

FCC Test Report

Client Name : Ehuoyan Technology Co.,Ltd.

Address : 1306# HongFu Building, Beiqijia ChangPing District,
102209 Beijing, China

Product Name : NFC Reader Writer

Date : May 28, 2022

Shenzhen Anbotek Compliance Laboratory Limited



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TEST REPORT

Applicant : Ehuoyan Technology Co.,Ltd.
Manufacturer : Ehuoyan Technology Co.,Ltd.
Product Name : NFC Reader Writer
Model No. : ER719
Trade Mark : EHUOYAN
Rating(s) : Input: 5V= 0.12A Max

Test Standard(s) : FCC Part15 Subpart C, Section 15.225

Test Method(s) : ANSI C63.10: 2020

The device described above is tested by Shenzhen Anbotech 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 Anbotech 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 Anbotech Compliance Laboratory Limited.

Date of Receipt

May 13, 2022

Date of Test

May 13~25, 2022

Prepared By

Tu Tu Hong

(TuTu Hong)

Approved & Authorized Signer

Kingkong Jin

(Kingkong Jin)

1. General Information

1.1. Client Information

Applicant	:	Ehuoyan Technology Co.,Ltd.
Address	:	1306# HongFu Building, Beiqijia ChangPing District, 102209 Beijing, China
Manufacturer	:	Ehuoyan Technology Co.,Ltd.
Address	:	1306# HongFu Building, Beiqijia ChangPing District, 102209 Beijing, China
Factory	:	Ehuoyan Technology Co.,Ltd.
Address	:	1306# HongFu Building, Beiqijia ChangPing District, 102209 Beijing, China

1.2. Description of Device (EUT)

Product Name	:	NFC Reader Writer	
Model No.	:	ER719	
Trade Mark	:	EHUOYAN	
Test Power Supply	:	DC 5V from PC input AC 120V/60Hz/ DC 5V from PC	
Product Description	:	Operation Frequency:	13.56MHz
	:	Modulation Type:	ASK
	:	Antenna Type:	PCB Antenna
	:	Antenna Gain(Peak):	0 dBi (Provide by customer)
	:	Adapter:	N.A
Remark: 1) For a more detailed features description, please refer to the manufacturer's specifications or the User's Manual.			
2) This report is for 13.56MHz module.			

1.3. Auxiliary Equipment Used During Test

AppleMacBook	:	Model: A1708 Input: 20.3V/3A CMIIT ID:2016AJ5746
Adapter		Input: AC 100-240V, 1.5A, 50-60Hz Output: 20.3V/3A (USB PD) or 9V/3A(USB PD) or 5.2V/2.4A

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	NFC Mode

For Conduction Emission	
Final Test Mode	Description
Mode 1	NFC Mode

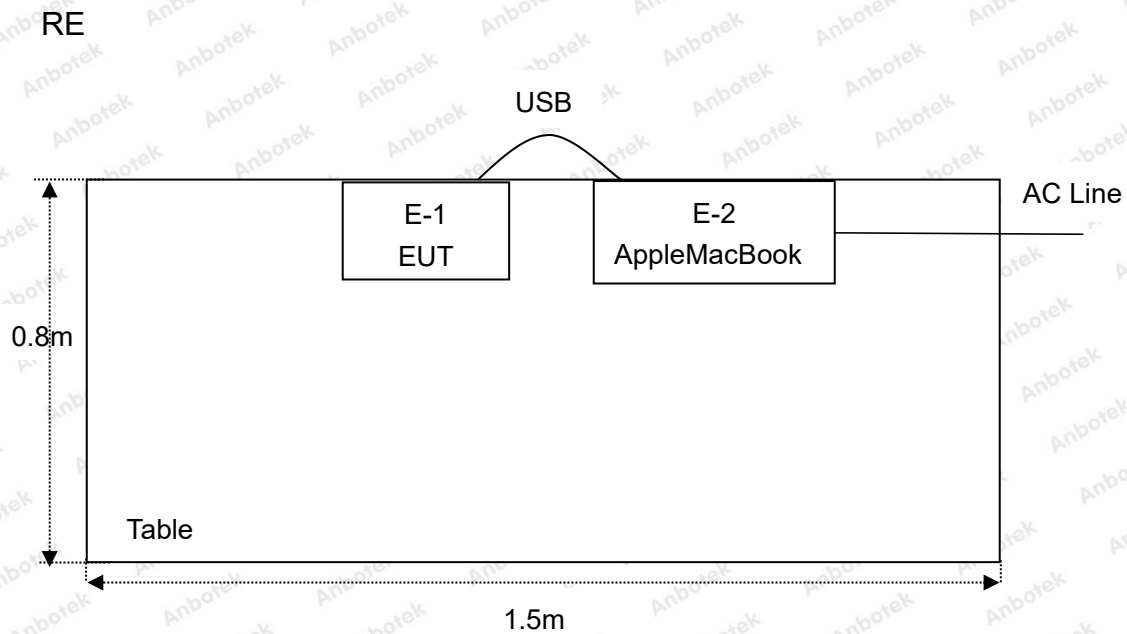
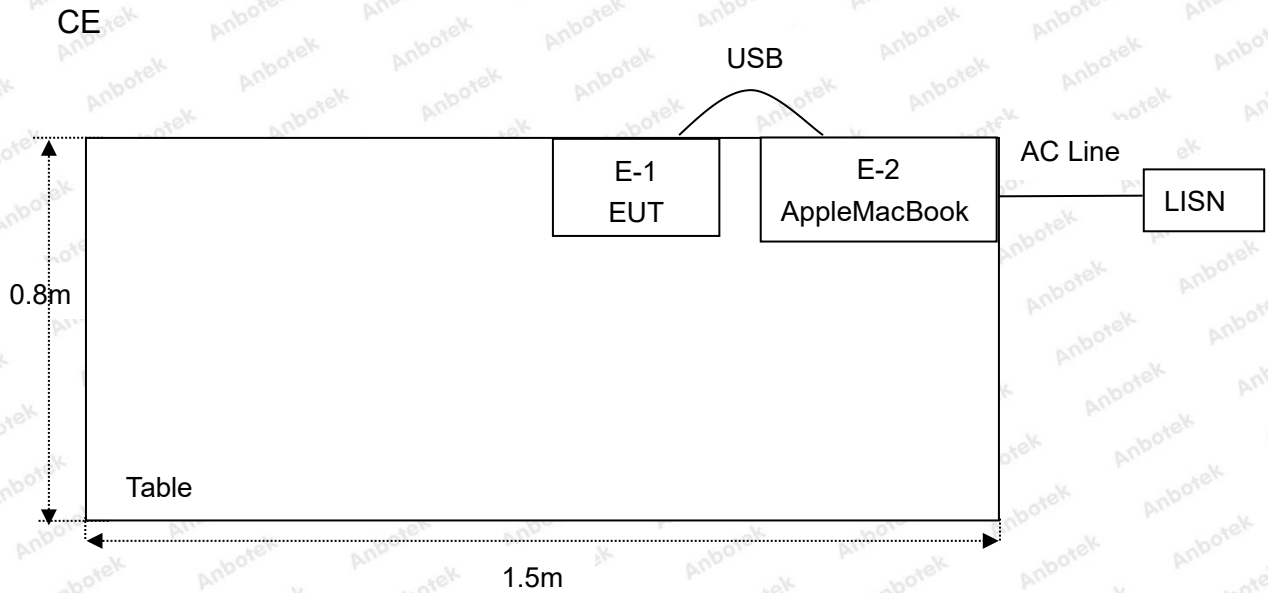
For Radiated Emission	
Final Test Mode	Description
Mode 1	TX Mode

Note: During the test, the EUT was keeping continuous transmission.

1.5. List of channels

Channel	Freq. (MHz)
01	13.56

1.6. Description Of Test Setup



1.7. Test Equipment List

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Three Phase V-type Artificial Power Network	CYBERTEK	EM5040DT	E215040DT001	Jul 05, 2021	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 22, 2021	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 22, 2021	1 Year
4.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 22, 2021	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 22, 2021	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30D	KD17503	Oct. 22, 2021	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Oct. 22, 2021	2 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Oct. 22, 2021	2 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Oct. 22, 2021	2 Year
10.	Horn Antenna	A-INFO	LB-180400-KF	J211060628	Oct. 22, 2021	2 Year
11.	Pre-amplifier	SONOMA	310N	186860	Oct. 22, 2021	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	Oct. 22, 2021	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Oct. 22, 2021	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Oct. 22, 2021	1 Year
16.	MXA Spectrum Analysis	KEYSIGHT	N9020A	MY53280032	Oct. 22, 2021	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 22, 2021	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 22, 2021	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 22, 2021	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80B	N/A	Oct. 22, 2021	1 Year

1.8. Measurement Uncertainty

Radiation Uncertainty	:	Ur = 3.9 dB (Horizontal)
		Ur = 3.8 dB (Vertical)
Conduction Uncertainty	:	Uc = 3.4 dB

1.9. 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 registered 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.

ISED-Registration No.: 8058A

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.

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	Antenna Requirement	PASS
15.207	Conducted Emission	PASS
15.205/15.209/15.225(b)	Spurious Emission	PASS
15.225(c)	20dB Occupied Bandwidth	PASS
15.225	Frequency Tolerance	PASS
Remark: "N/A" is an abbreviation for Not Applicable.		

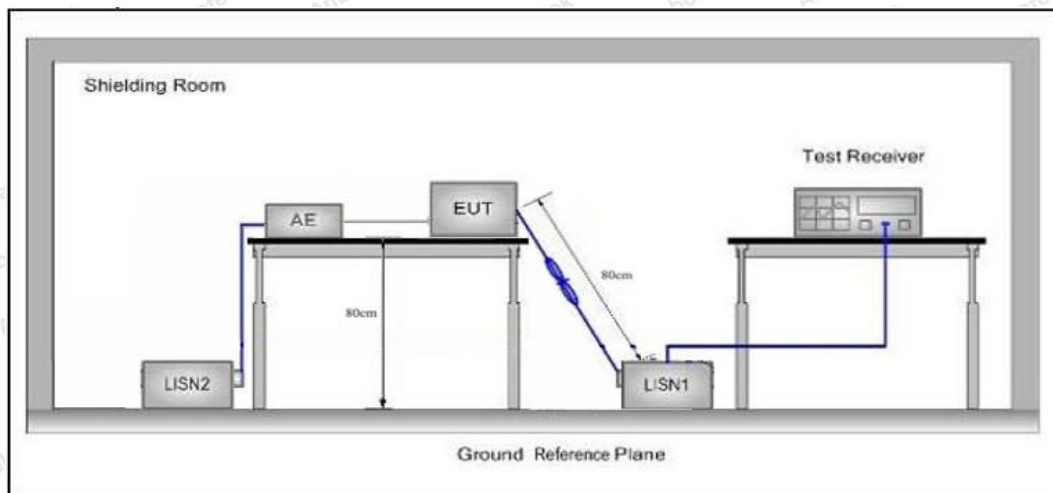
3. Conducted Emission Test

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 C63.10-2020 on Conducted Emission Measurement.

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

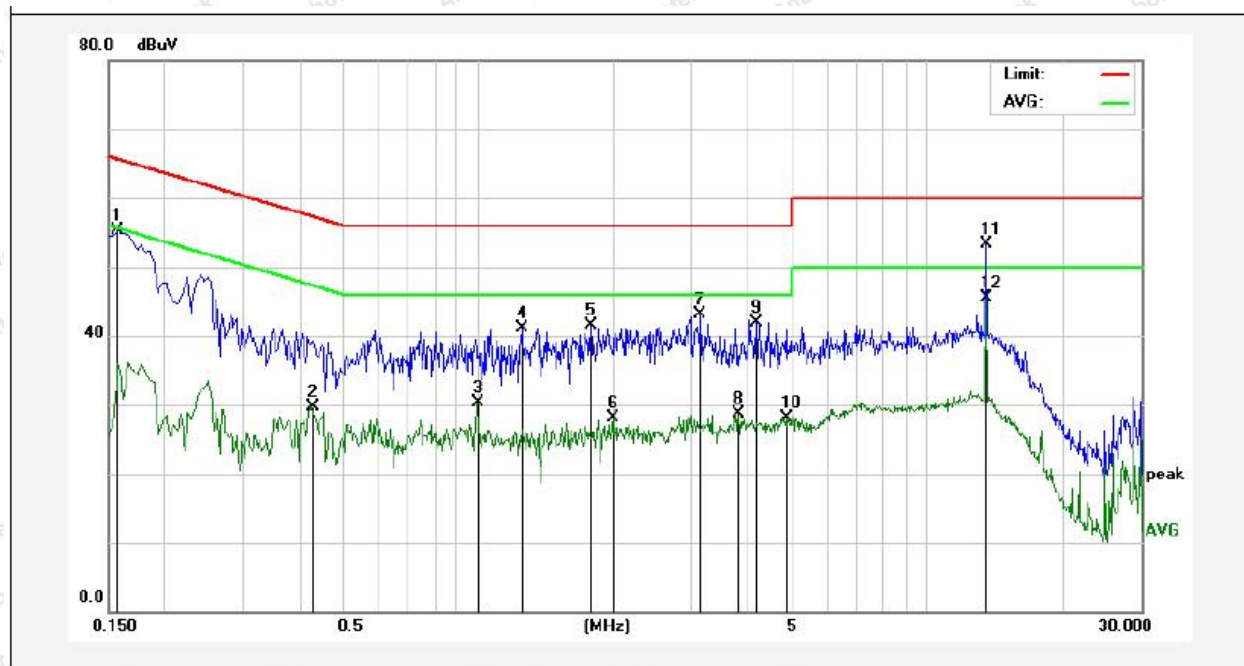
The frequency range from 150kHz to 30MHz is checked.

3.4. Test Data

Please to see the following pages.

Conducted Emission Test Data

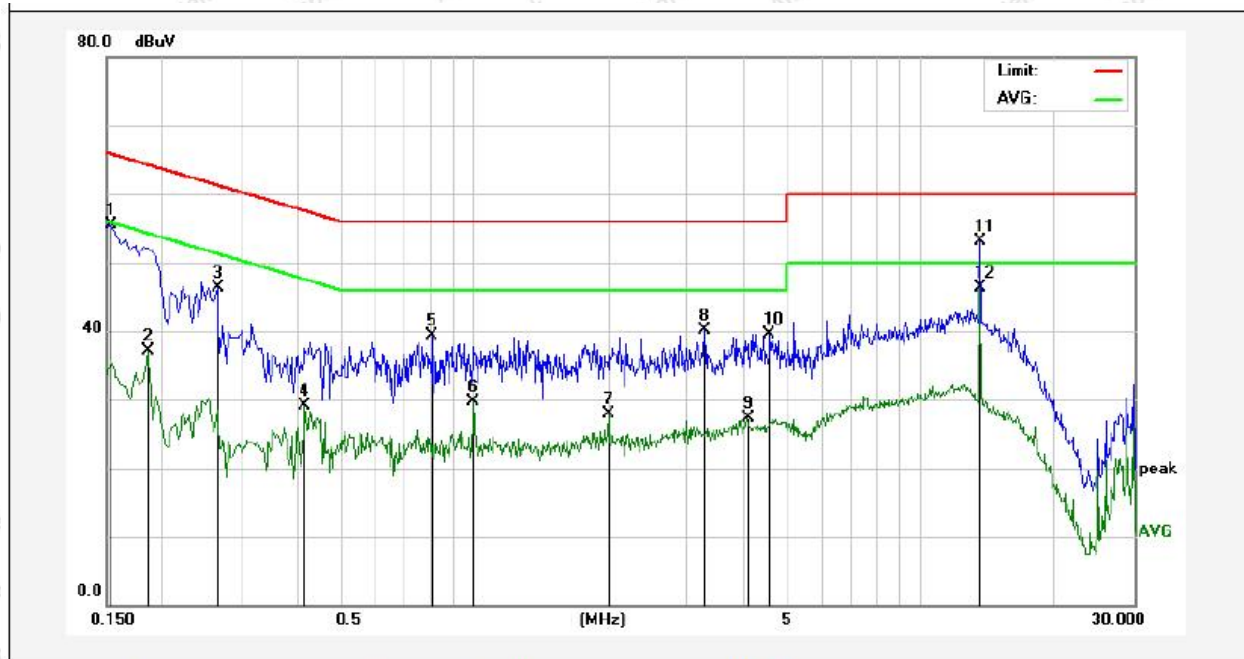
Test Site: 1# Shielded Room
Operating Condition: Mode 1
Test Specification: DC 5V from PC input AC 120V/60Hz
Comment: Live Line
Tem.: 23.7°C Hum.: 49%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1580	55.22	0.12	55.34	65.56	-10.22	QP	
2	0.4260	29.56	0.12	29.68	47.33	-17.65	AVG	
3	0.9980	30.15	0.15	30.30	46.00	-15.70	AVG	
4	1.2540	40.99	0.14	41.13	56.00	-14.87	QP	
5	1.7860	41.35	0.13	41.48	56.00	-14.52	QP	
6	1.9940	28.05	0.12	28.17	46.00	-17.83	AVG	
7	3.1260	42.90	0.12	43.02	56.00	-12.98	QP	
8	3.8020	28.50	0.12	28.62	46.00	-17.38	AVG	
9	4.1619	41.88	0.11	41.99	56.00	-14.01	QP	
10	4.8619	27.99	0.11	28.10	46.00	-17.90	AVG	
11	13.5617	53.11	0.16	53.27	60.00	-6.73	QP	
12	13.5617	45.27	0.16	45.43	50.00	-4.57	AVG	

Conducted Emission Test Data

Test Site: 1# Shielded Room
Operating Condition: Mode 1
Test Specification: DC 5V from PC input AC 120V/60Hz
Comment: Neutral Line
Tem.: 23.7°C Hum.: 49%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1539	55.38	0.12	55.50	65.78	-10.28	QP	
2	0.1860	36.93	0.12	37.05	54.21	-17.16	AVG	
3	0.2660	46.09	0.13	46.22	61.24	-15.02	QP	
4	0.4180	28.99	0.12	29.11	47.49	-18.38	AVG	
5	0.8059	39.25	0.15	39.40	56.00	-16.60	QP	
6	0.9980	29.49	0.15	29.64	46.00	-16.36	AVG	
7	1.9940	27.80	0.12	27.92	46.00	-18.08	AVG	
8	3.2860	39.96	0.12	40.08	56.00	-15.92	QP	
9	4.0780	27.27	0.11	27.38	46.00	-18.62	AVG	
10	4.5820	39.30	0.11	39.41	56.00	-16.59	QP	
11	13.5617	52.89	0.16	53.05	60.00	-6.95	QP	
12	13.5617	46.19	0.16	46.35	50.00	-3.65	AVG	

4. Radiation Spurious Emission and Band Edge

4.1. Test Standard and Limit

Test Standard	FCC Part15 C Section 15.209, 15.205 and 15.225(a)				
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.

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110–14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

Note:

(1) The tighter limit shall apply at the boundary between two frequency range.

(2) Limitation expressed in dBuV/m is calculated by $20\log$ Emission Level (uV/m).

(3) If measurement is made at 3m distance, then F.S Limitation at 3m distance is adjusted by using the formula of $Ld1 = Ld2 * (d2/d1)^2$.

Example:

F.S Limit at 30m distance is 30uV/m , then F.S Limitation at 3m distance is adjusted as $Ld1 = L1 = 30uV/m * (10)^2 = 100 * 30 uV/m$

4.2. Test Setup

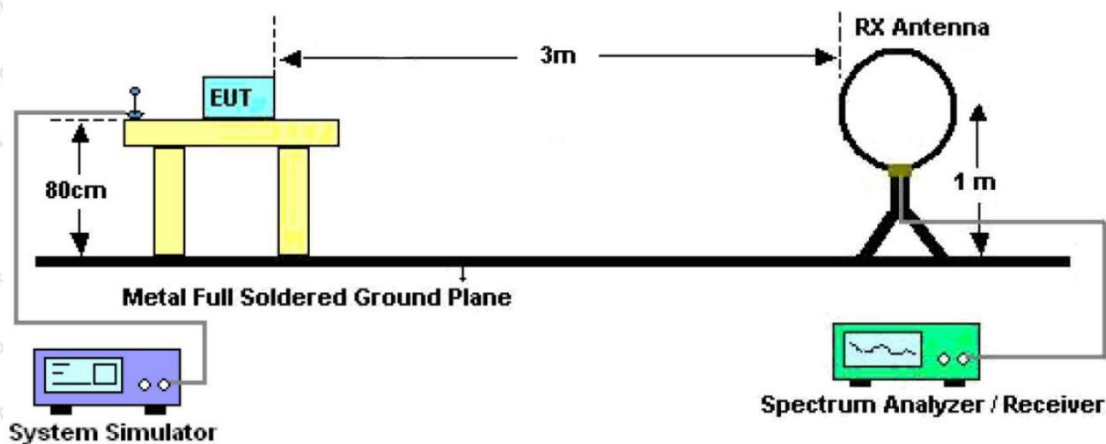


Figure 1. Below 30MHz

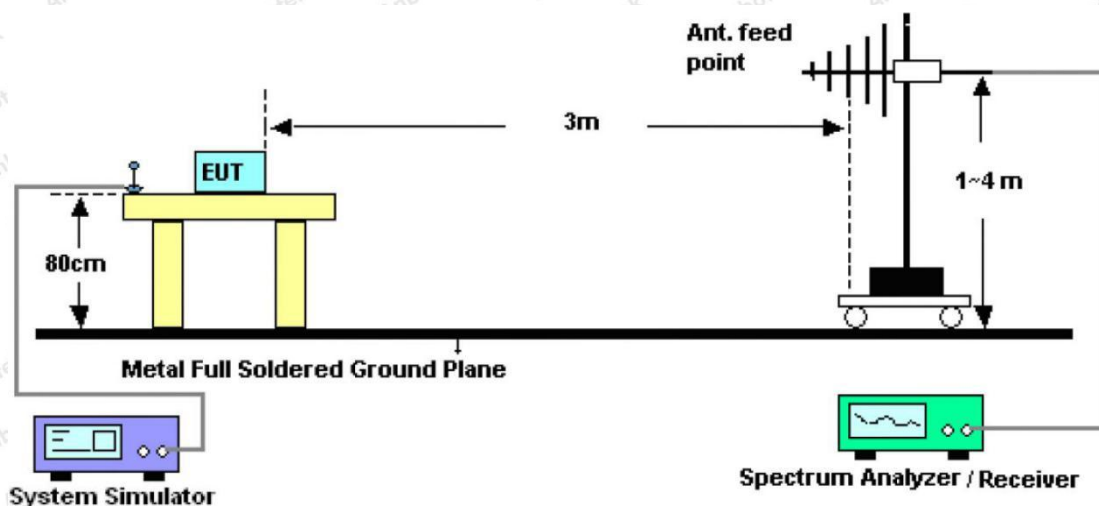


Figure 2. 30MHz to 1GHz

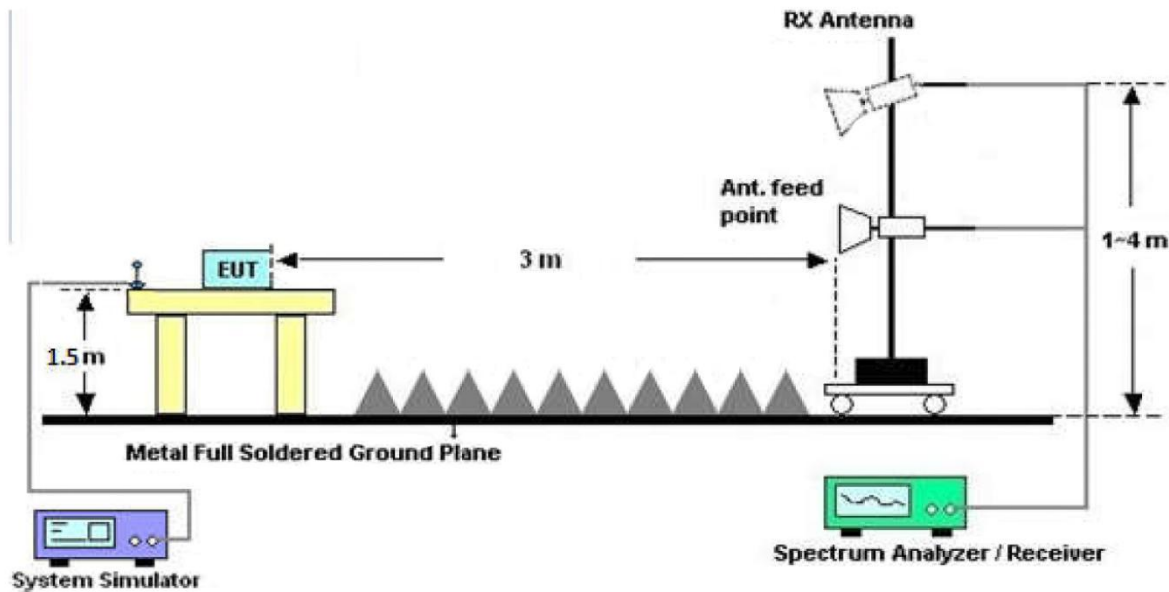


Figure 3. Above 1 GHz

4.3. Test Procedure

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

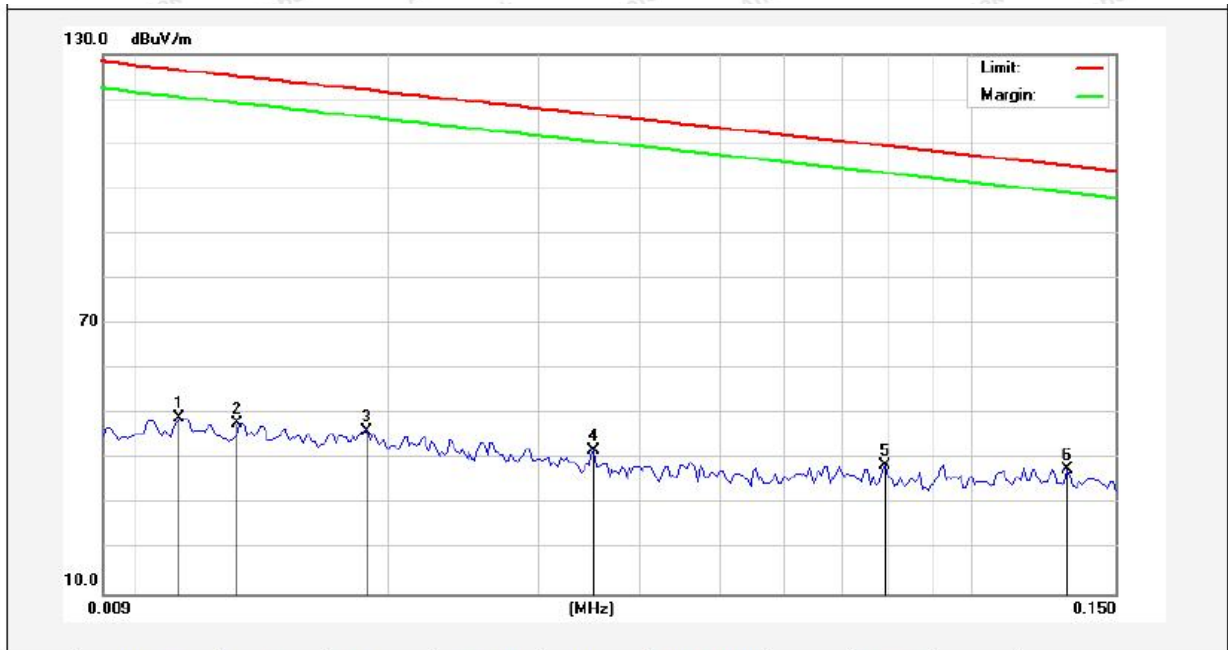
Test Results (9KHz~150KHz)

Test Mode: Mode 1

Power Source: DC 5V from PC

Polarization: Y

Temp.(°C)/Hum.(%RH): 23.3°C/48%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	0.0111	28.95	20.07	49.02	126.50	-77.48	AV			
2	0.0131	27.87	20.16	48.03	125.07	-77.04	AV			
3	0.0187	25.94	20.28	46.22	121.99	-75.77	AV			
4	0.0352	21.56	20.48	42.04	116.53	-74.49	AV			
5	0.0791	18.31	20.36	38.67	109.54	-70.87	AV			
6	0.1312	17.46	20.34	37.80	105.17	-67.37	AV			

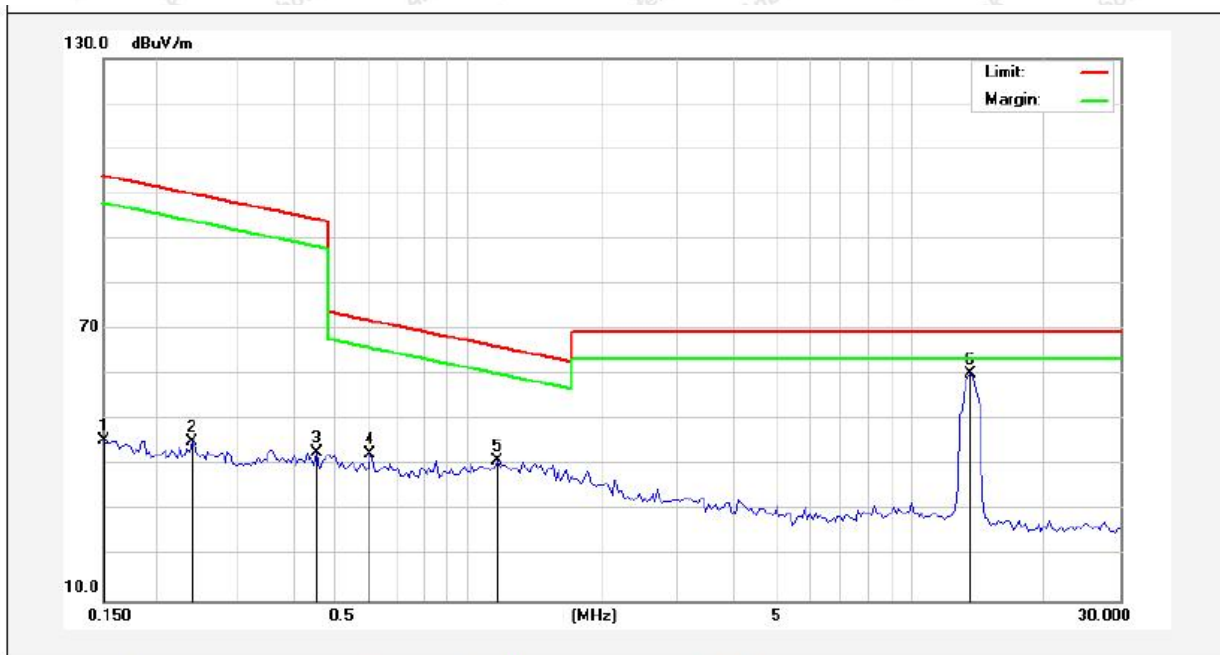
Test Results (150KHz~30MHz)

Test Mode: Mode 1

Power Source: DC 5V from PC

Polarization: Y

Temp.(°C)/Hum.(%RH): 23.3°C/48%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	0.1499	25.27	20.33	45.60	104.02	-58.42	AV			
2	0.2384	24.93	20.30	45.23	100.02	-54.79	AV			
3	0.4561	22.61	20.27	42.88	94.42	-51.54	AV			
4	0.6027	22.21	20.27	42.48	72.01	-29.53	QP			
5	1.1688	20.82	20.26	41.08	66.27	-25.19	QP			
6	13.5600	39.64	20.53	60.17	69.50	-9.33	QP			

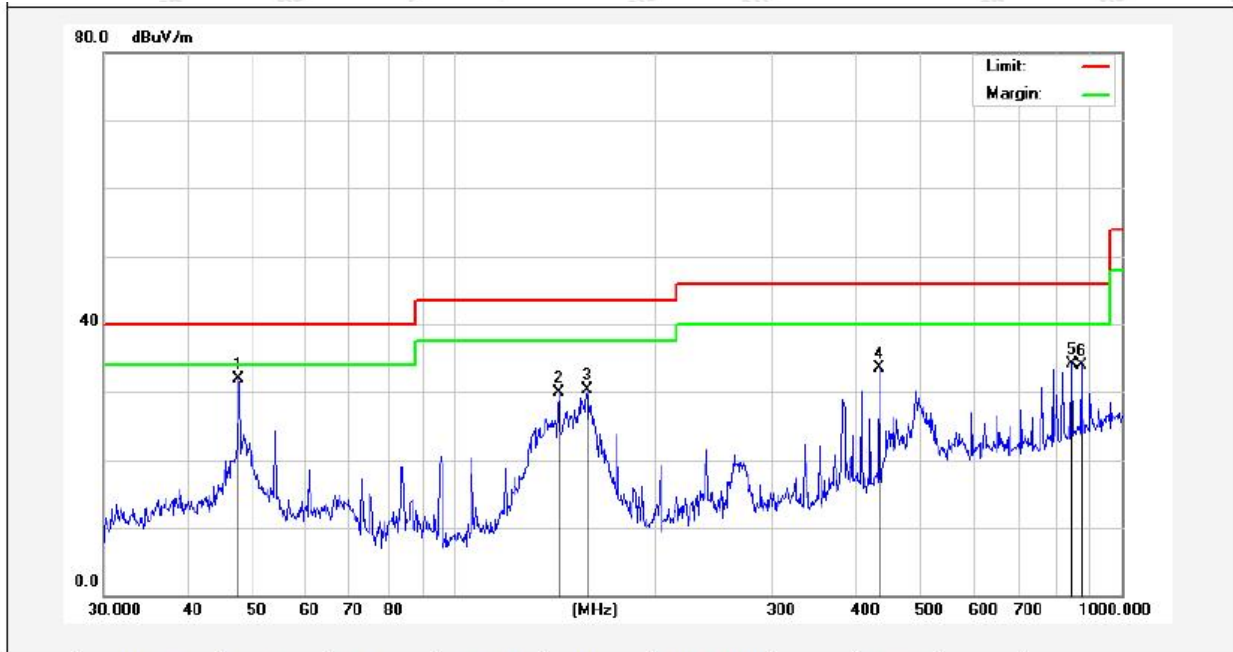
Test Results (30~1000MHz)

Test Mode: Mode 1

Power Source: DC 5V from PC

Polarization: Vertical

Temp.(°C)/Hum.(%RH): 24.1°C/48%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	47.8260	47.43	-15.45	31.98	40.00	-8.02	QP			
2	143.8295	52.11	-22.15	29.96	43.50	-13.54	QP			
3	158.6677	51.95	-21.70	30.25	43.50	-13.25	QP			
4	434.0651	47.37	-13.93	33.44	46.00	-12.56	QP			
5	842.1296	41.73	-7.61	34.12	46.00	-11.88	QP			
6	869.1302	40.86	-7.00	33.86	46.00	-12.14	QP			

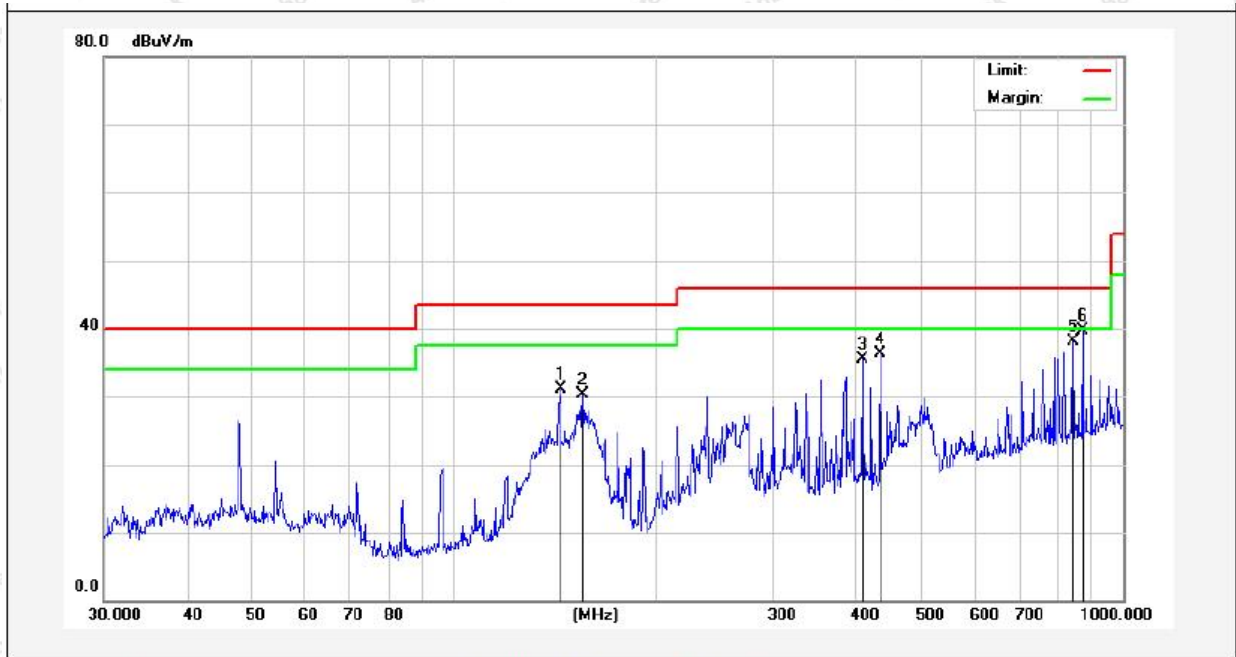
Test Results (30~1000MHz)

Test Mode: Mode 1

Power Source: DC 5V from PC

Polarization: Horizontal

Temp.(°C)/Hum.(%RH): 24.1°C/48%RH



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	144.3348	54.08	-22.98	31.10	43.50	-12.40	QP			
2	155.9101	53.88	-23.54	30.34	43.50	-13.16	QP			
3	407.5145	51.49	-16.04	35.45	46.00	-10.55	QP			
4	434.0651	51.92	-15.70	36.22	46.00	-9.78	QP			
5	842.1296	45.70	-7.61	38.09	46.00	-7.91	QP			
6	869.1302	46.77	-7.00	39.77	46.00	-6.23	QP			

Test Results (Inband)

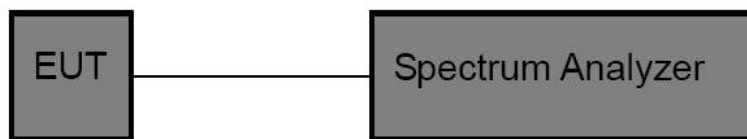
Indicated			Table Angle Degree	Antenna Height (m)	Detector	Correction Factor			Corrected Amplitude (dBuV/m) @3m	FCC part 15.225	
Frequency Range (MHz)	Mark Point (MHz)	Corrected Amplitude (dBuV/m) @3m				Ant. Factor (dB)	Cable Loss (dB)	Pre-Amp. Gain (dB)		Limit (dBuV/m) @3m	Result
13.110~13.410	13.387	76.10	0	1.0	QP	20.8	0.2	30.2	66.90	80.5	PASS
13.410~13.553	13.547	70.61	0	1.0	QP	20.9	0.2	30.2	61.51	90.5	PASS
13.553~13.567	13.558	91.67	0	1.0	QP	20.9	0.2	30.2	82.57	124	PASS
13.567~13.710	13.576	69.92	0	1.0	QP	21.1	0.2	30.2	61.02	90.5	PASS
13.710~14.010	13.889	70.18	0	1.0	QP	21.2	0.2	30.2	61.38	80.5	PASS

5. Frequency Tolerance

5.1. Test Requirement

According to FCC section 15.225, the devices operating in the 13.553~13.567 MHz shall maintain the carrier frequency within 0.01% of the operating frequency over the temperature variation of -20°C to +50°C using an environmental chamber. The primary supply voltage is varied from 85% to 115% of the voltage normally at the input to the device or at the power supply terminals if cables are not normally supplied.

5.2. Test Setup



5.3. Test Procedure

Let the EUT works on temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.4. Test Data

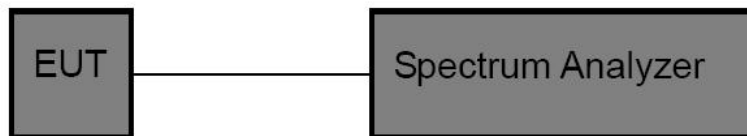
Test Condition					
	Voltage (VDC)	Temperature (°C)	Measured frequency (MHz)	Error (ppm)	Limit (ppm)
Normal Condition	5.00	-20	13.560649	47.86	100
		+20	13.560601	44.29	100
		+50	13.560570	42.02	100
Extreme Condition	4.25	+20	13.560651	48.02	100
	5.75	+20	13.560618	45.59	100

6. 20DB Occupy Bandwidth Test

6.1. Test Standard and Limit

According to FCC section 15.215(c), the 20dB bandwidth should be contained within the frequency band designated in the rule section under which the EUT is operated, it was measured with a spectrum analyzer connected the EUT while the EUT is operating in transmission mode.

6.2. Test Setup



6.3. Test Procedure

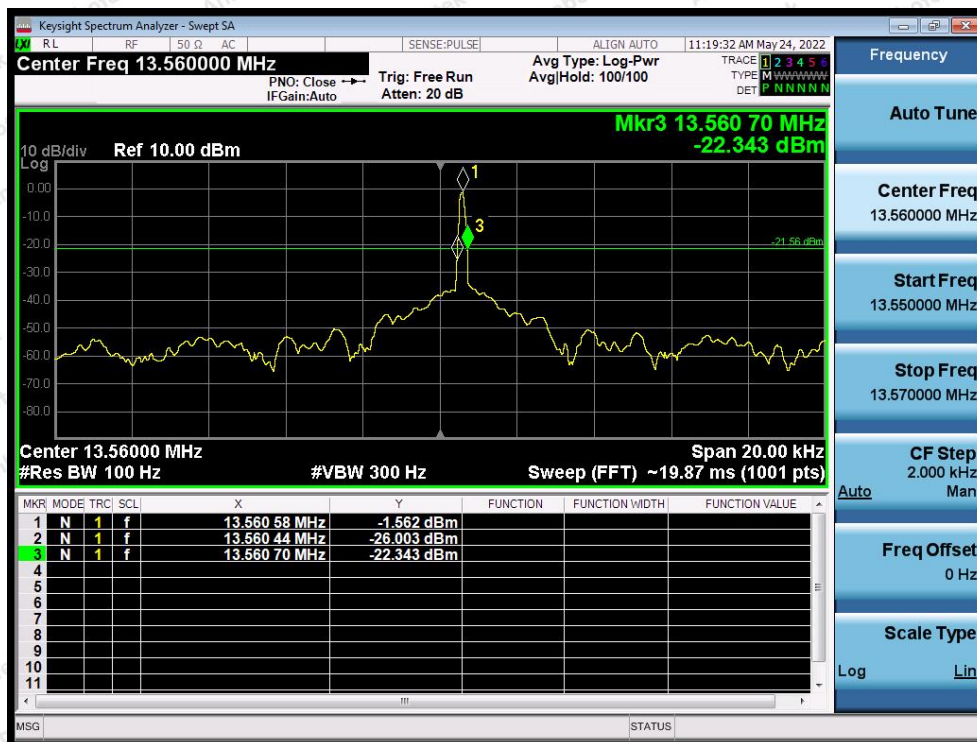
The bandwidth of the fundamental frequency was measured by spectrum analyzer with 3kHz RBW and VBW $\geq$ 3*RBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

6.4. Test Data

Test Item : 20dB Bandwidth
Test Voltage : DC 5V from PC
Test Result : PASS

Test Mode : Continuously transmitting
Temperature : 24℃
Humidity : 55%RH

Freq. (MHz)	Bandwidth (kHz)	Results
13.56	0.26	PASS



13.56MHz



7. Antenna Requirement

7.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 15.203
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. Antenna requirement must meet at least one of the following: 1) Antenna must be permanently attached to device. 2) The antenna must use a unique type of connector to attach to the device. 3) Device must be professionally installed. The installer shall be responsible for ensuring that the correct antenna is employed by the device.

7.2. Antenna Connected Construction

The antenna is a PCB Antenna which permanently attached, and the best case gain of the antenna is 0 dBi. It complies with the standard requirement.

APPENDIX I -- TEST SETUP PHOTOGRAPH

Photo of Conducted Emission Measurement



Photo of Radiation Emission Test

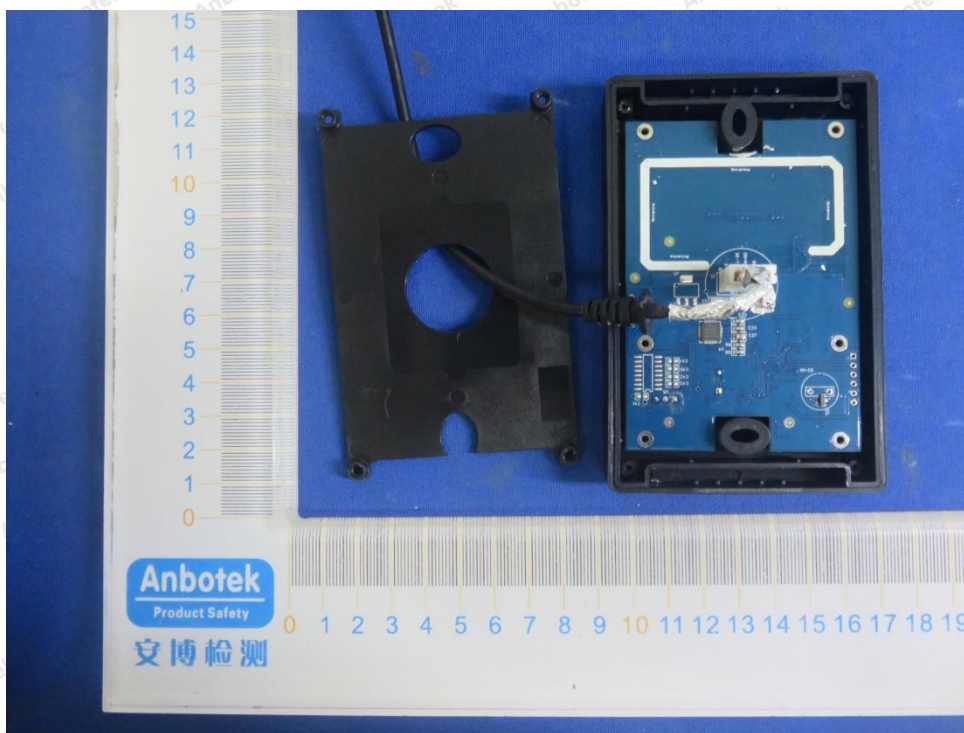


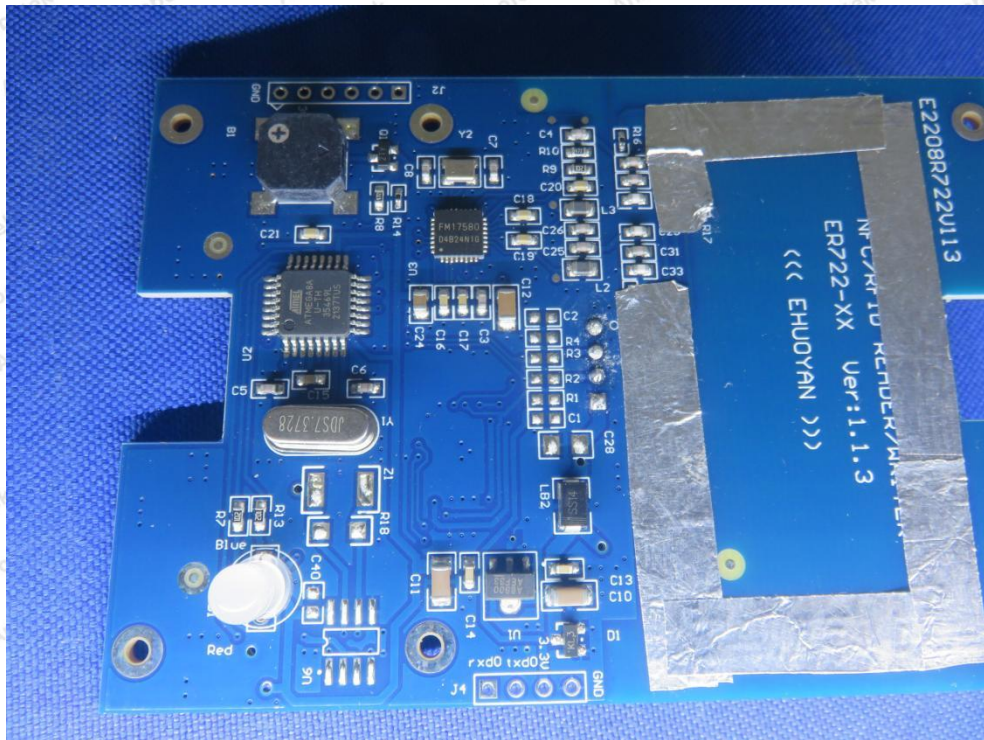
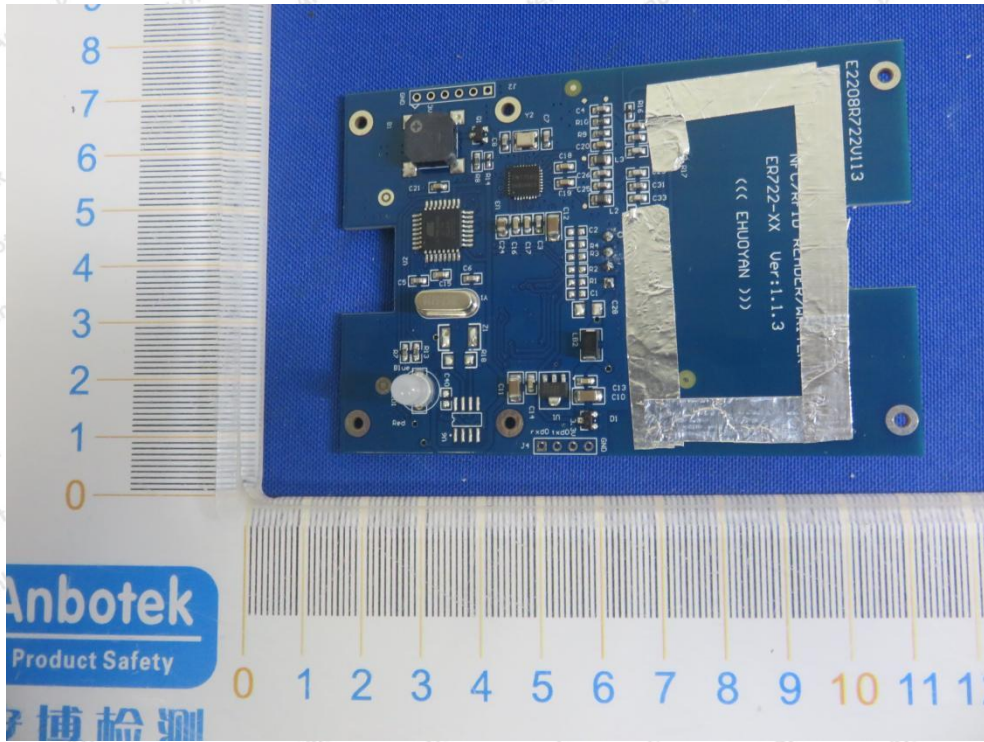


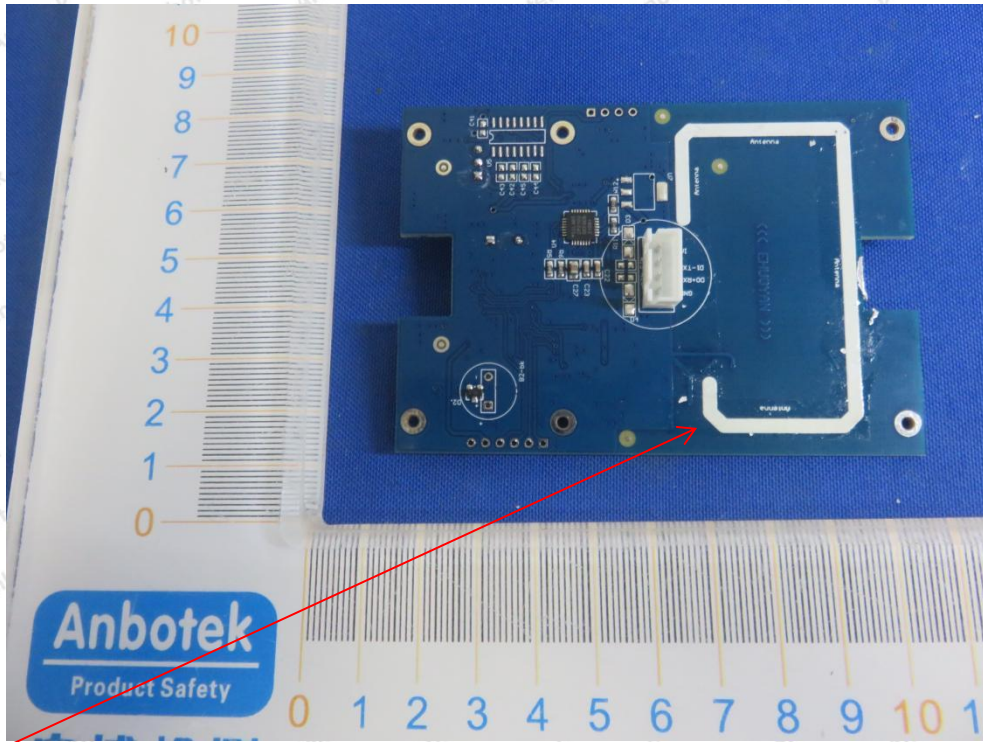
APPENDIX II -- EXTERNAL PHOTOGRAPH



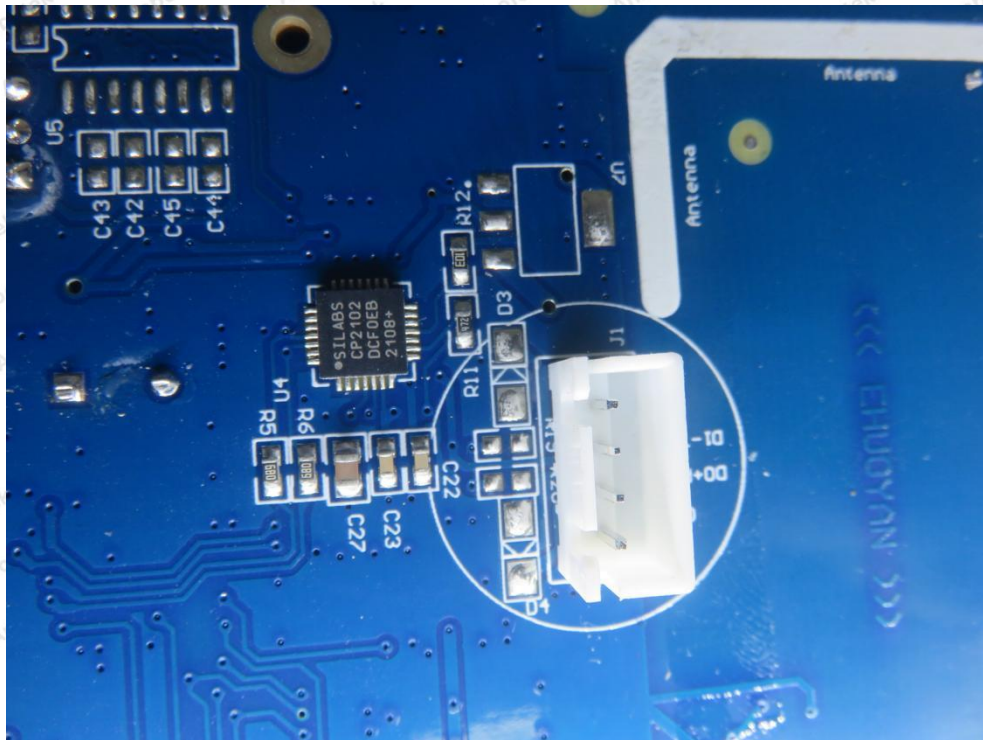


APPENDIX III -- INTERNAL PHOTOGRAPH





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