



Test Report

Date : 2020-05-16
No. : HMD20050001

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Applicant : Zhongshan Hefeng Electronics Co., Ltd.
6/F, Building D, Ou Le Ya Industrial Park, No.19, Jinan Road,
Minzhong Town, Zhongshan City, Guangdong Province, China

Supplier / Manufacturer : Zhongshan Hefeng Electronics Co., Ltd.
6/F, Building D, Ou Le Ya Industrial Park, No.19, Jinan Road,
Minzhong Town, Zhongshan City, Guangdong Province, China

Description of Sample(s) : Submitted sample(s) said to be
Product: Fan Light Remote Control
Brand Name: HF
Model No.: RT36A
FCC ID: 2AWB7-RT36A

Date Samples Received : 2020-04-29

Date Tested : 2020-05-15 to 2020-05-16

Investigation Requested : Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 and ANSI C63.10:2013 for FCC Certification.

Conclusions : 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.

Remarks : ---

LEUNG Kwun Hang, Joey
Authorized Signatory



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

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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 Equipment Under Test [EUT]

Description of Sample(s)

Product:	Fan Light Remote Control
Manufacturer:	Zhongshan Hefeng Electronics Co., Ltd. 6/F, Building D, Ou Le Ya Industrial Park, No.19, Jinan Road, Minzhong Town, Zhongshan City, Guangdong Province, China
Brand Name:	HF
Model Number:	RT36A
Rating:	3Vd.c. (Two CR2032 batteries in parallel)

1.2.1 Description of EUT Operation

The Equipment Under Test (EUT) is a Fan Light Remote Control. The EUT is operating at 315MHz. Test was conducted under Tx mode.

1.3 Date of Order

2020-04-29

1.4 Submitted Sample(s):

1 Sample

1.5 Test Duration

2020-05-15 to 2020-05-16

1.6 Country of Origin

China

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2.0 Technical Details

2.1 Investigations Requested

Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15 and ANSI C63.10: 2013 for FCC Certification.

This is a manually operated transmitter, Press the button to start sending signals.

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 15.231(a)	ANSI C63.10: 2013	N/A	☒	☐	☐
20dB Bandwidth of Fundamental Emission	FCC 47CFR 15.231(c)	ANSI C63.10: 2013	N/A	☒	☐	☐
Radiated Emissions	FCC 47CFR 15.209	ANSI C63.10: 2013	N/A	☒	☐	☐
Manual Operated Transmitter Transmission Time	FCC 47CFR 15.231(a)	ANSI C63.10: 2013	N/A	☒	☐	☐
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	☒	☐	☐

Note: N/A - Not Applicable

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3.0 Test Results

3.1 Emission

3.1.1 Radiated Emissions

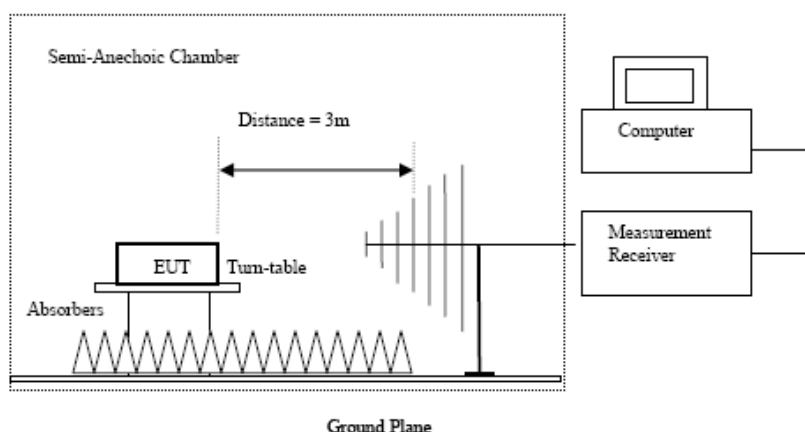
Test Requirement:	FCC 47CFR 15.231(a)	
Test Method:	ANSI C63.10:2013	
Test Date:	2020-05-16	
Mode of Operation:	Tx mode	
Ambient Temperature: 25°C	Relative Humidity: 52%	Atmospheric Pressure: 101 kPa

Test Method:

For emission measurements at or below 1 GHz, the sample was placed 0.8m above the ground plane of semi-anechoic Chamber*. For emission measurements above 1 GHz, the sample was placed 1.5m 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 G/F of The Hong Kong Standards and Testing Centre Ltd. with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

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, 9kHz to 30MHz loop antennas are used.

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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

¹Linear interpolations.

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

Results of Tx mode(1GHz – 18GHz): PASS

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
315.00	50.5	15.4	65.9	1972.4	60,430.5	Vertical
315.00	51.6	15.3	66.9	2213.1	60,430.5	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
630.00	34.1	22.8	56.9	703.1	6,043.05	Vertical
630.00	27.3	22.5	49.8	308.3	6,043.05	Horizontal
945.00	27.8	26.8	54.6	537.0	6,043.05	Vertical
945.00	23.4	26.8	50.2	323.6	6,043.05	Horizontal
1575.00	25.0	32.9	57.9	781.6	6,043.05	Vertical
1575.00	22.2	32.7	54.9	552.7	6,043.05	Horizontal
2205.00	17.2	38.2	55.4	586.8	6,043.05	Vertical
2205.00	17.6	38.1	55.7	609.5	6,043.05	Horizontal

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Results of Tx mode(1GHz – 18GHz): PASS

Field Strength of Fundamental Emissions						
Average Value						
Frequency MHz	Peak Value Level @3m dBμV	Duty Cycle Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
315.00	65.9	-12.4	53.5	472.1	6,043.05	Vertical
315.00	66.9	-12.4	54.6	533.9	6,043.05	Horizontal

Field Strength of Spurious Emissions						
Average Value						
Frequency MHz	Peak Value Level @3m dBμV	Duty Cycle Factor dB/m	Field Strength dBμV/m	Field Strength μV/m	Limit @3m μV/m	E-Field Polarity
630.00	56.9	-12.4	44.6	169.0	604.305	Vertical
630.00	49.8	-12.4	37.4	74.1	604.305	Horizontal
945.00	54.6	-12.4	42.2	128.8	604.305	Vertical
945.00	50.2	-12.4	37.8	77.6	604.305	Horizontal
1575.00	57.9	-12.4	45.5	187.9	604.305	Vertical
1575.00	54.9	-12.4	42.5	132.9	604.305	Horizontal
2205.00	55.4	-12.4	43.0	141.1	604.305	Vertical
2205.00	55.7	-12.4	43.3	146.7	604.305	Horizontal

Remarks:

- FCC Limit for Fundamental Average Measurement = $41.67(315.0) - 7083 = 6043.05 \mu\text{V/m}$
- +: 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.
- *: Adjusted by Duty Cycle = -12.38dB
Duty Cycle Correction = -12.38dB
Correction Factor = Cable loss Factor + Ant Factor - Amp Factor
Average Value Final Field Strength = Peak Value Final Field Strength + Duty Cycle
- Correction Factor includes Antenna Factor and Cable Attenuation.
- Calculated measurement uncertainty (9kHz-30MHz): 2.0dB
(30MHz -1GHz): 4.9dB
(1GHz -6GHz): 4.02dB
(6GHz -26.5GHz): 4.03dB
- 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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Limits for Radiated Emissions FCC 47 CFR 15.209 Class B1:

Frequency Range	Quasi-Peak Limits
[MHz]	[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.

Remarks:

Correction Factor includes Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty: (9kHz-30MHz): 2.0dB

(30MHz -1GHz): 4.9dB

(1GHz -6GHz): 4.02dB

(6GHz -26.5GHz): 4.03dB

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

Result of Tx mode (9kHz - 30MHz): PASS

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

Results of Tx 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
32.9	Horizontal	30.4	40.0	33.0	100
65.3	Horizontal	24.9	40.0	17.6	100
254.7	Horizontal	28.3	46.0	26.0	200
36.8	Vertical	31.3	40.0	36.6	100
44.1	Vertical	30.6	40.0	33.8	100
66.3	Vertical	27.1	40.0	22.5	100

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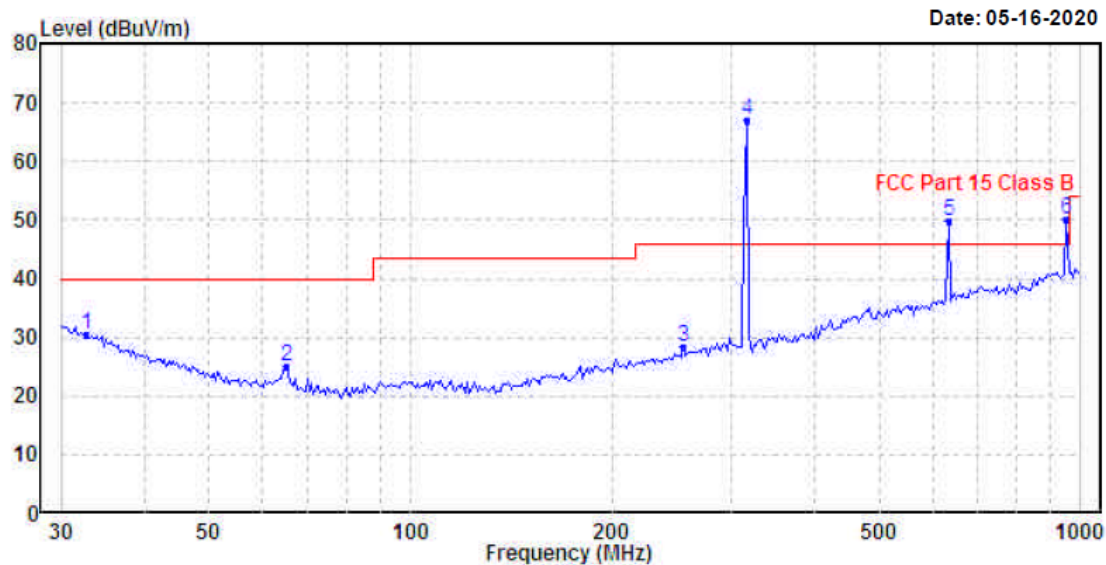


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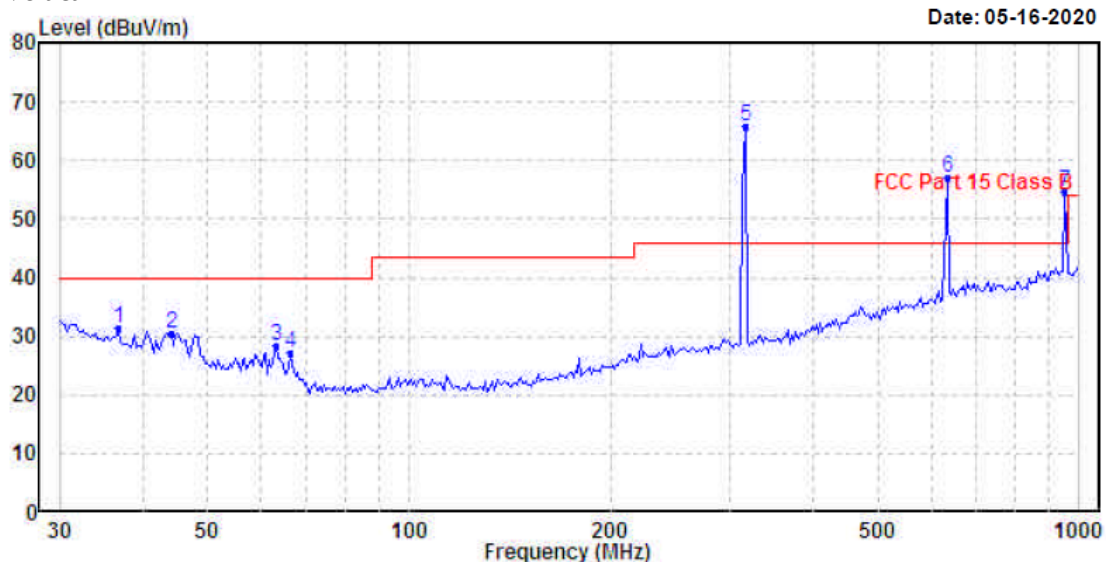
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Horizontal



Vertical



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3.1.2 Antenna Requirement

Ambient Temperature: 25°C

Relative Humidity: 51%

Atmospheric Pressure: 101 kPa

Test Requirements: § 15.203

Test Specification:

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.

Test Results:

This is PCB antenna. There is no external antenna, the antenna gain = 0dBi. User is unable to remove or changed the Antenna.

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3.2 20dB Bandwidth of Fundamental Emission

Test Requirement: FCC 47 CFR 15.231(c)
Test Method: ANSI C63.10:2013
Test Date: 2020-05-15
Mode of Operation: Tx mode

Ambient Temperature: 25°C Relative Humidity: 52% Atmospheric Pressure: 101 kPa

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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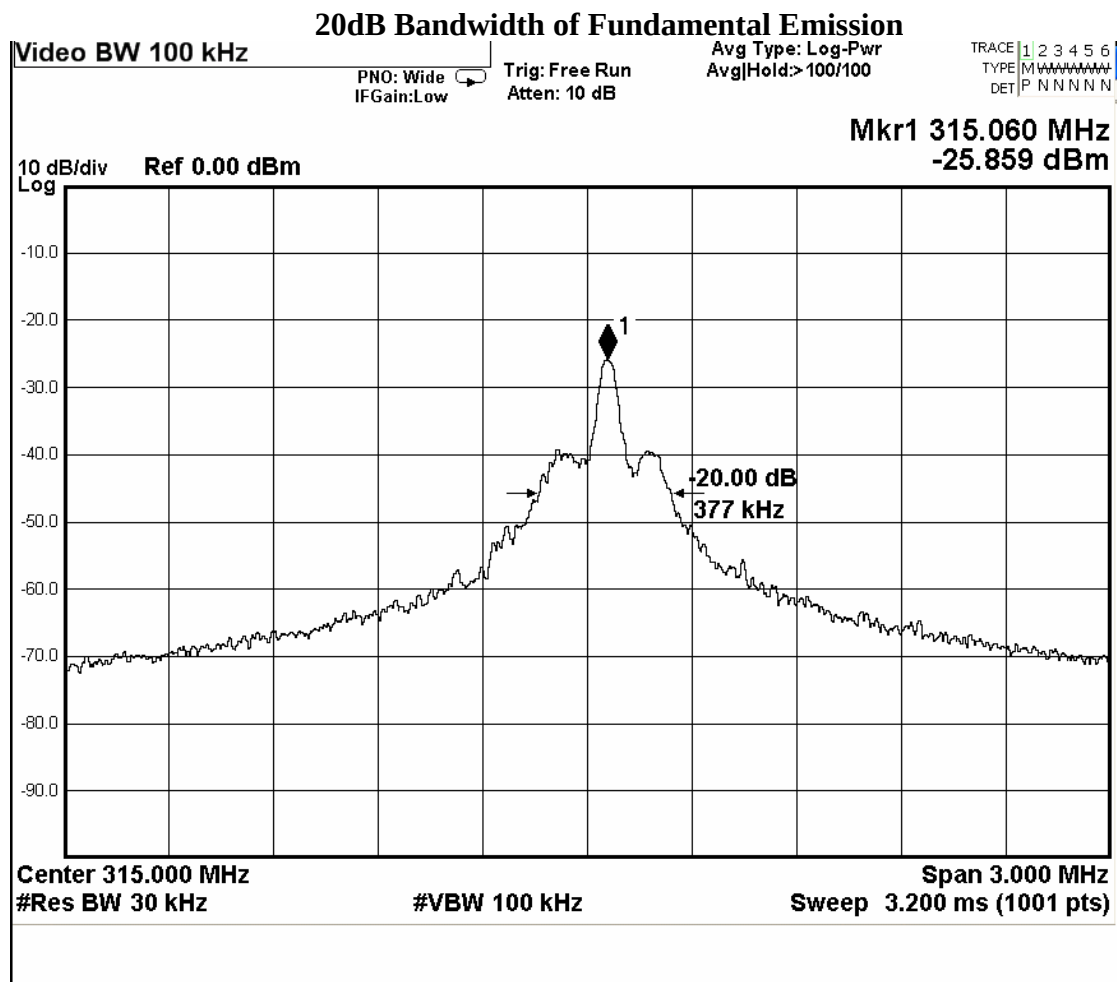
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Limits for 20 dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	20dB Bandwidth [kHz]	FCC Limits * [MHz]
315.0	377	0.7875

*: FCC Limit for Bandwidth measurement
= (0.25%)(Center Frequency)
= (0.0025)(315.0)
= 0.7875MHz



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Appendix A

List of Measurement Equipment

Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM217	ELECTRIC POWERED TURNABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2020/04/20	2021/04/20
EM356	ANTENNA POSITIONING TOWER	ETS-LINDGREN	2171B	00150346	N/A	N/A
EM336	PRECISION CONICAL DIPOLE	SEIBERSDORF LABORATORIES	PCD 3100	6236/M	2018/06/28	2020/06/28
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2020/05/13	2021/05/13
EM276	BROADBAND HORN ANTENNA	A-INFOMW	JXTXLB- 10180-SF	J203109090300 7	2019/03/20	2021/03/29
EM300	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-09	00130130	2020/04/28	2022/04/28
EM301	PYRAMIDAL STANDARD GAIN HORN ANTENNA	ETS-LINDGREN	3160-10	00130988	2020/04/28	2022/04/28
EM022	LOOP ANTENNA	ETS_LINDGREN	6502	00206533	2019/11/30	2021/11/30
EM045	POWER METER	ROHDE & SCHWARZ	NRVD	843246/028	2018/06/01	2020/06/01

Remarks:-

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

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Appendix B

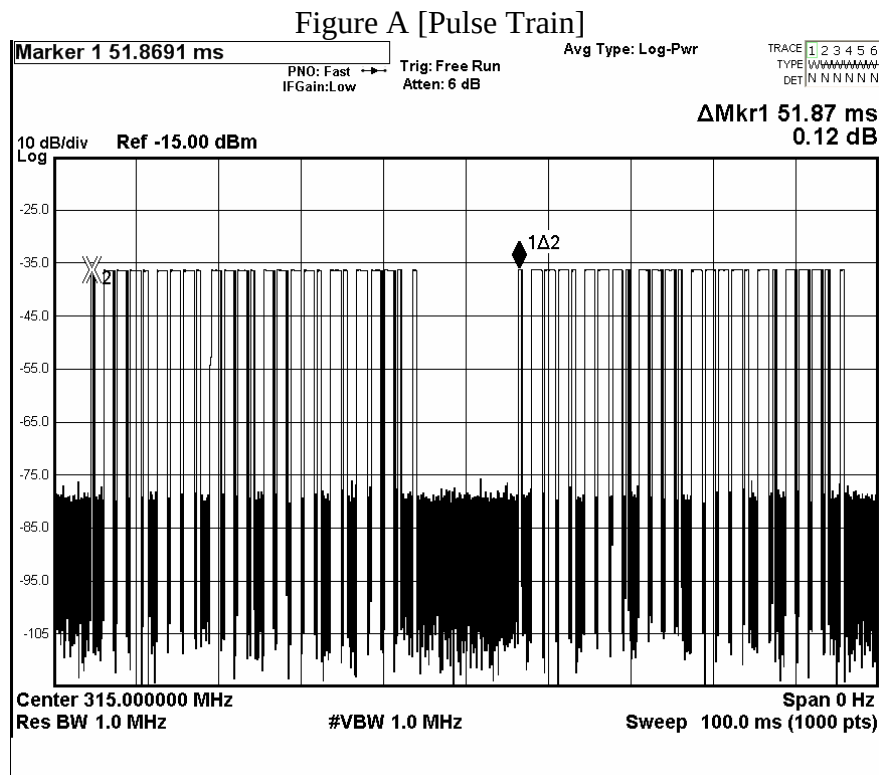
Duty Cycle Correction During 100msec

Each packet period (51.87msec) never exceeds a series of 17(1.202msec) long and 8(0.4506msec) 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 $(1.202 \times 17 + 0.4506 \times 8)$ msec per 51.87msec = 46.34% duty cycle.

Remarks:

Duty cycle factor = $20\text{Log} [(1.202 \times 17 + 0.4506 \times 8) / 51.87] = -12.38\text{dB}$

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



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Figure B [Long Pulse]

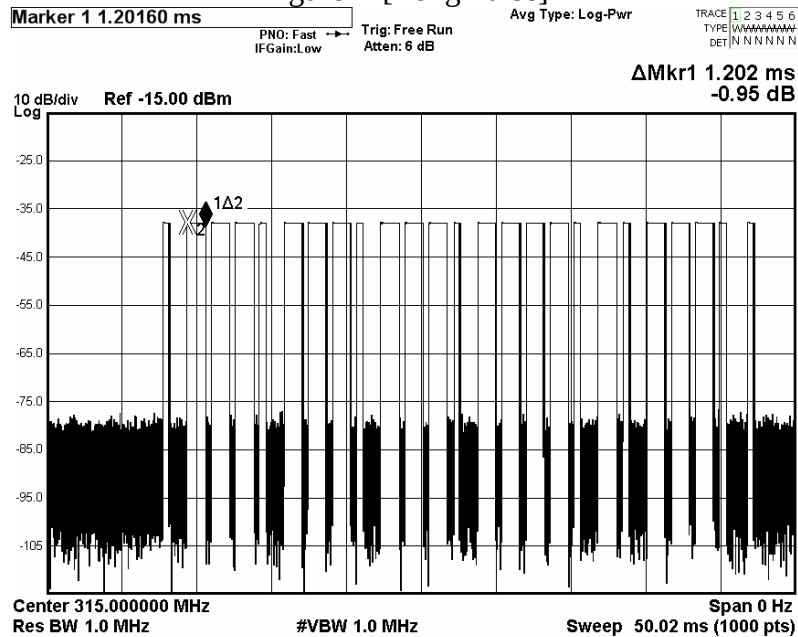
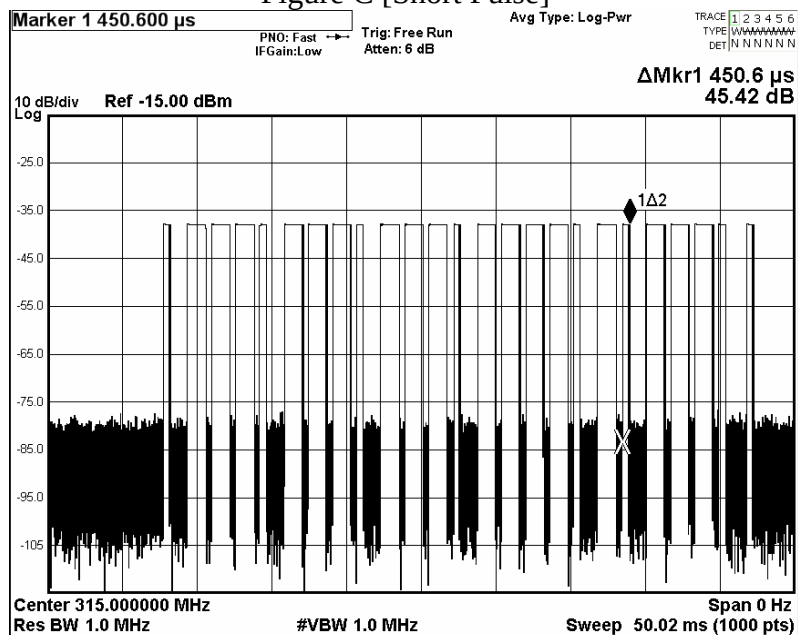


Figure C [Short Pulse]



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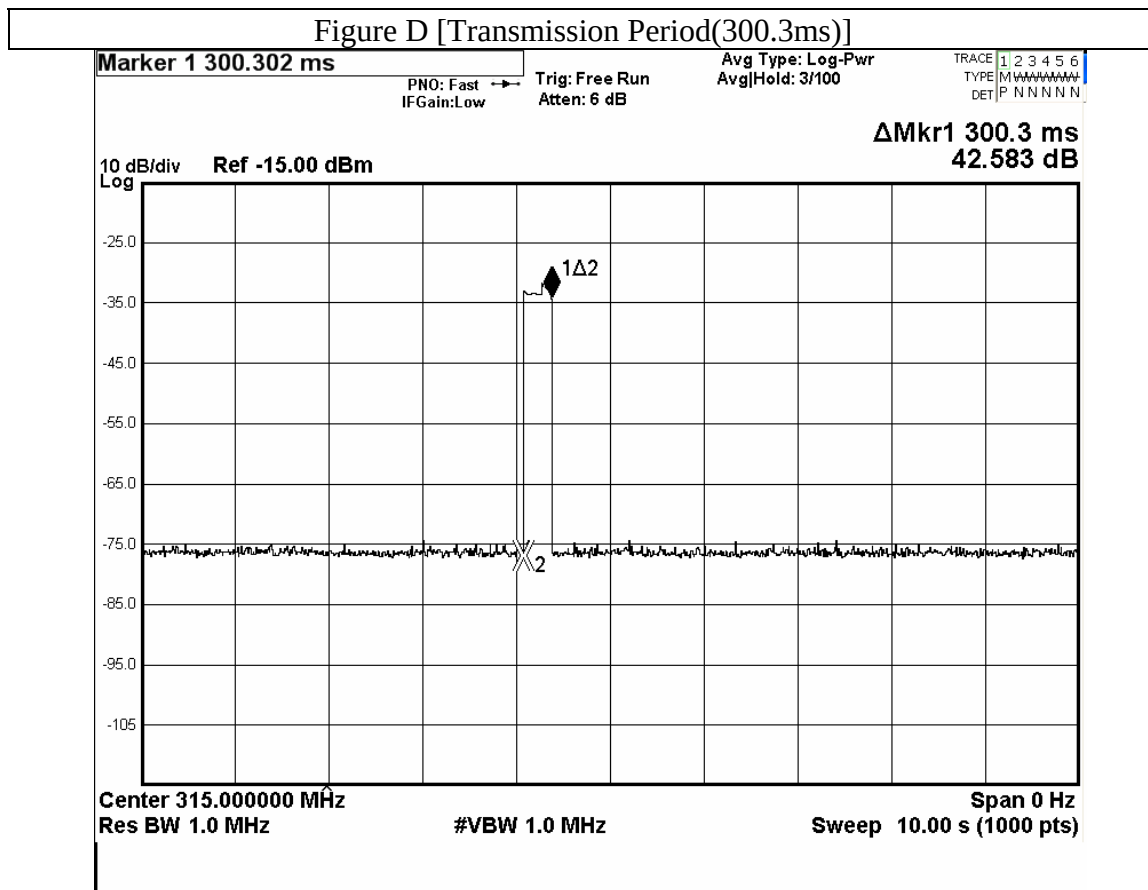
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Appendix C

Manual Operated Transmitter Transmission Time [FCC 47CFR 15.231(a)]

According to FCC 47CFR15.231 (a). A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
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.



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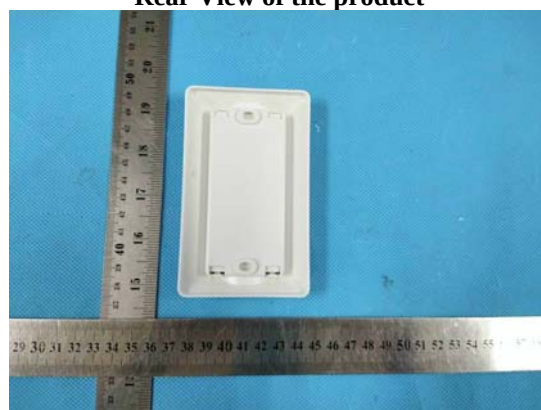
Appendix D

Photographs of EUT

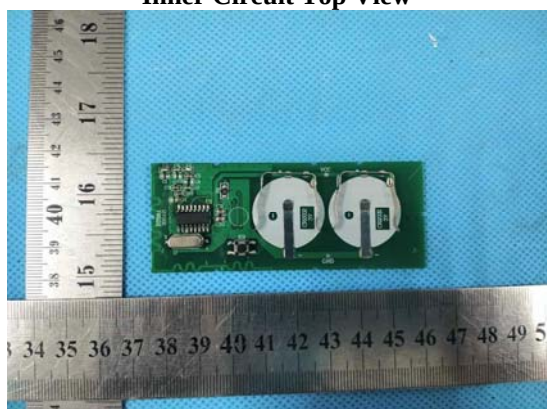
Front View of the product



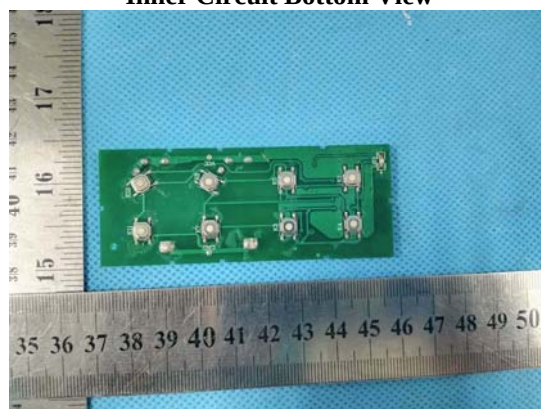
Rear View of the product



Inner Circuit Top View



Inner Circuit Bottom View



Test Report

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Photographs of EUT

Measurement of Radiated Emission Test Set Up (9kHz – 30MHz)



The Hong Kong Standards and Testing Centre Limited

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

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

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Test Report

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Photographs of EUT

Measurement of Radiated Emission Test Set Up (30MHz – 1000MHz)



The Hong Kong Standards and Testing Centre Limited

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

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

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Photographs of EUT

Measurement of Radiated Emission Test Set Up (above 1000MHz)



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

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

Tel: +852 2666 1888 Fax: +852 2664 4353 Email: hkstc@stc.group Website: www.stc.group

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