Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION
OF
FCC PART15 Subpart B COMPLIANCE

PRODUCT	:	MP3 PLAYER
MODEL/TYPE NO	:	MF-FE461, MF-FE462, MF-FE465
FCC ID	:	Q9JMF-FE465
TRADE NAME	:	EZMAX
APPLICANT	:	EZMAX Co.,Ltd. #302 Kumbong technovalley B/D, Dangjung-Dong, Gunpo, Kyunggi-Do 435-030, Korea
FCC CLASSIFICATION	:	JBP : Part 15 Class B Computer Device Peripheral
FCC RULE PART(S)	:	FCC Part 15 Subpart B Class B
FCC PROCEDURE	:	Certification
DATES OF TEST	:	June 25, 2004
DATES OF ISSUE	:	June 25, 2004
TEST REPORT No.	:	BWS-04-EF-0043
TEST LAB.	:	BWS TECH Inc. (Registration No. : 553281)

This Portable Digital Audio Player(MP3&Voice Recoder) has been tested in accordance with the measurement procedures specified in ANSI C63.4-2000 at the BWS TECH/EMC Test Laboratory and has been shown to be complied with the electromagnetic emission limits specified in FCC Rule Part15 Subpart B Section15.107 and 15.109
I attest to the accuracy of data. All measurement herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. 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 will not necessarily produce the same results due to production tolerance and measurement uncertainties.

June 25, 2004
(Date)

Tae-hyun Nam
Chief Engineer
Laboratory Division

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This report only responds to the tested sample and may not be reproduced, except in full, without written approval of the BWS TECH,Inc.

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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 Information

Company Name	:	EZMAX Co.,Ltd.
Company Address	:	#302 Kumbong technovalley B/D, Dangjung-Dong, Gunpo, Kyunggi-Do 435-030, Korea
Phone/Fax	:	Phone : +82-31-457-9185 / Fax : +82-31-457-9187

Manufacturer Information

Company Name	:	EZMAX Co.,Ltd.
Company Address	:	#302 Kumbong technovalley B/D, Dangjung-Dong, Gunpo, Kyunggi-Do 435-030, Korea
Phone/Fax	:	Phone : +82-31-457-9185 / Fax : +82-31-457-9187

- **EUT Type :** MP3 PLAYER
- **Model Number :** MF-FE461, MF-FE462, MF-FE465
- **FCC Identifier :** Q9JMF-FE465
- **S/N :** Prototype
- **FCC Rule Part(s) :** Part 15 Subpart B Class B
- **Test Procedure :** ANSI C63.4-2000
- **Date of Tests :** June 25, 2004
- **Place of Tests :** BWS TECH Inc.
  EMC Testing Lab (FCC Registration Number : 553281)
  294-9, Jungdae-Dong, Kwangju-Si, Kyunggi-Do 464-080, Korea
  TEL: +82 31 762 0124 FAX: +82 31 762 0126
- **Test Report No. :** BWS-04-EF-0043

2. Description of Test Facility

The measurement for radiated emission test were practiced at the open area test site of BWS TECH Inc. Measurement for conducted emission test were practiced at the semi EMC Anechoic Chamber test site of BWS TECH Inc. facility located at 294-9, Jungdae-Dong, Kwangju-Si, Kyunggi-Do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-2000 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 C63.4-2000 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.63.4-2000) was used in determining radiated and conducted emissions from the EZMAX Co.,Ltd. MP3 PLAYER Model : MF-FE461, MF-FE462, MF-FE465.

3. Product Information

3.1 Equipment Description

Specification

Memory		Built-in Memory 128MB/256MB/512MB
DISPLAY		80x48 OLED Type Blue Color Backlight
MP3 Encoding		MPEG 1/2/2.5 Layer3
Compatible File Format		MPEG 1/2/2.5 Layer3, WMA, ASF (Audio only)
Compatible File Bit Rate		8 Kbps ~ 320 Kbps (WMA/ASF: 32 ~ 192 Kbps)
Audio	Frequency	20 Hz ~ 20 KHz
	Headphone Output	6.5 mW + 6.5 mW (16 ohm)
	S/N Ratio	> 85 dB
FM Radio	FM Frequency	87.5 MHz ~ 108 MHz 76.0MHz ~ 108MHz(JAPAN only)
	Headphone Output	5 mW + 5 mW (16 ohm)
	S/N Ratio	> 55 dB
	Antenna	Earphone Antenna
Language		Multi-Language
USB		USB 1.1(5 Mbps)
Maximum Playback Time		Approx. 13 hours (Company standard)
Distortion Rate		< 0.1%
Size		31.0(W) x 81.0(L) x 14.5(H) mm
Battery		1 x AAA size
Weight		29g

* The specification and exterior of the product are subject to change without prior notice for further improvement of the performance.

3.2 Variations covered by this report

Model Difference : This products are different in memory size only.

MF-FE461 : 128 Mb, MF-FE462 : 256 Mb, MF-FE465 : 512 Mb,

Technical Deviation : Tested by model MF-FE465

This products are different in memory size only.(Other specification is same)

3.3 Additional Information Related to Testing

Test results apply only to the particular sample tested and functionality described in this test report.
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4. Description of Tests

4.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2000. The measurement were performed over the frequency range of 0.15MHz to 30MHz using a 50Ω/50uH LISN as the input transducer to a Spectrum Analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Peak" amplitude within an bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1m x 1.5m x 0.8m wooden table which is placed 40cm away from the vertical wall and 1.5m away from the side wall of the chamber room. Two LISNs are bonded to the shielded room. The EUT is powered from the PMM LISN and the support equipment is powered from the another Koritsu LISN. Power to the LISNs is filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the EMCO LISN. All interconnecting cables more than 1m were shortened by non-inductive bundling(serprntine fashion) to a 1m length. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to Spectrum Analyzer to determine the frequency producing the max. emission from the EUT. The frequency producing the max. level was reexamined using the detector function set to the CISPR Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.45 to 30MHz. The bandwidth of the Spectrum Analyzer was set to 9kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission. Each emission was maximized by switching power lines, varying the mode of operation or resolution, clock or data exchange speed, if applicable, whichever determined the worst-case emission. Each emission was calibrated using self-calibrating mode.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup.

4.2 Radiated Emission Measurement

Preliminary measurements were made at indoor 3 meter semi EMC Anechoic Chamber using broadband antennas, broadband amplifier, and spectrum analyzer to determine the emission frequencies producing the maximum EME.

Appropriate precaution was taken to ensure that all emissions from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using bi-log antenna and above 1000MHz, linearly polarized double ridge horn antennas were used. Above 1GHz, linearly polarized double ridge horn antennas were used. The measurements were performed with three frequencies which were selected as bottom, middle and top frequency in the operating band. Emission level from the EUT with various configurations were examined on the spectrum analyzer connected with the RF amplifier and plotted graphically.

Final measurements were made outdoors open site at 10-meter test range using biconical and logperiodic antenna. The output from the antenna was connected, via a preselector or a preamplifier, to the input of the EMI Measuring Receiver and Spectrum analyzer(for above 1GHz). The detector function was set to the quasi-peak or peak mode as appropriate. The measurement bandwidth of the Field strength receiver was set to at least 120kHz (1MHz for measurement above 1GHz), with all post-detector filtering no less than 10 times the measurement bandwidth. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition.

Each frequency found during preliminary measurement was examined and investigated as the same set up and configuration which produced the maximum emission The EUT , support equipment and interconnecting cables were configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8-meter high non-metallic 1m x 1.5 meter table. The turntable containing the system was rotated and the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the maximum emission.

Each emission was maximized by varying the mode of operating frequencies of the EUT. The system was tested in all the two orthogonal planes and changing the polarity of the antenna. The worst case emissions are recorded in the data tables. If necessary, the radiated emission measurement could be performed at a closer distance to ensure higher accuracy and the results were extrapolated to the specified distance using an inverse linear distance extrapolation factor(20dB/decade) as per section 15.31(f).

Photographs of the worst-case emission test setup can be seen in Appendix A.

5. Test Condition

5.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner which tends to maximize its emission level in a typical application.

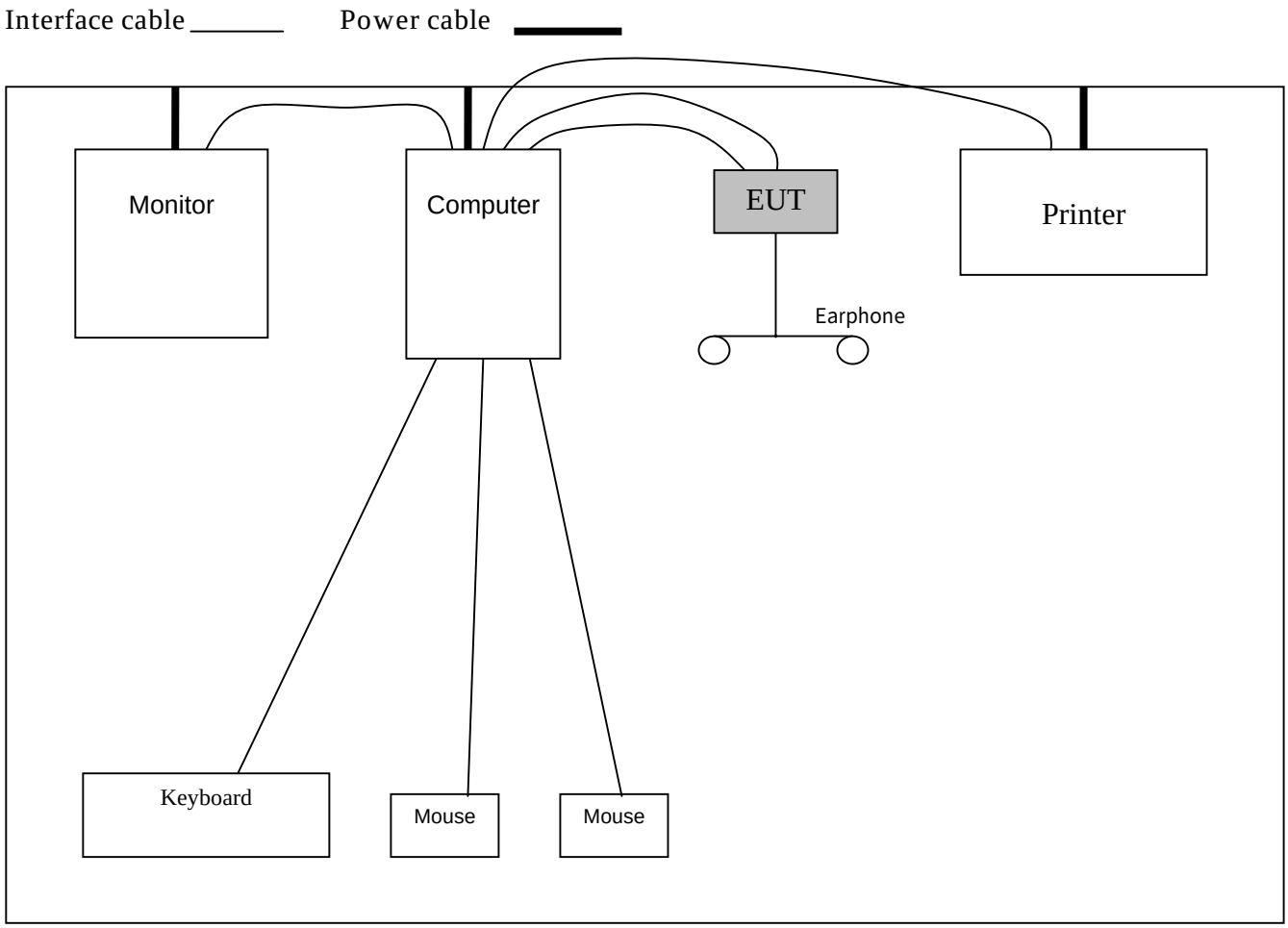
Radiated Emission Test

Preliminary radiated emission tests were performed using the procedure in ANSI C63.4/2000 Clause 8.3.1.1 to determine the worst operating condition. Final radiated emission tests were conducted at 3 meter open field test site.

5.2 EUT operation

EUT was tested according to the following operation modes provided by the specifications given by the manufacturer, and reported the worst emissions.

5.3 Test System layout on EUT and peripherals



5.4 Peripherals / Support Equipment Used

Following peripheral devices and interface cables were connected during the measurement:

Type of Peripheral Equipment Used:

Description	Model Name	Serial No.	Manufacturer	FCC ID
EUT	MF-FE461, MF-FE462, MF-FE465	-	EZMAX Co.,Ltd.	Q9JMF-FE465
Computer	BWS TEST-8	N/A	BWS TECH Inc.	DOC
Monitor	M782	BH68-00440P-02	Samsung Elec.	DOC
Keyboard	KB-0133	B69420KGAP012Y	HP	DOC
Mouse	Wheel Mouse 3.0 PS/2 COMPATIBLE	6189747-0	Microsoft	DOC
Serial Mouse	Wheel Mouse 3.0 COMPATIBLE	6190041-0	Microsoft	DOC
Printer	MJC-650G	H3AH703638	Samsung Elec.	DOC

Type of Cables Used:

Device from	Device to	Type of Cable	Length(m)	Type of shield
Computer	Monitor	VIDEO	1.8	Shielded
Computer	Keyboard	PS/2	2.1	Unshielded
Computer	Mouse	PS/2	1.8	Unshielded
Computer	Mouse	Serial	1.5	Unshielded
Computer	Printer	Parallel	1.9	Shielded
EUT	Computer	USB	1.4	Shielded
EUT	Computer	Line-in	0.6	Unshielded
EUT	Earphone	Line out	0.3	Unshielded

6. TEST RESULTS

6.1 Summary of 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.

FCC Rule Parts	Measurement Required	Result
15.107(a)	Conducted Emission	Passed by –12.01 dB
15.109(g)	Radiated Emissions	Passed by –3.57 dB

The data collected shows that the EZMAX Co.,Ltd. MP3 PLAYER model : MF-FE461, MF-FE462, MF-FE465 complies with technical requirements of the Part 15.107 and 15.109 of the FCC Rules.

Note : Modification to EUT

The device tested is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

6.2 Conducted Emissions

EUT	: MP3 PLAYER model : MF-FE461, MF-FE462, MF-FE465
Limit apply to	: FCC Part15 Subpart B Class B Section 15.107(a)
Test Date	: June 25, 2004
Operating Condition	: Download mode
Environment Condition	: Humidity Level : 27 %RH, Temperature : 20 ℃
Result	: Passed by –12.01 dB

The following table shows the highest levels of conducted emissions on both phase of Hot and Neutral line.

Tabulated Conducted Emission Test Data

Detector Mode ; CISPR Quasi Peak mode (6dB Bandwidth : 9kHz).

Freq [MHz]	Correcton		Phase [H/N]	Quasi-Peak Mode			Aberage Mode		
	AMN	C.L		Limit	Reading	Emission Level	Limit	Reading	Emission Level
				[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dBuV]
0.159	0.06	0.03	N	65.90	53.80	53.89	55.90		
0.172	0.06	0.03	N	65.40	38.70	38.79	55.40		
0.184	0.06	0.03	N	65.10	39.80	39.89	55.10		
0.201	0.07	0.10	N	64.60	50.90	51.07	54.60		
0.308	0.08	0.22	H	61.60	38.00	38.30	51.60		
0.466	0.07	0.28	H	57.00	27.60	27.95	47.00		
0.506	0.07	0.30	N	56.00	22.10	22.47	46.00		
0.544	0.07	0.30	N		15.50	15.87			
0.609	0.07	0.30	N		20.10	20.47			
0.933	0.05	0.35	H		13.60	14.00			
3.823	0.03	0.74	H		12.40	13.17			
4.306	0.04	0.80	H		15.10	15.94			
13.160	0.05	1.18	H	60.00	23.40	24.63	50.00		
13.840	0.07	1.21	H		24.70	25.98			
15.640	0.07	1.22	H		31.00	32.29			
17.260	0.07	1.25	H		31.40	32.72			
19.560	0.05	1.35	N		31.00	32.40			
29.330	0.26	1.64	H		25.20	27.10			

NOTES :

1. *H : Hot Line , N :Neutral Line*
2. *Emission Level = Reading + Correction Factor*
3. *Measurements were performed at the AC Power Inlet of the host PC with the EUT plugged in the frequency band of 150kHz ~30MHz*

*Tested by **Kim, Do-Yearn***

6.3 Radiated Emissions

EUT	: MP3 PLAYER model : MF-FE461, MF-FE462, MF-FE465
Limit apply to	: FCC Part15 Subpart B Class B Section 15.109(g)
Test Date	: June 25, 2004
Operating Condition	: Download mode
Environment Condition	: Humidity Level : 50 %RH, Temperature : 25 °C
Result	: Passed by –3.57 dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarization of horizontal and vertical.

Detector mode : CISPR Quasi-Peak mode (6dB Bandwidth : 120 kHz)

Measurement Distance : 3 meters

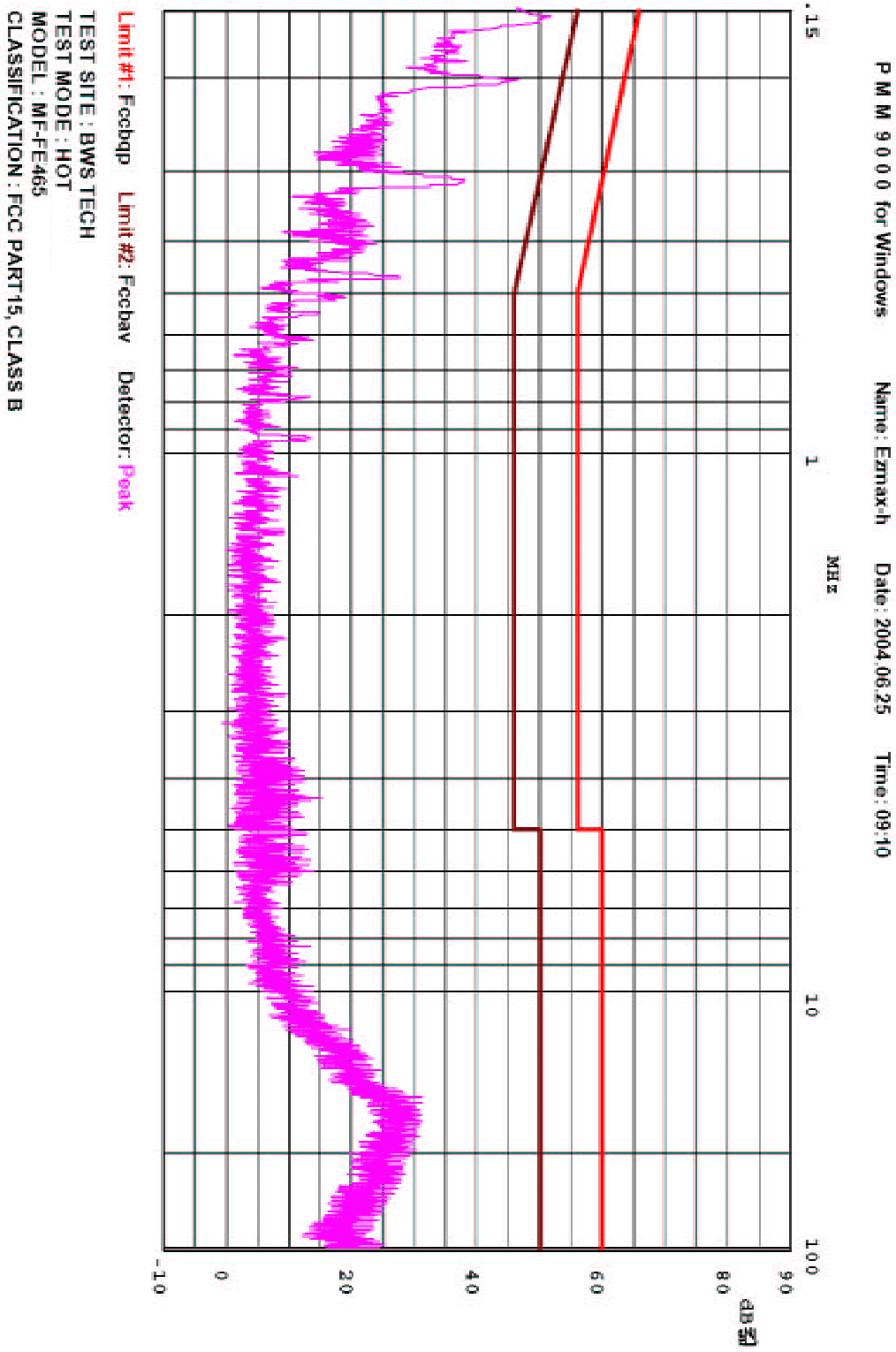
Frequency [MHz]	Reading [dBμV]	Polarization [*H/**V]	Ant.Factor [dB]	Cable Loss [dB]	Limit [dBμV/m]	Emission Level [dBμV/m]	Margin 04 [dB]
70.64	22.65	V	10.45	3.33	40.00	36.43	-3.57
450.06	17.08	H	16.92	4.77	46.00	38.77	-7.23
456.09	17.10	H	17.01	4.81	46.00	38.92	-7.08
462.06	20.14	V	17.10	4.85	46.00	42.09	-3.91
474.09	14.11	H	17.29	4.92	46.00	36.32	-9.68
614.41	11.87	V	20.03	5.66	46.00	37.56	-8.44

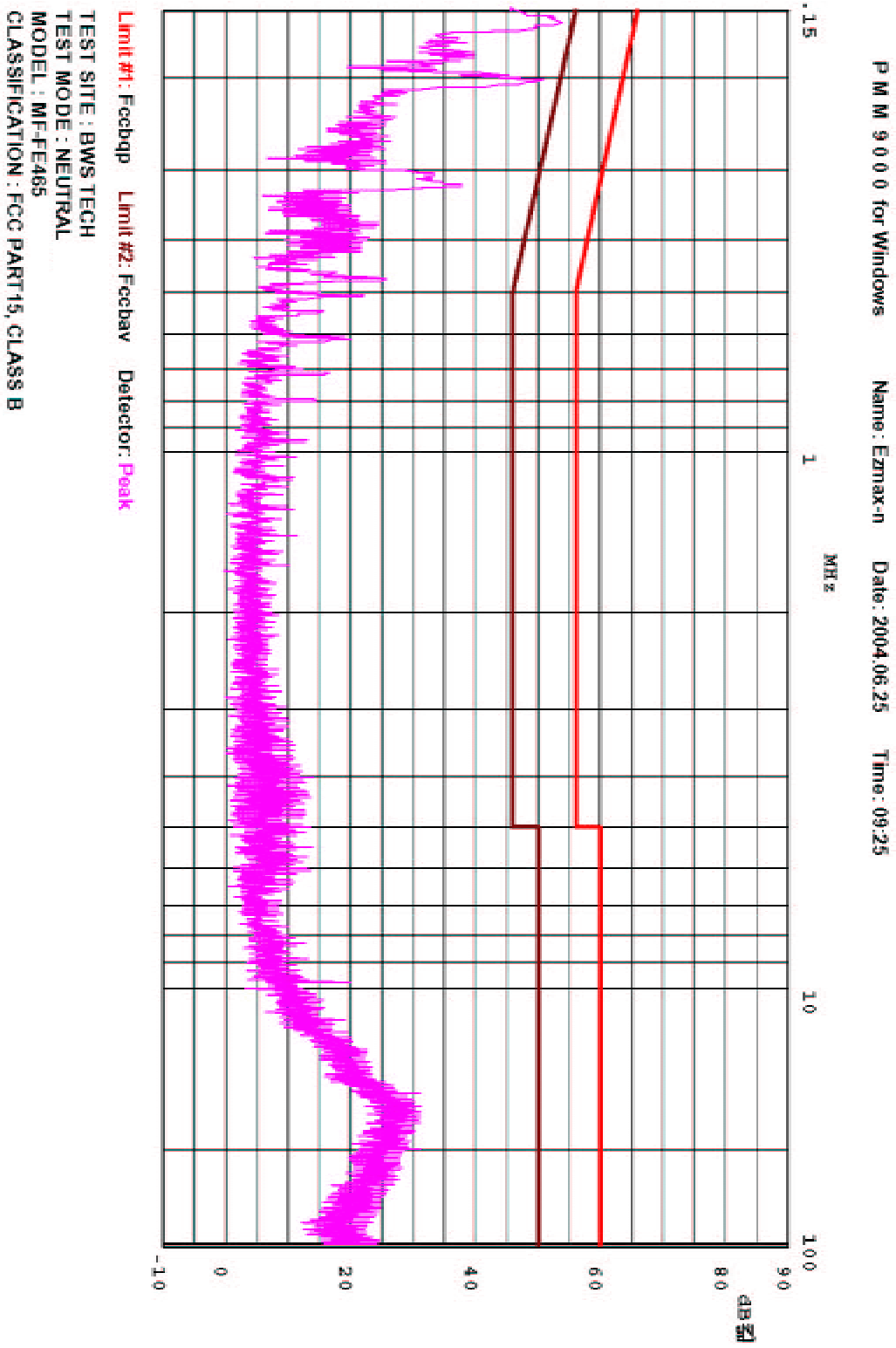
NOTES :

1. ** H : Horizontal polarization , ** V : Vertical polarization*
2. *Emission Level = Reading + Antenna factor + Cable loss*
3. *Margin value = Limit - Emission Level*
4. *All other emissions not reported were more than 25dB below the permitted limit.*

*Tested by **Kim, Do-Yearn***

Plots of Conducted Emission Test




P M M 9 0 0 0 for Windows
Name: Ezmax-n
Date: 2004.06.25
Time: 09:25
.15
1
MHz
10
100
90
80
60
40
20
0
-10
dBuV
Limit #1: Fccbqp
Limit #2: Fccbav
Detector: Peak
TEST SITE : BWS TECH
TEST MODE : NEUTRAL
MODEL : MF-FE465
CLASSIFICATION : FCC PART15, CLASS B

7. Sample Calculation and Other Information

7.1 Sample Calculations

$$dB\mu V = 20 \log 10 (\mu V / m)$$

$$\mu V = 10^{(dB\mu V / 20)}$$

EX. 1.

@ 0.159 MHz Class B limit(Quasi-peak) = 65.90 dBµV

Reading = 53.80 dBµV (calibrated level)
AMN factor + Cable Loss = 0.09 dB
Total = 53.89 dBµV / m
Margin = 53.89 - 65.90 = -12.01
12.01 dB ; below limit

EX. 2.

@ 70.64 MHz Class B limit = 40.00 dBµV / m

Reading = 22.65 dBµV(calibrated level)
Antenna factor + Cable Loss = 13.78 dB
Total = 36.43 dBµV / m
$10^{(43.12 / 20)}$ = µV / m
Margin = 36.43 – 40.00 = -3.57 dB
3.57 dB ; below limit

7.2. Measurement Uncertainty

Measurement uncertainty of RFI Voltage Measurement test was estimated at ±3.51 dB(k=2).
Measurement uncertainty of RFI Field Strength Measurement test was estimated at ±4.34dB (k=2).

8. TEST EQUIPMENTS LIST

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

Test Equipment	Manufacture Model Number	Serial Number	Calibration Due date
Signal Analyzer	PMM PMM9000	3100570602	09/09/04
EMC Analyzer	HP E7403A	US39150108	05/18/05
Bilog Antenna	SCHWARZBECK VULB9160	9160-3052	03/23/05
Shield Room 7m x 4m x 4m	SEMITECH	000815	N/A
Open Site Cable	N/A OSC-30	BWS-01	02/04/05
Antenna Turntable Controller	JAEMC JAC-2	N/A	N/A
Antenna Mast	Dae-il EMC JAC-3	N/A	N/A
Artificial Mains Network	PMM L3-25	1110K70403	04/06/05
LISN	FCC FCC-LISN-50-50-2-02	03074	10/07/04
Conducted Cable	N/A CC-10	BWS-02	09/09/04