

EMC TEST REPORT

Test item : Cellular/PCS GPRS and Cellular WCDMA/HSDPA/HSUPA
Wireless Router with WLAN

Model No. : L-02F

Order No. : DEMC1309-02886

Date of receipt : 2013-09-16

Test duration : 2013-11-01

Use of report : FCC CoC Marking

Date of Issue : 2013-11-01

Applicant : LG Electronics MobileComm USA, Inc.
1000 Sylvan Avenue, Englewood Cliffs NJ 07632

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 : (21 ~ 22) °C,
Humidity : (31 ~ 38) % 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.
This test report shall not be reproduced except in full, without the written approval of DIGITAL EMC CO., LTD.

Tested by:



Engineer
GiHyun Kim

Reviewed by:



Manager
MyungJin Song

PRESIDENT OF DIGITAL EMC CO., LTD.

CONTENTS

1. General Remarks	3
2. Test Laboratory	3
3. General Information of EUT	4
4. Test Summary	5
4.1 Applied standards and test results	5
4.2 Test environment and conditions	5
4.3 Test result Summary	5
5. Test Set-up and operation mode	6
5.1 Principle of Configuration Selection	6
5.2 Test Operation Mode	6
5.3 Support Equipment Used	6
6. Test Results : Emission	7
6.1 Conducted Disturbance	7
6.2 Radiated Disturbance	10
Appendix 1	18
List of Test and Measurement Instruments	18

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.digitalemc.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.	L-02F
FCC ID	ZNFL02F
Power Supply	DC 3.7 V
Frequency Range	2.4GHz Band <ul style="list-style-type: none"> 802.11b/g/n(20MHz): 2412 MHz ~ 2462 MHz 802.11n(40MHz): 2422 MHz ~ 2452 MHz
Max. RF Output Power	2.4GHz Band <ul style="list-style-type: none"> 802.11b: 15.73 dBm 802.11g: 21.69 dBm 802.11n (HT20): 21.33 dBm 802.11n (HT40): 21.21 dBm
Modulation Type	802.11b: DSSS/CCK 802.11g/n: OFDM
Antenna Specification	Antenna type: Internal Antenna Antenna gain: Chain 1 : -1.00 dBi & Chain 2 : - 1.40 dBi Directional Antenna gain for MIMO with uncorrelated signals : -1.20 Antenna configuration <ul style="list-style-type: none"> 802.11b/g: Single Transmitting (chain 1 or 2) 802.11n(MCS0 ~ 7) : Single Transmitting (chain 1 or 2) 802.11n(MCS8 ~ 15): Multiple Transmitting (chain 1 and 2)
Serial No	NONE
Supplied Power for Test	AC 120 V, 60 Hz
Applicant	LG Electronics MobileComm U.S.A., Inc. 1000 Sylvan Avenue, Englewood Cliffs NJ 07632
Manufacturer	LG Electronics MobileComm U.S.A., Inc. 1000 Sylvan Avenue, Englewood Cliffs NJ 07632

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	11-01	22	31
Radiated Disturbance	11-01	21	38

4.3 Test result Summary

(1) Conducted Emission

Frequency [MHz]	Phase	Result [dBμV]	Detector	Limit [dBμV]	Margin [dB]
0.18475	LI	42.1	Quasi-Peak	54.3	12.2

(2) Radiated Emission

Frequency [MHz]	Pol.	Result [dB(μV/m)]	Detector	Limit [dB(μV/m)]	Margin [dB]
42.125	V	27.9	Quasi-Peak	40.0	12.1

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

- EUT connected with laptop and usb, charging in normal operating mode

5.3 Support Equipment Used

Unit	Model No.	Serial No.	Manufacturer	CABLE			Backshell	FCC ID
				Connect type	Length (m)	shield		
Notebook	110-4103TU	5CD2090V98	HP	DC IN	1.4	Non-Shield	Plastic	DOC
				USB	1.8	Non-Shield	Plastic	
				USB	1.9	Shield	Plastic	
				USB	1.0	Non-Shield	Plastic	
				STEREO	2.0	Non-Shield	Plastic	
				DSUB	1.8	Non-Shield	Plastic	
				HDMI	1.8	Non-Shield	Plastic	
Adapter	HSTNN-CA18	F13761206288812	HP	POWER	1.6	Non-Shield	Plastic	VER
Printer	SRP-770	SRP77008060035	BICSOLON	USB	1.9	Shield	Plastic	DOC
				POWER	1.8	Non-Shield	Plastic	
EXTERNAL HDD	9ZR8N1-500	NA0H4ANH	Seagate	USB	1.0	Non-Shield	Plastic	DOC
HEADSET	COV909	N/A	COSY	STEREO	2.0	Non-Shield	Plastic	DOC
LCD MONITOR	W2453VQV	202NDDMAK978	LG	DSUB	1.8	Non-Shield	Plastic	DOC
				HDMI	1.8	Non-Shield	Plastic	
				POWER	1.8	Non-Shield	Plastic	

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

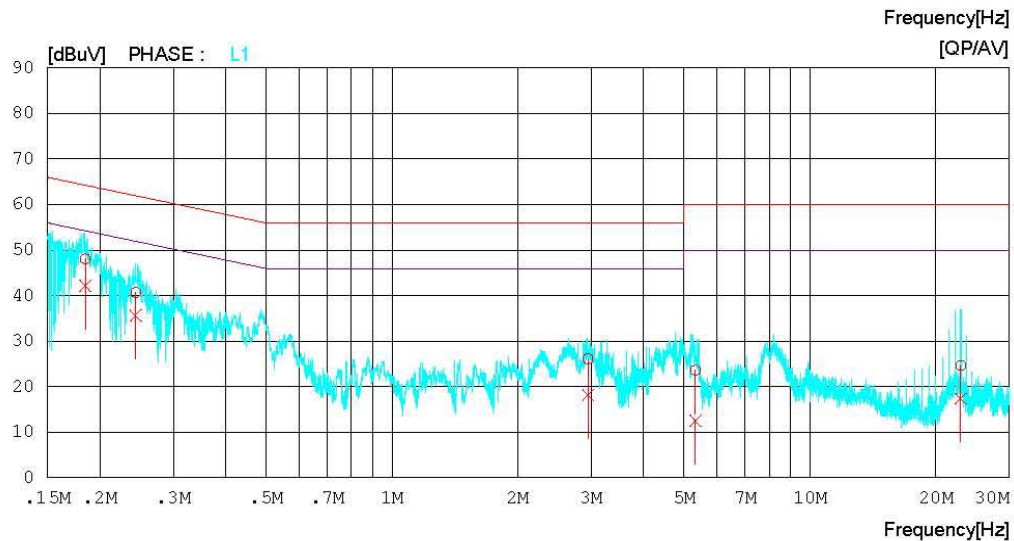
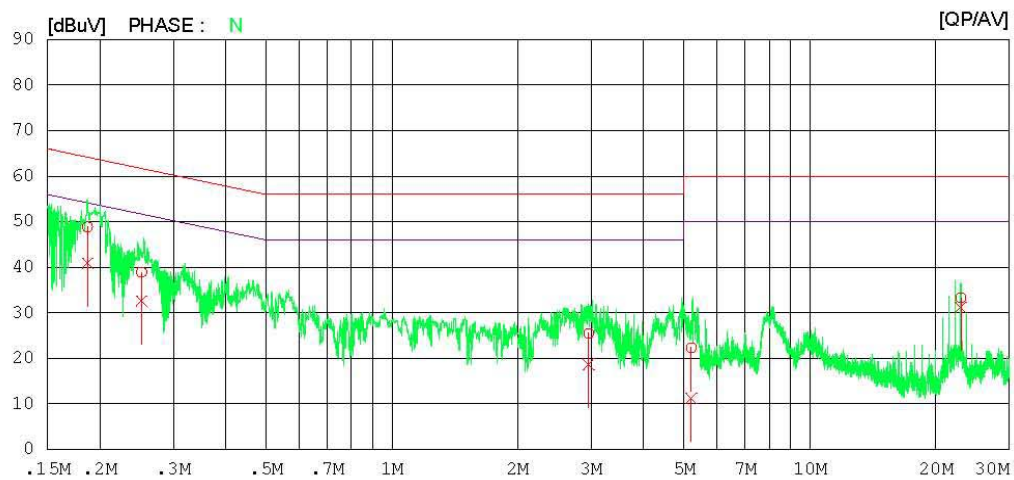
Digital EMC
Date : 2013-11-01

Model No. : L-02F
Type :
Serial No. :
Test Condition :

Reference No. :
Power Supply : 120 V 60 Hz
Temp/Humi. : 22°C 31 % R.H.
Operator :

Memo :

LIMIT : CISPR22_B QP
CISPR22_B AV



Results of Conducted Emission

Digital EMC
Date : 2013-11-01

Model No. : L-02F
Type :
Serial No. :
Test Condition :

Reference No. :
Power Supply : 120 V 60 Hz
Temp/Humi. : 22 °C 31 % 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	0.18717	48.8	40.7	0.1	48.9	40.8	64.2	54.2	15.3	13.4	N
2	0.25203	38.8	32.5	0.1	38.9	32.6	61.7	51.7	22.8	19.1	N
3	2.95680	25.1	18.3	0.4	25.5	18.7	56.0	46.0	30.5	27.3	N
4	5.20100	21.8	10.7	0.5	22.3	11.2	60.0	50.0	37.7	38.8	N
5	22.96140	32.6	30.5	0.7	33.3	31.2	60.0	50.0	26.7	18.8	N
6	0.18475	47.9	42.0	0.1	48.0	42.1	64.3	54.3	16.3	12.2	L1
7	0.24385	40.6	35.5	0.1	40.7	35.6	62.0	52.0	21.3	16.4	L1
8	2.94520	25.7	17.8	0.4	26.1	18.2	56.0	46.0	29.9	27.8	L1
9	5.32740	23.1	12.1	0.5	23.6	12.6	60.0	50.0	36.4	37.4	L1
10	22.94940	24.0	16.7	0.7	24.7	17.4	60.0	50.0	35.3	32.6	L1

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

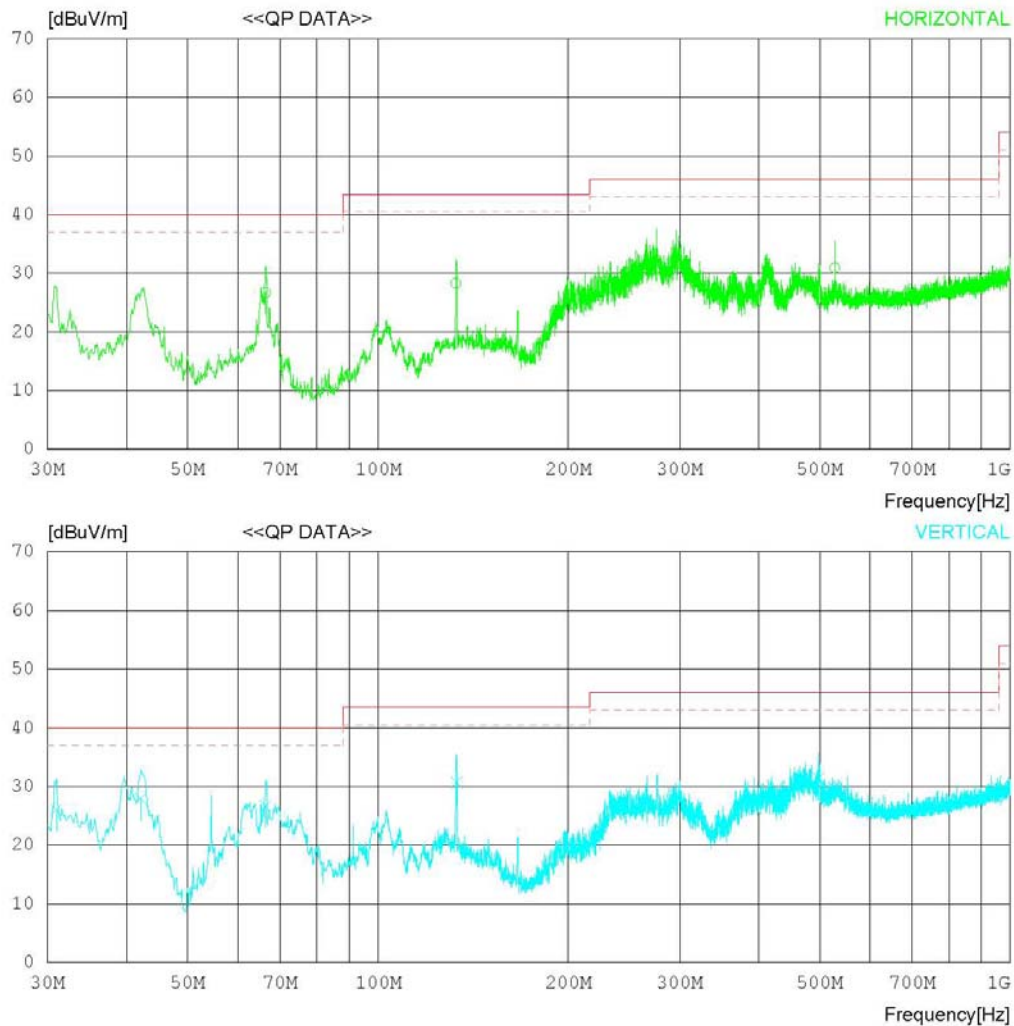
Date : 2013-11-01

Model Name : L-02F
Model No. :
Serial No. :
Test Condition :

Reference No. :
Power Supply : 120 V 60 Hz
Temp/Humi : 21 'C 38 % R.H.
Operator :

Memo :

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



RADIATED EMISSION

Date : 2013-11-01

Model Name : L-02F	Reference No. :
Model No. :	Power Supply : 120 V 60 Hz
Serial No. :	Temp/Humi : 21 'C 38 % 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	66.375	42.9	6.0	2.2	24.4	26.7	40.0	13.3	301	195
2	132.818	38.2	11.4	2.9	24.2	28.3	43.5	15.2	301	45
3	275.889	38.6	13.2	4.2	23.7	32.3	46.0	13.7	100	358
4	527.600	30.0	17.7	6.2	23.0	30.9	46.0	15.1	201	269
----- Vertical -----										
5	30.970	30.5	17.4	1.9	23.8	26.0	40.0	14.0	400	359
6	42.125	36.8	13.3	2.0	24.2	27.9	40.0	12.1	100	205
7	66.375	42.9	6.0	2.2	24.4	26.7	40.0	13.3	100	56
8	133.182	40.6	11.4	2.9	24.2	30.7	43.5	12.8	100	187
9	497.891	31.3	17.3	5.9	23.0	31.5	46.0	14.5	100	158

< (1 ~ 6) GHz_Peak >

RADIATED EMISSION

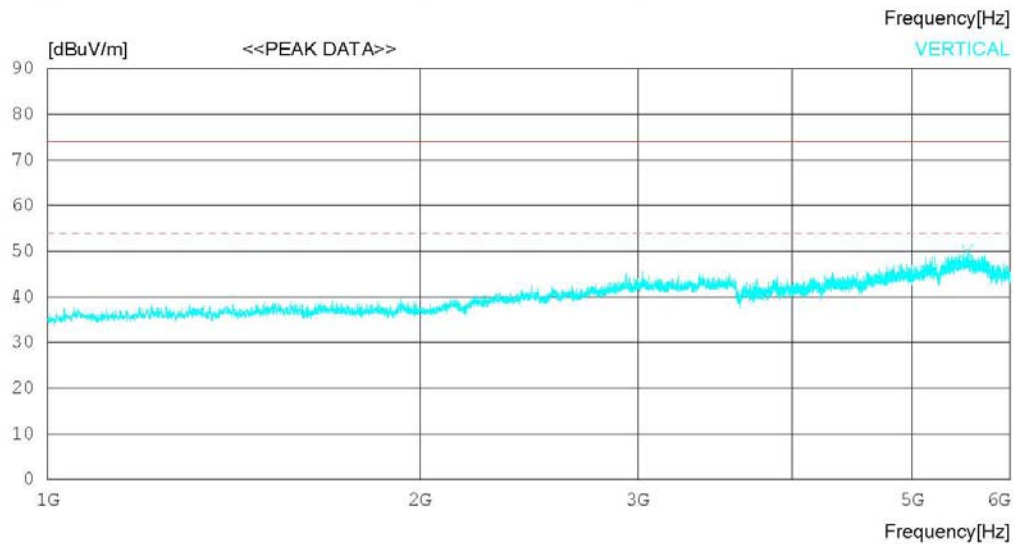
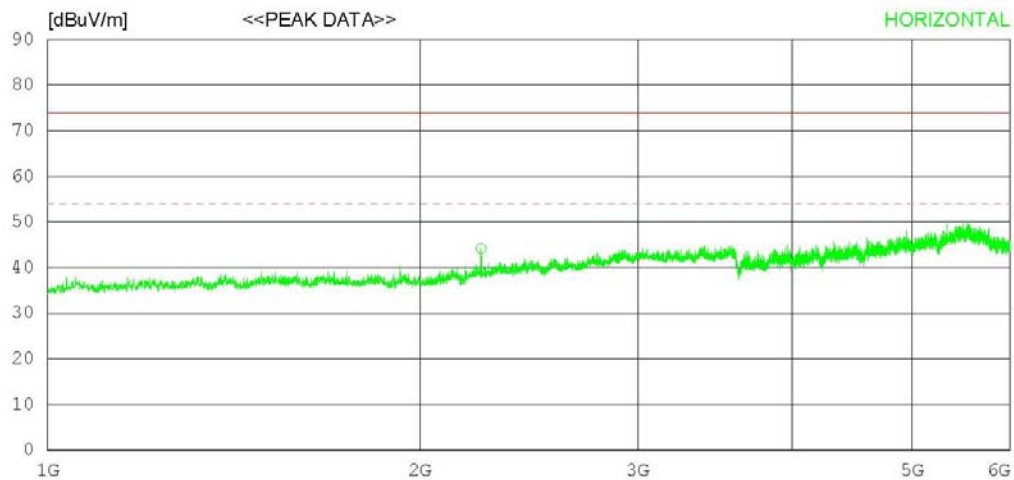
Date : 2013-11-01

Model Name : L-02F
Model No. :
Serial No. :
Test Condition :

Reference No. :
Power Supply : 120 V 60 Hz
Temp/Humi : 21 'C 38 % 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 : 2013-11-01

Model Name : L-02F	Reference No. :
Model No. :	Power Supply : 120 V 60 Hz
Serial No. :	Temp/Humi : 21 'C 38 % 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	2241.250	52.7	25.9	5.0	39.4	44.2	74.0	29.8	100	88
----- Vertical -----										
2	5541.875	45.7	34.8	8.0	38.3	50.2	74.0	23.8	100	297

< (1 ~ 6) GHz_Average >

RADIATED EMISSION

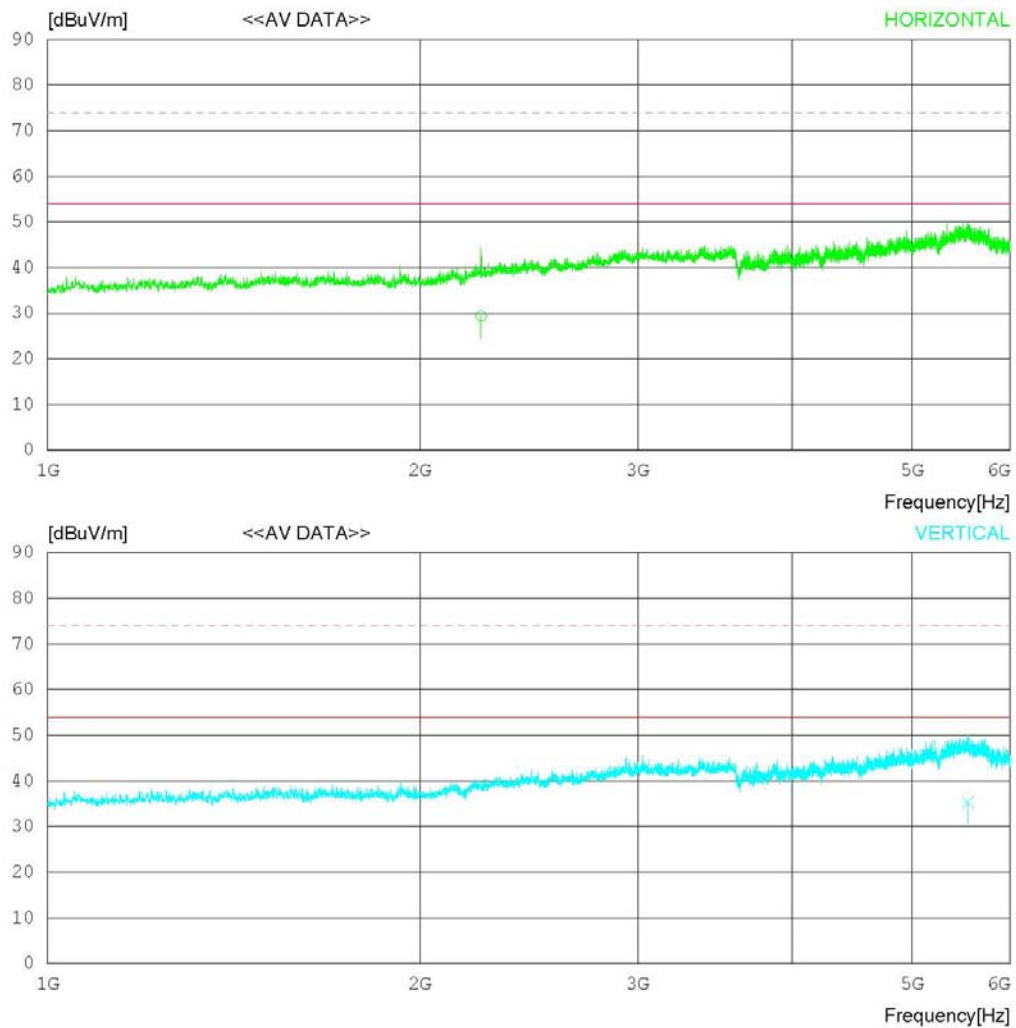
Date : 2013-11-01

Model Name : L-02F
Model No. :
Serial No. :
Test Condition :

Reference No. :
Power Supply : 120 V 60 Hz
Temp/Humi : 21 'C 38 % 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 : 2013-11-01

Model Name : L-02F	Reference No. :
Model No. :	Power Supply : 120 V 60 Hz
Serial No. :	Temp/Humi : 21 'C 38 % 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]
----- Horizontal -----										
1	2241.250	37.9	25.9	5.0	39.4	29.4	54.0	24.6	100	88
----- Vertical -----										
2	5541.875	30.9	34.8	8.0	38.3	35.4	54.0	18.6	100	297

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
<input type="checkbox"/> SPECTRUM ANALYZER	8591E	H/P	3649A05889	2013.02.28	2014.02.28
<input type="checkbox"/> RFI/FIELD INTENSITY METER	KNM-2402	KYORITSU	4N-170-3	2013.06.28	2014.06.28
<input type="checkbox"/> LISN	KNW-407	KYORITSU	8-317-8	2013.01.08	2014.01.08
<input type="checkbox"/> LISN	PMM L2-16B	NARDA S.T.S. / PMM	000WX20305	2013.06.27	2014.06.27
<input type="checkbox"/> ATTENUATOR	CFA-10BPJ-10	TAMAGAWA ELECTRONICS	1760307E	N/A	N/A
<input type="checkbox"/> 50 OHM TERMINATOR	CT-01	TME	N/A	2013.01.08	2014.01.08
<input checked="" type="checkbox"/> EMI TEST RECEIVER	ESCI	ROHDE & SCHWARZ	100364	2013.02.27	2014.02.27
<input checked="" type="checkbox"/> LISN	ESH2-Z5	ROHDE & SCHWARZ	828739/006	2013.09.12	2014.09.12
<input checked="" type="checkbox"/> LISN	LISN1600	TTI	197204	2013.06.28	2014.06.28
<input checked="" type="checkbox"/> 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
<input checked="" type="checkbox"/> EMI TEST RECEIVER	ESU	ROHDE & SCHWARZ	100014	2013.01.08	2014.01.08
<input checked="" type="checkbox"/> BILOG ANTENNA	CBL6112B	SCHAFFNER	2737	2012.11.06	2014.11.06
<input checked="" type="checkbox"/> HORN ANTENNA	BBHA9120A	SCHWARZBECK	322	2012.05.15	2014.05.15
<input checked="" type="checkbox"/> AMPLIFIER	8447E	H/P	2945A02865	2013.01.08	2014.01.08
<input checked="" type="checkbox"/> PREAMPLIFIER	8449B	AGILENT	3008A01590	2013.02.27	2014.02.27
<input type="checkbox"/> SPECTRUM ANALYZER	E4411B	AGILENT	US41062735	2013.06.27	2014.06.27
<input type="checkbox"/> AMPLIFIER	8447D	AGILENT	2443A03690	2013.06.28	2014.06.28
<input type="checkbox"/> EMI TEST RECEIVER	ESCI	ROHDE & SCHWARZ	100364	2013.02.27	2014.02.27
<input type="checkbox"/> LOG-PERIODIC ANT.	UHALP 9108A	SCHWARZBECK	590	2012.07.07	2014.07.07
<input type="checkbox"/> AMPLIFIER	MLA-100K01-B01-26	TSJ	1252741	2013.02.28	2014.02.28