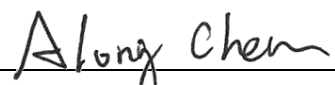


FCC Test Report

FCC ID : 2AAS9-PICONODE
Equipment : RPMA Piconode Module
Model No. : GR0136
Brand Name : BROWAN
Applicant : BROWAN COMMUNICATIONS
INCORPORATION
Address : No.15-1 Zhonghua Rd., Hsinchu Industrial
Park, Hukou, Hsinchu, Taiwan (R.O.C.), 30352
Standard : 47 CFR FCC Part 15.247
Received Date : Sep. 17, 2020
Tested Date : Oct. 28 ~ Nov. 06, 2020

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

Reviewed by:


Along Chen / Assistant Manager

Approved by:


Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR982302-01	Rev. 01	Initial issue	Dec. 01, 2020

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 4.525MHz 32.52 (Margin -13.48dB) - AV	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2376.00MHz 53.43 (Margin -0.57dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 22.48	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)	Mode	Ch. Frequency (MHz)	Channel Number
2400~2483.5	DSSS (with RPMA)	2402~2475.63	1-38 [38]

1.1.2 Antenna Details

Ant. No.	Brand	Model	Type	Connector	Gain (dBi)	Remarks
1	Linx	ANT-2.4-USP	Mono-pole	RSMA	3.8	External
2	Taiyo Yuden	AH 104F2450S1	Mono-pole (Inverted F)	RSMA	1.9	External
3	Taoglas	GW.34.5153	Dipole	RSMA	5.89	External
4	ethertronics	1001013	PIFA / magnetic Dipole	---	2.6	Internal
5	Jesoncom	10I010D	Mono-pole	RSMA	4.8	External

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3.3Vdc for host
-------------------	-----------------

1.1.4 Accessories

N/A

1.1.5 Channel List

Channel No.	Frequency (MHz)	Channel No.	Frequency (MHz)
1	2402	20	2439.81
2	2403.99	21	2441.8
3	2405.98	22	2443.79
4	2407.97	23	2445.78
5	2409.96	24	2447.77
6	2411.95	25	2449.76
7	2413.94	26	2451.75
8	2415.93	27	2453.74
9	2417.92	28	2455.73
10	2419.91	29	2457.72
11	2421.9	30	2459.71
12	2423.89	31	2461.7
13	2425.88	32	2463.69
14	2427.87	33	2465.68
15	2429.86	34	2467.67
16	2431.85	35	2469.66
17	2433.84	36	2471.65
18	2435.83	37	2473.64
19	2437.82	38	2475.63

1.1.6 Test Tool and Duty Cycle

Test Tool	EMC Certification Tools, Version: 1.6.14.1	
Duty Cycle and Duty Factor	Duty Cycle (%)	Duty Factor (dB)
	100	0

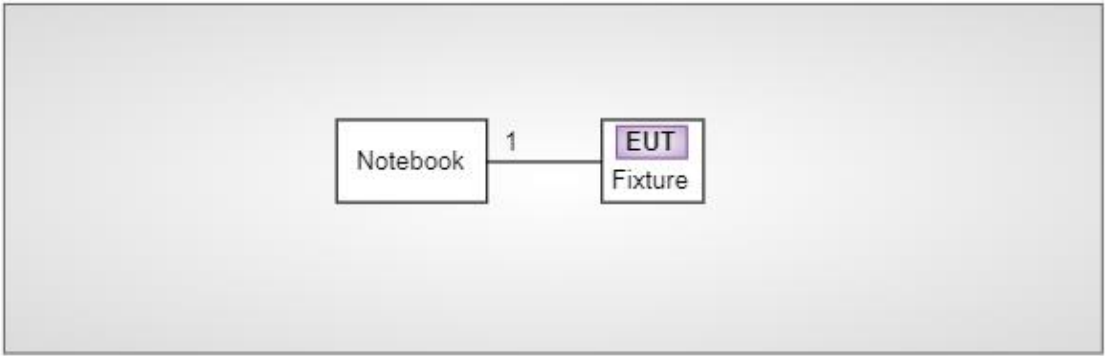
1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)	Power Index
DSSS (with RPMA)	2402	55
DSSS (with RPMA)	2437.82	55
DSSS (with RPMA)	2475.63	55

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Notebook	DELL	Latitude E5480	DoC	---
2	Fixture	Gemtek	RPMA shield One	---	Provided by applicant.

1.3 Test Setup Chart

Test Setup Diagram	
 <pre> graph LR Notebook[Notebook] --- 1 --- EUT[EUT Fixture] </pre>	
No.	Signal cable / Length (m)
1	USB, 1m non-shielded.

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Tested Date	Nov. 06, 2020				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101658	Dec. 12, 2019	Dec. 11, 2020
LISN	R&S	ENV216	101579	Mar. 12, 2020	Mar. 11, 2021
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 21, 2020	Oct. 20, 2021
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	Oct. 28 ~ Oct. 31, 2020				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Dec. 17, 2019	Dec. 16, 2020
Receiver	R&S	ESR3	101657	Feb. 14, 2020	Feb. 13, 2021
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Jul. 10, 2020	Jul. 09, 2021
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 12, 2019	Dec. 11, 2020
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2019	Nov. 14, 2020
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 13, 2019	Nov. 12, 2020
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 06, 2020	Oct. 05, 2021
Preamplifier	EMC	EMC02325	980225	Jul. 03, 2020	Jul. 02, 2021
Preamplifier	Agilent	83017A	MY39501308	Sep. 26, 2020	Sep. 25, 2021
Preamplifier	EMC	EMC184045B	980192	Jul. 21, 2020	Jul. 20, 2021
RF Cable	EMC	EMC104-SM-SM-8000	181106	Oct. 06, 2020	Oct. 05, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Oct. 06, 2020	Oct. 05, 2021
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Oct. 06, 2020	Oct. 05, 2021
LF cable 1M	EMC	EMCCFD400-NM-N M-1000	160502	Oct. 06, 2020	Oct. 05, 2021
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Oct. 06, 2020	Oct. 05, 2021
LF cable 11M	EMC	EMCCFD400-NW-N W-11000	200801	Oct. 06, 2020	Oct. 05, 2021
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	Nov. 03, 2020				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Apr. 30, 2020	Apr. 29, 2021
Power Meter	Anritsu	ML2495A	1241001	Jul. 21, 2020	Jul. 20, 2021
Power Sensor	Anritsu	MA2411B	1207362	Jul. 21, 2020	Jul. 20, 2021
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

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
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 Corp.
Test Site	CO01-WS, 03CH01-WS, TH01-WS
Address of Test Site	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

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

2.2 The Worst Test Modes and Channel Details

Test item	Modulation Mode	Test Frequency (MHz)	Test Configuration
Conducted Emissions	DSSS	2402	3
Radiated Emissions ≤1GHz	DSSS	2402	1, 2, 3, 4, 5
Radiated Emissions >1GHz	DSSS	2402 / 2437.82 / 2475.63	1, 2, 3, 4, 5
Maximum Output Power 6dB bandwidth Power spectral density	DSSS	2402 / 2437.82 / 2475.63	3
NOTE: 1. The EUT had five antennas been tested by following test configurations. 1) Configuration 1: Linx antenna, X-plane 2) Configuration 2: Taiyo Yuden antenna, Y-plane 3) Configuration 3: Taoglas antenna, Y-plane 4) Configuration 4: ethertronics antenna, X-plane 5) Configuration 5: Jesoncom antenna, Y-plane			

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of 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.

3.1.2 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.

3.1.3 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

3.1.4 Test Result of Conducted Emissions

Modulation	DSSS	Test Freq. (MHz)	2402																																																																																																																																							
Power Phase	Line																																																																																																																																									
Test by : Alex Tsai Temperature: 22°C Humidity: 58%																																																																																																																																										
Level (dBuV) <table><thead><tr><th></th><th>Freq</th><th>Level</th><th>Limit</th><th>Over</th><th>Read</th><th>LISN</th><th>cable</th><th></th></tr><tr><th></th><th>MHz</th><th>dBuV</th><th>Line</th><th>Limit</th><th>Level</th><th>factor</th><th>loss</th><th>Remark</th></tr><tr><th></th><th></th><th></th><th>dBuV</th><th>dB</th><th>dBuV</th><th>dB</th><th>dB</th><th></th></tr></thead><tbody><tr><td>1</td><td>0.153</td><td>35.24</td><td>55.82</td><td>-20.58</td><td>25.55</td><td>9.64</td><td>0.05</td><td>Average</td></tr><tr><td>2*</td><td>0.153</td><td>48.71</td><td>65.82</td><td>-17.11</td><td>39.02</td><td>9.64</td><td>0.05</td><td>QP</td></tr><tr><td>3</td><td>0.195</td><td>19.41</td><td>53.80</td><td>-34.39</td><td>9.72</td><td>9.63</td><td>0.06</td><td>Average</td></tr><tr><td>4</td><td>0.195</td><td>32.75</td><td>63.80</td><td>-31.05</td><td>23.06</td><td>9.63</td><td>0.06</td><td>QP</td></tr><tr><td>5</td><td>0.474</td><td>20.73</td><td>46.45</td><td>-25.72</td><td>11.01</td><td>9.63</td><td>0.09</td><td>Average</td></tr><tr><td>6</td><td>0.474</td><td>31.42</td><td>56.45</td><td>-25.03</td><td>21.70</td><td>9.63</td><td>0.09</td><td>QP</td></tr><tr><td>7</td><td>2.636</td><td>23.79</td><td>46.00</td><td>-22.21</td><td>13.93</td><td>9.64</td><td>0.22</td><td>Average</td></tr><tr><td>8</td><td>2.636</td><td>29.88</td><td>56.00</td><td>-26.12</td><td>20.02</td><td>9.64</td><td>0.22</td><td>QP</td></tr><tr><td>9</td><td>4.454</td><td>26.87</td><td>46.00</td><td>-19.13</td><td>16.92</td><td>9.65</td><td>0.30</td><td>Average</td></tr><tr><td>10</td><td>4.454</td><td>32.52</td><td>56.00</td><td>-23.48</td><td>22.57</td><td>9.65</td><td>0.30</td><td>QP</td></tr><tr><td>11</td><td>18.820</td><td>19.10</td><td>50.00</td><td>-30.90</td><td>8.73</td><td>9.72</td><td>0.65</td><td>Average</td></tr><tr><td>12</td><td>18.820</td><td>27.56</td><td>60.00</td><td>-32.44</td><td>17.19</td><td>9.72</td><td>0.65</td><td>QP</td></tr></tbody></table>					Freq	Level	Limit	Over	Read	LISN	cable			MHz	dBuV	Line	Limit	Level	factor	loss	Remark				dBuV	dB	dBuV	dB	dB		1	0.153	35.24	55.82	-20.58	25.55	9.64	0.05	Average	2*	0.153	48.71	65.82	-17.11	39.02	9.64	0.05	QP	3	0.195	19.41	53.80	-34.39	9.72	9.63	0.06	Average	4	0.195	32.75	63.80	-31.05	23.06	9.63	0.06	QP	5	0.474	20.73	46.45	-25.72	11.01	9.63	0.09	Average	6	0.474	31.42	56.45	-25.03	21.70	9.63	0.09	QP	7	2.636	23.79	46.00	-22.21	13.93	9.64	0.22	Average	8	2.636	29.88	56.00	-26.12	20.02	9.64	0.22	QP	9	4.454	26.87	46.00	-19.13	16.92	9.65	0.30	Average	10	4.454	32.52	56.00	-23.48	22.57	9.65	0.30	QP	11	18.820	19.10	50.00	-30.90	8.73	9.72	0.65	Average	12	18.820	27.56	60.00	-32.44	17.19	9.72	0.65	QP
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Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB). 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).																																																																																																																																										

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7	2.500	26.12	46.00	-19.88	16.24	9.66	0.22	Average																																																																																																																
8	2.500	32.49	56.00	-23.51	22.61	9.66	0.22	QP																																																																																																																
9*	4.525	32.52	46.00	-13.48	22.54	9.68	0.30	Average																																																																																																																
10	4.525	38.38	56.00	-17.62	28.40	9.68	0.30	QP																																																																																																																
11	8.323	29.58	50.00	-20.42	19.49	9.72	0.37	Average																																																																																																																
12	8.323	35.48	60.00	-24.52	25.39	9.72	0.37	QP																																																																																																																
Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB). 2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).																																																																																																																								

3.2 6dB and Occupied Bandwidth

3.2.1 Limit of 6dB Bandwidth

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

3.2.2 Test Procedures

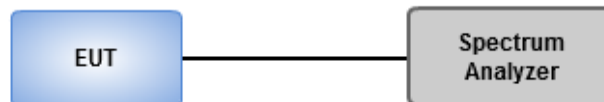
6dB Bandwidth

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 MHz, Video bandwidth = 3 MHz.
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.

3.2.3 Test Setup



3.2.4 Test Result of 6dB and Occupied Bandwidth

Ambient Condition	23°C / 63%	Tested By	Brad Wu
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Summary

Mode	Max-N dB (Hz)	Max-OBW (Hz)	ITU-Code	Min-N dB (Hz)	Min-OBW (Hz)
2.4-2.4835GHz	-	-	-	-	-
2.4G	1.022M	1.551M	1M55D1D	992.754k	1.54M

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

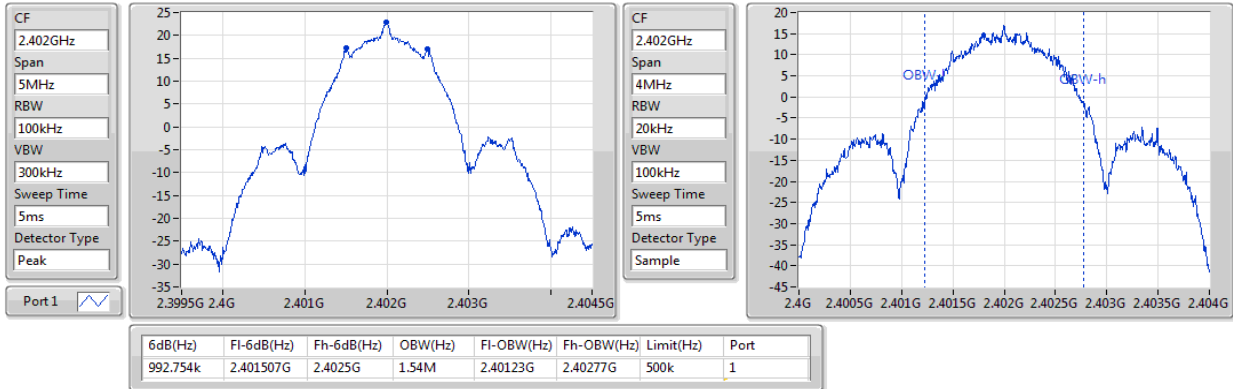
Mode	Result	Limit (Hz)	Port 1-N dB (Hz)	Port 1-OBW (Hz)
2.4G	-	-	-	-
2402MHz	Pass	500k	992.754k	1.54M
2437.82MHz	Pass	500k	1.022M	1.551M
2475.63MHz	Pass	500k	1.022M	1.551M

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

2.4G

EBW-DTS

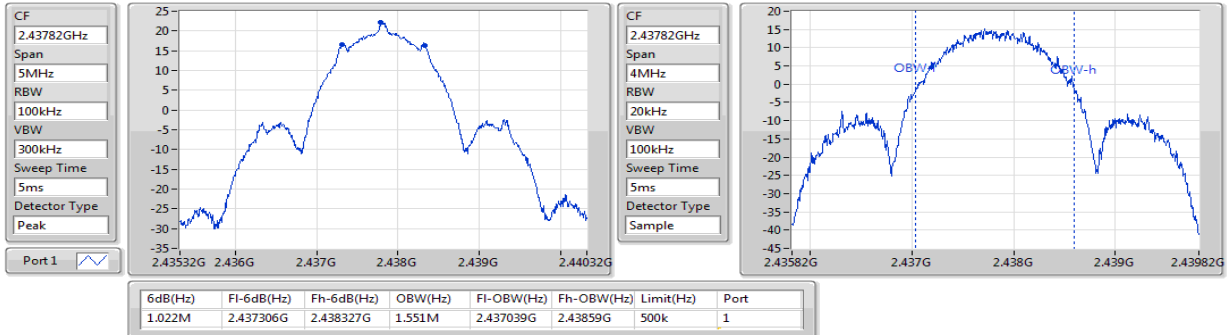
2402MHz



2.4G

EBW-DTS

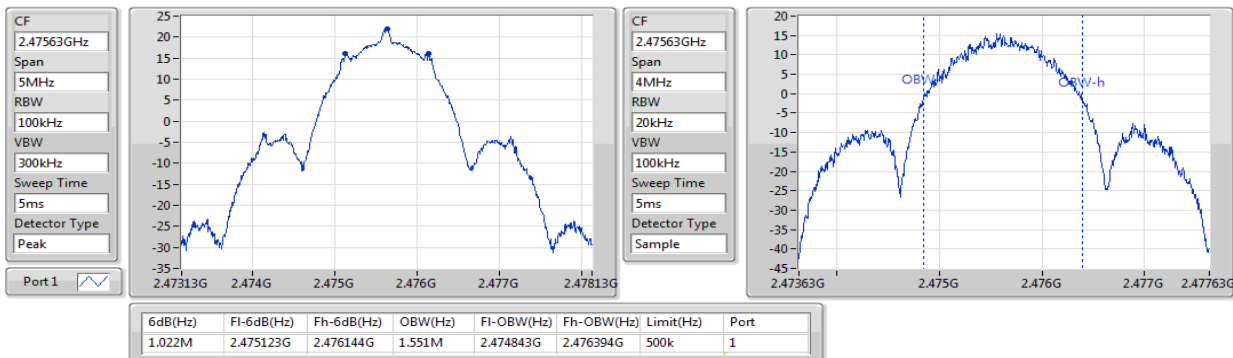
2437.82MHz



2.4G

EBW-DTS

2475.63MHz



3.3 RF Output Power

3.3.1 Limit of RF Output Power

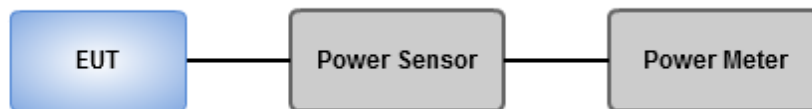
Conducted power shall not exceed 1Watt.

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

3.3.2 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.

3.3.3 Test Setup



3.3.4 Test Result of Maximum Output Power

Ambient Condition	23°C / 63%	Tested By	Brad Wu
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Summary

Mode	Power (dBm)	Power (W)
2.4-2.4835GHz	-	-
2.4G	22.48	0.17701

Result

Mode	Result	Gain (dBi)	Power (dBm)	Power Limit (dBm)
2.4G	-	-	-	-
2402MHz	Pass	5.89	22.48	30.00
2437.82MHz	Pass	5.89	21.78	30.00
2475.63MHz	Pass	5.89	21.45	30.00

Note: Average power is for reference only.

3.4 Power Spectral Density

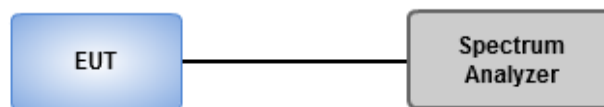
3.4.1 Limit of Power Spectral Density

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

3.4.2 Test Procedures

1. Set the RBW = 3 kHz, VBW = 10 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.

3.4.3 Test Setup



3.4.4 Test Result of Power Spectral Density

Ambient Condition	23°C / 63%	Tested By	Brad Wu
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Summary

Mode	PD (dBm/3kHz)
2.4-2.4835GHz	-
2.4G	-0.63

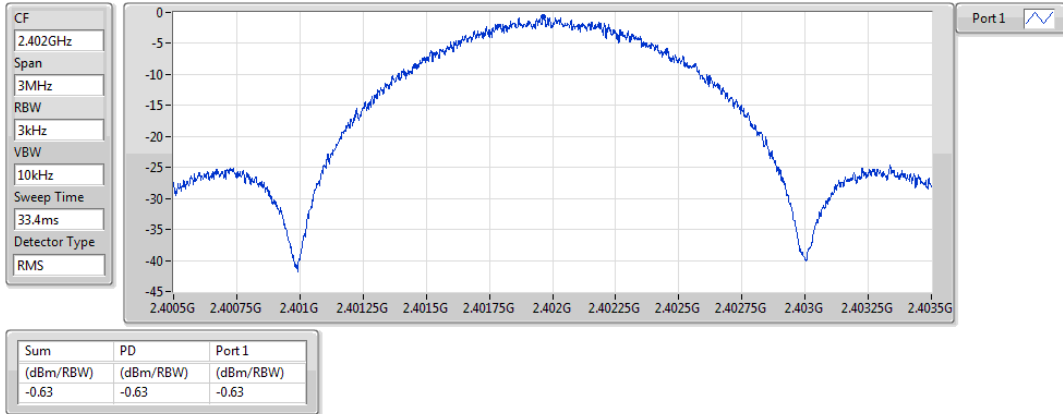
Result

Mode	Result	Gain (dBi)	PD (dBm/3kHz)	PD Limit (dBm/3kHz)
2.4G	-	-	-	-
2402MHz	Pass	5.89	-0.63	8.00
2437.82MHz	Pass	5.89	-0.98	8.00
2475.63MHz	Pass	5.89	-1.49	8.00

2.4G

PSD

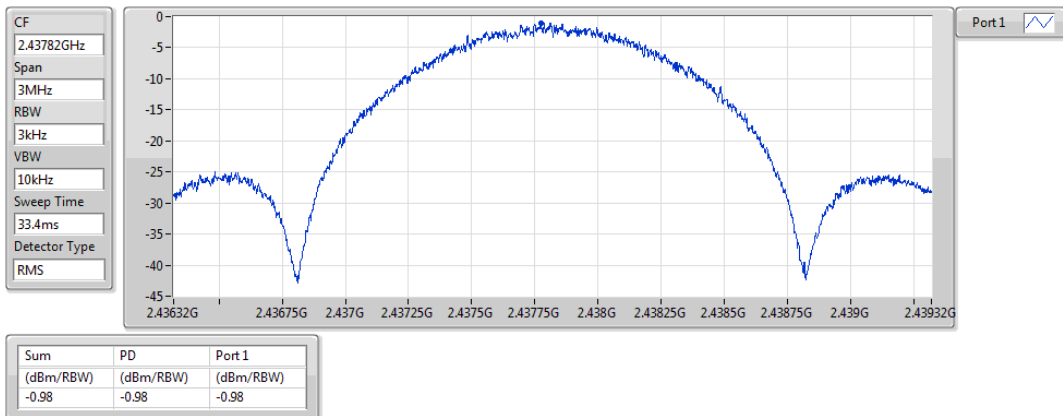
2402MHz



2.4G

PSD

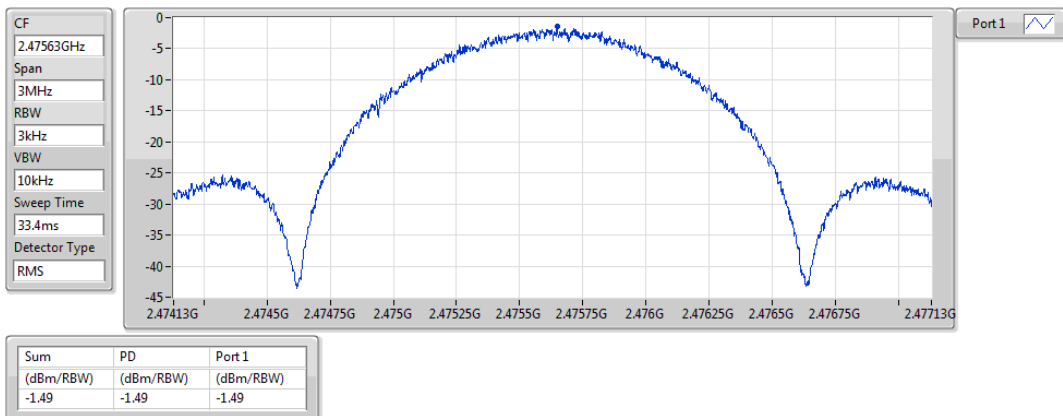
2437.82MHz



2.4G

PSD

2475.63MHz



3.5 Unwanted Emissions into Restricted Frequency Bands

3.5.1 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.

3.5.2 Test Procedures

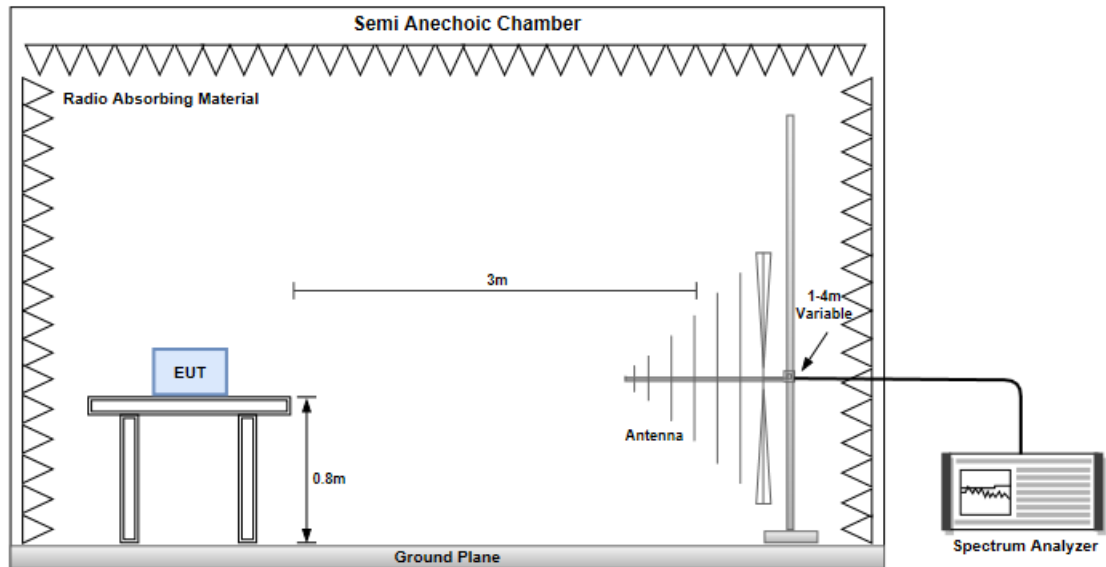
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

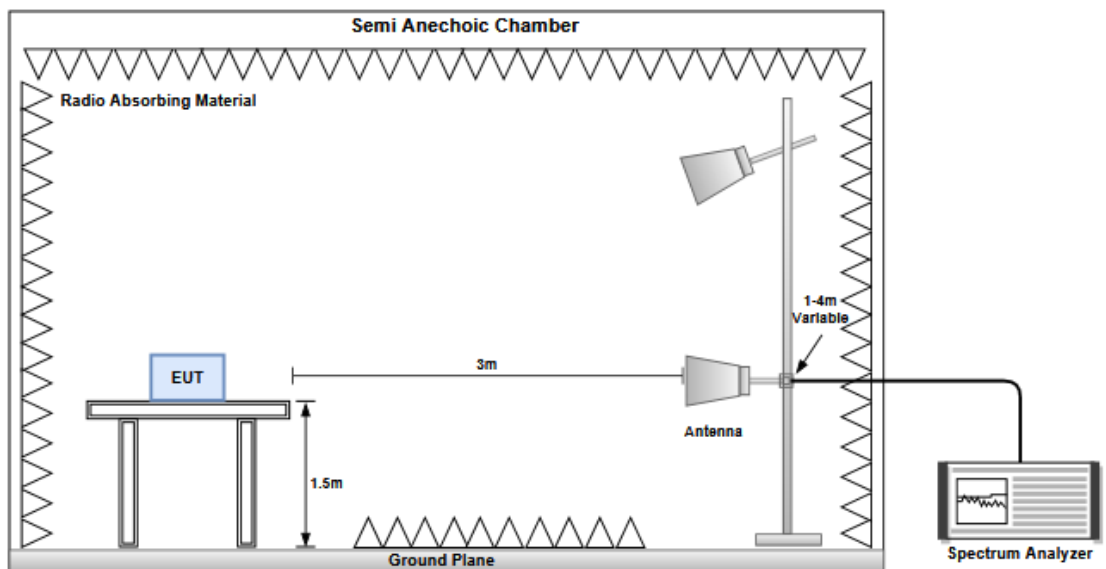
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz



Configuration 1: Linx antenna, X-plane

3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):63			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):63			
Level (dBuV/m)			

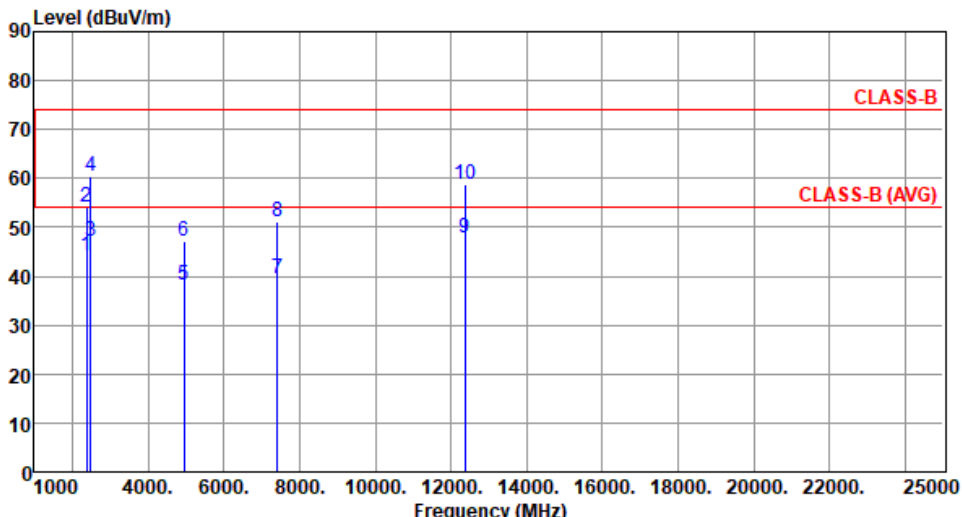
3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m) <			

Modulation	DSSS	Test Freq. (MHz)	2437.82
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2437.82
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m) </			

Modulation	DSSS	Test Freq. (MHz)	2475.63						
Polarization	Horizontal								
Test By :BRAD WU Temperature(°C):23 Humidity(%):64									
Level (dBuV/m)  Frequency (MHz)									
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
	MHz	level	dBuV/m	dB	reading	dB		High	Table
		dBuV/m			dBuV			cm	deg
1	2372.00	44.23	54.00	-9.77	46.89	-2.66	Average	133	318
2	2372.00	54.18	74.00	-19.82	56.84	-2.66	Peak	133	318
3	2483.50	47.08	54.00	-6.92	50.05	-2.97	Average	133	318
4	2483.50	60.44	74.00	-13.56	63.41	-2.97	Peak	133	318
5	4951.26	38.14	54.00	-15.86	34.41	3.73	Average	115	256
6	4951.26	47.29	74.00	-26.71	43.56	3.73	Peak	115	256
7	7426.89	39.64	54.00	-14.36	30.62	9.02	Average	108	336
8	7426.89	51.16	74.00	-22.84	42.14	9.02	Peak	108	336
9	12378.15	47.86	54.00	-6.14	33.75	14.11	Average	185	102
10	12378.15	58.86	74.00	-15.14	44.75	14.11	Peak	185	102

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	DSSS	Test Freq. (MHz)	2475.63
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBUV/m) </			

Configuration 2: Taiyo Yuden antenna, Y-plane

3.5.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):63			
Level (dBuV/m) <			

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):63			
Level (dBuV/m)			

3.5.7 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	DSSS	Test Freq. (MHz)	2402						
Polarization	Horizontal								
Test By :BRAD WU Temperature(°C):23 Humidity(%):64									
Level (dBUV/m) Frequency (MHz)									
	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2376.00	47.03	54.00	-6.97	49.72	-2.69	Average	100	141
2	2376.00	55.28	74.00	-18.72	57.97	-2.69	Peak	100	141
3	2390.00	41.63	54.00	-12.37	44.38	-2.75	Average	100	141
4	2390.00	55.77	74.00	-18.23	58.52	-2.75	Peak	100	141
5	4804.00	43.95	54.00	-10.05	40.43	3.52	Average	200	2
6	4804.00	50.96	74.00	-23.04	47.44	3.52	Peak	200	2
7	12010.00	52.76	54.00	-1.24	38.58	14.18	Average	162	335
8	12010.00	62.20	74.00	-11.80	48.02	14.18	Peak	162	335

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m) </			

Modulation	DSSS	Test Freq. (MHz)	2437.82
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2437.82
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

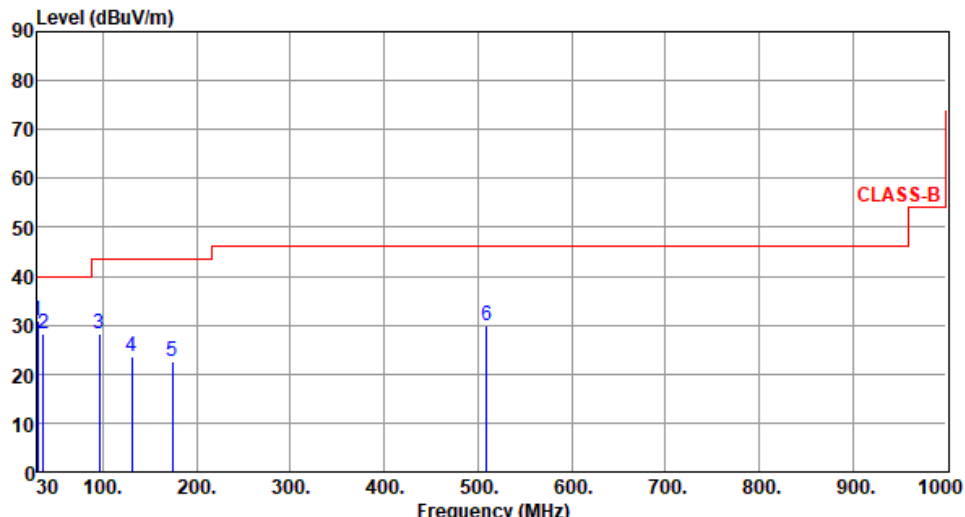
Modulation	DSSS	Test Freq. (MHz)	2475.63
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2475.63
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m) </			

Configuration 3: Taoglas antenna, Y-plane

3.5.8 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):63			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2402																																																																						
Polarization	Vertical																																																																								
Test By :BRAD WU Temperature(°C):22 Humidity(%):63																																																																									
Level (dBUV/m)  Frequency (MHz) <table><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</th><th>Remark</th><th>ANT High cm</th><th>Turn Table deg</th></tr><tr><td>1</td><td>30.02</td><td>30.76</td><td>40.00</td><td>-9.24</td><td>40.25</td><td>-9.49</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>2</td><td>36.79</td><td>28.31</td><td>40.00</td><td>-11.69</td><td>37.32</td><td>-9.01</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>3</td><td>95.96</td><td>28.25</td><td>43.50</td><td>-15.25</td><td>42.54</td><td>-14.29</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>4</td><td>130.88</td><td>23.52</td><td>43.50</td><td>-19.98</td><td>33.31</td><td>-9.79</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>5</td><td>174.53</td><td>22.74</td><td>43.50</td><td>-20.76</td><td>32.43</td><td>-9.69</td><td>Peak</td><td>---</td><td>---</td></tr><tr><td>6</td><td>509.18</td><td>30.00</td><td>46.00</td><td>-16.00</td><td>33.01</td><td>-3.01</td><td>Peak</td><td>---</td><td>---</td></tr></table>					Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg	1	30.02	30.76	40.00	-9.24	40.25	-9.49	Peak	---	---	2	36.79	28.31	40.00	-11.69	37.32	-9.01	Peak	---	---	3	95.96	28.25	43.50	-15.25	42.54	-14.29	Peak	---	---	4	130.88	23.52	43.50	-19.98	33.31	-9.79	Peak	---	---	5	174.53	22.74	43.50	-20.76	32.43	-9.69	Peak	---	---	6	509.18	30.00	46.00	-16.00	33.01	-3.01	Peak	---	---
	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg																																																																
1	30.02	30.76	40.00	-9.24	40.25	-9.49	Peak	---	---																																																																
2	36.79	28.31	40.00	-11.69	37.32	-9.01	Peak	---	---																																																																
3	95.96	28.25	43.50	-15.25	42.54	-14.29	Peak	---	---																																																																
4	130.88	23.52	43.50	-19.98	33.31	-9.79	Peak	---	---																																																																
5	174.53	22.74	43.50	-20.76	32.43	-9.69	Peak	---	---																																																																
6	509.18	30.00	46.00	-16.00	33.01	-3.01	Peak	---	---																																																																
Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB) *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.																																																																									

3.5.9 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m) </			

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m) <			

Modulation	DSSS	Test Freq. (MHz)	2437.82
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2437.82
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2475.63
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBUV/m)			

Modulation	DSSS	Test Freq. (MHz)	2475.63
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Configuration 4: ethertronics antenna, X-plane

3.5.10 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):63			
Level (dBuV/m) </			

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):63			
Level (dBuV/m)			

3.5.11 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBUV/m) </			

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2437.82
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2437.82
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2475.63
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2475.63
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Configuration 5: Jesoncom antenna, Y-plane

3.5.12 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):22 Humidity(%):63			
Level (dBUV/m)			

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):22 Humidity(%):63			
Level (dBuV/m)			

3.5.13 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2402
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2437.82
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2437.82
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2475.63
Polarization	Horizontal		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBuV/m)			

Modulation	DSSS	Test Freq. (MHz)	2475.63
Polarization	Vertical		
Test By :BRAD WU Temperature(°C):23 Humidity(%):64			
Level (dBUV/m) </			

3.6 Emissions in Non-Restricted Frequency Bands

3.6.1 Emissions in Non-Restricted Frequency Bands Limit

the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz.

3.6.2 Test Procedures

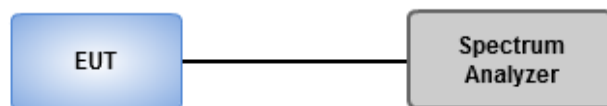
Reference level measurement

1. Set RBW=100 kHz, VBW = 300 kHz , 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=100 kHz, VBW = 300 kHz , 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.

3.6.3 Test Setup



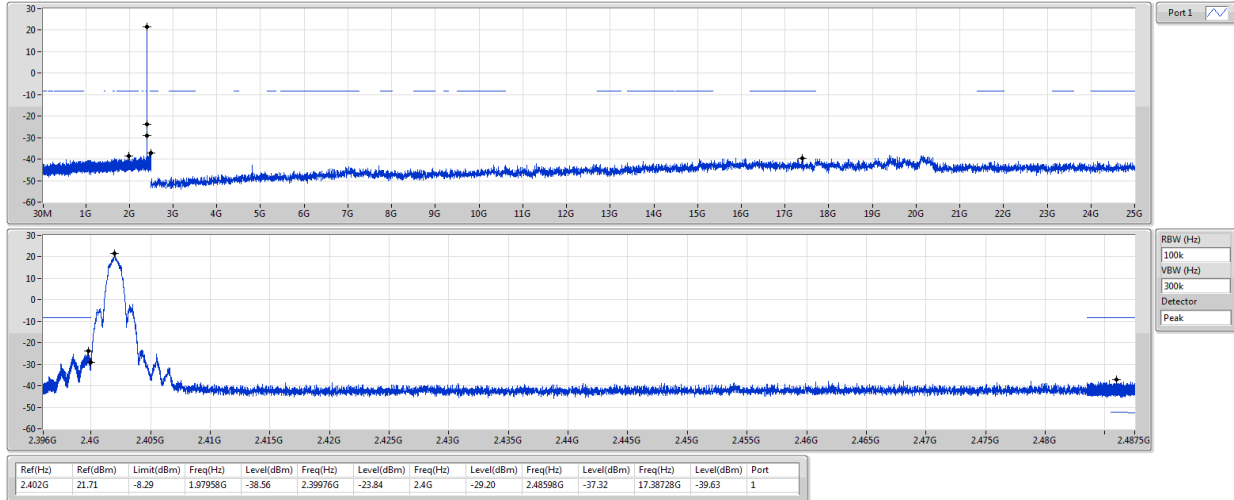
3.6.4 Unwanted Emissions into Non-Restricted Frequency Bands

Ambient Condition	23°C / 63%	Tested By	Brad Wu
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2.4G

CSENdB-DTS

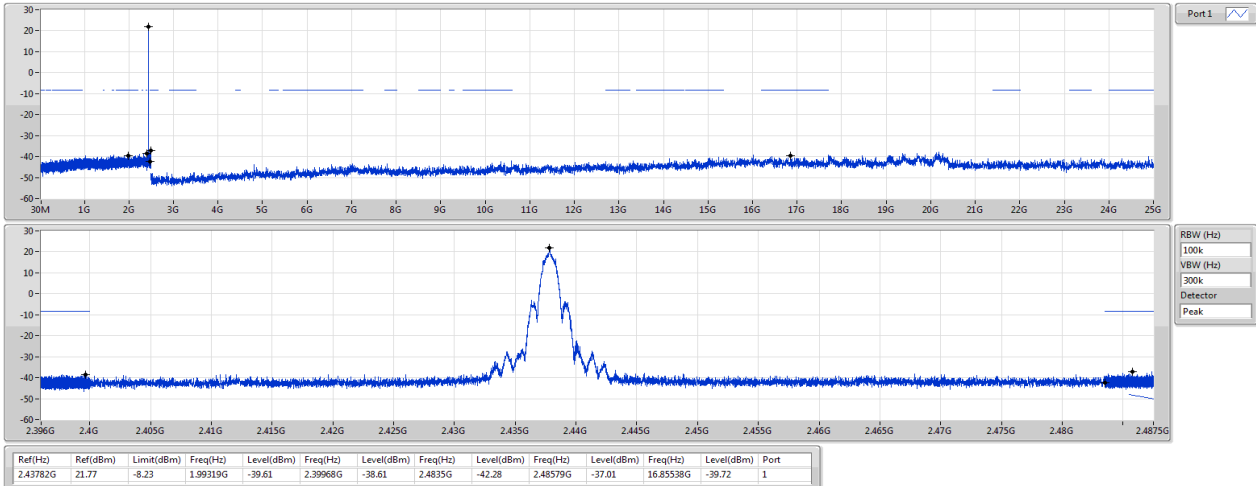
2402MHz

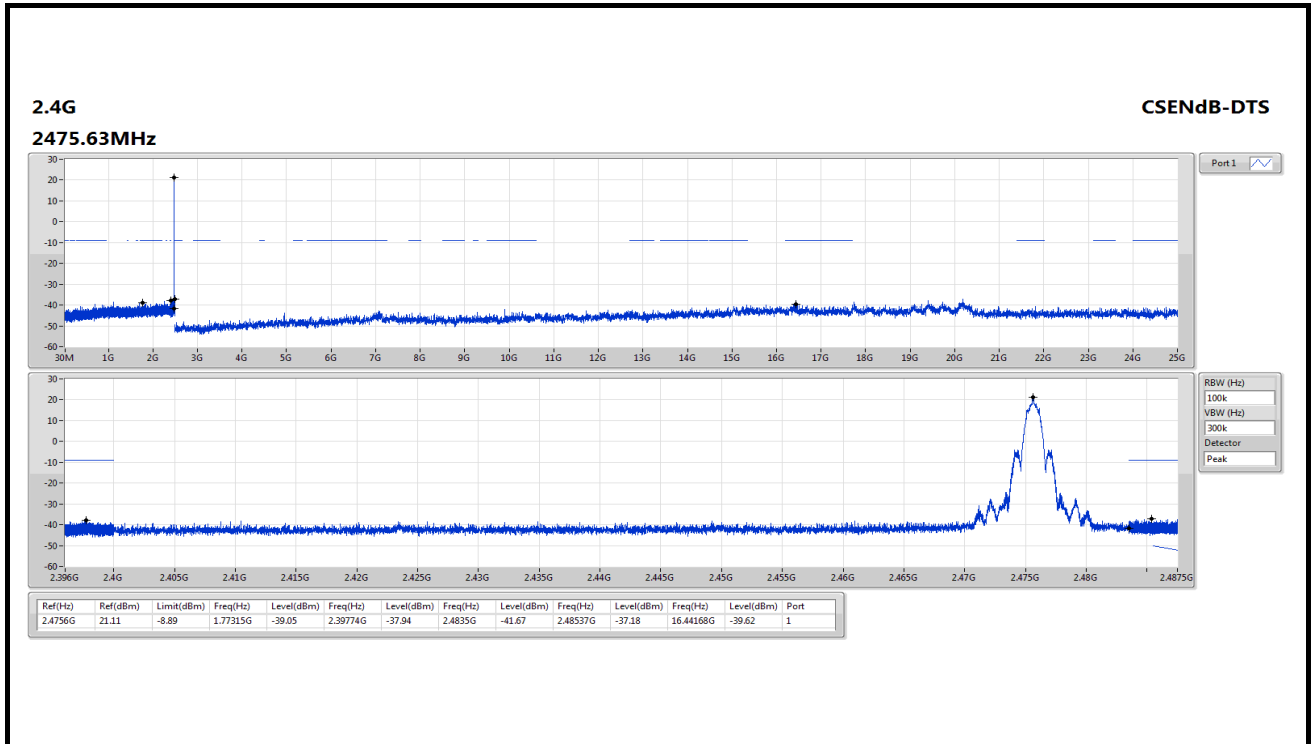


2.4G

CSENdB-DTS

2437.82MHz





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 Corp (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 District, Tao Yuan City
333, Taiwan, R.O.C.

Kwei Shan Site II

Tel: 886-3-271-8640

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

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

Tel: 886-3-271-8666

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Email: ICC_Service@icertifi.com.tw

==END==