

TEST REPORT

Report No: KST-FCR-100002

Applicant	Name	CNAPS
	Address	A203 Techno Park Korea Polytechnic2 colleges, 34-1, Gusan-dong, Bupyeong-gu, Incheon, Korea
Manufacturer	Name	UbiMate
	Address	363-7 Songnae-dong, Sosa-gu, Bucheon-si, Gyeonggi-do, Korea

Equipment	Name	FM Transmitter
	Model No	F4H
	Brand Name	ppyle
	FCC ID	X80F4H

Test Standard	FCC CFR 47, Part 15. Subpart C-15.239
Test Date(s)	2010. 04. 26 ~ 2009. 04. 29
Issue Date	2010. 04. 30
Test Result	Compliance

Supplementary Information

The device bearing the brand name and FCC ID specified above has been shown to comply with the applicable technical standards as indicated in the measurement report and was tested in accordance with measurement procedures specified in ANSI C 63.4-2003.

We attest to the accuracy of data and all measurements reported herein were performed by KOSTEC Co., Ltd. and were made under Chief Engineer's supervision. We assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.

Tested by Mi Young, Lee

Approved by Gyeong Hyeon, Park

Signature



Signature



Table of Contents

1. GENERAL INFORMATION	3
1.1 Test Facility	3
1.2 Location	3
2. EQUIPMENT DESCRIPTION	4
3. SYSTEM CONFIGURATION FOR TEST	5
3.1 Characteristics of equipment.....	5
3.2 Configuration of EUT	5
3.3 Support Equipment Used	5
3.4 Type of Cables Used	5
3.5 Product Modification.....	5
3.6 Operating Mode.....	5
3.7 Test Configuration.....	5
3.8 EUT Operation Table for Total tuning range	6
3.9 Used Test Equipment List.....	7
4. SUMMARY TEST RESULTS.....	8
5. MEASUREMENT RESULTS	9
5.1 Occupied bandwidth Measurement.....	9
5.2 Radiate emission of Field strength.....	11
5.3 Out of band Radiated emissions	14
5.4 General requirement	17

1. GENERAL INFORMATION

1.1 Test Facility

Test laboratory and address

KOSTEC Co., Ltd.

180-254, Annyeong-dong, Hwaseong-si, Gyeonggi-do, South Korea

The open area field test site and conducted measurement facility are used for these testing. This site at was fully described in a reports submitted to the Federal Communications Commission (FCC).

The details of these reports have been found to be in complies with the requirements of Section 2.948 of the FCC Rules on November 14, 2002. The facility also complies with the radiated and conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission (FCC) has the reports on file and KOSTEC Co., Ltd. is listed under FCC Registration No.525762. The test site has been approved by the FCC for public use and is list in the FCC Public Access Link CORES (Commission Registration System) and Industry Canada office (Industry Canada Site No.: 8305A)

Registration information

KCC (Korea Communications Commission) Number : KR0041

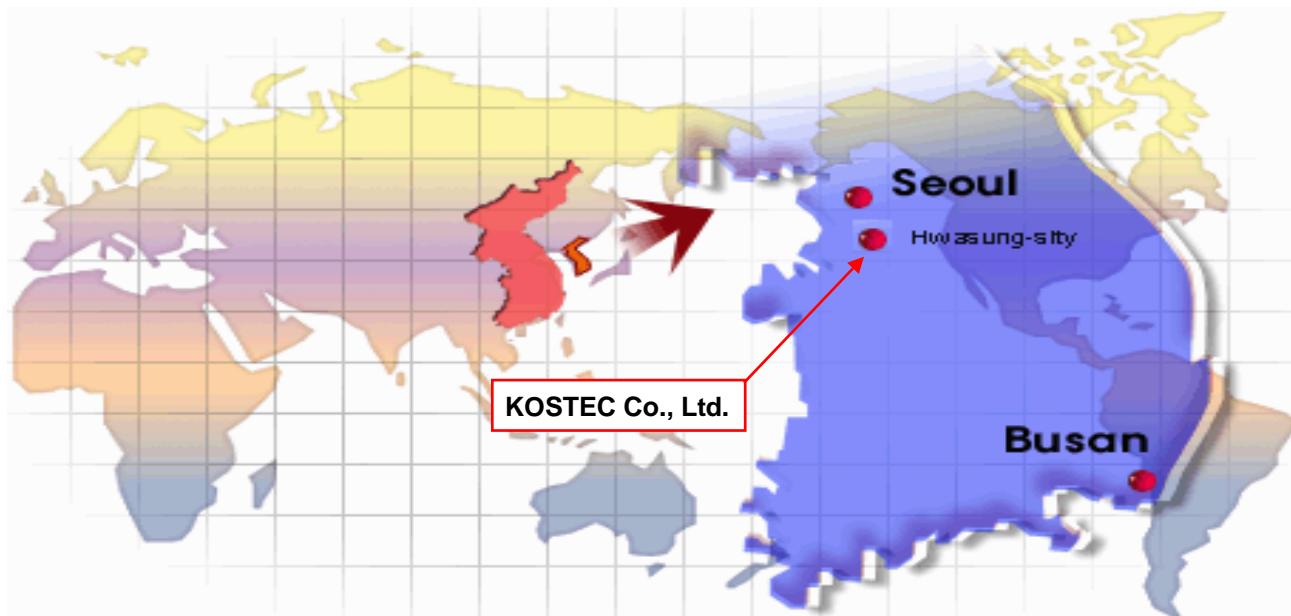
KOLAS(Korea Laboratory Accreditation Scheme) Number : 232

FCC Registration Number(FRN) : 525762

IC Company Number(C,N) : 8305A

VCCI Registration Number : R-1657 / C –1763

1.2 Location



2. EQUIPMENT DESCRIPTION

The product operation described herein was declared by manufacturer. and refer to user's manual for the details.

1) Equipment Name	FM Transmitter
2) Model No	F4H
3) Brand Name	ppyle
4) Serial Number	Prototype
5) Emission Type	F3E
6) Oscillation Type	PLL (Phase Local Loop)
7) Modulation Type	Frequency Modulation
8) Operated Frequency	TX/RX : 88.1 MHz ~ 107.9 MHz
9) Field Strength	33.97 dB μ V/m (@ 3meter)*
10) Channel spacing	199 Ch
11) Communication Type	Half duplex
12) Micro Processor	U1(S3F84i9)
13) Weight / Dimension	60g / 50(L) mm x 22(W) mm x 22(D) mm
14) Operation temperature	- 40°C ~ + 60°C
15) Power Source	Voltage: 5V _{DC} , 1.5 V _{DC} (AAA Type Cell Battery), Current: 100 mA (Operation), 5 mA (Stand by)
16) Antenna Description	Class : Cable ANT, Connect type: fixed , Length: 100 mm
17) FCC ID	X80F4H

* This field strength is maximum average value among operation frequency band according to required standard

3. SYSTEM CONFIGURATION FOR TEST

3.1 Characteristics of equipment

This equipment is the CNAPS FM Transmitter(Model:F4H) and it's power 1.5 Vdc from cell battery and 5 Vdc from MP3, PMP, small Notebook PC etc.

FM Transmitter is designed to operate on frequency in the 88.1 MHz ~ 107.9 MHz.

The amplified RF is transmitted cable antenna

This EUT is used with PMP, MP3, the other Audio device, etc.

3.2 Configuration of EUT

Description	Model Name	Serial No.	Manufacture	Remark
FM Transmitter	F4H	None	UbiMate	EUT (Stand alone)

3.3 Support Equipment Used

Description	Model Name	Serial No.	Manufacture	Remark
Notebook Computer	LS40-2AD3	402K1AW2-15672	IBM Corporation	

3.4 Type of Cables Used

Device from	Device to	Type of I/O port	Length [m]	Type of shield
EUT	Notebook Computer	Stereo audio jack	100 mm	Unshield

3.5 Product Modification

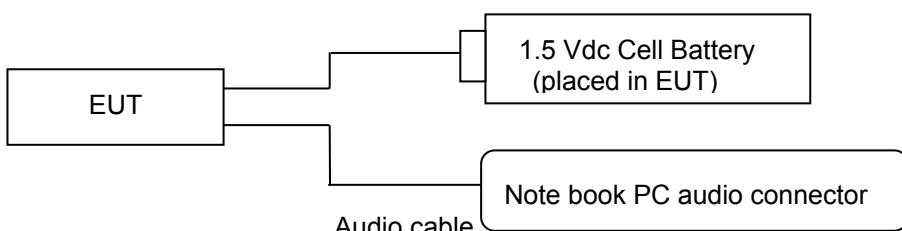
The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement

3.6 Operating Mode

The transmitter was operated in a continuous modulation transmit mode and all measurements were intended to emit maximum RF signal

3.7 Test Configuration

The below test setup configuration from EUT is a same as in this clause 5.1 to 5.4



3.8 EUT Operation Table for Total tuning range

The tuning controls were manually adjusted to verify the maximum tuning range

Accordingly it was found to maximum tuning range (88.1 MHz ~ 107.9 MHz) declaration by applicant

and also confirmed to as a selected 0.1 MHz step by manually adjusting left/right push up/down button on the EUT

Per FCC Rule, In the case of EUTs that can operate on more than one frequency, unless otherwise specified in the individual tests, measurements shall be made with the EUT set to a frequency as provided in Table :

Frequency range over which device operates	Number of frequencies	Location in the range of operation
1	Low channel	1 near middle
2	Middle channel	1 near top, 1 near bottom
3	High channel	1 near top, 1 near middle, and 1 near bottom

※ Note: above channel is described according to the FCC Part 15 subpart A 15.31(m)

So, above channel is set by according to operating frequency of tested EUT

According to required standard this equipment is set as following table

Table for Channel setting number

Frequency (MHz)	88.1	98.0	107.9
Channel Number	Ch 1	Ch 100	Ch 199
	Low channel	Middle channel	High channel

※ When Occupied bandwidth measurement is selected only middle channel and Radiated emission of field strength the other Out of band Radiated emissions is selected 3 channel (Low, Middle, High channel) by required standard



3.9 Used Test Equipment List

No.	Instrument	Model	Serial No.	Manufacturer	Due to Cal. Date	Used
1	Spectrum Analyzer	8563E	3846A10662	Agilent Technology	2010.05.20	<input checked="" type="checkbox"/>
2	Test Receiver	ESCS30	100111	Rohde & Schwarz	2010.03.07	<input checked="" type="checkbox"/>
3	Test Receiver	ESPI3	100109	Rohde & Schwarz	2010.03.03	<input type="checkbox"/>
4	LISN	ESH2-Z5	100044	Rohde & Schwarz	2010.03.16	<input type="checkbox"/>
5	LISN	ESH3-Z5	100147	Rohde & Schwarz	2010.06.25	<input type="checkbox"/>
6	Ultra broadband Antenna	HL562	100075	Rohde & Schwarz	2010.03.20	<input checked="" type="checkbox"/>
7	Ultra broadband Antenna	HL562	100076	Rohde & Schwarz	2010.04.14	<input type="checkbox"/>
8	Dipole Antenna	HZ-12	100005	Rohde & Schwarz	2010.04.03	<input type="checkbox"/>
9	Dipole Antenna	HZ-13	100007	Rohde & Schwarz	2010.04.03	<input type="checkbox"/>
10	Horn Antenna	3115	2996	EMCO	2010.06.13	<input checked="" type="checkbox"/>
11	Loop Antenna	6502	9203-0493	EMCO	2011.06.11	<input type="checkbox"/>
12	Digital Signal Generator	E4436B	US39260458	H.P	2010.05.20	<input checked="" type="checkbox"/>
13	Tracking CW Signal Source	85645A	070521-A1	H.P	2010.05.20	<input checked="" type="checkbox"/>
14	RF Power Amplifier	8347A	3307A01571	H.P	2010.05.20	<input checked="" type="checkbox"/>
15	Microwave Amplifier	8349B	2627A01037	H.P	2010.05.20	<input checked="" type="checkbox"/>
16	Attenuator	8498A	3318A09485	H.P	2010.05.20	<input checked="" type="checkbox"/>
17	Temperature & Humidity Chamber	EY-101	90E14260	TABAI ESPEC	2010.03.16	<input type="checkbox"/>
18	EPM Series Power meter	E4418B	GB39512547	Agilent Technology	2010.05.20	<input type="checkbox"/>
19	RF Power Sensor	ECP-E18A	US37181768	Agilent Technology	2010.05.20	<input type="checkbox"/>
20	Microwave Frequency Counter	5352B	2908A00480	Agilent Technology	2010.05.20	<input type="checkbox"/>
20	Band rejection filter	WTR-BRF2442-84NM	09020001	WAVE TECH Co.,Ltd.	2010.03.03	<input type="checkbox"/>
21	SLIDAC	None	0207-4	Myoung-Sung Electronic Co., Ltd.	2010.05.20	<input type="checkbox"/>
22	DC Power supply	DRP-5030	9028029	Digital Electronic Co.,Ltd	2010.06.04	<input type="checkbox"/>
23	DC Power supply	UP-3005T	68	Unicon Co.,Ltd	2010.05.20	<input type="checkbox"/>
24	DC Power supply	E3610A	KR24104505	Agilent Technology	2010.05.20	<input type="checkbox"/>
25	Antenna Master	-	-	Daeil EMC	-	<input checked="" type="checkbox"/>
26	Turn Table	-	-	Daeil EMC	-	<input checked="" type="checkbox"/>

4. SUMMARY TEST RESULTS

The measurement results were obtained with the EUT tested in the conditions described in this report.

Detailed measurement data and plots showing the maximum emission of the EUT are reported.

Description of Test	Standard Section	Reference Section	Test result	Remark
Occupied bandwidth Measurement	15.239(a)	Clause 5.1	Compliance	
Radiated emission of Field strength	15.239(b)	Clause 5.2	Compliance	
Out of band Radiated emissions	15.239(c)	Clause 5.3	Compliance	
General requirement	15.203, 15.19	Clause 5.4	Compliance	

Compliance : The EUT complies with the essential requirements in the standard.
 Not Compliance : The EUT does not comply with the essential requirements in the standard.
 N/A : The test was not applicable in the standard.

※ The data collected shows that the CNAPS FM Transmitter complied with technical requirements of the Part 15.239 of the FCC Rules.

5. MEASUREMENT RESULTS

5.1 Occupied bandwidth Measurement

5.1.1 Standard Applicable [FCC §15.239(a)]

Emissions from the intentional radiator shall be confined within a band 200 KHz wide centered on the Operating frequency. The 200 KHz band shall lie wholly within the frequency range of 88-108 MHz

5.1.2 Test Environment conditions

- Ambient temperature : 21 °C,
- Relative Humidity : (46 ~ 47) % R.H.

5.1.3 Measurement Procedure

The carrier frequency separation was measured with a spectrum analyzer connected to the antenna terminal while EUT had its hopping function enabled.

After the trace being stable, the reading value between the peak of the adjacent channels using the marker-Delta function was recorded as the measurement results.

The spectrum analyzer is set to the as follows :

- Span : approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel
- RBW : \geq 1% of the 20 dB bandwidth
- VBW : \geq RBW
- Sweep : auto
- Detector function : peak
- Trace : max hold

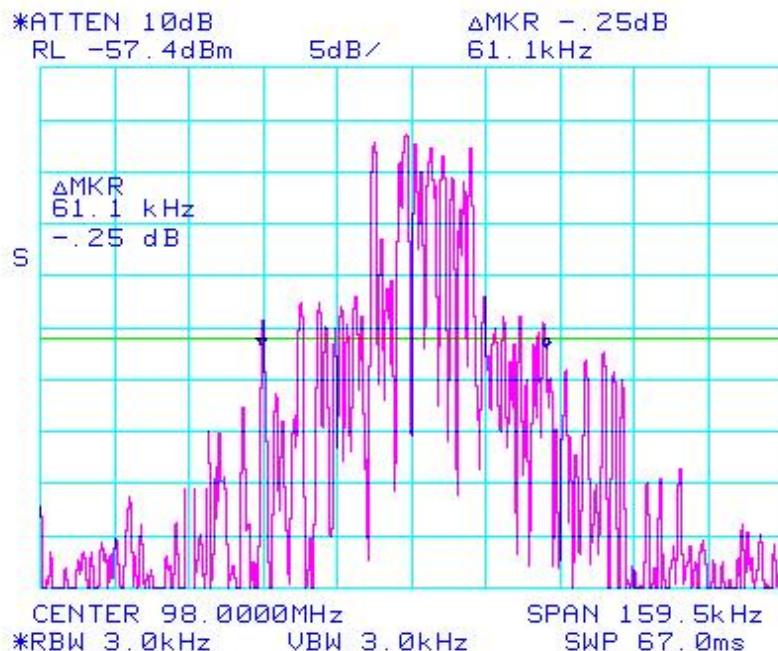
5.1.4 Measurement Result

Channel No.	Frequency (MHz)	Test Results		
		Measured Value [KHz]	Result	Limit [KHz]
100	98.0 MHz	61.1	Pass	Within a band 200 kHz

* please see plot in this next page 5.1.5

5.1.5 Test Plot (20 dB Occupied bandwidth)

Channel 99 (98.0 MHz)



5.2 Radiate emission of Field strength

5.2.1 Standard Applicable [FCC §15.239 (b)]

The field strength of any emissions within the permitted 200 KHz band shall not exceed 250 μ V/m at 3 meters. 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.

5.2.2 Test Environment conditions

- Ambient temperature : 19 °C,
- Relative Humidity : (47 ~ 48) % R.H.
- Pressure : 100.5 kPa

5.2.3 Measurement Procedure

- ① As below test setup figure, for frequencies measured below and above 1 GHz respectively. Turn on EUT and make sure that it is test mode function. Also was placed on a non-metallic table height of 0.8 m above the reference ground plane. If EUT is connected to cables, that were fixed to cause maximum emission. Horn antenna was used to for above 1 GHz and Broadband antenna below 1 GHz. it made with the antenna positioned in both the horizontal and vertical planes of polarization.
- ② For emission frequencies measured each below and above 1 GHz, a pre-scan is performed in a Shield chamber to determine the accurate frequencies before final test, after maximum emissions level will be checked on a open test site and measuring distance is 3 m from EUT to receiver antenna.
- ③ For emission frequencies measured below 1 GHz, set the Test Receiver on a 120 KHz resolution bandwidth using measurement instrumentation employing a CISPR average detector in accordance with in this required section. and for above 1 GHz set the spectrum analyzer on a 1 MHz resolution bandwidth with average and peak detector for each frequency measured in step② Required standard FCC Rule 15.35 and then EUT is located Position X,Y,Z on turn table
- ④ The search antenna is to be raised and lowered over a range from 1 to 4 meters in horizontally polarized orientation. Position the highness when the highest value is indicated on spectrum analyzer, then change the orientation of EUT on test table over a range from 0° to 360° with a speed as slow as possible, and keep the highest emission is indicated on the spectrum analyzer. Vary the antenna position again and record the highest value as a final reading.
- ⑤ Repeat step④ until all frequencies to be measured were complete.
- ⑥ Repeat step⑤ with search antenna in vertical polarized orientations.
- ⑦ Check the frequencies of highest emission with varying the placement of cables (if any) associated with EUT to obtain the worst case and record the result.

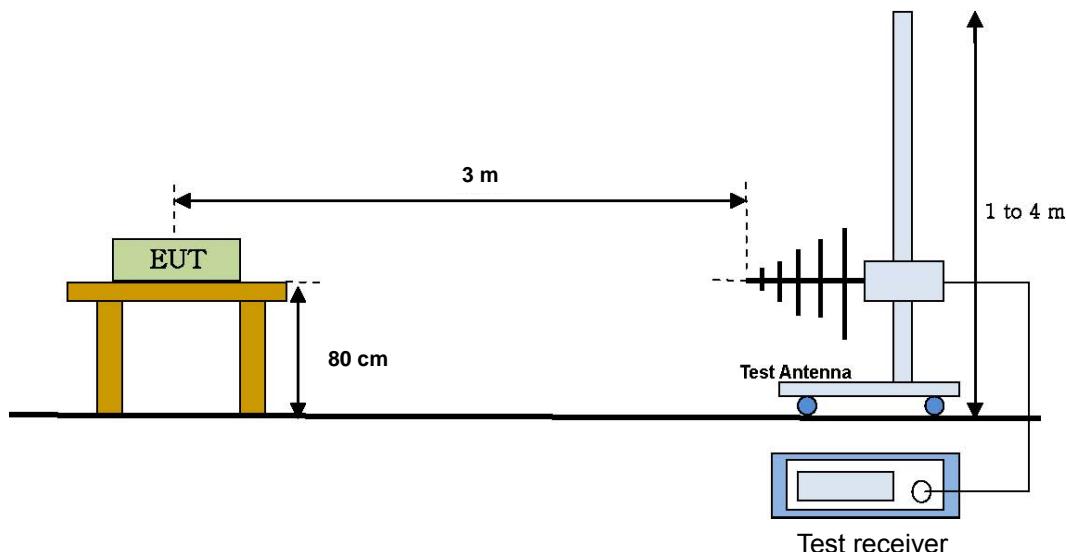
The measurement results are obtained as described below:

$$\text{Result(dB}_{\mu\text{V/m}}\text{)} = \text{Reading(dB}_{\mu\text{V/m}}\text{)} + \text{Antenna factor(dB/m)} + \text{CL(dB)} + \text{other applicable factor (dB)}$$

5.2.4 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are test receiver, Cable loss, Antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, Antenna frequency interpolation, measurement distance variation, Site imperfection, mismatch, and system repeatability based on NIS 80,81, The measurement uncertainty level with a 95 % confidence level were apply to Uncertainty of a radiation emissions measurement at OATS(Open Area Test Site) of KOSTEC is ± 4.0 dB

5.2.5 Test Configuration



* In case of above 1 GHz is using the Horn antenna instead of Broadband Antennal

[Radiated emission setup]

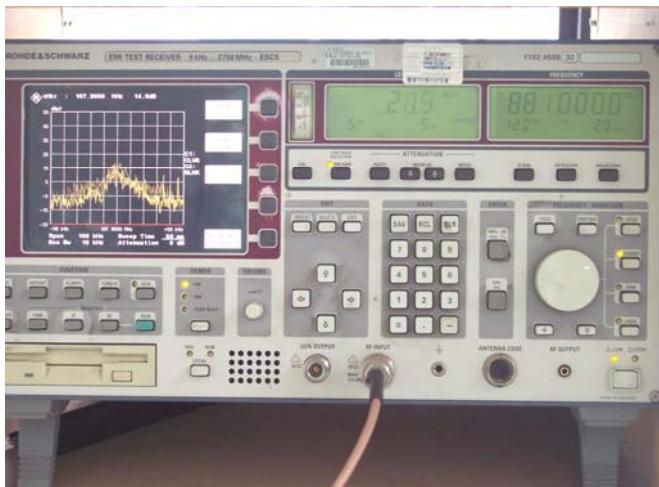
5.2.6 Test Result

Freq. (MHz)	Reading (dB μ V/m)	Axis	Table (Deg)	Antenna			CL (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn (dB)	Result
				Height (m)	Pol. (H/V)	Fctr. (dB/m)					
88.1	21.5	Y	105	1.9	H	7.89	3.44	32.83	47.96	15.13	Pass
98.0	20.0	Y	95	1.7	H	9.37	3.60	32.97	47.96	14.99	Pass
107.9	21.0	Y	126	1.8	H	9.37	3.60	33.97	47.96	13.99	Pass

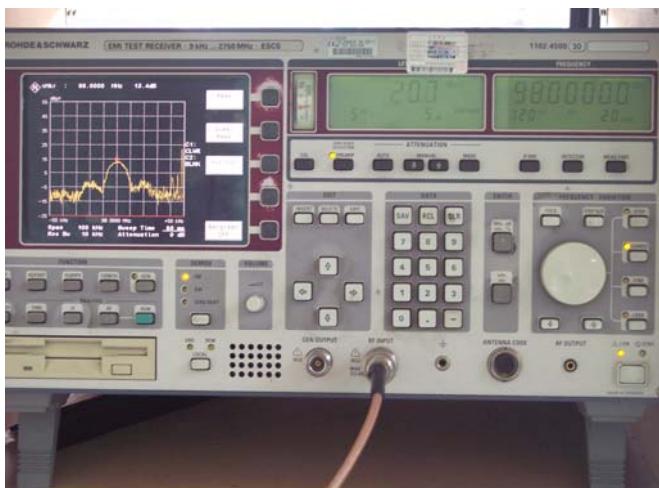
* Above Measured fundamental frequency is Less than 1 GHz. So, it is set by average detector mode on Field strength Receiver as see a next page test plot 5.2.7 in accordance with in this Section 15.239 and when above 1 GHz emission level is measurement, it is set by average and peak detector mode on Field strength required standard FCC Rule 15.35

5.2.7 Test Plot

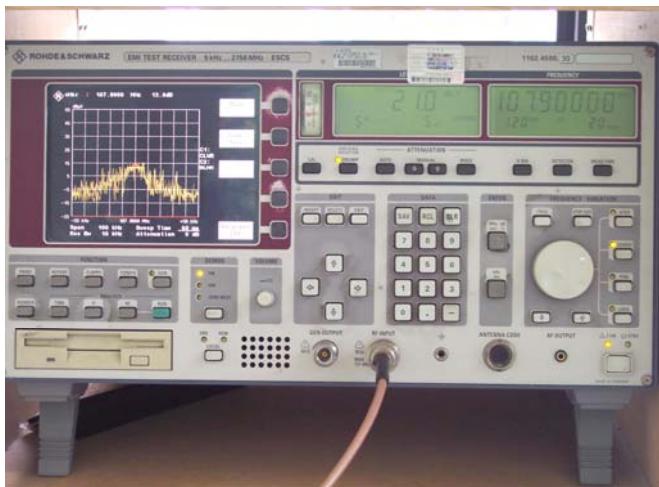
Channel 1 (88.1 MHz)



Channel 100 (98.0 MHz)



Channel 199 (107.9 MHz)



5.3 Out of band Radiated emissions

5.3.1 Standard Applicable [FCC §15.239(c)]

The field strength of any emissions radiated on any frequency outside of the specified 200 KHz band shall not exceed the general radiated emission limits in Section 15.209

§15.209. limits for radiated emissions measurements (distance at 3m)

Frequency Band [MHz]	Limit [μ V/m]	Limit [dB μ V/m]	Detector
30 - 88	100 **	40.00	Quasi peak
88 - 216	150 **	43.52	Quasi peak
216 - 960	200 **	46.02	Quasi peak
Above 960	500	54.00	Average

** fundamental emissions from intentional radiators operation 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 Section 15.231 and 15.241

§15.205. [Table 1] : Restrict Band of Operation

Only spurious emissions are permitted in any of the frequency bands listed below ;			
[MHz]	[MHz]	[MHz]	[GHz]
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
0.495 - 0.505**	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 - 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 - 1 427	8.025 - 8.
4.177 25 - 4.177 75	37.5 - 38.25	1 435 - 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 - 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 - 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 - 1 722.2	13.25 - 13.
6.311 75 - 6.312 25	123 - 138	2 200 - 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 - 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 - 2 500	17.7 - 21.4
8.376 25 - 8.38 6 75	156.7 - 156.9	2 690 - 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 - 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 - 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 - 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 - 4 400	Above 38.6

** Until February 1, 1999, this restricted band shall be 0.490-0.510

5.3.2 Test Environment conditions

- Ambient temperature : 19 °C,
- Relative Humidity : (47 ~ 48) % R.H.
- Pressure : 100.5 kPa

5.3.3 Measurement Procedure and Test Configuration

Please see refer to the 5.2.2 & 5.2.3

5.3.4 Measurement Result

□ Lowe Channel 1 (88.1 MHz)

Below 1 GHz

Freq. (MHz)	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	Pre AMP (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
176.2	35.96	105	1.9	H	7.97	4.90	25	23.83	43.52	19.69	Pass
Above 176.2	Nil emission										

Above 1 GHz

Freq.	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	Pre AMP (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn. (dB)	Result	
			Height (m)	Pol. (H/V)	Fctr. (dB/m)							
Above 1 GHz	Signal is not detected					54	-	Pass	74	-	Pass	
	“											

※ Above 1 GHz is measured average and peak detector mode on Spectrum analyzer in accordance with FCC Rule15.35
 ※ Limit: 54dB μ V/m(Average), 74dB μ V/m(Peak)

Freq.(MHz) : Measurement frequency, Reading(dB μ V/m) : Indicated value for test receiver,
 Table (Deg) : Directional degree of Turn table,

Antenna (Height, Pol, Fctr) : Antenna Height, Polarization and Factor

Cbl(dB) : Cable loss, Pre AMP(dB) : Preamplifier gain(dB)

Meas Result (dB μ V/m) : Reading(dB μ V/m)+ Antenna factor.(dB/m) + CL(dB) - Pre AMP(dB)

Limit(dB μ V/m): Limit value specified with FCC Rule, Mgn(dB) : FCC Limit (dB μ V/m) – Meas Result(dB μ V/m),

Middle Channel 100 (98.0 MHz)

Below 1 GHz

Freq. (MHz)	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	Pre AMP (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
196	35.84	95	1.7	H	7.54	5.20	25	23.58	43.52	19.94	Pass
Above 196	Nil emission										

Above 1 GHz

Freq. (MHz)	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	Pre AMP (dB)	Meas Result (dB μ V/m)	Limit (dB μ V/m)	Mgn. (dB)	Result					
			Height (m)	Pol. (H/V)	Fctr. (dB/m)											
Above 1 GHz	Signal is not detected									54	-	Pass				
	“									74	-	Pass				

※ Above 1 GHz is measured average and peak detector mode on Spectrum analyzer in accordance with FCC Rule 15.35
 ※ Limit: 54dB μ V/m(Average), 74dB μ V/m(Peak)

High Channel 199 (107.9 MHz)

Below 1 GHz

Freq. (MHz)	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	Pre AMP (dB)	Meas Result (dB μ V/ m)	Limit (dB μ V/ m)	Mgn (dB)	Result
			Height (m)	Pol. (H/V)	Fctr. (dB/m)						
215.8	34.79	126	1.8	H	7.54	5.20	25	22.53	43.52	20.99	Pass
Above 215.8	Nil emission										

Above 1 GHz

Freq. (MHz)	Reading (dB μ V/m)	Table (Deg)	Antenna			CL (dB)	Pre AMP (dB)	Meas Result (dB μ V/ m)	Limit (dB μ V/ m)	Mgn. (dB)	Result					
			Height (m)	Pol. (H/V)	Fctr. (dB/m)											
Above 1 GHz	Signal is not detected									54	-	Pass				
	“									74	-	Pass				

5.4 General requirement

5.4.1 Standard applicable

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than furnished by responsible party shall be used with the device.

The use of a permanently attached antenna or of an antenna that user a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The manufacturer may design the unit so that broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

According to above requirement standard's This product's antenna is designed by above section and it's type is Cable and it's length is 100 mm

5.4.2 User information [FCC §15.21]

For intentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

According to above requirement standards. this warning statement is described on user manual