Test of Aruba IAP-105 802.11a/b/g/n Wireless AP

To: FCC CFR 47 Part 15 & IC RSS-210

Test Report Serial No.: ARUB69-U1 Rev A

TEST REPORT

FROM

Test of Aruba IAP-105 802.11a/b/g/n Wireless AP

to

To FCC CFR 47 Part 15 & IC RSS-210

Test Report Serial No.: ARUB69-U1 Rev A

This report supersedes: NONE

Applicant: Aruba Networks, Inc
1344 Crossman Avenue
Sunnyvale
California 94089, USA

Product Function: Transmitting data and voice traffic

Copy No: pdf Issue Date: 2nd February 2011

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
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ACCREDITED
TESTING CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION, LISTINGS & RECOGNITION

TESTING ACCREDITATION

MiCOM Labs, Inc. is an accredited Electrical testing laboratory per the international standard EN ISO/IEC 17025. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.01. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-01.pdf

RECOGNITION

MiCOM Labs, Inc has widely recognized Electrical testing capabilities. Our international recognition includes Conformity Assessment Body designation by APEC MRA** countries. Our test reports are widely accepted for global type approvals.

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	Listing #: 4143A
Japan	VCCI	-	-	No. 2959
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

**APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement.
Is a recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.
Phase I - recognition for product testing
Phase II – recognition for both product testing and certification
N/A – Not Applicable

PRODUCT CERTIFICATION

MiCOM Labs, Inc. is an accredited Product Certification Body per the international standard EN ISO/IEC Guide 65. The company is accredited by the American Association for Laboratory Accreditation (A2LA) www.a2la.org test laboratory number 2381.02. MiCOM Labs test schedule is available at the following URL; http://www.a2la.org/scopepdf/2381-02.pdf

The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Product Certification Body

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence as a

Product Certification Body

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC Guide 65:1996 *General requirements for bodies operating product certification systems*. This accreditation demonstrates technical competence for a defined scope and the operation of a quality management system for a Telecommunications Certification Body (TCB) meeting FCC (U.S.), and IC (Canada) requirements.

Presented this 24th day of June 2010.

President & CEO
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2011

For the product certification schemes to which this accreditation applies, please refer to the organization's Product Certification Scope of Accreditation.

United States of America – Telecommunication Certification Body

TCB Identifier – US0159

Industry Canada – Certification Body

CAB Identifier – US0159

DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	2nd February 2011	Initial release.

1. TEST RESULT CERTIFICATE

Manufacturer:	Aruba Networks, Inc 1344 Crossman Avenue Sunnyvale California 94089, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT:	802.11a/b/g/n Wireless Access Point	Telephone:	+1 925 462 0304
Model:	IAP-105	Fax:	+1 925 462 0306
S/N's:	AL0248579		
Test Date(s):	23rd December 2010	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC CFR 47 Part 15 & IC RSS-210	EQUIPMENT COMPLIES

MiCOM Labs, Inc. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Notes:

1. This document reports conditions under which testing was conducted and the results of testing performed.
2. Details of test methods used have been recorded and kept on file by the laboratory.
3. Test results apply only to the item(s) tested.

Approved & Released for MiCOM Labs, Inc. by:

ACCREDITED

TESTING CERTIFICATE #2381.01

Graeme Grieve
Quality Manager MiCOM Labs,

Gordon Hurst
President & CEO MiCOM Labs, Inc.

2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

Ref.	Publication	Year	Title
(i)	47 CFR Part 15	2010	Radio Frequency Devices
(ii)	Industry Canada RSS-210	Issue 8 December 2010	Low Power License-Exempt Radiocommunication Devices (All Frequency Bands)
(iii)	Industry Canada RSS-Gen	Issue 3 December 2010	General Requirements and Information for the Certification of Radiocommunication Equipment.
(iv)	ICES-003	2004	Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard Digital Apparatus; Issue 4
(v)	ANSI C63.4	2009	American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
(vi)	CISPR 22/ EN 55022	2008 2006+A1:200	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
(vii)	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
(viii)	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
(ix)	ETSI TR 100 028	2001	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
(x)	A2LA	9th June 2010	Reference to A2LA Accreditation Status – A2LA Advertising Policy

2.2. Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, listed in the Normative References section of this report.

Measurement uncertainty figures are calculated in accordance with ETSI TR 100 028 Parts 1 and 2.

Measurement uncertainties stated are based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 % in accordance with UKAS document M 3003 listed in the Normative References section of this report.

3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the Aruba IAP-105 802.11a/b/g/n Wireless AP to FCC Part 15.247 and Industry Canada RSS-210 regulations.
Applicant:	Aruba Networks, Inc 1344 Crossman Avenue Sunnyvale California 94089, USA
Manufacturer:	As applicant.
Laboratory performing the tests:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	ARUB69-U1 Rev A
Date EUT received:	17th December 2010
Standard(s) applied:	FCC CFR 47 Part 15 & IC RSS-210
Test Dates:	23rd December 2010
No of Units Tested:	One
Type of Equipment:	802.11a/b/g/n Wireless Access Point, 2x2 Spatial Multiplexing MIMO configuration
Manufacturers Trade Name:	Wireless Access Point
Model(s):	IAP-105
Location for use:	Indoor
Declared Frequency Range(s):	2400 - 2483.5 MHz; 5725 - 5850 MHz 5150 – 5250 MHz, 5250 – 5350 MHz, 5470 – 5725 MHz
Software Release	Aruba OS 5.0.3.0
Type of Modulation:	Per 802.11 – CCK, BPSK, QPSK, DSSS, OFDM
Declared Nominal Average Output Power:	802.11b: +19 dBm 802.11g:Leg. +19dBm,HT-20 +19 dBm,HT-40 +18 dBm 802.11a:Leg. +19dBm,HT-20 +19 dBm,HT-40 +18 dBm
EUT Modes of Operation:	Legacy 802.11a/b/g, 802.11n HT-20, HT-40
Transmit/Receive Operation:	Time Division Duplex
Rated Input Voltage:	12Vdc 1.25A; POE 48 Vdc 350 mA
Operating Temperature Range:	Declared range 0 to +40ºC
ITU Emission Designator:	2400 – 2483.5 MHz 802.11b 15M8G1D 2400 – 2483.5 MHz 802.11g 17M7D1D 2400 – 2483.5 MHz 802.11n – HT-20 18M5D1D 2400 – 2483.5 MHz 802.11n – HT-40 36M9D1D 5725 – 5850 MHz 802.11a 16M8D1D 5725 – 5850 MHz 802.11n – HT-20 17M9D1D 5725 – 5850 MHz 802.11n – HT-40 36M3D1D
Frequency Stability:	±20 ppm max
Equipment Dimensions:	5½" x 5½" x 1¾"
Weight:	1 lb (454 grams)
Primary function of equipment:	Wireless Access Point for transmitting data and voice.

3.2. Scope of Test Program

The scope of the test program was to test Digital Emissions below and above 1 GHz on the Aruba Networks IAP-105 802.11a/b/g/n Wireless Access Point.

The original access point AP-105 device was certified as a stand-alone device operating in conjunction with an external controller and tested by MiCOM Labs (ARUB40-A2), test report release date 10th September 2009. FCC ID #: **Q9DAP105.** Due to component changes the equipment was re-tested by MiCOM Labs (ARUB50-A2) as a Class II Permissive Change and test report released 30th March 2010.

IAP-105 was selected as EUT based on its full functionality and as most equipped configuration (AP functionality and integrated virtual controller).

Client requests that AP-105 and IAP-105 are now submitted as a Software Defined Radio (SDR) with new FCC ID: **Q9DAP105SDR.**

Product Change(s)

- The new IAP-105 implements additional firmware to integrate controller functionality.
- Manufacturer declares that the product will be locked to the US/Canada regulatory domain
- The client declared that the RF functionality is unchanged to the original AP-105 device.
- Hardware change is adding a reset button to increase controller flexibility of the stand-alone access point.

Test Rationale

As a result of the single hardware change 'adding a reset button' also including additional firmware it was decided to complete digital emission testing 0.03 – 6 GHz.

Aruba IAP-105 Access Point

The AP-105 is a multi-band 802.11a/b/g/n dual-radio indoor wireless access point designed for dense enterprise deployments of 802.11n. The IAP-105 delivers unprecedented value with the performance and reliability of 802.11n in a compact, streamlined 2x2 MIMO package. Capable of delivering wireless data rates of up to 300Mbps, the multifunction IAP-105 provides wireless LAN access, air monitoring, and wireless intrusion detection and prevention over the 2.4GHz and 5GHz RF spectrum. The access point works in conjunction with Aruba's line of high-performance controllers to deliver high-speed, secure network services.

802.11n enables the use of wireless as a primary network connection with speed and reliability comparable to a wired LAN. 802.11n increases performance through techniques such as channel bonding, block acknowledgement, and Multiple-In-Multiple-Out (MIMO). Advanced RF techniques such Cyclic Delay Diversity also increases range and reliability.

The IAP-105 features a 100/1000Base-T Ethernet interface and operates from standard 802.3af Power over Ethernet (PoE) sources. Equipped with four internal omni-directional antennas, the AP-105 provides full RF diversity and 2x2 MIMO operation on both the 2.4 GHz and 5 GHz bands.

3.3. Equipment Model(s) and Serial Number(s)

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial Nos.
EUT	802.11a/b/g/n Wireless Access Point	Aruba Networks	IAP-105	AL0248579
Support	POE – Power Supply (48 Vdc)	PowerDsine	7001G	
Support	Laptop PC	IBM	Thinkpad	None

3.4. Antenna Details

1. Integral Antennas;-
    - 2.4 – 2.5 GHz; Gain: 2.5 dBi
    - 4.9 – 5.875 GHz; Gain: 4.0 dBi

3.5. Cabling and I/O Ports

Number and type of I/O ports

1. 10/100/1000 Ethernet
2. Console – serial maintenance terminal
3. 12 Vdc, 4mm supply connector

3.6. Test Configurations

Testing was performed to exercise digital emissions only. The unit was tested in a quiescent state, no communication to support devices.

Emission results for the above configurations are provided in this report.

3.7. Deviations from the Test Standard

The following deviations from the test standard were required in order to complete the test program:

1. NONE

3.8. Subcontracted Testing or Third Party Data

1. NONE

4. TEST SUMMARY

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15 and Industry Canada RSS-210.**

Standard Section(s)	Test Description	Result	Test Report Section
FCC 15 **IC RSS-210, RSS-Gen**	Radiated Emissions	Compliant	5.1

Note 1: *Test results reported in this document relate only to the items tested*
Note 2: *The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria*
Note 3: *Section 3.7 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix*

5. TEST RESULTS

5.1. Device Characteristics

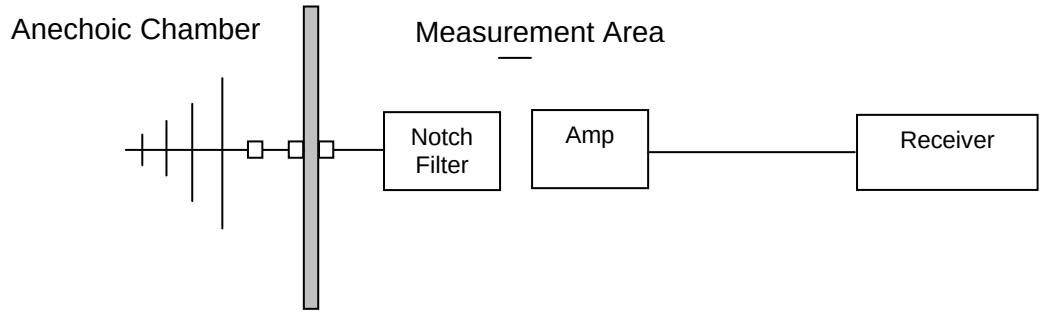
5.1.1. Radiated Spurious Emissions (0.03 - 1 GHz, 1 – 6 GHz)

FCC, Part 15 Subpart C §15.205/ §15.209
Industry Canada RSS-210, RSS-Gen

Test Procedure
Testing 30M-1 GHz was performed in a 3-meter anechoic chamber using a CISPR compliant receiver. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. To further maximize emissions the receive antenna was varied between 1 and 4 meters. The emissions are recorded with receiver in peak hold mode. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed. The anechoic chamber test set-up is identified in Section 6 Test Set-Up Photographs.

The EUT had two methods of powering on ac/dc converter and Power over Ethernet (POE). Both modes were tested for emissions below 1GHz.

Test Measurement Set up



Field Strength Calculation
The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver.

$$FS = R + AF + CORR$$

where:

FS = Field Strength
R = Measured Receiver Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain

For example:
Given a Receiver input reading of 51.5dBμV; Antenna Factor of 8.5dB; Cable Loss of 1.3dB; Falloff Factor of 0dB, an Amplifier Gain of 26dB and Notch Filter Loss of 1dB. The Field Strength of the measured emission is:

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3dBμV/m

Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

Level (dBμV/m) = 20 * Log (level (μV/m))

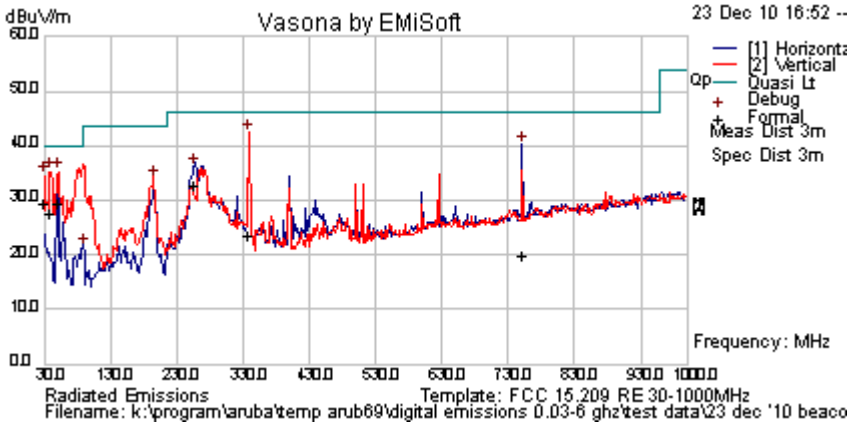
40 dBμV/m = 100μV/m
48 dBμV/m = 250μV/m

Measurement Results for Spurious Emissions (30 MHz – 1 GHz)

Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

TABLE OF RESULTS

Test Freq.	N/A	**Engineer**	GMH
Variant	Digital Emissions	**Temp (°C)**	21
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	38
Power Setting	N/A	**Press. (mBars)**	1008
Antenna	Integral		
Test Notes 1	IAP-105 digital emissions no transmitter (or beacons) active during the test		
Test Notes 2	POE - PowerDsine 7001G		

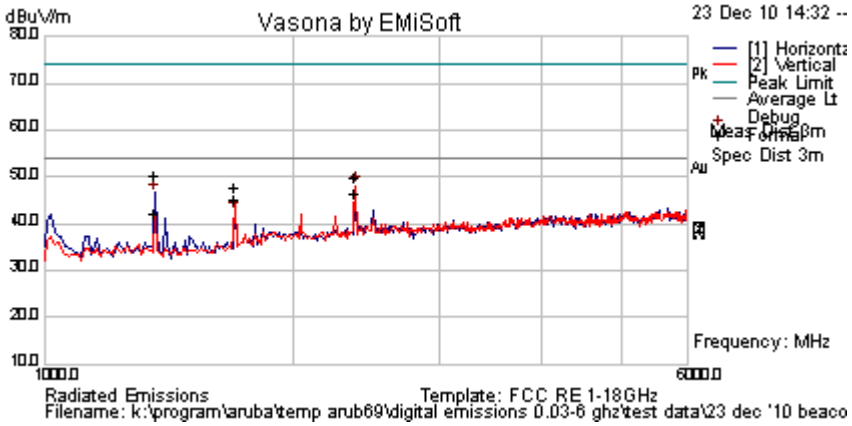


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
339.078	34.1	5.4	-16.1	23.4	Quasi Max	V	169	177	46	-22.6	Pass	DIG
39.719	41.1	3.6	-17.1	27.6	Quasi Max	V	109	208	40	-12.5	Pass	DIG
51.383	49.2	3.7	-23.3	29.6	Quasi Max	V	104	117	40	-10.4	Pass	DIG
30.000	35.4	3.4	-9.2	29.6	Quasi Max	V	115	203	40	-10.4	Pass	DIG
751.182	22.0	6.9	-9.0	19.9	Quasi Max	V	221	15	46	-26.1	Pass	DIG
257.578	46.5	5.0	-18.6	32.9	Quasi Max	H	98	295	46	-13.1	Pass	DIG

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Test Freq.	N/A	**Engineer**	GMH
Variant	Digital Emissions	**Temp (°C)**	21
Freq. Range	1000 MHz - 6000 MHz	**Rel. Hum.(%)**	33
Power Setting	N/A	**Press. (mBars)**	1000
Antenna	Integral		
Test Notes 1	IAP-105 digital emissions no transmitter (or beacons) active during the test		
Test Notes 2	POE - PowerDsine 7001G		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2380.071	58.2	2.9	-11.3	49.9	Peak Max	V	98	0	74.0	-24.1	Pass	DIG
1359.958	62.3	2.3	-14.0	50.5	Peak Max	V	201	22	74.0	-23.5	Pass	DIG
1700.008	58.9	2.5	-13.6	47.9	Peak Max	V	120	330	74.0	-26.2	Pass	DIG
2380.071	54.8	2.9	-11.3	46.4	Average Max	V	98	0	54.0	-7.6	Pass	DIG
1359.958	54.2	2.3	-14.0	42.4	Average Max	H	162	360	54.0	-11.6	Pass	DIG
1700.008	56.3	2.5	-13.6	45.3	Average Max	V	120	330	54.0	-8.7	Pass	DIG

Legend:	DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency
	NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band

Specification

Limits

§15.205 (a) Except as shown in paragraph (d) of 15.205 (a), only spurious emissions are permitted in any of the frequency bands listed.

§15.205 (a) Except as shown in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table.

§15.209 (a) and **RSS-Gen** Limit Matrix

Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

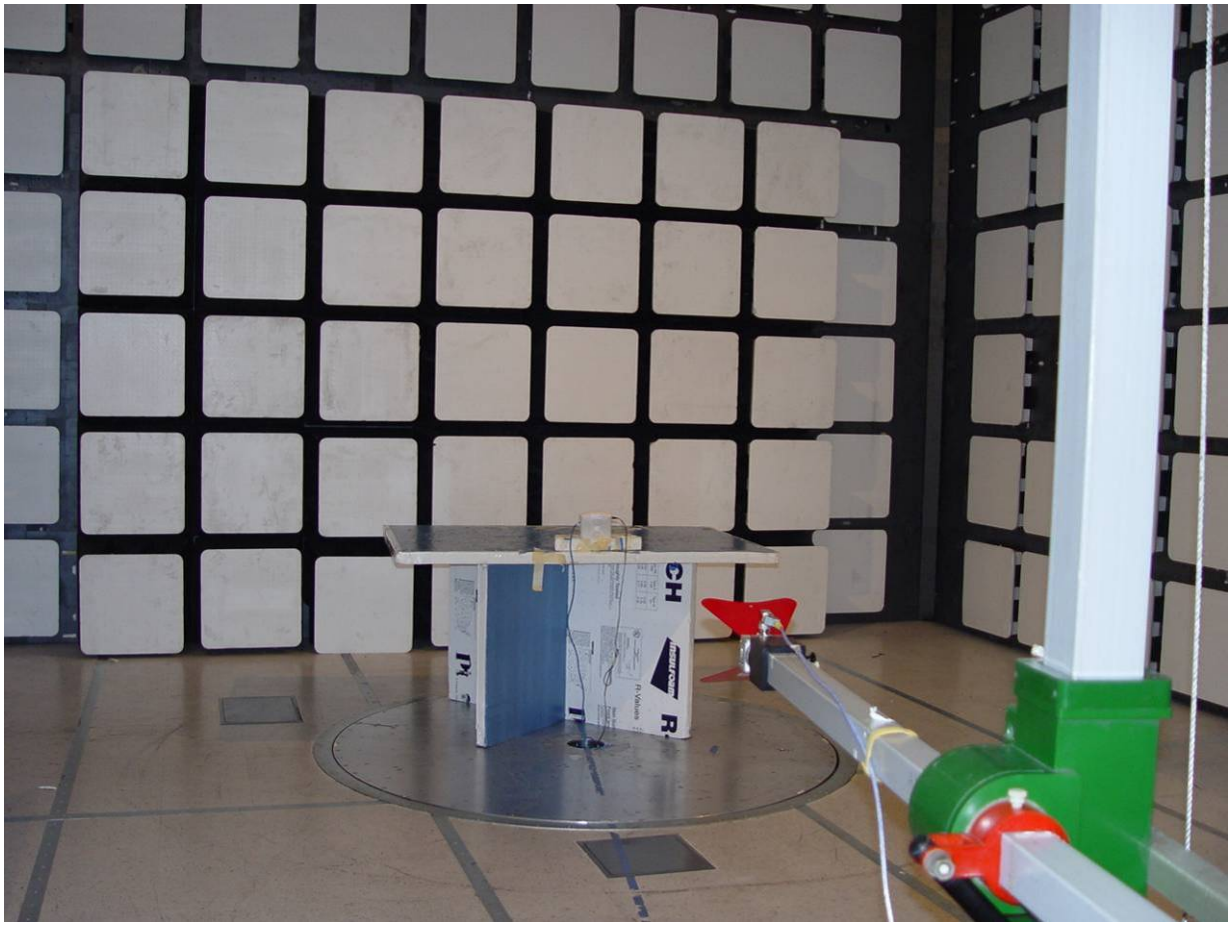
Measurement uncertainty	+5.6/ -4.5 dB

Traceability

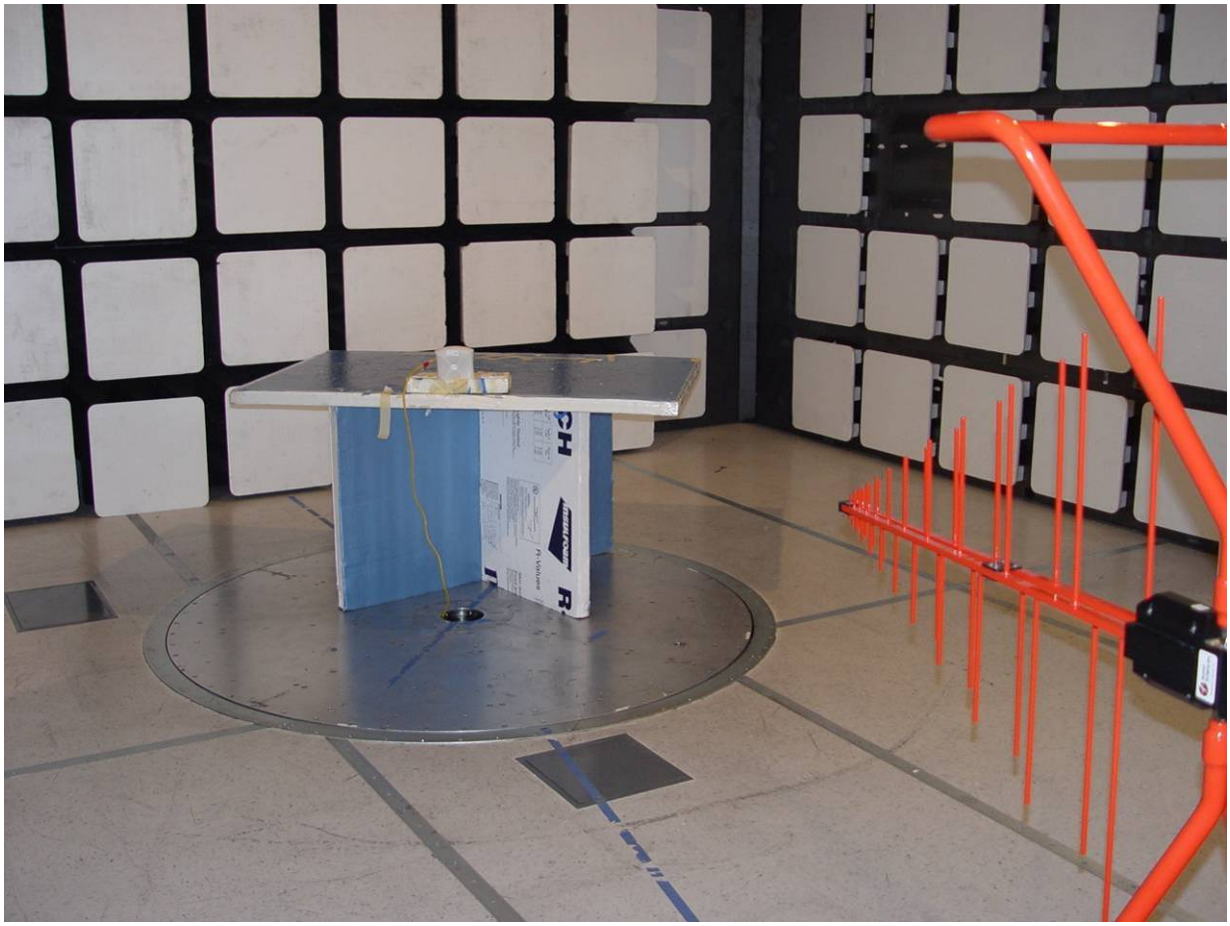
Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

6. PHOTOGRAPHS

6.1. Radiated Emissions > 1GHz



6.2. Radiated Emissions < 1GHz



7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #
0088	Spectrum Analyzer	Hewlett Packard	8564E	3410A00141
0134	Amplifier	Com Power	PA 122	181910
0158	Barometer /Thermometer	Control Co.	4196	E2846
0287	EMI Receiver	Rhode & Schwartz	ESIB 40	100201
0252	SMA Cable	Megaphase	Sucoflex 104	None
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001
0313	Coupler	Hewlett Packard	86205A	3140A01285
0314	30dB N-Type Attenuator	ARRA	N9444-30	1623
0070	Power Meter	Hewlett Packard	437B	3125U11552
0116	Power Sensor	Hewlett Packard	8485A	3318A19694
0117	Power Sensor	Hewlett Packard	8487D	3318A00371
0184	Pulse Limiter	Rhode & Schwartz	ESH3Z2	357.8810.52
0190	LISN	Rhode & Schwartz	ESH3Z5	836679/006
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001
0301	5.6 GHz Notch Filter	Micro-Tronics	RBC50704	001
0302	5.25 GHz Notch Filter	Micro-Tronics	BRC50703	002
0303	5.8 GHz Notch Filter	Micro-Tronics	BRC50705	003
0304	2.4GHzHz Notch Filter	Micro-Tronics	--	001
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002
0335	1-18GHz Horn Antenna	ETS- Lindgren	3117	00066580
0337	Amplifier	MiCOM Labs	--	--
0338	Antenna	Sunol Sciences	JB-3	A052907

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