

TEST REPORT

Part 15 Subpart C 15.225

1. Applicant

Name : Korea Creadic Life Co., Ltd.
Address : 3rd floor, Kolon building, 9-1, Dangsandong 1-ga,
Yeongdeungpogu, Seoul, Korea
FCC ID : PFY-ADPOP

2. Products

Name : AD-POP
Model/Type : ADPOP/ ASK
Manufacturer : Korea Creadic Life Co., Ltd.

3. Test Standard : 47 CFR FCC Part 15 Subpart C

4. Test Method : ANSI C63.4-2009

5. Test Result : Positive

6. Dates of Test : August 29, 2012 to September 04, 2012

7. Date of Issue : September 07, 2012

8. Test Laboratory : Korea Standard Quality Laboratories FCC Designation Number : KR0024 IC OATS Number : 9053A

Tested by



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Test Engineer:

Approved by



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Compliance Engineer:

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1.0 General product description

Equipment under test	AD-POP
Model name	ADPOP
Serial number	N/A
Frequency Range	13.561 MHz
Modulation technique	ASK
Number of channels	1
Antenna type	PCB antenna
Power source	DC 5V 2A

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

#102, Jangduk-Dong, Hwasung-City, Gyeonggi-Do, 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	S/N
USA	FCC	3 & 10 meter Open Area Test Sites and one conducted site to perform FCC Part 15/18 measurements.	100384
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)	KR0024
Canada	IC	3 & 10 meter Open Area Test Sites and one conducted site	9053A

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 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.

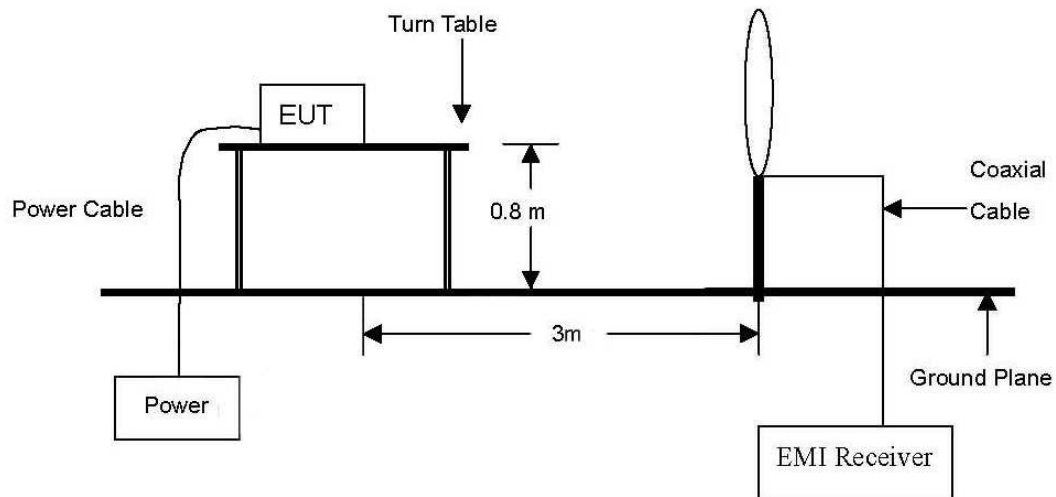
[30 MHz to 1 GHz]

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.

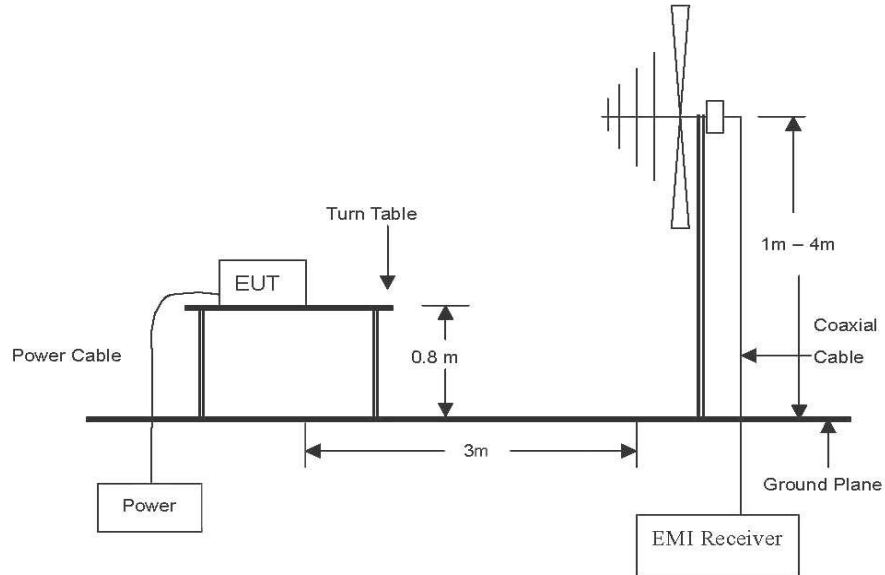
The spectrum analyzer is set to:

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 ($\mu V/m$)
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 $\mu V/m$) 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 $\mu V/m$) 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 $\mu V/m$) 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.

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	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 kHz 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)
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 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)
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 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.

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)
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

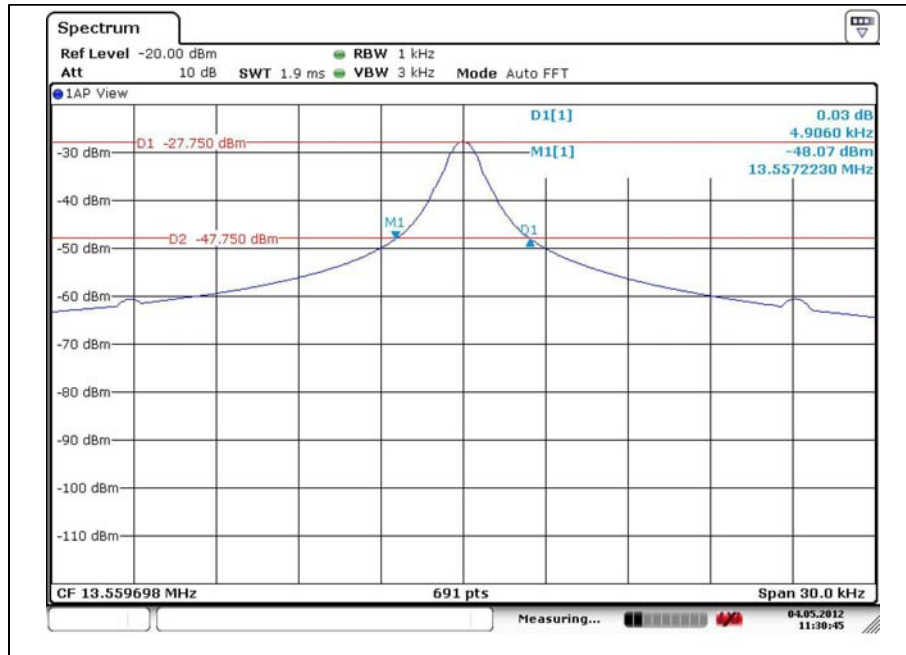
※ Remark

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

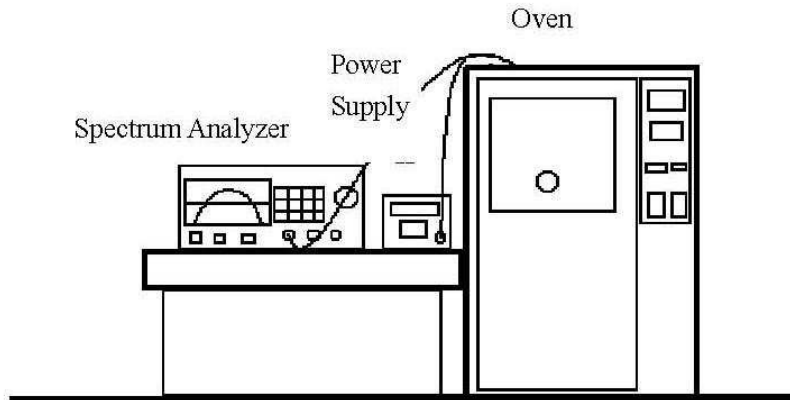
Test setup: The EUT was connected to a spectrum analyzer.

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 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.

Test results

Test voltage (%)	Test voltage (V)	Temperature (°C)	Measure frequency (MHz)	Frequency deviation (Hz)	Deviation (%)
100 %	DC 5	-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	-1089	-0.008 030
85 %	DC 4.25	20	13.559 731	-1269	-0.009 358
115 %	DC 5.75	20	13.559 704	-1296	-0.009 557

Appendix A. Test equipment used for test

No.	Description	Manufacturer	Model No.	Specifications	Next Cal. Data	Used equipment
1	EMI Test Receiver	LIG Nex1	LSA-265	3Hz~26.5GHz	12.12.27	■
2	Bi-log Antenna	Schwarzbeck	VULB9160	30~1GHz	13.11.17	■
3	Bi-log Antenna	Schaffner-Chase EMC Ltd.	CBL6140A	50V, 5A	N/A	□
4	Turn Table	KEI	KEI-TURN	1500×1000×800	N/A	□
5	Turn Table	KEI	KEI-TURN	1500×1000×800	N/A	■
6	Loop ANT.	Com-Power	AL-130	9kHz~30MHz	13.04.21	■
7	Spectrum Analyzer	LIG Nex1	ISA-265	1kHz~26.5GHz	13.05.24	■
8	Function Generator	Agilent	33120A	15MHz sine&square	13.06.08	□
9	Frequency Counter	HP	5350B	10Hz~20GHz	13.06.08	■
10	Modulation Analyzer	Agilent	8901B	10MHz~1.3GHz	13.06.08	□
11	Audio Analyaer	Agilent	8903B	20Hz~100kHz	13.06.08	□
12	Attenuator	Agilent	8494B	0~11dB, 18GHz	13.06.08	□
13	Attenuator	Agilent	8496B	0~110dB, 18GHz	13.06.08	□
14	Attenuator	Agilent	8495B	0~70dB, 18GHz	13.06.08	□
15	Attenuator	TAE SUNG	SMA-1	6dB	13.06.08	□
16	Attenuator	TAE SUNG	SMA-2	6dB	13.06.08	□
17	Power Meter	Agilent	E4418B	100kHz~110GHz, 0.0001uW~25100mW	13.06.08	■
18	Power Sensor	HP	8485A	50MHz~26.5GHz	13.06.08	■
19	Vibration Tester	Gana	GNV-400	10~60Hz, 0~4mm	13.06.21	□
20	RF Cable	Gigalane	SMS-LL280-SMS -1.5M	1.5m	N/A	■
21	Temp & Humidity Chamber	Seoksan Tech	SE-CT-02	-40~150℃, 30~98%	13.06.08	■
22	Signal Generator	Leader Electronics	3220	100kHz~1.3GHz	13.06.08	□
23	Oscilloscope	Tektronix	TDS-350	200MHz	13.06.08	□
24	Drop Tester	Self-made	KSQ-01	150cm	N/A	□
25	Pre Amplifier	GTC	GA-1825A	0.1~18GHz	13.06.08	■
26	Continuous operation tester	GTC	CT-100	Local Control	N/A	□
27	CW Generator	HP	83711B	1~20GHz	13.06.08	□
28	POWER DIVIDER	Agilent	11636B	26.5GHz	13.06.08	□
29	Power Sensor	Agilent	8482B	100kHz ~ 4.2GHz	13.06.08	□
30	Attenuator	Winswell	53-30-33	dc-2.5GHz, 500W	13.06.08	□
31	DC Power Supply	Hanil	HPS-505A	50V, 5A	13.06.08	■
32	Slidacs	Hanchang	5KV	5kW, 300V	13.06.08	□
33	Termination	Kwang Yeok	KYTE-NJ-150W	150W	13.06.08	□
34	Band-limited filter	MITECH	KSQ-02	600Ω	13.06.30	□
35	Signal Generator	WILTRON	6759B	10MHz ~ 26.5GHz	13.06.08	□
36	Digital Multimeter	DONG HWA	DM-300A	AC/DC 500V Max,320mA Max	13.06.08	■
37	Horn ANT.	SCHWARZBECK	BBHA 9120D	700MHz ~ 18GHz	14.07.12	■
38	DC Power Supply	ALINCO	DM-340MW	15V, 30A	13.06.08	■
39	LISN	Electro Metrics	ANS-25/2	2535	13.06.08	□
40	LISN	Kyoritsu	KNW-407	8-1010-14	13.06.08	□
41	Pulse Limiter	LIG Nex1	EPL-30	N/A	13.06.08	□

Appendix B. EUT photo

