

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

OF

Emitter

MODEL No.: DC146, DC147

Trade mark: N/A

FCC ID: VYYDC146

REPORT NO: ES100813075F

ISSUE DATE: 2011-7-21

Prepared for

**NINGBO DOOYA MECHANIC & ELECTRONIC TECHNOLOGY CO., LTD.
Loutou Industrial Area, Zhenhai, Ningbo, Zhejiang, China**

Prepared by

SHENZHEN EMTEK CO., LTD.

**Bldg 69, Majialong Industry Zone, Nanshan District,
Shenzhen, Guangdong, China**

TEL: 86-755-26954280

FAX: 86-755-26954282

VERIFICATION OF COMPLIANCE

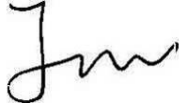
Applicant:	NINGBO DOOYA MECHANIC & ELECTRONIC TECHNOLOGY CO., LTD. Loutou Industrial Area, Zhenhai, Ningbo, Zhejiang, China
Product Description:	Emitter
Model Number:	DC146, DC147 (Note: Both the models are the same, except their model number are different. We take DC146 to test.)
Serial Number:	N/A
File Number:	ES100813075F
Date of Test:	July 12, 2011 to July 19, 2011


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 12, 2011 to July 19, 2011

Prepared by : 
(Engineer)

Reviewer : 
(Quality Manager)


Approve & Authorized Signer : 
(Manager)

Table of Contents

1.	GENERAL INFORMATION	5
1.1	PRODUCT DESCRIPTION	5
1.2	RELATED SUBMITTAL(S) / GRANT (S)	5
1.3	TEST METHODOLOGY	5
1.4	SPECIAL ACCESSORIES	5
1.5	EQUIPMENT MODIFICATIONS	5
1.6	TEST FACILITY	6
2.	SYSTEM TEST CONFIGURATION	7
2.1	EUT CONFIGURATION	7
2.2	EUT EXERCISE	7
2.3	TEST PROCEDURE	7
2.4	LIMITATION	8
2.5	CONFIGURATION OF TESTED SYSTEM	9
3.	SUMMARY OF TEST RESULTS	10
4.	DESCRIPTION OF TEST MODES	10
5.	CONDUCTED EMISSIONS TEST (NOT APPLICABLE IN THIS REPORT)	11
5.1	MEASUREMENT PROCEDURE:	11
5.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	11
5.3	MEASUREMENT EQUIPMENT USED:	11
5.4	MEASUREMENT RESULT:	11
5.5	CONDUCTED MEASUREMENT PHOTOS:	11
6.	RADIATED EMISSION TEST	12
6.1	MEASUREMENT PROCEDURE	12
6.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	12
6.3	TEST EQUIPMENT	12
6.4	CALCULATION OF AVERAGE FACTOR	13
6.5	MEASUREMENT RESULT	16
7.	DEACTIVATION TESTING	18
7.1	REQUIREMENT	18
7.2	TEST SET-UP	18
7.3	MEASUREMENT EQUIPMENT USED:	18
7.4	TEST PROCEDURE	18
7.5	TEST DATA	19
8.	OCCUPIED BANDWIDTH	20
8.1	REQUIREMENTS:	20
8.2	TEST SET-UP (BLOCK DIAGRAM OF CONFIGURATION)	20

8.3	MEASUREMENT EQUIPMENT USED:	20
8.4	MEASUREMENT RESULTS:.....	20
9.	ANTENNA APPLICATION.....	21
9.1	ANTENNA REQUIREMENT.....	21
9.2	RESULT	21
APPENDIX I PHOTOGRAPHS OF SET UP.....		22

1. GENERAL INFORMATION

1.1 Product Description

The NINGBO DOOYA MECHANIC & ELECTRONIC TECHNOLOGY CO., LTD. Model: DC146 (referred to as the EUT in this report) The EUT is a short range, lower power Device. A major technical descriptions of EUT is described as following:

- A). Operation Frequency: 433.92MHz, one channel.
- B). Power Supply: DC 12V
- C). Modulation: ASK

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: VYYDC146 filing to comply with Section 15.231 of the FCC Part 15, Subpart C Rules. The composite system (receiver) is compliance with Subpart B is authorized under a DoC procedure.

1.3 Test Methodology

Both conducted and radiated testing were 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, 2010.10.29
The certificate is valid until 2013.10.28
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 2010.5.25
The Laboratory has been assessed according to the requirements
ISO/IEC 17025

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

2.4.1 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		
1. The lower limit shall apply at the transition frequencies		
2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

2.4.2 Radiated Emission

Radiated Emission Limit (15.231(b) section)

Fundamental Frequency(MHz)	Field Strength of Fundamental dBuV/m	Field Strength of Spurious emission dBuV/m
433.92	AV:80.83 dBuV/m at 3m distance	AV: 60.83dBuV/m at 3m distance
	PK:100.83dBuV/m at 3m distance	PK: 80.83dBuV/m at 3m distance

Radiated Emission limit 15.209

Frequency (MHz)	Distance (m)	Field strength μ V/m	Field strength at 3m dB μ V/m
30-88	3	100	40
88-216	3	150	43.5
216-960	3	200	46
960-1000	3	500	54
Above 1000	3	74.0 dB(μ V)/m (Peak) 54.0 dB(μ V)/m (Average)	

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
 4. All the emissions comply with 15.231(b) limit, and the emissions located in restricted bands also comply with 15.209 limit.
 5. 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.

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 (b)	Radiated Emission	Compliant
§ 15.231 (c)	Bandwidth Test	Compliant
§ 15.231 (a)(1)	Deactivation Testing	Compliant

4. Description of test modes

The EUT (Emitter) has been tested under normal operating condition.
The EUT stay in continuous transmitting mode. The operating frequency is 433.92MHz.

5. Conducted Emissions Test (Not applicable in this report)

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)

N/A

5.3 Measurement Equipment Used:

Conducted Emission					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/29/2011	05/29/2012
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/29/2011	05/29/2012
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/29/2011	05/29/2012
50ΩCoaxial Switch	Anritsu	MP59B	M20531	05/29/2011	05/29/2012

5.4 Measurement Result:

According to Paragraph (f) of FCC Part 15 section 15.231, Tests to demonstrate compliance with the conducted limits are not required for devices which only employ battery power for operation and which do not operate from the AC power lines or contain provisions for operation while connected to the AC power lines.

The power of EUT is from battery, So it is not required to test.

5.5 Conducted Measurement Photos:

N/A

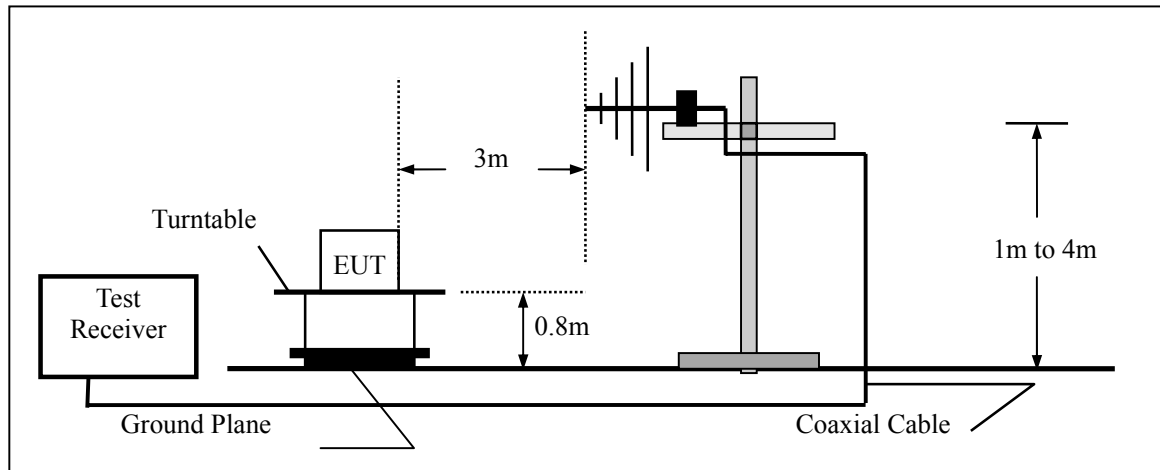
6. Radiated Emission Test

6.1 Measurement Procedure

The EUT and its simulators are placed on a turn table, which is 0.8 meter high above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT is set 3 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1 meter and 4 meters to find out the maximum emission level. Bilog antenna (calibrated by Dipole Antenna) and horn antenna are used as receiving antenna. Both horizontal and vertical polarization of the antenna is set on Test. In order to find the maximum emission levels, all of the interface cables must be manipulated according to ANSI C63.10-2009 on radiated emission Test.

6.2 Test SET-UP (Block Diagram of Configuration)

Radiated Emission Test Set-Up



6.3 Test Equipment

Radiated emission tested in 3m chamber					
Item	Equipment	Manufacturer	Model No.	Serial No.	Cal. Due
1.	EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	May 29, 2012
2.	Pre-Amplifier	HP	8447D	2944A07999	May 29, 2012
3.	Bilog Antenna	Schwarzbeck	VULB9163	142	May 29, 2012
4.	Loop Antenna	ARA	PLA-1030/B	1029	May 29, 2012
5.	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	May 29, 2012
6.	Horn Antenna	Schwarzbeck	BBHA 9120	D143	May 29, 2012
7.	Cable	Schwarzbeck	AK9513	ACRX1	May 29, 2012
8.	Cable	Rosenberger	N/A	FP2RX2	May 29, 2012
9.	Cable	Schwarzbeck	AK9513	CRPX1	May 29, 2012
10.	Cable	Schwarzbeck	AK9513	CRRX2	May 29, 2011

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)

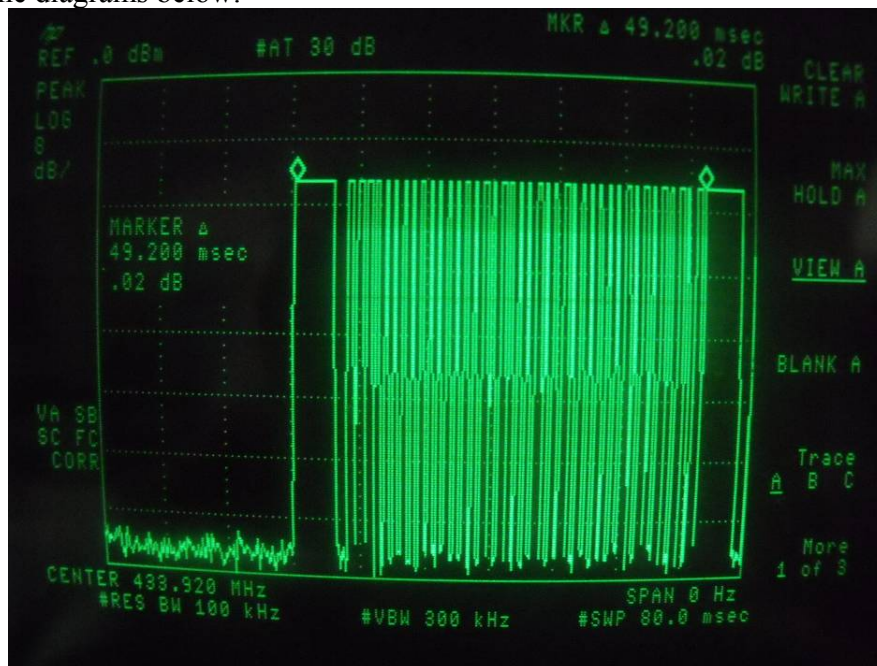
Where the duty factor is calculated from following formula:

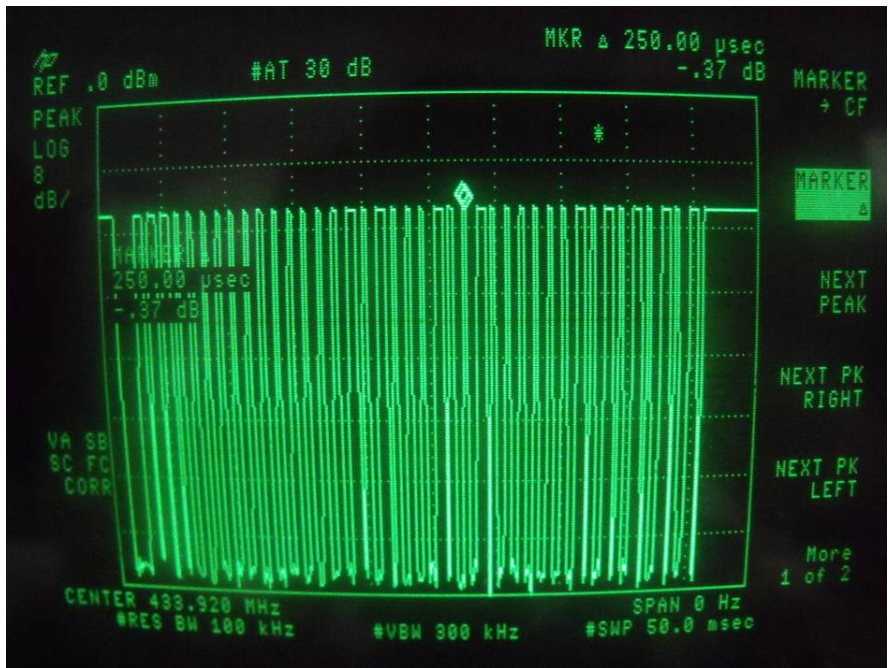
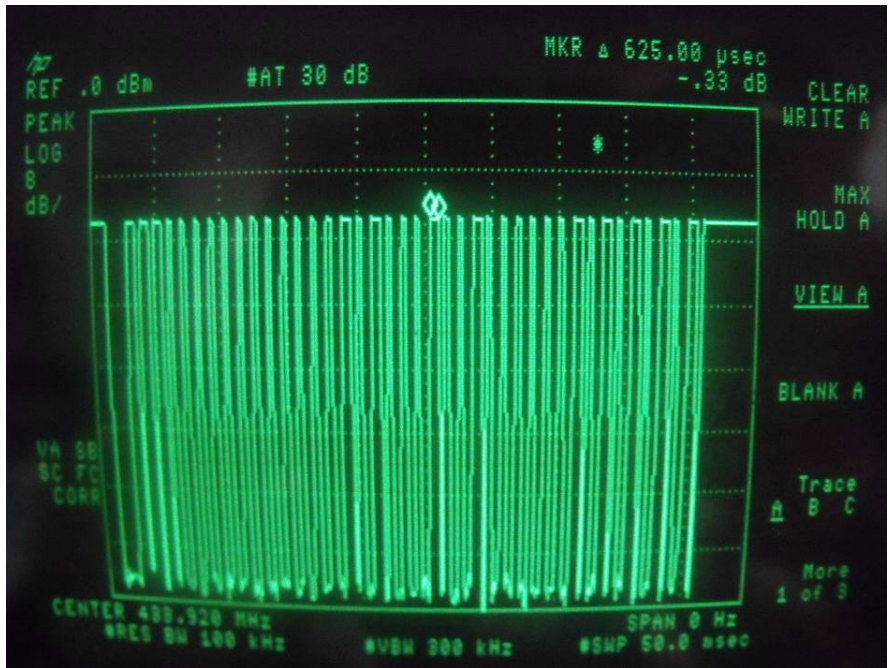
$$20\log(\text{Duty cycle})=20\log((3.129\text{ms}+0.625\text{ms}\cdot 16+0.25\cdot 24)/49.2\text{ms})=-8.2\text{ dB}$$

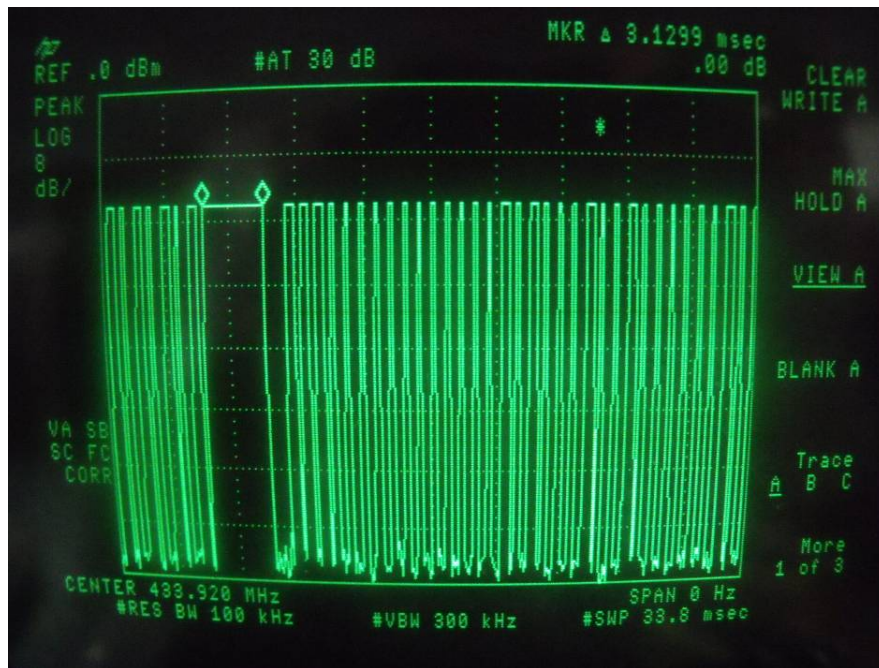
Therefore, the averaging factor is -8.2dB.

The signal bandwidth was measured and less then 100KHz RBW so PDCF factor is not required

Please see the diagrams below:







6.5 Measurement Result

A. Fundamental Radiated Emission Data

Operation Mode: Transmitting Mode Test Date : July 17, 2011
 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)		Limit 3m (dBuV/m)		Margin (dB)	
		Average	Peak	Average	Peak	Average	Peak
433.92	V	55	63.20	80.83	100.83	-25.83	-37.63
867.84	V	20.13	28.33	60.83	80.83	-40.7	-52.5
1301.28	V	28.1	36.30	54	54	-25.9	-17.7
2166.67	V	25.21	33.41	60.83	80.83	-35.62	-47.42
2602.56	V	29.57	37.77	60.83	80.83	-31.26	-43.06
3038.46	V	37.26	45.46	60.83	80.83	-23.57	-35.37
433.92	H	61.2	69.40	80.83	100.83	-19.63	-31.43
867.84	H	23.72	31.92	60.83	80.83	-37.11	-48.91
1301.28	H	33.9	42.10	54	54	-20.1	-11.9
2166.67	H	32.46	40.66	60.83	80.83	-28.37	-40.17
2602.56	H	36.28	44.48	60.83	80.83	-24.55	-36.35
3038.46	H	33.18	41.38	60.83	80.83	-27.65	-39.45

Note: 1. 1301.28MHz 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) All Readings are Peak Value.
 - (2) Emission Level= Reading Level+Probe Factor +Cable Loss
 - (3) The average measurement was not performed when the peak measured data under the limit of average detection.

B. General Radiated Emission Data

Operation Mode: Transmitting Mode (Below 1GHz) Test Date : July 17, 2011
 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
441.05	V	23.98	46	-22.02	Peak
463.38	V	23.37	46	-22.63	Peak
871.17	V	28.51	46	-17.49	Peak
961.22	V	31.24	54	-22.76	Peak
973.33	V	29.96	54	-24.04	Peak
985.46	V	28.47	46	-17.53	Peak
383.84	H	21.63	46	-24.37	Peak
459.25	H	24.38	46	-21.62	Peak
574.19	H	25.27	46	-20.73	Peak
745.05	H	27.96	46	-18.04	Peak
833.27	H	28.34	46	-17.66	Peak
957.12	H	26.74	46	-19.26	Peak

Operation Mode: Transmitting Mode(above 1GHz) Test Date : July 17, 2011
 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)		Over(dB)	
		PK	AV	PK	AV	PK	AV
2173.56	V	48.25	40.05	74	54	-25.75	-13.95
4325.31	V	49.07	40.87	74	54	-24.93	-13.13
2172.25	H	49.53	41.33	74	54	-24.47	-12.67
4321.77	H	49.22	41.02	74	54	-24.78	-12.98

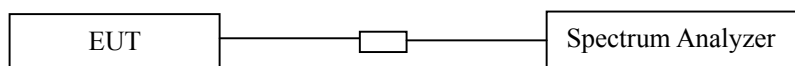
Note: Emission Level= Reading Level+ Probe Factor +Cable Loss
 Other harmonics emissions are lower than 20dB below the allowable limit.

7. DEACTIVATION TESTING

7.1 Requirement

Per 15.231(a) (1), a manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

7.2 Test SET-UP



7.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	HP	8594E	88156318	05/29/2011	05/29/2012

7.4 Test Procedure

The following table is the setting of spectrum analyzer.

Spectrum analyzer	Setting
Attenuation	Auto
Span Frequency	0Hz
RB	1MHz
VB	1MHz
Detector	Peak
Trace	Max hold
Sweep Time	10s

- The transmitter output (antenna port) was connected to the spectrum analyzer.
- Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz, Set Detector to Peak, Trace to Max Hold.
- Set the span to 0Hz and the sweep time to 10s and record the value.

7.5 Test Data

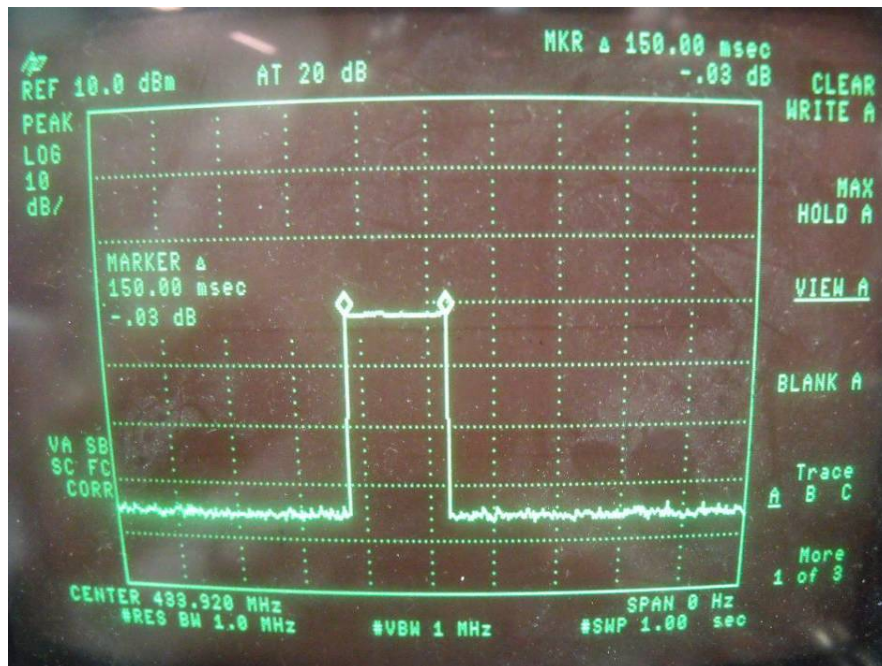
Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	52%
ATM Pressure:	1032mbar

Test Mode: Transmitting

Transmitting time	Limit (Second)	Result
150ms	5	PASS

Refer to the attached plot

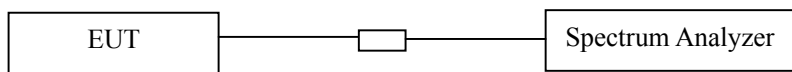


8. Occupied Bandwidth

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 $(433.92/100) \times 0.25 = 1.0848\text{MHz}$

8.2 Test SET-UP (Block Diagram of Configuration)

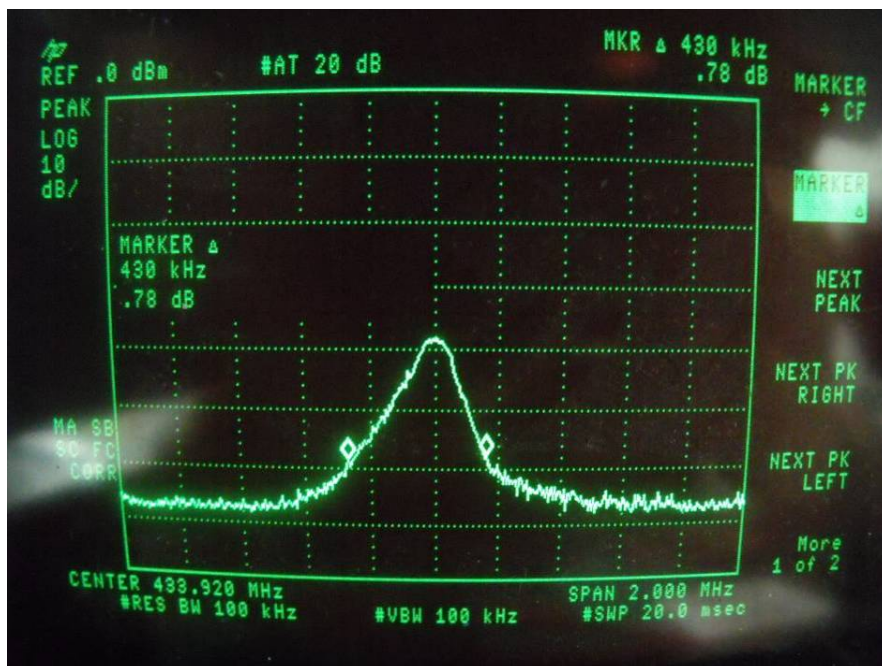


8.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	HP	8594E	88156318	05/29/2011	05/29/2012

8.4 Measurement Results:

20dB Occupied bandwidth is 430KHz.
 The tested unit meets the standards requirements.
 Refer to attached data chart.



9. Antenna Application

9.1 Antenna Requirement

For intentional device, according to FCC 47 CFR Section 15.203, 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.

9.2 Result

The EUT'S antenna is printed on PCB. The antenna's gain is 0dBi and meets the requirement.

APPENDIX I PHOTOGRAPHS OF SET UP

Radiated Emission Setup Photos

