Certification Test Report

CFR 47 FCC Part 15, Subpart C Section 15.225
Industry Canada RSS 210, Issue 8

Wireless Dynamics
iCarte 420

FCC ID: SHFICARTE420
IC: 5998A-ICARTE420

Project Code C-0102172

(Report C0102172-RA-1-2)

This report supersedes report C0102172-RA-1-1

February 08, 2011

Prepared for:	Wireless Dynamics Inc.
Author:	Lixin Wang EMC Technologist
Approved by:	Nick Kobrosly Director of Canadian Operations

Report Summary

Test Facility:	**National Technical Systems, Canada** Product Integrity Laboratory 5151-47th Street, N.E. Calgary Alberta T3J 3R2
Accreditation Numbers:	0214.22 Electrical 0214.23 Mechanical Accredited by A2LA The American Association for Laboratory Accreditation CLIENTS SERVED: All interested parties FIELDS OF TESTING: Electrical/Electronic, Mechanical/Physical ACCREDITATION DATE:: May 14, 2009 VALID TO: December 31, 2011
Applicant:	Wireless Dynamics Inc 220, 3636 - 23 Street N.E. Calgary, AB T2E 8Z5 Canada Phone: (403) 219-8221
Customer Representative:	Name: Carlos Aguirre-Charo Phone #. (403) 219-8221 Email Address: caguirre@wdi.ca
Responsible Manager:	Name: Damon Adams Phone #: (403) 219 8226 Email Address: dadams@wdi.ca

Test Summary

Appendix	Test/Requirement Description	Deviations* from:			Pass / Fail	Applicable FCC Rule Parts	Applicable Industry Canada Rule Parts
		Base Standard	Test Basis	NTS Procedure			
A	Radiated Emission 9 kHz to 1 GHz	No	No	No	Pass	FCC 15, Subpart C 15.225	RSS 210 Issue 8 RSS Gen Issue 3
B	Power Line Conducted Emission	No	No	No	Pass	FCC 15, Subpart C 15.207 (a)	RSS Gen Issue 3
C	Frequency Tolerance	No	No	No	Pass	FCC 15, Subpart C 15.225 (e)	RSS 210 Issue 8

Test Result: The product presented for testing complied with test requirements as shown above.

Lixin Wang
2011.02.08
15:28:48 -07'00'

Prepared By: _____
Lixin Wang
EMC Technologist

Glen Moore
Digitally signed by Glen Moore
DN: cn=Glen Moore, c=CA, email=glen.moore@ntscorp.com
Reason: I have reviewed this document
Date: 2011.02.08 15:56:10 -07'00'

Reviewed By: _____
Glen Moore
Wireless/EMC Manager

Alex Mathews
2011.02.08
16:06:50
-07'00'

Approved By: _____
Alex Mathews
Quality Management Representative

Table of Contents

Register of revisions

Revision	Date	Description of Revisions
1	January 26, 2011	Initial release
2	February 08, 2011	Update after application

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this document is to describe the tests applied by NTS Canada to demonstrate compliance of the iCarte 420 from Wireless Dynamics to FCC CFR 47 Part 15, Subpart C Section 15.225 and Industry Canada RSS 210

2.0 EUT DESCRIPTION

2.1 CONFIGURATION

Description of EUT

	Name	Model	Revision	Serial Number
EUT (Emission tests)	Wireless Dynamics Inc.	iCarte420	HW 0.1.0	FFFE1101999005
EUT (Frequency stability tests)	Wireless Dynamics Inc.	iCarte420	HW 0.1.0	FFFE1038999013
Classification	Mobile			
Size (m)	120 mm x 60 mm x 10 mm			
Weight	20 grams			
Antenna	13.56 MHz PCB trace loop antenna 50x60 mm			
General Functional Description	The iCarte is a 13.56 MHz RFID/Near Field Communications device that also contains a Smart Element that allows it to act as a passive tag. The iCarte can only be powered from the iPhone.			
Physical Description	The iCarte is a small accessory to the Apple iPhone4 which connects via the phone's bottom connector.			

2.1.1 EUT POWER

Voltage	3.3 VDC iPhone
Number of Feeds	1
Gauge of cable	N/A
Current Draw	100 mA max, RF Field ON
Special Requirements	Device is only powered from the iPhone

2.2 FREQUENCIES

EUT Frequency List

Module	Signal	Frequency (MHz)
MCU Xtal Oscillator Frequency	ACLK_TP	13.56
RFID Transceiver Xtal Oscillator	OSC_IN	13.56
RFID Transceiver Frequency	TP13	13.56
Smart Element Communications Bus	SMX_CLK	Host dependent, 5MHz max by spec

2.3 EUT SOFTWARE

Software Name	Software Release Number	Software Configuration
100.30.0	00	Transmit Mode Active, software selectable

2.4 MODE OF OPERATION DURING TESTS

See test appendices for specific EUT operating modes and conditions
For all test cases pre-scans were completed in all modes to determine worst case levels.

3.0 SUPPORT EQUIPMENT

3.1 CO-LOCATED SUPPORT EQUIPMENT

Manufacturer	Model	Description	Serial Number
Apple iphone4	MC603FB	Host unit	7V0474QAA4S
Apple iPhone4	MC603C	Host unit	81038QQQA4S
Apple AC/DC Adapter	A1265	Charger	1X001601N8Q2

4.0 TEST ENVIRONMENT

4.1 NORMAL TEST CONDITIONS

Temperature: 23 – 26 °C
Relative Humidity: 30 – 41 %
Atmospheric pressure: 883 – 890 mbar
Nominal test voltage: 120 VAC 60 Hz (3.3 VDC iPhone)

The values are the limits registered during the test period.

4.2 EXTREME TEST CONDITIONS

Temperature: -20 °C to +50 °C
Test voltage: 102 VAC 60 Hz to 138 VAC 60 Hz

The extreme test voltages for frequency tolerance test was applied to Apple AC/DC Adapter

APPENDICES

APPENDIX A: RADIATED EMISSIONS

A.1. Base Standard & Test Basis

Base Standard	FCC 15, Subpart C 15.225 RSS 210 Issue 8
Test Basis	FCC Subpart C 15.225 (a)(b)(c)(d) Part 15.205 – Restricted bands of operation RSS 210 Issue 8 A 2.6
Test Method	Emissions Test Methods SOP-CAG-EMC-02 and ANSI C63.10

A.2. Specifications

FCC Subpart C 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.

MHz									
13.110	13.410	13.410	13.553	13.553	13.567	13.567	13.710	13.710	14.010
dBµV/m at 30 m									
40.51	40.51	50.47	50.47	84.00	84.00	50.47	50.47	40.51	40.51

(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;

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
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

FCC 15.205 and RSS 210 Issue 7 2.2 Restricted bands of operation.

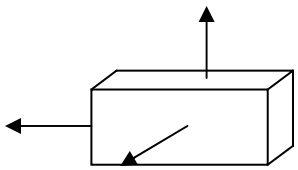
MHz	MHz	MHz	GHz
0.090–0.110	16.42–16.423	399.9–410	4.5–5.15
[1]0.495–0.505	16.69475–16.69525	608–614	5.35–5.46
2.1735–2.1905	16.80425–16.80475	960–1240	7.25–7.75
4.125–4.128	25.5–25.67	1300–1427	8.025–8.5
4.17725–4.17775	37.5–38.25	1435–1626.5	9.0–9.2
4.20725–4.20775	73–74.6	1645.5–1646.5	9.3–9.5
6.215–6.218	74.8–75.2	1660–1710	10.6–12.7
6.26775–6.26825	108–121.94	1718.8–1722.2	13.25–13.4
6.31175–6.31225	123–138	2200–2300	14.47–14.5
8.291–8.294	149.9–150.05	2310–2390	15.35–16.2
8.362–8.366	156.52475–156.52525	2483.5–2500	17.7–21.4
8.37625–8.38675	156.7–156.9	2690–2900	22.01–23.12
8.41425–8.41475	162.0125–167.17	3260–3267	23.6–24.0
12.29–12.293	167.72–173.2	3332–3339	31.2–31.8
12.51975–12.52025	240–285	3345.8–3358	36.43–36.5
12.57675–12.57725	322–335.4	3600–4400	N/A
13.36–13.41	N/A	N/A	N/A

(b) The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209.

A.3. Test Procedure

ANSI C63.10

A.4. Operating Mode During Test



The EUT was tested in the modes below with three orthogonal orientations;

- ISO14443A @ 106kbps
- ISO14443A @ 212kbps
- ISO14443A @ 424kbps
- ISO14443A @ 848kbps
- ISO15693 high bit rate, 1 out of 4
- ISO15693 high bit rate, 1 out of 256
- NFC initiator @ 106kbps
- NFC initiator @ 212kbps
- NFC initiator @424kbps
- Direct mode

Note1: iPhone OS does not support voice call and RFID application at the same time hence Bluetooth was not active
Note2: iPhone OS does not support 802.11b/g WIFI and RFID application at the same time hence WIFI was not active
Note3: iPhone OS does not support GSM GPRS 850, PCS 1900 GPRS EDGE and WCDMA at the same time as RFID transmission. No co-location emissions testing is required.
Note4: Worst case emissions presented

A.5. Test Result

Compliant

A.5.1 RFID In-band

Frequency (MHz)	Polarization	Emission level at 3m distance (dBµV/m)	Detector	Limit at 3m distance* (dBµV/m)	Margin (dB)
13.231	Parallel	37.12	Peak	76.01	38.89
13.277	Parallel	38.32	Peak	76.01	37.69
13.372	Parallel	35.93	Peak	76.01	40.08
13.410	Parallel	32.69	Peak	76.01	43.32
13.553	Parallel	43.84	Peak	85.97	42.13
13.562	Parallel	52.73	Peak	119.50	66.77
13.563	Perpendicular	42.35	Peak	119.50	77.15
13.567	Parallel	50.80	Peak	85.97	35.17
13.710	Parallel	31.15	Peak	76.01	44.86
13.752	Parallel	36.97	Peak	76.01	39.04
13.843	Parallel	38.29	Peak	76.01	37.72
13.870	Parallel	36.56	Peak	76.01	39.45
13.893	Parallel	37.86	Peak	76.01	38.15

All final reported values are corrected values
***13.56 MHz 3 m limit conversion Factor:**
Carrier measured at 3 m: 52.73 dBµV/m
Carrier measured at 10m: 34.15 dBµV/m
Conversion factor: 18.58 dB
Limit for 3 m test distance = 35.5dB + Limit for 30 m test distance at 13.56 MHz

A.5.3 Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Lixin Wang
Function: EMC Technologist

A.6. Test date

Started: January 14, 2011 Completed: January 20, 2011

Figure 1 13.11 MHz to 14.01 MHz Parallel ISO14443A @ 848kbps at 3m distance

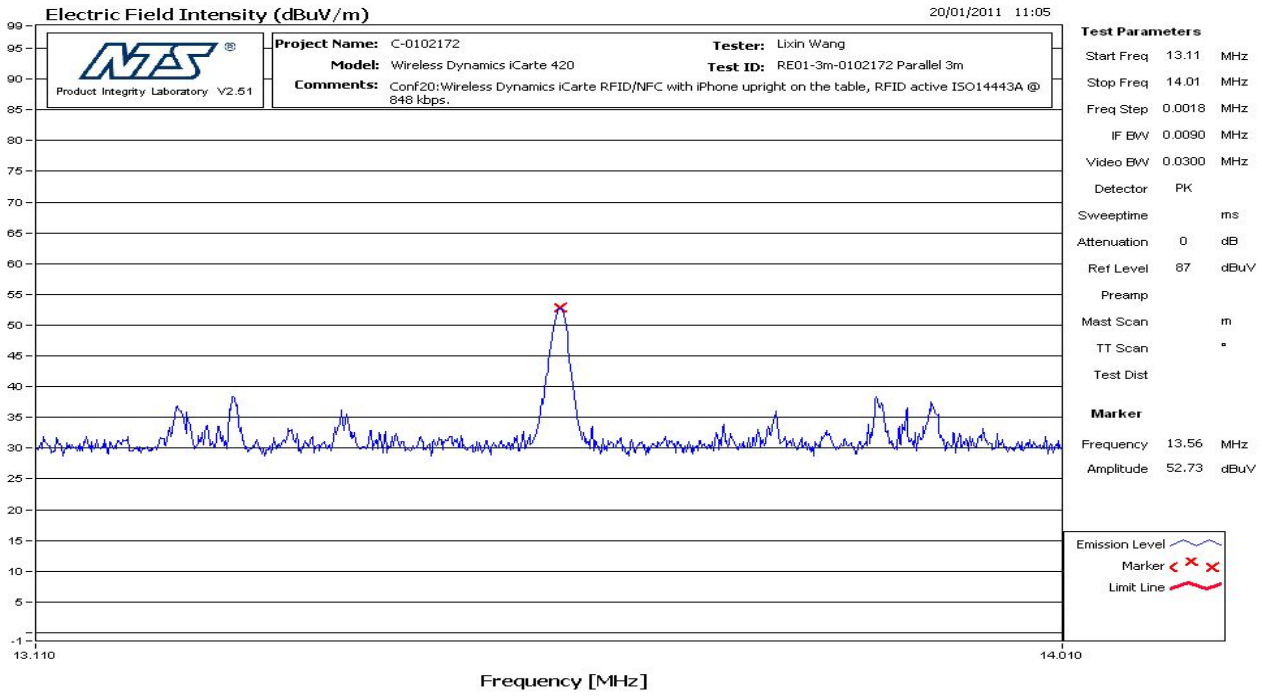


Figure 2 13.11 MHz to 14.01 MHz Parallel ISO14443A @ 848kbps at 10m distance

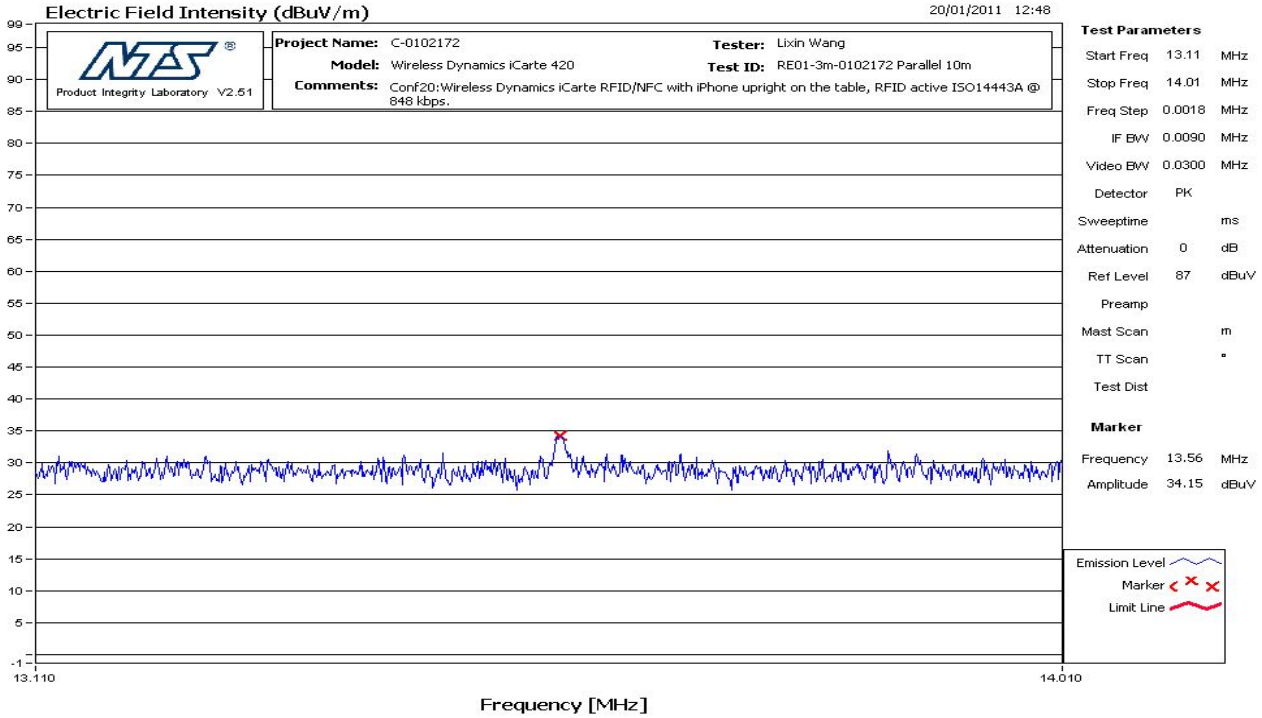


Figure 3 9 kHz to 150 kHz Parallel ISO14443A @ 848kbps at 3m distance

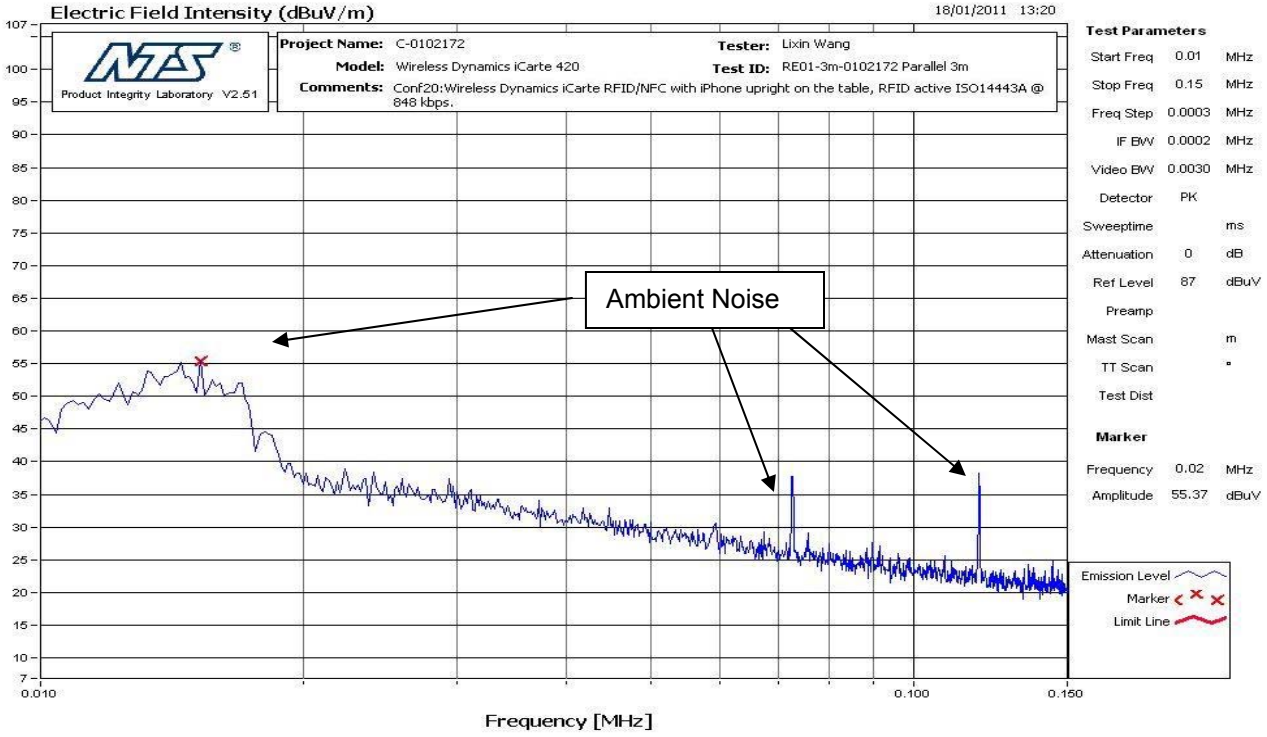


Figure 4 150 kHz to 13.11 MHz Parallel ISO14443A @ 848kbps at 3m distance

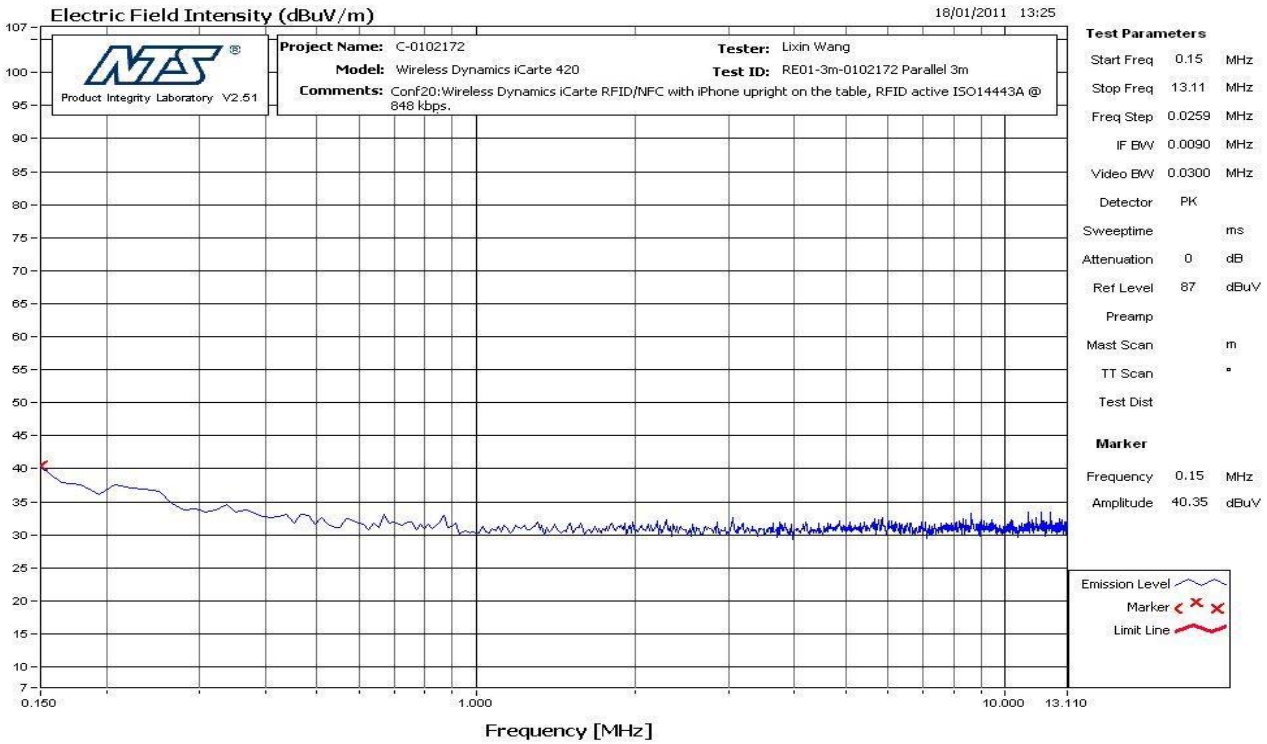


Figure 5 13.11 MHz to 14.01 MHz Parallel ISO14443A @ 848kbps at 3m distance

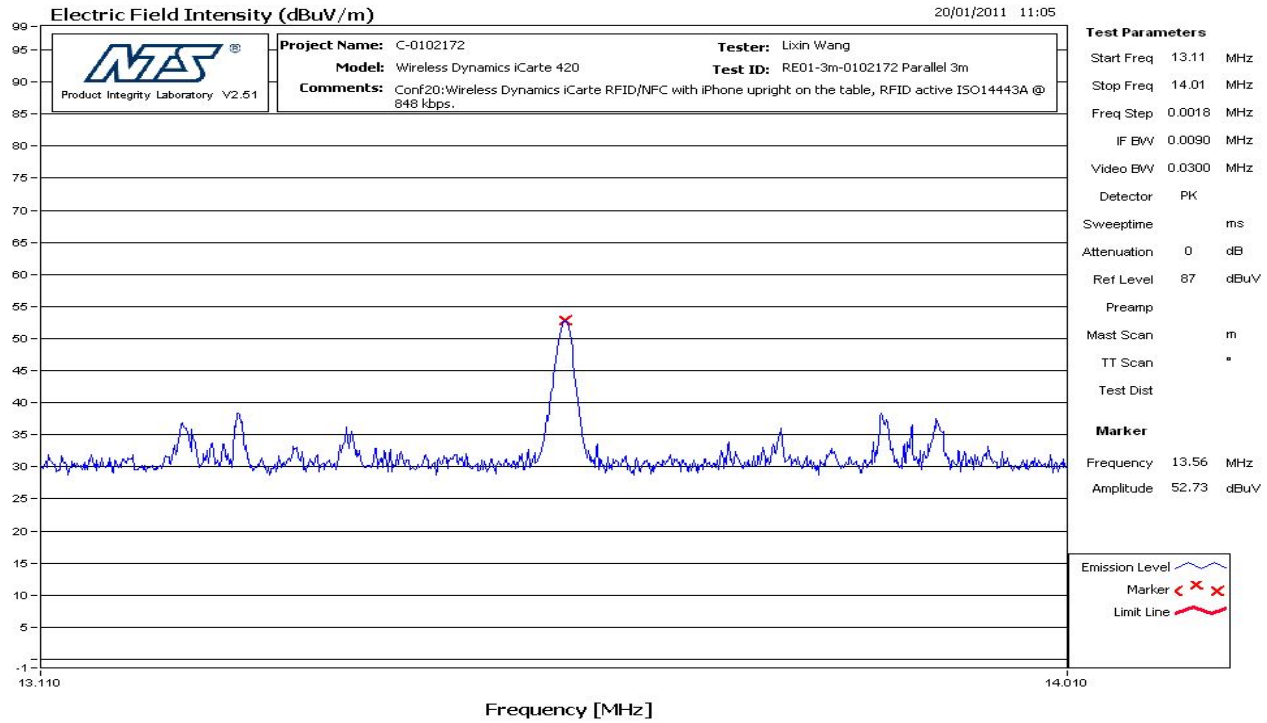


Figure 6 14.01 MHz to 30 MHz Parallel ISO14443A @ 848kbps at 3m distance

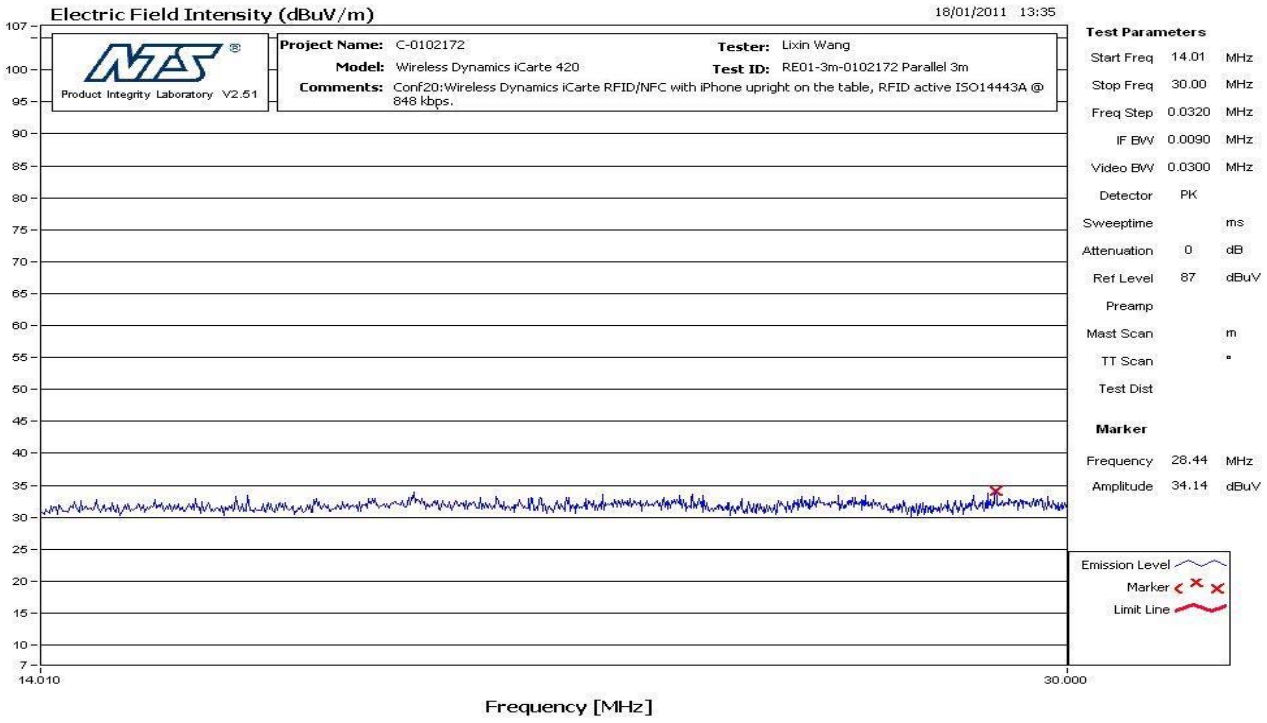


Figure 7 9 kHz to 150 kHz Perpendicular ISO14443A @ 848kbps at 3m distance

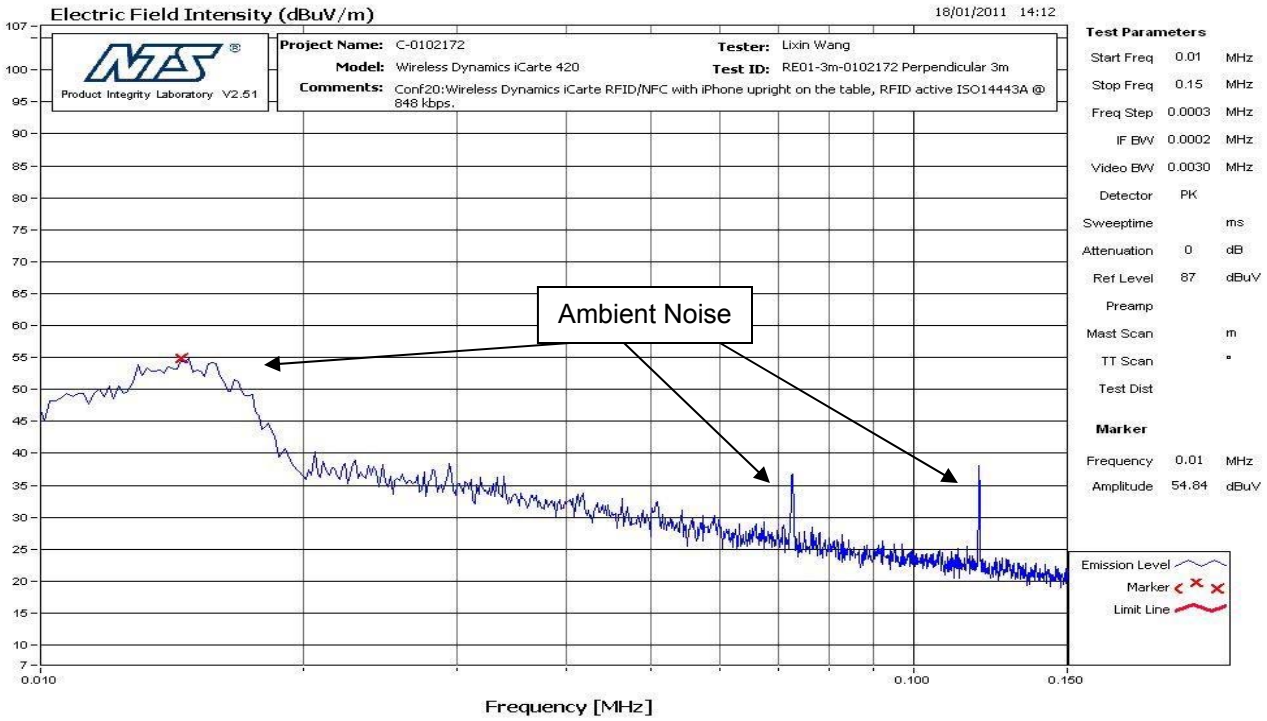


Figure 8 150 kHz to 13.11 MHz Perpendicular ISO14443A @ 848kbps at 3m distance

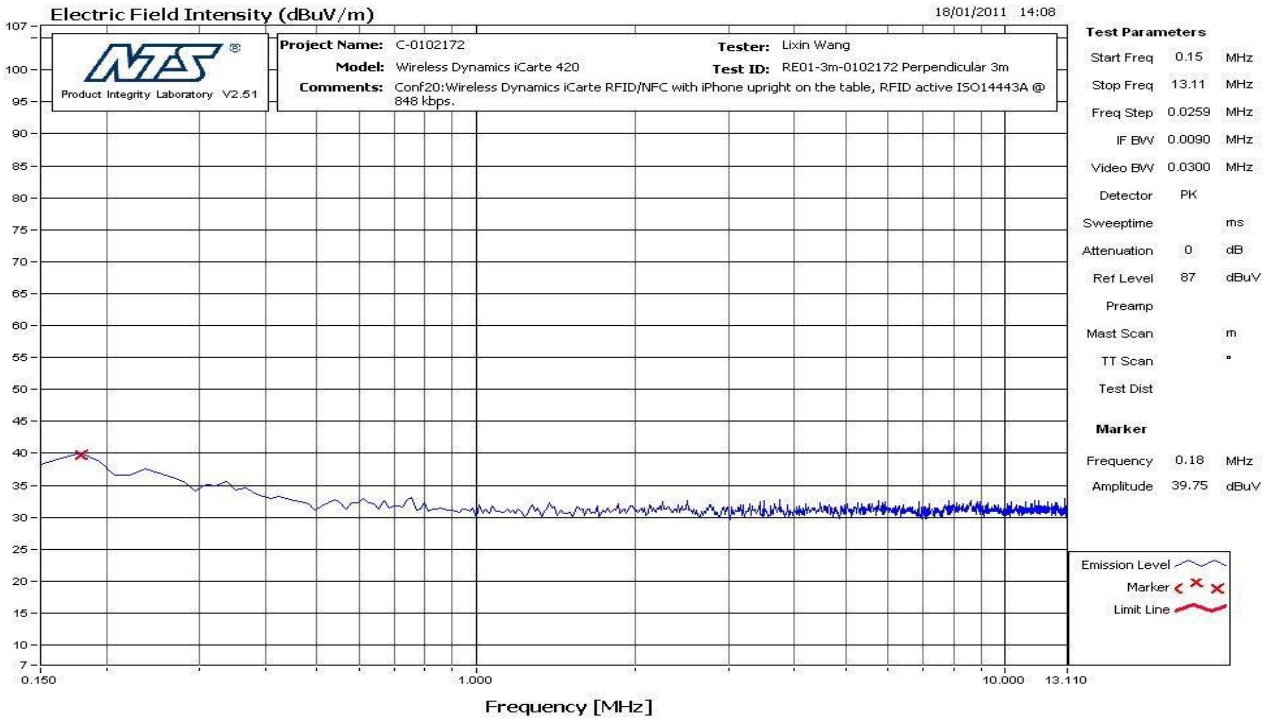


Figure 9 13.11 MHz to 14.01 MHz Perpendicular ISO14443A @ 848kbps at 3m distance

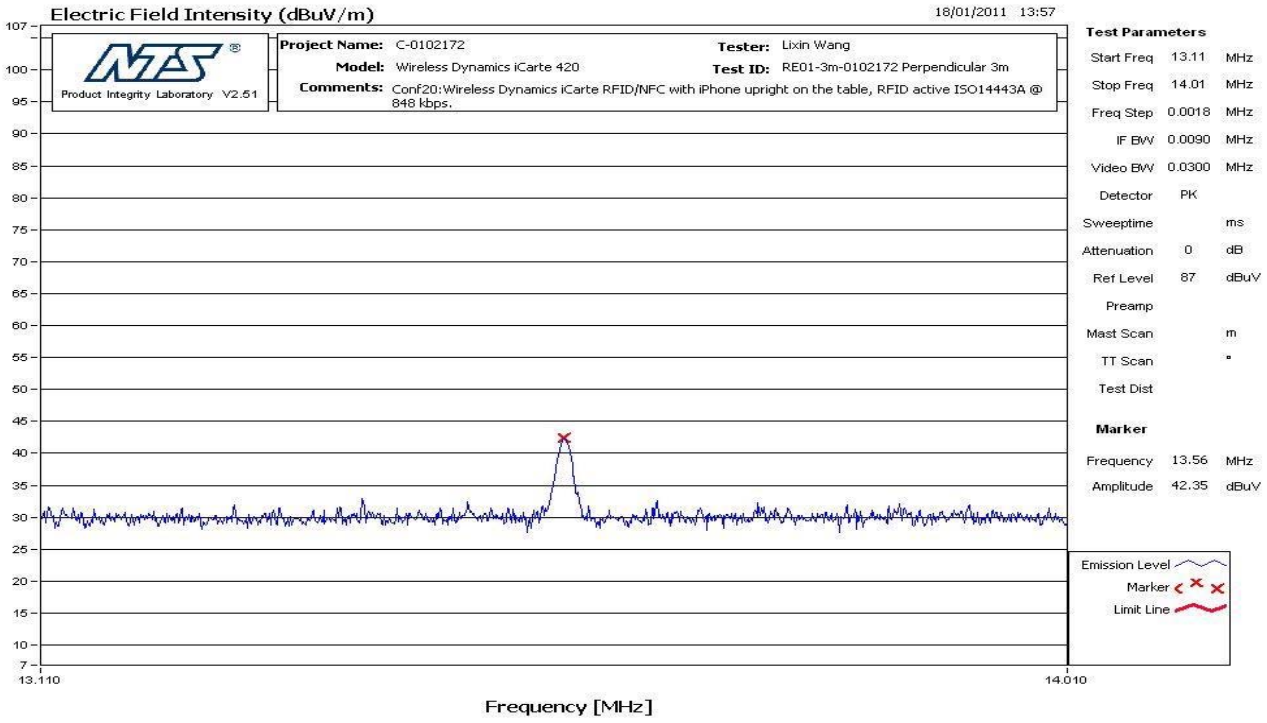


Figure 10 14.01 MHz to 30 MHz Perpendicular ISO14443A @ 848kbps at 3m distance

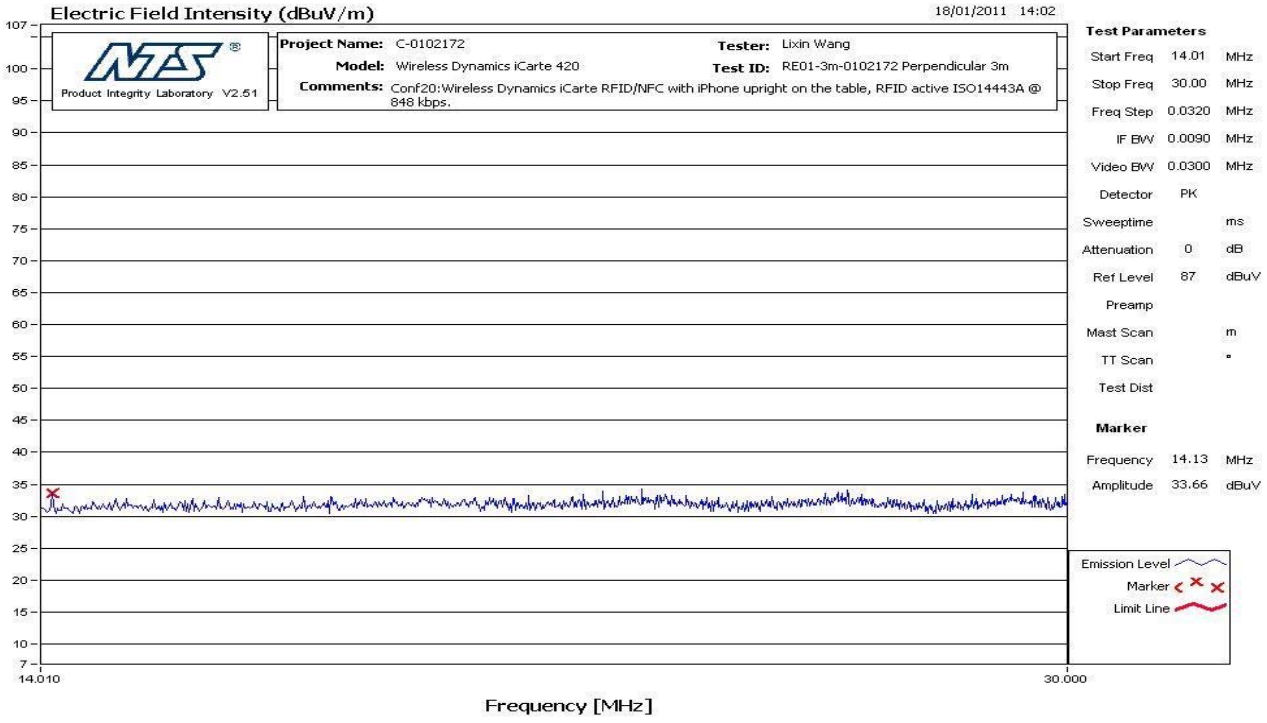


Figure 11 30 MHz to 1000 MHz Horizontal Direct mode at 10m distance

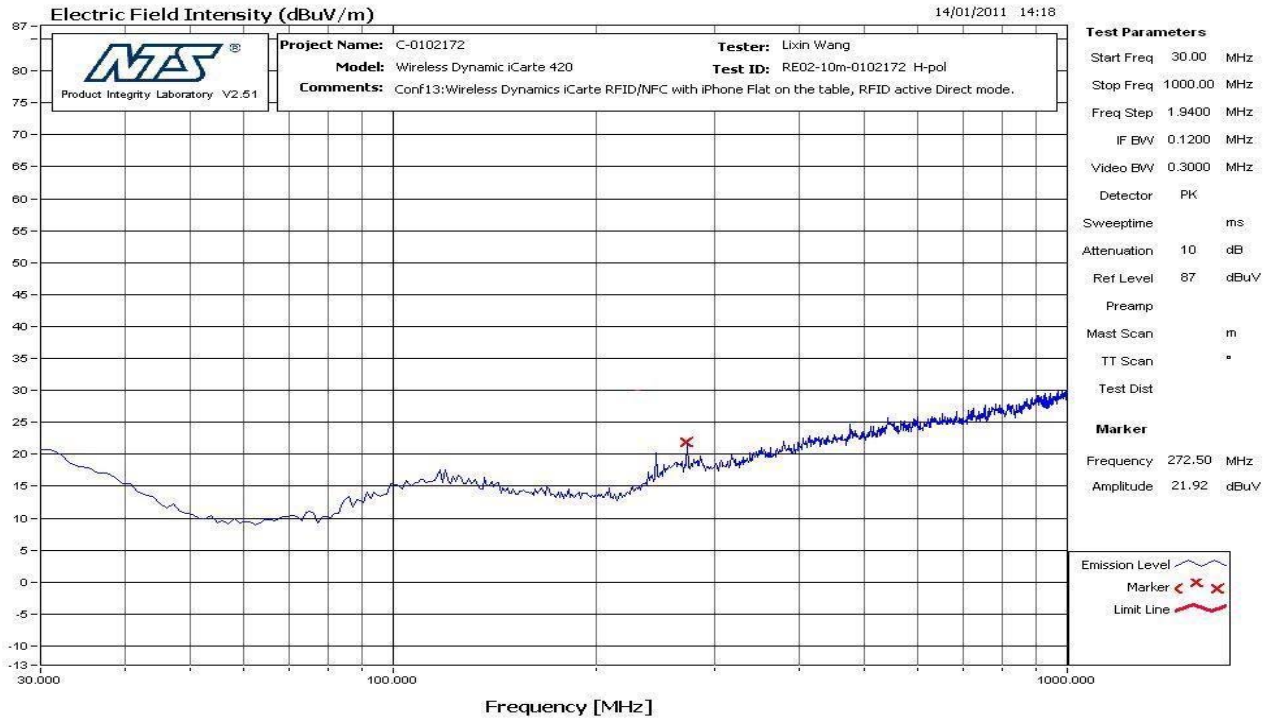
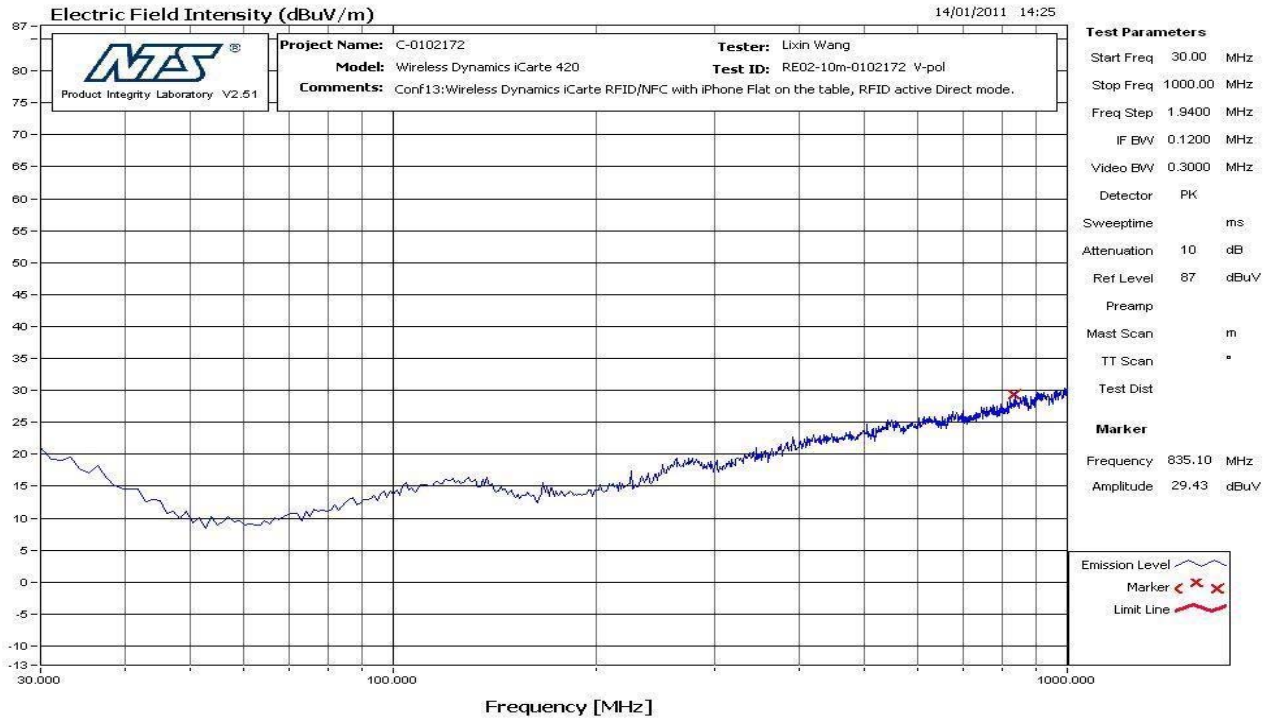


Figure 12 30 MHz to 1000 MHz Vertical Direct mode at 10m distance



APPENDIX B: POWER LINE CONDUCTED EMISSION

B.1. Base Standard & Test Basis

Base Standard	FCC PART 15.207 (a) RSS GEN Issue 3 7.2.4
Test Basis	ANSI C63.4-2003
Test Method	SOP-CAG- EMC-02

B.2. Specifications

Frequency MHz	Limit (Class B)	
	Quasi-Peak dBµV	Average dBµV
0.150 – 0.500	66 to 56[1]	56 to 46[1]
0.500 – 5.00	56	46
5.00 – 30.00	60	50

Note 1: decrease with the logarithm of the frequency

B.3. Test Procedure

ANSI C63.4-2003.
The EUT was pre tested in all modes worst case test results being reported.

B.4. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
None						

B.5. Test setup

iCarte RFID installed in iPhone, power supply Apple Model:A1265.S/N: 1X001601N8Q2 connected to the iCarte via USB cable, 120VAC, 60Hz. RFID active ISO 14443A@848Kbps.

Note: 50 Ω RF dummy load was used in order to eliminate 13.56 MHz radiated coupling to the power cable during conducted emission measurement of 13.56 MHz as per FCC KDB publication # 174176. All other emissions were measured with RFID antenna in place and transmitting

B.6. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Deniz Demirci
Function: EMC Technologist

B.7. Test date

January 19, 2011

B.8. Test Results

Product Integrity Laboratory V2.5

Project Number:	C-0102172	**Tester:**	Deniz
Model:	Wireless Dynamics iCarte 420	**Test ID:**	CE02tc-10m-0102172
Comments:	Conf20: Wireless Dynamics iCarte RFID/NFC with iPhone, RFID active ISO14443A @ 848 kbps.		

Standard: FCC15_B

Voltage/Line	Frequency (MHz)	Measurement Detector	Measured Value (dBμV)	Correction Factors (dB)	Emission Level (dBμV)	Limit Type	Limit (dBμV)	Margin (dB)
AC 120V Line1A	0.150	QP	23.06	12.17	35.23	QP	65.98	**30.75**
AC 120V Line1A	0.248	QP	29.28	11.34	40.62	QP	61.83	**21.21**
AC 120V Line1A	0.363	QP	11.09	10.98	22.07	QP	58.66	**36.59**
AC 120V Line1A	0.750	QP	26.10	10.76	36.86	QP	56.00	**19.14**
AC 120V NeutralA	0.252	QP	31.87	11.27	43.14	QP	61.69	**18.55**
AC 120V NeutralA	0.501	QP	30.49	10.75	41.24	QP	56.00	**14.76**
AC 120V NeutralA	1.501	QP	27.85	10.71	38.56	QP	56.00	**17.44**
AC 120V NeutralA	2.517	QP	26.54	10.80	37.34	QP	56.00	**18.66**
AC 120V Line1A	0.197	AV	8.58	11.76	20.34	AV	53.74	**33.40**
AC 120V Line1A	0.257	AV	16.12	11.35	27.47	AV	51.54	**24.07**
AC 120V Line1A	0.269	AV	17.24	11.21	28.45	AV	51.16	**22.71**
AC 120V Line1A	0.356	AV	12.69	10.98	23.67	AV	48.81	**25.14**
AC 120V Line1A	0.499	AV	16.09	10.82	26.91	AV	46.02	**19.11**
AC 120V Line1A	0.753	AV	15.41	10.76	26.17	AV	46.00	**19.83**
AC 120V Line1A	1.011	AV	13.05	10.75	23.80	AV	46.00	**22.20**
AC 120V Line1A	1.256	AV	15.69	10.76	26.45	AV	46.00	**19.55**
AC 120V Line1A	13.560	Peak	12.72	11.37	24.09	AV	50.00	**25.91**
AC 120V Line1A	27.120	AV	25.11	11.88	36.99	AV	50.00	**13.01**
AC 120V NeutralA	0.258	AV	23.56	11.28	34.84	AV	51.51	**16.67**
AC 120V NeutralA	0.501	AV	24.50	10.75	35.25	AV	46.00	**10.75**
AC 120V NeutralA	0.558	AV	22.24	10.72	32.96	AV	46.00	**13.04**
AC 120V NeutralA	1.260	AV	22.11	10.69	32.80	AV	46.00	**13.20**
AC 120V NeutralA	1.517	AV	19.88	10.71	30.59	AV	46.00	**15.41**
AC 120V NeutralA	2.251	AV	21.25	10.79	32.04	AV	46.00	**13.96**
AC 120V NeutralA	2.521	AV	20.89	10.80	31.69	AV	46.00	**14.31**
AC 120V NeutralA	13.565	Peak	17.55	11.26	11.28	AV	50.00	**38.72**

The emission measured with least margin to the applied limit was 35.25 dBμV with average detector at 501 kHz on the neutral port. It has 10.75 dB margin to the FCC Part 15.207 limits.

Figure 13 Conducted Emission 120 VAC Line - Quasi-peak Detector

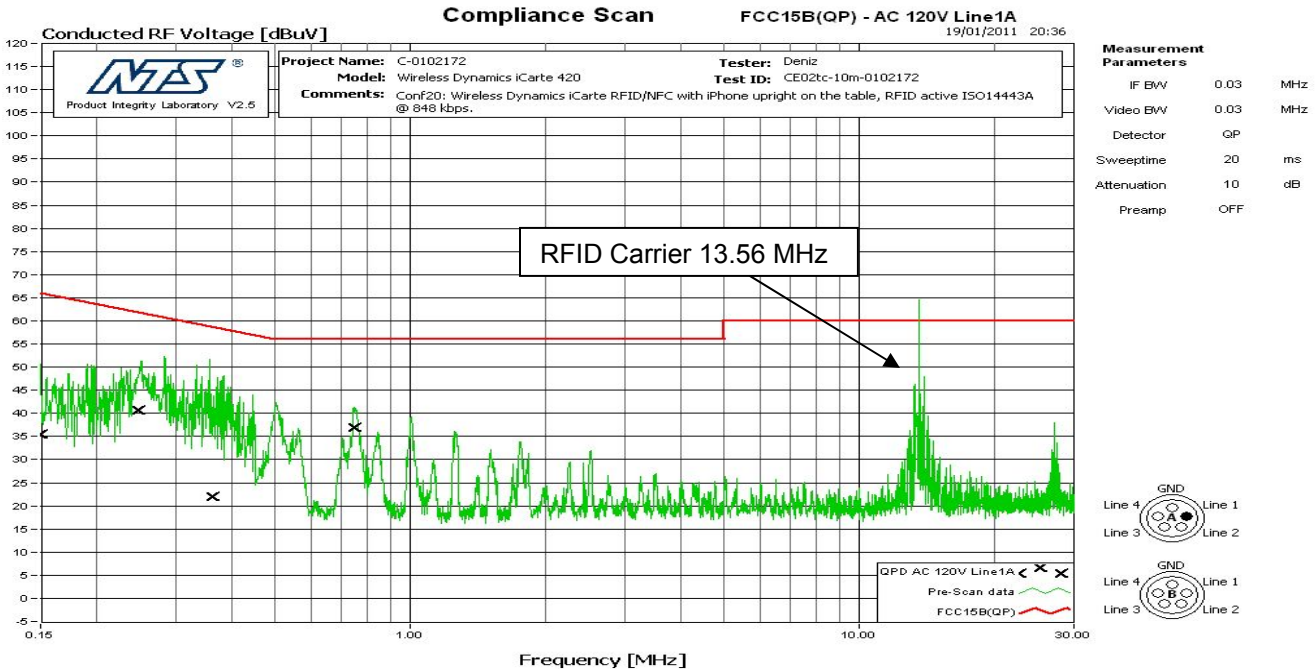
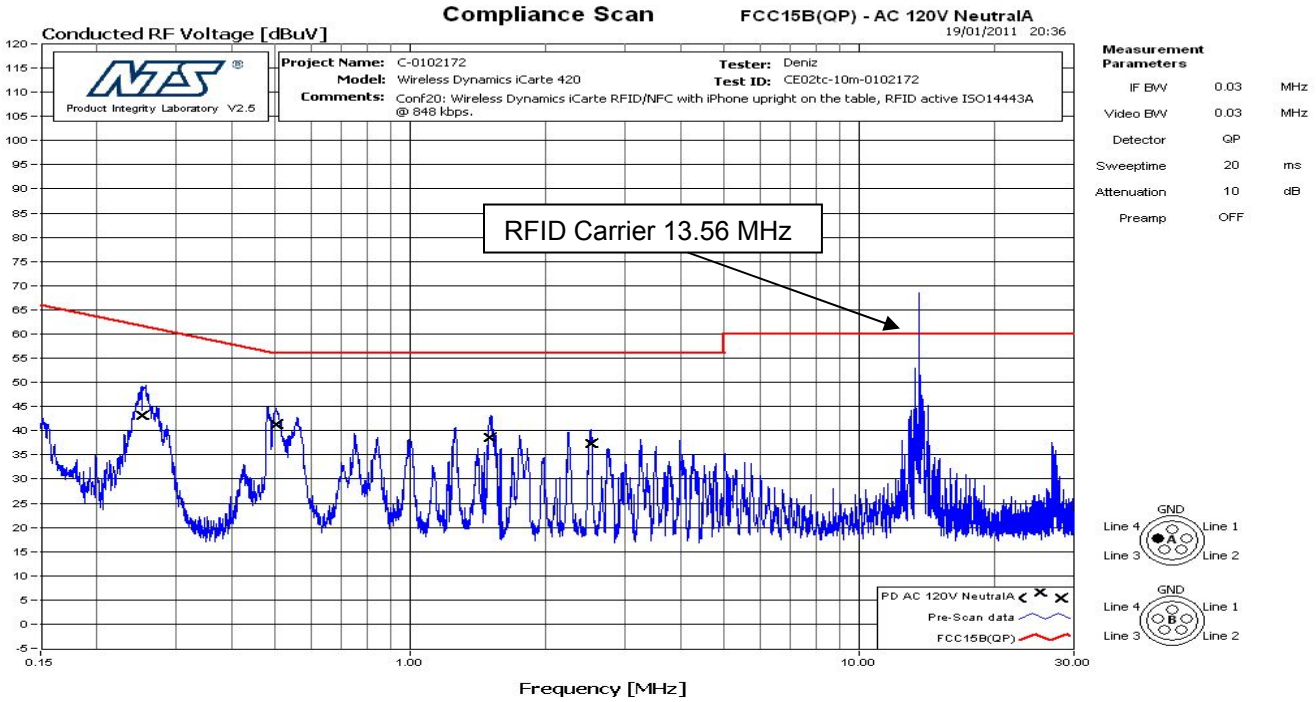


Figure 14 Conducted Emission 120 VAC Neutral - Quasi-peak Detector



Note: Plots above are used to show frequency identification. See result table for data. The emission at 13.56 MHz on the plots was due to pick up of the intentional signal and not conducted through the EUT – refer to plots on the following page taken with the EUT antenna replaced with a non-radiating load to confirm this

Figure 15 Conducted Emission 120 VAC Line - Average Detector

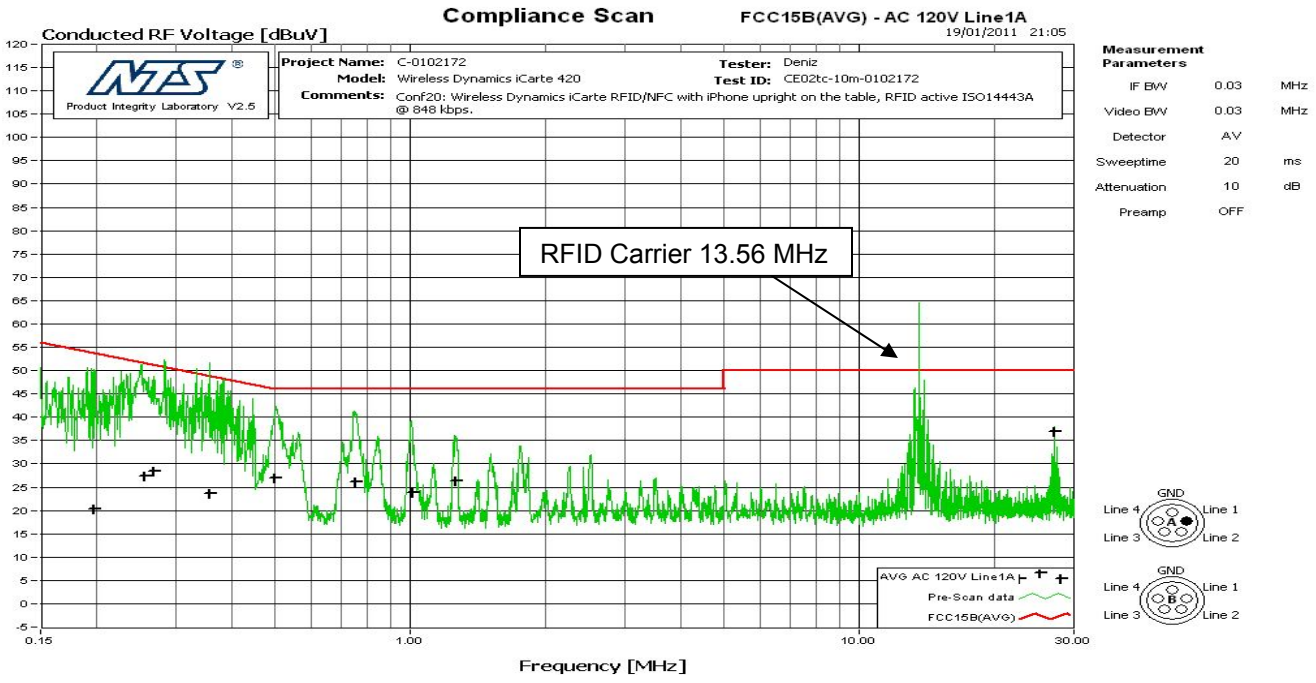
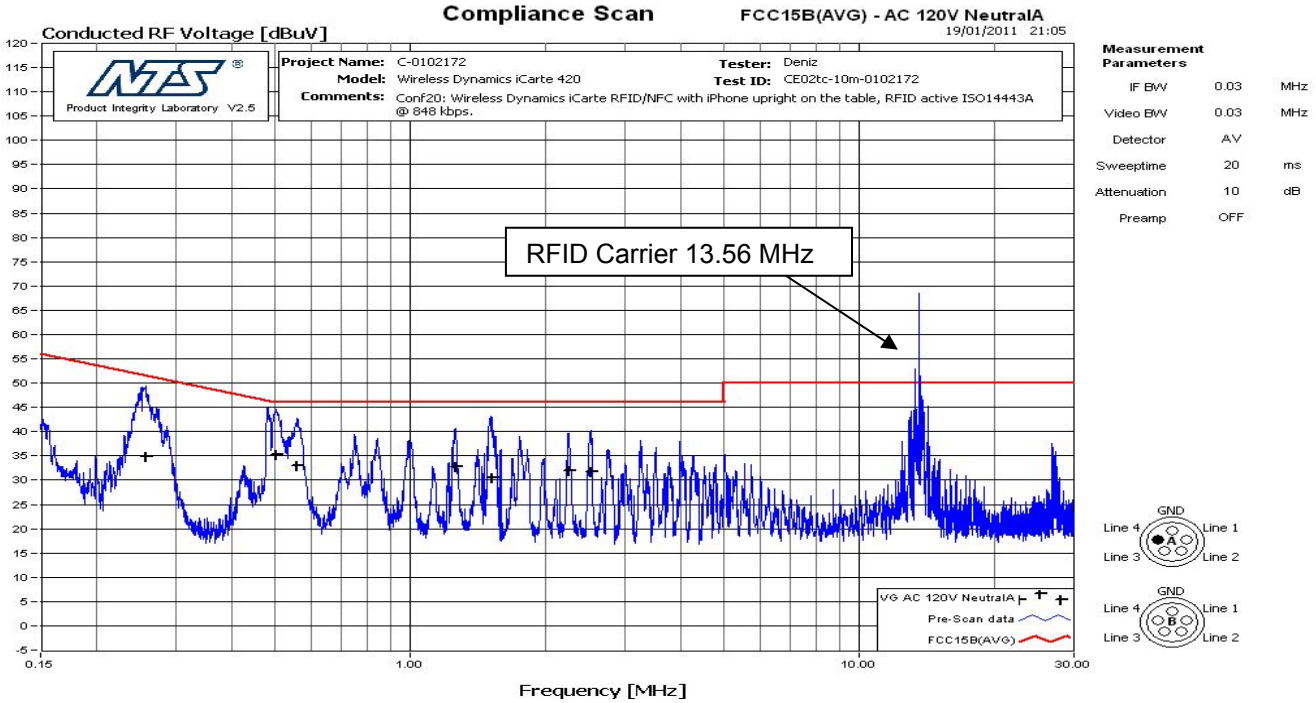


Figure 16 Conducted Emission 120 VAC Neutral - Average Detector



Note: Plots above are used to show frequency identification. See result table for data. The emission at 13.56 MHz on the plots was due to pick up of the intentional signal and not conducted through the EUT – refer to plots on the following page taken with the EUT antenna replaced with a non-radiating load to confirm this

Figure 17 Conducted Emission 120 VAC Line – With Dummy load

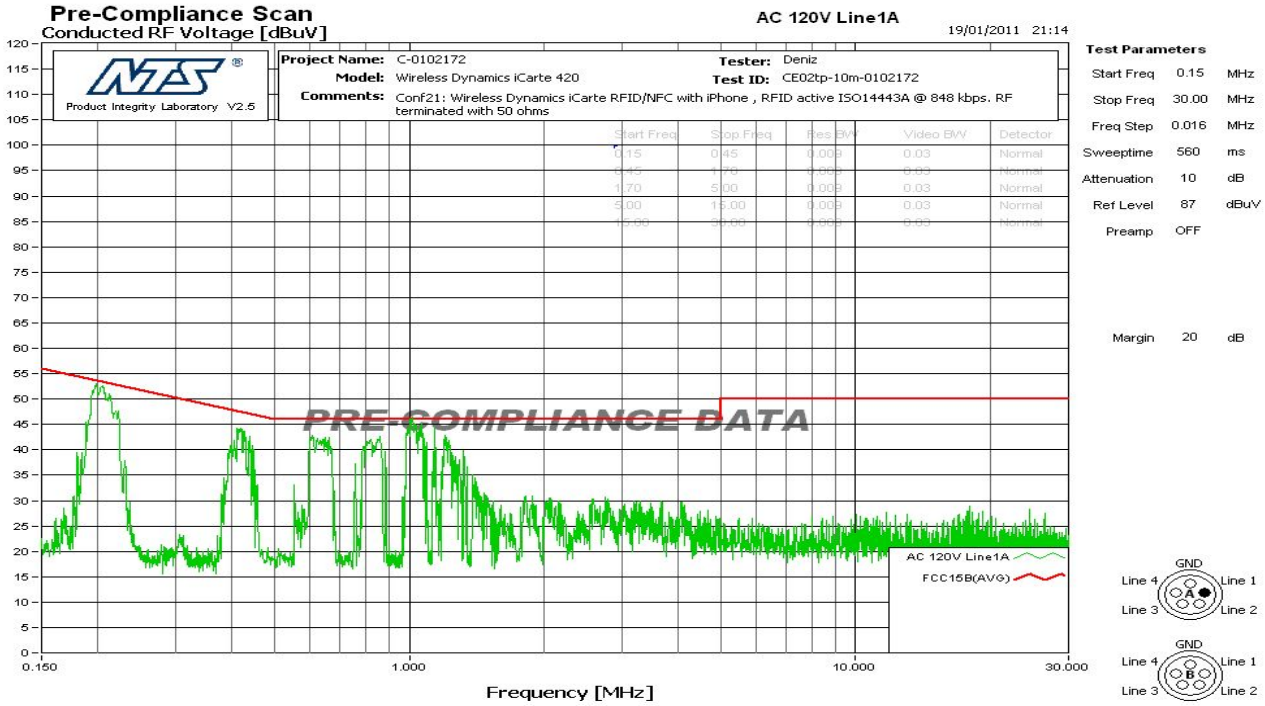
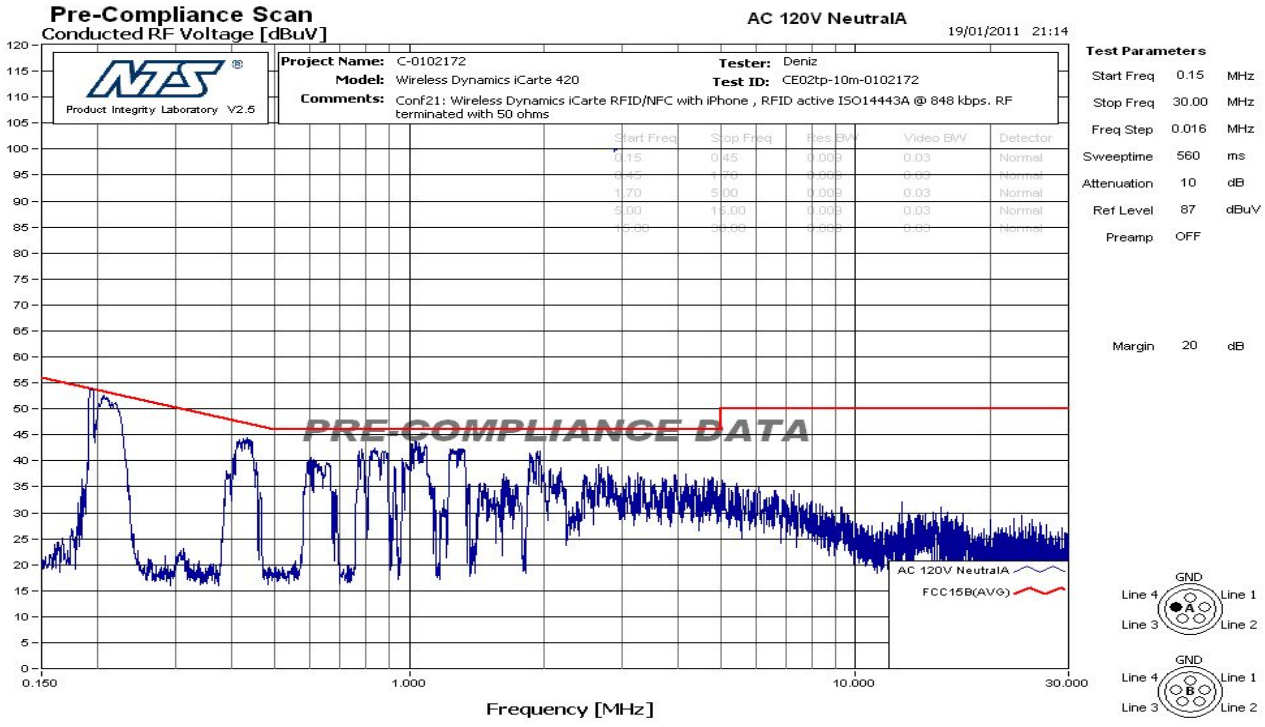


Figure 18 Conducted Emission 120 VAC Neutral – With Dummy load



Note: Plots above are used to show frequency identification. See result table for data.

APPENDIX C: FREQUENCY TOLERANCE

C.1. Base Standard & Test Basis

Base Standard	FCC Part 15.225, RSS-210 Issue 8
Test Basis	FCC Part 15.225, RSS-210 Issue 8
Test Method	ANSI C63.10

C.2. Specifications

ANSI C63.10

Frequency stability with respect to ambient temperature

a) Supply the EUT with a nominal ac voltage, or install a new or fully charged battery in the EUT. If possible a dummy load should be connected to the EUT, because an antenna near the metallic walls of an environmental test chamber could affect the output frequency of the EUT. If the EUT is equipped with a permanently attached, adjustable-length antenna, the EUT should be placed in the center of the chamber with the antenna adjusted to the shortest length possible. Turn on the EUT, and tune it to one of the number of frequencies shown in 5.6.
b) Couple the unlicensed wireless device output to the measuring instrument by connecting an antenna to the measuring instrument with a suitable length of coaxial cable and placing the measuring antenna near the EUT (e.g., 15 cm away) or by connecting a dummy load to the measuring instrument through an attenuator, if necessary.
c) Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).
d) Turn the EUT off, and place it inside the environmental temperature chamber. For devices that have oscillator heaters, energize only the heater circuit.
e) Set the temperature control on the chamber to the highest specified in the regulatory requirements for the type of device and allow the oscillator heater and the chamber temperature to stabilize.
f) While maintaining a constant temperature inside the environmental chamber, turn the EUT on and record the operating frequency at startup and two, five, and ten minutes after the EUT is energized. Four measurements in total are made.
g) Measure the frequency at each of frequencies specified in 5.6.
h) Switch off the EUT, but do not switch off the oscillator heater.
i) Lower the chamber temperature by not more that 10 °C and allow the temperature inside the chamber to stabilize.
j) Repeat step f) through step i) down to the lowest specified temperature.

Frequency stability when varying supply voltage

a) Supply the EUT with nominal ac voltage or install a new or fully charged battery in the EUT. Turn on the EUT, and couple its output to a frequency counter or other frequency-measuring instrument.
b) Tune the EUT to one of the number of frequencies required in 5.6. Adjust the location of the measurement antenna and the controls on the measurement instrument to obtain a suitable signal level (i.e., a level that will not overload the measurement instrument, but is strong enough to allow measurement of the operating or fundamental frequency of the EUT).
c) Measure the frequency at each of the frequencies specified in 5.6.
d) If the EUT is powered from the ac power line, repeat the above procedure at 85 % and 115 % of the nominal ac voltage.

FCC Part 15.225 Limit

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.

C.3. Deviations

Deviation Number	Time & Date	Description and Justification of Deviation	Deviation Reference			Approval
			Base Standard	Test Basis	NTS Procedure	
none						

C.4. Test Method

The EUT was setup with Wireless Dynamics software to transmit in CW mode. A coaxial loop antenna was connected to the spectrum analyzer and placed near the EUT to obtain a suitable signal level for frequency stability measurements.

The EUT was off during the temperature stabilization period. Measurements were taken at startup, and two, five, and ten minutes after the EUT was energized. Four measurements in total were made at each test temperature.

At 20°C, frequency measurements were also made at 102 VAC and 138 VAC.

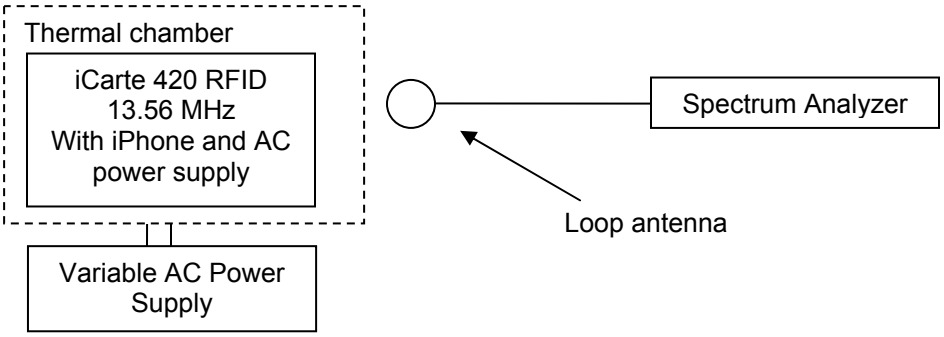
C.5. EUT Tested

The frequency stability test was performed on an EUT that consisted of the following hardware;

- iCarte 420, serial number FFFE1038999013
- Apple iPhone Model A1332
- 6’ micro USB cable
- 100-240V power adapter

C.6. Test Set Up

Figure 19 Frequency Stability Setup



C.7. Test Results

Complies.

The EUT was set to CW Mode, and the maximum frequency error was -221 Hz. This is within the FCC limit of ± 0.01% of the operating frequency (± 1356 Hz for the carrier frequency of 13.56 MHz).

Carrier Frequency	Operating Conditions	Maximum Frequency Error (Hz)			
		At startup	Startup + 2 minutes	Startup + 5 minutes	Startup + 10 minutes
13.56 MHz	50°C and 120 VAC	-215	-218	-220	-221
	40°C and 120 VAC	-185	-194	-199	-192
	30°C and 120 VAC	-158	-168	-170	-175
	20°C and 120 VAC	-135	-141	-144	-146
	20°C and 138 VAC	-148			
	20°C and 102 VAC	-148			
	10°C and 120 VAC	-119	-121	-124	-124
	0°C and 120 VAC	-116	-114	-114	-114
	-10°C and 120 VAC	-133	-125	-120	-120
	-20°C and 120 VAC	-166	-146	-144	-146

C.8. Tested By

This testing was conducted in accordance with the ISO 17025:2005 scope of accreditation, table 1; Quality Manual.

Name: Daryl Therens
Senior Test Specialist

C.9. Test Dates

Test Started: January 17, 2011
Test Completed: January 19, 2011

APPENDIX D: TEST EQUIPMENT LIST

Type	Manufacturer	Model	Asset #	Cal Due	Cal Date
Bilog Antenna	Teseq	CBL 6112D	CG1177	14SEP12	14SEP10 in service
Loop Antenna 9 kHz – 30 MHz	Rohde & Schwarz	HFH2-Z2	CG0701	18JAN12	18JAN11 in service
Signal Analyzer 20 Hz – 26.5GHz	Rohde & Schwarz	FSQ 26	CG0118	20-Dec-2011	20-Dec-2010
Test Receiver	Rohde & Schwarz	ESMI	CG0123 CG0434	04MAY11	04MAY09
Autotransformer	General Radio USA	W10MT3A	CG1456	NCR	NCR
Environmental Chamber	Thermotron	SE-1200-5-5	CG1402	25-Feb-2011	25-Feb-2010
Data Acquisition/Switch Unit	Fluke	Hydra Series II	CG0204	23-Mar-2011	23-Mar-2010
Voltmeter	Fluke	87	CG0384	19-Nov-2011	19-Nov-2010
HPIB Extender	HP	37204	CG0181	N/A	N/A
Mast Controller	EMCO	2090	CG0179	N/A	N/A
Turntable Controller	EMCO	2090	CG0178	N/A	N/A

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