FCC TEST REPORT

For

MAXIIOT LTD

LoRaWAN

Model No.: GL5712-UX, GL5712-UA

Prepared For	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680
Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
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Report Number	:	SZAWW180830006-01
Date of Receipt	:	Aug. 30, 2018
Date of Test	:	Aug. 30~Nov. 13, 2018
Date of Report	:	Nov. 13, 2018

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TEST REPORT

Applicant	:	MAXIIOT LTD
Manufacturer	:	MAXIIOT LTD
Product Name	:	LoRaWAN
Model No.	:	GL5712-UX, GL5712-UA
Trade Mark	:	MAXIIOT
Rating(s)	:	Input: 3.3V⎓ 2A
Test Standard(s)	**:**	**FCC Part15 Subpart C 2018, Section 15.247**
Test Method(s)	**:**	**ANSI C63.10: 2013, KDB558074 D01 DTS Meas Guidance v05**

The device described above is tested by Shenzhen Anbotek Compliance Laboratory Limited to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The measurement results are contained in this test report and Shenzhen Anbotek Compliance Laboratory Limited is assumed full of responsibility for the accuracy and completeness of these measurements. Also, this report shows that the EUT (Equipment Under Test) is technically compliant with the FCC Part 15 Subpart C requirements.

This report applies to above tested sample only and shall not be reproduced in part without written approval of Shenzhen Anbotek Compliance Laboratory Limited.

Date of Test: Aug. 30~Nov. 13, 2018

Prepared by: (Engineer / OliayYang)

Reviewer: (Supervisor / Snowy Meng)

Approved & Authorized Signer: (Manager / Sally Zhang)

1. General Information

1.1. Client Information

Applicant	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680
Manufacturer	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680
Factory	:	MAXIIOT LTD
Address	:	No.60, Zhongshan Rd., Tucheng Dist, New Taipei, Taiwan 23680

1.2. Description of Device (EUT)

Product Name	:	LoRaWAN	
Model No.	:	GL5712-UX, GL5712-UA (Note: All samples are the same except the different connectors, so we prepare "GL5712-UX" for test only.)	
Trade Mark	:	MAXIIOT	
Test Power Supply	:	TX & RX: DC 5V via USB Port	
Test Sample No.	:	S1(Normal Sample), S2(Engineering Sample)	
Product Description	:	Operation Frequency:	923.3~927.5MHz
		Number of Channel:	8 Channels
		Modulation Type:	LoRa/FSK
		Antenna Type:	Cylindrical Antenna
		Antenna Gain(Peak):	5 dBi
Remark: 1)For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			

1.3. Auxiliary Equipment Used During Test

PC	:	Manufacturer: DELL
		M/N: Optiplex 3020 MT S/N: CN-079V51-70163-4AD-089K-A00 Input Rating: AC 100-240V, 50-60Hz 5.4A CE , FCC DOC, CCC
MONITOR	:	Manufacturer: DELL
		M/N: E1914Hf S/N: CN-034H2R-72872-419-AFJB Input:100V-240V, 1.5A, 50/60Hz TUV-GS, FCC, CE, KCC, VCCI
KEYBOARD	:	Manufacturer: DELL
		M/N: SK-8120 S/N: CN-0DJ365-71616-49J-0MVR-A00 Input Rating: DC 5V, 0.05A CE, FCC, VCCI, KCC, TUV-GS Cable: 1.8m, unshielded
MOUSE	:	Manufacturer: DELL M/N: MS111-T S/N: CN-0KW2YH-71616-488-1CBJ Input Rating: DC 5V, 0.1A Cable: 1.8m, unshielded CE, FCC, VCCI, KCC, TUV-GS

1.4. Description of Test Modes

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 above was evaluated respectively.

Pretest Mode	Description
Mode 1	CH01
Mode 2	CH05
Mode 3	CH08
Mode 4	Keeping TX Mode

For Conducted Emission	
Final Test Mode	Description
Mode 4	Keeping TX Mode

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01
Mode 2	CH05
Mode 3	CH08
Mode 4	Keeping TX Mode

Note:

(1) The measurements are performed at the highest, middle, lowest available channels.

1.5. List of channels

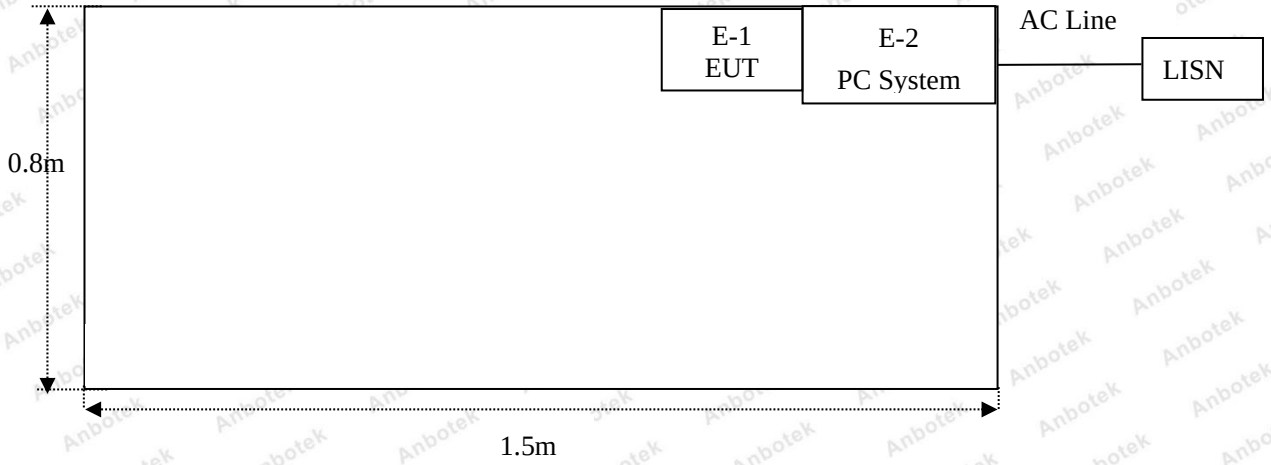
Channel	Freq. (MHz)
01	923.3
02	923.9
03	924.5
04	925.1
05	925.7
06	926.3
07	926.9
08	927.5

Note:

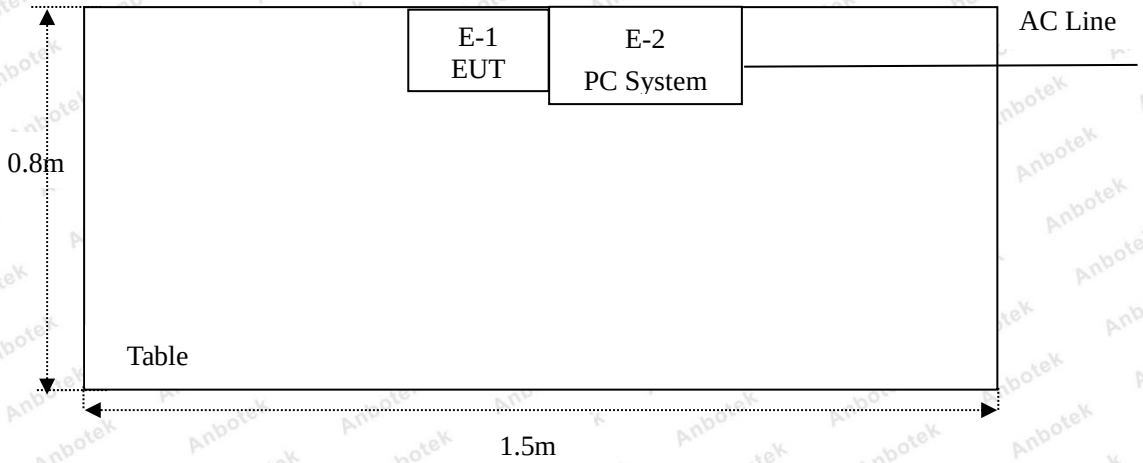
1. The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.
2. EUT built-in battery-powered, fully-charged battery use of the test battery.

1.6. Description Of Test Setup

CE



RE



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	L.I.S.N. Artificial Mains Network	Rohde & Schwarz	ENV216	100055	Nov. 05, 2018	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESPI3	101604	Nov. 05, 2018	1 Year
3.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Nov. 05, 2018	1 Year
4.	Spectrum Analysis	Agilent	E4407B	US39390582	Nov. 05, 2018	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Nov. 05, 2018	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 19, 2018	1 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 19, 2018	1 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Nov. 19, 2018	1 Year
10.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Nov. 20, 2018	1 Year
11.	Pre-amplifier	SONOMA	310N	186860	Nov. 05, 2018	1 Year
12.	EMI Test Software EZ-EMC	SHURPLE	N/A	N/A	N/A	N/A
13.	RF Test Control System	YIHENG	YH3000	2017430	Nov. 05, 2018	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Nov. 05, 2018	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Nov. 05, 2018	1 Year
16.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Nov. 05, 2018	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Nov. 05, 2018	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Nov. 05, 2018	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Apr. 02, 2018	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Nov. 01, 2018	1 Year

1.8. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registed and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration No. 184111, July 31, 2017.

ISED-Registration No.: 8058A-1

Shenzhen Anbotek Compliance Laboratory Limited, EMC Laboratory has been registered and fully described in a report filed with the (ISED) Innovation, Science and Economic Development Canada. The acceptance letter from the ISED is maintained in our files. Registration 8058A-1, June 13, 2016.

Test Location

Shenzhen Anbotek Compliance Laboratory Limited.
1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102

2. Summary of Test Results

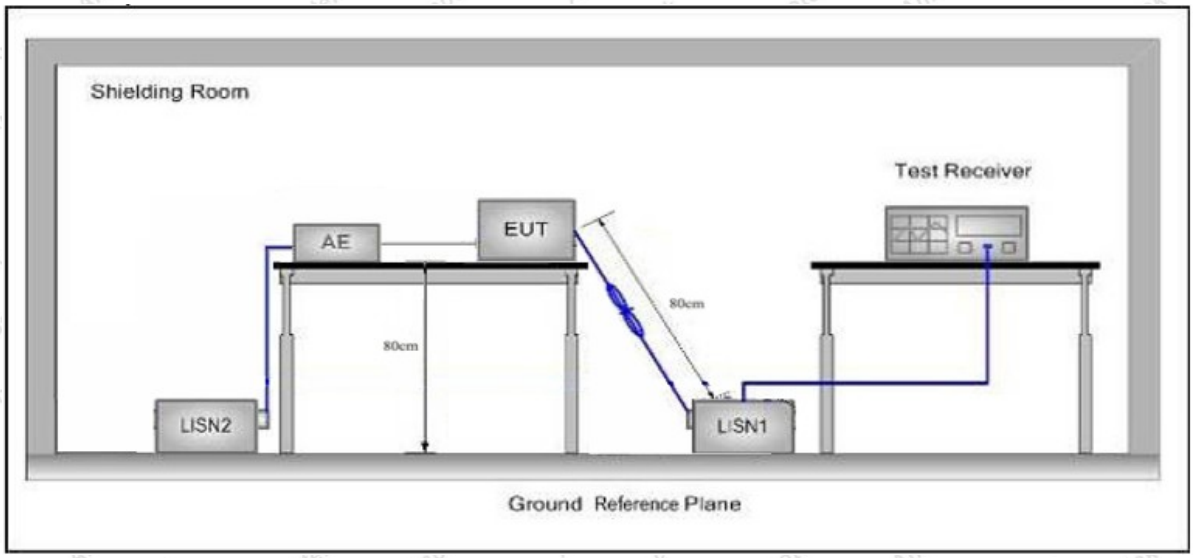
Standard Section	Test Item	Result
15.203/15.247(c)	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.247(b)(3)	Conducted Peak Output Power	PASS
15.247(a)(2)	6dB Occupied Bandwidth	PASS
15.247(e)	Power Spectral Density	PASS
15.247(d)	Band Edge	PASS
Remark: "N/A" is an abbreviation for Not Applicable.		

3. Conducted Emission Test

3.1. Test Standard and Limit

Test Standard	FCC Part15 Section 15.207		
Test Limit	Frequency	Maximum RF Line Voltage (dBuV)	
		Quasi-peak Level	Average Level
	150kHz~500kHz	66 ~ 56 *	56 ~ 46 *
	500kHz~5MHz	56	46
	5MHz~30MHz	60	50
Remark: (1) *Decreasing linearly with logarithm of the frequency. (2) The lower limit shall apply at the transition frequency.			

3.2. Test Setup



3.3. Test Procedure

The EUT system is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC line are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to FCC ANSI C63.10-2013 on Conducted Emission Measurement.

The bandwidth of test receiver (ESCI) set at 9kHz.

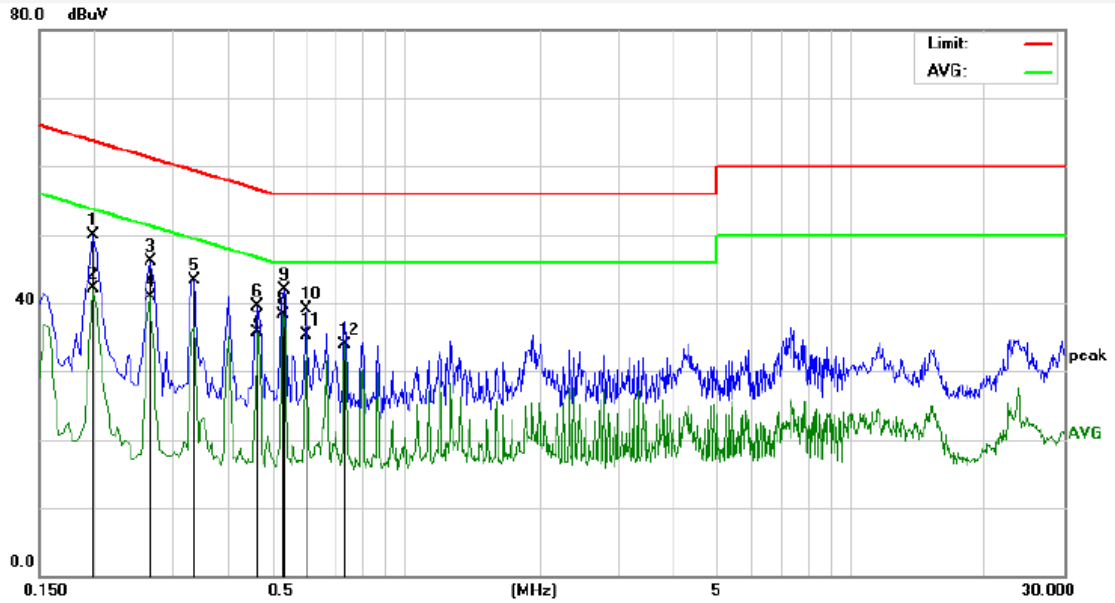
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Please to see the following pages.

Conducted Emission Test Data

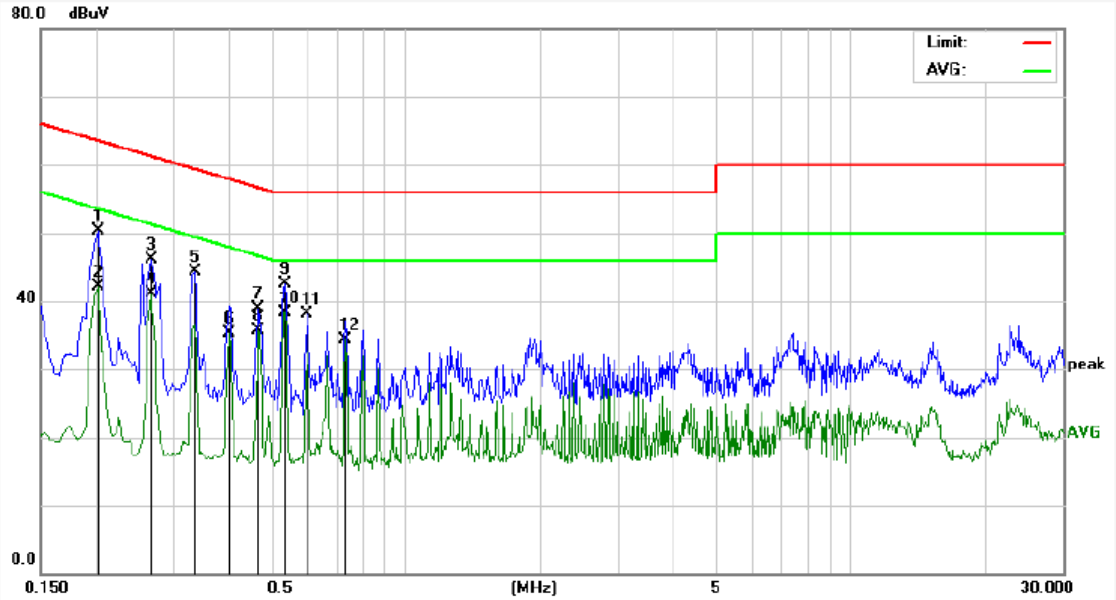
Test Site:	1# Shielded Room
Operating Condition:	Keeping TX Mode
Test Specification:	TX & RX: DC 5V via USB Port
Comment:	Live Line
	Tem.: 24.6℃ Hum.: 45%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1980	30.10	19.90	50.00	63.69	-13.69	QP	
2	0.1980	22.28	19.90	42.18	53.69	-11.51	AVG	
3	0.2660	26.14	19.89	46.03	61.24	-15.21	QP	
4	0.2660	21.06	19.89	40.95	51.24	-10.29	AVG	
5	0.3339	23.49	19.91	43.40	59.35	-15.95	QP	
6	0.4660	19.58	19.96	39.54	56.58	-17.04	QP	
7	0.4660	15.75	19.96	35.71	46.58	-10.87	AVG	
8	0.5299	18.38	19.99	38.37	46.00	-7.63	AVG	
9	0.5340	21.93	19.99	41.92	56.00	-14.08	QP	
10	0.5980	19.15	20.01	39.16	56.00	-16.84	QP	
11	0.5980	15.24	20.01	35.25	46.00	-10.75	AVG	
12	0.7300	13.89	20.05	33.94	46.00	-12.06	AVG	

Conducted Emission Test Data

Test Site:	1# Shielded Room
Operating Condition:	Keeping TX+ Charging Mode
Test Specification:	TX & RX: DC 5V via USB Port
Comment:	Neutral Line
	Tem.: 24.6℃ Hum.: 45%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.2020	30.34	19.90	50.24	63.52	-13.28	QP	
2	0.2020	22.11	19.90	42.01	53.52	-11.51	AVG	
3	0.2660	26.30	19.89	46.19	61.24	-15.05	QP	
4	0.2660	21.14	19.89	41.03	51.24	-10.21	AVG	
5	0.3339	24.47	19.91	44.38	59.35	-14.97	QP	
6	0.3980	15.45	19.93	35.38	47.89	-12.51	AVG	
7	0.4660	18.96	19.96	38.92	56.58	-17.66	QP	
8	0.4660	15.71	19.96	35.67	46.58	-10.91	AVG	
9	0.5340	22.56	19.99	42.55	56.00	-13.45	QP	
10	0.5340	18.39	19.99	38.38	46.00	-7.62	AVG	
11	0.5980	18.18	20.01	38.19	56.00	-17.81	QP	
12	0.7300	14.18	20.05	34.23	46.00	-11.77	AVG	

4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209 and 15.205				
Test Limit	Frequency (MHz)	Field strength (microvolt/meter)	Limit (dBuV/m)	Remark	Measurement distance (m)
	0.009MHz~0.490MHz	2400/F(kHz)	-	-	300
	0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
	1.705MHz-30MHz	30	-	-	30
	30MHz~88MHz	100	40.0	Quasi-peak	3
	88MHz~216MHz	150	43.5	Quasi-peak	3
	216MHz~960MHz	200	46.0	Quasi-peak	3
	960MHz~1000MHz	500	54.0	Quasi-peak	3
	Above 1000MHz	500	54.0	Average	3
		-	74.0	Peak	3

Remark:
(1)The lower limit shall apply at the transition frequency.
(2) 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

4.2. Test Setup

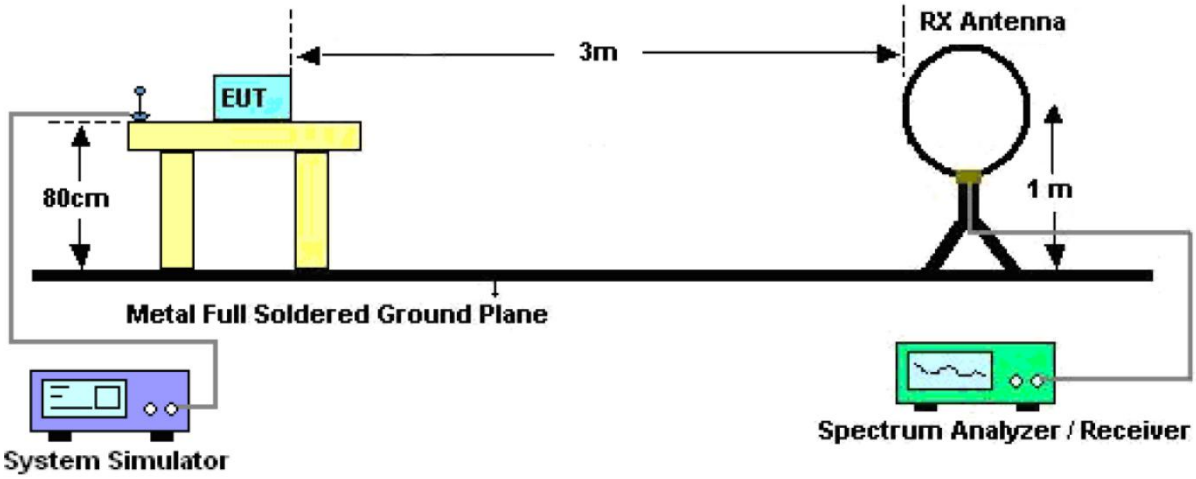


Figure 1. Below 30MHz

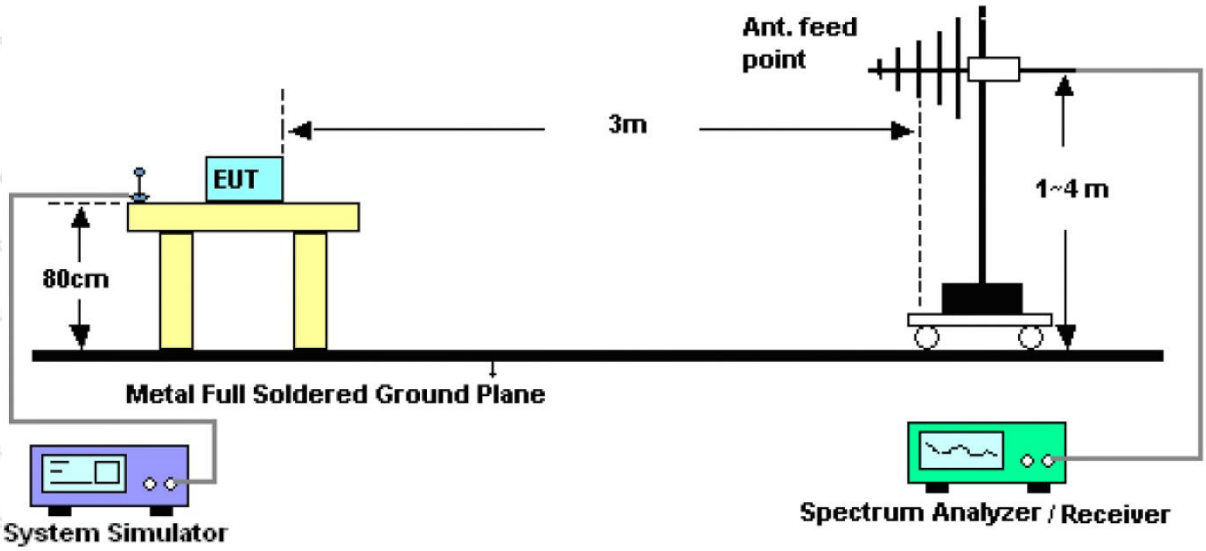


Figure 2. 30MHz to 1GHz

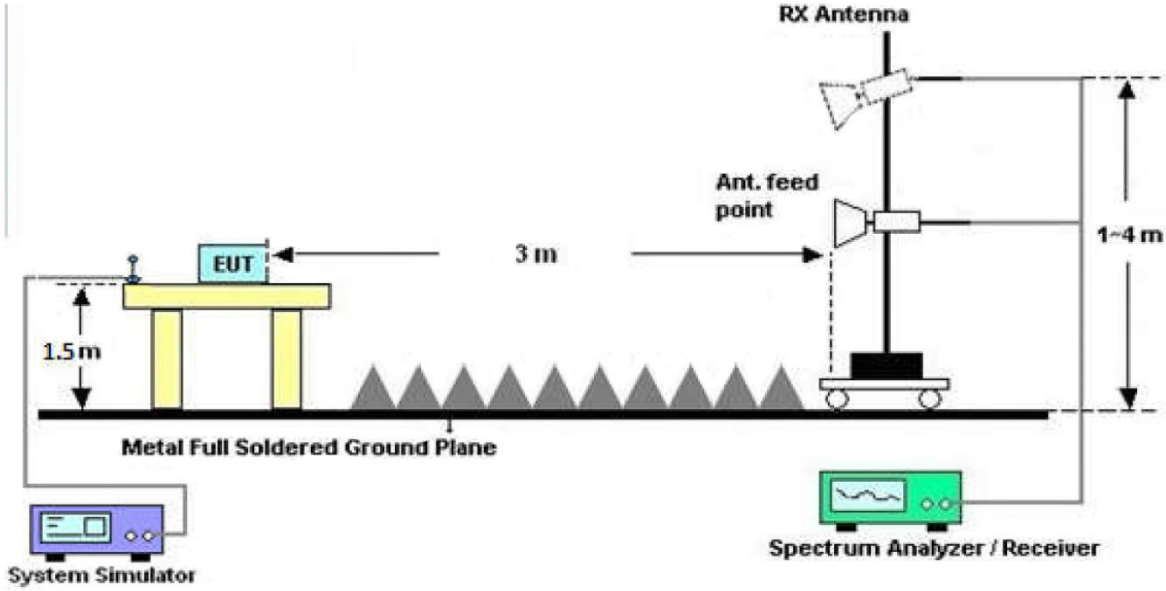


Figure 3. Above 1 GHz

4.3. Test Procedure

For below 1GHz: The EUT is placed on a turntable, which is 0.8m above the ground plane.

For above 1GHz: The EUT is placed on a turntable, which is 1.5m above the ground plane.

The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna which is mounted on a antenna tower. The antenna can be moved up and down from 1 to 4 meters to find out the maximum emission level. Rotated the EUT through three orthogonal axes to determine the maximum emissions, both horizontal and vertical polarization of the antenna are set on test. The EUT is tested in 9*6*6 Chamber. The device is evaluated in xyz orientation.

For the radiated emission test above 1GHz:

Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying

aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.

For 9kHz to 150kHz, Set the spectrum analyzer as:
RBW = 200Hz, VBW =1kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 150kHz to 30MHz, Set the spectrum analyzer as:
RBW = 9KHz, VBW =30kHz, Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For 30MHz to 1000MHz, Set the spectrum analyzer as:
RBW = 100kHz, VBW =300kHz,Detector= Quasi-Peak, Trace mode= Max hold, Sweep- auto couple.

For above 1GHz,Set the spectrum analyzer as:
RBW =1MHz, VBW =1MHz, Detector= Peak, Trace mode= Max hold, Sweep- auto couple.
RBW =1MHz, VBW =10Hz, Detector= Average, Trace mode= Max hold, Sweep- auto couple.

4.4. Test Data

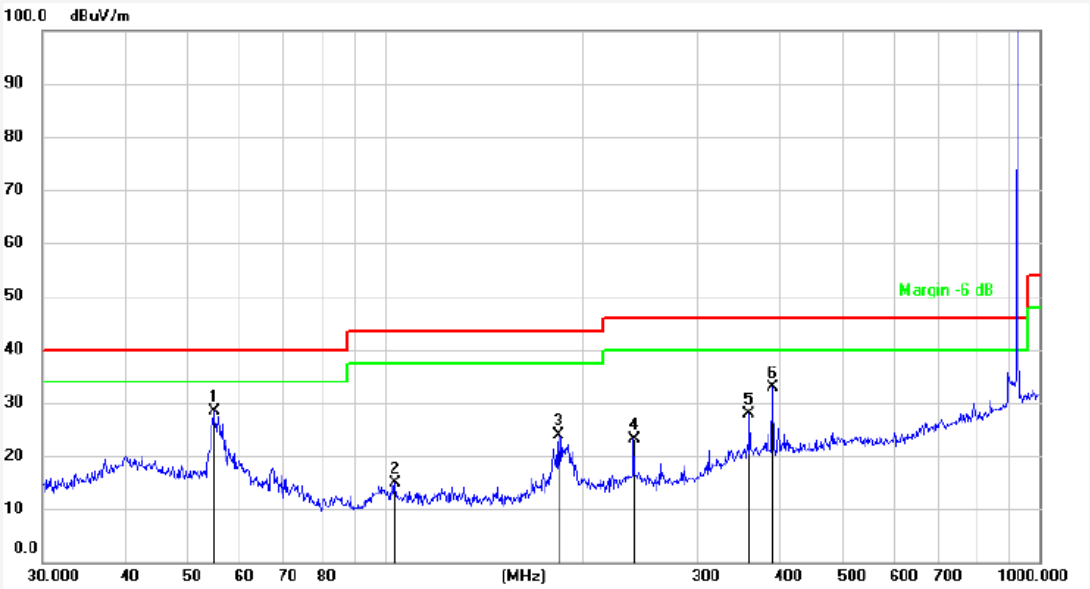
PASS

During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

The test results of 9kHz-30MHz was attenuated more than 20dB below the permissible limits, so the results don't record in the report.

Test Results (30~1000MHz)

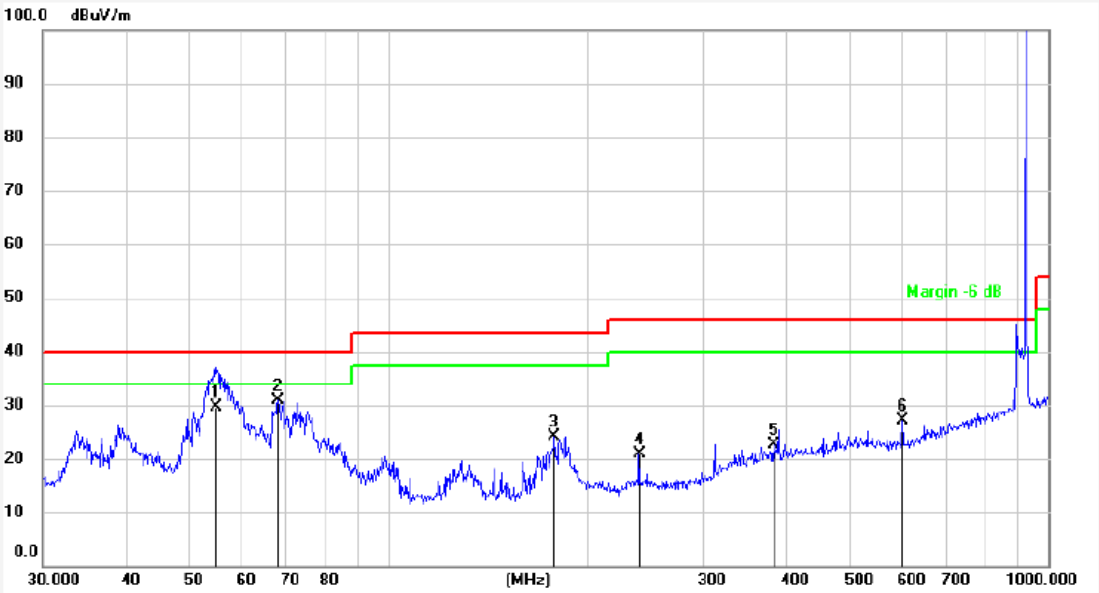
Job No.:	SZAWW180830006-01	Temp.(℃)/Hum.(%RH):	24.3℃/55%RH
Standard:	FCC PART 15C	Power Source:	TX & RX: DC 5V via USB Port
Test Mode:	Mode 4	Polarization:	Horizontal



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	54.8348	45.06	-16.72	28.34	40.00	-11.66	QP	300	0	
2	103.8054	35.54	-20.71	14.83	43.50	-28.67	QP	300	96	
3	184.4898	43.64	-19.88	23.76	43.50	-19.74	QP	300	154	
4	239.9874	40.58	-17.49	23.09	46.00	-22.91	QP	300	201	
5	360.4476	41.54	-13.65	27.89	46.00	-18.11	QP	300	296	
6	390.7226	46.01	-13.05	32.96	46.00	-13.04	QP	300	360	

Test Results (30~1000MHz)

Job No.:	SZAWW180830006-01	Temp.(℃)/Hum.(%RH):	24.3℃/55%RH
Standard:	FCC PART 15C	Power Source:	TX & RX: DC 5V via USB Port
Test Mode:	Mode 4	Polarization:	Vertical



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	54.8248	45.31	-15.72	29.59	40.00	-10.41	QP	300	0	
2	68.1514	49.89	-19.10	30.79	40.00	-9.21	QP	300	96	
3	178.7584	40.00	-15.94	24.06	43.50	-19.44	QP	300	154	
4	239.9874	34.28	-13.49	20.79	46.00	-25.21	QP	300	214	
5	383.9318	34.94	-12.19	22.75	46.00	-23.25	QP	300	296	
6	601.4265	36.48	-9.23	27.25	46.00	-18.75	QP	300	360	

Test Results (1GHz-25GHz)

Test Mode: CH01					Test channel: Lowest				
Frequency (MHz)	Antenna Pol.	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Det. Mode
1846.6000	H	46.17	7.39	28.73	26.31	55.98	74	-18.02	PK
1846.6000	H	36.4	7.39	28.73	26.31	46.21	54	-7.79	AV
2769.9000	H	44.18	8.10	29.71	27.01	54.98	74	-19.02	PK
2769.9000	H	35.42	8.10	29.71	27.01	46.22	54	-7.78	AV
3693.2000	H	--	--	--	--	--	--	--	PK
3693.2000	H	--	--	--	--	--	--	--	AV
1846.6000	V	46.4	7.39	28.73	26.31	56.21	74	-17.79	PK
1846.6000	V	36.17	7.39	28.73	26.31	45.98	54	-8.02	AV
2769.9000	V	44.21	8.10	29.71	27.01	55.01	74	-18.99	PK
2769.9000	V	34.53	8.10	29.71	27.01	45.33	54	-8.67	AV
3693.2000	V	--	--	--	--	--	--	--	PK
3693.2000	V	--	--	--	--	--	--	--	AV

Test Mode: CH05					Test channel: Middle				
Frequency (MHz)	Antenna Pol.	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Det. Mode
1851.4000	H	48.57	7.41	28.72	26.31	58.39	74	-15.61	PK
1851.4000	H	38.06	7.41	28.72	26.31	47.88	54	-6.12	AV
2777.1000	H	45.44	8.11	29.71	27.01	56.25	74	-17.75	PK
2777.1000	H	34.17	8.11	29.71	27.01	44.98	54	-9.02	AV
3702.8000	H	--	--	--	--	--	--	--	PK
3702.8000	H	--	--	--	--	--	--	--	AV
1851.4000	V	49.39	7.41	28.72	26.31	59.21	74	-14.79	PK
1851.4000	V	36.05	7.41	28.72	26.31	45.87	54	-8.13	AV
2777.1000	V	46.07	8.11	29.71	27.01	56.88	74	-17.12	PK
2777.1000	V	35.93	8.11	29.71	27.01	46.74	54	-7.26	AV
3702.8000	V	--	--	--	--	--	--	--	PK
3702.8000	V	--	--	--	--	--	--	--	AV

Test Mode: CH08					Test channel: Highest				
Frequency (MHz)	Antenna Pol.	Reading (dBuV/m)	Cable Loss (dB)	Ant Factor (dB)	Amplifier (dB)	Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Det. Mode
1855.0000	H	48.51	7.43	28.69	26.31	58.32	74	-15.68	PK
1855.0000	H	36.17	7.43	28.69	26.31	45.98	54	-8.02	AV
2782.5000	H	46.01	8.15	29.84	27.01	56.99	74	-17.01	PK
2782.5000	H	35.23	8.15	29.84	27.01	46.21	54	-7.79	AV
3710.0000	H	--	--	--	--	--	--	--	PK
3710.0000	H	--	--	--	--	--	--	--	AV
1855.0000	V	45.98	7.43	28.69	26.31	55.79	74	-18.21	PK
1855.0000	V	37.06	7.43	28.69	26.31	46.87	54	-7.13	AV
2782.5000	V	46	8.15	29.84	27.01	56.98	74	-17.02	PK
2782.5000	V	35.89	8.15	29.84	27.01	46.87	54	-7.13	AV
3710.0000	V	--	--	--	--	--	--	--	PK
3710.0000	V	--	--	--	--	--	--	--	AV

Remark:

1. Level = Reading + Cable Loss+Ant Factor-Amplifier
2. " -- " Mark indicated Background Noise Level

Radiated Band Edge:

Test Mode: CH01					Test channel: Lowest				
Frequency (MHz)	Read Level (dBuV/m)	Antenna Factor (dB)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Pol.	Det.
902.0000	42.63	22.45	4.48	31.33	38.23	46.00	-7.77	H	QP
928.0000	40.44	22.59	4.54	31.35	36.22	46.00	-9.78	H	QP
902.0000	41.94	22.45	4.48	31.33	37.54	46.00	-8.46	V	QP
928.0000	40.44	22.59	4.54	31.35	36.22	46.00	-9.78	V	QP

Remark:

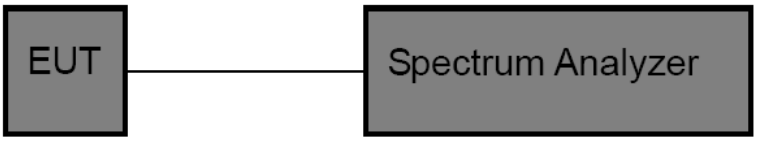
Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor

5. Maximum Peak Output Power Test

5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (b)(3)
Test Limit	30dBm

5.2. Test Setup



5.3. Test Procedure

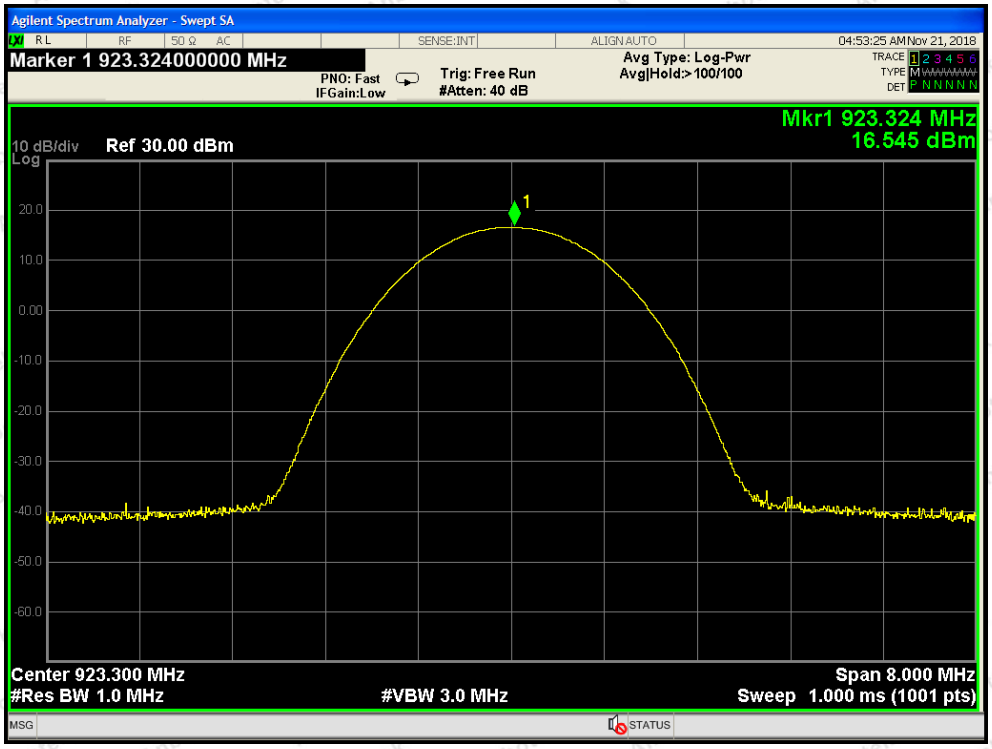
This procedure shall be used when the measurement instrument has available a resolution bandwidth that is greater than the DTS bandwidth.

1. Set the RBW ≥DTS bandwidth.
2. Set the VBW≥3*RBW.
3. Set the span≥ 3*RBW.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use peak marker function to determine the peak amplitude level.

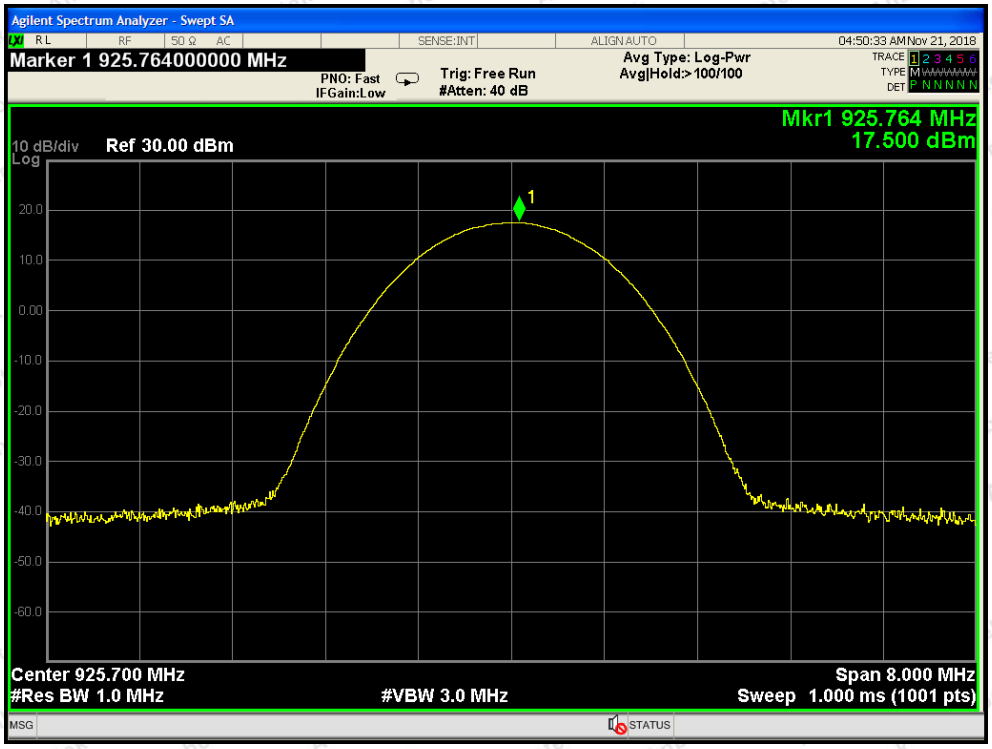
5.4. Test Data

Test Item	:	Max. peak output power	Test Mode	:	CH Low ~ CH High
Test Voltage	:	TX & RX: DC 5V via USB Port	Temperature	:	23.9℃
Test Result	:	PASS	Humidity	:	54%RH

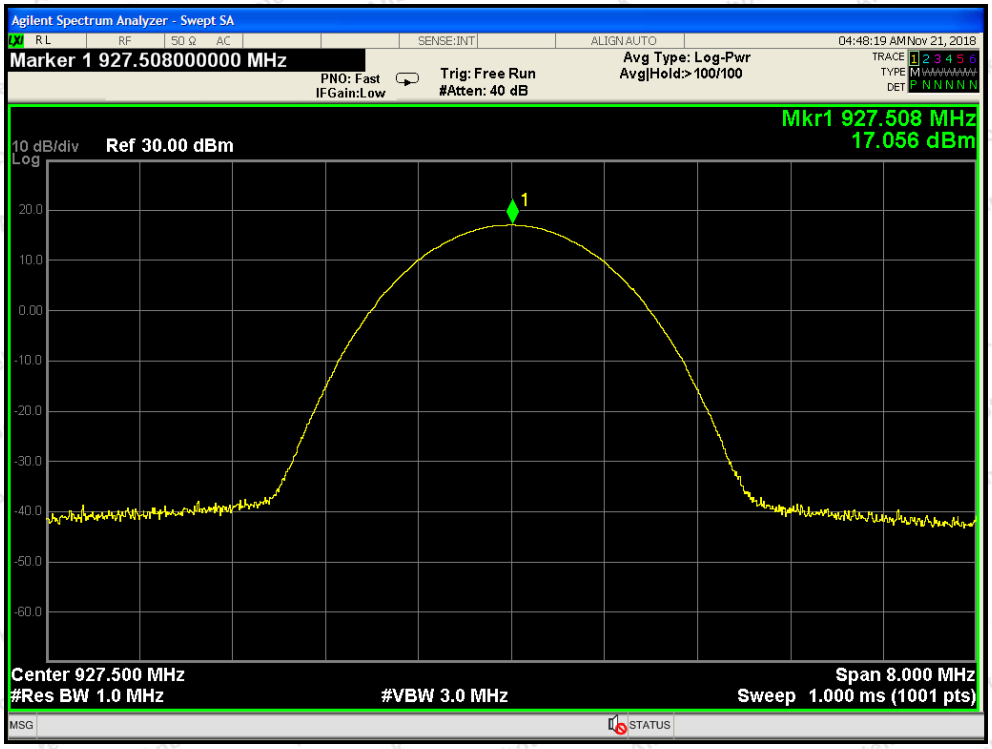
Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
923.3	16.545	30	PASS
925.7	**17.500**	30	PASS
927.5	17.056	30	PASS



CH: Low



CH: Middle


Agilent Spectrum Analyzer - Swept SA
Marker 1 927.508000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
04:48:19 AM Nov 21, 2018
Mkr1 927.508 MHz
17.056 dBm
10 dB/div
Log
Ref 30.00 dBm
Center 927.500 MHz
#Res BW 1.0 MHz
#VBW 3.0 MHz
Span 8.000 MHz
Sweep 1.000 ms (1001 pts)

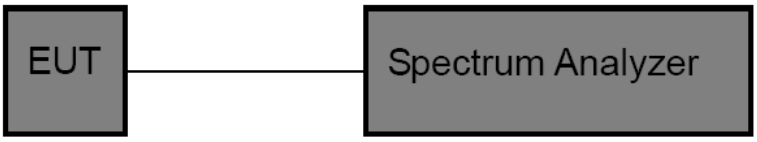
CH: High

6. 6DB Occupy Bandwidth Test

6.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(2)
Test Limit	>500kHz

6.2. Test Setup



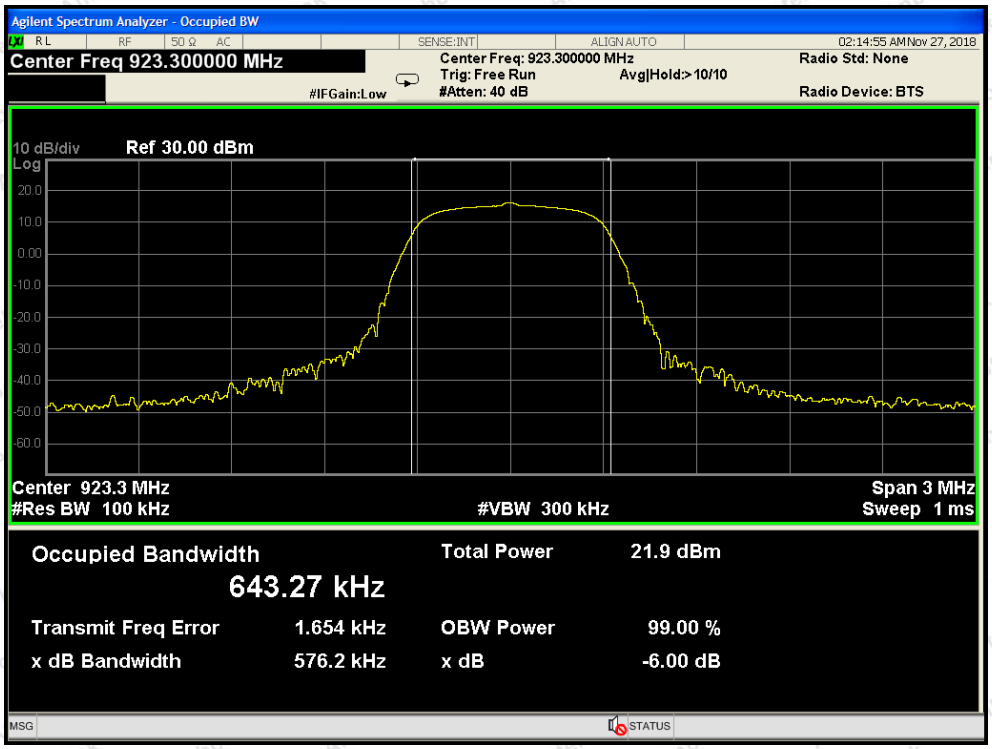
6.3. Test Procedure

1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as:
RBW = 100kHz, VBW⩾3*RBW =300kHz,
Detector= Peak
Trace mode= Max hold.
Sweep- auto couple.
4. Mark the peak frequency and –6dB (upper and lower) frequency.
5. Repeat until all the rest channels are investigated.

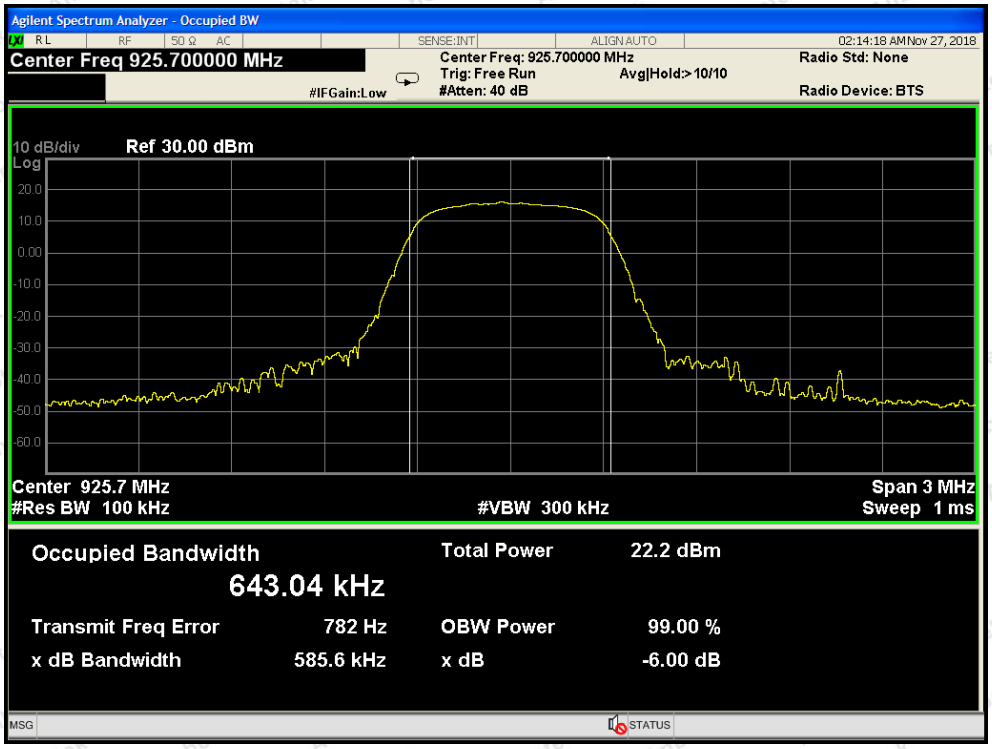
6.4. Test Data

Test Item	:	6dB Bandwidth	Test Mode	:	CH Low ~ CH High
Test Voltage	:	TX & RX: DC 5V via USB Port	Temperature	:	23.9℃
Test Result	:	PASS	Humidity	:	54%RH

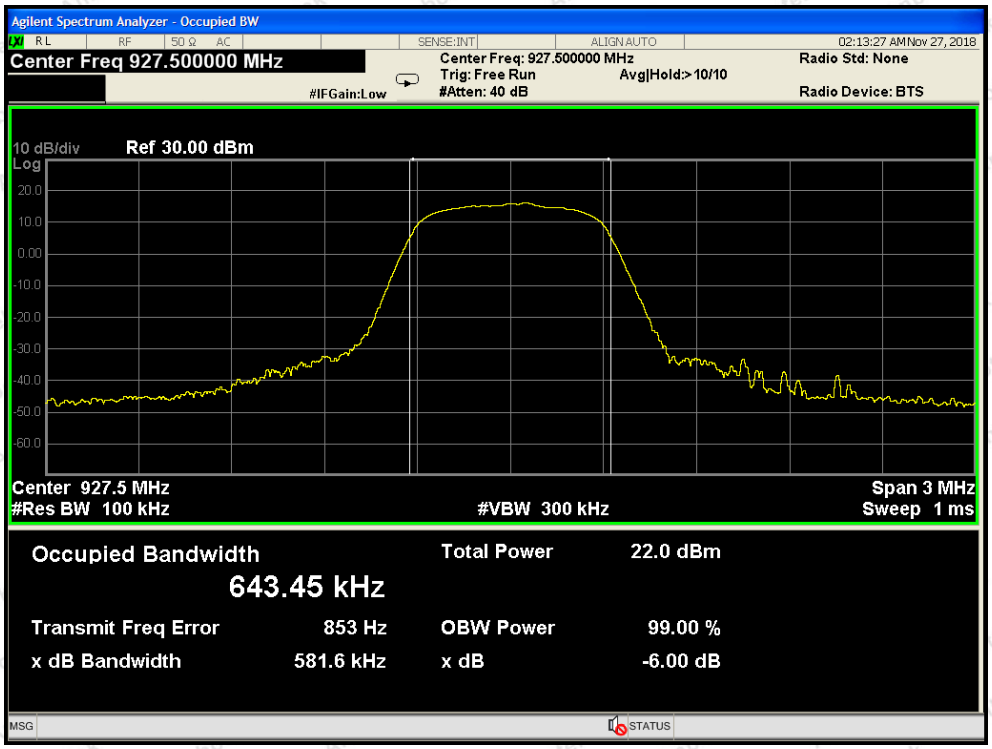
Channel	Frequency(MHz)	Bandwidth (kHz)	Limit (kHz)	Results
Low	923.3	576.2	>500	PASS
Middle	925.7	585.6		PASS
High	927.5	581.6		PASS



CH: Low



CH: Middle


Agilent Spectrum Analyzer - Occupied BW
Center Freq 927.500000 MHz
Center Freq: 927.500000 MHz
Trig: Free Run
#Atten: 40 dB
Avg|Hold:>10/10
Radio Std: None
Radio Device: BTS
02:13:27 AM Nov 27, 2018
#IFGain:Low
10 dB/div
Ref 30.00 dBm
Log
Center 927.5 MHz
#Res BW 100 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms
Occupied Bandwidth
643.45 kHz
Total Power 22.0 dBm
Transmit Freq Error 853 Hz
OBW Power 99.00 %
x dB Bandwidth 581.6 kHz
x dB -6.00 dB
MSG
STATUS

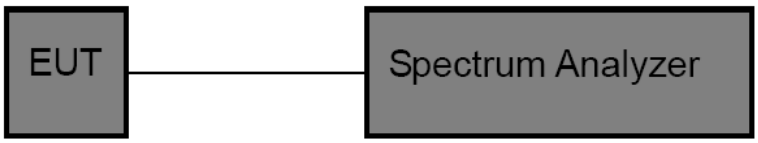
CH: High

7. Power Spectral Density Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (e)
Test Limit	8dBm

7.2. Test Setup



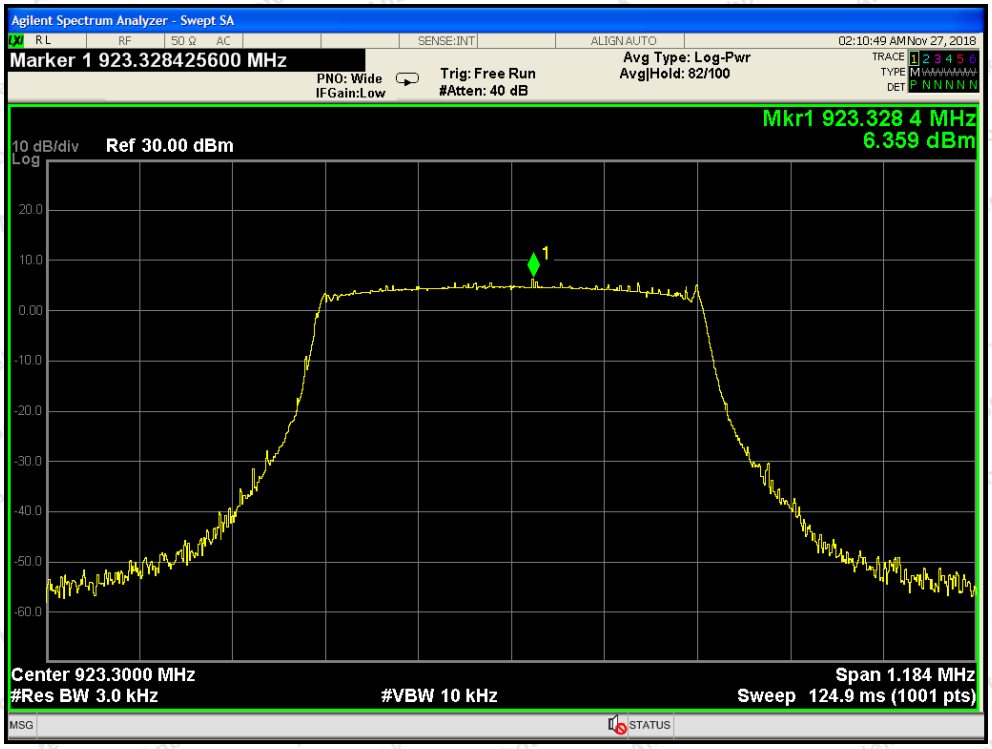
7.3. Test Procedure

1. Place the EUT on the table and set it in transmitting mode. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
2. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 1.5xDTS BW
3. Record the max. reading.
4. Repeat the above procedure until the measurements for all frequencies are completed.

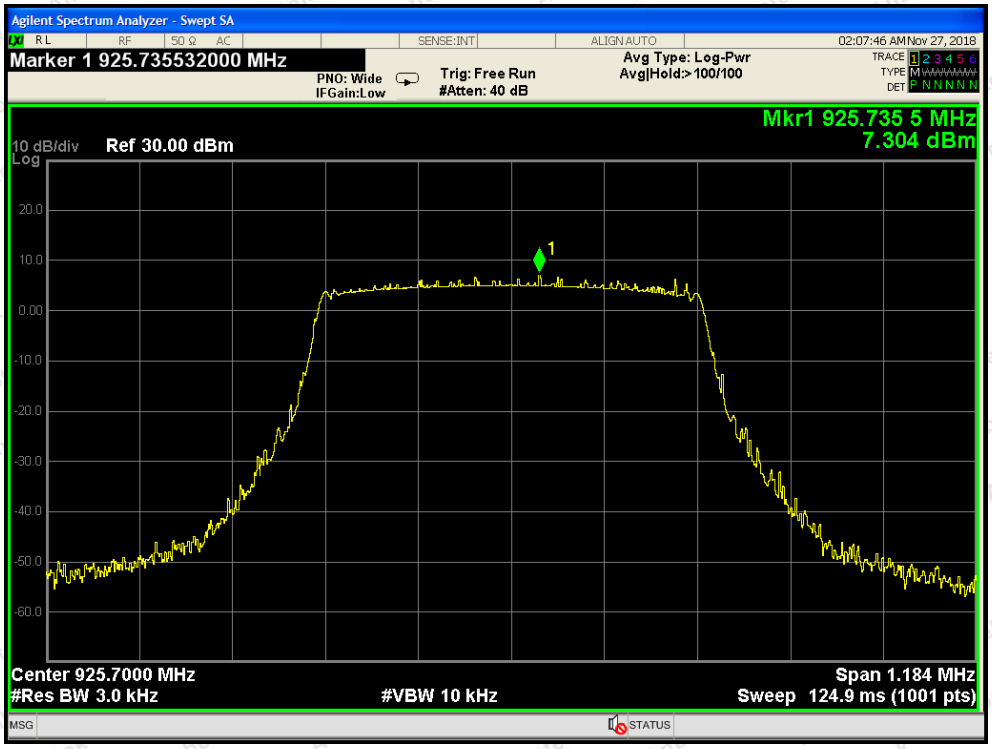
7.4. Test Data

Test Item	:	Power Spectral Density	Test Mode	:	CH Low ~ CH High
Test Voltage	:	TX & RX: DC 5V via USB Port	Temperature	:	23.9℃
Test Result	:	PASS	Humidity	:	54%RH

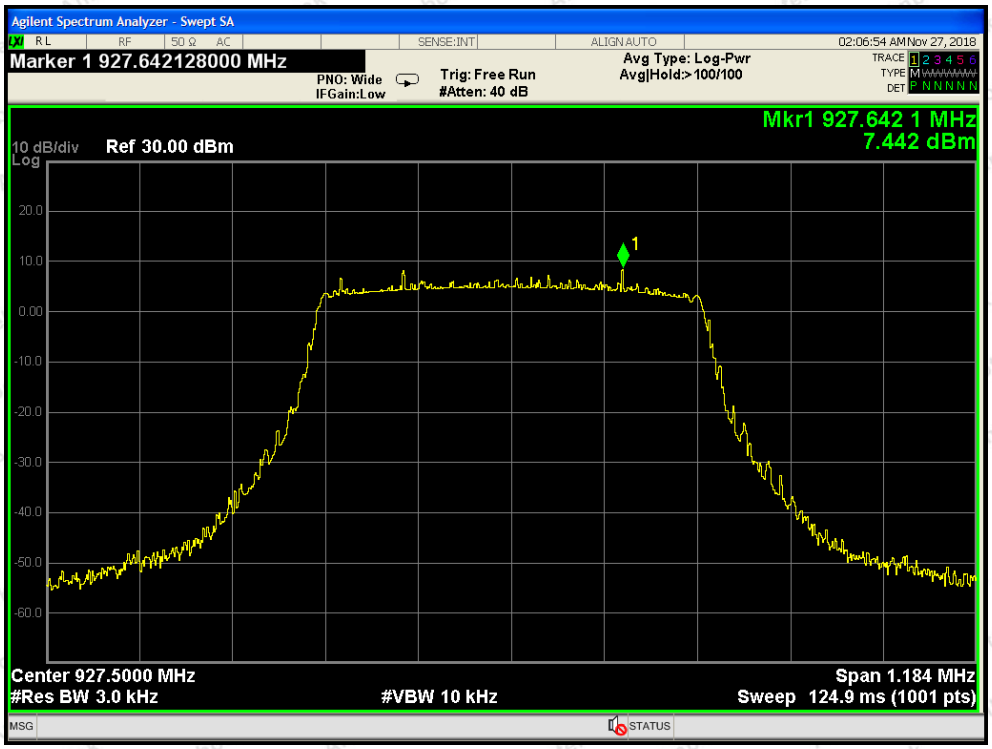
Channel	Frequency (MHz)	PPSD (dBm/KHz)	Limit (dBm/KHz)	Results
Low	923.3	6.359	8.00	PASS
Middle	925.7	7.304	8.00	PASS
High	927.5	7.442	8.00	PASS



CH: Low



CH: Middle


Agilent Spectrum Analyzer - Swept SA
Marker 1 927.642128000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
02:06:54 AM Nov 27, 2018
Mkr1 927.642 1 MHz
7.442 dBm
10 dB/div
Log
Ref 30.00 dBm
Center 927.5000 MHz
#Res BW 3.0 kHz
#VBW 10 kHz
Span 1.184 MHz
Sweep 124.9 ms (1001 pts)

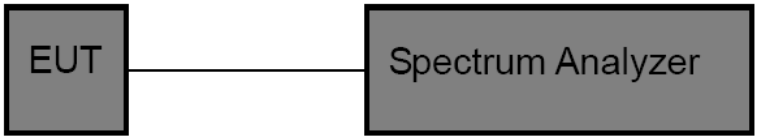
CH: High

8. 100kHz Bandwidth of Frequency Band Edge Requirement

8.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (d)
Test Limit	in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

8.2. Test Setup



8.3. Test Procedure

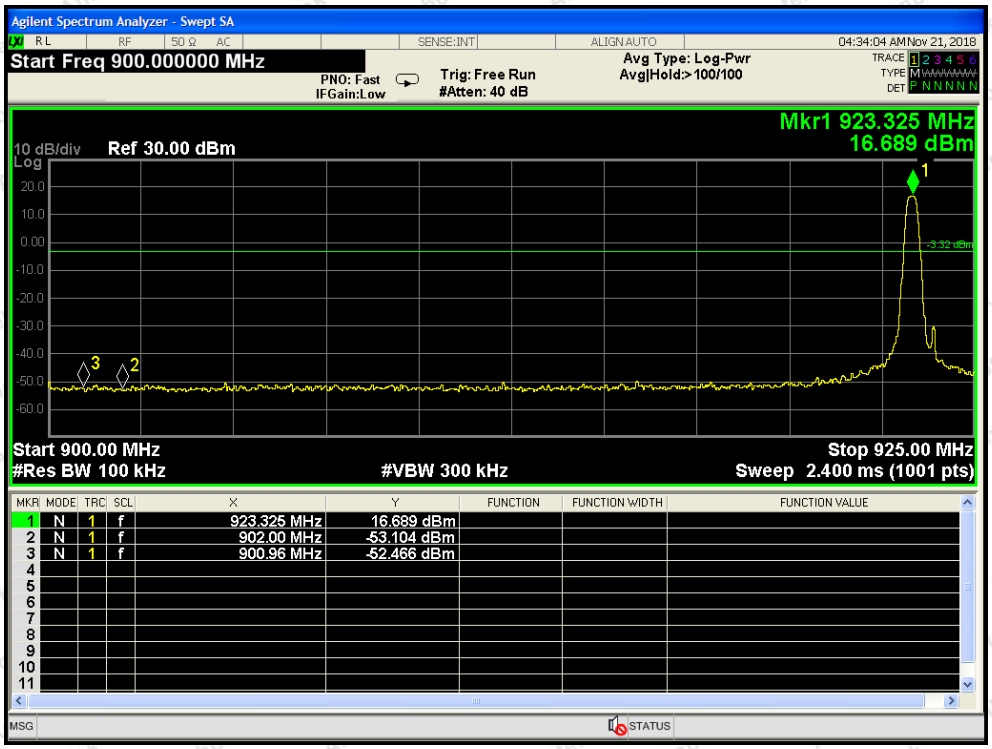
Using the following spectrum analyzer setting:

1. Set the RBW = 100KHz.
2. Set the VBW = 300KHz.
3. Sweep time = auto couple.
4. Detector function = peak.
5. Trace mode = max hold.
6. Allow trace to fully stabilize.

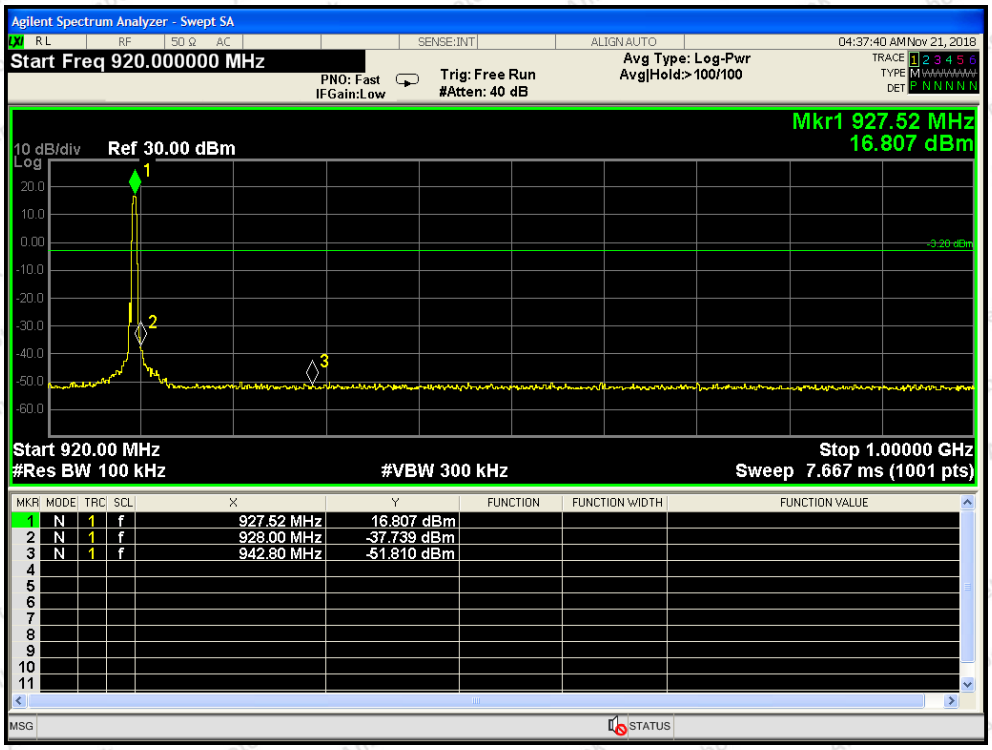
8.4. Test Data

Test Item	:	Band edge	Test Mode	:	CH Low ~ CH High
Test Voltage	:	TX & RX: DC 5V via USB Port	Temperature	:	23.9℃
Test Result	:	PASS	Humidity	:	54%RH

Frequency Band (MHz)	Delta Peak to Band Emission (dBc)	Limit (dBc)	Results
902	69.793	>20	PASS
928	54.546	>20	PASS

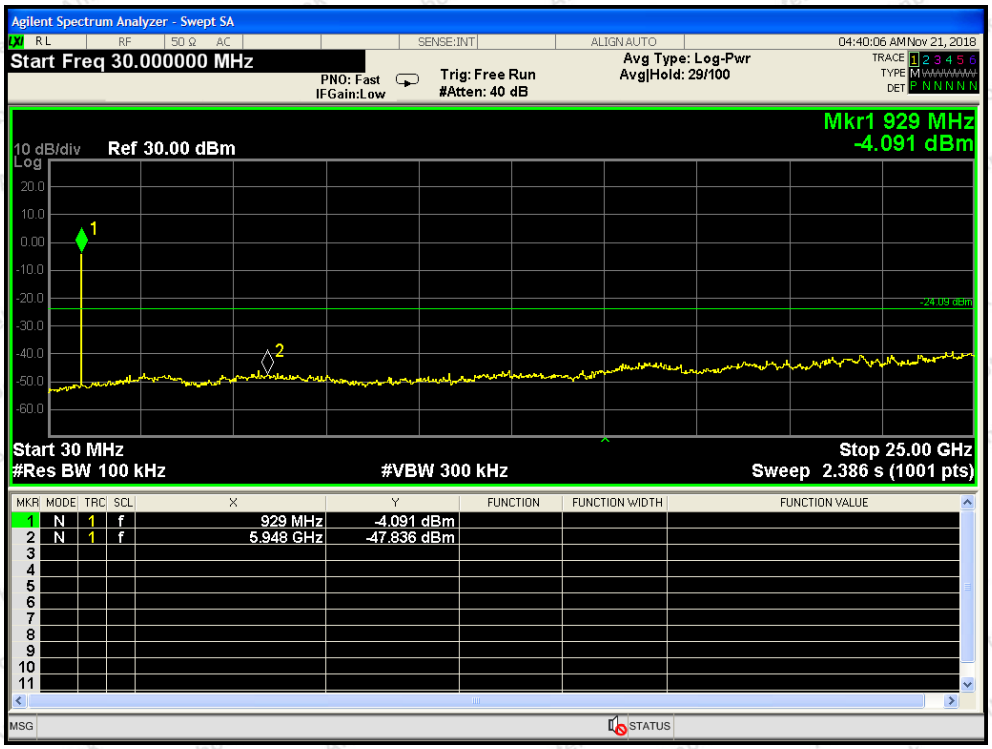


CH: Low

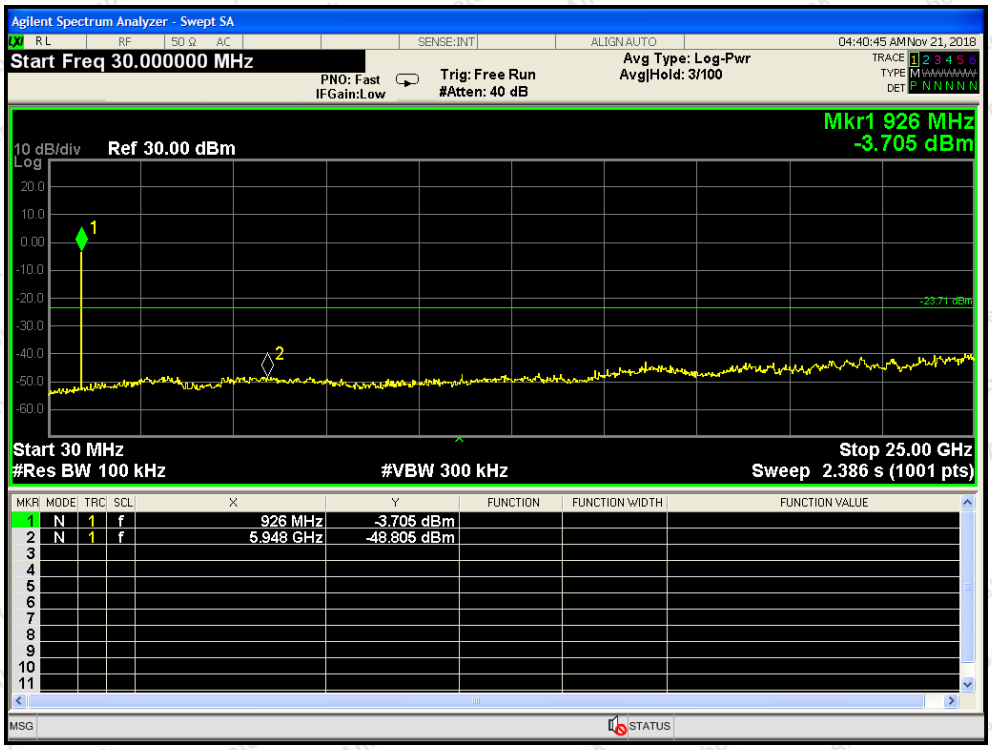


CH: High

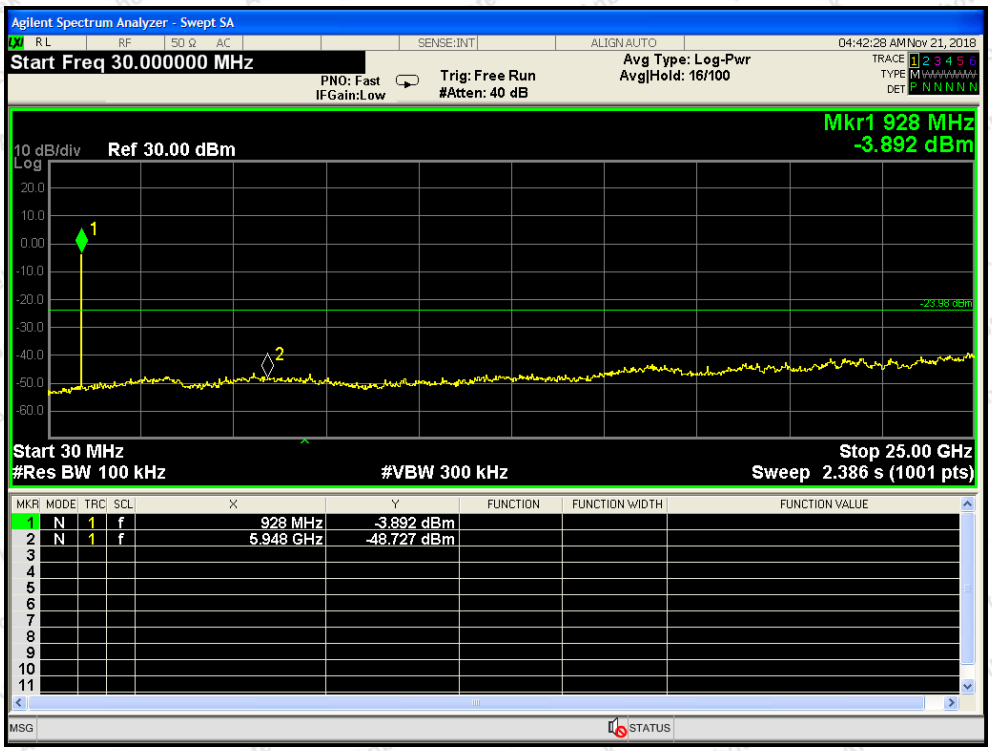
Conducted Emission Method



CH: Low



CH: Middle


Agilent Spectrum Analyzer - Swept SA
Start Freq 30.000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold: 16/100
04:42:28 AM Nov 21, 2018
Mkr1 928 MHz
-3.892 dBm
10 dB/div
Ref 30.00 dBm
Start 30 MHz
#Res BW 100 kHz
#VBW 300 kHz
Stop 25.00 GHz
Sweep 2.386 s (1001 pts)
1 N 1 f 928 MHz -3.892 dBm
2 N 1 f 5.948 GHz -48.727 dBm

CH: High

9. Antenna Requirement

9.1. Test Standard and Requirement

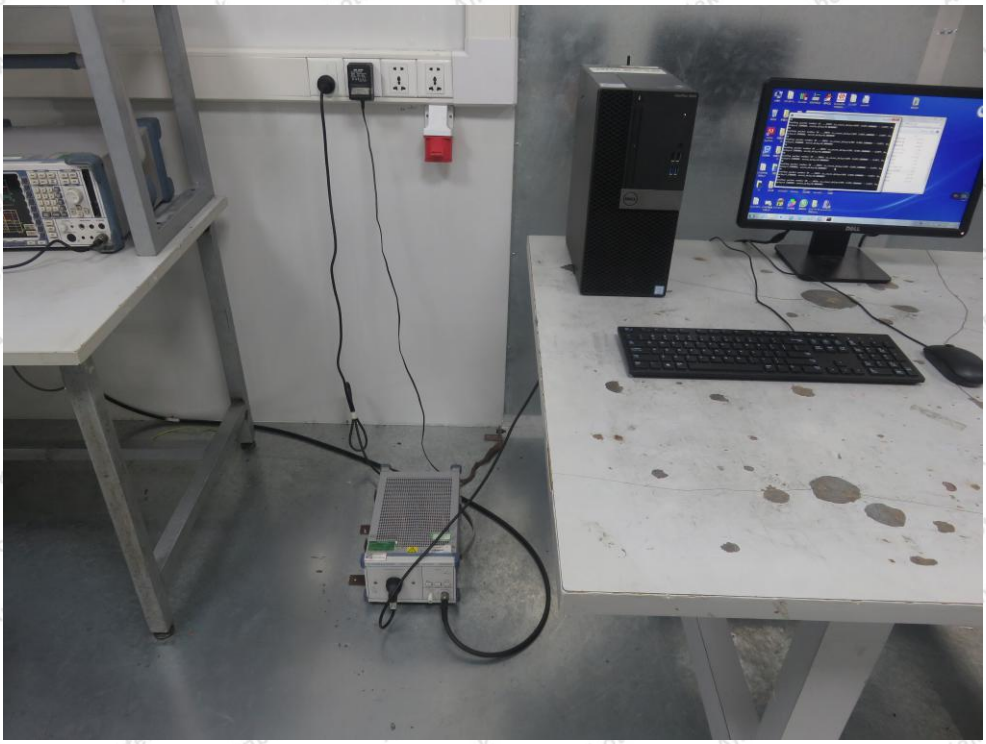
Test Standard	FCC Part15 Section 15.203 /247(c)
Requirement	1) 15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. 2) 15.247(c) (1)(i) requirement: Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

9.2. Antenna Connected Construction

The antenna is a Cylindrical Antenna which permanently attached, and the best case gain of the antenna is 5 dBi. It complies with the standard requirement.

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Conducted Emission Test



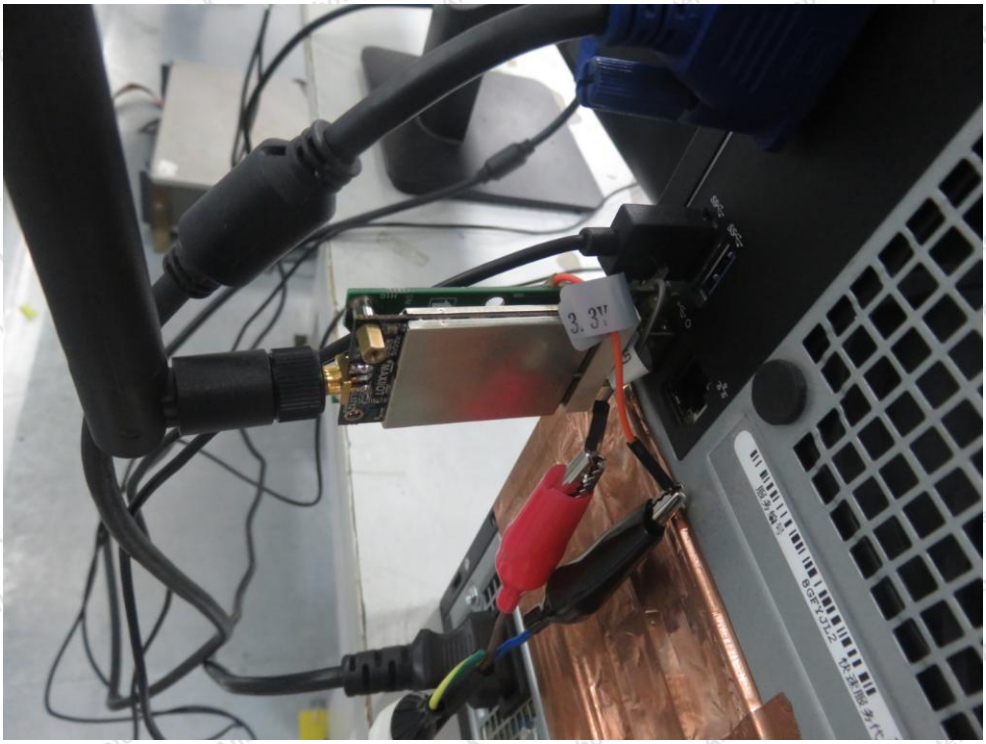
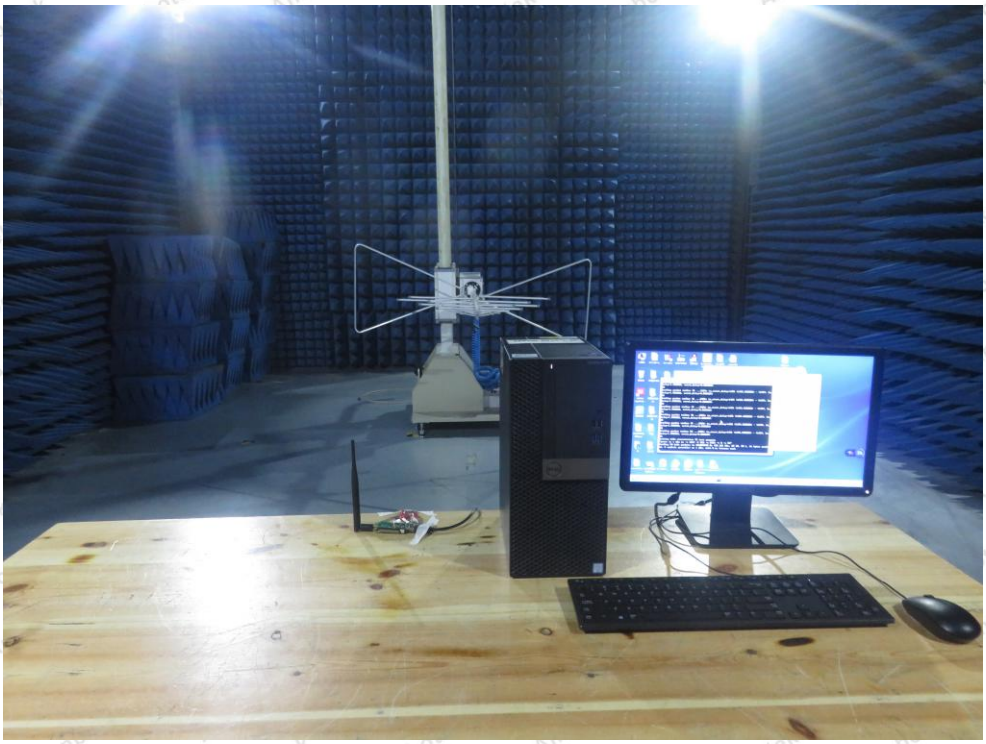
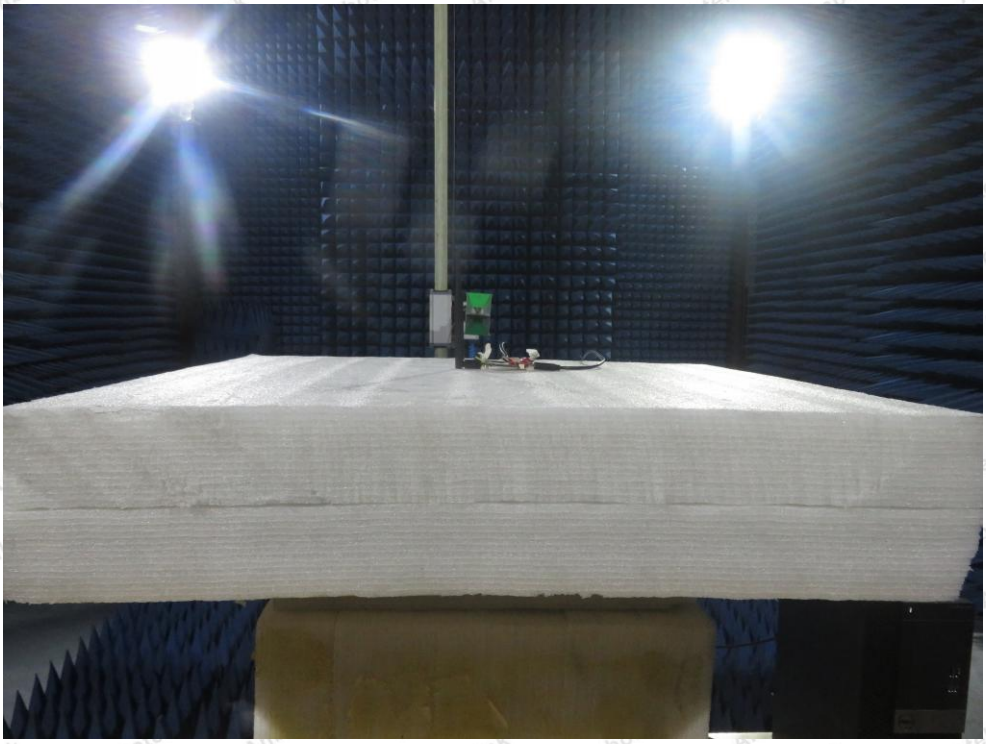
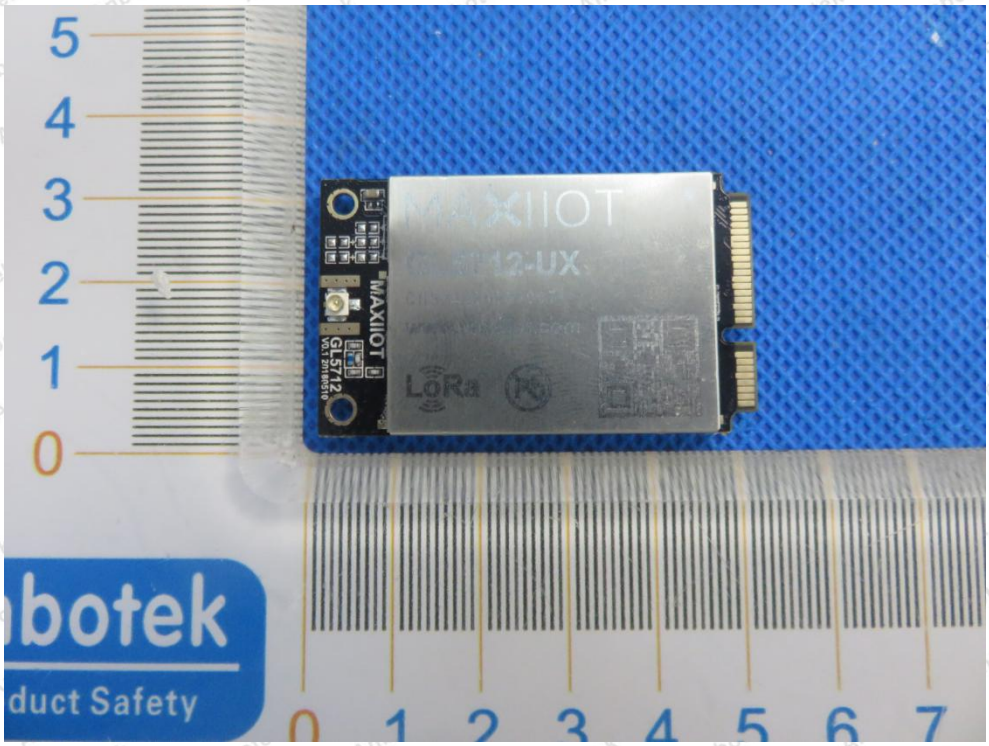


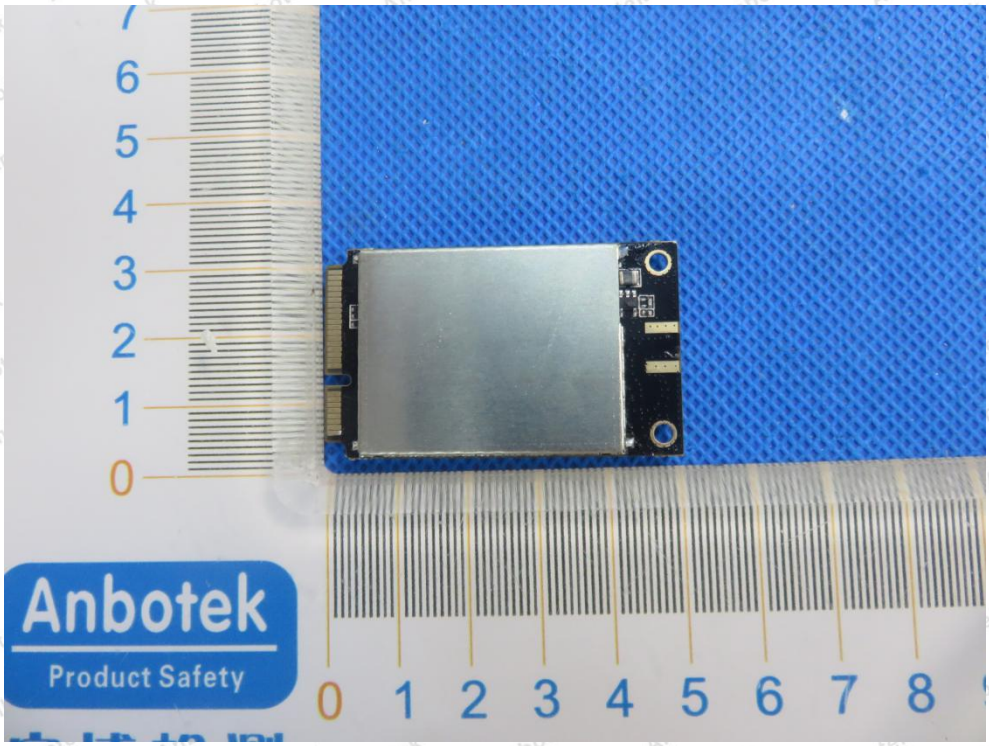
Photo of Radiation Emission Test



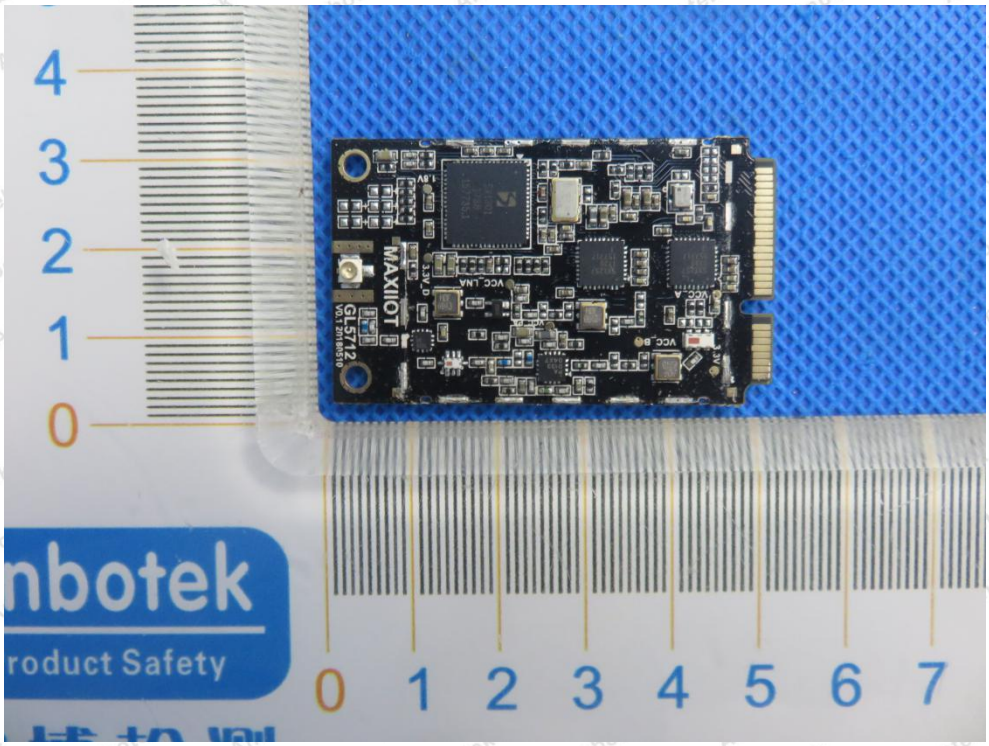


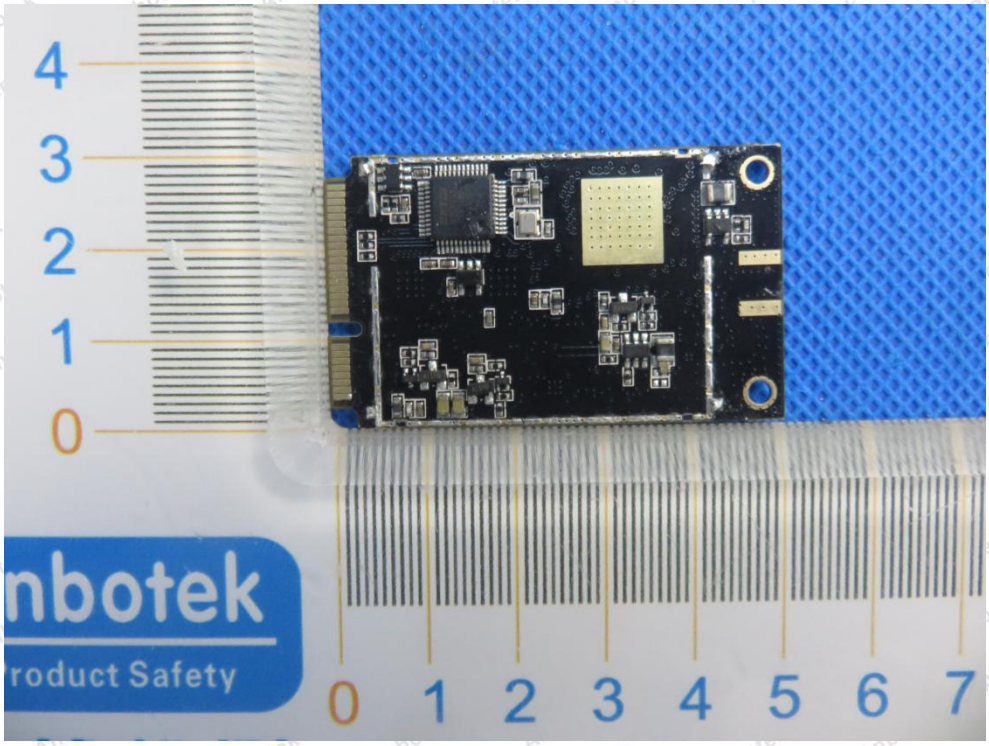
APPENDIX II -- EXTERNAL PHOTOGRAPH

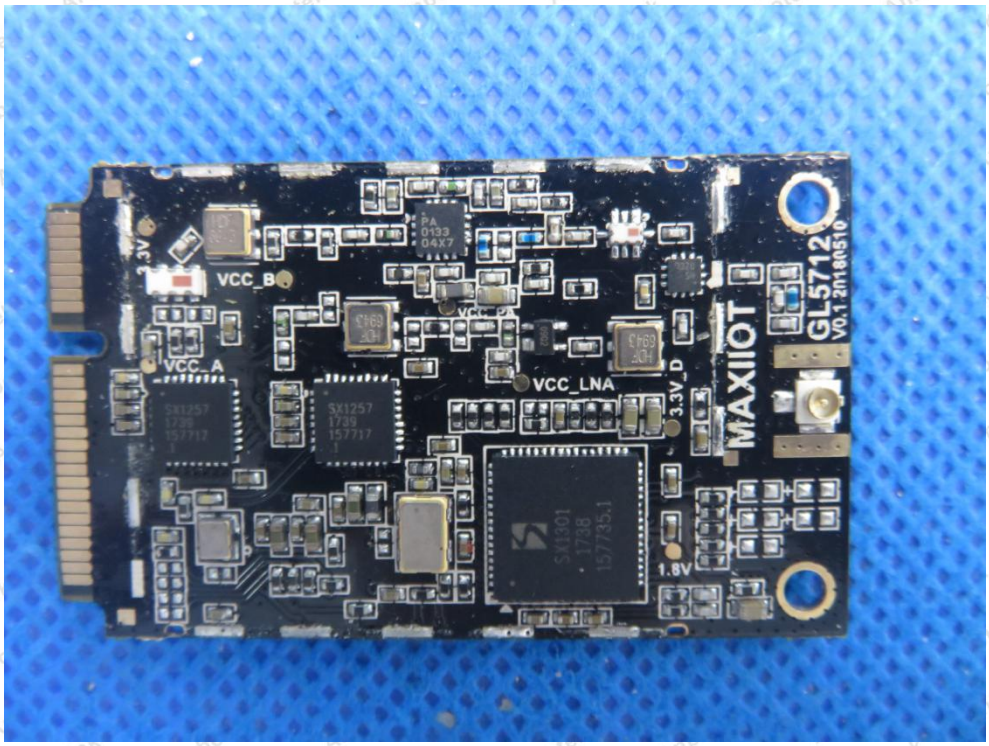

MAXIIOT
LoRa

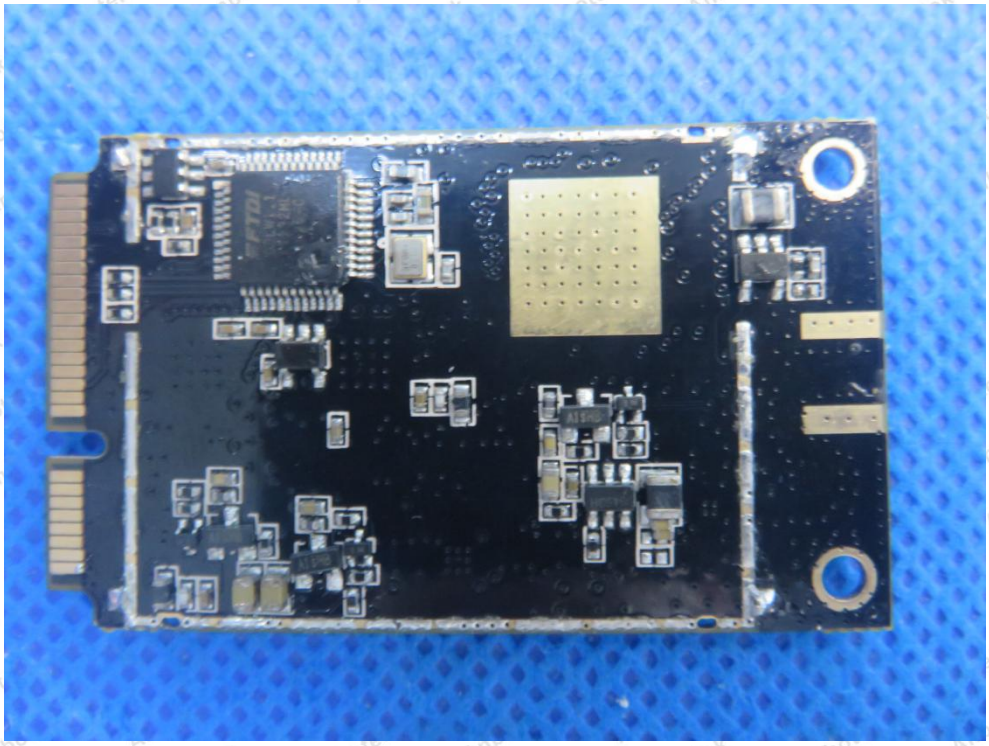

Anbotek
Product Safety

APPENDIX III -- INTERNAL PHOTOGRAPH









---------- End of Report ----------