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FCC TEST REPORT

Under :

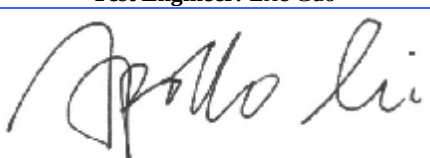
FCC 15 Subpart C, Paragraph 15.231

Prepared For :

STL INTERNATIONAL LTD.

Tung Kong Industrial Zone, Liu Mei Village, Yuen Zhou Bolou, China

FCC ID: RF7-RX5-TX2
EUT: Remote Controller
Model: RX5-TX2-1

June 26, 2013
Issue Date:
Original Report
Report Type:
<i>Eric Guo</i>
Test Engineer: Eric Guo

Review By: Apollo Liu / Manager

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TABLE OF CONTENTS

1. General Information	3
1. 1 Notes.....	3
1. 2 Testing Laboratory	3
1. 3 Details of Applicant.....	3
1. 4 Application Details	3
1. 5 Test Item	3
1. 6 Test Standards.....	3
2. Technical Test	4
2. 1 Summary of Test Results	4
3. EUT Modifications	4
4. Conducted Power Line Test	5
4. 1 Test Equipment	5
4. 2 Test Procedure	5
4. 3 Test Setup	5
4. 4 Configuration of The EUT.....	6
4. 5 EUT Operating Condition.....	7
4. 6 Conducted Power Line Emission Limits	7
4. 7 Conducted Power Line Test Result.....	7
5. Radiated Emission Test	8
5. 1 Test Equipment	8
5. 2 Test Procedure	8
5. 3 Radiated Test Setup	8
5. 4 Configuration of The EUT.....	10
5. 5 EUT Operating Condition.....	10
5. 6 Radiated Emission Limit	10
5. 7 Radiated Emission Test Result.....	11
6. Technical Characteristic.....	12
6. 1 Band Edge	12
6.1.1 Test Equipment	12
6.1.2 Test Procedure	12
6.1.3 Radiated Test Setup	12
6.1.4 Configuration of The EUT.....	13
6.1.5 EUT Operating Condition.....	13
6.1.6 Band Edge FCC 15.231 Limit	13
6.1.7 Band Edge Test Result.....	13
6. 2 Calculation of Average Factor	14
6. 3 Manually Operated Transmitter Deactivation.....	16
6. 4 Antenna Requirement	17
7. Photos of Testing	18
7. 1 EUT Test Photographs.....	18
7. 2 EUT Detail Photographs.....	19
8. FCC ID Label.....	30
9. Test Equipment	31

1. General Information

1.1 Notes

The test results of this report relate exclusively to the test item specified in 1.5. The KMO Lab does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the KMO Lab.

1.2 Testing Laboratory

SinTek Laboratory Co., Ltd.

Site on File with the Federal Communications Commission – United States

Registration Number: 963441

1.3 Details of Applicant

Name : STL INTERNATIONAL LTD.
Address : Tung Kong Industrial Zone, Liu Mei Village, Yuen Zhou Bolou, China
Contact : Eunice Chan
Tel : 24998911
Fax : 30180754

1.4 Application Details

Date of Receipt of Application : April 28, 2013
Date of Receipt of Test Item : April 28, 2013
Date of Test : May 22~May 30, 2013

1.5 Test Item

Manufacturer : STL INTERNATIONAL LTD.
Address : Tung Kong Industrial Zone, Liu Mei Village, Yuen Zhou Bolou, China
Trade Name : N/A
Model No.(Base) : RX5-TX2-1
Model No.(Extension) : RX5-TX2-2, RX5-TX2-3
Description : Remote controller

Additional Information

Frequency : 433.920MHz
Transmission Range : N/A
Number of Channels : 1
Antenna : Internal
Power Supply : DC 3V(By battery AAA 1.5V*2)
Extreme Temp. Tolerance : N/A

1.6 Test Standards

Title 47 CFR, FCC Part 15, including: 15.203, 15.205, 15.207, 15.209, 15.231a, 15.231b and 15.231c.

Note: All radiated measurements were made in all three orthogonal planes. The values reported are the maximum values.

2. Technical Test

2.1 Summary of Test Results

The EUT has been tested according to the following specifications:

Standard	Test Type	Result	Notes
FCC Part 15, Paragraph 15.203	Antenna Requirement	PASS	Complies
FCC Part 15, Paragraph 15.207	Conducted Test	N/A	Owing to the DC operation of EUT, this test item is not performed.
FCC Part 15 Subpart C Paragraph 15.231(a)	Periodic Operation Characteristics	PASS	Complies
FCC Part 15 Subpart C Paragraph 15.231(b) Limit	Field Strength of Fundamental	PASS	Complies
FCC Part 15, Subpart C Paragraph 15.231(b) Limit & Paragraph 15.209, Paragraph 15.205(b)	Radiated Test	PASS	Complies
FCC Part 15 Subpart C Paragraph 15.231(c) Limit	Measured 20 dB Bandwidth	PASS	Complies.

3. EUT Modifications

No modification by test lab.

4. Conducted Power Line Test

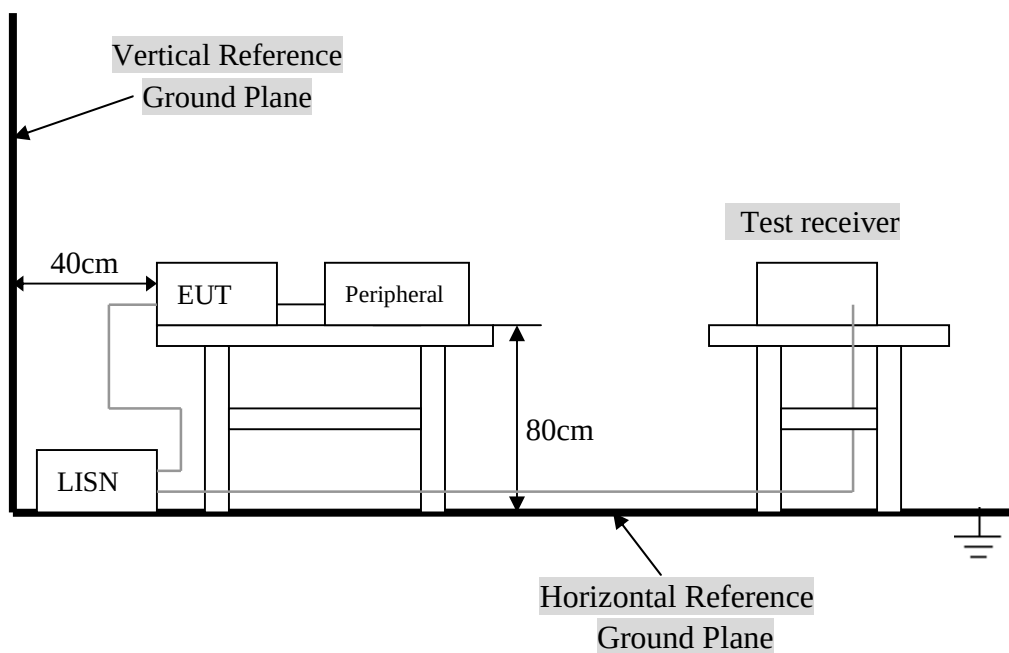
4.1 Test Equipment

Please refer to Section 9 this report.

4.2 Test Procedure

The EUT was tested according to ANSI C63.4 - 2003. The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm / 50 uHenry as specified by section 5.1 of ANSI C63.4 - 2003. cables and peripherals were moved to find the maximum emission levels for each frequency.

4.3 Test Setup



For the actual test configuration, Please refer to the related items – Photos of Testing.

4. 4 Configuration of The EUT

The EUT was configured according to ANSI C63.4-2003. EUT was used DC 3V. Press any key of the EUT. Once the button releasing, the transmission will be stopped within 5 second. The EUT transmitted continuously and the duty cycle of transmitting was set to worst case condition, which provided by manufacturer during all the tests. All interface ports were connected to the appropriate peripherals. All peripherals and cables are listed below.

A. EUT

Device	Manufacturer	Model #	FCC ID
Remote controller	STL INTERNATIONAL LTD.	RX5-TX2-1	RF7-RX5-TX2

B. Internal Devices

Device	Manufacturer	Model #	FCCID / DoC
N/A			

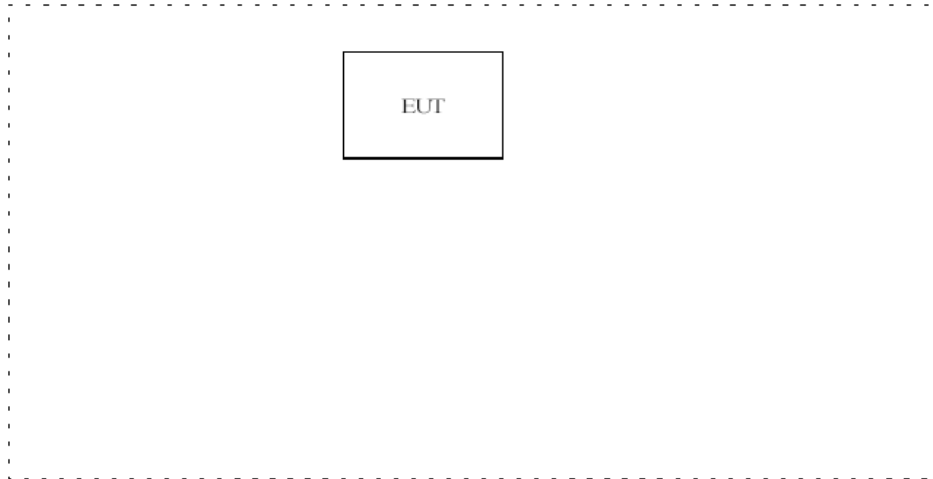
C. Peripherals

Device	Manufacturer	Model # Serial #	FCC ID/ DoC	Cable
N/A				

4. 5 EUT Operating Condition

Operating condition is according to ANSI C63.4 - 2003.

- A. Setup the EUT and simulators as shown on follow.
- B. Enable RF signal and confirm EUT active.
- C. Modulate output capacity of EUT up to specification.



4. 6 Conducted Power Line Emission Limits

FCC Part 15 Paragraph 15.207 (dBuV)		
Frequency Range (MHz)	Class A QP/AV	Class B QP/AV
0.15 – 0.5	79/66	66-56/56-46
0.5 – 5.0	73/60	56/46
5.0 - 30	73/60	60/50

NOTE : In the above table, the tighter limit applies at the band edges.

4. 7 Conducted Power Line Test Result

Owing to the DC operation of EUT, this test item is not performed.

5. Radiated Emission Test

5.1 Test Equipment

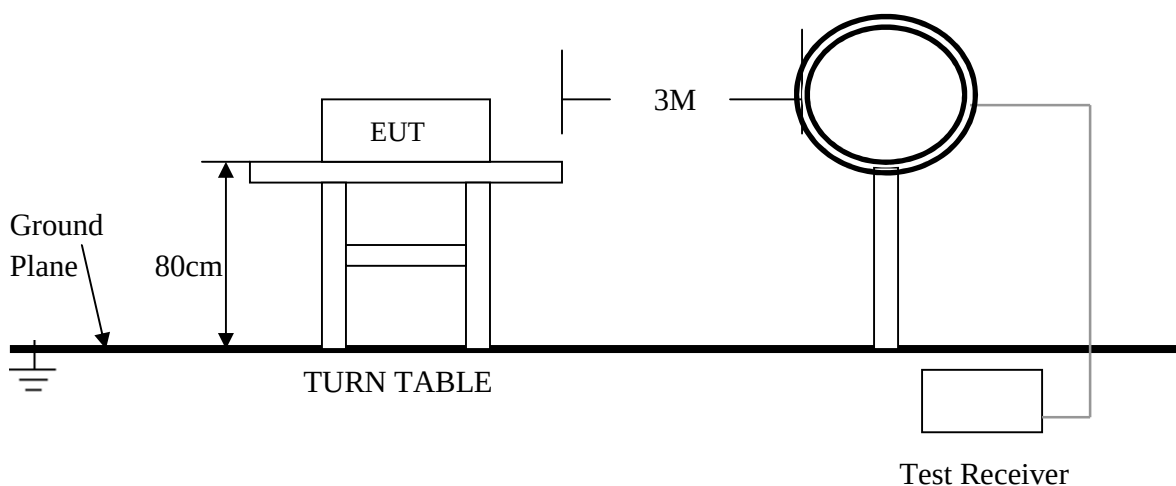
Please refer to Section 9 this report.

5.2 Test Procedure

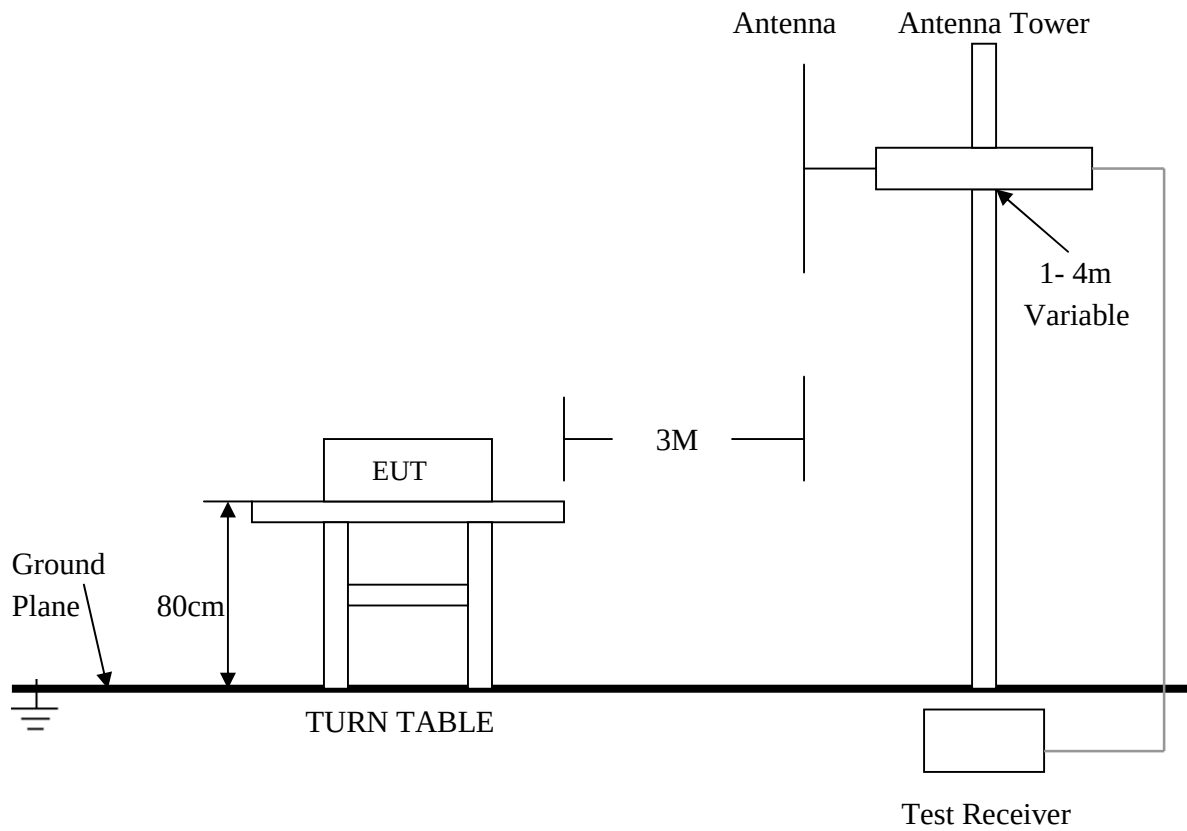
1. The EUT was tested according to ANSI C63.4 - 2003.
2. The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.4-2003.
3. The frequency spectrum from 9 kHz to 25 GHz was investigated. All readings from 9 kHz to 150 kHz are quasi-peak values with a resolution bandwidth of 200 Hz. All readings from 150 kHz to 30 MHz are quasi-peak values with a resolution bandwidth of 9 KHz. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 KHz. All readings are above 1 GHz , peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.
4. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. The Receiving antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency. Emissions below 30MHz were measured with a loop antenna while emission above 30MHz were measured using a broadband E-field antenna.
5. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.4 - 2003.

5.3 Radiated Test Setup

For Frequencies below 30 MHz



For the actual test configuration , please refer to the related items – Photos of Testing

For Frequencies above 30 MHz

For the actual test configuration , please refer to the related items – Photos of Testing.

5.4 Configuration of The EUT

Same as section 4 . 4 of this report

5.5 EUT Operating Condition

Same as section 4 . 5 of this report.

5.6 Radiated Emission Limit

All emission from a digital device, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strength specified below :

A. FCC Part 15 Subpart C Paragraph 15.231(b) Limit

Calculation of Radiated Emissions limits for FCC Part 15.231b (260-470MHz)

Field Strength of Fundamental / Harmonic Frequencies:

The calculation involves a linear interpolation of 3750 to 12500 uV/m over 260 - 470 MHz, where field strength of the fundamental frequency (f_0) when, 260 - 470 MHz, can be found by: $41.6667(f_0) - 7083.3333$, where f_0 is in MHz.

Field Strength of Spurious / Harmonic Frequencies:

The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

where $f_0 = 433.920\text{MHz}$

Fundamental: $41.6667(433.920) - 7083.3333 = 10996.6\text{uV/m}$

Fundamental Frequency (MHz)	Field Strength of Fundamental (3m)		Field Strength of Harmonics (3m)	
	uV/m	dBuV/m	uV/m	dBuV/m
433.920	10996.6	80.83	1099.96	60.83

- Note:**
- (1) RF Voltage (dBuV) = 20 log RF Voltage (uV)
 - (2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
 - (3) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.

B. Frequencies in restricted band are complied to limit on Paragraph 15.209.

Frequency (MHz)	Distance (m)	Field Strength (dBuV/m)
30 - 88	3	40.0
88 - 216	3	43.5
216 - 960	3	46.0
ABOVE 960	3	54.0

- Note:**
- (1) RF Voltage (dBuV) = 20 log RF Voltage (uV)
 - (2) In the Above Table, the tighter limit applies at the band edges.
 - (3) Distance refers to the distance in meters between the measuring instrument antenna and the

5. 7 Radiated Emission Test Result

A. Fundamental Radiated Emission Data

Product	: Remote controller	Test Mode	: Normal
Test Item	: Fundamental Radiated Emission Data	Temperature	: 25 °C
Test Voltage	: DC 3V	Humidity	: 56%RH
Test Result	: PASS		

Freq. (MHz)	Emission Peak (dBuV/m)	Calculated Average Level (dBuV/m)	HORIZ / VERT	Limits (dBuV/m)	Margin (dB)
433.920	82.42	70.72	HORIZ	80.83	-10.11
433.920	76.26	64.56	VERT	80.83	-16.27

Note: (1) Emission Level = Reading Level + Probe Factor + Cable Loss + Duty Cycle.
 (2) The Duty Cycle = 11.7dB, Refer to section 6.2 of this report.

B. General Radiated Emission Data & Harmonics Radiated Emission Data

Product	: Remote controller	Test Mode	: Normal
Test Item	: General Radiated Emission Data & Harmonics Radiated Emission Data	Temperature	: 25 °C
Test Voltage	: DC 3V	Humidity	: 56%RH
Test Result	: PASS		

For Frequency Below 30MHz

Freq. (MHz)	Emission (dBuV/m) QP Detector	HORIZ / VERT	Limits (dBuV/m)	Margin (dB)
N/A	N/A	N/A	N/A	N/A

Note: (1) All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
 (2) "N/A" remark, if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
 (3) Emission Level = Reading Level + Probe Factor + Cable Loss.

For Frequency Above 30MHz

Freq. (MHz)	Emission Peak (dBuV/m)	Calculated Average Level (dBuV/m)	HORIZ / VERT	Limits (dBuV/m)	Margin (dB)
867.84	55.78	44.08	HORIZ	60.83	-16.75
867.84	54.37	42.67	VERT	60.83	-18.16
1301.76	37.33	25.41	HORIZ	60.83	-35.42
1301.76	45.28	33.58	VERT	60.83	-27.25
4338.80	-	-	HORIZ	-	-
4338.80	-	-	VERT	-	-

Note: (1) Emission Level = Reading Level + Probe Factor + Cable Loss + Duty Cycle.
 (2) The Duty Cycle = -11.7dB, Refer to section 6.2 of this report.

6. Technical Characteristic

6.1 Band Edge

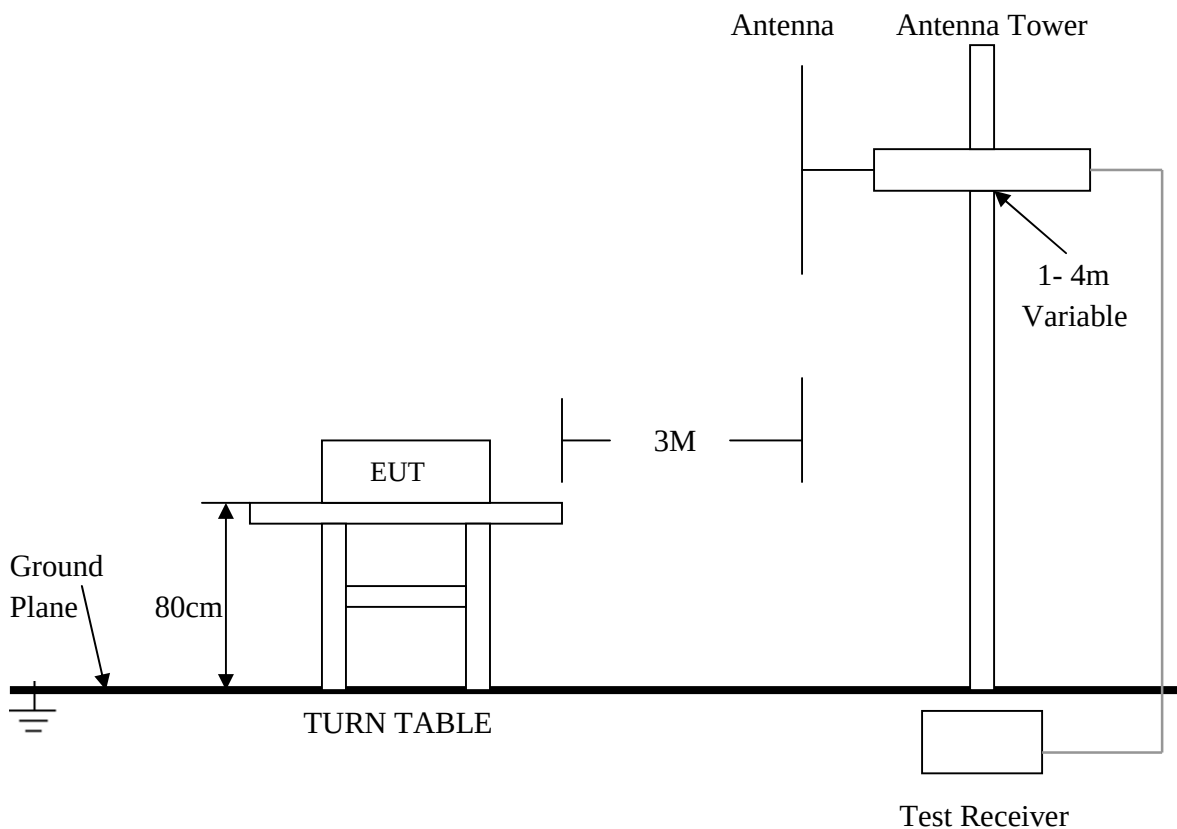
6.1.1 Test Equipment

Please refer to Section 9 this report.

6.1.2 Test Procedure

1. The EUT was tested according to ANSI C63.4 - 2003.
2. The EUT, peripherals were put on the turntable which table size is 1m x 1.5 m, table high 0.8 m. All set up is according to ANSI C63.4-2003.
3. The frequency spectrum from 9 kHz to 25 GHz was investigated. All readings from 9 kHz to 150 kHz are quasi-peak values with a resolution bandwidth of 200 Hz. All readings from 150 kHz to 30 MHz are quasi-peak values with a resolution bandwidth of 9 KHz. All readings from 30 MHz to 1 GHz are quasi-peak values with a resolution bandwidth of 120 KHz. All readings are above 1 GHz , peak values with a resolution bandwidth of 1 MHz . Measurements were made at 3 meters.
4. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. The Receiving antenna high is varied from 1 m to 4 m high to find the maximum emission for each frequency. Emissions below 30MHz were measured with a loop antenna while emission above 30MHz were measured using a broadband E-field antenna.
5. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limit), and are distinguished with a "QP" in the data table.
6. Each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this transmitter(EUT) was rotated through three orthogonal axes according to the requirements in Section 8 and 13 of ANSI C63.4 - 2003.

6.1.3 Radiated Test Setup



For the actual test configuration , please refer to the related items – Photos of Testing

6.1.4 Configuration of The EUT

Same as section 4 . 4 of this report

6.1.5 EUT Operating Condition

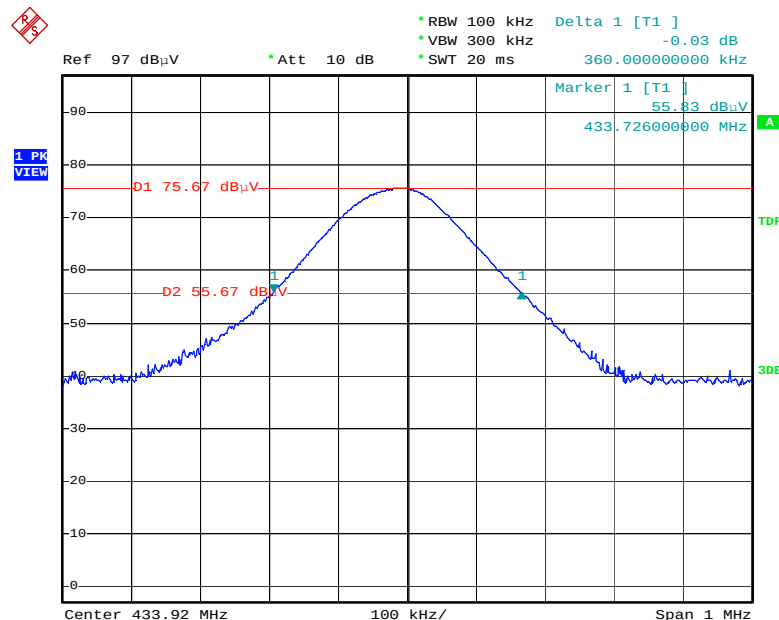
Same as section 4 . 5 of this report.

6.1.6 Band Edge FCC 15.231 Limit

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.
 $B.W(20dBc) \text{ Limit} = 0.25\% \times f \text{ (MHz)} = 0.25\% \times 433.92\text{MHz} = 1.0848\text{MHz}$
From the plot, the bandwidth is observed to be 0.360MHz, at 20dBc where the bandwidth limit is 1.0848MHz.

6.1.7 Band Edge Test Result

Product	: Remote controller	Test Mode	: Normal
Test Item	: Band Edge Data	Temperature	: 25 °C
Test Voltage	: DC 3V	Humidity	: 56%RH
Test Result	: PASS		



Date: 30.MAY.2013 13:28:37

- Note:**
- (1) The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.209.
 - (2) The average measurement was not performed when the peak measured data under the limit of average detection.

6.2 Calculation of Average Factor

For a graphical presentation of the data bursts being transmitted from the transmitter, refer to below figures for the amount of time that the transmitter is active. Figures are provided that show the On-time of the transmitter that occurs when a key is held down continuously, and also over a 100 milliseconds (worst case) period. In the 100 millisecond window, with 103.5ms packet length, and 103.5 ms between packets with each packet consisting of 174 bits we will obtain a total of 1 packet transmitted during the 103.5 ms interval. If all bits are high and each bit is 0.156ms long, the On-time for a burst is; $0.156\text{ms} \times 174 \text{ bits} = 27.14\text{ms}$.

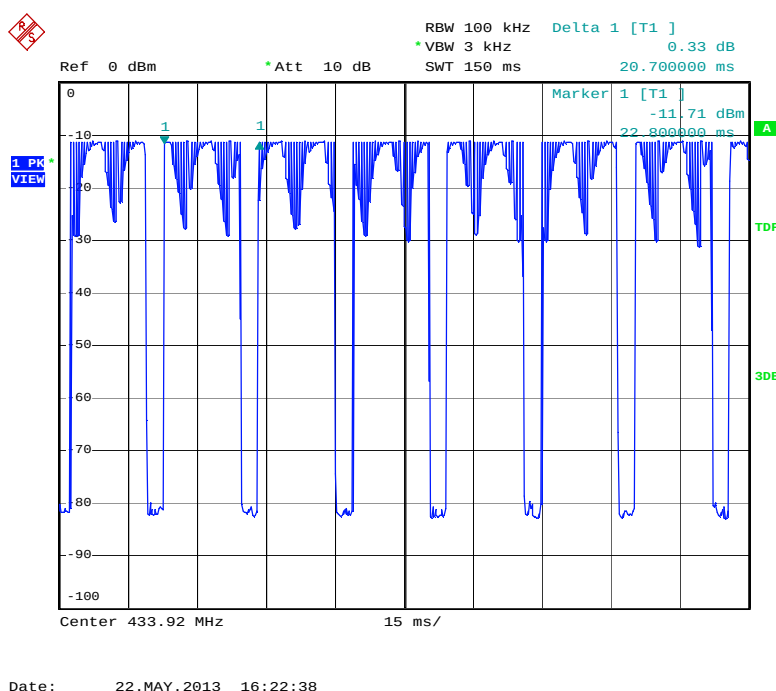
The duration of one cycle = 103.5ms

Effective period of the cycle = 27.14ms

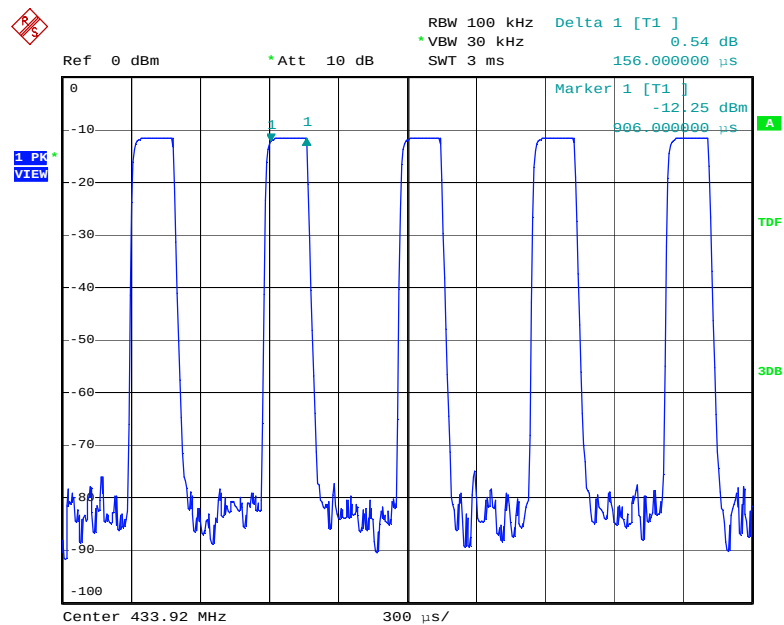
DC = $27.14\text{ms} / 103.5\text{ms} = 0.26$

Averaging Factor = $20 \times \log(\text{DC}) = -11.7\text{dB}$

Duty Cycle Detail, Over a 150 ms Interval

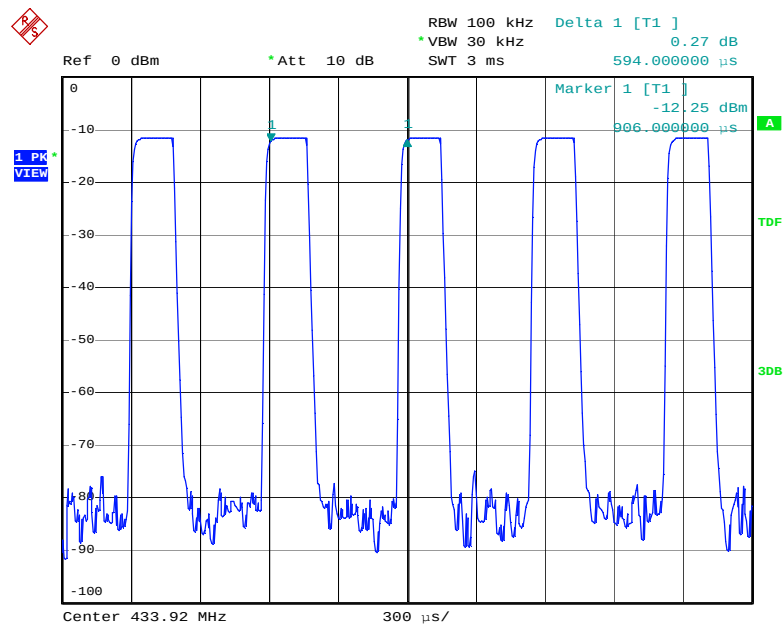


Duty Cycle Detail, Over a 3.0 ms Interval



Date: 22.MAY.2013 16:25:52

Duty Cycle Detail, Over a 3.0 ms Interval

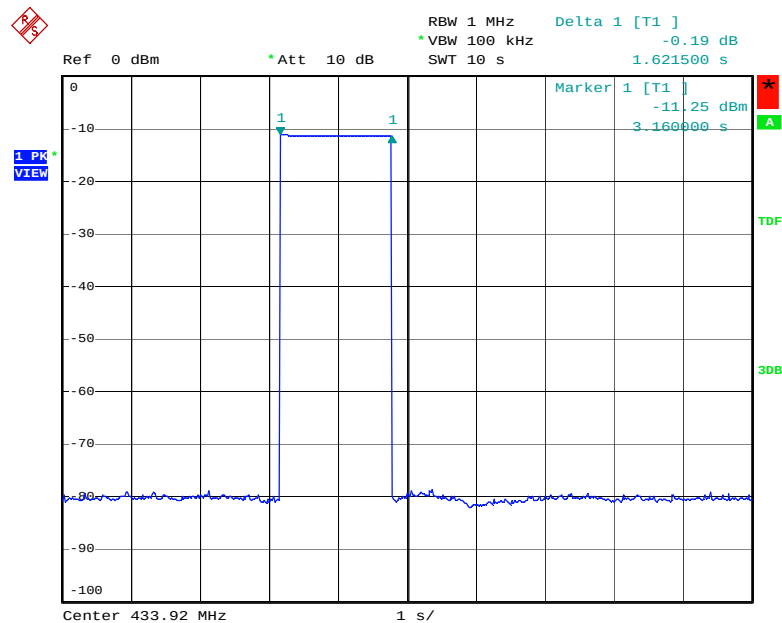


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6. 3 Manually Operated Transmitter Deactivation

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.

Transmitter Turn-Off Release Time, Upon Momentary Activation of Push Switch
(Showing release time less than 3 second)



Date: 22.MAY.2013 16:29:50

6. 4 Antenna Requirement

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

The EUT's antenna is a trace on the PCB. The EUT meets the requirements of this section.

7. Photos of Testing

7.1 EUT Test Photographs

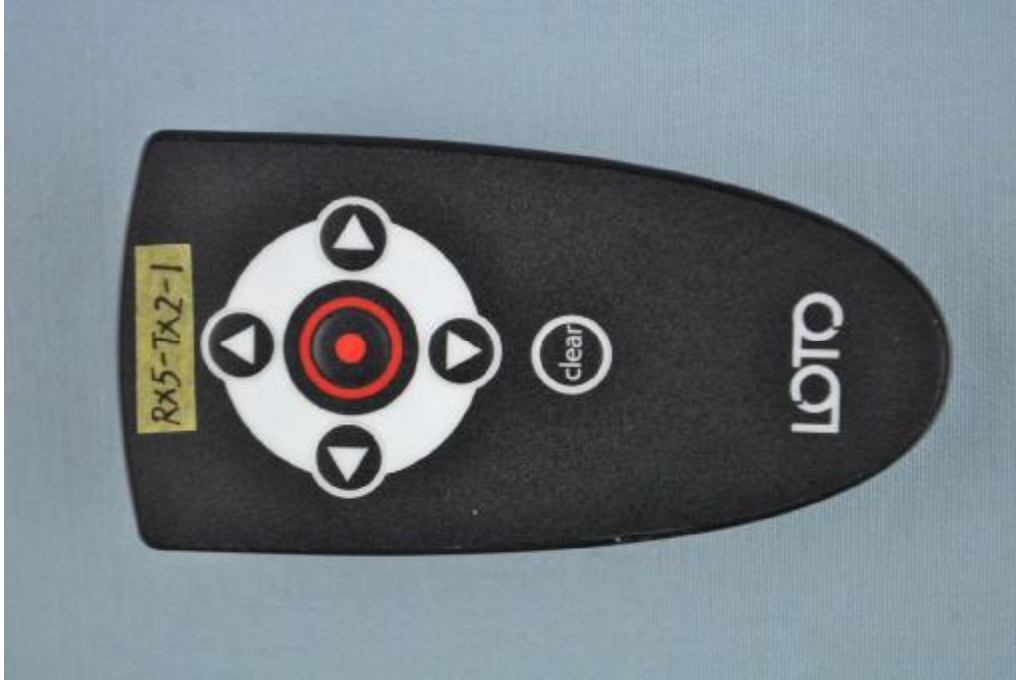
Radiated emission test view



7.2 EUT Detail Photographs

EUT top view

RX5-TX2-1



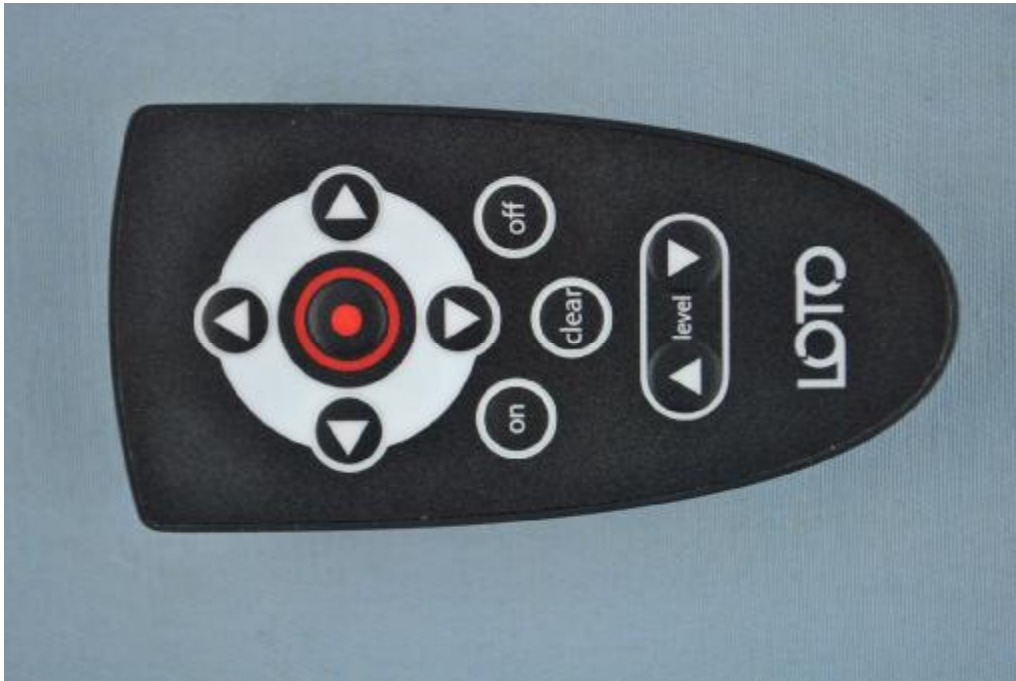


RX5-TX2-2





RX5-TX2-3





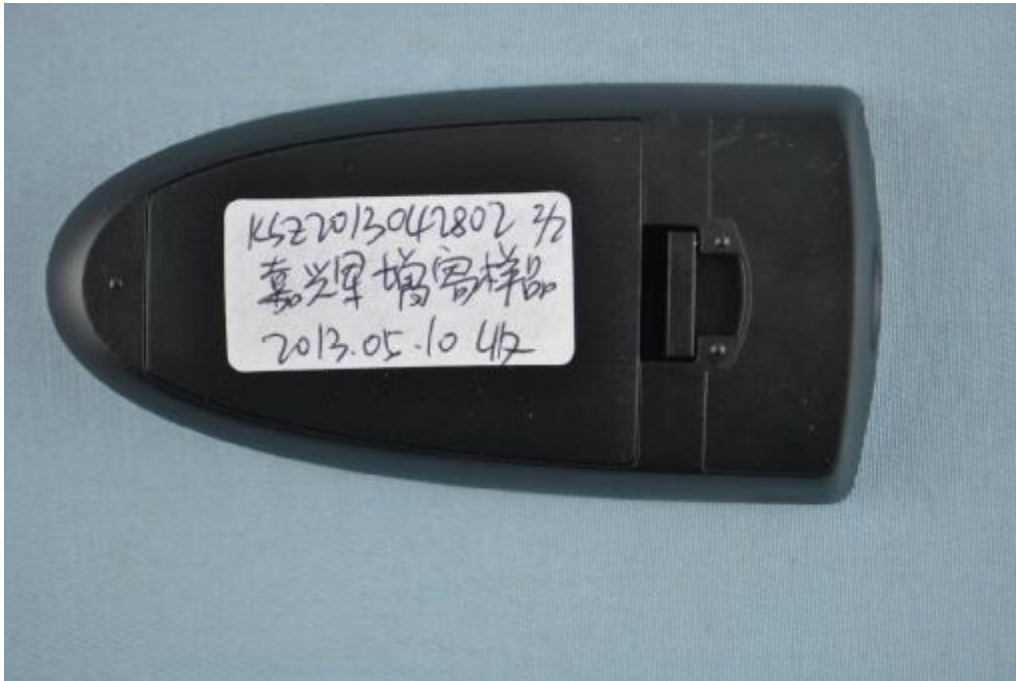
EUT bottom view

RX5-TX2-1





RX5-TX2-2





RX5-TX2-3

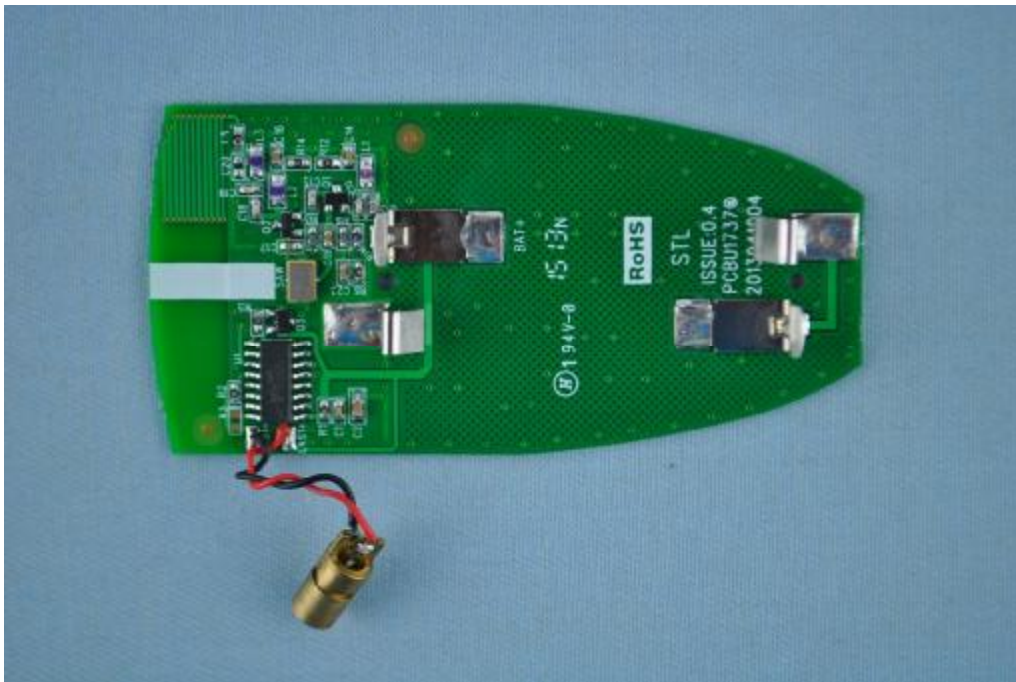




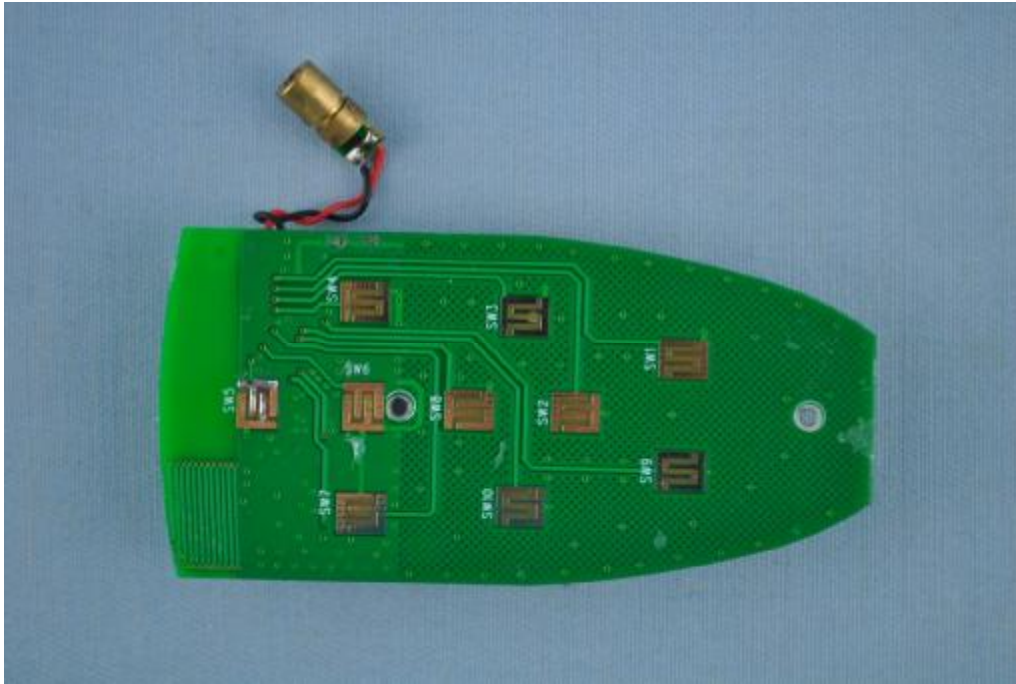
EUT inside whole view



Main board component side



Main board solder side



8. FCC ID Label

FCC ID: RF7-RX5-TX2

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The Label must not be a stick-on paper label. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Proposed Label Location on EUT

EUT Bottom View/Proposed FCC ID Label Location



9. Test Equipment

Equipment/ Facilities	Manufacturer	Model #	Serial No.	Due Date
Turntable	SinTek	N/A	N/A	NCR
Antenna Tower	SinTek	N/A	N/A	NCR
OATS	SinTek	N/A	N/A	Sep.28, 2013
Pre-Amplifier	Agilent	87405C	KMO-SZ155	Dec.6, 2013
Pre-Amplifier	Com-Power	PAM-840	KMO-SZ156	Dec.6, 2013
Horn Antenna	Com-Power	AH-840	KMO-SZ157	Dec.6, 2013
EMI Test Receiver	Rohde & Schwarz	ESPI7	KMO-SZ002	June 01, 2013
Spectrum Analyzer	Rohde & Schwarz	FSP40	KMO-SZ003	May 27, 2014
Signal Generator	FLUKE	PM5418+Y/C	KMO-SZ020	May 27, 2014
Loop Antenna	Rohde & Schwarz	HFH2-Z2	KMO-SZ004	Jan. 30, 2014
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB9161	KMO-SZ005	Sep.18, 2013
Trilog-Super Broadband Antenna	SCHWARZBECK	VULB9161	KMO-SZ006	Sep.18, 2013
Broad-Band Horn Antenna	SCHWARZBECK	BBHA 9120D	KMO-SZ007	Sep.18, 2013
Broad-Band Horn Antenna	SCHWARZBECK	BBHA 9120D	KMO-SZ008	Sep.18, 2013
AMN	Rohde & Schwarz	ESH3-Z5	KMO-SZ009	May 27, 2014
Pulse Limiter	SCHWARZBECK	VTSD 9561-F	KMO-SZ077	Nov.29, 2013
ISN	SCHWARZBECK	NTFM 8158 CAT3	KMO-SZ070	Nov.19, 2013
ISN	SCHWARZBECK	NTFM 8158 CAT5	KMO-SZ071	Nov.19, 2013
ISN	SCHWARZBECK	NTFM 8158 CAT6	KMO-SZ072	Nov.19, 2013
KMO Shielded Room	KMO	KMO-001	N/A	N/A
Coaxial Cable with N-Connectors	SCHWARZBECK	AK9515H	KMO-SZ037	Sep.18, 2013
SOHO Telephone Switching System	IKE	2000-108C	N/A	NCR
3m Anechoic Chamber	KMO	KMO-3AC	KMO-3AC-1	May 29, 2014
Temperature Chamber	TABAI	PSL-4GTW	N/A	Feb.10, 2013