MEASUREMENT/TECHNICAL REPORT
FCC Part 15 Subpart C

Issued: February 5th, 2008

Name and Address of the Applicant:	Welcat Inc. 4-12-8, Higashi-Shinagawa, Shinagawa Seaside East tower 6F, Sinagawa-ku Tokyo 140-0002, Japan
Test Item:	IC Card / IC Tag Reader Writer
Identification:	CSH-07334
Serial No.:	WBF0700078
FCC ID:	Q98CSH07334
Sample Receipt Date:	January 10th, 2008
Test Specification:	FCC Part 15 Subpart C, 15.225
Date of Testing:	January 26th - 30th, 2008
Test Result:	PASS

Report Prepared by: Cosmos Corporation
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Phone: +81-596-63-0707 Fax: +81-596-63-0777

Tested by: M. Yamanaka, Engineer — Date: February 5th, 2008

Reviewed by: Y. Kawahara, Leader — Date: February 5th, 2008

Notes:
1. This report should not be reproduced except in full, without the written approval of Cosmos Corporation.
2. All measurement data contained in this report may have uncertainty. A judgment for the limitation should be taken into the count.
3. The report in this report apply only to the sample tested.

List of Contents

Page

1. Description of Equipment Under Test

1.1 Product Description

Manufacturer	: Welcat Inc.
Model (referred to as the EUT)	: CSH-07334
Nominal Voltage	: DC 5V(USB buspower)
Type of Modulation	: ASK
Mode of Operation	: ☐ duplex ☐ 1/2 duplex ☒ simplex ☐ other
The type of the equipment	: ☐ Stand-alone ☐ Combined Equipment ☐ Plug –In Card ☒ Other (USB)
The type of the antenna	: ☒ Integral ☐ external ☐ Other
The type of power source	: ☐ AC mains ☐ Dedicated AC adapter (V) ☒ DC Voltage ☐ Battery
The type of battery (if applicable)	: N/A
Type of Operation	: ☐ Continuous ☐ Burst ☒ Intermittent
Stand by Mode	: ☐ Available ☒ N/A
Intended functions	: RFID IC Card Reader/Writer
The bandwidth of the IF filters	: N/A
Method of Communication Link	: Software to make maximum power transmitting
The operating frequency band	: 13.56 MHz
The thermal limitation	: 0 to 40℃

1.2 Antenna Description

No.	Type Name	Gain	Antenna Type	Remarks
1	Loop Antenna	−51dBi	Printed Loop	Originally Integrated.

1.3 Accompanied Peripherals Description

No.	Equipment Name	Manufacturer	Type Name	Serial Number	Remarks
1	PC	IBM	08N1180	None	-
2	AC adapter	IBM	02K6661	None	-

2. General Information

2.1 Test Methodology

All measurement subject to the present test report is carried out according to the procedures in ANSI C63.4:2003.

2.2 Test Facility

All measurement was performed in the following facility;

Cosmos Corporation EMC Lab. Ohnogi

(2-3571 Ohaza-iwatachi, Ohnogi, Watarai-cho, Watarai-gun, Mie-ken 516-2102, Japan) This site has been accepted in a letter dated November 2, 2004 from FCC.

2.3 Tractability

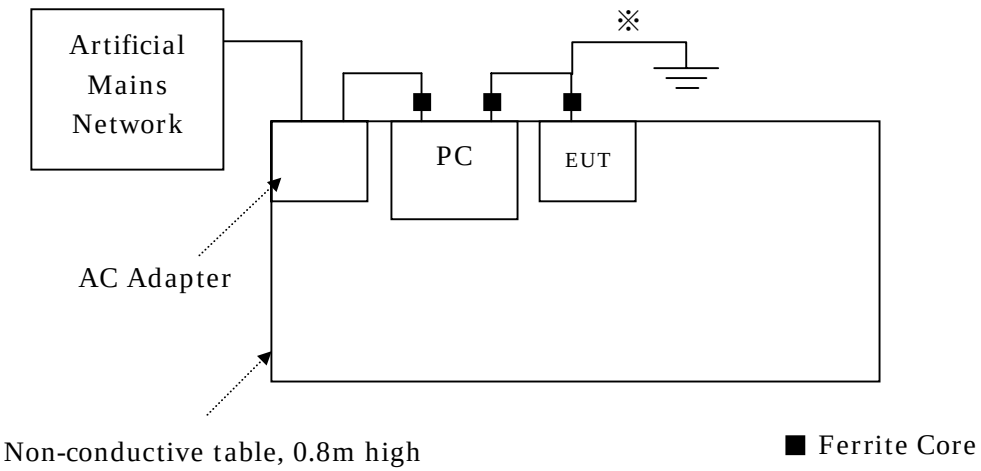
The calibration of measurement equipment used in the test subject to the present report is designed and operated to ensure that the measurement is traceable to national standards of measurement or equivalent abroad.

3. Summary of Test Results

Section	Test Item	Limit	Result
15. 207	AC Power Conducted Emission	Limit: min.48dBuV	Pass
15. 209	Field Strength of Spurious Emission	Refer to 15. 209	Pass
15. 225	Maximum Output Power	15,848 uV/m @ 30 m	Pass
15. 225	Frequency Tolerance	± 0.01 %	Pass

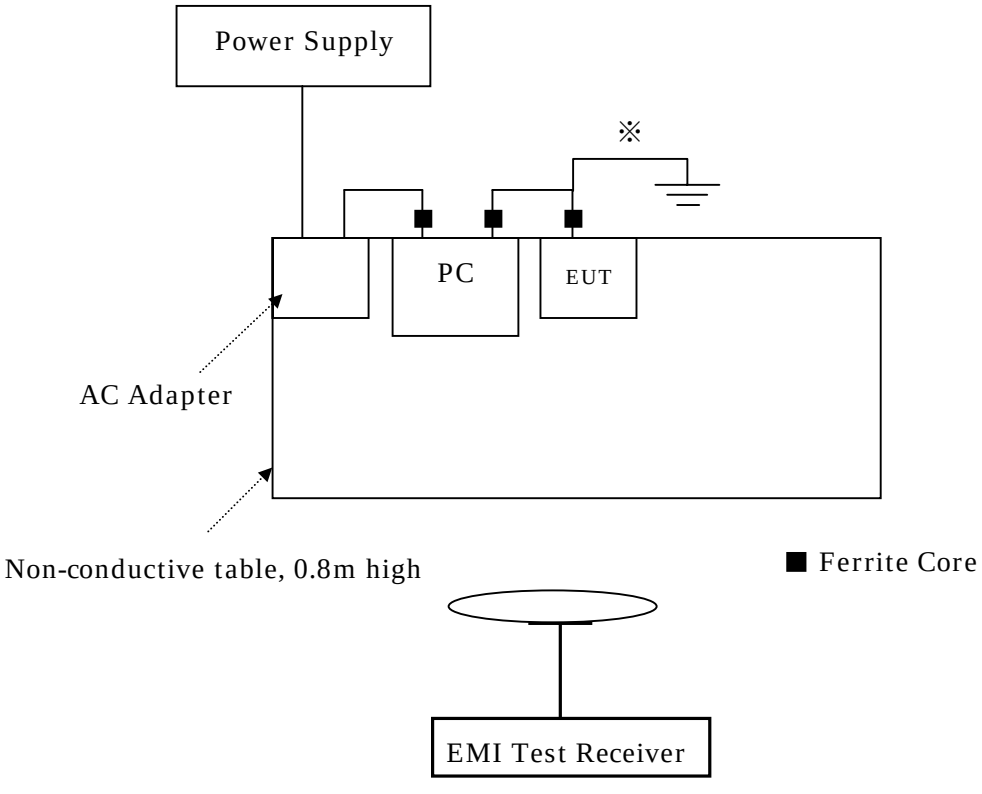
4. Test Configuration

4.1 Conducted Emission Measurement



Note : ※ : USB cable was out of the shield and connected to earth line, and EUT was placed on the GND.

4.2 Radiated Measurement in 3m Anechoic Chamber



4.3 Test Mode

In all test configurations above, EUT makes communication link between the integrated RFID module and a RFID tag with the maximum RF power by a special test program.

Maximum Output Power and Frequency Tolerance measurement were performed with an external stabilized AC power supply voltage varied between 85% and 115% of the nominal rated supply voltage 120 VAC.

Frequency Tolerance measurement is performed under the following extreme condition:

Temperature: - 20℃ to +50℃ (120 VAC)
Voltage: 102 to 138 VAC (Normal temperature)

5. Measurement Result

5.1 15. 207 AC Power Conducted Emission

5.1.1 Setting Remarks

- Configure the EUT System in accordance with ANSI C63.4-2003.
- A wooden test table (1.5m×1.0m, height 0.8m) was used.
- EUT's dedicated AC adapter connected to Artificial Mains Network (AMN).
- Activate the EUT System and run the software prepared for the test, if necessary.
- Refer to test configuration figure 4.1.

5.1.2 Minimum Standard

(a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

5.1.3 Result

EUT complies with the requirement.

Uncertainty of measurement : ± 2.26 dB
Temperature, Humidity : 21 ˚C, 39 %

5.1.4 Measured Data

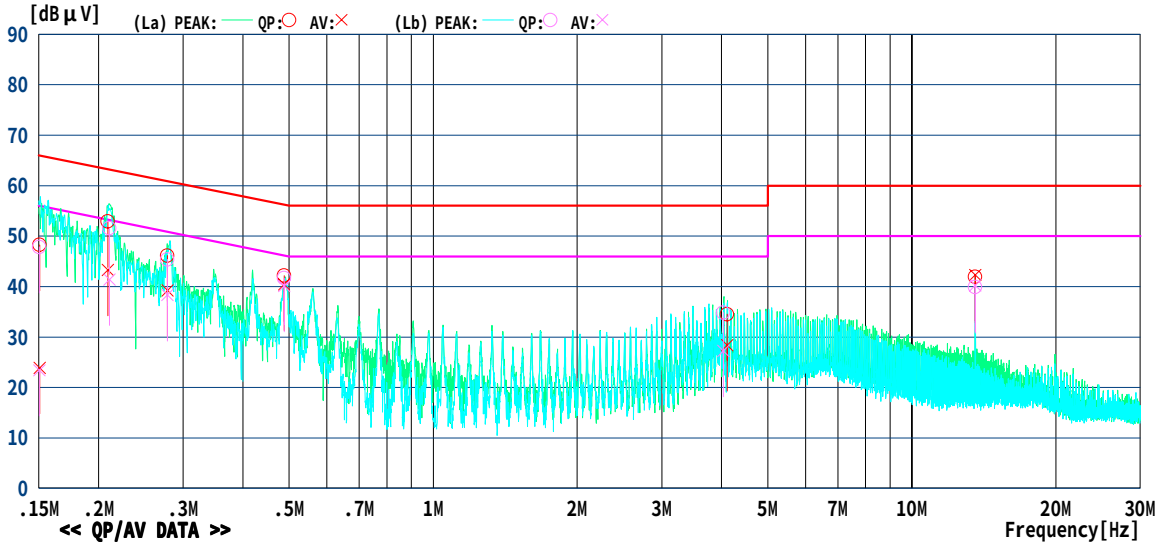
Measured Value Table

Model Name : CSH-07334
Serial No. : WBF0700078
Operator : M.Yamanaka
Power Supply : AC 120V,60Hz

Job No : CJ07-064425EZ
Temp/Humi : 21°C/39%
Condition : Operated
Remark : USB Shield GND connected to GND Plane

Memo : RBW:9kHz

LIMIT : FCC 15.207(QP)
FCC 15.207(AV)



No	Freq.	Reading Level		C.Fac	Results		Limit		Margin		Phase	Comment
		QP	AV		QP	AV	QP	AV	QP	AV		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15058	38.0	13.7	10.2	48.2	23.9	66.0	56.0	17.8	32.1	La	
2	0.20894	42.8	33.2	10.1	52.9	43.3	63.2	53.2	10.3	9.9	La	
3	0.27850	36.1	29.1	10.1	46.2	39.2	60.9	50.9	14.7	11.7	La	
4	0.48785	32.1	30.3	10.1	42.2	40.4	56.2	46.2	14.0	5.8	La	
5	4.11044	24.3	18.2	10.2	34.5	28.4	56.0	46.0	21.5	17.6	La	
6	13.55943	31.2	31.6	10.7	41.9	42.3	60.0	50.0	18.1	7.7	La	
7	0.15030	37.6	13.2	10.2	47.8	23.4	66.0	56.0	18.2	32.6	Lb	
8	0.21065	41.5	31.3	10.1	51.6	41.4	63.2	53.2	11.7	11.8	Lb	
9	0.27840	35.3	28.3	10.1	45.4	38.4	60.9	50.9	15.5	12.6	Lb	
10	0.48835	31.6	30.0	10.1	41.7	40.1	56.2	46.2	14.5	6.1	Lb	
11	4.03739	24.6	17.1	10.2	34.8	27.3	56.0	46.0	21.2	18.8	Lb	
12	13.56003	29.2	29.6	10.7	39.9	40.3	60.0	50.0	20.1	9.8	Lb	

-TEPTO-DV/CE Ver1.50.0128

5.2 15. 209 Transmitter Radiated Emissions

5.2.1 Setting Remarks

- The data lists in "5.2.4 Measured Data " list the significant emission frequencies, measured levels, correction factor (includes cable and antenna corrections), the corrected reading, plus the limit.
- In the frequency range between 9kHz to 1 GHz, the Electric Field Strength was measured in accordance with ANSI C63.4: 2003 and CISPR22: 1997.
- The test setup was made in accordance with ANSI C63.4: 2003.
- The antenna was measured at 1-4m height for 30MHz to 1GHz.
- The EUT was placed on the non-conductive table in the center of turntable. The height of this table was 0.8m.
- The measurement was carried out with both horizontal and vertical antenna polarization.
- The highest radiation from the equipment was recorded.
- Below 30MHz, a loop antenna was used at 1m height.
- By varying the configuration of the test sample and the cable routing, it was attempted to maximize the emission.
- The test receiver with Quasi Peak and Average detector is in compliance with CISPR 16-1:1993.
- 9-90 kHz, 110-490 kHz are based on measurements employing an average detector.
- The spectrum analyzer was set-up as following;

  (Frequency range : 9kHz - 30 MHz)
  - ✓ Resolution bandwidth : 10 kHz
  - ✓ Video bandwidth : 100 kHz
  - ✓ Detector function : Peak
  - ✓ Trace Mode : Max Hold

  (Frequency range : 30 - 1000 MHz)
  - ✓ Resolution bandwidth : 100 kHz
  - ✓ Video bandwidth : 300 kHz
  - ✓ Detector function : Peak
  - ✓ Trace Mode : Max Hold

- EMI Test Receiver analyzer was set-up as following (Quasi-Peak Detector);

  - ✓ IF bandwidth : 200 Hz (9kHz - 150kHz)
  - ✓ IF bandwidth : 9 kHz (150kHz - 30MHz)
  - ✓ IF bandwidth : 120 kHz (30MHz - 1GHz)

- Refer to test configuration figure 4.2.

5.2.2 Minimum Standard

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

5.2.3 Result

EUT complies with the requirement.

Uncertainty of measurement result: ± 3.64 dB
Temperature, Humidity : Refer to each data table

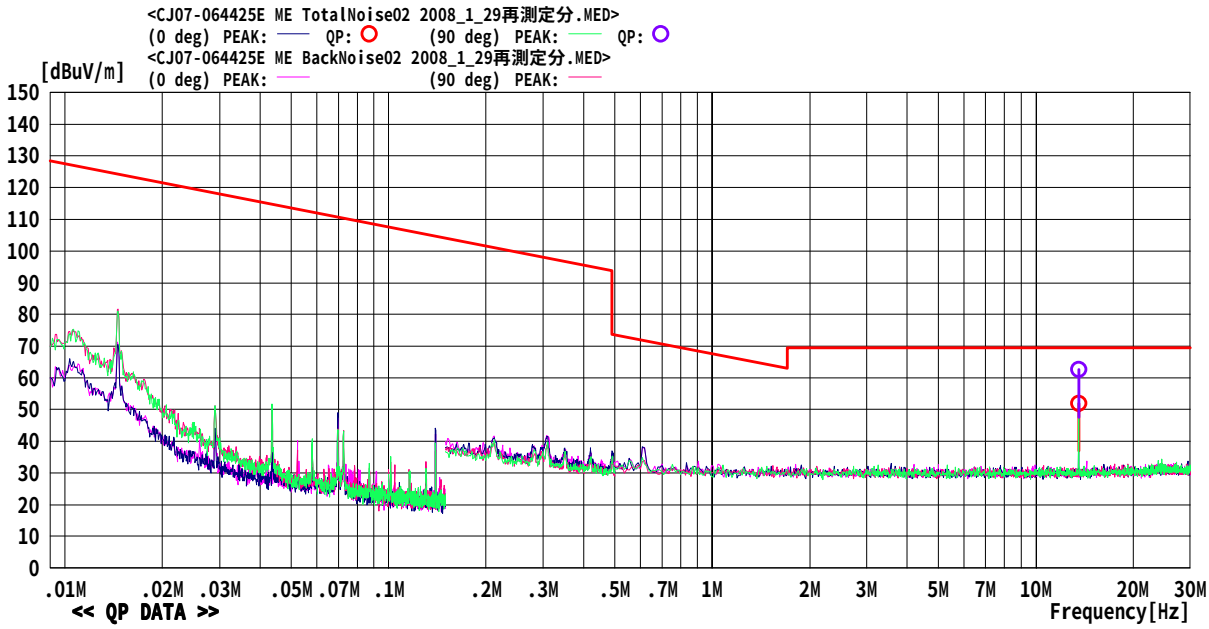
5.2.4 Measured Data (3m distance)

9kHz to 30MHz

Model Name	: CSH-07334	Job No.	: CJ07-064425EZ
Serial No.	: WBF0700078	Temp./Humi.	: 23°C/37%
Operator	: M.Yamanaka	Condition	: Operated
Power Supply	: DC 5V	Remark	: USB Shield GND connected to GND Plane

Memo : RBW:200Hz(9k-150kHz),9kHz(150k-30MHz)

LIMIT : FCC Part15 SubpartC 15.209 9KHz-30MHz



No	Freq. [MHz]	Reading [dBuV]	Ant.Fac [dB/m]	Loss [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Antenna	Angle [deg]	Comment
1	13.56064	32.7	18.4	0.8	51.9	69.5	17.6	0deg	113	Fundamental Frequency
2	13.56064	43.4	18.4	0.8	62.6	69.5	6.9	90deg	149	Fundamental Frequency

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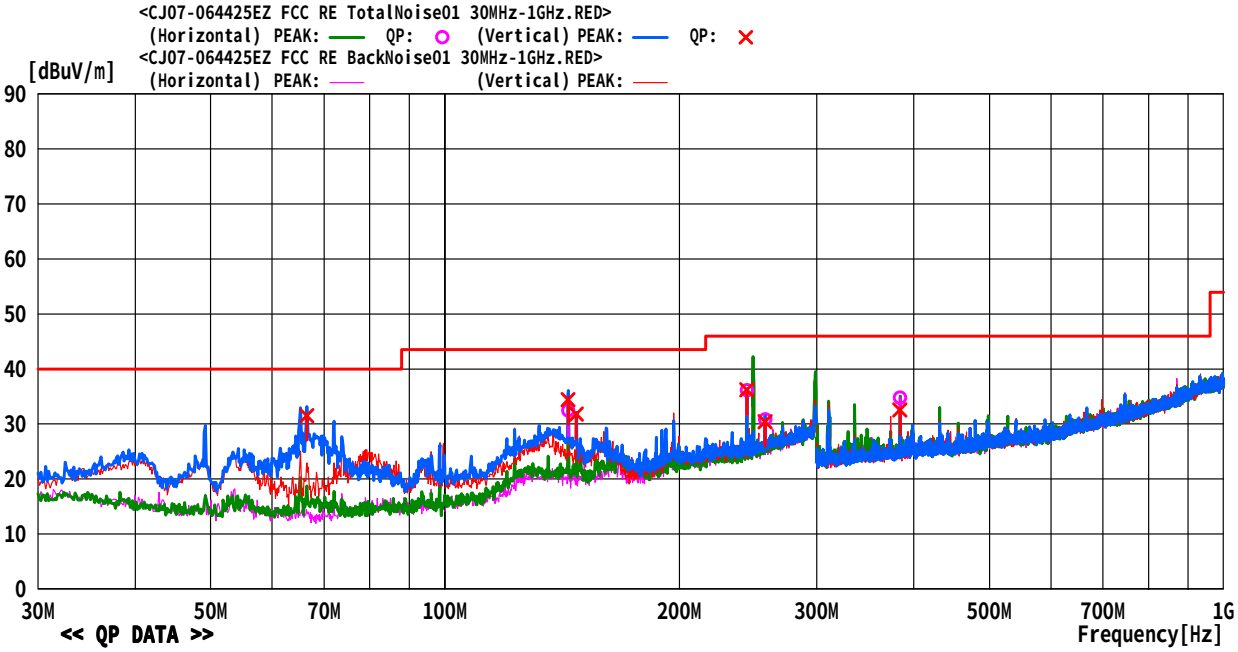
30MHz to 1GHz

Model Name : CSH-07334
Serial No. : WBF0700078
Operator : M.Yamanaka
Power Supply : DC 5V

Job No : CJ07-064425EZ
Temp./Humi. : 21°C/39%
Condition : Operated
Remark : USB Shield GND connected to GND Plane

Memo : RBW:120kHz

LIMIT : FCC 15.209 3m



No	Freq. [MHz]	Reading [dBuV]	C.Fac [dB/m]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Pola. [H/V]	Height [cm]	Angle [deg]	Ant Type	Comment
1	144.003	43.1	-10.7	32.4	43.5	11.1	Hori.	239	210	BC	
2	244.073	40.9	-4.8	36.1	46.0	9.9	Hori.	135	249	BC	
3	257.660	34.7	-3.9	30.8	46.0	15.2	Hori.	127	259	BC	
4	384.033	39.3	-4.5	34.8	46.0	11.2	Hori.	100	101	LP	
5	66.428	46.2	-14.7	31.5	40.0	8.5	Vert.	100	105	BC	
6	144.013	45.1	-10.7	34.4	43.5	9.1	Vert.	100	147	BC	
7	147.460	42.3	-10.5	31.8	43.5	11.7	Vert.	100	99	BC	
8	244.073	41.0	-4.8	36.2	46.0	9.8	Vert.	100	182	BC	
9	257.640	34.3	-3.9	30.4	46.0	15.6	Vert.	100	181	BC	
10	384.023	37.1	-4.5	32.6	46.0	13.4	Vert.	141	185	LP	

-TEPTO-DV/RE Ver 1.80.0020

5.3 Maximum Carrier Output Power

5.3.1 Setting Remarks

- Refer to 5.2.1
- Refer to test configuration figure 4.2.
- The EUT was placed on the non-conductive table in the center of turntable. The height of this table was 1m.
- The measurement was carried out with both horizontal and vertical antenna polarization.
- The highest radiation from the equipment was recorded.
- The test receiver with Quasi Peak and Average detector is in compliance with CISPR 16-1:1993.
- The spectrum analyzer was set-up as following;

  - ✓ Frequency Span : Appropriate to determine carrier frequency.
  - ✓ Resolution bandwidth : Appropriate to determine carrier frequency.
  - ✓ Video bandwidth : Appropriate to determine carrier frequency.
  - ✓ Sweep : Auto
  - ✓ Detector function : Peak
  - ✓ Trace Mode : Max Hold

- EMI Test Receiver analyzer was set-up as following (Quasi-Peak Detector);

  - ✓ IF bandwidth : 9 kHz

- Refer to test configuration figure 4.2.

5.3.2 Minimum Standard

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

5.3.3 Result

EUT complies with the requirement.

Uncertainty of measurement result: ± 3.64 dB
Temperature, Humidity : 23 ˚C, 35%

5.3.4 Measured Data (3m distance)

(102 VAC)

Frequency [MHz]	Polarization [°]	Correction Factor [dB]	Reading [dBμV/m]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin[dB]
13.110	90	19.3	4.26	23.560	80.50	56.940
13.410	90	19.2	4.54	23.740	80.50	56.760
13.553	90	19.2	30.73	49.930	90.47	40.540
13.560	90	19.2	43.48	62.680	124.00	61.320
13.567	90	19.2	30.79	49.990	90.47	40.480
13.710	90	19.2	4.54	23.740	80.50	56.760
14.010	90	19.3	4.26	23.560	80.50	56.940

(120 VAC)

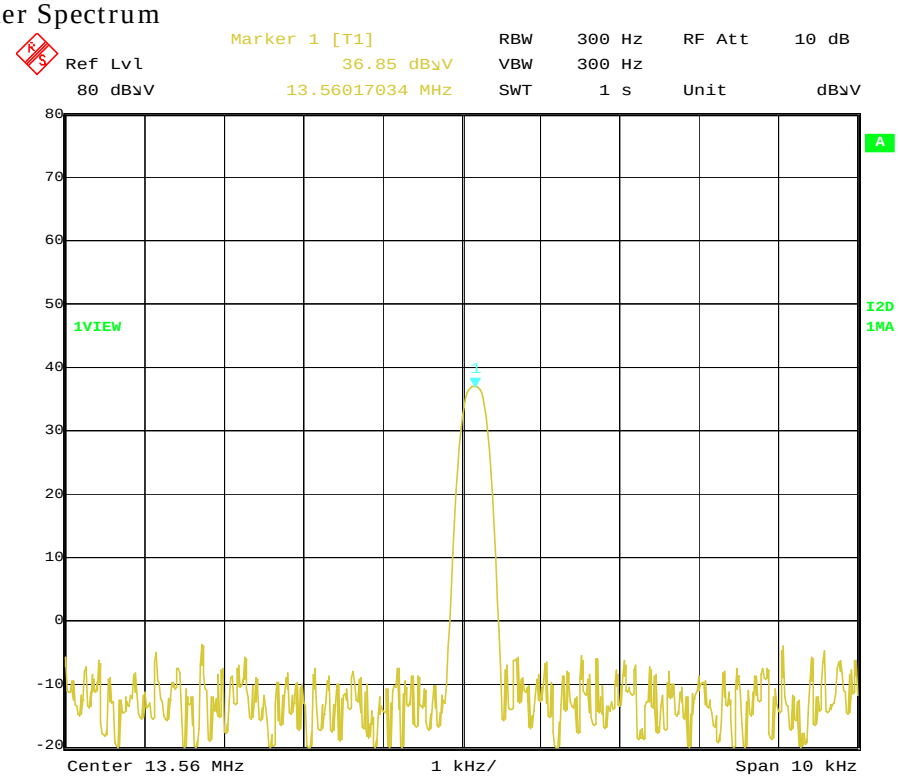
Frequency [MHz]	Polarization [°]	Correction Factor [dB]	Reading [dBμV/m]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin[dB]
13.110	90	19.3	4.26	23.560	80.50	56.940
13.410	90	19.2	4.54	23.740	80.50	56.760
13.553	90	19.2	30.28	49.480	90.47	40.990
13.560	90	19.2	43.49	62.690	124.00	61.310
13.567	90	19.2	30.79	49.990	90.47	40.480
13.710	90	19.2	4.80	24.000	80.50	56.500
14.010	90	19.3	4.54	23.840	80.50	56.660

(138 VAC)

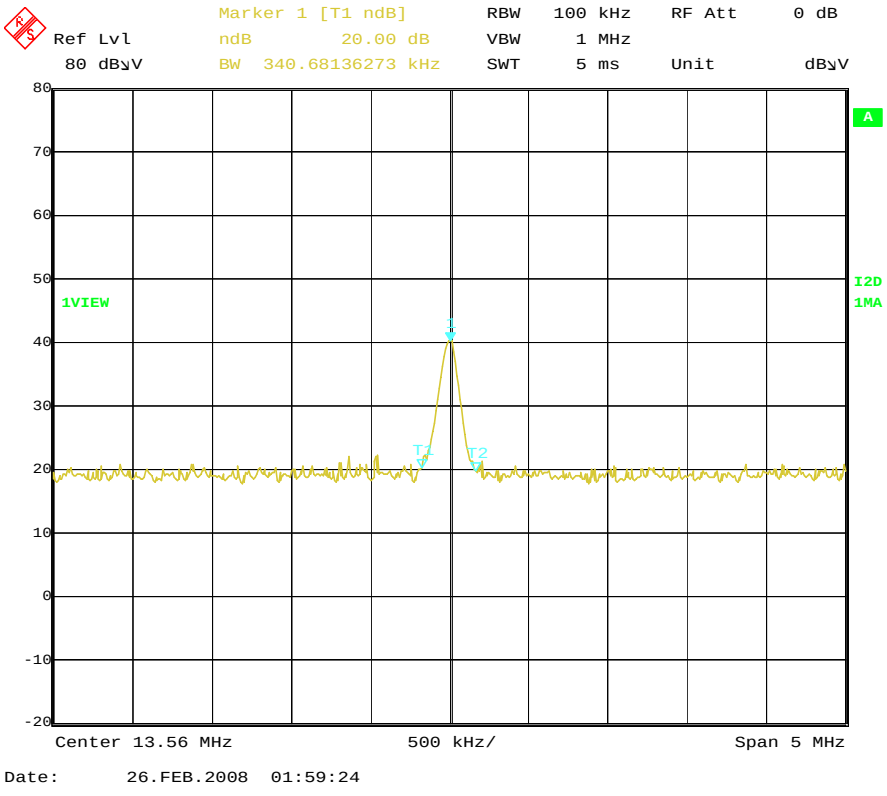
Frequency [MHz]	Polarization [°]	Correction Factor [dB]	Reading [dBμV/m]	Peak Power [dBμV/m]	Limit [dBμV/m]	Margin[dB]
13.110	90	19.3	4.26	23.560	80.50	56.940
13.410	90	19.2	4.54	23.740	80.50	56.760
13.553	90	19.2	30.27	49.470	90.47	41.000
13.560	90	19.2	43.48	62.680	124.00	61.320
13.567	90	19.2	4.54	23.740	90.47	66.730
13.710	90	19.2	4.26	23.460	80.50	57.040
14.010	90	19.3	4.26	23.560	80.50	56.940

* Correction Factor = Cable Loss (dB) + Antenna Factor (dB)

Carrier Spectrum



20dB Bandwidth



5.4 Frequency Tolerance

5.4.1 Setting Remarks

- Refer to setting remarks 5.3.1.
- Refer to test configuration figure 4.2.
- With an environmental test chamber, EUT is exposed in extreme temperatures until its temperature is stabilized. (Approximately 30 minutes) Then EUT is on with nominal AC voltage, or installed a fully charged battery.

5.4.2 Minimum Standard

(e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% of the operating frequency over a temperature variation of –20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.4.3 Result

EUT complies with the requirement.

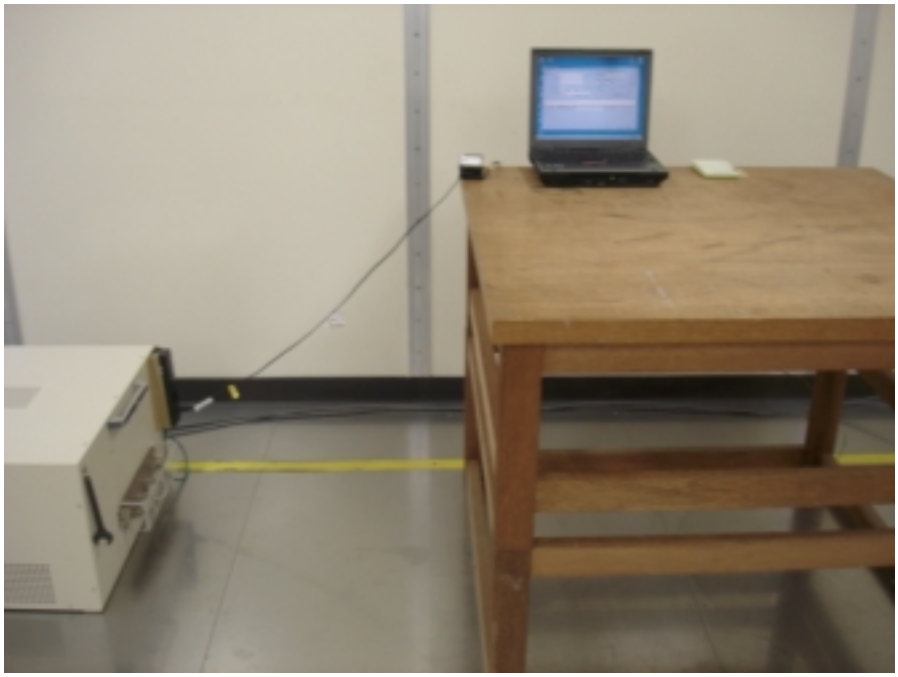
Uncertainty of measurement result: ± 1 Hz

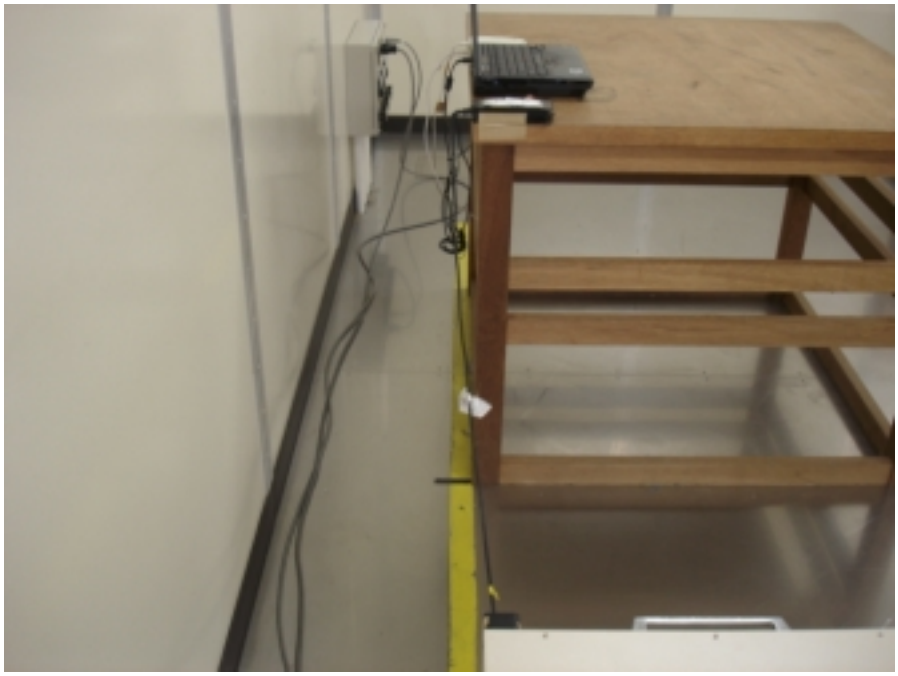
5.4.4 Measured Data

Temp [℃]	P/S [VAC]	Frequency [Hz]	Limit [± Hz]	Offset from the CF [Hz]	Limit [%]	Error[%]
Center Frequency		13,560,000				
25	102	13560085	1356.00	85	±0.01	0.001
25	120	13560085	1356.00	85	±0.01	0.001
25	138	13560086	1356.00	86	±0.01	0.001
-20	102	13560107	1356.00	107	±0.01	0.001
-20	120	13560115	1356.00	115	±0.01	0.001
-20	138	13560123	1356.00	123	±0.01	0.001
50	102	13560052	1356.00	52	±0.01	0.000
50	120	13560052	1356.00	52	±0.01	0.000
50	138	13560051	1356.00	51	±0.01	0.000

6. Photos

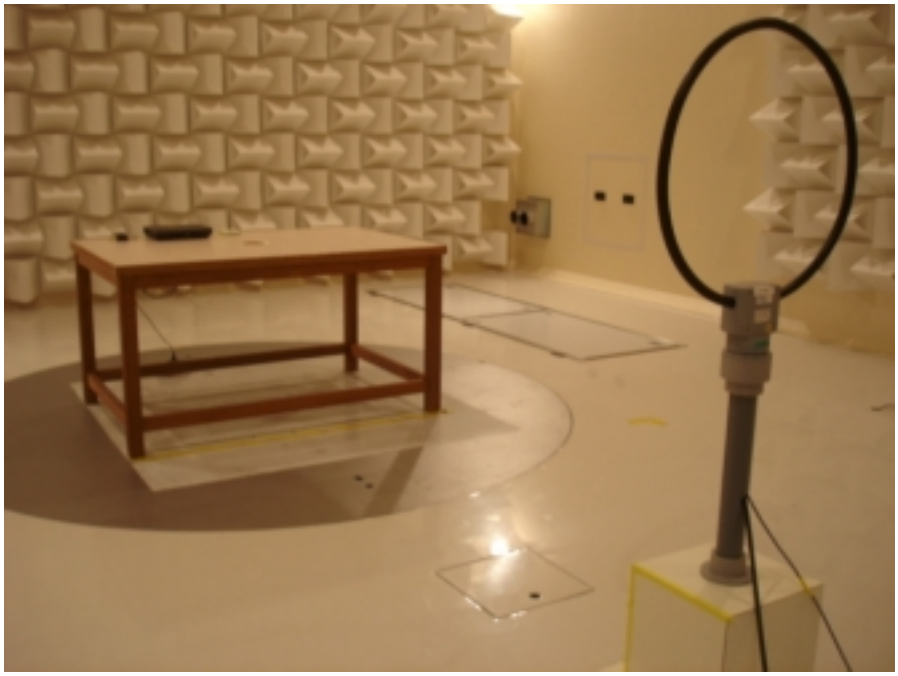
6.1 Setup Photo (Conducted Emission)





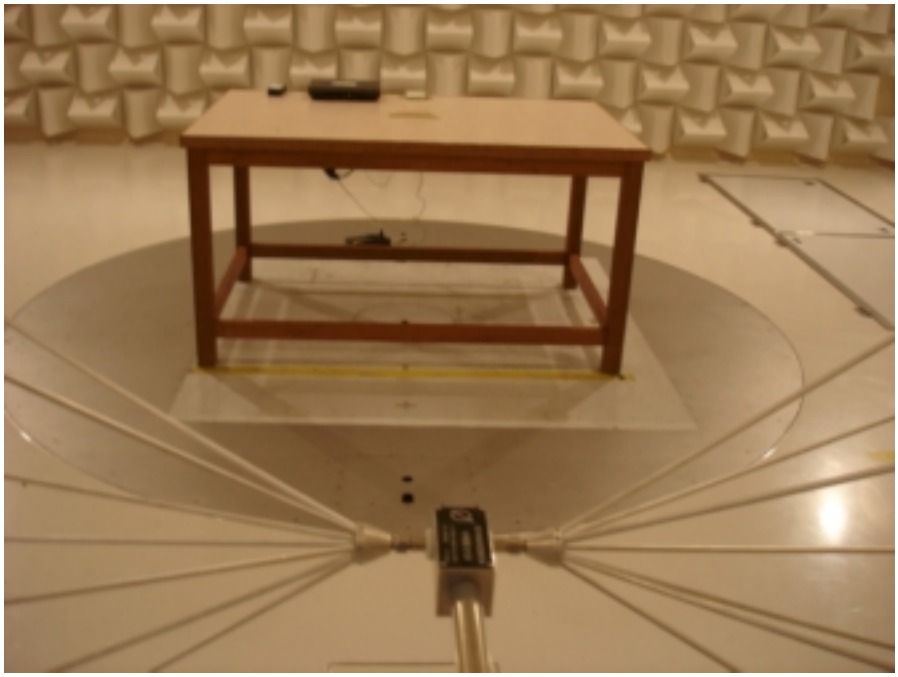
6.2 Setup Photo (Radiated Emission)

9kHz - 30MHz

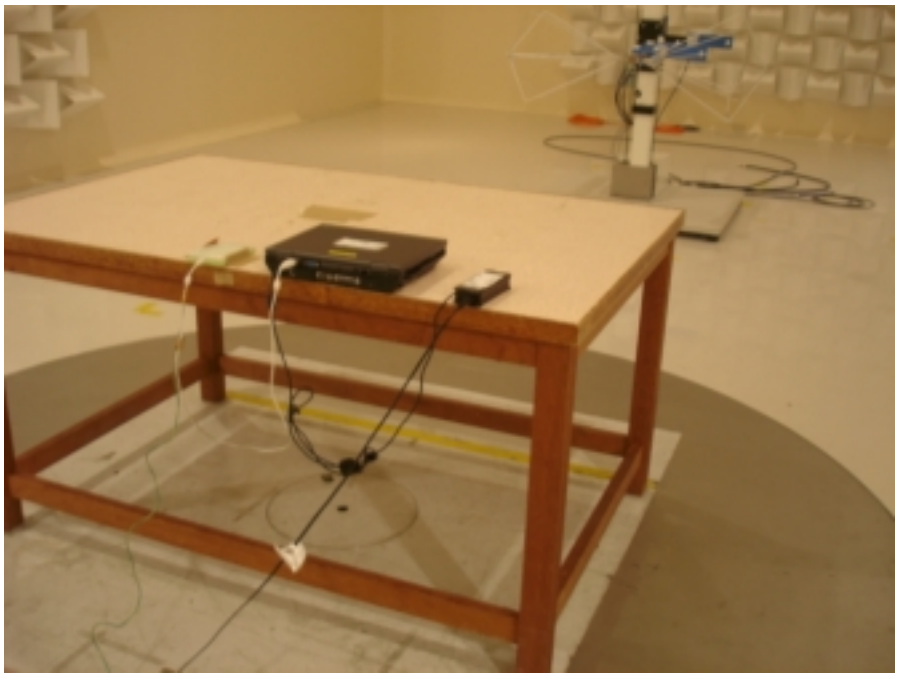


9kHz - 30MHz

Above 30MHz



Above 30MHz



7. List of Test Measurement Instruments

7.1 Conducted Emission Measurement

Instruments	Manufacturer	Model / Type	Serial No.	Calibration Date Next Calibration
Spectrum Analyzer	ADVANTEST CORPORATION	R3132	140501174	July, 2006 July, 2008
EMI Test Receiver	ROHDE & SCHWARZ	ESCS30	100335	April, 2007 April, 2008
Artificial-Mains Network	KYORITSU CORPORATION	KNW-244C (for EUT)	8-1657-1	April, 2007 April, 2009
Transient Limiter	AGILENT TECHNOLOGIES	11947A	3107A03745	October, 2007 October, 2008
RF Selector	Techno Science Japan Corp.	RFM-E221	3148	- -

7.2 Radiated Emission Measurement

Instruments	Manufacturer	Model / Type	Serial No.	Calibration Date Next Calibration
Programmable AC/DC Power Source	NF Corporation	ES18000W	425779	---
EMI Test Receiver	ROHDE & SCHWARZ	ESIB40	100211	April, 2007 April, 2008
Biconical Antenna (30 to 300MHz)	SCHWARZBECK	VHBB9124(Balun) BBA9106(Elements)	311	September, 2007 September, 2008
Log.-Periodic Antenna (300 MHz to 1 GHz)	SCHWARZBECK	UHALP 9108 A	645	September, 2007 September, 2008
Loop Antenna (0.15 to 30 MHz)	ROHDE & SCHWARZ	HFH2-Z2	131	August, 2007 August, 2008
Environment Chamber	ISUZU	HPAF-800-20	---	---