FCC TEST REPORT

For

SOLTEC Soluzioni Tecnologiche S.r.l.

BLUEBOX UHF 1CH Mid Range Controller

Model No.: R-IN-UHF-5239U

Prepared For	:	SOLTEC Soluzioni Tecnologiche S.r.l.
Address	:	Viale Ungheria 125, Udine, Italy 33100
Prepared By	:	Shenzhen Anbotek Compliance Laboratory Limited
Address	:	1/F, Building D, Sogood Science and Technology Park, Sanwei community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.518102 Tel: (86) 755-26066440 Fax: (86) 755-26014772
Report Number	:	SZAWW181030011-01
Date of Receipt	:	Oct. 30, 2018
Date of Test	:	Oct. 30~ Dec. 17, 2018
Date of Report	:	Dec. 18, 2018

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TEST REPORT

Applicant	:	SOLTEC Soluzioni Tecnologiche S.r.l.
Manufacturer	:	SOLTEC Soluzioni Tecnologiche S.r.l.
Product Name	:	Hyundai R-IN-UHF-5239U
Model No.	:	R-IN-UHF-5239U
Trade Mark	:	N.A.
Rating(s)	:	Input: DC 24V

Test Standard(s)	**:**	**FCC Part15 Subpart C 2018, Section 15.247**
Test Method(s)	**:**	**ANSI C63.10: 2013**

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 Oct. 30~ Dec. 17, 2018

Prepared by

(Engineer / Oliay Yang)

Reviewer

(Supervisor / Snowy Meng)

Approved & Authorized Signer

(Manager / Sally Zhang)

1. General Information

1.1. Client Information

Applicant	:	SOLTEC Soluzioni Tecnologiche S.r.l.
Address	:	Viale Ungheria 125, Udine, Italy 33100
Manufacturer	:	SOLTEC Soluzioni Tecnologiche S.r.l.
Address	:	Viale Ungheria 125, Udine, Italy 33100
Factory	:	SOLTEC Soluzioni Tecnologiche S.r.l.
Address	:	Viale Ungheria 125, Udine, Italy 33100

1.2. Description of Device (EUT)

Product Name	:	Hyundai R-IN-UHF-5239U	
Model No.	:	R-IN-UHF-5239U	
Trade Mark	:	N.A.	
Test Power Supply	:	DC 24V	
Test Sample No.	:	S1(Normal Sample), S2(Engineering Sample)	
Product Description	:	Operation Frequency:	902MHz~928MHz
		Number of Channel:	50 Channels
		Modulation Type:	ASK, PR-ASK
		Antenna Type:	Patch Antenna
		Antenna Gain(Peak):	8.5 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

Adapter		MODEL: GS25E24 Input: DC 24V OUTPUT: 24V, 1.04A

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	CH25
Mode 3	CH50
Mode 4	Keeping TX+ Charging Mode

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

For Radiated Emission	
Final Test Mode	Description
Mode 1	CH01
Mode 2	CH25
Mode 3	CH50
Mode 4	Keeping TX+ Charging Mode

Note:

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

(2)The data rate was set in 1Mbps for radiated emission due to the highest RF output power.

1.5. List of channels

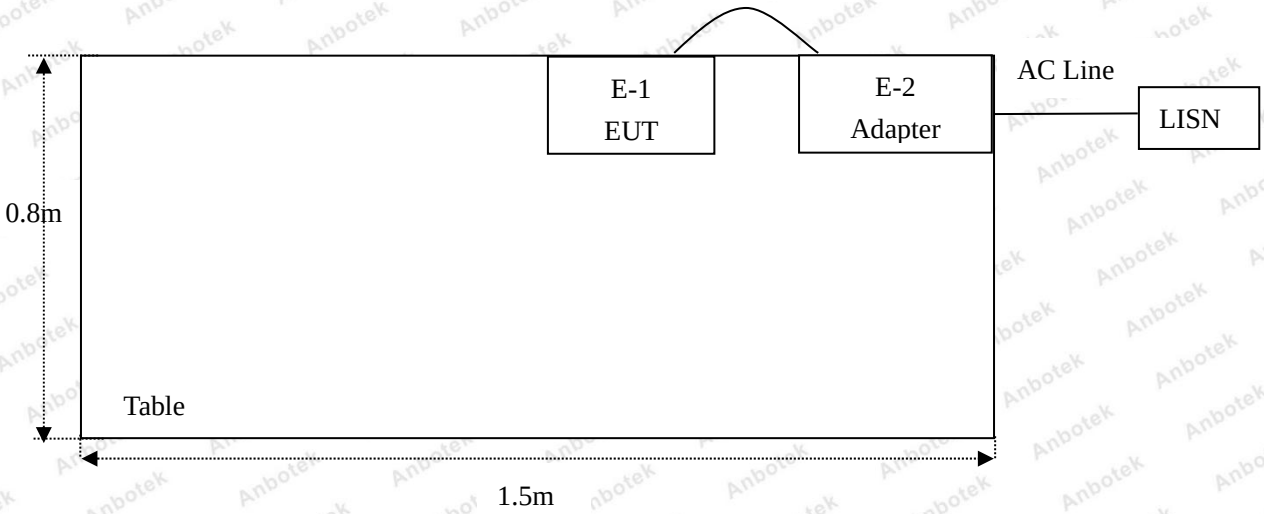
Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
01	902.75	11	907.75	21	912.75	31	917.75	41	922.75
02	903.25	12	908.25	22	913.25	32	918.25	42	923.25
03	903.75	13	908.75	23	913.75	33	918.75	43	923.75
04	904.25	14	909.25	24	914.25	54	919.25	44	924.25
05	904.75	15	909.75	25	914.75	35	919.75	45	924.75
05	905.25	16	910.25	26	915.25	36	920.25	46	925.25
07	905.75	17	910.75	27	915.75	37	920.75	47	925.75
08	906.25	18	911.25	28	916.25	38	921.25	48	926.25
09	906.75	19	911.75	29	916.75	39	921.75	49	926.75
10	907.25	20	912.25	30	917.25	40	922.25	50	927.25

Note:

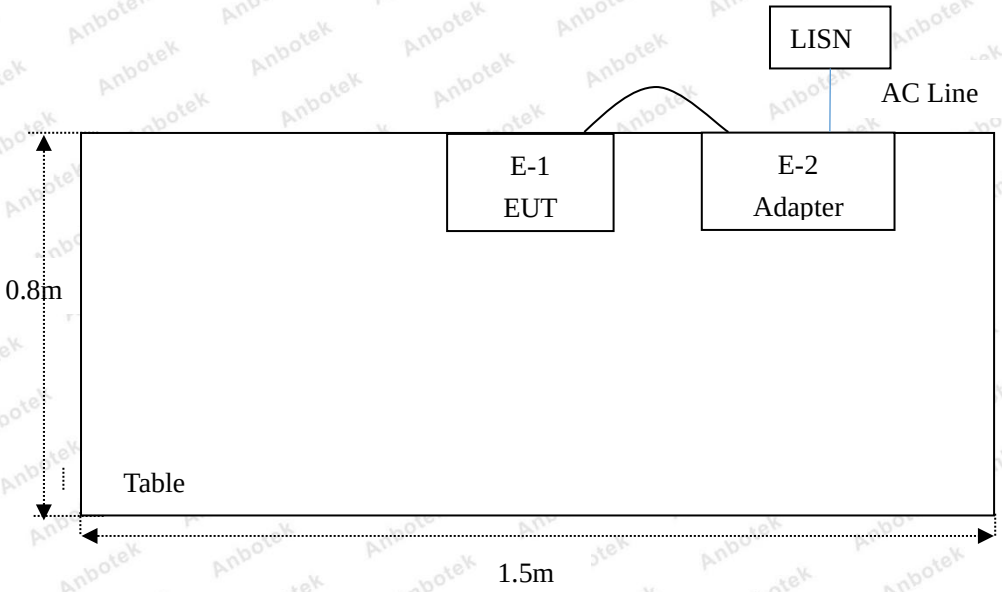
1. The engineering test program was provided and the EUT was programmed to be in continuously transmitting mode.
2. EUT built-in battery-powered, fully-charged battery use of the test battery.

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.
at 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

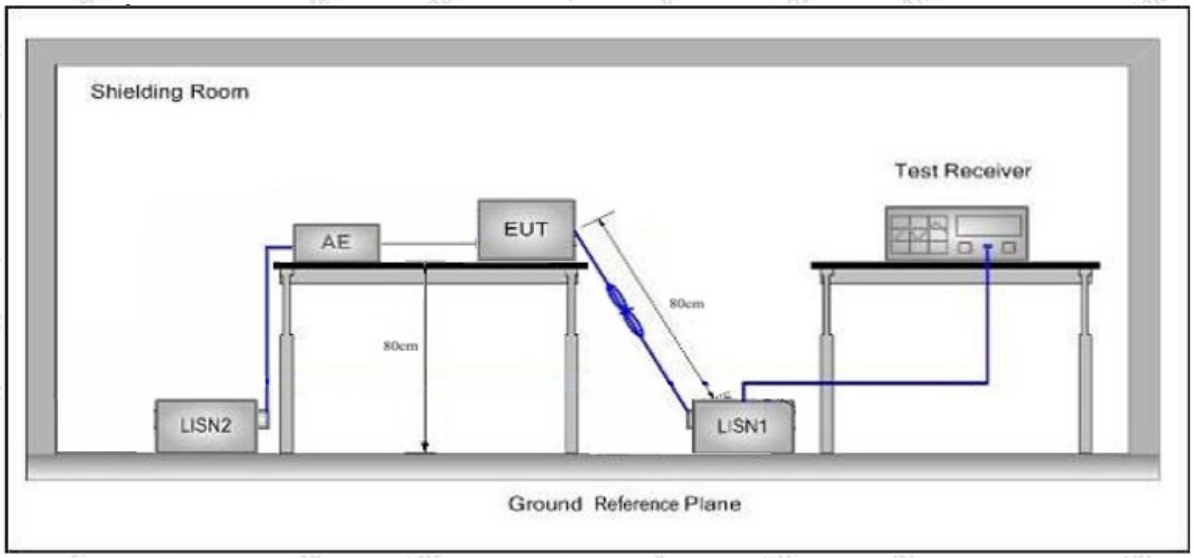
Standard Section	Test Item	Result
15.203/15.247(c)	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.205/15.209	Spurious Emission	PASS
15.247(b)(1)	Conducted Peak Output Power	PASS
15.247(a)(1)	20dB Occupied Bandwidth	PASS
15.247(a)(1)	Carrier Frequencies Separation	PASS
15.247(a)(1)	Hopping Channel Number	PASS
15.247(a)(1)	Dwell Time	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.

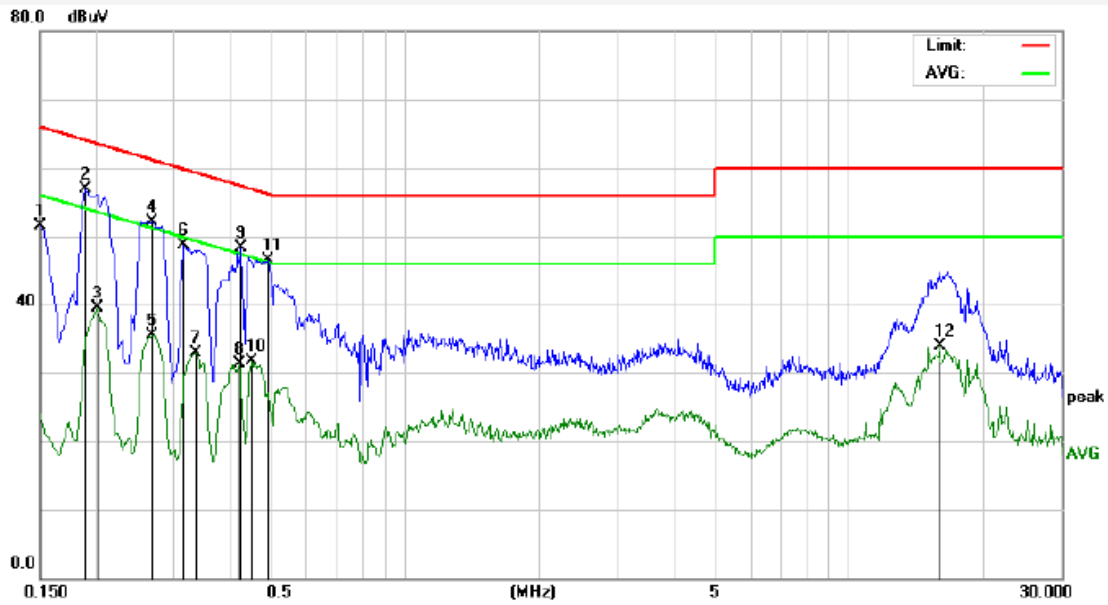
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Please to see the following pages.

Conducted Emission Test Data

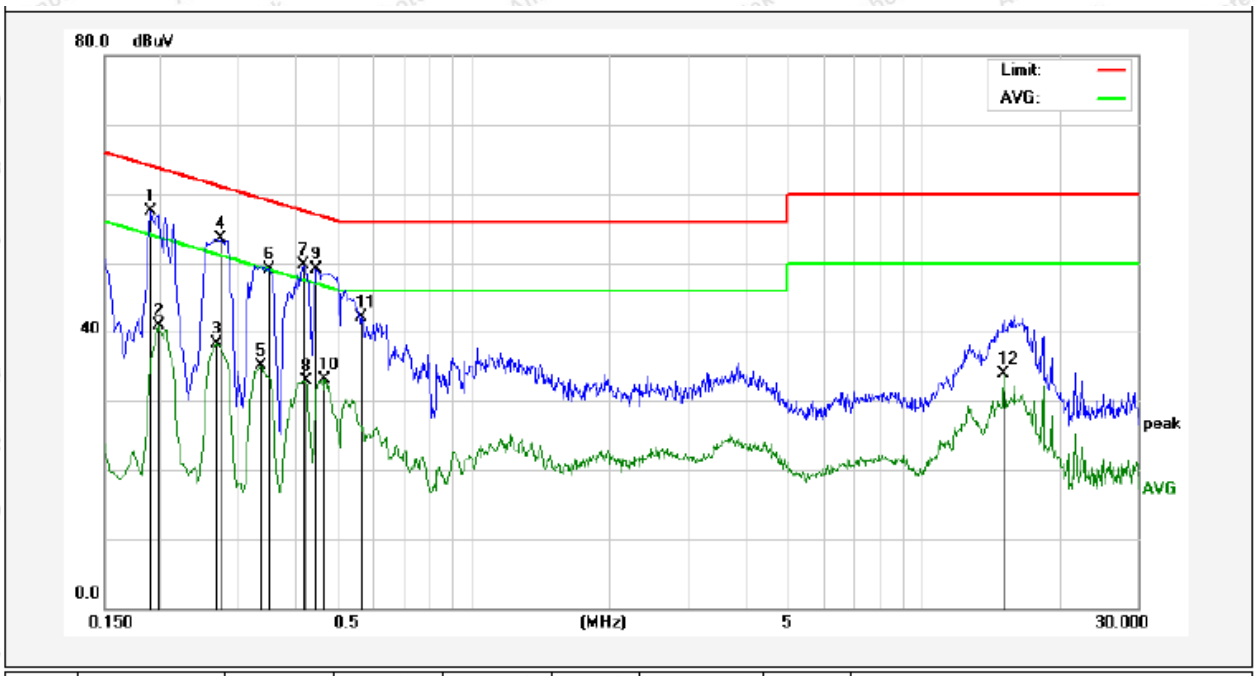
Test Site: 1# Shielded Room
Operating Condition: Keeping TX+ Charging Mode
Test Specification: DC 24V
Comment: Live Line
Tem.: 23.9℃ Hum.: 54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1500	31.55	19.90	51.45	65.99	-14.54	QP	
2	0.1900	37.08	19.90	56.98	64.03	-7.05	QP	
3	0.2020	19.55	19.90	39.45	53.52	-14.07	AVG	
4	0.2700	32.14	19.89	52.03	61.12	-9.09	QP	
5	0.2700	15.66	19.89	35.55	51.12	-15.57	AVG	
6	0.3180	28.71	19.90	48.61	59.76	-11.15	QP	
7	0.3379	13.07	19.91	32.98	49.25	-16.27	AVG	
8	0.4220	11.37	19.94	31.31	47.41	-16.10	AVG	
9	0.4260	28.30	19.95	48.25	57.33	-9.08	QP	
10	0.4500	11.82	19.96	31.78	46.87	-15.09	AVG	
11	0.4900	26.47	19.98	46.45	56.17	-9.72	QP	
12	15.8900	13.73	20.27	34.00	50.00	-16.00	AVG	

Conducted Emission Test Data

Test Site:	1# Shielded Room
Operating Condition:	Keeping TX+ Charging Mode
Test Specification:	DC 24V
Comment:	Neutral Line
	Tem.: 23.9℃ Hum.: 54%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Over Limit (dB)	Detector	Remark
1	0.1900	37.69	19.90	57.59	64.03	-6.44	QP	
2	0.1980	20.97	19.90	40.87	53.69	-12.82	AVG	
3	0.2660	18.35	19.89	38.24	51.24	-13.00	AVG	
4	0.2740	33.52	19.89	53.41	60.99	-7.58	QP	
5	0.3339	15.21	19.91	35.12	49.35	-14.23	AVG	
6	0.3500	29.17	19.91	49.08	58.96	-9.88	QP	
7	0.4180	29.67	19.94	49.61	57.49	-7.88	QP	
8	0.4220	12.92	19.94	32.86	47.41	-14.55	AVG	
9	0.4460	29.17	19.96	49.13	56.95	-7.82	QP	
10	0.4660	13.17	19.96	33.13	46.58	-13.45	AVG	
11	0.5620	22.15	20.00	42.15	56.00	-13.85	QP	
12	15.0700	13.71	20.26	33.97	50.00	-16.03	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

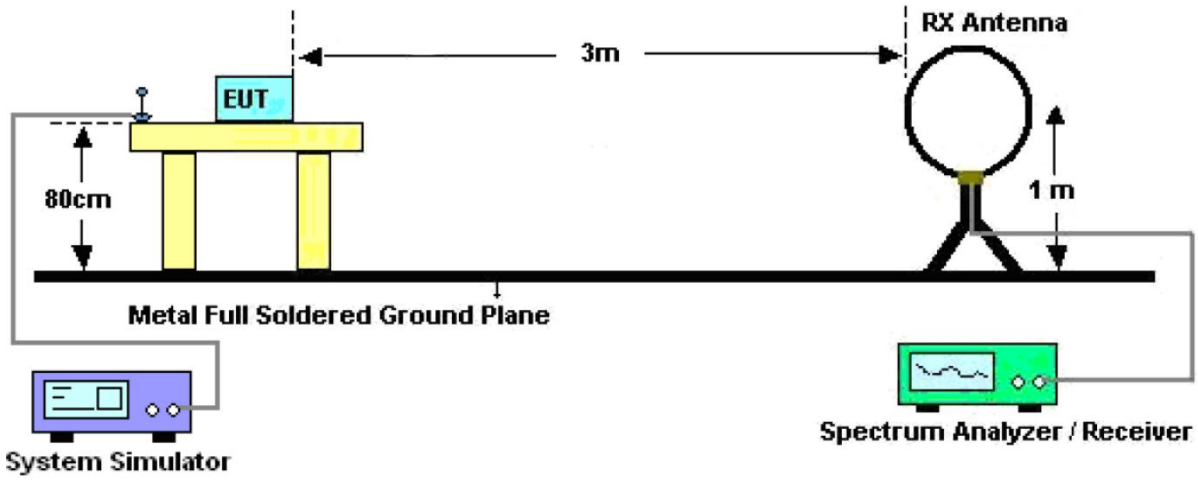


Figure 1. Below 30MHz

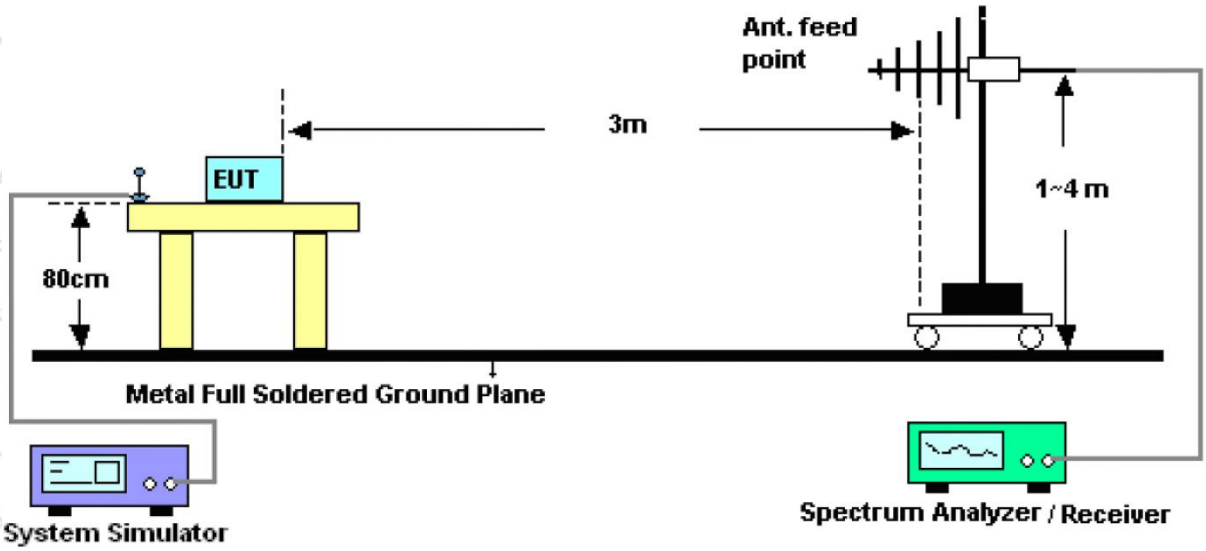


Figure 2. 30MHz to 1GHz

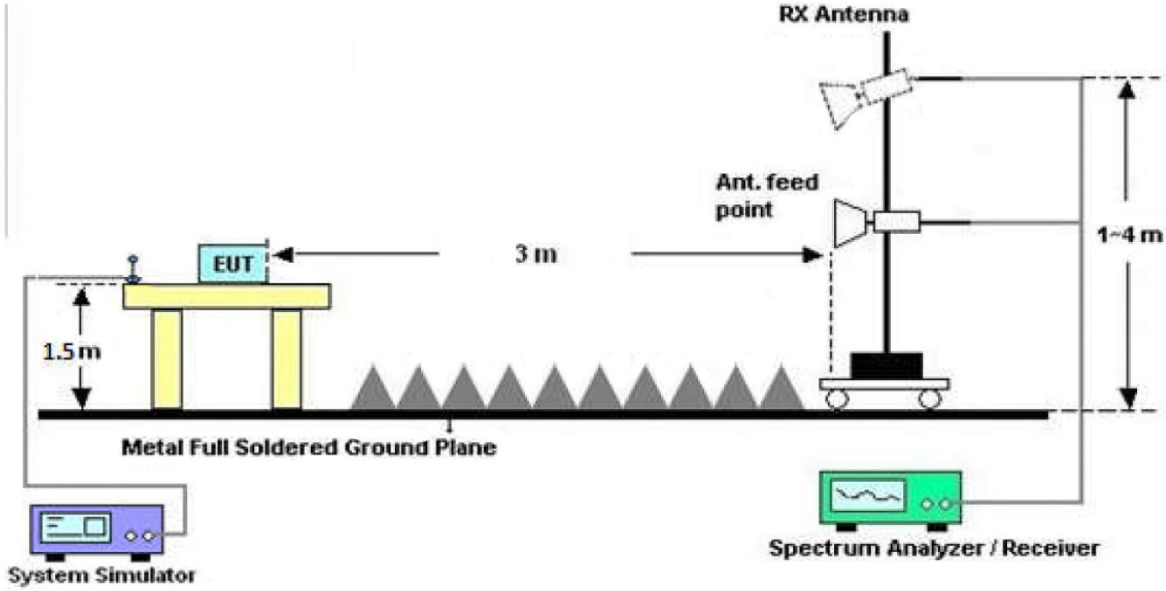


Figure 3. Above 1 GHz

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

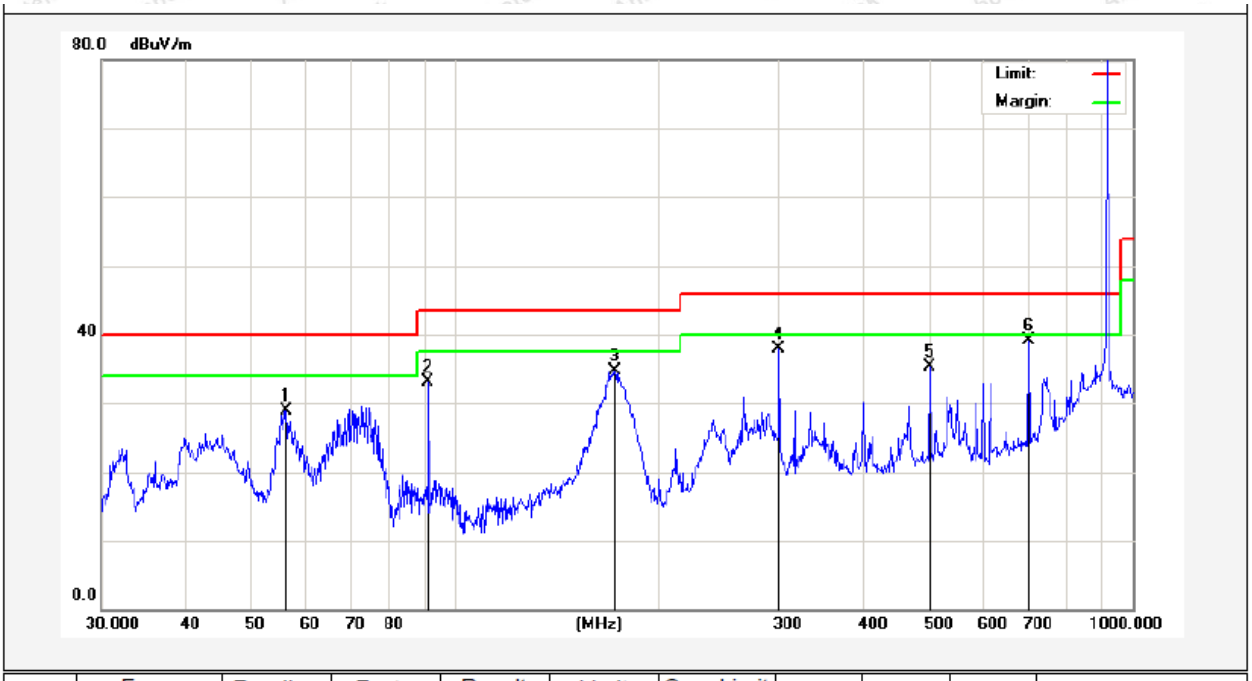
PASS

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

Note: The data is in TX only mode, and this is the worst mode.

Test Results (30~1000MHz)

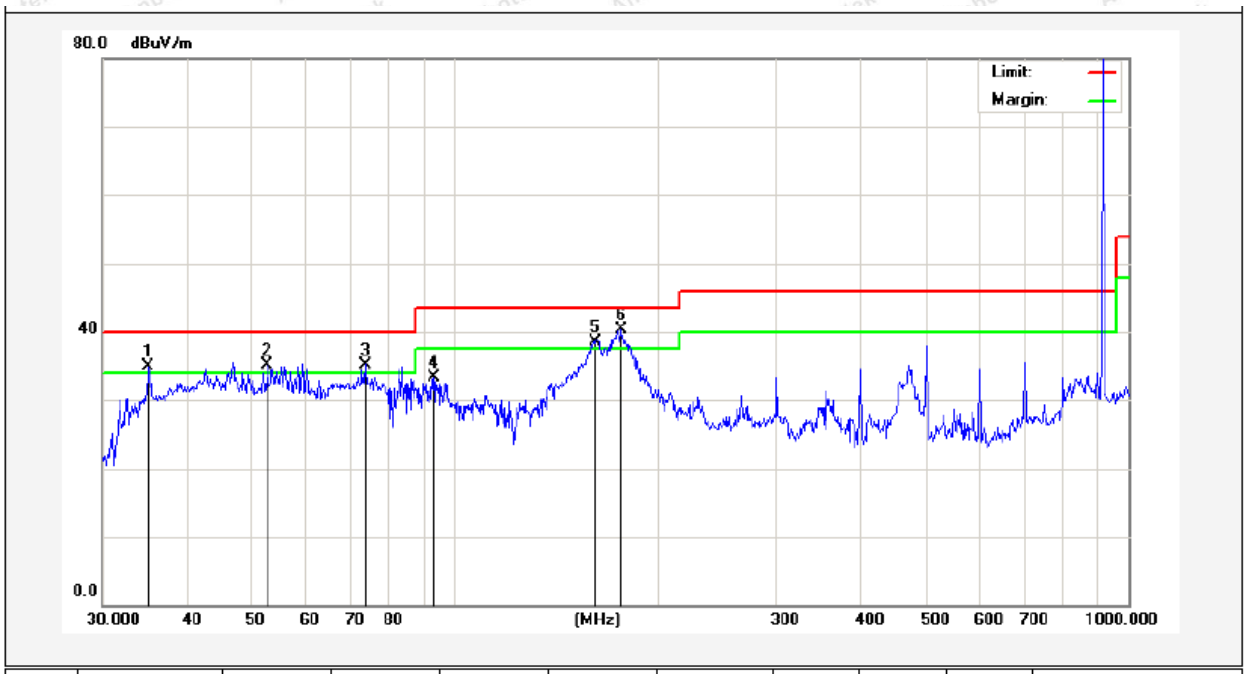
Job No.:	SZAWW181030011-01	Temp.(℃)/Hum.(%RH):	24.5℃/53%RH
Standard:	FCC PART 15C	Power Source:	DC 24V
Test Mode:	Keeping TX+ Charging Mode	Polarization:	Horizontal



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	56.1974	46.79	-17.80	28.99	40.00	-11.01	QP	300	34	
2	91.1746	56.98	-23.79	33.19	43.50	-10.31	QP	300	0	
3	171.9946	55.34	-20.62	34.72	43.50	-8.78	QP	300	54	
4	300.3672	56.51	-18.64	37.87	46.00	-8.13	QP	300	74	
5	501.1790	46.19	-10.96	35.23	46.00	-10.77	QP	300	195	
6	701.7610	47.47	-8.44	39.03	46.00	-6.97	QP	300	263	

Test Results (30~1000MHz)

Job No.:	SZAWW181030011-01	Temp.(℃)/Hum.(%RH):	24.5℃/53%RH
Standard:	FCC PART 15C	Power Source:	DC 24V
Test Mode:	Keeping TX+ Charging Mode	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	35.1278	50.99	-16.02	34.97	40.00	-5.03	QP	300	57	
2	52.7599	51.67	-16.66	35.01	40.00	-4.99	QP	300	130	
3	73.6170	56.57	-21.37	35.20	40.00	-4.80	QP	300	210	
4	93.1132	50.34	-17.00	33.34	43.50	-10.16	QP	300	30	
5	162.0414	56.41	-17.81	38.60	43.50	-4.90	QP	300	350	
6	176.8876	57.41	-17.06	40.35	43.50	-3.15	QP	300	80	

Test Results (1GHz-25GHz)

Low Channel

Frequency	Antenna	Reading	Cable Loss	Ant Factor	Amplifier	Level	Limits	Margin	Det.
(MHz)	Pol.	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Mode
1805.5000	H	49.88	7.39	28.73	26.31	59.69	74	-14.31	PK
1805.5000	H	40.07	7.39	28.73	26.31	49.88	54	-4.12	AV
2708.2500	H	47.96	8.10	29.71	27.01	58.76	74	-15.24	PK
2708.2500	H	37.21	8.10	29.71	27.01	48.01	54	-5.99	AV
3611.0000	H	--	--	--	--	--	--	--	PK
3611.0000	H	--	--	--	--	--	--	--	AV
1805.5000	V	45.25	7.39	28.73	26.31	55.06	74	-18.94	PK
1805.5000	V	38.92	7.39	28.73	26.31	48.73	54	-5.27	AV
2708.2500	V	45.62	8.10	29.71	27.01	56.42	74	-17.58	PK
2708.2500	V	37.96	8.10	29.71	27.01	48.76	54	-5.24	AV
3611.0000	V	--	--	--	--	--	--	--	PK
3611.0000	V	--	--	--	--	--	--	--	AV

Middle Channel

Frequency	Antenna	Reading	Cable Loss	Ant Factor	Amplifier	Level	Limits	Margin	Det.
(MHz)	Pol.	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Mode
1829.5000	H	50.88	7.39	28.73	26.31	60.69	74	-13.31	PK
1829.5000	H	39.76	7.39	28.73	26.31	49.57	54	-4.43	AV
2744.2500	H	48.60	8.10	29.71	27.01	59.40	74	-14.60	PK
2744.2500	H	37.41	8.10	29.71	27.01	48.21	54	-5.79	AV
3659.0000	H	--	--	--	--	--	--	--	PK
3659.0000	H	--	--	--	--	--	--	--	AV
1829.5000	V	46.22	7.39	28.73	26.31	56.03	74	-17.97	PK
1829.5000	V	39.93	7.39	28.73	26.31	49.74	54	-4.26	AV
2744.2500	V	46.17	8.10	29.71	27.01	56.97	74	-17.03	PK
2744.2500	V	37.53	8.10	29.71	27.01	48.33	54	-5.67	AV
3659.0000	V	--	--	--	--	--	--	--	PK
3659.0000	V	--	--	--	--	--	--	--	AV

High Channel

Frequency	Antenna	Reading	Cable Loss	Ant Factor	Amplifier	Level	Limits	Margin	Det.
(MHz)	Pol.	(dBuV/m)	(dB)	(dB)	(dB)	(dBuV/m)	(dBuV/m)	(dB)	Mode
1854.5000	H	50.13	7.39	28.73	26.31	59.94	74	-14.06	PK
1854.5000	H	40.72	7.39	28.73	26.31	50.53	54	-3.47	AV
2781.7500	H	48.20	8.10	29.71	27.01	59.00	74	-15.00	PK
2781.7500	H	38.45	8.10	29.71	27.01	49.25	54	-4.75	AV
3709.0000	H	--	--	--	--	--	--	--	PK
3709.0000	H	--	--	--	--	--	--	--	AV
1854.5000	V	45.13	7.39	28.73	26.31	54.94	74	-19.06	PK
1854.5000	V	38.19	7.39	28.73	26.31	48.00	54	-6.00	AV
2781.7500	V	45.17	8.10	29.71	27.01	55.97	74	-18.03	PK
2781.7500	V	37.34	8.10	29.71	27.01	48.14	54	-5.86	AV
3709.0000	V	--	--	--	--	--	--	--	PK
3709.0000	V	--	--	--	--	--	--	--	AV

Remark:

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

Radiated Band Edge:

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	40.11	22.45	4.48	31.33	35.71	46.00	-10.29	H	QP
928.0000	40.89	22.59	4.54	31.35	36.67	46.00	-9.33	H	QP
902.0000	43.19	22.45	4.48	31.33	38.79	46.00	-7.21	V	QP
928.0000	43.30	22.59	4.54	31.35	39.08	46.00	-6.92	V	QP

5. Maximum Peak Output Power Test

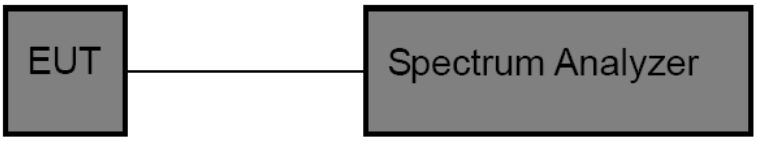
5.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (b)(2)& (b)(4)

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

5.2. Test Setup



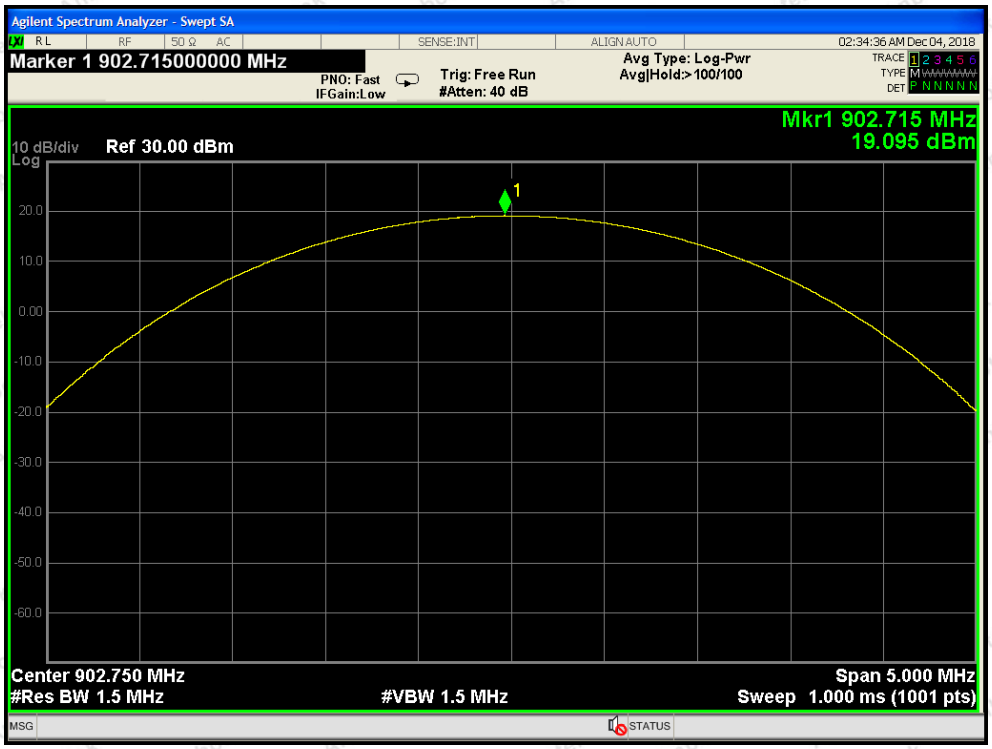
5.3. Test Procedure

1. The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram above,
2. Spectrum Setting:
   RBW > the 20 dB bandwidth of the emission being measured
   Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel
   VBW ≥ RBW
   Sweep = auto
   Detector function = peak
   Trace = max hold

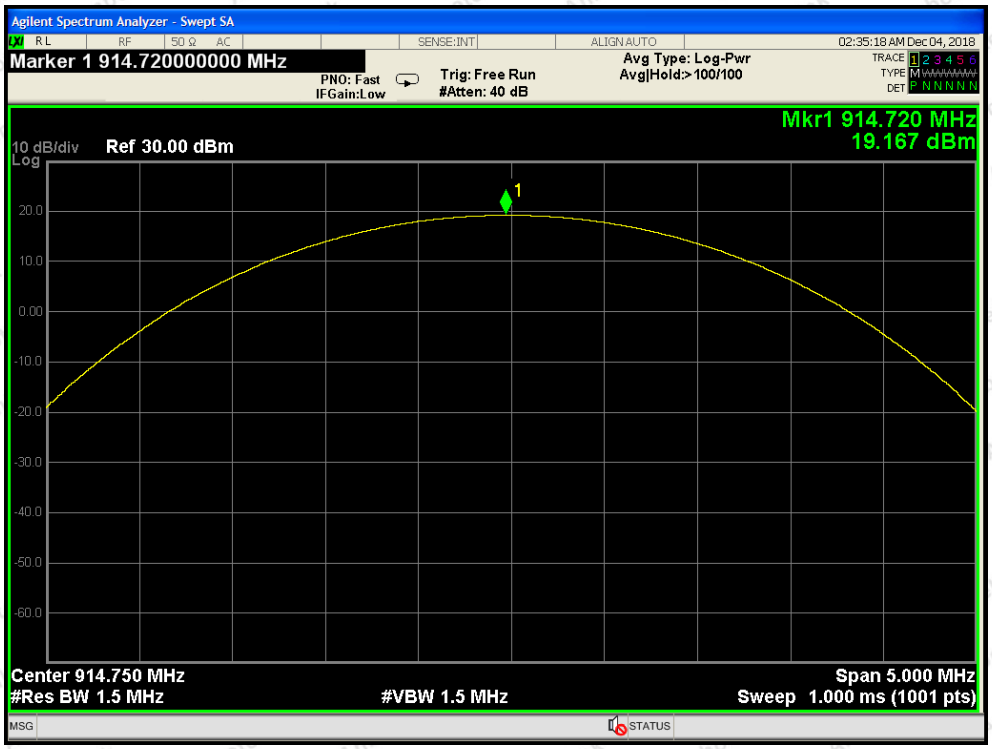
5.4. Test Data

Test Item	:	Max. peak output power	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 24V	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

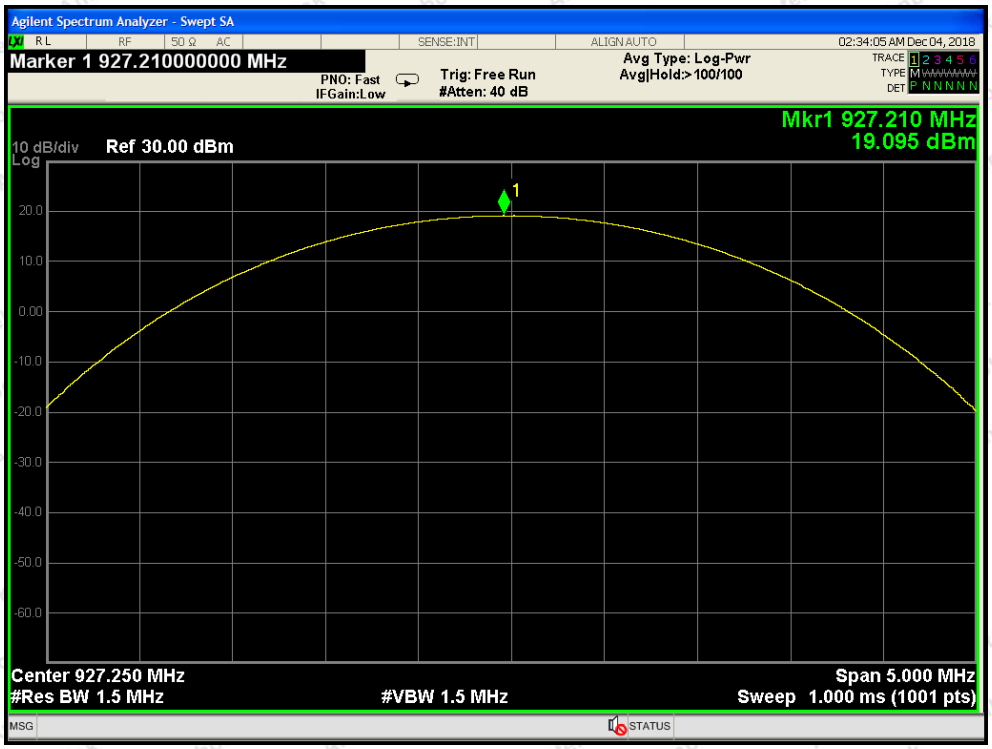
Channel Frequency (MHz)	Peak Power output (dBm)	Limit (dBm)	Results
902.75	19.095	27.5	PASS
914.75	19.167	27.5	PASS
927.25	19.095	27.5	PASS
Remark: The Power Limit (dBm)=30-(Antenna Gain-6). The Antenna Gain is 8.5 dBi.			



Low Channel



Middle Channel



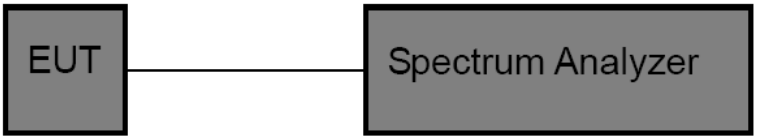
High Channel

6. 20DB Occupy Bandwidth Test

6.1. Test Standard

Test Standard	FCC Part15 C Section 15.247 (a)(1)

6.2. Test Setup



6.3. Test Procedure

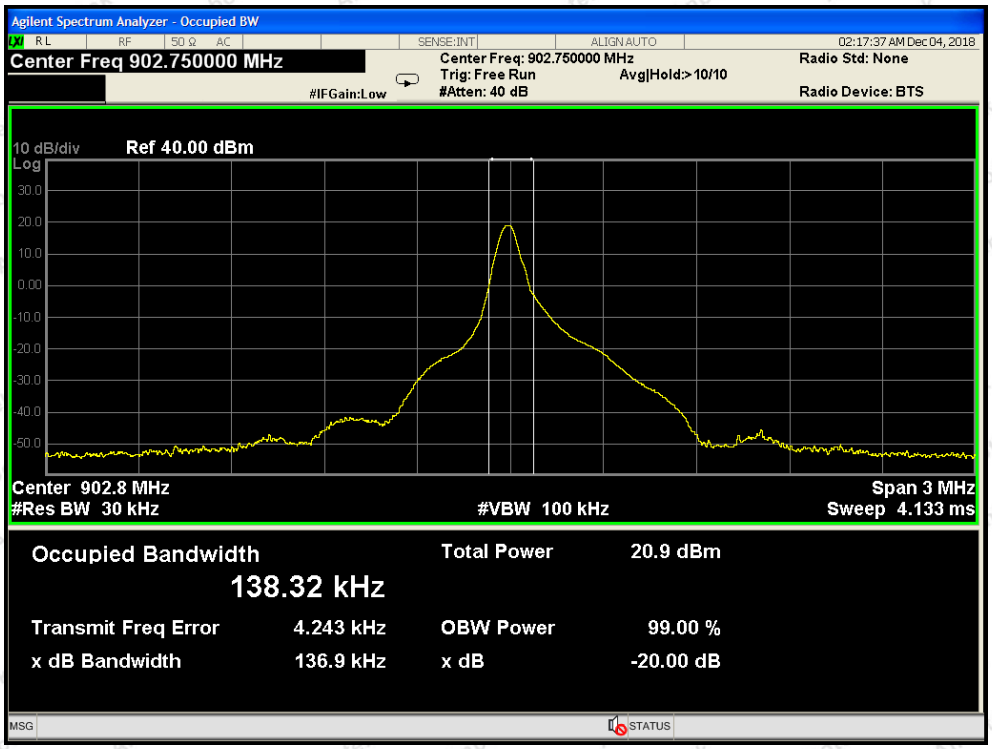
Using the following spectrum analyzer settings:

1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW = 30 kHz.
3. Set the VBW = 100 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

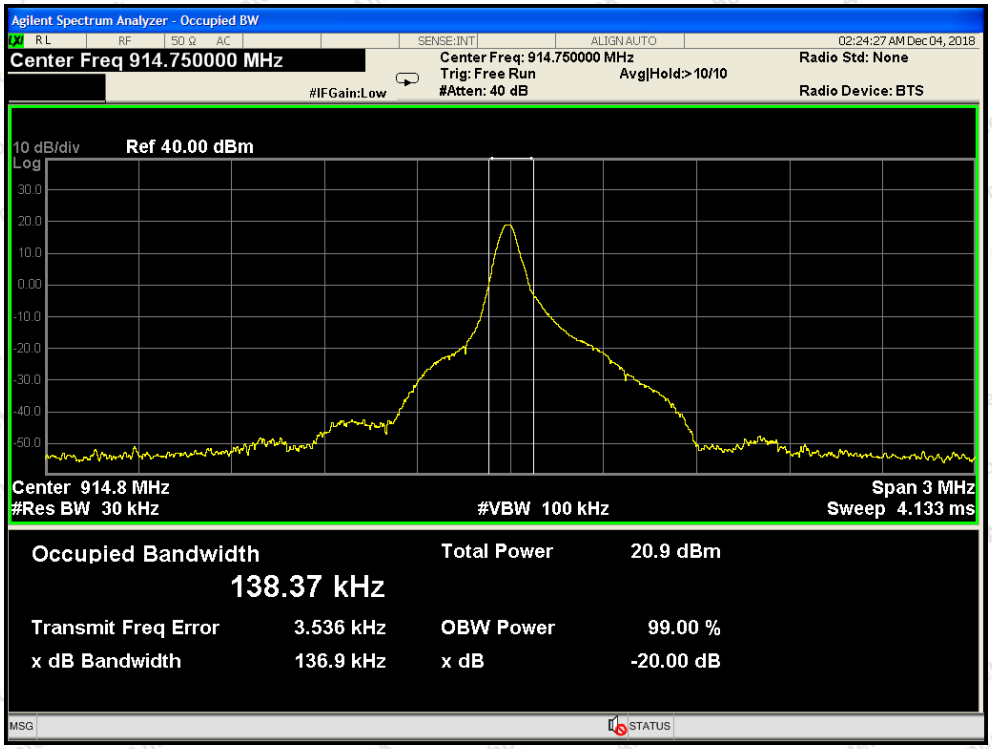
6.4. Test Data

Test Item	:	20dB BW	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 24V	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

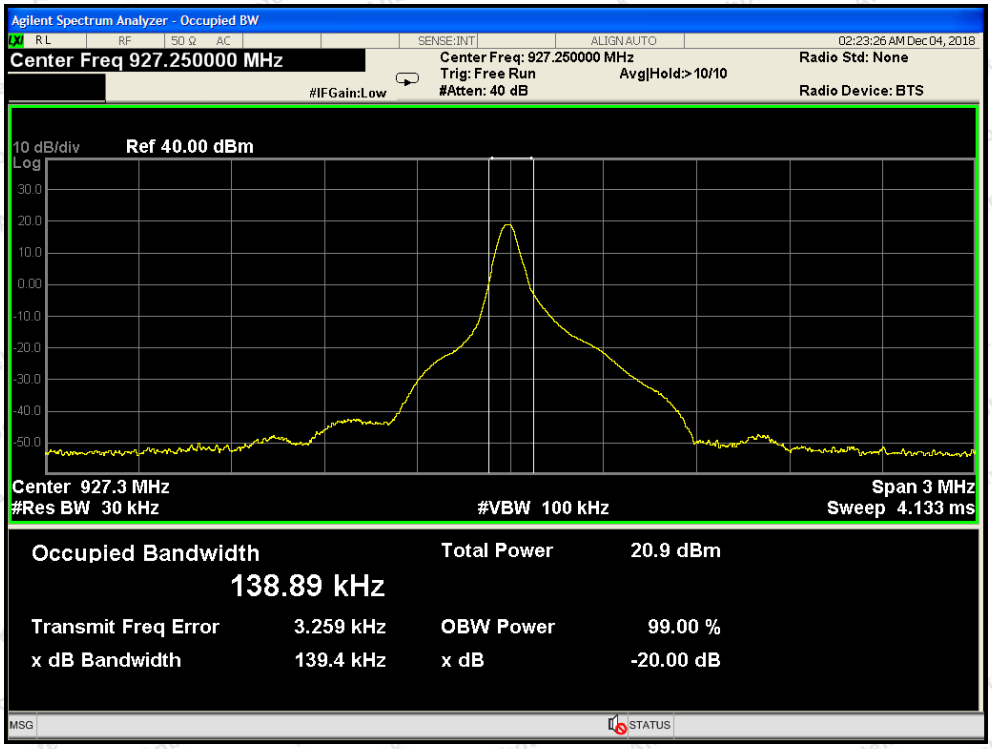
Channel	Frequency(MHz)	20dB Down BW(kHz)	Limit（MHz）	Verdict
Low	902.75	136.9	0.250	PASS
Middle	914.75	136.9	0.250	PASS
High	927.25	139.4	0.250	PASS


Agilent Spectrum Analyzer - Occupied BW
Center Freq 902.750000 MHz
Center Freq: 902.750000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
02:17:37 AM Dec 04, 2018
10 dB/div
Ref 40.00 dBm
Center 902.8 MHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
138.32 kHz
Total Power 20.9 dBm
Transmit Freq Error 4.243 kHz
OBW Power 99.00 %
x dB Bandwidth 136.9 kHz
x dB -20.00 dB

Low


Agilent Spectrum Analyzer - Occupied BW
Center Freq 914.750000 MHz
Center Freq: 914.750000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
#IFGain:Low
Radio Std: None
Radio Device: BTS
02:24:27 AM Dec 04, 2018
10 dB/div
Ref 40.00 dBm
Center 914.8 MHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
138.37 kHz
Total Power 20.9 dBm
Transmit Freq Error 3.536 kHz
OBW Power 99.00 %
x dB Bandwidth 136.9 kHz
x dB -20.00 dB

Middle


Agilent Spectrum Analyzer - Occupied BW
Center Freq 927.250000 MHz
Center Freq: 927.250000 MHz
Trig: Free Run
Avg|Hold:>10/10
#Atten: 40 dB
Radio Std: None
Radio Device: BTS
10 dB/div
Ref 40.00 dBm
Log
Center 927.3 MHz
#Res BW 30 kHz
#VBW 100 kHz
Span 3 MHz
Sweep 4.133 ms
Occupied Bandwidth
138.89 kHz
Total Power 20.9 dBm
Transmit Freq Error 3.259 kHz
OBW Power 99.00 %
x dB Bandwidth 139.4 kHz
x dB -20.00 dB

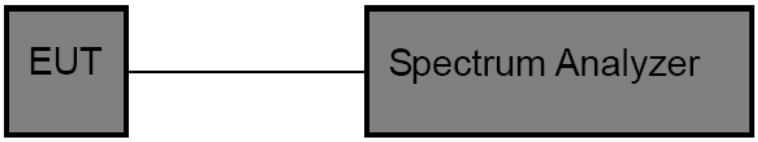
High

7. Carrier Frequency Separation Test

7.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater

7.2. Test Setup



7.3. Test Procedure

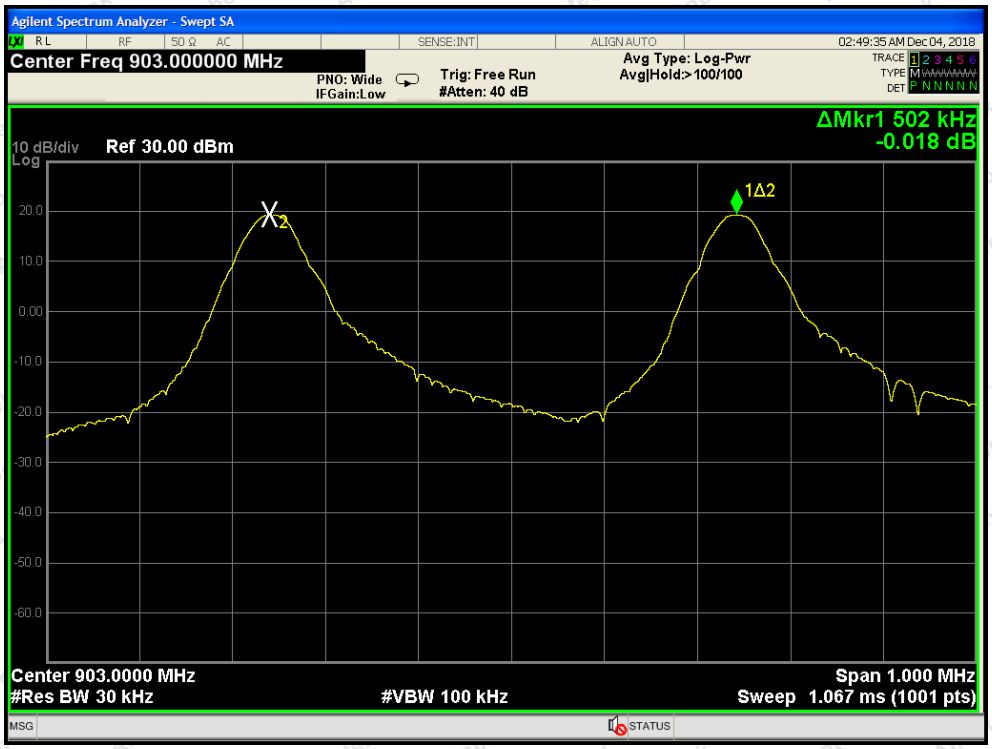
The EUT must have its hopping function enabled. Using the following spectrum analyzer settings:

1. Span= Wide enough to capture the peaks of two adjacent channels.
2. Set the RBW = 30 kHz.
3. Set the VBW = 100 kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

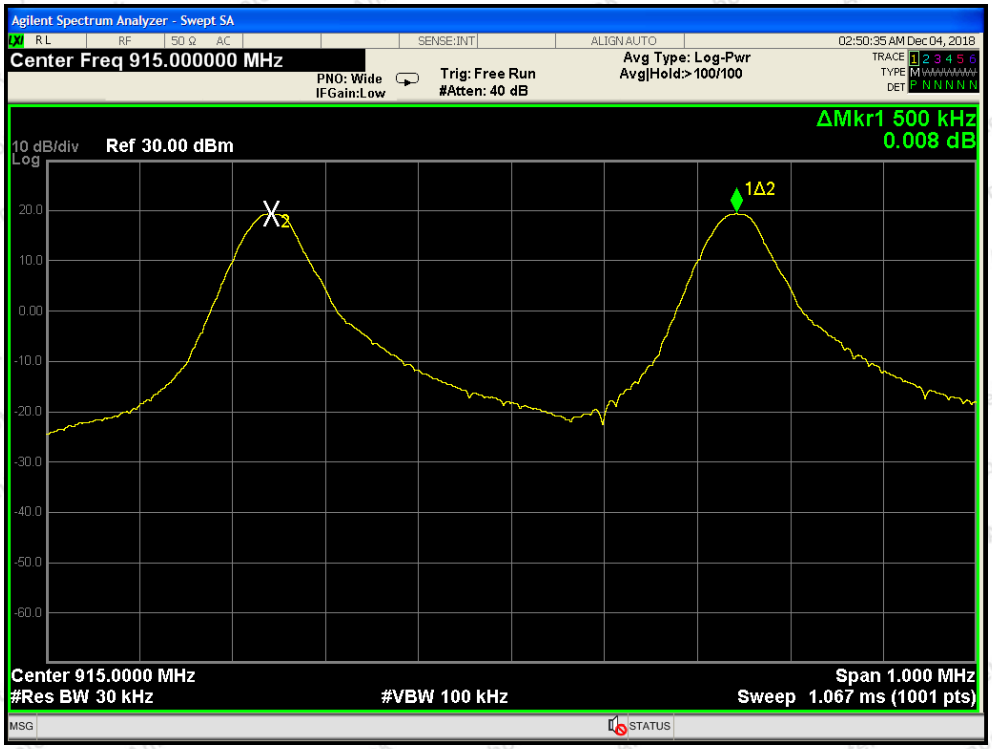
7.4. Test Data

Test Item	:	Frequency Separation	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 24V	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

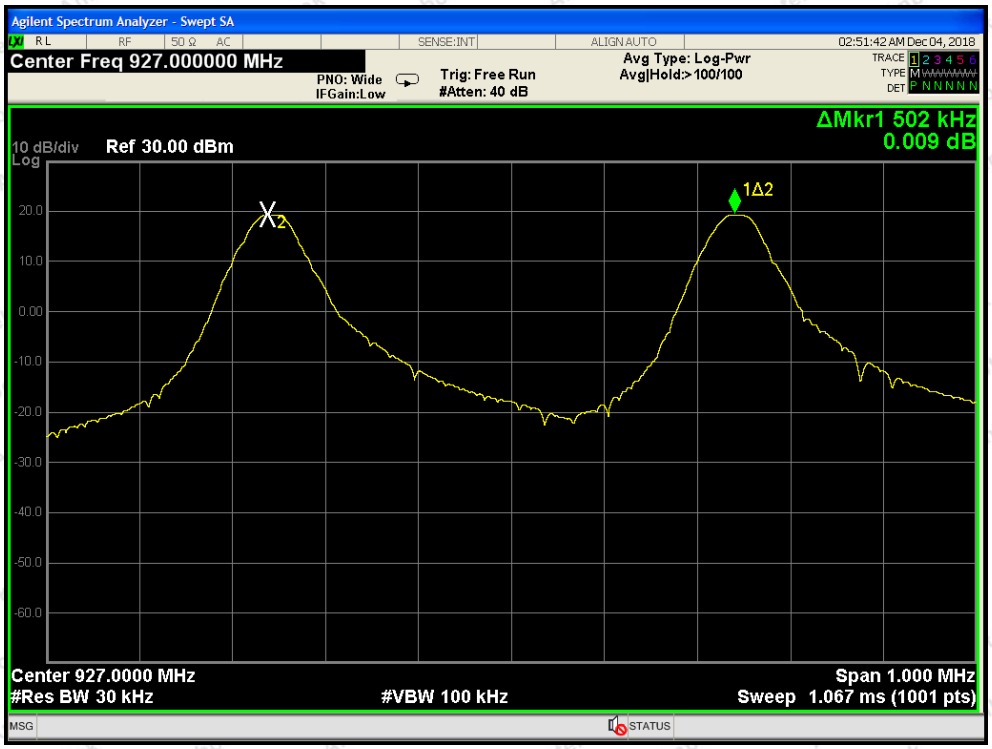
Channel	Frequency (MHz)	Separation Read Value (kHz)	Limit (kHz)	Verdict
Low Channel	902.75	502	136.9	PASS
Adjacency Channel	903.25			
Middle Channel	914.75	500	136.9	PASS
Adjacency Channel	915.25			
High Channel	927.25	502	139.4	PASS
Adjacency Channel	926.75			


Agilent Spectrum Analyzer - Swept SA
Center Freq 903.000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
02:49:35 AM Dec 04, 2018
ΔMkr1 502 kHz
-0.018 dB
10 dB/div
Ref 30.00 dBm
Center 903.0000 MHz
#Res BW 30 kHz
#VBW 100 kHz
Span 1.000 MHz
Sweep 1.067 ms (1001 pts)

Low


Agilent Spectrum Analyzer - Swept SA
Center Freq 915.000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
02:50:35 AM Dec 04, 2018
ΔMkr1 500 kHz
0.008 dB
10 dB/div
Ref 30.00 dBm
Center 915.0000 MHz
#Res BW 30 kHz
#VBW 100 kHz
Span 1.000 MHz
Sweep 1.067 ms (1001 pts)

Middle


Agilent Spectrum Analyzer - Swept SA
Center Freq 927.000000 MHz
PNO: Wide
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
02:51:42 AM Dec 04, 2018
ΔMkr1 502 kHz
0.009 dB
10 dB/div
Log
Ref 30.00 dBm
1Δ2
Center 927.0000 MHz
#Res BW 30 kHz
#VBW 100 kHz
Span 1.000 MHz
Sweep 1.067 ms (1001 pts)

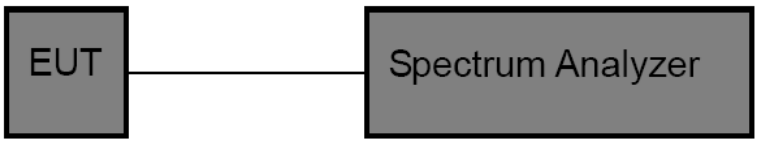
High

8. Number of Hopping Channel Test

8.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	⩾50 channels

8.2. Test Setup



8.3. Test Procedure

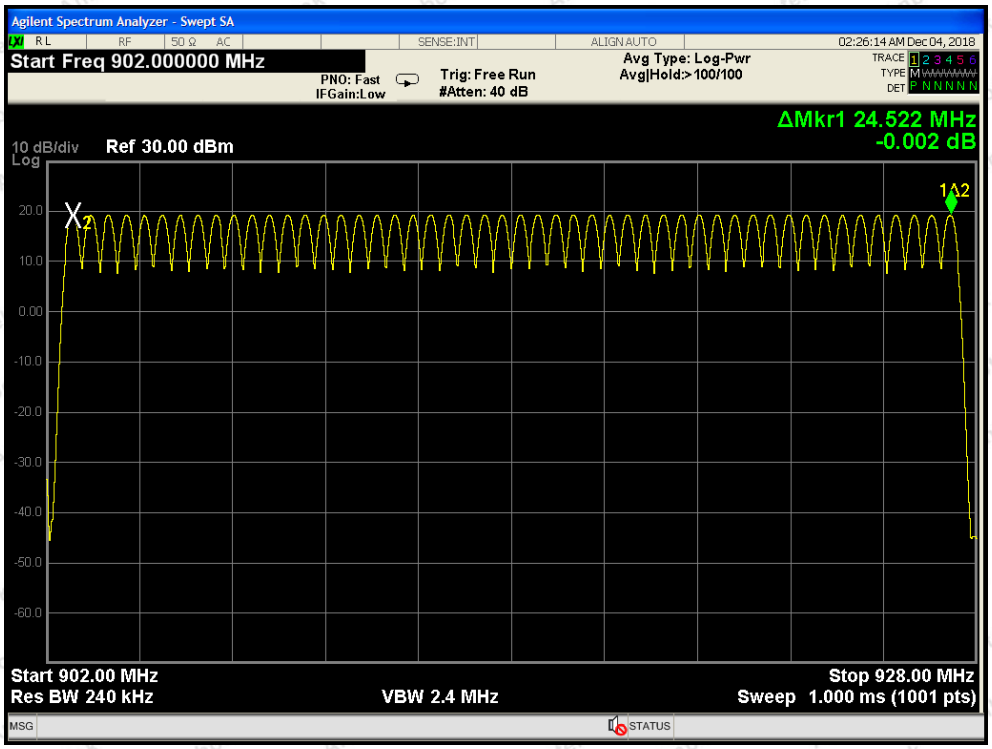
The EUT must have its hopping function enabled. Using the following spectrum analyzer setting:

1. Span= the frequency band of operation
2. Set the RBW = 100kHz.
3. Set the VBW = 300kHz.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

8.4. Test Data

Test Item	:	Number of Hopping Frequency	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 24V	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Hopping Channel Frequency Range（MHz）	Quantity of Hopping Channel	Limit	Verdict
902-928	50	⩾50	PASS

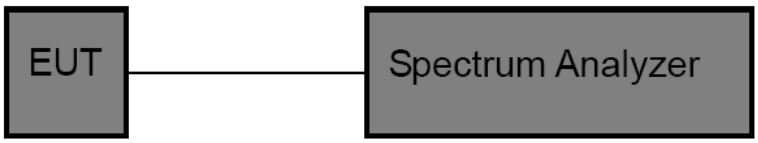

Agilent Spectrum Analyzer - Swept SA
Start Freq 902.000000 MHz
PNO: Fast
IFGain:Low
Trig: Free Run
#Atten: 40 dB
Avg Type: Log-Pwr
Avg|Hold:>100/100
02:26:14 AM Dec 04, 2018
ΔMkr1 24.522 MHz
-0.002 dB
10 dB/div
Log
Ref 30.00 dBm
1Δ2
Start 902.00 MHz
Res BW 240 kHz
VBW 2.4 MHz
Stop 928.00 MHz
Sweep 1.000 ms (1001 pts)

9. Dwell Time Test

9.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.247 (a)(1)
Test Limit	0.4 sec

9.2. Test Setup



9.3. Test Procedure

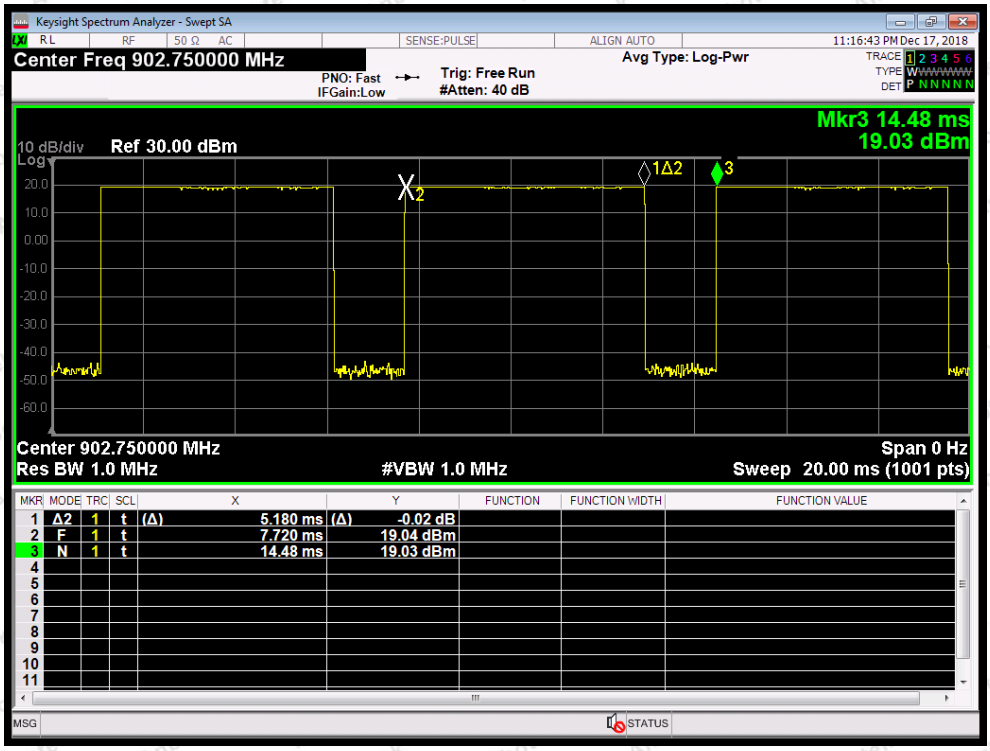
The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

1. Span= zero span, centered on a hopping channel
2. Set the RBW = 1 MHz.
3. Set the VBW = 1 MHz.
4. Sweep time = as necessary to capture the entire dwell time per hopping channel.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

9.4. Test Data

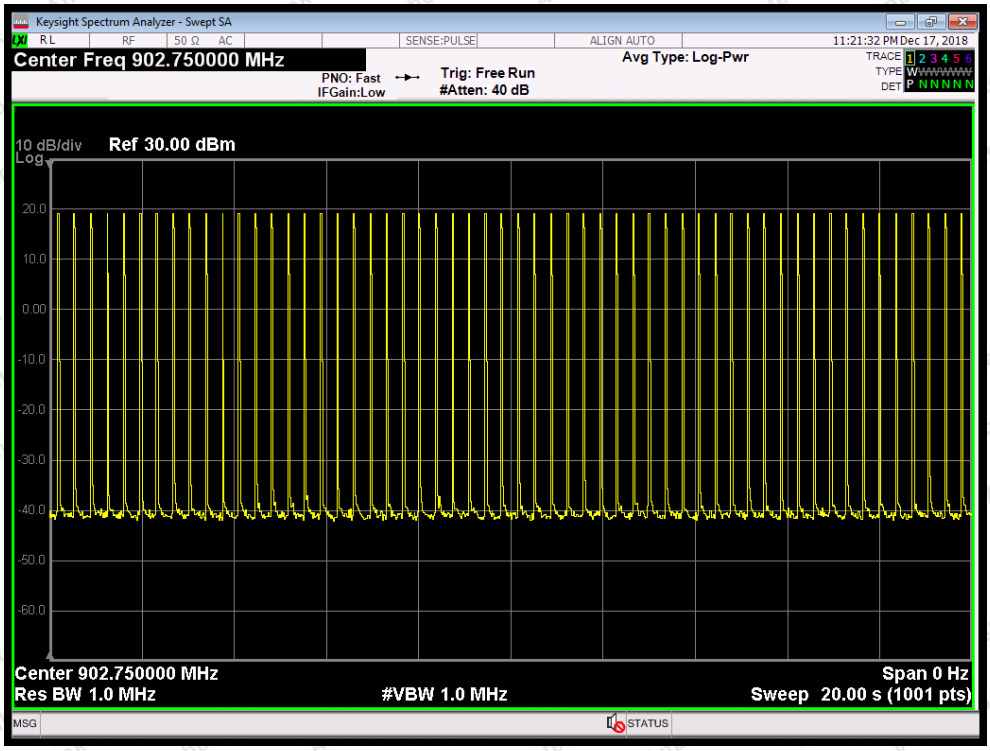
Test Item	:	Time of Occupancy	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 24V	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

Frequency (MHz)	Test period (s)	Number of Bursts per Hopping Period	Burst Duration (ms)	Dwell time (s)	Limit (s)
902.75	20	56	5.180	0.29	0.4
914.75	20	56	5.040	0.28	0.4
927.25	20	56	5.020	0.28	0.4



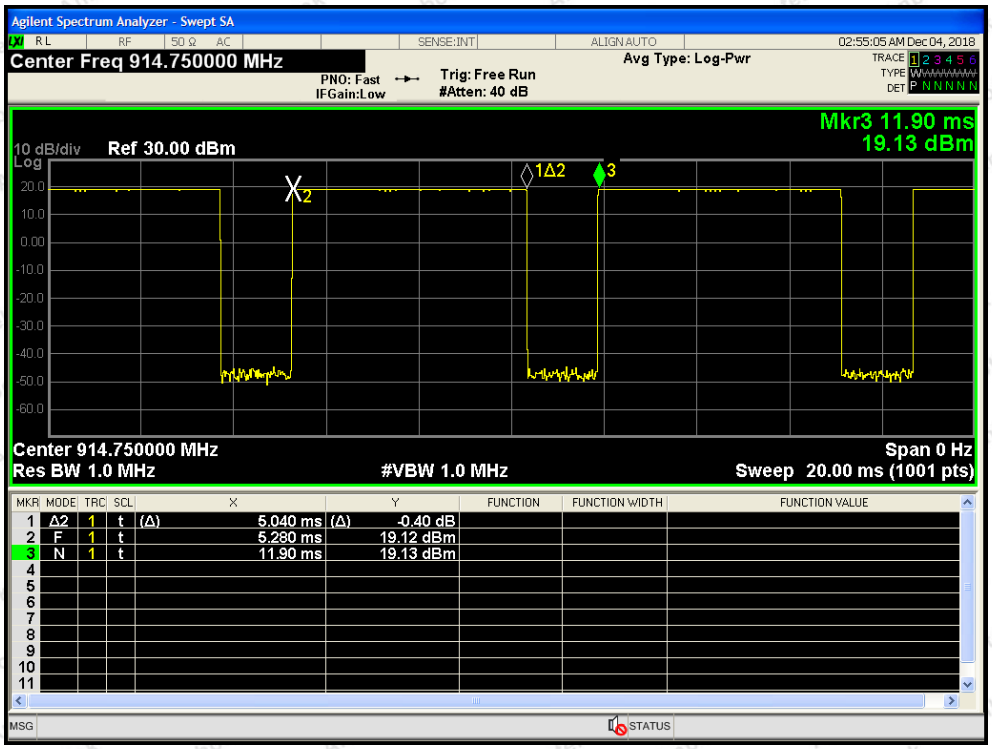
Low channel

Burst Durration



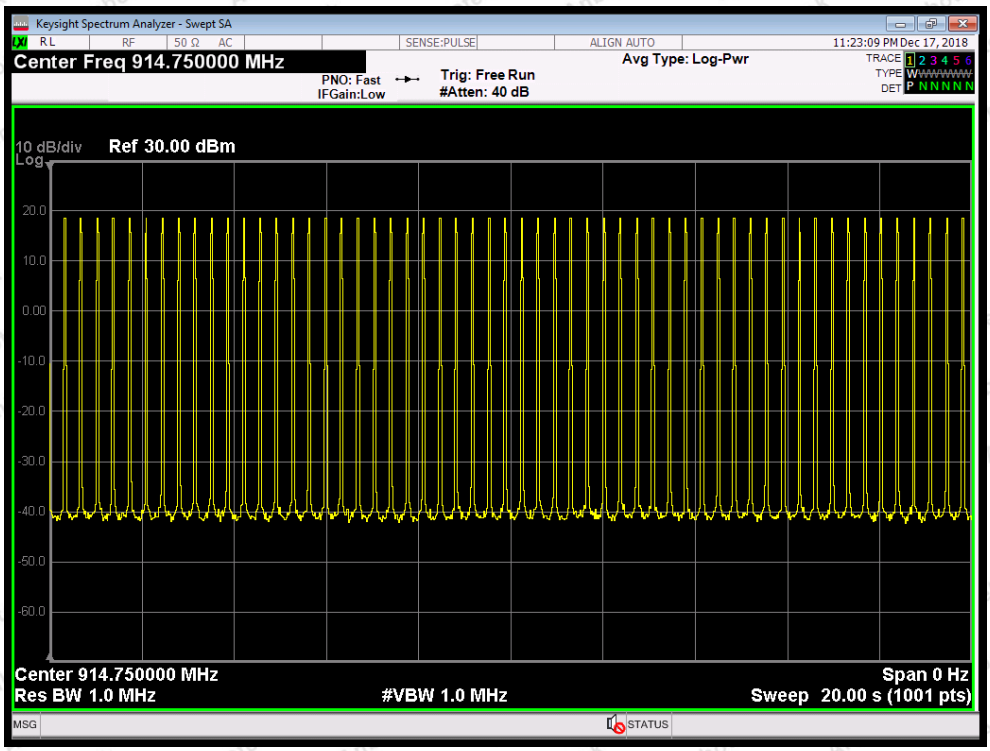
Low channel

Number of Bursts



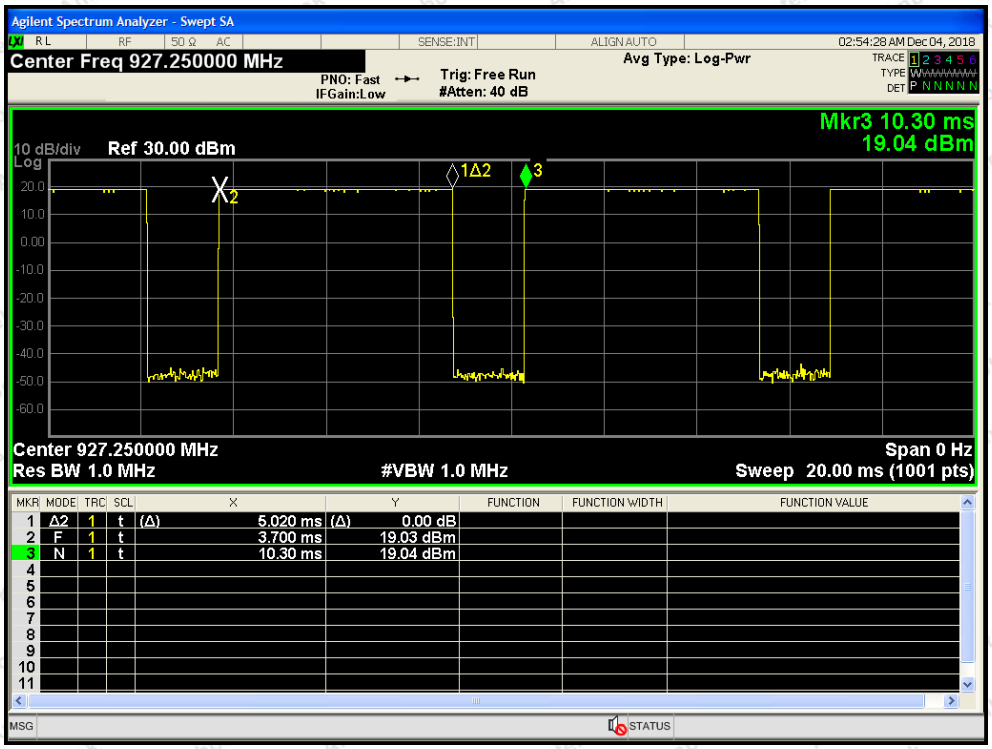
Middle channel

Burst Durration



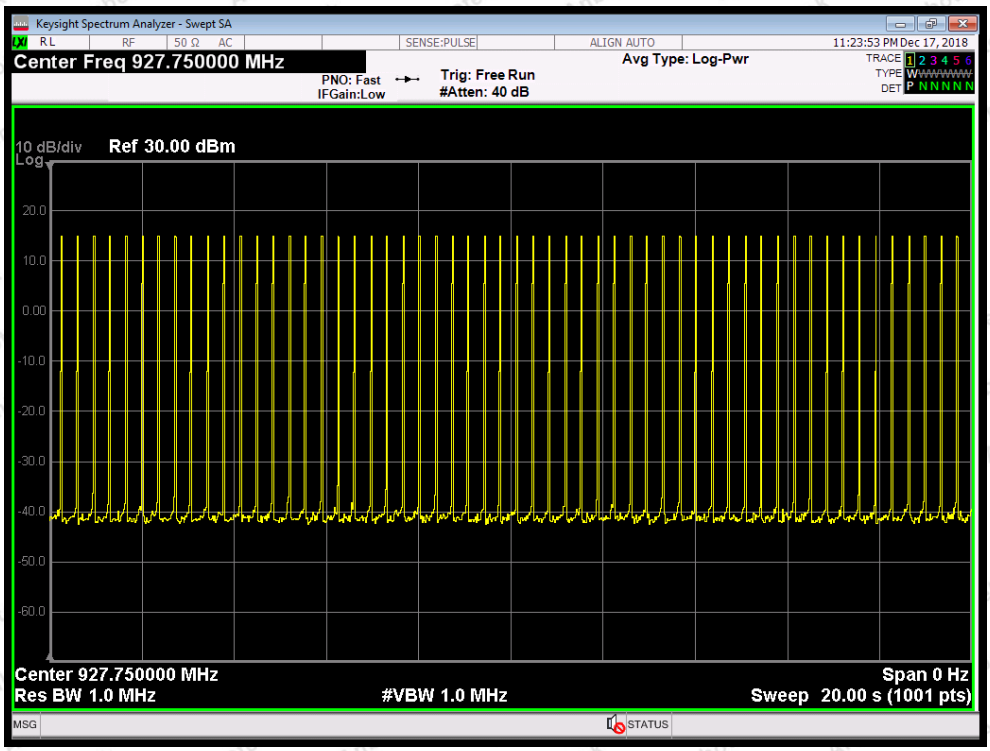
Middle channel

Number of Bursts



High channel

Burst Durration



High channel

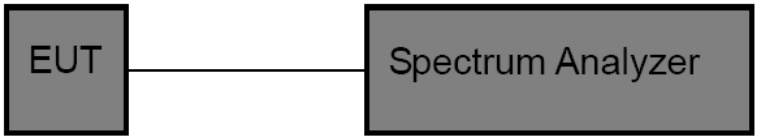
Number of Bursts

10. 100kHz Bandwidth of Frequency Band Edge Requirement

10.1. 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 in 15.209(a).

10.2. Test Setup



10.3. Test Procedure

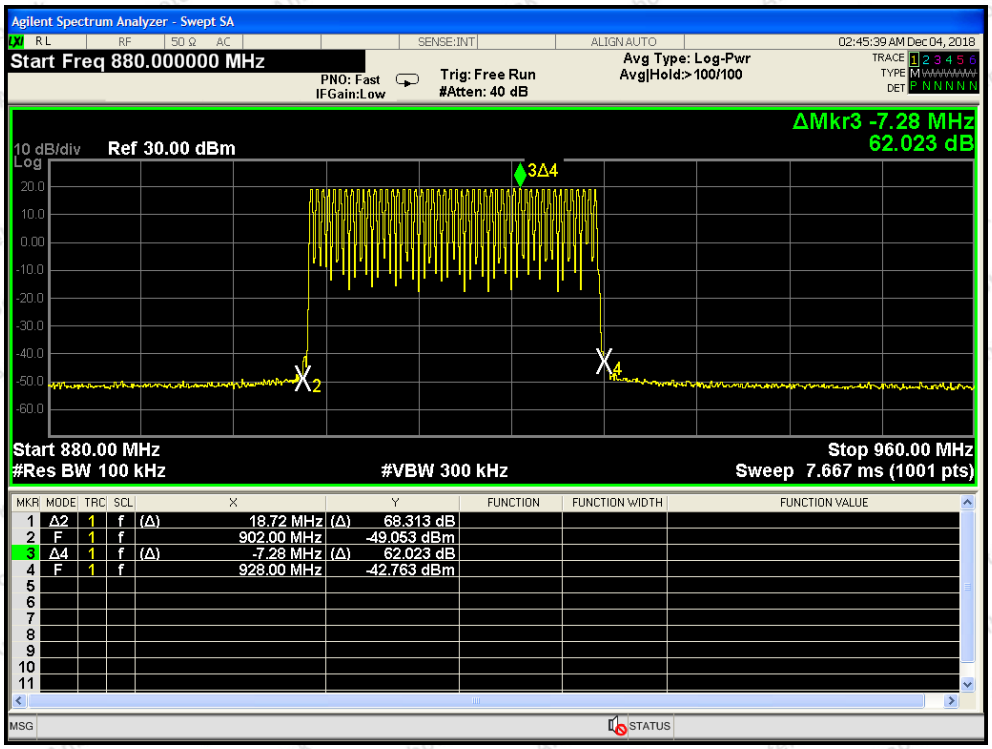
The EUT must have its hopping/Non-hopping function enabled. Using the following spectrum analyzer setting:

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.

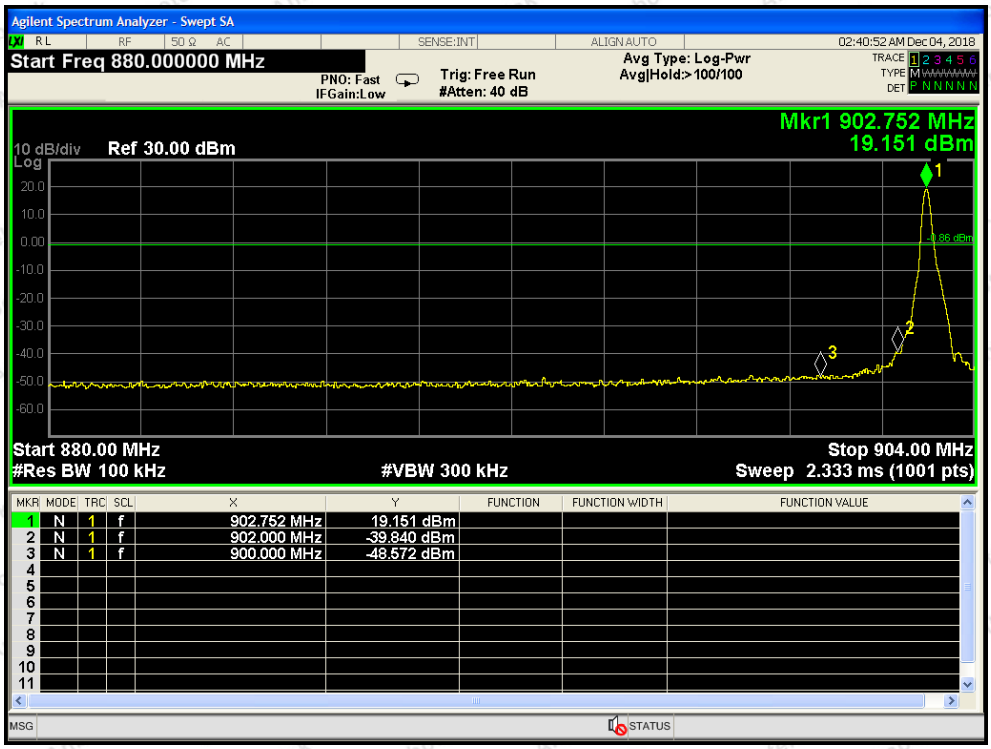
10.4. Test Data

Test Item	:	Band edge	Test Mode	:	CH Low ~ CH High
Test Voltage	:	DC 24V	Temperature	:	24℃
Test Result	:	PASS	Humidity	:	55%RH

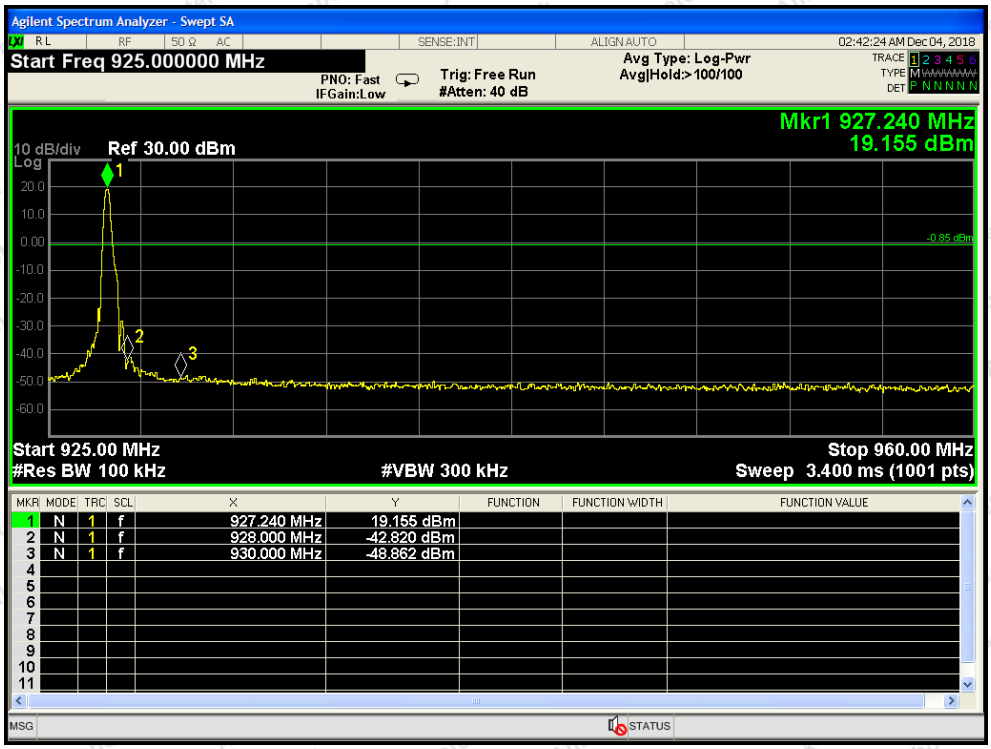
For Hopping Mode



For Non-Hopping Mode

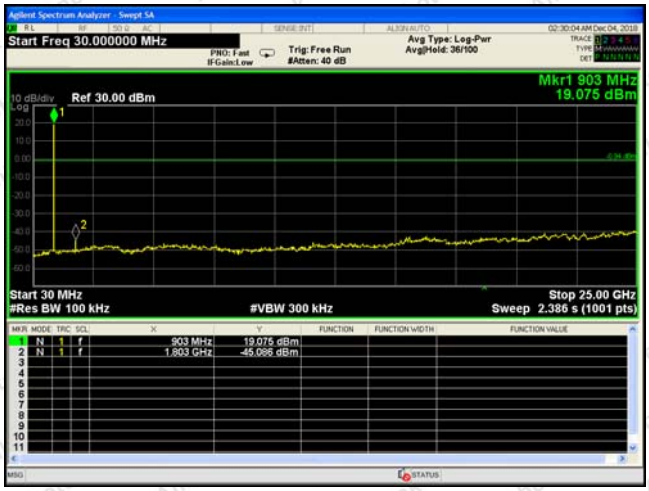


Lowest

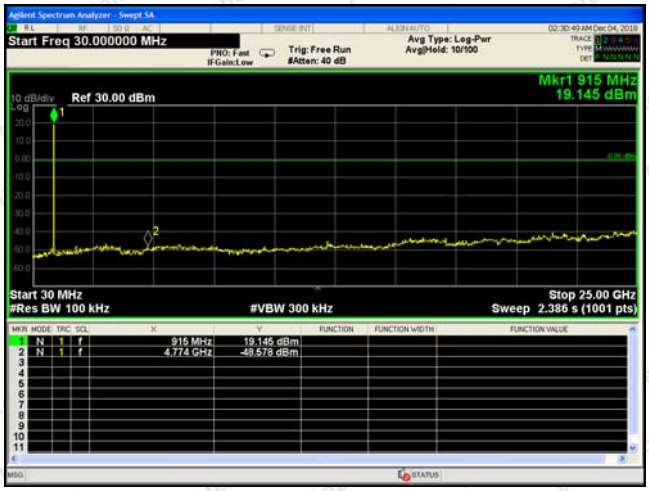


Highest

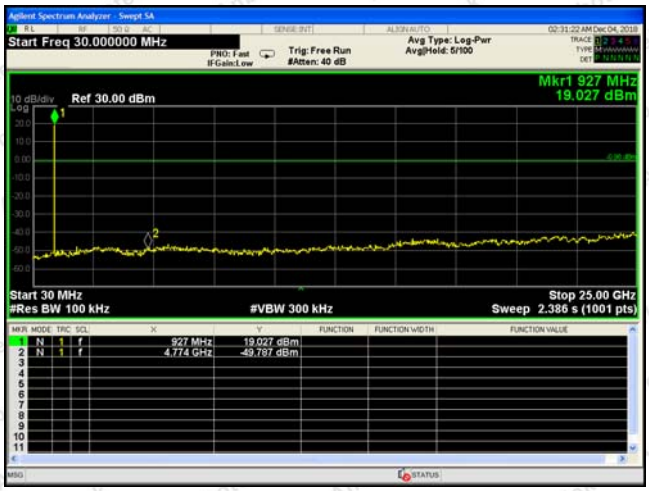
Conducted Emission Method



Low



Mid



High

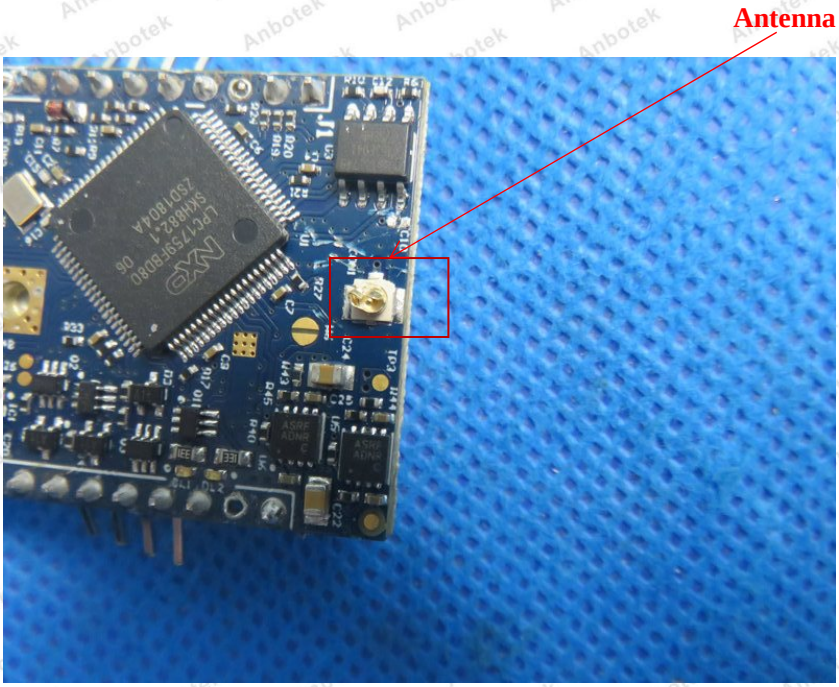
11. Antenna Requirement

11.1. 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.

11.2. Antenna Connected Construction

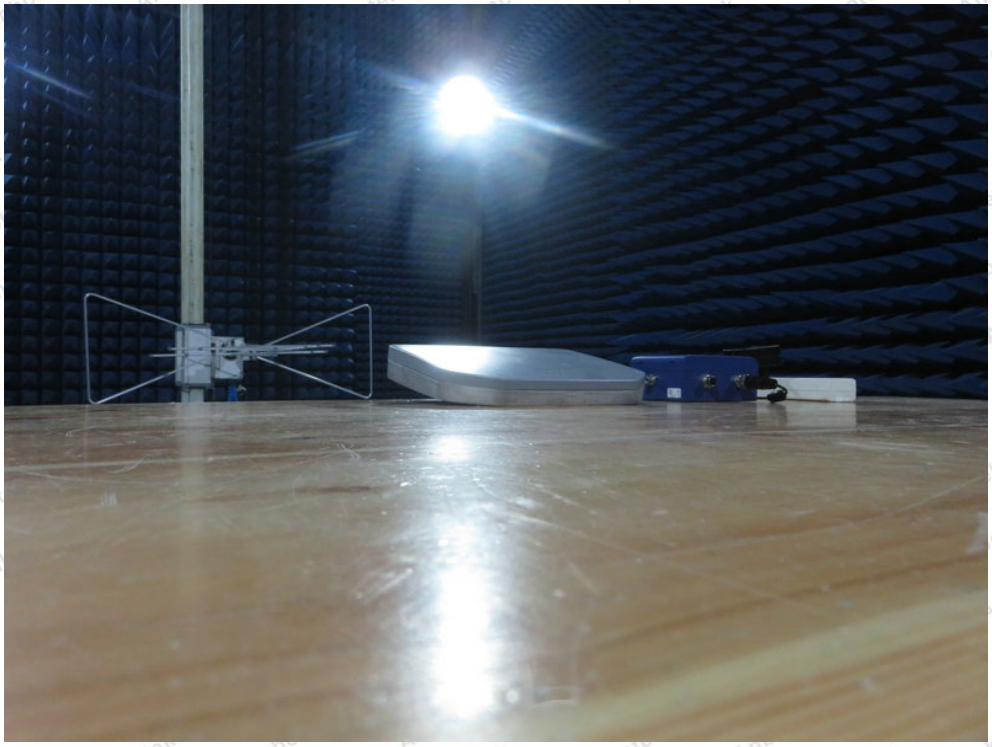
The an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited., and the best case gain of the antenna is 8.5 dBi. It complies with the standard requirement.

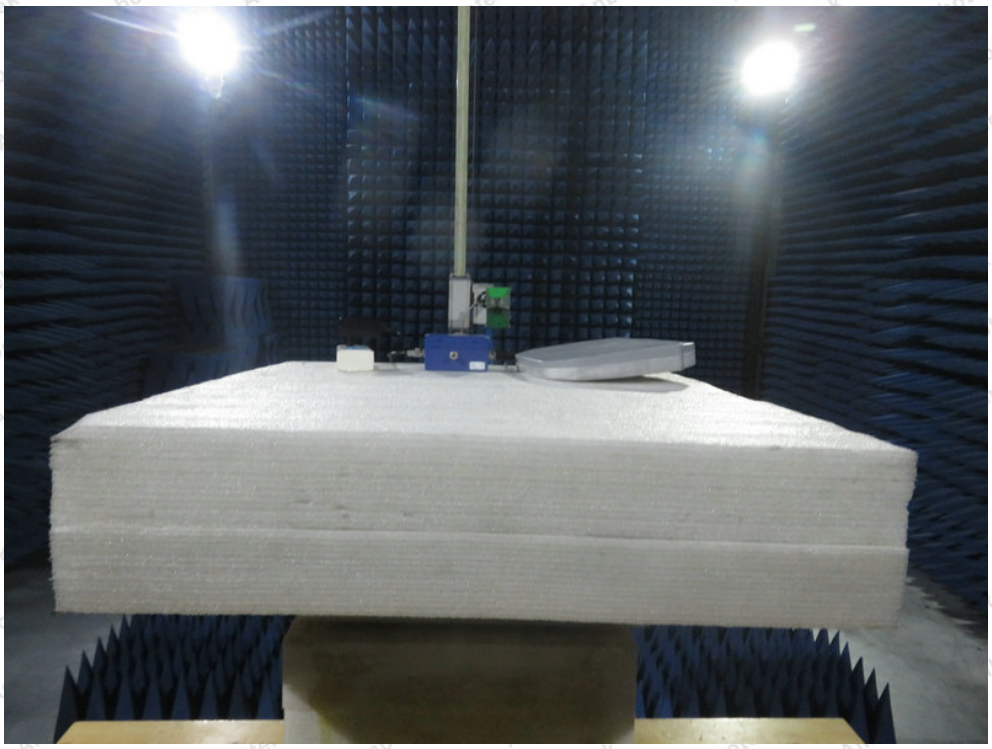


APPENDIX I -- TEST SETUP PHOTOGRAPH

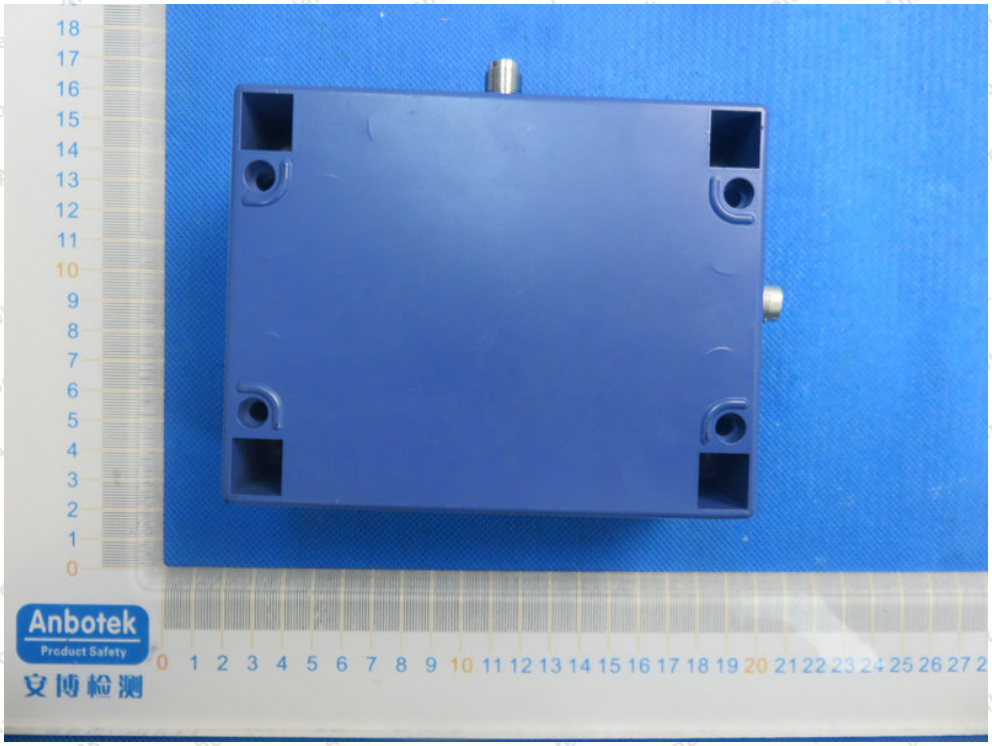
Photo of Conducted Emission Measurement

Photo of Radiation Emission Test





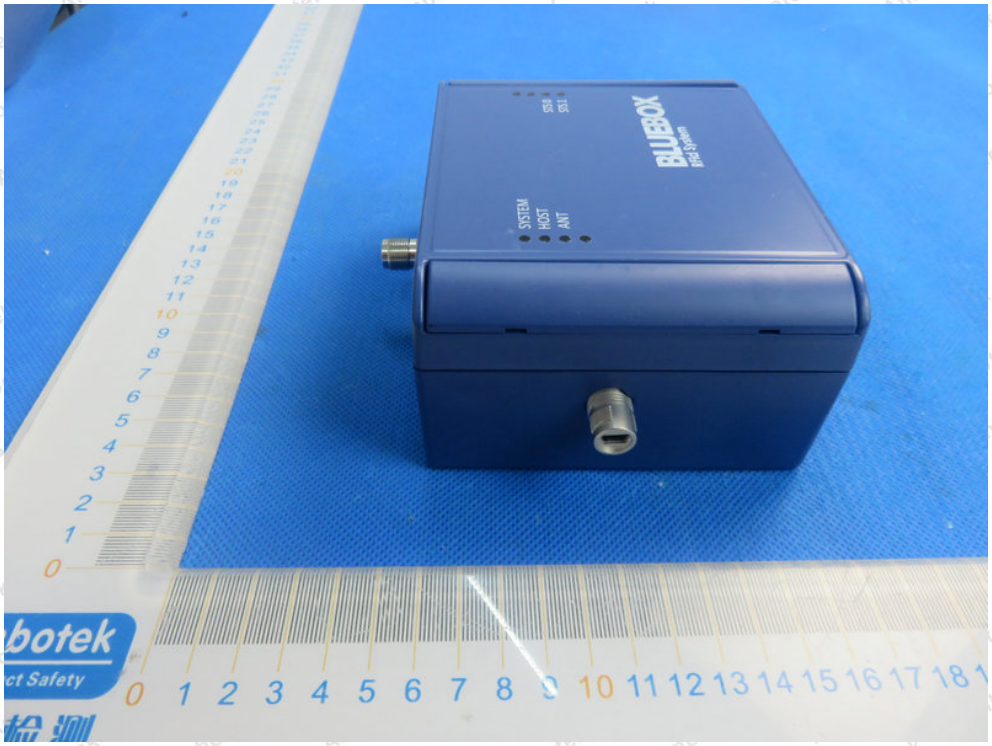
APPENDIX II -- EXTERNAL PHOTOGRAPH



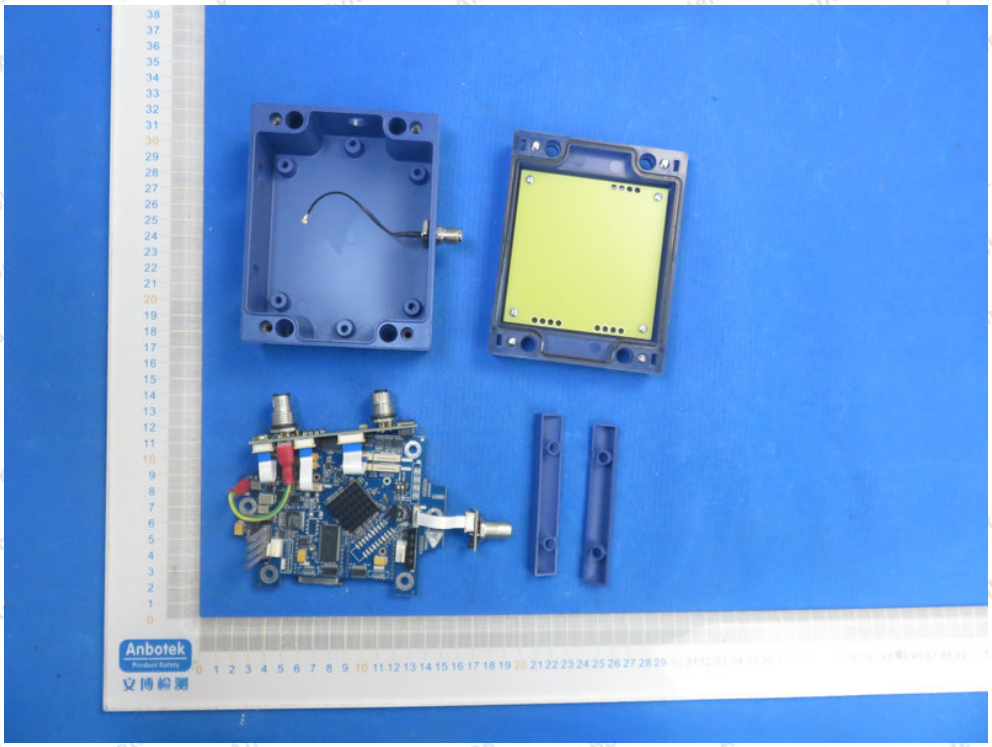
SYSTEM
HOST
ANT
STS 0
STS 1
BLUEBOX
RFid System

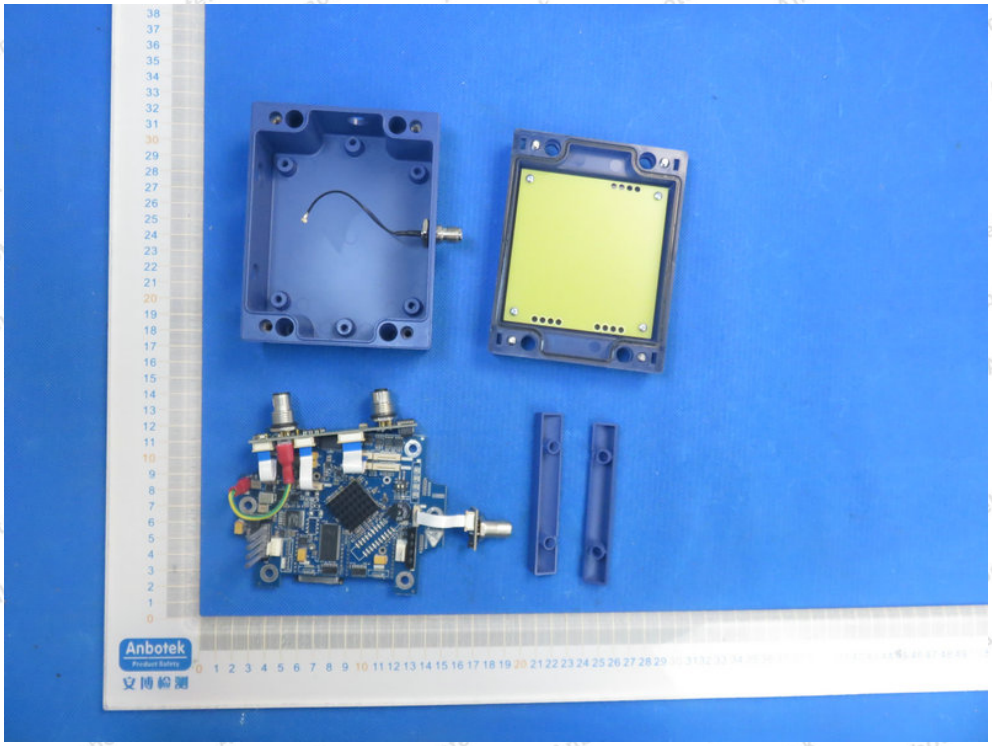
BLUEBOX
RFID System
STS 0
STS 1
SYSTEM
HOST
ANT

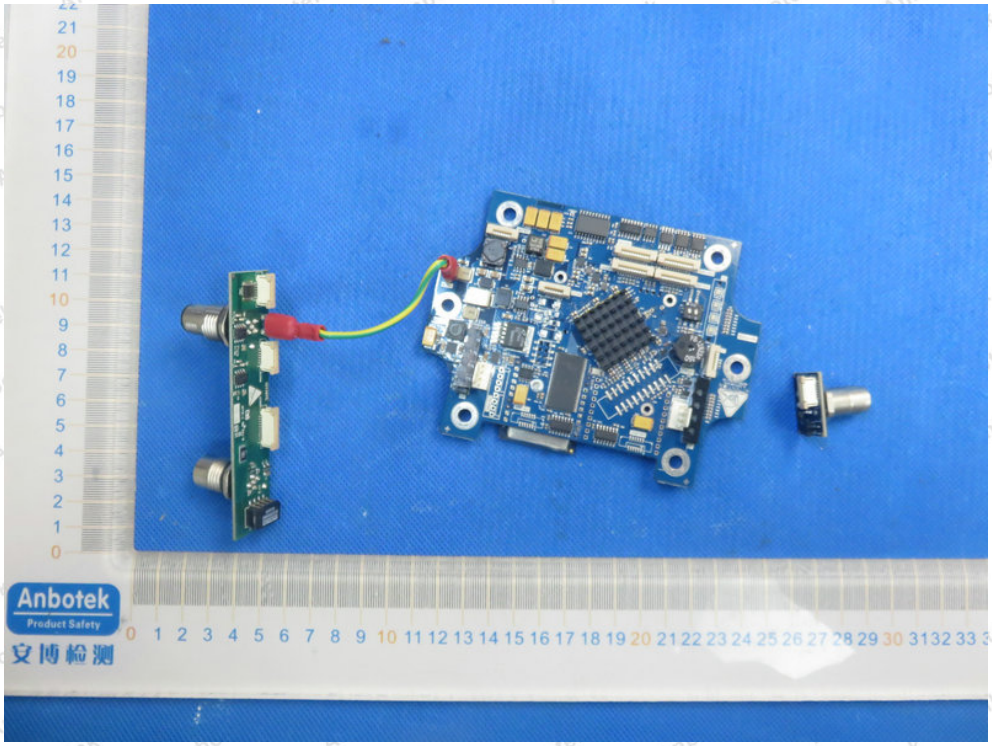
BLUEBOX
RFID System
UHF
STS 0
STS 1

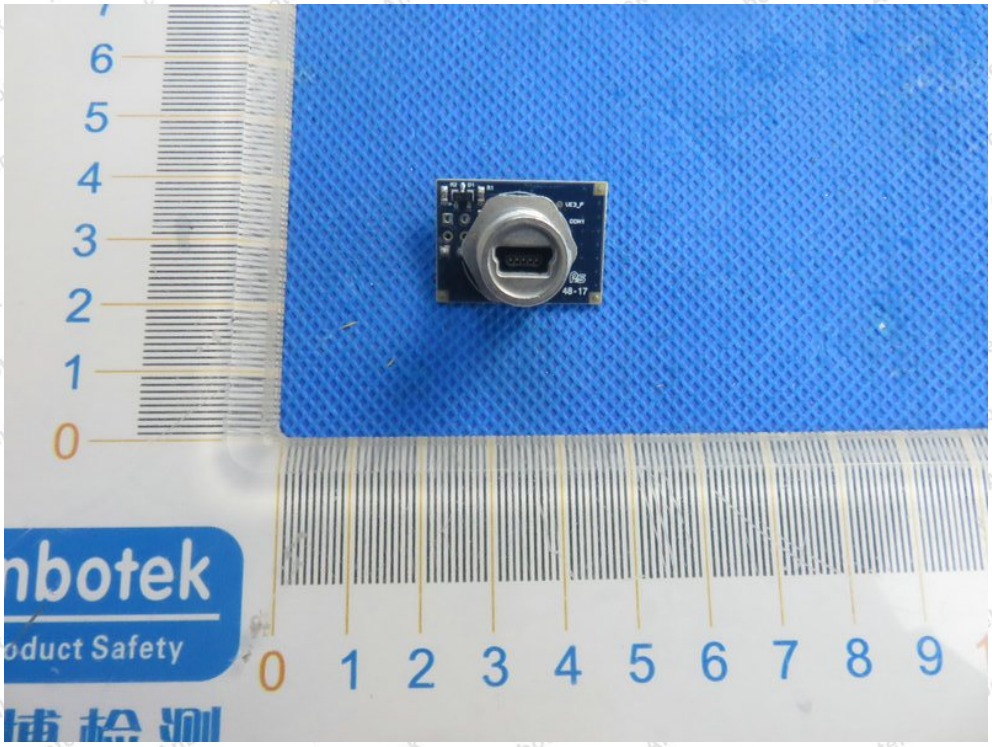

BLUEBOX
SYSTEM
HOST
ANT

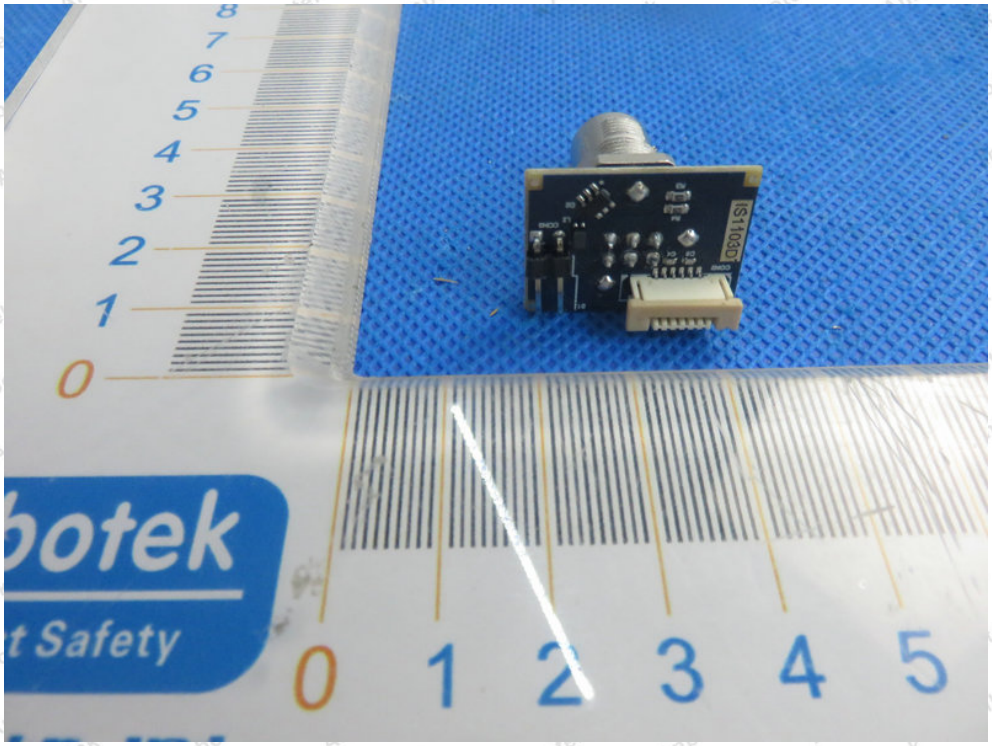
APPENDIX III -- INTERNAL PHOTOGRAPH







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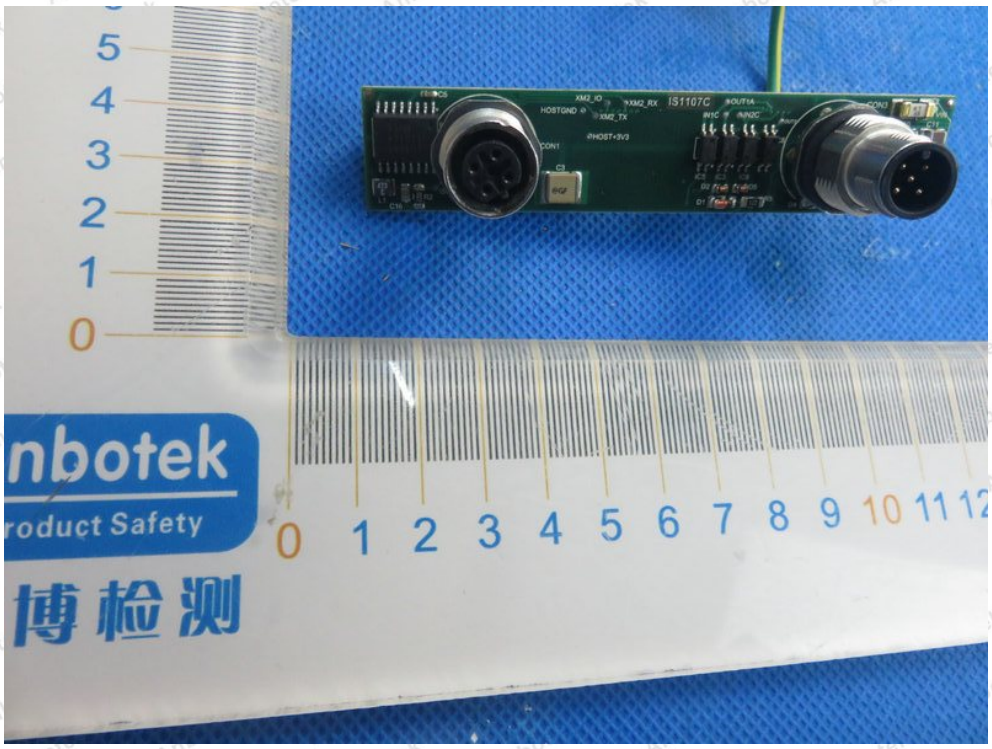
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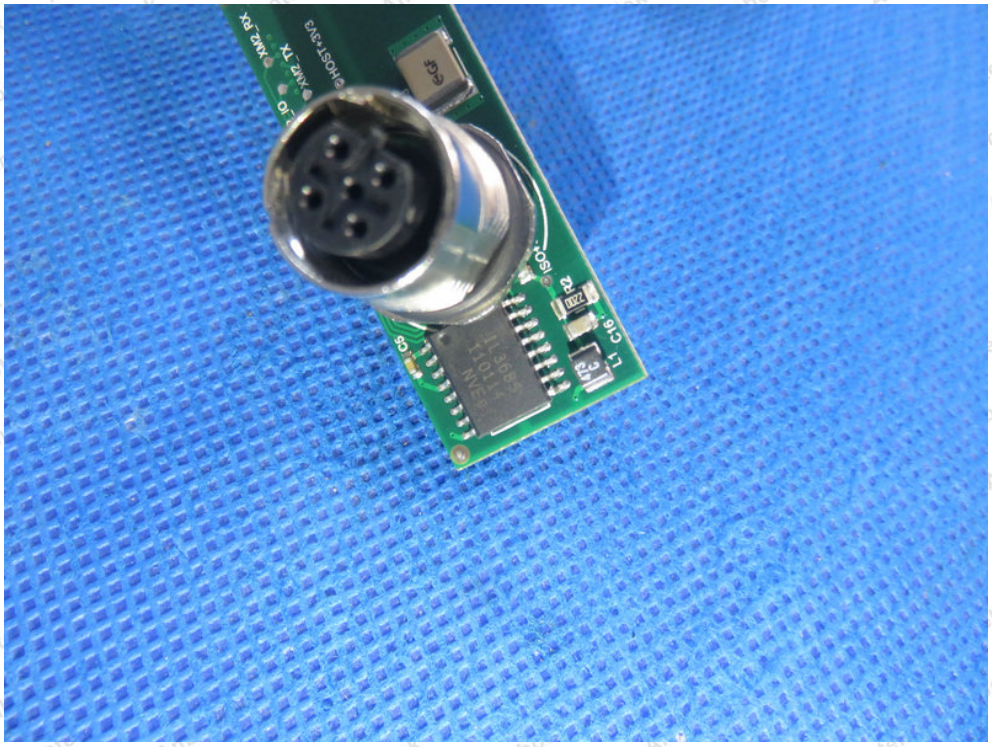
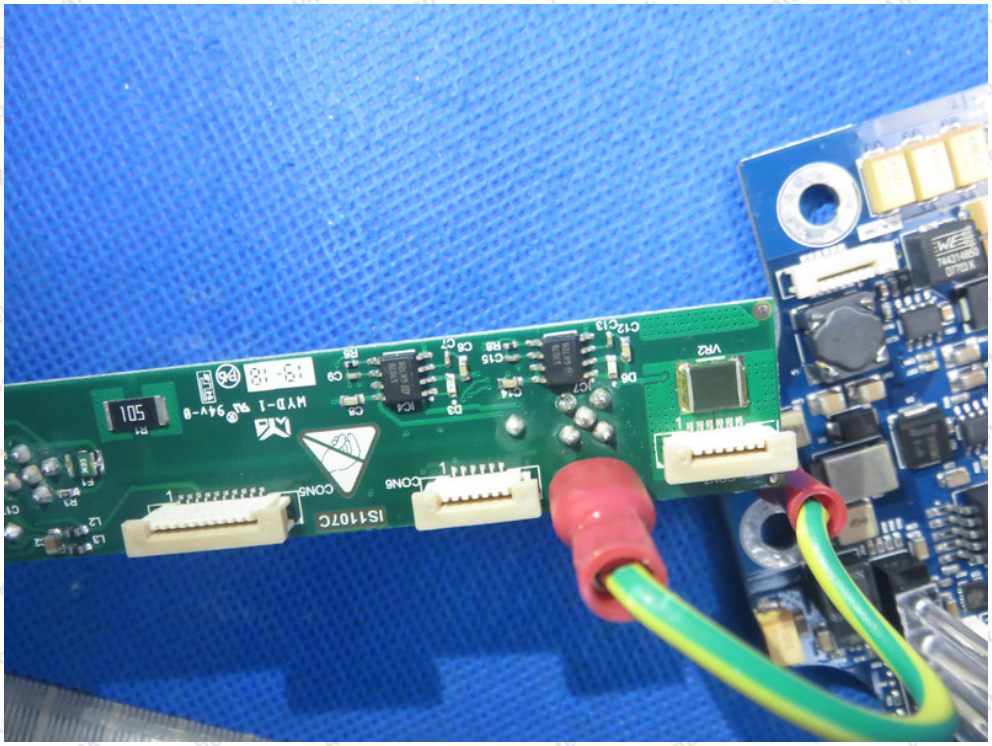
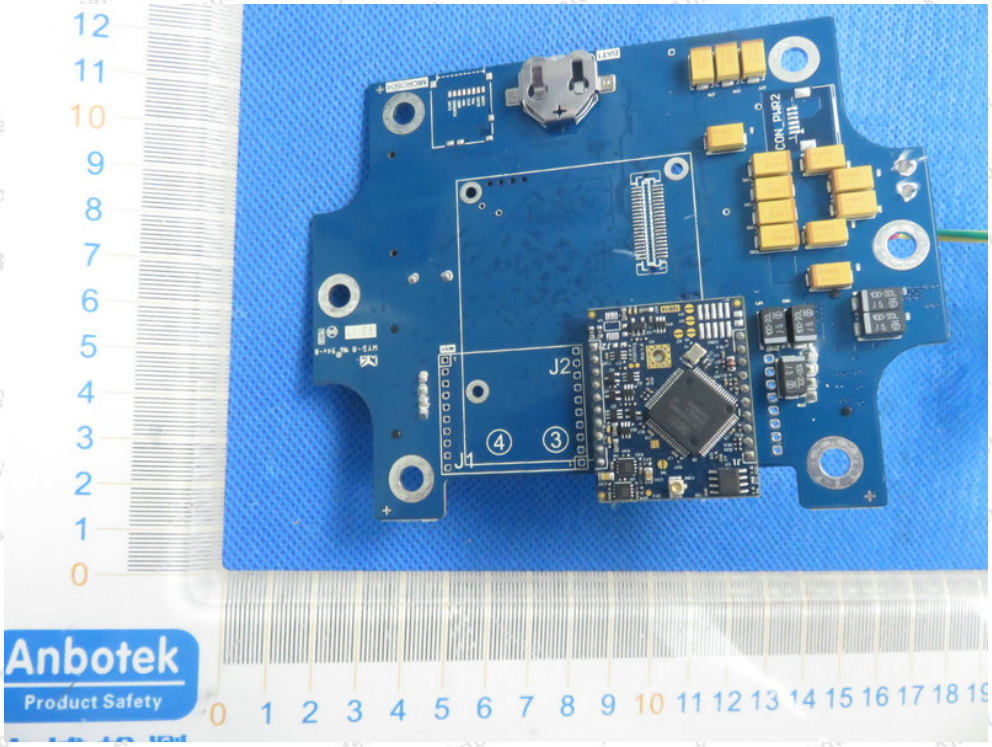
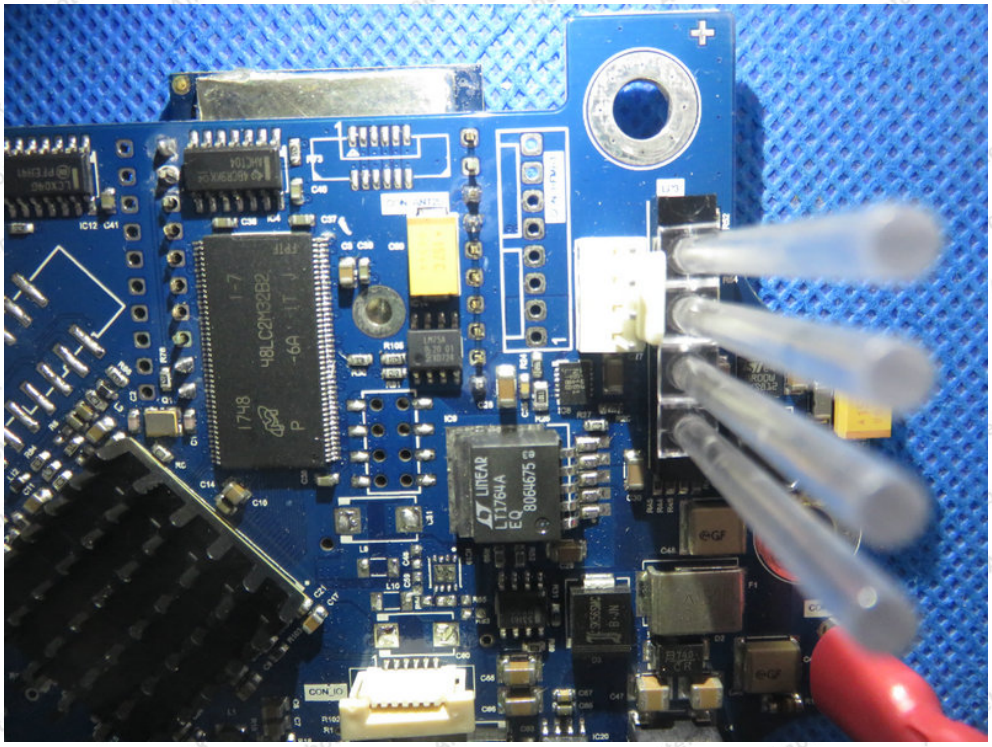
IS1107C
Anbotek
Product Safety
安博检测

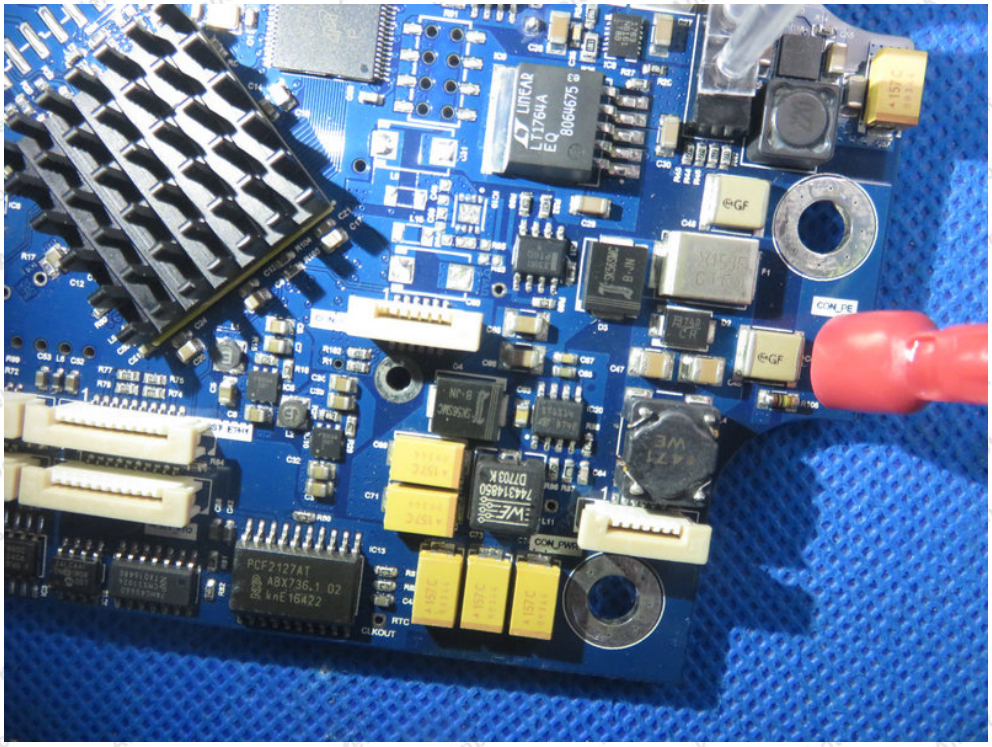


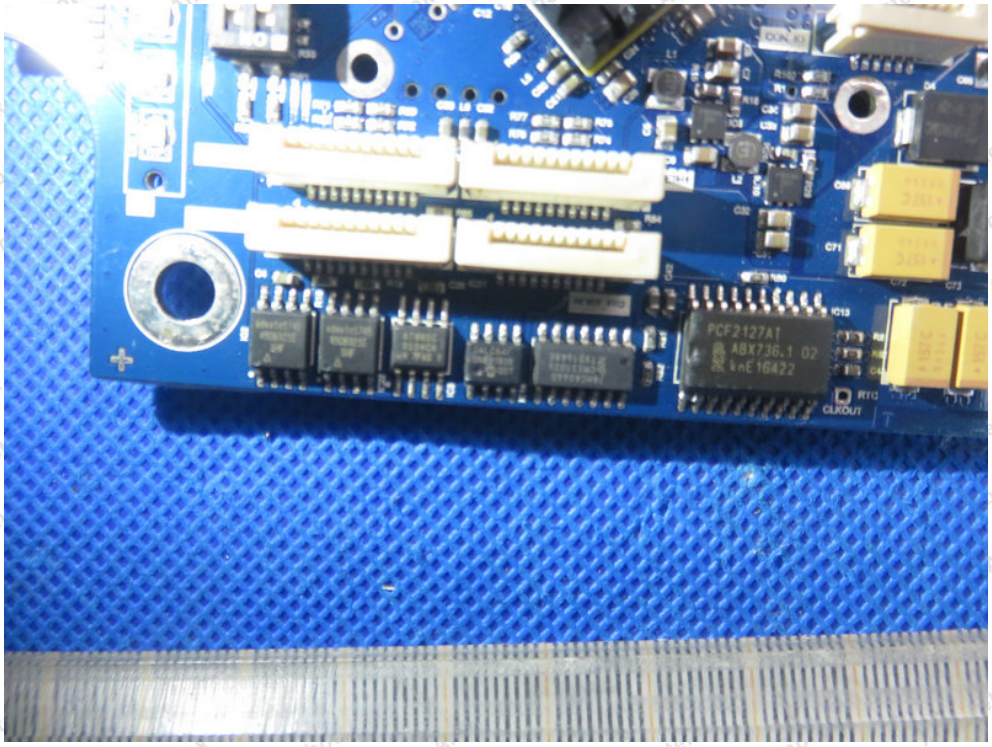


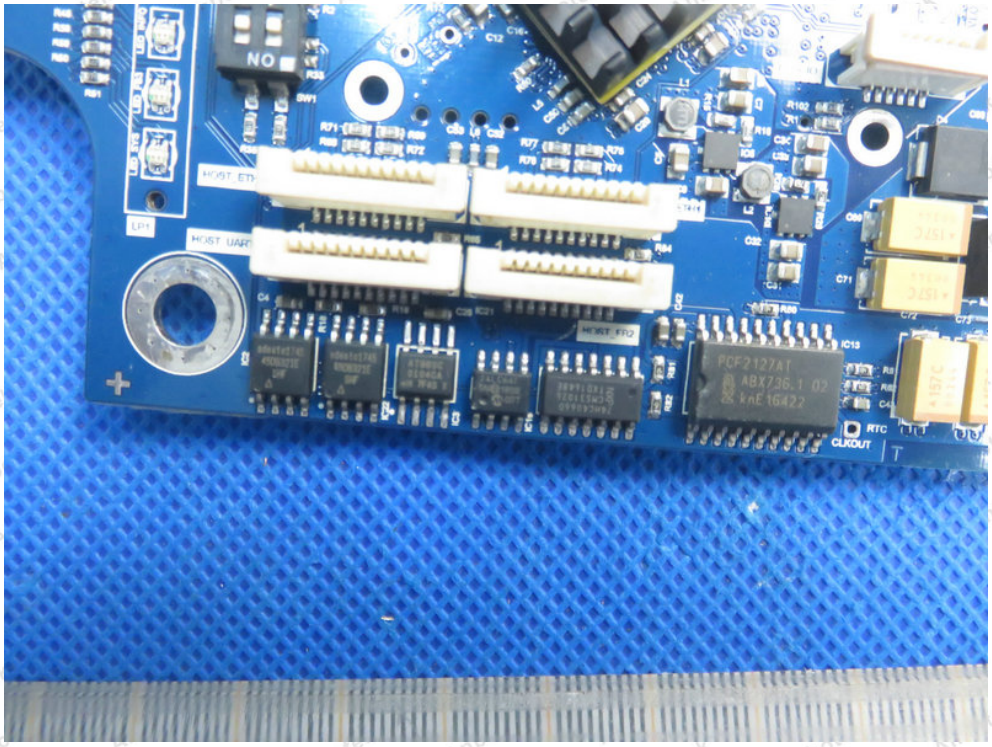
Anbotek
Product Safety
安博检测

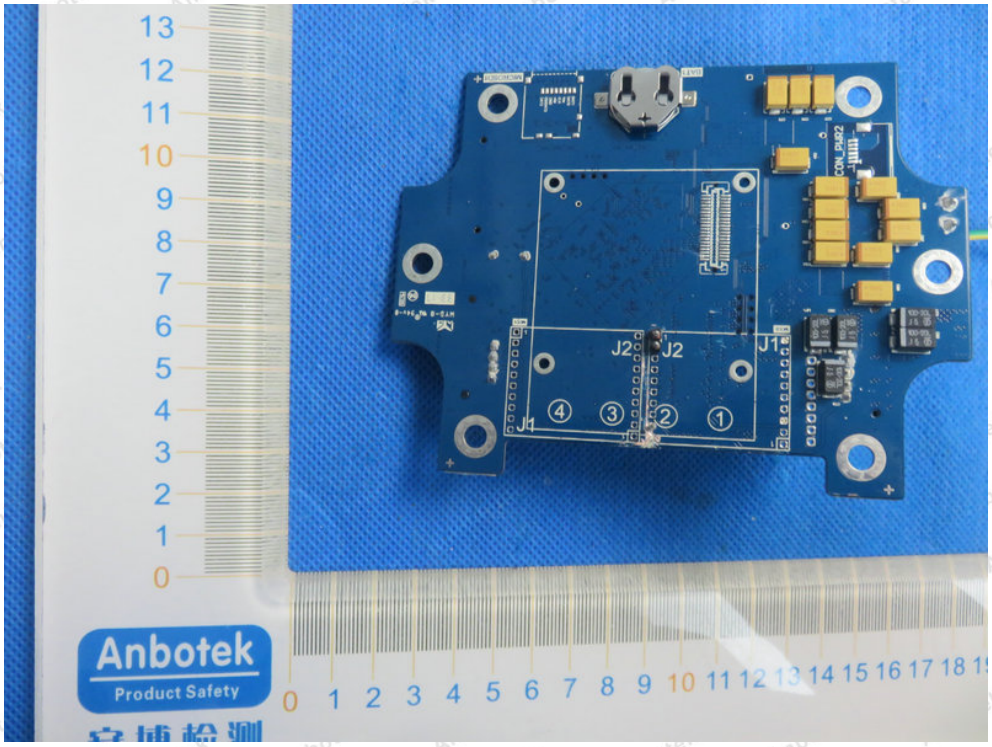

J2
J1
Anbotek
Product Safety

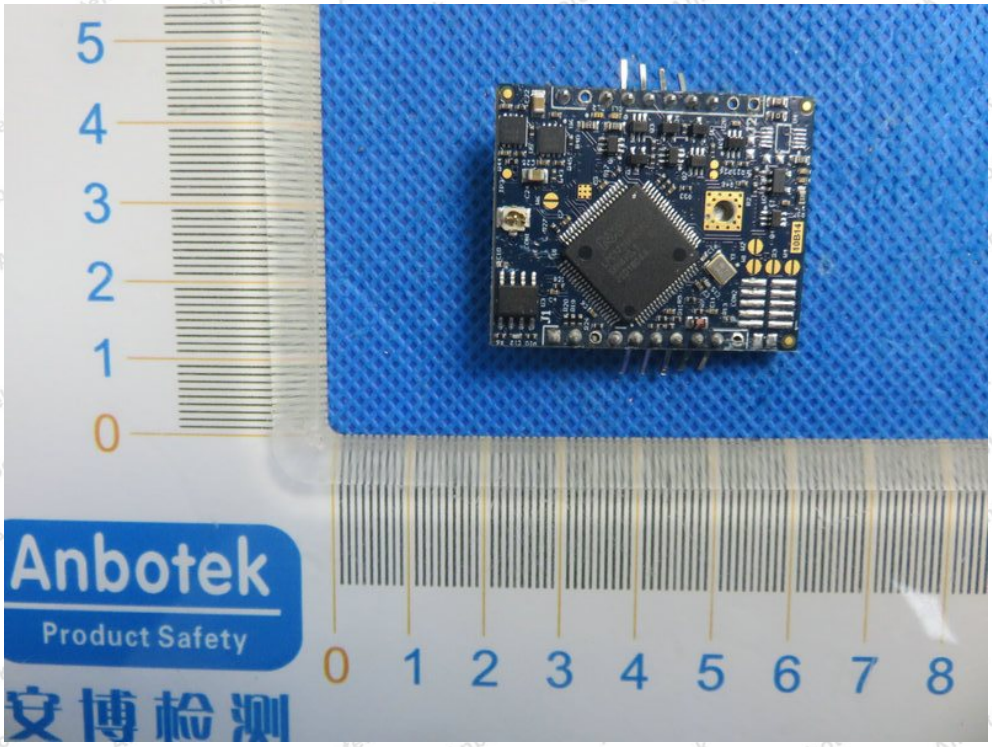

LINEAR
LT1764A







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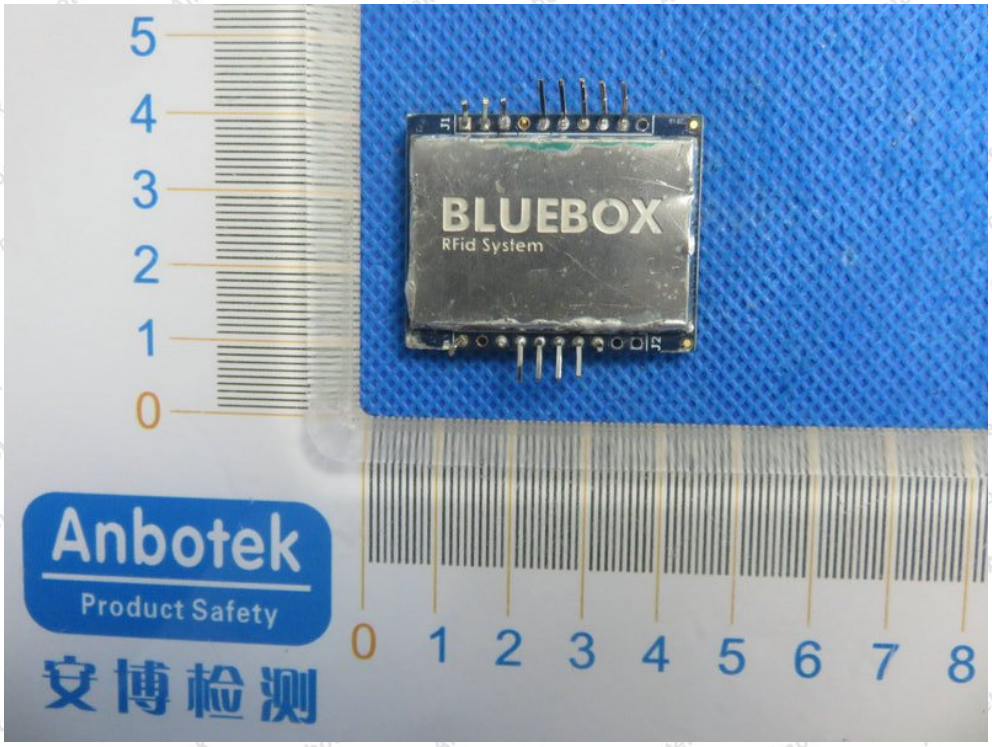
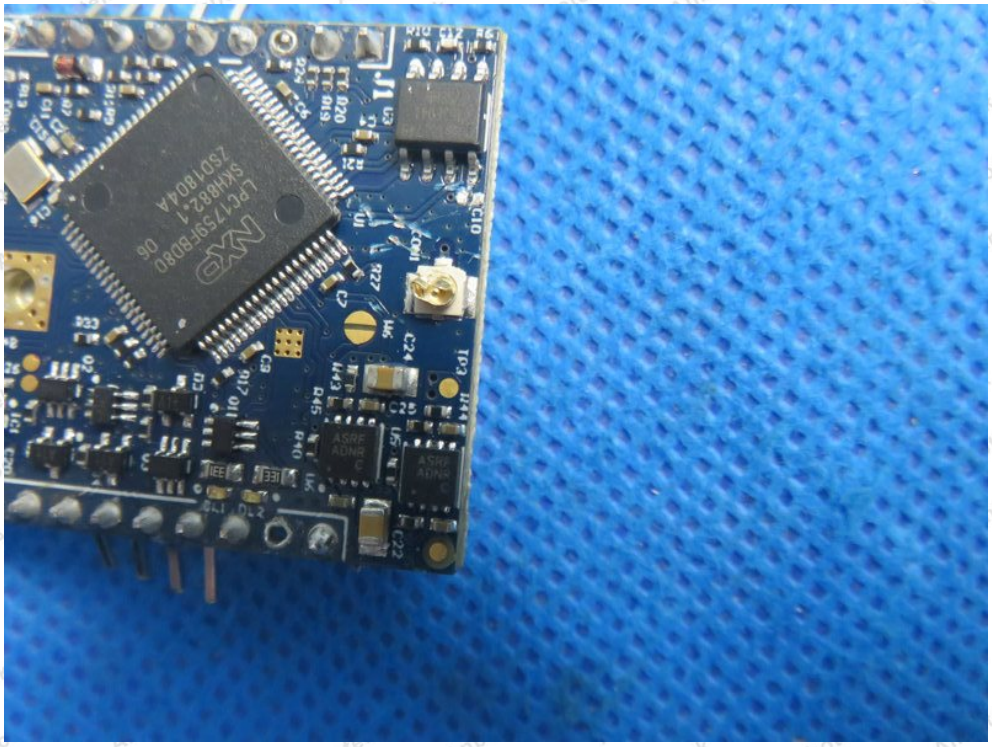
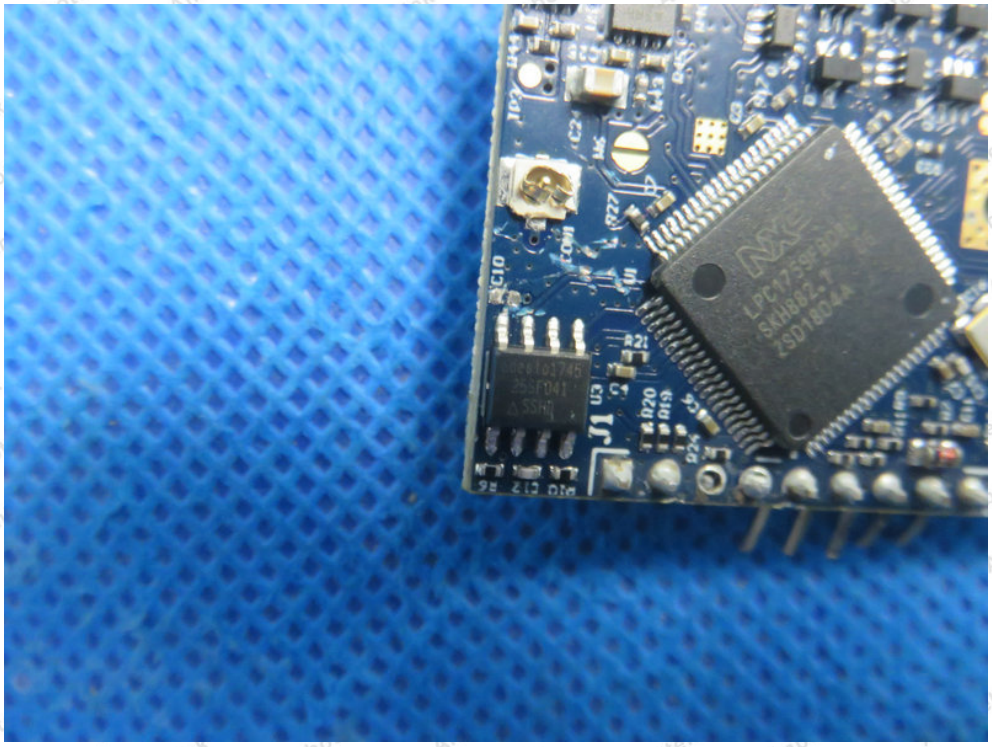
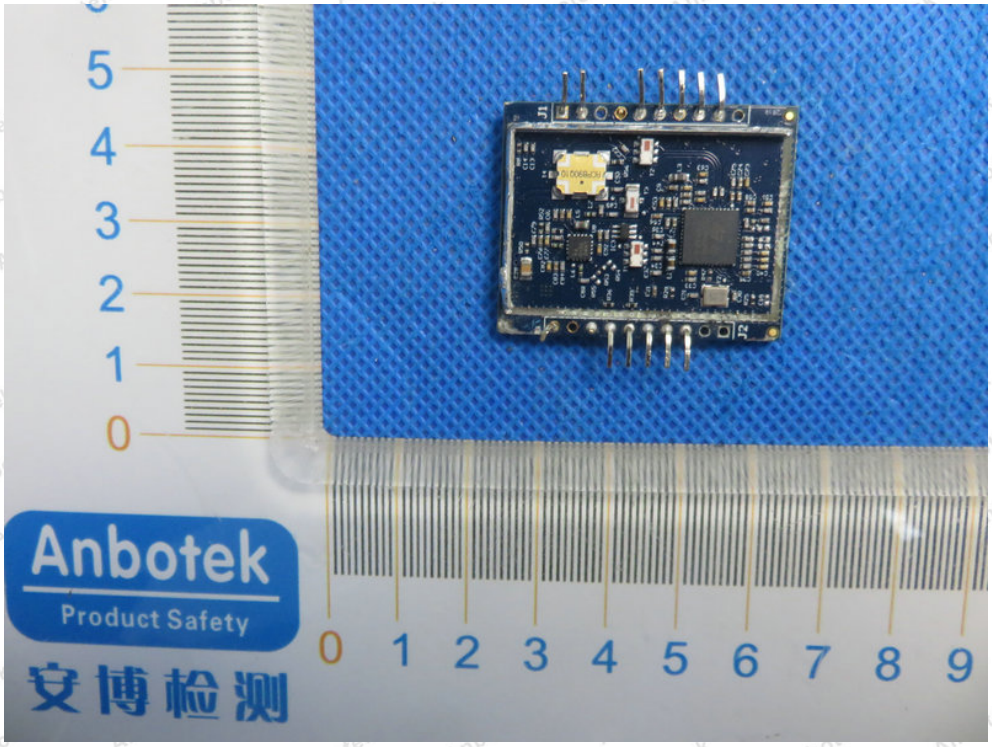
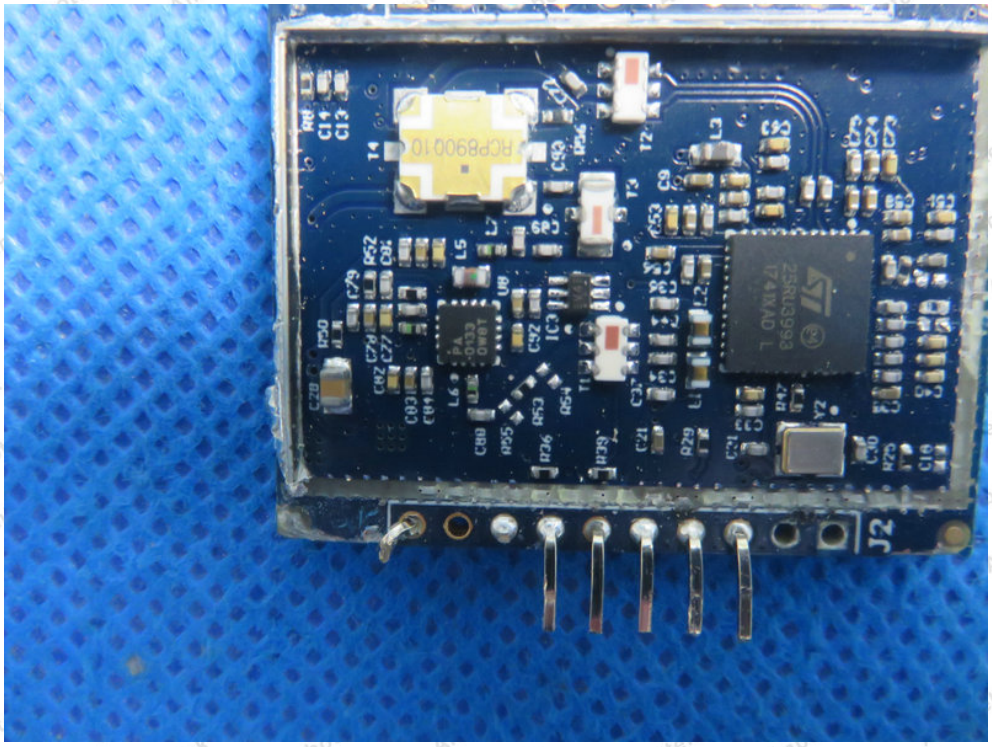
Product Safety
安博检测


BLUEBOX
RFid System
Anbotek
Product Safety
安博检测









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