



FCC PART 15.225

TEST REPORT

For

Shanghai Smarfid Security Equipment Co., Ltd.

Room 301, 4th Bldg., No.4 TongLi Road, SongJiang District, Shanghai 201615, China

FCC ID: X3A-MG321356M

Report Type: Original Report	Product Type: Magic Series 13.56MHz reader
Test Engineer: <u>Allen Qiao</u> <i>Allen Qiao</i>	
Report Number: <u>R2SH130708053-00</u>	
Report Date: <u>2013-08-07</u>	
Reviewed By: Ivan Cao RF Leader	<i>Ivan Cao</i>
Test Laboratory: Bay Area Compliance Laboratories Corp. (Dongguan) No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China Tel: +86-769-86858888 Fax: +86-769-86858891 www.baclcorp.com.cn	

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP*, or any agency of the Federal Government.

* This report may contain data that are not covered by the NVLAP accreditation and shall be marked with an asterisk “★” (Rev.2)
This report is valid only with a valid digital signature. The digital signature may be available only under the Adobe software above version 7.0.

TABLE OF CONTENTS

GENERAL INFORMATION.....	3
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
OBJECTIVE	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY	3
TEST FACILITY	4
SYSTEM TEST CONFIGURATION.....	5
JUSTIFICATION	5
EUT EXERCISE SOFTWARE	5
SUPPORT EQUIPMENT LIST AND DETAILS	5
EXTERNAL CABLE.....	5
BLOCK DIAGRAM OF TEST SETUP	5
SUMMARY OF TEST RESULTS.....	6
FCC§15.203 - ANTENNA REQUIREMENT.....	7
APPLICABLE STANDARD	7
ANTENNA CONNECTED CONSTRUCTION	7
FCC§15.225, §15.205 & §15.209 - RADIATED EMISSIONS TEST	8
APPLICABLE STANDARD	8
MEASUREMENT UNCERTAINTY	8
EUT SETUP.....	9
EMI TEST RECEIVER SETUP.....	9
CORRECTED AMPLITUDE & MARGIN CALCULATION	9
TEST EQUIPMENT LIST AND DETAILS.....	10
TEST RESULTS SUMMARY	10
TEST DATA	10
FCC§15.225(E) - FREQUENCY STABILITY.....	12
APPLICABLE STANDARD	12
TEST PROCEDURE	12
TEST EQUIPMENT LIST AND DETAILS.....	12
TEST DATA	12
FCC §15.215(C) – 20 DB EMISSION BANDWIDTH.....	14
DECLARATION OF SIMILARITY	16

GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Shanghai Smarfid Security Equipment Co., Ltd.*'s product, model number: *MW322-8K (FCC ID: X3A-MG321356M)* or ("EUT") in this report is a *Magic Series 13.56MHz reader*, which was measured approximately: 11.5 cm (L) x 8.5 cm (W) x 2.5cm (H), rated input voltage: DC 12.0 V from system.

Note: The series product, model MW322-8K, MX322-8K, MC322-8K, MW322-8N, MX322-8N, MC322-8N are electrically identical except for model name and with or without buttons ("K" means have buttons, "N" means have no buttons), we selected MW322-8K for fully testing, and MW322-8N for Radiated Emission Test, the details was explained in the attached declaration letter.

** All measurement and test data in this report was gathered from production sample serial number: 130708053 (Assigned by Dongguan BACL). The EUT was received on 2013-07-09.*

Objective

This Type approval report is prepared on behalf of *Shanghai Smarfid Security Equipment Co., Ltd.* in accordance with Part 2, Subpart J, and Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The objective is to determine the compliance of the EUT with FCC rules, sec 15.203, 15.205, 15.207, 15.209 and 15.225.

Related Submittal(s)/Grant(s)

No Related Submittals.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Dongguan).

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Dongguan) to collect test data is located on the No.69 Pulongcun, Puxinhu Industrial Zone, Tangxia, Dongguan, Guangdong, China

Test site at Bay Area Compliance Laboratories Corp. (Dongguan) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 02, 2012. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 273710. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Dongguan) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 500069-0).



The current scope of accreditations can be found at <http://ts.nist.gov/standards/scopes/5000690.htm>

SYSTEM TEST CONFIGURATION

Justification

The system was configured for testing in a typical fashion (as normally used by a typical user).

EUT Exercise Software

No software was performed under test.

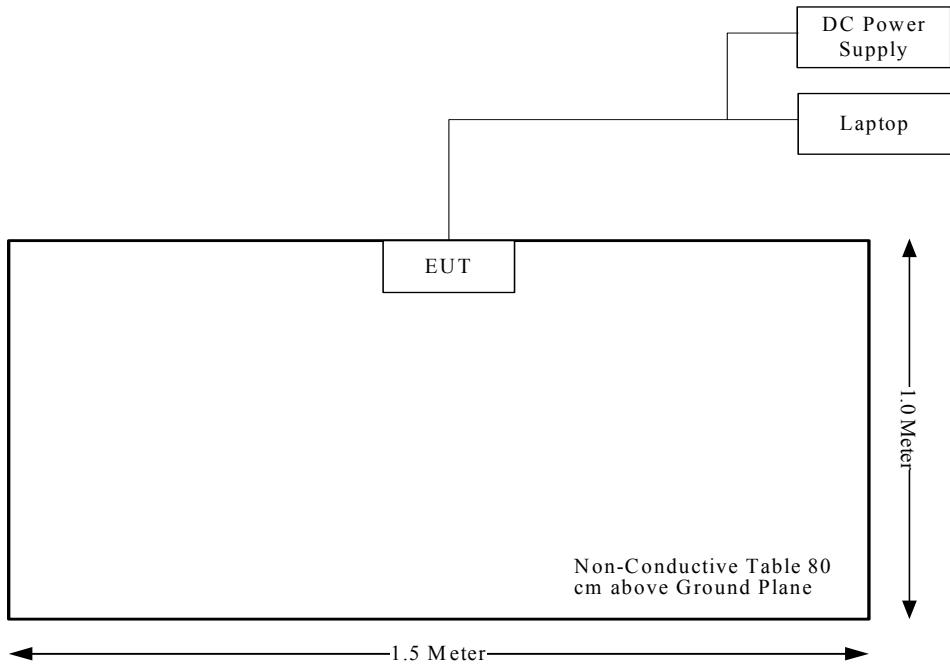
Support Equipment List and Details

Manufacturer	Description	Model	Serial Number
DELL	Laptop	PP11L	QDS-BRCM1017
Pro instrument	DC Power Supply	pps3300	N/A

External Cable

Cable Description	Length (m)	From	To
Shielded Un-detachable Control Cable	3.0	Serial port of Laptop and DC power Supply	EUT

Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207	AC Line Conducted Emission	Not Applicable*
§15.225 §15.209 §15.205	Radiated Emission Test	Compliance
§15.225(e)	Frequency Stability	Compliance
§15.215(c)	20 dB Emission Bandwidth	Compliance

Not Applicable*: the EUT was powered by DC 12V.

FCC§15.203 - ANTENNA REQUIREMENT

Applicable Standard

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Antenna Connected Construction

This EUT has an integrated antenna arrangement which fulfills the requirement of this section, and please refers to the internal photos.

Result: Compliance.

FCC§15.225, §15.205 & §15.209 - RADIATED EMISSIONS TEST

Applicable Standard

As per FCC Part 15.225

- (a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/meter 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 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 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.

Measurement Uncertainty

Compliance or non- compliance with a disturbance limit shall be determined in the following manner:

If U_{lab} is less than or equal to U_{cisp} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level exceeds the disturbance limit.

If U_{lab} is greater than U_{cisp} of Table 1, then:

- compliance is deemed to occur if no measured disturbance level, increased by $(U_{\text{lab}} - U_{\text{cisp}})$, exceeds the disturbance limit;
- non - compliance is deemed to occur if any measured disturbance level, increased by $(U_{\text{lab}} - U_{\text{cisp}})$, exceeds the disturbance limit.

Based on CISPR 16-4-2: 2011, measurement uncertainty of radiated emission at a distance of 3m at Bay Area Compliance Laboratories Corp. (Dongguan) is:

30M~200MHz: 5.0 dB

200M~1GHz: 6.2 dB

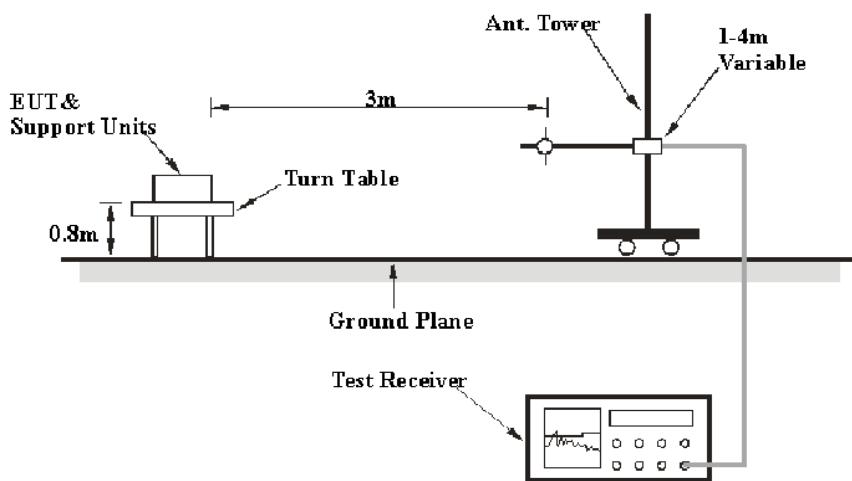
1G~6GHz: 4.45 dB

6G~18GHz: 5.23 dB

Table 1 – Values of U_{cisp}

Measurement	U_{cisp}
Radiated disturbance (electric field strength at an OATS or in a SAC) (30 MHz to 1000 MHz)	6.3 dB
Radiated disturbance (electric field strength in a FAR) (1 GHz to 6 GHz)	5.2 dB
Radiated disturbance (electric field strength in a FAR) (6 GHz to 18 GHz)	5.5 dB

EUT Setup



The radiated emission tests were performed in the 3-meter chamber a test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC Part Subpart C limits.

The spacing between the peripherals was 10 cm.

The EUT was connected to 12V DC power source.

EMI Test Receiver Setup

According to FCC Rules, 47 CFR 15.33, the EUT emissions were investigated up to 1000 MHz.

During the radiated emission test, the EMI test Receiver was set with the following configurations:

Frequency Range	RBW	Video B/W	Detector
9kHz – 150 kHz	300 Hz	1 kHz	QP
150KHz – 30 MHz	10 kHz	30 kHz	QP
30MHz – 1000 MHz	100 kHz	300 kHz	QP

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Loss and Cable Loss, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Meter Reading} + \text{Antenna Loss} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corr. Ampl.}$$

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	EMI TEST RECEIVER	ESCI	100224	2013-5-6	2014-5-5
Sunol Sciences	Antenna	JB3	A060611-1	2012-9-6	2015-9-5
HP	HP AMPLIFIER	8447E	2434A02181	N/A	N/A
The Electro-Mechanics Company	Passive Loop Antenna	6512	9706-1206	2012-11-30	2015-11-29

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209 with the worst margin reading of:

11.48 dB at 35.82 MHz in the Vertical polarization

Test Data**Environmental Conditions**

Temperature:	24.8 C
Relative Humidity:	57 %
ATM Pressure:	99.8kPa

* The testing was performed by Allen Qiao on 2013-08-01.

Test mode: Transmitting(MW322-8K was the worst)

1) Spurious Emissions (9 kHz~30 MHz):

Frequency (MHz)	Receiver		Factor (dB(1/m))	Cable loss (dB)	Amplifier Gain (dB)	Corrected Amplitude @ 3m (dB μ V/m)	FCC 15.225	
	Reading (dB μ V)	Detector (PK/QP/AV)					Limit @ 3m (dB μ V/m)	Margin (dB)
0.95	22.21	QP	48.10	0.76	21.50	49.57	69.50	19.93
5.63	18.24	QP	34.30	0.76	21.50	31.80	69.50	37.70
13.21	11.7	QP	32.10	0.76	21.50	23.06	80.50	57.44
13.415	17.37	QP	32.10	0.76	21.50	28.73	90.50	61.77
13.56	33.71	QP	32.10	0.76	21.50	45.07	124.00	78.93
13.575	16.91	QP	32.10	0.76	21.50	28.27	90.50	62.23
13.805	14.72	QP	32.10	0.76	21.50	26.08	80.50	54.42
21.561	13.72	QP	31.30	0.76	21.50	24.28	69.50	45.22

2) Spurious Emissions (30 MHz ~1 GHz):

Frequency	Receiver		Rx Antenna		Cable loss	Amplifier Gain	Corrected Amplitude	Limit	Margin
	Reading	Detector	Polar	Factor					
MHz	dB μ V	PK/QP/AV	H/V	dB(1/m)	dB	dB	dB μ V/m	dB μ V/m	dB
35.82	21.6	QP	H	17.67	0.77	21.42	18.62	40.00	21.38
35.82	31.5	QP	V	17.67	0.77	21.42	28.52	40.00	11.48
108.57	25.9	QP	H	12.63	1.27	21.41	18.39	43.50	25.11
108.57	38.1	QP	V	12.63	1.27	21.41	30.59	43.50	12.91

FCC§15.225(e) - FREQUENCY STABILITY

Applicable Standard

The frequency tolerance of the carrier signal shall be maintained within $\pm 0.01\%$ 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 Procedure

Frequency Stability vs. Temperature: The equipment under test was connected to PC, than to an external AC power supply and loop antenna was connected to a f Spectrum Analyzer. The EUT was placed inside the temperature chamber.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the Spectrum Analyzer.

Frequency Stability vs. Voltage: An external variable AC power supply Source. The voltage was set to 115% of the nominal value and was then decreased until the transmitter light no longer illuminated; i.e., the end point. The output frequency was recorded for each voltage.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum analyzer	FSP 38	100478	2013-6-16	2014-6-15
Dongzhixu	Humidity tester	DP1000	201105083-3	2013-7-3	2014-7-2
The Electro-Mechanics Company	Passive Loop Antenna	6512	9706-1206	2012-11-30	2015-11-29

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

Test Data

Environmental Conditions

Temperature:	28.8 °C
Relative Humidity:	59 %
ATM Pressure:	99.8 kPa

The testing was performed by Allen Qiao on 2013-08-01.

Test Mode: Transmitting

Test Result: Pass

$f_0 = 13.56 \text{ MHz}$				
Temperature	Voltage	Measured frequency	Frequency Error	Limit
°C	V _{DC}	MHz		
-20	12	13.56088	0.0065%	±0.01%
-10	12	13.5609	0.0066%	±0.01%
0	12	13.56088	0.0065%	±0.01%
10	12	13.56092	0.0068%	±0.01%
20	12	13.56085	0.0063%	±0.01%
30	12	13.56086	0.0063%	±0.01%
40	12	13.5609	0.0066%	±0.01%
50	12	13.56089	0.0066%	±0.01%
25	13.8	13.56088	0.0065%	±0.01%
25	10.2	13.56087	0.0064%	±0.01%

FCC §15.215(c) – 20 dB EMISSION BANDWIDTH

Applicable Standard

Per FCC §15.215 (c) 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 a 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.

Test Procedure

- 1 Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
- 2 Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
- 3 Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
R&S	Spectrum analyzer	FSP 38	100478	2013-6-16	2014-6-15
The Electro-Mechanics Company	Passive Loop Antenna	6512	9706-1206	2012-11-30	2015-11-29

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Dongguan) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to National Primary Standards and International System of Units (SI).

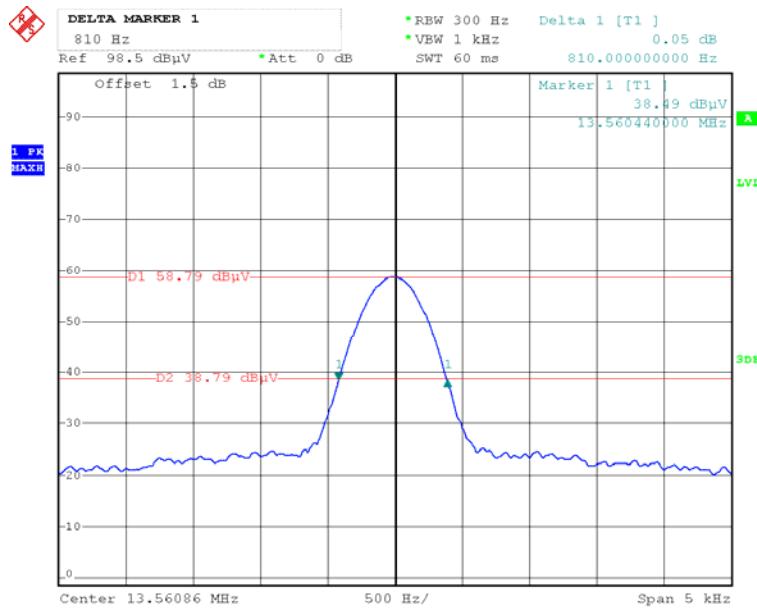
Test Data Environmental Conditions

Temperature:	28.8 °C
Relative Humidity:	59 %
ATM Pressure:	99.8 kPa

The testing was performed by Allen Qiao on 2013-08-01.

Test Mode: Transmitting

20 dB Emission Bandwidth



Date: 1.AUG.2013 16:56:48

DECLARATION OF SIMILARITY

Shanghai Smarfid Security Equipment Co., Ltd.
Add: Room 301, 4th Bldg., No.4 TongLi Road, SongJiang District, Shanghai 201615,
China
Tel: (86-21) 54260103, 54260132 ext.215 Fax: (86-21) 54260132 ext.222

DECLARATION OF SIMILARITY

July 08, 2013

To:

Bay Area Compliance Laboratories Corp.(Dongguan)
No.69 Pulong Village, Puxinhu Industry Zone, Tangxia, Dongguan, China
Tel: +86 769 86858888 Fax: +86 769 86858892
<http://www.baclcorp.com>

Dear Sir or Madam:

We Shanghai Smarfid Security Equipment Co., Ltd. hereby declare that product Magic Series 13.56MHz reader, model(s): MW322-8K, MX322-8K, MC322-8K, MW322-8N, MX322-8N, MC322-8N are electrically identical with the same electromagnetic emissions and electromagnetic compatibility characteristics. And MW322-8K is tested by BACL, the results of which are featured in BACL project: R2SH130708052, R2SH130708053, R2SH130708052-03

A description of the differences between the tested model and those that are declared similar areas follows:

Models: MW322-8K, MX322-8K, MC322-8K, MW322-8N, MX322-8N, MC322-8N just have different model names and "K" means have buttons but "N" means have no buttons.

Please contact me should there be need for any additional clarification or information.

Best Regards,

Xiaoling Yang
Hardware Engineer

*****END OF REPORT*****