



PRECISE TESTING

TEST REPORT

FCC ID: 2A3EJ-DEEPER-HLD01A

Product Name	:	LoRaWAN Dongle
Model Name	:	HLD01,HLD02,HLD03,HLD04
Report No.	:	PTC21080305201E-FC02

Prepared for

Deeper Network Inc.

5200 Great America pkwy, Santa Clara CA USA 95054

Prepared by

Precise Testing & Certification Co., Ltd

Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China



1 TEST RESULT CERTIFICATION

Applicant's name : Deeper Network Inc.
Address : 5200 Great America pkwy, Santa Clara CA USA 95054
Manufacturer's name : Deeper Network Inc.
Address : 5200 Great America pkwy, Santa Clara CA USA 95054
Product name : LoRaWAN Dongle
Model name : HLD01,HLD02,HLD03,HLD04
Standards : FCC CFR47 Part 15 Section 15.247
Test procedure : ANSI C63.10: 2013
Test Date : September 18, 2021 to October 14, 2021
Date of Issue : October 15, 2021
Test Result : Pass

This device described above has been tested by PTC, and the test results show that the equipment under test (EUT) is in compliance with the requirements. And it is applicable only to the tested sample identified in the report.

This report shall not be reproduced except in full, without the written approval of PTC, this document may be altered or revised by PTC, personal only, and shall be noted in the revision of the document.

Test Engineer:

Leo Yang / Engineer

Technical Manager:

Chris Du / Manager



Contents

	Page
1 TEST RESULT CERTIFICATION.....	2
2 TEST SUMMARY.....	5
3 TEST FACILITY.....	6
4 GENERAL INFORMATION.....	7
4.1 GENERAL DESCRIPTION OF E.U.T.....	7
4.2 CHANNEL LIST OF E.U.T.....	7
5 EQUIPMENT DURING TEST.....	8
5.1 EQUIPMENTS LIST.....	8
5.2 MEASUREMENT UNCERTAINTY.....	10
5.3 DESCRIPTION OF SUPPORT UNITS.....	11
5.4 DESCRIPTION OF TEST MODE.....	12
5.5 DESCRIPTION OF TEST SOFTWARE SETTING.....	13
6 CONDUCTED EMISSION.....	14
6.1 E.U.T. OPERATION.....	14
6.2 EUT SETUP.....	14
6.3 TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION).....	15
6.4 MEASUREMENT PROCEDURE:.....	15
6.5 CONDUCTED EMISSION LIMIT.....	15
6.6 MEASUREMENT DESCRIPTION.....	15
6.7 CONDUCTED EMISSION TEST RESULT.....	15
7 RADIATED SPURIOUS EMISSIONS.....	18
7.1 EUT OPERATION.....	19
7.2 TEST SETUP.....	19
7.3 SPECTRUM ANALYZER SETUP.....	21
7.4 TEST PROCEDURE.....	21
7.5 SUMMARY OF TEST RESULTS.....	22
8 -6DB BANDWIDTH MEASUREMENT.....	31
8.1 TEST PROCEDURE AND LIMIT.....	31
8.2 TEST RESULT.....	31



9 MAXIMUM PEAK CONDUCTED OUTPUT POWER.....	34
9.1 TEST PROCEDURE AND LIMIT.....	34
9.2 TEST RESULT.....	34
10 BAND EDGES REQUIREMENT.....	37
10.1 TEST RESULT.....	37
11 ANTENNA REQUIREMENT.....	41
12 TEST PHOTOS.....	42
13 EUT PHOTOS.....	44



2 Test Summary

Test Items	Test Requirement	Result
AC Power Conducted Emission	15.207	PASS
Radiated Spurious Emissions	15.205(a)	PASS
Occupied Bandwidth	15.247(a)(2)	PASS
Maximum peak conducted output power	15.247(b)(3)	PASS
Band edge	15.247(d)	PASS
Power spectral density	15.247(e)	PASS
Antenna Requirement	15.203	PASS

Remark:

1. The EUT only powered via adaptor.



PRECISE TESTING

Report No.: PTC21080305201E-FC02

3 TEST FACILITY

Precise Testing & Certification Co., Ltd

Building 1, No. 6, Tongxin Road, Dongcheng Street, Dongguan, Guangdong, China

FCC Registration Number: 790290

A2LA Certificate No.: 4408.01

IC Registration Number: 12191A-1



4 General Information

4.1 General Description of E.U.T.

Product Name	:	LoRaWAN Dongle
Model Name	:	HLD01,HLD02,HLD03,HLD04
Operating frequency	:	923.3MHz-927.5MHz
Numbers of Channel	:	8
Antenna Type	:	External Antenna
Antenna Gain	:	3dBi
Type of Modulation	:	LoRa Chirp Spread Spectrum
Power supply	:	DC5V 1A via Adaptor input AC 100-240V~50/60Hz 0.5A (Adaptor Model: XSC-0503000TUSD)

4.2 Channel List of E.U.T.

Channel	Frequency (MHz)
01	923.3
02	923.9
03	924.5
04	925.1
05	925.7
06	926.3
07	926.9
08	927.5



5 Equipment During Test

5.1 Equipments List

RF Conducted Test

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	interval time
MXG Signal Analyzer	Agilent	N9020A	MY56070279	10Hz-26.5GHz	Sep.18, 2022	1 year
Coaxial Cable	CDS	79254	46107086	10Hz-30GHz	Sep.18, 2022	1 year

Remark: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

Radiated Emissions(9KHz-18GHz)

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	interval time
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep.18, 2022	1 year
Loop Antenna	Schwarzbeck	FMZB 1519	012	9 KHz -30MHz	Sep.18, 2022	1 year
Bilog Antenna	SCHWARZBECK	VULB9160	9160-3355	25MHz-2GHz	Sep.18, 2022	1 year
Preamplifier (low frequency)	SCHWARZBECK	BBV 9475	9745-0013	1MHz-1GHz	Sep.18, 2022	1 year
Cable	Schwarzbeck	PLF-100	549489	9KHz-3GHz	Sep.18, 2022	1 year
Spectrum Analyzer	Agilent	E4407B	MY45109572	9KHz-40GHz	Sep.18, 2022	1 year
Horn Antenna	SCHWARZBECK	9120D	9120D-1246	1GHz-18GHz	Sep.18, 2022	1 year
Power Amplifier	LUNAR EM	LNA1G18-40	J10100000081	1GHz-26.5GHz	Sep.18, 2022	1 year
Cable	H+S	CBL-26	N/A	1GHz-26.5GHz	Sep.18, 2022	1 year



Conducted Emissions

Name of Equipment	Manufacturer	Model	Serial No.	Characteristics	Calibration Due	interval time
EMI Test Receiver	Rohde&Schwarz	ESCI	101417	9KHz-3GHz	Sep.18, 2022	1 year
Artificial Mains Network	Rohde&Schwarz	L2-16B	000WX31025	9KHz-300MHz	Sep.18, 2022	1 year
Artificial Mains Network	Rohde&Schwarz	ENV216	101342	9KHz-300MHz	Sep.18, 2022	1 year



5.2 Measurement Uncertainty

Parameter	Uncertainty
RF output power, conducted	$\pm 1.0\text{dB}$
Power Spectral Density, conducted	$\pm 2.2\text{dB}$
Radio Frequency	$\pm 1 \times 10^{-6}$
Bandwidth	$\pm 1.5 \times 10^{-6}$
Time	$\pm 2\%$
Duty Cycle	$\pm 2\%$
Temperature	$\pm 1^\circ\text{C}$
Humidity	$\pm 5\%$
DC and low frequency voltages	$\pm 3\%$
Conducted Emissions (150kHz~30MHz)	$\pm 3.64\text{dB}$
Radiated Emission(30MHz~1GHz)	$\pm 5.03\text{dB}$
Radiated Emission(1GHz~25GHz)	$\pm 4.74\text{dB}$
Remark: The coverage Factor (k=2), and measurement Uncertainty for a level of Confidence of 95%	



5.3 Description of Support Units

Equipment	Model No.	Series No.
Notebook	ThinkPad X230i	OB65377



5.4 Description of Test Mode

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned follow was evaluated respectively.

For Conducted Test	
Final Test Mode	Description
Mode 1	TX Mode(923.3MHz)
For Radiated Test	
Final Test Mode	Description
Mode 1	TX Mode(923.3MHz/925.1MHz/927.5MHz)

Note:

For all test, we have verified the construction and function in typical operation. And all the test modes were carried out with the EUT in transmitting operation in maximum power with all kinds of data rate.

- (1) According to ANSI C63.10 standards, the measurements are performed at the highest, middle, lowest available channels.
- (2) During the testing procedure, the continuously transmitting with the maximum power mode was programmed by the customer.
- (3) The EUT is considered a portable unit; it was pre-tested on the positioned of each 3 axis, X-plane, Y-plane and Z-plane. The worst case was found positioned on X-plane. Therefore only the test data of this X-plane was used for radiated emission measurement test.



5.5 Description of Test software Setting

During testing channel & Power controlling software provided by the customer was used to control the operating channel as well as the output power level. The RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product power parameters of RF mode.

Test Software Version	libloragw v2.0.0		
Frequency	923.3MHz	925.1MHz	927.5MHz



6 Conducted Emission

Test Requirement: : FCC CFR 47 Part 15 Section 15.207
Test Method: : ANSI C63.10:2013
Test Result: : PASS
Frequency Range: : 150kHz to 30MHz
Class/Severity: : Class B
Detector: : Peak for pre-scan (9kHz Resolution Bandwidth)

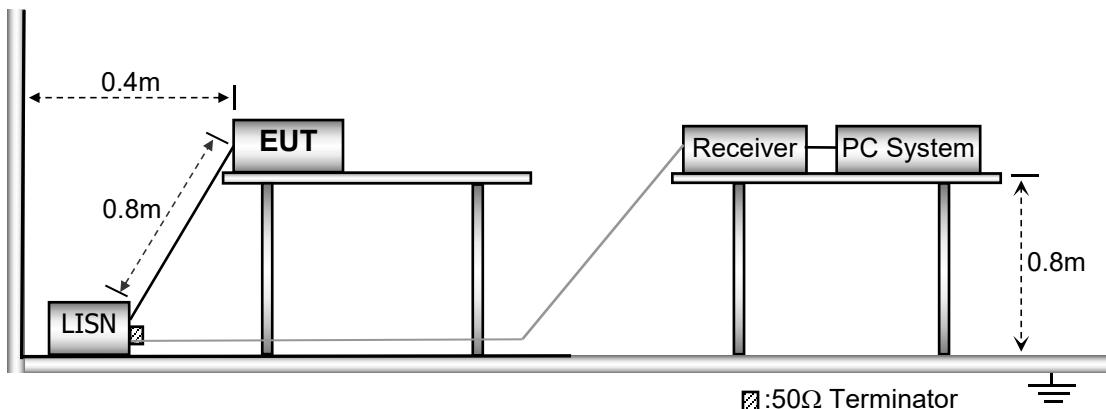
6.1 E.U.T. Operation

Operating Environment :

Temperature: : 25.5 °C
Humidity: : 51 % RH
Atmospheric Pressure: : 101.2kPa

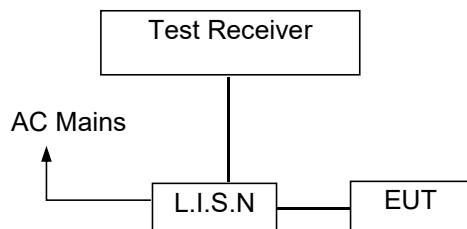
6.2 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.10: 2013.





6.3 Test SET-UP (Block Diagram of Configuration)



6.4 Measurement Procedure:

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

6.5 Conducted Emission Limit

Conducted Emission

Frequency(MHz)	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note:

1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

6.6 Measurement Description

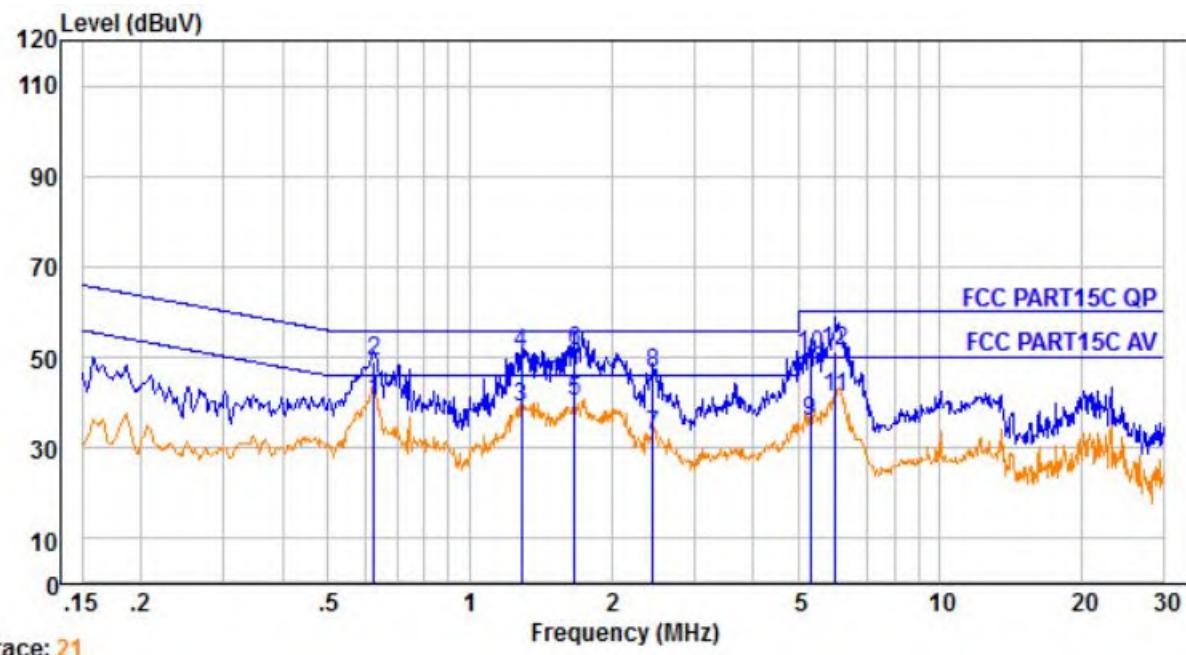
The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line. CH01 with the power AC 230V 50Hz and AC 120V 60Hz are both tested and worst case is AC 120V 60Hz for record.

6.7 Conducted Emission Test Result

Passed.



Line



Trace: 21

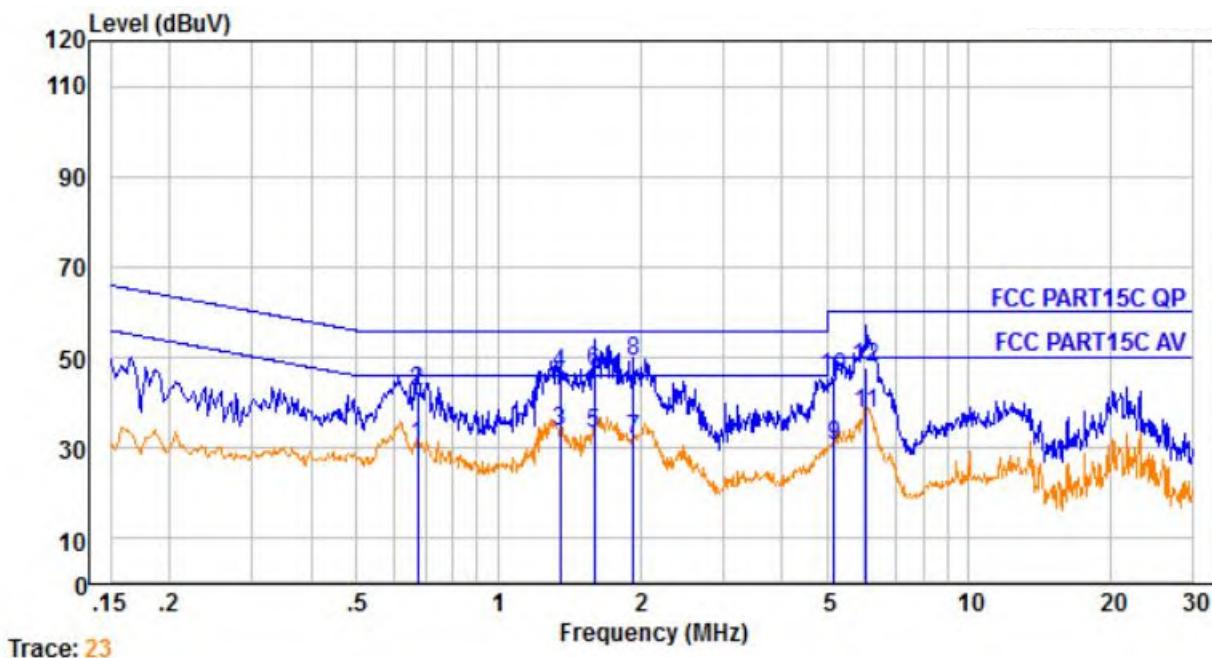
No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dB μ V	Emission Level dB μ V	Limit dB μ V	Over Limit dB	Remark
1.	0.627	0.44	9.61	30.21	40.26	46.00	-5.74	Average
2.	0.627	0.44	9.61	39.20	49.25	56.00	-6.75	QP
3.	1.289	0.46	9.61	29.02	39.09	46.00	-6.91	Average
4.	1.289	0.46	9.61	40.64	50.71	56.00	-5.29	QP
5.	1.671	0.47	9.61	30.40	40.48	46.00	-5.52	Average
6.	1.671	0.47	9.61	41.10	51.18	56.00	-4.82	QP
7.	2.448	0.47	9.62	22.53	32.62	46.00	-13.38	Average
8.	2.448	0.47	9.62	36.30	46.39	56.00	-9.61	QP
9.	5.305	0.51	9.68	25.86	36.05	50.00	-13.95	Average
10.	5.305	0.51	9.68	40.49	50.68	60.00	-9.32	QP
11.	5.993	0.53	9.70	31.00	41.23	50.00	-8.77	Average
12.	5.993	0.53	9.70	41.10	51.33	60.00	-8.67	QP

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = QuasiPeak/Average (dBuV)-Limit (dBuV)



Neutral



No.	Freq MHz	Cable Loss dB	AMN Factor dB	Receiver Reading dB μ V	Emission Level dB μ V	Limit dB μ V	Over Limit dB	Remark
1.	0.675	0.44	9.64	20.38	30.46	46.00	-15.54	Average
2.	0.675	0.44	9.64	32.54	42.62	56.00	-13.38	QP
3.	1.352	0.46	9.64	23.46	33.56	46.00	-12.44	Average
4.	1.352	0.46	9.64	36.26	46.36	56.00	-9.64	QP
5.	1.602	0.47	9.64	23.30	33.41	46.00	-12.59	Average
6.	1.602	0.47	9.64	37.00	47.11	56.00	-8.89	QP
7.	1.939	0.47	9.64	21.91	32.02	46.00	-13.98	Average
8.	1.939	0.47	9.64	39.23	49.34	56.00	-6.66	QP
9.	5.166	0.51	9.71	20.27	30.49	50.00	-19.51	Average
10.	5.166	0.51	9.71	35.18	45.40	60.00	-14.60	QP
11.	6.056	0.53	9.73	27.40	37.66	50.00	-12.34	Average
12.	6.056	0.53	9.73	37.60	47.86	60.00	-12.14	QP

Remark:

1. Corr. Factor (dB) = LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = QuasiPeak/Average (dBuV)-Limit (dBuV)



7 Radiated Spurious Emissions

Test Requirement: : FCC Part C section 15.205

Test Method: : ANSI C63.10: 2013

Test Result: : PASS

Measurement Distance: : 3m

Limit: : See the follow table

15.209 limit:

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$
1.705 ~ 30	30	30	100 * 30	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

Note: 1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

The field strength of emission from intentional radiators operated within these frequency bands shall comply with the following:

15.249(a) Limit:

Fundamental Frequency (MHz)	Field strength of fundamental		Field strength of harmonics	
	mV/m	dBuV/m	uV/m	dBuV/m
902-928	50	94	500	54
2400-2483.5	50	94	500	54
5725-5875	50	94	500	54
24000-24250	250	108	2500	68

7.1 EUT Operation

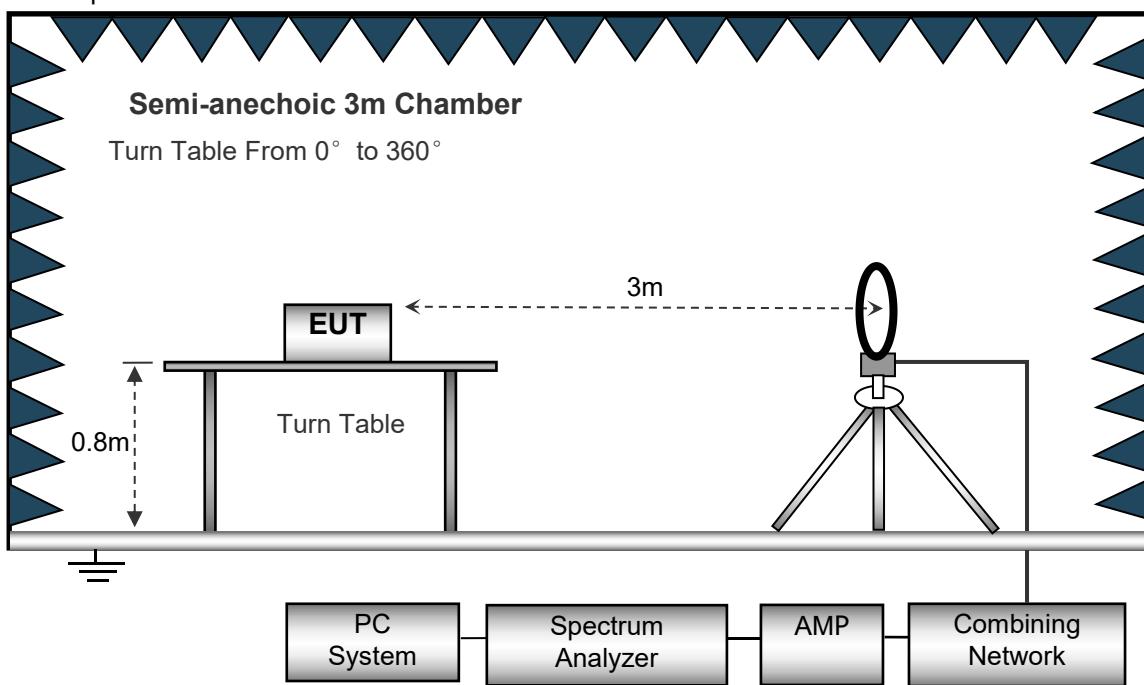
Operating Environment :

Temperature: : 23.5 °C
Humidity: : 51.1 % RH
Atmospheric Pressure: : 101.2kPa
Test Voltage : DC 5V via Adaptor input AC 120V 60Hz

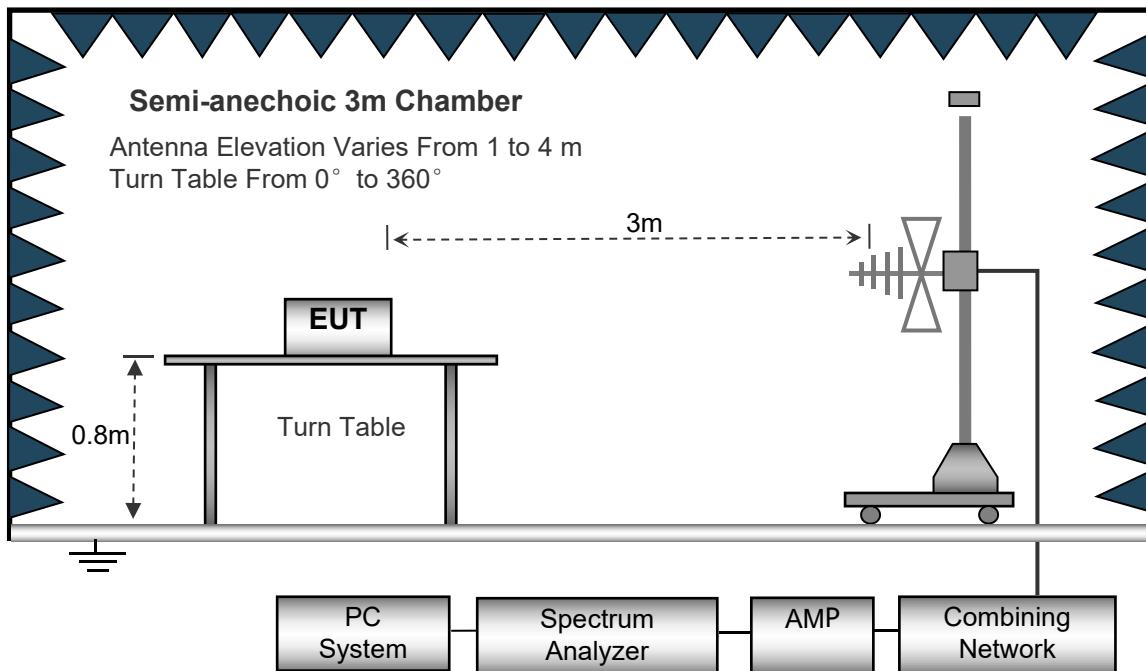
7.2 Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site

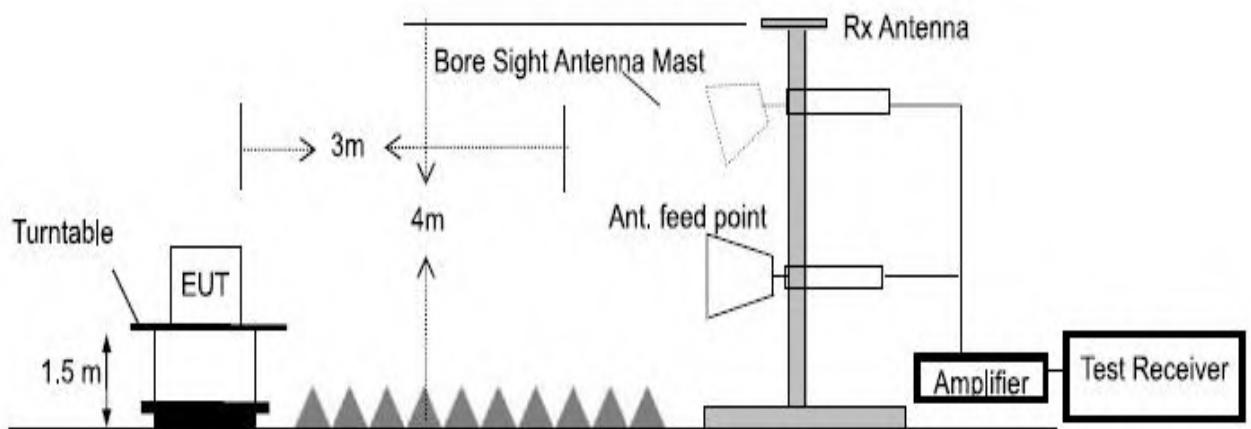
The test setup for emission measurement below 30MHz.



The test setup for emission measurement from 30 MHz to 1 GHz.



The test setup for emission measurement above 1 GHz.





7.3 Spectrum Analyzer Setup

	Frequency	Detector	RBW	VBW	Remark
Receiver Setup	Below 30MHz	--	10kHz	10kHz	--
	30MHz ~ 1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak Value
	Above 1GHz	Peak	1MHz	3MHz	Peak Value
		RMS	1MHz	3MHz	Average Value

7.4 Test Procedure

1. The testing follows the guidelines in Spurious Radiated Emissions of ANSI C63.10-2013.
2. Below 1000MHz, The EUT was placed on a turn table which is 0.8m above ground plane. And above 1000MHz, The EUT was placed on a styrofoam table which is 1.5m above ground plane.
3. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
4. For each suspected emission, the EUT was arranged to its worst case and then tune the Antenna tower (From 1m to 4m) and turntable (from 0 degree to 360 degree) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level to comply with the guidelines.
5. Set to the maximum power setting and enable the EUT transmit continuously.
6. Final measurement (Above 1GHz): The frequency range will be divided into different sub ranges depending of the frequency range of the used horn antenna. The EMI Receiver set to peak and average mode and a resolution bandwidth of 1MHz. The measurement will be performed in horizontal and vertical polarization of the measuring antenna and while rotating the EUT in its vertical axis in the range of 0 degree to 360 degree in order to have the antenna inside the cone of radiation.
7. Test Procedure of measurement (For Above 1GHz):
 - 1) Monitor the frequency range at horizontal polarization and move the antenna over all sides of the EUT(if necessary move the EUT to another orthogonal axis).
 - 2) Change the antenna polarization and repeat 1) with vertical polarization.
 - 3) Make a hardcopy of the spectrum.
 - 4) Measure the frequency of the detected emissions with a lower span and resolution bandwidth to increase the accuracy and note the frequency value.
 - 5) Change the analyser mode to Clear/ Write and found the cone of emission.
 - 6) Rotate and move the EUT, so that the measuring distance can be enlarged to 3m and the antenna will be still inside the cone of emission.



- 7) Measure the level of the detected frequency with the correct resolution bandwidth, with the antenna polarization and azimuth and the peak and average detector, which causes the maximum emission.
- 8) Repeat steps 1) to 7) for the next antenna spot if the EUT is larger than the antenna beamwidth.
8. The radiation measurements are tested under 3-axes(X,Y,Z) position(X denotes lying on the table, Y denotes side stand and Z denotes vertical stand), After pre-test, It was found that the worse radiation emission was get at the X position. So the data shown was the X position only.

7.5 Summary of Test Results

Test Frequency: 9KHz-30MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	>20

Note:

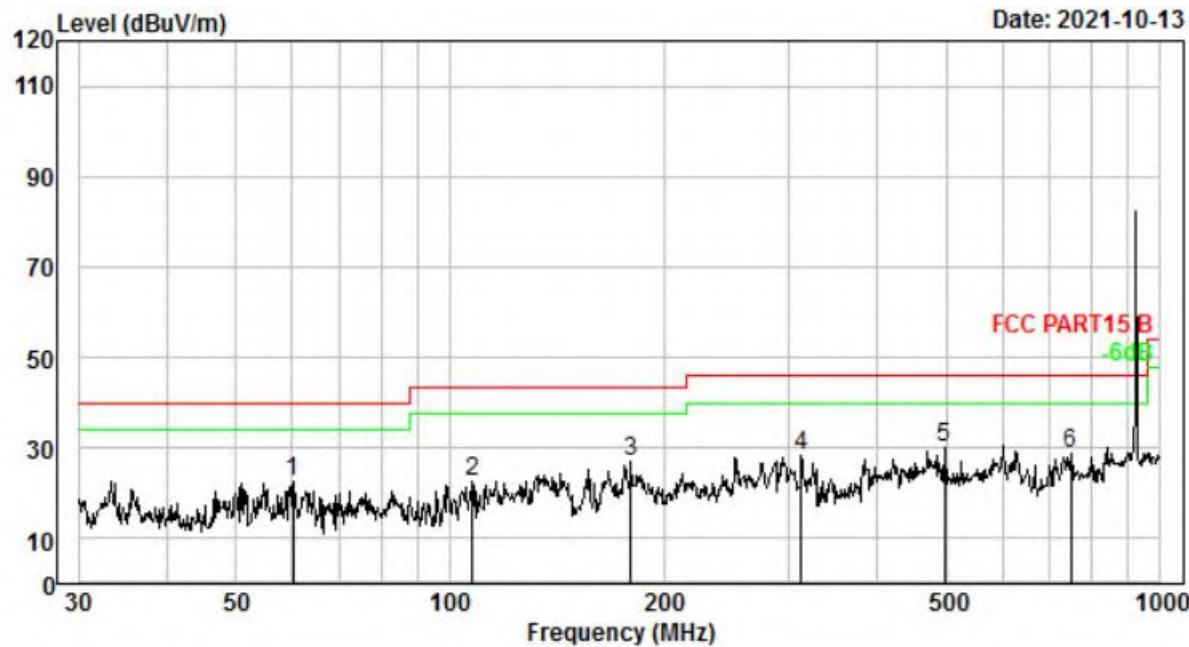
The amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40\log(\text{Specific distance} / \text{test distance})$ (dB);
Limit line=Specific limits(dBuV) + distance extrapolation factor.



Test Frequency: 30MHz ~ 1GHz

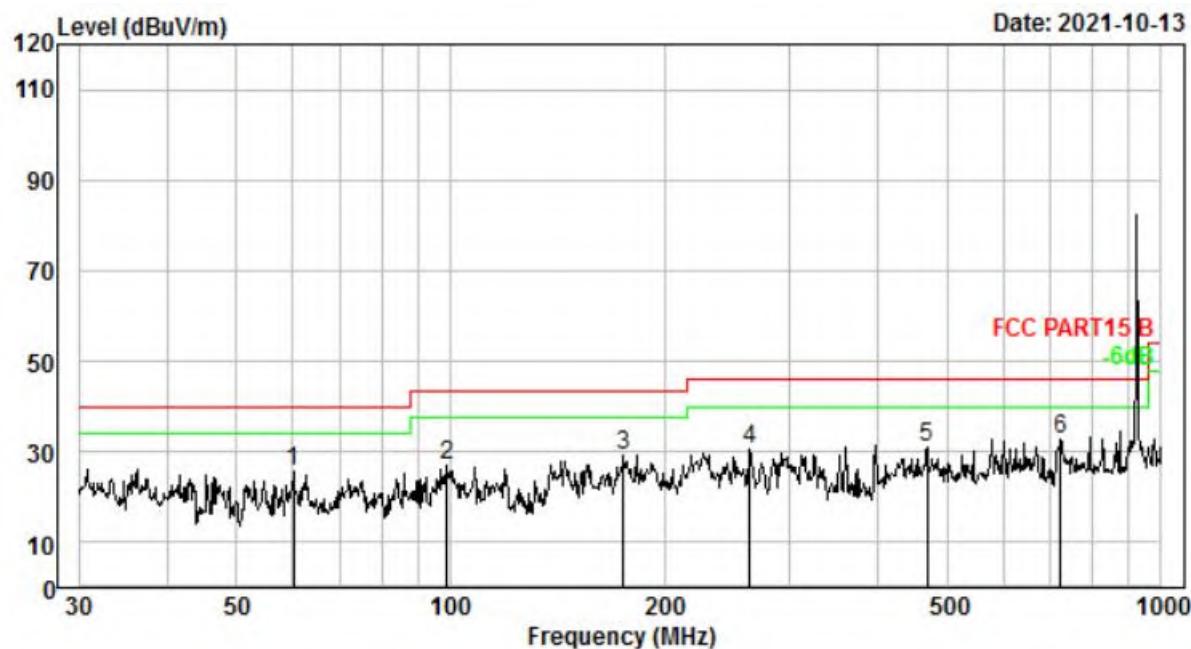
CH 923.3MHz Horizontal



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	60.069	2.39	11.69	38.36	29.94	22.50	40.00	-17.50	QP
2.	107.510	3.40	10.51	38.73	30.00	22.64	43.50	-20.86	QP
3.	180.017	4.28	12.50	40.35	30.03	27.10	43.50	-16.40	QP
4.	312.179	5.23	13.51	39.83	30.37	28.20	46.00	-17.80	QP
5.	497.677	6.03	17.05	37.98	30.90	30.16	46.00	-15.84	QP
6.	750.108	6.74	20.70	32.59	31.13	28.90	46.00	-17.10	QP



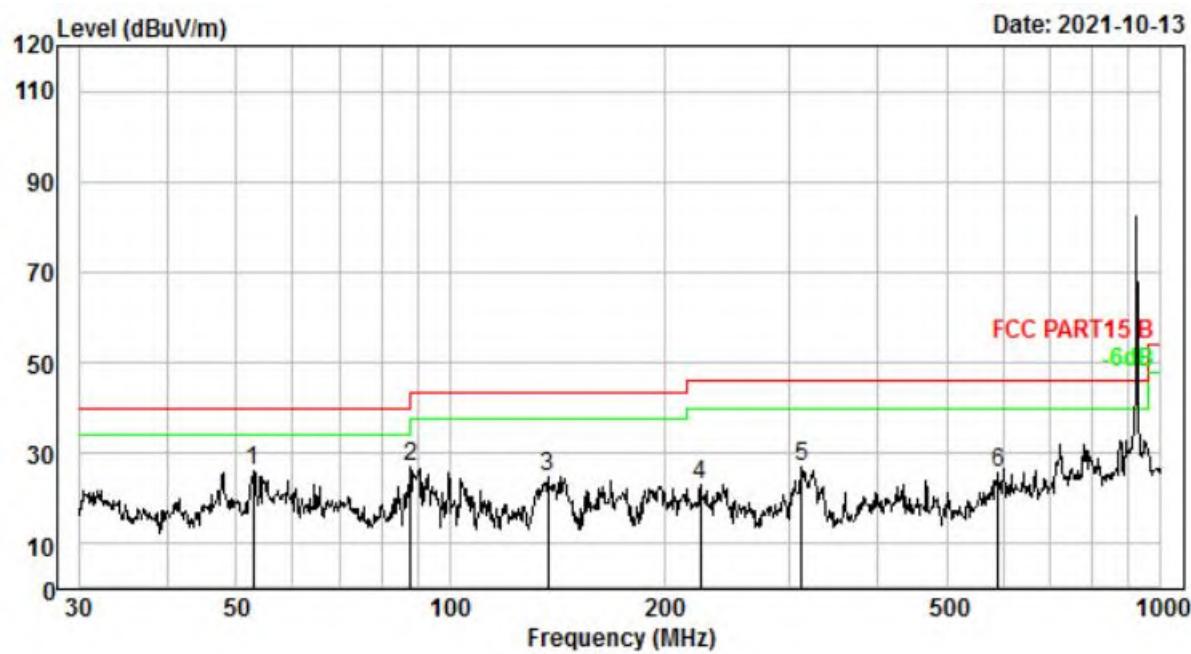
CH 923.3MHz Vertical



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	60.069	2.39	11.69	41.59	29.94	25.73	40.00	-14.27	QP
2.	98.833	3.25	9.49	44.36	29.99	27.11	43.50	-16.39	QP
3.	175.037	4.23	12.88	42.29	30.03	29.37	43.50	-14.13	QP
4.	263.819	4.94	12.71	42.97	30.23	30.39	46.00	-15.61	QP
5.	468.876	5.93	16.37	39.62	30.84	31.08	46.00	-14.92	QP
6.	721.726	6.67	20.37	36.76	31.10	32.70	46.00	-13.30	QP



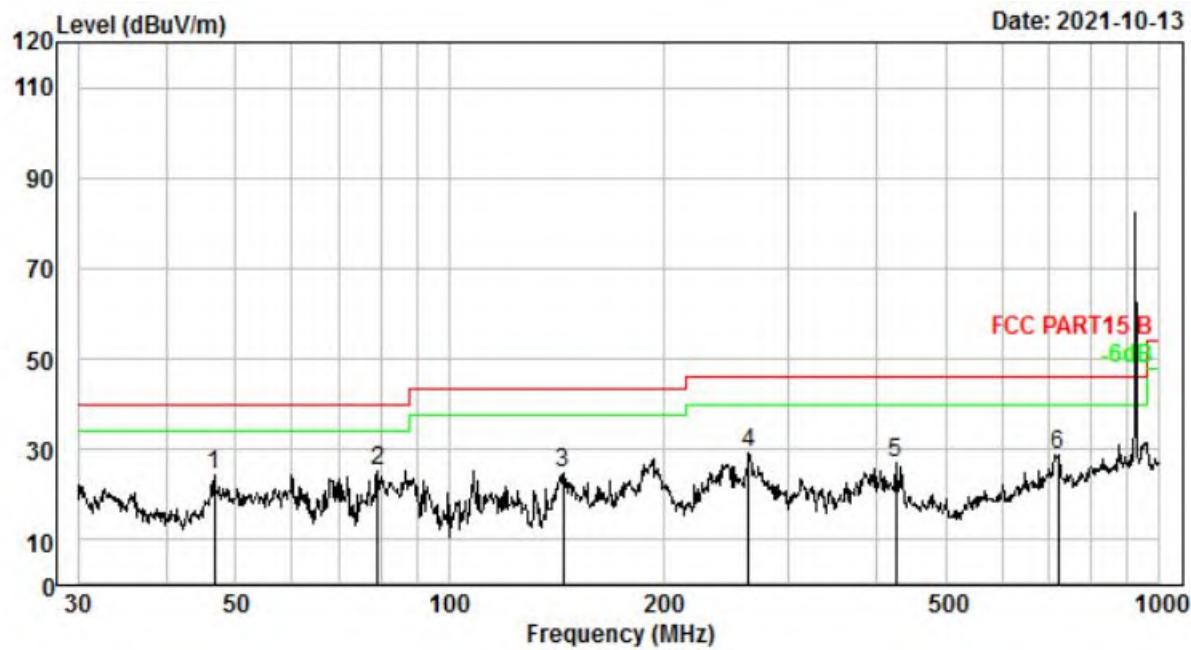
CH 925.1MHz Vertical



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	52.760	2.17	12.10	41.67	29.93	26.01	40.00	-13.99	QP
2.	88.033	3.05	9.01	44.78	29.98	26.86	43.50	-16.64	QP
3.	137.420	3.82	13.14	37.94	30.01	24.89	43.50	-18.61	QP
4.	225.308	4.67	11.80	36.83	30.12	23.18	46.00	-22.82	QP
5.	312.179	5.23	13.51	38.70	30.37	27.07	46.00	-18.93	QP
6.	590.974	6.32	18.67	31.52	31.00	25.51	46.00	-20.49	QP



CH 925.1MHz Horizontal



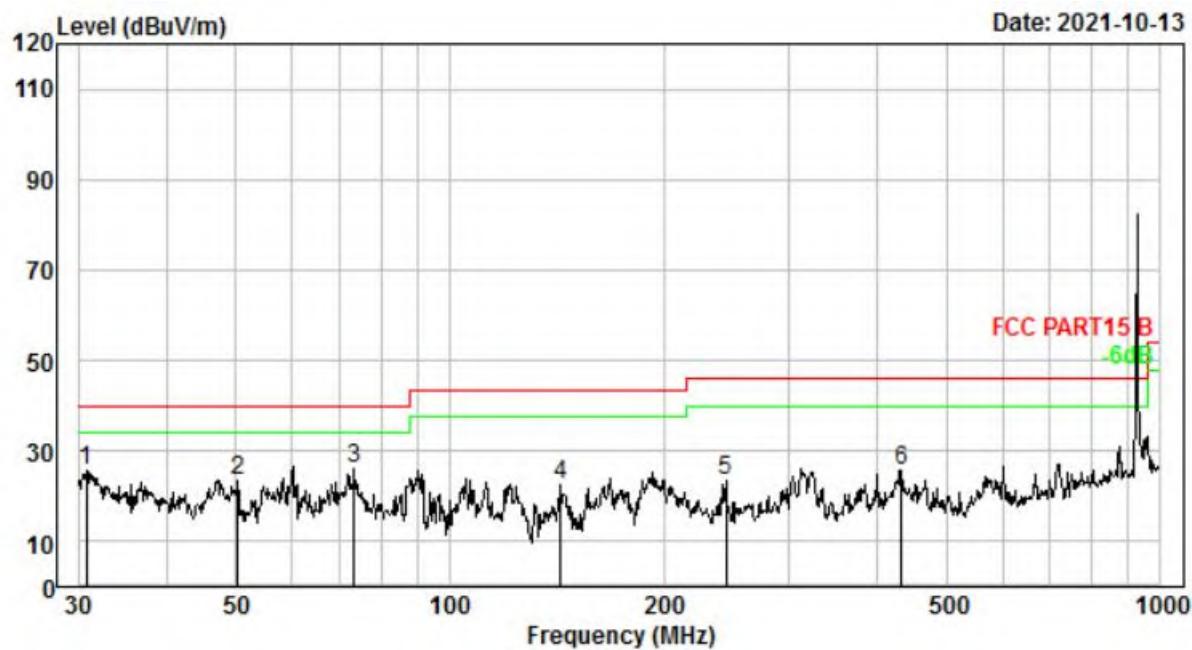
No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	46.666	1.96	12.23	39.87	29.92	24.14	40.00	-15.86	QP
2.	79.243	2.87	9.06	43.21	29.97	25.17	40.00	-14.83	QP
3.	144.842	3.91	13.50	37.38	30.02	24.77	43.50	-18.73	QP
4.	263.819	4.94	12.71	41.70	30.23	29.12	46.00	-16.88	QP
5.	425.028	5.76	15.37	36.65	30.75	27.03	46.00	-18.97	QP
6.	719.200	6.67	20.34	32.80	31.10	28.71	46.00	-17.29	QP



PRECISE TESTING

Report No.: PTC21080305201E-FC02

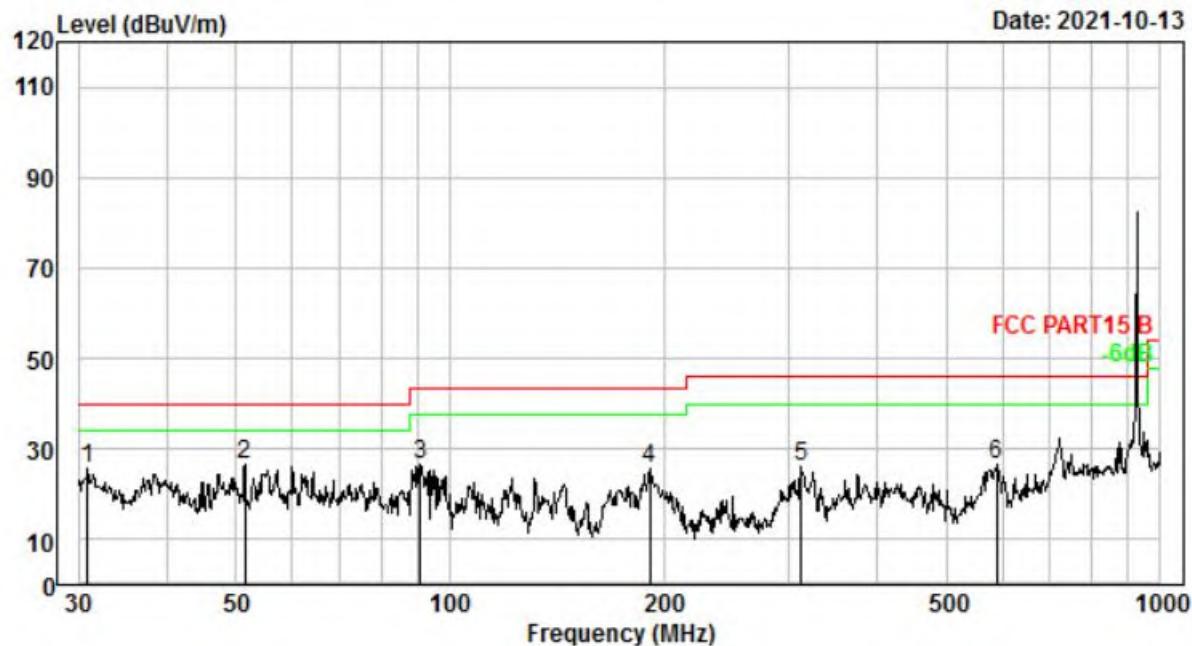
CH 927.5MHz Vertical



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	30.745	1.24	11.78	42.49	29.89	25.62	40.00	-14.38	QP
2.	50.232	2.09	12.10	39.39	29.92	23.66	40.00	-16.34	QP
3.	73.359	2.74	9.62	43.86	29.96	26.26	40.00	-13.74	QP
4.	143.326	3.89	13.44	35.07	30.02	22.38	43.50	-21.12	QP
5.	245.090	4.81	12.37	36.31	30.18	23.31	46.00	-22.69	QP
6.	432.546	5.79	15.53	35.31	30.77	25.86	46.00	-20.14	QP



CH 927.5MHz Horizontal



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Receiver Reading dBuV	Preamp Factor dB	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	30.853	1.25	11.79	42.53	29.89	25.68	40.00	-14.32	QP
2.	51.481	2.13	12.10	42.20	29.92	26.51	40.00	-13.49	QP
3.	90.855	3.11	9.18	44.16	29.98	26.47	43.50	-17.03	QP
4.	191.074	4.38	11.65	39.62	30.04	25.61	43.50	-17.89	QP
5.	312.179	5.23	13.51	37.81	30.37	26.18	46.00	-19.82	QP
6.	588.905	6.32	18.66	32.37	31.00	26.35	46.00	-19.65	QP

**Test Frequency 1GHz-10GHz:**

CH	Freq.	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
	(MHz)	H/V	PK	AV	PK	AV	PK	AV
CH01	1846.6	V	52.22	43.52	74.00	54.00	-21.78	-10.48
	2769.9	V	53.05	43.29	74.00	54.00	-20.95	-10.79
	3693.2	V	51.62	42.05	74.00	54.00	-22.38	-11.95
	4616.5	V	50.29	41.72	74.00	54.00	-23.71	-12.28
	5539.8	V	48.72	38.65	74.00	54.00	-25.28	-15.35
	6463.1	V	46.35	37.21	74.00	54.00	-27.65	-16.79
	1846.6	H	55.07	44.19	74.00	54.00	-18.93	-9.29
	2769.9	H	54.16	43.06	74.00	54.00	-19.84	-11.04
	3693.2	H	52.09	42.58	74.00	54.00	-21.91	-10.49
	4616.5	H	51.47	40.62	74.00	54.00	-22.53	-13.08
	5539.8	H	48.37	37.58	74.00	54.00	-26.66	-16.12
	6463.1	H	46.22	35.69	74.00	54.00	-26.18	-16.11

CH	Freq.	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
	(MHz)	H/V	PK	AV	PK	AV	PK	AV
CH04	1850.2	V	54.32	45.62	74.00	54.00	-19.68	-8.38
	2775.3	V	53.05	43.29	74.00	54.00	-20.95	-10.71
	3700.4	V	51.62	42.05	74.00	54.00	-22.38	-11.95
	4625.5	V	50.29	41.72	74.00	54.00	-23.71	-12.28
	4650.6	V	48.72	38.65	74.00	54.00	-25.28	-15.35
	6475.7	V	46.35	37.21	74.00	54.00	-27.65	-16.79
	1850.2	H	55.07	44.19	74.00	54.00	-18.93	-9.81
	2775.3	H	54.16	43.06	74.00	54.00	-19.84	-10.94
	3700.4	H	52.09	42.58	74.00	54.00	-21.91	-11.42
	4625.5	H	51.47	40.62	74.00	54.00	-22.53	-13.38
	4650.6	H	48.37	37.58	74.00	54.00	-25.63	-16.42
	6475.7	H	46.22	35.69	74.00	54.00	-27.78	-18.31



CH	Freq.	Ant.Pol.	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Margin(dB)	
	(MHz)		H/V	PK	AV	PK	AV	PK
CH08	1855.0	V	54.32	45.62	74.00	54.00	-22.18	-10.81
	2782.5	V	53.05	43.29	74.00	54.00	-23.59	-11.73
	3710.0	V	51.62	42.05	74.00	54.00	-24.28	-13.55
	4637.5	V	50.29	41.72	74.00	54.00	-25.72	-16.18
	5565.0	V	48.72	38.65	74.00	54.00	-27.28	-17.51
	6492.5	V	46.35	37.21	74.00	54.00	-29.59	-18.19
	1855.0	H	55.07	44.19	74.00	54.00	-19.98	-11.81
	2782.5	H	54.16	43.06	74.00	54.00	-21.43	-10.94
	3710.0	H	52.09	42.58	74.00	54.00	-24.92	-11.42
	4637.5	H	51.47	40.62	74.00	54.00	-25.53	-17.83
	5565.0	H	48.37	37.58	74.00	54.00	-28.36	-18.02
	6492.5	H	46.22	35.69	74.00	54.00	-31.18	-25.31

Remark:

1. Margin= Emission Level - Limit
2. “*” means the test results were attenuated more than 20dB below the permissible limits, so the results don't record in the report.



8 -6dB Bandwidth Measurement

Test Method : ANSI C63.10: 2013

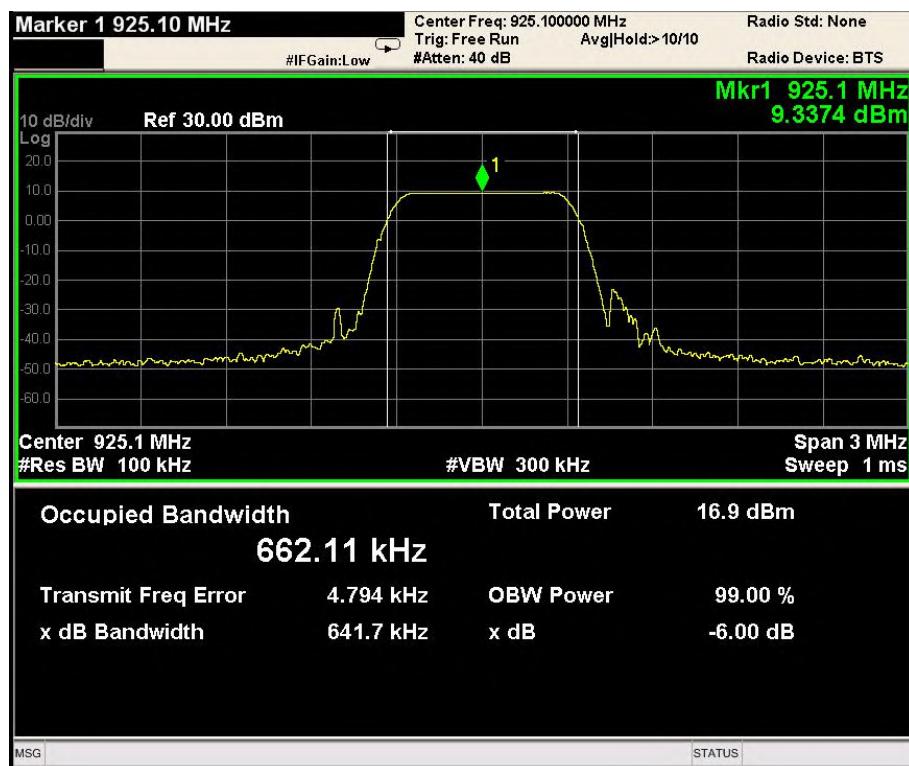
8.1 Test Procedure and limit

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 100kHz, VBW = 300kHz
3. The minimum -6 dB bandwidth shall be at least 500 kHz.

8.2 Test Result

Channel frequency (MHz)	-6dB Down BW(KHz)
923.30	640,8
925.10	641.7
927.5	639.5

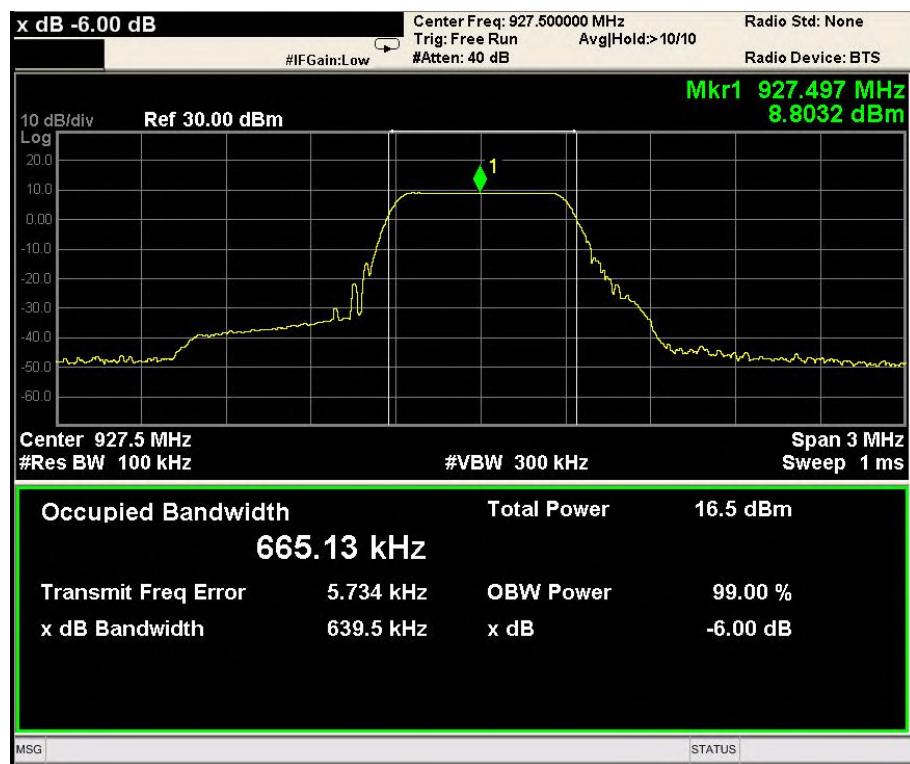






PRECISE TESTING

Report No.: PTC21080305201E-FC02





9 Maximum peak conducted output power

Test Method : ANSI C63.10: 2013

9.1 Test Procedure and limit

1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer: RBW = 10kHz, VBW = 100kHz
3. For systems employing digital modulation techniques operating in the bands 902 to 928 MHz, 2400 to 2483.5 MHz and 5725 to 5850 MHz, the maximum peak conducted output power shall not exceed 1 W.
4. The measurement detector: RMS Average

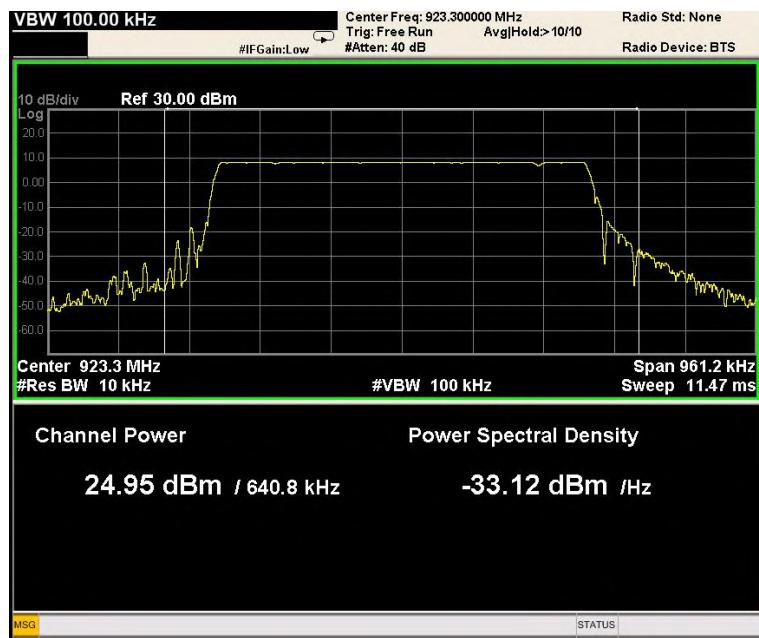
9.2 Test Result

Channel frequency (MHz)	-6dB Down BW (KHz)	Analyzer level (dbm)	Result (W)	Verdict
923.30	640,8	24,95	0.3126	PASS
925.10	641.7	25.95	0.3936	PASS
927.5	639.5	25.56	0.3597	PASS



PRECISE TESTING

Report No.: PTC21080305201E-FC02





PRECISE TESTING

Report No.: PTC21080305201E-FC02





10 Band edges Requirement

Test Requirement:	FCC Part 15 C section 15.247(d) (d) Emission radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50dB below the level of the fundamental or to the general radiated emission limits in 15.209, whichever is the lesser attenuation.
Test Method:	ANSI C63.10: Clause 6.10
Test Status:	Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports(if EUT with antenna diversity architecture). The lowest, middle and highest channels were selected for the final test as listed below.

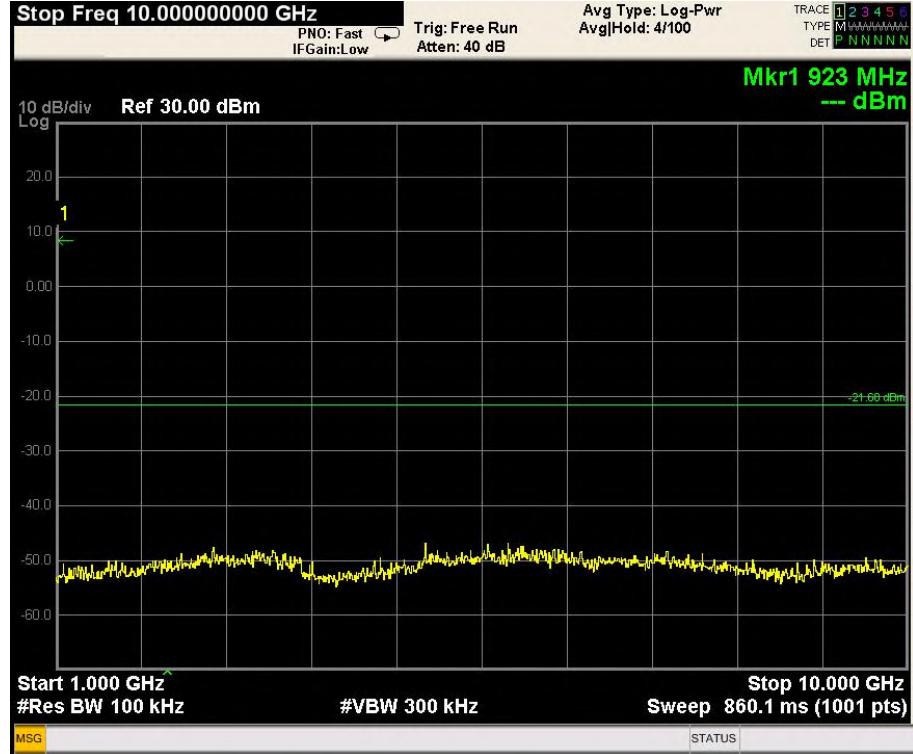
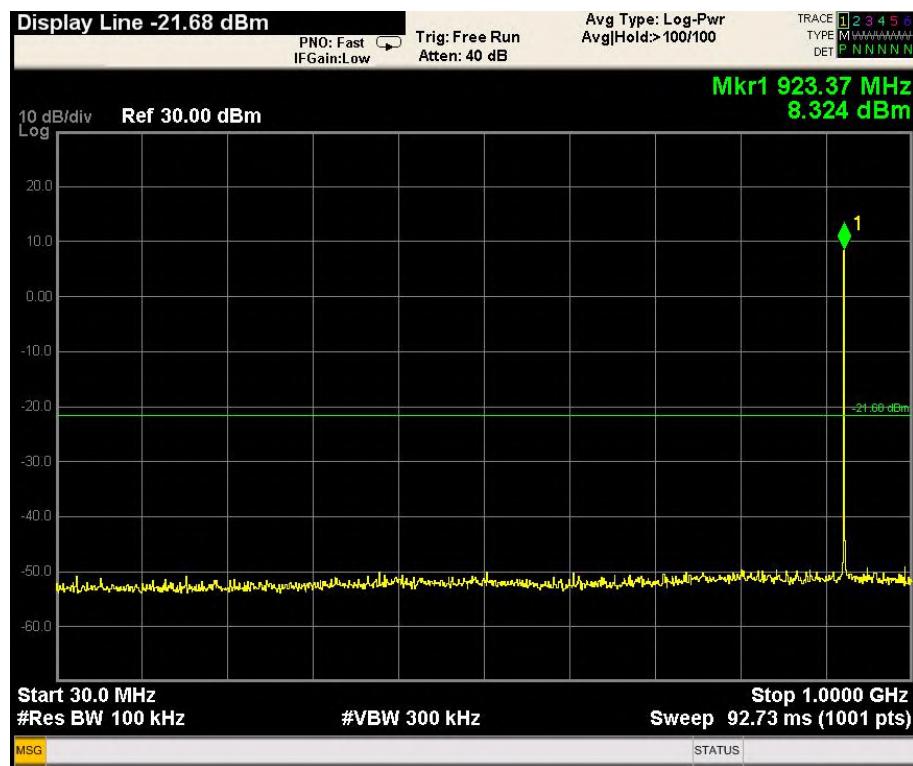
10.1 Test Result

No significant emissions within 20 dB to the limit .



PRECISE TESTING

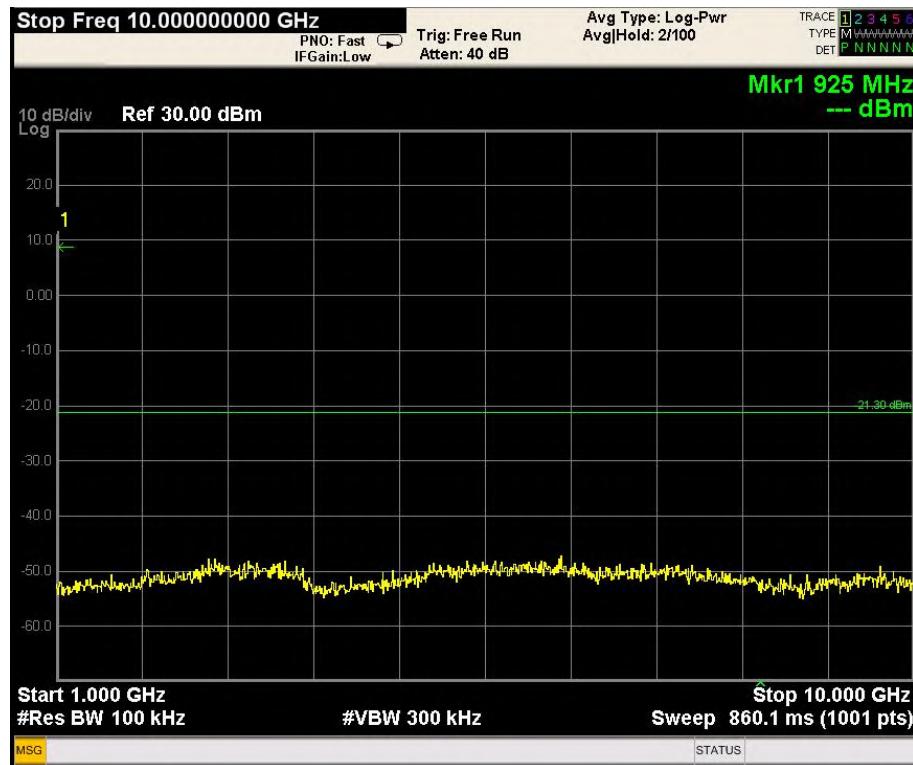
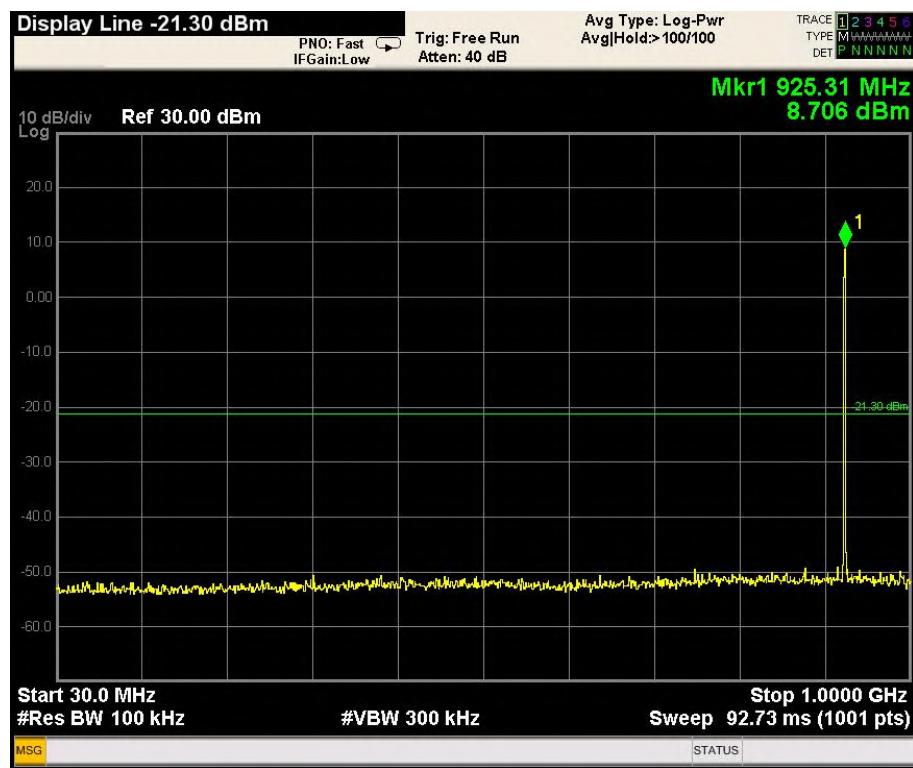
Report No.: PTC21080305201E-FC02





PRECISE TESTING

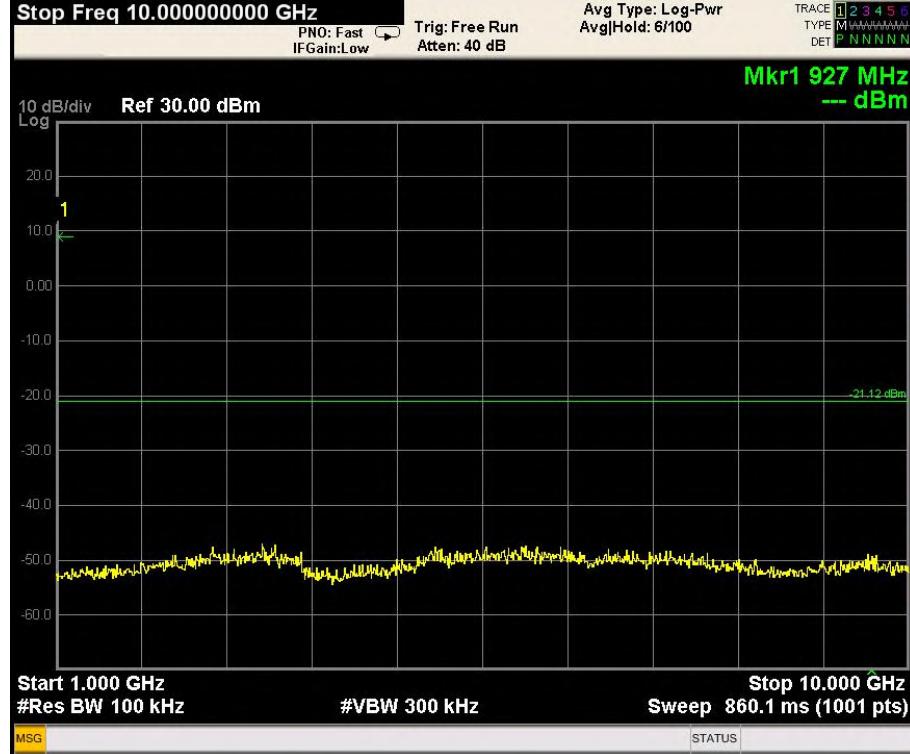
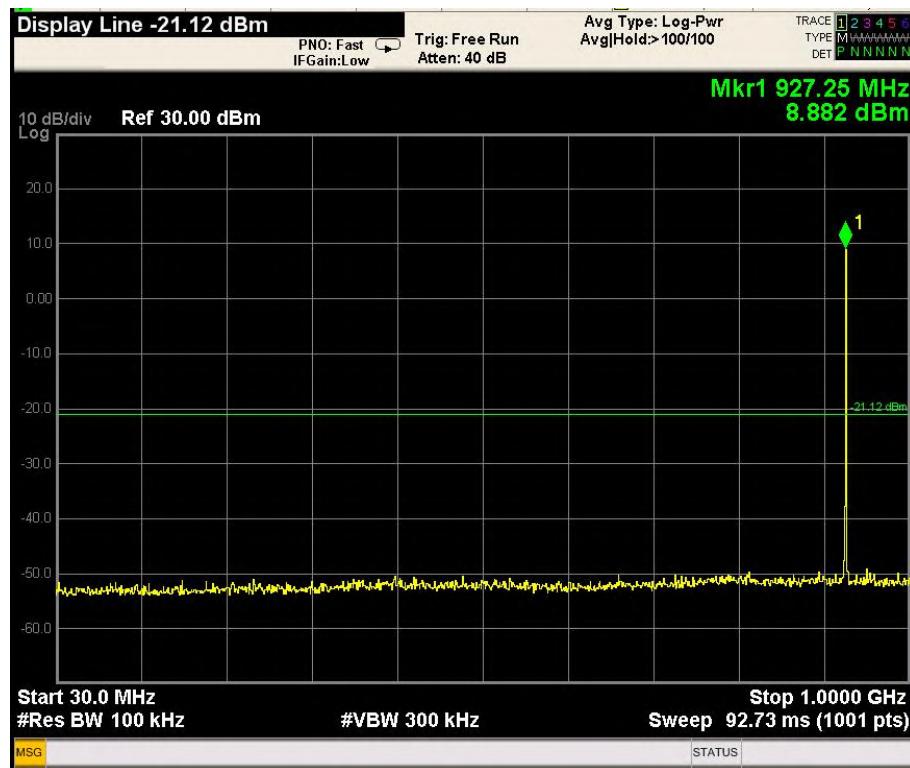
Report No.: PTC21080305201E-FC02





PRECISE TESTING

Report No.: PTC21080305201E-FC02





11 Antenna Requirement

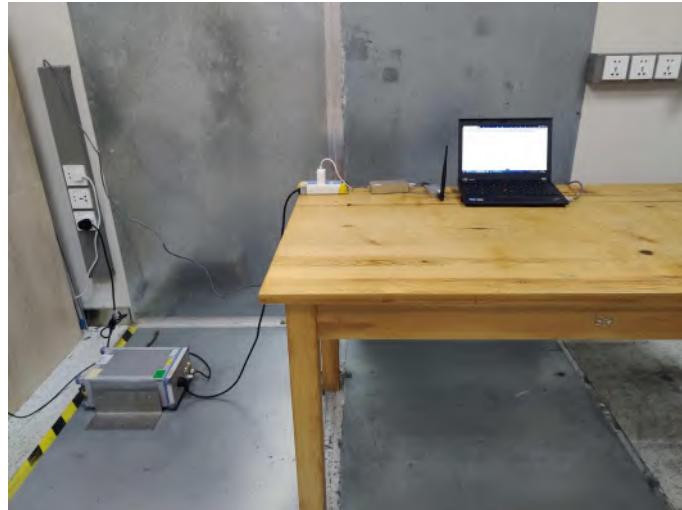
The antenna is inversion , no consideration of replacement. Please see the photos for details.



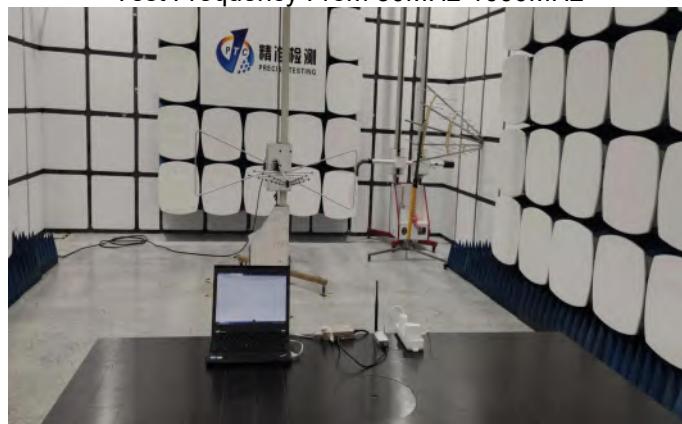


12 TEST PHOTOS

Conduction Test



Test Frequency From 30MHz-1000MHz

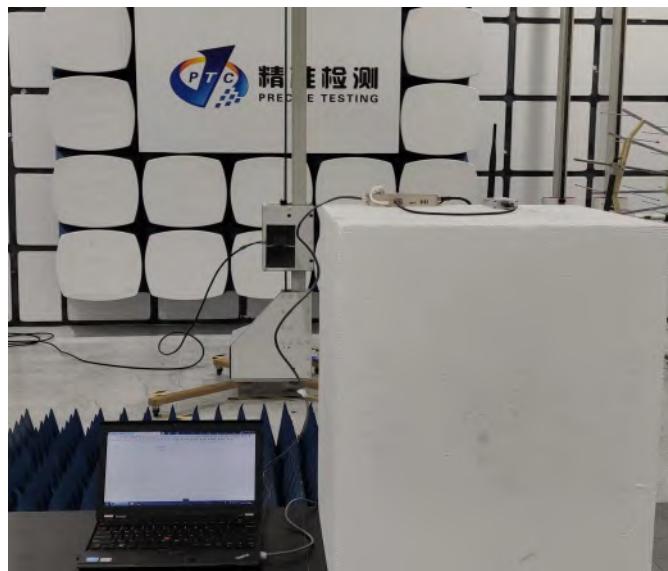




PRECISE TESTING

Report No.: PTC21080305201E-FC02

Test frequency from 1GHz-10GHz





PRECISE TESTING

Report No.: PTC21080305201E-FC02

13 EUT PHOTOS





PRECISE TESTING

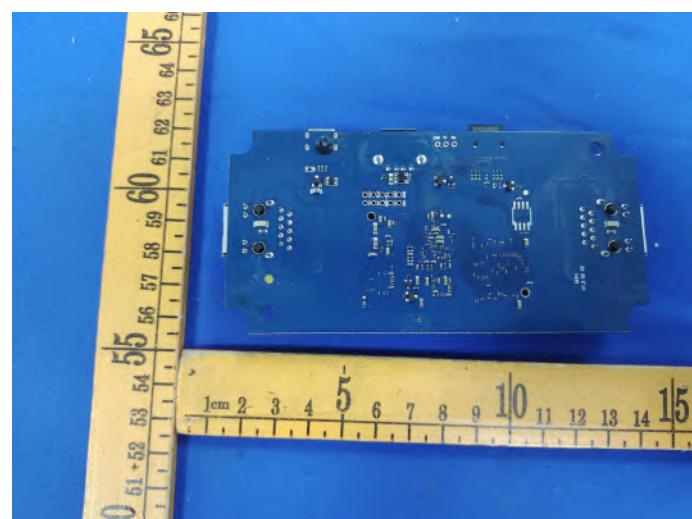
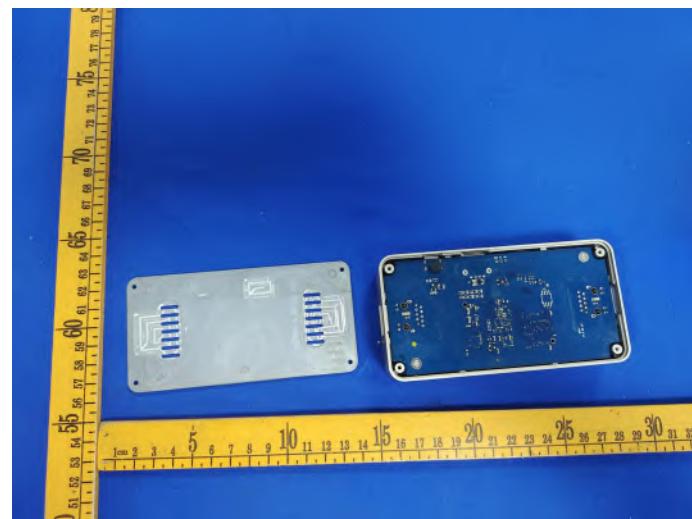
Report No.: PTC21080305201E-FC02





PRECISE TESTING

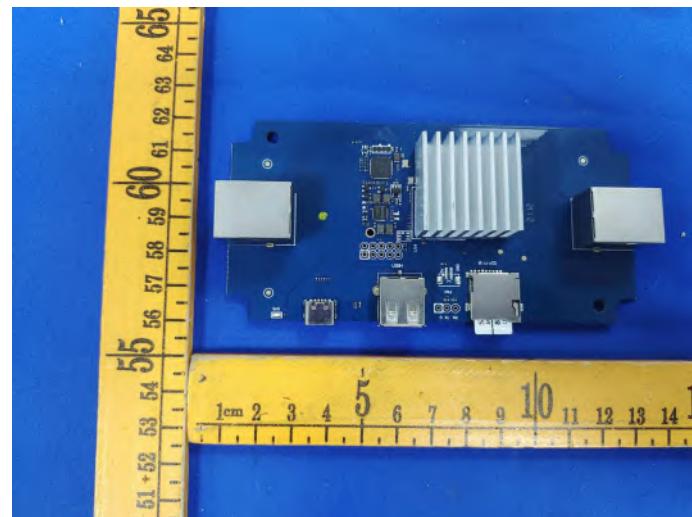
Report No.: PTC21080305201E-FC02





PRECISE TESTING

Report No.: PTC21080305201E-FC02

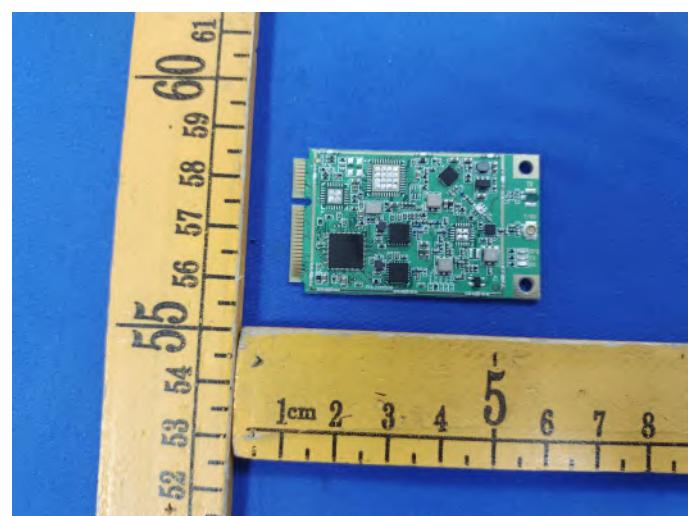
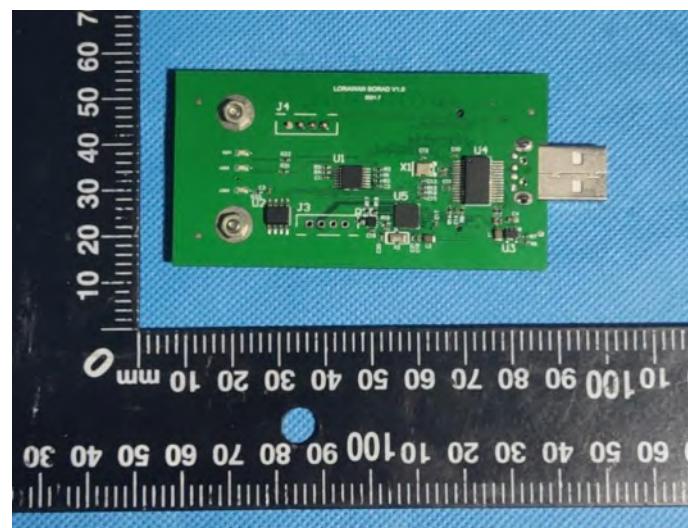


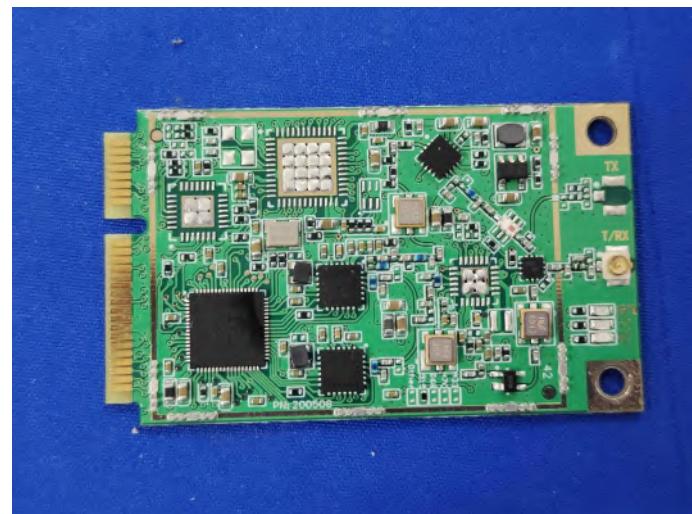
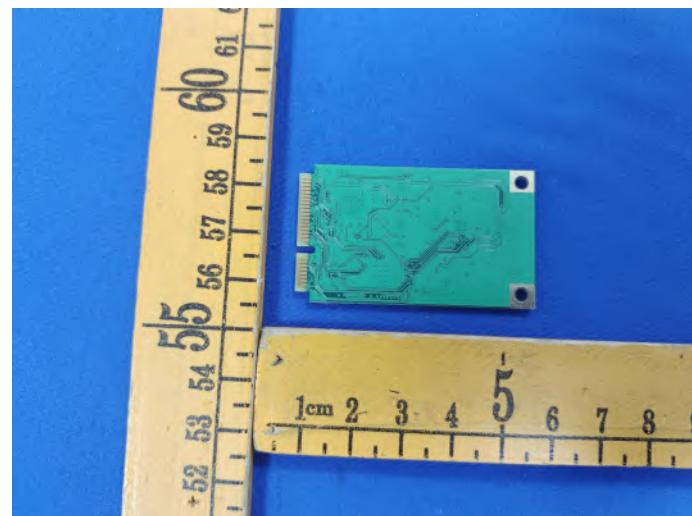




PRECISE TESTING

Report No.: PTC21080305201E-FC02





*****THE END REPORT*****