



## **STC Test Report**

Date : 2006-10-20

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No. : HM157526

**Applicant:**

Ewig Industries Macao Commercial Offshore Limited.  
Rua de Pequim Macau Finance Centre 10E, Macau

**Description of Samples:**

Model name: RF WIRELESS TRANSMITTER / LONG  
RANGE THERMO SENSOR (WITH LCD)  
Model no.: MAV211  
Brand name: Maverick  
FCC ID: N9ZET-902WS

**Date Samples Received:** 2006-10-18

**Date Tested:** 2006-10-19

**Investigation Requested:** FCC Part 15 Subpart C

**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:**

For additional models details, see page 5.

TSANG Chi Ho, Steven, EMD

For and on behalf of

The Hong Kong Standards and Testing Centre Ltd.

**The Hong Kong Standards and Testing Centre Ltd.**

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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 Applicant Details** **Applicant**

Ewig Industries Macao Commercial Offshore Limited.  
Rua de Pequim Macau Finance Centre 10E, Macau

#### **Manufacturer**

Q & S Manufacturing Co., Ltd.  
Yin Shan District, Fu Gang Village, Xiang Mang West Road,  
Qing Xi Town, Dong Guan City, China

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### **1.3 Equipment Under Test [EUT] Description of Sample**

Product: RF WIRELESS TRANSMITTER / LONG RANGE THERMO  
SENSOR (WITH LCD)  
Manufacturer: Q & S Manufacturing Co., Ltd.  
Brand Name: Maverick  
Model Number: MAV211  
Additional Model Number: ET-902WS  
Rating: 3Vd.c. ("AAA" size battery x 2)

#### **1.3.1 Description of EUT Operation**

The Equipment Under Test (EUT) is a Ewig Industries Macao Commercial Offshore Limited., RF WIRELESS TRANSMITTER / LONG RANGE THERMO SENSOR (WITH LCD). The transmitter is a trigger transmitter. It is Pulse transmitter, Modulation by data code; and type is pulses modulation.

### **1.4 Date of Order**

2006-10-18

### **1.5 Submitted Sample(s):**

2 Samples

### **1.6 Test Duration**

2006-10-19

### **1.7 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: 2005 and ANSI C63.4:2003 for FCC Certification.

#### **2.2 Test Standards and Results Summary Tables**

<b>EMISSION Results Summary</b>						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Failed	N/A
Field Strength of Fundamental Emissions & Spurious Emissions	FCC 47CFR 15.231e	ANSI C63.4:2003	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Emissions, 30MHz to 1GHz	FCC 47CFR 15.209	ANSI C63.4:2003	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conducted Emissions on AC, 0.15MHz to 30MHz	FCC 47CFR 15.207	ANSI C63.4:2003	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Note: N/A - Not Applicable

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### **3.0 Test Results**

#### **3.1 Emission**

##### **3.1.1 Radiated Emissions**

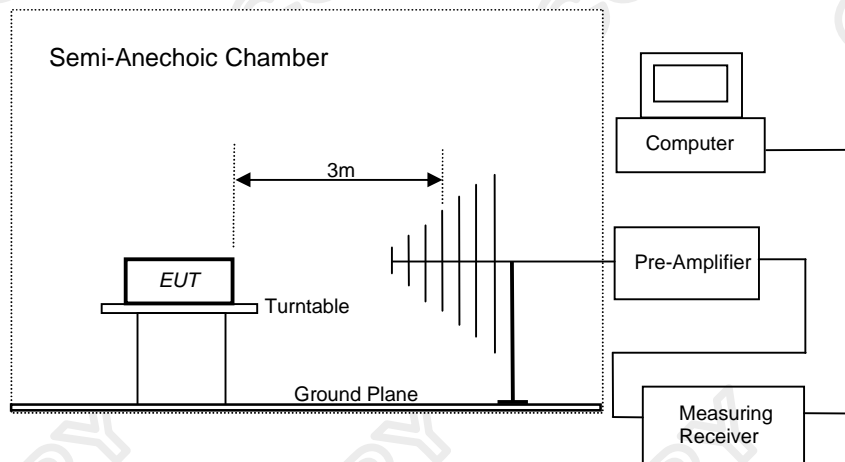
Test Requirement: FCC 47CFR 15.231e  
Test Method: ANSI C63.4:2003  
Test Date: 2006-10-19  
Mode of Operation: Tx mode

#### **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 G/F of HKSTC with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

#### **Test Setup:**



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

Frequency Range of Fundamental [MHz]	Field Strength of Fundamental Emission [Average] [μV/m]	Field Strength of Fundamental Emission [Average] [μV/m]
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500 *	50 to 150 *
174-260	1,500	150
260-470	1,500 to 5,000 *	150 to 500 *
Above 470	5,000	500

Where F is the frequency in MHz, the formula for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz,  $\mu\text{V/m}$  at 3 meters =  $22.72727(F) - 2454.545$ ; for the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $16.6667(F) - 2833.3333$ . The maximum permissible unwanted emission level is 20dB below the maximum fundamental level.

### Results of Tx Mode: 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	Antenna Polarity
433.85	59.3	18.4	77.7	7673.6	43,975.1	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	Antenna Polarity
867.70	< 1.0	28.0	< 29.0	< 28.2	4,397.5	Vertical
+ 1301.55	< 1.0	29.4	< 30.4	< 33.1	5,000.0	Vertical
1735.40	< 1.0	32.2	< 33.2	< 45.7	4,397.5	Vertical
2169.25	< 1.0	15.9	< 16.9	< 7.0	4,397.5	Vertical
2603.10	< 1.0	17.4	< 18.4	< 8.3	4,397.5	Vertical
3036.95	< 1.0	17.2	< 18.2	< 8.1	4,397.5	Vertical
3470.80	< 1.0	18.8	< 19.8	< 9.8	4,397.5	Vertical
+ 3904.65	< 1.0	19.7	< 20.7	< 10.8	5,000.0	Vertical
+ 4338.50	< 1.0	20.6	< 21.6	< 12.0	5,000.0	Vertical

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### Results of Transmitter Mode: PASS

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	Antenna Polarity
* 433.85	38.2	18.4	56.6	676.1	4,397.5	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	Antenna Polarity
867.70	< 1.0	28.0	< 29.0	< 28.2	439.8	Vertical
+ 1301.55	< 1.0	29.4	< 30.4	< 33.1	500.0	Vertical
1735.40	< 1.0	32.2	< 33.2	< 45.7	439.8	Vertical
2169.25	< 1.0	15.9	< 16.9	< 7.0	439.8	Vertical
2603.10	< 1.0	17.4	< 18.4	< 8.3	439.8	Vertical
3036.95	< 1.0	17.2	< 18.2	< 8.1	439.8	Vertical
3470.80	< 1.0	18.8	< 19.8	< 9.8	439.8	Vertical
+ 3904.65	< 1.0	19.7	< 20.7	< 10.8	500.0	Vertical
+ 4338.50	< 1.0	20.6	< 21.6	< 12.0	500.0	Vertical

#### Remarks:

\*: Adjusted by Duty Cycle = -21.1dB

\*\* : According to FCC C47CFR 15.231e,  
FCC Limit for Average Measurement =  $16.667(433.85\text{MHz}) - 2833.333 = 4,397.5\mu\text{V/m}$

+ : Denotes restricted band of operation.  
Measurements were made using a peak detector. For emissions falling within the restricted bands of FCC Rules Part 15 Section 15.205, 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 ±5.7dB

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### Limited for Radiated Emissions [FCC 47 CFR 15.209]:

Frequency Range [MHz]	Quasi-Peak Limits [ $\mu\text{V/m}$ ]
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.

### Results:

Radiated Emissions Quasi-Peak						
Frequency MHz	Measured Level @3m dB $\mu\text{V}$	Correction Factor dB/m	Field Strength dB $\mu\text{V/m}$	Field Strength $\mu\text{V/m}$	Limit @3m $\mu\text{V/m}$	Antenna Polarity
EMISSIONS DETECTED ARE MORE THAN 20dB BELOW THE FCC LIMITS						

Remarks:

Correction Factor includes Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty = 30MHz to 1GHz  $\pm 5.7\text{dB}$

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### **3.1.2 Conducted Emissions (0.15MHz to 30MHz)**

Test Requirement:

FCC 47CFR 15.207

Test Method:

ANSI C63.4:2003

Test Date:

N/A

Mode of Operation:

N/A

**Results:** N/A

The EUT is operated by a single source of internal battery power [located in the battery compartment], therefore power line conducted emission was deemed unnecessary.

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### **3.2 20dB Bandwidth of Fundamental Emission**

Test Requirement:	FCC 47 CFR 15.231e
Test Method:	ANSI C63.4:2003 (Section 13.1.7)
Test Date:	2006-10-19
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.

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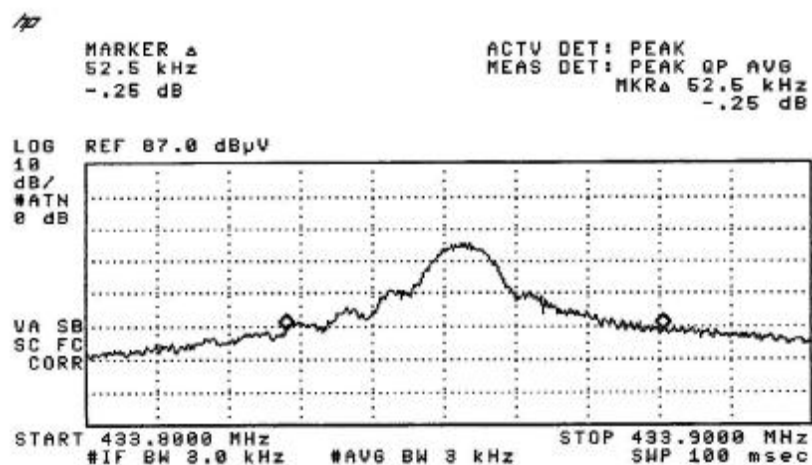
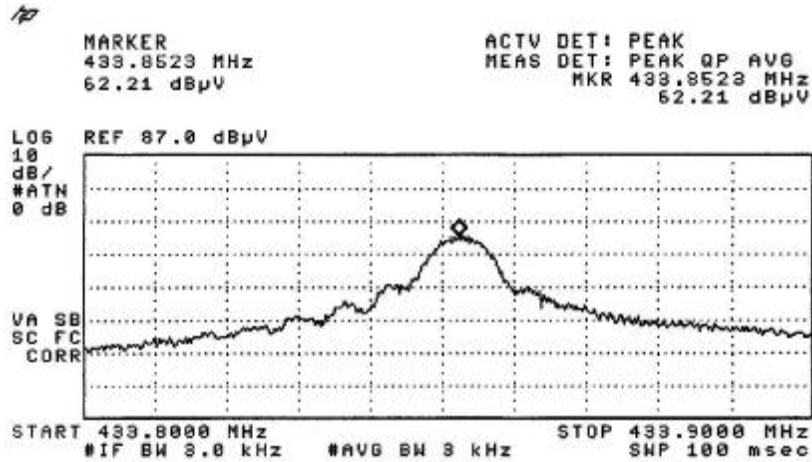
No. : HM157526

### Limits for 20dB Bandwidth of Fundamental Emission:

Frequency Range [MHz]	20dB Bandwidth [KHz]	FCC Limits * [KHz]
433.85	52.5	1084.6

\*: FCC Limit for Bandwidth measurement = (0.25%)(Center Frequency)  
=(0.0025)(433.85)  
=1084.6KHz

### 20dB Bandwidth of Fundamental Emission



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### Appendix A

#### List of Measurement Equipment

##### Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.
EM007	SPECTRUM ANALYZER	HEWLETT PACKARD	HP85660B	3144A21192
EM008	SPECTRUM ANALYZER DISPLAY	HEWLETT PACKARD	HP85662A	3144A20514
EM009	QUASI PEAK ADAPTOR	HEWLETT PACKARD	HP85650A	3303A01702
EM010	RF PRESELECTOR	HEWLETT PACKARD	HP85685A	3221A01410
EM011	ATTENUATOR/SWITCH	HEWLETT PACKARD	HP11713A	2508A10595
EM012	PRE-AMPLIFIER	HEWLETT PACKARD	HP8449B	3008A00262
EM020	HORN ANTENNA	ETS-Linggren	3115	4032
EM022	LOOP ANTENNA	ETS-Linggren	6502	1189-2424
EM072	SIGNAL GENERATOR	HEWLETT PACKARD	8640B	1948A11892
EM083	OPEN AREA TEST SITE	HKSTC	N/A	N/A
EM131	EMC ANALYZER	HEWLETT PACKARD	8595EM	3710A00155
EM145	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESCS 30	830245/021
EM195	ANTENNA POSITIONING MAST	ETS-Linggren	2075	2368
EM196	MULTI-DEVICE CONTROLLER	ETS-Linggren	2090	1662
EM215	MULTIDEVICE CONTROLER	ETS-Linggren	2090	00024676
EM216	MINI MAST SYSTEM	ETS-Linggren	2075	00026842
EM217	ELECTRIC POWERED TURNTABLE	ETS-Linggren	2088	00029144
EM218	ANECHOIC CHAMBER	ETS-Linggren	FACT-3	--
EM219	BICONILOG ANTENNA	ETS-Linggren	3142C	00029071
EM229	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB40	100248

##### Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.
EM078	VARIAC	SHANGHAI VOLTAGE	TDGC-3/0.5	N/A
EM081	SMALL SCREENED ROOM	MIKO INST HK	N/A	N/A
EM119	LISN	ROHDE & SCHWARZ	ESH3-Z5	0831.5518.52
EM127	ISOLATION TRANSFORMER 220 TO 300V	WING SUN	N/A	N/A
EM233	PULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	100314
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072
EM154	SHIELDING ROOM	SIEMENA MATSUSHITA COMPONENTS	N/A	803-740-057-99A
EM197	LISN	ETS-Linggren	4825/2	1193
EM213	DIGITAL POWER METER	VICNOBL	VIP120	00277

#### Remarks:-

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

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### Appendix B

#### Duty Cycle Correction During 100msec

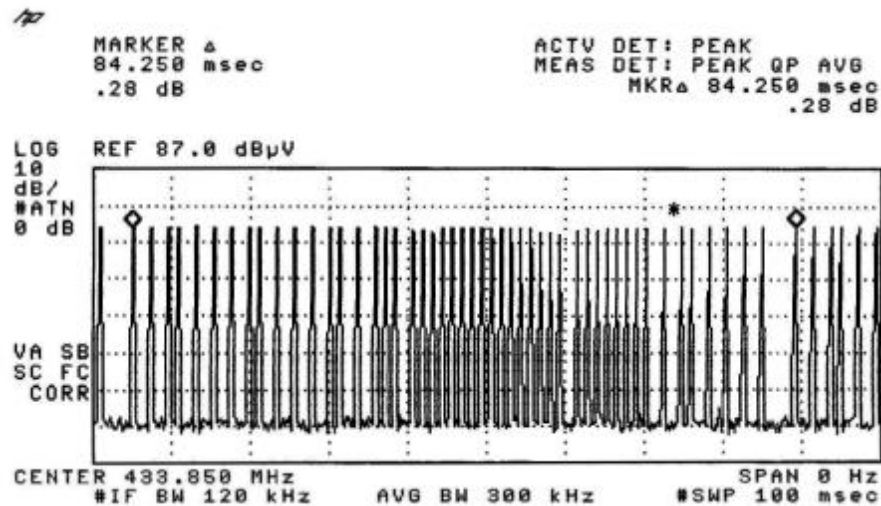
Each function key sends a different series of characters, but each packet period (84.25msec) never exceeds a series of 49 long (150µsec) or 49 short (100µsec) pulses. Assuming any combination of short and long pulses may be obtained due to encoding the worse case transmit duty cycle would be considered  $49 \times 150 \mu\text{sec}$  per 84.25msec = 8.7% duty cycle. Figure A through C show the characteristics of the pulse train for one of these functions.

Remarks:

Duty Cycle Correction =  $20\text{Log}(0.087) = -21.1\text{dB}$

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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Figure B [Long Pulse]

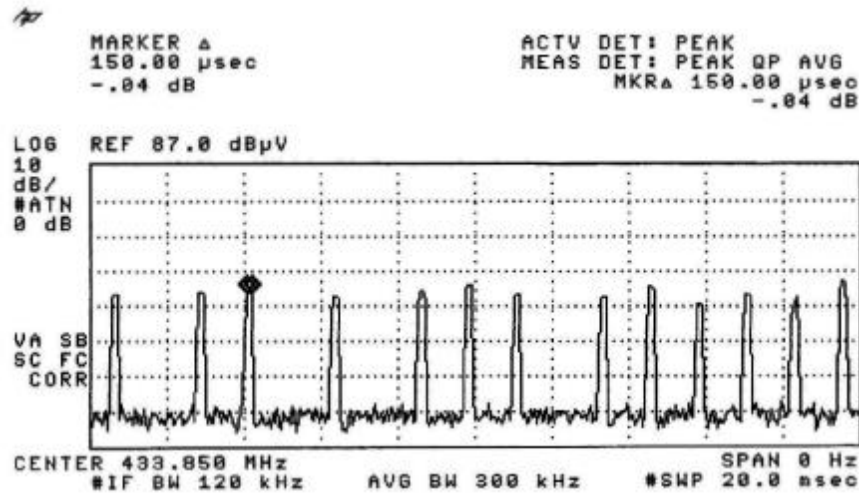
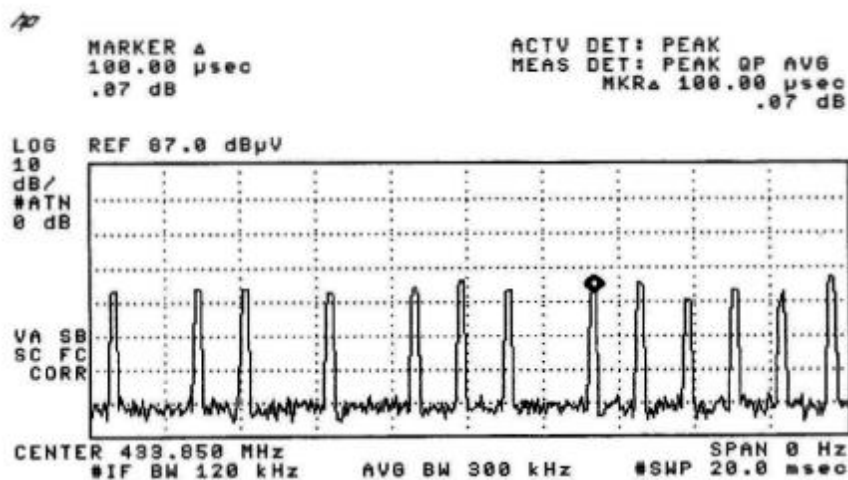


Figure C [Short Pulse]



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#### Periodic Operation [FCC 47CFR 15.231e]

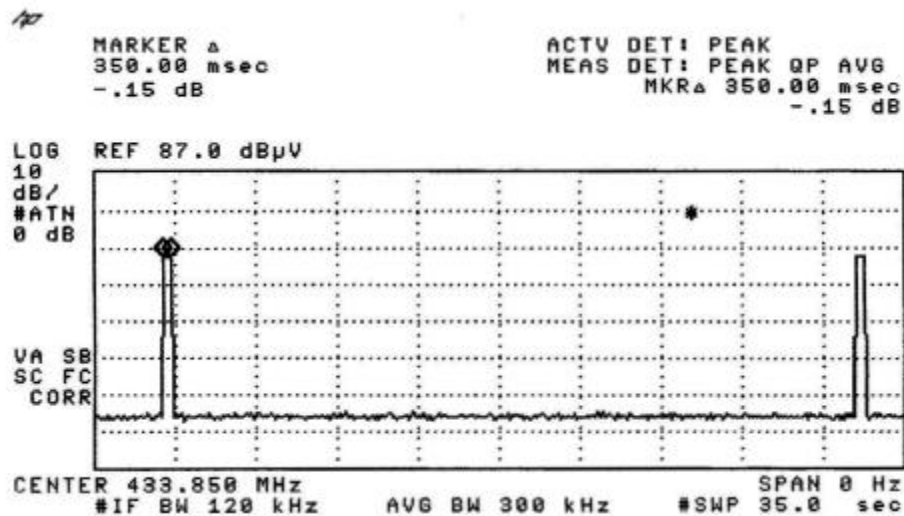
According to FCC 47CFR15.231e, The EUT shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

#### Results:

Since the EUT of each transmission is 350msec, so the silent period must not less than 10.5 seconds (350msec x 30).

The following figures [Figure D to Figure E] showed the duration of each transmission and silent period.

Figure D [Each transmission]



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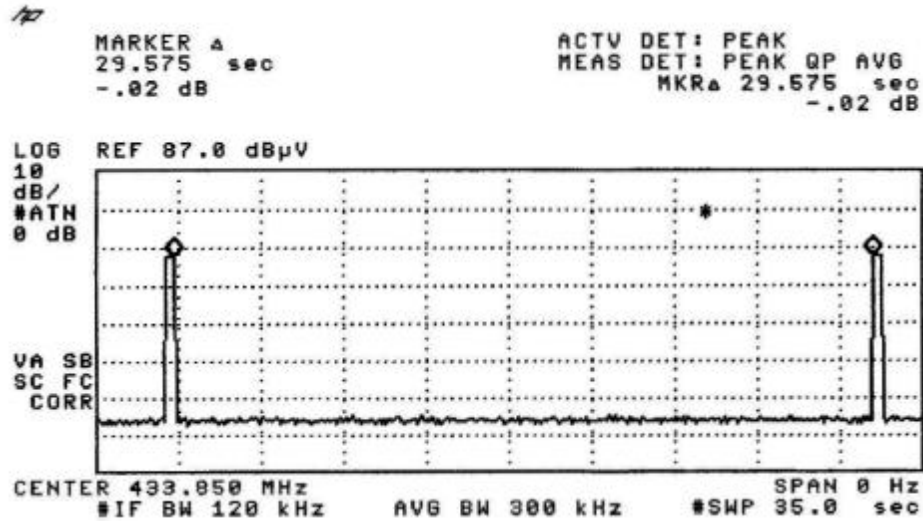
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### Periodic operation [FCC 47CFR15.231e] Figure E [Silent Period]



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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**



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### Photographs of EUT

#### Measurement of Radiated Emission Test Set Up



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

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