Certification Test Report

CFR 47 FCC Part 15, Subpart C Section 15.225
Industry Canada RSS 210, Issue 7

Wireless Dynamics
iCarte RFID/NFC

FCC ID: SHFICARTE110
IC: 5998A-ICARTE110

Project Code CG-1440

(Report CG-1440-RA-1-2)
Revision: 2

(This report supersedes CG-1440-RA-1-1)

July 30, 2010

Prepared for:	Wireless Dynamics Inc.
Author:	Deniz Demirci Senior Wireless/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 Subpart C 15.225	RSS 210 Issue 7 RSS Gen Issue 2
B	Power Line Conducted Emission	No	No	No	Pass	FCC Subpart C 15.207 (a)	RSS-Gen Issue 2
C	Frequency Tolerance	No	No	No	Pass	FCC Subpart C 15.225 (e)	RSS 210 Issue 7

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

Prepared By: Digitally signed by Deniz Demirci
Date: 2010.07.30 08:21:12 -06'00'
Deniz Demirci
Senior Wireless/EMC Technologist

Reviewed By: Glen Moore
Digitally signed by Glen Moore
DN: cn=Glen Moore, c=CA, o=NTS, email=glen.moore@ntscorp.com
Reason: I have reviewed this document
Date: 2010.07.30 08:45:35 -06'00'
Glen Moore
Wireless/EMC Manager

Approved By: Digitally signed by Nick Kobrosly
Reason: on behalf of
Date: 2010.07.30 08:53:43 -06'00'
Alex Mathews
Quality Management Representative

Table of Contents

Register of revisions

Revision	Date	Description of Revisions
1	June 10, 2010	Initial release
2	July 30, 2010	Changes after internal review

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 RFID/NFC 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.	iCarte110	HW 0.5.0	DI 05.30
EUT (Frequency stability tests)	Wireless Dynamics Inc.	iCarte110	HW 0.5.0	DI 05.01
Classification	Mobile			
Size (m)	64 mm x 25 mm x 10 mm			
Weight	9 grams			
Antenna	13.56 MHz PCB trace loop antenna 42x23 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 iPhone 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
123.0.1	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 iPhone	A1241	Host unit	5K9390H5Y7K
Apple AC/DC Adapter	A1265	Charger	XT85027PU59T

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 Subpart C 15.225 RSS 210 Issue 7
Test Basis	FCC Subpart C 15.225 (a)(b)(c)(d) Part 15.205 – Restricted bands of operation RSS 210 Issue 7 A8.1 (b)
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.

RSS Gen Issue 2, 4.10 Receiver Spurious Emission

The receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.

Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions.

The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

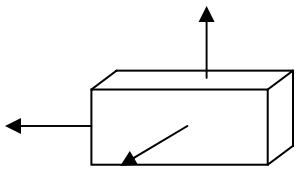
Spurious Emission Limits for Receivers

Spurious Frequency (MHz)	Field Strength (microvolt/m at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960	500

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
- Smart element active (Rx mode)
- iPhone GSM GPRS 850 Ch128, MS Tx Level Burst 0, 1up 1down, RFID ISO14443A @ 848kbps
- iPhone PCS GPRS Ch661, MS Tx Level Burst 0, 1up 1down, RFID ISO14443A @ 848kbps
- PCS EDGE Ch661, MS Tx Level Burst 0, 1up 1down, RFID ISO14443A @ 848kbps
- PCS WCDMA (HSDPA only) CH 9400, All up bits, UE target power 23dBm, RFID ISO14443A @ 848kbps

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

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)
13.277	Parallel	38.45	Peak	80.37	41.92
13.282	Parallel	36.34	Peak	80.37	44.03
13.553	Parallel	45.15	Peak	90.33	45.18
13.554	Parallel	46.32	Peak	123.86	77.54
13.562	Parallel	53.53	Peak	123.86	70.33
13.561	Perpendicular	43.50	Peak	123.86	80.36
13.567	Parallel	51.67	Peak	90.33	38.66
13.575	Parallel	38.93	Peak	90.33	51.40
13.576	Parallel	37.71	Peak	90.33	52.62
13.577	Parallel	37.68	Peak	90.33	52.65
13.578	Parallel	35.68	Peak	90.33	54.65
13.579	Parallel	35.14	Peak	90.33	55.19
13.746	Parallel	36.24	Peak	80.37	44.13
13.849	Parallel	38.26	Peak	80.37	42.11
13.892	Parallel	39.58	Peak	80.37	40.79

All final reported values are corrected values

***13.56 MHz 3 m limit conversion Factor:**
Carrier measured at 3 m: 53.53 dBµV/m
Carrier measured at 10m: 33.60 dBµV/m
Conversion factor: 19.93 dB

Limit for 3 m test distance = 39.86 dB + Limit for 30 m test distance at 13.56 MHz

A.5.2 Receiver spurious emissions

EUT was set to Smart element active (Rx) mode.

There was no receiver related spurious emission observed.

A.5.3 Co-located spurious emissions

EUT was set to RFID ISO14443A @ 848kbps (highest data rate) and iPhone was set to GSM 850 Ch128, PCS GPRS Ch661, PCS EDGE Ch661 and PCS WCDMA Ch9400 with maximum rated powers with Agilent 8960 call box.

Mode	Frequency (MHz)	Pol.	Emission Level dBµV/m	Sig gen level (dBm)	Cable Loss (dB)	Ant. Gain (dBi)	e.i.r.p level (dB)	Limit (dBm)	Margin (dB)
GSM 850 Ch128	810.70	H	59.34	-31.00	0.92	1.50	-30.42	-13.00	17.42
	837.79	H	61.61	-29.39	0.92	1.50	-28.81	-13.00	15.81
PCS GPRS Ch661	1866.44	H	64.18	-40.14	1.32	8.65	-32.81	-13.00	19.81
	1893.56	H	65.54	-37.04	1.33	8.67	-29.70	-13.00	16.70
	1866.44	V	61.73	-40.85	1.33	8.67	-33.51	-13.00	20.51
	1893.56	V	62.65	-39.93	1.33	8.67	-32.59	-13.00	19.59
PCS EDGE Ch661	1866.44	H	62.86	-39.71	1.32	8.65	-32.38	-13.00	19.38
	1893.56	H	62.17	-40.41	1.33	8.67	-33.07	-13.00	20.07
	1866.44	V	61.04	-41.54	1.33	8.67	-34.20	-13.00	21.20
	1893.56	V	61.55	-41.03	1.33	8.67	-33.69	-13.00	20.69

Note: There was no spurious emission observed with PCS WCDMA (Ch9400) and RFID ISO14443A @ 848kbps modes

A.6. Tested By

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

Name:	Deniz Demirci	Lixin Wang
Function:	Senior EMC / Wireless Technologist	EMC Technologist

A.7. Test date

Started: June 04, 2010 Completed: June 10, 2010

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

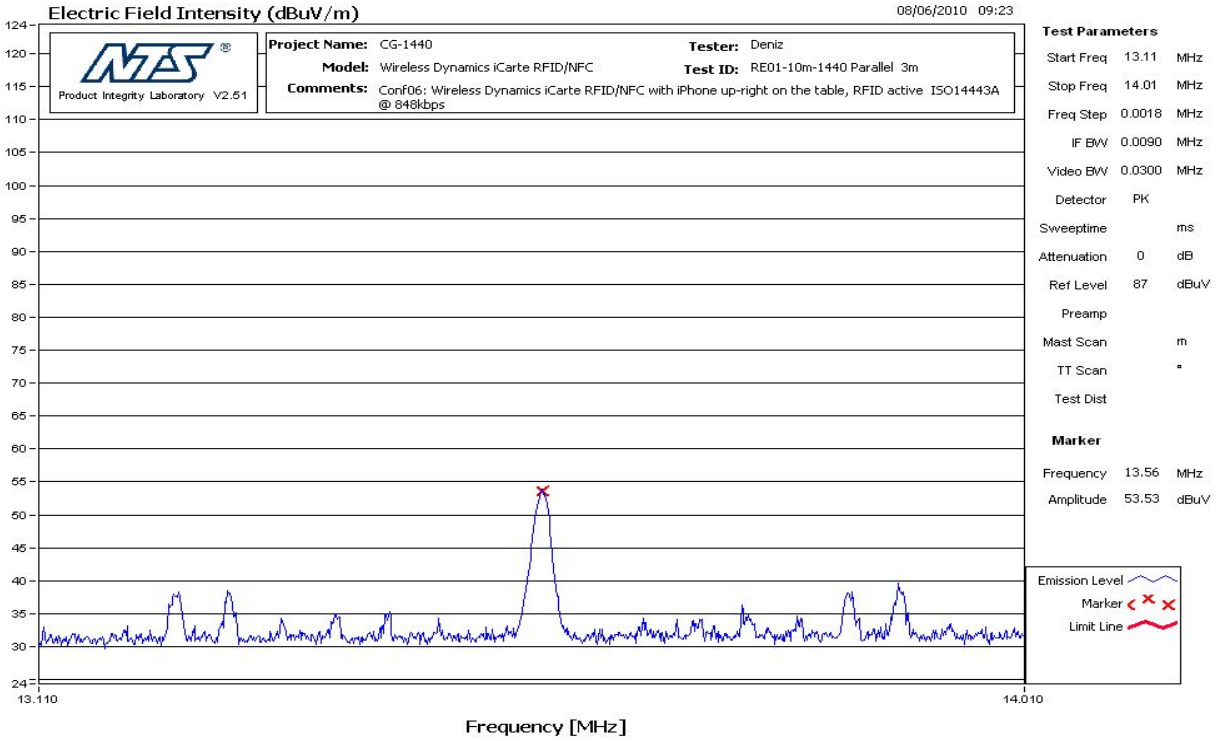


Figure 2 13.11 MHz to 14.01 MHz Parallel ISO14443A @ 848kbps at 10m distance

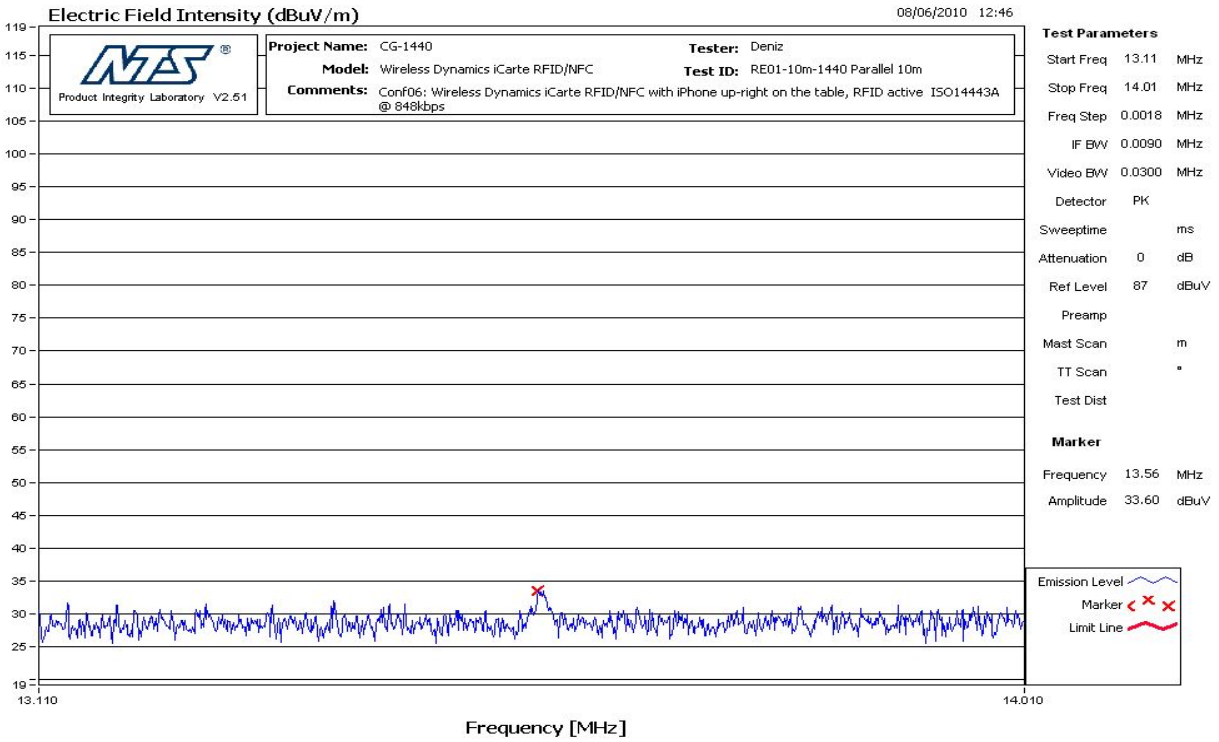


Figure 3 9 kHz to 150 kHz Parallel ISO14443A @ 848kbps at 3m distance

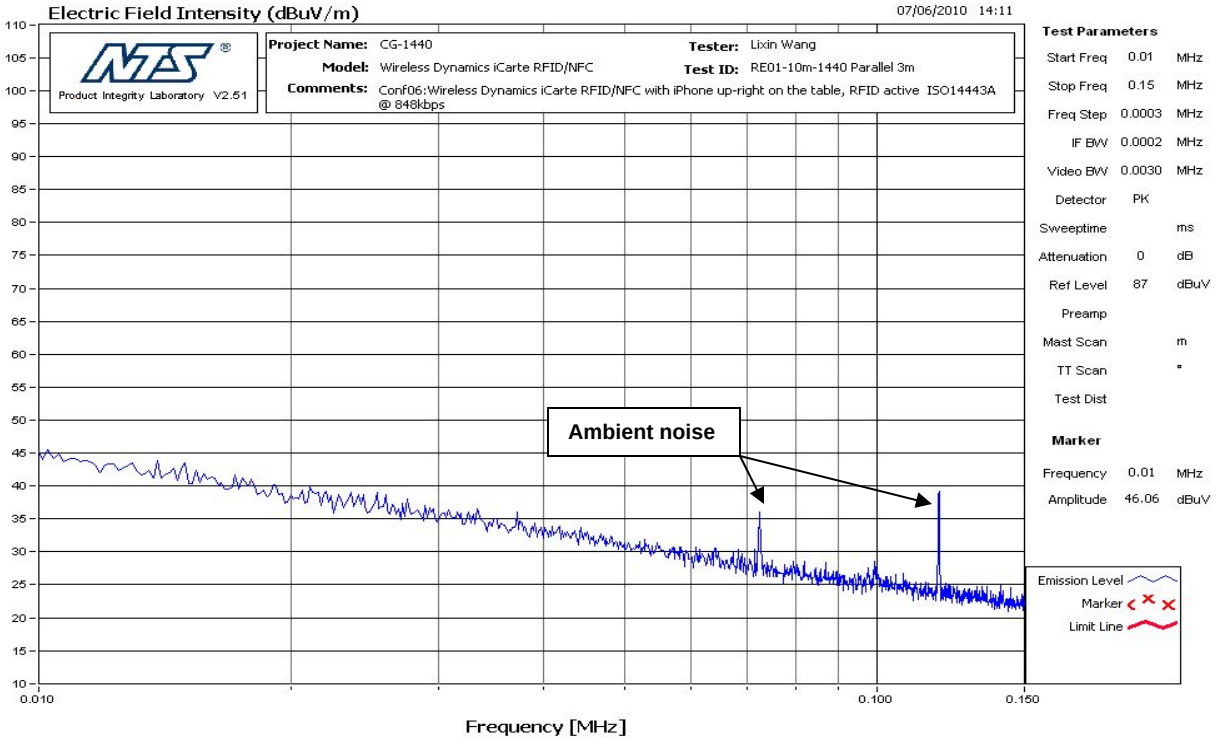


Figure 4 150 kHz to 13.11 MHz Parallel ISO14443A @ 848kbps 3m distance

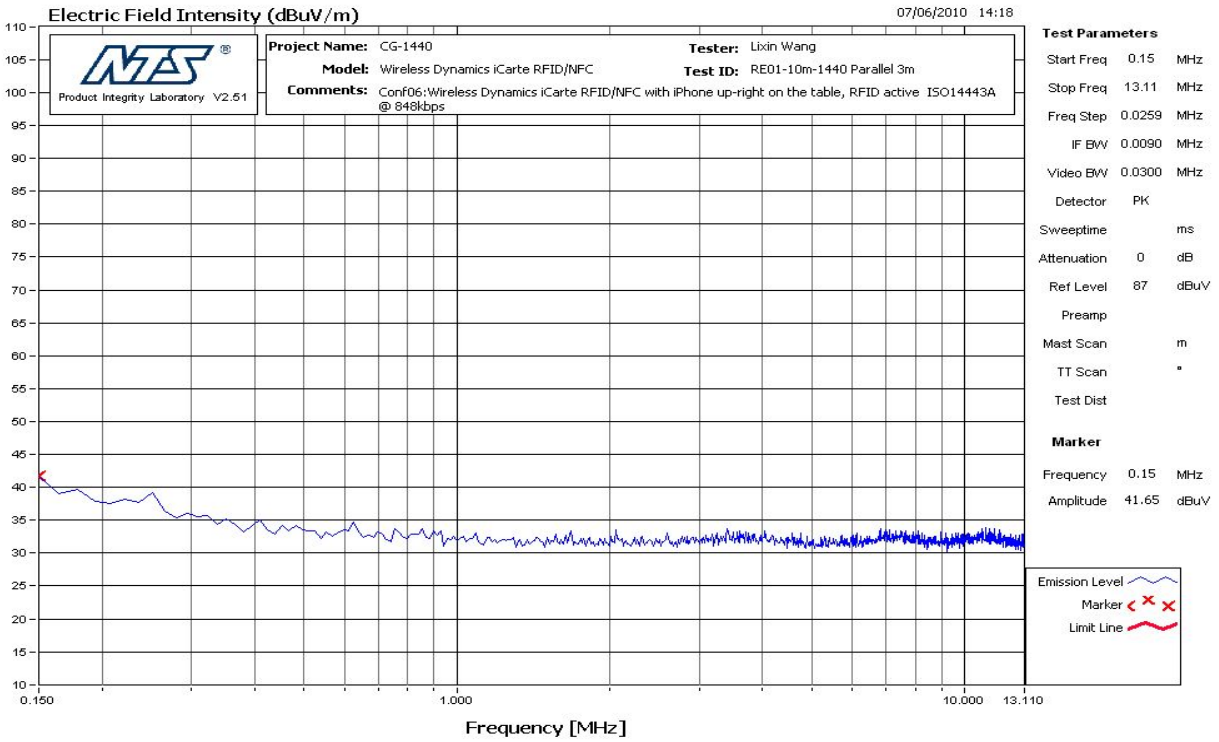


Figure 5 13.11 MHz to 14.01 MHz Parallel ISO14443A @ 848kbps 3m distance

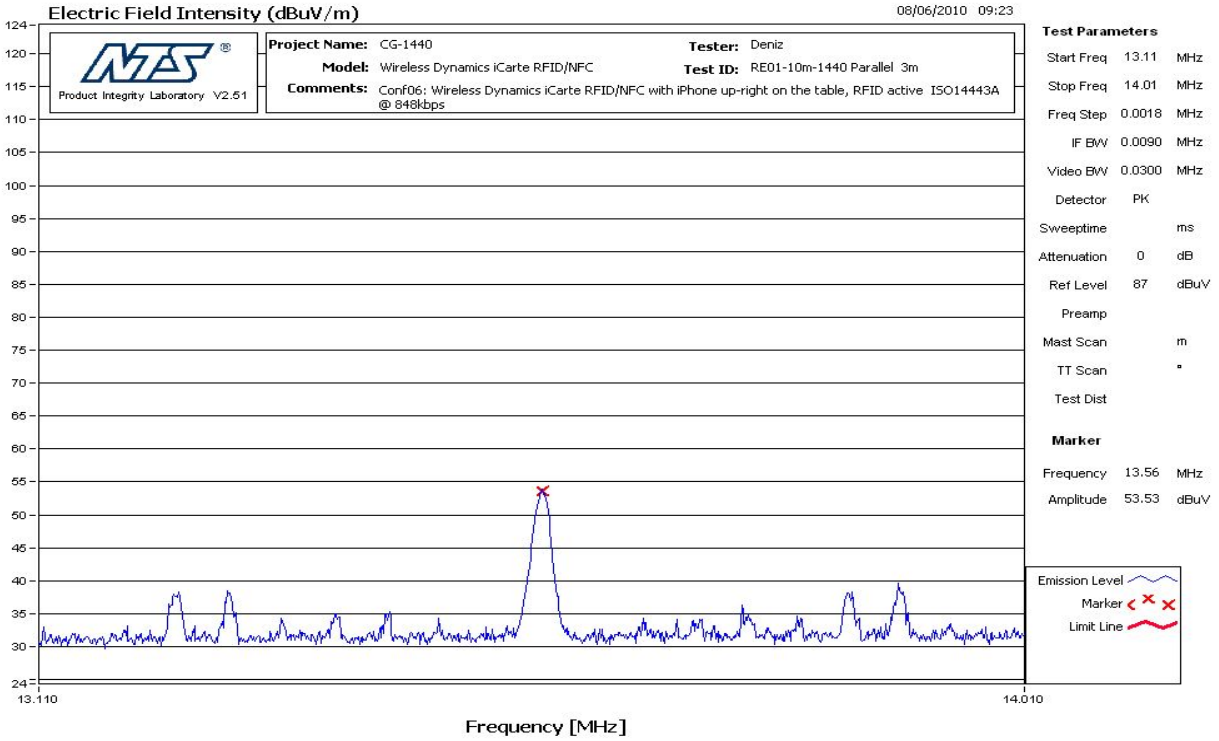


Figure 6 14.01 MHz to 30 MHz Parallel ISO14443A @ 848kbps 3m distance

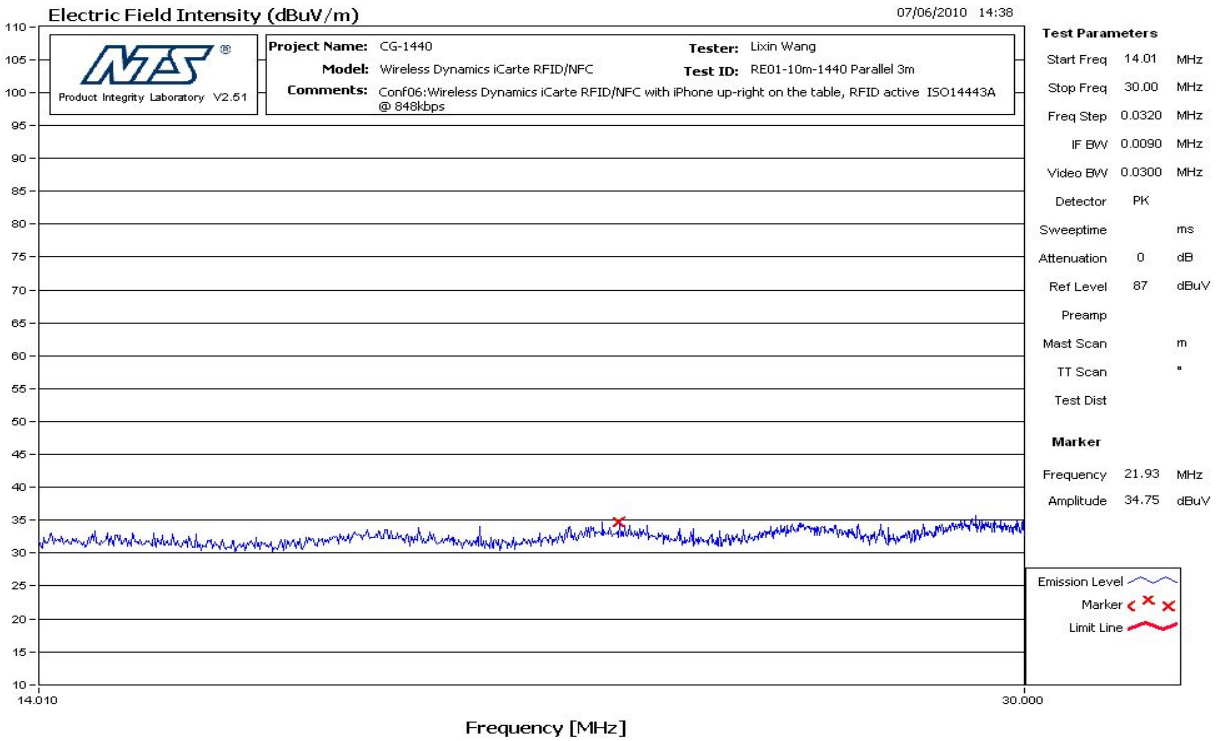


Figure 7 9 kHz to 150 kHz Perpendicular ISO14443A @ 848kbps at 3m distance

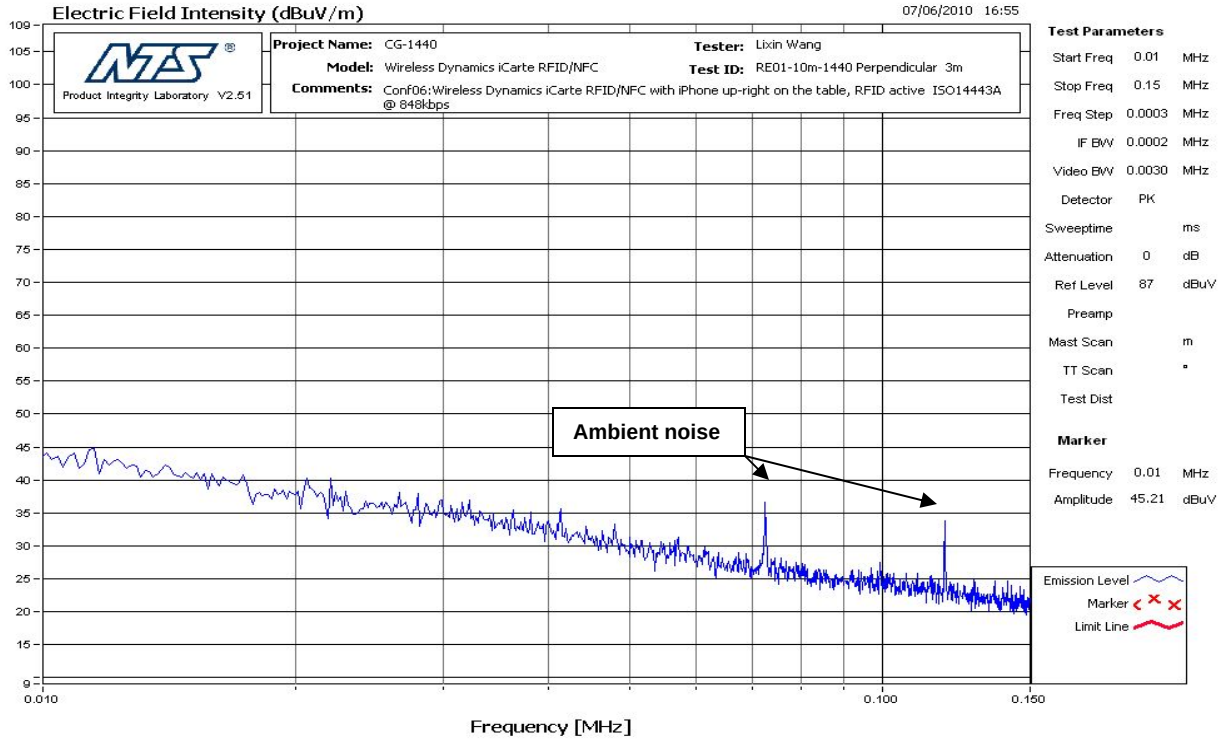


Figure 8 150 kHz to 13.11 MHz Perpendicular ISO14443A @ 848kbps 3m distance

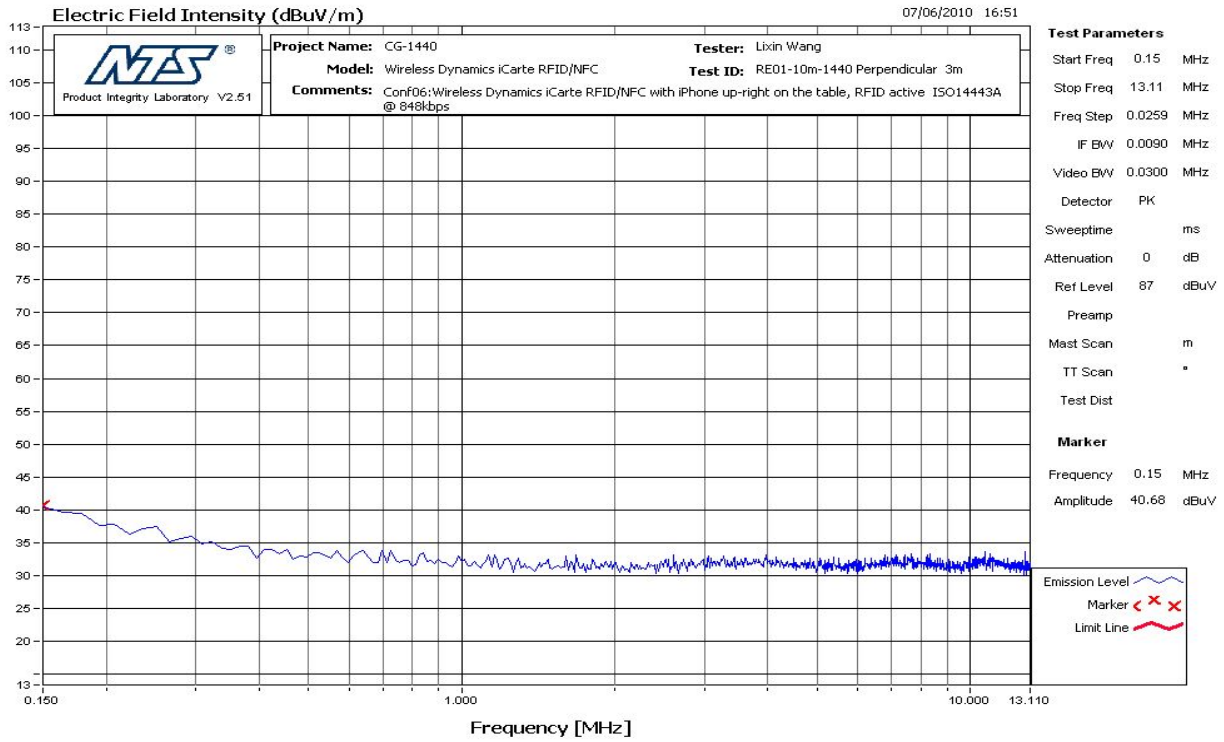


Figure 9 13.11 MHz to 14.01 MHz Perpendicular ISO14443A @ 848kbps 3m distance

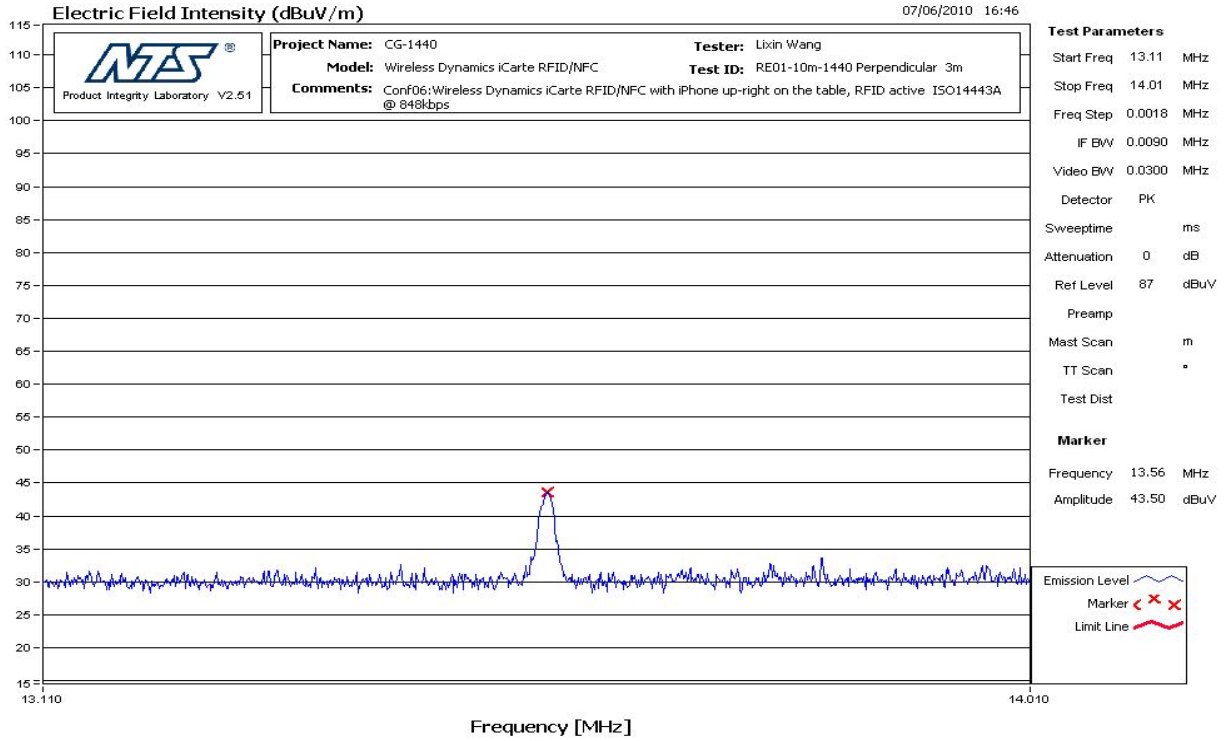


Figure 10 14.01 MHz to 30 MHz Perpendicular ISO14443A @ 848kbps 3m distance

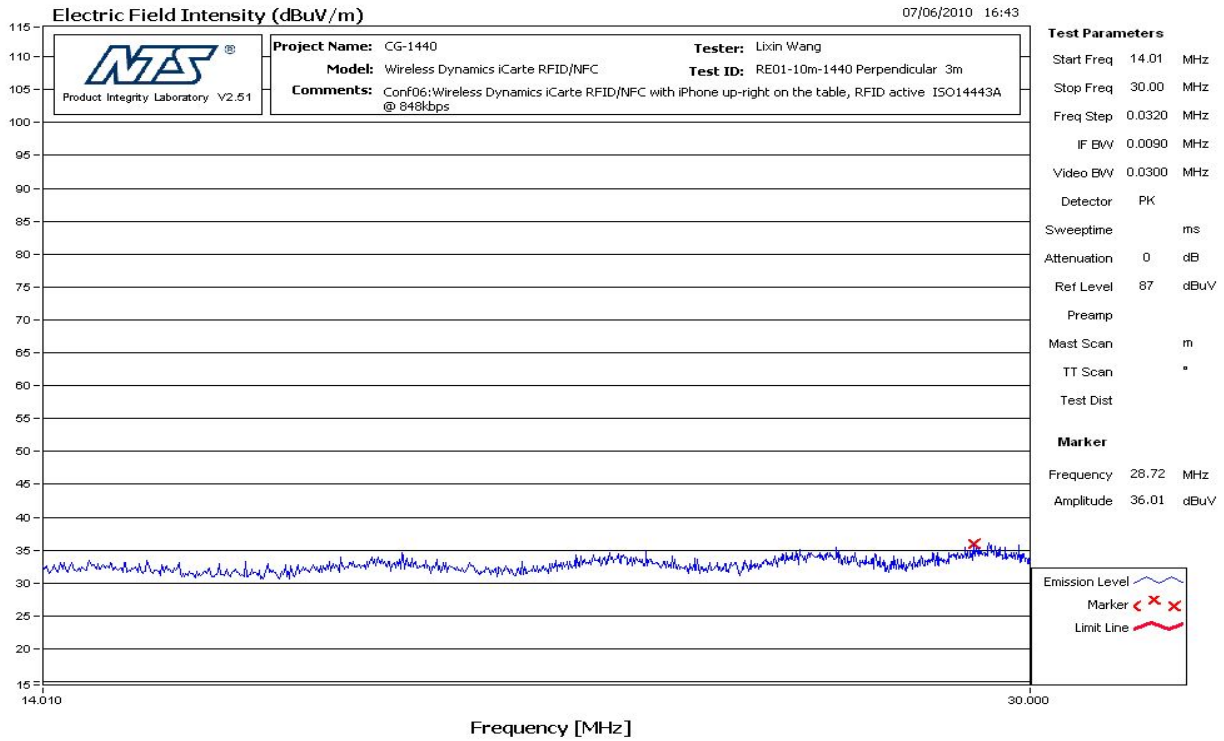


Figure 11 30 MHz to 1000 MHz Horizontal ISO14443A @ 848kbps 10m distance

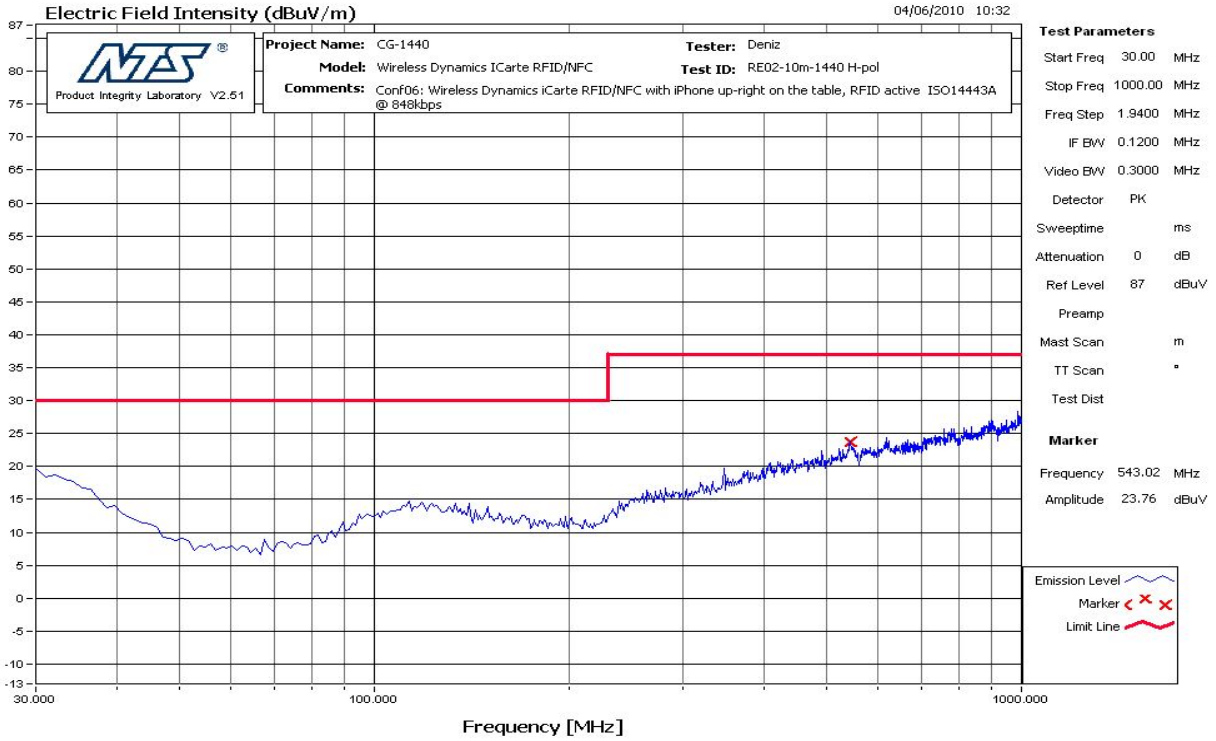
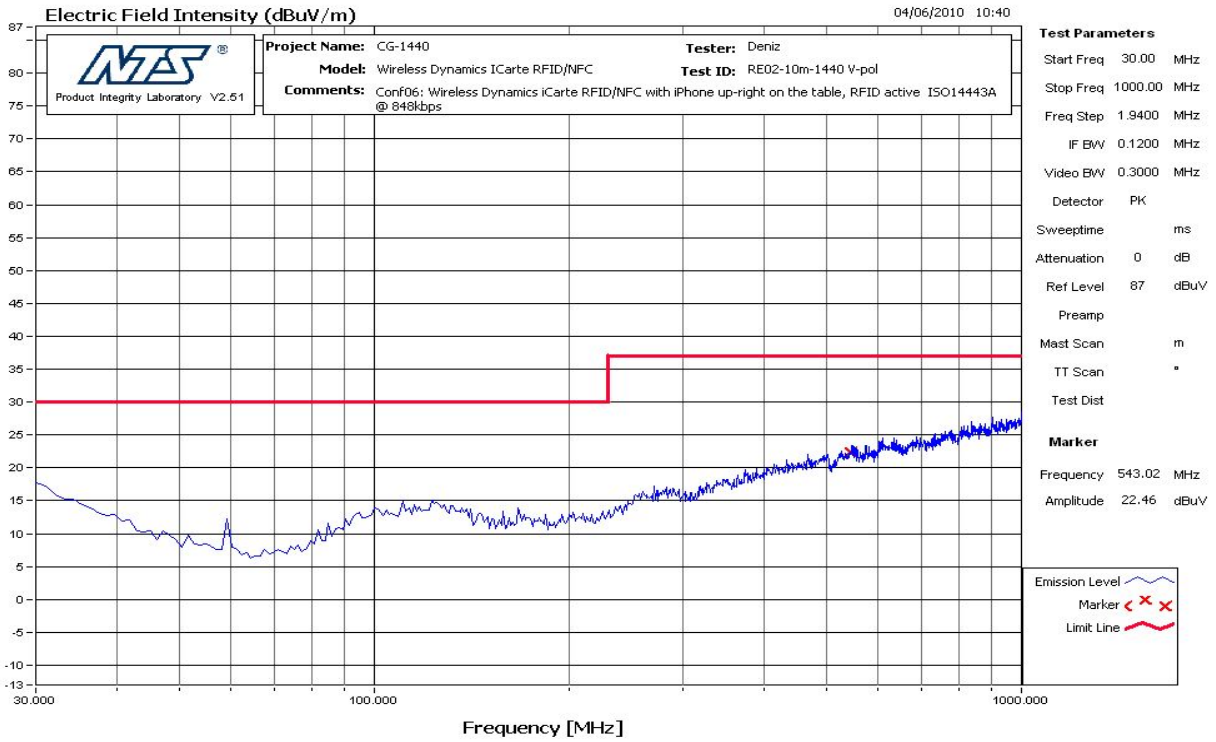


Figure 12 30 MHz to 1000 MHz Vertical ISO14443A @ 848kbps 10m distance



APPENDIX B: POWER LINE CONDUCTED EMISSION

B.1. Base Standard & Test Basis

Base Standard	FCC PART 15.207 (a) RSS-Gen Issue 2, 7.2.2
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:XT85027PU59T 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. 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: Lixin Wang
Function: EMC Technologist

B.7. Test date

June 09, 2010

B.8. Test Results

Product Integrity Laboratory V2.5

Project Number: CG-1440 **Tester:** Lixin Wang
Model: Wireless Dynamics ICarte RFID/NFC (13.56MHz RFID **Test ID:** CE02tc-10m-1440
Comments: 120VAC, 60Hz.Apple Model:A1265.S/N:XT85027PU59T.ISO 14443A@848Kbps.

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	0.251	QP	28.09	12.35	40.44	QP	61.74	**21.30**
AC 120V Line1A	0.510	QP	28.98	11.12	40.10	QP	56.00	**15.90**
AC 120V Line1A	0.852	QP	23.47	10.76	34.23	QP	56.00	**21.77**
AC 120V Line1A	1.526	QP	24.84	10.75	35.59	QP	56.00	**20.41**
AC 120V NeutralA	0.255	QP	27.25	12.26	39.51	QP	61.58	**22.07**
AC 120V NeutralA	0.511	QP	26.97	11.04	38.01	QP	56.00	**17.99**
AC 120V Line1A	13.560	QP	13.39	11.37	24.76	QP	60.00	**35.24**
AC 120V NeutralA	13.560	QP	17.48	11.28	28.76	QP	60.00	**31.24**
AC 120V Line1A	0.199	AV	2.42	12.14	14.56	AV	53.66	**39.10**
AC 120V Line1A	0.230	AV	22.18	11.11	33.29	AV	52.46	**19.17**
AC 120V Line1A	0.707	AV	13.64	10.76	24.40	AV	46.00	**21.60**
AC 120V Line1A	1.435	AV	16.36	10.75	27.11	AV	46.00	**18.89**
AC 120V NeutralA	0.243	AV	18.32	12.23	30.55	AV	52.00	**21.45**
AC 120V NeutralA	0.507	AV	14.76	11.03	25.79	AV	46.00	**20.21**
AC 120V Line1A	13.560	AV	11.26	11.37	22.63	AV	50.00	**27.37**
AC 120V NeutralA	13.560	AV	12.22	11.28	23.50	AV	50.00	**26.50**

The highest emission measured was 40.10 dBμV with quasi-peak detector at 510 kHz. It has 15.90 dB margin to the FCC Part 15.207 and RSS-Gen Issue 2 7.2.2 limits.

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

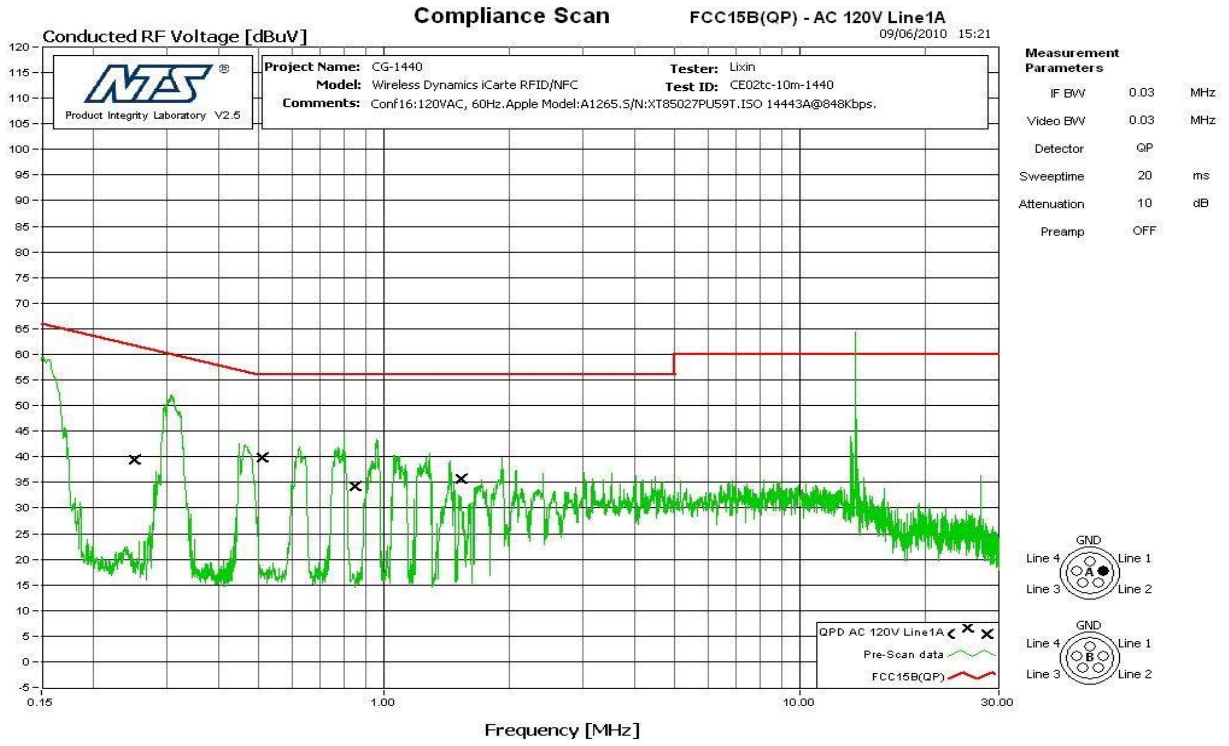


Figure 14 Conducted Emission 120 VAC Return - Quasi-peak Detector

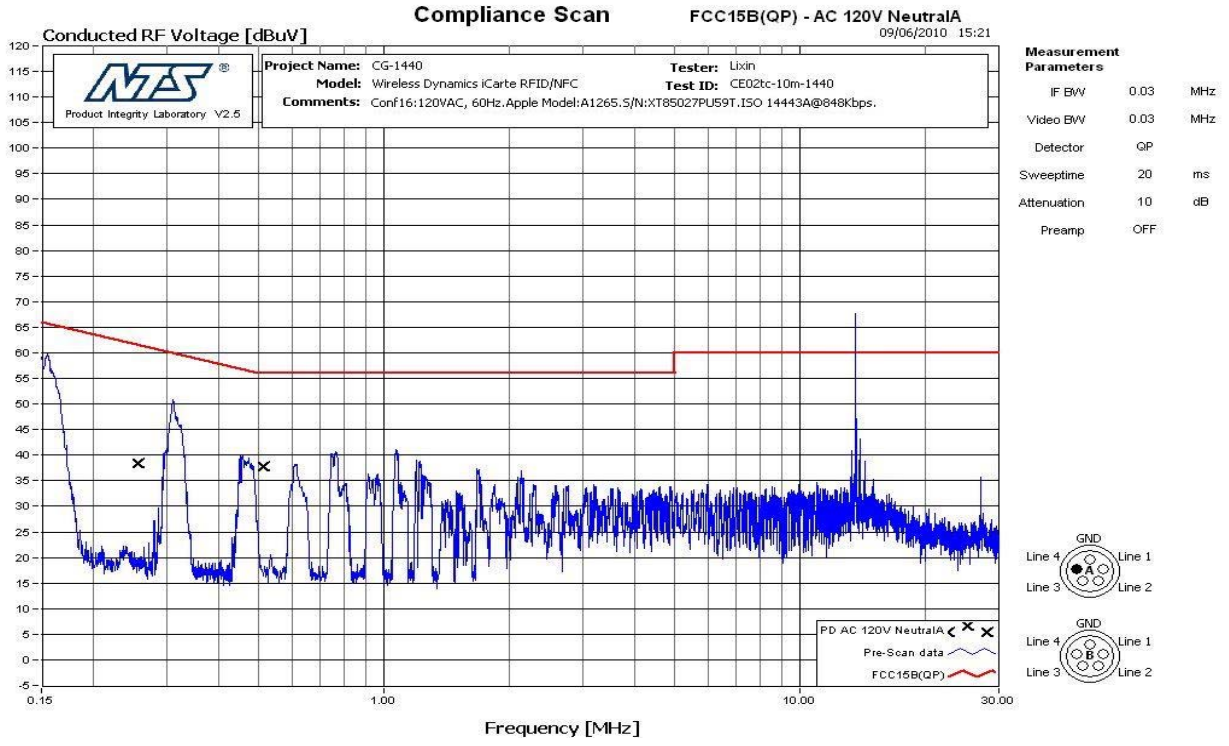


Figure 15 Conducted Emission 120 VAC Line - Average Detector

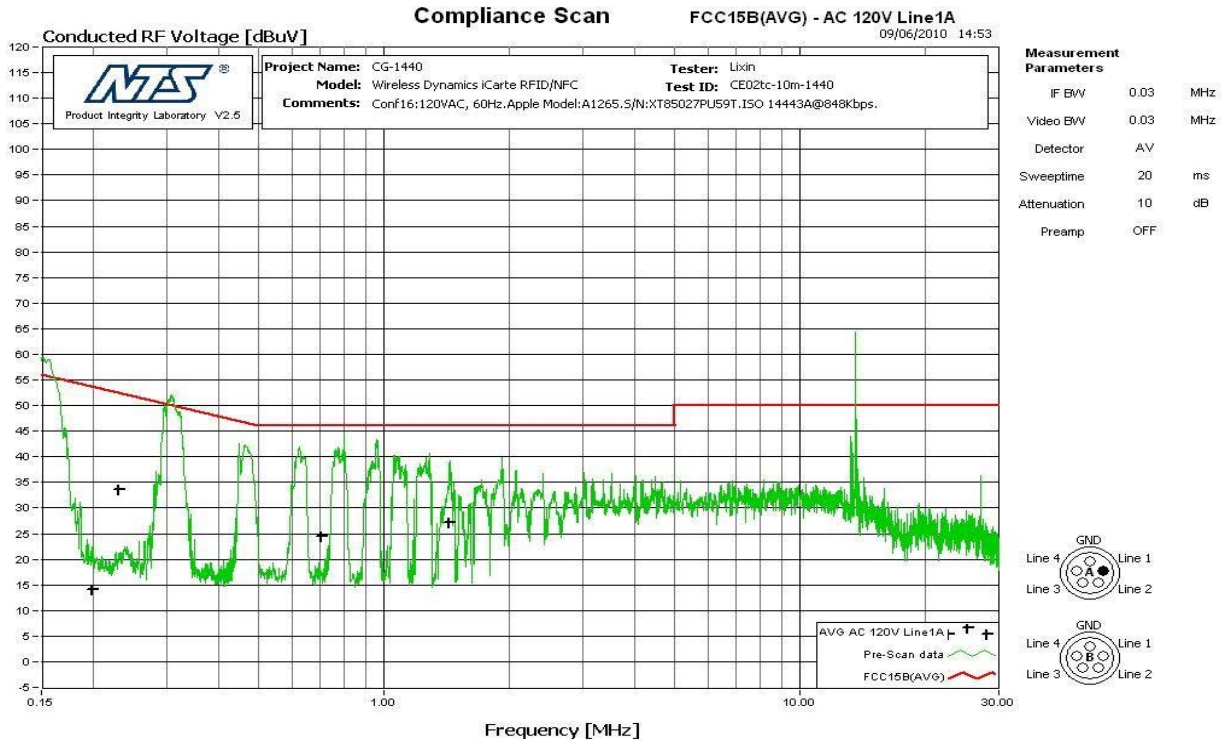
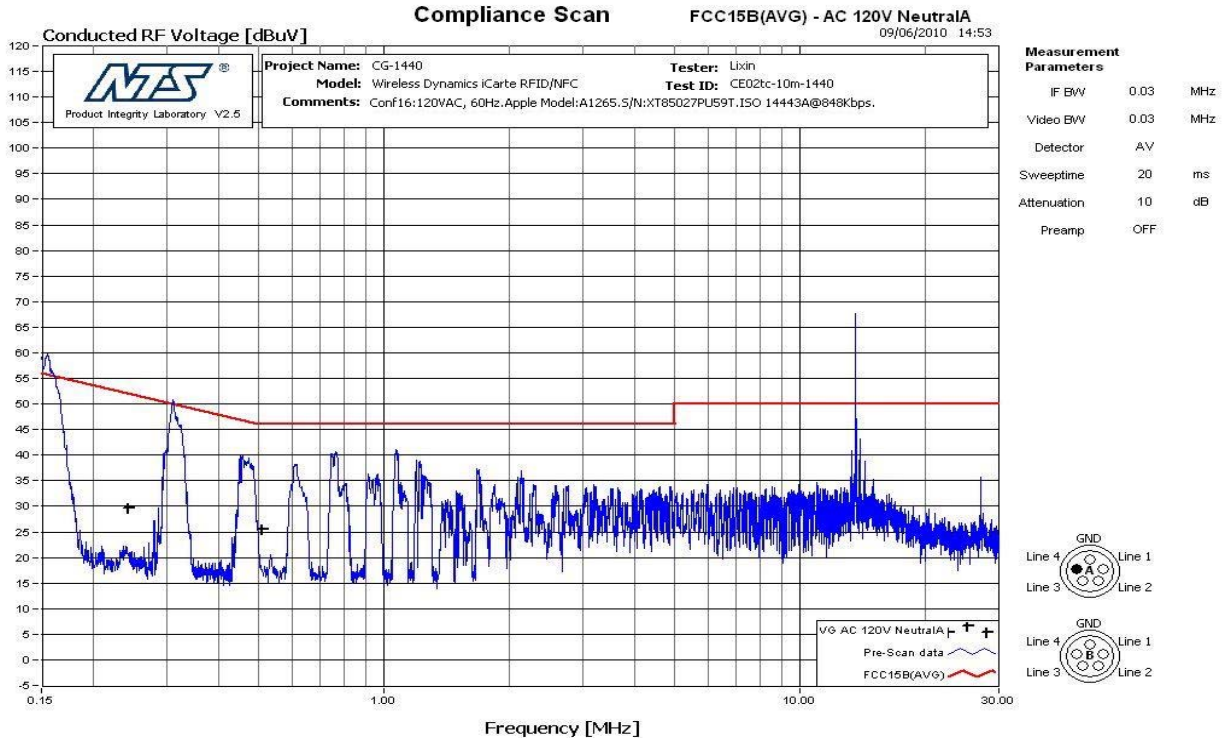


Figure 16 Conducted Emission 120 VAC Return - Average Detector



APPENDIX C: FREQUENCY TOLERANCE

C.1. Base Standard & Test Basis

Base Standard	FCC Part 15.225, RSS-210 Issue 7
Test Basis	FCC Part 15.225, RSS-210 Issue 7
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

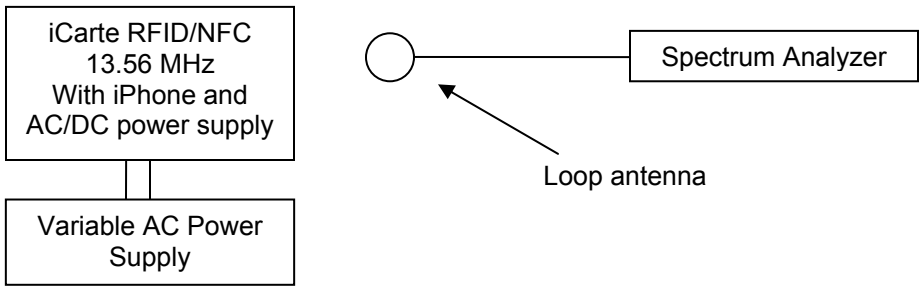
The EUT was setup with Wireless Dynamics software to transmit in CW mode. A coaxial loop antenna was connected to the spectrum analyzer and placed near the EUT to obtain a suitable signal level for frequency stability measurements.

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. Test Set Up

Figure 17 Frequency Stability Setup



C.6. Test Results

Complies.
EUT was set to CW Mode
The maximum frequency error was -224 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	-192	-197	-197	-197
	40°C and 120 VAC	-168	-186	-188	-189
	30°C and 120 VAC	-139	-168	-169	-169
	20°C and 120 VAC	-109	-137	-140	-141
	20°C and 138 VAC	-141			
	20°C and 102 VAC	-140			
	10°C and 120 VAC	-40	-107	-108	-109
	0°C and 120 VAC	-32	-87	-87	-87
	-10°C and 120 VAC	-89	-79	-79	-79
	-20°C and 120 VAC	-224	-87	-89	-89

C.7. 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.8. Test Dates

Test Started: June 9, 2010 Test Completed: June 9, 2010

APPENDIX D: TEST EQUIPMENT LIST

Type	Manufacturer	Model	Asset #	Cal Due	Cal Date
Bilog Antenna	Teseq	CBL 6112B	CG0314	21SEP10	29OCT08
Horn Antenna (Rx) 1 GHz – 18 GHz	EMCO	3115	CG0368	08SEP11	08SEP09
Loop Antenna 9 kHz – 30 MHz	Rohde & Schwarz	HFH2-Z2	CG0701	02OCT10	02OCT08
LNA 1 GHz < f < 18 GHz	Miteq	JSD00121	CG0761	13NOV11	13NOV09
Spectrum Analyzer 9 kHz – 40 GHz	Rohde & Schwarz	FSEK-20	CG0118	06AUG10	06AUG09
Test Receiver	Rohde & Schwarz	ESMI	CG0123 CG0434	04MAY11	04MAY09
Environmental Simulation Chamber	Thermotron	SM-8C	CG0001	N/A	N/A
20 Channel Multiplexer	Agilent	34901A	CG0006	07JAN11	07JAN10
Data Acquisition/Switch Unit	Agilent	34970A	CG0934	07JAN11	07JAN10
Voltmeter	Fluke	87	CG0384	06NOV10	06NOV09
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
Call Box	Agilent	8960	CG-R-1254	27NOV10	27NOV08

END OF DOCUMENT