FCC TEST REPORT

for

Lelux Electronics Ltd.

Wireless Security Alert System

Model Number:615

FCC ID: NS3S615

Prepared for	:	Lelux Electronics Ltd.
Address	:	Unit 6, 10/F, TCL Tower, No.8, Tai Chung Road, Tsuen Wan, New Territories, Hong Kong
Prepared by	:	Keyway Testing Technology Co., Ltd.
Address	:	Baishun Industrial Zone, Zhangmutou Town, Dongguan, Guangdong, China
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Report No.	:	14KWE112030F
Date of Test	:	Nov. 6~10, 2014
Date of Report	:	Nov. 11, 2014

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Keyway Testing Technology Co., Ltd.

Applicant: **Address:**	Lelux Electronics Ltd.. Unit 6, 10/F, TCL Tower, No.8, Tai Chung Road, Tsuen Wan, New Territories, Hong Kong		
Manufacturer: **Address:**	Lelux Electronics Ltd.. Unit 6, 10/F, TCL Tower, No.8, Tai Chung Road, Tsuen Wan, New Territories, Hong Kong		
E.U.T:	Wireless Security Alert System		
Model Number:	615		
Trade Name:	HomeSafe®	**Serial No.:**	------
Date of Receipt:	Nov. 6, 2014	**Date of Test:**	Nov. 6~10, 2014
Test Specification:	FCC Part 15, Subpart C: Oct. 1, 2014 ANSI C63.4:2009		
Test Result:	The equipment under test was found to be compliance with the requirements of the standards applied. **Issue Date: Nov. 11, 2014**		

Tested by:	Reviewed by:	Approved by:
Jack	Andy	Jade Yang
Jack Bu / Engineer	Andy Gao / Supervisor	Jade Yang/ Supervisor

Other Aspects:

None.

Abbreviations: OK/P=passed fail/F=failed n.a/N=not applicable E.U.T=equipment under tested

1. GENERAL PRODUCT INFORMATION

1.1. Product Function

Refer to Technical Construction Form and User Manual.

1.2. Description of Device (EUT)

Description	:	Wireless Security Alert System
M/N	:	615
Power Supply	:	DC 9V
Operation Frequency	:	433.92MHz
Modulation Technology	:	ASK
Antenna Type	:	Integral
Antenna Gain	:	2dBi

1.3. Independent Operation Modes

The basic operation modes are:

1.3.1. Transmitting mode(TX Mode)

1.3.2. Normal mode.

1.3.3. Transmitting mode(Low voltage Mode)

Remark: For all test, used new battery.

2. TEST SITES

2.1. 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

2.2. List of Test and Measurement Instruments

2.2.1. For radiated emission test

Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
EMI Test Receiver	Rohde&Schwarz	ESCI	101156	Apr. 27,14	Apr. 26,15
System Simulator	Agilent	E5515C	GB43130245	Apr. 30,14	Apr. 29,15
Power Splitter	Weinschel	1506A	NW425	Apr. 30,14	Apr. 29,15
Bilog Antenna	ETS-LINDGREEN	3142D	135452	Apr. 27,14	Apr. 26,15
Loop antenna	teseq	HLA6120	22032	Apr. 30,14	Apr. 29,15
Spectrum Analyzer	Agilent	E4411B	MY4511304	Apr. 27,14	Apr. 26,15
3m Semi-anechoic Chamber	ETS-LINDGREEN	966	KW01	Apr. 27,14	Apr. 26,15
Signal Amplifier	SONOMA	310	187016	Apr. 27,14	Apr. 26,15
Signal Amplifier	Agilent	8449B	3008A00251	Apr. 27,14	Apr. 26,15
RF Cable	IMRO	IMRO-400	966 Cable 1#	Apr. 27,14	Apr. 26,15
RF Cable	IMRO	IMRO-400	966 Cable 2#	Apr. 27,14	Apr. 26,15
RF Cable	IMRO	IMRO-400	966 Cable 3#	Apr. 27,14	Apr. 26,15
MULTI-DEVICE Controller	ETS-LINDGREEN	2090	126913	N/A	N/A
Horn Antenna	DAZE	ZN30701	11003	Apr. 27,14	Apr. 26,15
Horn Antenna	SCHWARZBECK	BBHA9170	9170-068	Apr. 27,14	Apr. 26,15
Spectrum Analyzer	Agilent	8593E	3911A04271	Apr. 27,14	Apr. 26,15
Spectrum Analyzer	Agilent	E4408B	MY44211125	Apr. 30,14	Apr. 29,15
Signal Amplifier	DAZE	ZN3380C	11001	Apr. 27,14	Apr. 26,15
High Pass filter	Micro	HPM50111	324216	Apr. 30,14	Apr. 29,15
Filter	COM-MW	ZBSF-C836.5-25-X	KW032	Apr. 30,14	Apr. 29,15
Filter	COM-MW	ZBSF-C1747.5-75-X2	KW035	Apr. 30,14	Apr. 29,15
Filter	COM-MW	ZBSF-C1880-60-X2	KW037	Apr. 30,14	Apr. 29,15
DC Power Supply	LongWei	PS-305D	010964729	Apr. 27,14	Apr. 26,15
Constant temperature and humidity box	GF	GTH-800-40-1P	MAA9906-005	Apr. 27,14	Apr. 26,15
Universal radio communication tester	Rohde&Schwarz	CMU200	3215420	Apr. 27,14	Apr. 26,15
Splitter	Agilent	11636B	0025164	Apr. 27,14	Apr. 26,15

3. TEST SET-UP AND OPERATION MODES

3.1. 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.

3.2. Block Diagram of Test Set-up

System Diagram of Connections between EUT and Simulators

EUT

(EUT: Wireless Security Alarm / Auto Dialer System)

3.3. Test Operation Mode and Test Software

Refer to Test Setup in clause 4.

3.4. Special Accessories and Auxiliary Equipment

None.

3.5. Countermeasures to Achieve EMC Compliance

None.

3.6. Test Environment:

Ambient conditions in the test laboratory:

Items	Actual
Temperature (℃)	21~23
Humidity (%RH)	50~65

4. EMISSION TEST RESULTS

4.1. Radiated Emission Test

4.1.1. Limit 15.209 limits

FREQUENCY MHz	DISTANCE Meters	FIELD STRENGTHS LIMIT	
		μV/m	dB(μV)/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 dB(μV)/m (Peak) 54.0 dB(μV)/m (Average)	

4.1.2. Fundamental and harmonics emission limits

Frequency	Field Strength of Fundamental		Field Strength of Harmonics	
(MHz)	(μV/m@3m)	(dBμV/m@3m)	(μV/m@3m)	(dBμV/m@3m)
433.92	10996	80.8	1099.6	60.8

4.1.3. Restricted bands of operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])

All the emissions appearing within 15.205 restricted frequency bands shall not exceed the limits shown in 15.209, all the other emissions shall be at least 20dB below the fundamental emissions, or comply with 15.209 limits.

4.1.4. Test setup

The EUT was placed on a turn table which was 0.8 m 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.

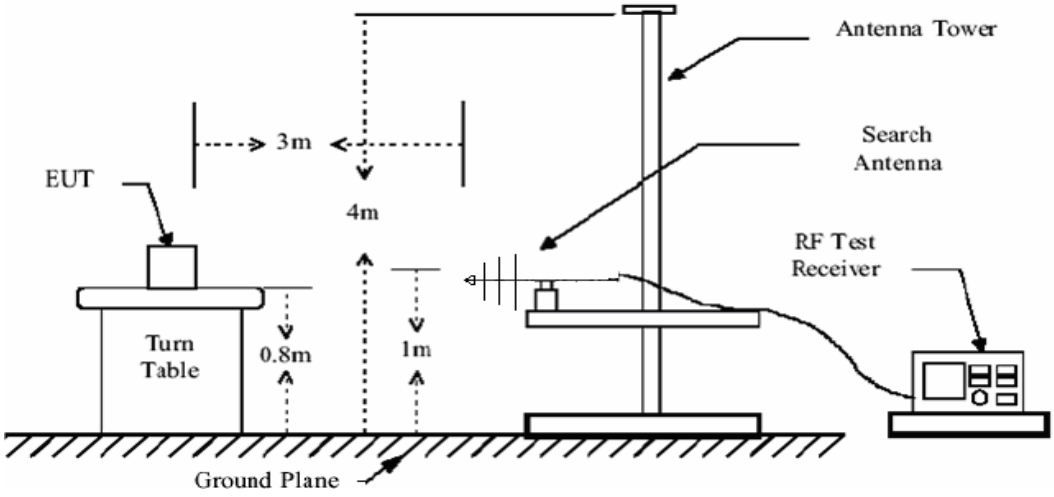
The bandwidth of the EMI test receiver is set at 120kHz for frequency range from 30MHz to 1000 MHz. The frequency range from 30MHz to 10th harmonic (25GHz) are checked

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.

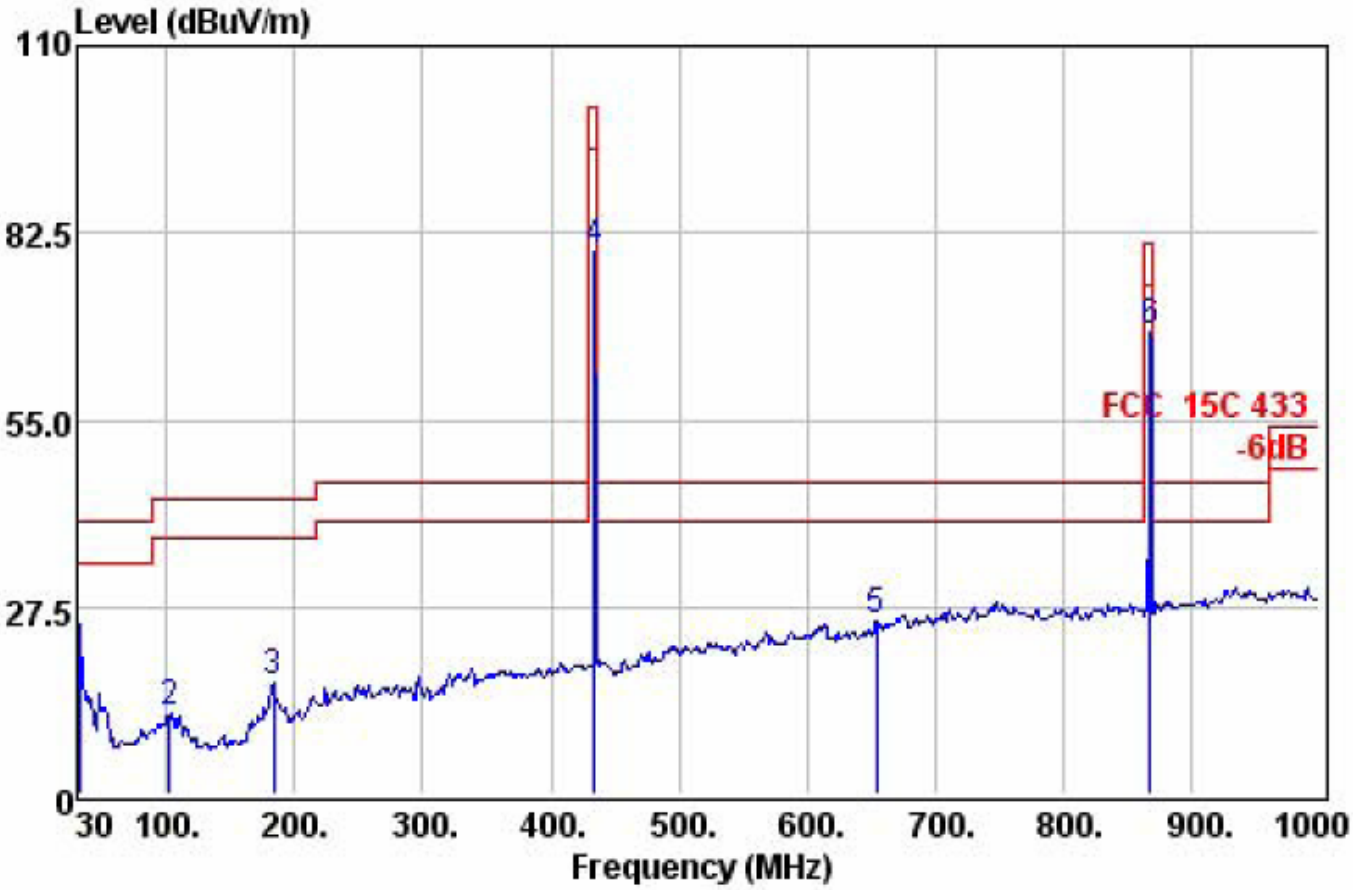
The test data of the worst case condition(s) was reported on the following pages.

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 no show it.
5: we pretest all mode, the TX mode was worst and the data recording in the report.



Test Data below 1GHz

Horizontal



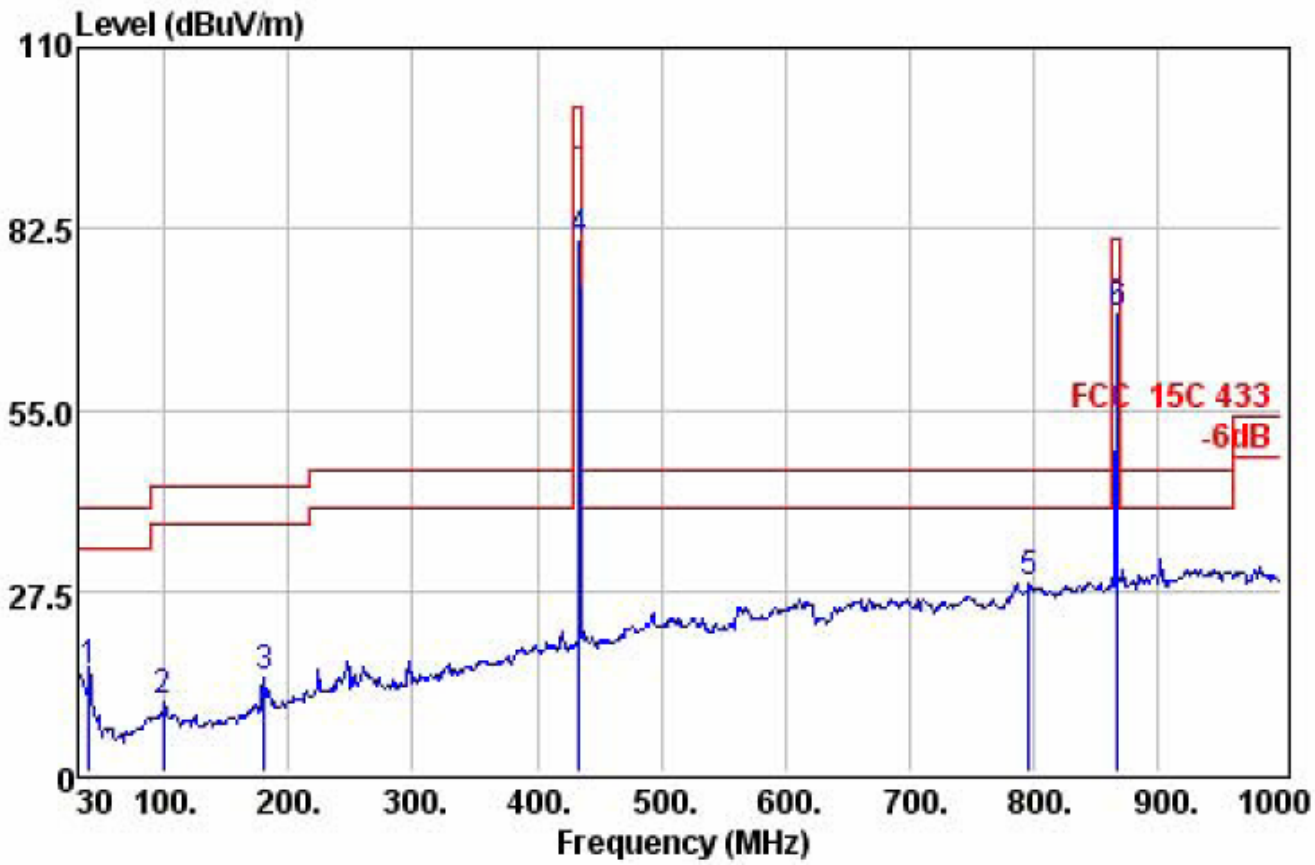
	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	31.91	31.40	38.06	0.56	17.67	24.89	40.00	-15.11	QP
2	102.68	31.35	32.61	1.03	9.52	11.81	43.50	-31.69	QP
3	183.19	31.15	35.72	1.39	10.30	16.26	43.50	-27.24	QP
4	433.92	30.62	90.72	2.55	17.28	79.93	100.80	-20.87	Peak
5	654.89	30.82	31.10	3.58	21.52	25.38	46.00	-20.62	QP
6	867.84	30.27	70.17	4.67	23.39	67.96	80.80	-12.84	Peak

For average:

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit	Margin dB
433.92	79.93	-9.4	70.53	80.80	-10.27
867.84	67.96	-9.4	58.56	60.80	-2.24

Notes: 1. Average emission Level = Peak Level + Duty cycle factor
2.Duty cycle level please see clause 5.

Vertical



	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	39.29	31.37	32.70	0.56	13.32	15.21	40.00	-24.79	QP
2	99.37	31.35	31.67	0.94	9.57	10.83	43.50	-32.67	QP
3	180.29	31.16	33.80	1.39	10.39	14.42	43.50	-29.08	QP
4	433.92	30.62	91.53	2.55	17.28	80.74	100.80	-20.06	Peak
5	796.12	30.57	32.11	4.29	22.95	28.78	46.00	-17.22	QP
6	867.84	30.27	68.58	4.67	23.39	66.37	80.80	-14.43	Peak

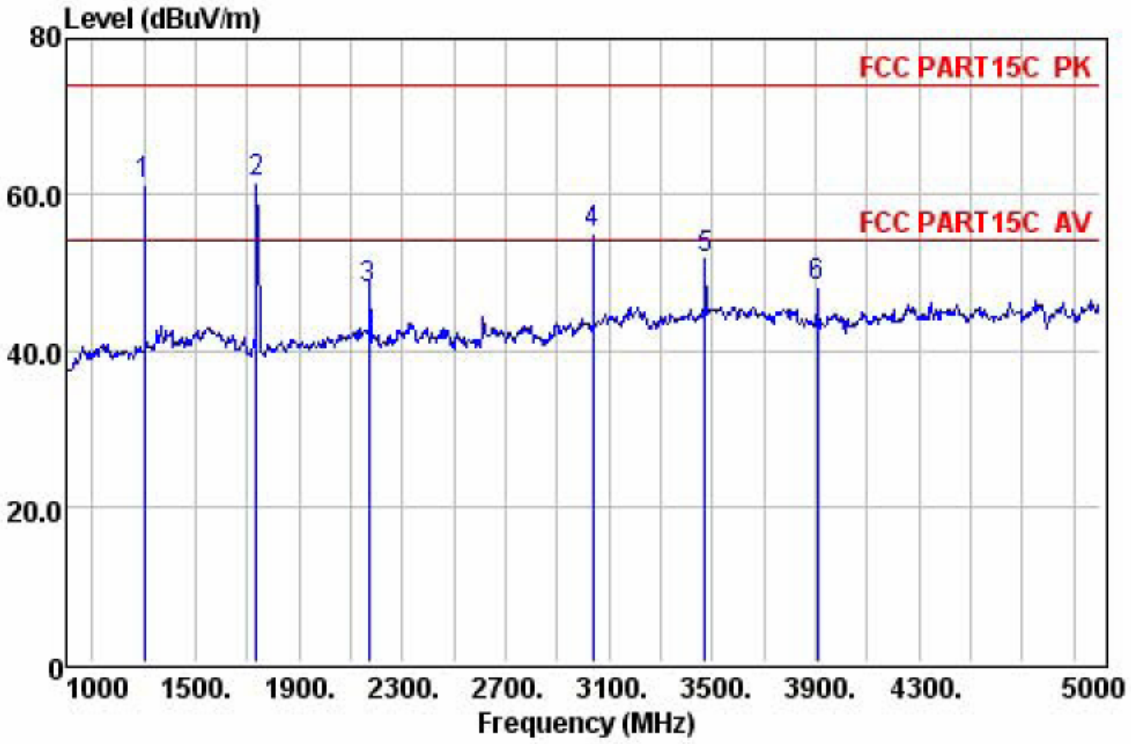
For average:

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit	Margin dB
433.92	80.74	-9.4	71.34	80.80	-9.46
867.84	66.37	-9.4	56.97	60.80	-3.83

Notes: 1. Average emission Level = Peak Level + Duty cycle factor
2.Duty cycle level please see clause 5.

Test Data for 1GHz~5GHz

Horizontal



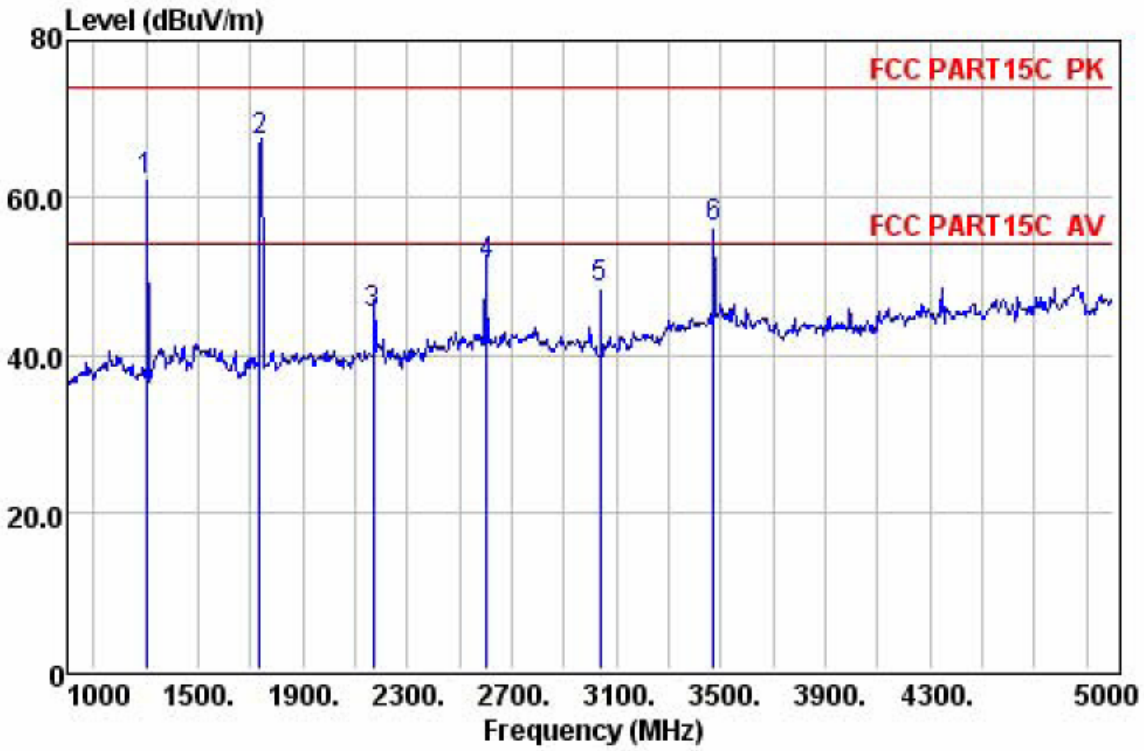
	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	1301.76	26.06	53.97	5.15	28.17	61.23	74.00	-12.77	Peak
2	1735.68	26.15	52.66	5.85	29.13	61.49	74.00	-12.51	Peak
3	2169.60	26.25	37.13	6.80	30.19	47.87	74.00	-26.13	Peak
4	3037.44	26.52	39.51	9.93	31.95	54.87	74.00	-19.13	Peak
5	3471.36	26.73	33.52	9.98	34.91	51.68	74.00	-22.32	Peak
6	3905.28	26.96	30.22	10.37	34.69	48.32	74.00	-25.68	Peak

For peak and average

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit		Margin dB	
				PK	AV	PK	AV
1301.76	61.23	-9.4	51.83	80.80	60.80	-19.57	-8.97
1735.68	61.49	-9.4	52.09	80.80	60.80	-19.31	-8.71
2169.60	47.87	-9.4	38.47	80.80	60.80	-32.93	-22.33
2603.52	54.87	-9.4	45.47	80.80	60.80	-25.93	-15.33
3037.44	51.68	-9.4	42.28	80.80	60.80	-29.12	-18.52
3471.36	48.32	-9.4	38.92	80.80	60.80	-32.48	-21.88

Notes: 1. Average emission Level = Peak Level + Duty cycle factor
2.Duty cycle level please see clause 5.

Vertical



	Freq	Preamp Factor	Read Level	Cable Loss	Antenna Factor	Level	Limit Line	Over Limit	Remark
	MHz	dB	dBuV	dB	dB/m	dBuV/m	dBuV/m	dB	
1	1301.76	26.06	54.92	5.15	28.17	62.18	74.00	-11.82	Peak
2	1735.68	26.15	58.51	5.85	29.13	67.34	74.00	-6.66	Peak
3	2169.60	26.25	34.54	6.80	30.19	45.28	74.00	-28.72	Peak
4	2603.52	26.38	36.94	8.02	32.81	51.39	74.00	-22.61	Peak
5	3037.44	26.52	33.26	9.93	31.95	48.62	74.00	-25.38	Peak
6	3471.36	26.73	37.96	9.98	34.91	56.12	74.00	-17.88	Peak

For peak and average

Frequency MHz	Peak Level dBuV/m	Duty cycle factor	Average Level dBuV/m	Limit		Margin dB	
				PK	AV	PK	AV
1301.76	62.18	-9.4	52.78	80.80	60.80	-18.62	-8.02
1735.68	67.34	-9.4	57.94	80.80	60.80	-13.46	-2.86
2169.60	45.28	-9.4	35.88	80.80	60.80	-35.52	-24.92
2603.52	51.39	-9.4	41.99	80.80	60.80	-29.41	-18.81
3037.44	48.62	-9.4	39.22	80.80	60.80	-32.18	-21.58
3471.36	56.12	-9.4	46.72	80.80	60.80	-24.68	-14.08

Notes: 1. Average emission Level = Peak Level + Duty cycle factor
2.Duty cycle level please see clause 5.

5. CALCULATION OF AVERAGE FACTOR

The output field strengths of specification in accordance with the FCC 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 100kHz resolution bandwidth.

Averaging factor in dB =20log (duty cycle)

The duration of one cycle = 62.8ms

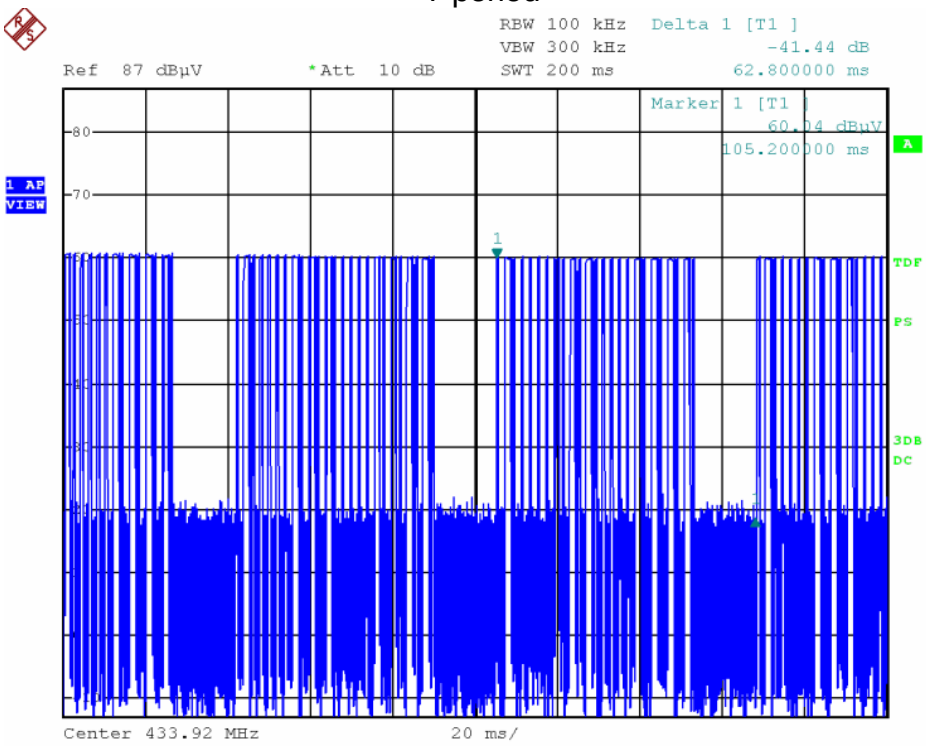
The duty cycle is simply the on-time divided the duration of one cycle

Duty Cycle = (1.56ms*8+0.52ms*17)/ 62.8=21.32ms / 62.8ms=0.339

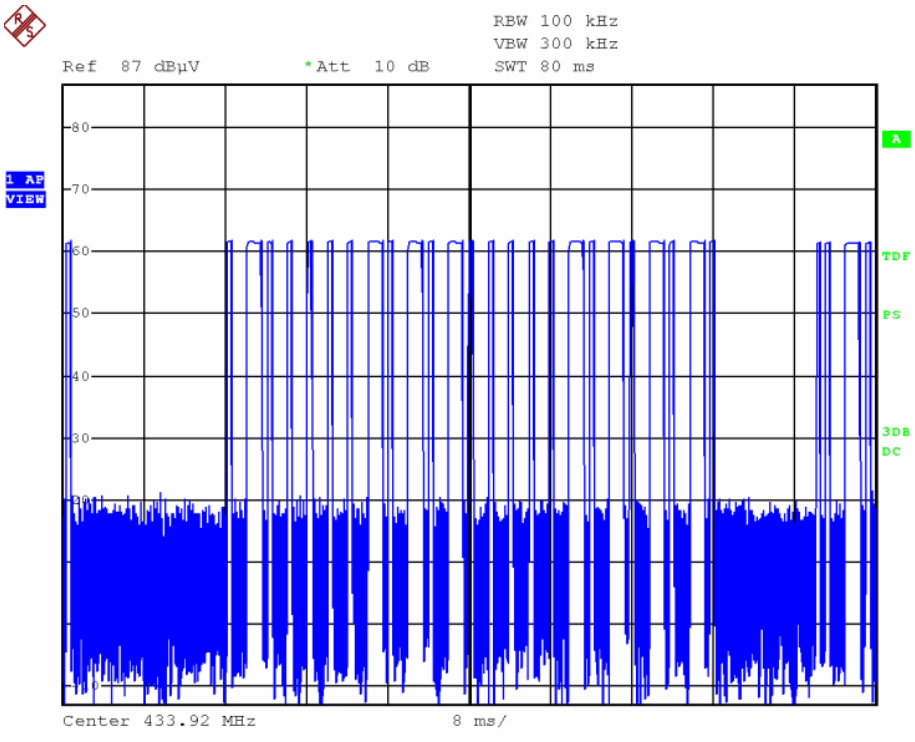
Therefore, the averaging factor is found by 20log0.339 =**−9.4dB**

Test plot as follows:

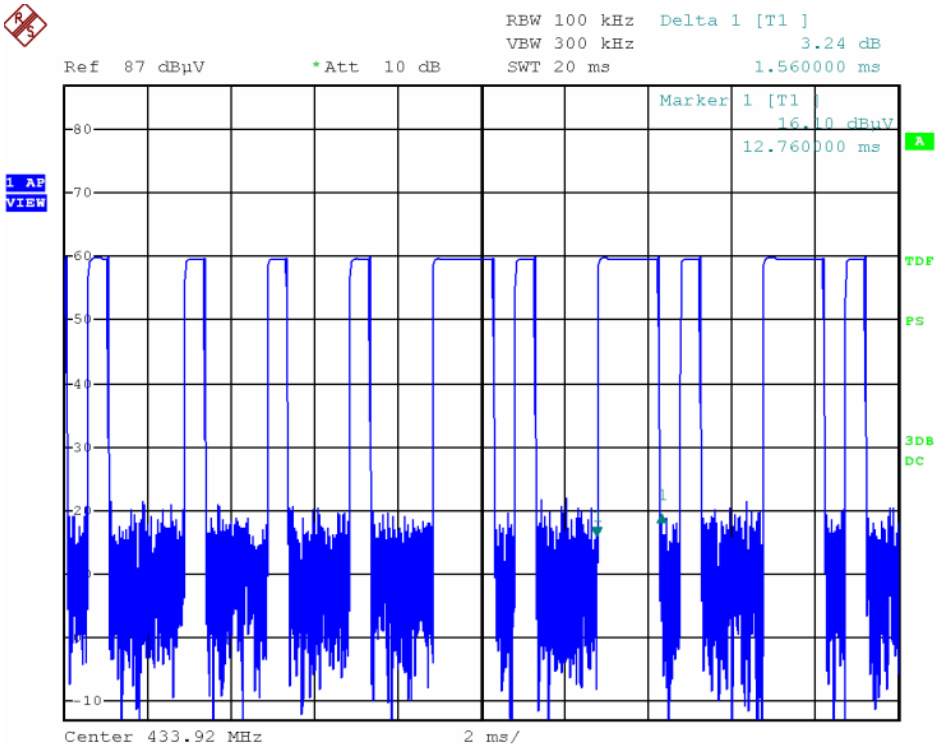
T period

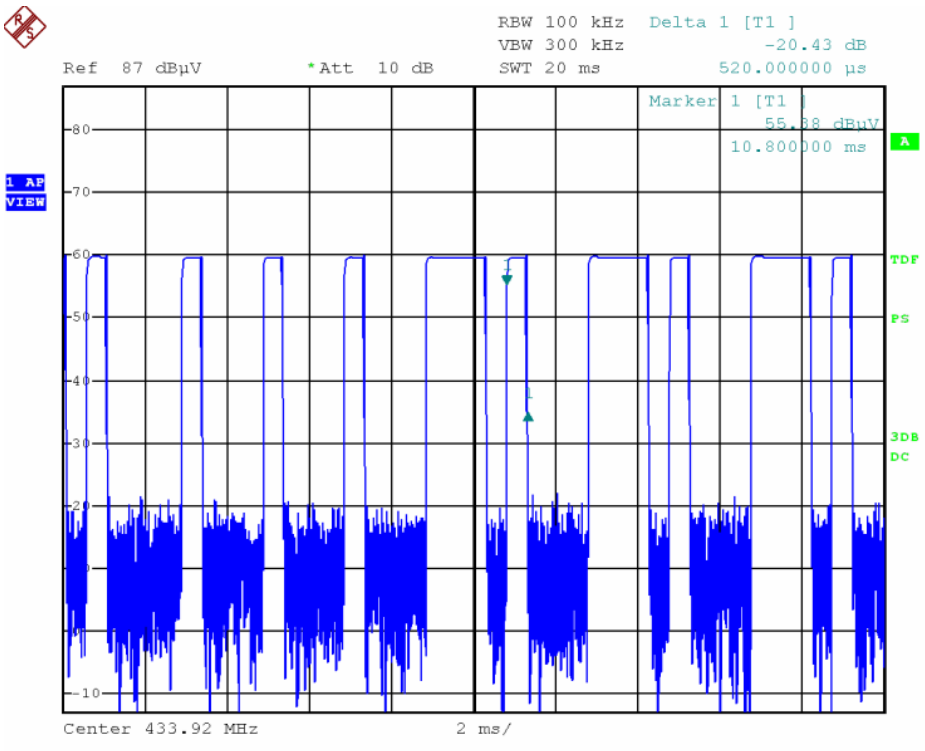


T on time slot



T on time slot


RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Delta 1 [T1]
3.24 dB
1.560000 ms
Ref 87 dBµV
*Att 10 dB
Marker 1 [T1]
16.10 dBµV
12.760000 ms
1 AP
VIEW
A
TDF
PS
3DB
DC
Center 433.92 MHz
2 ms/


RBW 100 kHz
VBW 300 kHz
SWT 20 ms
Delta 1 [T1]
-20.43 dB
520.000000 µs
Ref 87 dBµV
*Att 10 dB
Marker 1 [T1]
55.88 dBµV
10.800000 ms
1 AP
VIEW
A
TDF
PS
3DB
DC
Center 433.92 MHz
2 ms/

6. 20DB OCCUPY BANDWIDTH

6.1. Limits

According to FCC 15.231(c) requirement:

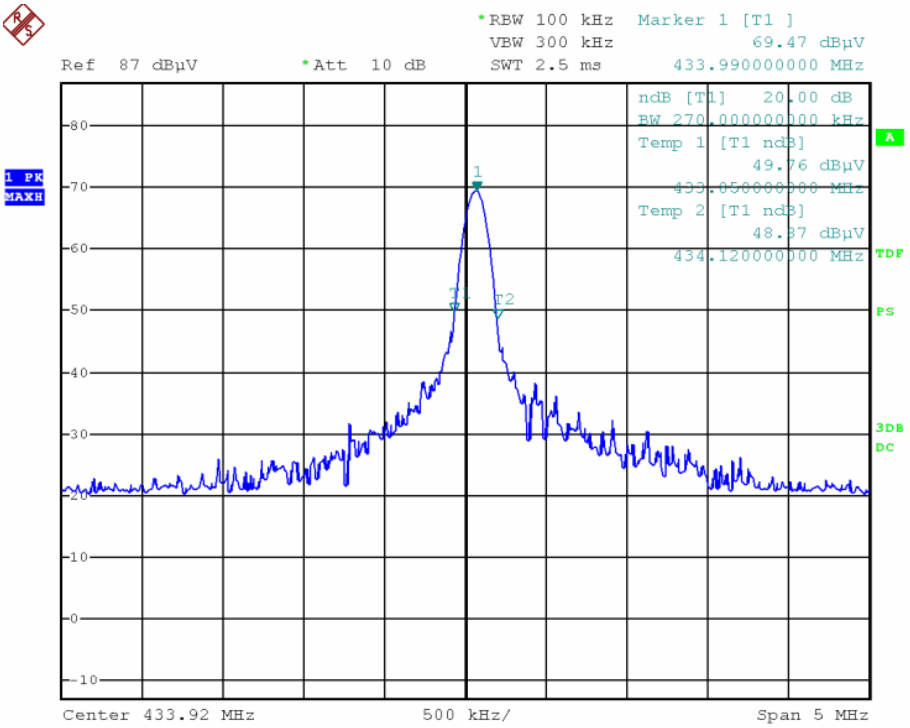
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating between 70 MHz to 900 MHz. Those devices operating above 900 MHz, the emission spurious shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the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

B.W (20dBc) Limit = 0.25% * f(MHz) = 0.25% * 433.92MHz = 1.0848MHz

Test data:

Channel Frequency (MHz)	20dB Bandwidth (MHz)	Limit (MHz)	Result
433.92	0.270	1.0848	Pass

Test plot as follows:



7. DWELL TIME

7.1. Limits

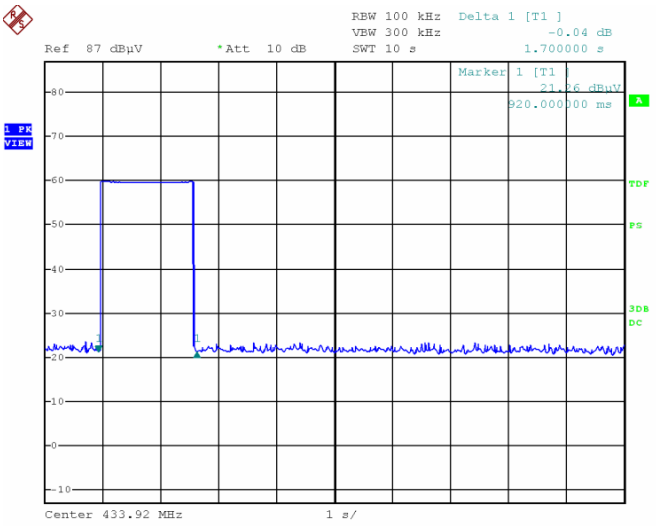
According to FCC 15.231(a) requirement:

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

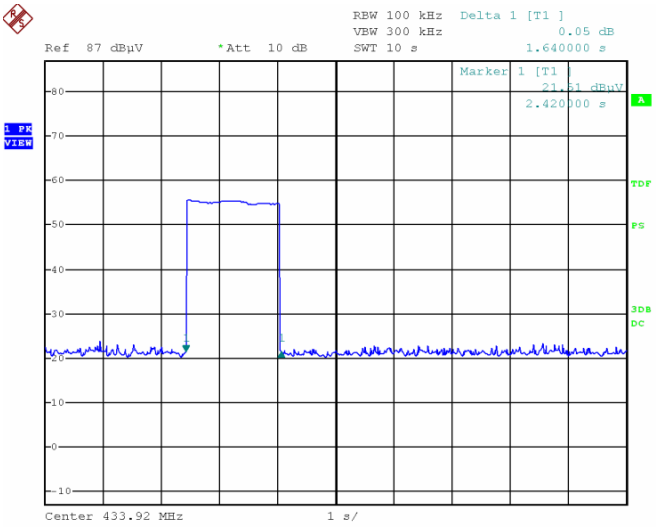
Test Data:

	Dwell time (second)	Limit (second)	Result
Full voltage	1.7s	<5s	Pass
Low voltage	1.64s	<5s	Pass

Test plot as follows:



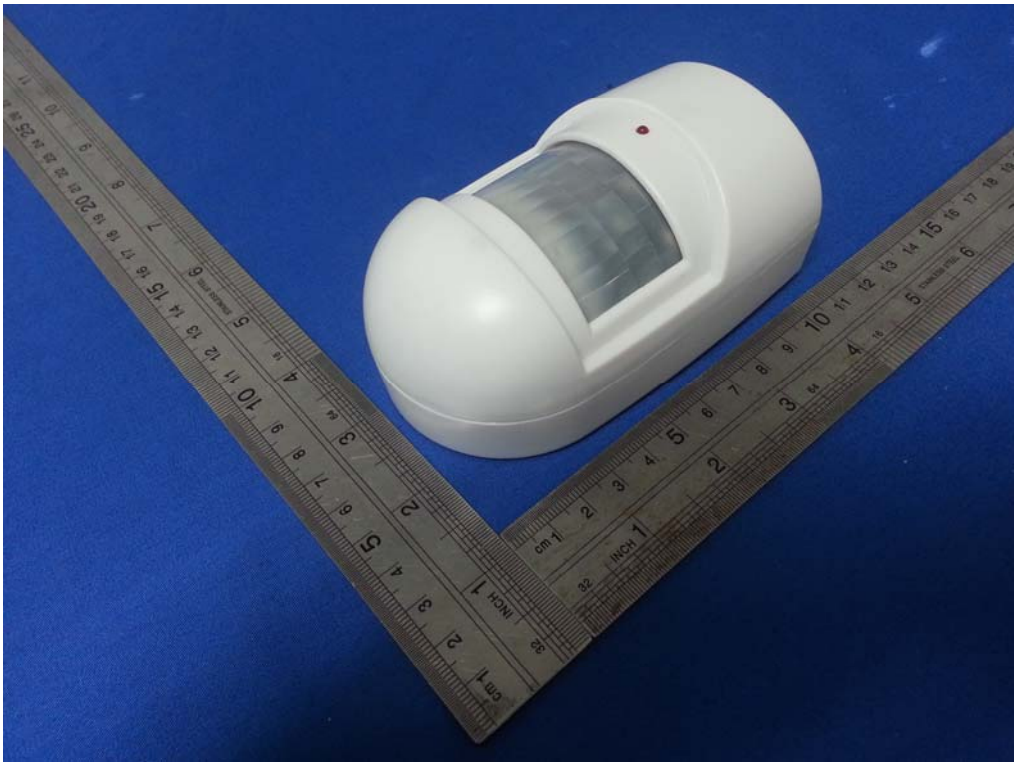
Full voltage

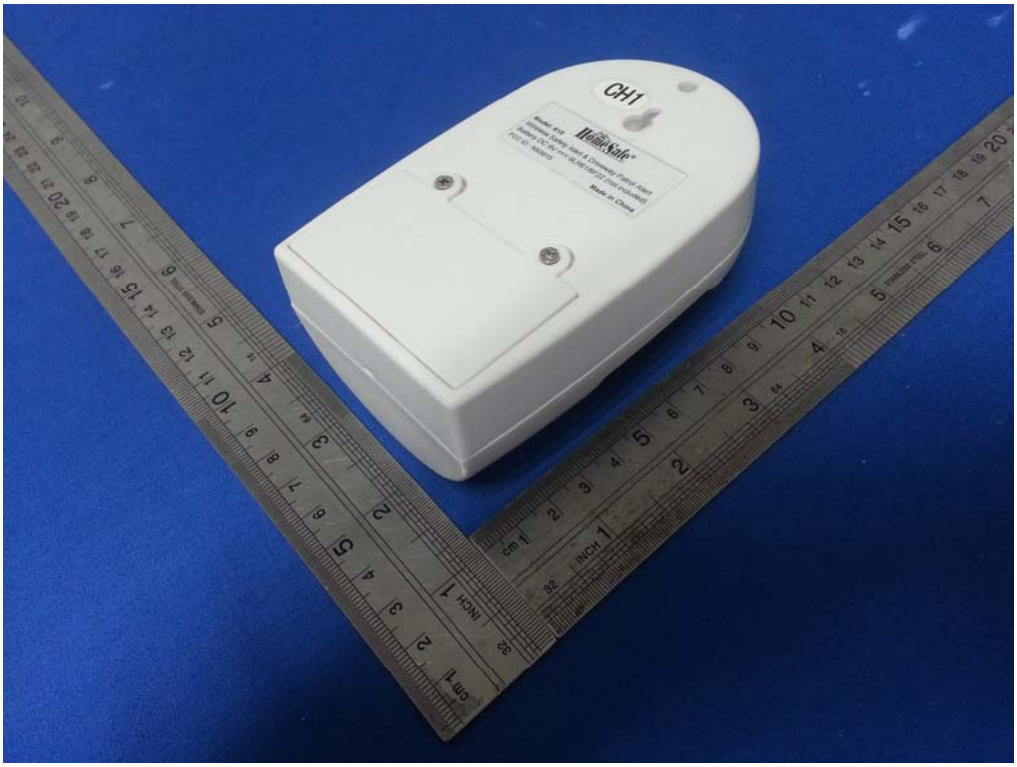


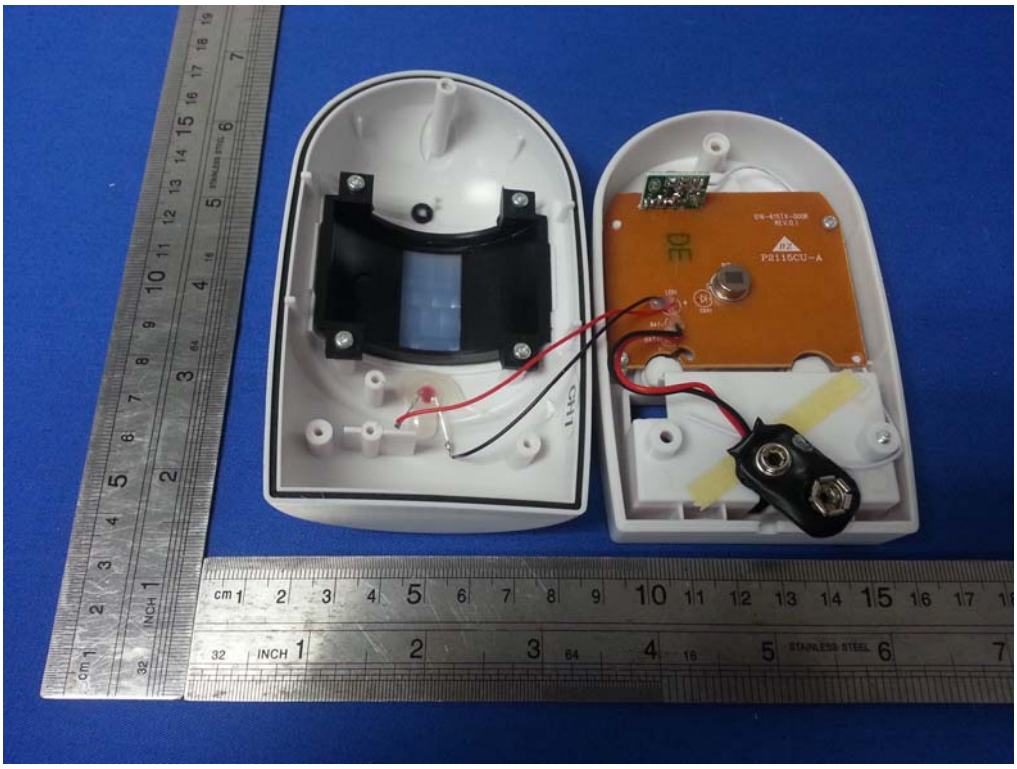
Low voltage

8. PHOTOGRAPHS OF TEST SET-UP

9. PHOTOGRAPHS OF THE EUT






P2115CU-A
DE
cm 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
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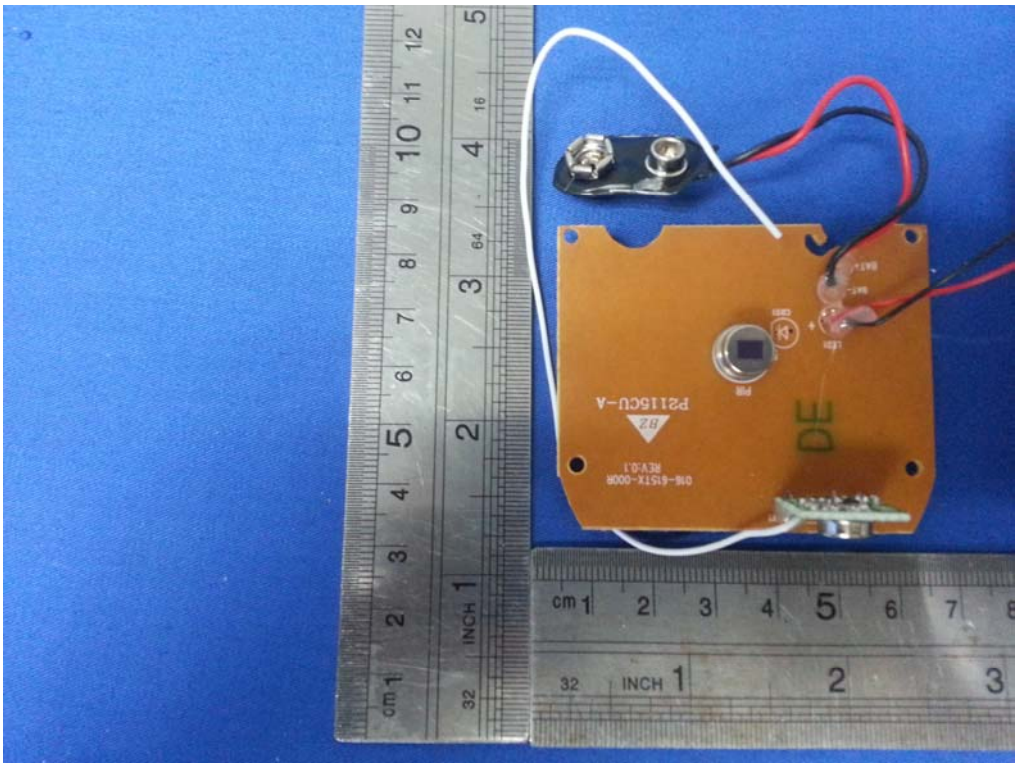
STAINLESS STEEL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DE
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INCH 1 2 3
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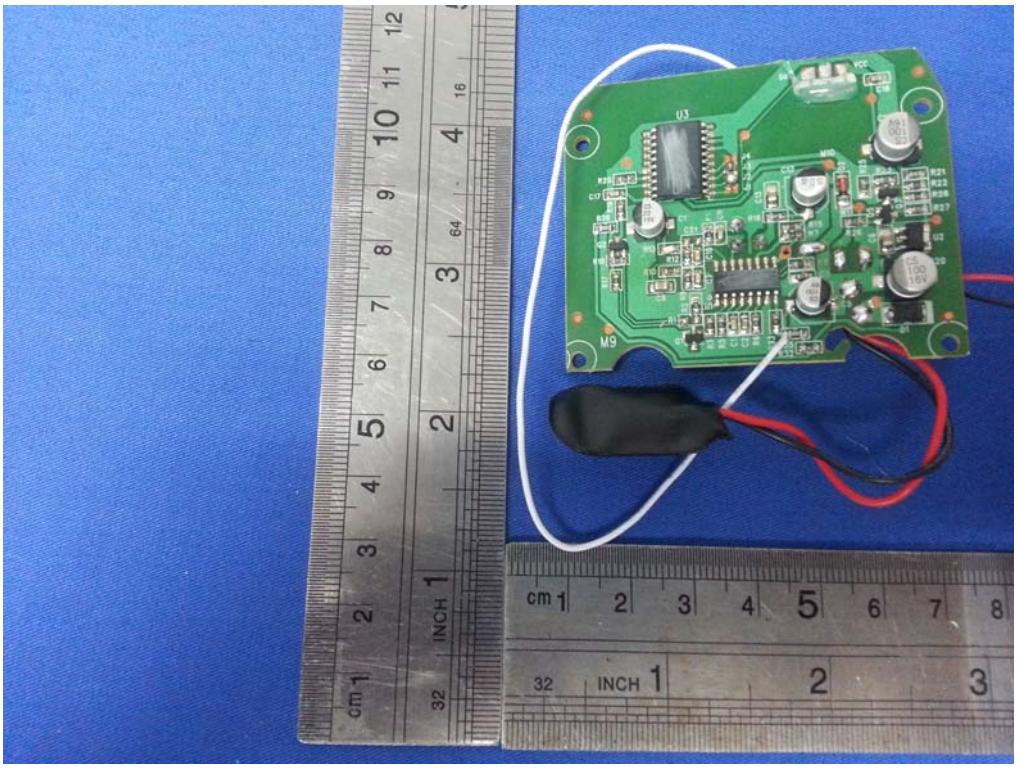

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