



STC Test Report



Date: 2013-08-12
No. : DM111105

Page 1 of 22

Applicant (ZSG003):

HONG KONG CHINA ELECTRIC APPLIANCE
MANUFACTURE CO., LTD
12/F, MONGKOK HARBOUR CENTRE, 638 SHANGHAI
STREET, HONG KONG, China

Description of Sample(s):

Submitted sample(s) said to be
Product: Ceiling Fan Remote Controller
Brand Name: N/A
Model Number: HH-R002
FCC ID: ZJF-HH-R002

Date Sample(s) Received: 2013-05-09

Date Tested: 2013-05-25

Investigation Requested:

Perform ElectroMagnetic Interference measurement in
accordance with FCC 47CFR [Codes of Federal Regulations]
Part 15: 2012 and ANSI C63.4: 2009 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):



LONG Yun Jian, 
Authorized Signatory
ElectroMagnetic Compatibility Department
For and on behalf of
STC (Dongguan) Company Limited

The Hong Kong Standards and Testing Centre Ltd.

10 Dai Wang Street, Taipo Industrial Estate, N.T., Hong Kong

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STC Test Report

Date: 2013-08-12
No. : DM111105

Page 2 of 22

CONTENT:

Cover	Page 1 of 22
Content	Page 2-3 of 22
<u>1.0 General Details</u>	
1.1 Equipment Under Test [EUT] Description of EUT operation	Page 4 of 22
1.2 Date of Order	Page 4 of 22
1.3 Submitted Sample(s)	Page 4 of 22
1.4 Test Duration	Page 4 of 22
1.5 Country of Origin	Page 4 of 22
<u>2.0 Technical Details</u>	
2.1 Investigations Requested	Page 5 of 22
2.2 Test Standards and Results Summary	Page 5 of 22
<u>3.0 Test Results</u>	
3.1 Emission	Page 6-10 of 22
3.2 Bandwidth Measurement	Page 11-12 of 22

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STC Test Report

Date: 2013-08-12
No. : DM111105

Page 3 of 22

Appendix A

List of Measurement Equipment

Page 13 of 22

Appendix B

Duty Cycle Correction During 100 msec

Page 14-17 of 22

Appendix C

A manually Operation

Page 18 of 22

Appendix D

Photographs

Page 19-22 of 22

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STC Test Report

Date: 2013-08-12
No. : DM111105

Page 4 of 22

1.0 General Details

1.1 Equipment Under Test [EUT] Description of Sample(s)

Submitted sample(s) said to be
Product: Ceiling Fan Remote Controller
Manufacturer: ZHONGSHAN KONG LUEN WAH HOI ELECTRICAL
APPLIANCE CO. LTD
Science And Technology Development Zone, Min Zhong Town,
Zhong Shan
Brand Name: N/A
Model Number: HH-R002
Rating: 12Vd.c. ("23AE" size battery x 1)

1.1.1 Description of EUT Operation

The Equipment Under Test (EUT) is a ZHONGSHAN KONG LUEN WAH HOI ELECTRICAL APPLIANCE CO. LTD, Ceiling Fan Remote Controller. The transmitter is a manually operated transmitter. It is pulse transmitter. Modulation by IC; and type is ASK modulation.

1.2 Date of Order

2013-05-09

1.3 Submitted Sample(s):

1 Sample

1.4 Test Duration

2013-05-25

1.5 Country of Origin

China

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STC Test Report

Date: 2013-08-12

Page 5 of 22

No. : DM111105

2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 2012 and ANSI C63.4:2009 for FCC Certification.

2.2 Test Standards and Results Summary Tables

EMISSION Results Summary					
Test Condition	Test Requirement	Test Method	Class / Severity		
			Pass	Failed	N/A
Field Strength of Fundamental Emissions & Spurious Emissions	FCC 47CFR 15.231a	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Note: N/A - Not Applicable

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STC Test Report

Date: 2013-08-12

Page 6 of 22

No. : DM111105

3.0 Test Results

3.1 Emission

3.1.1 Radiated Emissions

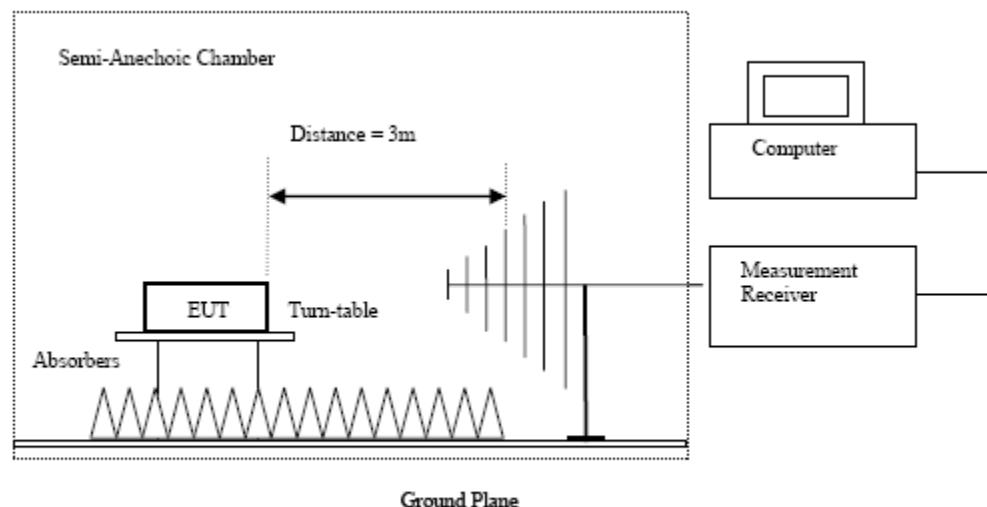
Test Requirement: FCC 47CFR 15.231a
Test Method: ANSI C63.4:2009
Test Date: 2013-05-25
Mode of Operation: Tx mode

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:



- Absorbers placed on top of the ground plane are for measurements above 1000MHz only.
- Measurements between 30MHz to 1000MHz made with Bi-log antennas, above 1000MHz horn antennas are used.

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STC Test Report

Date: 2013-08-12
No. : DM111105

Page 7 of 22

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

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Average] [μ V/m]	Field Strength of Spurious Emission [Average] [μ V/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, μ V/m at 3 meters = $56.81818(F) - 6136.3636$; for the band 260-470 MHz, μ V/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 of Tx mode: PASS

Field Strength of Fundamental Emissions Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
315.00	49.9	16.4	66.3	2065.4	60,416.8	Vertical

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
630.00	40.3	22.5	62.8	1380.4	6,041.7	Vertical
945.00	28.9	26.6	55.5	595.7	6,041.7	Vertical
1260.00	24.4	29.2	53.6	478.6	6,041.7	Vertical
1575.00	< 1.0	1.0	< 2.0	< 1.3	5,000.0	Vertical
1890.00	20.1	34.8	54.9	555.9	6,041.7	Vertical

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STC Test Report

Date: 2013-08-12

Page 8 of 22

No. : DM111105

Results of Tx mode: PASS

Field Strength of Fundamental Emissions						
Average Value						
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity
*	315.00	41.4	16.4	57.8	776.2	6,041.7

Field Strength of Spurious Emissions							
Average Value							
Frequency MHz	Measured Level @3m dB μ V	Correction Factor dB/m	Field Strength dB μ V/m	Field Strength μ V/m	Limit @3m μ V/m	E-Field Polarity	
630.00	31.8	22.5	54.3	518.8	604.2	Vertical	
945.00	20.4	26.6	47.0	223.9	604.2	Vertical	
1260.00	15.9	29.2	45.1	179.9	604.2	Vertical	
+	1575.00	< 1.0	1.0	< 2.0	< 1.3	500.0	Vertical
1890.00	11.6	34.8	46.4	208.9	604.2	Vertical	

Remarks:

*: Adjusted by Duty Cycle = -8.5dB

FCC Limit for Average Measurement = $41.6667(315.0\text{MHz})-7083.3333=6041.677\mu\text{V/m}$

+: 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.

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STC Test Report

Date: 2013-08-12
No. : DM111105

Page 9 of 22

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

Frequency Range [MHz]	Quasi-Peak Limits [μ V/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
Above 960	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 Tx mode (9kHz - 30MHz): PASS

Emissions detected are more than 20 dB below the limit line(s).

Result of Tx mode (30MHz – 1GHz): PASS

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dB μ V/m	Limit @3m dB μ V/m	Level @3m μ V/m	Limit @3m μ V/m
40.7	Vertical	30.5	40.0	33.5	100
55.6	Horizontal	29.7	40.0	30.5	100
212.3	Vertical	28.6	43.5	26.9	150
450.5	Horizontal	32.7	46.0	43.2	200

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STC Test Report

Date: 2013-08-12
No. : DM111105

Page 10 of 22

Result of Tx mode (above 1GHz): PASS

Frequency MHz	Peak Level @3m dB μ V/m	Peak Limit @3m dB μ V/m	Peak Margin dB	E-Field Polarity
1575.0	53.6	74.0	20.4	Vertical
3000.0	50.4	74.0	23.6	Vertical

Frequency MHz	Average Level @3m dB μ V/m	Average Limit @3m dB μ V/m	Average Margin dB	E-Field Polarity
1575.0	45.2	54.0	9.8	Vertical
3000.0	42.6	54.0	12.4	Vertical

Remarks:

Correction Factor includes Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty (30MHz – 1GHz): 4.6dB

(1GHz – 18GHz): 4.4dB

Emissions in the vertical and horizontal polarizations have been investigated and the worst-case test results are recorded in this report.

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STC Test Report

Date: 2013-08-12
No. : DM111105

Page 11 of 22

3.2 20dB Bandwidth of Fundamental Emission

Test Requirement:	FCC 47 CFR 15.231a
Test Method:	ANSI C63.4:2009 (Section 13.1.7)
Test Date:	2013-05-25
Mode of Operation:	Tx 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.

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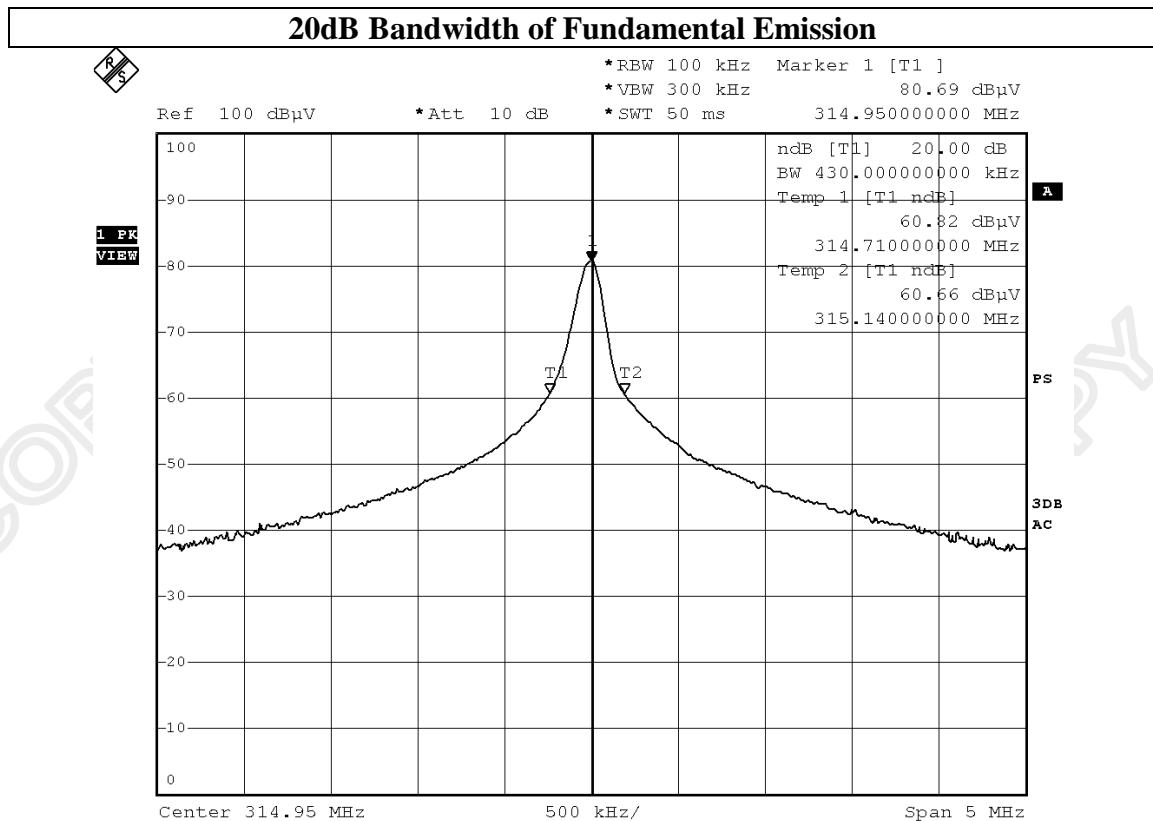
Date: 2013-08-12
No. : DM111105

Page 12 of 22

Limits for 20 dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	20dB Bandwidth [kHz]	FCC Limits * [kHz]
315.0	430.0	787.5

$$\begin{aligned}
 *: \quad \text{FCC Limit for Bandwidth measurement} &= (0.25\%)(\text{Center Frequency}) \\
 &= (0.0025)(315.0) \\
 &= 787.5\text{kHz}
 \end{aligned}$$



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STC Test Report

Date: 2013-08-12
No. : DM111105

Page 13 of 22

Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EMD015	Signal Generator	MARCONI INSTRUMENTS	2030	112191/012	2013.03.15	2014.03.14
EMD036	EMI Test Receiver	ROHDE & SCHWARZ	ESIB26	100388	2012.07.06	2013.07.06
EMD061	Biconilog Antenna	ETS.LINDGREN	3142C	00060439	2012.11.03	2014.11.03
EMD062	Double-Ridged Waveguide (1 – 18GHz)	ETS.LINDGREN	3117	00075933	2012.11.28	2014.11.28
EMD084	MULTI-DVICE CONTROLLER	ETS.LINDGREN	2090	00060107	N/A	N/A
EMD088	Video Control Unit	ETS.LINDGREN	Y21953A	2601073	N/A	N/A
EMD093	Monitor	ViewSonic	VA9036	Q8X064201876	N/A	N/A
EMD102	Intelligent Frequency	Ainuo Instrument Co., Ltd	AN97005SS	79707454	N/A	N/A
EMD105	FACT-3 EMC Chamber	ETS.LINDGREN	FACT-3	3803	N/A	N/A
EMD124	Loop Antenna	ETS-Lindgren	6502	00104905	2012.03.26	2014.03.26

Remarks:-

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

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STC Test Report

Date: 2013-08-12
No. : DM111105

Page 14 of 22

Appendix B

Duty Cycle Correction During 100msec

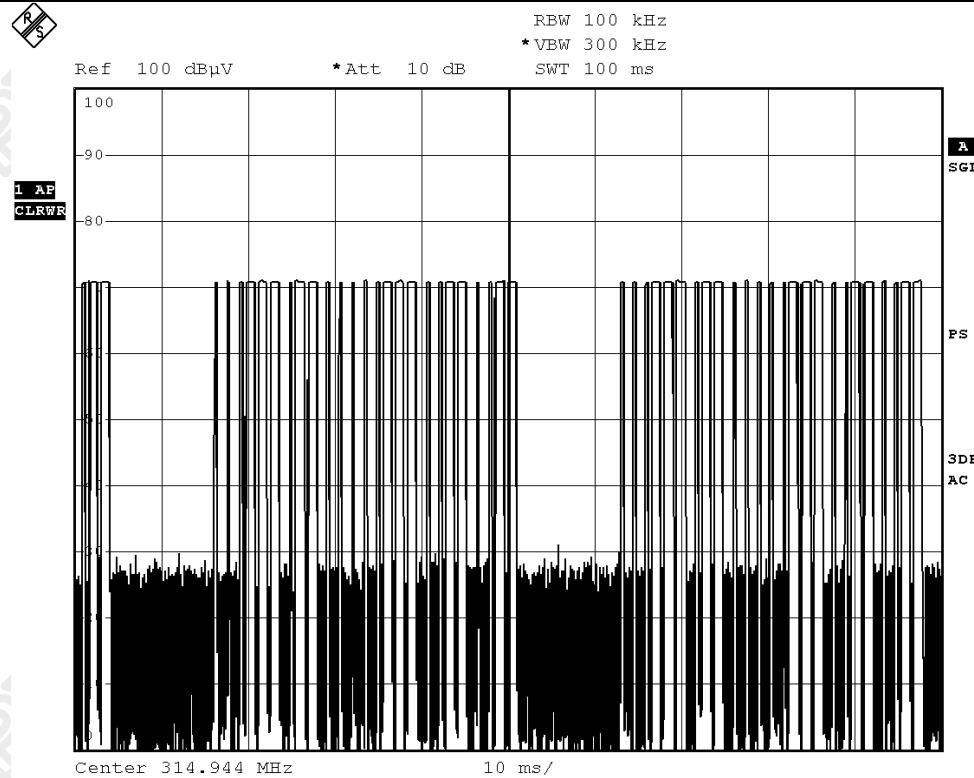
Each packet period (100msec) never exceeds a series of 26 (1.08msec) long and 27 (0.36msec) short pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worst case transmit duty cycle would be considered $(26 \times 1.08 + 27 \times 0.36) \text{ msec per 100msec} = 37.8\% \text{ duty cycle}$. Figure A through D shows the characteristics of the pulses train for one of these functions.

Remarks:

Duty cycle = $20\log [(0.36*27+1.08*26)/100] = -8.5\text{dB}$

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

Figure A [Pulse Train]



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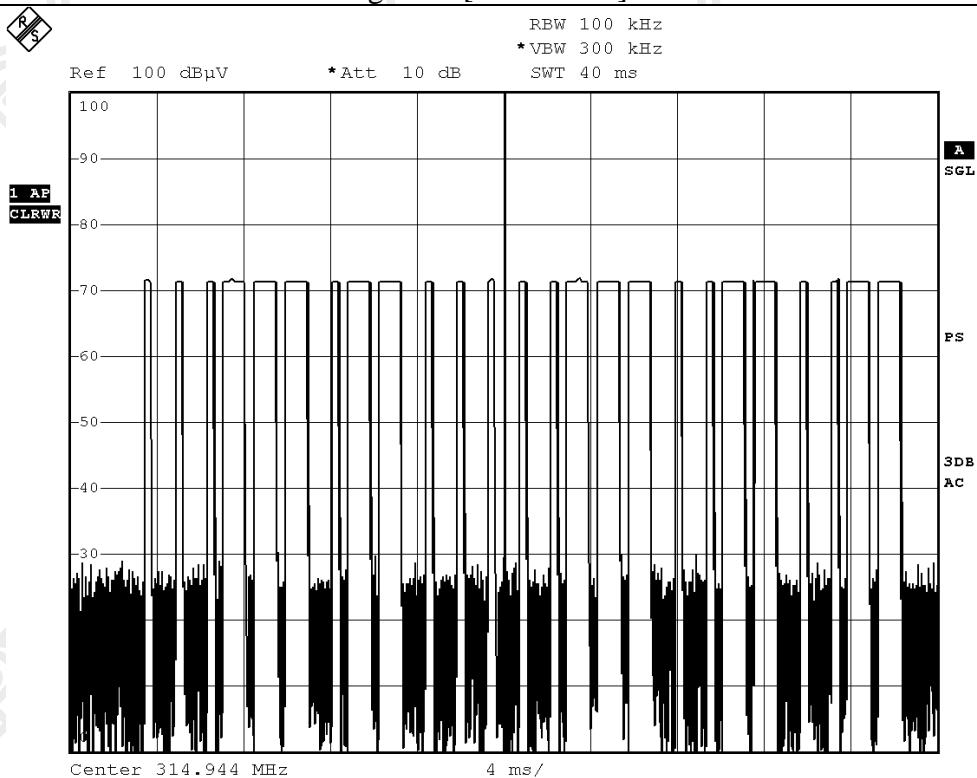


STC Test Report

Date: 2013-08-12
No. : DM111105

Page 15 of 22

Figure B [Pulse Train]



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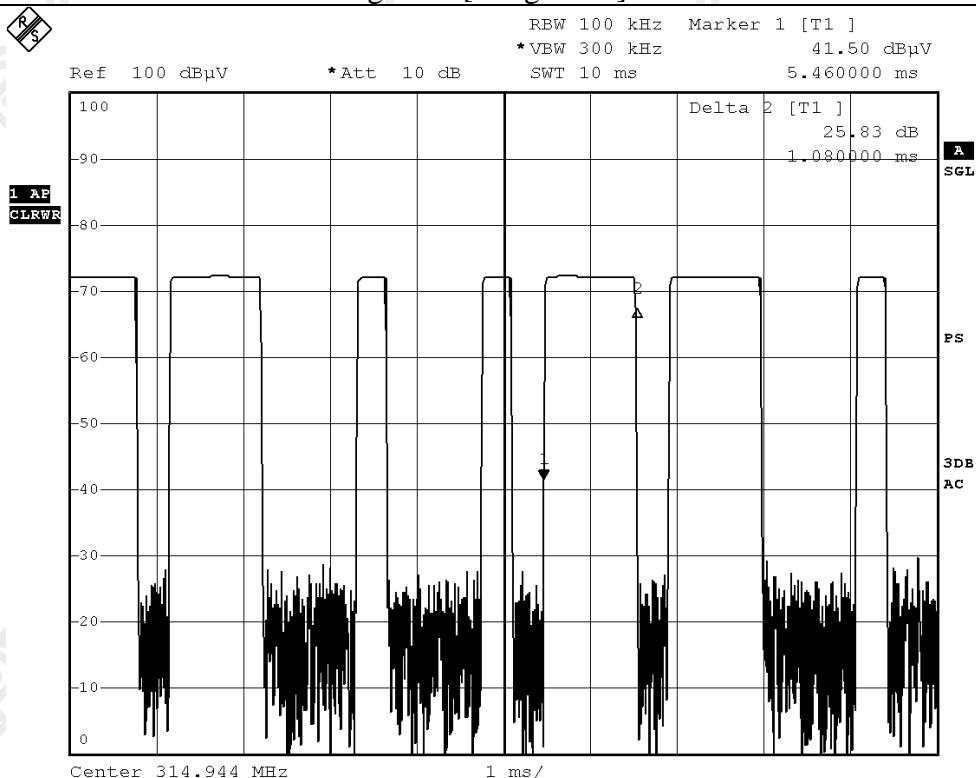


STC Test Report

Date: 2013-08-12
No. : DM111105

Page 16 of 22

Figure C [Long Train]



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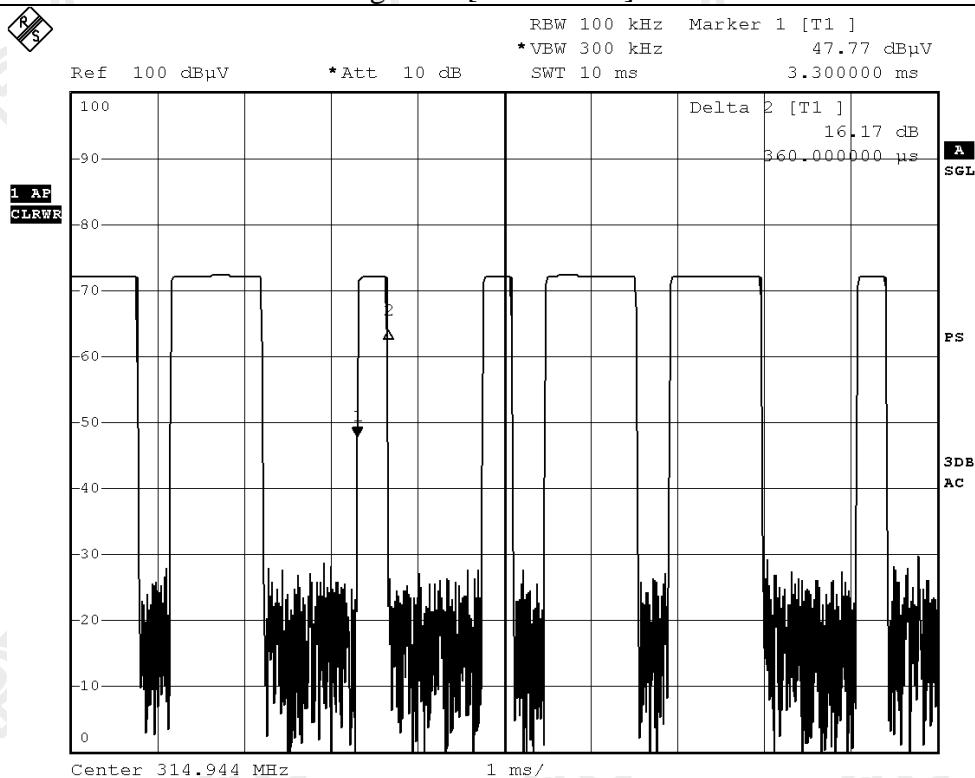


STC Test Report

Date: 2013-08-12
No. : DM111105

Page 17 of 22

Figure D [Short Pulse]



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No. : DM111105

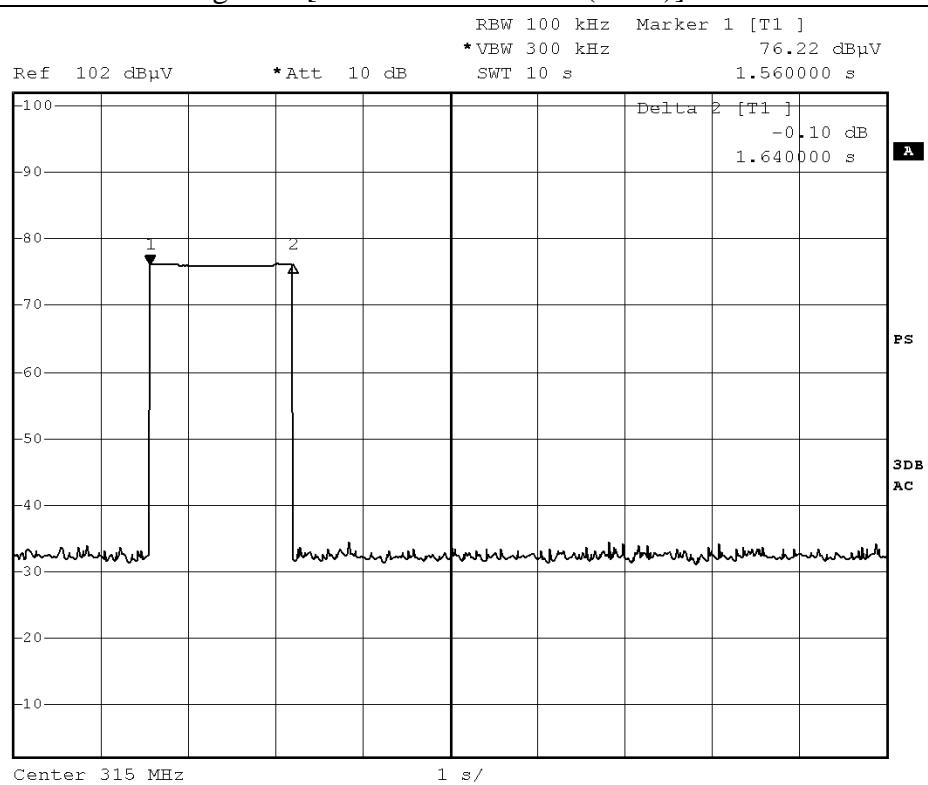
Page 18 of 22

Appendix C

Periodic Operation [FCC 47CFR 15.231(a2)]

According to FCC 47CFR15.231 (a1). A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter 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.

Figure E [Transmission Period (1.68s)]



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STC Test Report

Date: 2013-08-12
No. : DM111105

Page 19 of 22

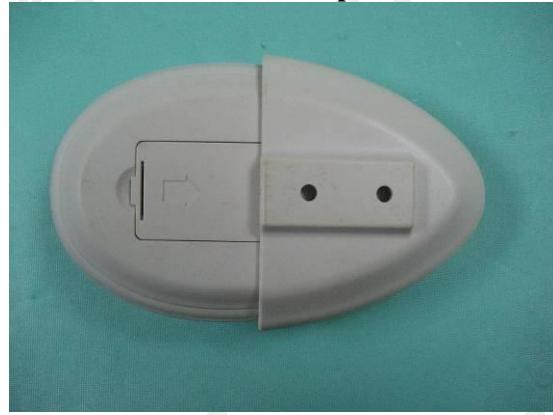
Appendix D

Photographs of EUT

Front View of the product



Rear View of the product



Inner Circuit Top View



Inner Circuit Bottom View



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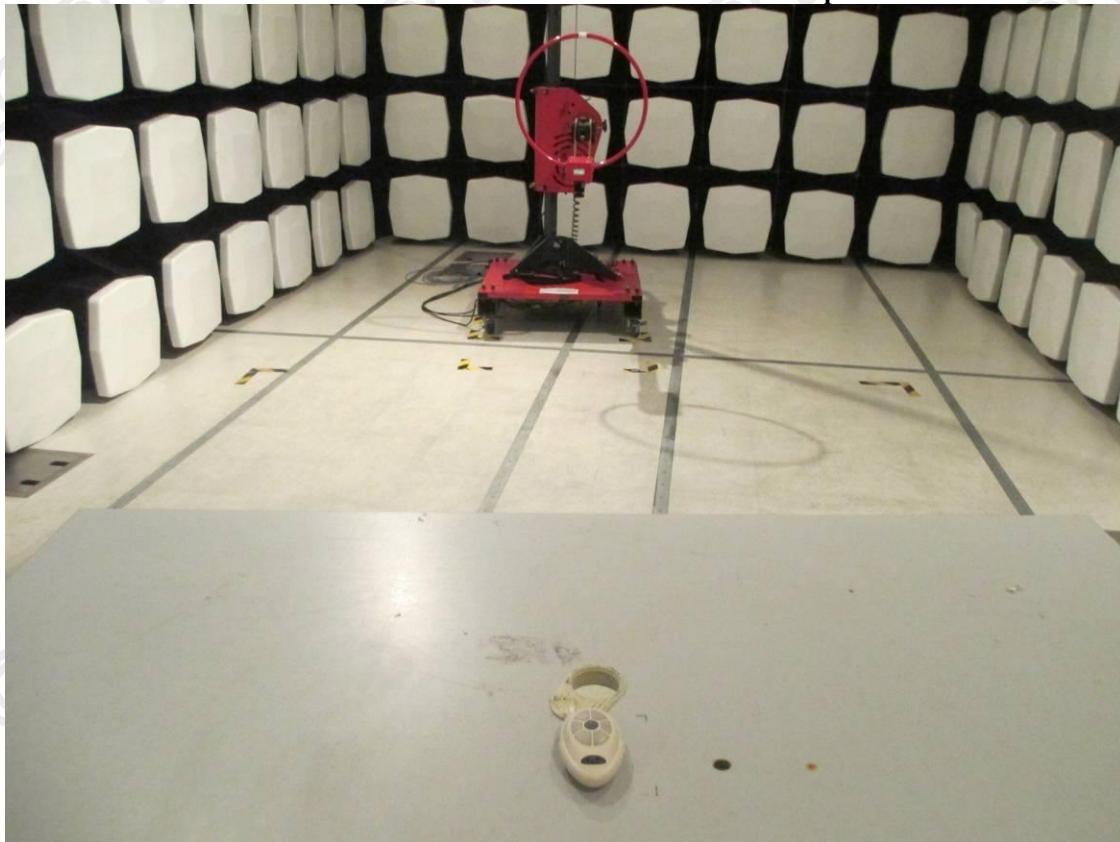
STC Test Report

Date: 2013-08-12
No. : DM111105

Page 20 of 22

Photographs of EUT

Measurement of Radiated Emission Test Set Up



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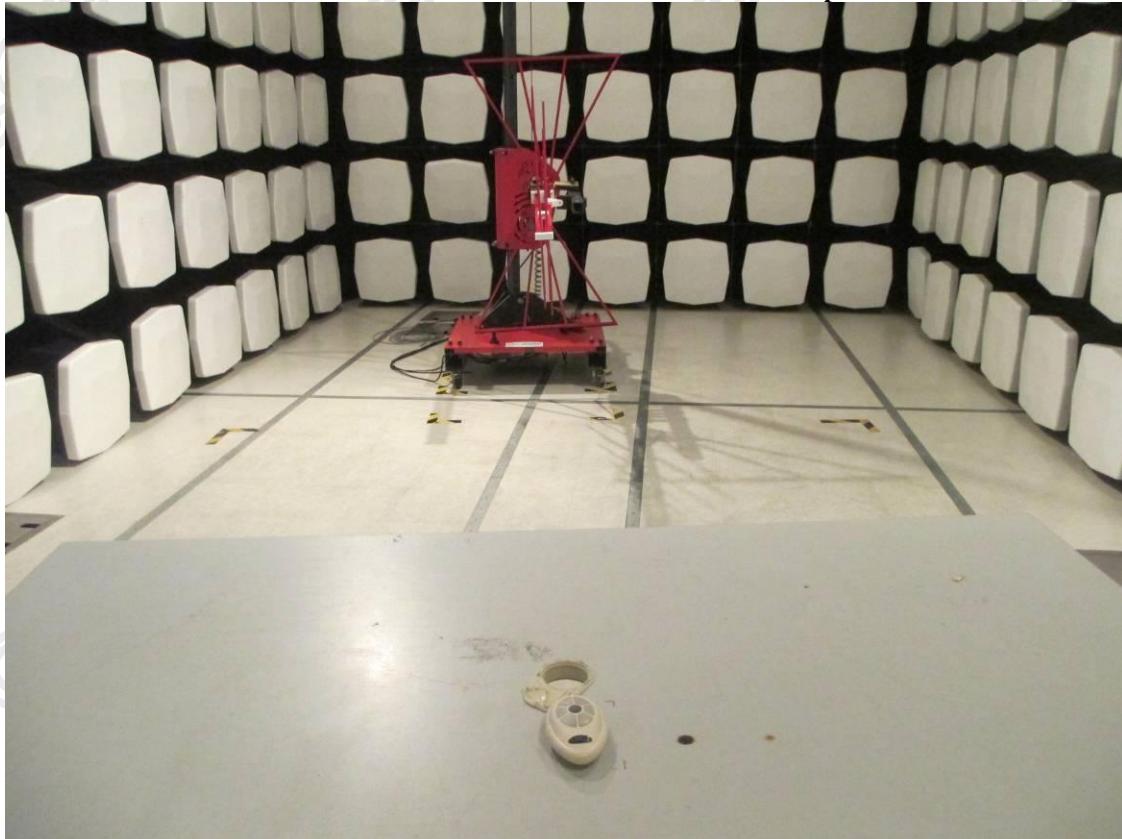
STC Test Report

Date: 2013-08-12
No. : DM111105

Page 21 of 22

Photographs of EUT

Measurement of Radiated Emission Test Set Up



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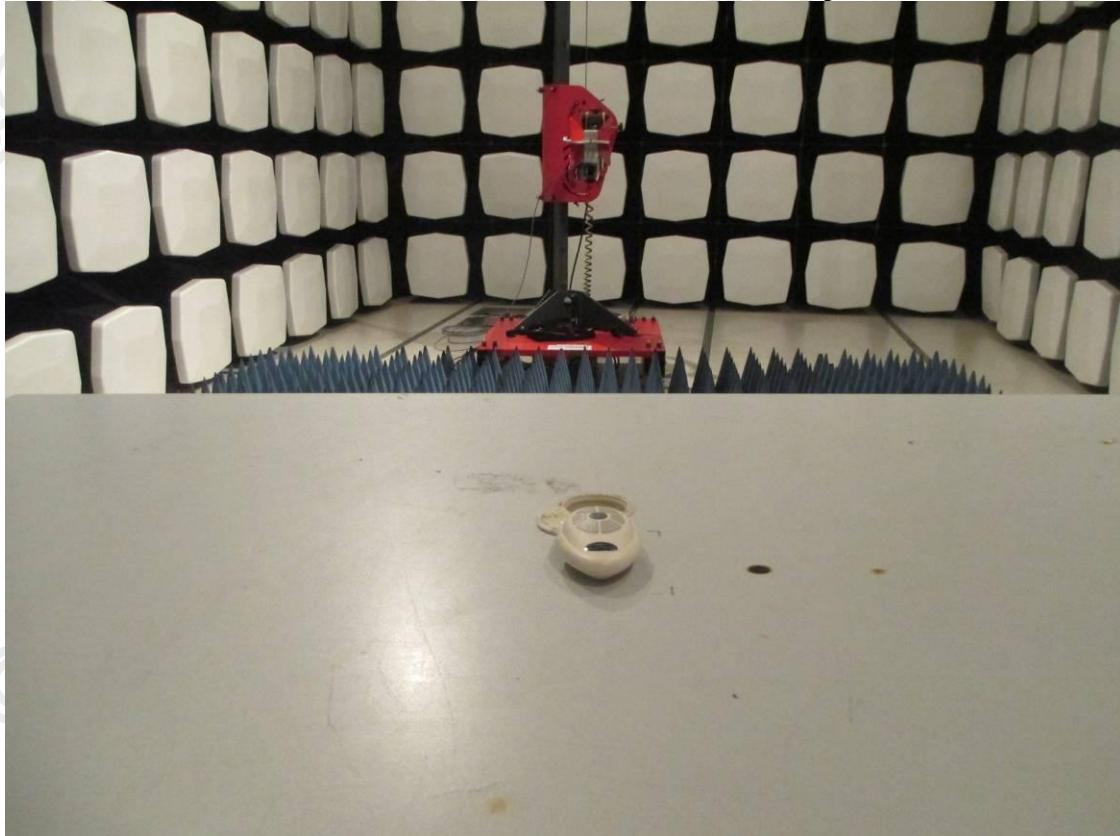
STC Test Report

Date: 2013-08-12
No. : DM111105

Page 22 of 22

Photographs of EUT

Measurement of Radiated Emission Test Set Up



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