

FCC TEST REPORT

Client Name : FERMAX ELECTRONICA, S.A.U.

Address : AV. TRES CRUCES, 133, VALENCIA Spain 46017

Product Name : RESISTANT KEYPAD AND PROX READER

Date : Jan. 13, 2021

Shenzhen Anbotech Compliance Laboratory Limited



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TEST REPORT

Applicant : FERMAX ELECTRONICA, S.A.U.
Manufacturer : Secukey Technology Co., Ltd.
Product Name : RESISTANT KEYPAD AND PROX READER
Model No. : 5293, 5296
Trade Mark : FERMAX
Rating(s) : Input: AC 12-28V /DC 12-28V

Test Standard(s) : FCC Part15 Subpart C, Paragraph 15.209

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 Receipt

Dec. 02, 2020

Date of Test

Dec. 02~23, 2020

Prepared By

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Reviewer

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(Supervisor / Bibo Zhang)

Approved & Authorized Signer

Kingkong Jin

(Manager / Kingkong Jin)

1. General Information

1.1. Client Information

Applicant	:	FERMAX ELECTRONICA, S.A.U.
Address	:	AV. TRES CRUCES, 133, VALENCIA Spain 46017
Manufacturer	:	Secukey Technology Co., Ltd.
Address	:	Floor 5, Building 13, Longbi Industrial Park, Dafa Road, Bantian Subdistrict, Longgang District, Shenzhen, China
Factory	:	Secukey Technology Co., Ltd.
Address	:	Floor 5, Building 13, Longbi Industrial Park, Dafa Road, Bantian Subdistrict, Longgang District, Shenzhen, China

1.2. Description of Device (EUT)

Product Name	:	RESISTANT KEYPAD AND PROX READER
Model No.	:	5293, 5296 (Note: All samples are the same except the model number, so we prepare "5293" for test only.)
Trade Mark	:	FERMAX
Test Power Supply	:	AC12V /DC 12V
Test Sample No.	:	1-2-1(Normal Sample), 1-2-2(Engineering Sample)
Product Description	Operation Frequency:	125KHz
	Number of Channel:	1 Channels
	Modulation Type:	BPSK
	Antenna Type:	Inductive loop coil Antenna
	Antenna Gain(Peak):	0 dBi
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 125KHz module.		

1.3. Auxiliary Equipment Used During Test.

N/A	:	
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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.

For Conducted Emission	
Final Test Mode	Description
125KHz	TX

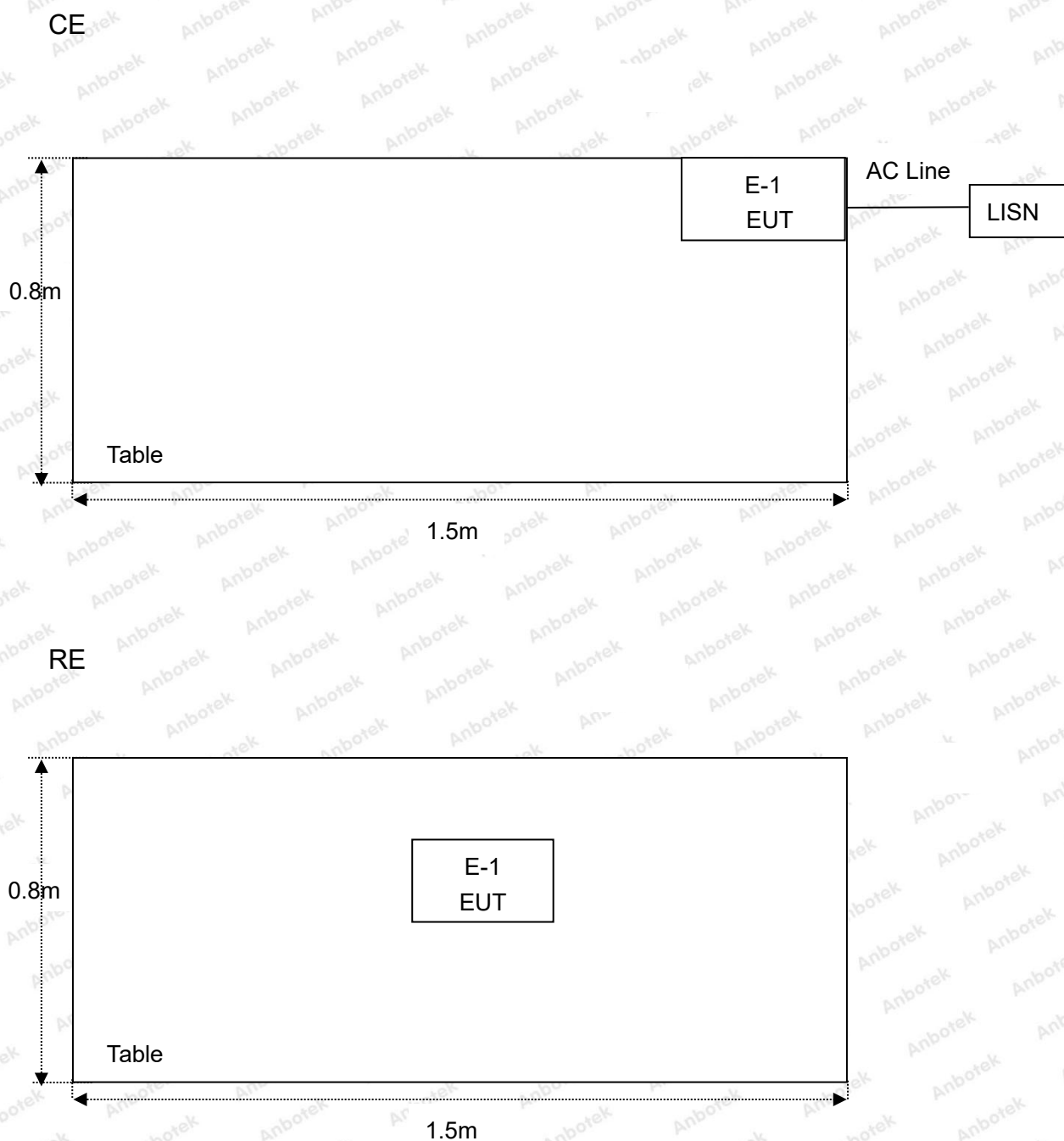
For Radiated Emission	
Final Test Mode	Description
125KHz	TX

1.5. List of Channels

Channel	Freq. (MHz)
01	0.125



1.5. Description Of Test Setup



1.6. 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	Oct. 26, 2020	1 Year
2.	EMI Test Receiver	Rohde & Schwarz	ESCI	100627	Oct. 26, 2020	1 Year
3.	EMI Test Receiver	Rohde & Schwarz	ESR26	101481	Oct. 26, 2020	1 Year
4.	RF Switching Unit	Compliance Direction	RSU-M2	38303	Oct. 26, 2020	1 Year
5.	MAX Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 26, 2020	1 Year
6.	Preamplifier	SKET Electronic	BK1G18G30 D	KD17503	Oct. 26, 2020	1 Year
7.	Double Ridged Horn Antenna	Instruments corporation	GTH-0118	351600	Nov. 02, 2020	2 Year
8.	Bilog Broadband Antenna	Schwarzbeck	VULB9163	VULB 9163-289	Nov. 02, 2020	2 Year
9.	Loop Antenna	Schwarzbeck	FMZB1519B	00053	Nov. 02, 2020	2 Year
10.	Horn Antenna	A-INFO	LB-180400- KF	J211060628	Nov. 02, 2020	2 Year
11.	Pre-amplifier	SONOMA	310N	186860	Oct. 26, 2020	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. 26, 2020	1 Year
14.	Power Sensor	DAER	RPR3006W	15I00041SN045	Oct. 26, 2020	1 Year
15.	Power Sensor	DAER	RPR3006W	15I00041SN046	Oct. 26, 2020	1 Year
16.	MXA Spectrum Analysis	Agilent	N9020A	MY51170037	Oct. 26, 2020	1 Year
17.	MXG RF Vector Signal Generator	Agilent	N5182A	MY48180656	Oct. 26, 2020	1 Year
18.	Signal Generator	Agilent	E4421B	MY41000743	Oct. 26, 2020	1 Year
19.	DC Power Supply	IVYTECH	IV3605	1804D360510	Oct. 26, 2020	1 Year
20.	Constant Temperature Humidity Chamber	ZHONGJIAN	ZJ-KHWS80 B	N/A	Oct. 26, 2020	1 Year

1.7. Description of Test Facility

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

FCC-Registration No.: 184111

Shenzhen Anbotech 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, September 30, 2020.

ISED-Registration No.: 8058A-1

Shenzhen Anbotech 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, September 30, 2020.

Test Location

Shenzhen Anbotech 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
FCC Part 15, Paragraph 15.207	Conducted Emission Test	PASS
FCC Part 15, Paragraph 15.209(a)(f)	Spurious Emission	PASS
FCC Part 15, Paragraph 15.203	Antenna Requirement	PASS
FCC Part 15, Paragraph 15.215 (c)	20dB Emission Bandwidth	PASS

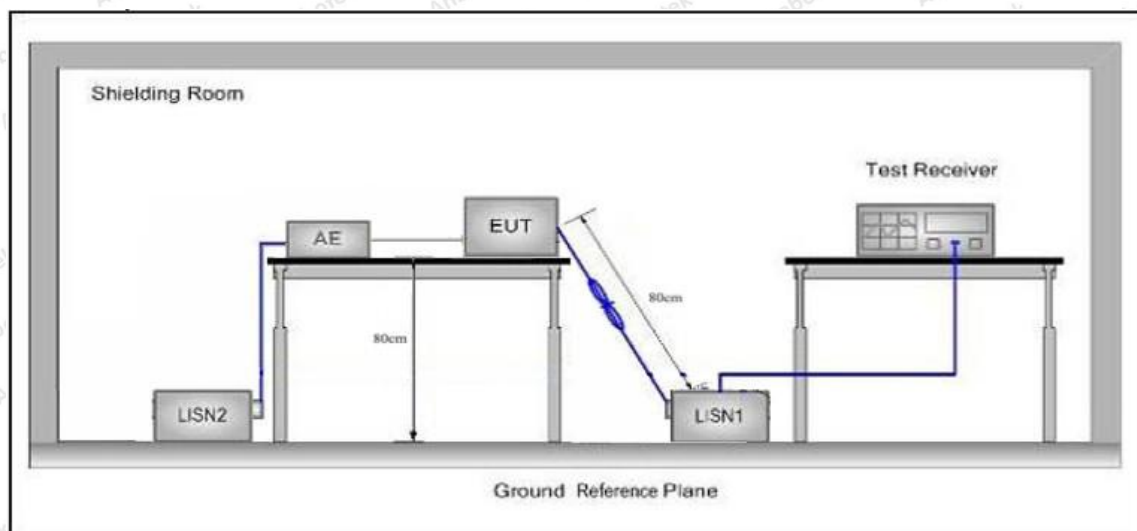


3. Conducted Emission Test

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

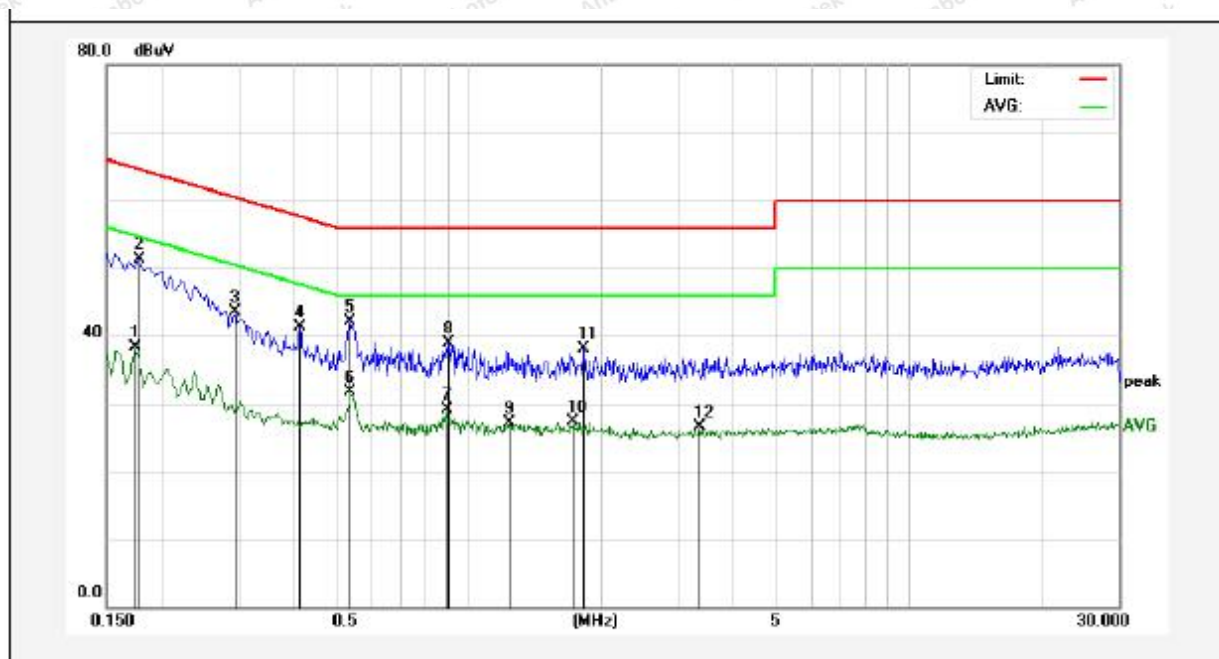
Report No.: 18220WC00180002

FCC ID: 2ATDU-5293

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Conducted Emission Test Data

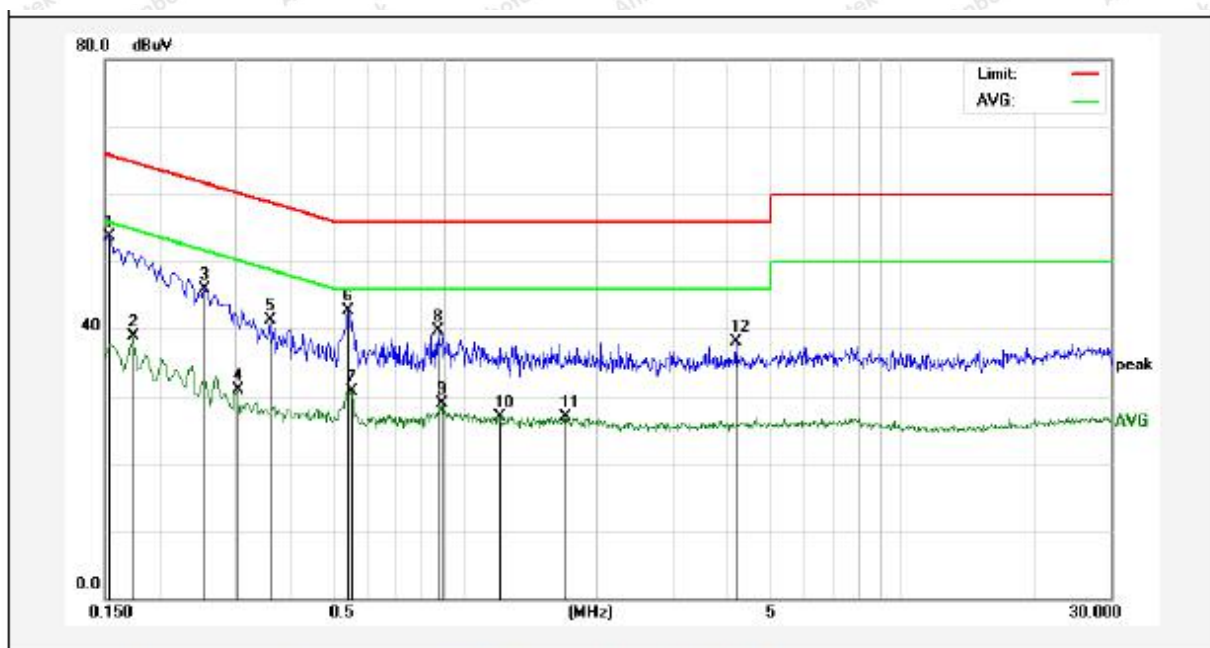
Test Site: 1# Shielded Room
 Operating Condition: 125KHz
 Test Specification: AC 12V
 Comment: Live Line
 Tem.: 24.0°C Hum.: 53%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1740	8.89	29.46	38.35	54.76	-16.41	AVG	
2	0.1780	21.93	29.46	51.39	64.57	-13.18	QP	
3	0.2940	13.98	29.43	43.41	60.41	-17.00	QP	
4	0.4140	11.91	29.47	41.38	57.57	-16.19	QP	
5	0.5380	12.67	29.52	42.19	56.00	-13.81	QP	
6	0.5380	2.12	29.52	31.64	46.00	-14.36	AVG	
7	0.8900	-0.49	29.61	29.12	46.00	-16.88	AVG	
8	0.9020	9.24	29.61	38.85	56.00	-17.15	QP	
9	1.2420	-2.57	29.64	27.07	46.00	-18.93	AVG	
10	1.7300	-2.39	29.64	27.25	46.00	-18.75	AVG	
11	1.8260	8.48	29.65	38.13	56.00	-17.87	QP	
12	3.3540	-3.19	29.68	26.49	46.00	-19.51	AVG	

Conducted Emission Test Data

Test Site: 1# Shielded Room
 Operating Condition: 125KHz
 Test Specification: AC 12V
 Comment: Neutral Line
 Tem.: 24.0°C Hum.: 53%



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit (dBuV)	Over Limit (dB)	Detector	Remark
1	0.1539	24.15	29.46	53.61	65.78	-12.17	QP	
2	0.1740	9.38	29.46	38.84	54.76	-15.92	AVG	
3	0.2540	16.46	29.44	45.90	61.62	-15.72	QP	
4	0.3020	1.52	29.43	30.95	50.19	-19.24	AVG	
5	0.3580	11.82	29.46	41.28	58.77	-17.49	QP	
6	0.5420	13.11	29.52	42.63	56.00	-13.37	QP	
7	0.5540	1.26	29.53	30.79	46.00	-15.21	AVG	
8	0.8700	10.04	29.61	39.65	56.00	-16.35	QP	
9	0.8860	-0.76	29.61	28.85	46.00	-17.15	AVG	
10	1.2059	-2.78	29.64	26.86	46.00	-19.14	AVG	
11	1.7020	-2.64	29.64	27.00	46.00	-19.00	AVG	
12	4.1660	8.40	29.70	38.10	56.00	-17.90	QP	

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

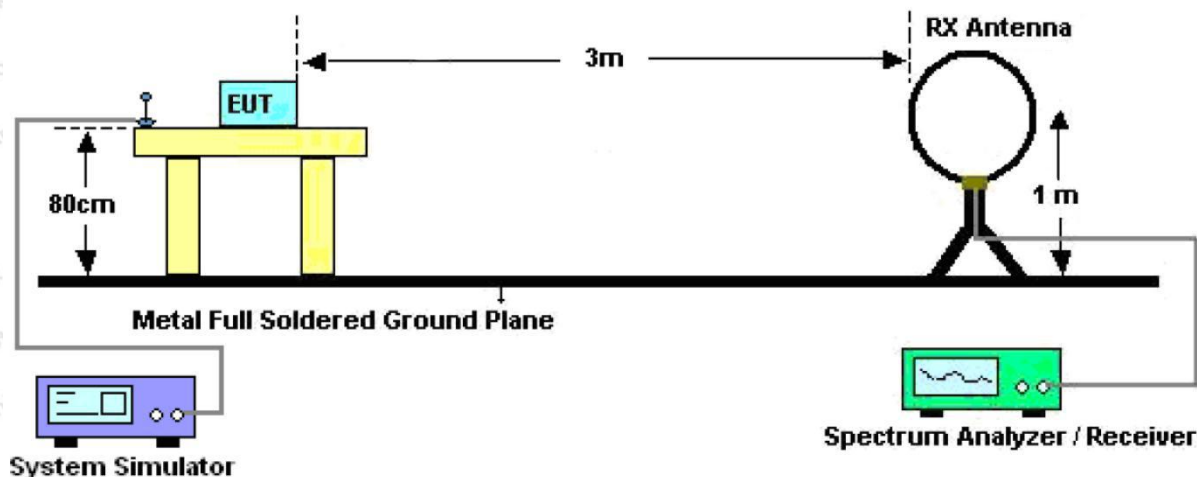


Figure 1. Below 30MHz

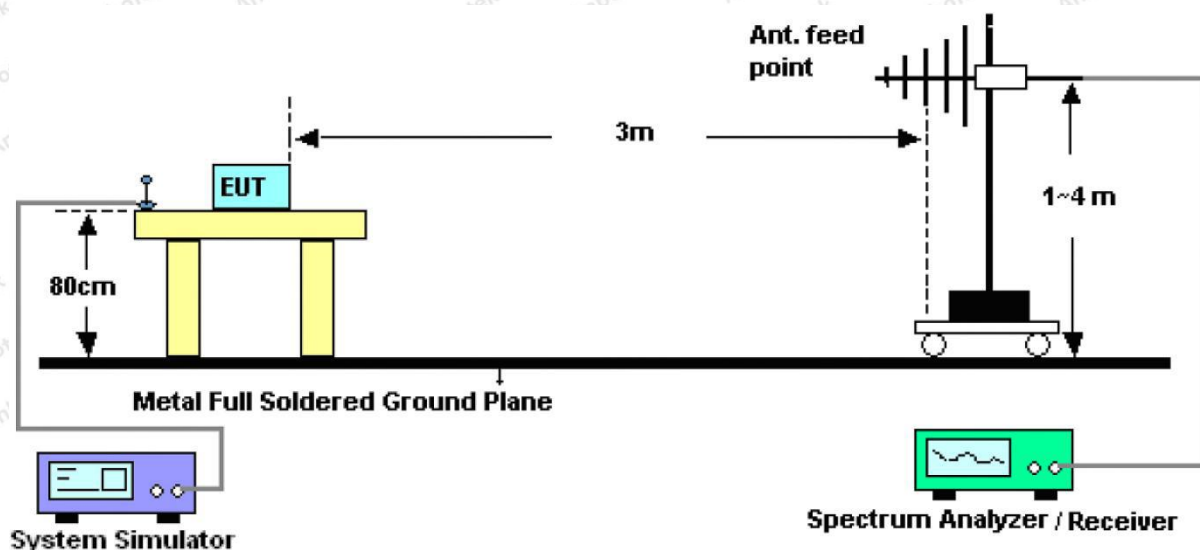


Figure 2. 30MHz to 1GHz

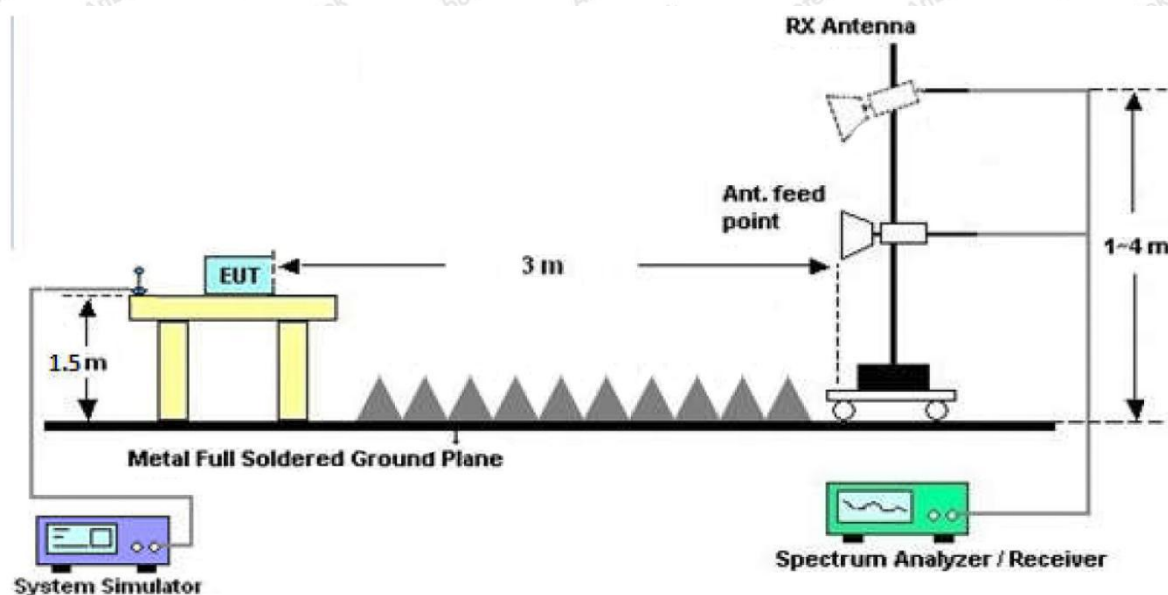


Figure 3. Above 1 GHz

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 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.

4.4. Test Data

PASS

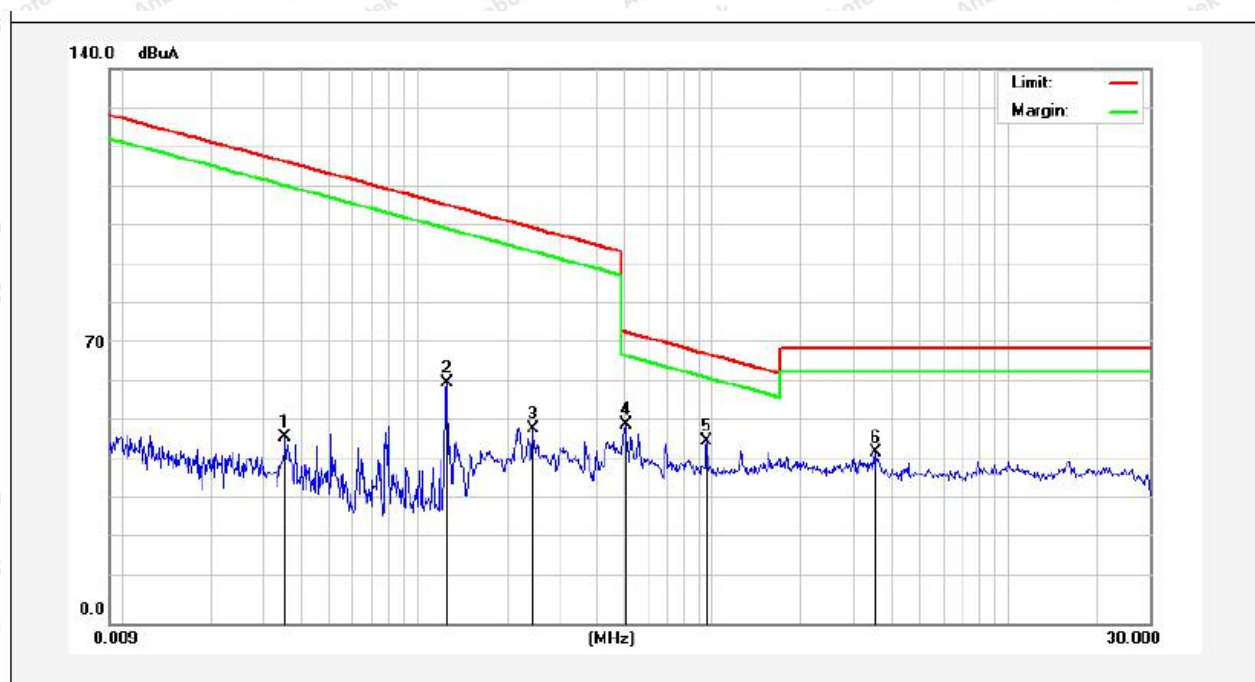
During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

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



Test Results

(Between 9KHz – 30MHz)

Job No.: 18220WC00180001**Standard:** FCC PART15 C _3m**Power Source:** DC 12V**Test item:** Radiation Test**Temp.(C)/Hum.(%RH):** 24.3℃/54%RH**Test Mode:** 125KHz**Distance:** 3m

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	degree (dgc)
0.0354	34.67	19.28	2.53	0	56.48	136.50	-80.02	Peak	351
0.0354	25.22	19.28	2.53	0	47.03	116.50	-69.47	AV	351
0.1250	48.00	19.30	2.54	0	69.84	125.60	-55.76	Peak	217
0.1250	38.73	19.30	2.54	0	60.57	105.60	-45.03	AV	217
0.2459	36.65	19.30	2.54	0	58.49	119.75	-61.26	Peak	281
0.2459	27.22	19.30	2.54	0	49.06	99.75	-50.69	AV	281
0.5060	28.04	19.53	2.59	0	50.16	73.52	-23.36	QP	317
0.9495	23.93	19.53	2.59	0	46.05	68.05	-22.00	QP	29
3.5659	21.07	19.53	2.59	0	43.19	69.54	-26.35	QP	173

Remark: According to FCC PART 15.209 (d), the emission limits for the frequency bands 9–90 kHz, 110–490 kHz and above 1000 MHz, Radiated emission limits in these three bands are based on measurements employing an average detector.

Report No.: 18220WC00180002
(Between 30MHz –1000 MHz)

FCC ID: 2ATDU-5293

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Job No.: 18220WC00180001

Polarization: Horizontal

Standard: FCC PART15 C _3m

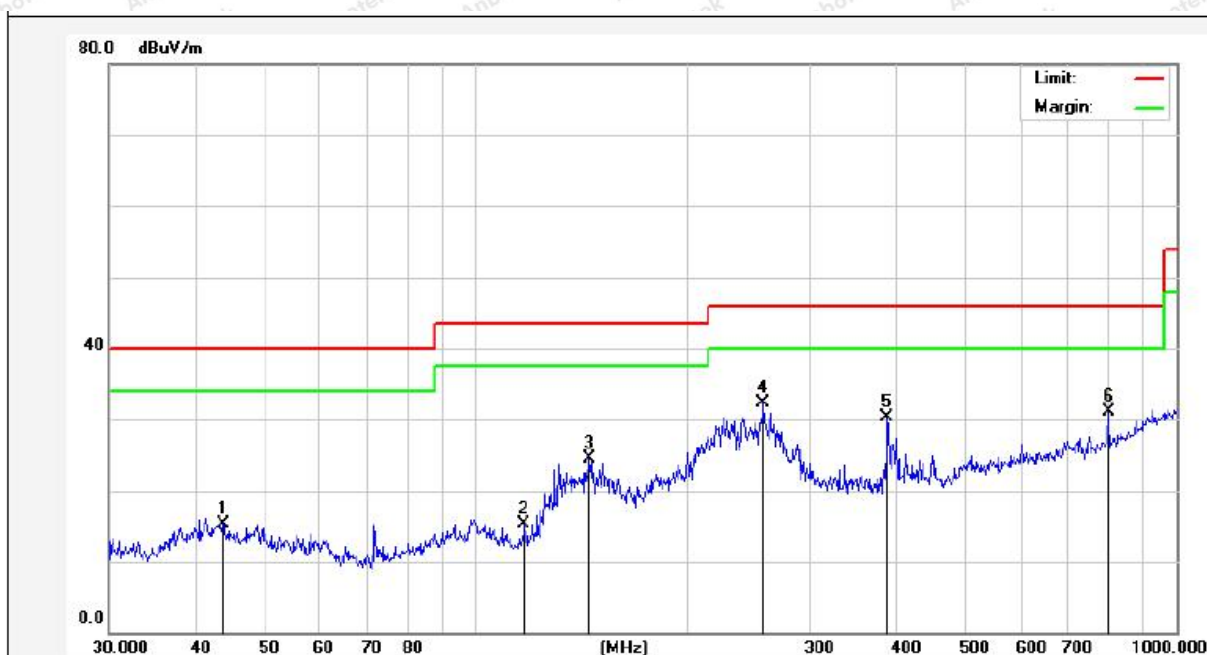
Power Source: DC 12V

Test item: Radiation Test

Temp.(C)/Hum.(%RH): 24.6°C/50%RH

Test Mode: 125KHz

Distance: 3m



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	43.6584	29.69	-14.47	15.22	40.00	-24.78	QP	100	0	
2	117.3603	37.06	-21.75	15.31	43.50	-28.19	QP	100	360	
3	145.3506	45.24	-20.80	24.44	43.50	-19.06	QP	100	0	
4	257.4222	50.38	-18.16	32.22	46.00	-13.78	QP	100	360	
5	386.6338	43.34	-12.98	30.36	46.00	-15.64	QP	100	0	
6	798.9797	35.28	-4.17	31.11	46.00	-14.89	QP	100	360	

Job No.: 18220WC00180001
Standard: FCC PART15 C_3m
Test item: Radiation Test
Test Mode: 125KHz

Polarization: Vertical
Power Source: DC 12V
Temp.(C)/Hum.(%RH): 24.6°C/50%RH
Distance: 3m



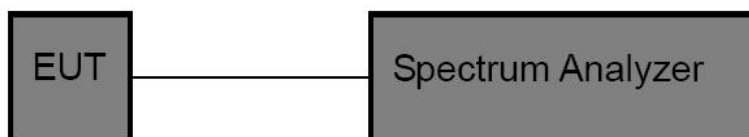
No.	Freq. (MHz)	Reading (dBuV)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	42.4508	30.62	-13.84	16.78	40.00	-23.22	QP	100	0	
2	71.8320	35.59	-18.49	17.10	40.00	-22.90	QP	100	360	
3	138.8735	43.06	-19.99	23.07	43.50	-20.43	QP	100	0	
4	220.6171	39.99	-16.41	23.58	46.00	-22.42	QP	100	360	
5	392.0951	44.29	-11.40	32.89	46.00	-13.11	QP	100	0	
6	801.7863	38.01	-4.13	33.88	46.00	-12.12	QP	100	360	

5. 20dB Emission Bandwidth

5.1. Test Standard

Test Standard	FCC Part15 C Section 15.247 (a)(1)
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5.2. Test Setup



5.3. 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 = 220 Hz.
3. Set the VBW = set approximately 3 x RBW.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

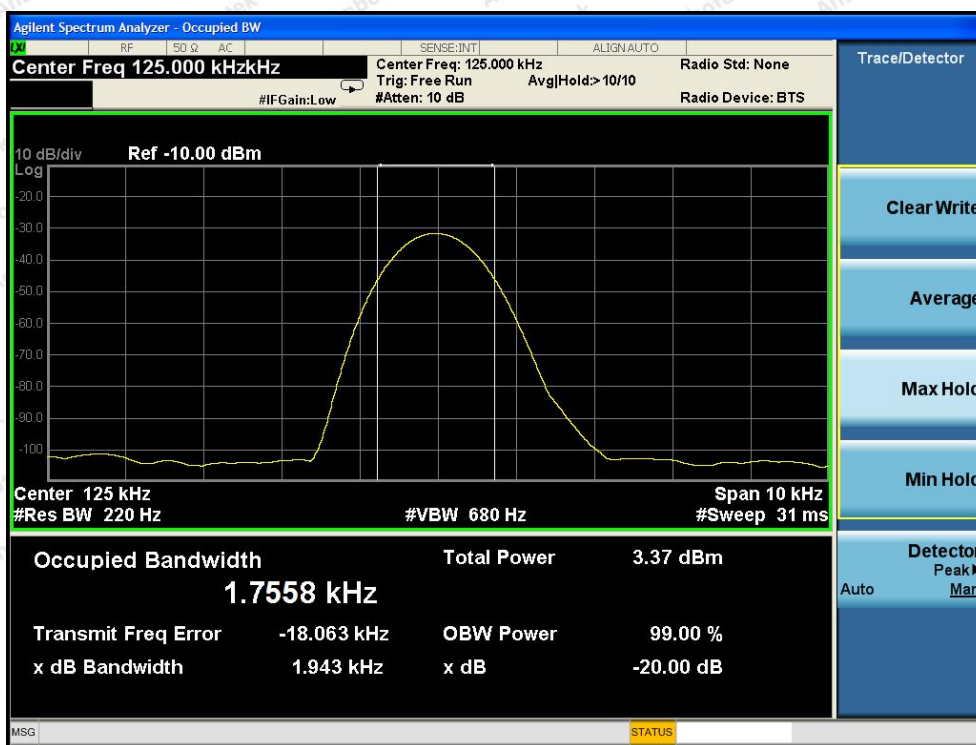
5.4. Test Data

Test Item	: 20dB Bandwidth
Test Voltage	: DC 12V
Test Result	: PASS

Test Mode	: 125KHz
Temperature	: 23.6° C
Humidity	: 49 %

20dB Down BW (KHz)	99% BW (KHz)	Modulation Mode
1.943	1.7558	BPSK

Plot of 99% Bandwidth



6. Antenna Requirement

5.1. Test Standard and Requirement

Test Standard	FCC Part15 Section 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

6.2. Antenna Connected Construction

The antenna is a Inductive loop coil 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

Please refer to separated files for Test Setup Photos of the EUT.

APPENDIX II -- EXTERNAL PHOTOGRAPH

Please refer to separated files for External Photos of the EUT.

APPENDIX III -- INTERNAL PHOTOGRAPH

Please refer to separated files for Internal Photos of the EUT.

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

