

TEST REPORT

Product Name: RexID Encoder
FCC ID: 2A7JB-RE125V01
Trademark: N/A
Model Number: RE125V01
Prepared For: Freevision Technologies Co.,Ltd

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Manufacturer: Freevision Technologies Co.,Ltd
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Sample Received Date: May.26, 2022
Sample tested Date: May.26, 2022 to Jun. 14, 2022
Issue Date: Jun. 14, 2022
Report No.: CTB220614053RFX
Test Standards: FCC Part15.209 ANSI C63.10:2013
Test Results: PASS
Remark: This is 125kHz radio test report.

Compiled by:

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Reviewed by:

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Approved by:


Bin Mei, Director

The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client.

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(Note: N/A means not applicable)

1. VERSION

Report No.	Issue Date	Description	Approved
CTB220614053RFX	Jun. 14, 2022	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

Test Item	Test Requirement	Test method	Result
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS
Radiated Emission	47 CFR Part 15 Subpart C Section 15.209; 15.225(a)(b)(c)(d)	ANSI C63.10-2013	PASS
Antenna requirement	47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013	PASS

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Item	Uncertainty
Occupancy bandwidth	54.3kHz
Conducted output power Above 1G	0.9dB
Conducted output power below 1G	0.9dB
Power Spectral Density , Conduction	0.9dB
Conduction spurious emissions	2.0dB
Out of band emission	2.0dB
3m chamber Radiated spurious emission(30MHz-1GHz)	4.6dB
3m chamber Radiated spurious emission(1GHz-18GHz)	5.1dB
3m chamber Radiated spurious emission(18GHz-40GHz)	3.4dB
humidity uncertainty	5.5%
Temperature uncertainty	0.63°C
frequency	1×10^{-7}
Conducted Emission (150KHz-30MHz)	3.2 dB
Radiated Emission(30MHz ~ 1000MHz)	4.8 dB
Radiated Emission(1GHz ~6GHz)	4.9 dB

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	RE125V01
Model Description:	N/A
Hardware Version:	V1.0
Software Version:	V1.0
Operation Frequency:	125KHz
Type of Modulation:	ASK
Antenna installation:	Internal antenna
Antenna Gain:	0dBi
Ratings:	DC 5V charging from adapter

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

No.	Device Type	Brand	Model	Series No.	Note
1	AC adapter	SHENZHEN ENGINE ELECTRONIC CO.,LTD	EE-0501000E	N/A	AE

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode
Keep the EUT in transmitting mode (NFC mode) with modulation.
The sample was placed (0.8m below 1GHz, 1.5m above 1GHz) above the ground plane of 3m chamber. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating the turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

4.5 Test Environment

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Normal Voltage(DC):	5.0
Normal Temperature(°C)	23

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

Item	Equipment	Manufacturer	Type No.	Serial No.	Last calibration	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	2020.09.27	2022.08.05
2	Power Sensor	Agilent	U2021XA	MY56120032	2020.09.27	2022.08.05
3	Power Sensor	Agilent	U2021XA	MY56120034	2020.09.27	2022.08.05
4	Communication test set	R&S	CMW500	108058	2020.09.27	2022.08.05
5	Spectrum Analyzer	R&S	FSP40	100550	2020.09.27	2022.08.05
6	Signal Generator	Agilent	N5181A	MY49060920	2020.09.27	2022.08.16
7	Signal Generator	Agilent	N5182A	MY47420195	2020.09.27	2022.08.05
8	Communication test set	Agilent	E5515C	MY50102567	2020.09.27	2022.08.16
9	band rejection filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	2020.09.27	2022.08.05
10	band rejection filter	Shenxiang	MSF5150-5850MS-1155	20181015001	2020.09.27	2022.08.05
11	band rejection filter	Xingbo	XBLBQ-DZA120	190821-1-1	2020.09.27	2022.08.05
12	BT&WI-FI Automatic test software	Microwave	MTS8310	Ver. 2.0.0.0	\	\
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	2020.09.27	2022.08.05
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	2020.09.27	2022.08.05
15	234G Automatic test software	Microwave	MTS8200	Ver. 2.0.0.0	\	\

16	966 chamber	C.R.T.	966 Room	966	2020.09.27	2024.08.11
17	Receiver	R&S	ESPI	100362	2020.09.27	2022.08.05
18	Amplifier	HP	8447E	2945A02747	2020.09.27	2022.08.05
19	Amplifier	Agilent	8449B	3008A01838	2020.09.27	2022.08.05
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	2020.09.27	2022.08.07
21	Horn Antenna	Schwarzbeck	BBHA9120D	1911	2020.09.27	2022.08.08
22	Software	Fala	EZ-EMC	FA-03A2 RE	\	\
23	3-Loop Antenna	Daze	ZN30401	17014	2020.09.27	2022.08.05
24	loop antenna	ZHINAN	ZN30900A	/	2020.09.27	2022.08.05
25	Horn antenna	A/H/System	SAS-574	588	2020.09.27	2022.08.05
26	Amplifier	AEROFLEX	/	S/N/ 097	2020.09.27	2022.08.05

Conducted emissions Test

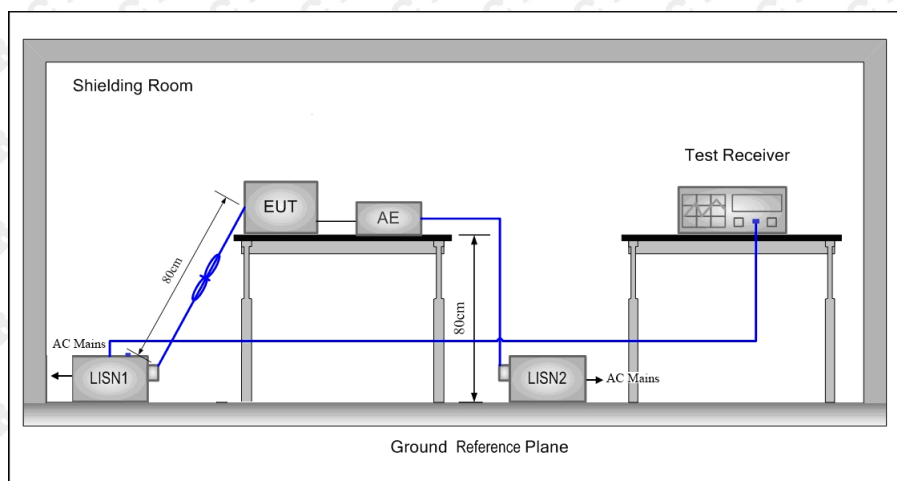
Equipment	Manufacturer	Model#	Serial#	Last Cal.	Next Cal.
AMN	ROHDE&SCHWARZ	ESH3-Z5	100318	2020.09.27	2022.08.05
Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	2020.09.27	2022.08.05
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCS30	834115/006	2020.09.27	2022.08.05
Coaxial cable	ZDECL	Z302S	18091804	2020.09.27	2022.08.05
ISN	TESEQ	NTFM8158	183	2020.09.27	2022.08.05
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428/003	2020.09.27	2022.08.05
Software	Fala	EZ-EMC	EMC-CON 3A1.1	\	\

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	1911	2020.09.27	2022.08.08
TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	869	2020.09.27	2022.08.05
Amplifier	Agilent	8449B	3008A01838	2020.09.27	2022.08.05
Amplifier	HP	8447E	2945A02747	2020.09.27	2022.08.05
EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI7	100362	2020.09.27	2022.08.05
Coaxial cable	ETS	RFC-SNS-100-NMS-80 NI	/	2020.09.27	2022.08.05
Coaxial cable	ETS	RFC-SNS-100-NMS-20 NI	/	2020.09.27	2022.08.05

Coaxial cable	ETS	RFC-SNS-100-SMS-20 NI	/	2020.09.27	2022.08.05
Coaxial cable	ETS	RFC-NNS-100-NMS-300 NI	/	2020.09.27	2022.08.05
Communication test set	Agilent	E5515C	MY50102567	2020.09.27	2022.08.16
Communication test set	R&S	CMW500	108058	2020.09.27	2022.08.05
EZ-EMC	Frad	EMC-con3A1.1	/	/	/

6. AC POWER LINE CONDUCTED EMISSION

6.1 Block Diagram Of Test Setup



6.2 Limit

Frequency (MHz)	Maximum RF Line Voltage (dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15 - 0.50	79	66	66-56*	56-46*
0.50 - 5.00	73	60	56	46
5.00 - 30.0	73	60	60	50

* Decreasing linearly with the logarithm of the frequency

6.3 Test procedure

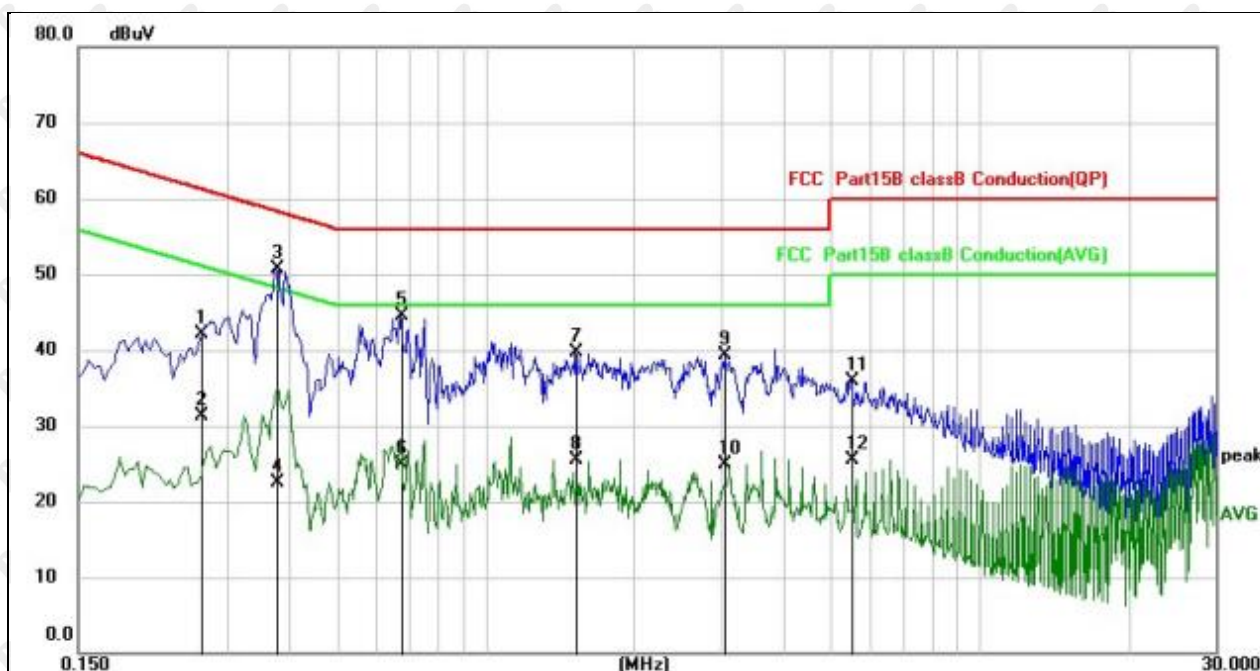
- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was

between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

6.4 Test Result

Temperature:	23°C	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	L
Test Voltage :	AC 120V/60Hz	Test Mode:	Normal Link

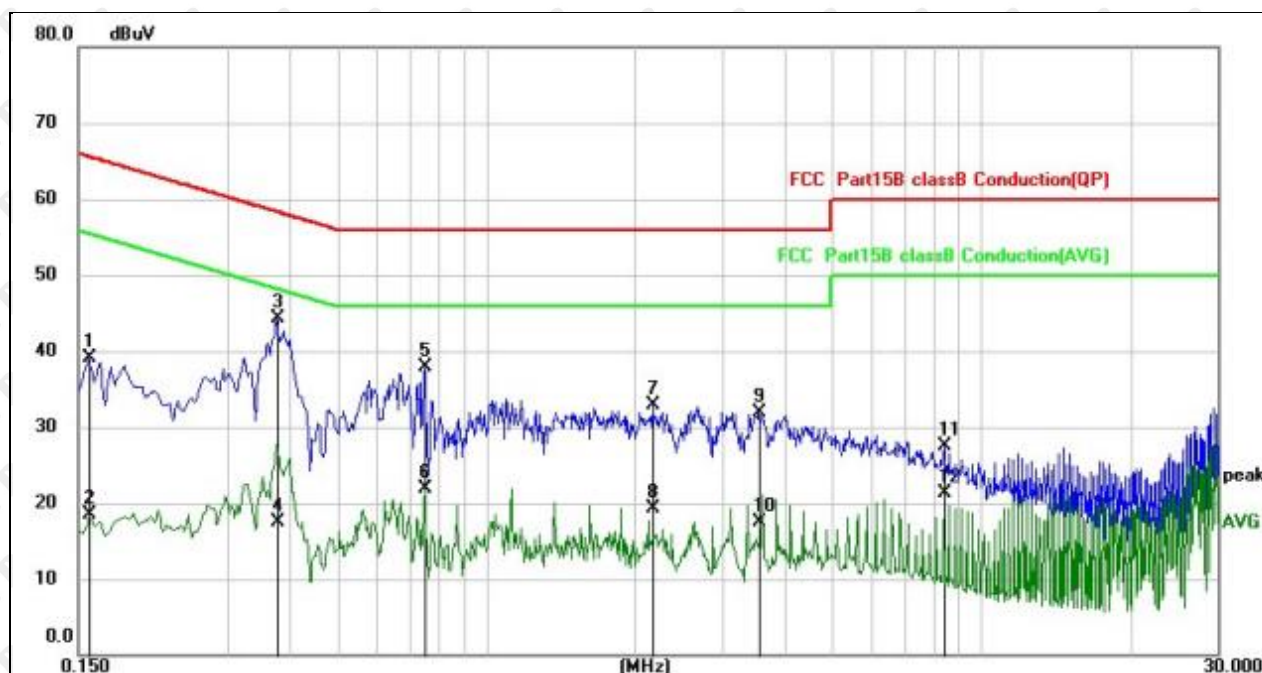


Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector
1		0.2660	31.46	10.65	42.11	61.24	-19.13	QP
2		0.2660	20.58	10.65	31.23	51.24	-20.01	AVG
3	*	0.3780	40.03	10.59	50.62	58.32	-7.70	QP
4		0.3780	11.82	10.59	22.41	48.32	-25.91	AVG
5		0.6740	34.03	10.55	44.58	56.00	-11.42	QP
6		0.6740	14.33	10.55	24.88	46.00	-21.12	AVG
7		1.5260	29.03	10.62	39.65	56.00	-16.35	QP
8		1.5260	14.86	10.62	25.48	46.00	-20.52	AVG
9		3.0540	28.75	10.64	39.39	56.00	-16.61	QP
10		3.0540	14.31	10.64	24.95	46.00	-21.05	AVG
11		5.5060	25.24	10.67	35.91	60.00	-24.09	QP
12		5.5060	14.81	10.67	25.48	50.00	-24.52	AVG

Temperature:	23 °C	Relative Humidity:	54%
Pressure:	1010hPa	Phase :	N
Test Voltage :	AC 120V/60Hz	Test Mode:	Normal Link



Remark:

1. All readings are Quasi-Peak and Average values.
2. Factor = Insertion Loss + Cable Loss.

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector
		MHz	dBuV	dB	dBuV	dBuV	dB	
1		0.1580	28.35	10.72	39.07	65.57	-26.50	QP
2		0.1580	7.77	10.72	18.49	55.57	-37.08	AVG
3	*	0.3780	33.67	10.59	44.26	58.32	-14.06	QP
4		0.3780	6.99	10.59	17.58	48.32	-30.74	AVG
5		0.7539	27.36	10.57	37.93	56.00	-18.07	QP
6		0.7539	11.38	10.57	21.95	46.00	-24.05	AVG
7		2.1740	22.30	10.63	32.93	56.00	-23.07	QP
8		2.1740	8.76	10.63	19.39	46.00	-26.61	AVG
9		3.5580	21.22	10.64	31.86	56.00	-24.14	QP
10		3.5580	6.77	10.64	17.41	46.00	-28.59	AVG
11		8.4180	16.64	10.77	27.41	60.00	-32.59	QP
12		8.4180	10.49	10.77	21.26	50.00	-28.74	AVG

7. RADIATED EMISSION

7.1 Block Diagram Of Test Setup

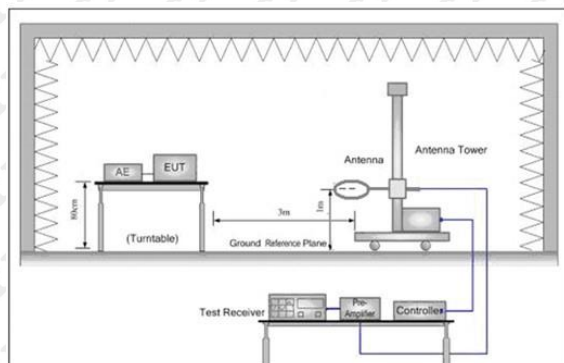


Figure 1. Below 30MHz

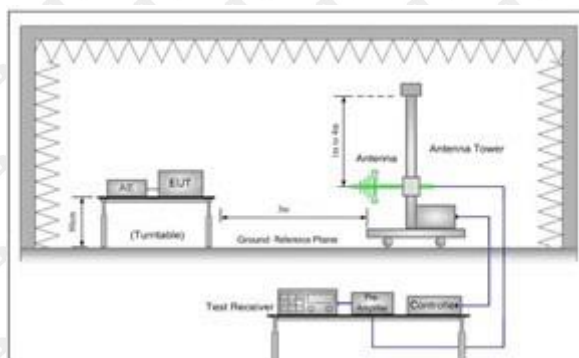


Figure 2. 30MHz to 1GHz

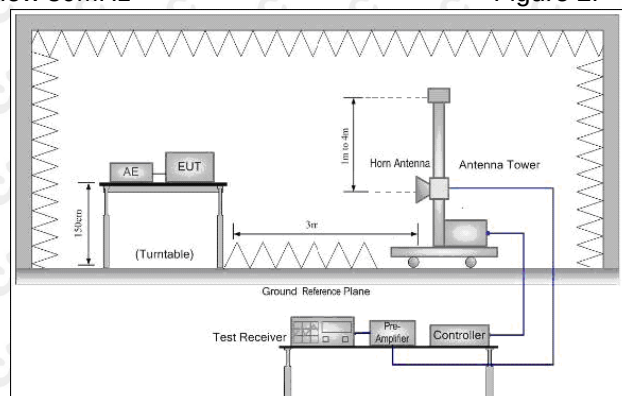


Figure 3. Above 1GHz

7.2 Limit

Spurious Emissions:

Frequency	Field strength (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	$20\log 2400/F \text{ (kHz)} + 80$	Quasi-peak	3
0.490MHz-1.705MHz	$20\log 24000/F \text{ (kHz)} + 40$	Quasi-peak	3
1.705MHz-30MHz	$20\log 30 + 40$	Quasi-peak	3
30MHz-88MHz	40.0	Quasi-peak	3
88MHz-216MHz	43.5	Quasi-peak	3
216MHz-960MHz	46.0	Quasi-peak	3
960MHz-1GHz	54.0	Quasi-peak	3
Above 1GHz	54.0	Average	3

Note: 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.

7.3 Test procedure

Below 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a

variable-height antenna tower.

c. The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.

e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

f. If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

g. Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).

h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel

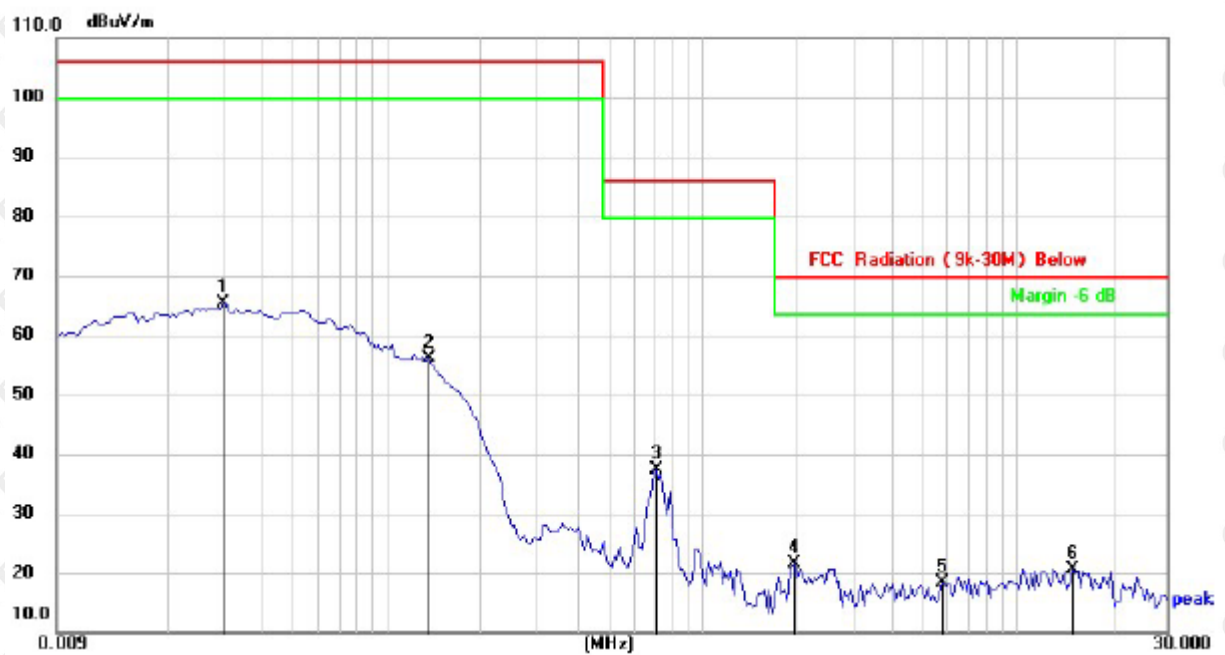
j. Repeat above procedures until all frequencies measured was complete.

Receiver set:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120 kHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

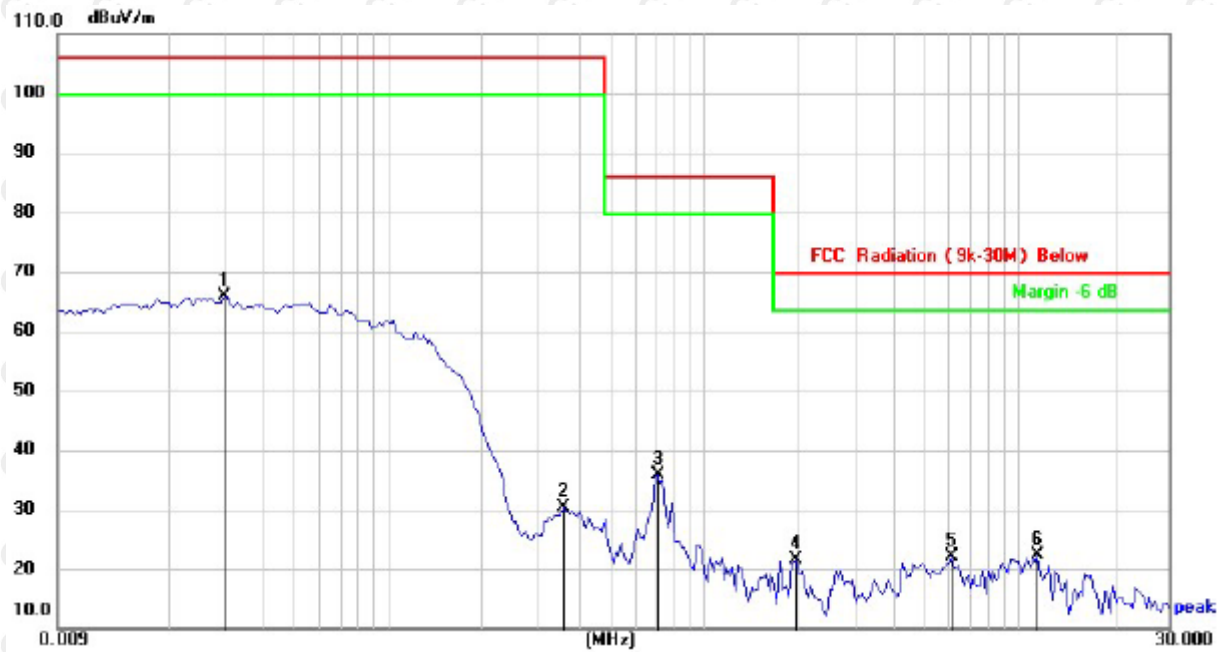
7.4 Test Result

9 kHz-30MHz Horizontal:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1	*	0.0303	123.08	-57.73	65.35	105.6	-40.32	QP
2		0.1360	115.05	-59.04	56.01	105.6	-49.66	QP
3		0.7186	96.20	-58.77	37.43	85.67	-48.24	QP
4		1.9813	79.85	-58.27	21.58	69.50	-47.92	QP
5		5.8041	76.18	-57.76	18.42	69.50	-51.08	QP
6		15.0548	77.54	-56.95	20.59	69.50	-48.91	QP

9 kHz-30MHz Vertical:



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	Level	Factor	ment			Detector
			dBuV	dB	dBuV/m	dB/m	dB	
1	*	0.0303	123.58	-57.73	65.85	105.6	-39.82	QP
2		0.3607	90.36	-59.99	30.37	105.6	-75.30	QP
3		0.7186	94.70	-58.77	35.93	85.67	-49.74	QP
4		1.9813	79.85	-58.27	21.58	69.50	-47.92	QP
5		6.1680	79.76	-57.71	22.05	69.50	-47.45	QP
6		11.5655	79.59	-57.12	22.47	69.50	-47.03	QP

Harmonics and Spurious Emissions**Frequency Range (9 kHz-30MHz)**

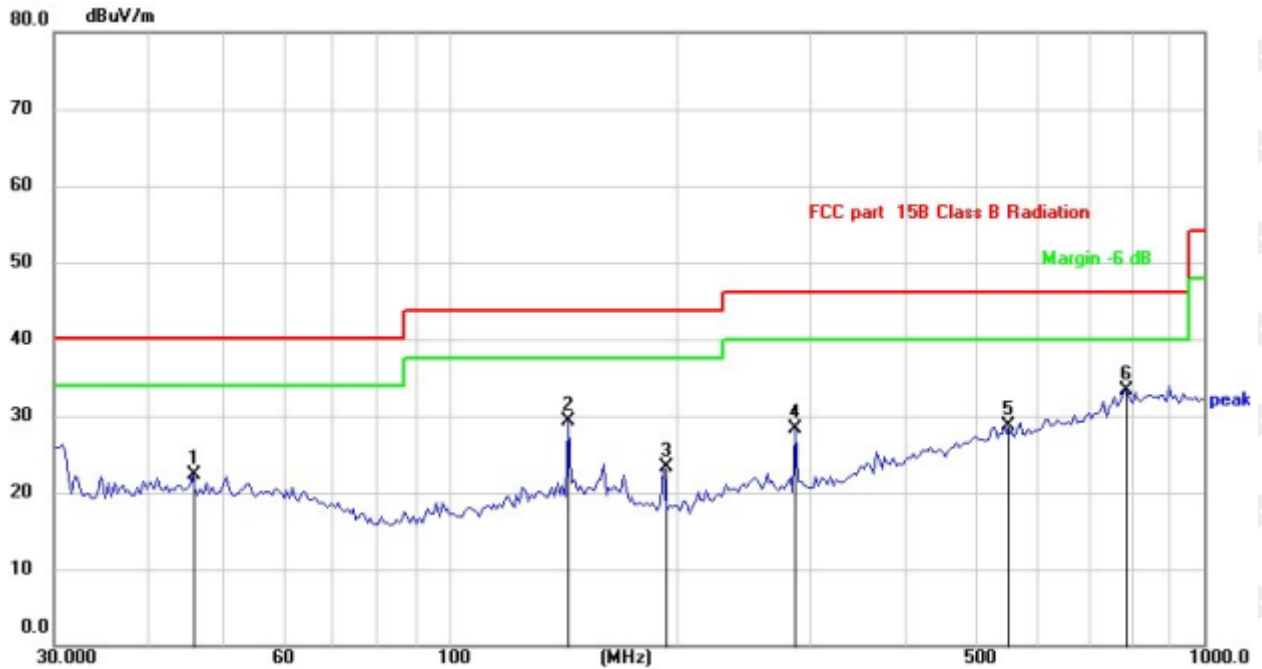
Frequency (MHz)	Level@3m (dB μ V/m)	Limit@3m (dB μ V/m)
--	--	--
--	--	--
--	--	--
--	--	--

Note: 1. Emission Level=Reading+ Cable loss-Antenna factor-Amp factor

2. The emission levels are 20 dB below the limit value, which are not reported. It is deemed to comply with the requirement

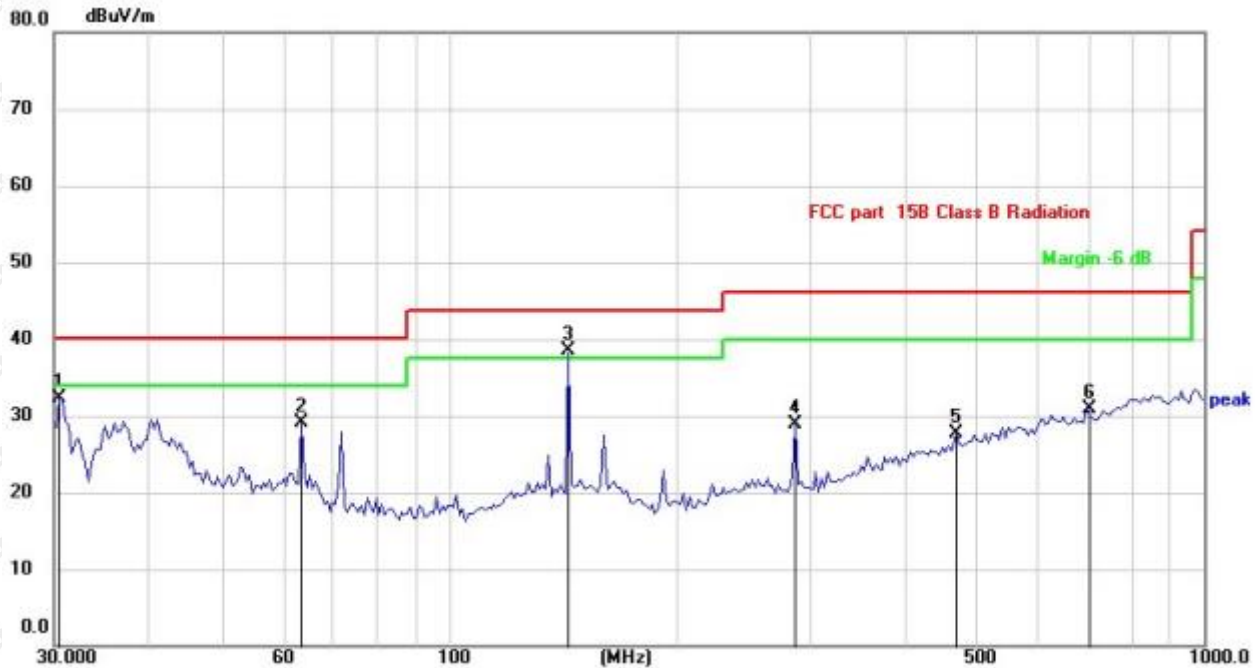
About 30MHz-1GHz Test Results:

Antenna polarity: H



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		45.6948	27.74	-5.48	22.26	40.00	-17.74	QP
2		144.0819	34.67	-5.46	29.21	43.50	-14.29	QP
3		192.4186	31.51	-8.13	23.38	43.50	-20.12	QP
4		287.9904	33.63	-5.33	28.30	46.00	-17.70	QP
5		546.1393	27.23	1.57	28.80	46.00	-17.20	QP
6	*	789.2338	27.48	5.81	33.29	46.00	-12.71	QP

Antenna polarity: V



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		30.5306	39.80	-7.43	32.37	40.00	-7.63	QP
2		63.7588	35.87	-6.83	29.04	40.00	-10.96	QP
3	*	144.0069	44.02	-5.46	38.56	43.50	-4.94	QP
4		287.9904	34.33	-5.33	29.00	46.00	-17.00	QP
5		470.5232	27.75	0.01	27.76	46.00	-18.24	QP
6		698.0796	27.02	3.94	30.96	46.00	-15.04	QP

Remark: 1. Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level
2. This EUT was tested in 3 axis and the worst case position data was reported.

8. ANTENNA REQUIREMENT

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.

EUT Antenna:

The antenna is Internal antenna and no consideration of replacement. The best case gain of the antenna is 0dBi.

9. EUT PHOTOGRAPHS

EUT Photo1



EUT Photo2



10. EUT TEST SETUP PHOTOGRAPHS

Radiated Emission



30MHz-1GHz



9KHz-30MHz

Conducted emission



※※※※※ END OF REPORT ※※※※※