

**Zhejiang Hooeasy Technology Co., Ltd.**

# **RF TEST REPORT**

**Report Type:**

FCC Part 15.231 RF report

**Model:**

DC1602, DC1602Q

**REPORT NUMBER:**

250400527HAN-001

**ISSUE DATE:**

May 13, 2025

**DOCUMENT CONTROL NUMBER:**

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## TEST REPORT

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Report no.: 250400527HAN-001

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**FCC ID:** **2BPAM-20251802**

### SUMMARY:

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

**47CFR Part 15 (2023):** Radio Frequency Devices (Subpart C)

**ANSI C63.10 (2020):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

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**TEST REPORT****Content**

<b>REVISION HISTORY.....</b>	<b>4</b>
<b>MEASUREMENT RESULT SUMMARY .....</b>	<b>5</b>
<b>1 GENERAL INFORMATION .....</b>	<b>6</b>
1.1 DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) .....	6
1.2 TECHNICAL SPECIFICATION.....	6
1.3 DESCRIPTION OF TEST FACILITY .....	7
<b>2 TEST SPECIFICATIONS.....</b>	<b>8</b>
2.1 STANDARDS OR SPECIFICATION .....	8
2.2 MODE OF OPERATION DURING THE TEST .....	8
2.3 TEST SOFTWARE LIST .....	8
2.4 TEST PERIPHERALS LIST.....	8
2.5 TEST ENVIRONMENT CONDITION:.....	8
2.6 INSTRUMENT LIST .....	9
2.7 MEASUREMENT UNCERTAINTY.....	10
<b>3 FUNDAMENTAL &amp; SPURIOUS EMISSION &amp; RESTRICT BAND RADIATED EMISSION.....</b>	<b>11</b>
3.1 LIMIT .....	11
3.2 MEASUREMENT PROCEDURE .....	12
3.3 TEST CONFIGURATION .....	13
3.4 TEST RESULTS OF RADIATED EMISSIONS .....	15
<b>4 POWER LINE CONDUCTED EMISSION.....</b>	<b>18</b>
4.1 LIMIT .....	18
4.2 TEST CONFIGURATION .....	18
4.3 MEASUREMENT PROCEDURE .....	19
4.4 TEST RESULTS OF POWER LINE CONDUCTED EMISSION.....	19
<b>5 EMISSION BANDWIDTH .....</b>	<b>20</b>
5.1 LIMIT .....	20
5.2 MEASUREMENT PROCEDURE .....	20
5.3 TEST CONFIGURATION .....	20
5.4 THE RESULTS.....	21
<b>6 DEACTIVATING TIME.....</b>	<b>22</b>
6.1 TEST LIMIT .....	22
6.2 TEST CONFIGURATION .....	22
6.3 TEST PROCEDURE AND TEST SETUP .....	23
6.4 TEST PROTOCOL.....	23
<b>7 ANTENNA REQUIREMENT.....</b>	<b>24</b>

**Revision History**

Report No.	Version	Description	Issued Date
250400527HAN-001	Rev. 01	Initial issue of report.	May 13, 2025

**TEST REPORT****Measurement result summary**

TEST ITEM	FCC REFERENCE	RESULT
Fundamental & spurious emission &Restrict band radiated emission	15.231(b) 15.209(a) 15.205	Pass
Power line conducted emission	15.207	N/A
Emission bandwidth	15.231(c)	Pass
Transmission Time	15.231(a)(1)	Pass
Antenna requirement	15.203	Pass

**Notes:**

- 1: N/A =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.

**TEST REPORT****1 GENERAL INFORMATION****1.1 Description of Equipment Under Test (EUT)**

Product name:	Single Channel Emitter
Type/Model:	DC1602, DC1602Q
Description of EUT:	The EUT covered in the report is RF remote controller with 433MHz as carrier. DC1602 and DC1602Q are the same except for the appearance.
Rating:	3VDC
Category of EUT:	Class B
EUT type:	<input checked="" type="checkbox"/> Tabletop <input type="checkbox"/> Floor standing
Software Version:	/
Hardware Version:	/
Sample Identification No.:	A250407-27-002
Sample received date:	April 7, 2025
Date of test:	April 10, 2025 ~ April 25, 2025

**1.2 Technical Specification**

Operation Frequency:	433.900MHz
Type of Modulation:	ASK
Product Type:	<input type="checkbox"/> Mobile <input checked="" type="checkbox"/> Portable <input type="checkbox"/> Fix Location
Channel Number:	1
Antenna Designation:	Integral PCB antenna, non-user removable

**TEST REPORT****1.3 Description of Test Facility**

Name:	Intertek Testing Services (Shanghai FTZ) Co., Ltd.
Address:	Building 86, No. 1198 Qinzhou Road (North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
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The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L21189
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Member No: 3598 (Registration No.: R-14243, G-10845, C-14723, T-12252)
	A2LA Accreditation Lab Certificate Number: 3309.02

**TEST REPORT****2 TEST SPECIFICATIONS****2.1 Standards or specification**

**47CFR Part 15 (2023):** Radio Frequency Devices (Subpart C)

**ANSI C63.10 (2020):** American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

**2.2 Mode of operation during the test**

Within this test report, EUT was tested with modulation and tested under its rating voltage and frequency.

**2.3 Test software list**

Test Items	Software	Manufacturer	Version
Conducted emission	SKET Auto EMC Test Software	Keleto	V3.0
Radiated emission	SKET Auto EMC Test Software	Keleto	V3.0

**2.4 Test peripherals list**

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

**2.5 Test environment condition:**

Test items	Temperature	Humidity
Fundamental & spurious emission & Restrict band radiated emission	25°C	45% RH
Power line conducted emission	NA	NA
Emission bandwidth & Transmission Time	25°C	45% RH

**TEST REPORT****2.6 Instrument list**

Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2025-08-18
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESR	EC6501	2025-09-10
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2025-09-11
<input checked="" type="checkbox"/>	Pre-amplifier	tonscend	tap01018050	EC 6432-1	2025-12-03
<input checked="" type="checkbox"/>	Horn antenna	ETS	3117	EC 4792-1	2025-09-13
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2026-07-11
RF test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	PXA Signal Analyzer	Keysight	N9030A	EC 5338	2026-03-11
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESCI 7	EC 4501	2026-03-09
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Therom-Hygrograph	Testo	175h1	EC 6644	2025-08-29

**TEST REPORT****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

## TEST REPORT

### 3 Fundamental & Spurious Emission & Restrict band radiated emission

**Test result:** **PASS**

### 3.1 Limit

**3.1.1** The emission shall test through the 10th harmonic or to 40GHz, whichever is lower. It must comply with the limits below:

Fundamental Frequency (MHz)	Fundamental limit (uV/m)	Spurious limit (uV/m)
<input type="checkbox"/> 40.66 – 40.70	2250	225
<input type="checkbox"/> 70 – 130	1250	125
<input type="checkbox"/> 130 - 174	1250 to 3750	125 to 375
<input type="checkbox"/> 174 - 260	3750	375
<input checked="" type="checkbox"/> 260 – 470	3750 to 12500	375 to 1250
<input type="checkbox"/> Above 470	12500	1250

The formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz,  $\mu\text{V/m}$  at 3 meters =  $56.81818(\text{Frequency}) - 6136.3636$ ; for the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $41.6667(\text{Frequency}) - 7083.3333$ . The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

For that the EUT use fundamental frequency of 433.900 MHz, after calculation, the limit is:

Fundamental limit =  $41.6667 * 433.900 - 7083.3333 = 10995.84 \text{ uV/m} = 80.82 \text{ dBuV/m}$   
Spurious limit =  $80.82 - 20 = 60.82 \text{ dBuV/m}$

**3.1.2** The radiated emissions which fall in the restricted bands, as defined in §15.201

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

**TEST REPORT****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:**

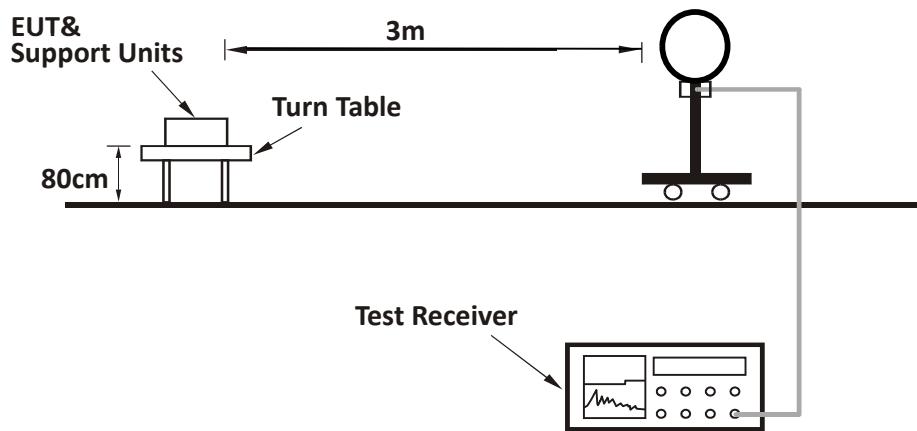
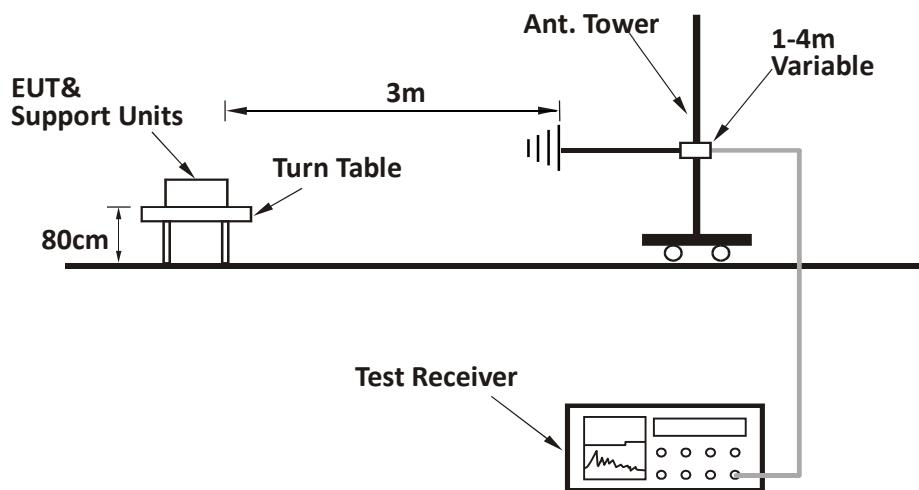
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 9kHz at frequency below 30MHz.

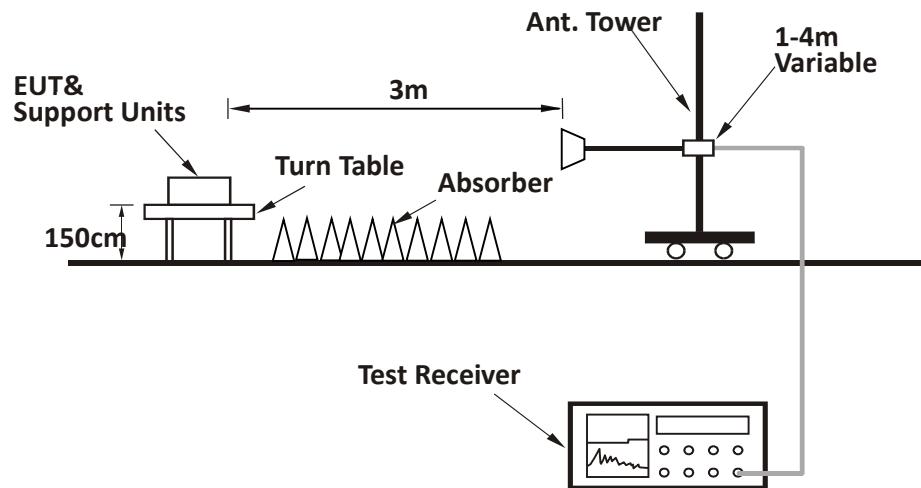
**For Radiated emission above 30MHz:**

- 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:**

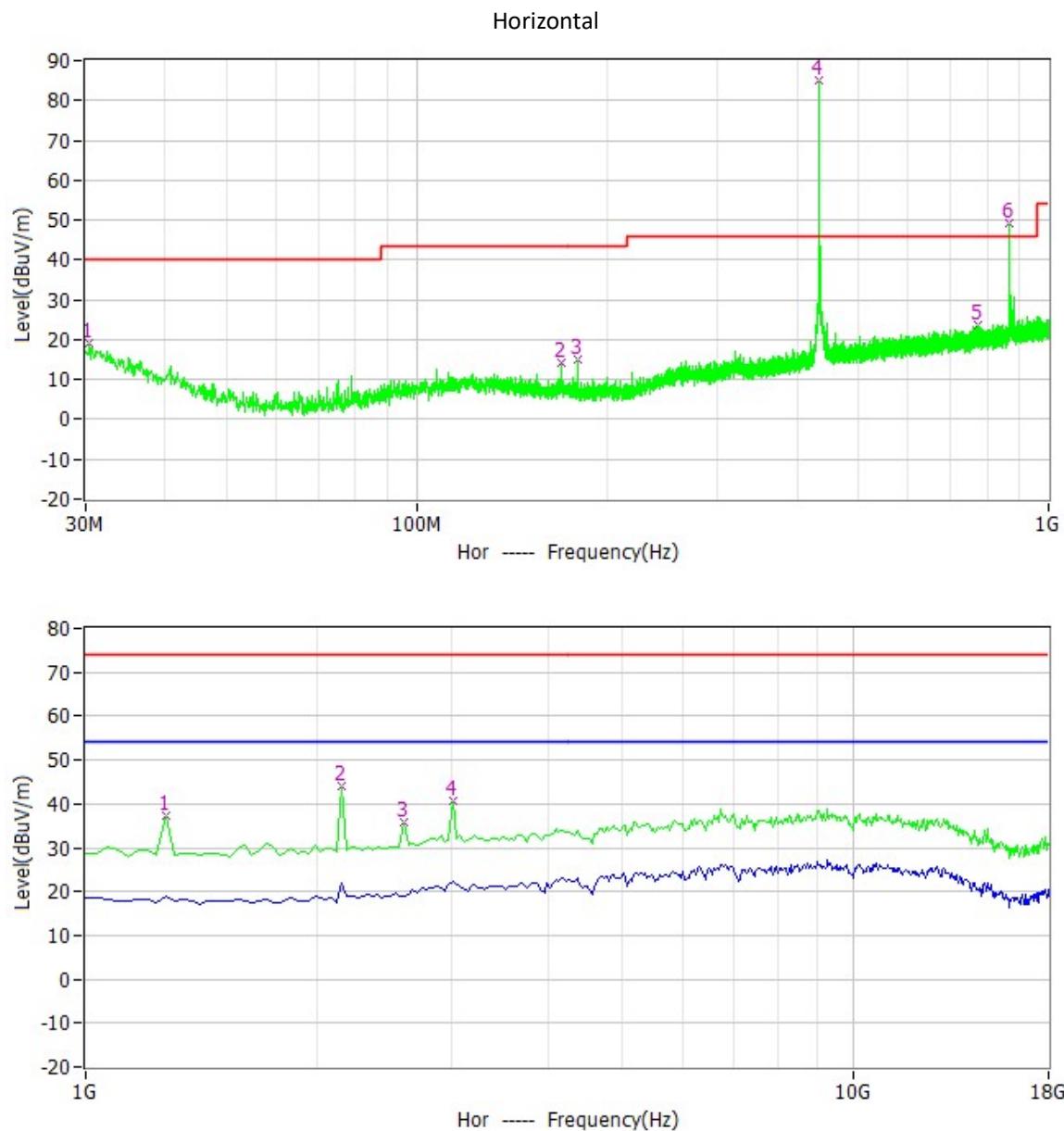
1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 3 MHz for Peak detection (PK) at frequency above 1GHz.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

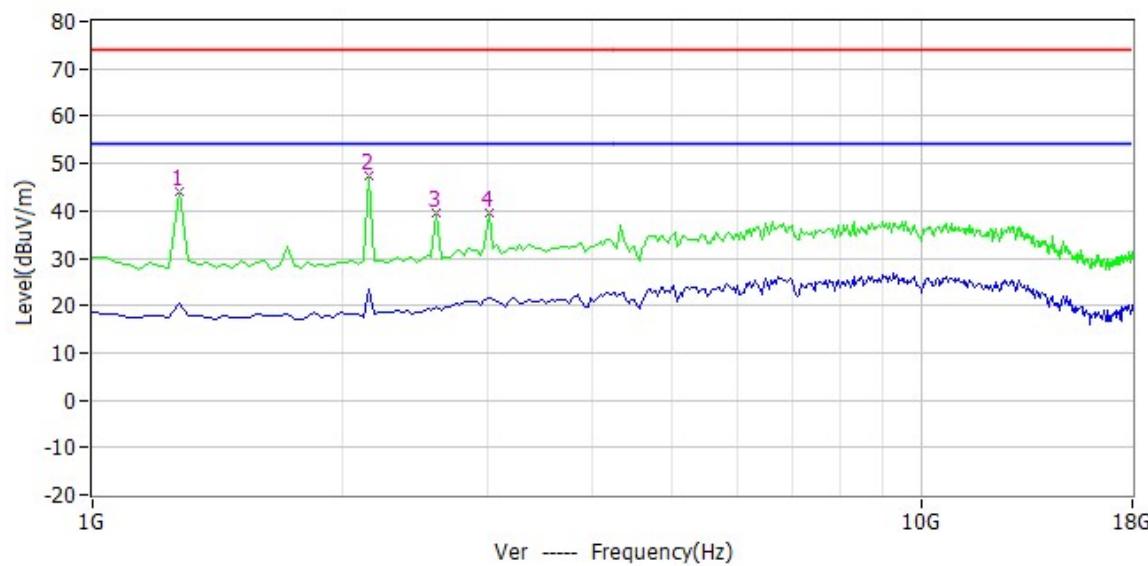
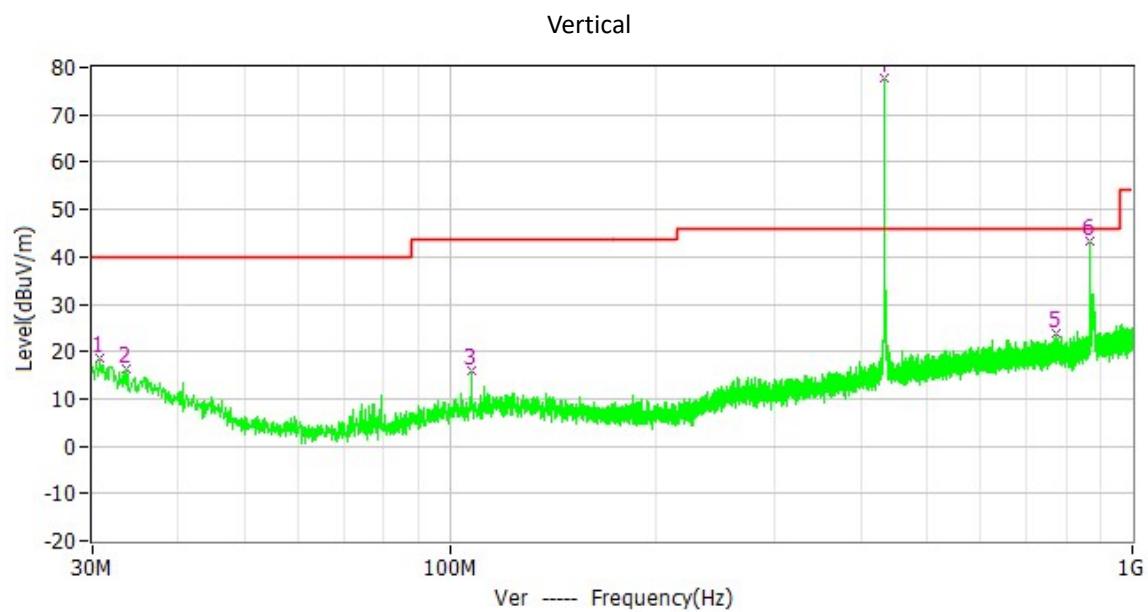
**TEST REPORT****3.3 Test Configuration****For Radiated emission below 30MHz:****For Radiated emission 30MHz to 1GHz:**

**TEST REPORT****For Radiated emission above 1GHz:**

**TEST REPORT****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 REPORT**

**TEST REPORT**
**Test data:**

Polarization	Frequency	Corrected Reading (dB $\mu$ V/m)	Correct Factor (dB/m)	Limits (dB $\mu$ V/m)	Margin (dB)	Detector
H	30.388MHz	19.10	19.60	40.00	20.90	PK
	169.971MHz	14.00	11.10	43.50	29.50	PK
	179.962MHz	15.20	10.70	43.50	28.30	PK
	433.900MHz	<b>85.20</b>	18.70	100.82	15.62	PK
	433.900MHz	76.56	18.70	80.82	4.26	AV
	775.057MHz	23.50	22.50	46.00	22.50	PK
	867.800MHz	49.40	23.70	80.82	31.42	PK
	1.301GHz	37.24	-24.07	74.00	36.76	PK
	2.169GHz	44.16	-22.12	80.82	36.66	PK
	2.603GHz	35.87	-20.29	80.82	44.95	PK
	3.037GHz	40.72	-18.40	80.82	40.10	PK
V	30.776MHz	18.40	19.40	40.00	21.60	PK
	33.686MHz	16.40	17.80	40.00	23.60	PK
	107.697MHz	15.90	12.50	43.50	27.60	PK
	433.900MHz	77.70	18.70	100.82	23.12	PK
	774.087MHz	23.90	22.50	46.00	22.10	PK
	867.800MHz	43.20	23.70	80.82	37.62	PK
	1.301GHz	44.14	-24.07	74.00	29.86	PK
	2.169GHz	47.52	-22.12	80.82	33.30	PK
	2.603GHz	39.52	-20.29	80.82	41.30	PK
	3.037GHz	39.52	-18.40	80.82	41.30	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.

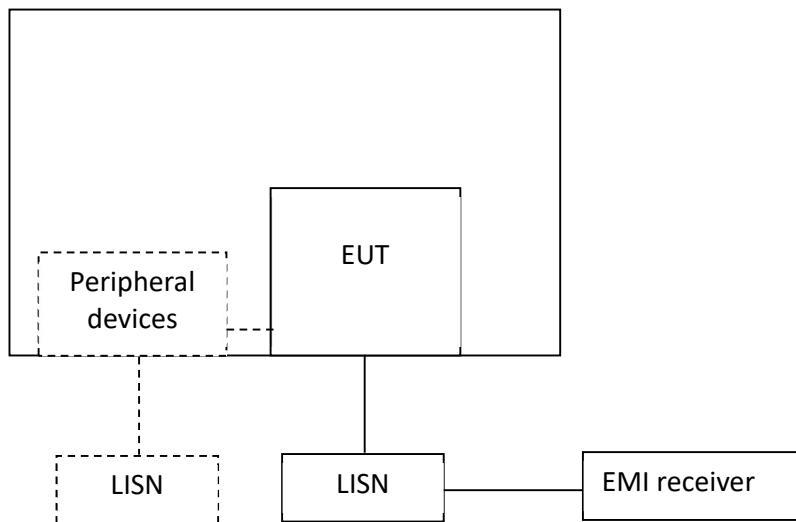
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,  
 Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dB $\mu$ V,  
 Limit = 40.00dB $\mu$ V/m.  
 Then Correct Factor =  $30.20 + 2.00 - 32.00 = 0.20$ dB/m;  
 Corrected Reading =  $10.00 + 0.20$ dB/m = 10.20dB $\mu$ V/m;  
 Margin =  $40.00 - 10.20$ dB $\mu$ V/m = 29.80dB.

**TEST REPORT****4 Power line conducted emission****Test result:** NA**4.1 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.

**4.2 Test Configuration**

**TEST REPORT****4.3 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.

**4.4 Test Results of Power line conducted emission**

NA

**TEST REPORT****5 Emission Bandwidth**

**Test result:** **PASS**

**5.1 Limit**

The bandwidth of the emission shall be no wider than 0.25 % of the center frequency for devices operating above 70MHz and below 900MHz. For devices operating above 900 MHz, the 99% bandwidth shall be less or equal to 0.5% of the center frequency.

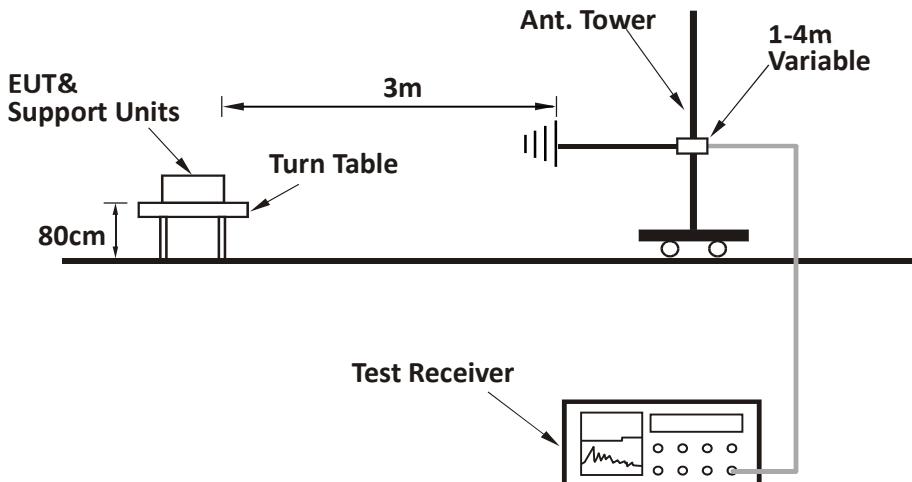
The limit for the EUT =  $0.25\% * 433.900 \text{ MHz} = 1084.75 \text{ kHz}$

**5.2 Measurement Procedure**

The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turn table rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The central frequency of test receiver was set near the operating frequency of EUT.

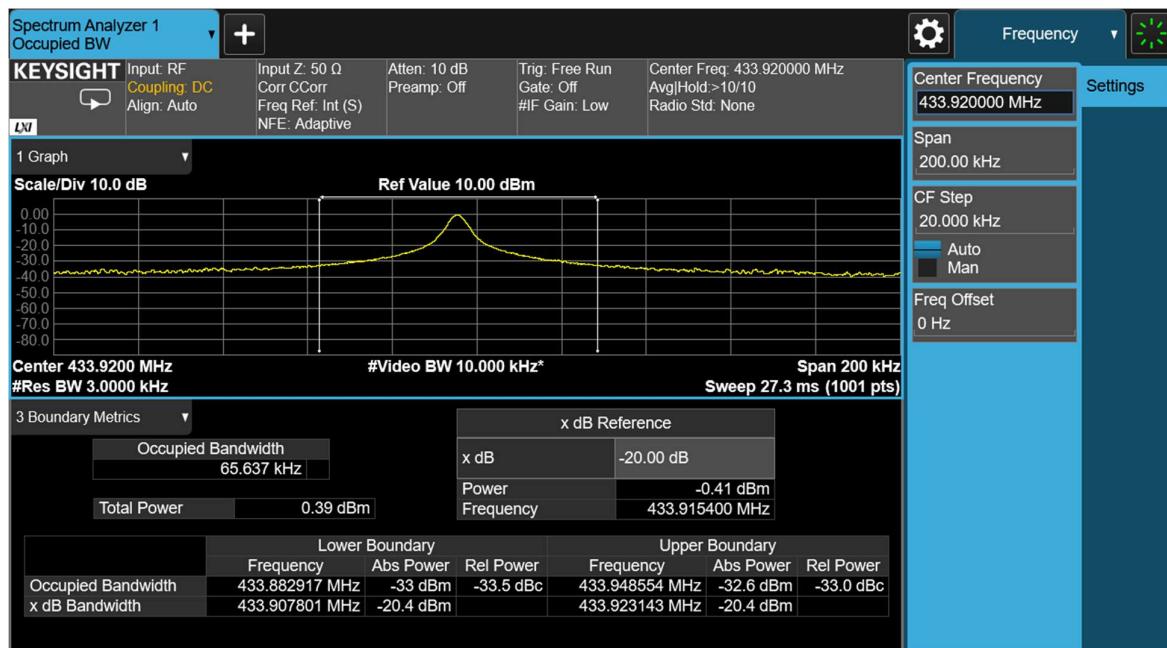
The test was conducted using the Spectrum Analyzer with the resolutions bandwidth set at 10kHz, the video bandwidth set at 30kHz.

**5.3 Test Configuration**

## TEST REPORT

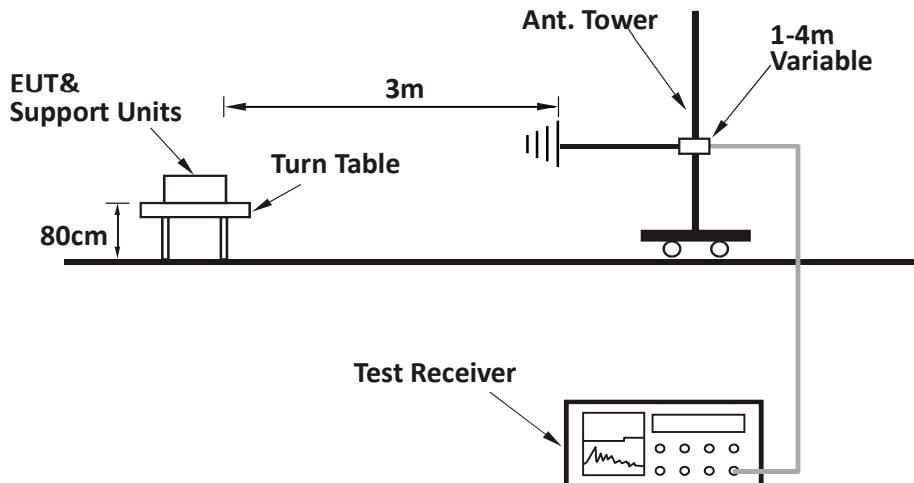
## 5.4 The results

Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
433.900	15.342	65.637
Limit	1084.75	1084.75
Result	Complied	Complied



**TEST REPORT****6 Deactivating time**Test result: **PASS****6.1 Test limit**

- (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted.  
However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.
- (4) Intentional radiators which are employed for radio control purposes during emergencies involving fire, security, and safety of life, when activated to signal an alarm, may operate during the pendency of the alarm condition.
- (5) Transmission of set-up information for security systems may exceed the transmission duration limits in (1) and (2) above, provided such transmission are under the control of a professional installer and do not exceed ten seconds after a manually operated switch is released or a transmitter is activated automatically. Such set-up information may include data.

**6.2 Test Configuration**

## TEST REPORT

### 6.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber.

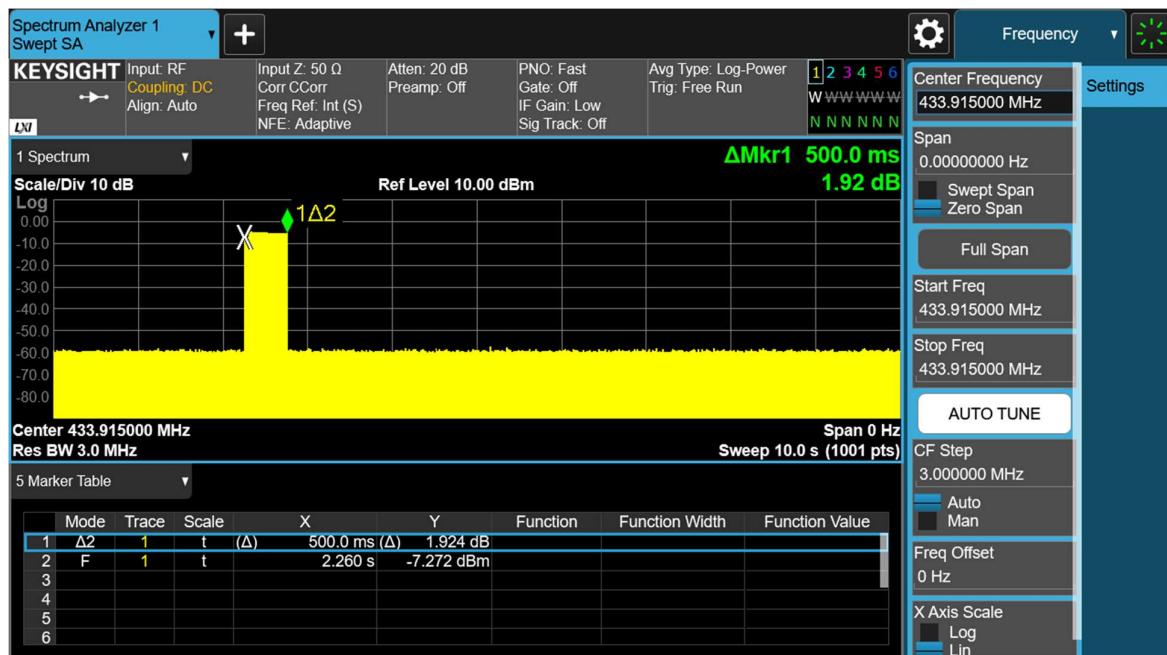
The central frequency of test receiver was set as the operating frequency of EUT and the Span was set as 0.

The EUT was switched once. The test receiver recorded the whole time from the triggered moment to the time of stopping radiating. For manual switching, to avoid uncertainty, the operating above would be repeated five times and the worst data is recorded.

### 6.4 Test protocol

Whole time from the triggered moment to the time of stopping radiating: 0.5s.

As a result, the EUT complies with the limit of 5s' deactivating time.



**TEST REPORT****7 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 \*\*\*\*\*