Electromagnetic Emission

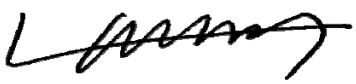
F C C M E A S U R E M E N T R E P O R T

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT	:	Outdoor Navigation
MODEL/Serial No.	:	MN710 / Proto type
MULTIPLE MODEL	:	MN700
FCC ID	:	YDY-MN710
APPLICANT	:	GIOVE S.R.L Via Enrico Reginato 87 31100 Treviso. Italy Attn.: Giuseppe Torre / Purchasing Manager
MANUFACTURER	:	MAINS.co.Ltd 3F EAGLE TOWN B/D, 278-20, Sungsu 2Ga-3Dong, Seongdong-Gu, Seoul, Korea
FCC CLASSIFICATION	:	Part 15 Low Power Communication Device Transmitter
TYPE OF MODULATION	:	DSSS(GFSK)
FREQUENCY CHANNEL	:	2 402 MHz to 2 479 MHz and Channel Spacing 1 MHz (78 Ch)
AIR DATE RATE	:	1 Mbps
ANTENNA TYPE	:	Chip Antenna (Integral)
ANTENNA GAIN	:	4.23 dBi max
RULE PART(S)	:	FCC Part 15 Subpart C Section 15.249
FCC PROCEDURE	:	ANSI C63.4-2003
TEST REPORT No.	:	ETLE100119.06
DATES OF TEST	:	February 11, 2010 to February 17, 2010
REPORT ISSUE DATE	:	May 18, 2010
TEST LABORATORY	:	ETL Inc. (FCC Designation Number : KR0022)

The Outdoor Navigation, Model MN710 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 section 15.249
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

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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 : GIOVE S.R.L

Address : Via Enrico Reginato 87 31100 Treviso. Italy

Attention : Giuseppe Torre / Purchasing Manager

- **EUT Type** : Outdoor Navigation
- **Model Number** : MN710
- **Multiple Number** : MN700
- **S/N** : Proto type
- **Freq. Range** : 2 402 MHz - 2 479 MHz
- **Number of Channels** : 78
- **Modulation Technique** : DSSS(GFSK)
- **Frequency Channel** : 2 402 MHz to 2 479 MHz and Channel Spacing 1 MHz (78 Channels)
- **Air Data Rate** : 1 Mbps
- **Antenna Type** : Chip Antenna (Integral)
- **ANTENNA GAIN** : 4.23 dBi max
- **FCC Rule Part(s)** : FCC Part 15 Subpart C Section 15.249
- **Test Procedure** : ANSI C63.4-2003
- **FCC Classification** : Part 15 Low Power Communication Device Transmitter
- **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

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1. INTRODUCTION

The measurement test for radiated and conducted emission test was 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 GIOVE S.R.L Model: MN710

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2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the Outdoor Navigation (model: MN710).

The model MN710 is basic model that tested.

The multi model MN700 is identical to basic model, except for model designation.

2.2 General Specification

Items		Descriptions
CPU		S3C2442 - 400 MHz (ARM9 Core)
Memory		NAND Flash - 128 MB
		SDRAM - 64 MB SDRAM
GPS		SIRF star III Smart Type
		Patch 10 mm x 10 mm Internal Antenna
Speaker		1 Watt Mono (4 Ω/8 Ω)
SD/MMC		Micro SD Card (Up to 16 GB)
Display		3.5 inch TFT-LCD with Touch Screen 240 x 320
Barometer(Option)		10 mbar ~ 1 100 mbar
ANT+		Dynastream ANT + Sport wireless communication protocol
ANT	Channel	78
	Frequency range	2 402 MHz ~ 2 479 MHz
	Communication mode	Two-way communication
	Oscillation mode	Crystal
	Modulation mode	GFSK
Power		USB Type 5 VDC/1 A
Battery		DC 3.6 V(DC 1.2 V 'AAA' type battery 3 EA) or DC 4.5 V(DC 1.5 V 'AAA' type battery)
Operating Temp		-20 ℃ ~ +55 ℃
Operating Humidity		0 %R.H. ~ 90 %R.H.
OS		Windows CE. Net 5.0
Multimedia	Music player	MP3, WMA, OGG
	Movie Player	AVI, ASF, WMA, MPG, MP4

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Channel Table

channel	frequency[㎒]	channel	frequency[㎒]	channel	frequency[㎒]	channel	frequency[㎒]
0	2 402	20	2 422	40	2 442	60	2 462
1	2 403	21	2 423	41	2 443	61	2 463
2	2 404	22	2 424	42	2 444	62	2 464
3	2 405	23	2 425	43	2 445	63	2 465
4	2 406	24	2 426	44	2 446	64	2 466
5	2 407	25	2 427	45	2 447	65	2 467
6	2 408	26	2 428	46	2 448	66	2 468
7	2 409	27	2 429	47	2 449	67	2 469
8	2 410	28	2 430	48	2 450	68	2 470
9	2 411	29	2 431	49	2 451	69	2 471
10	2 412	30	2 432	50	2 452	70	2 472
11	2 413	31	2 433	51	2 453	71	2 473
12	2 414	32	2 434	52	2 454	72	2 474
13	2 415	33	2 435	53	2 455	73	2 475
14	2 416	34	2 436	54	2 456	74	2 476
15	2 417	35	2 437	55	2 457	75	2 477
16	2 418	36	2 438	56	2 458	76	2 478
17	2 419	37	2 439	57	2 459	77	2 479
18	2 420	38	2 440	58	2 460		
19	2 421	39	2 441	59	2 461		

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3. DESCRIPTION OF TESTS

3.1 Radiated Emission Measurement

Radiated emission measurements were made in accordance with § 13 in ANSI C63.4-2003 "Measurement of Intentional radiators" The measurements were performed over the frequency range of 30 MHz to 40 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 "Peak, Quasi-peak, Average" within a bandwidth of 120 kHz and above 1GHz is 1 MHz.

Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determine 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 to 1000 MHz using Log-Bicon antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used. 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 120 kHz or 1 MHz 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 1m 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.

Varying the mode of operating frequencies of the EUT maximized each emission. The system was tested in all the three 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 (20 dB/decade) as per section 15.31(f).

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 Conducted Emission Measurement

Conducted emissions measurements were made in accordance with section § 13 in ANSI C63.4-2003 "measurement of intentional radiators" 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.

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3.3 FCC Part 15.205 Restricted Bands of Operations

(a) Except as shown in paragraph (d) of this section, 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
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2690 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

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4. TEST CONDITION

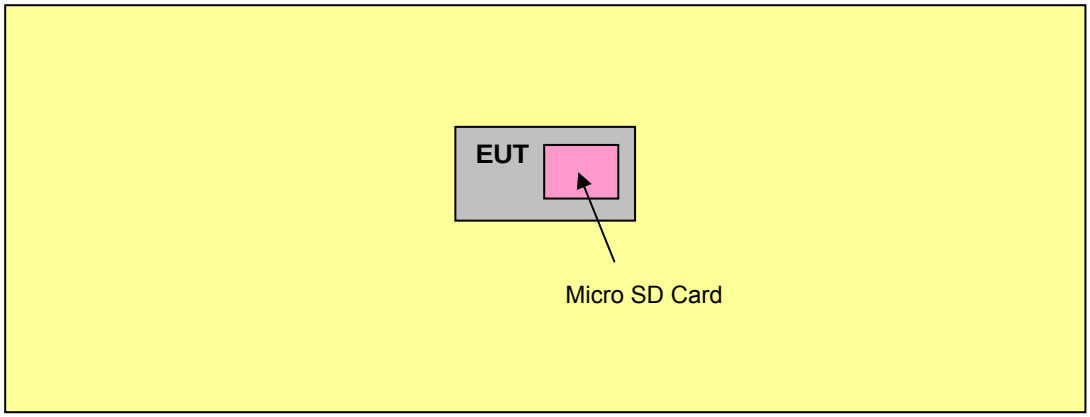
4.1 Test Configuration

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 Description of Test modes

Outdoor Navigation that has the control software.

4.3 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.

Applied Standard : 47 CFR Part 15, Subpart C Section 15.249			
FCC Rule	**Measurement Required**	**Limit**	**Result**
15.209	Radiation Emissions Measurement	**Various**	**Pass**
15.249	Fundamental Radiated Emission Measurement	**Peak: 114 [dB(μV/m)] Av: 94 [dB(μV/m)]**	**Pass**
15.249	Harmonic Radiated Emission Measurement	**Peak: 74 [dB(μV/m)] Av: 54 [dB(μV/m)]**	**Pass**
15.207	Conducted Emissions	**Various**	**N/A ***

* This test was not applied. Because, EUT power supplies from battery type.
(Battery type: DC 1.2 V or DC 1.5 V 'AAA' type battery 3 EA)

The data collected shows that the **GIOVE S.R.L / Outdoor Navigation / MN710** complied with technical requirements of above rules part 15.209, 249 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.

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5.2 Radiation Emissions Measurement

EUT	Outdoor Navigation / MN710
Limit apply to	FCC Part 15. 209, 249
Test Date	February 11, 2010
Operating Condition	RF transmitting continuously during the tested.
Result	Passed

Limit

Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequencies [MHz]	Field Strength [μN/m]	Measurement Distance [m]
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

* Except as provided in paragraph (g), fundamental emissions from intentional radiators operating 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, e.g., Sections 15.231 and 15.241.

Test Results

- Refer to see the measured plot in next page.

Test Engineer: Jeong-hwan, Pyo

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

Radiated Emissions Test data

9 kHz to 30 MHz

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi – Peak mode (100 Hz, 9 kHz)

Test mode: Power supply from battery DC 3.60 V

Frequency [MHz]	Reading [dB(μN)]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μN/m)]	Limit [dB(μN/m)]	Margin [dB]
	Emission attenuated more than 20 dB below the limit are not reported.						

Test mode: Power supply from battery DC 4.50 V

Frequency [MHz]	Reading [dB(μN)]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μN/m)]	Limit [dB(μN/m)]	Margin [dB]
	Emission attenuated more than 20 dB below the limit are not reported.						

Result: All emissions below noise floor of 20 dBμN/m

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 9 kHz to 30 MHz according to FCC Part 15.209.**

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Above 30 MHz

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)

Test mode: Power supply from battery DC 3.60 V

Frequency [MHz]	Reading [dB(μN)]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μN/m)]	Limit [dB(μN/m)]	Margin [dB]
53.18	9.50	V	9.39	1.71	20.60	40.00	19.40
199.75	11.56	H	10.07	3.77	25.40	43.50	18.10
216.71	10.08	H	10.33	3.89	24.30	46.00	21.70
402.51	7.50	H	15.18	5.32	28.00	46.00	18.00
466.14	8.34	H	16.89	5.87	31.10	46.00	14.90

Test mode: Power supply from battery DC 4.50 V

Frequency [MHz]	Reading [dB(μN)]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μN/m)]	Limit [dB(μN/m)]	Margin [dB]
52.04	12.55	V	9.45	1.70	23.70	40.00	16.30
53.27	10.00	V	9.39	1.71	21.10	40.00	18.90
199.75	11.06	H	10.07	3.77	24.90	43.50	18.60
274.90	10.06	H	12.04	4.30	26.40	46.00	19.60
402.51	9.60	H	15.18	5.32	30.10	46.00	15.90
466.14	10.04	H	16.89	5.87	32.80	46.00	13.20

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 above 30 MHz according to FCC Part 15.209.**

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5.3 Fundamental Radiated Emission Measurement

EUT	Outdoor Navigation / MN710
Limit apply to	FCC Part 15. 249
Test Date	February 16, 2010
Operating Condition	RF transmitting continuously during the tested.
Result	Passed

Radiated Emissions Test data

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

Test Results

- Refer to see the measured plot in next page.

Test Engineer: Jeong-hwan, Pyo

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

- Test mode: Power supply from battery DC 3.60 V

1. Low CH
Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2402.00	61.67	H	29.03	12.26	-34.80	55.18	114.00	58.82
2402.00	61.83	V	29.03	12.26	-34.80	55.34		58.66

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2402.00	47.43	H	29.03	12.26	-34.80	40.94	94.00	53.06
2402.00	47.54	V	29.03	12.26	-34.80	41.05		52.95

2. Middle CH
Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2440.00	59.01	H	29.10	12.31	-34.80	52.40	114.00	61.60
2440.00	59.12	V	29.10	12.31	-34.80	52.51		61.49

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2440.00	45.66	H	29.10	12.31	-34.80	39.05	94.00	54.95
2440.00	46.08	V	29.10	12.31	-34.80	39.47		54.53

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3. High CH
Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2479.00	57.79	H	29.38	12.38	-34.80	50.83	114.00	63.17
2479.00	58.36	V	29.38	12.38	-34.80	51.40		62.60

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2479.00	42.30	H	29.38	12.38	-34.80	35.34	94.00	58.66
2479.00	42.78	V	29.38	12.38	-34.80	35.82		58.18

- Test mode: Power supply from battery DC 4.50 V

1. Low CH
Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2402.00	58.70	H	29.03	12.26	-34.80	52.21	114.00	61.79
2402.00	58.88	V	29.03	12.26	-34.80	52.39		61.61

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2402.00	47.56	H	29.03	12.26	-34.80	41.07	94.00	52.93
2402.00	48.14	V	29.03	12.26	-34.80	41.65		52.35

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2. Middle CH
Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2440.00	58.88	H	29.10	12.31	-34.80	52.27	114.00	61.73
2440.00	59.03	V	29.10	12.31	-34.80	52.42		61.58

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2440.00	46.59	H	29.10	12.31	-34.80	39.98	94.00	54.02
2440.00	46.82	V	29.10	12.31	-34.80	40.21		53.79

3. High CH
Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2479.00	56.72	H	29.38	12.38	-34.80	49.76	114.00	64.24
2479.00	57.05	V	29.38	12.38	-34.80	50.09		63.91

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
2479.00	43.96	H	29.38	12.38	-34.80	37.00	94.00	57.00
2479.00	44.48	V	29.38	12.38	-34.80	37.52		56.48

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5.4 Harmonic Radiated Emission Measurement

EUT	Outdoor Navigation / MN710
Limit apply to	FCC Part 15. 209, 249
Test Date	February 17, 2010
Operating Condition	RF transmitting continuously during the tested.
Result	Passed

Radiated Emission Test Data

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

Test Results

- Refer to see the measured plot in next page.

Test Engineer: Jeong-hwan, Pyo

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

- Test mode: Power supply from battery DC 3.60 V

1. Low CH

Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 804.00	20.71	V	31.55	14.32	-34.80	31.78	74.00	42.22

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 804.00	10.68	V	31.55	14.32	-34.80	22.05	54.00	31.95

2. Middle CH

Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 880.00	21.51	V	31.40	14.22	-34.80	32.33	74.00	41.67

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 880.00	10.93	V	31.40	14.22	-34.80	21.75	54.00	32.25

3. High CH

Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 958.00	22.57	V	31.05	14.02	-34.80	32.84	74.00	41.16

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 958.00	12.21	V	31.05	14.02	-34.80	22.48	54.00	31.52

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- Test mode: Power supply from battery DC 4.50 V

1. Low CH
Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 804.00	21.33	V	31.55	14.32	-34.80	32.40	74.00	41.60

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 804.00	10.78	V	31.55	14.32	-34.80	21.85	54.00	32.15

2. Middle CH
Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 880.00	22.05	V	31.40	14.22	-34.80	32.87	74.00	41.13

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 880.00	11.84	V	31.40	14.22	-34.80	22.66	54.00	31.34

3. High CH
Detector mode: Peak mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 958.00	21.99	V	31.05	14.02	-34.80	32.26	74.00	41.74

Detector mode: Average mode

Frequency [MHz]	Reading [dB(μV)]	Polarization (*H/**V)	Ant. Factor [dBm]	Cable Loss [dB(μV)]	Preamp [dBm]	Result [dB(μV/m)]	Limit [dB(μV/m)]	Margin [dB]
4 958.00	13.58	V	31.05	14.02	-34.80	23.85	54.00	30.15

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NOTES:

1. *** H : Horizontal polarization , ** V : Vertical polarization**
2. **Result = Reading + Antenna factor + Cable loss**
3. **Margin value = Limit - Result**
4. **Measuring frequencies from 1GHz to the 10th harmonic of highest fundamental frequency.**
5. **Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded.**
6. **Spectrum setting:**
   a. Peak Setting 1 GHz to 10th harmonics of fundamental, RBW = 1 MHz, VBW = 1 MHz, Sweep = Auto
   ***b*. AV Setting 1 GHz to 10th harmonics of fundamental, RBW = 1 MHz, VBW = 10 Hz, Sweep = Auto**

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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

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

Example : @ 466.14 MHz

Class B Limit = 46.00 dB(μV/m)

Reading = 10.04 dB(μV)

Antenna Factor + Cable Loss = 16.89 + 5.87 = 22.76 dB(μV/m)

Total = 22.76 dB(μV/m)

Margin = 46.00 – 32.80 = 13.20 dB

= 13.20 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	11.04.02
□	EMI TEST Receiver	ESPI3	R & S	100478	10.09.18
□	LISN	3825/2	EMCO	9208-1995	10.09.17
□	LISN	3816-2	EMCO	1002	10.09.17
■	Spectrum Analyzer	E7405A	H.P.	US41160290	10.09.18
■	Spectrum Analyzer	R3273	Advantest	95090411	11.04.02
■	LogBicon Antenna	VULB9165	Schwarzbeck	3082	11.01.25
■	Broad band Horn antenna	BBHA 9120D	Schwarz Beck	227	11.03.16
□	Broad band Horn antenna	BBHA 9120D	Schwarz Beck	285	11.03.16
■	Loop Antenna	Com-Power	AL-130	17100	11.03.02
■	Preamplifier	8348A	H.P.	3307A02865	10.09.17
■	System Power Supply	Agilent	6030A	1036546	11.04.02
□	Power Meter	NRVS	R & S	834053/060	10.09.18
■	Power Meter	E4417A	Agilent	MY45100457	11.04.01
■	Power Sensor	E9327A	Agilent	MY44420584	11.04.01
■	Turn-Table	MFT-120S	Max-Full Antenna Corp	N/A	N/A
■	Antenna Master	MFA-440E	Max-Full Antenna Corp	N/A	N/A

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