

FCC TEST REPORT

for

Jie Du Electronics Technology Co., LTD

RF-Remote Controller

Model Number: FDI-R668, FDI-R730, FDI-R731

FCC ID: 2AMNJ-39154-T

Prepared for : Jie Du Electronics Technology Co., LTD
Address : Shui Wei Industrial Area, Tangjiao Village, ChaShan Town,
Dongguan, Guangdong

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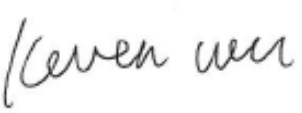
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Report No. : TR17050040-E-001
Date of Test : Jul. 5~10, 2017
Date of Report : Jul. 10, 2017

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Keyway Testing Technology Co., Ltd.

Applicant:	Jie Du Electronics Technology Co., LTD		
Address:	Shui Wei Industrial Area, Tangjiao Village, ChaShan Town, Dongguan, Guangdong		
Manufacturer:	Jie Du Electronics Technology Co., LTD		
Address:	Shui Wei Industrial Area, Tangjiao Village, ChaShan Town, Dongguan, Guangdong		
E.U.T:	RF-Remote Controller		
Model Number:	FDI-R668, FDI-R730, FDI-R731		
Trade Name:	SMK/Fando	Serial No.:	-----
Date of Receipt:	Jul. 4, 2017	Date of Test:	Jul. 5~10, 2017
Test Specification:	FCC Part 15, Subpart C Section 15.231: 2016 ANSI C63.10-2013		
Test Result:	The equipment under test was found to be compliance with the requirements of the standards applied.		
	Issue Date: Jul. 10, 2017		
Tested by:	Reviewed by:	Approved by:	
 	 	 	
Keven Wu / Engineer	Mark Li / Supervisor	Andy Gao / Supervisor	
Other Aspects:	None.		
Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested			
This test report is based on a single evaluation of one sample of above mentioned products. It is not permitted to be duplicated in extracts without written approval of Keyway Testing Technology Co., Ltd.			

1. TEST SUMMARY

FCC Part15, Subpart C (15.231)		
Test Items	Test Requirement	Result
Conducted Emissions	15.207	N/A
Radiated Emissions	15.231(b)	PASS
Occupied Bandwidth	15.231(c)	PASS
Transmitter Time out	15.231(a)(1)	PASS
Antenna Requirement	15.203	PASS

2. GENERAL PRODUCT INFORMATION

2.1. Product Function

Refer to Technical Construction Form and User Manual.

2.2. Description of Device (EUT)

Description	: RF-Remote Controller
M/N	: FDI-R668, FDI-R730, FDI-R731
Model Difference	: Only the appearance is different, others are the same.
Power Supply	: DC12V from battery
Operation Frequency	: 433.92MHz
Modulation Technology	: OOK
Antenna Type	: Integral Antenna
Antenna Gain	: 0dBi

2.3. Independent Operation Modes

The basic operation modes are:

2.3.1. Transmitting mode(TX Mode)

2.4. Product Version

SW Version:	A401B
HW Version:	35-66800-000-000

3. TEST SITES

3.1. Test Facilities

Lab Qualifications : 944 Shielded Room built by ETS-Lindgren, USA
Date of completion: March 28, 2011

966 Chamber built by ETS-Lindgren, USA
Date of completion: March 28, 2011

Certificated by TUV Rheinland, Germany.
Registration No.: UA 50207153
Date of registration: July 13, 2011

Certificated by UL, USA
Registration No.: 100567-237
Date of registration: September 1, 2011

Certificated by Intertek
Registration No.: 2011-RTL-L1-31
Date of registration: October 11, 2011

Certificated by FCC, USA
Registration No.: 370994
Date of registration: February 21, 2012

Certificated by Industry Canada
Registration No.: 9868A
Date of registration: December 8, 2011

3.2. List of Test and Measurement Instruments

3.2.1. For radiated emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 08,17	Apr. 08,18
System Simulator	Agilent	E5515C	GB43130245	Apr. 08,17	Apr. 08,18
Power Splitter	Weinschel	1506A	NW425	Apr. 08,17	Apr. 08,18
Bilog Antenna	ETS-LINDGREEN	3142D	135452	Apr. 08,17	Apr. 08,18
Loop antenna	teseq	HLA6120	22032	Apr. 08,17	Apr. 08,18
Spectrum Analyzer	Keysight	N9020A	MY56070279	Apr. 08,17	Apr. 08,18
3m Semi-anechoic Chamber	ETS-LINDGREEN	966	KW01	Apr. 08,17	Apr. 08,18
Signal Amplifier	SONOMA	310	187016	Apr. 08,17	Apr. 08,18
Signal Amplifier	Agilent	8449B	3008A00251	Apr. 08,17	Apr. 08,18
RF Cable	IMRO	IMRO-400	966 Cable 1#	Apr. 08,17	Apr. 08,18
RF Cable	IMRO	IMRO-400	966 Cable 2#	Apr. 08,17	Apr. 08,18
RF Cable	IMRO	IMRO-400	966 Cable 3#	Apr. 08,17	Apr. 08,18
MULTI-DEVICE Controller	ETS-LINDGREEN	2090	126913	N/A	N/A
Horn Antenna	DAZE	ZN30701	11003	Apr. 08,17	Apr. 08,18
Horn Antenna	SCHWARZBECK	BBHA9170	9170-068	Apr. 08,17	Apr. 08,18
Spectrum Analyzer	Agilent	8593E	3911A04271	Apr. 08,17	Apr. 08,18
Spectrum Analyzer	Agilent	E4408B	MY44211125	Apr. 08,17	Apr. 08,18
Signal Amplifier	DAZE	ZN3380C	11001	Apr. 08,17	Apr. 08,18
High Pass filter	Micro	HPM50111	324216	Apr. 08,17	Apr. 08,18
Filter	COM-MW	ZBSF-C836.5-25-X	KW032	Apr. 08,17	Apr. 08,18
Filter	COM-MW	ZBSF-C1747.5-75-X2	KW035	Apr. 08,17	Apr. 08,18
Filter	COM-MW	ZBSF-C1880-60-X2	KW037	Apr. 08,17	Apr. 08,18
DC Power Supply	LongWei	PS-305D	010964729	Apr. 08,17	Apr. 08,18
Constant temperature and humidity box	GF	GTH-800-40-1P	MAA9906-005	Apr. 08,17	Apr. 08,18
Splitter	Agilent	11636B	0025164	Apr. 08,17	Apr. 08,18

4. TEST SET-UP AND OPERATION MODES

4.1. Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the Operating Instructions.

4.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators



(EUT: RF-Remote Controller)

4.3. Test Operation Mode and Test Software

Refer to Test Setup in clause 4.

4.4. Special Accessories and Auxiliary Equipment

None.

4.5. Countermeasures to Achieve EMC Compliance

None.

4.6. Test Environment:

Ambient conditions in the test laboratory:

Items	Actual
Temperature (°C)	22~26
Humidity (%RH)	45~60

5. EMISSION TEST RESULTS

5.1. Radiated Emission Test

5.1.1. Limit 15.209 limits

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		$\mu\text{V}/\text{m}$	$\text{dB}(\mu\text{V})/\text{m}$
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
960 ~ 1000	3	500	54.0
Above 1000	3	74.0 $\text{dB}(\mu\text{V})/\text{m}$ (Peak) 54.0 $\text{dB}(\mu\text{V})/\text{m}$ (Average)	

5.1.2. Fundamental and harmonics emission limits(15.231(b))

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 1,250 to 3,750	¹ 125 to 375
174-260	3,750	375
260-470	¹ 3,750 to 12,500	¹ 375 to 1,250
Above 470	12,500	1,250

¹Linear interpolations.

Note:

- Limits on the field strength of emissions, as shown in this table, are based on the average value of the measured emissions. As an alternative, compliance with the limits in this table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector.
- Frequency bands 225-328.6 MHz and 335.4-399.9 MHz are designated for the exclusive use of the Government of Canada. Manufacturers should be aware of possible harmful interference and degradation of their licence-exempt radio equipment in these frequency bands.
- Linear interpolation with frequency F in MHz:
 For 130–174 MHz: $\text{FS (microvolts/m)} = (56.82 \times F) - 6136$
 For 260–470 MHz: $\text{FS (microvolts/m)} = (41.67 \times F) - 7083$

5.1.3. Test setup

The EUT was placed on a turn table which was 0.8 m (above 1GHz, the high was 1.5m) above the ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was set 3 m away from the receiving antenna which was mounted on an antenna tower. The measuring antenna moved up and down to find out the maximum emission level. It moved from 1 m to 4 m for both horizontal and vertical polarizations.

The EUT was tested in the Chamber Site. It was pre-scanned with a Peak detector from the spectrum, and all the final readings from the test receiver were measured with the Quasi-Peak detector.

The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz. The frequency range from 30MHz to 10th harmonic (25GHz) are checked

The bandwidth of the Spectrum's VBW is set at 3MHz and RBW is set at 1MHz for peak emissions measurement above 1GHz and 1MHz RBW, 10Hz VBW for average emissions measure above 1GHz.

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Y axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

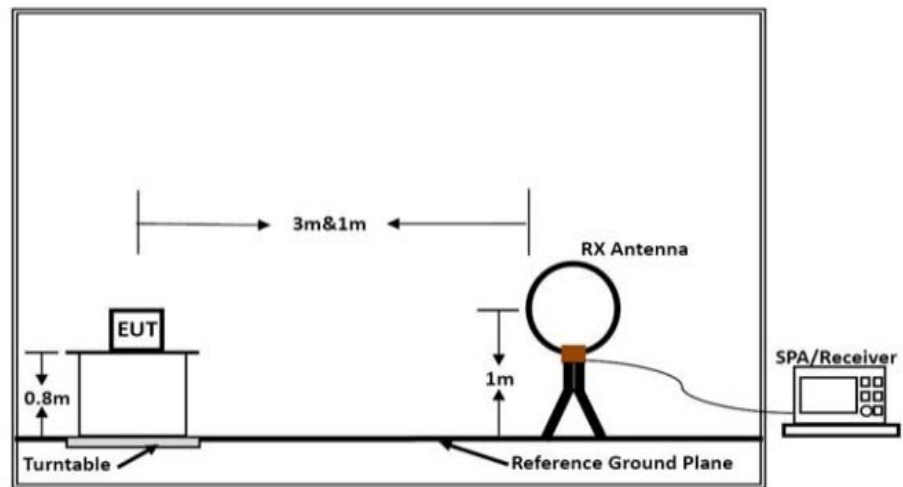
The test data of the worst case condition(s) was reported on the following pages.

Notes:

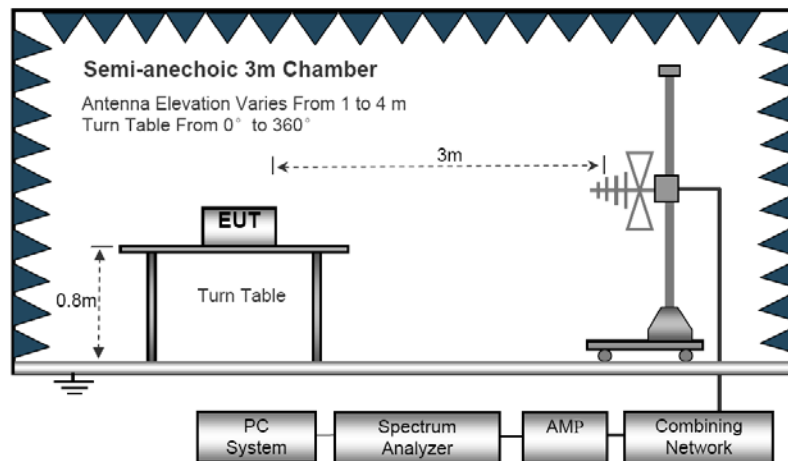
1. Emission Level = Antenna Factor + Cable Loss + Meter Reading-Preamp Factor.
2. Measurement Uncertainty: ± 3.2 dB at a level of confidence of 95%.
3. For emissions above 1GHz, if peak level comply with average limit, then the average level is deemed to comply with average limit.
4. The emission of below 30MHz is background, the data of it is not reflected.
5. We pretest all fourteen keys, The test data of the worst case condition(s) was reported on the following pages.

Radiated Emission Test-Up

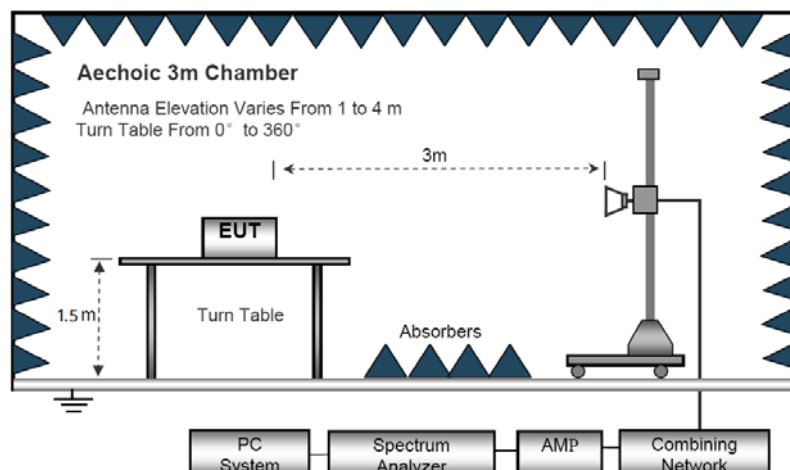
Below 30MHz



30MHz-1GHz



Above 1GHz



Test Data Below 30MHz

Freq.	Reading	Limit	Margin	State
(MHz)	(dBuV/m)	(dBuV/m)	(dB)	P/F
--	--	--	--	P(See Note)
--	--	--	--	P(See Note)

Note:

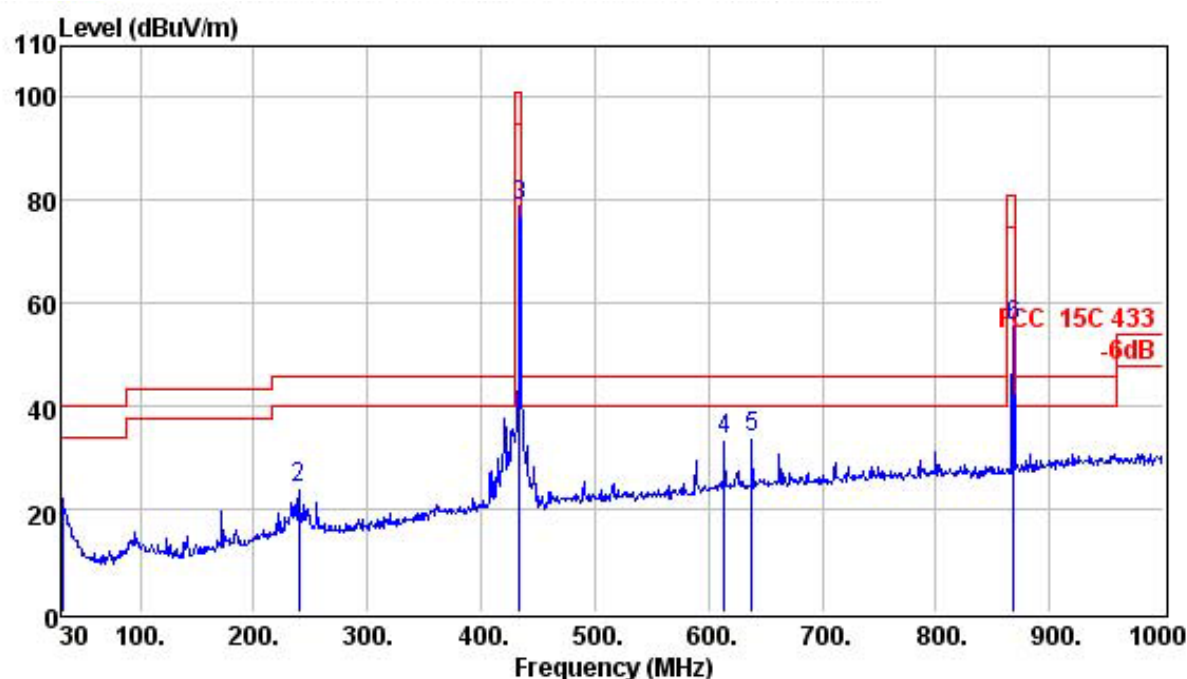
The amplitude of spurious emissions which are attenuated by more than 20dB below the permissible value has no need to be reported.

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

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

Test Data Below 1GHz

Horizontal



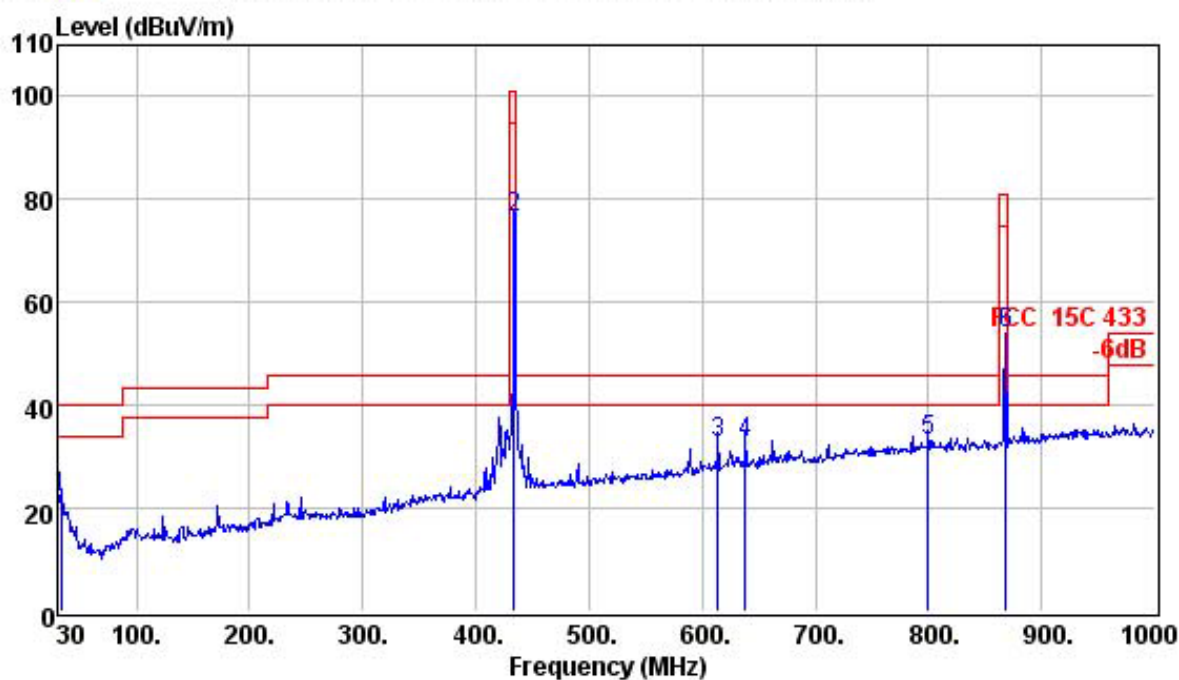
	Freq	Read	Antenna	Cable	Limit	Over	
	MHz	Level	Factor	Loss	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB
1	30.970	1.80	18.23	1.21	21.24	40.00	-18.76 QP
2	239.520	8.61	12.61	2.76	23.98	46.00	-22.02 QP
3	433.520	57.64	17.27	3.83	78.74	100.80	-22.06 Peak
4	613.940	7.85	20.99	4.83	33.67	46.00	-12.33 QP
5	638.190	7.85	21.35	4.93	34.13	46.00	-11.87 QP
6	868.080	25.79	23.39	6.46	55.64	80.80	-25.16 Peak

For average:

Frequency MHz	Peak Level dBuV/m	Duty Cycle factor	Average Level dBuV/m	Limit	Margin dB
433.52	78.74	-3.62	75.12	80.80	-5.68
868.08	55.64	-3.62	52.02	60.80	-8.78

- Notes: 1. Average emission Level = Peak Level + Duty Cycle Factor
 2. Duty cycle level please see clause 6.
 3. We pretest all fourteen keys, only worst case is presented in the report.

Vertical



	Freq	Read	Antenna	Cable		Limit	Over	
	MHz	Level	Factor	Loss	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	32.910	3.60	17.08	1.23	21.91	40.00	-18.09	QP
2	433.520	55.51	17.27	3.83	76.61	100.80	-24.19	Peak
3	613.940	6.01	20.99	4.83	31.83	46.00	-14.17	QP
4	638.190	6.57	21.35	4.93	32.85	46.00	-13.15	QP
5	800.180	4.03	23.00	6.29	33.32	46.00	-12.68	QP
6	868.080	24.32	23.39	6.46	54.17	80.80	-26.63	Peak

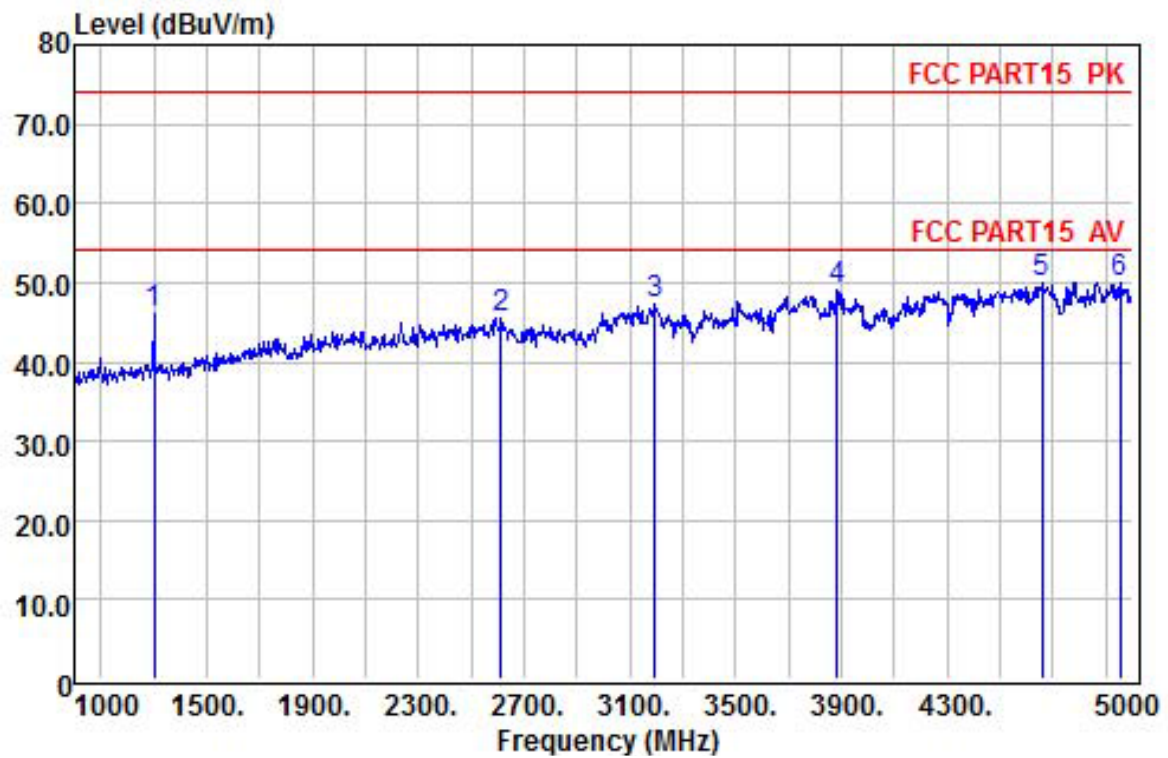
For average:

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit	Margin dB
433.52	76.61	-3.62	72.99	80.80	-7.81
868.08	54.17	-3.62	50.55	60.80	-10.25

- Notes: 1. Average emission Level = Peak Level + Duty cycle factor
 2. Duty cycle level please see clause 6.
 3. We pretest all fourteen keys, only worst case is presented in the report.

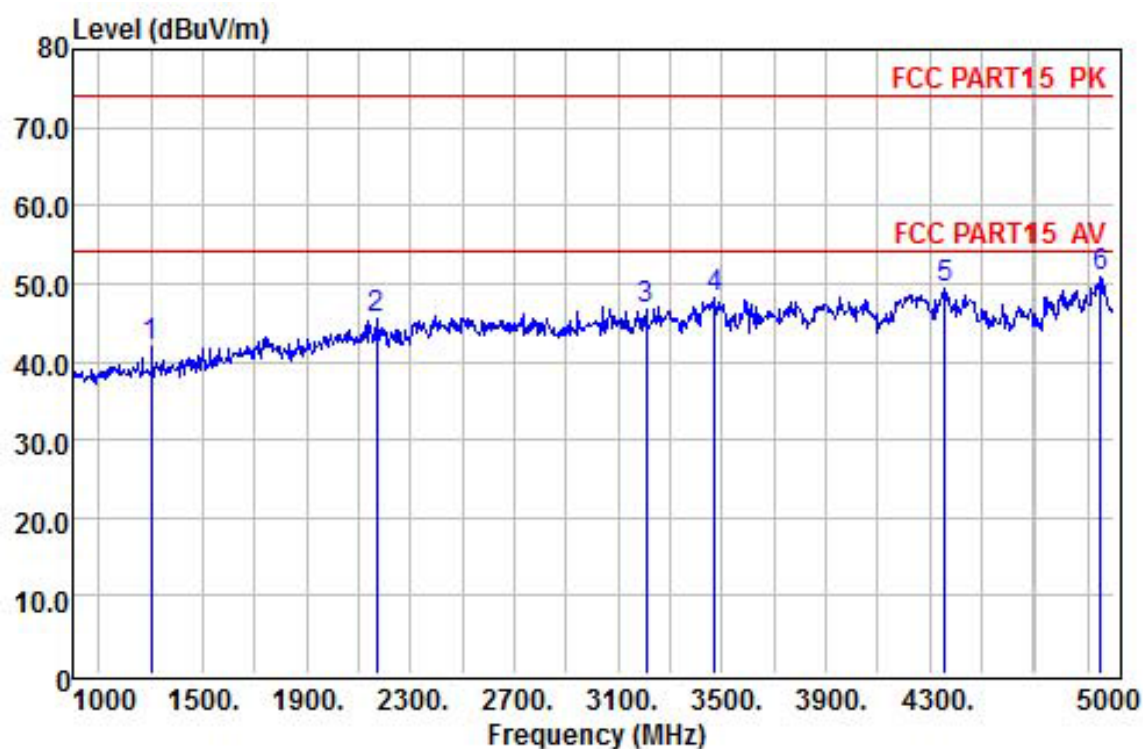
Test Data for 1GHz~5GHz

Horizontal



	Freq	ReadAntenna	Cable	Preamp		Limit	Over	
	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	1300.00	45.28	24.84	2.11	26.06	46.17	74.00	-27.83 Peak
2	2612.00	39.18	29.08	3.65	26.38	45.53	74.00	-28.47 Peak
3	3196.00	39.77	30.19	3.86	26.59	47.23	74.00	-26.77 Peak
4	3884.00	41.37	31.29	3.24	26.95	48.95	74.00	-25.05 Peak
5	4656.00	41.05	32.57	3.83	27.40	50.05	74.00	-23.95 Peak
6	4952.00	41.05	32.28	4.12	27.57	49.88	74.00	-24.12 Peak

Vertical



	Freq	ReadAntenna	Cable	Preamp		Limit	Over	
	Level	Factor	Loss	Factor	Level	Line	Limit	Remark
	MHz	dBuV	dB/m	dB	dB	dBuV/m	dBuV/m	dB
1	1304.00	40.96	24.84	2.12	26.06	41.86	74.00	-32.14 Peak
2	2168.00	40.08	28.54	3.06	26.25	45.43	74.00	-28.57 Peak
3	3208.00	39.11	30.21	3.86	26.60	46.58	74.00	-27.42 Peak
4	3472.00	40.80	30.47	3.61	26.73	48.15	74.00	-25.85 Peak
5	4356.00	40.93	31.99	3.54	27.21	49.25	74.00	-24.75 Peak
6	4948.00	42.06	32.28	4.12	27.57	50.89	74.00	-23.11 Peak

6. CALCULATION OF AVERAGE FACTOR

The output field strengths of specification in accordance with the rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 100 ms or the repetition cycle period, whichever is a shorter time frame. The duty cycle is measured by placing the spectrum analyzer to set zero span at 1000kHz resolution bandwidth.

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

The duration of one cycle = 57.8ms

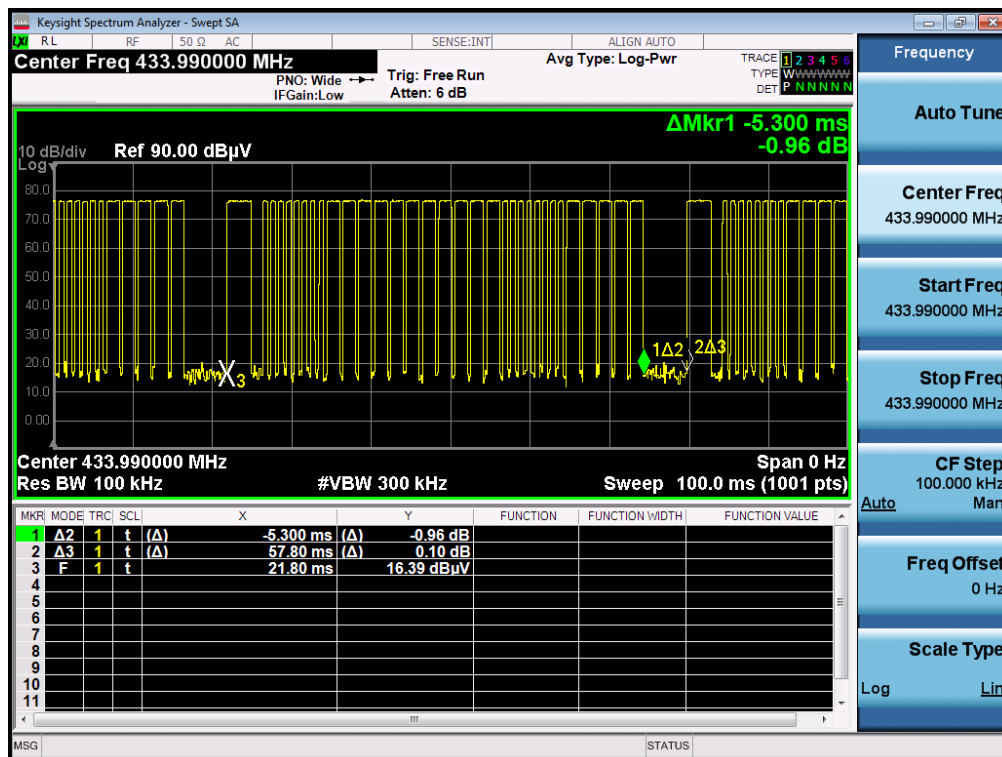
The duty cycle is simply the on-time divided the duration of one cycle

Duty Cycle = $(3.06\text{ms} + 0.57\text{ms} \times 16 + 1.62\text{ms} \times 16) / 57.8\text{ms} = 38.1\text{ms} / 57.8\text{ms} = 0.6592$

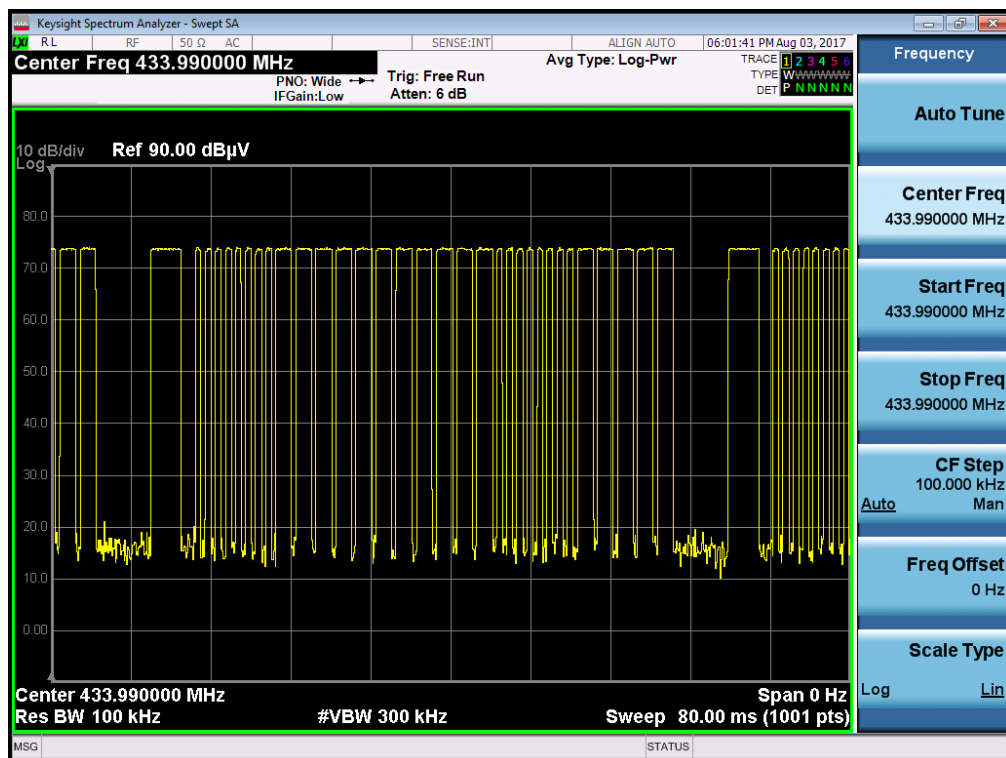
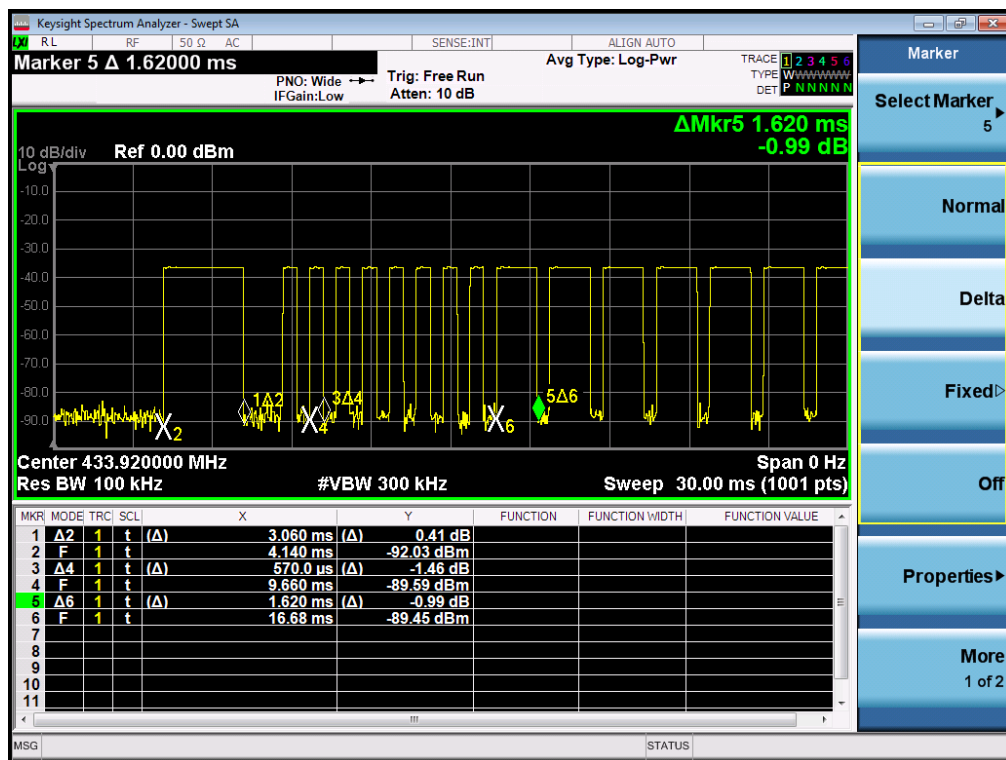
Therefore, the averaging factor is found by $20\log 0.6592 = -3.62\text{dB}$

Test plot as follows:

T period



T on time slot



7. 20DB&99% OCCUPY BANDWIDTH

7.1. Limits

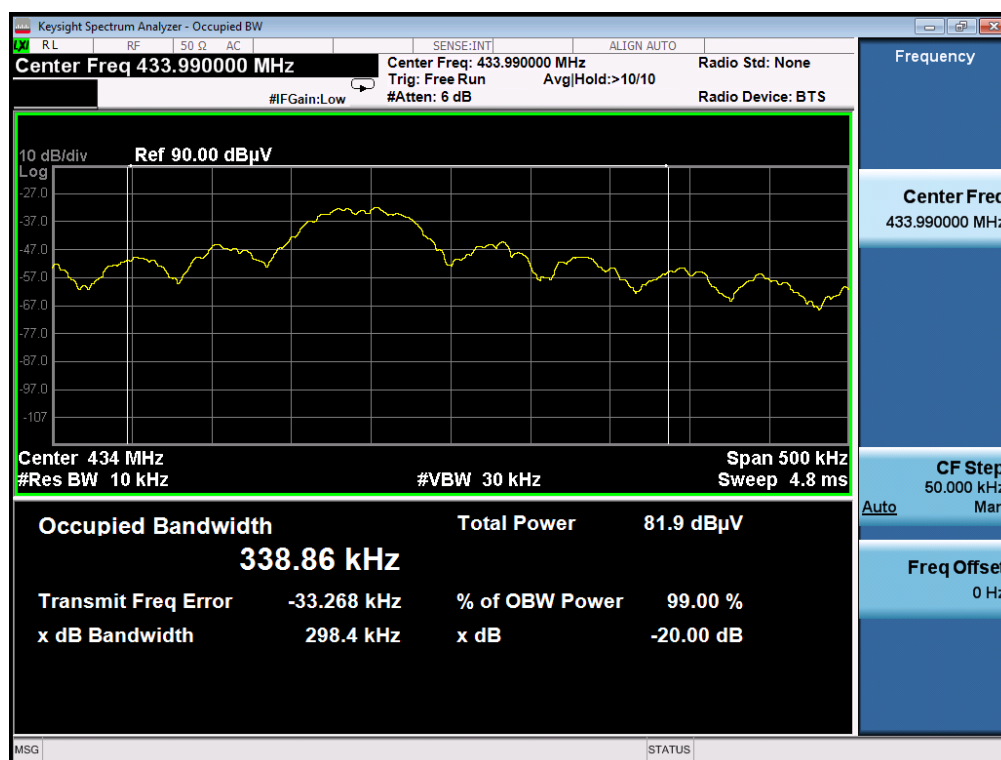
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated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

$$\text{B.W Limit} = 0.25\% * f(\text{MHz}) = 0.25\% * 433.92\text{MHz} = 1.08\text{MHz}$$

Test data:

Channel Frequency (MHz)	-20dB Bandwidth (MHz)	99% Bandwidth (MHz)	Limit (MHz)	Result
433.92	0.298	0.339	1.08	Pass

Test plot as follows:



Note: we pretest all fourteen keys, only worst case is presented in the report.

8. TRANSMITTER TIMEOUT

8.1. Limits

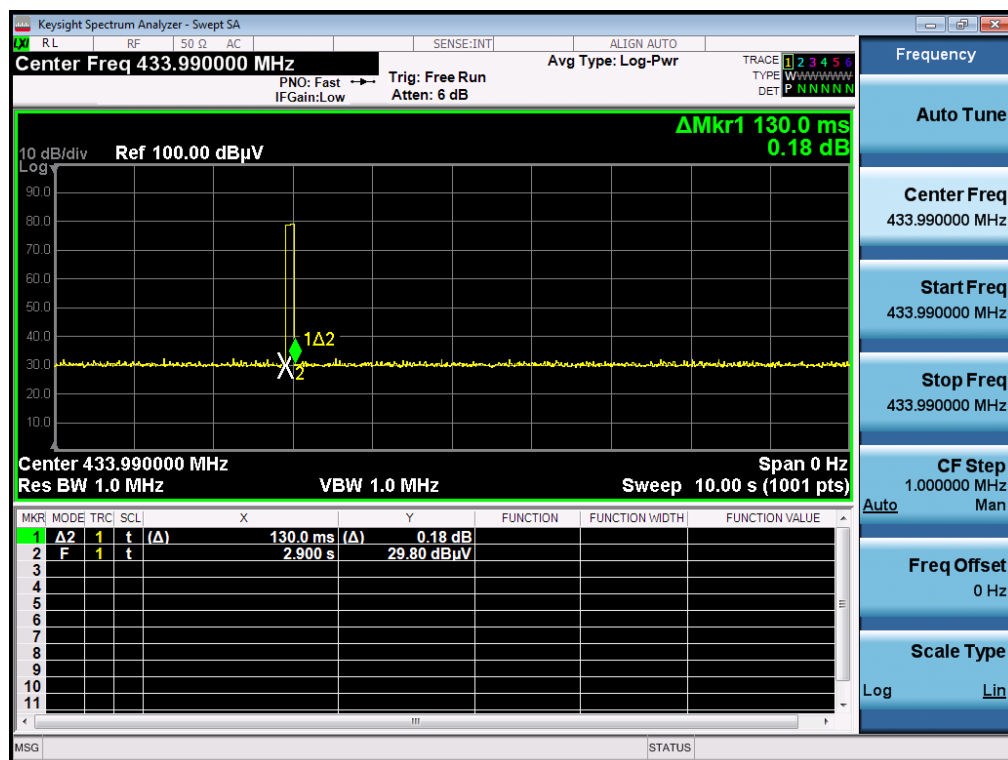
According to 15.231(a)(1) requirement:

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

Test data:

	Dwell time (second)	Limit (second)	Result
Full voltage	0.13s	<5s	Pass

Test plot as follows:

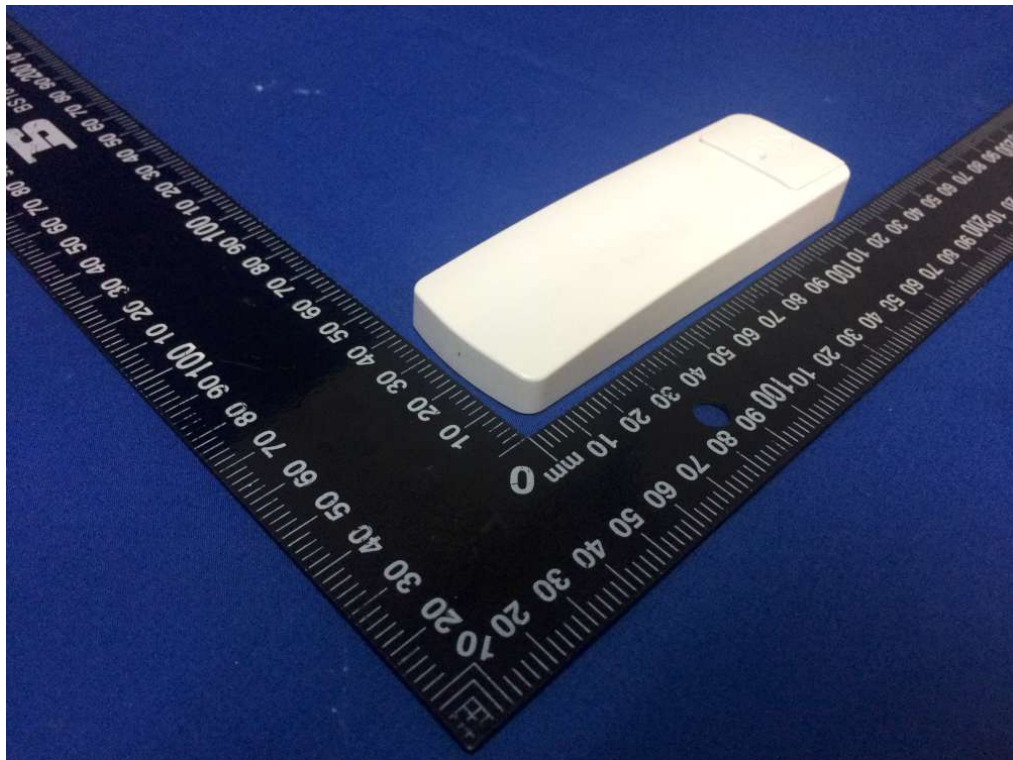
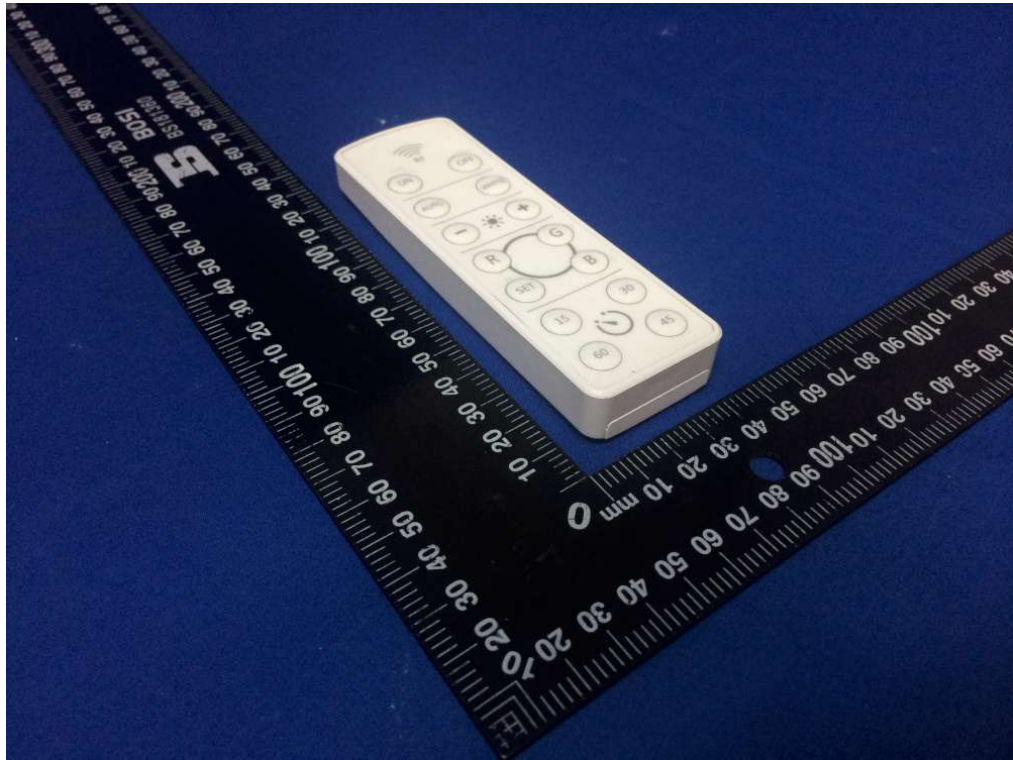


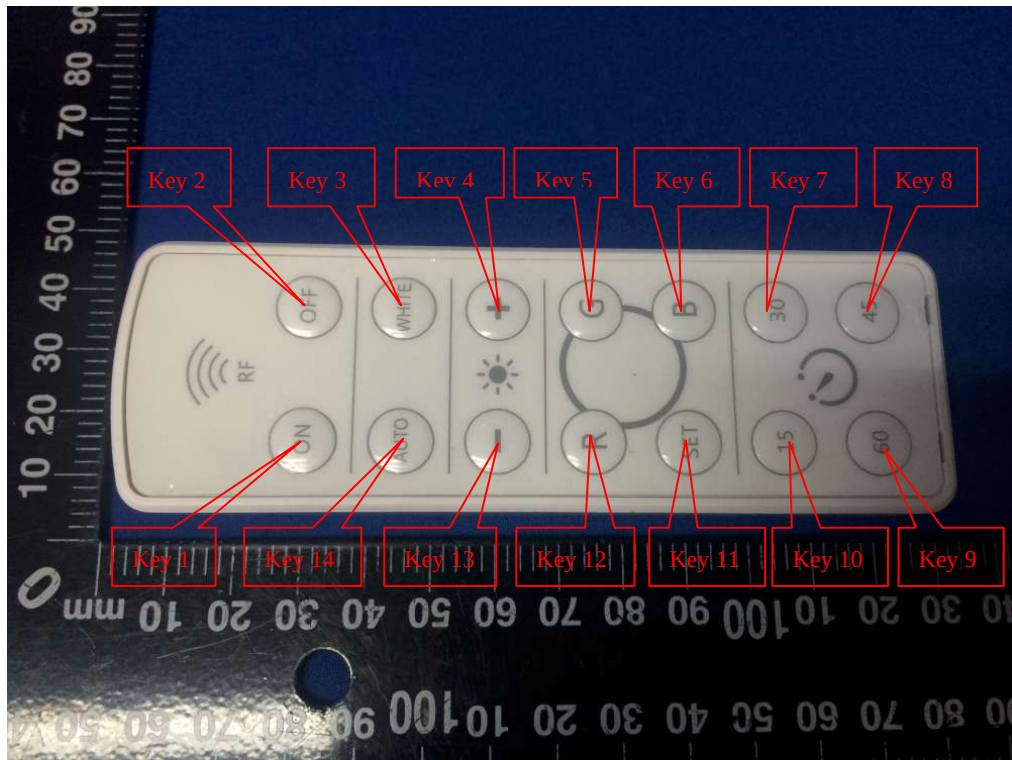
Note: we pretest all fourteen keys, only worst case is presented in the report.

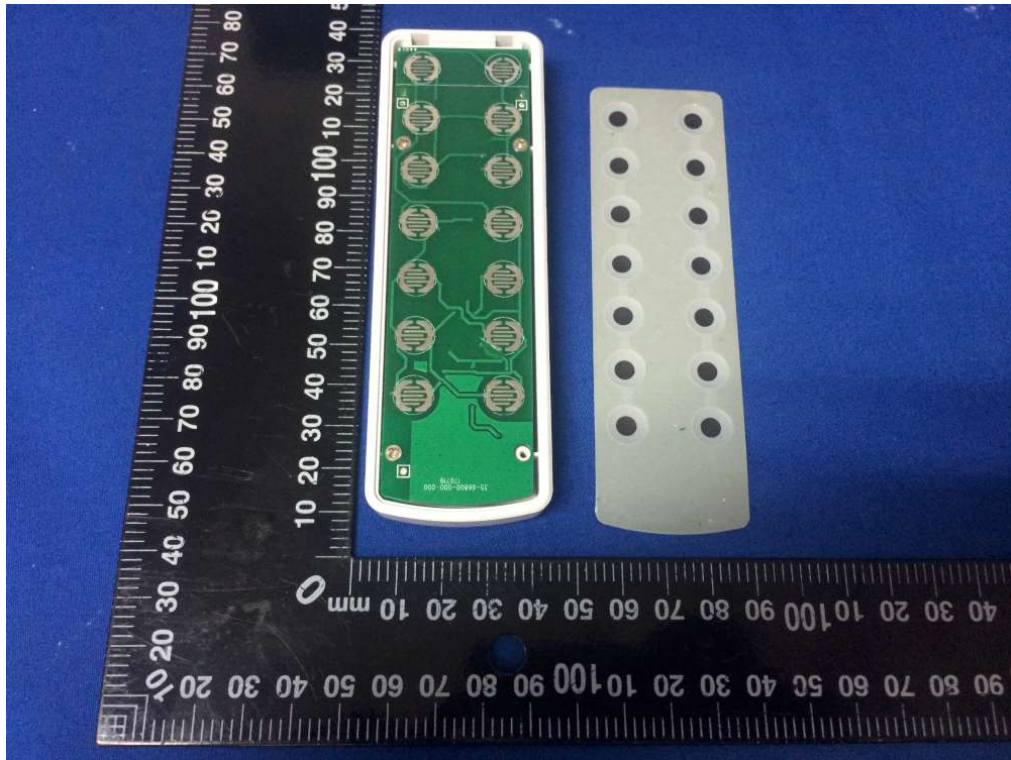
9. PHOTOGRAPHS OF TEST SET-UP



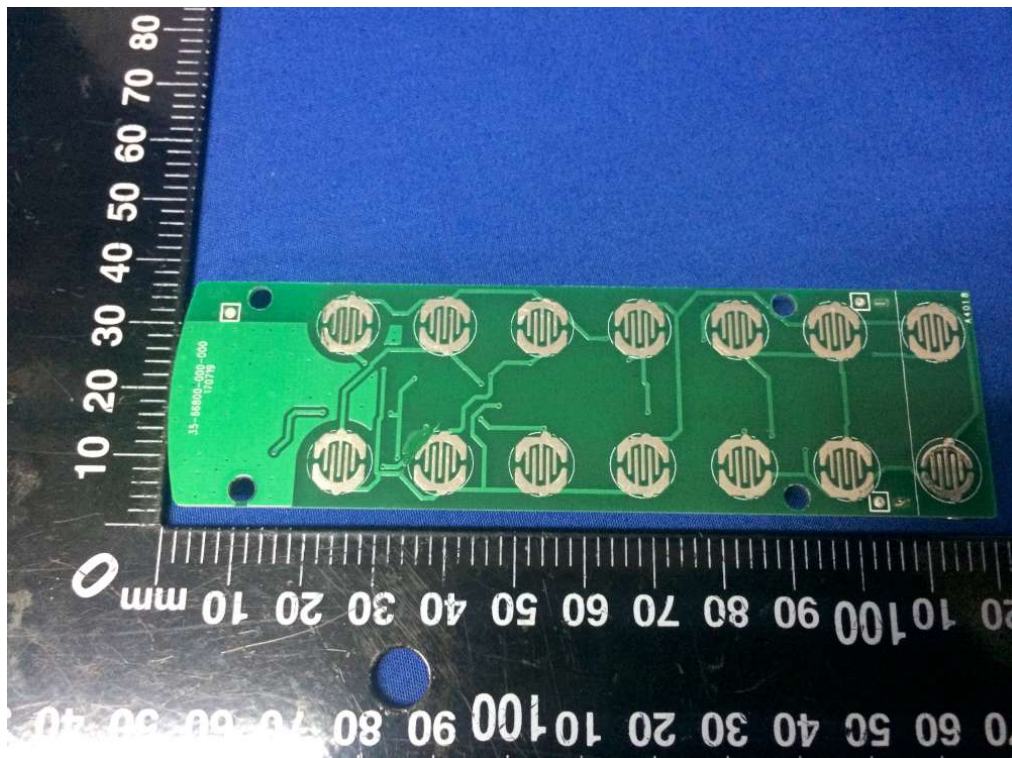
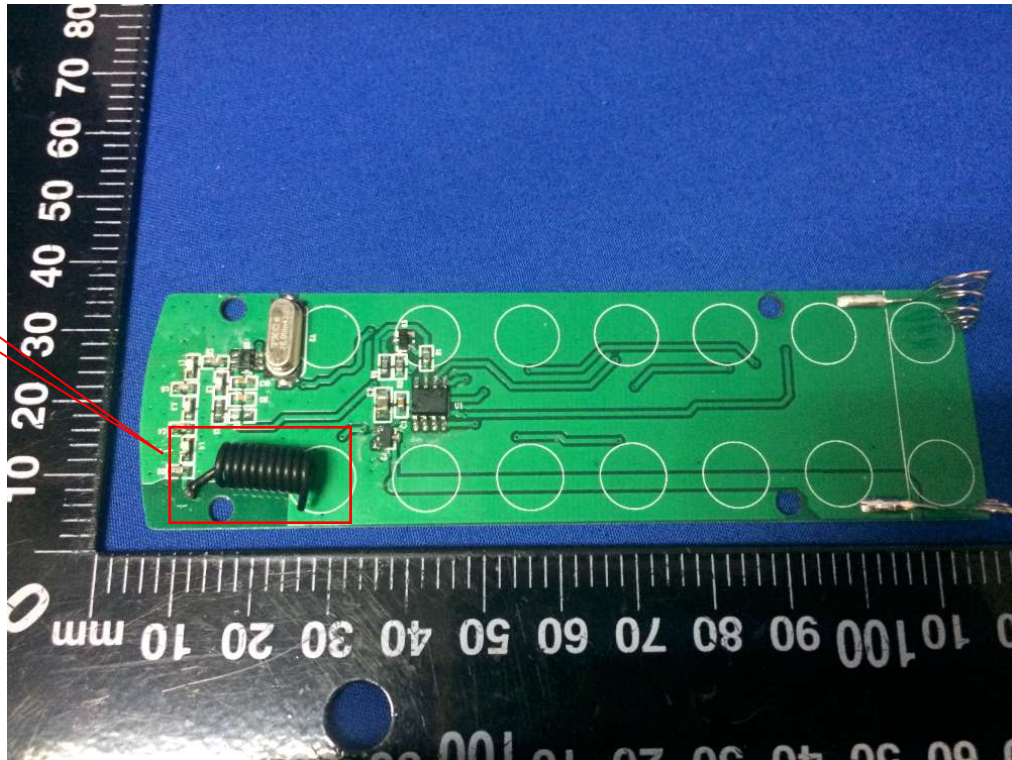
10. PHOTOGRAPHS OF THE EUT







Antenna



*** the end of report ***