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TEST REPORT

Part 15 Subpart B&C 15.225

Equipment under test Attended Recharger

Model name KSCC-CB-R310

FCC ID RTQKSCCCBR310

Applicant LG CNS Co., Ltd.

Manufacturer ATEC Co., Ltd.

Date of test(s) 2012.03.07 ~ 2012.03.29

Date of issue 2012.04.02

Issued to



LG CNS CO., LTD.

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

Issued by

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Test and report completed by :	Report approval by :
	
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Revision history

Revision	Date of issue	Test report No.	Description
-	2012.04.02	KES-RF-120018	Initial



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1.0 General product description

Equipment under test	Attended Recharger
Model name	KSCC-CB-R310
Serial number	N/A
Frequency Range	13.561 MHz
Modulation technique	ASK
Number of channels	1
Antenna type	Loop antenna
Power source	AC 110 V

1.1 Test frequency

	Low channel	Middle channel	High channel
Frequency (MHz)	13.561	N/A	N/A

1.2 Model differences

N/A

1.3 Device modifications




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

1.4 Test facility

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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 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 anechoic chamber 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]

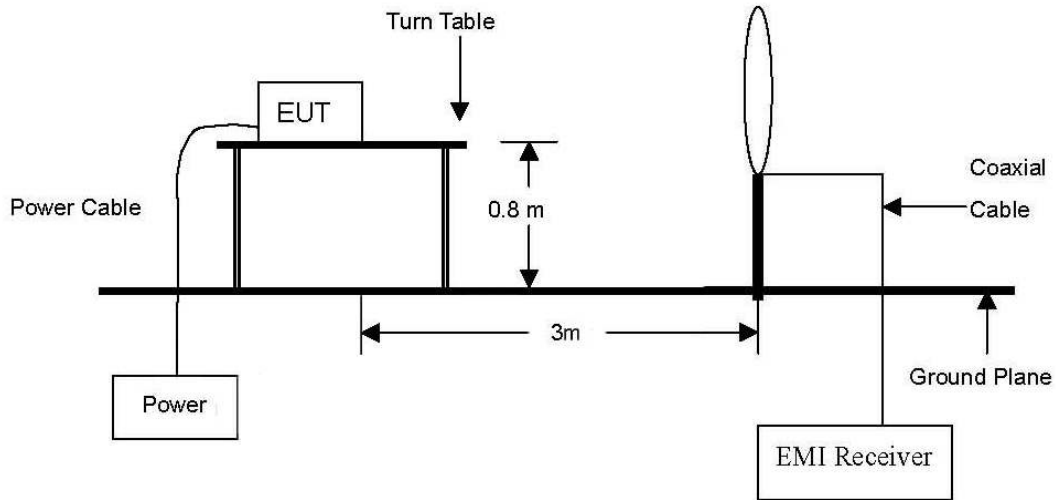
The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity.

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

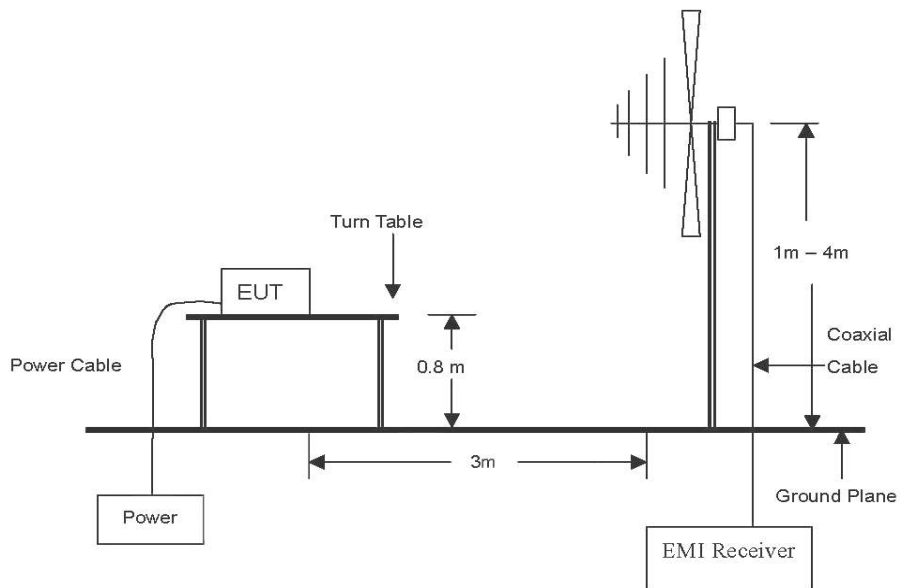
The spectrum analyzer is set to:

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.





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 ($\mu\text{V}/\text{m}$)
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 $\mu\text{V}/\text{m}$) 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 $\mu\text{V}/\text{m}$) 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 $\mu\text{V}/\text{m}$) 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.
- (e) The frequency tolerance of the carrier signal shall be maintained within +/-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 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)
13.561	31.58	H	18.30	0.57	-40	10.45	84.00	73.55
13.561	29.24	V	18.30	0.57	-40	8.11	84.00	75.89

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)
8.079	14.89	H	18.17	0.50	-40	-6.44	29.54	35.98
8.079	14.64	V	18.17	0.50	-40	-6.69	29.54	36.23

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)
16.536	15.78	H	18.49	0.62	-40	-5.11	29.54	34.61
16.536	15.47	V	18.49	0.62	-40	-5.42	29.54	34.61

※ 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)
76.10	25.57	H	10.25	1.60	37.42	40.00	2.58
76.10	26.26	V	10.25	1.60	38.11	40.00	1.89
124.60	27.33	H	11.56	2.10	40.99	43.50	2.51
226.40	28.14	H	10.85	3.09	42.09	46.00	3.91
274.90	28.39	H	12.51	3.45	44.35	46.00	1.65
274.90	28.49	V	12.51	3.45	44.45	46.00	1.55
301.60	27.71	H	13.40	3.62	44.73	46.00	1.27
333.10	26.48	H	14.10	3.83	44.41	46.00	1.59
350.10	25.16	V	14.49	3.94	43.59	46.00	2.41
381.60	22.98	H	15.20	4.12	42.29	46.00	3.71
381.60	21.58	V	15.20	4.12	40.89	46.00	5.11
405.90	20.96	H	15.74	4.26	40.95	46.00	5.05
449.50	22.76	V	16.66	4.53	43.95	46.00	2.05
454.40	22.99	V	16.76	4.56	44.31	46.00	1.69
500.50	20.02	H	17.74	4.84	42.60	46.00	3.40
500.50	21.23	V	17.74	4.84	43.81	46.00	2.19
599.90	17.71	V	19.73	5.31	42.75	46.00	3.25
650.80	18.95	V	20.29	5.57	44.81	46.00	1.19
687.20	14.29	H	20.70	5.75	40.74	46.00	5.26
699.30	17.09	V	20.83	5.82	43.74	46.00	2.26

※ 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.



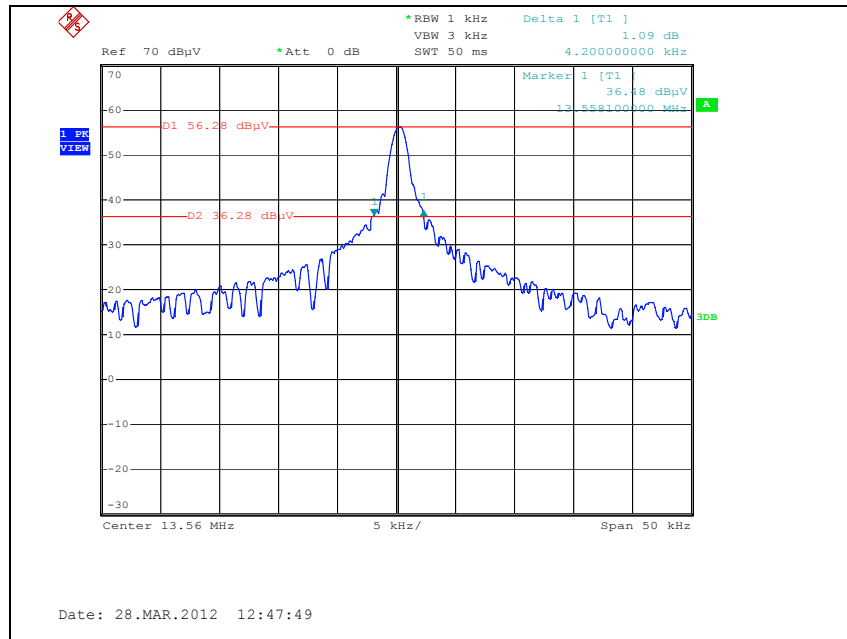
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2.1.2 20 dB bandwidth

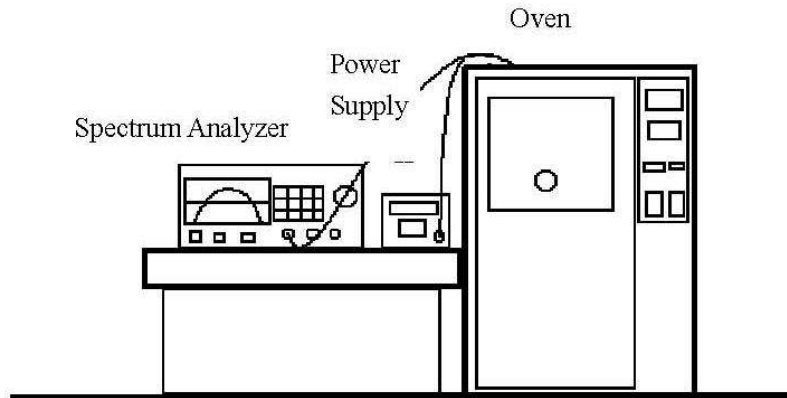
Test setup: The EUT was connected to a spectrum analyzer.

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 +/-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 (°C)	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)
100 %	AC 110	-20	13.560 997	997	0.007 353
100 %		-10	13.560 816	816	0.006 018
100 %		0	13.560 953	953	0.007 028
100 %		10	13.560 982	982	0.007 242
100 %		20	13.561 033	1033	0.007 618
100 %		30	13.561 048	1048	0.007 729
100 %		40	13.560 953	953	0.007 028
100 %		50	13.560 939	939	0.006 925
85 %		AC 93.5	20	13.561 033	1 033
115 %	AC 126.5	20	13.561 040	1 040	0.007 670



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 (dB μ V/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

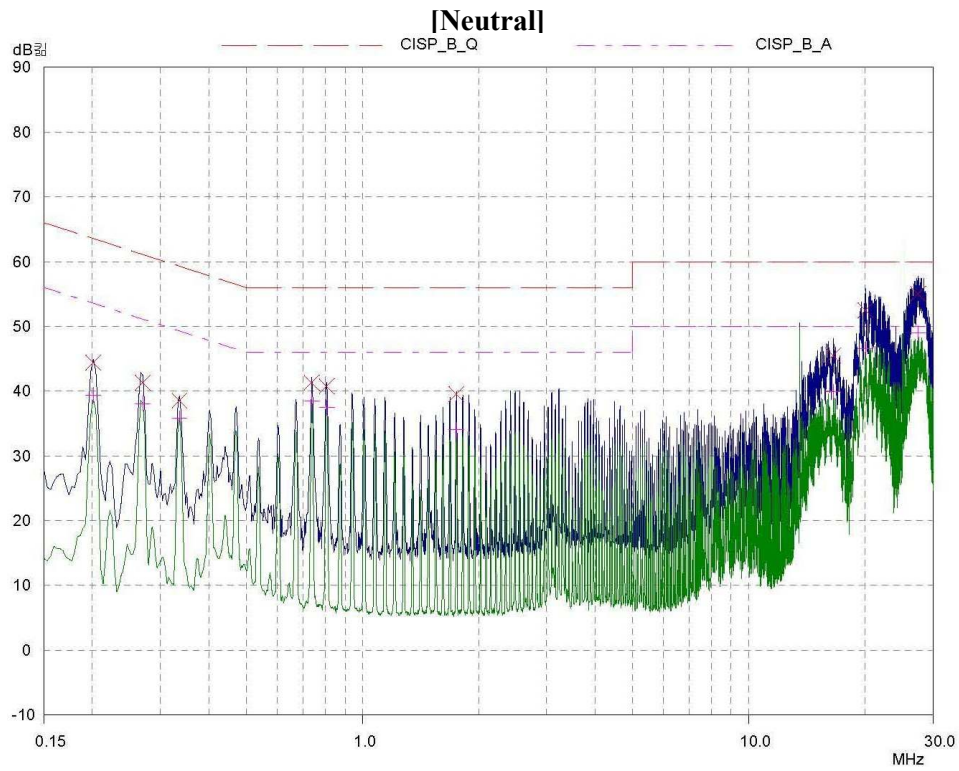
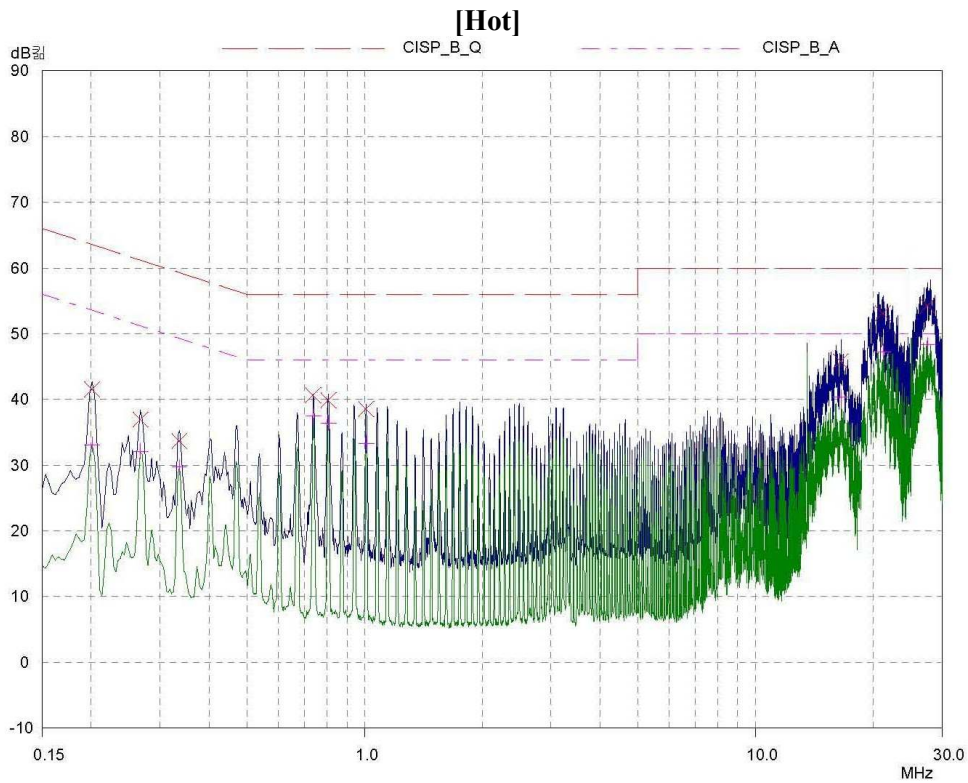
Decreases with the logarithm of the frequency.

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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	31.995	41.560	63.569	23.515	33.080	53.569
0.201	9.540	0.035	N	34.825	44.400	63.569	29.835	39.410	53.569
0.267	9.537	0.035	H	27.368	36.940	61.211	22.548	32.120	51.211
0.270	9.547	0.035	N	31.688	41.270	61.118	28.488	38.070	51.118
0.336	9.544	0.034	H	24.102	33.680	59.302	20.132	29.710	49.302
0.336	9.554	0.034	N	28.962	38.550	59.302	26.242	35.830	49.302
0.738	9.541	0.049	H	31.030	40.620	56.000	27.880	37.470	46.000
0.738	9.561	0.049	N	31.650	41.260	56.000	28.820	38.430	46.000
0.807	9.544	0.050	H	30.256	39.850	56.000	26.846	36.440	46.000
0.807	9.564	0.050	N	31.166	40.780	56.000	27.856	37.470	46.000
1.008	9.550	0.057	H	28.933	38.540	56.000	23.693	33.300	46.000
1.746	9.570	0.076	N	29.904	39.550	56.000	24.384	34.030	46.000
16.536	9.705	0.225	H	35.870	45.800	60.000	30.400	40.330	50.000
16.536	10.000	0.225	N	35.315	45.540	60.000	29.665	39.890	50.000
20.028	10.169	0.268	N	42.063	52.500	60.000	36.163	46.600	50.000
21.162	9.745	0.277	H	33.098	43.120	60.000	37.238	47.260	50.000
27.399	10.037	0.297	N	44.686	55.020	60.000	38.646	48.980	50.000
27.498	9.770	0.298	H	44.172	54.240	60.000	38.222	48.290	50.000





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Appendix A. Test equipment used for test

Equipment	Manufacturer	Model	Calibration due.
Spectrum Analyzer	R&S	FSP	2012.05.04
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	TABAI	MC711P	2012.05.06
EMI Test Receiver	Agilent	E7405A	2012.08.22
EMI Test Receiver	R&S	ESHS10	2012.05.09
LISN	R&S	ENV216	2013.02.27

Peripheral device

Device	Manufacturer	Model No.	Serial No.
Netbook	Lenovo	S10-2	2957N5K

Appendix B. Test setup photos





N/A