INGENIUM TESTING, LLC

ELECTROMAGNETIC COMPATIBILITY (EMC)

CERTIFICATION TEST REPORT FOR

API HEALTHCARE CORPORATION

FOR THE ICLASS BADGE READER

DOCUMENT NUMBER: CTR-20035, REVISION A

APPROVED BY	SIGNATURE	DATE
President, TWC: Ed Stiltner	Ed Stiltner	06/03/09
Vice-President, Engineering: Louis Luedtke		June 03 '09
Vice-President, Operations: Michael Caruso		6/3/09

INGENIUM TESTING, LLC
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TITLE:
EMC CERTIFICATION TEST REPORT FOR API HEALTHCARE CORPORATION FOR THE ICLASS BADGE READER

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REVISION: A

DATE
03 June 2009

RECORD OF REVISIONS			
REVISION	DESCRIPTION	DATE	APPROVED
A	New revision of report to include the RFID reader and the TA-500 host only. BSEIM 1000 host is still in development at the time of publish of this report, and is removed as a host from this report in order to meet publishing schedules and deadlines. The qualifications with the BSEIM 1000 will be pursued at a later date.	2009-06-02	A.Spantman
	Removed references to the 'BEISM 1000 host' from list of equipment tested. Affected sections: 'Scope', Page 4, section 1.0 'Detailed Product Description', Section 2.2 'Modes of Operation', section 2.3 'Table 3' modified, section 2.4 'Applicable Test Matrix and Test Results', section 2.10 'Table 7' modified, section 2.10 'Radiated Emissions Measurem.–Test Criterion', Matrix table, section 4.1.1.1 'Radiated Emissions Measurem.–Test Setup', section 4.1.1.3 'Figure 11' removed, section 4.1.1.3 'Figure 12' removed, section 4.1.1.3 'Figure 13' removed, section 4.1.1.3 'Radiated Emissions Measurem.–Test Results', Matrix table, section 4.1.1.5 'Table 13' removed, section 4.1.1.5 'Figure 18' removed, section 4.1.1.5 'Figure 19' removed, section 4.1.1.5 'Figure 23' removed, section 4.1.1.5 'Figure 24' removed, section 4.1.1.5 'Conducted Emissions Measurem.–Test Criterion', Matrix table, section 4.2.1.1 'Figure 27' removed, section 4.2.1.3 'Figure 28' removed, section 4.2.1.3 'Conducted Emissions Measurem.–Test Results', Matrix table, section 4.2.1.5 'Table 19' removed, section 4.2.1.5 'Figure 33' removed, section 4.2.1.5 'Figure 34' removed, section 4.2.1.5		
	Corrected section reference for the 'Applicable Test Matrix and Test Results', from section 1.5 to section 2.10. Affected sections: 'Signatories', section 2.13 'Conducted Emissions – Test Criterion', section 4.2.1.1 'Conducted Performance – Carrier Stability', section 4.2.7.3		

	Removed references to the Class A radiated emission limits Affected sections: 'Radiated Emissions Measurements –Test Criterion', section 4.1.1.1 'Table 10', section 4.1.1.1 'Radiated Emissions Measurements –Test Procedure', section 4.1.1.4, ¶4.		
	Removed references to the Class A conducted emission limits Affected sections: 'Conducted Emissions Measurements –Test Criterion', section 4.2.1.1 Middle table in section 4.2.1.1 'Conducted Emissions Measurements –Test Procedure', section 4.1.1.4, ¶3.		
	Updated section reference for 'Operating Conditions' from section 1.2.3.1 to section 2.3.1 Affected sections: 'Radiated Emissions Measurements –Test Setup', section 4.1.1.3, ¶1. 'Conducted Emissions Measurements –Test Procedure', section 4.2.1.4, ¶1.		
	Formatting changes to enhance appearance or readability: Affected sections: 'Figure 9' rotated back to horizontal view, section 4.1.1.5. 'Figure 10' rotated back to horizontal view, section 4.1.1.5. 'Figure 11' rotated back to horizontal view, section 4.1.1.5. 'Figure 12' rotated back to horizontal view, section 4.1.1.5. 'Figure 13' rotated back to horizontal view, section 4.1.1.5. 'Figure 14' rotated back to horizontal view, section 4.1.1.5. 'Figure 15' rotated back to horizontal view, section 4.1.1.5. 'Table 15' updated column headers, section 4.2.1.5 'Table 16' updated column headers, section 4.2.1.5 'Figure 18' rotated back to horizontal view, section 4.2.1.5. 'Figure 19' rotated back to horizontal view, section 4.2.1.5. 'Figure 20' rotated back to horizontal view, section 4.2.1.5. 'Figure 21' rotated back to horizontal view, section 4.2.1.5.		
	Corrected radiated emission limits per 47CFR 15.225 Affected sections: 'Table 8', section 4.1.1.1 'Table 12', section 4.1.1.5		
	Corrected AT-500 to TA-500 Affected sections: All		

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1.0 SCOPE

On March 5TH and 6TH, 2009, and May 12, 2009, a series of radiated and Mains-conducted RF Emissions (EMC) tests were performed on two identical samples of the API Healthcare "iCLASS Badge Reader", serial numbers "A139625" and "A139619", here forth collectively referred to as the "*Equipment Under Test*" or "*EUT*".

The radio frequency (RF) emission tests were performed are in accordance with 47 CFR, Section 15.225, released (2008-07-10) operating under Class C for an intentional radiator product, within the frequencies of 13.110 MHz and 14.010 MHz, using the emission test procedures outlined in ANSI C63.4 (2003), with test instruments adhering to CISPR 16-2 guidelines. The tests were performed, with the EUT in pre-defined operating modes and performance criterion as defined in advance by API Healthcare Corporation, here forth referred to as the *"API Test Plan"*.

The tests were performed to allow verification, in part, of the product's EMI compliance in accordance with the EMC standards in the United States of America and abroad. This was accomplished by testing the units in two configurations. The units were tested, first, as modular transceivers with 10 cm tether cables, and second, embedded in an "TA500" type host. The tests were performed by Abtin Spantman, EMC Engineer at Ingenium Testing and witnessed by Mr. Gary Sutcliffe, Assistant Director of Engineering, representing API Healthcare Corporation.

2.0 GENERAL

2.1 General Product Description

The API Healthcare iCLASS Badge Reader is an RFID product operating at fixed center frequency of 13.56 MHz. The Badge Reader is a modular product that may be added to a host 'entry point console'. The Badge Reader will only be installed in products under the control of API Healthcare Corporation.

The iCLASS Badge Reader will be available for use exclusively in API access point control applications. The iCLASS Badge Reader is designed to be installed in different API Hosts, with the host capable of accepting different 'Reader' accessories such as magnetic stripe readers and bar-code readers. The accessory 'iCLASS Badge Reader' is the subject of this test report. The iCLASS Badge Reader is not self-sufficient and can not operate without the use of an API Host unit. The Badge Reader receives power and commands from the Host unit, and sends communication back to the Host unit. **The iCLASS Badge Reader unit is defined as the Equipment Under Test or 'EUT', but is tested in conjunction with the API Access Point Host.**

The iCLASS Badge Reader receives regulated power from the host unit. The badge reader also receives command prompts from the host unit. These command prompts control and allow the badge reader to activate the RF section. The host also controls the flow of data between the host and the badge reader module.

The application of the iCLASS Badge Reader is limited to API host units, and as such, is not threatened by uncontrolled installations. Development testing determined that an RF shield is not necessary for such limited and controlled applications. A secondary power regulator on-board the module was also deemed un-necessary in such controlled installations. ***API Healthcare would have control over the installation and use of the iCLASS Badge Reader module in all cases.***

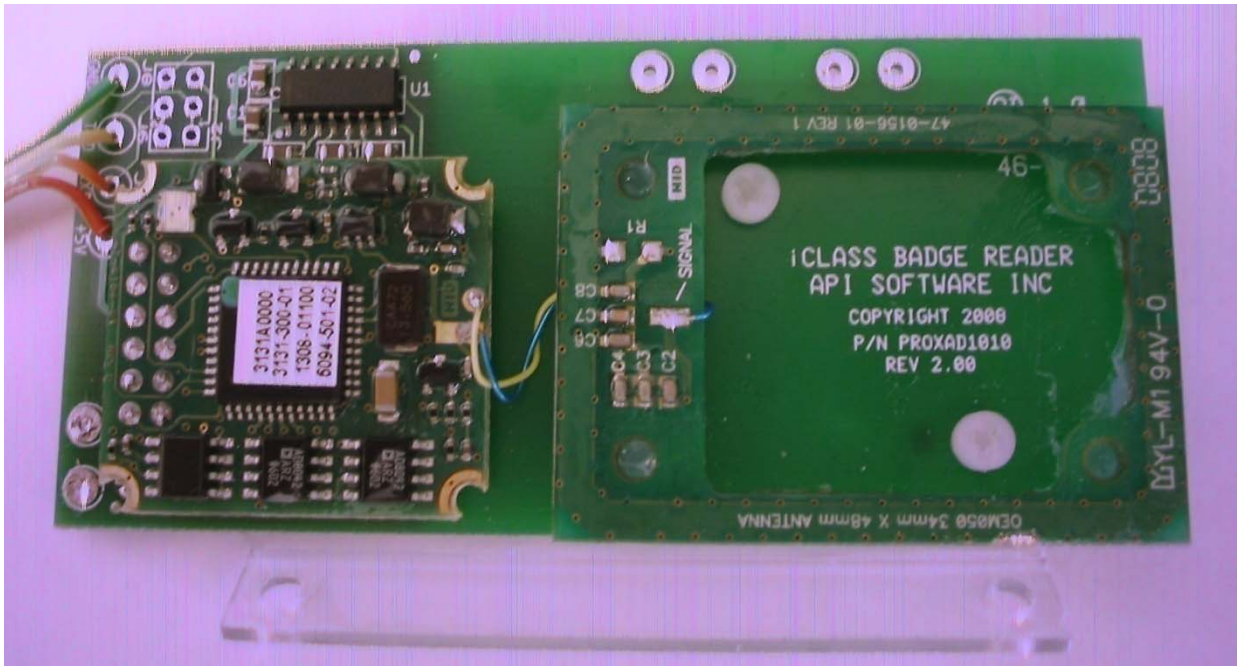


Figure 1: The API Healthcare iCLASS Badge Reader Module

2.2 Detailed Product Description

The iCLASS Badge Reader (also referred to as the proximity reader) has a PCB-Trace Loop type antenna installed on-board the module. The antenna is not accessible or modifiable by the user. This particular iCLASS Badge Reader is being qualified with a 34mm X 48mm loop antenna.

The module uses 9600 Baud TTL level serial communication between the host and the module, through a four-pin standard 0.1 inch SIP header. This header also provides the +5VDC power needed to operate the module. This module will only derive power from a regulated +5VDC source as provided by the particular host unit. The hosts derive their power from the AC mains.

The RF characteristics of the module are controlled by a proprietary RF sub-module PCB as visible on the lower left side of Figure 1.

Num.	Description	Type
J5	RX-Data	RS-232 - Unbalanced
J6	TX-Data	RS-232 - Unbalanced
J7	+5VDC Regulated Power Input Line	DC
J8	Ground Reference and Return line for the DC power.	Ground (DC)

Table 1: Table of Interfaces To/From the iCLASS Badge Reader Module

The iCLASS Badge Reader would be a 'reader option' that gets installed on a TA500 host. The iCLASS Badge Reader was tested as a modular transmitter as well as an embedded transmitter within the host mentioned here.

The TA500 Host:

Figure 2: The API Healthcare Module AP500 Badge Reader Used as a Host Controller During Testing

The TA500 host has many of the features that would be incorporated in a typical host reader. The TA500 has an LCD display window, LED indicators, input/output relays, the capability to use a key-pad, an optical bar-code reader, a magnetic card reader, as well as a proximity reader (the module we are testing). ***The host used in testing was configured with the dot LCD, LEDs, Keypad, and a magnetic card reader, considered as the configuration that may have the most interaction with the proximity reader module under test.***

The TA500 host may be powered by a linear step-down wall-transformer, or by a switch-mode AC-to-DC supply that provides Power-over-Ethernet (POE) to the system, as shown below.

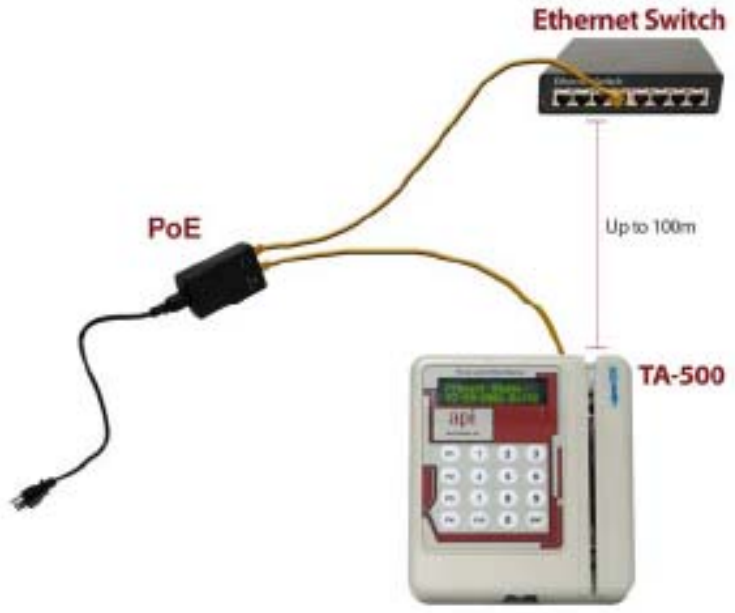


Figure 3: Inter-Relationships Between the EUT and Other Peripheral or System Components

The switch-mode supply with POE was considered to be the worst case test situation. This system is installed with a clamp-on ferrite suppressor as defined in the TA500 installation manual, pages 14 through 18. ***The TA500 host was powered by a switch-mode AC-to-DC supply that provides Power-over-Ethernet (POE) to the system, during this series of testing. The TA500 host unit was tested to CLASS B limits for residential and light industrial applications.***

2.3 Modes of Operation

Testing was performed in worst-case conditions.

The TA500 host used in testing was configured with the LCD, LEDs, Keypad, and a magnetic card reader, considered as the configuration that may have the most interaction with the proximity reader module under test. The TA500 host was powered by a switch-mode AC-to-DC supply that provides Power-over-Ethernet (POE) to the system, during this series of testing.

2.3.1 Mode of Operation During RF Emission Testing

For RF emission testing, the EUT was commanded via the host unit, to transmit as fast as it possibly can in normal operation.

The module is to be tested as a stand-alone (with 10 cm tether cable), and as installed in the available host units.

2.3.2 Mode of Operation During RF SusceptibilityTesting

For Voltage and Temperature variation testing, the EUT was commanded via the host unit, to transmit as fast as it possibly can in normal operation, while the frequency of operation and relative output power level were monitored for excursions.

The module is to be tested as a stand-alone (with 10 cm tether cable), and as installed in a TA500 unit.

2.4 Equipment Under Test (EUT) Tracking Information

The following information has been supplied by the applicant.

Product Name:	iCLASS Badge Reader
Model Number:	iCLASS Badge Reader
Serial Number:	A139625 used as stand-alone with 10cm tether cable. A139619 used as installed in TA500 host unit.

Table 2: Equipment Under Test (EUT) Product Information

Product Name:	Access Point Host: With a magnetic stripe card reader.
Model Number:	TA500
Serial Number:	A98555

Product Name:	Access Point Host: With optical barcode reader installed along with output relays, opto-isolated.
Model Number:	TA500
Serial Number:	A112480

Product Name:	I.T.E. Power Supply (for POE testing)
Model Number:	PW130, rev B.
Serial Number:	N/A

Product Name:	10/100 Ethernet Switch
Model Number:	SD208, V1.1
Serial Number:	RE-G10G293170

Table 3: Support Equipment Product Information

2.5 Equipment Under Test (EUT) Technical Specifications

Frequency Range (in MHz)	13.56 MHz
RF Power (W)	0.14 mW (Equivalent ERP)
Field Strength (and at what distance)	86.5 dBµV/m at 3m
Occupied Bandwidth (99% BW)	N/A
Type of Modulation	AM-OOK
Emission Designator	A1D
Transmitter Spurious (worst case)	22.8 dBµV/m at 10m
Frequency Tolerance %, Hz, ppm	50 ppm (700Hz)
Microprocessor Model # (if applicable)	N/A
EUT will be operated under FCC Rule Part(s)	47CFR15.225
Modular Filing	☒ Yes ☐ No
Power Requirements	Host: 100-240 VAC, 47-63 Hz, 1.0A BEISM 1100 Host: 100-240 VAC, 47-63 Hz, 3.0A Module: +5VDC, 200mA
Environmental Operating conditions	Host: (0 to 40 °C) 20 – 80 % RH, Indoor, Non-condensing

Table 4: Equipment Under Test (EUT) Additional Specifications

2.6 Associated Antenna Description

The antenna is a proprietary design PCB-trace 'Loop' type antenna.
The antenna is permanently installed on the module and is not accessible to the user.
The antenna is not outfitted with a connector.
The rectangular antenna dimensions are approximately 34mm X 48mm.

2.7 RF Technical Information

Type of Evaluation (check one)		SAR Evaluation: Device Used in the Vicinity of the Human Head
		SAR Evaluation: Body-worn Device
	X	RF Evaluation

If RF Evaluation checked above, test engineer to complete the following:

- Evaluated against exposure limits: ☒ General Public Use ☐ Controlled Use
- Duty Cycle used in evaluation: 100 %
- Standard used for evaluation: 47 CFR 2.1091
- Measurement Distance: 20 cm
- RF Value: **0.00027** ☐ V/m ☐ A/m ☒ **W/m^2**
  ☒ **Measured** ☐ Computed ☐ Calculated

2.8 Applicable Normative Documents

Table 5: Regulatory Documents

Publication	Year	Title
47 CFR, Parts 0-15 (FCC)	Released on: 2008-07-10	United States of America Code of Federal Regulations Title 47 – Telecommunications.
FCC Public Notice DA 00-1407	2000	Part 15 Unlicensed Modular Transmitter Approval.
RSS-210	Issue 7 (2007-06)	Industry Canada Spectrum Management and Telecommunications Radio Standard Specification. Low-power License-Exempt Radio Communication Devices (All Frequency Bands): Category I Equipment.
ANSI C63.4	2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
CISPR 16-1-1	Edition 2.1 (2006-11)	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-1: Measuring Apparatus.
CISPR 16-1-2	Edition 1.2 (2006-08)	Specification for radio disturbance and immunity measuring apparatus and methods. Part 1-2: Ancillary equipment – conducted disturbances.
CISPR 16-2-1	Edition 1.1 (2005-09)	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-1: Conducted disturbance measurement.

Publication	Year	Title
CISPR 16-2-2	Edition 1.2 (2005-09)	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-2: Measurement of disturbance power.
CISPR 16-2-3	Second Edition (2006-07)	Specification for radio disturbance and immunity measuring apparatus and methods. Part 2-3: Methods of Measurement of disturbance and immunity – Radiated disturbance measurements.

Table 6: Non-Regulatory Controlled Documents from API Healthcare or Ingenium Testing, LLC.

Document	Owner	Title
DSI Version 2	API Healthcare Corporation	TA-500 Badge Reader Installation and Configuration Guide
JCEAQ1080	Ingenium Testing	Statement of Work

2.9 Operational Definitions and Performance Criterion

Manufacturer and Device-Specific Operational Definitions and Performance Criterion:
In normal operational mode, the "ES2" unit shall operate per manufacturer specifications.
In specific programmed test mode, the "ES1" unit shall operate continuously as a transmitter (CW mode), with the sounder off to conserve battery life during testing.

Performance Criterion A:
N/A

Performance Criterion B:
N/A

Performance Criterion C:
N/A

2.10 Applicable Test Matrix and Test Results

The following matrix defines the scope of testing as covered by this report, and agreed to between API Healthcare Corporation (Client) and Ingenium Testing, LLC.

This series of testing is performed to verify that the electromagnetic performance of the iCLASS Badge Reader Module, as used in conjunction with the TA-500 host /controller, adheres to the expected performance stated in the aforementioned standards. These tests verified that the transmitter characteristics meet the specific limits dictated by 47CFR 15.225, and that the receiver characteristics meet the specific limits dictated by 47CFR 15.109. The following matrix describes the test regiment.

Table 7: Test Matrix and Test Results

Port Definition	Description/ Detail	Basic Standard	Performance Criteria	Pass / Fail
Enclosure	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Transmit Mode***	Radiated RF Emissions 47 CFR 15.225	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits	Pass
	iCLASS Module installed on-board TA-500 Host ***Transmit Mode***	Radiated RF Emissions 47 CFR 15.225	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits	Pass
AC Power	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Transmit Mode***	Conducted RF Emissions 47 CFR 15.207	150kHz-30 MHz Measured RF Emission should be Below specified Limits	Pass
	iCLASS Module installed on-board TA-500 Host ***Transmit Mode***	Conducted RF Emissions 47 CFR 15.207	150kHz-30 MHz Measured RF Emission should be Below specified Limits	Pass
Enclosure	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Receive Mode***	Radiated RF Emissions 47 CFR 15.109 Class B Products	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits	Pass
	iCLASS Module installed on-board TA-500 Host ***Receive Mode***	Radiated RF Emissions 47 CFR 15.109 Class B Products	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits	Pass

Port Definition	Description/ Detail	Basic Standard	Performance Criteria	Pass / Fail
AC Power	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Receive Mode***	Conducted RF Emissions 47 CFR 15.107 Class B Products	150kHz-30 MHz Measured RF Emission should be Below specified Limits	Pass
	iCLASS Module installed on-board TA-500 Host ***Receive Mode***	Conducted RF Emissions 47 CFR 15.107 Class B Products	150kHz-30 MHz Measured RF Emission should be Below specified Limits	Pass

2.11 Notes and Exceptions to Report

None

2.12 Declaration of Conformity

DECLARATION OF CONFORMITY

*The API Healthcare Corporation model "iCLASS Badge Reader" was found to **MEET** the emission and performance requirements as described within the specifications of Title 47, Part 15, of the Code of Federal Regulations for the United States of America.*

The API Healthcare Corporation model "iCLASS Badge Reader" unit meets the requirements of 47 CFR 15.225, subpart C, for an intentional radiator product in transmit mode, and meets the requirements of 47 CFR 15.109, subpart B, for an un-intentional radiator in receive mode, as well as the Industry Canada requirements specified within ICES-003 for a digital device.. The conformity statement is limited in scope to the testing that was commissioned and administered and covered in this report.

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.

Ingenium Testing, 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.

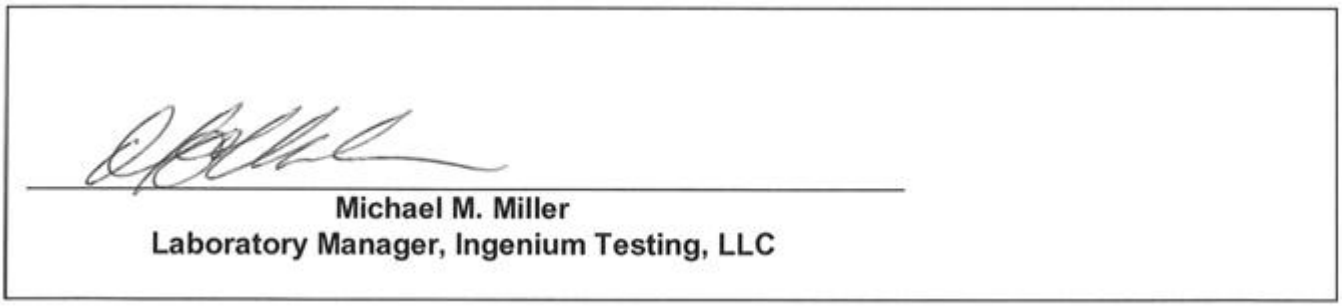
2.13 Signatories

The test matrix presented in section 2.10 of this report was generated, in agreement, by the cognizant parties representing the client as the manufacturer of the equipment, and by the cognizant parties at Ingenium Testing. The performance of the tests and reporting of the results are accurate to the best of our collective knowledge as presented within the body of this report.

The testing of this product was approved by the cognizant parties representing the manufacturer:

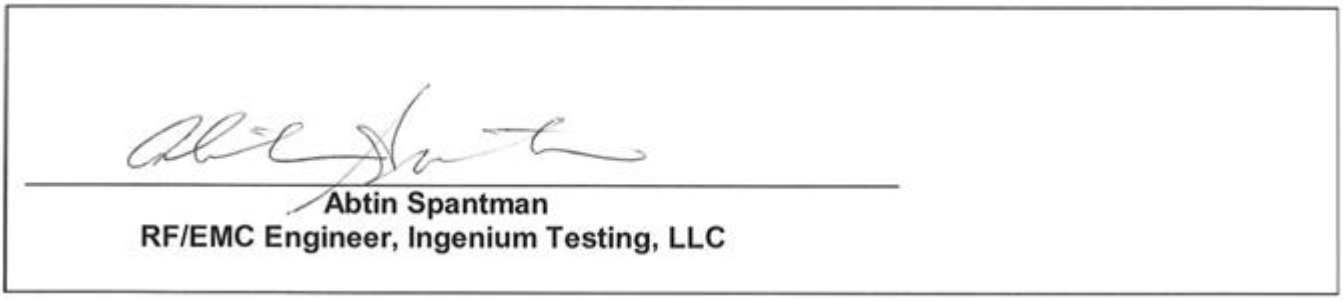
Manufacturer Name:	**API Healthcare Corporation** **1550 Innovation Way** **Hartford, WI 53027** **United Stated of America**
Contact Person: (Administrative)	Ms. Gail Rohde Contract Administrative Representative 1550 Innovation Way Hartford, WI 53027 Ph: +1 262 670 2869 Fx: +1 262 673 2650 EM: Gail.Rohde@APIHealthcare.com
Contact Person: (Technical)	Mr. Gary Sutcliffe Assistant Director of Engineering 1550 Innovation Way Hartford, WI 53027 Ph: +1 262 670 2789 Fx: +1 262 673 2650 EM: Gary.Sutcliffe@APIHealthcare.com

This Test Report is issued under the Authority of:



Michael M. Miller
Laboratory Manager, Ingenium Testing, LLC

The testing was performed by:



Abtin Spantman
RF/EMC Engineer, Ingenium Testing, LLC

2.14 Test Facility and Accreditations

Ingenium Testing, 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".

Ingenium Testing, LLC's scope of accreditation includes all test methods listed herein, unless otherwise noted. A copy of the accreditation may be accessed on our web site: www.IngeniumTesting.com. Accreditation status can be verified at A2LA's web site: www.a2la2.net.

2.15 **Location of Test Facility**

All testing was performed at Ingenium Testing, LLC, 3761 South Central Avenue, Rockford, Illinois, 61102-4292, United States of America, utilizing the facilities listed below, unless otherwise noted.

List of Chamber Facilities used at Ingenium Testing, LLC:

- 10-meter Semi-Anechoic Chamber, designated Chamber number 6.
- 3-meter Semi-Anechoic Chamber, designated Chamber number 10.
- RF Shielded room, designated Chamber 11.
- RF Shielded room, designated Chamber 12.

3.0 APPLICABLE DOCUMENTS

Document	Owner	Title
DSI Version 2	API Healthcare Corporation	TA-500 Badge Reader Installation and Configuration Guide
JCEAQ1080	Ingenium Testing	Statement of Work

4.0 TEST DETAILS

4.1 Electromagnetic Emission Tests

4.1.1 Radiated RF Emissions Measurements

4.1.1.1 Test Criterion

The following ports should be tested for compliance according to the test matrix:

Port Definition	Description/ Detail	Basic Standard	Performance Criteria
Enclosure	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Transmit Mode***	Radiated RF Emissions 47 CFR 15.225	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits
	iCLASS Module installed on-board TA-500 Host ***Transmit Mode***	Radiated RF Emissions 47 CFR 15.225	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits
Enclosure	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Receive Mode***	Radiated RF Emissions 47 CFR 15.109 Class B Products	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits
	iCLASS Module installed on-board TA-500 Host ***Receive Mode***	Radiated RF Emissions 47 CFR 15.109 Class B Products	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits

The stated test conditions and expected performance levels are stated below:
The EUT functions as a transceiver. The testing of this device will be divided into transmitter testing and a receiver testing.

Transmitter test limits:

The following tables present the limits for intentional radiated RF emissions, at the fundamental frequency, as specified in Title 47 CFR, Section 15.225, subsections (a) through (d). These limits also include elements of 47 CFR, Section 15.209 and Par 15.205 for limits within restricted bands of operation. In the frequency range between 1.7 MHz and 30 MHz, the limits are mathematically adjusted by an extrapolation factor of 40 dB/decade, as described in the procedures in 47 CFR, Section 15.31(f)(2).

Frequency (MHz)	15.225 Field Strength Limit (μV/m)	Field Strength Limit (dBμV/m at 3m)	Field Strength Limit (dBμV/m at 10m)
0.009 – 0.490	2400/F (kHz) @ 300m	N/A	N/A
0.490 – 1.705	24000/F (kHz) @ 30m	N/A	N/A
1.705 – 13.110	30μV/m @ 30m	69.5	48.5
13.110 – 13.410	106μV/m @ 30m	80.5	59.5
13.410 – 13.553	334μV/m @ 30m	90.5	69.5
13.553 – 13.567	15,848μV/m @ 30m	124.0	103.0
13.567 – 13.710	334μV/m @ 30m	90.5	69.5
13.710 – 14.010	106μV/m @ 30m	80.5	59.5
14.010 – 30.000	30μV/m @ 30m	69.5	48.5
30.0 – 88.0	100μV/m @ 3 m	40.0	29.5
88.0 – 216.0	150μV/m @ 3 m	43.5	33.0
216.0 – 960.0	200μV/m @ 3 m	46.0	35.5
Above 960.0	500μV/m @ 3 m	54.0	43.5

Notes: In the calculations for margin below the limit, the limits are rounded to one digit past the decimal.

Table 8: Field Strength Limit for Intentional Radiators Under 47CFR 15.225

Receiver test limits:

The following table presents the limits for unintentional radiated RF emissions as specified in Title 47 CFR, Section 15.109(a), for products qualifying as Class B Digital Devices. These limits were also applied to any signals found in the restricted frequency bands as defined in 47 CFR, Section 15.205.

Frequency (MHz)	Field Strength Limit at 3m (μV/m)	Field Strength Limit at 3m (dBμV/m)	Field Strength Limit at 10m (dBμV/m)
30 – 88	100.0	40.0	29.5
88 - 216	150.0	43.5	33.0
216 – 960	200.0	46.0	35.5
Above 960	500.0	54.0	43.5

Notes: In the calculations for margin below the limit, the limits are rounded to one digit past the decimal

Table 9: Field Strength Limits for Un-Intentional Radiators Under 47CFR 15.109, Class B Digital Devices

4.1.1.2 Test Equipment

All equipment is calibrated according to governing standards, and is N.I.S.T. traceable. The equipment is used according to the operation manuals as provided by the manufacturers.

Table 10: List of Equipment Used:

Manufacturer	Model	Ingenium Asset Number	Description	Last Cal data	Cal due date
Agilent	E4440A	1207	PSA Spec. Analyzer	18 Dec 2008	18 Dec 2009
Agilent	N9039A	1206	Pre-Selector	23 Dec 2008	23 Dec 2009
Agilent	N5182	1208	RF Generator	18 Dec 2008	18 Dec 2009
A.H.Systems	PAM-0118	1388	Pre-Amplifier	01 Dec 2008	01 Dec 2009
HP	8447	RP-0054	Pre-Amplifier	13 Mar 2009	13 Sep 2009
ETS	3142C	1360	Hybrid Antenna	17 Mar 2008	17 Mar 2010
ETS	6507	1315	Active Loop Antenna	26 Jan 2009	20 Feb 2010

The data presented 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 measurement result.

4.1.1.3 Test Setup

The EUT was considered as a "mobile" type modular transmitter, and tested as a "table-top" unit as described in ANSI C63.4. The EUT module was tested in three setup variants: separated from the host for modular testing, embedded into the TA500 host, as in normal operation. For the modular tests, the EUT module was separated from the TA500 host using a 10 cm harness cable and located as far from the host as the cable allowed. The EUT was tested in vertical and horizontal orientations as shown in the photos below. For the embedded tests, the module would normally be positioned in a horizontal orientation within the host. In both cases, the EUT was placed on a non-conductive table, centered on a flush-mounted 3 meter-diameter turntable in the 10 Meter FCC Listed Semi-Anechoic Chamber located at Ingenium Testing. The test setup complies with the necessary procedures as described in the ANSI standard. The EUT was powered by the host, in this case, by the TA500 host, over the Ethernet cable, and exercised as fast as possible under standard operating conditions as described in section 2.3.1 of this report. The host was powered by 120VAC/60Hz Mains.

Test Setup Photos

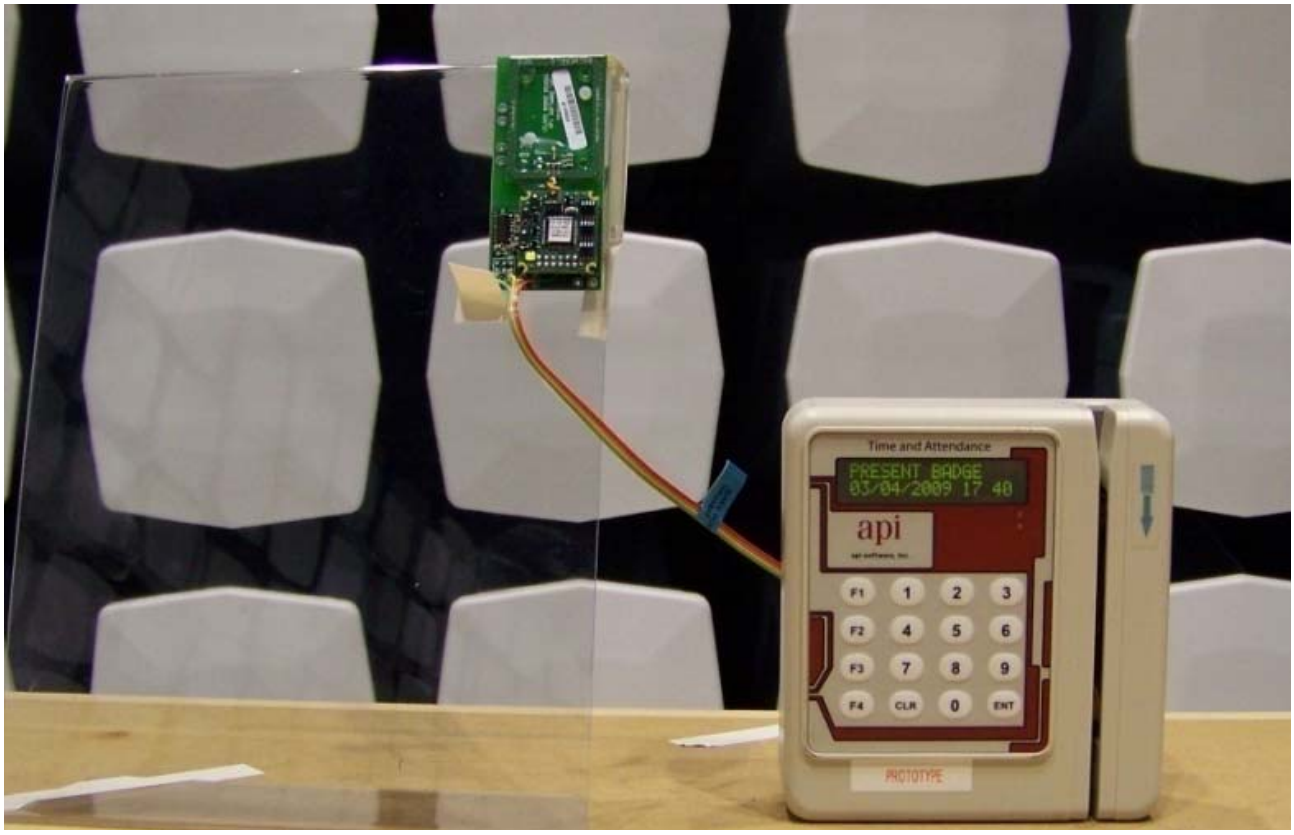


Figure 4: EUT Transmit Module in "Vertical" Orientation

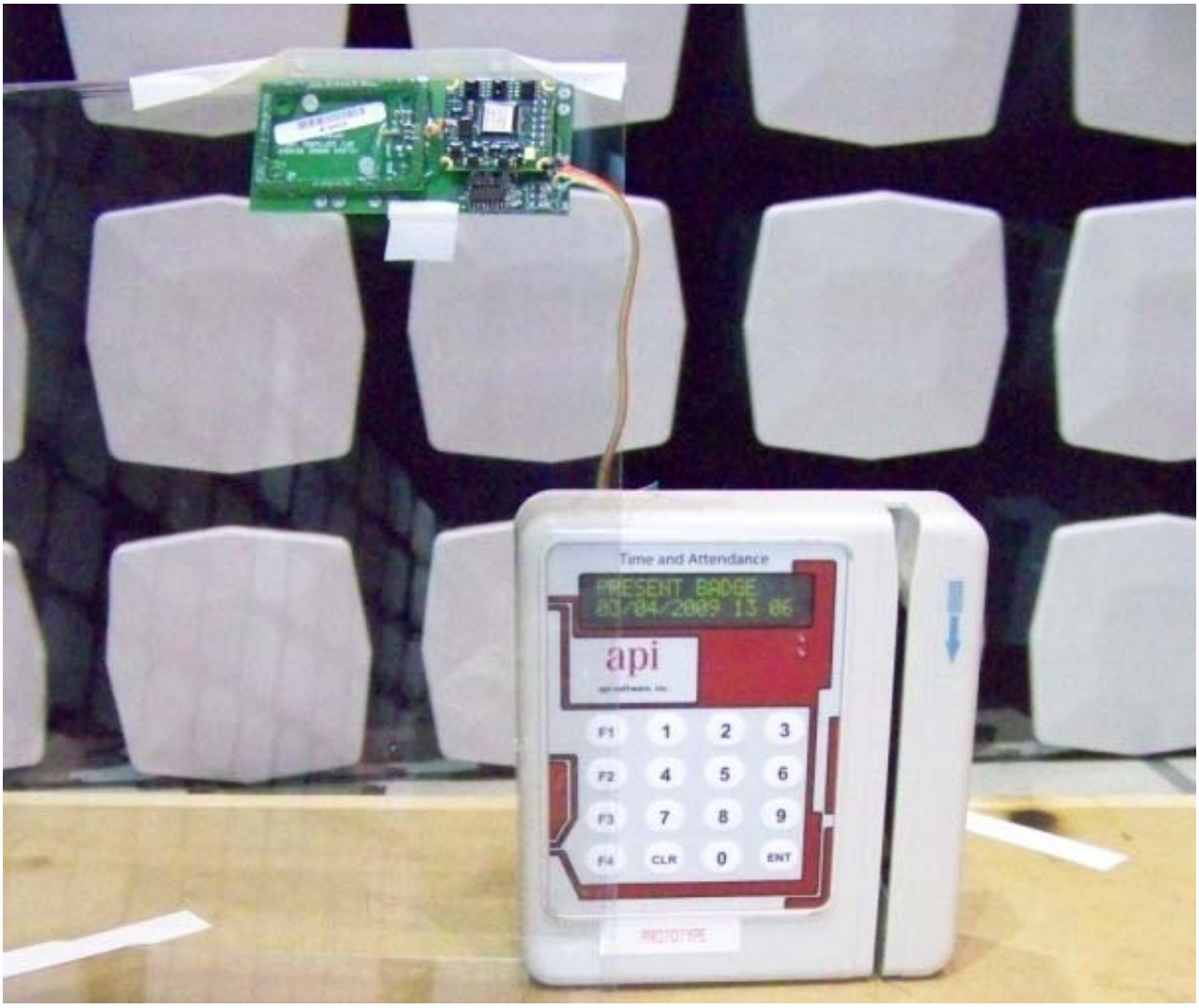


Figure 5: EUT Transmit Module in "Horizontal" Orientation

Side Orientation

Side orientation where the module would be co-planar with the ground plane would not be used in any installations by API Healthcare, and hence is not tested.

Figure 6: EUT Module Embedded Inside the Host Keypad and Card Reader (Opened for Photo)

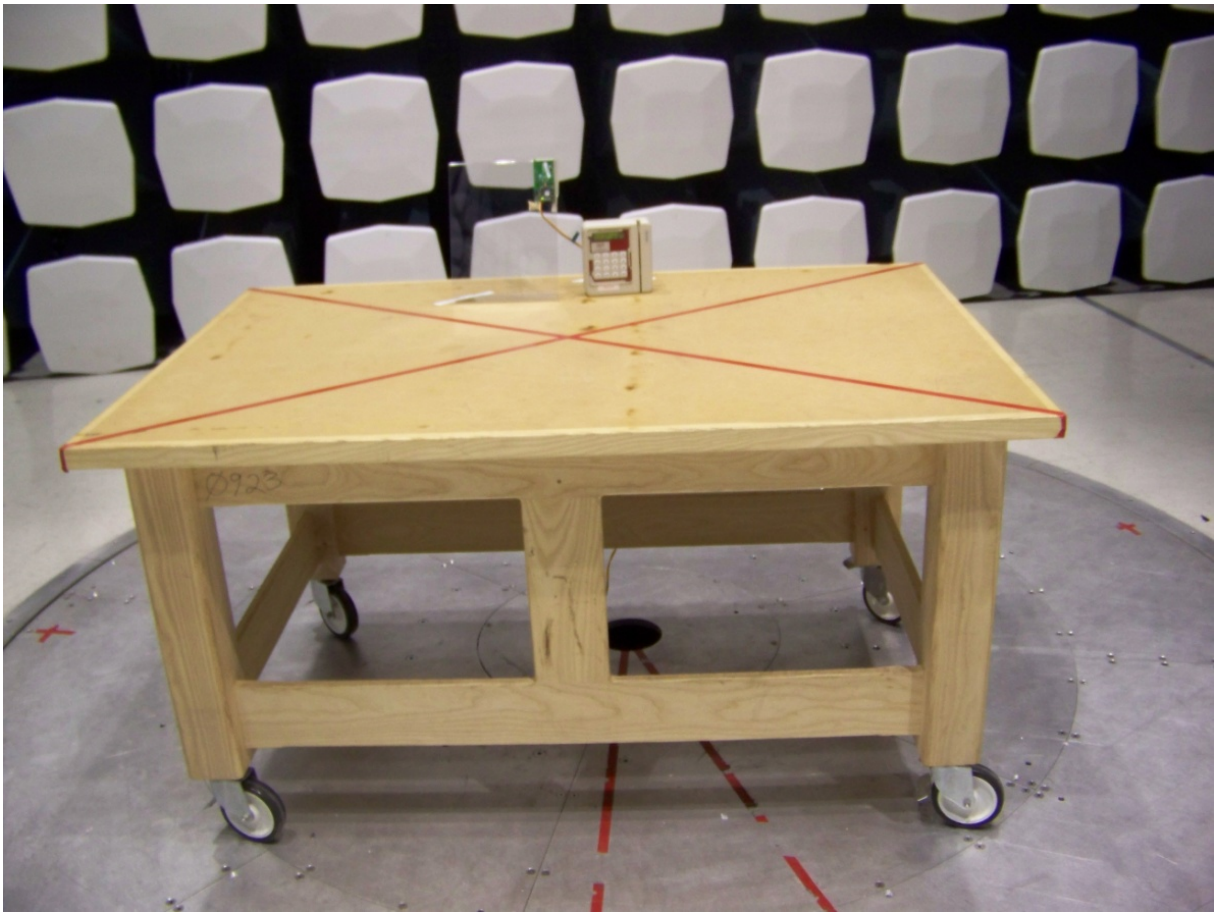


Figure 7: EUT Shown On Table, With the TA500 Host, Inside Test Chamber

Figure 8: RF ID Tags Used to Verify Operation Of The Host Units

4.1.1.4 Test Procedure

The EUT was measured for Radiated RF Emissions in the 10 Meter FCC Listed Semi-Anechoic Chamber located at Ingenium Testing. The frequency range from 9 kHz to 1000 MHz was investigated for RF emissions, and emission levels were noted along with the fixed degree settings of azimuth on the turntable and sense antenna height. The EUT was placed on a non-conductive pedestal (table), centered on a turn-table with a conductive rotating surface, flush and in contact with the conductive ground plane. The antenna mast was placed such that the antenna was separated by 10 meters from the test object for general emissions. Transmitter emissions measurements at the fundamental frequency and second harmonic were measured at both 10 meter and at 3 meters separation distances, **and the worst case emission is reported in the data section.** An Active Loop antenna was used to measure emissions from 9 kHz to 30 MHz, and a Hybrid Biconni-Log Antenna was used to measure emissions from 30 MHz to 1000 MHz. The maximum radiated emissions were found by raising and lowering the antenna between 1 and 4 meters in height (30 MHz to 1 GHz Range only), and by rotating the Loop antenna about it's vertical axis (360 degrees) and horizontal axis (45 degrees), at a height of 1 meter above the ground reference plane, while utilizing the turn-table to rotate the product. The process was repeated using both horizontal and vertical antenna polarizations. The maximum emission levels were then recorded along with the attitude of the product. The test was then repeated two more times with the module installed within the host units.

The receiver was operated with the IF resolution bandwidth (RBW) of 200 Hz for measurements between the frequencies of 9 kHz and 150 kHz (video bandwidth of 300 Hz), 9 kHz for measurements between the frequencies of 150 kHz and 30 MHz (video bandwidth of 30 kHz), 120 kHz for measurements between 30 MHz and 1 GHz (video bandwidth of 300 kHz), and a resolution bandwidth of 1 MHz for measurements above 1 GHz (video bandwidth of 1 MHz).

The EUT was set-up and operated, by the client cognizant engineer, in the proper mode as defined in section 2.3.1 for emission testing.

The applicable limits, as noted in 47 CFR Part 15.225 for an RFID type product were applied for transmitter testing. The applicable limits, as noted in 47 CFR Part 15.109 limits, for a CLASS B type product were applied for receiver testing. The applicable limits, as noted in 47 CFR Part 15.109 limits, for a CLASS B type product were applied for general emissions testing with the AT 500 host unit.

By virtue of how this RFID system operates, with the unit active in normal operation, the characteristics of the transmitter and receiver may be measured at the same time. The test results and graphs reflect this concept on broad-band sweeps.

4.1.1.5 Test Results

The EUT was found to **MEET** the requirements as described within the specifications of the FCC, Title 47 CFR, Part 15.225, for products qualifying as RFID transmitters, as well as meeting the requirements set forth by 47 CFR, Part 15.209, and Part 15.205. The EUT was found to **MEET** the requirements as described within the specifications of the FCC, Title 47 CFR, Part 15.109 for radiated emissions from a Class B product, as well as the Industry Canada requirements specified within ICES-003 for a Class B digital device. Supporting evidence of significant measured RF emissions, are tabulated and presented below.

Port Definition	Description/ Detail	Basic Standard	Performance Criteria	Pass / Fail
Enclosure	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Transmit Mode***	Radiated RF Emissions 47 CFR 15.225	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits	Pass
	iCLASS Module installed on-board TA-500 Host ***Transmit Mode***	Radiated RF Emissions 47 CFR 15.225	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits	Pass
Enclosure	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Receive Mode***	Radiated RF Emissions 47 CFR 15.109 Class B Products	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits	Pass
	iCLASS Module installed on-board TA-500 Host ***Receive Mode***	Radiated RF Emissions 47 CFR 15.109 Class B Products	9kHz-1.0 GHz Measured RF Emission should be Below specified Limits	Pass

CLIMATE TEST CONDITIONS

Temperature:	70 °F (21 °C)
Humidity:	38 % RH

Mode (Tx / Rx)	Frequency (MHz)	Antenna Polarization	Height (cm)	Azimuth (0° - 360°)	Measured EFI (dBµV/m@10m)	15.109 Limit (dBµV/m@10m)	Margin (dB)
Tx and Rx	91.4	V	120	0	19.3	33.0	13.7
Tx and Rx	111.7	V	185	285	20.6	33.0	12.4
Tx and Rx	143.6	V	100	245	27.0	33.0	6.0
Tx and Rx	175.6	V	100	155	28.4	33.0	4.6

Table 11: Level of Significant Spurious Radiated RF Emissions Measured in Transmit and Receive Mode and In Normal Operation as Installed in the TA500 Host Unit – CLASS B Limits

Frequency (MHz)	Ant./EUT Polarization	Measurement Distance (m)	Height (cm)	Azimuth (0° - 360°)	Measured EFI (dBµV/m)	15.225 Limit (dBµV/m)	Margin (dB)
13.56	A_V, E_V	3	100	0	86.5	124.0	37.5
27.12	A_V, E_V	10	100	0	21.3	69.5	48.2
40.68	A_V, E_V	10	100	0	22.8	29.5	6.7
54.24	A_V, E_V	10	100	0	16.6	29.5	12.9
67.80	A_V, E_V	10	100	330	8.0	29.5	21.5
81.36	A_V, E_V	10	100	130	11.4	33.0	21.6
94.92	A_V, E_V	10	100	130	14.2	33.0	18.8
108.48	A_V, E_V	10	100	130	13.2	33.0	19.8
122.04	A_V, E_V	10	100	130	13.2	33.0	19.8
135.60	A_V, E_V	10	100	130	14.5	33.0	18.5

Table 12: Level of Significant Radiated RF Emissions Measured In Transmit Fundamental and Harmonic Frequencies, With the 10 cm Tether Cable

Uncertainty Calculations – All Factors Combined Includes a comparison between CISPR 16-4-2 and Ingenium Testing			
Measurement		U_{CISPR}	Ingenium Testing
Radiated Disturbance	30 MHz – 300 MHz	7.4 dB	5.4 dB
Radiated Disturbance	300 MHz – 1 GHz	6.5 dB	5.1 dB

Notes: Date of Estimation: November 02, 2007.

Table 13: Uncertainty Calculations for Ingenium Testing

SCREEN CAPTURES – RADIATED RF EMISSIONS TESTING

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

The signature scans shown here are from worst-case emissions, as measured with the sense antenna both in vertical and horizontal polarity.

Transmit Mode – EUT In "Modular" Setup

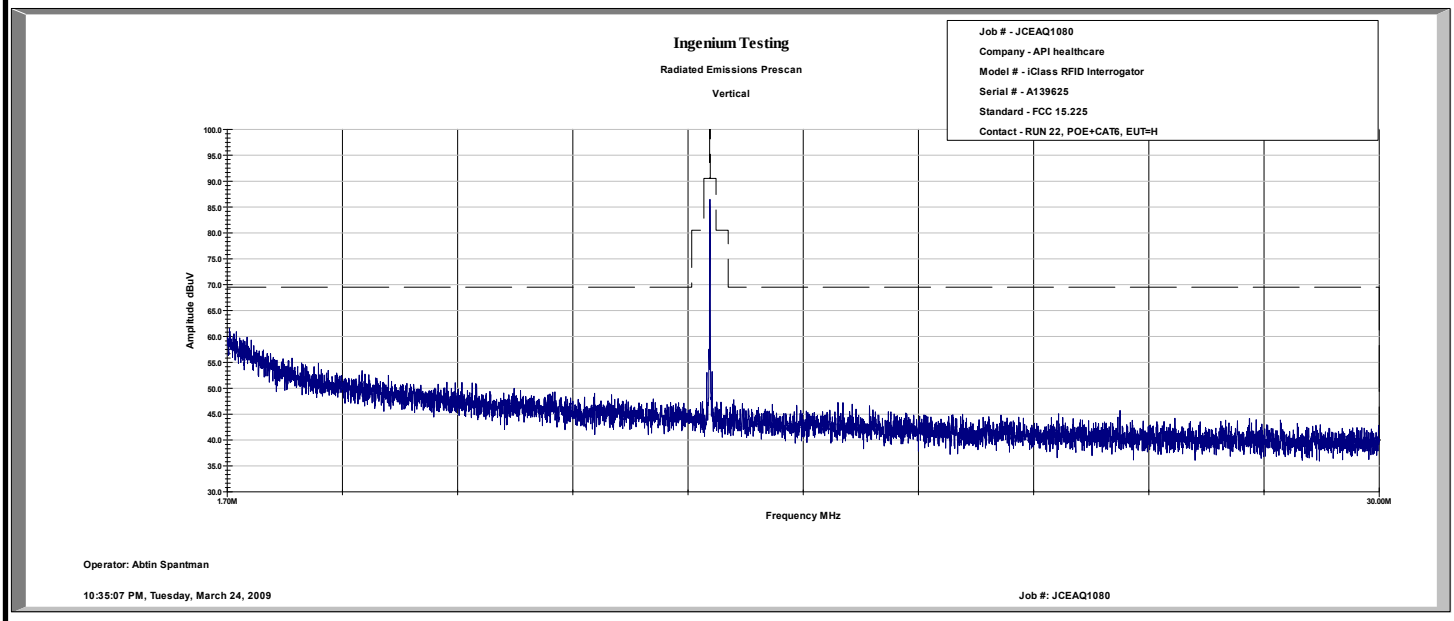


Figure 9: Transmit RF Emission Signature, Antenna Vertical, 1.7-30 MHz, at 3 m - Modular

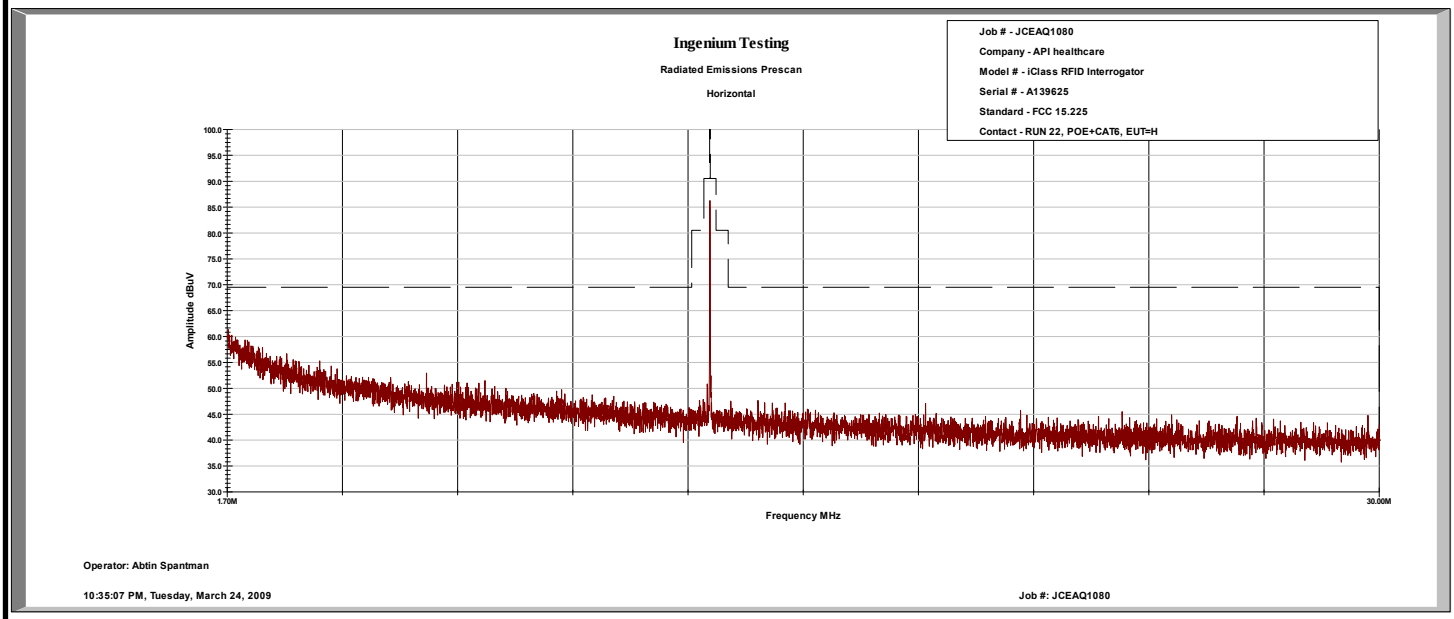


Figure 10: Transmit RF Emission Signature, Antenna Horizontal, 1.7-30 MHz, at 3 m – Modular

Transmit Mode – EUT Embedded Within the TA500 Host

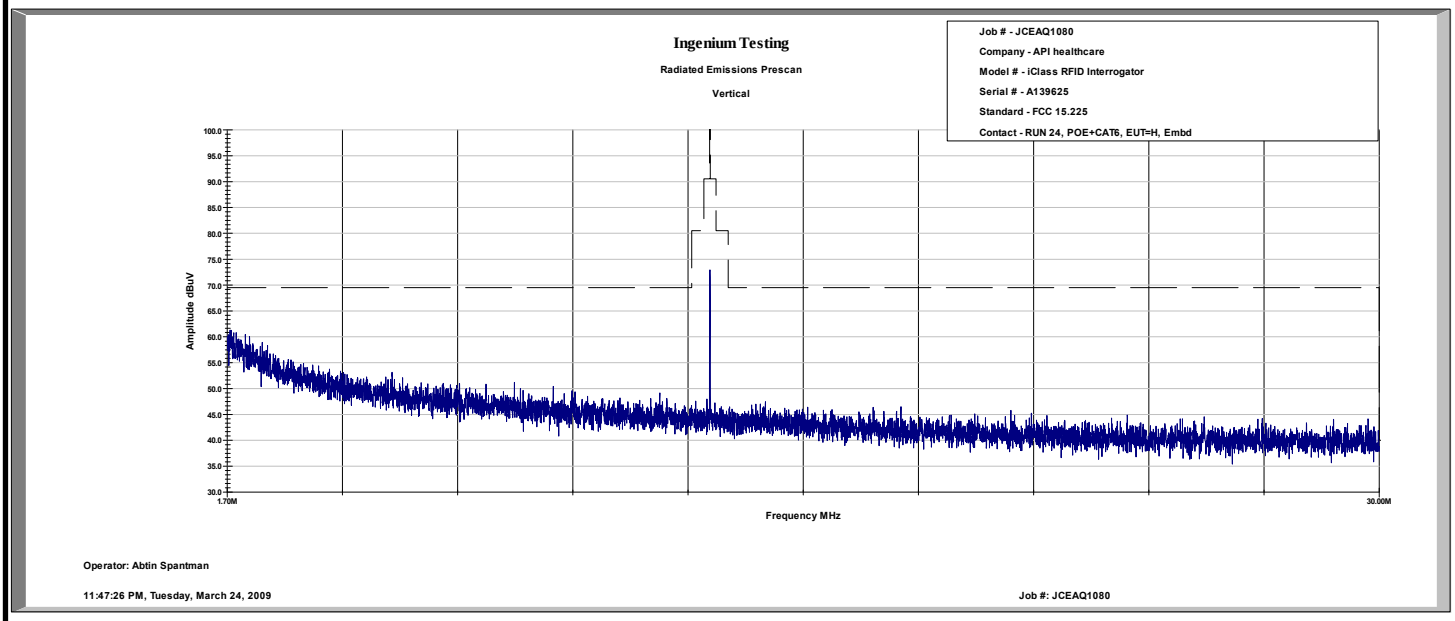


Figure 11: Transmit RF Emission Signature, Antenna Vertical, 1.7 – 30 MHz, at 3 m - Embedded

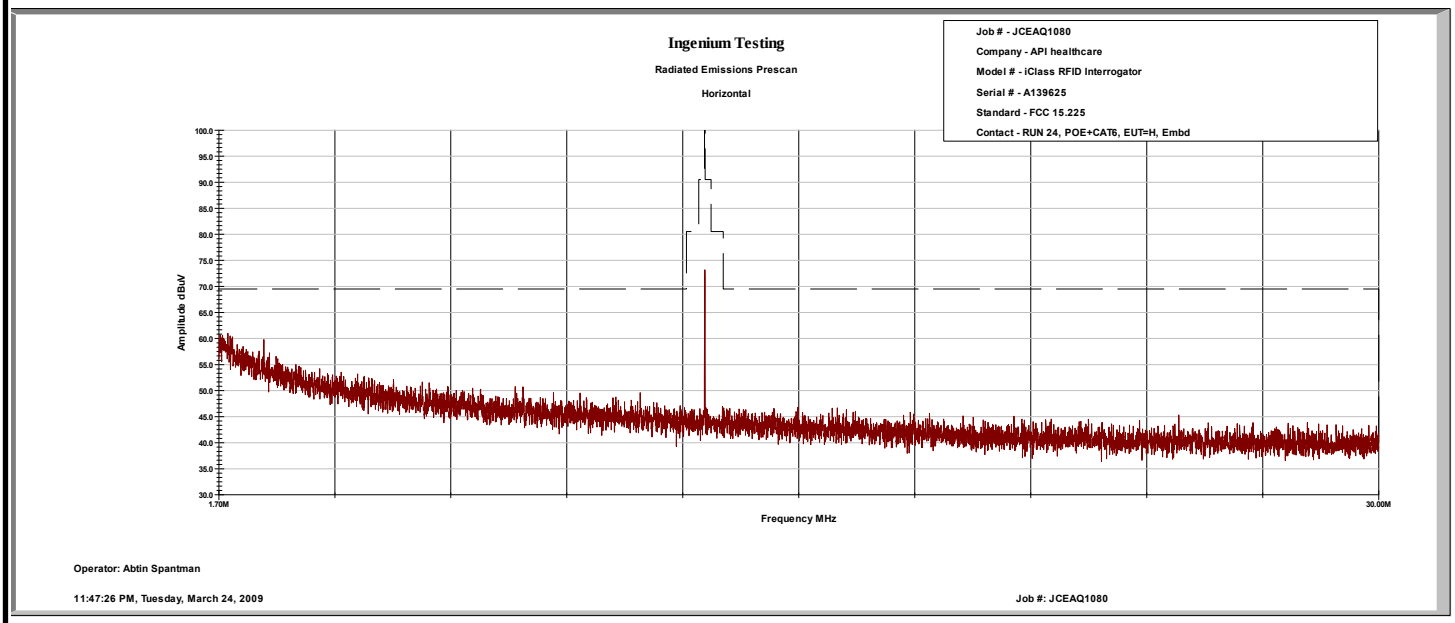


Figure 12: Transmit RF Emission Signature, Antenna Horizontal, 1.7-30 MHz, at 3 m – Embedded

Transmit Mode – EUT in "Modular" Setup

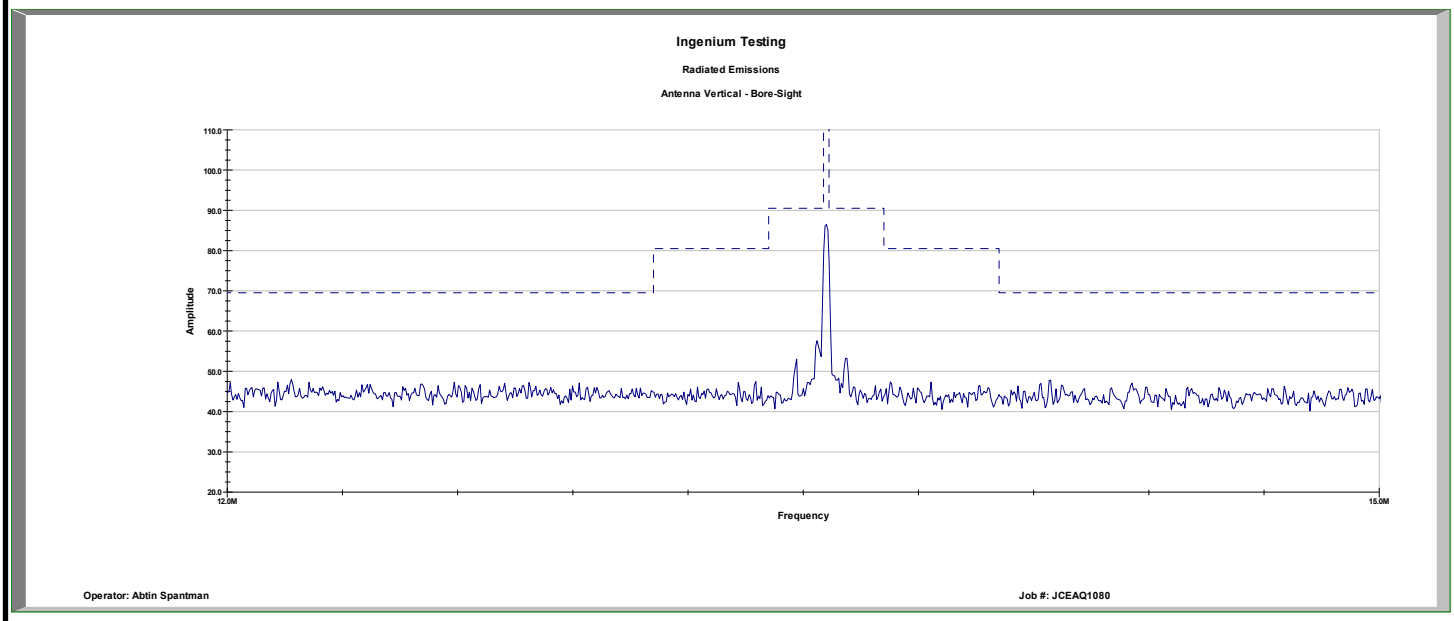


Figure 13: Transmit RF Emission Fundamental Frequency, Antenna Vertical Bore-Sight, 12-15 MHz, at 3 m

Transmit and Receive Mode – EUT Embedded Within the TA500 Host

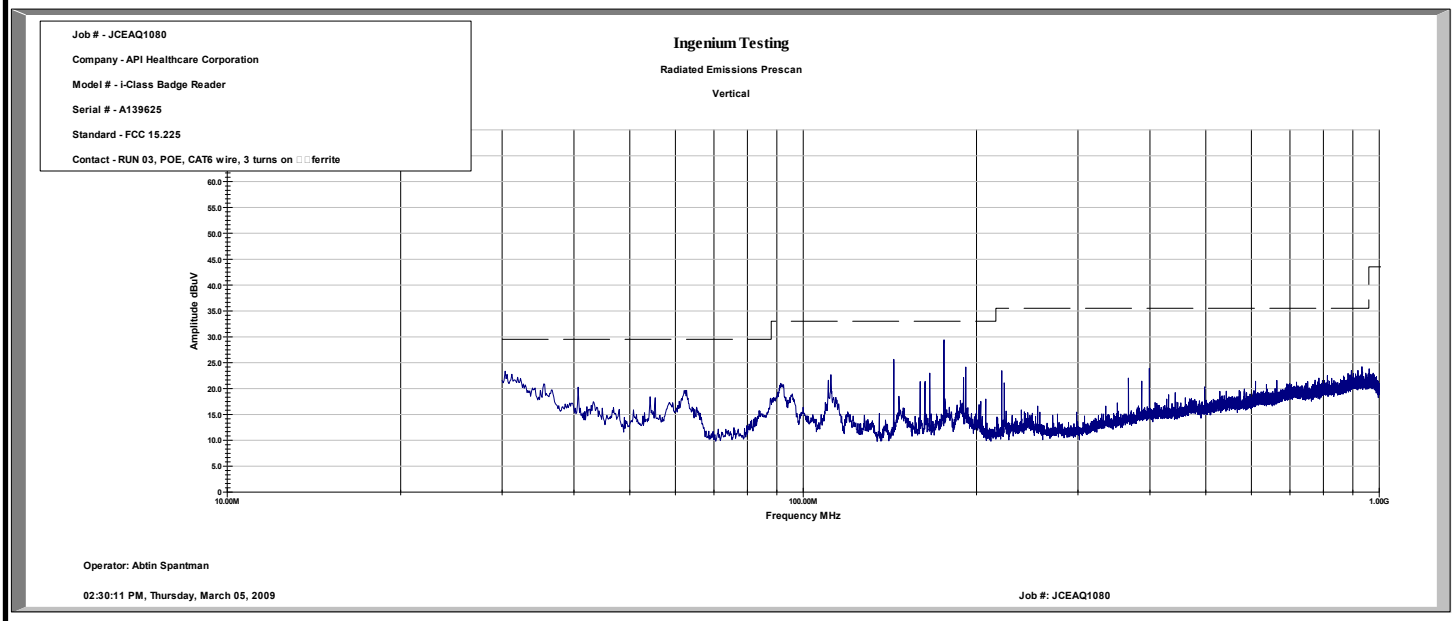


Figure 14: Transmit RF Emission Signature, Antenna Vertically Polarized, 30-1000 MHz, at 10 m

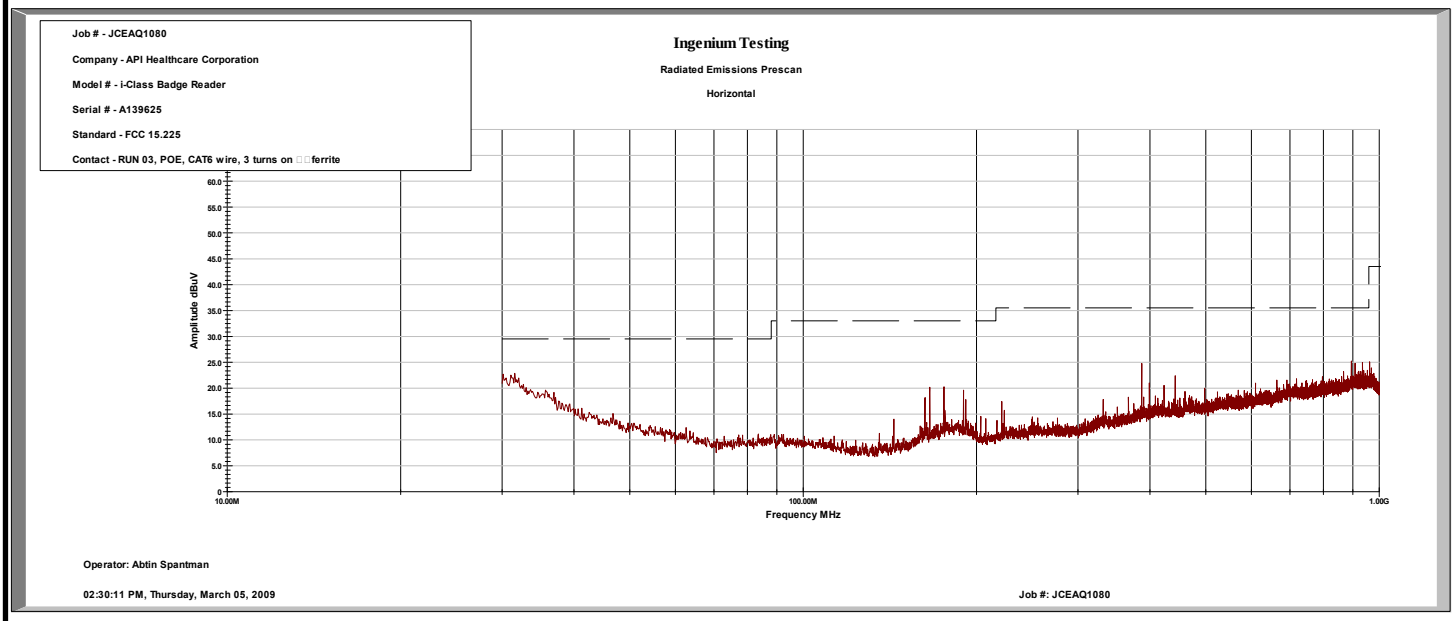


Figure 15: Transmit RF Emission Signature, Antenna Horizontally Polarized, 30-1000 MHz, at 10 m

4.2 Conducted RF Emission Tests

4.2.1 Conducted RF Emission Onto AC Mains Measurements

4.2.1.1 Test Criterion

The test matrix in section 2.10 was used as a guide for test points and conditions.
The following table presents the limits for unintentional RF emissions conducted onto AC Mains, as specified in the FCC Title 47 CFR, Part 15.207, for intentional radiators, as well as the limits specified in the FCC Title 47 CFR, Part 15.107, section (a), for un-intentional radiators and products qualifying as Class B Digital Devices.

Frequency (MHz)	Conducted RF Voltage Quasi-peak Limit (dBμV)	Conducted RF Voltage Average Limit (dBμV)
0.15 – 0.50	66.0 Decreasing linearly with logarithm of frequency to 56.0	56.0 Decreasing linearly with logarithm of frequency to 46.0
0.50 – 5.0	56.0	46.0
5.0 – 30.0	60.0	50.0

Notes: In the calculations for margin below the limit, the limits are rounded to one digit past the decimal.

The following ports should be tested for compliance according to the test matrix:

Port Definition	Description/ Detail	Basic Standard	Performance Criteria
AC Power	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Transmit Mode***	Conducted RF Emissions 47 CFR 15.207	150kHz-30 MHz Measured RF Emission should be Below specified Limits
	iCLASS Module installed on-board TA-500 Host ***Transmit Mode***	Conducted RF Emissions 47 CFR 15.207	150kHz-30 MHz Measured RF Emission should be Below specified Limits

Port Definition	Description/ Detail	Basic Standard	Performance Criteria
AC Power	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Receive Mode***	Conducted RF Emissions 47 CFR 15.107 Class B Products	150kHz-30 MHz Measured RF Emission should be Below specified Limits
	iCLASS Module installed on-board TA-500 Host ***Receive Mode***	Conducted RF Emissions 47 CFR 15.107 Class B Products	150kHz-30 MHz Measured RF Emission should be Below specified Limits

4.2.1.2 Test Equipment

All equipment is calibrated according to governing standards, and is N.I.S.T. traceable. The equipment is used according to the operation manuals as provided by the manufacturers.

Table 14: List of Equipment Used:

Manufacturer	Model	Ingenium Asset Number	Description	Last Cal data	Cal due date
Hewlett Packard	8546A	1133	EMI analyzer	26 Jan 2009	26 Jan 2010
ETS	3816/2	1363	Dual LISN	11 Mar 2009	11 Mar 2010
Agilent	11947A	1314	Transient Limiter	18 Dec 2008	18 Dec 2009

Correction factors and cable loss factors were entered into the appropriate test equipment. As a result, the data taken 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 measurement result.

4.2.1.3 Test Setup

The EUT was tested as a "Table-Top" type product, as described in ANSI C63.4. The EUT was placed on a non-conductive pedestal, 80 cm above the reference ground plane, inside a Shielded Chamber located at Ingenium Testing. 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 to the LISN via appropriate broadband EMI Filters. The LISN used has the ability to terminate the unused RF sampling port connection with a 50Ω (ohm) load, when switched to either L1 (line) or L2 (neutral). A transient limiter was installed in the RF path to protect the detection equipment.

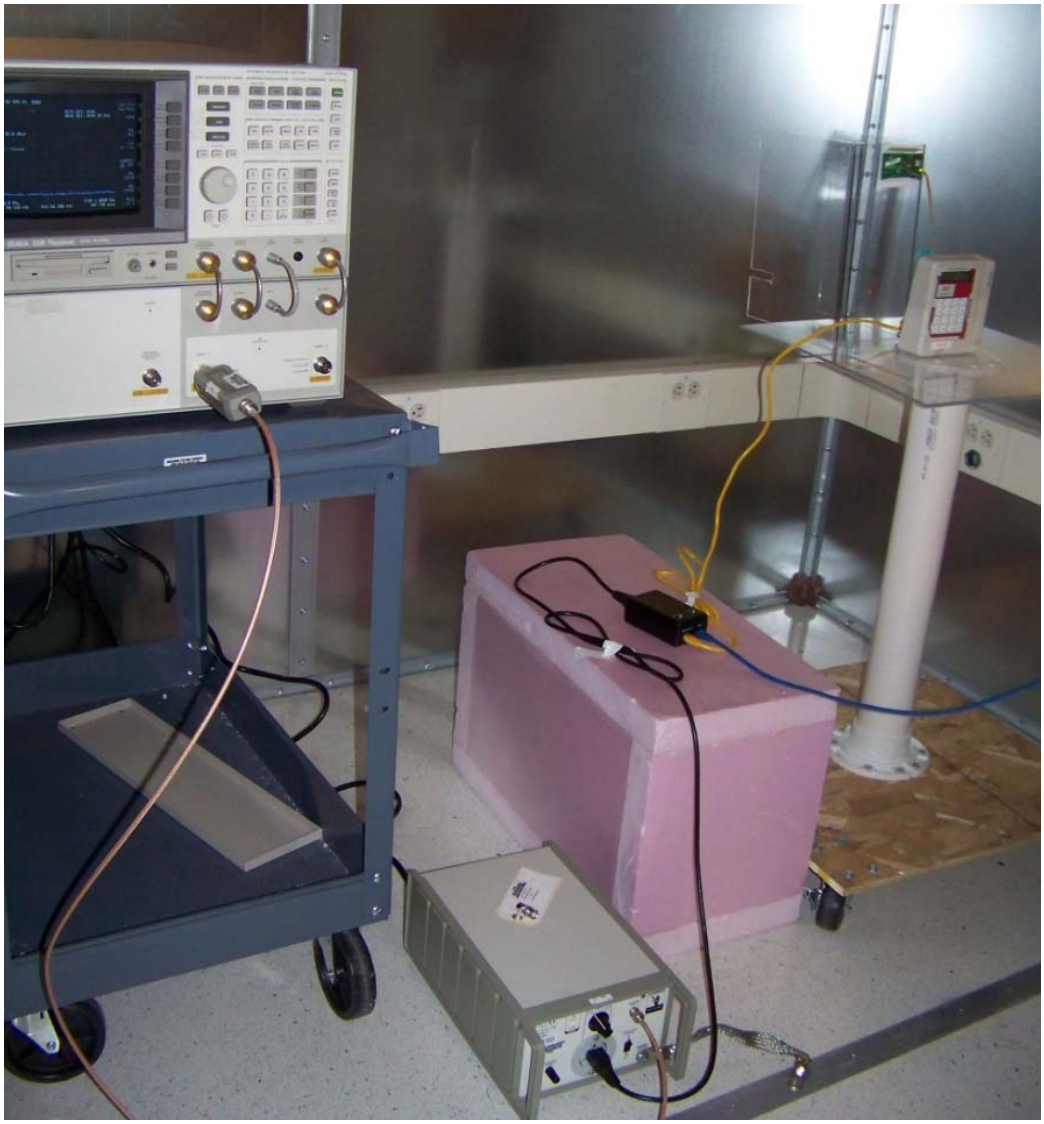


Figure 16: General Setup During Conducted RF Emissions Testing, Showing TA500 Host With EUT

Figure 17: Close Up View of Conducted RF Emission Testing, Showing EUT in "Modular Transmitter" Test Setup

4.2.1.4 Test Procedure

The EUT was measured for RF Emissions conducted onto AC Mains lines, in an RF shield-room located at Ingenium Testing. Frequency range from 150 kHz to 30 MHz was investigated for RF emissions. Measurements were made via a LISN, equipped with a 50 Ω RF sampling port. The measurements were made using the "Quasi-Peak" and "Average" detector functions as defined in CISPR 16-1-1, and available on the test equipment selected for this test.

The EUT was investigated in continuous transmit mode for modular transmitter testing, particular setup for emission testing as defined in section 2.3.1 of this report. The EUT was also investigated in normal operation mode for general emissions while embedded in the host units. By nature of RFID operation, the transmitter is active during these tests as polled by the system.

The receiver was operated with the IF resolution bandwidth (RBW) of 9 kHz for measurements between the frequencies of 150 kHz and 30 MHz (video bandwidth of 30 kHz). The applicable Class B limits, as noted in 47 CFR 15.107 were applied when testing emissions with the TA500 host unit.

Automation software TILE4 was used to perform the Conducted RF Emission measurements.

4.2.1.5 Test Results

The EUT was found to **MEET** the requirements as described within the specifications of the FCC, Title 47 CFR, Part 15.107 for conducted emissions from a Class B product, onto AC Mains, as well as the Industry Canada requirements specified within ICES-003 for a Class B digital device. Supporting evidence of significant measured RF emissions, are tabulated and presented below.

Port Definition	Description/ Detail	Basic Standard	Performance Criteria	Pass / Fail
AC Power	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Transmit Mode***	Conducted RF Emissions 47 CFR 15.207	150kHz-30 MHz Measured RF Emission should be Below specified Limits	Pass
	iCLASS Module installed on-board TA-500 Host ***Transmit Mode***	Conducted RF Emissions 47 CFR 15.207	150kHz-30 MHz Measured RF Emission should be Below specified Limits	Pass
AC Power	iCLASS Module Modular with 10cm tether cable To TA-500 Host ***Receive Mode***	Conducted RF Emissions 47 CFR 15.107 Class B Products	150kHz-30 MHz Measured RF Emission should be Below specified Limits	Pass
	iCLASS Module installed on-board TA-500 Host ***Receive Mode***	Conducted RF Emissions 47 CFR 15.107 Class B Products	150kHz-30 MHz Measured RF Emission should be Below specified Limits	Pass

CLIMATE TEST CONDITIONS

Temperature:	74 ^{o}F (23 ^{o}C)
Humidity:	40 % RH

		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Quasi-Peak Measurement (dBµV)	Quasi-Peak Limit (dBµV)	Quasi-Peak Margin (dB)	Average Measurement (dBµV)	Average Limit (dBµV)	Average Margin (dB)
0.150	L1	34.9	66.0	31.1	14.5	56.0	41.5
0.172	L1	32.3	65.3	33.0	12.9	55.3	42.4
2.001	L1	14.2	56.0	41.8	2.3	46.0	43.7
6.217	L1	30.6	60.0	29.4	25.5	50.0	24.5
6.613	L1	31.3	60.0	28.7	24.7	50.0	25.3
6.620	L1	27.4	60.0	32.6	16.8	50.0	33.2
6.687	L1	24.6	60.0	35.4	16.6	50.0	33.4
13.560	L1	45.3	60.0	14.7	43.6	50.0	6.4
13.568	L1	32.2	60.0	27.8	30.0	50.0	20.0
13.575	L1	16.3	60.0	43.7	12.5	50.0	37.5
0.202	L2	29.7	64.5	34.8	20.3	54.5	34.2
5.172	L2	10.6	60.0	49.4	6.2	50.0	43.8
5.568	L2	15.3	60.0	44.7	11.4	50.0	38.6
5.963	L2	18.6	60.0	41.4	15.0	50.0	35.0
6.351	L2	34.2	60.0	25.8	32.3	50.0	17.7
6.747	L2	34.6	60.0	25.4	32.5	50.0	17.5
6.754	L2	26.0	60.0	34.0	21.7	50.0	28.3
13.560	L2	44.9	60.0	15.1	43.0	50.0	7.0
13.568	L2	32.0	60.0	28.0	29.3	50.0	20.7
13.575	L2	15.6	60.0	44.4	12.5	50.0	37.5

Notes: All other emissions were better than 20 dB below the limits.

Table 15: Level of Significant Conducted RF Emissions Measured In Transmit Mode, With the Module Extended Out (Class B Limits Applied)

		QUASI-PEAK			AVERAGE		
Frequency (MHz)	Line	Quasi-Peak Measurement (dBµV)	Quasi-Peak Limit (dBµV)	Quasi-Peak Margin (dB)	Average Measurement (dBµV)	Average Limit (dBµV)	Average Margin (dB)
5.000	L1	24.0	56.0	32.0	18.9	46.0	27.1
6.000	L1	30.2	56.0	25.8	23.6	46.0	22.4
13.553	L1	21.9	60.0	38.1	11.3	50.0	38.7
13.560	L1	31.0	60.0	29.0	23.0	50.0	27.0
5.000	L2	23.1	56.0	32.9	21.2	46.0	24.8
6.000	L2	30.4	60.0	29.6	28.3	50.0	21.7
13.553	L2	20.8	60.0	39.2	16.5	50.0	33.5
13.560	L2	29.3	60.0	30.7	27.4	50.0	22.6

Notes: All other emissions were better than 20 dB below the limits.

Table 16: Level of Significant Conducted RF Emissions Measured in Normal Operation (Transmit & Receive) With Module Embedded Within the TA500 Host Unit (Class B Limits Applied)

Uncertainty Calculations Includes a comparison between CISPR 16-4-2 and Ingenium Testing			
Measurement		U_{CISPR}	Ingenium Testing
Conducted Disturbance	150 kHz – 30 MHz	5.1 dB	4.2 dB

Notes: Date of Estimation: November 02, 2007.

Table 17: Uncertainty Calculations for Ingenium Testing

SCREEN CAPTURES – CONDUCTED RF EMISSIONS TESTING

These screen captures represent Peak Emissions. For conducted emission measurements, both a Quasi-Peak detector and an Average detector function is utilized.

Transmit Mode – Extended

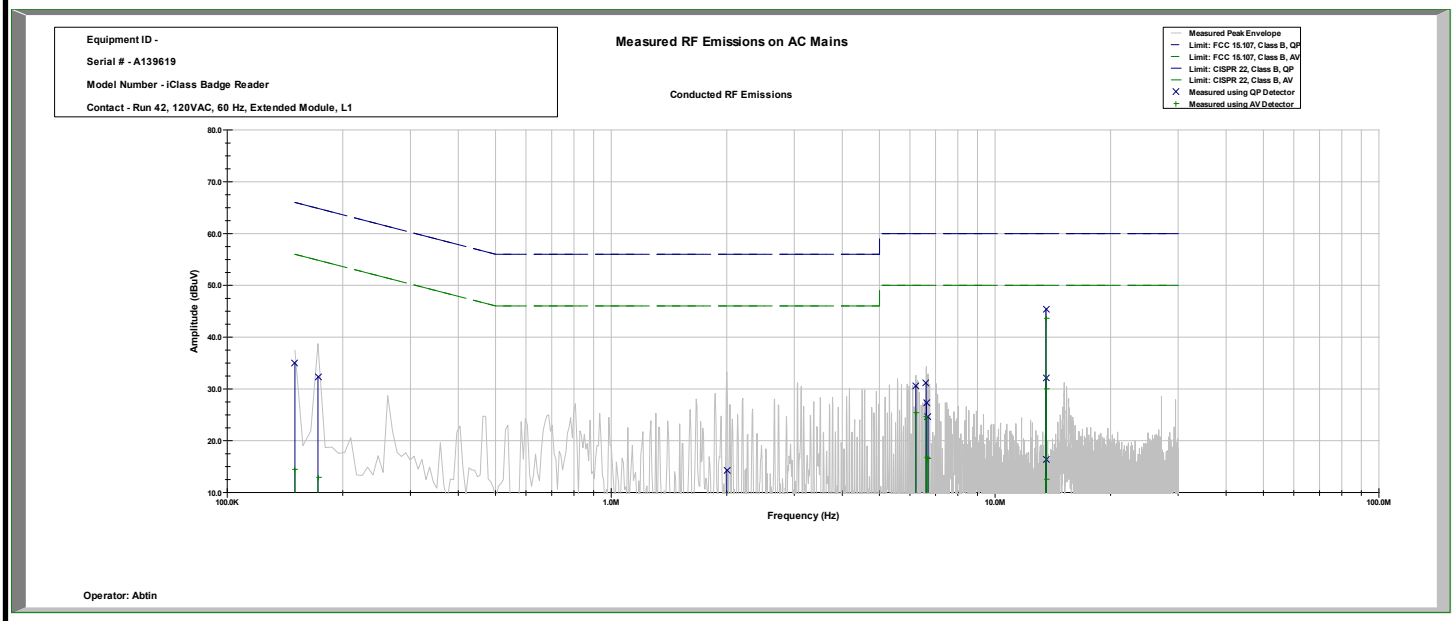


Figure 18: Conducted RF Emission Signature, L1, RF Module Extended

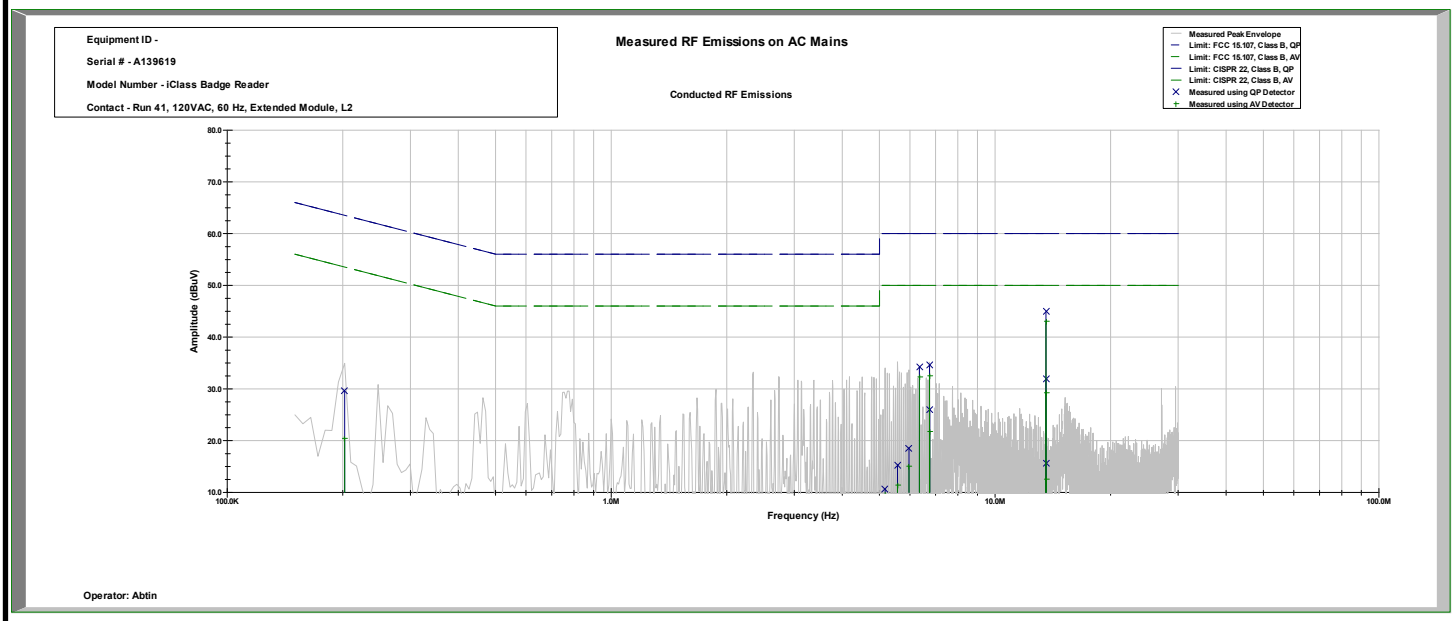


Figure 19: Conducted RF Emission Signature, L2, RF Module Extended

Continued - SCREEN CAPTURES – CONDUCTED RF EMISSIONS TESTING

Transmit Mode – Embedded Within TA500 Host

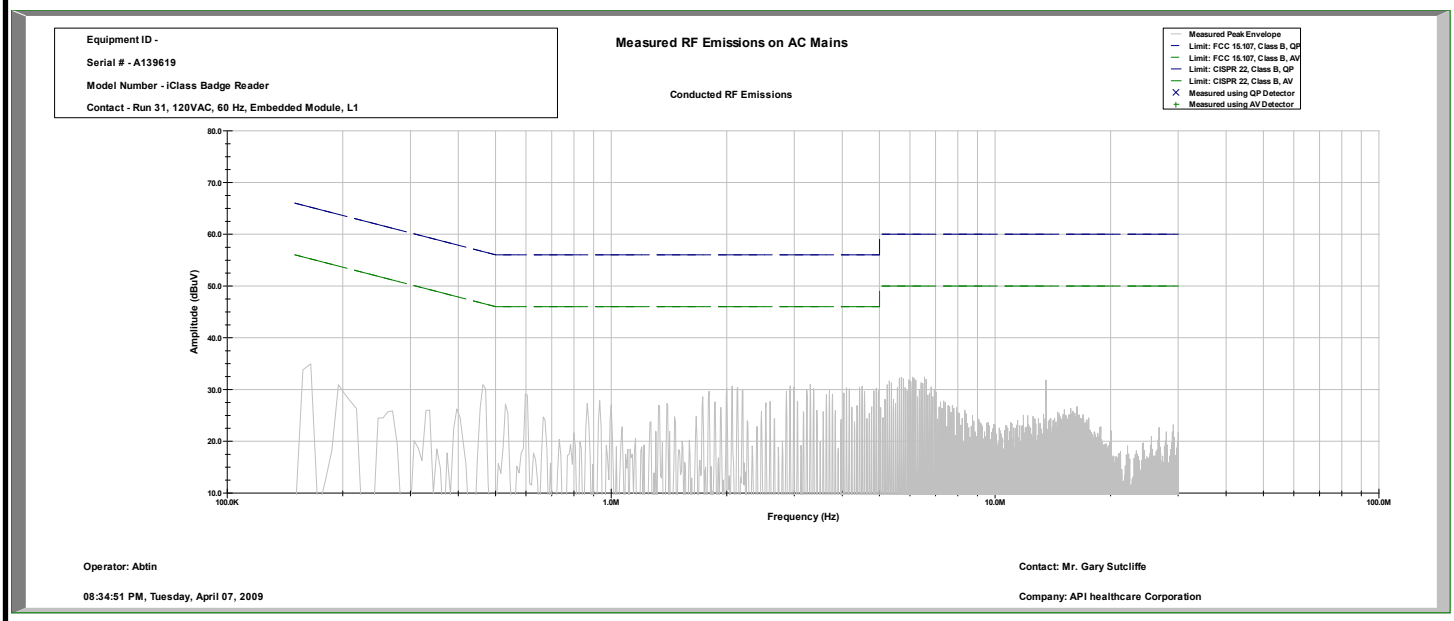


Figure 20: Conducted RF Emission Signature, L1, RF Module in TA500 Host

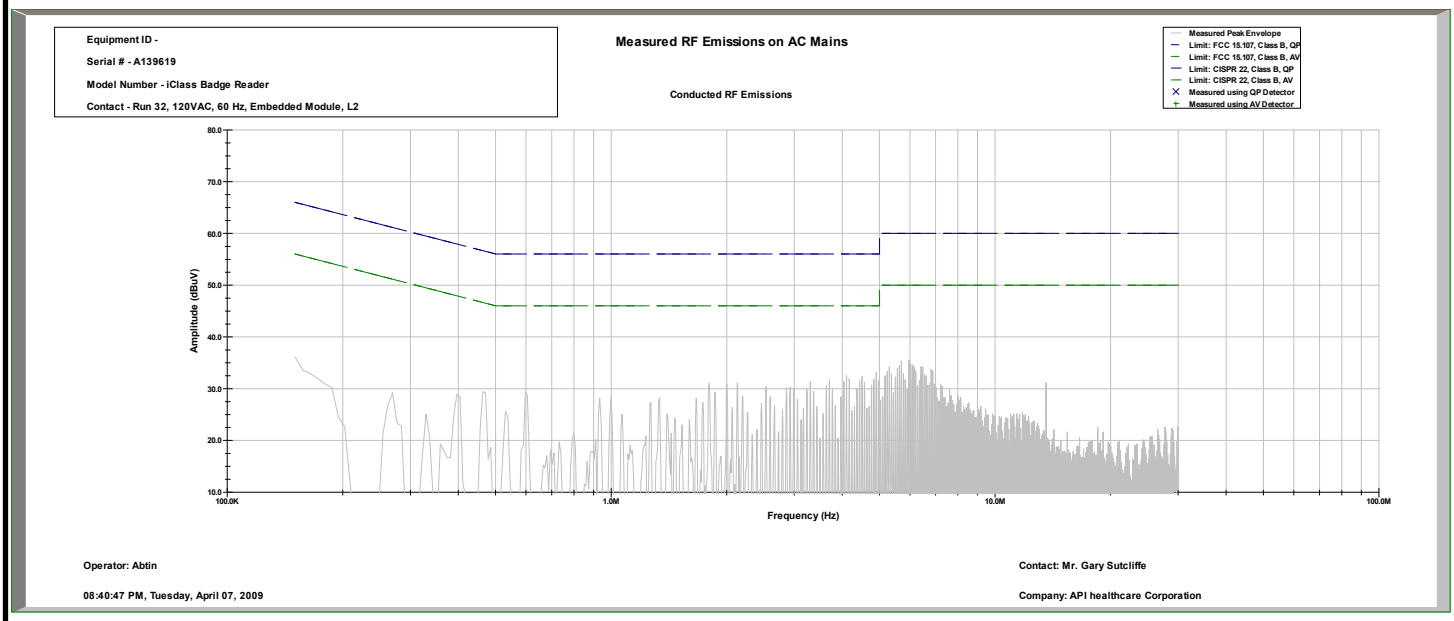


Figure 21: Conducted RF Emission Signature, L2, RF Module in TA500 Host

Receive Mode

(Same as Transmit mode Embedded within TA500 Host)

For receive mode testing, the module was Embedded in the Host unit, and tested in normal operation. In normal operation, both the transmit and receive functions are active and can be tested. Since the unit conformed to the limit even with the transmit function enabled, there was no need to perform additional tests with the transmit function forced off.

4.2.2 Conducted RF Performance Parameters – Occupied Bandwidth Measurements

Occupied Bandwidth measurements are not required, under part 15.225, for this transmitter.
No tests were performed.

4.2.3 Radiated RF Performance Parameters – Band-Edge Measurements

Band-Edge measurements are not required, under part 15.225, for this transmitter.
No tests were performed.

4.2.4 Conducted RF Performance Parameters – Conducted RF Power Output Measurements

Conducted RF Output Power measurements are not required, under part 15.225, for this transmitter.
No tests were performed.

4.2.5 Conducted RF Performance Parameters – Power Spectral Density Measurements

PSD measurements are not required, under part 15.225, for this transmitter.
No tests were performed.

4.2.6 Conducted RF Performance Parameters – Spurious RF Emission Measurements

Conducted Spurious Emission measurements are not required, under part 15.225, for this transmitter.
No tests were performed.

4.2.7 Conducted RF Performance Parameters – Carrier Frequency and RF Power Stability Measurements (Voltage and Temperature Variation)

4.2.7.1 Test Criterion

Per 47 CFR Part 15.225(e), all intentional radiators shall maintain a stable carrier frequency to within ±0.01%, when tested at a temperature range between **-20**°C and +**50**°C at nominal input voltage, and stable when tested at +**20**°C at an input voltage range between ±15% of nominal voltage.

4.2.7.2 Test Equipment

All equipment is calibrated according to governing standards, and is N.I.S.T. traceable. The equipment is used according to the operation manuals as provided by the manufacturers.

Table 18: List of Equipment Used:

Manufacturer	Model	Ingenium Asset Number	Description	Last Cal data	Cal due date
Agilent	E4440A	1207	PSA Spec. Analyzer	18 Dec 2008	18 Dec 2009
Agilent	N9039A	1206	Pre-Selector	23 Dec 2008	23 Dec 2009

The data presented 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 measurement result.

4.2.7.3 Test Setup

For measurements of the frequency and power stability, the transmitter was placed inside a temperature controlled environmental chamber. A Spectrum Analyzer was used to monitor the EUT through a small coaxial cable and a very small sense antenna. The transmitter portion of the EUT placed in the emission mode as described in section 2.3.1 of this report, which is almost CW continuous transmit mode. Power to the EUT was supplied by an external variable power supply. The frequency of operation was monitored using the spectrum analyzer. The power supply and spectrum analyzer were located outside the temperature chamber. The frequency was measured with a receiver resolution bandwidth of 200 Hz, and video bandwidth of 200 Hz (RBW=VBW=200 Hz).

The RF Power Output of the EUT was also monitored in a separate test, also using a Spectrum Analyzer with RBW=VBW=1 MHz setting while the voltage was varied.

4.2.7.4 Test Procedure

The stability of the device was examined as a function of the input voltage available to the EUT. For measurements of the frequency and power stability, the transmitter was placed inside a temperature controlled environmental chamber. A Spectrum Analyzer was used to measure the frequency at the appropriate frequency markers. For this test, the EUT was place inside a temperature chamber, with the transmitter portion of the EUT placed in the Emission setup mode. Power was supplied by an external variable power supply and varied to the desired test levels, and the frequency of operation and relative power output were monitored using the spectrum analyzer. A "Marker – Delta" method was utilized with a "Peak-Search" function at each setting to measure the relative frequency and power change.

4.2.7.5 Test Results

Relative Frequency Excursion

	AC Voltage Source		
Temperature (°C)	102 VAC	120 VAC	138 VAC
+50	-	-510 (Hz)	-
+20	50 (Hz)	0 (Hz)	40 (Hz)
-20	-	650 (Hz)	-

Relative Power Excursion

Temperature (°C)	AC Voltage Source		
	102 VAC	120 VAC	138 VAC
+50	-	-1.7 (dB)	-
+20	-0.3 (dB)	0 (dB)	-0.4 (dB)
-20	-	+0.8 (dB)	-

The power was then cycled On/Off to observe system response. No unusual response was observed, the emission characterizes were well behaved, and the system returned to the same state of operation as before the power cycle.

At the extreme temperature settings, a wide frequency sweep was also investigated, with minimum and maximum input voltages, to ensure that no unexpected anomalies have occurred. No anomalies were noted, in the measured transmit power, varying less than 1.8 dB, during the voltage and temperature variation tests.

4.2.8 **Conducted RF Performance Parameters – MPE Calculations**

The following MPE calculations are based on an integrated internal printed circuit board trace Loop antenna, with a measured ERP of 86.5 dBµV/m, at 3 meters separation distance.

The gain of this antenna already accounted for in the measurement. The gain is listed as 0 dBi for MPE calculations only, and is not reflective of the actual gain of the antenna. Because of the impedance of the Loop antenna, conducted RF power measurements are not readily available on this product, therefore, the true or apparent gain of this antenna was not determined.

Prediction of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{PG}{4\pi R^2}$$

where: S = power density
P = power input to the antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

Maximum peak output power at antenna input terminal:	-8.70	(dBm)
Maximum peak output power at antenna input terminal:	0.135	(mW)
Antenna gain(typical):	0	(dBi)
Maximum antenna gain:	1.000	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	13.56	(MHz)
MPE limit for uncontrolled exposure at prediction frequency:	0.9789	(mW/cm^2)
Power density at prediction frequency:	0.000027	(mW/cm^2)
Maximum allowable antenna gain:	45.6	(dBi)
Margin of Compliance at 20 cm =	45.6	dB

4.3 Electromagnetic Susceptibility Tests

There are no susceptibility requirements.
No susceptibility tests were performed on this product.

APPENDIX A: INGENIUM TESTING, LLC APPLICABLE ACCREDITATIONS

THE AMERICAN ASSOCIATION FOR LABORATORY ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

INGENIUM TESTING, LLC

Rockford, IL

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated 18 June 2005*).

Presented this 24th day of January 2008.

President
For the Accreditation Council
Certificate Number 2674.01
Valid to February 28, 2010

For the tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

SCOPE OF ACCREDITATION TO ISO/IEC 17025:2005

INGENIUM TESTING, LLC
3761 South Central Avenue
Rockford, IL 61102
James Blaha 815 315 9250 x117

ELECTRICAL

Valid To: February 28, 2010 Certificate Number: 2674.01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following electromagnetic compatibility tests:

Test	Test Method
Emissions	
Radiated Emissions	47 CFR FCC Part 15.109, 209, 225, 231, 247, 249 using ANSI C63.4; 47 CFR FCC Part 18 using ANSI C63.4; FCC/OST MP-5; EN 55011; CISPR 11; AS/NZS CISPR 11; EN 55012; CISPR 12; AS/NZS CISPR 12; EN 55014-1; CISPR 14-1; AS/NZS CISPR 14-1; EN 55022; CISPR 22; AS/NZS CISPR 22; EN 61000-6-3; IEC 61000-6-3; EN 61000-6-4; IEC 61000-6-4; AS/NZS 4268+A1/A2; AS/NZS 4251-1; AS/NZS 4251-2; MIL-STD 461(E) (*Methods: RE101, RE102, RE103*); RTCA/DO160 Section 21
Conducted Emissions	47 CFR FCC Part 15.107, 207 using ANSI C63.4; 47 CFR FCC Part 18 using ANSI C63.4; FCC/OST MP-5; EN 55011; CISPR 11; AS/NZS CISPR 11; EN 55012; CISPR 12; AS/NZS CISPR 12; EN 55014-1; CISPR 14-1; AS/NZS CISPR 14-1; EN 55022; CISPR 22; AS/NZS CISPR 22; AS/NZS 4268 +A1/A2; AS/NZS 4251-1; AS/NZS 4251-2; AS/NZS 4250-1; AS/NZS 4250-2; MIL-STD 461(E) (*Methods: CE101, CE102, CE106)*; RTCA/DO160 Section 21
Harmonics	EN 61000-3-2; IEC 61000-3-2; AS/NZS 61000-3-2
Flicker	EN 61000-3-3; IEC 61000-3-3; AS/NZS 61000-3-3
Immunity	
Electrostatic Discharge (ESD)	EN 61000-4-2; IEC 61000-4-2; AS/NZS 61000-4-2; RTCA/DO160 Section 25
Electrical Fast Transient/Burst	EN 61000-4-4; IEC 61000-4-4; AS/NZS 61000-4-4
Surge Immunity	EN 61000-4-5; IEC 61000-4-5; AS/NZS 61000-4-5
Radiated	EN 61000-4-3; IEC 61000-4-3; AS/NZS 61000-4-3; MIL-STD 461(E) (*Methods: RS101, RS103*); RTCA/DO160 Section 20

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Test	Test Method
Immunity (cont'd)	
Conducted	EN 61000-4-6; IEC 61000-4-6; AS/NZS 61000-4-6; MIL-STD 461(E) (*Methods: CS101, CS103, CS104, CS105, CS109, CS114, CS115, CS116*); RTCA/DO160 Section 20
Power Frequency Magnetic Field	EN 61000-4-8; IEC 61000-4-8; AS/NZS 61000-4-8; RTCA/DO160 Section 15
Pulsed Magnetic Field	EN 61000-4-9; IEC 61000-4-9
Voltage Dips/Interrupts and Variations	EN 61000-11; IEC 6100-11; AS/NZS 61000-4-11; RTCA/DO160 Section 17
Power Input	RTCA/DO160 Section 16
Audio Frequency Conducted Susceptibility Power Inputs	RTCA/DO160 Section 18
Induced Signal Susceptibility	RTCA/DO160 Section 19
Lightning Inducted Transient	RTCA/DO160 Section 22
Generic and Product Family Standards	EN 61000-6-1; IEC 61000-6-1; AS/NZS 61000-6-1; EN 61000-6-2; IEC 61000-6-2; AS/NZS 61000-6-2; CISPR 14-2; EN 55014-2; AS/NZS CISPR 14-2; CISPR 24; EN 55024; AS/NZS CISPR 24; BS EN 60601-1-2; IEC 60601-1-2; BS EN 60947-1; IEC 60947-1; BS EN 60439-1; IEC 60439-1; BS EN 61326; IEC 61326; BS EN 50130-4; BS EN 50131-1; EN 61800-3, IEC 61800-3 (limited to 75A, 1000V); BS EN ISO 14892, ISO 14892 (using component methods except ISO-7637, ISO-11452-3)
Radio	
European Union	ETSI EN 300220-1 V2.1.1; ETSI EN 300 220-2 V2.1.1; ETSI EN 300 220-3 V1.1.1; ETSI EN 300 328 V1.7.1; ETSI EN 300 328-1 V1.3.1; ETSI EN 300 328-2 V1.2.1; ETSI EN 300 330 V1.2.1; ETSI EN 300 330-1 V1.5.1; ETSI EN 300 330-2 V1.3.1; ETSI EN 300 440-1 V1.3.1; ETSI EN 300 440-2 V1.1.2; ETSI EN 301 489-1 V1.7.1; ETSI EN 301 489-3 V1.4.1; ETSI EN 301 489-17 V1.3.1;
Canada	RSS-119; RSS-210; RSS-243; ICES-001; ICES-002; ICES-003
Telecommunications	47 CFR FCC Parts 2, 90, 95.628

FEDERAL COMMUNICATIONS COMMISSION

Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046

June 12, 2008

Ingenium Testing, LLC
3761 South Central Avenue,
Rockford, IL 61102

Attention: James Blaha

Re: Accreditation of Ingenium Testing, LLC
Designation Number: US1107
Test Firm Registration #: 191720

Dear Sir or Madam:

We have been notified by American Association for Laboratory Accreditation that Ingenium Testing, LLC has been accredited as a Conformity Assessment Body (CAB).

At this time Ingenium Testing, LLC is hereby designated to perform compliance testing on equipment subject to Declaration Of Conformity (DOC) and Certification under Parts 15 and 18 of the Commission's Rules.

This designation will expire upon expiration of the accreditation or notification of withdrawal of designation.

Sincerely,

George Tannahill

rge Tannahill
tronics Engineer

END OF REPORT