

Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT : USB DRIVE
MODEL/TYPE NO : FMD-WC2
FCC ID : PESFMD-WC2
APPLICANT : JUNG MYUNG TELECOM CO., LTD.
703 SILLA TECHNOVIL., 39-3, DANG-DONG, KOONPO-SHI,
KYUNGKI-DO, KOREA
Attn. : HYEK-WON KWEON / Quality Assurance Div. / Manager
FCC CLASSIFICATION : Part 15 Class B Unintentional Radiators
Computing Device Peripheral (JBP)
FCC RULE PART(S) : FCC Part 15 Subpart B
FCC PROCEDURE : Certification
TRADE NAME : JMT
TEST REPORT No. : E02.1105. FCC.740N
DATES OF TEST : November 1 ~ 4, 2002
DATES OF ISSUE : November 5, 2002
TEST LABORATORY : ETL Inc (FCC Registration Number : 95422)
584 Sangwhal-ri, Kanam-myon, Yoju-kun,
Kyounggi-do, 469-885, Korea
Tel : (031) 885-0072 Fax : (031) 885-0074

This USB DRIVE, Model FMD-WC2 has been tested in accordance with the measurement procedures specified in ANSI C63.4-1992 at the ETL/EMC Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart B : Unintentional Radiators.

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.



Name : Yo han, park

Title : Chief Engineer & Lab.Manager

E-RAE Testing Laboratory Inc.

584 Sangwhal-ri, Kanam-myon, Yoju-kun,
Kyounggi-do, 469-885, Korea



Table of Contents

ATTACHMENT A: COVER LETTER(S)

FCC Measurement Report

- 1. Introduction**
- 2. Product Information**
- 3. Description of Tests**
- 4. Test Condition**
- 5. Test Results**
 - 5.1 Summary of Test Results**
 - 5.2 Conducted Emissions Measurement**
 - 5.3 Radiated Emissions Measurement**
- 6. Sample Calculations**
- 7. List of test Equipment used for Measurement**

Appendix A. FCC ID Label and Location

Appendix B. Test Setup Photographs

Appendix C. External Photographs

Appendix D. Internal Photographs

Appendix E. Block Diagram

Appendix F. User Manual

Appendix G. Schematics

FCC MEASUREMENT 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)

General Information

Applicant Name : JUNG MYUNG TELECOM CO., LTD.

Address : 703 SILLA TECHNOVIL., 39-3, DANG-DONG,
KOONPO-SHI, KYUNGKI-DO, KOREA

Attention : HYEK-WON KWEON / Quality Assurance Div. / Manager

- **EUT Type** : USB DRIVE
- **Model Number** : FMD-WC2
- **FCC Identifier** : PESFMD-WC2
- **S/N** : N/A
- **Modulation** : N/A
- **FCC Rule Part(s)** : Part 15 Subpart B Unintentional Radiators
- **Test Procedure** : ANSI C63.4-1992
- **FCC Classification** : Part 15 Class B Unintentional Radiators
Computing Device Peripheral (JBP)
- **Dates of Tests** : November 1 ~ 4, 2002
- **Place of Tests** : ETL Inc
EMC Testing Lab (FCC Registration Number : 95422)
584, Sangwhal-Ri, Kanam-Myun, Yoju-Kun,
Kyounggi-Do, Korea
Tel : (031) 885-0072 Fax : (031) 885-0074
- **Test Report No.** : E02.1105.FCC.740N

1. INTRODUCTION

The measurement test for radiated and conducted emission test were conducted at the open area test site of E-RAE Testing Laboratory Inc. facility located at 584, Sangwhal-ri, Ganam-myun, Youju-kun, Kyoungki-do, Korea. The site is constructed in conformance with the requirements of the ANSI C63.4-1992 and CISPR Publication 16. The ETL has site descriptions on file 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 C63.4-1992 and registered to the Federal Communications Commission(Registration Number : 95422).

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.63.4-1992) was used in determining radiated and conducted emissions from the JUNG MYUNG TELECOM CO., LTD. , Model : FMD-WC2

2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test(EUT) is the USB DRIVE from JUNG MYUNG TELECOM CO., LTD.
Please refer to Users manual

2.2 General Specification

- Chassis Type : Plastic & Metal Cover
- List of Each OSC. Or X-Tal. Freq. (≥ 1 MHz) : X-TAL – 12.0MHz
- Chipset Brand & Part No. : 0238MF59H01-11 – GL814, K9K1G08UOM YCBO – SAMSUNG
- Number of Layers : Main board – 6Layers, Memory – 6 Layers
- USB DRIVE Specifications : USB DRIVE 16MB - 1GB
- Interface : USB compatible with USB 2.0 spec
- Capacity MB : 16 / 32 / 64 / 128 / 256 / 512 / 1024
- Data Retention : up to 10 years
- Data Access Rate : 4MB / sec (read), 1MB / sec (write)
- Power supply : USB BUS-Powered (4.5V ~ 5.5V)
- OS Support : Windows 98 / SE / Me / 2000 / XP
Mac OS 8.6 ~ 10.1, Linux 2.4.X

3. DESCRIPTION OF TESTS

3.1 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with § 12.2 in ANSI C63.4-1992 "Measurement of Information Technology Equipment ". The measurement were performed over the frequency range of 0.15MHz to 30MHz using a $50\Omega/50\mu\text{H}$ 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 a bandwidth of 10KHz or for "quasi-peak" within a bandwidth of 9KHz.

- Procedure of Test

The line-conducted facility is located inside a shielded room 1m X 1.5m wooden table 80cm high is placed 40cm away from the vertical wall and 1.5m away from the side wall of the shielded room. Two EMCO 3825/2 LISN are bonded to the shielded room. The EUT is powered from the EMCO LISN and the support equipment is powered from the another EMCO LISN. Power to the LISNs are 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. Non-inductive bundling to a 1m length shortened all interconnecting cables more than 1m. 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 the R3261A Spectrum Analyzer to determine the frequency producing the max. emission from the EUT. The frequency producing the max. level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 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.

3. DESCRIPTION OF TESTS

3.2 Radiated Emission Measurement

Radiated emission measurements were in accordance with § 12.2 in ANSI C63.4-1992 "Measurement of Information Technology Equipment ". The measurements were performed over the frequency range of 30MHz to 1GHz using antenna as the input transducer to a Spectrum analyzer or a Field Intensity Meter. The measurements were made with the detector set for "Quasi-peak" within a bandwidth of 120KHz.

- Procedure of Test

Preliminary measurements were made at 3 meter using broadband antennas, and spectrum analyzer to determined the frequency producing the max. emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 to 1000MHz using SchwarzBeck Log-Bicon antenna. Above 1GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site at 10-meters. The test equipment was placed on a wooden turn-table. 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 pre-scan measurements was re-examined by manual. The detector function was set to CISPR Quasi-peak mode and the bandwidth of the receiver was set to 120kHz or 1MHz depending on the frequency of type of signal. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the max. emission for the frequency and were placed on top of a 0.8-meter high nonmetallic 1 x 1.5 meter table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 to 4 meters and stopped at the azimuth or height producing the max. emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission. Photographs of the worst-case emission can be seen in Photographs of the worst-case emission test setup can be seen in Appendix B.

4. TEST CONDITION

4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the following conditions and configurations were used.

4.2 EUT operation

The EUT was connected as user's guide. And during the test executed test program for make a Comparison PC Image file and USB DRIVE Image file. And during test EUT is PC communication mode. The test executed EUT is max capacity 1024MB

4.3 Support Equipment Used

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

EUT – USB DRIVE (JUNG MYUNG TELECOM CO., LTD.)

FCC ID	: PESFMD-WC2
Model Name	: FMD-WC2
Serial No.	: N/A
Manufacturer	: JUNG MYUNG TELECOM CO., LTD.
Power Supply Type	: Power supply from PC USB Port of DC 4.5V ~ 5.5V
Power Cord	: N/A
Cable	: Shielded, Detachable, 1.0m

Support Unit 1 – Monitor (E-RAE)

FCC ID	: OIOELM-150A
Model Name	: ELM-150A
Serial No.	: N/A
Manufacturer	: E-RAE ELECTRONICS INDUSTRY CO., LTD.
Power Supply Type	: Switching
Power Cord	: Non-Shielded, Detachable, 1.2m
Data cable	: Shielded detachable 15-pin D-sub and ferrite core on signal cable

Support Unit 2 – Keyboard (COMPAQ)

FCC ID	: DOC
Model Name	: KB-9963
Serial No.	: B26960GBUK013F
Manufacturer	: COMPAQ
Power Supply Type	: N/A
Power Cord	: N/A
Data Cable	: Shielded: 1.2m

Support Unit 3 - MOUSE (LOGITECH)

FCC ID : JNZ211443
Model Name : M-S69
Serial No. : F466BOM5BMLIN3D
Manufacturer : LOGITECH
Power Supply Type : N/A
Power Cord : N/A
Data Cable : Shielded, 1.2m

Support Unit 5 – PC (COMPAQ)

FCC ID : DOC
Model Name : EvoD5M
Serial No. : 6F1BJYFZX070
Manufacturer : COMPAQ
Power Supply Type : Switching
Power Cord : Non-Shielded, Detachable, 1.2m
Port : MOUSE: 1, Keyboard: 1, USB: 2, Joystick: 1, Parallel: 1,
RS-232: 2, Audio in: 1, Audio out: 1, MIC: 1

Support Unit 6 – Serial Mouse (PETRA)

FCC ID : JKGMUS5S01
Model Name : MUS5S
Serial No. : E183027
Manufacturer : PETRA
Power Supply Type : N/A
Power Cord : N/A
Data Cable : Un-Shielded, 1.2m

Support Unit 7 – Printer (EPSON)

FCC ID : N/A
Model Name : STYLUS PHOTO 750
Serial No. : BRL0005620
Manufacturer : SEIKO EPSON CORP.
Power Supply Type : Switching
Power Cord : Non-Shielded, Detachable, 1.2m
Data Cable : Shielded, 1.5m

Support Unit 8 – EAR MIC (JE TECH)

FCC ID : N/A
Model Name : N/A
Serial No. : N/A
Manufacturer : JE TECH
Power Supply Type : N/A
Power Cord : N/A
Data Cable : Non-Shielded, 1.0m

5. TEST RESULTS

5.1 Summary of Test Results

This equipment is Power Supply system from PC of USB port, The Conducted Test data is PC Power Test data
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.

Test Rule Parts	Measurement Required	Result
15.107(e)	Conducted Emissions Measurement	Passed by – 12.74 dB
15.109(e)	Radiated Emissions Measurement	Passed by – 4.60 dB

The data collected shows that the JUNG MYUNG TELECOM CO., LTD., USB DRIVE, FMD-WC2 complies with technical requirements of above rules part 15.107 and 15.109 Class B Limits.

The equipment 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.

5. TEST RESULTS

5.2 Conducted Emissions Measurement

EUT	USB DRIVE / FMD-WC2 (SN:N/A)
Limit apply to	15.107(e) : CISPR Pub.22(1997) Class B
Test Date	November 1, 2002
Operating Condition	Communications mode
Environment Condition	Humidity Level : 40 %RH, Temperature : 25°C
Result	Passed by - 12.74 dB

Conducted Emission Test Data

The following table shows the highest levels of conducted emissions on both polarization of live and neutral line.

Detector mode : CISPR Quasi-Peak mode (6dB Bandwidth : 9 KHz)

Frequency [MHz]	Reading [dBμV]		Phase (*H/**N)	Limit [dBμV]		Margin [dB]	
	Quasi-peak	Average		Quasi-peak	Average	Q.Peak	Average
0.204	50.70	-	N	63.44	53.44	12.74	-
0.344	34.80	-	N	59.10	49.10	24.30	-
0.410	38.50	-	N	57.64	47.64	19.14	-
0.755	31.70	-	N	56.00	46.00	24.30	-
2.060	31.40	-	H			24.60	-
4.530	31.80	-	H			24.20	-
11.32	44.30	-	N	60.00	50.00	15.70	-
17.44	32.80	-	H			27.20	-
23.21	28.90	-	N			31.10	-

NOTES :

- * H : HOT Line , **N: Neutral Line
- Margin value = Limit - Reading
- Measurement were performed at the PC AC Power Inlet in the frequency band of 150kHz ~ 30MHz according to the CISPR 22 Class B
- If the Reading Quasi-Peak value is bellowed the Average Limit, Do not test Average Mode.



Test Engineer : C. S. Kim

5. TEST RESULTS

Line: HOT Line

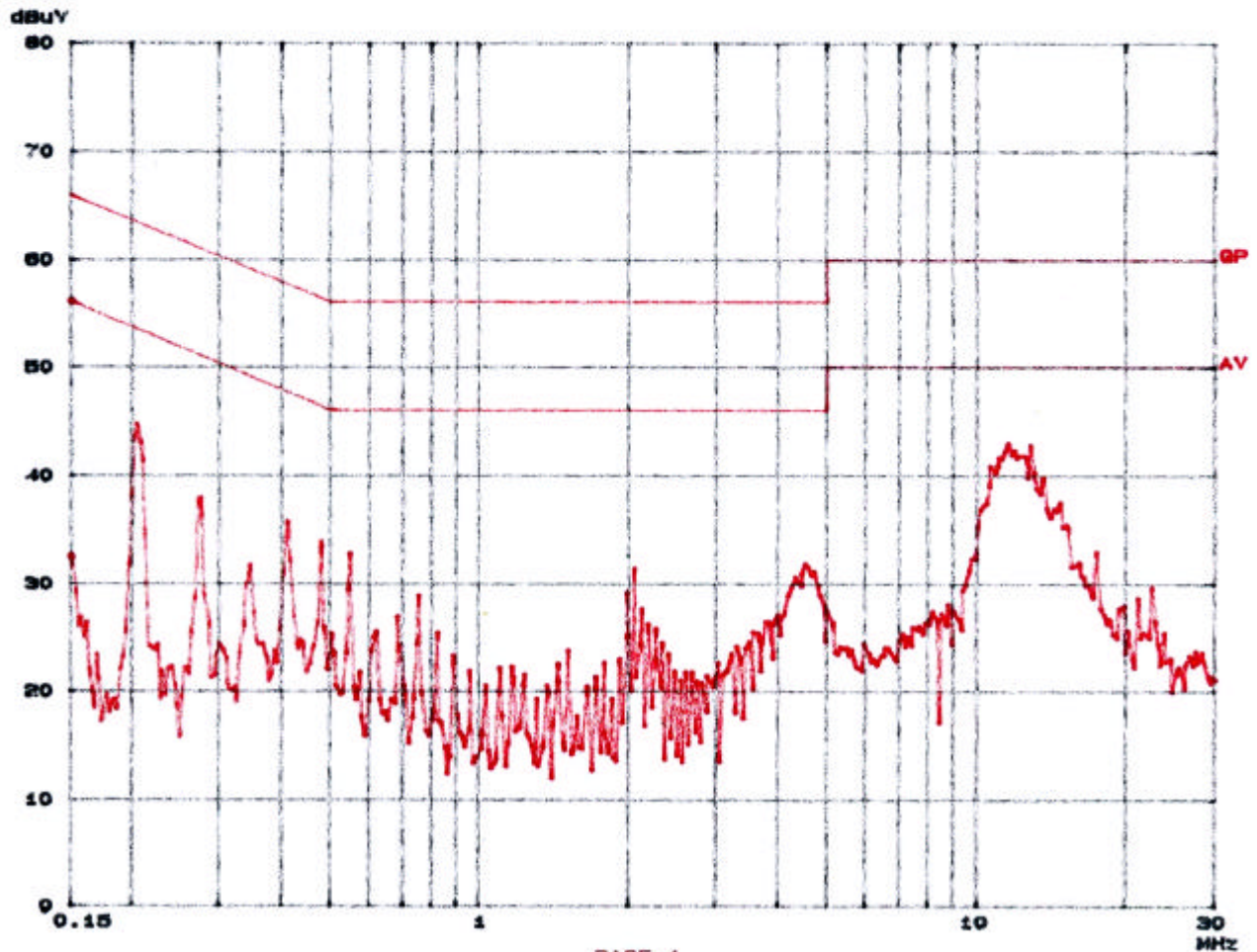
ETL INC.
CONDUCTED EMISSION

EUT: FMD-WC2
Manuf: JUNGMYUNG TELECOM
Operator: CHON SIK KIM
Test Spec: EN 55022 CLASS B
Comment: HOT

Scan Settings (3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	500k	2k	10k	PK	20ms	AUTO	LN OFF	60dB
500k	5M	5k	10k	PK	20ms	AUTO	LN OFF	60dB
5M	30M	10k	10k	PK	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP Transducer No. Start Stop Name
 Meas Time: 1 s 1 100K 30M EN55022
 Subranges: 50
 Acc Margin: 3dB



5.TEST RESULTS

Line: Neutral Line

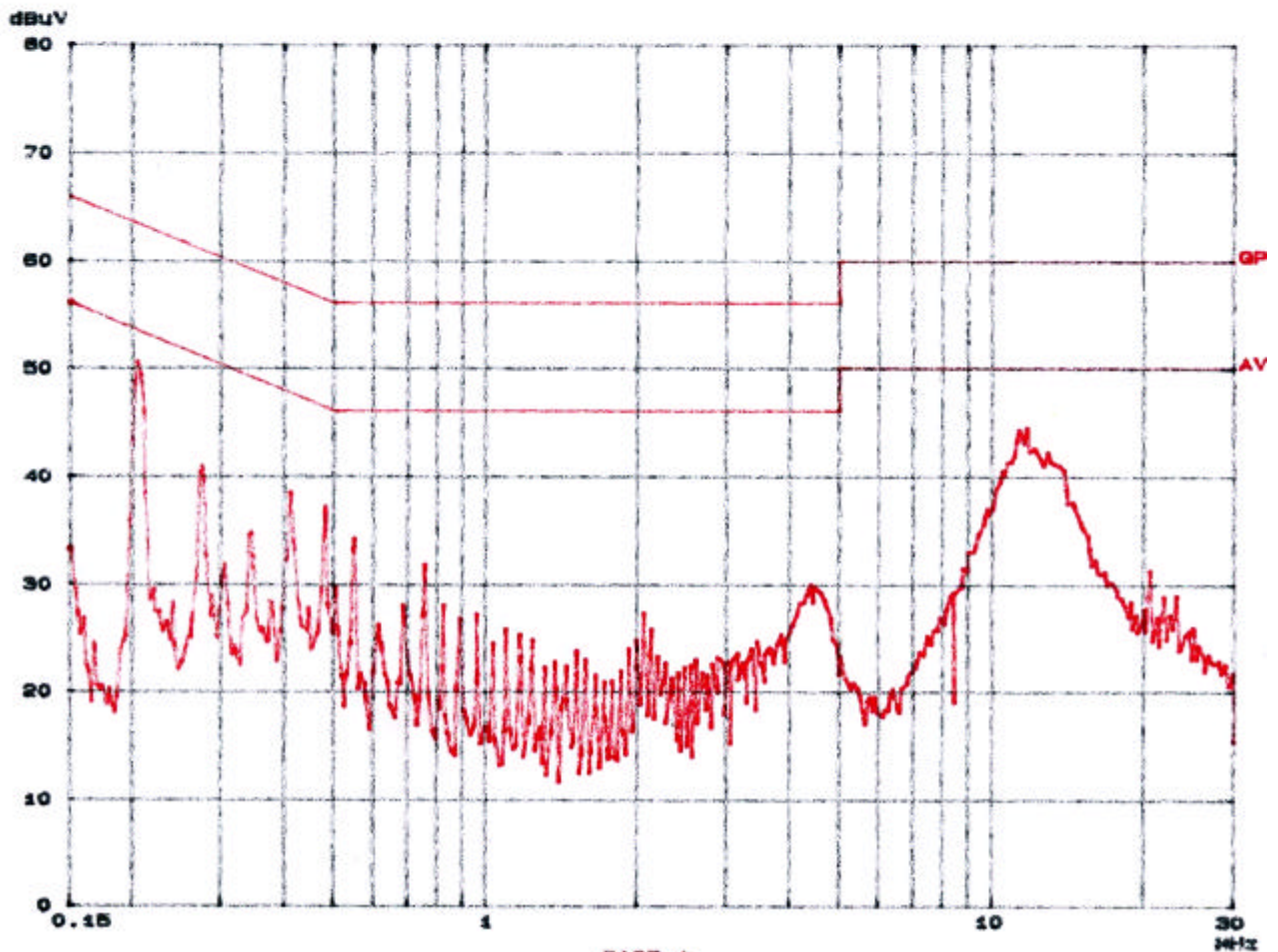
ETL INC.
CONDUCTED EMISSION

EUT: FMD-WC2
Manuf: JUNGMYUNG TELECOM
Operator: CHON SIK KIM
Test Spec: EN 55022 CLASS B
Comment: NEUTRAL

Scan Settings (3 Ranges)

Frequencies			Receiver Settings					
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp	OpRge
150k	500k	2k	10k	PK	20ms	AUTO	LN OFF	60dB
500k	5M	5k	10k	PK	20ms	AUTO	LN OFF	60dB
5M	30M	10k	10k	PK	20ms	AUTO	LN OFF	60dB

Final Measurement: x QP Transducer No. Start Stop Name
Mass Time: 1 s 1 100K 30M EN55022
Subranges: 50
Acc Margin: 3dB



PAGE 1

5. TEST RESULTS

5.3 Radiated Emissions Measurement

EUT	USB DRIVE / FMD-WC2 (SN:N/A)
Limit apply to	15.109(e) : CISPR Pub.22(1997) Class B
Test Date	November 1, 2002
Operating Condition	Communications mode
Environment Condition	Humidity Level : 41 %RH, Temperature : 25°C
Result	Passed by – 4.60dB

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 : 10 meters

Frequency [MHz]	Reading [dBμV]	Polarization (*H/**V)	Ant. Factor [dB]	Cable Loss [dB]	Emission Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]
60.00	12.10	V	11.04	2.00	25.14	30.0	4.86
120.0	11.35	V	11.25	2.80	25.40		4.60
144.0	8.13	V	12.57	3.00	23.70		6.30
180.0	10.10	H	10.81	3.70	24.61		5.39
288.0	13.39	H	12.32	4.50	30.21	37.0	6.79
300.0	12.79	H	12.68	4.60	30.07		6.93
312.0	13.69	H	12.92	4.65	31.26		5.74

NOTES :

1. * H : Horizontal polarization , ** V : Vertical polarization
2. Emission Level = Reading + Antenna factor + Cable loss
3. Margin value = Limit - Emission Level
4. The measurement was performed for the frequency range 30MHz ~ 1000MHz according to the CISPR 22 Class B



Test Engineer : C. S. Kim

6. SAMPLE CALCULATION

Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.
The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF$$

where FS = Field Strength

RA = Receiver Amplitude

AF = Antenna Factor

CF = Cable Attenuation Factor

$$dB(\mu V/m) = 20 \log_{10} (\mu V / m) : \text{Equation 1}$$

$$dB\mu V = dBm + 107 : \text{Equation 2}$$

Example 1 : @ 0.204 MHz

$$\text{Class B Limit} = 1486 \mu V = 63.44 \text{ dB}\mu V$$

$$\text{Reading} = 50.70 \text{ dB}\mu V$$

$$\text{Convert to uV} = 342.8 \mu V$$

$$\text{Margin} = 50.70 - 63.44 = -12.74$$

$$= -12.74 \text{ dB below Limit}$$

Example 2 : @ 120.0 MHz

$$\text{Class B Limit} = 31.70 \text{ uV} = 30.02 \text{ dBuV/m}$$

$$\text{Reading} = 11.35 \text{ dBuV}$$

$$\text{Antenna Factor + Cable Loss} = 14.05 \text{ dB}$$

$$\text{Total} = 25.40 \text{ dBuV/m}$$

$$\text{Margin} = 25.40 - 30.02 = -4.62$$

$$= -4.62 \text{ dB below Limit}$$

7. TEST EQUIPMENT LIST

List of Test Equipments Used for Measurements

Test Equipment		Model	Mfg.	Serial No.	Cal. Date
☒	Spectrum Analyzer	R3261A	Advantest	21720033	01-10-25
☒	Receiver	ESVS 10	R & S	835165/001	02-03-21
☒	Receiver	ESHS30	R & S	84190/002	02-01-24
☒	Spectrum Analyzer	E7402A	HP	US39110107	03-05-21
☒	LISN	3825/2	EMCO	9208-1995	01-12-27
☒	LISN	3825/2	EMCO	9006-1669	01-12-27
☒	Preamplifier	HP8447D	HP	2944A07626	02-01-10
☐	Preamplifier	HP 8347A	HP	2834A00544	02-05-23
☒	TriLog Antenna	VULB9160	Schwarz Beck	3082	02-06-19
☐	LogBicon	VULB9165	Schwarz Beck	2023	02-05-28
☒	Dipole Antenna	VHAP	Schwarz Beck	964	02-05-04
☐	Dipole Antenna	VHAP	Schwarz Beck	965	02-05-04
☒	Dipole Antenna	UHAP	Schwarz Beck	949	02-05-04
☐	Dipole Antenna	UHAP	Schwarz Beck	950	02-05-04
☐	Broad-band Horn Antenna	BBHA 9120D	Schwarz Beck	227	02-03-15
☒	Turn-Table	DETT-03	Daeil EMC	-	N/A
☒	Antenna Master	DEAM-03	Daeil EMC	-	N/A
☒	Plotter	7440A	H.P	2725A 75722	N/A
☒	Chamber	DTEC01	DAETONG	-	N/A
☒	Thermo Hygrograph	3-3122	ISUZU	3312201	02-01-10
☒	BaroMeter	-	Regulus	-	-