



TEST REPORT

Part 15 Subpart B&C 15.225

Equipment under test Automatic Recharger

Model name KSCC-CB-R400A

FCC ID RTQKSCCCBR400A

Applicant LG CNS Co., Ltd.

Manufacturer ATEC Co., Ltd.

Date of test(s) 2012.05.17~2012.05.22

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Issued to



LG CNS CO., LTD.

Prime Tower, #10-1, Hoehyun-dong, 2-ga, Jung-gu, Seoul, South Korea

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KES Co., Ltd.

C3701 Dongil Techno Town, 889-1, Gwanyang 2-dong, Dongan-gu, Anyang-si,
Gyeonggi-do, 431-716, Korea
477-6, Hageo-ri, Yeoju-eup, Yeoju-gun, Gyeonggi-do, 469-803, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450

Test and report completed by :	Report approval by :
	
Jae Jun Lee Test engineer	Gyu-cheol Shin Technical manager



KES Co., Ltd.

C-3701 Dongil Techno Town, 889-1, Gwanyang 2-dong,
Dongan-gu, Anyang-si, Gyeonggi-do, 431-716, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
www.kes.co.kr

Revision history

Revision	Date of issue	Test report No.	Description
-	2012.05.22	KES-RF-120040	Initial



KES Co., Ltd.

C-3701 Dongil Techno Town, 889-1, Gwanyang 2-dong,
Dongan-gu, Anyang-si, Gyeonggi-do, 431-716, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
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C-3701 Dongil Techno Town, 889-1, Gwanyang 2-dong,
Dongan-gu, Anyang-si, Gyeonggi-do, 431-716, Korea
Tel: +82-31-425-6200 / Fax: +82-31-424-0450
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1.0 General product description

Equipment under test	Automatic Recharger
Model name	KSCC-CB-R400A
Serial number	N/A
Frequency Range	13.56 MHz
Modulation technique	ASK
Number of channels	1
Antenna type	PCB antenna
Power source	AC 120V

1.1 Test frequency

	Low channel	Middle channel	High channel
Frequency (MHz)	13.56	N/A	N/A

1.2 Information about variant model

N/A

1.3 Device modifications

Please refer to the attestation letter. (Device modification letter)

1.4 Test facility




C3701 Dongil Techno Town, 889-1, Gwanyang 2-dong, Dongan-gu, Anyang-si, Gyeonggi-do, 431-716, Korea
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The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

1.5 Test measurement procedure

The measurement procedure described in the American National Standard for Testing Unlicensed Wireless Devices (ANSI C63.4-2003).

1.6 Laboratory accreditations and listings

Country	Agency	Scope of accreditation	Logo
USA	FCC	3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.	 343818
KOREA	KC	EMI (10 meter Open Area Test Site and two conducted sites) Radio (3 & 10 meter Open Area Test Sites and one conducted site)	 KR0100
Canada	IC	3 & 10 meter Open Area Test Sites and one conducted site	 4769B-1

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2.0 Summary of tests

Section in FCC Part 15	Parameter	Status
15.225(a)	The field strength of fundamental	C
15.225(b)(c)	The field strength of spurious emission(In-band)	C
15.225(d) 15.209	The field strength of spurious emission(Out-band)	C
15.225(e)	The frequency tolerance	C
15.215(c)	20 dB bandwidth	C
15.207	AC conducted emission	C
Note 1: C=Complies NC=Not complies NT=Not tested NA=Not applicable		



2.1 Test data

2.1.1 Fundamental, spurious emission

Test location

Testing was performed at a test distance of 3 meter Open Area Test Site

Test procedures

[9 kHz to 30 MHz]

The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter Open Area Test Site. The table was rotated 360 degrees to determine the position of the highest radiation. Then antenna is a loop antenna is fixed at one meter above the ground to determine the maximum value of the field strength. Both parallel and perpendicular of the antenna are set to make the measurement. For each suspected emission, the EUT was arranged to its worst case and then the table was turned from 0 degrees to 360 degrees to find the maximum reading. The test-receiver system was set to Quasi-peak function and specified bandwidth with maximum hold mode.

The spectrum analyzer is set to:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer 200 Hz for Quasi-peak detection (QP) at frequency below 9 kHz~ 150 kHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer 9 kHz for Quasi-peak detection (QP) at frequency below 150 kHz~ 30 MHz.

[30 MHz to 1 GHz]

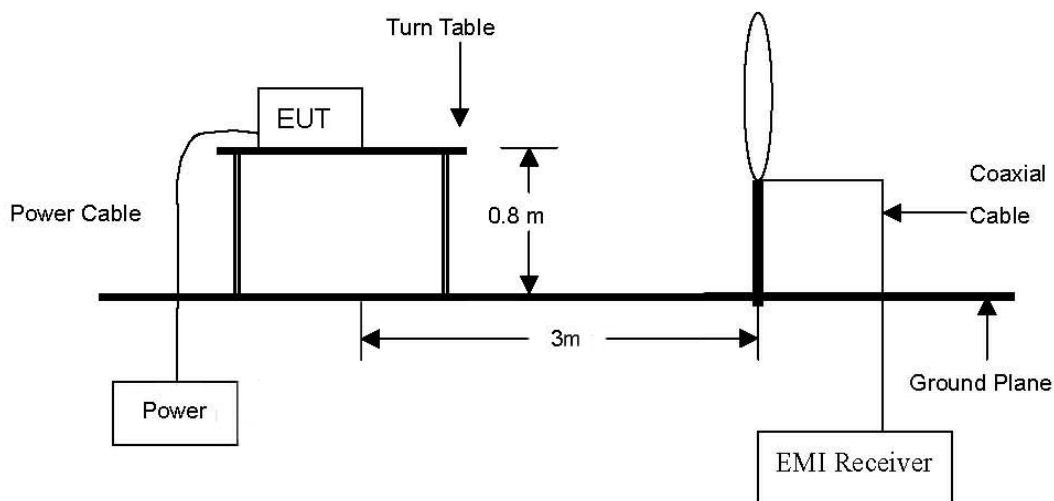
The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity.

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

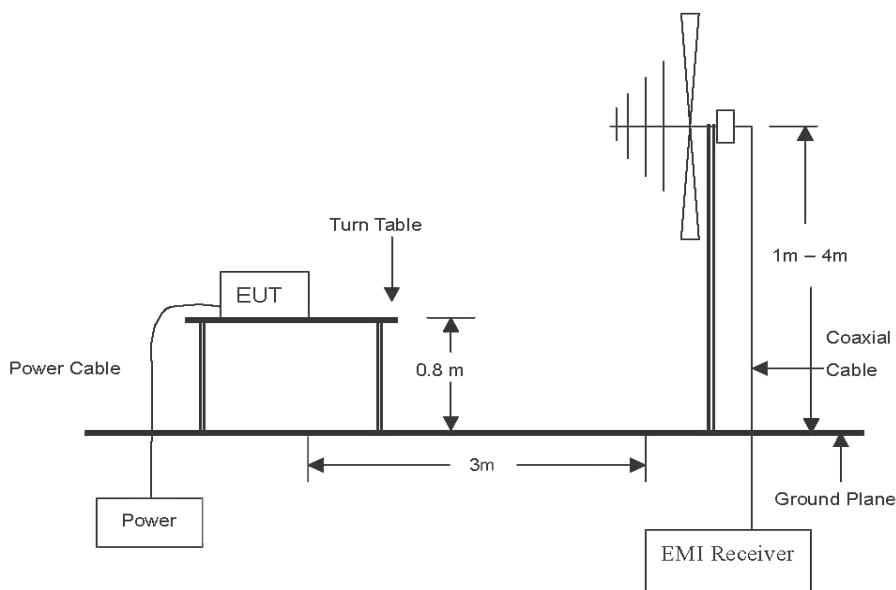
The spectrum analyzer is set to:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 kHz for Peak detection (PK) or Quasi-peak detection (QP) at frequency below 1 GHz.

The diagram below shows the test setup that is utilized to make the measurements for emission from 9 kHz to 30 MHz Emissions.



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 MHz to 1 GHz emissions.





KES Co., Ltd.

C-3701 Dongil Techno Town, 889-1, Gwanyang 2-dong,
Dongan-gu, Anyang-si, Gyeonggi-do, 431-716, Korea
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Limit

In the section 15.209:

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:

Frequency (MHz)	Distance (Meters)	Radiated ($\mu\text{V/m}$)
0.009 ~ 0.490	300	2400 / F(kHz)
0.490 ~ 1.705	30	24000 / F(kHz)
1.705 ~ 30.0	30	30
30 ~ 88	3	100**
88 ~ 216	3	150**
216 ~ 960	3	200**
Above 960	3	500

**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.

In the section 15.225:

- (a) The field strength of any emissions within the band 13.553 ~ 13.567 MHz shall not exceed 15,848 microvolts/meter (= 84 dB $\mu\text{V/m}$) at 30 meters.
- (b) Within the bands 13.410 ~ 13.553 MHz and 13.567 ~ 13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter (=50.5 dB $\mu\text{V/m}$) at 30 meters.
- (c) Within the bands 13.110 ~ 13.410 MHz and 13.710 ~ 14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter (=40.5 dB $\mu\text{V/m}$) at 30 meters.
- (d) The field strength of any emissions appearing outside of the 13.110 ~ 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209.

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Test results for fundamental

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Distance (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
13.560	35.26	H	18.30	0.57	-40	14.13	84	69.87
13.560	36.64	V	18.30	0.57	-40	15.41	84	68.59

Test results for in-band & out-band(9 MHz to 14.010 MHz)

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Distance (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
0.500	32.46	H	18.17	0.36	-40	10.99	33.6	22.61
0.500	35.55	V	18.17	0.36	-40	14.08	33.6	19.52
1.639	28.92	V	18.20	0.47	-40	7.59	14.6	7.01
4.170	46.25	H	18.21	0.55	-40	25.01	29.5	4.49

Test results for in-band & out-band(14.010 MHz to 30 MHz)

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Distance (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
14.129	14.72	V	18.32	0.58	-40	-6.37	29.5	35.87
27.121	17.48	V	19.25	0.80	-40	-2.47	29.5	31.97

※ Remark

1. Actual = Reading + Ant. factor + Cable loss + Distance
2. Distance correction below 30 MHz = $40\log(3 \text{ m}/30 \text{ m})$
Measurement distance: 3 m
3. Detector mode: Quasi peak
4. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

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Test results (Below 1000 MHz)

Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (MHz)	Reading (dB μ V)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Actual (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)
54.300	10.450	H	13.440	0.960	24.850	40.000	15.15
54.300	7.660	V	13.440	0.960	22.060	40.000	17.94
100.300	14.930	V	8.690	1.250	24.870	43.500	18.63
301.600	13.890	H	13.400	1.980	29.270	46.000	16.73
551.400	8.980	H	18.760	2.710	30.450	46.000	15.55
599.900	10.040	H	19.730	2.860	32.630	46.000	13.37
665.400	8.790	V	20.460	3.080	32.330	46.000	13.67
699.300	7.290	H	20.830	3.190	31.310	46.000	14.69
699.300	7.290	V	20.830	3.190	31.310	46.000	14.69
801.200	6.000	V	22.390	3.230	31.620	46.000	14.38

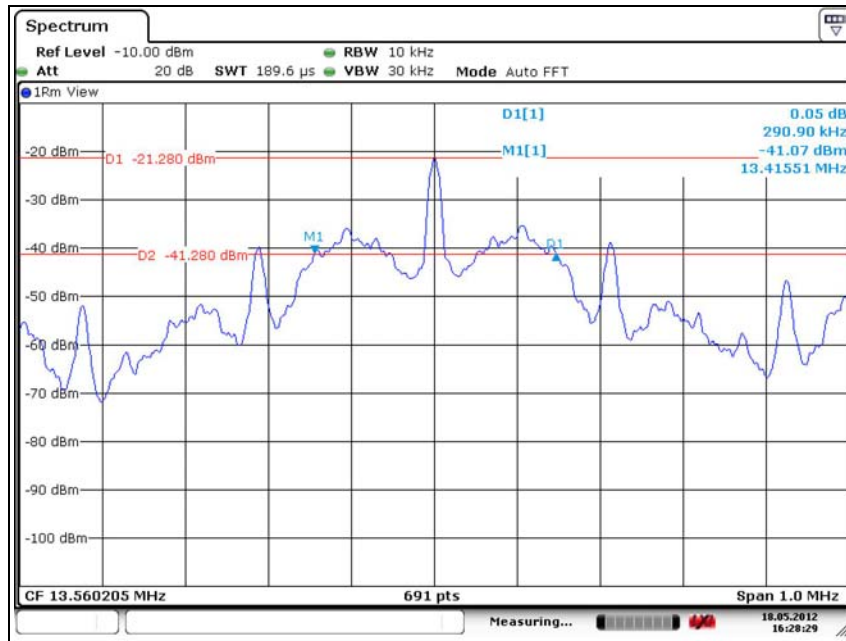
※ Remark

1. Actual = Reading + Ant. factor + Cable loss
2. Detector mode: Quasi peak
3. To get a maximum emission level from the EUT, the EUT was moved throughout the XY, XZ and YZ planes.

2.1.2 20 dB bandwidth

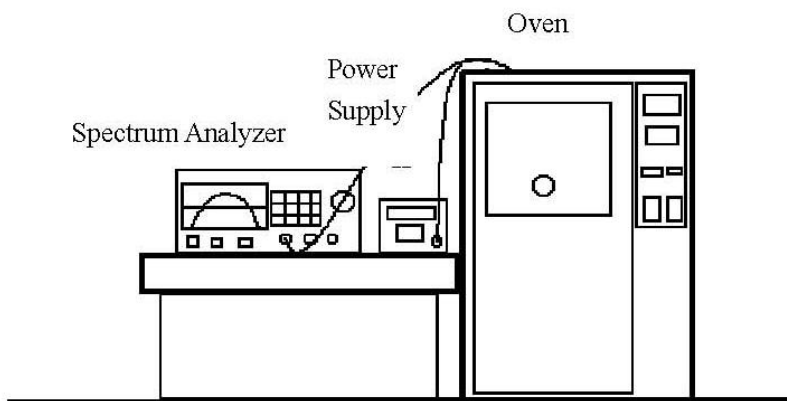
Test setup: The EUT was connected to a spectrum analyzer.

Test procedure: The 20 dB bandwidth was measured by using a spectrum analyzer.



2.1.3 Frequency tolerance

Test setup



Test procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The transmission time was measured with the spectrum analyzer using RBW=1 kHz, VBW=1 kHz.
3. Set the temperature of chamber to -20°C. Allow sufficient time (approximately 30 min) for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the chamber, turn the EUT on and measure the EUT operating frequency.
4. Repeat step 2 with a 10°C decreased per stage until the highest temperature 50°C is measured, record all measured frequencies on each temperature step.

Limit

According to FCC Part 15 Section 15.225 (e),

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85 % to 115 % of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

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Test results

Test voltage (%)	Test voltage (V)	Temperature (℃)	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)
100 %	AC 120	-20	13.560 672	672	0.004 956
100 %		-10	13.560 609	609	0.004 491
100 %		0	13.560 614	614	0.004 528
100 %		10	13.560 370	370	0.002 729
100 %		20	13.560 205	205	0.001 512
100 %		30	13.560 376	376	0.002 773
100 %		40	13.560 661	661	0.004 875
100 %		50	13.560 890	890	0.006 563
85 %	AC 102	20	13.560 205	205	0.001 512
115 %	AC 138	20	13.560 205	205	0.001 844



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2.1.4 AC conducted emissions

Frequency range of measurement

150 kHz to 30 MHz

Instrument settings

IF Band Width: 9 kHz

Test procedures

The EUT was placed on a non-metallic table 0.8m above the metallic, grounded floor and 0.4m from the reference ground plane wall. The distance to other metallic surfaces was at least 0.8m. Amplitude measurements were performed with a quasi-peak detector and an average detector.

Limit

According to 15.207(a), for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50uH/50 ohm line impedance stabilization network (LISN). Compliance with the provision of this paragraph shall on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted limit (dBμV/m)	
	Quasi-peak	Average
0.15 – 0.50	66 - 56*	56 - 46*
0.50 – 5.00	56	46
5.00 – 30.0	60	50

※ Remark

Decreases with the logarithm of the frequency.

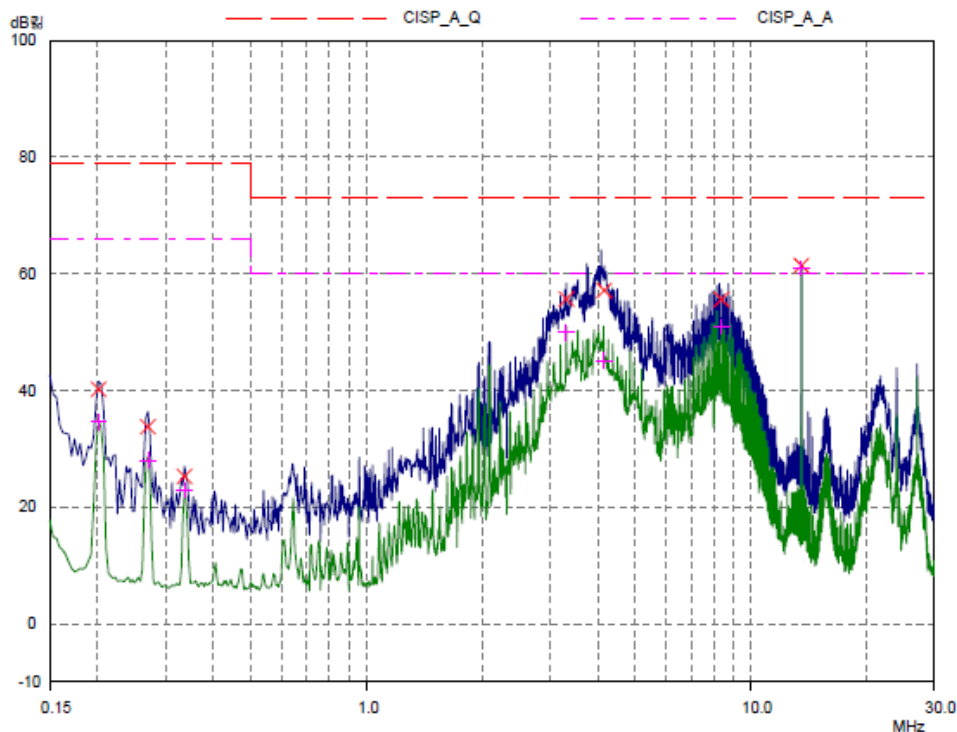
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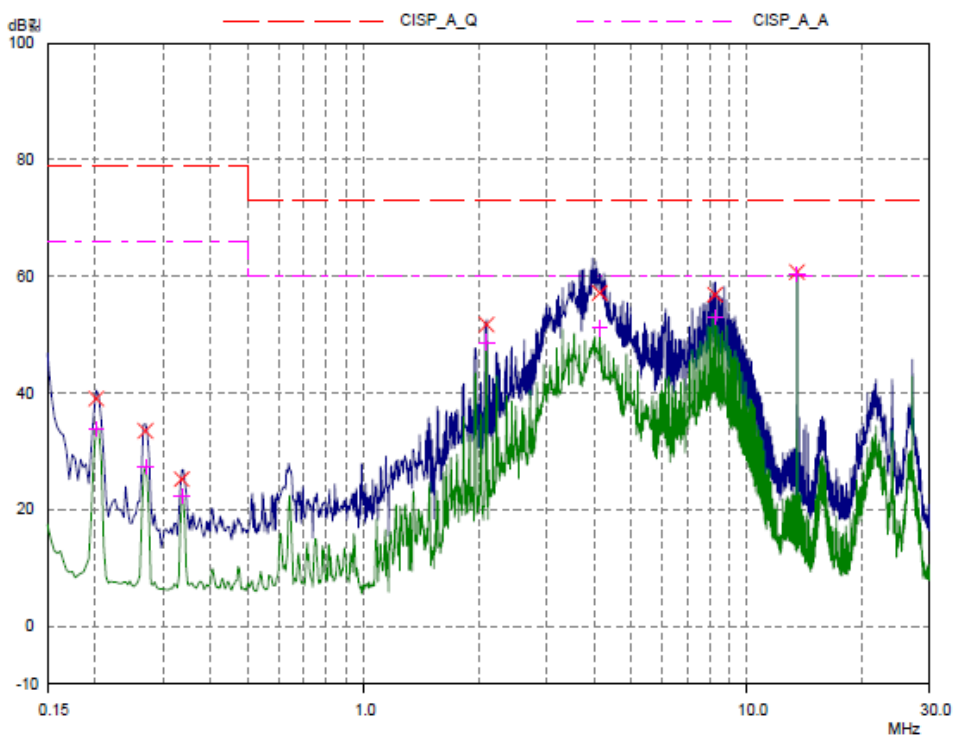
Test results

Frequency (MHz)	Correction		Phase Hot/ Neutral	Quasi peak			Average		
	LISN	Cable Loss		Reading	Result	Limit	Reading	Result	Limit
0.201	9.530	0.035	H	30.605	40.170	63.569	24.975	34.540	53.569
0.201	9.540	0.035	N	29.405	38.980	63.569	24.205	33.780	53.569
0.270	9.537	0.035	H	24.178	33.750	61.118	18.418	27.990	51.118
0.270	9.547	0.035	N	23.908	33.490	61.118	17.708	27.290	51.118
0.336	9.544	0.034	H	15.672	25.250	59.302	13.322	22.900	49.302
0.336	9.554	0.034	N	15.602	25.190	59.302	12.732	22.320	49.302
2.100	9.571	0.083	N	42.076	51.730	56.000	39.016	48.670	46.000
3.315	9.570	0.106	H	45.984	55.660	56.000	40.244	49.920	46.000
4.143	9.591	0.119	N	47.409	57.120	56.000	41.379	51.090	46.000
4.160	9.572	0.120	H	47.428	57.120	56.000	35.438	45.130	46.000
8.282	9.657	0.204	N	46.989	56.850	60.000	43.119	52.980	50.000
8.400	9.624	0.206	H	45.780	55.610	60.000	41.080	50.910	50.000

[Hot]



[Neutral]



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Appendix A. Test equipment used for test

Equipment	Manufacturer	Model	Calibration due.
Spectrum Analyzer	R&S	FSP	2013.01.10
AC Power Supply	DAEGWANG	3-5-1292	2012.08.04
Loop Antenna	R&S	HFH2-Z2.335.4711.52	2013.03.10
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	2013.04.28
Temperature chamber	BESTECH	TEMI550	2012.05.30
EMI Test Receiver	Agilent	E7405A	2012.08.22
EMI Test Receiver	R&S	ESHS10	2013.05.04
LISN	R&S	ENV216	2013.02.27

Peripheral device

Device	Manufacturer	Model No.	Serial No.
Netbook	Lenovo	T-61	N/A

Appendix B. Test setup photos



