

# RF TEST REPORT



Report No.: 18070606-FCC-R

Supersede Report No.: N/A

Applicant	DongGuan HuangJiang KaiYue Electronic Factory	
Product Name	Wireless Remote Control Switch	
Model No.	H-994RGB	
Serial Model No.	N/A	
Test Standard	FCC 15.231, ANSI C63.10:2013	
Test Date	June 12 to 27, 2018	
Issue Date	June 28, 2018	
Test Result	<input checked="" type="checkbox"/> Pass	<input type="checkbox"/> Fail
Equipment complied with the specification		<input checked="" type="checkbox"/>
Equipment did not comply with the specification		<input type="checkbox"/>
Aaron Liang	David Huang	
Aaron Liang Test Engineer	David Huang Checked By	
This test report may be reproduced in full only Test result presented in this test report is applicable to the tested sample only		

Issued by:

SIEMIC (SHENZHEN-CHINA) LABORATORIES

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## Laboratories Introduction

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### Accreditations for Conformity Assessment

Country/Region	Scope
USA	EMC, RF/Wireless, SAR, Telecom
Canada	EMC, RF/Wireless, SAR, Telecom
Taiwan	EMC, RF, Telecom, SAR, Safety
Hong Kong	RF/Wireless, SAR, Telecom
Australia	EMC, RF, Telecom, SAR, Safety
Korea	EMI, EMS, RF, SAR, Telecom, Safety
Japan	EMI, RF/Wireless, SAR, Telecom
Singapore	EMC, RF, SAR, Telecom
Europe	EMC, RF, SAR, Telecom, Safety

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## 1. Report Revision History

Report No.	Report Version	Description	Issue Date
18070606-FCC-R	NONE	Original	June 28, 2018

## 2. Customer information

Applicant Name	DongGuan HuangJiang KaiYue Electronic Factory
Applicant Add	No.96, DiaoLang Avenue,DiaoLang Village,HuangJiang, DongGuan, GuangDong, China
Manufacturer	DongGuan HuangJiang KaiYue Electronic Factory
Manufacturer Add	No.96, DiaoLang Avenue,DiaoLang Village,HuangJiang, DongGuan, GuangDong, China

## 3. Test site information

Lab performing tests	SIEMIC (Shenzhen-China) LABORATORIES
Lab Address	Zone A, Floor 1, Building 2 Wan Ye Long Technology Park South Side of Zhoushi Road, Bao' an District, Shenzhen, Guangdong China 518108
FCC Test Site No.	535293
IC Test Site No.	4842E-1
Test Software	Radiated Emission Program-To Shenzhen v2.0

## 4. Equipment under Test (EUT) Information

Description of EUT: Wireless Remote Control Switch

Main Model: H-994RGB

Serial Model: N/A

Date EUT received: June 11, 2018

Test Date(s): June 12 to 27, 2018

RF Operating Frequency (ies): 433.92MHz(TX/RX)

Number of Channels : 1CH

Equipment Category: DSC

Antenna Gain: 0DBi

Input Power: Battery: 3Vdc

Trade Name : N/A

FCC ID: 2AP4ZH-994RGB

Port: Pls refer to user' s manual

Type of Modulation: FSK

## 5. Test Summary

The product was tested in accordance with the following specifications.

All testing has been performed according to below product classification:

### Test Results Summary

Test Standard	Description	Pass / Fail
CFR 47 Part 15.231: 2014		
15.203	Antenna Requirement	Pass
15.207	Conducted Emissions Voltage	N/A
15.231(a)	Fundamental & Radiated Spurious Emission	Pass
15.231(c)	20dB Bandwidth	Pass
15.231(a)	Deactivation	Pass
ANSI C63.10:2013		
PS: All measurement uncertainties are not taken into consideration for all presented test result.		

## **6. MEASUREMENTS, EXAMINATION AND DERIVED RESULTS**

### **6.1 Antenna Requirement**

**Requirement(s):** 47 CFR §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 requirement must meet at least one of the following:

- a) Antenna must be permanently attached to the device.
- b) Antenna must use a unique type of connector to attach to the device.
- c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.

Test result: Pass

The antenna is permanently attached to the device which meets the requirement.

## 6.2 Conducted Emissions Voltage

Temperature	24°C
Relative Humidity	62%
Atmospheric Pressure	1012mbar
Test date :	-----
Tested By :	Aaron Liang

### **Requirement:**

Frequency of emission (MHz)	Conducted limit (dB $\mu$ V)	
	Quasi-peak	Average
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.

### **Procedures:**

1. All possible modes of operation were investigated. Only the 6 worst case emissions measured, using the correct CISPR and Average detectors, are reported. All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Conducted Emissions Measurement Uncertainty

All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 9kHz – 30MHz (Average & Quasi-peak) is  $\pm 3.5$ dB.

Test result: N/A (Batteries operated)

## 6.3 20dB Occupied Bandwidth

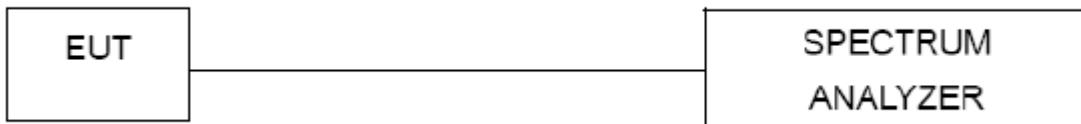
Temperature	24°C
Relative Humidity	54%
Atmospheric Pressure	1017mbar
Test date :	June 14, 2018
Tested By :	Aaron Liang

### **Test Procedure:**

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

**Limit:**  $433.92\text{MHz} \times 0.25\% = 1084.80 \text{ KHz}$

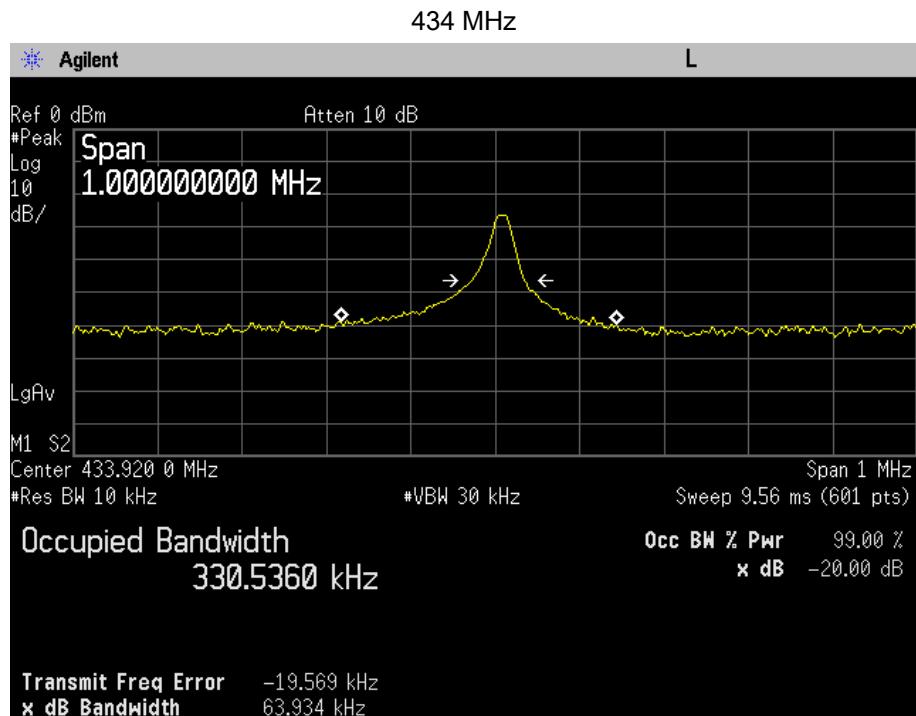
### **Test Setup:**



**Test Result:** Pass

**Test Result:**

Fundamental Frequency (MHz)	Measured 20dB Bandwidth (kHz)	FCC 15.231 Limit (kHz)	Result
433.92	63.934	1084.80	Pass



## 6.4 Radiated Fundamental and Spurious Emission

Temperature	24°C
Relative Humidity	54%
Atmospheric Pressure	1017mbar
Test date :	June 14, 2018
Tested By :	Aaron Liang

### Test Procedure:

1. Radiated emissions were measured according to ANSI C63.4. The EUT was set 3 meter away from the measuring antenna. The loop antenna was positioned 1meter above the ground from the center of the loop. The measuring bandwidth was set to 10kHz. All possible modes of operation were investigated. Only the worst case emissions measured, All other emissions were relatively insignificant.
2. A "-ve" margin indicates a PASS as it refers to the margin present below the limit line at the particular frequency.
3. Sample Calculation: Corrected Amplitude=Raw Amplitude(dBuV/m)+ACF(dB)+Cable Loss(dB)-Distance Correction Factor.

#### Sample Calculation:

1) Corrected Amplitude= Raw Amplitude(dBuV/m)+ACF(dB)+Cable Loss(dB)-Distance Correction Factor

2) Average = peak reading + 20log(duty cycle)

4. Radiated Emissions Measurement Uncertainty

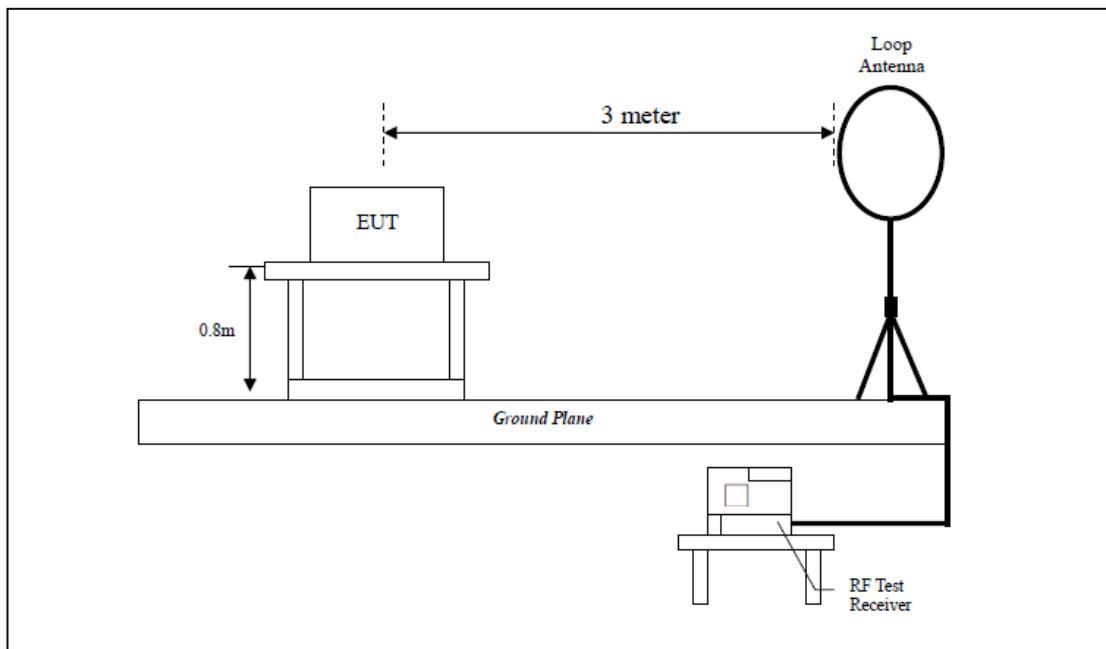
All test measurements carried out are traceable to national standards. The uncertainty of the measurement at a confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2, in the range 30MHz – 1GHz( QP only3m & 10m) is +5.6/-4.5dB(for EUTs<0.5m×0.5m×0.5m).In range of 1-40GHz) is ±3.6dB.

### Standard Requirement:

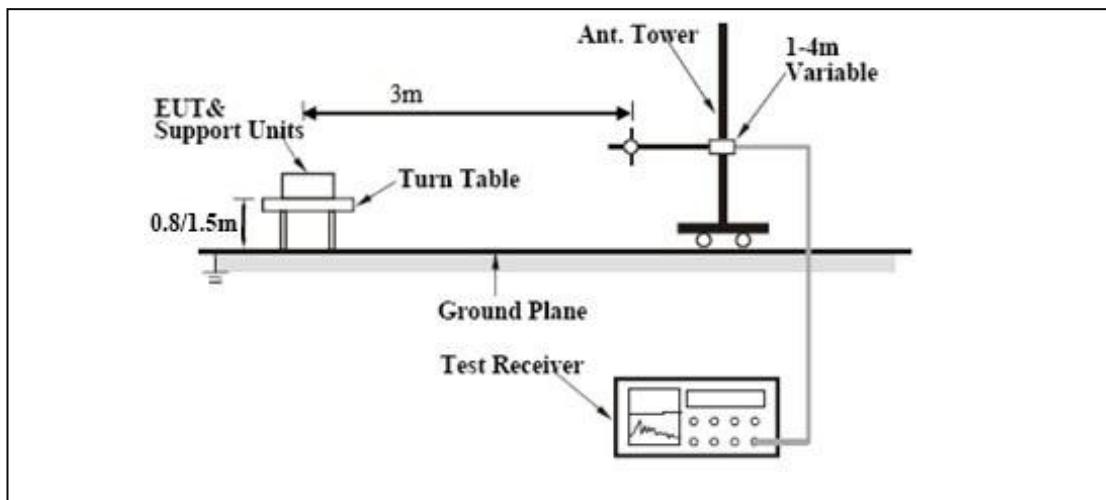
Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	1,250 to 3,750	125 to 375
174-260	3,750	375
260-470	13,750 to 12,500	1375 to 1,250
Above 470	12,500	1,250

**Test Setup:**

Radiated Emission Test-Up Frequency Below 30MHz



Radiated Emission Test-Up Frequency 30MHz~1GHz/Above 1GHz



**Test Result: Pass**

## Test Result:

Test Mode:	Transmitting Mode
------------	-------------------

Frequency range: 9KHz - 30MHz

Freq. (MHz)	Detection value	Factor (dB/m)	Reading (dBuV/m)	Result (dBuV/m)	Limit@3m (dBuV/m)	Margin (dB)
--	--	--	--	--	--	>20
--	--	--	--	--	--	>20

Note:

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

Distance extrapolation factor =  $40 \log (\text{specific distance}/\text{test distance})$ (dB);

Limit line = specific limits(dBuv) + distance extrapolation factor.

### 434 MHz

Frequency (MHz)	Average Factor (dB)	Polarity (H/V)	Field Strength(PK) (dBuV/m)	Field Strength(AV) (dBuV/m)	Limit(PK) (dBuV/m)	Limit(AV) (dBuV/m)	Margin(PK) (dB)	Margin(AV) (dB)
434.065	-9.26	H	79.31	70.05	100.83	80.83	-21.52	-10.78
868.13	-9.26	H	54.42	45.16	80.83	60.83	-26.41	-15.67
1302.195	-9.26	H	41.52	32.26	80.83	60.83	-39.31	-28.57
1736.26	-9.26	H	42.42	33.16	80.83	60.83	-38.41	-27.67
2170.325	-9.26	H	57.09	47.83	80.83	60.83	-23.74	-13
2604.39	-9.26	H	46.61	37.35	80.83	60.83	-34.22	-23.48
651.94	-9.26	H	39.31	30.05	74	54	-34.69	-23.95
325.6	-9.26	H	38.12	28.86	74	54	-35.88	-25.14
1057.116	-9.26	H	39.86	30.60	74	54	-34.14	-23.4
434.065	-9.26	V	82.19	72.93	100.83	80.83	-18.64	-7.9
868.13	-9.26	V	53.7	44.44	80.83	60.83	-27.13	-16.39
1302.195	-9.26	V	46.63	37.37	80.83	60.83	-34.2	-23.46
1736.26	-9.26	V	42.31	33.05	80.83	60.83	-38.52	-27.78
2170.325	-9.26	V	44.86	35.60	80.83	60.83	-35.97	-25.23
2604.39	-9.26	V	41.45	32.19	80.83	60.83	-39.38	-28.64
325.6	-9.26	V	34.12	24.86	74	54	-39.88	-29.14
1053.335	-9.26	V	39.79	30.53	74	54	-34.21	-23.47
1160.343	-9.26	V	39.87	30.61	74	54	-34.13	-23.39

Notes:

1. Duty cycle is 34.45%, 20log (duty cycle) = -9.26dB correction was used to determine the average level from the peak
2. reading. Average = peak reading + 20log (duty cycle), Final Average= peak reading -9.26
3. All the data measurement of peak values.

FCC Limit for Average Measurement=  $3,750 + (12,500 - 3,750) / (470 - 260) * (433.92 - 260) \mu \text{V/m}$   
 $= 80.83 \text{dB}\mu \text{V/m}$

4. Average pulsed signal over one complete pulse train or 100 ms time frame if pulse train exceeds 100 ms
5. Maximum average in 100 ms
6. Calculate duty cycle for pulse train or 100 ms
7. Duty cycle =  $(t_1 + t_2 + t_3 + \dots + t_n) / T$  where  $t_n$  = pulse width,  $T$  = pulse train length or 100 ms
8. Pulse width (PW) = 69.68ms

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2/PW = 2/69.68ms =0.03 kHz

RBW > 2/PW (69.68kHz)

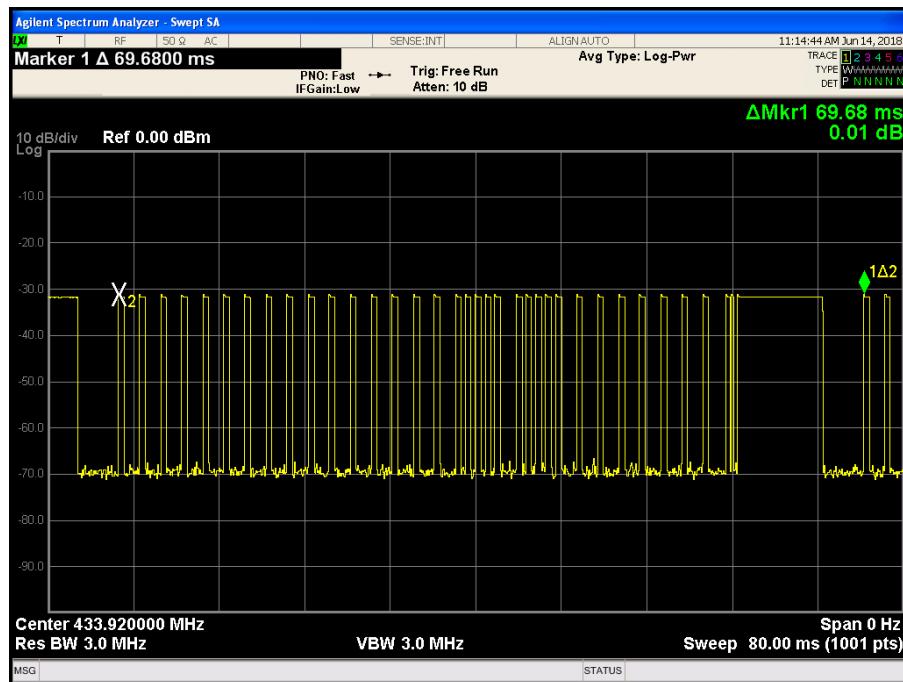
Therefore PDCF is not needed.

Pulse Duty Cycle:

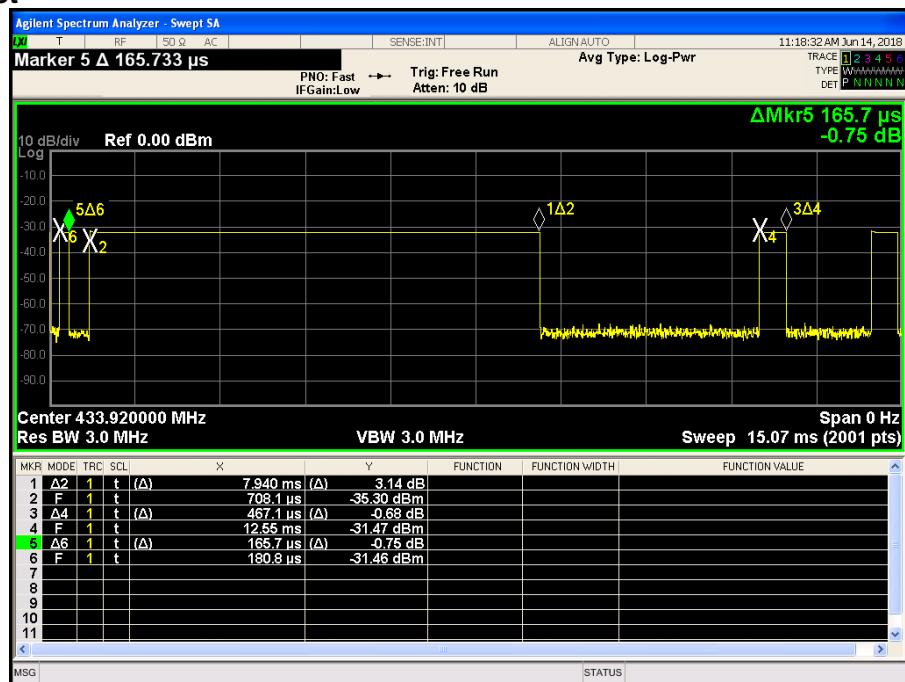
Duty cycle=  $(34*0.4671+7.94+0.1667)/69.68=24.0022/69.68=34.45\%$

Average Duty Factor:  $20*\log(\text{Duty Cycle}) = -9.26\text{dB}$

Duty Cycle  
T Period



## T on time slot



## 6.5 Deactivation

Temperature	24°C
Relative Humidity	54%
Atmospheric Pressure	1017mbar
Test date :	June 14, 2018
Tested By :	Aaron Liang

Standard requirement: 47 CFR §15.231 (a)

**Test Procedure:**

The following table is the setting of spectrum analyser:

Spectrum Analyser	Setting
Attenuation	Auto
Span Frequency	0Hz
RB	3MHz
VB	3MHz
Detector	Peak
Trace	Max Hold
Sweep Time	5s

**TEST SETUP:**

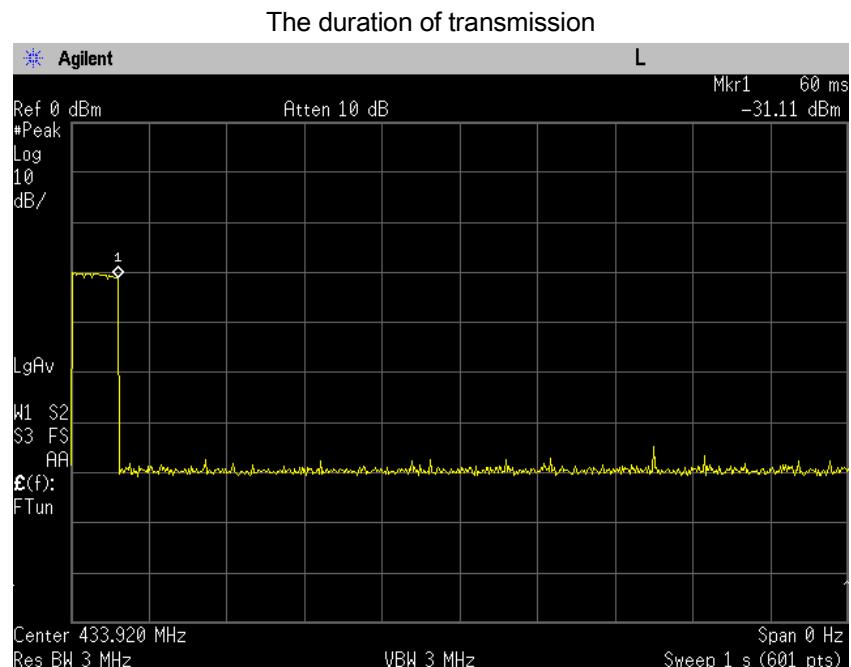


Mark: A transmitter activated automatically shall cease transmission within 5 seconds after activation

**Test Result: Pass**

**Test Result:**

Frequency (MHz)	The duration of transmission(s)	Limit ( s )	Verdict (Pass)
433.92	0.06	<=5	Pass



## Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Due	In use
<b>AC Line Conducted</b>					
EMI test receiver	ESCS30	8471241027	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191106	09/23/2017	09/22/2018	<input checked="" type="checkbox"/>
Line Impedance	LI-125A	191107	09/23/2017	09/22/2018	<input checked="" type="checkbox"/>
ISN	ISN T800	34373	09/23/2017	09/22/2018	<input type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/22/2017	09/21/2018	<input checked="" type="checkbox"/>
Transient Limiter	LIT-153	531118	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>
<b>RF conducted test</b>					
Agilent ESA-E SERIES	E4407B	MY45108319	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
Power Splitter	1#	1#	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>
DC Power Supply	E3640A	MY40004013	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
<b>Radiated Emissions</b>					
EMI test receiver	ESL6	100262	09/15/2017	09/14/2018	<input checked="" type="checkbox"/>
Positioning Controller	UC3000	MF780208282	11/17/2017	11/16/2018	<input checked="" type="checkbox"/>
OPT 010 AMPLIFIER (0.1-1300MHz)	8447E	2727A02430	08/30/2017	08/29/2018	<input checked="" type="checkbox"/>
Microwave Preamplifier (1 ~ 26.5GHz)	8449B	3008A02402	03/22/2018	03/21/2019	<input checked="" type="checkbox"/>
Bilog Antenna (30MHz~6GHz)	JB6	A110712	09/19/2017	09/18/2018	<input checked="" type="checkbox"/>
Double Ridge Horn Antenna (1 ~18GHz)	AH-118	71283	09/22/2017	09/21/2018	<input checked="" type="checkbox"/>
Universal Radio Communication Tester	CMU200	121393	09/23/2017	09/22/2018	<input checked="" type="checkbox"/>

## Annex B. EUT And Test Setup Photographs

### Annex B.i. Photograph: EUT External Photo

Whole Package View



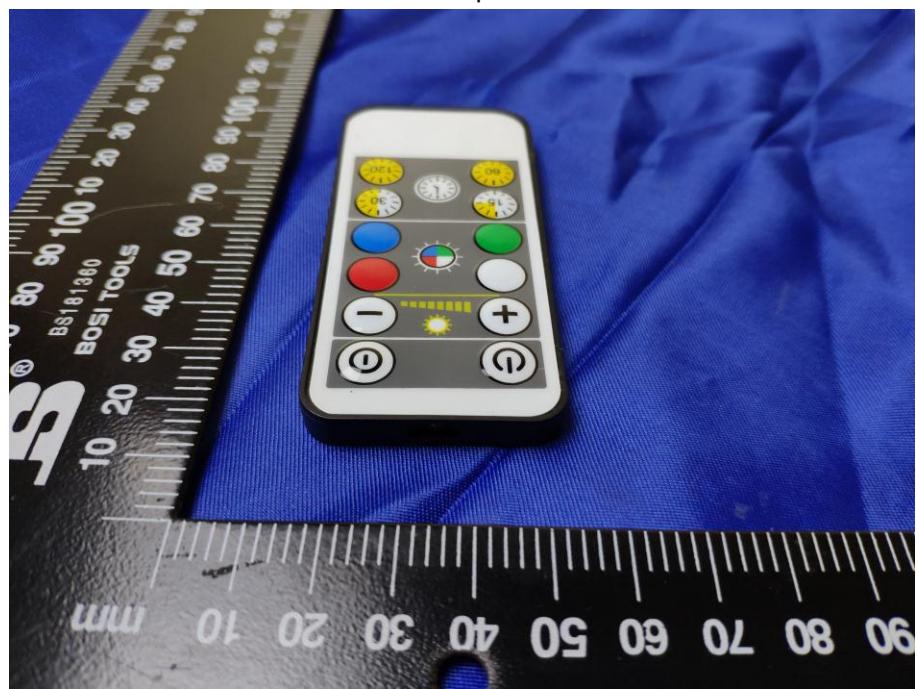
EUT - Front View



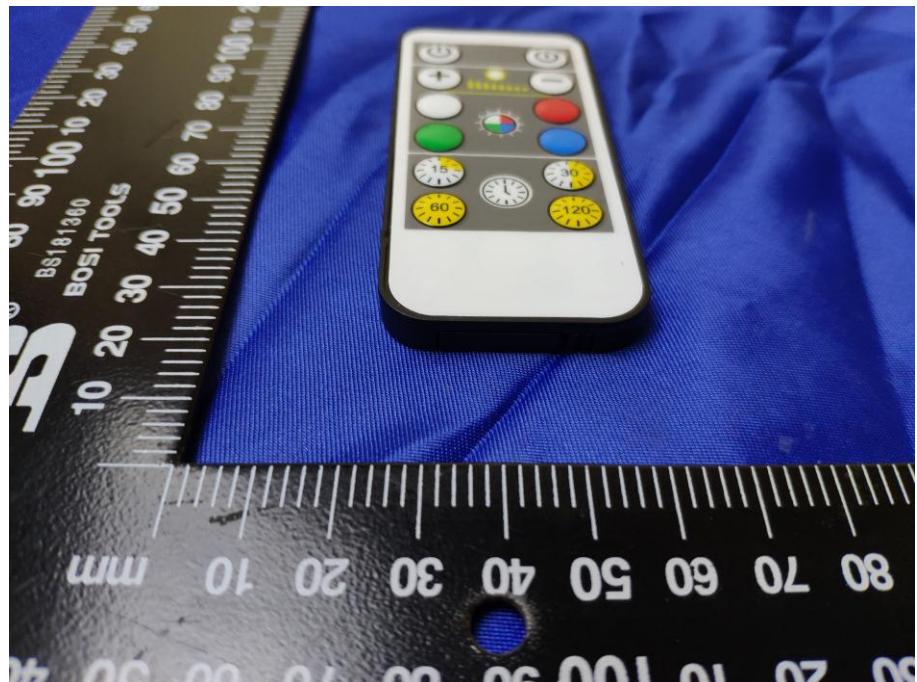
EUT - Rear View



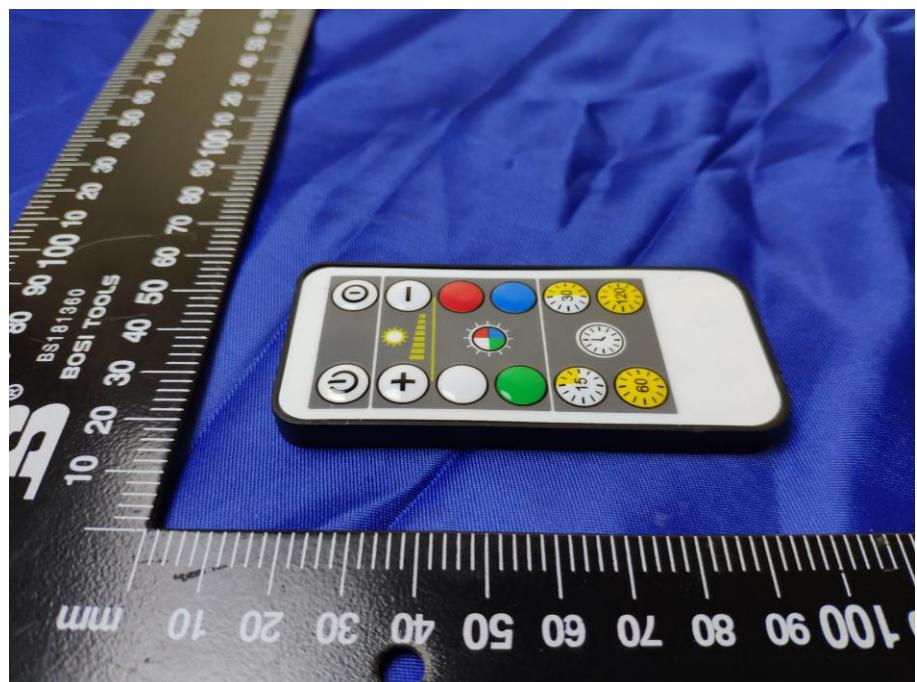
EUT - Top View



EUT - Bottom View



EUT - Left View



EUT - Right View

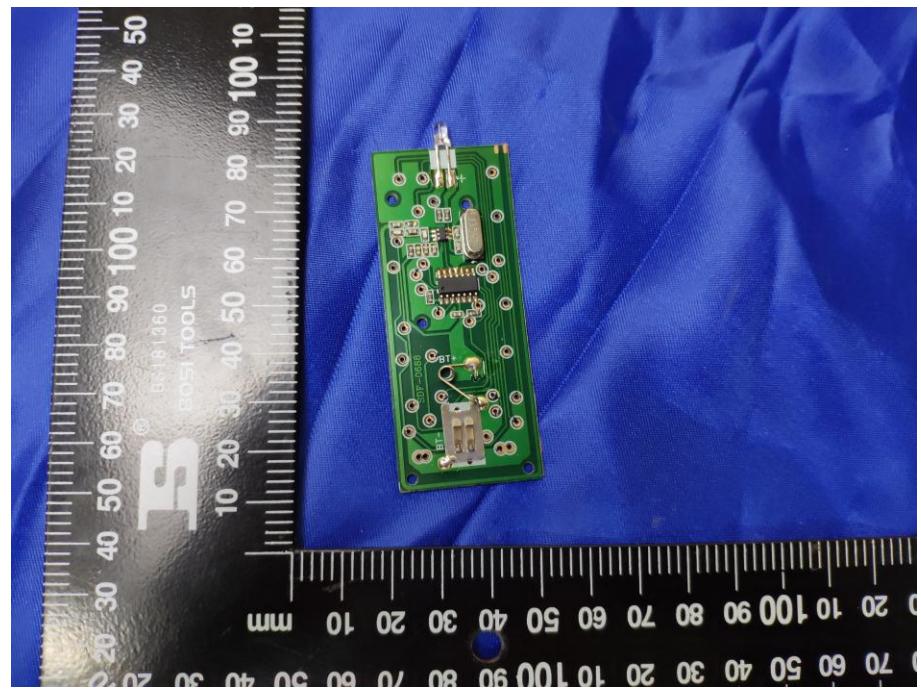


**Annex B.ii. Photograph: EUT Internal Photo**

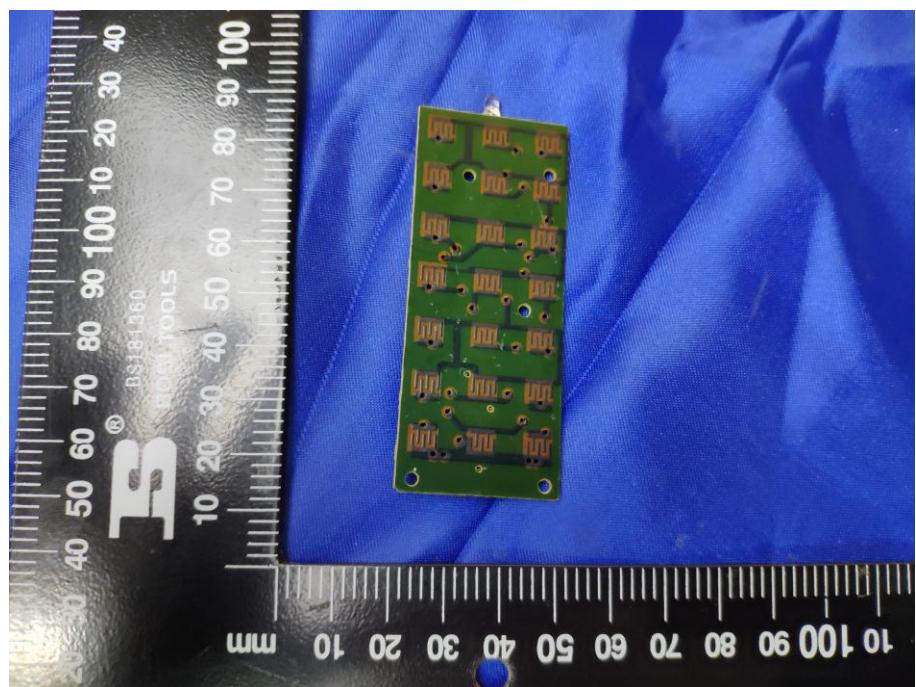
Cover of view



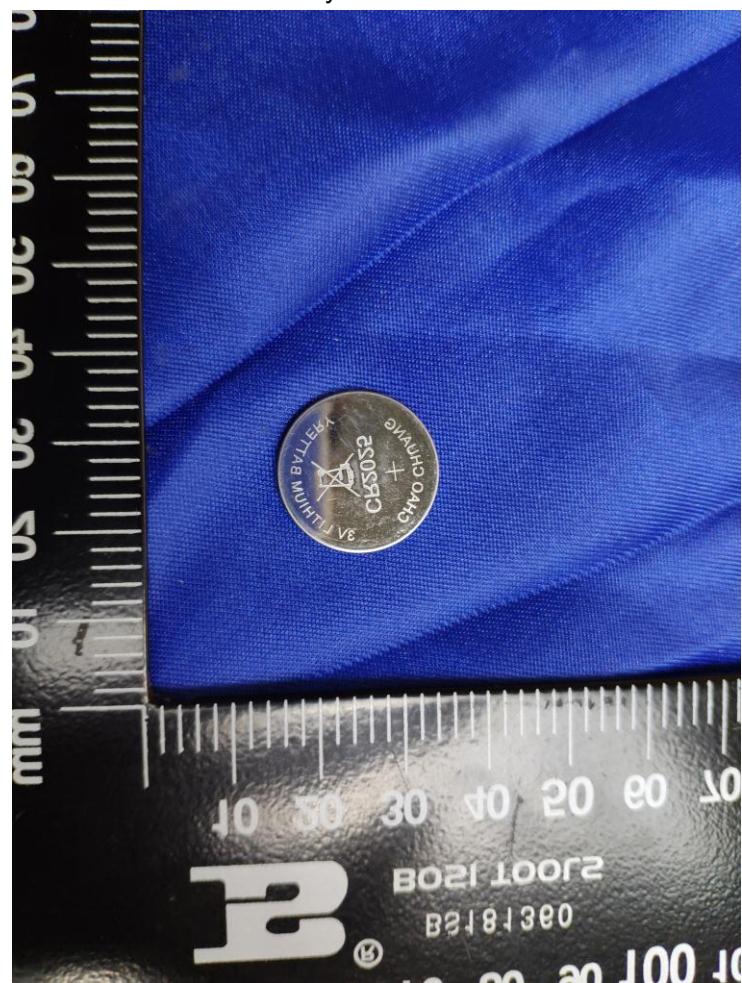
Mainboard - Front View



Mainboard – Rear View



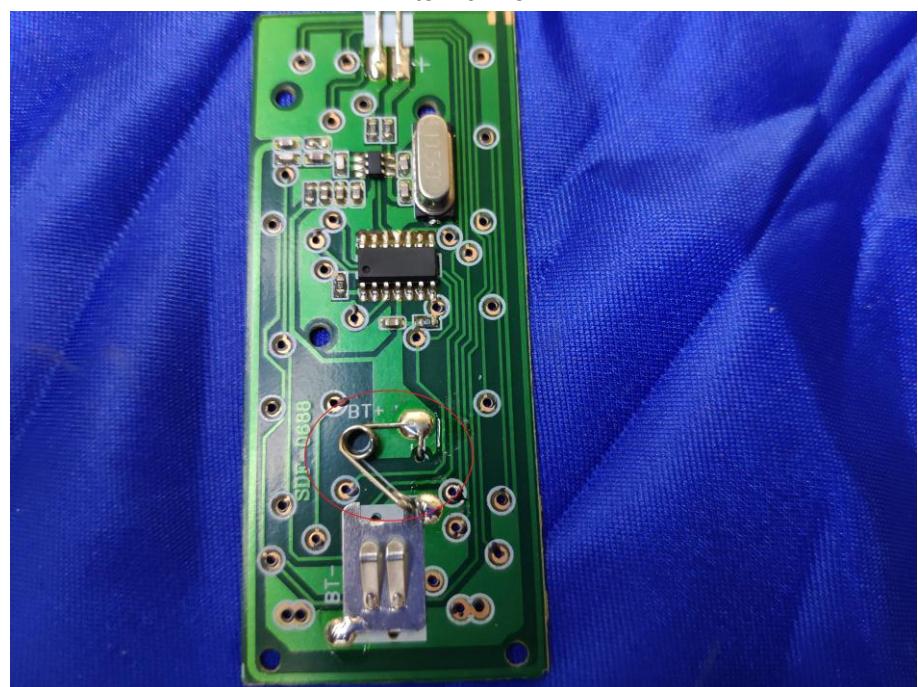
Battery – Front View



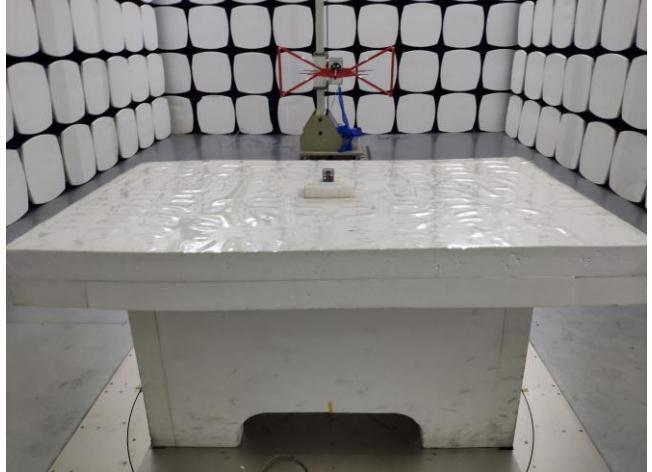
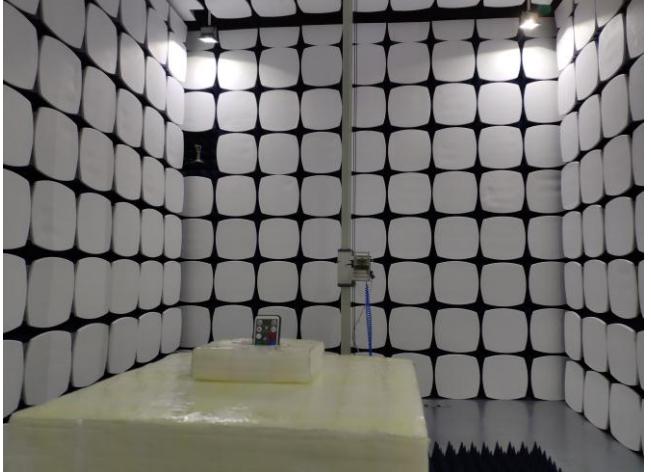
Battery – Rear View



Antenna View



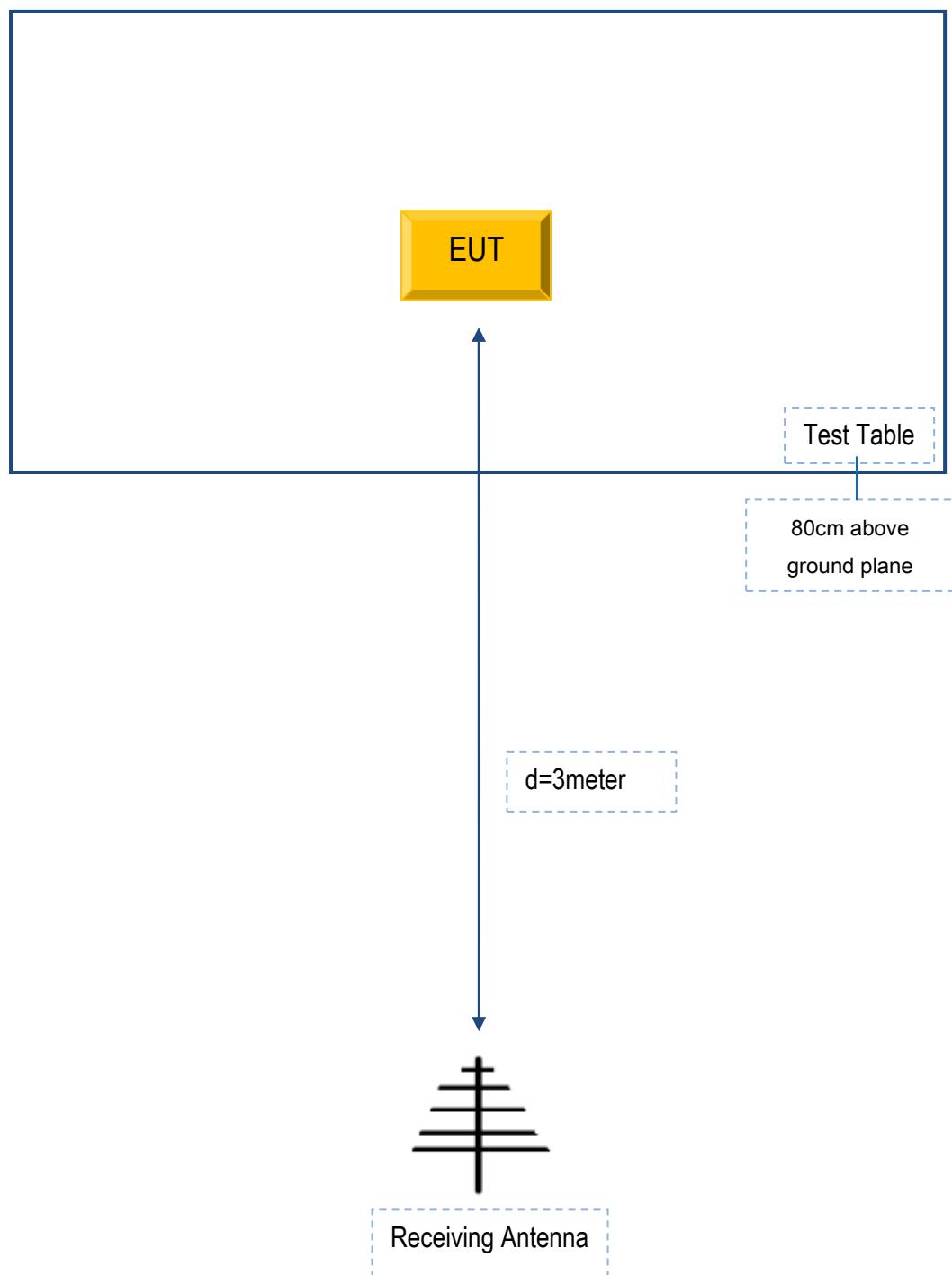
**Annex B.iii. Photograph: Test Setup Photo**

 A photograph showing a test setup in a large anechoic chamber. A white rectangular test object is placed on a white reflective surface. A red and black measurement horn antenna is positioned above the object. The chamber walls are covered with a black and white grid of rectangular panels.	 A photograph showing a test setup in a large anechoic chamber. A white rectangular test object is placed on a white reflective surface. A black measurement horn antenna is positioned above the object. The chamber walls are covered with a black and white grid of rectangular panels.
Radiated Spurious Emissions Test Setup Below 1GHz	Radiated Spurious Emissions Test Setup Above 1GHz

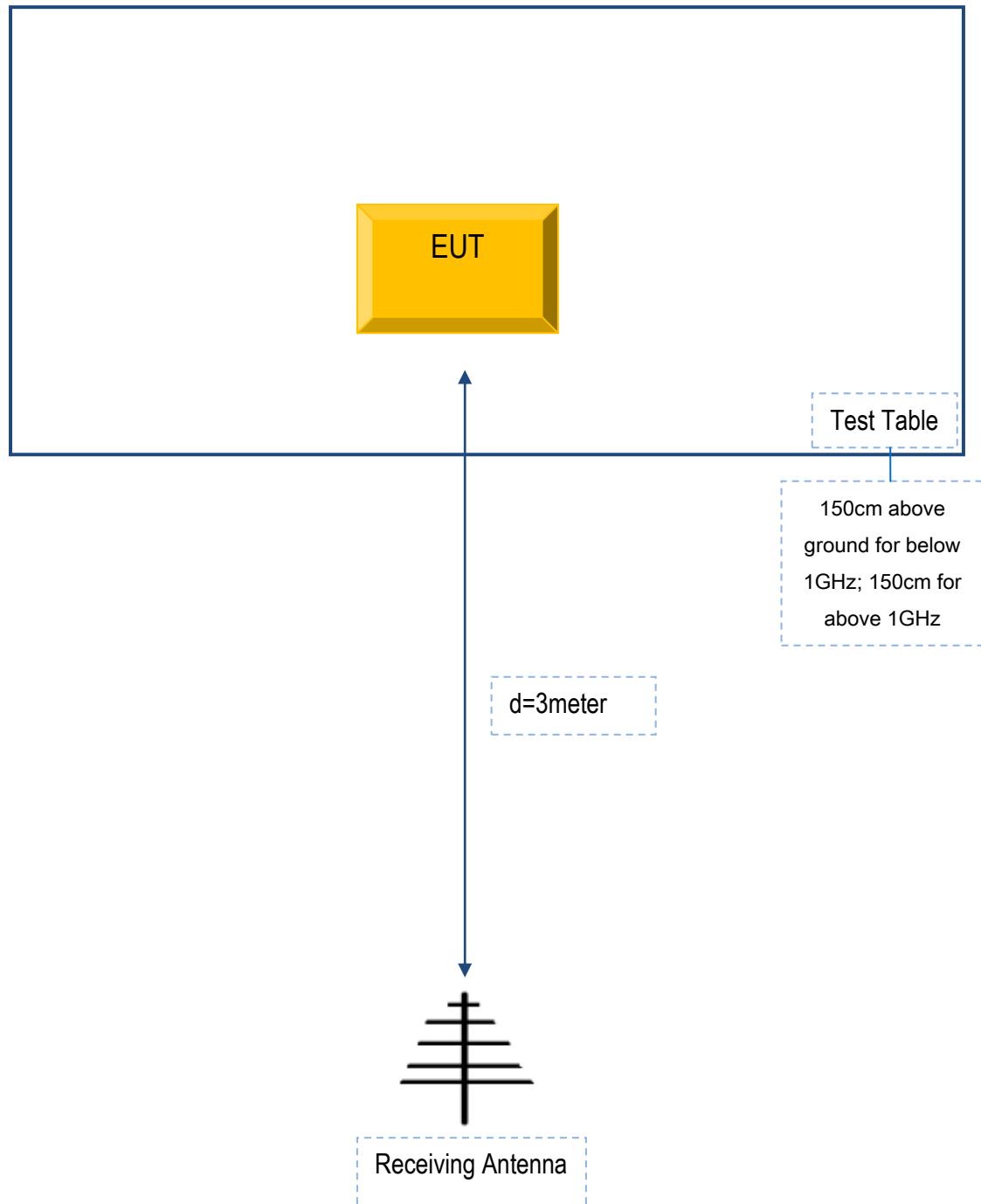
## Annex C. TEST SETUP AND SUPPORTING EQUIPMENT

### Annex C.ii. TEST SET UP BLOCK

Block Configuration Diagram for Radiated Emissions ( Below 1GHz ) .



### Block Configuration Diagram for Radiated Emissions ( Above 1GHz )



## Annex C. ii. SUPPORTING EQUIPMENT DESCRIPTION

The following is a description of supporting equipment and details of cables used with the EUT.

### Supporting Equipment:

Manufacturer	Equipment Description	Model	Serial No
N/A	N/A	N/A	N/A

### Supporting Cable:

Cable type	Shield Type	Ferrite Core	Length	Serial No
N/A	N/A	N/A	N/A	N/A

## Annex D. User Manual / Block Diagram / Schematics / Partlist

Please see attachment

## Annex E. DECLARATION OF SIMILARITY

N/A