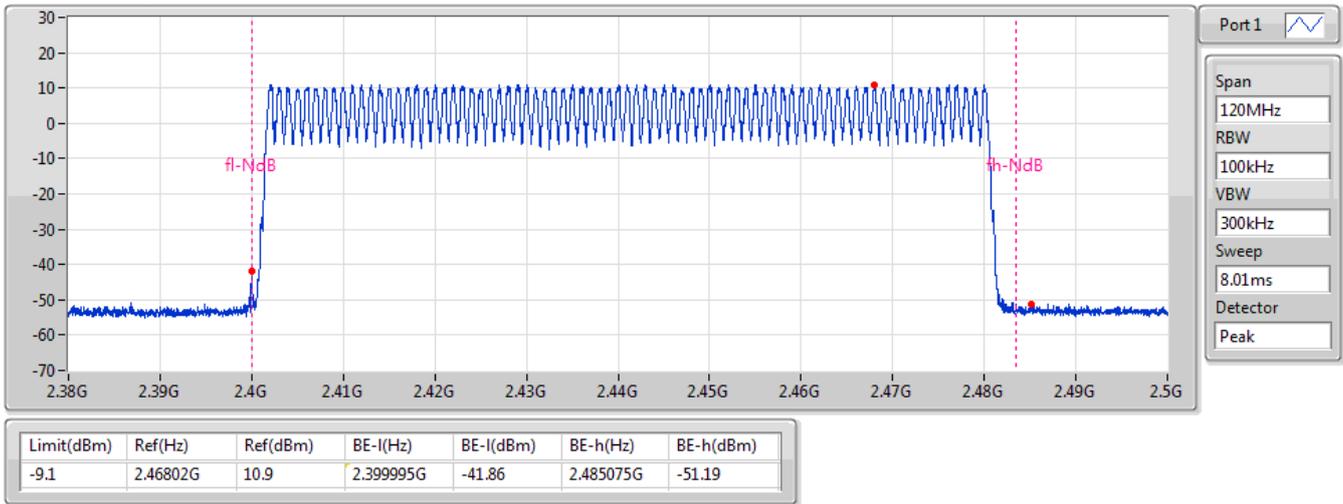




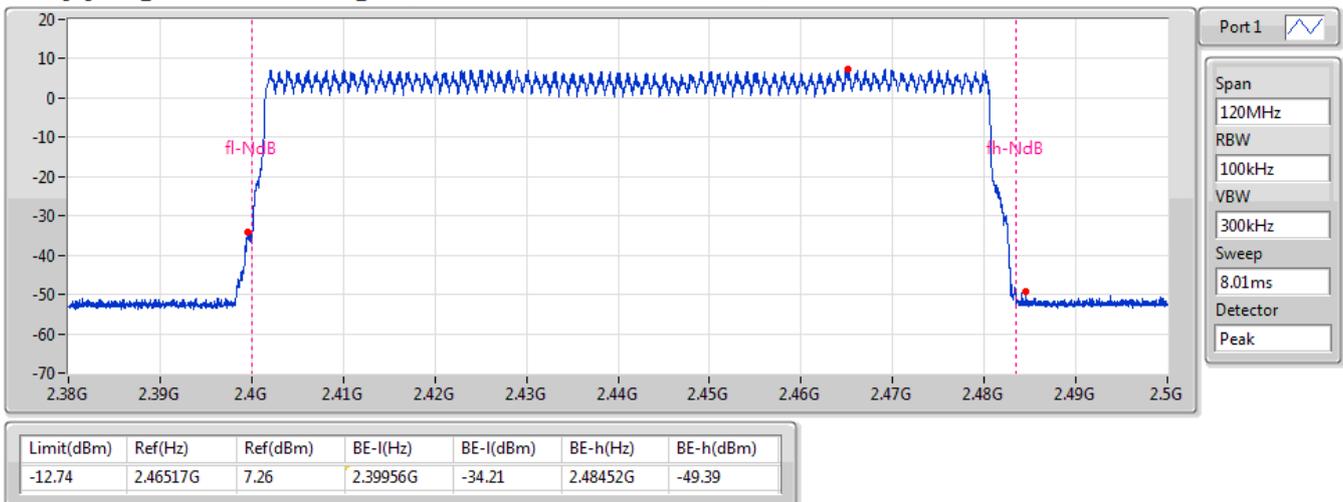




BT-BR(1Mbps)
2402MHz
Hopping Ch Bandedge (Non-restricted Band)



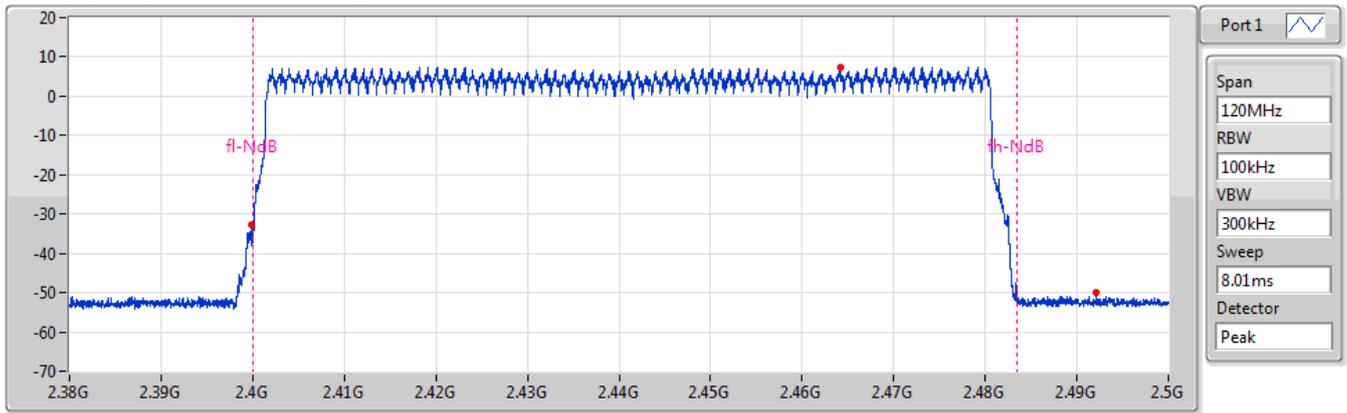
BT-EDR(2Mbps)
2402MHz
Hopping Ch Bandedge (Non-restricted Band)



BT-EDR(3Mbps)

2402MHz

Hopping Ch Bandedge (Non-restricted Band)





Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	11.42	0.01387
BT-EDR(2Mbps)	7.94	0.00622
BT-EDR(3Mbps)	7.96	0.00625

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	-2.08	11.42	-
2441MHz	Pass	-2.08	11.32	-
2480MHz	Pass	-2.08	11.41	-
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	-2.08	7.81	-
2441MHz	Pass	-2.08	7.46	-
2480MHz	Pass	-2.08	7.94	-
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	-2.08	7.81	-
2441MHz	Pass	-2.08	7.48	-
2480MHz	Pass	-2.08	7.96	-

Note: Average power is for reference only.



Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	11.47	0.01403
BT-EDR(2Mbps)	10.34	0.01081
BT-EDR(3Mbps)	10.53	0.01130

Result

Mode	Result	Antenna Gain (dBi)	Power (dBm)	Power Limit (dBm)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	-2.08	11.47	21.00
2441MHz	Pass	-2.08	11.36	21.00
2480MHz	Pass	-2.08	11.45	21.00
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	-2.08	10.21	21.00
2441MHz	Pass	-2.08	9.93	21.00
2480MHz	Pass	-2.08	10.34	21.00
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	-2.08	10.36	21.00
2441MHz	Pass	-2.08	10.13	21.00
2480MHz	Pass	-2.08	10.53	21.00



Summary

Mode	Max-Hop No
2.4-2.4835GHz	-
BT-BR(1Mbps)	79
BT-EDR(2Mbps)	79
BT-EDR(3Mbps)	79

Result

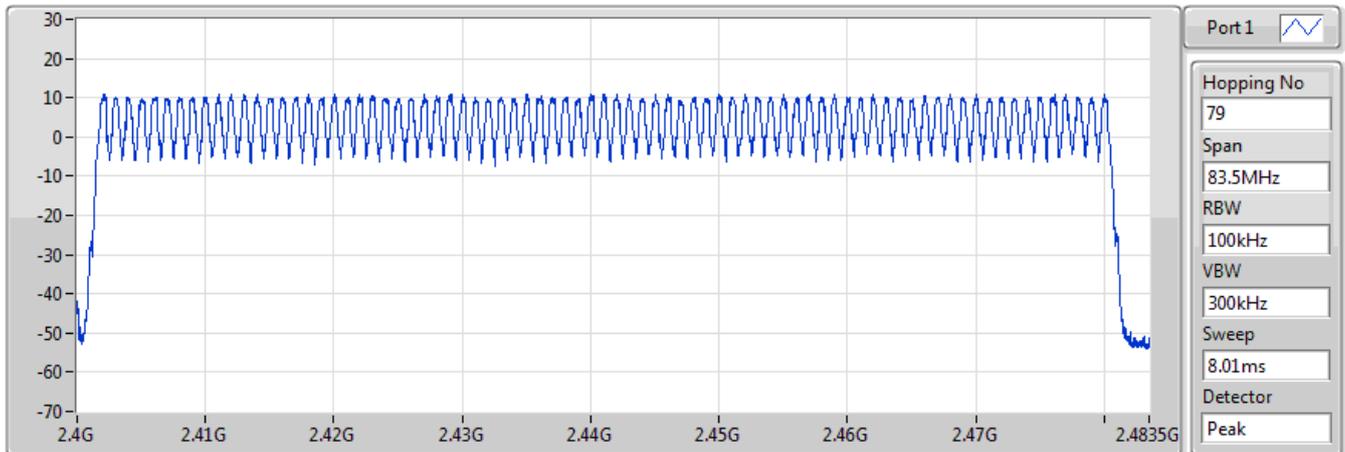
Mode	Result	Hopping No	Limit
BT-BR(1Mbps)	-	-	-
2402MHz	Pass	79	15
BT-EDR(2Mbps)	-	-	-
2402MHz	Pass	79	15
BT-EDR(3Mbps)	-	-	-
2402MHz	Pass	79	15



BT-BR(1Mbps)

Hopping-FS

2402MHz

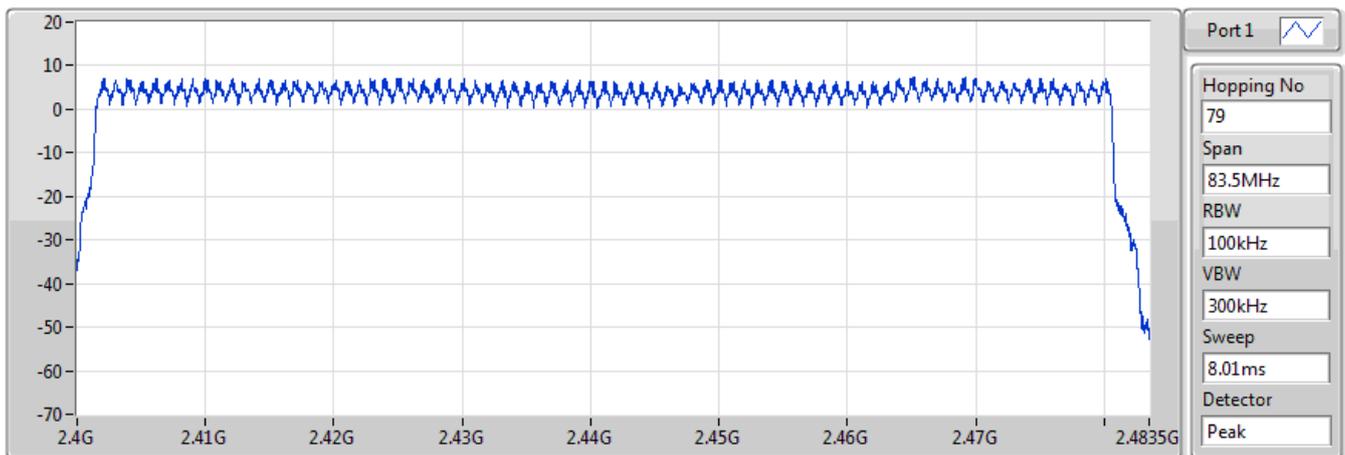


Hopping No	Limit
79	15

BT-EDR(2Mbps)

Hopping-FS

2402MHz

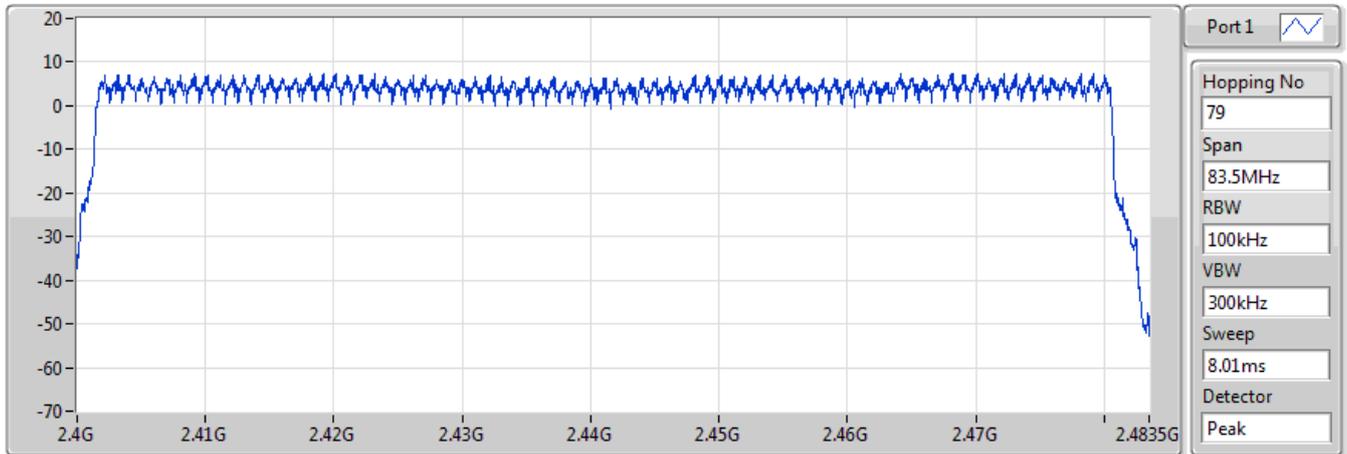


Hopping No	Limit
79	15



BT-EDR(3Mbps)
2402MHz

Hopping-FS



Hopping No	Limit
79	15



Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
BT-BR(1Mbps)	1.033M	947.902k	948KF1D	887.681k	918.958k
BT-EDR(2Mbps)	1.395M	1.317M	1M32G1D	1.355M	1.284M
BT-EDR(3Mbps)	1.377M	1.299M	1M30G1D	1.348M	1.259M

Max-N dB = Maximum 20dB down bandwidth; Max-OBW = Maximum 99% occupied bandwidth;
Min-N dB = Minimum 20dB down bandwidth; Min-OBW = Minimum 99% occupied bandwidth

Result

Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
BT-BR(1Mbps)	-	-	-	-
2402MHz	Pass	Inf	942.029k	918.958k
2441MHz	Pass	Inf	887.681k	947.902k
2480MHz	Pass	Inf	1.033M	940.666k
BT-EDR(2Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.395M	1.317M
2441MHz	Pass	Inf	1.355M	1.284M
2480MHz	Pass	Inf	1.355M	1.299M
BT-EDR(3Mbps)	-	-	-	-
2402MHz	Pass	Inf	1.355M	1.299M
2441MHz	Pass	Inf	1.377M	1.259M
2480MHz	Pass	Inf	1.348M	1.281M

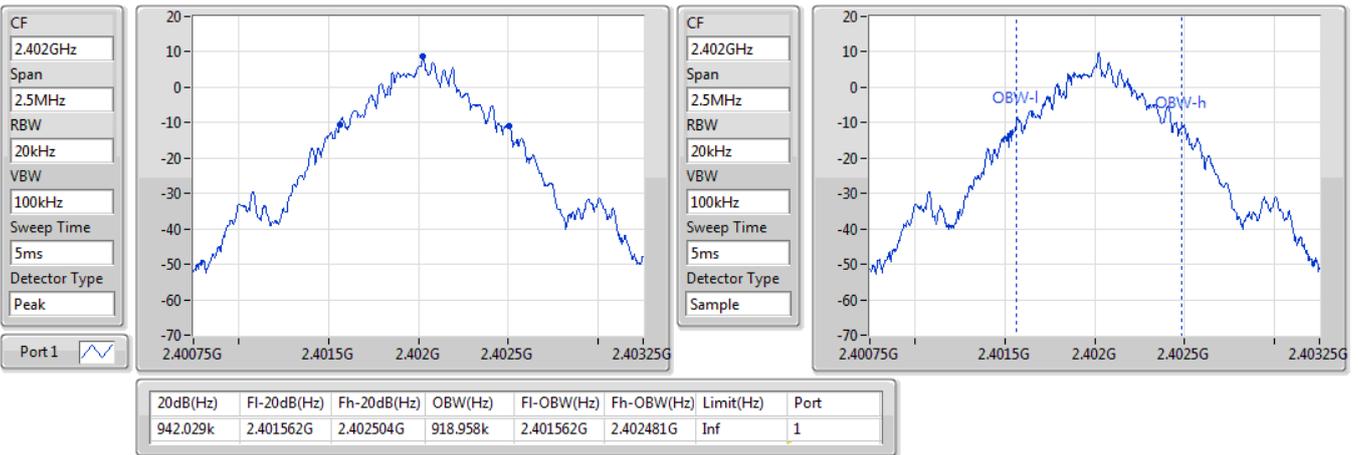
Port X-N dB = Port X 20dB down bandwidth;
Port X-OBW = Port X 99% occupied bandwidth



BT-BR(1Mbps)

EBW-FS

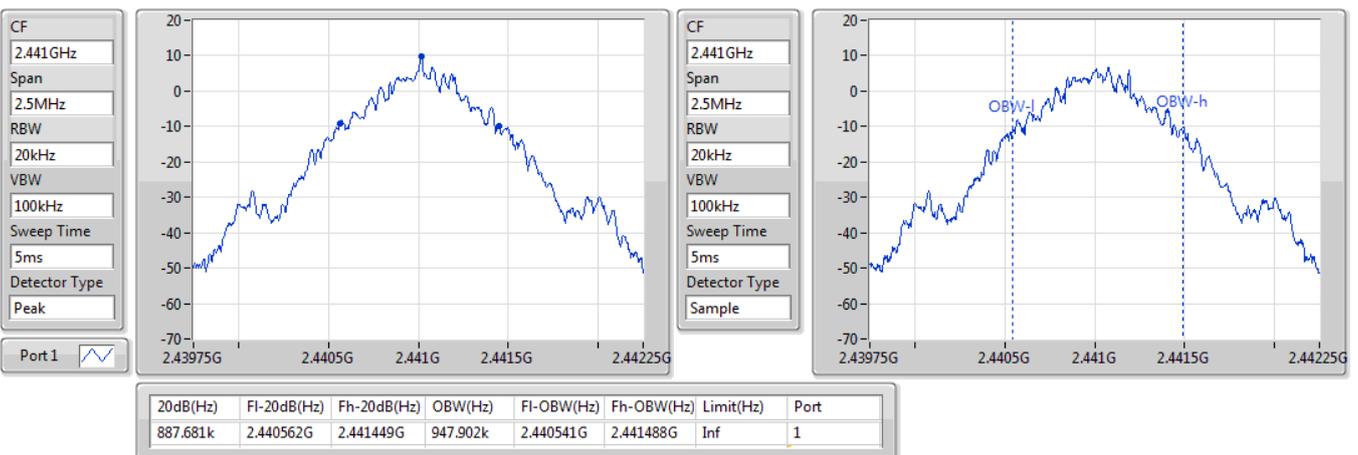
2402MHz



BT-BR(1Mbps)

EBW-FS

2441MHz

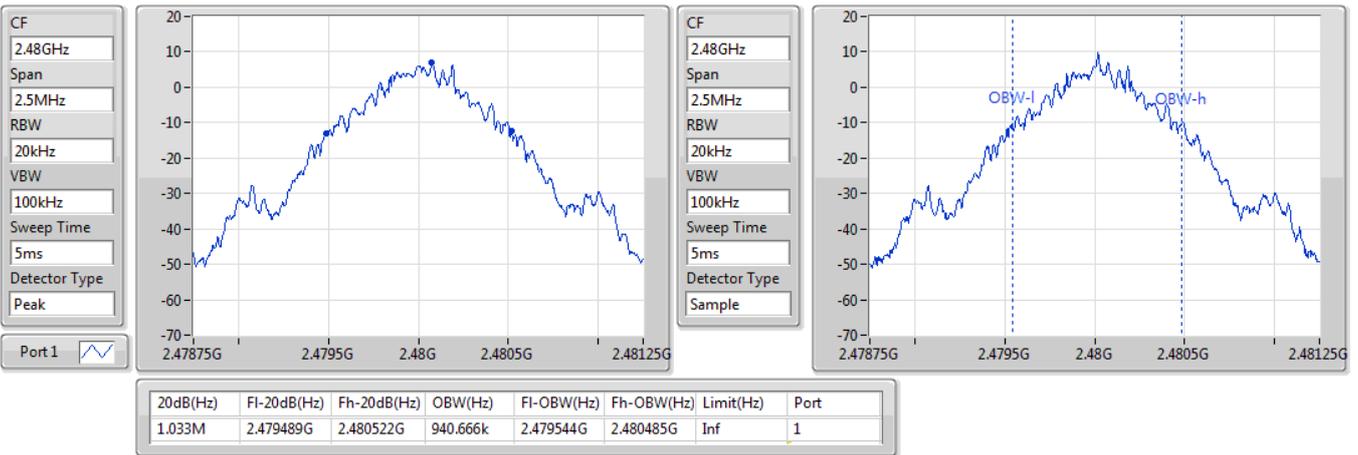




BT-BR(1Mbps)

EBW-FS

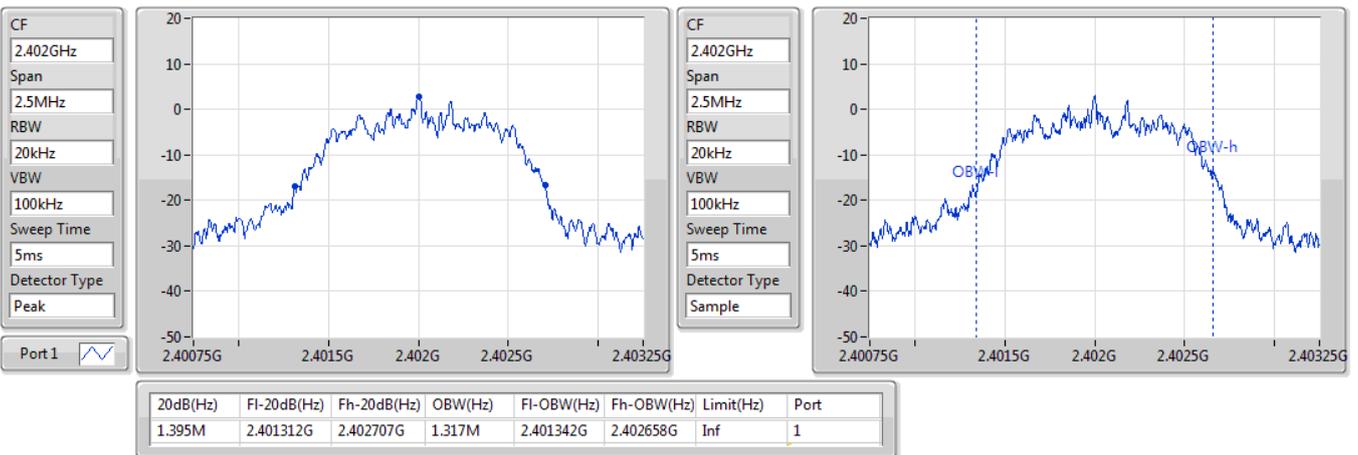
2480MHz

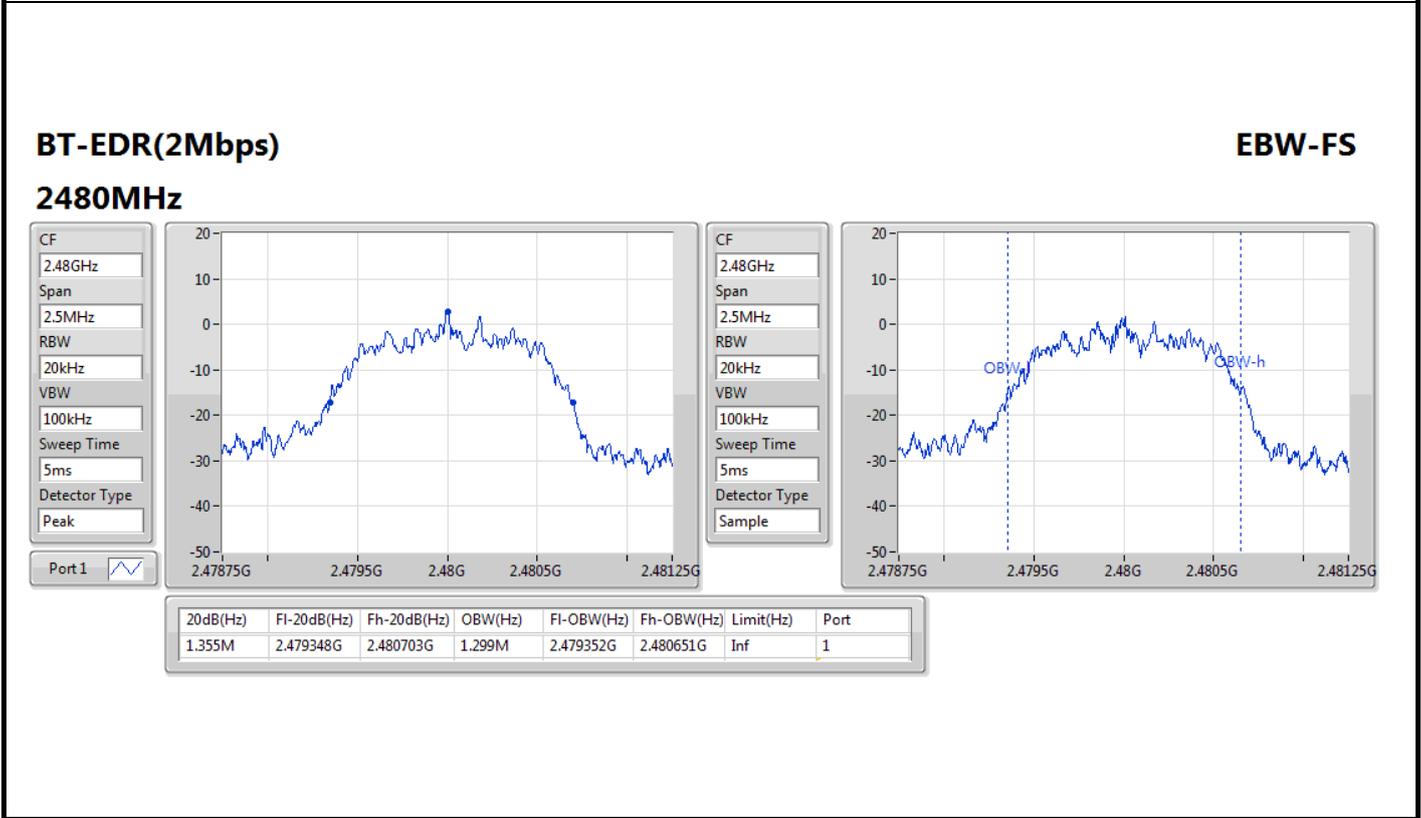
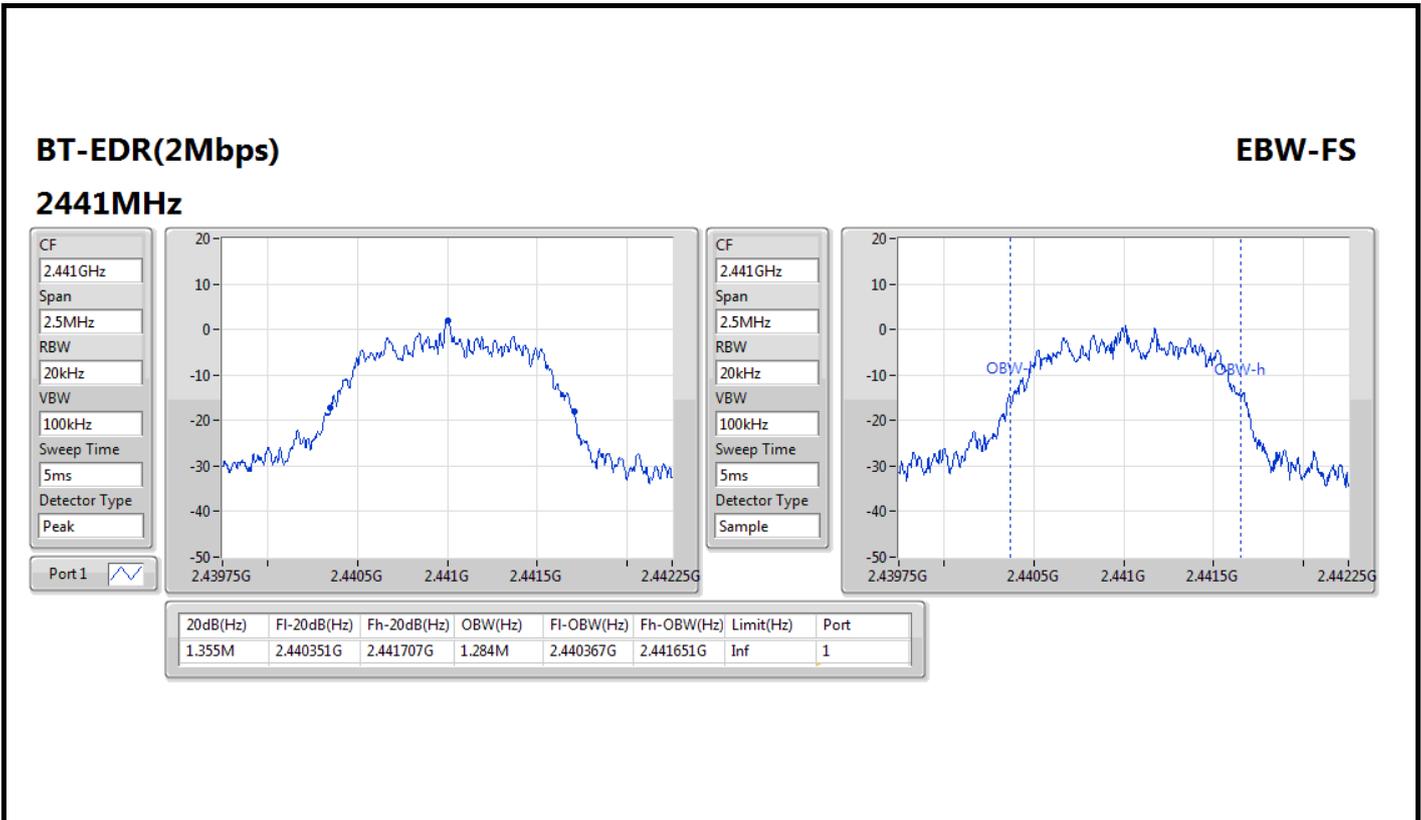


BT-EDR(2Mbps)

EBW-FS

2402MHz



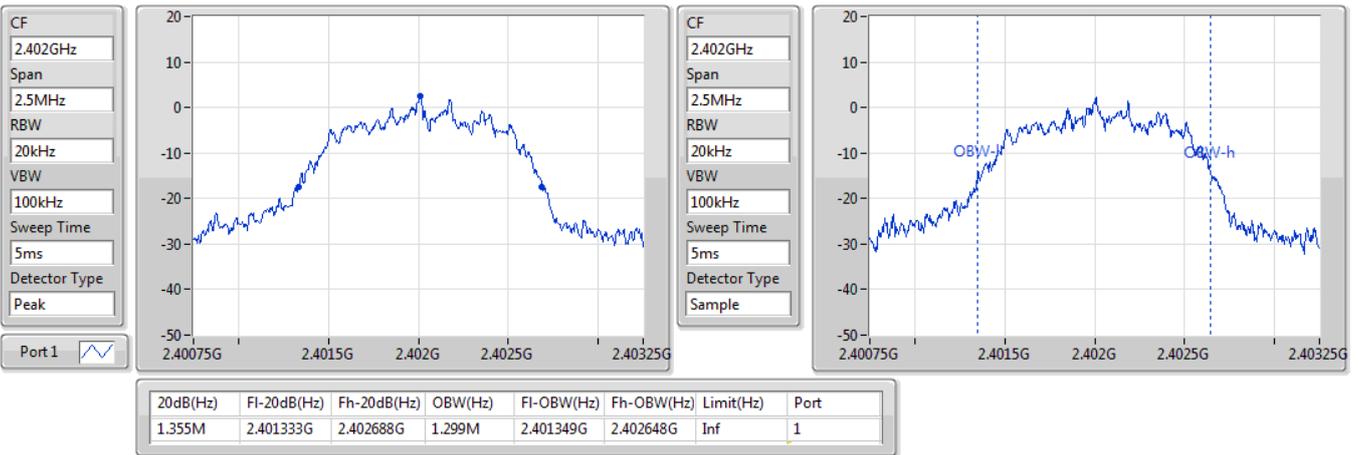




BT-EDR(3Mbps)

EBW-FS

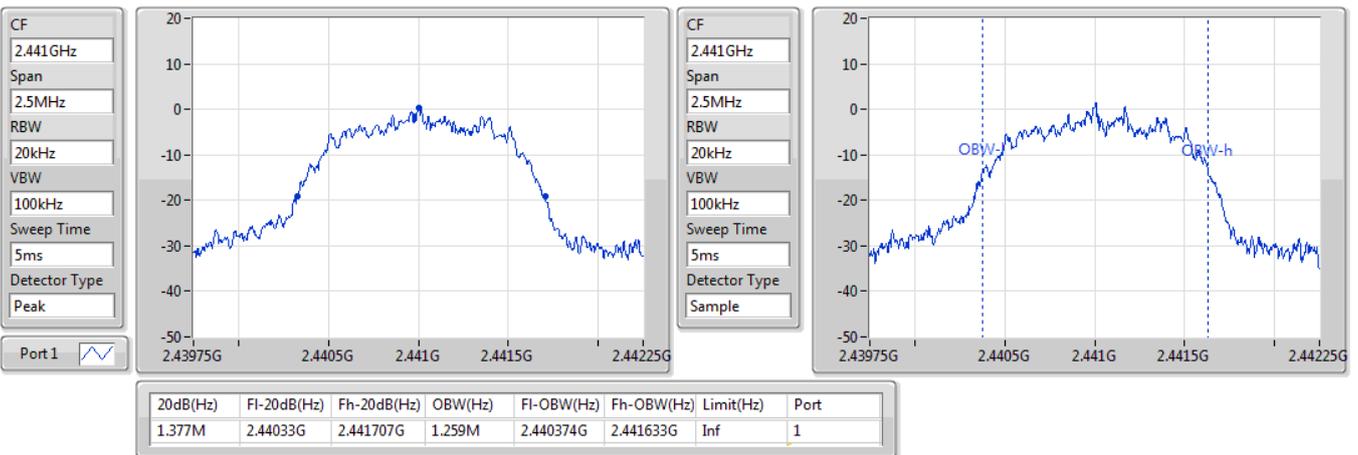
2402MHz

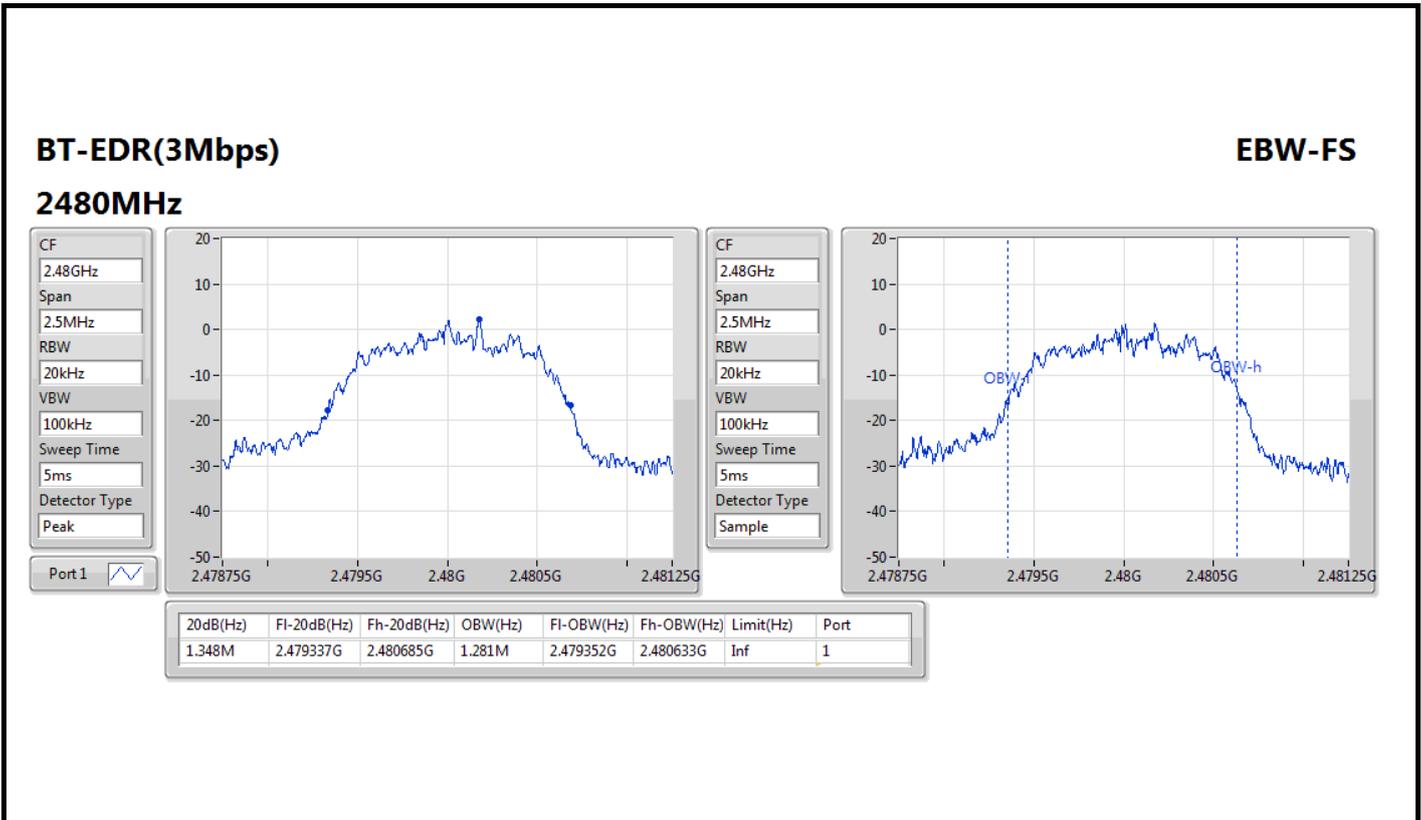


BT-EDR(3Mbps)

EBW-FS

2441MHz







Summary

Mode	Max-Space (Hz)	Min-Space (Hz)
2.4-2.4835GHz	-	-
BT-BR(1Mbps)	1.004348M	1M
BT-EDR(2Mbps)	1M	1M
BT-EDR(3Mbps)	1.004348M	1M

Result

Mode	Result	Fl (Hz)	Fh (Hz)	Ch.Space (Hz)	Limit (Hz)
BT-BR(1Mbps)	-	-	-	-	-
2402MHz	Pass	2.402022G	2.403022G	1M	627.391314k
2441MHz	Pass	2.441017G	2.442022G	1.004348M	591.195546k
2480MHz	Pass	2.479017G	2.480017G	1M	687.978k
BT-EDR(2Mbps)	-	-	-	-	-
2402MHz	Pass	2.402009G	2.403009G	1M	929.07k
2441MHz	Pass	2.441004G	2.442004G	1M	902.43k
2480MHz	Pass	2.479004G	2.480004G	1M	902.43k
BT-EDR(3Mbps)	-	-	-	-	-
2402MHz	Pass	2.402009G	2.403009G	1M	902.43k
2441MHz	Pass	2.441004G	2.442009G	1.004348M	917.082k
2480MHz	Pass	2.479004G	2.480004G	1M	897.768k



BT-BR(1Mbps)

Channel Separation-FS

2.402G/2.403GHz



BT-BR(1Mbps)

Channel Separation-FS

2.441G/2.442GHz

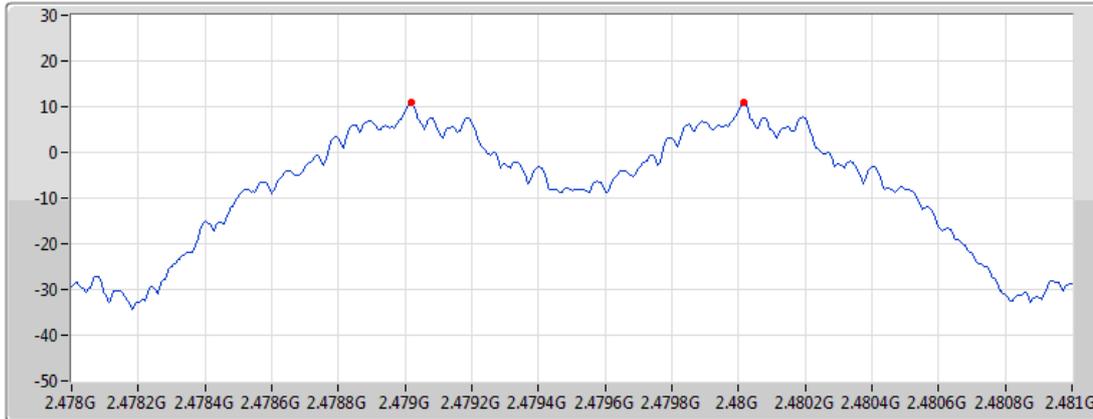




BT-BR(1Mbps)

Channel Separation-FS

2.48G/2.479GHz



Port 1

Ch Freq
2.48G/2.479G

Span
3MHz

RBW
30kHz

VBW
100kHz

Sweep
1.05ms

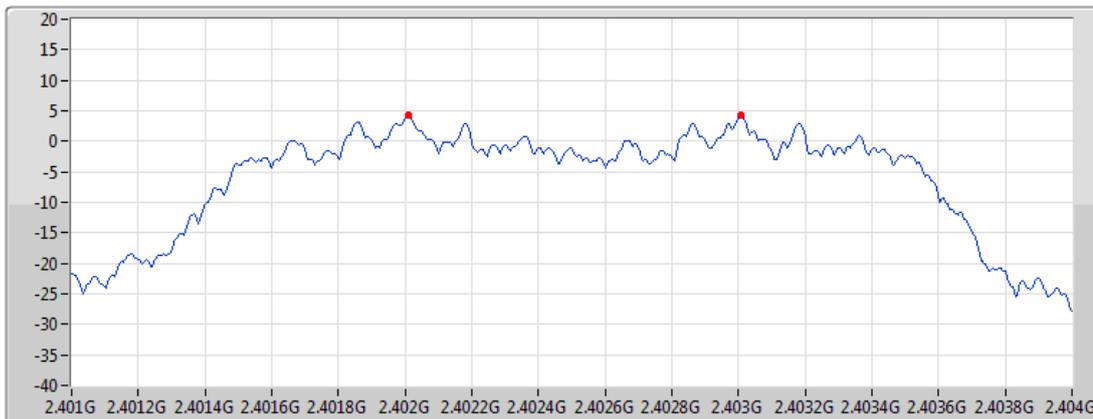
Detector
Peak

F1(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.479017G	2.480017G	1M	687.978k

BT-EDR(2Mbps)

Channel Separation-FS

2.402G/2.403GHz



Port 1

Ch Freq
2.402G/2.403G

Span
3MHz

RBW
30kHz

VBW
100kHz

Sweep
1.05ms

Detector
Peak

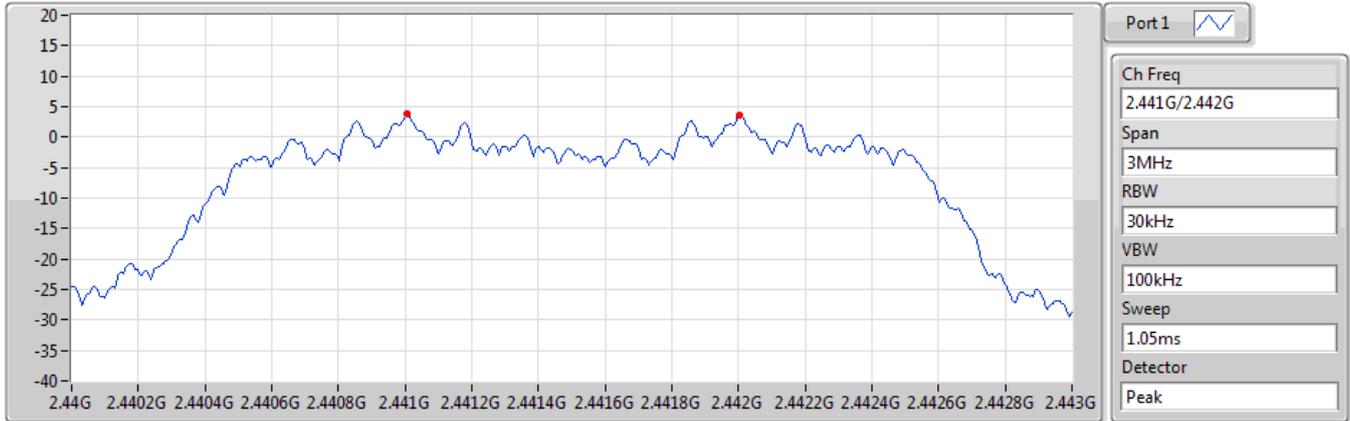
F1(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.402009G	2.403009G	1M	929.07k



BT-EDR(2Mbps)

Channel Separation-FS

2.441G/2.442GHz

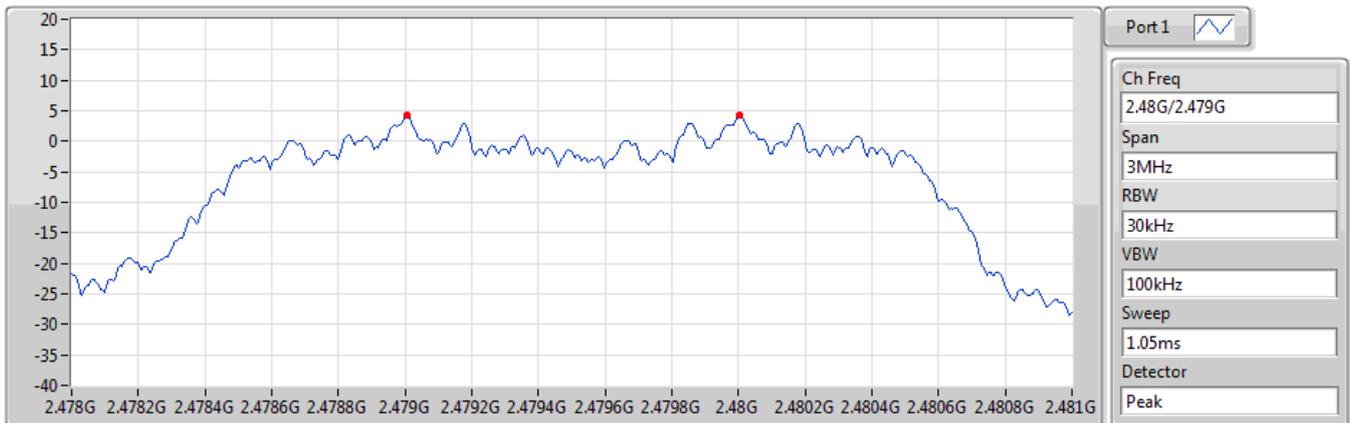


Ff(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.441004G	2.442004G	1M	902.43k

BT-EDR(2Mbps)

Channel Separation-FS

2.48G/2.479GHz



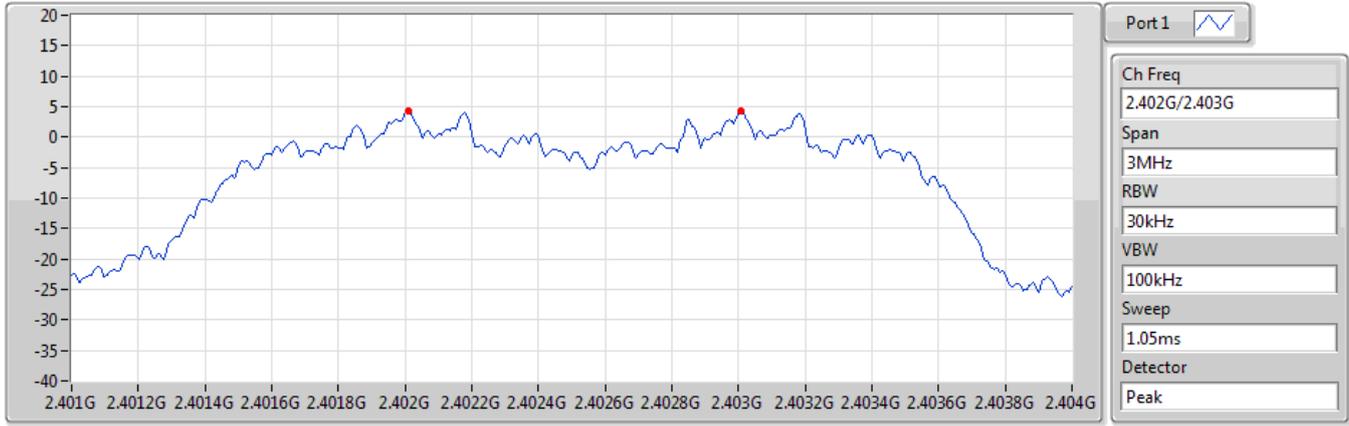
Ff(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.479004G	2.480004G	1M	902.43k



BT-EDR(3Mbps)

Channel Separation-FS

2.402G/2.403GHz



F1(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.402009G	2.403009G	1M	902.43k

BT-EDR(3Mbps)

Channel Separation-FS

2.441G/2.442GHz



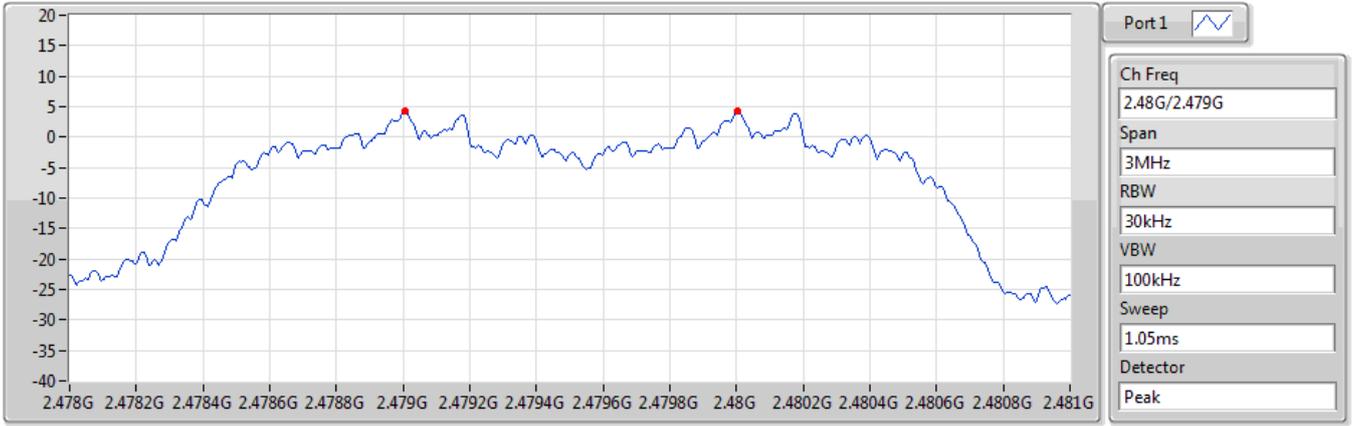
F1(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.441004G	2.442009G	1.004348M	917.082k



BT-EDR(3Mbps)

Channel Separation-FS

2.48G/2.479GHz



F1(Hz)	Fh(Hz)	Ch.Space(Hz)	Limit(Hz)
2.479004G	2.480004G	1M	897.768k



Summary

Mode	Max-Dwell (s)
2.4-2.4835GHz	-
BT-BR(1Mbps)	316.92114m_DH5
BT-EDR(2Mbps)	347.45148m_DH5
BT-EDR(3Mbps)	311.09252m_DH5
BT-BR-AFH(1Mbps)	295.075m_DH5-AFH
BT-EDR-AFH(2Mbps)	312.498m_DH5-AFH
BT-EDR-AFH(3Mbps)	312.714m_DH5-AFH

Result/ Non AFH mode

Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (ms)	Number of transmission in a 5 s
BT-BR(1Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	31.6	0.31692	0.4	2.94975	17
BT-EDR(2Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	31.6	0.34745	0.4	2.89350	19
BT-EDR(3Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	31.6	0.31109	0.4	2.89550	17

Note 1: Dwell time =Number of transmission in a 5 second x Tx On Time x 6.32

Note 2: DH5 was the worst mode.

Result/ AFH mode

Mode	Result	Period (s)	Dwell (s)	Limit (s)	Tx On (ms)	Number of transmission in a 2 s
BT-BR-AFH(1Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	8	0.29508	0.4	2.95075	25
BT-EDR-AFH(2Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	8	0.31250	0.4	2.89350	27
BT-EDR-AFH(3Mbps)	-	-	-	-	-	-
2402MHz_DH5	PASS	8	0.31271	0.4	2.89550	27

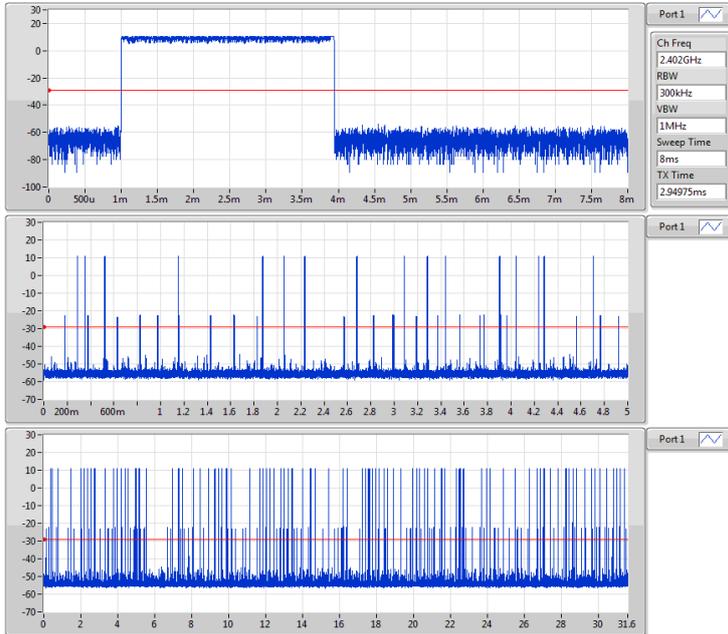
Note 1: Dwell time =Number of transmission in a 2 second x Tx On Time x 4

Note 2: DH5 was the worst mode.



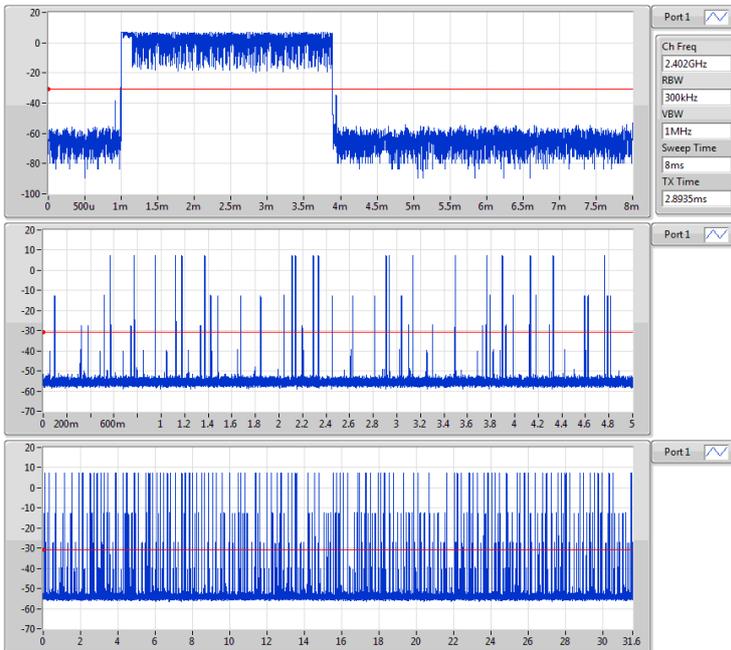
BT-BR(1Mbps)
2402MHz

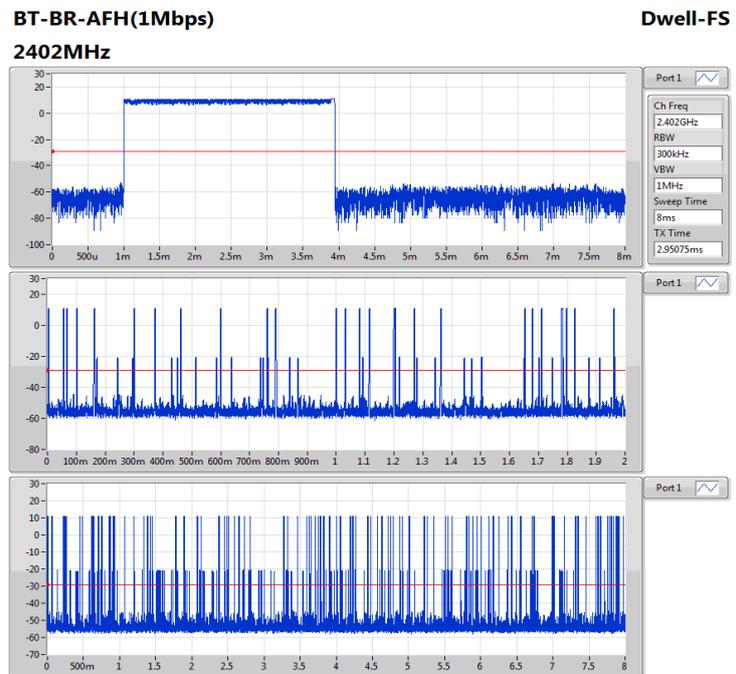
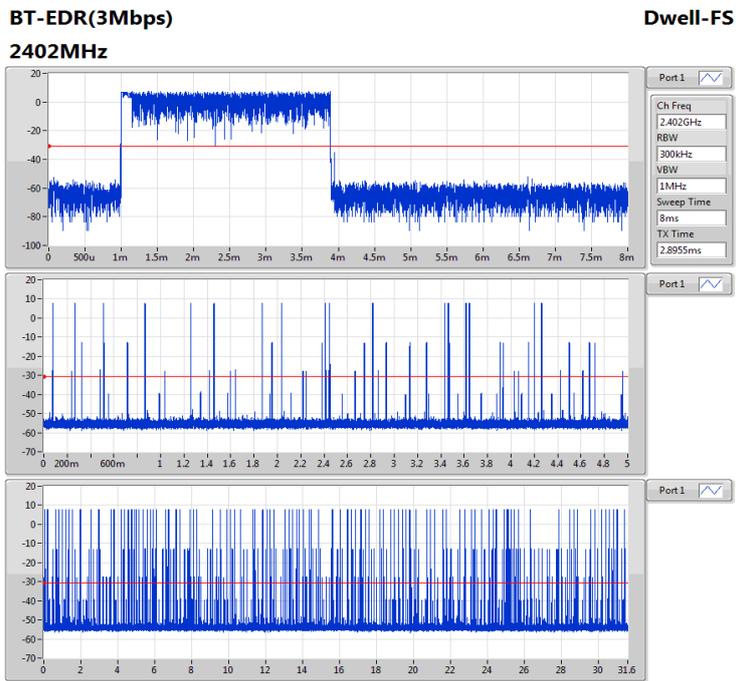
Dwell-FS



BT-EDR(2Mbps)
2402MHz

Dwell-FS



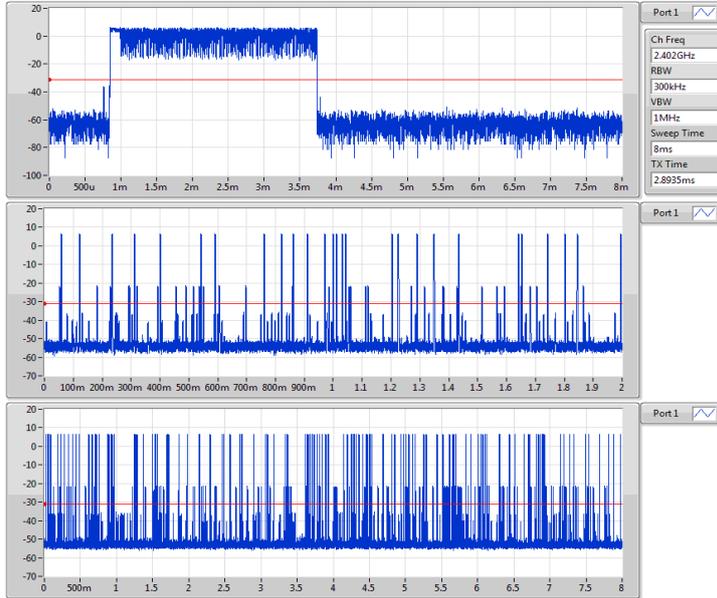




BT-EDR-AFH(2Mbps)

Dwell-FS

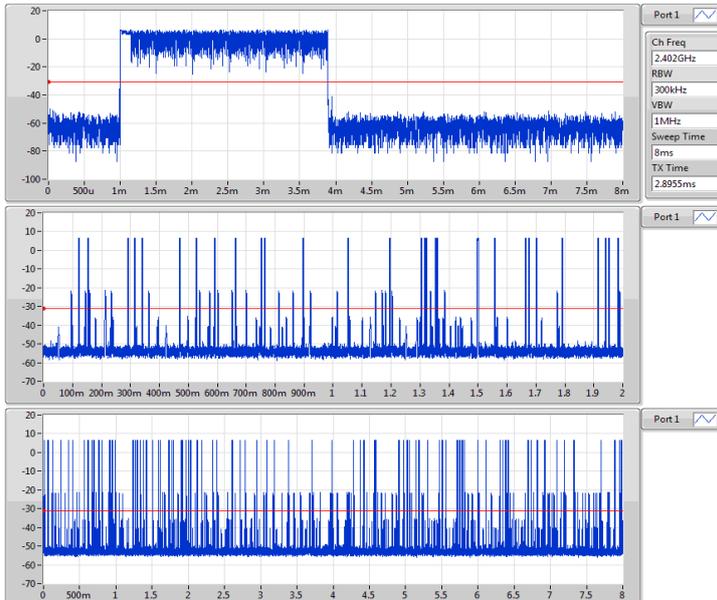
2402MHz



BT-EDR-AFH(3Mbps)

Dwell-FS

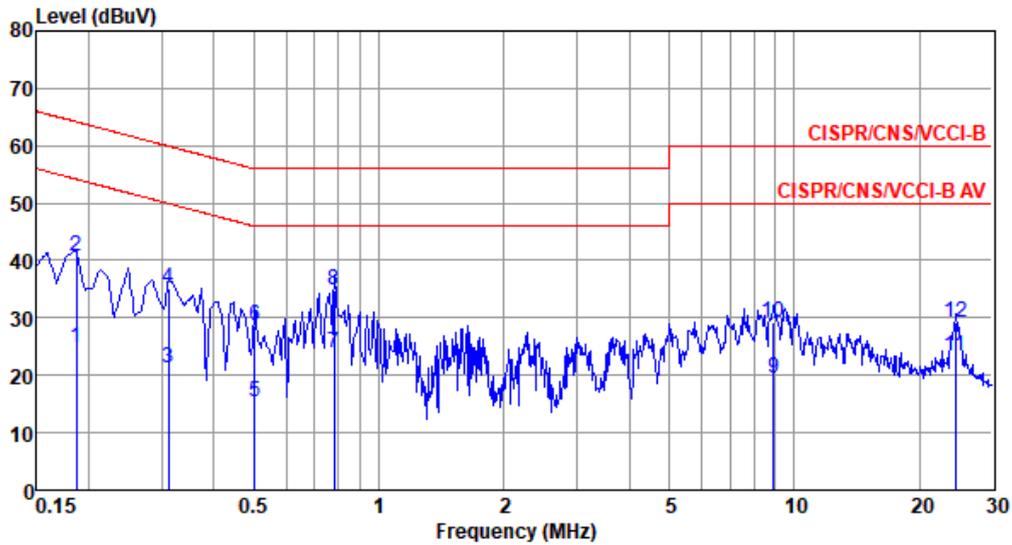
2402MHz





Modulation	Charging
Power Phase	Line

Test by : Joe Liao Temperature: 22°C Humidity: 61%



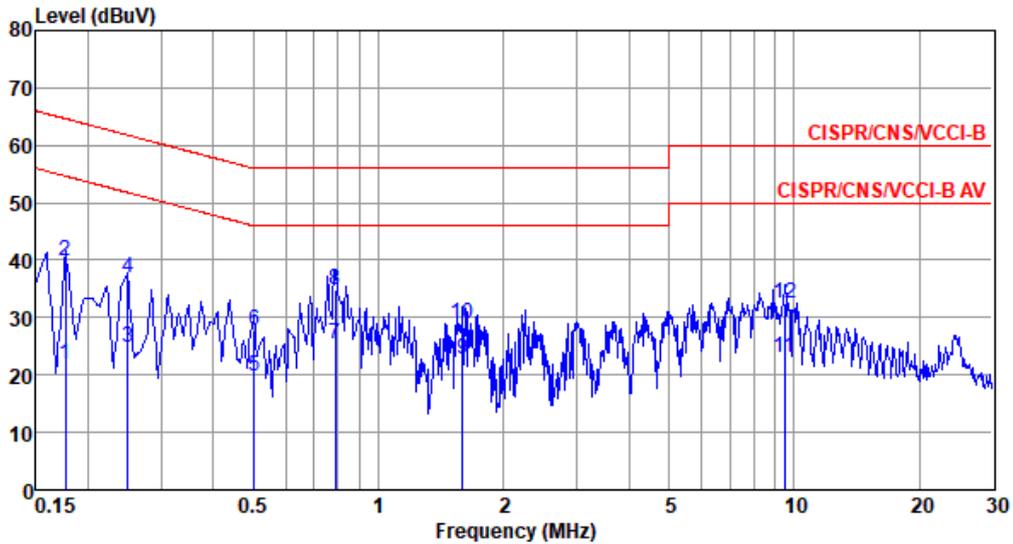
	Freq	Level	Limit	Over	Read	Factor	Cable	Aux	Remark
	MHz	dBuV	Line	Limit	Level	dB	loss	dB	
			dBuV	dB	dBuV		dB		
1	0.186	24.71	54.20	-29.49	14.74	9.68	0.08	0.21	Average
2	0.186	40.71	64.20	-23.49	30.74	9.68	0.08	0.21	QP
3	0.312	21.15	49.93	-28.78	11.09	9.67	0.08	0.31	Average
4	0.312	35.05	59.93	-24.88	24.99	9.67	0.08	0.31	QP
5	0.502	15.34	46.00	-30.66	5.21	9.67	0.10	0.36	Average
6	0.502	28.61	56.00	-27.39	18.48	9.67	0.10	0.36	QP
7	0.779	23.98	46.00	-22.02	13.79	9.68	0.14	0.37	Average
8*	0.779	34.96	56.00	-21.04	24.77	9.68	0.14	0.37	QP
9	8.916	19.60	50.00	-30.40	9.01	9.73	0.42	0.44	Average
10	8.916	29.30	60.00	-30.70	18.71	9.73	0.42	0.44	QP
11	24.400	23.35	50.00	-26.65	12.28	9.70	0.69	0.68	Average
12	24.400	29.12	60.00	-30.88	18.05	9.70	0.69	0.68	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 Note 2: Over Limit (dB) = Level (dBuV) - Limit Line (dBuV).



Modulation	Charging
Power Phase	Neutral

Test by : Joe Liao Temperature: 22°C Humidity: 61%



	Freq MHz	Level dBUV	Limit Line dBUV	Over Limit dB	Read Level dBUV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.177	21.73	54.64	-32.91	11.87	9.61	0.08	0.17	Average
2	0.177	39.75	64.64	-24.89	29.89	9.61	0.08	0.17	QP
3	0.249	24.81	51.78	-26.97	14.94	9.61	0.08	0.18	Average
4	0.249	36.84	61.78	-24.94	26.97	9.61	0.08	0.18	QP
5	0.502	19.89	46.00	-26.11	9.97	9.61	0.10	0.21	Average
6	0.502	27.88	56.00	-28.12	17.96	9.61	0.10	0.21	QP
7*	0.788	25.45	46.00	-20.55	15.44	9.61	0.14	0.26	Average
8	0.788	34.87	56.00	-21.13	24.86	9.61	0.14	0.26	QP
9	1.593	22.80	46.00	-23.20	12.70	9.62	0.19	0.29	Average
10	1.593	28.99	56.00	-27.01	18.89	9.62	0.19	0.29	QP
11	9.502	23.03	50.00	-26.97	12.53	9.69	0.44	0.37	Average
12	9.502	32.41	60.00	-27.59	21.91	9.69	0.44	0.37	QP

Note 1: Level (dBUV) = Read Level (dBUV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 2: Over Limit (dB) = Level (dBUV) – Limit Line (dBUV).

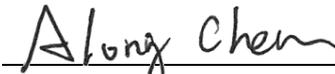
FCC Test Report

FCC ID : IPH-04390
Equipment : Smart Watch
Model No. : A04390
Brand Name : GARMIN
Applicant : Garmin International, Inc.
Address : 1200 E. 151st Street Olathe, KS 66062 United States
Standard : 47 CFR FCC Part 15.225
Received Date : Apr. 07, 2022
Tested Date : Apr. 23 ~ May 10, 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 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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APPENDIX A. 20DB AND OCCUPIED BANDWIDTH

APPENDIX B. FIELD STRENGTH OF FUNDAMENTAL EMISSIONS

APPENDIX C. UNWANTED EMISSIONS INTO RESTRICTED FREQUENCY BANDS

APPENDIX D. FIELD STRENGTH OF FUNDAMENTAL EMISSIONS

APPENDIX E. AC POWER LINE CONDUCTED EMISSIONS

Release Record

Report No.	Version	Description	Issued Date
FR240702NF	Rev. 01	Initial issue	Jun. 01, 2022

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.788MHz 25.45 (Margin -20.55dB) - AV	Pass
15.225(a)~(c)	Field strength of fundamental emissions and spectrum mask	Meet the requirement of limit	Pass
15.225(d)	Field strength of any emissions appearing outside of the 13.110-14.010 MHz band	Meet the requirement of limit	Pass
15.225(e)	Frequency tolerance	Meet the requirement of limit	Pass
15.215 (c)	20dB bandwidth	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	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)

RF General Information			
Frequency Range (MHz)	Modulation	Ch. Frequency (MHz)	Channel Number
13.553 – 13.567	ASK	13.56	1

1.1.2 Antenna Details

Ant. No.	Brand	Model	Type	Connector	Gain (dBi)	Remarks
1	INPAQ TECH CO LTD	NF-C-F9-R0-120	Loop	No	---	---

1.1.3 EUT Operational Condition

Power Type	5Vdc from adapter 3.87Vdc from battery		
Operational Voltage	<input checked="" type="checkbox"/> Vnom (3.87 V)	<input checked="" type="checkbox"/> Vmax (4.50 V)	<input checked="" type="checkbox"/> Vmin (3.60 V)
Operational Climatic	<input checked="" type="checkbox"/> Tnom (20°C)	<input checked="" type="checkbox"/> Tmax (55°C)	<input checked="" type="checkbox"/> Tmin (-20°C)

1.1.4 Accessories

No.	Equipment	Description
1	Battery	Brand: Garmin Model: 361-00136-20 Power Rating: 3.87V, 205mAh
2	USB cable	Brand: GARMIN Model: 320-01069-10 Line: 0.52m shielded without core

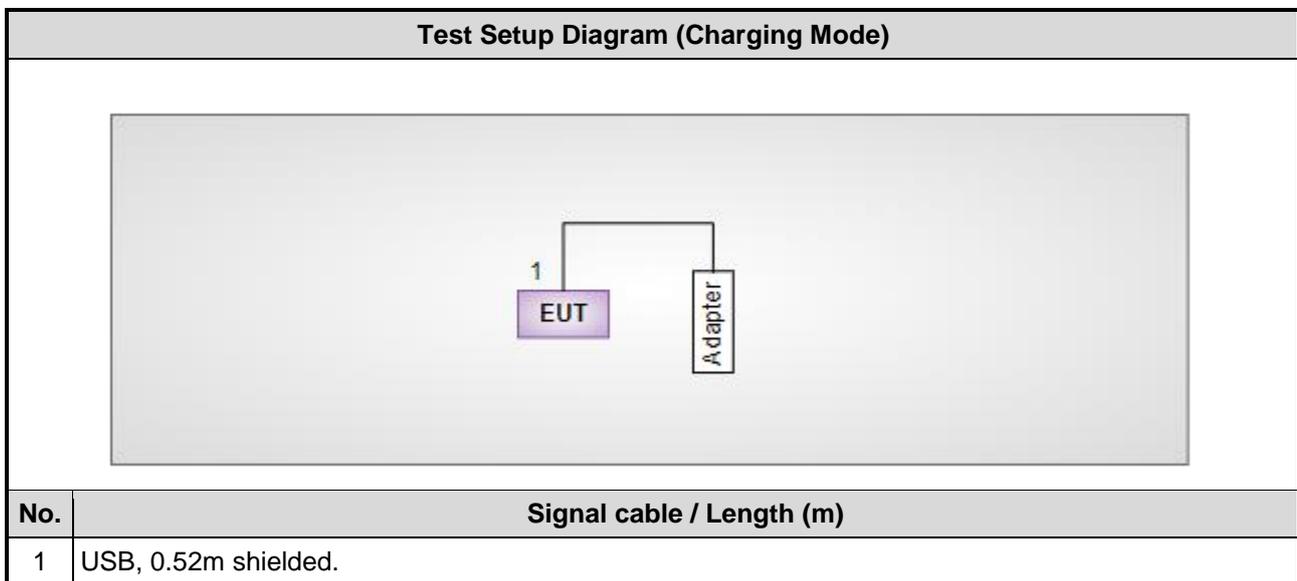
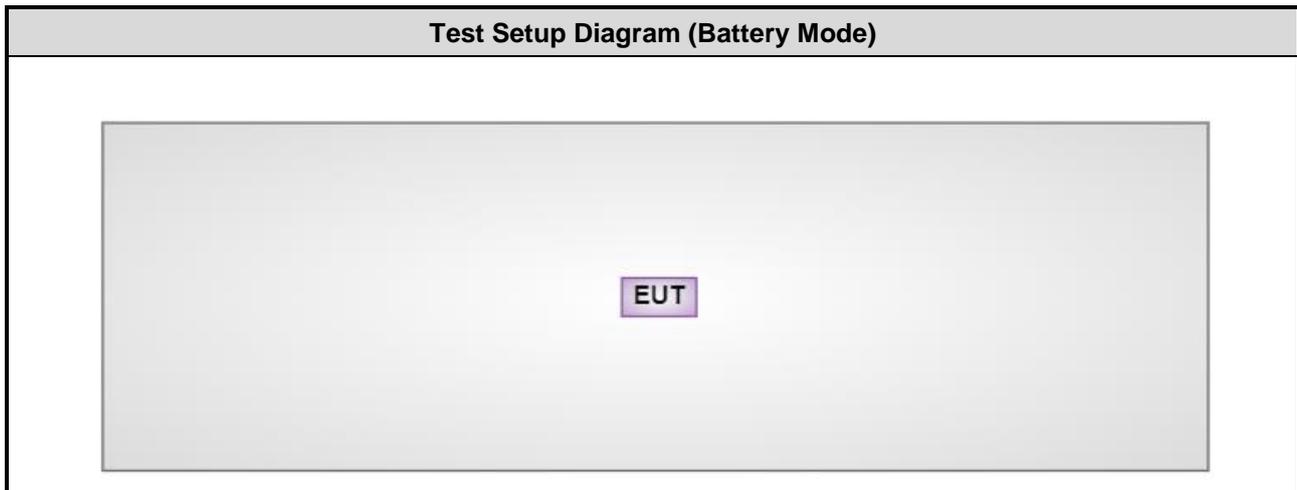
1.1.5 Test Tool and Power Index

Test Tool	Garmin USB Monitor, Version: 3.0
Power Index	Default

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Adapter	samsung	ETA-U90JWS	---	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	May 09, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Feb. 16, 2022	Feb. 15, 2023
LISN	R&S	ENV216	101579	Apr. 21, 2022	Apr. 20, 2023
LISN (Support Unit)	SCHWARZBECK	Schwarzbeck 8127	8127667	Jan .07, 2022	Jan .06, 2023
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 19, 2021	Oct. 18, 2022
50 ohm terminal (Support Unit)	NA	50	04	May 25, 2021	May 24, 2022
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Apr. 23 ~ May 10, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 15, 2022	Mar. 14, 2023
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jun. 30, 2021	Jun. 29, 2022
Preamplifier	EMC	EMC02325	980225	Jun. 29, 2021	Jun. 28, 2022
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 05, 2021	Oct. 04, 2022
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 05, 2021	Oct. 04, 2022
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 05, 2021	Oct. 04, 2022
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 05, 2021	Oct. 04, 2022
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	Apr. 23, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101910	Apr. 18, 2022	Apr. 17, 2023
Power Meter	Anritsu	ML2495A	1241002	Nov. 07, 2021	Nov. 06, 2022
Power Sensor	Anritsu	MA2411B	1207366	Nov. 07, 2021	Nov. 06, 2022
DC POWER SOURCE	GW INSTEK	GPC-6030D	GES855395	Nov. 08, 2021	Nov. 07, 2022
TEMP&HUMIDITY CHAMBER	GIANT FORCE	GCT-225-40-SP-SD	MAF1212-002	May 25, 2021	May 24, 2022
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

47 CFR FCC Part 15.225
ANSI C63.10-2013

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 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
Bandwidth	±34.130 Hz
Radiated emission ≤ 30MHz	±2.3 dB
Radiated emission ≤ 1GHz	±3.41 dB
Temperature	±0.4 °C
AC conducted emission	±2.92 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, 03CH01-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.)

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

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Test Configuration
AC Power Line Conducted Emissions	NFC	13.56	2
Field strength of fundamental emissions	NFC	13.56	2
Unwanted Emissions into Restricted Frequency Bands < 30MHz	NFC	13.56	2
Unwanted Emissions into Restricted Frequency Bands > 30MHz	NFC	13.56	2
	Charging	---	1
Frequency tolerance	NFC	13.56	2
20dB bandwidth	NFC	13.56	2
AC Power Line Conducted Emissions	Charging	---	1

NOTE:

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 had been tested by following test configurations.
 - 1) Configuration 1: Charging mode
 - 2) Configuration 2: Battery mode

3 Transmitter Test Results

3.1 20dB and Occupied Bandwidth

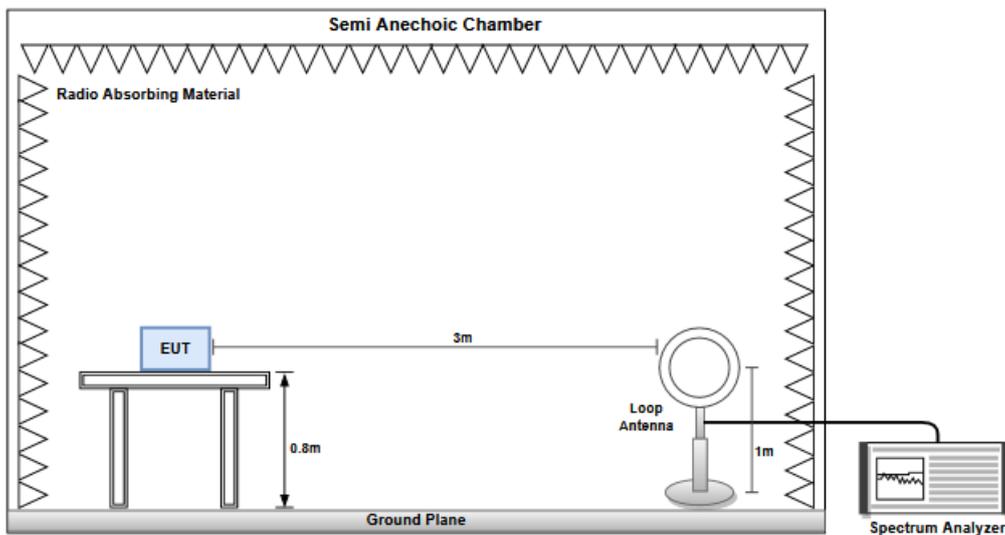
3.1.1 Limit of 20dB Bandwidth

The upper and lower frequency of the 20dB bandwidth shall within 13.553~13.567 MHz

3.1.2 Test Procedures

1. Set resolution bandwidth (RBW) = 1 kHz, Video bandwidth = 3 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20dB relative to the maximum level measured in the fundamental emission.

3.1.3 Test Setup



3.1.4 Test Result

Ambient Condition	22°C / 68%	Tested By	Akun Chung
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Refer to Appendix A.

3.2 Field Strength of Fundamental Emissions

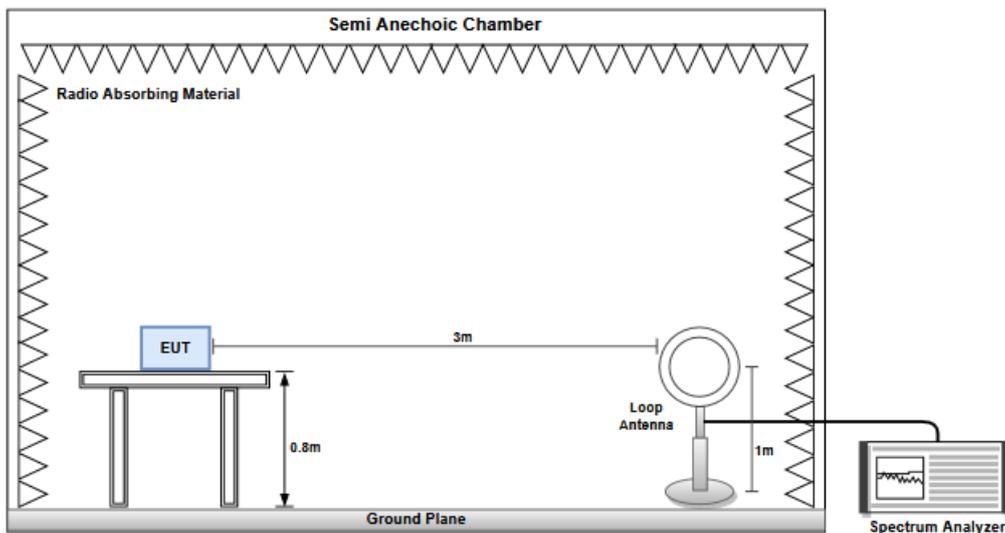
3.2.1 Field Strength of Fundamental Emissions

The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

3.2.2 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 a height of 0.8 m test table above the ground plane.
2. Measurement is made with the antenna positioned in both the open and close planes of polarization. . Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, and the antenna rotated to repeat the measurements for both the open and close antenna polarizations.

3.2.3 Test Setup



3.2.4 Test Result

Ambient Condition	24°C / 65%	Tested By		Roger Lu
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Refer to Appendix B.

3.3 Unwanted Emissions into Restricted Frequency Bands

3.3.1 Limit of Unwanted Emissions into Restricted Frequency Bands

- 1) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
- 2) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
- 3) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in below table

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.

3.3.2 Test Procedures

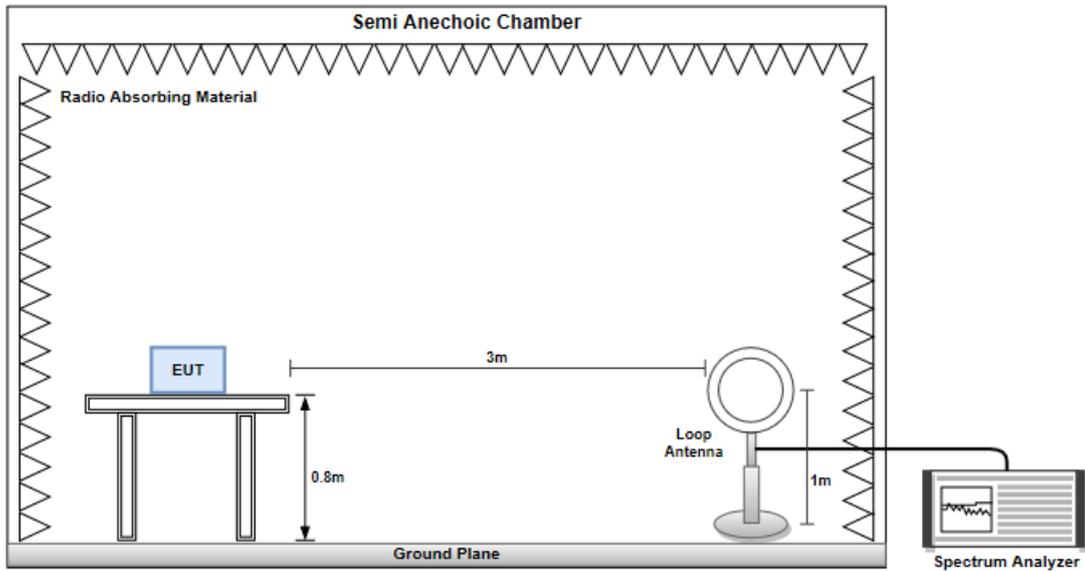
4. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at a height of 0.8 m test table above the ground plane.
5. 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.
6. 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:

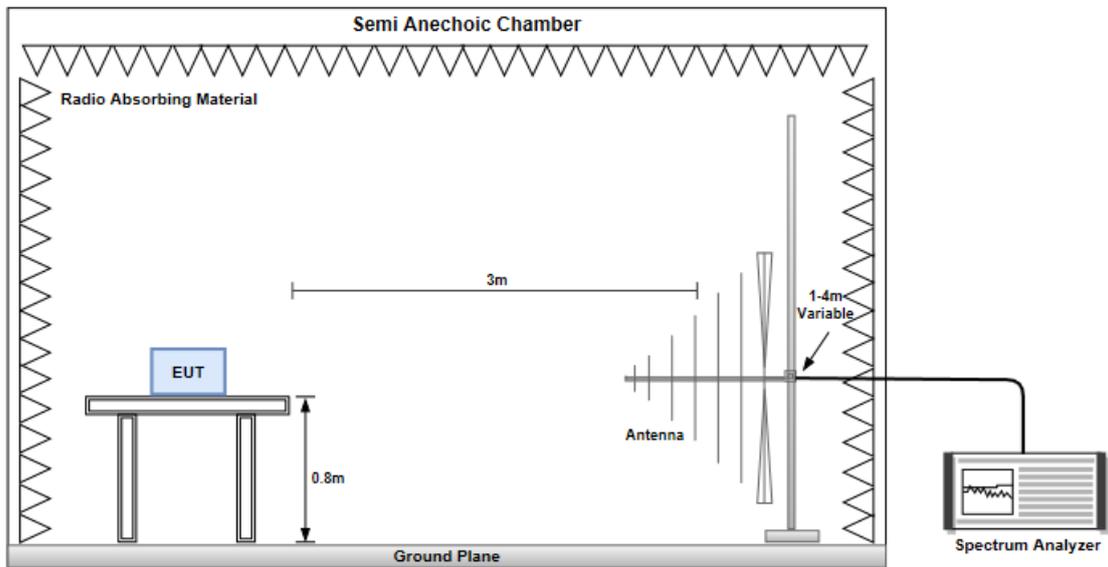
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.

3.3.3 Test Setup

Radiated Emissions below 30MHz



Radiated Emissions below 1 GHz



3.3.4 Test Results

Refer to Appendix C.

3.4 Frequency Stability

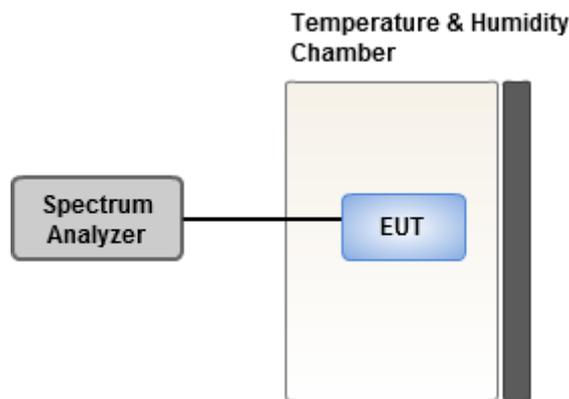
3.4.1 Frequency Stability Limit

Carrier frequency stability shall be maintained to $\pm 0.01\%$ (± 100 ppm).

3.4.2 Test Procedures

Test Method	
<input checked="" type="checkbox"/>	Refer as ANSI C63.10, clause 6.8 for frequency stability tests
<input checked="" type="checkbox"/>	Frequency stability with respect to ambient temperature
<input checked="" type="checkbox"/>	Frequency stability when varying supply voltage
<input type="checkbox"/>	For conducted measurement.
<input checked="" type="checkbox"/>	For radiated measurement. The equipment to be measured and the test antenna shall be oriented to obtain the maximum emitted power level.

3.4.3 Test Setup



3.4.4 Test Result

Ambient Condition	22°C / 68%	Tested By	Akun Chung
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Refer to Appendix D.

3.5 AC Power Line Conducted Emissions

3.5.1 Limit of AC Power Line Conducted Emissions

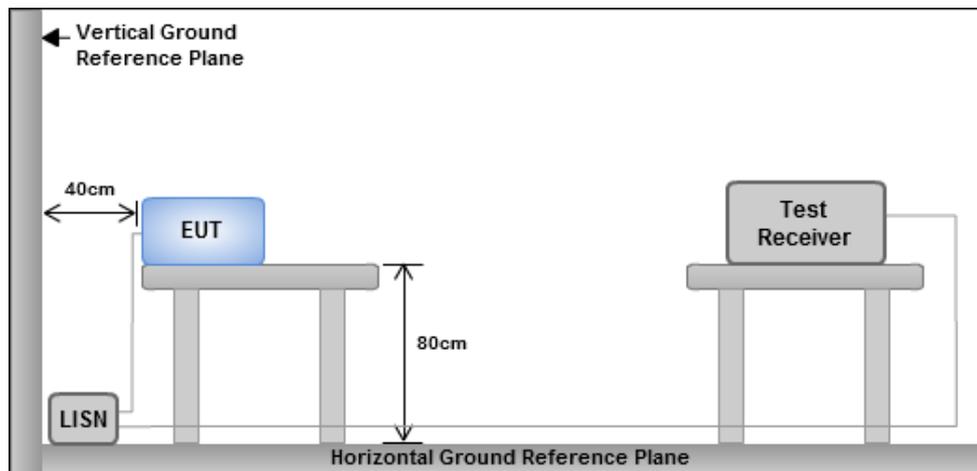
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.5.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

3.5.3 Test Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.5.4 Test Result

Refer to Appendix E.

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

No.3-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
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

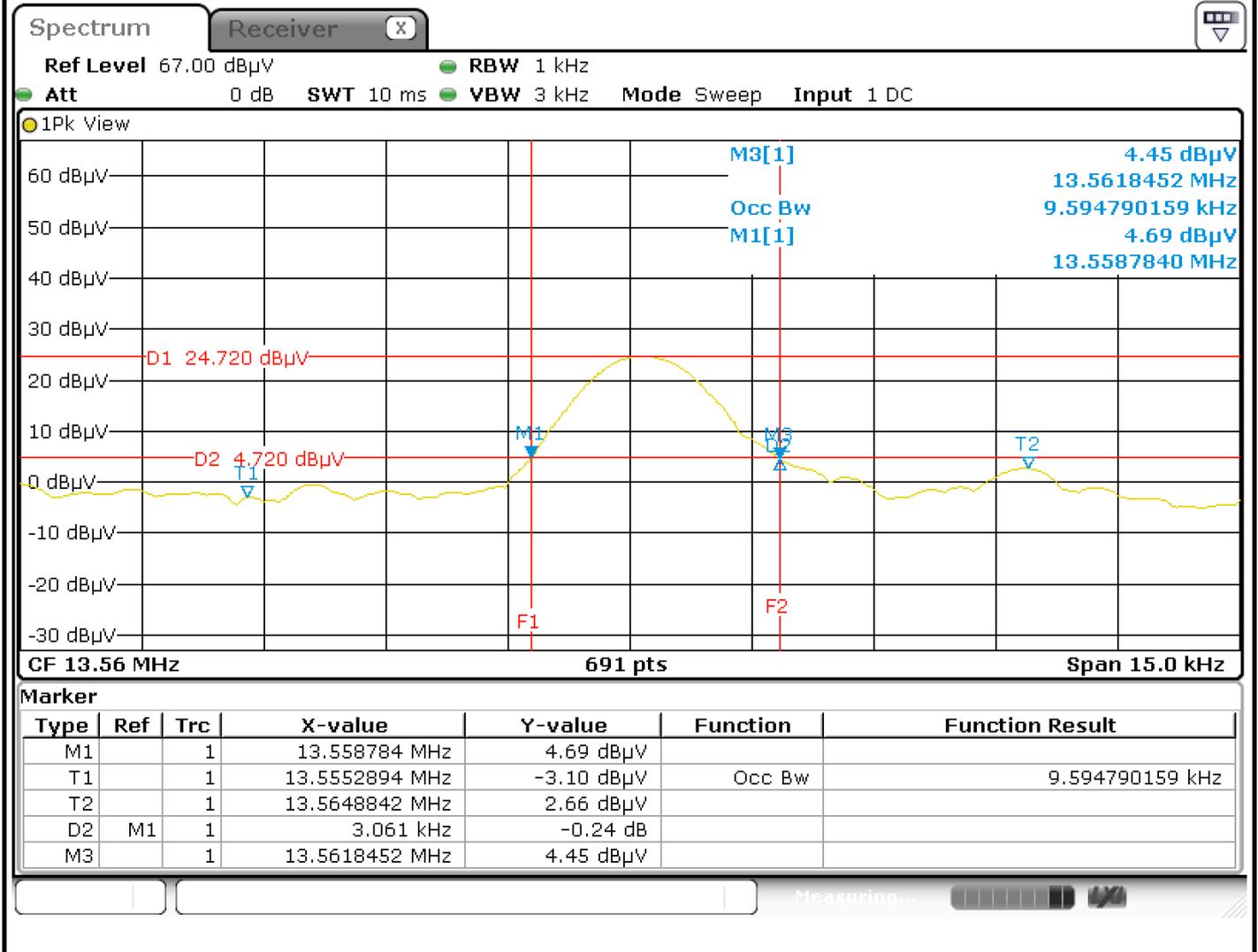
Fax: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

==END==



Modulation Mode	Freq. (MHz)	20dB Bandwidth (kHz)	F _L at 20dB BW (MHz)	F _H at 20dBBW (MHz)	99% Bandwidth (kHz)
NFC	13.56	3.061	13.558784	13.561845	9.594790159
Limit		N/A	13.553	13.567	N/A





Field Strength of Fundamental Emissions Result							
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor (dB)	Remark
Open	13.56	45.48	105.39	-59.91	21.1	24.38	QP

Field Strength of Fundamental Emissions Result							
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor (dB)	Remark
Close	13.56	42.08	105.39	-63.31	17.7	24.38	QP

Note: Emission level = SA reading + Factor



Unwanted Emissions (Below 30MHz)

Field Strength of Fundamental Emissions Result							
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor(dB)	Remark
Open	13.41	35.12	62	-26.88	10.78	24.34	QP
Open	13.553	39.78	71.87	-32.09	15.4	24.38	QP
Open	13.567	41.68	71.86	-30.18	17.3	24.38	QP
Open	13.71	35.22	61.81	-26.59	10.8	24.42	QP
Open	27.12	30.5	49.54	-19.04	10.67	19.83	QP

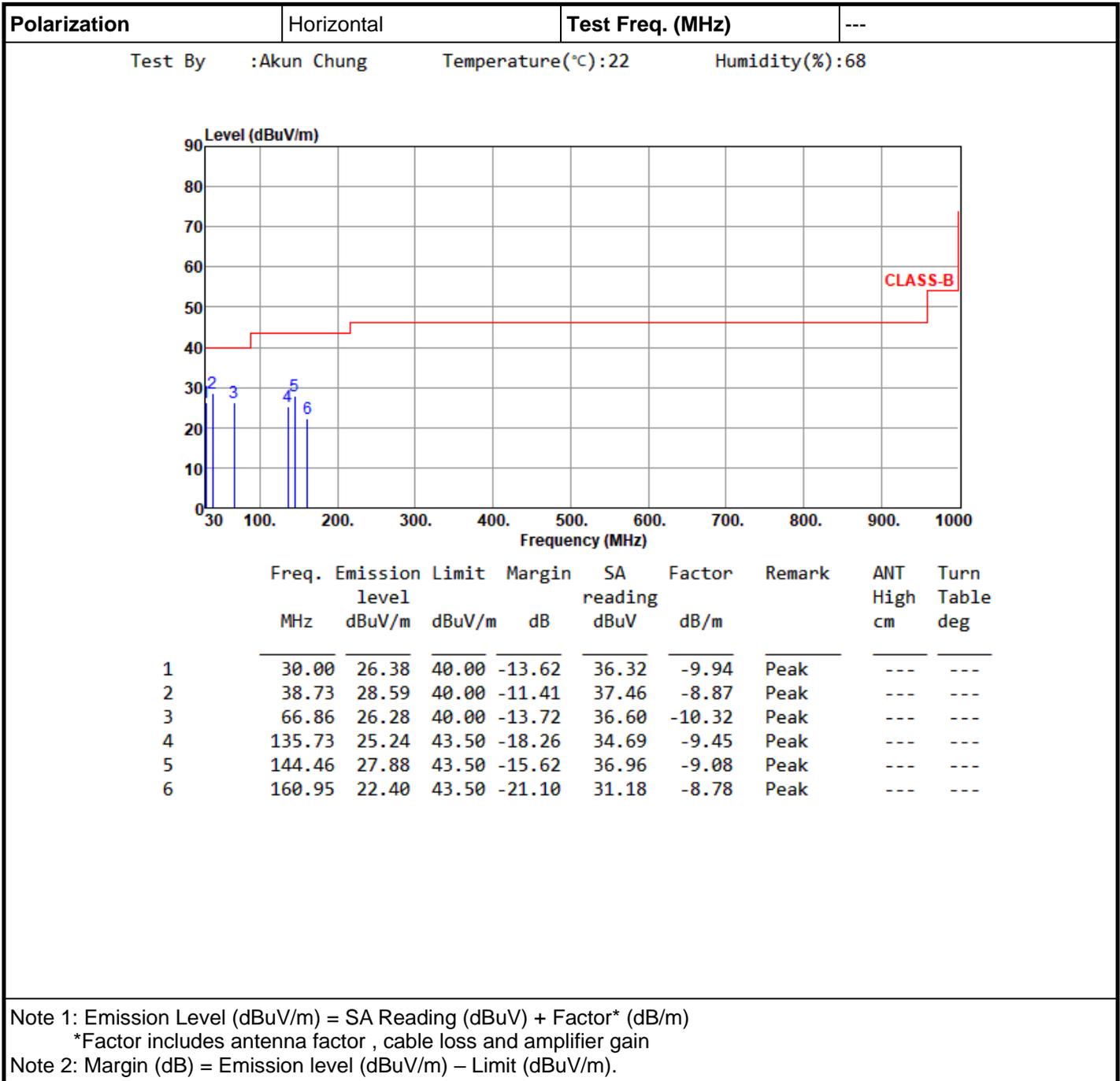
Field Strength of Fundamental Emissions Result							
Polarization	Emission Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	SA Reading (dBuV)	Factor(dB)	Remark
Close	13.41	35	62	-27	10.66	24.34	QP
Close	13.553	38.04	71.87	-33.83	13.66	24.38	QP
Close	13.567	39.15	71.86	-32.71	14.77	24.38	QP
Close	13.71	35.12	61.81	-26.69	10.7	24.42	QP
Close	27.12	31.14	49.54	-18.4	11.31	19.83	QP

Note: Emission level = SA reading + Factor



Unwanted Emissions (Above 30MHz)

Configuration 1: Charging mode





Polarization	Vertical	Test Freq. (MHz)	---						
Test By	:Akun Chung	Temperature(°C):22	Humidity(%):68						
	Freq.	Emission level	Limit	Margin	SA	Factor	Remark	ANT	Turn
	MHz	dBuV/m	dBuV/m	dB	reading	dB/m		High	Table
					dBuV			cm	deg
1	30.00	33.77	40.00	-6.23	43.71	-9.94	Peak	---	---
2	45.52	29.80	40.00	-10.20	38.30	-8.50	Peak	---	---
3	73.65	30.73	40.00	-9.27	42.59	-11.86	Peak	---	---
4	135.73	21.46	43.50	-22.04	30.91	-9.45	Peak	---	---
5	154.16	27.79	43.50	-15.71	36.58	-8.79	Peak	---	---
6	160.95	24.21	43.50	-19.29	32.99	-8.78	Peak	---	---

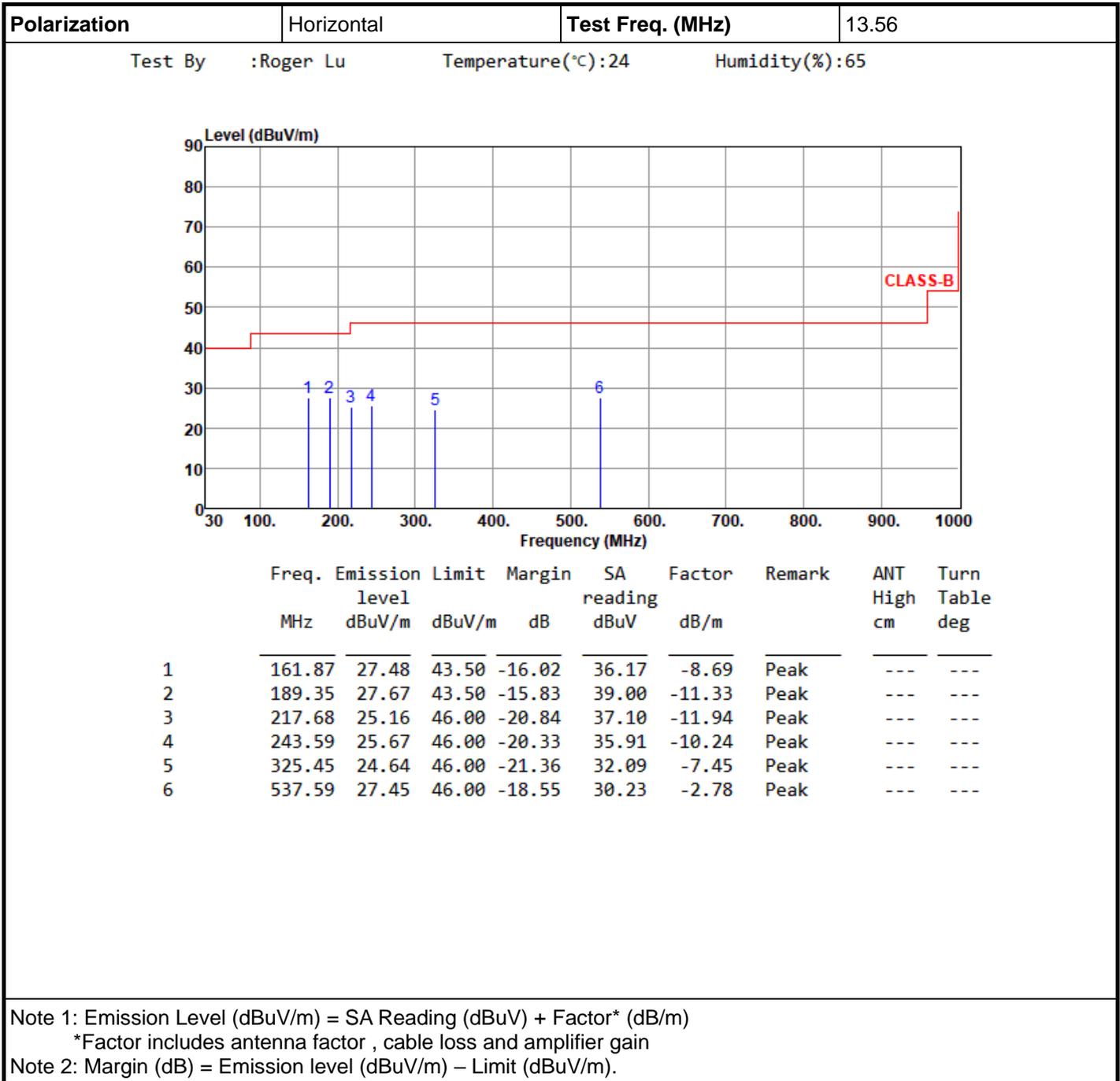
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV) + Factor* (dB/m)

*Factor includes antenna factor , cable loss and amplifier gain

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



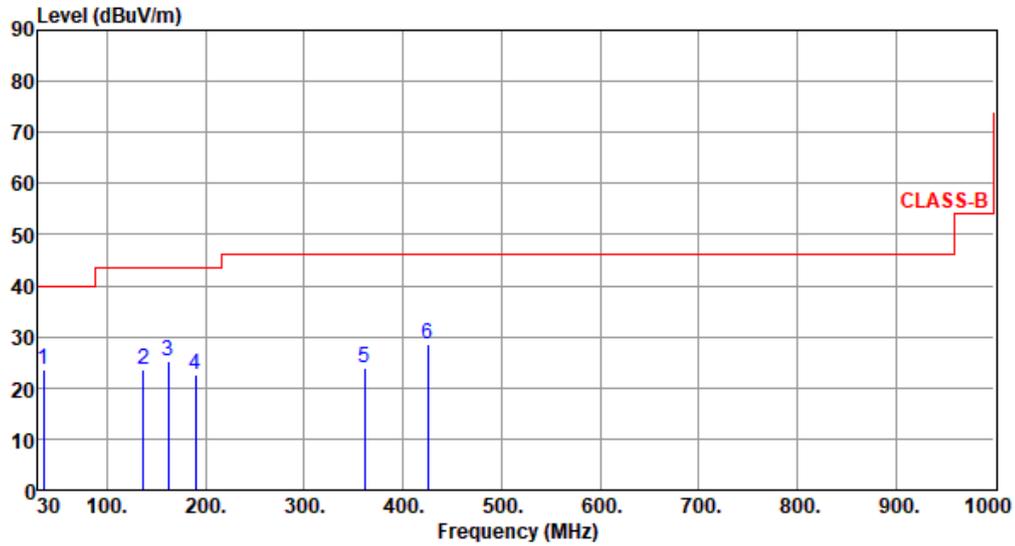
Configuration 2: Battery mode





Polarization	Vertical	Test Freq. (MHz)	13.56
---------------------	----------	-------------------------	-------

Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	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	35.95	23.69	40.00	-16.31	33.15	-9.46	Peak	---	---
2	136.59	23.58	43.50	-19.92	33.03	-9.45	Peak	---	---
3	161.89	25.37	43.50	-18.13	34.06	-8.69	Peak	---	---
4	189.45	22.56	43.50	-20.94	33.90	-11.34	Peak	---	---
5	361.26	23.87	46.00	-22.13	30.50	-6.63	Peak	---	---
6	425.59	28.56	46.00	-17.44	33.55	-4.99	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).

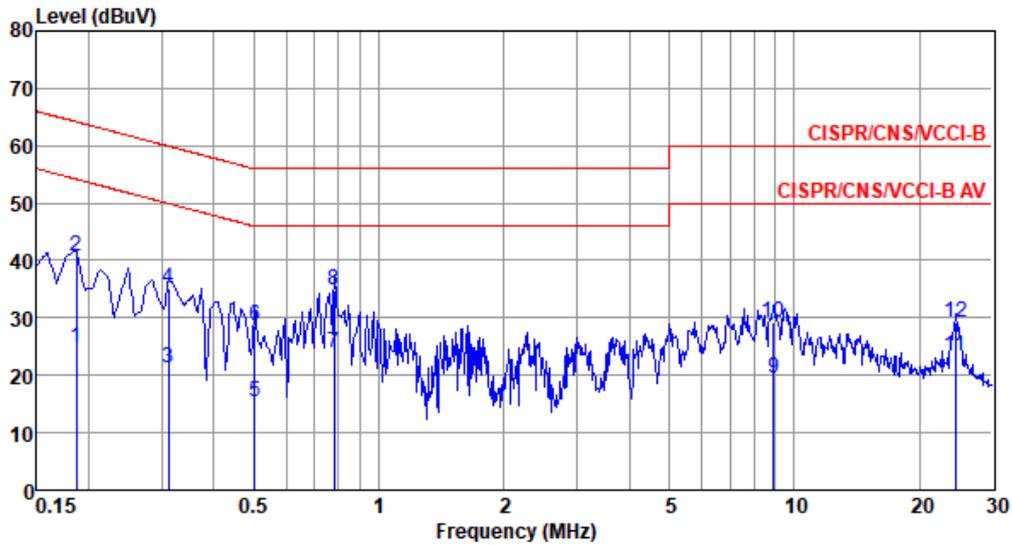


Frequency: 13.56 MHz	Frequency Drift (ppm)			
	0 minute	2 minutes	5 minutes	10 minutes
T20°C Vmax	14.75	15.49	14.75	15.49
T20°C Vmin	14.01	14.75	14.75	14.75
T55°C Vnom	9.59	11.06	10.32	11.80
T50°C Vnom	11.06	11.06	10.32	11.80
T40°C Vnom	11.06	11.80	11.80	13.27
T30°C Vnom	12.54	11.80	13.27	14.01
T20°C Vnom	14.01	14.75	14.75	14.75
T10°C Vnom	14.75	14.75	16.22	14.75
T0°C Vnom	16.22	15.49	17.70	15.49
T-10°C Vnom	16.96	16.22	18.44	16.22
T-20°C Vnom	16.96	16.22	18.44	18.44
Vnom [V]: 3.87	Vmax [V]: 4.50		Vmin [V]: 3.60	
Tnom [°C]: 20	Tmax [°C]: 55		Tmin [°C]: -20	



Modulation	Charging
Power Phase	Line

Test by : Joe Liao Temperature: 22°C Humidity: 61%



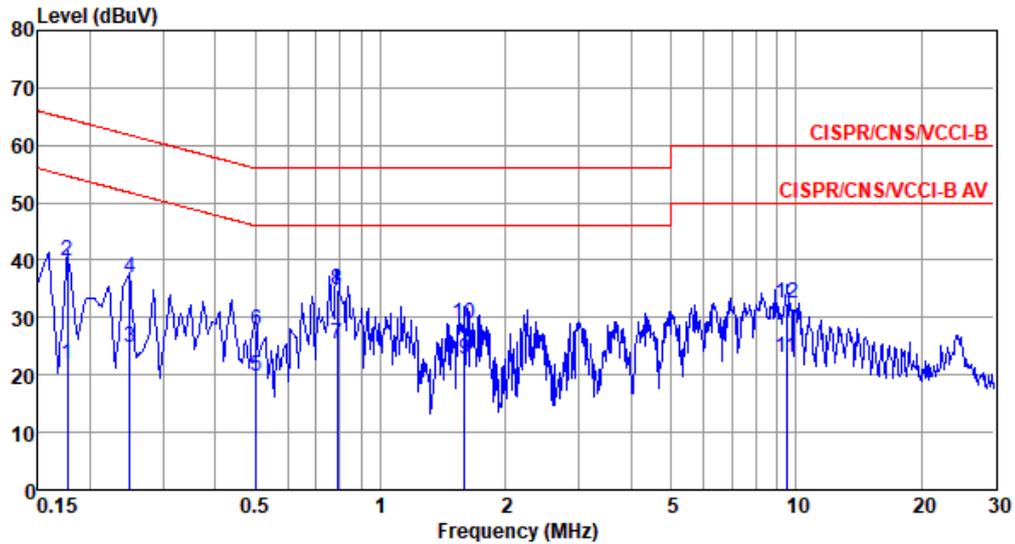
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.186	24.71	54.20	-29.49	14.74	9.68	0.08	0.21	Average
2	0.186	40.71	64.20	-23.49	30.74	9.68	0.08	0.21	QP
3	0.312	21.15	49.93	-28.78	11.09	9.67	0.08	0.31	Average
4	0.312	35.05	59.93	-24.88	24.99	9.67	0.08	0.31	QP
5	0.502	15.34	46.00	-30.66	5.21	9.67	0.10	0.36	Average
6	0.502	28.61	56.00	-27.39	18.48	9.67	0.10	0.36	QP
7	0.779	23.98	46.00	-22.02	13.79	9.68	0.14	0.37	Average
8*	0.779	34.96	56.00	-21.04	24.77	9.68	0.14	0.37	QP
9	8.916	19.60	50.00	-30.40	9.01	9.73	0.42	0.44	Average
10	8.916	29.30	60.00	-30.70	18.71	9.73	0.42	0.44	QP
11	24.400	23.35	50.00	-26.65	12.28	9.70	0.69	0.68	Average
12	24.400	29.12	60.00	-30.88	18.05	9.70	0.69	0.68	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 Note 2: Over Limit (dB) = Level (dBuV) - Limit Line (dBuV).



Modulation	Charging
Power Phase	Neutral

Test by : Joe Liao Temperature: 22°C Humidity: 61%



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.177	21.73	54.64	-32.91	11.87	9.61	0.08	0.17	Average
2	0.177	39.75	64.64	-24.89	29.89	9.61	0.08	0.17	QP
3	0.249	24.81	51.78	-26.97	14.94	9.61	0.08	0.18	Average
4	0.249	36.84	61.78	-24.94	26.97	9.61	0.08	0.18	QP
5	0.502	19.89	46.00	-26.11	9.97	9.61	0.10	0.21	Average
6	0.502	27.88	56.00	-28.12	17.96	9.61	0.10	0.21	QP
7*	0.788	25.45	46.00	-20.55	15.44	9.61	0.14	0.26	Average
8	0.788	34.87	56.00	-21.13	24.86	9.61	0.14	0.26	QP
9	1.593	22.80	46.00	-23.20	12.70	9.62	0.19	0.29	Average
10	1.593	28.99	56.00	-27.01	18.89	9.62	0.19	0.29	QP
11	9.502	23.03	50.00	-26.97	12.53	9.69	0.44	0.37	Average
12	9.502	32.41	60.00	-27.59	21.91	9.69	0.44	0.37	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

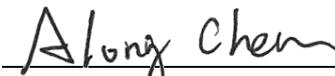
FCC Test Report

FCC ID : IPH-04390
Equipment : Smart Watch
Model No. : A04390
Brand Name : GARMIN
Applicant : Garmin International, Inc.
Address : 1200 E. 151st Street Olathe, KS 66062 United States
Standard : 47 CFR FCC Part 15.247
Received Date : Apr. 07, 2022
Tested Date : Apr. 18 ~ May 09, 2022

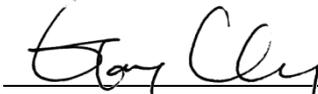
We, International Certification Corporation, would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It shall not be reproduced except in full without the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

Reviewed by:

Approved by:



Along Chen / Assistant Manager



Gary Chang / Manager

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Appendix A. 6dB and Occupied Bandwidth

Appendix B. Conducted Output Power

Appendix C. Power Spectral Density

Appendix D. Unwanted Emissions into Restricted Frequency Bands

Appendix E. Emissions in Non-Restricted Frequency Bands

Appendix F. AC Power Line Conducted Emissions

Release Record

Report No.	Version	Description	Issued Date
FR240702AC	Rev. 01	Initial issue	Jun. 01, 2022

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emission	[dBuV]: 0.788MHz 25.45 (Margin -20.55dB) - AV	Pass
15.247(d) 15.209	Unwanted Emissions	[dBuV/m at 3m]: 2390.00MHz 69.80 (Margin -4.20dB) - PK	Pass
15.247(b)(3)	Conducted Output Power	Max Power [dBm]: 20.86	Pass
15.247(a)(2)	6dB Bandwidth	Meet the requirement of limit	Pass
15.247(e)	Power Spectral Density	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	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)

RF General Information					
Frequency Range (MHz)	IEEE Std. 802.11	Ch. Freq. (MHz)	Channel Number	Transmit Chains (N _{TX})	Data Rate / MCS
2400-2483.5	b	2412-2462	1-11 [11]	1	1-11 Mbps
2400-2483.5	g	2412-2462	1-11 [11]	1	6-54 Mbps
2400-2483.5	n (HT20)	2412-2462	1-11 [11]	1	MCS 0-7

Note 1: RF output power specifies that Maximum Conducted (Average) Output Power.
 Note 2: DSSS-DBPSK, DQPSK, CCK modulation
 OFDM - BPSK, QPSK, 16QAM, 64QAM modulation.

1.1.2 Antenna Details

Ant. No.	Brand	Model	Type	Connector	Gain (dBi)
1	Garmin	117-01806-0X	PIFA	N/A	-2.08

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Type	5Vdc from adapter 3.87Vdc from battery
------------	---

1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	Battery	Brand: Garmin Model: 361-00136-20 Power Rating: 3.87V, 205mAh
2	USB cable	Brand: GARMIN Model: 320-01069-10 Line: 0.52m shielded without core

1.1.5 Channel List

Frequency band (MHz)	2400~2483.5
802.11 b / g / n HT20	
Channel	Frequency(MHz)
1	2412
2	2417
3	2422
4	2427
5	2432
6	2437
7	2442
8	2447
9	2452
10	2457
11	2462

1.1.6 Test Tool and Duty Cycle

Test Tool	WiFi Test, Version:4.01		
Duty Cycle and Duty Factor	Mode	Duty Cycle (%)	Duty Factor (dB)
	11b	100.00%	0.00
	11g	100.00%	0.00
	HT20	100.00%	0.00

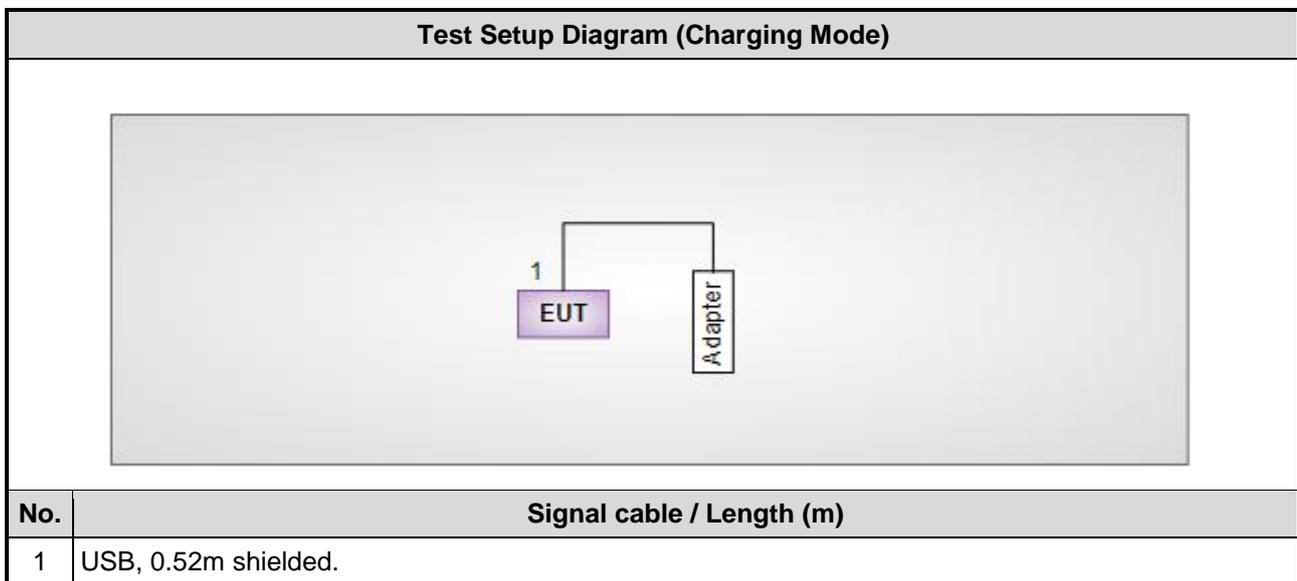
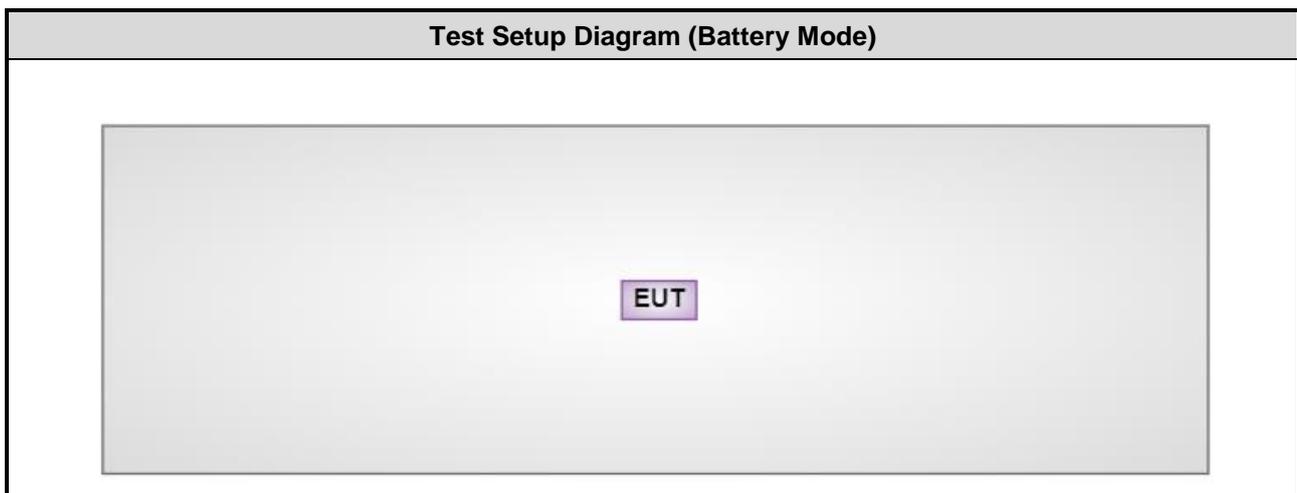
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)	Power Index
11b	2412	default
11b	2437	default
11b	2462	default
11g	2412	default
11g	2437	default
11g	2462	default
HT20	2412	default
HT20	2437	default
HT20	2462	default

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Adapter	samsung	ETA-U90JWS	---	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	May 09, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Feb. 16, 2022	Feb. 15, 2023
LISN	R&S	ENV216	101579	Apr. 21, 2022	Apr. 20, 2023
LISN (Support Unit)	SCHWARZBECK	NSLK 8127	8127667	Jan .07, 2022	Jan .06, 2023
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 19, 2021	Oct. 18, 2022
50 ohm terminal (Support Unit)	NA	50	04	May 25, 2021	May 24, 2022
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	Apr. 18 ~ Apr. 23, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 15, 2022	Mar. 14, 2023
Spectrum Analyzer	R&S	FSV40	101498	Nov. 29, 2021	Nov. 28, 2022
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jun. 30, 2021	Jun. 29, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 03, 2021	Dec. 02, 2022
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Jan. 11, 2022	Jan. 10, 2023
Preamplifier	EMC	EMC02325	980225	Jun. 29, 2021	Jun. 28, 2022
Preamplifier	Agilent	83017A	MY39501308	Sep. 28, 2021	Sep. 27, 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 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 05, 2021	Oct. 04, 2022
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 05, 2021	Oct. 04, 2022
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 05, 2021	Oct. 04, 2022
RF Cable	EMC	EMC104-35M-35M-8000	210920	Oct. 05, 2021	Oct. 04, 2022
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 05, 2021	Oct. 04, 2022
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Tested Date	Apr. 29, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101910	Apr. 18, 2022	Apr. 17, 2023
Power Meter	Anritsu	ML2495A	1241002	Nov. 07, 2021	Nov. 06, 2022
Power Sensor	Anritsu	MA2411B	1207366	Nov. 07, 2021	Nov. 06, 2022
Measurement Software	Sporton	SENSE-15247_DTS	V5.10.7.18	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

47 CFR FCC Part 15.247
ANSI C63.10-2013

1.6 Reference Guidance

FCC KDB 558074 D01 15.247 Meas Guidance v05r02

1.7 Deviation from Test Standard and Measurement Procedure

None

1.8 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
Bandwidth	±34.130 Hz
Conducted power	±0.808 dB
Power density	±0.583 dB
Conducted emission	±2.715 dB
AC conducted emission	±2.92 dB
Unwanted Emission ≤ 1GHz	±3.41 dB
Unwanted Emission > 1GHz	±4.59 dB

2 Test Configuration

2.1 Testing Facility

Test Laboratory	International Certification Corporation
Test Site	CO01-WS, 03CH01-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.)

- 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	Modulation Mode	Test Frequency (MHz)	Data Rate	Test Configuration
AC Power Line Conducted Emission	Charging	---	---	1
Unwanted Emissions ≤ 1GHz	11g	2437	6 Mbps	2
Unwanted Emissions ≤ 1GHz	Charging	---	---	1
Unwanted Emissions >1GHz	11b 11g HT20	2412 / 2437 / 2462 2412 / 2437 / 2462 2412 / 2437 / 2462	1 Mbps 6 Mbps MCS 0	2
Conducted Output Power 6dB bandwidth Power spectral density	11b 11g HT20	2412 / 2437 / 2462 2412 / 2437 / 2462 2412 / 2437 / 2462	1 Mbps 6 Mbps MCS 0	2

NOTE:

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 had been tested by following test configurations.
 - 1) Configuration 1: Charging mode
 - 2) Configuration 2: Battery mode

3 Transmitter Test Results

3.1 6dB and Occupied Bandwidth

3.1.1 Limit of 6dB Bandwidth

The minimum 6dB bandwidth shall be at least 500 kHz.

3.1.2 Test Procedures

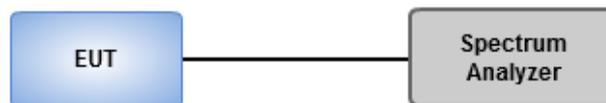
6dB Bandwidth

1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 6dB relative to the maximum level measured in the fundamental emission.

Occupied Bandwidth

1. Set resolution bandwidth (RBW) = 1% ~ 5 % of OBW, Video bandwidth = 3 x RBW
2. Detector = Sample, Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Use the OBW measurement function of spectrum analyzer to measure the occupied bandwidth.

3.1.3 Test Setup



3.1.4 Test Results

Ambient Condition	23°C / 64%	Tested By	Brad Wu
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Refer to Appendix A.

3.2 Conducted Output Power

3.2.1 Limit of Conducted Output Power

Conducted power shall not exceed 1Watt.

Antenna gain \leq 6dBi, no any corresponding reduction is in output power limit.

Antenna gain $>$ 6dBi

Non Fixed, point to point operations.

The conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dB

Fixed, point to point operations

Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point Operations, maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

3.2.2 Test Procedures

A broadband RF power meter is used for output power measurement. The video bandwidth of power meter is greater than DTS bandwidth of EUT. If duty cycle of test signal is not 100 %, trigger and gating function of power meter will be enabled to capture transmission burst for measuring output power.

3.2.3 Test Setup



3.2.4 Test Results

Ambient Condition	23°C / 64%	Tested By	Brad Wu
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Refer to Appendix B.

3.3 Power Spectral Density

3.3.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band.

3.3.2 Test Procedures

Peak PSD

1. Set the RBW = 3 kHz, VBW = 10 kHz.
2. Detector = Peak, Sweep time = auto couple.
3. Trace mode = max hold, allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

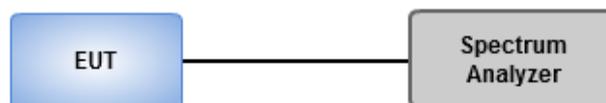
Average PSD, duty cycle \geq 98%

1. Set the RBW = 30 kHz, VBW = 100 kHz.
2. Detector = RMS, Sweep time = auto couple.
3. Sweep time = auto couple.
4. Employ trace averaging (RMS) mode over a minimum of 100 traces.
5. Use the peak marker function to determine the maximum amplitude level.

Average PSD, duty cycle $<$ 98%

1. Set the RBW = 30 kHz, VBW = 100 kHz. Detector = RMS.
2. Set the sweep time to: ≥ 10 (number of measurement points in sweep) x (total on/off period of the transmitted signal).
3. Perform the measurement over a single sweep.
4. Use the peak marker function to determine the maximum amplitude level.
5. Add $10 \log (1/x)$, where x is the duty cycle.

3.3.3 Test Setup



3.3.4 Test Results

Ambient Condition	23°C / 64%	Tested By	Brad Wu
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Refer to Appendix C.

3.4 Unwanted Emissions into Restricted Frequency Bands

3.4.1 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.

3.4.2 Test Procedures

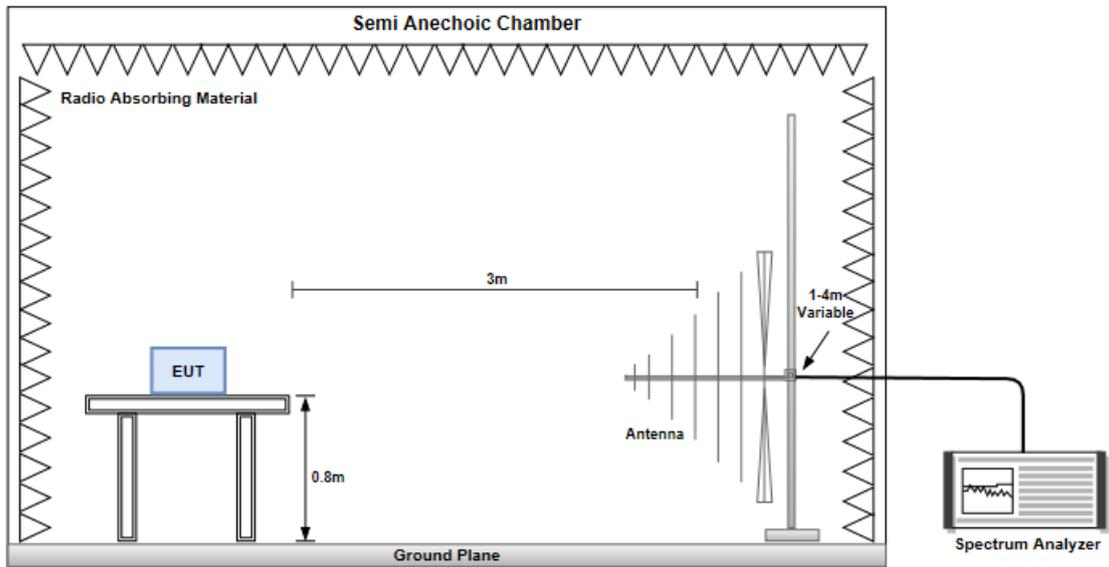
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

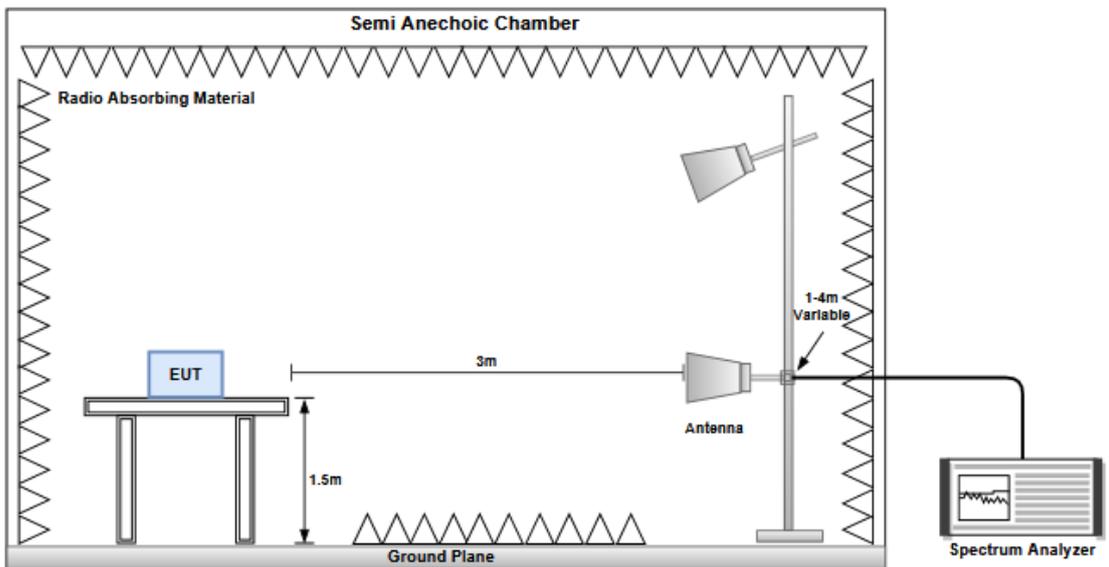
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.4.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



3.4.4 Test Results

Refer to Appendix D.

3.5 Emissions in Non-Restricted Frequency Bands

3.5.1 Emissions in Non-Restricted Frequency Bands Limit

Peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.5.2 Test Procedures

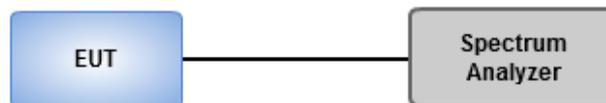
Reference level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Use the peak marker function to determine the maximum PSD level

Emission level measurement

1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 25GHz
4. Use the peak marker function to determine the maximum amplitude level

3.5.3 Test Setup



3.5.4 Test Results

Ambient Condition	23°C / 64%	Tested By	Brad Wu
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Refer to Appendix E.

3.6 AC Power Line Conducted Emissions

3.6.1 Limit of AC Power Line Conducted Emissions

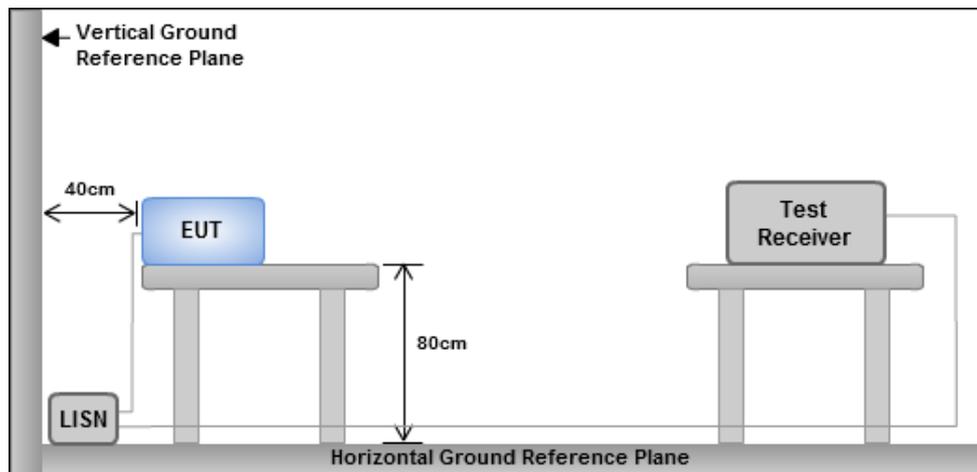
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.6.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

3.6.3 Test Setup



- Note: 1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.6.4 Test Results

Refer to Appendix F.

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

No.3-1, Lane 6, Wen San 3rd St., Kwei Shan Dist., Tao Yuan 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

Fax: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

==END==

**Summary**

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
802.11b_Nss1,(1Mbps)_1TX	12.1M	14.093M	14M1G1D	12.075M	13.968M
802.11g_Nss1,(6Mbps)_1TX	16.525M	16.792M	16M8D1D	16.475M	16.742M
802.11n HT20_Nss1,(MCS0)_1TX	17.7M	17.866M	17M9D1D	17.675M	17.791M

Max-N dB = Maximum 6dB down bandwidth; Max-OBW = Maximum 99% occupied bandwidth;
 Min-N dB = Minimum 6dB down bandwidth; Min-OBW = Minimum 99% occupied bandwidth

Result

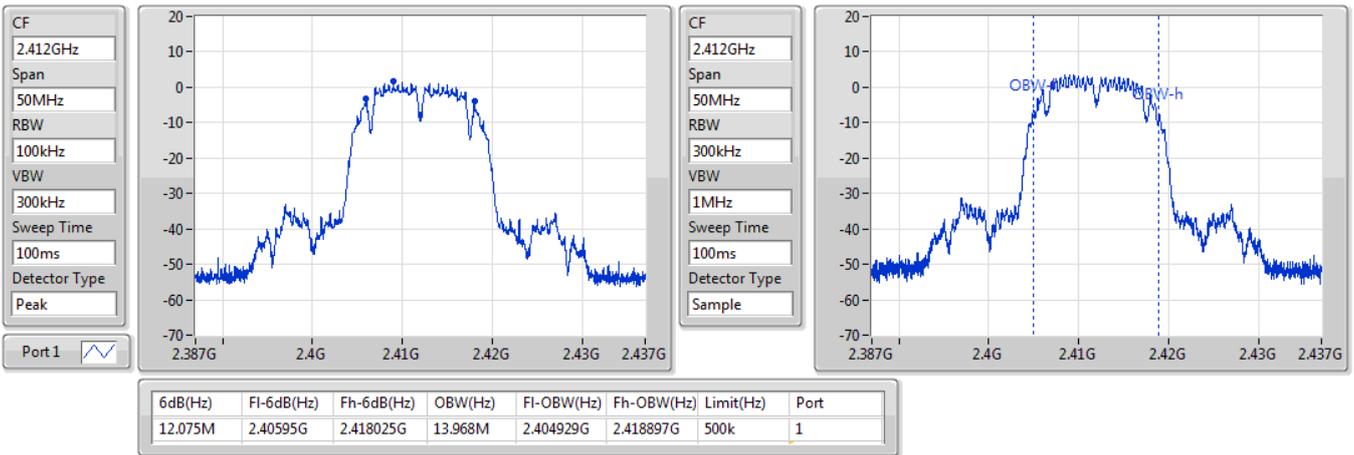
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-
2412MHz	Pass	500k	12.075M	13.968M
2437MHz	Pass	500k	12.075M	14.093M
2462MHz	Pass	500k	12.1M	13.968M
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-
2412MHz	Pass	500k	16.475M	16.742M
2437MHz	Pass	500k	16.5M	16.792M
2462MHz	Pass	500k	16.525M	16.742M
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-
2412MHz	Pass	500k	17.7M	17.791M
2437MHz	Pass	500k	17.675M	17.866M
2462MHz	Pass	500k	17.7M	17.791M

Port X-N dB = Port X 6dB down bandwidth;
 Port X-OBW = Port X 99% occupied bandwidth

802.11b_Nss1,(1Mbps)_1TX

EBW

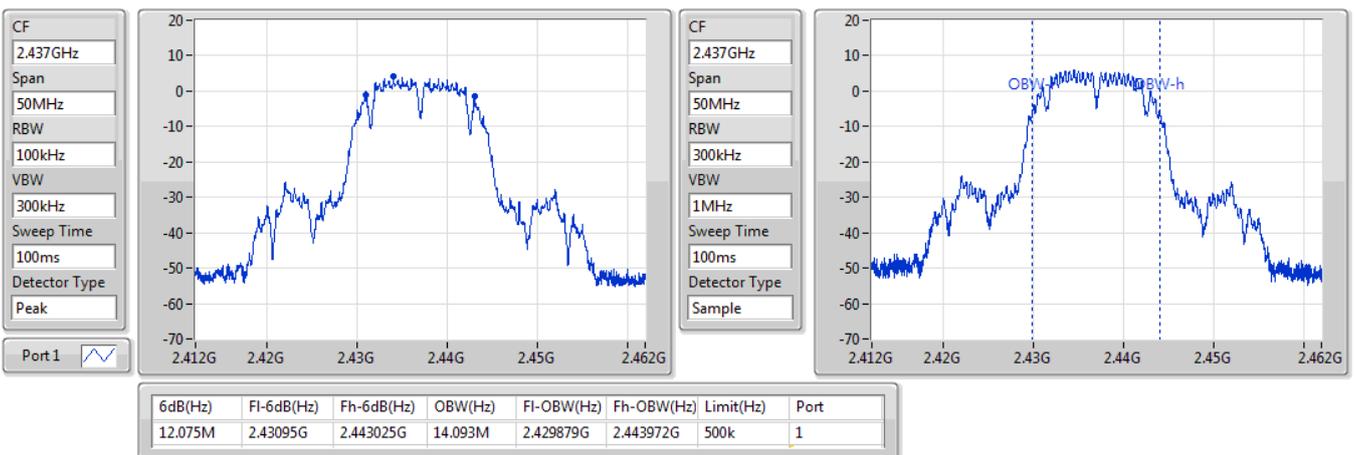
2412MHz



802.11b_Nss1,(1Mbps)_1TX

EBW

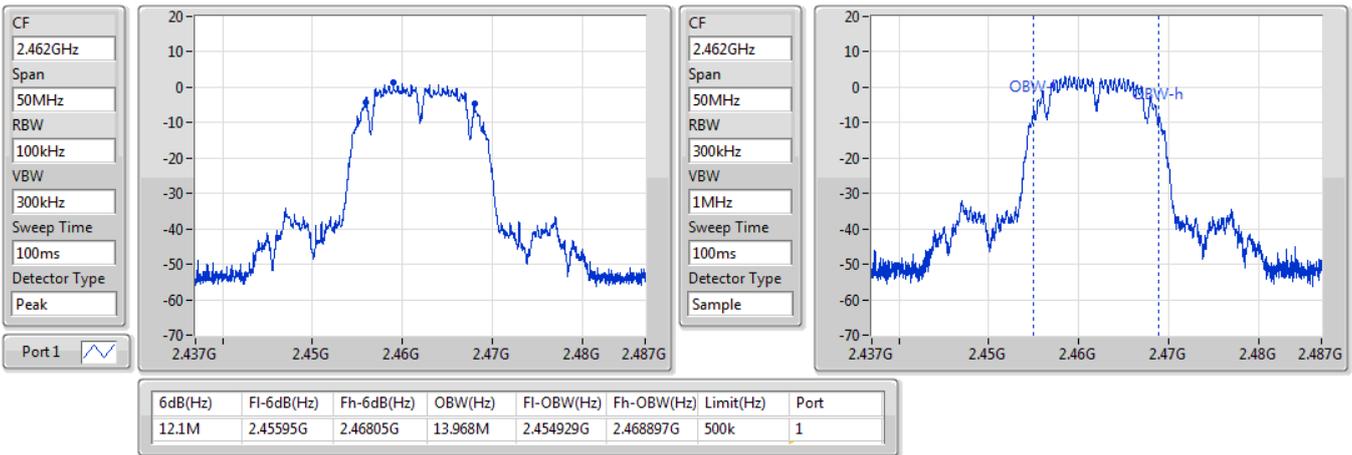
2437MHz



802.11b_Nss1,(1Mbps)_1TX

EBW

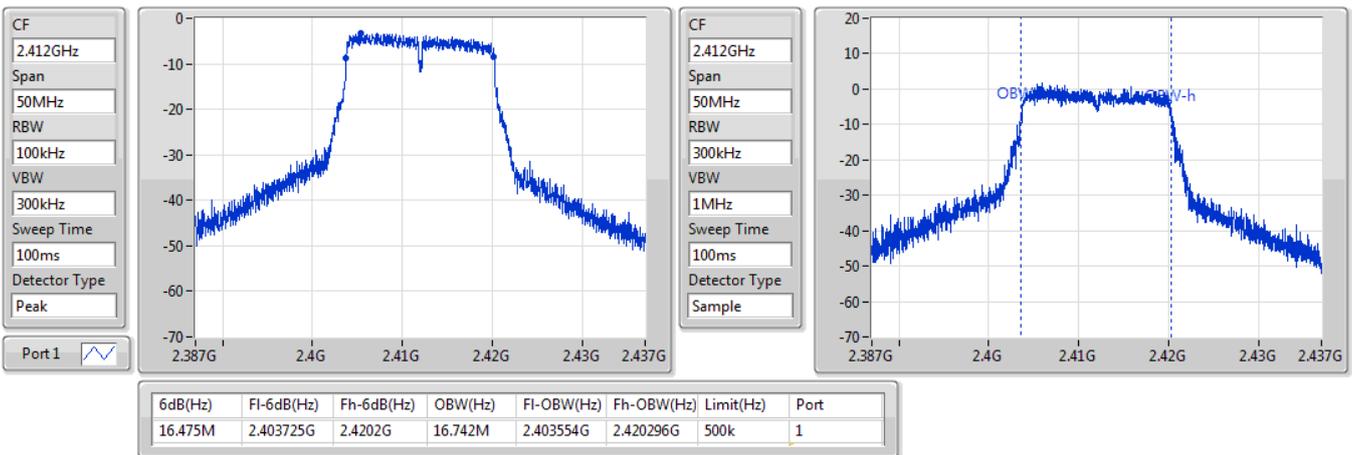
2462MHz



802.11g_Nss1,(6Mbps)_1TX

EBW

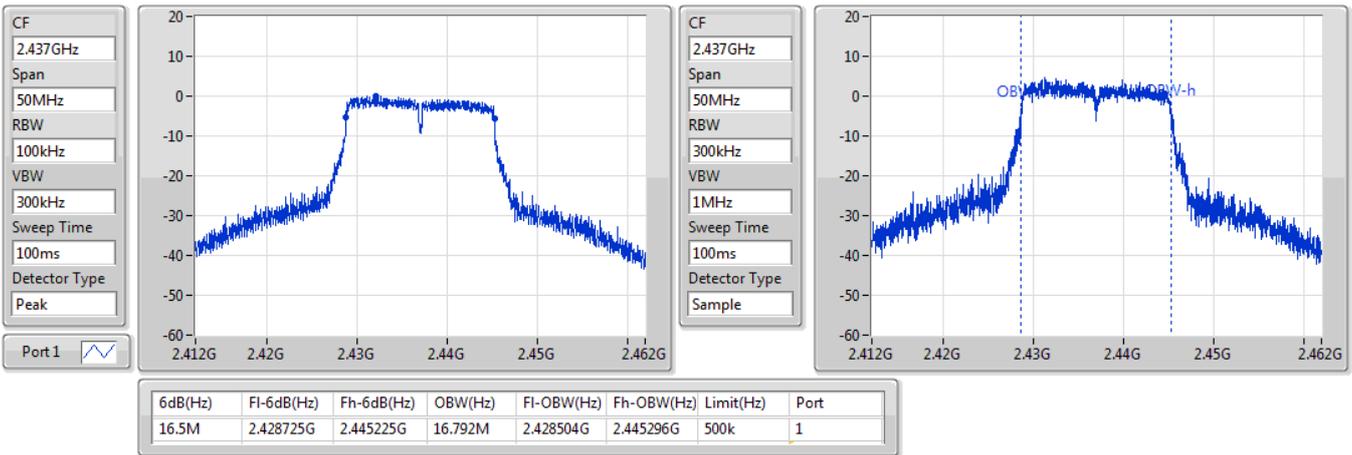
2412MHz



802.11g_Nss1,(6Mbps)_1TX

EBW

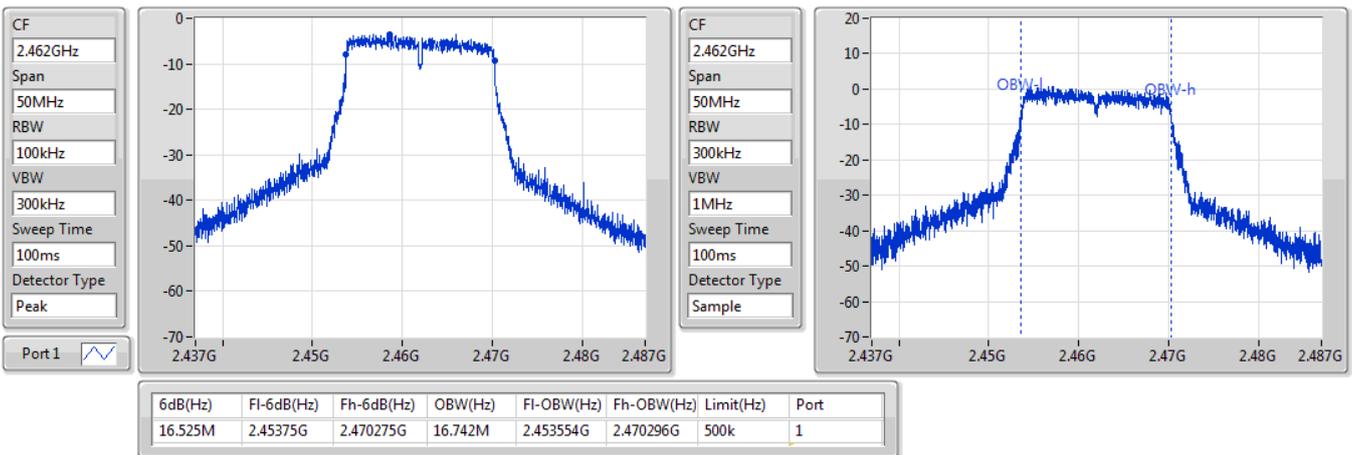
2437MHz



802.11g_Nss1,(6Mbps)_1TX

EBW

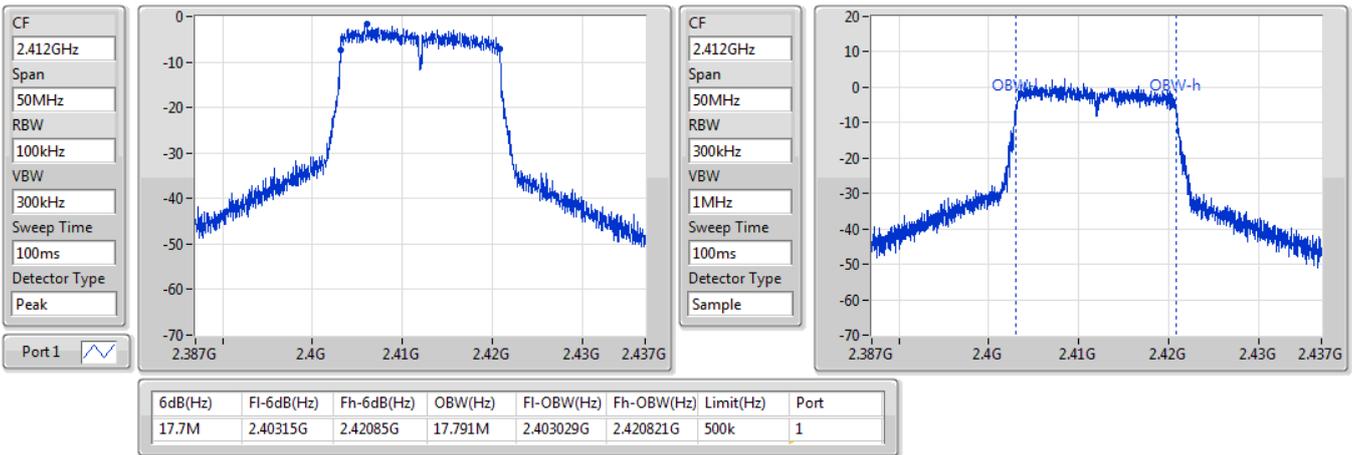
2462MHz



802.11n HT20_Nss1,(MCS0)_1TX

EBW

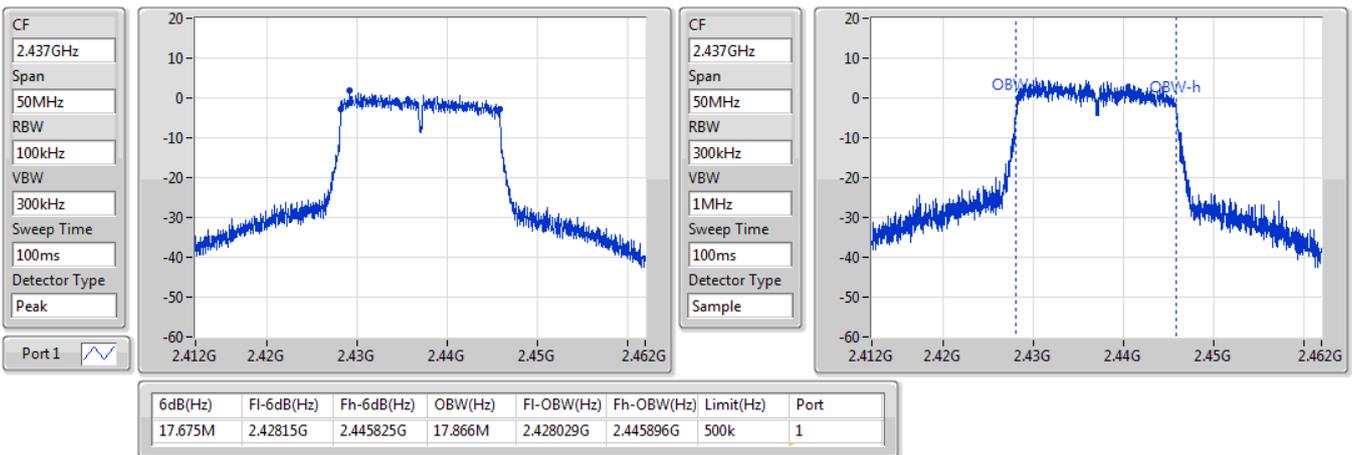
2412MHz



802.11n HT20_Nss1,(MCS0)_1TX

EBW

2437MHz



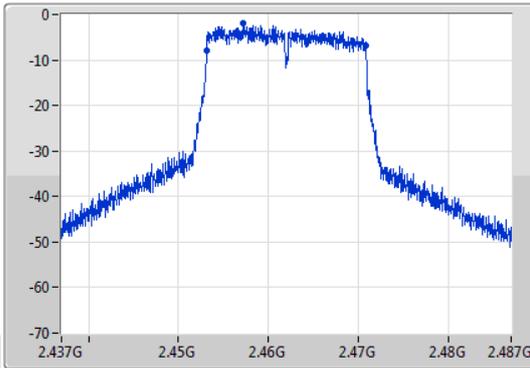


802.11n HT20_Nss1,(MCS0)_1TX

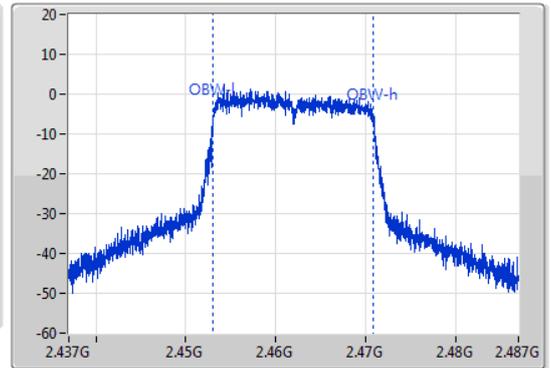
EBW

2462MHz

CF
2.462GHz
Span
50MHz
RBW
100kHz
VBW
300kHz
Sweep Time
100ms
Detector Type
Peak



CF
2.462GHz
Span
50MHz
RBW
300kHz
VBW
1MHz
Sweep Time
100ms
Detector Type
Sample



6dB(Hz)	Fl-6dB(Hz)	Fh-6dB(Hz)	OBW(Hz)	Fl-OBW(Hz)	Fh-OBW(Hz)	Limit(Hz)	Port
17.7M	2.453125G	2.470825G	17.791M	2.453054G	2.470846G	500k	1



Conducted Output Power(Average)

Appendix B

Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_1TX	15.89	0.03882
802.11g_Nss1,(6Mbps)_1TX	13.79	0.02393
802.11n HT20_Nss1,(MCS0)_1TX	13.76	0.02377

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	-2.08	13.39	13.39	-	11.31	-
2437MHz	Pass	-2.08	15.89	15.89	-	13.81	-
2462MHz	Pass	-2.08	13.21	13.21	-	11.13	-
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	-2.08	11.15	11.15	-	9.07	-
2437MHz	Pass	-2.08	13.79	13.79	-	11.71	-
2462MHz	Pass	-2.08	10.51	10.51	-	8.43	-
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	-2.08	10.76	10.76	-	8.68	-
2437MHz	Pass	-2.08	13.76	13.76	-	11.68	-
2462MHz	Pass	-2.08	10.45	10.45	-	8.37	-

DG = Directional Gain; Port X = Port X output power



Summary

Mode	Total Power (dBm)	Total Power (W)
2.4-2.4835GHz	-	-
802.11b_Nss1,(1Mbps)_1TX	18.28	0.06730
802.11g_Nss1,(6Mbps)_1TX	20.86	0.12190
802.11n HT20_Nss1,(MCS0)_1TX	20.82	0.12078

Result

Mode	Result	DG (dBi)	Port 1 (dBm)	Total Power (dBm)	Power Limit (dBm)	EIRP (dBm)	EIRP Limit (dBm)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	-2.08	16.05	16.05	30.00	13.97	36.00
2437MHz	Pass	-2.08	18.28	18.28	30.00	16.20	36.00
2462MHz	Pass	-2.08	15.86	15.86	30.00	13.78	36.00
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	-2.08	20.06	20.06	30.00	17.98	36.00
2437MHz	Pass	-2.08	20.86	20.86	30.00	18.78	36.00
2462MHz	Pass	-2.08	19.85	19.85	30.00	17.77	36.00
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-	-	-
2412MHz	Pass	-2.08	19.81	19.81	30.00	17.73	36.00
2437MHz	Pass	-2.08	20.82	20.82	30.00	18.74	36.00
2462MHz	Pass	-2.08	19.79	19.79	30.00	17.71	36.00

DG = Directional Gain; Port X = Port X output power



Summary

Mode	PD (dBm/RBW)
2.4-2.4835GHz	-
802.11b_Nss1,(1Mbps)_1TX	-13.88
802.11g_Nss1,(6Mbps)_1TX	-11.03
802.11n HT20_Nss1,(MCS0)_1TX	-11.57

RBW= 3 kHz

Result

Mode	Result	DG (dBi)	Port 1 (dBm/RBW)	PD (dBm/RBW)	PD Limit (dBm/RBW)
802.11b_Nss1,(1Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	-2.08	-17.02	-17.02	8.00
2437MHz	Pass	-2.08	-13.88	-13.88	8.00
2462MHz	Pass	-2.08	-16.17	-16.17	8.00
802.11g_Nss1,(6Mbps)_1TX	-	-	-	-	-
2412MHz	Pass	-2.08	-14.23	-14.23	8.00
2437MHz	Pass	-2.08	-11.03	-11.03	8.00
2462MHz	Pass	-2.08	-14.45	-14.45	8.00
802.11n HT20_Nss1,(MCS0)_1TX	-	-	-	-	-
2412MHz	Pass	-2.08	-14.87	-14.87	8.00
2437MHz	Pass	-2.08	-11.57	-11.57	8.00
2462MHz	Pass	-2.08	-14.57	-14.57	8.00

DG = Directional Gain; RBW = 3kHz;

PD = trace bin-by-bin of each transmits port summing can be performed maximum power density; Port X = Port X Power Density;

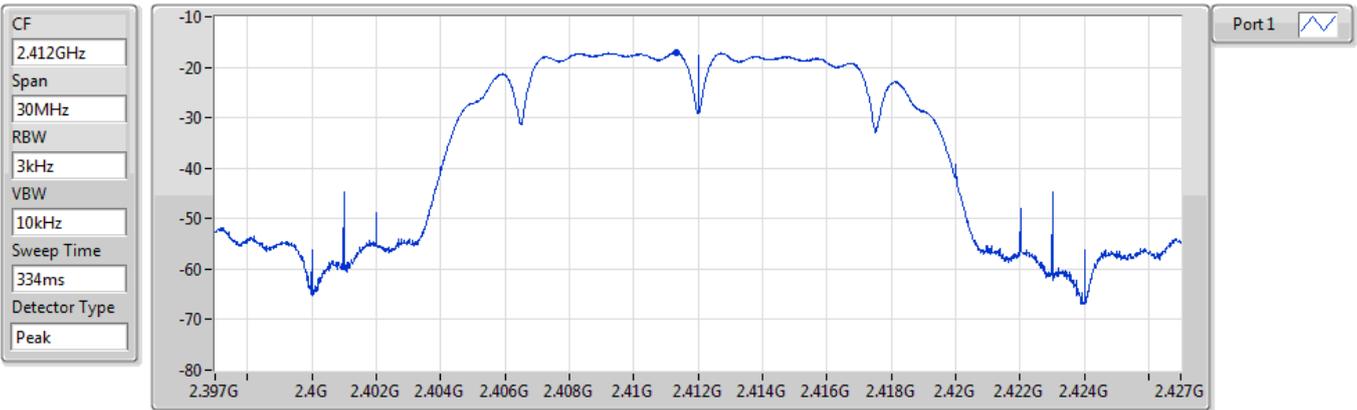
RBW= 3 kHz



802.11b_Nss1,(1Mbps)_1TX

PSD

2412MHz

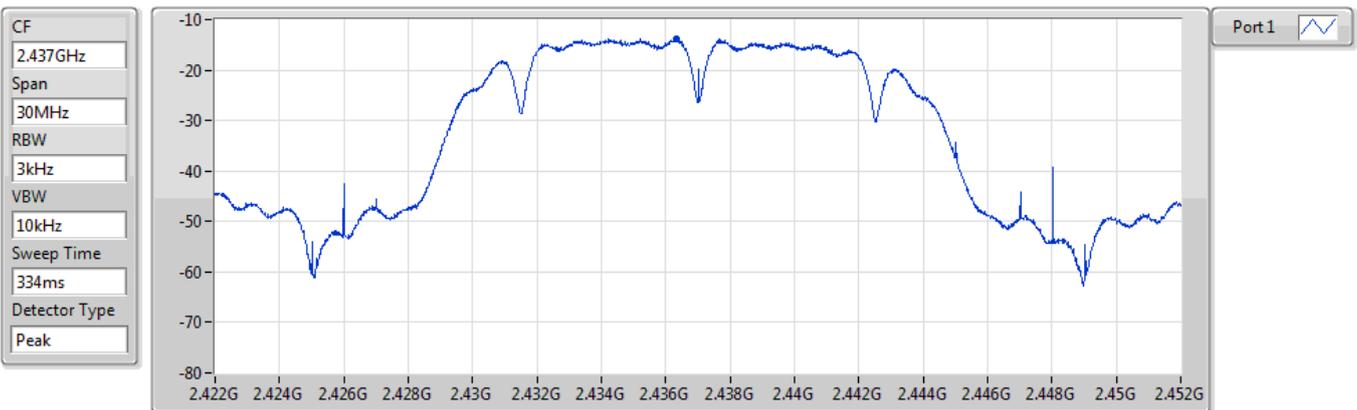


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-17.02	-17.02	-17.02

802.11b_Nss1,(1Mbps)_1TX

PSD

2437MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-13.88	-13.88	-13.88

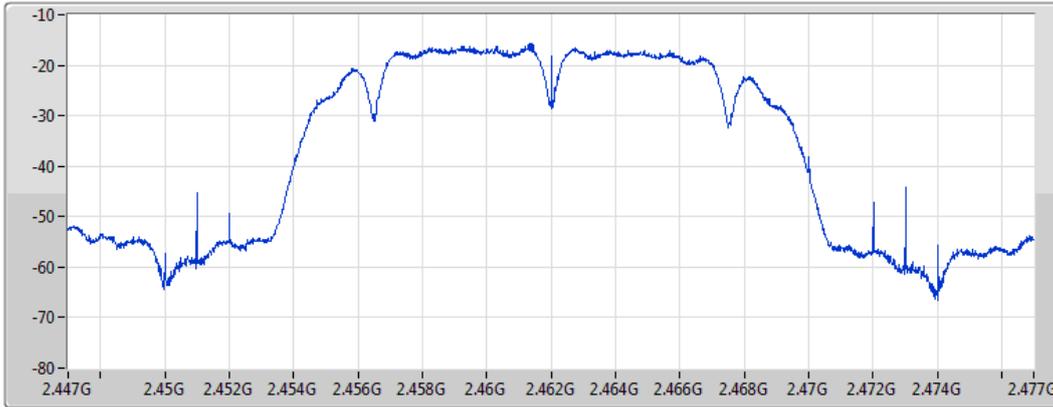


802.11b_Nss1,(1Mbps)_1TX

PSD

2462MHz

CF
2.462GHz
Span
30MHz
RBW
3kHz
VBW
10kHz
Sweep Time
334ms
Detector Type
Peak



Port 1

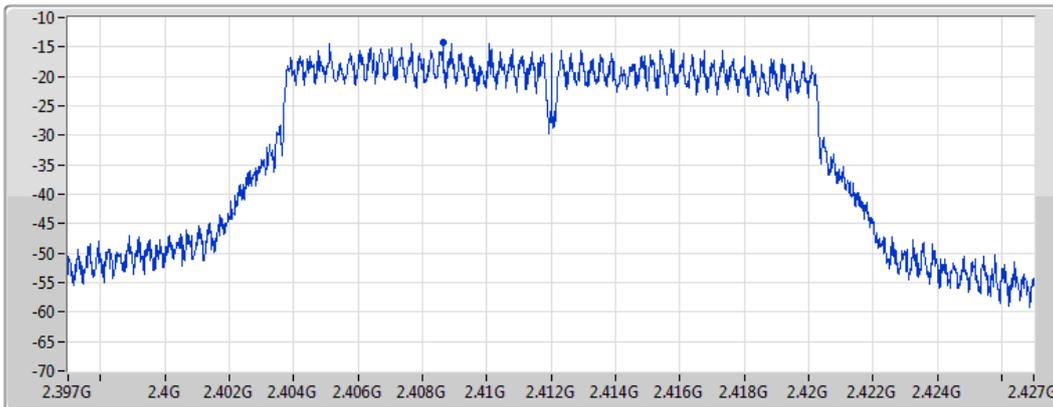
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-16.17	-16.17	-16.17

802.11g_Nss1,(6Mbps)_1TX

PSD

2412MHz

CF
2.412GHz
Span
30MHz
RBW
3kHz
VBW
10kHz
Sweep Time
334ms
Detector Type
Peak



Port 1

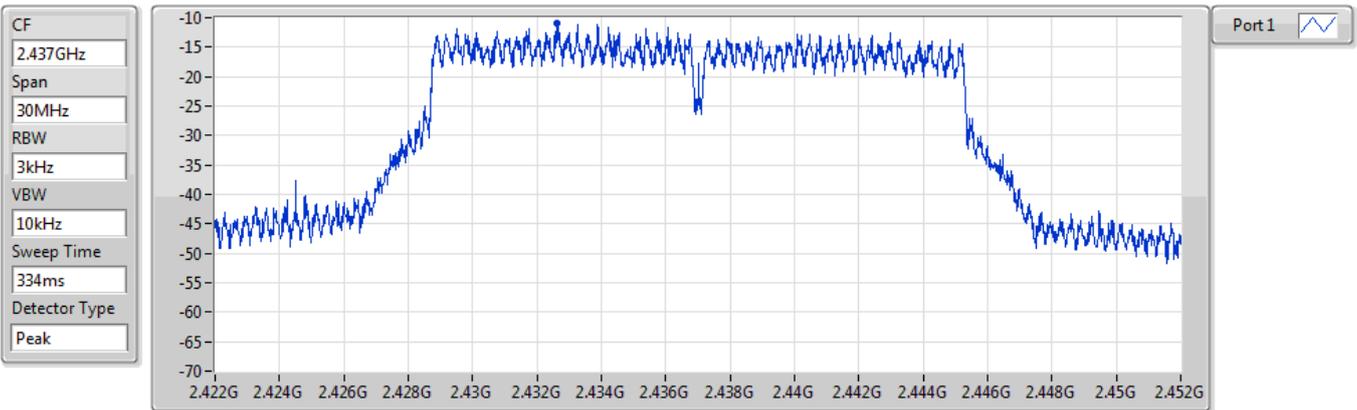
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-14.23	-14.23	-14.23



802.11g_Nss1,(6Mbps)_1TX

PSD

2437MHz

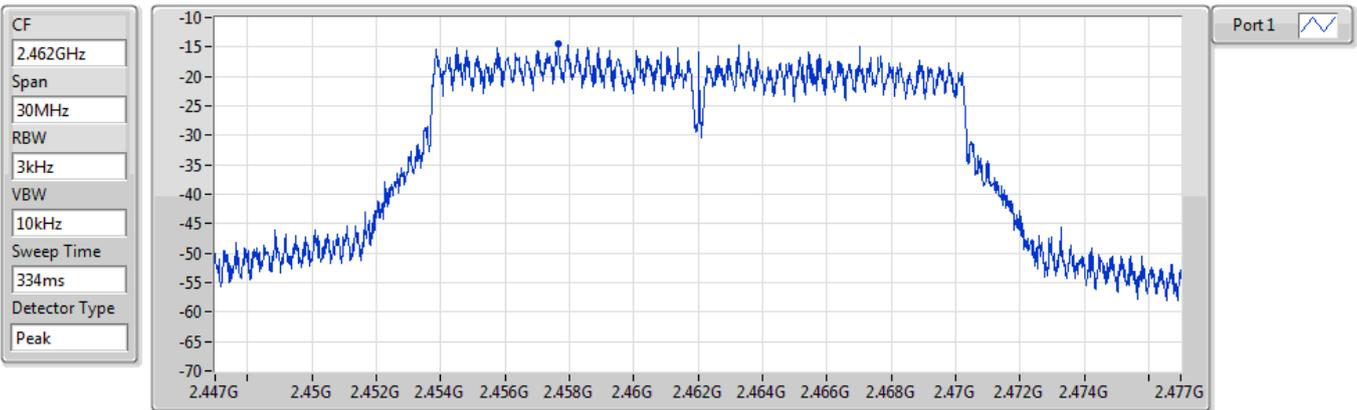


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-11.03	-11.03	-11.03

802.11g_Nss1,(6Mbps)_1TX

PSD

2462MHz



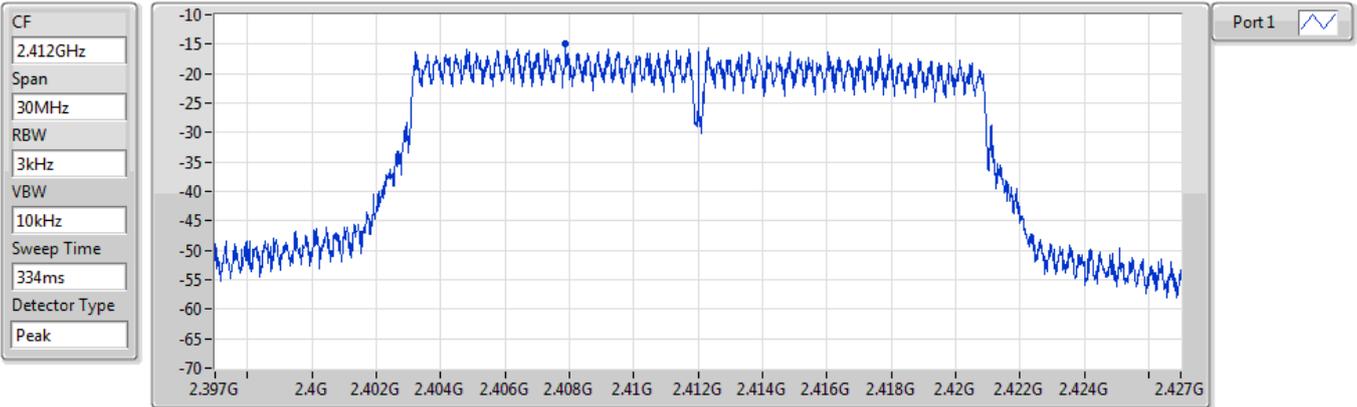
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-14.45	-14.45	-14.45



802.11n HT20_Nss1,(MCS0)_1TX

PSD

2412MHz

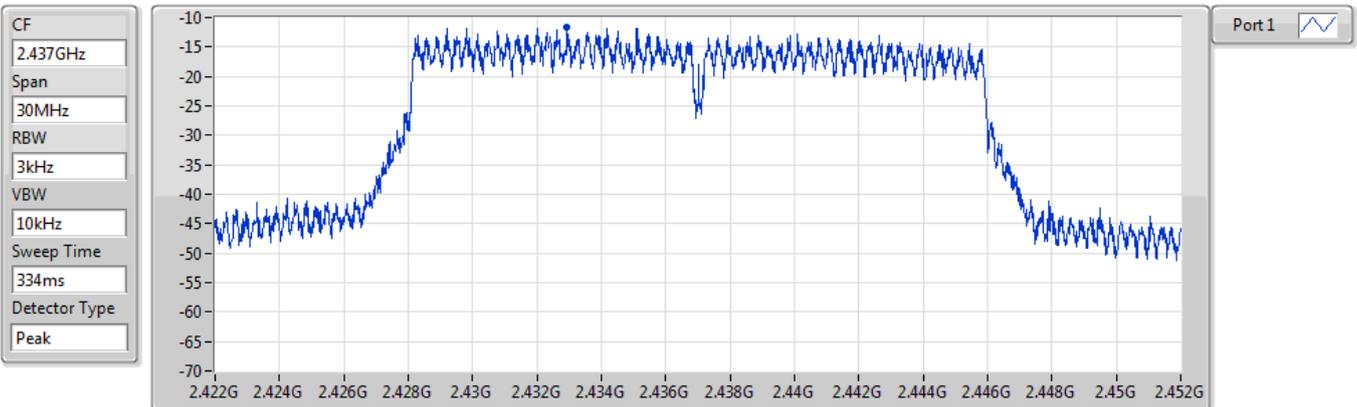


Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-14.87	-14.87	-14.87

802.11n HT20_Nss1,(MCS0)_1TX

PSD

2437MHz



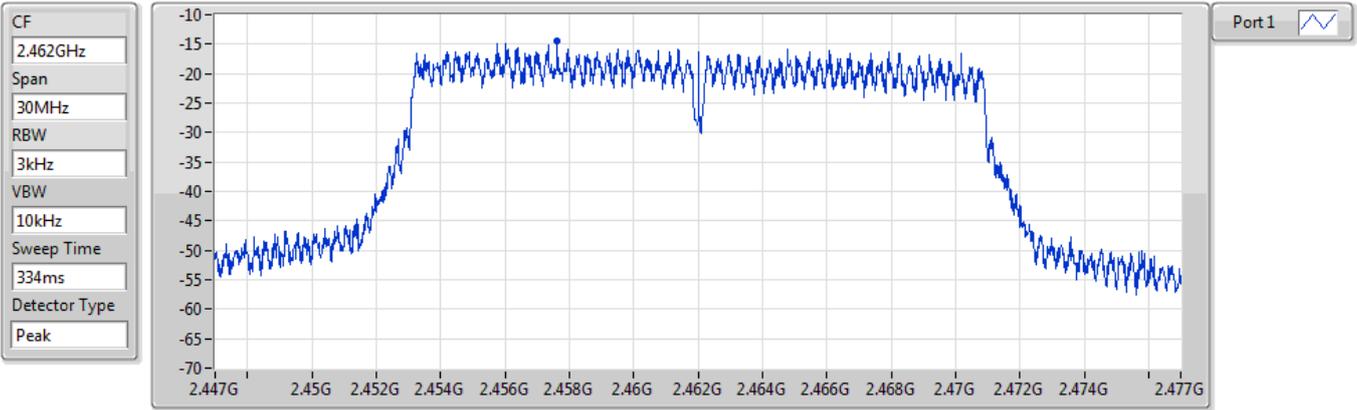
Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-11.57	-11.57	-11.57



802.11n HT20_Nss1,(MCS0)_1TX

PSD

2462MHz



Sum	PD	Port 1
(dBm/RBW)	(dBm/RBW)	(dBm/RBW)
-14.57	-14.57	-14.57

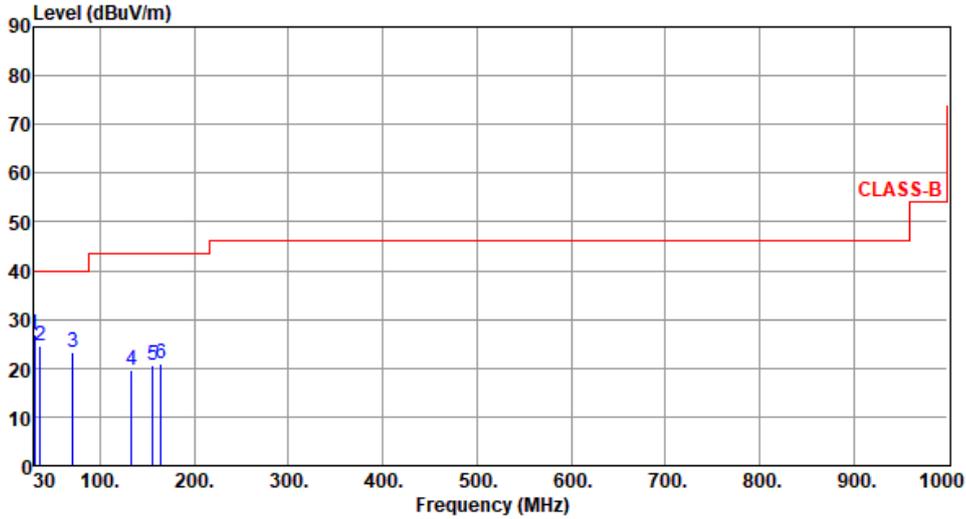


Configuration 2: Battery mode

Unwanted Emissions (Below 1GHz)

Modulation	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):22 Humidity(%):68



	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	30.00	26.99	40.00	-13.01	36.93	-9.94	Peak	---	---
2	36.79	24.52	40.00	-15.48	33.68	-9.16	Peak	---	---
3	70.74	23.37	40.00	-16.63	34.37	-11.00	Peak	---	---
4	133.79	19.74	43.50	-23.76	29.24	-9.50	Peak	---	---
5	156.10	20.73	43.50	-22.77	29.43	-8.70	Peak	---	---
6	164.83	20.84	43.50	-22.66	29.69	-8.85	Peak	---	---

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

*Factor includes antenna factor , cable loss and amplifier gain

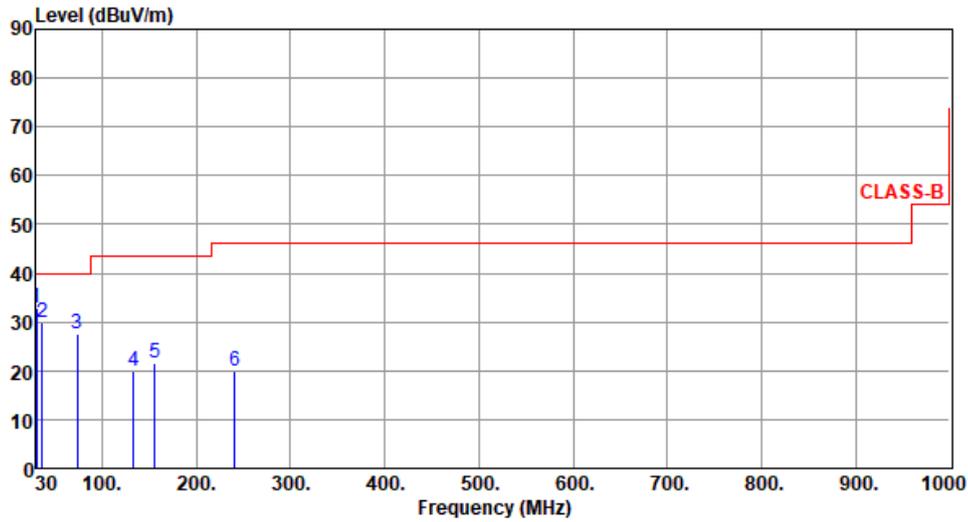
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

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



Modulation	11g	Test Freq. (MHz)	2437
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):22 Humidity(%):68



	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	30.00	32.97	40.00	-7.03	42.91	-9.94	Peak	---	---
2	36.79	29.98	40.00	-10.02	39.14	-9.16	Peak	---	---
3	73.65	27.49	40.00	-12.51	39.35	-11.86	Peak	---	---
4	133.79	19.99	43.50	-23.51	29.49	-9.50	Peak	---	---
5	156.10	21.50	43.50	-22.00	30.20	-8.70	Peak	---	---
6	240.49	19.91	46.00	-26.09	30.27	-10.36	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.



Unwanted Emission (Above 1GHz) for 11b

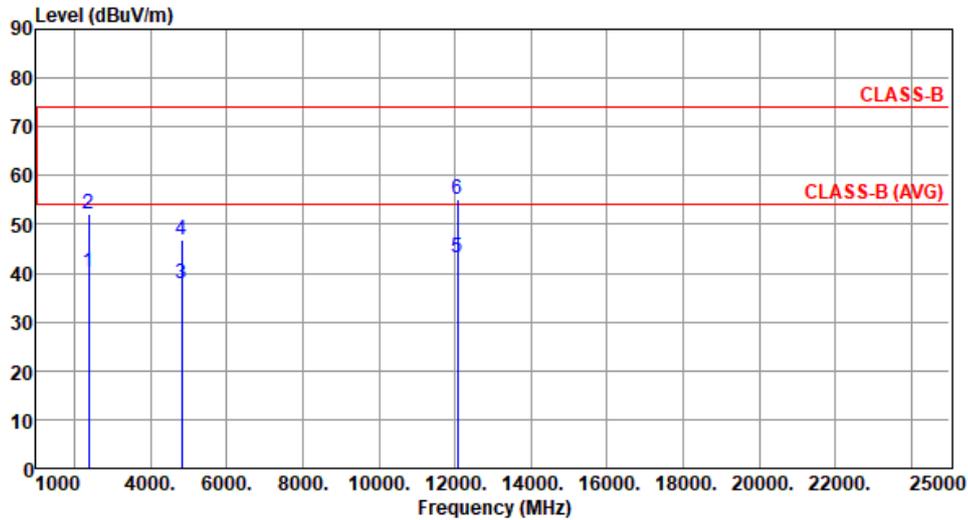
Modulation	11b	Test Freq. (MHz)	2412						
Polarization	Horizontal								
Test By :Akun Chung Temperature(°C):25 Humidity(%):67									
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	37.87	54.00	-16.13	40.62	-2.75	Average	172	205
2	2390.00	51.81	74.00	-22.19	54.56	-2.75	Peak	172	205
3	4824.00	39.16	54.00	-14.84	35.02	4.14	Average	246	293
4	4824.00	47.91	74.00	-26.09	43.77	4.14	Peak	246	293
5	12060.00	44.48	54.00	-9.52	30.69	13.79	Average	100	304
6	12060.00	56.44	74.00	-17.56	42.65	13.79	Peak	100	304

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).



Modulation	11b	Test Freq. (MHz)	2412
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 67



	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	2390.00	40.13	54.00	-13.87	42.88	-2.75	Average	105	185
2	2390.00	52.20	74.00	-21.80	54.95	-2.75	Peak	105	185
3	4824.00	37.80	54.00	-16.20	33.66	4.14	Average	100	7
4	4824.00	46.79	74.00	-27.21	42.65	4.14	Peak	100	7
5	12060.00	43.22	54.00	-10.78	29.43	13.79	Average	100	20
6	12060.00	54.96	74.00	-19.04	41.17	13.79	Peak	100	20

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

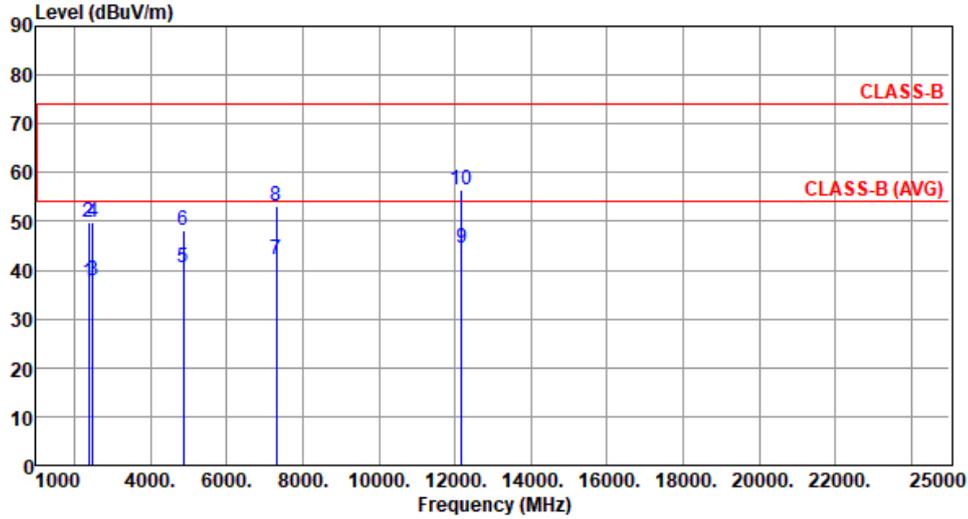
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	11b	Test Freq. (MHz)	2437
Polarization	Horizontal		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 67



	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	2390.00	37.47	54.00	-16.53	40.22	-2.75	Average	167	202
2	2390.00	49.69	74.00	-24.31	52.44	-2.75	Peak	167	202
3	2483.50	37.77	54.00	-16.23	40.47	-2.70	Average	167	202
4	2483.50	49.69	74.00	-24.31	52.39	-2.70	Peak	167	202
5	4874.00	40.43	54.00	-13.57	36.30	4.13	Average	244	292
6	4874.00	48.30	74.00	-25.70	44.17	4.13	Peak	244	292
7	7311.00	42.03	54.00	-11.97	32.75	9.28	Average	100	306
8	7311.00	53.16	74.00	-20.84	43.88	9.28	Peak	100	306
9	12185.00	44.56	54.00	-9.44	30.87	13.69	Average	100	310
10	12185.00	56.43	74.00	-17.57	42.74	13.69	Peak	100	310

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

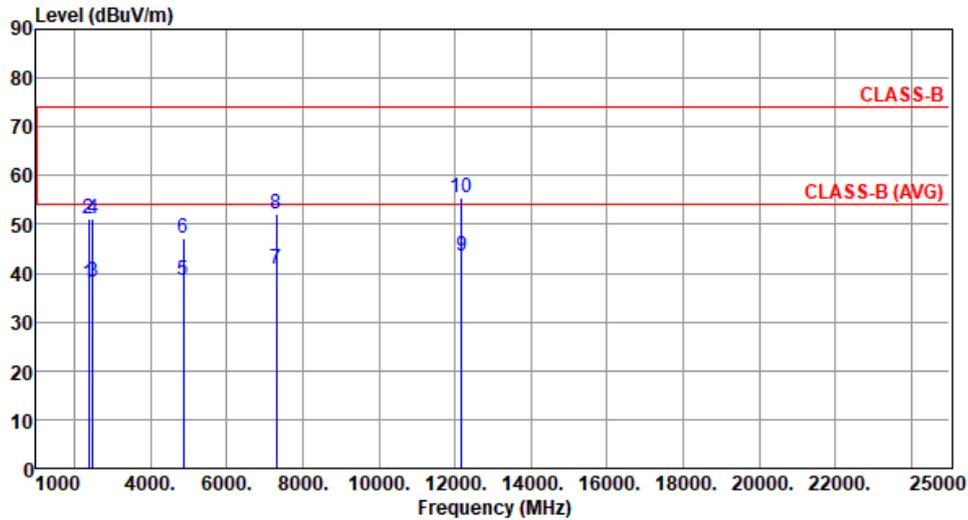
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	11b	Test Freq. (MHz)	2437
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):25 Humidity(%):67



	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	2390.00	38.02	54.00	-15.98	40.77	-2.75	Average	101	182
2	2390.00	51.03	74.00	-22.97	53.78	-2.75	Peak	101	182
3	2483.50	38.16	54.00	-15.84	40.86	-2.70	Average	101	182
4	2483.50	50.99	74.00	-23.01	53.69	-2.70	Peak	101	182
5	4874.00	38.43	54.00	-15.57	34.30	4.13	Average	100	4
6	4874.00	47.28	74.00	-26.72	43.15	4.13	Peak	100	4
7	7311.00	40.94	54.00	-13.06	31.66	9.28	Average	100	5
8	7311.00	52.13	74.00	-21.87	42.85	9.28	Peak	100	5
9	12185.00	43.45	54.00	-10.55	29.76	13.69	Average	100	19
10	12185.00	55.45	74.00	-18.55	41.76	13.69	Peak	100	19

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

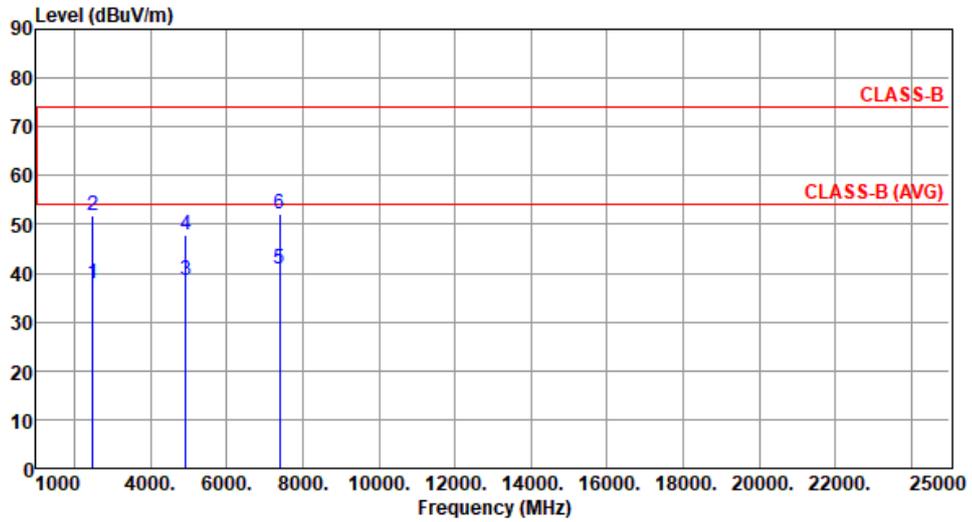
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	11b	Test Freq. (MHz)	2462
Polarization	Horizontal		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 67



	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	2483.50	37.96	54.00	-16.04	40.66	-2.70	Average	170	215
2	2483.50	51.88	74.00	-22.12	54.58	-2.70	Peak	170	215
3	4924.00	38.61	54.00	-15.39	34.55	4.06	Average	249	291
4	4924.00	47.72	74.00	-26.28	43.66	4.06	Peak	249	291
5	7386.00	40.91	54.00	-13.09	31.66	9.25	Average	100	300
6	7386.00	52.20	74.00	-21.80	42.95	9.25	Peak	100	300

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

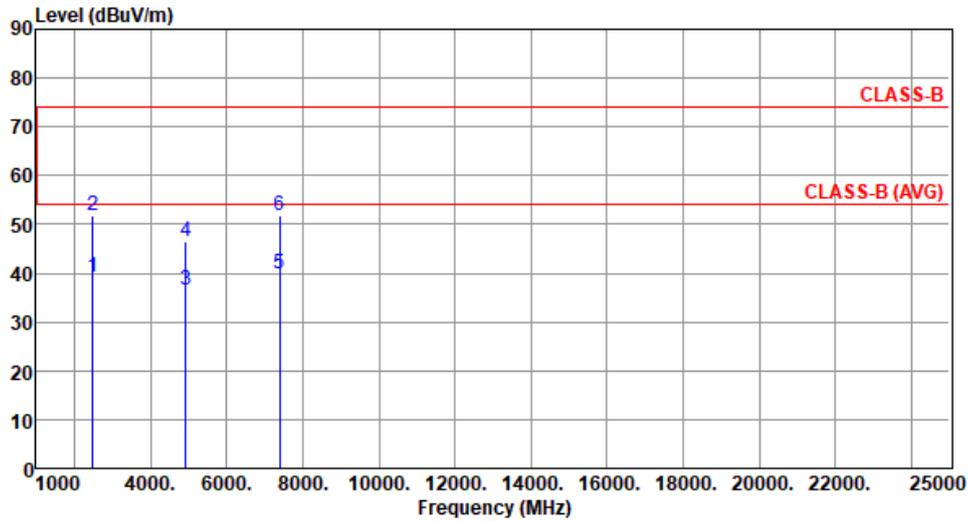
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	11b	Test Freq. (MHz)	2462
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 67



	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	2483.50	39.29	54.00	-14.71	41.99	-2.70	Average	108	177
2	2483.50	51.90	74.00	-22.10	54.60	-2.70	Peak	108	177
3	4924.00	36.61	54.00	-17.39	32.55	4.06	Average	100	9
4	4924.00	46.54	74.00	-27.46	42.48	4.06	Peak	100	9
5	7386.00	39.73	54.00	-14.27	30.48	9.25	Average	100	2
6	7386.00	51.66	74.00	-22.34	42.41	9.25	Peak	100	2

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

*Factor includes antenna factor , cable loss and amplifier gain

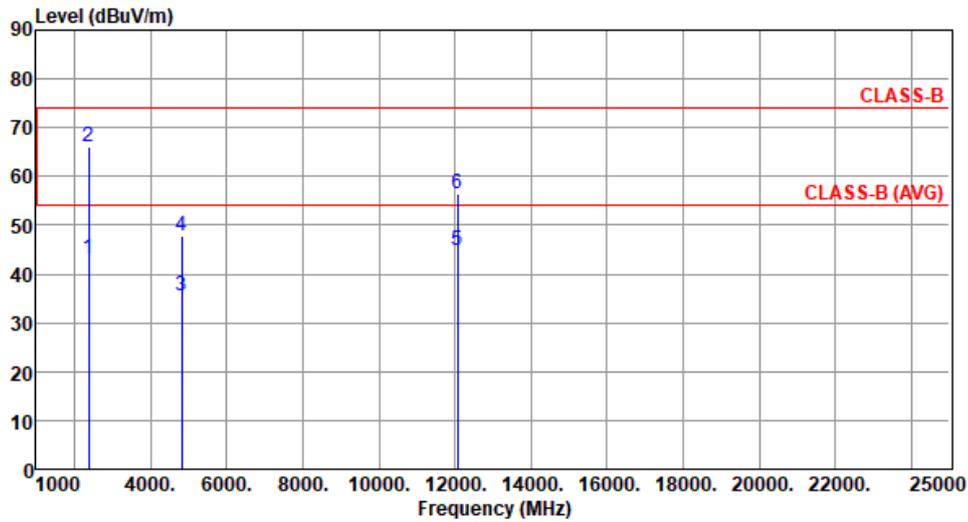
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).



Unwanted Emissions (Above 1GHz) for 11g

Modulation	11g	Test Freq. (MHz)	2412
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):25 Humidity(%):67



	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	2390.00	43.02	54.00	-10.98	45.77	-2.75	Average	155	208
2	2390.00	66.14	74.00	-7.86	68.89	-2.75	Peak	155	208
3	4824.00	35.47	54.00	-18.53	31.33	4.14	Average	100	306
4	4824.00	47.80	74.00	-26.20	43.66	4.14	Peak	100	306
5	12060.00	44.73	54.00	-9.27	30.94	13.79	Average	100	311
6	12060.00	56.55	74.00	-17.45	42.76	13.79	Peak	100	311

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

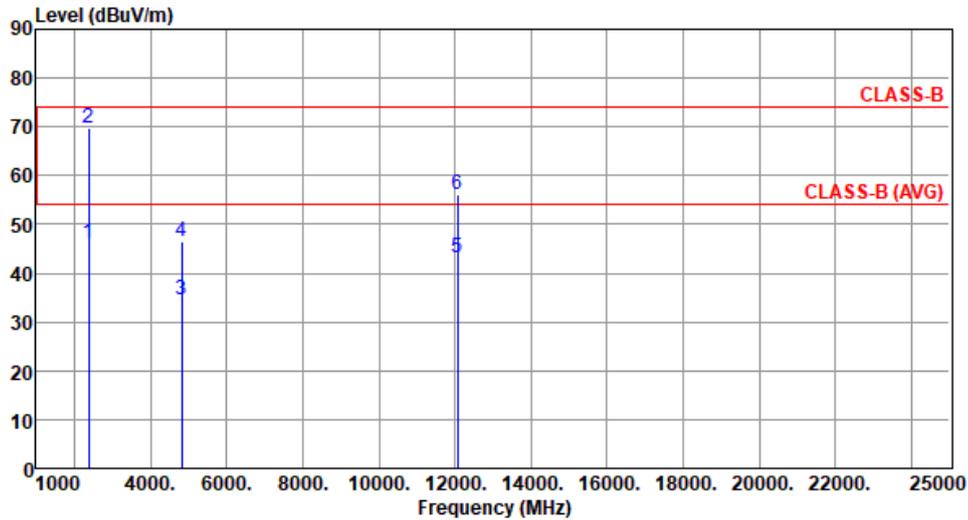
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	11g	Test Freq. (MHz)	2412
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 67



	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	2390.00	46.14	54.00	-7.86	48.89	-2.75	Average	102	176
2	2390.00	69.80	74.00	-4.20	72.55	-2.75	Peak	102	176
3	4824.00	34.50	54.00	-19.50	30.36	4.14	Average	100	5
4	4824.00	46.42	74.00	-27.58	42.28	4.14	Peak	100	5
5	12060.00	43.13	54.00	-10.87	29.34	13.79	Average	100	11
6	12060.00	56.11	74.00	-17.89	42.32	13.79	Peak	100	11

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

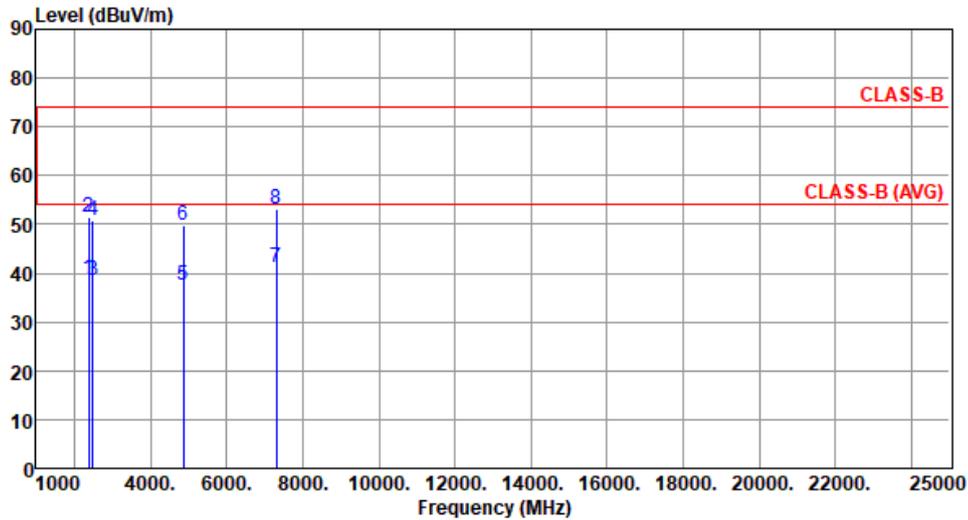
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	11g	Test Freq. (MHz)	2437
Polarization	Horizontal		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 67



	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	2390.00	38.69	54.00	-15.31	41.44	-2.75	Average	189	198
2	2390.00	51.47	74.00	-22.53	54.22	-2.75	Peak	189	198
3	2483.50	38.55	54.00	-15.45	41.25	-2.70	Average	189	198
4	2483.50	50.96	74.00	-23.04	53.66	-2.70	Peak	189	198
5	4874.00	37.68	54.00	-16.32	33.55	4.13	Average	255	318
6	4874.00	49.68	74.00	-24.32	45.55	4.13	Peak	255	318
7	7311.00	41.05	54.00	-12.95	31.77	9.28	Average	100	307
8	7311.00	52.97	74.00	-21.03	43.69	9.28	Peak	100	307

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).

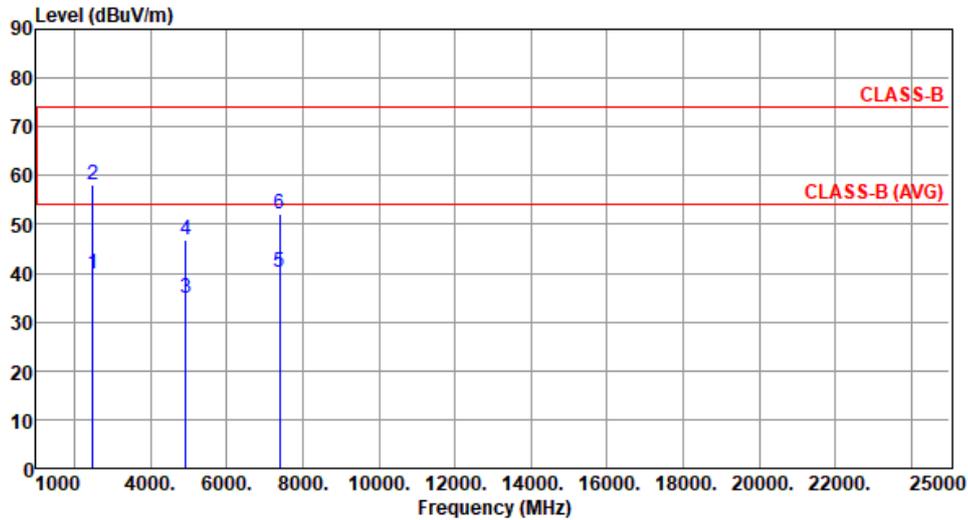


Modulation	11g	Test Freq. (MHz)	2437																																																																																											
Polarization	Vertical																																																																																													
Test By : Akun Chung Temperature(°C):25 Humidity(%):67																																																																																														
	<table border="1"> <thead> <tr> <th></th> <th>Freq. MHz</th> <th>Emission level dBuV/m</th> <th>Limit dBuV/m</th> <th>Margin dB</th> <th>SA reading dBuV</th> <th>Factor dB/m</th> <th>Remark</th> <th>ANT High cm</th> <th>Turn Table deg</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2390.00</td> <td>40.13</td> <td>54.00</td> <td>-13.87</td> <td>42.88</td> <td>-2.75</td> <td>Average</td> <td>153</td> <td>177</td> </tr> <tr> <td>2</td> <td>2390.00</td> <td>52.24</td> <td>74.00</td> <td>-21.76</td> <td>54.99</td> <td>-2.75</td> <td>Peak</td> <td>153</td> <td>177</td> </tr> <tr> <td>3</td> <td>2483.50</td> <td>39.25</td> <td>54.00</td> <td>-14.75</td> <td>41.95</td> <td>-2.70</td> <td>Average</td> <td>153</td> <td>177</td> </tr> <tr> <td>4</td> <td>2483.50</td> <td>52.18</td> <td>74.00</td> <td>-21.82</td> <td>54.88</td> <td>-2.70</td> <td>Peak</td> <td>153</td> <td>177</td> </tr> <tr> <td>5</td> <td>4874.00</td> <td>34.57</td> <td>54.00</td> <td>-19.43</td> <td>30.44</td> <td>4.13</td> <td>Average</td> <td>100</td> <td>1</td> </tr> <tr> <td>6</td> <td>4874.00</td> <td>46.61</td> <td>74.00</td> <td>-27.39</td> <td>42.48</td> <td>4.13</td> <td>Peak</td> <td>100</td> <td>1</td> </tr> <tr> <td>7</td> <td>7311.00</td> <td>39.73</td> <td>54.00</td> <td>-14.27</td> <td>30.45</td> <td>9.28</td> <td>Average</td> <td>100</td> <td>3</td> </tr> <tr> <td>8</td> <td>7311.00</td> <td>51.83</td> <td>74.00</td> <td>-22.17</td> <td>42.55</td> <td>9.28</td> <td>Peak</td> <td>100</td> <td>3</td> </tr> </tbody> </table>		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	2390.00	40.13	54.00	-13.87	42.88	-2.75	Average	153	177	2	2390.00	52.24	74.00	-21.76	54.99	-2.75	Peak	153	177	3	2483.50	39.25	54.00	-14.75	41.95	-2.70	Average	153	177	4	2483.50	52.18	74.00	-21.82	54.88	-2.70	Peak	153	177	5	4874.00	34.57	54.00	-19.43	30.44	4.13	Average	100	1	6	4874.00	46.61	74.00	-27.39	42.48	4.13	Peak	100	1	7	7311.00	39.73	54.00	-14.27	30.45	9.28	Average	100	3	8	7311.00	51.83	74.00	-22.17	42.55	9.28	Peak	100	3			
	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	2390.00	40.13	54.00	-13.87	42.88	-2.75	Average	153	177																																																																																					
2	2390.00	52.24	74.00	-21.76	54.99	-2.75	Peak	153	177																																																																																					
3	2483.50	39.25	54.00	-14.75	41.95	-2.70	Average	153	177																																																																																					
4	2483.50	52.18	74.00	-21.82	54.88	-2.70	Peak	153	177																																																																																					
5	4874.00	34.57	54.00	-19.43	30.44	4.13	Average	100	1																																																																																					
6	4874.00	46.61	74.00	-27.39	42.48	4.13	Peak	100	1																																																																																					
7	7311.00	39.73	54.00	-14.27	30.45	9.28	Average	100	3																																																																																					
8	7311.00	51.83	74.00	-22.17	42.55	9.28	Peak	100	3																																																																																					
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).																																																																																														



Modulation	11g	Test Freq. (MHz)	2462
Polarization	Horizontal		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 67



	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	2483.50	39.80	54.00	-14.20	42.50	-2.70	Average	143	209
2	2483.50	58.07	74.00	-15.93	60.77	-2.70	Peak	143	209
3	4924.00	34.75	54.00	-19.25	30.69	4.06	Average	100	308
4	4924.00	46.84	74.00	-27.16	42.78	4.06	Peak	100	308
5	7386.00	40.20	54.00	-13.80	30.95	9.25	Average	100	302
6	7386.00	52.20	74.00	-21.80	42.95	9.25	Peak	100	302

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).



Modulation	11g	Test Freq. (MHz)	2462						
Polarization	Vertical								
Test By : Akun Chung Temperature(°C):25 Humidity(%):67									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg
1	2483.50	41.84	54.00	-12.16	44.54	-2.70	Average	112	179
2	2483.50	61.29	74.00	-12.71	63.99	-2.70	Peak	112	179
3	4924.00	34.48	54.00	-19.52	30.42	4.06	Average	100	7
4	4924.00	46.54	74.00	-27.46	42.48	4.06	Peak	100	7
5	7386.00	39.62	54.00	-14.38	30.37	9.25	Average	100	8
6	7386.00	51.67	74.00	-22.33	42.42	9.25	Peak	100	8
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).									



Unwanted Emissions (Above 1GHz) for HT20

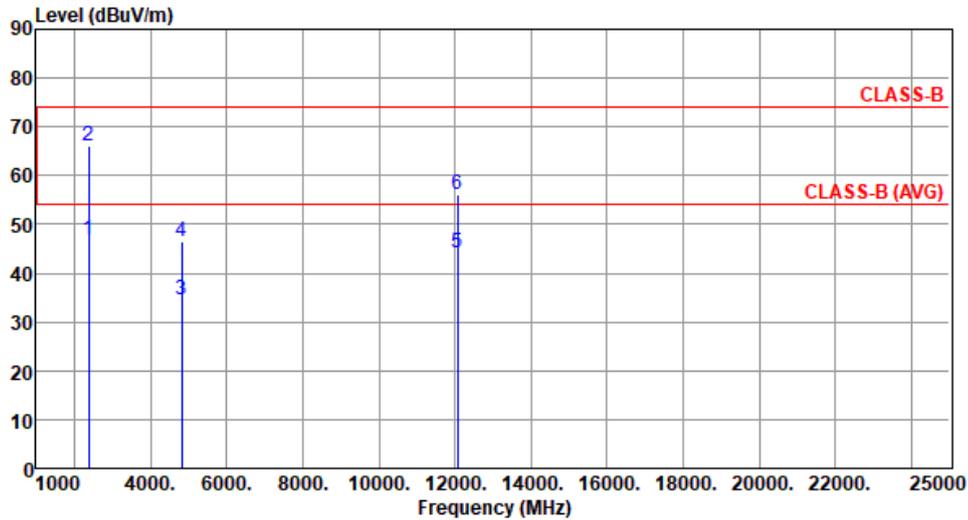
Modulation	HT20	Test Freq. (MHz)	2412						
Polarization	Horizontal								
Test By :Akun Chung Temperature(°C):25 Humidity(%):67									
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB/m	Remark	ANT High cm	Turn Table deg
1	2390.00	43.47	54.00	-10.53	46.22	-2.75	Average	142	200
2	2390.00	62.13	74.00	-11.87	64.88	-2.75	Peak	142	200
3	4824.00	34.99	54.00	-19.01	30.85	4.14	Average	100	315
4	4824.00	46.89	74.00	-27.11	42.75	4.14	Peak	100	315
5	12060.00	44.38	54.00	-9.62	30.59	13.79	Average	100	302
6	12060.00	56.33	74.00	-17.67	42.54	13.79	Peak	100	302

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).



Modulation	HT20	Test Freq. (MHz)	2412
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):25 Humidity(%):67



	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	2390.00	46.80	54.00	-7.20	49.55	-2.75	Average	101	177
2	2390.00	66.20	74.00	-7.80	68.95	-2.75	Peak	101	177
3	4824.00	34.41	54.00	-19.59	30.27	4.14	Average	100	10
4	4824.00	46.44	74.00	-27.56	42.30	4.14	Peak	100	10
5	12060.00	44.04	54.00	-9.96	30.25	13.79	Average	100	4
6	12060.00	56.05	74.00	-17.95	42.26	13.79	Peak	100	4

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

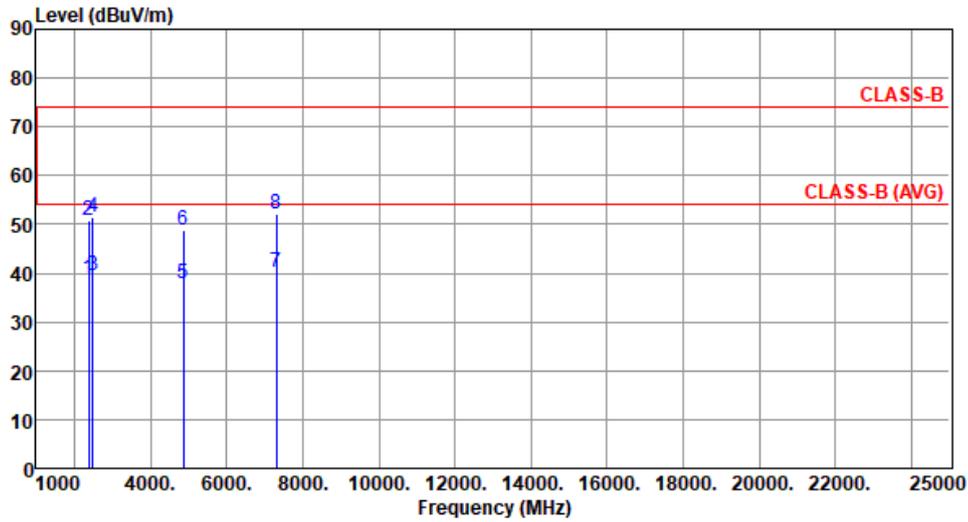
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Horizontal		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 67



	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	2390.00	38.72	54.00	-15.28	41.47	-2.75	Average	159	204
2	2390.00	50.80	74.00	-23.20	53.55	-2.75	Peak	159	204
3	2483.50	39.66	54.00	-14.34	42.36	-2.70	Average	159	204
4	2483.50	51.55	74.00	-22.45	54.25	-2.70	Peak	159	204
5	4874.00	37.79	54.00	-16.21	33.66	4.13	Average	254	307
6	4874.00	48.68	74.00	-25.32	44.55	4.13	Peak	254	307
7	7311.00	40.18	54.00	-13.82	30.90	9.28	Average	100	310
8	7311.00	52.13	74.00	-21.87	42.85	9.28	Peak	100	310

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

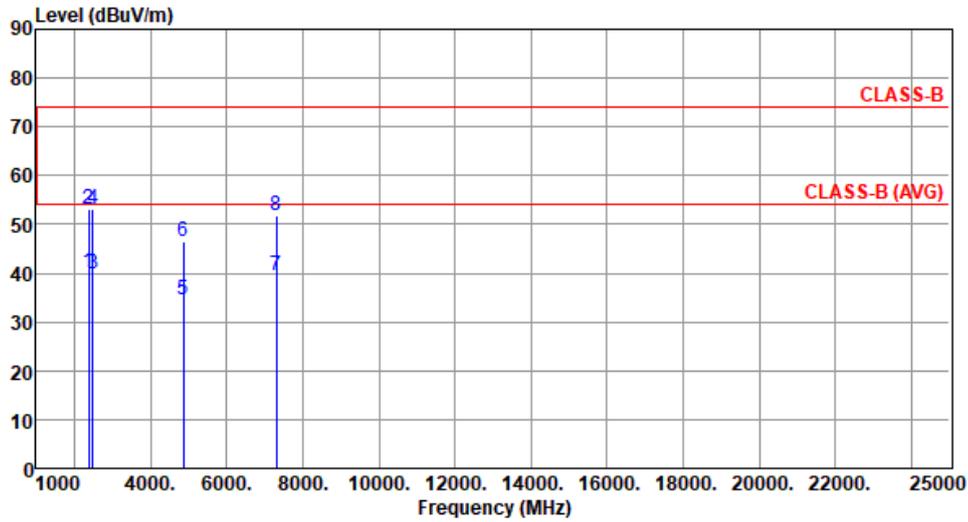
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	HT20	Test Freq. (MHz)	2437
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 67



	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	2390.00	40.13	54.00	-13.87	42.88	-2.75	Average	122	177
2	2390.00	53.21	74.00	-20.79	55.96	-2.75	Peak	122	177
3	2483.50	40.00	54.00	-14.00	42.70	-2.70	Average	122	177
4	2483.50	53.18	74.00	-20.82	55.88	-2.70	Peak	122	177
5	4874.00	34.52	54.00	-19.48	30.39	4.13	Average	100	11
6	4874.00	46.58	74.00	-27.42	42.45	4.13	Peak	100	11
7	7311.00	39.67	54.00	-14.33	30.39	9.28	Average	100	3
8	7311.00	51.68	74.00	-22.32	42.40	9.28	Peak	100	3

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

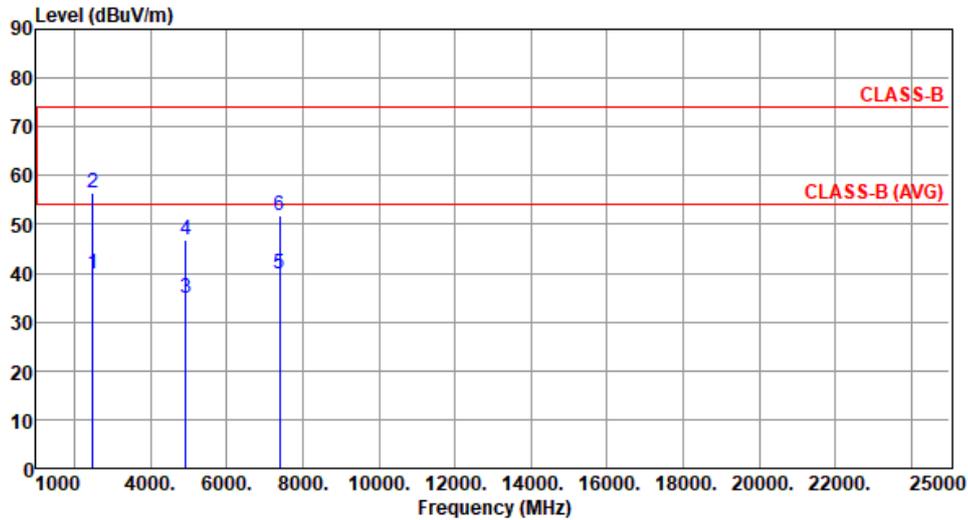
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Horizontal		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 67



	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	2483.50	39.80	54.00	-14.20	42.50	-2.70	Average	147	204
2	2483.50	56.42	74.00	-17.58	59.12	-2.70	Peak	147	204
3	4924.00	34.91	54.00	-19.09	30.85	4.06	Average	100	306
4	4924.00	46.83	74.00	-27.17	42.77	4.06	Peak	100	306
5	7386.00	39.87	54.00	-14.13	30.62	9.25	Average	100	318
6	7386.00	51.94	74.00	-22.06	42.69	9.25	Peak	100	318

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

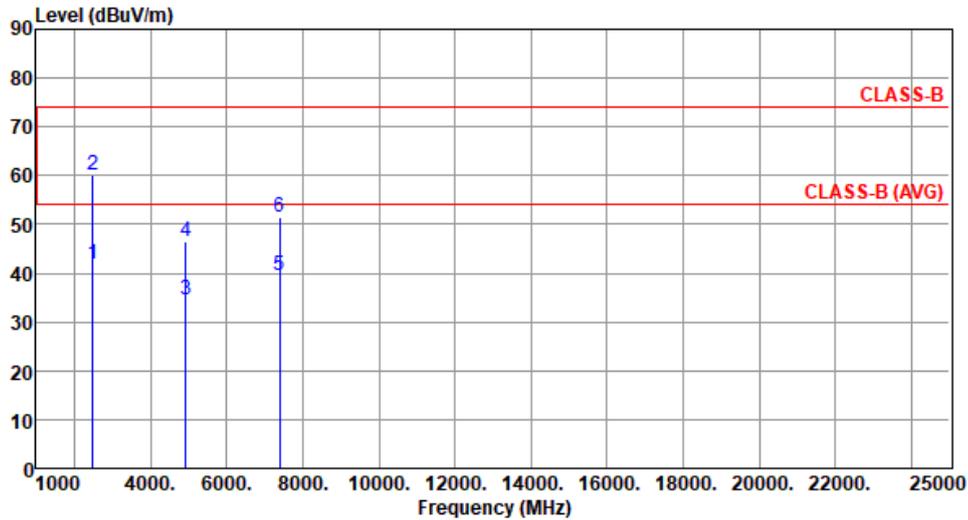
*Factor includes antenna factor , cable loss and amplifier gain

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



Modulation	HT20	Test Freq. (MHz)	2462
Polarization	Vertical		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 67



	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	2483.50	41.94	54.00	-12.06	44.64	-2.70	Average	113	178
2	2483.50	59.96	74.00	-14.04	62.66	-2.70	Peak	113	178
3	4924.00	34.47	54.00	-19.53	30.41	4.06	Average	100	4
4	4924.00	46.45	74.00	-27.55	42.39	4.06	Peak	100	4
5	7386.00	39.40	54.00	-14.60	30.15	9.25	Average	100	9
6	7386.00	51.43	74.00	-22.57	42.18	9.25	Peak	100	9

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).



Configuration 1: Charging mode

Unwanted Emissions (Below 1GHz)

Modulation	Charging									
Polarization	Horizontal									
Test By : Akun Chung			Temperature(°C): 22			Humidity(%): 68				
<p>The graph displays the emission level in dBuV/m across a frequency range from 30 MHz to 1000 MHz. A red step function represents the CLASS-B limit, starting at 40 dBuV/m from 30 MHz to 100 MHz, rising to 45 dBuV/m from 100 MHz to 200 MHz, and then to 55 dBuV/m from 200 MHz to 1000 MHz. Six blue vertical lines indicate measured peaks at 30.00, 38.73, 66.86, 135.73, 144.46, and 160.95 MHz, with their respective levels and margins detailed in the table below.</p>										
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	30.00	26.38	40.00	-13.62	36.32	-9.94	Peak	---	---	
2	38.73	28.59	40.00	-11.41	37.46	-8.87	Peak	---	---	
3	66.86	26.28	40.00	-13.72	36.60	-10.32	Peak	---	---	
4	135.73	25.24	43.50	-18.26	34.69	-9.45	Peak	---	---	
5	144.46	27.88	43.50	-15.62	36.96	-9.08	Peak	---	---	
6	160.95	22.40	43.50	-21.10	31.18	-8.78	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.



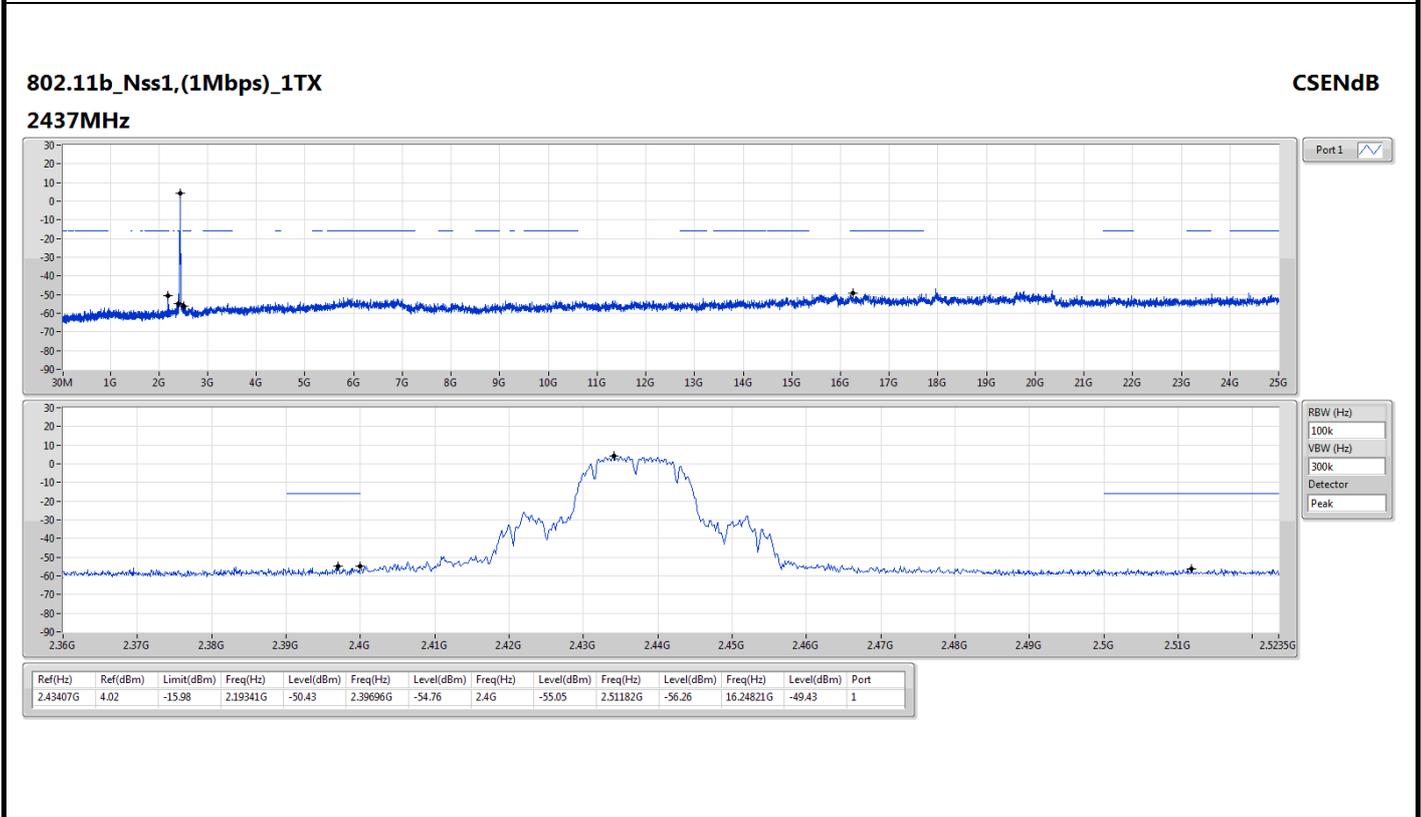
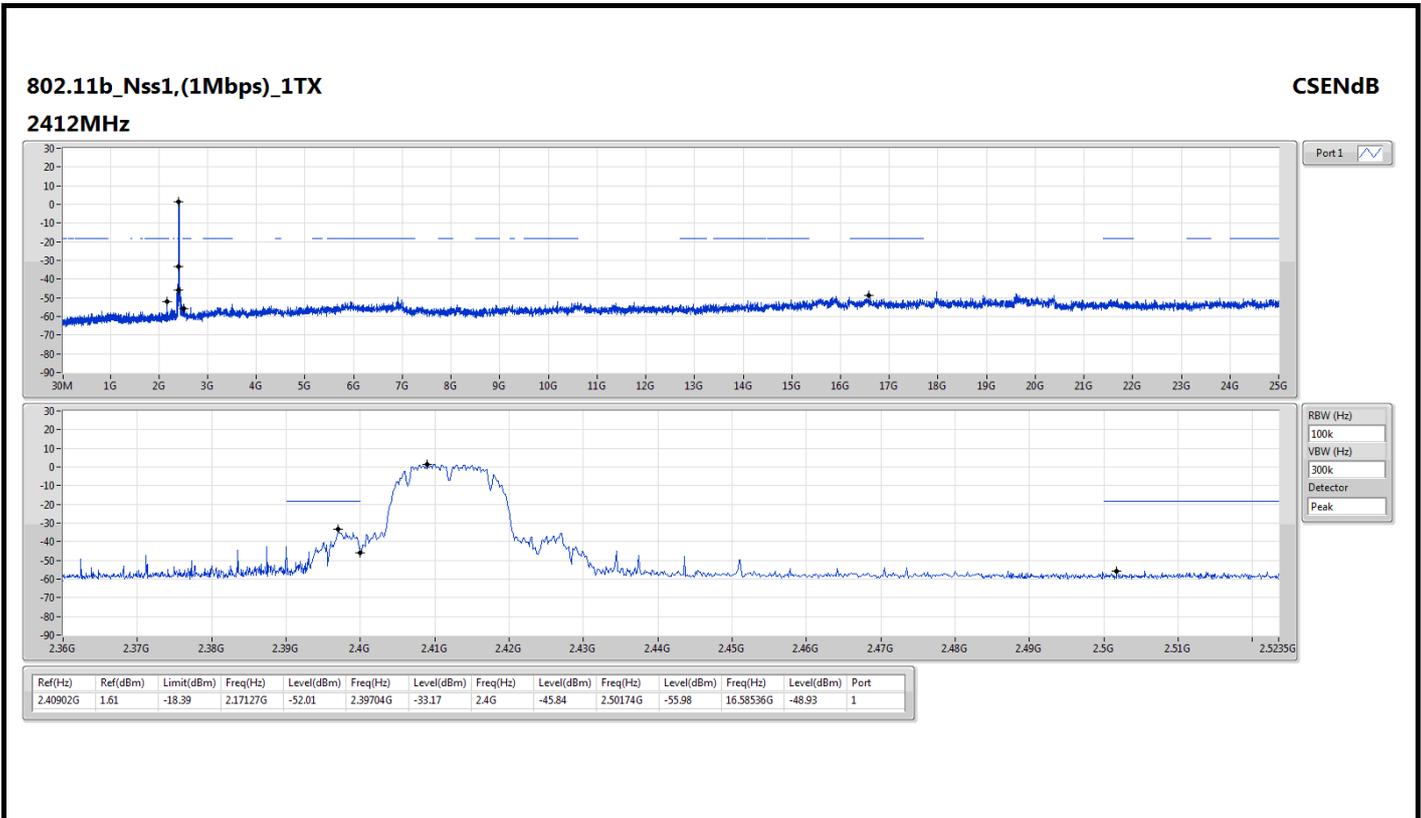
Modulation	Charging									
Polarization	Vertical									
Test By : Akun Chung			Temperature(°C): 22			Humidity(%): 68				
<p>The graph displays the emission level in dBuV/m across a frequency range from 30 MHz to 1000 MHz. A red step function represents the CLASS-B limit, which is 40 dBuV/m from 30 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 with blue vertical lines and labeled 2 through 6. Peak 2 is at 30.00 MHz, peak 3 at 45.52 MHz, peak 4 at 135.73 MHz, peak 5 at 154.16 MHz, and peak 6 at 160.95 MHz. All peaks are significantly below the CLASS-B limit.</p>										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
								cm	deg	
1	30.00	33.77	40.00	-6.23	43.71	-9.94	Peak	---	---	
2	45.52	29.80	40.00	-10.20	38.30	-8.50	Peak	---	---	
3	73.65	30.73	40.00	-9.27	42.59	-11.86	Peak	---	---	
4	135.73	21.46	43.50	-22.04	30.91	-9.45	Peak	---	---	
5	154.16	27.79	43.50	-15.71	36.58	-8.79	Peak	---	---	
6	160.95	24.21	43.50	-19.29	32.99	-8.78	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.

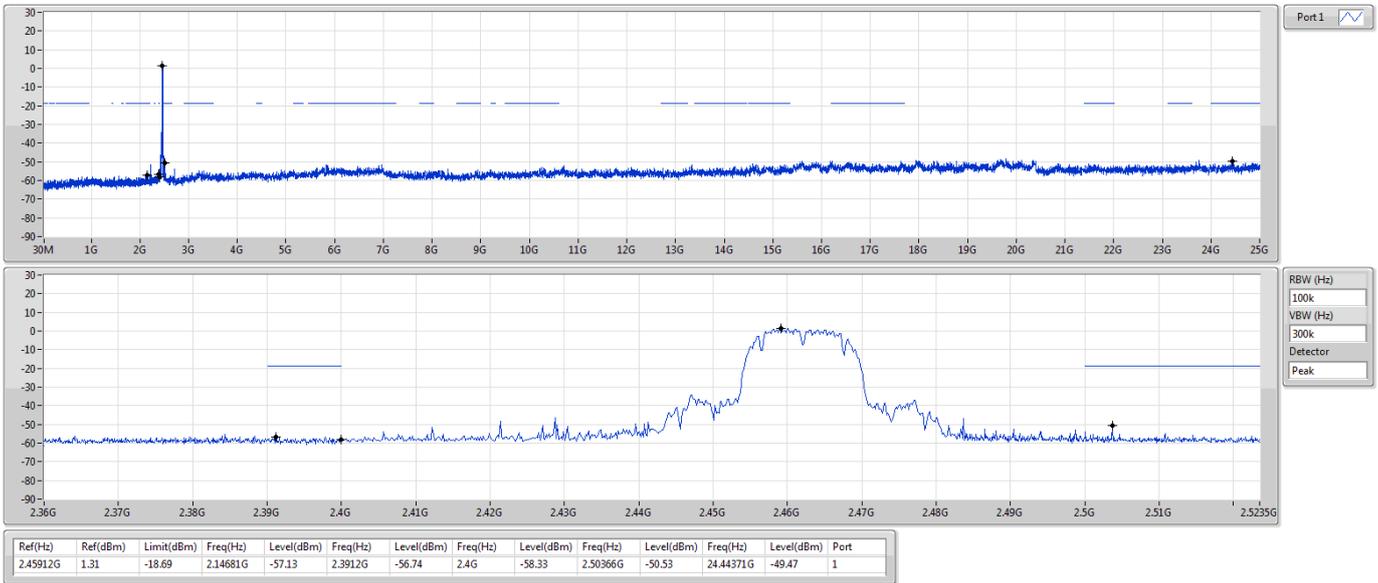




802.11b_Nss1,(1Mbps)_1TX

CSENdB

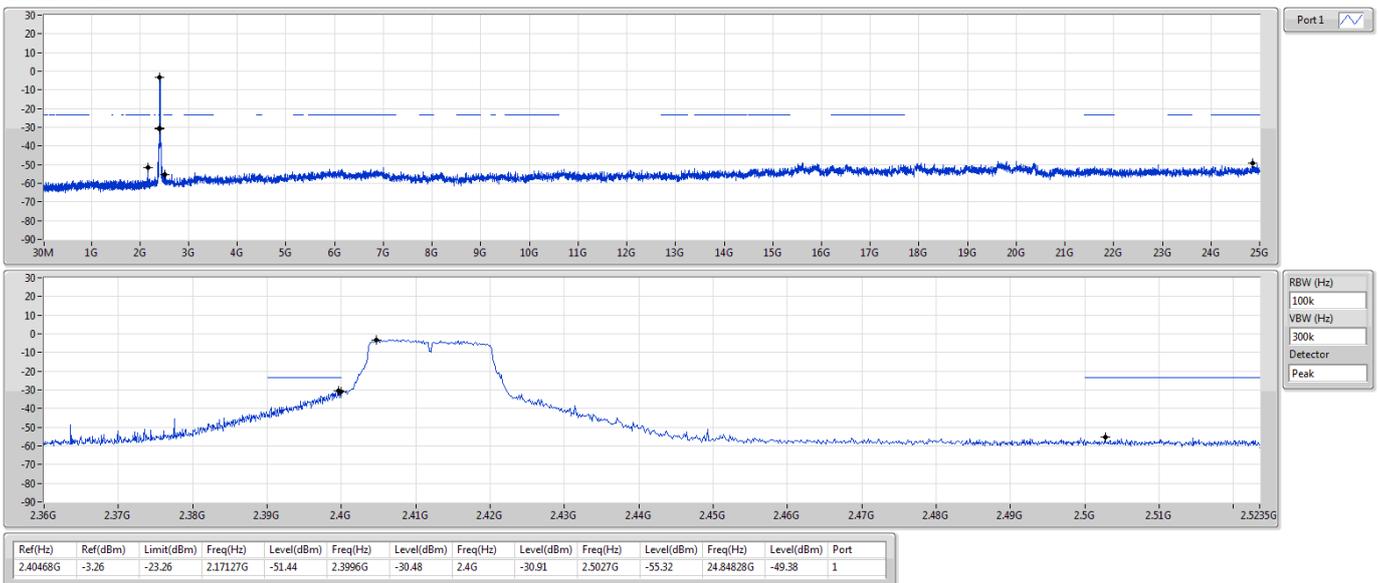
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802.11g_Nss1,(6Mbps)_1TX

CSENdB

2412MHz

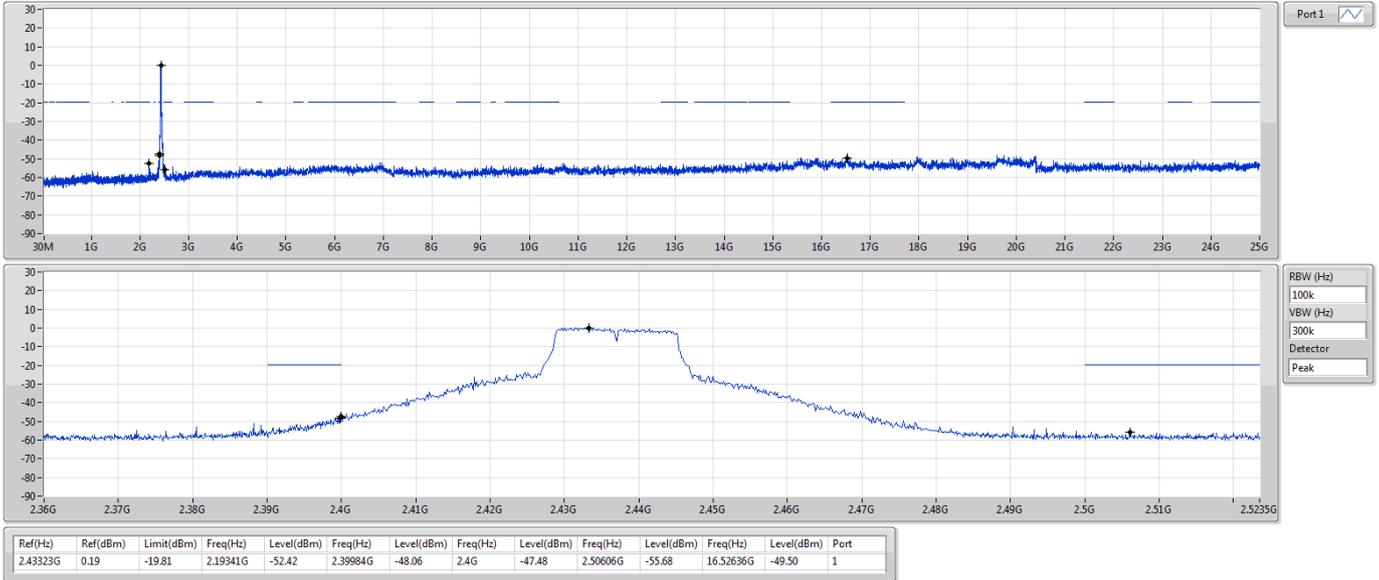




802.11g_Nss1,(6Mbps)_1TX

CSENdB

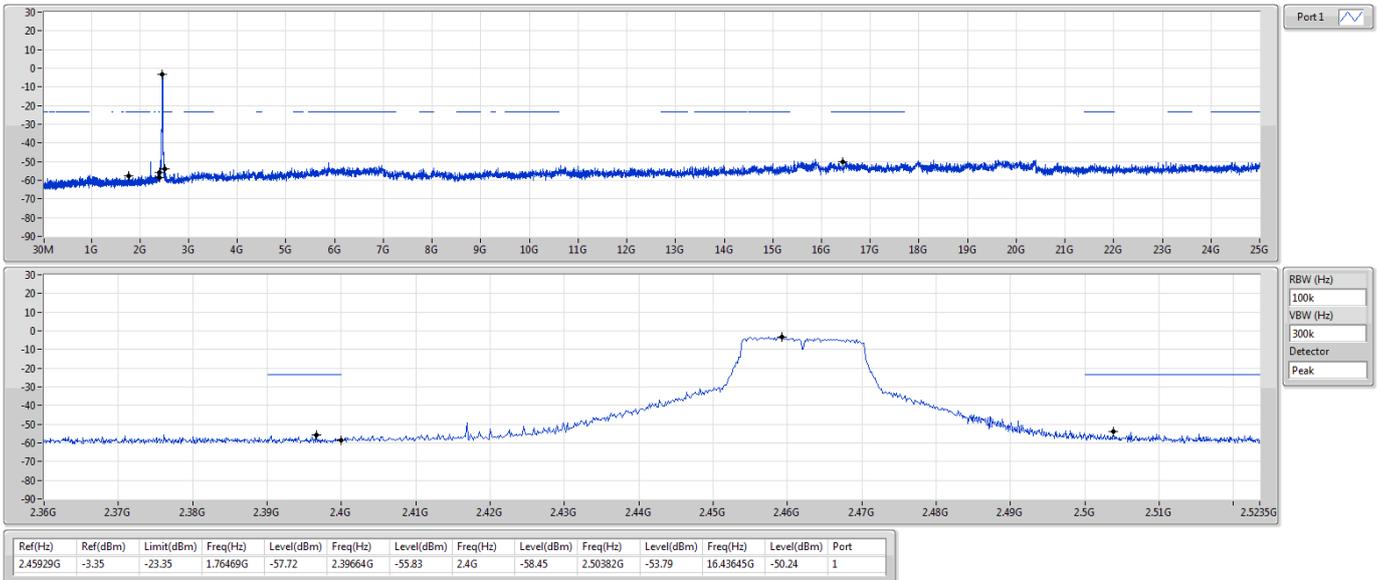
2437MHz



802.11g_Nss1,(6Mbps)_1TX

CSENdB

2462MHz

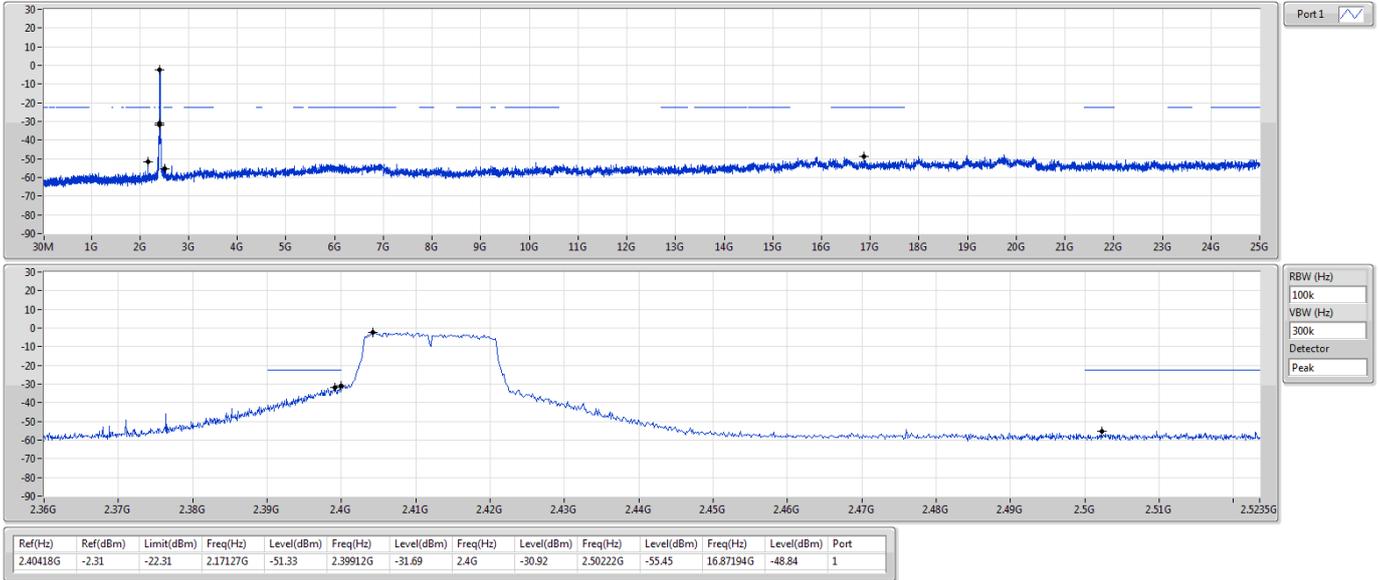




802.11n HT20_Nss1,(MCS0)_1TX

CSENdB

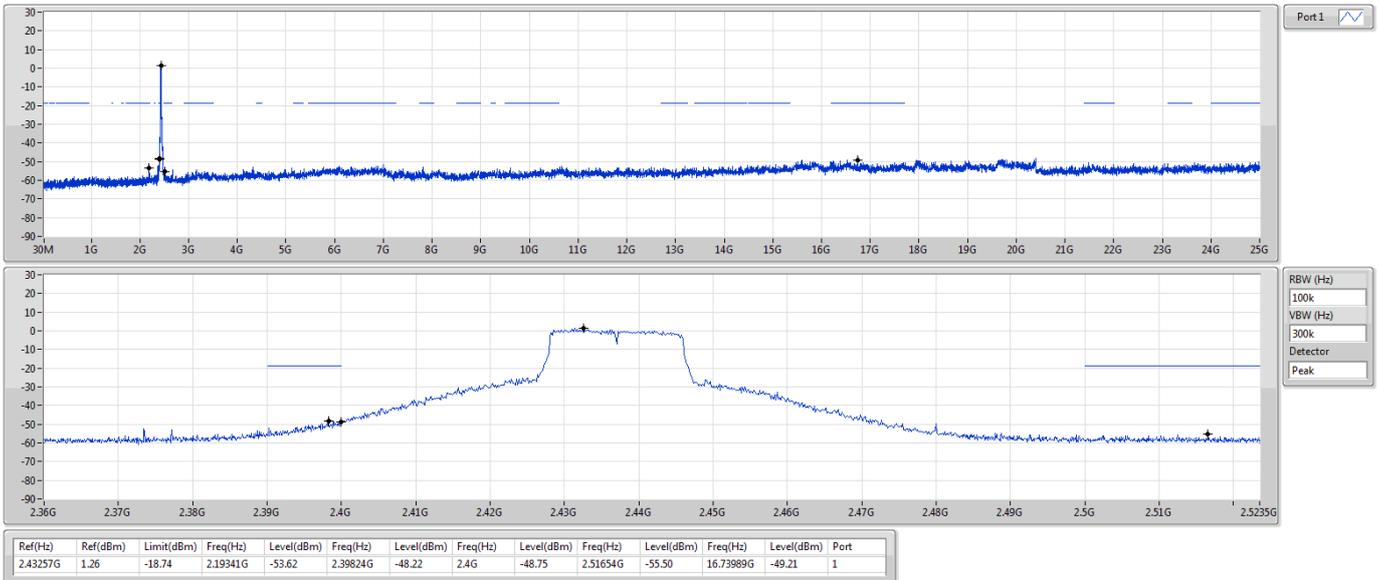
2412MHz



802.11n HT20_Nss1,(MCS0)_1TX

CSENdB

2437MHz

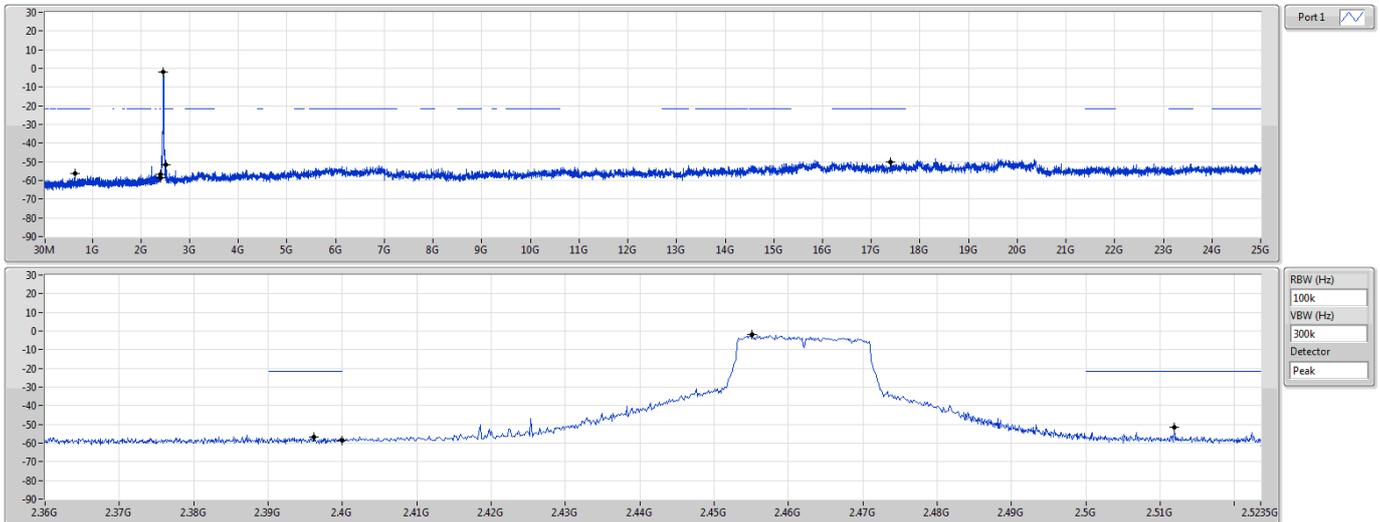




802.11n HT20_Nss1,(MCS0)_1TX

CSEndB

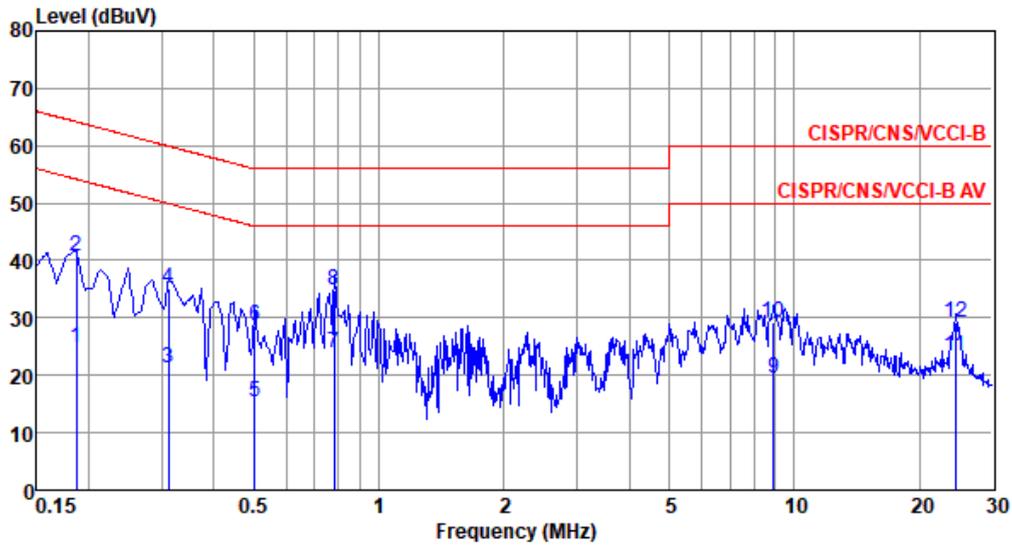
2462MHz





Modulation	Charging
Power Phase	Line

Test by : Joe Liao Temperature: 22°C Humidity: 61%



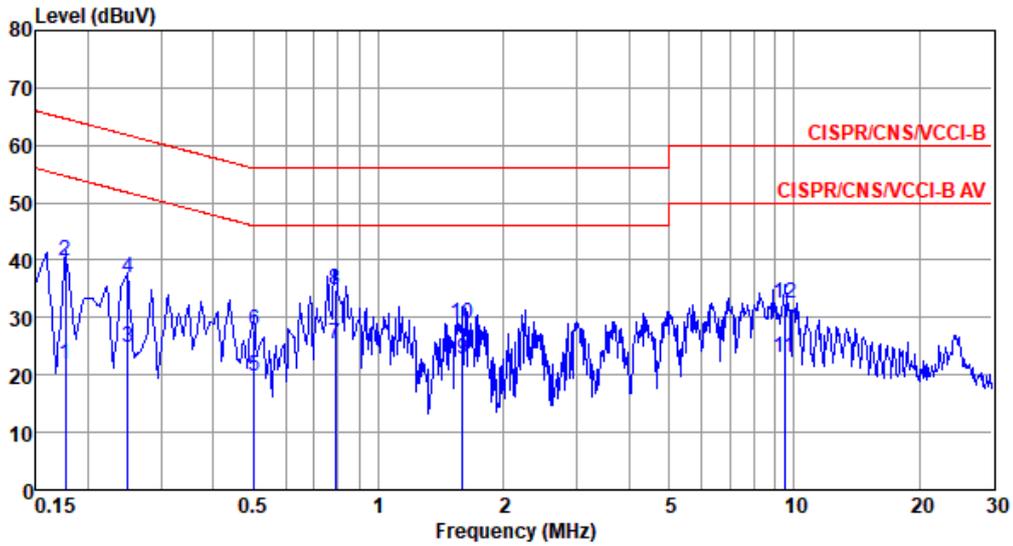
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.186	24.71	54.20	-29.49	14.74	9.68	0.08	0.21	Average
2	0.186	40.71	64.20	-23.49	30.74	9.68	0.08	0.21	QP
3	0.312	21.15	49.93	-28.78	11.09	9.67	0.08	0.31	Average
4	0.312	35.05	59.93	-24.88	24.99	9.67	0.08	0.31	QP
5	0.502	15.34	46.00	-30.66	5.21	9.67	0.10	0.36	Average
6	0.502	28.61	56.00	-27.39	18.48	9.67	0.10	0.36	QP
7	0.779	23.98	46.00	-22.02	13.79	9.68	0.14	0.37	Average
8*	0.779	34.96	56.00	-21.04	24.77	9.68	0.14	0.37	QP
9	8.916	19.60	50.00	-30.40	9.01	9.73	0.42	0.44	Average
10	8.916	29.30	60.00	-30.70	18.71	9.73	0.42	0.44	QP
11	24.400	23.35	50.00	-26.65	12.28	9.70	0.69	0.68	Average
12	24.400	29.12	60.00	-30.88	18.05	9.70	0.69	0.68	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 Note 2: Over Limit (dB) = Level (dBuV) - Limit Line (dBuV).



Modulation	Charging
Power Phase	Neutral

Test by : Joe Liao Temperature: 22°C Humidity: 61%



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Aux dB	Remark
1	0.177	21.73	54.64	-32.91	11.87	9.61	0.08	0.17	Average
2	0.177	39.75	64.64	-24.89	29.89	9.61	0.08	0.17	QP
3	0.249	24.81	51.78	-26.97	14.94	9.61	0.08	0.18	Average
4	0.249	36.84	61.78	-24.94	26.97	9.61	0.08	0.18	QP
5	0.502	19.89	46.00	-26.11	9.97	9.61	0.10	0.21	Average
6	0.502	27.88	56.00	-28.12	17.96	9.61	0.10	0.21	QP
7*	0.788	25.45	46.00	-20.55	15.44	9.61	0.14	0.26	Average
8	0.788	34.87	56.00	-21.13	24.86	9.61	0.14	0.26	QP
9	1.593	22.80	46.00	-23.20	12.70	9.62	0.19	0.29	Average
10	1.593	28.99	56.00	-27.01	18.89	9.62	0.19	0.29	QP
11	9.502	23.03	50.00	-26.97	12.53	9.69	0.44	0.37	Average
12	9.502	32.41	60.00	-27.59	21.91	9.69	0.44	0.37	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB) + Aux (dB).
 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

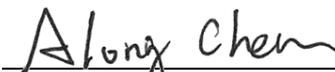
FCC Co-Location Test Report

FCC ID : IPH-04390
Equipment : Smart Watch
Model No. : A04390
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. 07, 2022
Tested Date : May 09 ~ May 10, 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 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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Appendix A. Unwanted Emissions Into Restricted Frequency Bands

Release Record

Report No.	Version	Description	Issued Date
FR240702CO	Rev. 01	Initial issue	Jun. 01, 2022

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.247(d) 15.209 15.249(a) 15.225(d)	Radiated Emissions	[dBuV/m at 3m]: 189.48MHz 28.95 (Margin -14.55dB) - 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)

ANT+	
Operating Frequency	2402 MHz ~ 2480 MHz
Modulation Type	GFSK
BT	
Operating Frequency	2402 MHz ~ 2480 MHz
Modulation Type	Bluetooth 5.0 LE: GFSK
NFC	
Operating Frequency	13.553 – 13.567
Modulation Type	ASK
WLAN	
Operating Frequency	802.11b/g/n: 2412 MHz ~ 2462 MHz
Modulation Type	802.11b: DSSS (DBPSK / DQPSK / CCK) 802.11g / n: OFDM (BPSK / QPSK / 16QAM / 64QAM)

1.1.2 Antenna Details

LE / ANT+ /2.4G

Ant. No.	Brand	Model	Type	Connector	Gain (dBi)
1	Garmin	117-01806-0X	PIFA	No	-2.08

NFC

Ant. No.	Brand	Model	Type	Connector	Gain (dBi)
1	INPAQ TECH CO LTD	NF-C-F9-R0-120	Loop	No	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Type	5Vdc from adapter 3.87Vdc from battery
------------	---

1.2 The Equipment List

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Tested Date	May 09 ~ May 10, 2022				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Mar. 15, 2022	Mar. 14, 2023
Spectrum Analyzer	R&S	FSV40	101498	Nov. 29, 2021	Nov. 28, 2022
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 08, 2021	Nov. 07, 2022
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jun. 30, 2021	Jun. 29, 2022
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 03, 2021	Dec. 02, 2022
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170508	Jan. 11, 2022	Jan. 10, 2023
Preamplifier	EMC	EMC02325	980225	Jun. 29, 2021	Jun. 28, 2022
Preamplifier	Agilent	83017A	MY39501308	Sep. 28, 2021	Sep. 27, 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 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 05, 2021	Oct. 04, 2022
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 05, 2021	Oct. 04, 2022
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 05, 2021	Oct. 04, 2022
RF Cable	EMC	EMC104-35M-35M- 8000	210920	Oct. 05, 2021	Oct. 04, 2022
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 05, 2021	Oct. 04, 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
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
Unwanted Emission \leq 1GHz	± 3.41 dB
Unwanted 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	Modulation Mode
Unwanted Emissions	BT GFSK CH0 + NFC
	2.4G 11G CH06 + NFC
	ANT+ 2441MHz + NFC

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.

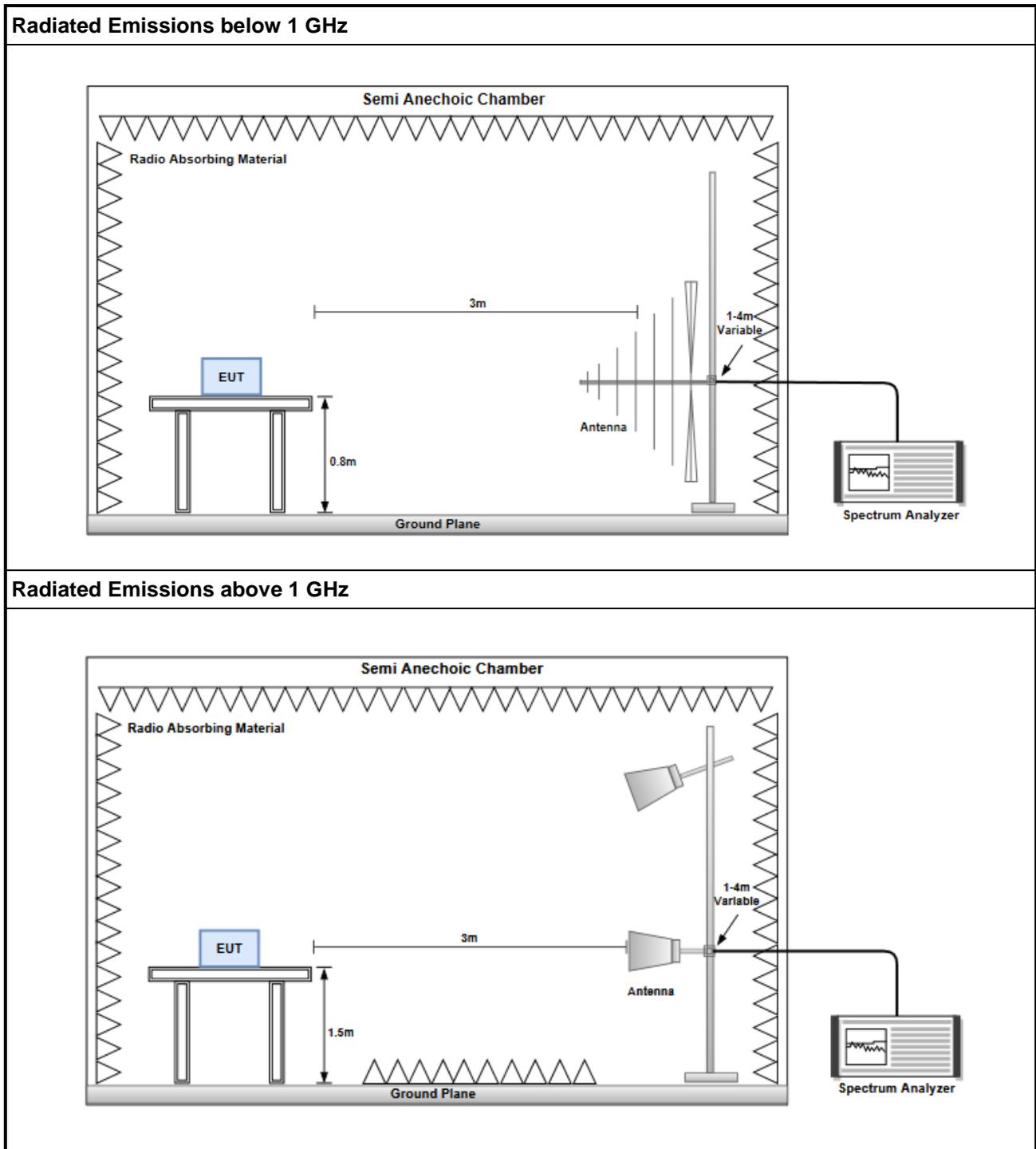
3.1.2 Test Procedures

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



3.1.4 Test Results

Refer to Appendix A.

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

No.3-1, Lane 6, Wen San 3rd
St., Kwei Shan Dist., Tao Yuan
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

Fax: 886-3-318-0345

Email: ICC_Service@icertifi.com.tw

==END==



Unwanted Emissions (Below 1GHz)

Test Mode	2.4G 11G CH06 + NFC									
Polarization	Horizontal									
Test By : Roger Lu			Temperature(°C): 24			Humidity(%): 65				
<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 step function represents the CLASS-B limit, starting at 40 dBuV/m, rising to 45 dBuV/m at 100 MHz, and to 55 dBuV/m at 950 MHz. Six blue vertical lines indicate emission peaks labeled 1 through 6, with their corresponding data listed in the table below.</p>										
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table	
	MHz	dBUV/m	dBUV/m	dB	dBuV	dB/m		cm	deg	
1	161.92	27.57	43.50	-15.93	36.26	-8.69	Peak	---	---	
2	189.08	28.34	43.50	-15.16	39.65	-11.31	Peak	---	---	
3	217.21	24.40	46.00	-21.60	36.35	-11.95	Peak	---	---	
4	243.40	24.95	46.00	-21.05	35.19	-10.24	Peak	---	---	
5	324.88	25.53	46.00	-20.47	32.99	-7.46	Peak	---	---	
6	536.34	28.91	46.00	-17.09	31.75	-2.84	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	2.4G 11G CH06 + NFC									
Polarization	Vertical									
Test By : Roger Lu			Temperature(°C): 24			Humidity(%): 65				
<p>The graph displays the emission spectrum with a red step-like line representing the CLASS-B limit. The y-axis is Level (dBuV/m) from 0 to 90, and the x-axis is Frequency (MHz) from 30 to 1000. Six peaks are labeled 1 through 6, corresponding to the data table below.</p>										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
								cm	deg	
1	36.79	24.75	40.00	-15.25	33.91	-9.16	Peak	---	---	
2	135.73	22.37	43.50	-21.13	31.82	-9.45	Peak	---	---	
3	161.92	24.50	43.50	-19.00	33.19	-8.69	Peak	---	---	
4	189.08	22.92	43.50	-20.58	34.23	-11.31	Peak	---	---	
5	364.65	24.46	46.00	-21.54	31.03	-6.57	Peak	---	---	
6	424.79	27.34	46.00	-18.66	32.36	-5.02	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	ANT+ 2441MHz + NFC									
Polarization	Horizontal									
Test By :Roger Lu			Temperature(°C):24			Humidity(%):65				
<p>The graph displays the emission level in dBuV/m across a frequency range from 30 MHz to 1000 MHz. A red step function represents the CLASS-B limit, which is approximately 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 numbered 1 through 6, corresponding to the data in the table below.</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	161.88	27.19	43.50	-16.31	35.88	-8.69	Peak	---	---	
2	189.32	28.67	43.50	-14.83	40.00	-11.33	Peak	---	---	
3	217.45	23.69	46.00	-22.31	35.63	-11.94	Peak	---	---	
4	243.59	25.22	46.00	-20.78	35.46	-10.24	Peak	---	---	
5	447.10	27.32	46.00	-18.68	31.64	-4.32	Peak	---	---	
6	567.38	29.41	46.00	-16.59	31.36	-1.95	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	ANT+ 2441MHz + NFC									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):24			Humidity(%):65				
<p>The graph displays the emission level in dBuV/m across a frequency range from 30 MHz to 1000 MHz. A red step function represents the CLASS-B limit, which is approximately 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 blue vertical lines indicate specific emission peaks labeled 1 through 6, with their corresponding data listed in the table below.</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	57.16	22.45	40.00	-17.55	31.54	-9.09	Peak	---	---	
2	168.71	22.38	43.50	-21.12	31.34	-8.96	Peak	---	---	
3	252.13	20.81	46.00	-25.19	30.78	-9.97	Peak	---	---	
4	348.16	24.00	46.00	-22.00	31.13	-7.13	Peak	---	---	
5	455.83	27.33	46.00	-18.67	31.45	-4.12	Peak	---	---	
6	503.36	28.05	46.00	-17.95	31.26	-3.21	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	BT GFSK CH0 + NFC									
Polarization	Horizontal									
Test By :Roger Lu			Temperature(°C):24			Humidity(%):65				
<p>The graph displays the emission spectrum for BT GFSK CH0 + NFC. 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 step function indicates the CLASS-B emission limit, which is approximately 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 numbered 1 through 6, corresponding to the data in the table below.</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	161.86	27.21	43.50	-16.29	35.90	-8.69	Peak	---	---	
2	189.48	28.95	43.50	-14.55	40.30	-11.35	Peak	---	---	
3	217.58	23.49	46.00	-22.51	35.43	-11.94	Peak	---	---	
4	243.59	25.21	46.00	-20.79	35.45	-10.24	Peak	---	---	
5	354.95	24.62	46.00	-21.38	31.49	-6.87	Peak	---	---	
6	501.42	28.30	46.00	-17.70	31.56	-3.26	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	BT GFSK CH0 + NFC									
Polarization	Vertical									
Test By : Roger Lu			Temperature(°C): 24			Humidity(%): 65				
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
								cm	deg	
1	37.76	23.88	40.00	-16.12	32.96	-9.08	Peak	---	---	
2	154.16	22.57	43.50	-20.93	31.36	-8.79	Peak	---	---	
3	189.45	23.28	43.50	-20.22	34.62	-11.34	Peak	---	---	
4	279.29	22.53	46.00	-23.47	31.24	-8.71	Peak	---	---	
5	348.16	24.00	46.00	-22.00	31.13	-7.13	Peak	---	---	
6	455.83	27.33	46.00	-18.67	31.45	-4.12	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>										



Unwanted Emissions (Above 1GHz)

Test Mode	2.4G 11G CH06 + NFC									
Polarization	Horizontal									
Test By :Roger Lu			Temperature(°C):24			Humidity(%):65				
<p>The graph plots Level (dBuV/m) on the y-axis (0 to 90) against Frequency (MHz) on the x-axis (1000 to 25000). Two horizontal red lines represent limits: CLASS-B at approximately 74 dBuV/m and CLASS-B (AVG) at approximately 54 dBuV/m. Four vertical blue lines indicate emission peaks: 1 (at 4901.12 MHz, level 32.35 dBuV/m), 2 (at 4901.12 MHz, level 44.76 dBuV/m), 3 (at 7270.32 MHz, level 37.79 dBuV/m), and 4 (at 7270.32 MHz, level 50.37 dBuV/m).</p>										
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	
	MHz	level	dBuV/m	dB	reading	dB/m		High	Table	
								cm	deg	
1	4901.12	32.35	54.00	-21.65	28.26	4.09	Average	100	4	
2	4901.12	44.76	74.00	-29.24	40.67	4.09	Peak	100	4	
3	7270.32	37.79	54.00	-16.21	28.55	9.24	Average	100	50	
4	7270.32	50.37	74.00	-23.63	41.13	9.24	Peak	100	50	
<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	2.4G 11G CH06 + NFC									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):24			Humidity(%):65				
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	4901.12	32.31	54.00	-21.69	28.22	4.09	Average	100	30	
2	4901.12	44.64	74.00	-29.36	40.55	4.09	Peak	100	30	
3	7270.32	37.89	54.00	-16.11	28.65	9.24	Average	100	90	
4	7270.32	50.47	74.00	-23.53	41.23	9.24	Peak	100	90	
<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	ANT+ 2441MHz + NFC									
Polarization	Horizontal									
Test By : Roger Lu			Temperature(°C):24			Humidity(%):65				
<p>The graph displays the emission level in dBuV/m against frequency in MHz. Two horizontal red lines represent the CLASS-B limit at approximately 75 dBuV/m and the CLASS-B (AVG) limit at approximately 55 dBuV/m. Four vertical blue lines indicate specific emission peaks labeled 1, 2, 3, and 4. Peak 1 is at 4909.12 MHz, peak 2 is at 4909.12 MHz, peak 3 is at 7282.32 MHz, and peak 4 is at 7282.32 MHz.</p>										
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	4909.12	32.42	54.00	-21.58	28.34	4.08	Average	100	80	
2	4909.12	44.57	74.00	-29.43	40.49	4.08	Peak	100	80	
3	7282.32	37.63	54.00	-16.37	28.37	9.26	Average	100	50	
4	7282.32	50.01	74.00	-23.99	40.75	9.26	Peak	100	50	

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).

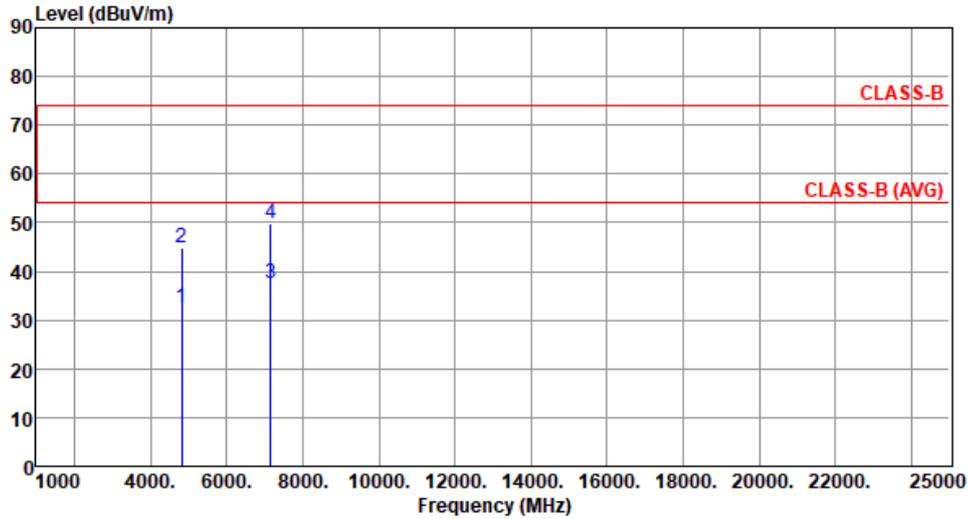


Test Mode	ANT+ 2441MHz + NFC									
Polarization	Vertical									
Test By :Roger Lu			Temperature(°C):24			Humidity(%):65				
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	4909.12	32.36	54.00	-21.64	28.28	4.08	Average	100	20	
2	4909.12	44.73	74.00	-29.27	40.65	4.08	Peak	100	20	
3	7282.32	37.85	54.00	-16.15	28.59	9.26	Average	100	50	
4	7282.32	49.99	74.00	-24.01	40.73	9.26	Peak	100	50	
<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	BT GFSK CH0 + NFC
Polarization	Horizontal

Test By :Roger Lu Temperature(°C):24 Humidity(%):65



	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	4831.12	32.56	54.00	-21.44	28.41	4.15	Average	100	50
2	4831.12	44.72	74.00	-29.28	40.57	4.15	Peak	100	50
3	7165.32	37.48	54.00	-16.52	28.59	8.89	Average	100	60
4	7165.32	49.68	74.00	-24.32	40.79	8.89	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	BT GFSK CH0 + NFC									
Polarization	Vertical									
Test By : Roger Lu			Temperature(°C): 24			Humidity(%): 65				
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table	
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m		cm	deg	
1	4831.12	32.49	54.00	-21.51	28.34	4.15	Average	100	30	
2	4831.12	44.73	74.00	-29.27	40.58	4.15	Peak	100	30	
3	7165.32	37.42	54.00	-16.58	28.53	8.89	Average	100	90	
4	7165.32	49.78	74.00	-24.22	40.89	8.89	Peak	100	90	
<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>										

FCC SAR TEST REPORT

FCC ID : IPH-04390
Equipment : Smart Watch
Brand Name : GARMIN
Model Name : A04390
Applicant : Garmin International, Inc.
1200 E. 151st Street Olathe, KS 66062 United States
Manufacturer : Garmin Corp.
No.68, Zhangshu 2nd Rd., Xizhi Dist., New Taipei City 221,
Taiwan (R.O.C)
Standard : FCC 47 CFR Part 2 (2.1093)

The product was received on May 19, 2022 and testing was started from May 20, 2022 and completed on May 20, 2022. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample provide by manufacturer and the test data has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been pass the FCC requirement.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. Laboratory, the test report shall not be reproduced except in full.



Approved by: Cona Huang / Deputy Manager



Sporton International Inc. Wensan Laboratory

No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan



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Appendix A. Plots of System Performance Check

Appendix B. Plots of High SAR Measurement

Appendix C. DASYS Calibration Certificate

Appendix D. Test Setup Photos



1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Garmin International, Inc., Smart Watch, A04390, are as follows.

Equipment Class	Frequency Band		Highest SAR Summary		
			Head (separation 10mm)	Body-Worn (separation 5mm)	Extremity (separation 0mm)
			1g SAR (W/kg)		10g SAR (W/kg)
DTS	WLAN	2.4GHz WLAN	0.31	0.79	0.44
DSS	2.4GHz Band	Bluetooth	0.11	0.24	0.15
Date of Testing:			2022/5/20		

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation and the FCC designation No. TW3786 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test. This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR, 4.0 W/kg for Product Specific 10g SAR) specified in FCC 47 CFR part 2 (2.1093), and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

Reviewed by: Jason Wang
Report Producer: Carlie Tsai

2. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards, the below KDB standard may not including in the TAF code without accreditation.

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02

3. Equipment Under Test (EUT) Information

3.1 General Information

Product Feature & Specification	
Equipment Name	Smart Watch
Brand Name	GARMIN
Model Name	A04390
FCC ID	IPH-04390
Wireless Technology and Frequency Range	WLAN 2.4 GHz Band: 2400 MHz ~ 2483.5 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz NFC: 13.56 MHz
Mode	WLAN: 802.11b/g/n HT20 Bluetooth BR/EDR/LE NFC: ASK
HW Version	105-04390-00
SW Version	2.0
EUT Stage	Identical Prototype



4. RF Exposure Limits

4.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

4.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

5. Specific Absorption Rate (SAR)

5.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

5.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$SAR = \frac{d}{dt} \left(\frac{dW}{dm} \right) = \frac{d}{dt} \left(\frac{dW}{\rho dv} \right)$$

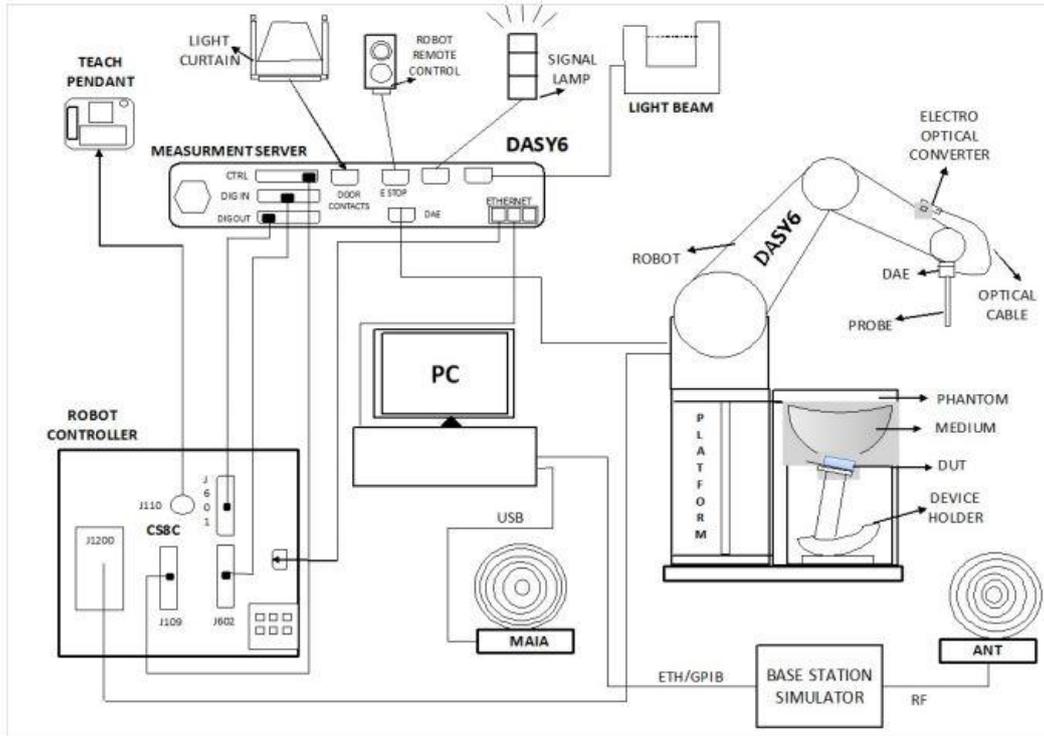
SAR is expressed in units of Watts per kilogram (W/kg)

$$SAR = \frac{\sigma |E|^2}{\rho}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

6. System Description and Setup

The DASY system used for performing compliance tests consists of the following items:



- The DASY system in SAR Configuration is shown above
- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running windows software and the DASY software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

6.1 Test Site Location

The SAR measurement facilities used to collect data are within both Sporton Lab list below test site location are accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190 and 3786) and the FCC designation No. TW1190 and TW3786 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

Test Site	EMC & Wireless Communications Laboratory		Wensan Laboratory		
Test Site Location	TW1190 No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan		TW3786 No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan		
Test Site No.	SAR01-HY	SAR03-HY	SAR08-HY	SAR09-HY	SAR15-HY
	SAR04-HY	SAR05-HY	SAR11-HY	SAR12-HY	
	SAR06-HY	SAR10-HY	SAR13-HY	SAR14-HY	

6.2 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ± 0.2 dB (30 MHz – 4 GHz)	
Directivity	± 0.2 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 μ W/g – >100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ± 0.2 dB (30 MHz – 6 GHz)	
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 μ W/g – >100 mW/g Linearity: ± 0.2 dB (noise: typically <1 μ W/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

6.3 Data Acquisition Electronics (DAE)

The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

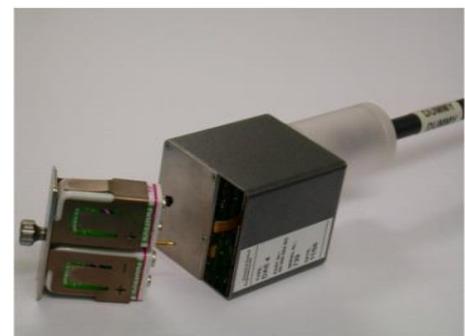


Fig 5.1 Photo of DAE

6.4 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat Phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

6.5 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.



Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.



Mounting Device for Laptops

7. Measurement Procedures

The measurement procedures are as follows:

- (a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
- (b) Place the EUT in the positions as Appendix D demonstrates.
- (c) Set scan area, grid size and other setting on the DASY software.
- (d) Measure SAR results for the highest power channel on each testing position.
- (e) Find out the largest SAR result on these testing positions of each band
- (f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

7.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

7.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

7.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB) is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: $\Delta x_{Area}, \Delta y_{Area}$	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

7.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

		≤ 3 GHz	> 3 GHz	
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*	
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm	
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm	
Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details. * When zoom scan is required and the <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.				

7.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

7.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASy measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.



8. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	2450MHz System Validation Kit ⁽²⁾	D2450V2	929	Nov. 21, 2019	Nov. 18, 2022
SPEAG	Data Acquisition Electronics	DAE4	1697	Nov. 09, 2021	Nov. 08, 2022
SPEAG	Dosimetric E-Field Probe	EX3DV4	7695	Nov. 19, 2022	Nov. 18, 2023
RCPTWN	Thermometer	HTC-1	TM685-1	Oct. 28, 2021	Oct. 27, 2022
R&S	BT Base Station	CBT32	101136	Oct. 17, 2021	Oct. 16, 2022
SPEAG	Device Holder	N/A	N/A	N/A	N/A
Anritsu	Signal Generator	MG3710A	6201502524	Oct. 24, 2021	Oct. 23, 2022
Keysight	ENA Network Analyzer	E5071C	MY46316648	Jul. 22, 2021	Jul. 21, 2022
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 24, 2021	Sep. 23, 2022
LINE SEIKI	Digital Thermometer	DTM3000-spezial	3252	Jul. 15, 2021	Jul. 14, 2022
Anritsu	Power Meter	ML2495A	1419002	Aug. 18, 2021	Aug. 17, 2022
Anritsu	Power Sensor	MA2411B	1911176	Aug. 18, 2021	Aug. 17, 2022
Anritsu	Power Meter	ML2495A	1804003	Oct. 09, 2021	Oct. 08, 2022
Anritsu	Power Sensor	MA2411B	1726150	Oct. 09, 2021	Oct. 08, 2022
Anritsu	Spectrum Analyzer	N9010A	MY53470118	Jan. 12, 2022	Jan. 11, 2023
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 19, 2021	Aug. 18, 2022
Mini-Circuits	Power Amplifier	ZVE-8G+	6418	Oct. 12, 2021	Oct. 11, 2022
Mini-Circuits	Power Amplifier	ZVE-8G+	479102029	Sep. 06, 2021	Sep. 05, 2022
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check source.
2. The dipole calibration interval can be extended to 3 years with justification according to KDB 865664 D01. The dipoles are also not physically damaged, or repaired during the interval. The justification data in appendix C can be found which the return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration for each dipole.

9. System Verification

9.1 Tissue Verification

The tissue dielectric parameters of tissue-equivalent media used for SAR measurements must be characterized within a temperature range of 18°C to 25°C, measured with calibrated instruments and apparatuses, such as network analyzers and temperature probes. The temperature of the tissue-equivalent medium during SAR measurement must also be within 18°C to 25°C and within ± 2°C of the temperature when the tissue parameters are characterized. The tissue dielectric measurement system must be calibrated before use. The dielectric parameters must be measured before the tissue-equivalent medium is used in a series of SAR measurements.

The liquid tissue depth was at least 15cm in the phantom for all SAR testing

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ε _r)	Conductivity Target (σ)	Permittivity Target (ε _r)	Delta (σ) (%)	Delta (ε _r) (%)	Limit (%)	Date
2450	22.5	1.820	38.900	1.80	39.20	1.11	-0.77	±5	2022/5/20

9.2 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Test Site	Date	Frequency (MHz)	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
SAR15	2022/5/20	2450	50	D2450V2-929	EX3DV4 - SN7695	DAE4 Sn1697	2.52	53.10	50.4	-5.08

Test Site	Date	Frequency (MHz)	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
SAR15	2022/5/20	2450	50	D2450V2-929	EX3DV4 - SN7695	DAE4 Sn1697	1.16	24.70	23.2	-6.07

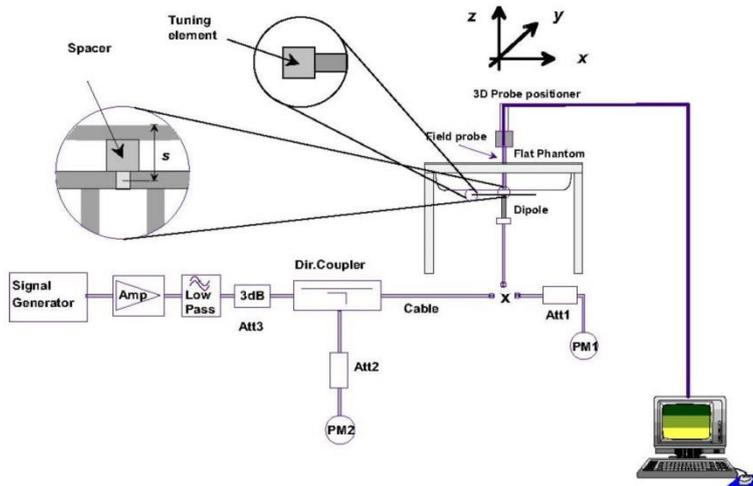


Fig 8.3.1 System Performance Check Setup



Fig 8.3.2 Setup Photo



10. WiFi/Bluetooth Output Power (Unit: dBm)

General Note:

1. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
2. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
3. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
4. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures. 18 The initial test position procedure is described in the following:
 - a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
 - b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
 - c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	13.39	13.50	100.00
		6	2437	15.89	16.00	
		11	2462	13.21	13.50	
	802.11g 6Mbps	1	2412	Not required	11.50	Not required
		6	2437		14.00	
		11	2462		11.00	
	802.11n-HT20 MCS0	1	2412	Not required	11.00	Not required
		6	2437		14.00	
		11	2462		11.00	



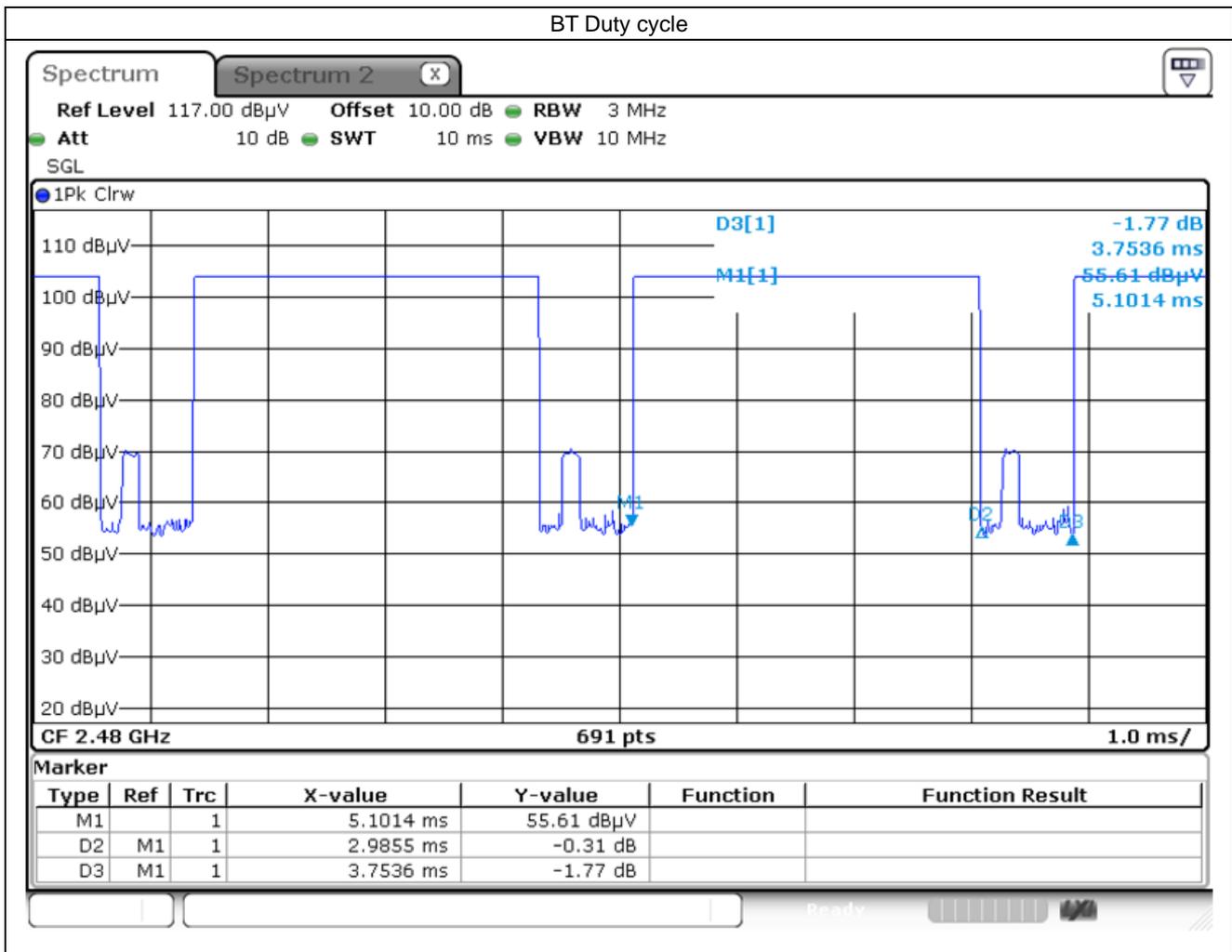
<2.4GHz Bluetooth>

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	11.42	Not required	Not required
	CH 39	2441	11.32		
	CH 78	2480	11.41		
Tune-up Limit			11.5	8	8

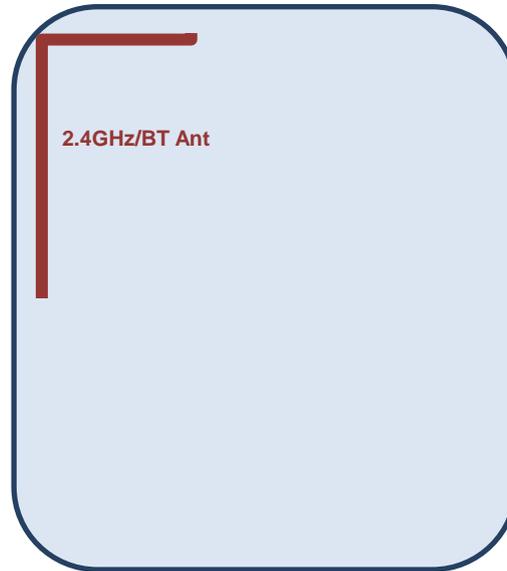
Mode	Channel	Frequency (MHz)	Average power (dBm)	
			1Mbps	2Mbps
LE	CH 00	2402	Not required	Not required
	CH 19	2440		
	CH 39	2480		
Tune-up Limit			0.5	0.5

General Note:

- For 2.4GHz Bluetooth SAR testing was selected 1Mbps due to its highest average power and duty cycle is 79.54% considered in SAR testing, and the duty cycle would be scaled to theoretical 83.3% in reported SAR calculation.



11. Antenna Location





12. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
 - c. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥ 0.8 W/kg.

WLAN Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
3. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
4. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

12.1 Head SAR

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
01	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	6	2437	15.89	16.00	1.026	100	1.000	-0.12	0.306	0.314
	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	1	2412	13.39	13.50	1.026	100	1.000	0	0.269	0.276
	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	11	2462	13.21	13.50	1.069	100	1.000	0.01	0.142	0.152

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	Bluetooth	1Mbps	Front	10mm	0	2402	11.42	11.50	1.019	79.54	1.047	0.12	0.099	0.106
02	Bluetooth	1Mbps	Front	10mm	39	2441	11.32	11.50	1.042	79.54	1.047	0.08	0.098	0.107
	Bluetooth	1Mbps	Front	10mm	78	2480	11.41	11.50	1.021	79.54	1.047	-0.03	0.080	0.086

12.2 Body-worn SAR

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
05	WLAN2.4GHz	802.11b 1Mbps	Front	5mm	6	2437	15.89	16.00	1.026	100	1.000	-0.14	0.770	0.790
	WLAN2.4GHz	802.11b 1Mbps	Front	5mm	1	2412	13.39	13.50	1.026	100	1.000	0.09	0.537	0.551
	WLAN2.4GHz	802.11b 1Mbps	Front	5mm	11	2462	13.21	13.50	1.069	100	1.000	0.01	0.387	0.414
	WLAN2.4GHz	802.11b 1Mbps	Back	5mm	6	2437	15.89	16.00	1.026	100	1.000	0.03	0.417	0.428

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	Bluetooth	1Mbps	Front	5mm	0	2402	11.42	11.50	1.019	79.54	1.047	0.11	0.185	0.197
06	Bluetooth	1Mbps	Front	5mm	39	2441	11.32	11.50	1.042	79.54	1.047	0.02	0.224	0.244
	Bluetooth	1Mbps	Front	5mm	78	2480	11.41	11.50	1.021	79.54	1.047	0.19	0.211	0.226
	Bluetooth	1Mbps	Back	5mm	0	2402	11.42	11.50	1.019	79.54	1.047	-0.04	0.173	0.184



12.3 Extremity SAR

<WLAN SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
03	WLAN2.4GHz	802.11b 1Mbps	Back	0mm	6	2437	15.89	16.00	1.026	100	1.000	-0.16	0.433	0.444
	WLAN2.4GHz	802.11b 1Mbps	Back	0mm	1	2412	13.39	13.50	1.026	100	1.000	0.15	0.337	0.346
	WLAN2.4GHz	802.11b 1Mbps	Back	0mm	11	2462	13.21	13.50	1.069	100	1.000	0.03	0.220	0.235
	WLAN2.4GHz	802.11b 1Mbps	Right Side	0mm	6	2437	15.89	16.00	1.026	100	1.000	-0.09	0.095	0.097
	WLAN2.4GHz	802.11b 1Mbps	Left Side	0mm	6	2437	15.89	16.00	1.026	100	1.000	-0.15	0.165	0.169
	WLAN2.4GHz	802.11b 1Mbps	Left Side	0mm	1	2412	13.39	13.50	1.026	100	1.000	0.1	0.142	0.146
	WLAN2.4GHz	802.11b 1Mbps	Left Side	0mm	11	2462	13.21	13.50	1.069	100	1.000	0.03	0.123	0.131
	WLAN2.4GHz	802.11b 1Mbps	Top Side	0mm	6	2437	15.89	16.00	1.026	100	1.000	0.01	0.051	0.052
	WLAN2.4GHz	802.11b 1Mbps	Bottom Side	0mm	6	2437	15.89	16.00	1.026	100	1.000	0	0.048	0.049

<Bluetooth SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	Bluetooth	1Mbps	Back	0mm	0	2402	11.42	11.50	1.019	79.54	1.047	0.12	0.137	0.146
04	Bluetooth	1Mbps	Back	0mm	39	2441	11.32	11.50	1.042	79.54	1.047	0.02	0.141	0.154
	Bluetooth	1Mbps	Back	0mm	78	2480	11.41	11.50	1.021	79.54	1.047	-0.06	0.123	0.131
	Bluetooth	1Mbps	Right Side	0mm	0	2402	11.42	11.50	1.019	79.54	1.047	0.07	0.035	0.037
	Bluetooth	1Mbps	Left Side	0mm	0	2402	11.42	11.50	1.019	79.54	1.047	0.06	0.048	0.051
	Bluetooth	1Mbps	Left Side	0mm	39	2441	11.32	11.50	1.042	79.54	1.047	0.04	0.052	0.057
	Bluetooth	1Mbps	Left Side	0mm	78	2480	11.41	11.50	1.021	79.54	1.047	0.11	0.045	0.048
	Bluetooth	1Mbps	Top Side	0mm	0	2402	11.42	11.50	1.019	79.54	1.047	0.16	0.019	0.020
	Bluetooth	1Mbps	Bottom Side	0mm	0	2402	11.42	11.50	1.019	79.54	1.047	0.09	0.015	0.016

Test Engineer : Kevin Guo



13. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

Declaration of Conformity:

The test results with all measurement uncertainty excluded is 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.

14. References

- [1] FCC 47 CFR Part 2 "Frequency Allocations and Radio Treaty Matters; General Rules and Regulations"
- [2] ANSI/IEEE Std. C95.1-1992, "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz", September 1992
- [3] IEEE Std. 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", Sep 2013
- [4] SPEAG DASY System Handbook
- [5] FCC KDB 248227 D01 v02r02, "SAR Guidance for IEEE 802.11 (WiFi) Transmitters", Oct 2015.
- [6] FCC KDB 447498 D01 v06, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", Oct 2015
- [7] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [8] FCC KDB 865664 D02 v01r02, "RF Exposure Compliance Reporting and Documentation Considerations" Oct 2015.