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: **Approved by:**

Along Chen / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

Table of Contents

Release Record

Report No.	Version	Description	Issued Date
FR0D2803AH	Rev. 01	Initial issue	Feb. 03, 2021

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	Conducted Emissions	[dBuV]: 0.150MHz 62.88 (Margin -3.12dB) - QP	Pass
15.247(d) 15.209	Radiated Emissions	[dBuV/m at 3m]: 2709.00MHz 50.81 (Margin -3.19dB) - AV	Pass
15.247(b)(3)	Maximum Output Power	Max Power [dBm]: 21.05	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)	**Ch. Freq. (MHz)**	**Channel Number**	**Data Rate (bit/sec)**	**Spread Factor**	**Channel Bandwidth (kHz)**
902 ~ 928	903 ~ 914.2	65 ~ 72 [8]	21900 ~ 980	SF7~12	500
Note 1: RF output power specifies that Maximum Conducted (Average) Output Power. Note 2: The device uses Lora modulation.					

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)
65	903
66	904.6
67	906.2
68	907.8
69	909.4
70	911
71	912.6
72	914.2

1.1.6 Test Tool and Duty Cycle

Test Tool	Tera Term, version: V4.80	
Duty Cycle and Duty Factor	Duty Cycle (%)	Duty Factor (dB)
	100%	0

1.1.7 Power Setting

Modulation Mode	Test Frequency (MHz)		
	903	907.8	914.2
Lora	22	22	22

1.2 Local Support Equipment List

POE Mode

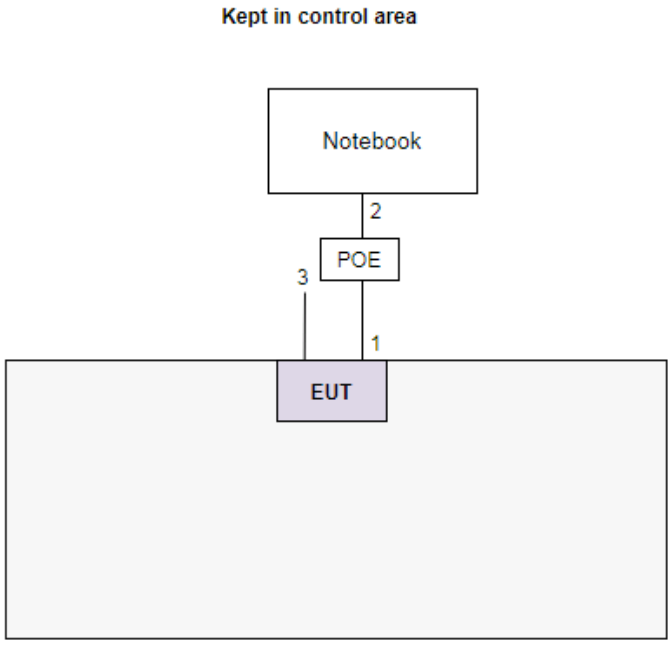
Support Equipment List					
No.	**Equipment**	**Brand**	**Model**	**FCC ID**	**Remarks**
1	RJ45	ICC	RJ45-10m	---	---
2	RJ45	ICC	RJ45-1m	---	---
3	RJ45	---	---	---	Provided by applicant.
4	Notebook	DELL	Latitude E5470	DoC	---
5	USB cable	---	---	---	Provided by applicant.
6	Fixture	---	HLCB_V00	---	Provided 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

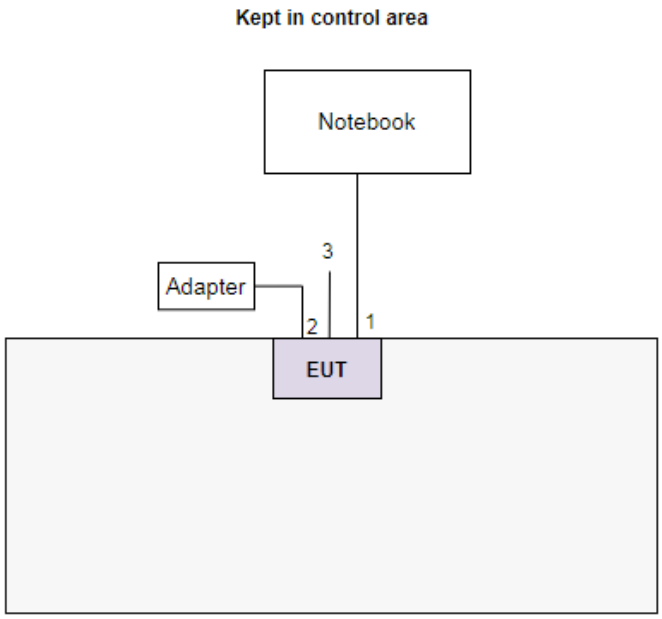
POE Mode

Test Setup Diagram


No.	Signal cable / Length (m)
1	RJ45, 10m non-shielded
2	RJ45, 1m non-shielded
3	RJ45, 0.15m non-shielded with load

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

Adapter Mode

Test Setup Diagram


No.	Signal cable / Length (m)
1	RJ45, 10m non-shielded
2	USB, 1m shielded
3	RJ45, 0.15m non-shielded with load

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	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-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	903 / 907.8 / 914.2	500	Lora / 12	1, 2
Radiated Emissions >1GHz	903 / 907.8 / 914.2	500	Lora / 12	1, 2
Maximum Output Power 6dB Bandwidth Power Spectral Density	903 / 907.8 / 914.2	500	Lora / 12	1
Radiated Emissions ≤1GHz	903 / 907.8 / 914.2	500	Lora / 12	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

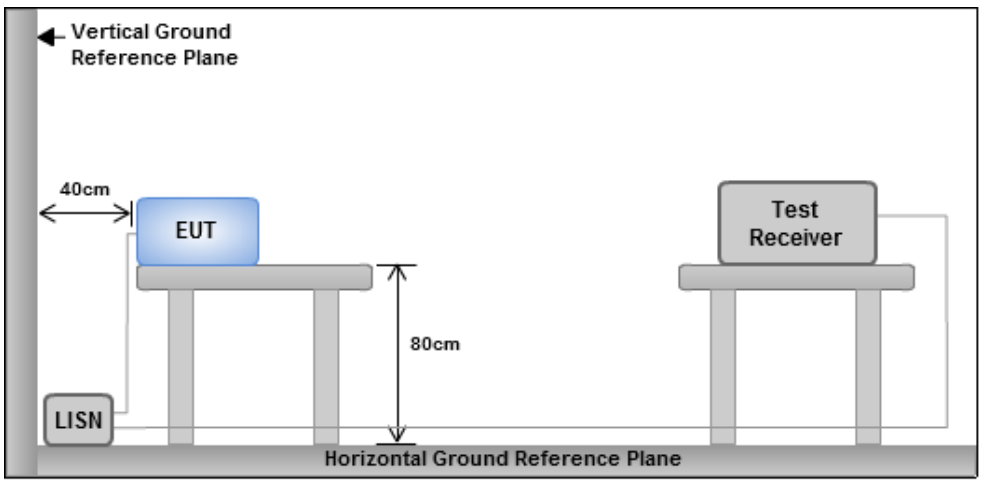
3.1.1 Limit of Conducted Emissions

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.

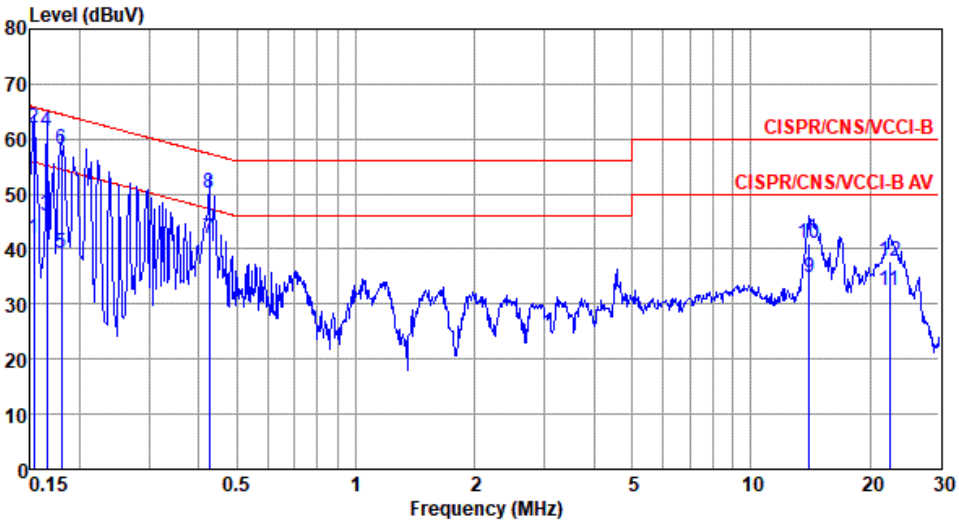
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

Configuration 1: POE Mode

Modulation / SF	Lora / 12	**Test Freq. (MHz)**	903
Power Phase	Line		

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

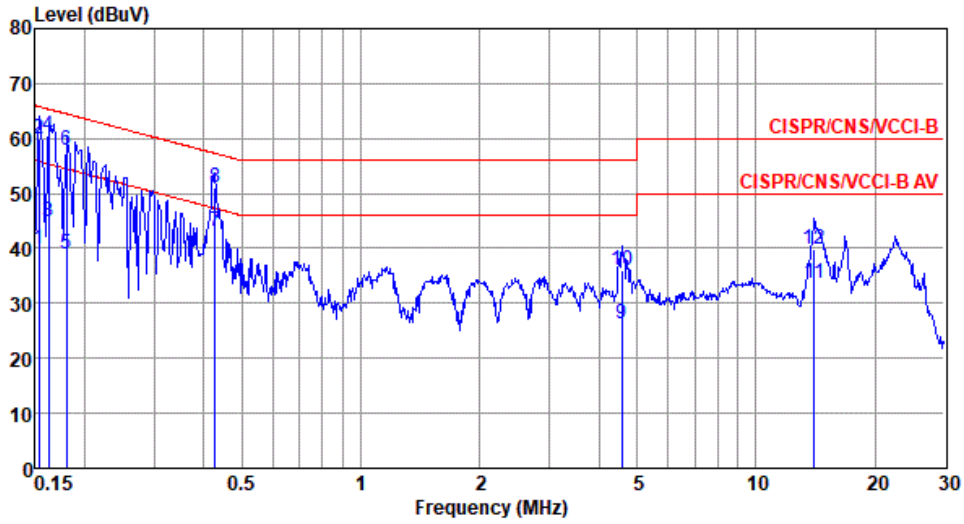


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.153	41.87	55.82	-13.95	32.18	9.64	0.05	Average
2	0.153	61.93	65.82	-3.89	52.24	9.64	0.05	QP
3	0.165	45.91	55.21	-9.30	36.22	9.64	0.05	Average
4*	0.165	61.42	65.21	-3.79	51.73	9.64	0.05	QP
5	0.180	39.17	54.50	-15.33	29.48	9.63	0.06	Average
6	0.180	58.02	64.50	-6.48	48.33	9.63	0.06	QP
7	0.426	41.81	47.33	-5.52	32.10	9.63	0.08	Average
8	0.426	50.22	57.33	-7.11	40.51	9.63	0.08	QP
9	14.063	34.97	50.00	-15.03	24.70	9.70	0.57	Average
10	14.063	41.09	60.00	-18.91	30.82	9.70	0.57	QP
11	22.416	32.38	50.00	-17.62	22.00	9.69	0.69	Average
12	22.416	37.93	60.00	-22.07	27.55	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 / 12	Test Freq. (MHz)	903
Power Phase	Neutral		

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

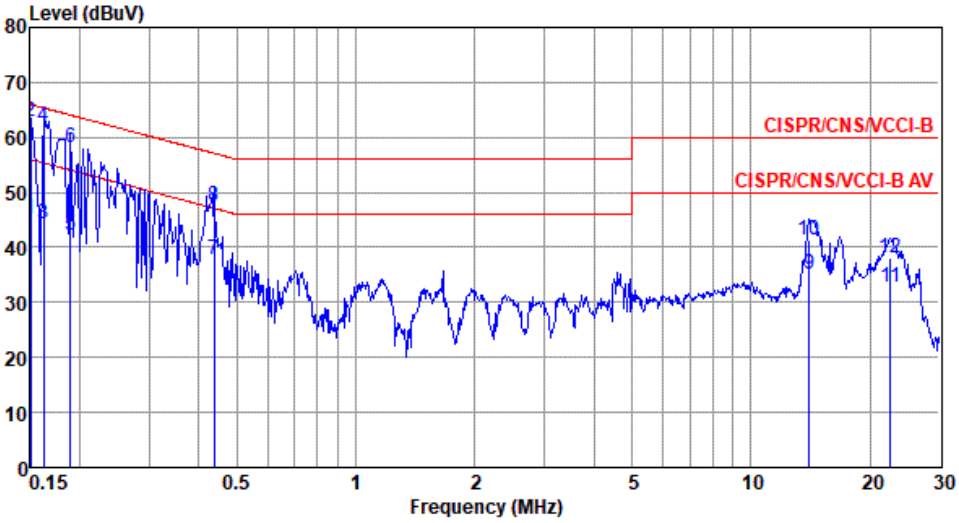


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.153	39.97	55.82	-15.85	30.26	9.66	0.05	Average
2	0.153	60.04	65.82	-5.78	50.33	9.66	0.05	QP
3	0.162	44.73	55.34	-10.61	35.02	9.66	0.05	Average
4	0.162	60.65	65.34	-4.69	50.94	9.66	0.05	QP
5	0.180	39.06	54.50	-15.44	29.35	9.65	0.06	Average
6	0.180	57.81	64.50	-6.69	48.10	9.65	0.06	QP
7*	0.428	42.98	47.29	-4.31	33.25	9.65	0.08	Average
8	0.428	51.10	57.29	-6.19	41.37	9.65	0.08	QP
9	4.574	26.17	46.00	-19.83	16.18	9.68	0.31	Average
10	4.574	35.96	56.00	-20.04	25.97	9.68	0.31	QP
11	14.063	33.69	50.00	-16.31	23.34	9.78	0.57	Average
12	14.063	39.88	60.00	-20.12	29.53	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 / 12	Test Freq. (MHz)	907.8
Power Phase	Line		

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

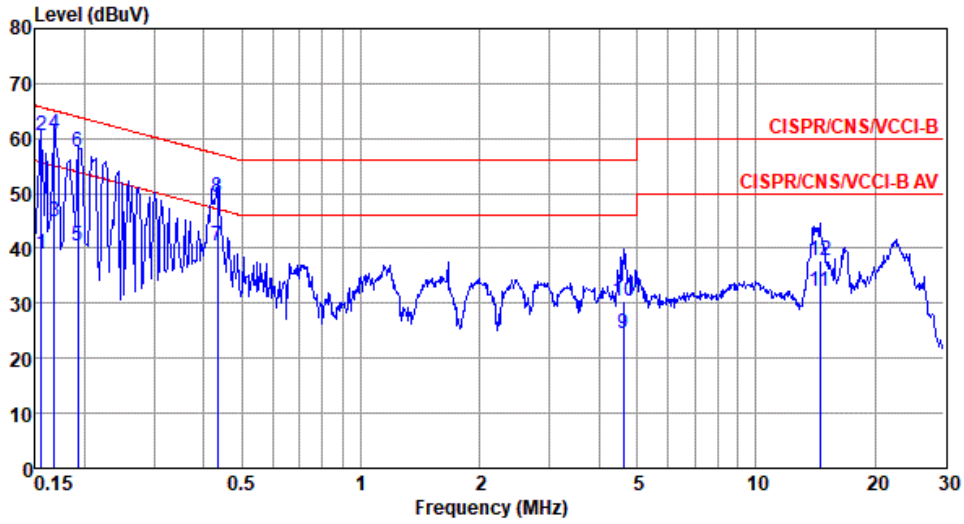


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.150	45.29	56.00	-10.71	35.60	9.64	0.05	Average
2*	0.150	62.88	66.00	-3.12	53.19	9.64	0.05	QP
3	0.162	44.21	55.34	-11.13	34.52	9.64	0.05	Average
4	0.162	61.85	65.34	-3.49	52.16	9.64	0.05	QP
5	0.189	42.35	54.06	-11.71	32.66	9.63	0.06	Average
6	0.189	58.18	64.06	-5.88	48.49	9.63	0.06	QP
7	0.437	37.79	47.11	-9.32	28.08	9.63	0.08	Average
8	0.437	47.50	57.11	-9.61	37.79	9.63	0.08	QP
9	14.063	35.22	50.00	-14.78	24.95	9.70	0.57	Average
10	14.063	41.21	60.00	-18.79	30.94	9.70	0.57	QP
11	22.535	32.78	50.00	-17.22	22.40	9.69	0.69	Average
12	22.535	37.97	60.00	-22.03	27.59	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 / 12	Test Freq. (MHz)	907.8
Power Phase	Neutral		

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

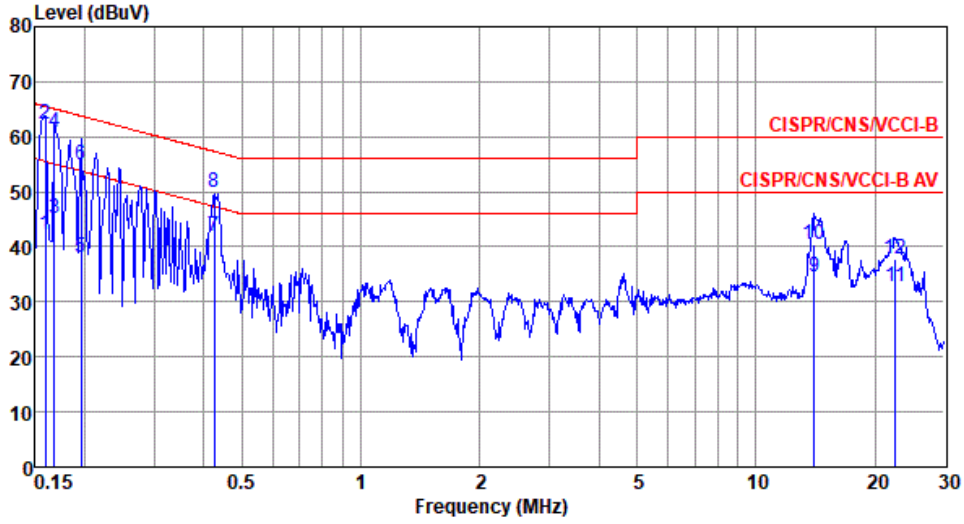


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.156	38.88	55.69	-16.81	29.17	9.66	0.05	Average
2	0.156	60.44	65.69	-5.25	50.73	9.66	0.05	QP
3	0.168	44.95	55.08	-10.13	35.24	9.66	0.05	Average
4*	0.168	60.68	65.08	-4.40	50.97	9.66	0.05	QP
5	0.192	40.47	53.93	-13.46	30.76	9.65	0.06	Average
6	0.192	57.53	63.93	-6.40	47.82	9.65	0.06	QP
7	0.433	40.59	47.20	-6.61	30.86	9.65	0.08	Average
8	0.433	49.37	57.20	-7.83	39.64	9.65	0.08	QP
9	4.622	24.58	46.00	-21.42	14.59	9.68	0.31	Average
10	4.622	30.47	56.00	-25.53	20.48	9.68	0.31	QP
11	14.517	32.18	50.00	-17.82	21.81	9.79	0.58	Average
12	14.517	37.89	60.00	-22.11	27.52	9.79	0.58	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 / 12	Test Freq. (MHz)	914.2
Power Phase	Line		

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

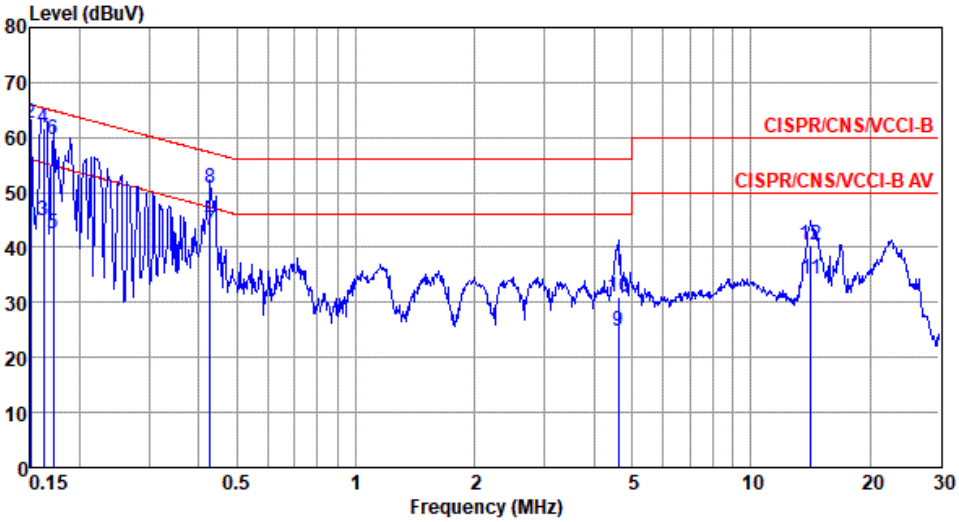


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.159	42.18	55.52	-13.34	32.49	9.64	0.05	Average
2*	0.159	62.27	65.52	-3.25	52.58	9.64	0.05	QP
3	0.168	45.08	55.08	-10.00	35.39	9.64	0.05	Average
4	0.168	60.85	65.08	-4.23	51.16	9.64	0.05	QP
5	0.195	38.01	53.80	-15.79	28.32	9.63	0.06	Average
6	0.195	55.05	63.80	-8.75	45.36	9.63	0.06	QP
7	0.426	41.97	47.33	-5.36	32.26	9.63	0.08	Average
8	0.426	49.89	57.33	-7.44	40.18	9.63	0.08	QP
9	14.063	34.62	50.00	-15.38	24.35	9.70	0.57	Average
10	14.063	40.31	60.00	-19.69	30.04	9.70	0.57	QP
11	22.535	32.66	50.00	-17.34	22.28	9.69	0.69	Average
12	22.535	37.90	60.00	-22.10	27.52	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 / 12	Test Freq. (MHz)	914.2
Power Phase	Neutral		

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



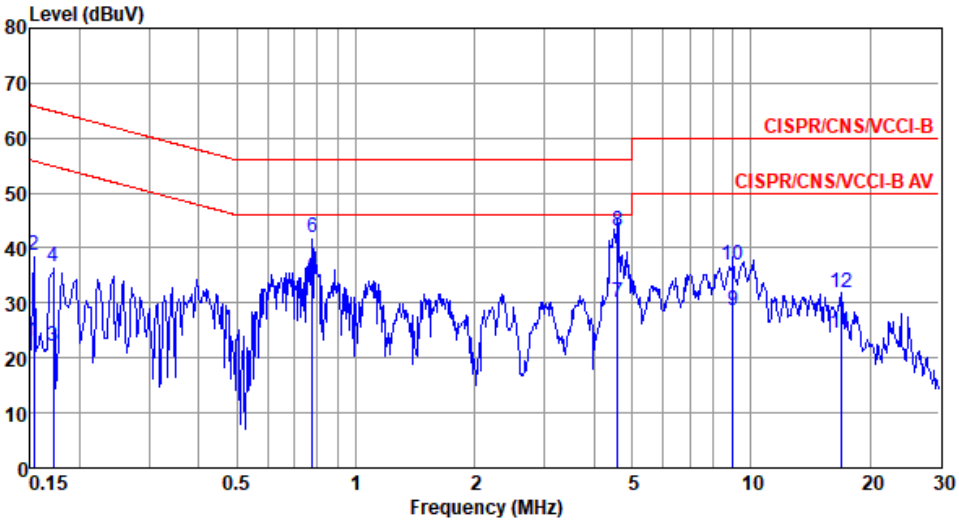
	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.150	43.75	56.00	-12.25	34.04	9.66	0.05	Average
2*	0.150	62.46	66.00	-3.54	52.75	9.66	0.05	QP
3	0.162	44.91	55.34	-10.43	35.20	9.66	0.05	Average
4	0.162	61.60	65.34	-3.74	51.89	9.66	0.05	QP
5	0.171	42.60	54.90	-12.30	32.89	9.66	0.05	Average
6	0.171	59.73	64.90	-5.17	50.02	9.66	0.05	QP
7	0.428	42.95	47.29	-4.34	33.22	9.65	0.08	Average
8	0.428	50.79	57.29	-6.50	41.06	9.65	0.08	QP
9	4.622	24.74	46.00	-21.26	14.75	9.68	0.31	Average
10	4.622	30.91	56.00	-25.09	20.92	9.68	0.31	QP
11	14.213	34.13	50.00	-15.87	23.77	9.79	0.57	Average
12	14.213	40.43	60.00	-19.57	30.07	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 / 12	**Test Freq. (MHz)**	903
Power Phase	Line		

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

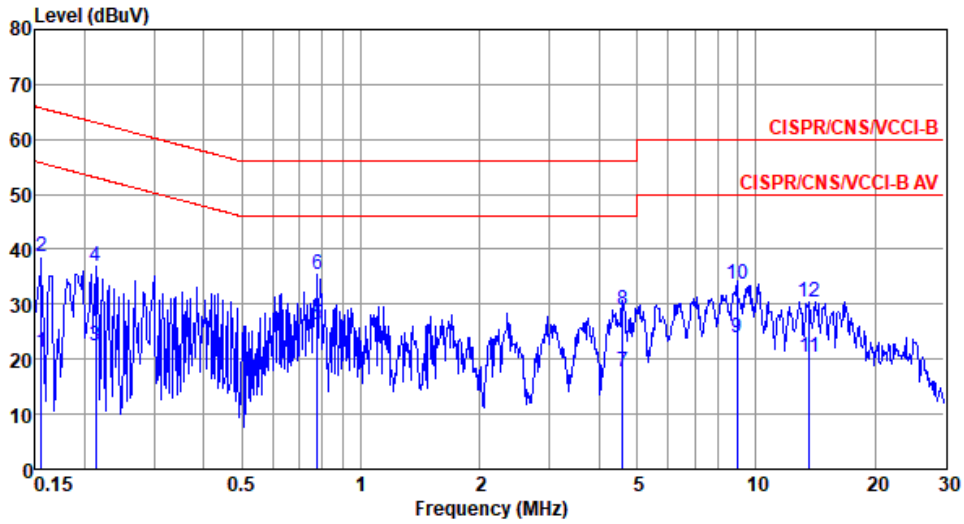


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.153	23.12	55.82	-32.70	13.26	9.81	0.05	Average
2	0.153	38.73	65.82	-27.09	28.87	9.81	0.05	QP
3	0.171	22.16	54.90	-32.74	12.30	9.81	0.05	Average
4	0.171	36.49	64.90	-28.41	26.63	9.81	0.05	QP
5*	0.775	34.10	46.00	-11.90	24.05	9.94	0.11	Average
6	0.775	41.97	56.00	-14.03	31.92	9.94	0.11	QP
7	4.598	30.08	46.00	-15.92	19.74	10.03	0.31	Average
8	4.598	43.17	56.00	-12.83	32.83	10.03	0.31	QP
9	9.011	28.72	50.00	-21.28	18.25	10.08	0.39	Average
10	9.011	36.92	60.00	-23.08	26.45	10.08	0.39	QP
11	16.928	24.57	50.00	-25.43	13.70	10.24	0.63	Average
12	16.928	31.99	60.00	-28.01	21.12	10.24	0.63	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 / 12	Test Freq. (MHz)	903
Power Phase	Neutral		

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

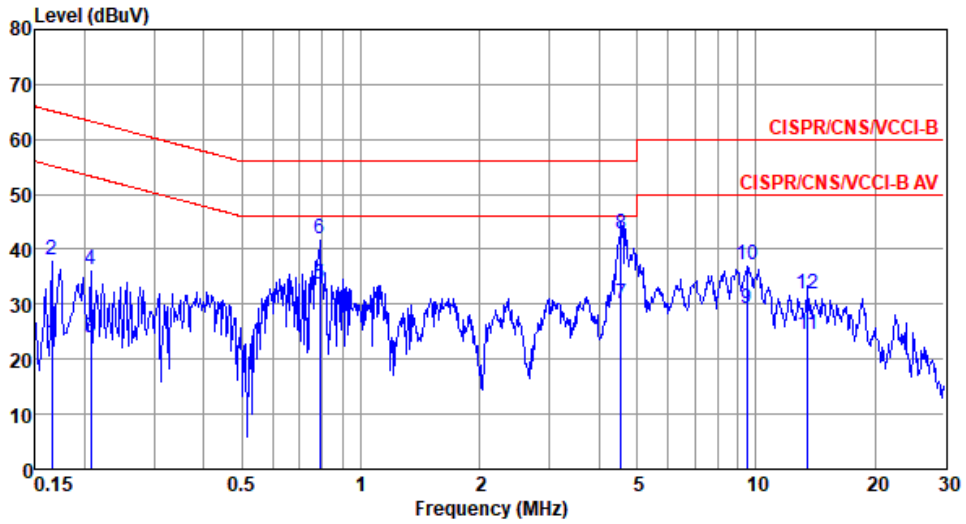


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.156	21.24	55.69	-34.45	11.40	9.79	0.05	Average
2	0.156	38.55	65.69	-27.14	28.71	9.79	0.05	QP
3	0.213	22.36	53.10	-30.74	12.50	9.80	0.06	Average
4	0.213	36.87	63.10	-26.23	27.01	9.80	0.06	QP
5*	0.775	26.40	46.00	-19.60	16.45	9.84	0.11	Average
6	0.775	35.46	56.00	-20.54	25.51	9.84	0.11	QP
7	4.598	17.75	46.00	-28.25	7.49	9.95	0.31	Average
8	4.598	28.95	56.00	-27.05	18.69	9.95	0.31	QP
9	8.964	24.05	50.00	-25.95	13.62	10.04	0.39	Average
10	8.964	33.71	60.00	-26.29	23.28	10.04	0.39	QP
11	13.623	20.23	50.00	-29.77	9.54	10.14	0.55	Average
12	13.623	30.39	60.00	-29.61	19.70	10.14	0.55	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 / 12	Test Freq. (MHz)	907.8
Power Phase	Line		

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

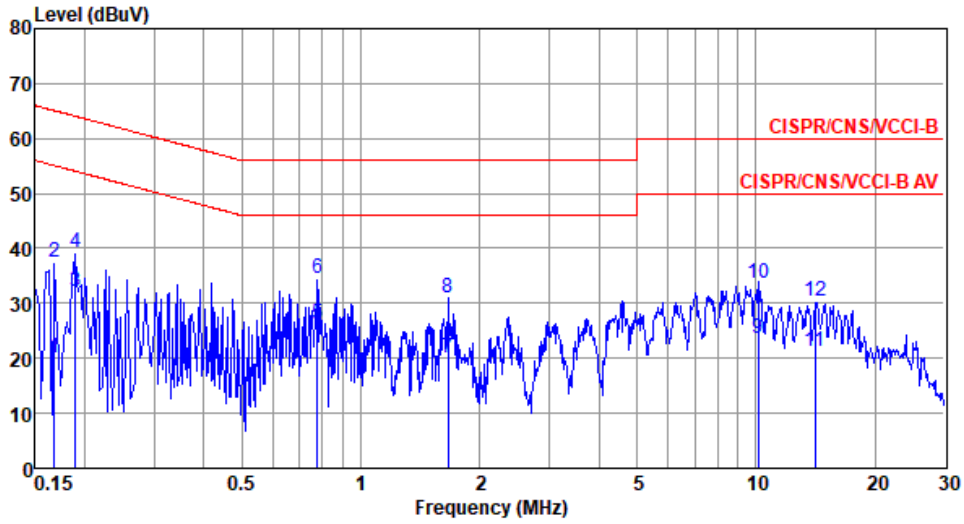


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.165	23.09	55.21	-32.12	13.23	9.81	0.05	Average
2	0.165	38.02	65.21	-27.19	28.16	9.81	0.05	QP
3	0.207	23.98	53.32	-29.34	14.10	9.82	0.06	Average
4	0.207	36.36	63.32	-26.96	26.48	9.82	0.06	QP
5*	0.788	33.72	46.00	-12.28	23.66	9.95	0.11	Average
6	0.788	42.01	56.00	-13.99	31.95	9.95	0.11	QP
7	4.549	29.98	46.00	-16.02	19.64	10.03	0.31	Average
8	4.549	42.93	56.00	-13.07	32.59	10.03	0.31	QP
9	9.502	29.11	50.00	-20.89	18.63	10.09	0.39	Average
10	9.502	37.23	60.00	-22.77	26.75	10.09	0.39	QP
11	13.551	24.46	50.00	-25.54	13.74	10.17	0.55	Average
12	13.551	31.93	60.00	-28.07	21.21	10.17	0.55	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 / 12	Test Freq. (MHz)	907.8
Power Phase	Neutral		

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

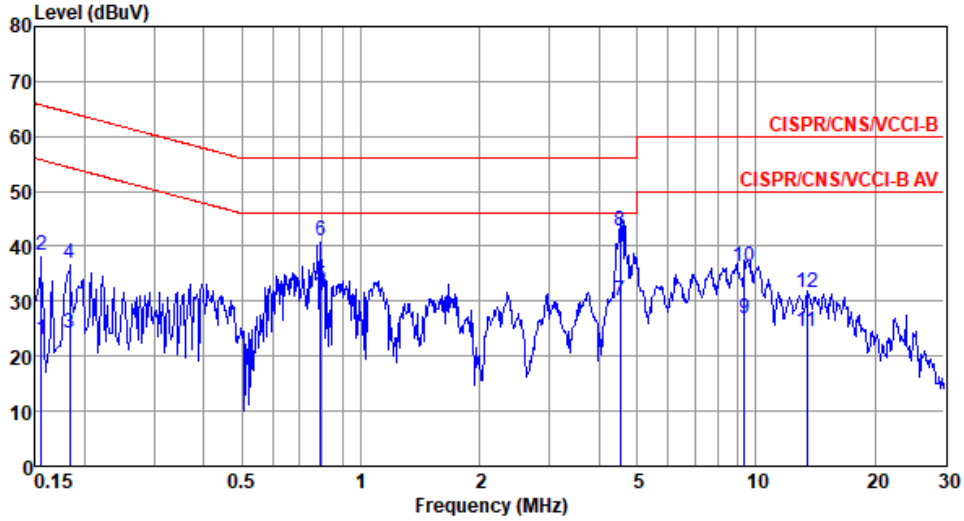


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.168	20.17	55.08	-34.91	10.33	9.79	0.05	Average
2	0.168	37.57	65.08	-27.51	27.73	9.79	0.05	QP
3	0.189	32.17	54.06	-21.89	22.31	9.80	0.06	Average
4	0.189	39.23	64.06	-24.83	29.37	9.80	0.06	QP
5*	0.775	26.24	46.00	-19.76	16.29	9.84	0.11	Average
6	0.775	34.50	56.00	-21.50	24.55	9.84	0.11	QP
7	1.662	20.17	46.00	-25.83	10.11	9.90	0.16	Average
8	1.662	31.00	56.00	-25.00	20.94	9.90	0.16	QP
9	10.125	23.68	50.00	-26.32	13.21	10.06	0.41	Average
10	10.125	33.75	60.00	-26.25	23.28	10.06	0.41	QP
11	14.138	21.17	50.00	-28.83	10.45	10.15	0.57	Average
12	14.138	30.40	60.00	-29.60	19.68	10.15	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 / 12	**Test Freq. (MHz)**	914.2
Power Phase	Line		

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

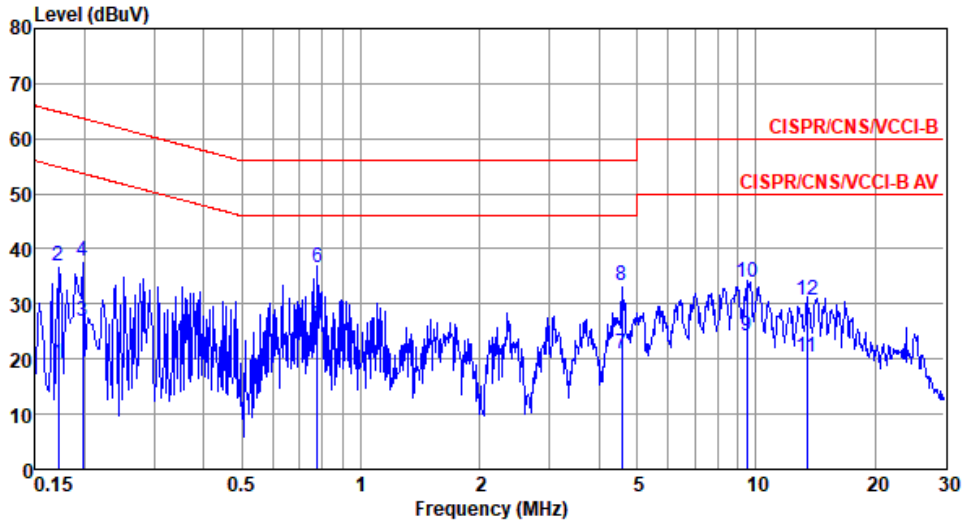


	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.156	23.07	55.69	-32.62	13.21	9.81	0.05	Average
2	0.156	38.36	65.69	-27.33	28.50	9.81	0.05	QP
3	0.183	24.15	54.33	-30.18	14.27	9.82	0.06	Average
4	0.183	36.78	64.33	-27.55	26.90	9.82	0.06	QP
5*	0.792	32.79	46.00	-13.21	22.73	9.95	0.11	Average
6	0.792	40.97	56.00	-15.03	30.91	9.95	0.11	QP
7	4.525	30.17	46.00	-15.83	19.84	10.03	0.30	Average
8	4.525	42.75	56.00	-13.25	32.42	10.03	0.30	QP
9	9.352	26.98	50.00	-23.02	16.50	10.09	0.39	Average
10	9.352	36.44	60.00	-23.56	25.96	10.09	0.39	QP
11	13.479	24.47	50.00	-25.53	13.76	10.16	0.55	Average
12	13.479	31.70	60.00	-28.30	20.99	10.16	0.55	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 / 12	Test Freq. (MHz)	914.2
Power Phase	Neutral		

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



	Freq	Level	Limit Line	Over Limit	Read Level	Factor	Cable loss	Remark
	MHz	dBuV	dBuV	dB	dBuV	dB	dB	
1	0.171	19.32	54.90	-35.58	9.48	9.79	0.05	Average
2	0.171	36.76	64.90	-28.14	26.92	9.79	0.05	QP
3	0.198	26.82	53.71	-26.89	16.96	9.80	0.06	Average
4	0.198	37.77	63.71	-25.94	27.91	9.80	0.06	QP
5	0.775	26.09	46.00	-19.91	16.14	9.84	0.11	Average
6*	0.775	36.67	56.00	-19.33	26.72	9.84	0.11	QP
7	4.574	20.98	46.00	-25.02	10.72	9.95	0.31	Average
8	4.574	33.39	56.00	-22.61	23.13	9.95	0.31	QP
9	9.502	24.07	50.00	-25.93	13.63	10.05	0.39	Average
10	9.502	33.96	60.00	-26.04	23.52	10.05	0.39	QP
11	13.479	20.22	50.00	-29.78	9.54	10.13	0.55	Average
12	13.479	30.59	60.00	-29.41	19.91	10.13	0.55	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

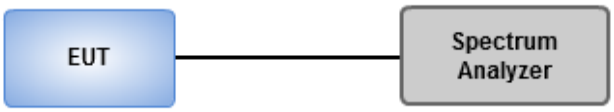
6dB Bandwidth

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) = 10kHz, Video bandwidth = 30kHz.
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

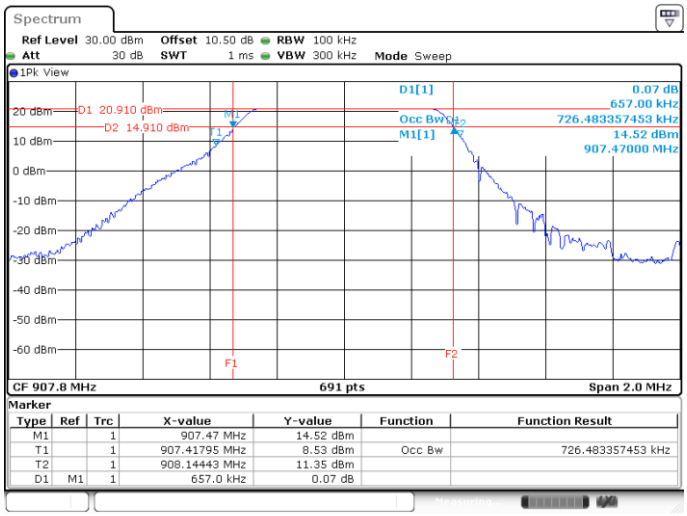


3.2.4 Test Result of 6dB and Occupied Bandwidth

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

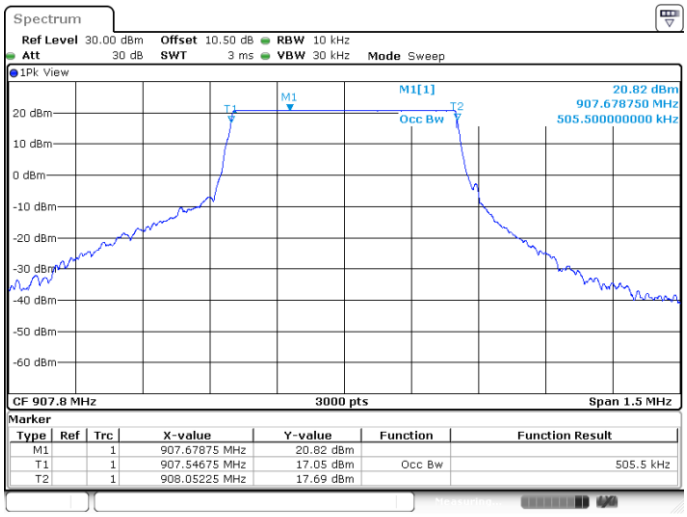
Modulation / SF	Freq. (MHz)	6dB Bandwidth (MHz)	Limit (MHz)
Lora / 12	903	0.654	0.5
Lora / 12	907.8	0.657	0.5
Lora / 12	914.2	0.648	0.5

Worst Plot



Modulation / SF	Freq. (MHz)	99% Occupied Bandwidth (MHz)
Lora / 12	903	0.505
Lora / 12	907.8	0.506
Lora / 12	914.2	0.505

Worst Plot



3.3 RF Output Power

3.3.1 Limit of RF Output Power

Conducted power shall not exceed 1Watt.

☒ Antenna gain <= 6dBi, no any corresponding reduction is in output power limit.

☐ Antenna gain > 6dBi

Transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi

3.3.2 Test Procedures

☐ Maximum Peak Conducted Output Power

☐ **Spectrum analyzer**

1. Set RBW = 1MHz, VBW = 3MHz, Detector = Peak.
2. Sweep time = auto, Trace mode = max hold, Allow trace to fully stabilize.
3. Use the spectrum analyzer channel power measurement function with the band limits set equal to the DTS bandwidth edges.

☐ **Power meter**

1. A broadband Peak 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.

☒ Maximum Conducted Output Power

☒ **Power meter**

1. A broadband Average 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	21°C / 65%	Tested By	Aska Huang

Modulation / SF	Freq. (MHz)	Output Power (mW)	Output Power (dBm)	Limit (dBm)
Lora / 12	903	132.4342	21.05	30
Lora / 12	907.8	129.1219	20.97	30
Lora / 12	914.2	124.7384	20.88	30

3.4 Power Spectral Density

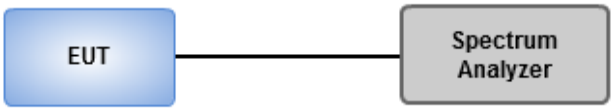
3.4.1 Limit of Power Spectral Density

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

3.4.2 Test Procedures

1. Set the RBW = 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.

3.4.3 Test Setup

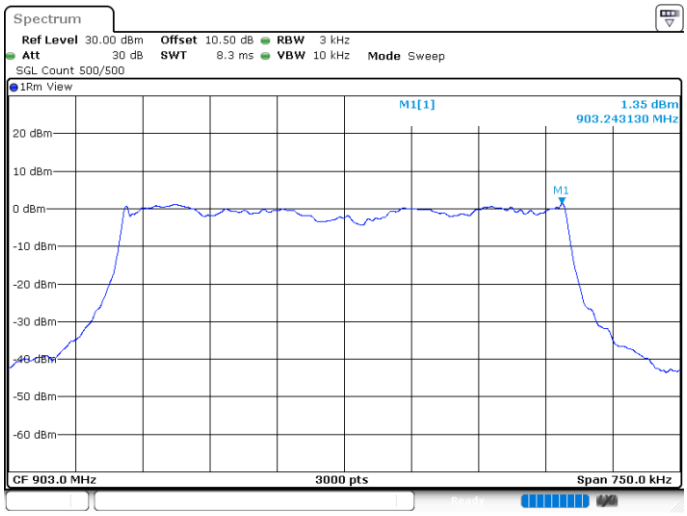


3.4.4 Test Result of Power Spectral Density

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

Modulation / SF	Freq. (MHz)	Total Power Spectral Density (dBm/3kHz)	Limit (dBm/3kHz)
Lora / 12	903	1.35	8.00
Lora / 12	907.8	1.29	8.00
Lora / 12	914.2	0.92	8.00

Worst Plot



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:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.5.2 Test Procedures

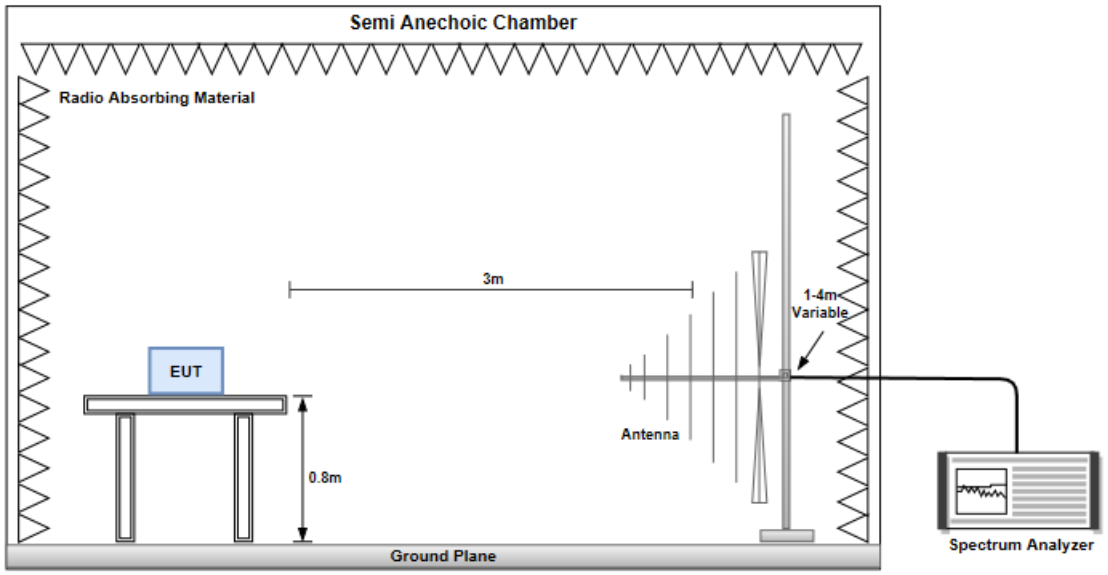
1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission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

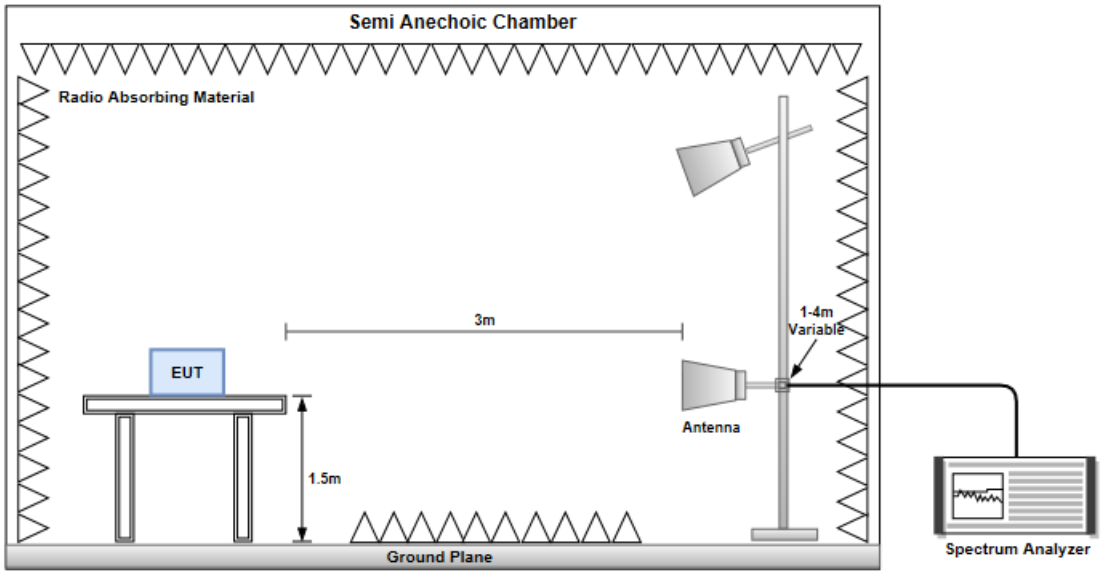
1. 120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission below 1GHz.
2. RBW=1MHz, VBW=3MHz and Peak detector is for peak measured value of radiated emission above 1GHz.
3. RBW=1MHz, VBW=1/T and Peak detector is for average measured value of radiated emission above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

3.5.3 Test Setup

Radiated Emissions below 1 GHz



Radiated Emissions above 1 GHz

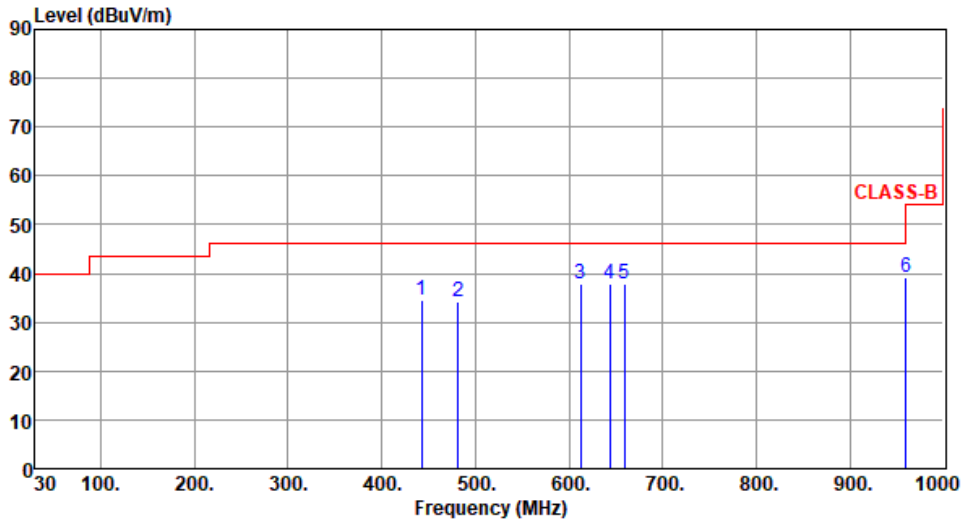


Configuration 1: POE Mode

3.5.4 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation / SF	Lora /12	**Test Freq. (MHz)**	903
Polarization	Horizontal		

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

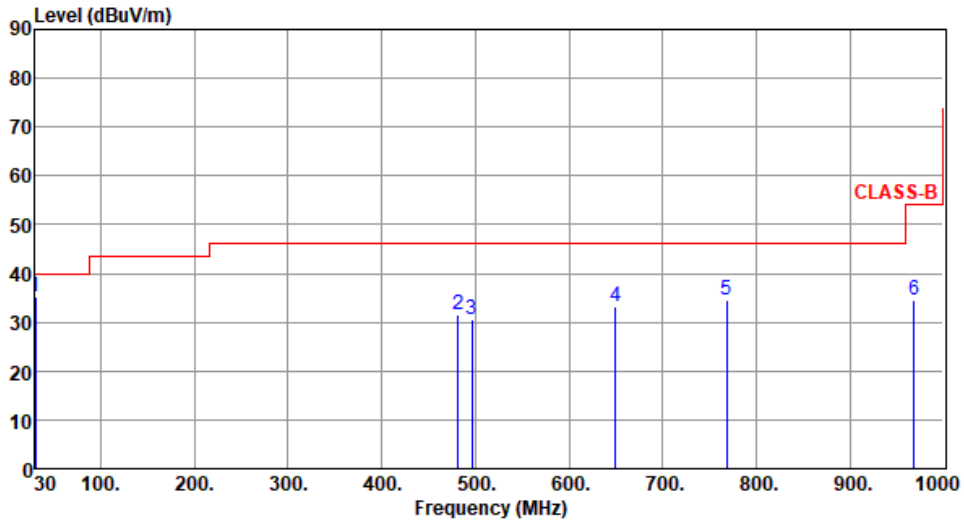


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	442.40	34.67	46.00	-11.33	39.23	-4.56	Peak	---	---
2	481.60	34.37	46.00	-11.63	38.02	-3.65	Peak	---	---
3	612.80	37.88	46.00	-8.12	38.57	-0.69	Peak	---	---
4	644.00	37.95	46.00	-8.05	38.19	-0.24	Peak	---	---
5	659.20	37.71	46.00	-8.29	37.98	-0.27	Peak	---	---
6	960.00	39.15	46.00	-6.85	34.38	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 /12	Test Freq. (MHz)	903
Polarization	Vertical		

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

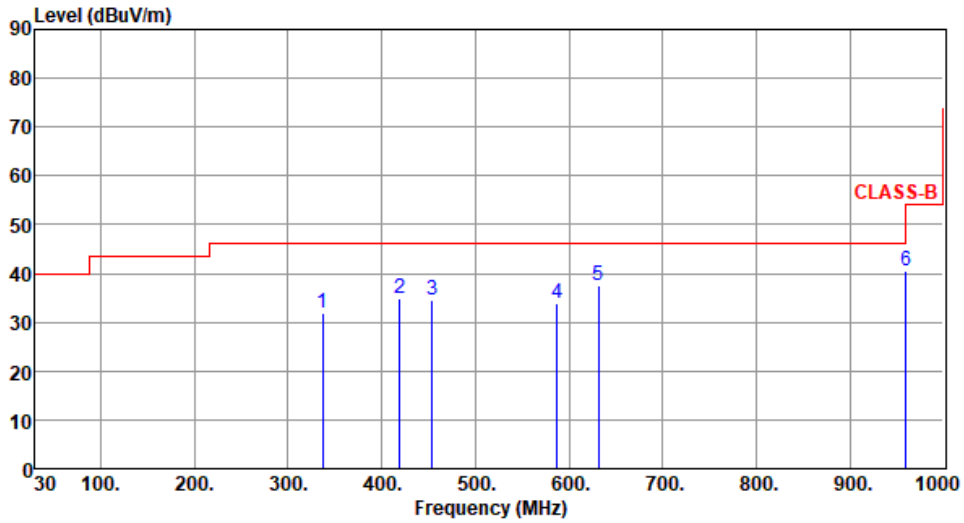


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.25	35.28	40.00	-4.72	44.84	-9.56	Peak	---	---
2	481.60	31.68	46.00	-14.32	35.33	-3.65	Peak	---	---
3	496.80	30.68	46.00	-15.32	33.95	-3.27	Peak	---	---
4	649.60	33.31	46.00	-12.69	33.53	-0.22	Peak	---	---
5	768.00	34.39	46.00	-11.61	32.49	1.90	Peak	---	---
6	968.80	34.70	54.00	-19.30	29.82	4.88	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 /12	Test Freq. (MHz)	907.8
Polarization	Horizontal		

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

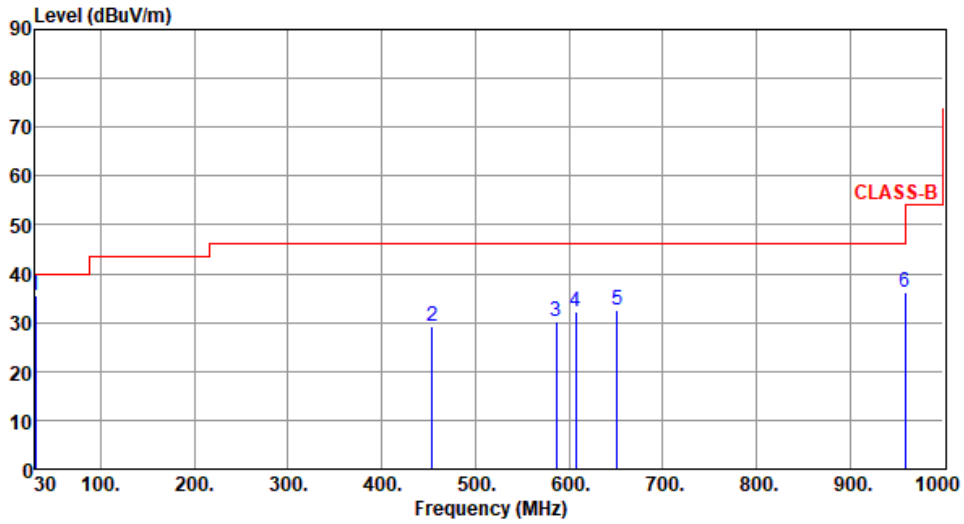


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	336.80	31.91	46.00	-14.09	38.93	-7.02	Peak	---	---
2	419.20	34.82	46.00	-11.18	40.09	-5.27	Peak	---	---
3	453.60	34.57	46.00	-11.43	38.72	-4.15	Peak	---	---
4	587.20	33.91	46.00	-12.09	35.28	-1.37	Peak	---	---
5	631.20	37.51	46.00	-8.49	37.90	-0.39	Peak	---	---
6	960.00	40.38	46.00	-5.62	35.61	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 /12	Test Freq. (MHz)	907.8
Polarization	Vertical		

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

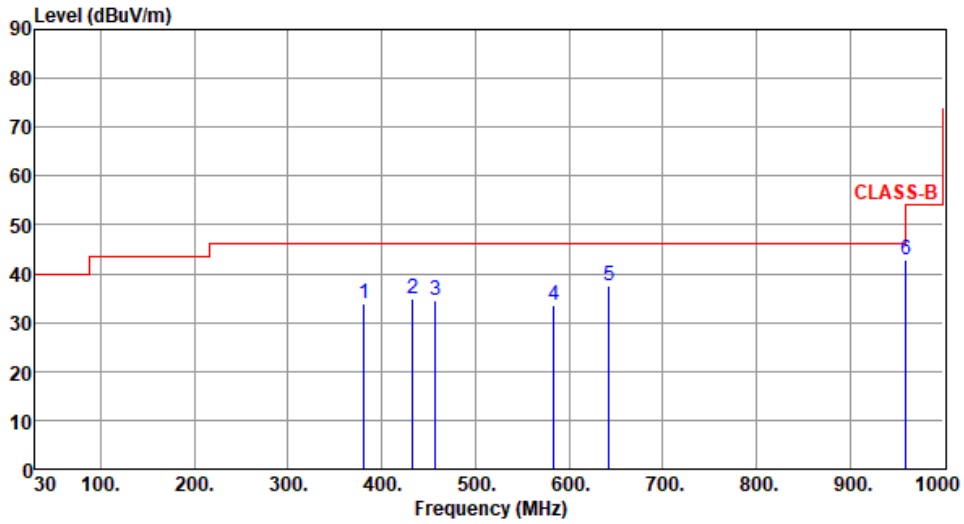


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.29	35.63	40.00	-4.37	45.20	-9.57	Peak	---	---
2	453.60	29.38	46.00	-16.62	33.53	-4.15	Peak	---	---
3	586.40	30.31	46.00	-15.69	31.69	-1.38	Peak	---	---
4	607.20	32.28	46.00	-13.72	33.17	-0.89	Peak	---	---
5	651.20	32.52	46.00	-13.48	32.74	-0.22	Peak	---	---
6	959.20	36.19	46.00	-9.81	31.43	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 /12	Test Freq. (MHz)	914.2
Polarization	Horizontal		

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

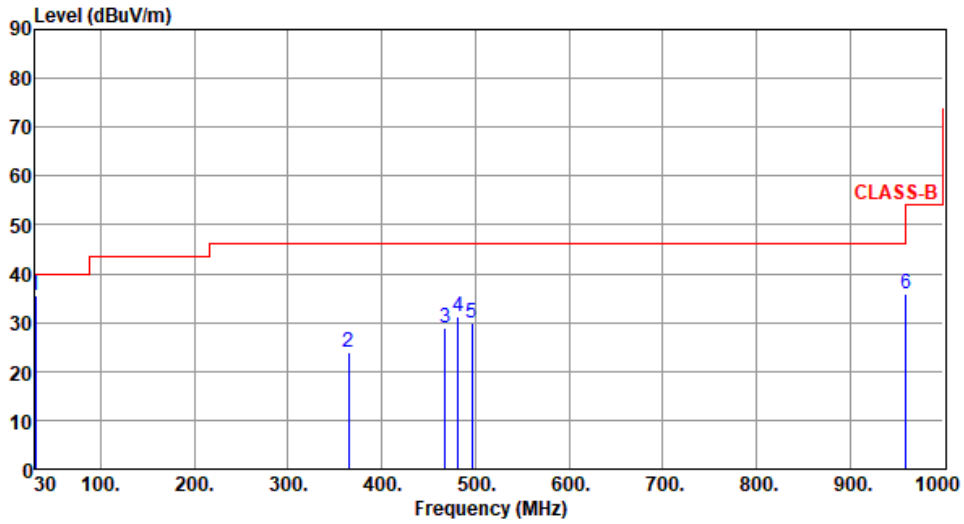


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	381.14	33.83	46.00	-12.17	39.92	-6.09	Peak	---	---
2	433.52	34.92	46.00	-11.08	39.64	-4.72	Peak	---	---
3	457.77	34.62	46.00	-11.38	38.73	-4.11	Peak	---	---
4	583.87	33.63	46.00	-12.37	35.09	-1.46	Peak	---	---
5	643.04	37.37	46.00	-8.63	37.61	-0.24	Peak	---	---
6	960.00	42.80	46.00	-3.20	38.03	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 /12	Test Freq. (MHz)	914.2
Polarization	Vertical		

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



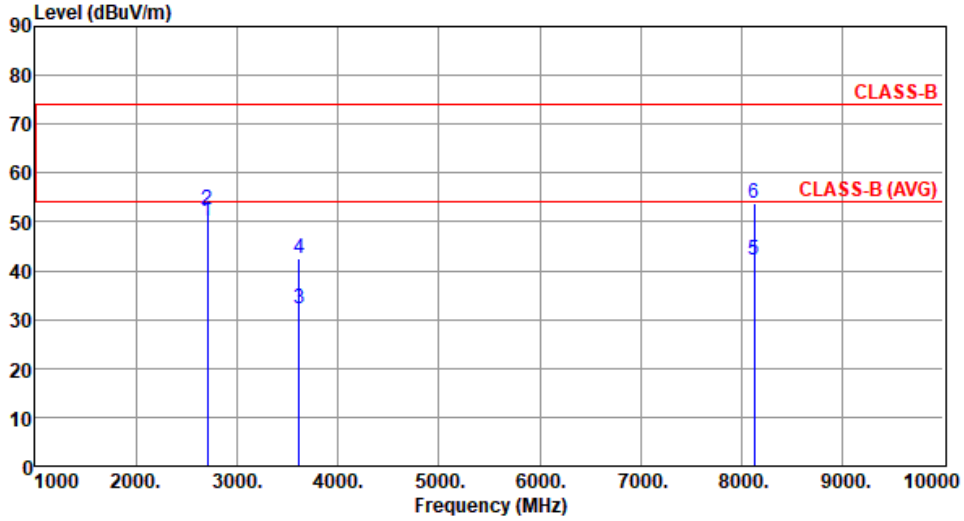
	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.29	35.52	40.00	-4.48	45.09	-9.57	Peak	---	---
2	364.80	23.79	46.00	-22.21	30.14	-6.35	Peak	---	---
3	468.00	29.01	46.00	-16.99	32.90	-3.89	Peak	---	---
4	481.60	31.34	46.00	-14.66	34.99	-3.65	Peak	---	---
5	496.80	29.77	46.00	-16.23	33.04	-3.27	Peak	---	---
6	960.00	35.95	46.00	-10.05	31.18	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.

3.5.5 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation / SF	Lora /12	Test Freq. (MHz)	903
Polarization	Horizontal		

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

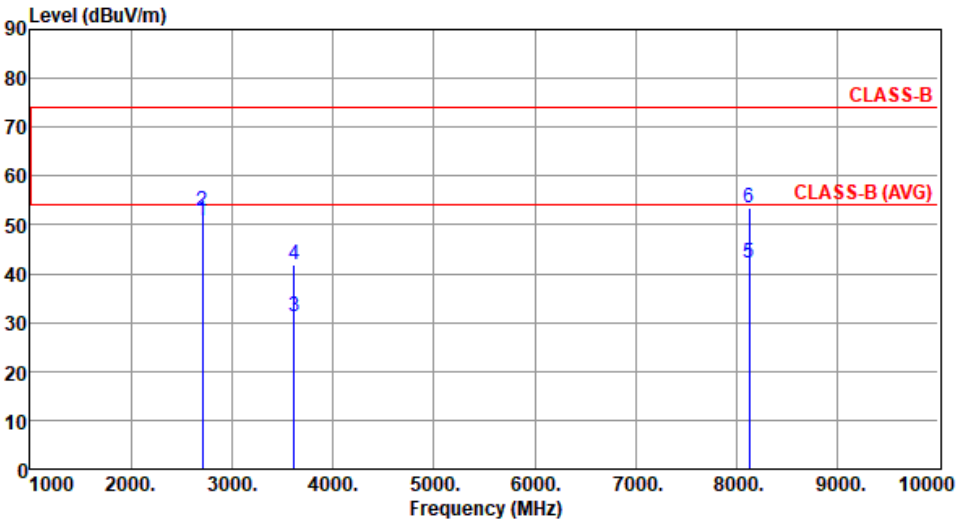


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2709.00	50.06	54.00	-3.94	22.31	27.75	Average	299	246
2	2709.00	52.44	74.00	-21.56	24.69	27.75	Peak	299	246
3	3612.00	32.38	54.00	-21.62	3.26	29.12	Average	110	31
4	3612.00	42.56	74.00	-31.44	13.44	29.12	Peak	110	31
5	8127.00	42.34	54.00	-11.66	5.55	36.79	Average	104	36
6	8127.00	53.82	74.00	-20.18	17.03	36.79	Peak	104	36

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 /12	Test Freq. (MHz)	903
Polarization	Vertical		

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

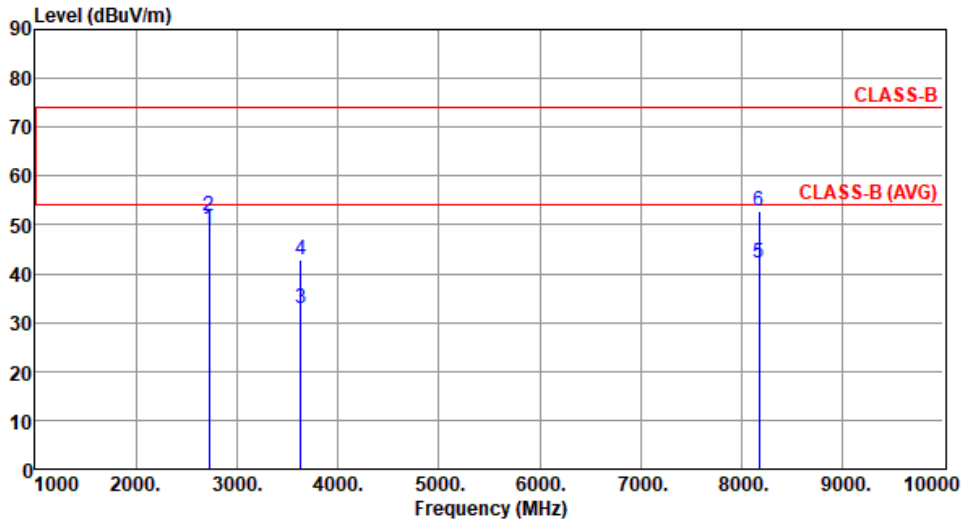


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2709.00	50.81	54.00	-3.19	23.06	27.75	Average	256	181
2	2709.00	52.96	74.00	-21.04	25.21	27.75	Peak	256	181
3	3612.00	31.36	54.00	-22.64	2.24	29.12	Average	102	61
4	3612.00	41.94	74.00	-32.06	12.82	29.12	Peak	102	61
5	8127.00	42.14	54.00	-11.86	5.35	36.79	Average	100	52
6	8127.00	53.41	74.00	-20.59	16.62	36.79	Peak	100	52

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 /12	Test Freq. (MHz)	907.8
Polarization	Horizontal		

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

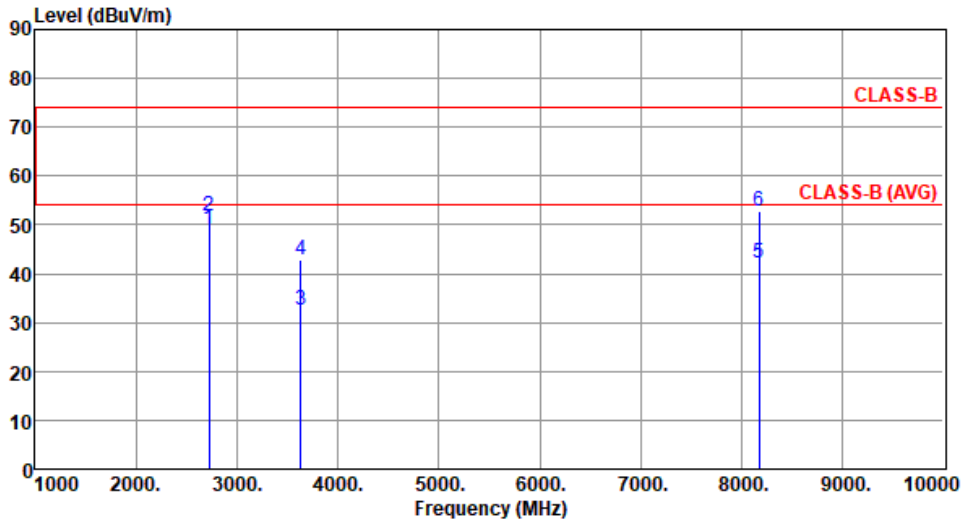


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2723.40	49.04	54.00	-4.96	21.20	27.84	Average	291	248
2	2723.40	51.65	74.00	-22.35	23.81	27.84	Peak	291	248
3	3631.20	32.76	54.00	-21.24	3.60	29.16	Average	106	45
4	3631.20	42.69	74.00	-31.31	13.53	29.16	Peak	106	45
5	8170.20	42.04	54.00	-11.96	5.38	36.66	Average	100	25
6	8170.20	52.86	74.00	-21.14	16.20	36.66	Peak	100	25

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 /12	Test Freq. (MHz)	907.8
Polarization	Vertical		

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

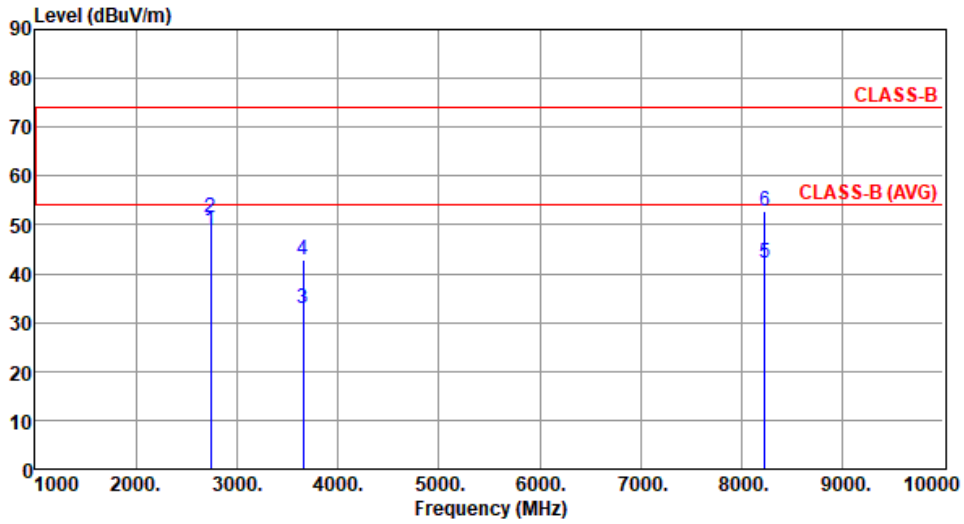


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2723.40	49.15	54.00	-4.85	21.31	27.84	Average	282	189
2	2723.40	51.86	74.00	-22.14	24.02	27.84	Peak	282	189
3	3631.20	32.55	54.00	-21.45	3.39	29.16	Average	104	14
4	3631.20	42.74	74.00	-31.26	13.58	29.16	Peak	104	14
5	8170.20	42.24	54.00	-11.76	5.58	36.66	Average	100	64
6	8170.20	52.96	74.00	-21.04	16.30	36.66	Peak	100	64

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 /12	Test Freq. (MHz)	914.2
Polarization	Horizontal		

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

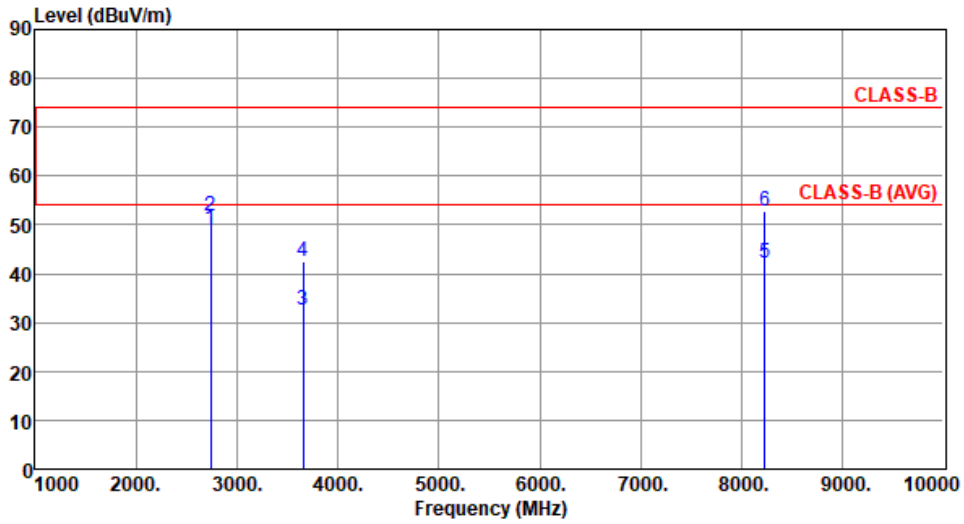


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2742.60	48.95	54.00	-5.05	20.99	27.96	Average	294	244
2	2742.60	51.62	74.00	-22.38	23.66	27.96	Peak	294	244
3	3656.80	32.84	54.00	-21.16	3.65	29.19	Average	100	28
4	3656.80	42.95	74.00	-31.05	13.76	29.19	Peak	100	28
5	8227.80	42.03	54.00	-11.97	5.49	36.54	Average	105	48
6	8227.80	52.76	74.00	-21.24	16.22	36.54	Peak	105	48

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 /12	Test Freq. (MHz)	914.2
Polarization	Vertical		

Test By :BRAD WU Temperature(℃):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	2742.60	49.03	54.00	-4.97	21.07	27.96	Average	295	176
2	2742.60	51.74	74.00	-22.26	23.78	27.96	Peak	295	176
3	3656.80	32.45	54.00	-21.55	3.26	29.19	Average	100	44
4	3656.80	42.66	74.00	-31.34	13.47	29.19	Peak	100	44
5	8227.80	42.03	54.00	-11.97	5.49	36.54	Average	103	52
6	8227.80	52.64	74.00	-21.36	16.10	36.54	Peak	103	52

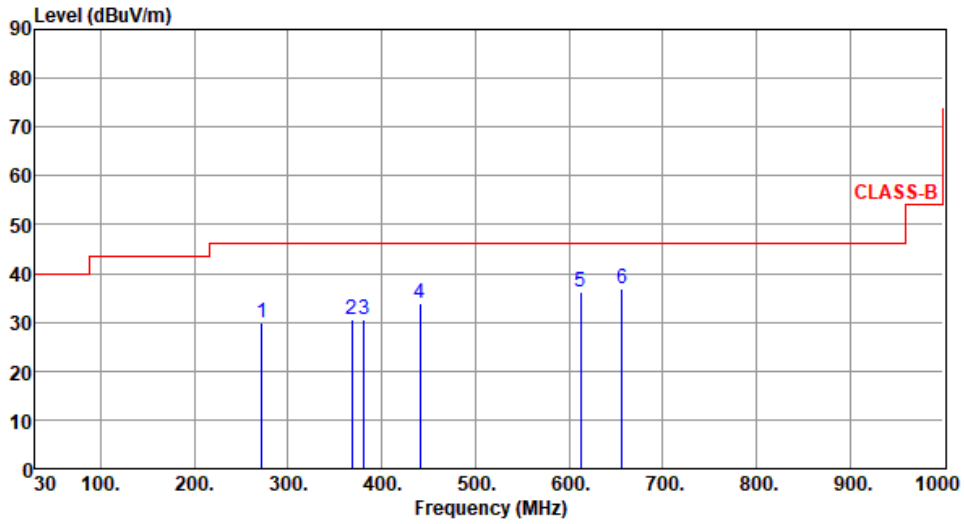
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Configuration 2 : Adapter Mode

3.5.6 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation / SF	Lora /12	**Test Freq. (MHz)**	903
Polarization	Horizontal		

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

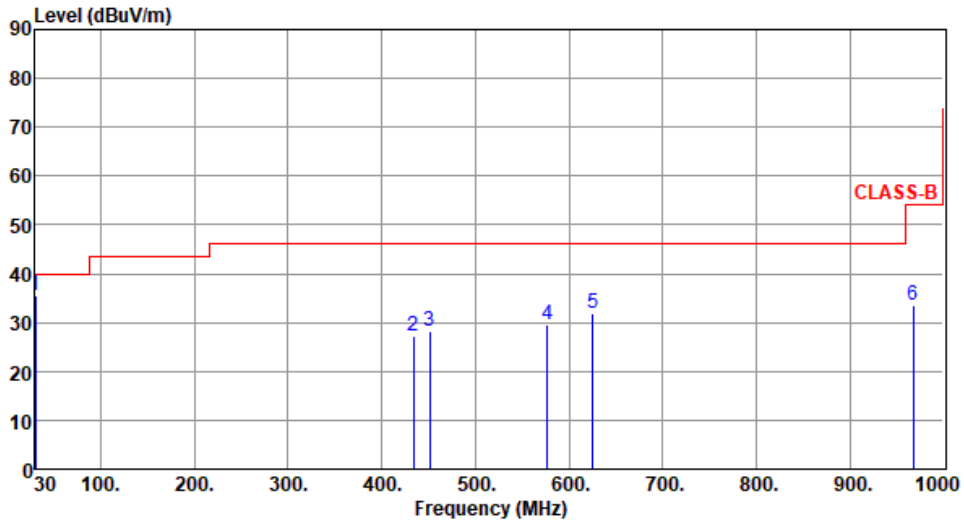


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	272.00	29.74	46.00	-16.26	38.79	-9.05	Peak	---	---
2	368.00	30.70	46.00	-15.30	36.98	-6.28	Peak	---	---
3	380.80	30.64	46.00	-15.36	36.73	-6.09	Peak	---	---
4	440.80	33.94	46.00	-12.06	38.51	-4.57	Peak	---	---
5	612.80	36.29	46.00	-9.71	36.98	-0.69	Peak	---	---
6	656.80	36.85	46.00	-9.15	37.09	-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 /12	Test Freq. (MHz)	903
Polarization	Vertical		

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

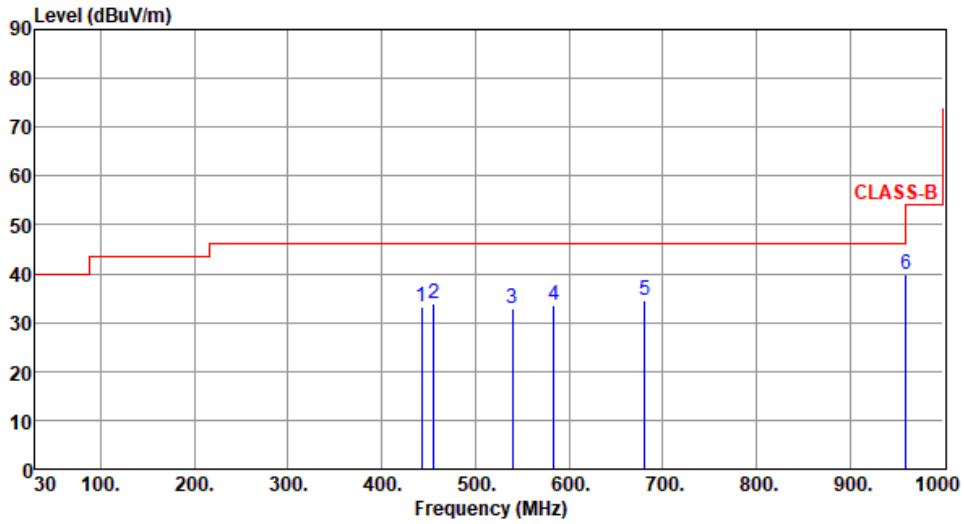


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.29	35.40	40.00	-4.60	44.97	-9.57	Peak	---	---
2	434.40	27.10	46.00	-18.90	31.79	-4.69	Peak	---	---
3	451.20	28.25	46.00	-17.75	32.46	-4.21	Peak	---	---
4	576.80	29.62	46.00	-16.38	31.30	-1.68	Peak	---	---
5	625.60	31.77	46.00	-14.23	32.26	-0.49	Peak	---	---
6	967.20	33.66	54.00	-20.34	28.78	4.88	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 /12	Test Freq. (MHz)	907.8
Polarization	Horizontal		

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

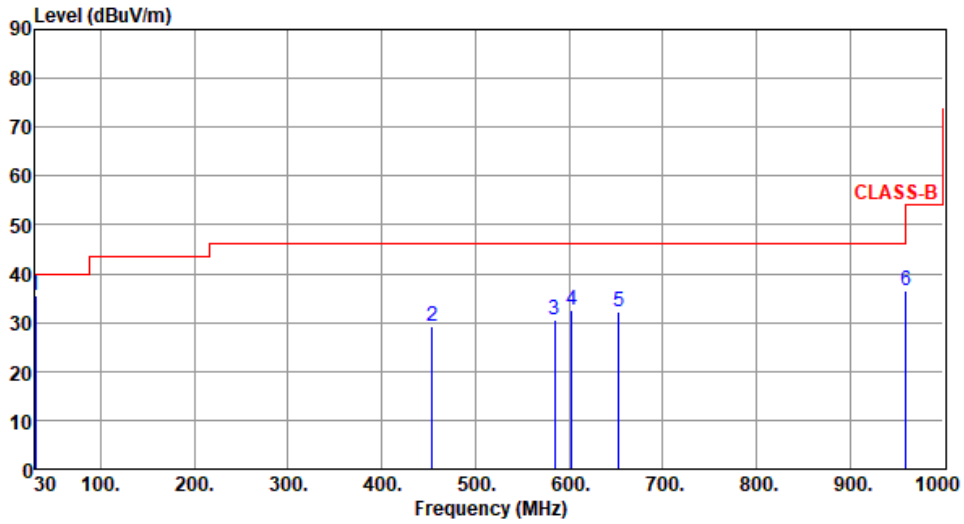


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	442.40	33.08	46.00	-12.92	37.64	-4.56	Peak	---	---
2	456.00	33.96	46.00	-12.04	38.08	-4.12	Peak	---	---
3	540.00	32.88	46.00	-13.12	35.52	-2.64	Peak	---	---
4	584.00	33.65	46.00	-12.35	35.10	-1.45	Peak	---	---
5	680.80	34.53	46.00	-11.47	34.63	-0.10	Peak	---	---
6	960.00	39.78	46.00	-6.22	35.01	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 /12	Test Freq. (MHz)	907.8
Polarization	Vertical		

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

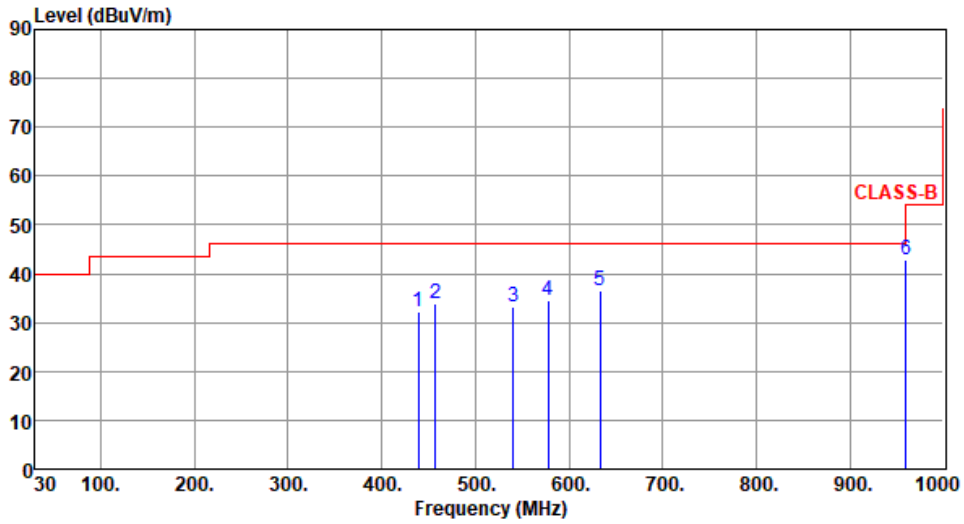


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	30.21	35.52	40.00	-4.48	45.06	-9.54	Peak	---	---
2	453.60	29.33	46.00	-16.67	33.48	-4.15	Peak	---	---
3	584.80	30.58	46.00	-15.42	32.00	-1.42	Peak	---	---
4	603.20	32.43	46.00	-13.57	33.46	-1.03	Peak	---	---
5	653.60	32.17	46.00	-13.83	32.38	-0.21	Peak	---	---
6	960.00	36.49	46.00	-9.51	31.72	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 /12	Test Freq. (MHz)	914.2
Polarization	Horizontal		

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

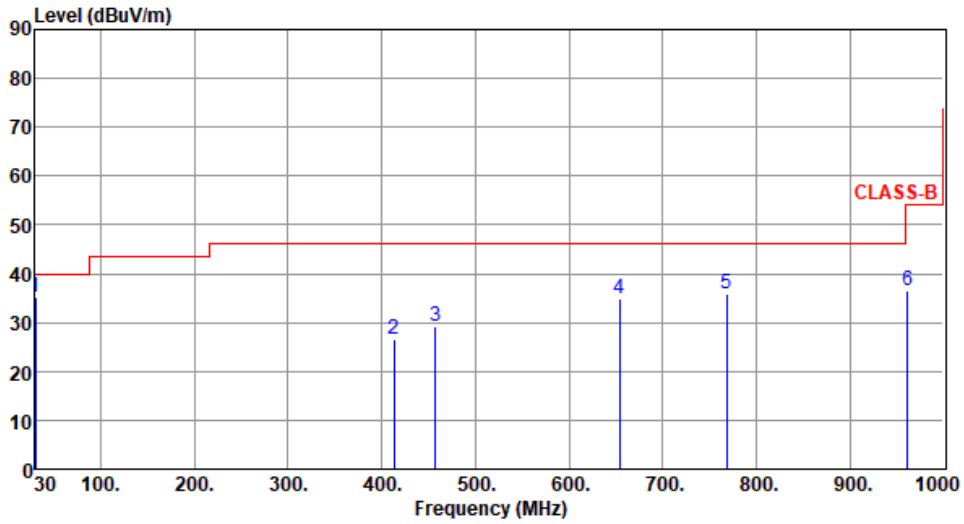


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	439.20	32.16	46.00	-13.84	36.75	-4.59	Peak	---	---
2	457.60	33.82	46.00	-12.18	37.93	-4.11	Peak	---	---
3	540.80	33.25	46.00	-12.75	35.86	-2.61	Peak	---	---
4	577.60	34.57	46.00	-11.43	36.24	-1.67	Peak	---	---
5	633.60	36.51	46.00	-9.49	36.89	-0.38	Peak	---	---
6	960.00	42.76	46.00	-3.24	37.99	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 /12	Test Freq. (MHz)	914.2
Polarization	Vertical		

Test By :Akun Chung Temperature(℃):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	30.58	35.28	40.00	-4.72	44.93	-9.65	Peak	---	---
2	413.60	26.55	46.00	-19.45	32.06	-5.51	Peak	---	---
3	457.60	29.20	46.00	-16.80	33.31	-4.11	Peak	---	---
4	654.40	34.78	46.00	-11.22	34.99	-0.21	Peak	---	---
5	768.00	35.89	46.00	-10.11	33.99	1.90	Peak	---	---
6	961.60	36.62	54.00	-17.38	31.82	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.

3.6 Emissions in Non-Restricted Frequency Bands

3.6.1 Emissions in Non-Restricted Frequency Bands Limit

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

3.6.2 Measuring Instruments

Refer a test equipment and calibration data table in this test report.

3.6.3 Test Procedures

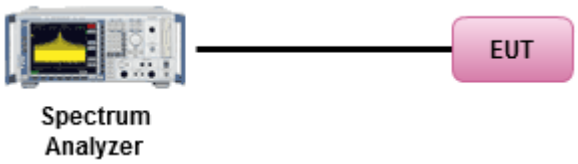
Reference level measurement

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

Emission level measurement

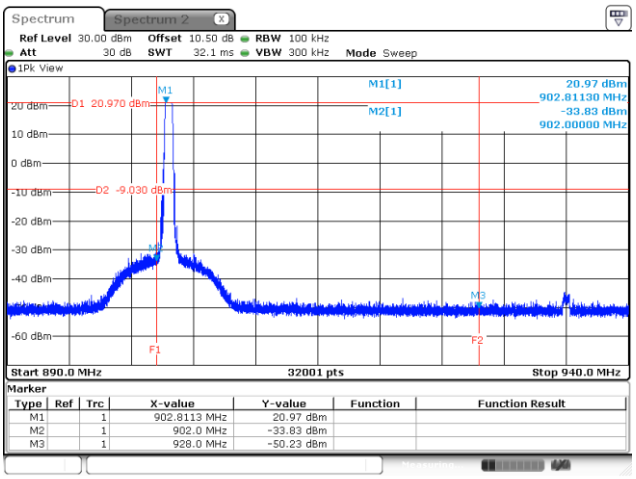
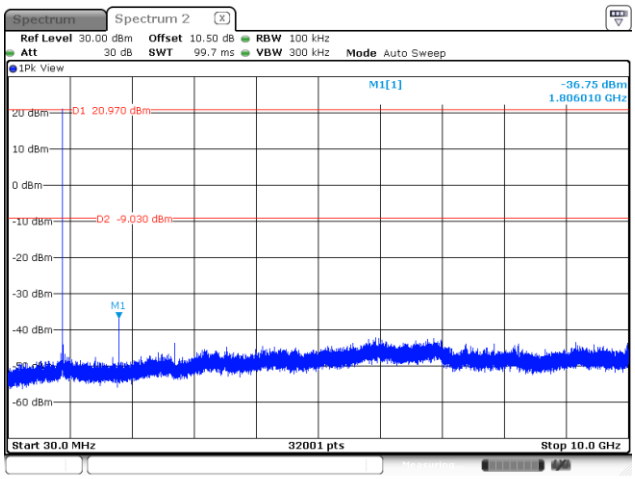
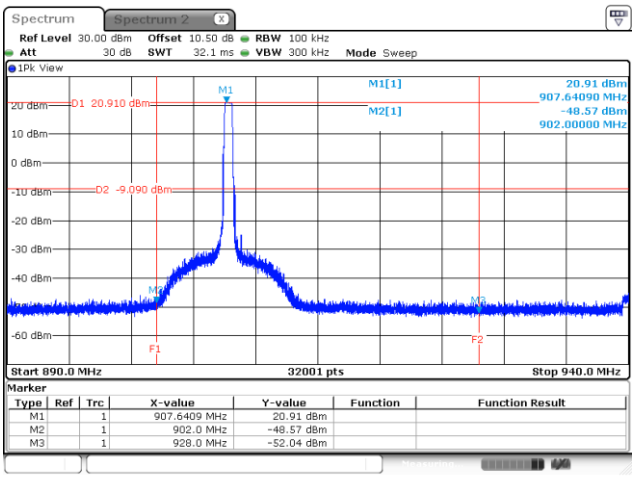
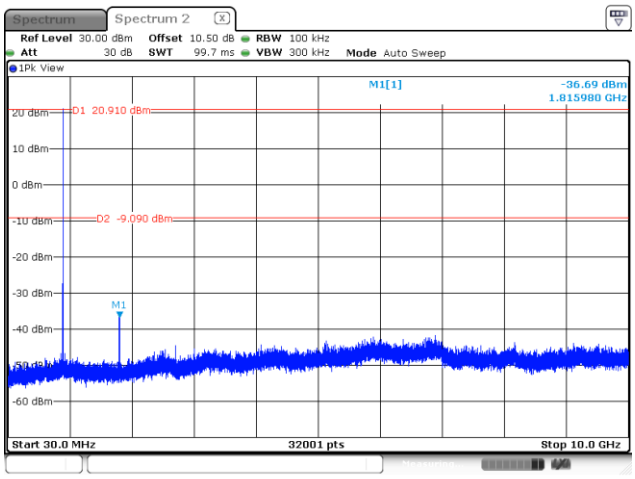
1. Set RBW=100kHz, VBW = 300kHz , Detector = Peak, Sweep time = Auto
2. Trace = max hold , Allow Trace to fully stabilize
3. Scan Frequency range is up to 10GHz
4. Use the peak marker function to determine the maximum amplitude level

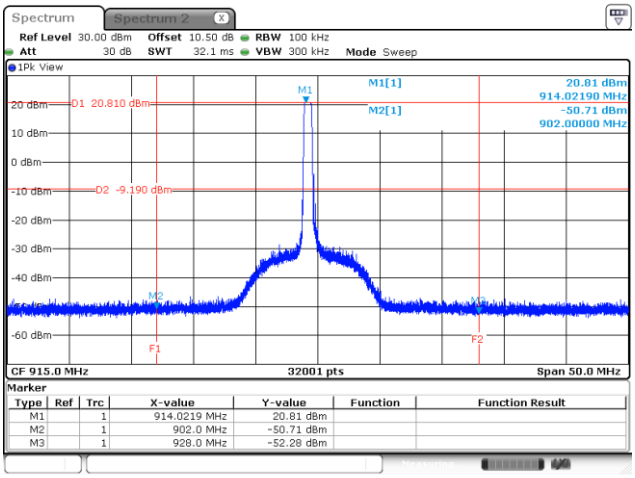
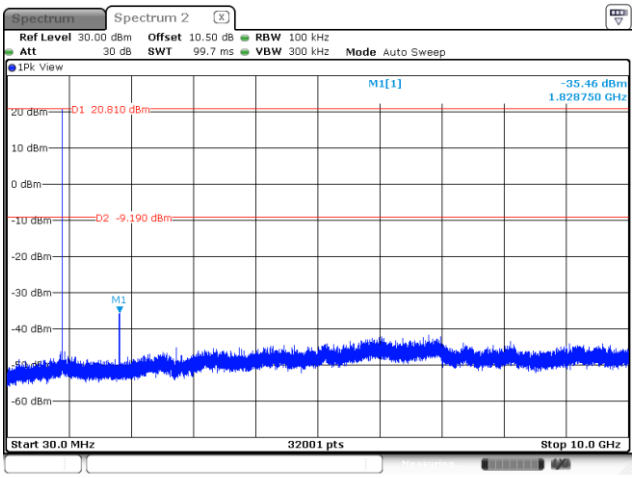
3.6.4 Test Setup

Transmitter Radiated Bandedge Emissions


3.6.5 Unwanted Emissions into Non-Restricted Frequency Bands

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

TX Freq 903MHz / 30MHz~10GHz (down 30dBc)	TX Freq 907.8MHz / 30MHz~10GHz (down 30dBc)
	
	

TX Freq 914.2MHz / 30MHz~10GHz (down 30dBc)	---
	---
	---

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	**Kwei Shan**	**Kwei Shan Site II**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	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==