Lab Code: 200707-0

FCC PART 15.225

TEST REPORT

For

Advanced Card Systems Ltd.

Units 2010-2013, 20/F, Chevalier Commercial Centre, Kowloon, Hong Kong

FCC ID: V5MACR1251U-A

Report Type:	**Product Type:**
Original Report	RFID Contactless Smart Card Reader and Writer

Test Engineer:	Henry Ding
Report Number:	RSZ120329005-00
Report Date:	2012-04-16
Reviewed By:	Alvin Huang EMC Manager
Test Laboratory:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 www.baclcorp.com.cn

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Advanced Card Systems Ltd.'s* product, model number: *ACR1251U-A (FCC ID: V5MACR1251U-A)* the "EUT" in this report is a *Contactless Smart Card Reader and Writer*. The EUT is measured approximately: 9.8 cm (L) x 6.5 cm (W) x 12.8 cm (H). Rated input voltage: DC 5V from USB.

** All measurement and test data in this report was gathered from production sample serial number: RR220-XXXXXX (Assigned by applicant). The EUT was received on 2012-03-29.*

Objective

This Type approval report is prepared on behalf of *Advanced Card Systems 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 C63.4-2009, 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 on 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 December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

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 an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (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

ACR38_100_122_PCSC_Driver_Installer Supply by Client

Equipment Modifications

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

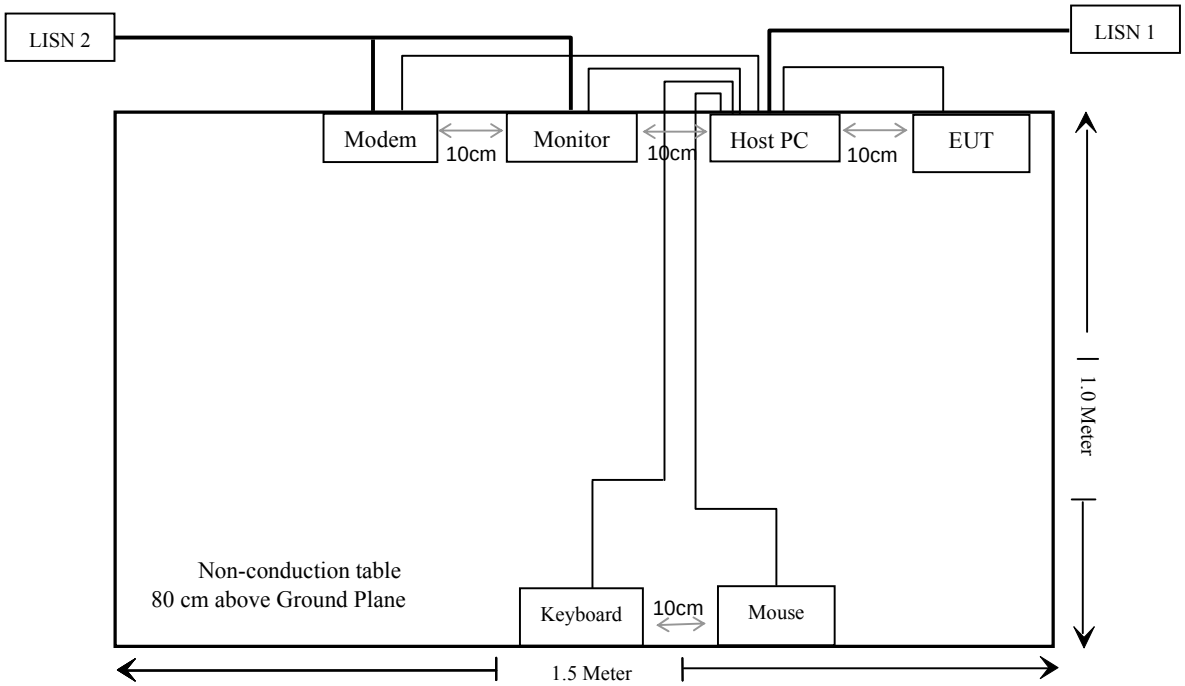
Local Support Equipment

Manufacturer	Description	Model	Serial Number
DELL	PC	DELL 170L	CN-0TC670-70821-560-F4WQ
DELL	LCD Monitor	E178WFPC	CN-OWY564-64180-7C4-2SQH
DELL	Mouse	MOC5UO	G1B0096D
DELL	Keyboard	L100	CNORH656658907BL04TY
SAST	Modem	AEM-2100	0293

External I/O Cable

Cable Description	Length (m)	From/Port	To
Unshielded Detachable K/B Cable	1.5	Host PC	K/B
Unshielded Detachable USB Cable	1.5	Host PC	Mouse
Unshielded Detachable VGA Cable	1.5	Host PC	Monitor
Shielded Detachable Serial Cable	1.2	Host PC	Modem
Unshielded Detachable USB Cable	0.9	EUT	PC

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	Compliance
§15.225 §15.209 §15.205	Radiated Emission Test	Compliance
§15.225(e)	Frequency Stability	Compliance

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

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

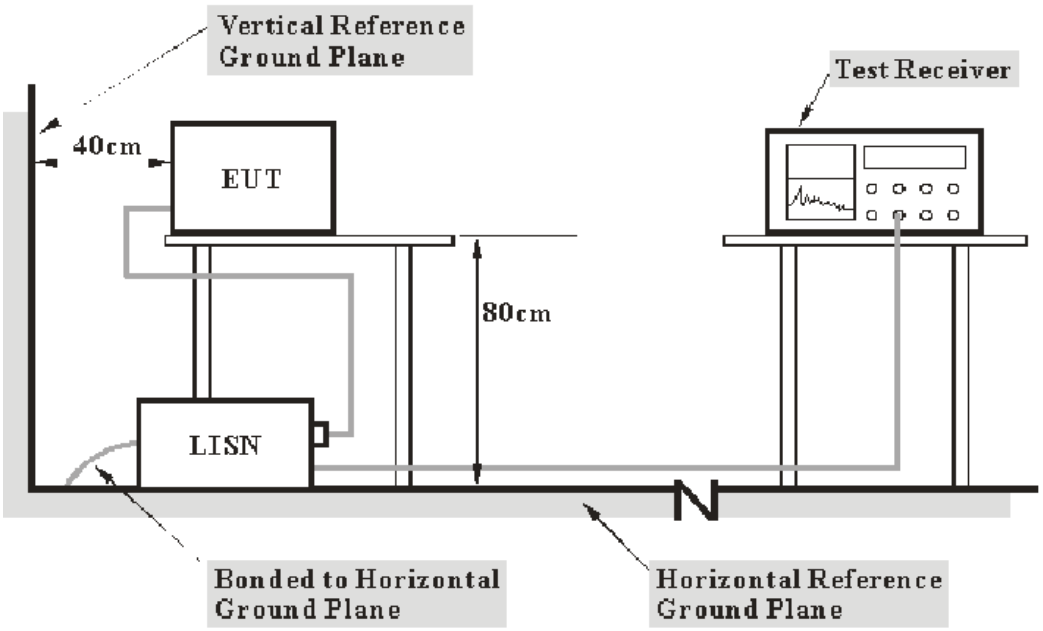
FCC §15.207 – AC LINE CONDUCTED EMISSION

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on CISPR 16-4-4, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at Bay Area Compliance Lab Corp. (Shenzhen) is 2.4 dB(k=2, 95% level of confidence).

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2009 measurement procedure. The specification used was with the FCC Part 15.207.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The host PC was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	***IF B/W***
150 kHz – 30 MHz	9 kHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245/006	2012-03-03	2013-03-02
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2012-03-09	2013-03-08
Rohde & Schwarz	Pulse limiter	ESH3Z2	DE25985	2011-07-08	2012-07-07

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

Test Procedure

During the conducted emission test, the host PC was connected to the outlet of the LISN.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the Quasi-peak and average detection mode.

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

6.38 dB at **12.375 MHz** in the **Neutral** conducted mode

Test Data

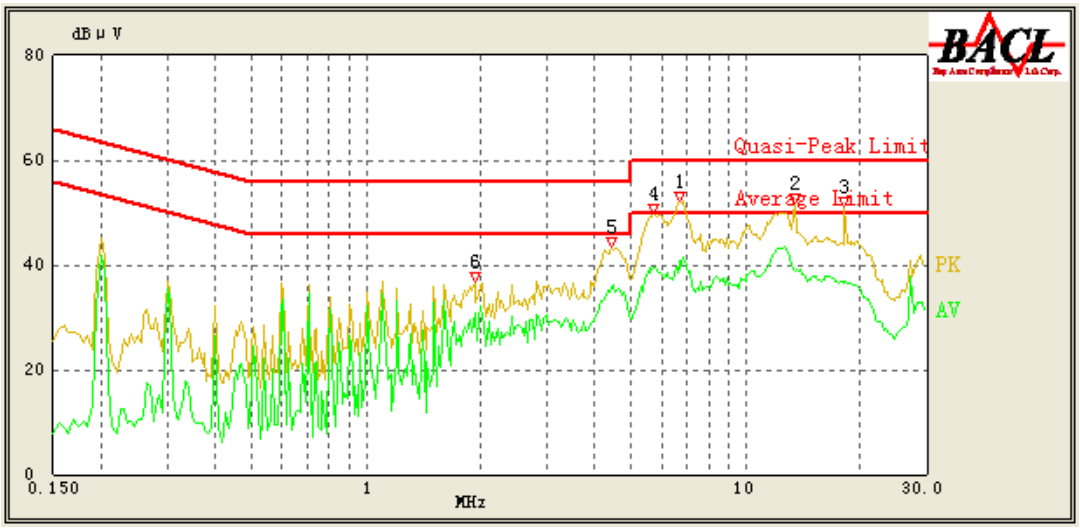
Environmental Conditions

Temperature:	25 °C
Relative Humidity:	48 %
ATM Pressure:	100.0 kPa

The testing was performed by Henry Ding on 2012-04-06.

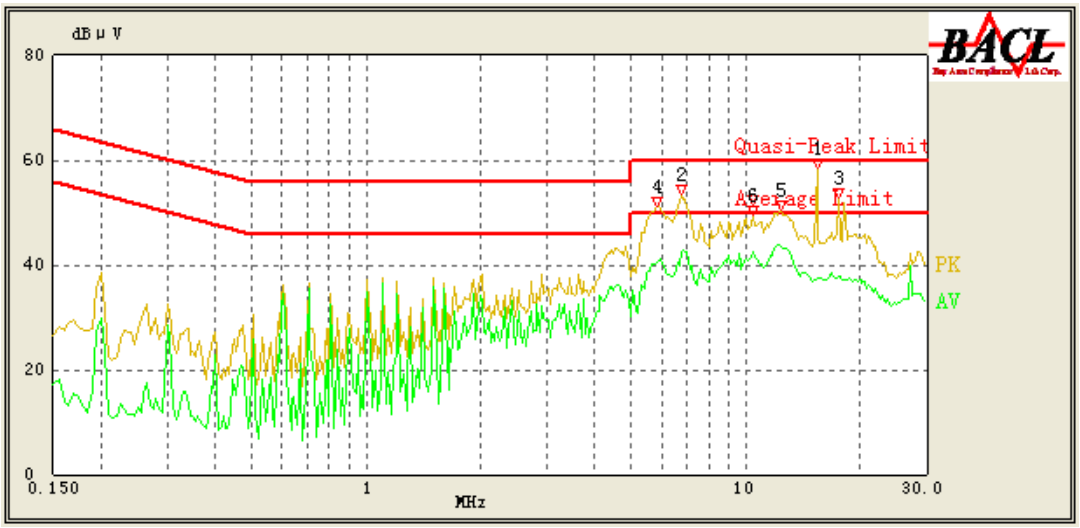
Test Mode: Transmitting

120V, 60 Hz, Line:



Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	**Corrected Result (dBµV)**	**Correction Factor (dB)**	**Limit (dBµV)**	**Margin (dB)**	**Remark (PK/QP/Ave.)**
6.700	40.91	10.72	50.00	9.09	Ave.
4.430	35.95	10.55	46.00	10.05	Ave.
5.735	39.60	10.65	50.00	10.40	Ave.
13.550	38.98	11.30	50.00	11.02	Ave.
6.700	47.37	10.72	60.00	12.63	QP
18.160	36.70	11.50	50.00	13.30	Ave.
1.930	30.88	10.32	46.00	15.12	Ave.
4.425	39.88	10.55	56.00	16.12	QP
5.735	43.16	10.65	60.00	16.84	QP
13.515	41.53	11.30	60.00	18.47	QP
1.930	37.09	10.32	56.00	18.91	QP
18.210	38.47	11.50	60.00	21.53	QP

120V, 60 Hz, Neutral



Conducted Emissions			FCC Part 15.207		
Frequency (MHz)	Corrected Result (dBµV)	Correction Factor (dB)	Limit (dBµV)	Margin (dB)	Remark (PK/QP/Ave.)
12.375	43.62	11.19	50.00	6.38	Ave.
6.795	42.55	10.73	50.00	7.45	Ave.
10.460	42.37	11.00	50.00	7.63	Ave.
10.460	50.77	11.00	60.00	9.23	QP
5.835	40.58	10.66	50.00	9.42	Ave.
6.740	49.16	10.73	60.00	10.84	QP
17.460	37.42	11.48	50.00	12.58	Ave.
15.370	37.32	11.45	50.00	12.68	Ave.
5.835	45.95	10.66	60.00	14.05	QP
12.375	44.39	11.19	60.00	15.61	QP
17.600	39.90	11.49	60.00	20.10	QP
15.470	39.17	11.45	60.00	20.83	QP

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.

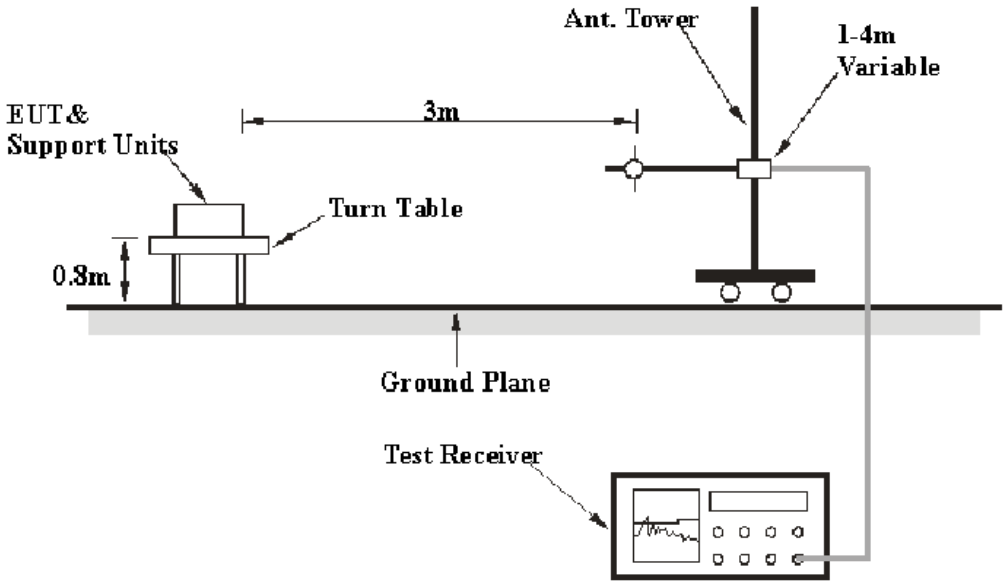
Measurement Uncertainty

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 CISPR 16-4-4, 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 (k=2, 95% level of confidence).

The fundamental data was recorded in average detection mode: set the VBW AVE on, and 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 C63.4-2009. The specification used was the FCC Part Subpart C limits.

The spacing between the peripherals was 10 cm.

The host PC was connected to a 120 VAC/60 Hz 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***
9 kHz – 150 kHz	300 Hz	1 kHz
150 kHz – 30 MHz	10 kHz	30 kHz
30 – 1000 MHz	100 kHz	300 kHz

Corrected Amplitude & Margin Calculation

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

Corr. Ampl. = Meter Reading + Antenna Factor+ Cable Loss - 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:

Margin = Limit - Corr. Ampl.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10
HP	Amplifier	8447E	1937A01046	2011-08-02	2012-08-01
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2011-07-05	2012-07-04
ETS	Passive Loop Antenna	6512	00029604	2011-04-27	2012-04-26

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

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:

7.1 dB at **40.690000 MHz** in the **Vertical** polarization

Test Data

Environmental Conditions

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

The testing was performed by Henry Ding on 2012-04-05.

Test mode: Transmitting

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

Indicated		Table Angle Degree	Antenna Height (m)	Detector PK/QP/Ave.	Correction Factor			Corrected Amplitude (dBµV/m) @3m	FCC Part 15.225	
Frequency (MHz)	Maximum Reading (dBµV) @3m				Ant. Factor (dB)	Cable Loss (dB)	Pre-Amp. Gain (dB)		Limit (dBµV/m) @3m	Result
0.013	1.76	0	1.00	Peak	87.8	0.05	0.0	89.61	125.32	Pass
0.150	16.76	0	1.00	Peak	63.5	0.06	0.0	80.32	104.08	Pass
14.630	21.21	0	1.00	Peak	31.9	0.20	0.0	53.31	69.5	Pass
27.120	24.35	0	1.00	Peak	29.2	0.25	0.0	53.8	69.5	Pass

2) Fundamental:

Indicated			Table Angle Degree	Antenna Height (m)	Detector PK/QP/Ave.	Correction Factor			Corrected Amplitude (dBµV/m) @3m	FCC Part 15.225	
Frequency Range (MHz)	Mark point (MHz)	Maximum Reading (dBµV) @3m				Ant. Factor (dB)	Cable Loss (dB)	Pre-Amp. Gain (dB)		Limit (dBµV/m) @3m	Result
13.110-13.410	13.410	4.85	0	1.1	Peak	32.1	0.20	0.0	37.15	80.5	Pass
13.410-13.553	13.553	12.45	0	1.2	Peak	32.1	0.20	0.0	44.75	90.5	Pass
13.553-13.567	13.560	30.2	0	1.1	Peak	32.1	0.20	0.0	62.50	124	Pass
13.567-13.710	13.567	12.82	0	1.2	Peak	32.1	0.20	0.0	45.12	90.5	Pass
13.710-14.010	13.710	5.04	0	1.1	Peak	32.1	0.20	0.0	37.34	80.5	Pass

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

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Detector PK/QP/Ave.	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBµV/m)	Margin (dB)
40.690000	32.9	QP	123.0	V	317.0	-12.5	40.0	7.1
67.810500	26.3	QP	123.0	V	184.0	-18.4	40.0	13.7
30.274569	26.2	QP	101.0	V	97.0	-5.6	40.0	13.8
487.234500	31.9	QP	101.0	V	266.0	-8.6	46.0	14.1
566.446500	28.5	QP	102.0	V	51.0	-7.2	46.0	17.5
923.398250	27.0	QP	139.0	H	0.0	0.0	46.0	19.0

FCC§15.225(e) - FREQUENCY STABILITY

Applicable Standard

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 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
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10
WUHUAN	Temperature & Humidity Chamber	HTP205	20021115	2011-06-04	2012-06-03

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

Test Data

Environmental Conditions

Temperature:	20 °C
Relative Humidity:	56 %
ATM Pressure:	100.1 kPa

The testing was performed by Henry Ding on 2012-04-06.

Test Result: Pass

Test Mode: Transmitting

Power Supply	Temperature (℃)	Measured Frequency (MHz)	Frequency Error	Part 15.225 Limit
120Vac	-20	13.56087	0.006416%	±0.01%
	-10	13.56113	0.008333%	±0.01%
	0	13.56107	0.007891%	±0.01%
	10	13.56109	0.008038%	±0.01%
	20	13.56110	0.008112%	±0.01%
	30	13.56107	0.007891%	±0.01%
	40	13.56109	0.008038%	±0.01%
	50	13.56113	0.008333%	±0.01%
Min. = 102Vac	20	13.56087	0.006416%	±0.01%
Max. = 138Vac	20	13.56107	0.007891%	±0.01%

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