Test of Aruba AP-104 802.11a/b/g/n Wireless AP

To: FCC 47 CFR Part 15.407 & IC RSS-210

Test Report Serial No.: ARUB99-U3 Rev A

TEST REPORT

FROM

MiCOM Labs

Test of Aruba AP-104 802.11a/b/g/n Wireless AP
to
To: FCC 47 CFR Part 15.407 & IC RSS-210

Test Report Serial No.: ARUB99-U3 Rev A

Note: this report contains data with regard to the 5,150 to 5,250 MHz band for the Aruba Networks AP-104 Wireless Access Point. 2.4 and 5.8 GHz test data are reported in MiCOM Labs test report ARUB86-A2.

This report supersedes: MiCOM Labs Inc Report NONE

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

Product Function: Wireless LAN Access Point

Copy No: pdf Issue Date: 4th April 2012

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
440 Boulder Court, Suite 200
Pleasanton, CA 94566 USA
Phone: +1 (925) 462-0304
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ACCREDITED
TEST CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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TABLE OF CONTENTS

ACCREDITATION, LISTINGS & RECOGNITION

ACCREDITATION

MiCOM Labs, Inc. an accredited laboratory complies with 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

ilac-MRA

A2LA World Class Accreditation

The American Association for Laboratory Accreditation

Accredited Laboratory

A2LA has accredited

MICOM LABS

Pleasanton, CA

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 8 January 2009*).

Presented this 27th day of March 2012.

President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to November 30, 2013

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

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-2
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	210
	VCCI	--	--	No. 2959
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
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

**EU MRA – European Union Mutual Recognition Agreement.
Is a recognition agreement under which test lab is accredited to regulatory standards of the EU member countries.

**NB – Notified Body

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

United States of America – Telecommunication Certification Body (TCB)
TCB Identifier – US0159

Industry Canada – Certification Body
CAB Identifier – US0159

Europe – Notified Body
Notified Body Identifier - 2280

Japan – Recognized Certification Body (RCB)
RCB Identifier - 210

DOCUMENT HISTORY

Document History		
Revision	**Date**	**Comments**
Draft		
Rev A	4th April 2012	Initial release.

1. TEST RESULT CERTIFICATE

Applicant:	Aruba Networks, Inc 1344 Crossman Avenue Sunnyvale CA 94089, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT:	Wireless LAN Access Point	Tel:	+1 925 462 0304
Model:	AP-104	Fax:	+1 925 462 0306
S/N:	BE0253435		
Test Date(s):	7th - 30th Jan 2012	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15.407 & 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.

ACCREDITED
TEST CERTIFICATE #2381.01

Approved & Released for MiCOM Labs, Inc. by:

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)	FCC 47 CFR Part 15.407	2012	Code of Federal Regulations
(ii)	FCC 06-96	June 2006	Memorandum Opinion and Order
(iii)	Industry Canada RSS-210	2010	Low Power License-Exempt Radiocommunication Devices (All Frequency Bands): Category 1 Equipment
(iv)	Industry Canada RSS-Gen	2010	General Requirements and Information for the Certification of Radiocommunication Equipment
(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+A1:2007	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
(xi)	FCC Public Notice – DA 02-2138	2002	Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices

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 AP-104 802.11a/b/g/n Wireless AP in the frequency ranges 5150 to 5250 MHz to FCC Part 15.407 and Industry Canada RSS-210 regulations.
Applicant:	Aruba Networks, Inc 1344 Crossman Avenue Sunnyvale CA 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:	ARUB99-U3 Rev A
Date EUT received:	6th January 2012
Standard(s) applied:	FCC 47 CFR Part 15.407 & IC RSS-210
Dates of test (from - to):	7th - 30th Jan 2012
No of Units Tested:	Two (separate units for conducted and radiated)
Type of Equipment:	802.11a/b/g/n Wireless Access Point, 2x2 Spatial Multiplexing MIMO configuration
Applicants Trade Name:	Wireless Access Point
Model(s):	AP-104
Software Release	ART version 09 build 07; Aruba OS 6.1.3
Location for use:	Indoor
Declared Frequency Range(s):	5,150 to 5,250 MHz
Type of Modulation:	Per 802.11 –CCK, BPSK, QPSK, DSSS, OFDM
Declared Nominal Output Power: (Average Power)	802.11a: Legacy +19 dBm 802.11n: HT-20 +19 dBm 802.11n: HT-40 +19 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 and Current:	12Vdc 1.25A; POE 48 Vdc 350 mA
Operating Temperature Range:	Declared range 0 to +40ºC
ITU Emission Designator:	5150 – 5250 MHz 802.11a 17M1D1D 5150 – 5250 MHz 802.11n HT-20 18M2D1D 5150 – 5250 MHz 802.11n HT-40 38M1D1D
Frequency Stability:	±20 ppm max
Equipment Dimensions:	132 X 135 X 45mm
Weight:	300 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 the AP-104 (external antennas) for compliance against the FCC CFR 47 Subpart 15, 15.407 and RSS-210 Annex 9.

Aruba AP-104 Access Point
The AP-104 is a multi-band 802.11a/b/g/n dual-radio indoor wireless access point designed for dense enterprise deployments of 802.11n. The AP-104 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 AP-104 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 increase range and reliability.

The AP-104 features a 100/1000Base-T Ethernet interface and operates from standard 802.3af Power over Ethernet (PoE) sources. Equipped with four external antenna ports, the AP-104 provides full RF diversity and 2x2 MIMO operation on both the 2.4GHz and 5GHz bands.

Aruba Networks AP-104

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

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	802.11a/b/g/n Wireless Access Point	Aruba Networks	AP-104	BE0253435
Support	Laptop PC	IBM	Thinkpad	None

3.4. Antenna Details

Model	Type	Gain	Freq. Band	Note
		dBi	MHz	
AP-ANT-1B	Omni	3.8	2400 - 2500	(4 x per unit)
		5.8	4900 - 5875	
AP-ANT-1F	Omni	2.8	2400-2500	(4 x per unit)
		4.5	5100-5900	
AP-ANT-8	Omni	5	2400-2500	(2 x per unit)
AP-ANT-10	Omni	6	5100-5900	(2 x per unit)
AP-ANT-13B	Omni	4.4	2400 - 2500	(2 x per unit)
		3.3	4900 - 5900	
AP-ANT-14	Omni	3	2400-2500	(1x per unit)
		3.6	4900-5990	MIMO
AP-ANT-16	Omni	3.9	2400 - 2500	(1x per unit)
		4.7	4900 - 5900	MIMO
AP-ANT-17	Directional 120degr.	6	2400 - 2500	(1x per unit)
		5	4900 - 5875	MIMO
AP-ANT-18	Directional 60degr.	7	2400 - 2500	(1x per unit)
		7.5	5150 - 5875	MIMO
AP-ANT-19	Omni	3	2400 - 2500	(2 x per unit)
		6	5150 - 5875	

Antenna's highlighted were the highest gain antenna tested as part of this test program. All other antennas were of equal or lower gain.

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 determine the highest power level versus bit rate. The variant with the highest power was used to exercise the product.

Matrix of test configurations

Operational Mode(s) (802.11)	Variant	Data Rates with Highest Power	Frequencies (MHz)
a,n	Legacy	6 MBit/s	5,180 5,200 5,240
	HT-20	6.5 MCS	
	HT-40	13.5 MCS	5,190 5,230

Antenna Test Configurations for Radiated Emissions

Spurious Emission and Band-Edge Test Strategy

11a	11n HT-20	11n HT-40
5180	5180	5190
5200	5200	
5240	5240	5230
BE 5150	BE 5150	BE 5150

KEY;-

BE – Band-Edge

PK - Peak Emission

3.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance:

EUT Software Power Settings - Radiated Testing

1. Measurements were made using the highest gain antenna used with the AP-104, Antenna AP-ANT-18; 7.5 dBi; 5150 – 5875 MHz band.

2. As no other antennas were fully evaluated for radiated emissions and band edge performance these ART power settings apply irrespective of the antenna installed with the AP-104.

AP-ANT-18; 7.5 dBi; 5150 – 5250 MHz

	Channel Freq (MHz)	Nominal ART Power	Passing ART Power	Aggregate Measured Pwr (dBm)
11a	5180	20	13.0	+14.61
	5200	20	13.0	+14.47
	5240	20	13.0	+14.21
HT-20	5180	20	13.0	+14.59
	5200	20	13.0	+14.28
	5240	20	13.0	+14.30
HT-40	5190	20	12.0	+14.81
	5230	20	13.0	+14.69

3.8. Deviations from the Test Standard

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

1. NONE

3.9. 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 15.407** and **Industry Canada RSS-210**.and **Industry Canada RSS-Gen**.

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.407(a) **A9.2(2)** **4.4**	26dB and 99% Emission BW	Emission bandwidth measurement	Conducted	Complies	5.1.1
15.407(a) **A9.2(2)** **4.6**	Transmit Output Power	Power Measurement	Conducted	Complies	5.1.2
15.407(a) **A9.2(2)**	Peak Power Spectral Density	PPSD	Conducted	Complies	5.1.3
15.407(a)(6)	Peak Excursion Ratio	<13dB in any 1MHz bandwidth	Conducted	Complies	5.1.4
15.407(g) **15.31** **2.1** **4.5**	Frequency Stability	Limits: contained within band of operation at all times.	Applicant declaration	Complies	5.1.5
15.407(f) **5.5**	Radio Frequency Radiation Exposure	Exposure to radio frequency energy levels, Maximum Permissible Exposure (MPE)	Conducted	Complies	5.1.6

List of Measurements (continued)

The following table represents the list of measurements required under the **FCC CFR47 Part 15.407** and **Industry Canada RSS-210** and **Industry Canada RSS-Gen**.

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.407(b)(2) **15.205(a)** **15.209(a)** **2.2** **2.6** **A9.3(2)** **4.7**	Radiated Emissions		Radiated		5.1.7
	Transmitter Radiated Spurious Emissions	Emissions above 1 GHz		Complies	*5.1.7.1*
	Radiated Band Edge	Band edge results		Complies	*5.1.7.1*
Industry Canada only **RSS-Gen §4.10, §6**	Receiver Radiated Spurious Emissions	Emissions above 1 GHz		Complies	*5.1.7.2*
15.407(b)(6) **15.205(a)** **15.209(a)** **2.2**	Radiated Emissions	Emissions <1 GHz (30M-1 GHz)		Complies	*5.1.7.3*
15.407(b)(6) **15.207** **7.2.2**	AC Wireline Conducted Emissions 150 kHz–30 MHz	Conducted Emissions	Conducted	Complies	5.1.8

5. TEST RESULTS

5.1. Device Characteristics

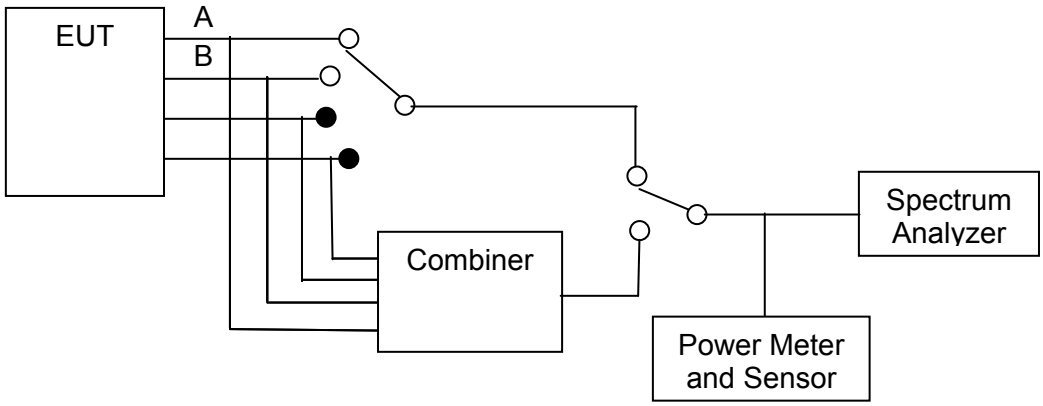
5.1.1. 26 dB and 99 % Bandwidth

FCC, Part 15 Subpart C §15.407(a)

FCC, Part 15 Subpart C §15.407(a)
Industry Canada RSS-210 § A9.2(2)
Industry Canada RSS-Gen 4.4

Test Procedure
The bandwidth at 26 dB and 99 % is measured with a spectrum analyzer connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency.

Test Measurement Set up



Measurement set up for 26 dB and 99 % bandwidth test

Radio Parameters
Duty Cycle: 100%
Output: Modulated Carrier
Power: Maximum Default Power

Measurement Results for 26 dB and 99 % Operational Bandwidth(s)

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

TABLE OF RESULTS – **802.11a Legacy 5150 – 5250 MHz**

Test Conditions:	15.247 (a)(2)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11a	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (x):**	100
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	N/A dBi
Applied Voltage:	12.0 Vdc		
Notes 1:			
Notes 2:			

26 dB Bandwidth

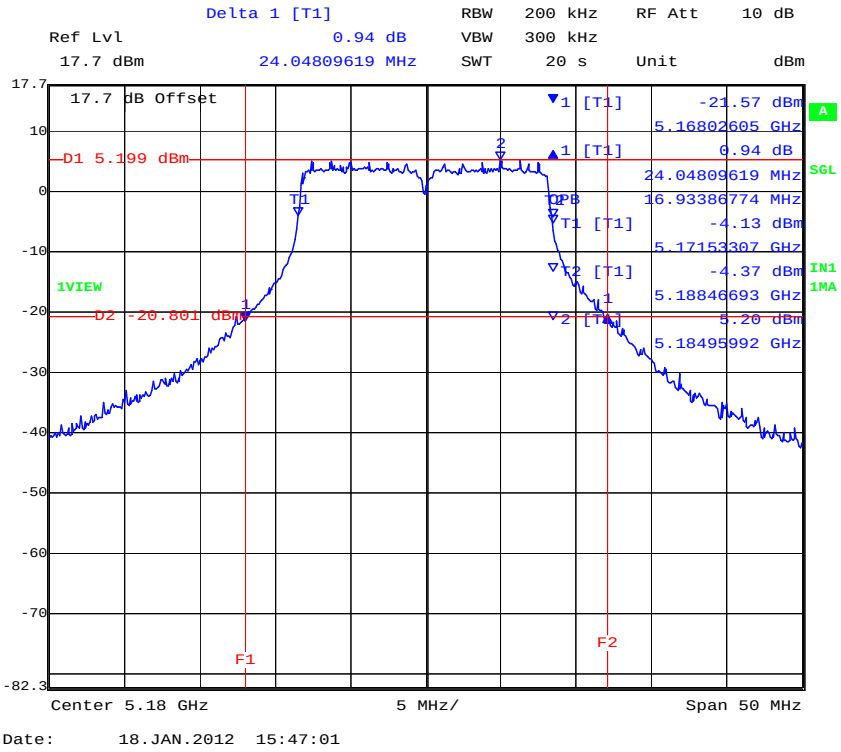
Test Frequency	26 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
5180	24.048000	24.148000	--	--	500	0.5	-23.548000
5200	23.747000	24.148000	--	--			-23.247000
5240	23.647000	24.950000	--	--			-23.147000

99% Bandwidth

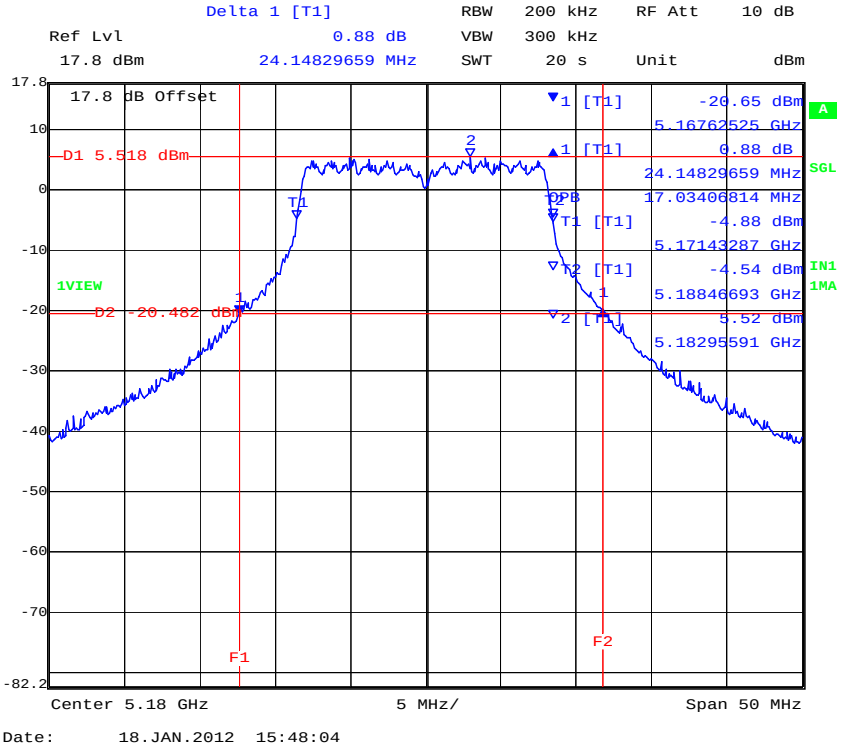
Test Frequency	99 % Bandwidth						
	MHz						
MHz	**a**	**b**	**c**	**d**			
5180	16.934000	17.034000	--	--			
5200	16.834000	17.034000	--	--			
5240	16.834000	17.034000	--	--			

Measurement uncertainty:	±2.81 dB

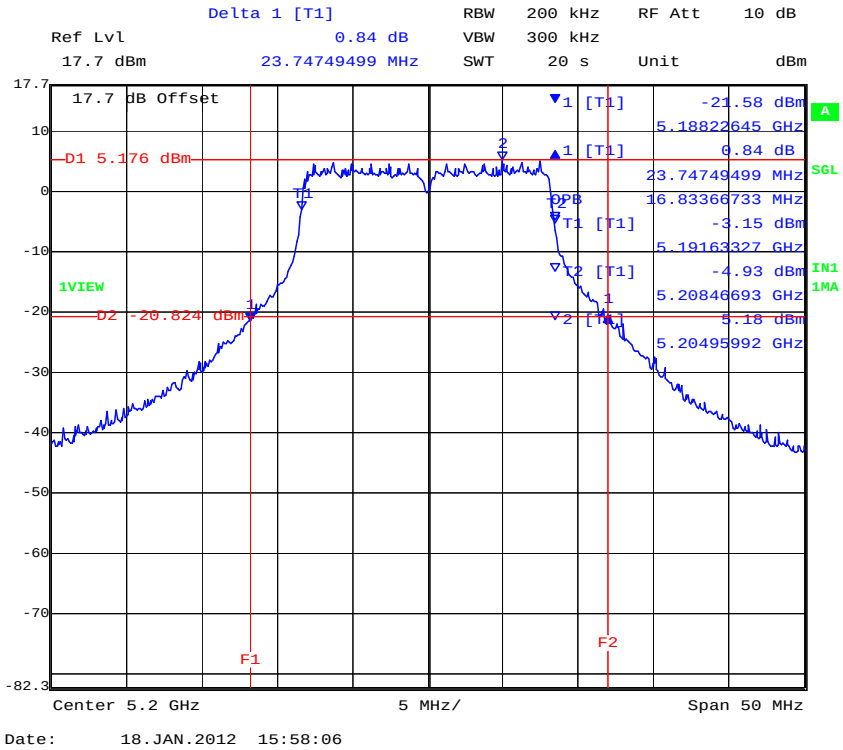
PORT A 5,180 MHz 802.11a Legacy 26 dB and 99 % Bandwidth



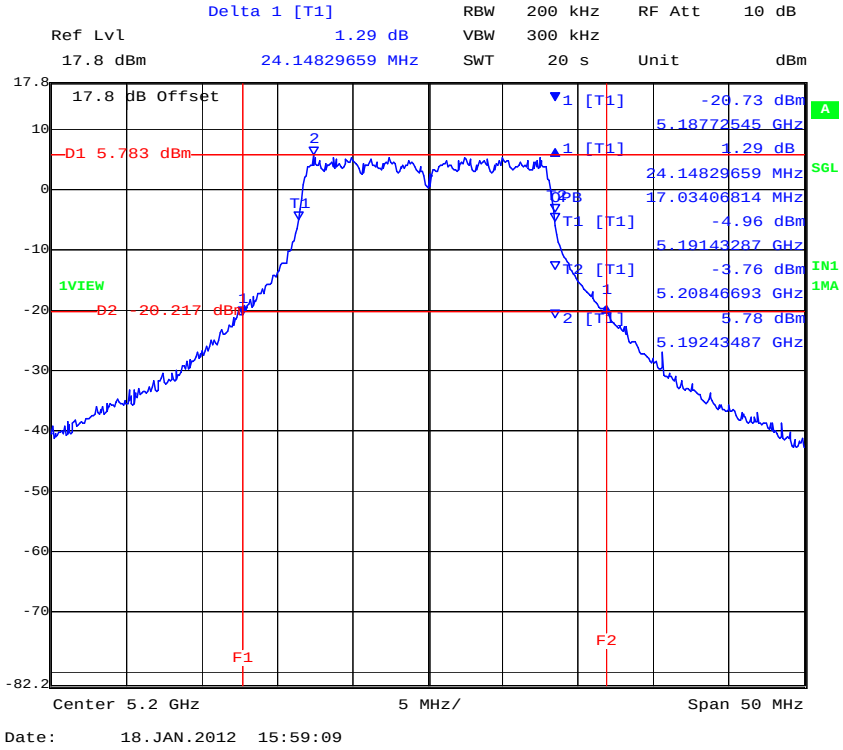
PORT B 5,180 MHz 802.11a Legacy 26 dB and 99 % Bandwidth



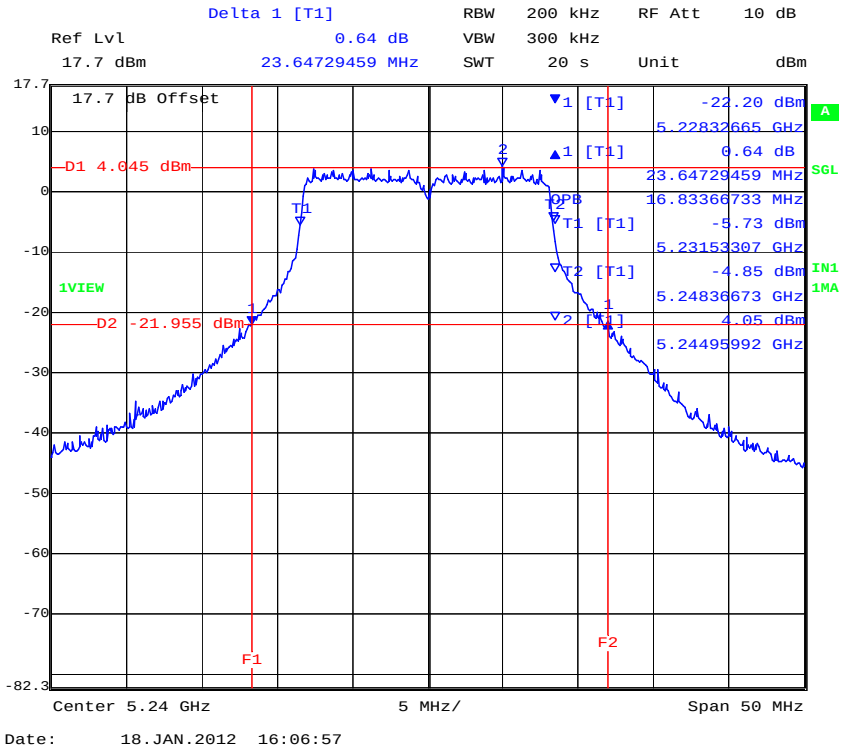
PORT A 5,200 MHz 802.11a Legacy 26 dB and 99 % Bandwidth



PORT B 5,200 MHz 802.11a Legacy 26 dB and 99 % Bandwidth



PORT A 5,240 MHz 802.11a Legacy 26 dB and 99 % Bandwidth



PORT B 5,240 MHz 802.11a Legacy 26 dB and 99 % Bandwidth

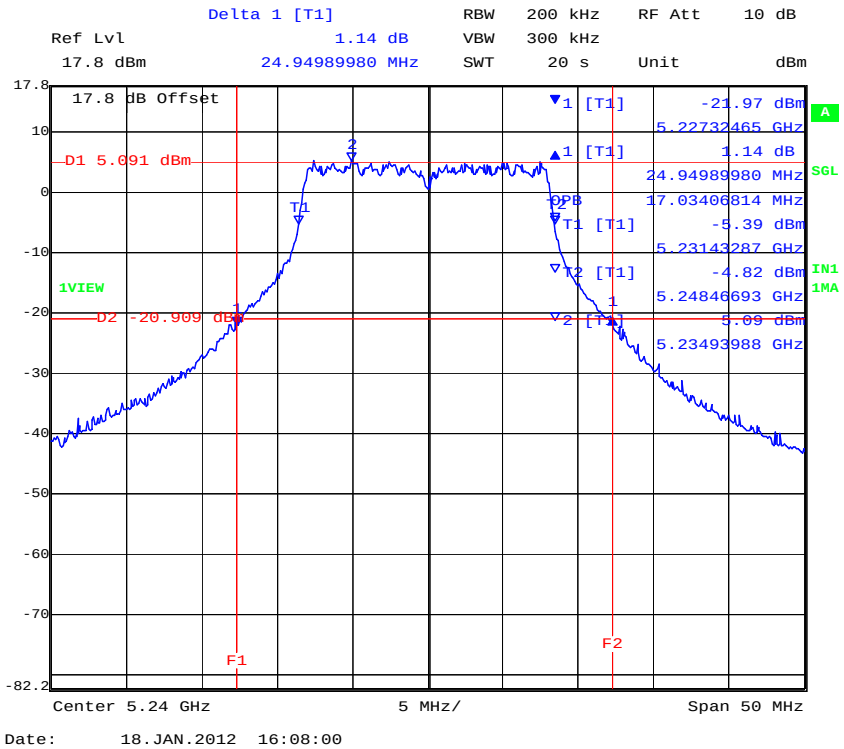


TABLE OF RESULTS – **802.11n HT-20 5150 – 5250 MHz**

Test Conditions:	15.247 (a)(2)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11n HT-20	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (x):**	100
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	N/A dBi
Applied Voltage:	12.0 Vdc		
Notes 1:			
Notes 2:			

26 dB Bandwidth

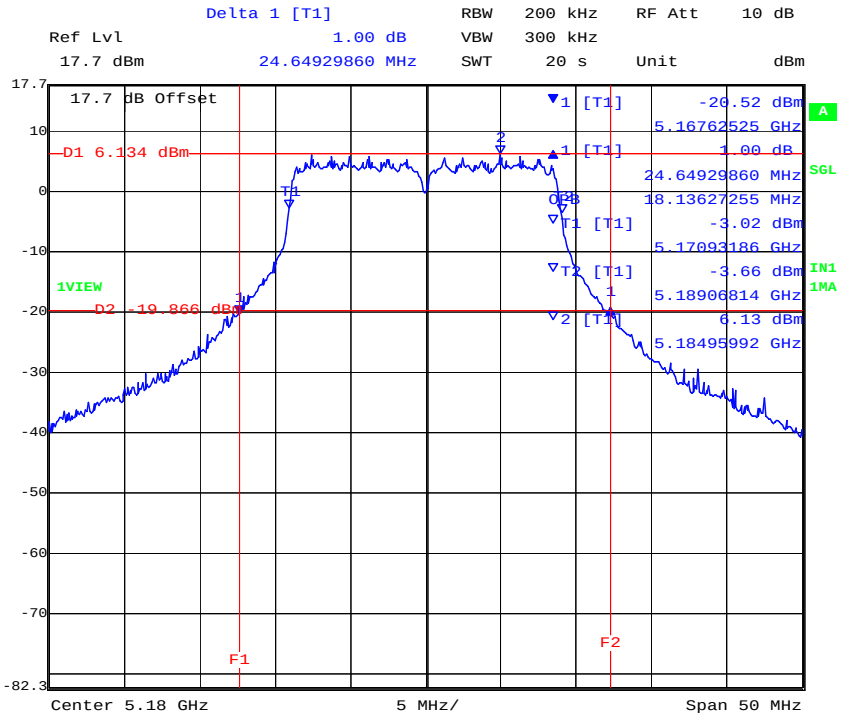
Test Frequency	26 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
5180	24.649000	24.950000	--	--	500	0.5	-24.149000
5200	24.549000	24.850000	--	--			-24.049000
5240	24.449000	25.050000	--	--			-23.949000

99% Bandwidth

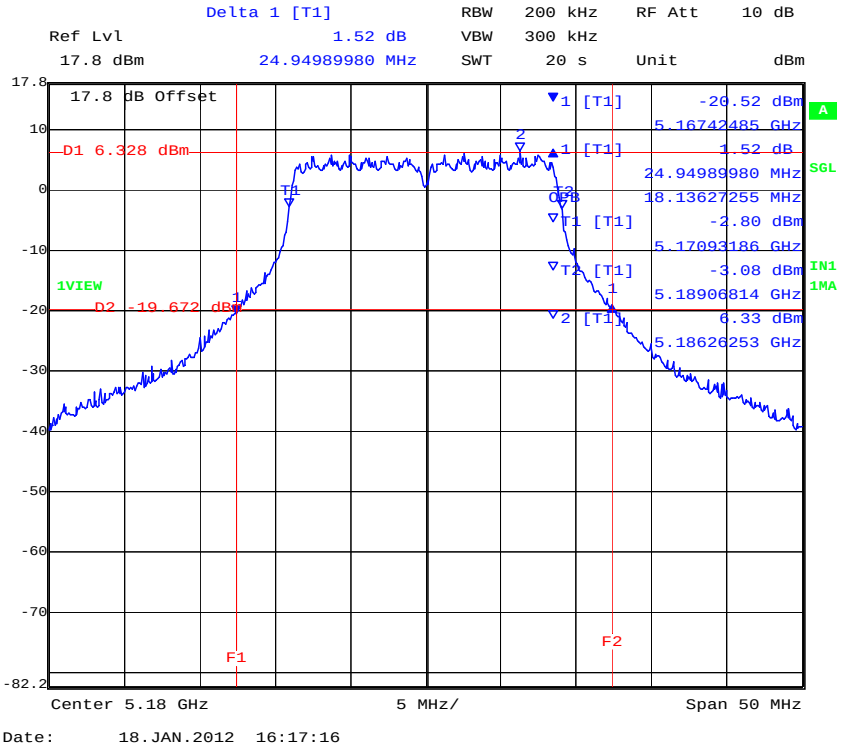
Test Frequency	99 % Bandwidth						
	MHz						
MHz	**a**	**b**	**c**	**d**			
5180	18.136000	18.136000	--	--			
5200	18.036000	18.136000	--	--			
5240	18.036000	18.036000	--	--			

Measurement uncertainty:	±2.81 dB

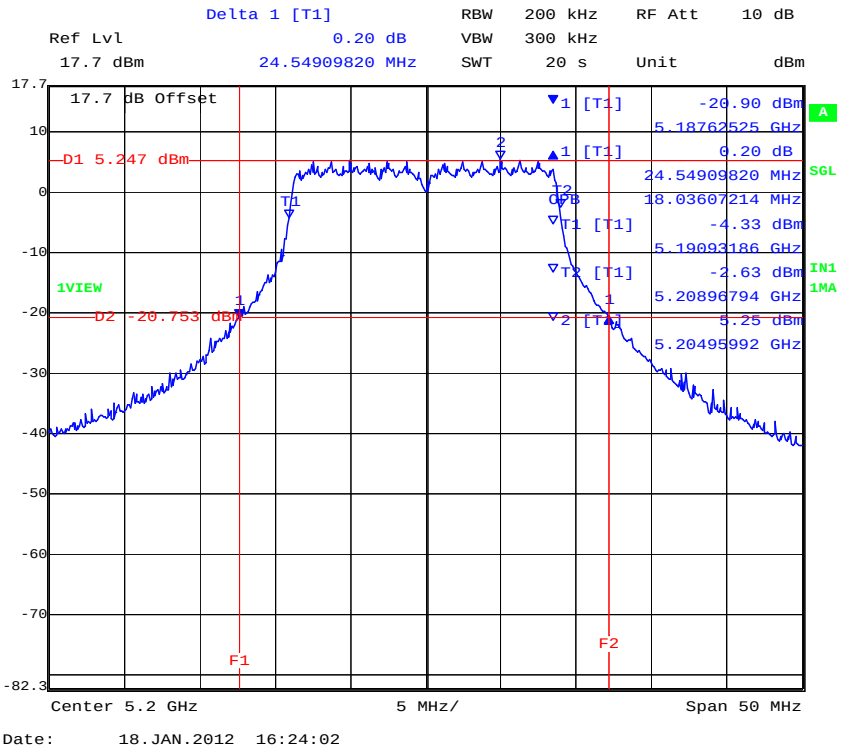
PORT A 5,180 MHz 802.11n HT-20 26 dB and 99 % Bandwidth



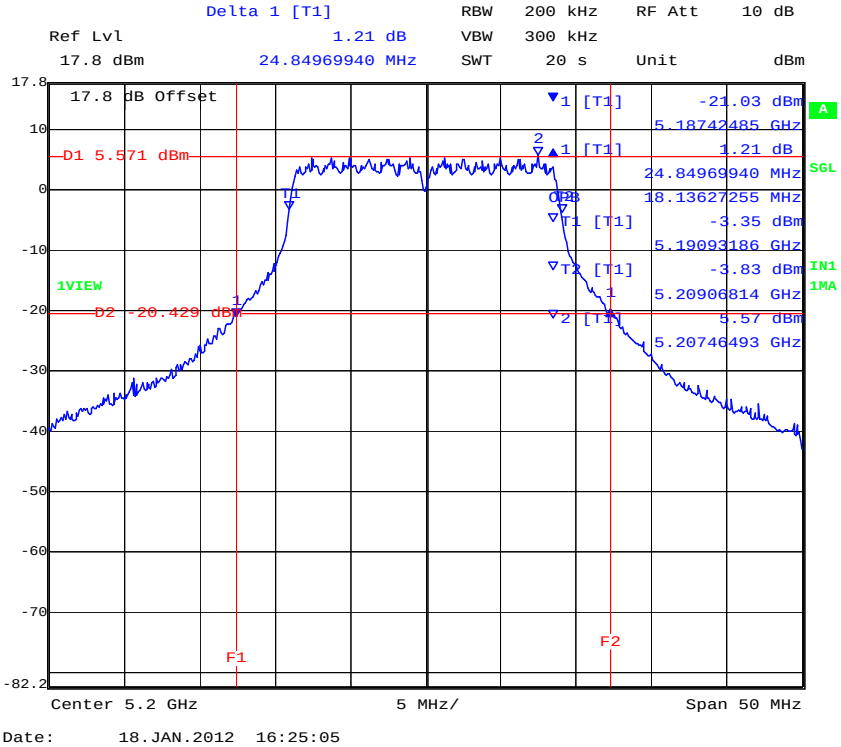
PORT B 5,180 MHz 802.11a Legacy 26 dB and 99 % Bandwidth



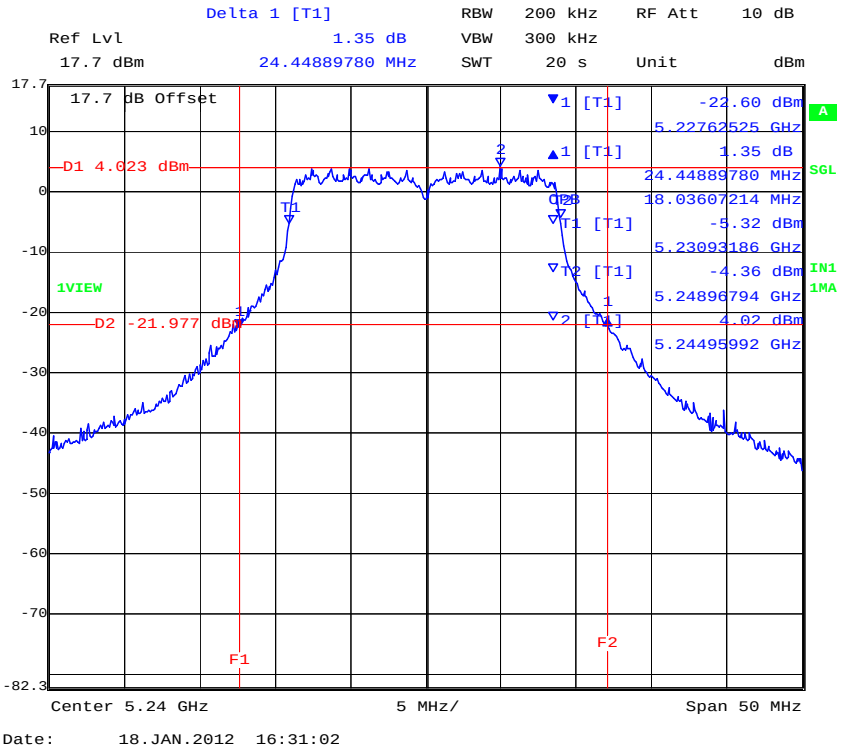
PORT A 5,200 MHz 802.11n HT-20 26 dB and 99 % Bandwidth



PORT B 5,200 MHz 802.11a Legacy 26 dB and 99 % Bandwidth



PORT A 5,240 MHz 802.11n HT-20 26 dB and 99 % Bandwidth



PORT B 5,240 MHz 802.11a Legacy 26 dB and 99 % Bandwidth

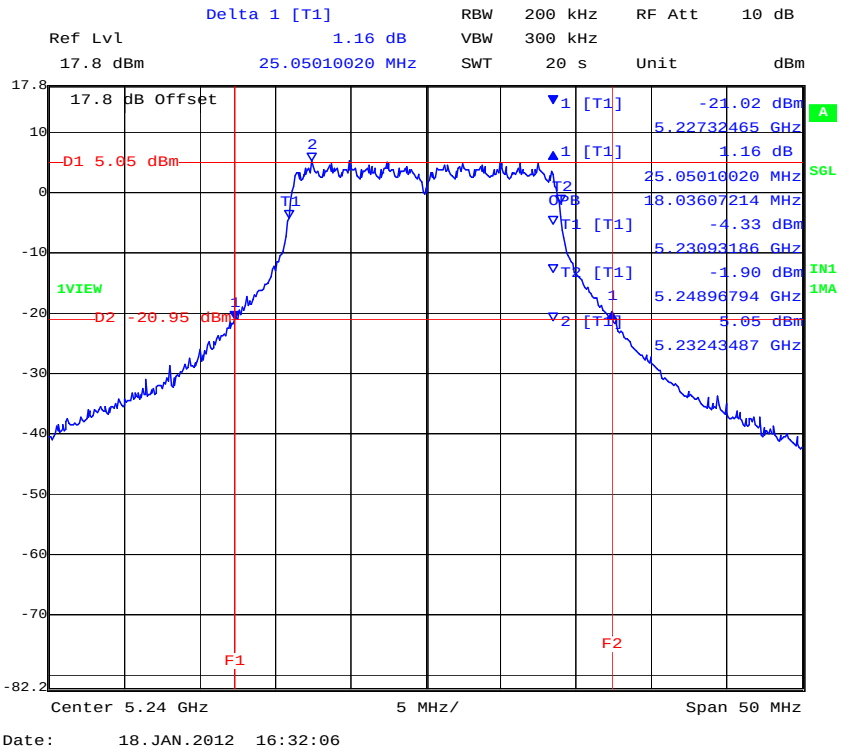


TABLE OF RESULTS – **802.11n HT-40 5150 – 5250 MHz**

Test Conditions:	15.247 (a)(2)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11n HT-40	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (x):**	100
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	N/A dBi
Applied Voltage:	12.0 Vdc		
Notes 1:			
Notes 2:			

26 dB Bandwidth

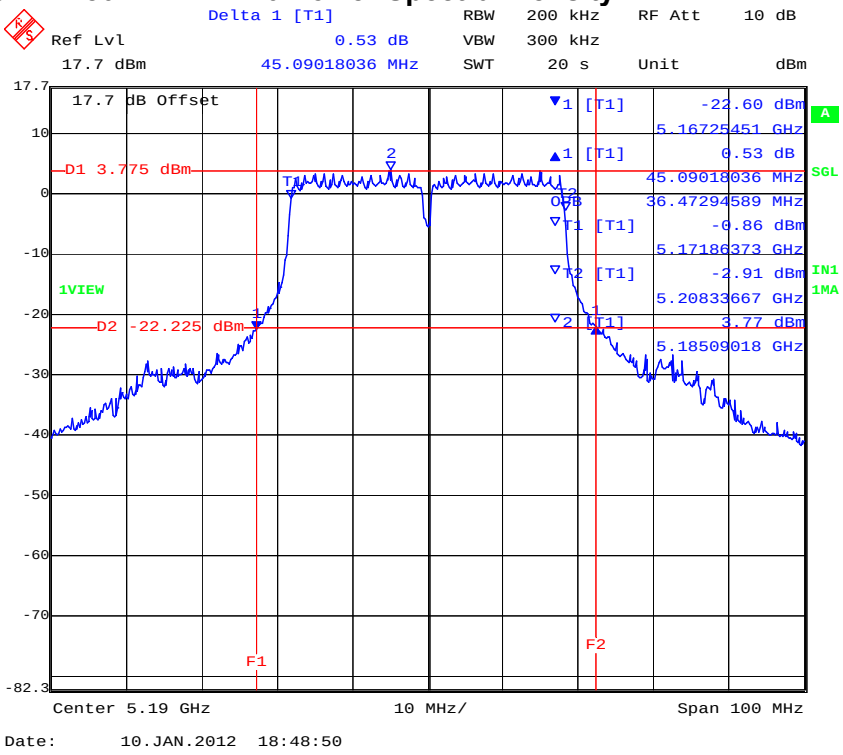
Test Frequency	26 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
5190	45.090000	45.291000	--	--	500	0.5	-44.590000
5230	44.890000	46.493000	--	--			-44.390000

99% Bandwidth

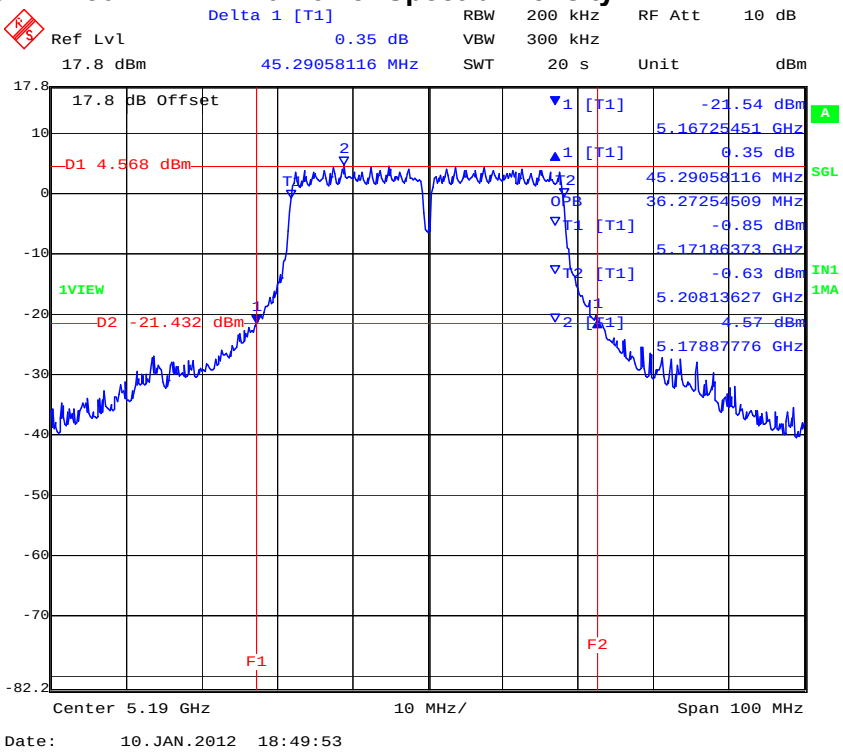
Test Frequency	99 % Bandwidth						
	MHz						
MHz	**a**	**b**	**c**	**d**			
5190	36.473000	36.273000	--	--			
5230	36.273000	36.273000	--	--			

Measurement uncertainty:	±2.81 dB

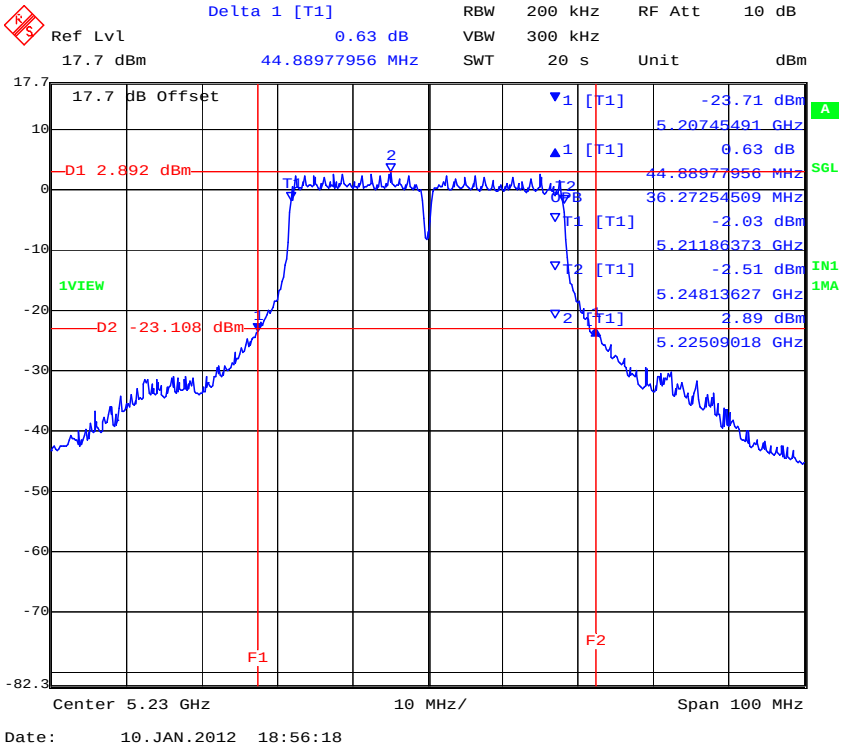
PORT A 5,190 MHz 802.11n HT-40 Power Spectral Density



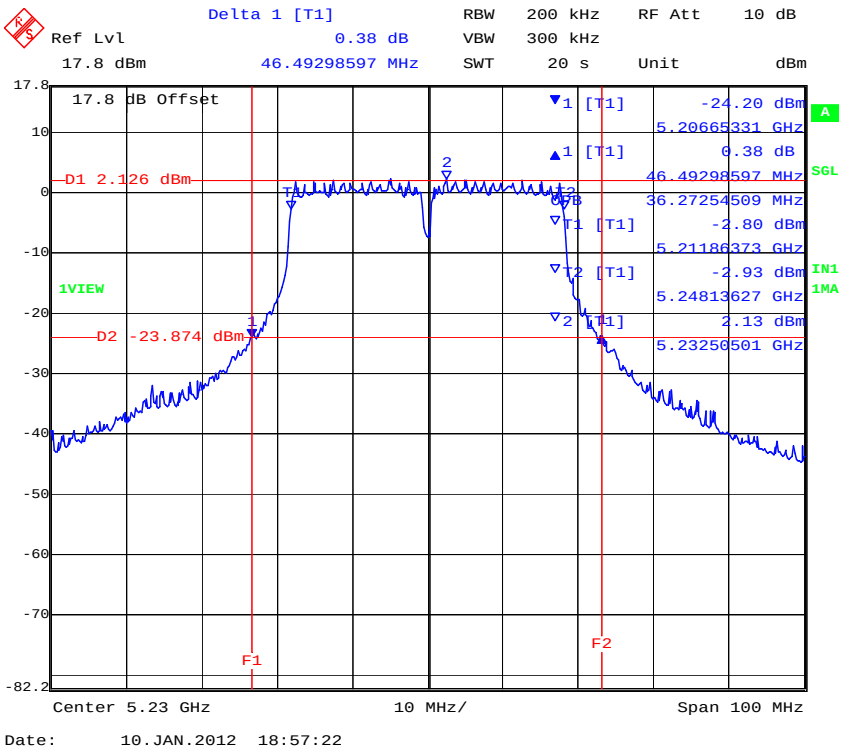
PORT B 5,190 MHz 802.11n HT-40 Power Spectral Density



PORT A 5,230 MHz 802.11n HT-40 Power Spectral Density



PORT B 5,230 MHz 802.11n HT-40 Power Spectral Density



Specification

Limits

FCC, Part 15 §15.407 (a)(1), (a)(2) and Industry Canada RSS-210 § A9.2(2)

(a)(1) For the band 5.15-5.25 GHz the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or +4 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed +4 dBm in any 1 megahertz band.

(a)(2) For the 5.25-5.35 GHz band the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or +11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed +11 dBm in any 1 megahertz band.

Industry Canada RSS-Gen 4.4

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement uncertainty	±2.81 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0158, 0287, 0252, 0313, 0314, 0070, 0116, 0117

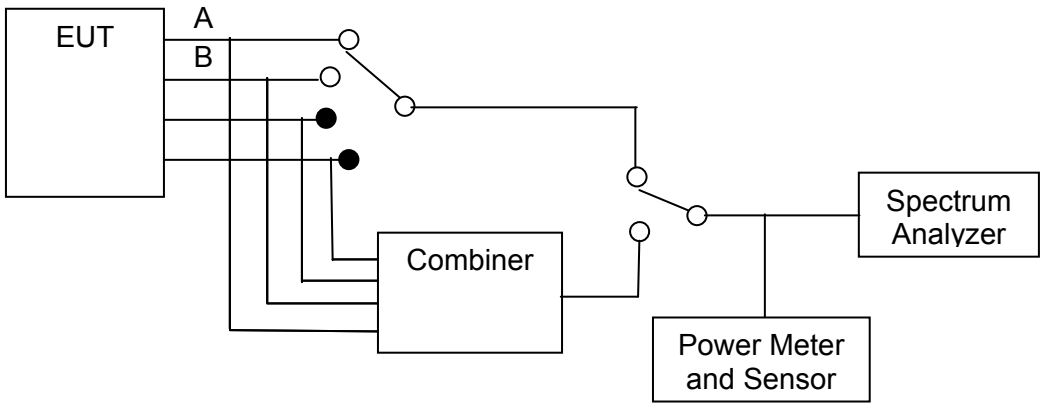
5.1.2. Transmit Output Power

FCC, Part 15 Subpart C §15.407(a)
Industry Canada RSS-210 §9.9(2)
Industry Canada RSS-Gen 4.6

Test Procedure

The transmitter terminal of EUT was connected to the input of an average power meter. Measurements were made while EUT was operating in a continuous transmission mode i.e. 100 % duty cycle at the appropriate center frequency. All cable losses and offsets were taken into consideration in the measured result.

Test Measurement Set up



Measurement set up for Transmitter Output Power

Maximum Conducted Power, FCC Limits

Limit 5150 – 5250 MHz: Lesser of 50 mW (+17dBm) or 4 + 10 Log (B) dBm

Frequency Range (MHz)	Maximum 26 dB Bandwidth (MHz)	4 + 10 Log (B) (dBm)	Limit (dBm)
11a	24.950	17.97	17.00
HT-20	25.050	17.99	17.00
HT-40	46.493	20.67	17.00

Maximum Conducted Power Industry Canada Limits

Limit 5150 – 5250 MHz: Lesser of 200 mW (+23 dBm) or 10 + 10 Log (B) dBm

Frequency Range (MHz)	Maximum 99% Bandwidth (MHz)	10 + 10 Log (B) (dBm)	EIRP Limit (dBm)
11a	17.034	22.31	22.31
HT-20	18.136	22.59	22.59
HT-40	36.473	25.62	23.00

Antenna Beam and Non-Beam Forming Power Levels

15. 407 (a)(1), (a) (2) Operation with directional antenna gains greater than 6 dBi.

If transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi. Further FCC KDB 662911 D01 Multiple Transmitter Output v01 requires that the gain of antennas transmitting the same data (legacy 802.11a mode) must be increased by 10 * Log (N) when N is the number of antenna elements.

Operating Frequency Band 5150-5250 MHz

MIMO Operation

Antenna	Gain	Max. Allowable Conducted Peak Power (dBm)		Maximum EIRP
(dB)	(dBi)	Non-Beam Forming	Beam Forming	(dBm)
AP-ANT-1B	5.8	+17.0	N/A	+23.0
AP-ANT-1F	4.5	+17.0		+23.0
AP-ANT-10	6.0	+17.0		+23.0
AP-ANT-13B	3.3	+17.0		+23.0
AP-ANT-14	3.6	+17.0		+23.0
AP-ANT-16	4.7	+17.0		+23.0
AP-ANT-17	5.0	+17.0		+23.0
AP-ANT-18	7.5	+15.5		+23.0
AP-ANT-19	6.0	+17.0		+23.0

Non-MIMO Operation (Legacy)

Antenna	Gain dBi	Increased Gain V's No. Antenna Ports		Total Gain	Max. Allowable Conducted Peak Power	Maximum EIRP
(dB)		Ports	dB	dBi	(dBm)	(dBm)
AP-ANT-1B	5.8	2	3.01	8.81	+14.19	+23.0
AP-ANT-1F	4.5	2	3.01	7.51	+15.49	+23.0
AP-ANT-10	6.0	2	3.01	9.01	+13.99	+23.0
AP-ANT-13B	3.3	2	3.01	6.31	+16.69	+23.0
AP-ANT-14	3.6	2	3.01	6.61	+16.39	+23.0
AP-ANT-16	4.7	2	3.01	7.71	+15.29	+23.0
AP-ANT-17	5.0	2	3.01	8.01	+14.99	+23.0
AP-ANT-18	7.5	2	3.01	10.51	+12.49	+23.0
AP-ANT-19	6.0	2	3.01	9.01	+13.99	+23.0

Measurement Results for Transmit Output Power
Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

EUT parameters.
Power Level: Maximum
Duty Cycle: 100%

TABLE OF RESULTS –

NOTE: The following power measurements take into account the power reduction as a result of Radiated Band-Edge measurements made using antenna AP-ANT-18; 7.5 dBi.

802.11a

Test Conditions:	15.407 (a)(1)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11a		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (x):**	100	
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	0 dBi	
Applied Voltage:	12.0	Vdc			
Notes 1:					
Notes 2:					

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
5180	11.62	11.58	--	--	N/A	14.61	17.00	-2.39
5200	11.27	11.65	--	--	N/A	14.47	17.00	-2.53
5240	11.31	11.09	--	--	N/A	14.21	17.00	-2.79

Measurement uncertainty:	±1.33 dB

NOTE: The following power measurements take into account the power reduction as a result of Radiated Band-Edge measurements made using antenna AP-ANT-18; 7.5 dBi.

802.11n HT-20

Test Conditions:	15.407 (a)(1)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11N HT-20		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (x):**	100	
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	0 dBi	
Applied Voltage:	12.0	Vdc			
Notes 1:					
Notes 2:					

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
5180	11.75	11.41	--	--	N/A	14.59	17.00	-2.41
5200	11.38	11.16	--	--	N/A	14.28	17.00	-2.72
5240	11.20	11.38	--	--	N/A	14.30	17.00	-2.70

Measurement uncertainty:	±1.33 dB

NOTE: The following power measurements take into account the power reduction as a result of Radiated Band-Edge measurements made using antenna AP-ANT-18; 7.5 dBi.

802.11n HT-40

Variant:	802.11n HT-40	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (x):**	100
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	0 dBi
Applied Voltage:	12.0 Vdc		
Notes 1:			
Notes 2:			

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
5190	11.92	11.68	--	--	N/A	14.81	17.00	-2.19
5230	11.84	11.51	--	--	N/A	14.69	17.00	-2.31

Measurement uncertainty:	±1.33 dB

Specification

Limits

FCC, Part 15 §15.407 (a)(1), (a)(2) and Industry Canada RSS-210 § A9.2(2)

(a)(1) For the band 5.15-5.25 GHz the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or +4 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed +4 dBm in any 1 megahertz band.

(a)(2) For the 5.25-5.35 GHz band the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or +11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed +11 dBm in any 1 megahertz band.

Industry Canada RSS-210 §A9.2(2)

For the band 5150-5250 MHz, the maximum equivalent isotropically radiated power (e.i.r.p.) shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

For the band 5250-5350 MHz and 5470-5725 MHz, the maximum conducted output power shall not exceed 250 mW or 11 + 10 log10 B, dBm, whichever power is less. The power spectral density shall not exceed 11 dBm in any 1.0 MHz band. The maximum e.i.r.p. shall not exceed 1.0 W or 17 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

Industry Canada RSS-Gen 4.4

When an occupied bandwidth value is not specified in the applicable RSS, the transmitted signal bandwidth to be reported is to be its 99% emission bandwidth, as calculated or measured.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

Traceability

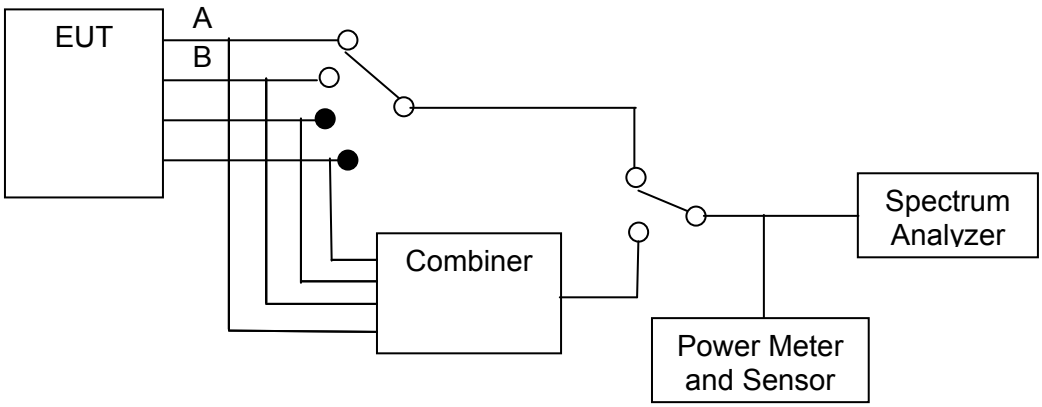
Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0287, 0252, 0313, 0314, 0070, 0116, 0117

5.1.3. Peak Power Spectral Density

FCC, Part 15 Subpart C §15.407(a)
Industry Canada RSS-210 § A9.2(2)

Test Procedure
The transmitter output was connected to a spectrum analyzer and the peak power spectral density measured. Method 2 Sample Detection and power averaging, specified in FCC document DA 02-2138 (Normative Reference (ix) Section 2.1 "Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices") was used to determine the peak power spectral density of the emission. The Peak Power Spectral Density is the highest level found across the emission in a 1 MHz resolution bandwidth.

Test Measurement Set up



Measurement set up for Peak Power Spectral Density

Measurement Results for Peak Power Spectral Density

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

Radio Parameters
Duty Cycle: 100%
Output: Modulated Carrier
Power: Maximum Default Power

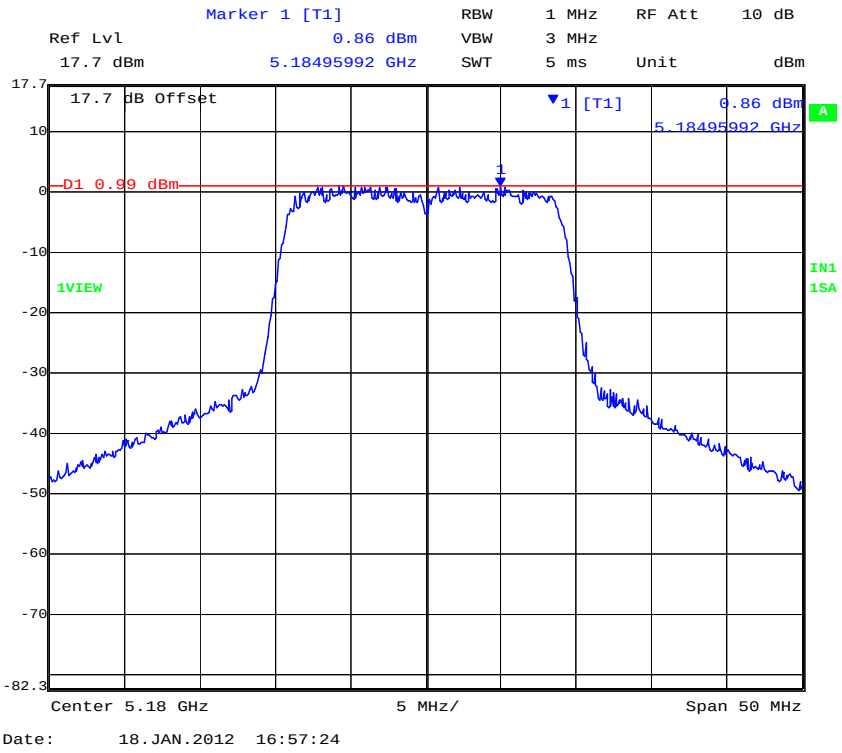
TABLE OF RESULTS – **802.11a Legacy 5150 – 5250 MHz**

Test Conditions:	15.407 (a)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11a		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	100	
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	6 dBi	
Applied Voltage:	12.0	Vdc	**Antenna Ports (N):**	2	
Notes 1:					
Notes 2:					

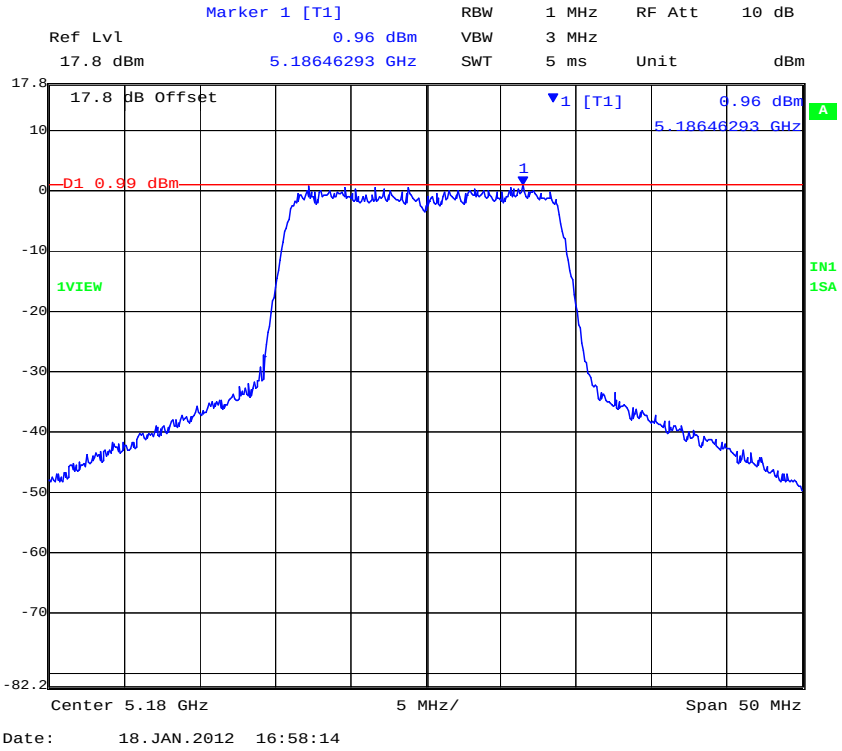
Test Frequency	**Measured Peak Power RF Port (dBm)**				**Correction factor**	**Peak Power Spectral Density**	**Limit**	**Margin**
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
5180	0.86	0.96	--	--	3.01	3.97	4.00	-0.03
5200	0.42	0.23	--	--	3.01	3.43	4.00	-0.57
5240	-0.10	0.73	--	--	3.01	3.74	4.00	-0.26

Measurement uncertainty:	±1.33 dB

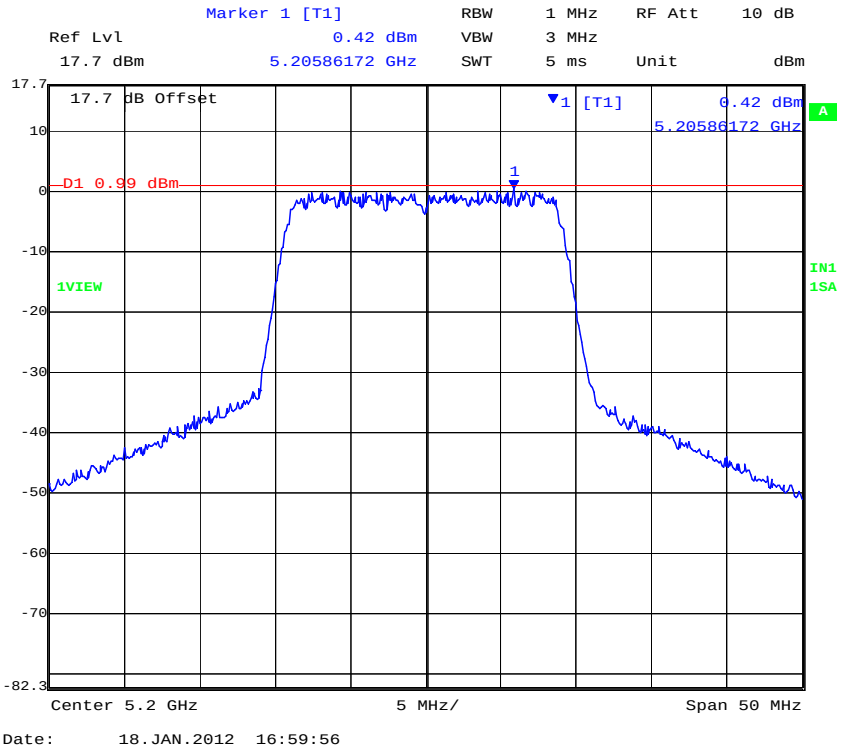
PORT A 5,1800 MHz 802.11a Legacy Power Spectral Density



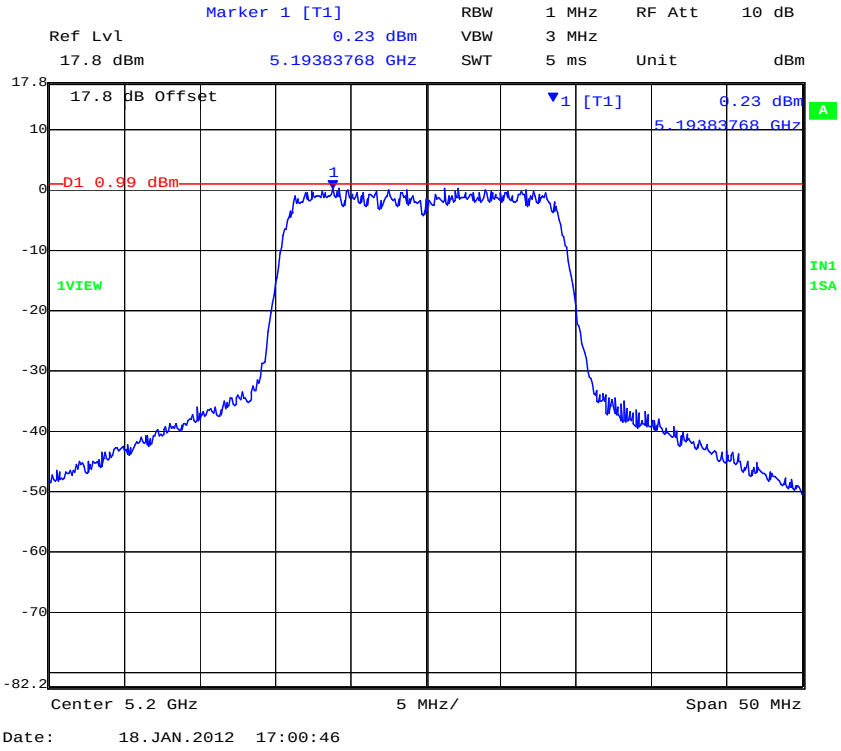
PORT B 5,1800 MHz 802.11a Legacy Power Spectral Density



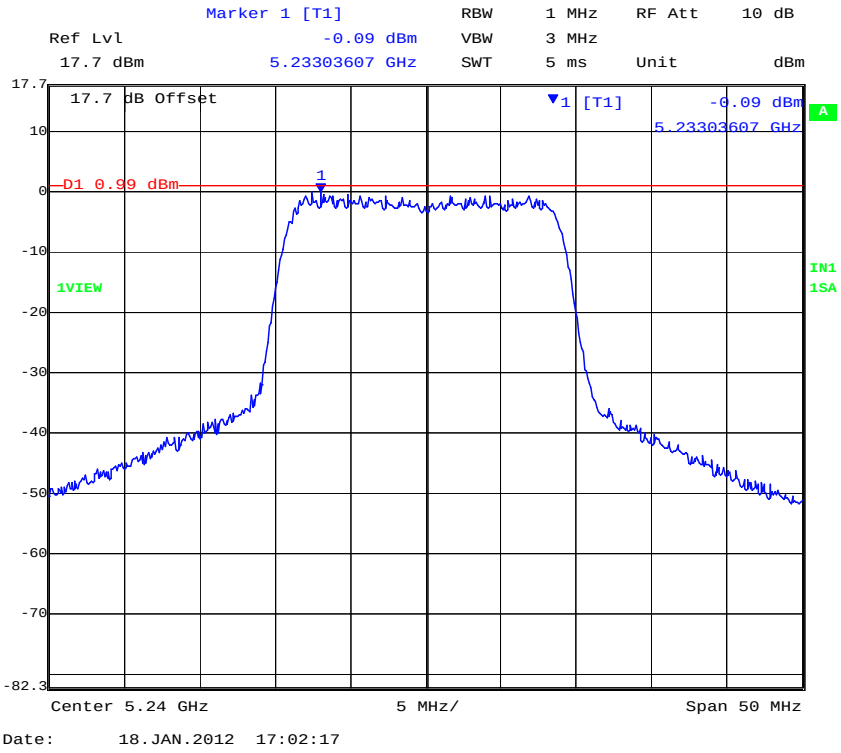
PORT A 5,200 MHz 802.11a Legacy Power Spectral Density



PORT B 5,200 MHz 802.11a Legacy Power Spectral Density



PORT A 5,240 MHz 802.11a Legacy Power Spectral Density



PORT B 5,240 MHz 802.11a Legacy Power Spectral Density

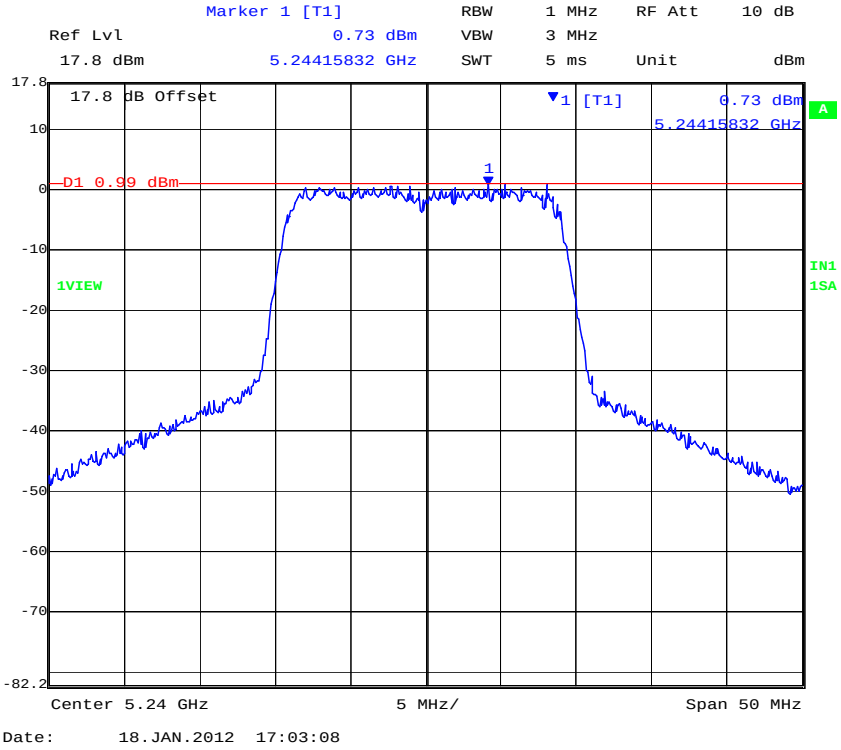


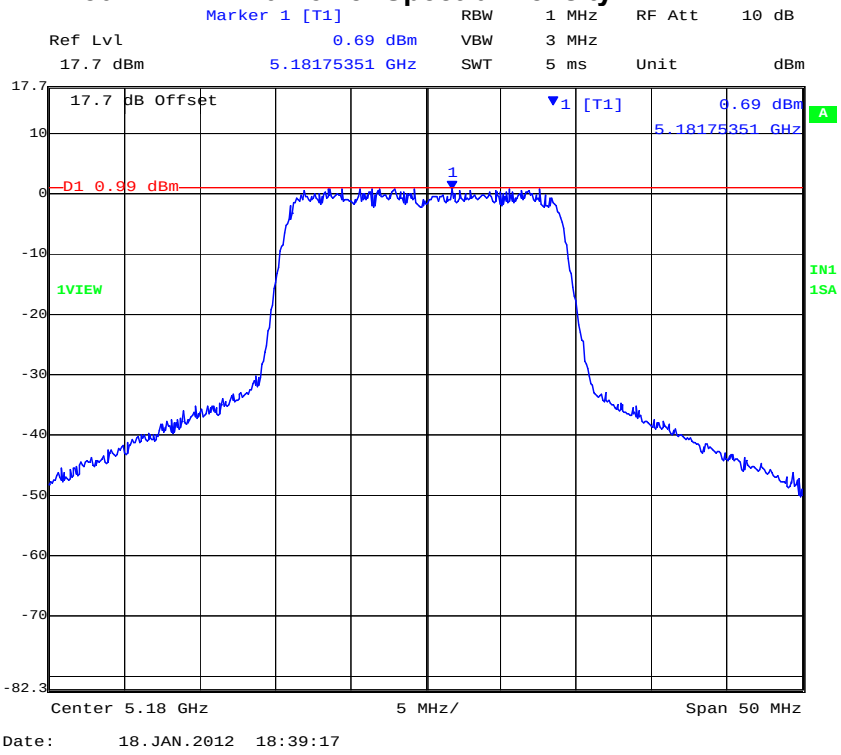
TABLE OF RESULTS – **802.11n HT-20 5150 – 5250 MHz**

Test Conditions:	15.407 (a)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11n HT-20		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	100	
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	6 dBi	
Applied Voltage:	12.0	Vdc	**Antenna Ports (N):**	2	
Notes 1:					
Notes 2:					

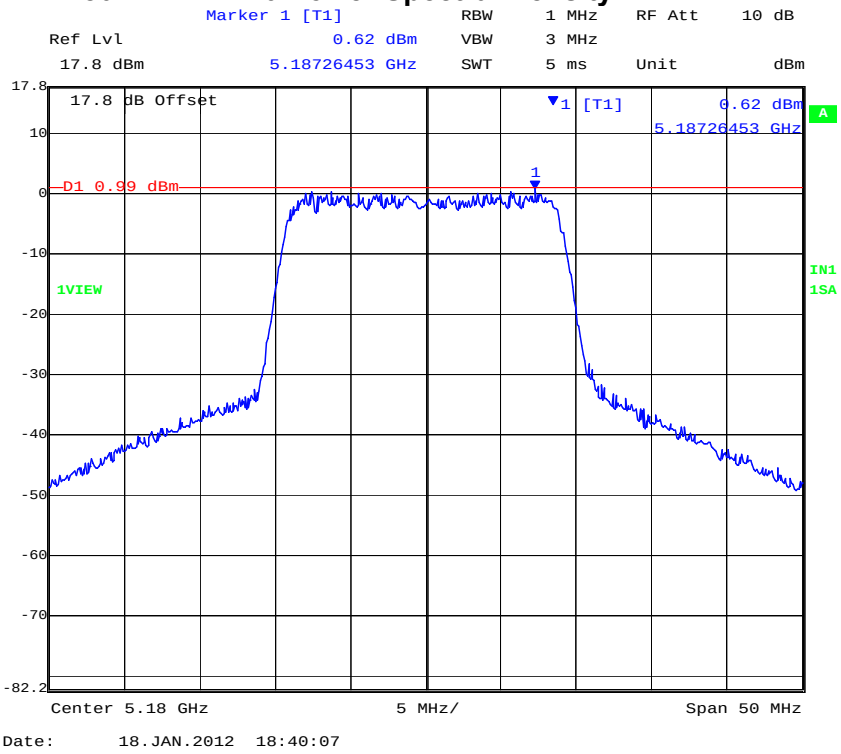
Test Frequency	**Measured Peak Power**				**Correction factor**	**Peak Power Spectral Density**	**Limit**	**Margin**
	RF Port (dBm)							
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
5180	0.69	0.62	--	--	3.01	3.70	4.00	-0.30
5200	0.58	0.92	--	--	3.01	3.93	4.00	-0.07
5240	-0.14	0.67	--	--	3.01	3.68	4.00	-0.32

Measurement uncertainty:	±1.33 dB

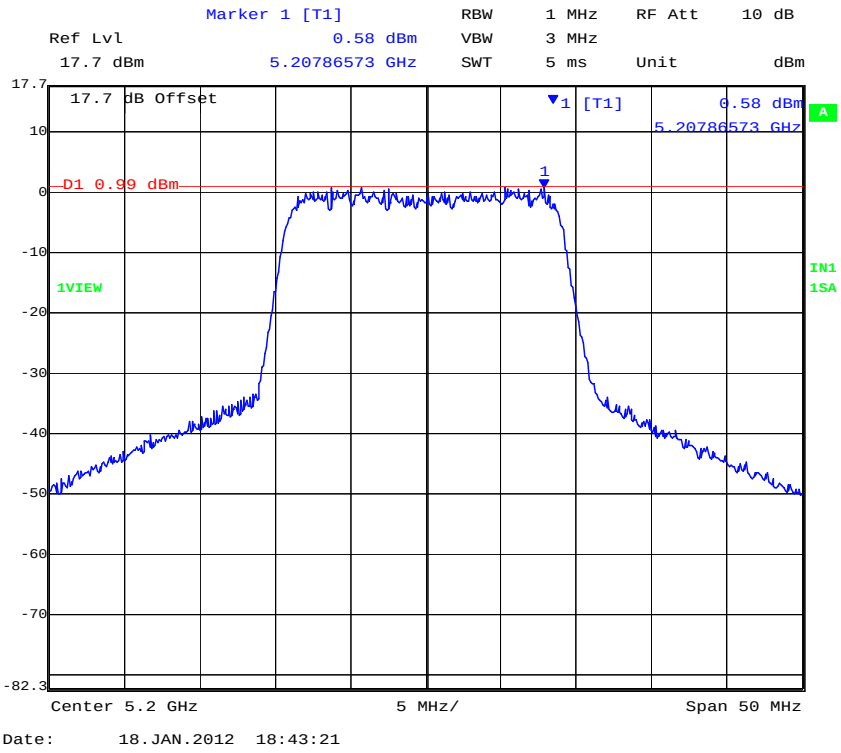
PORT A 5,180 MHz 802.11n HT-20 Power Spectral Density



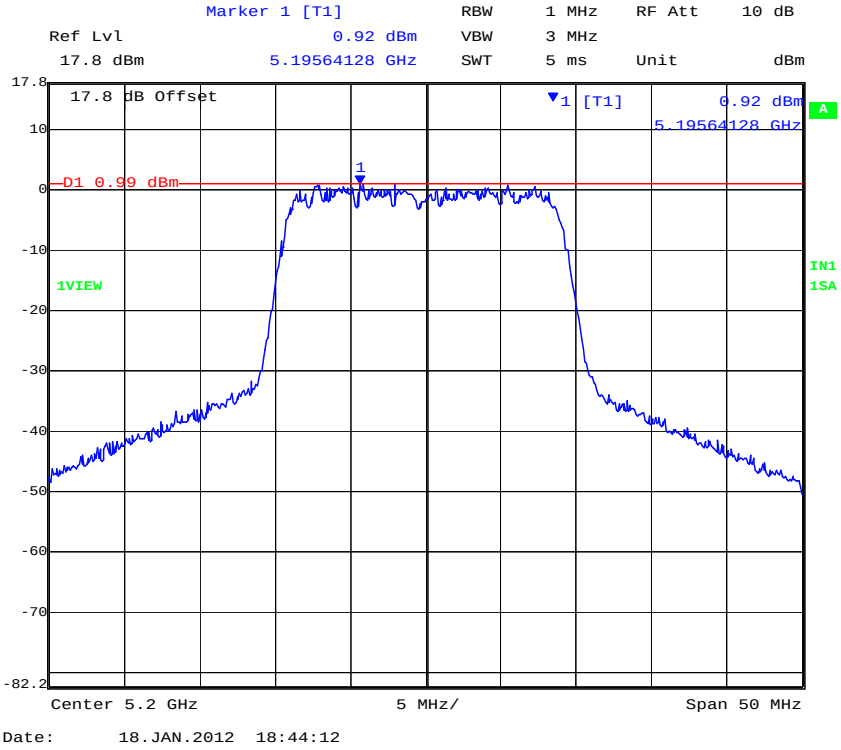
PORT B 5,180 MHz 802.11n HT-20 Power Spectral Density



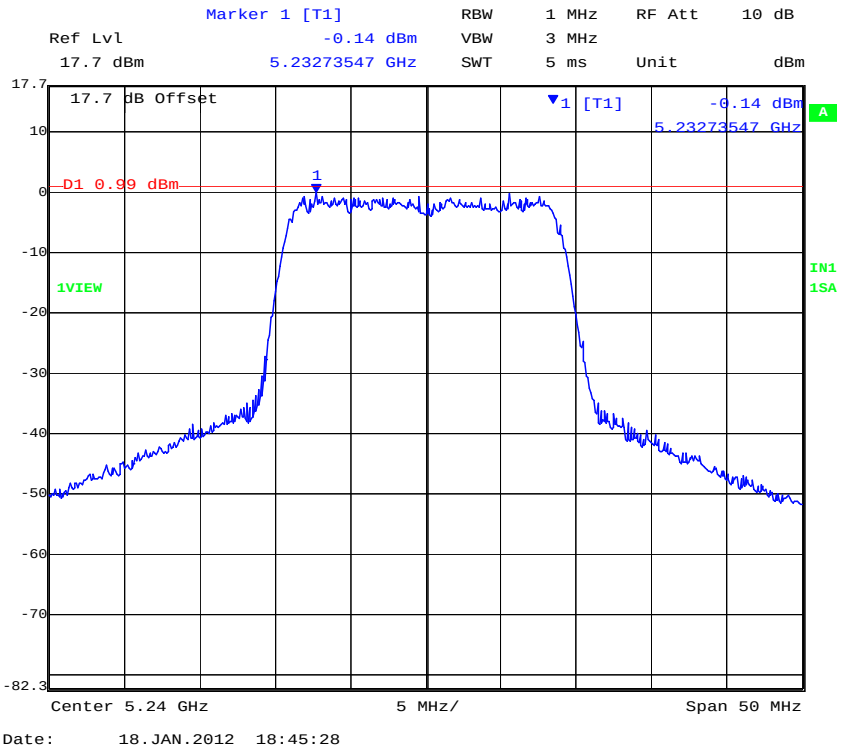
PORT A 5,200 MHz 802.11n HT-20 Power Spectral Density



PORT B 5,200 MHz 802.11n HT-20 Power Spectral Density



PORT A 5,240 MHz 802.11n HT-20 Power Spectral Density



PORT B 5,240 MHz 802.11n HT-20 Power Spectral Density

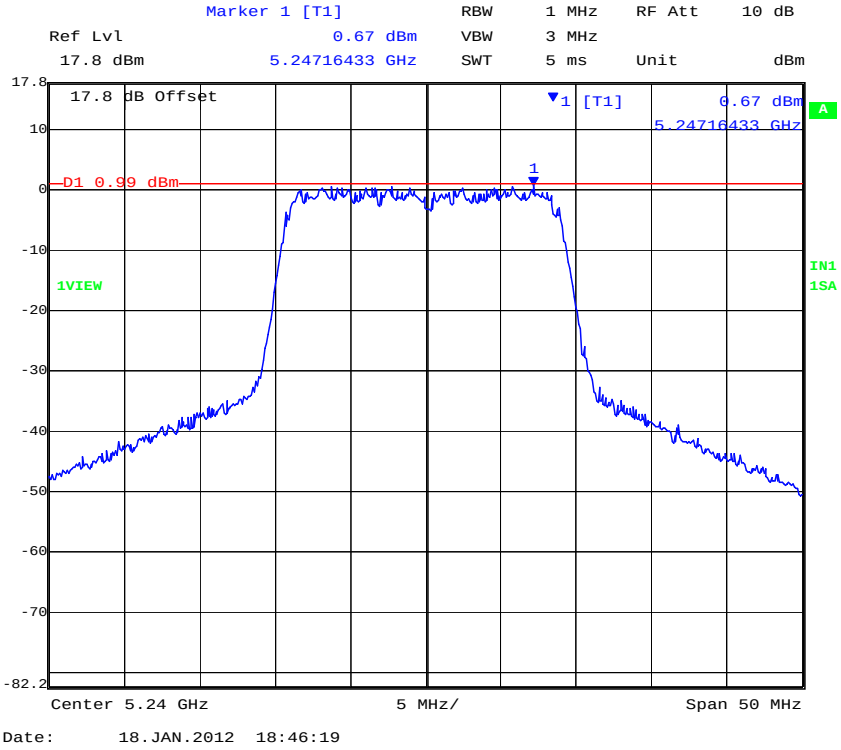


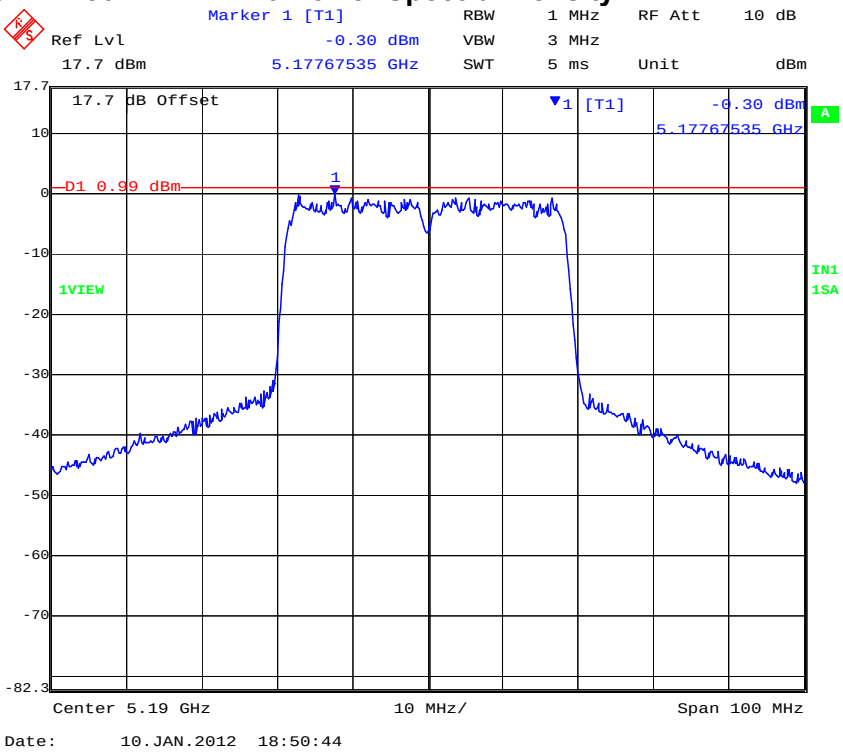
TABLE OF RESULTS – **802.11n HT-40 5150 – 5250 MHz**

Test Conditions:	15.407 (a)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11n HT-40	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	100
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	6 dBi
Applied Voltage:	12.0 Vdc	**Antenna Ports (N):**	2
Notes 1:			
Notes 2:			

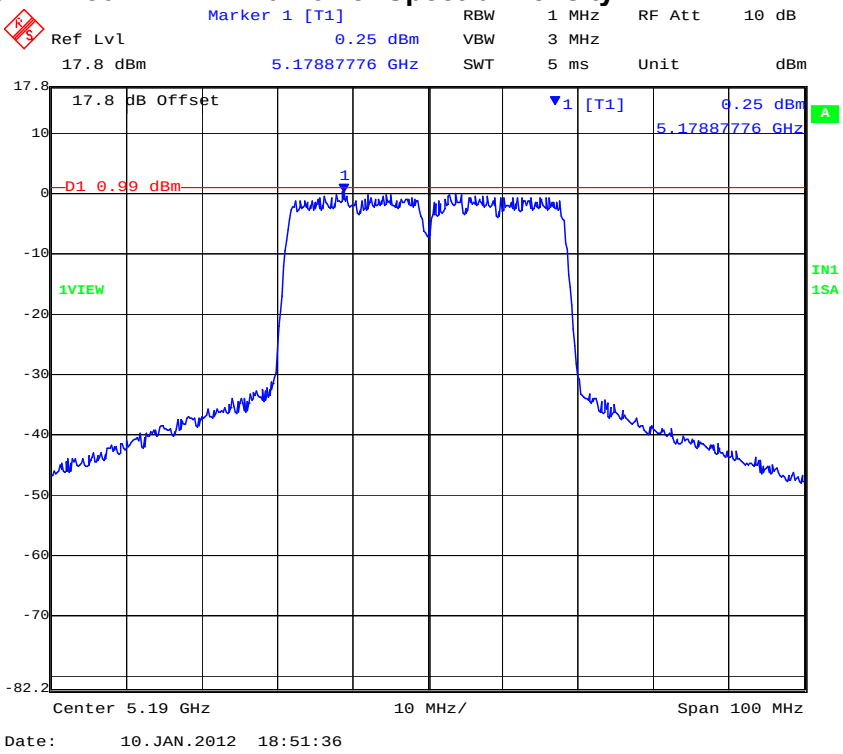
Test Frequency	**Measured Peak Power RF Port (dBm)**				**Correction factor**	**Peak Power Spectral Density**	**Limit**	**Margin**
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
5190	-0.30	0.25	--	--	3.01	3.26	4.00	-0.74
5230	-1.87	-1.96	--	--	3.01	1.15	4.00	-2.85

Measurement uncertainty:	±1.33 dB

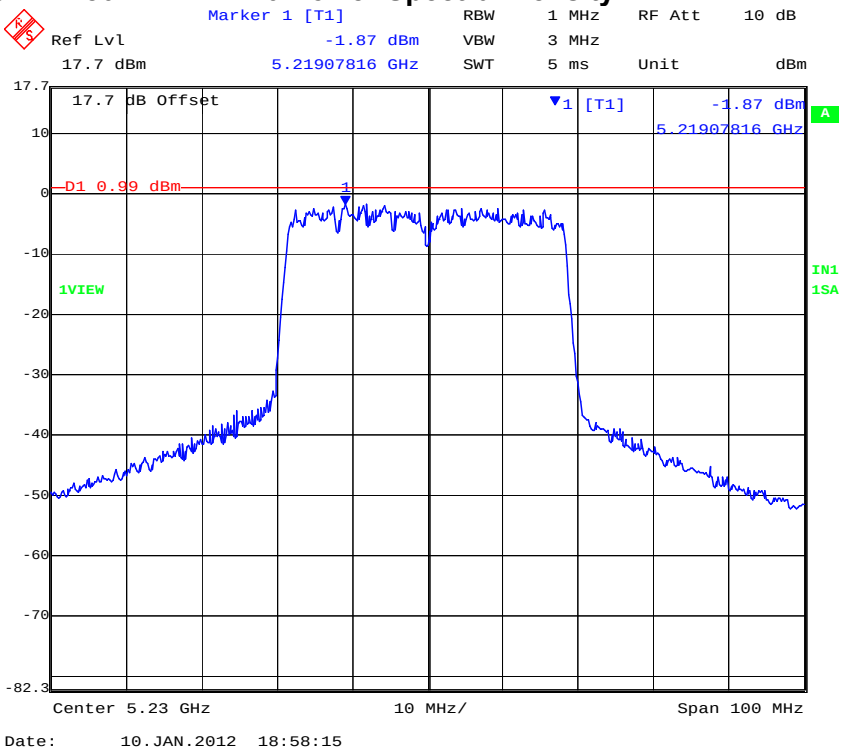
PORT A 5,190 MHz 802.11n HT-40 Power Spectral Density



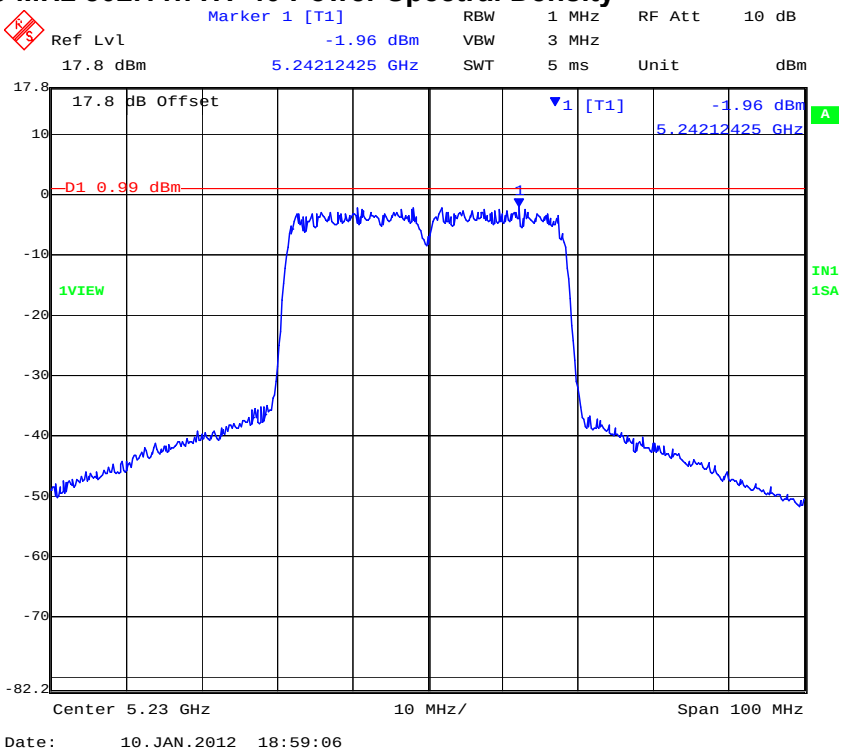
PORT B 5,190 MHz 802.11n HT-40 Power Spectral Density



PORT A 5,230 MHz 802.11n HT-40 Power Spectral Density



PORT B 5,230 MHz 802.11n HT-40 Power Spectral Density



Specification

FCC, Part 15 §15.407 (a)(1), (a)(2)
5150 – 5250 MHz
(a)(1) The peak power spectral density shall not exceed +4 dBm in any 1 megahertz band.

5250 – 5350 MHz & 5470 – 5725 MHz
(a)(2) The peak power spectral density shall not exceed +11 dBm in any 1 megahertz band.

Industry Canada RSS-210 § **A9.2(1), A9.2(2)**
5150 – 5250 MHz
§ **A9.2(1)** The eirp spectral density shall not exceed +10 dBm in any 1 MHz band

5250 – 5350 MHz & 5470 – 5725 MHz
§ **A9.2(2)** The power spectral density shall not exceed +11 dBm in any 1 MHz band

Laboratory Measurement Uncertainty for Spectral Density

Measurement uncertainty	±1.33 dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0287, 0252, 0313, 0314, 0070, 0116, 0117

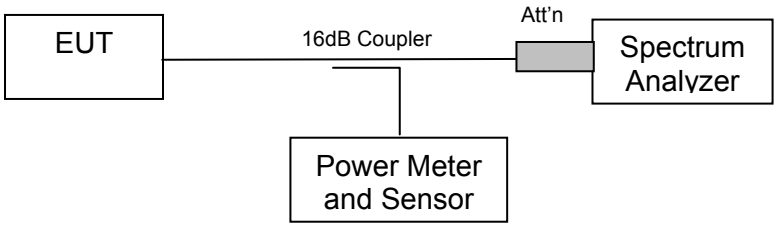
5.1.4. Peak Excursion Ratio

FCC, Part 15 Subpart C §15.407(a)(6)

Test Procedure

Normative Reference (xi) Section 2.1 Measurement Procedure DA 02-2138 "Measurement Procedure Updated for Peak Transmit Power in the UNII Bands" was implemented to determine the Peak Excursion Ratio. This is a conducted measurement using a spectrum analyzer. The Peak Excursion Ratio is the difference in amplitude (dB) between the two traces.

Test Measurement Set up



Measurement set up for Peak Excursion Ratio

Measurement Results for Peak Excursion Ratio

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

Radio Parameters
Duty Cycle: 100%
Output: Modulated Carrier
Power: Maximum Default Power

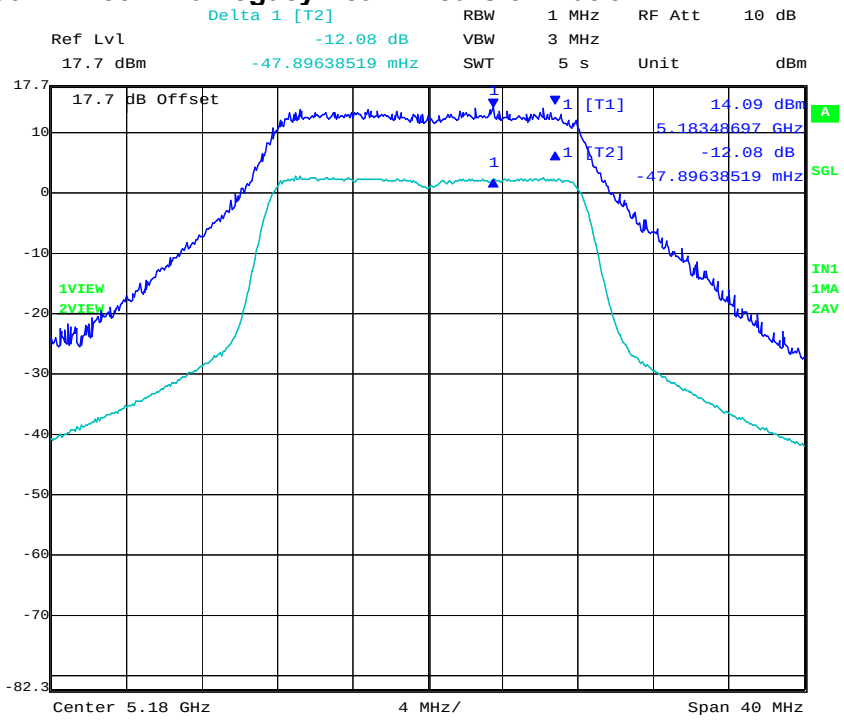
TABLE OF RESULTS – **802.11a Legacy 5150 – 5250 MHz**

Test Conditions:	15.407 (a)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11a	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	100
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	6 dBi
Applied Voltage:	12.0 Vdc		
Notes 1:			
Notes 2:			

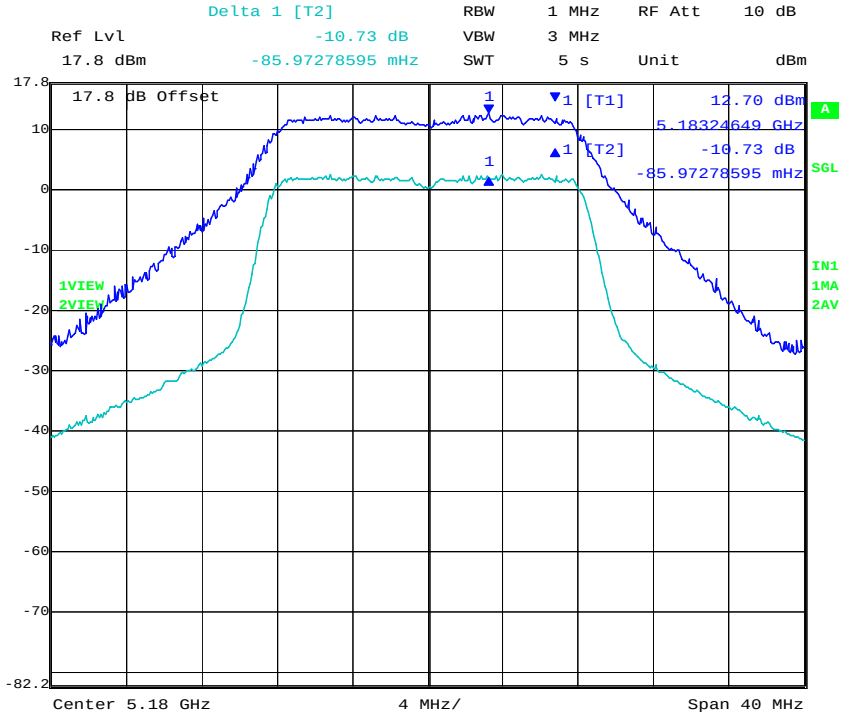
Test Frequency	Trace Δ Marker				Limit	Margin
	Port A	Port B	Port C	Port D		
MHz	dB	dB	dB	dB	dB	dB
5180	-12.08	-10.73	--	--	-13.00	-0.92
5200	-12.33	-11.00	--	--		-0.67
5240	-12.66	-10.19	--	--		-0.34

Measurement uncertainty:	±1.33 dB

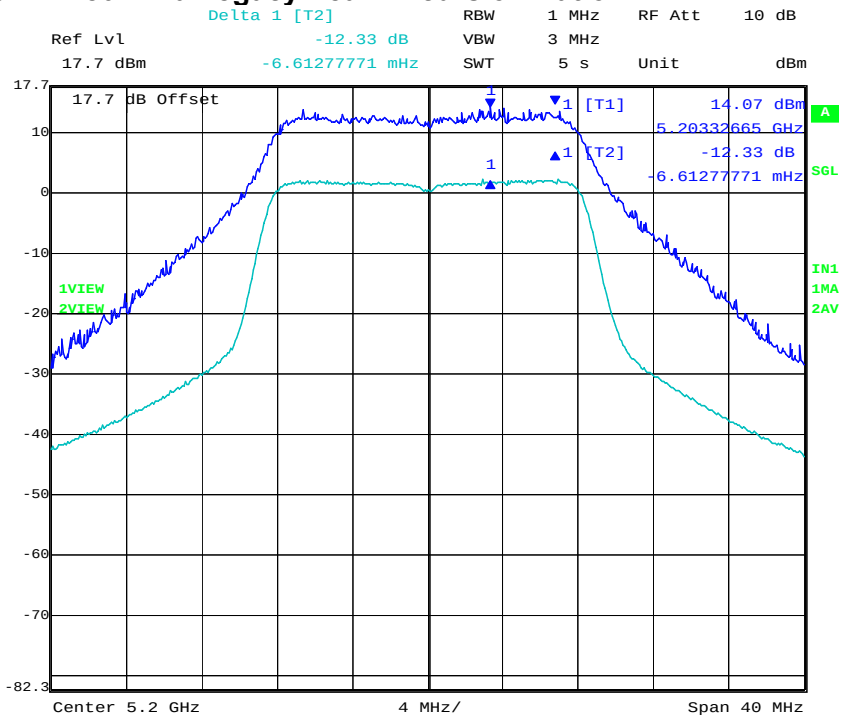
PORT A 5,1800 MHz 802.11a Legacy Peak Excursion Ratio



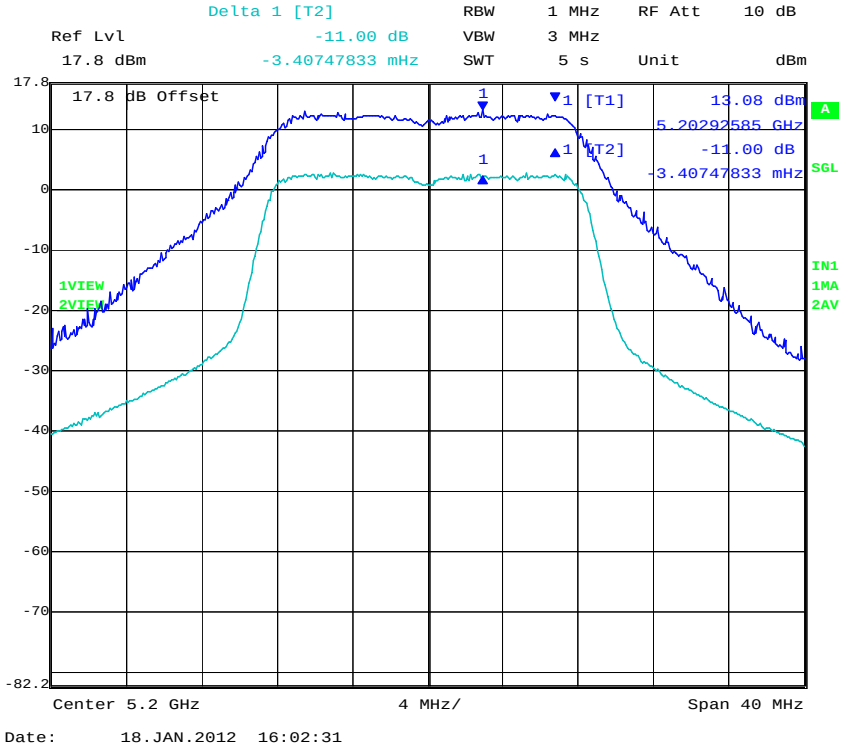
PORT B 5,1800 MHz 802.11a Legacy Peak Excursion Ratio



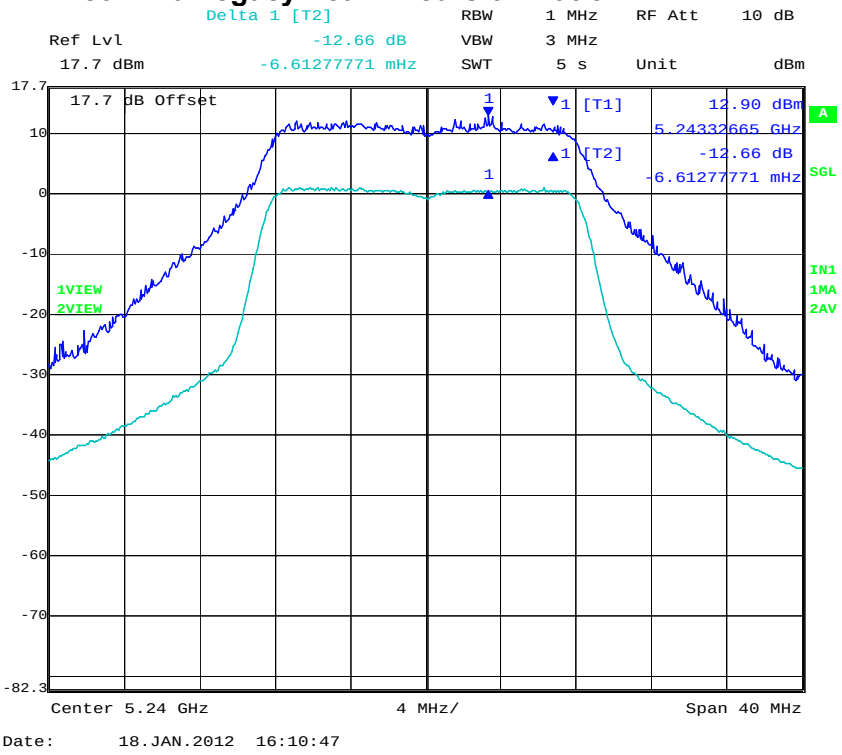
PORT A 5,200 MHz 802.11a Legacy Peak Excursion Ratio



PORT B 5,200 MHz 802.11a Legacy Peak Excursion Ratio



PORT A 5,240 MHz 802.11a Legacy Peak Excursion Ratio



PORT B 5,240 MHz 802.11a Legacy Peak Excursion Ratio

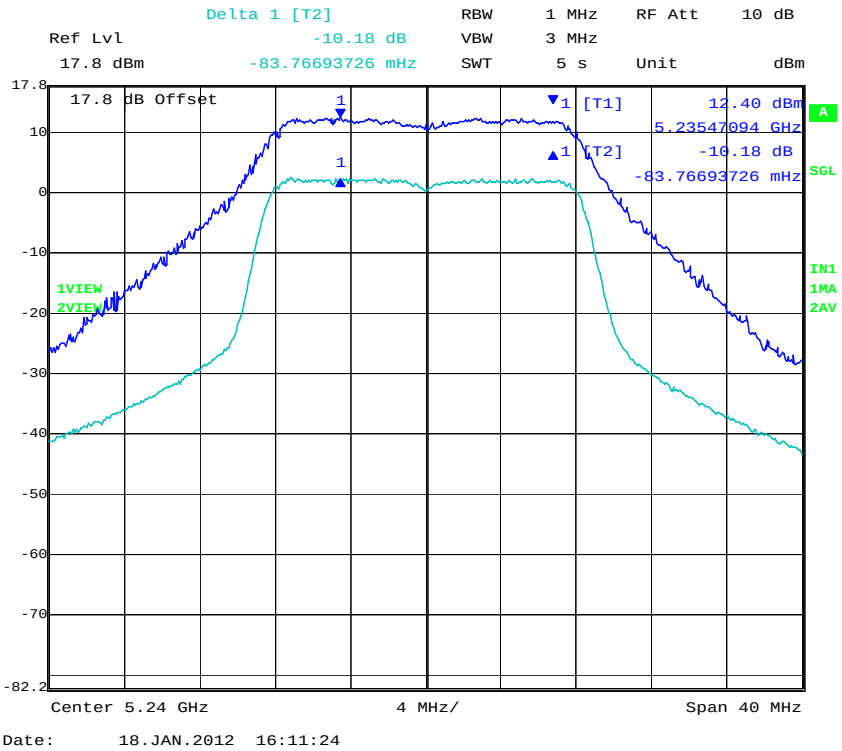


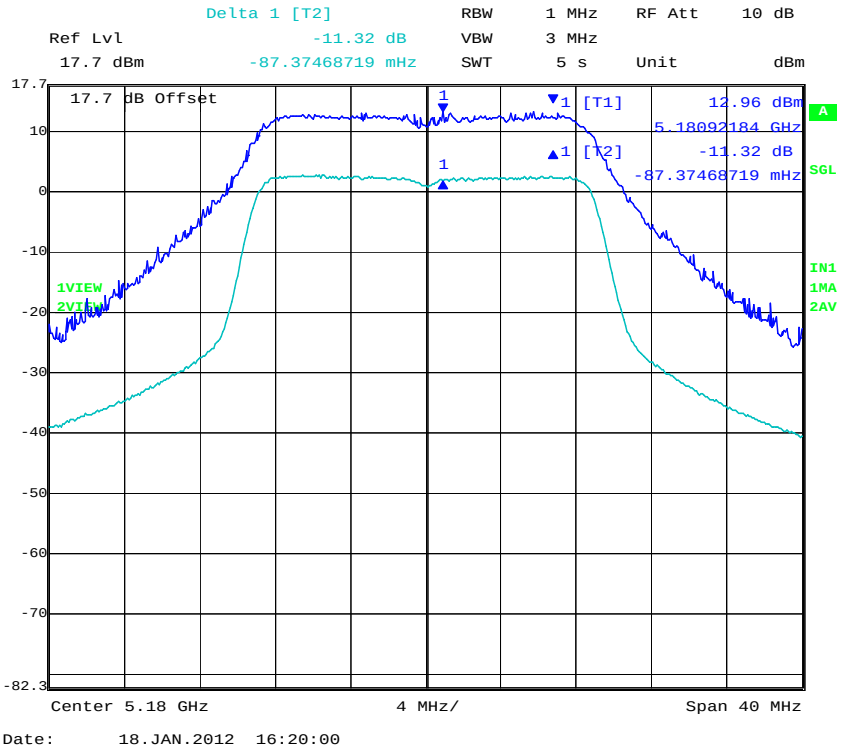
TABLE OF RESULTS – **802.11n HT-20 5150 – 5250 MHz**

Test Conditions:	15.407 (a)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11n HT-20	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	100
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	6 dBi
Applied Voltage:	12.0 Vdc		
Notes 1:			
Notes 2:			

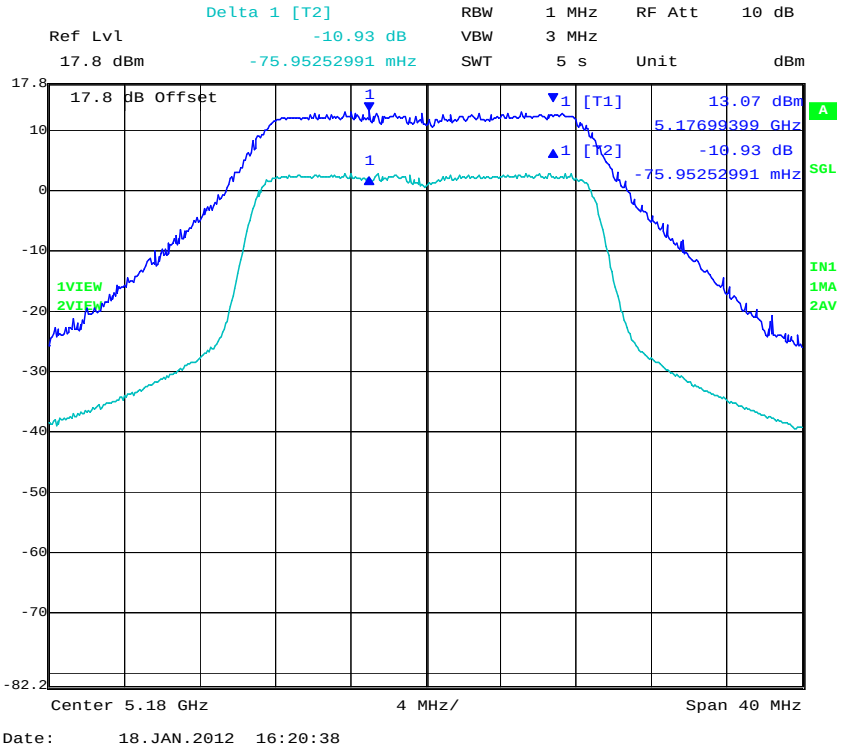
Test Frequency	Trace Δ Marker				Limit	Margin
	Port A	Port B	Port C	Port D		
MHz	dB	dB	dB	dB	dB	dB
5180	-11.32	-10.93	--	--	-13.00	-1.68
5200	-11.50	-11.41	--	--		-1.50
5240	-10.99	-10.79	--	--		-2.02

Measurement uncertainty:	±1.33 dB

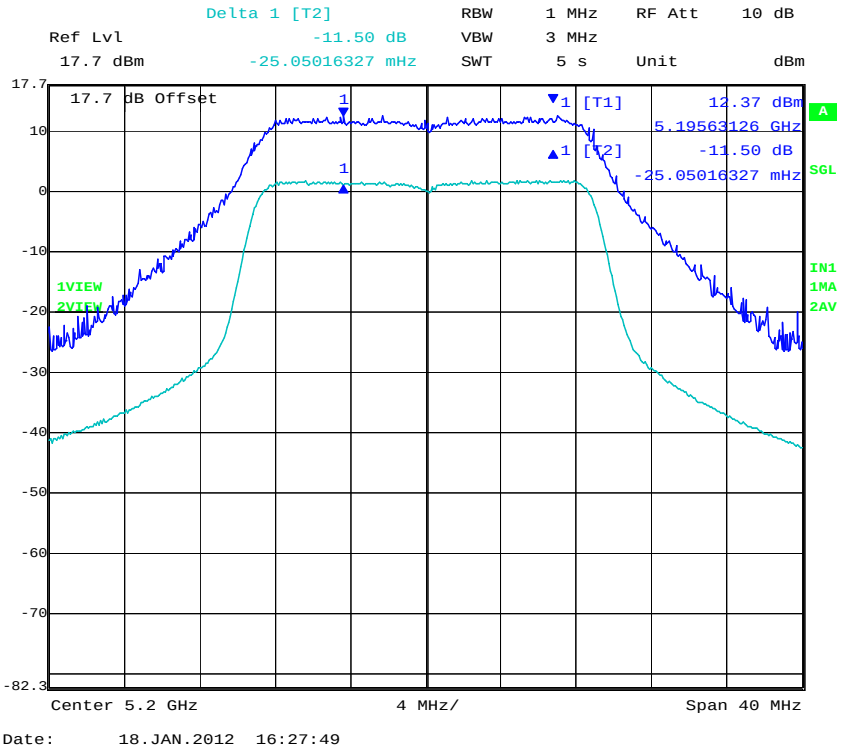
PORT A 5,180 MHz 802.11n HT-20 Peak Excursion Ratio



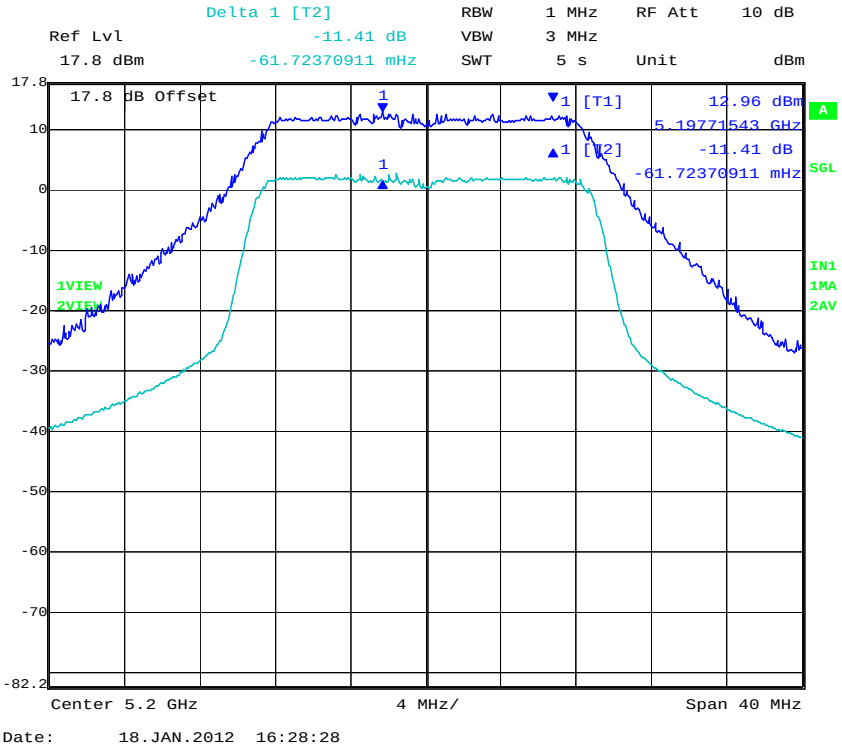
PORT B 5,180 MHz 802.11n HT-20 Peak Excursion Ratio



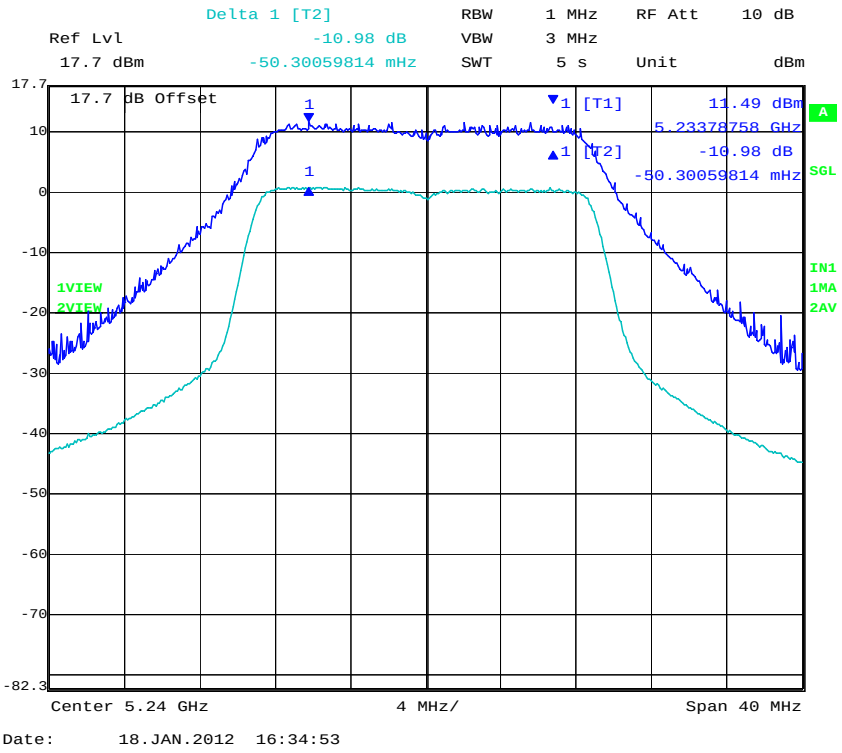
PORT A 5,200 MHz 802.11n HT-20 Peak Excursion Ratio



PORT B 5,200 MHz 802.11n HT-20 Peak Excursion Ratio



PORT A 5,240 MHz 802.11n HT-20 Peak Excursion Ratio



PORT B 5,240 MHz 802.11n HT-20 Peak Excursion Ratio

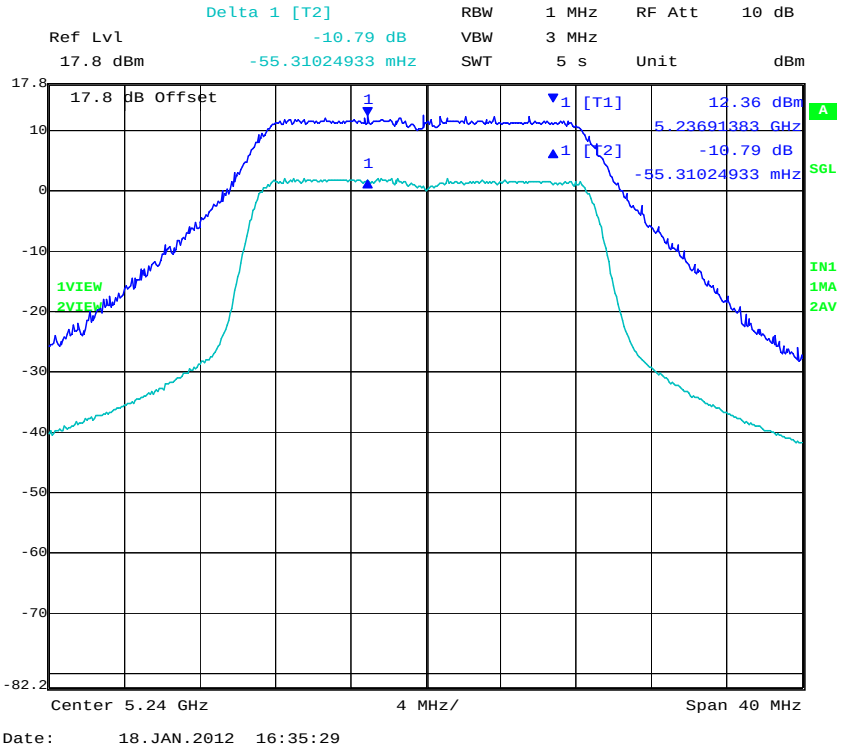


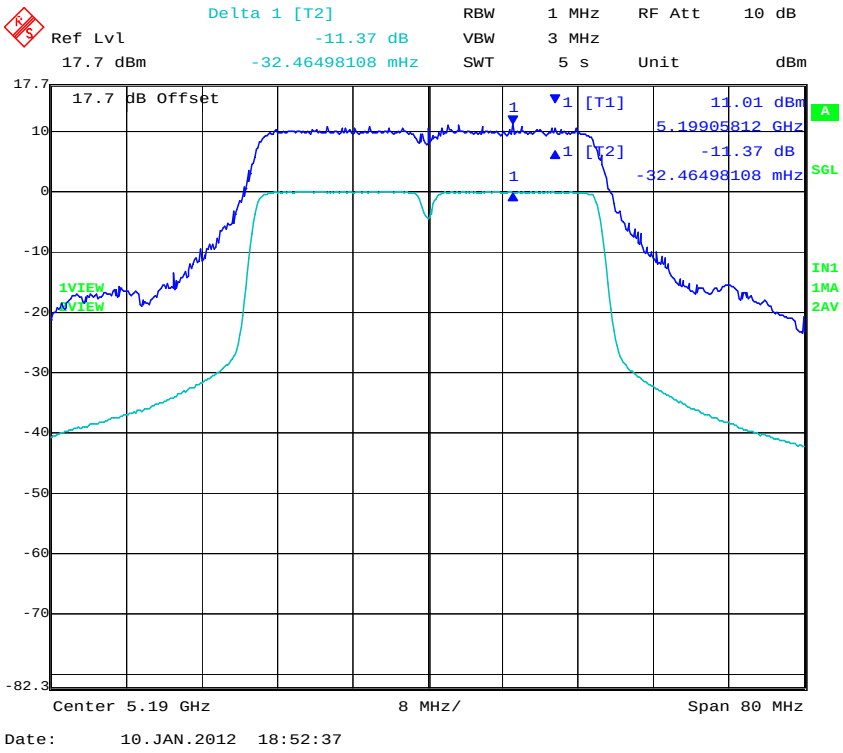
TABLE OF RESULTS – **802.11n HT-40 5150 – 5250 MHz**

Test Conditions:	15.407 (a)	**Rel. Humidity (%):**	35 to 42
Variant:	802.11n HT-40	**Ambient Temp. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	100
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	6 dBi
Applied Voltage:	12.0 Vdc		
Notes 1:			
Notes 2:			

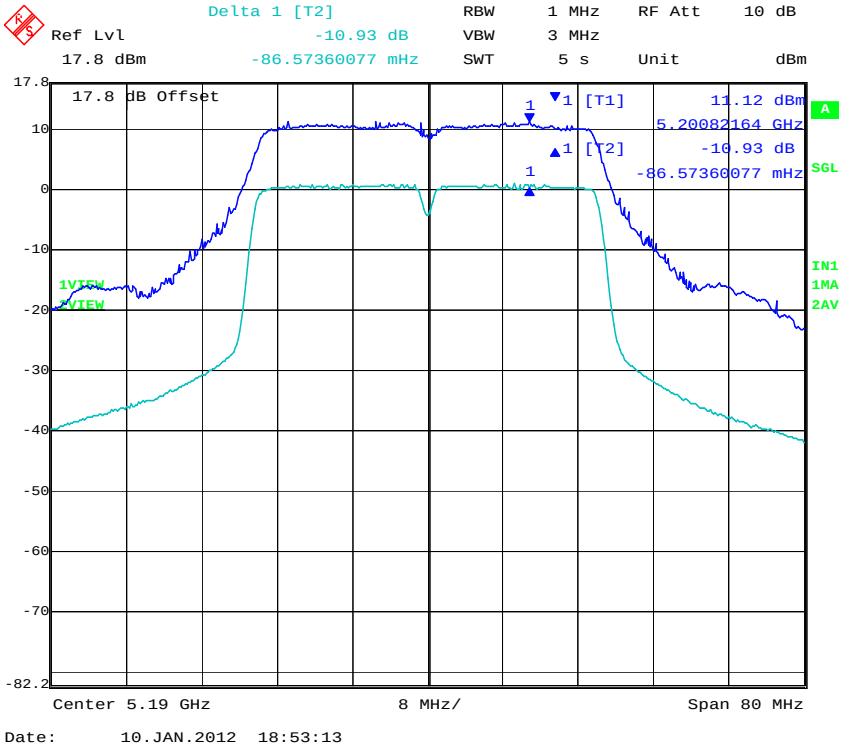
Test Frequency	Trace Δ Marker				Limit	Margin
	Port A	Port B	Port C	Port D		
MHz	dB	dB	dB	dB	dB	dB
5190	-11.37	-10.93	--	--	-13.00	-1.63
5230	-11.64	-11.76	--	--		-1.24

Measurement uncertainty:	±1.33 dB

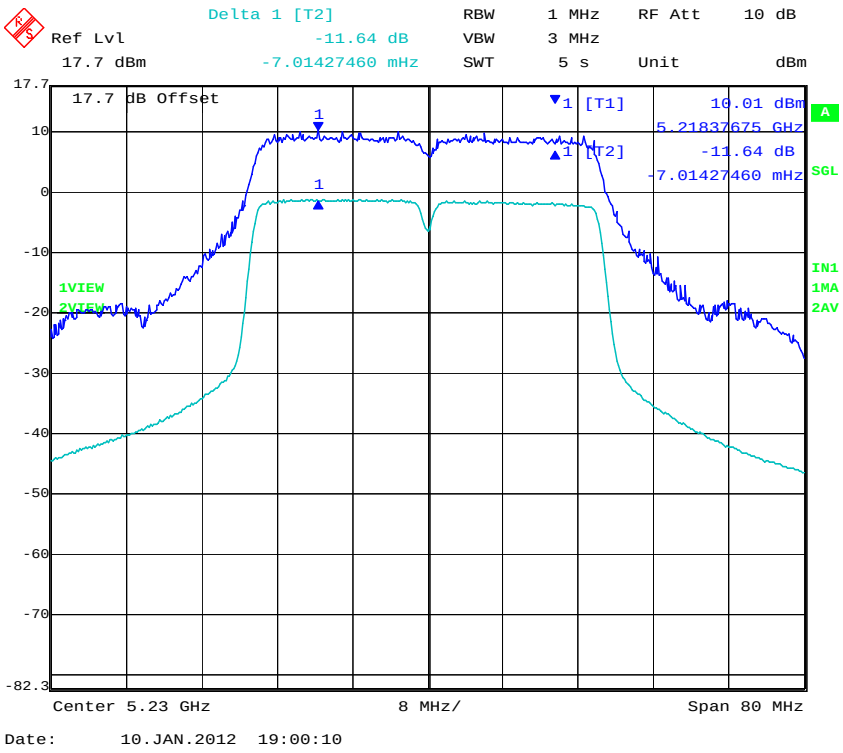
PORT A 5,190 MHz 802.11n HT-40 Peak Excursion Ratio



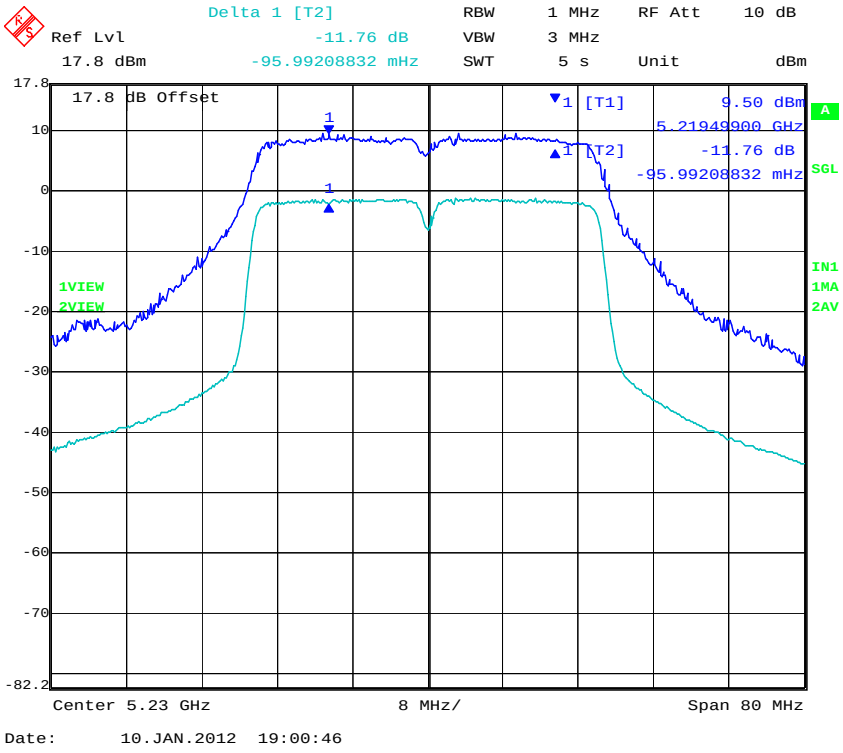
PORT B 5,190 MHz 802.11n HT-40 Peak Excursion Ratio



PORT A 5,230 MHz 802.11n HT-40 Peak Excursion Ratio



PORT B 5,230 MHz 802.11n HT-40 Peak Excursion Ratio



Specification

Limits

§15.407 (a)(6) The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified in this paragraph) shall not exceed 13dB across any 1MHz bandwidth or the emission bandwidth whichever is less

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement uncertainty	± 2.81dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0158, 0287, 0252, 0313, 0314, 0070, 0116, 0117

5.1.5. Frequency Stability

FCC, Part 15 Subpart C §15.407(g)
Industry Canada RSS-210 §2.1

Test Procedure

The manufacturer of the equipment is responsible for ensuring that the frequency stability is such that emissions are always maintained within the band of operation under all conditions.

Manufacturer Declaration

The frequency stability of the reference oscillator sets the frequency stability of the RF transceiver signals. Therefore all of the RF signals should have ±20ppm stability.
This stability accounts for room temp tolerance of the crystal oscillator circuit, frequency variation across temperature, and crystal ageing.

±20ppm at 5.250 GHz translates to a maximum frequency shift of ±105 KHz. As the edge of the channels is at least one MHz from either of the band edges, ±105 KHz is more than sufficient to guarantee that the intentional emission will remain in the band over the entire operating range of the EUT.

Specification

Limits

§15.407 (g) Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

5.1.6. Maximum Permissible Exposure

FCC, Part 15 Subpart C §15.407(f)
Industry Canada RSS-Gen §5.5

Calculations for Maximum Permissible Exposure Levels

Power Density = Pd (mW/cm^2) = EIRP/(4πd^2)

EIRP = P * G * 3

P = Peak output power (mW)

G = Antenna numeric gain (numeric)

d = Separation distance (cm)

Numeric Gain = 10 ^ (G (dBi)/10)

The Aruba AP-104 has two transmitters. The peak power in the table below is calculated by assuming a worst case scenario where the two transmitters are operating simultaneously in the same band. The Peak Power in mW is calculated by taking the maximum conducted power measured.

Because the EUT belongs to the General Population/Uncontrolled Exposure the limit of power density is 1.0 mW/cm^2

Freq. Band (MHz)	Antenna Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Power Density @ 20cm (mW/cm^2)	Minimum Separation Distance (cm)
5150 - 5250	7.5	5.62	+14.81	30.27	0.034	20*

***Note:** for mobile or fixed location transmitters the minimum separation distance is 20cm, even if calculations indicate the MPE distance to be less.

Specification
Maximum Permissible Exposure Limits

FCC §1.1310 Limit = 1mW / cm^2 from 1.310 Table 1

RSS-Gen §5.5 Before equipment certification is granted, the application requirements of RSS-102 shall be met.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

5.1.7. Radiated Emissions

5.1.7.1. Transmitter Radiated Spurious Emissions (above 1 GHz); Peak Field Strength Measurements; and Radiated Band Edge Measurements – Restricted Bands

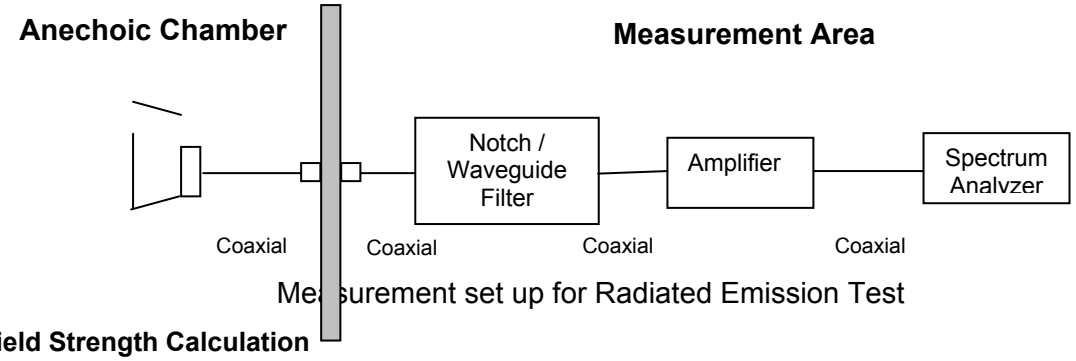
FCC, Part 15 Subpart C §15.407(b)(2), §15.205(a)/15.209(a)
Industry Canada RSS-210 §A9.3(2); §2.2; §2.6; RSS-Gen §4.7

Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

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

FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/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 = 100 μV/m
48 dBμV/m = 250 μV/m

The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength (dBμV/m);

$$E = 1000000 \times \sqrt{30P} / 3 \ \mu V/m$$

where P is the EIRP in Watts

Therefore: -27 dBm/MHz = 68.23 dBuV/m

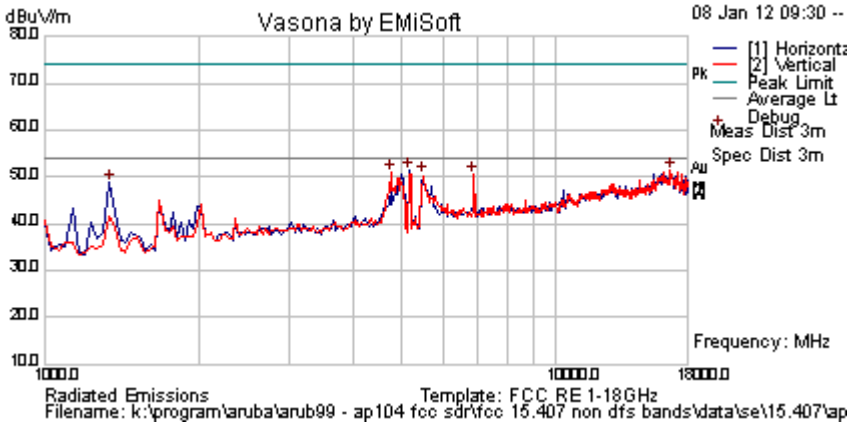
Note: The data in this Section identifies that the EUT is in compliance with the -27dBm/MHz EIRP limit (68.23 dBμV/m) for out of band emissions. All peak emissions are less than 68.23 dB μV/m.

Measurement Results Transmitter Radiated Spurious Emissions above 1 GHz

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

AP-ANT-18

Test Freq.	5180 MHz	**Engineer**	GMH
Variant	802.11a; 6 Mbs	**Temp (ºC)**	18
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	ART = 13	**Press. (mBars)**	1010
Antenna	AP-ANT-18	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

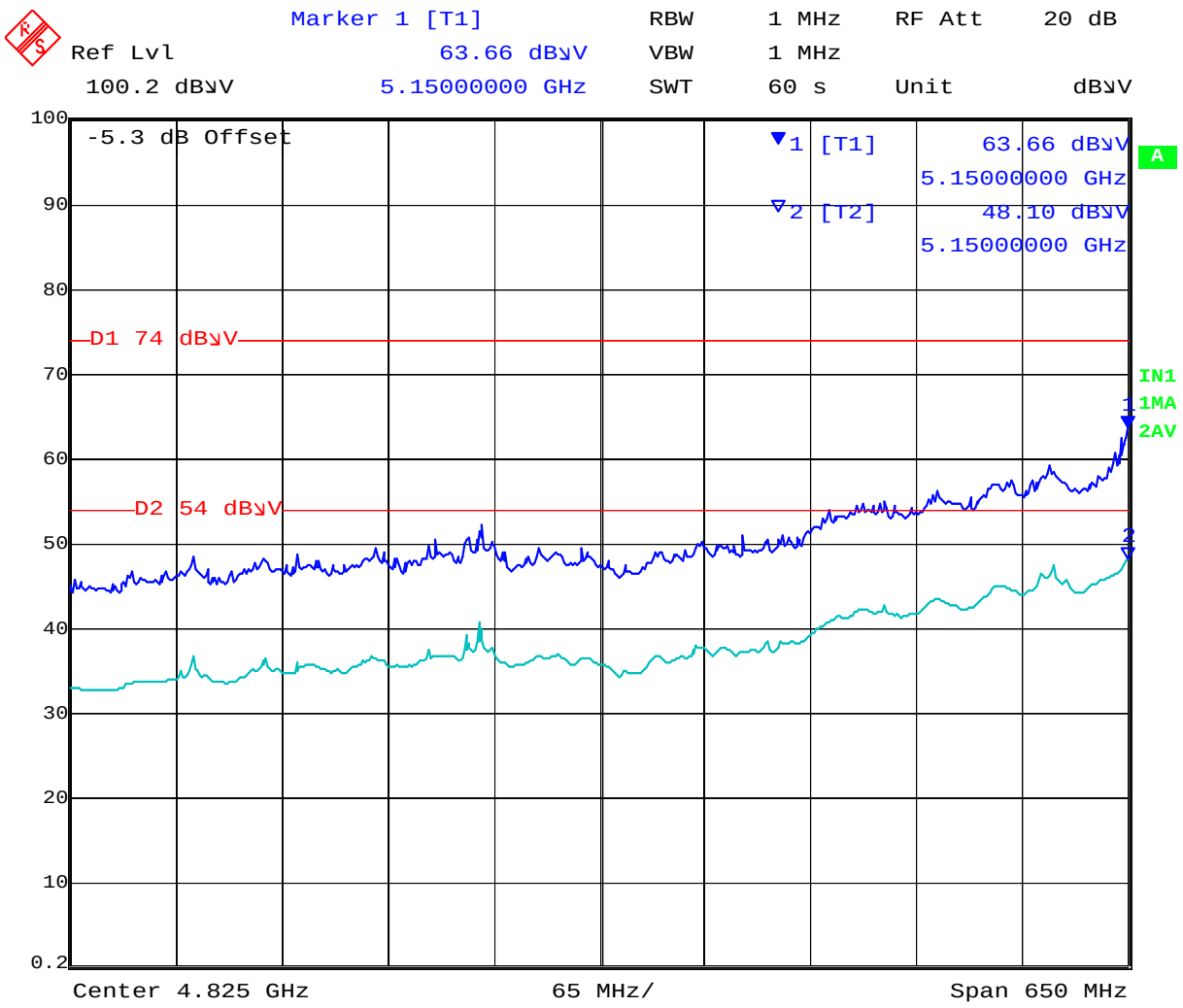


Formally measured emission peaks

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
5156.313	56.7	4.6	-9.9	51.4	Peak [Scan]	H						FUND
16705.411	41.8	8.7	0.8	51.3	Peak [Scan]	V	100	0	54.0	-2.7	Pass	NOISE
4747.495	56.2	4.4	-9.7	50.9	Peak [Scan]	V	100				Pass	BE
6893.788	51.6	5.3	-6.5	50.4	Peak [Scan]	V	100	0	54	-3.6	Pass	NRB
5496.994	55.3	4.6	-9.6	50.3	Peak [Scan]	V	100				Pass	BE
1340.681	60.4	2.3	-13.9	48.7	Peak [Scan]	H	100	0	54	-5.3	Pass	NRB

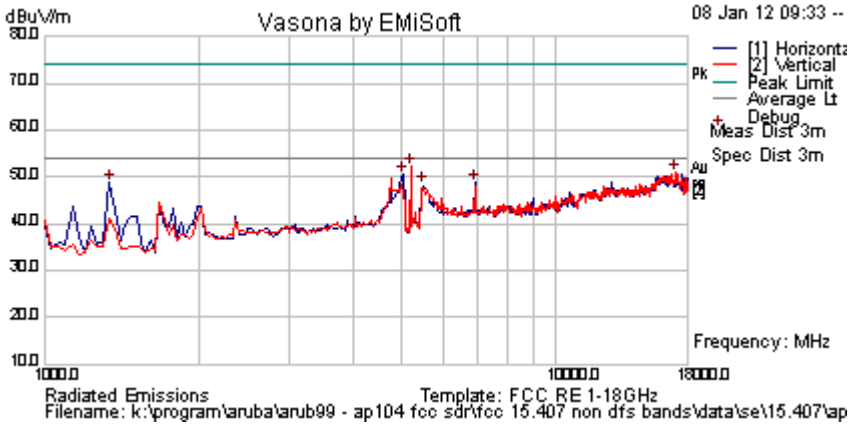
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

802.11a 5150 MHz Band-Edge



ART =13

Test Freq.	5200 MHz	**Engineer**	GMH
Variant	802.11a; 6 Mbs	**Temp (ºC)**	18
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	ART = 13	**Press. (mBars)**	1010
Antenna	AP-ANT-18	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

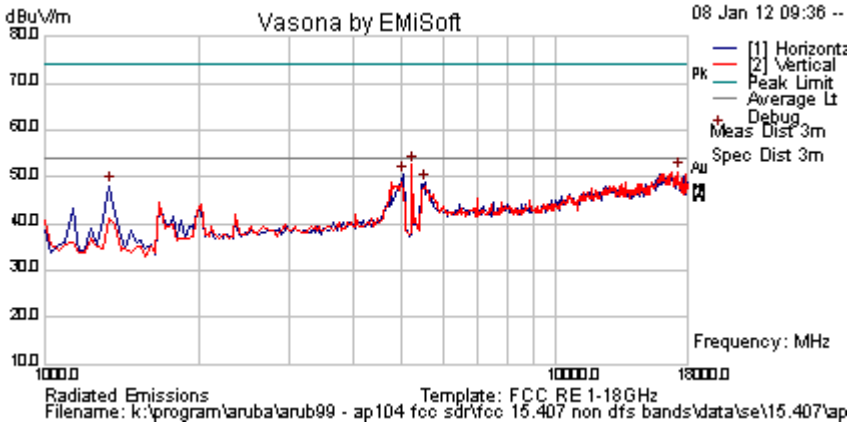


Formally measured emission peaks

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
5190.381	57.5	4.6	-9.9	52.2	Peak [Scan]	V						FUND
17114.228	41.9	8.5	0.5	50.8	Peak [Scan]	V	100	0	54.0	-3.2	Pass	NOISE
5020.040	55.7	4.6	-9.9	50.4	Peak [Scan]	H					Pass	BE
1340.681	60.3	2.3	-13.9	48.7	Peak [Scan]	H	100	0	54	-5.3	Pass	NRB
6927.856	49.8	5.4	-6.5	48.7	Peak [Scan]	H	100	0	54	-5.4	Pass	NRB
5496.994	53.1	4.6	-9.6	48.1	Peak [Scan]	H					Pass	BE

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5240 MHz	**Engineer**	GMH
Variant	802.11a; 6 Mbs	**Temp (ºC)**	18
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	ART = 13	**Press. (mBars)**	1010
Antenna	AP-ANT-18	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

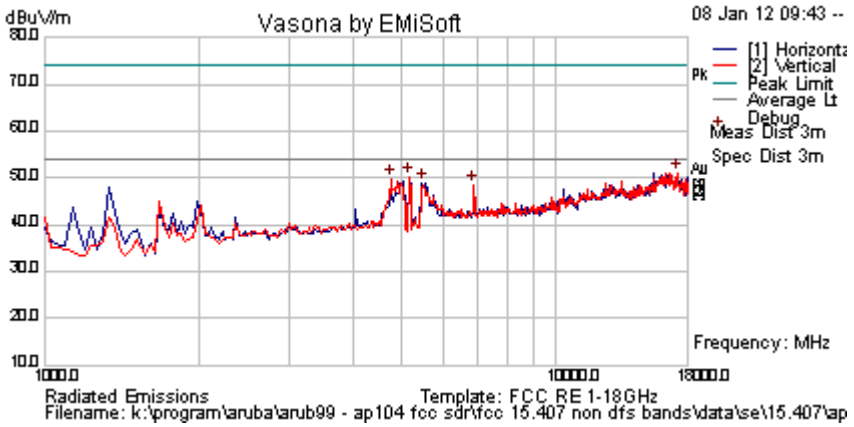


Formally measured emission peaks

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
5224.449	57.7	4.6	-9.8	52.5	Peak [Scan]	V						FUND
17284.569	41.4	8.6	1.1	51.2	Peak [Scan]	H	100	0	54.0	-2.9	Pass	NOISE
5020.040	55.8	4.6	-9.9	50.6	Peak [Scan]	H					Pass	BE
5531.062	53.9	4.6	-9.7	48.8	Peak [Scan]	H					Pass	BE
1340.681	59.8	2.3	-13.9	48.2	Peak [Scan]	H	100	0	54	-5.8	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5180 MHz	**Engineer**	GMH
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	18
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	ART = 13	**Press. (mBars)**	1010
Antenna	AP-ANT-18	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

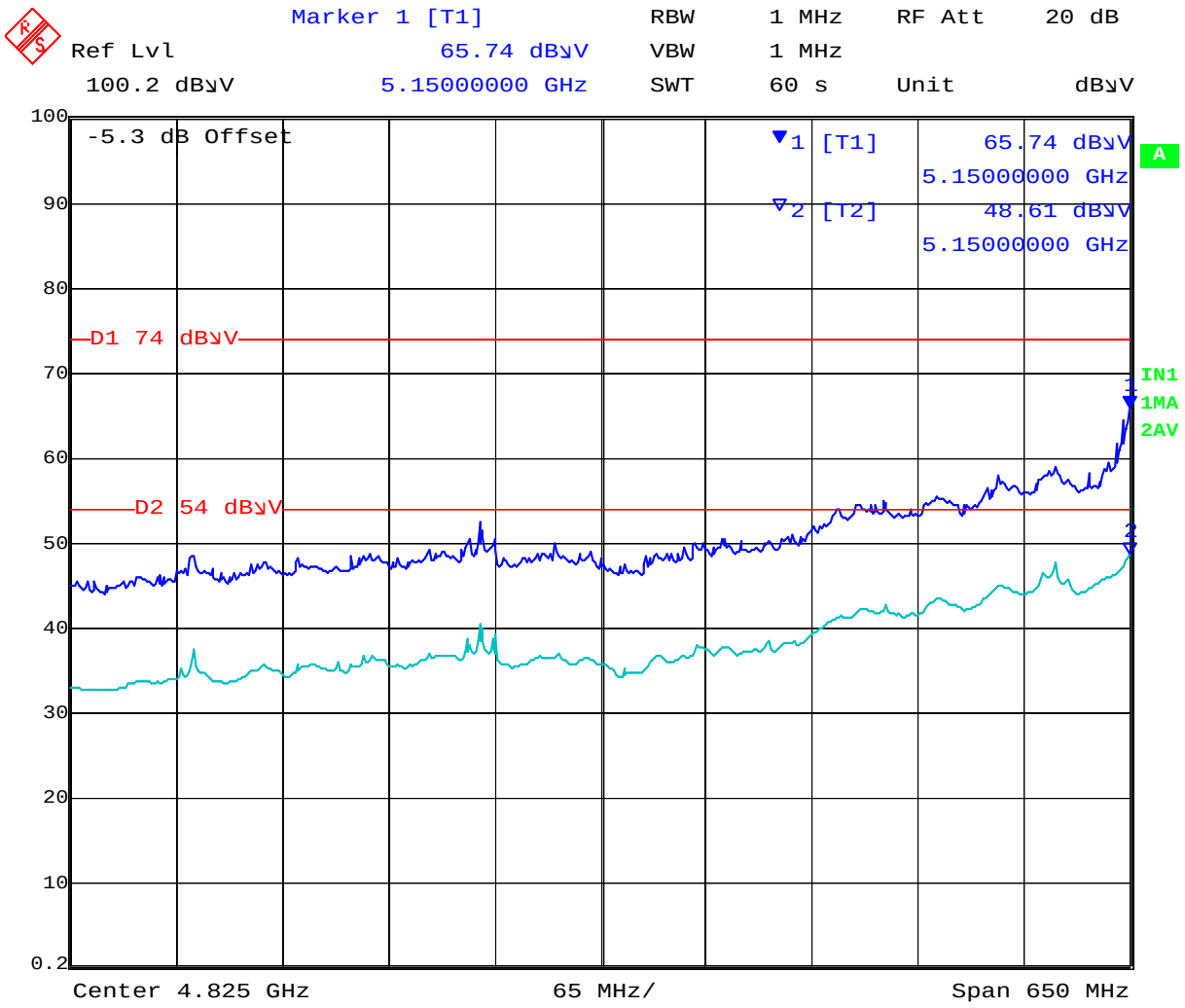


Formally measured emission peaks

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
17182.365	41.9	8.6	0.7	51.2	Peak [Scan]	V	100	0	54.0	-2.9	Pass	NOISE
5156.31263	55.5	4.6	-9.9	50.2	Peak [Scan]	V						FUND
4747.495	55.1	4.4	-9.7	49.8	Peak [Scan]	V					Pass	BE
5462.926	54.0	4.6	-9.7	49.0	Peak [Scan]	H					Pass	BE
6893.788	49.7	5.3	-6.5	48.5	Peak [Scan]	H	100	0	54	-5.5	Pass	NRB

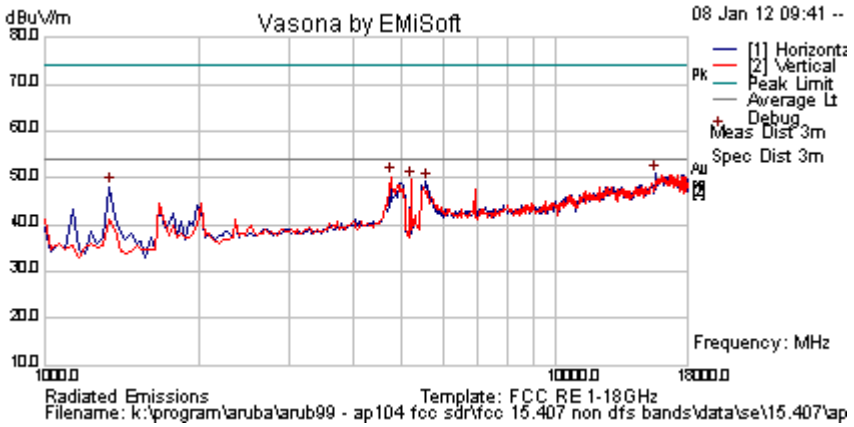
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

802.11n HT-20 5150 MHz Band-Edge



ART =13

Test Freq.	5200 MHz	**Engineer**	GMH
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	18
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	ART = 13	**Press. (mBars)**	1010
Antenna	Ant 18	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

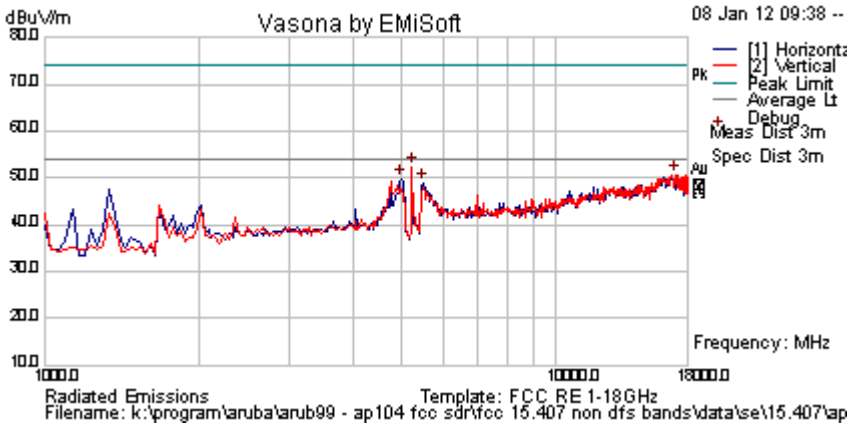


Formally measured emission peaks

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
15615.230	43.1	8.4	-0.6	51.0	Peak [Scan]	H	100	0	54.0	-3.0	Pass	NOISE
4747.49499	55.5	4.4	-9.7	50.2	Peak [Scan]	V					Pass	BE
5190.381	54.8	4.6	-9.9	49.6	Peak [Scan]	V						FUND
5565.130	54.3	4.7	-9.7	49.3	Peak [Scan]	H					Pass	BE
1340.681	59.7	2.3	-13.9	48.0	Peak [Scan]	H	100	0	54	-6.0	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5240 MHz	**Engineer**	GMH
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	18
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	ART = 13	**Press. (mBars)**	1010
Antenna	Ant 18	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

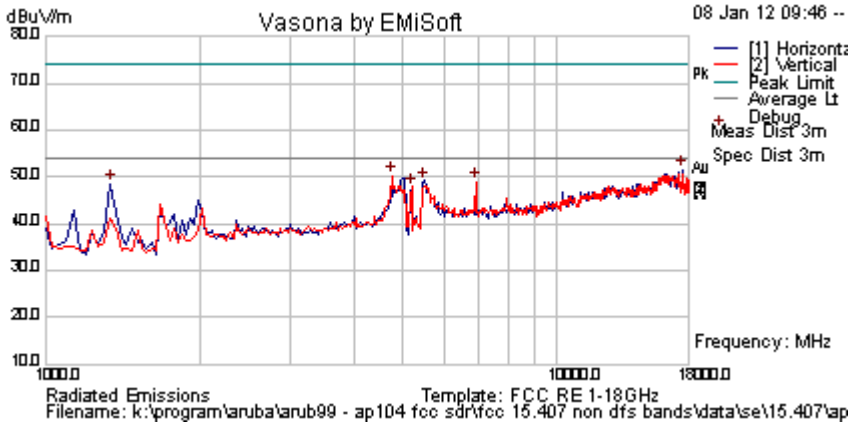


Formally measured emission peaks

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
5224.449	57.6	4.6	-9.8	52.4	Peak [Scan]	V						FUND
17114.228	41.7	8.5	0.5	50.7	Peak [Scan]	V	100	0	54.0	-3.3	Pass	NOISE
4985.972	55.1	4.6	-9.9	49.8	Peak [Scan]	H					Pass	BE
5496.994	54.1	4.6	-9.6	49.1	Peak [Scan]	H					Pass	BE

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5190 MHz	**Engineer**	GMH
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	18
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	ART = 12	**Press. (mBars)**	1010
Antenna	AP-ANT-18	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

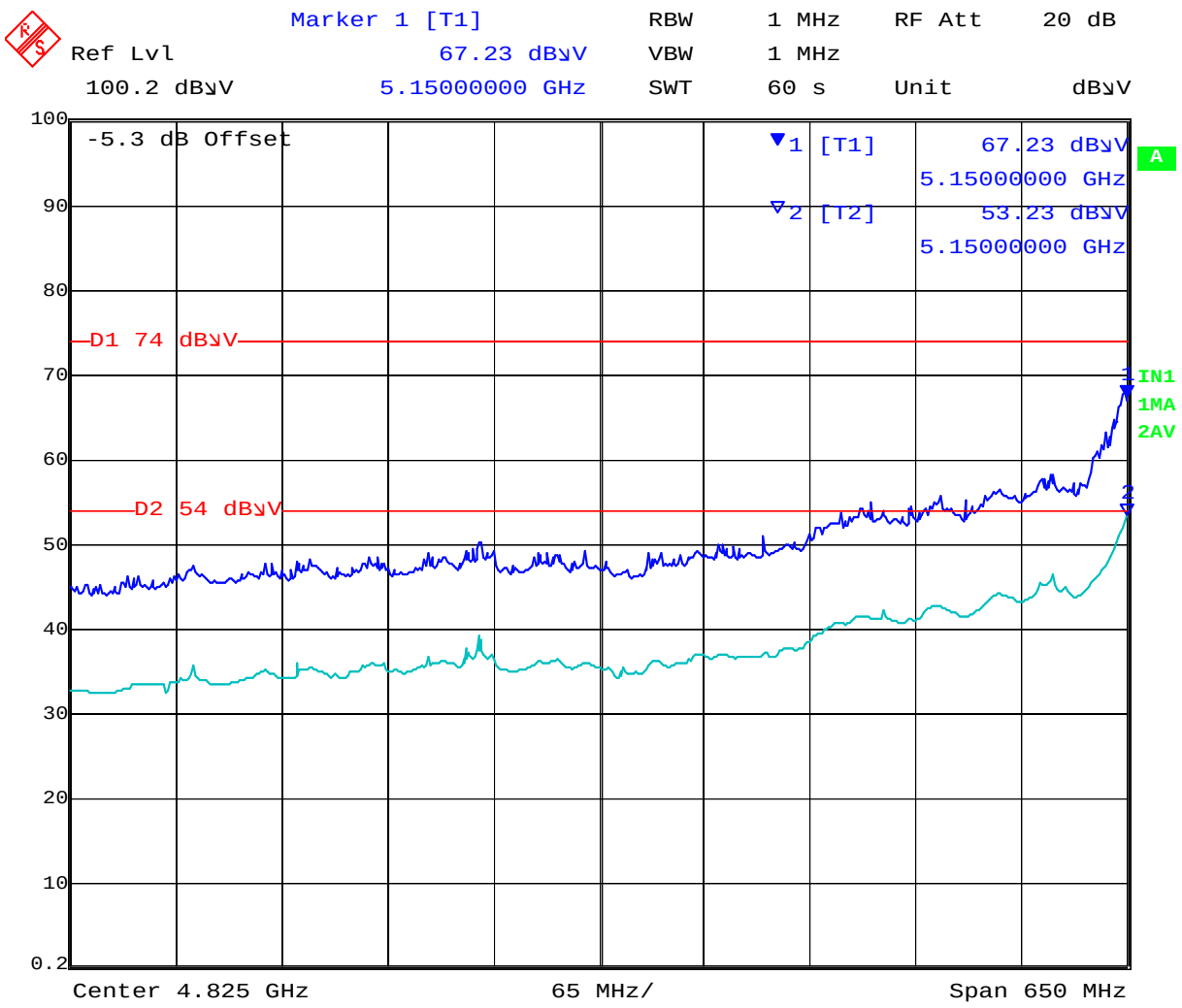


Formally measured emission peaks

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
17591.182	42.1	8.8	0.6	51.5	Peak [Scan]	H	100	0	54.0	-2.5	Pass	NOISE
4747.49499	55.5	4.4	-9.7	50.2	Peak [Scan]	V					Pass	BE
5496.994	54.2	4.6	-9.6	49.2	Peak [Scan]	H					Pass	BE
6927.856	50.1	5.4	-6.5	49.0	Peak [Scan]	V	100	0	54	-5.0	Pass	NRB
1340.681	60.2	2.3	-13.9	48.6	Peak [Scan]	H	100	0	54	-5.4	Pass	NRB
5190.381	53.3	4.6	-9.9	48.0	Peak [Scan]	V						FUND

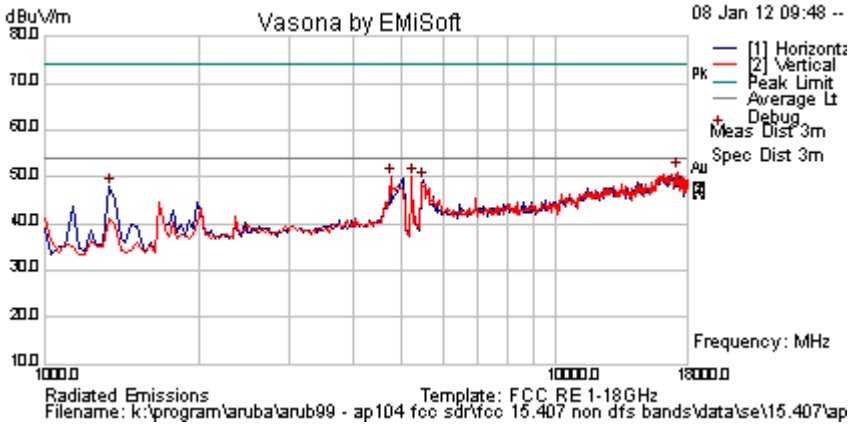
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

802.11n HT-40 5150 MHz Band-Edge



ART =12

Test Freq.	5230 MHz	**Engineer**	GMH
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	18
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	ART = 13	**Press. (mBars)**	1010
Antenna	AP-ANT-18	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



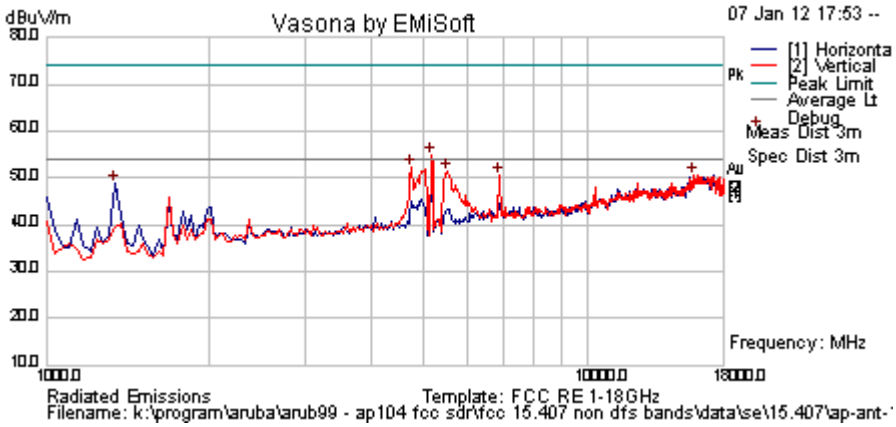
Formally measured emission peaks

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
17182.365	41.9	8.6	0.7	51.2	Peak [Scan]	H	100	0	54.0	-2.8	Pass	NOISE
5224.4489	55.2	4.6	-9.8	50.0	Peak [Scan]	V						FUND
4747.495	55.3	4.4	-9.7	50.0	Peak [Scan]	V					Pass	BE
5496.994	54.2	4.6	-9.6	49.2	Peak [Scan]	H					Pass	BE
1340.681	59.6	2.3	-13.9	48.0	Peak [Scan]	H	100	0	54	-6.0	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

AP-ANT-19

Test Freq.	5180 MHz	**Engineer**	GMH
Variant	802.11a; 6 Mbs	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	ART = 13	**Press. (mBars)**	1006
Antenna	Ant 19, 6 dBi	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

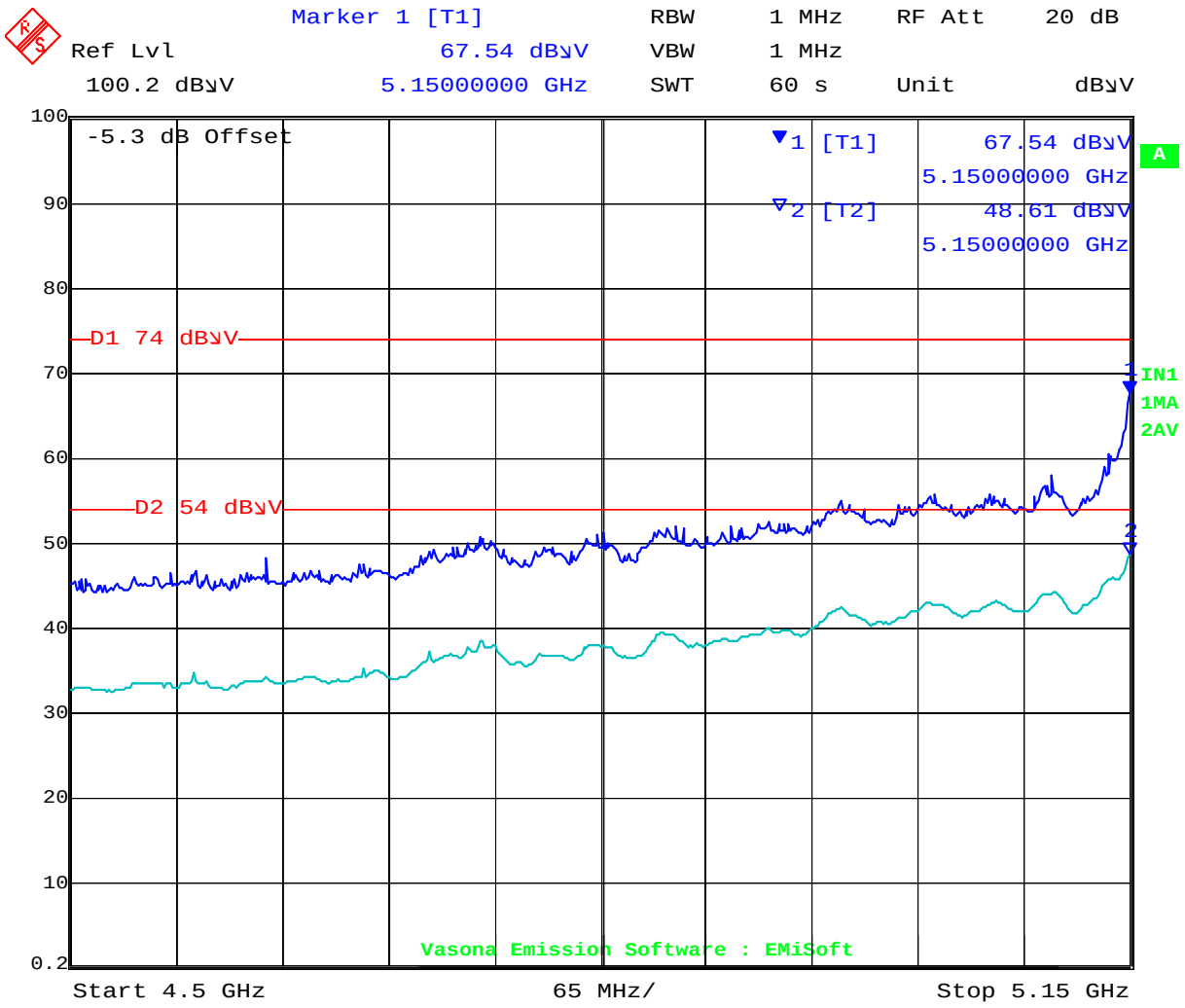


Formally measured emission peaks

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
5156.313	60.0	4.6	-9.9	54.7	Peak [Scan]	V						FUND
4747.49499	57.4	4.4	-9.7	52.1	Peak [Scan]	V					Pass	BE
5531.062	56.4	4.6	-9.7	51.4	Peak [Scan]	V					Pass	BE
6893.788	51.7	5.3	-6.5	50.5	Peak [Scan]	V	100	0	54	-3.5	Pass	NRB
15751.503	42.1	8.6	-0.3	50.4	Peak [Scan]	V	100	0	54	-3.6	Pass	NOISE
1340.681	60.4	2.3	-13.9	48.8	Peak [Scan]	H	100	0	54	-5.3	Pass	NRB

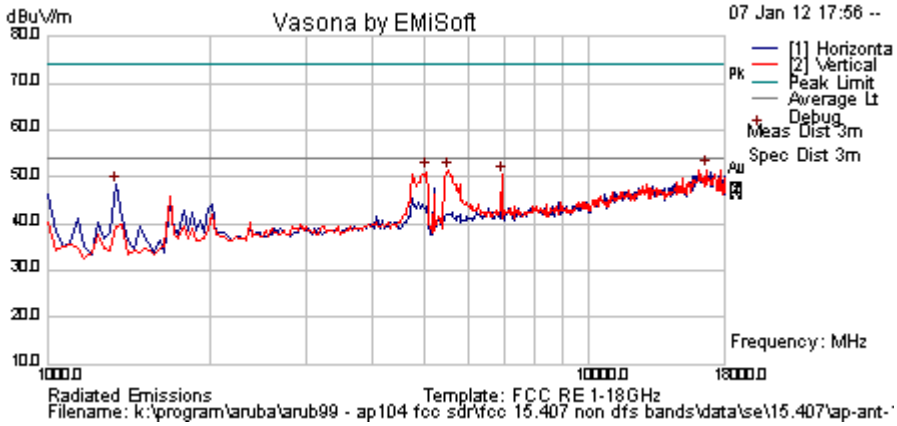
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

802.11a 5150 MHz Band-Edge



ART =13

Test Freq.	5200 MHz	**Engineer**	GMH
Variant	802.11a; 6 Mbs	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	ART = 13	**Press. (mBars)**	1006
Antenna	Ant 19, 6 dBi	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

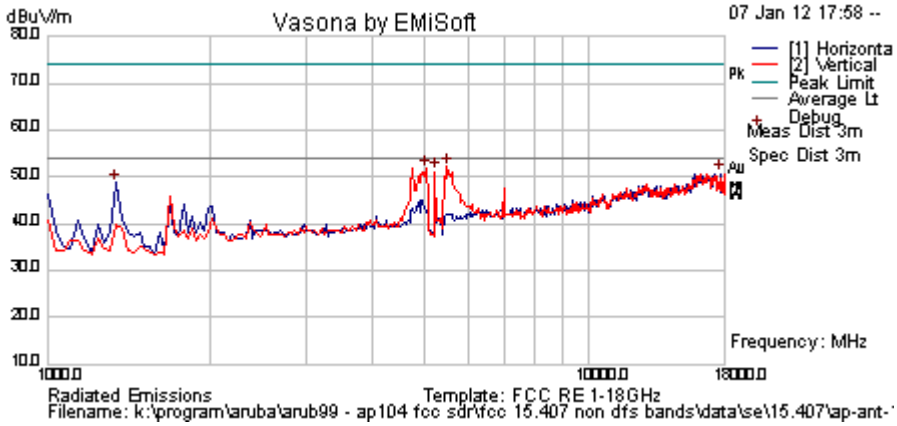


Formally measured emission peaks

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
16569.138	42.3	8.8	0.5	51.5	Peak [Scan]	V	100	0	54.0	-2.5	Pass	NOISE
5531.06212	56.3	4.6	-9.7	51.3	Peak [Scan]	V					Pass	BE
5020.040	56.4	4.6	-9.9	51.1	Peak [Scan]	V					Pass	BE
6927.856	51.6	5.4	-6.5	50.5	Peak [Scan]	V	100	0	54	-3.5	Pass	NRB
1340.681	60.0	2.3	-13.9	48.3	Peak [Scan]	H	100	0	54	-5.7	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5240 MHz	**Engineer**	GMH
Variant	802.11a; 6 Mbs	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	ART = 13	**Press. (mBars)**	1006
Antenna	Ant 19, 6 dBi	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

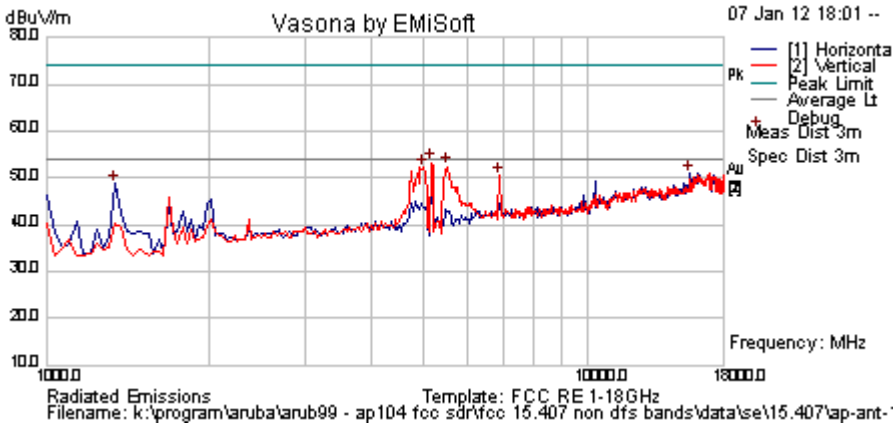


Formally measured emission peaks

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
5496.994	57.1	4.6	-9.6	52.1	Peak [Scan]	V					Pass	BE
5020.04008	57.0	4.6	-9.9	51.7	Peak [Scan]	V					Pass	BE
5224.449	56.3	4.6	-9.8	51.1	Peak [Scan]	V						FUND
17591.182	41.4	8.8	0.6	50.8	Peak [Scan]	H	100	0	54	-3.3	Pass	NOISE
1340.681	60.3	2.3	-13.9	48.7	Peak [Scan]	H	100	0	54	-5.3	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5180 MHz	**Engineer**	GMH
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	ART = 13	**Press. (mBars)**	1006
Antenna	ANT 19, 6dBi	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

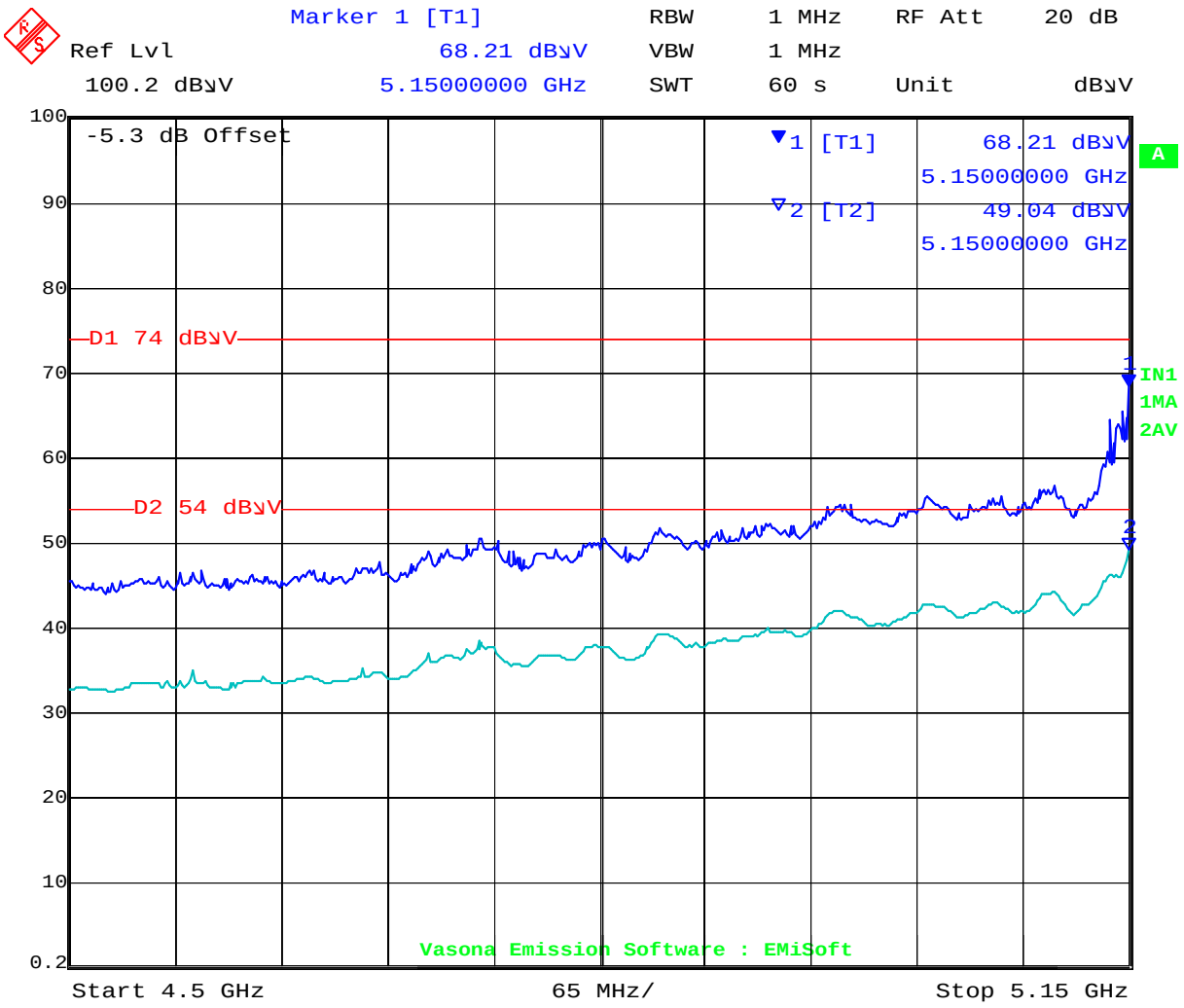


Formally measured emission peaks

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
5156.313	58.5	4.6	-9.9	53.2	Peak [Scan]	V						FUND
5531.06212	57.4	4.6	-9.7	52.3	Peak [Scan]	V					Pass	BE
4985.972	57.5	4.6	-9.9	52.3	Peak [Scan]	V					Pass	BE
15547.094	43.3	8.3	-0.6	51.0	Peak [Scan]	H	100	0	54	-3.0	Pass	NOISE
6893.788	51.7	5.3	-6.5	50.5	Peak [Scan]	V	100	0	54	-3.6	Pass	NRB
1340.681	60.3	2.3	-13.9	48.7	Peak [Scan]	H	100	0	54	-5.3	Pass	NRB

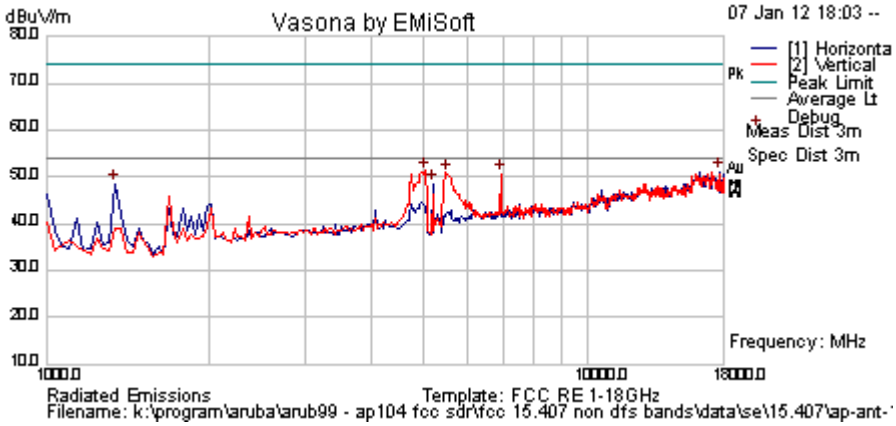
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

802.11n HT-20 5150 MHz Band-Edge



ART =13

Test Freq.	5200 MHz	**Engineer**	GMH
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	ART = 13	**Press. (mBars)**	1006
Antenna	ANT 19, 6dBi	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

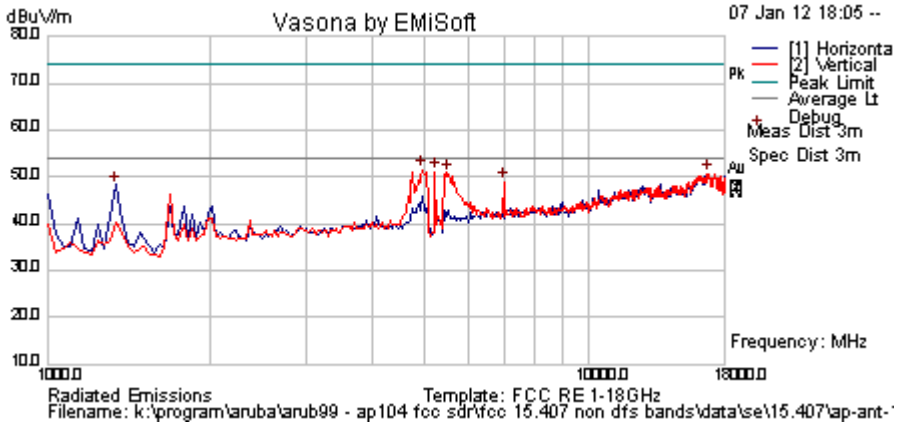


Formally measured emission peaks

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
5020.040	56.6	4.6	-9.9	51.3	Peak [Scan]	V					Pass	BE
17591.182	41.8	8.8	0.6	51.2	Peak [Scan]	H	100	0	54.0	-2.8	Pass	NOISE
5496.994	56.0	4.6	-9.6	51.0	Peak [Scan]	V					Pass	BE
6927.856	51.7	5.4	-6.5	50.6	Peak [Scan]	V	100	0	54	-3.4	Pass	NRB
1340.681	60.1	2.3	-13.9	48.5	Peak [Scan]	H	100	0	54	-5.5	Pass	NRB
5190.381	53.7	4.6	-9.9	48.5	Peak [Scan]	H						FUND

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5240 MHz	**Engineer**	GMH
Variant	802.11n HT-20; 6.5 MCS	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	ART = 13	**Press. (mBars)**	1006
Antenna	ANT 19, 6dBi	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

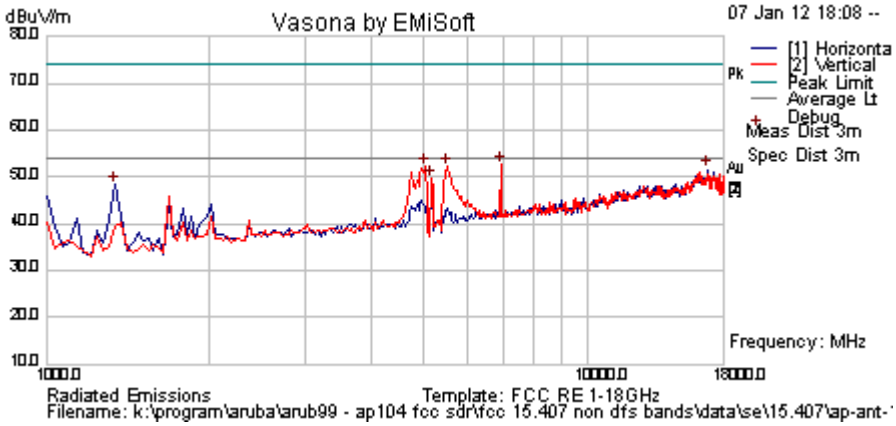


Formally measured emission peaks

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
4951.904	56.8	4.6	-9.8	51.5	Peak [Scan]	V					Pass	BE
5224.4489	56.4	4.6	-9.8	51.2	Peak [Scan]	H						FUND
5496.994	55.8	4.6	-9.6	50.8	Peak [Scan]	V					Pass	BE
16739.479	41.1	8.7	0.9	50.6	Peak [Scan]	V	100	0	54	-3.4	Pass	NOISE
6995.992	50.0	5.4	-6.4	49.0	Peak [Scan]	V	100	0	54	-5.0	Pass	NRB
1340.681	59.9	2.3	-13.9	48.3	Peak [Scan]	H	100	0	54	-5.7	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Test Freq.	5190 MHz	**Engineer**	GMH
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	ART = 13	**Press. (mBars)**	1006
Antenna	ANT 19, 6dBi	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

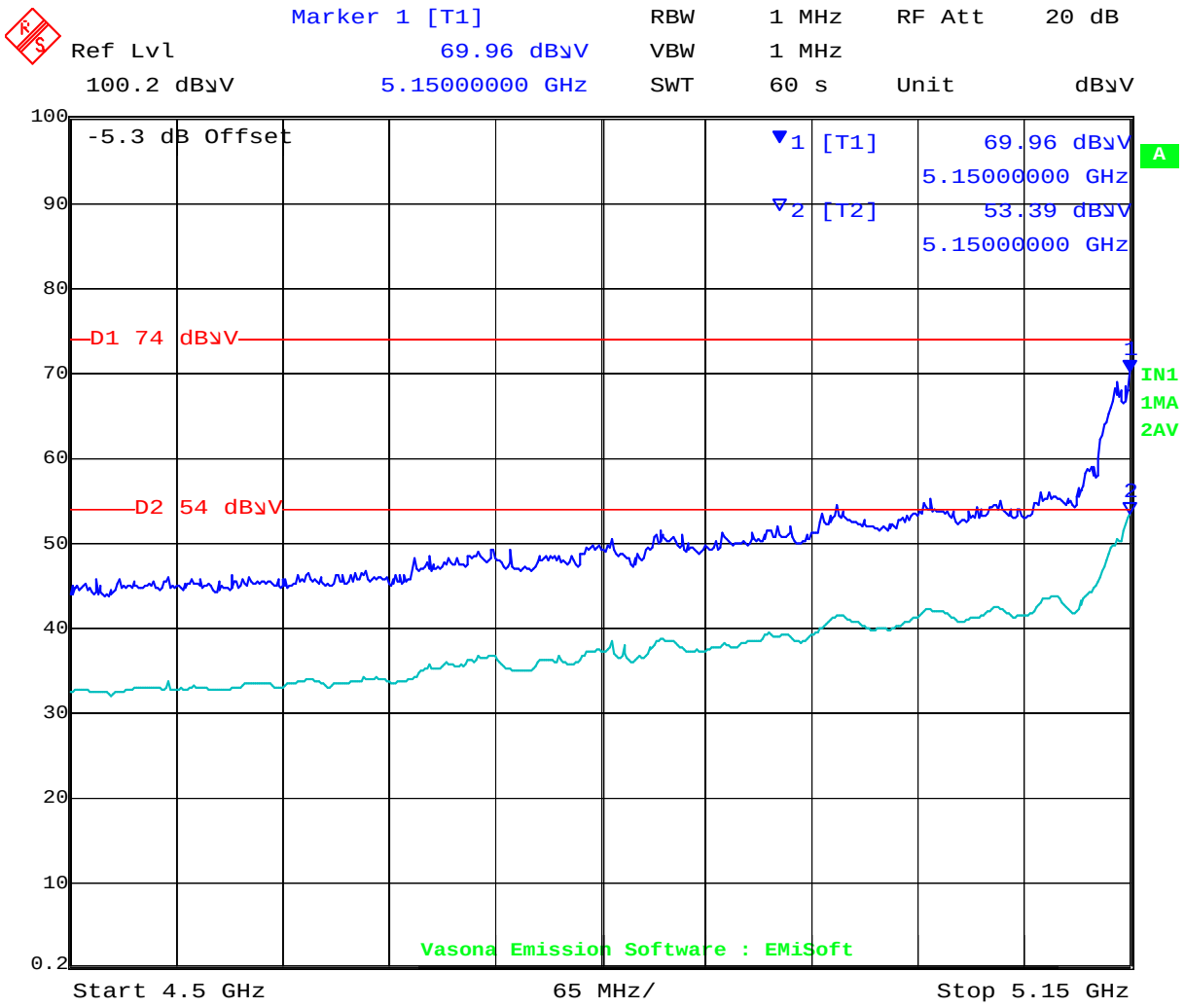


Formally measured emission peaks

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
6927.856	53.6	5.4	-6.5	52.5	Peak [Scan]	V	100	0	54.0	-1.5	Pass	NRB
5531.06212	57.3	4.6	-9.7	52.3	Peak [Scan]	V					Pass	BE
5020.040	57.5	4.6	-9.9	52.2	Peak [Scan]	V					Pass	BE
16807.615	42.0	8.6	0.8	51.5	Peak [Scan]	H	100	0	54	-2.6	Pass	NOISE
5156.313	54.8	4.6	-9.9	49.5	Peak [Scan]	V						FUND
1340.681	60.0	2.3	-13.9	48.4	Peak [Scan]	H	100	0	54	-5.6	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

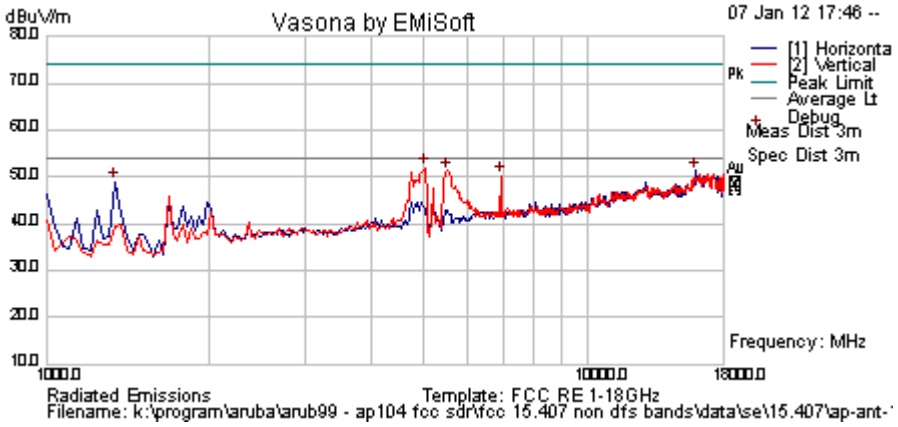
802.11n HT-40 5150 MHz Band-Edge



Date: 7.JAN.2012 18:29:15

ART=13

Test Freq.	5230 MHz	**Engineer**	GMH
Variant	802.11n HT-40; 13.5 MCS	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	ART = 13	**Press. (mBars)**	1006
Antenna	ANT 19, 6dBi	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			



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
5020.040	57.2	4.6	-9.9	52.0	Peak [Scan]	V					Pass	BE
15921.844	42.6	8.9	-0.1	51.4	Peak [Scan]	H	100	0	54.0	-2.7	Pass	NOISE
5531.062	56.3	4.6	-9.7	51.3	Peak [Scan]	V					Pass	BE
6927.856	51.3	5.4	-6.5	50.2	Peak [Scan]	V	100	0	54	-3.8	Pass	NRB
1340.681	60.7	2.3	-13.9	49.1	Peak [Scan]	H	100	0	54	-4.9	Pass	NRB

Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	NRB = Non-Restricted Band. Limit = 68.23 dBuV/m; RB = Restricted Band. Limits per 15.205

Specification

Limits

15.407 (b)(2). All emissions outside of the 5,150-5,350MHz band shall not exceed an EIRP of -27dBm/MHz.

§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.

RSS-210 §A9.3(2) For transmitters operating in the 5250-5350 MHz band, all emissions outside the 5150-5350 MHz band shall not exceed -27 dBm/MHz e.i.r.p. Devices operating in the 5250-5350 MHz band that generate emissions in the 5150-5250 MHz band shall not exceed out of band emission limit of 27 dBm/MHz e.i.r.p. in the 5150-5250 MHz band in order to operate indoor/outdoor, or alternatively shall comply with the spectral power density for operation within the 5150-5250 MHz band and shall be labeled “for indoor use only”.

RSS-Gen §4.7 The search for unwanted emissions shall be from the lowest frequency internally generated or used in the device (local oscillator, intermediate of carrier frequency), or from 30 MHz , whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

RSS-Gen §6 Receiver Spurious Emission Standard
If a radiated measurement is made, all spurious emissions shall comply with the limits of the following Table. The resolution bandwidth of the spectrum analyzer shall be 100 kHz for spurious emission measurements below 1.0 GHz and 1.0 MHz for measurements above 1.0 GHz

§15.209 (a) 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

5.1.7.2. Receiver Radiated Spurious Emissions (above 1 GHz)

Industry Canada RSS-Gen §4.10, §6

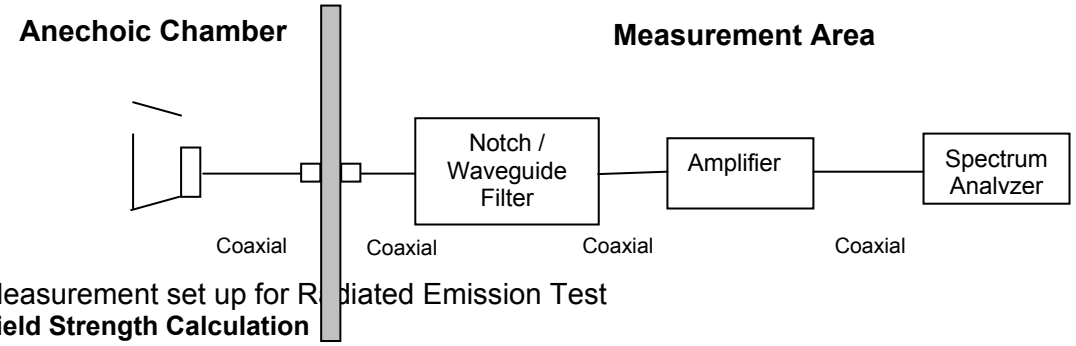
Test Procedure

Radiated emissions above 1 GHz are measured in the anechoic chamber at a 3-meter distance on every azimuth in both horizontal and vertical polarities. The emissions are recorded and maximized as a function of azimuth by rotation through 360° with a spectrum analyzer in peak hold mode. Depending on the frequency band spanned a notch filter and waveguide filter was used to remove the fundamental frequency. The highest emissions relative to the limit are listed for each frequency spanned.

All measurements on any frequency or frequencies over 1 MHz are based on the use of measurement instrumentation employing an average detector function. All measurements above 1 GHz were performed using a minimum resolution bandwidth of 1 MHz.

All Sectors of the EUT were tested simulatneously

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. All factors are included in the reported data.

FS = R + AF + CORR - FO

where: FS = Field Strength
R = Measured Spectrum analyzer Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain
FO = Distance Falloff Factor
NFL = Notch Filter Loss or Waveguide Loss

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

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

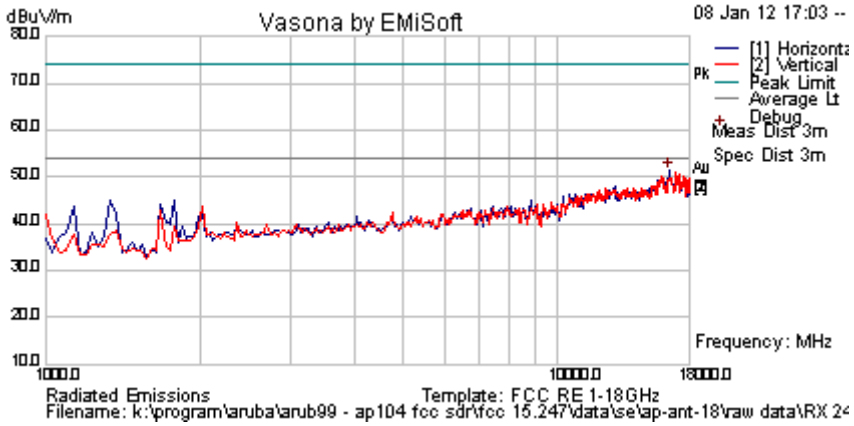
Conversion between dBμV/m (or dBμV) and μV/m (or μV) are done as:

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

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

Section 5.1.6.1 Transmitter Spurious above 1 GHz identifies that emissions peaking above 54 dBμV/m emanate from the EUT and not transmitted through the antenna port. These (1 – 3.5 GHz) emissions were formally measured and characterized and are not considered when examining Receiver Radiated Spurious above 1 GHz.

Test Freq.	2412 MHz	**Engineer**	GMH
Variant	Receive in Test Utility	**Temp (ºC)**	18.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	34
Power Setting	Not Applicable in Receive Mode	**Press. (mBars)**	1010
Antenna	AP-ANT-18		
Test Notes 1			
Test Notes 2			

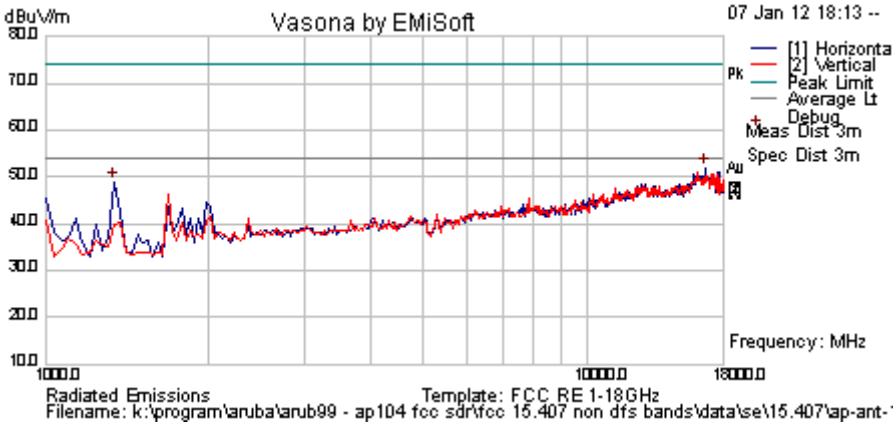


Formally measured emission peaks

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
17318.637	41.6	8.7	1.2	51.5	Peak [Scan]	V	100	0	54	-2.6	Pass	NOISE

Legend:	RB = Restricted Band; NRB = Non-Restricted Band; FUND = Fundamental Freq.
	BE = Emission in Restricted Band Nearest Transmission Band Edge;

Test Freq.	5180 MHz	**Engineer**	GMH
Variant	Receive in Test Utility	**Temp (ºC)**	20
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	Not Applicable in Receive Mode	**Press. (mBars)**	1006
Antenna	AP-ANT 19, 6dBi		
Test Notes 1			
Test Notes 2			



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
15989.980	42.7	9.0	0.1	51.8	Peak [Scan]	H	100	0	54	-2.2	Pass	NOISE
1340.681	60.1	2.3	-13.9	48.4	Peak [Scan]	H	100	0	54	-5.6	Pass	NRB

Legend:	RB = Restricted Band; NRB = Non-Restricted Band; FUND = Fundamental Freq.
	BE = Emission in Restricted Band Nearest Transmission Band Edge;

Specification

Receiver Radiated Spurious Emissions

Industry Canada RSS-Gen §4.10,
The search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tunable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

RSS-Gen §6
The following receiver spurious emission limits shall be complied with;
(a) If a radiated measurement is made, all spurious emissions hall comply with the limits of Table 1.

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

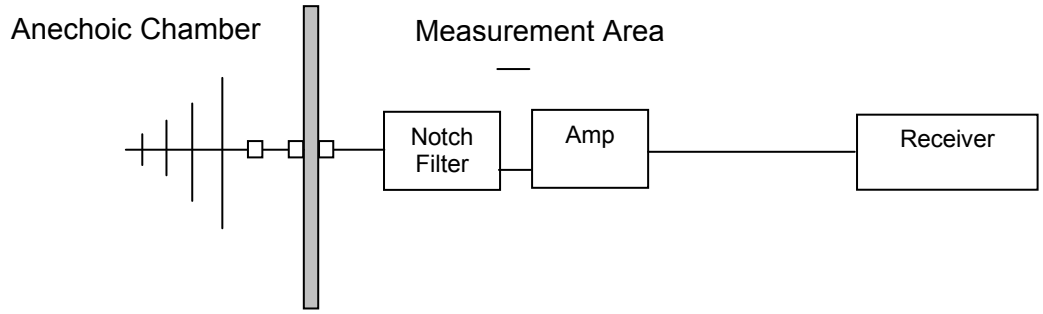
5.1.7.3. Radiated Spurious Emissions (30M-1 GHz)

FCC, Part 15 Subpart C §15.407(b)(6); §15.205(a); §15.209(a)
Industry Canada RSS-210 §2.2

Test Procedure
Preliminary radiated emissions are measured in the anechoic chamber at a 10-meter distance on every azimuth in both horizontal and vertical polarity. The emissions are recorded with a spectrum analyzer 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, Both modes were tested.

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)

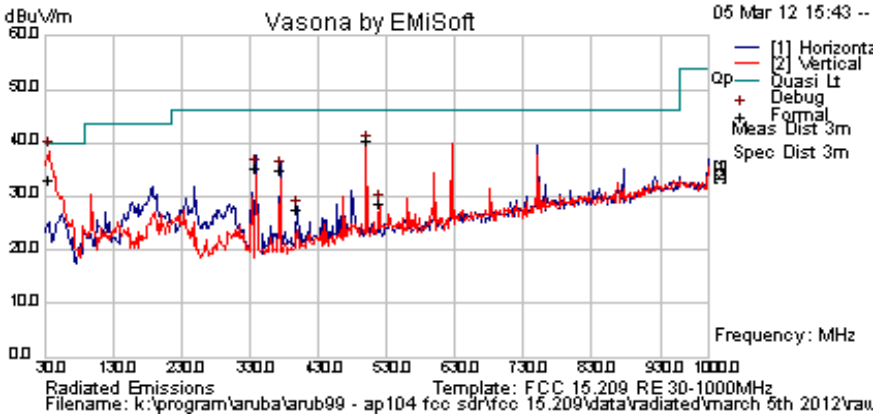
Ambient conditions.
Temperature: 17 to 23 °C Relative humidity: 31 to 57 % Pressure: 999 to 1012 mbar

For emissions below 1 GHz the AP-105 Wireless Access Point ports were fully loaded and exercised;

TABLE OF RESULTS

12V dc Operation

Test Freq.	Channel 1 (g) + 100+ (HT-40)	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	21.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	33
Power Setting	Beaconing Maximum	**Press. (mBars)**	1000
Antenna	System tested with 2XAP-ANT-18 + 2XAP-ANT-19;		
Test Notes 1	Ferrites changed "R150 & R189";		
Test Notes 2	Gasket on the shielding ;removed ground from shield of RJ45;110vac;15.209 Limits		



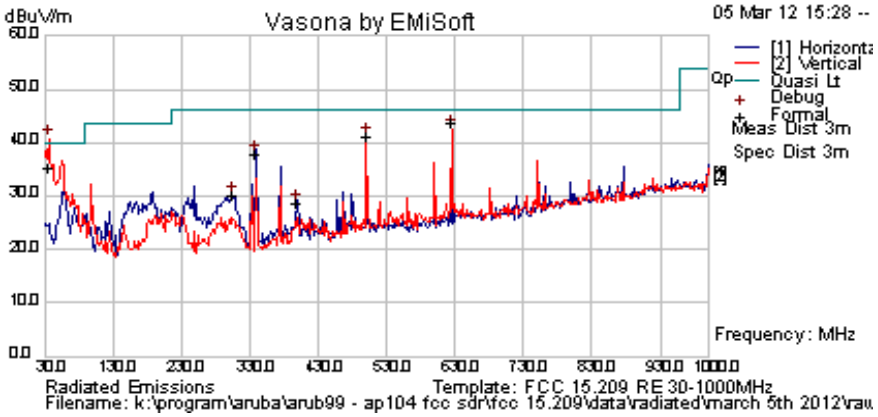
Formally measured emission peaks

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
37.106	44.0	3.5	-14.5	33.0	Quasi Max	V	159	149	40.0	-7.0	Pass	
499.991	46.9	6.0	-12.4	40.4	Quasi Max	V	115	360	46.0	-5.6	Pass	
339.355	45.6	5.4	-15.8	35.2	Peak [Scan]	H	98	360	46.0	-10.8	Pass	
373.860	44.4	5.6	-15.0	35.0	Peak [Scan]	H	98	360	46.0	-11.0	Pass	
519.915	34.7	6.1	-12.2	28.6	Peak [Scan]	V	98	360	46.0	-17.4	Pass	
399.065	36.2	5.7	-14.4	27.5	Peak [Scan]	H	98	360	46.0	-18.5	Pass	

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

TABLE OF RESULTS – POE Power Supply

Test Freq.	Channel 1 (g) + 100+ (HT-40)	**Engineer**	SB
Variant	Digital Emissions	**Temp (ºC)**	21.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	35
Power Setting	Beaconing Maximum	**Press. (mBars)**	1007
Antenna	System tested with 2XAP-ANT-18 + 2XAP-ANT-19		
Test Notes 1	EUT powered via POE connected to switch; Ferrites changed "R150 & R189";		
Test Notes 2	Gasket on the shielding ;removed ground from shield of RJ45;15.209 Limits		



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
37.242	46.2	3.5	-14.5	35.3	Quasi Max	V	102	161	40	-4.8	Pass	
625.000	47.8	6.5	-10.5	43.7	Quasi Max	V	105	203	46	-2.3	Pass	
500.504	42.0	6.0	-12.4	35.6	Quasi Max	H	103	52	46.0	-10.4	Pass	
339.186	48.2	5.4	-15.8	37.8	Peak [Scan]	H	105	202	46	-8.2	Pass	
304.291	41.4	5.2	-16.6	30.1	Peak [Scan]	H	105	202	46	-15.9	Pass	
399.142	37.6	5.7	-14.4	28.8	Peak [Scan]	H	105	202	46	-17.2	Pass	

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

§15.407(b)(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209.

§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.

RSS-210 §2.2 refers to Section 2.7 Table 2 below;-

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

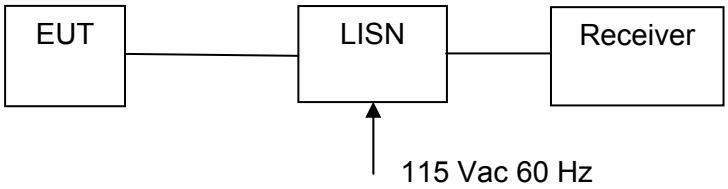
5.1.8. AC Wireline Conducted Emissions (150 kHz – 30 MHz)

FCC, Part 15 Subpart C §15.407(b)(6)/15.207
Industry Canada RSS-Gen §7.2.2

Test Procedure

The EUT is configured in accordance with ANSI C63.4. The conducted emissions are measured in a shielded room with a spectrum analyzer in peak hold in the first instance. Emissions closest to the limit are measured in the quasi-peak mode (QP) with the tuned receiver using a bandwidth of 9 kHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

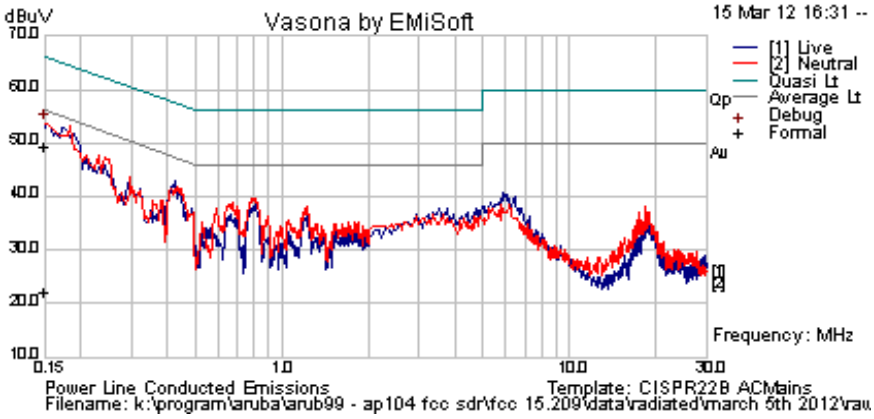
Test Measurement Set up



Measurement set up for AC Wireline Conducted Emissions Test

Measurement Results for AC Wireline Conducted Emissions (150 kHz – 30 MHz)

Test Freq.	N/A	**Engineer**	SB
Variant	AC Line Emissions	**Temp (ºC)**	24.5
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum.(%)**	37
Power Setting	20	**Press. (mBars)**	1004
Antenna	System tested with 2XAP-ANT-18 + 2XAP-ANT-19		
Test Notes 1	AP105 board in AP104 chassis ; Ferrites changed "R150 & R189";		
Test Notes 2	Gasket on the shielding ;removed ground from shield of RJ45;110vac;		



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.150	39.3	9.9	0.1	49.3	Quasi Peak	Neutral	66	-16.7	Pass	
0.150	12.2	9.9	0.1	22.1	Average	Neutral	56	-33.9	Pass	

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

Limit

§15.407 (b)(6); Any U-NII devices using an AC power line are required to comply also with the limits set forth in Section 15.207.

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μΩ line impedance stabilization network (LISN), see §15.207 (a) matrix below. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

RSS-Gen §7.2.2
The radio frequency voltage that is conducted back into the AC power lines in the frequency range of 0.15 MHz to 30 MHz shall not exceed the limits shown in the table below. The tighter limit applies at the frequency range boundaries.

§15.207 (a) and **RSS-Gen §7.2.2** Limit Matrix
The lower limit applies at the boundary between frequency ranges

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency

Laboratory Measurement Uncertainty for Conducted Emissions

Measurement uncertainty	±2.64 dB

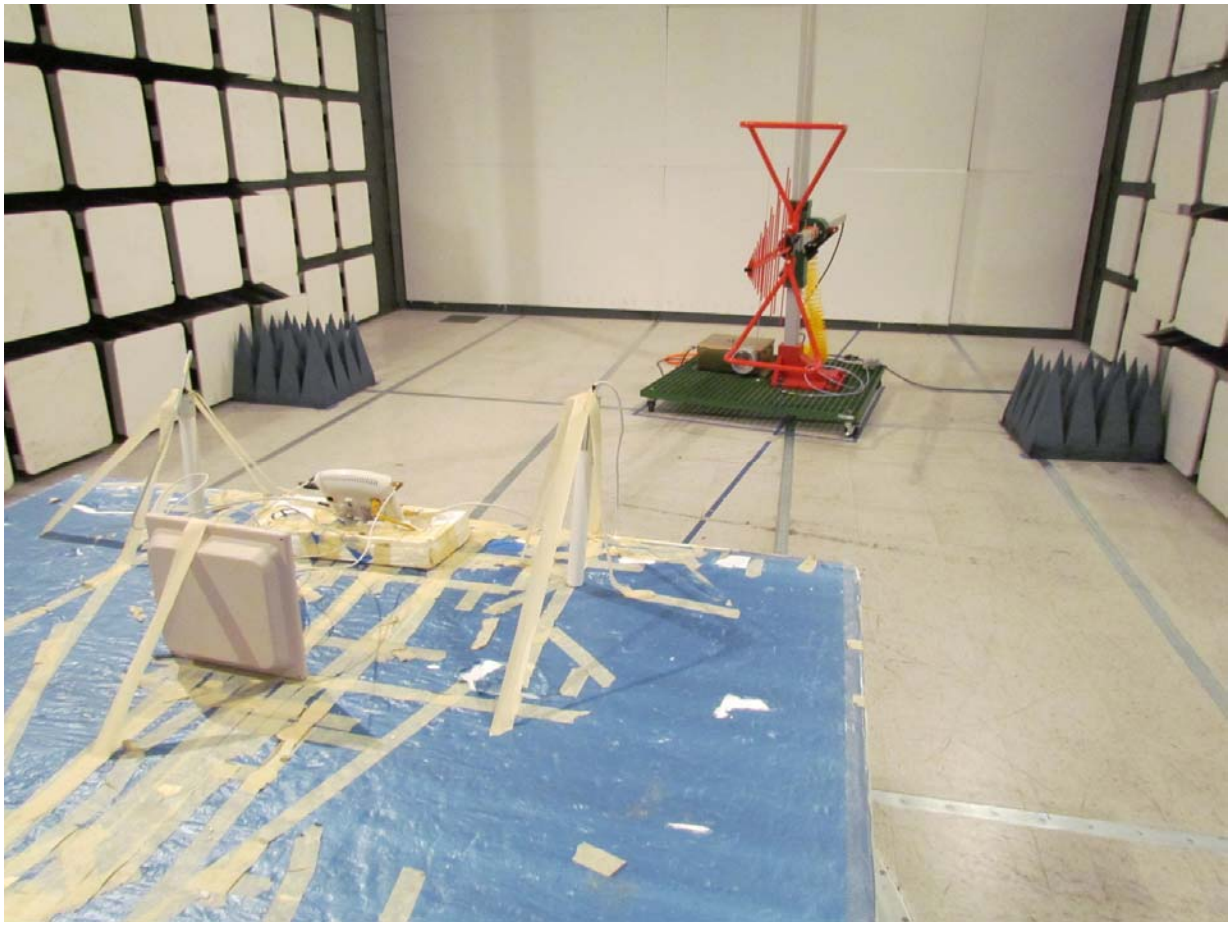
Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-EMC-01 'Measurement of Conducted Emissions'	0158, 0184, 0287, 0190, 0293, 0307

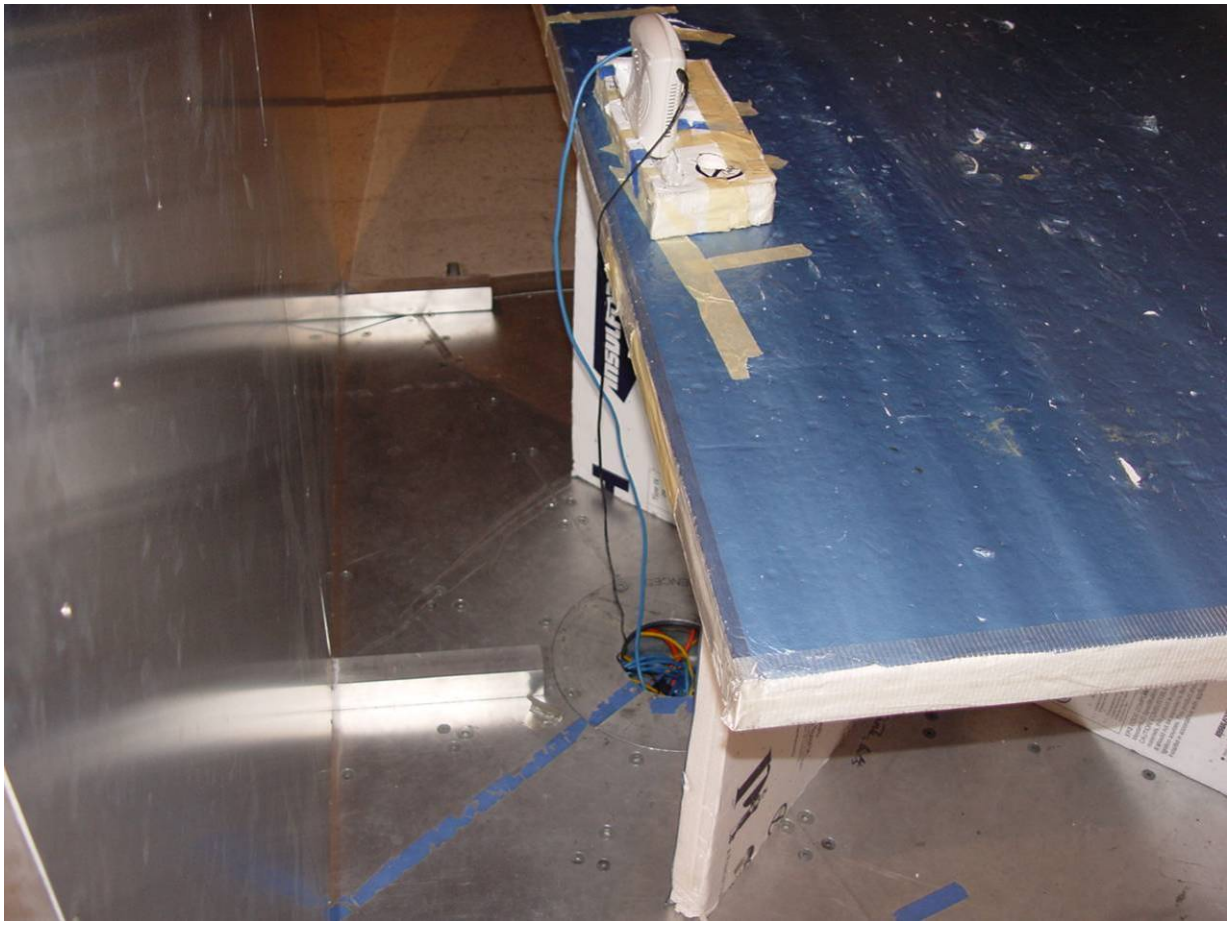
6. PHOTOGRAPHS

6.1. Radiated Emissions > 1GHz

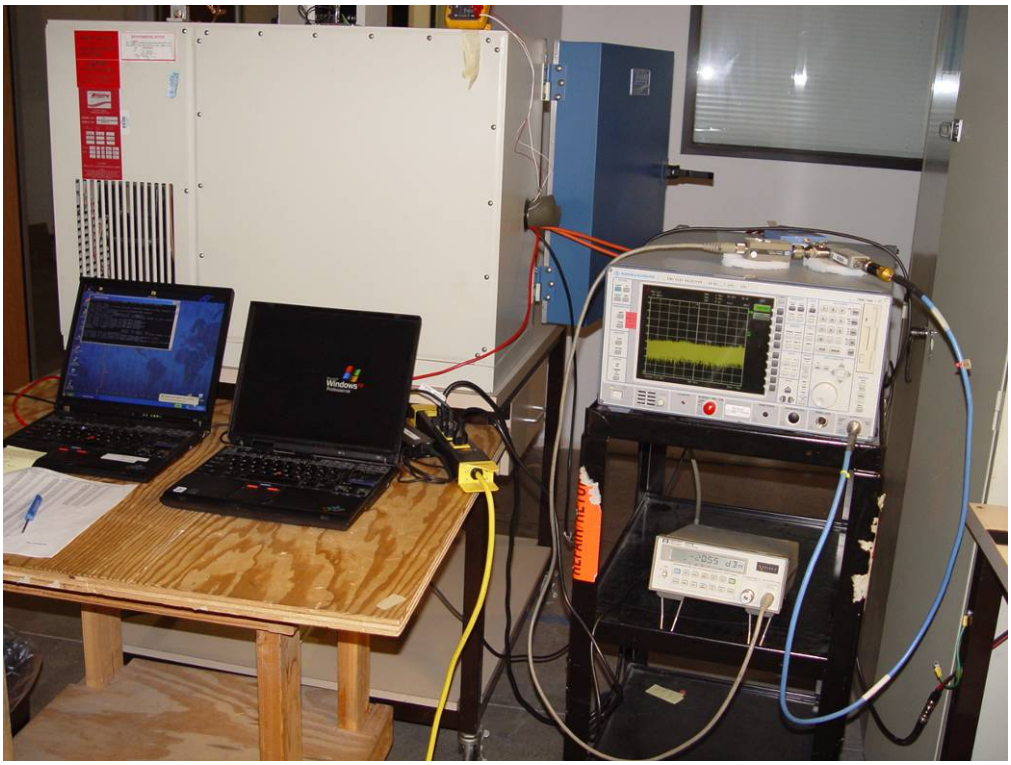
6.2. Radiated Emissions < 1GHz



6.3. AC Wireline Conducted Emissions



6.4. Conducted RF Measurement Test Set-Up



7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #	Calibration Due Date
0070	Power Meter	Hewlett Packard	437B	3125U11552	28th Nov 12
0117	Power Sensor	Hewlett Packard	8487D	3318A00371	15th Nov 12
0223	Power Meter	Hewlett Packard	EPM-442A	US37480256	15th Nov 12
0374	Power Sensor	Hewlett Packard	8485A	3318A19694	29th Nov 12
0158	Barometer /Thermometer	Control Co.	4196	E2846	8th Dec 12
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007	2nd Dec 12
0287	EMI Receiver	Rhode & Schwartz	ESIB40	100201	16th Nov 12
0338	30 - 3000 MHz Antenna	Sunol	JB3	A052907	8th Nov 12
0335	1-18 GHz Horn Antenna	EMCO	3117	00066580	7th Nov 12
0252	SMA Cable	Megaphase	Sucoflex 104	None	N/A
0293	BNC Cable	Megaphase	1689 1GVT4	15F50B001	N/A
0307	BNC Cable	Megaphase	1689 1GVT4	15F50B002	N/A
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	209089-001	N/A
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	209092-001	N/A
0314	30dB N-Type Attenuator	ARRA	N9444-30	1623	N/A
0301	5.6 GHz Notch Filter	Micro-Tronics	RBC50704	001	N/A
0302	5.25 GHz Notch Filter	Micro-Tronics	BRC50703	002	N/A
0303	5.8 GHz Notch Filter	Micro-Tronics	BRC50705	003	N/A
0304	2.4GHzHz Notch Filter	Micro-Tronics	--	001	N/A

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