FCC TEST REPORT

Client Name	:	Secukey Technology Co., Ltd.
Address	:	Building 5, Floor 13, Longbi Industrial Park, Longgang District, Shenzhen, China
Product Name	:	RFID Reader
Date	:	Apr. 21, 2021

Shenzhen Anbotek Compliance Laboratory Limited

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TEST REPORT

Applicant	:	Secukey Technology Co., Ltd.
Manufacturer	:	Secukey Technology Co., Ltd.
Product Name	:	RFID Reader
Model No.	:	S1-RX, S1/2/3-R(EM/MF), S5/6-R(EM/MF), S7/8/9-R(EM/MF), SK1/2/4-R(EM/MF), S1/2/3/4-RX, S5/6/9-RX, SK1/2/4/5-RX
Trade Mark	:	N.A.
Rating(s)	:	Input: DC 9-24V

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	Mar. 23, 2021
Date of Test	Mar. 23~Apr. 06, 2021
Prepared By	Ella Liang (Engineer /Ella Liang)
Reviewer	Bibo Zhang (Supervisor / Bibo Zhang)
Approved & Authorized Signer	KingKong Jin (Manager / Kingkong Jin)

Address: 1/F., Building D, Sogood Science and Technology Park, Sanwei Community, Hangcheng Street, Bao'an District, Shenzhen, Guangdong, China.
Tel:(86) 755-26066440 Fax: (86) 755-26014772 Email: service@anbotek.com
Hotline 400-003-0500
www.anbotek.com

1. General Information

1.1. Client Information

Applicant	:	Secukey Technology Co., Ltd.
Address	:	Building 5, Floor 13, Longbi Industrial Park, Longgang District, Shenzhen, China
Manufacturer	:	Secukey Technology Co., Ltd.
Address	:	Building 5, Floor 13, Longbi Industrial Park, Longgang District, Shenzhen, China
Factory	:	Secukey Technology Co., Ltd.
Address	:	Building 5, Floor 13, Longbi Industrial Park, Longgang District, Shenzhen, China

1.2. Description of Device (EUT)

Product Name	:	RFID Reader	
Model No.	:	S1-RX, S1/2/3-R(EM/MF), S5/6-R(EM/MF), S7/8/9-R(EM/MF), SK1/2/4-R(EM/MF), S1/2/3/4-RX, S5/6/9-RX, SK1/2/4/5-RX (Note: All samples are the same except the model number, so we prepare "S1-RX" for test only.)	
Trade Mark	:	N.A.	
Test Power Supply	:	DC 24V (Note: During the test, pre-scan all test voltages and only show the test data of the worst case (DC 24V) in this Report.)	
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	:	

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

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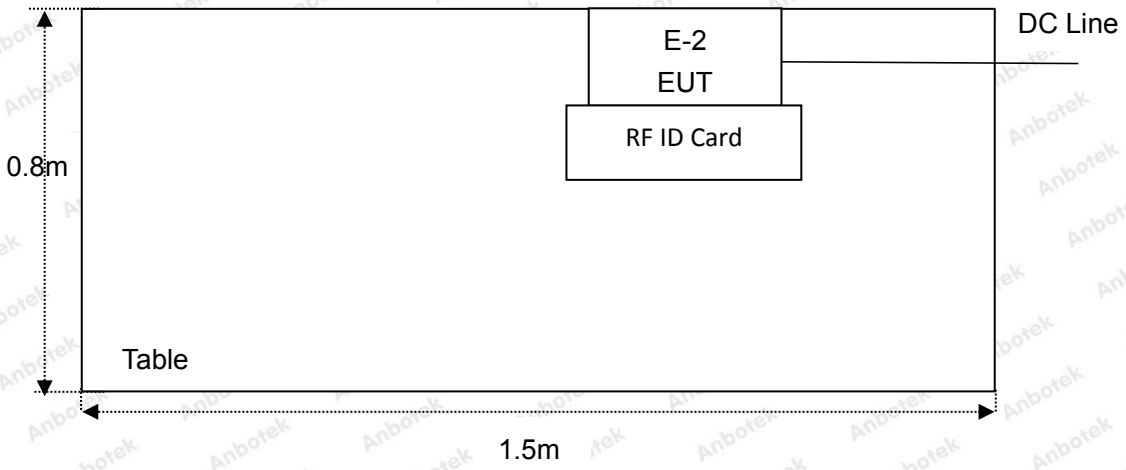
Hotline 400-003-0500
www.anbotek.com

1.5. Description Of Test Setup

RE



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	BK1G18G30D	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-KHWS80B	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 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, September 30, 2020.

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, September 30, 2020.

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

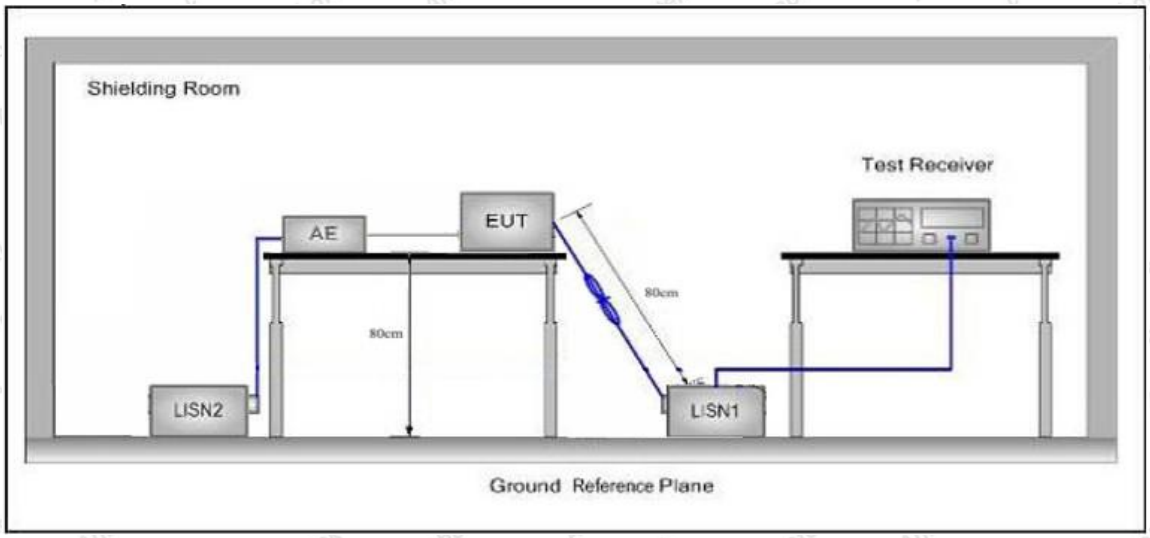
Standard Section	Test Item	Result
FCC Part 15, Paragraph 15.207	Conducted Emission Test	N/A
FCC Part 15, Paragraph 15.209(a)(f)	Spurious Emission	PASS
FCC Part 15, Paragraph15.203	Antenna Requirement	PASS
FCC Part 15, Paragraph 15.215 (c)	20dB Emission Bandwidth	PASS

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

Not applicable for equipment operated with DC power supply.

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

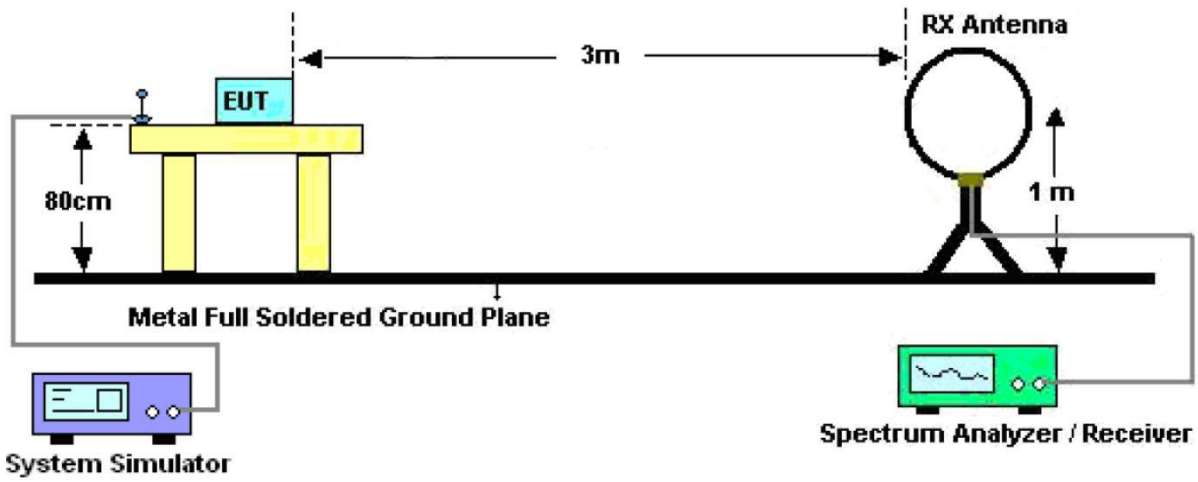


Figure 1. Below 30MHz

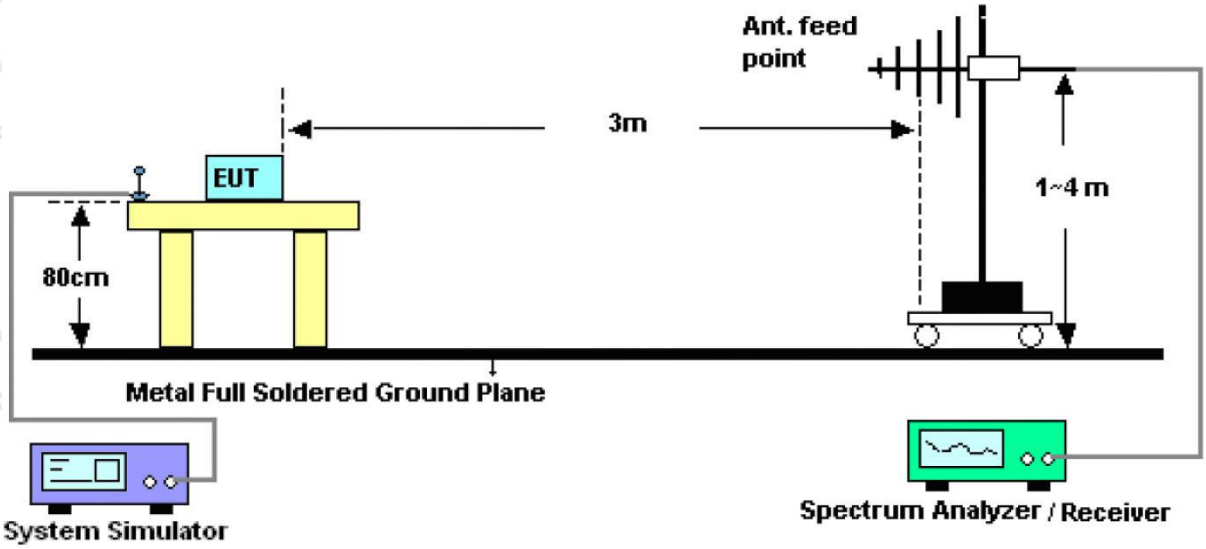


Figure 2. 30MHz to 1GHz

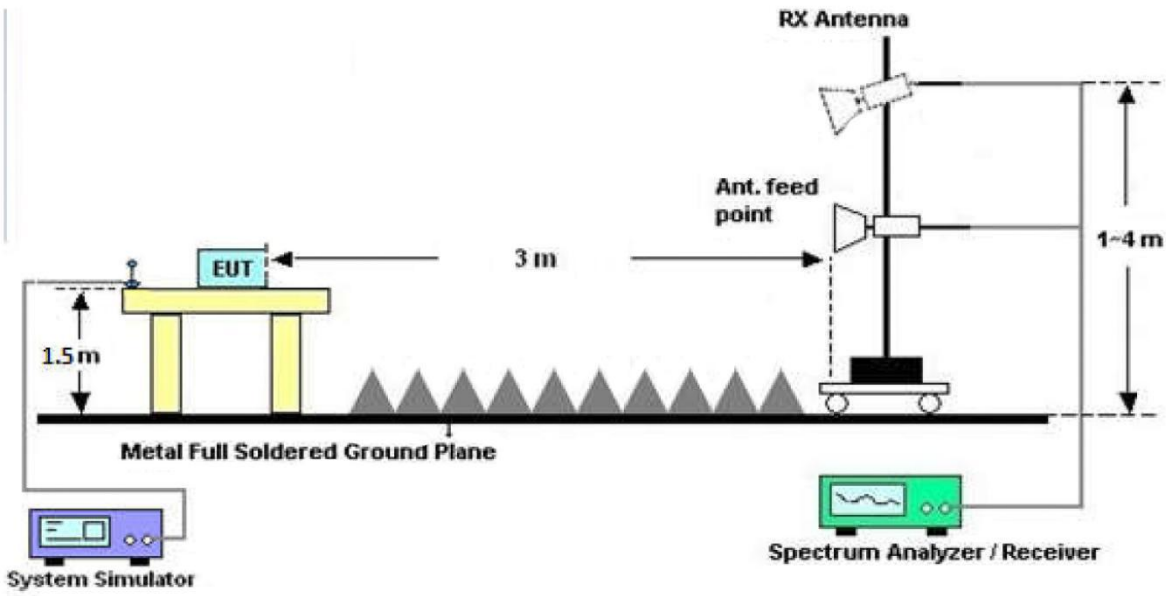


Figure 3. Above 1 GHz

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

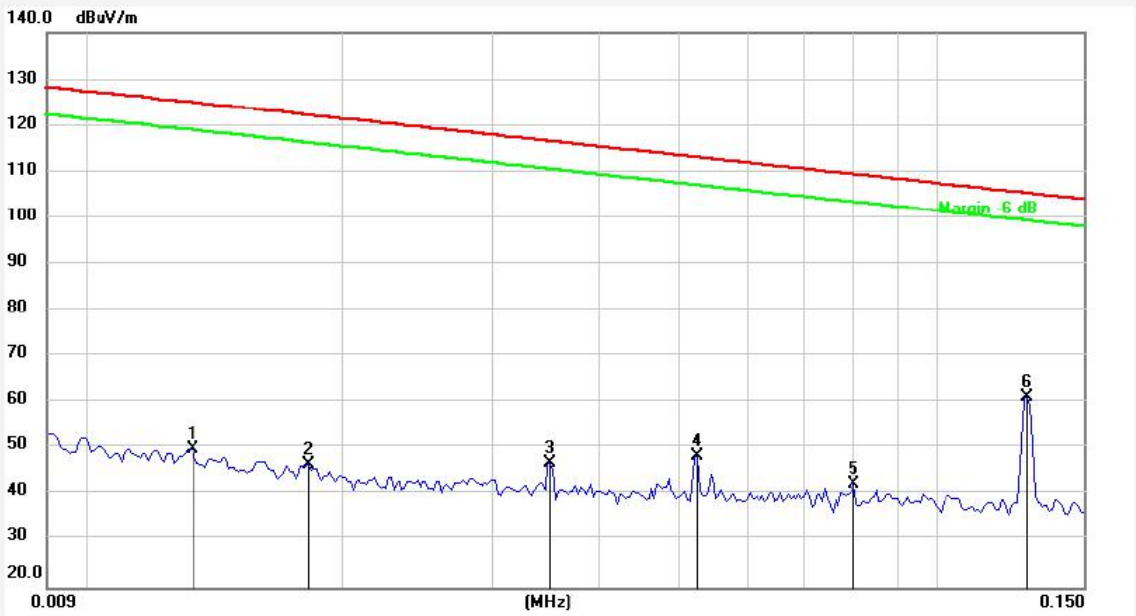
During the test, Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the X-axis is the worst case.

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

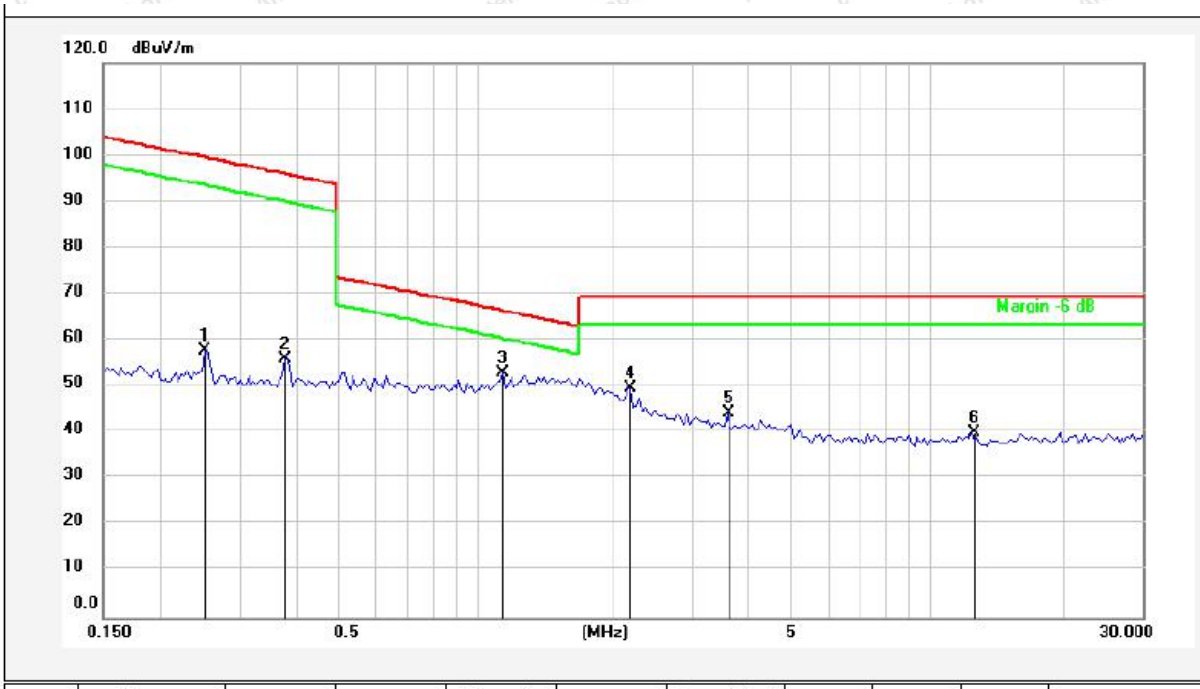
Test Results

(Between 9KHz – 30MHz)

Standard:	**FCC PART15 C _3m**	**Power Source:**	DC 24V
Test item:	**Radiation Test**	**Temp.(C)/Hum.(%RH):**	**24.3℃/54%RH**
Test Mode:	**125KHz**	**Distance:**	**3m**



No.	Freq. (MHz)	Reading (dBuV)	Factor ()	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	0.0133	29.82	20.16	49.98	124.93	-74.95	peak			
2	0.0183	26.31	20.23	46.54	122.18	-75.64	peak			
3	0.0352	26.26	20.48	46.74	116.53	-69.79	peak			
4	0.0526	27.97	20.38	48.35	113.07	-64.72	peak			
5	0.0802	21.97	20.36	42.33	109.42	-67.09	peak			
6	0.1285	40.83	20.34	61.17	105.35	-44.18	peak			

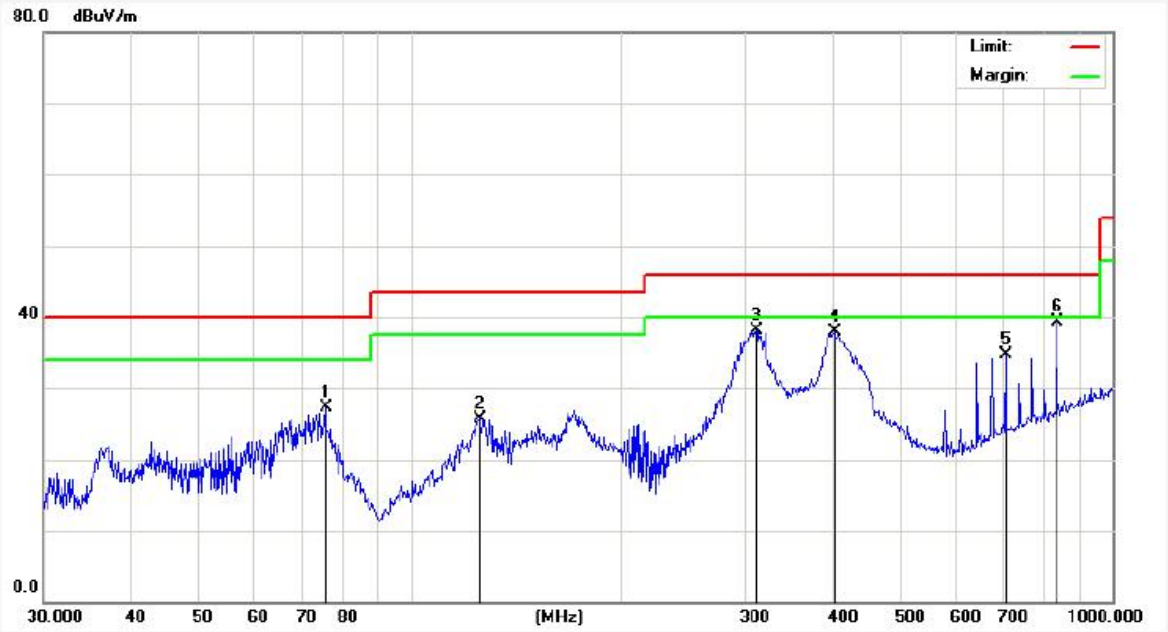


No.	Freq. (MHz)	Reading (dBuV)	Factor ()	Result (dBuV/m)	Limit (dBuV/m)	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	0.2514	37.46	20.30	57.76	99.56	-41.80	peak			
2	0.3791	35.69	20.28	55.97	96.01	-40.04	peak			
3	1.1534	32.80	20.26	53.06	66.39	-13.33	peak			
4	2.1783	29.49	20.28	49.77	69.50	-19.73	peak			
5	3.6034	24.05	20.34	44.39	69.50	-25.11	peak			
6	12.5156	19.55	20.53	40.08	69.50	-29.42	peak			

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.

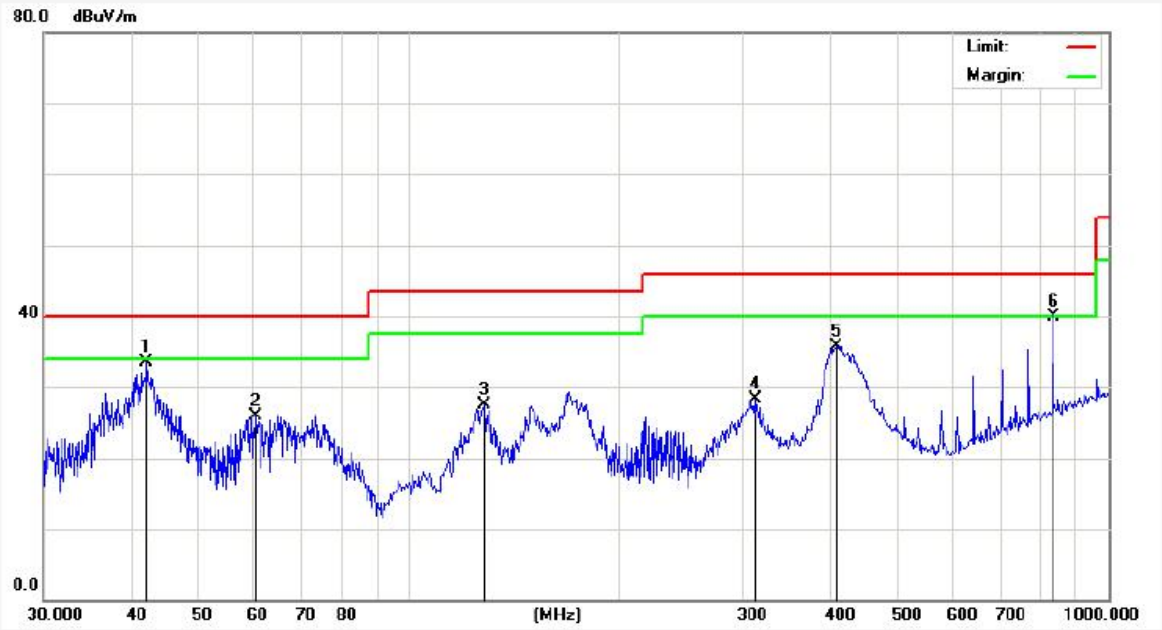
(Between 30MHz –1000 MHz)

Standard:	**FCC PART15 C _3m**	**Polarization:**	**Horizontal**
Test Mode:	**125KHz**	**Power Source:**	**DC 24V**
Distance:	**3m**	**Temp.(C)/Hum.(%RH):**	**23.2℃/54%RH**



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	75.7114	49.06	-21.76	27.30	40.00	-12.70	QP	300	0	
2	125.8864	47.17	-21.55	25.62	43.50	-17.88	QP	300	26	
3	311.0867	54.48	-16.34	38.14	46.00	-7.86	QP	300	79	
4	401.8385	50.66	-12.82	37.84	46.00	-8.16	QP	300	111	
5	704.2261	43.16	-8.40	34.76	46.00	-11.24	QP	300	174	
6	833.3171	45.18	-5.94	39.24	46.00	-6.76	QP	300	360	

Standard:	**FCC PART15 C _3m**	**Polarization:**	**Vertical**
Test Mode:	**125KHz**	**Power Source:**	**DC 24V**
Distance:	**3m**	**Temp.(C)/Hum.(%RH):**	**23.2℃/54%RH**



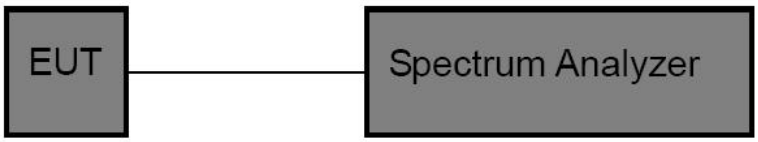
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/	Over Limit (dB)	Detector	Height (cm)	degree (deg)	Remark
1	42.1542	47.24	-13.78	33.46	40.00	-6.54	QP	300	0	
2	60.2801	41.96	-16.10	25.86	40.00	-14.14	QP	300	29	
3	128.1130	44.05	-16.54	27.51	43.50	-15.99	QP	300	174	
4	312.1794	42.65	-14.43	28.22	46.00	-17.78	QP	300	277	
5	408.9460	47.34	-11.60	35.74	46.00	-10.26	QP	300	340	
6	833.3171	44.94	-4.94	40.00	46.00	-6.00	QP	300	360	

5. 20dB Emission Bandwidth

5.1. Test Standard

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

5.2. Test Setup



5.3. Test Procedure

Using the following spectrum analyzer settings:

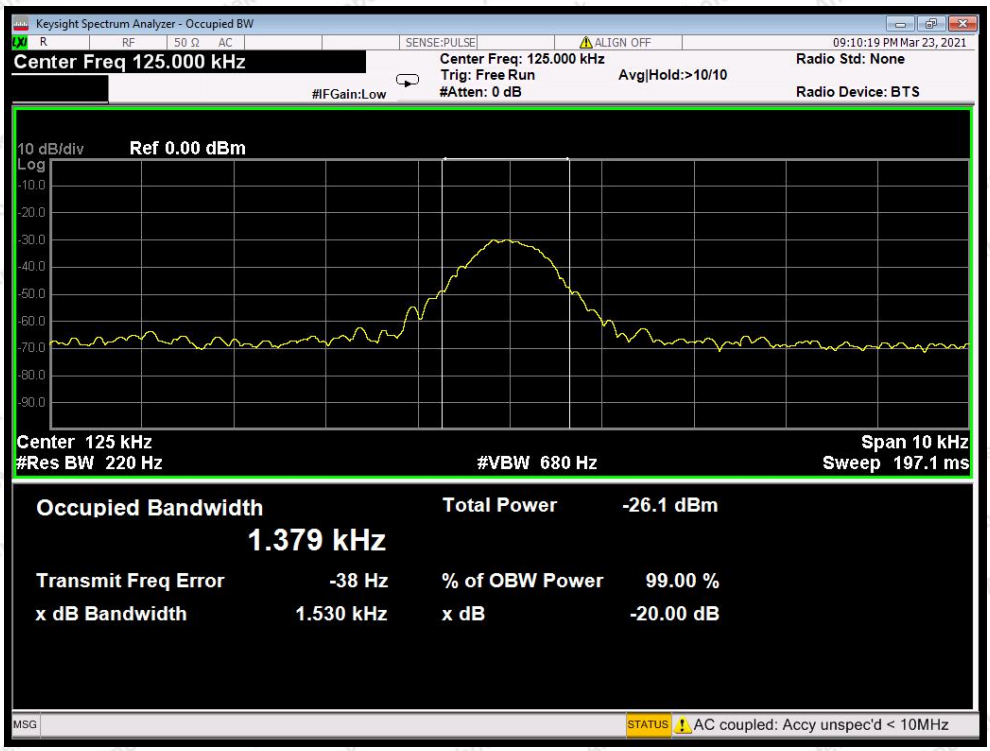
1. Span= approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel.
2. Set the RBW = 220 Hz.
3. Set the VBW = set approximately 3 x RBW.
4. Sweep time = auto couple.
5. Detector function = peak.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.

5.4. Test Data

Test Item	:	20dB Bandwidth	Test Mode	:	125KHz
Test Voltage	:	DC 24V	Temperature	:	23.6° C
Test Result	:	PASS	Humidity	:	49 %

20dB Down BW (KHz)	99% BW (KHz)	Modulation Mode
1.530	1.379	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

Photo of Radiation Emission Test

APPENDIX II -- EXTERNAL PHOTOGRAPH

Reference to the test report 18220WC10052401.

APPENDIX III -- INTERNAL PHOTOGRAPH

Reference to the test report 18220WC10052401.

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