FCC TEST REPORT

For

Shenzhen Junfa Ruida Intelligent Technology Co., LTD

RFID radio module

Test Model: HR601M

Prepared for	:	Shenzhen Junfa Ruida Intelligent Technology Co., LTD
Address	:	304, Workshop No.7, Lianjian Science and Technology Industrial Park, Huarong Road, Tongsheng Community, Dalang Street, Longhua District, Shenzhen, China
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	June 22, 2022
Number of tested samples	:	2
Sample No.	:	A061322106-1, A061322106-2
Serial number	:	Prototype
Date of Test	:	June 22, 2022 ~ July 28, 2022
Date of Report	:	July 30, 2022

FCC TEST REPORT
FCC CFR 47 PART 15 C (15.247)

Report Reference No.	**:**	**LCSA061322106EA**
Date of Issue.....	:	July 30, 2022
Testing Laboratory Name.....	**:**	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....	:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Testing Location/ Procedure.....	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.....	**:**	**Shenzhen Junfa Ruida Intelligent Technology Co., LTD**
Address.....	:	304, Workshop No.7, Lianjian Science and Technology Industrial Park, Huarong Road, Tongsheng Community, Dalang Street, Longhua District, Shenzhen, China
Test Specification		
Standard.....	:	FCC CFR 47 PART 15 C (15.247)
Test Report Form No.....	**:**	LCSEMC-1.0
TRF Originator.....	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....	:	Dated 2011-03

EUT Description.....	**:**	**RFID radio module**
Trade Mark.....	:	N/A
Test Model.....	:	HR601M
Ratings.....	:	Input: DC 3.8~5.5V
Result	:	**Positive**

Compiled by:	**Supervised by:**	**Approved by:**
Diamond Lu / administrators	Cary Luo/ Technique principal	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : **LCSA061322106EA**	July 30, 2022 Date of issue

Test Model.....	: HR601M
EUT.....	: RFID radio module
Applicant.....	**: Shenzhen Junfa Ruida Intelligent Technology Co., LTD**
Address.....	: 304, Workshop No.7, Lianjian Science and Technology Industrial Park, Huarong Road, Tongsheng Community, Dalang Street, Longhua District, Shenzhen, China
Telephone.....	:
Fax.....	:
Manufacturer.....	**: Shenzhen Junfa Ruida Intelligent Technology Co., LTD**
Address.....	: 304, Workshop No.7, Lianjian Science and Technology Industrial Park, Huarong Road, Tongsheng Community, Dalang Street, Longhua District, Shenzhen, China
Telephone.....	:
Fax.....	:
Factory.....	**: Shenzhen Junfa Ruida Intelligent Technology Co., LTD**
Address.....	: 304, Workshop No.7, Lianjian Science and Technology Industrial Park, Huarong Road, Tongsheng Community, Dalang Street, Longhua District, Shenzhen, China
Telephone.....	:
Fax.....	:

Test Result	**Positive**

The test report merely corresponds to the test sample.

It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Revision	Issue Date	Revisions	Revised By
000	July 30, 2022	Initial Issue	Gavin Liang

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	RFID radio module
Test Model	:	HR601M
Power Supply	:	Input: DC 3.8~5.5V
Hardware Version	:	V6
Software Version	:	V2.3.6
RFID	:	
Frequency Range	:	902.25MHz-927.75MHz
Channel Number	:	52 channels
Channel Spacing	:	500KHz
Modulation Type	:	RFID UHF - DSB-ASK
Antenna Description	:	Ceramic Antenna, 1.91dBi(Max.)

1.2. Host System Configuration List and Details

Manufacturer	Description	Model	Serial Number	Certificate
Lenovo	ADAPTER for Notebook	ADLX65YCC3A	--	SDOC
Lenovo	Notebook	TP00094A	--	SDOC

1.3. External I/O Cable

I/O Port Description	Quantity	Cable
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1.4. Description of Test Facility

NVLAP Accreditation Code is 600167-0.

FCC Designation Number is CN5024.

CAB identifier is CN0071.

CNAS Registration Number is L4595.

Test Firm Registration Number: 254912.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.4:2014 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5. Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6. Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.10dB	(1)
		30MHz~200MHz	±2.96dB	(1)
		200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.7. Description of Test Modes

The EUT has been tested under operating condition.

This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.

Worst-case mode and channel used for 9 KHz-1000 MHz radiated emissions was the mode and channel with the highest output power, that was determined to be High Channel-927.75MHz.

1.8. Frequency of Channels

Channel	Frequency(MHz)	Channel	Frequency(MHz)
00	902.25	27	915.25
01	902.75	28	915.75
02	903.25	29	916.25
03	903.75	30	916.75
04	904.25	31	917.25
05	904.75	32	917.75
06	905.25	33	918.25
07	905.75	34	918.75
08	906.25	35	919.25
09	906.75	36	919.75
10	907.25	37	920.15
11	907.75	38	920.75
12	908.25	39	921.25
13	908.75	40	921.75
14	909.25	41	922.25
15	909.75	42	922.75
16	910.25	43	923.25
17	910.75	44	923.75
18	911.25	45	924.25
19	911.75	46	924.75
20	912.25	47	925.25
21	912.75	48	925.75
22	913.25	49	926.25
23	913.75	50	926.75
25	914.25	51	927.25
26	914.75	52	927.75

Test Frequency and Channel

Channel	Frequency(MHz)
00(LCH)	902.25
26(MCH)	914.75
52(HCH)	927.75

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR PART 15C 15.207, 15.209, 15.247 and DA 00-705.

2.1. EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2. EUT Exercise

The EUT was operated in the normal operating mode for Hopping Numbers and Dwell Time test and a continuous transmits mode for other tests(The duty cycle is 100%).

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209, 15.247 under the FCC Rules Part 15 Subpart C.

2.3. General Test Procedures

2.3.1 Conducted Emissions

The EUT is directly placed on the ground. According to the requirements in Section 6.2.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turntable, which is directly placed on the ground. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.3 of ANSI C63.10-2013

2.4. Test Sample

The application provides 2 samples to meet requirement;

Sample Number	Description
Sample 1	(A061322106-1)Engineer sample – continuous transmit
Sample 2	(A061322106-2)Normal sample – Intermittent transmit

3. SYSTEM TEST CONFIGURATION

3.1. Justification

The system was configured for testing in a continuous transmits condition.

3.2. EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software (JF100_UHF_Reader) provided by application.

3.3. Special Accessories

No.	Equipment	Manufacturer	Model No.	Serial No.	Length	shielded/ unshielded	Notes
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3.4. Block Diagram/Schematics

Please refer to the related document

3.5. Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6. Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

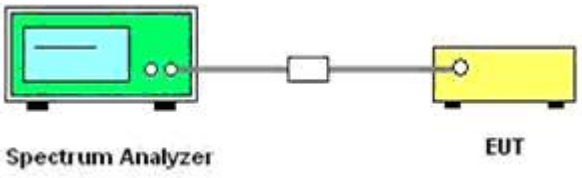
Applied Standard: FCC Part 15 Subpart C				
FCC Rules	Description of Test	Test Sample	Result	Remark
§15.247(b)(2)	Maximum Peak Conducted Output Power	Sample 1	Compliant	Appendix A.1
§15.247(a)(1)(i)	20 dB Bandwidth	Sample 1	Compliant	Appendix A.2
§15.247(a)(1)	Frequency Separation	Sample 1	Compliant	Appendix A.3
§15.247(a)(1)(i)	Number of Hopping Frequency	Sample 2	Compliant	Appendix A.4
§15.247(a)(1)(i)	Time Of Occupancy (Dwell Time)	Sample 2	Compliant	Appendix A.5
§15.247(d)	Band Edges Measurements and Conducted Spurious Emissions	Sample 1	Compliant	Appendix A.6 Appendix A.7
§15.205, § 15.209	Radiated Spurious Emissions	Sample 1	Compliant	Note 1
§15.207(a)	AC Conducted Emissions	N/A	N/A	N/A
§15.203	Antenna Requirements	Sample 1	Compliant	Note 1
§1.1310 §2.1091	RF Exposure	Sample 1	Compliant	Note 2

Remark:
1. Note 1 – Test results inside test report;
2. Note 2 – Test results in other test report (MPE Report).

5. MEASUREMENT RESULTS

5.1. Maximum Peak Conducted Output Power

5.1.1 Block Diagram of Test Setup



5.1.2 Limit

According to §15.247(b)(2), For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

5.1.3 Test Procedure

The transmitter output is connected to the spectrum.

a) Use the following spectrum analyzer settings:

1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.

2) RBW > 20 dB bandwidth of the emission being measured.

3) VBW ≥ RBW.

4) Sweep: Auto.

5) Detector function: Peak.

6) Trace: Max hold.

b) Allow trace to stabilize.

c) Use the marker-to-peak function to set the marker to the peak of the emission.

d) The indicated level is the peak output power, after any corrections for external attenuators and cables.

5.1.4 Test Results

PASS

Please refer to Appendix A.1

Remark:

1) Test results including cable loss;

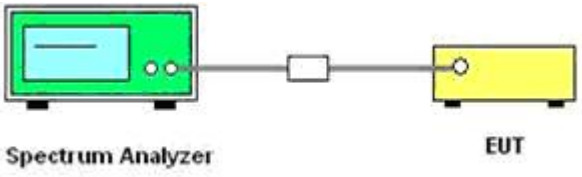
5.2. Frequency Separation and 20 dB Bandwidth

5.2.1 Limit

1. According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

2. According to §15.247(a)(1)(i), The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

5.2.2 Block Diagram of Test Setup



5.2.3 Test Procedure

Frequency separation test procedure:

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set center frequency of Spectrum Analyzer = middle of hopping channel.

4). Set the Spectrum Analyzer as RBW = 100 kHz, VBW = 300 kHz, Span = wide enough to capture the peaks of two adjacent channels, Sweep = auto.

5). Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

20dB bandwidth test procedure:

1). Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel.

2). RBW ≥1% of the 20 dB bandwidth, VBW ≥RBW.

3). Detector function = peak.

4). Trace = max hold.

5.2.4 Test Results

5.2.4.1 99% Bandwidth and 20dB Bandwidth

PASS

Please refer to Appendix A.2

Remark:

1. *Test results including cable loss;*

5.2.4.2 Frequency Separation

PASS

Please refer to Appendix A.3

Remark:

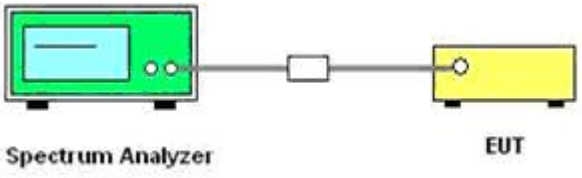
1. *Test results including cable loss;*

5.3. Number of Hopping Frequency

5.3.1 Limit

According to §15.247(a)(1)(i), if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

5.3.2 Block Diagram of Test Setup



5.3.3 Test Procedure

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set Spectrum Analyzer Start=902MHz, Stop = 928MHz, Sweep = auto.

4). Set the Spectrum Analyzer as RBW/VBW=100 KHz/300KHz.

5). Max hold, view and count how many channel in the band.

5.3.4 Test Results

PASS

Please refer to Appendix A.4

Remark:

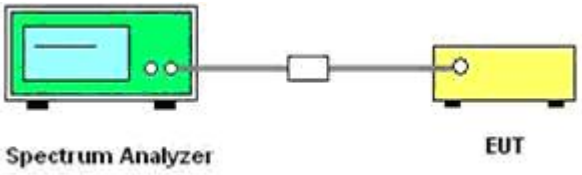
1). Test results including cable loss;

5.4. Time of Occupancy (Dwell Time)

5.4.1 Limit

According to §15.247(a)(1)(i), if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

5.4.2 Block Diagram of Test Setup



5.4.3 Test Procedure

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set center frequency of Spectrum Analyzer = operating frequency.

4). Set the Spectrum Analyzer as RBW/VBW=300KHz/1000KHz, Span = 0Hz, Sweep = auto.

5). the width of a single pulse is measured in fast scan. The number of pulses is measured in a 0.2 second scan, to enable resolution of each occurrence.

6). Repeat above procedures until all frequency measured was complete.

5.4.4 Test Results

PASS

Please refer to Appendix A.5

The average time of occupancy in the specified 20 second period is equal to 10(number of pulses in 2s)*pulse width.*

Remark:

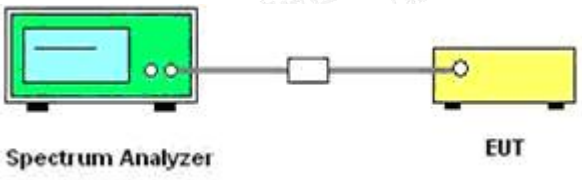
1. *Test results including cable loss;*

5.5. Conducted Spurious Emissions and Band Edges Test

5.5.1 Limit

According to §15.247(d), In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

5.5.2 Block Diagram of Test Setup



5.5.3 Test Procedure

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 300 KHz.

Measurements are made over the 9 KHz to 18GHz range with the transmitter set to the lowest, middle, and highest channels

5.5.4 Test Results of Conducted Spurious Emissions

PASS

Please refer to Appendix A.6 for conducted spurious emission.

Please refer to Appendix A.7 for conducted band edge.

Remark:
1). Test results including cable loss;
2). "---"means that the fundamental frequency not for 15.209 limits requirement.
3). Not recorded emission from 9 KHz to 30 MHz as emission level at least 20dBc lower than emission limit.

5.6. Radiated Spurious Emissions

5.6.1. Standard Applicable

FCC §15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

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

5.6.2. Measuring Instruments and Setting

Please refer to of equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/T kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/T kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

5.6.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1.0 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with

QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 4 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 10 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 4 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

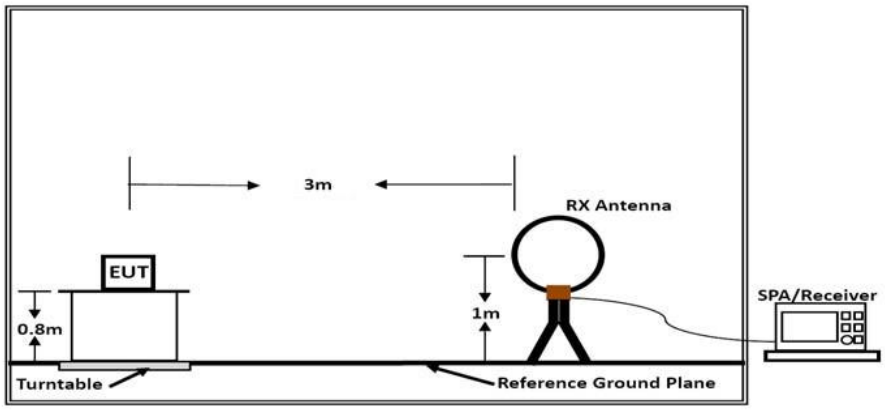
--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

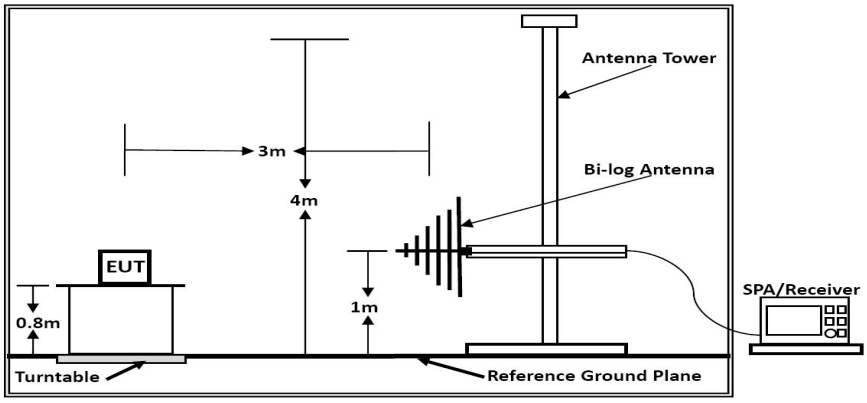
--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

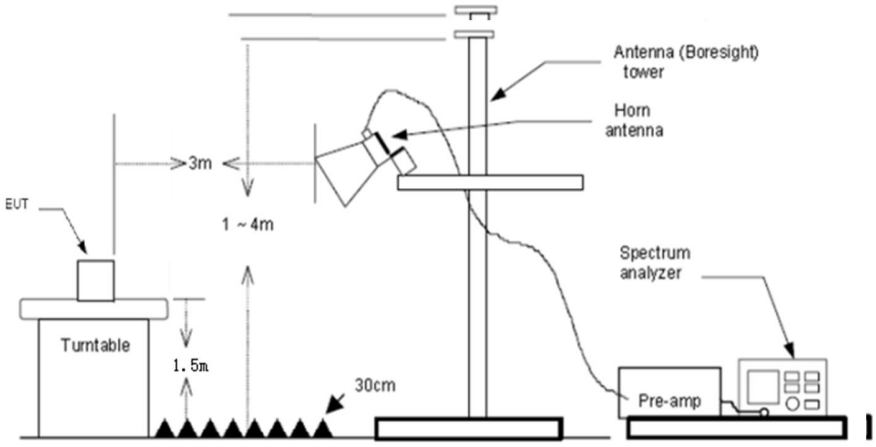
5.6.4. Test Setup Layout



Below 30MHz



Below 1GHz



5.6.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

5.6.6. Results of Radiated Emissions (9 KHz~30MHz)

Temperature	24.6℃	Humidity	54.1%
Test Engineer	Monkey Li	Configurations	RFID

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

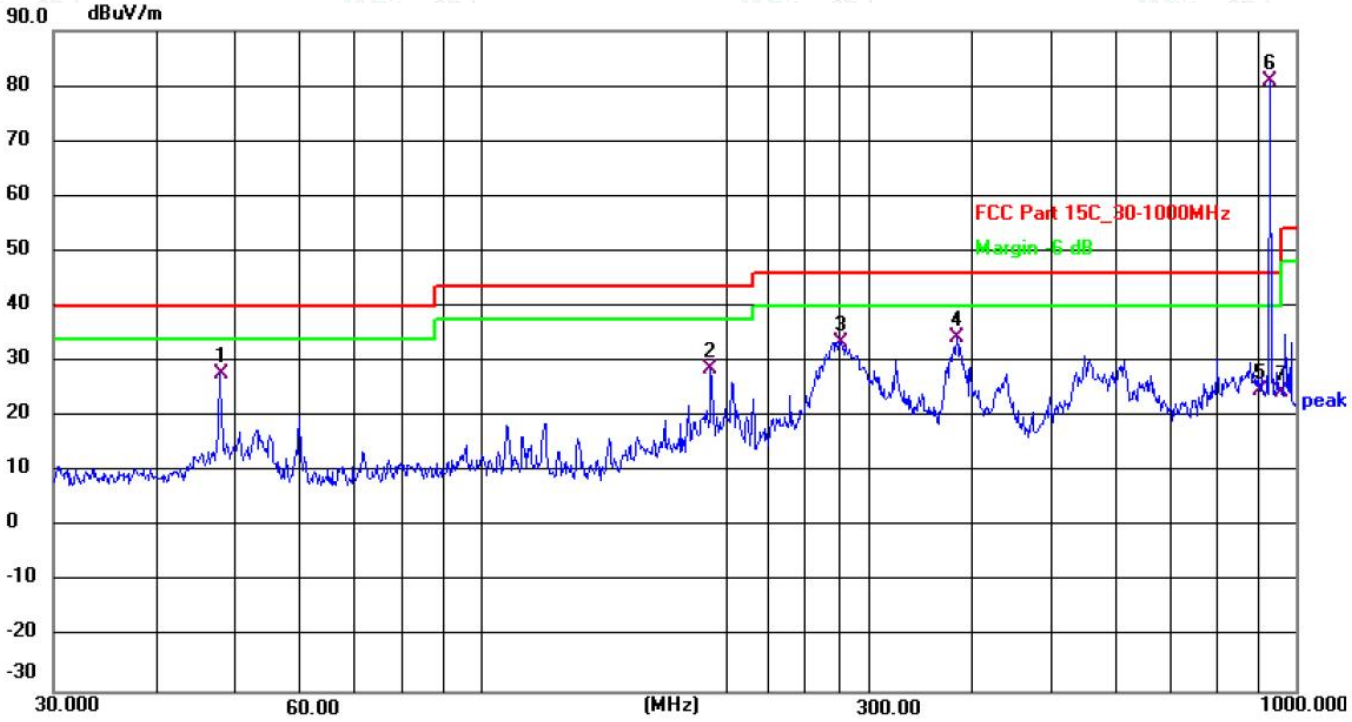
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

5.6.7. Results of Radiated Emissions (30 MHz – 1000 MHz)

PASS.

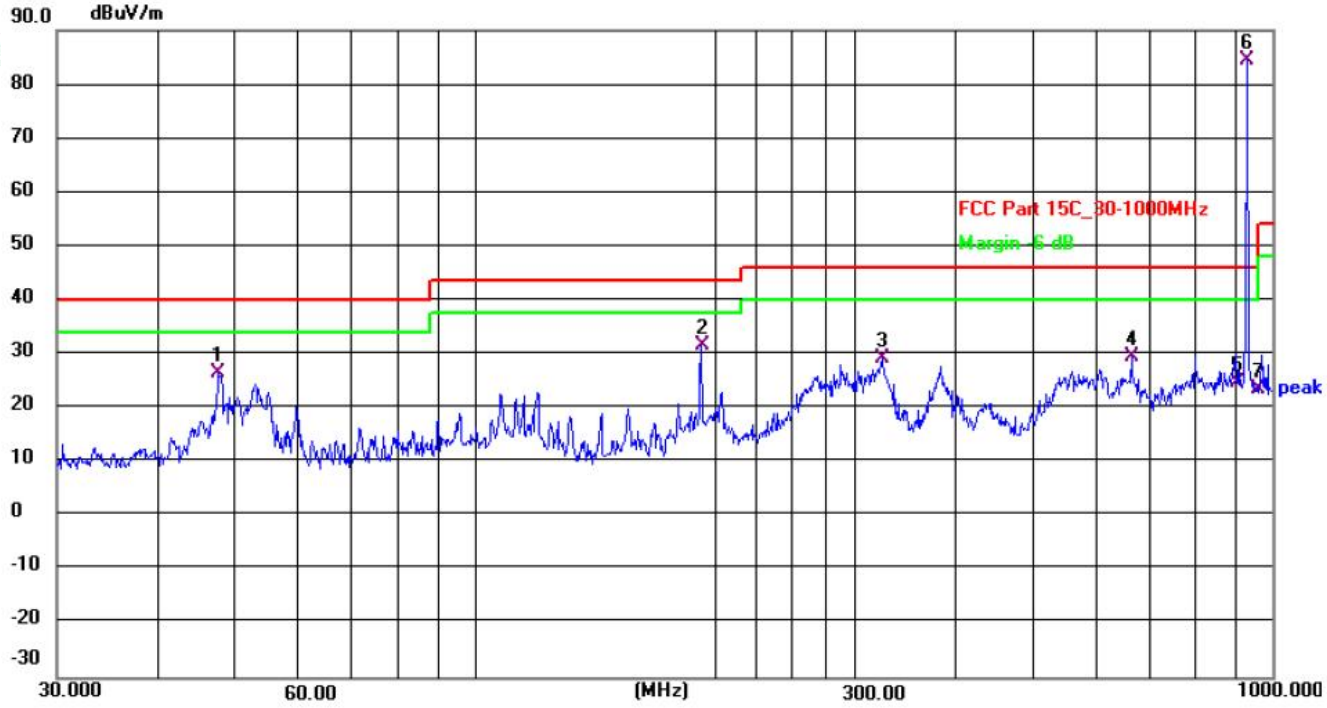
Below 1GHz

Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	47.9940	44.65	-16.99	27.66	40.00	-12.34	QP
2	191.7450	46.09	-17.35	28.74	43.50	-14.76	QP
3	277.0935	48.94	-15.39	33.55	46.00	-12.45	QP
4	383.9318	48.96	-14.63	34.33	46.00	-11.67	QP
5	902.0000	32.99	-8.27	24.72	46.00	-21.28	QP
6	928.0081	88.69	-7.91	80.78	125.30	-44.52	QP
7	960.0000	32.14	-7.73	24.41	46.00	-21.59	QP

Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	47.8260	43.46	-16.98	26.48	40.00	-13.52	QP
2	192.4185	49.67	-18.11	31.56	43.50	-11.94	QP
3	324.4560	43.58	-14.22	29.36	46.00	-16.64	QP
4	665.8034	40.74	-11.06	29.68	46.00	-16.32	QP
5	902.0000	32.90	-8.27	24.63	46.00	-21.37	QP
6	928.0081	92.39	-7.96	84.43	125.30	-41.00	QP
7	960.0000	31.57	-8.01	23.56	46.00	-22.44	QP

Note:

1). Pre-scan all modes and recorded the worst case results in this report (High Channel-927.75MHz).

2). Emission level (dBuV/m) = 20 log Emission level (uV/m).

3). Level = Reading + Factor, Margin = Level – Limit, Factor = Antenna Factor + Cable Loss - Preamp Facto

5.6.8. Results of Radiated Emissions (1 GHz – 10 GHz)

Note: All the modes have been tested and recorded worst mode in the report.

Channel 0 / 902.25 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
1804.5	52.61	33.06	35.04	3.94	54.57	74.00	-19.43	Peak	Horizontal
1804.5	38.29	33.06	35.04	3.94	40.25	54.00	-13.75	Average	Horizontal
1804.5	52.06	33.06	35.04	3.94	54.02	74.00	-19.98	Peak	Vertical
1804.5	39.76	33.06	35.04	3.94	41.72	54.00	-12.28	Average	Vertical

Channel 25 / 914.75 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
1829.50	49.02	33.16	35.15	3.96	50.99	74.00	-23.01	Peak	Horizontal
1829.50	39.08	33.16	35.15	3.96	41.05	54.00	-12.95	Average	Horizontal
1829.50	49.89	33.16	35.15	3.96	51.86	74.00	-22.14	Peak	Vertical
1829.50	36.17	33.16	35.15	3.96	38.14	54.00	-15.86	Average	Vertical

Channel 50 / 927.75 MHz

Freq. MHz	Reading dBuV	Ant. Fac dB/m	Pre. Fac dB	Cab.Los dB	Measured dBuV/m	Limit dBuV/m	Margin dB	Remark	Pol.
1855.50	51.00	33.26	35.14	3.98	53.10	74.00	-20.90	Peak	Horizontal
1855.50	39.62	33.26	35.14	3.98	41.72	54.00	-12.28	Average	Horizontal
1855.50	51.31	33.26	35.14	3.98	53.41	74.00	-20.59	Peak	Vertical
1855.50	38.84	33.26	35.14	3.98	40.94	54.00	-13.06	Average	Vertical

Notes:

1). Measuring frequencies from 9 KHz~10th harmonic (ex. 10GHz), at least have 20dB margin found between lowest internal used/generated frequency to 30 MHz.

2). Radiated emissions measured in frequency range from 9 KHz~10^{th} harmonic (ex. 10GHz) were made with an instrument using Peak detector mode.

3). Measured Level = Reading Level + Factor, Margin = Measured Level – Limit, Factor = Antenna Factor + Cable Loss - Preamp Factor

5.10. Antenna Requirement

5.10.1 Standard Applicable

According to antenna requirement of §15.203.

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 shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

5.10.2 Antenna Connected Construction

5.10.2.1. Standard Applicable

According to § 15.203, 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.

5.10.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 1.91dBi(Max), and the antenna is a Ceramic Antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

5.10.2.3. Results: Compliance.

6. SUMMARY OF TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	R&S	NRVS	100444	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
2	Power Sensor	R&S	NRV-Z81	100458	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
3	Power Sensor	R&S	NRV-Z32	10057	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
4	Test Software	Tonscend	JS1120-2	/	N/A	N/A
5	RF Control Unit	Tonscend	JS0806-2	N/A	2021-11-16	2022-11-15
6	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2021-11-16	2022-11-15
7	DC Power Supply	Agilent	E3642A	N/A	2021-11-25	2022-11-24
8	EMI Test Software	AUDIX	E3	/	N/A	N/A
9	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
10	Positioning Controller	MF	MF7082	MF78020803	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
11	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2021-07-25	2024-07-24
12	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2021-07-25	2024-07-24
13	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2021-07-01	2024-06-30
14	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2020-09-20	2023-09-19
15	Broadband Preamplifier	SCHWARZBECK	BBV9745	9719-025	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
16	EMI Test Receiver	R&S	ESR 7	101181	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
17	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2021-11-16	2022-11-15
18	Broadband Preamplifier	/	BP-01M18G	P190501	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
19	6dB Attenuator	/	100W/6dB	1172040	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
20	3dB Attenuator	/	2N-3dB	/	2021-11-16	2022-11-15
21	EMI Test Receiver	R&S	ESPI	101840	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
22	Artificial Mains	R&S	ENV216	101288	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
23	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2021-06-21	2022-06-20
					2022-06-16	2023-06-15
24	EMI Test Software	Farad	EZ	/	N/A	N/A

7. TEST SETUP PHOTOGRAPHS OF EUT

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

8. EXTERIOR PHOTOGRAPHS OF THE EUT

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

9. INTERIOR PHOTOGRAPHS OF THE EUT

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

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