STC Test Report

Date : 2010-07-19
No. : HM165460

Applicant (XLT001): X10 (USA) Inc.
620 Naches Ave. SW Renton, WA 98057

Description of Sample(s): Submitted sample(s) said to be
Product: icon Remote
Brand Name: X10
Model Number: IR34A
FCC ID: B4SIR34A

Date Sample(s) Received: 2010-06-30

Date Tested: 2010-07-07

Investigation Requested: Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2009 and ANSI C63.4:2003 for FCC Certification.

Conclusion(s): The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

Remark(s): ---

Dr. LEE Kam Chuen
Authorized Signatory
ElectroMagnetic Compatibility Department
For and on behalf of
The Hong Kong Standards and Testing Centre Ltd.

CONTENT:

1.0 General Details

1.1 Test Laboratory

The Hong Kong Standards and Testing Centre Ltd.
EMC Laboratory
10 Dai Wang Street, Taipo Industrial Estate
New Territories, Hong Kong

Telephone: 852 2666 1888
Fax: 852 2664 4353

1.2 Applicant Details

Applicant

X10 (USA) Inc.
620 Naches Ave. SW Renton, WA 98057

Manufacturer

X-10 Electronics (Shenzhen) Co., Ltd.
Together Rich Industrial Park B, Sanwei Industrial District,
Xixiang Town, Baoan County, ShenZhen, China

1.3 Equipment Under Test [EUT]

Description of Sample(s)

Submitted sample(s) said to be

Product:	icon Remote
Manufacturer:	X-10 Electronics (Shenzhen) Co., Ltd.
Brand Name:	X10
Model Number:	IR34A
Rating:	4.5Vd.c. (“AA” size battery x 3)

1.3.1 Description of EUT Operation

The Equipment Under Test (EUT) is a X10 (USA) Inc., icon Remote. The transmitter is a ON/OFF keying type transmitter. The EUT continues to transmit while keyboard is being pressed. It is pulse transmitter. Modulation by IC; and type is pulse modulation.

1.4 Date of Order

2010-06-30

1.5 Submitted Sample(s):

1 Sample

1.6 Test Duration

2010-07-07

1.7 Country of Origin

China

2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 2009 and ANSI C63.4:2003 for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION
Results Summary

Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Failed	N/A
Field Strength of Fundamental Emissions & Spurious Emissions	FCC 47CFR 15.231a	ANSI C63.4:2003	N/A	☒	☐	☐
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.4:2003	N/A	☒	☐	☐

Note: N/A - Not Applicable

3.0 Test Results

3.1 Emission

3.1.1 Radiated Emissions

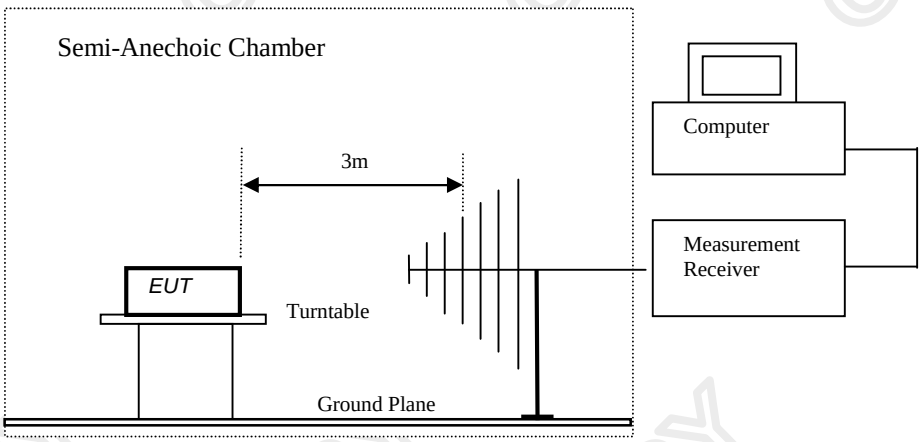
Test Requirement:	FCC 47CFR 15.231a
Test Method:	ANSI C63.4:2003
Test Date:	2010-07-07
Mode of Operation:	On Mode

Test Method:

The sample was placed 0.8m above the ground plane of semi-anechoic chamber*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, rotated about all 3 axis (X, Y & Z) and considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

*: Semi-anechoic chamber located on the STC (Dongguan) Company Ltd. 68 Fumin Nan Road, Dalang, Dongguan, Guangdong, PRC with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 629686.

Test Setup:



Limits for Field Strength of Fundamental Emissions [FCC 47CFR 15.231a]:

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Average] [μV/m]	Field Strength of Spurious Emission [Average] [μV/m]
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	3,750 to 12,500 *	375 to 1,250 *
Above 470	12,500	1,250

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, μV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, μV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

Results:

Field Strength of Fundamental Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
310.00	63.0	15.7	78.7	8609.9	58,333.4	Horizontal

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
620.00	30.7	22.9	53.6	478.6	5,833.3	Horizontal
930.00	10.7	26.5	37.2	72.4	5,833.3	Horizontal
+ 1240.00	< 1.0	32.2	< 33.2	< 45.7	5,000.0	Vertical
+ 1550.00	< 1.0	38.8	< 39.8	< 97.7	5,000.0	Vertical
1860.00	< 1.0	17.4	< 18.4	< 8.3	5,833.3	Vertical
2170.00	< 1.0	17.2	< 18.2	< 8.1	5,833.3	Vertical
2480.00	< 1.0	18.8	< 19.8	< 9.8	5,833.3	Vertical
+ 2790.00	< 1.0	19.7	< 20.7	< 10.8	5,000.0	Vertical
3100.00	< 1.0	20.6	< 21.6	< 12.0	5,833.3	Vertical

Results:

Field Strength of Fundamental Emissions Average Value							
	Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
*	310.00	51.2	15.7	66.9	2213.1	5,833.3	Horizontal

Field Strength of Spurious Emissions Average Value							
	Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
	620.00	18.9	22.9	41.8	123.0	583.3	Horizontal
	930.00	< 1.0	26.5	< 27.5	< 23.7	583.3	Horizontal
+	1240.00	< 1.0	32.2	< 33.2	< 45.7	500.0	Vertical
+	1550.00	< 1.0	38.8	< 39.8	< 97.7	500.0	Vertical
	1860.00	< 1.0	17.4	< 18.4	< 8.3	583.3	Vertical
	2170.00	< 1.0	17.2	< 18.2	< 8.1	583.3	Vertical
	2480.00	< 1.0	18.8	< 19.8	< 9.8	583.3	Vertical
+	2790.00	< 1.0	19.7	< 20.7	< 10.8	500.0	Vertical
	3100.00	< 1.0	20.6	< 21.6	< 12.0	583.3	Vertical

Remarks:

*: Adjusted by Duty Cycle = -11.78dB

FCC Limit for Average Measurement = 41.6667(310.0MHz)-7083.3333=5833.34μV/m

+: Denotes restricted band of operation.
Measurements were made using a peak detector. Any emission less than 1000 MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 were not adjusted for averaging and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor includes Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 5.1dB

Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [μV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Result of On Mode (9kHz ~ 30MHz): PASS
Emissions detected are more than 20 dB below the limit line(s)

Result of On Mode (30MHz ~ 1GHz): PASS

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dBμV/m	Limit @3m dBμV/m	Level @3m μV/m	Limit @3m μV/m
92.7	Horizontal	28.2	43.5	25.7	150
125.3	Horizontal	30.1	43.5	32.0	150
212.2	Horizontal	12.3	43.5	4.1	200
570.2	Horizontal	21.5	46.0	11.9	200
798.1	Horizontal	24.9	46.0	17.6	200
959.6	Horizontal	27.3	46.0	23.2	200

Result of On Mode (1GHz ~ 4.2GHz): PASS
Emissions detected are more than 20 dB below the limit line(s)

Remark:

Correction Factor includes Antenna Factor and Cable Attenuation.
Calculated measurement uncertainty: 30MHz to 1GHz 5.1dB

Limits for Field Strength of Fundamental Emissions [FCC 47CFR 15.231a]:

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Average] [μV/m]	Field Strength of Spurious Emission [Average] [μV/m]
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	3,750 to 12,500 *	375 to 1,250 *
Above 470	12,500	1,250

Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, μV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, μV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

Results:

Field Strength of Fundamental Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
418.00	59.9	17.8	77.7	7673.6	103,333.5	Vertical

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
836.00	18.0	25.1	43.1	142.9	10,333.3	Vertical
+ 1254.00	< 1.0	26.7	< 27.7	< 24.3	5,000.0	Vertical
+ 1672.00	< 1.0	32.2	< 33.2	< 45.7	5,000.0	Vertical
2090.00	< 1.0	38.8	< 39.8	< 97.7	10,333.3	Vertical
2508.00	< 1.0	17.4	< 18.4	< 8.3	10,333.3	Vertical
2926.00	< 1.0	17.2	< 18.2	< 8.1	10,333.3	Vertical
3344.00	< 1.0	18.8	< 19.8	< 9.8	10,333.3	Vertical
+ 3762.00	< 1.0	19.7	< 20.7	< 10.8	5,000.0	Vertical
+ 4180.00	< 1.0	20.6	< 21.6	< 12.0	5,000.0	Vertical

Results:

Field Strength of Fundamental Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
* 418.00	39.9	17.8	57.7	767.4	10,333.3	Vertical

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dBμV	Correction Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
836.00	< 1.0	25.1	< 26.1	< 20.2	1,033.3	Vertical
+ 1254.00	< 1.0	26.7	< 27.7	< 24.3	500.0	Vertical
+ 1672.00	< 1.0	32.2	< 33.2	< 45.7	500.0	Vertical
2090.00	< 1.0	38.8	< 39.8	< 97.7	1,033.3	Vertical
2508.00	< 1.0	17.4	< 18.4	< 8.3	1,033.3	Vertical
2926.00	< 1.0	17.2	< 18.2	< 8.1	1,033.3	Vertical
3344.00	< 1.0	18.8	< 19.8	< 9.8	1,033.3	Vertical
+ 3762.00	< 1.0	19.7	< 20.7	< 10.8	500.0	Vertical
+ 4180.00	< 1.0	20.6	< 21.6	< 12.0	500.0	Vertical

Remarks:

*: Adjusted by Duty Cycle = -20dB

FCC Limit for Average Measurement = 41.6667(418.0MHz)-7083.3333=10333.35μV/m

+: Denotes restricted band of operation.
Measurements were made using a peak detector. Any emission less than 1000 MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 were not adjusted for averaging and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor includes Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 5.1dB

Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [µV/m]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

Result of On Mode (9kHz ~ 30MHz): PASS
Emissions detected are more than 20 dB below the limit line(s)

Result of On Mode (30MHz ~ 1GHz): PASS

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dBµV/m	Limit @3m dBµV/m	Level @3m µV/m	Limit @3m µV/m
122.4	Horizontal	33.4	43.5	46.8	150
141.0	Horizontal	35.9	43.5	62.4	150
212.2	Horizontal	12.3	43.5	4.1	200
570.2	Horizontal	21.5	46.0	11.9	200
798.1	Horizontal	24.9	46.0	17.6	200
959.6	Horizontal	27.3	46.0	23.2	200

Result of On Mode (1GHz ~ 4.2GHz): PASS
Emissions detected are more than 20 dB below the limit line(s)

Remark:
Correction Factor includes Antenna Factor and Cable Attenuation.
Calculated measurement uncertainty: 30MHz to 1GHz 5.1dB

3.2 20dB Bandwidth of Fundamental Emission

Test Requirement:	FCC 47 CFR 15.231a
Test Method:	ANSI C63.4:2003 (Section 13.1.7)
Test Date:	2010-07-07
Mode of Operation:	On Mode

Test Method:

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

Test Setup:

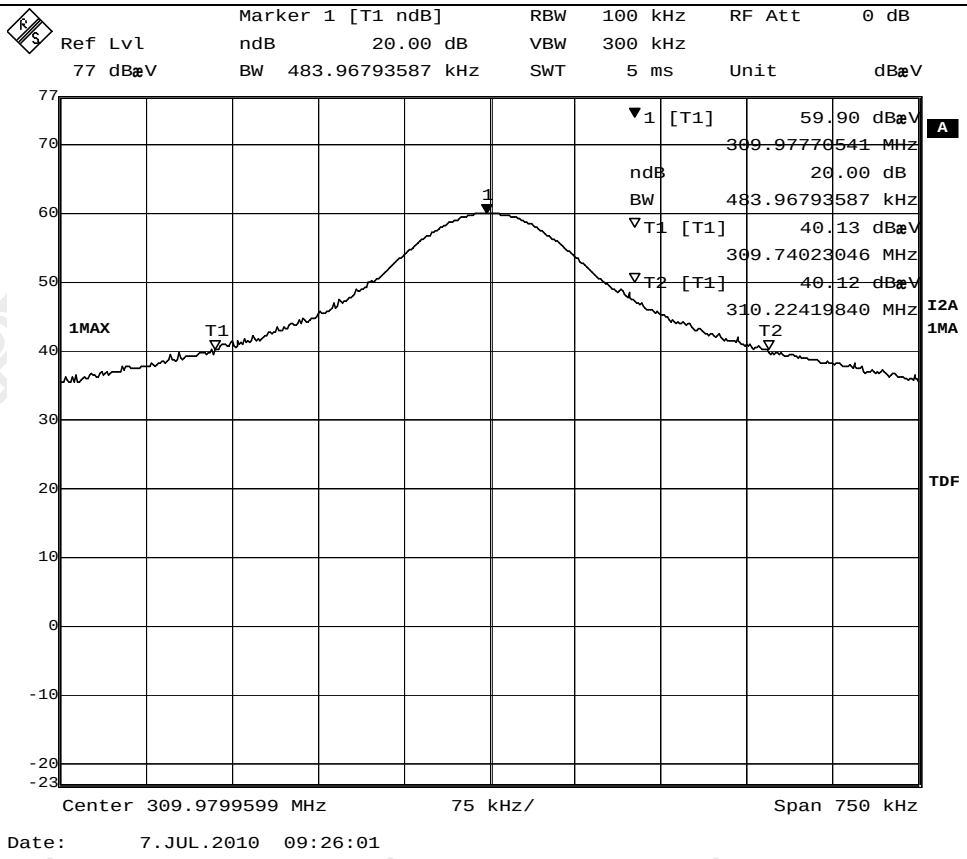
As Test Setup of clause 3.1.1 in this test report.

Limits for 20 dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	20dB Bandwidth [kHz]	FCC Limits * [kHz]
310.0	483.968	775

*: FCC Limit for Bandwidth measurement = (0.25%)(Center Frequency)
=(0.0025)(310.0)
= 775kHz

20dB Bandwidth of Fundamental Emission

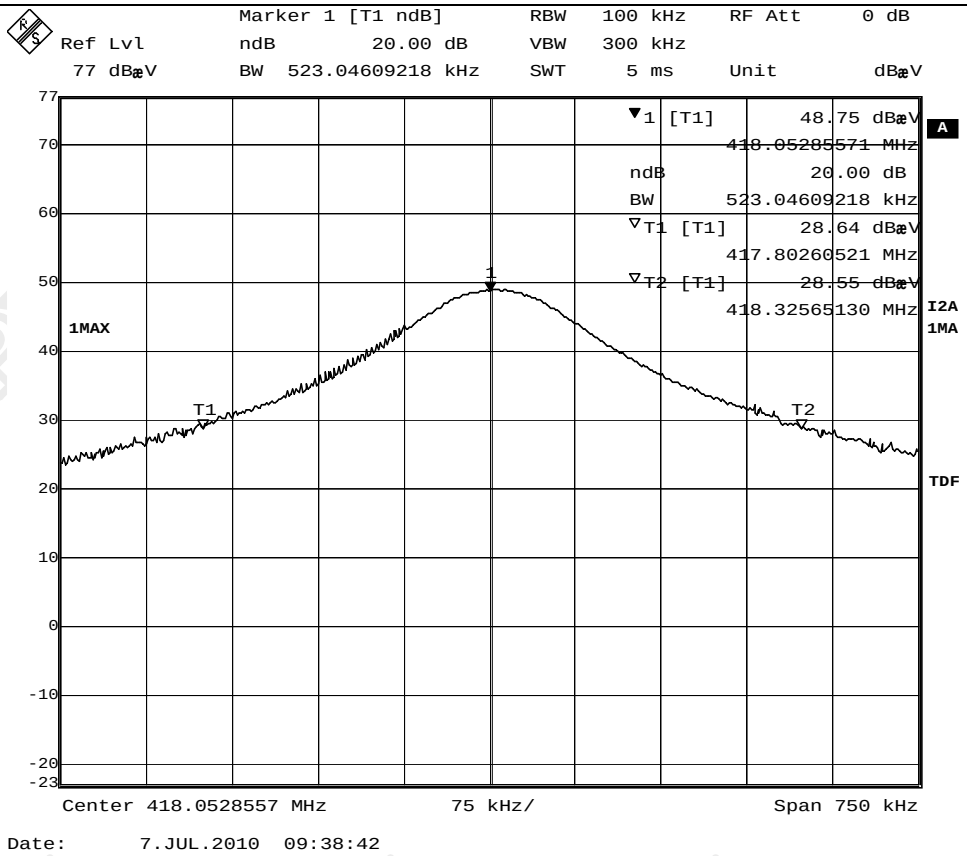


Limits for 20 dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	20dB Bandwidth [kHz]	FCC Limits * [kHz]
418.0	523.046	1045

*: FCC Limit for Bandwidth measurement = (0.25%)(Center Frequency)
=(0.0025)(418.0)
= 1045kHz

20dB Bandwidth of Fundamental Emission



Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM020	HORN ANTENNA	EMCO	3115	4032	2009/09/02	2010/09/02
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM216	MINI MAST SYSTEM	EMCO	2075	00026842	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-Linggren	FACT-3	--	2008/12/01	2011/12/01
EM194	BICONILOG ANTENNA	EMCO	3142B	1795	2008/09/08	2010/09/08
EM229	EMI Test Receiver	R&S	ESIB40	100248	2009/09/27	2010/09/27
EM022	LOOP ANTENNA	EMCO	6502	1189-2424	2009/07/26	2011/07/26

Remarks:-
CM Corrective Maintenance
N/A Not Applicable
TBD To Be Determined

Appendix B

Duty Cycle Correction During 100msec (For 310MHz)

Each packet period (100msec) never exceeds a series of 1 long (9.218msec), 33 short (501.002μsec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worst case transmit duty cycle would be considered (1x9.218) + (33x0.501002)msec per 100msec=25.751% duty cycle. Figure A through D show the characteristics of the pulses train for one of these functions.

Remarks:

Duty Cycle Correction = 20Log(0.25751)=-11.78dB

The following figures [Figure A to Figure D] showed the characteristics of the pulse train for one of these functions.

Figure A [Pulse Train]

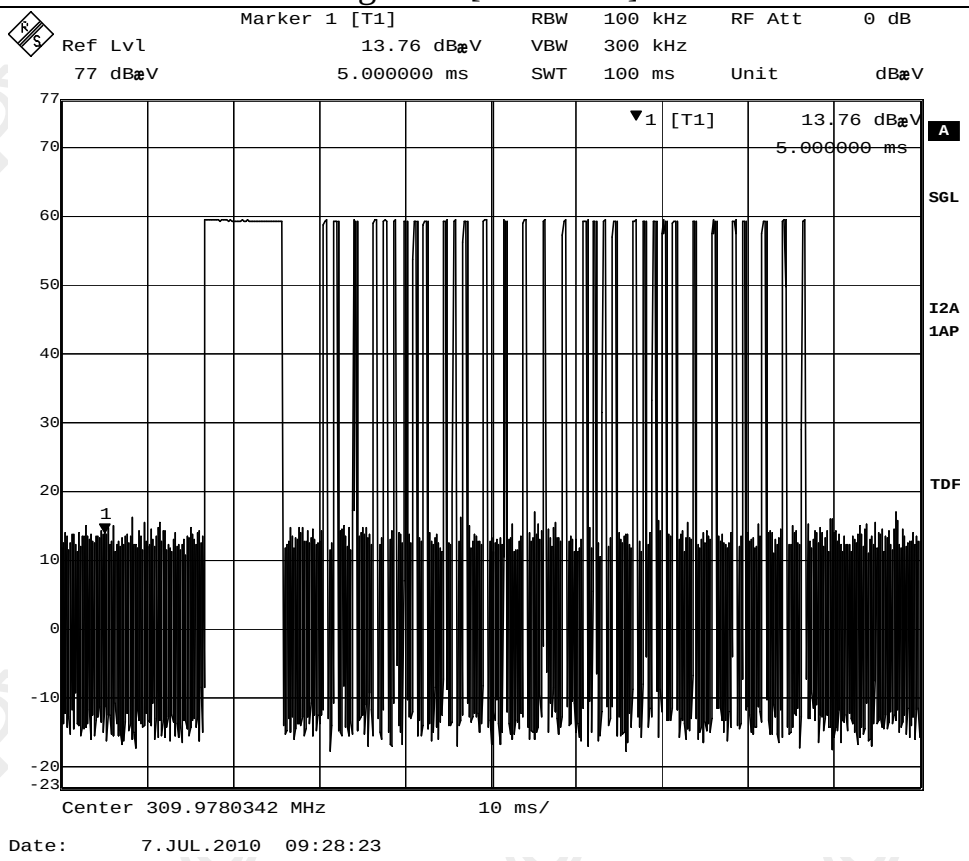


Figure B [Long Pulse]

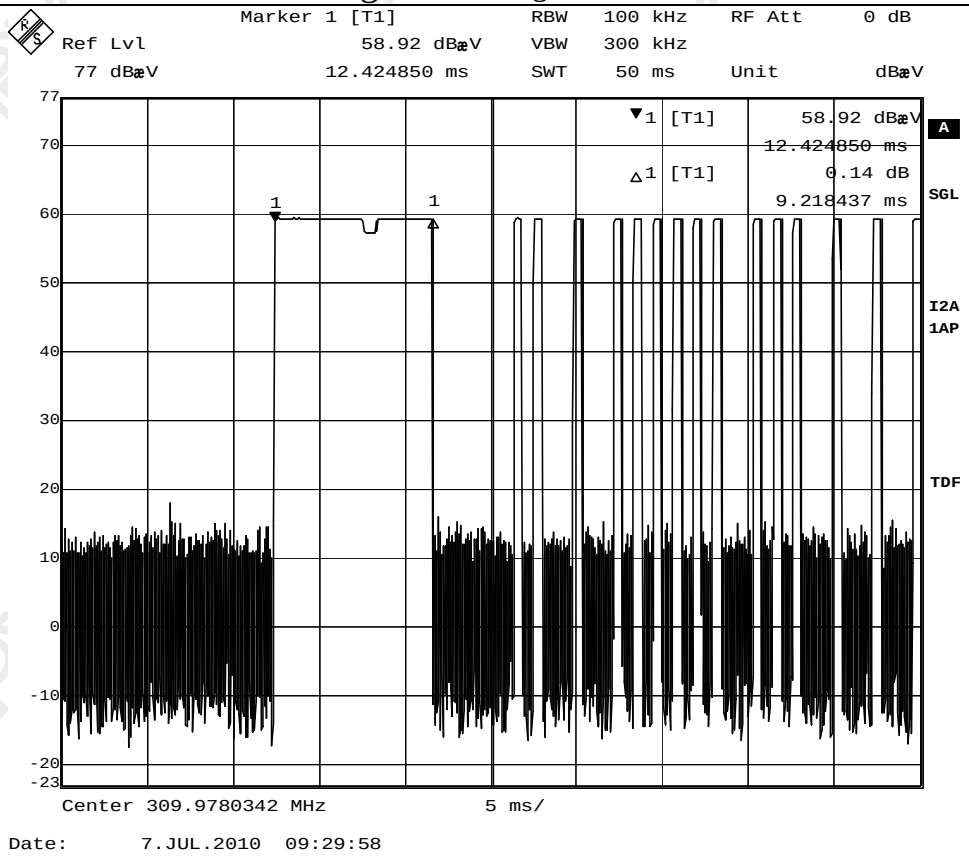


Figure C [Short Pulse]

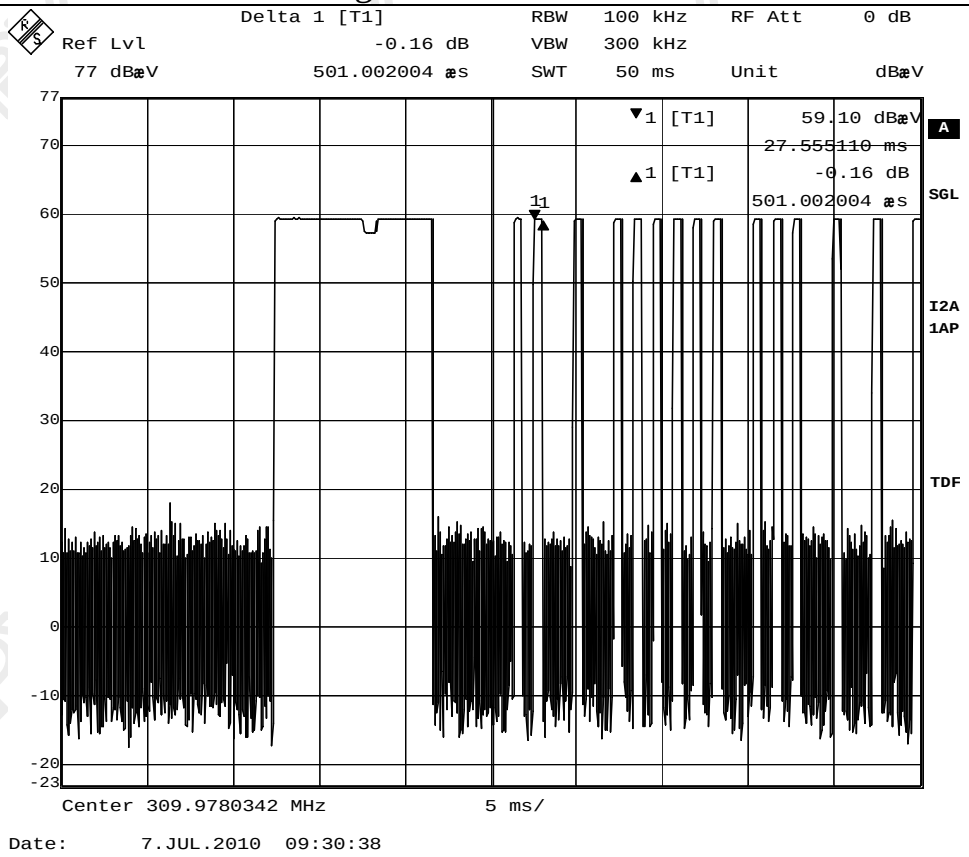
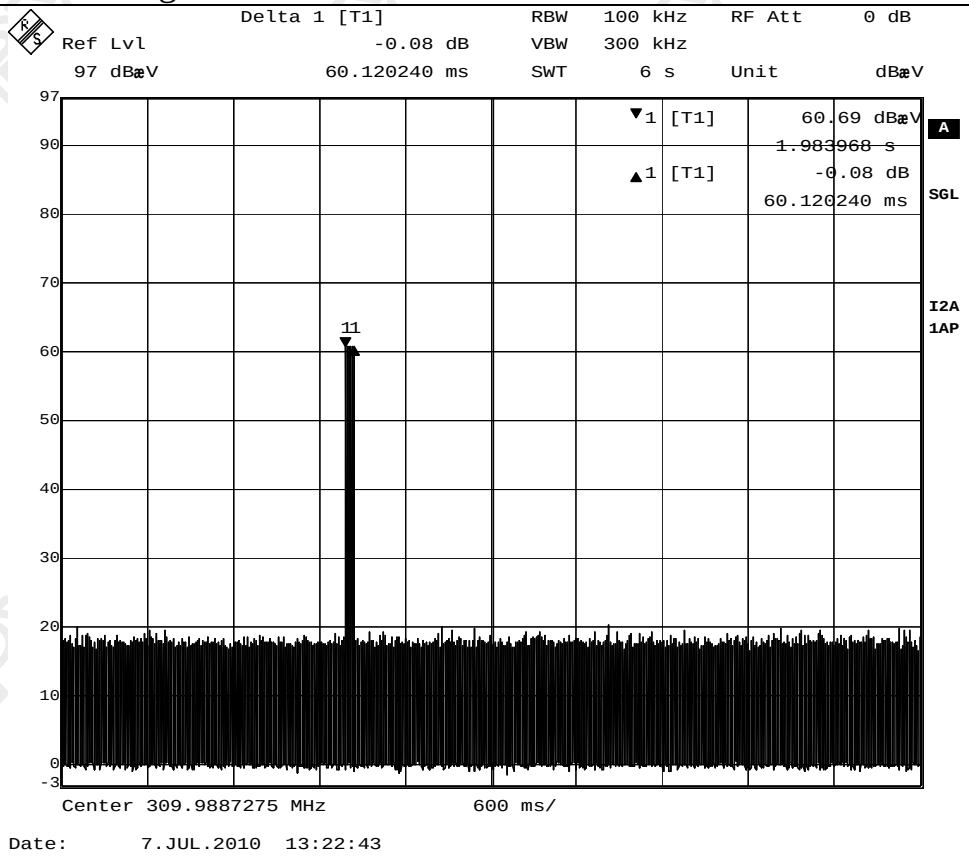


Figure D [Total Transmission Time = 60.120ms < 5s]



Duty Cycle Correction During 100msec (For 418MHz)

Each packet period (100msec) never exceeds a series of 1 long (1.503msec), 12 short (701.403µsec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worst case transmit duty cycle would be considered (1x1.503) + (12x0.701403)msec per 100msec=9.92% duty cycle. Figure A through D show the characteristics of the pulses train for one of these functions.

Remarks:

Duty Cycle Correction = 20Log(0.0992)=-20dB

The following figures [Figure A to Figure D] showed the characteristics of the pulse train for one of these functions.

Figure A [Pulse Train]

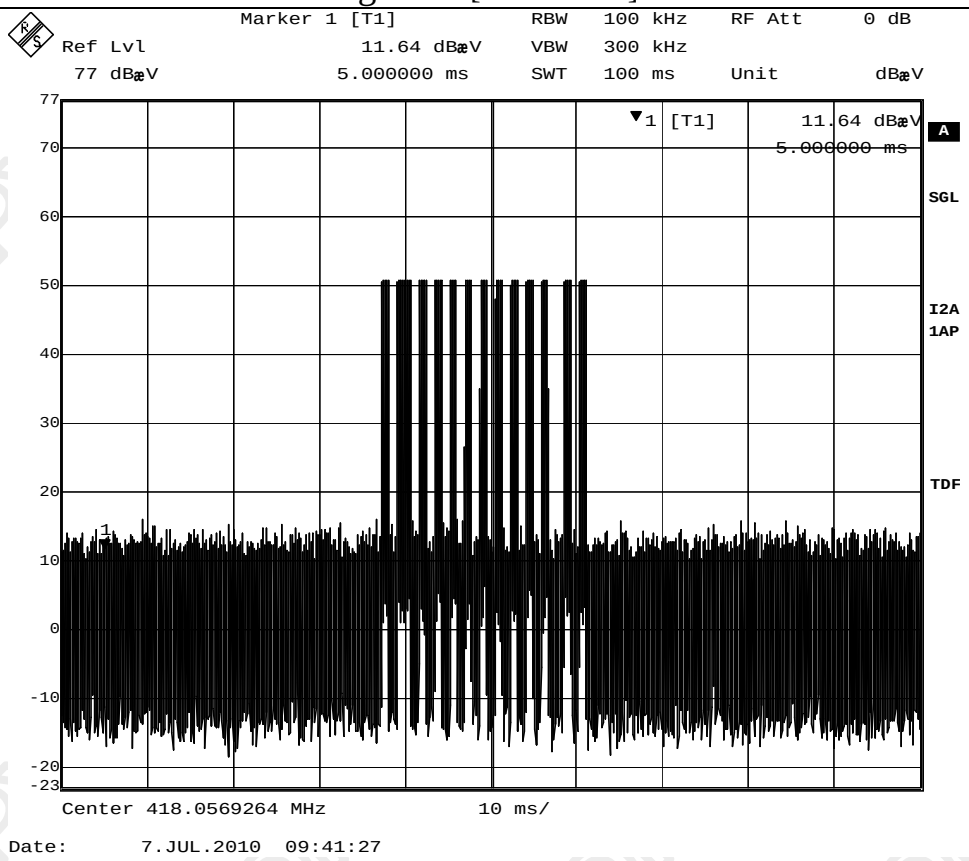


Figure B [Long Pulse]

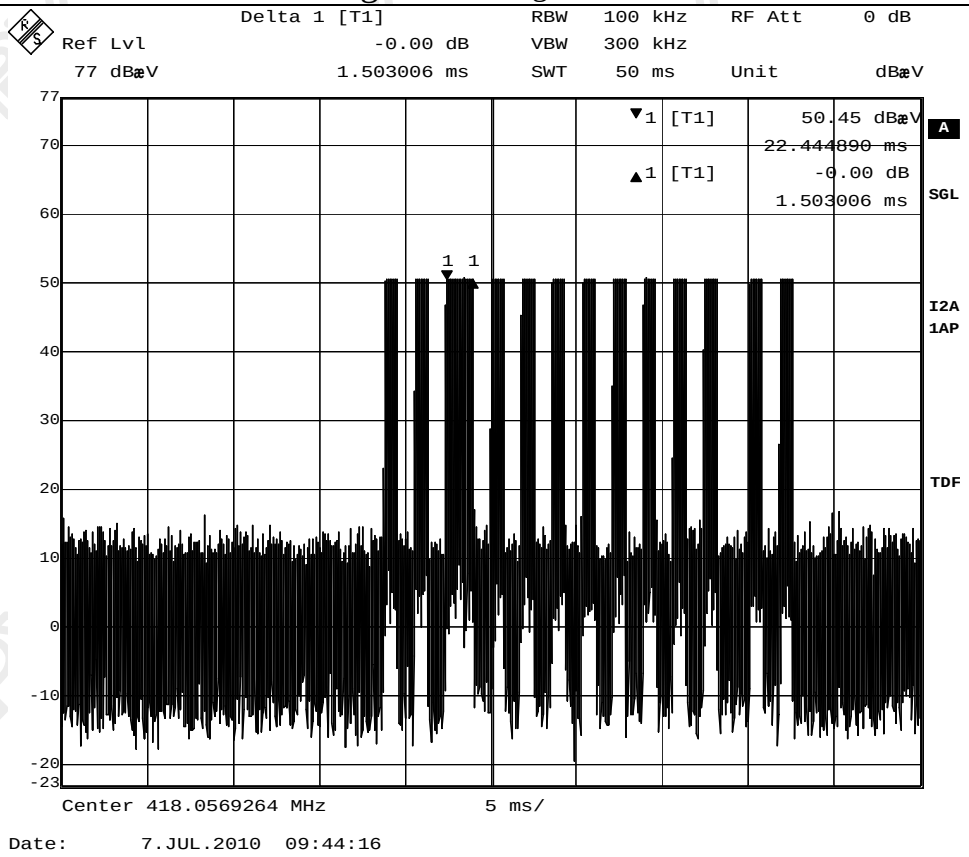


Figure C [Short Pulse]

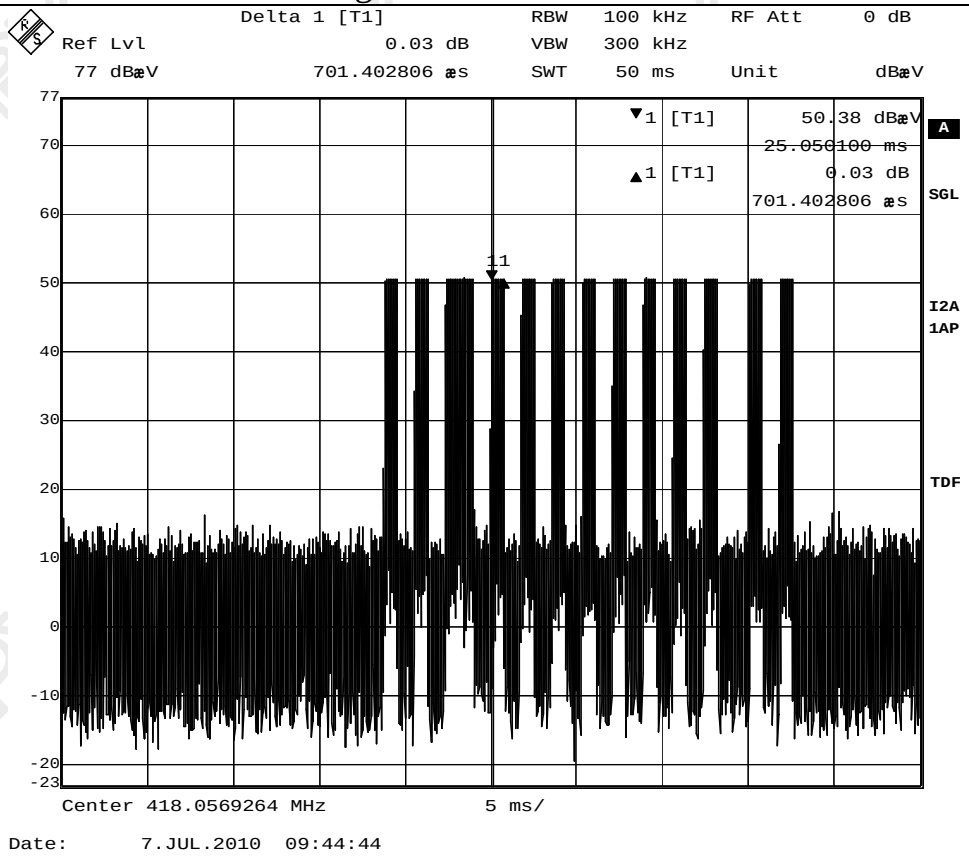
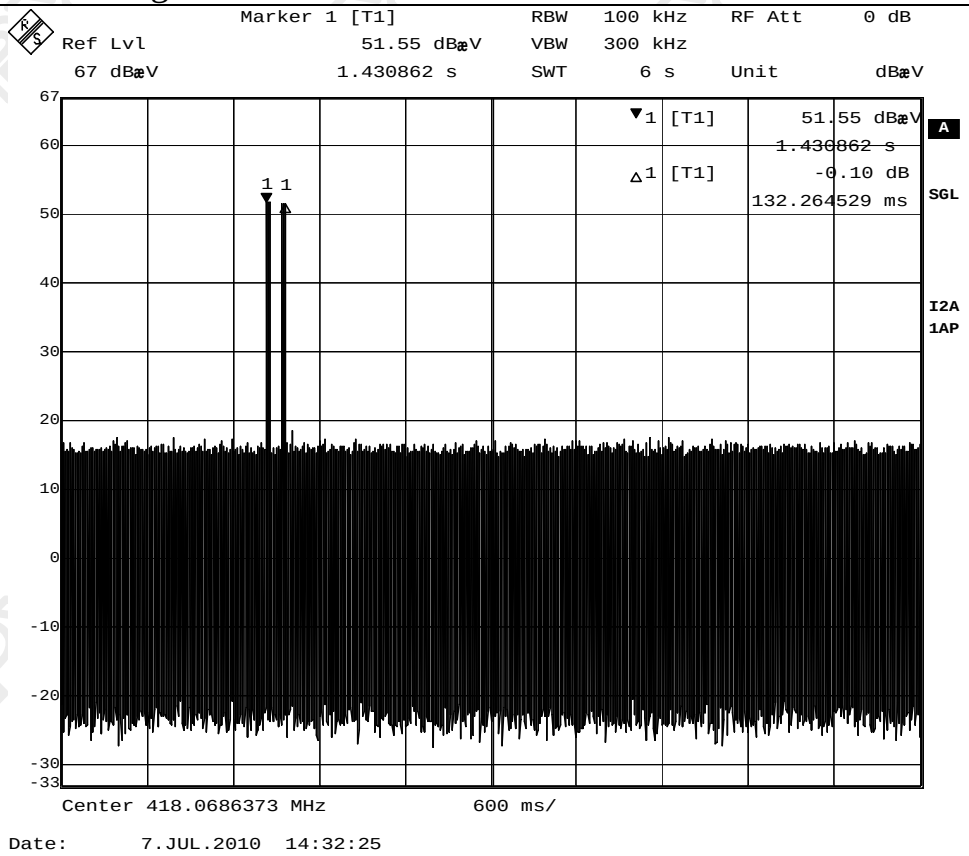


Figure D [Total Transmission Time = 132.265ms < 5s]



Appendix C

Periodic Operation [FCC 47CFR 15.231(a2)]

According to FCC 47CFR15.231 (a2). A transmitter automatically activated must automatically deactivate within not more than 5 seconds of being released. The EUT ceases transmission almost immediately upon being released and appears to finish the current packet being transmitted. Therefore the longest period of time the transmitter should take to deactivate is a packet length.

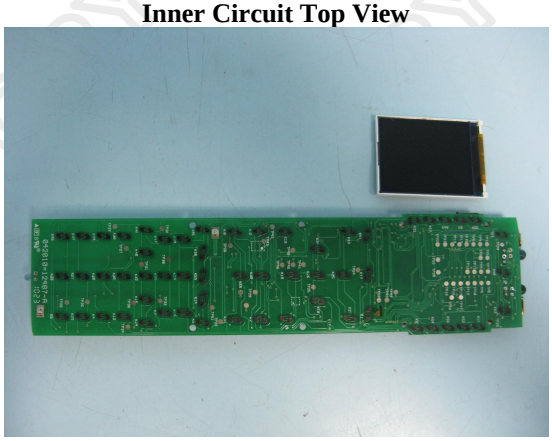
Appendix D

Photographs of EUT

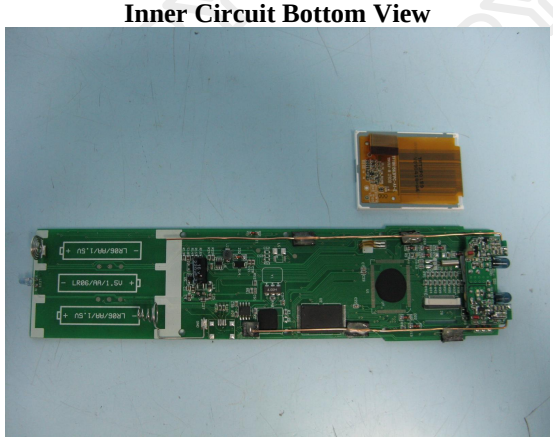
Front View of the product

Rear View of the product

Inner Circuit Top View

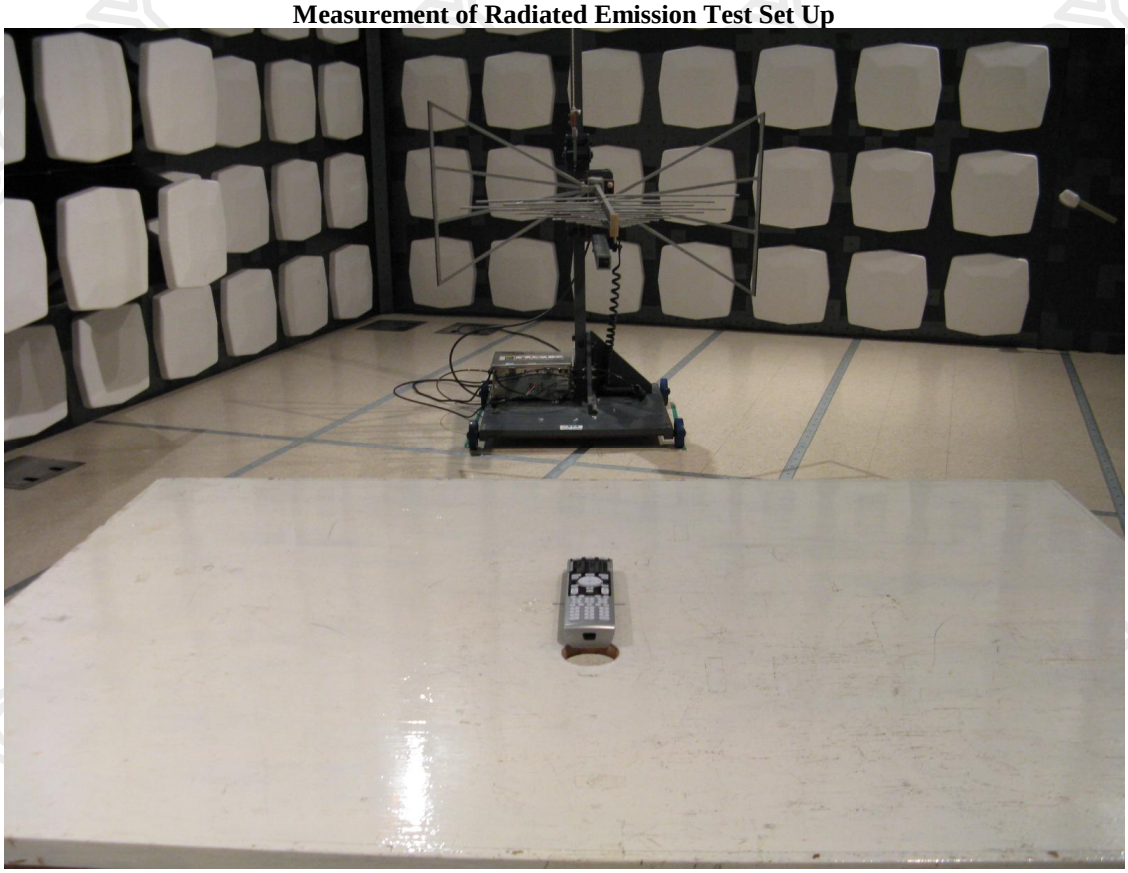


Inner Circuit Bottom View



Photographs of EUT

Measurement of Radiated Emission Test Set Up



******* End of Test Report *******