

# FCC MEASUREMENT REPORT

## CERTIFICATION OF COMPLIANCE

PRODUCT : REPEATER  
MODEL/TYPE NO : HCM-800N  
FCC ID : X6AHCM-800N  
TRADE NAME : **futurecomm**  
APPLICANT : Future Comm Co., Ltd.  
#1105-302 BucheonTechnopark III, 36-1 Samjeon-Dong, Ojeong-Gu,  
Bucheon-Si, Kyungki-Do, Korea  
RULE PART(S) : FCC Part 15C  
FCC PROCEDURE : Certification  
DATES OF TEST : January 4 to February 9, 2010  
DATES OF ISSUE : February 10, 2010  
TEST REPORT No. : BWS-10-RF-0001  
TEST LAB. : BWS TECH Inc. (Registration No. : 553281)

This REPEATER HCM-800N has been tested in accordance with the measurement procedures specified in ANSI C63.4-2003 and ANSI/TIA-603-C-2004 at the BWS TECH/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part 15.

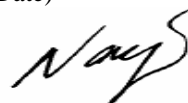
I attest to the accuracy of data. All measurement herein was performed by me or were made under my supervision. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. The results of testing in this report apply to the product/system, which was tested only. Other similar equipment may not necessarily produce the same results due to production tolerance and measurement uncertainties.

February 10, 2010  
(Date)



Reviewed by **HyunSup, Jin**

February 10, 2008  
(Date)



Reviewed by **TaeHyun, Nam**

**BWS TECH Inc.**

**www.bws.co.kr**

#611-1 Maesan-Ri, Mohyeon-Myeon, Yongin-Si, Gyeonggi-Do, 449-853 Korea

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# FCC TEST REPORT

*Scope - Measurement and determination of electromagnetic emission(EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

## 1. General Information

### Applicant

**Company Name** Future Comm Co., Ltd.  
**Company Address** #1105-302 BucheonTechnopark III, 36-1 Samjeon-Dong, Ojeong-Gu, Bucheon-Si, Kyungki-Do, Korea  
**Phone/Fax** Tel No. : +82.32.624.1290 Fax No. : +82.32.624.1296

### Manufacturer

**Company Name** Future Comm Co., Ltd.  
**Company Address** #1105-302 BucheonTechnopark III, 36-1 Samjeon-Dong, Ojeong-Gu, Bucheon-Si, Kyungki-Do, Korea  
**Phone/Fax** Phone : 82-32-624-1290 Fax : 82-32-624-1296

- **EUT Type** REPEATER
- **Model Number** HCM-800N
- **FCC Identifier** X6AHCM-800N
- **S/N** Prototype
- **FCC Rule Part(s)** FCC Part 15C
- **Frequency** 433.92 MHz
- **Modulation Method** ASK
- **Emission Designator** N/A
- **Channel** 1
- **Dates of Tests** January 4 to February 9, 2010
- **Place of Tests** BWS TECH Inc. (FCC Registration Number : 553281)  
#611-1 Maesan-Ri, Mohyeon-Myeon, Yongin-Si, Gyeonggi-Do, 449-853 Korea  
TEL: +82 31 333 5997 FAX: +82 31 333 0017
- **Test Report No.** BWS-10-RF-0001

## 2. Description of Test Facility

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The measurement for radiated and conducted emission test were conducted at the open area test site of BWS TECH Inc. facility located at #611-1 Maesan-Ri, Mohyeon-Myeon, Yongin-Si, Gyeonggi-Do, 449-853 Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2003 and CISPR Publication 16. The BWS TECH measurement facility has been filed to the Commission with the FCC for 3 and 10-meter site configurations. Detailed description of test facility was found to be in compliance with the requirements of Section 2.948 FCC Rules according to the ANSI C63.4-2003 and registered to the Federal Communications Commission (Registration Number : 553281 ).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9kHz to 40GHz (ANSI C.63.4-2003) was used in determining radiated and conducted emissions from the Future Comm Co., Ltd. REPEATER Model : **HCM-800N**.

### 3. Product Information

#### 3.1 General Specification

Kind of Product	Repeater
Model Name	HCM-800N
Serial Number	Proto Type
Power Supply	AC 100~230V DC 12V / 1A
Frequency Range	433.92 MHz
Modulation Technique	ASK
Number of Channels	1
Operating Conditions	433.92 MHz
Antenna Type	Internal type (Hellical Antenna)
Product Size	117X117X77 mm
Reception Sensitivity	-105dBm

## 4. Summery of The Test Result

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No.	Test case	FCC reference	Verdict
1	Power Line Conducted Emission	15.207	Pass
2	Field strength of the fundamental & spurious emissions	15.209 15.231(b)	Pass
3	Transmission time	15.231(a)	Pass
4	Bandwidth of operation frequency	15.231(c)	Pass

## 5. TEST DATA

## 5.1 Power Line Conducted Emission

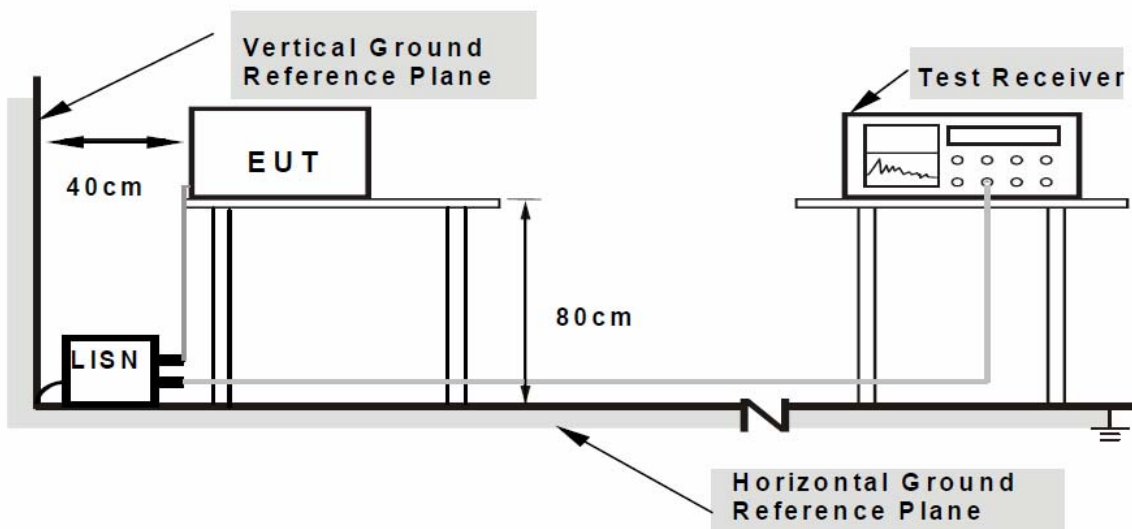
### 5.1.1 Specification

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 kHz on the AC 100V power and return leads of the EUT according to the methods defined in FCC Part 15.207. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 3.1.5. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions.

### 5.1.2 Method of Measurement

The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 3.1.5. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position producing maximum conducted emissions

### 5.1.3 Measurement Set-Up



Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

### 5.1.4 Limit

Frequency Range (MHz)	Limit (dBuV)	
	Quasi-Peak	Average
0.15 ~ 0.5	66 ~ 56	56 ~ 46
0.5 ~ 5	56	46
5 ~ 30	60	50

### 5.1.5 Test Result

Frequency Range of Test : 150 kHz to 30 MHz  
Test Standard : FCC Part 15.207  
Test Date : January 4, 2010  
Temperature/Humidity : 22 °C/ 51 %

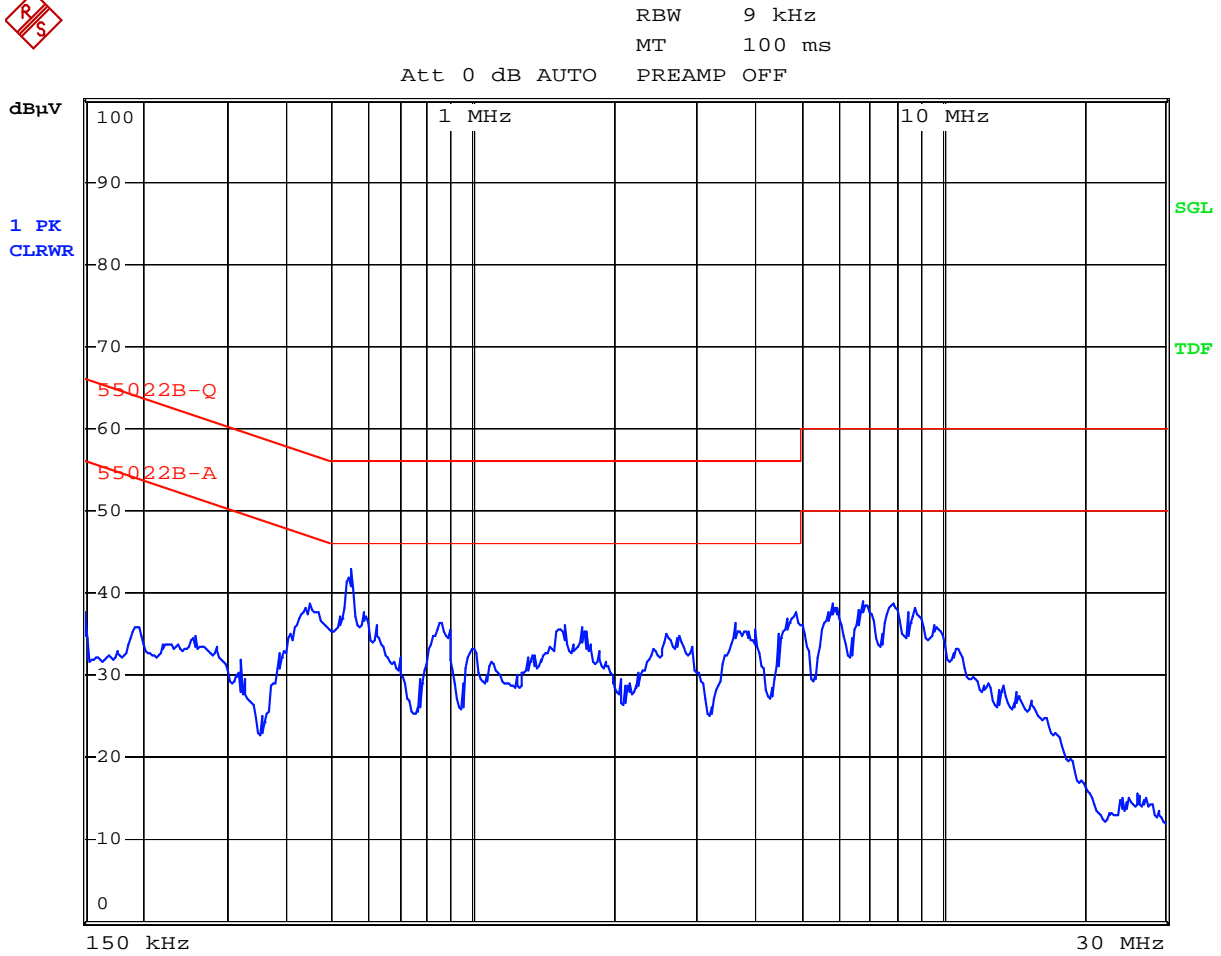
Freq [MHz]	Correcton		Phase [H/N]	Quasi-Peak Mode				Average Mode			
	AMN	C.L		Limit	Reading	Emission Level	Margin	Lim it	Reading	Emission Level	Margin
				[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]
0.262	0.07	0.16	H	62.90	54.20	54.43	8.47	52.90	32.41	32.64	20.26
0.314	0.08	0.22	H	61.40	55.37	55.67	5.73	51.40	30.29	30.59	20.81
0.390	0.08	0.24	H	59.10	52.24	52.56	6.54	49.10	32.13	32.45	16.65
0.522	0.07	0.30	N	56.00	46.13	46.50	9.50	46.00	31.36	31.73	14.27
0.822	0.08	0.30	H		39.20	39.58	16.42		27.53	27.91	18.09
1.662	0.03	0.50	H		35.86	36.39	19.61				
8.000	0.06	1.00	N	60.00	30.45	31.51	28.49	50.00			

**Notes:**

1. All modes of operation were investigated and the worst-case emissions are reported.  
See [the plots](#) in next 2 pages.
2. Line N = (Neutral), Line H = (Hot)
3. Measurement uncertainty estimated at  $\pm 3.788$  dB.  
The measurement uncertainty is given with a confidence of 95.00 % with the coverage factor, k=2
4. The detail plot data is refer to 6.1.



## PLOTS OF EMISSIONS

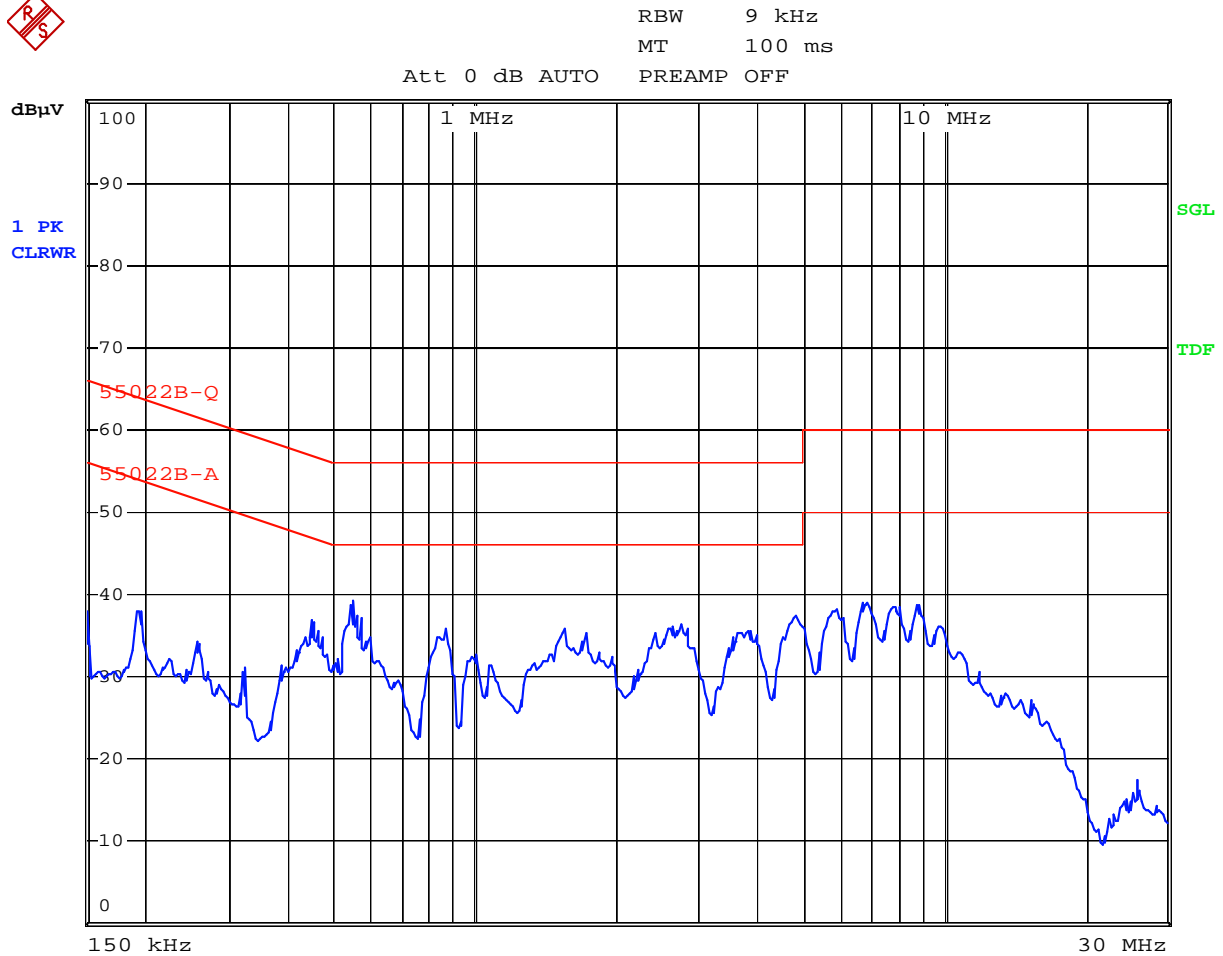


Date: 4.AUG.2009 02:29:04

**Test Mode: HOT**

**Model Name: HCM-800N**

## PLOTS OF EMISSIONS



Date: 4.AUG.2009 02:32:34

**Test Mode: NEUTRAL**

**Model Name: HCM-800N**

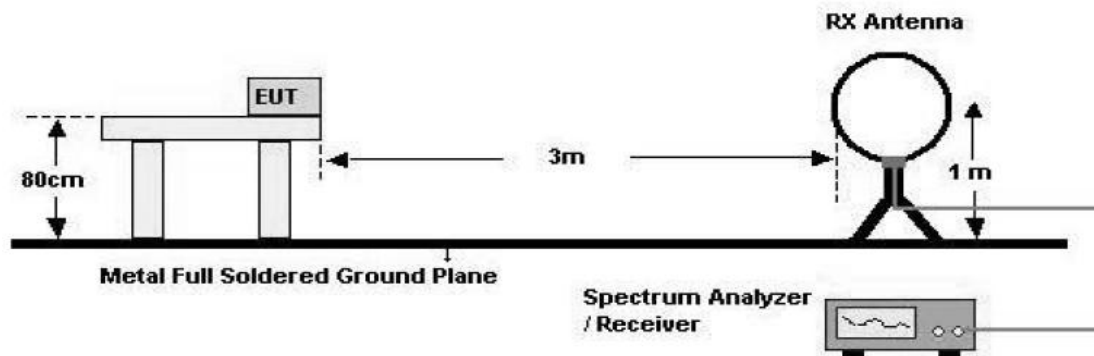
## 5.2 Field strength of the fundamental & spurious emission

### 5.2.1 Test Conditions

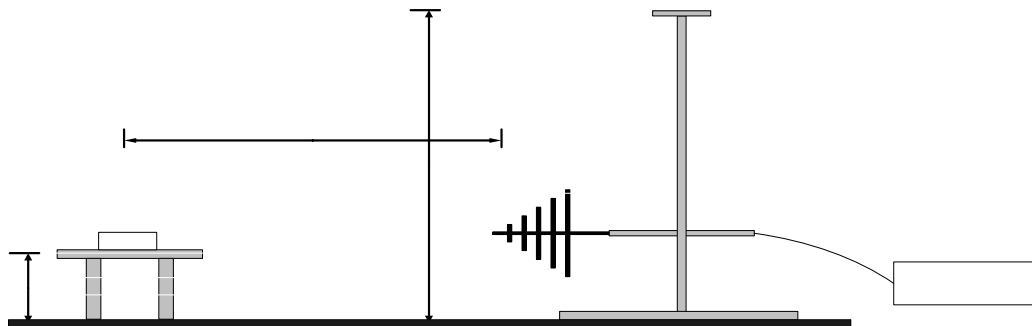
Test Standard : FCC Part 15 Subpart C Section 15.231(b)&15.209  
Operating Condition : The EUT was operated at transmitting condition continuously during the test.  
Temperature/Humidity : 22°C / 47%

### 5.2.2 Measurement Set-Up

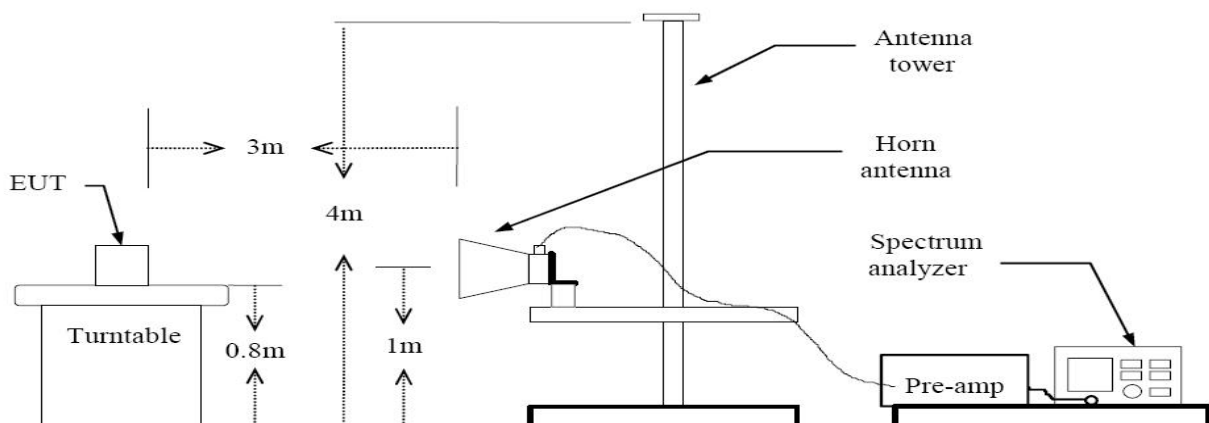
Below 30MHz



30MHz – 1GHz.



Above 1GHz



### 5.2.3 Test Result

#### 9 kHz – 30MHz

**Operation Mode:** Normal Link

**Notes:**

1. Measuring frequencies from 9 kHz to the 30MHz.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB)
4. Limit line = specific Limits (dBuV) + Distance extrapolation factor

#### Below 1 GHz

**Operation Mode:** Normal Link

Frequency [MHz]	Reading [dBuV]	Polarization [H/V]	A.F [dB]	C.L [dB]	Limit [dBuV/m]	Emission Level [dBuV/m]	Margin (dB)
433.92	48.94	H	16.49	4.77	80.82	70.2	10.62
867.86	26.74	H	23.11	7.15	61.93	57.0	4.93

**Notes:**

1. Measuring frequencies from 30 MHz to the 1 GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000 MHz were made with an instrument using Quasi peak detector mode.

#### Above 1 GHz

**Operation Mode:** Normal Link

Frequency [MHz]	Reading [dBuV]	Polarization [H/V]	A.F [dB]	C.L [dB]	Limit [dBuV/m]	Emission Level [dBuV/m]	Margin (dB)
The Emission level is below 20dB to Limit							

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. The reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.
3. Radiated emissions measured in frequency above 1000 MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Spectrum setting:
  - a. Peak Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 1 MHz.
  - b. AV Setting 1 GHz – 26 GHz, RBW = 1 MHz, VBW = 10 Hz.

## 5.2.4 Limit

### 1. Section 15.231(b) Limit

In addition to the provisions of Section 15.205, the field strength of emissions from intentional radiators operated under this Section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolt/meter)	Field strength of spurious emissions (microvolt/meter)
40.66-47.70	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	12,500	1,250

\*\* linear interpolations

Where F is the frequency in MHz, formulas for calculating the maximum permitted fundamental field strength are as follows : for the band 130-174 MHz,  $\mu\text{V/m}$  at 3meters =  $56.81818(F)-6136.3636$ ; for the band 260-470 MHz,  $\mu\text{V/m}$  at 3 meters =  $41.6667(F)-7083.333$ . The maximum permitted unwanted emission level is 20dB below the maximum permitted fundamental level.

### 2. Section 15.209 Radiated emission limits

Frequency Field Strength Measurement Distance

(MHz)	(microvolts/meter)	(meters)
0.009 - 0.490	$2400/F(\text{kHz})$	300
0.490 - 1.705	$24000/F(\text{kHz})$	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

\*\* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

## 5.3 Transmission time

### 5.3.1 Test Conditions

Test Standard : FCC Part 15 Subpart C Section 15.231(a)  
Operating Condition : The EUT was operated in normal condition.  
Temperature/Humidity : 27°C / 52%

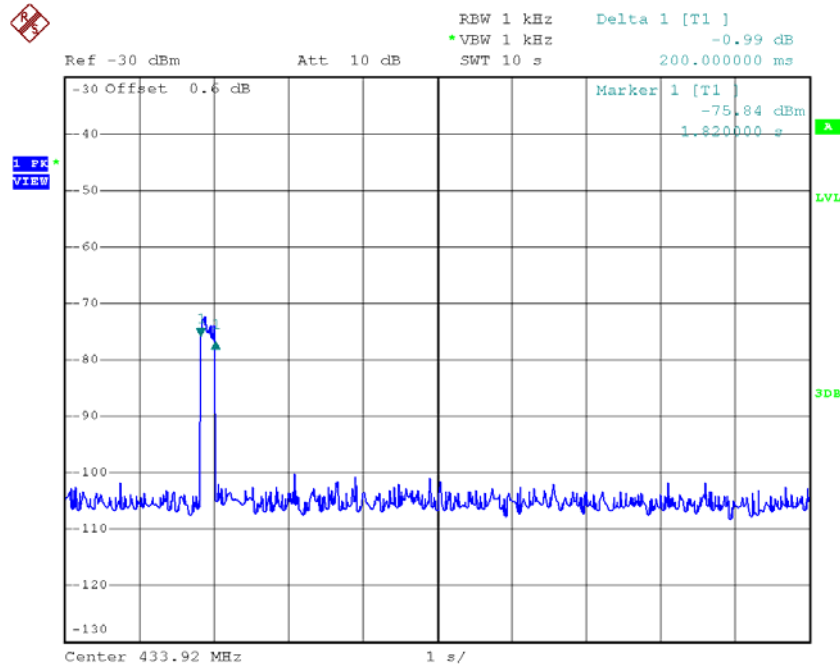
### 5.3.2 Measurement Set-Up



### 5.3.3 Test Results

Frequency (MHz)	Transmission time (s)	Limits
433.92	0.200	Less than 5s

### 5.3.4 Test Plot



Date: 10.DEC.2009 11:08:42

### 5.3.5 Limit

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

## 5.4 Bandwidth of operating frequency

### 5.4.1 Test Conditions

Test Standard : FCC Part 15 Subpart C Section 15.231(a)  
Operating Condition : The EUT was operated in normal condition.  
Temperature/Humidity : 27°C / 52%

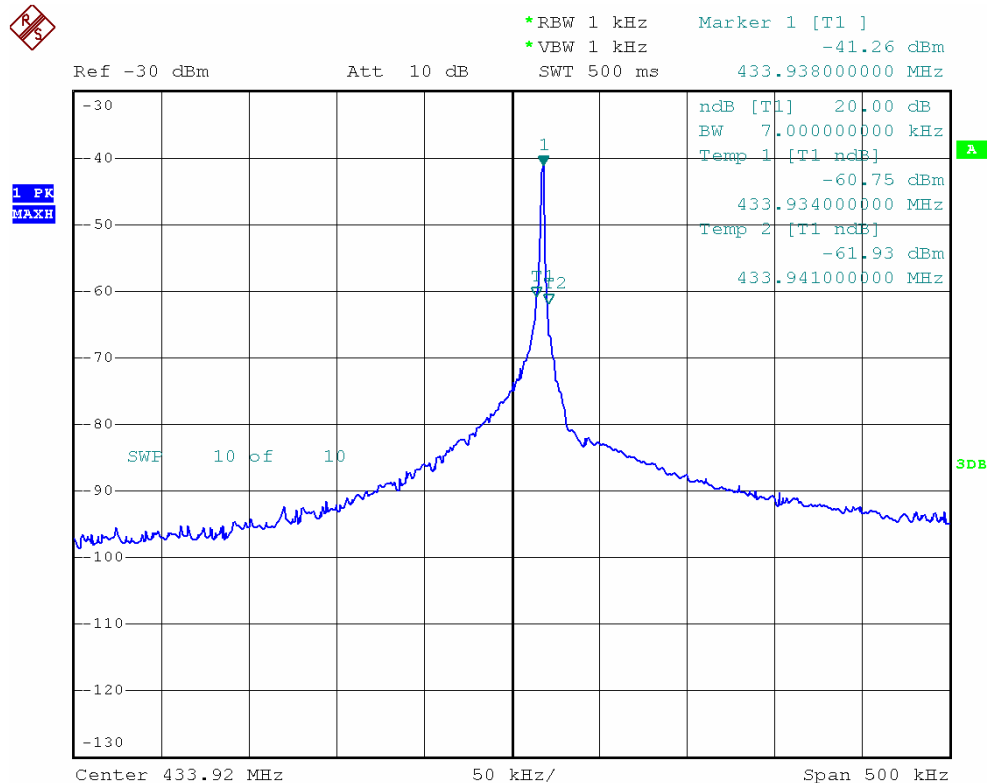
### 5.4.2 Measurement Set-Up



### 5.4.3 Test Results

Frequency (MHz)	20dB Bandwidth (kHz)	Limits(kHz)
433.92	7.0	1084.8

### 5.4.4 Test Plot



Date: 5.FEB.2010 13:24:28

#### **5.4.5 Limit**

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. Bandwidth is determined at the points 20 dB down from the modulated carrier.

Limit of 20 dB bandwidth  
 $433.92\text{MHz} \times 0.0025 = 1084.8 \text{ kHz}$



## 6. TEST EQUIPMENTS LIST

The listing below denotes the test equipments utilized for the test(s).

	EQUIPMENT	MODEL	MANUFACTURE	SERIAL NUMBER	Calibration Due date
1	Receiver	ESVN 30	Rohde & Schwarz	832854/010	10/07/25
2	Spectrum analyzer	FSP7	Rohde & Schwarz	100001	10/07/27
3	Spectrum analyzer	FSP13SE	Rohde & Schwarz	15892	10/07/07
4	Signal Generator	GT9000	Gigatronics	9604010	10/10/30
5	Frequency Counter	R5372	Advantest	41855204	10/10/29
6	Shield Room (7m x 4m x 3m)	N/A	SJEMC	0004	N/A
7	Turn Table	OSC-30	N/A	BWS-01	N/A
8	Antenna Mast	JAC-3	Dail EMC	N/A	N/A
9	Temperature & Humidity chamber	EN-GLMP-54	Enex	N/A	10/10/30
10	Bilog Antenna	VULB9161	Schwarzbeck	VULB9161-4067	11/12/01
11	Bilog Antenna	VULB9161	Schwarzbeck	VULB9161-4068	11/11/12
12	Horn Antenna	BBHA 9120 D	Schwarzbeck	BBHA 9120 D 234	10/12/18
13	Horn Antenna	BBHA 9170	Schwarzbeck	BBHA9170157	10/03/15
14	Power Meter	E4418A	Agilent	GB38272621	10/10/29
15	Power Sensor	E9301B	Agilent	US40010238	10/10/29
16	Power supply	IPS-30B03DD	Interact	42052	10/10/29
17	Loop Antenna	HFH2-Z2	Rohde & Schwarz	881056/6	10/10/23