



# TEST REPORT

## Part 15 Subpart C 15.225

**Equipment under test** TVM

**Model name** KSCC-B400C

**FCC ID** RTQKSCCB400C

**Applicant** LG CNS Co., Ltd.

**Manufacturer** ATEC Co., Ltd.

**Date of test(s)** 2012.06.29 ~ 2012.07.04

**Date of issue** 2012.07.05

**Issued to**

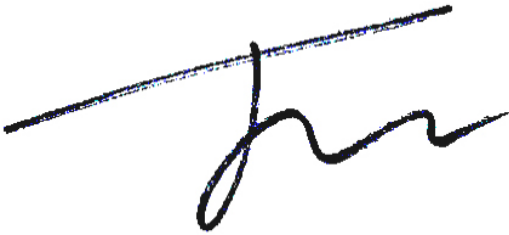

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**Revision history**

Revision	Date of issue	Test report No.	Description
-	2012.07.05	KES-RF-120048	Initial



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### 1.0 General product description

<b>Equipment under test</b>	TVM
<b>Model name</b>	KSCC-B400C
<b>Serial number</b>	N/A
<b>Frequency Range</b>	13.560 MHz
<b>Modulation technique</b>	ASK
<b>Number of channels</b>	1
<b>Antenna type</b>	PCB antenna
<b>Power source</b>	DC 24 V

### 1.1 Test frequency

	<b>Low channel</b>	<b>Middle channel</b>	<b>High channel</b>
<b>Frequency (MHz)</b>	13.560	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 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**

<b>Section in FCC Part 15</b>	<b>Parameter</b>	<b>Status</b>
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 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]

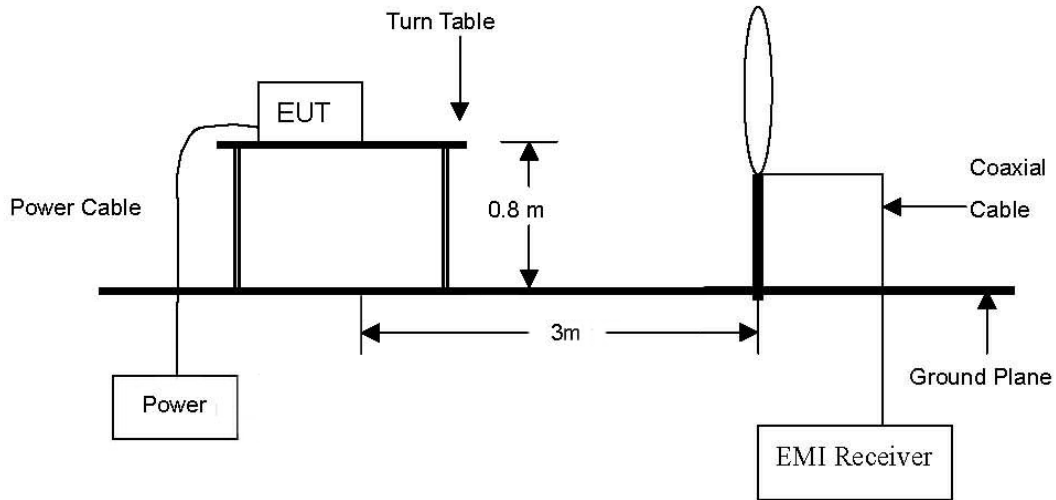
The height of the measuring antenna was varied between 1 to 4 m and the table was rotated a full revolution in order to obtain maximum values of the electric field intensity.

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

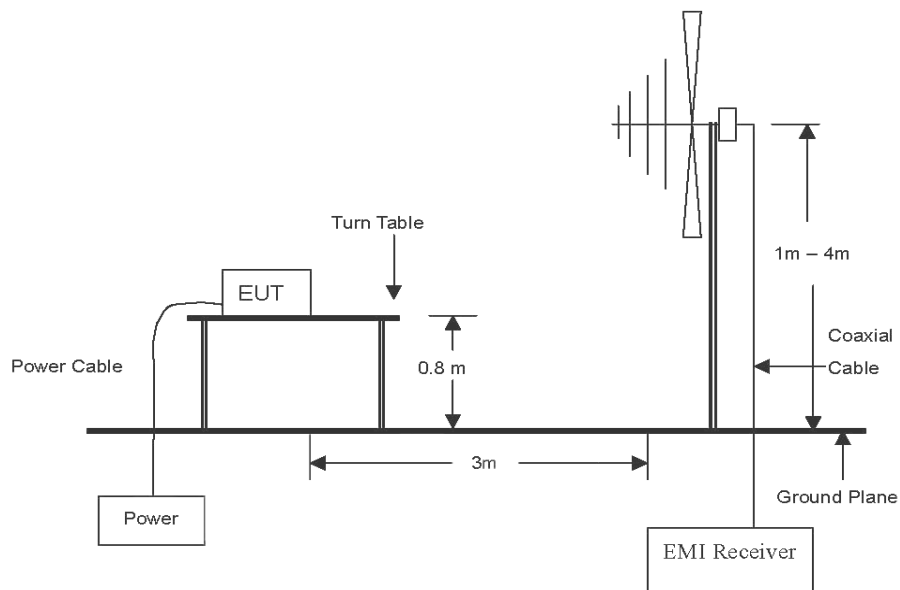
The spectrum analyzer is set to:

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.



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#### Test results for fundamental

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Distance (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
13.560	31.82	H	18.30	0.57	-40	10.69	84.00	73.31
13.560	29.74	V	18.30	0.57	-40	8.61	84.00	75.39

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

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Distance (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
0.055	17.87	H	18.30	0.19	-80	-43.64	32.79	76.43
0.064	22.23	V	18.30	0.19	-80	-39.28	29.96	69.24
1.640	25.39	H	18.20	0.47	-40	4.06	27.34	23.28
1.792	28.23	V	18.20	0.47	-40	6.90	29.54	22.64
10.151	33.97	V	18.16	0.46	-40	12.59	29.54	16.95

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

Radiated emissions		Ant.	Correction factors			Total	Limit	
Frequency (MHz)	Reading (dB $\mu$ V)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Distance (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
The emission level is much lower than the limit by over 20 dB.								

#### ※ Remark

- Actual = Reading + Ant. factor + Cable loss + Distance
- Distance correction below 30 MHz = 40log(3 m/30 m or 300 m)  
Measurement distance: 3 m
- Detector mode: Quasi peak
- 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 $\mu$ V)	Pol.	Ant. factor (dB/m)	Cable loss (dB)	Actual (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)
122.1	10.30	H	11.38	1.30	22.98	43.50	20.52
149.2	21.33	H	12.97	1.51	36.28	43.50	7.22
149.2	15.42	V	12.97	1.51	34.78	43.50	8.72
162.7	12.60	H	13.08	1.61	31.89	43.50	11.61
162.7	16.01	V	13.08	1.61	32.69	43.50	10.81
176.3	20.16	V	11.95	1.63	29.38	43.50	14.12
233.6	18.47	H	11.10	1.86	29.36	46.00	16.64
300.0	11.58	H	13.37	1.98	26.05	46.00	19.95

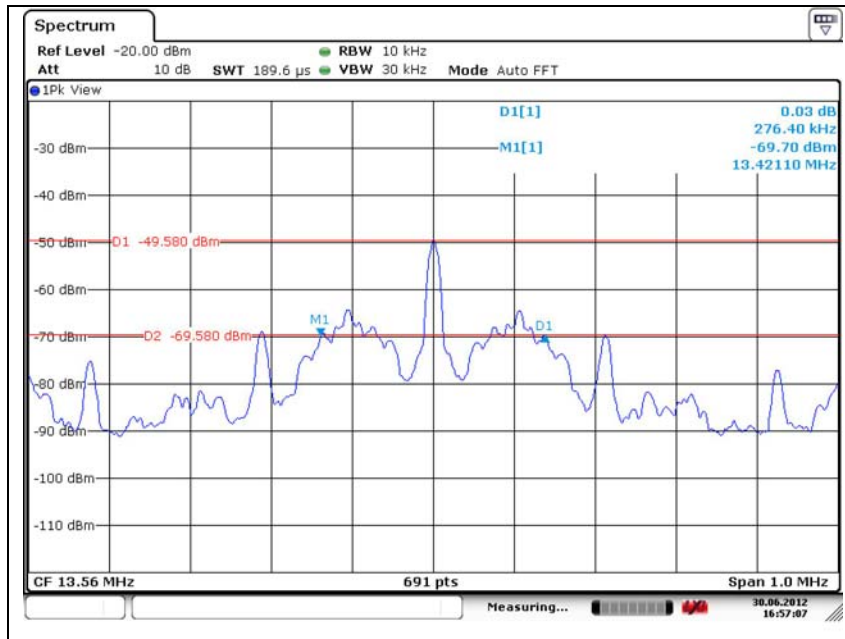
**※ Remark**

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

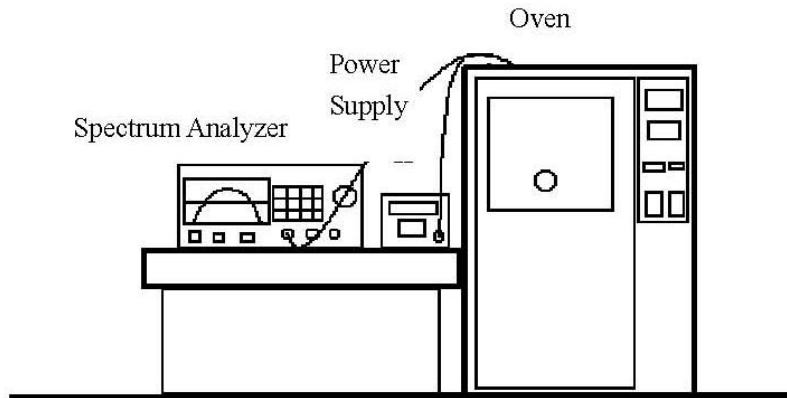
Test setup: The EUT was connected to a spectrum analyzer.

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 +/-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 %	DC 24.0	-20	13.560 261	261	0.001 924
100 %		-10	13.560 261	261	0.001 924
100 %		0	13.560 261	261	0.001 924
100 %		10	13.560 272	272	0.002 005
100 %		20	13.560 272	272	0.002 005
100 %		30	13.560 272	272	0.002 005
100 %		40	13.560 272	272	0.002 005
100 %		50	13.560 278	278	0.002 050
Battery End Point		DC 18.0	20	13.560 274	274
115 %	DC 27.6	20	13.559 272	272	0.002 005



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**Appendix A. Test equipment used for test**

Equipment	Manufacturer	Model	Calibration due.
Spectrum Analyzer	R&S	FSV30	2013.01.10
Loop Antenna	R&S	HFH2-Z2.335.4711.52	2013.03.10
Trilog-Broadband Antenna	SCHWARZBECK	VULB 9168	2013.04.28
Room chamber	Best Tech	TEMI550	2013.05.31
EMI Test Receiver	Agilent	E7405A	2012.08.22
DC Power Supply	HP	6674A	2012.12.05

**Peripheral device**

Device	Manufacturer	Model No.	Serial No.
N/A	-	-	-

**Appendix B. Test setup photo**

