

**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART C REQUIREMENT**

OF

TAWG01

MODEL No.: TAWG01

Trade mark: N/A

FCC ID: PS4TAWG01

REPORT NO: ES120713123E

ISSUE DATE: August 31, 2012

Prepared for

Rain Harvesting Pty Ltd

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Prepared by

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VERIFICATION OF COMPLIANCE

Applicant:	Rain Harvesting Pty Ltd 91 Sandgate Road Albion Qld 4010 Australia
Manufacturer	FUZHOU JINSHUN ELECTRONIC CO.,LTD NO 2, HOU XIANG RD., JIAN XIN TOWN, CANGSHAN, FUZHOU 350008 CHINA
Product Description:	TAWG01
Model Number:	TAWG01
Serial Number:	N/A
Trade mark:	N/A
File Number:	ES120713123E
Date of Test:	July 15, 2012 to August 31, 2012

We hereby certify that:

The above equipment was tested by SHENZHEN EMTEK Co., Ltd. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 (2009) and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.231.

The test results of this report relate only to the tested sample identified in this report.

Date of Test : July 15, 2012 to August 31, 2012

Prepared by : 
Aaron Lai/Editor

Reviewer : 
King Wang/Supervisor


Approve & Authorized Signer : 
Lisa Wang/Manager



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1. GENERAL INFORMATION

1.1 Product Description

The Rain Harvesting Pty Ltd Model: TAWG01 (referred to as the EUT in this report) The EUT is a short range, lower power, Wireless Calling & Service System designed as an Input Device.

A major technical descriptions of EUT is described as following:

A). Operation Frequency: 433.92MHz, one channel.

B). Power Supply: DC 3V for 2 X 1.5V AAA battery

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: PS4TAWG01 filing to comply with Section 15.231(e) of the FCC Part 15, Subpart C Rules.

1.3 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4 (2009). Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Special Accessories

Not available for this EUT intended for grant.

1.5 Equipment Modifications

Not available for this EUT intended for grant.

1.6 Test Facility

Site Description
EMC Lab. : Accredited by CNAS, 2005.11.02
The certificate is valid until 2010.11
The Laboratory has been assessed and proved to be in compliance
with CNAS-CL01: 2006(identical to ISO/IEC17025: 2005)
The Certificate Registration Number is L2291

Accredited by TUV Rheinland Shenzhen, 2008.3
The Laboratory has been assessed according to the requirements
ISO/IEC 170250.

Accredited by FCC, October 28, 2010
The Certificate Registration Number is 406365.

Accredited by Industry Canada, March 05, 2010
The Certificate Registration Number is 46405-4480.

Name of Firm : SHENZHEN EMTEK Co., Ltd.
Site Location : Bldg 69, Majialong Industry Zone,
Nanshan District, Shenzhen, Guangdong, China

2. System Test Configuration

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner which intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

2.3 Test Procedure

2.3.1 Conducted Emissions (Not apply in the report)

The EUT is a placed on as turn table which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-2009. Conducted emissions from the EUT measured in the **frequency range between 0.15 MHz and 30MHz** using **CISPR Quasi-Peak and average detector mode**.

2.3.2 Radiated Emissions

The EUT is a placed on as turn table which is 0.8 m above ground plane. The turn table shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emission. And also, 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 hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4-2009.

2.4 Limitation

(1) Conducted Emission (Not applicable in this report)

According to section 15.207(a) Conducted Emission Limits is as following.

Frequency range MHz	Limits dB(uV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Note

- The lower limit shall apply at the transition frequencies
- The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.

(2) Radiated Emission

- The field strength of any emission within this band (section 15.231(e)) shall not exceed 10000 microvolt/meter at 3 meters. (80dB μ V at 3m) The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in section 15.35 for limiting peak emissions apply.
- The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in section 15.209 and section 15.231(e)(Intentional Radiators general limit). As below.

Frequency (MHz)	Field strength μ V/m	Distance (m)	Field strength at 3m dB μ V/m
30-88	100	3	40
88-216	150	3	43.5
216-960	200	3	46
Above 960	500	3	54

- Remark:
- Emission level in dBuV/m=20 log (uV/m)
 - Measurement was performed at an antenna to the closed point of EUT distance of meters.
 - Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of ξ 15.205
 - Emission spurious frequency which appearing within the Restricted Bands specified in provision of ξ 15.205, then the general radiated emission limits in ξ 15.209 apply.

Fundamental Frequency(MHZ)	Field Strength of Fundamental	
	uV/m	dBuV/m
433.92	4398.68	72.86
Harmonics	439.54	52.86

- Remark: (1) Emission level in dBuV/m=20 log (uV/m)
(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.

15.205 Restricted bands of operation

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
¹ 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	(²)

- Remark:
1. Emission level in dBuV/m=20 log (uV/m)
 2. Measurement was performed at an antenna to the closed point of EUT distance of meters.
 3. Only spurious frequency is permitted to locate within the Restricted Bands specified in provision of § 15.205, and the emissions located in restricted bands also comply with 15.209 limit.

2.5 Configuration of Tested System

Fig. 2-1 Configuration of Tested System



3. Summary of Test Results

FCC Rules	Description Of Test	Result
§ 15.207	Conducted Emission	N/A
§ 15.231(e)	Radiated Emission	Compliant
§ 15.231(c)	Bandwidth Test	Compliant
§ 15.231(e)	Deactivation Testing	Compliant

4. Description of test modes

The EUT (TAWG01) has been tested under normal operating condition.
The EUT stay in continuous transmitting mode. The Frequency 433.92MHz is chosen for testing.

5. Conducted Emissions Test (Not applicable)

5.1 Measurement Procedure:

1. The EUT was placed on a table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured was complete.

5.2 Test SET-UP (Block Diagram of Configuration)

5.3 Measurement Equipment Used:

Conducted Emission Test Site # 4					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/29/2012	05/29/2013
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/29/2012	05/29/2013
50ΩCoaxial Switch	Anritsu	MP59B	M20531	05/29/2012	05/29/2013

5.4 Measurement Result:

This test is not applicable due to this EUT is powered by batteries only.

5.5 Conducted Measurement Photos:

N/A

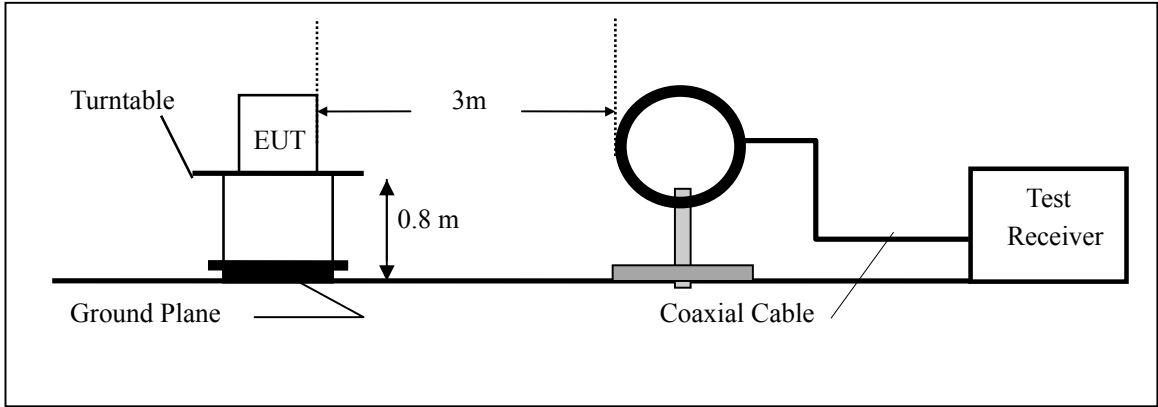
6. Radiated Emission Test

6.1 Measurement Procedure

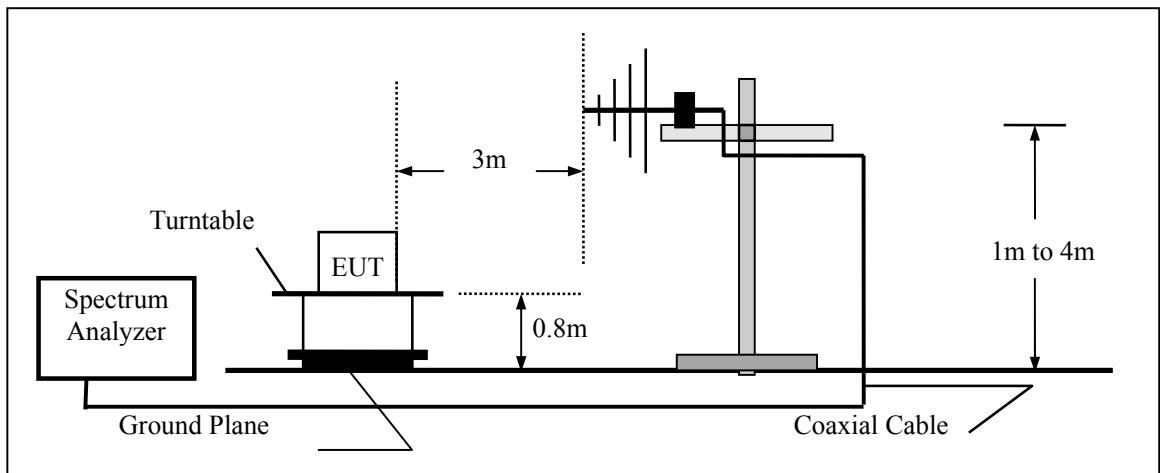
1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
4. Repeat above procedures until all frequency measured was complete.

6.2 Test SET-UP (Block Diagram of Configuration)

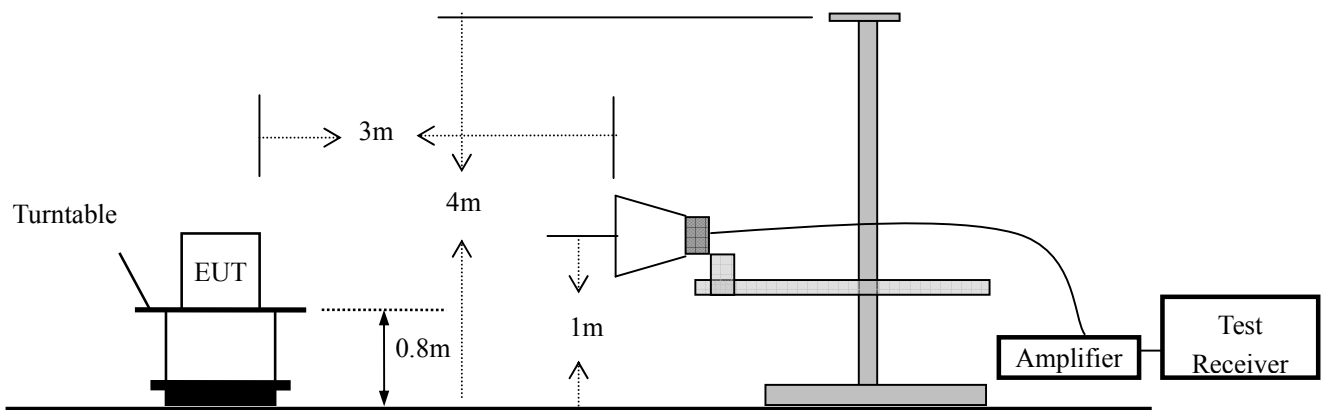
(A) Radiated Emission Test Set-Up, Frequency Below 30MHz



(B) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(C) Radiated Emission Test Set-Up, Frequency above 1000MHz



6.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	May 29, 2012	05/29/2013
Spectrum Analyzer	Agilent	E4407B	88156318	05/29/2012	05/29/2013
Pre-Amplifier	HP	8447D	2944A07999	May 29, 2012	05/29/2013
Bilog Antenna	Schwarzbeck	VULB9163	142	May 29, 2012	05/29/2013
Loop Antenna	ARA	PLA-1030/B	1029	May 29, 2012	05/29/2013
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	May 29, 2012	05/29/2013
Horn Antenna	Schwarzbeck	BBHA 9120	D143	May 29, 2012	05/29/2013
Cable	Schwarzbeck	AK9513	ACRX1	May 29, 2012	05/29/2013
Cable	Rosenberger	N/A	FP2RX2	May 29, 2012	05/29/2013
Cable	Schwarzbeck	AK9513	CRPX1	May 29, 2012	05/29/2013
Cable	Schwarzbeck	AK9513	CRRX2	May 29, 2012	05/29/2013

6.4 Calculation of Average factor

The output field strengths of specification in accordance with the FCC rules specify measurements with an average detector. During the test, a spectrum analyzer incorporating a peak detector was used. Therefore, a reduction factor can be applied to the resultant peak signal level and compared to the limit for measurement instrumentation incorporating an average detector.

The duty cycle is measured in 100ms or the repetition cycle period, whichever is a shorter time frame, the duty cycle is measured by placing the spectrum analyzer to set zero span at 100kHz resolution bandwidth.

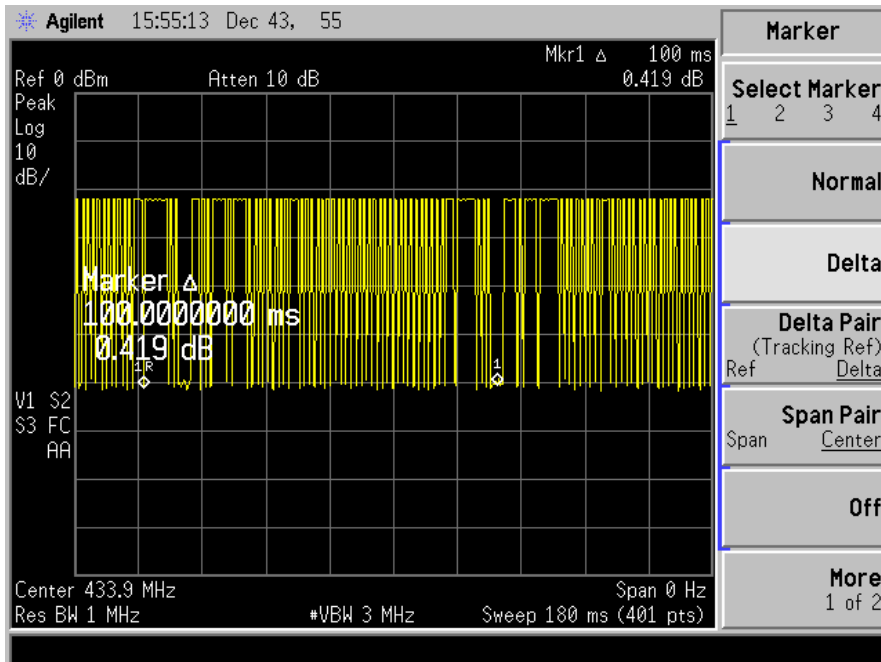
Averaging factor in dB=20log (duty cycle)

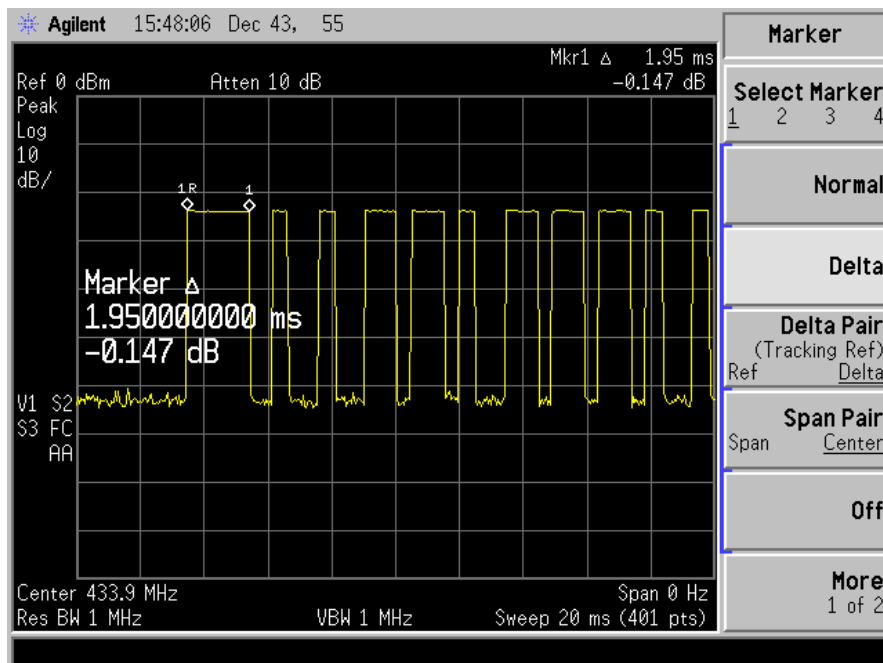
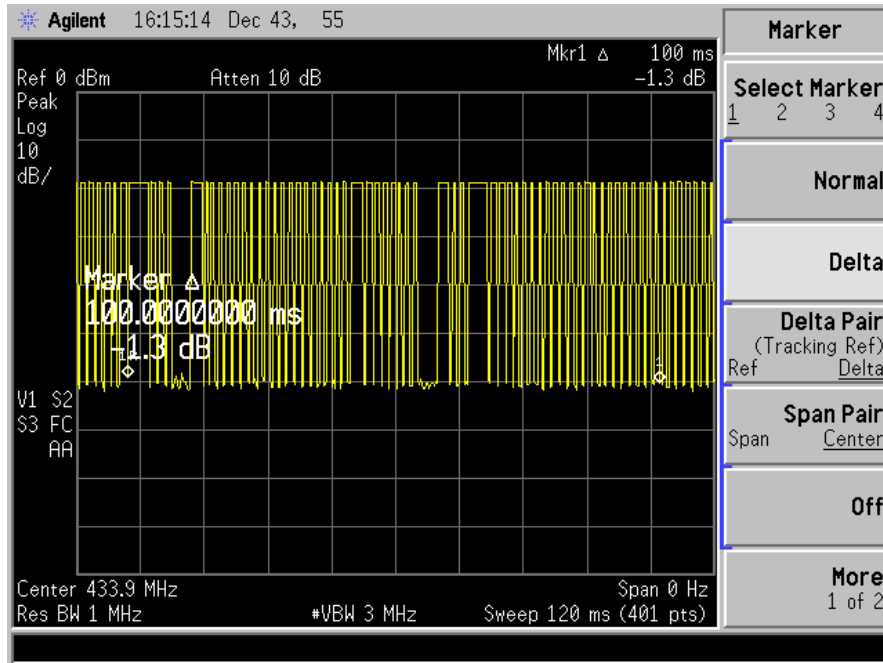
Where the duty factor is calculated from following formula:

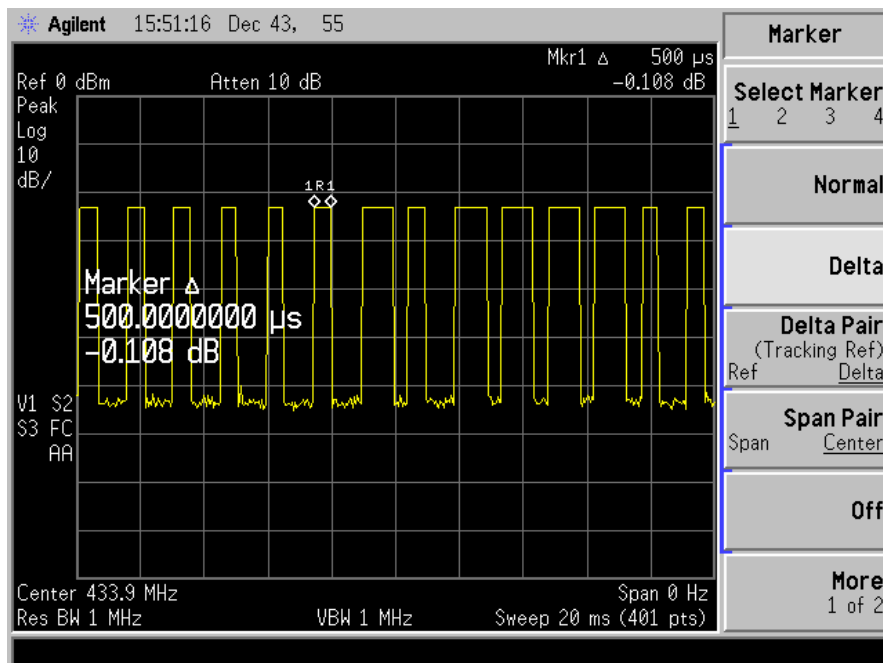
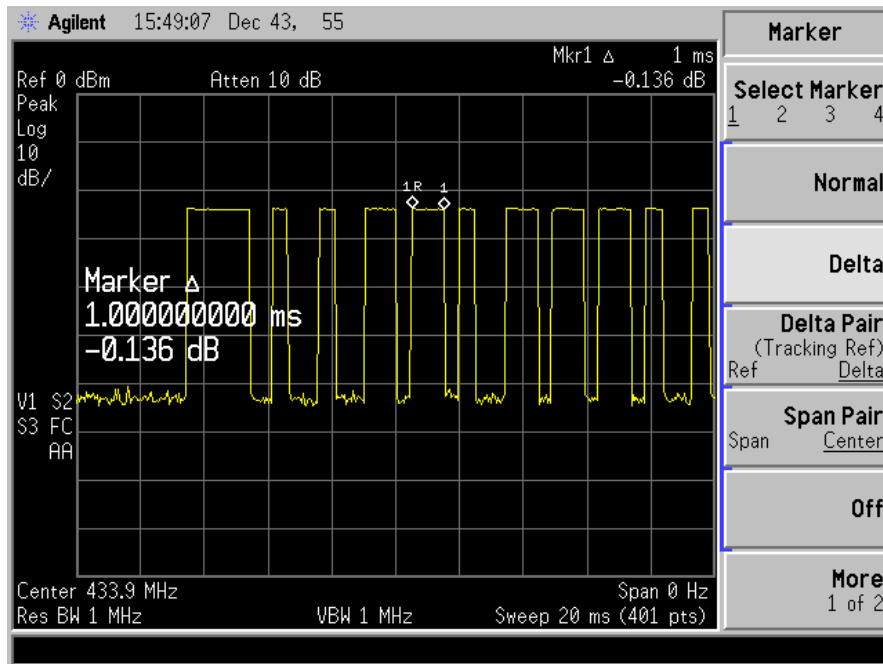
$$20\log(\text{Duty cycle})=20\log((1.95\text{ms}\cdot 2+1\text{s}\cdot 3+0.5\text{ms}\cdot 53)/100\text{ms})=-9.52\text{dB}$$

Therefore, the averaging factor is -9.52dB.

Please see the diagrams below:







6.5 Measurement Result

A. Fundamental Radiated Emission Data

Operation Mode: Transmitting Mode Test Date : July 23, 2012
 Test Item: Fundamental Radiated Emission Data Temperature : 24 °C
 Fundamental Frequency: 433.92MHz Humidity : 52 %
 Test Result: PASS Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV) Peak	Limit 3m (dBuV/m)	Margin (dB)	Det
433.92	V	74.10	92.86	-18.76	Peak
433.92	H	76.59	92.86	-16.27	Peak

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV)			Limit 3m (dBuV/m) Average	Margin (dB) Average
		Peak	AV factor	Average		
433.92	V	74.10	-9.52	64.58	72.86	-14.28
433.92	H	76.59	-9.52	67.07	72.86	-11.79

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV)			Limit 3m (dBuV/m) Peak	Limit 3m (dBuV/m) Peak	Margin (dB) Peak	Margin (dB) Average
		Peak	AV factor	Average				
867.84	V	37.78	-9.52	47.78	74.00	54.00	-36.22	-25.74
1301.76	V	41.30	-9.52	49.48	74.00	54.00	-32.70	-22.22
3037.44	V	42.79	-9.52	49.86	74.00	54.00	-31.21	-20.73
3471.36	V	53.40	-9.52	51.52	74.00	54.00	-20.60	-10.12
867.84	H	38.16	-9.52	40.63	74.00	54.00	-35.84	-25.36
1301.76	H	40.48	-9.52	49.50	74.00	54.00	-33.52	-23.04
3037.44	H	43.79	-9.52	49.86	74.00	54.00	-30.21	-19.73
3471.36	H	50.69	-9.52	52.48	74.00	54.00	-36.22	-25.74

Note: 1. 1301.00MHz is in a restricted band. Above 1000MHz, compliance with the emission limits in section 15.209 shall be demonstrated based on the average value of the measured emissions. The maximum Permitted average limit should be 54dBuV/m.

2. All x,y, z orientation has been investigated , and present only worst orientation data.

Other harmonics emissions are lower than 20dB below the allowable limit.

Note: (1) Readings are Average Value and Peak Value.
 (2) Emission Level= Reading Level+Probe Factor +Cable Loss

B. General Radiated Emission Data

Operation Mode: TX Mode Test Date : July 29, 2012
 Frequency Range: 9KHz~30MHz Temperature : 28°C
 Test Result: PASS Humidity : 65 %
 Measured Distance: 3m Test By: WOLF

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV/m)	Limit 3m (dBuV/m)	Over (dB)
--	--	--	--	--

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor =40log (Specific distance/ test distance)(dB);

Limit line=Specific limits (dBuV) + distance extrapolation factor.

Operation Mode: Transmitting Mode Test Date : July 29, 2012
 Test Item: General Radiated Emission Data Temperature : 24 °C
 Fundamental Frequency: 433.92MHz Humidity : 52%
 Test Result: PASS Test By: Andy

Freq. (MHz)	Ant.Pol. H/V	Emission Level (dBuV)	Limit 3m (dBuV/m)	Margin (dB)	Note
427.95	V	30.98	46.00	-15.02	Peak
448.16	V	29.76	46.00	-16.24	Peak
612.93	V	28.06	46.00	-17.94	Peak
682.88	V	26.28	46.00	-19.72	Peak
869.42	V	34.48	46.00	-11.52	Peak
959.58	V	27.90	46.00	-18.10	Peak
317.58	H	23.68	46.00	-22.32	Peak
448.16	H	34.46	46.00	-11.54	Peak
612.93	H	27.99	46.00	-18.01	Peak
681.33	H	24.40	46.00	-21.60	Peak
805.69	H	24.49	46.00	-21.51	Peak
869.42	H	38.78	46.00	-7.22	Peak

Note: Emission Level= Reading Level+ Probe Factor +Cable Loss

7. DEACTIVATION TESTING

7.1 Requirement

Per 15.231(e), devices operated under the provisions of this paragraph 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 second

7.2 Test SET-UP

Same as 6.2 Radiated Emission Measurements.

7.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Agilent	E4407B	88156318	05/29/2012	05/29/2013
Pre-Amplifier	HP	8447D	2944A07999	05/29/2012	05/29/2013
Broadband Antenna	Sunol Sciences	JB1	A040904-2	05/29/2012	05/29/2013

7.4 Test Procedure

1. The deactivation test was performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.4 (2009). The specification used was the FCC 15.231(e) limits.
2. Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

7.5 Test Data

Environmental Conditions

Temperature:	24 ° C
Relative Humidity:	52%
ATM Pressure:	1032mbar

Transmitting time:

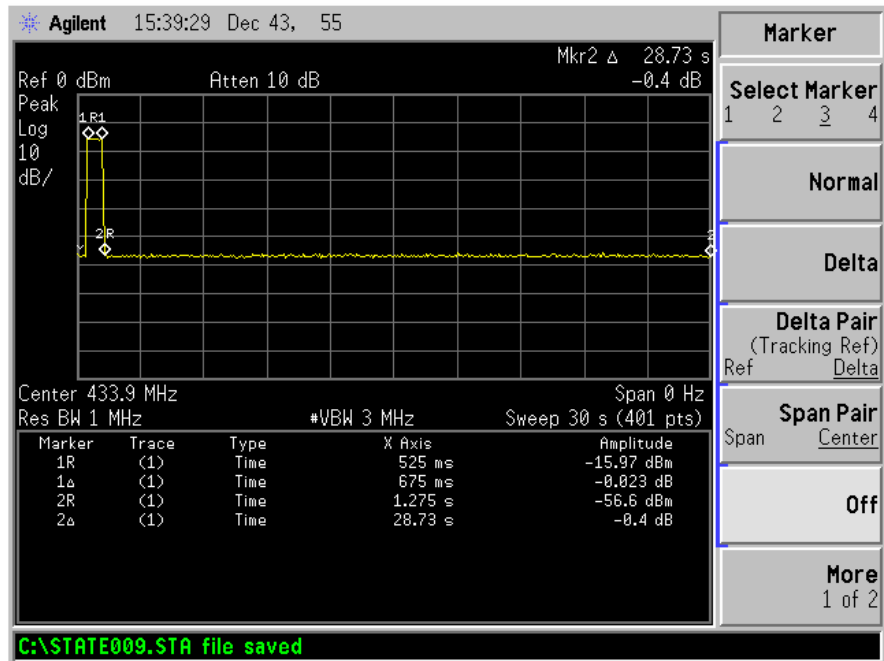
Limit(Sec)	Measurement (Sec)	Result
1s	0.675	PASS

At least 30*Ton but in no case less than 10s:

Measurement (Sec)	Result
0.675*30=20.25	PASS

Note: From the Test Plot of Page 21, the Silent Period is at least 28.73s

Refer to the attached Duty Cycle plot



8. Occupied Bandwidth

8.1. Requirements:

The bandwidth of the emissions 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, for 433.92MHz center frequency allowed occupied bandwidth shall be less than $(433.92/100)*0.25=1.0848\text{MHz}$

8.2 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation
3. Set SPA Center Frequency = fundamental frequency, RBW=10 KHz, VBW= 30 KHz
4. Set SPA Max hold. Mark peak.

8.3 Test SET-UP (Block Diagram of Configuration)

Same as 6.2 Radiated Emission Measurement.

8.4 Measurement Equipment Used:

Same as 6.2 Radiated Emission Measurement.

8.5 Measurement Results:

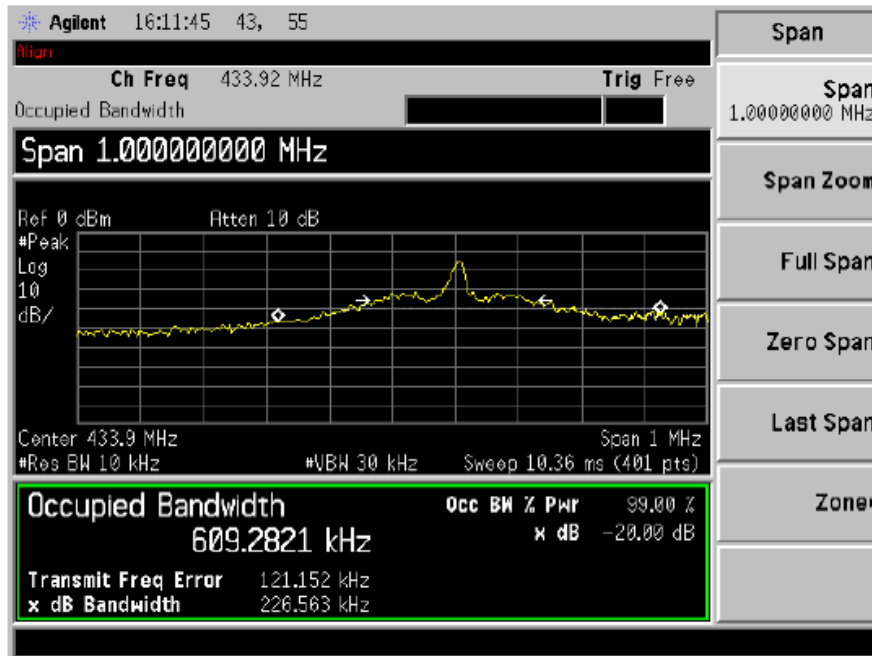
The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in section 15.209.

Refer to attached data chart.

20dB Occupied bandwidth is 226.563 KHz.

The tested unit meets the standards requirements.

Band Width Test Data



APPENDIX 1

PHOTOGRAPHS OF SET UP

Radiated Emission Setup Photos

