

Qingdao Richmat Intelligence Technology Inc

FCC Class II Permissive Change Report

Report Type:

FCC Part 15.249 RF report

Model:

HJ RF

REPORT NUMBER:

221200050SHA-001

ISSUE DATE:

December 26, 2022

DOCUMENT CONTROL NUMBER:

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Applicant: Qingdao Richmat Intelligence Technology Inc
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Qingdao, Shandong Province, China.

Manufacturer: Qingdao Richmat Intelligence Technology Inc
NO.78 Kongquehe 4th Road, Qingdao Clothing Industry park, Jimo,
Qingdao, Shandong Province, China.

FCC ID: 2AJJGHJRF

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

47CFR Part 15 (2020): Radio Frequency Devices (Subpart C)

ANSI C63.10 (2013): American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

PREPARED BY: **REVIEWED BY:**



Project Engineer
Sky Yang



Reviewer
Erick Liu

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TEST REPORT

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Revision History

Report No.	Version	Description	Issued Date
221200050SHA-001	Rev. 01	Initial issue of report	December 26, 2022

Measurement result summary

TEST ITEM	FCC REFERENCE	RESULT
Radiated emission	15.249 & 15.209	Pass
Power line conducted emission	15.207	NA
Assigned bandwidth (20dB bandwidth)	15.215(c)	NA
Antenna requirement	15.203	NA

Notes: 1: NA =Not Applicable

2: Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3: Additions, Deviations and Exclusions from Standards: None.

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Module
Type/Model:	HJ RF
Description of EUT:	The report is C2PC report, the following host models were added and tested.
Host models:	HJH13D, HJH103
Rating:	DC 3V battery
EUT type:	<input checked="" type="checkbox"/> Table top <input type="checkbox"/> Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	December 12, 2022
Date of test:	December 12, 2022 ~ December 26, 2022

1.2 Technical Specification

Frequency Range:	2405MHz ~ 2480MHz
Type of Modulation:	FSK
Channel Number:	151 channels
Channel Separation:	0.5 MHz
Antenna Information:	PCB antenna, 0dBi

1.3 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Registration No.: R-14243, G-10845, C-14723, T-12252
	A2LA Accreditation Lab Certificate Number: 3309.02

2 TEST SPECIFICATIONS

2.1 Standards or specification

47CFR Part 15 (2020)

ANSI C63.10 (2013)

2.2 Mode of operation during the test

The host devices are handheld devices, so three axes (X, Y, Z) were observed while the test receiver worked as “max hold” continuously and the highest reading among the whole test procedure was recorded.

The lowest, middle and highest channel were tested as representatives.

Mode	Lowest (MHz)	Middle (MHz)	Highest (MHz)
-	2405	2440	2480

2.3 Test software list

Test Items	Software	Manufacturer	Version
Conducted emission	ESxS-K1	R&S	V2.1.0
Radiated emission	ES-K1	R&S	V1.71

2.4 Test peripherals list

Item No.	Name	Band and Model	Description
-	-	-	-

2.5 Test environment condition:

Test items	Temperature	Humidity
Radiated emission	21°C	52% RH

2.6 Instrument list

Conducted Emission/Disturbance Power/Tri-loop Test/CDN method					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input type="checkbox"/>	Test Receiver	R&S	ESCS 30	EC 2107	2023-07-18
<input type="checkbox"/>	Test Receiver	R&S	ESR7	EC 6194	2023-12-07
<input type="checkbox"/>	Attenuator	Hua Xiang	Ts5-10db-6g	EC 6194-1	2023-12-07
<input type="checkbox"/>	A.M.N.	R&S	ESH2-Z5	EC 3119	2023-11-09
<input type="checkbox"/>	A.M.N.	R&S	ENV 216	EC 3393	2023-07-17
<input type="checkbox"/>	A.M.N.	R&S	ENV4200	EC 3558	2023-06-04
<input type="checkbox"/>	Absorbing clamp	R&S	MDS 21	EC 2108	2023-06-04
<input type="checkbox"/>	CDN	Frankonia	CDN M2M316	EC 5969	2023-02-10
<input type="checkbox"/>	CDN	Schaffner	CDN M316	EC 2113-1	2023-09-19
<input type="checkbox"/>	Attenuator	Weinschel	68-6-44	EC 3043-9	2023-02-08
<input type="checkbox"/>	Tri-loop	Schwarzbeck	HXYZ 9170	EC 3384	2023-01-20
<input type="checkbox"/>	Voltage Probe	Schwarzbeck	TK9420	EC 4888	2023-10-09
<input type="checkbox"/>	Voltage Probe	R&S	Esh2-z3	EC 6204	2023-02-27
<input type="checkbox"/>	Current probe	R&S	EZ-17	EC 3221	2022-12-22
<input type="checkbox"/>	I.S.N.	FCC	FCC-TLISN -T2-02	EC 3754	2023-02-08
<input type="checkbox"/>	I.S.N.	FCC	FCC-TLISN -T4-02	EC 3755	2023-02-08
<input type="checkbox"/>	I.S.N.	FCC	FCC-TLISN -T8-02	EC 3756	2023-02-08
<input type="checkbox"/>	I.S.N.	Schwarzbeck	ISN S1	EC 6352	2023-08-09
<input type="checkbox"/>	CDNE	Schwarzbeck	CDNM3	EC 6351	2023-10-10
<input type="checkbox"/>	CDNE	Schwarzbeck	CDN M2	EC 6350	2023-10-10
<input type="checkbox"/>	CDN	Frankonia	CDN M2M3-32	EC 6349	2023-08-09
<input type="checkbox"/>	DC-A.M.N.	Schwarzbeck	PVDC8300	EC 6290	2023-11-09
<input type="checkbox"/>	I.S.N.	Schwarzbeck	NTFM8131	EC 6424	2023-11-08
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2023-07-18
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESR	EC6501	2023-09-05
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2023-08-23
<input type="checkbox"/>	TRILOG broadband Antenna	Schwarzbeck	VULB9168	EC 6402	2023-01-17

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<input checked="" type="checkbox"/>	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC 5262	2023-06-04
<input type="checkbox"/>	Pre-amplifier	Tonscend	tap01018050	EC 6432-1	2023-12-07
<input type="checkbox"/>	Horn antenna	Tonscend	bha9120d	EC 6432-2	2023-01-09
<input checked="" type="checkbox"/>	Horn antenna	ETS	3117	EC 4792-1	2023-08-28
<input type="checkbox"/>	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2023-07-29
<input type="checkbox"/>	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2023-06-15
<input type="checkbox"/>	Horn antenna	ETS	3116c	EC 5955	2023-06-17

RF test

Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input type="checkbox"/>	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2023-03-14
<input type="checkbox"/>	Power sensor	Agilent	U2021XA	EC 5338-1	2023-03-14
<input type="checkbox"/>	Vector Signal Generator	Agilent	N5182B	EC 5175	2023-03-14
<input type="checkbox"/>	Universal Radio Communication Tester	R&S	CMW500	EC5944	2023-01-20
<input type="checkbox"/>	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2023-03-14
<input type="checkbox"/>	Mobile Test System	Litepoint	lqxel	EC 5176	2023-01-11
<input type="checkbox"/>	Test Receiver	R&S	ESCI 7	EC 4501	2022-12-09
<input type="checkbox"/>	Climate chamber	GWS	MT3065	EC 6021	2023-03-06
<input type="checkbox"/>	Spectrum Analyzer	Keysight	N9030B	EC 6078	2023-06-04
<input type="checkbox"/>	Universal Radio Communication Tester	R&S	CMW500	EC 6209	2023-01-20
<input type="checkbox"/>	Signal generator	Agilent	N5182A	EC 6172	2023-08-09
<input type="checkbox"/>	Signal generator	Agilent	N5181A	EC 6171	2023-08-09

Tet Site

Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2023-01-11
<input type="checkbox"/>	Shielded room	Zhongyu	-	EC 2839	2023-01-11
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2023-07-08
<input type="checkbox"/>	Fully-anechoic chamber	Albatross project	-	EC 3047	2023-07-08

Additional instrument

Used	Equipment	Manufacturer	Type	Internal no.	Due date
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<input type="checkbox"/>	Spectrum analyzer	Agilent	E7402A	EC 2254	2023-07-17
<input type="checkbox"/>	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2023-03-24
<input type="checkbox"/>	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2023-03-08
<input checked="" type="checkbox"/>	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3442	2023-01-03
<input type="checkbox"/>	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5844	2023-03-08
<input type="checkbox"/>	Pressure meter	YM3	Shanghai Mengde	EC 4620	2023-09-13

2.7 Measurement uncertainty

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Test item	Measurement uncertainty
Maximum peak output power	$\pm 0.74\text{dB}$
Radiated Emissions in restricted frequency bands below 1GHz	$\pm 4.90\text{dB}$
Radiated Emissions in restricted frequency bands above 1GHz	$\pm 5.02\text{dB}$
Emission outside the frequency band	$\pm 2.89\text{dB}$
Power line conducted emission	$\pm 3.19\text{dB}$

3 Radiated emission

Test result: Pass

3.1 Limit

Fundamental Frequency (MHz)	Fundamental limit (dBuV/m)	Harmonic limit (dBuV/m)
<input type="checkbox"/> 902 - 928	94	54
<input checked="" type="checkbox"/> 2400 - 2483.5	94	54
<input type="checkbox"/> 5725 - 5875	94	54
<input type="checkbox"/> 24000 - 24250	108	68

The radiated emissions which fall in the restricted bands, must also comply with the radiated emission limits:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

3.2 Measurement Procedure

For Radiated emission below 30MHz:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter chamber room. 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.
- Both X and Y axes of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

- The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

TEST REPORT**For Radiated emission above 30MHz:**

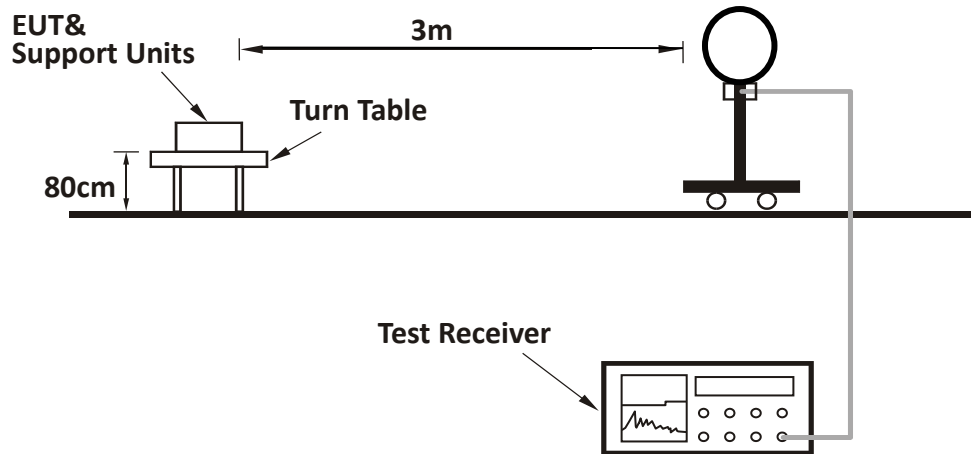
- a) The EUT was placed on the top of a rotating table 0.8 meters (for 30MHz ~ 1GHz) / 1.5 meters (for above 1GHz) above the ground at 3 meter chamber room for test. The table was rotated 360 degrees to determine the position of the highest radiation.
- b) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c) The height of antenna 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 and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.
- f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

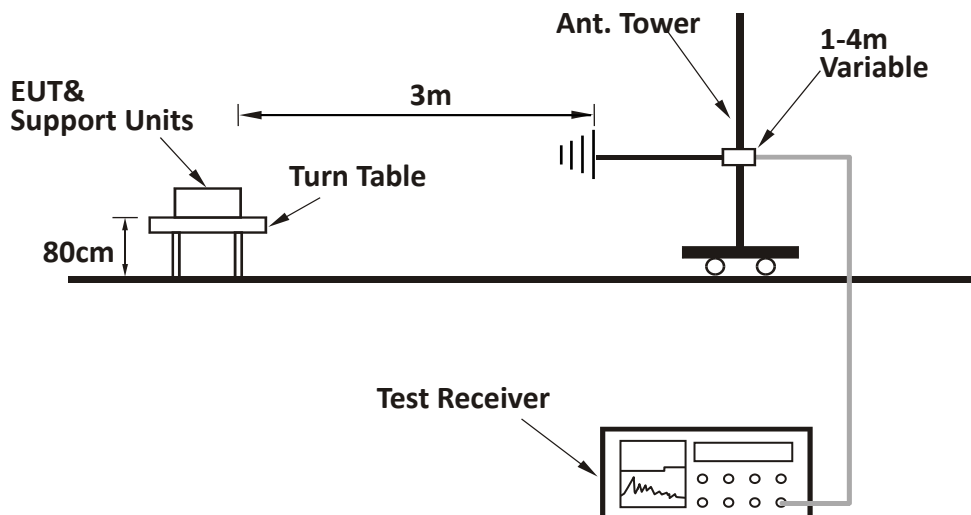
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is $\geq 1/T$ (Duty cycle < 98%) or $3 \times \text{RBW}$ (Duty cycle $\geq 98\%$) for Average detection (AV) at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported

3.3 Test Configuration

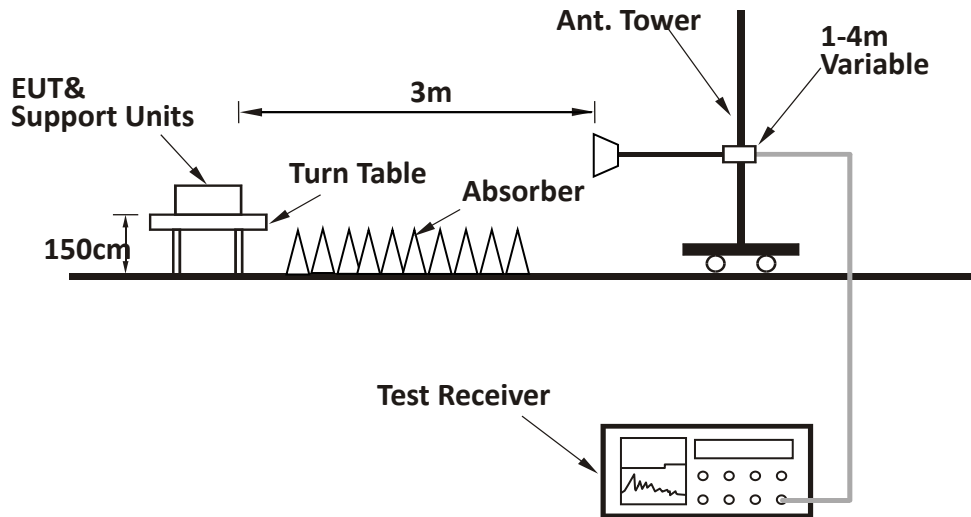
For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



For Radiated emission above 1GHz:

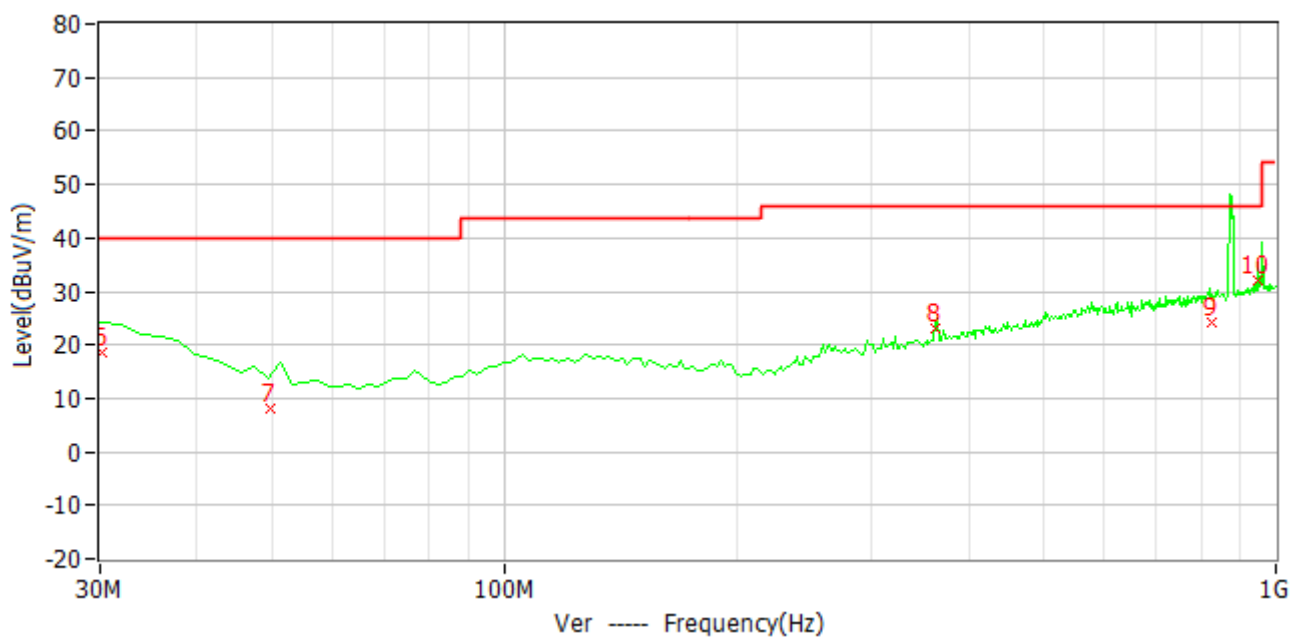
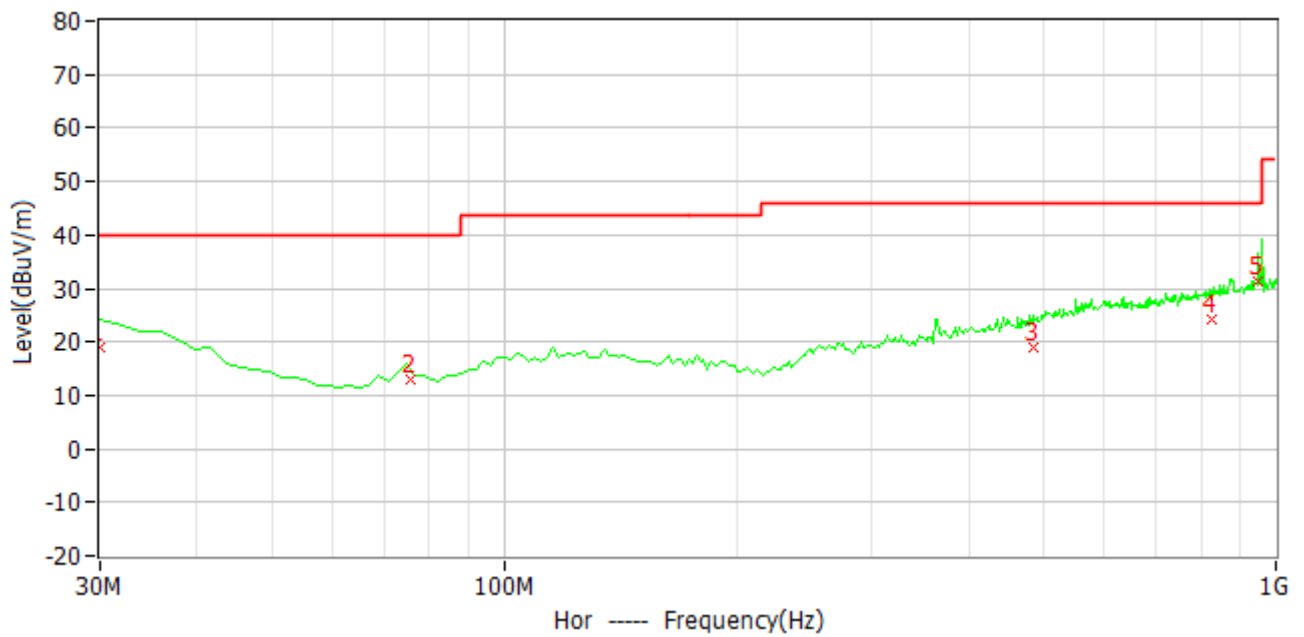


3.4 Test Results of Radiated Emissions

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line per 15.31(o) was not reported.

Test data below 1GHz:

HJH103:

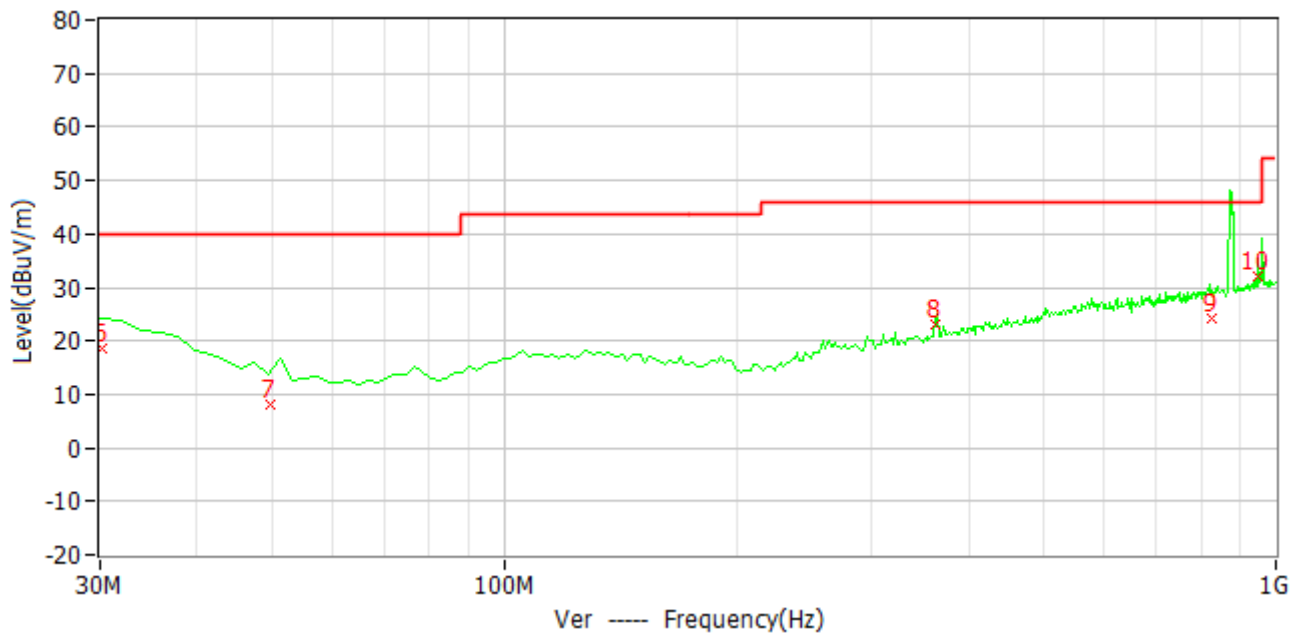
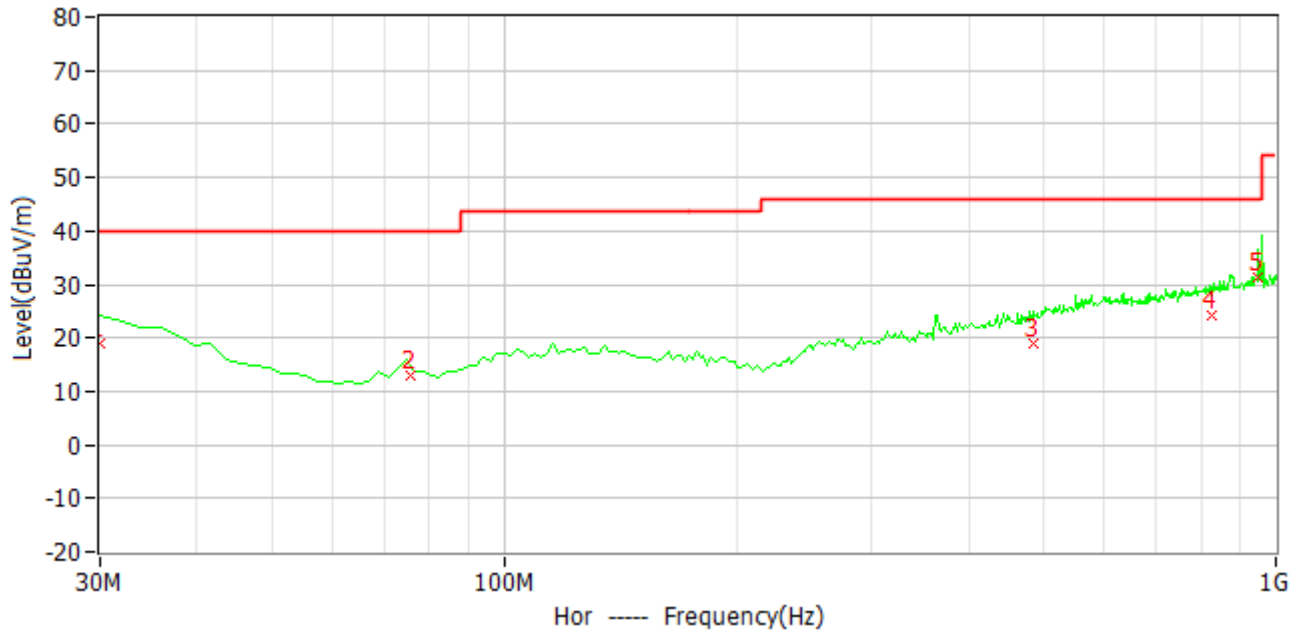


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No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar	Height cm	Angle deg
1	30.058MHz	40.0	18.8	-21.2	-2.6	21.4	QP	Hor	100.0	46.8
2	75.820MHz	40.0	13.0	-27.0	4.4	8.6	QP	Hor	100.0	235.7
3	486.323MHz	46.0	19.1	-26.9	-1.0	20.1	QP	Hor	100.0	145.3
4	825.588MHz	46.0	24.1	-21.9	0.3	23.8	QP	Hor	100.0	87.7
5	948.508MHz	46.0	31.2	-14.8	6.4	24.8	QP	Hor	100.0	17.0
6	30.245MHz	40.0	18.6	-21.4	-2.7	21.3	QP	Ver	100.0	327.6
7	49.704MHz	40.0	8.2	-31.8	-2.1	10.3	QP	Ver	100.0	233.2
8	362.674MHz	46.0	23.0	-23.0	5.6	17.4	QP	Ver	100.0	250.8
9	825.011MHz	46.0	24.1	-21.9	0.3	23.8	QP	Ver	100.0	172.6
10	948.469MHz	46.0	32.2	-13.8	7.4	24.8	QP	Ver	100.0	146.1

TEST REPORT

HJH13D:



TEST REPORT

No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar	Height cm	Angle deg
1	30.058MHz	40.0	18.8	-21.2	-2.6	21.4	QP	Hor	100.0	46.8
2	75.820MHz	40.0	13.0	-27.0	4.4	8.6	QP	Hor	100.0	235.7
3	486.323MHz	46.0	19.1	-26.9	-1.0	20.1	QP	Hor	100.0	145.3
4	825.588MHz	46.0	24.1	-21.9	0.3	23.8	QP	Hor	100.0	87.7
5	948.508MHz	46.0	31.2	-14.8	6.4	24.8	QP	Hor	100.0	17.0
6	30.245MHz	40.0	18.6	-21.4	-2.7	21.3	QP	Ver	100.0	327.6
7	49.704MHz	40.0	8.2	-31.8	-2.1	10.3	QP	Ver	100.0	233.2
8	362.674MHz	46.0	23.0	-23.0	5.6	17.4	QP	Ver	100.0	250.8
9	825.011MHz	46.0	24.1	-21.9	0.3	23.8	QP	Ver	100.0	172.6
10	948.469MHz	46.0	32.2	-13.8	7.4	24.8	QP	Ver	100.0	146.1

Test result above 1GHz:

HJH103:

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2405	95.50	9.17	114.00	18.50	PK
	V	2405	92.60	9.59	114.00	21.40	PK
	H	2390	58.62	9.19	74.00	15.38	PK
	H	2390	42.69	9.19	54.00	11.31	AV
	V	2390	56.41	9.61	74.00	17.59	PK
	V	2390	41.69	9.61	54.00	12.31	AV
	H	4810	58.30	9.13	74.00	15.70	PK
	H	4810	40.99	9.13	54.00	13.01	AV
	V	4810	54.96	9.24	74.00	19.04	PK
	V	4810	39.20	9.24	54.00	14.80	AV
	H	7215	46.20	8.59	74.00	27.80	PK
	V	7215	43.90	8.69	74.00	30.10	PK
M	H	2440	93.60	9.09	114.00	20.40	PK
	V	2440	89.60	9.51	114.00	24.40	PK
	H	4880	57.30	9.13	74.00	16.70	PK
	H	4880	41.20	9.13	54.00	12.80	AV
	V	4880	56.10	9.31	74.00	17.90	PK
	V	4880	42.69	9.31	74.00	31.31	AV
H	H	2480	93.80	9.00	114.00	20.20	PK
	V	2480	91.50	9.40	114.00	22.50	PK
	H	2483.5	66.18	8.98	74.00	7.82	PK

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	H	2483.5	46.96	8.98	54.00	7.04	AV
	V	2483.5	66.90	9.39	74.00	7.10	PK
	V	2483.5	45.68	9.39	54.00	8.32	AV
	H	4960	58.10	9.12	74.00	15.90	PK
	H	4960	41.60	9.12	54.00	12.40	AV
	V	4960	55.95	9.38	74.00	18.05	PK
	V	4960	41.68	9.38	54.00	12.32	AV

HJH13D:

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2405	97.50	9.17	114.00	16.50	PK
	V	2405	91.10	9.59	114.00	22.90	PK
	H	2390	59.83	9.19	74.00	14.17	PK
	H	2390	41.51	9.19	54.00	12.49	AV
	V	2390	56.85	9.61	74.00	17.15	PK
	V	2390	41.14	9.61	54.00	12.86	AV
	H	4810	57.71	9.13	74.00	16.29	PK
	H	4810	41.65	9.13	54.00	12.35	AV
	V	4810	54.63	9.24	74.00	19.37	PK
	V	4810	38.47	9.24	54.00	15.53	AV
	H	7215	46.10	8.59	74.00	27.90	PK
	V	7215	44.80	8.69	74.00	29.20	PK
M	H	2440	94.20	9.09	114.00	19.80	PK
	V	2440	90.00	9.51	114.00	24.00	PK
	H	4880	56.64	9.13	74.00	17.36	PK
	H	4880	40.61	9.13	54.00	13.39	AV
	V	4880	56.26	9.31	74.00	17.74	PK
	V	4880	40.41	9.31	74.00	33.59	AV
H	H	2480	93.20	9.00	114.00	20.80	PK
	V	2480	91.80	9.40	114.00	22.20	PK
	H	2483.5	66.97	8.98	74.00	7.03	PK
	H	2483.5	45.66	8.98	54.00	8.34	AV
	V	2483.5	67.50	9.39	74.00	6.50	PK
	V	2483.5	46.20	9.39	54.00	7.80	AV
	H	4960	57.12	9.12	74.00	16.88	PK

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	H	4960	41.89	9.12	54.00	12.11	AV
	V	4960	56.26	9.38	74.00	17.74	PK
	V	4960	40.89	9.38	54.00	13.11	AV

Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.

2. Corrected Reading = Original Receiver Reading + Correct Factor

3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,

Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,

Limit = 40.00dBuV/m.

Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;

Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;

Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

***** END *****