



NVLAP LAB CODE 200707-0



FCC PART 15.225 EMI MEASUREMENT AND TEST REPORT

For

Shanghai Smarfid Security Equipment Co, Ltd.

Rm.206, 4th Bldg, No.471 Guiping Road, Shanghai, China

FCC ID: X3AMF34X8

Report Type: Original Report	Product Type: Mifare Slender Reader
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Report Number: RSZ09103051	
Report Date: 2009-12-29	
Reviewed By: EMC Engineer	<i>Merry Zhao</i>
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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*, NIST, or any agency of the Federal Government.
* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "*" (Rev.2)

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Shanghai Smarfid Security Equipment Co, Ltd.*'s product, model number: *MW3528 (FCC ID: X3AMF34X8)* or the "EUT" as referred to in this report is a *Mifare Slender Reader*. The EUT is measured approximately 15.0 cm L x 5.3 cm W x 2.5 cm H, rated input voltage: DC 12V from DV power source.

Note: The series products, model MW3528, MW3428, MW3438, MW3538, we select MW3528 to test, the all models have same circuit diagram, PCB, only LED color and number of LED have differences, which was explained in the attached Declaration Letter.

** All measurement and test data in this report was gathered from production sample serial number: 0910127 (Assigned by BAEL). The EUT was received on 2009-10-30.*

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 compliance 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 radiated and conducted emissions measurement was performed at Bay Area Compliance Lab Corp. (ShenZhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp.(Shenzhen) to collect test data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) 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 November 21, 2007. 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.: 382179. 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. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



NVLAP LAB CODE 200707-0

The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.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

N/A

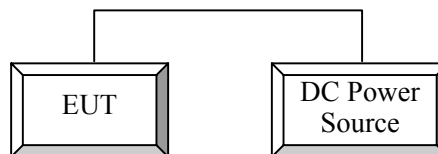
Equipment Modifications

Bay Area Compliance Lab Corp. (Shenzhen) has not done any modification on the EUT.

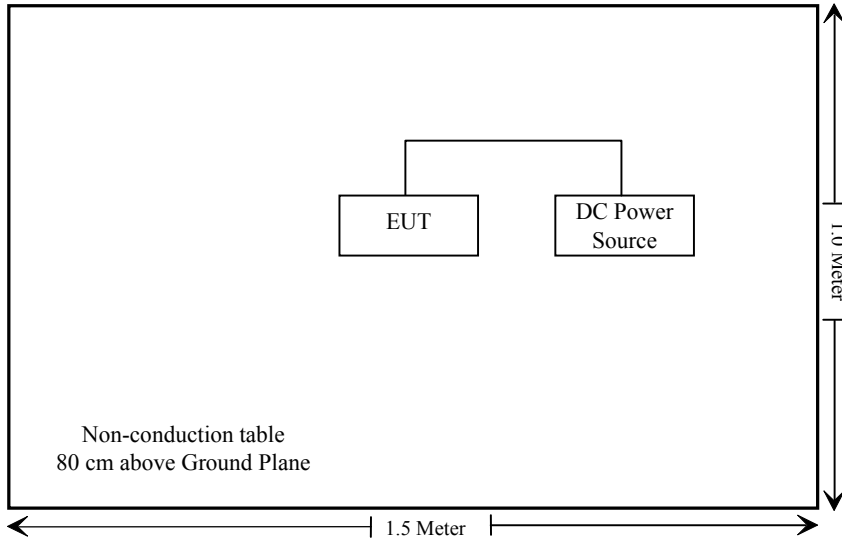
External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded Detachable DC Power Cable	0.5	EUT	DC Power Source

Configuration of Test Setup



Block Diagram of Test Setup



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of operation	N/A
§15.207	Conducted Emission	N/A
§15.209	Radiated Emission Test	Compliant*
§15.225(a) (b) (c) §15.31(f)	Field Strength of Radiated Emissions	Compliant
§15.225(d) §15.209, §15.31(f)	Out of Band Emission	Compliant
§15.225(e)	Frequency Stability	Compliant
§15.215(c)	20 dB Bandwidth Testing	Compliant

Note: * Within measurement uncertainty.

FCC §15.203 - ANTENNA REQUIREMENT

Standard Applicable

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

The EUT has a printed loop antenna on PCB, which complies with the Part 15.203. Please see EUT photo for details.

FCC §15.205 & §15.209 - RADIATED EMISSIONS TEST

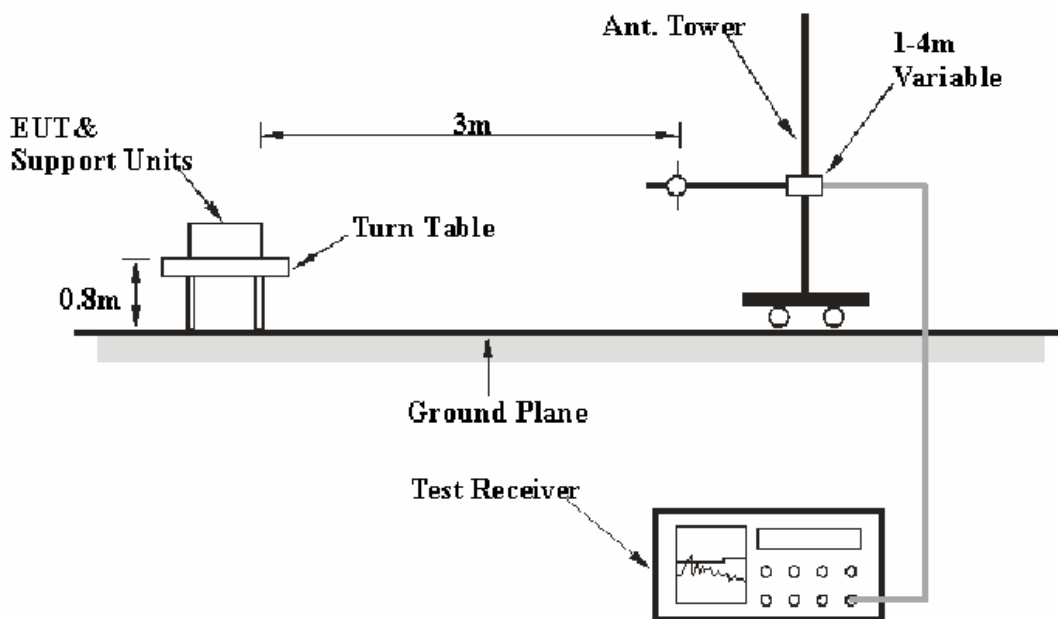
Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Lab Corp. (ShenZhen) is ± 4.0 dB.

The fundamental data was recorded in average detection mode: set the VBW AVE on, then record the data.

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 a 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:

<i>Frequency Range</i>	<i>RBW</i>	<i>Video B/W</i>
30 – 1000 MHz	100 kHz	300 kHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2009-08-02	2010-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-07	2010-11-06
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2009-03-11	2010-03-11
HP	Amplifier	8449B	3008A00277	2009-09-12	2010-09-11
Sunol Sciences	Horn Antenna	DRH-118	A052604	2009-05-05	2010-05-04
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2009-08-28	2010-08-27

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

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:

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

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

$$\text{Margin} = \text{Limit} - \text{Cord. Amp.}$$

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:

Below 1GHz:

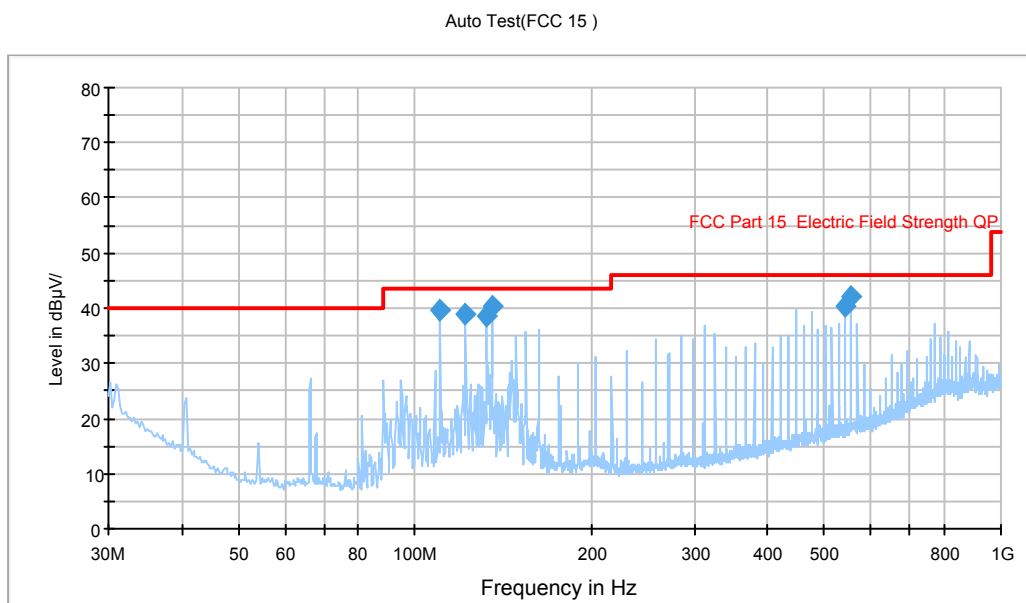
3.2 dB at 135.171250 MHz in the Horizontal polarization

Test Data**Environmental Conditions**

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Phoenix Liu on 2009-12-24.

Test mode: Reading Card

Below 1 GHz:

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBµV/m)	Margin (dB)
135.171250	40.3	181.0	H	202.0	-14.1	43.5	3.2*
110.582000	39.8	286.0	H	0.0	-14.7	43.5	3.7*
555.941250	42.2	100.0	V	80.0	-9.3	46.0	3.8*
122.054000	39.1	286.0	H	173.0	-13.7	43.5	4.4
132.711250	38.7	324.0	H	181.0	-13.9	43.5	4.8
542.239750	40.2	101.0	V	119.0	-9.5	46.0	5.8

* Within measurement uncertainty.

Above 1 GHz:

Note: The data which below the limit 20dB was not recorded.

FCC §15.225(a)(b)(c) & §15.31(f) – FIELD STRENGTH OF RADIATED EMISSIONS

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.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447E	1937A01046	2009-08-02	2010-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-07	2010-11-06
ETS	Passive Loop Antenna	6512	00029604	2009-03-04	2010-03-04

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

EUT Setup

The field strength of radiated emissions 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.

Test Data

Environmental Conditions

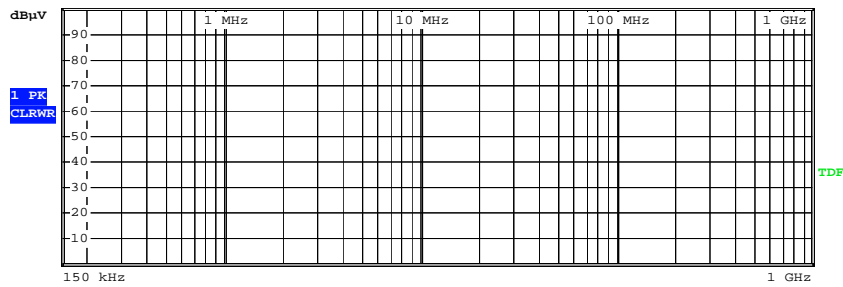
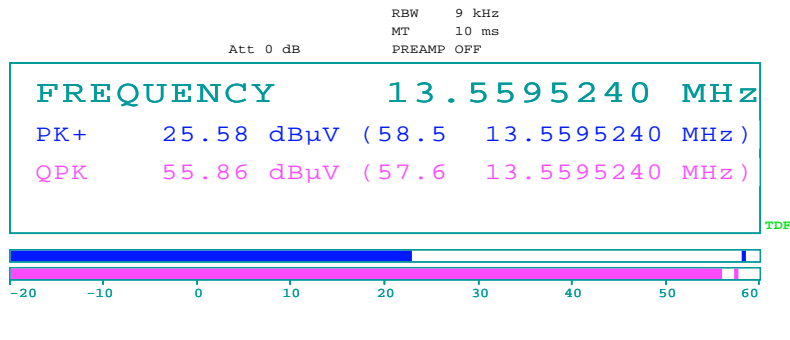
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Phoenix Liu on 2009-12-26.

Test Mode: Reading Card

Test Result: Pass

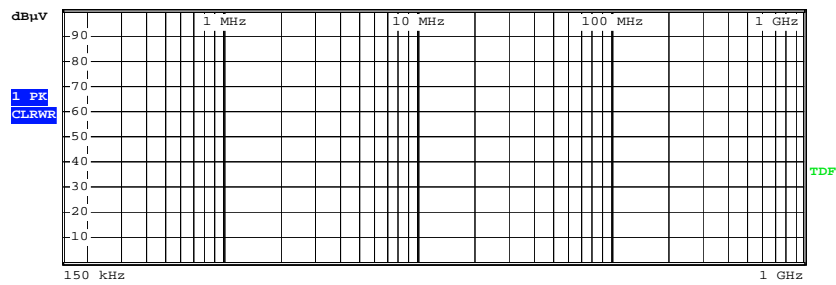
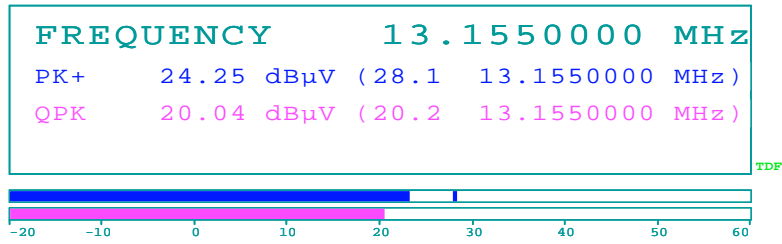
Indicated		Table Angle Degree	Antenna Height (m)	Detector PK/QP/AV	Correction Factor			Cord. Amp. (dBµV/m) @ 3m	FCC Part 15.225	
Frequency Range (MHz)	Mark Point (MHz)				Ant. Factor (dB)	Cable Loss (dB)	Pre-Amp. Gain (dB)		Limit (dBµV/m) @ 3m	Result
13.110-13.410	13.155	182	1.32	QP	32.1	0.20	0.0	20.2	80.5	Pass
13.410-13.553	13.506	180	1.31	QP	32.1	0.20	0.0	22.2	90.5	Pass
13.553-13.567	13.560	181	1.32	QP	32.1	0.20	0.0	57.6	124.0	Pass
13.567-13.710	13.567	180	1.30	QP	32.1	0.20	0.0	41.0	90.5	Pass
13.710-14.010	13.770	182	1.32	QP	32.1	0.20	0.0	29.5	80.5	Pass



Date: 26.DEC.2009 07:27:17



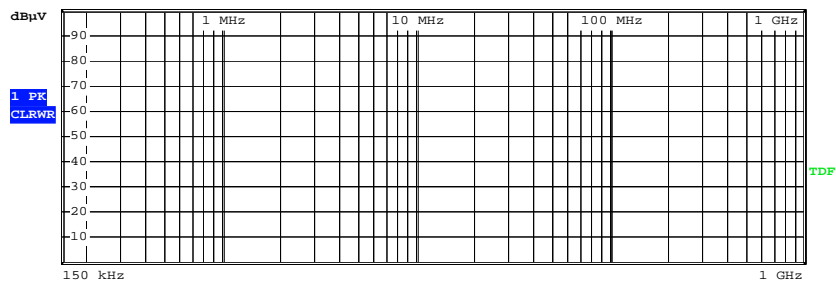
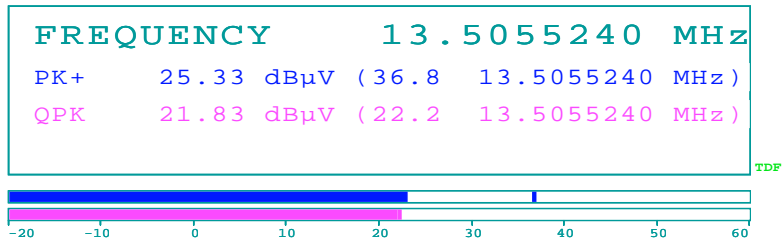
Att 0 dB RBW 9 kHz
MT 10 ms
PREAMP OFF



Date: 26.DEC.2009 07:25:21



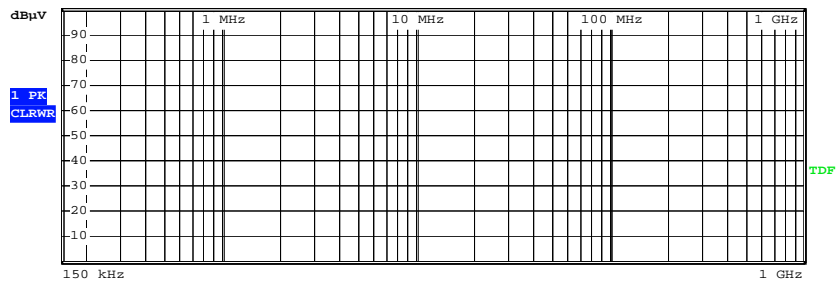
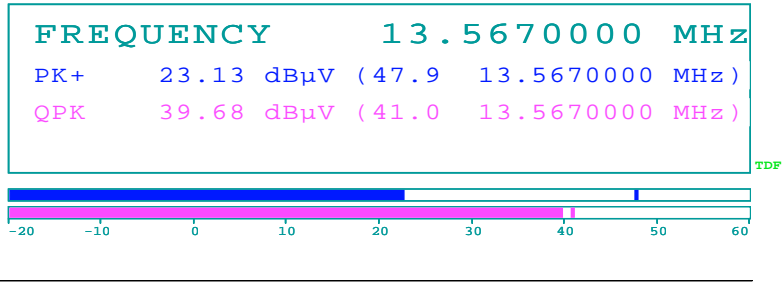
Att 0 dB RBW 9 kHz
MT 10 ms
PREAMP OFF



Date: 26.DEC.2009 07:26:20



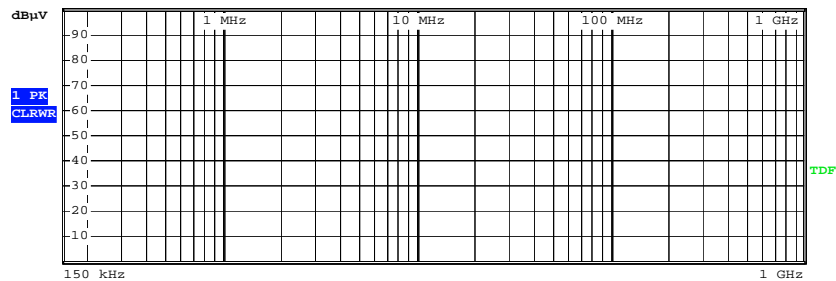
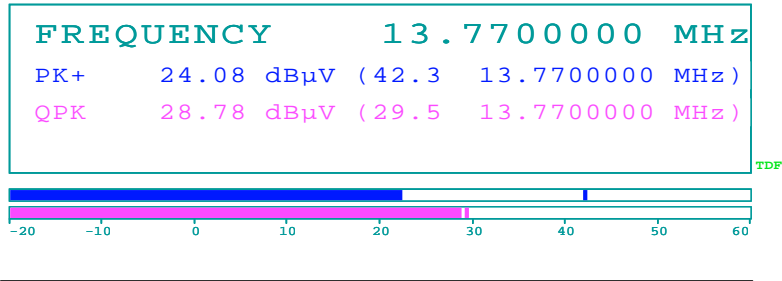
Att 0 dB RBW 9 kHz
MT 10 ms
PREAMP OFF



Date: 26.DEC.2009 07:28:20



Att 0 dB RBW 9 kHz
MT 10 ms
PREAMP OFF



Date: 26.DEC.2009 07:30:38

FCC §15.225(d) §15.209 & §15.31(f) - OUT OF BAND EMISSION**Applicable Standard**

As per FCC Part 15.225(d) §15.31(f) 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447E	1937A01046	2009-08-02	2010-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-07	2010-11-06
ETS	Passive Loop Antenna	6512	00029604	2009-03-04	2010-03-04

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

EUT Setup

The out of band 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.

Test Data**Environmental Conditions**

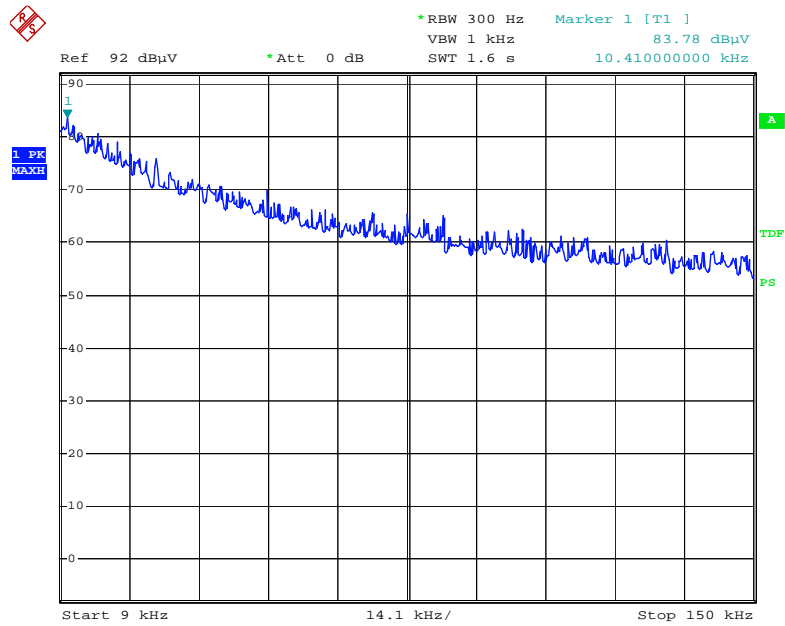
Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Phoenix Liu on 2009-12-26.

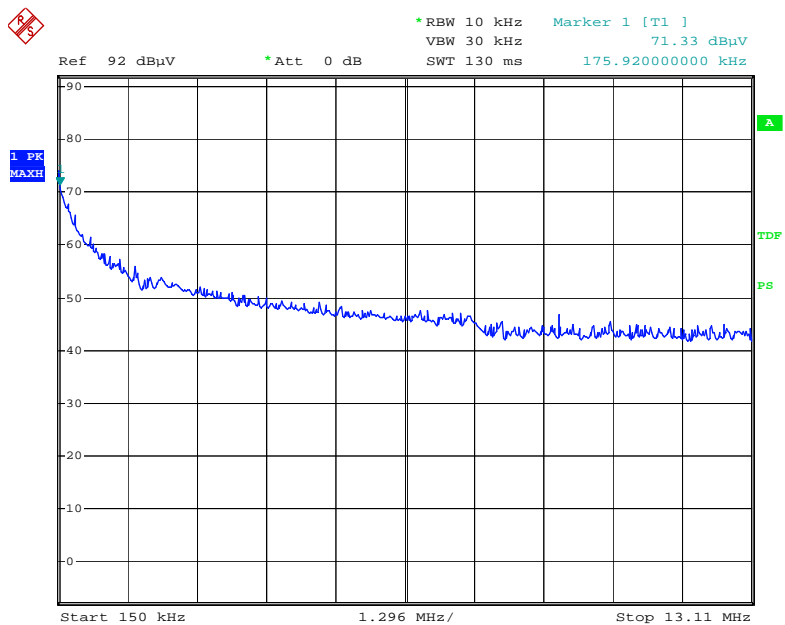
Test Mode: Reading Card

Indicated Frequency (MHz)	Table Angle Degree	Antenna Height (m)	Detector (PK/QP/AV)	Corrected Amplitude (dB μ V/m) @3m	FCC Part 15.225/209	
					Limit (dB μ V/m) @3m	Result
0.0104	180	1.52	PK	83.78	126.02	Pass
0.1759	180	1.51	PK	71.33	104.00	Pass
14.477	183	1.50	PK	45.89	69.50	Pass
29.660	181	1.52	PK	45.13	69.50	Pass

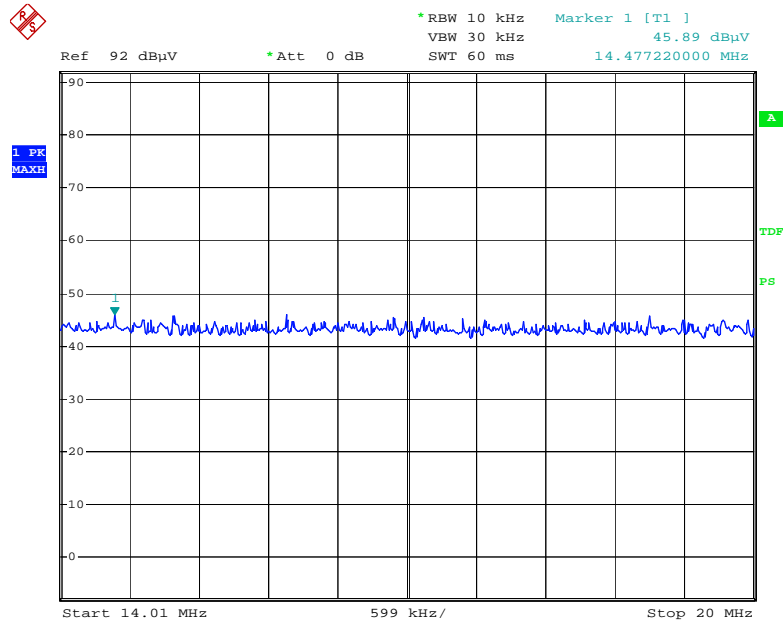
Test Result: Pass



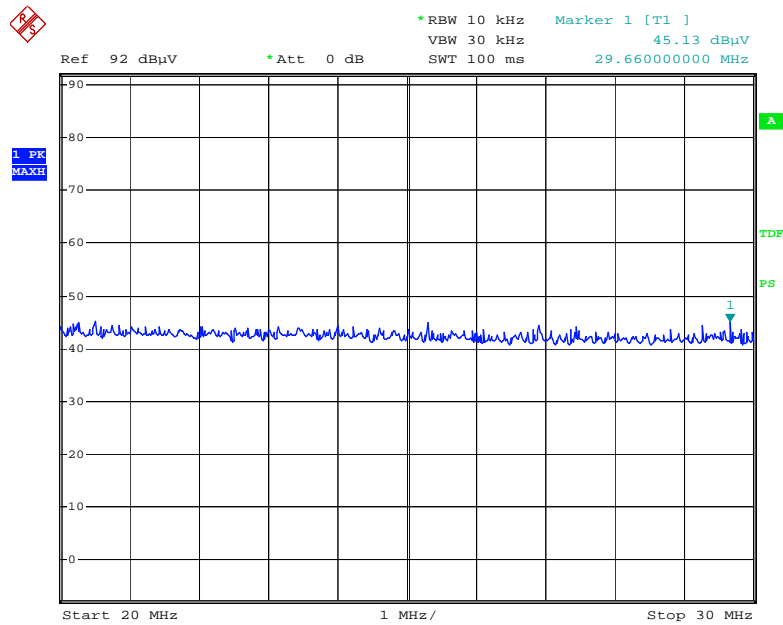
Date: 26.DEC.2009 07:34:13



Date: 26.DEC.2009 07:35:26



Date: 26.DEC.2009 07:36:08



Date: 26.DEC.2009 07:37:35

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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-07	2010-11-06
WUHUAN	Temperature & Humidity Chamber	HTP205	20021115	2009-05-09	2010-05-09

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

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 Data

Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Phoenix Liu on 2009-12-26.

Test Result: Pass

Test Mode: Reading Card

Test Environment		Frequency Reading (MHz)	Frequency Error	Part 15.225 Limit	Result
Power Supply to Laptop	Temperature (°C)				
DC 12V	-20	13.55947	-0.0039%	±0.01%	Pass
	-10	13.55946	-0.0040%	±0.01%	Pass
	0	13.55947	-0.0039%	±0.01%	Pass
	10	13.55946	-0.0040%	±0.01%	Pass
	20	13.55952	-0.0035%	±0.01%	Pass
	30	13.55949	-0.0038%	±0.01%	Pass
	40	13.55948	-0.0038%	±0.01%	Pass
	50	13.55948	-0.0038%	±0.01%	Pass
	60	13.55940	-0.0044%	±0.01%	Pass
Max. =DC 13.2 V	25	13.55949	-0.0038%	±0.01%	Pass
Min. = DC 10.8 V	25	13.55947	-0.0039%	±0.01%	Pass

FCC §15.215(c) – 20 dB BANDWIDTH TESTING

Requirement

Per 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 Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-07	2010-11-06
HP	Amplifier	8447E	1937A01046	2009-08-02	2010-08-02
Sunol Sciences	Bilog Antenna	JB1	A040904-2	2009-04-12	2010-04-11

* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

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 Data

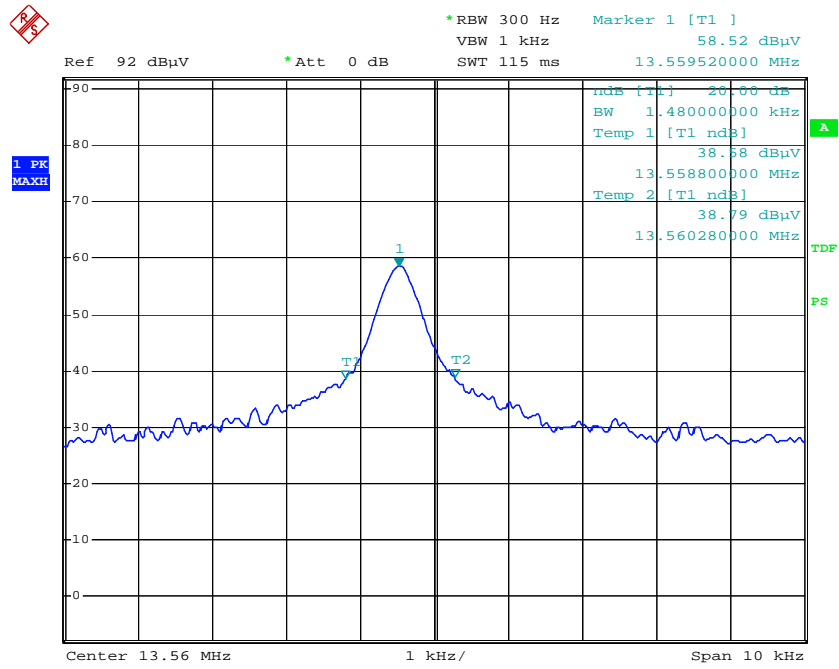
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Phoenix Liu on 2009-12-26.

Test Mode: Reading Card

20 dB Occupied Bandwidth



Date: 26.DEC.2009 07:33:06

PRODUCT SIMILARITY DECLARATION LETTER



Shanghai Smarfid Security Equipment Co, Ltd.

Different Declaration

We, Shanghai Smarfid Security Equipment Co, Ltd., declare that the Mifare Slender Reader, the MW3528; MW3428; MW3438; MW3538, which have the same circuit diagram and PCB layout inside. Base on different model, the LEDs color and the number of LEDs might be different. Thank you!

Sincerely,




Company: Shanghai Smarfid Security Equipment Co, Ltd.

Title: General Manager

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