Qingdao Richmat Intelligence Technology Inc

FCC Class II Permissive Change Report

Report Type:
FCC Part 15.249 RF report

Model:
HJ RF

REPORT NUMBER:
211200627SHA-001

ISSUE DATE:
January 10, 2022

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TEST REPORT

Report no.: 211200627SHA-001

Applicant:	Qingdao Richmat Intelligence Technology Inc NO.78 Kongquehe 4th Road, Qingdao Clothing Industry park, Jimo, 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 (2019): 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:**
Sky Yang	Erick Liu
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
211200627SHA-001	Rev. 01	Initial issue of report	January 10, 2022

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Measurement result summary

TEST ITEM	FCC REFERANCE	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:	HJH104
Rating:	DC 3.3V
EUT type:	☒ Table top ☐ Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	December 15, 2021
Date of test:	December 16, 2021 ~ December 31, 2021

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.: CN0051
	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 (2019)
ANSI C63.10 (2013)

2.2 Mode of operation during the test

The host devices are handhold 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
☐	Test Receiver	R&S	ESCS 30	EC 2107	2022-07-15
☐	A.M.N.	R&S	ESH2-Z5	EC 3119	2022-11-30
☐	A.M.N.	R&S	ENV 216	EC 3393	2022-07-04
☐	A.M.N.	R&S	ENV4200	EC 3558	2022-06-10
☐	Absorbing clamp	R&S	MDS 21	EC 2108	2022-06-19
☐	CDN	Frankonia	CDN M2M316	EC 5969	2022-03-15
☐	CDN	Schaffner	CDN M316	EC 2113-1	2022-07-16
☐	Attenuator	Weinschel	68-6-44	EC 3043-9	2022-02-05
☐	Tri-loop	Schwarzbeck	HXYZ 9170	EC 3384	2022-10-10
☐	Voltage Probe	Schwarzbeck	TK9420	EC 4888	2022-09-12
☐	Current probe	R&S	EZ-17	EC 3221	2022-03-15
☐	I.S.N.	FCC	FCC-TLISN -T2-02	EC 3754	2022-02-05
☐	I.S.N.	FCC	FCC-TLISN -T4-02	EC 3755	2022-02-05
☐	I.S.N.	FCC	FCC-TLISN -T8-02	EC 3756	2022-02-05
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Test Receiver	R&S	ESIB 26	EC 3045	2022-09-12
☑	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2022-06-10
☑	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2022-06-10
☐	Horn antenna	R&S	HF 906	EC 3049	2022-11-17
☑	Horn antenna	ETS	3117	EC 4792-1	2023-01-08
☐	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2022-07-09
☑	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2022-03-07

		EM TEST	NETWAVE-30-400	EC 5383-2	2022-06-19
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2022-03-05
☐	Power sensor	Agilent	U2021XA	EC 5338-1	2022-03-05
☐	Vector Signal Generator	Agilent	N5182B	EC 5175	2022-03-05
☐	Spectrum analyzer	R&S	CMW500	EC5944	2022-12-23
☐	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2022-03-05
☐	Mobile Test System	Litepoint	Iqxel	EC 5176	2023-01-08
☐	Test Receiver	R&S	ESCI 7	EC 4501	2022-09-12
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☐	Shielded room	Zhongyu	-	EC 2838	2023-01-06
☐	Shielded room	Zhongyu	-	EC 2839	2022-01-14
☑	Semi-anechoic chamber	Albatross project	-	EC 3048	2022-07-31
☐	Fully-anechoic chamber	Albatross project	-	EC 3047	2022-07-31
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☑	Spectrum analyzer	Agilent	E7402A	EC 2254	2022-07-15
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2022-02-28
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 2122	2022-03-11
☑	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5198	2022-01-18
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3326	2022-03-28
☐	Pressure meter	YM3	Shanghai Mengde	EC 3320	2022-07-01

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	± 0.74dB
Radiated Emissions in restricted frequency bands below 1GHz	± 4.90dB
Radiated Emissions in restricted frequency bands above 1GHz	± 5.02dB
Emission outside the frequency band	± 2.89dB
Power line conducted emission	± 3.19dB

3 Radiated emission

Test result: **Pass**

3.1 Limit

Fundamental Frequency (MHz)	Fundamental limit (dBuV/m)	Harmonic limit (dBuV/m)
☐ 902 - 928	94	54
☒ 2400 - 2483.5	94	54
☐ 5725 - 5875	94	54
☐ 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:

a) 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.
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) Both X and Y axes of the antenna are set to make the measurement.
d) 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.
e) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

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

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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.

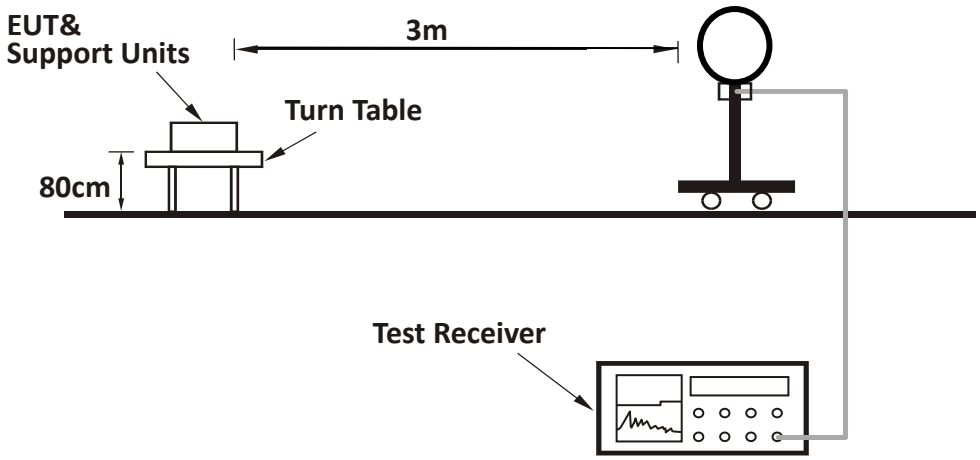
f) The test-receiver system was set to peak and average detect function and specified bandwidth with maximum hold mode when the test frequency is above 1 GHz. If the peak reading value also meets average limit, measurement with the average detector is unnecessary.

Note:

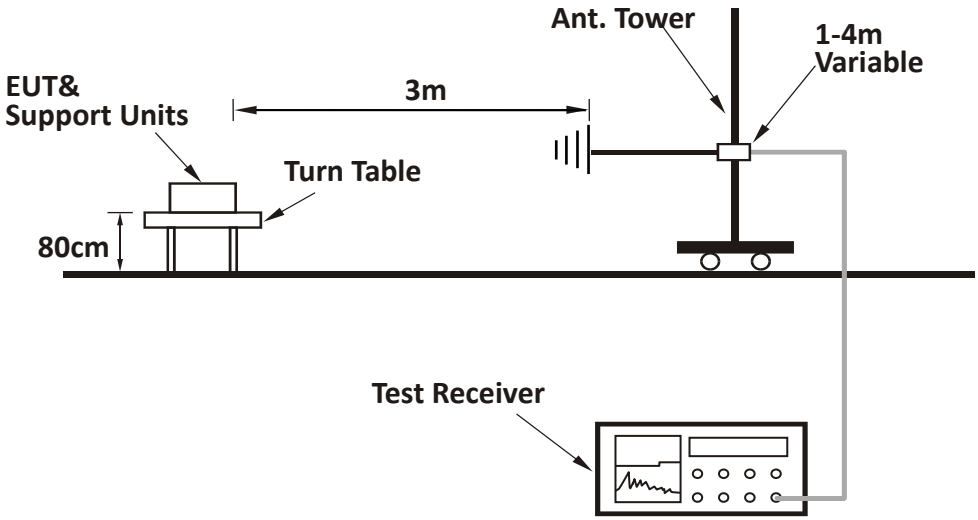
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is ≥ 1/T (Duty cycle < 98%) or 3 x RBW (Duty cycle ≥ 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:



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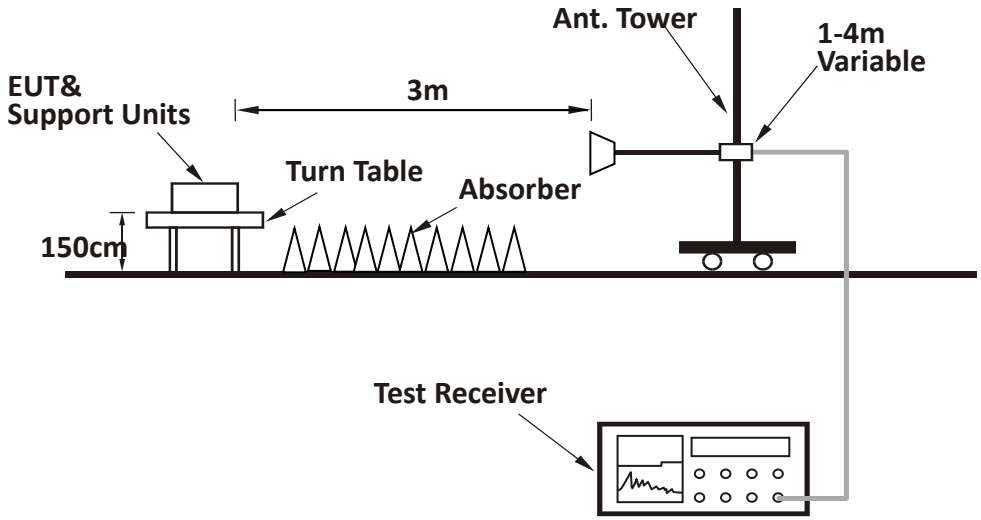
For Radiated emission above 1GHz:



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:

All the models were tested and the worst result was listed in the report as below:

Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.06	18.80	21.40	40.00	21.20	PK
H	75.82	13.00	8.60	40.00	27.00	PK
H	486.32	19.10	20.10	46.00	26.90	PK
H	825.59	24.10	23.80	46.00	21.90	PK
H	948.51	31.20	24.80	46.00	14.80	PK
V	30.25	18.60	21.30	40.00	21.40	PK
V	49.70	8.20	10.30	40.00	31.80	PK
V	362.67	23.00	17.40	46.00	23.00	PK
V	825.01	24.10	23.80	46.00	21.90	PK
V	948.47	32.20	24.80	46.00	13.80	PK

Test result above 1GHz:

CH	Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
L	H	2405	91.90	9.17	114.00	22.10	PK
	V	2405	79.70	9.59	114.00	34.30	PK
	H	2390	51.30	9.19	74.00	22.70	PK
	V	2390	49.80	9.61	74.00	24.20	PK
	H	4810	45.20	9.13	74.00	28.80	PK
	V	4810	49.60	9.24	74.00	24.40	PK
	H	7215	55.20	8.59	74.00	18.80	PK
	H	7215	40.70	8.59	54.00	13.30	AV
	V	7215	55.10	8.69	74.00	18.90	PK
	V	7215	40.50	8.69	54.00	13.50	AV

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M	H	2440	87.50	9.09	114.00	26.50	PK
	V	2440	76.10	9.51	114.00	37.90	PK
	H	4880	48.60	9.13	74.00	25.40	PK
	V	4880	52.80	9.31	74.00	21.20	PK
	H	7320	58.09	8.56	74.00	15.91	PK
	H	7320	40.90	8.56	54.00	13.10	AV
	V	7320	55.50	8.66	74.00	18.50	PK
	V	7320	40.60	8.66	54.00	13.40	AV
H	H	2480	89.90	9.00	114.00	24.10	PK
	V	2480	76.80	9.40	114.00	37.20	PK
	H	2483.5	51.33	8.98	74.00	22.67	PK
	V	2483.5	46.64	9.39	74.00	27.36	PK
	H	4960	48.00	9.12	74.00	26.00	PK
	V	4960	51.40	9.38	74.00	22.60	PK
	H	7440	58.03	8.52	74.00	15.97	PK
	H	7440	41.27	8.52	54.00	12.73	AV
	V	7440	52.40	8.62	74.00	21.60	PK

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 **********