

EMC TEST REPORT

Test item : Mouse Dongle
Model No. : CMR-1400
Order No. : DEMC1303-01100
Date of receipt : 2013-03-22
Test duration : 2013-04-01 ~ 2013-04-02
Use of report : FCC CoC Marking
Date of Issue : 2013-04-03

Applicant : LG Electronics Inc.

50 Hyangjeong-dong, Heungdeok-gu, Cheongju-si, Chungcheongbuk-do,
361-480, Korea

Test laboratory : Digital EMC Co., Ltd.

683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, 449-080, Korea

Test specification : ANSI C 63.4:2003
FCC Part 15 Subpart B
(Class B personal computers and peripherals)

Test environment : Temperature : (20 ~ 22) °C,
Humidity : (26 ~ 33) % R.H.

Test result : ☒ Comply ☐ Not Comply

The test results presented in this test report are limited only to the sample supplied by applicant and
the use of this test report is inhibited other than its purpose.

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Tested by:



Manager
MyungJin Song

Reviewed by:



Technical Manager
ChangHo Lee

PRESIDENT OF DIGITAL EMC CO., LTD.

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1. General Remarks

This report contains the result of tests performed by:

DIGITAL EMC CO., LTD.

Address : 683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Gyeonggi-Do, 449-080, Korea

<http://www.digitalemcc.com>

Tel: +82-31-321-2664 Fax: +82-31-321-1664

2. Test Laboratory

Digital EMC Co., Ltd. has been accredited / filed / authorized by the agencies listed in the following table;

Certificate	Nation	Agency	Code	Mark
Accreditation	Korea	KOLAS	393	ISO/IEC 17025
Site Filing	USA	FCC	101842 678747	Test Facility list & NSA Data
	Canada	IC	5740A-1 5740A-2	Test Facility list & NSA Data
	Japan	VCCI	C-1427 R-1364, R-3385 T-1442, G-338	Test Facility list & NSA Data
Certification	Korea	KC	KR0034	Test Facility list & NSA Data
	Germany	TUV	ROK1221C	ISO/IEC 17025

Quality control in the testing laboratory is implemented as per ISO/IEC 17025 which is the "General requirements for the competent of calibration and testing laboratory".

3. General Information of EUT

Model No.	Mouse Dongle
Add Model No.	CMR-1400
Serial No	NONE
Supplied Power for Test	AC 120 V, 60 Hz
Rating Power Supply	DC 5 V (USB Power by PC)
Applicant	LG Electronics Inc. 50 Hyangjeong-dong, Heungdeok-gu, Cheongjusi, Chungcheongbuk-do, 361-480, Korea
Manufacturer	Intech Electronics Corp. Guan-Lan,Shenzhen City,GuangDong, China.
Factory	Intech Electronics Corp. Guan-Lan,Shenzhen City,GuangDong, China.

4. Test Summary

4.1 Applied standards and test results

Test Items	Applied Standards	Results
Conducted Disturbance	ANSI C63.4:2003	C
Radiated Disturbance	ANSI C63.4:2003	C
C=Comply N/C=Not Comply N/T=Not Tested N/A=Not Applicable		

The data in this test report are traceable to the national or international standards.

4.2 Test environment and conditions

Test Items	Test date (MM-DD)	Temp (°C)	Humidity (% R.H.)
Conducted Disturbance	04-01	22	26
Radiated Disturbance	04-02	20	31
	04-02	22	33

4.3 Test result Summary

(1) Conducted Emission

Frequency [MHz]	Phase	Result [dB μ V]	Detector	Limit [dB μ V]	Margin [dB]
0.20019	N	30.8	Average	53.6	22.8

(2) Radiated Emission

Frequency [MHz]	Pol.	Result [dB(μ V/m)]	Detector	Limit [dB(μ V/m)]	Margin [dB]
2658.807	H	46.3	Average	54.0	7.7

5. Test Set-up and operation mode

5.1 Principle of Configuration Selection

Emission : The equipment under test (EUT) was configured to measure its highest possible radiation level. The test modes were adapted accordingly in reference to the instructions for use.

5.2 Test Operation Mode

- WIRELESS MOUSE RECEIVER MODE

5.3 Support Equipment Used

Unit	Model No.	Serial No.	Manufacturer	CABLE			Backshell	FCC ID
				Connect type	Length (m)	shield		
NOTE-PC	4230S	CNU20935R8	HP	DC IN	1.2	Shield	Plastic	DOC
				USB	-	-		
				DSUB	1.2	Shield		
				USB	1.6	Shield		
NOTE-PC TA	Series PPP009L-E	WBGST0A1R1T 2TC	LITE-ON TECHNOLOGY	DC IN POWER	1.2 1.6	Non-shield Non-shield	Plastic	DOC
LCD MONITOR	W2453VQV	104NDKDEJ101	LG Electronics Inc.	POWER DSUB	1.6 1.2	Non-shield Shield	Plastic	DOC
USB MOUSE	1484	352700021374	Microsoft Corporation	USB	1.6	Shield	Plastic	DOC

6. Test Results : Emission

6.1 Conducted Disturbance

6.1.1 Measurement Procedure

In the range of 0.15 MHz to 30 MHz, the conducted disturbance was measured and set-up was made accordance with **ANSI C63.4**.

If the EUT is table top equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 0.4 m from the conducting wall of the shielded room.

Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 m above the reference ground plane.

Connect the EUT's power source lines to the appropriate power mains / peripherals through the LISN. All the other peripherals are connected to the 2nd LISN, if any.

Unused measuring port of the LISN was resistively terminated by 50 ohm terminator.

The measuring port of the LISN for EUT was connected to spectrum analyzer.

Using conducted emission test software, the emissions were scanned with peak detector mode.

After scanning over the frequency range, suspected emissions were selected to perform final measurement. When performing final measurement, the receiver was used which has Quasi-Peak detector and Average detector.

By varying the configuration of the test sample and the cable routing it was attempted to maximize the emission.

For further description of the configuration refer to the picture of the test set-up.

6.1.2 Limit for Conducted Disturbance

(1) Conducted disturbance at mains ports.

Frequency range (MHz)	Limits dB(μV)			
	Quasi-peak		Average	
	Class A	Class B	Class A	Class B
0.15 to 0.50	79	66 to 56	66	56 to 46
0.50 to 5	73	56	60	46
5 to 30		60		50
Note 1 The lower limit shall apply at the transition frequencies.				
Note 2 The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.				

Note) 1. Emission Level = Reading Value + Correction Factor.

2. Correction Factor = Cable Loss + Insertion Loss of LISN

3. Margin = Limit - Emission level

Test Result



Results of Conducted Emission

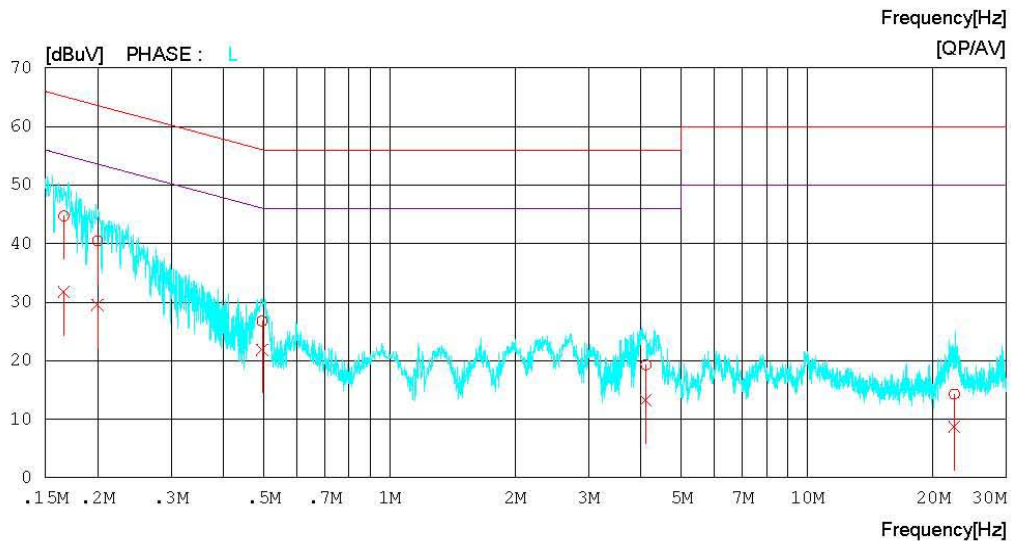
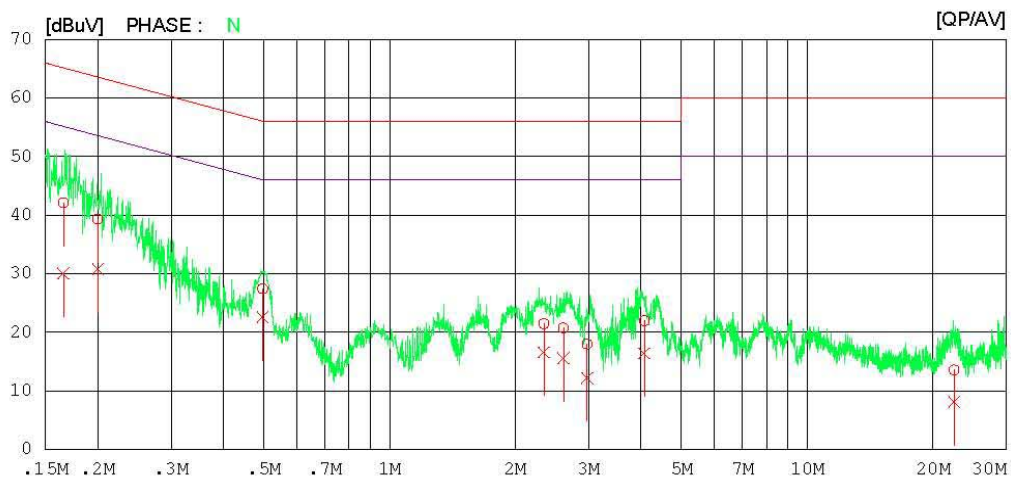
Digital EMC
Date : 2013-04-01

Model No. : CMR-1400
Type :
Serial No. :
Test Condition :

Reference No. :
Power Supply : 120V 60Hz
Temp/Humi. : 22°C 26 % R.H.
Operator :

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV



Results of Conducted Emission

Digital EMC
Date : 2013-04-01

Model No. : CMR-1400
Type :
Serial No. :
Test Condition :

Reference No. :
Power Supply : 120V 60Hz
Temp/Humi. : 22 °C 26 % R.H.
Operator :

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV

NO	FREQ [MHz]	READING		C.FACTOR [dB]	RESULT		LIMIT		MARGIN		PHASE
		QP [dBuV]	AV [dBuV]		QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	QP [dBuV]	AV [dBuV]	
1	0.16568	41.9	29.9	0.2	42.1	30.1	65.2	55.2	23.1	25.1	N
2	0.20019	39.2	30.6	0.2	39.4	30.8	63.6	53.6	24.2	22.8	N
3	0.49693	27.2	22.4	0.2	27.4	22.6	56.1	46.1	28.7	23.5	N
4	2.34300	21.2	16.3	0.3	21.5	16.6	56.0	46.0	34.5	29.4	N
5	2.61000	20.4	15.3	0.3	20.7	15.6	56.0	46.0	35.3	30.4	N
6	2.97400	17.7	11.9	0.3	18.0	12.2	56.0	46.0	38.0	33.8	N
7	4.07750	21.7	16.0	0.3	22.0	16.3	56.0	46.0	34.0	29.7	N
8	22.47950	12.7	7.2	0.9	13.6	8.1	60.0	50.0	46.4	41.9	N
9	0.16603	44.5	31.5	0.2	44.7	31.7	65.2	55.2	20.5	23.5	L
10	0.19989	40.3	29.3	0.2	40.5	29.5	63.6	53.6	23.1	24.1	L
11	0.49578	26.6	21.7	0.2	26.8	21.9	56.1	46.1	29.3	24.2	L
12	4.11050	19.0	13.0	0.3	19.3	13.3	56.0	46.0	36.7	32.7	L
13	22.51200	13.4	7.8	0.9	14.3	8.7	60.0	50.0	45.7	41.3	L

6.2 Radiated Disturbance

6.2.1 Measurement Procedure

The radiated disturbance was measured and set-up was made accordance with **ANSI C63.4**.

If the EUT is tabletop equipment, it was placed on a wooden table with a height of 0.8 m above the reference ground plane and 3 m or 10m away from the interference receiving antenna in the **10m semi-anechoic chamber**.

Also if the EUT is floor-standing equipment, it was placed on a non-conducted support with a height up to 0.15 m above the reference ground plane.

Rotate the EUT from (0 - 360)° and position the receiving antenna at heights from (1 - 4) m above the reference ground plane continuously to determine associated with higher emission levels and record them.

The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

For below 1 GHz frequency range, Quasi-Peak detector with 120 kHz RBW was used.

Also Peak and Average detector with 1 MHz RBW were used for above 1 GHz frequency range.

For further description of the configuration refer to the picture of the test set-up.

6.2.2 Limit for Radiated Disturbance

- The test frequency range of Radiated Disturbance measurements are listed below.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 108	1 000
108 – 500	2 000
500 – 1 000	5 000
Above 1 000	5 th harmonic of the highest frequency or 40 GHz, whichever is lower

(1) Limit for Radiated Emission below 1 000MHz

Frequency range (MHz)	Class A Equipment (10m distance)	Class B Equipment (3m distance)
	Quasi-peak (dBμV/m)	Quasi-peak (dBμV/m)
30 to 88	39.1	40
88 to 216	43.5	43.5
216 to 960	46.4	46
960 to 1 000	49.5	54

Note 1 The lower limit shall apply at the transition frequency.

Note 2 Additional provisions may be required for cases where interference occurs.

Note 3 According to 15.109(g), as an alternative to the radiated emission limit shown above, digital devices may be shown to comply with the standards(CISPR), Pub. 22 shown as below.

Frequency range (MHz)	Class A Equipment (10 m distance)	Class B Equipment (10 m distance)
	Quasi-peak (dBμV/m)	Quasi-peak (dBμV/m)
30 to 230	40	30
230 to 1 000	47	37

(2) Limits for Radiated Emission above 1 000MHz at a measuring distance of 3 m

Frequency (GHz)	Class A Equipment		Class B Equipment	
	Peak (dBμV/m)	Average (dBμV/m)	Peak (dBμV/m)	Average (dBμV/m)
1 to 40	80	60	74	54

Note) 1. Emission Level = Reading Value + Correction Factor.

2. Correction Factor = Cable loss - Amp gain + Antenna Factor

3. Margin = Limit - Emission level

Test Result

< 30 MHz ~ 1 GHz >

RADIATED EMISSION

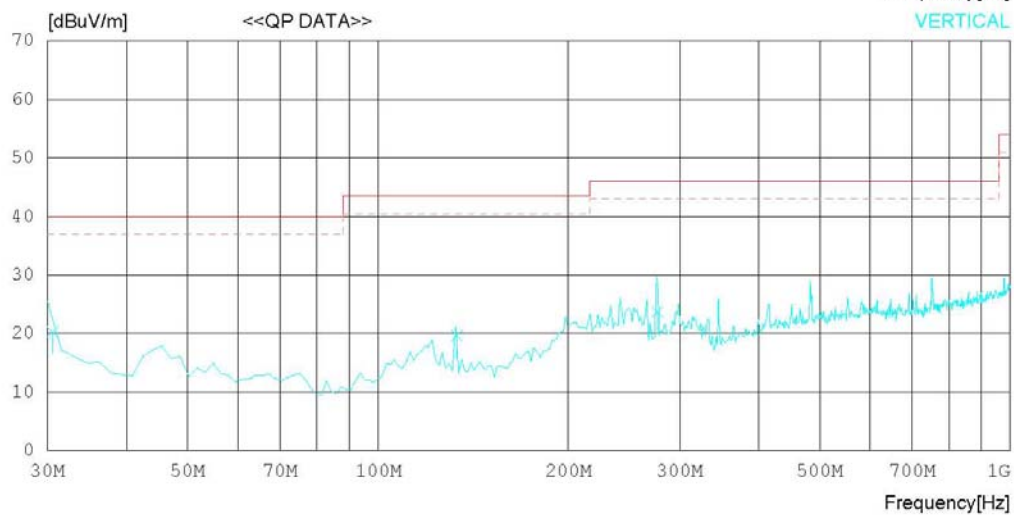
Date : 2013-04-02

Model Name : CMR-1400
Model No. :
Serial No. :
Test Condition :

Reference No. :
Power Supply : 120V 60Hz
Temp/Humi : 22 'C 33 % R.H.
Operator :

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m)
MARGIN: 3 dB



RADIATED EMISSION

Date : 2013-04-02

Model Name : CMR-1400	Reference No. :
Model No. :	Power Supply : 120V 60Hz
Serial No. :	Temp/Humi : 22 'C 33 % R.H.
Test Condition :	Operator :

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m)
MARGIN: 3 dB

No.	FREQ [MHz]	READING QP [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	107.724	31.2	11.0	1.5	24.1	19.6	43.5	23.9	301	356
2	276.968	35.8	13.3	2.7	23.7	28.1	46.0	17.9	100	320
3	346.250	32.2	14.8	3.3	23.6	26.7	46.0	19.3	100	291
----- Vertical -----										
4	30.569	25.6	17.6	0.9	23.8	20.3	40.0	19.7	100	6
5	133.242	30.9	11.4	1.6	24.2	19.7	43.5	23.8	160	358
6	276.968	31.4	13.3	2.7	23.7	23.7	46.0	22.3	199	359

< (1 ~ 2) GHz_Peak >

RADIATED EMISSION

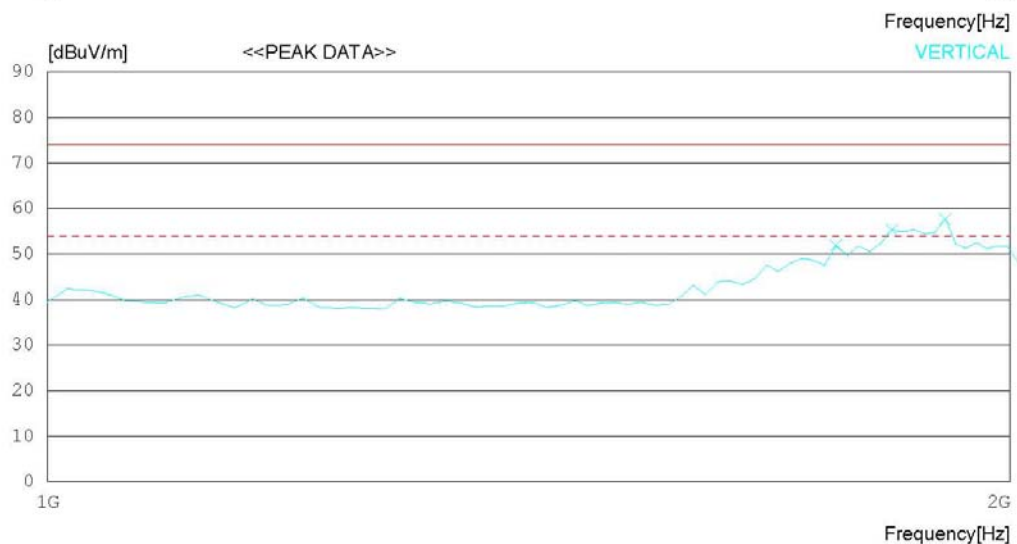
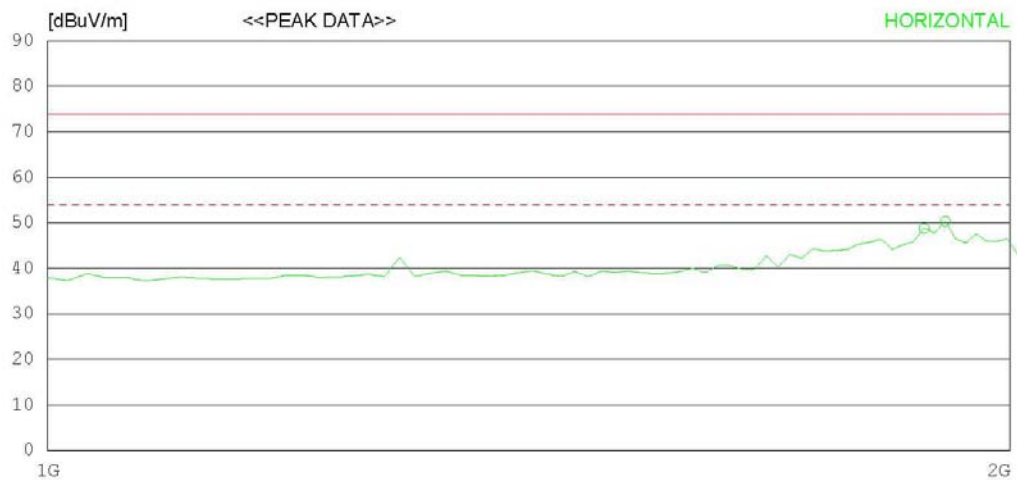
Date : 2013-04-02

Model Name : CMR-1400
Model No. :
Serial No. :
Test Condition :

Reference No. :
Power Supply : 120V 60Hz
Temp/Humi : 20 °C 31 % R.H.
Operator :

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m) - 18G(Peak)
FCC Part15 Subpart.B Class B (3m) - 18G(Avg)



RADIATED EMISSION

Date : 2013-04-02

Model Name : CMR-1400	Reference No. :
Model No. :	Power Supply : 120V 60Hz
Serial No. :	Temp/Humi : 20 'C 31 % R.H.
Test Condition :	Operator :

Memo :

LIMIT : FCC Part15 Subpart B Class B (3m) - 18G(Peak)
FCC Part15 Subpart B Class B (3m) - 18G(Avg)

No.	FREQ [MHz]	READING PEAK [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Horizontal -----										
1	1879.809	58.0	25.7	4.6	39.5	48.8	74.0	25.2	100	266
2	1908.655	59.4	25.8	4.6	39.5	50.3	74.0	23.7	100	262
----- Vertical -----										
3	1764.424	61.5	25.6	4.4	39.6	51.9	74.0	22.1	100	305
4	1836.540	64.7	25.7	4.5	39.6	55.3	74.0	18.7	100	1
5	1908.655	66.7	25.8	4.6	39.5	57.6	74.0	16.4	100	310

< (1 ~ 2) GHz_Average >

RADIATED EMISSION

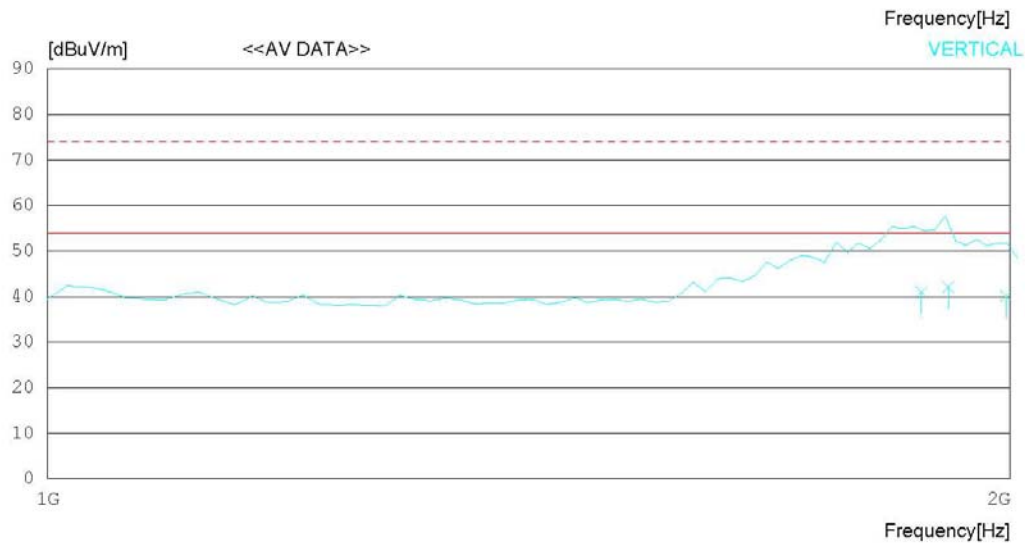
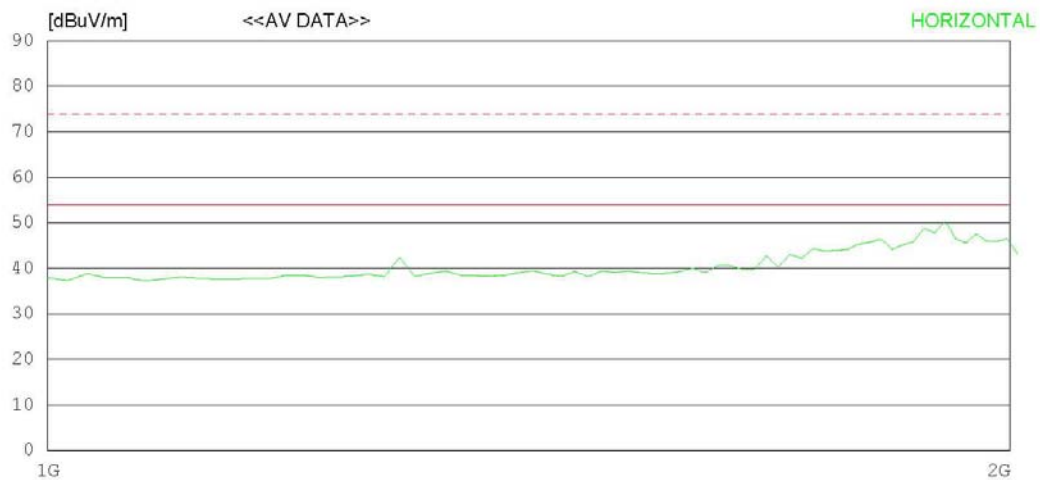
Date : 2013-04-02

Model Name : CMR-1400
Model No. :
Serial No. :
Test Condition :

Reference No. :
Power Supply : 120V 60Hz
Temp/Humi : 20 °C 31 % R.H.
Operator :

Memo :

LIMIT : FCC Part15 Subpart.B Class B (3m) - 18G(Avg)
FCC Part15 Subpart.B Class B (3m) - 18G(Peak)



RADIATED EMISSION

Date : 2013-04-02

Model Name : CMR-1400	Reference No. :
Model No. :	Power Supply : 120V 60Hz
Serial No. :	Temp/Humi : 20 °C 31 % R.H.
Test Condition :	Operator :

Memo :

LIMIT : FCC Part15 Subpart B Class B (3m) - 18G(Avg)
FCC Part15 Subpart B Class B (3m) - 18G(Peak)

No.	FREQ [MHz]	READING AV [dBuV]	ANT FACTOR [dB]	LOSS [dB]	GAIN [dB]	RESULT [dBuV/m]	LIMIT [dBuV/m]	MARGIN [dB]	ANTENNA [cm]	TABLE [DEG]
----- Vertical -----										
1	1876.205	50.2	25.7	4.6	39.5	41.0	54.0	13.0	100	1
2	1913.064	51.2	25.8	4.6	39.5	42.1	54.0	11.9	100	310
3	1994.474	48.9	25.9	4.7	39.4	40.1	54.0	13.9	100	189

Appendix 1

List of Test and Measurement Instruments

To facilitate inclusion on each page of the test equipment used for related tests, each item of test equipment is identified by the Test Laboratory.

1. Conducted Disturbance

Name of Instrument	Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☐ SPECTRUM ANALYZER	8591E	H/P	3649A05889	2013.02.28	2014.02.28
☐ RFI/FIELD INTENSITY METER	KNM-2402	KYORITSU	4N-170-3	2012.07.02	2013.07.02
☐ LISN	KNW-407	KYORITSU	8-317-8	2013.01.08	2014.01.08
☐ LISN	PMM L2-16B	NARDA S.T.S. / PMM	000WX20305	2012.07.25	2013.07.25
☐ 50 OHM TERMINATOR	CT-01	TME	N/A	2013.01.08	2014.01.08
☒ EMI TEST RECEIVER	ESCI	ROHDE & SCHWARZ	100364	2013.02.27	2014.02.27
☒ LISN	ESH2-Z5	ROHDE & SCHWARZ	828739/006	2012.09.18	2013.09.18
☒ LISN	LISN1600	TTI	197204	2012.07.02	2013.07.02
☒ 50 OHM TERMINATOR	CT-01	TME	N/A	2013.01.08	2014.01.08

2. Radiated Disturbance

Name of Instrument	Model No.	Manufacturer	Serial No.	Cal. Date	Next Cal. Date
☒ EMI TEST RECEIVER	ESU	ROHDE & SCHWARZ	100014	2013.01.08	2014.01.08
☒ BILOG ANTENNA	CBL6112B	SCHAFFNER	2737	2012.11.06	2014.11.06
☒ HORN ANTENNA	BBHA9120A	SCHWARZBECK	322	2012.05.15	2014.05.15
☒ AMPLIFIER	8447E	H/P	2945A02865	2013.01.08	2014.01.08
☒ PREAMPLIFIER	8449B	AGILENT	3008A01590	2013.02.27	2014.02.27
☐ SPECTRUM ANALYZER	E4411B	AGILENT	US41062735	2012.07.11	2013.07.11
☐ AMPLIFIER	8447D	AGILENT	2443A03690	2012.07.01	2013.07.01
☐ EMI TEST RECEIVER	ESCI	ROHDE & SCHWARZ	100364	2013.02.27	2014.02.27
☐ BICONICAL ANT.	VHA 9103	SCHWARZBECK	91032789	2012.04.10	2014.04.10
☐ LOG-PERIODIC ANT.	UHALP 9108A	SCHWARZBECK	590	2012.04.10	2014.04.10
☐ BICONICAL ANT.	VHA 9103	SCHWARZBECK	91031946	2012.03.12	2014.03.12
☐ LOG-PERIODIC ANT.	UHALP 9108-A1	SCHWARZBECK	1098	2012.03.12	2014.03.12
☐ AMPLIFIER	MLA-100K01-B01-26	TSJ	1252741	2013.02.28	2014.02.28