



FCC TEST REPORT

REPORT NO.: LDF-19MY0631VTSHPB

MODEL NO.: SCT-R1 FCC White,SCT-R1 FCC Black
SCT-R5 FCC White,SCT-R5 FCC Black

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APPLICANT: Zhejiang Lianda Science and Technology Co., Ltd

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ISSUED BY: BUREAU VERITAS ADT (Shanghai) Corporation

ADDRESS: No. 829, Xinzhuan Road, Shanghai, P.R.China
(201612)

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1 CERTIFICATION

PRODUCT: Remote Control
MODEL NO.: SCT-R1 FCC White, SCT-R1 FCC Black
SCT-R5 FCC White, SCT-R5 FCC Black
APPLICANT: Zhejiang Lianda Science and Technology Co., Ltd
MANUFACTURER: Zhejiang Lianda Science and Technology Co., Ltd
TESTED: May.08, 2019~ May.23, 2019
STANDARDS: FCC Part 15
Subpart C (Section 15.209 and 15.231),
ANSI C63.10-2013

We, BUREAU VERITAS ADT (Shanghai) Corporation, declare that the equipment above has been tested in our facility and found compliance with the requirement limits of applicable standards. The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate under the standards herein specified.

PREPARED BY : W. Y. M., **DATE:** May.23, 2019

APPROVED BY : Daniel SUN, **DATE:** May.23, 2019





2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

APPLIED STANDARD: FCC Part 15, Subpart C			
Standard Paragraph	Test Type	Result	Remarks
15.207	Conducted Emission Test	N/A	Please refer to 4.1.2.
15.231(a)	De-activation Time	PASS	Meet the requirement of limit
15.209 15.231(b)	Radiated Emission Test	PASS	Minimum passing margin is -17.56dB/PK at 433.92 MHz
15.231(c)	20dB Occupied Bandwidth Measurement	PASS	Meet the requirement of limit

2.1 MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4:

Measurement		Value
Conducted emissions		2.55 dB
Conducted emissions at telecom port		2.60 dB
Radiated emissions	30 MHz ~ 1GHz	3.22 dB
	Above 1GHz	2.89 dB



3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Remote Control
MODEL NO.	(1)SCT-R1 FCC White;(2)SCT-R1 FCC Black (3)SCT-R5 FCC White;(4)SCT-R5 FCC Black
DIFFERENCE OF MODELS	The difference between Model (1)&(2) or (3)&(4) is the color; The difference between Model(1)&(3) or (2)&(4) is the quantity of button and LED, the PCB, Structure, Electric circuit is the same.
POWER SUPPLY	1.5Vdc by battery
MODULATION TYPE	ASK
CARRIER FREQUENCY OF EACH CHANNEL	433.92MHz
NUMBER OF CHANNEL	1
ANTENNA TYPE	Integral PCB Antenna
DATA CABLE SUPPLIED	N/A
I/O PORTS	N/A

NOTE: 1.The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

3.2 DESCRIPTION OF TEST MODES

Test Mode	Description
1	Make sure EUT work in the operation mode.

One channel is provided to this EUT:

Channel	Frequency
1	433.92MHz

**TEST MODE APPLICABILITY AND TESTED CHANNEL DETAIL:**

EUT configure mode	Applicable to				Description
	PLC	De-a T	RE	20dB OBM	
1	-	√	√	√	Continuously transmitting

Where PLC: Power Line Conducted Emission
RE: Radiated Emission

De-a T: De-activation Time
20dB OBM: 20dB Occupied Bandwidth Measurement

Radiated Emission Test:

- ☒ ☐ Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, and X.Y.Z. axis.
- ☒ Following channel(s) was (were) selected for the final test as listed below.

Available Channel	Tested Channel	Modulation Type	Axis
1	1	ASK	X



3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a remote switching. According to the specifications of the manufacturer, it must comply with the requirements of the following standards:

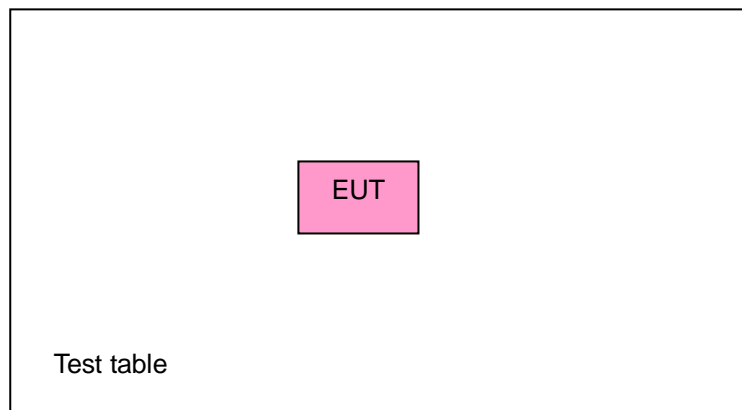
FCC Part 15, Subpart C. (15.231)

ANSI C63.10- 2013

All test items have been performed and recorded as per the above standards.

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.



Note: When doing the test, fresh batteries were used.



4 EMISSION TEST

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

FREQUENCY (MHz)	Quasi-peak	Average
0.15 - 0.5	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

- NOTES:** 1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

4.1.2 TEST RESULTS

Since the EUT is powered by battery, the report doesn't require for conduct emission test.



4.2 DEACTIVATION TIME

4.2.1 LIMITS OF DEACTIVATION TIME MEASUREMENT

TEST STANDARD:

FCC Part 15: 2015, Subpart C (Section: 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.

4.2.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Last Calibrated	Calibrated Until
Spectrum Analyzer Keysight	N9030B	E1S1003	Jul. 13, 18	Jul. 12, 19

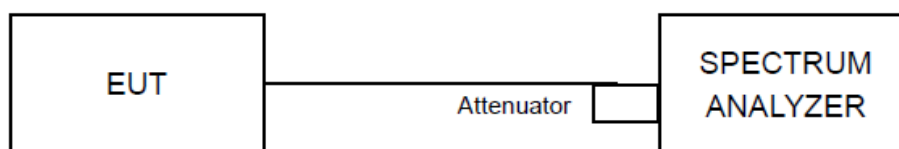
4.2.3 TEST PROCEDURES

- Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
- Turn on the EUT and connect its antenna terminal to measurement via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
- Adjust the center frequency of SA on any frequency be measured and set SA to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
- Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
- Repeat above procedures until all different time-slot modes have been completed.

4.2.4 DEVIATION FROM TEST STANDARD

No deviation.

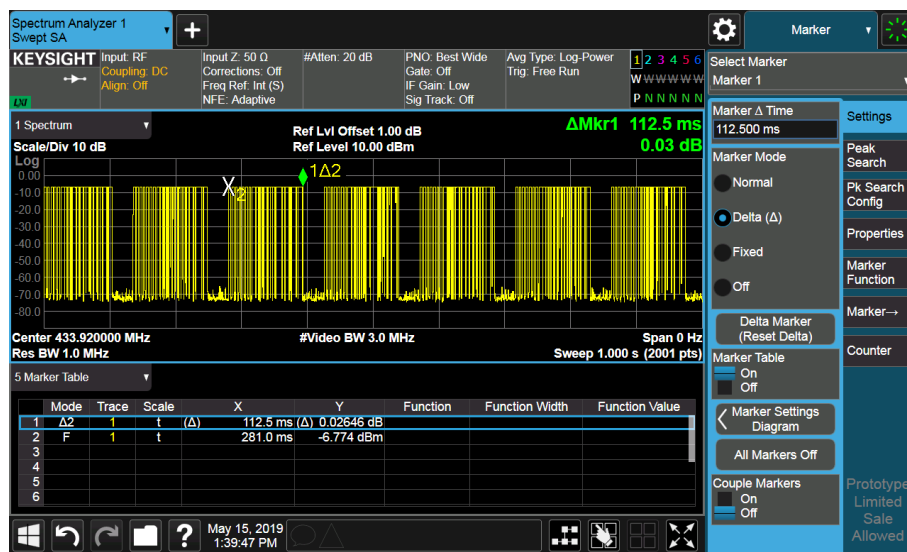
4.2.5 TEST SETUP





4.2.6 TEST RESULTS

Frequency (MHz)	Transmission duration	Maximum limit (sec)	Pass / Fail
433.92	112.5ms	5	Pass





4.3 RADIATED EMISSION MEASUREMENT

4.3.1 LIMITS OF RADIATED EMISSION MEASUREMENT

TEST STANDARD:

FCC Part 15: 2015, Subpart C (Section: 15.205)

FCC Part 15: 2015, Subpart C (Section: 15.209)

FCC Part 15: 2015, Subpart C (Section: 15.231(b))

According to 15.231 the field strength of emissions from intentional radiators operated under these frequencies bands shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental		Field Strength of Spurious	
	uV/meter	dBuV/meter	uV/meter	dBuV/meter
40.66 – 40.70	2250	67.04	225	48.04
70 – 130	1250	61.94	125	41.94
130 – 174	1250 to 3750	61.94 to 71.48	125 to 375	41.94 to 51.48
174 – 260	3750	71.48	75	37.50
260 – 470	3750 to 12500	71.48 to 81.94	375 to 1250	51.48 to 61.94
Above 470	12500	81.94	1250	61.94

NOTE:

- (1) Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = $56.81818(F) - 6136.3636$; for the band 260-470 MHz, uV/m at 3 meters = $41.6667(F) - 7083.3333$. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.
- (2) The above field strength limits are specified at a distance of 3meters. The tighter limits apply at the band edges.



Emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

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

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

FREQUENCY RANGE OF RADIATED MEASUREMENT

(For intentional radiators)

If the intentional radiator operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.



4.3.2 TEST INSTRUMENTS

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
Hybrid antenna(25MHz-1.5GHz)	Schwarzbeck	VULB9168	E1A1001	Feb.27, 19	Feb.26, 20
Horn Antenna(1GHz-18GHz)	Schwarzbeck	BBHA9120D	E1A1017	Jan.27, 19	Jan.26, 20
Pre-Amplifier(100kHz-1.3GHz)	Agilent	8447D	E1A2001	Oct.19, 17	Oct.14, 19
Pre-Amplifier(1GHz-26.5GHz)	Agilent	8449B	E1A2002	Mar. 26, 19	Mar. 25, 20
EMI test receiver	R&S	ESR7	E1R1005	Dec.04, 18	Dec.03, 19
Spectrum Analyzer	Keysight	N9030B	E1S1003	Jul. 13, 18	Jul. 12, 19
EMI test receiver	R&S	ESCS30	E1R1001	Mar.26, 19	Mar.25, 20
LISN	R&S	ENV216	E1L1011	Jul.18, 18	Jul.17, 19
Test Software	Toyo	Toyo	N/A	N/A	N/A
Test Software	Keysight	V1.01.10	N/A	N/A	N/A

4.3.3 TEST PROCEDURE

- When tested from 30MHz to 1000MHz, the EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation. When tested above 1GHz, the EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- 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.
- 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.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

NOTE:

- The resolution bandwidth of test receiver/spectrum analyzer is 120kHz for Peak detection (PK) and Quasi-peak detection at frequency below 1GHz.
- The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection (PK) at frequency above 1GHz.



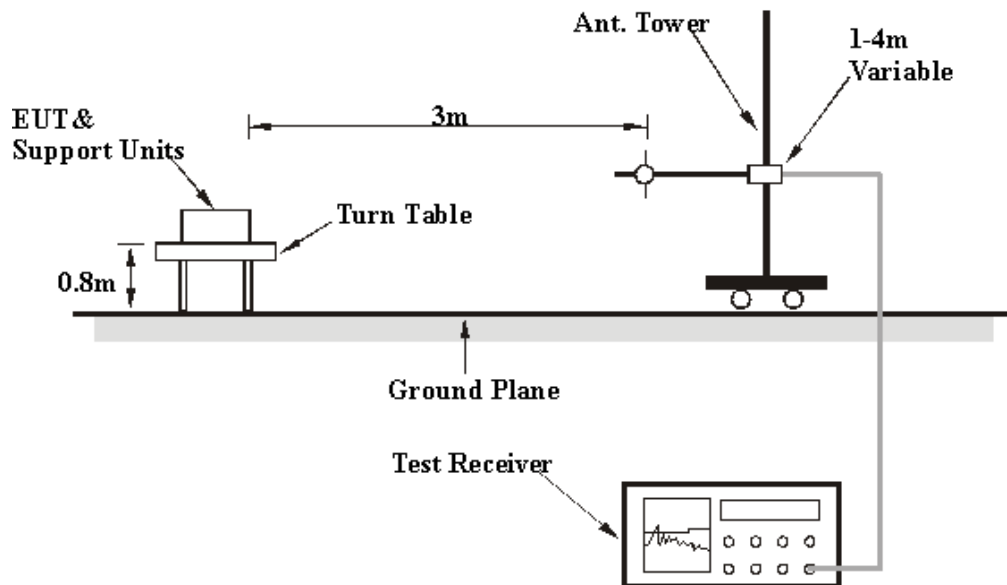
4.3.4 DEVIATION FROM TEST STANDARD

No deviation.

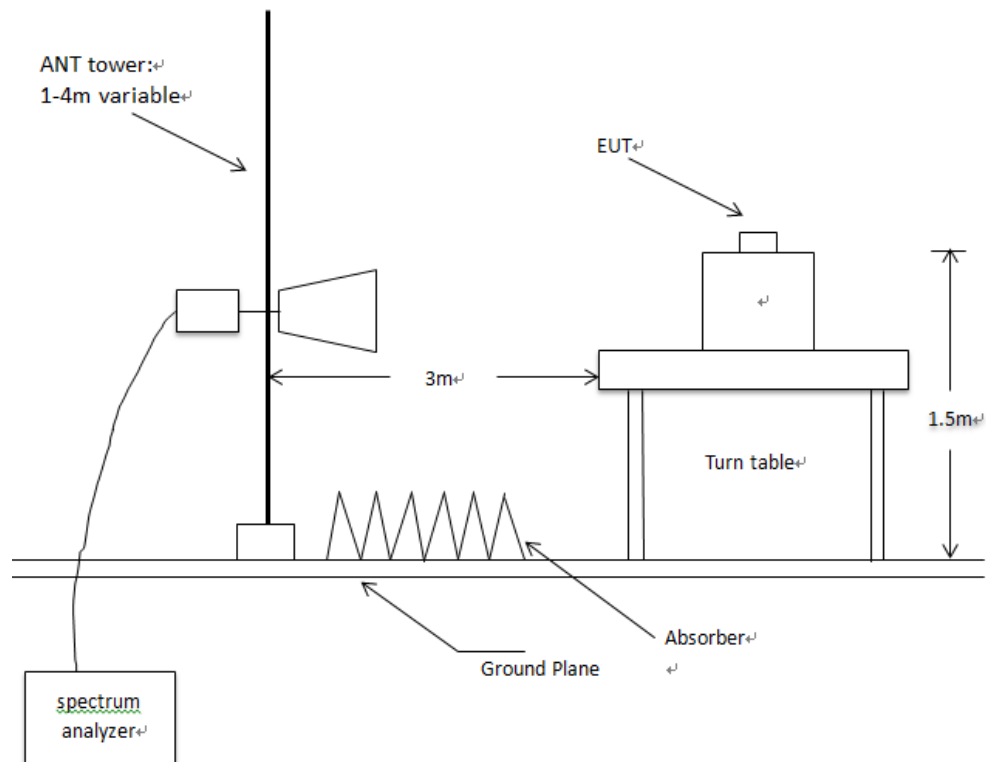


4.3.5 TEST SETUP

Test from 80MHz to 1000MHz



Test from 1GHz above



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.



4.3.6 EUT OPERATING CONDITIONS

Settic channel frequency. the transmitter part of EUT under transmission condition continuously at specific channel frequency.



4.3.7 TEST RESULTS

Below 1GHz Worst-Case Data

EUT	Remote Control		
CHANNEL	Channel 1	FREQUENCY RANGE	30 ~ 1000 MHz
MODULATION TYPE	ASK	INPUT POWER (SYSTEM)	1.5Vdc by battery
ENVIRONMENTAL CONDITIONS	24 deg. C, 55% RH, 101kPa	DETECTOR FUNCTION	Peak/Average
TESTED BY	Will YAN		

ANTENNA POLARITY & TEST DISTANCE: HORIZONTAL AT 3 M								
No.	Freq. (MHz)	Factor (dB/M)	Reading (dBuV/M)	Emission (dBuV/M)	Limit (dBuV/M)	Margin (dB)	Ant. Height (cm)	Table Angle (Deg.)
1*	433.92 PK	7.43	90.30	83.27	100.825	-17.56	--	--
1*	433.92 AV	--	--	75.84	80.825	-5.00	--	--
2	867.84 PK	7.43	47.76	47.30	80.825	-33.53	--	--
2	867.84 AV	--	--	39.70	60.825	-39.14	--	--



ANTENNA POLARITY & TEST DISTANCE: VERTICAL AT 3 M								
No.	Freq. (MHz)	Factor (dB/M)	Reading (dBuV/M)	Emission (dBuV/M)	Limit (dBuV/M)	Margin (dB)	Ant. Height (cm)	Table Angle (Deg.)
1*	433.92 PK	7.43	80.01	72.98	100.825	-27.85	--	--
1*	433.92 AV	--	--	65.55	80.825	-15.28	--	--
2	867.84 PK	7.43	36.13	35.67	80.825	-45.16	--	--
2	867.84 AV	--	--	28.24	60.825	-32.59	--	--

NOTE:

1. Emission level (dBuV/m) = Reading (dBuV/m) + Factor (dB/m)
2. Correction Factor (dB) = Antenna Factor (dB) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “*” = Fundamental frequency
6. The average value of fundamental frequency and spurious emission is:

Average = Peak value + 20log(Duty cycle)

Where the duty factor is calculated from following formula:

$$20\log(\text{Duty cycle}) = 20\log \frac{(2.4*7+4.7+12*1.2+0.6*11)\text{ms}}{100\text{ms}} = -7.43\text{dB}$$

please see page 20,21 for plotted duty

7. Pulse Width=0.6ms, RBW>2/0.6ms(3.333KHz), then PDCF not required.



Above 1GHz Worst-Case Data

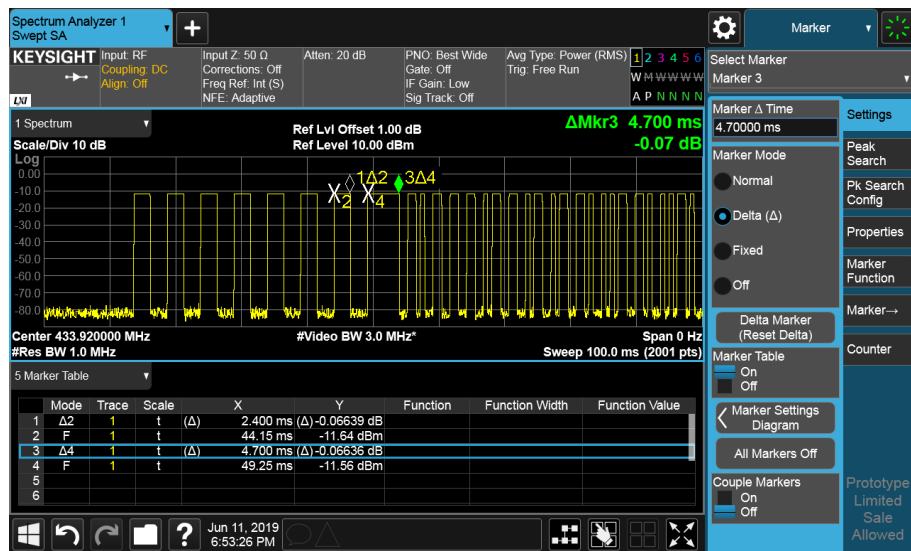
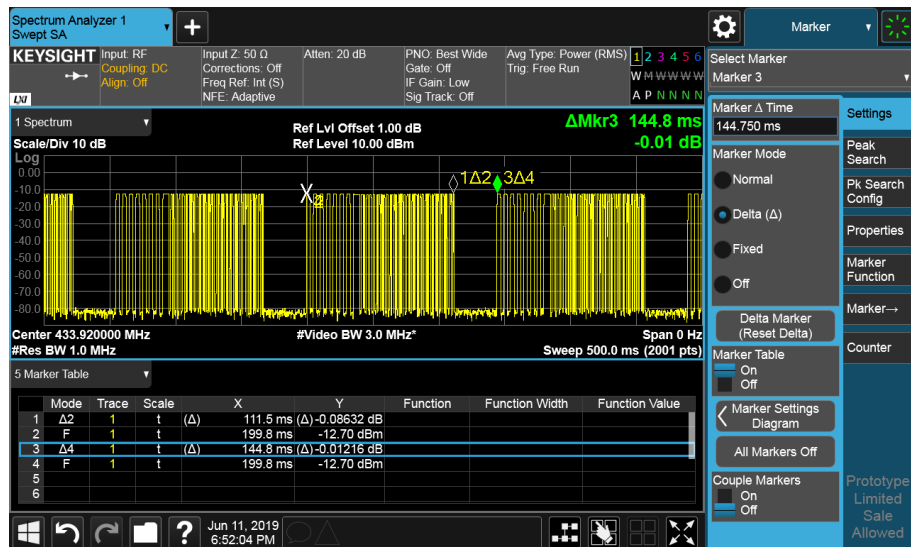
EUT	Remote Control		
CHANNEL	Channel 1	FREQUENCY RANGE	1 GHz~5 GHz
MODULATION TYPE	ASK	INPUT POWER (SYSTEM)	1.5Vdc by battery
ENVIRONMENTAL CONDITIONS	24 deg. C, 55% RH, 1000 hPa	DETECTOR FUNCTION	Peak/Average
TESTED BY	Will Yan		

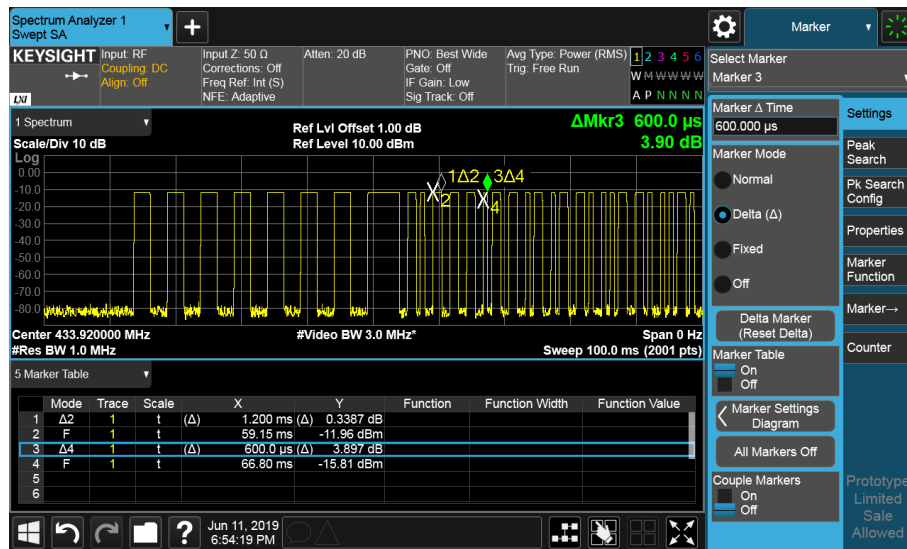
Frequency(MHz)		PK Emission (dBuV/m)	PK limit (dBuV/m)	PK margin (dBuV/m)	AV EMISSION	AV LIMIT	AV MARGIN
1301.75	H	48.21	74	-25.79	40.78	54	-13.22
	V	43.68	74	-30.32	36.25	54	-17.75
1736.10	H	42.67	74	- 31.33	35.24	54	-18.76
	V	55.40	74	- 35.95	47.97	54	-6.03
2169.60	H	55.19	74	- 18.81	47.96	54	-6.04
	V	51.30	74	- 22.70	43.87	54	-10.13
2603.95	H	52.77	74	- 21.23	45.34	54	-8.66
	V	48.24	74	- 25.76	40.81	54	-13.19
3037.45	H	45.24	74	- 28.76	37.81	54	-16.19
	V	39.12	74	- 34.88	31.69	54	-22.31
3471.80	H	40.89	74	- 33.11	33.46	54	-20.54
	V	42.14	74	- 31.86	34.71	54	-19.29

NOTE:

1. Emission level (dBuV/m) = Reading (dBuV/m) + Factor (dB/m)
2. Correction Factor (dB) = Antenna Factor (dB) + Cable Factor (dB)
3. The other emission levels were very low against the limit.
4. Margin value = Emission level – Limit value.
5. “*” = Fundamental frequency
6. The average value of fundamental frequency and spurious emission is:
 Average = Peak value + 20log(Duty cycle)
 Where the duty factor is calculated from following formula:

$$20\log(\text{Duty cycle}) = 20\log \frac{(2.4*7+4.7+1.2*12+0.6*11)\text{ms}}{100\text{ms}} = -7.43\text{dB}$$
 please see page 20,21 for plotted duty
7. Pulse Width (PW)=0.6ms, RBW>2/0.6ms(3.333KHz), then PDCF not required.







4.4 20DB OCCUPIED BANDWIDTH MEASUREMENT

4.4.1 LIMITS OF BAND EDGES MEASUREMENT

TEST STANDARD:

FCC Part 15: 2011, Subpart C (Section: 15.231(C))

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for device operating above 70 MHz and below 900 MHz.

Fundamental Frequency (MHz)	Limit of 20 dB Bandwidth(kHz)
433.92	1084.8

4.4.2 TEST INSTRUMENTS

Description & Manufacturer	Model No.	Serial No.	Last Calibrated	Calibrated Until
Spectrum Analyzer Keysight	N9030B	E1S1003	Jul. 13, 18	Jul. 12, 19

NOTE: The calibration interval of the above test instruments is 12 months.



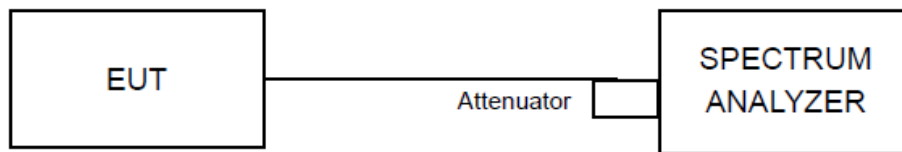
4.4.3 TEST PROCEDURES

- a. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- b. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- c. Measure the frequency difference of two frequencies that were attenuated 20dB from the reference level. Record the frequency difference as the emission bandwidth.
- d. Repeat above procedures until all frequencies measured were complete.

4.4.4 DEVIATION FROM TEST STANDARD

No deviation.

4.4.5 TEST SETUP





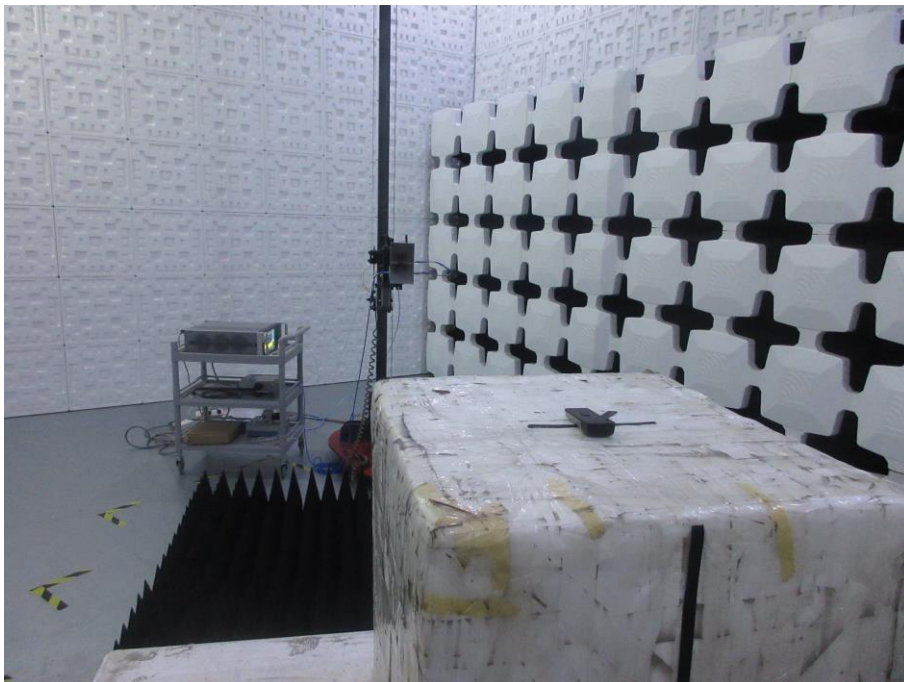
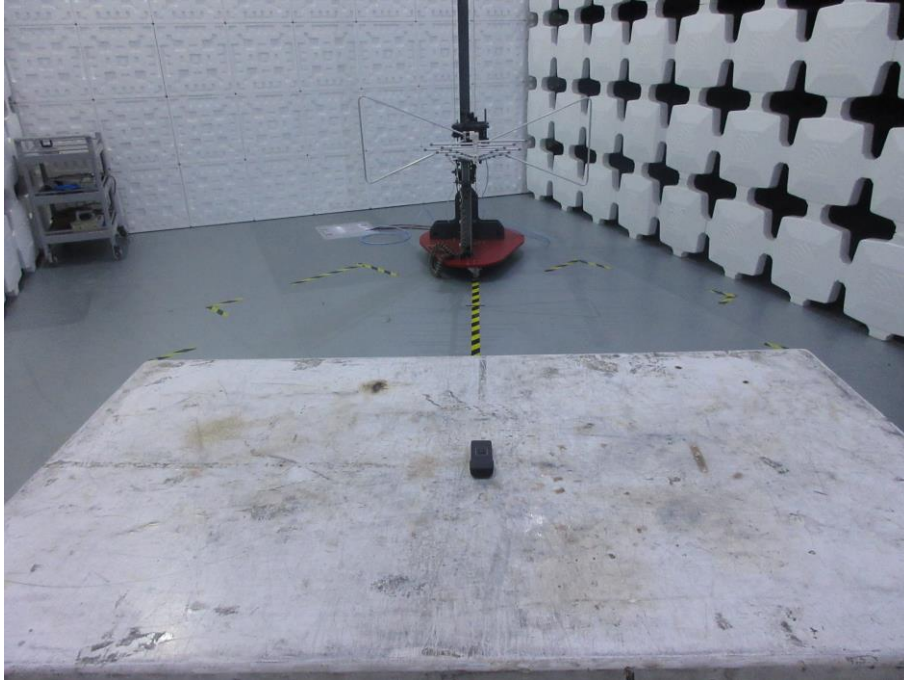
TEST RESULTS

Frequency (MHz)	20 dB bandwidth (kHz)	Maximum limit (kHz)	Pass / Fail
433.92	59.21	1084.8	Pass

The plot of test result is attached as below.



5 PHOTOGRAPHS OF THE TEST CONFIGURATION



6 PHOTOGRAPHS OF THE EUT



--- END ---