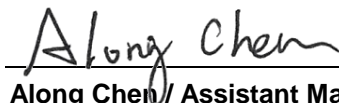


FCC Test Report

FCC ID : 2AXXQMLBADA
Equipment : Location Bridge
Model No. : MLB-AD-A
Brand Name : MACHINEQ
Applicant : Humax Networks, INC.
Address : 216, Hwangsaeul-ro, Bundang-gu, Seongnam-si,
South Korea
Standard : 47 CFR FCC Part 15.247
Received Date : Dec. 28, 2020
Tested Date : Jan. 08 ~ Jan. 26, 2021

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
FR0D2803-1AH	Rev. 01	Initial issue	Feb. 03, 2021

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.165MHz 61.95 (Margin -3.26dB) - QP	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2706.90MHz 51.28 (Margin -2.72dB) - AV	Pass
15.247(d)	Band Edge	Meet the requirement of limit	Pass
15.247(b)(2)(3)	Conducted Output Power	Power [dBm]: 21.06	Pass
15.247(a)(1)(i)	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(f)	Dwell Time	Meet the requirement of limit	Pass
15.247(f)	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)	Ch. Freq. (MHz)	Channel Number	Data Rate (bit/sec)	Spread Factor	Channel Bandwidth (kHz)
902 ~ 928	902.3 ~ 914.9	1-64 [64]	5470 ~ 980	SF7~10	125
Note 1: RF output power specifies that Maximum Conducted (Average) Output Power. Note 2: The device uses Lora modulation. Note 3: The device supports hybrid mode.					

1.1.2 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)
1	PIFA	NA	2.18

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	55Vdc from PoE 5Vdc from USB adapter
--------------------------	---

1.1.4 Accessories

N/A

1.1.5 Channel List

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	902.3	17	905.5	33	908.7	49	911.9
2	902.5	18	905.7	34	908.9	50	912.1
3	902.7	19	905.9	35	909.1	51	912.3
4	902.9	20	906.1	36	909.3	52	912.5
5	903.1	21	906.3	37	909.5	53	912.7
6	903.3	22	906.5	38	909.7	54	912.9
7	903.5	23	906.7	39	909.9	55	913.1
8	903.7	24	906.9	40	910.1	56	913.3
9	903.9	25	907.1	41	910.3	57	913.5
10	904.1	26	907.3	42	910.5	58	913.7
11	904.3	27	907.5	43	910.7	59	913.9
12	904.5	28	907.7	44	910.9	60	914.1
13	904.7	29	907.9	45	911.1	61	914.3
14	904.9	30	908.1	46	911.3	62	914.5
15	905.1	31	908.3	47	911.5	63	914.7
16	905.3	32	908.5	48	911.7	64	914.9

1.1.6 Test Tool and Duty Cycle

Test Tool	Tera Term, version: V4.80
Duty cycle	100 %

1.1.7 Power Index of Test Tool

Modulation Mode	Test Frequency (MHz)		
	902.3	908.5	914.9
LORA	22	22	22

1.2 Local Support Equipment List

POE Mode

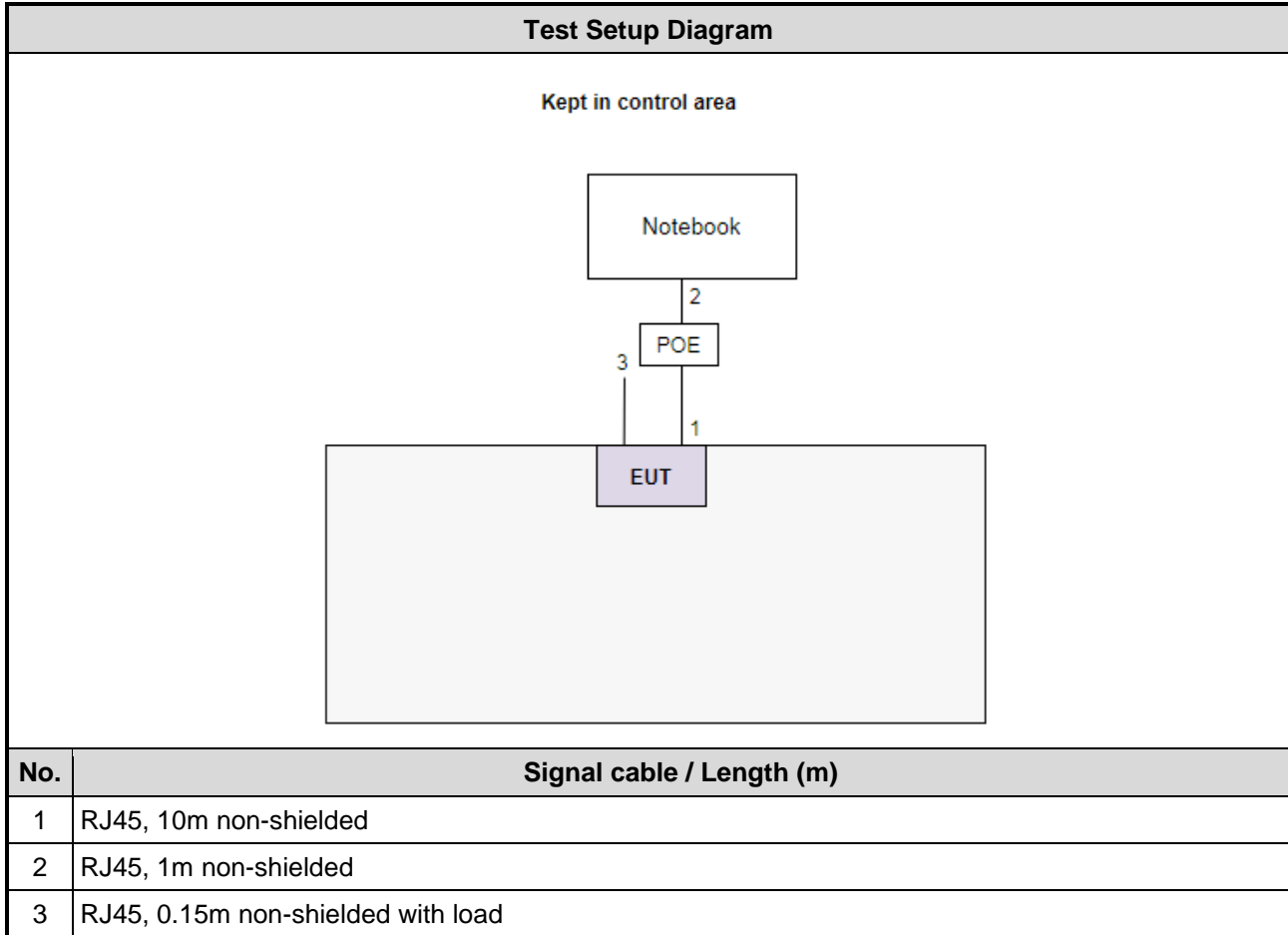
Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	RJ45	ICC	RJ45-10m	---	---
2	RJ45	ICC	RJ45-1m	---	---
3	RJ45	---	---	---	Provided by applicant.
4	Notebook	DELL	Latitude E5470	DoC	---
5	USB cable	---	---	---	Provided by applicant.
6	Fixture	---	HLCB_V00	---	Provided by applicant.
7	POE	Microsemi	PD-9001GR/AC	---	Provided by applicant.

Adapter Mode

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	RJ45	ICC	RJ45-10m	---	---
2	RJ45	---	---	---	Provided by applicant.
3	Notebook	DELL	Latitude E5470	DoC	---
4	USB Cable	I-Gota	micro to A	---	---
5	Adapter	Samsung	ETA-U90JWS	---	---
6	USB cable	---	---	---	Provided by applicant.
7	Fixture	---	HLCB_V00	---	Provided by applicant.

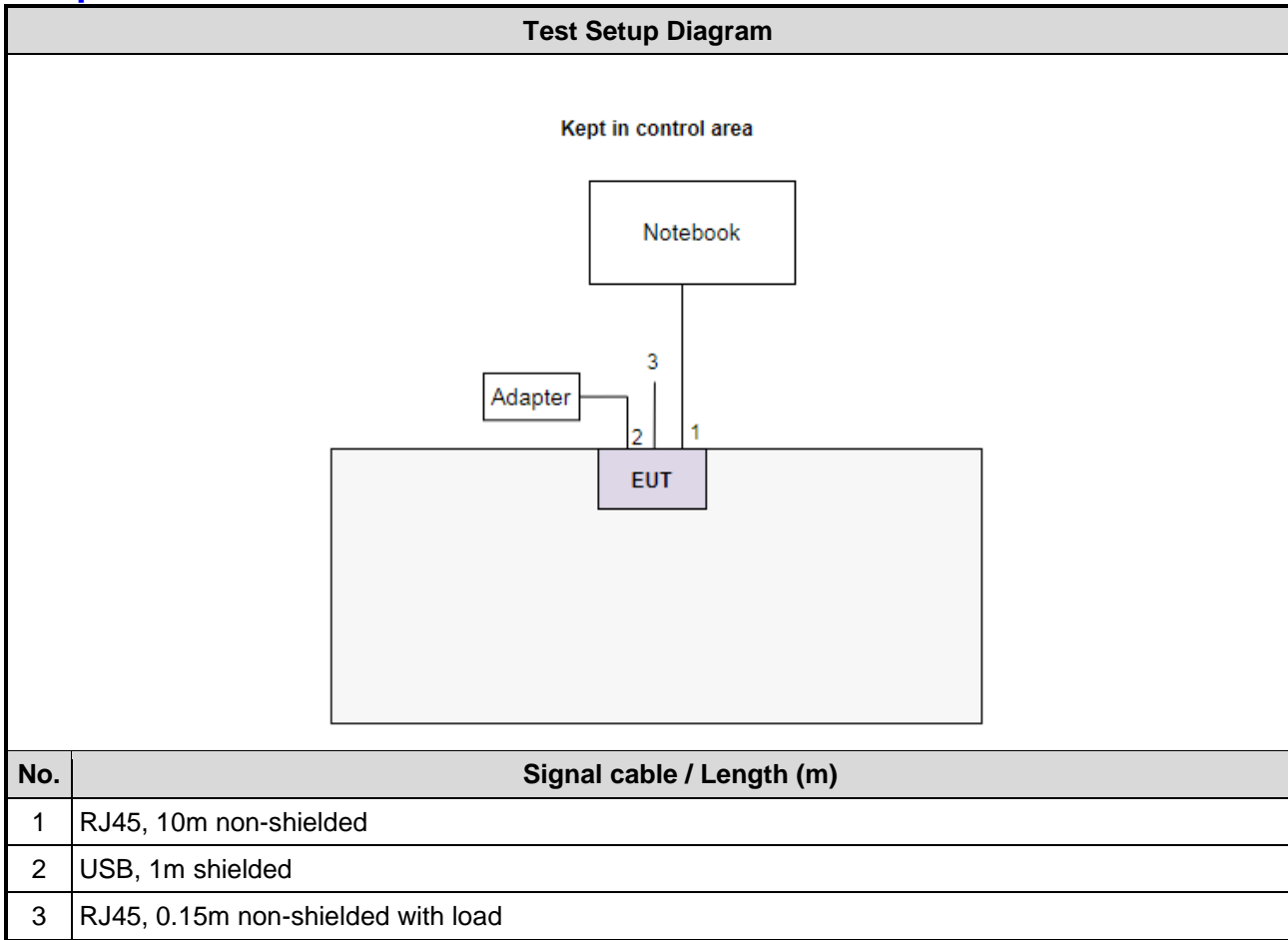
1.3 Test Setup Chart

POE Mode



Note: The USB cable and fixture are disconnected from EUT and removed from test table when EUT is set to transmit continuously.

Adapter Mode



Note: The USB cable and fixture are disconnected from EUT and removed from test table when EUT is set to transmit continuously.

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Feb. 14, 2020	Feb. 13, 2021
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)				
Instrument	Brand	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Dec. 04, 2020	Dec. 03, 2021
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. 11, 2020	Dec. 10, 2021
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 06, 2020	Nov. 05, 2021
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 17, 2020	Nov. 16, 2021
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	EMCCFD400-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-NM-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-NW-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)				
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	1241002	Nov. 04, 2020	Nov. 03, 2021
Power Sensor	Anritsu	MA2411B	1207366	Nov. 04, 2020	Nov. 03, 2021
AC POWER SOURCE	APC	AFC-500W	F312060012	Dec. 04, 2020	Dec. 03, 2021
Measurement Software	--	SENSE-15247_DTS	V5.10.7	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
Radiated emission ≤ 1GHz	±3.96 dB
Radiated emission > 1GHz	±4.51 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
- ISED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Test Frequency (MHz)	Channel Bandwidth (kHz)	Modulation / SF	Test Configuration
Conducted Emissions	902.3 / 908.5 / 914.9	125	Lora / 10	1, 2
Radiated Emissions ≤ 1GHz	902.3 / 908.5 / 914.9	125	Lora / 10	1, 2
Conducted Output Power Hopping Channel Separation 20dB and Occupied bandwidth Power Spectral Density	902.3 / 908.5 / 914.9	125	Lora / 10	1
Radiated Emissions >1GHz	902.3 / 908.5 / 914.9	125	Lora / 10	1
Number of Hopping Channels	902.3 ~ 914.9	125	Lora / 10	1
Dwell Time	902.3	125	Lora / 10	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 X-plane results were found as the worst case and were shown in this report.				
2. The test configurations are listed as follows: Configuration 1: POE Mode Configuration 2 : Adapter Mode				

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

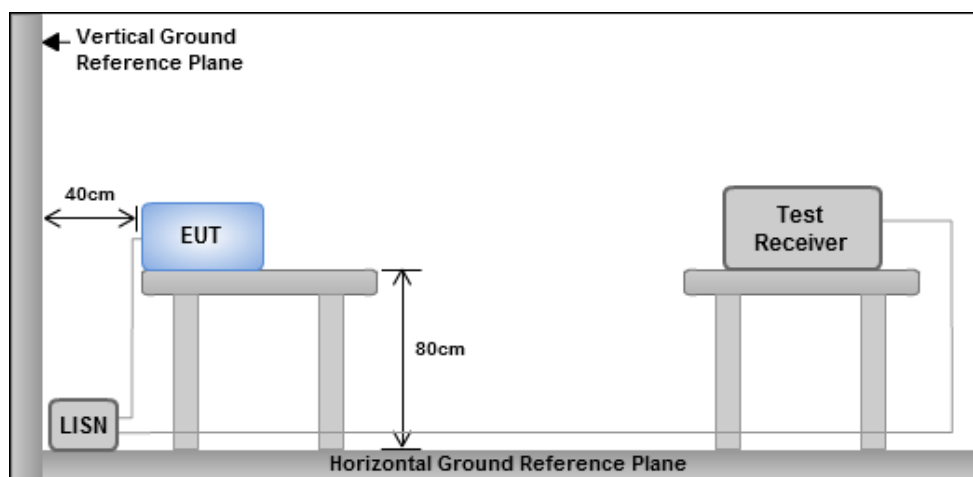
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

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

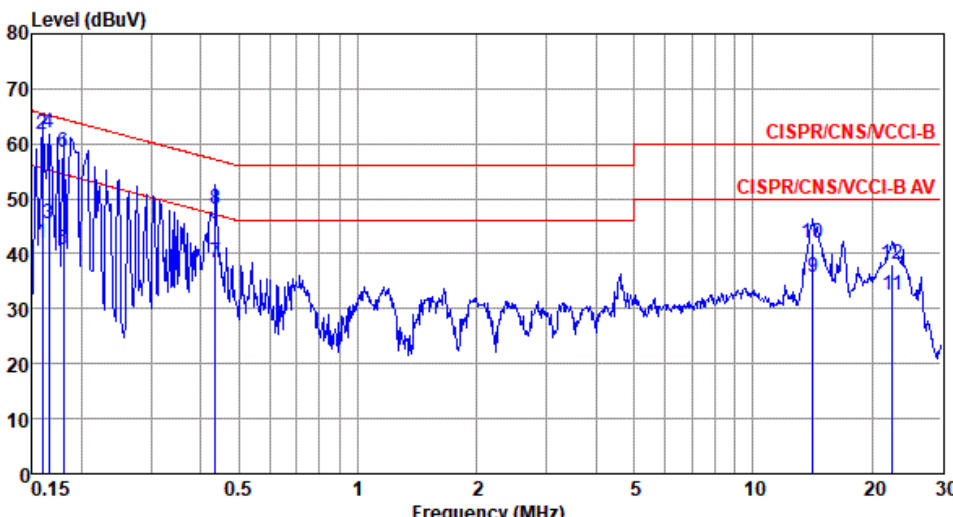
3.1.3 Test Setup



- 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

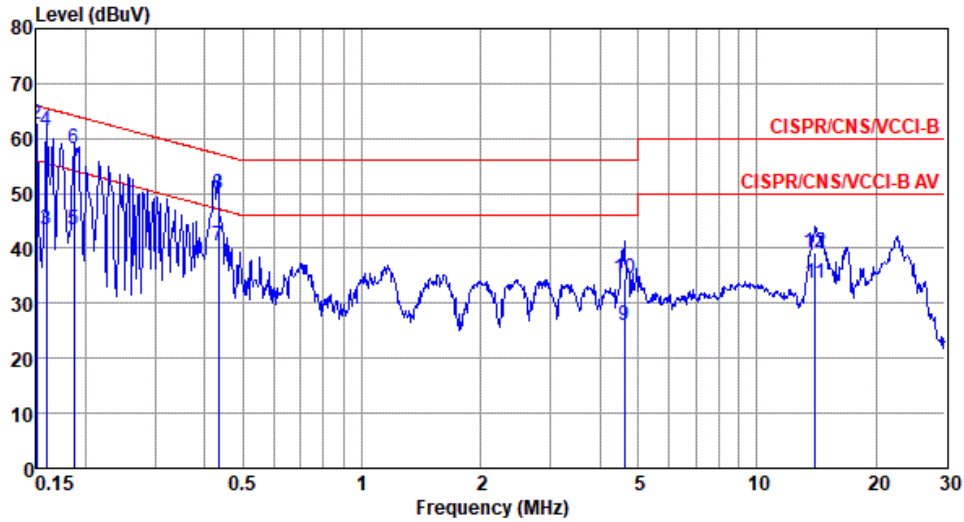
3.1.4 Test Result of Conducted Emissions

Configuration 1: POE Mode

Modulation / SF	Lora / 10	Test Freq. (MHz)	902.3																																																																																																																					
Power Phase	Line																																																																																																																							
<p>Test by : Alex Tsai Temperature: 22°C Humidity: 61%</p>																																																																																																																								
																																																																																																																								
<table border="1"> <thead> <tr> <th></th> <th>Freq MHz</th> <th>Level dBuV</th> <th>Limit Line dBuV</th> <th>Over Limit dB</th> <th>Read Level dBuV</th> <th>Factor dB</th> <th>Cable loss dB</th> <th>Remark</th> </tr> </thead> <tbody> <tr><td>1</td><td>0.159</td><td>41.89</td><td>55.52</td><td>-13.63</td><td>32.20</td><td>9.64</td><td>0.05</td><td>Average</td></tr> <tr><td>2</td><td>0.159</td><td>61.70</td><td>65.52</td><td>-3.82</td><td>52.01</td><td>9.64</td><td>0.05</td><td>QP</td></tr> <tr><td>3</td><td>0.165</td><td>45.42</td><td>55.21</td><td>-9.79</td><td>35.73</td><td>9.64</td><td>0.05</td><td>Average</td></tr> <tr><td>4*</td><td>0.165</td><td>61.95</td><td>65.21</td><td>-3.26</td><td>52.26</td><td>9.64</td><td>0.05</td><td>QP</td></tr> <tr><td>5</td><td>0.180</td><td>40.76</td><td>54.50</td><td>-13.74</td><td>31.07</td><td>9.63</td><td>0.06</td><td>Average</td></tr> <tr><td>6</td><td>0.180</td><td>58.45</td><td>64.50</td><td>-6.05</td><td>48.76</td><td>9.63</td><td>0.06</td><td>QP</td></tr> <tr><td>7</td><td>0.435</td><td>38.44</td><td>47.15</td><td>-8.71</td><td>28.73</td><td>9.63</td><td>0.08</td><td>Average</td></tr> <tr><td>8</td><td>0.435</td><td>48.09</td><td>57.15</td><td>-9.06</td><td>38.38</td><td>9.63</td><td>0.08</td><td>QP</td></tr> <tr><td>9</td><td>14.213</td><td>35.66</td><td>50.00</td><td>-14.34</td><td>25.38</td><td>9.71</td><td>0.57</td><td>Average</td></tr> <tr><td>10</td><td>14.213</td><td>41.85</td><td>60.00</td><td>-18.15</td><td>31.57</td><td>9.71</td><td>0.57</td><td>QP</td></tr> <tr><td>11</td><td>22.535</td><td>32.56</td><td>50.00</td><td>-17.44</td><td>22.18</td><td>9.69</td><td>0.69</td><td>Average</td></tr> <tr><td>12</td><td>22.535</td><td>38.04</td><td>60.00</td><td>-21.96</td><td>27.66</td><td>9.69</td><td>0.69</td><td>QP</td></tr> </tbody> </table>					Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark	1	0.159	41.89	55.52	-13.63	32.20	9.64	0.05	Average	2	0.159	61.70	65.52	-3.82	52.01	9.64	0.05	QP	3	0.165	45.42	55.21	-9.79	35.73	9.64	0.05	Average	4*	0.165	61.95	65.21	-3.26	52.26	9.64	0.05	QP	5	0.180	40.76	54.50	-13.74	31.07	9.63	0.06	Average	6	0.180	58.45	64.50	-6.05	48.76	9.63	0.06	QP	7	0.435	38.44	47.15	-8.71	28.73	9.63	0.08	Average	8	0.435	48.09	57.15	-9.06	38.38	9.63	0.08	QP	9	14.213	35.66	50.00	-14.34	25.38	9.71	0.57	Average	10	14.213	41.85	60.00	-18.15	31.57	9.71	0.57	QP	11	22.535	32.56	50.00	-17.44	22.18	9.69	0.69	Average	12	22.535	38.04	60.00	-21.96	27.66	9.69	0.69	QP
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Modulation / SF	Lora / 10	Test Freq. (MHz)	902.3
Power Phase	Neutral		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%

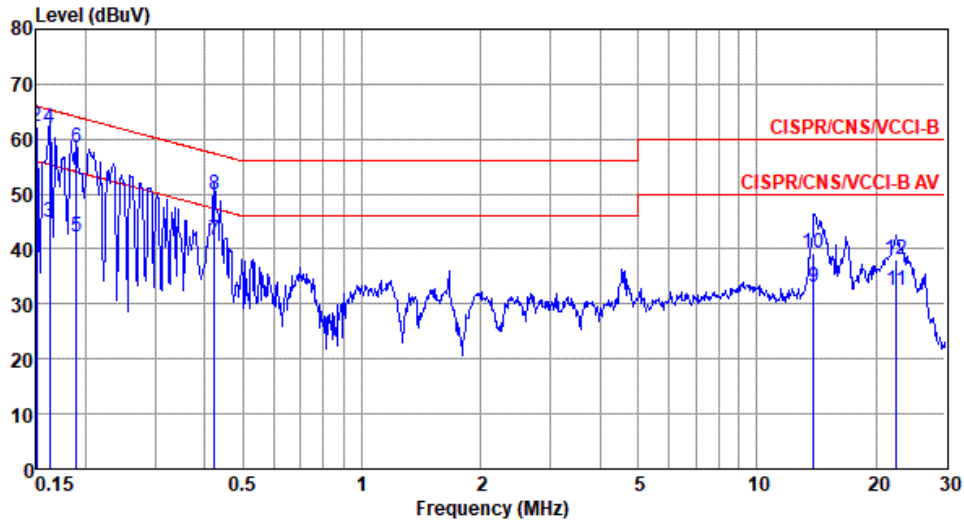


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.150	46.14	56.00	-9.86	36.43	9.66	0.05	Average
2*	0.150	62.70	66.00	-3.30	52.99	9.66	0.05	QP
3	0.159	43.33	55.52	-12.19	33.62	9.66	0.05	Average
4	0.159	61.39	65.52	-4.13	51.68	9.66	0.05	QP
5	0.186	43.25	54.20	-10.95	33.54	9.65	0.06	Average
6	0.186	58.17	64.20	-6.03	48.46	9.65	0.06	QP
7	0.433	40.37	47.20	-6.83	30.64	9.65	0.08	Average
8	0.433	49.88	57.20	-7.32	40.15	9.65	0.08	QP
9	4.622	25.92	46.00	-20.08	15.93	9.68	0.31	Average
10	4.622	34.53	56.00	-21.47	24.54	9.68	0.31	QP
11	14.063	33.69	50.00	-16.31	23.34	9.78	0.57	Average
12	14.063	39.34	60.00	-20.66	28.99	9.78	0.57	QP

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	908.5
Power Phase	Line		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%

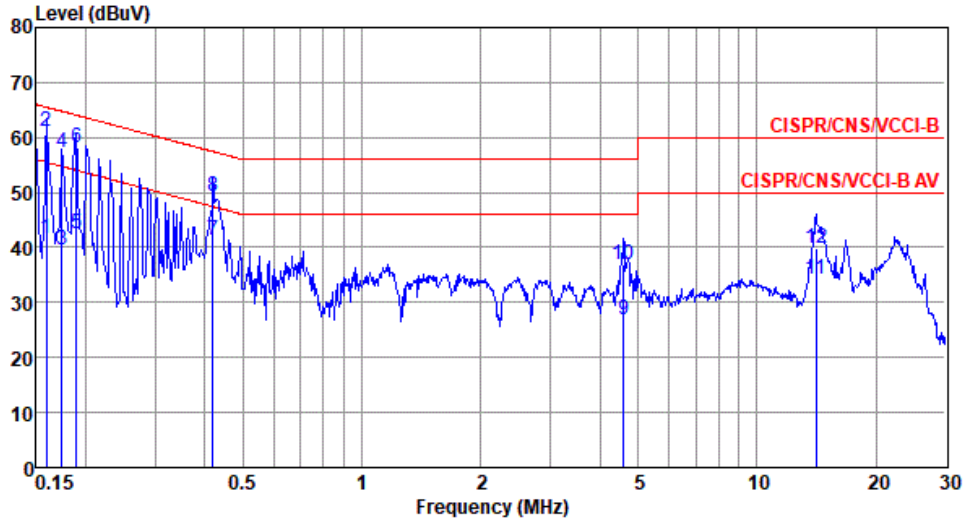


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.150	43.32	56.00	-12.68	33.63	9.64	0.05	Average
2	0.150	62.19	66.00	-3.81	52.50	9.64	0.05	QP
3	0.162	44.87	55.34	-10.47	35.18	9.64	0.05	Average
4*	0.162	62.05	65.34	-3.29	52.36	9.64	0.05	QP
5	0.189	42.25	54.06	-11.81	32.56	9.63	0.06	Average
6	0.189	58.40	64.06	-5.66	48.71	9.63	0.06	QP
7	0.424	41.63	47.37	-5.74	31.92	9.63	0.08	Average
8	0.424	49.90	57.37	-7.47	40.19	9.63	0.08	QP
9	13.915	33.20	50.00	-16.80	22.94	9.70	0.56	Average
10	13.915	39.13	60.00	-20.87	28.87	9.70	0.56	QP
11	22.535	32.55	50.00	-17.45	22.17	9.69	0.69	Average
12	22.535	38.03	60.00	-21.97	27.65	9.69	0.69	QP

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	908.5
Power Phase	Neutral		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%

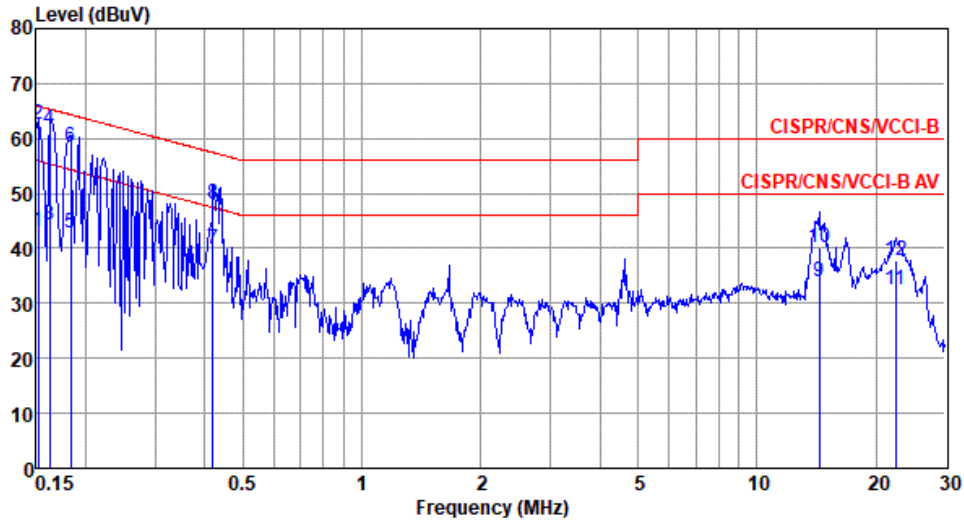


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.159	41.64	55.52	-13.88	31.93	9.66	0.05	Average
2*	0.159	61.08	65.52	-4.44	51.37	9.66	0.05	QP
3	0.174	39.54	54.77	-15.23	29.83	9.65	0.06	Average
4	0.174	57.40	64.77	-7.37	47.69	9.65	0.06	QP
5	0.189	42.61	54.06	-11.45	32.90	9.65	0.06	Average
6	0.189	58.03	64.06	-6.03	48.32	9.65	0.06	QP
7	0.419	41.30	47.46	-6.16	31.57	9.65	0.08	Average
8	0.419	49.22	57.46	-8.24	39.49	9.65	0.08	QP
9	4.598	26.83	46.00	-19.17	16.84	9.68	0.31	Average
10	4.598	37.02	56.00	-18.98	27.03	9.68	0.31	QP
11	14.138	34.38	50.00	-15.62	24.03	9.78	0.57	Average
12	14.138	39.95	60.00	-20.05	29.60	9.78	0.57	QP

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	914.9
Power Phase	Line		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%

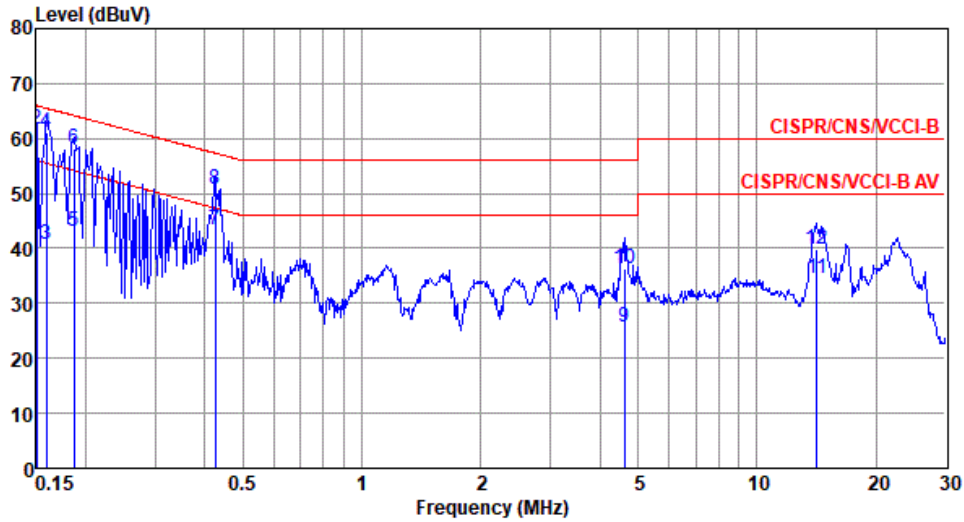


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.152	42.96	55.91	-12.95	33.27	9.64	0.05	Average
2*	0.152	62.48	65.91	-3.43	52.79	9.64	0.05	QP
3	0.162	44.40	55.34	-10.94	34.71	9.64	0.05	Average
4	0.162	61.84	65.34	-3.50	52.15	9.64	0.05	QP
5	0.183	42.77	54.33	-11.56	33.08	9.63	0.06	Average
6	0.183	58.54	64.33	-5.79	48.85	9.63	0.06	QP
7	0.419	39.91	47.46	-7.55	30.20	9.63	0.08	Average
8	0.419	48.01	57.46	-9.45	38.30	9.63	0.08	QP
9	14.364	34.06	50.00	-15.94	23.77	9.71	0.58	Average
10	14.364	40.01	60.00	-19.99	29.72	9.71	0.58	QP
11	22.416	32.37	50.00	-17.63	21.99	9.69	0.69	Average
12	22.416	37.84	60.00	-22.16	27.46	9.69	0.69	QP

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	914.9
Power Phase	Neutral		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%



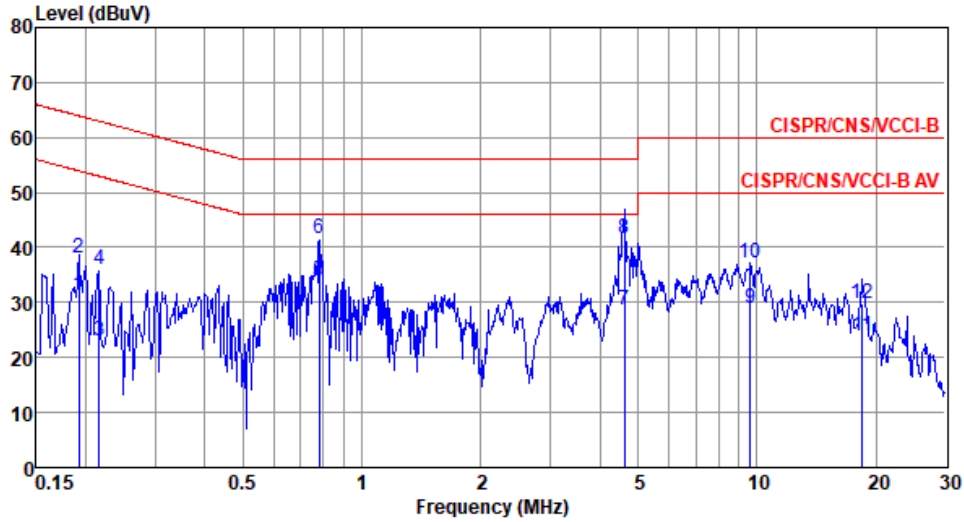
	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.150	44.32	56.00	-11.68	34.61	9.66	0.05	Average
2	0.150	61.68	66.00	-4.32	51.97	9.66	0.05	QP
3	0.159	40.75	55.52	-14.77	31.04	9.66	0.05	Average
4	0.159	61.15	65.52	-4.37	51.44	9.66	0.05	QP
5	0.186	43.23	54.20	-10.97	33.52	9.65	0.06	Average
6	0.186	58.18	64.20	-6.02	48.47	9.65	0.06	QP
7*	0.426	43.36	47.33	-3.97	33.63	9.65	0.08	Average
8	0.426	50.86	57.33	-6.47	41.13	9.65	0.08	QP
9	4.622	25.80	46.00	-20.20	15.81	9.68	0.31	Average
10	4.622	36.31	56.00	-19.69	26.32	9.68	0.31	QP
11	14.213	34.57	50.00	-15.43	24.21	9.79	0.57	Average
12	14.213	39.97	60.00	-20.03	29.61	9.79	0.57	QP

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

Configuration 2 : Adapter Mode

Modulation / SF	Lora / 10	Test Freq. (MHz)	902.3
Power Phase	Line		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%

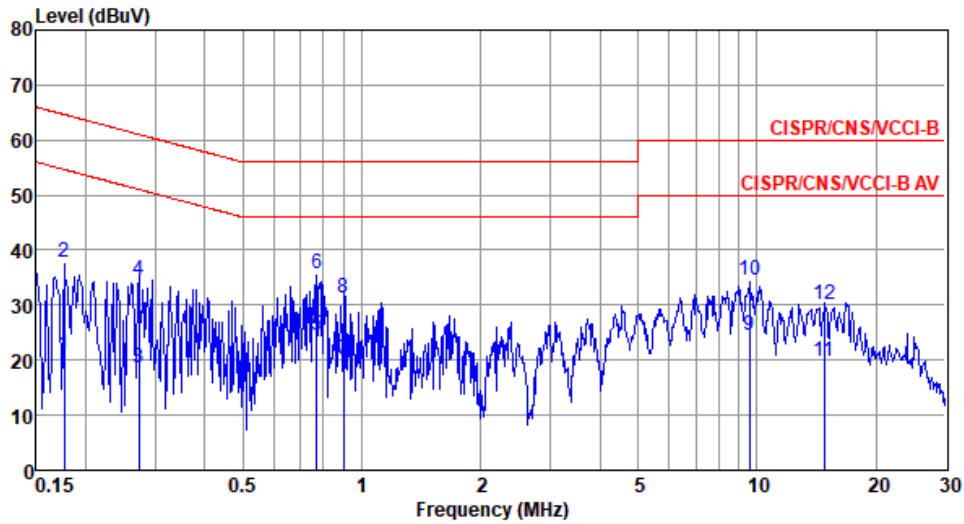


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.192	31.24	53.93	-22.69	21.36	9.82	0.06	Average
2	0.192	37.94	63.93	-25.99	28.06	9.82	0.06	QP
3	0.216	23.00	52.96	-29.96	13.11	9.83	0.06	Average
4	0.216	35.97	62.96	-26.99	26.08	9.83	0.06	QP
5*	0.779	33.94	46.00	-12.06	23.88	9.95	0.11	Average
6	0.779	41.63	56.00	-14.37	31.57	9.95	0.11	QP
7	4.622	28.62	46.00	-17.38	18.28	10.03	0.31	Average
8	4.622	41.60	56.00	-14.40	31.26	10.03	0.31	QP
9	9.603	29.03	50.00	-20.97	18.54	10.09	0.40	Average
10	9.603	37.17	60.00	-22.83	26.68	10.09	0.40	QP
11	18.524	24.00	50.00	-26.00	13.08	10.27	0.65	Average
12	18.524	29.81	60.00	-30.19	18.89	10.27	0.65	QP

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	902.3
Power Phase	Neutral		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%

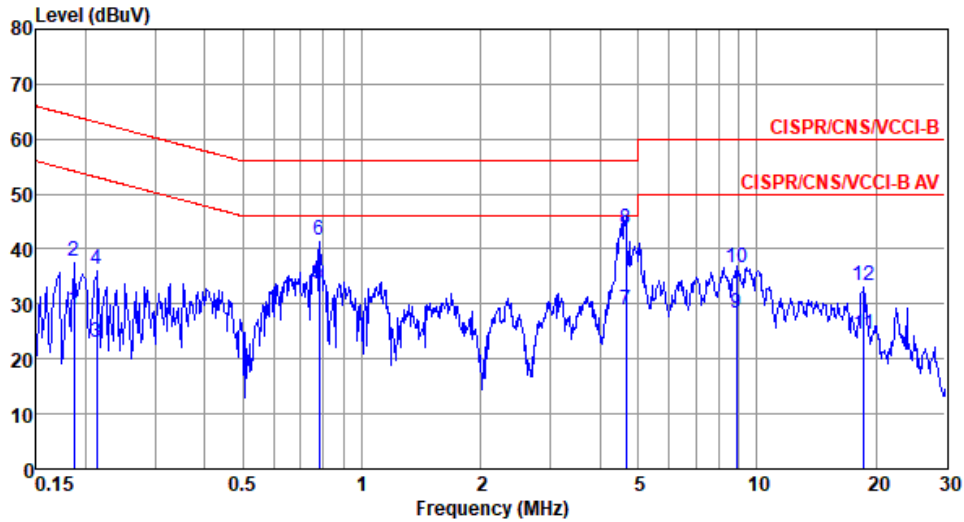


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.177	20.83	54.64	-33.81	10.97	9.80	0.06	Average
2	0.177	37.91	64.64	-26.73	28.05	9.80	0.06	QP
3	0.273	18.73	51.03	-32.30	8.85	9.81	0.07	Average
4	0.273	34.56	61.03	-26.47	24.68	9.81	0.07	QP
5	0.767	24.40	46.00	-21.60	14.45	9.84	0.11	Average
6*	0.767	35.62	56.00	-20.38	25.67	9.84	0.11	QP
7	0.899	19.96	46.00	-26.04	9.99	9.85	0.12	Average
8	0.899	31.43	56.00	-24.57	21.46	9.85	0.12	QP
9	9.552	24.40	50.00	-25.60	13.96	10.05	0.39	Average
10	9.552	34.44	60.00	-25.56	24.00	10.05	0.39	QP
11	14.828	19.69	50.00	-30.31	8.94	10.16	0.59	Average
12	14.828	30.01	60.00	-29.99	19.26	10.16	0.59	QP

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	908.5
Power Phase	Line		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%

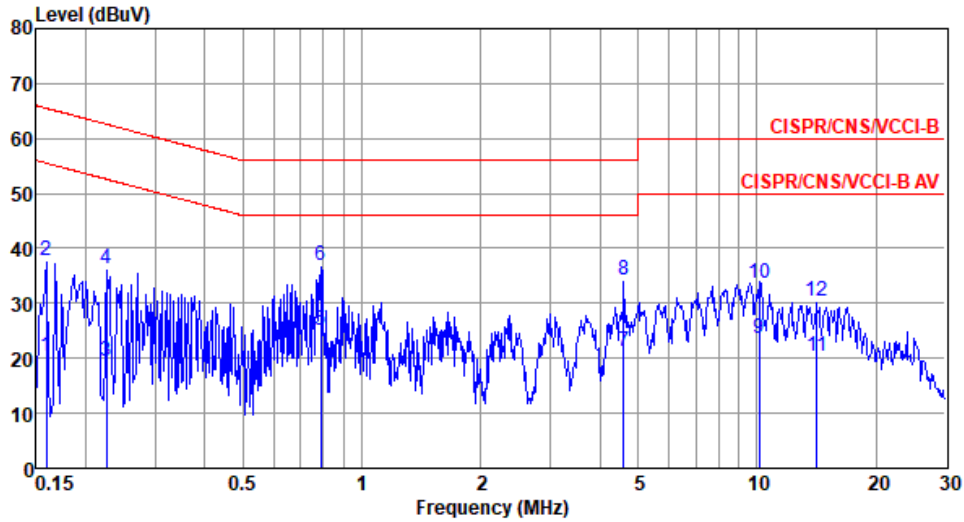


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.186	28.86	54.20	-25.34	18.98	9.82	0.06	Average
2	0.186	37.77	64.20	-26.43	27.89	9.82	0.06	QP
3	0.213	23.12	53.10	-29.98	13.24	9.82	0.06	Average
4	0.213	36.28	63.10	-26.82	26.40	9.82	0.06	QP
5*	0.779	33.78	46.00	-12.22	23.72	9.95	0.11	Average
6	0.779	41.60	56.00	-14.40	31.54	9.95	0.11	QP
7	4.672	29.00	46.00	-17.00	18.66	10.03	0.31	Average
8	4.672	43.75	56.00	-12.25	33.41	10.03	0.31	QP
9	8.869	28.39	50.00	-21.61	17.92	10.08	0.39	Average
10	8.869	36.61	60.00	-23.39	26.14	10.08	0.39	QP
11	18.622	24.59	50.00	-25.41	13.67	10.27	0.65	Average
12	18.622	33.34	60.00	-26.66	22.42	10.27	0.65	QP

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	908.5
Power Phase	Neutral		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%

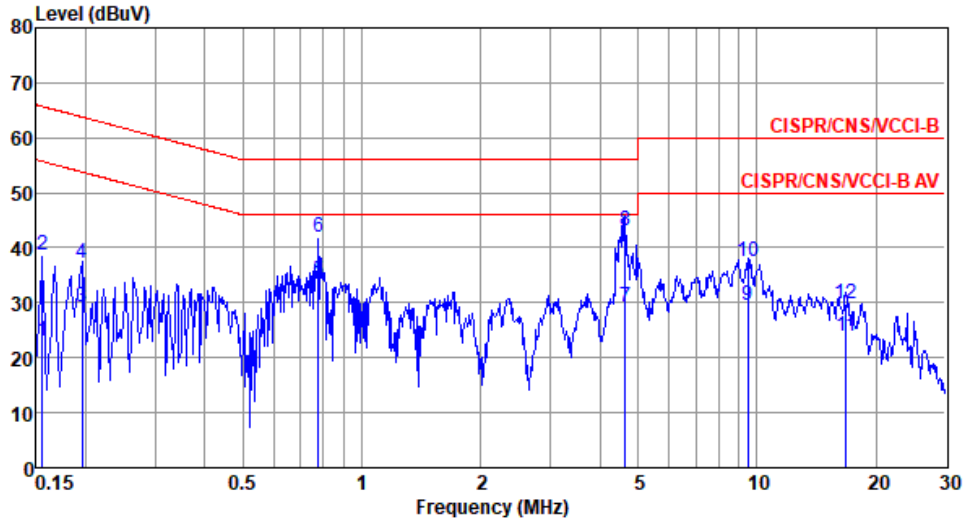


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.159	20.44	55.52	-35.08	10.60	9.79	0.05	Average
2	0.159	37.84	65.52	-27.68	28.00	9.79	0.05	QP
3	0.226	19.52	52.61	-33.09	9.65	9.81	0.06	Average
4	0.226	36.23	62.61	-26.38	26.36	9.81	0.06	QP
5	0.788	25.09	46.00	-20.91	15.14	9.84	0.11	Average
6*	0.788	37.04	56.00	-18.96	27.09	9.84	0.11	QP
7	4.598	21.17	46.00	-24.83	10.91	9.95	0.31	Average
8	4.598	34.23	56.00	-21.77	23.97	9.95	0.31	QP
9	10.125	23.66	50.00	-26.34	13.19	10.06	0.41	Average
10	10.125	33.70	60.00	-26.30	23.23	10.06	0.41	QP
11	14.213	20.33	50.00	-29.67	9.61	10.15	0.57	Average
12	14.213	30.53	60.00	-29.47	19.81	10.15	0.57	QP

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	914.9
Power Phase	Line		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%

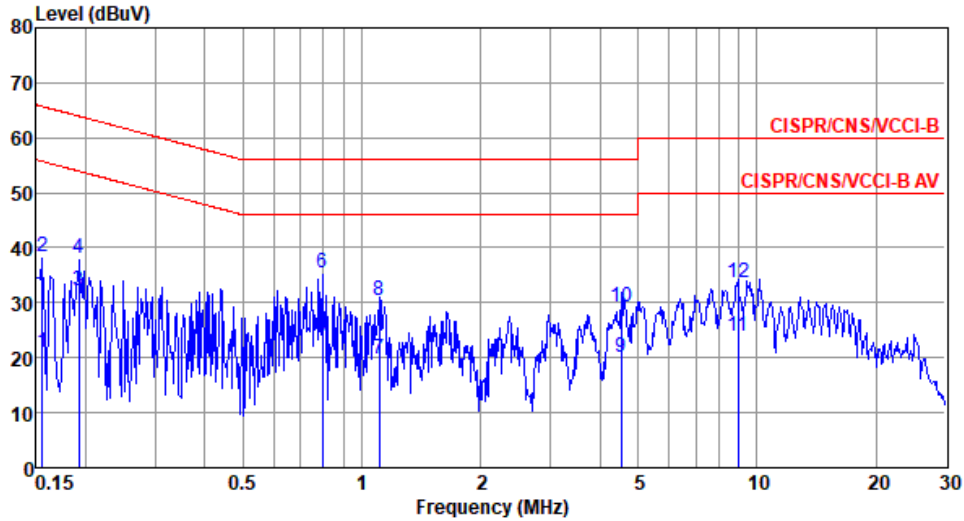


	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.156	23.04	55.69	-32.65	13.18	9.81	0.05	Average
2	0.156	38.58	65.69	-27.11	28.72	9.81	0.05	QP
3	0.195	29.10	53.80	-24.70	19.22	9.82	0.06	Average
4	0.195	37.19	63.80	-26.61	27.31	9.82	0.06	QP
5*	0.775	33.90	46.00	-12.10	23.85	9.94	0.11	Average
6	0.775	42.02	56.00	-13.98	31.97	9.94	0.11	QP
7	4.647	29.19	46.00	-16.81	18.85	10.03	0.31	Average
8	4.647	43.17	56.00	-12.83	32.83	10.03	0.31	QP
9	9.502	29.40	50.00	-20.60	18.92	10.09	0.39	Average
10	9.502	37.38	60.00	-22.62	26.90	10.09	0.39	QP
11	16.839	23.98	50.00	-26.02	13.11	10.24	0.63	Average
12	16.839	29.72	60.00	-30.28	18.85	10.24	0.63	QP

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	914.9
Power Phase	Neutral		

Test by : Alex Tsai Temperature: 22°C Humidity: 61%



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	Factor dB	Cable loss dB	Remark
1	0.156	21.07	55.69	-34.62	11.23	9.79	0.05	Average
2	0.156	38.41	65.69	-27.28	28.57	9.79	0.05	QP
3	0.192	32.09	53.93	-21.84	22.23	9.80	0.06	Average
4	0.192	38.03	63.93	-25.90	28.17	9.80	0.06	QP
5	0.796	23.98	46.00	-22.02	14.02	9.85	0.11	Average
6*	0.796	35.35	56.00	-20.65	25.39	9.85	0.11	QP
7	1.106	19.83	46.00	-26.17	9.84	9.86	0.13	Average
8	1.106	30.53	56.00	-25.47	20.54	9.86	0.13	QP
9	4.525	20.13	46.00	-25.87	9.88	9.95	0.30	Average
10	4.525	29.24	56.00	-26.76	18.99	9.95	0.30	QP
11	8.964	24.00	50.00	-26.00	13.57	10.04	0.39	Average
12	8.964	33.69	60.00	-26.31	23.26	10.04	0.39	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 Unwanted Emissions into Restricted Frequency Bands

3.2.1 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.

3.2.2 Test Procedures

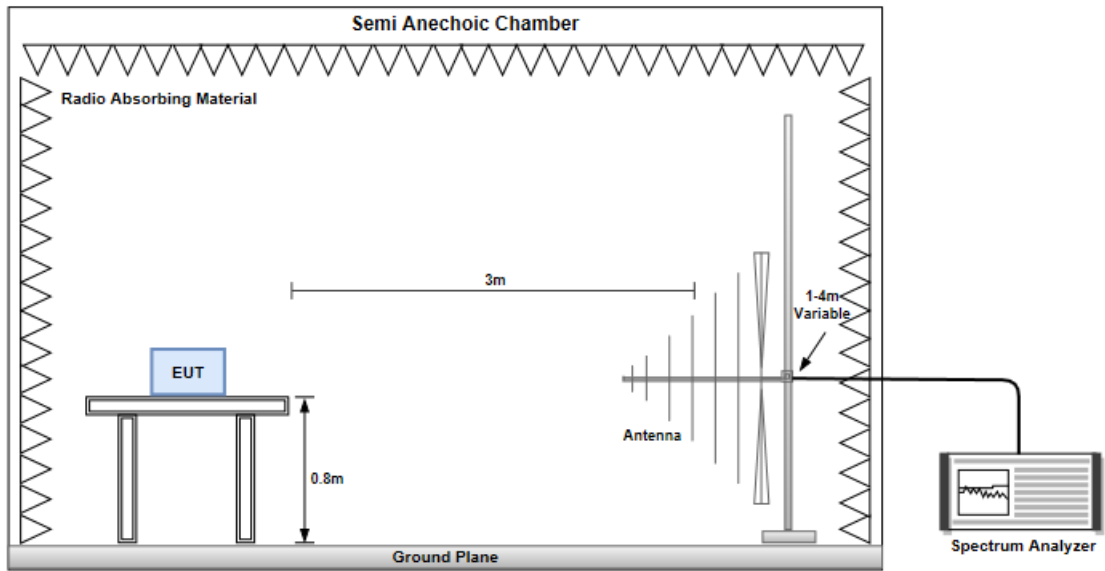
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

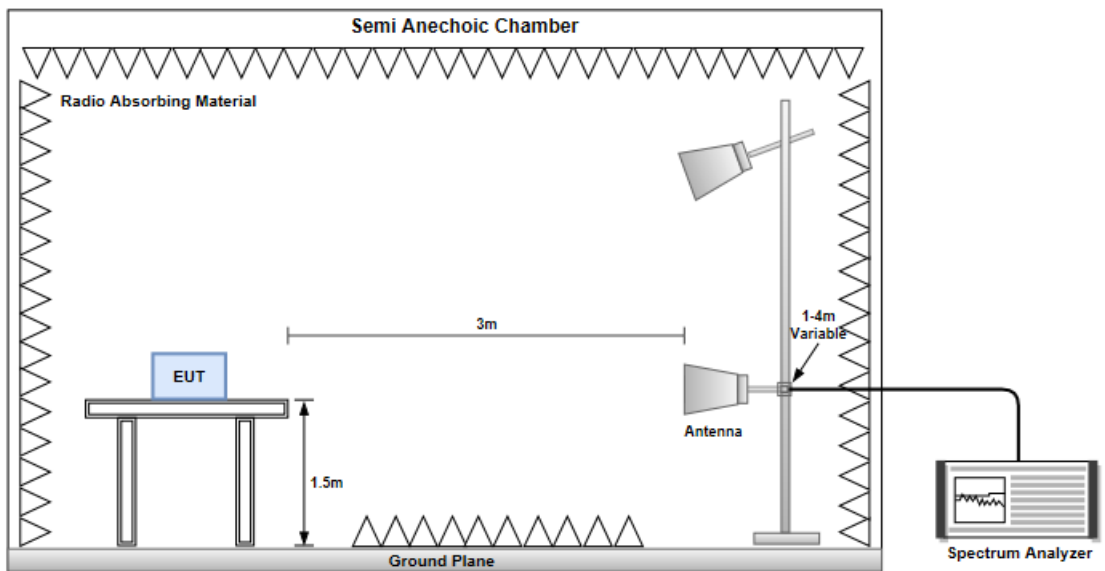
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.2.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz

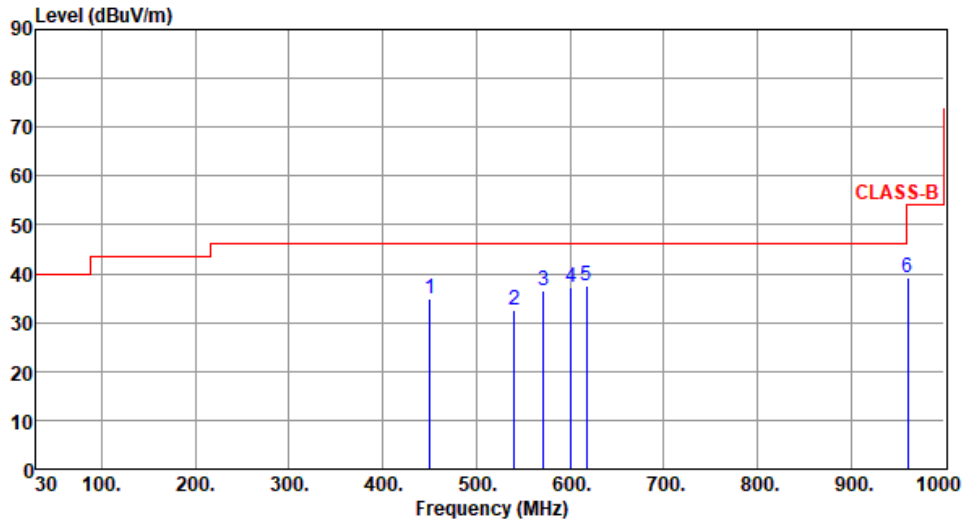


Configuration 1: POE Mode

3.2.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation / SF	Lora / 10	Test Freq. (MHz)	902.3
Polarization	Horizontal		

Test By : Akun Chung Temperature(°C): 25 Humidity(%): 64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	450.40	34.94	46.00	-11.06	39.16	-4.22	Peak	---	---
2	540.80	32.51	46.00	-13.49	35.12	-2.61	Peak	---	---
3	572.00	36.65	46.00	-9.35	38.48	-1.83	Peak	---	---
4	600.80	37.28	46.00	-8.72	38.36	-1.08	Peak	---	---
5	617.60	37.62	46.00	-8.38	38.21	-0.59	Peak	---	---
6	960.80	39.27	54.00	-14.73	34.48	4.79	Peak	---	---

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

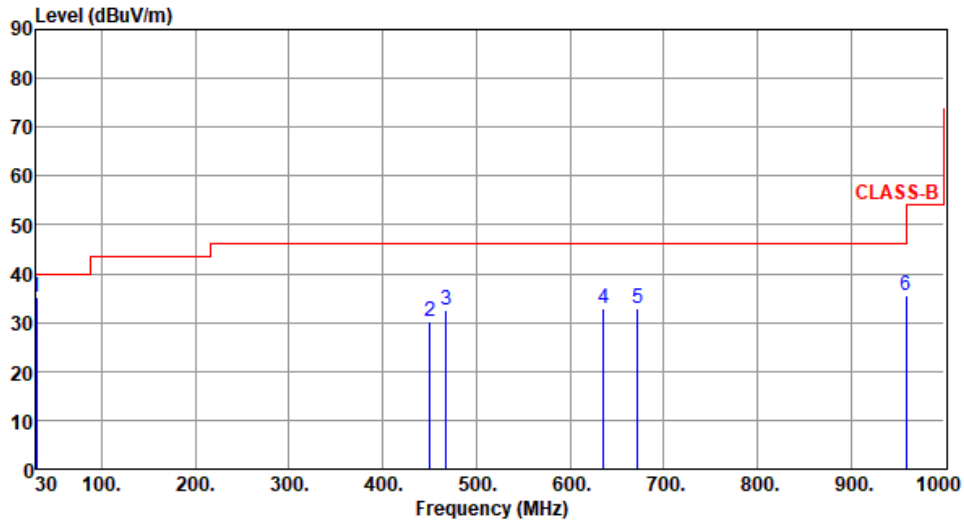
*Factor includes antenna factor , cable loss and amplifier gain

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.

Modulation / SF	Lora / 10	Test Freq. (MHz)	902.3
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.25	35.25	40.00	-4.75	44.81	-9.56	Peak	---	---
2	450.40	30.18	46.00	-15.82	34.40	-4.22	Peak	---	---
3	468.00	32.51	46.00	-13.49	36.40	-3.89	Peak	---	---
4	636.00	32.93	46.00	-13.07	33.28	-0.35	Peak	---	---
5	672.00	32.84	46.00	-13.16	33.07	-0.23	Peak	---	---
6	959.20	35.54	46.00	-10.46	30.78	4.76	Peak	---	---

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

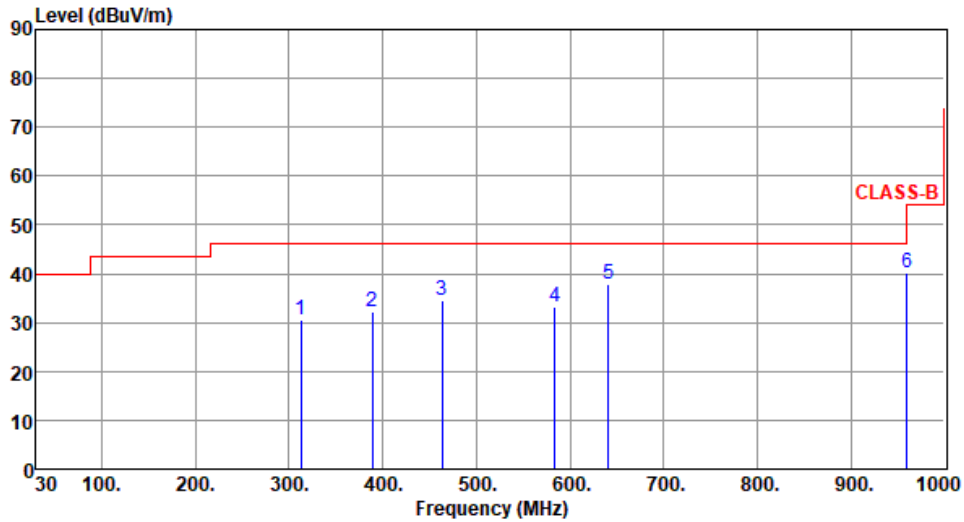
*Factor includes antenna factor , cable loss and amplifier gain

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.

Modulation / SF	Lora / 10	Test Freq. (MHz)	908.5
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	312.80	30.49	46.00	-15.51	38.13	-7.64	Peak	---	---
2	388.80	32.27	46.00	-13.73	38.24	-5.97	Peak	---	---
3	463.20	34.48	46.00	-11.52	38.45	-3.97	Peak	---	---
4	584.00	33.17	46.00	-12.83	34.62	-1.45	Peak	---	---
5	640.80	37.93	46.00	-8.07	38.19	-0.26	Peak	---	---
6	960.00	40.05	46.00	-5.95	35.28	4.77	Peak	---	---

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

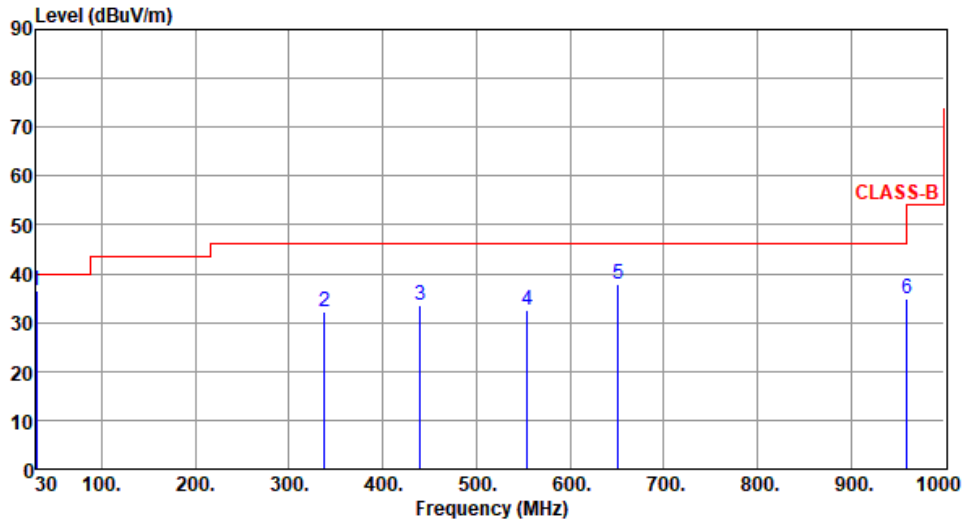
*Factor includes antenna factor , cable loss and amplifier gain

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.

Modulation / SF	Lora / 10	Test Freq. (MHz)	908.5
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.59	36.42	40.00	-3.58	46.08	-9.66	Peak	---	---
2	337.60	32.25	46.00	-13.75	39.26	-7.01	Peak	---	---
3	440.00	33.50	46.00	-12.50	38.07	-4.57	Peak	---	---
4	554.40	32.41	46.00	-13.59	34.64	-2.23	Peak	---	---
5	651.20	37.92	46.00	-8.08	38.14	-0.22	Peak	---	---
6	960.00	34.72	46.00	-11.28	29.95	4.77	Peak	---	---

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

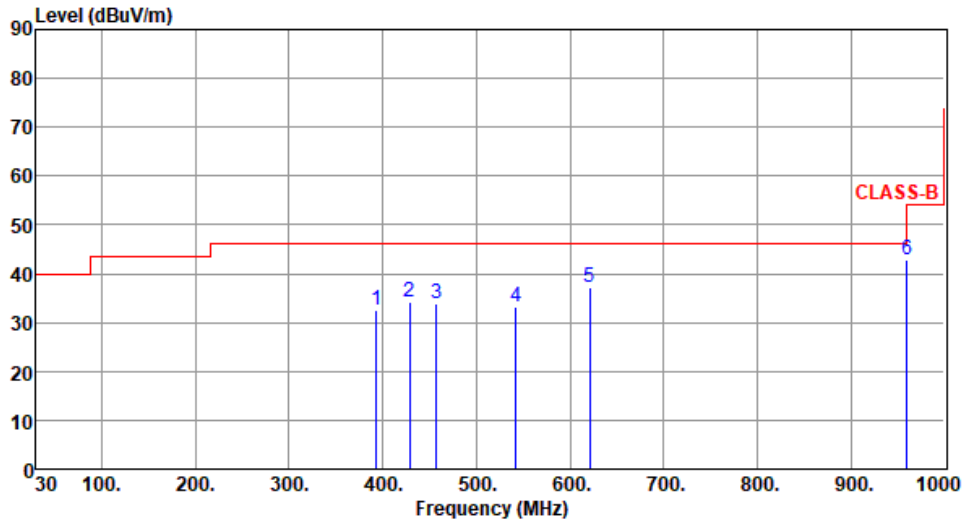
*Factor includes antenna factor , cable loss and amplifier gain

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.

Modulation / SF	Lora / 10	Test Freq. (MHz)	914.9
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	393.60	32.44	46.00	-13.56	38.30	-5.86	Peak	---	---
2	428.80	34.24	46.00	-11.76	39.10	-4.86	Peak	---	---
3	457.60	34.03	46.00	-11.97	38.14	-4.11	Peak	---	---
4	542.40	33.26	46.00	-12.74	35.81	-2.55	Peak	---	---
5	620.80	37.17	46.00	-8.83	37.70	-0.53	Peak	---	---
6	960.00	42.89	46.00	-3.11	38.12	4.77	Peak	---	---

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

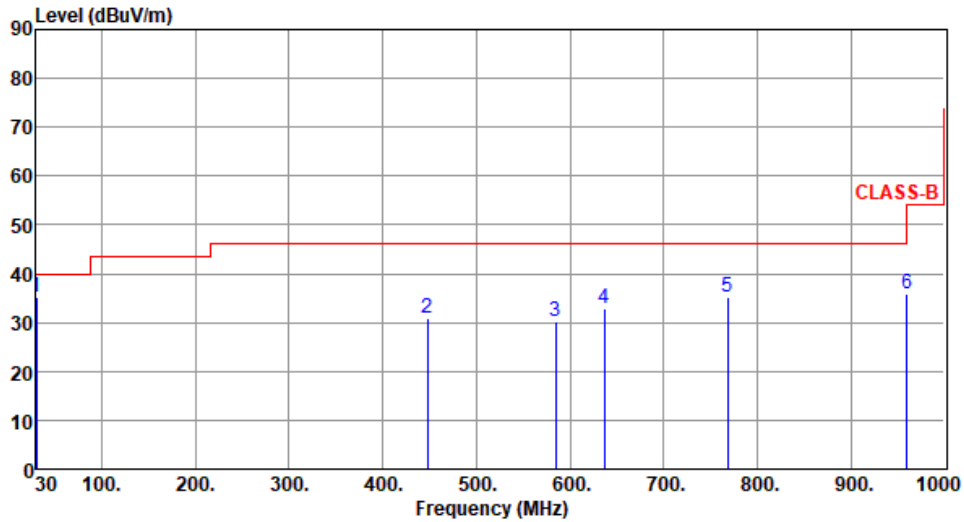
*Factor includes antenna factor , cable loss and amplifier gain

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.

Modulation / SF	Lora / 10	Test Freq. (MHz)	914.9
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.18	35.22	40.00	-4.78	44.75	-9.53	Peak	---	---
2	448.00	30.93	46.00	-15.07	35.30	-4.37	Peak	---	---
3	584.80	30.17	46.00	-15.83	31.59	-1.42	Peak	---	---
4	636.80	32.91	46.00	-13.09	33.24	-0.33	Peak	---	---
5	768.00	35.23	46.00	-10.77	33.33	1.90	Peak	---	---
6	960.00	35.70	46.00	-10.30	30.93	4.77	Peak	---	---

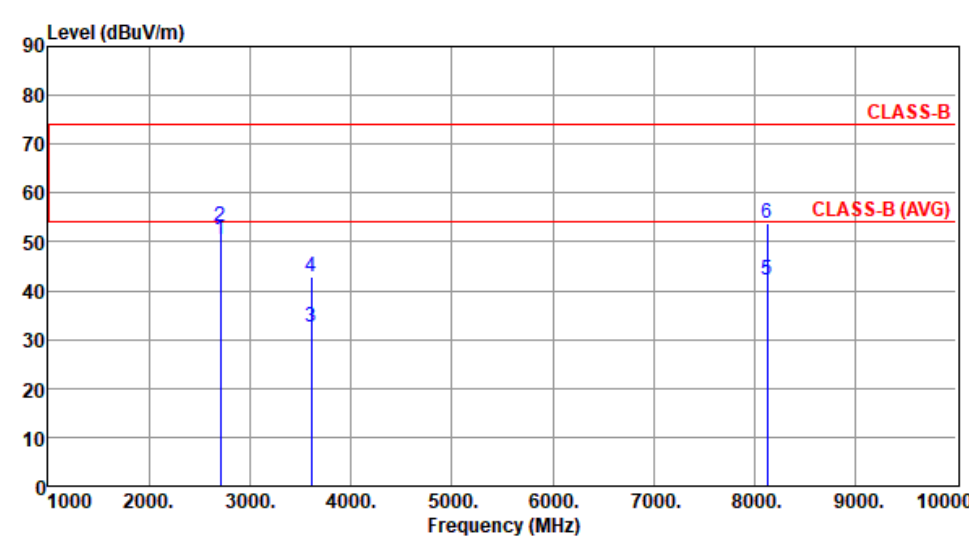
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

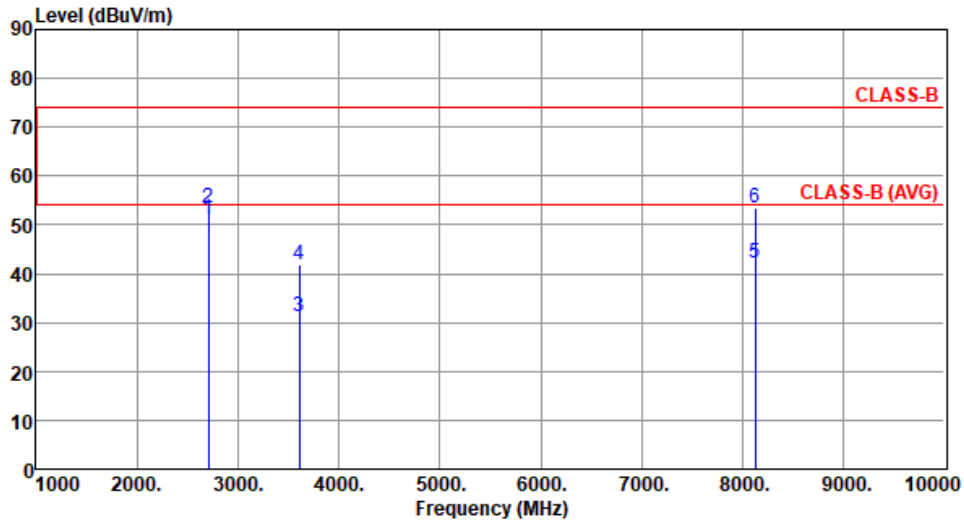
Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

3.2.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation / SF	Lora / 10	Test Freq. (MHz)	902.3						
Polarization	Horizontal								
Test By :BRAD WU		Temperature(°C):21		Humidity(%):66					
									
	Freq.	Emission level	Limit	Margin	SA reading	Factor	Remark	ANT High	Turn Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2706.90	50.53	54.00	-3.47	22.79	27.74	Average	298	244
2	2706.90	52.98	74.00	-21.02	25.24	27.74	Peak	298	244
3	3609.20	32.44	54.00	-21.56	3.32	29.12	Average	109	28
4	3609.20	42.68	74.00	-31.32	13.56	29.12	Peak	109	28
5	8120.70	42.26	54.00	-11.74	5.44	36.82	Average	105	41
6	8120.70	53.64	74.00	-20.36	16.82	36.82	Peak	105	41
<p>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).</p>									

Modulation / SF	Lora / 10	Test Freq. (MHz)	902.3
Polarization	Vertical		

Test By :BRAD WU Temperature(°C):21 Humidity(%):66



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2706.90	51.28	54.00	-2.72	23.54	27.74	Average	254	179
2	2706.90	53.49	74.00	-20.51	25.75	27.74	Peak	254	179
3	3609.20	31.22	54.00	-22.78	2.10	29.12	Average	103	58
4	3609.20	41.86	74.00	-32.14	12.74	29.12	Peak	103	58
5	8120.70	42.24	54.00	-11.76	5.42	36.82	Average	101	66
6	8120.70	53.55	74.00	-20.45	16.73	36.82	Peak	101	66

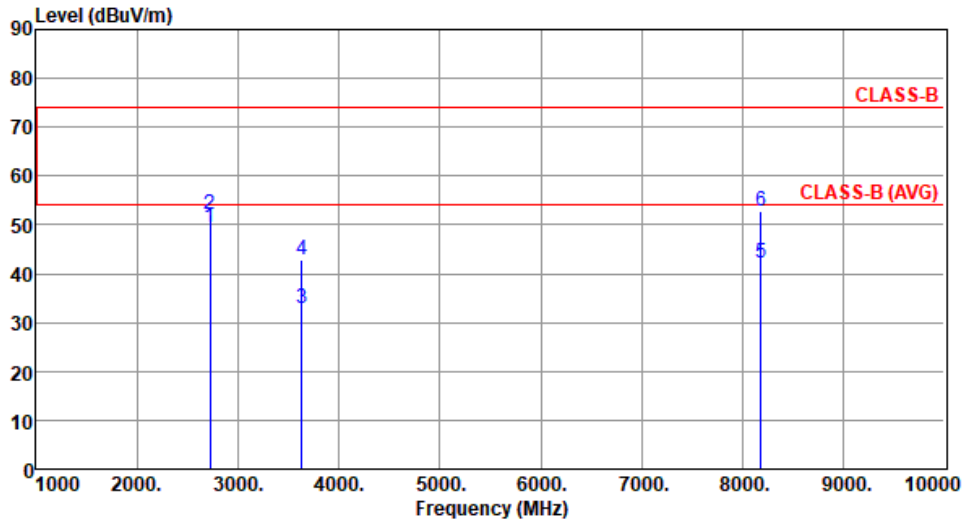
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	908.5
Polarization	Horizontal		

Test By :BRAD WU Temperature(°C):21 Humidity(%):66



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2725.50	49.61	54.00	-4.39	21.76	27.85	Average	292	245
2	2725.50	52.18	74.00	-21.82	24.33	27.85	Peak	292	245
3	3634.00	32.89	54.00	-21.11	3.72	29.17	Average	105	34
4	3634.00	42.83	74.00	-31.17	13.66	29.17	Peak	105	34
5	8176.50	42.11	54.00	-11.89	5.46	36.65	Average	100	31
6	8176.50	52.95	74.00	-21.05	16.30	36.65	Peak	100	31

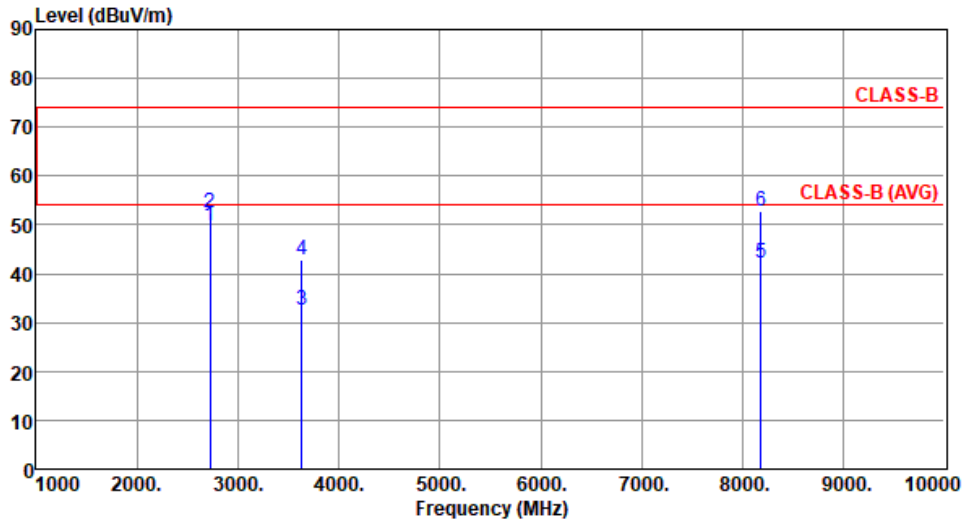
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	908.5
Polarization	Vertical		

Test By :BRAD WU Temperature(°C):21 Humidity(%):66

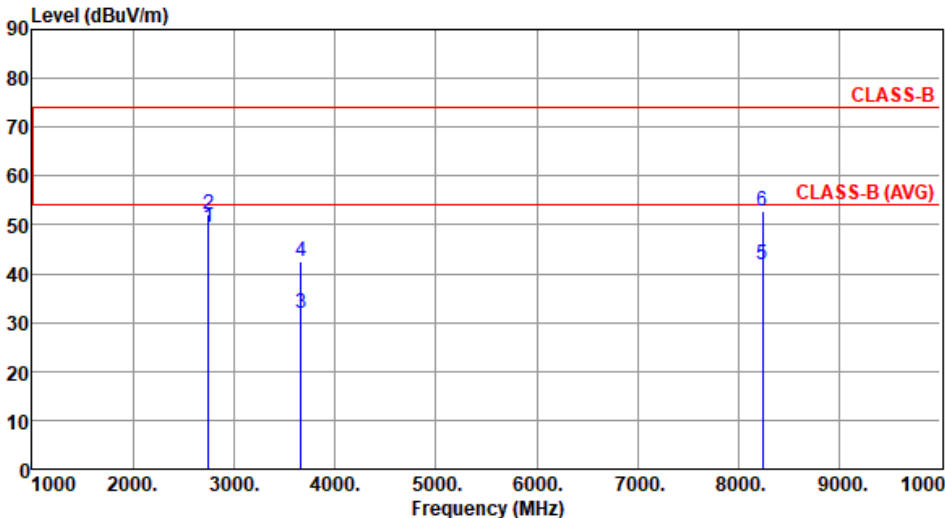


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2725.50	49.70	54.00	-4.30	21.85	27.85	Average	280	185
2	2725.50	52.41	74.00	-21.59	24.56	27.85	Peak	280	185
3	3634.00	32.63	54.00	-21.37	3.46	29.17	Average	100	21
4	3634.00	42.81	74.00	-31.19	13.64	29.17	Peak	100	21
5	8176.50	42.11	54.00	-11.89	5.46	36.65	Average	108	59
6	8176.50	52.85	74.00	-21.15	16.20	36.65	Peak	108	59

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

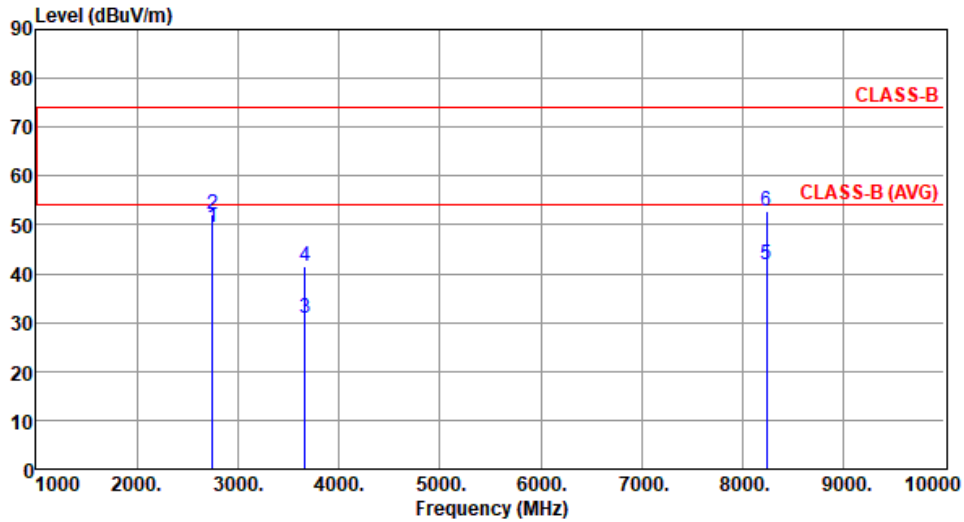
*Factor includes antenna factor , cable loss and amplifier gain

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

Modulation / SF	Lora / 10	Test Freq. (MHz)	914.9						
Polarization	Horizontal								
Test By :BRAD WU		Temperature(°C):21			Humidity(%):66				
									
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
	MHz	level	dBuV/m	dB	reading	dB		High	Table
		dBuV/m			dBuV			cm	deg
1	2744.70	49.45	54.00	-4.55	21.48	27.97	Average	292	240
2	2744.70	52.10	74.00	-21.90	24.13	27.97	Peak	292	240
3	3659.60	32.04	54.00	-21.96	2.86	29.18	Average	100	81
4	3659.60	42.56	74.00	-31.44	13.38	29.18	Peak	100	81
5	8234.10	41.81	54.00	-12.19	5.28	36.53	Average	106	25
6	8234.10	52.94	74.00	-21.06	16.41	36.53	Peak	106	25
<p>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).</p>									

Modulation / SF	Lora / 10	Test Freq. (MHz)	914.9
Polarization	Vertical		

Test By :BRAD WU Temperature(°C):21 Humidity(%):66



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2744.70	49.58	54.00	-4.42	21.61	27.97	Average	293	174
2	2744.70	52.19	74.00	-21.81	24.22	27.97	Peak	293	174
3	3659.60	30.95	54.00	-23.05	1.77	29.18	Average	107	48
4	3659.60	41.44	74.00	-32.56	12.26	29.18	Peak	107	48
5	8234.10	41.86	54.00	-12.14	5.33	36.53	Average	109	51
6	8234.10	52.94	74.00	-21.06	16.41	36.53	Peak	109	51

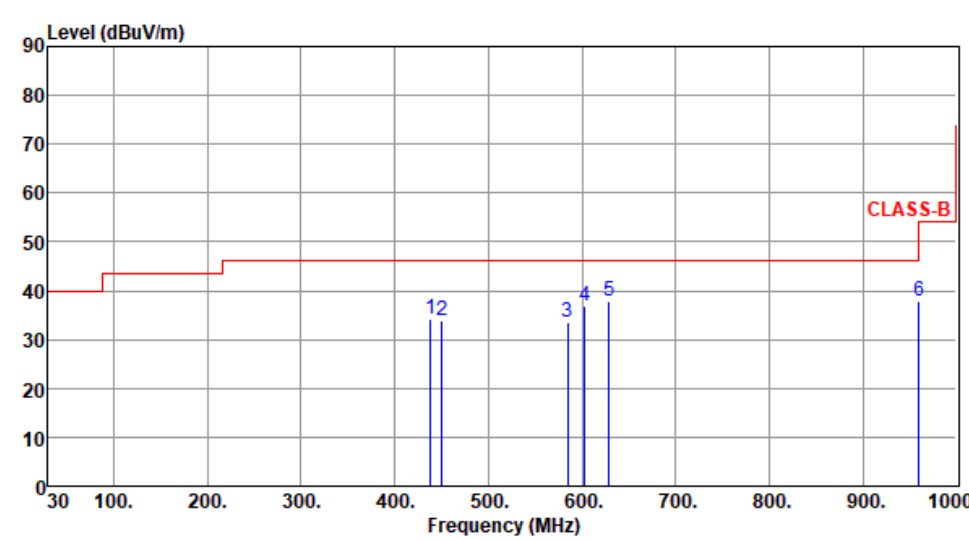
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

*Factor includes antenna factor , cable loss and amplifier gain

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

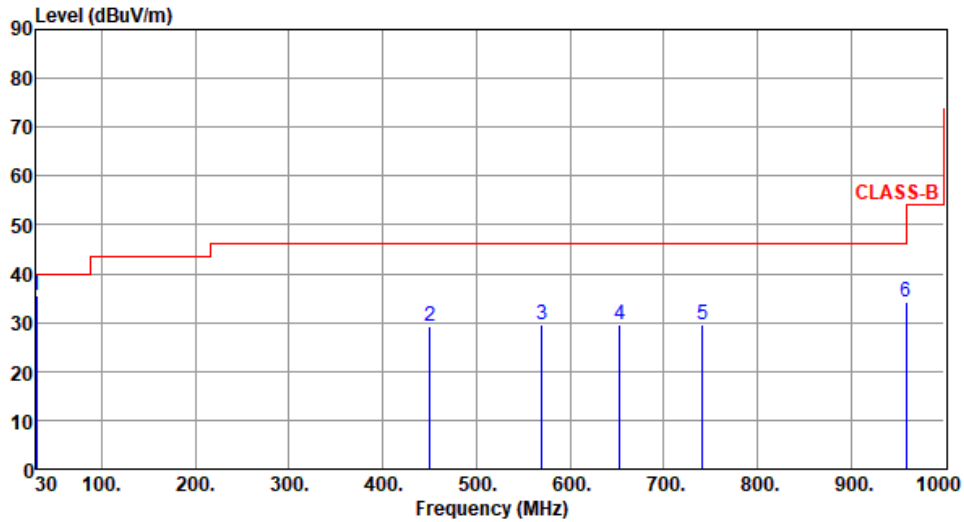
Configuration 2 : Adapter Mode

3.2.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation / SF	Lora / 10	Test Freq. (MHz)	902.3																																																															
Polarization	Horizontal																																																																	
Test By : Akun Chung Temperature(°C):25 Humidity(%):64																																																																		
 <p>The graph plots Level (dBuV/m) on the y-axis (0 to 90) against Frequency (MHz) on the x-axis (30 to 1000). A red line represents the CLASS-B limit, which is constant at 46 dBuV/m from 100 MHz to 900 MHz, then steps up to 55 dBuV/m at 900 MHz. Several peaks are labeled with numbers 1 through 6, corresponding to the data table below.</p>																																																																		
	<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</th> <th>Remark</th> <th>ANT High cm</th> <th>Turn Table deg</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>438.40</td> <td>34.21</td> <td>46.00</td> <td>-11.79</td> <td>38.81</td> <td>-4.60</td> <td>---</td> <td>---</td> </tr> <tr> <td>2</td> <td>450.40</td> <td>34.01</td> <td>46.00</td> <td>-11.99</td> <td>38.23</td> <td>-4.22</td> <td>---</td> <td>---</td> </tr> <tr> <td>3</td> <td>584.80</td> <td>33.46</td> <td>46.00</td> <td>-12.54</td> <td>34.88</td> <td>-1.42</td> <td>---</td> <td>---</td> </tr> <tr> <td>4</td> <td>603.20</td> <td>36.90</td> <td>46.00</td> <td>-9.10</td> <td>37.93</td> <td>-1.03</td> <td>---</td> <td>---</td> </tr> <tr> <td>5</td> <td>628.80</td> <td>37.91</td> <td>46.00</td> <td>-8.09</td> <td>38.32</td> <td>-0.41</td> <td>---</td> <td>---</td> </tr> <tr> <td>6</td> <td>960.00</td> <td>37.91</td> <td>46.00</td> <td>-8.09</td> <td>33.14</td> <td>4.77</td> <td>---</td> <td>---</td> </tr> </tbody> </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	438.40	34.21	46.00	-11.79	38.81	-4.60	---	---	2	450.40	34.01	46.00	-11.99	38.23	-4.22	---	---	3	584.80	33.46	46.00	-12.54	34.88	-1.42	---	---	4	603.20	36.90	46.00	-9.10	37.93	-1.03	---	---	5	628.80	37.91	46.00	-8.09	38.32	-0.41	---	---	6	960.00	37.91	46.00	-8.09	33.14	4.77	---	---		
Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg																																																										
1	438.40	34.21	46.00	-11.79	38.81	-4.60	---	---																																																										
2	450.40	34.01	46.00	-11.99	38.23	-4.22	---	---																																																										
3	584.80	33.46	46.00	-12.54	34.88	-1.42	---	---																																																										
4	603.20	36.90	46.00	-9.10	37.93	-1.03	---	---																																																										
5	628.80	37.91	46.00	-8.09	38.32	-0.41	---	---																																																										
6	960.00	37.91	46.00	-8.09	33.14	4.77	---	---																																																										
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.																																																																		

Modulation / SF	Lora / 10	Test Freq. (MHz)	902.3
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.33	35.63	40.00	-4.37	45.21	-9.58	Peak	---	---
2	450.40	29.22	46.00	-16.78	33.44	-4.22	Peak	---	---
3	569.60	29.39	46.00	-16.61	31.32	-1.93	Peak	---	---
4	653.60	29.49	46.00	-16.51	29.70	-0.21	Peak	---	---
5	741.60	29.64	46.00	-16.36	28.18	1.46	Peak	---	---
6	959.20	34.19	46.00	-11.81	29.43	4.76	Peak	---	---

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

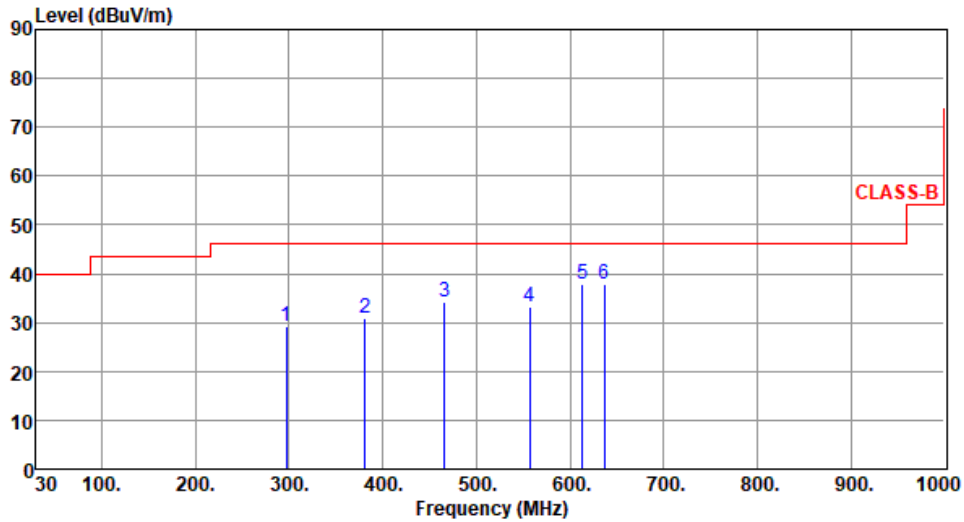
*Factor includes antenna factor , cable loss and amplifier gain

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.

Modulation / SF	Lora / 10	Test Freq. (MHz)	908.5
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	296.80	29.24	46.00	-16.76	37.50	-8.26	Peak	---	---
2	380.80	30.92	46.00	-15.08	37.01	-6.09	Peak	---	---
3	466.40	34.33	46.00	-11.67	38.22	-3.89	Peak	---	---
4	556.80	33.33	46.00	-12.67	35.51	-2.18	Peak	---	---
5	613.60	37.82	46.00	-8.18	38.50	-0.68	Peak	---	---
6	636.80	37.98	46.00	-8.02	38.31	-0.33	Peak	---	---

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

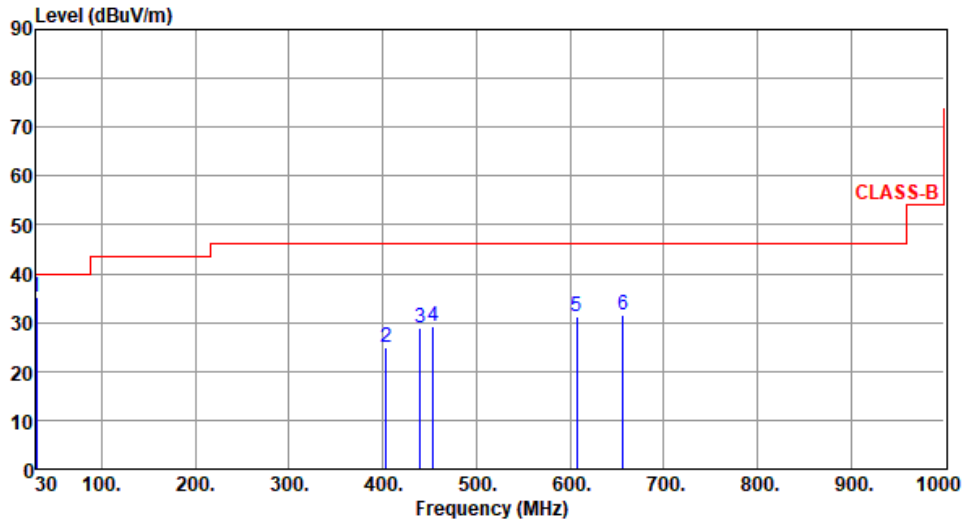
*Factor includes antenna factor , cable loss and amplifier gain

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.

Modulation / SF	Lora / 10	Test Freq. (MHz)	908.5
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.19	35.24	40.00	-4.76	44.78	-9.54	Peak	---	---
2	404.00	24.97	46.00	-21.03	30.68	-5.71	Peak	---	---
3	440.00	28.91	46.00	-17.09	33.48	-4.57	Peak	---	---
4	453.60	29.09	46.00	-16.91	33.24	-4.15	Peak	---	---
5	607.20	31.16	46.00	-14.84	32.05	-0.89	Peak	---	---
6	656.80	31.61	46.00	-14.39	31.85	-0.24	Peak	---	---

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

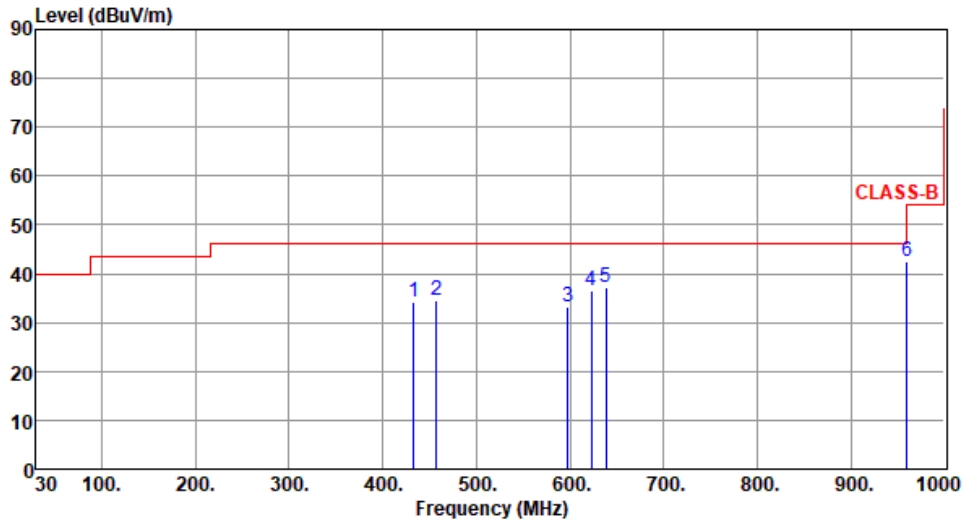
*Factor includes antenna factor , cable loss and amplifier gain

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.

Modulation / SF	Lora / 10	Test Freq. (MHz)	914.9
Polarization	Horizontal		

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	432.80	34.24	46.00	-11.76	38.97	-4.73	Peak	---	---
2	457.60	34.63	46.00	-11.37	38.74	-4.11	Peak	---	---
3	597.60	33.19	46.00	-12.81	34.34	-1.15	Peak	---	---
4	623.20	36.68	46.00	-9.32	37.20	-0.52	Peak	---	---
5	638.40	37.14	46.00	-8.86	37.43	-0.29	Peak	---	---
6	960.00	42.44	46.00	-3.56	37.67	4.77	Peak	---	---

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

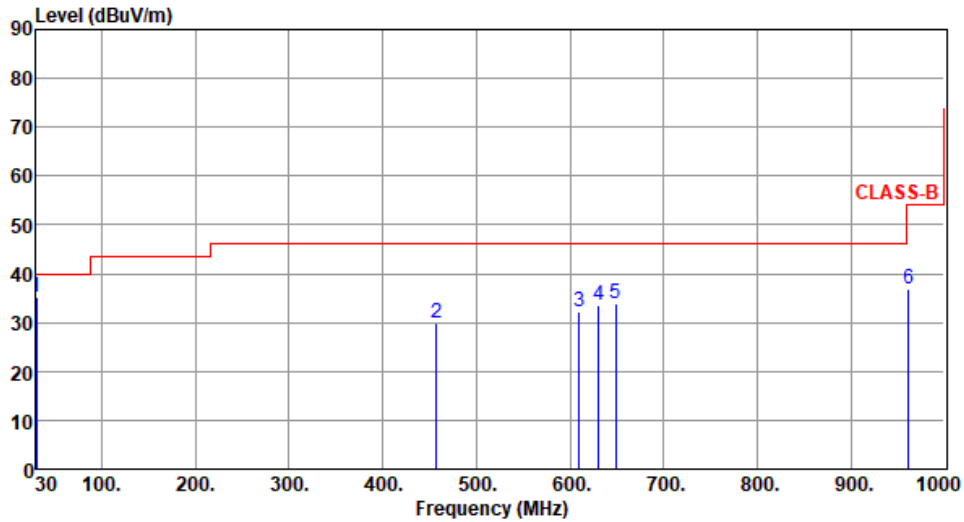
*Factor includes antenna factor , cable loss and amplifier gain

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.

Modulation / SF	Lora / 10	Test Freq. (MHz)	914.9
Polarization	Vertical		

Test By :Akun Chung Temperature(°C):25 Humidity(%):64



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.39	35.29	40.00	-4.71	44.89	-9.60	Peak	---	---
2	457.60	29.84	46.00	-16.16	33.95	-4.11	Peak	---	---
3	609.60	32.28	46.00	-13.72	33.06	-0.78	Peak	---	---
4	630.40	33.68	46.00	-12.32	34.07	-0.39	Peak	---	---
5	648.80	34.03	46.00	-11.97	34.25	-0.22	Peak	---	---
6	961.60	36.92	54.00	-17.08	32.12	4.80	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.

3.3 Unwanted Emissions into Non-Restricted Frequency Bands

3.3.1 Limit of Unwanted Emissions into Non-Restricted Frequency Bands

The peak output power measured 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.

3.3.2 Test Procedures

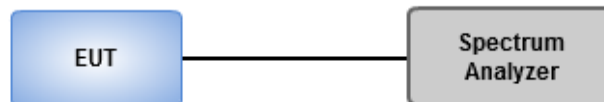
Reference Level Measurement

1. Set the RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
2. Set Sweep time = auto couple, Trace mode = max hold.
3. Allow trace to fully stabilize.
4. Use the peak marker function to determine the maximum amplitude level.

Unwanted Emissions Level Measurement

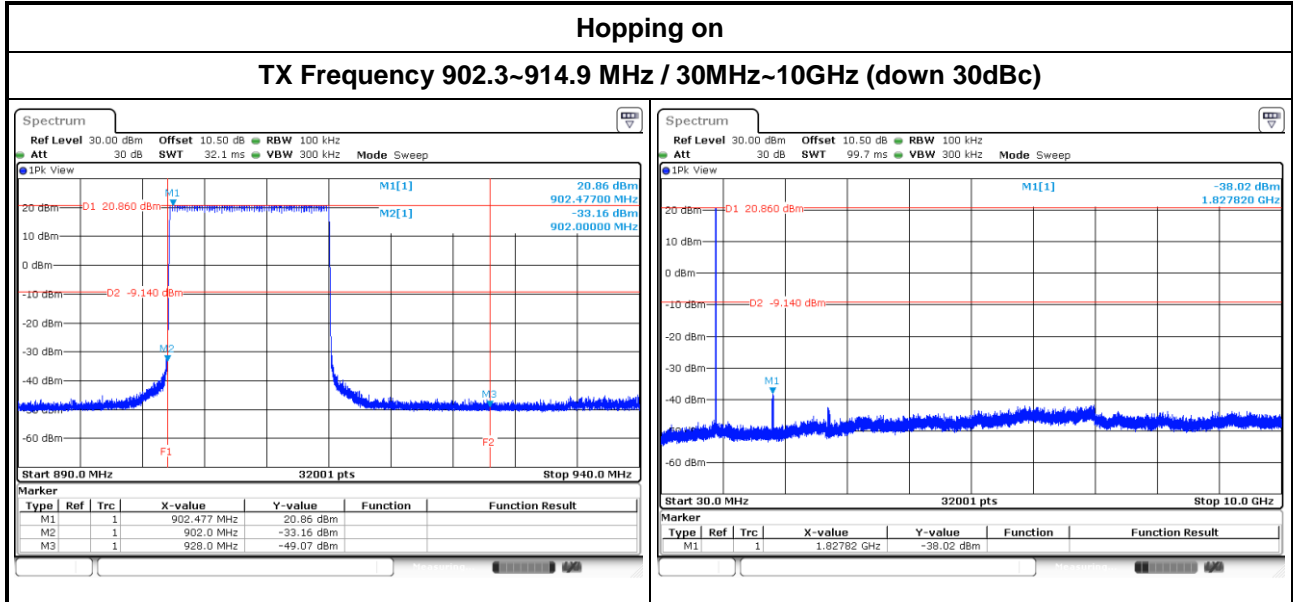
1. Set RBW = 100 kHz, VBW = 300 kHz, Detector = peak.
2. Trace Mode = max hold, Sweep = auto couple.
3. Allow the trace to stabilize.
4. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

3.3.3 Test Setup



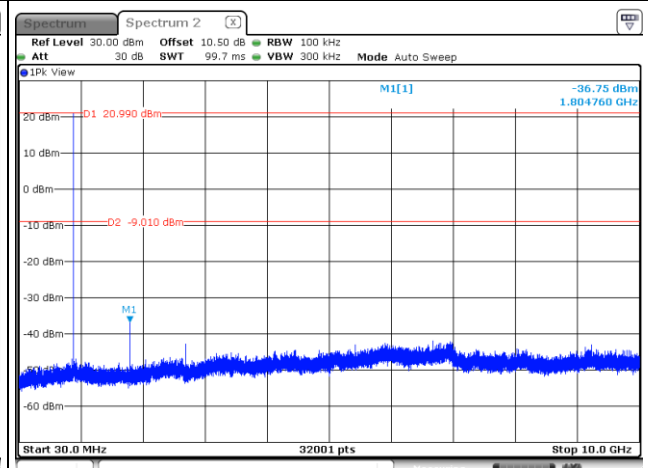
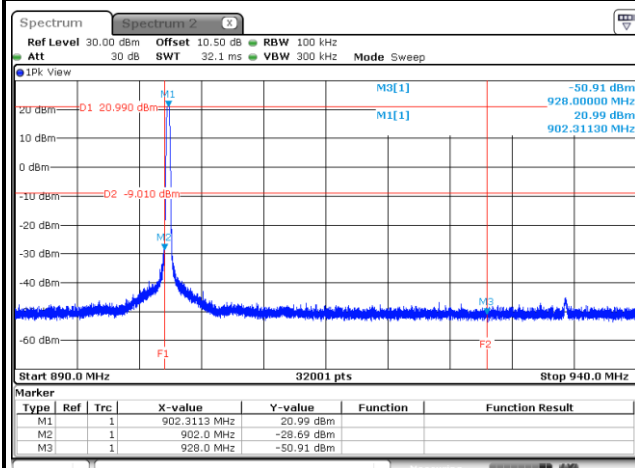
3.3.4 Unwanted Emissions into Non-Restricted Frequency Bands

Ambient Condition	21°C / 65%	Tested By	Aska Huang
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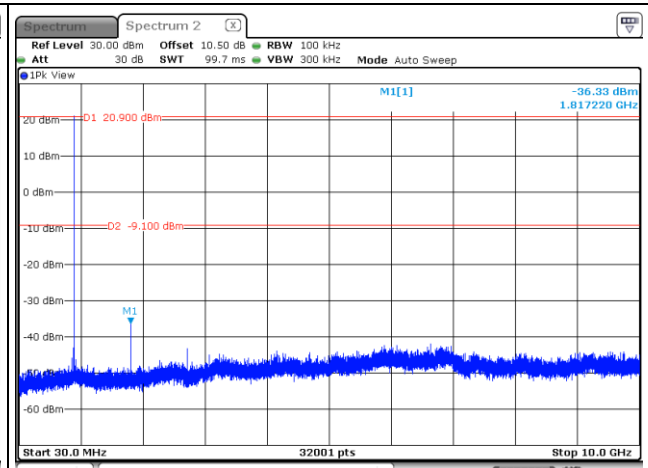
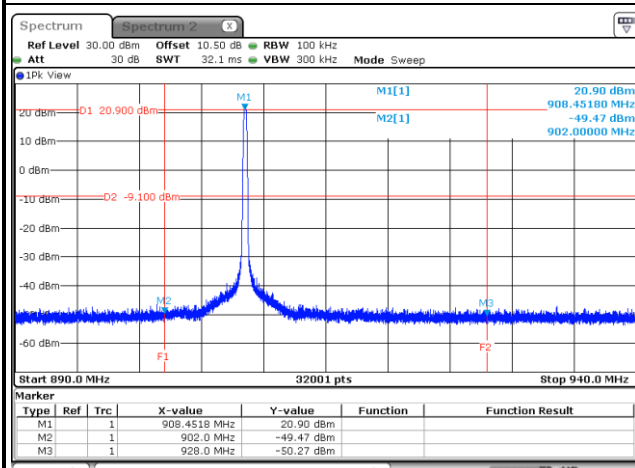


Hopping off

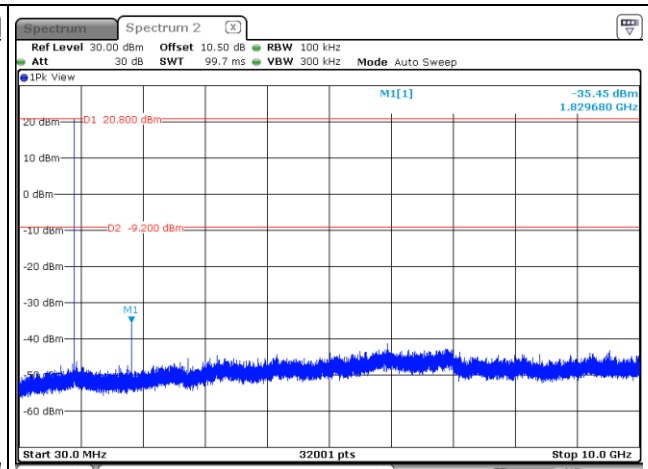
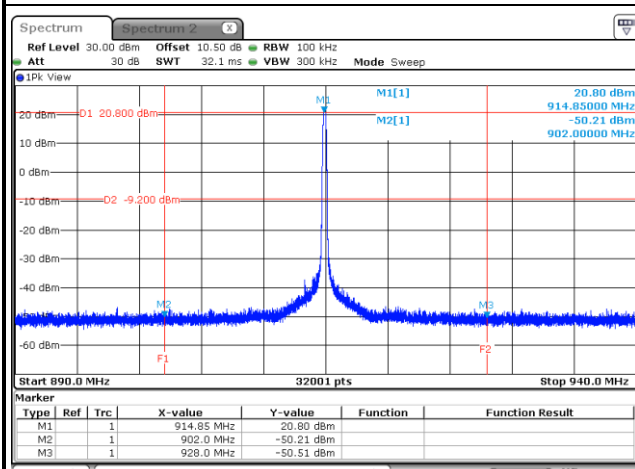
TX Frequency 902.3MHz / 30MHz~10GHz (down 30dBc)



TX Frequency 908.5MHz / 30MHz~10GHz (down 30dBc)



TX Frequency 914.9MHz / 30MHz~10GHz (down 30dBc)



3.4 Conducted Output Power

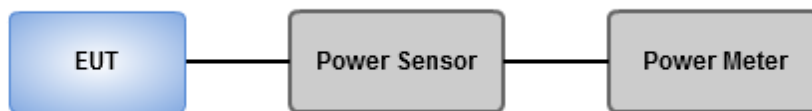
3.4.1 Limit of Conducted Output Power

- 1 Watt, systems employing at least 50 hopping channels;
- 0.25 Watt, for systems employing less than 50 hopping channels, but at least 25 hopping channels,

3.4.2 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

3.4.3 Test Setup



3.4.4 Test Result of Conducted Output Power

Ambient Condition	21°C / 65%	Tested By	Aska Huang
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Modulation / SF	Freq. (MHz)	Output Power (mW)	Output Power (dBm)	Limit (W)
Lora / 10	902.3	127.64	21.06	1
Lora / 10	908.5	125.31	20.98	1
Lora / 10	914.9	122.74	20.89	1

3.5 Number of Hopping Frequency

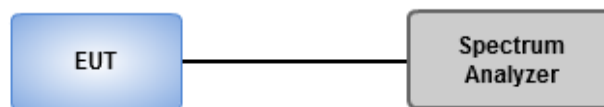
3.5.1 Limit of Number of Hopping Frequency

Number of Hopping Frequencies Limit for Frequency Hopping Systems	
<input checked="" type="checkbox"/>	902-928 MHz Band:
<input type="checkbox"/>	$N \geq 50$, 20 dB bandwidth of the hopping channel is less than 250 kHz
<input type="checkbox"/>	$N \geq 25$, 20 dB bandwidth of the hopping channel is 250 kHz or greater
<input checked="" type="checkbox"/>	Hybrid mode, No minimum number of hopping channels associated with hybrid system.
N: Number of Hopping Frequencies	

3.5.2 Test Procedures

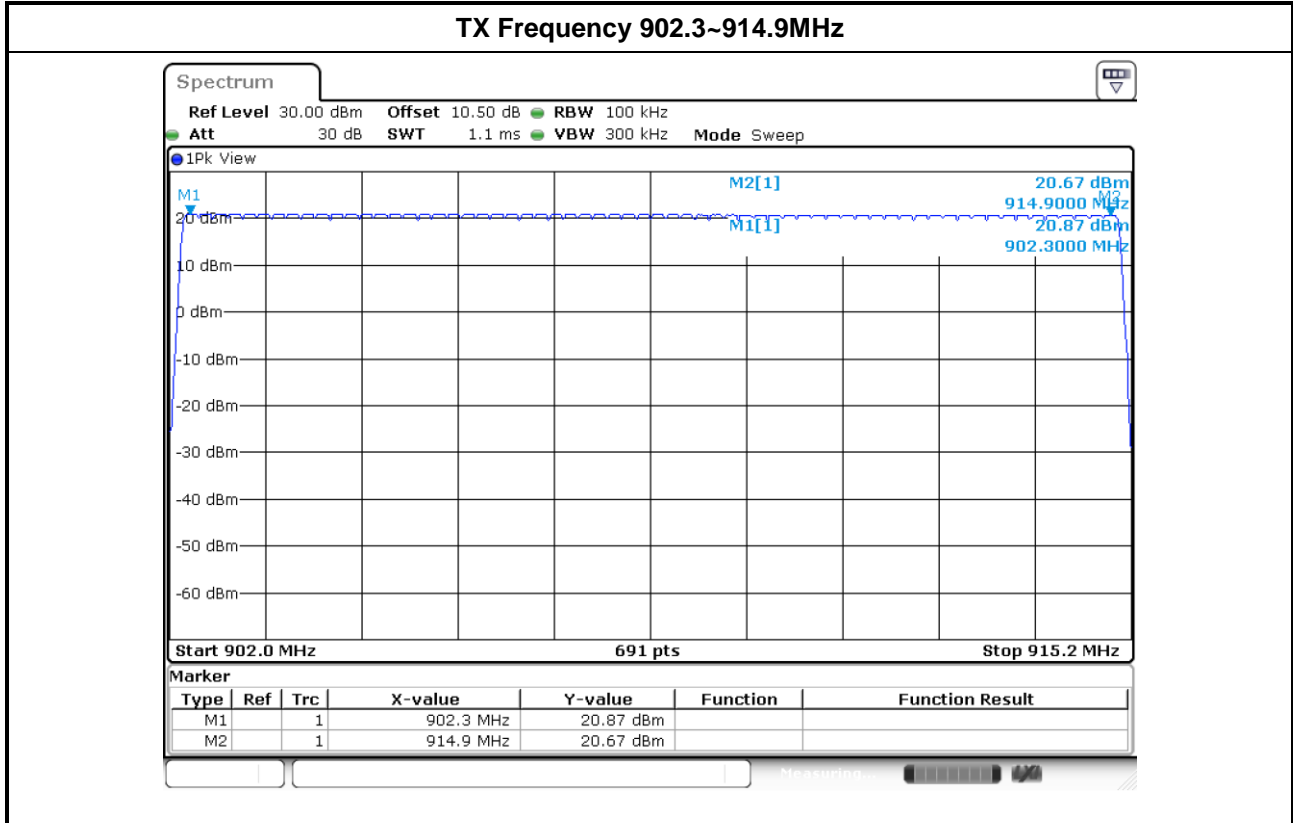
1. Set RBW = 100kHz, VBW = 300kHz, Sweep time = Auto, Detector = Peak Trace max hold.
2. Allow trace to stabilize.

3.5.3 Test Setup



3.5.4 Test Result of Number of Hopping Frequency

Ambient Condition	21°C / 65%	Tested By	Aska Huang
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3.6 20dB and Occupied Bandwidth

3.6.1 Test Procedures

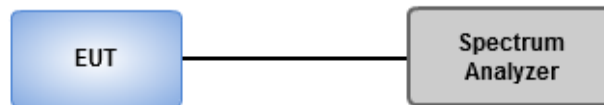
20dB Bandwidth

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

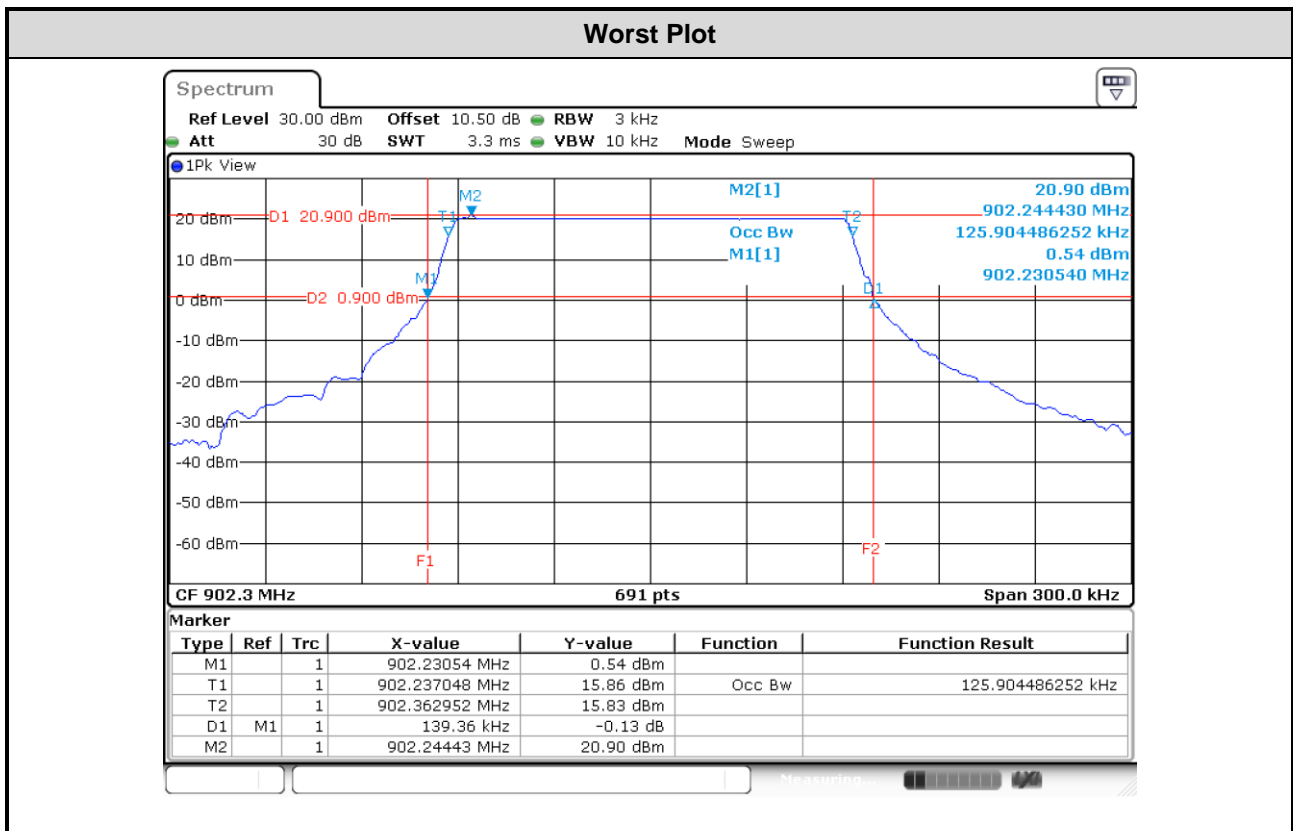
3.6.2 Test Setup



3.6.3 Test result of 20dB and Occupied Bandwidth

Ambient Condition	21°C / 65%	Tested By	Aska Huang
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Modulation / SF	Freq. (MHz)	20dB Bandwidth (kHz)	Occupied Bandwidth (kHz)
Lora / 10	902.3	139.36	125.90
Lora / 10	908.5	138.49	125.90
Lora / 10	914.9	139.36	125.90



3.7 Channel Separation

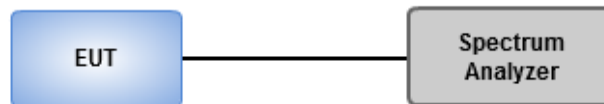
3.7.1 Limit of Channel Separation

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.

3.7.2 Test Procedures

1. Set RBW=10kHz, VBW=30kHz, 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

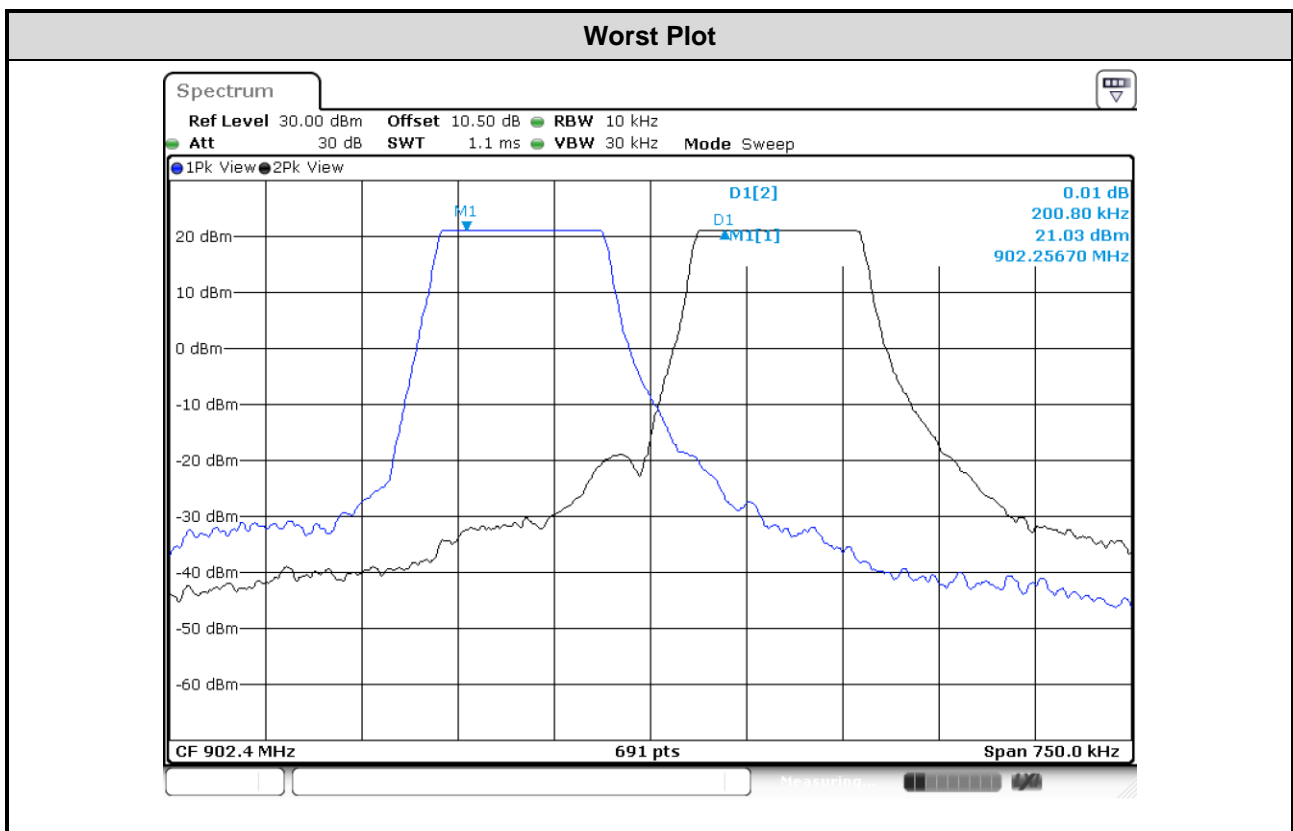
3.7.3 Test Setup



3.7.4 Test result of Channel Separation

Ambient Condition	21°C / 65%	Tested By	Aska Huang
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Modulation / SF	Freq. (MHz)	Adjacent Channel Separation (kHz)	20dB Bandwidth (kHz)	Pass/Fail
Lora / 10	902.3	200.80	139.36	Pass
Lora / 10	908.5	200.80	138.49	Pass
Lora / 10	914.9	200.80	139.36	Pass



3.8 Number of Dwell Time

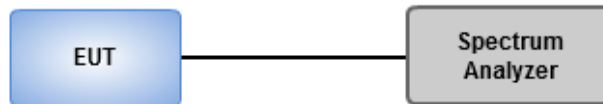
3.8.1 Limit of Dwell time

Time of Occupancy (Dwell Time) Limit for Frequency Hopping Systems	
<input checked="" type="checkbox"/>	902-928 MHz Band:
<input type="checkbox"/>	≤ 0.4 second within a 20 second period, 20 dB bandwidth of the hopping channel is less than 250 kHz
<input type="checkbox"/>	≤ 0.4 second within a 10 second period, 20 dB bandwidth of the hopping channel is 250 kHz or greater
<input checked="" type="checkbox"/>	Hybrid mode ,an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4

3.8.2 Test Procedures

1. Set RBW=200kHz, VBW=1000kHz, Sweep time=25.6s / 500ms, Detector=Peak, Span=0Hz, Trace max hold.
2. Measure and record the burst on time.

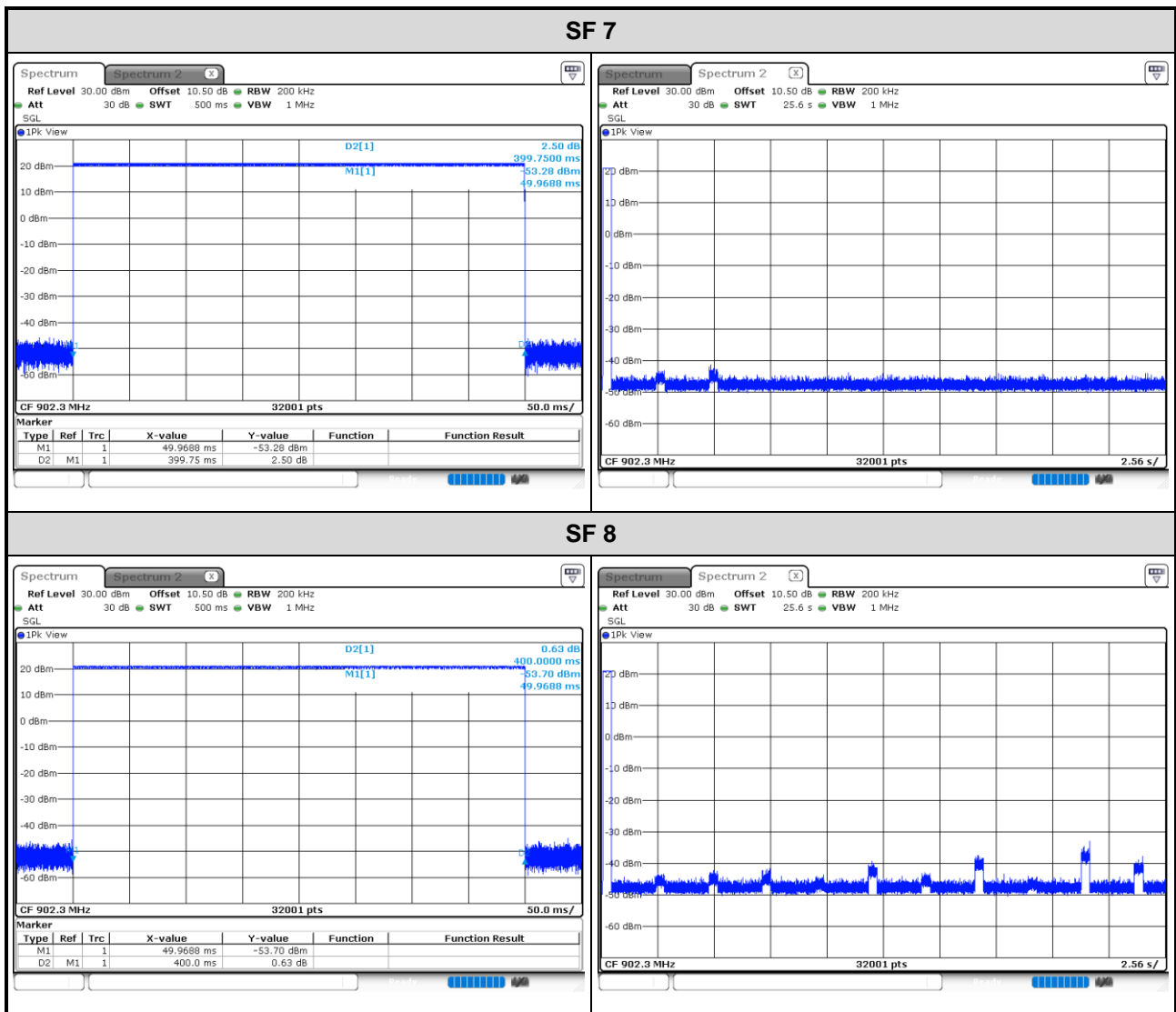
3.8.3 Test Setup



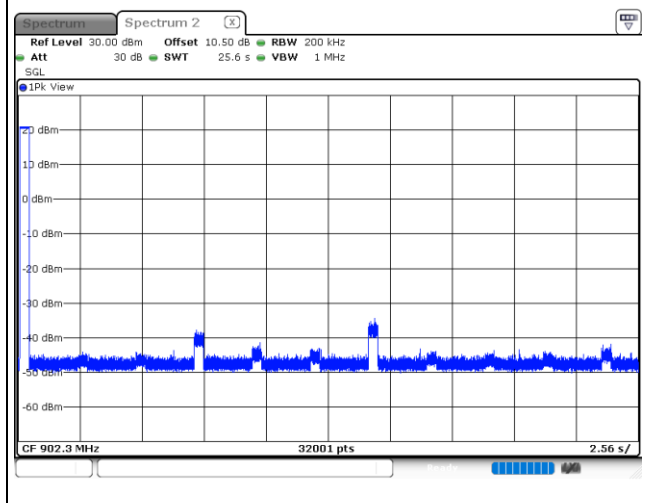
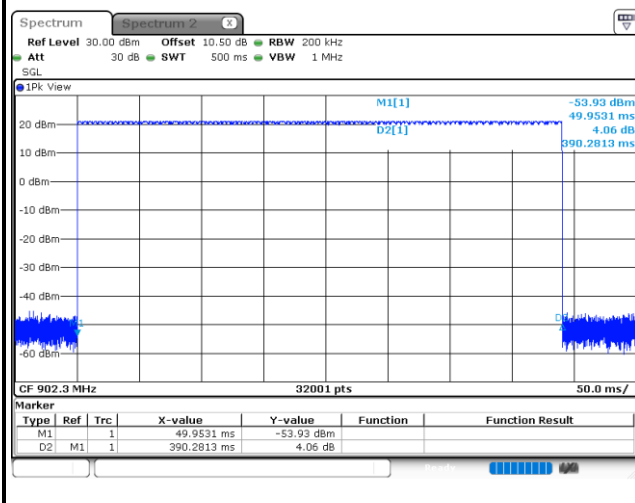
3.8.4 Test Result of Dwell Time

Ambient Condition	21°C / 65%	Tested By	Aska Huang
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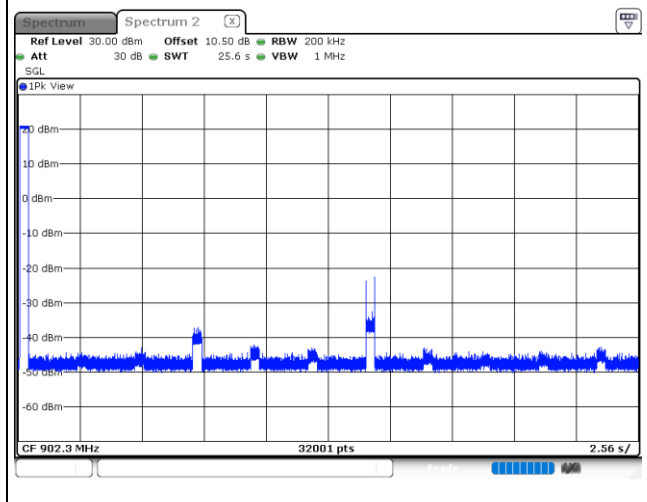
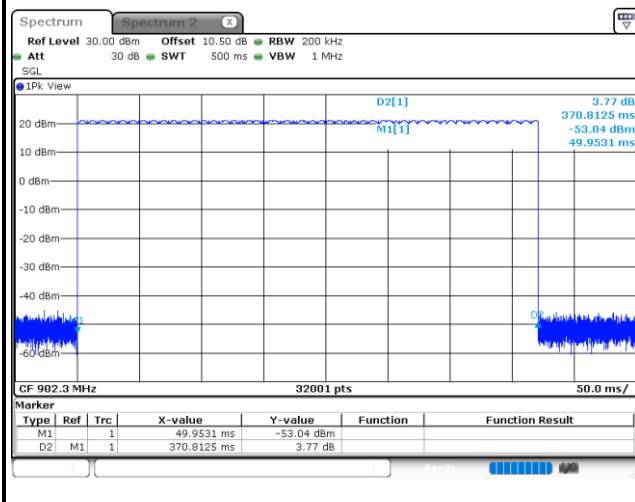
Modulation / SF	Freq. (MHz)	Length of Transmission Time (sec)	Number of Transmission in a 25.6 s (64 Hopping*0.4s)	Result (s)	Limit (s)
Lora / 7	902.3	0.399750	1	0.399750	0.4
Lora / 8	902.3	0.400000	1	0.400000	0.4
Lora / 9	902.3	0.390281	1	0.390281	0.4
Lora / 10	902.3	0.370813	1	0.370813	0.4



SF 9



SF 10



3.9 Power Spectral Density

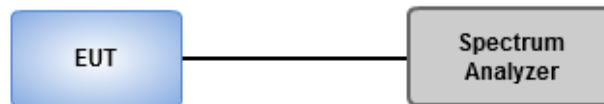
3.9.1 Limit of Power Spectral Density

Power spectral density shall not be greater than 8 dBm in any 3 kHz band. This item is for Hybrid mode.

3.9.2 Test Procedures

1. Set the RBW = 3kHz, VBW = 10 kHz.
2. Detector = RMS, Sweep time = auto couple.
3. Employ trace averaging (RMS) mode over a minimum of 100 traces
4. Use the peak marker function to determine the maximum amplitude level.

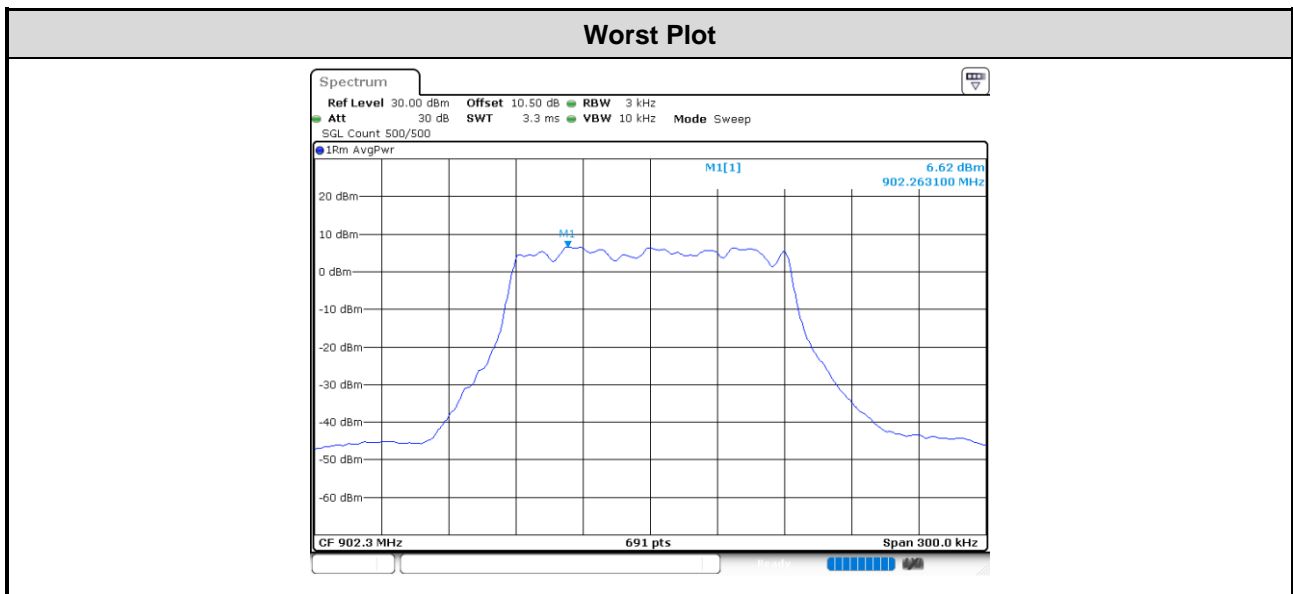
3.9.3 Test Setup



3.9.4 Test Result of Power Spectral Density

Ambient Condition	21°C / 65%	Tested By	Aska Huang
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Modulation / SF	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Lora / 10	902.3	6.62	8.00
Lora / 10	908.5	6.62	8.00
Lora / 10	914.9	6.41	8.00



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

Fax: 886-3-318-0155

Email: ICC_Service@icertifi.com.tw

==END==