Electromagnetic Emission

FCC MEASUREMENT REPORT

CERTIFICATION OF COMPLIANCE

FCC Part 15 Certification Measurement

PRODUCT	:	Barcode Scanner
MODEL/TYPE NO	:	KDC450 / Proto type
MULTIPLE MODEL	:	-
FCC ID	:	VH9KDC450
APPLICANT	:	AISOLUTION CO., LTD. 691-4, Mia-dong, Gangbuk-gu, Seoul, 137-896, Republic of Korea Attn.: HYOIN, LEE / Manager
MANUFACTURER	:	AISOLUTION CO., LTD. 691-4, Mia-dong, Gangbuk-gu, Seoul, 137-896, Republic of Korea
FCC CLASSIFICATION	:	DXX (Part 15 Low Power Communication Device Transmitter)
TYPE OF MODULATION	:	ASK
OPERATING FREQUENCY	:	13.56 MHz
ANTENNA TYPE	:	PCB Pattern Antenna
RULE PART(S)	:	FCC Part 15 Subpart C
PROCEDURE	:	ANSI C63.4-2003
TEST REPORT No.	:	ETLE130405.0358
DATES OF TEST	:	April 09, 2013 to April 15, 2013
REPORT ISSUE DATE	:	June 03, 2013
TEST LABORATORY	:	ETL Inc. (FCC Designation Number : KR0022)

The Barcode Scanner, Model KDC450 has been tested in accordance with the measurement procedures specified in ANSI C63.4-2003 at the ETL Test Laboratory and has been shown to be complied with the electromagnetic radiated emission limits specified in FCC Rule Part15 Subpart C section 15.225.
I attest to the accuracy of data. All measurement herein was performed by me or was made under my supervision and is correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.
The results of testing in this report apply to the product/system which was tested only. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.

Prepared by:
Hoon Pyo, Lee (Test Engineer)
June 03, 2013

Reviewed by:
Kug Kyoung, Yoon (Chief Engineer)
June 03, 2013

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Table of Contents

Head Office: # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788

FCC MEASUREMENT REPORT

Scope – *Measurement and determination of electromagnetic emission (EME) of radio frequency devices including intentional radiators and/or unintentional radiators for compliance with the technical rules and regulations of the U.S Federal Communications Commission(FCC)*

General Information

Applicant Name : AISOLUTION CO., LTD.

Address : 691-4, Mia-dong, Gangbuk-gu, Seoul, 137-896, Republic of Korea

Attention : HYOIN, LEE / Manager

- **EUT Type :** Barcode Scanner
- **Model Number :** KDC450
- **S/N :** Proto type
- **Type of Modulation :** ASK
- **Operating Frequency :** 13.56 MHz
- **Antenna Type :** PCB Pattern Antenna
- **FCC Rule Part(s) :** FCC Part 15 Subpart C
- **Test Procedure :** ANSI C63.4-2003
- **FCC Classification :** DXX (Part 15 Low Power Communication Device Transmitter)
- **Dates of Tests :** April 09, 2013 to April 15, 2013
- **Place of Tests :** ETL Inc. Testing Lab.

  Radiated Emission test;
  #499-1, Sagot-ri, Seosin-myeon, Hwaseong-si,
  Gyeonggi-do, 445-882, Korea

  Conducted Emission test;
  ETL Inc. Testing Lab.
  371-51, Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea
- **Test Report No. :** ETLE130405.0358

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1. INTRODUCTION

The measurement test for radiated and conducted emission test was conducted at the ETL Inc. The site is constructed in conformance with the requirements of the ANSI C63.4-2003 and CISPR Publication 16. The ETL has site descriptions on file with the FCC for 3 m and 10 m site configurations. Detailed description of test facility was found to be in compliance with FCC Rules according to the ANSI C63.4-2003 and registered to the Federal Communications Commission (FCC Designation Number : KR0022).

The measurement procedure described in American National Standard for Method of Measurement of Radio-Noise Emission from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (ANSI C63.4-2003) was used in determining radiated and conducted emissions from the AISOLUTION CO., LTD. Model: KDC450

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2. PRODUCT INFORMATION

2.1 Equipment Description

The Equipment Under Test (EUT) is the Barcode Scanner (model: KDC450).

2.2 General Specification

Item			Specification
Physical Characteristics	Size		2.4” x 3.7” x 0.4” ~ 0.7” 62 mm x 95 mm x 10 mm ~ 19 mm
	Weight		94 g
Electrical Characteristics	Battery		Lithium-Ion (3.7 V DC, 1 200 mAh)
	Charging		Via USB connector
	Typical Operating Current		300 mA @ 3.3 V
Scanning Performance	1D Laser		100 scans per second
	2D Image		752 x 480 CMOS sensor
User Environment	Drop Spec		5 feet (1.5 m)
	Temperature	Operating	(22.5 ± 22.5) ℃
		Storage	(12.5 ± 32.5) ℃
	Humidity		(45 ± 40) % R.H. (noncondensing)
Interfaces	Bluetooth	Bluetooth V2.1+EDR, Class2	
		HID/SPP/MFi (Optional 2 ports)	
		Operating Freq.	2 402 MHz ~ 2 480 MHz
		Freq. Channel	79 (CH space: 1 MHz)
		Modulation method	FHSS (GFSK (Normal), PSK (EDR))
	RFID	Operating Freq.	13.56 MHz
		Modulation method	ASK

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Item		Specification
Functionality	Memory Flash ROM	256 kB
	Memory RAM	64 kB
	Microprocessor	ARM7, 32 bits
	Real-time Clock	Quartz RTC
	Buzzer	92 dB
	Button	2 Scan, 1 Up, 1 Down
	LED	1
Barcode Symbologies	1 Dimensional	EAN, UPC, Code 39, code 93, Code 128, Codabar, Interleaved 2 of 5, GS1-128, Code 3 of 5
	2 Dimensional	All major 1D, 2D, Postal, OCR-A/B codes

- Frequency Channel Table (Bluetooth)

CH	MHz	CH	MHz	CH	MHz	CH	MHz	CH	MHz	CH	MHz	CH	MHz	CH	MHz
1	2402	11	2412	21	2422	31	2432	41	2442	51	2452	61	2462	71	2472
2	2403	12	2413	22	2423	32	2433	42	2443	52	2453	62	2463	72	2473
3	2404	13	2414	23	2424	33	2434	43	2444	53	2454	63	2464	73	2474
4	2405	14	2415	24	2425	34	2435	44	2445	54	2455	64	2465	74	2475
5	2406	15	2416	25	2426	35	2436	45	2446	55	2456	65	2466	75	2476
6	2407	16	2417	26	2427	36	2437	46	2447	56	2457	66	2467	76	2477
7	2408	17	2418	27	2428	37	2438	47	2448	57	2458	67	2468	77	2478
8	2409	18	2419	28	2429	38	2439	48	2449	58	2459	68	2469	78	2479
9	2410	19	2420	29	2430	39	2440	49	2450	59	2460	69	2470	79	2480
10	2411	20	2421	30	2431	40	2441	50	2451	60	2461	70	2471		

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3. DESCRIPTION OF TESTS

3.1 Conducted Emission

Conducted emissions measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2003. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 μH LISN as the input transducer to a Spectrum Analyzer or a Test Receiver. The measurements were made with the detector set for "Peak" amplitude within a bandwidth of 9 kHz or for "quasi-peak" within a bandwidth of 9 kHz.

The line-conducted emission test is conducted inside a shielded anechoic chamber room with 1 m x 1.5 m x 0.8 m wooden table which is placed 40 cm away from the vertical wall and 1.5 m away from the side wall of the chamber room. Two LISN are bonded to the shielded room. The EUT is powered from the LISN and the support equipment is powered from the other LISN. Power to the LISNs are filtered by a noise cut power line filters. All electrical cables are shielded by braided tinned steel tubing with inner ϕ 1.2 cm. If the EUT is a DC-powered device, power will be derived from the source power supply it normally will be powered from and these supply lines will be connected to the LISN. Non-inductive bundling to a 1 m length shortened all interconnecting cables more than 1 m. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. The RF output of the LISN was connected to the EMI Test Receiver to determine the frequency producing the maximum emission from the EUT. The frequency producing the maximum level was reexamined using to set Quasi-Peak mode by manual, after scanned by automatic Peak mode from 0.15 MHz to 30 MHz. The bandwidth of the spectrum analyzer was set to 9 kHz. The EUT, support equipment, and interconnecting cables were arranged and manipulated to maximize each emission.

Photographs of the worst-case emission can be seen in photographs of conducted emission test setup in Appendix B.

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3.2 Radiated Emission

Radiated emission measurements were made in accordance with section 11, "Measurement of Information Technology Equipment" of ANSI C63.4-2003. The measurements were performed over the frequency range of 30 MHz to 1 GHz using antenna as the input transducer to a spectrum analyzer or a field intensity meter. The measurements were made with the detector set for "Quasi-peak" within a bandwidth of 120 kHz.

Preliminary measurements were made at 3 m using broadband antennas, and spectrum analyzer to determined the frequency producing the maximum emission in shielded room. Appropriate precaution was taken to ensure that all emission from the EUT were maximized and investigated. The system configuration, mode of operation, turntable azimuth and height with respect to the antenna were noted for each frequency found. The spectrum was scanned from 30 MHz to 1 000 MHz using Log-Bicon antenna. Above 1 GHz, linearly polarized double ridge horn antennas were used. Final measurements were made open site at 3 m. The test equipment was placed on a wooden turn-table. Sufficient time for the EUT, support equipment, and test equipment was allowed in order for them to warm up to their normal operating condition. Each frequency found during pre-scan measurements was re-examined by manual. The detector function was set to CISPR Quasi-peak mode and the bandwidth of the receiver was set to 120 kHz or 1 MHz depending on the frequency of type of signal. The EUT, support equipment and interconnecting cables were re-configured to the set-up producing the maximum emission for the frequency and were placed on top of a 0.8 m high nonmetallic 1 m x 1.5 m table. The EUT, support equipment, and interconnecting cables were re-arranged and manipulated to maximize each emission. The turntable containing the system was rotated; the antenna height was varied 1 m to 4 m and stopped at the azimuth or height producing the maximum emission. Each emission was maximized by: varying the mode of operation to the EUT and/or support equipment and changing the polarity of the antenna, whichever determined the worst-case emission.

Photographs of the worst-case emission can be seen in Photographs of the worst-case emission test setup can be seen in Appendix B.

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3.2.1 Radiated Emission Limits:

(1) According to §15.209 Radiated emission limits, general requirements

(a) 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:

Frequencies [MHz]	Field Strength [μV/m]	Measurement Distance [m]
0.009 - 0.490	2400/F (kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54 MHz - 72 MHz, 76 MHz - 88 MHz, 174 MHz - 216 MHz or 470 MHz - 806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241

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3.3 Carrier field strength and field strength outside 13.110 MHz - 14.010 MHz and occupied bandwidth

(1) According to §15.225 Operation within the band 13.110 MHz - 14.010 MHz

(a) The field strength of any emissions within the band 13.553 MHz - 13.567 MHz shall not exceed 15 848 micro volts/meter at 30 meters
(b) Within the bands 13.410 MHz - 13.553 MHz and 13.567 MHz - 13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters
(c) Within the bands 13.110 MHz - 13.410 MHz and 13.710 MHz - 14.010 MHz, the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters
(d) The field strength of any emissions appearing outside of the 13.110 MHz - 14.010 MHz band shall not exceed the general radiated emission limits in § 15.209

Frequency [MHz]	Field Strength Limit [μV/m] @ 30 m	Field Strength Limit [dB(μV/m)] @ 30 m	Field Strength Limit [dB(μV/m)] @ 3 m
13.110 - 13.410	106	40.5	80.5
13.410 - 13.553	334	50.5	90.5
13.553 - 13.567	15 848	84.0	124.0
13.567 - 13.710	334	50.5	90.5
13.710 - 14.010	106	40.5	80.5

(2) According to §15.215(c) Occupied bandwidth

(a) Intentional radiators operating under the alternative provisions to the general emission limits, as contained in § 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80 % of the permitted band in order to minimize the possibility of out-of-band operation.

3.4 Frequency tolerance

(1) According to §15.225 Operation within the band 13.110 MHz - 14.010 MHz

(e) The frequency tolerance of the carrier signal shall be maintained within ± 0.01 % of the operating frequency over a temperature variation of -20 ℃ to +50 ℃ 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 ℃. For battery-operated equipment, the equipment tests shall be performed using a new battery.

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3.5 FCC Part 15.205 Restricted Bands of Operations

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.694 75 - 16.695 25	608 - 614	5.35 - 5.46
2.173 5 - 2.190 5	16.804 25 - 16.804 75	960 - 1 240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1 300 - 1 427	8.025 - 8.5
4.177 25 - 4.177 75	37.5 - 38.25	1 435 - 1 626.5	9.0 - 9.2
4.207 25 - 4.207 75	73 - 74.6	1 645.5 - 1 646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1 660 - 1 710	10.6 - 12.7
6.267 75 - 6.268 25	108 - 121.94	1 718.8 - 1 722.2	13.25 - 13.4
6.311 75 - 6.312 25	123 - 138	2 200 - 2 300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2 310 - 2 390	15.35 - 16.2
8.362 - 8.366	156.524 75 - 156.525 25	2 483.5 - 2 500	17.7 - 21.4
8.376 25 - 8.386 75	156.7 - 156.9	2 690 - 2 900	22.01 - 23.12
8.414 25 - 8.414 75	162.012 5 - 167.17	3 260 - 3 267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3 332 - 3 339	31.2 - 31.8
12.519 75 - 12.520 25	240 - 285	3 345.8 - 3 358	36.43 - 36.5
12.576 75 - 12.577 25	322 - 335.4	3 600 - 4 400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490 MHz - 0.510 MHz.
[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1 000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1 000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

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4. TEST CONDITION

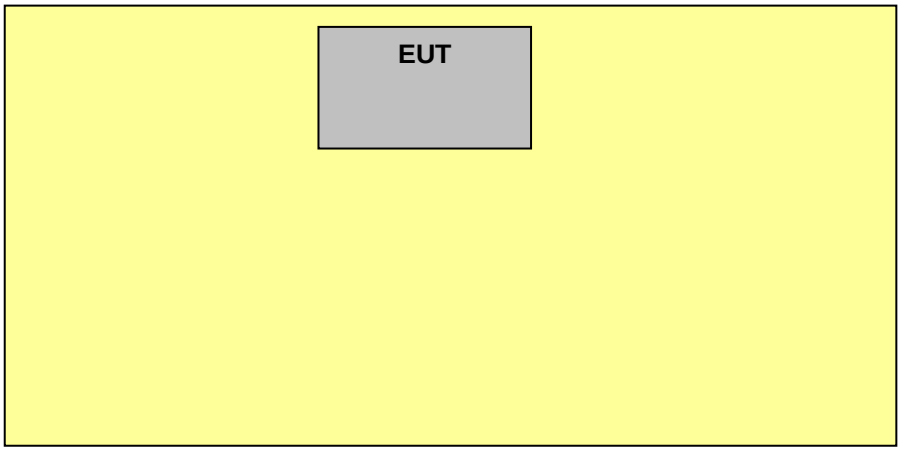
4.1 Test Configuration

The device was configured for testing in a typical fashion (as a customer would normally use it). During the tests, the EUT and the supported equipments were installed to meet FCC requirement and operated in a manner and which tends to maximize its emission level in a typical application.

4.2 EUT operation

- RF transmitting continuously during the tested.

4.3 The setup drawing(s)



: Signal Line

: Power Line

: Adapter

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5. TEST RESULTS

5.1 Summary of Test Results

The measurement results were obtained with the EUT tested in the conditions described in this report. Detailed measurement data and plots showing the maximum emission of the EUT are reported.

Test Rule Parts	Measurement Required	Result
15.207(a)(d)	Conducted emissions	**N/A ***
15.209 15.225(d)	Radiated emissions Field strength outside 13.110 MHz - 14.010 MHz	**Pass**
15.225(a)(b)(c)	13.56 MHz carrier field strength within the bands	**Pass**
15.215	Occupied Bandwidth	**Pass**
15.225(e)	Frequency Tolerance	**Pass**

*** EUT is powered by DC power supply that uses battery only. (Battery type: DC 3.7 V, Rechargeable Li-ion battery) If the USB port of EUT and host pc is connected, wireless does not work.**

The data collected shows that the **AISOLUTION CO., LTD. / Barcode Scanner / KDC450** complied with technical requirements of above rules part 15.207, 15.209, 15.215 and 15.225.

The equipment is not modified anything, mechanical or circuits to improve EMI status during a measurement. No EMI suppression device(s) was added and/or modified during testing.

Head Office: # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788

5.2 Radiated Emissions

EUT	Barcode Scanner / KDC450 (S/N: Proto type)
Limit apply to	FCC Part 15.209 and 15.225(d)
Test Date	April 10, 2013
Operating Condition	RF transmitting continuously during the tested
Result	Passed by 3.80 dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi-Peak mode (6 dB Bandwidth: 9 KHz, 120 kHz)

- Frequency Range from 9 kHz to 30 MHz Test Data

Frequency [MHz]	Reading [dB(μV) @ 3 m]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μV/m) @ 3 m]	Limit [dB(μV/m) @ 3 m]	Margin [dB]
7.19	30.58	H	14.59	0.53	45.70	49.50	3.80
12.72	17.20	H	14.63	0.67	32.50	49.50	17.00
13.07	18.00	H	14.62	0.68	33.30	49.50	16.20
14.41	26.71	H	14.59	0.70	42.00	49.50	7.50

- Frequency Range from 30 MHz to 1 000 MHz Test Data

Frequency [MHz]	Reading [dB(μV) @ 3 m]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μV/m) @ 3 m]	Limit [dB(μV/m) @ 3 m]	Margin [dB]
136.70	13.87	V	12.29	1.94	28.10	43.50	15.40
148.82	14.38	V	12.81	2.01	29.20	43.50	14.30
192.50	13.51	V	10.58	2.21	26.30	43.50	17.20
272.50	19.02	H	12.42	2.56	34.00	46.00	12.00

NOTES:

1. *** H : Horizontal polarization , ** V : Vertical polarization**
2. **Result = Reading + Antenna factor + Cable loss**
3. **Margin value = Limit - Result**
4. **The measurement was performed for the frequency range 9 kHz ~ 1 000 MHz according to FCC Part 15.209 and 15.225(d)**

Head Office: # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788

5.3 13.56 MHz carrier field strength within bands

EUT	Barcode Scanner / KDC450 (S/N: Proto type)
Limit apply to	FCC Part 15.225(a)(b)(c)
Test Date	April 10, 2013
Operating Condition	RF transmitting continuously during the tested
Result	Passed by 37.70 dB

Radiated Emission Test Data

The following table shows the highest levels of radiated emissions on both polarizations of horizontal and vertical.
Detector mode: CISPR Quasi-Peak mode (6 dB Bandwidth: 9 kHz)

Frequency [MHz]	Reading [dB(μV) @ 3 m]	Polarization (*H/**V)	Ant. Factor [dB/m]	Cable Loss [dB]	Result [dB(μV/m) @ 3 m]	Limit [dB(μV/m) @ 3 m]	Margin [dB]
13.350	27.51	H	14.61	0.68	42.80	80.50	37.70
13.420	29.11	H	14.61	0.68	44.40	90.50	46.10
13.490	30.71	H	14.61	0.68	46.00	90.50	44.50
13.640	28.00	H	14.61	0.69	43.30	90.50	47.20
13.670	27.10	H	14.61	0.69	42.40	90.50	48.10

NOTES:

1. *** H : Horizontal polarization , ** V : Vertical polarization**
2. **Result = Reading + Antenna factor + Cable loss**
3. **Margin value = Limit - Result**
4. **The measurement was performed for the frequency range 13.56 MHz according to FCC Part 15.225(a)(b)(c)**

Head Office: # 371-51 Gasan-dong, Geumcheon-gu, Seoul, 153-803, Korea Tel : 82-2-858-0786 Fax : 82-2-858-0788

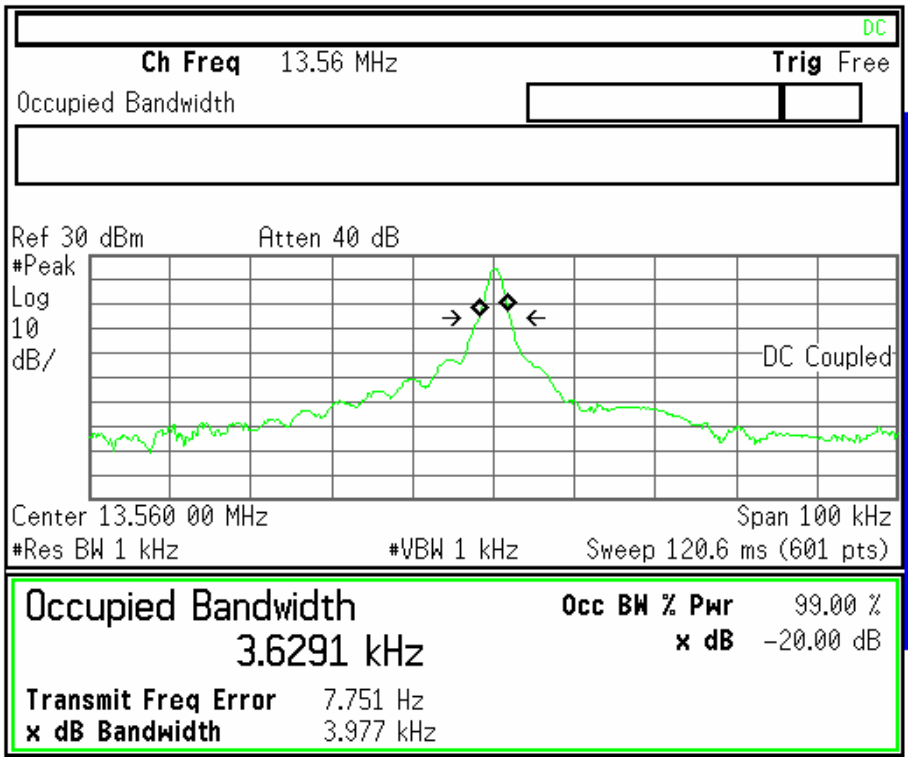
5.4 Occupied Bandwidth

EUT	Barcode Scanner / KDC450 (S/N: Proto type)
Limit apply to	FCC Part 15.215
Test Date	April 09, 2013
Operating Condition	RF transmitting continuously during the tested
Result	Passed

20 dB Bandwidth Test Data

The spectrum analyzer is set up to as following

- RBW: 1 kHz
- VBW: 1 kHz
- Span: 100 kHz
- Sweep: suitable duration based on the EUT specification



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5.5 Frequency Tolerance

EUT	Barcode Scanner / KDC450 (S/N: Proto type)
Limit apply to	FCC Part 15.215(e)
Test Date	April 15, 2013
Operating Condition	RF transmitting continuously during the tested
Result	Passed

Frequency Tolerance Test Data

The Frequency Tolerance of the carrier signal shall be maintained within ± 0.01 % of operating frequency over a temperature variation of -20 ℃ to +50 ℃ 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 ℃.

- Operating frequency: 13.56 MHz
- Limit: ± 1 356 Hz
- Within the band: 13.558 644 MHz - 13.561 356 MHz

Frequency Stability Versus Environment Temperature (+50 ℃ ~ -20 ℃)

Reference Frequency: 13.56 MHz					Limit: ± 1 356 Hz			
Environment Temperature [℃]	Frequency Measure with Time Elapsed							
	Start up		2 Minute		5 Minute		10 Minute	
	MHz	Deviation	MHz	Deviation	MHz	Deviation	MHz	Deviation
50	13.560 098	0.000 098	13.560 079	0.000 079	13.560 082	0.000 082	13.560 084	0.000 084
40	13.560 112	0.000 112	13.560 095	0.000 095	13.560 080	0.000 080	13.560 078	0.000 078
30	13.560 131	0.000 131	13.560 109	0.000 109	13.560 099	0.000 099	13.560 095	0.000 095
20	13.560 170	0.000 170	13.560 145	0.000 145	13.560 122	0.000 122	13.560 119	0.000 119
10	13.560 223	0.000 223	13.560 175	0.000 175	13.560 147	0.000 147	13.560 143	0.000 143
0	13.560 230	0.000 230	13.560 189	0.000 189	13.560 170	0.000 170	13.560 163	0.000 163
-10	13.560 244	0.000 244	13.560 224	0.000 224	13.560 214	0.000 214	13.560 210	0.000 210
-20	13.560 248	0.000 248	13.560 246	0.000 246	13.560 244	0.000 244	13.560 240	0.000 240

Frequency Stability Versus Input Power (± 15 %): Environment Temperature: 25 ℃

Reference Frequency: 13.56 MHz					Limit: ± 1 356 Hz			
Power Supplied [Vdc]	Frequency Measure with Time Elapsed							
	Start up		2 Minute		5 Minute		10 Minute	
	MHz	Deviation	MHz	Deviation	MHz	Deviation	MHz	Deviation
3.15	13.560 148	0.000 148	13.560 120	0.000 120	13.560 109	0.000 109	13.560 106	0.000 106
3.70	13.560 151	0.000 151	13.560 121	0.000 121	13.560 112	0.000 112	13.560 108	0.000 108
4.26	13.560 146	0.000 146	13.560 118	0.000 118	13.560 110	0.000 110	13.560 105	0.000 105

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6. SAMPLE CALCU LATION

Sample Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor.
The basic equation with a sample calculation is as follows:

FS = RA + AF + CF

Where FS = Field Strength
RA = Receiver Amplitude
AF = Antenna Factor
CF = Cable Attenuation Factor

$dB(\mu V) = 20 \log_{10} (\mu V)$
dB(μV) = dBm + 107

Example : @ 7.19 MHz

Class B Limit = 49.50 dB(μV/m)

Reading = 30.58 dB(μV)

Antenna Factor + Cable Loss = 14.59 + 0.53 = 15.12 dB(μV/m)

Total = 45.70 dB(μV/m)

Margin = 49.50 – 45.70 = 3.80 dB

= 3.80 dB below Limit

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7. List of test equipments used for measurements

Test Equipment		Model	Mfg.	Serial No.	Cal. Date	Cal. Due Date
☒	EMI Test Receiver	ESVS 10	R&S	835165/001	13.03.18	14.03.18
☒	TEMP.&HUMID. Chamber	PL-1KP	Tabai Espec Corp.	14006754	13.03.19	14.03.19
☒	LogBicon Antenna	VULB9160	Schwarzbeck	3128	12.02.22	14.02.22
☒	PSA Series Spectrum Analyzer	E4440A	Agilent	MY46185482	13.03.18	14.03.18
☒	Loop Antenna	AL-130	COM-POWER	121025	12.06.14	14.06.14
☒	Attenuator	33-30-34	Weinschel	BG9477	12.09.05	13.09.05
☒	DC Power Supply	DP30-05A	Toyo Tech	0300266	12.09.06	13.09.06
☒	Controller	HD2000	HD GmbH	C/125	N/A	N/A
☒	Antenna Master	MA2400	HD GmbH	N/A	N/A	N/A
☒	Turn-Table	TT 1.35 SI	SES	-	N/A	N/A
☒	Antenna Master	AM 4.5	SES	-	N/A	N/A

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