



A Test Lab Techno Corp.

No.140-1, Chang-an St., Bade City, Tao-Yuan County 334, Taiwan (R.O.C.)
Tel : +886-3-2710188 / Fax : +886-3-2710190

P15C Measurement Report



Report No.	: 0907FR13
Applicant	: Hearth & Home Technologies
Product Type	: Remote Control Transmitter
Trade Mark	: HEARTH & HOME TECHNOLOGIES
Model No	: RC100
FCC ID	: ULE-RC100
Dates of Test	: May 21 ~ Jun. 18, 2009
Test Specification	: FCC Part 15 Subpart C (15.231) Canada RSS-210 Issue 7(June 2007) Canada RSS-Gen Issue 2(June 2007) ANSI C63.4-2003
Location of Test Lab.	: Chang-an Lab.

1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
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4. This document may be altered or revised by A Test Lab Techno. Corp. personnel only, and shall be noted in the revision section of the document.


Kevin Wang 20090714
Approve Signer


John Cheng 20090714
Testing Engineer



CERTIFICATION

We hereby verify that:

The test data, data evaluation, test procedures and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4:2003. All test were conducted by *A Test Lab Techno Corp. No.140-1, Chang-an St., Bade City, Tao-Yuan County 334, Taiwan (R.O.C.)* Also, we attest to the accuracy of each.

We further submit that the energy emitted by the sample EUT tested as described in the report is in compliance with Class B radiated and conducted emission limit of FCC Rules Part 15 Subpart C (15.231) & Canada RSS-210 Issue 7(June 2007).

EUT : Remote Control Transmitter

Applicant : Hearth & Home Technologies

20802 Kensington Blvd Lakeville Minnesota United States 55044

Trade Mark : HEARTH & HOME TECHNOLOGIES

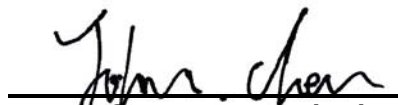
Model No : RC100

FCC ID : ULE-RC100

Approved by :


Kevin Wang 2009/07/14

Prepared by :


John Cheng 2009/07/14

A Test Lab Techno Corp.

*No.140-1, Chang-an St., Bade City, Tao-Yuan County 334, Taiwan (R.O.C.)
Tel : 03-2710188 / Fax : 03-2710190*



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1. GENERAL

1.1 Description of Equipment under Test (EUT)

Applicant : **Hearth & Home Technologies**
20802 Kensington Blvd Lakeville Minnesota United States 55044

Manufacturer : GRAND MATE CO., LTD.
Manufacturer Address : NO.38, YUAN-CHEN RD, TAIPING CITY, TAICHUNG,
TAIWAN, R.O.C.
Trade Mark : HEARTH & HOME TECHNOLOGIES
Product Model : RC100
Product Type : Remote Control Transmitter
FCC ID : ULE-RC100
Frequency Range : 433.89 MHz
Channel Number : 1 CH
Type of Modulation : ASK
Power Supply : 3 Vdc / Lithium Battery * 2 PCS
Type of Antenna : PCB Antenna

During testing the EUT was operated at Tx or Rx mode for each emission measured. This was done in order to ensure that maximum emission levels were attained.

1.2 Introduction

The following measurement report is submitted on behalf of **Hearth & Home Technologies** In support of a Class B Digital Device certification in accordance with Part2 Subpart J and Part 15 Subpart A and B&C and RSS-210 of the Commission's and Regulations.

1.3 Summary of Tests

Applied Standard : FCC Part 15, Subpart C (Section 15.231); RSS-210				
Reference		Test	Results	Note
Part 15 C	RSS-210			
15.231 (b), 15.209	A1.1.2	Radiated Emissions	PASS	-----
15.231 (c)	A1.1.3	99% Bandwidth / 20dB Bandwidth	PASS	-----

1.4 Description of Support Equipment

Describe	Manufacturer	Model	Serial No.	FCC ID
N/A	-----	-----	-----	-----

1.5 Configuration of System under Test

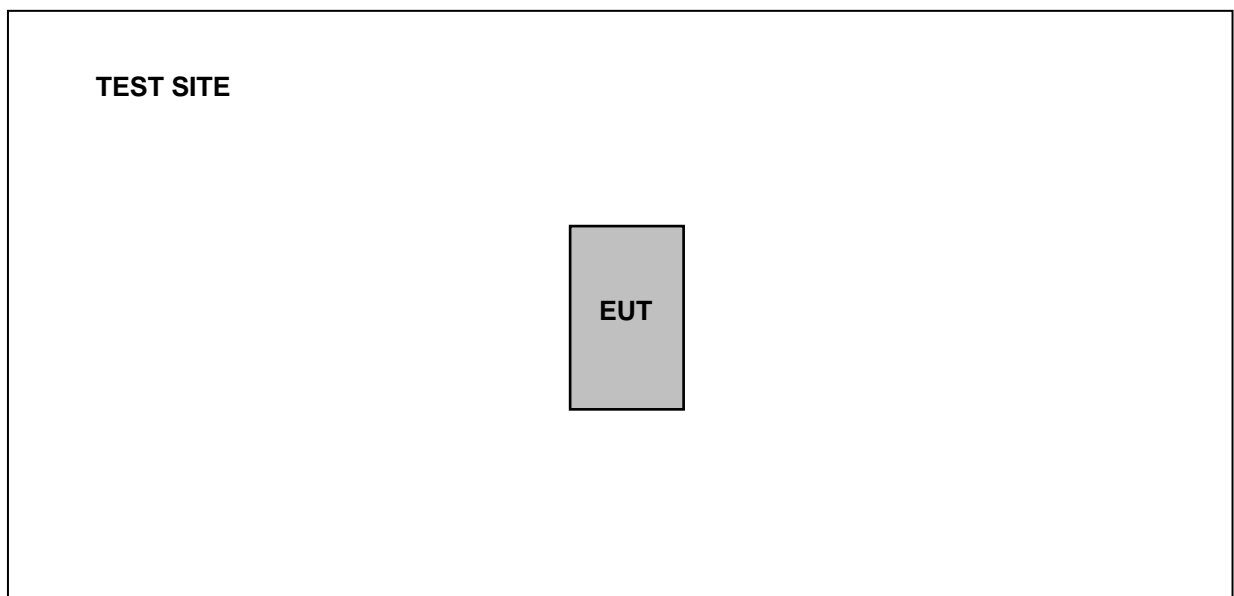


Figure 1. Configuration of System Under Test

During testing (LINK) put the EUT (Remote Control Transmitter)'s on the table.

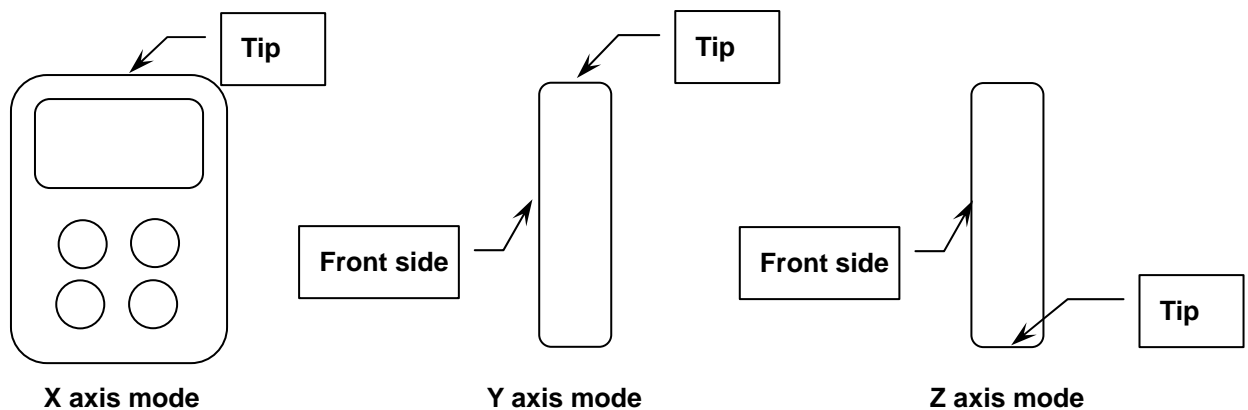
1.6 Test Procedure

All measurements contained in this report were performed according to the techniques described in Measurement procedure ANSI C63.4-2003 "Measurement of un-Intentional Radiators."

1.7 General Test Condition

The conditions under which the EUT operates were varied to determine their effect on the equipment's emission characteristics. The final configuration of the test system and the mode of operation used during these tests were chosen as that which produced the highest emission levels. However, only those conditions which the EUT was considered likely to encounter in normal use were investigated. Using a test program which sent a continuous data and transferred data to and from the EUT was proven to worst case emissions. The system's physical layout and cabling was randomly arranged to ensure that maximum emission levels were attained.

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



1.8 General Information of Test Site

Test Site Location: No. 140 -1, Changan Street, Bade City, Taoyuan County, Taiwan R.O.C.

TEL: 886-3-271-0188 FAX: 886-3-271-0190

Registration Number : 854525

Designation Number : TW1330

The chamber meets the characteristics of ANSI C63.4-2006. This site is on file with the FCC.



2. Radiated Emissions Requirements

2.1 Test Procedure

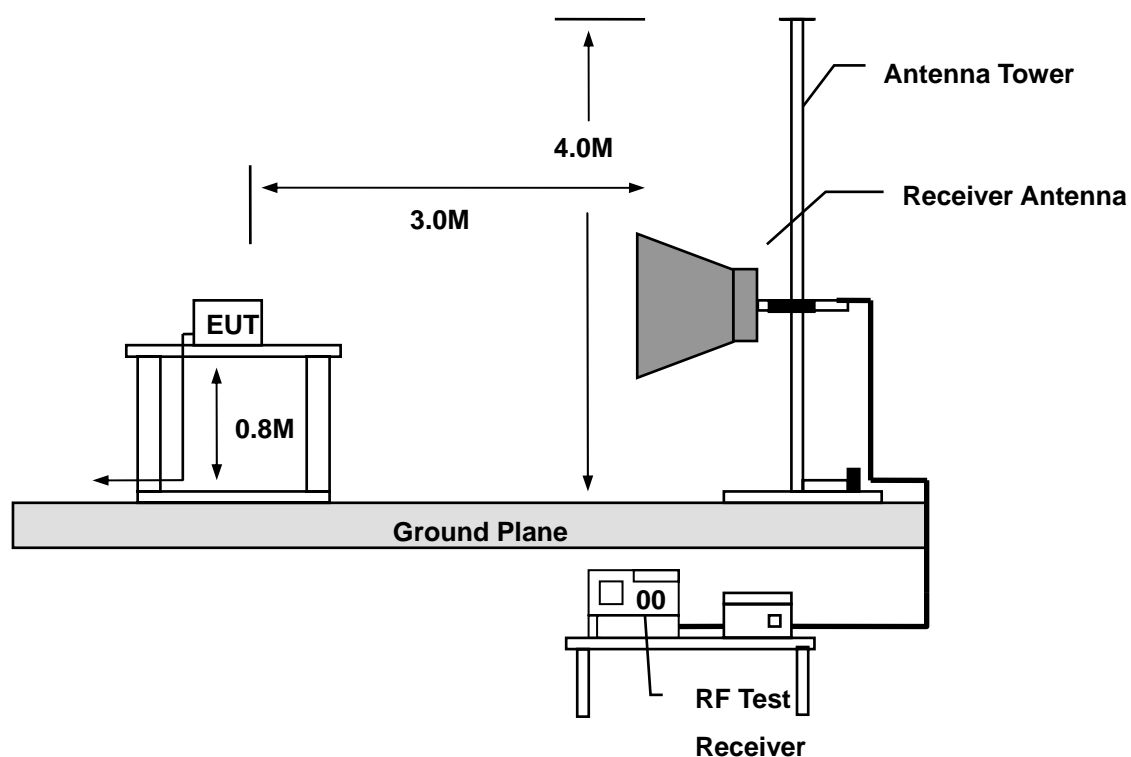
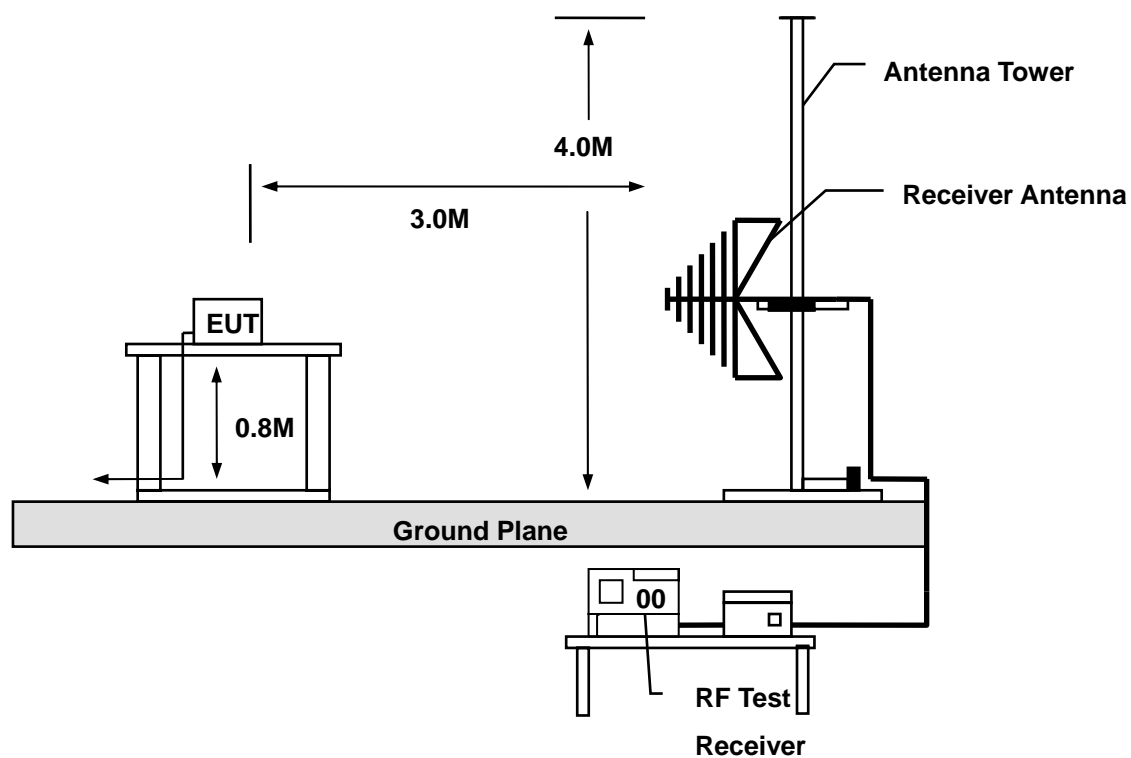
Radiated emission measurements frequency range were performed from 30MHz to 5GHz. Spectrum Analyzer Resolution Bandwidth set to 100kHz or greater for frequencies from 30MHz to 1GHz, and set 1MHz Resolution Bandwidth for frequencies above 1GHz. The EUT is place on non-conductive turntable for the test. If peripheral devices apply to the EUT, the peripheral devices will be connected to EUT and whole system. During the emission test, the signal is maximized through rotation and all cables were present worst-case emissions. The height of antenna and polarization is constantly changed for exploring maximum signal reading. The height of antenna can be up form reference ground to 4 meter and down to 1 meter.

2.2 Test Equipment List:

Describe	Manufacturer	Model	Serial Number	Calibration	
				Cal. Date	Due Date
Spectrum Analyzer	Agilent	E4408B	MY45107753	Jun. 05, 2008	Jun. 05, 2009
Pre Amplifier	Agilent	8449B	3008A02237	Jun. 03, 2008	Jun. 03, 2009
Pre Amplifier	Agilent	8447D	2944A10961	Jun. 10, 2008	Jun. 10, 2009
Test Receiver	R&S	ESCI	100367	Jun. 05, 2008	Jun. 05, 2009
Biconilog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	9163-270	Jun. 26, 2008	Jun. 26, 2009
Horn Antenna	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	Jun. 26, 2008	Jun. 26, 2009
Horn Antenna	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	Jun. 09, 2008	Jun. 09, 2009
Horn Antenna	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120E	0899	Jun. 26, 2008	Jun. 26, 2009

2.3 Test Configuration:

Measurement of radiated emission



2.4 Test Setup:



Figure 2. Front View of the Test Configuration (under 1GHz)



Figure 3. Rear View of the Test Configuration (under 1GHz)



2.5 Test condition:

EUT tested in accordance with the specifications given by the manufacturer, and exercised in the most unfavorable manner.

2.6 Radiated Emissions Limits:

According to FCC 15.231(b) & RSS-210 A1.1.2 requirement:

In addition to the provisions of §15.205, the field strength of emissions from intentional radiator operated under this section shall not exceed the following:

Fundamental and harmonics emission limits

Frequency range	Field Strength of Fundamental		Field Strength of Harmonics	
(MHz)	(μ V/m@3m)	(dB μ V/m@3m)	(μ V/m@3m)	(dB μ V/m@3m)
433.89	10990.01	80.82	1099.01	60.82

General Radiated emission Limit

Frequency range	15.209 Limits	
(MHz)	(μ V/m@3m)	(dB μ V/m@3m)
30 – 88	100	40
88 – 216	150	43.5
216 – 960	200	46
Above 960	500	54

Remark

1. The table above tighter limit applies at the band edges.
2. The measurement distance in meters, which that between form closest point of EUT to instrument antenna.



2.7 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.

Please see the diagrams below.

- (*) Canada : When the field strength (or envelope power) is not constant or when it is in pulses, and an averaging detector is specified to be used, the value of field strength or power over one complete pulse train, excluding blanking intervals, shall be averaged as long as the pulse train does not exceed 0.1 seconds. In cases where the pulse train exceeds 0.1 seconds, the average value (of field strength or output power) shall be determined during a 0.1 second interval during which the field strength or power is at its maximum value.

- (*) FCC : When the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value. The exact method of calculating the average field strength shall be submitted with any application for certification or shall be retained in the measurement data file for equipment subject to notification or verification.

Duty Cycle Results

Item	Results	Note
Length of a complete pulse train	217.5 > 100.00 ms	Section 2.7 (*)
Long Pluse (Number of Pluse)	29.00	-----
Short Pluse (Number of Pluse)	23.00	-----
Long Pluse (T)	1.075 ms	-----
Short Pluse (T)	0.525 ms	-----
Total ON interval in a complete pulse train	43.25 ms	-----
Duty Cycle	0.4325	-----
Averaging Factor (20 log * Duty Cycle)	-7.28	-----

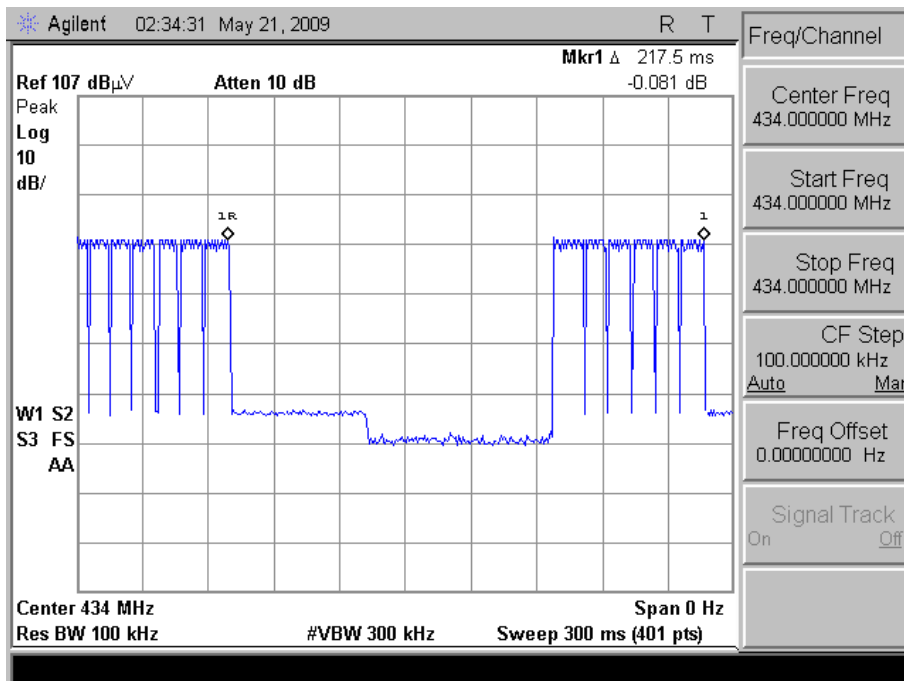
Please see the diagrams below.

Note:

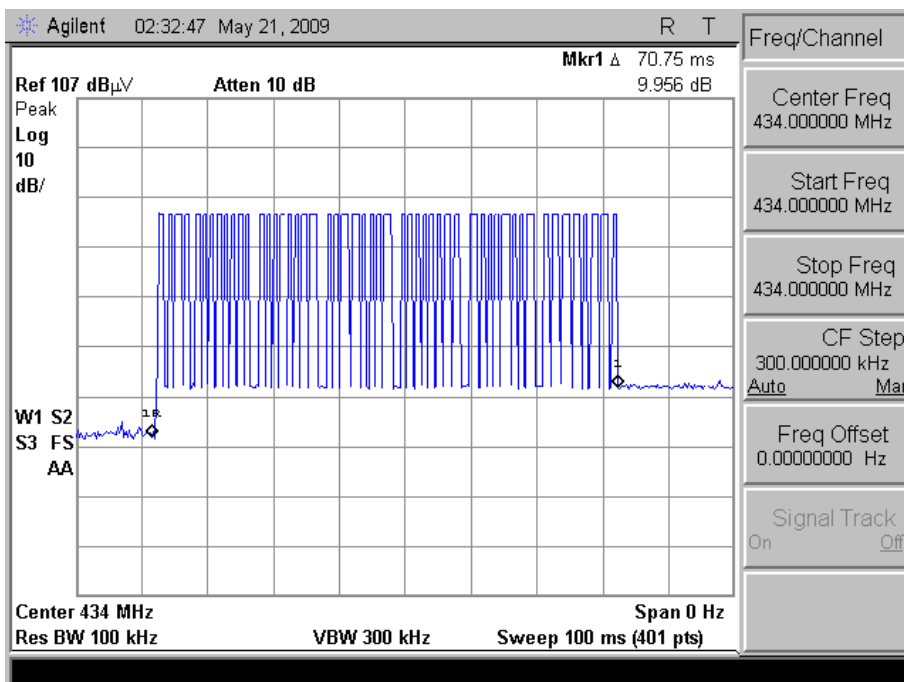
1. RB=100 KHz, VB=300 KHz, SPAN=0
2. Total ON interval in a complete pulse train = (Long Pluse * Long Pluse(Number of Pluse))+(Short Pluse * Short Pluse (Number of Pluse))
3. Duty Cycle=
$$\frac{\text{Total On Interval in a Complete Pulse Train}}{\text{Length of a Complete Pulse Train}}$$



Duty Cycle Test Diagrams



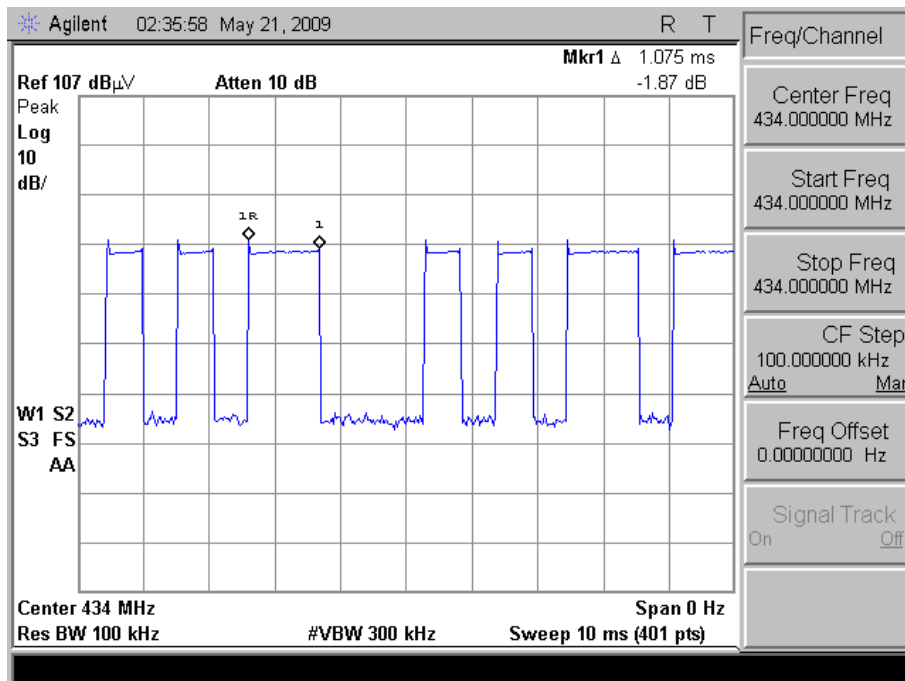
Duty cycle 1



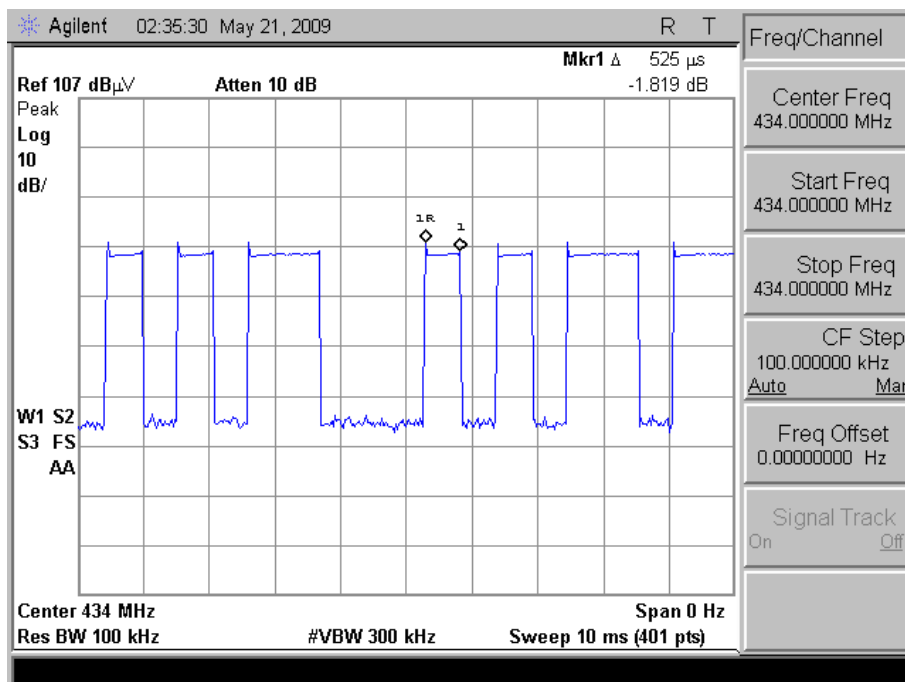
Duty cycle 2



Time Slot Test Diagrams



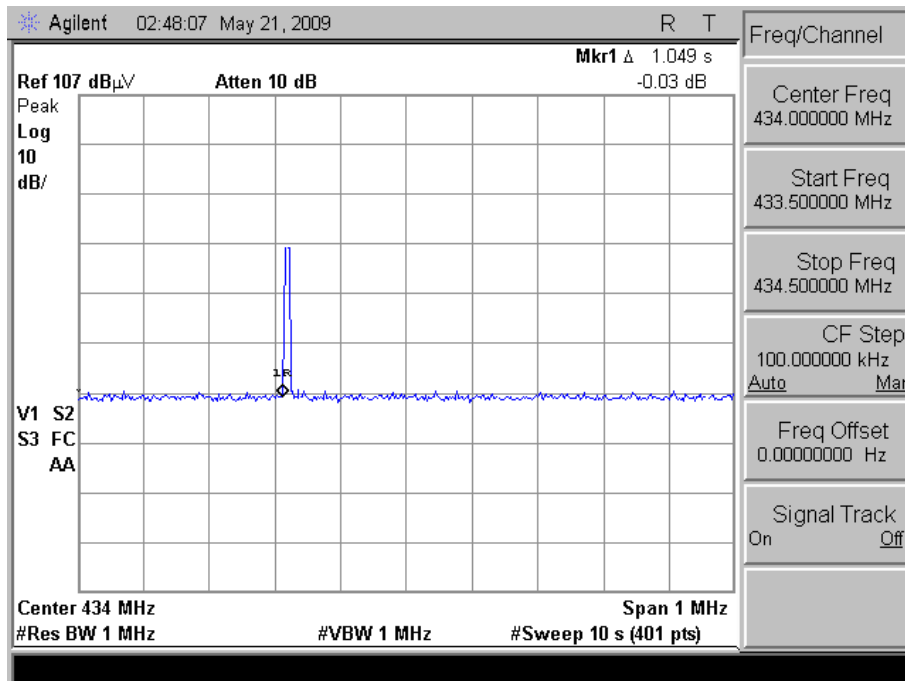
Time Slot 1



Time Slot 2



The EUT was complied with the requirement of FCC 15.231 (a) (1), which employed a switch that will automatically deactivate the transmitter within less than 5 seconds of being released.





2.8 Test Result:

The final test emission data is shown on as following tables.

Applicant : Hearth & Home Technologies
 Model No : RC100
 EUT : Remote Control Transmitter
 Test Mode : Radiated Emission below 1GHz
 Test Date : 05/26/2009

Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Correction Factor (dB/m)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
48.11	V	40.16	-12.04	28.12	40.0	-11.88	Peak
98.76	V	38.67	-11.86	26.81	43.5	-16.69	Peak
123.99	V	38.49	-14.91	23.58	43.5	-19.92	Peak
195.96	V	36.45	-13.12	23.33	43.5	-20.17	Peak
240.87	V	38.38	-11.42	26.96	46.0	-19.04	Peak
297.18	V	37.26	-10.09	27.17	46.0	-18.83	Peak
342.18	V	40.66	-9.00	31.66	46.0	-14.34	Peak
543.09	V	44.23	-6.05	38.18	46.0	-7.82	Peak
651.07	V	38.38	-4.21	34.17	46.0	-11.83	Peak
989.43	V	41.68	0.89	42.57	54.0	-11.43	Peak
40.36	H	38.38	-11.89	26.49	40.0	-13.51	Peak
103.38	H	37.62	-12.00	25.62	43.5	-17.88	Peak
137.26	H	43.43	-16.13	27.30	43.5	-16.20	Peak
217.85	H	56.72	-12.57	44.15	46.0	-1.85	Peak
249.69	H	40.39	-10.84	29.55	46.0	-16.45	Peak
291.57	H	43.43	-10.05	33.38	46.0	-12.62	Peak
367.11	H	37.75	-8.68	29.07	46.0	-16.93	Peak
537.29	H	38.51	-6.25	32.26	46.0	-13.74	Peak
633.44	H	37.62	-4.41	33.21	46.0	-12.79	Peak
993.48	H	34.98	0.84	35.82	54.0	-18.18	Peak

Notes:

1. Margin= Corrected Level – Limits
2. Corrected Level = Reading + Correction Factor
3. Correction Factor = Antenna Factor + Cable Loss - Preamp
4. The EUT was worst case on X axis after pretest on X & Y & Z axis setting.



Applicant : Hearth & Home Technologies
 Model No : RC100
 EUT : Remote Control Transmitter
 Test Mode : Fundamental and harmonics emissions
 Test Date : 05/26/2009

Frequency (MHz)	Antenna Polarization	Reading (dB μ V)	Correction Factor (dB/m)	Average Factor (dB)	Corrected Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Det. Mode
433.89	V	93.53	-8.01	-7.28	78.24	80.82	-2.58	Peak
868.40	V	52.18	-0.77	-7.28	44.13	60.82	-16.69	Peak
433.89	H	73.15	-8.01	-7.28	57.86	80.82	-22.96	Peak
868.40	H	48.36	-0.77	-7.28	40.31	60.82	-20.51	Peak

Notes:

1. Margin= Corrected Level – Limits
2. Corrected Level = Reading + Correction Factor
3. Correction Factor = Antenna Factor + Cable Loss - Preamp
4. The present spurious points only shows that above noise level and the frequency range test from 30MHz to 10th harmonic of frequency.
5. The EUT was worst case on X axis after pretest on X & Y & Z axis setting.

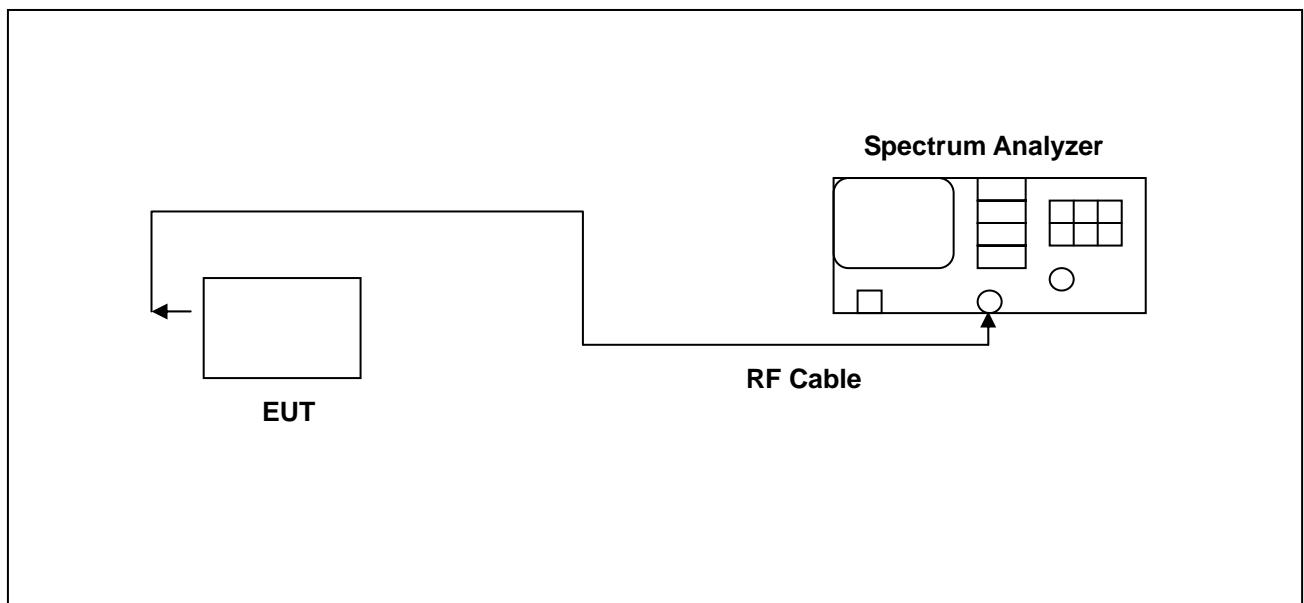
3. 99 % Bandwidth / 20dB Bandwidth

3.1 Test Condition & Setup:

The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The spectrum analyzer used the following settings:

1. Span = approx. 2 to 3 times the 20dB bandwidth, centered on a hopping frequency
2. VBW \geq RBW
3. Sweep = auto
4. Detector function = peak
5. Trace = max hold

3.2 Test Instruments Configuration:





3.3 Test Equipment List:

Describe	Manufacturer	Model	Serial Number	Calibration	
				Cal. Date	Due Date
Spectrum Analyzer	Agilent	E4445A	MY46181986	May 14, 2009	May 14, 2010

3.4 Limits

According to FCC 15.231(c) & RSS-210 Section A1.1.3 requirement:

The 99% bandwidth shall be no wider than 0.25% of the centre frequency for devices operating between 70-900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the centre frequency.

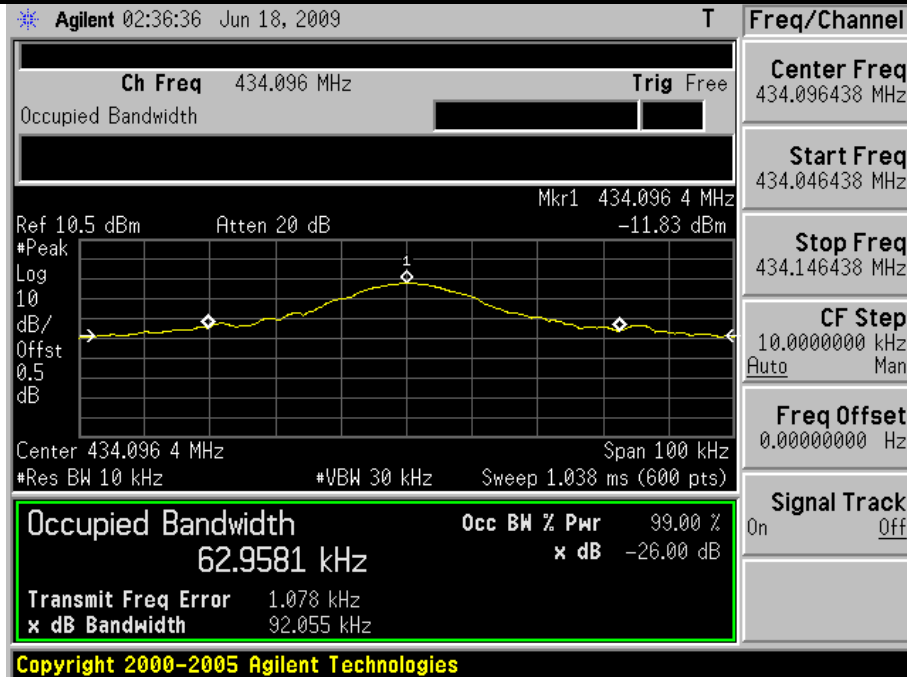
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated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

B.W (20dBc) Limit = $0.25\% \times f \text{ (MHz)} = 0.25\% \times 433.89 \text{ MHz} = 1084.73 \text{ kHz}$

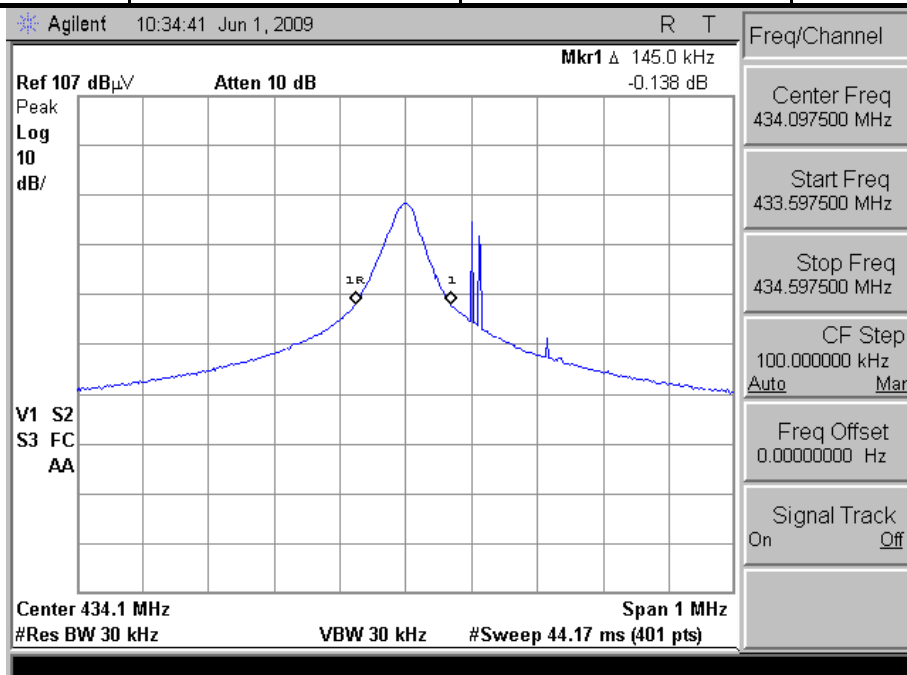


3.5 Test Result

Channel Frequency (MHz)	99% Bandwidth (kHz)	Limit (kHz)	Note
434.1	62.9581	1084.73	RB=10KHz , VB=30KHz



Channel Frequency (MHz)	20dB Bandwidth (kHz)	Limit (kHz)	Note
434.1	145	1084.73	RB=30KHz , VB=30KHz



Appendix A - EUT Photographs

EUT Photo _ 1 of 14



EUT Photo _ 2 of 14



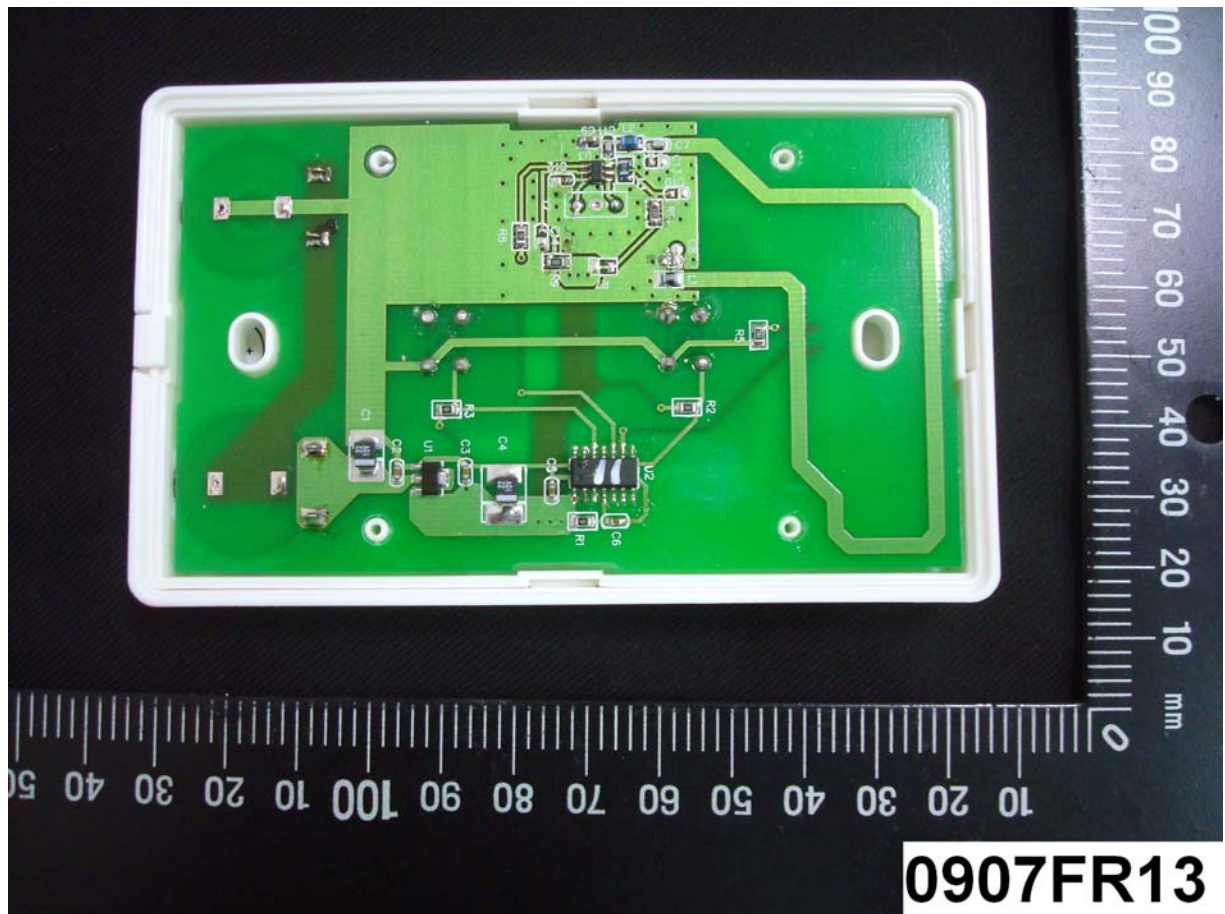
EUT Photo _ 3 of 14



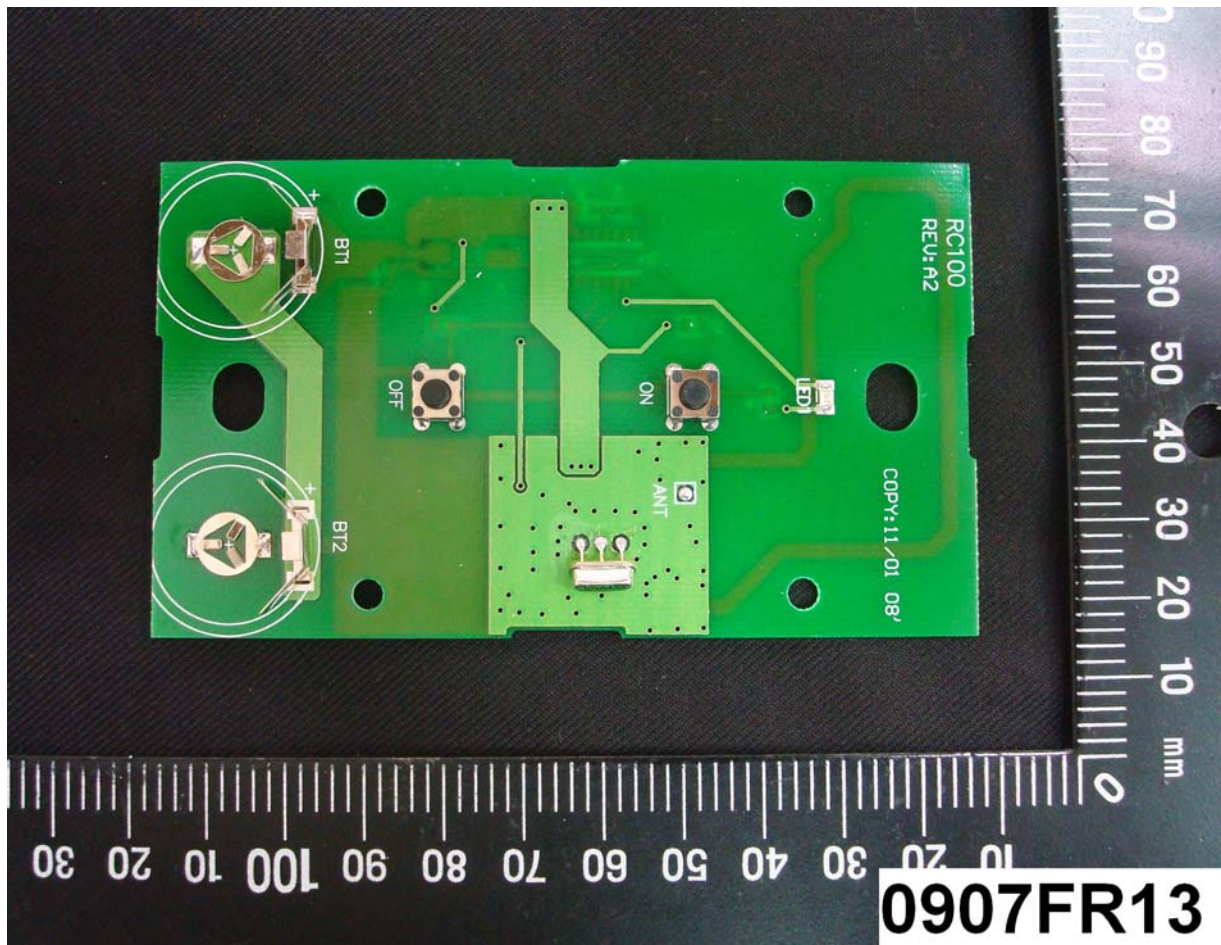
EUT Photo _ 4 of 14



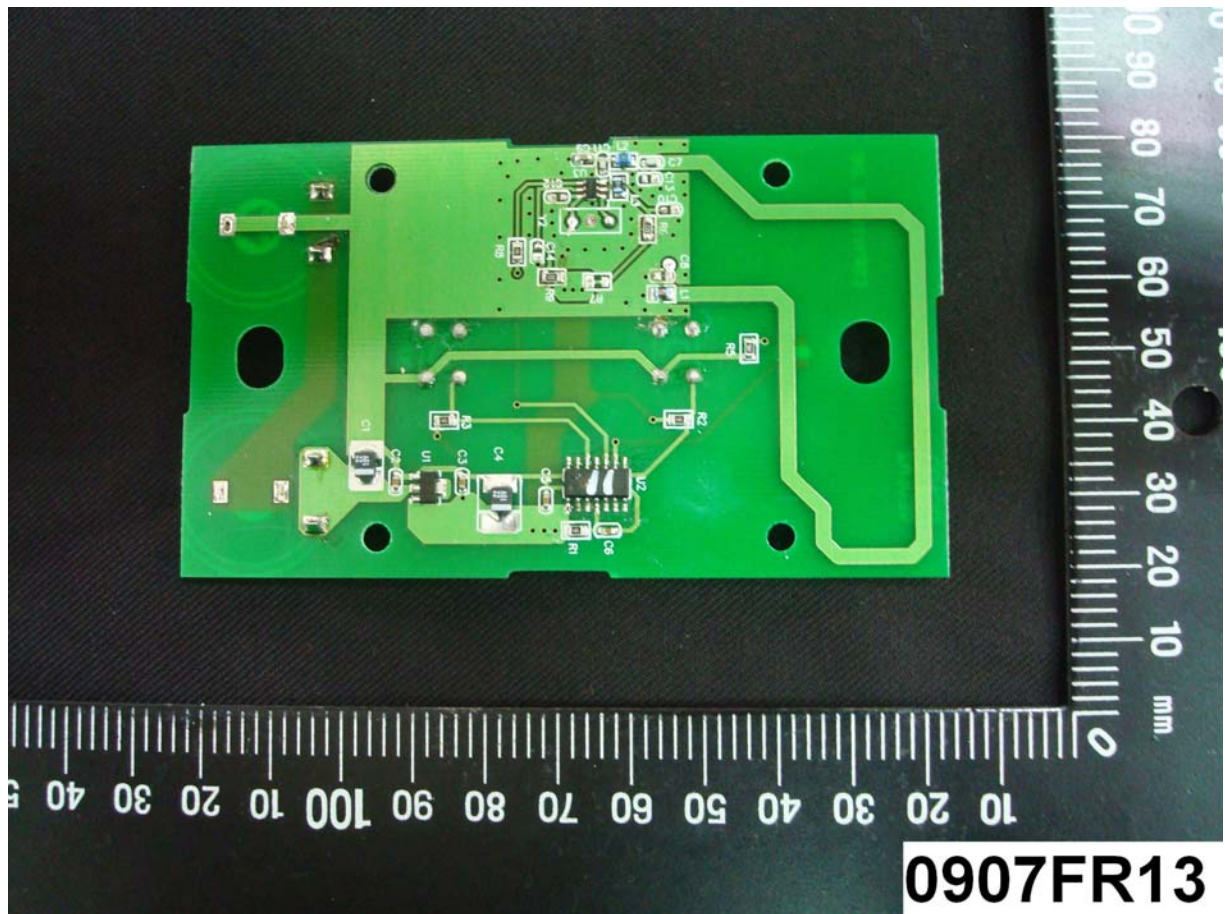
EUT Photo _ 5 of 14



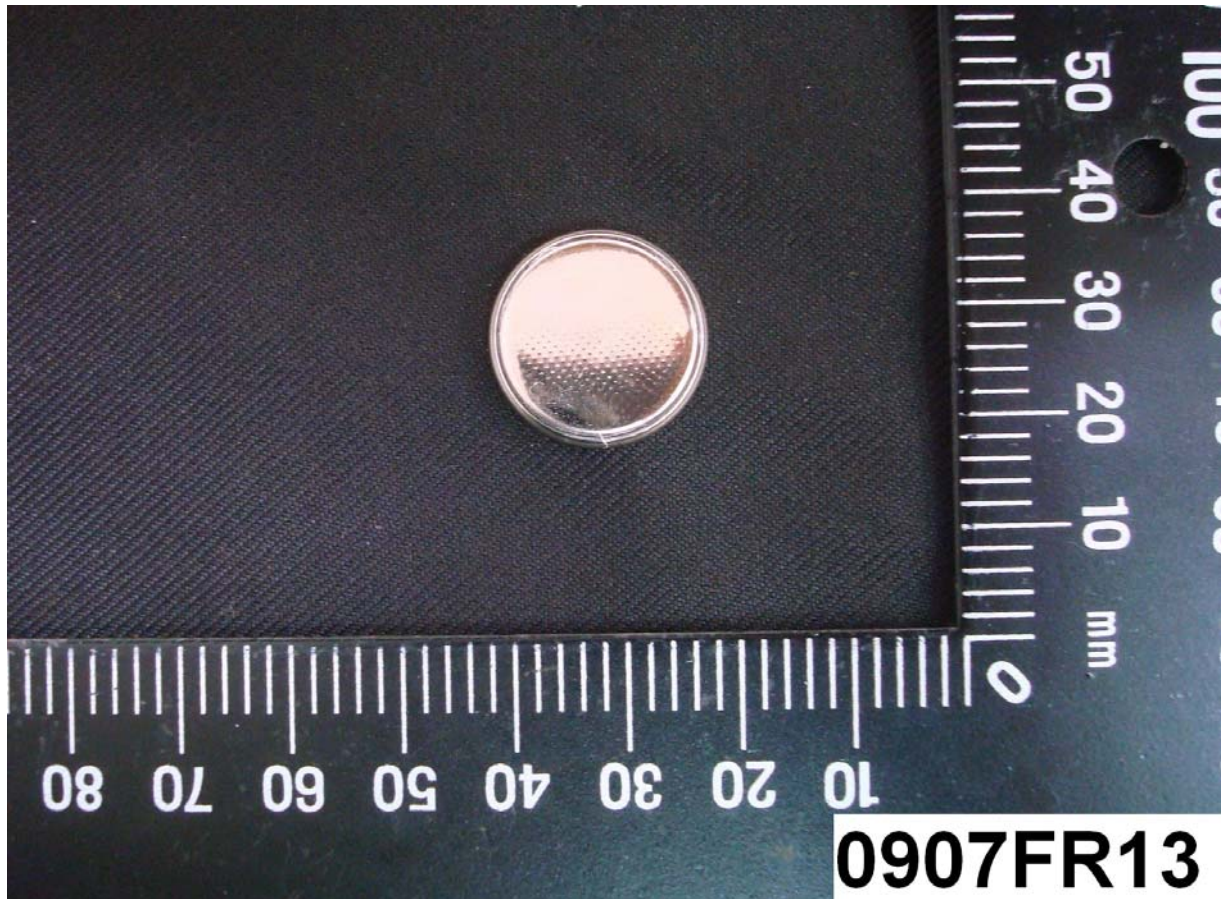
EUT Photo _ 6 of 14



EUT Photo _ 7 of 14



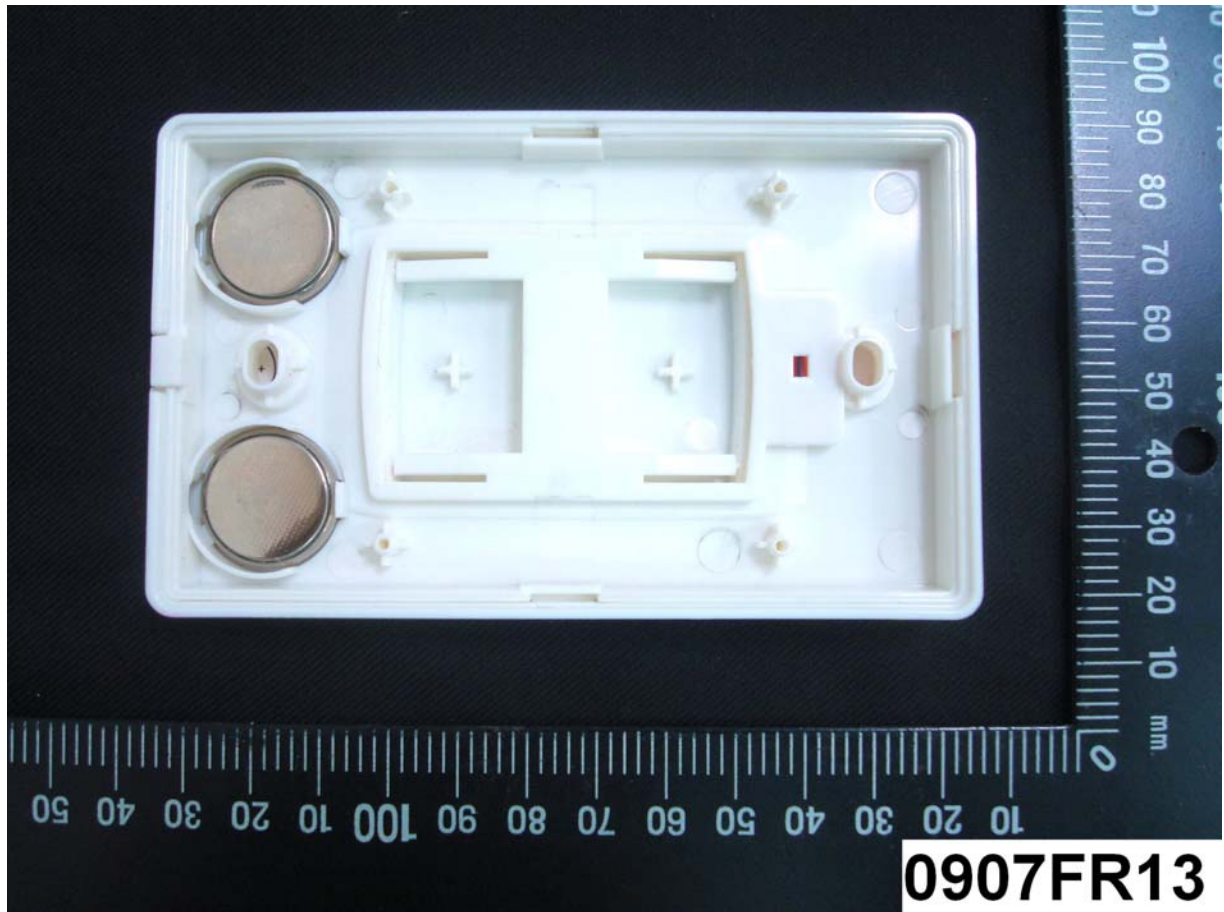
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EUT Photo _ 9 of14



EUT Photo _ 10 of 14



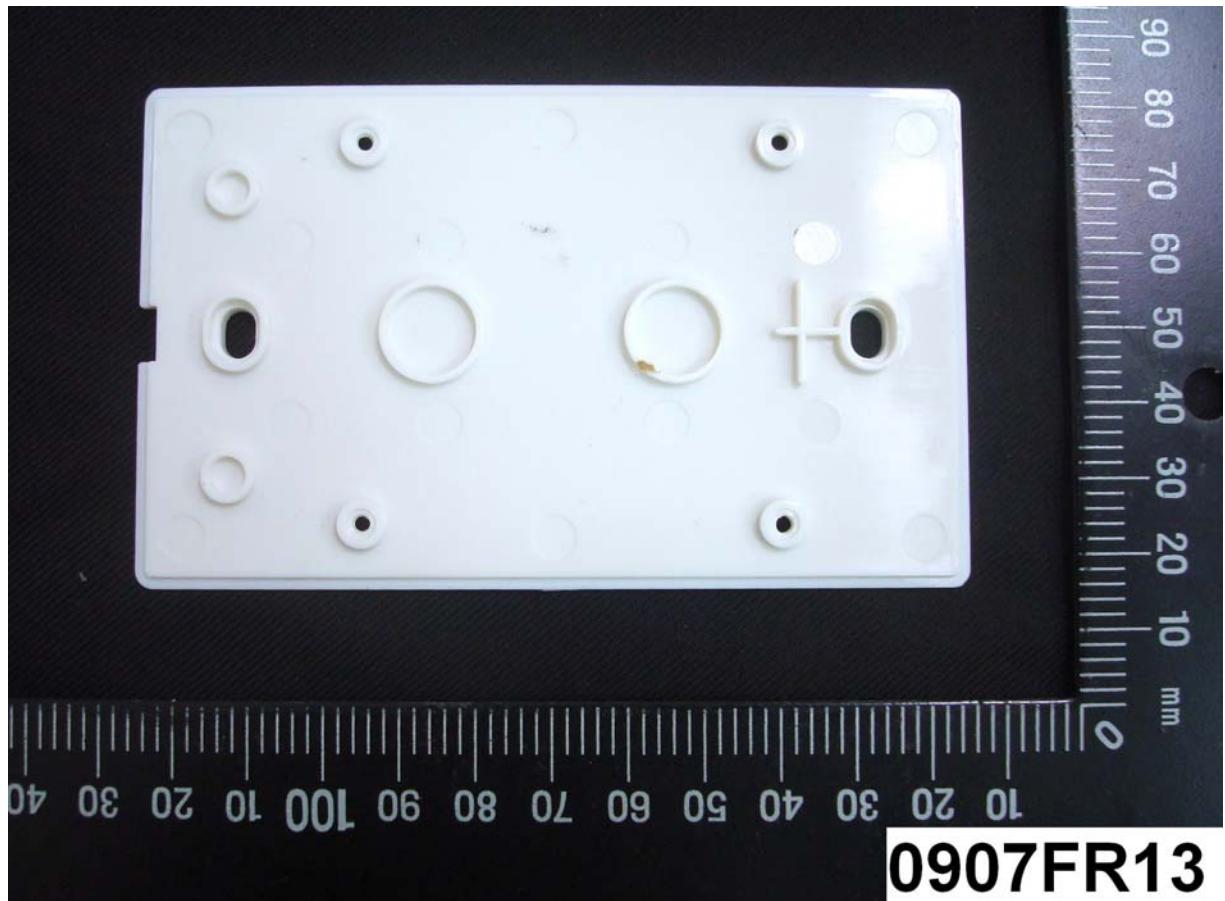
EUT Photo _ 11 of 14



EUT Photo _ 12 of14



EUT Photo _13 of 14



EUT Photo _14 of 14

