Xingtel (Xiamen) Intelligent Control Technology Co.,Ltd

RF TEST REPORT

Report Type:
FCC Part 15.519 RF report

Model:
Forecaddy

REPORT NUMBER:
200302211SHA-003

ISSUE DATE:
April 27, 2020

DOCUMENT CONTROL NUMBER:
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TEST REPORT

Report no.: 200302211SHA-003

Applicant:	Xingtel (Xiamen) Intelligent Control Technology Co.,Ltd Xingtel Building, Torch Industrial District, Xiamen 361006, P R China
Manufacturer:	Xingtel (Xiamen) Intelligent Control Technology Co.,Ltd Xingtel Building, Torch Industrial District, Xiamen 361006, P R China
Factory:	Xingtel (Xiamen) Intelligent Control Technology Co.,Ltd Xingtel Building, Torch Industrial District, Xiamen 361006, P R China
FCC ID:	2AWAX-FORECADDY

SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:
47CFR Part 15 (2019): Radio Frequency Devices (Subpart F) **ANSI C63.10 (2013):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

PREPARED BY:	**REVIEWED BY:**
	
Project Engineer Nemo Li	Reviewer Daniel Zhao

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Content

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Revision History

Report No.	Version	Description	Issued Date
200302211SHA-003	Rev. 01	Initial issue of report	April 27, 2020

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Measurement result summary

TEST ITEM	FCC REFERANCE	RESULT
UWB Bandwidth	15.503(d) 15.519(b)	Pass
Cease transmitting time	15.519(a1)	Pass
Radiated emissions	15.519(c) 15.209	Pass
GPS receive band	15.519(d)	Pass
Peak level of the emissions	15.519(e)	Pass
Conducted emissions	15.207	Pass
Antenna requirement	15.203	Pass

Notes: 1: NA =Not Applicable

1 GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

Product name:	Smart Golf Cart
Type/Model:	Forecaddy
Description of EUT:	EUT is a Smart Golf Cart with UWB function, and has only one model.
Rating:	DC 22.2V
EUT type:	☐ Table top ☒ Floor standing
Software Version:	/
Hardware Version:	/
Sample received date:	April 3, 2020
Date of test:	April 3, 2020 ~ April 26, 2020

1.2 Technical Specification

Channel frequency:	6489.6MHz
Operating frequency band:	6240MHz - 6739.2MHz
Antenna Information:	Integrated antenna

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: CN1175
	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

While testing transmitting mode of EUT, the normal and continuously transmission was applied.
EUT has two UWB module, they are the same, the two modules cannot transmit at the same time. All the two UWB was tested and the worst data was listed in the report.

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
1	-	-	-

2.5 Test environment condition:

Test items	Temperature	Humidity
UWB Bandwidth	18°C	52%RH
Cease transmitting time		
Radiated emissions		
GPS receive band		
Peak level of the emissions		
Conducted emissions	19°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	2020-07-14
☒	A.M.N.	R&S	ESH2-Z5	EC 3119	2020-11-10
☐	A.M.N.	R&S	ENV 216	EC 3393	2020-07-14
☐	A.M.N.	R&S	ENV4200	EC 3558	2020-06-11
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Test Receiver	R&S	ESIB 26	EC 3045	2020-09-16
☒	Bilog Antenna	TESEQ	CBL 6112D	EC 4206	2020-09-24
☒	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2020-06-11
☒	Horn antenna	R&S	HF 906	EC 3049	2021-1-17
☐	Horn antenna	ETS	3117	EC 4792-1	2021-02-25
☐	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2020-07-09
☐	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2021-03-14
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2021-03-16
☐	Power sensor	Agilent	U2021XA	EC 5338-1	2021-03-16
☐	Vector Signal Generator	Agilent	N5182B	EC 5175	2021-03-16
☐	Universal Radio Communication Tester	R&S	CMW500	EC5944	2020-12-9
☐	MXG Analog Signal Generator	Agilent	N5181A	EC 5338-2	2021-03-16
☐	Mobile Test System	Litepoint	Iqxel	EC 5176	2021-01-16
☐	Test Receiver	R&S	ESCI 7	EC 4501	2020-09-16
☐	Climate chamber	GWS	MT3065	EC 6021	2020-07-04
☐	Spectrum Analyzer	Keysight	N9030B	EC 6078	2020-06-11
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Shielded room	Zhongyu	-	EC 2838	2021-01-12

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☐	Shielded room	Zhongyu	-	EC 2839	2021-01-12
☒	Semi-anechoic chamber	Albatross project	-	EC 3048	2020-06-31
☐	Fully-anechoic chamber	Albatross project	-	EC 3047	2020-06-31
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2021-03-3
☐	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3481	2021-01-05
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3442	2021-01-05
☒	Therom-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3324	2020-09-05
☐	Pressure meter	YM3	Shanghai Mengde	EC 3320	2020-07-14

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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 below 1GHz	± 4.90dB
Radiated Emissions above 1GHz	± 5.02dB
Power line conducted emission	± 3.19dB

3 UWB bandwidth

Test result: Pass

3.1 Limit

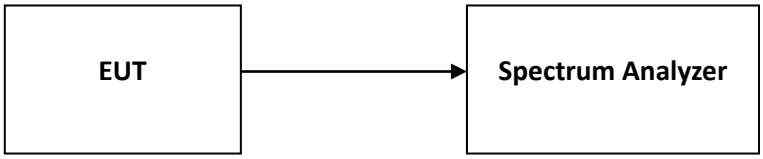
FCC 15.503(d) Has a fractional bandwidth equal to or greater than 0.20 or has a UWB bandwidth equal to or greater than 500 MHz, regardless of the fractional bandwidth.

FCC 15.519(3)(b) The UWB bandwidth of a device operating under the provisions of this section must be contained between 3100 MHz and 10,600 MHz.

3.2 Measurement Procedure

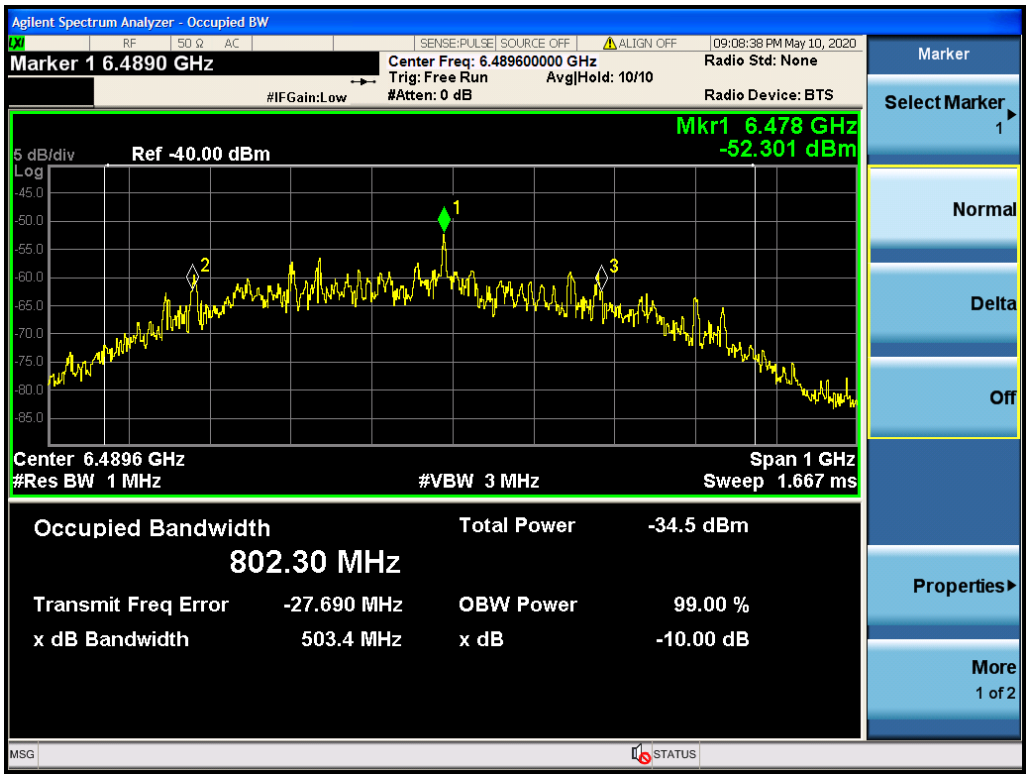
a) Set the centre frequency of the channel under test
b) Set RBW = 1MHz.
c) Set VBW ≥ 3 × RBW.
d) Detector = Peak.
e) Trace mode = max hold.
f) Sweep = auto couple.
g) Allow the trace to stabilize.
h) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 10 dB relative to the maximum level measured in the fundamental emission.

3.3 Test Configuration



3.4 Test Results of UWB bandwidth

Channel Frequency (MHz)	Measured Frequencies		10dB Bandwidth	Limit (MHz)	Pass/Fail
	FL (MHz)	FH (MHz)			
6489.6	6180	6683	503	F. > 3100 and FH < 10600	Pass



4 Cease of transmitting time

Test result: Pass

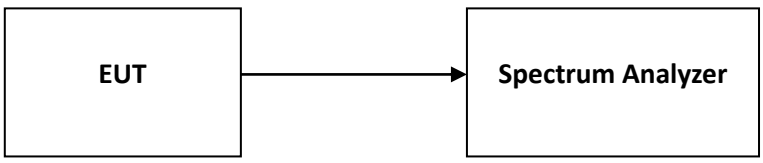
4.1 Limit

The UWB intentional radiator shall cease transmission within 10 seconds unless it receives an acknowledgement from the associated receiver that its transmission is being received. An acknowledgment of reception must continue to be received by the UWB intentional radiator at least every 10 seconds or the UWB device must cease transmitting.

4.2 Measurement Procedure

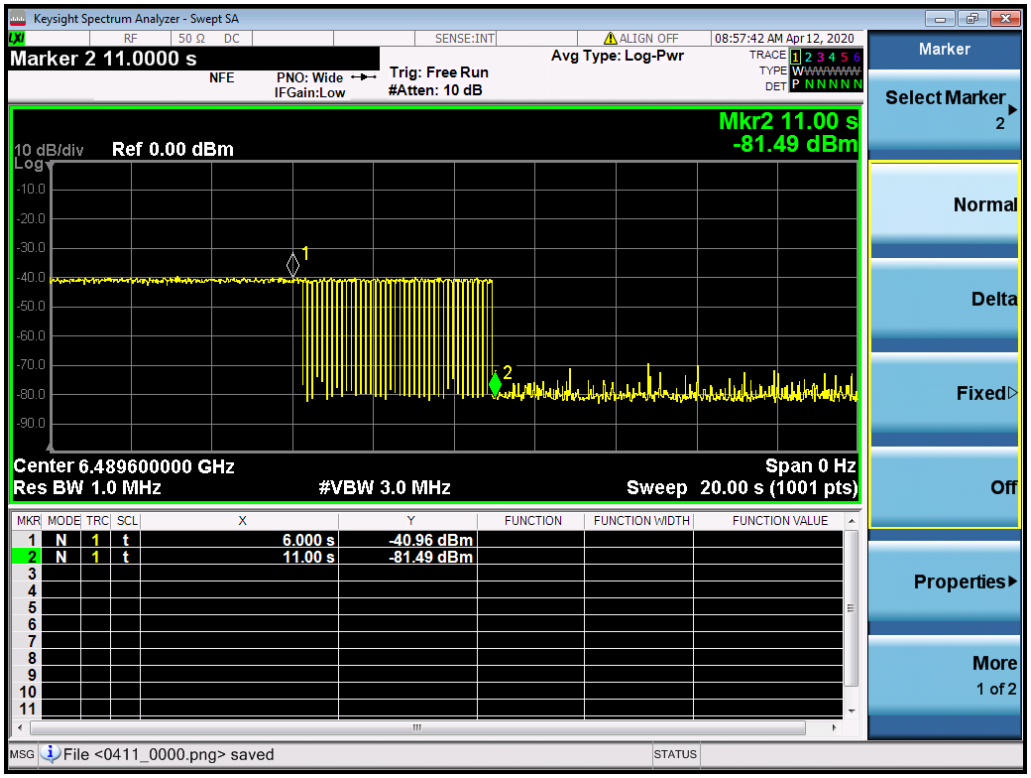
a) EUT was set to normal operation with companion device.
b) The emission was captured by a spectrum analyzer.
c) Switching off the companion device.
d) Measure the time from the moment of switching off the companion device to the moment of stopping transmitting.
e) Compare the time with the limit.

4.3 Test Configuration



4.4 Test Results of Cease of transmitting time

Channel Frequency (MHz)	Measurement result (s)	Maximum Limit (s)	Pass/Fail
6489.6	5.00	10	Pass
Marker 1: The moment of switching off the companion. Marker 2: The moment of stopping transmitting.			



5 Peak level of the emissions

Test result: **Pass**

5.1 Limit

There is a limit on the peak level of the emissions contained within a 50 MHz bandwidth centered on the frequency at which the highest radiated emission occurs, fM. That limit is 0 dBm EIRP.

When a peak measurement is required, it is acceptable to use a resolution bandwidth other than the 50 MHz specified in this subpart. This resolution bandwidth shall not be lower than 1 MHz or greater than 50 MHz. If a resolution bandwidth other than 50 MHz is employed, the peak EIRP limit shall be 20 log (RBW/50) dBm where RBW is the resolution bandwidth in megahertz that is employed. This may be converted to a peak field strength level at 3 meters using:
E(dBuV/m) = P(dBm EIRP) + 95.2.

When the test RBW=3 MHz, the EIRP limit should be 0+20log(3/50) = -24.44 dBm

5.2 Measurement Procedure

1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

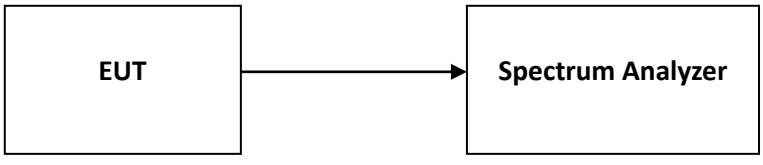
2. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

3. 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.

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

5. Find the maximum emission and compare to the limit.

5.3 Test Configuration



5.4 Peak level of the emissions

Channel Frequency (MHz)	Antenna polarization	Power (dBm EIRP)	Limit (dBm EIRP)	Margin (dBm)
6489.6	Horizontal	-5.50	0	5.50
6489.6	Vertical	-7.50	0	7.50

6 Radiated Emissions

Test result: **Pass**

6.1 Limit

a) The radiated emissions at or below 960 MHz from a device operating under the provisions of this section shall not exceed the emission levels in §15.209.

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

b) The radiated emissions above 960 MHz from a device operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of 1 MHz:

Frequencies (MHz)	EIRP (dBm)
960-1610	-75.3
1610-1990	-63.3
1990-3100	-61.3
3100-10600	-41.3
Above 10600	-61.3

c) The In addition to the radiated emission limits specified in the table in paragraph (a) (b) of this section, UWB transmitters operating under the provisions of this section shall not exceed the following average limits when measured using a resolution bandwidth of no less than 1 kHz:

Frequencies (MHz)	EIRP (dBm)
1164-1240	-85.3
1559-1610	-85.3

6.2 Measurement Procedure

1. The EUT was placed on the top of a rotating table 0.8 meters (below 960MHz) and1.5 meters (above 960MHz) above the ground at a 3 meters semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.

2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

3. The antenna is a broadband antenna, and its 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.

4. 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.

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

6. For below 30MHz, a loop antenna with its vertical plane is placed 3m from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. And the centre of the loop shall be 1m above the ground.

7. 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. The turntable was rotated to maximize the emission level.

NOTE:

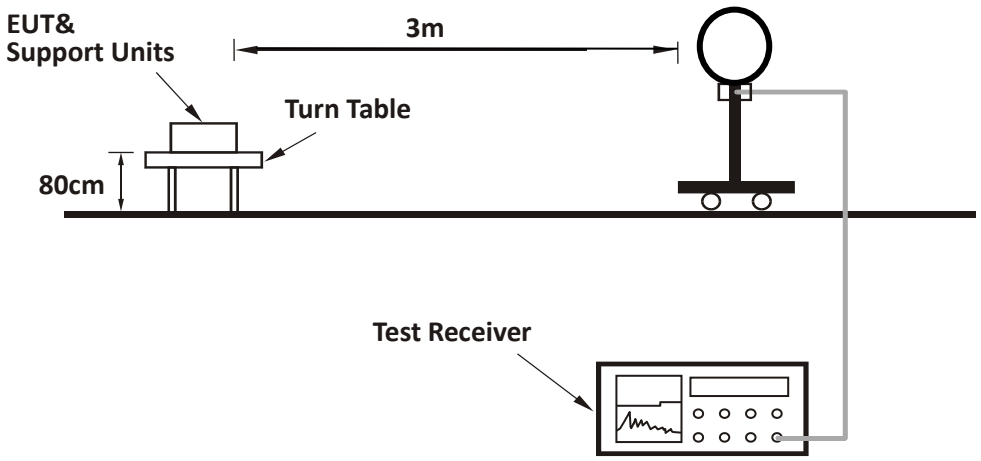
1. The resolution bandwidth of test receiver/spectrum analyzer is 120KHz and video bandwidth is 300kHzfor Quasi-peak detection at frequency below 960MHz.

2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for Average detection at frequency above 960MHz.

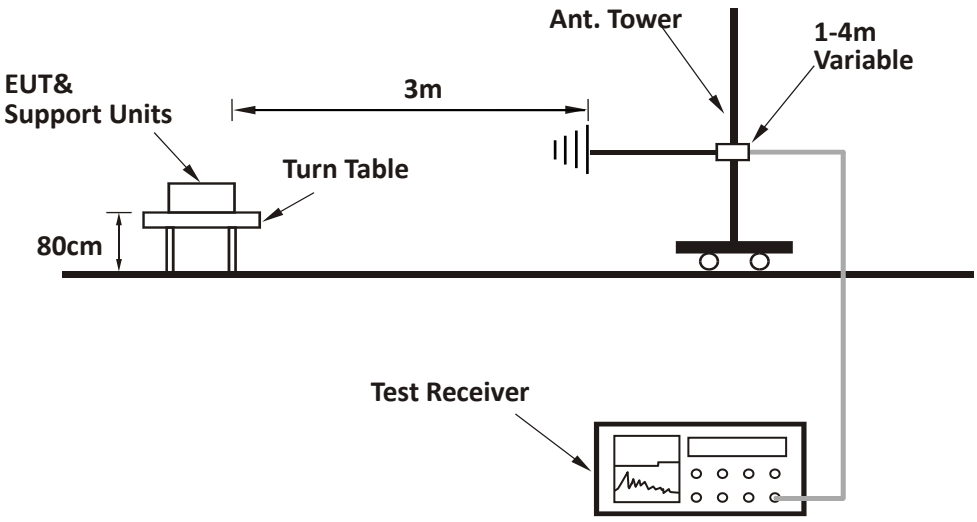
3. The resolution bandwidth of test receiver/spectrum analyzer is 1kHz and the video bandwidth is 3KHz for Average detection at frequency range from 1164-1240MHz & 1559-1610MHz.

6.3 Test Configuration

For Radiated emission below 30MHz:



For Radiated emission 30MHz to 1GHz:



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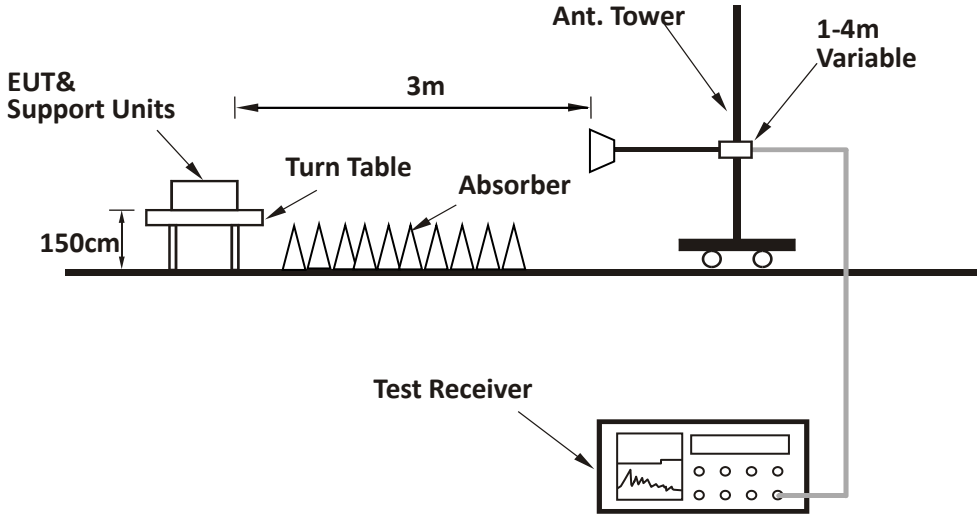
For Radiated emission above 1GHz:



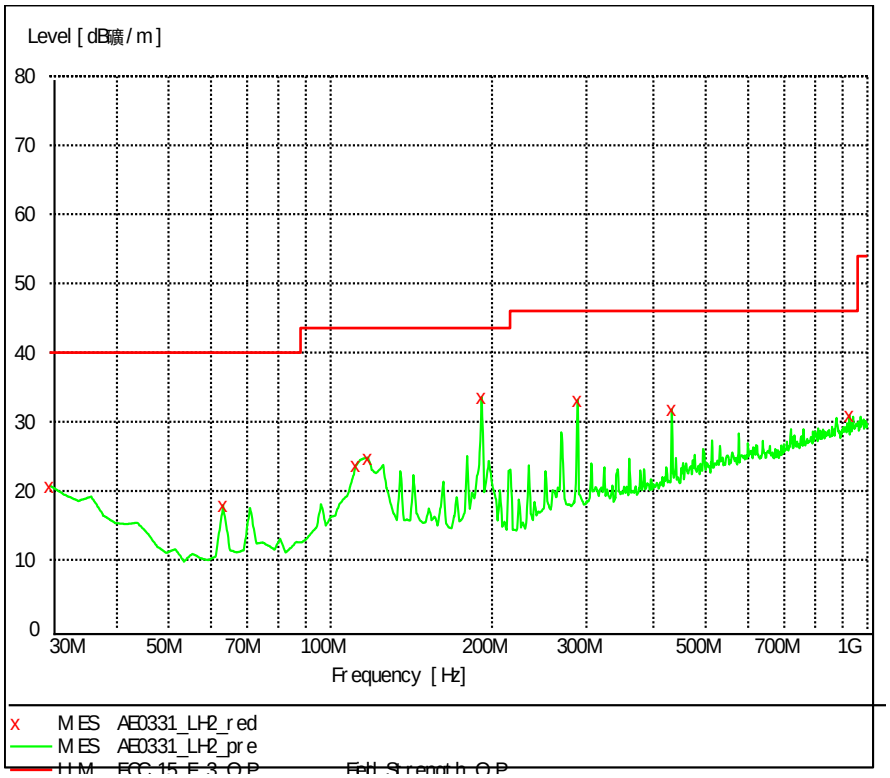
6.4 Test Results of Radiated Emissions

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.

EUT was tested with X, Y, Z direction and the worst data was listed in the report.

Test data below 960MHz

Horizontal



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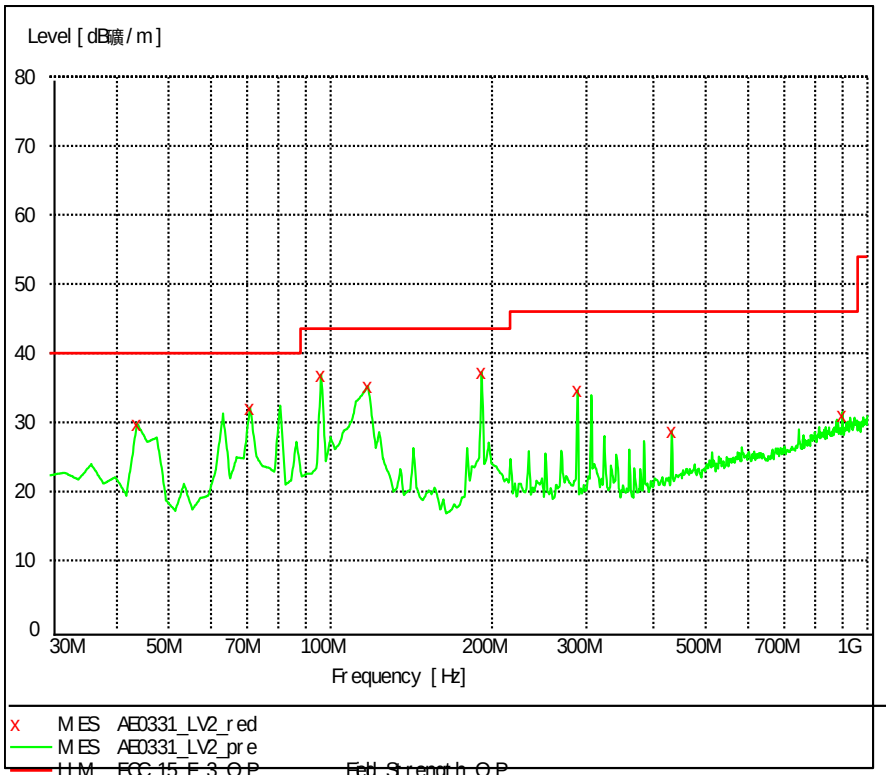
Vertical



Antenna	Frequency (MHz)	Corrected Reading (dBuV/m)	Correct Factor (dB/m)	Limit (dBuV/m)	Margin (dB)	Detector
H	30.00	20.70	18.80	40	19.30	PK
H	117.47	24.80	13.20	43.5	18.70	PK
H	191.34	33.60	10.90	43.5	9.90	PK
H	288.54	33.20	14.80	46	12.80	PK
H	432.38	31.80	18.40	46	14.20	PK
H	926.13	30.90	24.00	46	15.10	PK
V	43.61	29.80	11.70	40	10.20	PK
V	70.82	32.10	7.40	40	7.90	PK
V	96.09	36.90	11.30	43.5	6.60	PK
V	117.47	35.30	13.20	43.5	8.20	PK
V	191.34	37.30	10.90	43.5	6.20	PK
V	288.54	34.60	14.80	46	11.40	PK

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Test result above 960MHz:

The emission was conducted from 960MHz to 40GHz:

Channel Frequency (MHz)	Antenna	Emission Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Detector
6489.6	H	1007.50	-75.90	-75.3	0.90	RMS
6489.6	H	1980.32	-73.60	-63.3	10.30	RMS
6489.6	H	2508.50	-71.50	-61.3	10.20	RMS
6489.6	H	6450.50	-54.30	-41.3	13.00	RMS
6489.6	H	6557.25	-54.60	-41.3	13.30	RMS
6489.6	H	11375.26	-67.90	-61.3	6.60	RMS
6489.6	V	1106.80	-76.80	-75.3	1.50	RMS
6489.6	V	1980.20	-73.90	-63.3	10.60	RMS
6489.6	V	2585.20	-71.50	-61.3	10.20	RMS
6489.6	V	6450.20	-56.60	-41.3	15.30	RMS
6489.6	V	6558.20	-56.40	-41.3	15.10	RMS
6489.6	V	12315.28	-67.90	-61.3	6.60	RMS

Test result in GPS Bands:

Channel Frequency (MHz)	Antenna	Emission Frequency (MHz)	Emission Level (dBm)	Limit (dBm)	Margin (dB)	Detector
6489.6	H	1190.60	-94.20	-85.3	8.90	RMS
6489.6	H	1600.25	-93.10	-85.3	7.80	RMS
6489.6	V	1198.20	-95.10	-85.3	9.80	RMS
6489.6	V	1608.26	-94.40	-85.3	9.10	RMS

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;

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Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

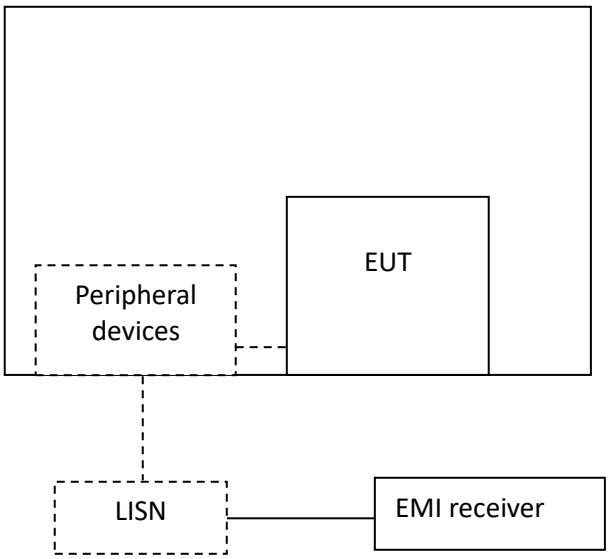
7 Power line conducted emission

Test result: **NA**

7.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50
* Decreases with the logarithm of the frequency.		

7.2 Test Configuration



7.3 Measurement Procedure

Measured levels of ac power-line conducted emission shall be the emission voltages from the voltage probe, where permitted, or across the 50 Ω LISN port (to which the EUT is connected), where permitted, terminated into a 50 Ω measuring instrument. All emission voltage and current measurements shall be made on each current-carrying conductor at the plug end of the EUT power cord by the use of mating plugs and receptacles on the LISN, if used. Equipment shall be tested with power cords that are normally supplied or recommended by the manufacturer and that have electrical and shielding characteristics that are the same as those cords normally supplied or recommended by the manufacturer. For those measurements using a LISN, the 50 Ω measuring port is terminated by a measuring instrument having 50 Ω input impedance. All other ports are terminated in 50 Ω loads.

Tabletop devices shall be placed on a platform of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The vertical conducting plane or wall of an RF-shielded (screened) room shall be located 40 cm to the rear of the EUT. Floor-standing devices shall be placed either directly on the reference ground-plane or on insulating material as described in ANSI C63.4. All other surfaces of tabletop or floor-standing EUTs shall be at least 80 cm from any other grounded conducting surface, including the case or cases of one or more LISNs.

The bandwidth of the test receiver is set at 9 kHz.

7.4 Test Results of Power line conducted emission

L Line

N Line

Remark: 1. Correct Factor = LISN Factor + Cable Loss, 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.

8 Antenna requirement

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 shall be considered sufficient to comply with the provisions of this section.

Result:
EUT uses permanently attached antenna to the intentional radiator, so it can comply with the provisions of this section.

********** END **********