

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

OF

Transmitter

MODEL No.: T1, T2

Trade mark: Moon

FCC ID: ZAC-T1

REPORT NO: ES110215023F

ISSUE DATE: February 17, 2011

Prepared for

BAT S.P.A

Via H.ford - Zona Industriale est, 30020 Noventa di Piave - Venice – Italy

Prepared by

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VERIFICATION OF COMPLIANCE

Applicant:	BAT S.P.A Via H.ford - Zona Industriale est, 30020 Noventa di Piave - Venice – Italy
Product Description:	Transmitter
Model Number:	T1, T2
Serial Number:	N/A
Trade Mark:	Moon
Modulation;	ASK
File Number:	ES110215023F
Date of Test:	February 15, 2011 to February 17, 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.

Approved By



David Lee/ Q.A. Manager
SHENZHEN EMTEK Co., Ltd.

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1. GENERAL INFORMATION

1.1 Product Description

The BAT S.P.A Model: T1, T2 (referred to as the EUT in this report) The EUT is a short range, lower power, Transmitter 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 12V

1.2 Related Submittal(s) / Grant (s)

This submittal(s) (test report) is intended for FCC ID: ZAC-T1 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 : Accredited by CNAS, 2010.10.29
EMC Lab. 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, 2010.10.25
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, May 24, 2008
The Certificate Registration Number is 464

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 placed on a 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 placed on a 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

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) Radiated Emission

- a. The field strength of any emission within this band (section 15.231) shall not exceed 10000 micro volts/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.
- b. 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(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: 1. Emission level in dB μ V/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 ξ 15.205
4. 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	10996.7	80.83
Harmonics	1100.0	60.83

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

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 (Transmitter) has been tested under normal operating condition.

The EUT stay in continuous transmitting mode. The Frequency 433.92MHz was chosen for testing.

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)

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	05/29/2010	05/29/2011
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/29/2010	05/29/2011
L.I.S.N	Rohde & Schwarz	ESH2-Z5	834549/005	05/29/2010	05/29/2011
50ΩCoaxial Switch	Anritsu	MP59B	M20531	05/29/2010	05/29/2011

5.4 Measurement Result: N/A

5.5 Conducted Measurement Photos: N/A

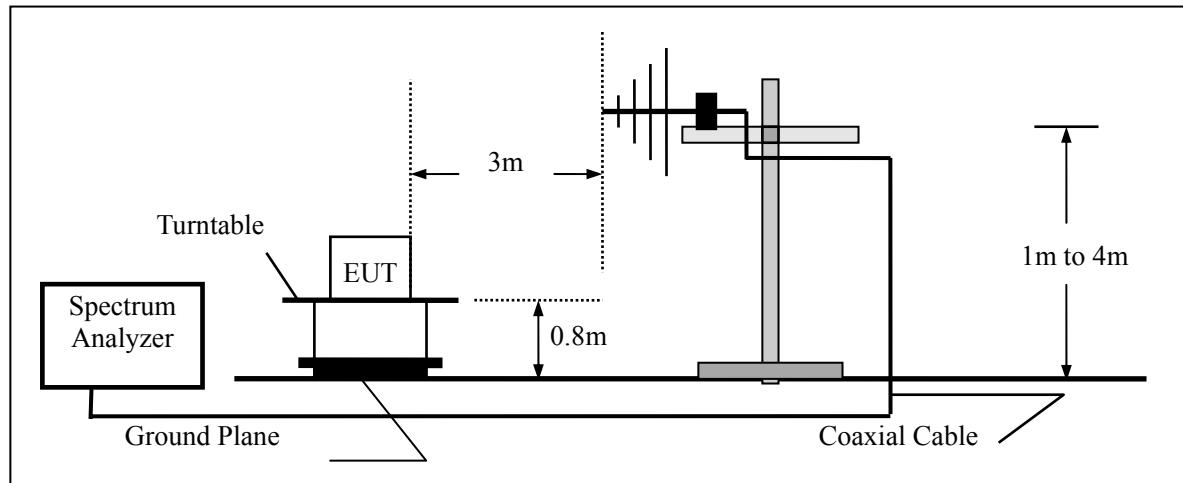
6. Radiated Emission Test

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 were complete.

6.2 Test SET-UP (Block Diagram of Configuration)

Radiated Emission Test Set-Up



6.3 Measurement Equipment Used:

Open Area Test Site # 3					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer	Rohde & Schwarz	FSEM30	849720/019	05/29/2010	05/29/2011
Amplifier	HP	8449B	3008A00277	05/29/2010	05/29/2011
Horn Antenna	Sunol Sciences	DRH-118	A052604	05/29/2010	05/29/2011
EMI Test Receiver	Rohde & Schwarz	ESCI	100028	05/29/2010	05/29/2011
Amplifier	HP	HP8447E	1937A01046	05/29/2010	05/29/2011
Broadband Antenna	Sunol Sciences	JB1	A040904-2	05/29/2010	05/29/2011

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.

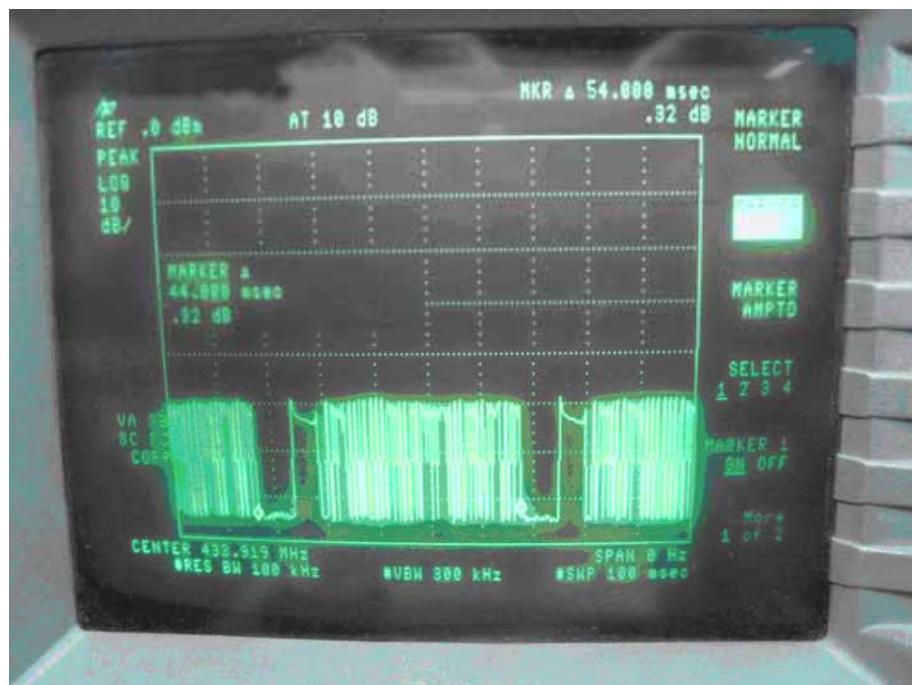
Averaging factor in dB=20log(duty cycle)

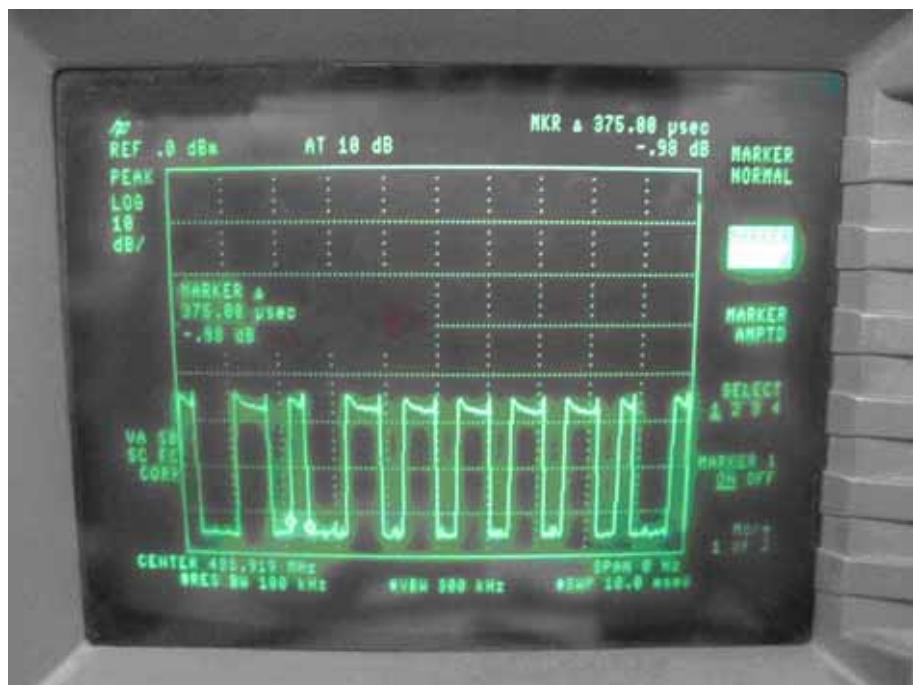
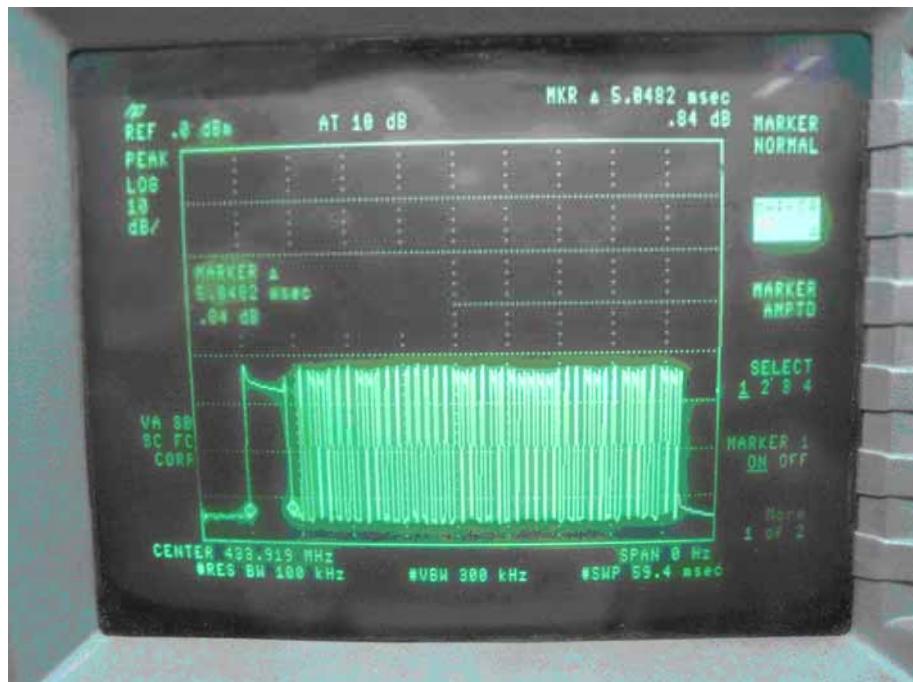
Where the duty factor is calculated from following formula:

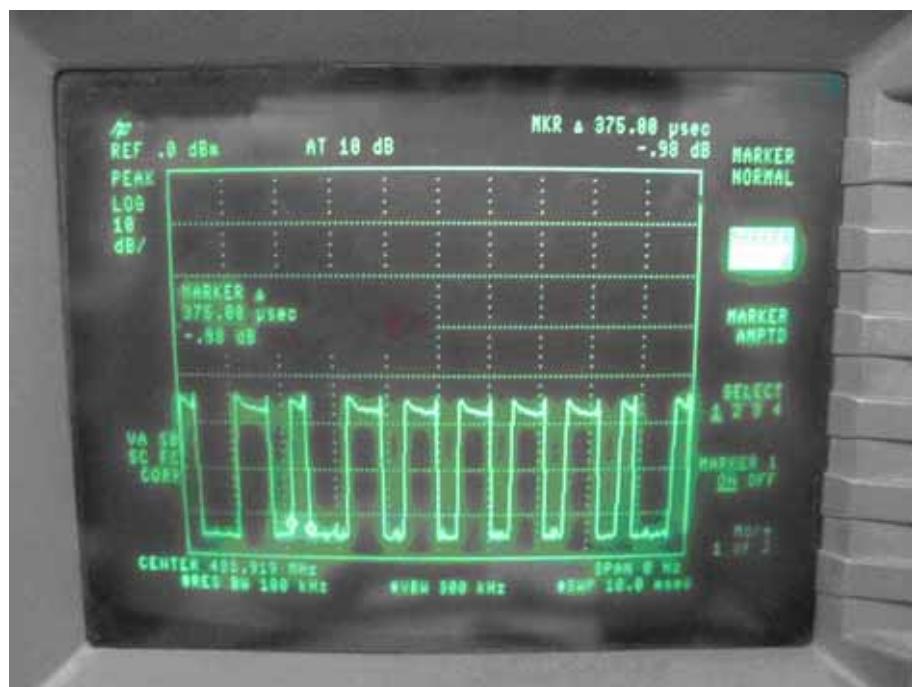
$$20\log(\text{Duty cycle}) = 20\log((5.0482 \text{ ms} + 0.375\text{ms}*23 + 0.775\text{ms}*18)/54\text{ms}) = -5.82\text{dB}$$

Therefore, the averaging factor is -5.82dB .

Please see the diagrams below:







6.5 Measurement Result

A. Fundamental Radiated Emission Data

Operation Mode: Transmitting Mode Test Date : February 15, 2010
Test Item: Fundamental Radiated Emission Data Temperature : 24
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
433.75	V	49.52	55.32	80.83	100.83	-31.31	-45.51
867.52	V	45.08	50.86	60.83	80.83	-15.75	-29.97
1301.50	V	32.75	38.59	54	74	-21.25	-35.41
2168.80	V	38.11	43.93	60.83	80.83	-22.72	-36.9
--	V	--	--	--	--	--	--
--	V	--	--	--	--	--	--
433.76	H	61.81	67.62	80.83	100.83	-19.02	-33.21
867.52	H	55.92	61.74	60.83	80.83	-4.91	-19.09
2168.80	H	39.61	45.43	60.83	80.83	-21.22	-35.4
3903.90	H	40.79	46.59	54	74	-13.21	-27.41
--	H	--	--	--	--	--	--
--	H	--	--	--	--	--	--

Note: 1. 1301.5MHz and 3903.90MHz are 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) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

B. General Radiated Emission Data

Operation Mode: Transmitting Mode (30M-1GHz) Test Date : February 15, 2010
Test Item: General Radiated Emission Data Temperature : 24
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
612.86	V	26.54	46.00	-19.66	Peak
691.37	V	28.39	46.00	-20.23	Peak
713.85	V	28.07	46.00	-18.59	Peak
960.24	V	29.82	46.00	-17.24	Peak
--	V	--	--	--	--
--	V	--	--	--	--
604.71	H	24.28	46.00	-20.61	Peak
662.53	H	26.85	46.00	-19.50	Peak
713.85	H	28.07	46.00	-13.45	Peak
960.24	H	27.16	46.00	-13.51	Peak
--	H	--	--	--	--
--	H	--	--	--	--

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.

(4) Data of measurement within this frequency range shown “ -- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

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

Same as 6.2 Radiated Emission Measurements.

7.3 Measurement Equipment Used:

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
EMI Test Receiver	Rohde & Schwarz	ESCS30	828985/018	05/29/2010	05/29/2011
Pre-Amplifier	HP	8447D	2944A07999	05/29/2010	05/29/2011
Broadband Antenna	Sunol Sciences	JB1	A040904-2	05/29/2010	05/29/2011

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 - 2003. The specification used was the FCC 15.231(a) 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

Test Mode: Transmitting

Transmitting time	Limit (Second)	Result
0.275S	5	PASS

Refer to the attached Duty Cycle plot



8. Occupied Bandwidth

8.1. Requirements:

The bandwidth of the emissions shall be no wide 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, VBW= 10KHz
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:

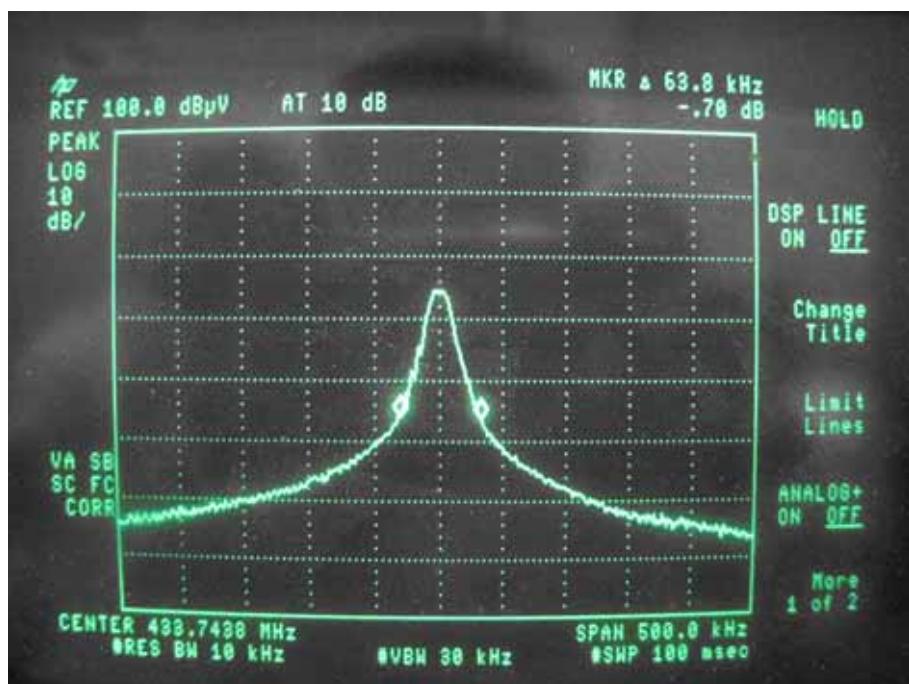
The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in section 15.209.

Refer to attached data chart.

20dB Occupied bandwidth is 63.8KHz.

The tested unit meets the standards requirements.

Band Width Test Data



9. Antenna Application

9.1 Antenna requirement

The EUT's antenna used a dipole antenna and integrated on PCB, The EUT'S antenna is met the requirement of FCC part 15C section 15.203

APPENDIX 1

PHOTOGRAPHS OF SET UP

Radiated Emission Setup Photos

