Report No.: HTT202210146F01

FCC PART 15 SUBPART C TEST REPORT

FCC PART 15.247

Report Reference No.	: **HTT202210146F01**	
FCC ID. ..... :	**2A884-RMRF10TP**	
Compiled by (position+printed name+signature) . :	File administrators Kevin Liu	Ervin Xu
Supervised by (position+printed name+signature) . :	Project Engineer Kevin Liu	Bruce Zhu
Approved by (position+printed name+signature) . :	RF Manager Eric Wang	Kevin Yang
Date of issue ..... :	Oct.24,2022	
Testing Laboratory Name..... :	**Shenzhen HTT Technology Co.,Ltd.**	
Address ..... :	1F, Building B, Huafeng International Robotics Industrial Park, Hangcheng Road,Nanchang Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China	
Applicant's name ..... :	Nanjing Ningyuan Intelligent Instrument Co., Ltd	
Address ..... :	Building 6, Jima Industrial Park, No. 669 Jiangjun Avenue, Jiangning District, Nanjing China	
Test specification..... **:**		
Standard..... :	**FCC Part 15.247**	

Test item description ..... :	LORA RF module
Trade Mark..... :	N/A
Manufacturer ..... :	Nanjing Ningyuan Intelligent Instrument Co., Ltd
Model/Type reference ..... :	RM-RF10TP-1278(PI)
Listed Models ..... :	RM-RF10TP-1278(N)，RM-RF10TP-1278(E)，RM-RF10TP-1278(C)
Frequency	903.0MHz-927.0MHz
Ratings ..... :	DC 5.0V
Result ..... :	**PASS**

TEST REPORT

Equipment under Test	:	LORA RF module
Model /Type	:	RM-RF10TP-1278(PI)
Listed Models	:	RM-RF10TP-1278(N)，RM-RF10TP-1278(E)，RM-RF10TP-1278(C)
Applicant	:	Nanjing Ningyuan Intelligent Instrument Co., Ltd
Address	:	Building 6, Jima Industrial Park, No. 669 Jiangjun Avenue, Jiangning District, Nanjing China
Manufacturer	:	Nanjing Ningyuan Intelligent Instrument Co., Ltd
Address	:	Building 6, Jima Industrial Park, No. 669 Jiangjun Avenue, Jiangning District, Nanjing China

Test Result:	**PASS**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz.
ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices
KDB558074 D01 V05r02: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247

2 SUMMARY

2.1 General Remarks

Date of receipt of test sample	:	Oct.18,2022
Testing commenced on	:	Oct.18,2022
Testing concluded on	:	Oct.24,2022

2.2 Product Description

Product Description:	LORA RF module
Model/Type reference:	RM-RF10TP-1278(PI)
Power supply:	DC 5.0V
Testing sample ID:	HTT202210146-1# (Engineer sample), HTT202210146-2# (Normal sample)
Lora	
Modulation Technology:	Hybrid system
Operation frequency:	903.0MHz-927.0MHz
Channel number:	25
Antenna type:	External antenna
Antenna gain:	-1.71dBi

2.3 Equipment Under Test

Power supply system utilised

Power supply voltage	:	○	230V / 50 Hz	○	120V / 60Hz
		○	12 V DC	○	24 V DC
		●	Other (specified in blank below)		

DC 5.0V

2.4 Short description of the Equipment under Test (EUT)

This is a LORA RF module.
For more details, refer to the user's manual of the EUT.

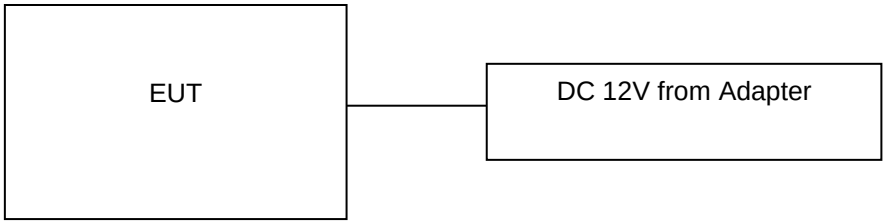
2.5 EUT operation mode

The Applicant provides communication tools software(Engineer mode) to control the EUT for staying in continuous transmitting (Duty Cycle more than 98%) and receiving mode for testing .There are 24 channels provided to the EUT and Channel 00/12/24 were selected to test.

Operation Frequency：

Channel	Frequency (MHz)	Channel	Frequency (MHz)
00	903.0	13	916.0
01	904.0	14	917.0
02	905.0	15	918.0
03	906.0	16	919.0
04	907.0	17	920.0
05	908.0	18	921.0
06	909.0	19	922.0
07	910.0	20	923.0
08	911.0	21	924.0
09	912.0	22	925.0
10	913.0	23	926.0
11	914.0	**24**	927.0
12	915.0		

2.6 Block Diagram of Test Setup



2.7 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for the device filing to comply with Section 15.247 of the FCC Part 15, Subpart C Rules.

2.8 Modifications

No modifications were implemented to meet testing criteria.

3 TEST ENVIRONMENT

3.1 Address of the test laboratory

Shenzhen HTT Technology Co.,Ltd.
1F, Building B, Huafeng International Robotics Industrial Park, Hangcheng Road,Nanchang Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China

3.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

FCC-Registration No.: 779513 Designation Number: CN1319
Shenzhen HTT Technology Co.,Ltd. has been listed on the US Federal Communications Commission list of test facilities recognized to perform electromagnetic emissions measurements.

A2LA-Lab Cert. No.: 6435.01
Shenzhen HTT Technology Co.,Ltd. has been listed by American Association for Laboratory Accreditation to perform electromagnetic emission measurement.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10 and CISPR 16-1-4:2010.

3.3 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:
Radiated Emission:

Temperature:	25 ° C
Humidity:	45 %
Atmospheric pressure:	950-1050mbar

AC Main Conducted testing：

Temperature:	24 ° C
Humidity:	47 %
Atmospheric pressure:	950-1050mbar

Conducted testing：

Temperature:	24 ° C
Humidity:	46 %
Atmospheric pressure:	950-1050mbar

3.4 Summary of measurement results

Test Specification clause	Test case	Test Mode	Test Channel	Recorded In Report		Test result
§15.247(e)	Power spectral density	Hybrid system	☒ Lowest ☒ Middle ☒ Highest	Hybrid system	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(a)(2)	Spectrum bandwidth – 6 dB bandwidth	Hybrid system	☒ Lowest ☒ Middle ☒ Highest	Hybrid system	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(b)(3)	Maximum output Peak power	Hybrid system	☒ Lowest ☒ Middle ☒ Highest	Hybrid system	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(d)	Band edge compliance conducted	Hybrid system	☒ Lowest ☒ Highest	Hybrid system	☒ Lowest ☒ Highest	complies
§15.205	Band edge compliance radiated	Hybrid system	☒ Lowest ☒ Highest	Hybrid system	☒ Lowest ☒ Highest	complies
§15.247(d)	TX spurious emissions conducted	Hybrid system	☒ Lowest ☒ Middle ☒ Highest	Hybrid system	☒ Lowest ☒ Middle ☒ Highest	complies
§15.247(d)	TX spurious emissions radiated	Hybrid system	☒ Lowest ☒ Middle ☒ Highest	Hybrid system	☒ Lowest ☒ Middle ☒ Highest	complies
§15.209(a)	TX spurious Emissions radiated Below 1GHz	Hybrid system	-/-	Hybrid system	-/-	complies
§15.107(a) §15.207	Conducted Emissions < 30 MHz	Hybrid system	-/-	Hybrid system	-/-	complies

Remark:
1. The measurement uncertainty is not included in the test result.
2. We tested all test mode and recorded worst case in report

3.5 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to TR-100028-01" Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 1" and TR-100028-02 "Electromagnetic compatibility and Radio spectrum Matters (ERM);Uncertainties in the measurement of mobile radio equipment characteristics; Part 2 " and is documented in the Shenzhen HTT Technology Co.,Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.
Hereafter the best measurement capability for Shenzhen HTT Technology Co.,Ltd. :

Test	Range	Measurement Uncertainty	Notes
Radiated Emission	30~1000MHz	4.10 dB	(1)
Radiated Emission	1~18GHz	4.32 dB	(1)
Radiated Emission	18-40GHz	5.54 dB	(1)
Conducted Disturbance	0.15~30MHz	3.12 dB	(1)

(1) This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

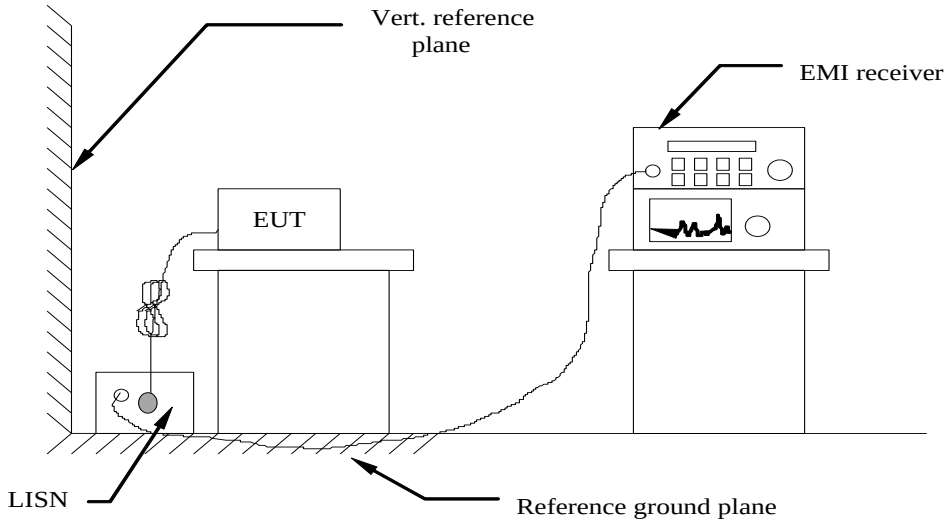
3.6 Equipments Used during the Test

Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	Shenzhen C.R.T technology co., LTD	9*6*6	HTT-E028	Aug. 10 2020	Aug. 09 2024
2	Control Room	Shenzhen C.R.T technology co., LTD	4.8*3.5*3.0	HTT-E030	Aug. 10 2020	Aug. 09 2024
3	EMI Test Receiver	Rohde&Schwar	ESCI7	HTT-E022	May 23 2022	May 23 2023
4	Spectrum Analyzer	Rohde&Schwar	FSP	HTT-E037	May 23 2022	May 23 2023
5	Coaxial Cable	ZDecl	ZT26-NJ-NJ-0.6M	HTT-E018	May 23 2022	May 23 2023
6	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-2M	HTT-E019	May 23 2022	May 23 2023
7	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-0.6M	HTT-E020	May 23 2022	May 23 2023
8	Coaxial Cable	ZDecl	ZT26-NJ-SMAJ-8.5M	HTT-E021	May 23 2022	May 23 2023
9	Composite logarithmic antenna	Schwarzbeck	VULB 9168	HTT-E017	May 23 2022	May 23 2023
10	Horn Antenna	Schwarzbeck	BBHA9120D	HTT-E016	May 23 2022	May 23 2023
11	Loop Antenna	Zhinan	ZN30900C	HTT-E039	May 23 2022	May 23 2023
12	Horn Antenna	Beijing Hangwei Dayang	OBH100400	HTT-E040	May 23 2022	May 23 2023
13	low frequency Amplifier	Sonoma Instrument	310	HTT-E015	May 23 2022	May 23 2023
14	high-frequency Amplifier	HP	8449B	HTT-E014	May 23 2022	May 23 2023
15	Variable frequency power supply	Shenzhen Anbiao Instrument Co., Ltd	ANB-10VA	HTT-082	May 23 2022	May 23 2023
16	EMI Test Receiver	Rohde & Schwarz	ESCS30	HTT-E004	May 23 2022	May 23 2023
17	Artificial Mains	Rohde & Schwarz	ESH3-Z5	HTT-E006	May 23 2022	May 23 2023
18	Artificial Mains	Rohde & Schwarz	ENV-216	HTT-E038	May 23 2022	May 23 2023
19	Cable Line	Robinson	Z302S-NJ-BNCJ-1.5M	HTT-E001	May 23 2022	May 23 2023
20	Attenuator	Robinson	6810.17A	HTT-E007	May 23 2022	May 23 2023
21	Variable frequency power supply	Shenzhen Yanghong Electric Co., Ltd	YF-650（5KVA）	HTT-E032	May 23 2022	May 23 2023
22	Control Room	Shenzhen C.R.T technology co., LTD	8*4*3.5	HTT-E029	May 23 2022	May 23 2023
23	DC power supply	Agilent	E3632A	HTT-E023	May 23 2022	May 23 2023
24	EMI Test Receiver	Agilent	N9020A	HTT-E024	May 23 2022	May 23 2023
25	Analog signal generator	Agilent	N5181A	HTT-E025	May 23 2022	May 23 2023
26	Vector signal generator	Agilent	N5182A	HTT-E026	May 23 2022	May 23 2023
27	Power sensor	Keysight	U2021XA	HTT-E027	May 23 2022	May 23 2023
28	Temperature and humidity meter	Shenzhen Anbiao Instrument Co., Ltd	TH10R	HTT-074	May 23 2022	May 23 2023
29	Radiated Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
30	Conducted Emission Test Software	Farad	EZ-EMC	N/A	N/A	N/A
31	RF Test Software	panshanrf	TST	N/A	N/A	N/A

4 TEST CONDITIONS AND RESULTS

4.1 AC Power Conducted Emission

TEST CONFIGURATION



TEST PROCEDURE

1 The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, a wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10-2013.
2 Support equipment, if needed, was placed as per ANSI C63.10-2013
3 All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10-2013
4 The EUT received power from adapter, the adapter received AC120V/60Hz and AC 240V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
5 All support equipments received AC power from a second LISN, if any.
6 The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT.The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
7 Analyzer / Receiver scanned from 150 KHz to 30MHz for emissions in each of the test modes.
8 During the above scans, the emissions were maximized by cable manipulation.

AC Power Conducted Emission Limit

For intentional device, according to § 15.207(a) AC Power Conducted Emission Limits is as following：

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

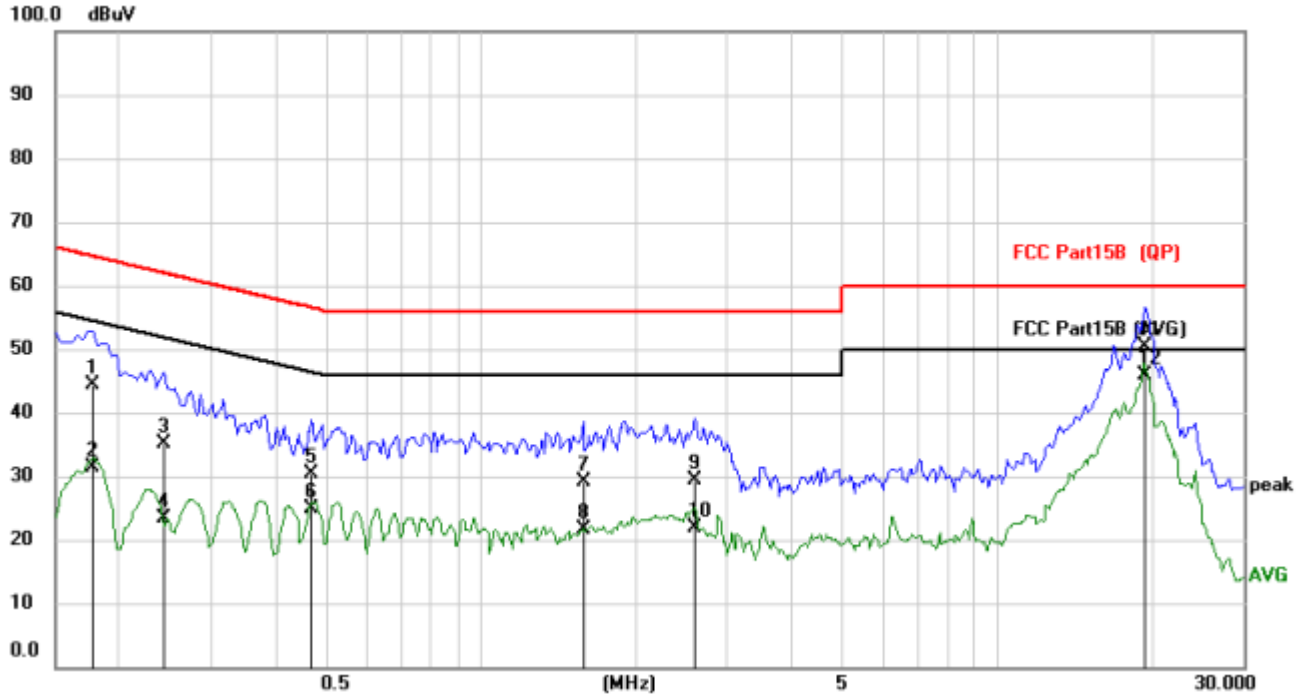
TEST RESULTS

Remark:

1. Lora was tested at Low, Middle, and High channel; only the worst result of Lora High channel was reported as below:

2. Both 120 VAC, 50/60 Hz and 240 VAC, 50/60 Hz power supply have been tested, only the worst result of 120 VAC, 60 Hz was reported as below:

Power supply:	DC 5.0V from PC AC 120V/60Hz	Polarization	L

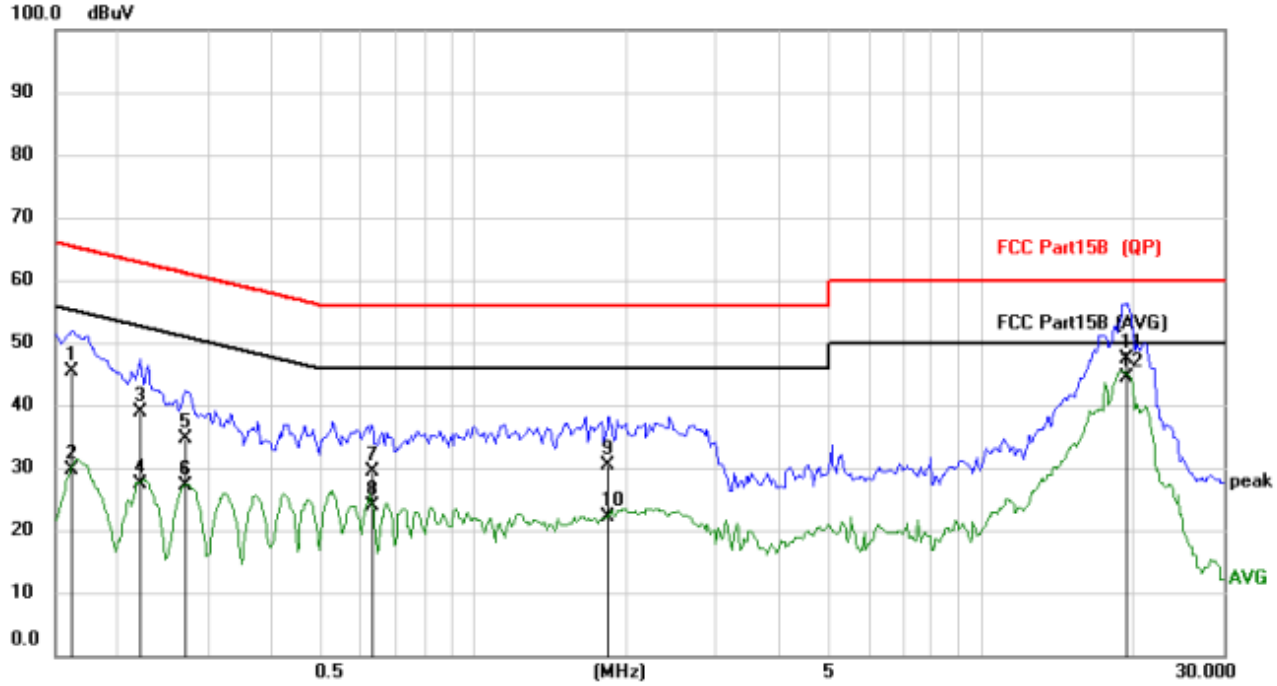


No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1773	34.07	10.38	44.45	64.61	-20.16	QP
2		0.1773	21.07	10.38	31.45	54.61	-23.16	AVG
3		0.2436	24.84	10.41	35.25	61.97	-26.72	QP
4		0.2436	13.06	10.41	23.47	51.97	-28.50	AVG
5		0.4698	19.82	10.44	30.26	56.52	-26.26	QP
6		0.4698	14.43	10.44	24.87	46.52	-21.65	AVG
7		1.5774	18.29	10.85	29.14	56.00	-26.86	QP
8		1.5774	10.86	10.85	21.71	46.00	-24.29	AVG
9		2.6031	18.63	10.84	29.47	56.00	-26.53	QP
10		2.6031	10.99	10.84	21.83	46.00	-24.17	AVG
11		19.4034	38.04	12.37	50.41	60.00	-9.59	QP
12	*	19.4034	33.60	12.37	45.97	50.00	-4.03	AVG

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Los

Power supply:	DC 5.0V from PC AC 120V/60Hz	Polarization	N



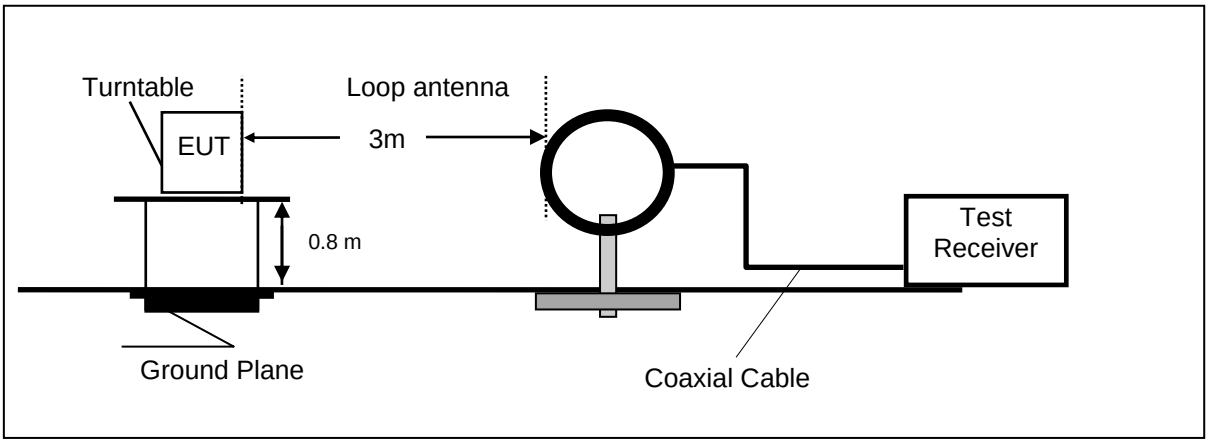
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector
1		0.1773	34.07	10.38	44.45	64.61	-20.16	QP
2		0.1773	21.07	10.38	31.45	54.61	-23.16	AVG
3		0.2436	24.84	10.41	35.25	61.97	-26.72	QP
4		0.2436	13.06	10.41	23.47	51.97	-28.50	AVG
5		0.4698	19.82	10.44	30.26	56.52	-26.26	QP
6		0.4698	14.43	10.44	24.87	46.52	-21.65	AVG
7		1.5774	18.29	10.85	29.14	56.00	-26.86	QP
8		1.5774	10.86	10.85	21.71	46.00	-24.29	AVG
9		2.6031	18.63	10.84	29.47	56.00	-26.53	QP
10		2.6031	10.99	10.84	21.83	46.00	-24.17	AVG
11		19.4034	38.04	12.37	50.41	60.00	-9.59	QP
12	*	19.4034	33.60	12.37	45.97	50.00	-4.03	AVG

Notes:
1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Los

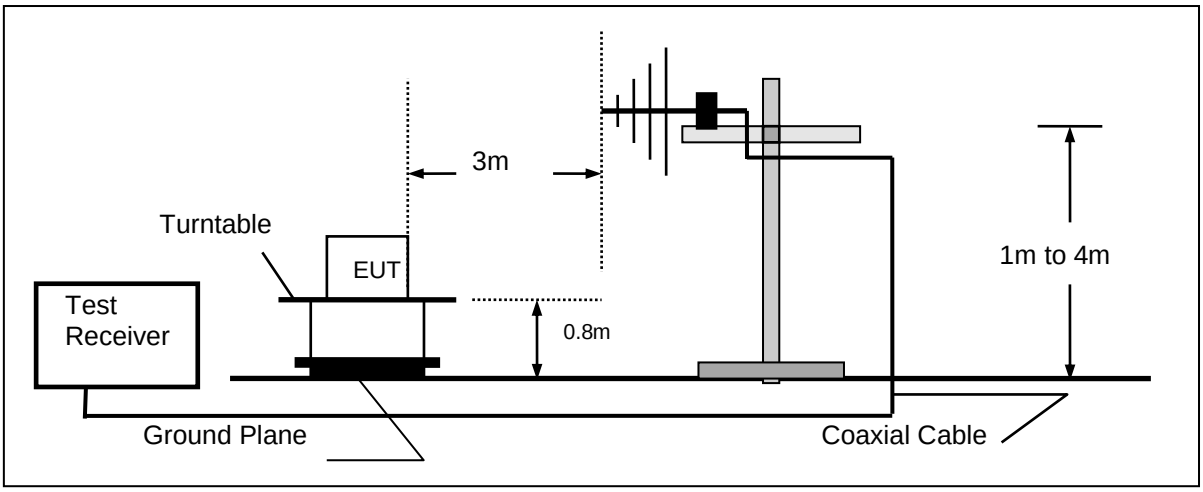
4.2 Radiated Emissions and Band Edge

TEST CONFIGURATION

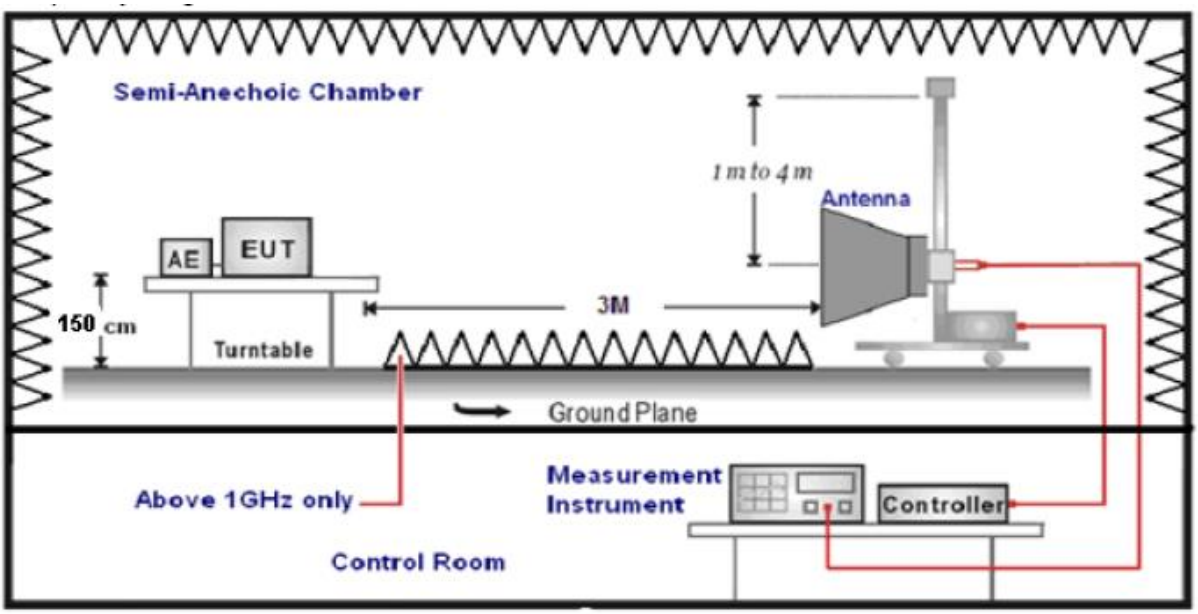
Frequency range 9 KHz – 30MHz



Frequency range 30MHz – 1000MHz



Frequency range above 1GHz-25GHz



TEST PROCEDURE

1. The EUT was placed on a turn table which is 0.8m above ground plane when testing frequency range 9 KHz –1GHz;the EUT was placed on a turn table which is 1.5m above ground plane when testing frequency range 1GHz – 25GHz.
2. Maximum procedure was performed by raising the receiving antenna from 1m to 4m and rotating the turn table from 0℃ to 360℃ to acquire the highest emissions from EUT.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measurements have been completed.
5. The EUT minimum operation frequency was 32.768KHz and maximum operation frequency was 2480MHz.so radiated emission test frequency band from 9KHz to 25GHz.
6. The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Ultra-Broadband Antenna	3
1GHz-18GHz	Double Ridged Horn Antenna	3
18GHz-25GHz	Horn Anternna	1

7. Setting test receiver/spectrum as following table states:

Test Frequency range	Test Receiver/Spectrum Setting	Detector
9KHz-150KHz	RBW=200Hz/VBW=3KHz,Sweep time=Auto	QP
150KHz-30MHz	RBW=9KHz/VBW=100KHz,Sweep time=Auto	QP
30MHz-1GHz	RBW=120KHz/VBW=1000KHz,Sweep time=Auto	QP
1GHz-40GHz	Peak Value: RBW=1MHz/VBW=3MHz, Sweep time=Auto Average Value: RBW=1MHz/VBW=10Hz, Sweep time=Auto	Peak

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

Transd=AF +CL-AG

RADIATION LIMIT

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emission from intentional radiators at a distance of 3 meters shall not exceed the following table. According to § 15.247(d), in any 100kHz bandwidth outside the frequency band in which the EUT is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the100kHz bandwidth within the band that contains the highest level of desired power.

The pre-test have done for the EUT in three axes and found the worst emission at position shown in test setup photos.

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
0.009-0.49	3	20log(2400/F(KHz))+40log(300/3)	2400/F(KHz)
0.49-1.705	3	20log(24000/F(KHz))+ 40log(30/3)	24000/F(KHz)
1.705-30	3	20log(30)+ 40log(30/3)	30
30-88	3	40.0	100
88-216	3	43.5	150
216-960	3	46.0	200
Above 960	3	54.0	500

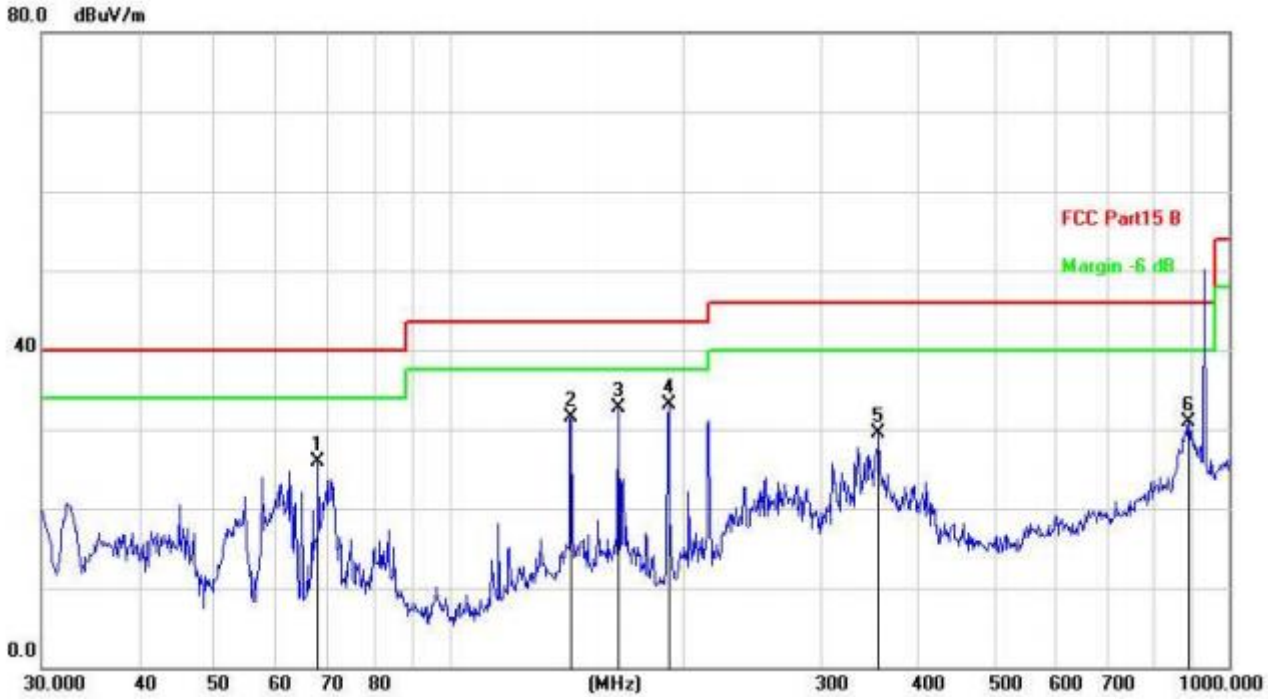
TEST RESULTS

Remark:

1. This test was performed with EUT in X, Y, Z position and the worse case was found when EUT in X position.
2. Lora were tested From 30MHz to 1GHz at Low, Middle, and High channel and recorded worst mode at High channel
3. Radiated emission test from 9 KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9 KHz to 30MHz and not recorded in this report.

For 30MHz-1GHz

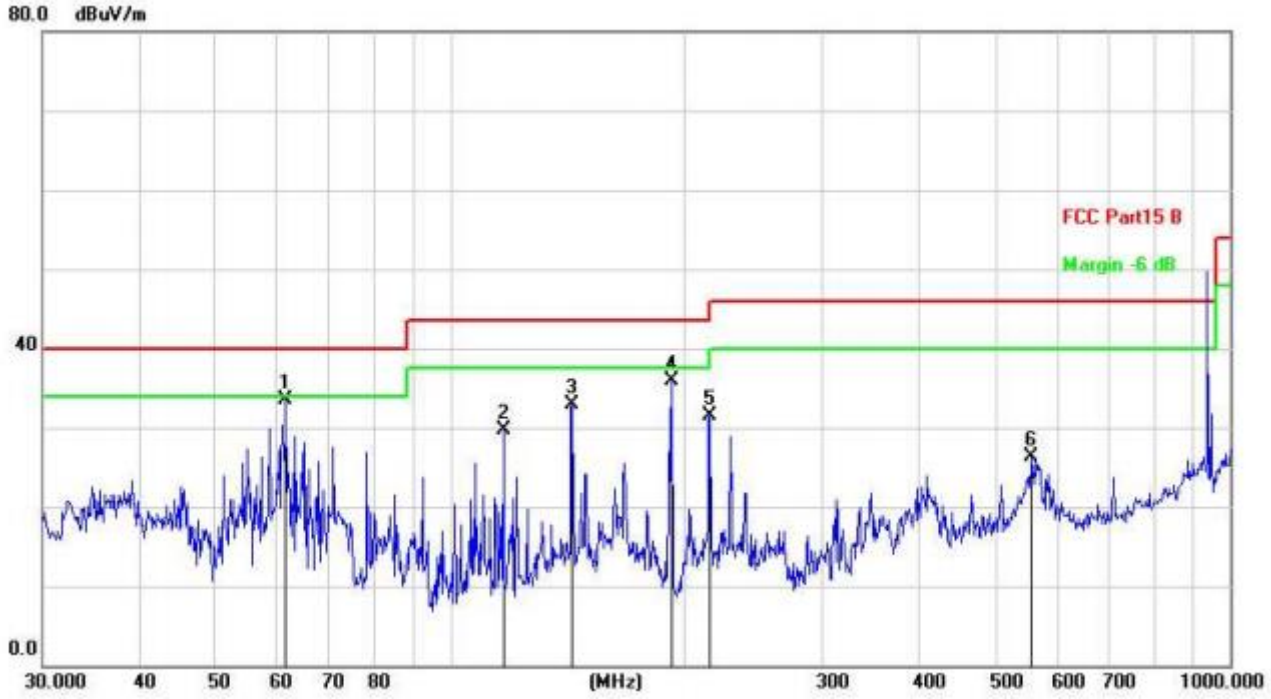
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dB/m	dB	Detector
1		67.9129	45.41	-19.58	25.83	40.00	-14.17	QP
2		143.3261	49.28	-17.81	31.47	43.50	-12.03	QP
3		164.9075	51.10	-18.31	32.79	43.50	-10.71	QP
4	*	191.0738	53.52	-20.47	33.05	43.50	-10.45	QP
5		355.4273	46.42	-16.85	29.57	46.00	-16.43	QP
6		887.6099	36.00	-5.02	30.98	46.00	-15.02	QP

Final Level =Receiver Read level + Correct Factor

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over	
		MHz	dBuV	dB/m	dBuV/m	dB/m	dB	Detector
1	*	61.5618	51.89	-18.42	33.47	40.00	-6.53	QP
2		116.9495	49.43	-19.63	29.80	43.50	-13.70	QP
3		143.3261	50.80	-17.84	32.96	43.50	-10.54	QP
4		192.4186	56.48	-20.56	35.92	43.50	-7.58	QP
5		215.2676	51.62	-20.10	31.52	43.50	-11.98	QP
6		556.7744	36.46	-10.25	26.21	46.00	-19.79	QP

Final Level =Receiver Read level + Correct Factor

For 1GHz to 25GHz

Frequency(MHz):			903.0		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1806.0	57.41	PK	74	16.59	64.49	23.15	3.28	33.51	-7.08
1806.0	45.38	AV	54	8.62	52.46	23.15	3.28	33.51	-7.08
2709.0	51.39	PK	74	22.61	54.52	27.56	4.59	35.28	-3.13
2709.0	42.67	AV	54	11.33	45.80	27.56	4.59	35.28	-3.13

Frequency(MHz):			903.0		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1806.0	58.34	PK	74	15.66	65.42	23.15	3.28	33.51	-7.08
1806.0	42.15	AV	54	11.85	49.23	23.15	3.28	33.51	-7.08
2709.0	55.97	PK	74	18.03	59.10	27.56	4.59	35.28	-3.13
2709.0	40.56	AV	54	13.44	43.69	27.56	4.59	35.28	-3.13

Frequency(MHz):			915		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1830	56.28	PK	74	17.72	63.36	23.15	3.28	33.51	-7.08
1830	40.61	AV	54	13.39	47.69	23.15	3.28	33.51	-7.08
2745	48.67	PK	74	25.33	51.80	27.56	4.59	35.28	-3.13
2745	39.77	AV	54	14.23	42.90	27.56	4.59	35.28	-3.13

Frequency(MHz):			915		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1830	58.36	PK	74	15.64	65.44	23.15	3.28	33.51	-7.08
1830	42.53	AV	54	11.47	49.61	23.15	3.28	33.51	-7.08
2745	51.81	PK	74	22.19	54.94	27.56	4.59	35.28	-3.13
2745	43.60	AV	54	10.40	46.73	27.56	4.59	35.28	-3.13

Frequency(MHz):			927		Polarity:		HORIZONTAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1854	59.17	PK	74	14.83	66.29	23.34	3.41	33.87	-7.12
1854	43.15	AV	54	10.85	50.27	23.34	3.41	33.87	-7.12
2781	51.96	PK	74	22.04	54.93	27.80	4.82	35.59	-2.97
2781	42.15	PK	54	11.85	45.12	27.80	4.82	35.59	-2.97

Frequency(MHz):			927		Polarity:		VERTICAL		
Frequency (MHz)	Emission Level (dBuV/m)		Limit (dBuV/m)	Margin (dB)	Raw Value (dBuV)	Antenna Factor (dB/m)	Cable Factor (dB)	Pre-amplifier (dB)	Correction Factor (dB/m)
1854	58.47	PK	74	15.53	65.59	23.34	3.41	33.87	-7.12
1854	41.69	AV	54	12.31	48.81	23.34	3.41	33.87	-7.12
2781	50.78	PK	74	23.22	53.75	27.80	4.82	35.59	-2.97
2781	43.04	PK	54	10.96	46.01	27.80	4.82	35.59	-2.97

REMARKS:
1. Emission level (dBuV/m) =Raw Value (dBuV)+Correction Factor (dB/m)
2. Correction Factor (dB/m) = Antenna Factor (dB/m)+Cable Factor (dB)- Pre-amplifier
3. Margin value = Limit value- Emission level.
4. -- Mean the PK detector measured value is below average limit.
5. The other emission levels were very low against the limit.

4.3 Maximum Peak Output Power

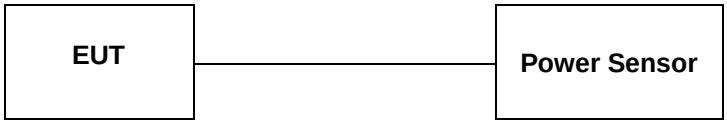
Limit

The Maximum Peak Output Power Measurement is 30dBm.

Test Procedure

Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the power sensor.

Test Configuration



Test Results

Channel	Output power (dBm)	Limit (dBm)	Result
00	-8.773	30.00	Pass
12	-8.433	30.00	Pass
24	-8.501	30.00	Pass

Note: 1.The test results including the cable lose.

4.4 Power Spectral Density

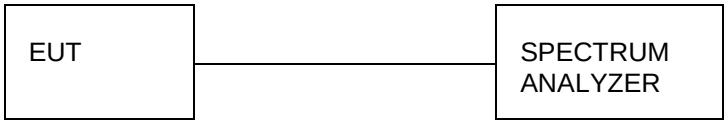
Limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

Test Procedure

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW ≥ 3 kHz.
3. Set the VBW ≥ 3× RBW.
4. Set the span to 1.5 times the DTS channel bandwidth.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.
11. The resulting peak PSD level must be 8dBm.

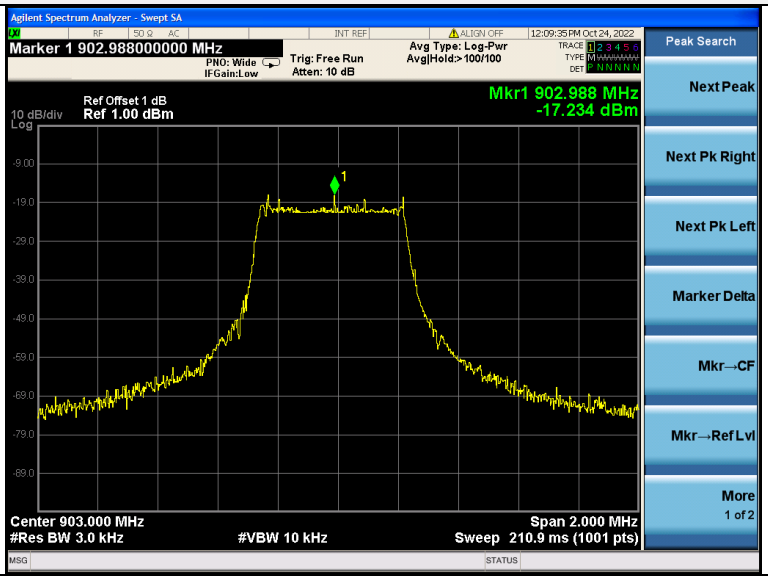
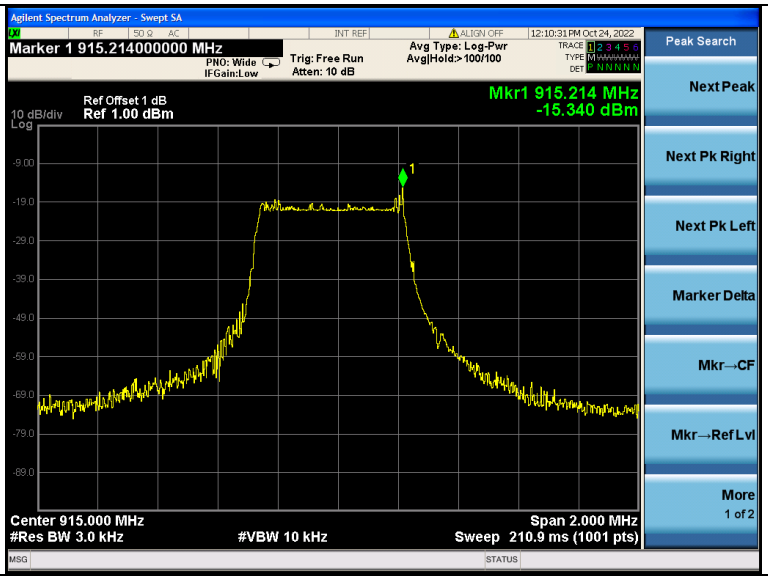
Test Configuration

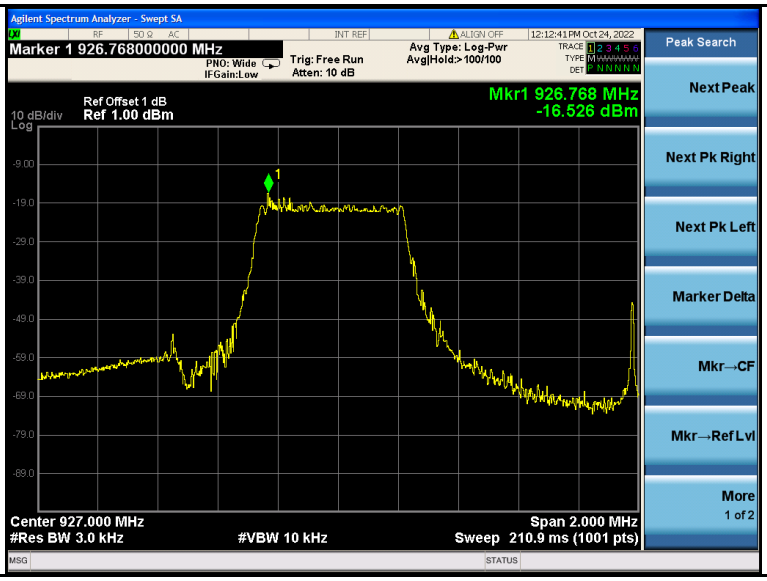


Test Results

Channel	Power Spectral Density (dBm/3KHz)	Limit (dBm/3KHz)	Result
00	-17.234	8.00	Pass
12	-15.340	8.00	Pass
24	-16.526	8.00	Pass

Test plot as follows:

Power Spectral Density

CH00

CH12


Agilent Spectrum Analyzer - Swept SA
Marker 1 926.768000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
Atten: 10 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
12:12:41 PM Oct 24, 2022
Ref Offset 1 dB
10 dB/div
Log
Ref 1.00 dBm
Mkr1 926.768 MHz
-16.526 dBm
Center 927.000 MHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 2.000 MHz
Sweep 210.9 ms (1001 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Marker Delta
Mkr→CF
Mkr→Ref Lvl
More
1 of 2

CH24

4.5 6dB Bandwidth

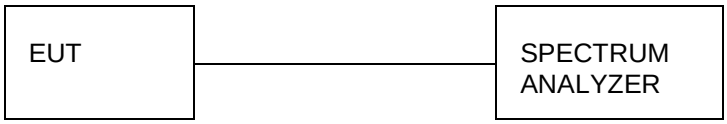
Limit

For digital modulation systems, the minimum 6 dB bandwidth shall be at least 500 kHz

Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

Test Configuration

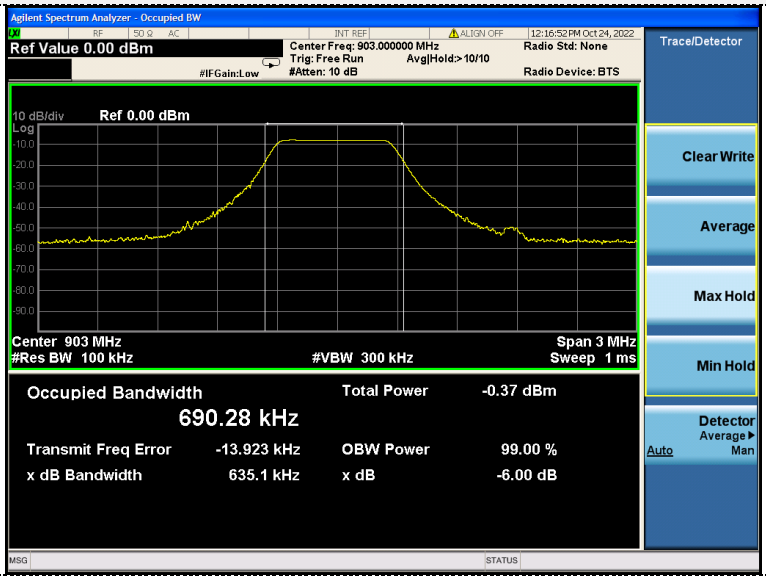


Test Results

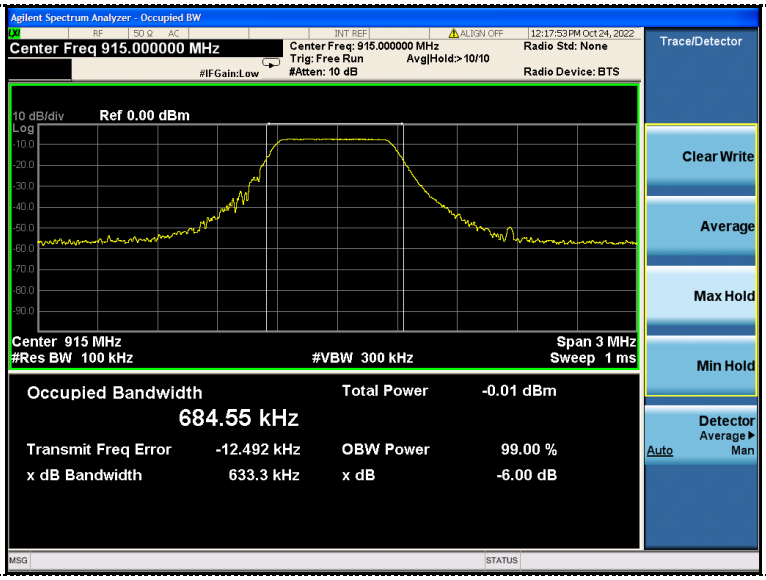
Channel	6dB Bandwidth (MHz)	Limit (KHz)	Result
00	0.6351	≥500	Pass
12	0.6333	≥500	Pass
24	0.6365	≥500	Pass

Test plot as follows:

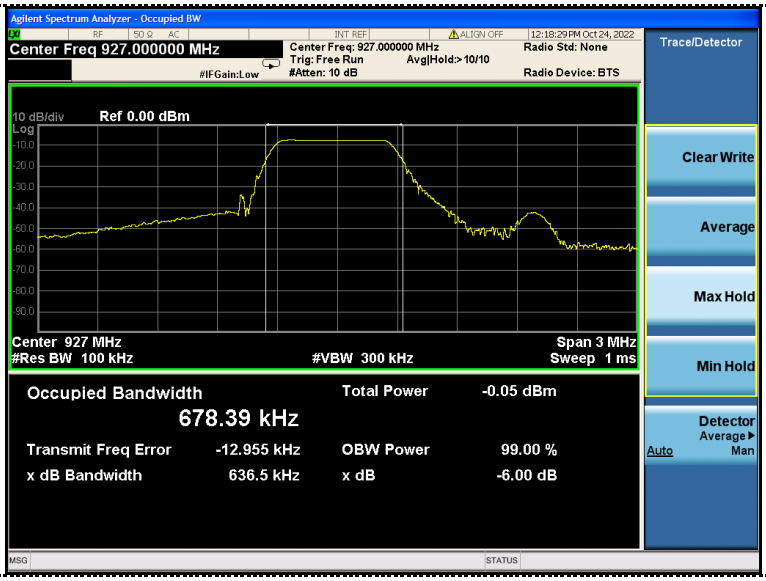
6dB Bandwidth



CH00



CH12


Agilent Spectrum Analyzer - Occupied BW
Center Freq 927.000000 MHz
Center Freq: 927.000000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 10 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
12:18:29 PM Oct 24, 2022
Trace/Detector
10 dB/div
Log
Ref 0.00 dBm
-10.0
-20.0
-30.0
-40.0
-50.0
-60.0
-70.0
-80.0
-90.0
Center 927 MHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
Occupied Bandwidth
678.39 kHz
Total Power -0.05 dBm
Transmit Freq Error -12.955 kHz
OBW Power 99.00 %
x dB Bandwidth 636.5 kHz
x dB -6.00 dB
Clear Write
Average
Max Hold
Min Hold
Detector
Average
Auto
Man
MSG
STATUS

CH24

4.6 Out-of-band Emissions

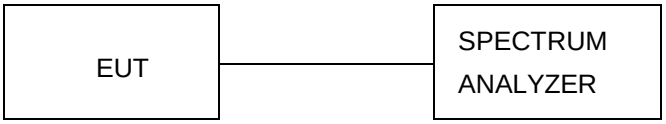
Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF con-ducted or a radiated measurement, pro-vided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter com-plies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required.

Test Procedure

Connect the transmitter output to spectrum analyzer using a low loss RF cable, and set the spectrum analyzer to RBW=100 kHz, VBW= 300 kHz, peak detector , and max hold. Measurements utilizing these setting are made of the in-band reference level, bandedge and out-of-band emissions.

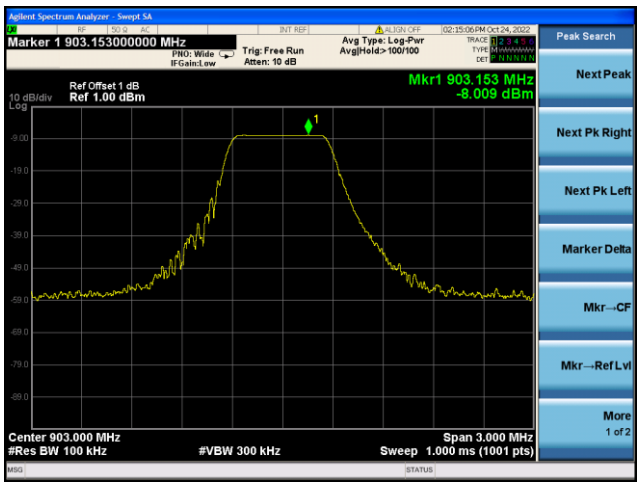
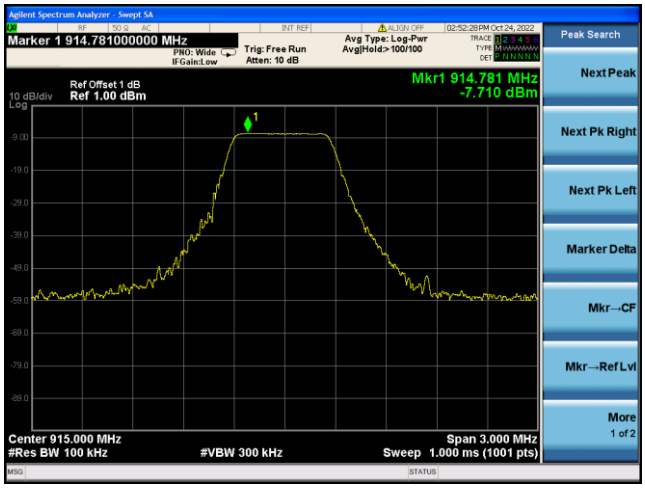
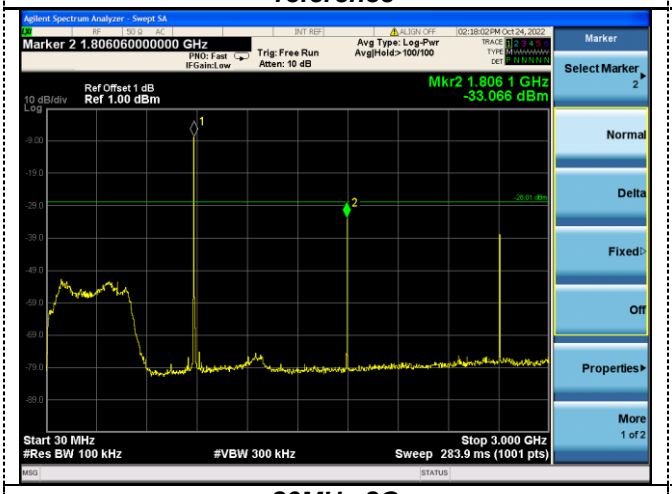
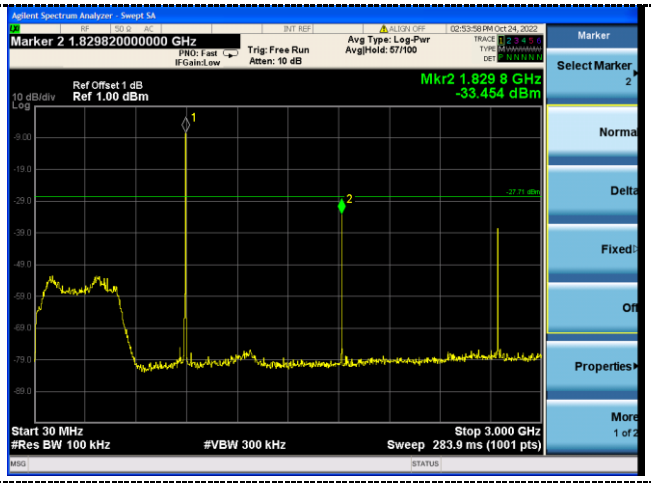
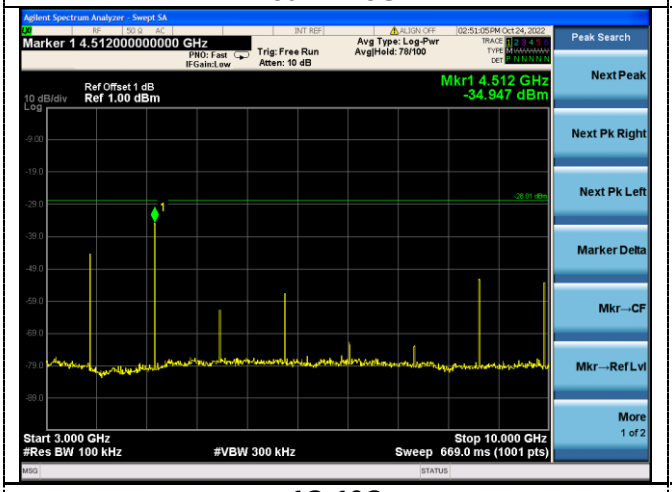
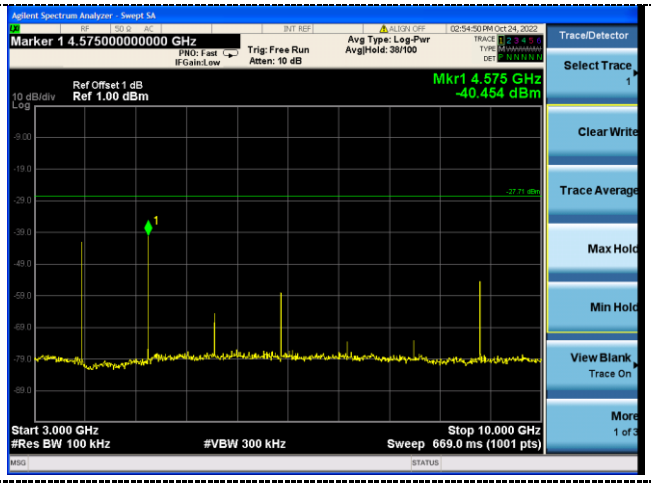
Test Configuration

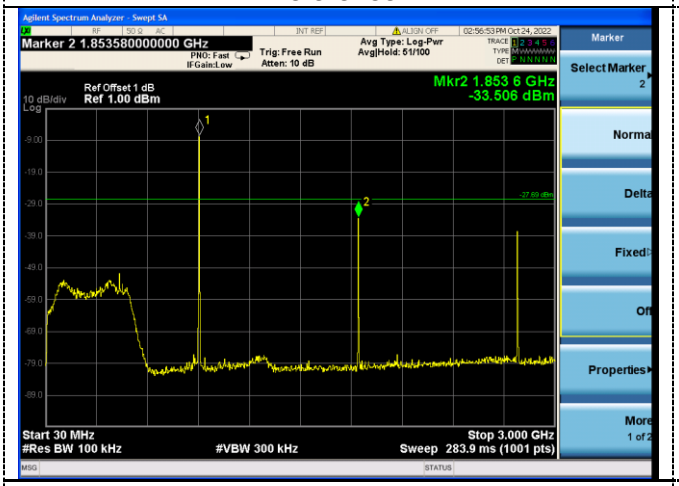
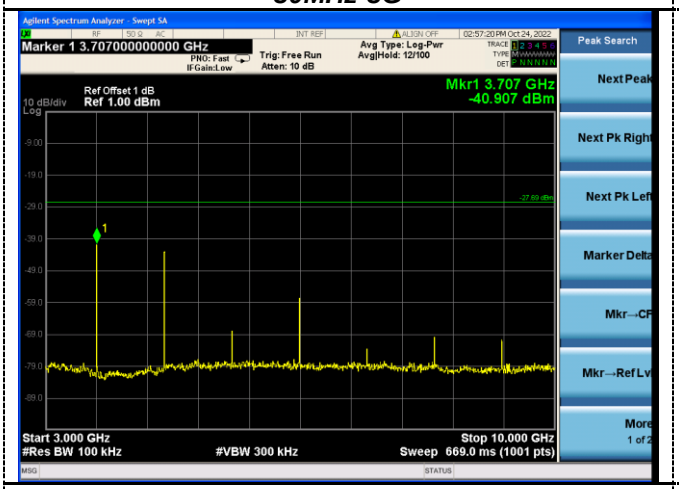


Test Results

Remark: The measurement frequency range is from 30MHz to the 10th harmonic of the fundamental frequency. The lowest, middle and highest channels are tested to verify the spurious emissions and bandage measurement data.

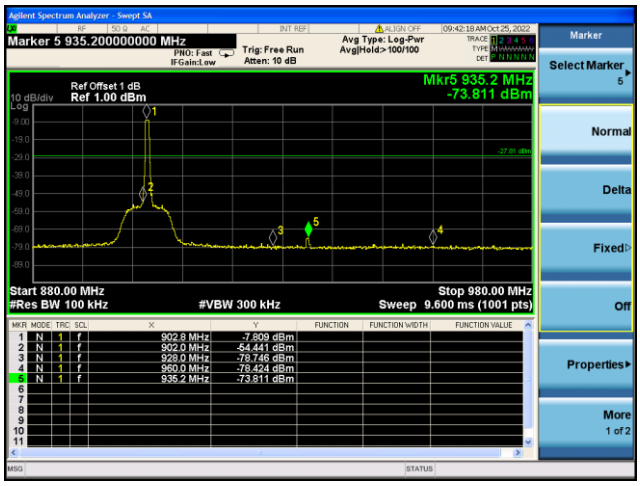
Test plot as follows:

CH00	CH12
	
reference	
	
30MHz-3G	
	
1G-10G	

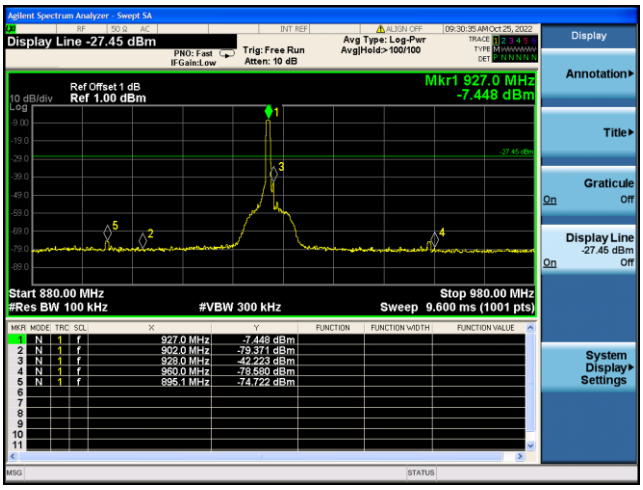
CH24	
	
reference	
	
30MHz-3G	
	
1G-10G	

Band-edge Measurements for RF Conducted Emissions:

Lora



Left Band edge



Right Band edge

4.7 Antenna Requirement

Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (c), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Refer to statement below for compliance

The manufacturer may design the unit so that the user can replace a broken antenna, but the use of a standard antenna jack or electrical connector is prohibited. Further, this requirement does not apply to intentional radiators that must be professionally installed.

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Antenna Connected Construction

The maximum gain of antenna was -1.71dBi.

Remark:The antenna gain is provided by the customer , if the data provided by the customer is not accurate, Shenzhen HTT Technology Co.,Ltd. does not assume any responsibility.

5 Test Setup Photos of the EUT

Reference to the **appendix I** for details

6 Photos of the EUT

Reference to the **appendix II** for details.

********** End of Report **********