

FCC RADIO TEST REPORT

FCC ID: 2AMLWHAYK-33

Product : Telecontrol of generator

Trade Name : HAOAI

Model Name : HAYK-33

Serial Model : HA188-Y1, HA-0808, HA-0805, HA-0812,
HAYK-03

Report No. : UNIA2018071217FR-01

Prepared for

Chongqing HaoAi tech Development Co., Ltd

No. 6-2, lishuwan, Shapingba District, Chongqing, China

Prepared by

Shenzhen United Testing Technology Co., Ltd.

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TEST RESULT CERTIFICATION

Applicant's name..... : Chongqing HaoAi tech Development Co., Ltd
Address..... : No. 6-2, lishuwan, Shapingba District, Chongqing, China
Manufacture's Name..... : Chongqing HaoAi tech Development Co., Ltd
Address..... : No. 6-2, lishuwan, Shapingba District, Chongqing, China

Product description

Product name..... : Telecontrol of generator
Trade Mark..... : HAOAI
Model and/or type reference : HAYK-33, HA188-Y1, HA-0808, HA-0805, HA-0812, HAYK-03
Standards..... : FCC Rules and Regulations Part 15 Subpart C Section 15.231
ANSI C63.10: 2013

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test..... :
Date (s) of performance of tests : Jul. 20, 2018 ~ Aug. 06, 2018
Date of Issue..... : Aug. 06, 2018
Test Result..... : Pass

Prepared by:

Kahn yang/Editor

Reviewer:

Sherwin Qian/Supervisor

Approved & Authorized Signer:

Liuze/Manager

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1 TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT
Conducted Emission	N/A
Radiation Emission	COMPLIANT
20 dB Bandwidth	COMPLIANT
Release Time	COMPLIANT
Duty Cycle	COMPLIANT
Antenna requirement	COMPLIANT

1.2 TEST FACILITY

Test Firm : Shenzhen United Testing Technology Co., Ltd.
 Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

The testing quality ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19. The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

CNAS-LAB Code: L6494

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

Designation Number: CN1227

Test Firm Registration Number: 674885

The EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications commission. The acceptance letter from the FCC is maintained in our files.

1.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty	
Conducted Emission Expanded Uncertainty	= 2.23dB, k=2
Radiated emission expanded uncertainty(9kHz-30MHz)	= 3.08dB, k=2
Radiated emission expanded uncertainty(30MHz-1000MHz)	= 4.42dB, k=2
Radiated emission expanded uncertainty(Above 1GHz)	= 4.06dB, k=2

2 GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

Equipment	Telecontrol of generator
Trade Mark	HAOAI
Model Name	HAYK-33
Serial No.	HA188-Y1, HA-0808, HA-0805, HA-0812, HAYK-03
Model Difference	All model's the function, software and electric circuit are the same, only with a product color and model named different. Test sample model: HAYK-33.
FCC ID	2AMLWHAYK-33
Antenna Type	Telescopic antenna
Antenna Gain	1dBi
Operation frequency	315MHz
Number of Channels	1CH
Modulation Type	ASK
Battery	DC 12V by a battery of 23A 12V
Power Source	DC 12V
Adapter Model	N/A

2.2 Carrier Frequency of Channels

Operation Frequency each of channel	
Channel	Frequency
01	315MHz

2.3 Operation of EUT during testing

Operating Mode

The mode is used: Transmitting mode

2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during testing:



Setup: Transmission mode

Table for auxiliary equipment:

Equipment Description	Manufacturer	Model	Calibration Due Date
N/A	N/A	N/A	N/A

2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
CONDUCTED EMISSIONS TEST					
1	AMN	Schwarzbeck	NNLK8121	8121370	2018.9.9
2	AMN	ETS	3810/2	00020199	2018.9.9
3	EMI TEST RECEIVER	Rohde&Schwarz	ESCI	101210	2018.9.9
4	AAN	TESEQ	T8-Cat6	38888	2018.9.9
RADIATED EMISSION TEST					
1	Horn Antenna	Sunol	DRH-118	A101415	2018.9.29
2	BicoNILog Antenna	Sunol	JB1 Antenna	A090215	2018.9.29
3	PREAMP	HP	8449B	3008A00160	2018.9.9
4	PREAMP	HP	8447D	2944A07999	2018.9.9
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2018.9.9
6	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2018.9.28
7	Signal Generator	Agilent	E4421B	MY4335105	2018.9.28
8	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2018.9.28
9	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2018.9.9
10	ANT Tower&Turn table Controller	Champro	EM 1000	60764	2018.9.28
11	Anechoic Chamber	Taihe Maorui	9m*6m*6m	966A0001	2018.9.9
12	Shielding Room	Taihe Maorui	6.4m*4m*3m	643A0001	2018.9.9
13	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2019.3.14
14	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2019.3.14
15	RF power divider	Anritsu	K241B	992289	2018.9.28
16	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2018.9.28
17	Biconical antenna	Schwarzbeck	VHA 9103	91032360	2018.9.8
18	Biconical antenna	Schwarzbeck	VHA 9103	91032361	2018.9.8
19	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2018.9.8
20	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2019.1.12
21	Active Receive Loop Antenna	Schwarzbeck	FMZB 1919B	00023	2018.11.02
22	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170651	2019.03.14
23	Microwave Broadband Preampifier	Schwarzbeck	BBV 9721	100472	2018.10.24
24	Active Loop Antenna	Com-Power	AL-130R	10160009	2019.05.10
25	Power Meter	KEYSIGHT	N1911A	MY50520168	2019.05.10

3. CONDUCTED EMISSIONS TEST

3.1 Test Limit

Frequency (MHz)	Maximum RF Line Voltage(dB μ V)			
	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

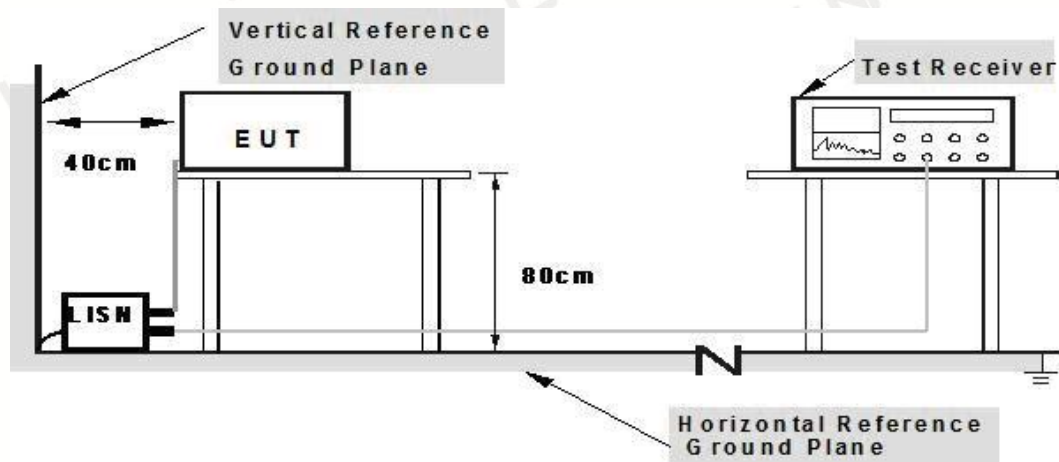
Note:

1. The tighter limit applies at the band edges.
2. The limit of " * " marked band means the limitation decreases linearly with the logarithm of the frequency in the range.

The following table is the setting of the receiver:

Receiver Parameters	Setting
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 kHz

3.2 Test Setup



- Note: 1.Support units were connected to second LISN.**
2.Both of LISNs (AMN) are 80 cm from EUT and at least 80 from other units and other metal planes

3.3 Test Procedure

1. The EUT was placed 0.4 meters from the horizontal ground plane with EUT being connected to the power mains through a line impedance stabilization network (LISN). All other support equipments powered from additional LISN(s). The LISN provide 50 Ohm/ 50uH of coupling impedance for the measuring instrument.
2. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 to 40 cm long.
3. I/O cables that are not connected to a peripheral shall be bundled in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
4. LISN at least 80 cm from nearest part of EUT chassis.
5. For the actual test configuration, please refer to the related Item EUT Test Photos.

3.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

3.5 Test Result

N/A

Remark: The EUT is powered by DC 12V of a battery of 23A 12V.

4 RADIATED EMISSION TEST

4.1 Test Limit

1. RADIATED EMISSION LIMIT (Frequency Range 9KHz-1000MHz)

According to 15.231(a), the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolt/meter) at 3m	Field Strength of Spurious Emissions (microvolt/meter) at 3m
40.66~40.70	1000	100
70~130	500	50
130~174	500 to 1500(**)	50 to 150(**)
174~260	1500	150
260~470	1500 to 5000(**)	150 to 500(**)
Above 470	5000	500

** Linear interpolations, the formulas for calculating the maximum permitted fundamental field strengths are as follows:

1. for the band 130~174 MHz, $\mu\text{V/m}$ at 3 meters = $22.72(F) - 2454.5455$;
2. for the band 260~470 MHz, $\mu\text{V/m}$ at 3 meters = $16.67(F) - 2833.3333$.

20 dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a) and RSS-210 Section 2.2&A8.5, then the 15.209(a) and RSS-General limit in the table below has to be followed.

FREQUENCY (MHz)	Field Strength ($\mu\text{V/m}$ at meter)	Measurement Distance (meters)
0.009 -0.490	$2400/F(\text{KHz})$	300
0.490 -1.705	$24000/F(\text{KHz})$	30
1.705 -30.0	30	30
30 -88	100	3
88 -216	150	3
216~960	200	3
Above 960	500	3

2. RADIATED EMISSION LIMITS (Above 1000MHz)

FREQUENCY (MHz)	3M Distance (dBuV/m)	
	Peak	Average
Above 1000	74	54

Note:

1. The limit for radiated test was performed according to FCC PART 15C.
2. The tighter limit applies at the band edges.
3. Emission Level (dBuV/m) = $20\log$ Emission Level($\mu\text{V/m}$)

The following table is the setting of the receiver:

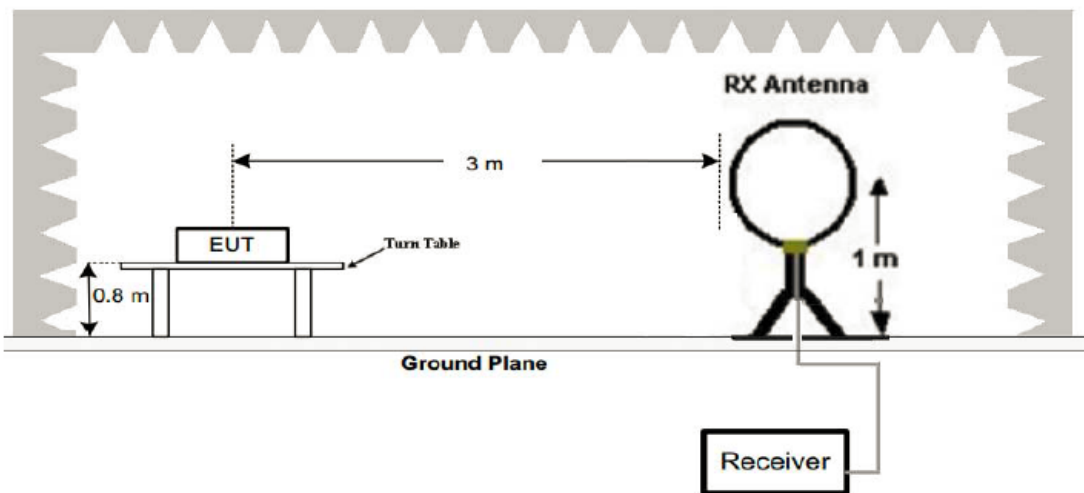
Receiver Parameters	Setting
Attenuation	Auto
Start Frequency~ Stop Frequency	9kHz~150kHz/ RB 200Hz for QP
Start Frequency~ Stop Frequency	150kHz~30MHz/ RB 9kHz for QP
Start Frequency~ Stop Frequency	30MHz~1000MHz/ RB120kHz for QP

The following table is the setting of the spectrum:

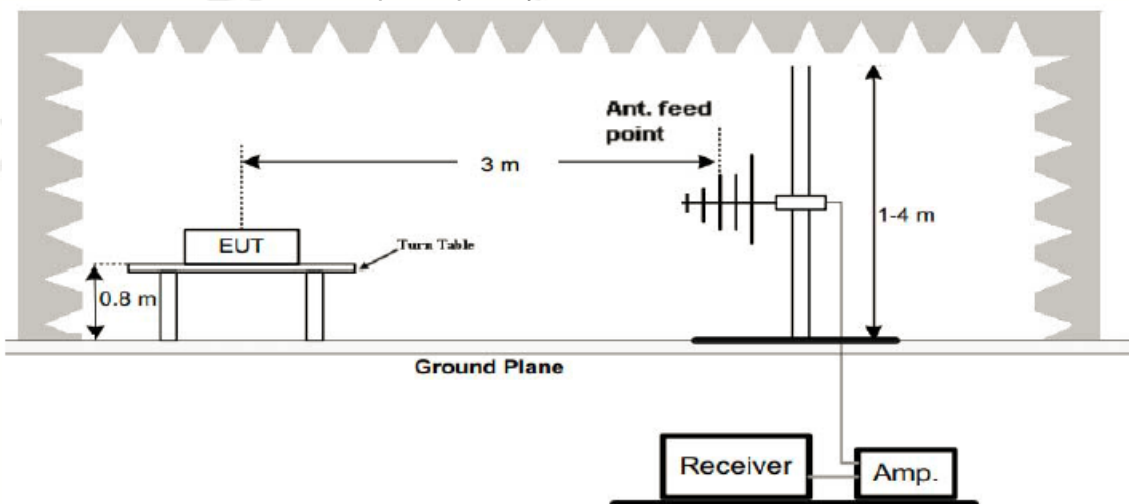
Spectrum Parameters	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10 th carrier harmonic
RB/ VB (emission in restricted band)	1MHz/ 3 MHz for Peak, 1MHz/ 10Hz for Average

4.2 Test Setup

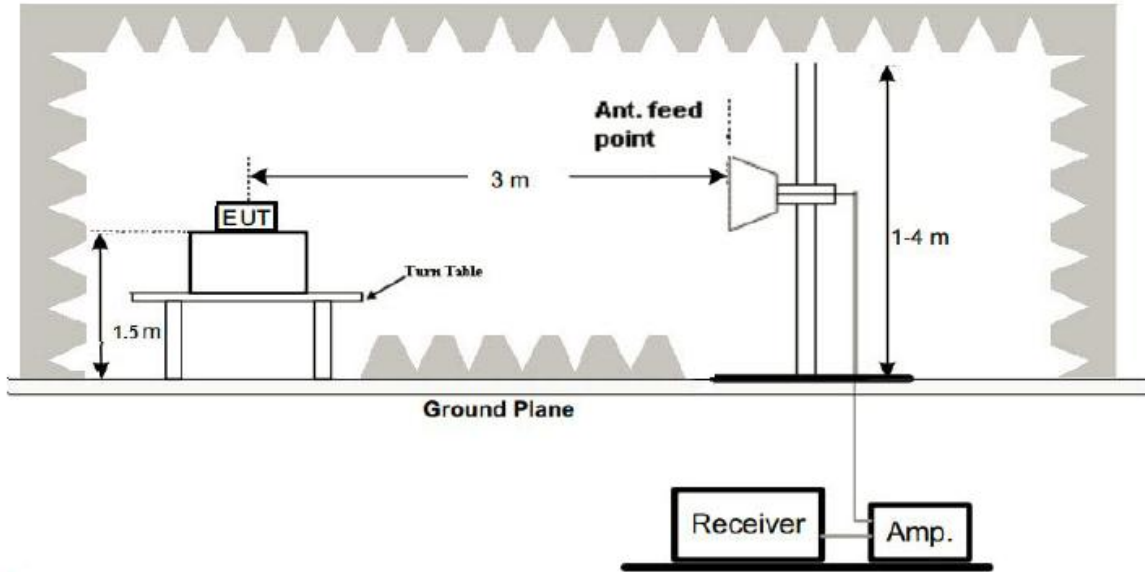
1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency 30MHz~1GHz



3. Radiated Emission Test-Up Frequency Above 1GHz



4.3 Test Procedure

1. The measuring distance of at 3 m shall be used for measurements at frequency up to 1GHz. For frequencies above 1GHz, any suitable measuring distance may be used.
2. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
3. The height of the equipment or of the substitution antenna shall be 0.8 m; the height of the test antenna shall vary between 1 m to 4 m. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
4. The initial step in collecting conducted emission data is a spectrum analyzer peak detector mode pre-scanning the measurement frequency range. Significant peaks are then marked and then Quasi Peak detector mode re-measured, above 1G Average detector mode will be instead.
5. If the Peak Mode measured value compliance with and lower than Quasi Peak Mode Limit, the EUT shall be deemed to meet QP Limits and then no additional QP Mode measurement performed.
6. For the actual test configuration, please refer to the related Item –EUT Test Photos.

Note:

Both horizontal and vertical antenna polarities were tested.
And performed pretest to three orthogonal axis. The worst case emissions were reported.

4.4 EUT OPERATING CONDITIONS

The EUT tested system was configured as the statements of 2.4 Unless otherwise a special operating condition is specified in the follows during the testing.

4.5 Test Result

TEST RESULTS (9KHz~30MHz):

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

Fundamental and Harmonics emissions(30MHz-4G):

Temperature:	22°C	Relative Humidity:	46%
Test Date:	Jul. 12, 2018	Pressure:	1010hPa
Test Voltage:	DC 12V	Test Mode:	Transmitting mode

Frequency (MHz)	Reading Result (dBμV)	Ant. Pol. (H/V)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
31.25	38.51	H	-9.64	28.87	40	-11.13	QP
44.26	41.61	H	-9.64	31.97	40	-8.03	QP
153.65	43.29	H	-9.35	33.94	43.5	-9.56	QP
1154.82	64.59	H	-13.51	51.08	74	-22.92	PK
1154.82	/	H	-10.84	40.24	54	-13.76	AV
2645.29	68.57	H	-13.92	54.65	74	-19.35	PK
2645.29	/	H	-10.84	43.81	54	-10.19	AV
5716.26	67.29	H	-14.37	52.92	74	-21.08	PK
5716.26	/	H	-10.84	42.08	54	-11.92	AV
32.41	40.67	V	-9.64	31.03	40	-8.97	QP
43.79	43.59	V	-9.64	33.95	40	-6.05	QP
146.35	46.82	V	-9.35	37.47	43.5	-6.03	QP
1183.14	63.15	V	-13.51	49.64	74	-24.36	PK
1183.14	/	V	-10.84	38.80	54	-15.20	AV
2416.13	67.94	V	-13.92	54.02	74	-19.98	PK
2416.13	/	V	-10.84	43.18	54	-10.82	AV
4691.47	66.83	V	-14.49	54.34	74	-19.66	PK
4691.47	/	V	-10.84	43.50	54	-10.50	AV

Frequency (MHz)	Reading Result (dB μ V)	Ant. Pol. (H/V)	Factor (dB)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector Type
315	84.66	H	-9.64	75.02	95.56	-20.54	PK
315	73.82	H	-10.84	62.98	75.56	-12.58	AV
630	48.52	H	-9.35	39.17	55.56	-16.39	QP
945	39.11	H	1.49	40.60	55.56	-14.96	QP
315	84.58	V	-9.64	74.94	95.56	-20.62	PK
315	73.74	V	-10.84	62.90	75.56	-12.66	AV
630	42.10	V	-9.35	32.75	55.56	-22.81	QP
945	35.15	V	1.49	36.64	55.56	-18.92	QP

Remark:

1. Emission Level = Reading Level + Factor, Margin = Emission Level – Limit
2. The testing has been conformed to 10th harmonics(1G~4G)
3. Other harmonics emission are lower then 20dB below the allowable Limit

Note:

- a. All Readings are Peak Value and AV. And AV is calculated by the following: Testing frequency range below 1GHz the measuring instrument use VBW = 120 kHz with Quasi-peak detection. Testing frequency range above 1GHz the measuring instrument use RBW = 1 MHz and VBW = 3 MHz with Peak Detector for Peak Values. Average Values = Peak Values + 20log (Duty Cycle)
- b. Emission Level = Reading Level + Probe Factor + Cable Loss
- c. Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

Pulse Desensitization Correction Factor

Note: The Smallest Pulse Width (PW) = 0.4ms (2) 2/PW = 2/0.4(ms) = 5kHz<100 kHz
Because 2/PW<RBW, so the PDCF is not needed.

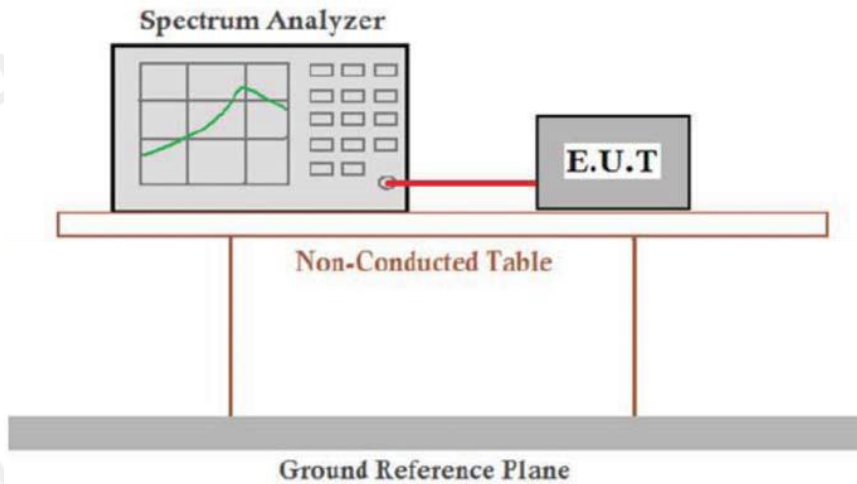
5 OCCUPIED BANDWIDTH TEST

5.1 Test Limit

The 20dB bandwidth of the emissions shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. So the emission bandwidth limits have been calculated in below table:

Fundamental Frequency	20 dB Bandwidth Limits (MHz)
315 MHz	0.7875

5.2 Test Setup



5.3 Test Procedure

The EUT was directly connected to the power meter and antenna output port as show in the block diagram as below:

Spectrum Parameters	Setting
Attenuation	Auto
RBW	10 kHz
VBW	$\geq 3\text{RBW}$
Detector	Peak
Trace	Max Hold
Sweep Time	Auto

5.4 EUT OPERATING CONDITIONS

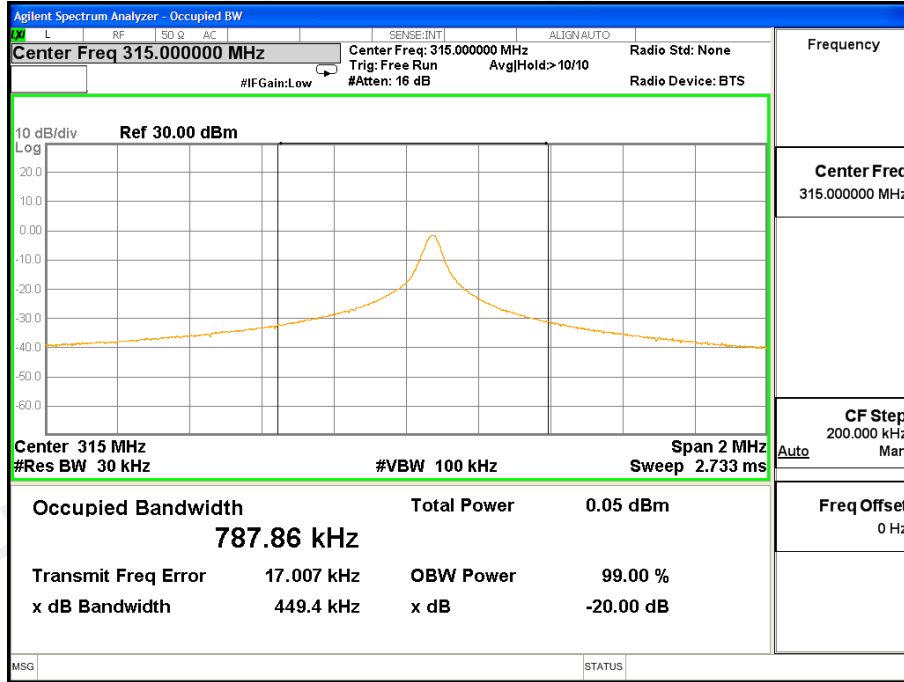
The EUT was set to continuously transmitting in the maximum power during the test.



5.5 Test Result

PASS

Mode	Frequency(MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Conclusion
TX	315	0.4494	0.7875	PASS

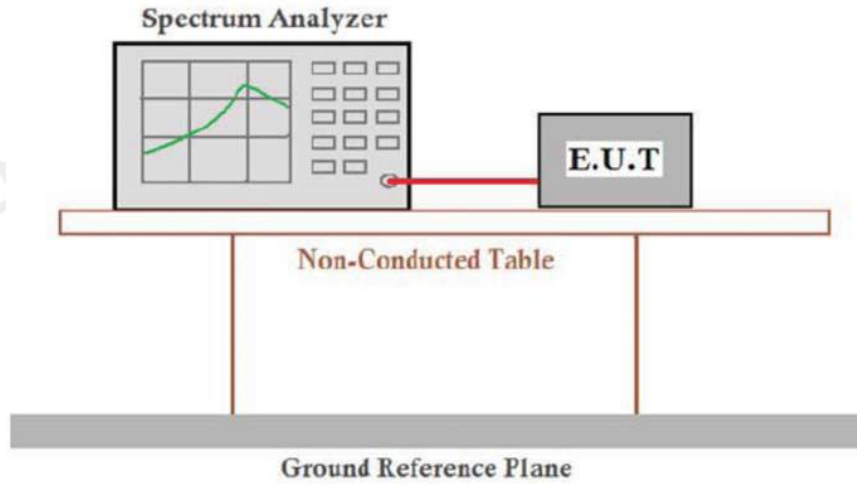


6 RELEASE TIME TEST

6.1 Test Limit

According to FCC 15.231(a), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

6.2 Test Setup



6.3 Test Procedure

The EUT was directly connected to the power meter and antenna output port as show in the block diagram as bellow:

Spectrum Parameters	Setting
Span	0MHz
RBW	100 kHz
VBW	≥ 3 RBW
Detector	Peak
Trace	Max Hold
Sweep Time	5S

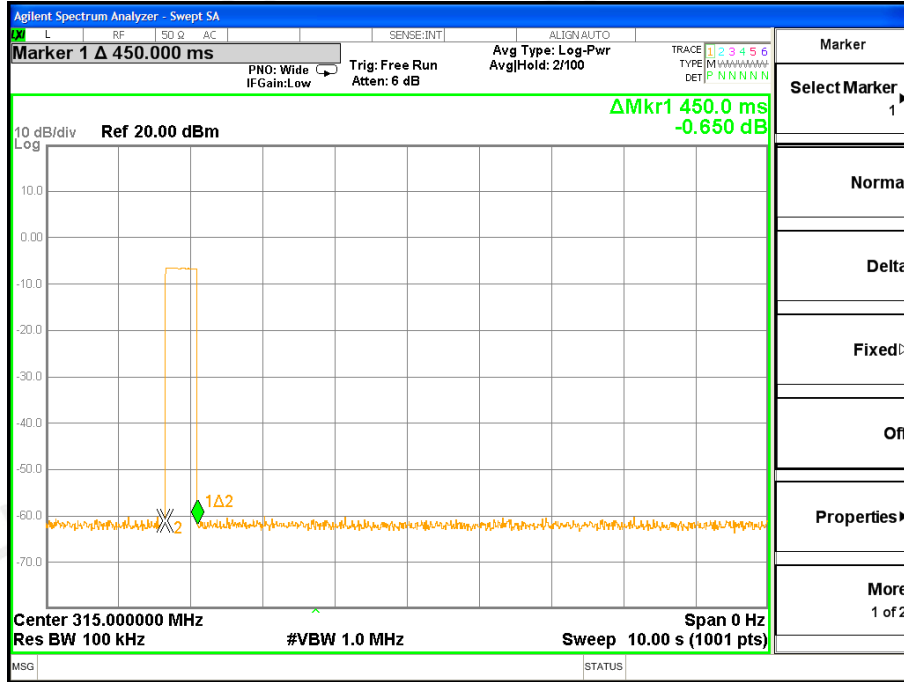
6.4 EUT OPERATING CONDITIONS

The EUT was set to continuously transmitting in the maximum power during the test.

6.5 Test Result

PASS

Mode	Frequency(MHz)	Transmission Time (s)	Limit (s)	Conclusion
TX	315	0.45	5	PASS



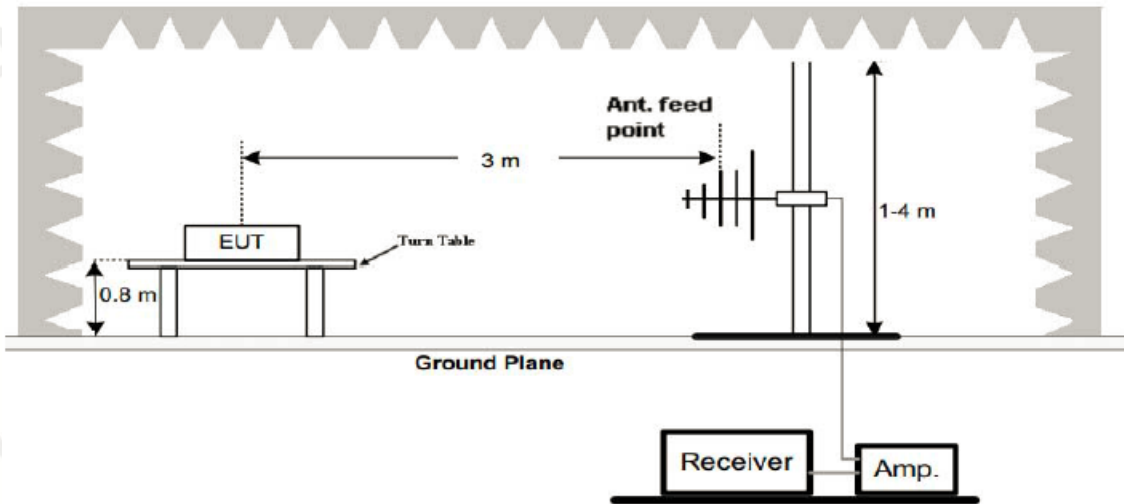
7 Duty Cycle TEST

7.1 Test Standard

FCC 15.231
ANSI C63.10: 2013

7.2 Test Setup

Radiated Emission Test Set-Up



7.3 Test Procedure

1. The EUT was placed on a turntable which is 0.8m above ground plane.
2. Set EUT operating in continuous transmitting mode.
3. Set the Spectrum Analyzer to the transmitter carrier frequency, and set the spectrum analyzer resolution bandwidth (RBW) to 100 kHz and video bandwidth (VBW) to 300 kHz, Span was set to 0 Hz.
4. The Duty Cycle was measured and recorded.

7.4 EUT OPERATING CONDITIONS

The EUT was set to continuously transmitting in the maximum power during the test.

7.5 Test Result

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

Result:

Averaging factor in dB = $20 \log(\text{duty cycle})$

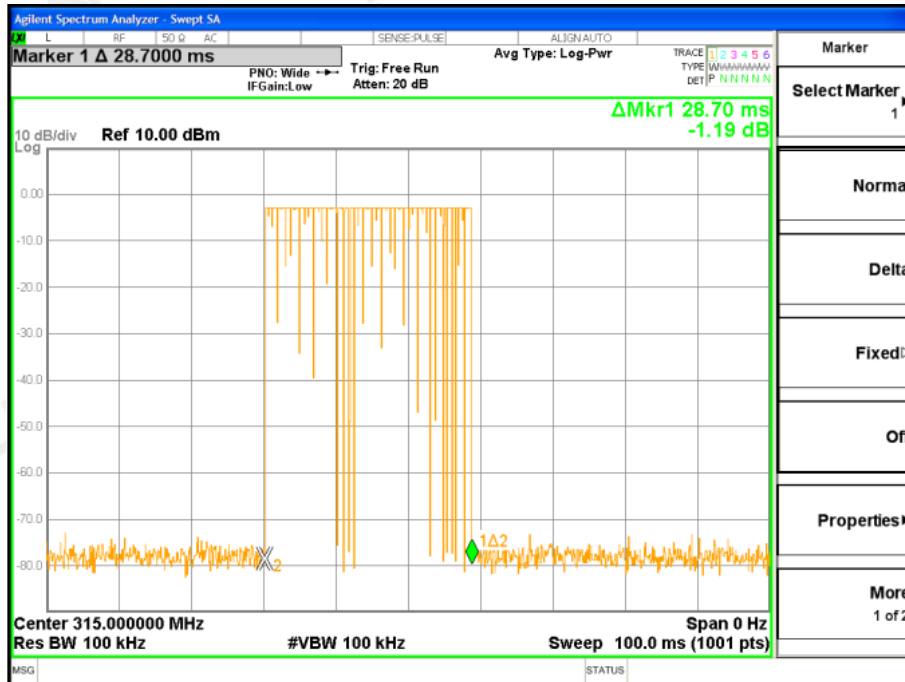
The duration of one cycle = 100ms

Duty Cycle = $28.7\text{ms}/100\text{ms} = 0.287$

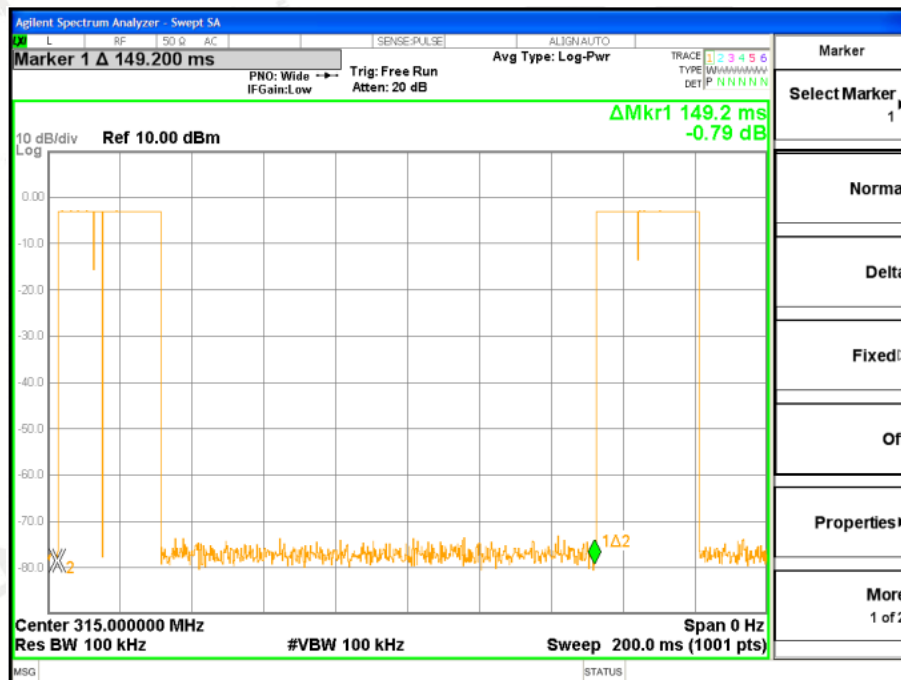
Therefore, the averaging factor is found by $20 \log 0.287 = -10.84\text{dB}$

Please see the diagrams below.

Time Slot:



Duty Cycle:



8 ANTENNA REQUIREMENT

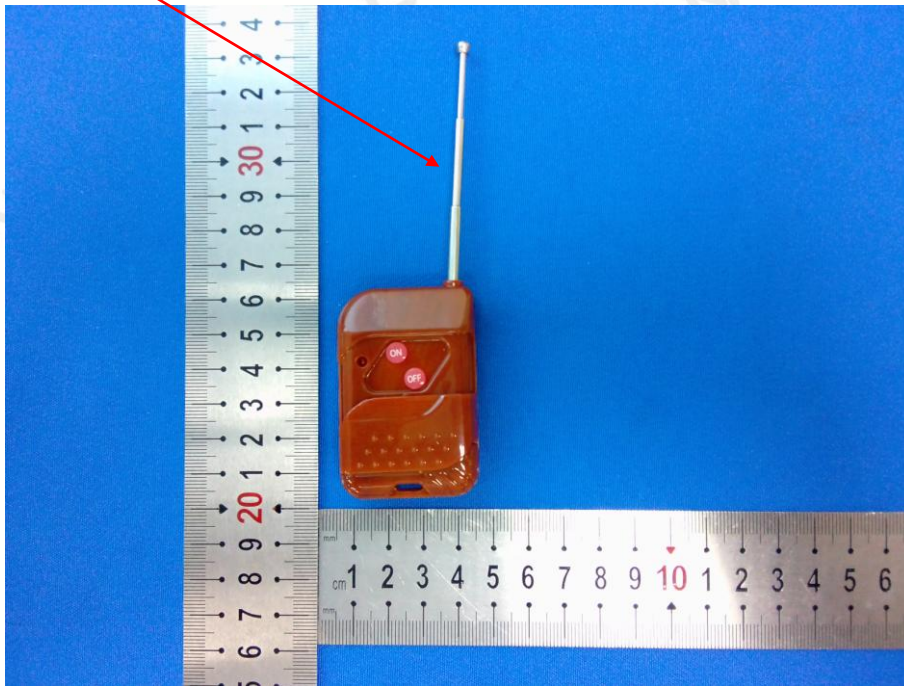
Standard Applicable:

For intentional device, according to FCC 47 CFR Section 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.

Antenna Connected Construction

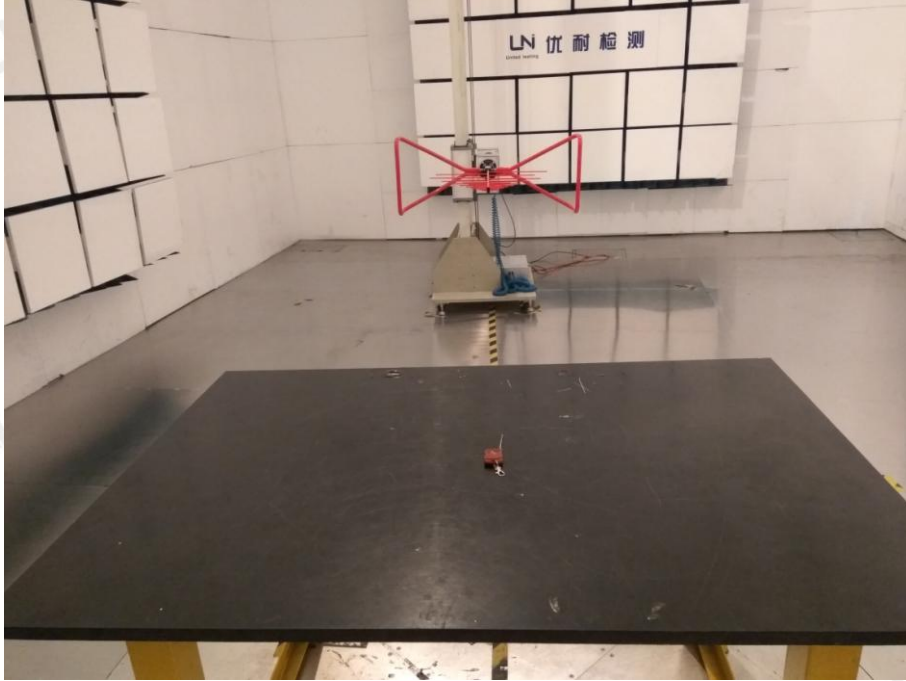
The antenna used in this product is a Telescopic antenna, The directional gains of antenna used for transmitting is 1dBi.

ANTENNA



9 PHOTOGRAPH OF TEST

9.1 Radiated Emission





9.2 Conducted Emission

N/A

End of Report