Electromagnetic Emission

F C C M E A S U R E M E N T R E P O R T

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT	:	PATROLSYSTEM
MODEL/Serial No.	:	MPE-100 / NONE
FCC ID	:	XLR-MPE-100
Multiple Model Name	:	NONE
BRAND NAME	:	Megapatrol
APPLICANT	:	BIORF Co., Ltd.
		3F 505-26 Mok 2(i)-dong, Yangcheon-gu, Seoul, Korea
		Attn. : Ey-Haing, Lee / President
MANUFACTURER	:	BIORF Co., Ltd.
		3F 505-26 Mok 2(i)-dong, Yangcheon-gu, Seoul, Korea
FCC CLASSIFICATION	:	DXT – Low power transceiver, RX Verified
RULE PART(S)	:	FCC Part 15 Subpart C
FCC PROCEDURE	:	ANSI C63.4-2003
TEST REPORT No.	:	ETLE090629.07
DATES OF TEST	:	July 08, 2009 to July 09, 2009
REPORT ISSUE DATE	:	July 20, 2009
TEST LABORATORY	:	ETL Inc. (FCC Designation Number : KR0022)

This PATROLSYSTEM, Model MPE-100 has been tested in accordance with the measurement procedures specified in ANSI C63.4-2003 at the ETL Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart C:
I attest to the accuracy of data. All measurement herein was performed by me or was made under my supervision and is 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.

Hyung Seok, Lee / Chief Engineer

ETL Inc.
#371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
Tel: 82-2-858-0786 Fax: 82-2-858-0788

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

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Head Office: # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788

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	**: BIORF Co., Ltd.**
Address	**: 3F 505-26 Mok 2(i)-dong, Yangcheon-gu, Seoul, Korea**
Attention	**: Ey-Haing, Lee / President**

- **EUT Type :** PATROLSYSTEM
- **Model Number :** MPE-100
- **S/N :** NONE
- **Frequency Range :** 129 kHz
- **Modulation :** ASK
- **FCC Rule Part(s) :** FCC Part 15 Subpart C
- **Test Procedure :** ANSI C63.4-2003
- **FCC Classification :** DXT – Low power transceiver, RX Verified
- **Dates of Tests :** July 08, 2009 to July 09, 2009
- **Place of Tests :** ETL Inc. Testing Lab.

  Radiated Emission test;
  #499-1, Sagot-ri, Seosin-myeon, Hwaseong-si,
  Gyeonggi-do, 445-882, Korea

  Conducted Emission test;
  ETL Inc. Testing Lab.
  371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
- **Test Report No. :** ETLE090629.07

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1. INTRODUCTION

The measurement test for radiated and conducted emission test were conducted at the ETL Inc. The site is constructed in conformance with the requirements of the ANSI C63.4-2003 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 m and 10 m site configurations. Detailed description of test facility was found to be in compliance with FCC Rules according to the ANSI C63.4-2003 and registered to the Federal Communications Commission (FCC Designation Number : KR0022).

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 9 kHz to 40 GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions from the BIORF Co., Ltd. Model: MPE-100

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2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is PATROLSYSTEM (model: MPE-100)

2.2 General Specification

Item	Specification
RF Frequency	129 kHz
Modulation	ASK
Recognition Method	RFID
Recognition Distance	3 cm – 7 cm
Alarms	Sound / Vibration
Communication Method	USB2.0 / USB1.1
Communication Speed	115 200 bps
Memory	2 MB EEPROM (Expandable to 4 MB)
Storage Capacity	20 000 times (Expandable to 40 000 times)
Operating Voltage	DC 3.7 V
Rechargeable Battery	Lithium-Ion 3.7 V, 2 200 mAh
Recharging Method	Direct recharge via USB communication port (Rechargeable during data transmission)
Exterior Material	PC
Product Size	150 mm x 43 mm x 38(36) mm
Product Weight	150 g
Operating System	Microsoft Windows XP, VISTA (32 bit)

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3. DESCRIPTION OF TESTS

3.1 Field Strength of Fundamental Emission Measurement

Radiated emission measurements were made in accordance with ANSI C63.4-2003. The measurements were performed over the frequency range of 30 MHz below 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 9 kHz.

Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determined the frequency producing the maximum 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 MHz below using Loop antenna. Final measurements were made open site at 3 m. The test equipment was laced 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 9 kHz depending on the frequency of type of signal. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8 m high nonmetallic 1 m x 1.5 m 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 m and stopped at the azimuth or height producing the maximum 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.

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3.2 Radiated Emission Measurement

Radiated emission measurements were made in accordance with ANSI C63.4-2003. The measurements were performed over the frequency range of 30 MHz below and 30 MHz to 1 GHz 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 9 kHz and 120 kHz.

Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determined the frequency producing the maximum 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 MHz below and 30 MHz to 1000 MHz using Log-Bicon antenna and Loop antenna. Final measurements were made open site at 3 m. The test equipment was laced 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 9 kHz or 120 kHz depending on the frequency of type of signal. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8 m high nonmetallic 1 m x 1.5 m 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 m to 4 m and stopped at the azimuth or height producing the maximum 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.

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3.3 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with ANSI C63.4-2003. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω / 50 uH LISN as the input transducer to a Spectrum Analyzer or a Test Receiver. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 9 kHz or for "quasi-peak" within a bandwidth of 9 kHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1 m x 1.5 m x 0.8 m wooden table which is placed 0.4 m away from the vertical wall and 1.5 m away from the side wall of the chamber room. Two LISN are bonded to the shielded room. The EUT is powered from the LISN and the support equipment is powered from the other 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 1.2 cm. 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 LISN. Non-inductive bundling to a 1 m length shortened all interconnecting cables more than 1 m. 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 EMI Test Receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 MHz to 30 MHz. The bandwidth of the spectrum analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

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

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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

Operating Mode	The worst operating condition
- Stand by mode	-
- File download mode	-
- RF Transmitter mode (129 kHz)	O

* O: Worst case investigated during the Test

4.3 Support Equipment Used

Description	Model Name	Serial No.	Manufacturer
Notebook Computer	Satellite M200	87183678Q	TOSHIBA Corporation
Adapter (for Notebook Computer)	SADP-65KBD	6032B0009901- MMW0729072674	Delta Electronics
Checkpoint Tags (RF card)	NONE	NONE	NONE

4.4 Type of Cables Used

Device from	Device to	Type of I/O port	Length(m)	Type of shield
EUT	Notebook Computer	USB	0.8	Shielded
EUT	Adapter	DC Input	0.8	Shielded

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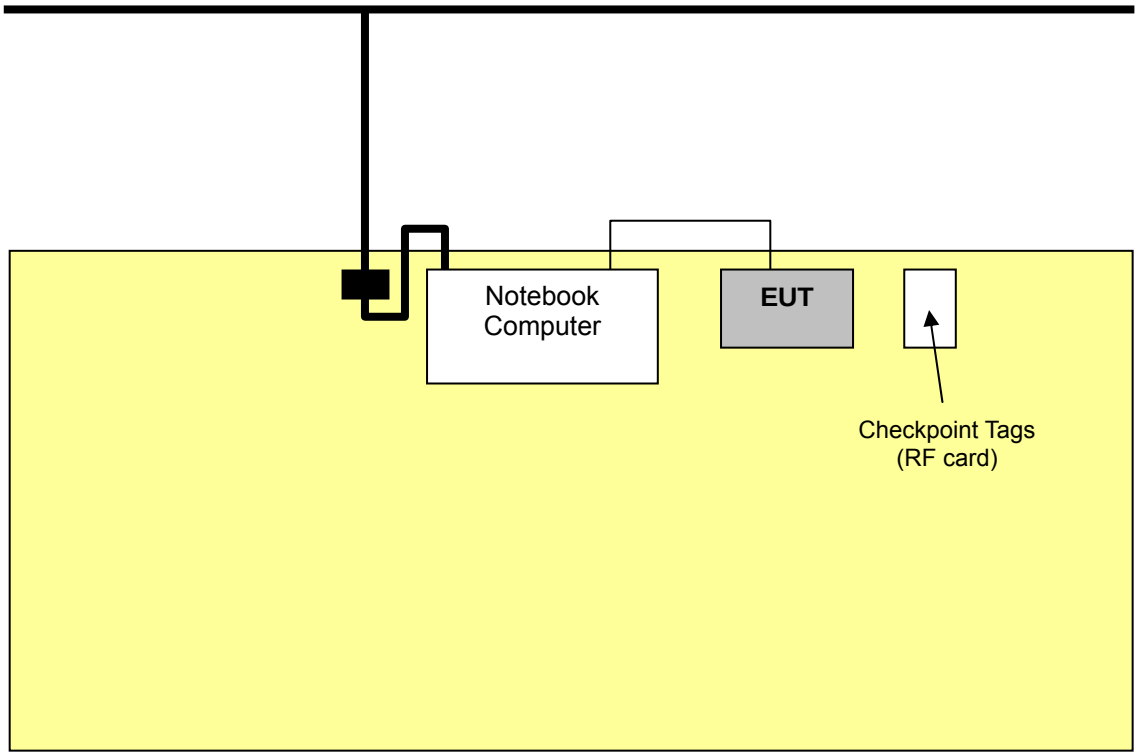
4.5 The setup drawing(s)



: Signal line

: Power line

: Adapter

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5. TEST RESULTS

5.1 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	Measurement Required	Result
15.209(a)	Field Strength of Fundamental Emission Measurement	**Passed by 26.50 dB**
15.209(a)	Radiated Emission Measurement	**Passed by 3.60 dB**
15.207(a)	Conducted Emission Measurement	**Passed by 10.20 dB**

The data collected shows that the **BIORF Co., Ltd. / PATROLSYSTEM / MPE-100** complied with technical requirements of above rules part 15.207(a) and 15.209(a) Class B Limits.

The equipment is modified anything, mechanical or circuits to improve EMI status during a measurement. EMI suppression device(s) was added and/or modified during testing.

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5.2 Field Strength of Fundamental Emissions Measurement

EUT	PATROLSYSTEM / MPE-100 (S/N: N/A)
Limit apply to	FCC Part 15.209(a)
Test Date	July 08, 2009
Operating Condition	RF Transmitter mode (129 kHz)
Result	Passed by 26.50 dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi – Peak mode

Frequency [MHz]	Reading [dBμN]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dBμN/m]	Limit [dBμN/m]	Margin [dB]
0.129	69.50	H	9.80	0.20	79.50	106.00	26.50

NOTES:

1. *** H : Horizontal polarization , ** V : Vertical polarization**
2. **Result = Reading + Antenna factor + Cable loss**
3. **Margin value = Limit - Result**
4. **The measurement was performed for the frequency range below 30 MHz according to FCC Part 15.209(a).**

Test Engineer: Kug Kyoung. Yoon

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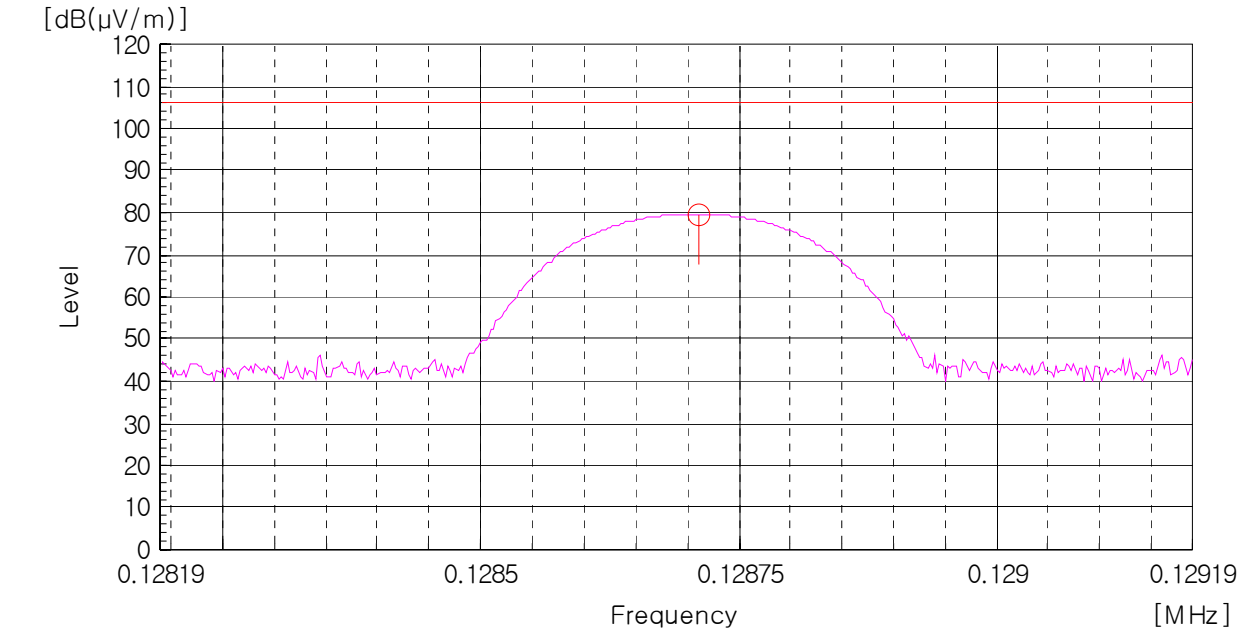
: Limit

[Fundamental Frequency: 0.129 MHz]



Quasi-peak

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5.3 Radiated Emissions Measurement

- Below 30 MHz

EUT	PATROLSYSTEM / MPE-100 (S/N: N/A)
Limit apply to	FCC Part 15.209(a) Class B
Test Date	July 08, 2009
Operating Condition	RF Transmitter mode (129 kHz)
Result	Passed

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi – Peak mode

Frequency [MHz]	Reading [dBμV]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]
	During the test, no signal detected.						

NOTES:

1. *** H : Horizontal polarization , ** V : Vertical polarization**
2. **Result = Reading + Antenna factor + Cable loss**
3. **Margin value = Limit - Result**
4. **The measurement was performed for the frequency range below 30 MHz according to FCC Part 15.209(a) Class B.**

Test Engineer: Kug Kyoung. Yoon

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- Above 30 MHz

EUT	PATROLSYSTEM / MPE-100 (S/N: N/A)
Limit apply to	FCC Part 15.209(a) Class B
Test Date	July 08, 2009
Operating Condition	RF Transmitter mode (129 kHz)
Result	Passed by 3.60 dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi – Peak mode (6 dB Bandwidth: 120 kHz)

Frequency [MHz]	Reading [dBμN]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dBμN/m]	Limit [dBμN/m]	Margin [dB]
48.40	19.93	V	12.20	1.17	33.30	40.00	6.70
72.30	25.38	V	9.39	1.43	36.20	40.00	3.80
120.00	26.48	V	11.22	2.20	39.90	43.50	3.60
132.20	25.38	V	12.00	2.32	39.70	43.50	3.80
143.80	24.83	V	12.54	2.43	39.80	43.50	3.70
156.10	23.87	V	12.69	2.54	39.10	43.50	4.40
167.70	22.43	V	12.01	2.66	37.10	43.50	6.40
216.20	29.75	V	9.63	3.02	42.40	46.00	3.60
240.10	28.00	H	10.55	3.15	41.70	46.00	4.30
263.80	26.21	H	11.35	3.34	40.90	46.00	5.10
312.40	25.25	H	12.75	3.80	41.80	46.00	4.20
337.20	24.78	H	13.32	4.00	42.10	46.00	3.90
432.60	18.92	H	15.58	4.80	39.30	46.00	6.70

NOTES:

1. *** H : Horizontal polarization , ** V : Vertical polarization**
2. **Result = Reading + Antenna factor + Cable loss**
3. **Margin value = Limit - Result**
4. **The measurement was performed for the frequency range 30 MHz – 1 000 MHz according to FCC Part 15.209(a) Class B.**

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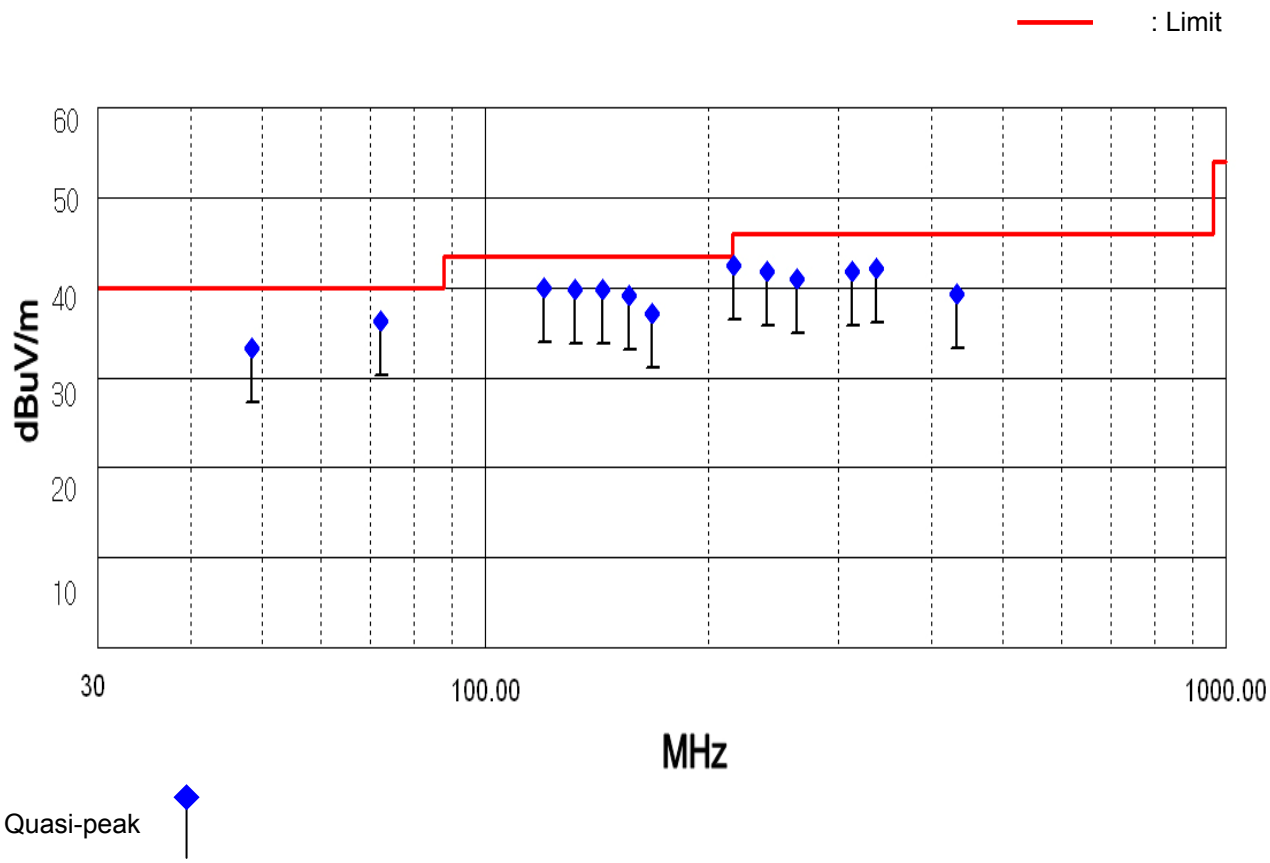

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5.4 Conducted Emissions Measurement

EUT	PATROLSYSTEM / MPE-100 (S/N: N/A)
Limit apply to	FCC Part 15.207(a) Class B
Test Date	July 09, 2009
Operating Condition	RF Transmitter mode (129 kHz)
Result	Passed by 10.20 dB

Conducted Emission Test Data

The following table shows the highest levels of conducted emissions on both polarizations of hot and neutral line.
Detector mode: CISPR Quasi-Peak mode (6 dB Bandwidth: 9 kHz)

Frequency [MHz]	Result [dBμV]		Phase (*L/**N)	Limit [dBμV]		Margin [dB]	
	Quasi-peak	Average		Quasi-peak	Average	Quasi-peak	Average
0.152	40.70	29.40	N	65.90	55.90	25.20	26.50
0.205	51.40	43.20	H	63.40	53.40	12.00	10.20
0.272	43.50	35.50	H	61.00	51.00	17.50	15.50
0.343	37.60	30.90	H	59.10	49.10	21.50	18.20
0.403	32.40	27.40	N	57.80	47.80	25.40	20.40
0.477	33.30	27.90	H	56.40	46.40	23.10	18.50
0.604	31.50	26.60	N	56.00	46.00	24.50	19.40
0.951	31.40	25.90	N	56.00	46.00	24.60	20.10
1.156	30.80	25.60	H	56.00	46.00	25.20	20.40
4.778	37.70	28.00	H	56.00	46.00	18.30	18.00
5.115	40.50	30.80	H	60.00	50.00	19.50	19.20
15.007	37.90	30.40	H	60.00	50.00	22.10	19.60
16.847	29.50	26.50	N	60.00	50.00	30.50	23.50

NOTES:

1. *** H : HOT Line , **N : Neutral Line**
2. **Margin value = Limit – Result**
3. **Measurement were performed at the AC Power Inlet in the frequency band of 150 kHz ~ 30 MHz according to the FCC Part 15.107(a) Class B**
4. **If the average limit is met when using a Quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.**

Test Engineer: Kug Kyoung. Yoon

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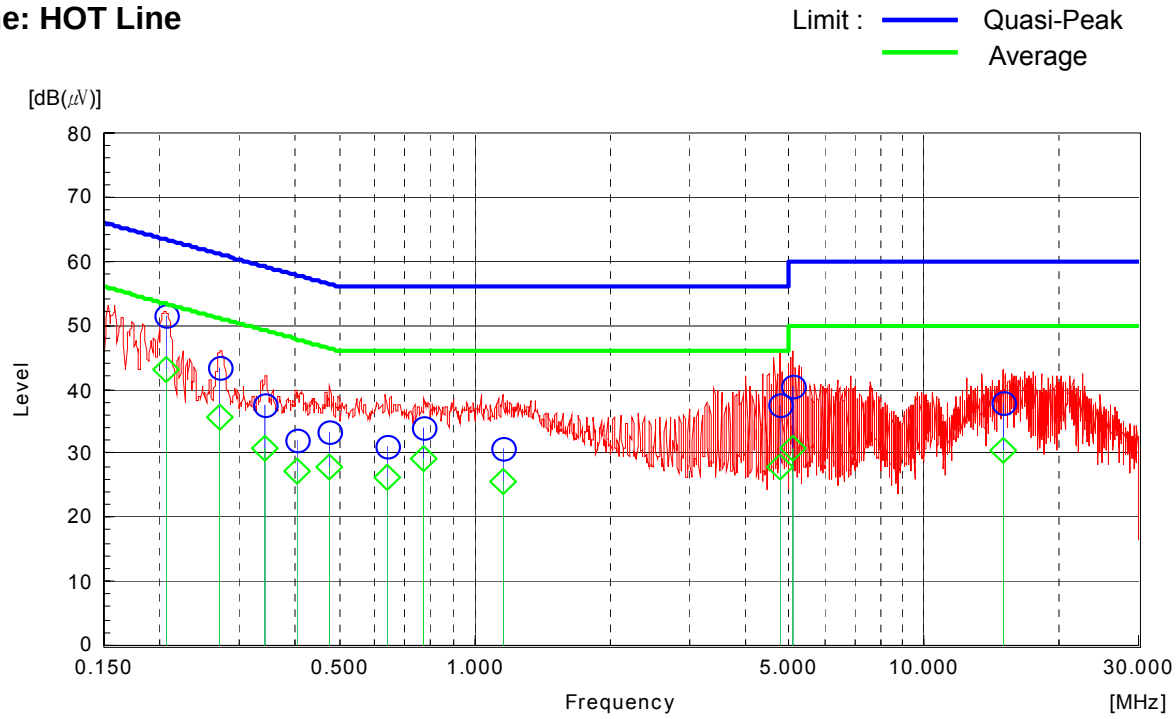
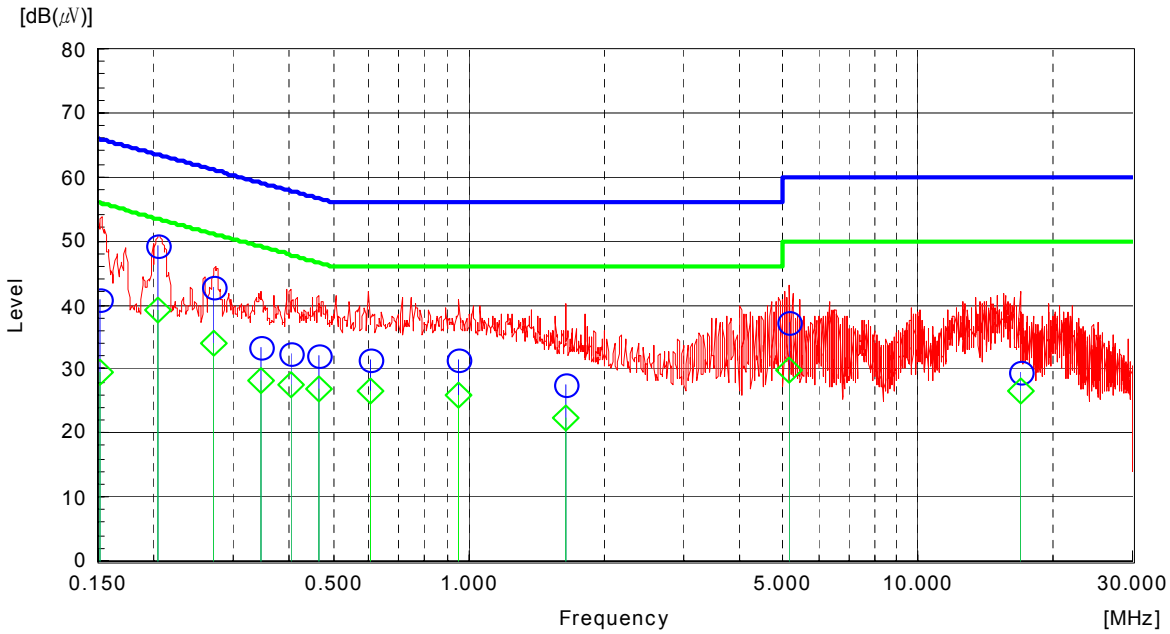
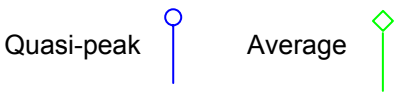
Line: HOT Line



Line: Neutral Line





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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

$dB(\mu V) = 20 \log_{10} (uV)$: Equation

Example : @ 216.20 MHz

Class B Limit = 46.00 dBuV/m

Reading = 29.75 dBuV

Antenna Factor + Cable Loss = 9.63 + 3.02 = 12.65 dBuV/m

Total = 42.40 dBuV/m

Margin = 46.00 – 42.40 = 3.60 dB

= 3.60 dB below Limit

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7. List of test equipments used for measurements

Test Equipment		Model	Mfg.	Serial No.	Cal. Due Date
☒	EMI TEST Receiver	ESVS10	R & S	835165/001	10.04.02
☒	EMI TEST Receiver	ESPI3	R & S	100478	09.10.02
☒	LISN	3825/2	EMCO	9208-1995	09.10.01
☒	Spectrum Analyzer	E7405A	H.P	US41160290	09.10.02
☒	LogBicon Antenna	VULB9160	Schwarzbeck	3082	10.01.25
☒	Loop Antenna	AL-130	COM-POWER	17100	11.02.21
☒	Turn-Table	MFT-120S	Max-Full Antenna Corp	-	N/A
☒	Antenna Master	MFA-440E	Max-Full Antenna Corp	-	N/A

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