LS RESEARCH, LLC
WIRELESS PRODUCT DEVELOPMENT
ACCREDITED
Testing Cert. 1255.01
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ENGINEERING TEST REPORT # 310037-A
LSR Job #: C-871

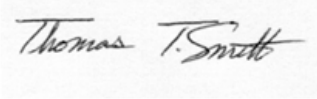
Compliance Testing of:
Casi-Rusco RFID Module

Test Date(s):
March 24th and April 12th 2010

Prepared For:
API Healthcare
Attn: Gary Sutcliffe
1550 Innovation Way
Hartford, WI 53027

In accordance with:
Federal Communications Commission (FCC)
Part 15, Subpart C, Section 15.209, and 15.109
Industry Canada (IC)
RSS 210 Annex 2 and section 2.7
General Operating Requirements for Low-Power License-Exempt Transceivers

This Test Report is issued under the Authority of:
Thomas T. Smith, Manager EMC Test Services

Signature:  Date: 05.06.10

Test Report Reviewed by:	**Tested by:**
Ryan M. Urness, Laboratory Manager	Khairul Aidi Zainal, Senior EMC Engineer
Signature:  Date: 05.06.10	Signature:  Date: 05.05.10

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EXHIBIT 1. INTRODUCTION

1.1 SCOPE

References:	FCC Part 15, Subpart C, Section 15.209
Title:	Telecommunication – Code of Federal Regulations, CFR 47, Part 15
Purpose of Test:	To gain FCC Certification Authorization for Low-Power License-Exempt Transmitters.

References:	FCC Part 15, Subpart B, Section 15.109
Title:	Telecommunication – Code of Federal Regulations, CFR 47, Part 15
Purpose of Test:	To gain FCC Certification Authorization for a Digital Device or a Non-Intentional Radiator.

References:	RSS 210 Annex 2
Title:	Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I equipment.
Purpose of Test:	To gain IC Certification Authorization for Low-Power License-Exempt Transmitters.

References:	RSS GEN
Title:	General requirements and Information for the Certification of Radiocommunication Equipment.
Purpose of Test:	To gain IC Certification Authorization for Low-Power License-Exempt Transmitters.

Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 – 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.
Environmental Classification:	• Commercial, Industrial or Business • Residential

1.2 NORMATIVE REFERENCES

Publication	Year	Title
47 CFR, Parts 0-15 (FCC)	2009	Code of Federal Regulations - Telecommunications
RSS 210 Annex 2	2007	Low-power License-exempt Radiocommunication Devices (All Frequency Bands): Category I equipment.
RSS GEN	2007	General requirements and information for the certification of Radiocommunication Equipment.
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.
CISPR 16-1-1	2006-03 A1: 2006-09 A2: 2007-07	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-2-1	2003 A1: 2004-04 A2: 2007-07	Specification for radio disturbance and immunity measuring apparatus and methods. Part 201: Conducted disturbance measurement.

1.3 LS Research, LLC TEST FACILITY

LS Research, LLC is accredited by A2LA (American Association for Laboratory Accreditation) to conform to ISO/IEC 17025, 2005 “General Requirements for the Competence of Calibration and Testing Laboratories”.

LS Research, LLC’s scope of accreditation includes all test methods listed herein, unless otherwise noted. Accreditation status can be verified at A2LA’s web site: www.a2la2.net.

1.4 LOCATION OF TESTING

All testing was performed at LS Research, LLC, W66 N220 Commerce Court, Cedarburg, Wisconsin, 53012 USA, utilizing the facilities listed below, unless otherwise noted.

List of Facilities Located at LS Research, LLC:

- Compact Semi-Anechoic Chamber
- FCC Listed Semi-Anechoic Chamber
- Open Area Test Site (OATS)

1.5 TEST EQUIPMENT UTILIZED

A complete list of equipment utilized in testing is provided in Appendix A of this test report. Calibration dates are indicated in Appendix A. All test equipment is calibrated by an ISO 17025 accredited calibration laboratory, traceable to the SI standard.

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1 CLIENT INFORMATION

Manufacturer Name:	API Healthcare Corporation.
Address:	1550 Innovation Way Hartford, WI 53027
Contact Person:	Gary Sutcliffe
Contact Phone:	262.670.2789
Contact Email:	Gary.sutcliffe@apihealthcare.cc

2.2 EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information has been supplied by the applicant.

Product Name:	Casi-Rusco RFID Module
Model Number:	RFID Module: DB-RFIDEAS_CR-CD Host: TA-500
Serial Number:	RFID module: A149380 Host: A96363

2.3 ASSOCIATED ANTENNA DESCRIPTION

The antenna associated with the module is a multi-turn loop antenna.

2.4 EUT'S TECHNICAL SPECIFICATIONS

Additional Information:

Frequency Range (in MHz)	0.125 MHz
RF Power in Watts (Near-field measurement at 3 meters)	EUT outside host enclosure: 0.0004753 Watts EUT Inside host enclosure : 0.0000189 Watts
Conducted Output Power (in dBm)	N/A
EIRP (in mW)	N/A
Field Strength at 3 meters	EUT outside host enclosure: 92.0 dBµV/m EUT Inside host enclosure : 77.9 dBµV/m
Occupied Bandwidth (99% BW)	437 Hz
Type of Modulation	ASK
Emission Designator	437HA1D
Transmitter Spurious (worst case) at 3 meters	EUT Outside: 39.7 dBµV/m at 351.3 MHz EUT Inside : 38.7 dBµV/m at 154.8 MHz
Receiver Spurious (worst case) at 3 meters	Refer to transmitter since EUT transmit and receives at the same time.
Frequency Tolerance %, Hz, ppm	50 ppm
Microprocessor Model # (if applicable)	PIC16C505 ATMEGA128
EUT will be operated under FCC Rule Part(s)	CFR 47 part 15.209
Antenna Information:	
a) Antenna Type	Multiple turn loop
b) Detachable/Non-Detachable	Non-detachable
c) Antenna Gain (in dBi)	Not available
Modular Filing	☒ Yes ☐ No
Portable or Mobile?	Portable

2.5 PRODUCT DESCRIPTION

The RF Ideas Casi-Rusco module is a 125 kHz RFID module. It is a modular product that may be incorporated into different API healthcare host consoles. The Casi-Rusco module will only be installed in products under the control of API healthcare Corporation. It is used exclusively with API Healthcare access point control applications. The Casi-Rusco RFID module is powered by the host interface with 5VDC. Communications with the host is via digital interface lines connecting the Casi-Rusco module and the host microprocessor. The Casi-Rusco RFID module is not self sufficient and cannot function without the use of a host unit. API healthcare will have control over the installation of the Casi-Rusco RFID module in its line of access point control applications.

EXHIBIT 3. EUT OPERATING CONDITIONS & CONFIGURATIONS DURING TESTS

3.1 CLIMATE TEST CONDITIONS

Temperature:	71° Fahrenheit
Humidity:	34%
Pressure:	749 mmHg

3.2 APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Paragraph	Test Requirements	Compliance (yes/no)
FCC : 15.107 IC : RSS GEN 7.2.2	Power Line Conducted Emissions Measurements	Yes
IC: RSS GEN 4.6	Occupied Bandwidth	Yes
FCC : 15.109 IC : RSS 210 2.6	Un-Intentional Radiated Emissions	Yes
FCC : 15.209 (a) IC : RSS 210 A2	Maximum RF Output Power	Yes
FCC : 15.209 (c) IC : RSS 210 A2	Maximum RF Spurious Emissions	Yes
FCC : 15.109 & 15.205 IC : RSS 210 A2 and 2.6	Transmitter General Radiated Emissions	Yes
FCC: 15.209 (b)	Band edge requirements	Yes

3.3 MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

☒ **None** ☐ **Yes (explain below)**

3.4 DEVIATIONS & EXCLUSIONS FROM TEST SPECIFICATIONS

☒ **None** ☐ **Yes (explain below)**

EXHIBIT 4. DECLARATION OF CONFORMITY

The EUT was found to **MEET** the requirements as described within the specification of FCC Title 47, CFR Part 15.209, and Industry Canada RSS-210, Issue 7 (2007), Section 2.6 for a Low-Power License-Exempt Transmitters, as well as the specification of FCC Title 47, CFR Part 15.109, and Industry Canada RSS-210, Issue 7 (2007), Section 7 for non-intentional radiators.

If some emissions are seen to be within 3 dB of their respective limits:
As these levels are within the tolerances of the test equipment and site employed, there is a possibility that this unit, or a similar unit selected out of production may not meet the required limit specification if tested by another agency.

LS Research, LLC certifies that the data contained herein was taken under conditions that meet or exceed the requirements of the test specifications. The results in this Test Report apply only to the item(s) tested on the above-specified dates. Any modifications made to the EUT subsequent to the indicated test date(s) will invalidate the data herein, and void this certification.

EXHIBIT 5. RADIATED EMISSIONS TEST FOR TRANSMIT AND RECEIVE.

5.1 Test Setup

The test setup was assembled in accordance with Title 47, CFR FCC Part 15, RSS GEN, and ANSI C63.4. The Casi-Rusco RFID module, henceforth referred to as the EUT, was placed on an 80cm high non-conductive pedestal, centered on a flush mounted 2-meter diameter turntable inside a 3 meter Semi-Anechoic, FCC listed Chamber. The EUT was tested in two setups:

1. The EUT outside of the host enclosure.
2. The EUT inside of the host enclosure.

The first setup variant is for modular testing while the second depicts normal usage/operation. The EUT operates on a single channel at 125 kHz.

The host (TA500) used in the test was chosen because it has many of the features that would be incorporated in a typical host reader. It was configured in an arrangement that may have the most interaction with the AWID badge reader under test. The host enclosure draws power via POE (power over Ethernet) which in turn powers the EUT. The host was exercised by activating communication through an Ethernet connection. It was tested against class B limits for residential and light industrial applications.

For the test, the EUT was in normal configuration where it continuously looks for a badge. Initial measurements were performed at 3m separation to identify the emissions below 30MHz, and all identified emissions were then re-measured at a 10m separation distance.

In accordance with Title 47, CFR FCC Part 15.33(b)(1), because the highest clock frequency present in the system is 90MHz, spurious emissions investigation will be tested to 1GHz.

5.2 Test Procedure

Radiated RF measurements were performed at a separation distance of 3 meters on the EUT in a Semi-Anechoic, FCC listed Chamber. The frequency range from 10 kHz to 1000 MHz was scanned and investigated. In cases where emissions below 30MHz were found, measurements of those emissions were repeated on the OATS at a 10m measurement distance. The radiated RF emission levels were manually noted at the various fixed degree settings of azimuth on the turntable and antenna height. A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, and a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. For emissions below 30 MHz, an active loop antenna was used. The loop antenna was set at a height of 1m above the conducting ground plane and it was rotated about its vertical and horizontal axes (while utilizing the turntable to rotate the EUT) in order to measure the maximum radiated RF emissions. The maximum radiated RF emissions above 30MHz were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities and rotating the EUT using the turntable.

The EUT was rotated along three orthogonal axes during the investigations to find the highest emission levels. In addition, the fundamental power and frequency was monitored while the EUT supply voltage was varied ±15% of the nominal (102 VAC and 138 VAC).

The receiver was operated with the resolution bandwidth set at 200 Hz for measurements between 9kHz and 150kHz, 9kHz for measurements between 150kHz and 30MHz and 120kHz for measurements between 30MHz and 1000 MHz.

Due to the nature of the device, while in normal operation, the emissions of the transmitter and receiver can be measured simultaneously. Proceeding graphs and data in this report are that of both TRANSMIT and RECEIVE modes.

5.3 Test Equipment Utilized

A list of the test equipment and antennas utilized for the Radiated Emissions test can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. All calibrations of the antennas used were performed at an IEC/ISO 17025 accredited calibration laboratory, traceable to the SI standard. In addition, the Connecting Cables were measured for losses using a calibrated Signal Generator and an Agilent E4445A/N9039A EMI System. The resulting correction factors and the cable loss factors from these calibrations were entered into the EMI Receiver database. As a result, the data taken from the EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The EMI Receiver was operated with resolution bandwidths as prescribed in ANSI C63.4.

5.4 Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Part 15.209 for a Low-Power License-Exempt transmitter [Canada RSS-210]. The frequencies with significant RF signal strength were recorded and plotted as shown in the Data Charts and Graphs.
The voltage variation test revealed that the EUT showed no variation in power and frequency. The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characteristics were within compliant parameters, and the system returned to the same state of operation as before the power cycle.

5.5 CALCULATION OF RADIATED EMISSIONS LIMITS

Transmitter Limits

The maximum peak output power of an intentional radiator in the 9-490 kHz band, as specified in Title 47 CFR 15.209 and RSS 210 section 2.7, is calculated in a formula as described below. The harmonic and spurious RF emissions, with appropriate receiver bandwidths, as specified in 15.209 (c) and section 2.7 of RSS 210, shall be below the measured power of the desired signal, and must also meet the requirements described in 15.205(c) for FCC and table 1 of RSS 210 where applicable.

The following table depicts the general radiated emission limits. These limits are obtained from Title 47 CFR, Part 15.209, for radiated emissions measurements and are comparable to that of table 3 in RSS 210 section 2.7. These limits were applied to the fundamental emission of the intentional radiator as well as all other significant spurious signals.

Frequency (MHz)	Limit μV/m	Limit (dBμV/m)	Measurement Distance (m)
0.009-0.490	2400/F (kHz)	Note 1	300
0.490-1.705	24000/F (kHz)		30
1.705-30.0	30		30
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
960-24,000	500	54.0	3

Note 1: Sample calculation for the Fundamental Emission of a transmitter:

For Example:

If a transmitter operates at a fundamental frequency of 25 kHz, the emission limit may be calculated:

2400/F = 2400/25 = 96.0 μV/m if measured at 300 meters separation.

Expressed in decibels: $20 \log_{10} (96.0)$ = 39.64 dBμV/m at 300 m separation.

At 3 meters separation, the limit may be extrapolated by the addition of 40 dB/decade per 47CFR 15.31(f)(2)

Limit for the fundamental emission = 39.64 dBμV/m + 80 dB = 119.6 dB/μV/m at 3 meters

Sample conversion from field strength μV/m to dBμV/m:

dBμV/m = $20 \log_{10} (100)$

= 40 dBμV/m (from 30-88 MHz)

For measurements made at 1.0 meter, a 9.5 dB correction may be invoked.

960 MHz to 10,000 MHz

500μV/m or 54.0 dB/μV/m at 3 meters

54.0 + 9.5 = 63.5 dB/μV/m at 1 meter

For measurements made at 0.3 meter, a 20 dB correction may be invoked.

960 MHz to 10,000 MHz

500μV/m or 54.0 dB/μV/m at 3 meters

54.0 + 20 = 74 dB/μV/m at 0.3 meters

Receiver Limits

The following table depicts the Class B limits for an unintentional radiator. These limits are obtained from Title 47 CFR, Part 15.109(a) and RSS 210 section 2.6, for radiated emissions measurements.

Frequency (MHz)	3 m Limit (μV/m)	3 m Limit (dBμV/m)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-10,000	500	54.0

Sample conversion from field strength μV/m to dBμV/m:

$dB\mu V/m = 20 \log_{10}$ (3m limit)

from 30-88 MHz for example: $dB\mu V/m = 20 \log_{10} (100)$

$40.0\ dB\mu V/m = 20 \log_{10} (100)$

5.6 RADIATED EMISSIONS DATA CHART

3 Meter Measurements of Electromagnetic Radiated Emissions
Frequency Range Inspected: 9 kHz to 1000 MHz

Manufacturer:	API Healthcare						
Date(s) of Test:	March 24th and April 12th 2010						
Project Engineer:	Aidi Zainal						
Test Engineer(s):	Aidi Zainal and Ken Boston						
Voltage:	EUT : 5VDC (from Host) Host : 120 VAC						
Operation Mode:	Normal operation. Simultaneous transmit and receive						
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %						
EUT Power:	√	Single Phase 120VAC		3 Phase ___VAC			
		Battery	√	Other: TA500			
EUT Placement:	√	80cm non-conductive table		10cm Spacers			
EUT Test Location:	√	3 Meter Semi-Anechoic FCC Listed Chamber	√	10m OATS			
Measurements:		Pre-Compliance		Preliminary	√	Final	
Detectors Used:	√	Peak	√	Quasi-Peak	√	Average	

RADIATED EMISSIONS DATA CHART *(continued)*

The following table depicts the level of significant ***spurious*** radiated RF emissions found for both **transmit** and **receive** mode**:**

1. EUT outside of host enclosure.

Frequency (MHz)	Antenna Polarization	EUT Orientation	Height (m)	Azimuth (°)	Q. Peak Det. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
154.9	H	V	1.22	158	36.7	43.0	6.3
165.9	H	V	1.80	85	30.1	43.0	12.9
175.7	H	V	1.00	195	32.9	43.0	10.1
191.6	H	V	1.60	0	35.0	43.0	8.0
199.1	H	V	1.00	0	36.0	43.0	7.0
207.6	H	V	1.50	0	33.7	43.0	9.3
255.5	H	V	1.30	65	35.0	46.0	11.0
110.6	V	V	1.00	35	33.2	43.0	9.8
154.9	V	V	1.00	0	36.2	43.0	6.8
165.9	V	V	1.00	320	37.1	43.0	5.9
367.3	V	V	1.40	0	39.7	46.0	6.3
351.3	H	V	1.00	265	36.9	46.0	9.1
367.3	H	V	1.00	245	35.7	46.0	10.3

Notes:

1) An Average and quasi peak Detector function was used in measurements below 30 MHz, a Quasi-Peak Detector was used in measurements between 30 MHz and 1 GHz.
2) The spurs seen are independent of EUT orientation.
3) V = Vertical, S= side, H = Horizontal, F= Flat.

2. EUT inside of host enclosure.

Frequency (MHz)	Antenna Polarization	EUT Orientation	Height (m)	Azimuth (°)	Q. Peak Det. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
31.9	V	V	1.00	325	31.1	40.0	8.9
99.6	V	V	1.00	233	34.7	43.0	8.3
110.6	V	V	1.27	177	38.7	43.0	4.3
154.8	V	V	1.00	0	32.5	43.0	10.5
154.8	H	V	1.27	177	38.7	43.0	4.3
165.9	H	V	1.00	0	35.5	43.0	7.5
207.6	H	V	1.20	183	33.4	43.0	9.6
223.6	H	V	1.30	0	37.6	46.0	8.4

Notes:

1) An Average and quasi peak Detector function was used in measurements below 30 MHz, a Quasi-Peak Detector was used in measurements between 30 MHz and 1 GHz.
2) The spurs seen are independent of EUT orientation.
3) V = Vertical, S= side, H = Horizontal, F= Flat.

RADIATED EMISSIONS DATA CHART *(continued)*

The following table depicts the level of significant radiated RF **fundamental and harmonic** emissions seen when the EUT OUTSIDE of the host enclosure (3m measurement):

Frequency (MHz)	Antenna Polarization	EUT Orientation	Height (m)	Azimuth (°)	Peak Det. (dBµV/m)	Q. Peak Det. (dBµV/m)	Avg Det. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
0.1250	V	S	1.00	188	92.0	92.0	92.0	105.7	13.7
0.2500				Note 2					
0.3751	V	S	1.00	177	58.1	56.8	54.8	96.1	41.4
0.5001				Note 2					
0.6251	V	S	1.00	175	52.1	48.4	45.3	71.7	23.3
0.7501				Note 2					
0.8751	V	S	1.00	178	46.7	44.3	40.4	68.8	24.4
1.0002				Note 2					
1.1252	V	S	1.00	155	44.1	39.4	35.5	66.6	27.2
1.2502				Note 2					

The following table depicts the level of significant radiated RF **fundamental and harmonic** emissions seen when the EUT OUTSIDE of the host enclosure (10m measurement):

Frequency (MHz)	Antenna Polarization	EUT Orientation	Height (m)	Azimuth (°)	Peak Det. (dBµV/m)	Q. Peak Det. (dBµV/m)	Avg Det. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
0.1250	V	S	1.00	7	64.2	62.4	59.5	84.8	25.3
0.2500				Note 2					
0.3751				Note 2					
0.5001				Note 2					

Notes:

1) An Average and quasi peak Detector function was used in measurements below 30 MHz, a Quasi-Peak Detector was used in measurements between 30 MHz and 1 GHz.
2) Measurement buried within receiver system noise floor.
3) Measurements below 30MHz were performed at 3m and 10m separation distance. The limits were corrected to reflect the change in measurement distance.
4) V = Vertical, S= side, H = Horizontal, F= Flat.

RADIATED EMISSIONS DATA CHART *(continued)*

The following table depicts the level of significant radiated RF **fundamental and harmonic** emissions seen when the EUT INSIDE of the host enclosure (3m measurement):

Frequency (MHz)	Antenna Polarization	Host Orientation	Height (m)	Azimuth (°)	Peak Det. (dBµV/m)	Q. Peak Det. (dBµV/m)	Avg Det. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
0.1250	V	V	1.00	0	78.0	77.9	77.9	105.7	27.8
0.2500				Note 2					
0.3751	V	V	1.00	0	54.2	51.9	46.7	96.1	49.5
0.5001				Note 2					
0.6251	V	V	1.00	0	46.6	43.8	38.0	71.7	27.9
0.7501	V	V	1.00	154	43.7	39.5	32.8	70.1	30.6
0.8751	V	V	1.00	0	46.1	41.5	35.7	68.8	27.2
1.0002				Note 2					
1.1252	V	V	1.00	7	40.2	36.2	30.1	66.6	30.4
1.2502				Note 2					

The following table depicts the level of significant radiated RF **fundamental and harmonic** emissions seen when the EUT INSIDE of the host enclosure (10m measurement):

Frequency (MHz)	Antenna Polarization	Host Orientation	Height (m)	Azimuth (°)	Peak Det. (dBµV/m)	Q. Peak Det. (dBµV/m)	Avg Det. (dBµV/m)	Limit (dBµV/m)	Margin (dB)
0.1250	V	V	1.00	0	56.1	53.9	49.9	84.8	34.9
0.2500				Note 2					
0.3751				Note 2					
0.5001				Note 2					

Notes:

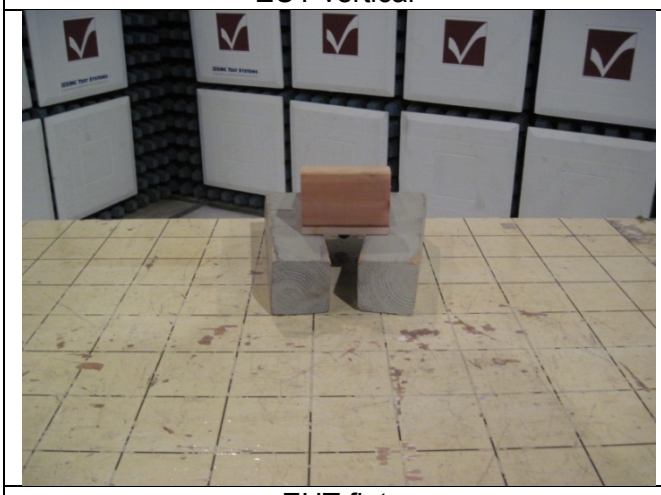
1) An Average and quasi peak Detector function was used in measurements below 30 MHz, a Quasi-Peak Detector was used in measurements between 30 MHz and 1 GHz.
2) Measurement buried within receiver system noise floor.
3) Measurements below 30MHz were performed at 3m and 10m separation distance. The limits were corrected to reflect the change in measurement distance.
4) V = Vertical, S= side, H = Horizontal, F= Flat

5.7 Test Setup Photo(s) – Radiated Emissions Test

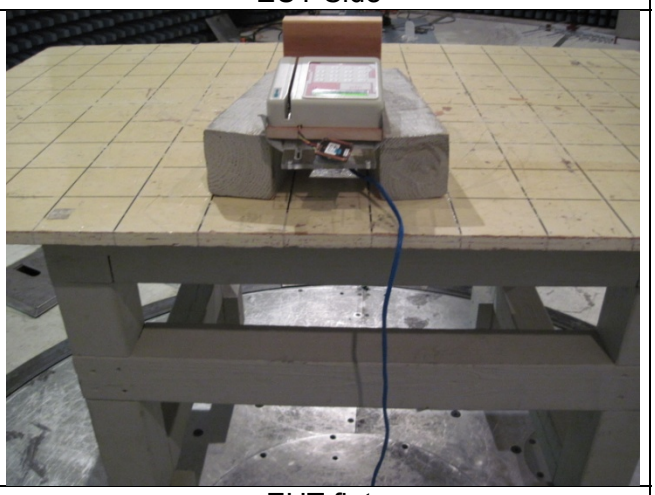
5.7.1 EUT outside of Host

EUT vertical

EUT Side



EUT flat



EUT flat

5.7.2 EUT inside of Host

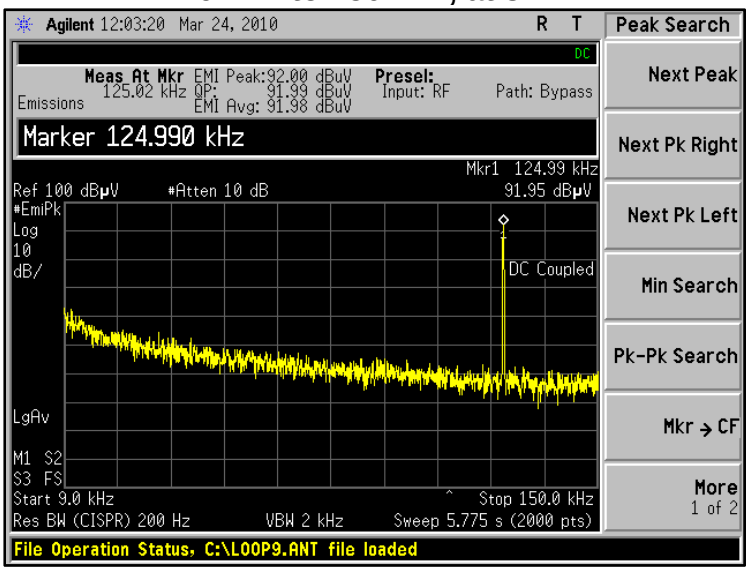
5.8 Screen Captures - Radiated Emissions Testing

These screen captures represent Peak Emissions. For radiated emission measurements, a Quasi-Peak or Average detector function is utilized when measuring frequencies below 1 GHz.

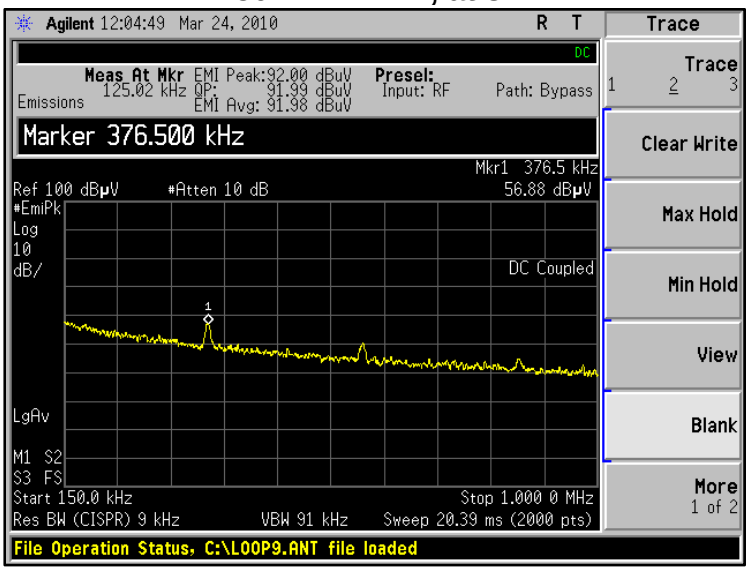
The signature scans shown here are from worst-case emissions with the sense antenna in either vertical or horizontal polarity for worst case presentations.

5.8.1 EUT outside of host.

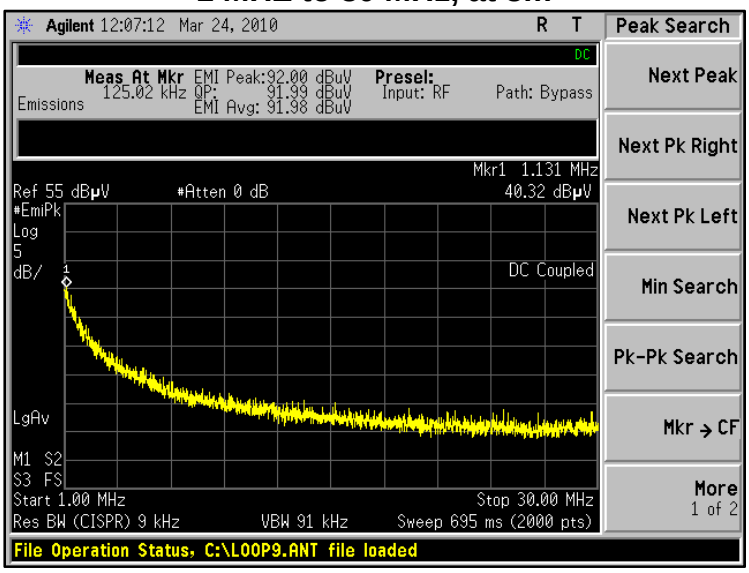
9 kHz to 150 kHz, at 3m



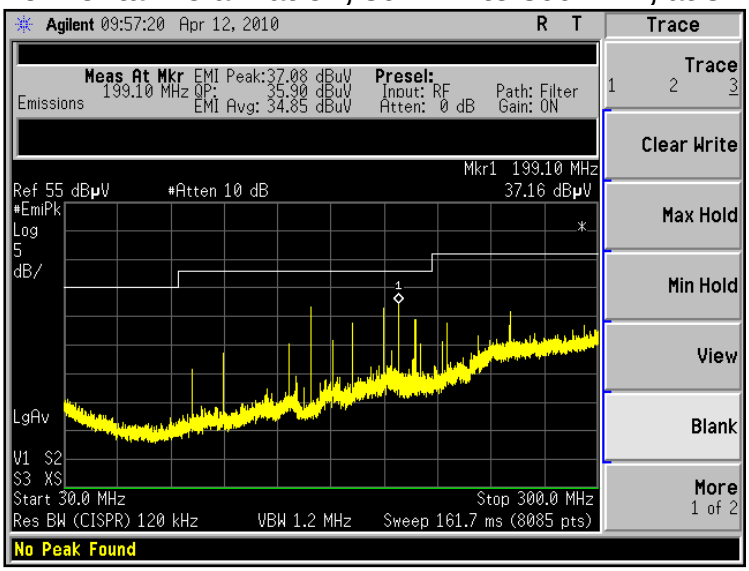
150 kHz-1MHz, at 3m



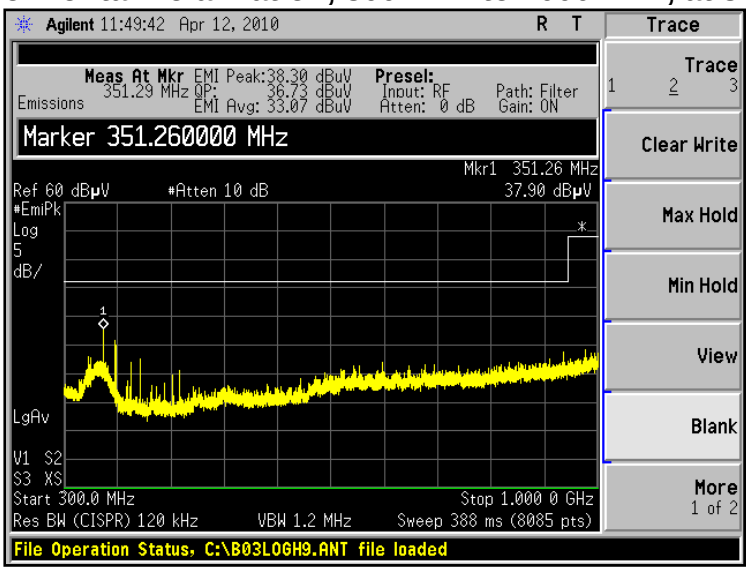
1 MHZ to 30 MHz, at 3m



Horizontal Polarization, 30 MHz to 300 MHz, at 3m

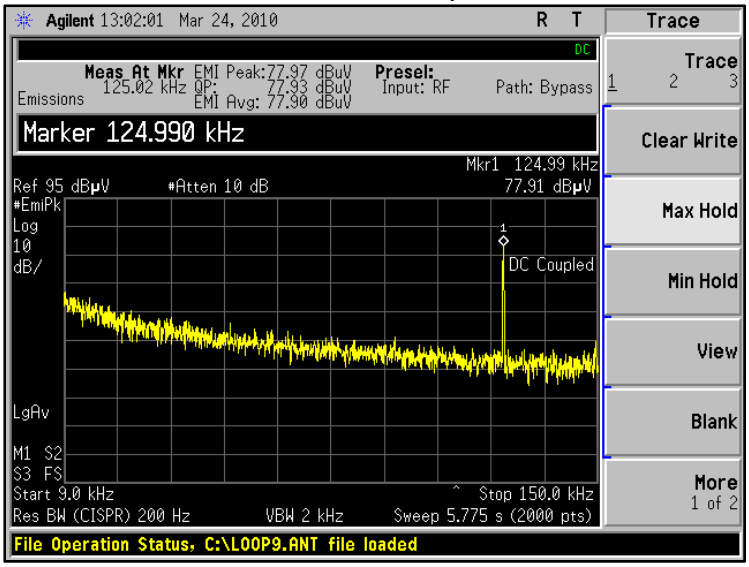


Horizontal Polarization, 300 MHz to 1000 MHz, at 3m

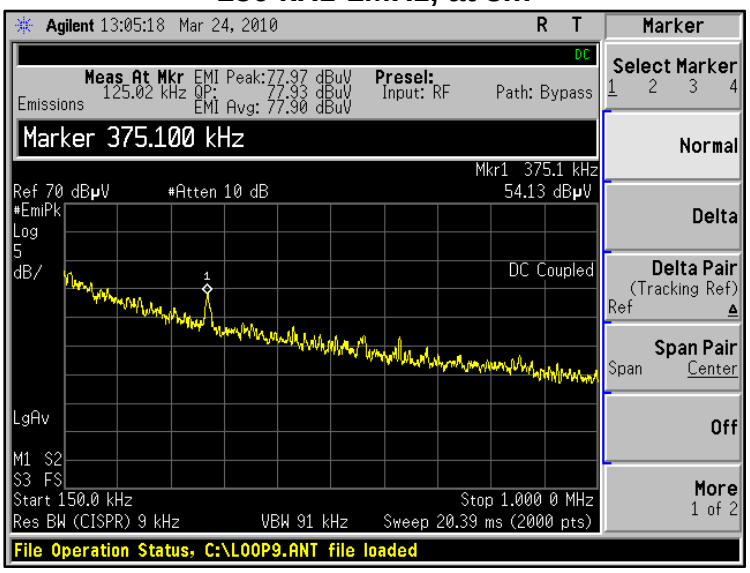


5.8.2 EUT inside of host.

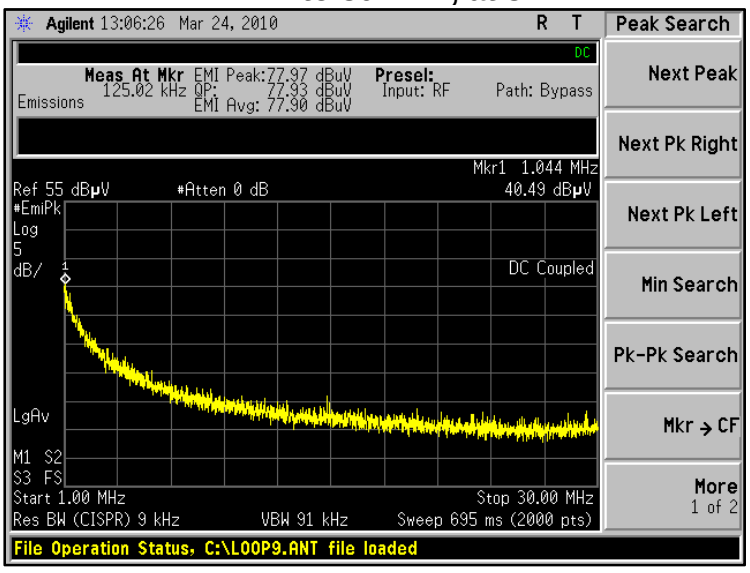
9 kHz to 150 kHz, at 3m



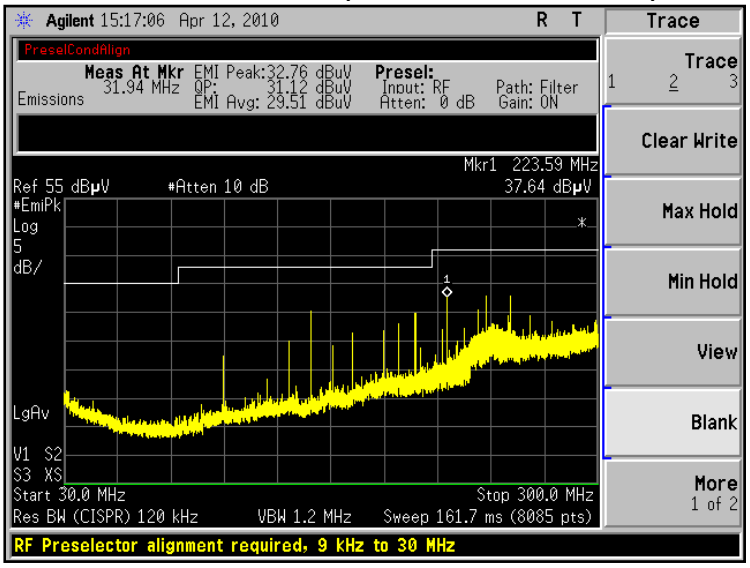
150 kHz-1MHz, at 3m



1 MHZ to 30 MHz, at 3m



Horizontal Polarization, 30 MHz to 300 MHz, at 3m



Horizontal Polarization, 300 MHz to 1000 MHz, at 3m

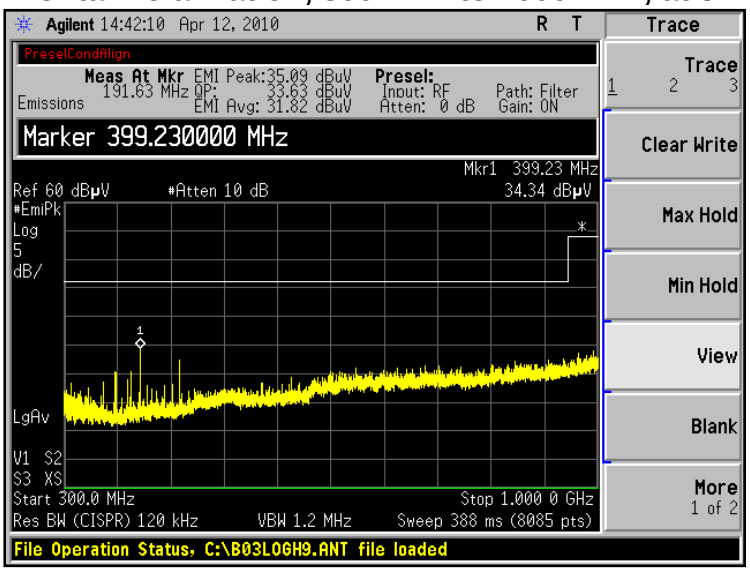


EXHIBIT 6. CONDUCTED EMISSIONS TEST, AC POWER LINE TRANSMIT AND RECEIVE:

6.1 Test Setup

The test area and setup are in accordance with ANSI C63.4 and with Title 47 CFR, FCC Part 15 (Industry Canada RSS-210, Issue 7, 2007). The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT's power cable was plugged into a 50Ω (ohm), 50/250 μH Line Impedance Stabilization Network (LISN). The AC power supply of 120V was provided via an appropriate broadband EMI Filter, and then to the LISN line input. Final readings were then taken and recorded. After the EUT was setup and connected to the LISN, the RF Sampling Port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the HP8546/85460A EMI System. The EMCO LISN used has the ability to terminate the unused port with a 50Ω (ohm) load when switched to either L1 (line) or L2 (neutral).

6.2 Test Procedure

The EUT was investigated in normal operation mode for this portion of the testing. The appropriate frequency range and bandwidths were selected on the EMI Receiver, and measurements were made. The bandwidth used for these measurements is 9 kHz, for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30MHz. Final readings were then taken and recorded.

6.3 Test Equipment Utilized

A list of the test equipment and accessories utilized for the Conducted Emissions test is provided in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers. Calibrations of the LISN and Limiter were performed by an ISO 17025 accredited calibration laboratory, traceable to the SI standard. All cables are calibrated and checked periodically for conformance. The emissions are measured on the HP8546/85460A EMI System, which has automatic correction for all factors stored in memory and allows direct readings to be taken.

6.4 Test Results

The EUT was found to **MEET** the Conducted Emission requirements of FCC Part 15.207 and RSS GEN 7.2.2 Conducted Emissions for an Intentional Radiator. See the Data Charts and Graphs for more details of the test results.

6.5 FCC Limits of Conducted Emissions at the AC Mains Ports

Frequency Range (MHz)	Class B Limits (dBµV)		Measuring Bandwidth
	Quasi-Peak	Average	
0.150 -0.50 *	66-56	56-46	RBW = 9 kHz VBW ≥ 9 kHz for QP VBW = 1 Hz for Average
0.5 – 5.0	56	46	
5.0 – 30	60	50	
* The limit decreases linearly with the logarithm of the frequency in this range.			

6.6 CONDUCTED EMISSIONS – TEST DATA CHART

Manufacturer:	API Healthcare					
Date(s) of Test:	April 12th 2010					
Project Engineer:	Aidi Zainal					
Test Engineer:	Peter Feilen					
Voltage:	110 VAC and 230 VAC					
Operation Mode:	Normal operation					
Environmental Conditions in the Lab:	Temperature: 20 – 25° C Relative Humidity: 30 – 60 %					
Test Location:	√	AC mains test bench				Chamber
EUT Placed On:	√	40cm from Vertical Ground Plane				10cm Spacers
	√	80cm above Ground Plane				Other:
Measurements:		Pre-Compliance		Preliminary	√	Final
Detectors Used:		Peak	√	Quasi-Peak	√	Average

110 VAC, 60 Hz

		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Q-Peak Reading (dBµV)	Q-Peak Limit (dBµ V)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµ V)	Average Margin (dB)
2.068	1.0	34.8	56.0	21.2	29.9	46.0	16.1
0.401	1.0	29.5	57.8	28.3	26.0	47.8	21.8
2.136	1.0	34.0	56.0	22.0	29.4	31.6	2.2
6.473	1.0	35.1	60.0	24.9	33.2	50.0	16.8
13.360	1.0	33.3	60.0	26.7	29.0	50.0	21.0
0.155	1.0	34.0	65.7	31.7	5.8	55.7	49.9
0.152	2.0	35.2	65.9	30.7	11.2	55.9	44.7
0.466	2.0	30.9	56.6	25.7	28.4	46.6	18.2
1.801	2.0	32.9	56.0	23.1	29.6	46.0	16.4
2.067	2.0	35.3	56.0	20.7	30.7	46.0	15.3
6.272	2.0	35.3	60.0	24.7	31.1	50.0	18.9
13.420	2.0	32.5	60.0	27.5	27.4	50.0	22.6

Notes:

1) The emissions listed are characteristic of the power supply used, and did not change by the EUT.

2) The EUT exhibited similar emissions when the AWID was inside the host.

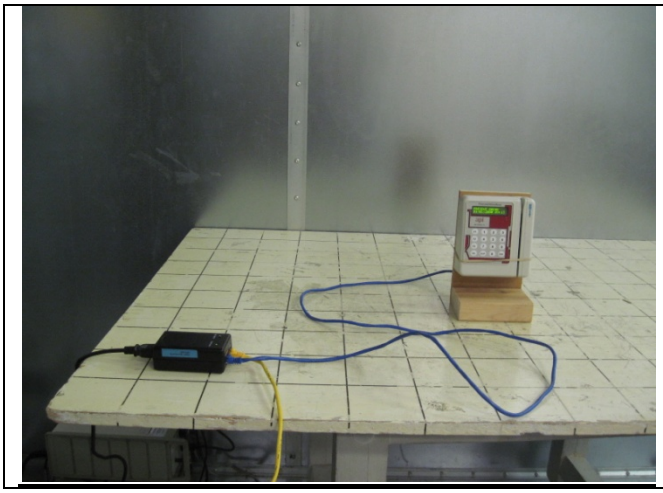
230 VAC, 50 Hz

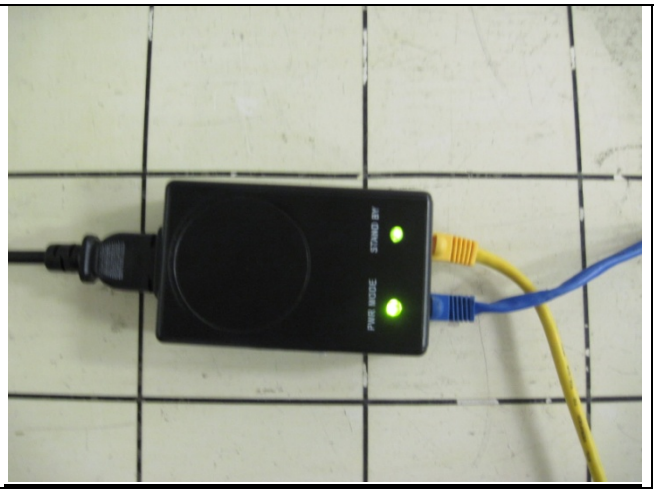
		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Q-Peak Reading (dBµV)	Q-Peak Limit (dBµ V)	Quasi-Peak Margin (dB)	Average Reading (dBµV)	Average Limit (dBµ V)	Average Margin (dB)
9.694	1.0	32.8	60.0	27.2	26.9	50.0	23.1
3.877	1.0	31.2	56.0	24.8	26.0	46.0	20.0
0.467	1.0	32.6	56.6	24.0	17.9	31.6	13.7
23.130	1.0	31.2	60.0	28.8	26.1	50.0	23.9
5.743	1.0	32.9	60.0	27.1	32.1	50.0	17.9
2.071	1.0	32.1	56.0	23.9	31.2	46.0	14.8
2.069	2.0	34.0	56.0	22.0	32.2	46.0	13.8
0.437	2.0	33.0	57.1	24.1	30.5	47.1	16.6
3.805	2.0	35.4	56.0	20.6	32.5	46.0	13.5
26.610	2.0	28.8	60.0	31.2	25.0	50.0	25.0
0.157	2.0	16.6	65.6	49.0	4.3	55.6	51.3

Notes:

1) The emissions listed are characteristic of the power supply used, and did not change by the EUT.
2) The EUT exhibited similar emissions when the AWID was inside the host.

6.7 Test Setup Photo(s) – Conducted Emissions Test

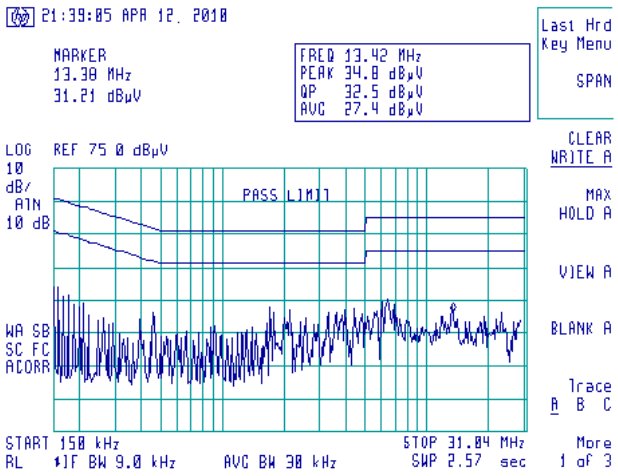




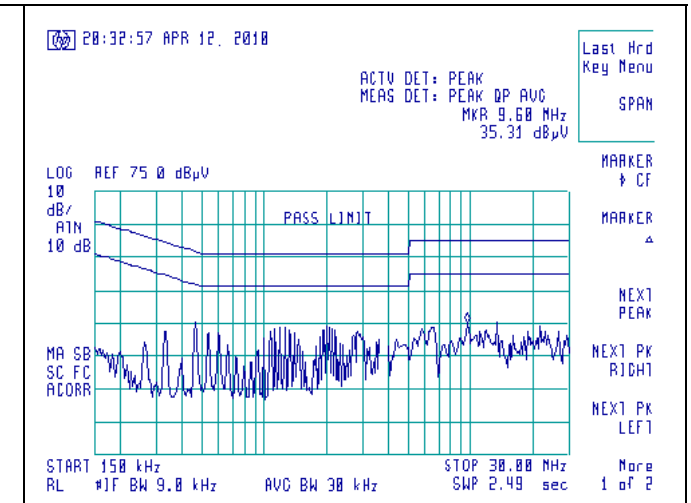
6.8 Screen Captures – Conducted Emissions Test

These screen captures represent Peak Emissions. For conducted emission measurements, both a Quasi-Peak detector function and an Average detector function are utilized. The emissions must meet both the Quasi-peak limit and the Average limit as described in 47 CFR 15.207 and RSS GEN 7.2.2.

Line 1

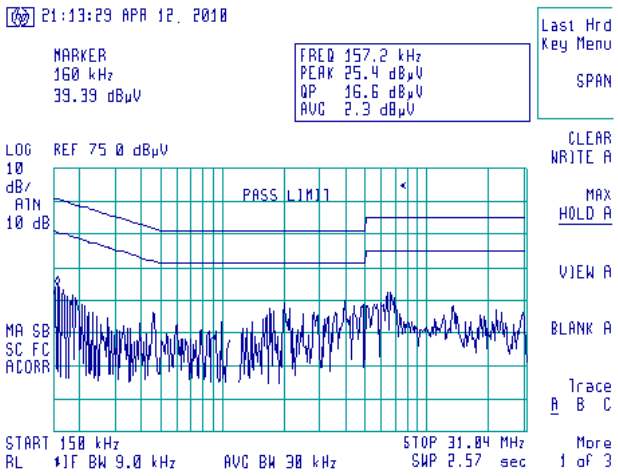


110 VAC

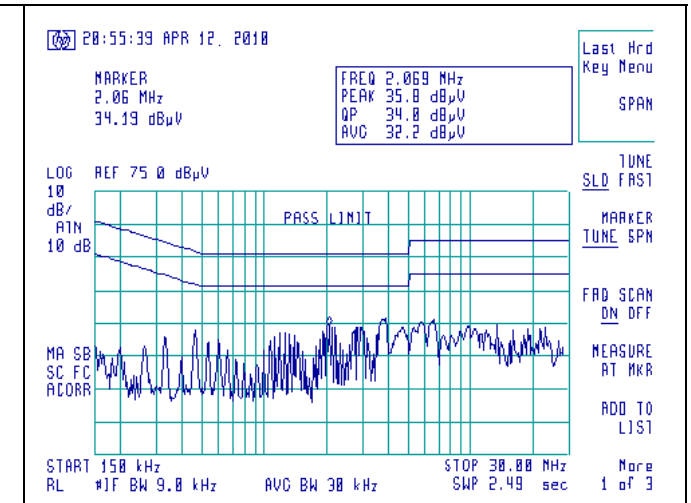


230 VAC

Line 2



110 VAC



230 VAC

EXHIBIT 7. OCCUPIED BANDWIDTH

7.1 Limits

There are no stated limits for the occupied bandwidth for devices operating under Title 47, CFR FCC Part 15.209. However, measurement of the bandwidth is required by Industry Canada per RSS GEN Section 4.6

7.2 Method of Measurements

ANSI C63.4, FCC and IC standard procedures were adhered to in these measurements.

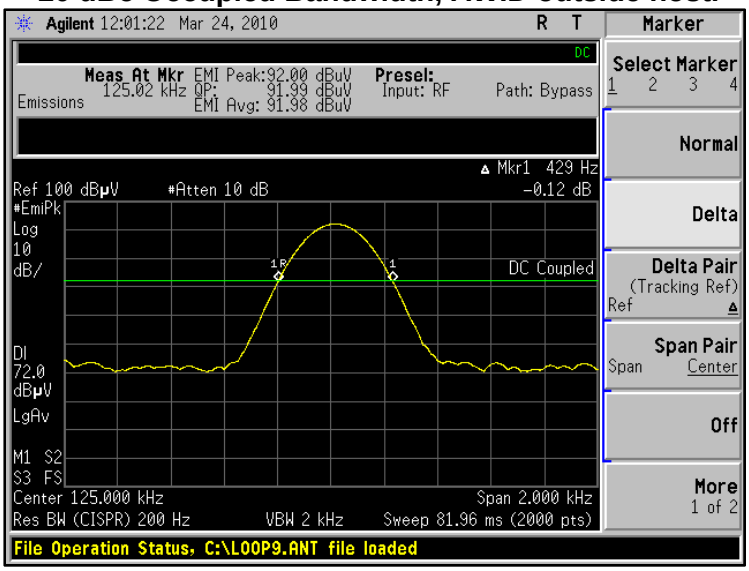
The transmitter output was placed in normal operation mode. The bandwidth of the fundamental frequency was measured via radiated measurement with the Spectrum Analyzer using RBW=200 Hz and VBW=2 kHz.

7.3 Test Data

Mode	Center Frequency (kHz)	Measured -6 dBc Occ. BW (Hz)	Measured -20 dBc Occ. BW (Hz)
AWID outside host	125.0	235	429
AWID inside host	125.0	235	437

7.4 Screen Captures - OCCUPIED BANDWIDTH

-20 dBc Occupied Bandwidth, AWID outside host.



-20 dBc Occupied Bandwidth, AWID inside host

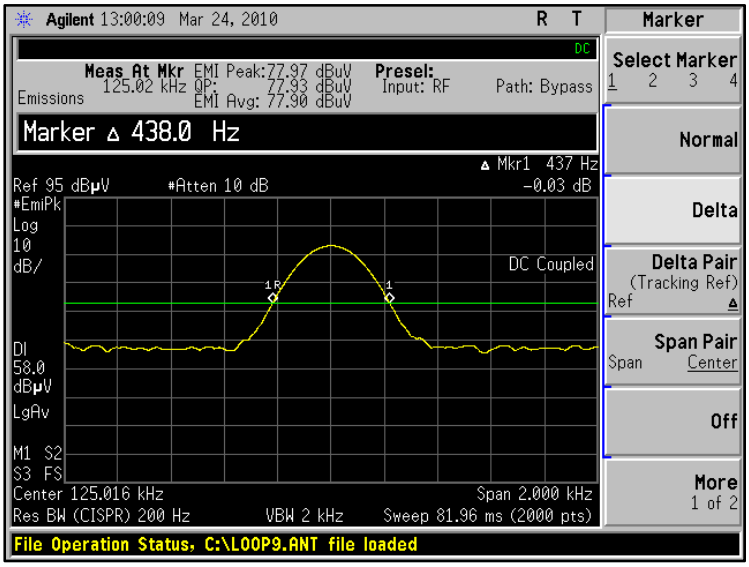


EXHIBIT 8. BAND EDGE MEASUREMENT

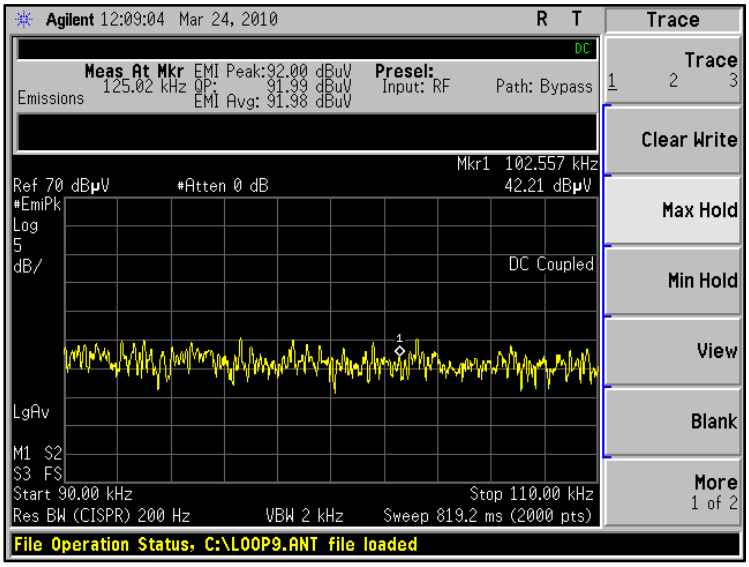
8.1 Test Criterion

FCC 15.209(b) requires a measurement of spurious emission levels to be no higher than the fundamental emission level, in particular at the Band-Edges where the intentional radiator operates. The operation of this device shall also be limited to the frequency band between 110 kHz and 490 kHz. No components of the fundamental emission shall be allowed outside of this band.

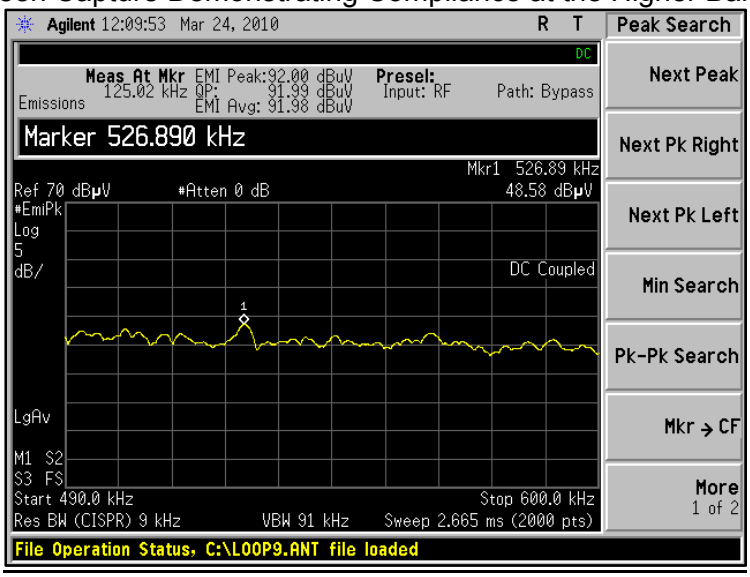
8.2 Screen captures.

8.2.1 AWID outside of host

Screen Capture Demonstrating Compliance at the Lower Band-Edge

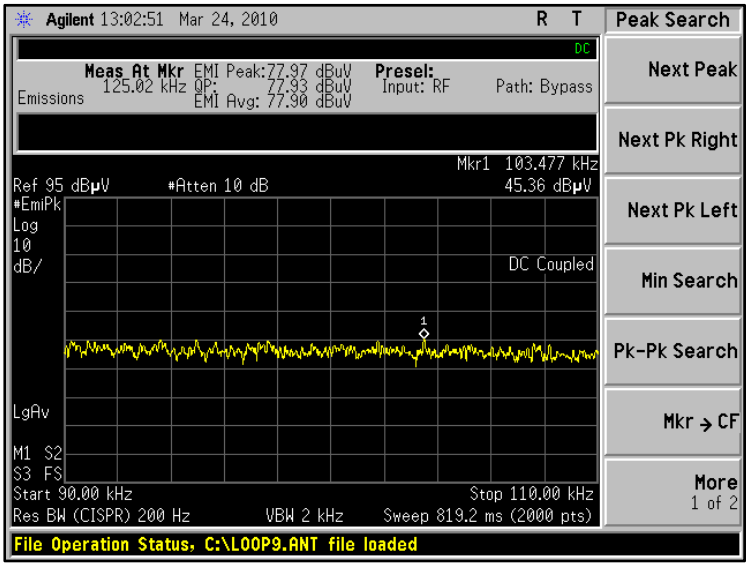


Screen Capture Demonstrating Compliance at the Higher Band-Edge

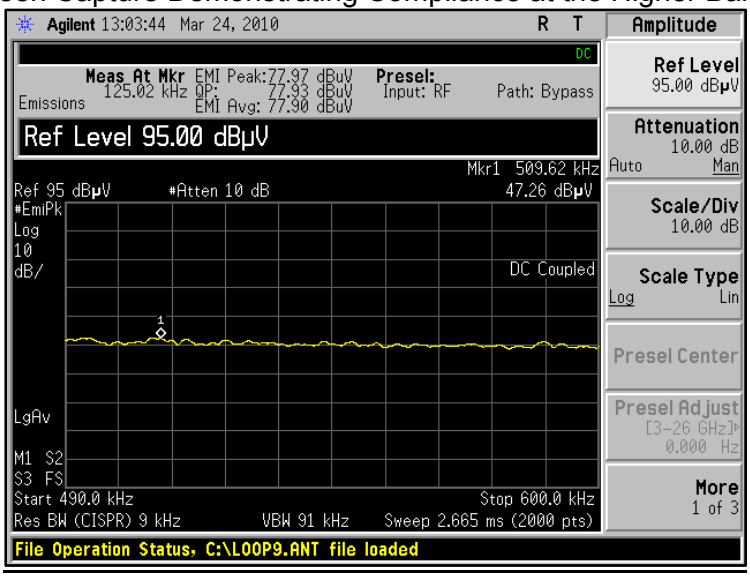


8.2.2 AWID inside of host

Screen Capture Demonstrating Compliance at the Lower Band-Edge



Screen Capture Demonstrating Compliance at the Higher Band-Edge



APPENDIX A

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 23-Mar-2010 Type Test : Radiated Emissions (209) Job # : C-871

Prepared By: AIDI Customer : API Healthcare Quote #: 310037

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	AA 960006	Active Loop Antenna	EMCO	6502	9205-2753	9/14/2009	9/14/2011	Active Calibration
2	EE 960157	3Hz-13.2GHz Spectrum Analyzer	Agilent	E4445A	MY48250225	7/2/2009	7/2/2010	Active Calibration
3	EE 960158	RF Preselecter	Agilent	N9039A	MY46520110	7/2/2009	7/2/2010	Active Calibration
4	AA 960150	Bicon Antenna	ETS	3110B	0003-3346	11/3/2009	11/3/2010	Active Calibration
5	aa 960078	Log Periodic Antenna	EMCO	93146	9701-4855	10/16/2009	10/16/2010	Active Calibration

Project Engineer: Aidi Quality Manager: Ryan Urness

LS RESEARCH LLC
Wireless Product Development
Equipment Calibration

Date : 23-Mar-2010 Type Test : AC mains conducted Job # : C-871

Prepared By: Aidi Customer : API Healthcare Quote #: 310037

No.	Asset #	Description	Manufacturer	Model #	Serial #	Cal Date	Cal Due Date	Equipment Status
1	ee 960013	EMI Receiver	HP	8546A System	3617A00320;3448A	9/17/2009	9/17/2010	Active Calibration
2	ee 960014	EMI Receiver-filter section	HP	85460A	3448A00296	9/17/2009	9/17/2010	Active Calibration
3	aa 960031	Transient Limiter	HP	11947A	3107A01708	9/15/2009	9/15/2010	Active Calibration
4	aa 960009	LISN	EMCO	3810/2NM	9509-1152	9/16/2009	9/16/2010	Active Calibration

Project Engineer: Aidi Quality Manager: Ryan Urness

APPENDIX B – TEST STANDARDS: CURRENT PUBLICATION DATES

STANDARD #	DATE	Am. 1	Am. 2
ANSI C63.4	2009		
ANSI C63.10	2009		
CISPR 11	2009-05	2009-12 P	
CISPR 12	2007-05		
CISPR 14-1	2005-11	2008-11	
CISPR 14-2	2001-11	2001-11	2008-05
CISPR 16-1-1 Note 1	2010-01		
CISPR 16-1-2 Note 1	2003	2004-04	2006-07
CISPR 22	2008-09		
CISPR 24	1997-09	2001-07	2002-10
EN 55011	2009		
EN 55014-1	2006		
EN 55014-2	1997		
EN 55022	2006	2007	
EN 60601-1-2	2007-03		
EN 61000-3-2	2006-05		
EN 61000-3-3	2008-12		
EN 61000-4-2	2009-05		
EN 61000-4-3	2006-07	2008-05	
EN 61000-4-4	2004		
EN 61000-4-5	2006-12		
EN 61000-4-6	2009-05		
EN 61000-4-8	1994	2001	
EN 61000-4-11	2004-10		
EN 61000-6-1	2007-02		
EN 61000-6-2	2005-12		
EN 61000-6-3	2007-02		
EN 61000-6-4	2007-02		
FCC 47 CFR, Parts 0-15, 18, 90, 95	2009		
FCC Public Notice DA 00-1407	2000		
FCC ET Docket # 99-231	2002		
FCC Procedures	2007		
ICES 001	2006-06		
ICES 002	2009-08		
ICES 003	2004-02		
IEC 60601-1-2 Note 1	2007-03		
IEC 61000-3-2	2005-11	2008-03	2009-02
IEC 61000-3-3	2008-06		
IEC 61000-4-2	2008-12		
IEC 61000-4-3	2008-04	incl in 2008-04	2009-12 FD

STANDARD #	DATE	Am. 1	Am. 2
IEC 61000-4-4	2004-07	2010-10	
IEC 61000-4-5	2005-11		
IEC 61000-4-6	2008-10		
IEC 61000-4-8	2009-09		
IEC 61000-4-11	2004-03		
IEC 61000-6-1	2005-03		
IEC 61326-1	2006-06		
ISO 14982	1998-07		
MIL Std. 461E	1999-08		
RSS GEN	2007-06		
RSS 119	2007-06		
RSS 123	1999-11		
RSS 125	2000-03		
RSS 131	2003-07		
RSS 136	2002-10		
RSS 137	2009-02		
RSS 210	2007-06		
RSS 213	2005-12		
RSS 243	2010-02		
RSS 310	2007-06		

Note 1: Test not on LSR Scope of Accreditation.

Updated on 04-27-10
P=Project FD= Final Draft

APPENDIX C
Uncertainty Statement

This uncertainty represents an expanded uncertainty expressed at approximately the 95 % confidence level, using a coverage factor of k=2.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V