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TEST REPORT

Part 15 Subpart C 15.225

Equipment under test	Validator
Model name	KSCC-CB-B450R
FCC ID	RTQKSCCCBB450R
Applicant	LG CNS Co., Ltd.
Manufacturer	ATEC Co., Ltd.
Date of test(s)	2012.04.26 ~ 2012.05.03
Date of issue	2012.05.03

Issued to

LG CNS CO., LTD.
Prime Tower, #10-1, Hoehyun-dong, 2-ga, Jung-gu, Seoul, South Korea

Issued by

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
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Test and report completed by :	**Report approval by :**
	
Jeff Do Test engineer	Gyu-cheol Shin Technical manager

Revision history

Revision	Date of issue	Test report No.	Description
-	2012.05.03	KES-RF-120038	Initial

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1.0 General product description

Equipment under test	Validator
Model name	KSCC-CB-B450R
Serial number	N/A
Frequency Range	13.561 ㎒
Modulation technique	ASK
Number of channels	1
Antenna type	PCB antenna
Power source	DC 12 ~ 24 V

1.1 Test frequency

	Low channel	**Middle channel**	**High channel**
Frequency (㎒)	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

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

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

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
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

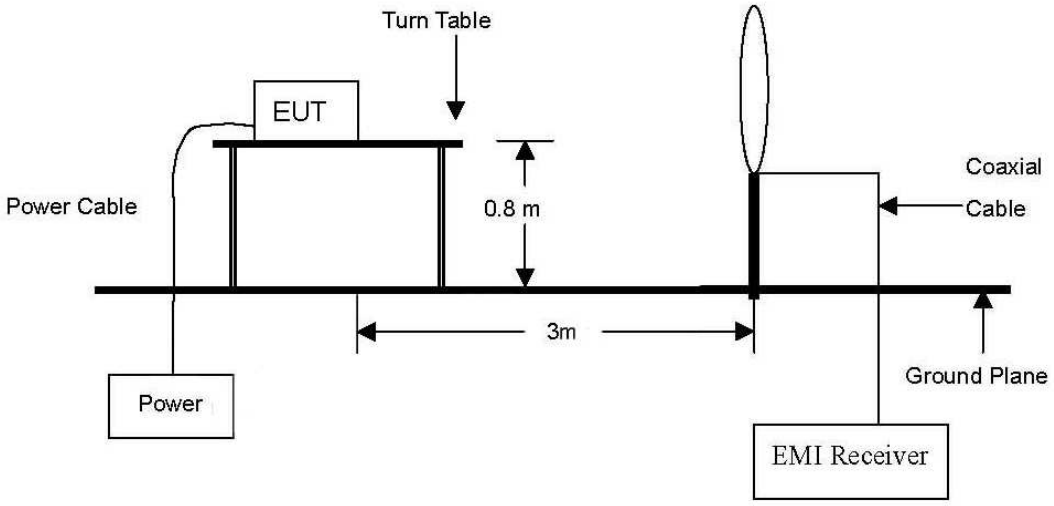
Test procedures
[9 ㎑ to 30 ㎒]
The EUT was placed on the top of a rotating table 0.8 meter above the ground at a 3 meter Open Area Test Site. The table was rotated 360 degrees to determine the position of the highest radiation. Then antenna is a loop antenna is fixed at one meter above the ground to determine 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 ㎐ for Quasi-peak detection (QP) at frequency below 9 ㎑~ 150 ㎑.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer 9 ㎑ for Quasi-peak detection (QP) at frequency below 150 ㎑~ 30 ㎒.

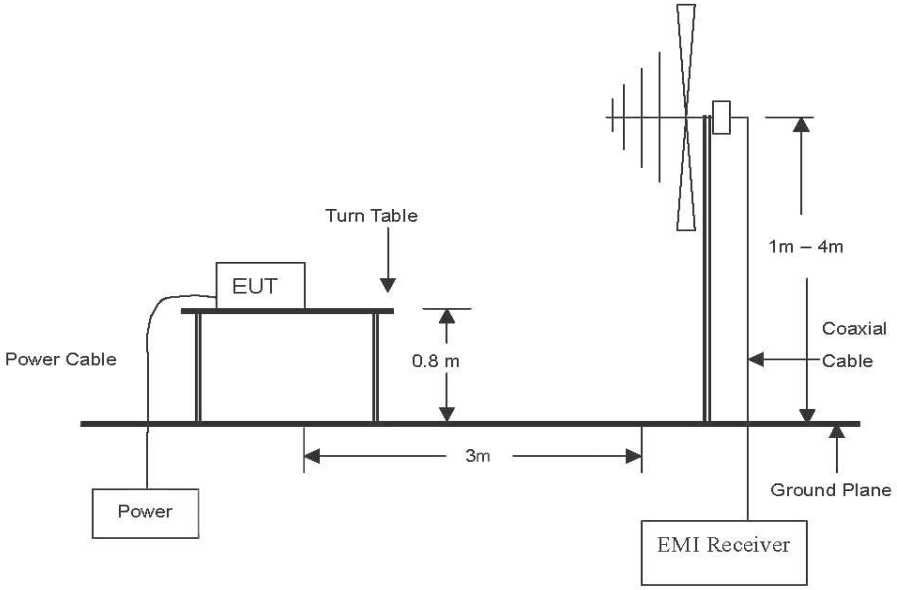
[30 ㎒ to 1 ㎓]
The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity.
The measurement was made in both the vertical and horizontal polarization, and the maximum value is presented in the report.

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

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



The diagram below shows the test setup that is utilized to make the measurements for emission from 30 ㎒ to 1 ㎓ 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 (㎒)	Distance (Meters)	Radiated (㎶/m)
0.009 ~ 0.490	300	2400 / F(㎑)
0.490 ~ 1.705	30	24000 / F(㎑)
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 ㎒, 76 ~ 88 ㎒, 174 ~ 216 ㎒ or 470 ~ 806 ㎒. 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 ㎒ shall not exceed 15,848 microvolts/meter (= 84 dB㎶/m) at 30 meters.

(b) Within the bands 13.410 ~ 13.553 ㎒ and 13.567 ~ 13.710 ㎒, the field strength of any emissions shall not exceed 334 microvolts/meter (=50.5 dB㎶/m) at 30 meters.

(c) Within the bands 13.110 ~ 13.410 ㎒ and 13.710 ~ 14.010 ㎒ the field strength of any emissions shall not exceed 106 microvolts/meter (=40.5 dB㎶/m) at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110 ~ 14.010 ㎒ band shall not exceed the general radiated emission limits in § 15.209.

Test results for fundamental

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Distance (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
13.561	38.08	H	18.30	0.57	-40	16.95	84.00	67.05
13.561	40.23	V	18.30	0.57	-40	19.10	84.00	64.90

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

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Distance (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
7.841	15.56	H	18.18	0.51	-40	-5.75	29.54	35.29
7.841	15.37	V	18.18	0.51	-40	-5.94	29.54	35.48

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

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Distance (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
17.961	15.81	H	18.61	0.62	-40	-4.96	29.54	-34.50
17.961	15.60	V	18.61	0.62	-40	-5.17	29.54	-34.71

※ Remark

1. Actual = Reading + Ant. factor + Cable loss + Distance
2. Distance correction below 30 ㎒ = 40log(3 m/30 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.

Test results (Below 1000 ㎒)

Radiated emissions		Ant.	Correction factors		Total	Limit	
Frequency (㎒)	Reading (dB㎶)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Actual (dB㎶/m)	Limit (dB㎶/m)	Margin (dB)
231.7	13.06	V	11.04	3.14	27.23	46.00	18.77
247.4	21.33	V	11.58	3.27	36.18	46.00	9.82
296.4	15.42	H	13.24	3.59	32.25	46.00	13.75
312.0	12.60	H	13.63	3.69	29.92	46.00	16.08
474.7	16.01	H	17.19	4.68	37.89	46.00	8.11
494.3	20.16	V	17.61	4.80	42.57	46.00	3.43
494.3	18.47	H	17.61	4.80	40.88	46.00	5.12
543.3	11.58	V	18.60	5.04	35.22	46.00	10.78
543.3	13.54	H	18.60	5.04	37.18	46.00	8.82
594.3	10.36	V	19.62	5.28	35.26	46.00	10.74
594.3	9.05	H	19.62	5.28	33.95	46.00	12.05
643.3	12.42	V	20.21	5.53	38.16	46.00	7.84
692.3	10.70	H	20.75	5.78	37.24	46.00	8.76
741.3	8.45	V	21.48	6.03	35.96	46.00	10.04
741.3	14.54	H	21.48	6.03	42.05	46.00	3.95
790.3	12.08	V	22.23	6.29	40.60	46.00	5.40
884.4	6.42	V	23.11	6.71	36.25	46.00	9.75
884.4	8.83	H	23.11	6.71	38.66	46.00	7.34
904.0	9.63	V	23.28	6.80	39.71	46.00	6.29
904.0	7.86	H	23.28	6.80	37.94	46.00	8.06

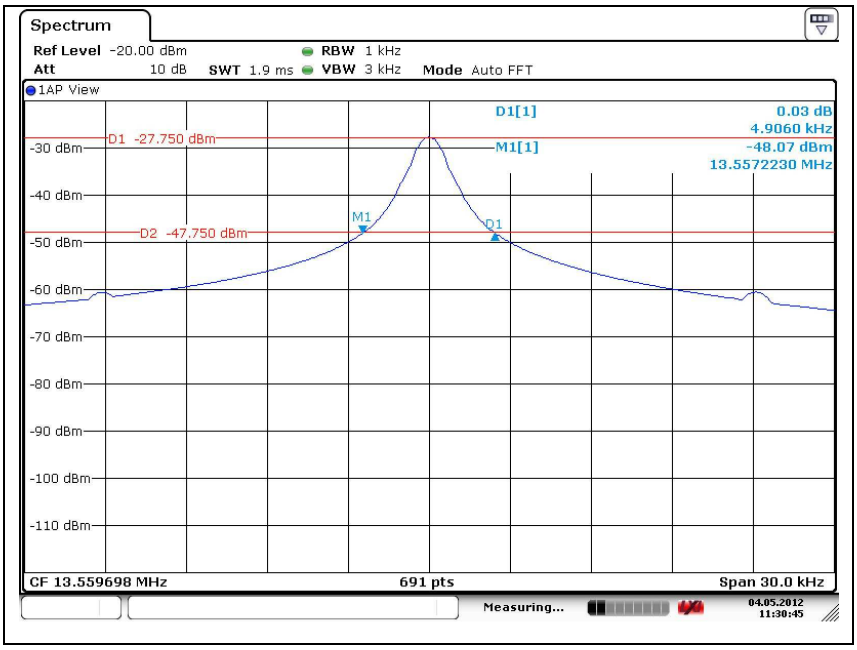
※ Remark

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

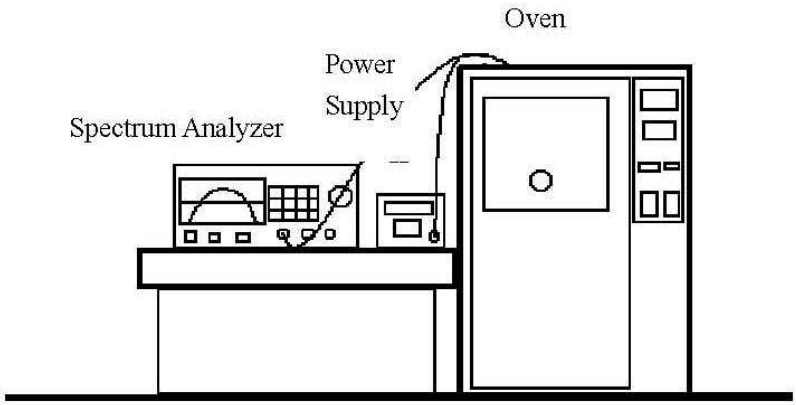
Test setup: The EUT was connected to a spectrum analyzer.

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 ㎑, VBW=1 ㎑.
3. Set the temperature of chamber to -20℃. 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℃ decreased per stage until the highest temperature 50℃ 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.

Test results

Test voltage (%)	Test voltage (V)	Temperature (℃)	Measure frequency (㎒)	Frequency deviation (㎐)	Deviation (%)
100 %	DC 24.0	-20	13.560 131	-869	-0.006 408
100 %		-10	13.560 078	-922	-0.006 799
100 %		0	13.560 093	-907	-0.006 688
100 %		10	13.559 849	-1 151	-0.008 488
100 %		20	13.559 684	-1 316	-0.009 704
100 %		30	13.559 855	-1 145	-0.008 443
100 %		40	13.560 140	-860	-0.006 342
100 %		50	13.559 911	-1 089	-0.008 030
85 %	DC 10.2	20	13.559 731	-1 269	-0.009 358
115 %	DC 27.6	20	13.559 704	-1 296	-0.009 557

Appendix A. Test equipment used for test

Equipment	Manufacturer	Model	Calibration due.
Spectrum Analyzer	R&S	FSV30	2013.01.10
DC Power Supply	Agilent	6632B	2012.05.06
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

Peripheral device

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

Appendix B. Test setup photo

N/A