

Test of Juniper Networks WLA321 Wireless LAN
Access Point

To: FCC 47 CFR Part 15.247 & IC RSS-210

Test Report Serial No.: JNIP16-U1 Rev A



TEST REPORT

FROM



Test of Juniper Networks WLA321 Wireless LAN Access Point

to

To FCC 47 CFR Part 15.247 & IC RSS-210

Test Report Serial No.: JNIP16-U1 Rev A

Note: this report contains data with regard to the 2400 to 2483.5 MHz and 5725 to 5850 MHz operational modes of the Juniper Networks WLA321 Wireless Access Point.

This report supersedes: NONE

Applicant: Juniper Networks, Inc
1194 North Mathilda Avenue
Sunnyvale
California 94089, USA

Product Function: Wireless LAN Access Point

Copy No: pdf Issue Date: 28th March 2012

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.

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TEST CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory



Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 3 of 221

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TABLE OF CONTENTS

ACCREDITATION, LISTINGS & RECOGNITION	5
TESTING ACCREDITATION	5
RECOGNITION	6
PRODUCT CERTIFICATION	7
1. TEST RESULT CERTIFICATE	9
2. REFERENCES AND MEASUREMENT UNCERTAINTY	10
2.1. Normative References	10
2.2. Test and Uncertainty Procedures	11
3. PRODUCT DETAILS AND TEST CONFIGURATIONS	12
3.1. Technical Details	12
3.2. Scope of Test Program	13
3.3. Equipment Model(s) and Serial Number(s)	16
3.4. Antenna Details	16
3.5. Cabling and I/O Ports	16
3.6. Test Configurations	17
3.7. Equipment Modifications	19
3.8. Deviations from the Test Standard	20
4. TEST SUMMARY	21
5. TEST RESULTS	23
5.1. Device Characteristics	23
5.1.1. <i>6 dB and 99 % Bandwidth</i>	23
5.1.2. <i>Peak Output Power</i>	72
5.1.3. <i>Peak Power Spectral Density</i>	83
5.1.4. <i>Maximum Permissible Exposure</i>	132
5.1.5. <i>Conducted Spurious Emissions</i>	133
5.1.6. <i>Radiated Emissions</i>	176
5.1.7. <i>AC Wireline Conducted Emissions (150 kHz – 30 MHz)</i>	215
6. PHOTOGRAPHS	217
6.1. Conducted Test Setup	217
6.2. Radiated Test Setup < 1 GHz	218
6.3. Radiated Test Setup > 1 GHz	219
7. TEST EQUIPMENT DETAILS	220



Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 5 of 221

ACCREDITATION, LISTINGS & RECOGNITION

TESTING ACCREDITATION

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



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.

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 6 of 221

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

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 7 of 221

PRODUCT CERTIFICATION

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



The American Association for Laboratory Accreditation

"World Class Accreditation"

Accredited Product Certification Body

A2LA has accredited

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for technical competence as a

Product Certification Body

This product certification body is accredited in accordance with the recognized International Standard ISO/IEC Guide 65:1996 *General requirements for bodies operating product certification systems*. This accreditation demonstrates technical competence for a defined scope and the operation of a quality management system.

Presented this 27th day of March 2012.



President & CEO
For the Accreditation Council
Certificate Number 2381.02
Valid to November 30, 2013

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

USA Telecommunication Certification Body (TCB) - TCB Identifier – US0159

Industry Canada Certification Body - CAB Identifier – US0159

European Notified Body - Notified Body Identifier - 2280

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

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 8 of 221

DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	28 th March 2012	Initial release.

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 9 of 221

1. TEST RESULT CERTIFICATE

Manufacturer:	Juniper Networks, Inc 1194 North Mathilda Avenue Sunnyvale California 94089, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT:	Wireless LAN Access Point	Telephone:	+1 925 462 0304
Model:	WLA321-US	Fax:	+1 925 462 0306
S/N's:	Conducted unit not available Radiated: MA351110064		
Test Date(s):	2nd February to 11th March 2012	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15.247 & IC RSS-210	EQUIPMENT COMPLIES

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

Notes:

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

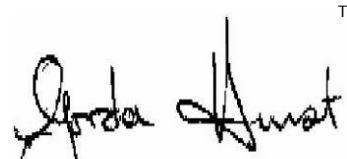
Approved & Released for MiCOM Labs, Inc. by:



TEST CERTIFICATE #2381.01



Graeme Grieve
Quality Manager MiCOM Labs,



Gordon Hurst
President & CEO MiCOM Labs, Inc.

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2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
i.	FCC 47 CFR Part 15, Subpart C	2010	Title 47: Telecommunication PART 15—RADIO FREQUENCY DEVICES Subpart C—Intentional Radiators
ii.	RSS-210 Annex 8	2010	Radio Standards Specification 210, Issue 8, Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment
iii.	FCC OET KDB 662911	4 th April 2011	Emissions Testing of Transmitters with Multiple Outputs in the Same Band
iv.	RSS-GEN	2010	Radio Standards Specification-Gen, Issue 3, General Requirements and Information for the Certification of Radiocommunication Equipment
v.	FCC 47 CFR Part 15, Subpart B	2010	47 CFR Part 15, SubPart B; Unintentional Radiators
vi.	ICES-003	2004	Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard Digital Apparatus; Issue 4
vii.	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
viii.	CISPR 22/ EN 55022	2008 2006+A1:2007	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
ix.	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
x.	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
xi.	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
xii.	A2LA	9th June 2010	Reference to A2LA Accreditation Status – A2LA Advertising Policy

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 11 of 221

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.

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 12 of 221

3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the Juniper Networks WLA321 Wireless LAN Access Point to FCC Part 15.247 and Industry Canada RSS-210 regulations.
Applicant:	Juniper Networks, Inc 1194 North Mathilda Avenue Sunnyvale California 94089, USA
Manufacturer:	As applicant.
Laboratory performing the tests:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	JNIP16-U1 Rev A
Date EUT received:	2nd February 2012
Standard(s) applied:	FCC 47 CFR Part 15.247 & IC RSS-210
Dates of test (from - to):	2nd February to 11th March 2012
No of Units Tested:	Two, Conducted + Radiated
Type of Equipment:	Wireless LAN Access Point, 2x2 Spatial Multiplexing MIMO configuration, Single Radio
Manufacturers Trade Name:	Wireless Access Point
Model(s):	WLA321
Location for use:	Indoor
Declared Frequency Range(s):	2400 - 2483.5 MHz; 5725 - 5850 MHz
Software Release	7.7.1.
Type of Modulation:	Per 802.11 –CCK, BPSK, QPSK, DSSS, OFDM
Declared Nominal Average Output Power:	802.11b: +18 dBm 802.11g:Leg. +21dBm,HT-20 +21 dBm,HT-40 +21 dBm 802.11a:Leg. +21dBm,HT-20 +21 dBm,HT-40 +21 dBm
EUT Modes of Operation:	Legacy 802.11a/b/g, 802.11n HT-20, HT-40
Transmit/Receive Operation:	Time Division Duplex
System Beam Forming:	WLA321 has no capability for beam forming
Rated Input Voltage and Current:	POE 48 Vdc 0.625 A
Operating Temperature Range:	Declared range 0° to +50°C
ITU Emission Designator:	2400 – 2483.5 MHz 802.11b 14M1G1D 2400 – 2483.5 MHz 802.11g 18M5D1D 2400 – 2483.5 MHz 802.11n – HT-20 20M9D1D 2400 – 2483.5 MHz 802.11n – HT-40 36M9D1D 5725 – 5850 MHz 802.11a 21M3D1D 5725 – 5850 MHz 802.11n – HT-20 20M9D1D 5725 – 5850 MHz 802.11n – HT-40 39M4D1D
Equipment Dimensions:	5.6in (H) x 5.4in (W) x 1.9in (D)
Weight:	8 oz
Primary function of equipment:	Wireless Access Point for transmitting data and voice.

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 13 of 221

3.2. Scope of Test Program

Juniper Networks WLA321 Wireless Access Point

The scope of the test program was to test the Juniper Networks WLA321 Wireless LAN Access Point, single radio 2x2 Spatial Multiplexing MIMO configurations in the frequency ranges 2400 - 2483.5 MHz and 5725 – 5850 MHz for compliance against FCC 47 CFR Part 15.247 and Industry Canada RSS-210 specifications.

WLA321-US (for US distribution)

WLA321-WW, WLA321-XX (where –XX can be any alphanumeric, for world wide distribution)

FCC OET KDB Implementation

This test program implements the following FCC KDB – 662911 4/4/2011;

Emissions Testing of Transmitters with Multiple Outputs in the Same Band

The KDB document provides guidance for measurements of conducted output emissions of devices that employ a single transmitter with multiple outputs in the same band, with the outputs occupying the same or overlapping frequency ranges. It applies to EMC compliance measurements on devices that transmit on multiple antennas simultaneously in the same or overlapping frequency ranges through a coordinated process. Examples include, but are not limited to, devices employing beam forming or multiple-input and multiple-output (MIMO.) This guidance applies to both licensed and unlicensed devices wherever the FCC rules call for conducted output measurements. Guidance is provided for in-band, out-of-band and spurious emission measurements.

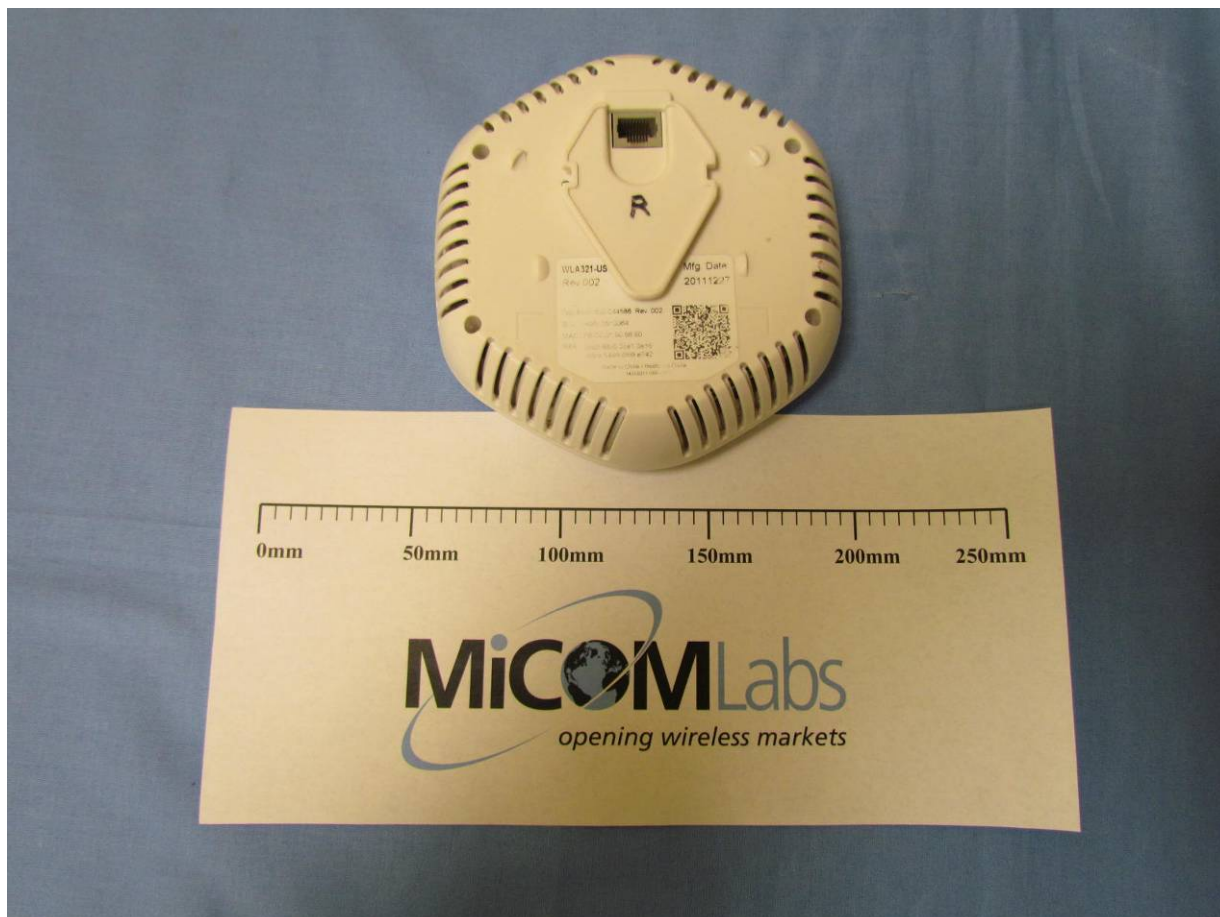
This guidance does not apply to the multiple transmitters included in a composite device, such as a device that combines an 802.11 modem with a cell phone in one enclosure with each driving its own antenna.

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WLA321 802.11 a/b/g/n Wireless Access Point



WLA321 802.11 a/b/g/n Wireless Access Point





Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 16 of 221

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

Type (EUT/Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	Wireless LAN Access Point	Juniper Networks	WLA321	Conducted unit not available
EUT	Wireless LAN Access Point	Juniper Networks	WLA321	Radiated - MA351110064
Support	Laptop PC	IBM	Thinkpad	None

3.4. Antenna Details

- Integral Single Band: Gain 2.4 GHz 0 dBi (average)
- Integral Single Band: Gain 5 GHz 0 dBi (average)

3.5. Cabling and I/O Ports

Number and type of I/O ports

1. 1 x 10/100/1000 Ethernet includes POE (Power over Ethernet +48 Vdc)

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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.

Operational Mode(s) (802.11a/b/g/n)	Variant	Data Rate with Highest Power	Frequencies (MHz)
b	Legacy	1 MBit/s	2,412
g	Legacy	6 MBit/s	2,437
n	HT-20	6.5 (MCS 0)	2,462
	HT-40	13.5 (MCS 0)	2,422 2,437 2,452
a	Legacy	6 MBit/s	5,745
n	HT-20	6.5 (MCS 0)	5,785
	HT-40	13.5 (MCS 0)	5,825 5,755 5,795

Legacy – data rates for 802.11abg products

Results for the above configurations are provided in this report.



Antenna Test Configurations for Radiated Emissions

Results for the following configurations are provided in this report.

2,400 – 2483.5 MHz

5,725 – 5850 MHz

15.247	
802.11b	b SE 2412
	b SE 2437
	b SE 2462
	BE b 2390
	BE b 2483.5
802.11g	g SE 2412
	g SE 2437
	g SE 2462
	BE g 2390
	BE g 2483.5
802.11n HT-20	n HT-20 SE 2412
	n HT-20 SE 2437
	n HT-20 SE 2462
	BE n HT-20 2390
	BE n HT-20 2483.5
802.11n HT-40	n HT-40 SE 2422
	n HT-40 SE 2437
	n HT-40 SE 2452
	BE n HT-40 2390
	BE n HT-40 2483.5

15.247	
802.11a	a SE 5745
	a SE 5785
	a SE 5825
802.11n HT-20	n HT-20 SE 5745
	n HT-20 SE 5785
	n HT-20 SE 5825
802.11n HT-40	n HT-40 SE 5755
	n HT-40 SE 5785
	n HT-40 SE 5815

KEY;-
 SE – Spurious Emission
 BE – Band-Edge

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3.7. Equipment Modifications

The following modifications were required to bring the equipment into compliance. Section 5.1.2 Peak Output Power identifies the total conducted power levels measured per antenna port and sums the powers. The tables in Section 5.1.2 includes the following power reduction and reports the maximum possible operating power levels.

1. Band-Edge Power Reduction

During radiated band-edge emission testing the output power was reduced in order to comply with the Restricted Band criteria. At 2.4 GHz restricted bands are 2,310 – 2,390 MHz and 2,483.5 – 2,500 MHz.

2.4 GHz Band-Edge Power Settings – Nominal Setting was NART = 18 all modes

Frequency Range	Mode	Channel	Band-Edge Frequency (MHz)	Power Setting (NART)
2,400 -2,483.5	802.11b	1	2390.0	Maximum
		11	2483.5	Maximum
	802.11g	1	2390.0	17
		11	2483.5	14
	802.11n HT-20	1	2390.0	15
		11	2483.5	13
	802.11n HT-40	3	2390.0	13
		9	2483.5	13
5,725 – 5,850	No band-edge power reduction was required			

2. Spurious Emission Power Reduction

During radiated emission testing the output power was reduced on the following frequencies and modes;

802.11b 2437 MHz power reduced from 18 to 16

802.11a 5825 MHz power reduced from 18 to 16



Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 20 of 221

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

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4. TEST SUMMARY

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15.247** and **Industry Canada RSS-210** and **Industry Canada RSS-Gen**.

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(a)(2) A8.2(1) 4.4	6 dB and 99 % Bandwidths	≥500 kHz	Conducted	Complies	5.1.1
15.247(b)(3) 15.31(e) A8.4(4)	Peak Output Power Voltage Variation	Shall not exceed 1W Variation of supply voltage 85 % -115 %	Conducted	Complies	5.1.2
15.247(e) A8.2	Peak Power Spectral Density	Shall not be greater than +8 dBm in any 3 kHz band	Conducted	Complies	5.1.3
15.247(i) 5.5	Maximum Permissible Exposure	Exposure to radio frequency energy levels	Conducted	Complies	5.1.4
15.247(d) 15.205 / 15.209 A8.5 2.2 4.7	Spurious Emissions (30MHz - 26 GHz b/g and 30 MHz – 40 GHz a)	The radiated emission in any 100 kHz of out-band shall be at least 20 dB below the highest in-band spectral density	Conducted	Complies	5.1.5

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List of Measurements (continued)

The following table represents the list of measurements required under the **FCC CFR47 Part 15.247**, **Industry Canada RSS-210**, and **Industry Canada RSS-Gen**.

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(d) 15.205 / 15.209 A8.5 2.2 2.6 4.7	Radiated Emissions	Restricted Bands	Radiated	Complies	5.1.6
	Transmitter Radiated Spurious Emissions	Emissions above 1 GHz		Complies	5.1.6.1
	Radiated Band Edge	Band-edge results Peak Emissions		Complies	5.1.6.2.
	Industry Canada only RSS-Gen §4.10, §6	Receiver Radiated Spurious Emissions	Emissions above 1 GHz		Complies
15.205 / 15.209 2.2	Radiated Spurious Emissions	Emissions <1 GHz (30M-1 GHz)	Radiated	Complies	5.1.6.4
15.207 7.2.2	AC Wireline Conducted Emissions 150 kHz–30 MHz	Conducted Emissions	Conducted	Not tested POE powered device	5.1.7

Note 1: Test results reported in this document relate only to the items tested

Note 2: The required tests demonstrated compliance as per client declaration of test configuration, monitoring methodology and associated pass/fail criteria

Note 3: Section 3.7 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix

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5. TEST RESULTS

5.1. Device Characteristics

5.1.1. 6 dB and 99 % Bandwidth

FCC, Part 15 Subpart C §15.247(a)(2)

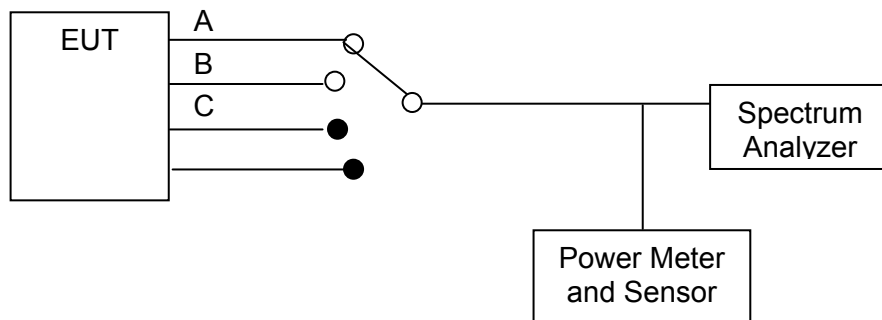
Industry Canada RSS-210 §A8.2

Industry Canada RSS-Gen §4.4

Test Procedure

The bandwidth at 6 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 6 dB and 99 % bandwidth test

Measurement Results for 6 dB & 99% Bandwidth

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: Default, Maximum Power

Test s/w: NART



Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 24 of 221

Measurement Results for 6 dB Operational Bandwidth(s) Ambient conditions.

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

TABLE OF RESULTS – 802.11b Legacy

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35 to 42
Variant:	802.11b	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	4 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz				kHz	MHz	
MHz	a	b	c	d			
2412.000	10.180000	10.180000	--	--	500	0.5	-9.680000
2437.000	10.180000	10.180000	--	--			-9.680000
2462.000	10.180000	10.100000	--	--			-9.600000

99% Bandwidth

Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
2412.000	13.948000	14.028000	--	--			
2437.000	14.028000	14.028000	--	--			
2462.000	14.108000	13.868000	--	--			

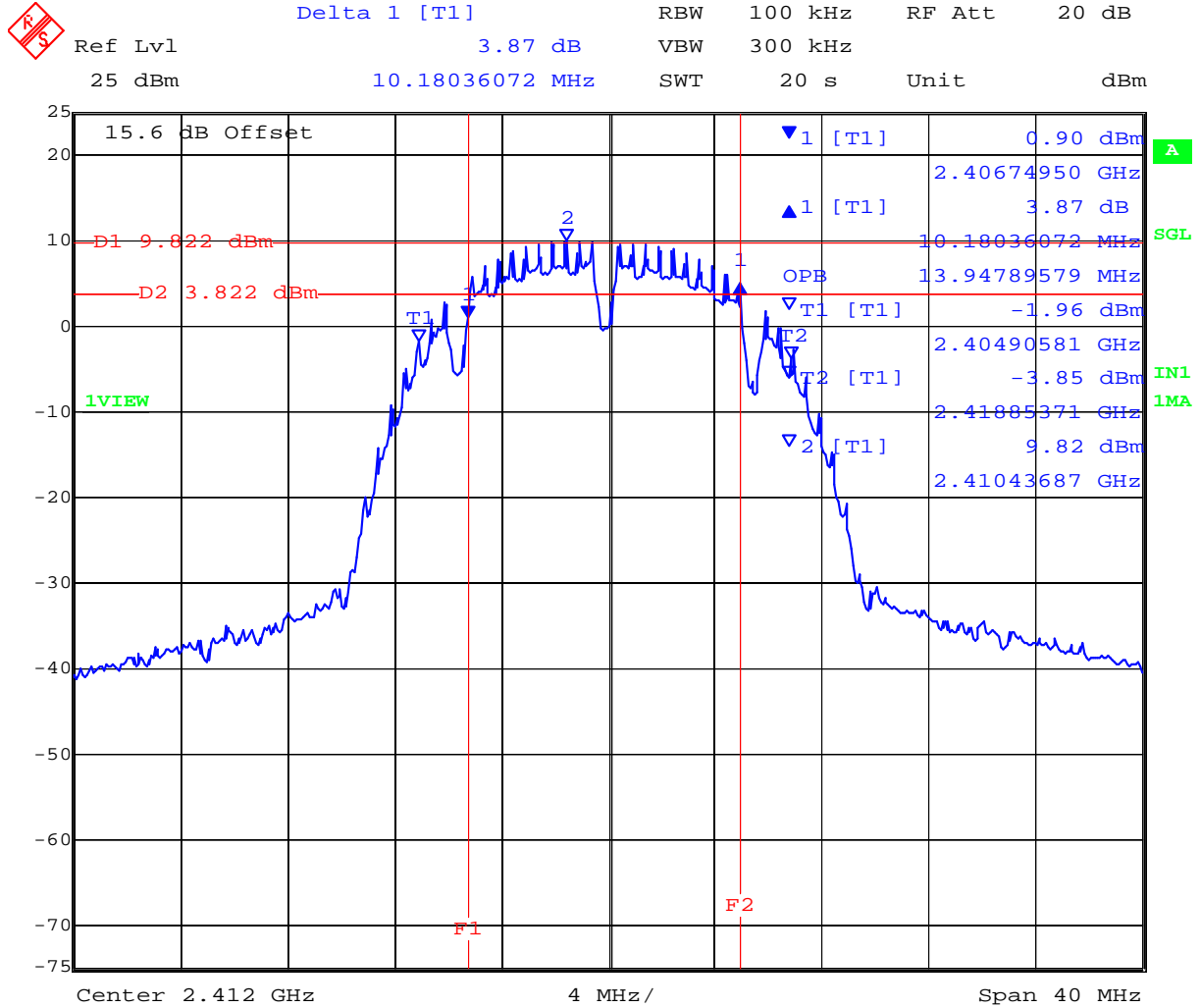
Measurement uncertainty:	±2.81 dB
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 25 of 221

PORT A 2,412 MHz 802.11b Legacy 6 dB and 99% Bandwidth

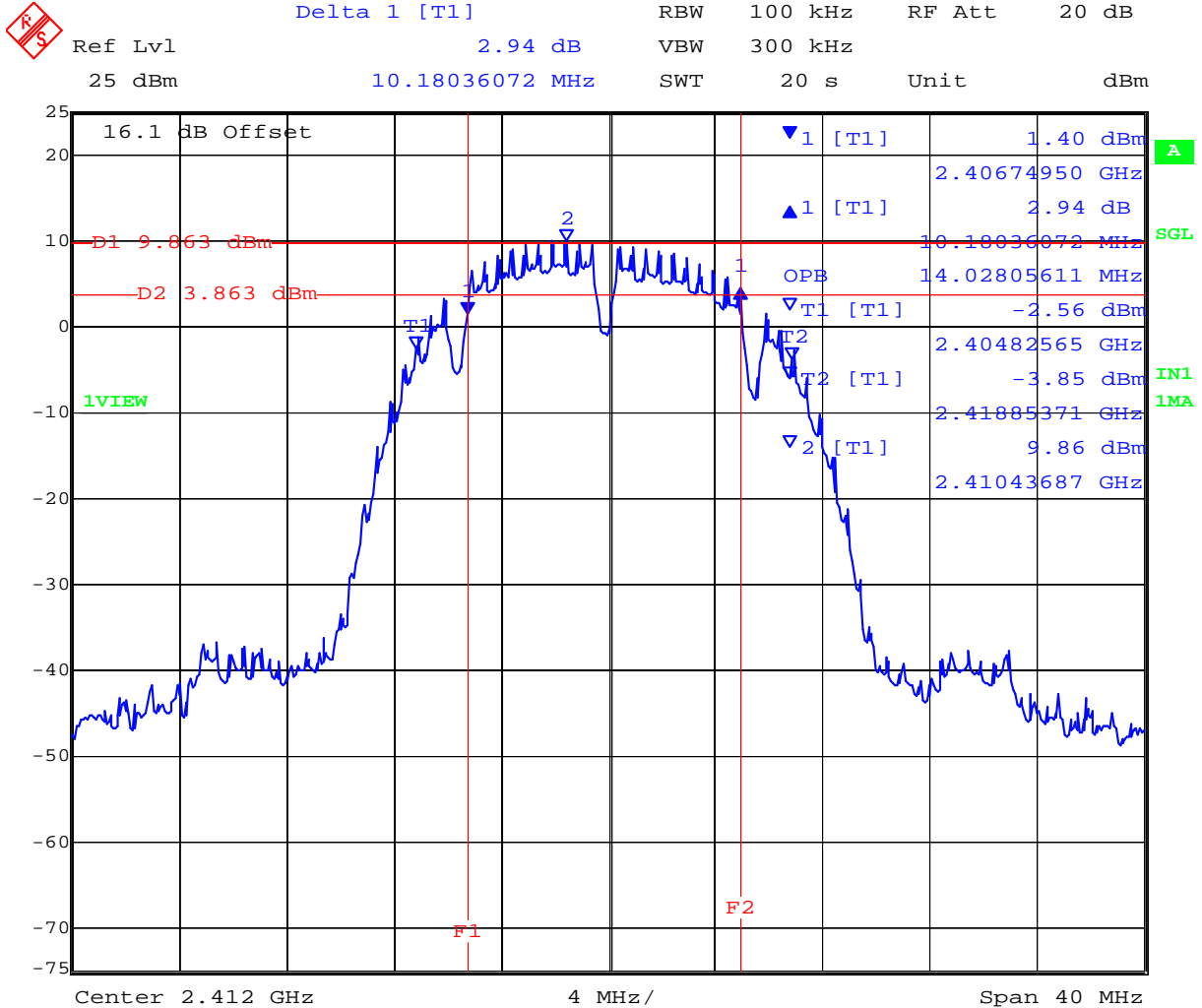


Date: 11.FEB.2012 13:01:25

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PORT B 2,412 MHz 802.11b Legacy 6 dB and 99% Bandwidth

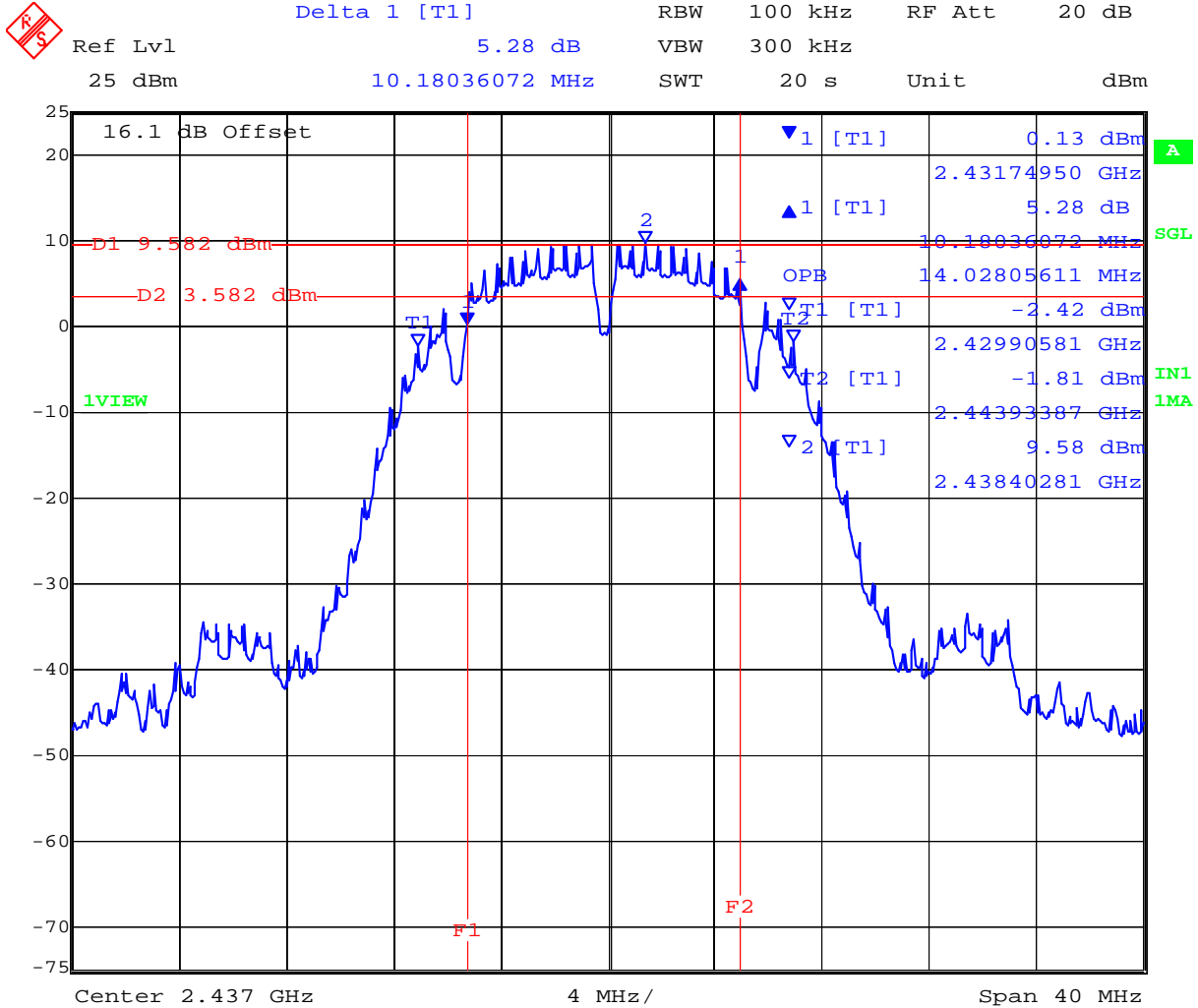


Date: 11.FEB.2012 13:02:29

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PORT B 2,437 MHz 802.11b Legacy 6 dB and 99% Bandwidth

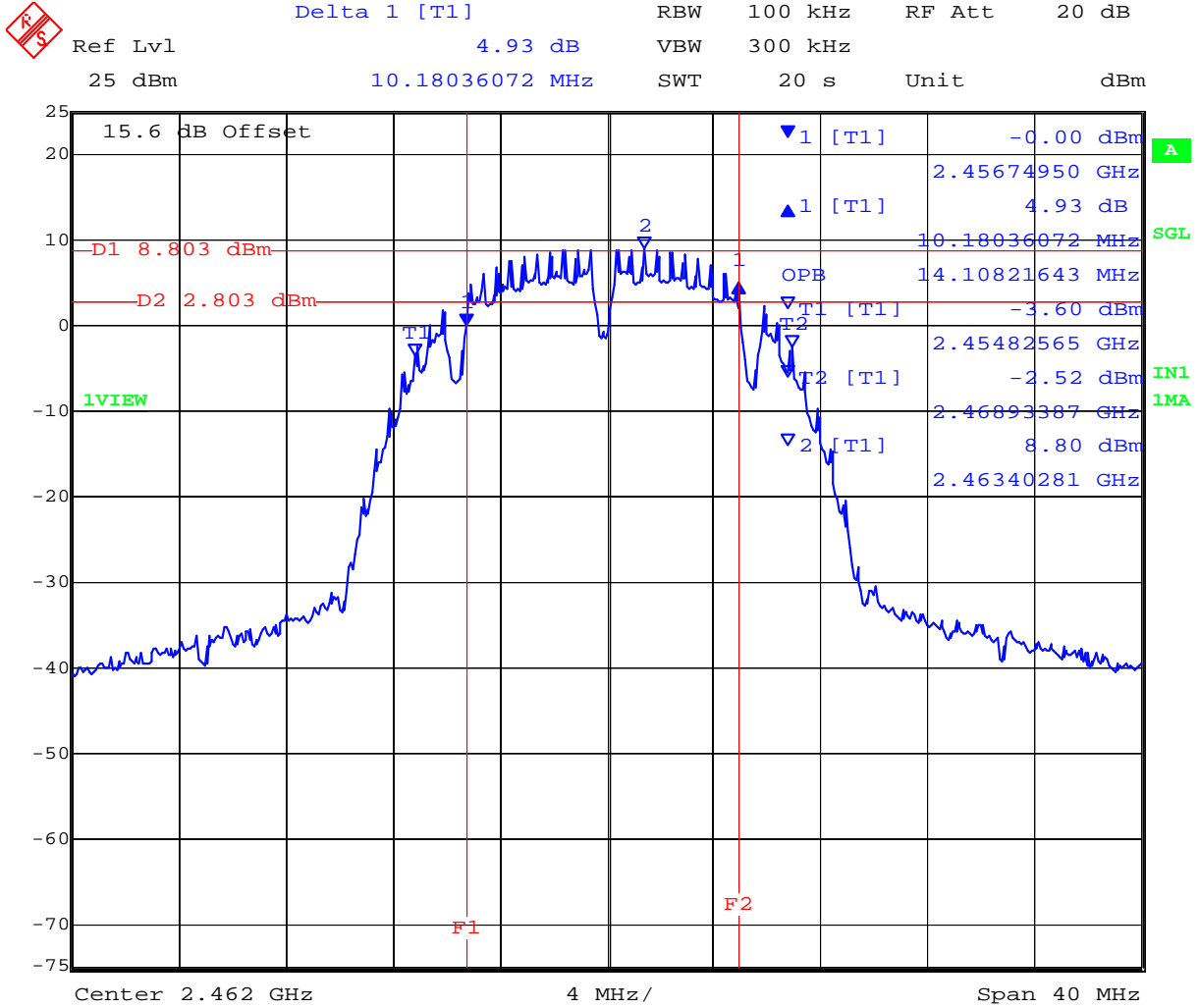


Date: 11.FEB.2012 13:22:10

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PORT A 2,462 MHz 802.11b Legacy 6 dB and 99% Bandwidth

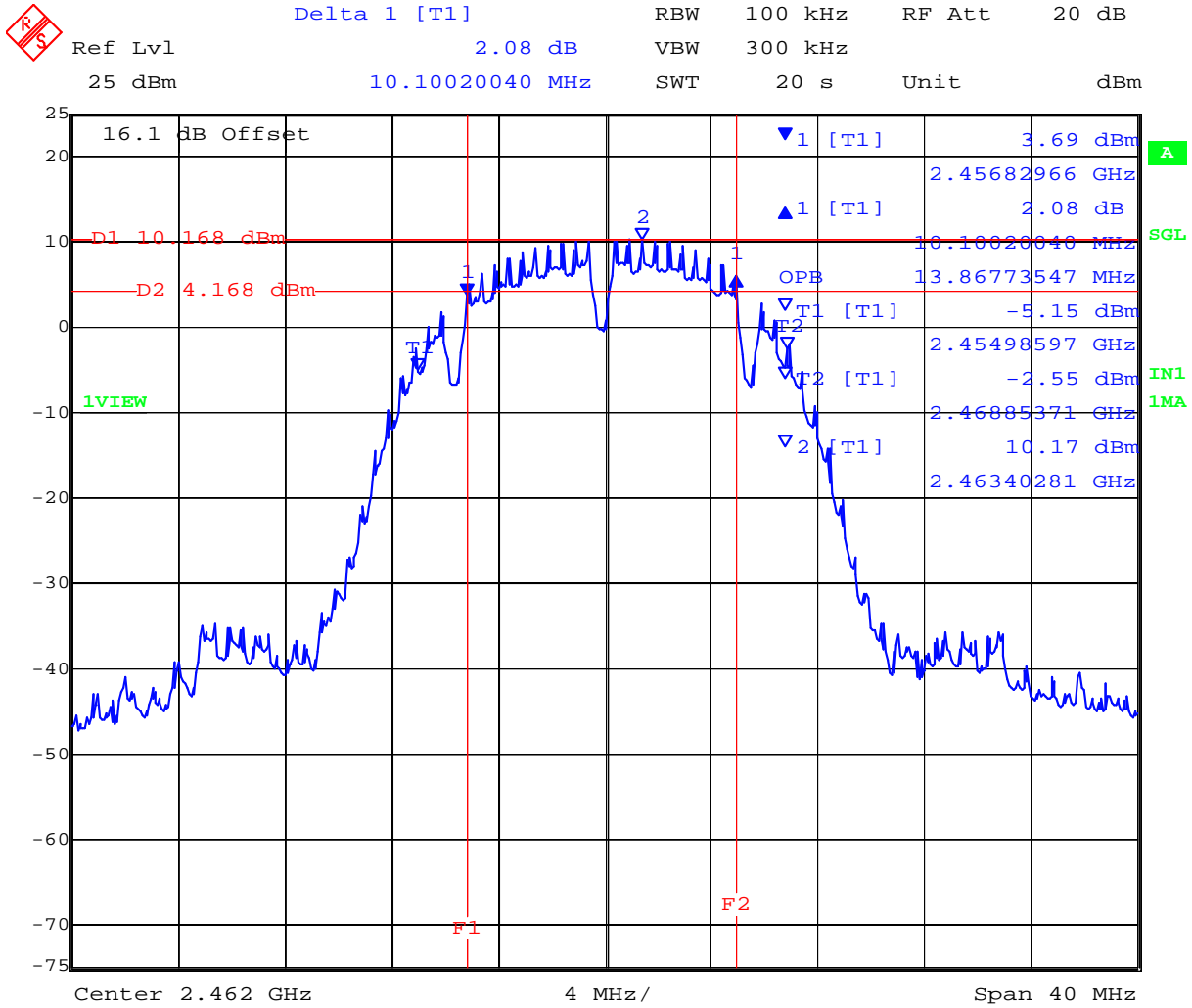


Date: 11.FEB.2012 13:44:49

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PORT B 2,462 MHz 802.11b Legacy 6 dB and 99% Bandwidth



Date: 11.FEB.2012 13:45:54

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 31 of 221

TABLE OF RESULTS – 802.11g Legacy

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35 to 42
Variant:	802.11g	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	4 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz				kHz	MHz	
MHz	a	b	c	d			
2412.000	16.513000	16.433000	--	--	500	0.5	-15.933000
2437.000	16.433000	16.433000	--	--			-15.933000
2462.000	16.433000	16.433000	--	--			-15.933000

99% Bandwidth

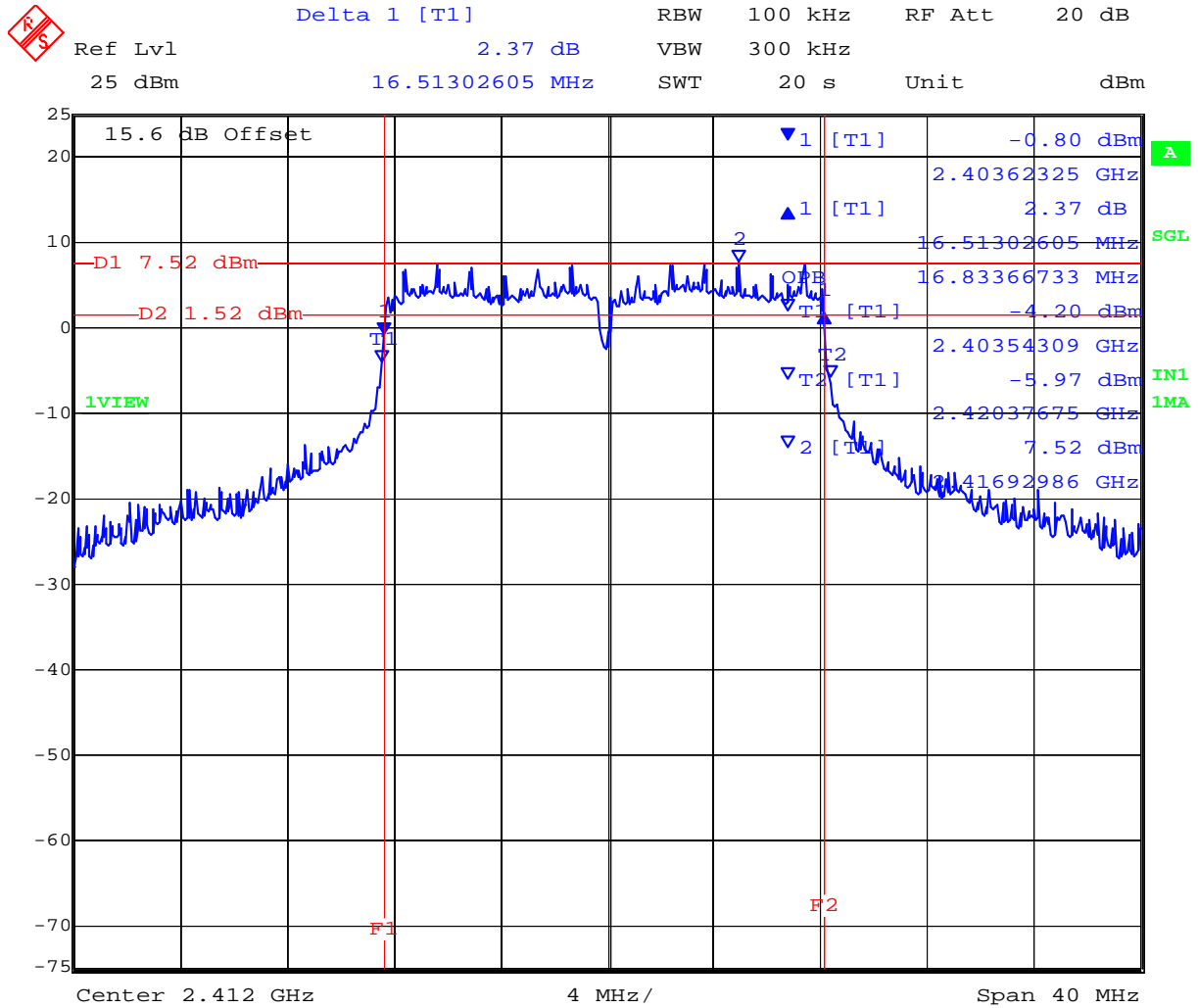
Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
2412.000	16.834000	17.074000	--	--			
2437.000	16.754000	17.555000	--	--			
2462.000	16.914000	17.234000	--	--			

Measurement uncertainty:	±2.81 dB
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PORT A 2,412 MHz 802.11g Legacy 6 dB and 99% Bandwidth

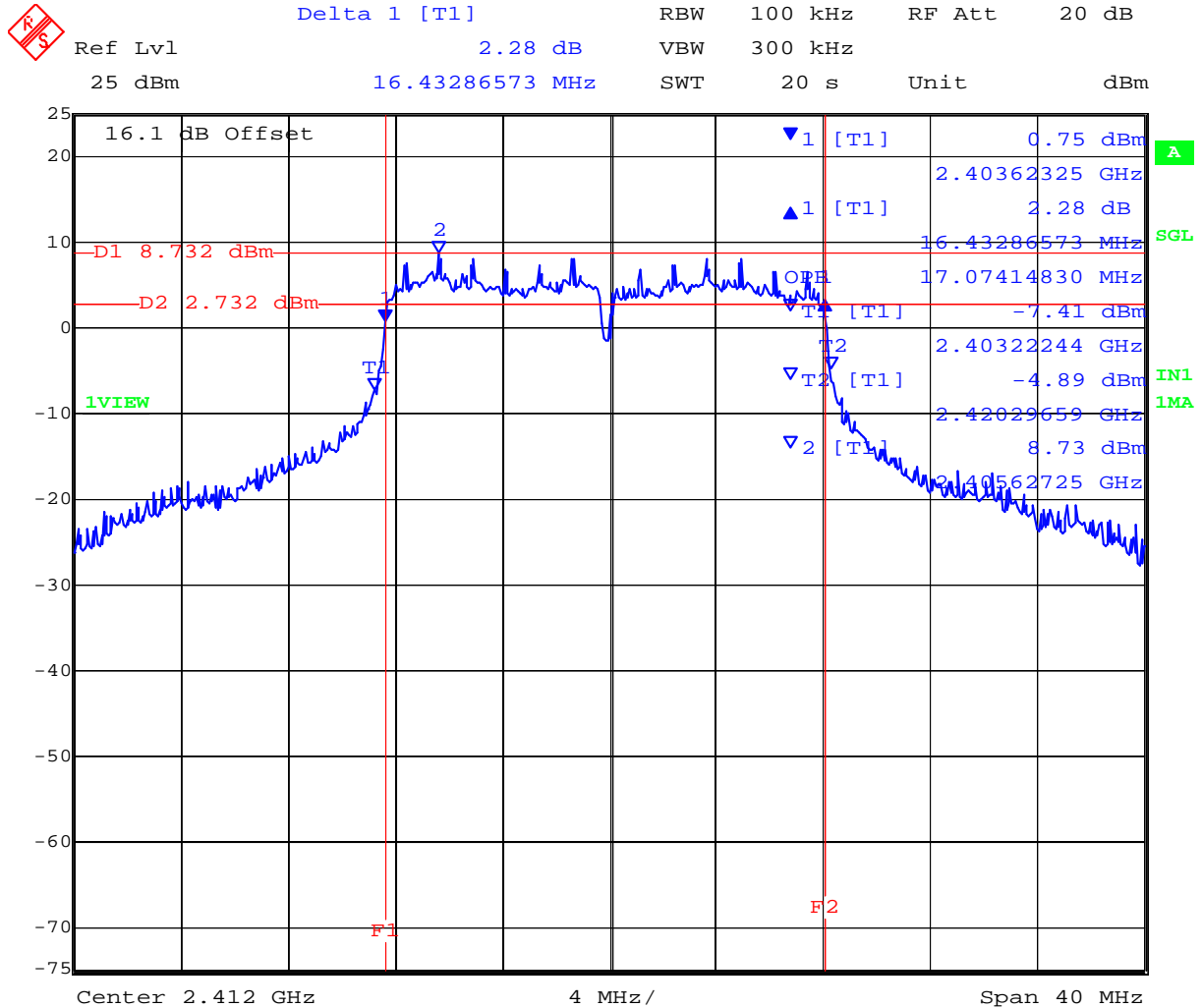


Date: 11.FEB.2012 14:31:13

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PORT B 2,412 MHz 802.11g Legacy 6 dB and 99% Bandwidth

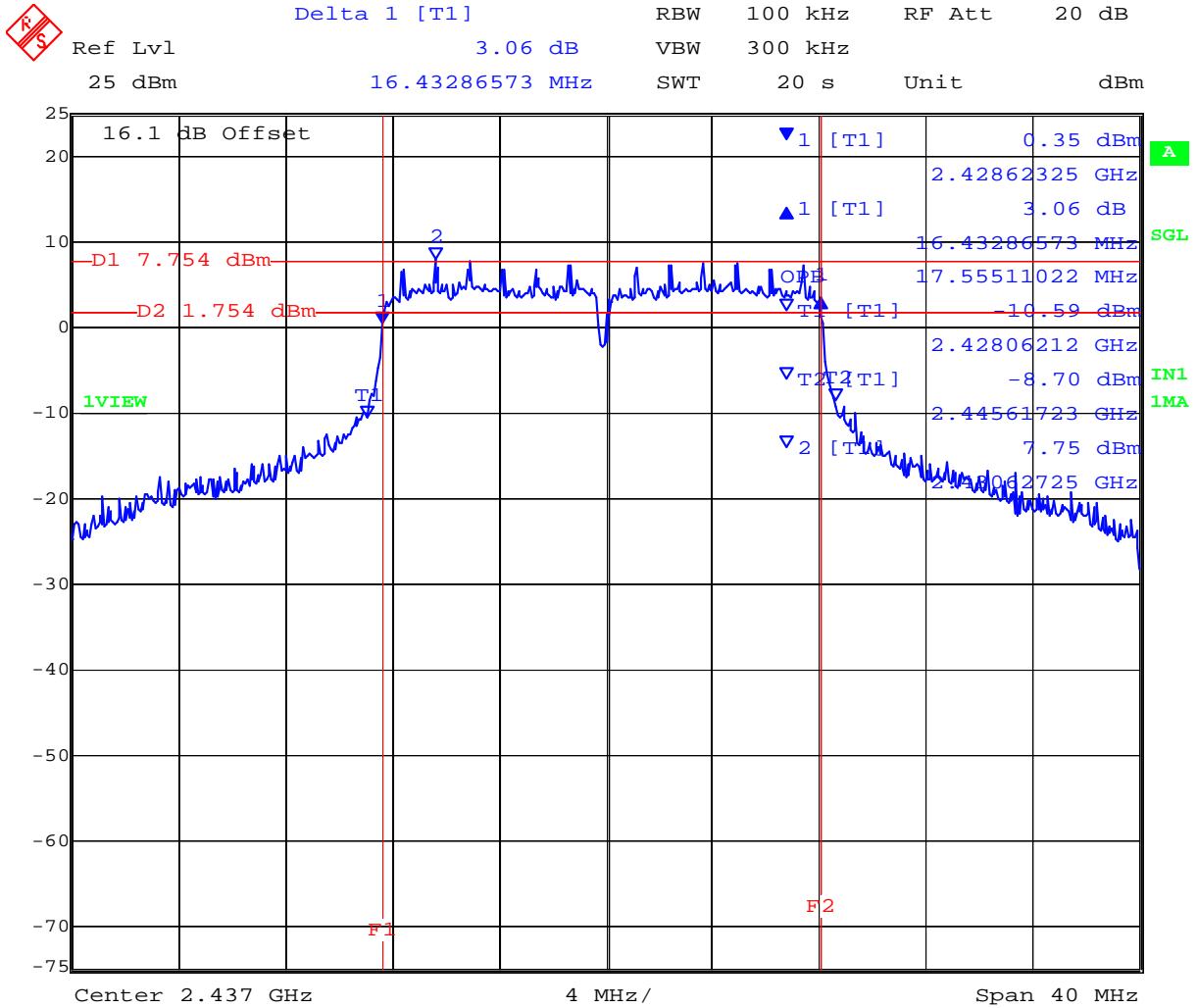


Date: 11.FEB.2012 14:32:17

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PORT B 2,437 MHz 802.11g Legacy 6 dB and 99% Bandwidth

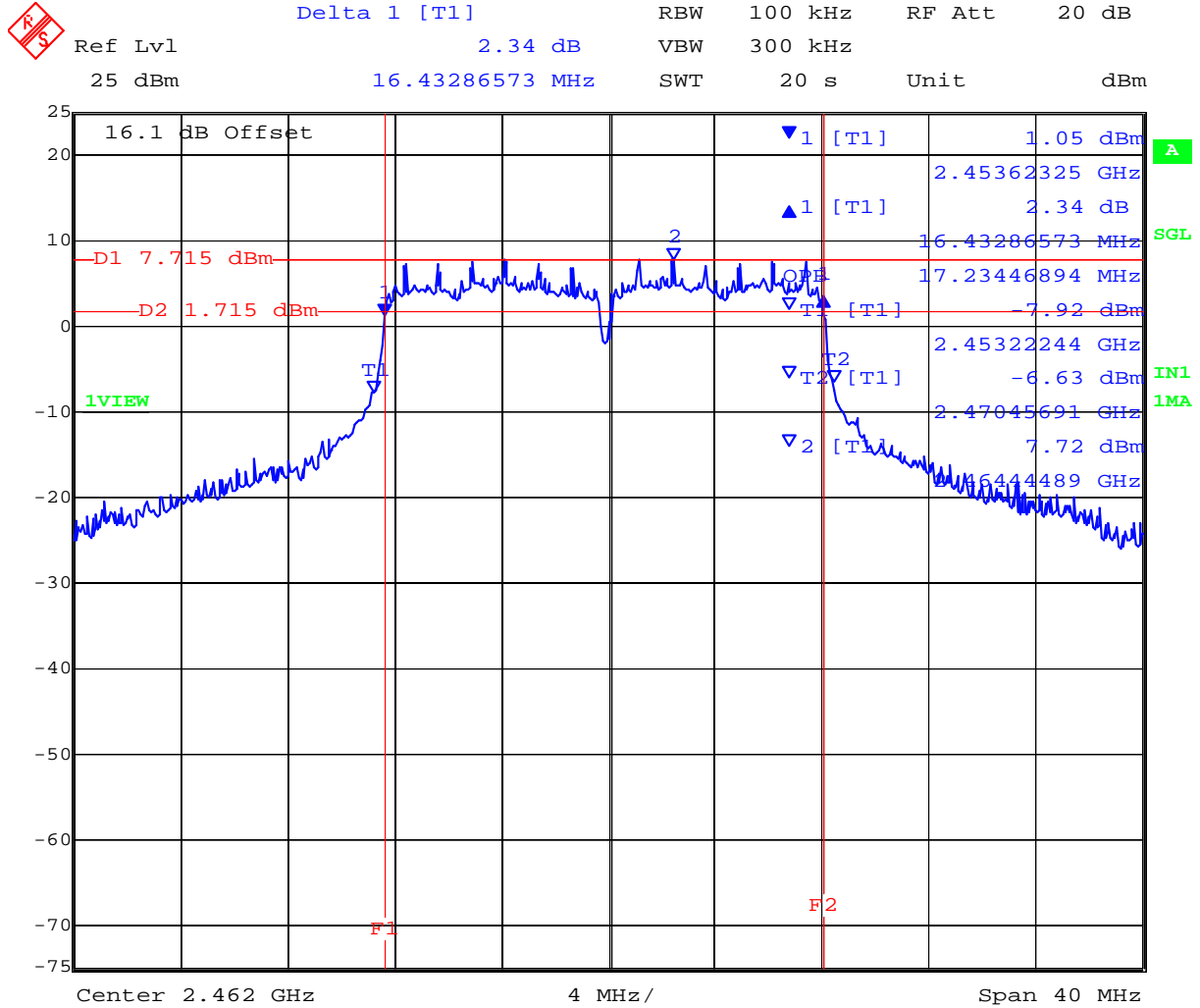


Date: 11.FEB.2012 14:54:31

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PORT B 2,462 MHz 802.11g Legacy 6 dB and 99% Bandwidth



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TABLE OF RESULTS – 802.11n HT-20 Legacy

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35 to 42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	4 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz				kHz	MHz	
MHz	a	b	c	d			
2412.000	17.635000	17.635000	--	--	500	0.5	-17.135000
2437.000	17.715000	17.635000	--	--			-17.135000
2462.000	17.395000	17.635000	--	--			-16.895000

99% Bandwidth

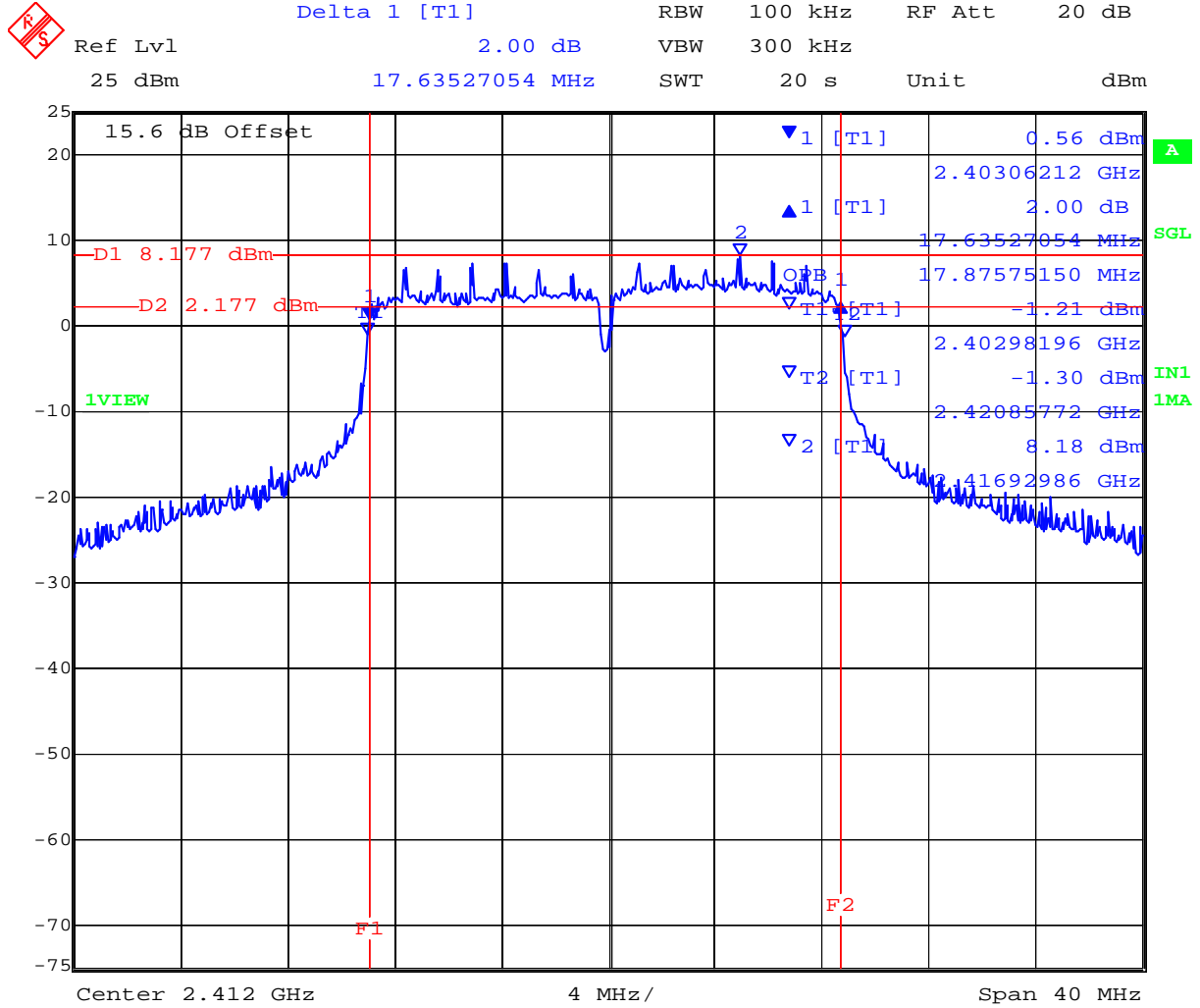
Test Frequency	99 % Bandwidth					
	MHz					
MHz	a	b	c	d		
2412.000	17.876000	18.116000	--	--		
2437.000	17.876000	18.517000	--	--		
2462.000	17.796000	18.196000	--	--		

Measurement uncertainty:	±2.81 dB
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PORT A 2,412 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth

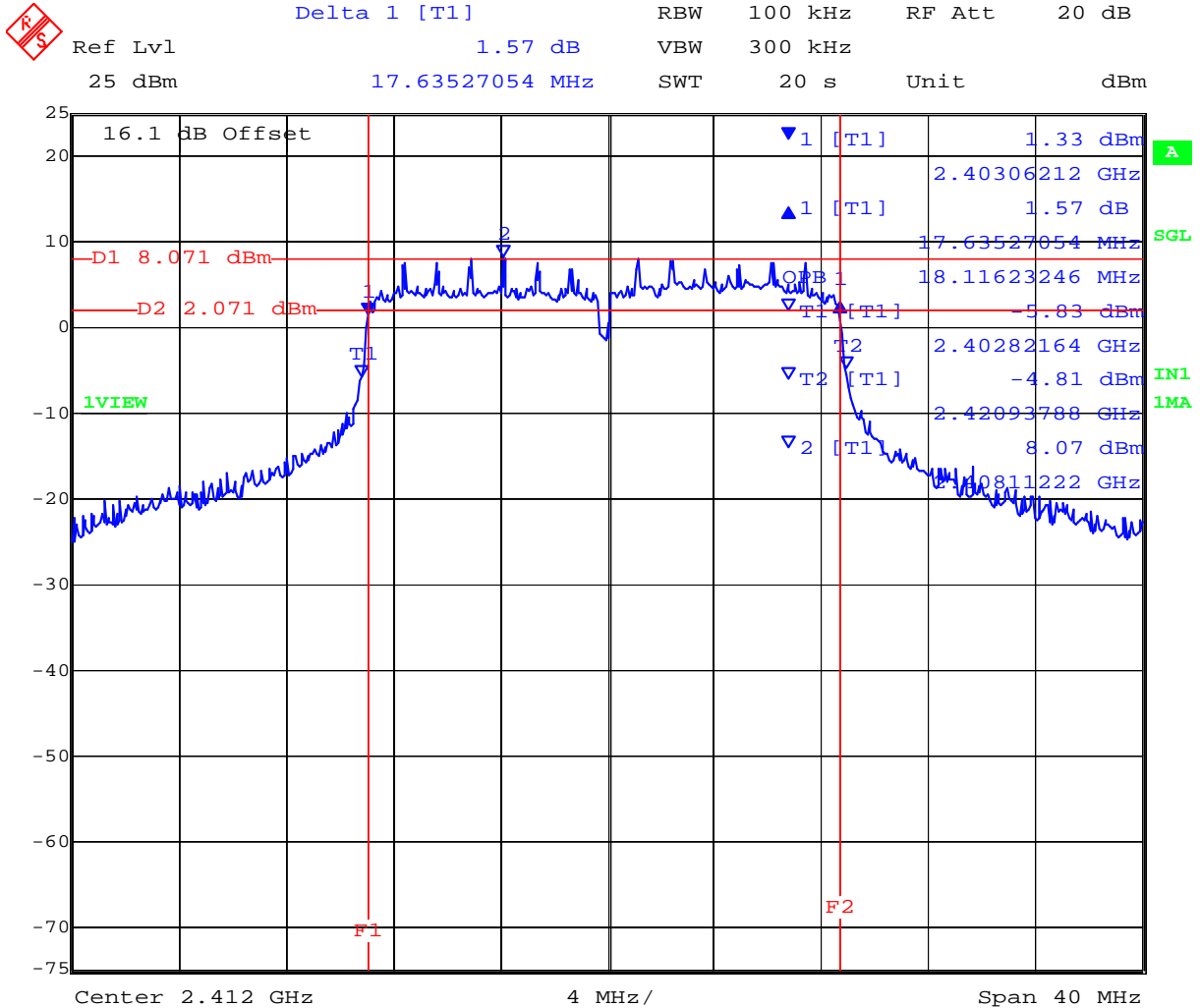


Date: 11.FEB.2012 15:41:12

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PORT B 2,412 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth

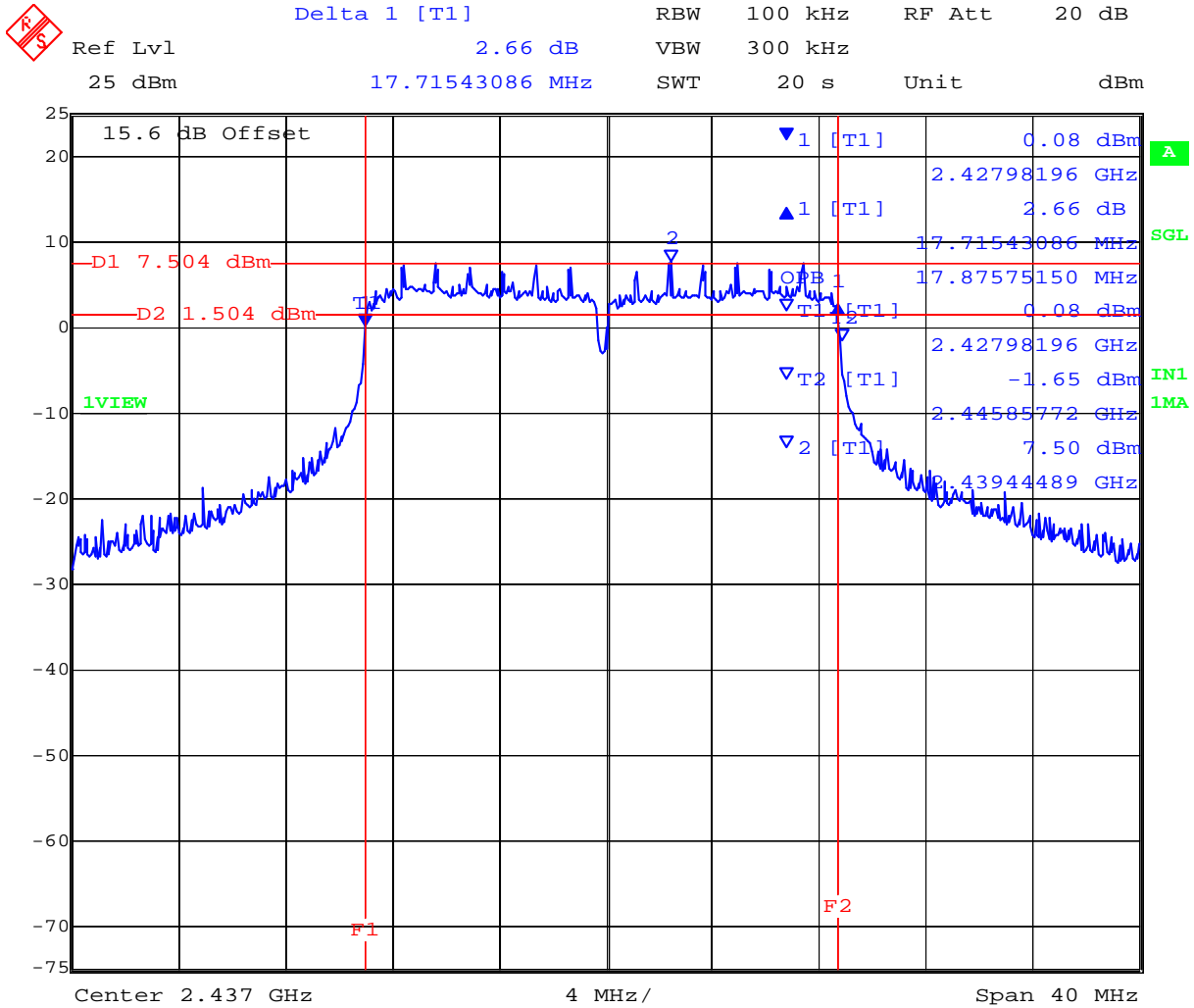


Date: 11.FEB.2012 15:42:17

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PORT A 2,437 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth

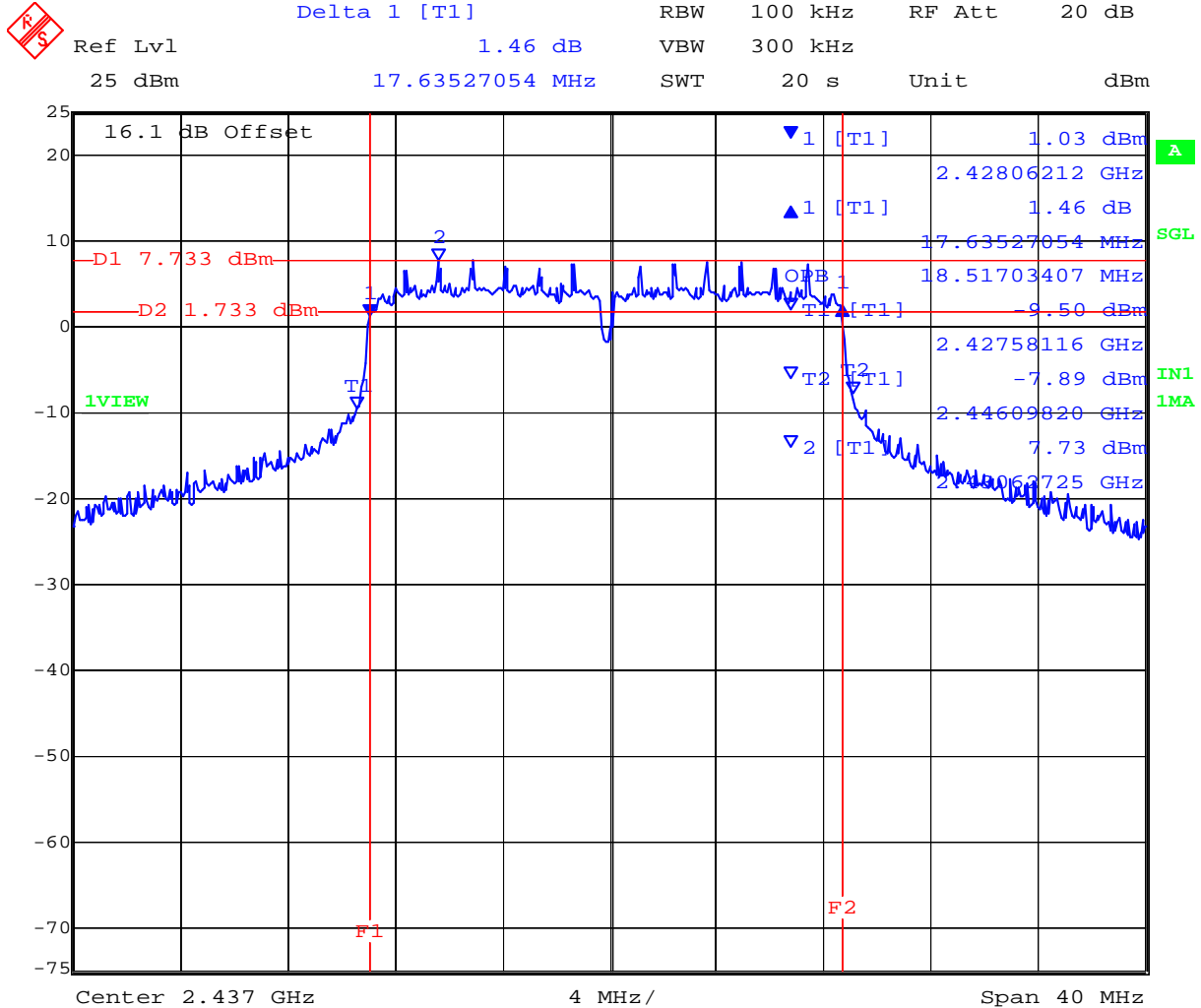


Date: 11.FEB.2012 16:01:58

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PORT B 2,437 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth

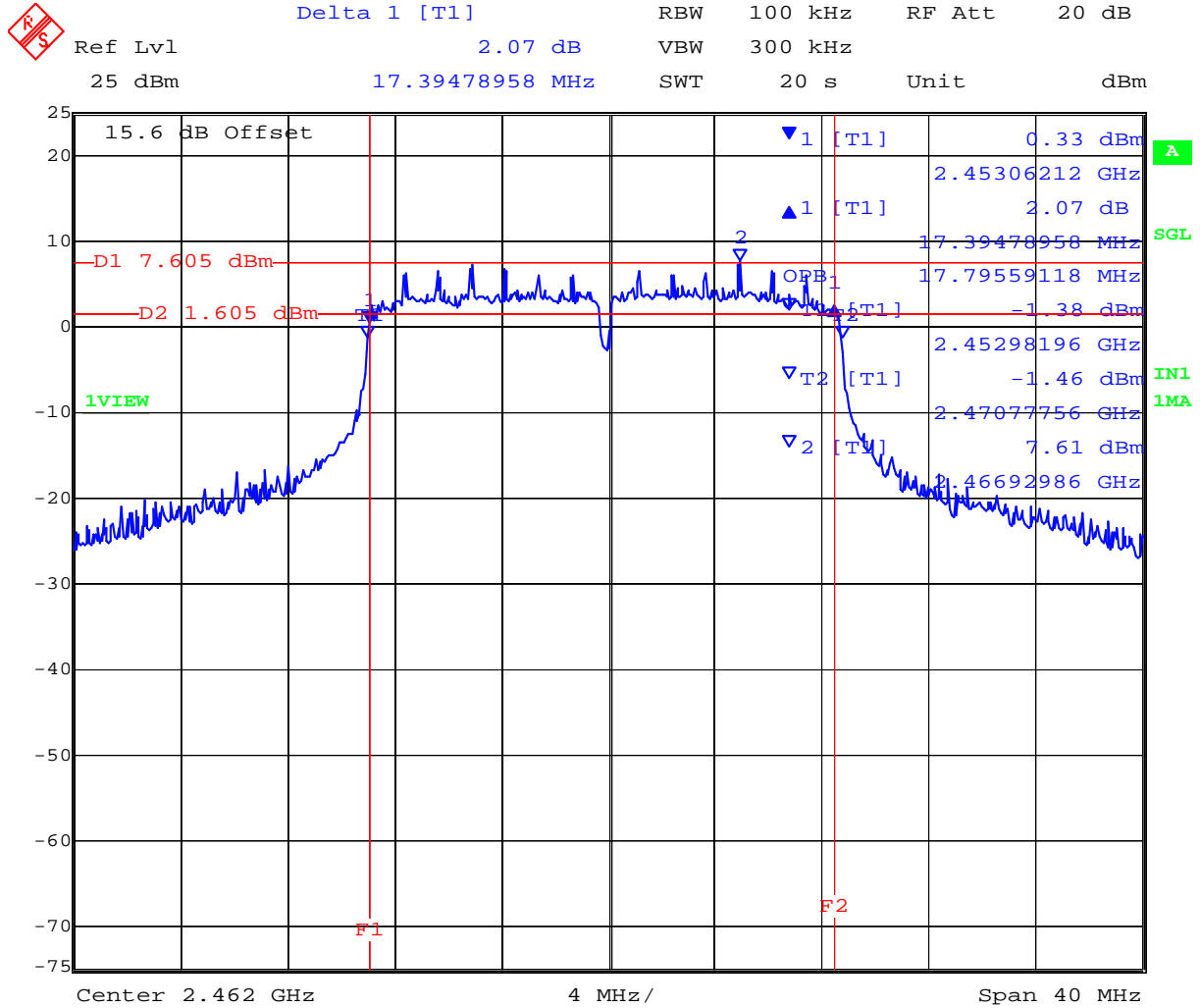


Date: 11.FEB.2012 16:03:04

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PORT A 2,462 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth

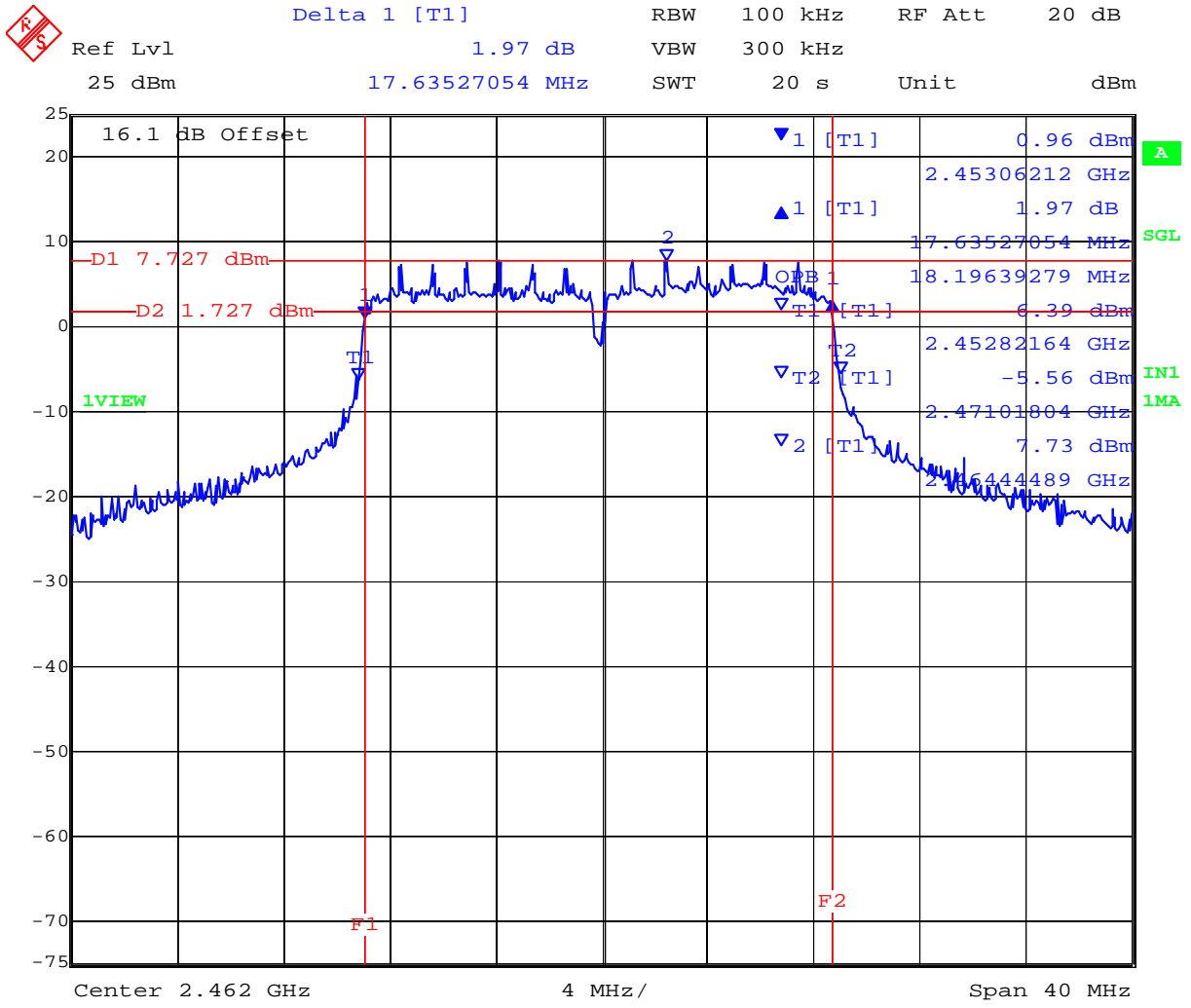


Date: 11.FEB.2012 16:18:10

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PORT B 2,462 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



Date: 11.FEB.2012 16:19:16

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 45 of 221

TABLE OF RESULTS – 802.11n HT-40 Legacy

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35 to 42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	4 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz				kHz	MHz	
MHz	a	b	c	d			
2422.000	36.393000	36.393000	--	--	500	0.5	-35.893000
2437.000	36.393000	36.393000	--	--			-35.893000
2452.000	36.393000	36.393000	--	--			-35.893000

99% Bandwidth

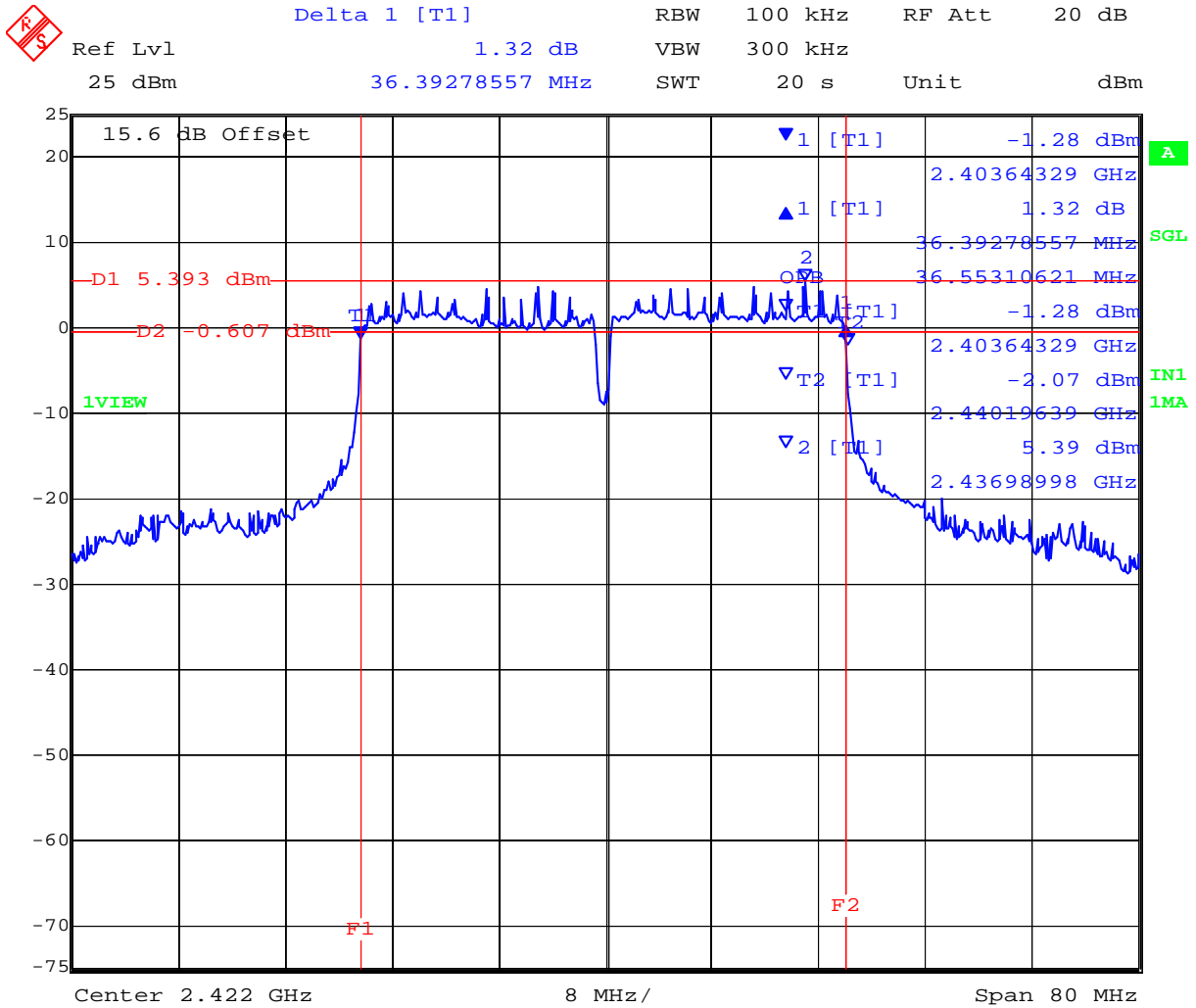
Test Frequency	99 % Bandwidth					
	MHz					
MHz	a	b	c	d		
2422.000	36.553000	36.713000	--	--		
2437.000	36.553000	36.874000	--	--		
2452.000	36.553000	36.553000	--	--		

Measurement uncertainty:	±2.81 dB
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PORT A 2,422 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth

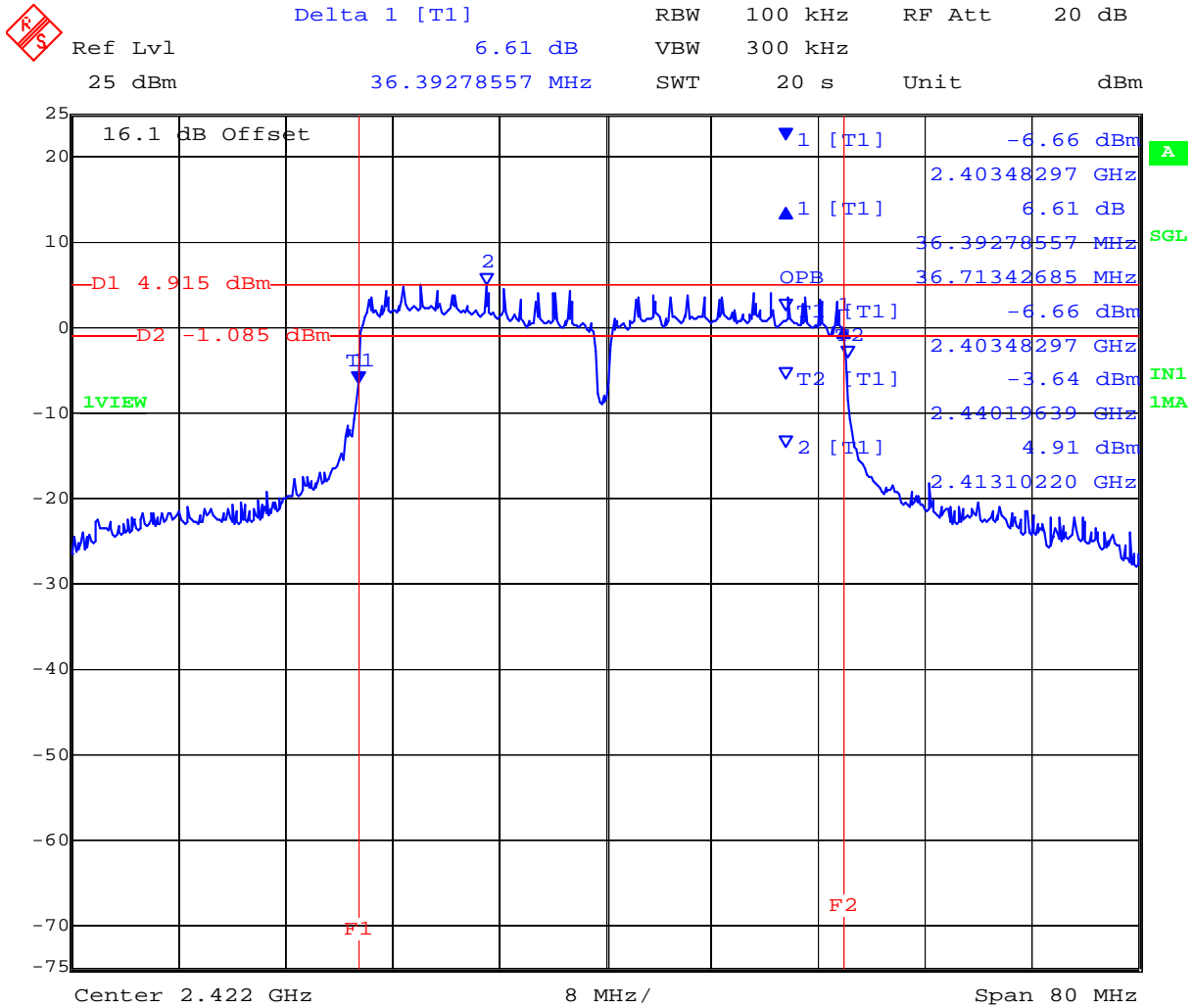


Date: 11.FEB.2012 16:42:27

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PORT B 2,422 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth

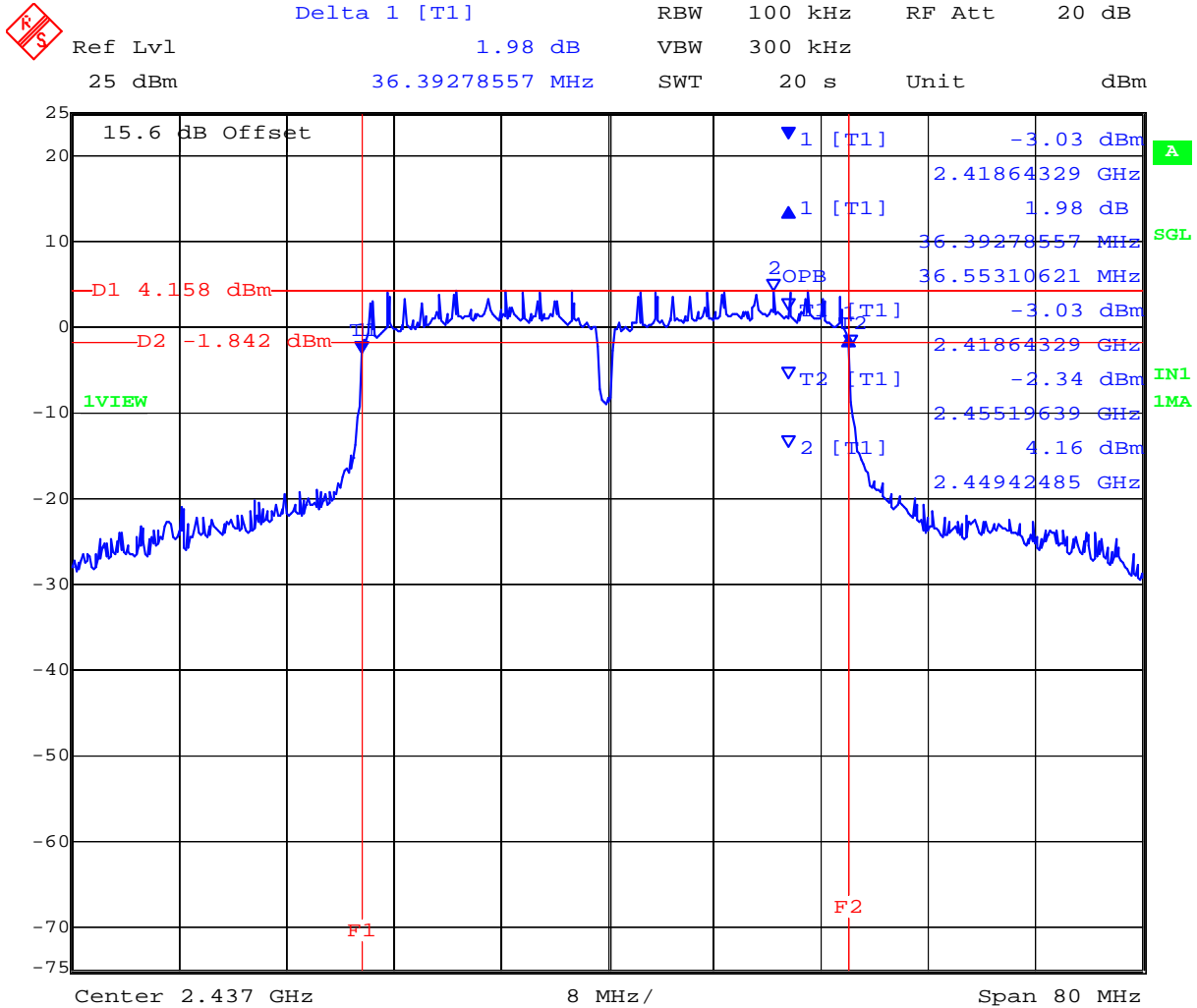


Date: 11.FEB.2012 16:43:32

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PORT A 2,437 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth

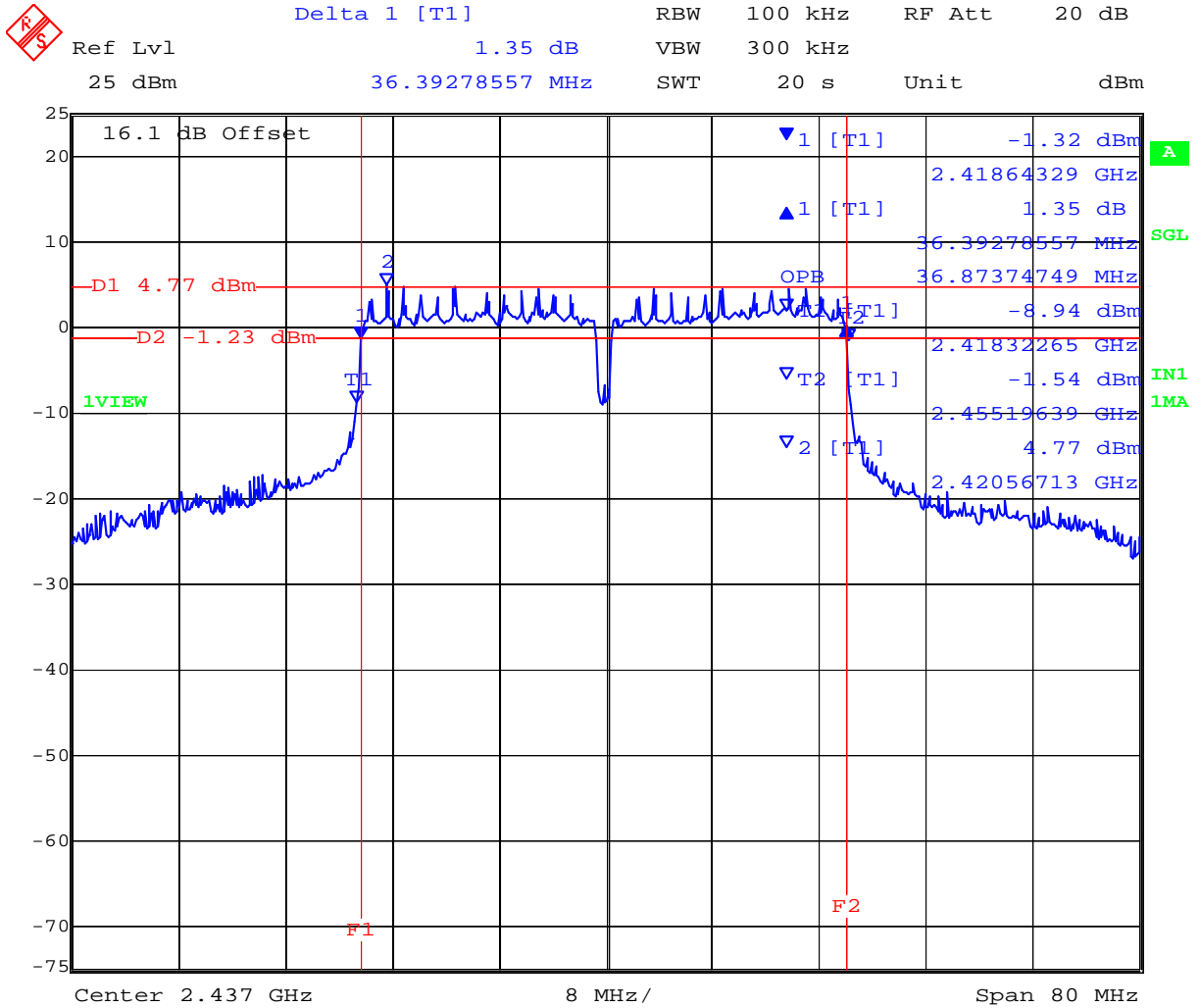


Date: 11.FEB.2012 17:05:55

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PORT B 2,437 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth

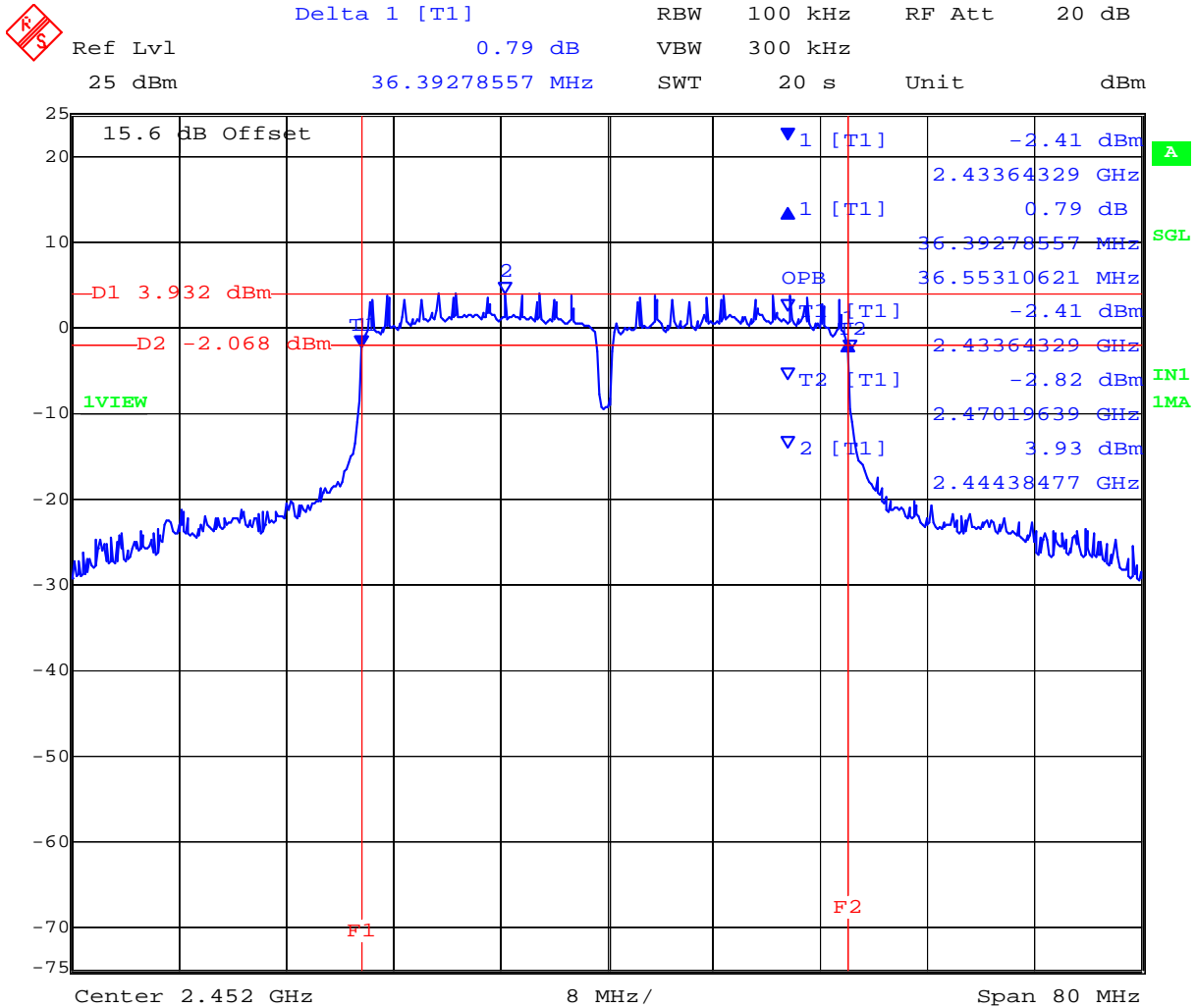


Date: 11.FEB.2012 17:07:02

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PORT A 2,452 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth

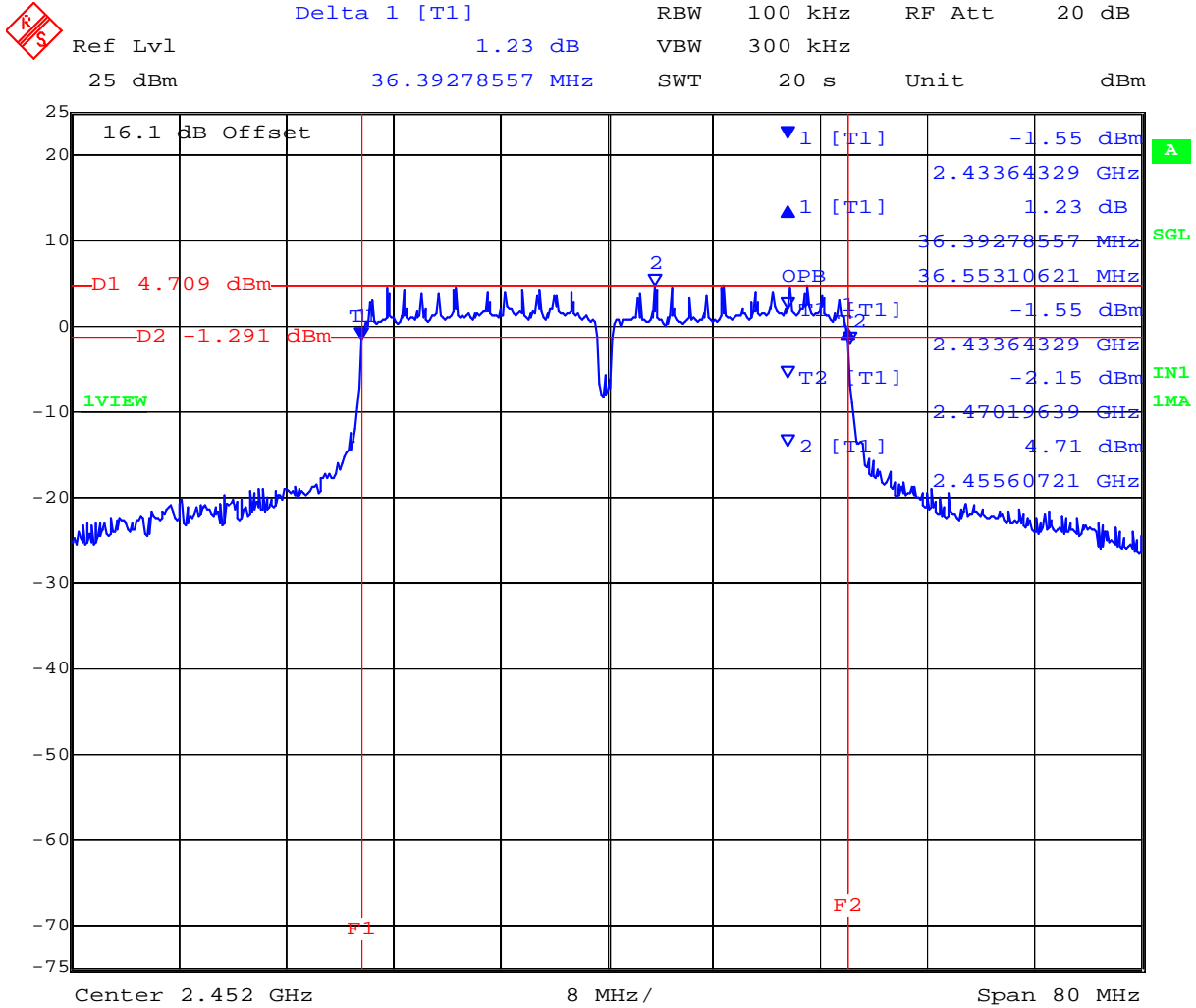


Date: 11.FEB.2012 17:22:23

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PORT B 2,452 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



Date: 11.FEB.2012 17:23:29

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 52 of 221

TABLE OF RESULTS – 802.11a - Legacy

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35 to 42
Variant:	802.11a	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	4 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz				kHz	MHz	
MHz	a	b	c	d			
5745.000	16.353000	16.353000	--	--	500	0.5	-15.853000
5785.000	15.792000	16.353000	--	--			-15.292000
5825.000	15.551000	16.353000	--	--			-15.051000

99% Bandwidth

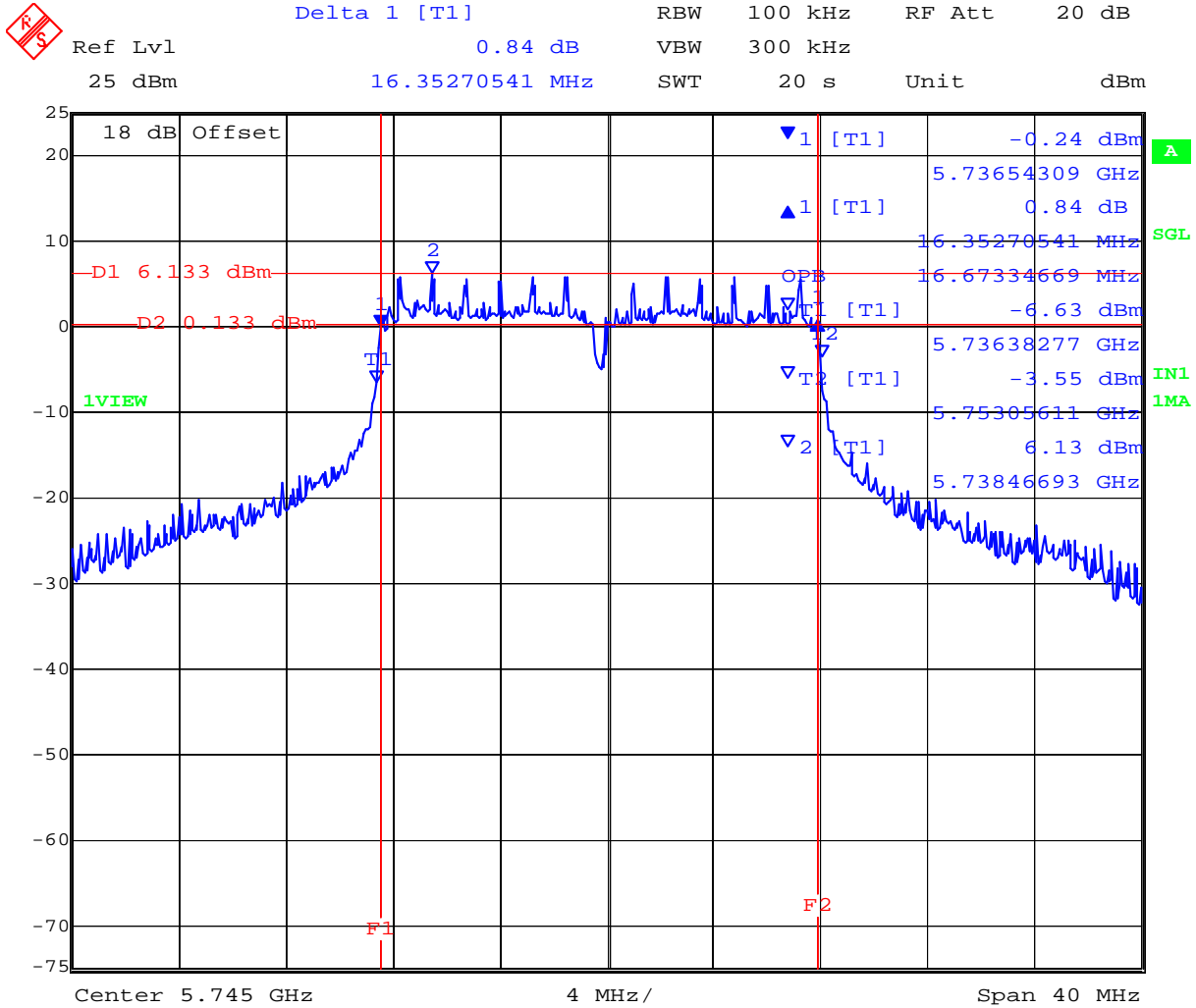
Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
5745.000	16.673000	20.281000	--	--			
5785.000	16.673000	21.323000	--	--			
5825.000	17.154000	19.399000	--	--			

Measurement uncertainty:	±2.81 dB
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PORT A 5,745 MHz 802.11a Legacy 6 dB and 99% Bandwidth

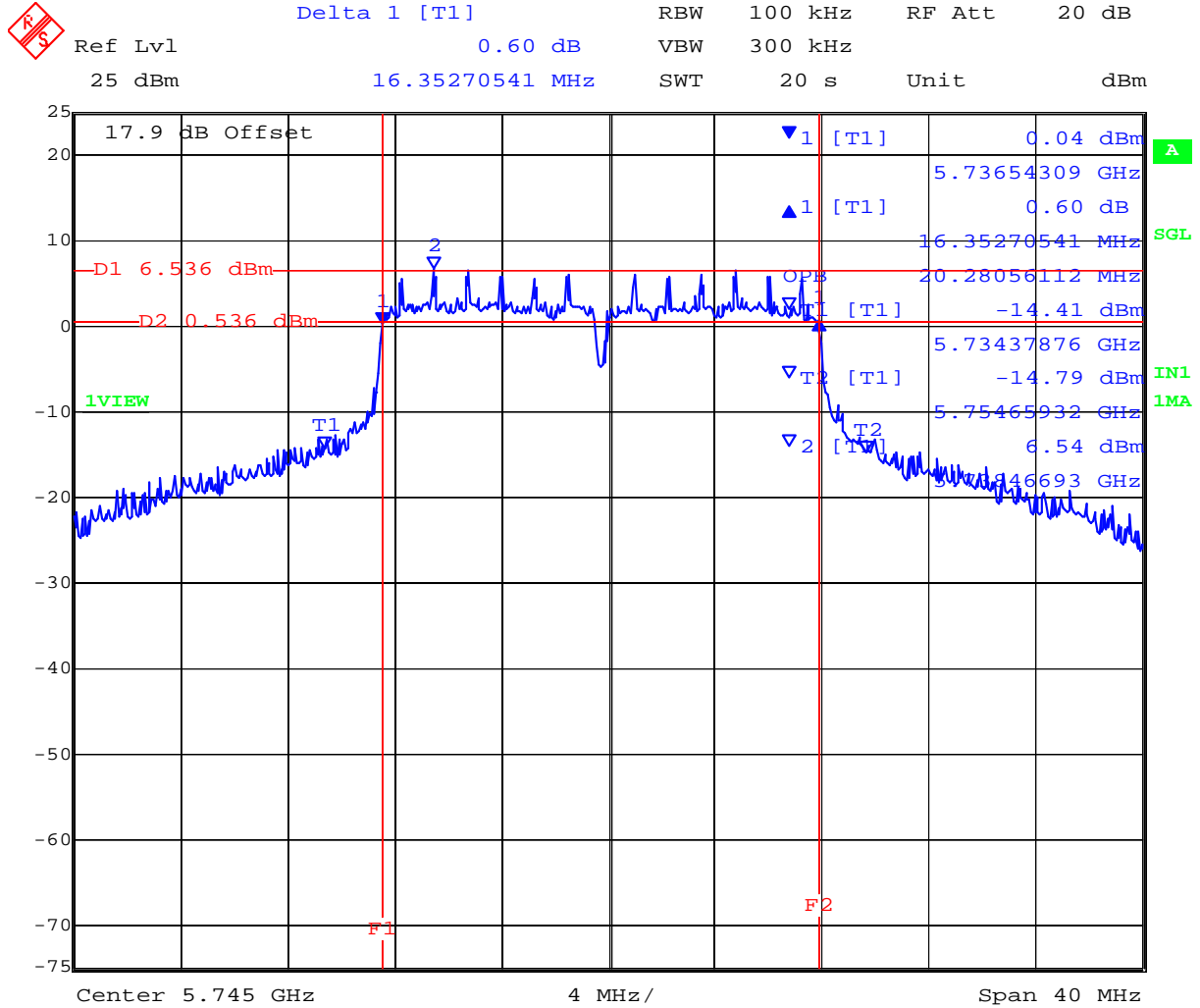


Date: 11.FEB.2012 17:43:22

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PORT B 5,745 MHz 802.11a Legacy 6 dB and 99% Bandwidth



Date: 11.FEB.2012 17:44:27

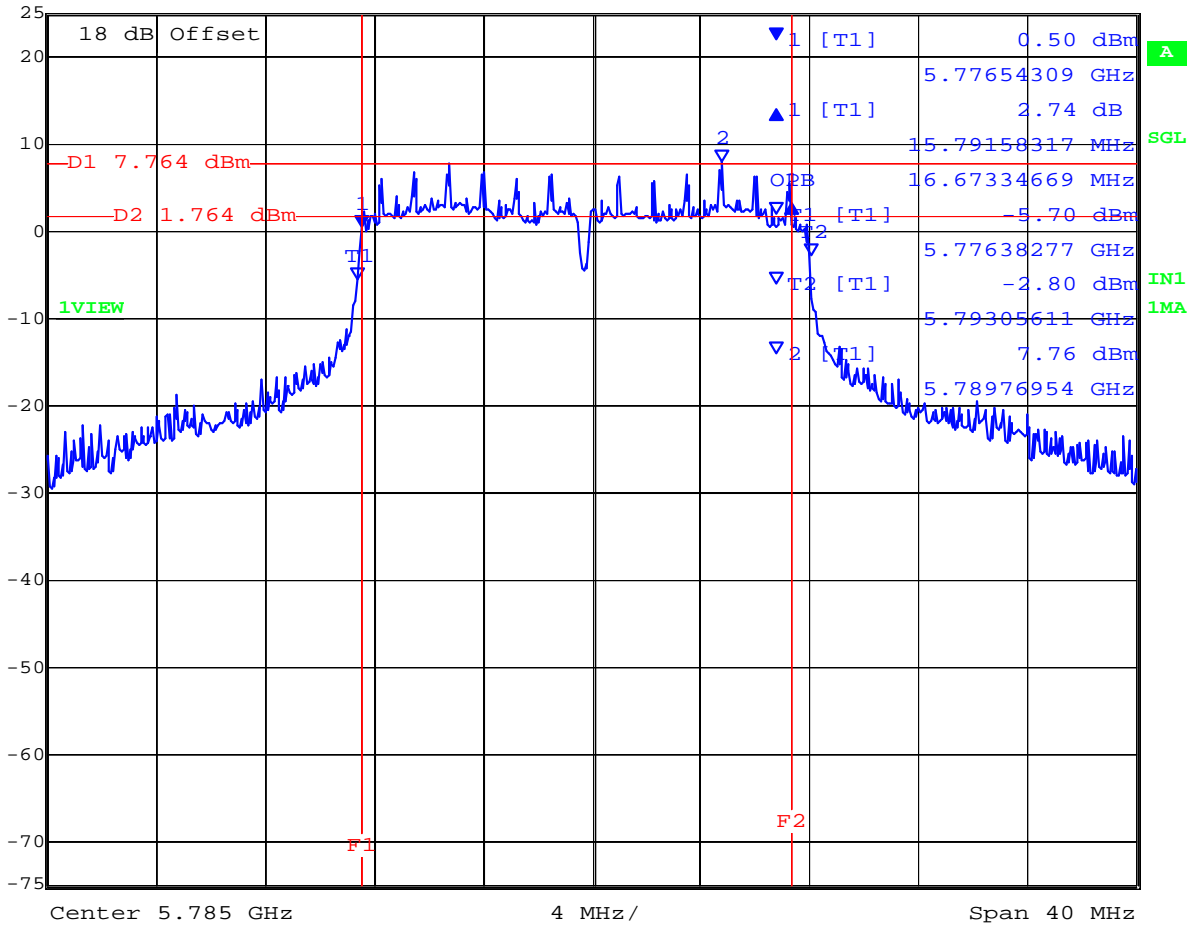
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PORT A 5,785 MHz 802.11a Legacy 6 dB and 99% Bandwidth



Delta 1 [T1] RBW 100 kHz RF Att 20 dB
 Ref Lvl 25 dBm 2.74 dB VBW 300 kHz
 15.79158317 MHz SWT 20 s Unit dBm

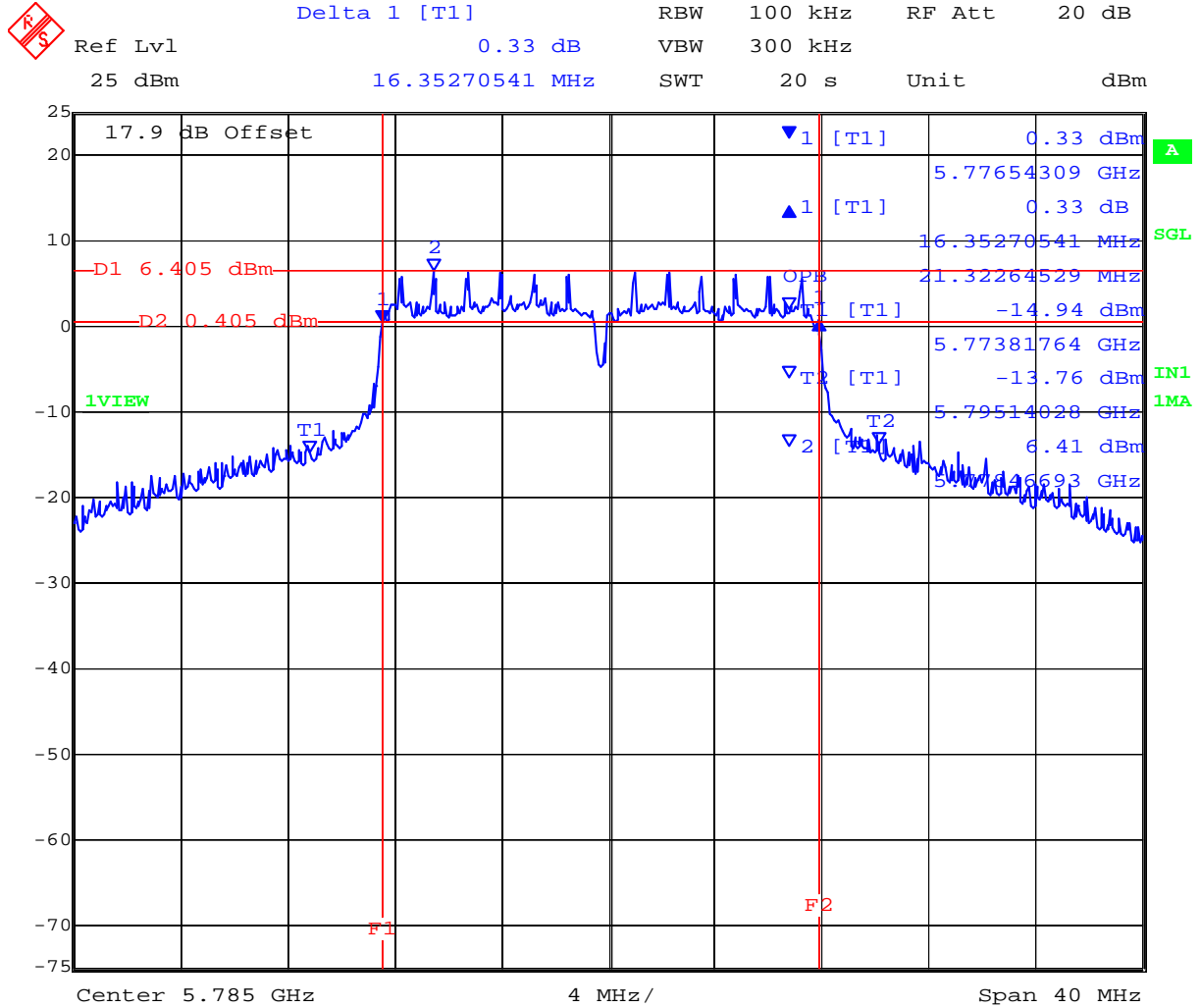


Date: 11.FEB.2012 18:02:03

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PORT B 5,785 MHz 802.11a Legacy 6 dB and 99% Bandwidth

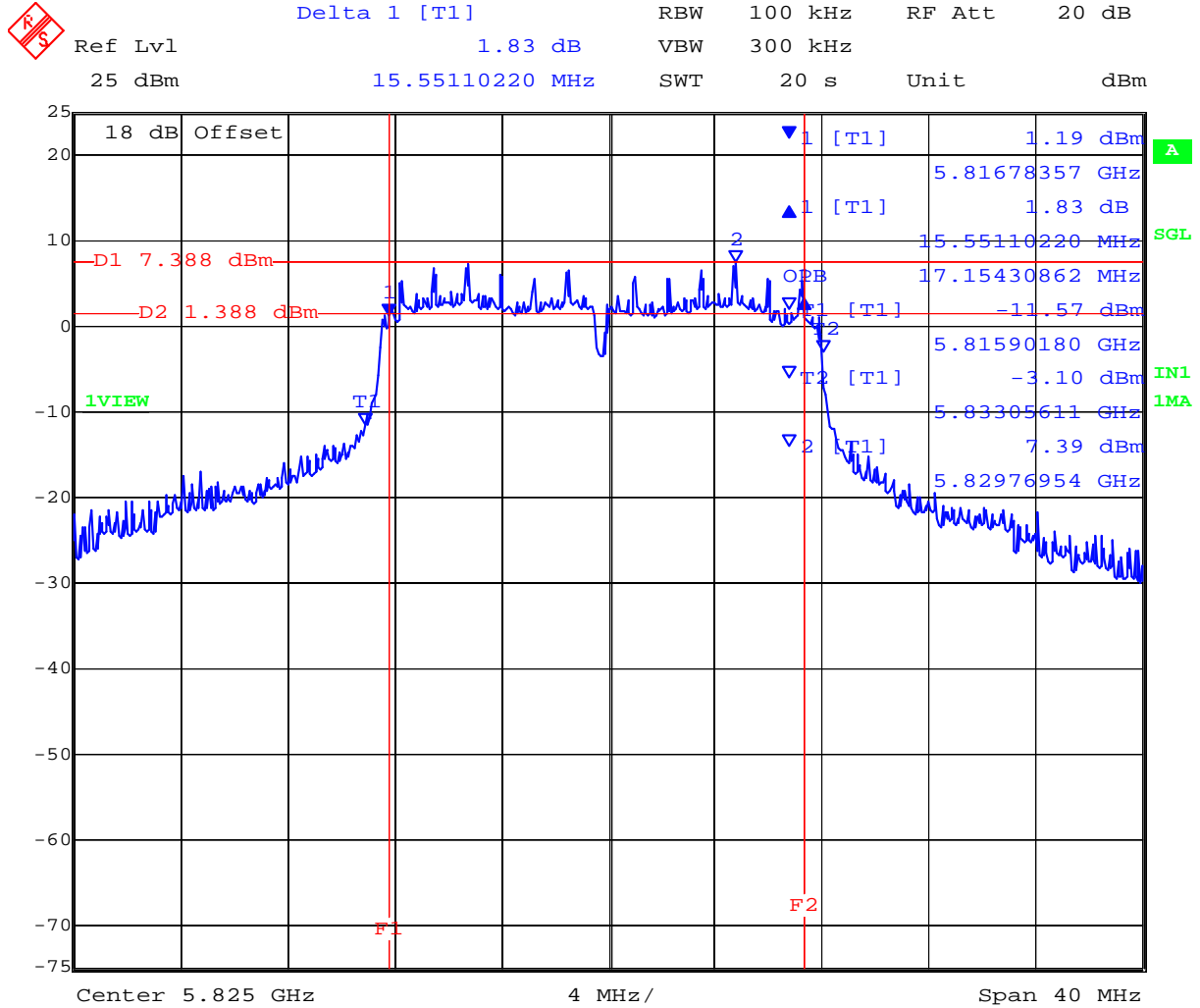


Date: 11.FEB.2012 18:03:08

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PORT A 5,825 MHz 802.11a Legacy 6 dB and 99% Bandwidth

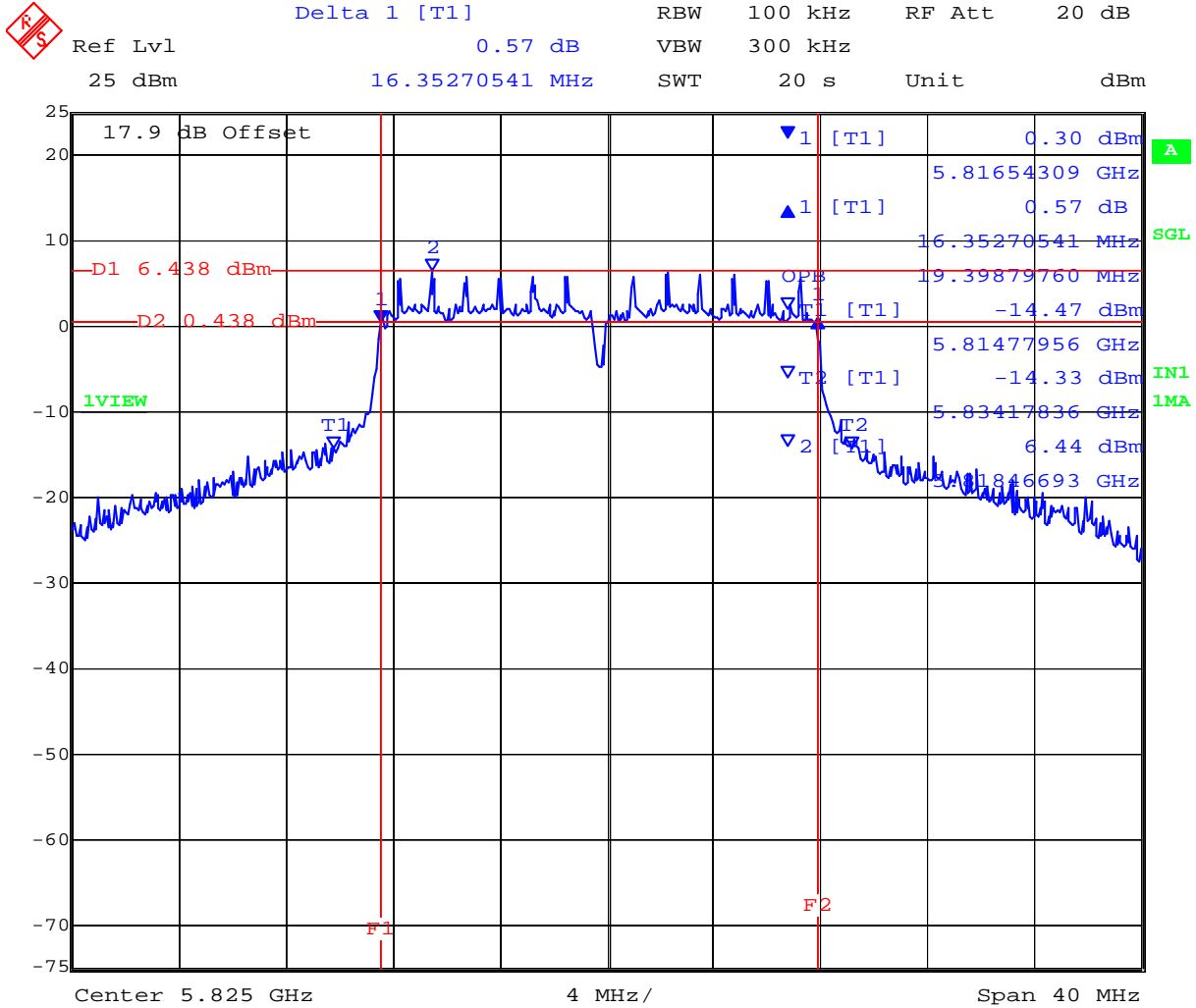


Date: 11.FEB.2012 18:18:47

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PORT B 5,825 MHz 802.11a Legacy 6 dB and 99% Bandwidth



Date: 11.FEB.2012 18:19:54

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 59 of 221

TABLE OF RESULTS – 802.11n HT-20

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35 to 42
Variants:	802.11n HT-20	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	4 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz				kHz	MHz	
MHz	a	b	c	d			
5745.000	17.635000	16.994000	--	--	500	0.5	-16.494000
5785.000	17.635000	16.192000	--	--			-15.692000
5825.000	16.032000	17.395000	--	--			-15.532000

99% Bandwidth

Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
5745.000	18.277000	20.922000	--	--			
5785.000	18.277000	20.842000	--	--			
5825.000	18.357000	20.361000	--	--			

Measurement uncertainty:	±2.81 dB
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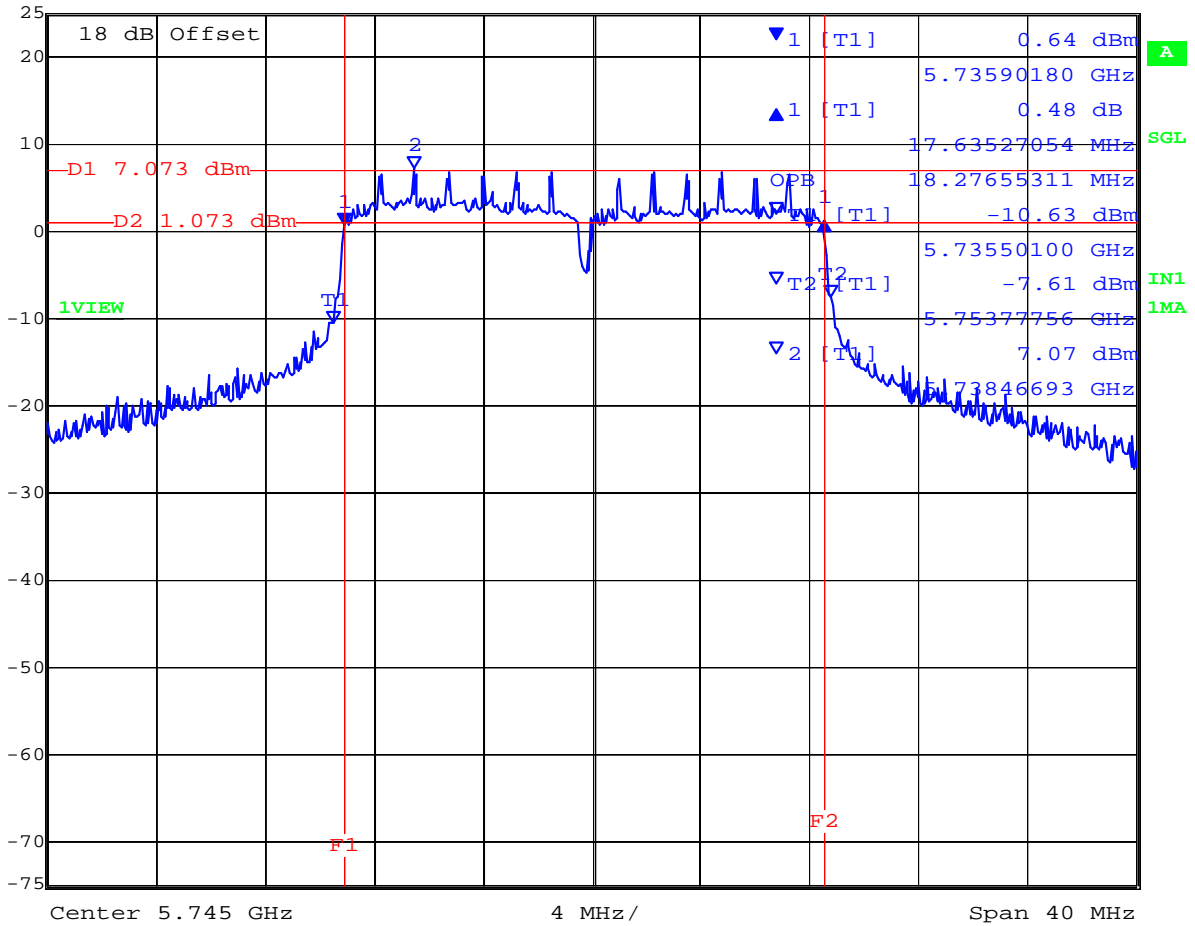
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PORT A 5,745 MHz 802.11n HT-20 6 dB and 99% Bandwidth



Delta 1 [T1] RBW 100 kHz RF Att 20 dB
 Ref Lvl 0.48 dB VBW 300 kHz
 25 dBm 17.63527054 MHz SWT 20 s Unit dBm

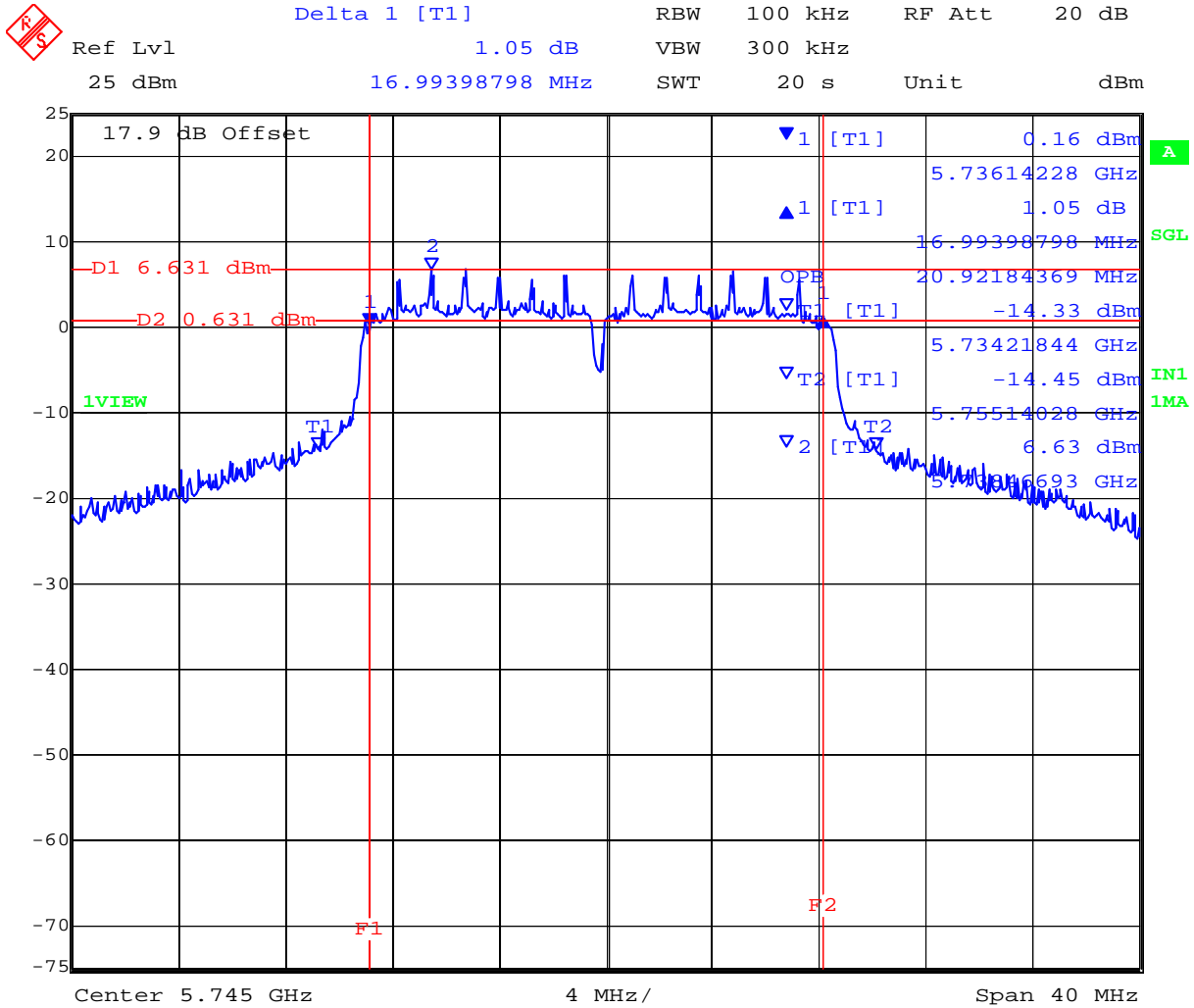


Date: 11.FEB.2012 18:44:31

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PORT B 5,745 MHz 802.11n HT-20 6 dB and 99% Bandwidth

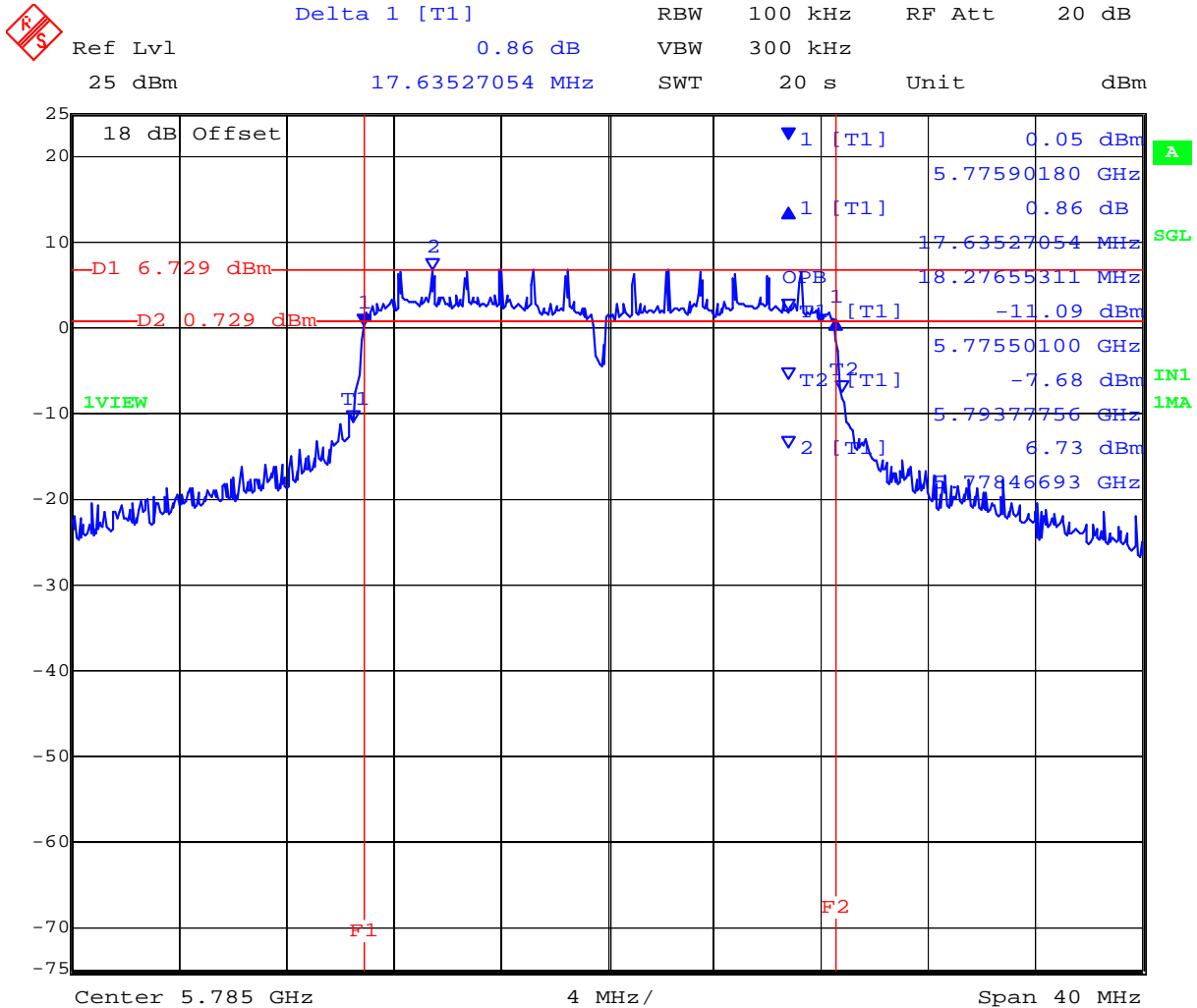


Date: 11.FEB.2012 18:45:36

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PORT A 5,785 MHz 802.11n HT-20 6 dB and 99% Bandwidth

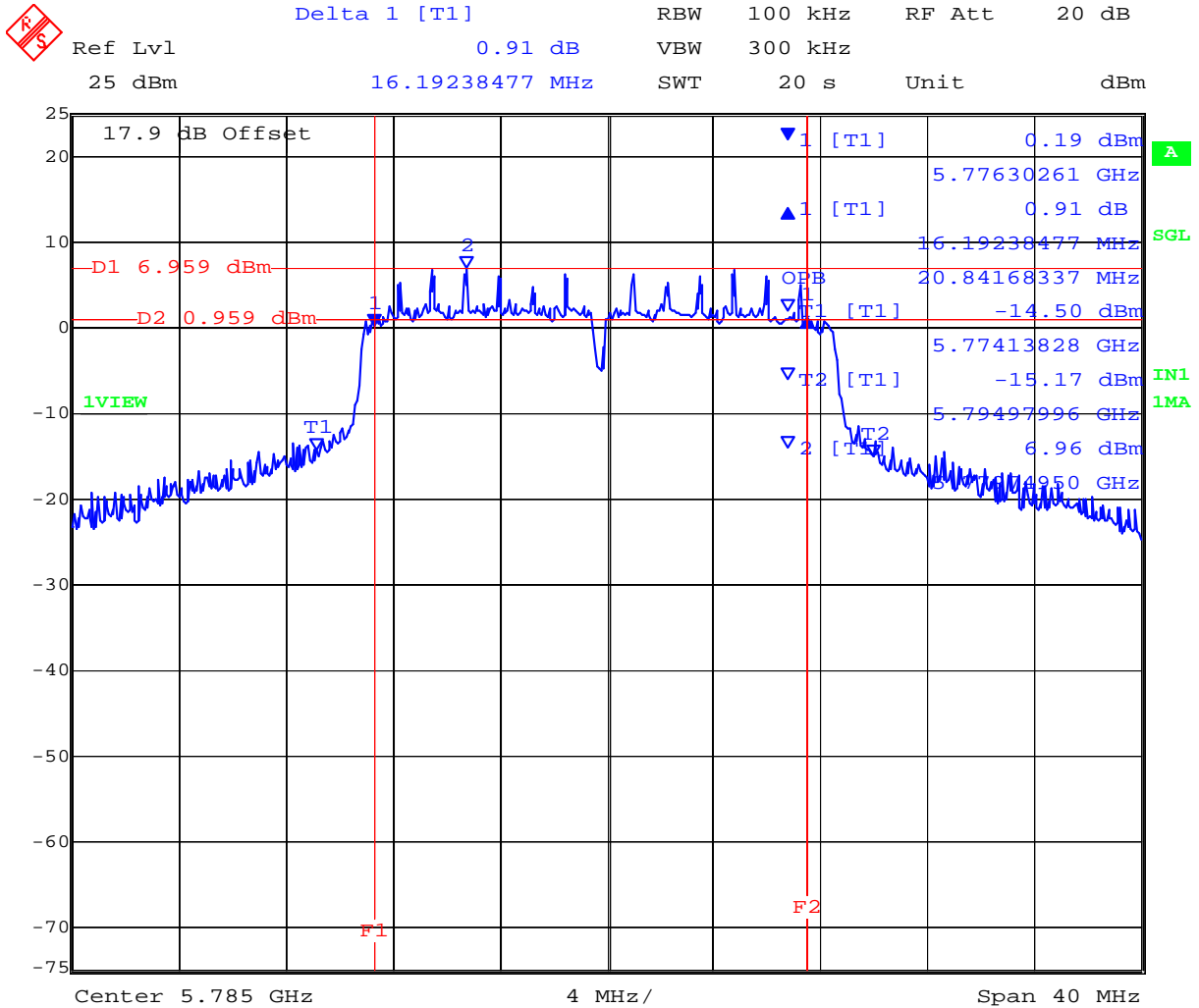


Date: 11.FEB.2012 19:03:12

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PORT B 5,785 MHz 802.11n HT-20 6 dB and 99% Bandwidth

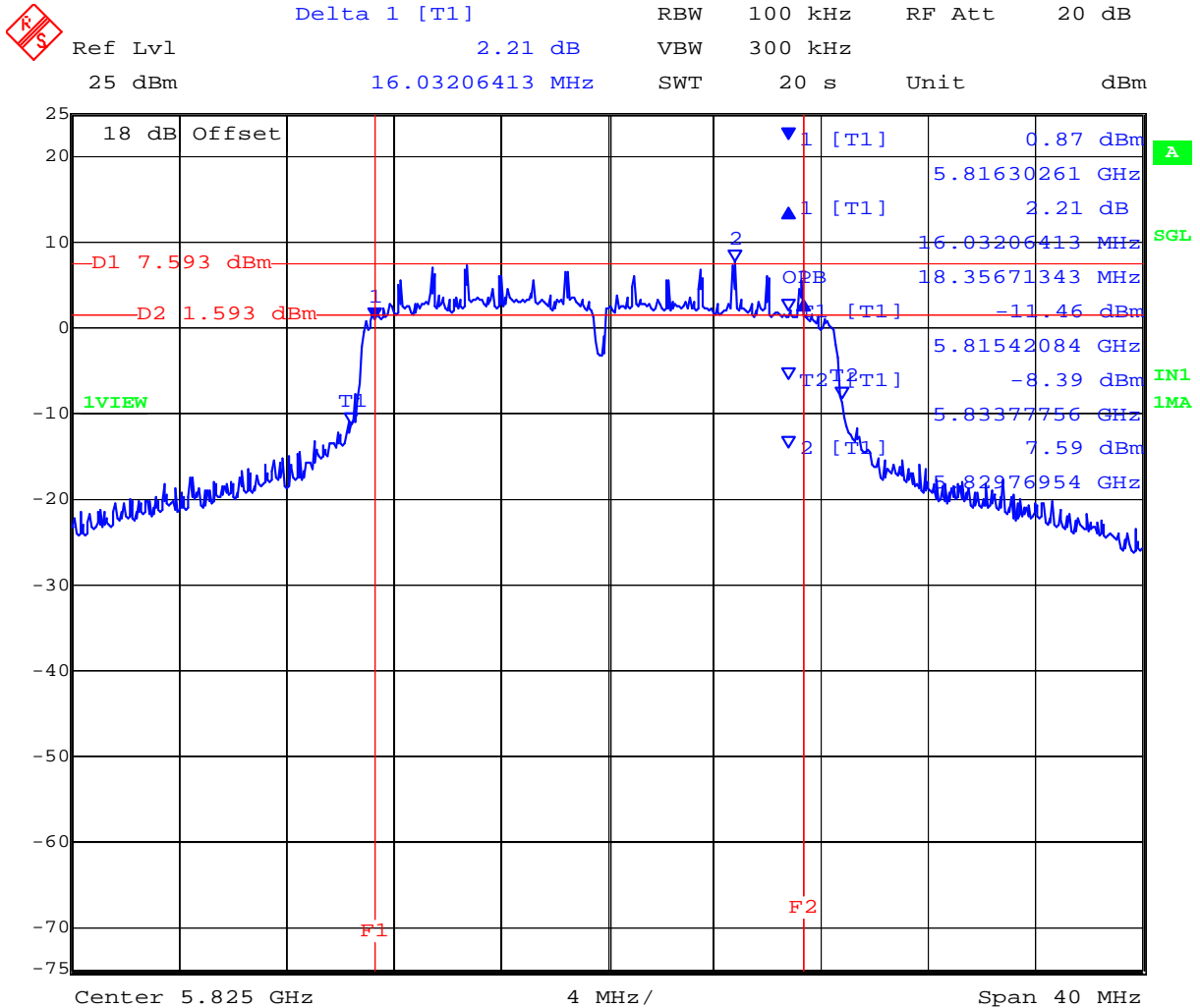


Date: 11.FEB.2012 19:04:18

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PORT A 5,825 MHz 802.11n HT-20 6 dB and 99% Bandwidth

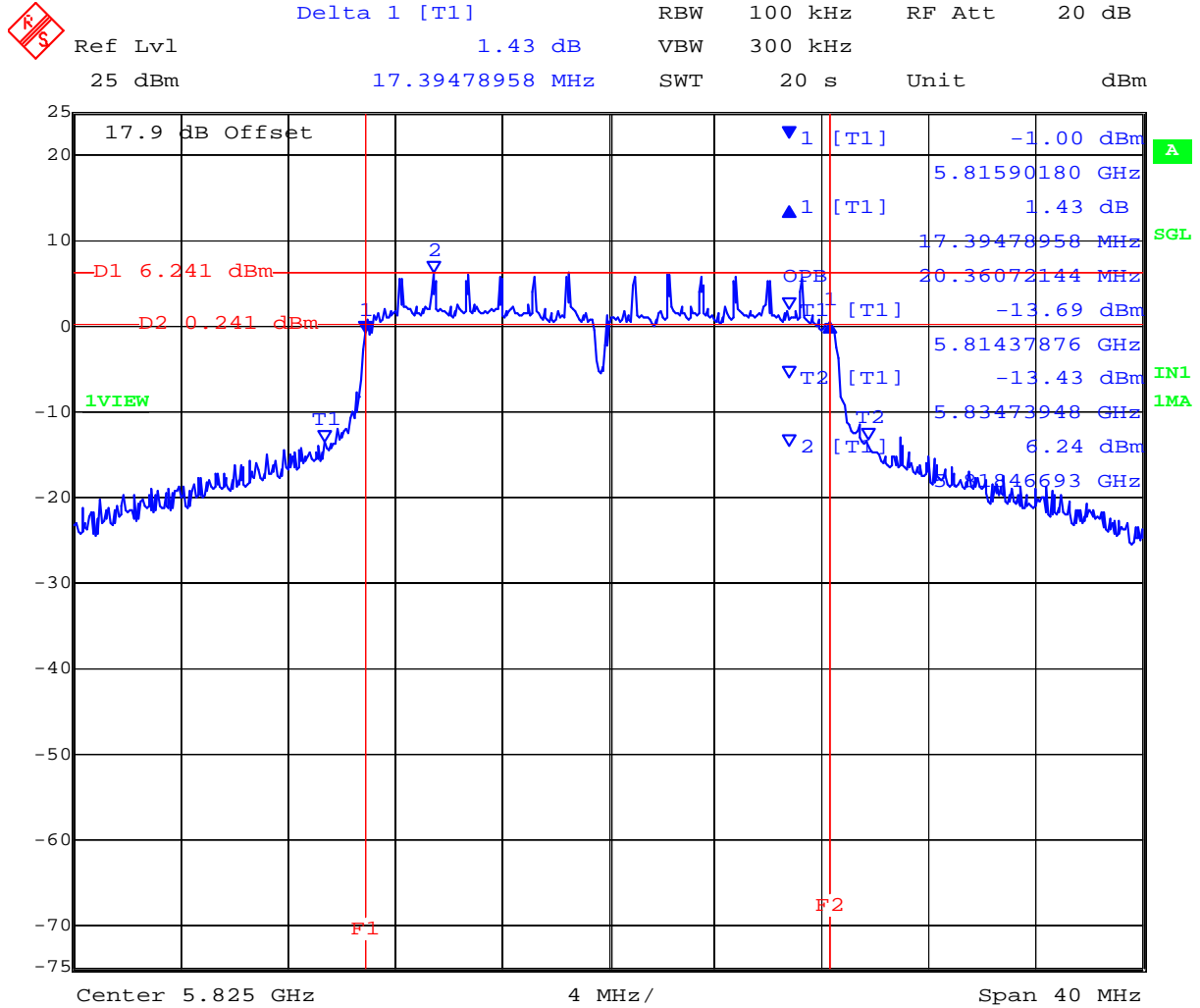


Date: 11.FEB.2012 19:19:15

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PORT B 5,825 MHz 802.11n HT-20 6 dB and 99% Bandwidth



Date: 11.FEB.2012 19:20:23

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 66 of 221

TABLE OF RESULTS – 802.11n - HT-40

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35 to 42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	4 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz				kHz	MHz	
MHz	a	b	c	d			
5755.000	35.912000	36.393000	--	--	500	0.5	-35.412000
5795.000	35.912000	36.393000	--	--			-35.412000

99% Bandwidth

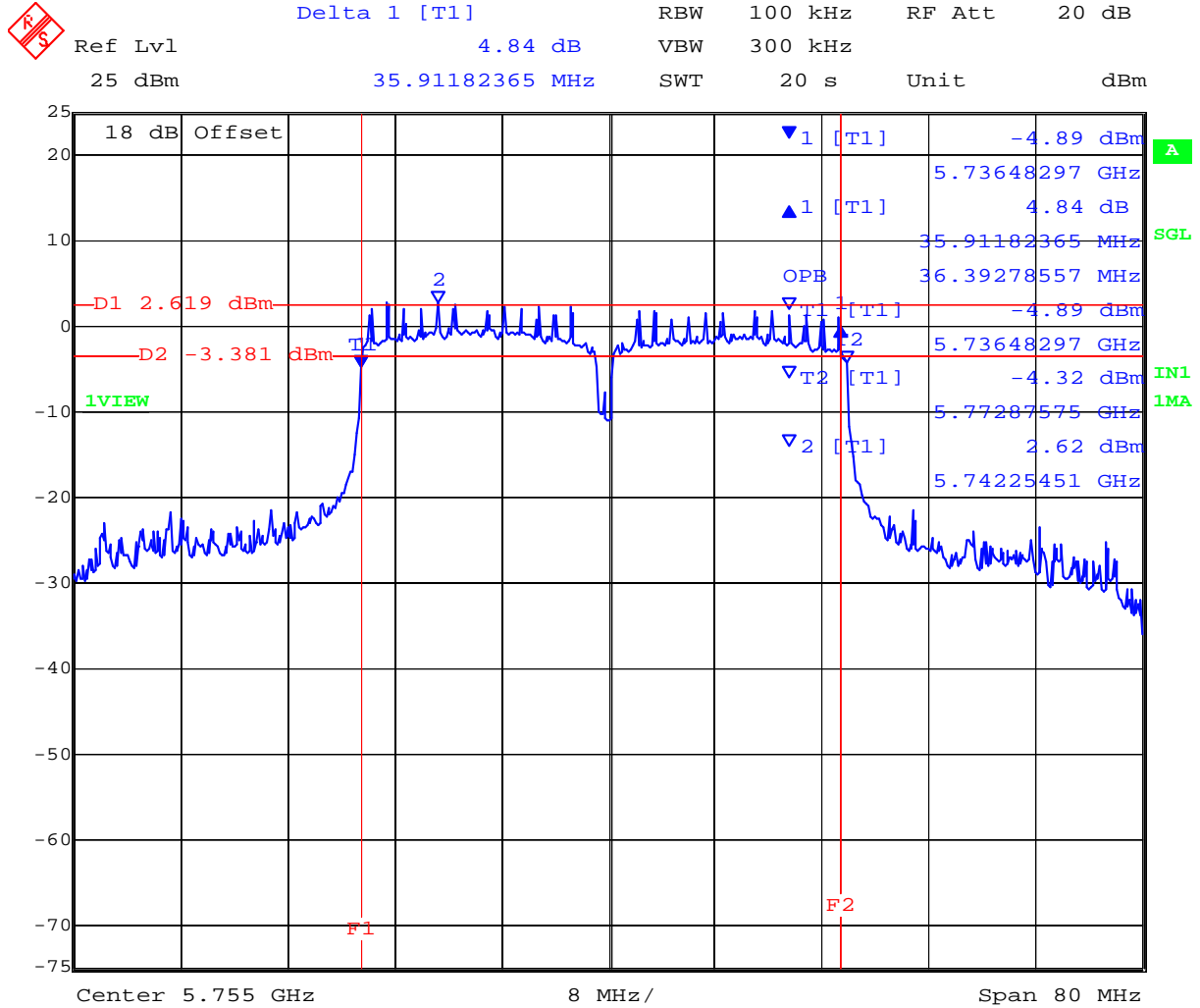
Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
5755.000	36.393000	38.637000	--	--			
5795.000	37.515000	39.439000	--	--			

Measurement uncertainty:	±2.81 dB
---------------------------------	----------

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PORTA 5,755 MHz 802.11n HT-40 6 dB and 99% Bandwidth

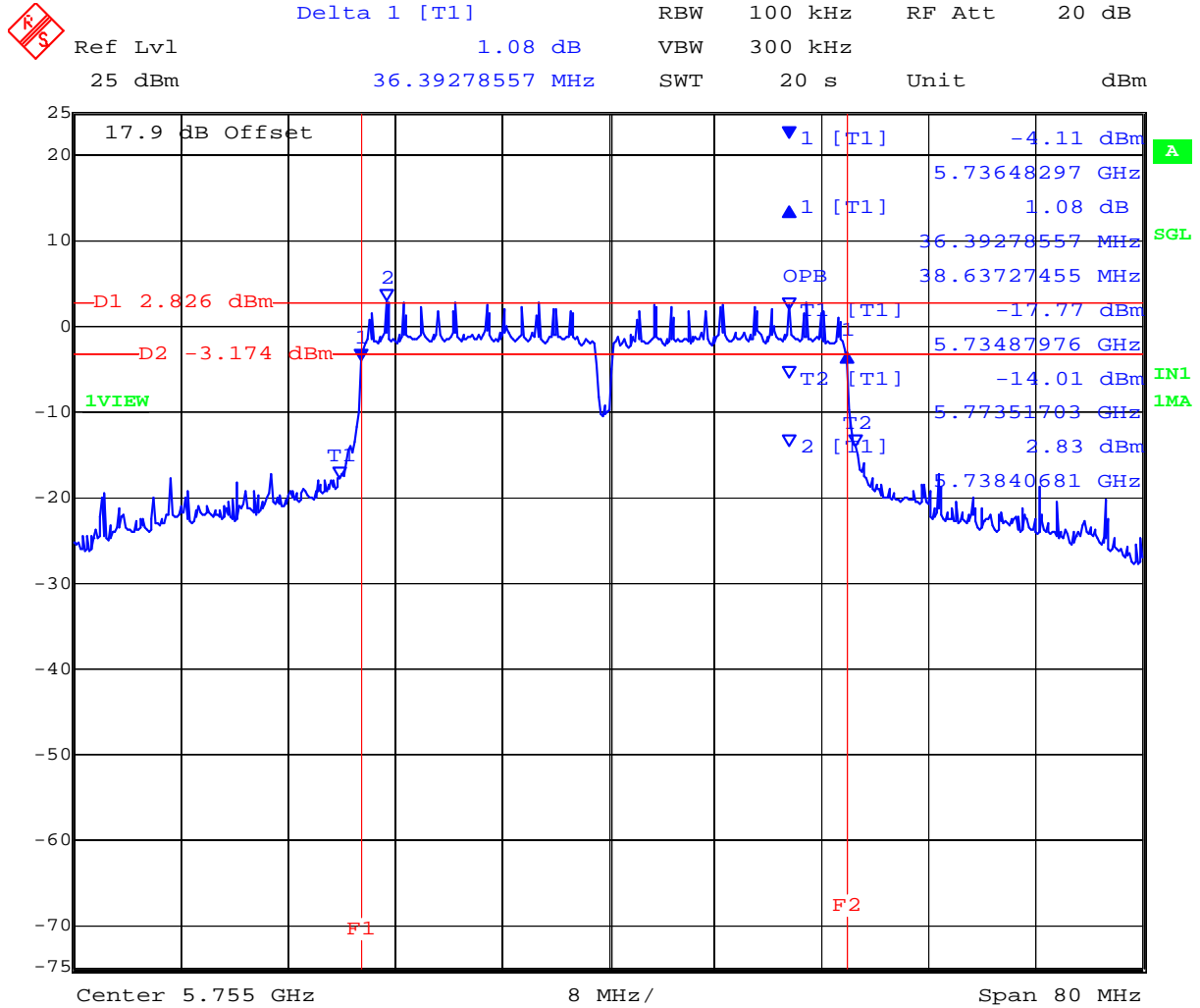


Date: 12.FEB.2012 09:05:04

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PORTB 5,755 MHz 802.11n HT-40 6 dB and 99% Bandwidth

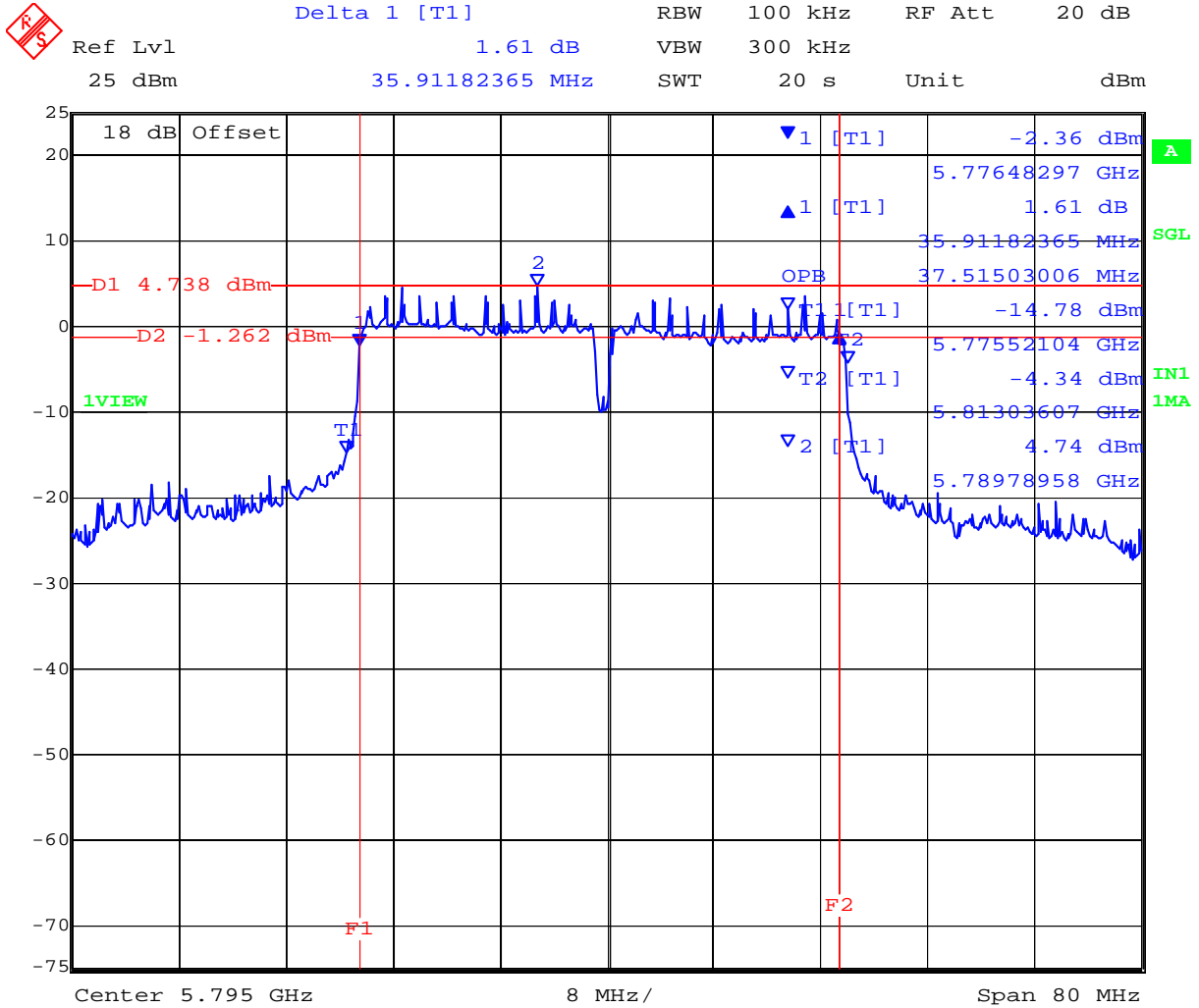


Date: 12.FEB.2012 09:06:11

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PORT A 5,795 MHz 802.11n HT-40 6 dB and 99% Bandwidth

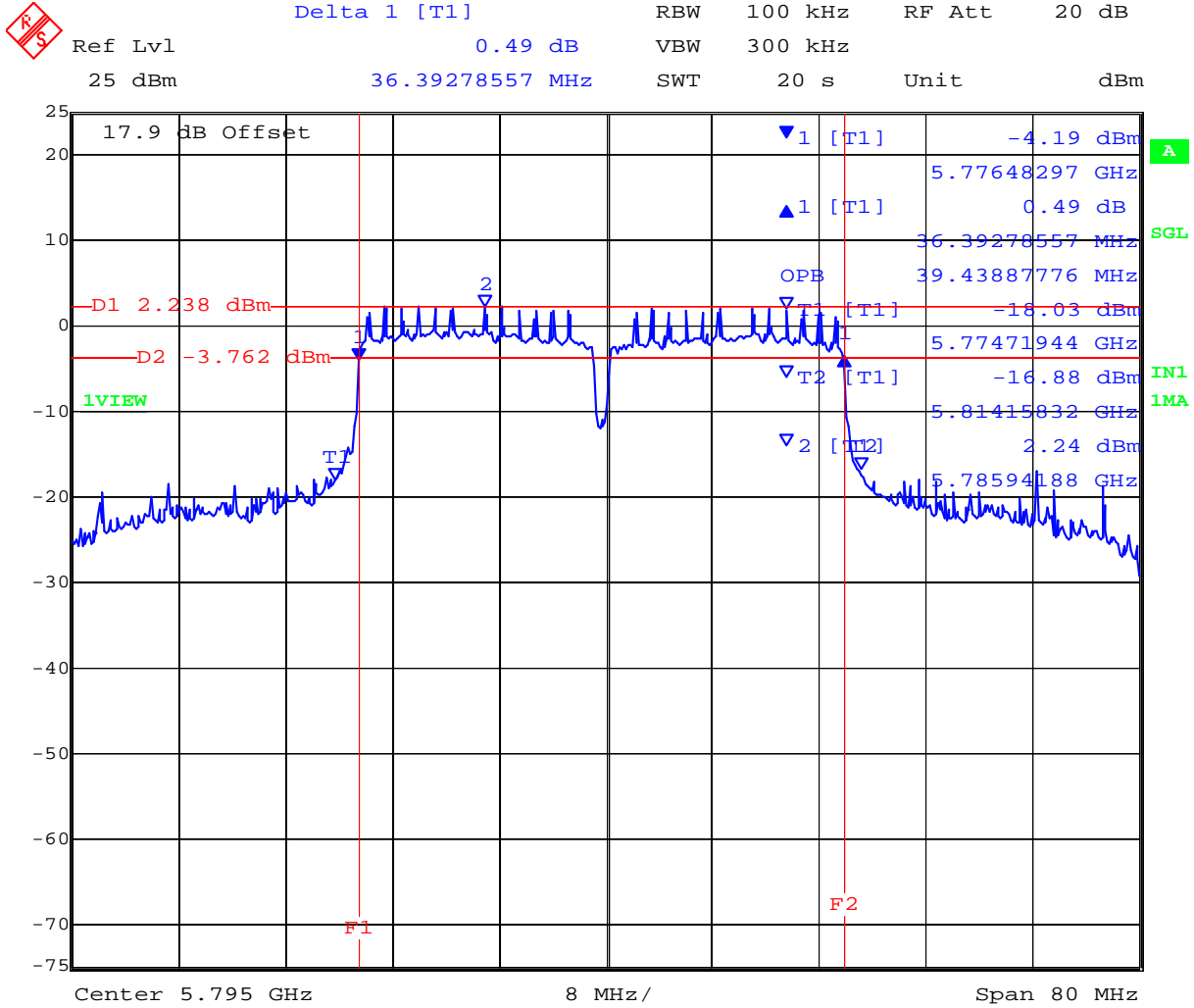


Date: 12.FEB.2012 09:30:14

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PORT B 5,795 MHz 802.11n HT-40 6 dB and 99% Bandwidth



Date: 12.FEB.2012 09:31:22

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 71 of 221

Specification

Limits

§15.247 (a)(2) & RSS-210 §A8.2(1)

The minimum 6 dB bandwidth shall be at least 500 kHz.

§ IC RSS-Gen 4.4.1 Occupied Bandwidth 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.

§ IC RSS-Gen 4.4.2 6 dB Bandwidth Where indicated, the 6 dB bandwidth is measured at the points when the spectral density of the signal is 6 dB down from the in-band spectral density of the modulated signal, with the transmitter modulated by a representative signal.

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement uncertainty	±2.81 dB
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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

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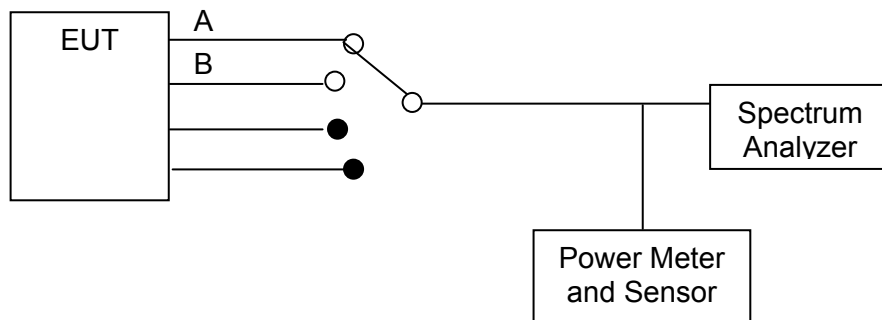
5.1.2. Peak Output Power

FCC, Part 15 Subpart C §15.247(b)(3), §15.31(e)
Industry Canada RSS-210 §A8.4(4)

Test Procedure

The transmitter terminal of EUT was connected to the input of the spectrum analyzer set to measure peak power. The resolution filter bandwidth was set to 6 dB, peak detector selected and the analyzer built-in power function was used to measure peak power over the 99 % bandwidth.

Test Measurement Set up



Measurement set up for Transmitter Peak Output Power

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

Calculated Power = $A + G + 10 \log (1/x)$ dBm

$A = \text{Total Power } [10 \text{ Log}_{10} (10^{a/10} + 10^{b/10})]$, $G = \text{Antenna Gain}$,
 $x = \text{Duty Cycle}$

NOTE: KDB 662911 was implemented for In-band power measurements. The measure and sum technique was implemented in all cases.



15.247 (c) 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.

MIMO Operation

2.4 GHz MIMO (Non-Legacy Operation)

Antenna (dB)	Gain (dBi)	Max. Allowable Conducted Peak Power (dBm)		Maximum EIRP (dBm)
		Non-Beam Forming	Beam Forming	
Integral	0.0	+30.0	N/A	+36.0

5.8 GHz MIMO Operation (Non-Legacy Operation)

Antenna (dB)	Gain (dBi)	Max. Allowable Conducted Peak Power (dBm)		Maximum EIRP (dBm)
		Non-Beam Forming	Beam Forming	
Integral	0.0	+30.0	N/A	+36.0

Non-MIMO Operation

2.4 GHz Non-MIMO Operation (Legacy)

Antenna (dB)	Gain dBi	Antenna Gain Increase V's No. Antenna Ports		Total Gain dBi	Max. Allowable Conducted Peak Power (dBm)	Maximum EIRP (dBm)
		Ports	dB			
Integral	0.0	2	3.01	3.01	+30.00	+36.0

5.8 GHz Non-MIMO Operation (Legacy)

Antenna (dB)	Gain dBi	Antenna Gain Increase V's No. Antenna Ports		Total Gain dBi	Max. Allowable Conducted Peak Power (dBm)	Maximum EIRP (dBm)
		Ports	dB			
Integral	0.0	2	3.01	3.01	+30.00	+36.0

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 74 of 221

TABLE OF RESULTS – 802.11b – Legacy

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35 to 42
Variant:	802.11b	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)				Combined	Calculated		
MHz	a	b	c	d				
2412	18.78	18.70	--	--	N/A	21.75	30.00	-8.25
2437	16.50	16.55	--	--	N/A	19.54	30.00	-10.46
2462	18.12	18.94	--	--	N/A	21.56	30.00	-8.44

Measurement uncertainty:	±1.33 dB
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 75 of 221

TABLE OF RESULTS – 802.11g – Legacy

Note the power levels as a result of radiated band-edge reduction are including in the following matrix, see Section 3.7 Equipment Modifications

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35 to 42
Variant:	802.11g	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)				Combined	Calculated		
MHz	a	b	c	d			dBm	dB
2412	18.42	17.85	--	--	N/A	21.15	30.00	-8.85
2437	18.30	18.13	--	--	N/A	21.23	30.00	-8.77
2462	15.65	14.98	--	--	N/A	18.34	30.00	-11.66

Measurement uncertainty:	±1.33 dB
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 76 of 221

TABLE OF RESULTS – 802.11n – HT-20

Note the power levels as a result of radiated band-edge reduction are including in the following matrix, see Section 3.7 Equipment Modifications

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35 to 42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)				Combined	Calculated		
MHz	a	b	c	d			dBm	dB
2412	16.66	15.93	--	--	N/A	19.32	30.00	-10.68
2437	18.20	18.02	--	--	N/A	21.12	30.00	-8.88
2462	14.69	14.07	--	--	N/A	17.40	30.00	-12.60

Measurement uncertainty:	±1.33 dB
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 77 of 221

TABLE OF RESULTS – 802.11n – HT-40

Note the power levels as a result of radiated band-edge reduction are including in the following matrix, see Section 3.7 Equipment Modifications

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35 to 42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)				Combined	Calculated		
MHz	a	b	c	d				
2422	15.58	14.78	--	--	N/A	18.21	30.00	-11.79
2437	17.93	18.16	--	--	N/A	21.06	30.00	-8.94
2452	15.43	14.74	--	--	N/A	18.11	30.00	-11.89

Measurement uncertainty:	±1.33 dB
---------------------------------	----------

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 78 of 221

5.8 GHz Band

TABLE OF RESULTS – 802.11a – Legacy

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35 to 42
Variant:	802.11a	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)				Combined	Calculated		
MHz	a	b	c	d				
5745	16.28	15.63	--	--	N/A	18.98	30.00	-11.02
5785	15.48	14.61	--	--	N/A	18.08	30.00	-11.92
5825	16.35	15.43	--	--	N/A	18.92	30.00	-11.08

Measurement uncertainty:	±1.33 dB
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 79 of 221

TABLE OF RESULTS – 802.11n – HT-20

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35 to 42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)				Combined	Calculated		
MHz	a	b	c	d			dBm	dB
5745	16.46	15.69	--	--	N/A	19.10	30.00	-10.90
5785	16.66	15.74	--	--	N/A	19.23	30.00	-10.77
5825	16.34	15.23	--	--	N/A	18.83	30.00	-11.17

Measurement uncertainty:	±1.33 dB
---------------------------------	----------

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 80 of 221

TABLE OF RESULTS – 802.11n – HT-40

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi		
Applied Voltage:	48.00 Vdc				
Notes 1:					
Notes 2:					

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)				Combined	Calculated		
MHz	a	b	c	d				
5755	15.24	15.36	--	--	N/A	18.31	30.00	-11.69
5795	16.35	15.29	--	--	N/A	18.86	30.00	-11.14

Measurement uncertainty:	±1.33 dB
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 81 of 221

Specification

Limits

§15.247 (b) The maximum peak output power of the intentional radiator shall not exceed the following:

§15.247 (b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands: 1.0 watt.

15.247 (b) (4) The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

15.247 (c) Operation with directional antenna gains greater than 6 dBi.

(1) Fixed point-to-point operation:

(i) Systems operating in the 2400–2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

(ii) Systems operating in the 5725–5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

§15.31 (e) For intentional radiators, measurements of the variation of the input power or the radiated signal level of the fundamental frequency component of the emission, as appropriate, shall be performed with the supply voltage varied between 85% and 115% of the nominal rated supply voltage. For battery operated equipment, the equipment tests shall be performed using a new battery.

§ RSS-210 A8.4(4) For systems employing digital modulation techniques operating in the 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz bands the maximum peak conducted power shall not exceed 1 watt.

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 82 of 221

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	± 1.33 dB
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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

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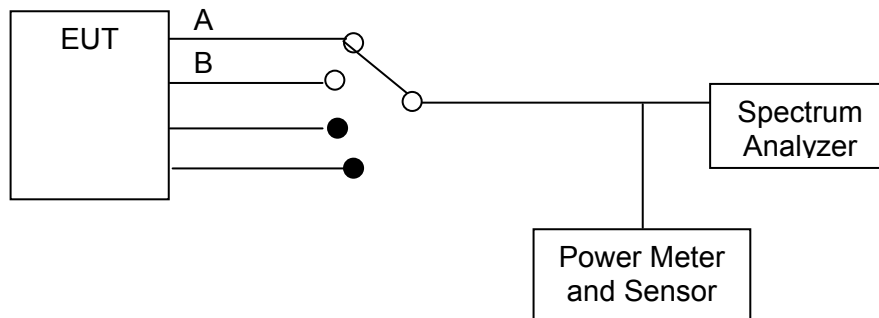
5.1.3. Peak Power Spectral Density

FCC, Part 15 Subpart C §15.247(e)
Industry Canada RSS-210 §A8.2

Test Procedure

The transmitter output was connected to a spectrum analyzer and the maximum level in a 3 kHz bandwidth was measured. A peak value was found over the full emission bandwidth and the frequency span reduced to obtain enhanced resolution. Sweep time \geq span / 3 kHz with video averaging turned off. The Peak Power Spectral Density is the highest level found across the emission in a 3 kHz 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

NOTE: KDB 662911 was implemented for In-band power spectral density (PSD) measurements. Option (2) Measure and add 10 log (N) dB was implemented



Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 84 of 221

Peak Power Spectral Density

TABLE OF RESULTS – 802.11b

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11b	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):	2		
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density				Correction factor	Maximum Peak Power Spectral Density	Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	10Log(N)	dBm	dBm	dB
2412.000	-4.66	-4.53	--	--	3.01	-4.53	4.99	-9.52
2437.000	-5.01	-4.77	--	--	3.01	-4.77	4.99	-9.76
2462.000	-5.62	-4.17	--	--	3.01	-4.17	4.99	-9.16

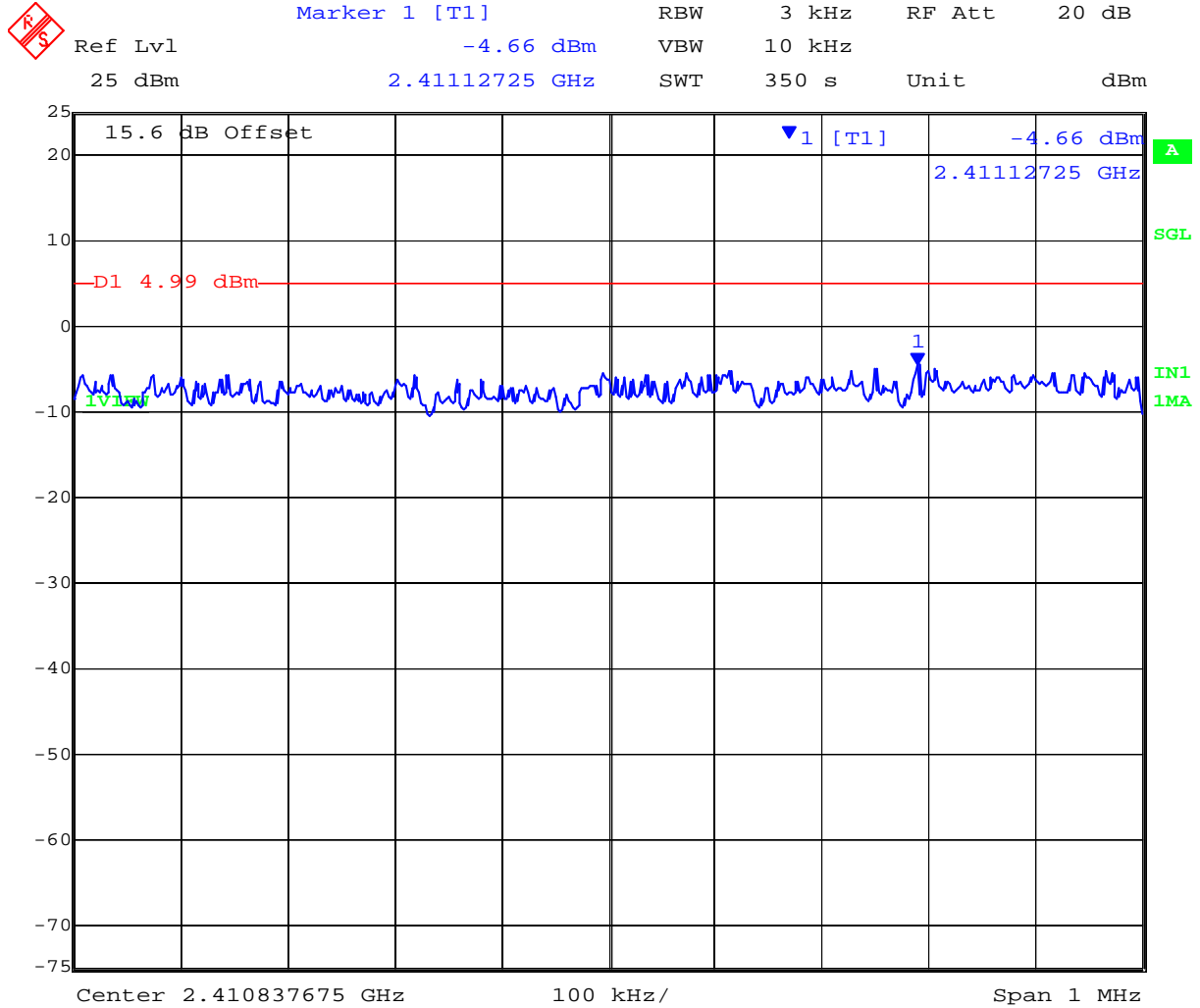
Measurement uncertainty:	± 1.33 dB
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 85 of 221

PORT A 2,412 MHz 802.11b - Peak Power Spectral Density



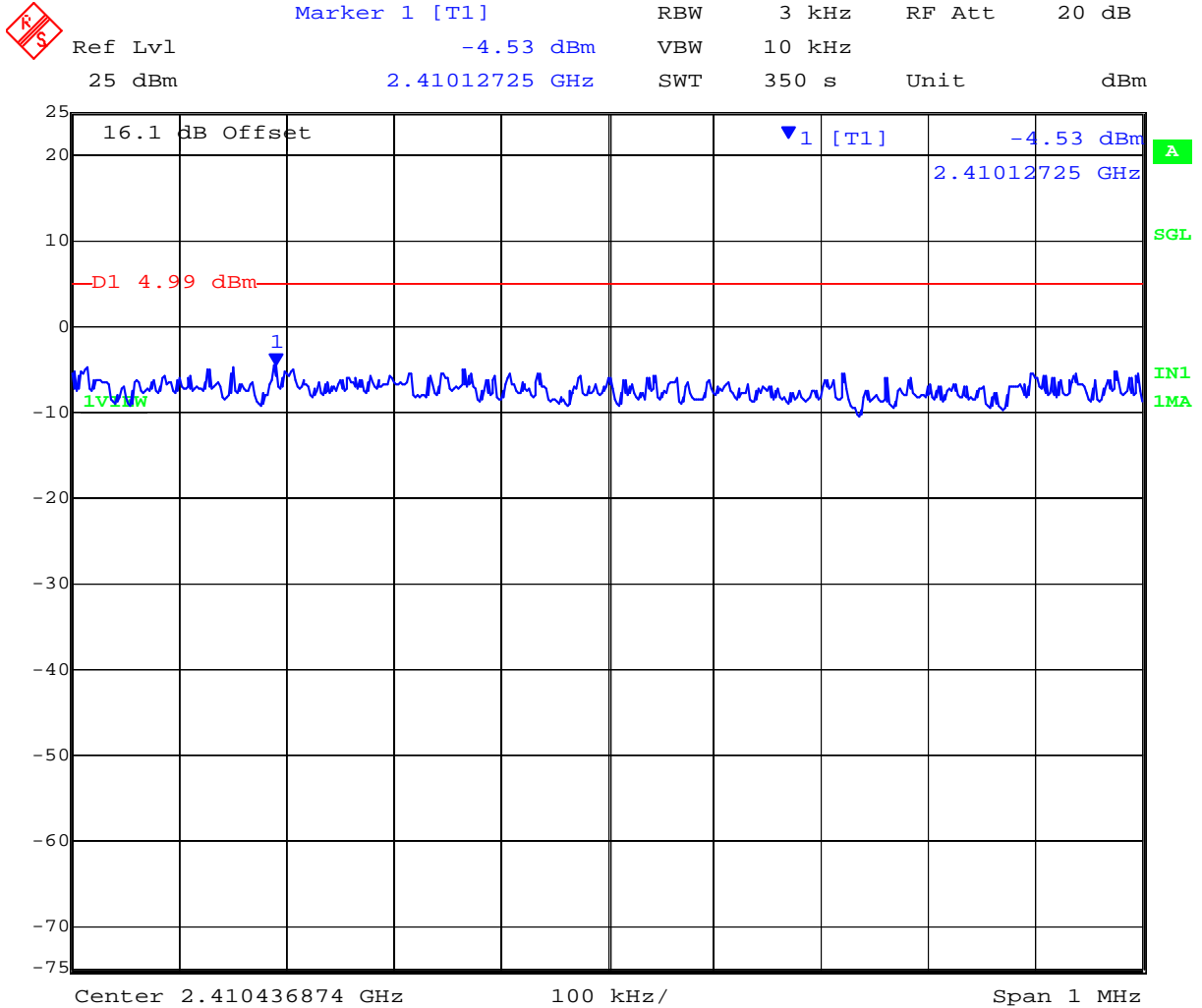
Date: 11.FEB.2012 13:11:38

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 86 of 221

PORT B 2,412 MHz 802.11b - Peak Power Spectral Density



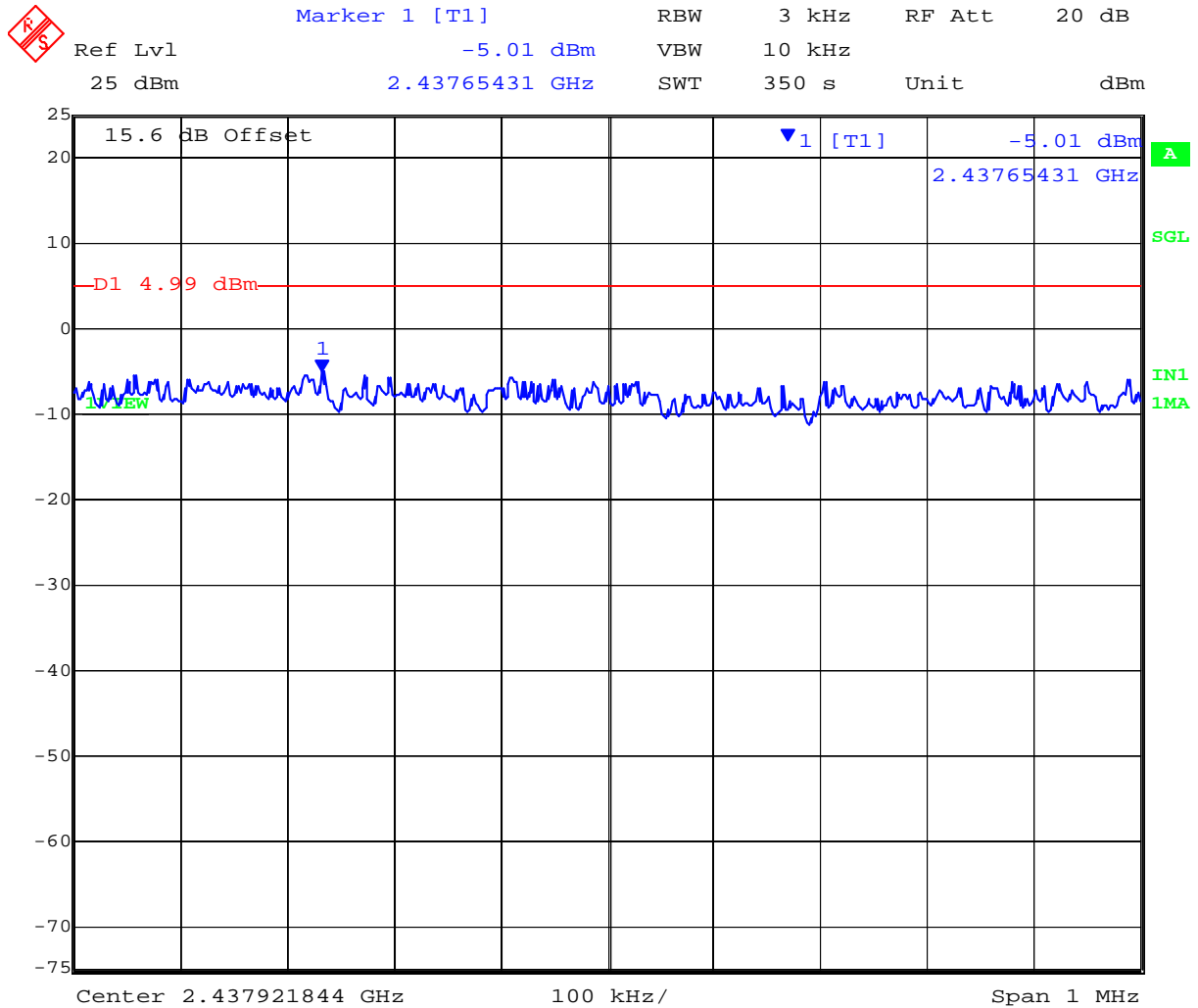
Date: 11.FEB.2012 13:18:09

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 87 of 221

PORT A 2,437 MHz 802.11b - Peak Power Spectral Density



Date: 11.FEB.2012 13:28:45

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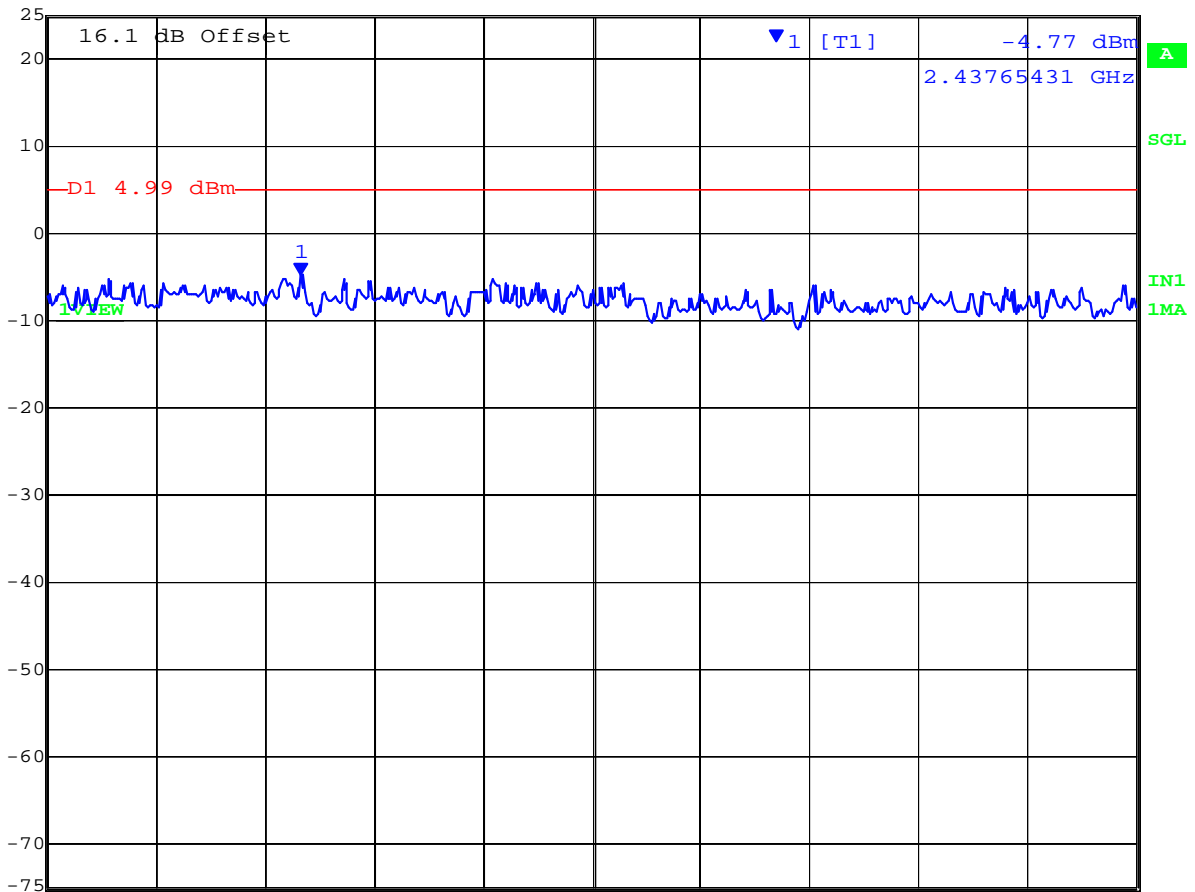


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 88 of 221

PORT B 2,437 MHz 802.11b - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -4.77 dBm VBW 10 kHz
25 dBm 2.43765431 GHz SWT 350 s Unit dBm



Center 2.437921844 GHz 100 kHz/ Span 1 MHz

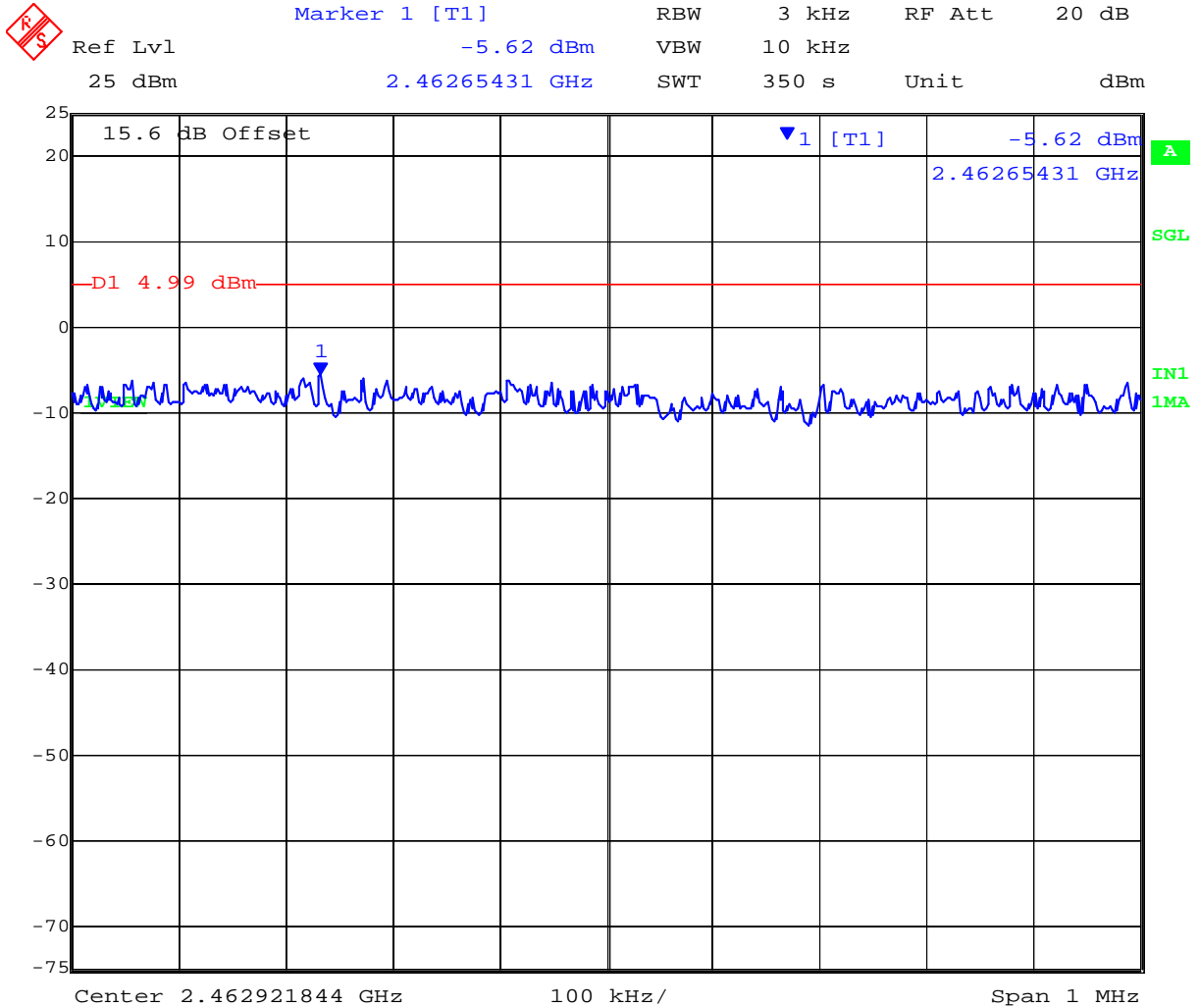
Date: 11.FEB.2012 13:35:17

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 89 of 221

PORT A 2,462 MHz 802.11b - Peak Power Spectral Density



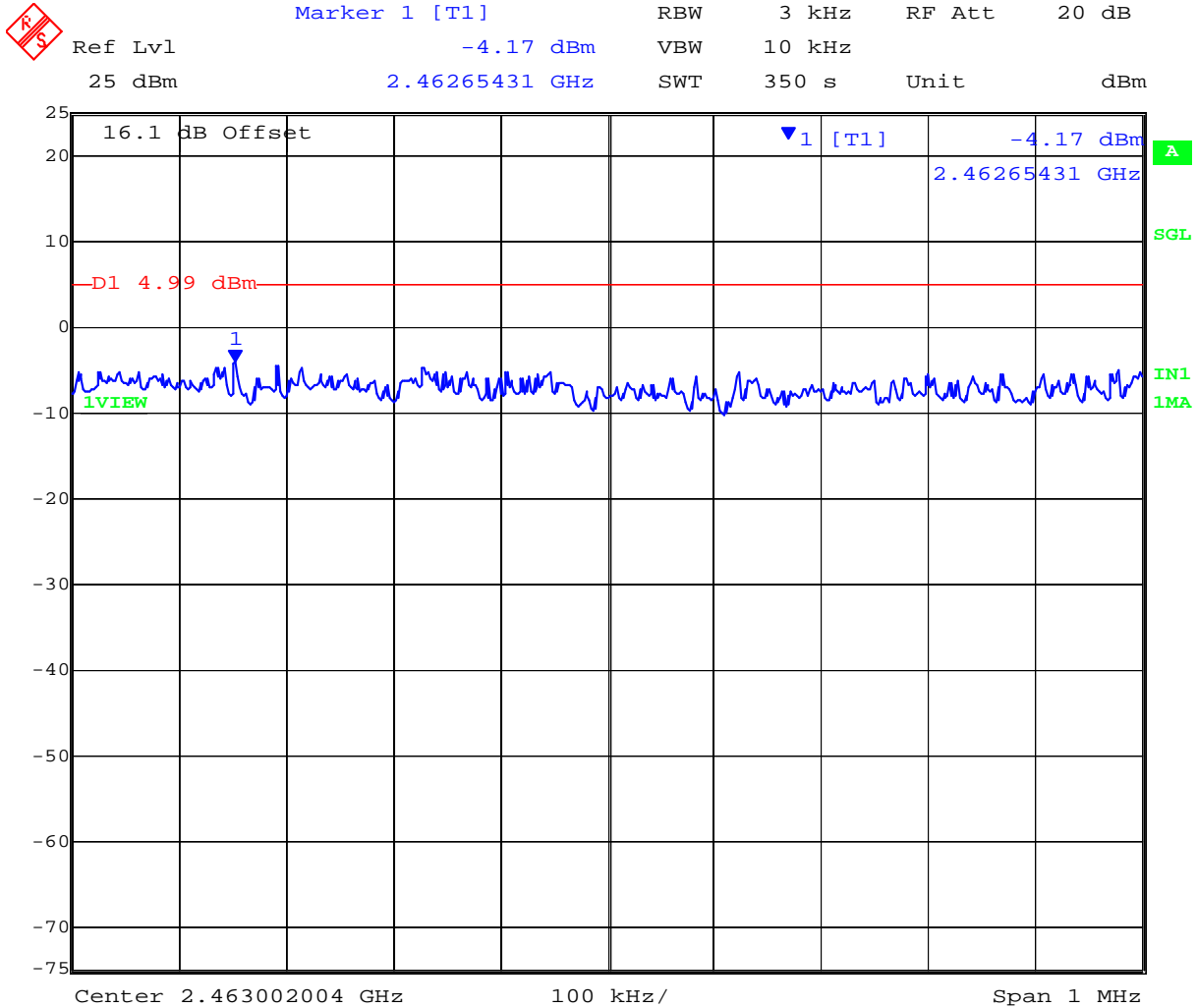
Date: 11.FEB.2012 13:55:06

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 90 of 221

PORT B 2,462 MHz 802.11b - Peak Power Spectral Density



Date: 11.FEB.2012 14:01:39

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 91 of 221

Peak Power Spectral Density

TABLE OF RESULTS – 802.11g Legacy

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11g	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):	2		
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density				Correction factor	Maximum Peak Power Spectral Density	Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	10Log(N)	dBm	dBm	dB
2412.000	-6.52	-5.20	--	--	3.01	-5.20	4.99	-10.19
2437.000	-5.88	-4.92	--	--	3.01	-4.92	4.99	-9.91
2462.000	-6.39	-6.69	--	--	3.01	-6.39	4.99	-11.38

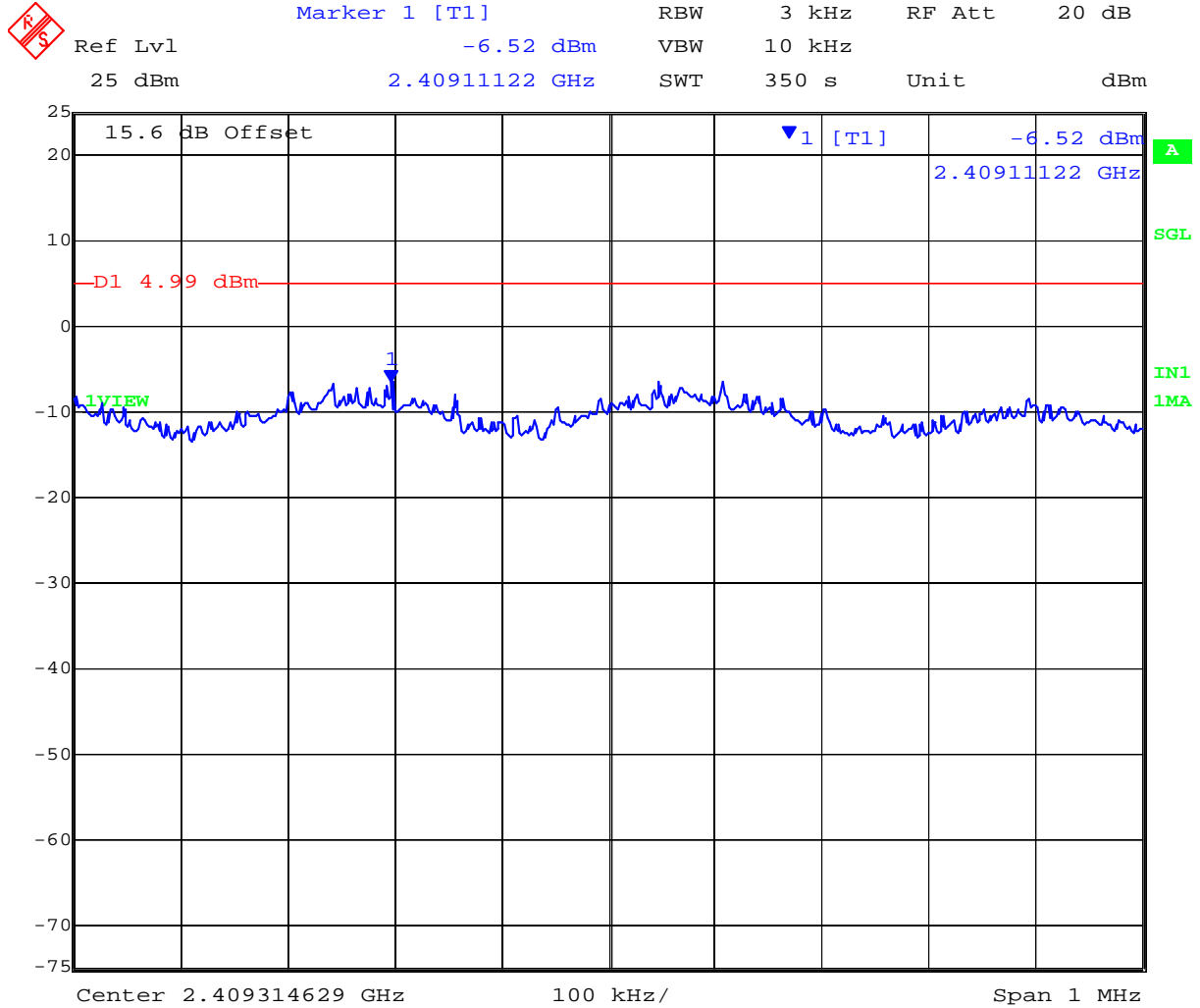
Measurement uncertainty:	± 1.33 dB
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 92 of 221

PORT A 2,412 MHz 802.11g Legacy - Peak Power Spectral Density

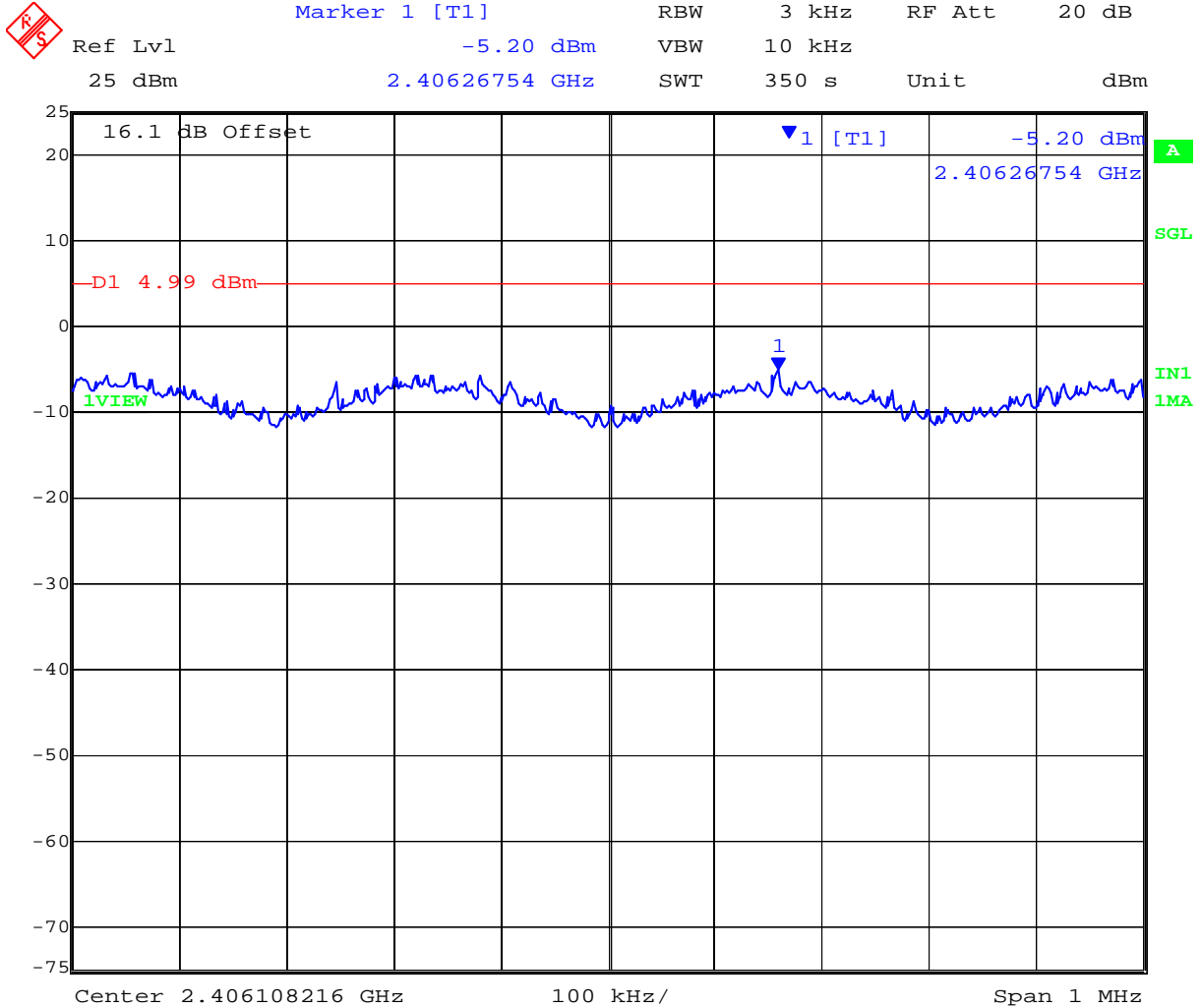


Date: 11.FEB.2012 14:41:24

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PORT B 2,412 MHz 802.11g Legacy - Peak Power Spectral Density



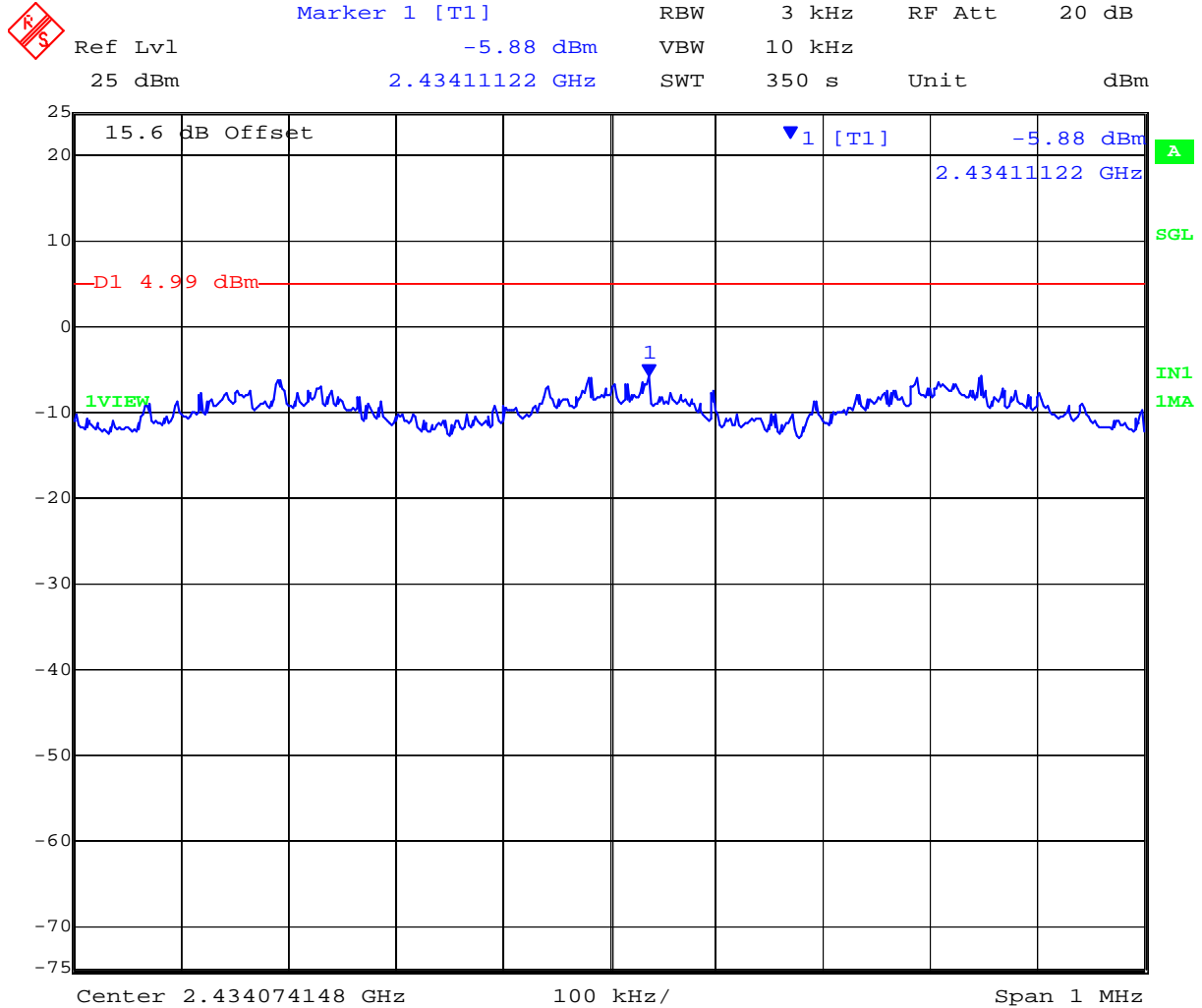
Date: 11.FEB.2012 14:47:57

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 94 of 221

PORT A 2,437 MHz 802.11g Legacy - Peak Power Spectral Density



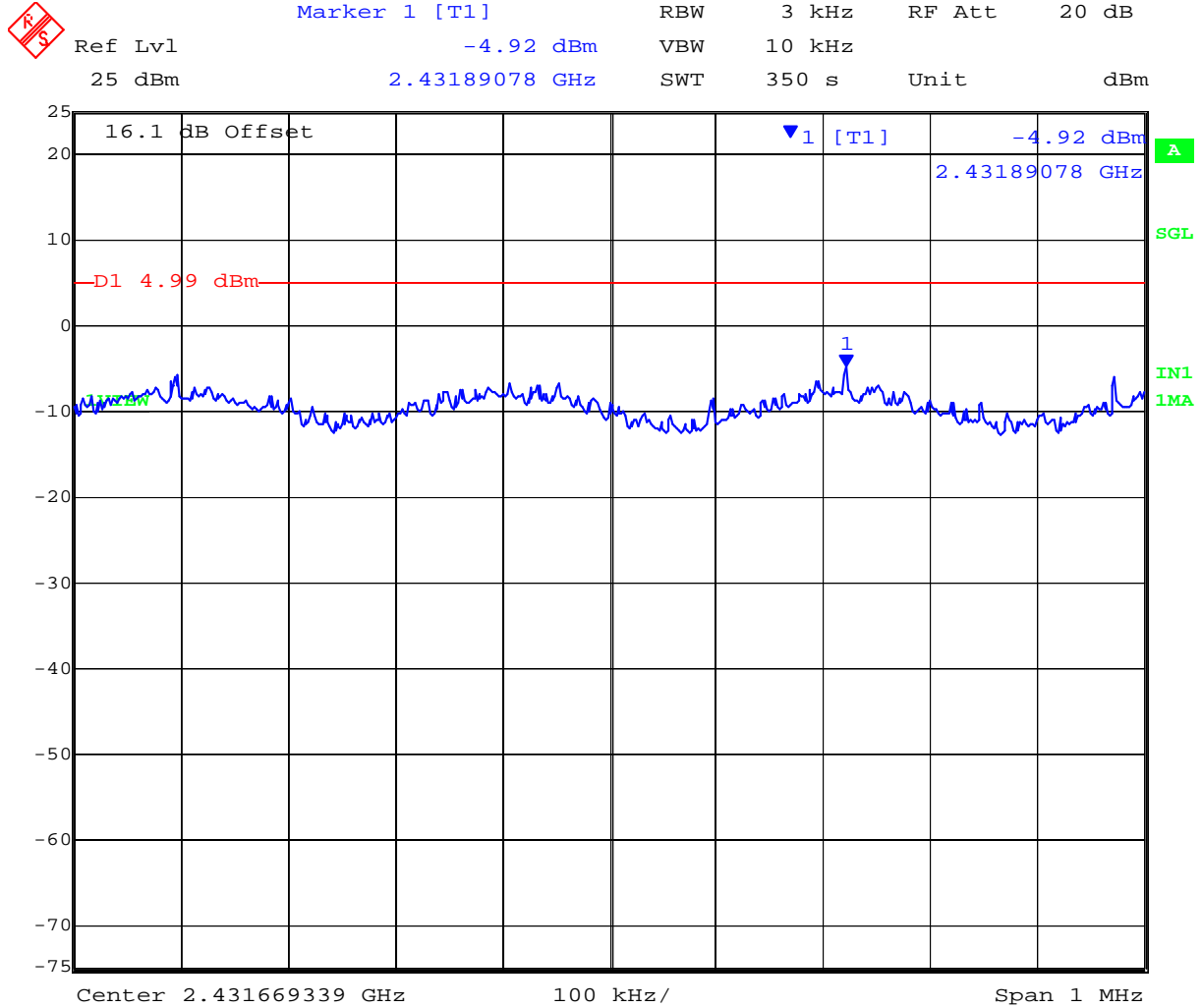
Date: 11.FEB.2012 15:01:05

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 95 of 221

PORT B 2,437 MHz 802.11g Legacy - Peak Power Spectral Density



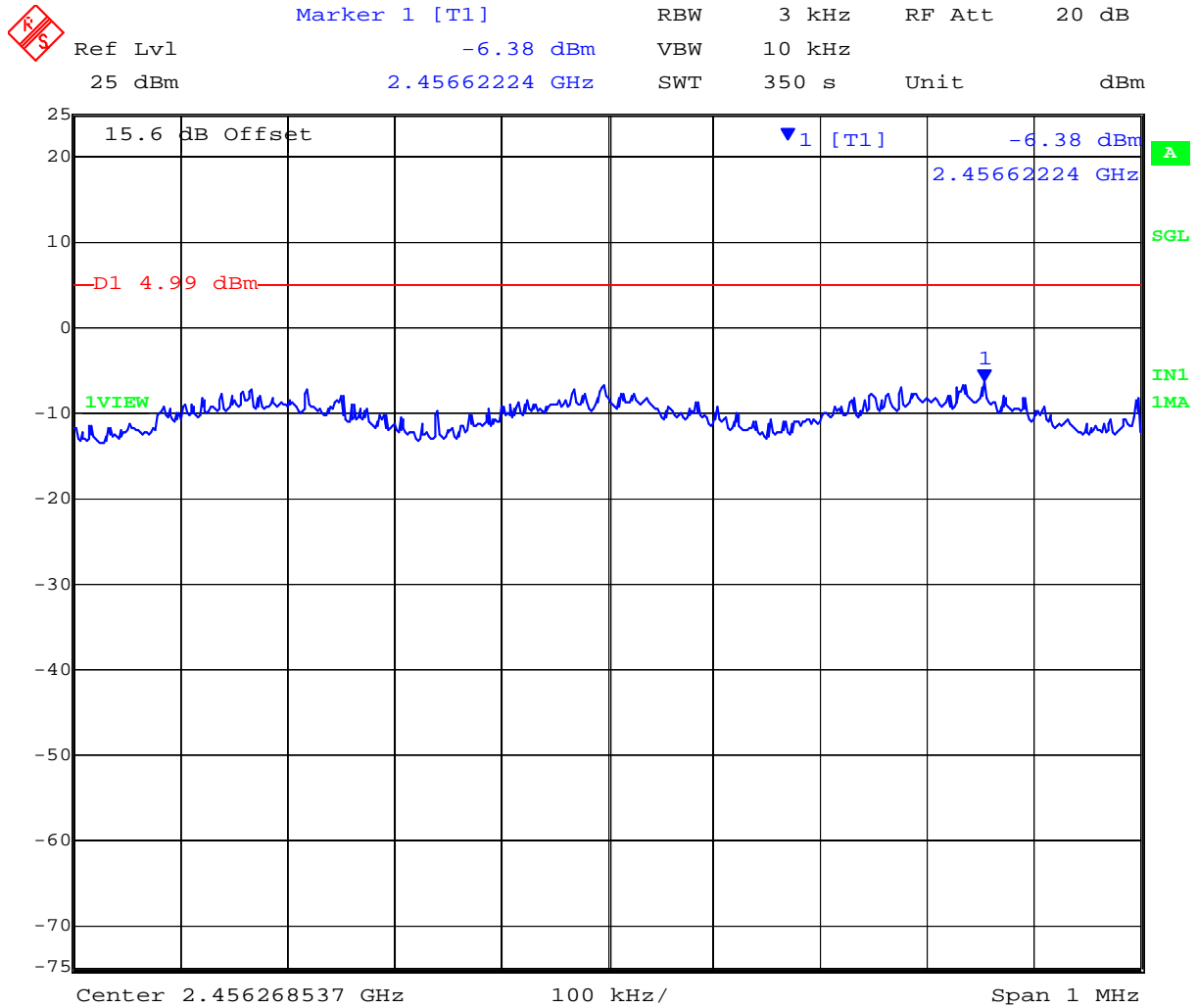
Date: 11.FEB.2012 15:07:36

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 96 of 221

PORT A 2,462 MHz 802.11g Legacy - Peak Power Spectral Density

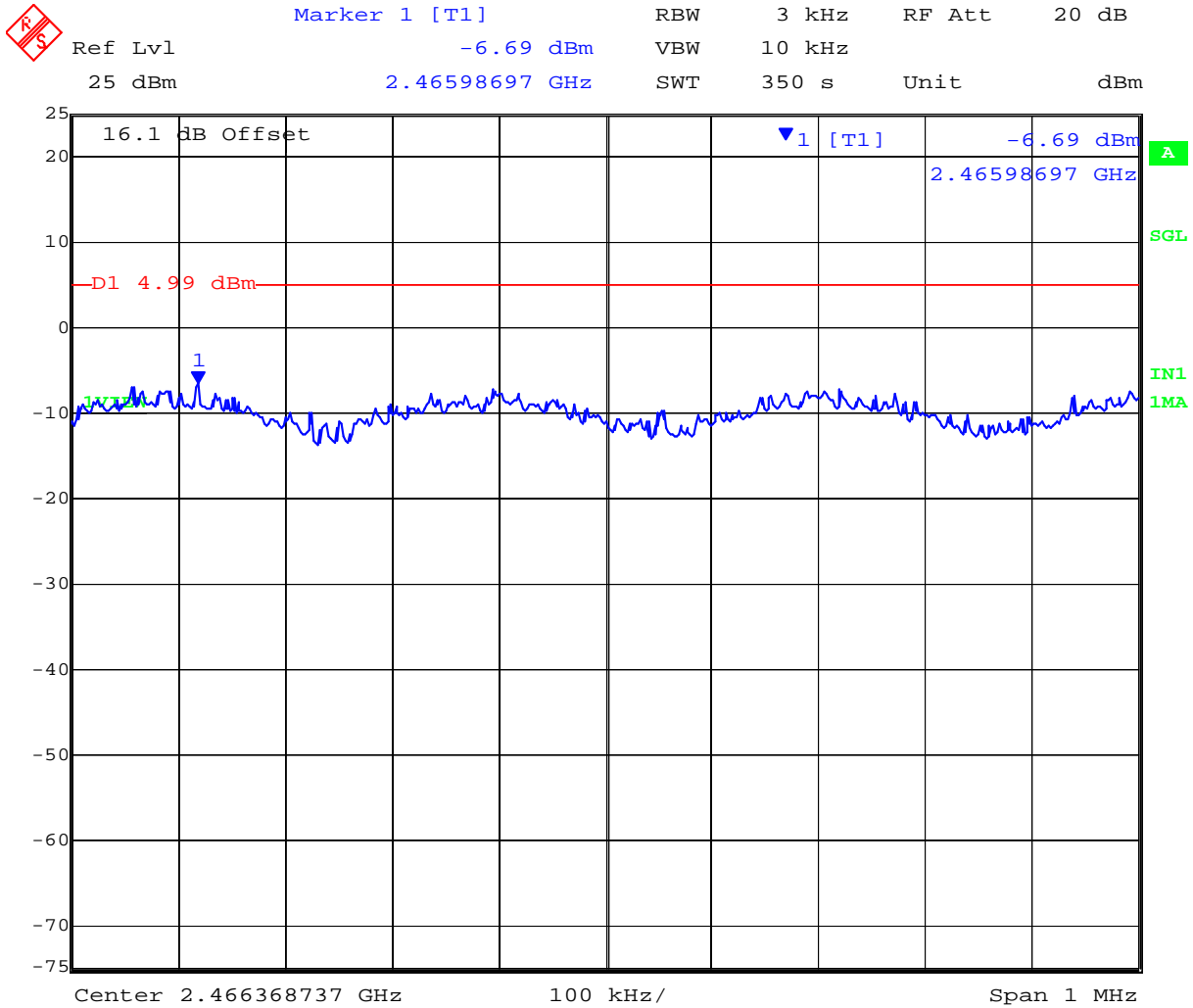


Date: 11.FEB.2012 15:20:00

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PORT B 2,462 MHz 802.11g Legacy - Peak Power Spectral Density



Date: 11.FEB.2012 15:26:33

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 98 of 221

Peak Power Spectral Density

TABLE OF RESULTS – 802.11N HT-20

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):	2		
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density				Correction factor	Maximum Peak Power Spectral Density	Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	10Log(N)	dBm	dBm	dB
2412.000	-6.16	-6.00	--	--	3.01	-6.00	4.99	-10.99
2437.000	-5.34	-6.02	--	--	3.01	-5.34	4.99	-10.33
2462.000	-6.30	-5.67	--	--	3.01	-5.67	4.99	-10.66

Measurement uncertainty:	± 1.33 dB
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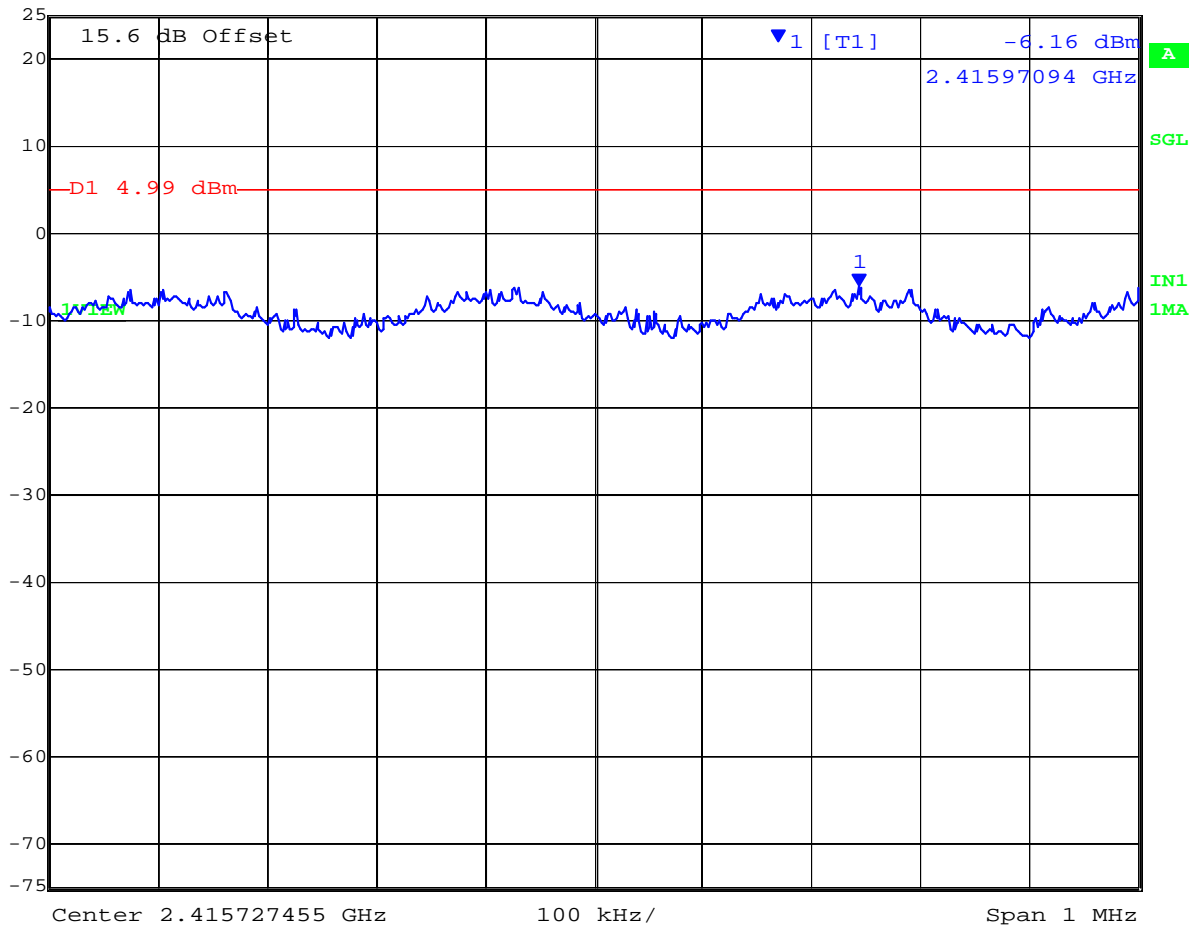


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 99 of 221

PORT A 2,412 MHz 802.11n HT-20 - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -6.16 dBm VBW 10 kHz
25 dBm 2.41597094 GHz SWT 350 s Unit dBm



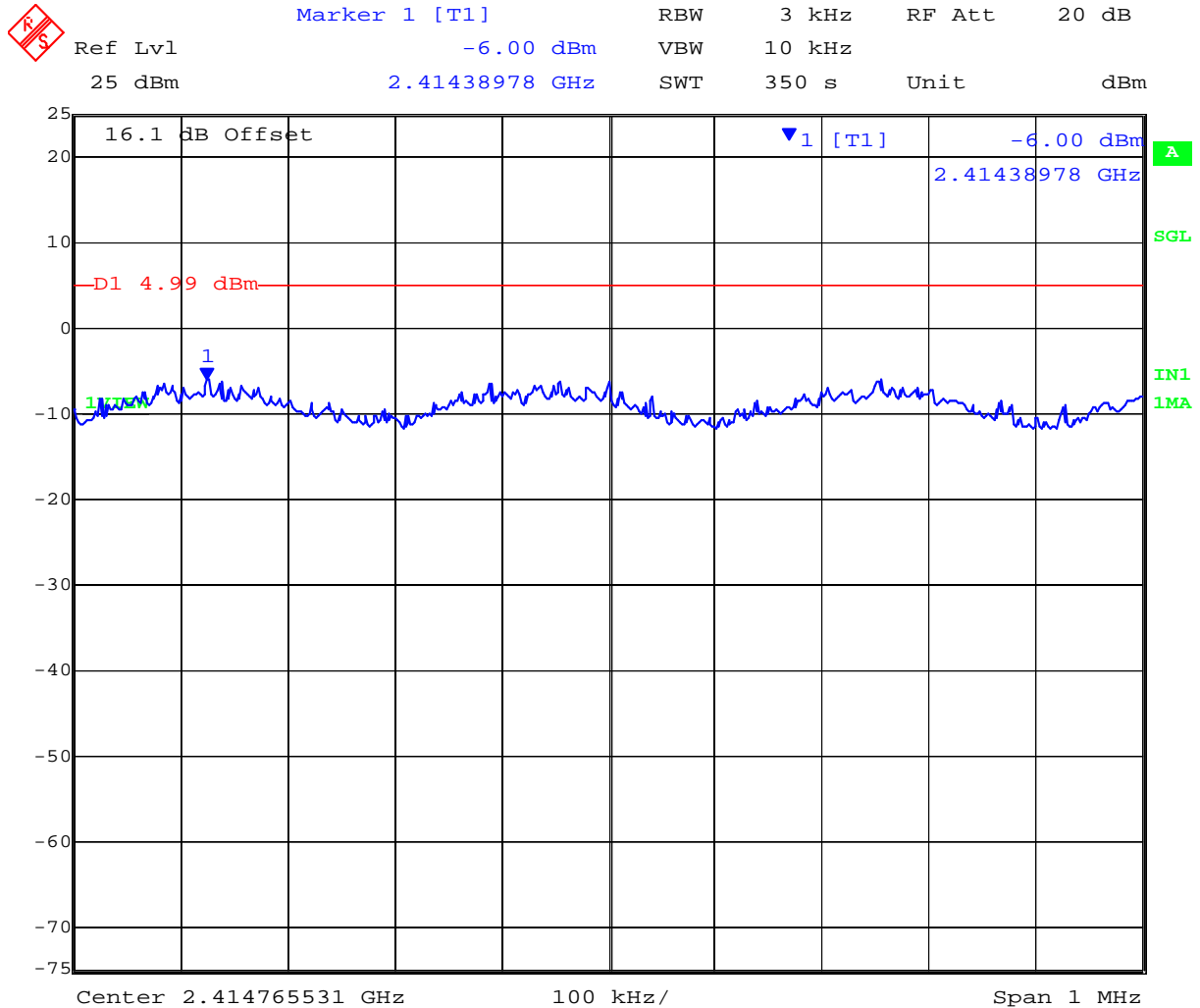
Date: 11.FEB.2012 15:51:26

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 100 of 221

PORT B 2,412 MHz 802.11n HT-20 - Peak Power Spectral Density



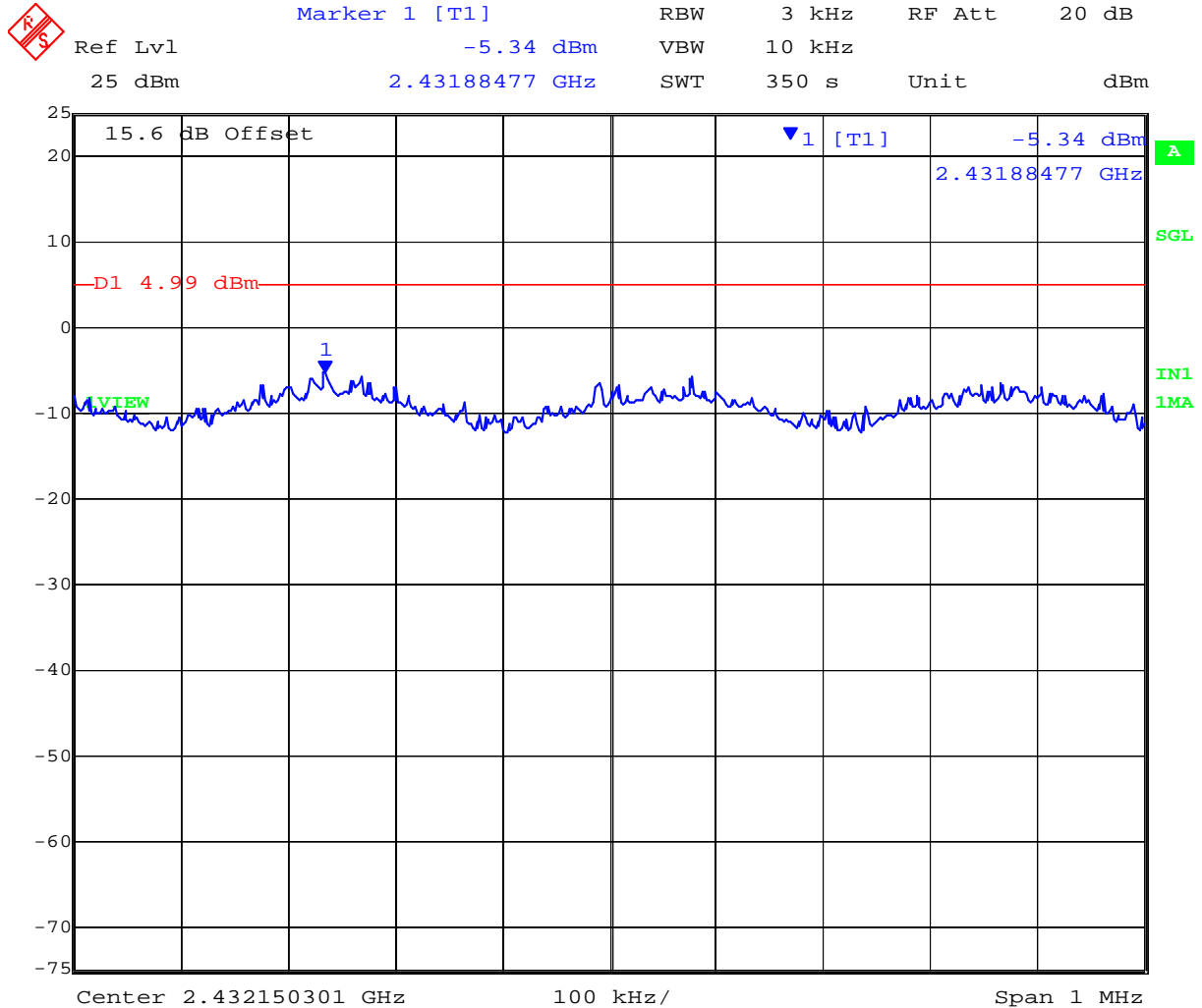
Date: 11.FEB.2012 15:57:58

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 101 of 221

PORT A 2,437 MHz 802.11n HT-20 - Peak Power Spectral Density



Date: 11.FEB.2012 16:09:38

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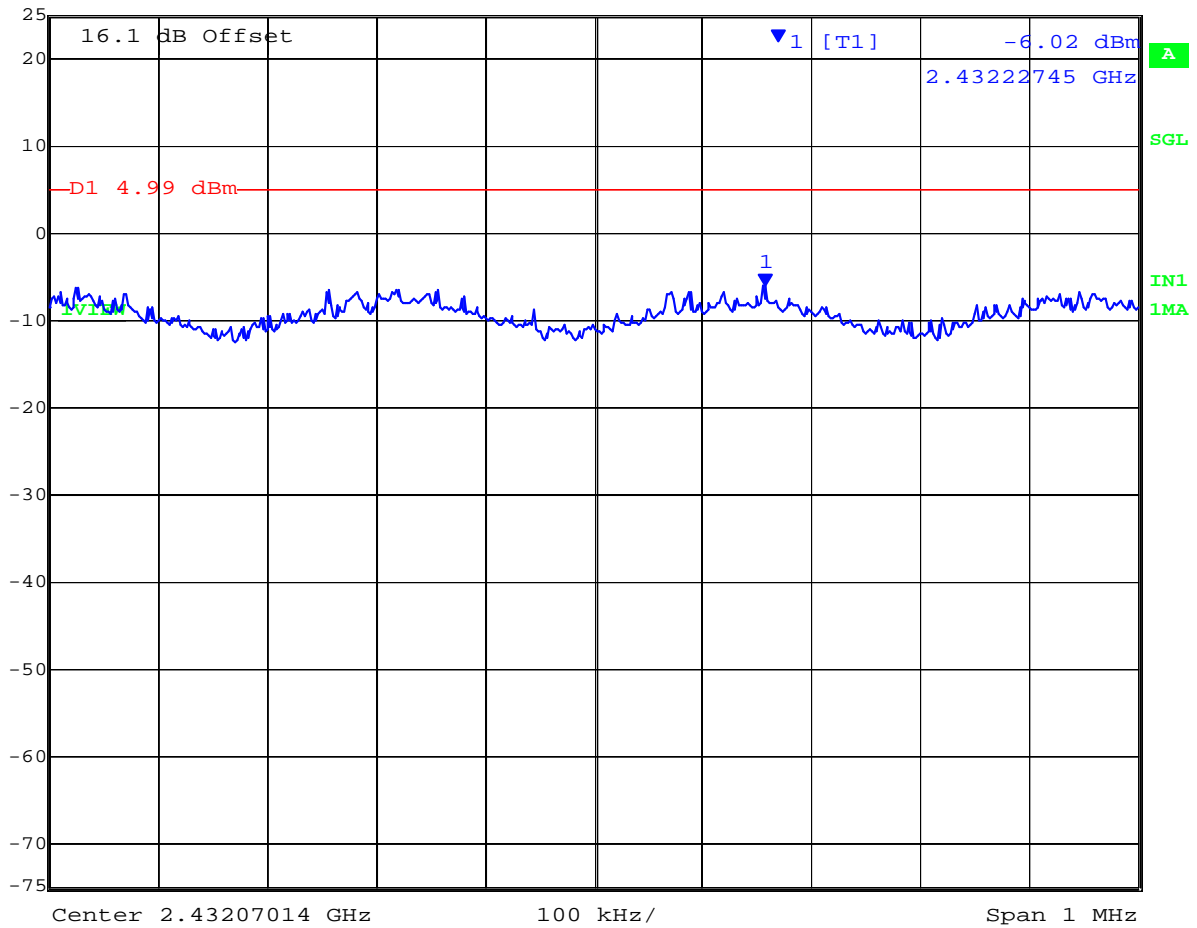


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 102 of 221

PORT B 2,437 MHz 802.11n HT-20 - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -6.02 dBm VBW 10 kHz
25 dBm 2.43222745 GHz SWT 350 s Unit dBm



Date: 11.FEB.2012 16:16:10

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 103 of 221

PORT A 2,462 MHz 802.11n HT-20 - Peak Power Spectral Density



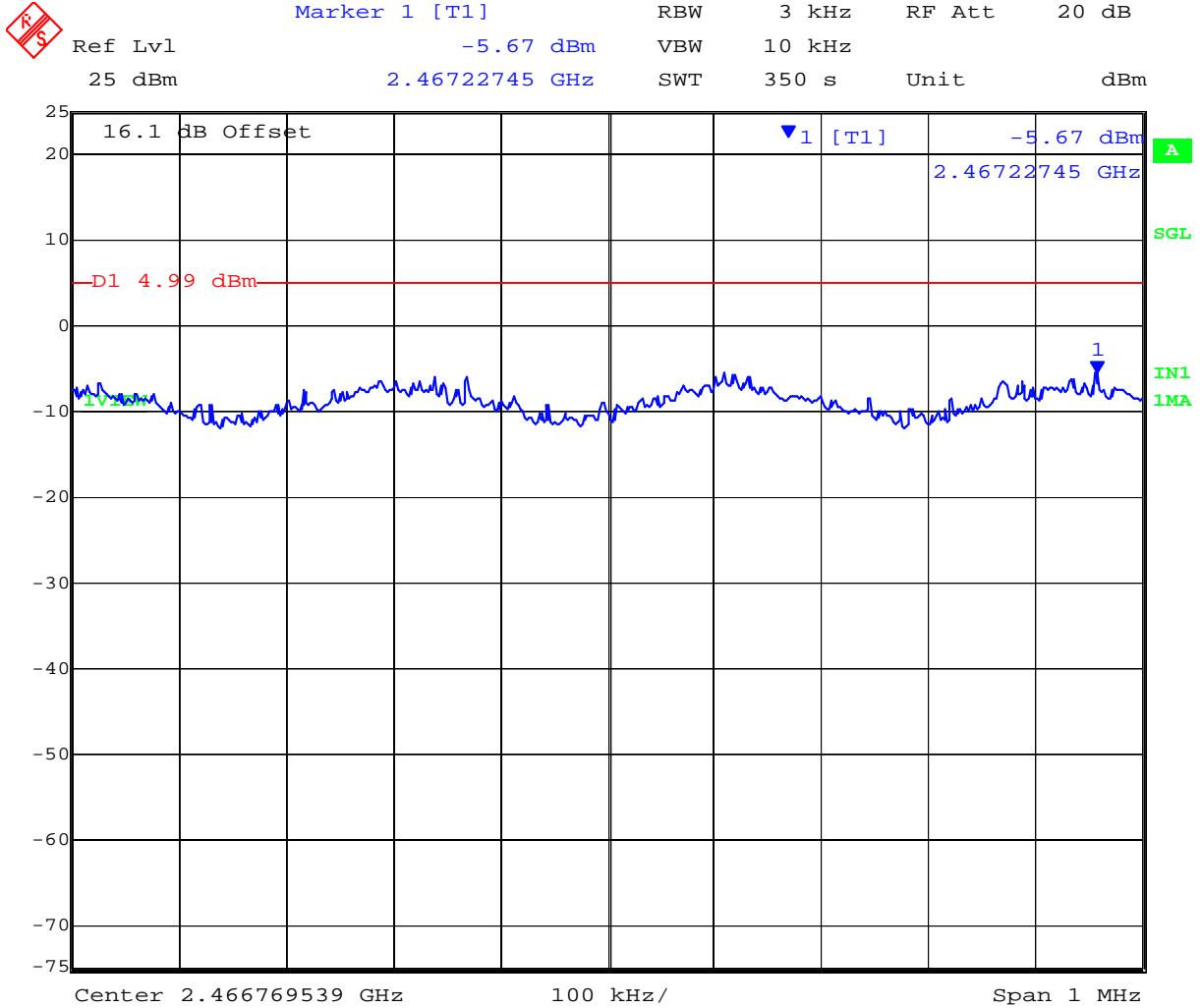
Date: 11.FEB.2012 16:28:28

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To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 104 of 221

PORT B 2,462 MHz 802.11n HT-20 - Peak Power Spectral Density



Date: 11.FEB.2012 16:35:01

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 105 of 221

Peak Power Spectral Density

TABLE OF RESULTS – 802.11N HT-40

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):	2		
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density				Correction factor	Maximum Peak Power Spectral Density	Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	10Log(N)	dBm	dBm	dB
2422.000	-8.92	-6.26	--	--	3.01	-6.26	4.99	-11.25
2437.000	-9.85	-8.75	--	--	3.01	-8.75	4.99	-13.74
2452.000	-10.12	-8.69	--	--	3.01	-8.69	4.99	-13.68

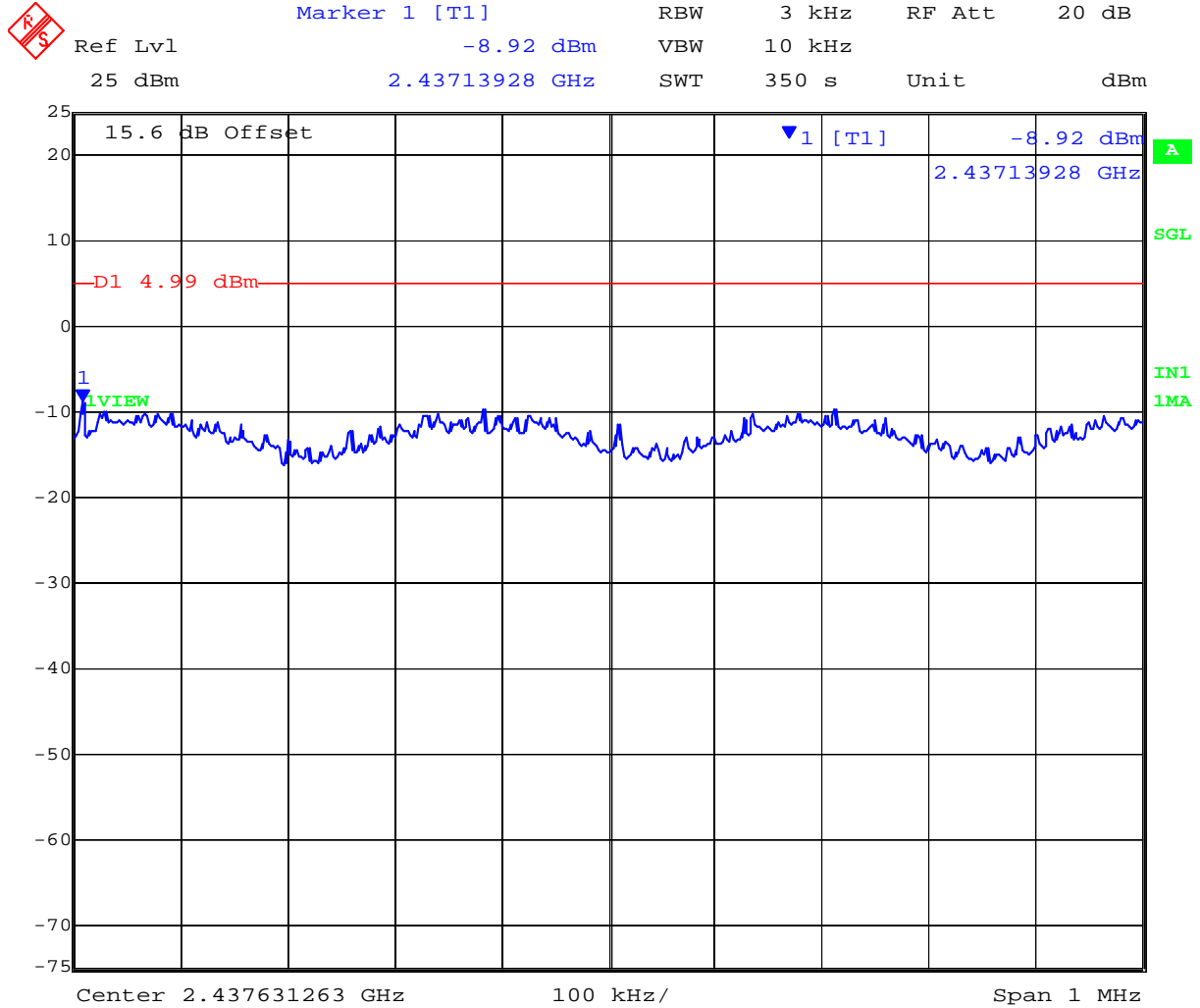
Measurement uncertainty:	± 1.33 dB
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 106 of 221

PORT A 2,422 MHz 802.11n HT-40 - Peak Power Spectral Density



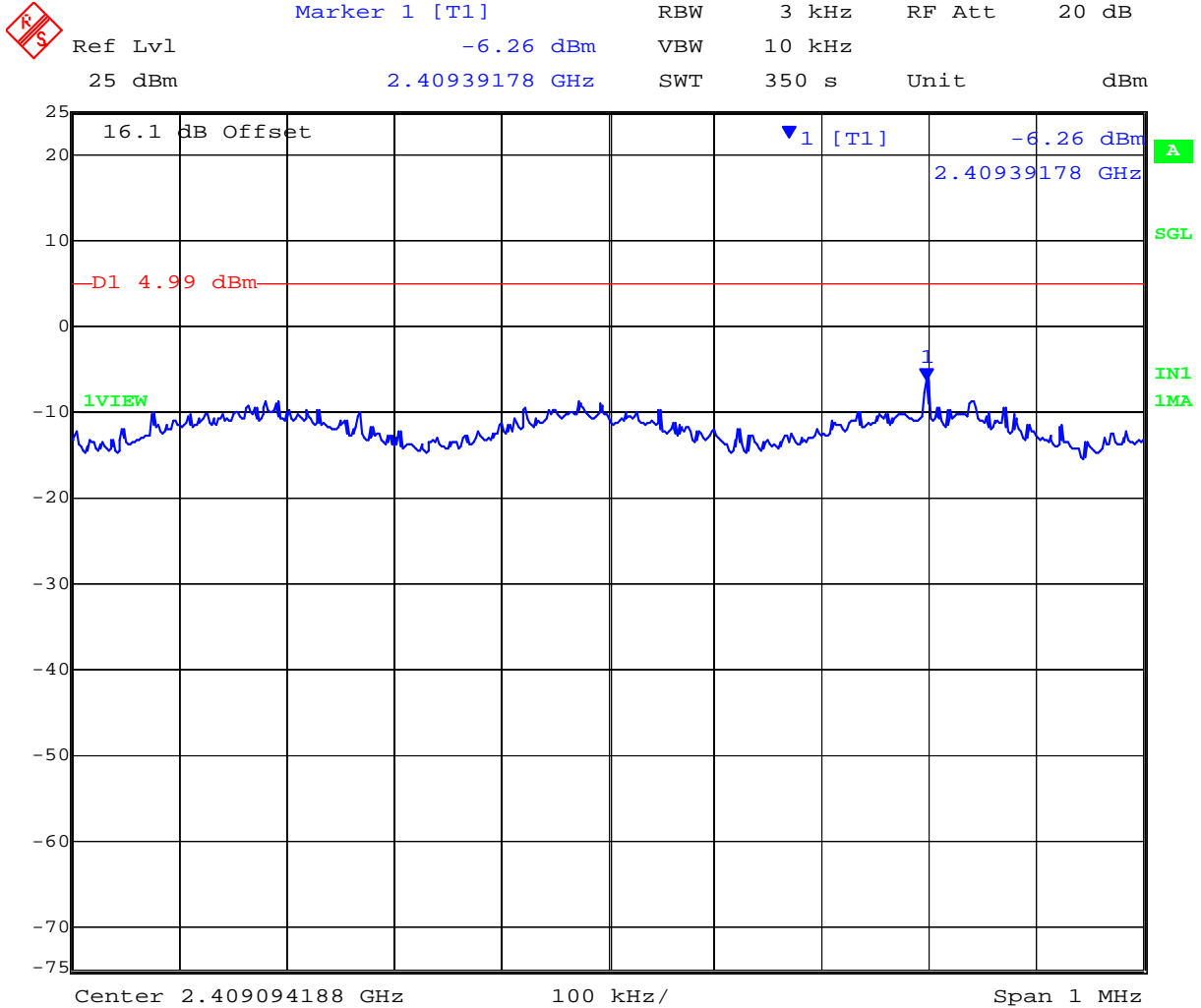
Date: 11.FEB.2012 16:52:40

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 107 of 221

PORT B 2,422 MHz 802.11n HT-40 - Peak Power Spectral Density



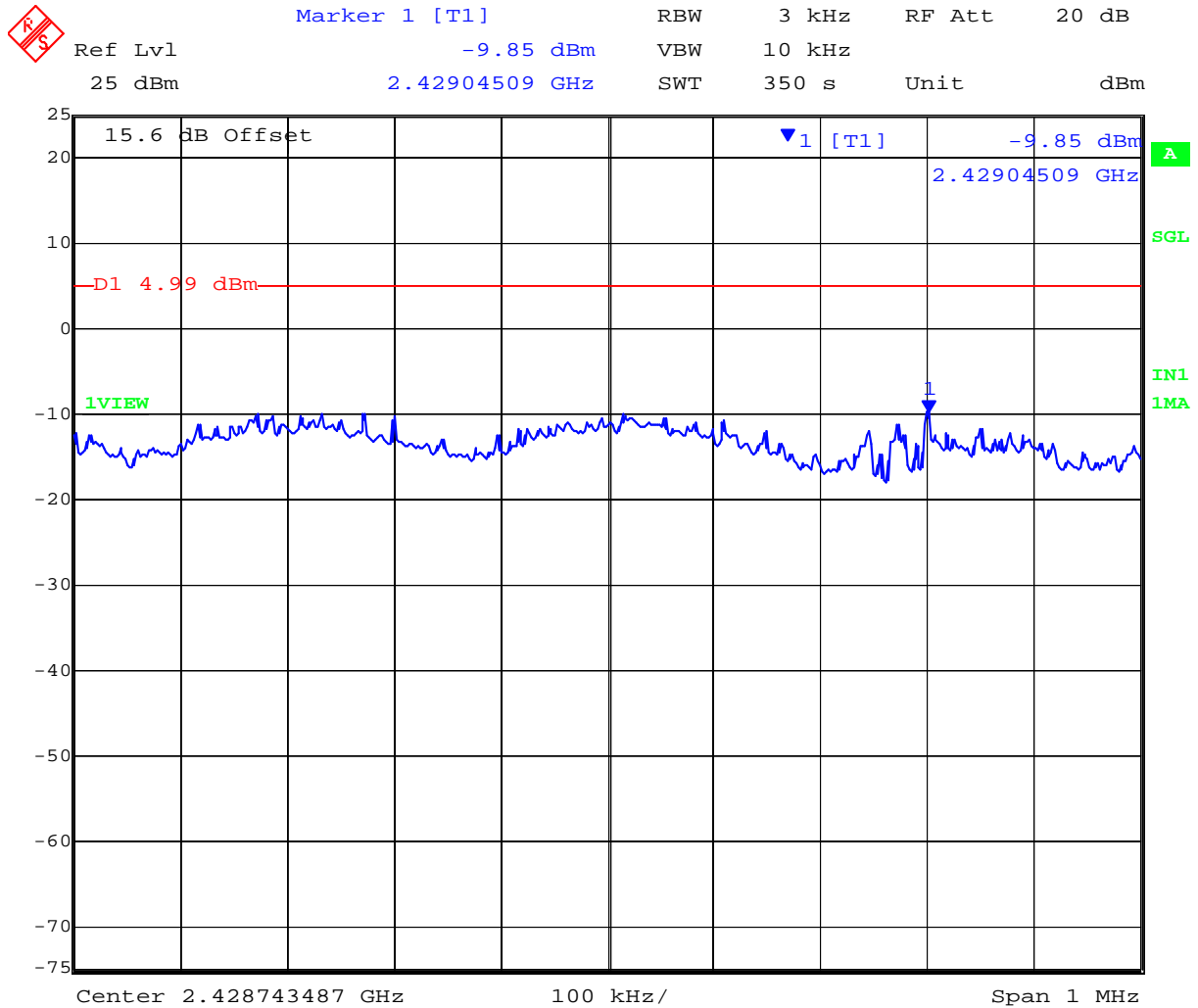
Date: 11.FEB.2012 16:59:12

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 108 of 221

PORT A 2,437 MHz 802.11n HT-40 - Peak Power Spectral Density



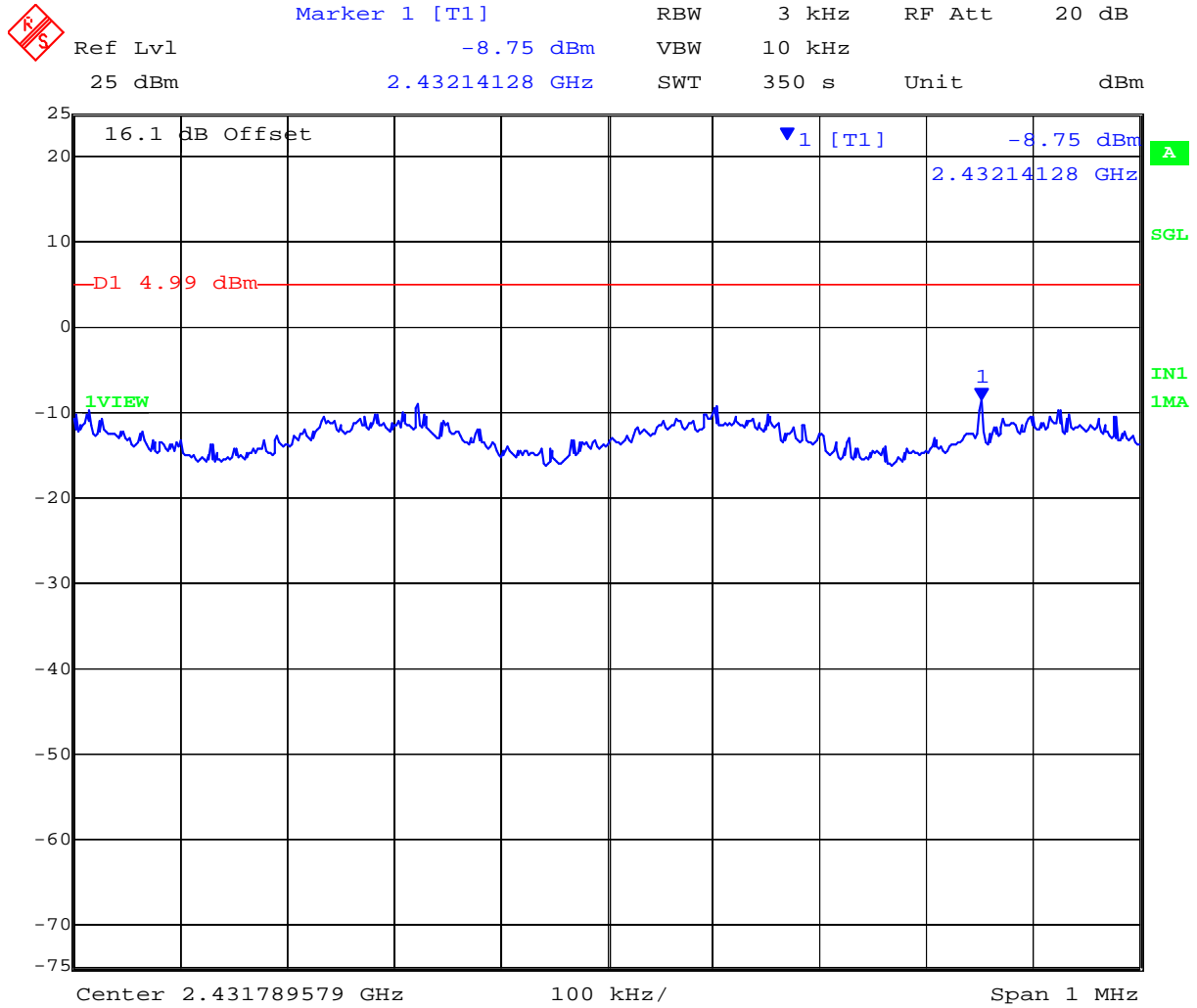
Date: 11.FEB.2012 17:13:34

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 109 of 221

PORT B 2,437 MHz 802.11n HT-40 - Peak Power Spectral Density

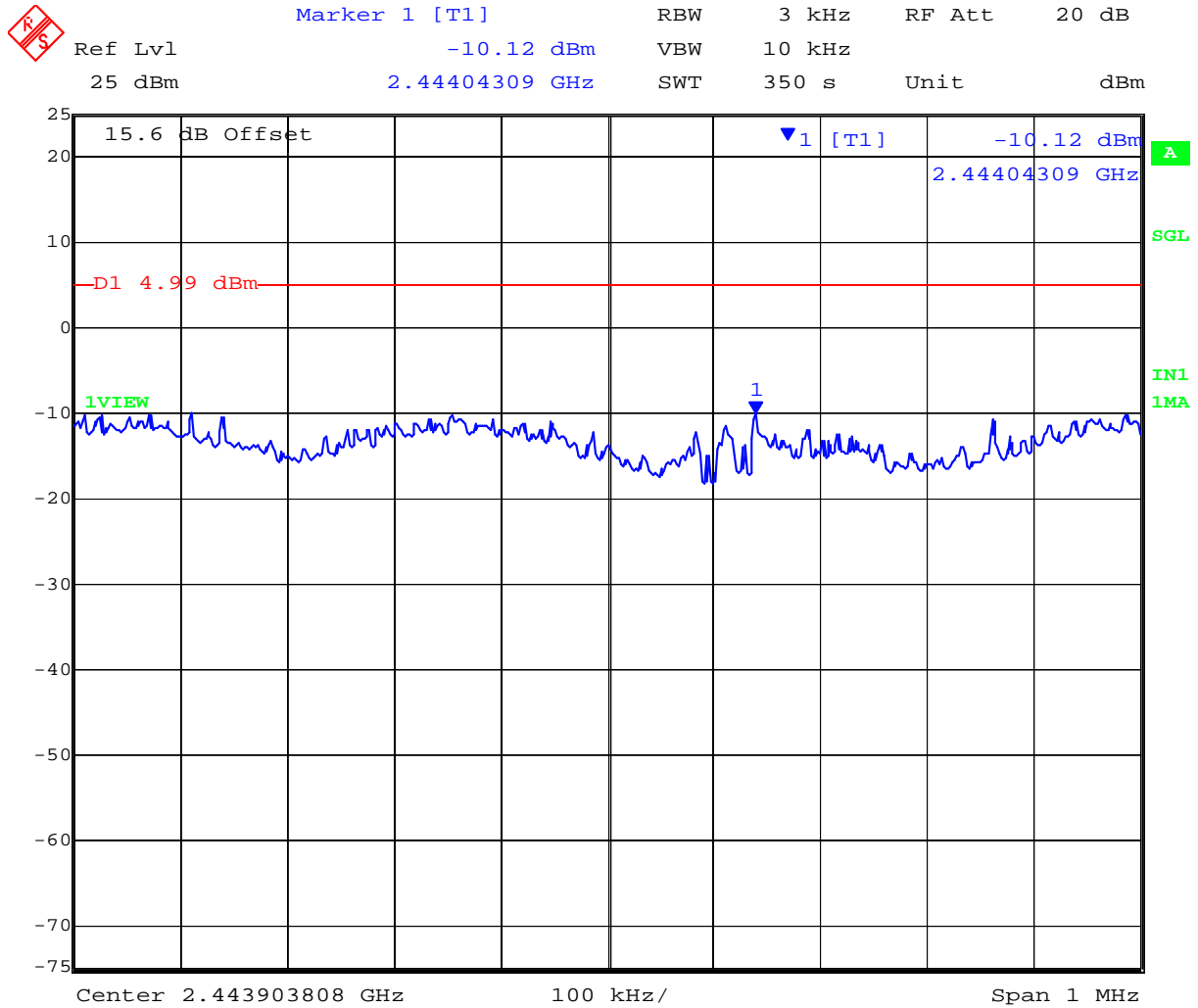


Date: 11.FEB.2012 17:20:08

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PORT A 2,452 MHz 802.11n HT-40 - Peak Power Spectral Density



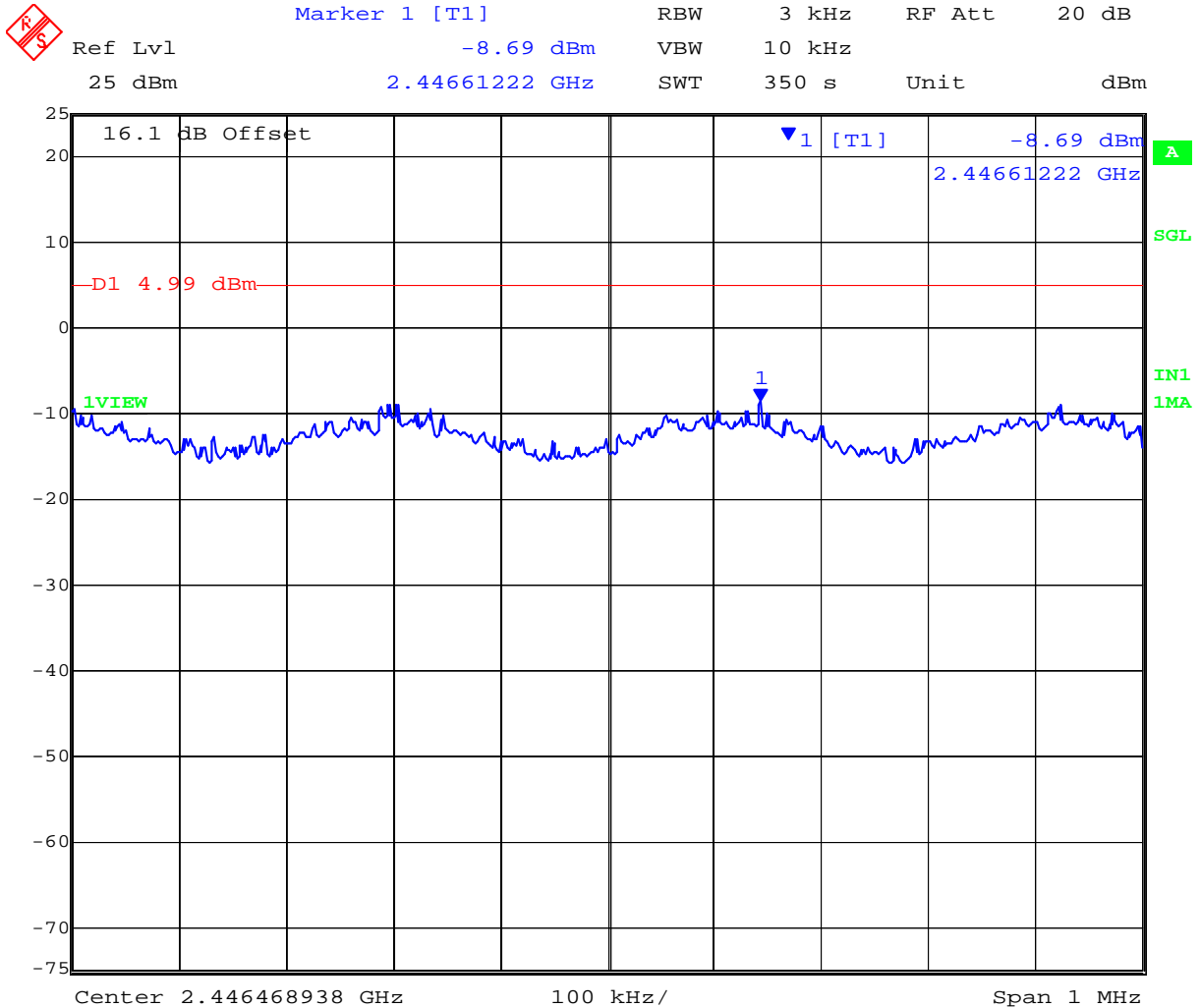
Date: 11.FEB.2012 17:32:38

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 111 of 221

PORT B 2,452 MHz 802.11n HT-40 - Peak Power Spectral Density



Date: 11.FEB.2012 17:39:11

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 112 of 221

TABLE OF RESULTS – 802.11a Legacy

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11a	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):	2		
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density				Correction factor	Maximum Peak Power Spectral Density	Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	10Log(N)	dBm	dBm	dB
5745.000	-7.63	-7.37	--	--	3.01	-4.36	4.99	-9.35
5785.000	-7.14	-8.65	--	--	3.01	-4.13	4.99	-9.12
5825.000	-7.18	-8.57	--	--	3.01	-4.17	4.99	-9.16

Measurement uncertainty:	± 1.33 dB
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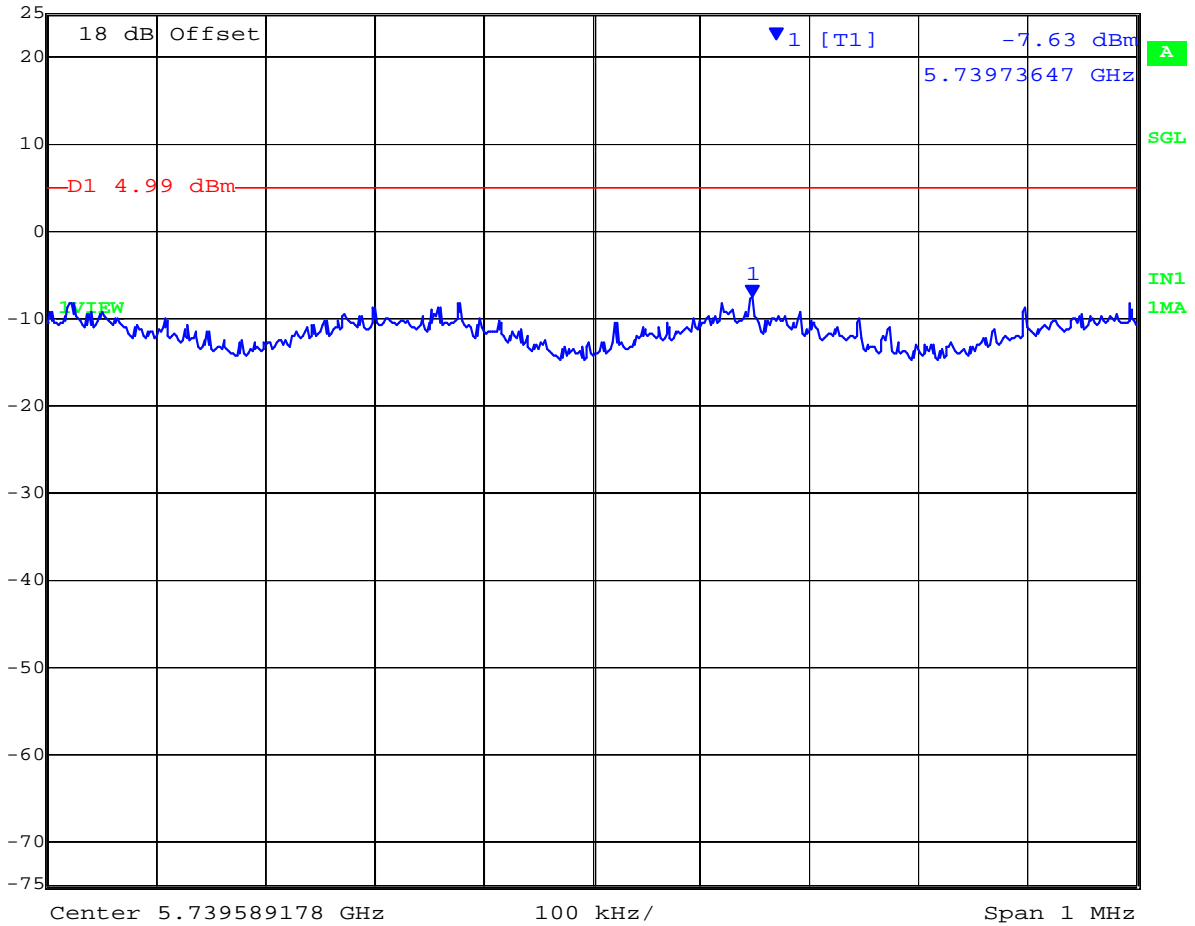


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 113 of 221

PORT A 5,745 MHz 802.11a Legacy - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -7.63 dBm VBW 10 kHz
25 dBm 5.73973647 GHz SWT 350 s Unit dBm



Date: 11.FEB.2012 17:53:36

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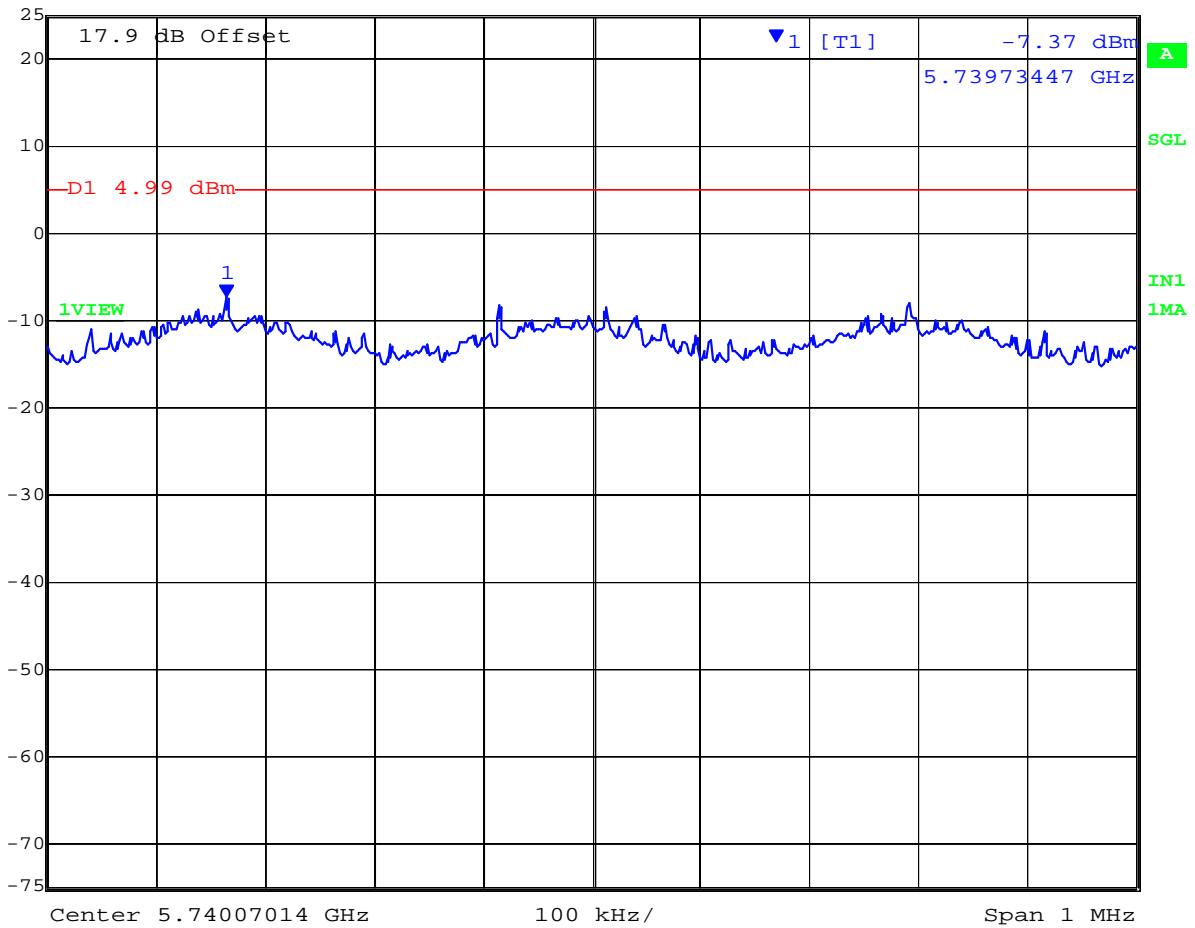


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 114 of 221

PORT B 5,745 MHz 802.11a Legacy - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -7.37 dBm VBW 10 kHz
25 dBm 5.73973447 GHz SWT 350 s Unit dBm

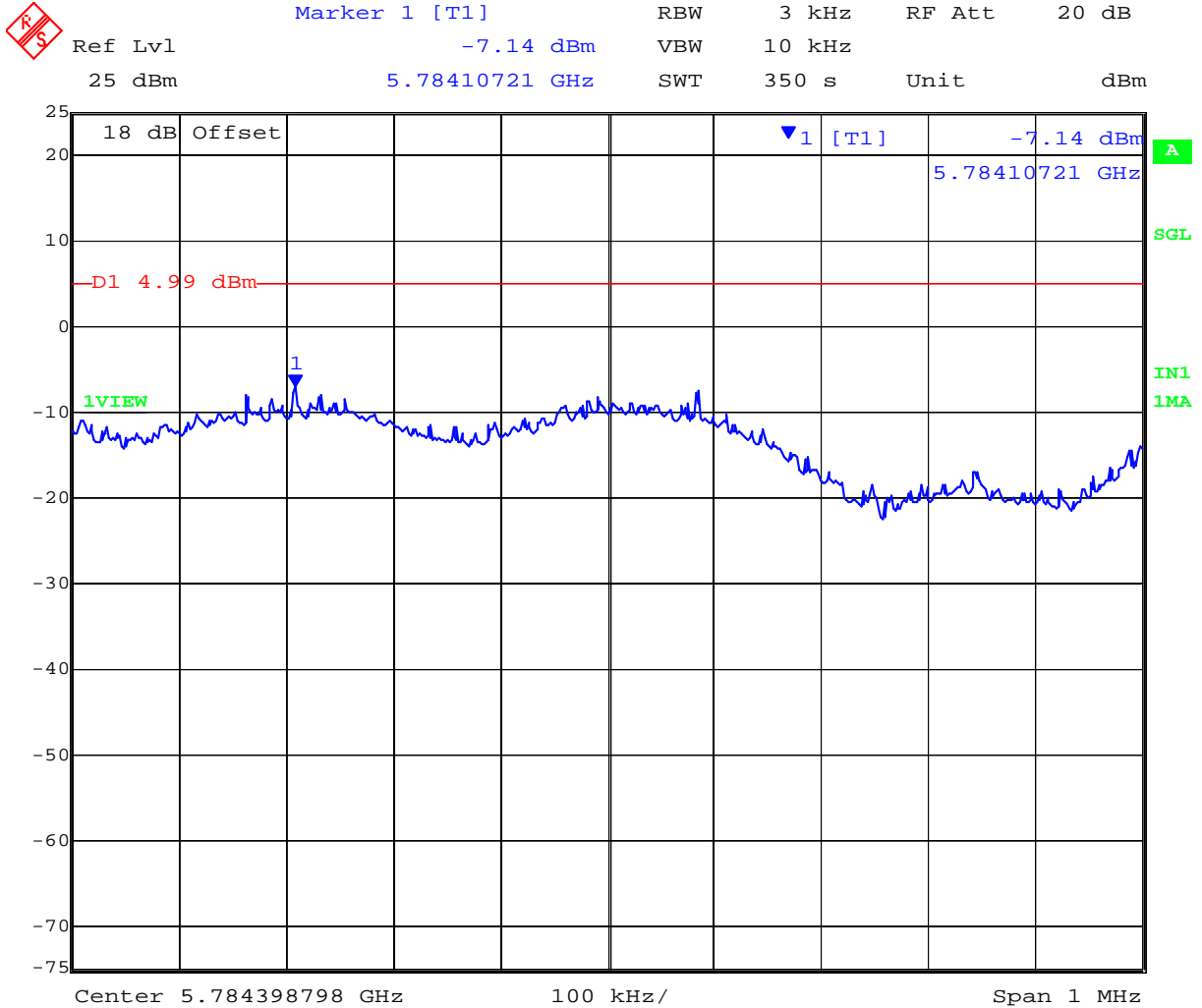


Date: 11.FEB.2012 18:00:07

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PORT A 5,785 MHz 802.11a Legacy - Peak Power Spectral Density



Date: 11.FEB.2012 18:09:42

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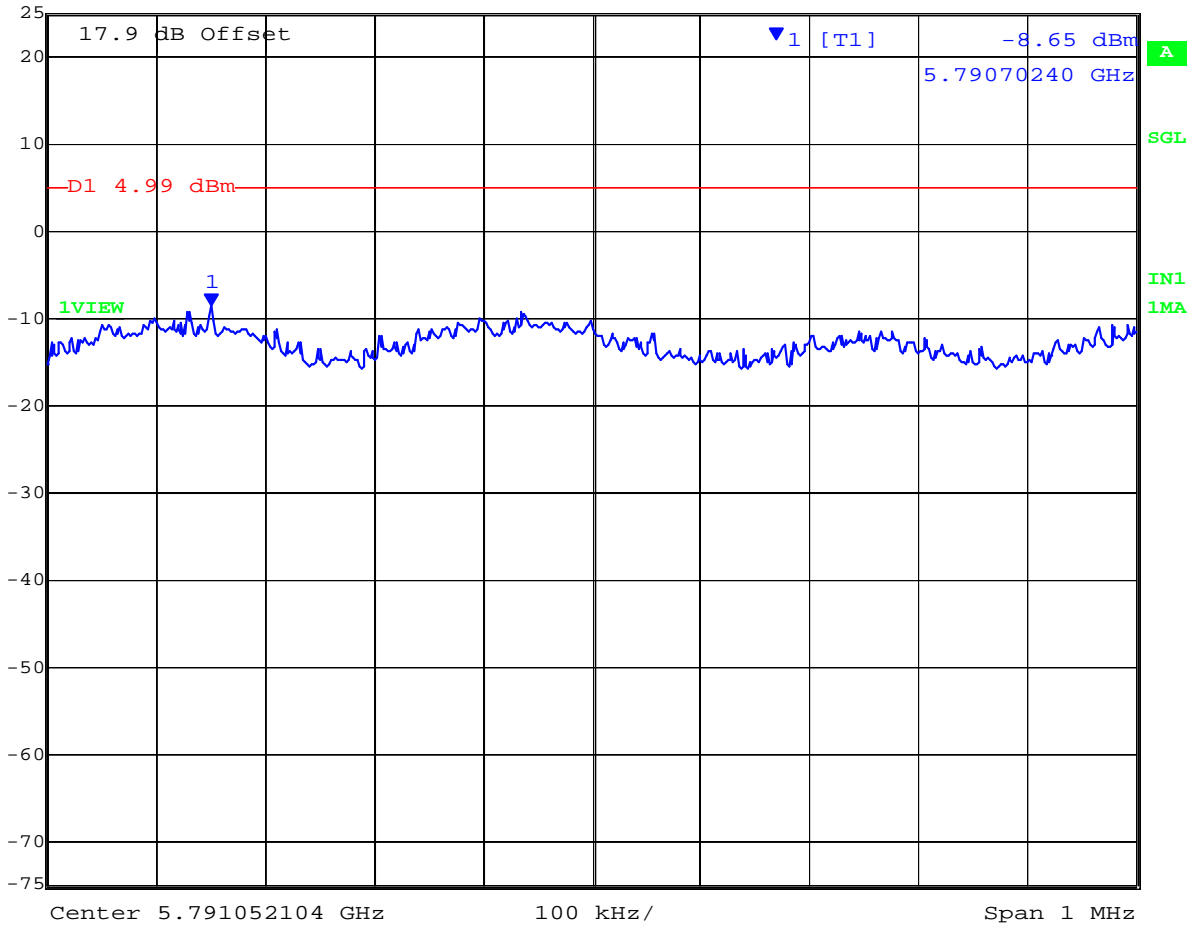


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 116 of 221

PORT B 5,785 MHz 802.11a Legacy - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -8.65 dBm VBW 10 kHz
25 dBm 5.79070240 GHz SWT 350 s Unit dBm



Date: 11.FEB.2012 18:16:14

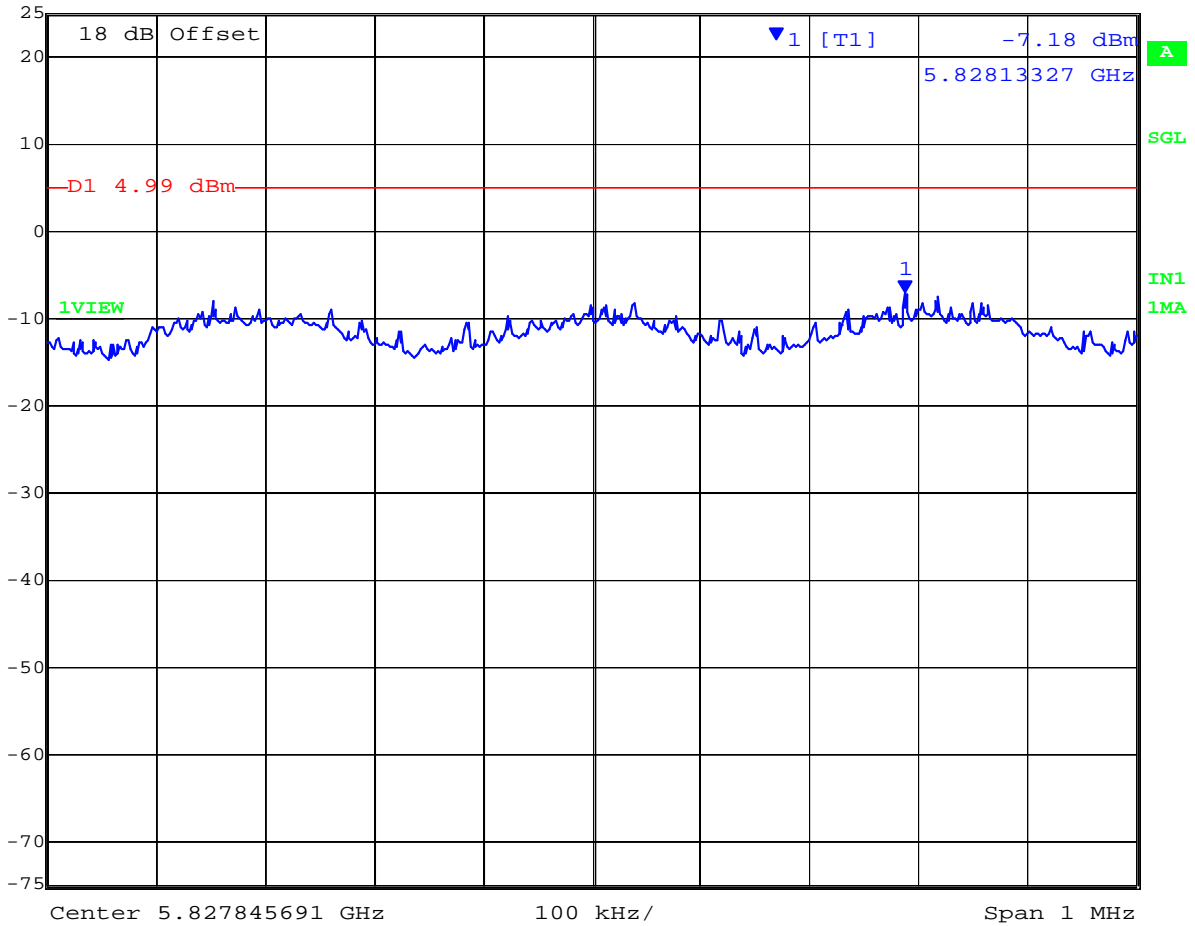
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PORT A 5,825 MHz 802.11a Legacy - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -7.18 dBm VBW 10 kHz
25 dBm 5.82813327 GHz SWT 350 s Unit dBm



Date: 11.FEB.2012 18:34:05

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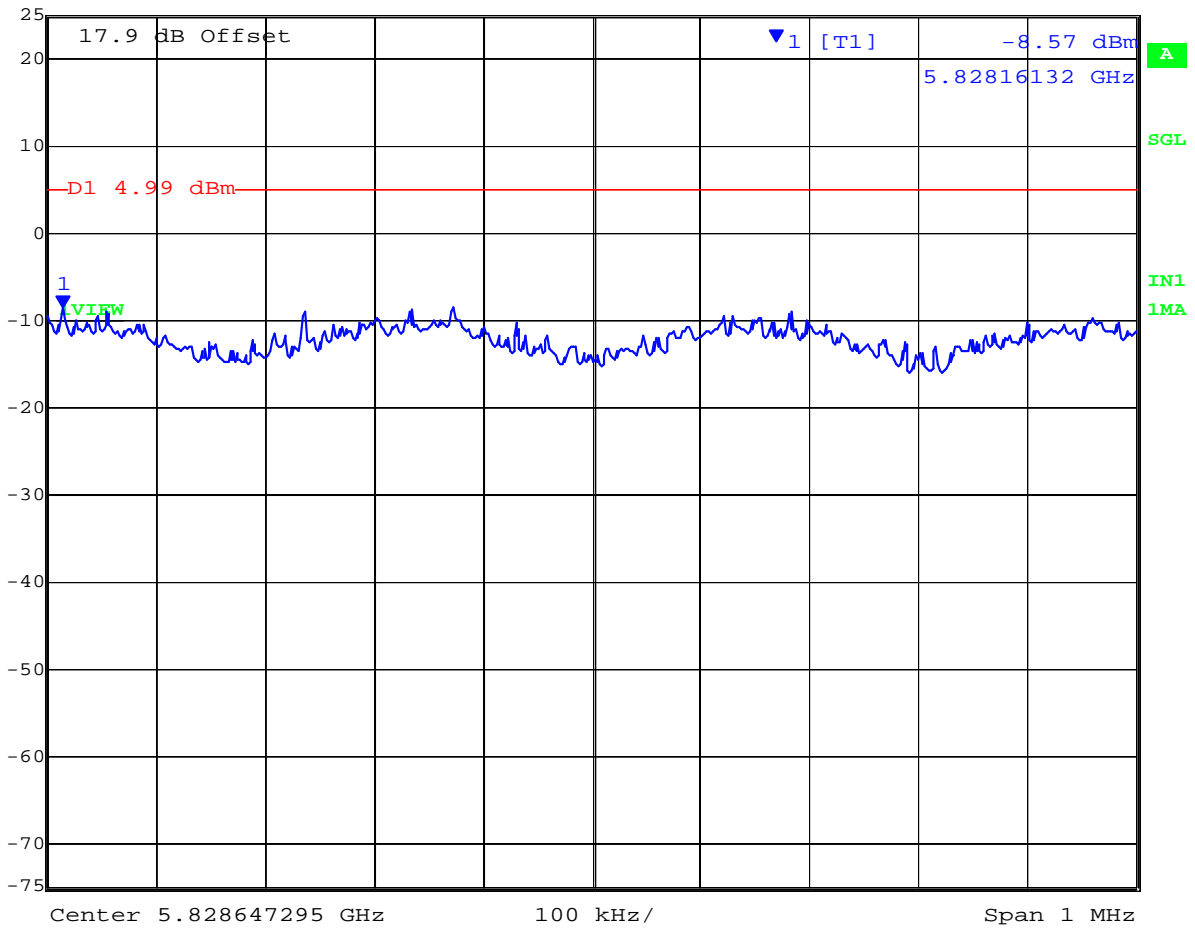


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 118 of 221

PORT B 5,825 MHz 802.11a Legacy - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -8.57 dBm VBW 10 kHz
25 dBm 5.82816132 GHz SWT 350 s Unit dBm



Date: 11.FEB.2012 18:40:38

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 119 of 221

TABLE OF RESULTS – 802.11N HT-20

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):	2		
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density				Correction factor	Maximum Peak Power Spectral Density	Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	10Log(N)	dBm	dBm	dB
5745.000	-7.53	-9.33	--	--	3.01	-4.52	4.99	-9.51
5785.000	-6.36	-7.78	--	--	3.01	-3.35	4.99	-8.34
5825.000	-7.22	-8.92	--	--	3.01	-4.21	4.99	-9.20

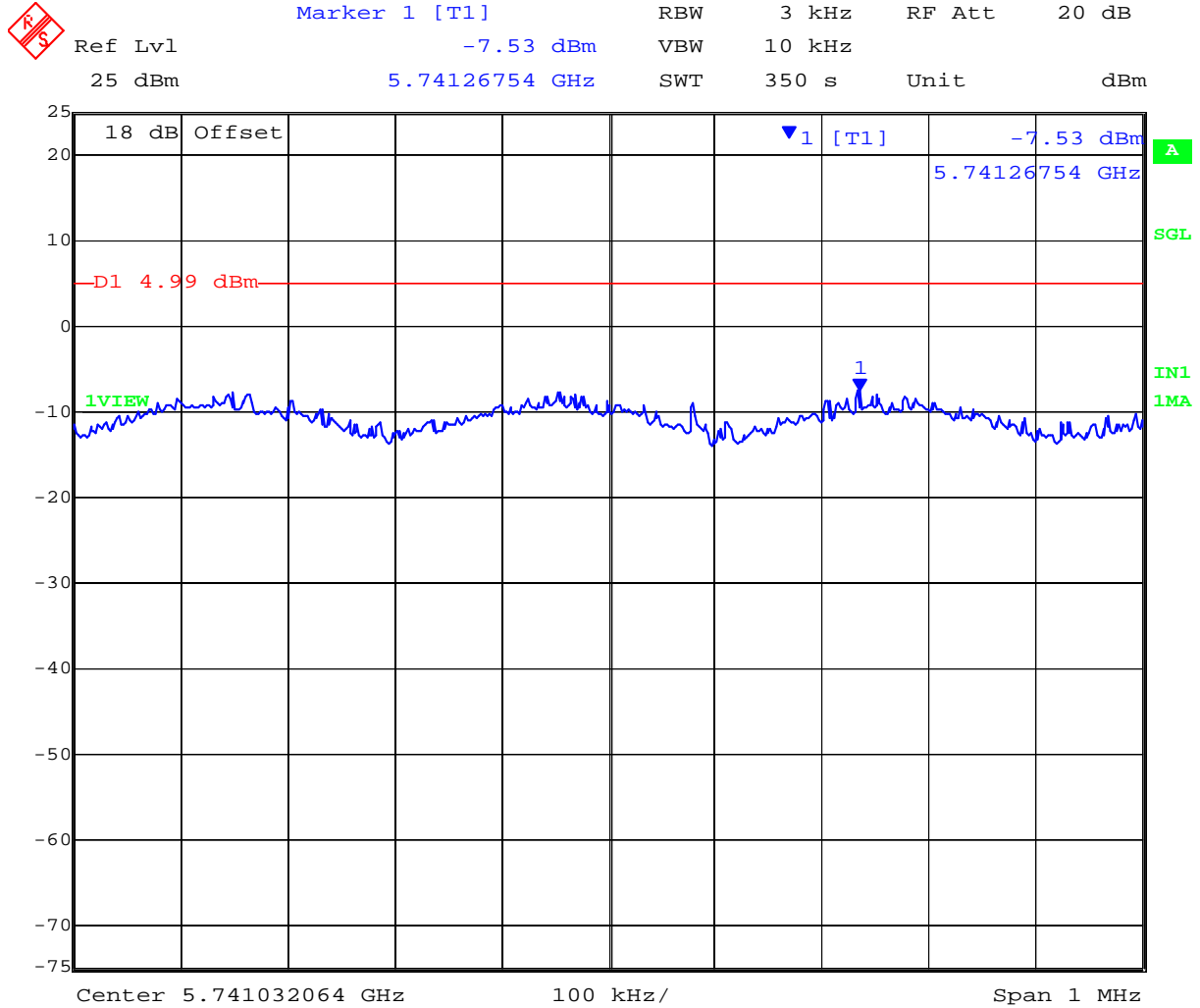
Measurement uncertainty:	± 1.33 dB
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 120 of 221

PORT A 5,745 MHz 802.11n HT-20 - Peak Power Spectral Density



Date: 11.FEB.2012 18:54:47

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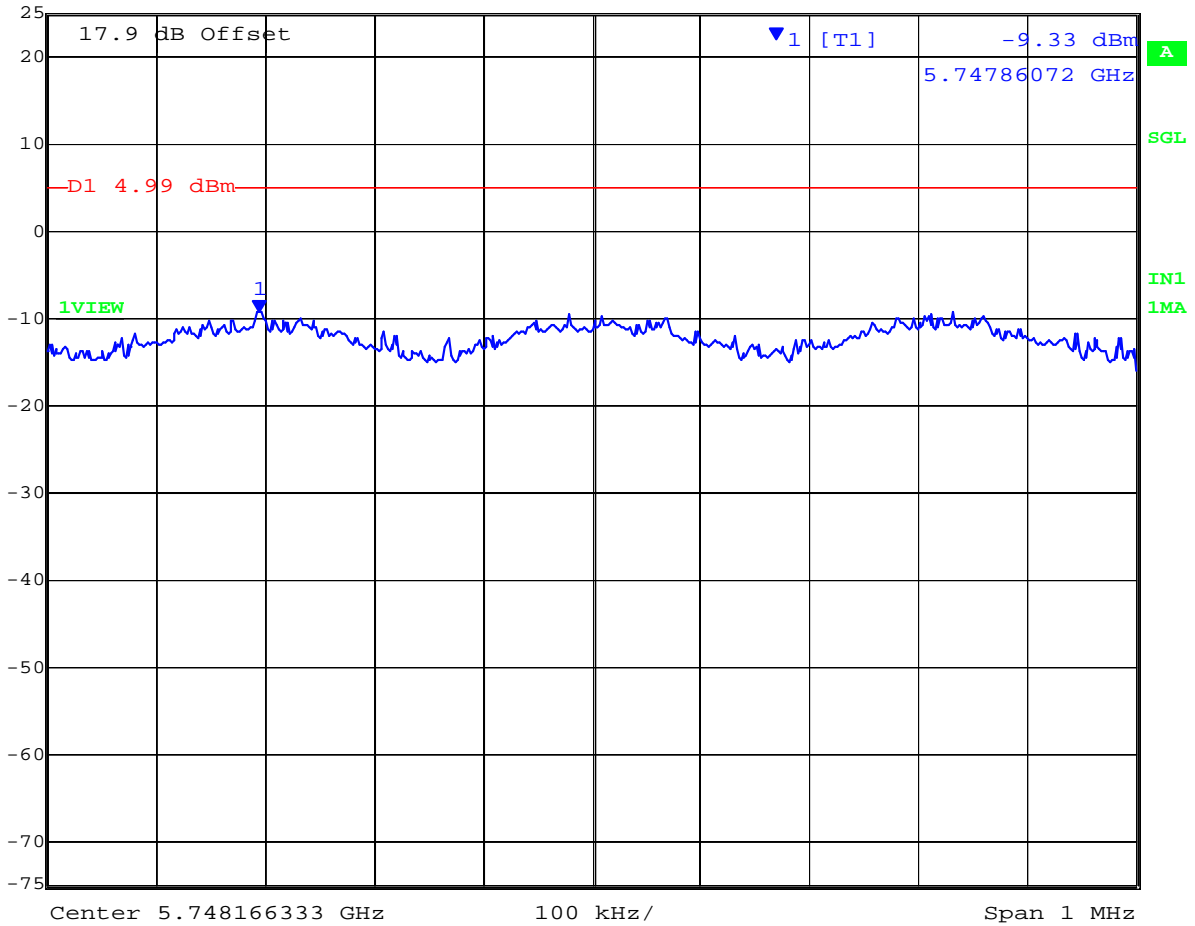


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 121 of 221

PORT B 5,745 MHz 802.11n HT-20 - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -9.33 dBm VBW 10 kHz
25 dBm 5.74786072 GHz SWT 350 s Unit dBm



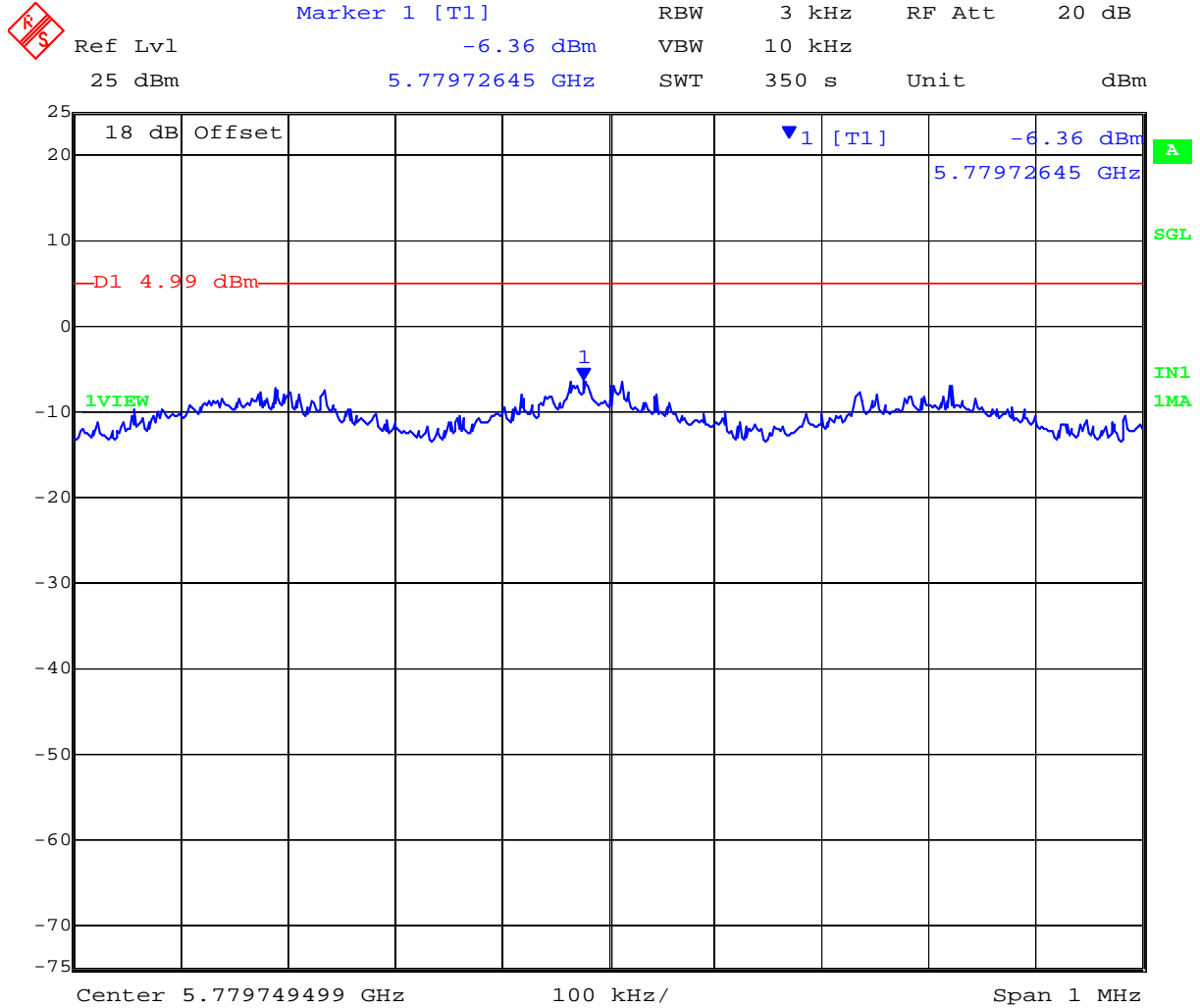
Date: 11.FEB.2012 19:01:18

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 122 of 221

PORT A 5,785 MHz 802.11n HT-20 - Peak Power Spectral Density



Date: 11.FEB.2012 19:10:53

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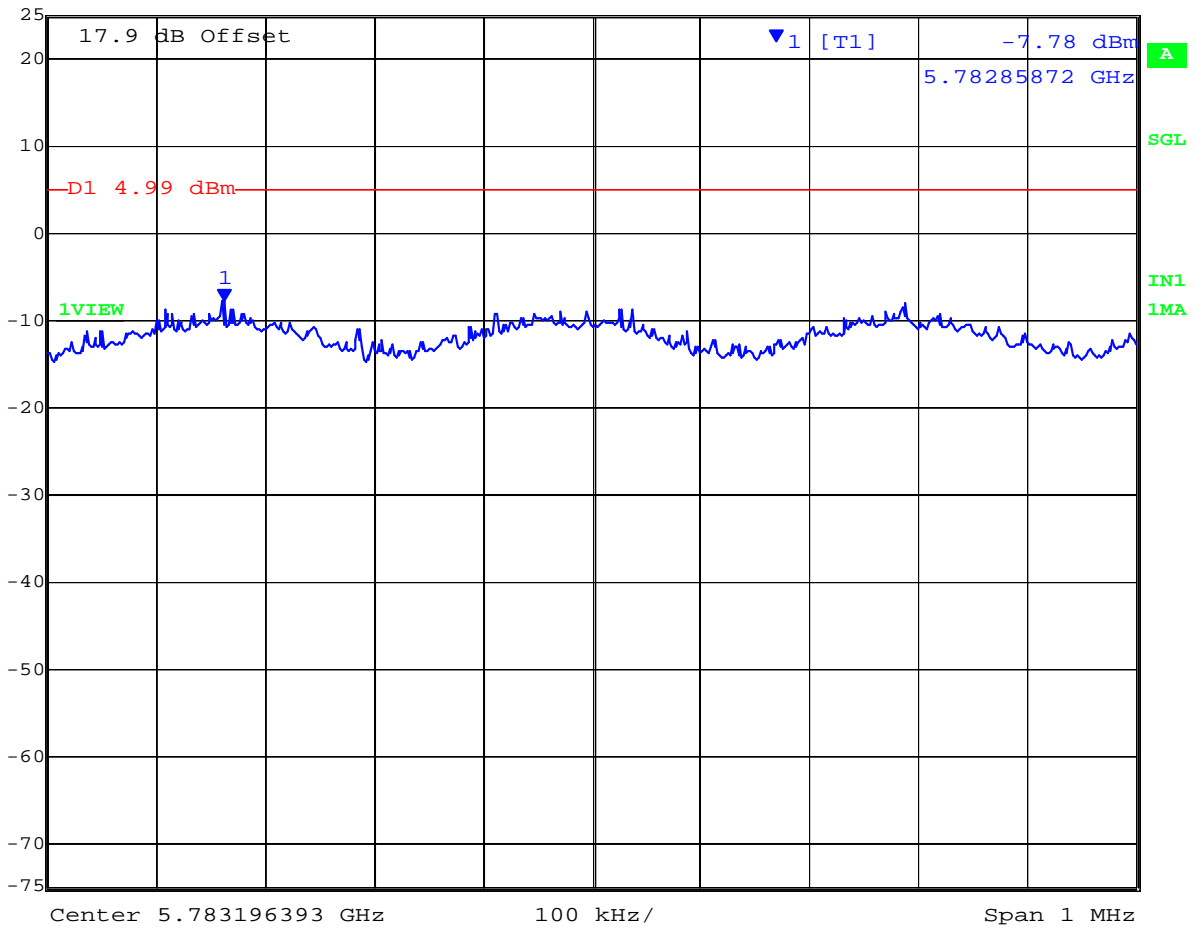


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 123 of 221

PORT B 5,785 MHz 802.11n HT-20 - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -7.78 dBm VBW 10 kHz
25 dBm 5.78285872 GHz SWT 350 s Unit dBm



Date: 11.FEB.2012 19:17:24

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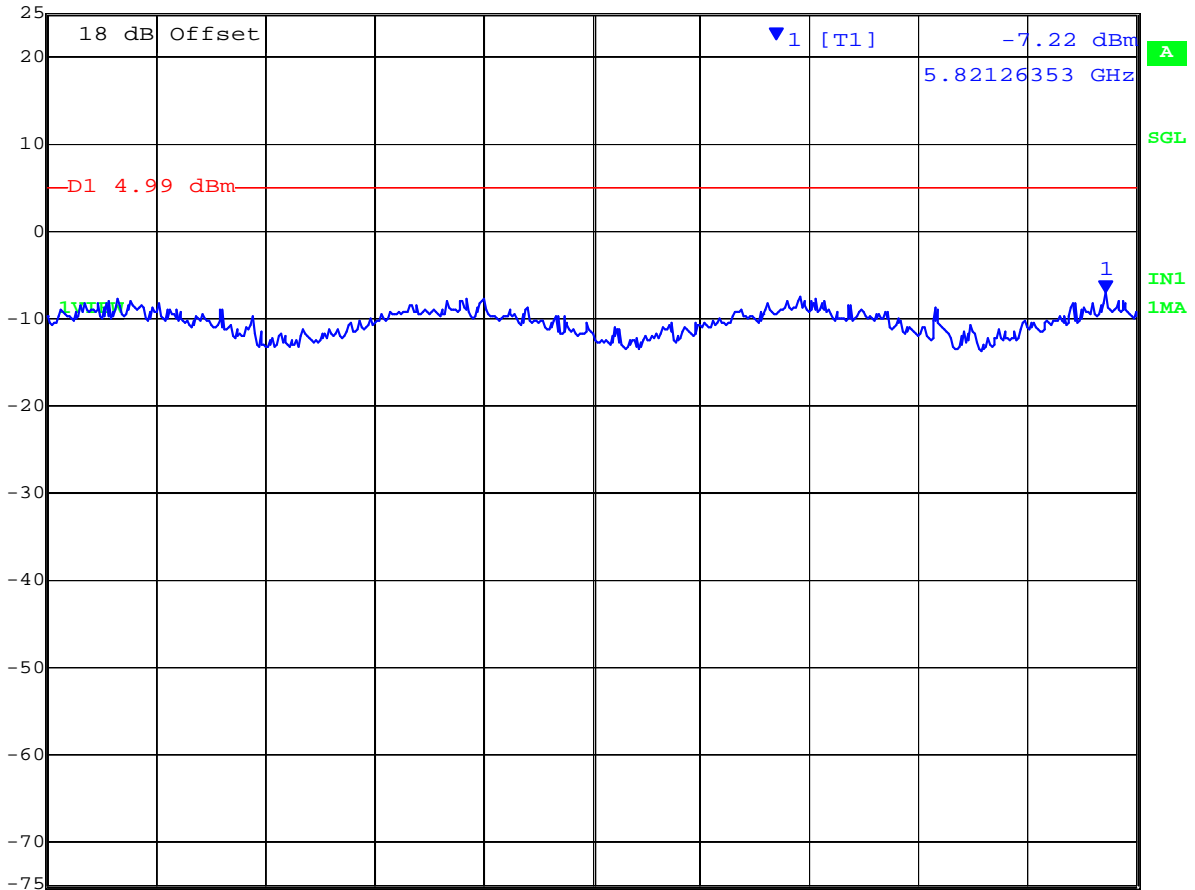


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 124 of 221

PORT A 5,825 MHz 802.11n HT-20 - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -7.22 dBm VBW 10 kHz
25 dBm 5.82126353 GHz SWT 350 s Unit dBm



Center 5.820791583 GHz 100 kHz/ Span 1 MHz

Date: 11.FEB.2012 19:29:34

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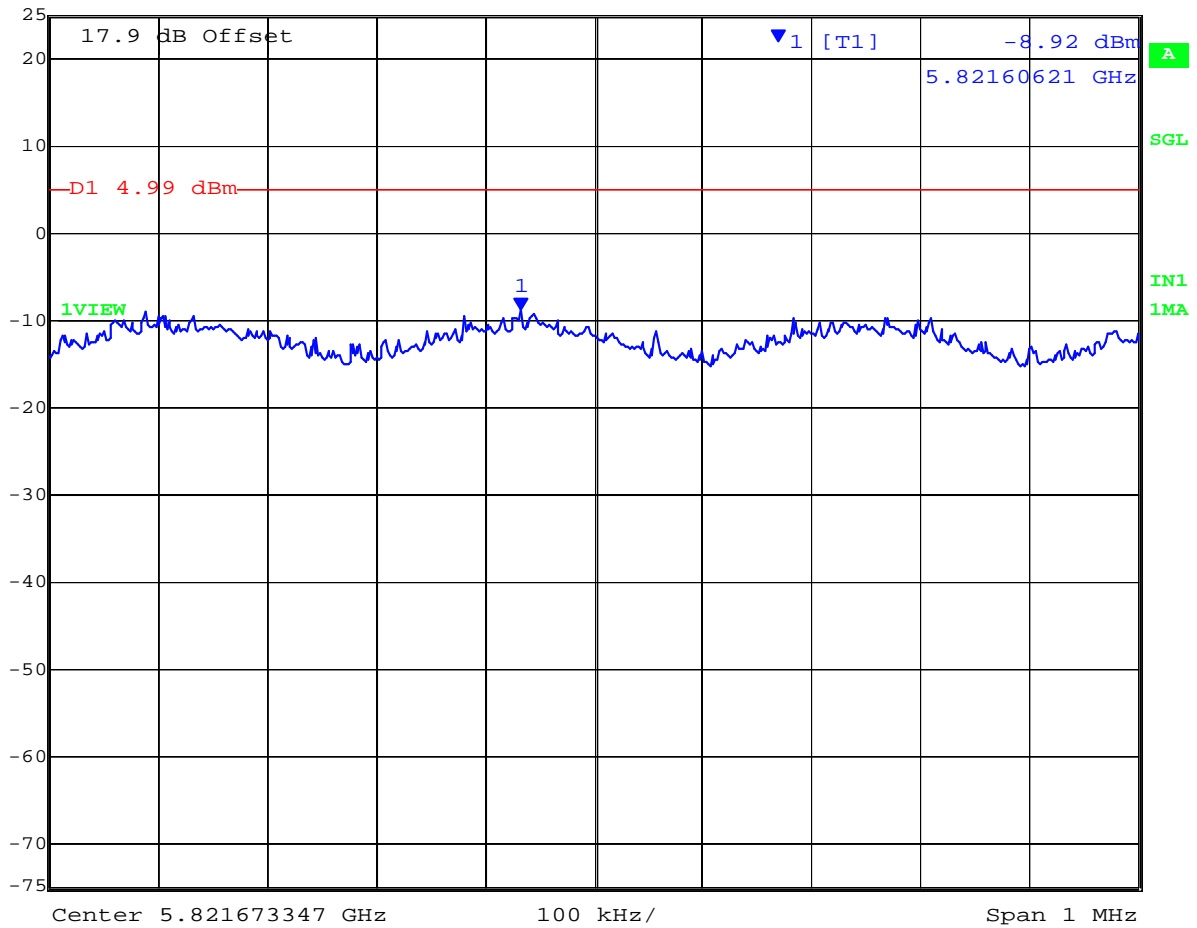


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 125 of 221

PORT B 5,825 MHz 802.11n HT-20 - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -8.92 dBm VBW 10 kHz
25 dBm 5.82160621 GHz SWT 350 s Unit dBm



Date: 11.FEB.2012 19:36:06

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 126 of 221

TABLE OF RESULTS – 802.11N HT-40

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	0 dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):	2		
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density				Correction factor	Maximum Peak Power Spectral Density	Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	10Log(N)	dBm	dBm	dB
5755.000	-11.10	-10.98	--	--	3.01	-10.98	4.99	-15.97
5795.000	-9.91	-12.47	--	--	3.01	-9.91	4.99	-14.90

Measurement uncertainty:	± 1.33 dB
---------------------------------	-----------

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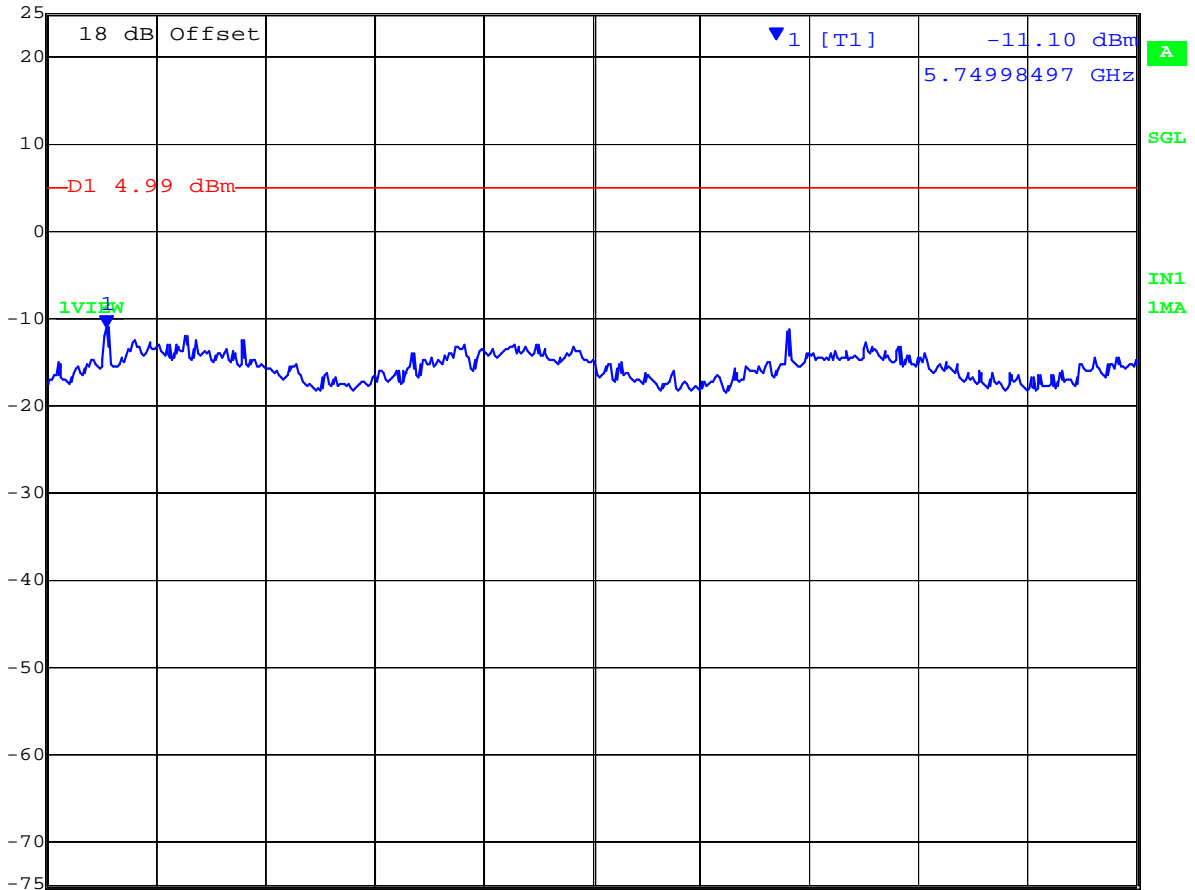


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 127 of 221

PORT A 5,755 MHz 802.11n HT-40 - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -11.10 dBm VBW 10 kHz
25 dBm 5.74998497 GHz SWT 350 s Unit dBm



Center 5.750430862 GHz 100 kHz/ Span 1 MHz

Date: 12.FEB.2012 09:15:16

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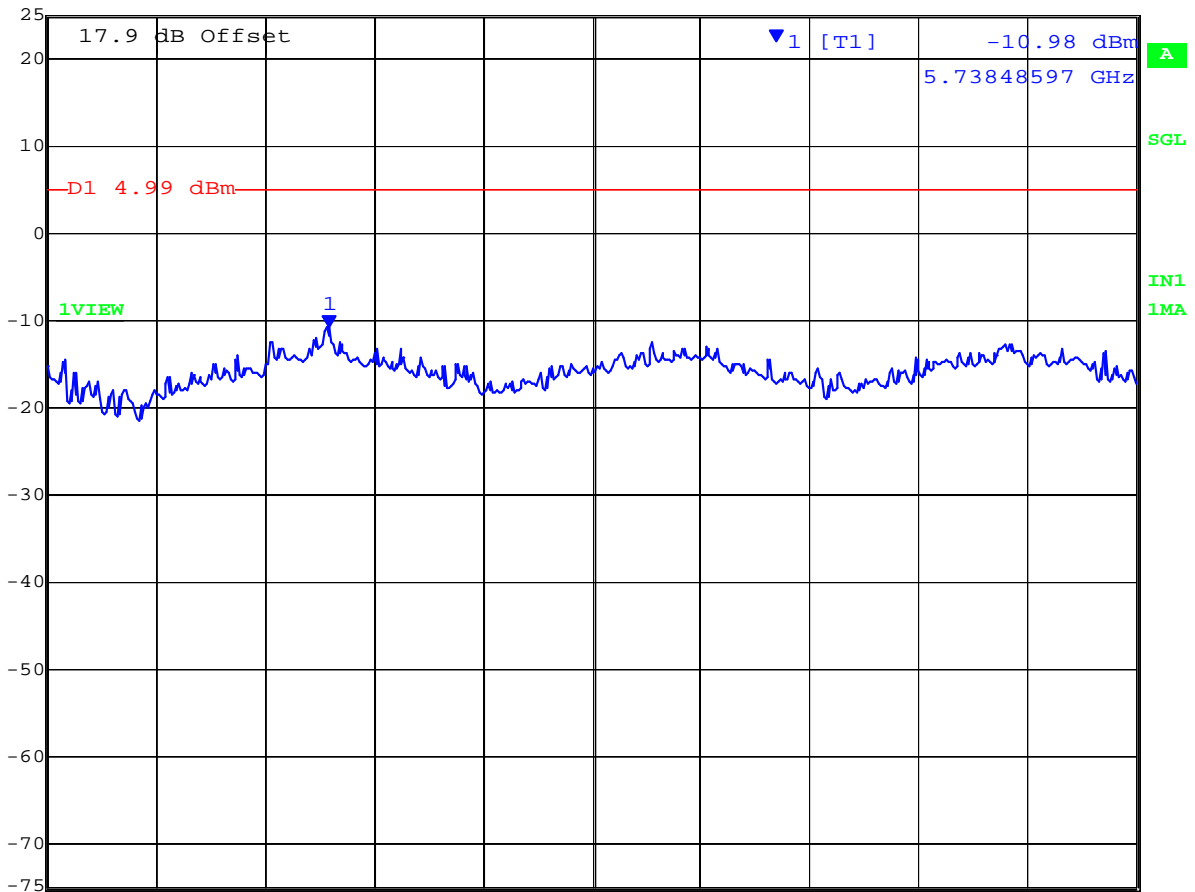


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 128 of 221

PORT B 5,755 MHz 802.11n HT-40 - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -10.98 dBm VBW 10 kHz
25 dBm 5.73848597 GHz SWT 350 s Unit dBm



Center 5.738727455 GHz 100 kHz/ Span 1 MHz

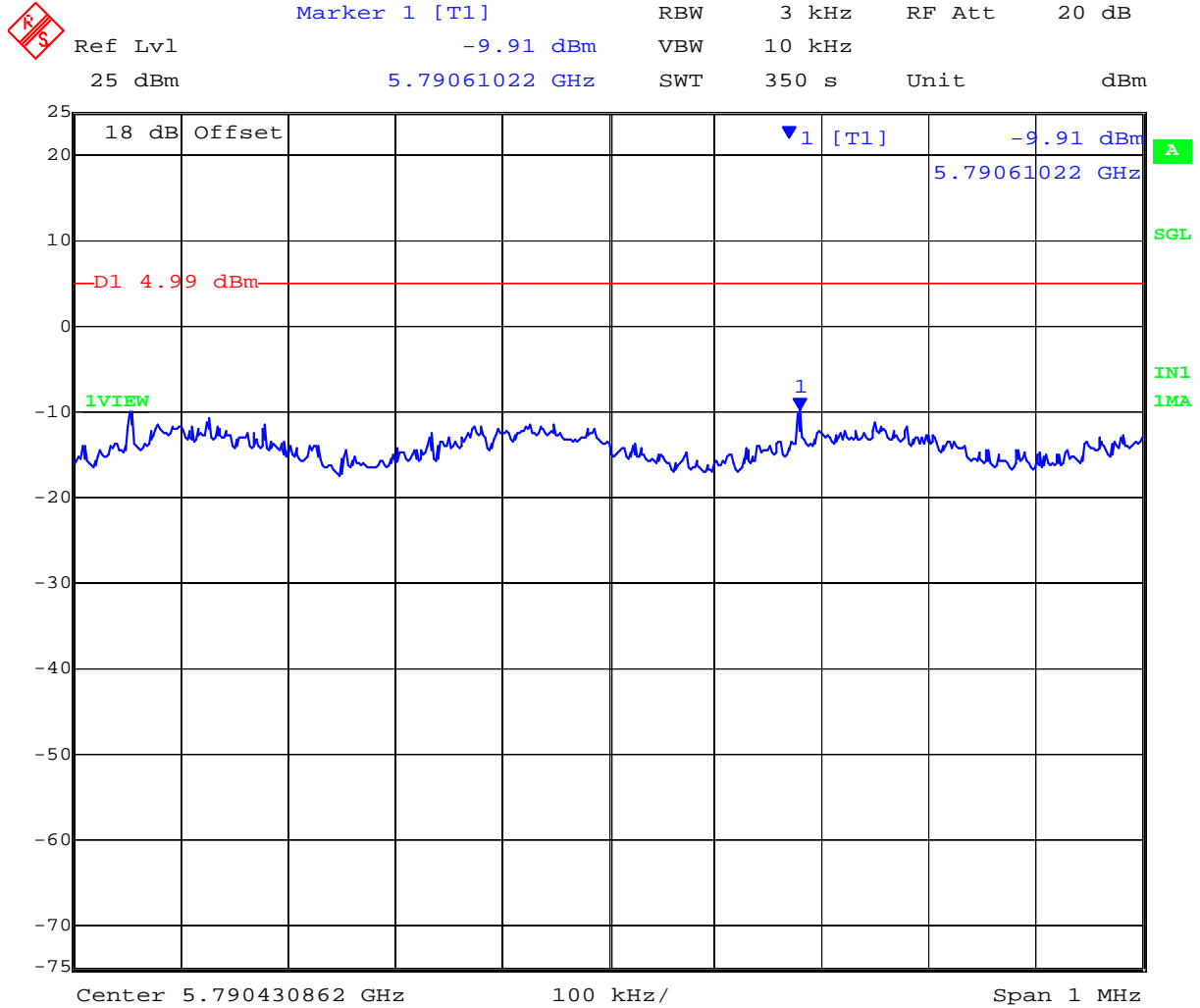
Date: 12.FEB.2012 09:21:48

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 129 of 221

PORT A 5,795 MHz 802.11n HT-40 - Peak Power Spectral Density



Date: 12.FEB.2012 09:40:32

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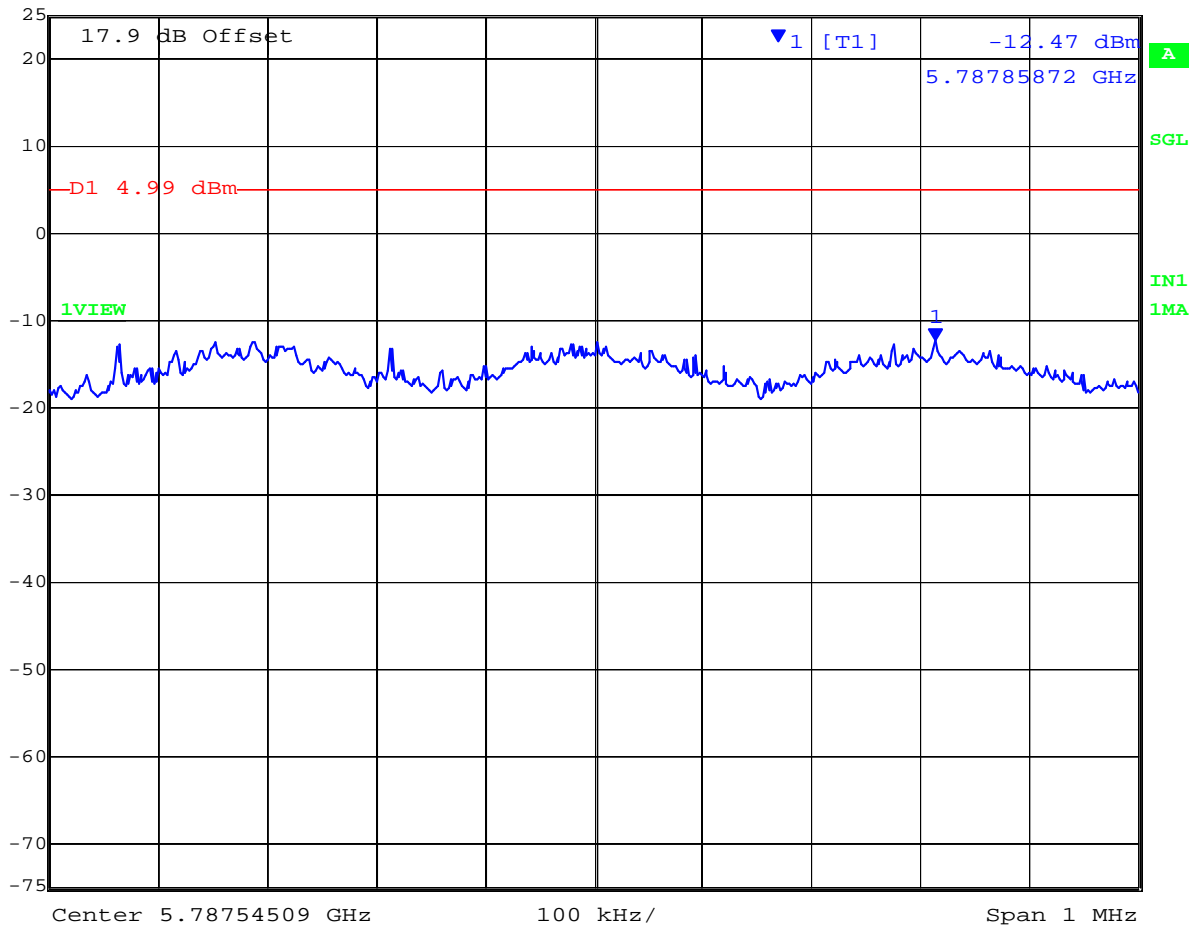


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 130 of 221

PORT B 5,795 MHz 802.11n HT-40 - Peak Power Spectral Density



Marker 1 [T1] RBW 3 kHz RF Att 20 dB
Ref Lvl -12.47 dBm VBW 10 kHz
25 dBm 5.78785872 GHz SWT 350 s Unit dBm



Date: 12.FEB.2012 09:47:05

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 131 of 221

Specification

Peak Power Spectral Density Limits

§15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission

RSS-210 §A8.2(2) The transmitter power spectral density (into the antenna) shall not be greater than +8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0 second duration.

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

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5.1.4. Maximum Permissible Exposure

FCC, Part 15 Subpart C §15.247(i)

Industry Canada RSS-Gen §5.5

Calculations for Maximum Permissible Exposure Levels

Power Density = Pd (mW/cm²) = EIRP/(4πd²)

EIRP = P * G

P = Peak output power (mW)

G = Antenna numeric gain (numeric)

d = Separation distance (cm)

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

The Juniper WLA321 has two transmitters. The peak power in the table below is calculated by using a worst case scenario where both transmitters are operating simultaneously in the same channel. The Σ of total power is used for calculation purposes.

Because the EUT belongs to the General Population/Uncontrolled Exposure the limit of power density is 1.0 mW/cm²

Freq. Band (GHz)	Antenna Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated Safe Distance @ 1mW/cm ² Limit(cm)	Minimum Separation Distance (cm)
2.4	0.0	1.00	+21.75	149.6	3.45	20.0*
5.8	0.0	1.00	+19.23	83.8	2.58	20.0*

*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

§15.247(i) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency levels in excess of the Commission’s guidelines.

FCC §1.1310 Limit = 1mW / cm² from 1.310 Table 1

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

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB
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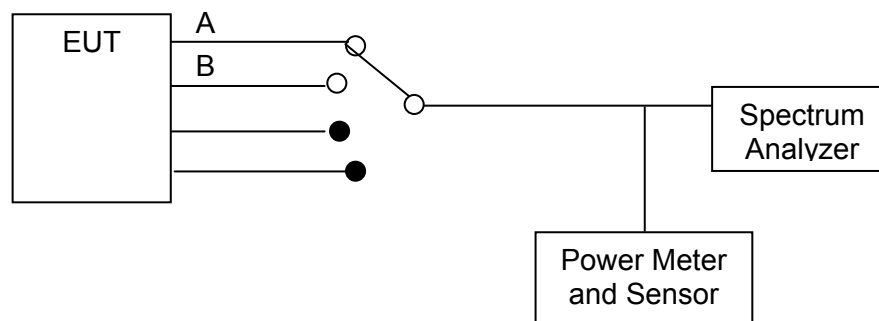
5.1.5. Conducted Spurious Emissions

FCC, Part 15 Subpart C §15.247(d); 15.205; 15.209
Industry Canada RSS-210 §A8.5, §2.2
Industry Canada RSS-Gen 4.7

Test Procedure

Conducted emissions were measured at a limit of 20 dB below the highest in-band spectral density measured with a spectrum analyzer connected to the antenna terminal. Emissions at the band edge were measured and recorded. Measurements were made while EUT was operating in transmit mode of operation at the appropriate center frequency.

Test Measurement Set up



Band-edge measurement test configuration

Measurement Results of Conducted Spurious Emissions

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

NOTE: KDB 662911 was implemented for Out-of-Band measurements. Where necessary Option (2) Measure and add 10 log (N) dB was implemented

Conducted Spurious Emission Results

Measurements were performed with the transmitter tuned to the channel closest to the band-edge being measured. All emissions were maximized during measurement. Limits which were derived from the band-edge measurements provided below are drawn on each plot.



Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 134 of 221

TABLE OF RESULTS – 802.11b – Legacy

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11b	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	N/A dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):			
Notes 1:					
Notes 2:					

Conducted Spurious Measurement

Test Freq.	Start Freq.	Stop Freq.	Port A		Port B		Port C		Port D	
			SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
2412.000	30.00	26000.00	-43.30	-10.94	-41.35	-10.89				
2437.000	30.00	26000.00	-42.68	-10.91	-43.17	-10.43				
2462.000	30.00	26000.00	-42.93	-11.23	-42.91	-11.60				

SE: Maximum spurious emission found

Band-edge Measurement

Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
		BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2412.000	2400.00	-41.68	-10.21	-42.10	-10.28				
2462.000	2483.50	-48.70	-10.49	-48.84	-10.70				

BE: Maximum Band edge emission found

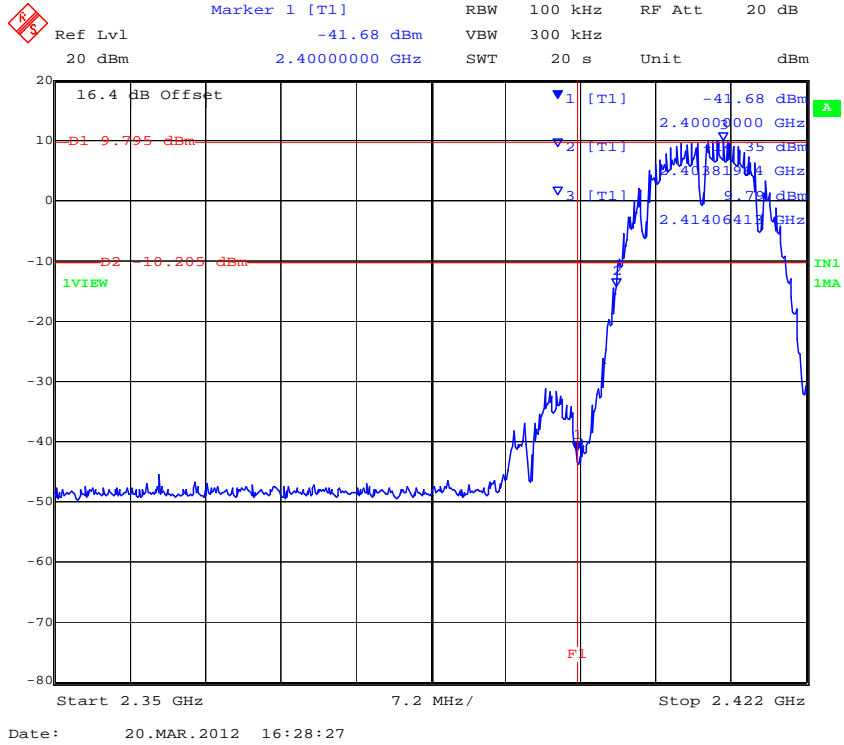
Measurement uncertainty:	±2.81 dB
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Note: Limit is based on 20dB down from fundamental emission

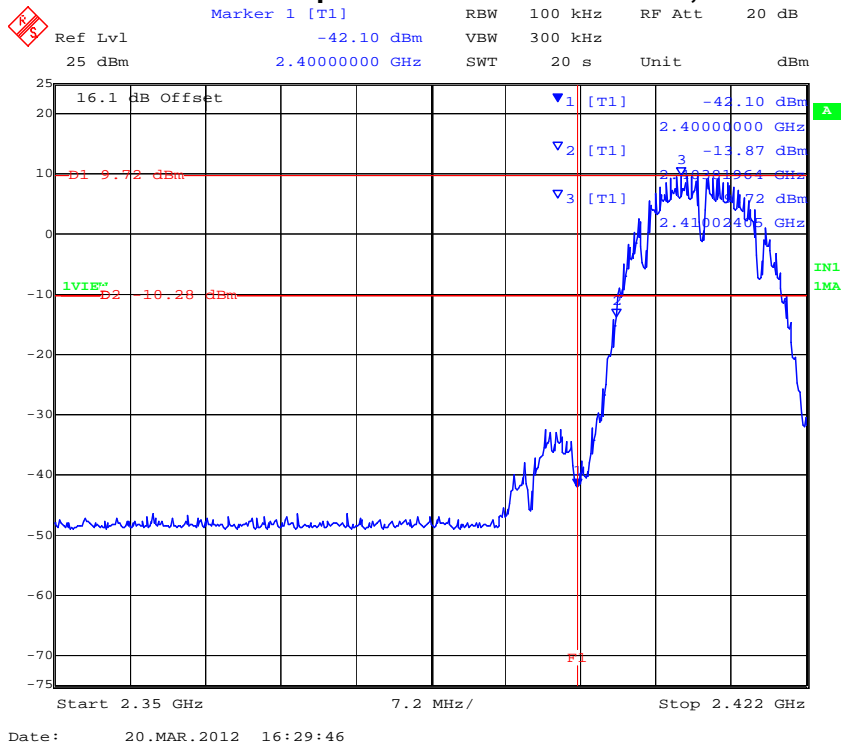
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PORT A 802.11b - Conducted Spurious Emissions at the 2,400 MHz Band Edge



PORT B 802.11b - Conducted Spurious Emissions at the 2,400 MHz Band Edge

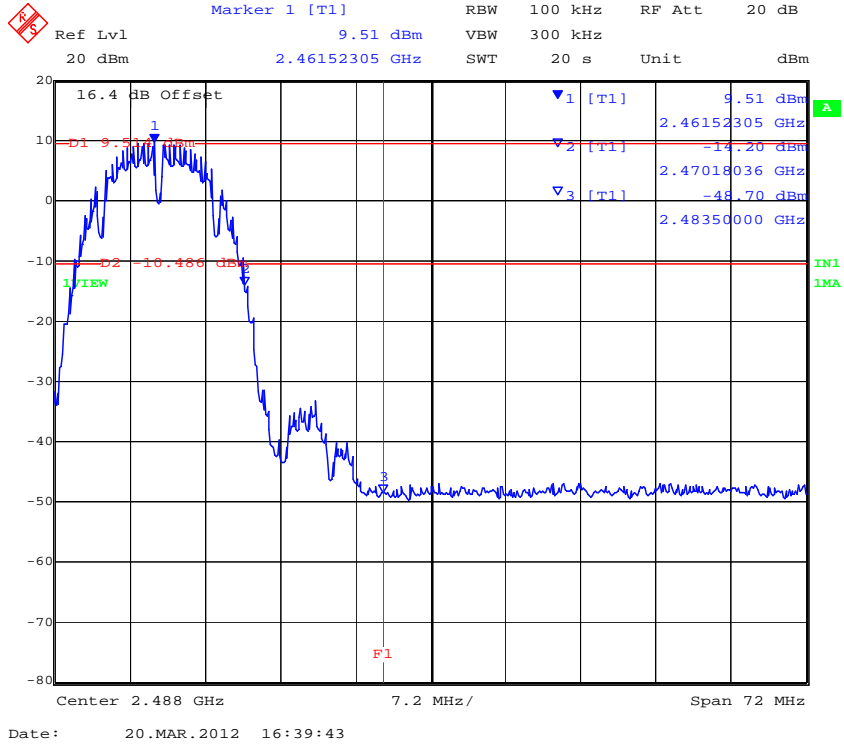


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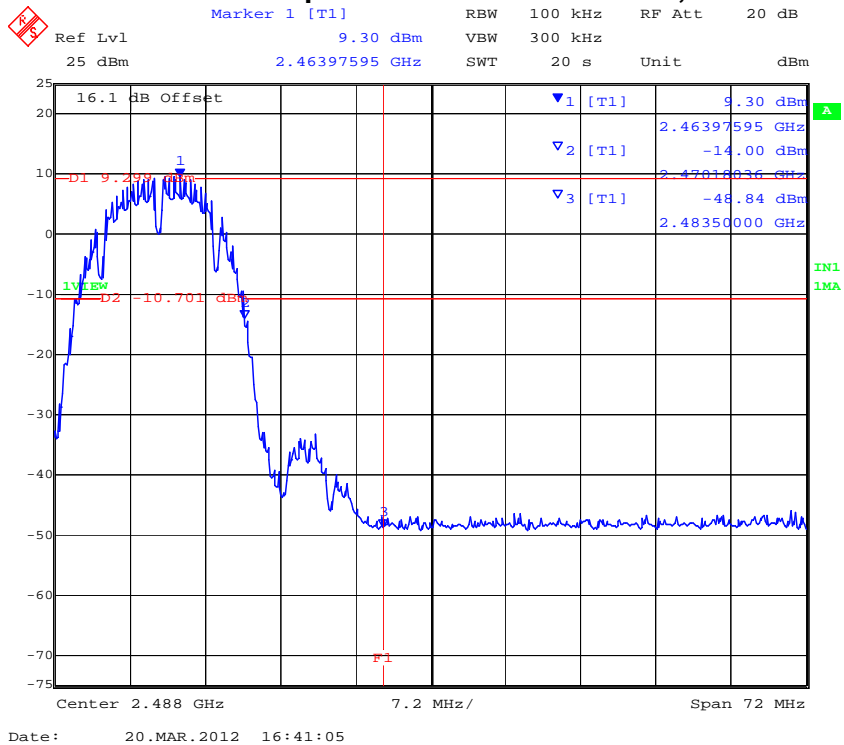


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 136 of 221

PORT A 802.11b - Conducted Spurious Emissions at the 2,483.5 MHz Band Edge



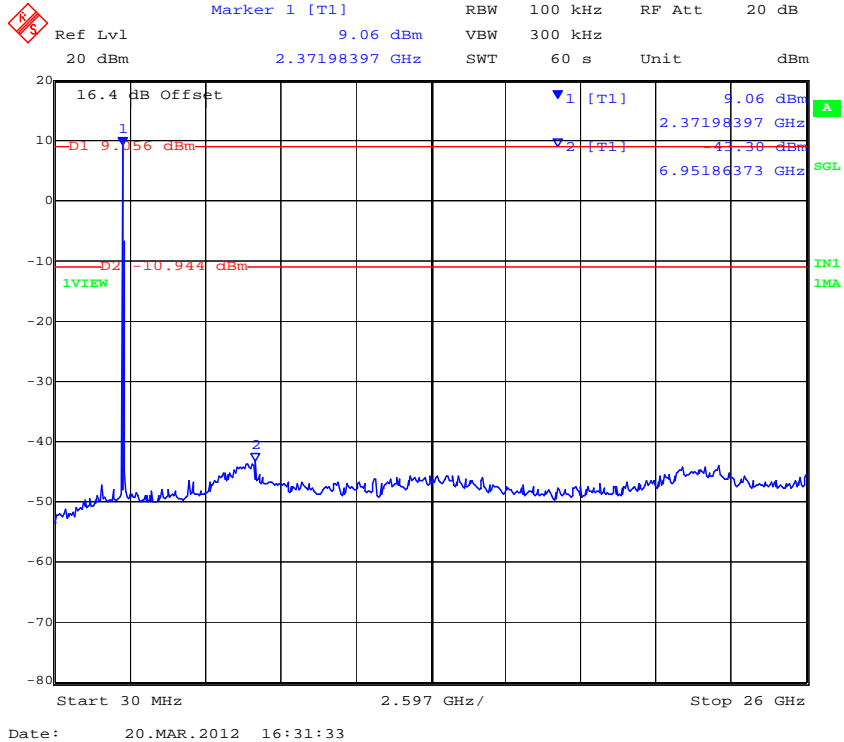
PORT B 802.11b - Conducted Spurious Emissions at the 2,483.5 MHz Band Edge



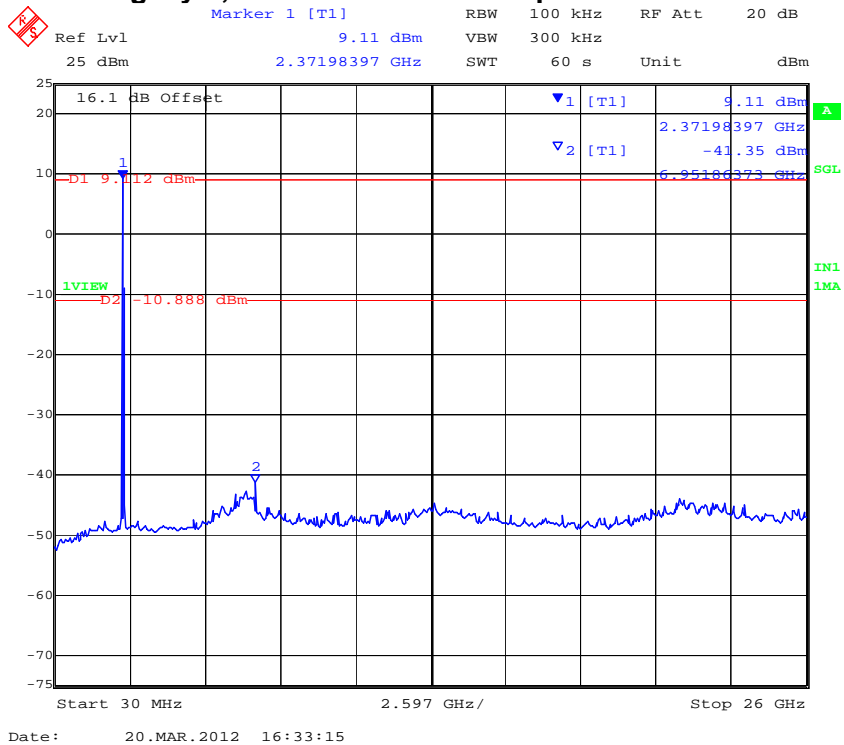
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PORT A 802.11b–Legacy 2,412 MHz Conducted Spurious Emissions 0.30 to 26 GHz



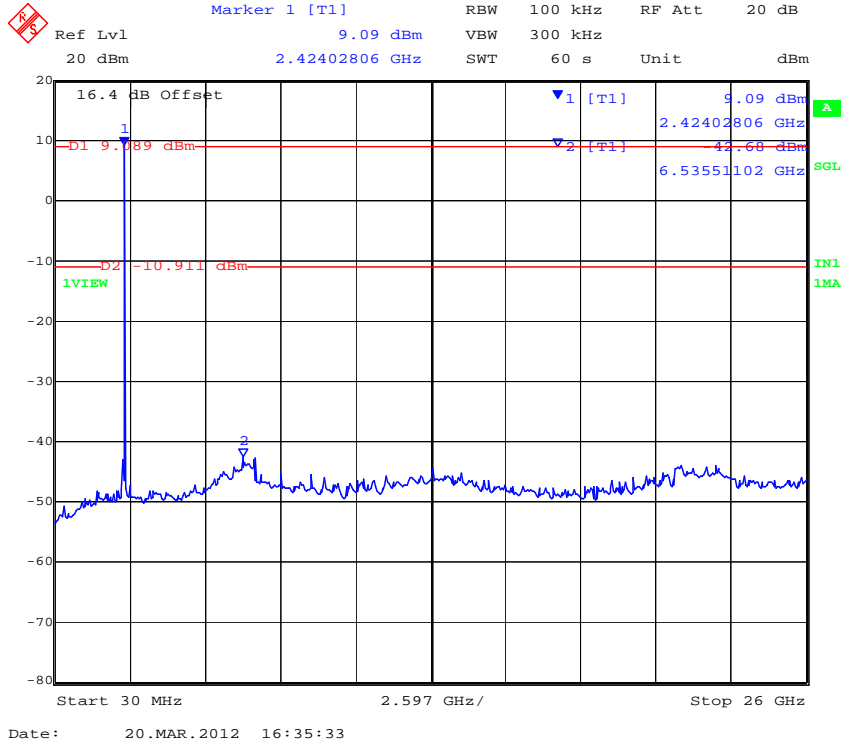
PORT B 802.11b–Legacy 2,412 MHz Conducted Spurious Emissions 0.30 to 26 GHz



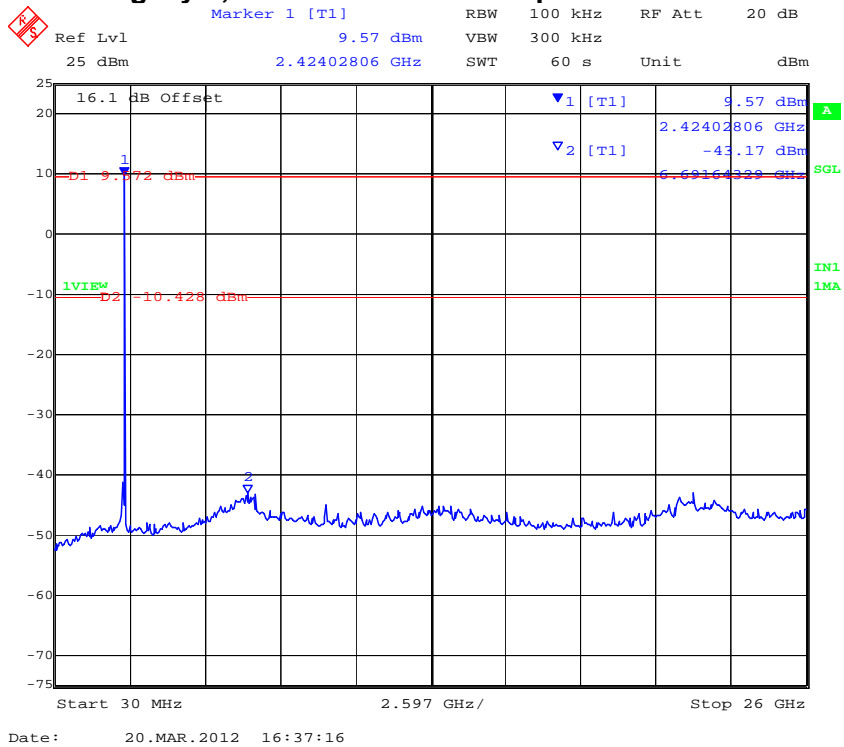
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PORT A 802.11b–Legacy 2,437 MHz Conducted Spurious Emissions 0.30 to 26 GHz



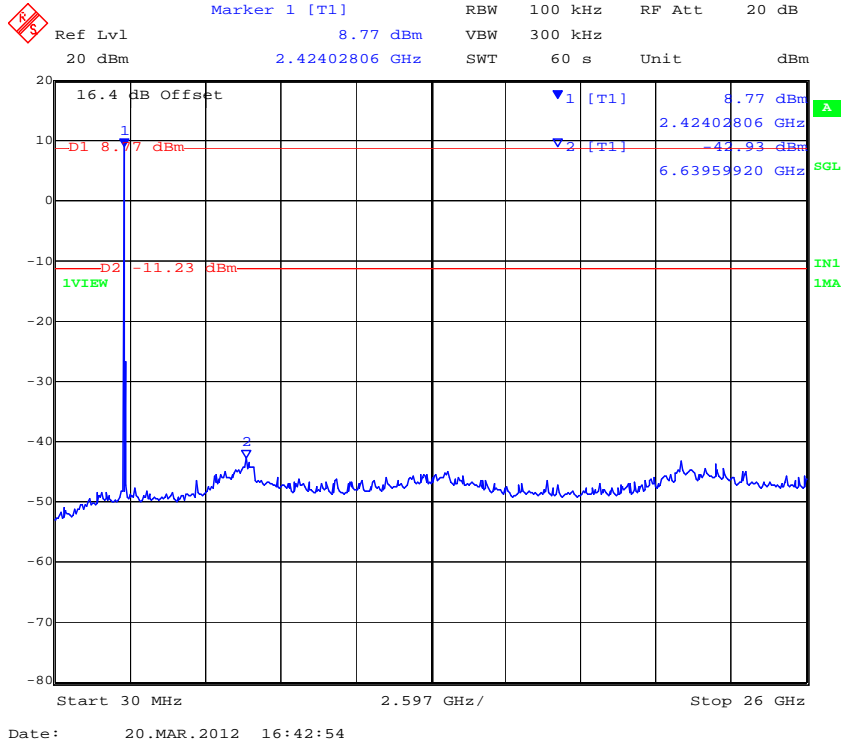
PORT B 802.11b–Legacy 2,437 MHz Conducted Spurious Emissions 0.30 to 26 GHz



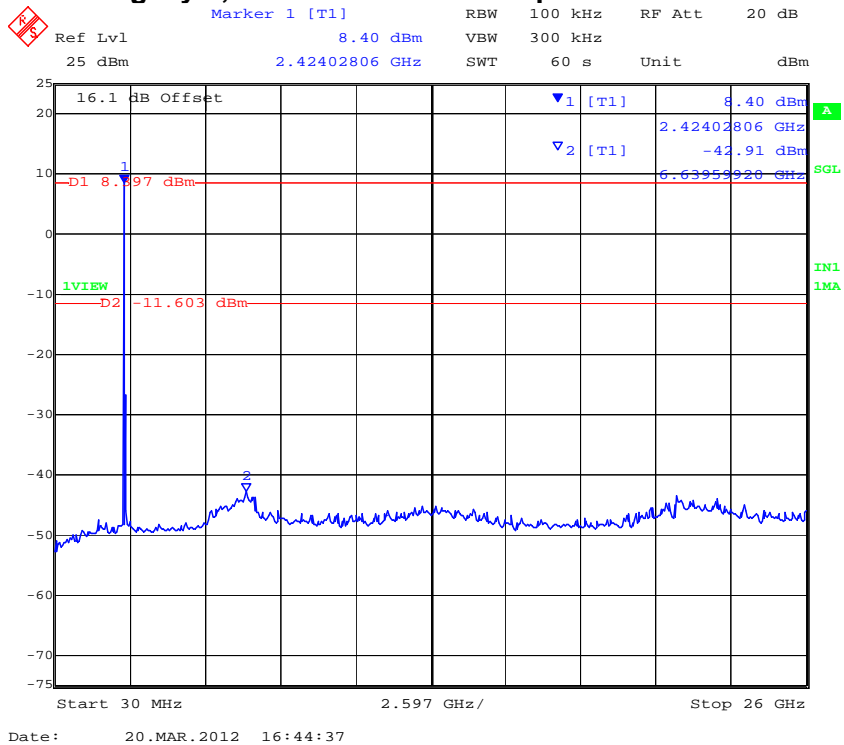
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PORT A 802.11b-Legacy 2,462 MHz Conducted Spurious Emissions 0.30 to 26 GHz



PORT B 802.11b-Legacy 2,462 MHz Conducted Spurious Emissions 0.30 to 26 GHz



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Conducted Spurious Emission Results

TABLE OF RESULTS – 802.11g Legacy

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11g	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	N/A dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):			
Notes 1:					
Notes 2:					

Conducted Spurious Measurement

Test Freq.	Start Freq.	Stop Freq.	Port A		Port B		Port C		Port D	
			SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
2412.000	30.00	26000.00	-43.35	-14.47	-42.85	-14.67				
2437.000	30.00	26000.00	-42.94	-14.15	-42.98	-15.11				
2462.000	30.00	26000.00	-43.18	-14.60	-42.40	-15.25				

SE: Maximum spurious emission found

Band-edge Measurement

Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
		BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2412.000	2400.00	-16.98	-13.46	-17.39	-13.72				
2462.000	2483.50	-27.96	-13.31	-28.95	-13.91				

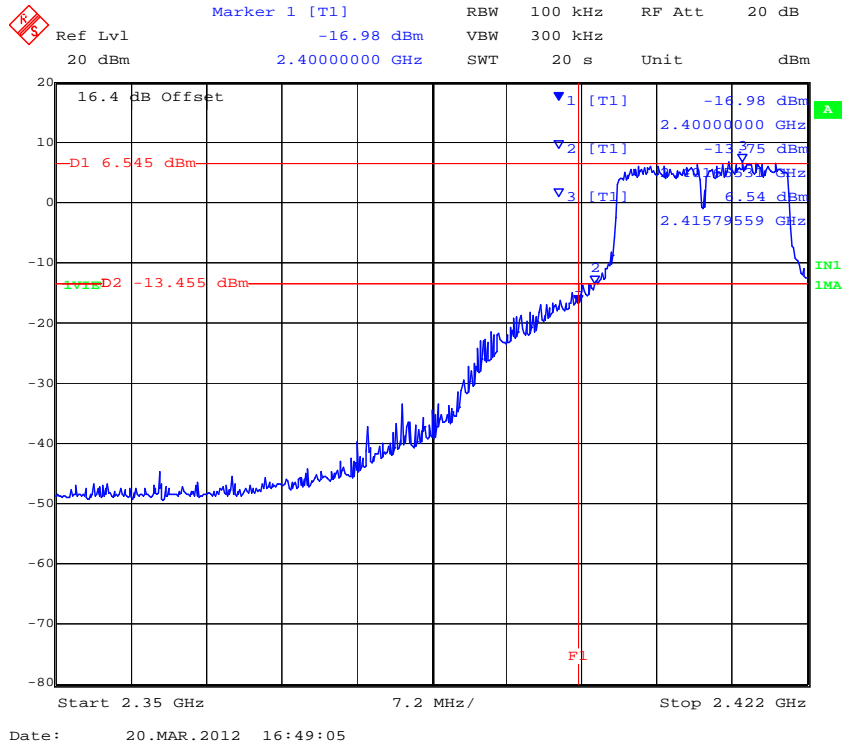
BE: Maximum Band edge emission found

Measurement uncertainty:	±2.81 dB
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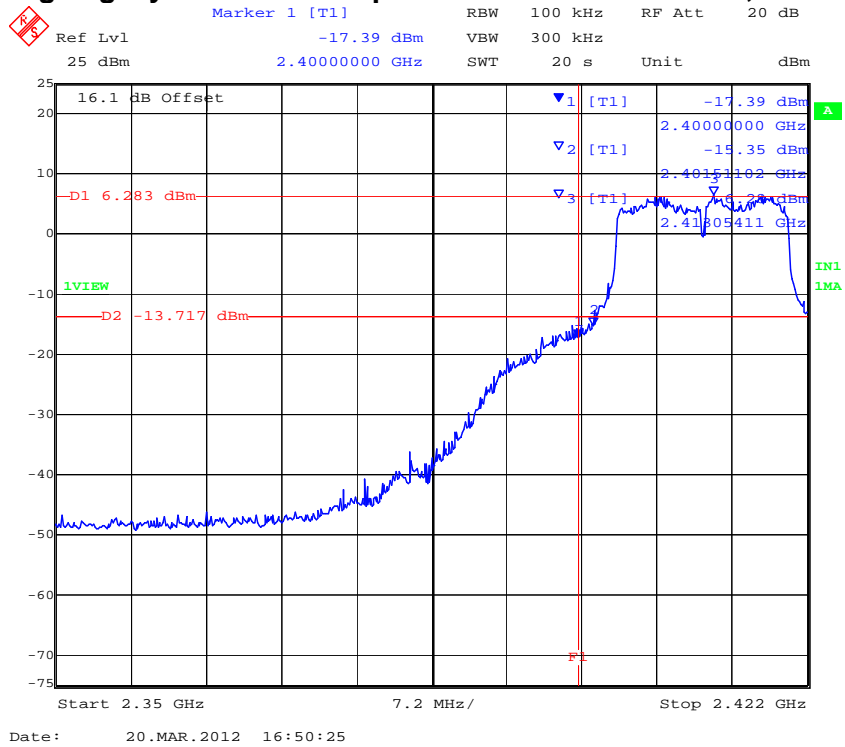
Note: Limit is based on 20dB down from fundamental emission



PORT A 802.11g Legacy - Conducted Spurious Emissions at the 2,400 MHz Band Edge



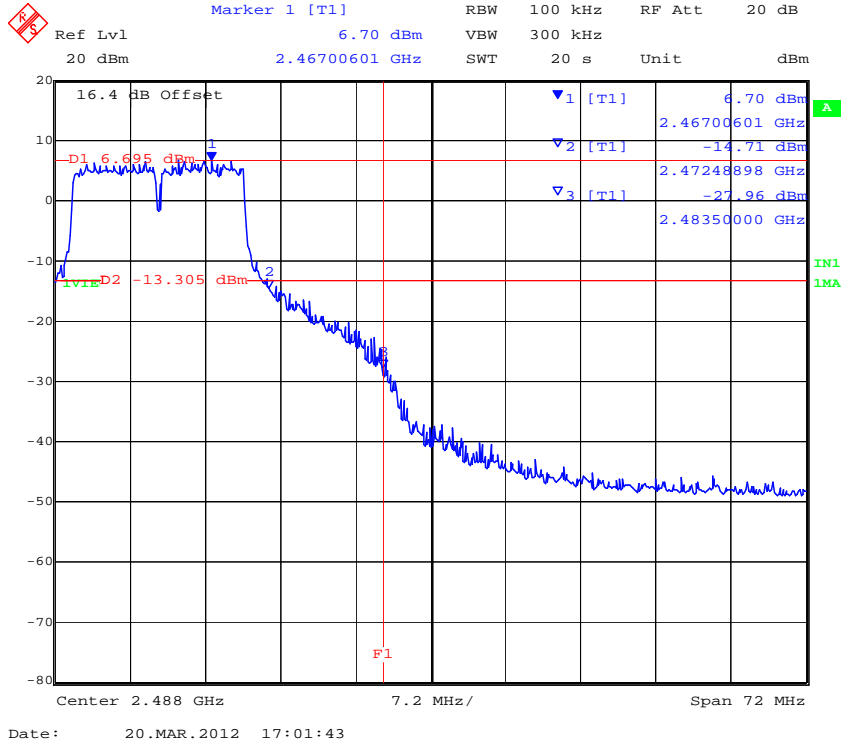
PORT B 802.11g Legacy - Conducted Spurious Emissions at the 2,400 MHz Band Edge



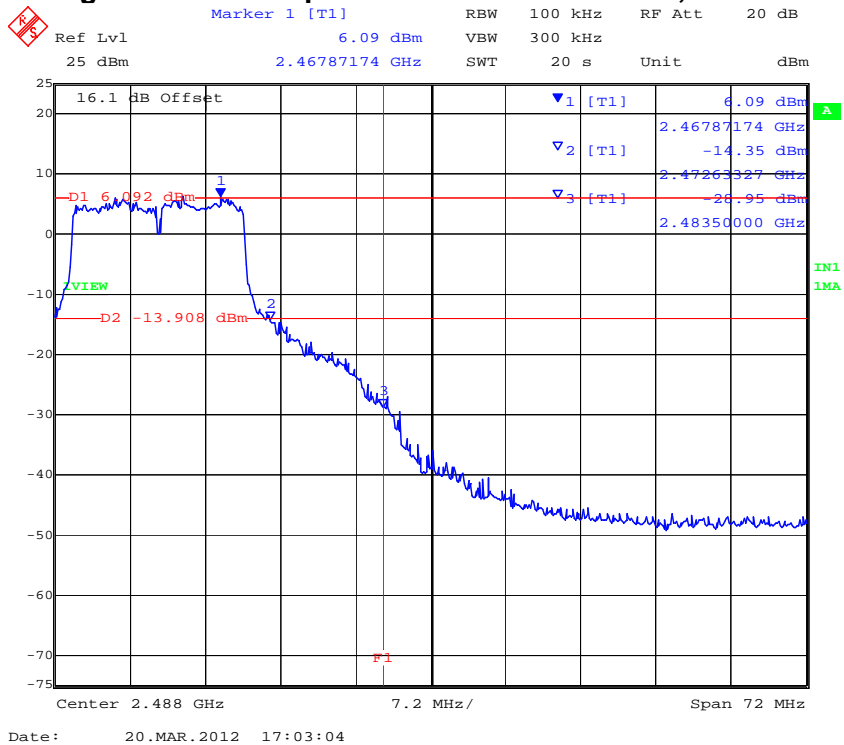
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PORT A 802.11g - Conducted Spurious Emissions at the 2,483.5 MHz Band Edge



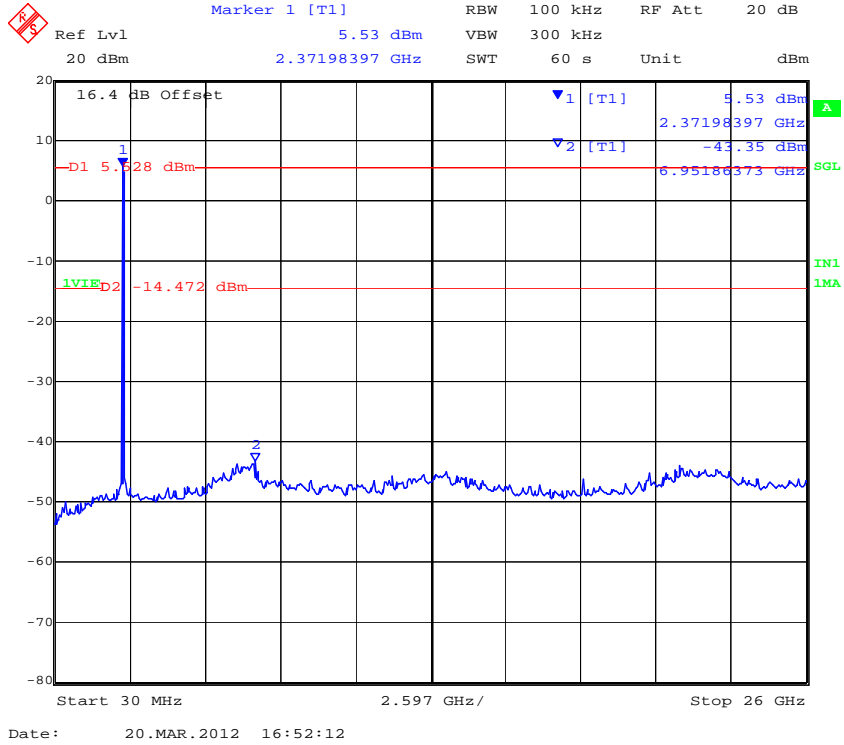
PORT B 802.11g - Conducted Spurious Emissions at the 2,483.5 MHz Band Edge



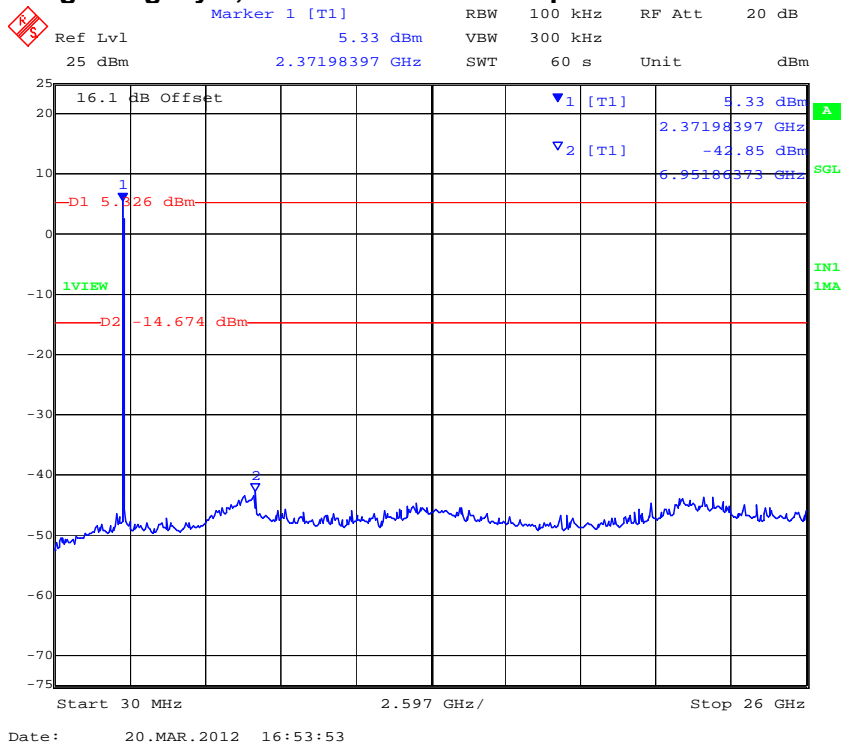
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PORT A 802.11g – Legacy 2,412 MHz Conducted Spurious Emissions 0.03 – 26 GHz



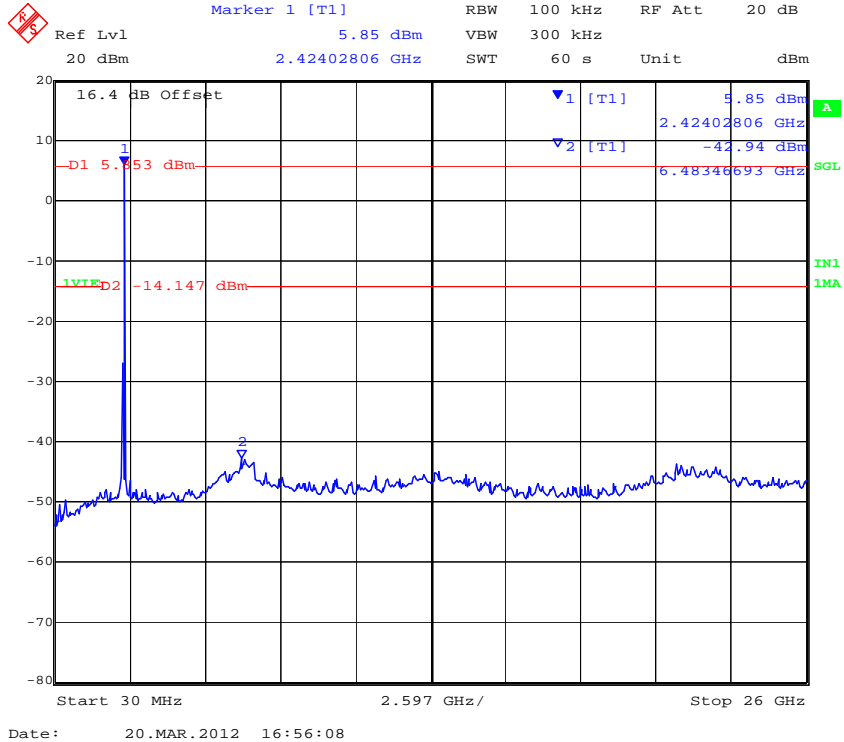
PORT B 802.11g – Legacy 2,412 MHz Conducted Spurious Emissions 0.03 – 26 GHz



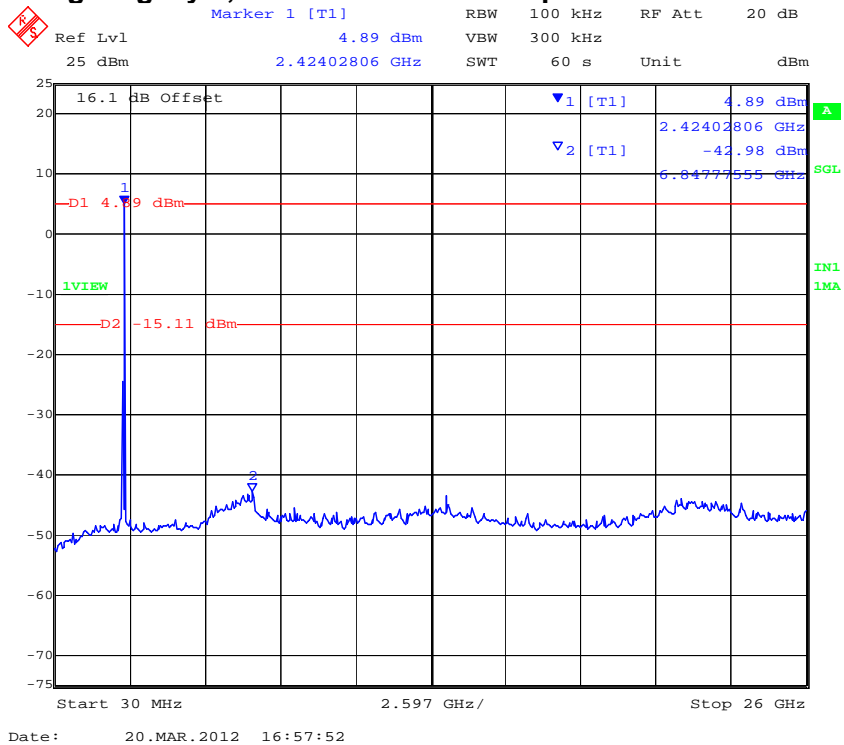
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PORT A 802.11g-Legacy 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



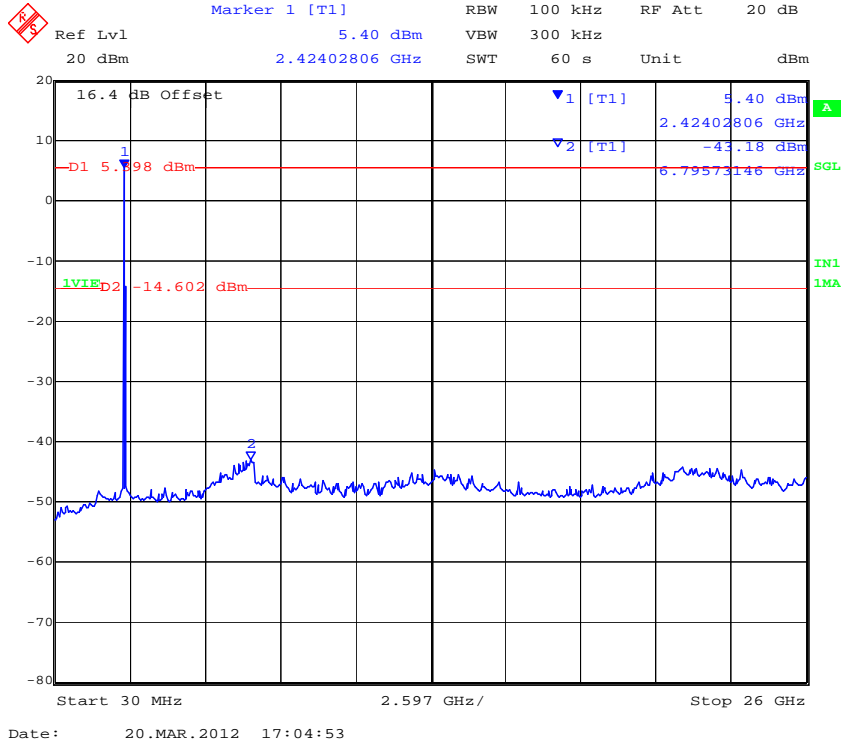
PORT B 802.11g-Legacy 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



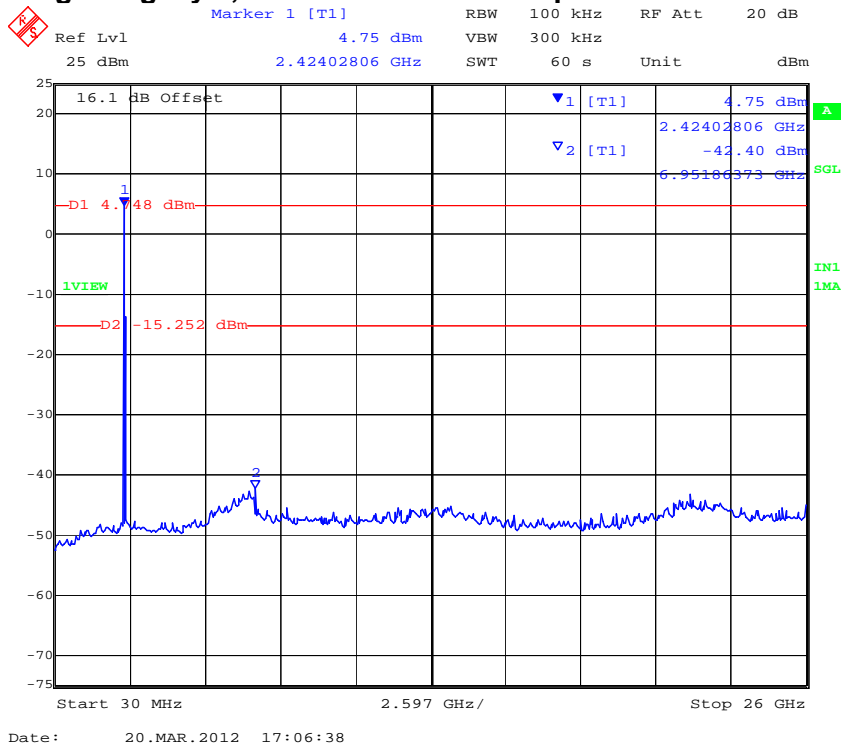
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PORT A 802.11g – Legacy 2,462 MHz Conducted Spurious Emissions 0.03 – 26 GHz



PORT B 802.11g – Legacy 2,462 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 146 of 221

Conducted Spurious Emission Results

TABLE OF RESULTS – 802.11n HT-20

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	N/A		dBi
Applied Voltage:	48.00 Vdc	Antenna Ports (N):			
Notes 1:					
Notes 2:					

Conducted Spurious Measurement

Test Freq.	Start Freq.	Stop Freq.	Port A		Port B		Port C		Port D	
			SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
2412.000	30.00	26000.00	-42.08	-14.85	-42.71	-15.25				
2437.000	30.00	26000.00	-43.32	-15.19	-42.86	-15.04				
2462.000	30.00	26000.00	-43.68	-15.01	-43.52	-15.12				

SE: Maximum spurious emission found

Band-edge Measurement

Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
		BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2412.000	2400.00	-14.48	-13.71	-16.80	-14.28				
2462.000	2483.50	-27.51	-14.40	-26.66	-13.82				

BE: Maximum Band edge emission found

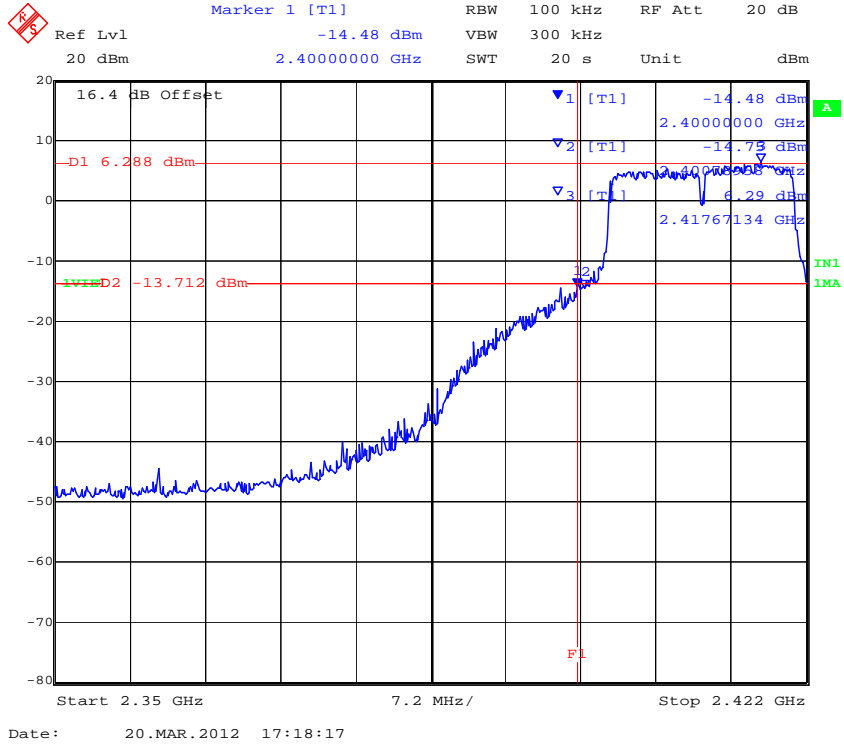
Measurement uncertainty:	±2.81 dB
---------------------------------	----------

Note: Limit is based on 20dB down from fundamental emission

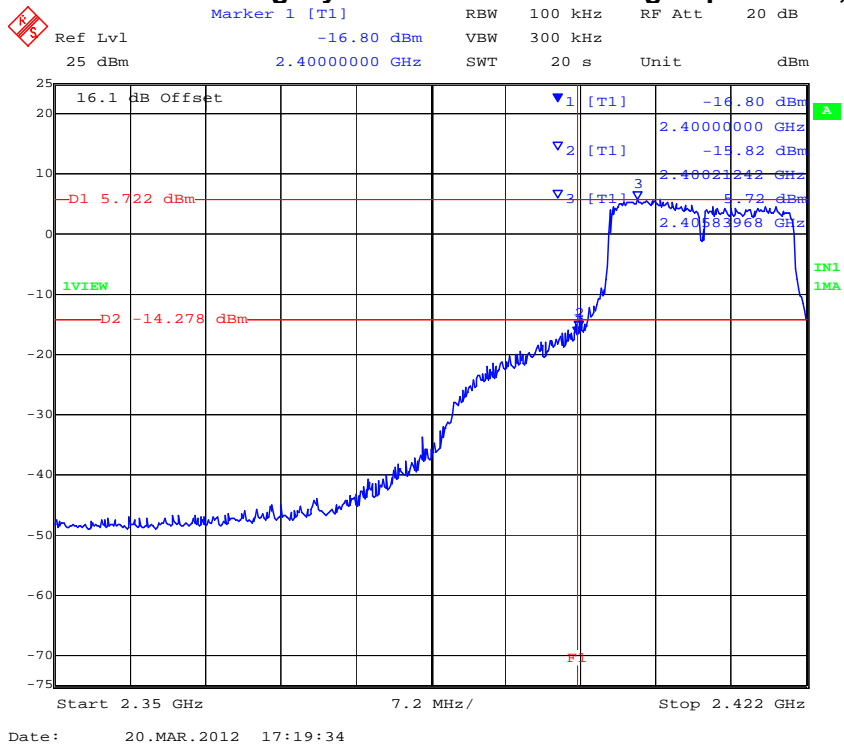
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PORT A 802.11n HT-20 Legacy - Conducted Band Edge Spurious 2,400 MHz



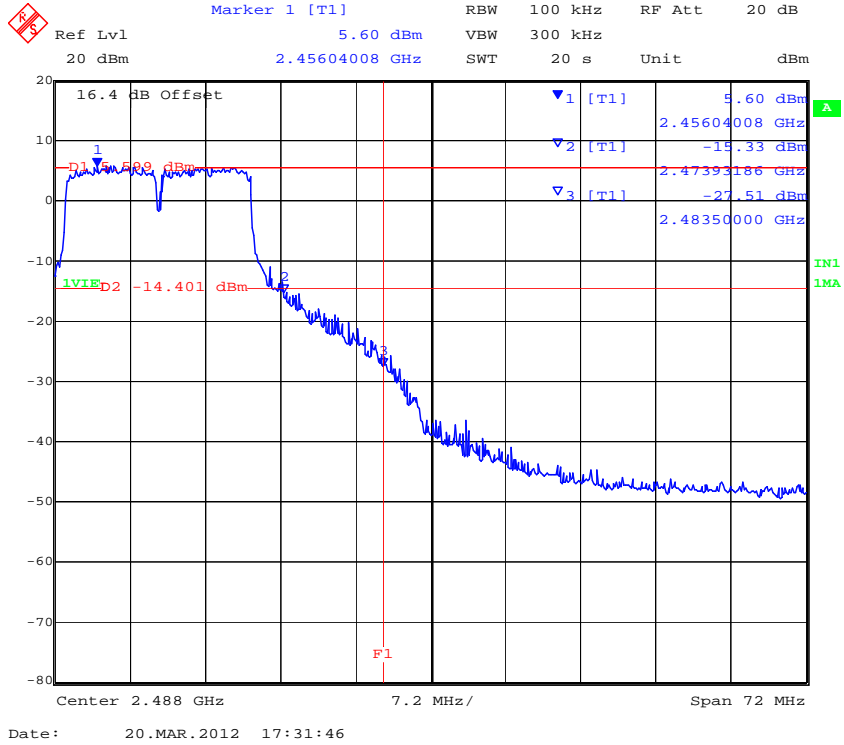
PORT B 802.11n HT-20 Legacy - Conducted Band Edge Spurious 2,400 MHz



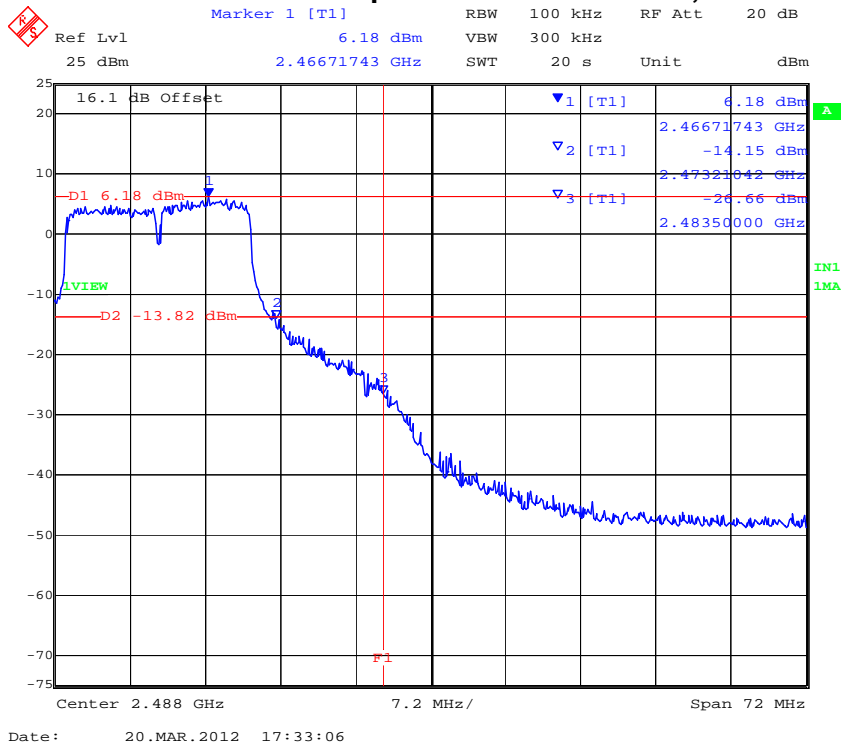
This test report may be reproduced in full only. The document may only be updated by MiCOM Labs personnel. Any changes will be noted in the Document History section of the report.



PORT A 802.11n HT-20 Conducted Spurious Emissions at 2,483.5 MHz Band Edge



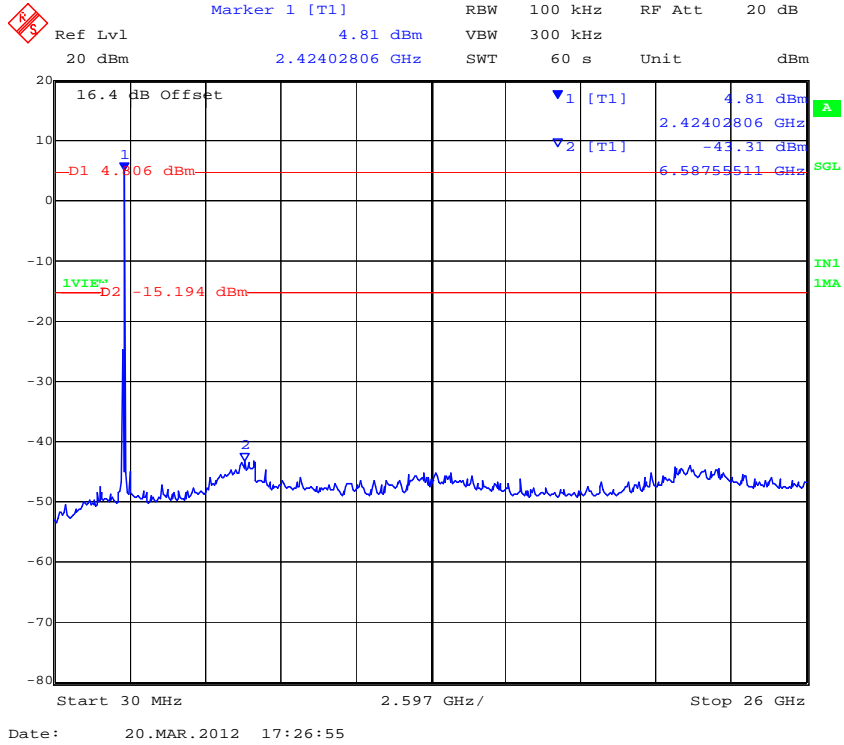
PORT B 802.11n HT-20 Conducted Spurious Emissions at 2,483.5 MHz Band Edge



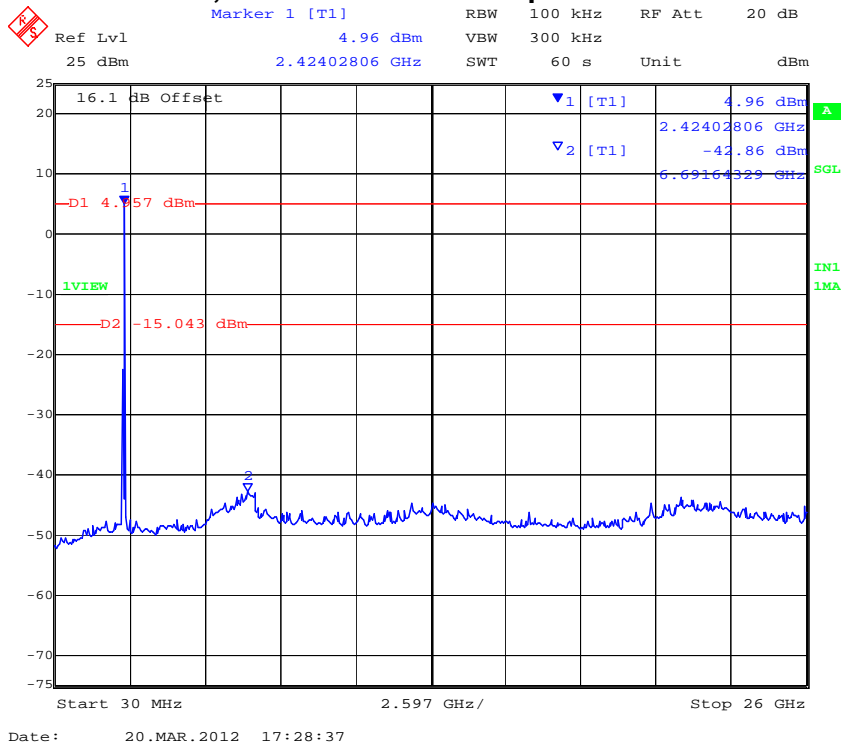
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PORT A 802.11n HT-20 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



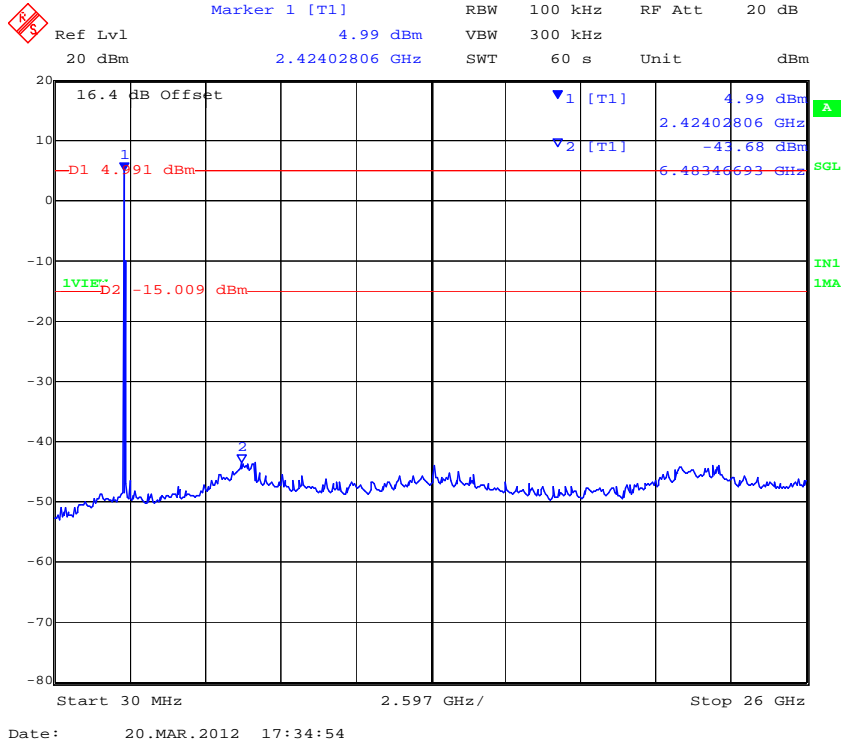
PORT B 802.11n HT-20 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



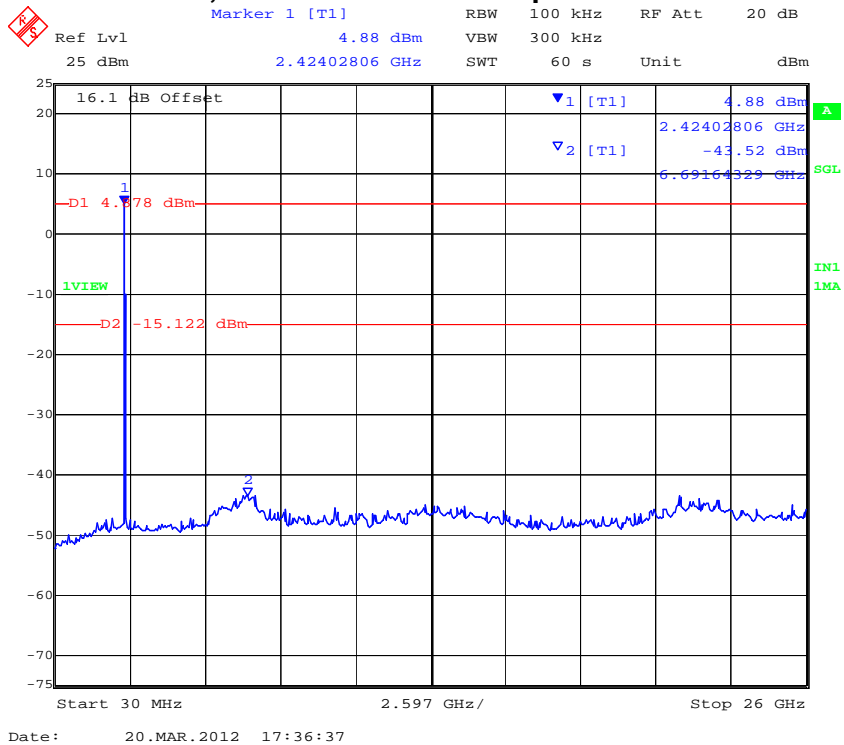
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PORT A 802.11n HT-20 2,462 MHz Conducted Spurious Emissions 0.03 – 26 GHz



PORT B 802.11n HT-20 2,462 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 152 of 221

Conducted Spurious Emission Results

TABLE OF RESULTS – 802.11N HT-40

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	N/A dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):			
Notes 1:					
Notes 2:					

Conducted Spurious Measurement

Test Freq.	Start Freq.	Stop Freq.	Port A		Port B		Port C		Port D	
			SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
2422.000	30.00	26000.00	-43.25	-17.47	-43.28	-18.24				
2437.000	30.00	26000.00	-43.53	-17.69	-43.05	-17.72				
2452.000	30.00	26000.00	-42.99	-17.57	-42.65	-18.47				

SE: Maximum spurious emission found

Band-edge Measurement

Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
		BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2422.000	2400.00	-20.45	-16.44	-19.67	-16.90				
2452.000	2483.50	-24.42	-17.22	-24.35	-17.59				

BE: Maximum Band edge emission found

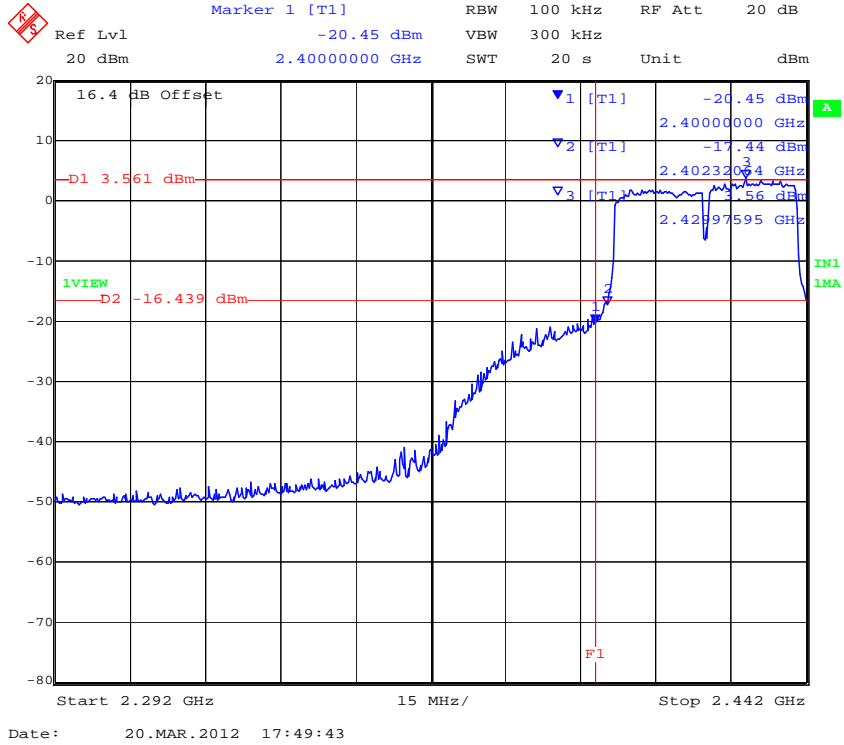
Measurement uncertainty:	±2.81 dB
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Note: Limit is based on 20dB down from fundamental emission

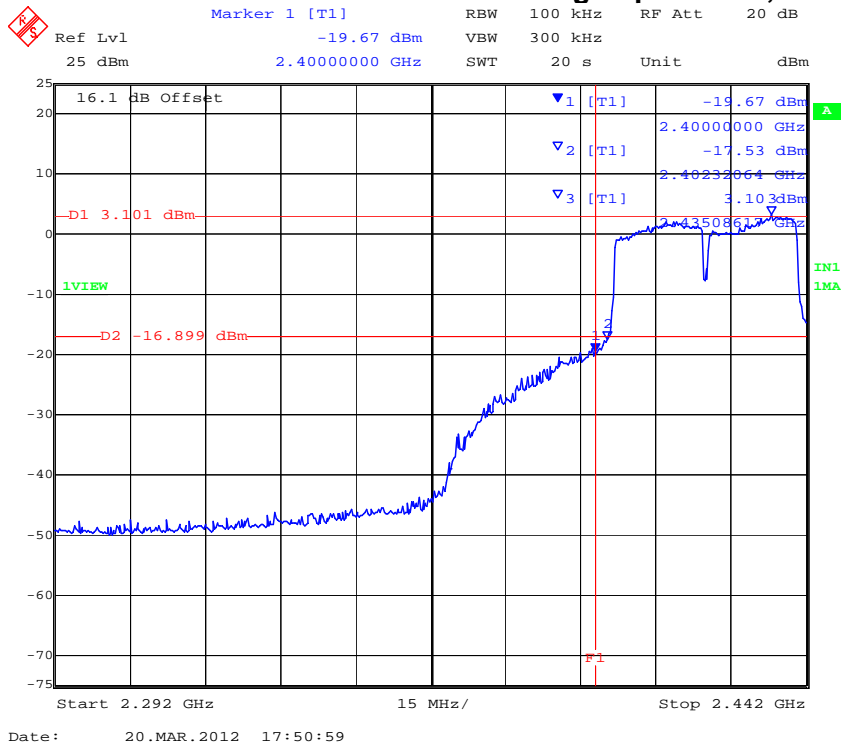
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PORT A 802.11n HT-40 Conducted Band Edge Spurious 2,400 MHz



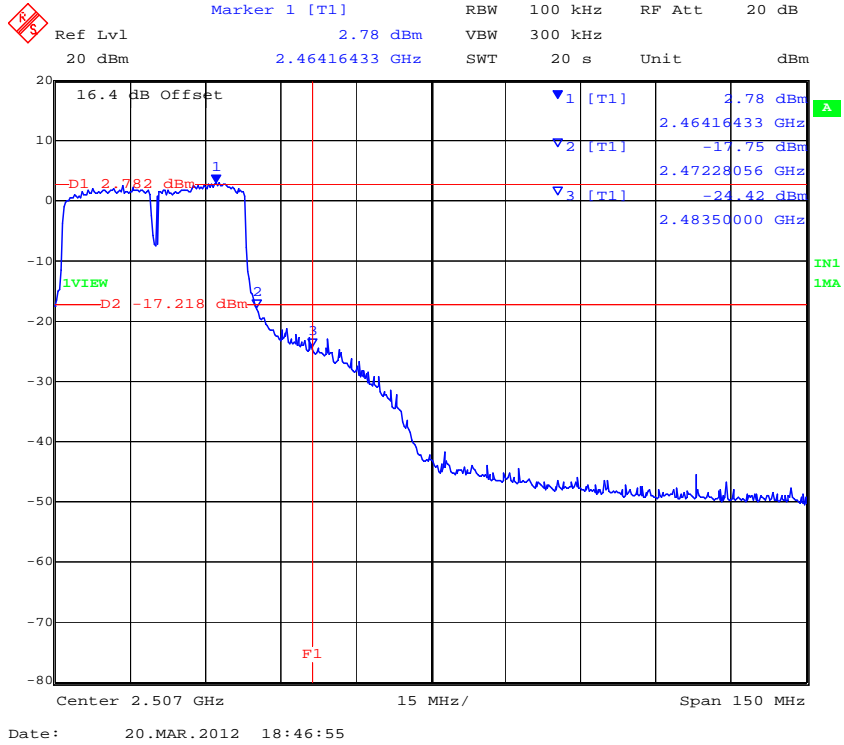
PORT B 802.11n HT-40 Conducted Band Edge Spurious 2,400 MHz



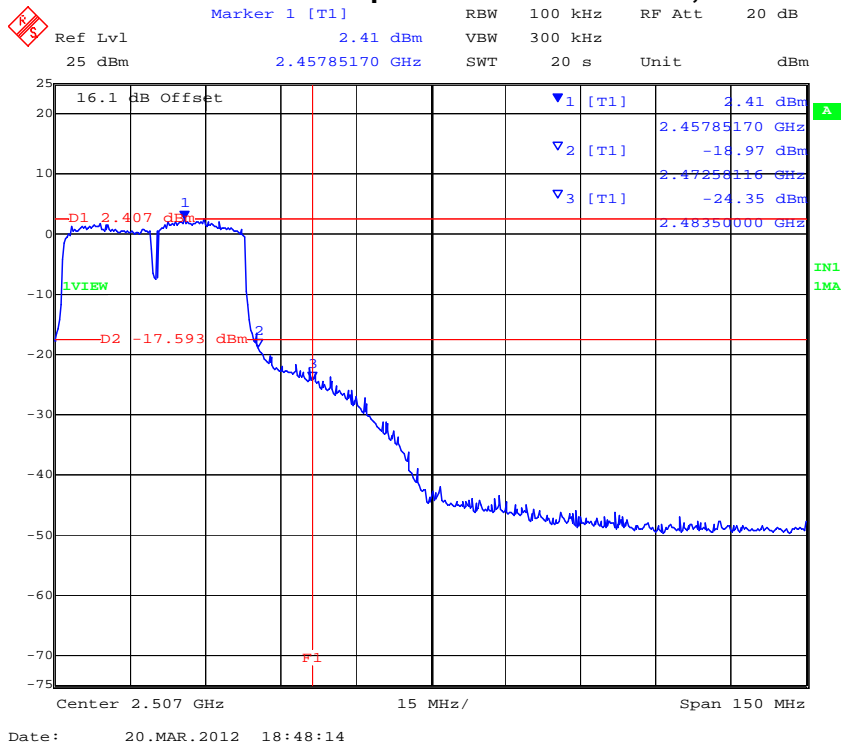
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PORT A 802.11n HT-40 Conducted Spurious Emissions at 2,483.5 MHz Band Edge



PORT B 802.11n HT-40 Conducted Spurious Emissions at 2,483.5 MHz Band Edge

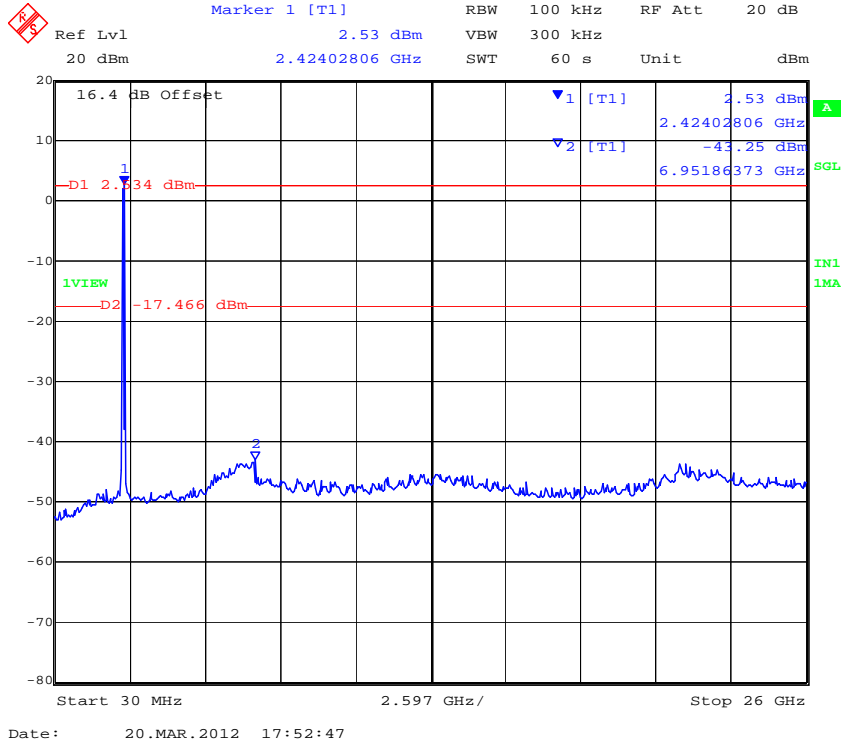


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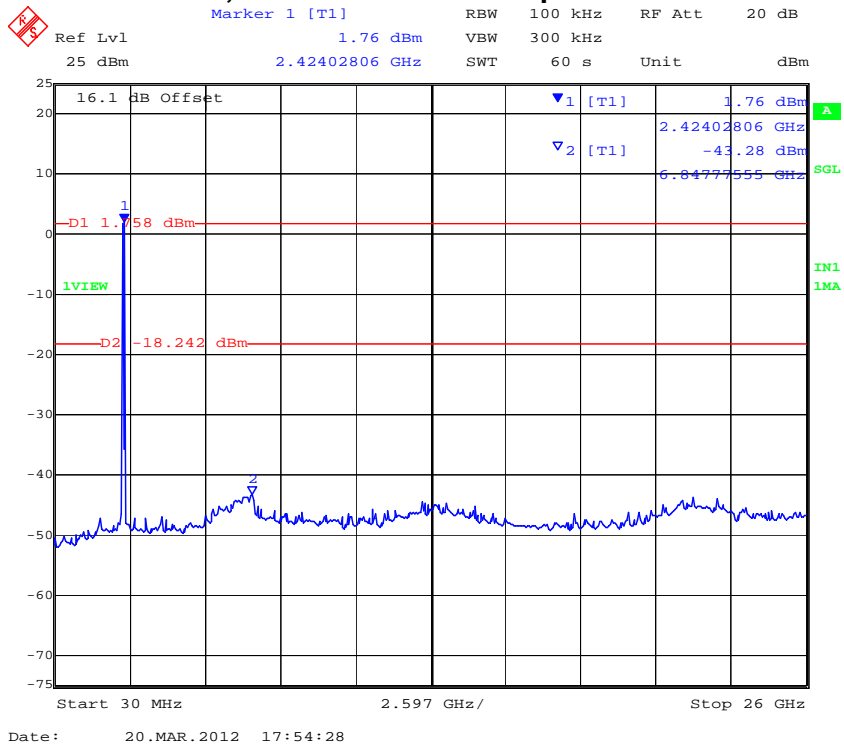


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 155 of 221

PORT A 802.11n – HT-40 2,422 MHz Conducted Spurious Emissions 0.03 – 26 GHz



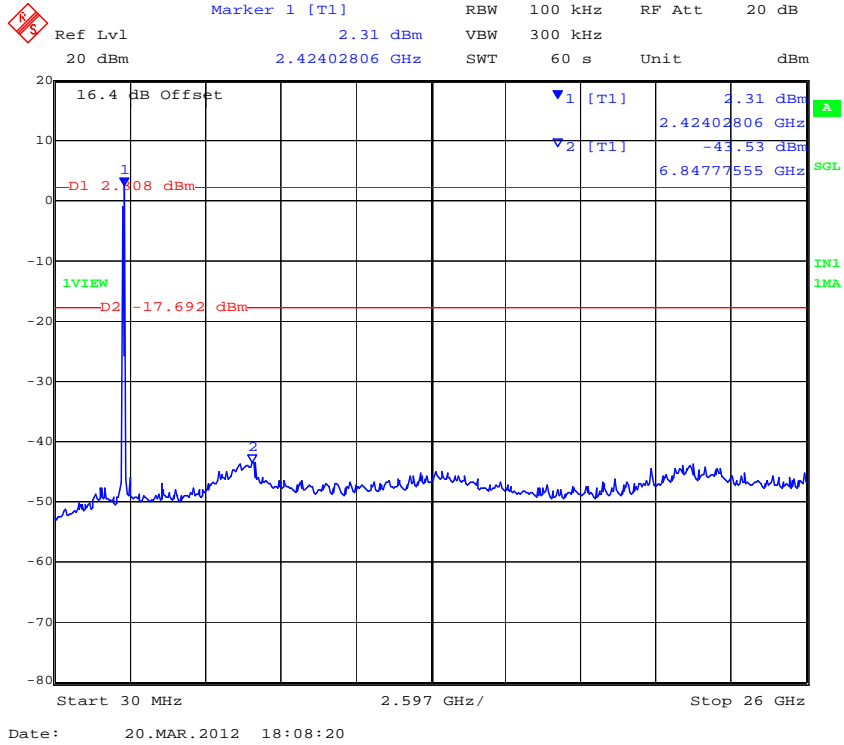
PORT B 802.11n – HT-40 2,422 MHz Conducted Spurious Emissions 0.03 – 26 GHz



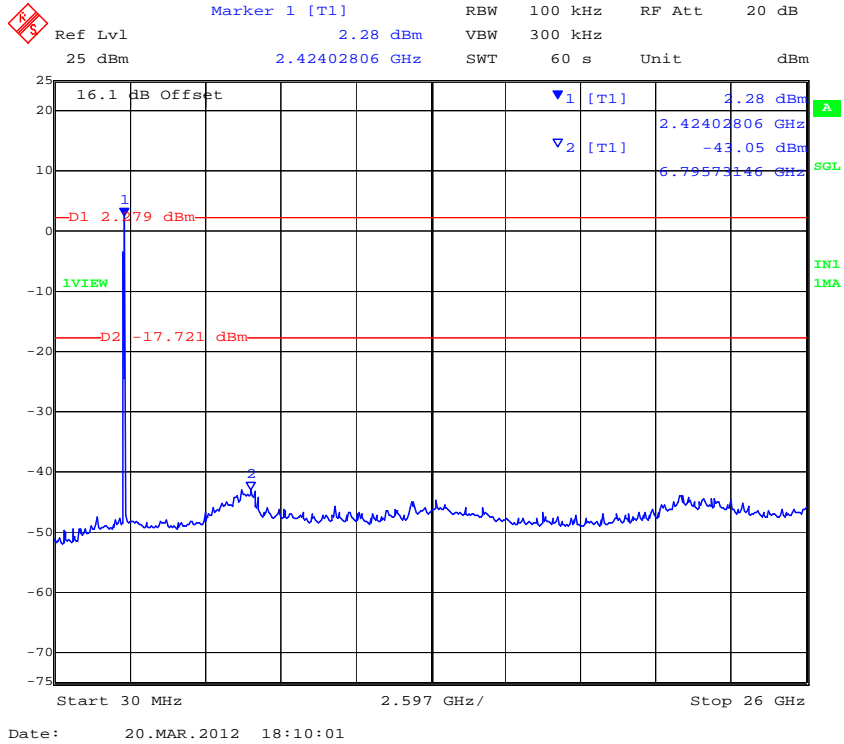
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PORT A 802.11n HT-40 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



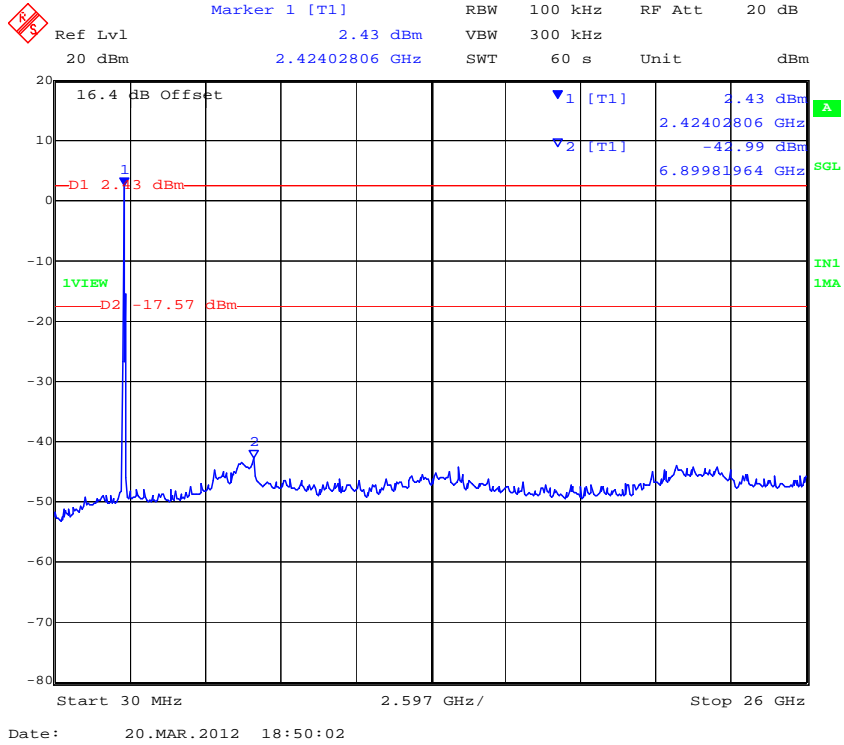
PORT B 802.11n HT-40 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



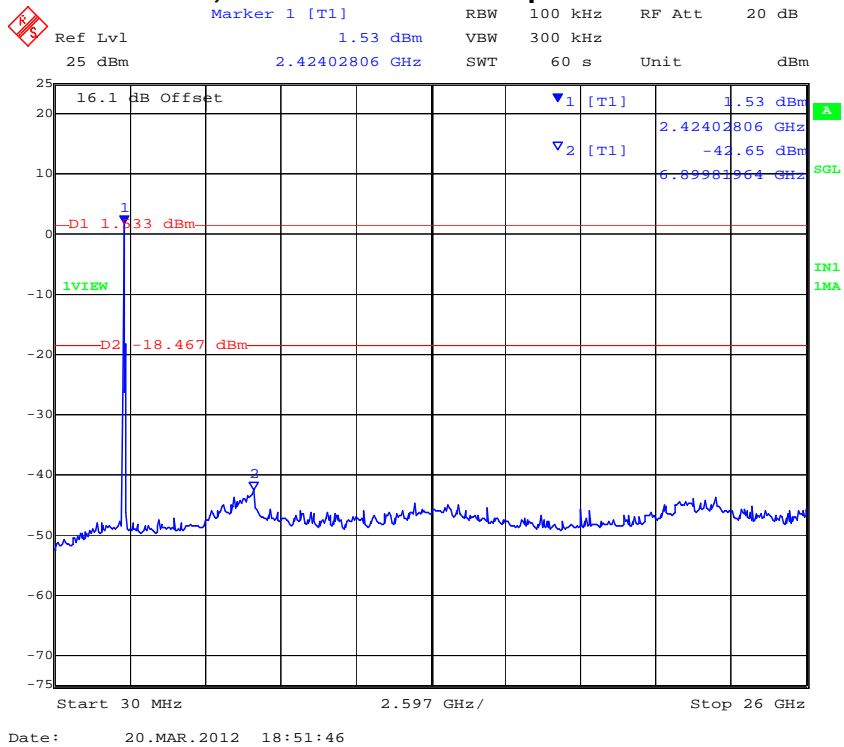
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PORT A 802.11n HT-40 2,452 MHz Conducted Spurious Emissions 0.03 – 26 GHz



PORT B 802.11n HT-40 2,452 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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Conducted Spurious Emission Results

TABLE OF RESULTS – 802.11a Legacy

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11a	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	N/A dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):			
Notes 1:					
Notes 2:					

Conducted Spurious Measurement

Test Freq.	Start Freq.	Stop Freq.	Port A		Port B		Port C		Port D	
			SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
5745.000	30.00	26000.00	-38.64	-13.10	-41.24	-13.94				
5785.000	30.00	26000.00	-36.19	-15.24	-41.08	-16.22				
5825.000	30.00	26000.00	-41.14	-17.62	-36.86	-17.14				

SE: Maximum spurious emission found

Band-edge Measurement

Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
		BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
5745.000	5725.00	-23.69	-13.28	-22.95	-13.43				
5825.000	5850.00	-37.79	-12.63	-34.58	-13.54				

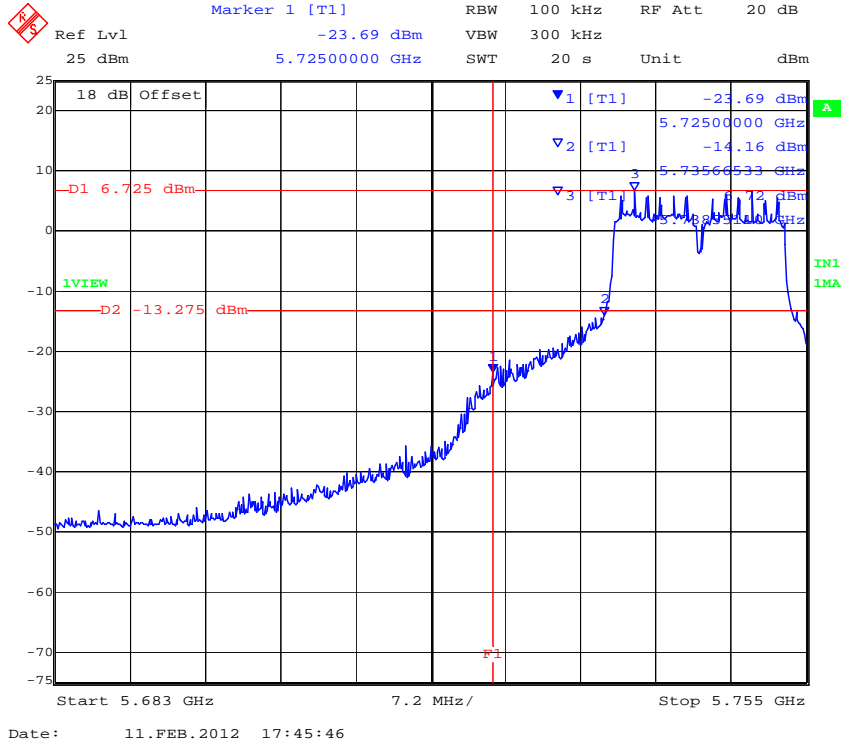
BE: Maximum Band edge emission found

Measurement uncertainty:	±2.81 dB
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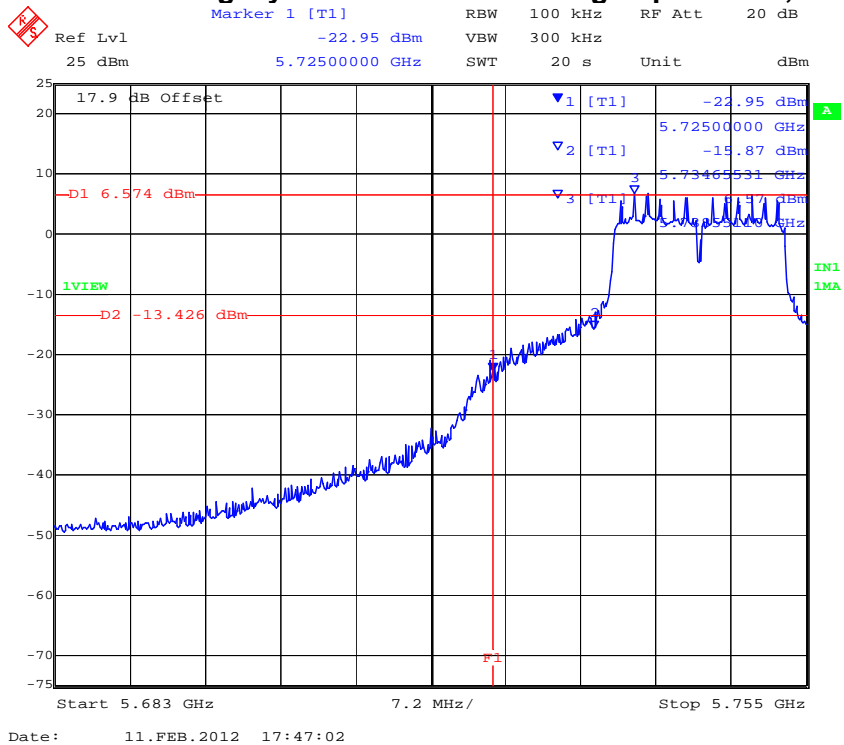
Note: Limit is based on 20dB down from fundamental emission



PORT A 802.11a Legacy - Conducted Band Edge Spurious 5,725 MHz



PORT B 802.11a Legacy - Conducted Band Edge Spurious 5,725 MHz

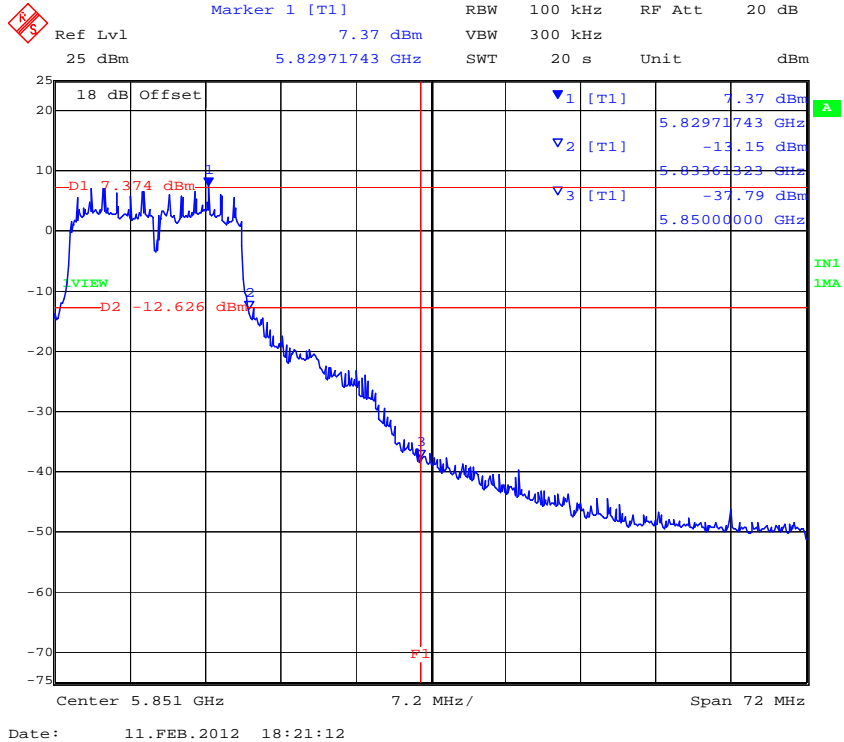


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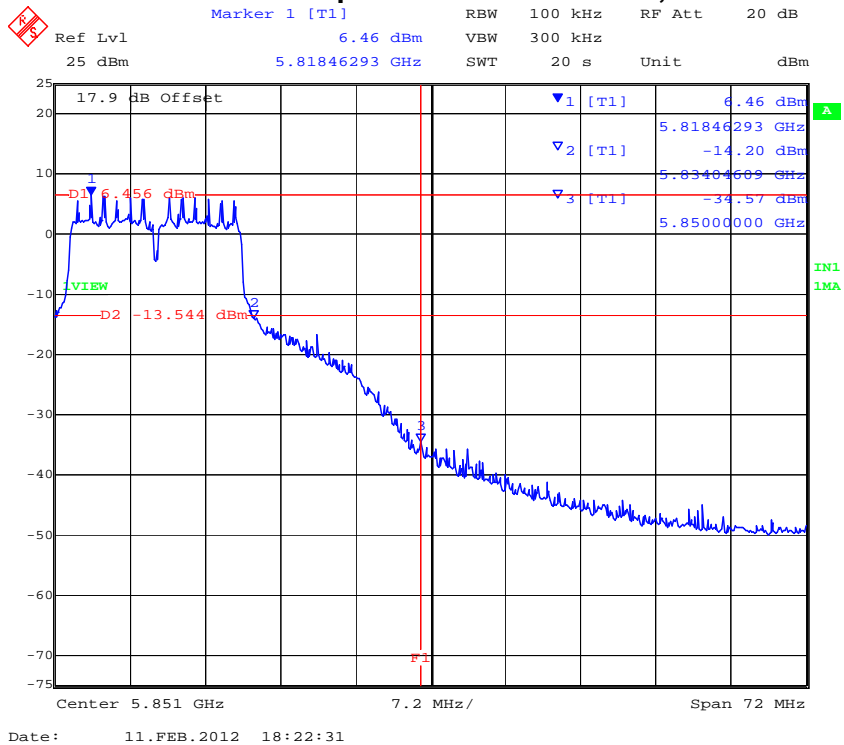


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 160 of 221

PORT A 802.11a Conducted Spurious Emissions at 5,850 MHz Band Edge



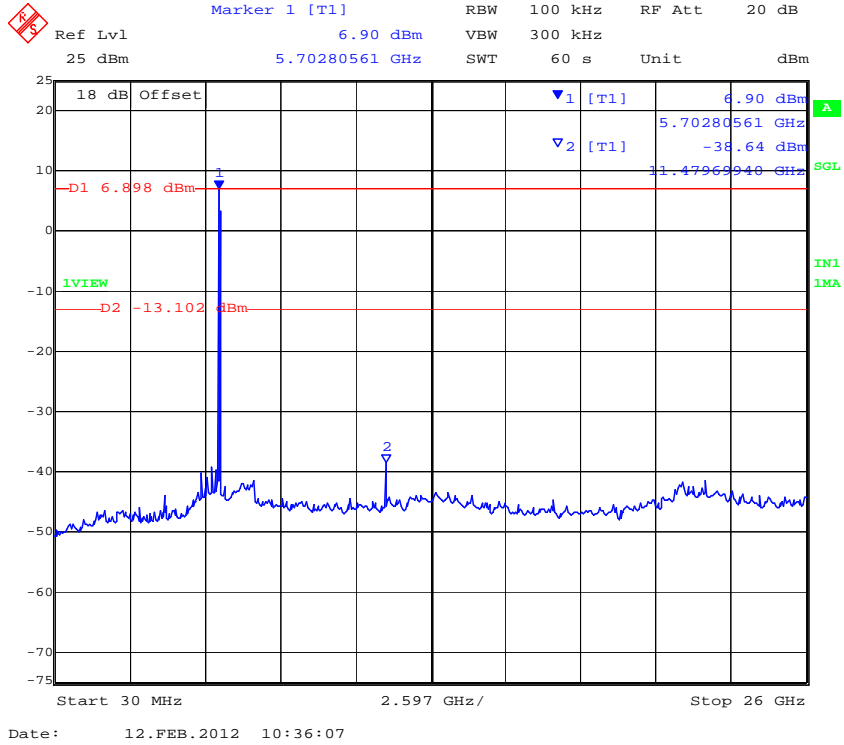
PORT B 802.11a Conducted Spurious Emissions at 5,850 MHz Band Edge



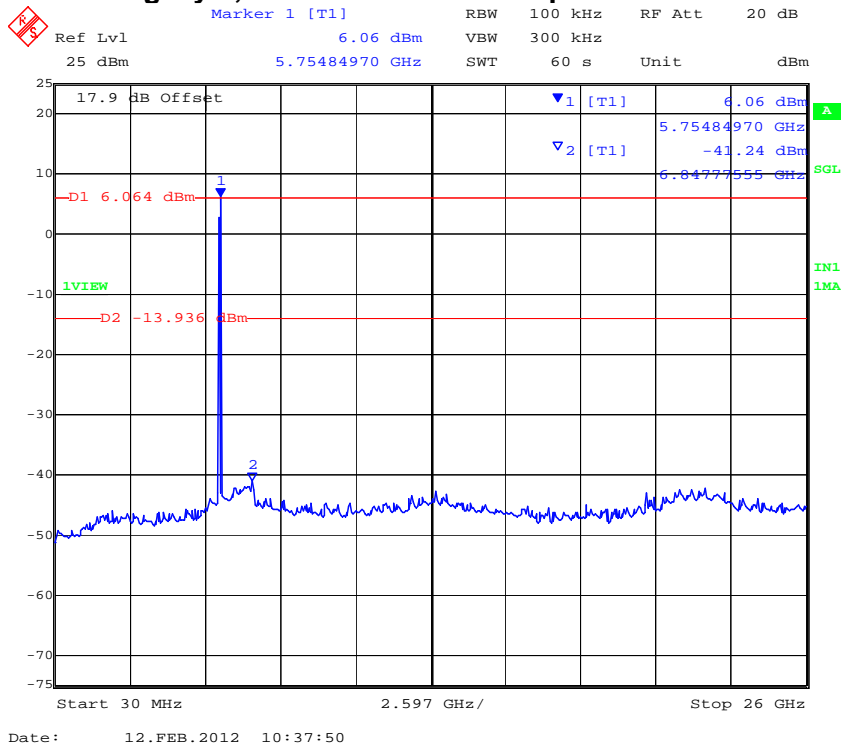
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PORT A 802.11a – Legacy 5,745 MHz Conducted Spurious Emissions 0.03 – 40 GHz



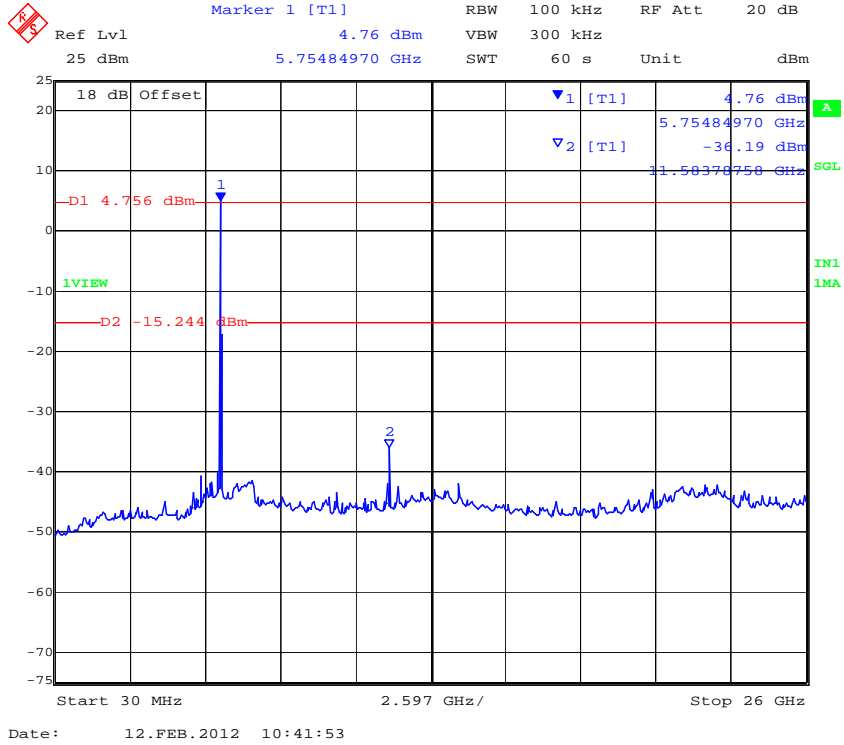
PORT B 802.11a – Legacy 5,745 MHz Conducted Spurious Emissions 0.03 – 40 GHz



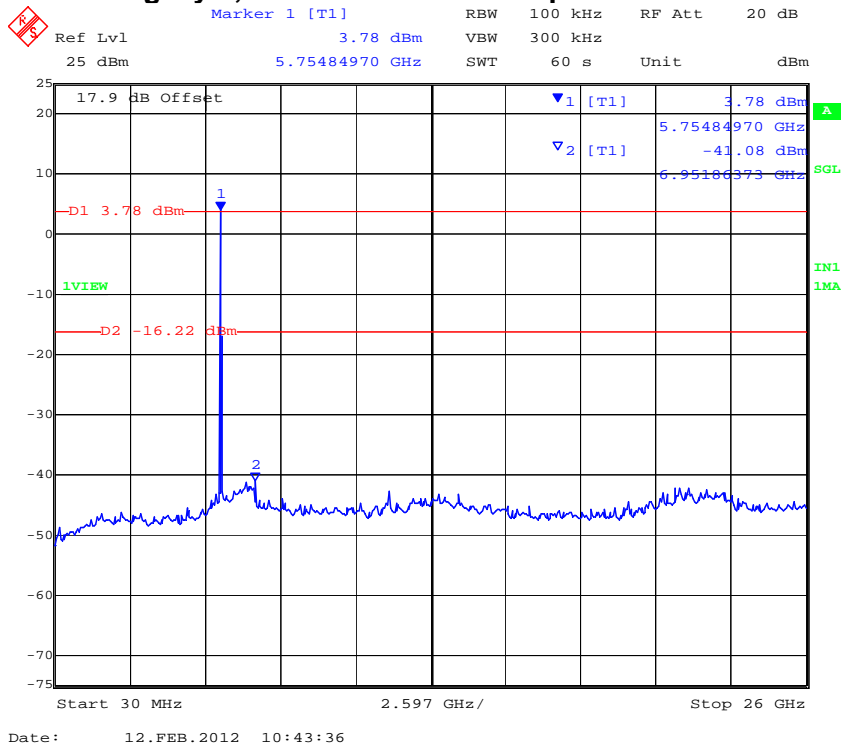
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PORT A 802.11a – Legacy 5,785 MHz Conducted Spurious Emissions 0.03 – 40 GHz



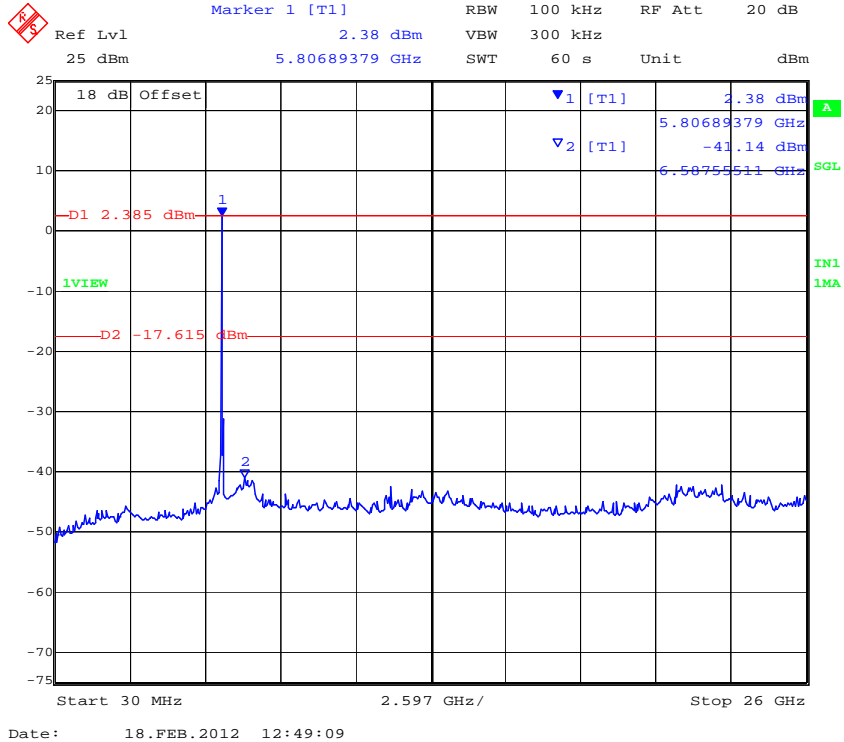
PORT B 802.11a – Legacy 5,785 MHz Conducted Spurious Emissions 0.03 – 40 GHz



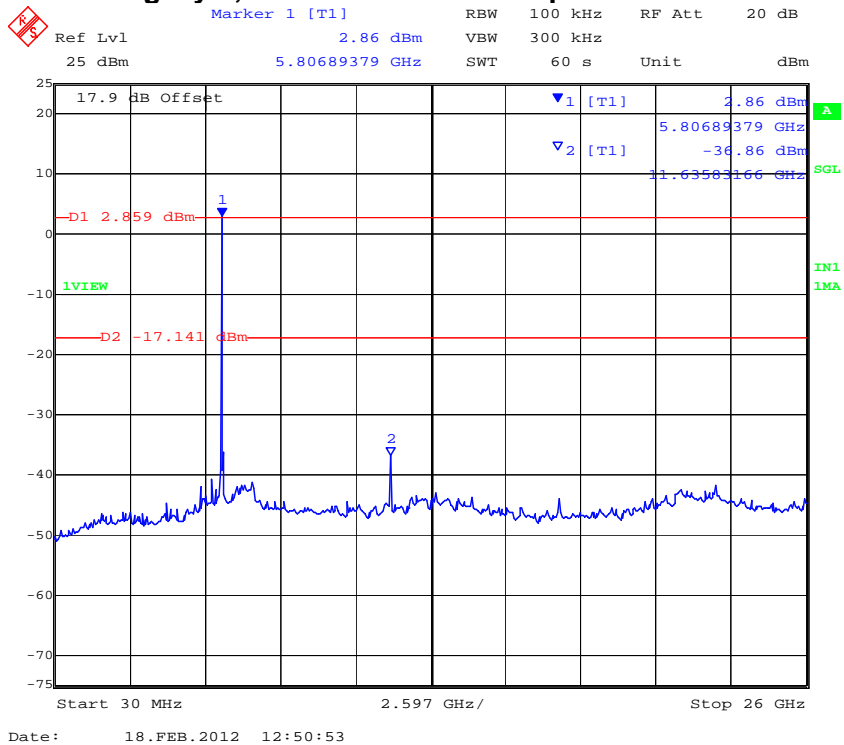
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PORT A 802.11a – Legacy 5,825 MHz Conducted Spurious Emissions 0.03 – 40 GHz



PORT B 802.11a – Legacy 5,825 MHz Conducted Spurious Emissions 0.03 – 40 GHz



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Conducted Spurious Emission Results

TABLE OF RESULTS – 802.11n HT-20

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	N/A dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):			
Notes 1:					
Notes 2:					

Conducted Spurious Measurement

Test Freq.	Start Freq.	Stop Freq.	Port A		Port B		Port C		Port D	
			SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
5745.000	30.00	26000.00	-41.53	-17.44	-41.43	-18.62				
5785.000	30.00	26000.00	-41.17	-17.56	-41.32	-18.94				
5825.000	30.00	26000.00	-41.11	-18.88	-40.41	-18.87				

SE: Maximum spurious emission found

Band-edge Measurement

Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
		BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
5745.000	5725.00	-22.68	-16.31	-32.69	-17.50				
5825.000	5850.00	-36.04	-17.52	-36.70	-18.25				

BE: Maximum Band edge emission found

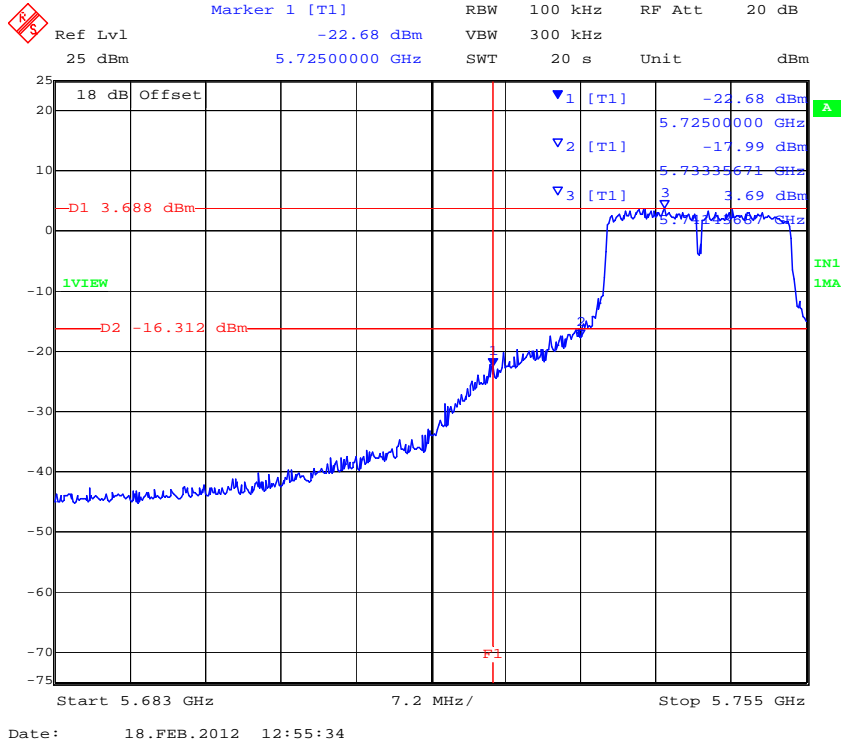
Measurement uncertainty:	±2.81 dB
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Note: Limit is based on 20dB down from fundamental emission

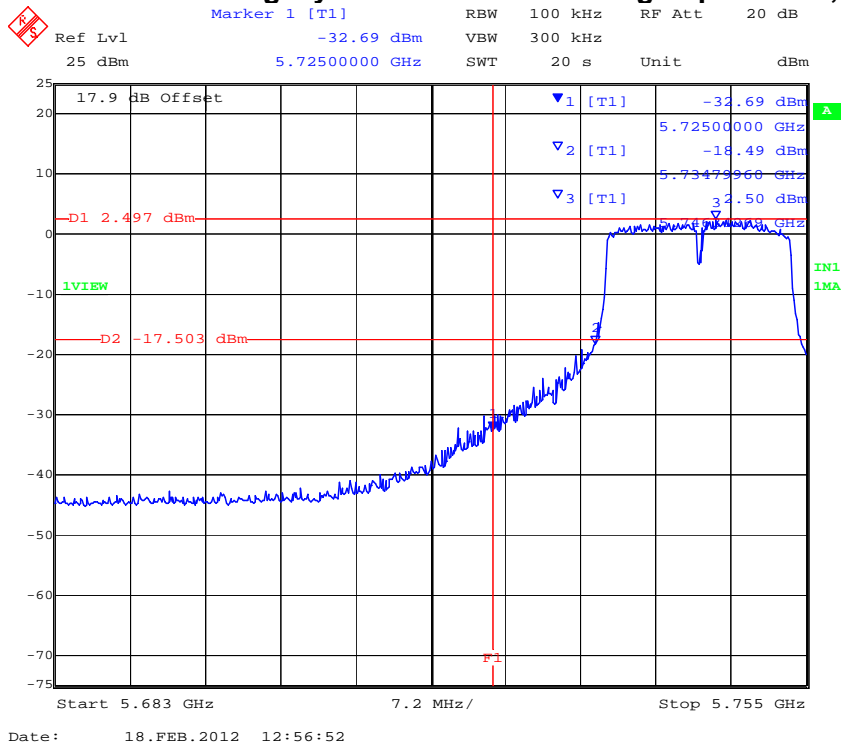


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 165 of 221

PORT A 802.11n HT-20 Legacy - Conducted Band Edge Spurious 5,725 MHz



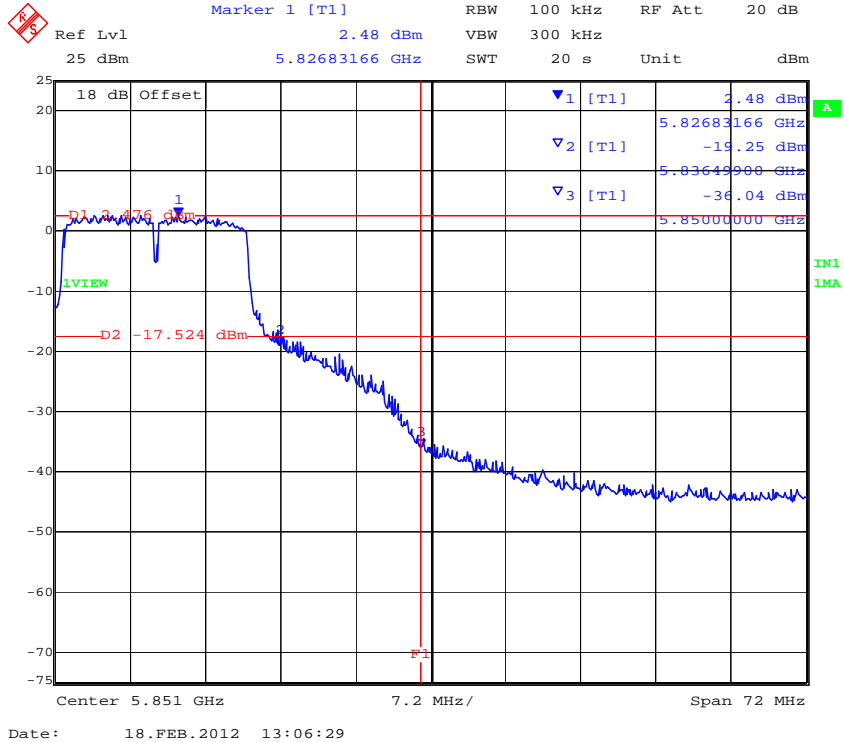
PORT B 802.11n HT-20 Legacy - Conducted Band Edge Spurious 5,725 MHz



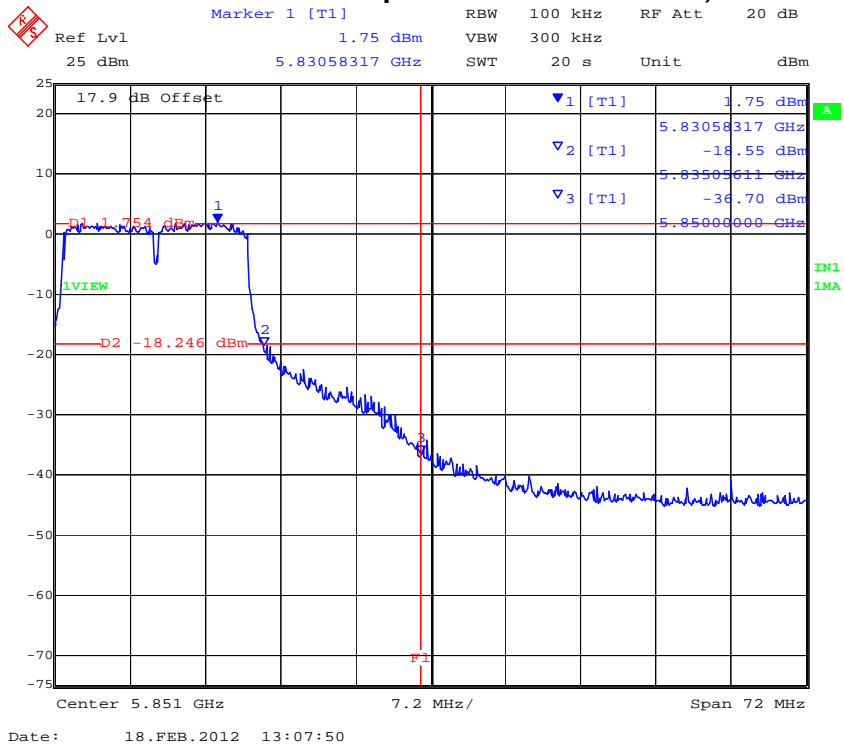
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PORT A 802.11n HT-20 Conducted Spurious Emissions at 5,850 MHz Band Edge



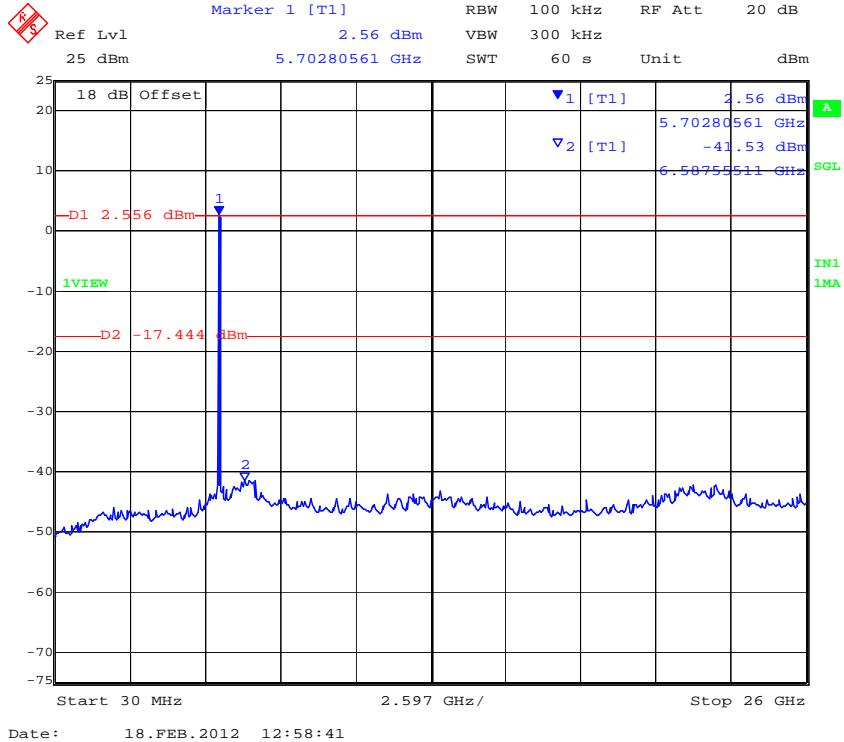
PORT B 802.11n HT-20 Conducted Spurious Emissions at 5,850 MHz Band Edge



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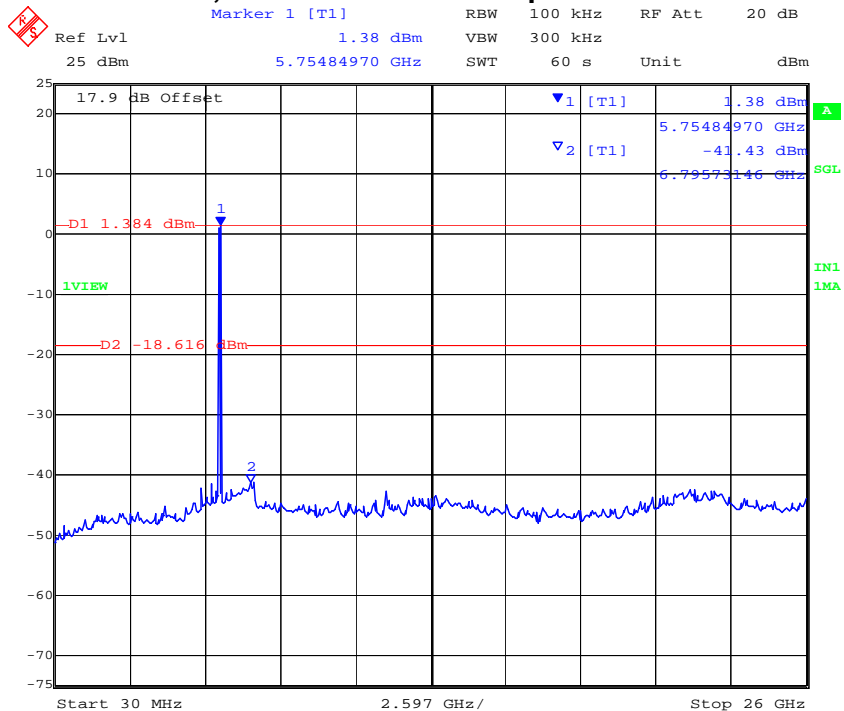


PORT A 802.11n HT-20 5,745 MHz Conducted Spurious Emissions 0.03 – 26 GHz



Date: 18.FEB.2012 12:58:41

PORT B 802.11n HT-20 5,745 MHz Conducted Spurious Emissions 0.03 – 26 GHz

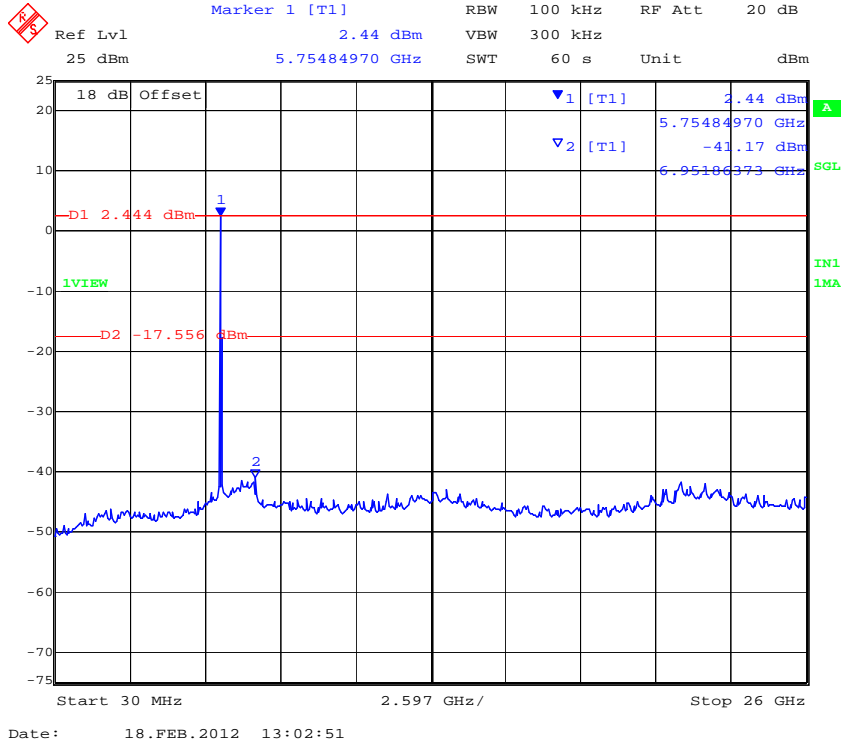


Date: 18.FEB.2012 13:00:23

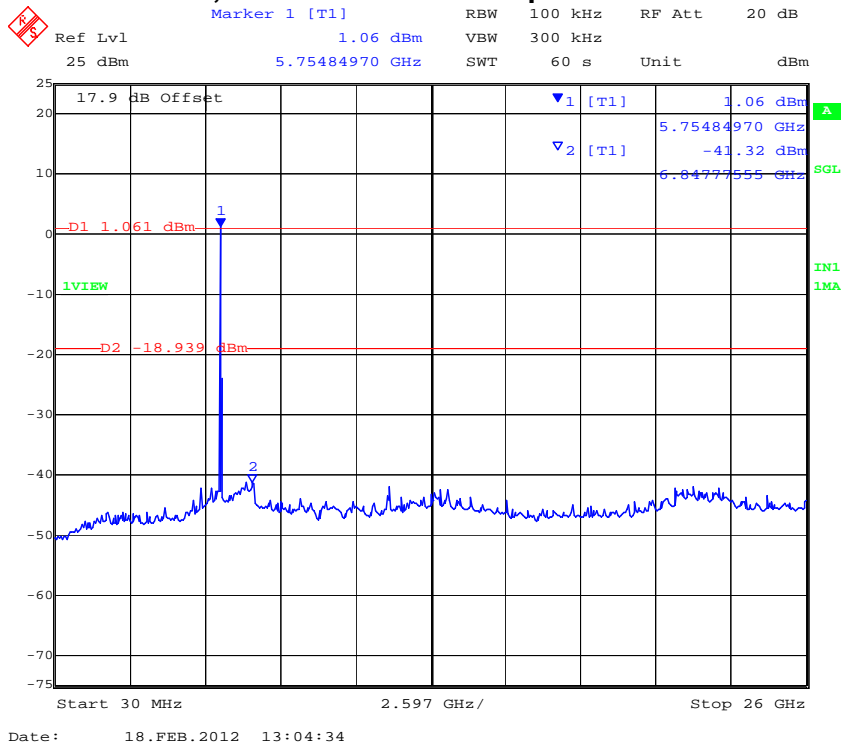
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PORT A 802.11n HT-20 5,785 MHz Conducted Spurious Emissions 0.03 – 26 GHz



PORT B 802.11n HT-20 5,785 MHz Conducted Spurious Emissions 0.03 – 26 GHz

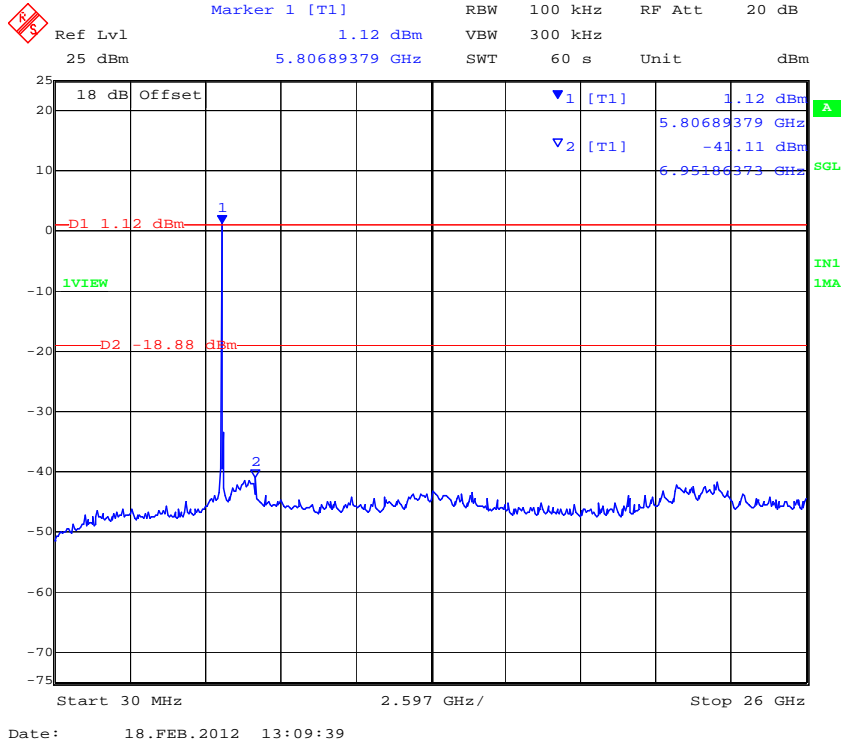


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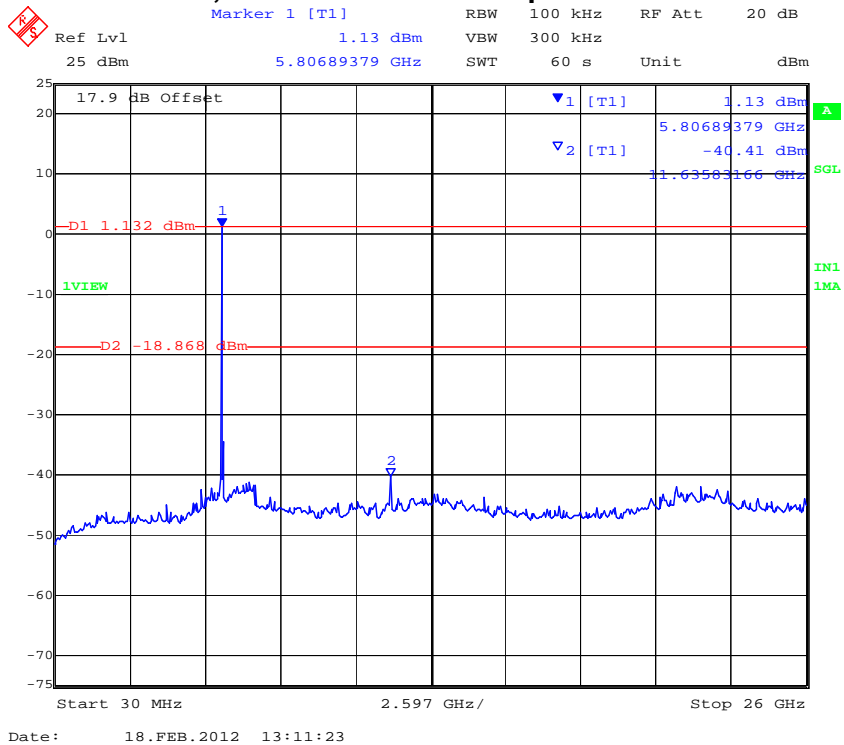


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 169 of 221

PORT A 802.11n HT-20 5,825 MHz Conducted Spurious Emissions 0.03 – 26 GHz



PORT B 802.11n HT-20 5,825 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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Conducted Spurious Emission Results

TABLE OF RESULTS – 802.11N HT-40

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	N/A dBi		
Applied Voltage:	48.00 Vdc	Antenna Ports (N):			
Notes 1:					
Notes 2:					

Conducted Spurious Measurement

Test Freq.	Start Freq.	Stop Freq.	Port A		Port B		Port C		Port D	
			SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
5755.000	30.00	26000.00	-41.24	-20.54	-41.35	-21.65				
5795.000	30.00	26000.00	-41.11	-21.19	-41.71	-21.57				

SE: Maximum spurious emission found

Band-edge Measurement

Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
		BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
5755.000	5725.00	-22.42	-19.91	-30.68	-20.72				
5795.000	5850.00	-38.94	-20.15	-41.93	-20.85				

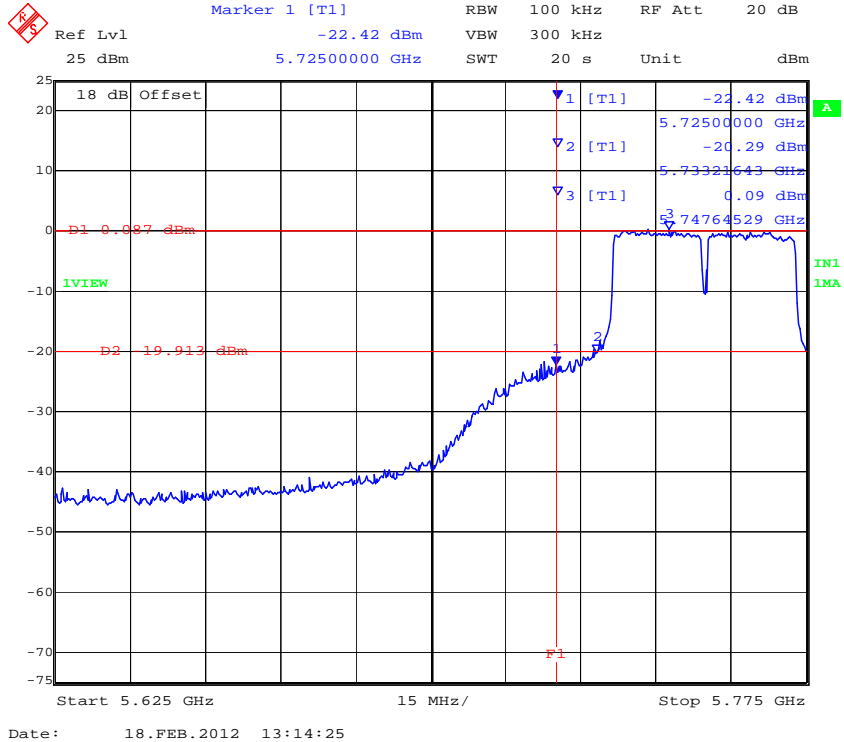
BE: Maximum Band edge emission found

Measurement uncertainty:	±2.81 dB
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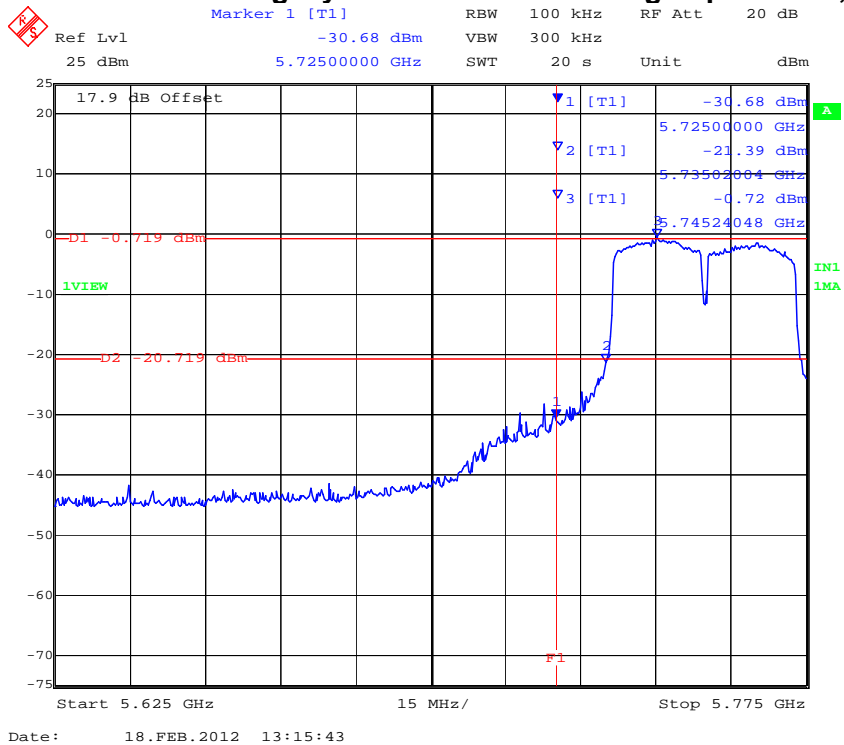
Note: Limit is based on 20dB down from fundamental emission



PORT A 802.11n HT-40 Legacy - Conducted Band Edge Spurious 5,725 MHz



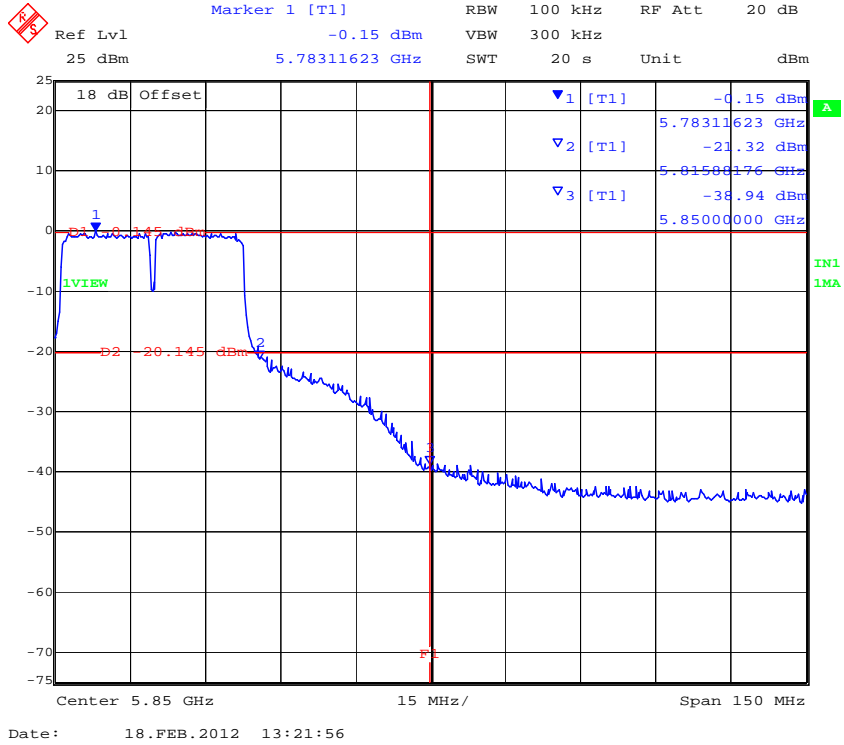
PORT B 802.11n HT-40 Legacy - Conducted Band Edge Spurious 5,725 MHz



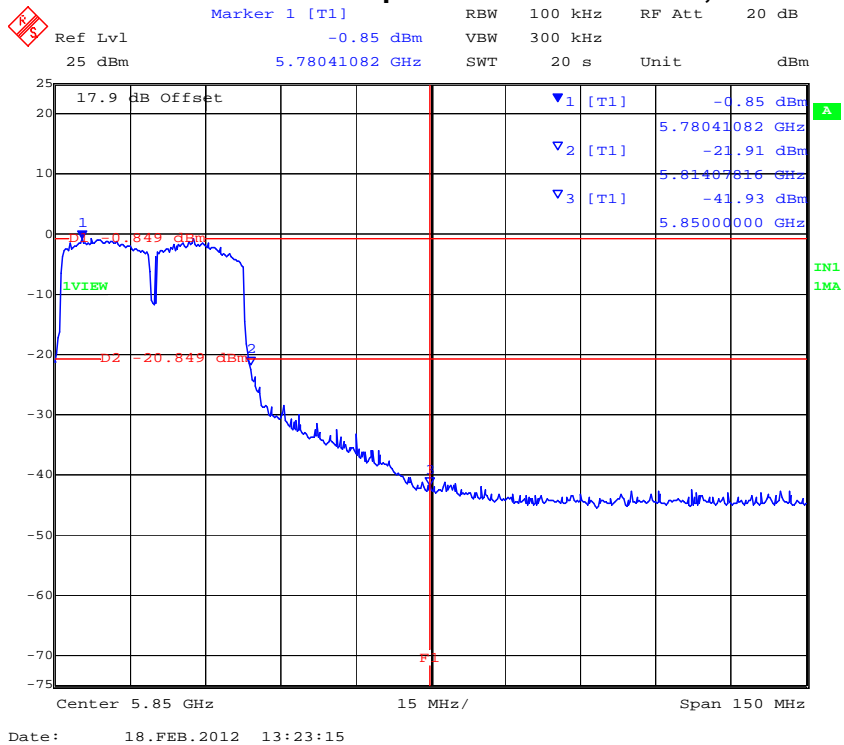
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PORT A 802.11n HT-40 Conducted Spurious Emissions at 5,850 MHz Band Edge



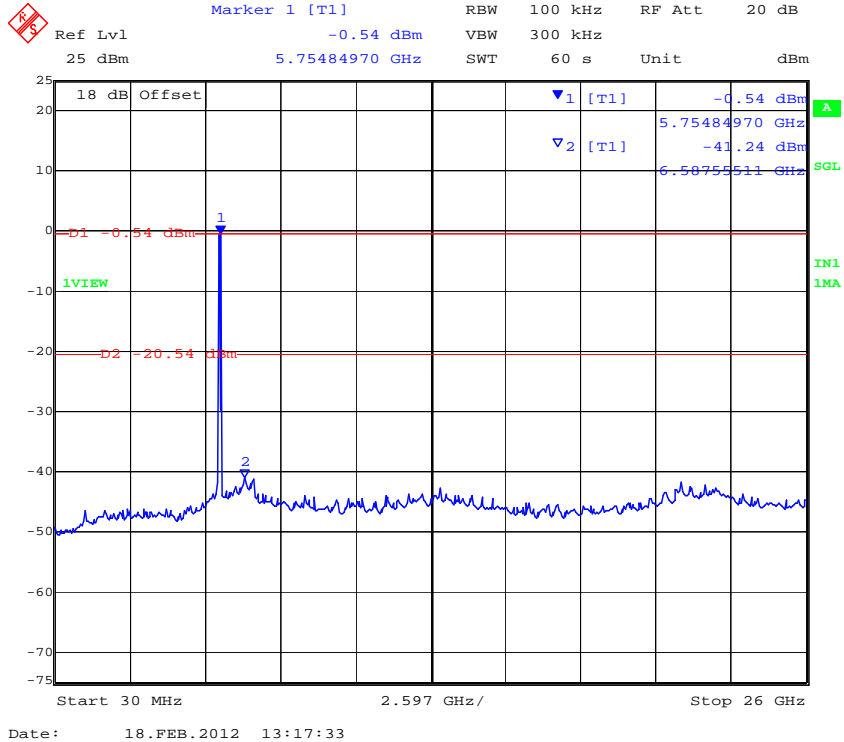
PORT B 802.11n HT-40 Conducted Spurious Emissions at 5,850 MHz Band Edge



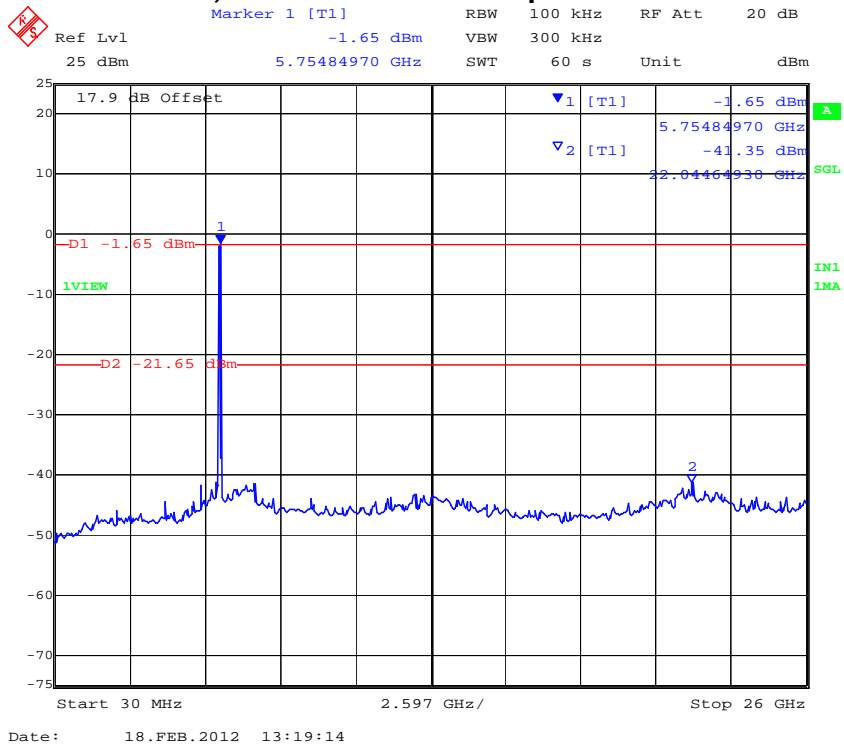
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PORT A 802.11n HT-40 5,755 MHz Conducted Spurious Emissions 0.03 – 26 GHz



PORT B 802.11n HT-40 5,755 MHz Conducted Spurious Emissions 0.03 – 26 GHz

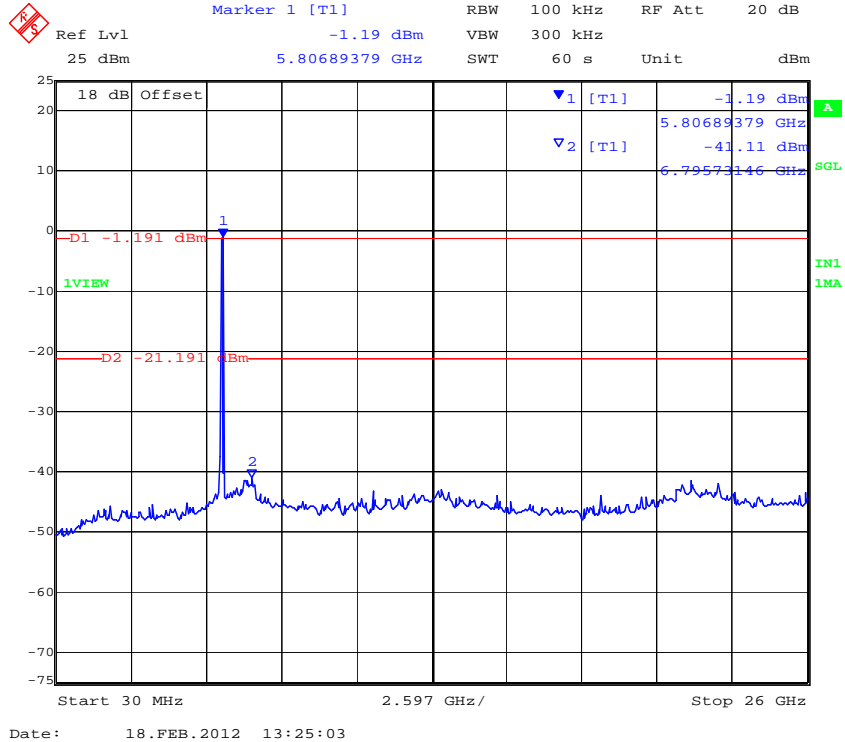


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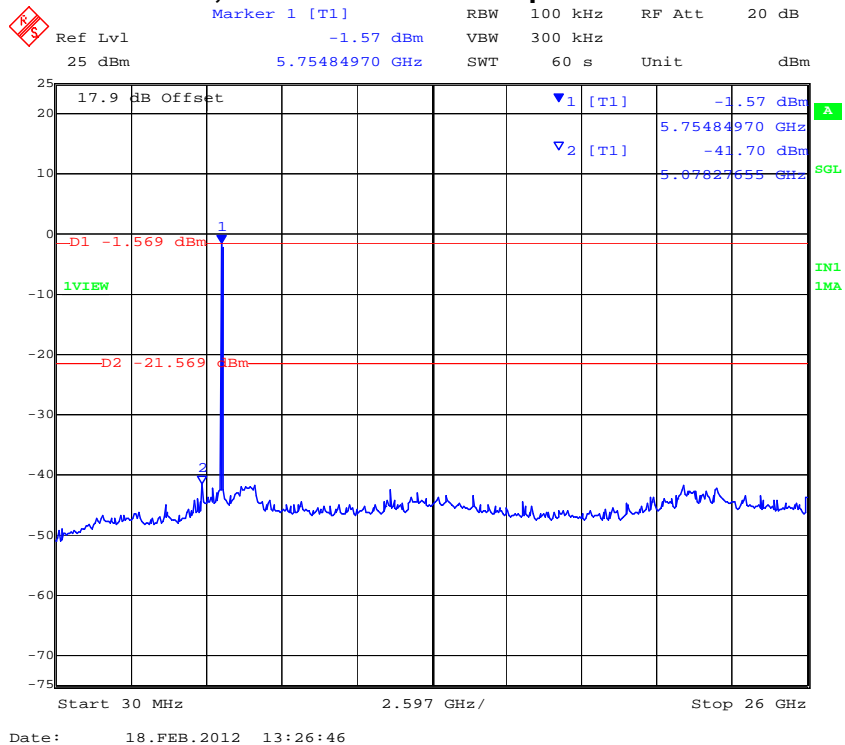


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 174 of 221

PORT A 802.11n HT-40 5,795 MHz Conducted Spurious Emissions 0.03 – 26 GHz



PORT B 802.11n HT-40 5,795 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 175 of 221

Specification

Limits Band-Edge

Lower Limit Band-edge	Upper Limit Band-edge	Limit below highest level of desired power
2,400 MHz	2,483.5 MHz	≥ 20 dB
5725 MHz	5850 MHz	

§15.247(d) and RSS-210 §A8.5 In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

§15.247(d)

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section §15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(a)).

RSS-210 §A8.5 If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

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 or carrier frequency), or from 30 MHz, whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

Laboratory Measurement Uncertainty for Conducted Spurious Emissions

Measurement uncertainty	±2.37 dB
-------------------------	----------

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0088, 0158, 0287, 0252, 0313, 0314, 0070, 0116, 0117.

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 176 of 221

5.1.6. Radiated Emissions

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

FCC, Part 15 Subpart C §15.247(d) 15.205; 15.209
Industry Canada RSS-210 §A8.5, §2.2, §2.6
Industry Canada 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.

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 dB μ V; 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:

$$FS = 51.5 + 8.5 + 1.3 - 26.0 + 1 = 36.3 \text{ dB}\mu\text{V/m}$$

Conversion between dB μ V/m (or dB μ V) and μ V/m (or μ V) are done as:

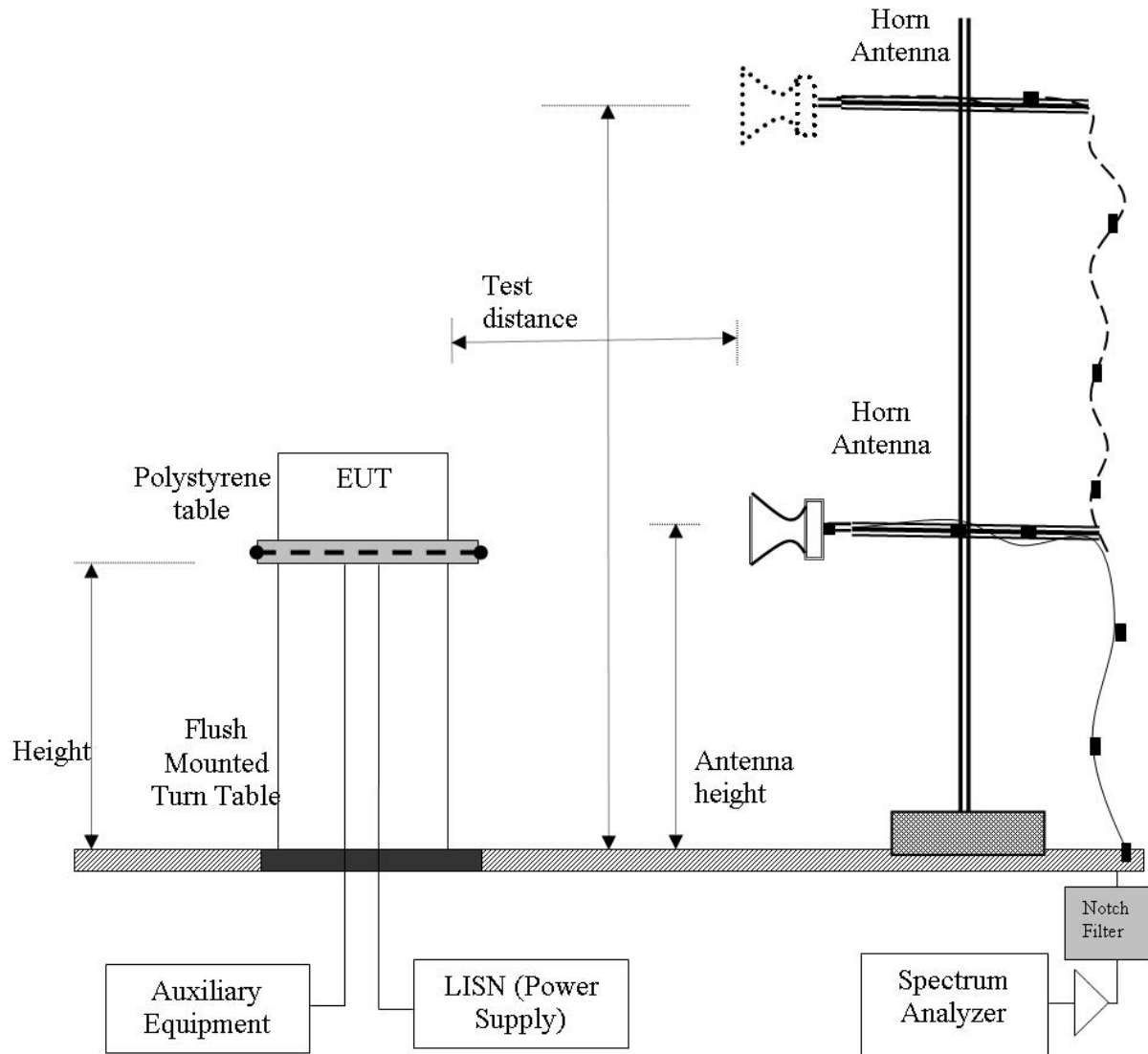
$$\text{Level (dB}\mu\text{V/m)} = 20 * \text{Log (level (\mu\text{V/m}))}$$

$$40 \text{ dB}\mu\text{V/m} = 100 \mu\text{V/m}$$

$$48 \text{ dB}\mu\text{V/m} = 250 \mu\text{V/m}$$

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Radiated Emission Measurement Setup – Above 1 GHz



NOTE: KDB 662911 was implemented for Out-of-Band measurements. Where necessary Option (2) Measure and add $10 \log(N)$ dB was implemented

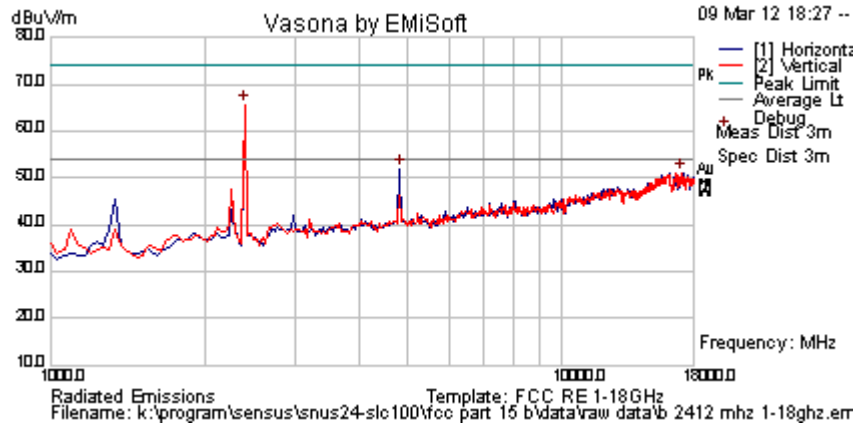


Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 178 of 221

5.1.6.1. Radiated Spurious Emissions (above 1 GHz)

2.4 GHz Radiated Emission Results

Test Freq.	2412 MHz	Engineer	GMH
Variant	802.11b; 1 Mbs	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 18	Press. (mBars)	1010
Antenna	Internal	Duty Cycle (%)	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

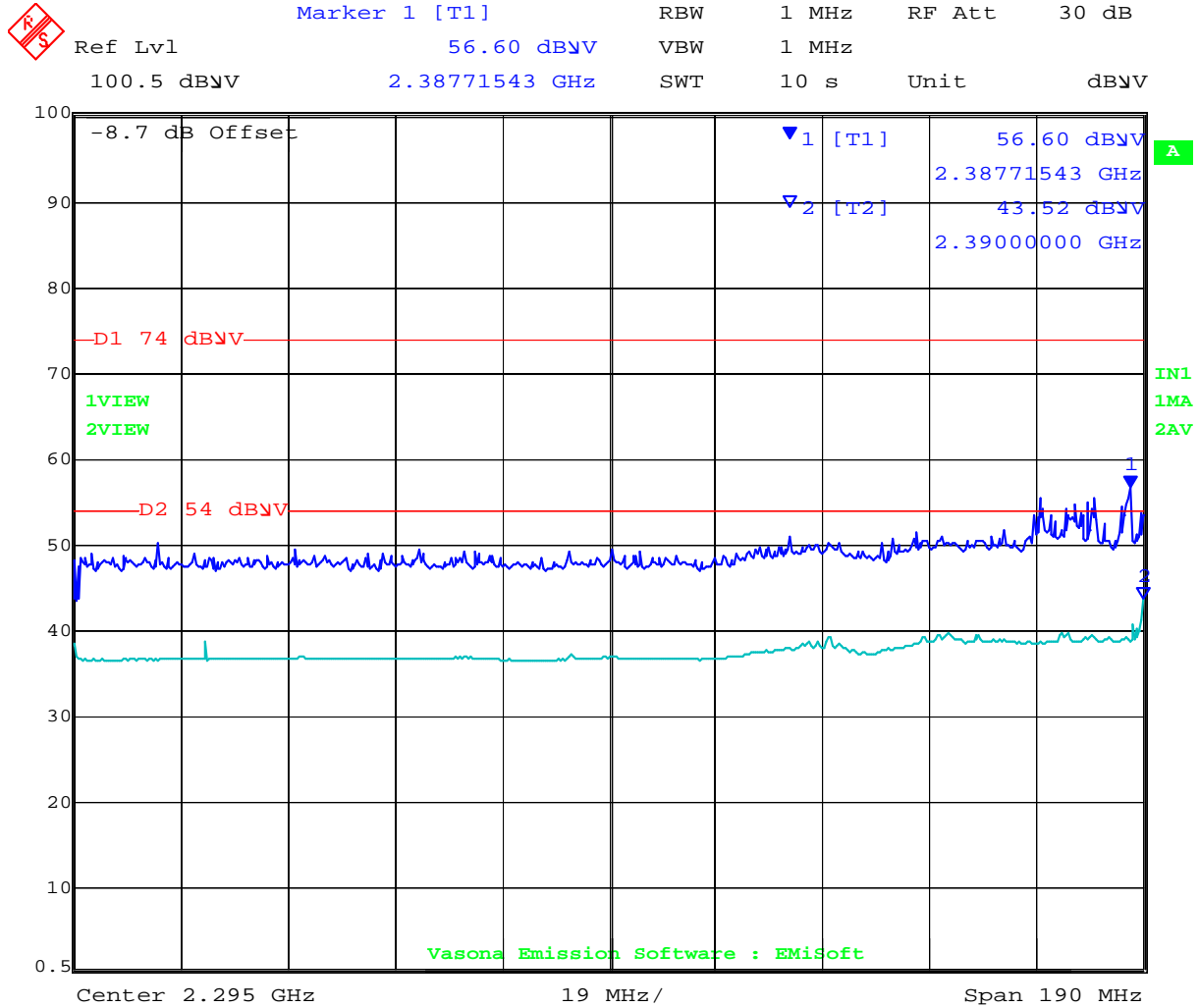
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.79359	74.32	2.95	-11.7	65.62	Peak [Scan]	H						FUND
17080.16	42.25	8.52	0.35	51.12	Peak [Scan]	V	100	0	54	-2.88	Pass	NOISE
4823.95606	58.85	4.47	-9.67	53.64	Peak Max	H	98	77	74	-20.36	Pass	RB
4823.95606	56.24	4.47	-9.67	51.04	Average Max	H	98	77	54	-2.96	Pass	RB

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band Edge



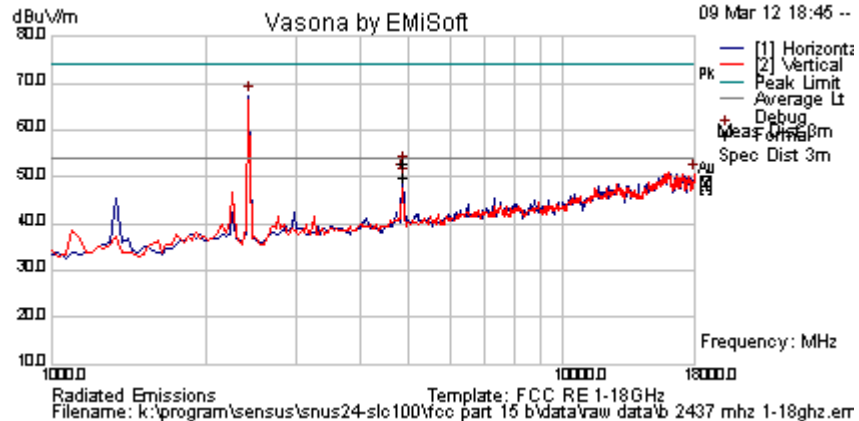
Date: 9.MAR.2012 20:19:00

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 180 of 221

Test Freq.	2437 MHz	Engineer	GMH
Variant	802.11b; 1 Mbs	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 16	Press. (mBars)	1010
Antenna	Internal	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
2430.9	76.0	3.0	-11.6	67.44	Peak [Scan]	H						FUND
18000.0	41.4	8.8	0.7	50.92	Peak [Scan]	V	100	0	54.0	-3.08	Pass	NOISE
4873.9	57.9	4.5	-9.7	52.73	Peak Max	H	98	72	74.0	-21.27	Pass	RB
4873.9	55.1	4.5	-9.7	49.88	Average Max	H	98	72	54.0	-4.12	Pass	RB

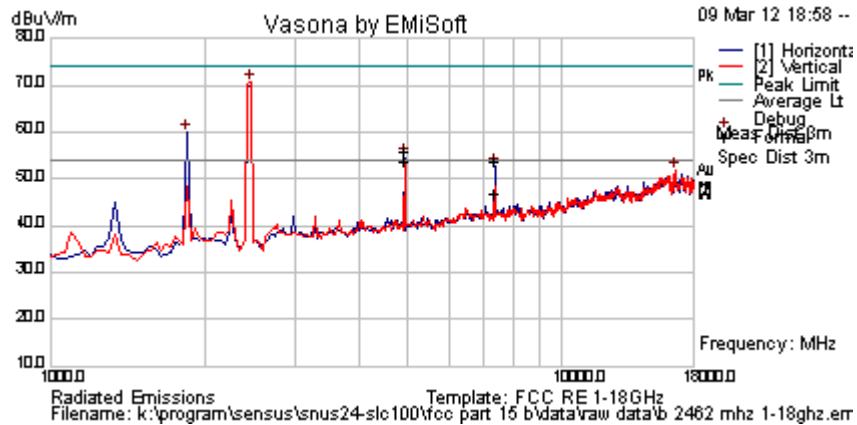
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 181 of 221

Test Freq.	2462 MHz	Engineer	GMH
Variant	802.11b; 1 Mbs	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 18	Press. (mBars)	1010
Antenna	Internal	Duty Cycle (%)	100
Test Notes 1			
Test Notes 2			



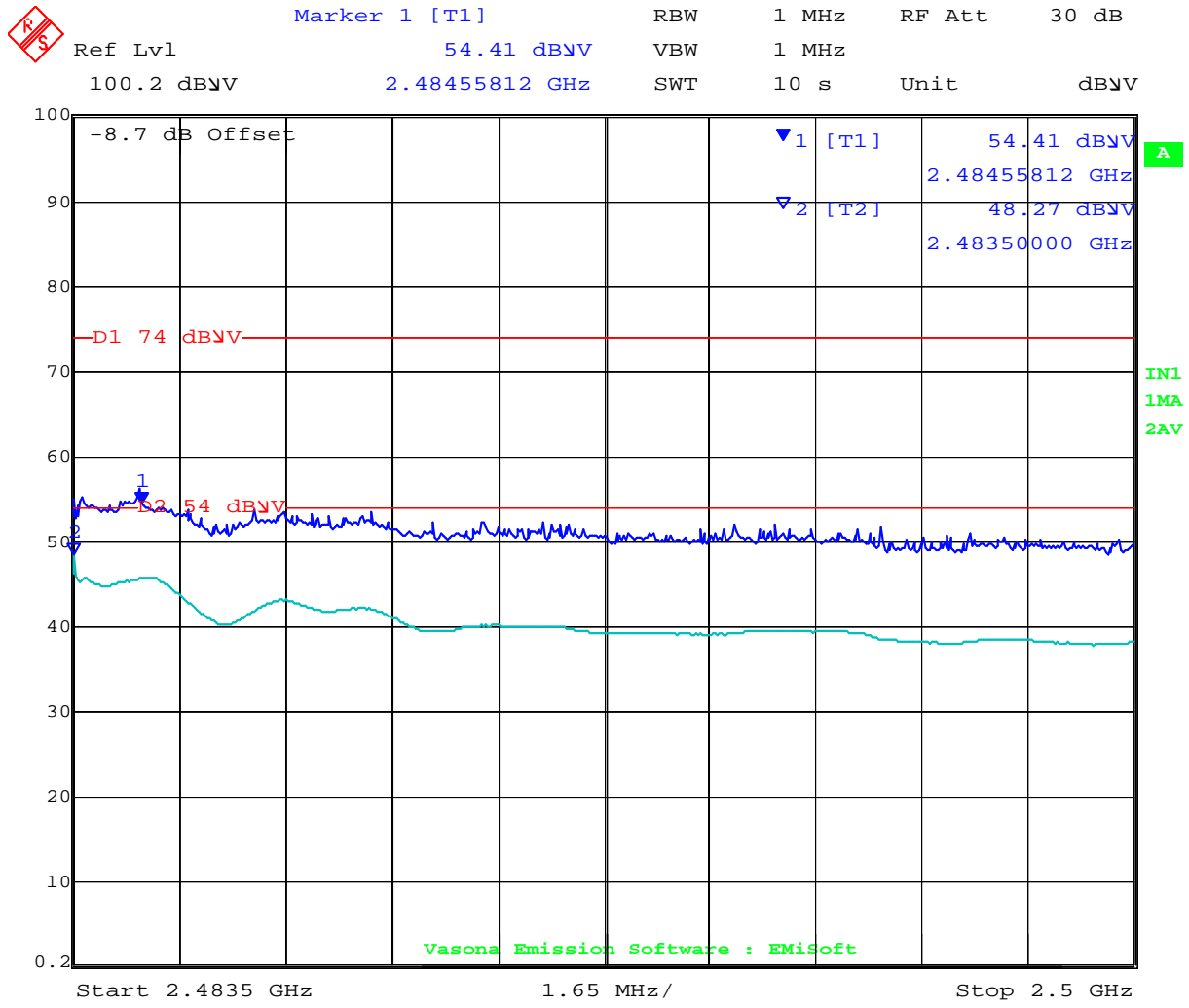
Formally measured emission peaks

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
2464.92986	79.16	2.98	-11.5	70.64	Peak [Scan]	V						FUND
1851.70341	69.73	2.65	-12.4	59.97	Peak [Scan]	H						NRB
16569.138	42.45	8.77	0.47	51.7	Peak [Scan]	V	100	0	54	-2.3	Pass	NOISE
4923.868	61.05	4.55	-9.79	55.82	Peak Max	H	98	69	74	-18.18	Pass	RB
7387.788	53.81	5.46	-5.48	53.79	Peak Max	H	137	65	74	-20.21	Pass	RB
4923.868	58.78	4.55	-9.79	53.55	Average Max	H	98	69	54	-0.45	Pass	RB
7387.788	46.8	5.5	-5.5	46.7	Average Max	H	137	65	54.0	-7.3	Pass	RB
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission											
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak											

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Band Edge



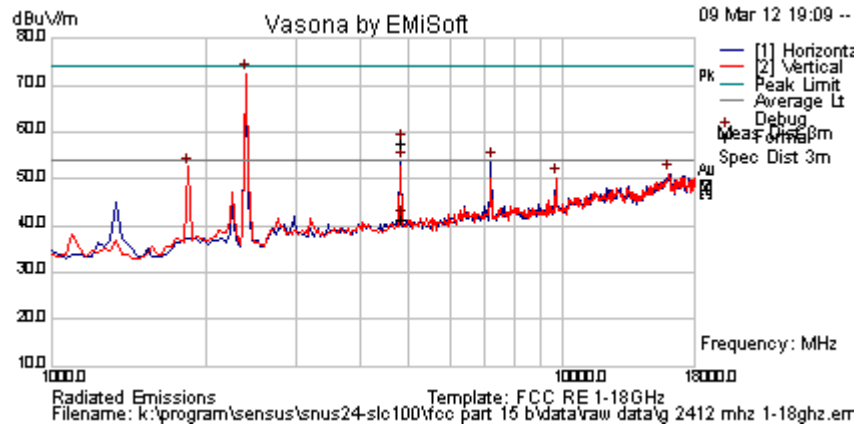
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 183 of 221

Test Freq.	2412 MHz	Engineer	GMH
Variant	802.11g; 6 Mbs	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 18	Press. (mBars)	1010
Antenna	Internal	Duty Cycle (%)	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

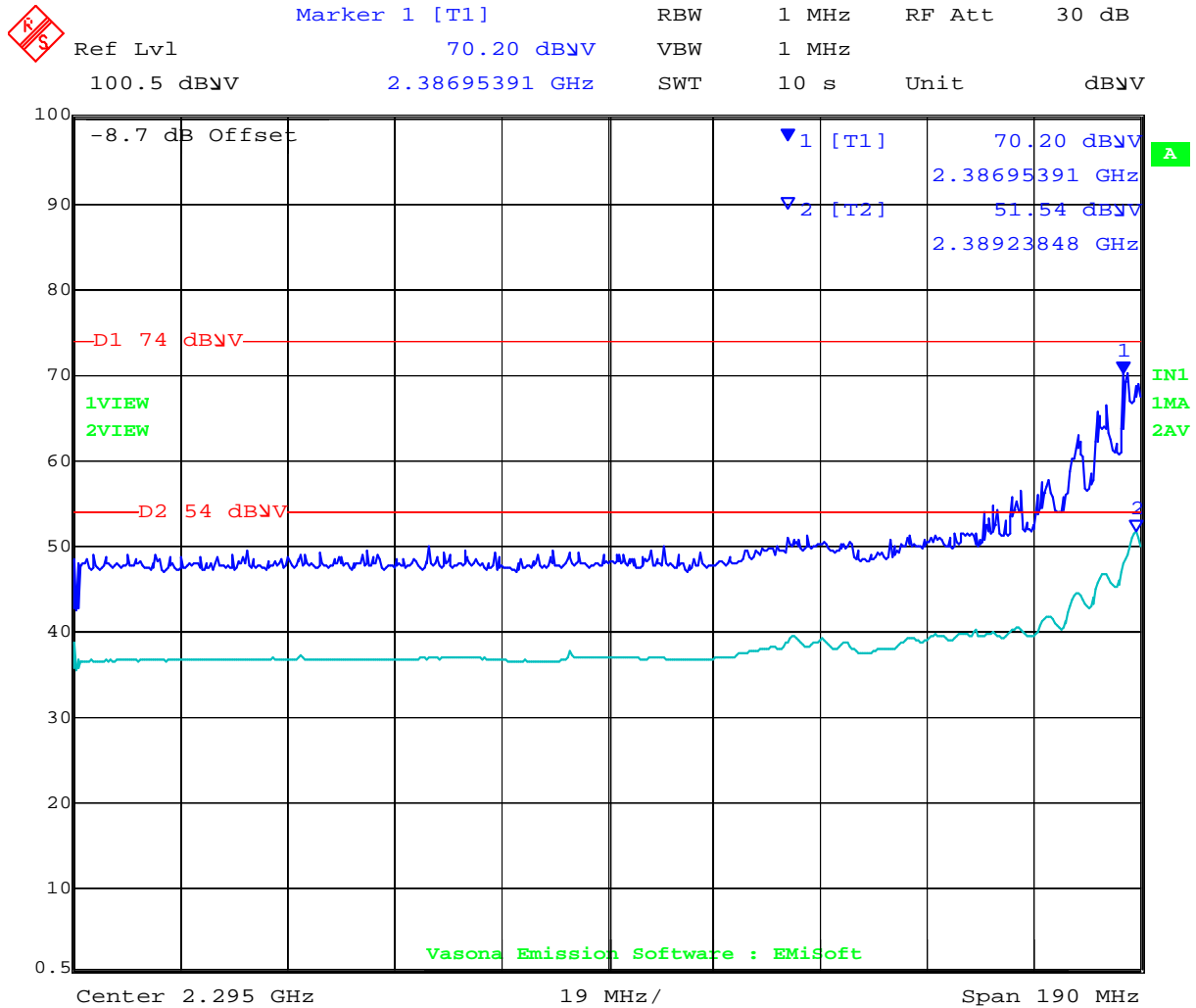
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	81.2	3.0	-11.7	72.5	Peak [Scan]	H						FUND
7234.469	54.2	5.4	-5.8	53.8	Peak [Scan]	H					Pass	NRB
1851.703	62.3	2.7	-12.4	52.5	Peak [Scan]	V					Pass	NRB
16024.048	41.8	9.0	0.2	51.0	Peak [Scan]	V	100	0	54	-3.0	Pass	NOISE
9653.307	47.6	6.3	-3.5	50.3	Peak [Scan]	V					Pass	NRB
4825.691	63.0	4.5	-9.7	57.8	Peak Max	H	139	174	74	-16.2	Pass	RB
4825.691	46.5	4.5	-9.7	41.3	Average Max	H	139	174	54	-12.7	Pass	RB

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band Edge



Date: 9.MAR.2012 20:20:35

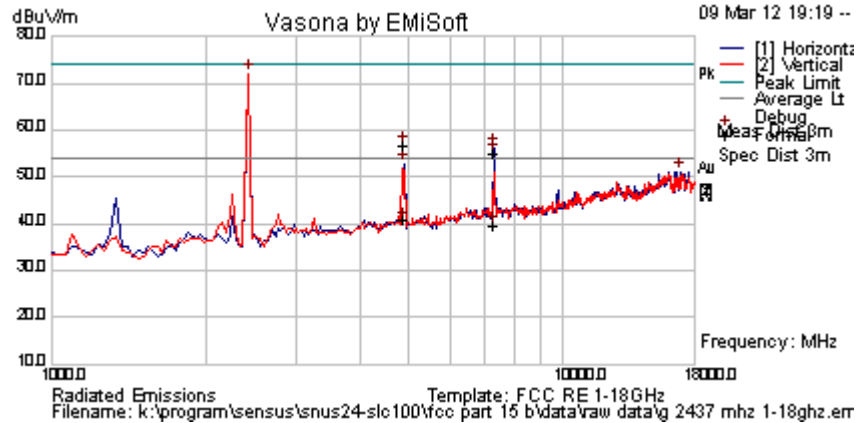
Power reduction required to bring the band-edge into compliance ART = 17

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 185 of 221

Test Freq.	2437 MHz	Engineer	GMH
Variant	802.11g; 6 Mbs	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 18	Press. (mBars)	1010
Antenna	Internal	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
2430.862	80.6	3.0	-11.6	72.0	Peak [Scan]	V						FUND
16909.820	42.1	8.5	0.6	51.2	Peak [Scan]	H	100	0	54	-2.8	Pass	NOISE
7307.615	55.4	5.4	-5.7	55.1	Peak Max	H	159	354	74	-18.9	Pass	RB
4876.573	62.0	4.5	-9.7	56.8	Peak Max	H	99	52	74	-17.2	Pass	RB
7307.615	40.1	5.4	-5.7	39.8	Average Max	H	159	354	54	-14.2	Pass	RB
4876.573	45.9	4.5	-9.7	40.7	Average Max	H	99	52	54	-13.3	Pass	RB

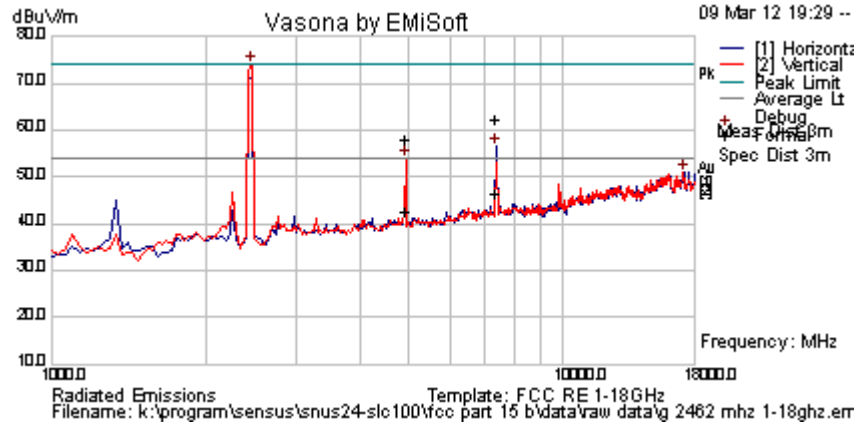
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 186 of 221

Test Freq.	2462 MHz	Engineer	GMH
Variant	802.11g; 6 Mbs	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 18	Press. (mBars)	1010
Antenna	Internal	Duty Cycle (%)	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

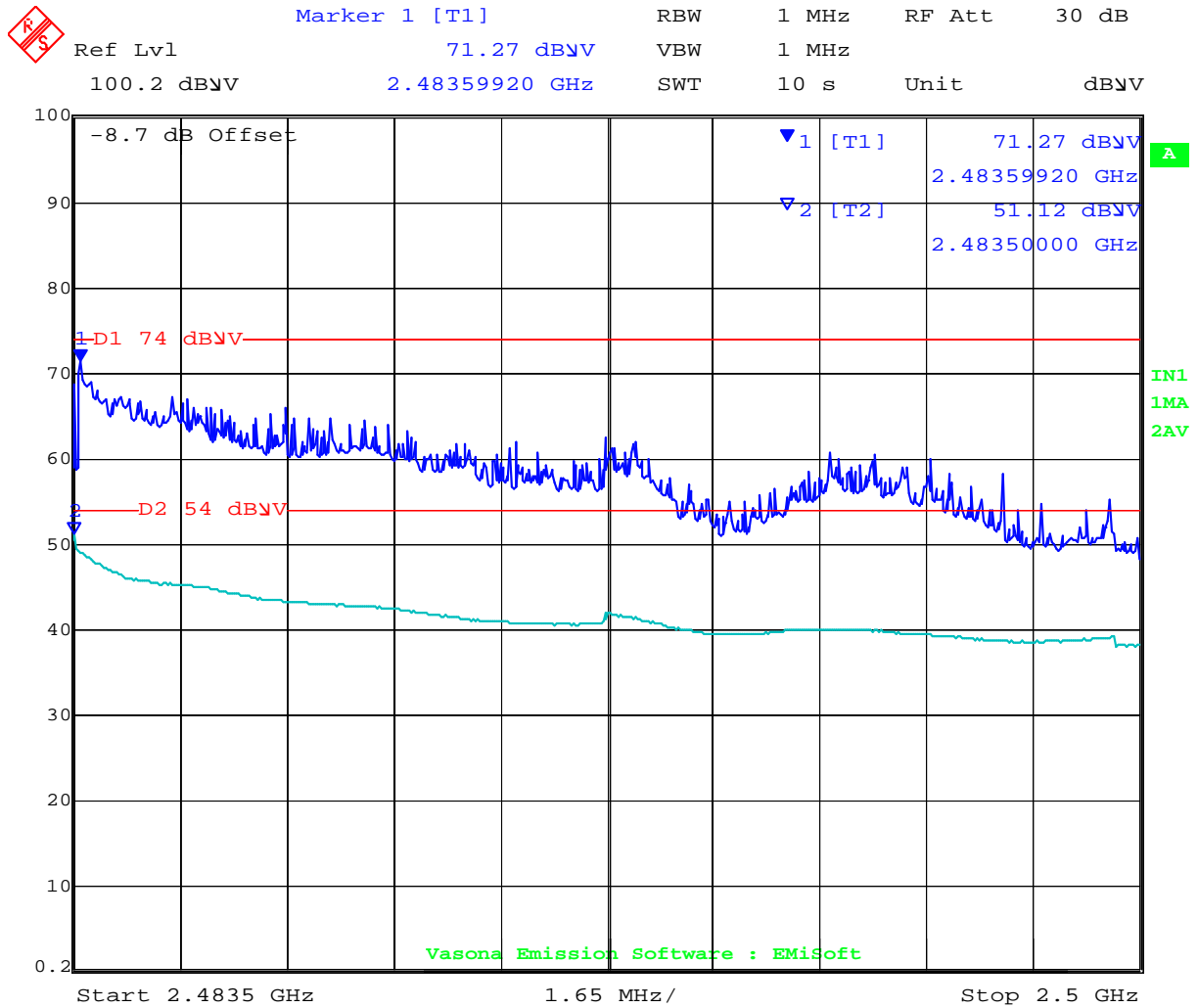
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2464.930	82.7	3.0	-11.5	74.1	Peak [Scan]	V						FUND
17182.365	41.6	8.6	0.7	50.8	Peak [Scan]	H	100	0	54	-3.2	Pass	NOISE
7381.333	62.3	5.5	-5.5	62.3	Peak Max	H	98	251	74	-11.7	Pass	RB
4921.353	63.4	4.6	-9.8	58.2	Peak Max	V	98	1	74	-15.8	Pass	RB
7381.333	46.3	5.5	-5.5	46.3	Average Max	H	98	251	54	-7.7	Pass	RB
4921.353	47.7	4.6	-9.8	42.5	Average Max	V	98	1	54	-11.5	Pass	RB

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band Edge



Date: 11.FEB.2012 11:51:24

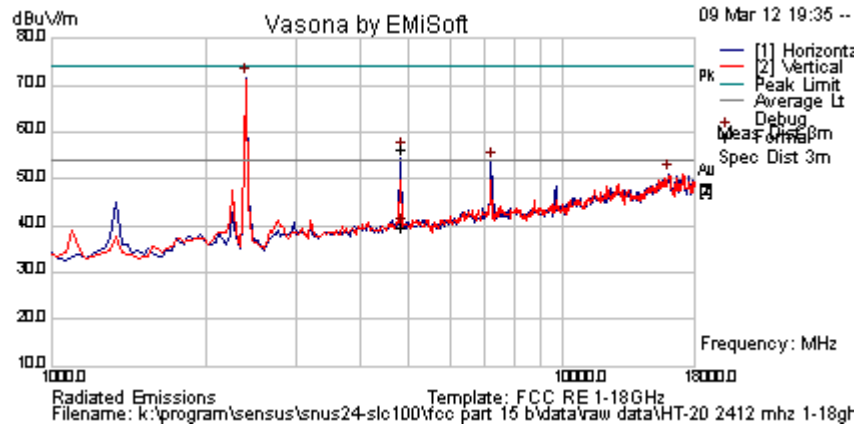
Power reduction required to bring the band-edge into compliance ART = 14

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 188 of 221

Test Freq.	2412 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 18	Press. (mBars)	1010
Antenna	Internal	Duty Cycle (%)	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

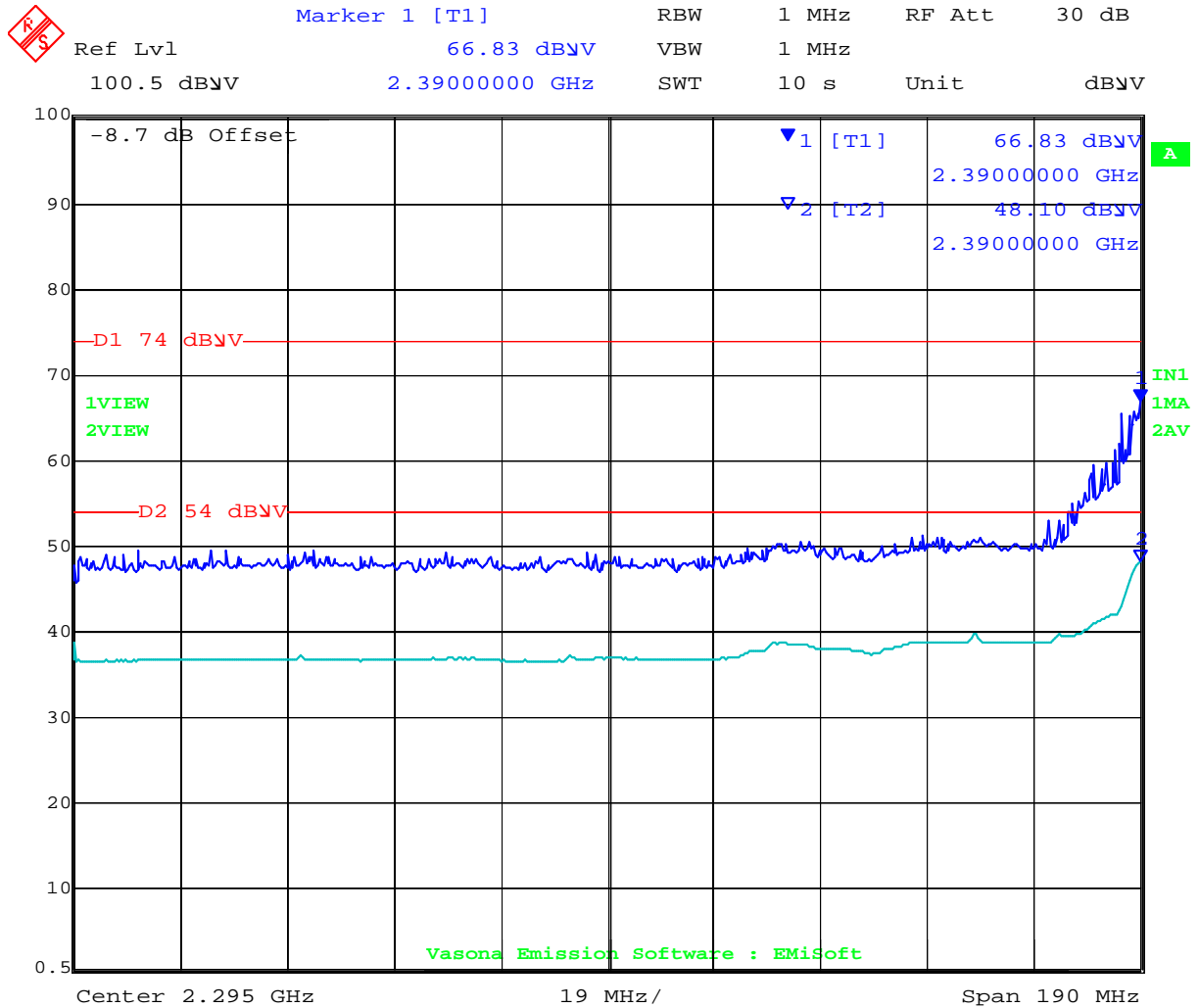
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	80.3	3.0	-11.7	71.6	Peak [Scan]	H						FUND
7234.469	54.2	5.4	-5.8	53.8	Peak [Scan]	H					Pass	NRB
16058.116	41.8	9.0	0.3	51.1	Peak [Scan]	H	100	0	54	-2.9	Pass	NOISE
4831.263	61.3	4.5	-9.7	56.1	Peak Max	H	151	192	74	-17.9	Pass	RB
4831.263	44.9	4.5	-9.7	39.7	Average Max	H	151	192	54	-14	Pass	RB

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 * Evaluated as 1600 MHz, RB Emission See Evaluation
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band Edge



Date: 9.MAR.2012 20:22:26

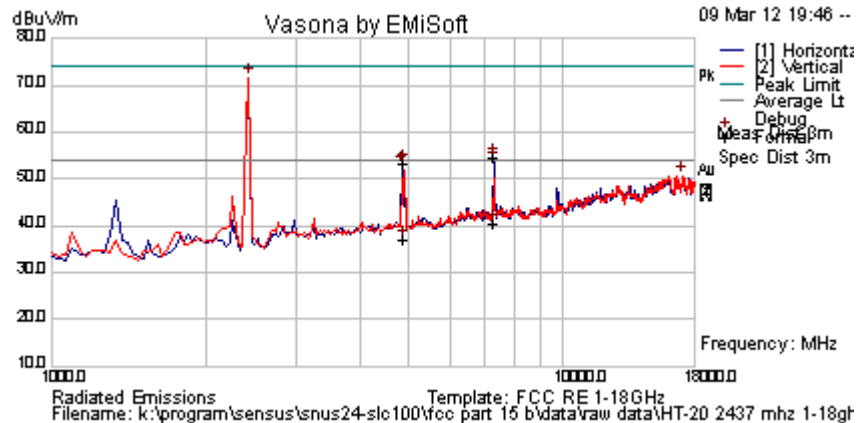
Power reduction required to bring the band-edge into compliance ART = 15

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 190 of 221

Test Freq.	2437 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 18	Press. (mBars)	1010
Antenna	Internal	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
2430.862	80.4	3.0	-11.6	71.8	Peak [Scan]	H						FUND
17080.160	41.8	8.5	0.4	50.7	Peak [Scan]	V	100	0	54	-3.3	Pass	NOISE
7307.214	55.0	5.4	-5.7	54.7	Peak Max	H	98	255	74	-19.3	Pass	RB
4880.240	58.7	4.5	-9.7	53.5	Peak Max	H	139	167	74	-20.5	Pass	RB
7307.214	40.7	5.4	-5.7	40.4	Average Max	H	98	255	54	-13.6	Pass	RB
4880.240	42.3	4.5	-9.7	37.1	Average Max	H	139	167	54	-16.9	Pass	RB

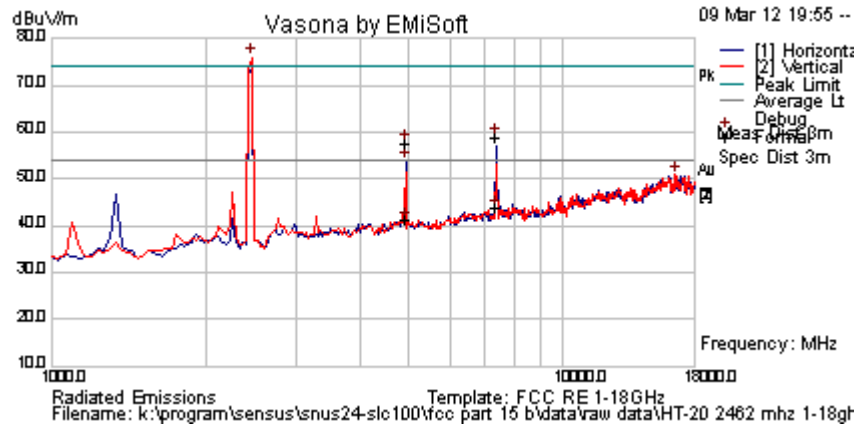
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 * Evaluated as 1600 MHz, RB Emission See Evaluation
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 191 of 221

Test Freq.	2462 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 18	Press. (mBars)	1010
Antenna	Internal	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
2464.930	84.5	3.0	-11.5	76.0	Peak [Scan]	V						FUND
16535.070	41.6	8.8	0.4	50.8	Peak [Scan]	V	100	0	54	-3.2	Pass	NOISE
7380.441	59.1	5.5	-5.5	59.1	Peak Max	H	98	252	74	-14.9	Pass	RB
4916.403	63.0	4.6	-9.8	57.8	Peak Max	H	99	49	74	-16.2	Pass	RB
7380.441	43.8	5.5	-5.5	43.7	Average Max	H	98	252	54	-10.3	Pass	RB
4916.403	46.4	4.6	-9.8	41.1	Average Max	H	99	49	54	-12.9	Pass	RB

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 * Evaluated as 1600 MHz, RB Emission See Evaluation
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band Edge



Date: 11.FEB.2012 11:53:51

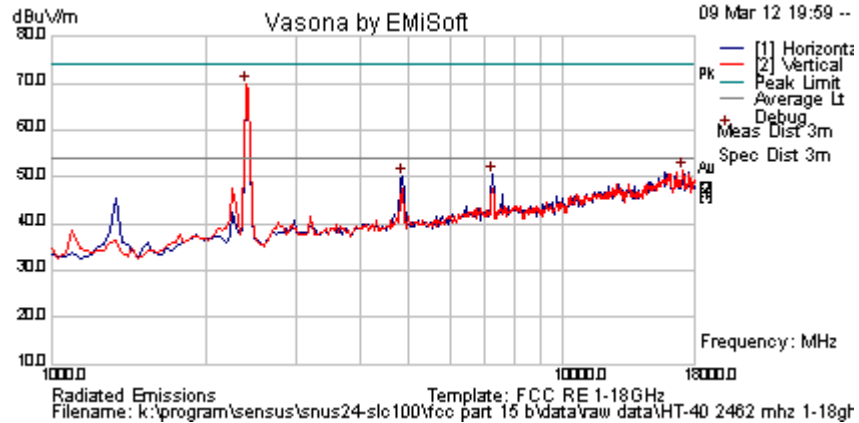
Power reduction required to bring the band-edge into compliance ART = 13

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 193 of 221

Test Freq.	2422 MHz	Engineer	GMH
Variant	802.11n; HT-40; 13.5 MCS	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 18	Press. (mBars)	1010
Antenna	Internal	Duty Cycle (%)	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

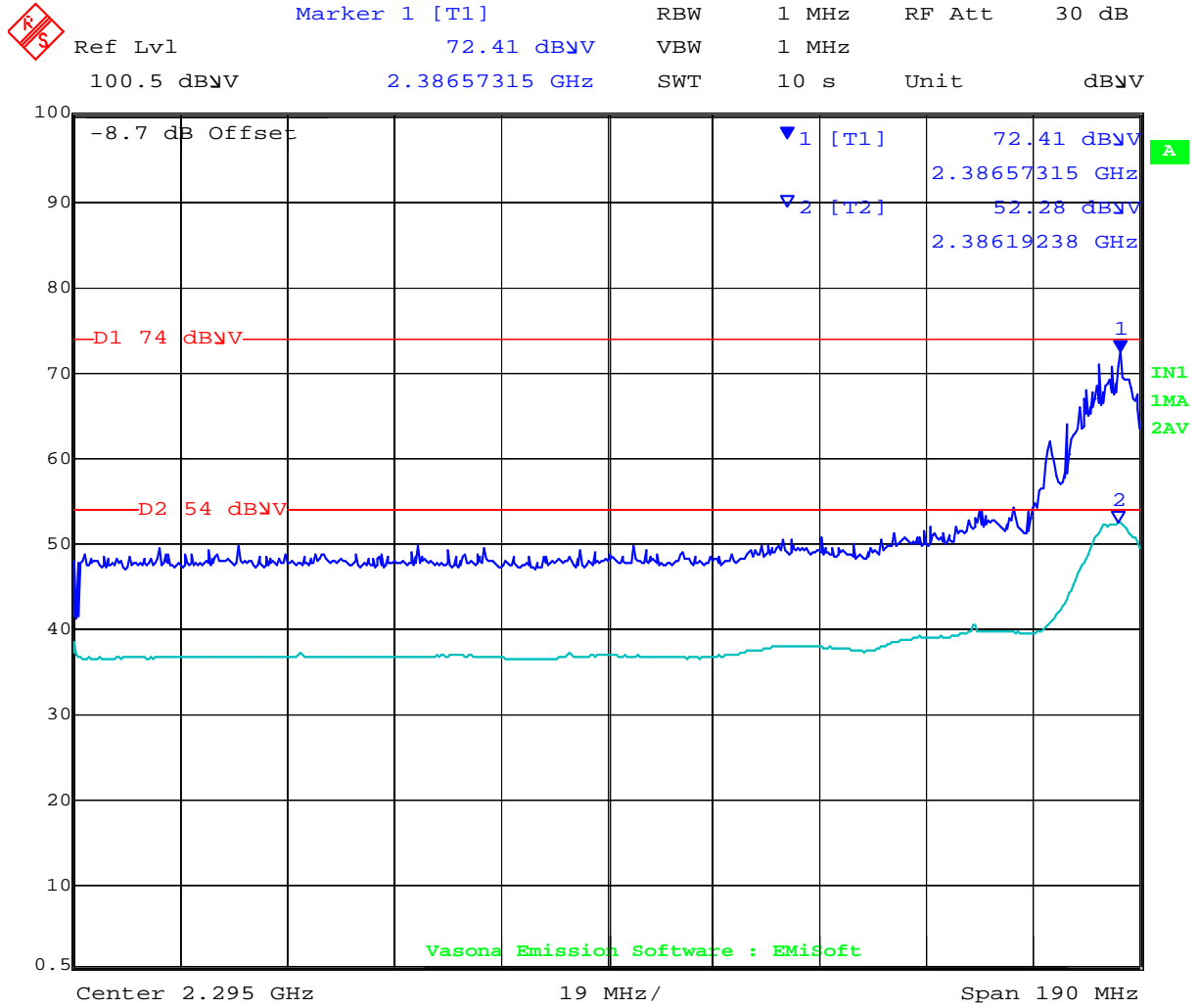
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	78.4	3.0	-11.7	69.7	Peak [Scan]	V						FUND
17114.228	42.4	8.5	0.5	51.4	Peak [Scan]	V	100	0	54	-2.6	Pass	NOISE
7268.537	50.7	5.4	-5.8	50.4	Peak [Scan]	H	100	0	54	-3.6	Pass	RB
4849.699	55.3	4.5	-9.7	50.1	Peak [Scan]	H	100	0	54	-3.89	Pass	RB

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 * Evaluated as 1600 MHz, RB Emission See Evaluation
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band Edge



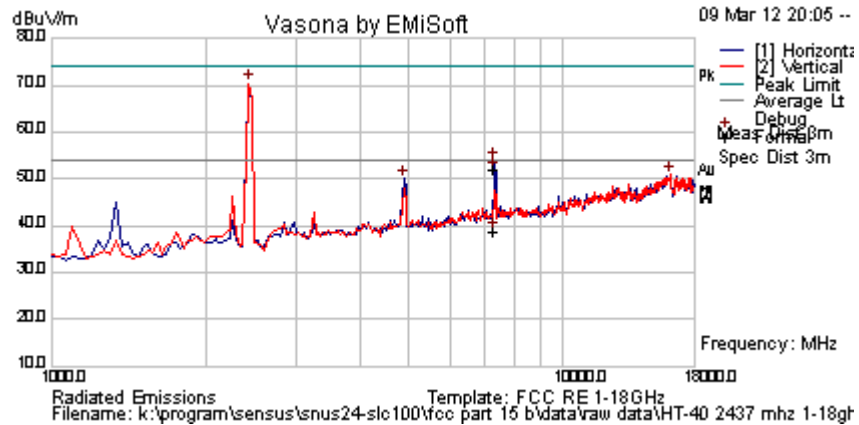
Date: 9.MAR.2012 20:24:03

Power reduction required to bring the band-edge into compliance ART = 13



Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 195 of 221

Test Freq.	2437 MHz	Engineer	GMH
Variant	802.11n; HT-40; 13.5 MCS	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 18	Press. (mBars)	1010
Antenna	Internal	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
2430.862	78.9	3.0	-11.6	70.4	Peak [Scan]	H						FUND
16160.321	41.8	9.0	0.2	51.0	Peak [Scan]	V	100	0	54	-3.1	Pass	NOISE
4883.768	55.3	4.5	-9.7	50.1	Peak [Scan]	H	100	0	54	-3.9	Pass	RB
7337.505	52.0	5.5	-5.6	51.9	Peak Max	H	98	60	74	-22.1	Pass	RB
7337.505	38.9	5.5	-5.6	38.7	Average Max	H	98	60	54	-15.3	Pass	RB

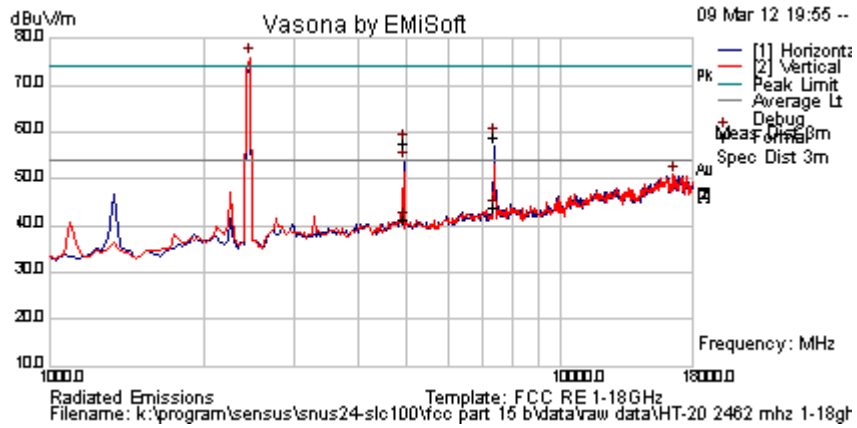
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 * Evaluated as 1600 MHz, RB Emission See Evaluation
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 196 of 221

Test Freq.	2452 MHz	Engineer	GMH
Variant	802.11n; HT-40; 13.5 MCS	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	33
Power Setting	ART = 18	Press. (mBars)	1010
Antenna	Internal	Duty Cycle (%)	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

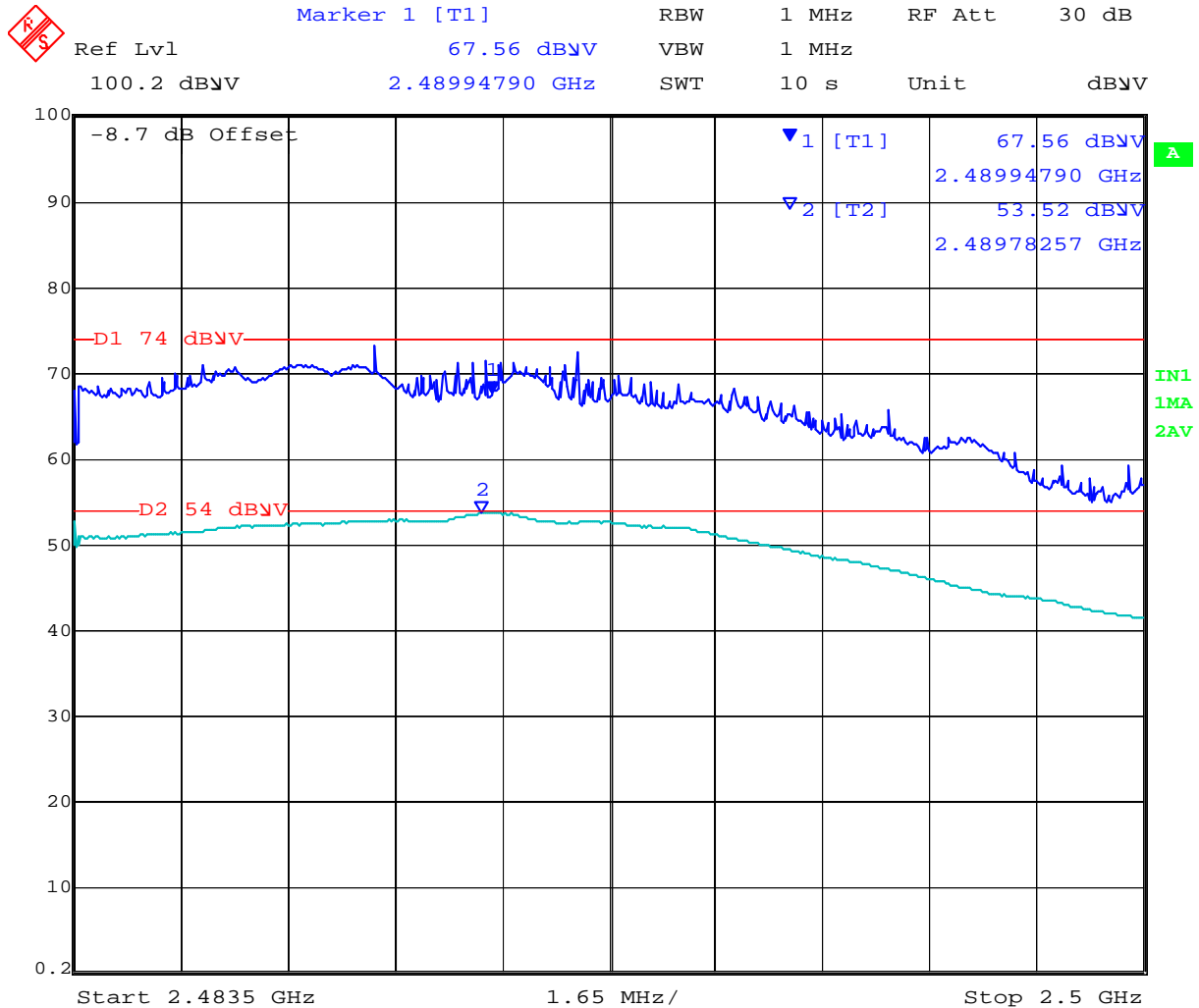
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2464.930	84.5	3.0	-11.5	76.0	Peak [Scan]	V						FUND
16535.070	41.6	8.8	0.4	50.8	Peak [Scan]	V	100	0	54	-3.2	Pass	NOISE
7380.441	59.1	5.5	-5.5	59.1	Peak Max	H	98	252	74	-14.9	Pass	RB
4916.403	63.0	4.6	-9.8	57.8	Peak Max	H	99	49	74	-16.2	Pass	RB
7380.441	43.8	5.5	-5.5	43.7	Average Max	H	98	252	54	-10.3	Pass	RB
4916.403	46.4	4.6	-9.8	41.1	Average Max	H	99	49	54	-12.9	Pass	RB

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 * Evaluated as 1600 MHz, RB Emission See Evaluation
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band Edge



Date: 11.FEB.2012 12:06:34

Power reduction required to bring the band-edge into compliance ART = 13

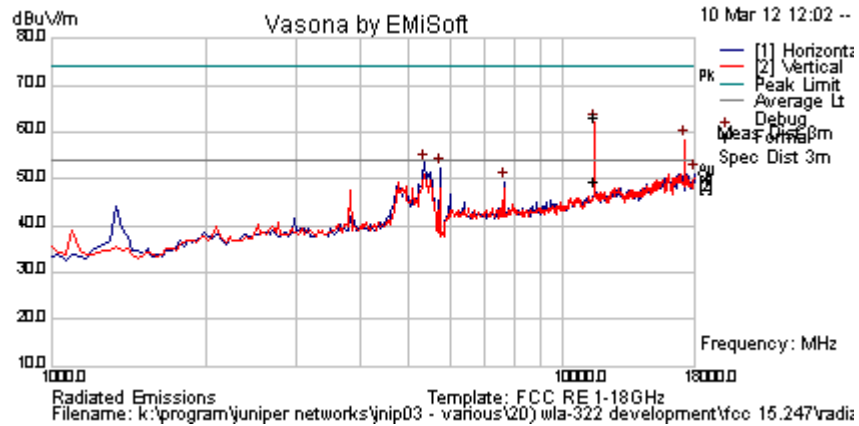
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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 198 of 221

5.8 GHz Radiated Emission Results

Test Freq.	5745 MHz	Engineer	GMH
Variant	802.11a; 6 Mbs	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	31
Power Setting	ART = 18	Press. (mBars)	1011
Antenna	INTERNAL	Duty Cycle (%)	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

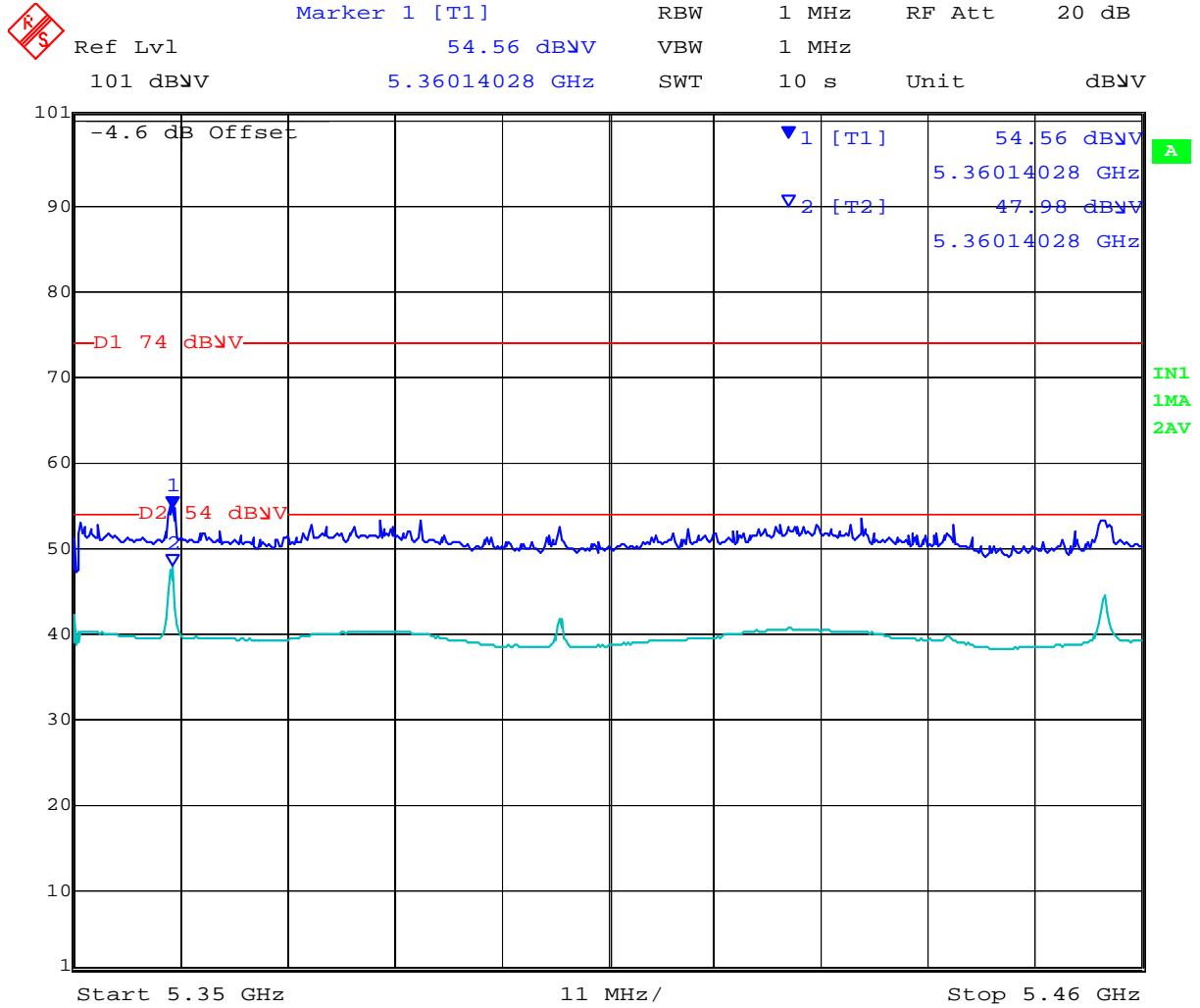
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
17250.501	48.7	8.6	1.0	58.3	Peak [Scan]	V					Pass	NRB
5360.721	58.5	4.6	-9.5	53.6	Peak [Scan]	H					Pass	BE
5735.471	57.2	4.8	-9.5	52.4	Peak [Scan]	H						FUND
18000.000	41.8	8.8	0.7	51.3	Peak [Scan]	H	100	0	54	-2.7	Pass	NOISE
7643.287	48.9	5.5	-4.9	49.5	Peak [Scan]	H	100	0	54	-4.5	Pass	RB
11492.986	58.5	6.8	-2.0	63.3	Peak Max	V	98	32	74	-10.7	Pass	RB
11492.986	44.8	6.8	-2.0	49.6	Average Max	V	98	32	54	-4.4	Pass	RB

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band-Edge



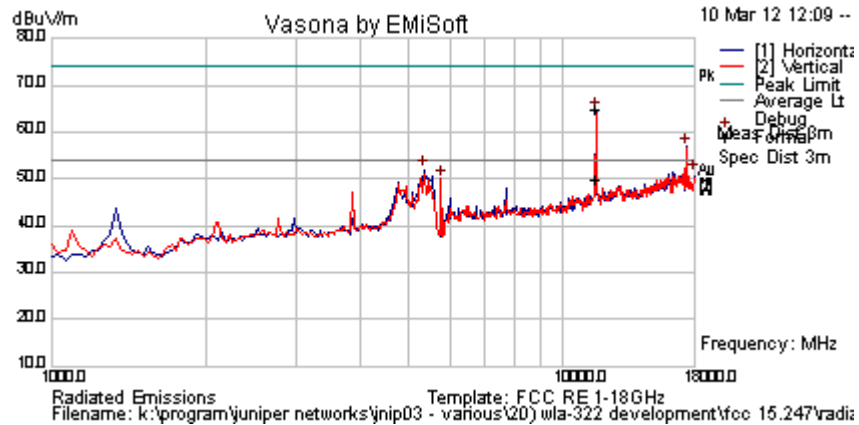
Date: 10.MAR.2012 13:32:55

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 200 of 221

Test Freq.	5785 MHz	Engineer	GMH
Variant	802.11a; 6 Mbs	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	31
Power Setting	ART = 18	Press. (mBars)	1011
Antenna	INTERNAL	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
17352.705	46.8	8.7	1.3	56.9	Peak [Scan]	H					Pass	NRB
5360.721	56.9	4.6	-9.5	52.0	Peak [Scan]	H					Pass	BE
18000.000	41.5	8.8	0.7	51.0	Peak [Scan]	H	100	0	54	-3.0	Pass	NOISE
5769.539	54.8	4.8	-9.5	50.1	Peak [Scan]	V						BE
11571.743	59.9	6.8	-2.0	64.7	Peak Max	H	107	24	74	-9.3	Pass	RB
11571.743	45.2	6.8	-2.0	50.0	Average Max	H	107	24	54	-4.0	Pass	RB

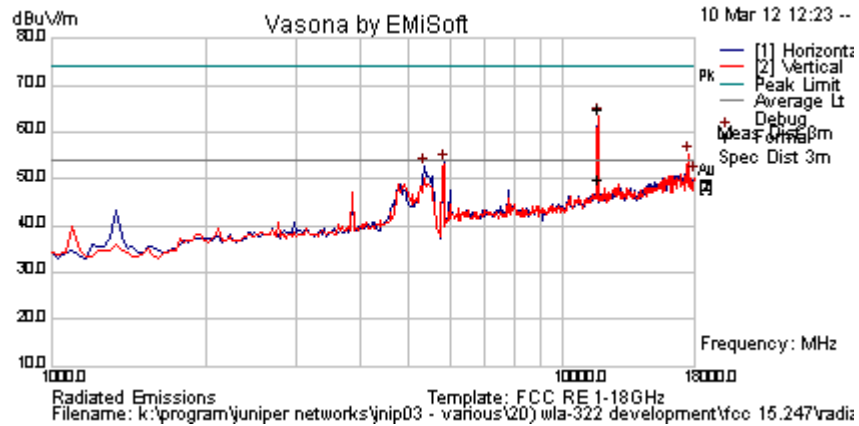
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 201 of 221

Test Freq.	5825 MHz	Engineer	GMH
Variant	802.11a; 6 Mbs	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	31
Power Setting	ART = 16	Press. (mBars)	1011
Antenna	INTERNAL	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
17488.978	45.5	8.8	1.0	55.3	Peak [Scan]	V					Pass	NRB
5837.675	57.8	4.8	-9.3	53.4	Peak [Scan]	H						FUND
5360.721	57.4	4.6	-9.5	52.5	Peak [Scan]	H					Pass	BE
18000.000	41.1	8.8	0.7	50.7	Peak [Scan]	H	100	0	54	-3.4	Pass	NOISE
11649.740	60.4	6.8	-2.3	64.9	Peak Max	V	98	28	74	-9.1	Pass	RB
11649.740	45.4	6.8	-2.3	49.9	Average Max	V	98	28	54	-4.1	Pass	RB

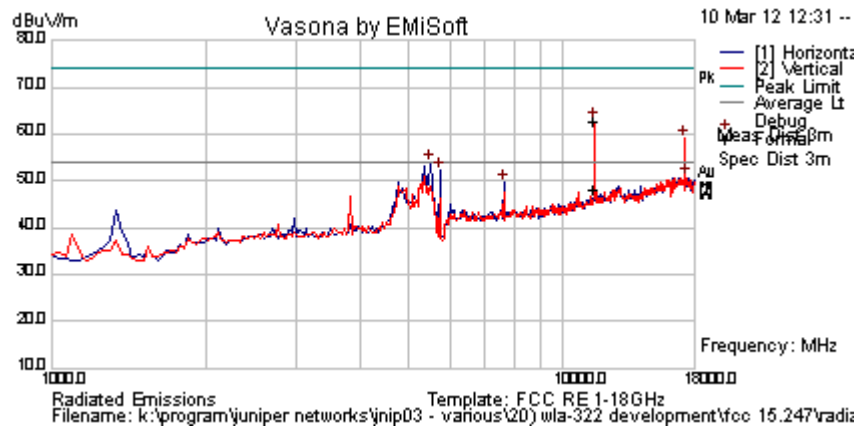
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 202 of 221

Test Freq.	5745 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	31
Power Setting	ART = 18	Press. (mBars)	1011
Antenna	INTERNAL	Duty Cycle (%)	100
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

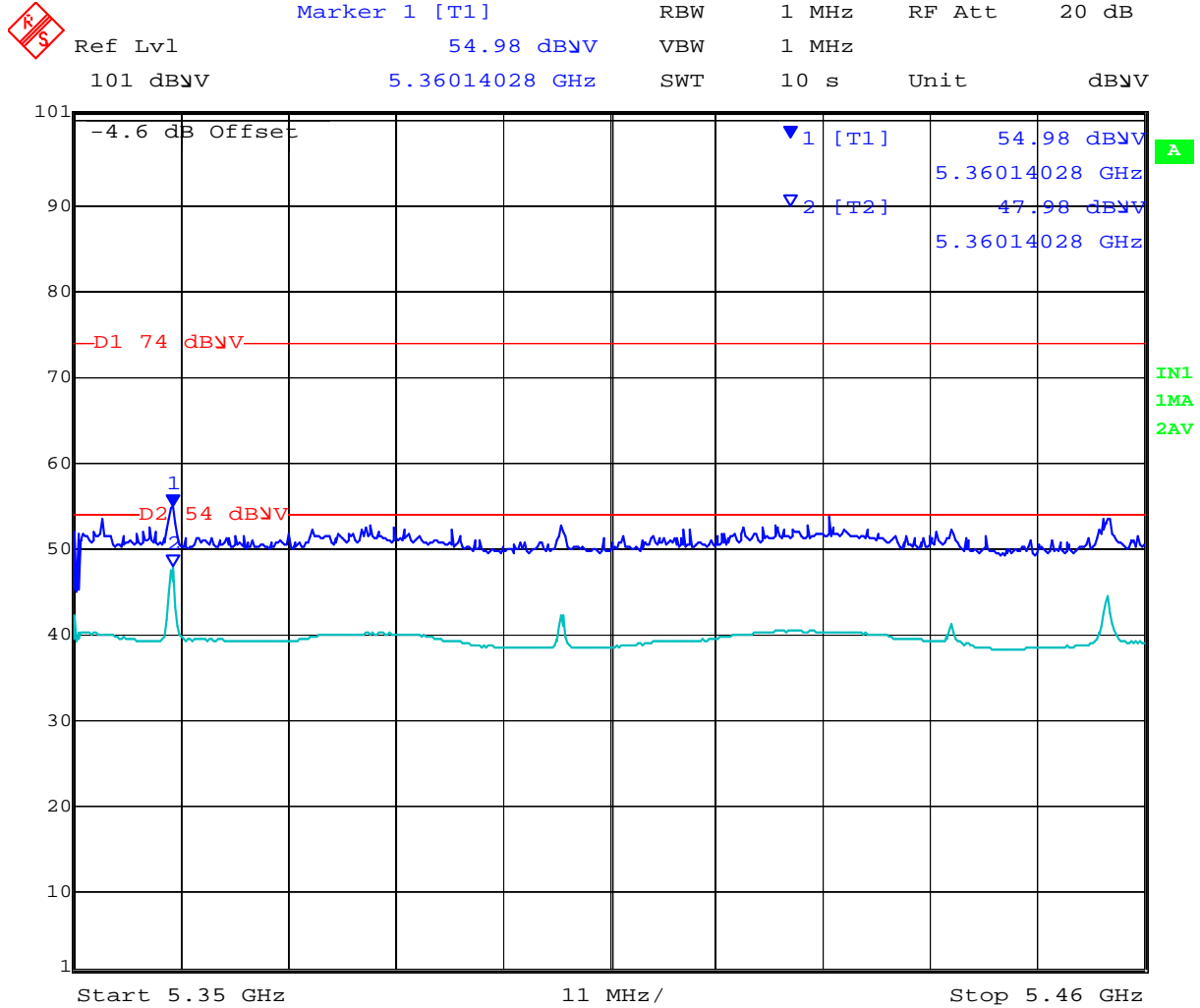
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
17250.501	49.4	8.6	1.0	59.0	Peak [Scan]	V						NRB
5496.994	58.7	4.6	-9.6	53.7	Peak [Scan]	H					Pass	BE
5735.471	56.9	4.8	-9.5	52.1	Peak [Scan]	H						FUND
17420.842	40.7	8.7	1.3	50.7	Peak [Scan]	V	100	0	54	-3.3	Pass	NOISE
7643.287	49.0	5.5	-4.9	49.6	Peak [Scan]	H	100	0	54	-4.4	Pass	RB
11492.986	57.8	6.8	-2.0	62.6	Peak Max	V	98	29	74	-11.4	Pass	RB
11492.986	43.3	6.8	-2.0	48.2	Average Max	V	98	29	54	-5.8	Pass	RB

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band-Edge



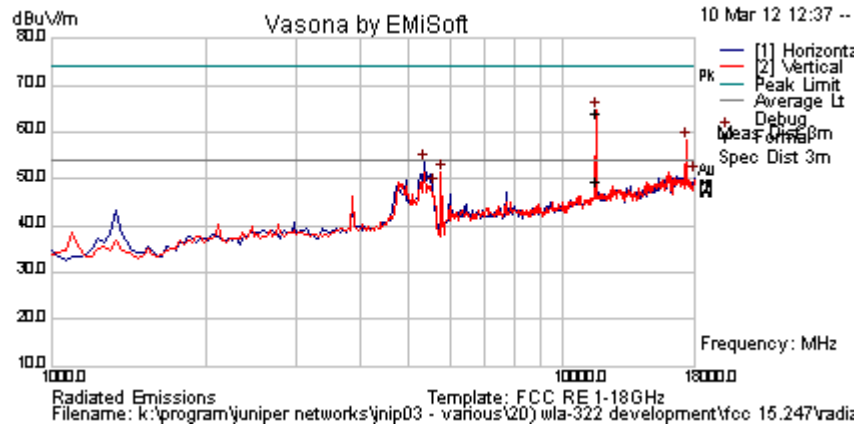
Date: 10.MAR.2012 13:33:38

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 204 of 221

Test Freq.	5785 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	31
Power Setting	ART = 18	Press. (mBars)	1011
Antenna	INTERNAL	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
17352.705	48.3	8.7	1.3	58.3	Peak [Scan]	V					Pass	NRB
5360.721	58.4	4.6	-9.5	53.5	Peak [Scan]	H					Pass	BE
5769.539	56.0	4.8	-9.5	51.3	Peak [Scan]	V						FUND
18000.000	41.2	8.8	0.7	50.7	Peak [Scan]	H	100	0	54	-3.3	Pass	NOISE
5565.130	53.4	4.7	-9.7	48.3	Peak [Scan]	H					Pass	BE
11575.711	59.1	6.8	-2.0	63.9	Peak Max	V	99	30	74	-10.1	Pass	RB
11575.711	44.6	6.8	-2.0	49.4	Average Max	V	99	30	54	-4.6	Pass	RB

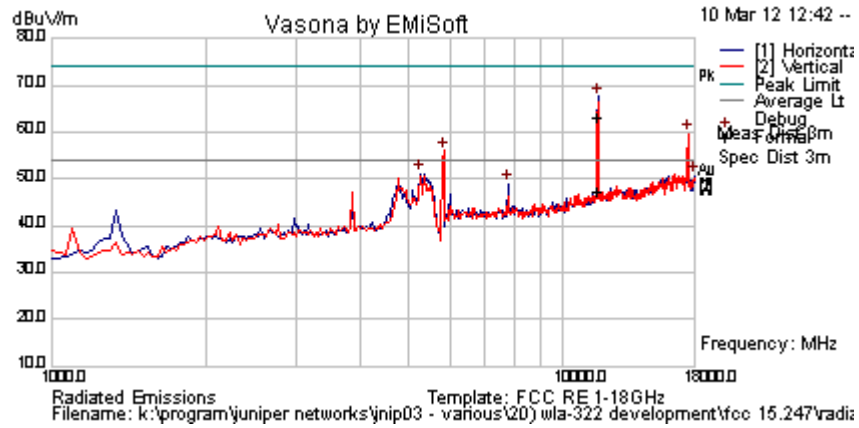
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 205 of 221

Test Freq.	5825 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	31
Power Setting	ART = 18	Press. (mBars)	1011
Antenna	INTERNAL	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
17488.978	49.9	8.8	1.0	59.7	Peak [Scan]	V					Pass	NRB
5837.675	60.5	4.8	-9.3	56.0	Peak [Scan]	V						FUND
5258.517	56.3	4.6	-9.7	51.1	Peak [Scan]	H					Pass	BE
18000.000	41.5	8.8	0.7	51.0	Peak [Scan]	H	100	0	54	-3.0	Pass	NOISE
7779.559	48.0	5.5	-4.5	49.0	Peak [Scan]	H	100	0	54	-5.0	Pass	RB
11663.327	58.6	6.8	-2.3	63.1	Peak Max	H	100	354	74	-10.9	Pass	RB
11663.327	42.9	6.8	-2.3	47.5	Average Max	H	100	354	54	-6.6	Pass	RB

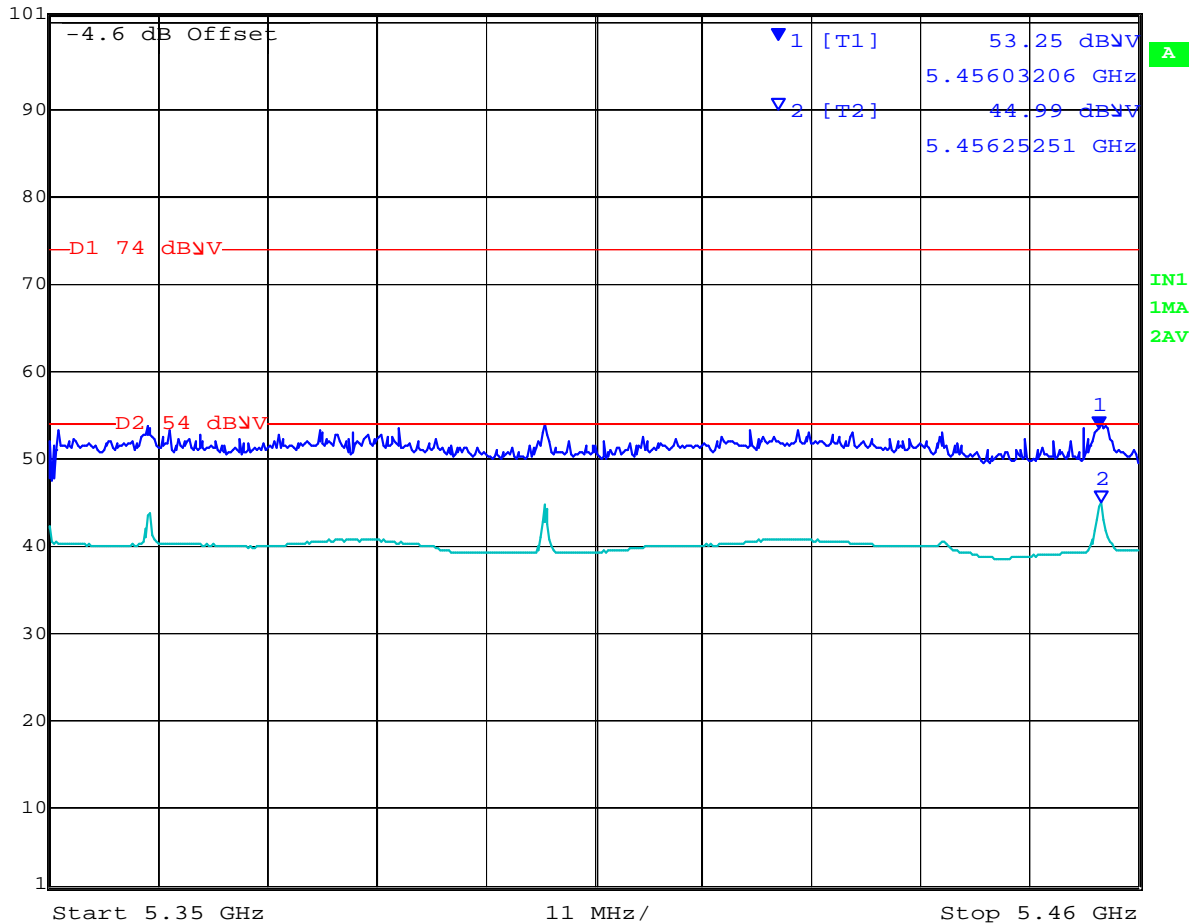
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band-Edge

 **Marker 1 [T1]** RBW 1 MHz RF Att 20 dB
Ref Lvl 53.25 dBμV VBW 1 MHz
101 dBμV 5.45603206 GHz SWT 10 s Unit dBμV



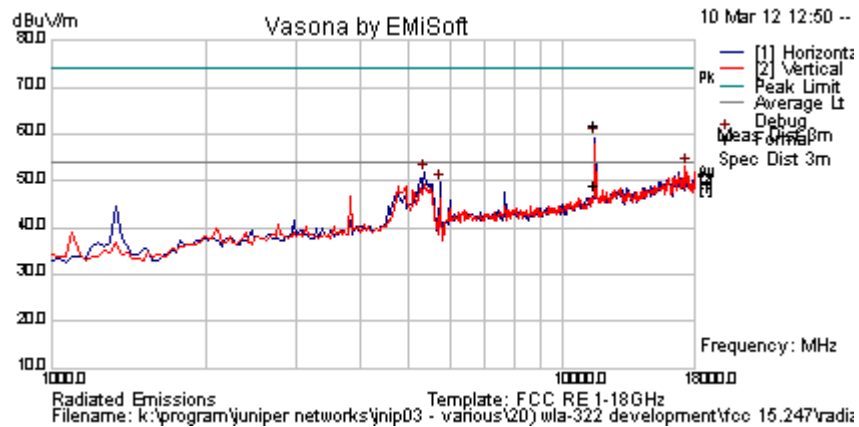
Date: 10.MAR.2012 13:34:44

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 207 of 221

Test Freq.	5755 MHz	Engineer	GMH
Variant	802.11n; HT-40; 13.5 MCS	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	31
Power Setting	ART = 18	Press. (mBars)	1011
Antenna	INTERNAL	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
17284.569	43.2	8.6	1.1	52.9	Peak [Scan]	V	100	0	54	-1.1	Pass	NRB
5360.721	56.7	4.6	-9.5	51.8	Peak [Scan]	H					Pass	BE
5735.471	54.3	4.8	-9.5	49.5	Peak [Scan]	H						FUND
11509.298	56.9	6.8	-1.9	61.8	Peak Max	H	98	0	74	-12.3	Pass	RB
11509.298	44.0	6.8	-1.9	48.9	Average Max	H	98	0	54	-5.1	Pass	RB

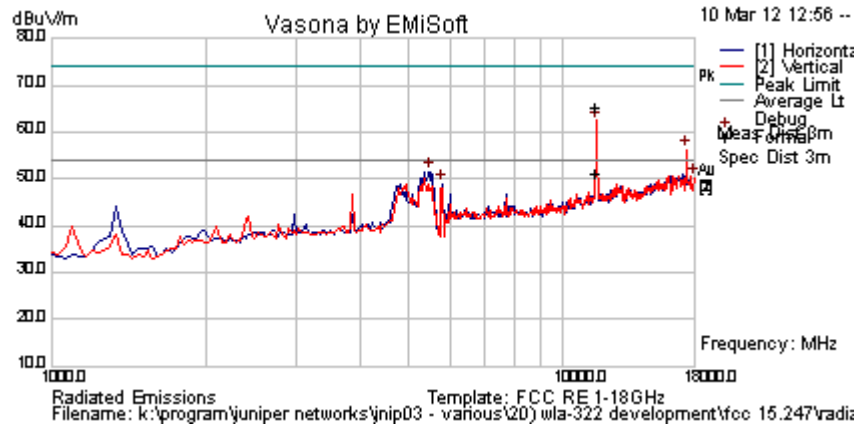
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 208 of 221

Test Freq.	5795 MHz	Engineer	GMH
Variant	802.11n; HT-40; 13.5 MCS	Temp (°C)	22
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	31
Power Setting	ART = 18	Press. (mBars)	1011
Antenna	INTERNAL	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
17386.774	46.1	8.7	1.4	56.2	Peak [Scan]	V					Pass	NRB
5496.994	56.5	4.6	-9.6	51.5	Peak [Scan]	H					Pass	BE
18000.000	40.8	8.8	0.7	50.4	Peak [Scan]	V	100	0	54	-3.6	Pass	NOISE
5803.607	53.6	4.8	-9.4	49.0	Peak [Scan]	H						FUND
11589.459	60.5	6.8	-2.1	65.2	Peak Max	V	98	25	74	-8.8	Pass	RB
11589.459	46.5	6.8	-2.1	51.2	Average Max	V	98	25	54	-2.8	Pass	RB

Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 209 of 221

Specification Limits

FCC §15.247(d) and RSS-210 §A8.5 In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

FCC §15.247(d)

If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section §15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(a)).

IC RSS-210 §A8.5 If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

IC 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 or carrier frequency), or from 30 MHz, whichever is the lowest frequency, to the 5th harmonic of the highest frequency generated without exceeding 40 GHz.

FCC §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.

FCC §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.

FCC §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.

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 210 of 221

§15.209 (a) Limit Matrix

Frequency(MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)	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
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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

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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 211 of 221

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

FCC, Part 15 Subpart C §15.205/ §15.209
Industry Canada RSS-210 §2.2

Test Procedure

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

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

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 51.5dB μ V; 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:

$$FS = 51.5 + 8.5 + 1.3 - 26.0 + 1 = 36.3\text{dB}\mu\text{V}/\text{m}$$

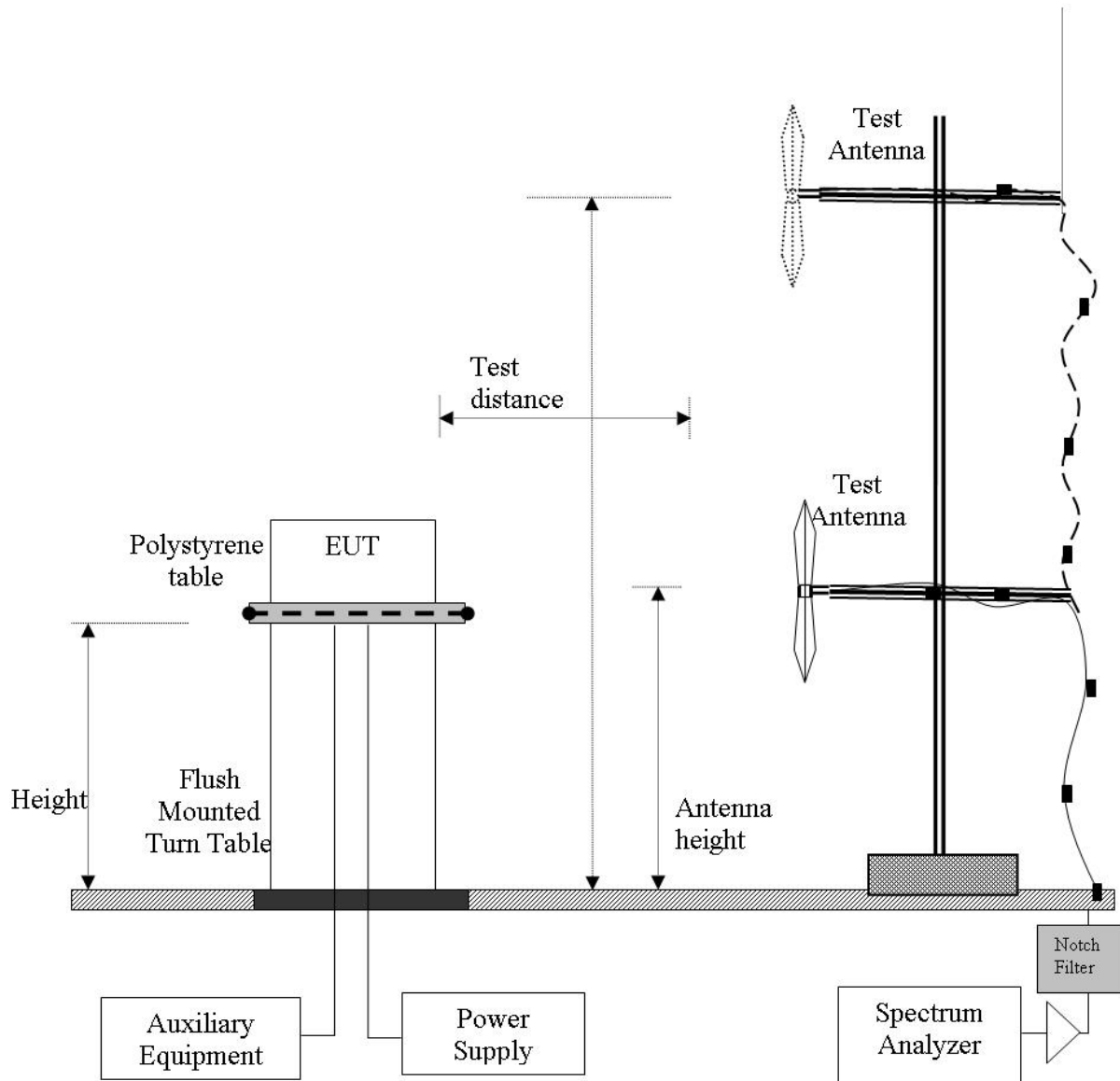
Conversion between dB μ V/m (or dB μ V) and μ V/m (or μ V) are done as:

$$\text{Level (dB}\mu\text{V}/\text{m)} = 20 * \text{Log (level (\mu\text{V}/\text{m}))}$$

$$\begin{aligned} 40 \text{ dB}\mu\text{V}/\text{m} &= 100\mu\text{V}/\text{m} \\ 48 \text{ dB}\mu\text{V}/\text{m} &= 250\mu\text{V}/\text{m} \end{aligned}$$

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Radiated Emission Measurement Setup – Below 1 GHz

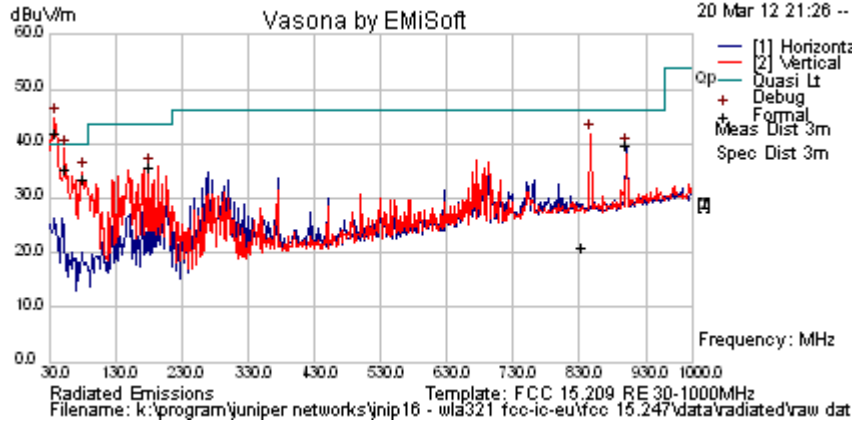


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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 213 of 221

Test Freq.	Ch 36 (5180 MHz)	Engineer	GMH
Variant	Digital Emissions	Temp (°C)	22
Freq. Range	30 MHz - 1000 MHz	Rel. Hum.(%)	38
Power Setting	16	Press. (mBars)	1007
Antenna	integral		
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
38.920	51.9	3.6	-16.6	38.9	Quasi Max	V	98	98	40	-1.1	Pass	
54.179	55.5	3.7	-24.0	35.2	Quasi Max	V	104	104	40.0	-4.8	Pass	
834.588	22.4	6.9	-8.5	20.8	Quasi Max	V	186	186	46.0	-25.2	Pass	
81.188	53.1	4.0	-23.7	33.4	Quasi Max	V	113	113	40.0	-6.6	Pass	
179.749	51.3	4.5	-19.9	35.8	Peak [Scan]	V	113	113	43.5	-7.7	Pass	
900.849	40.3	7.1	-7.8	39.6	Peak [Scan]	V	113	113	46.0	-6.4	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

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Specification

Limits

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

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

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

§15.209 (a) and RSS-Gen §2.2 Limit Matrix

Frequency(MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength ($\text{dB}\mu\text{V/m}$)	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
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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

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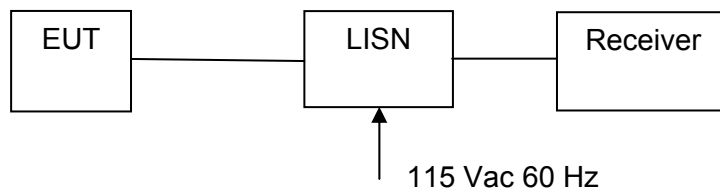
5.1.7. AC Wireline Conducted Emissions (150 kHz – 30 MHz)

FCC, Part 15 Subpart C §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)

Ambient conditions.

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

Not required - EUT is powered via POE switch.



Specification

Limit

§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 $\mu\Omega$ 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 (dB μ V)	
	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
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Traceability

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

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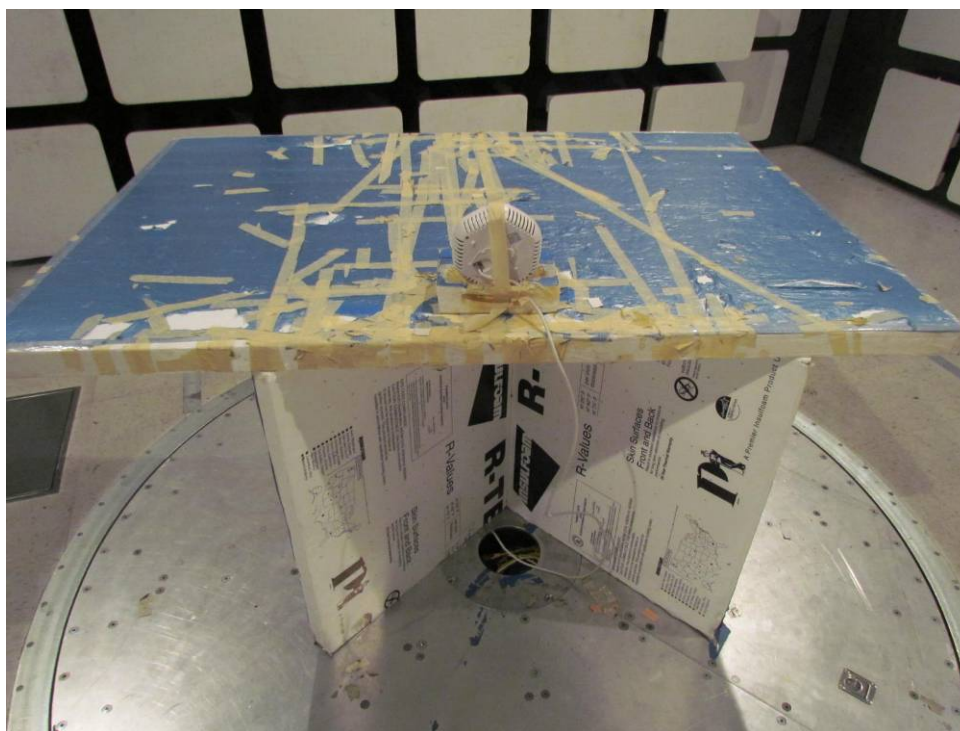
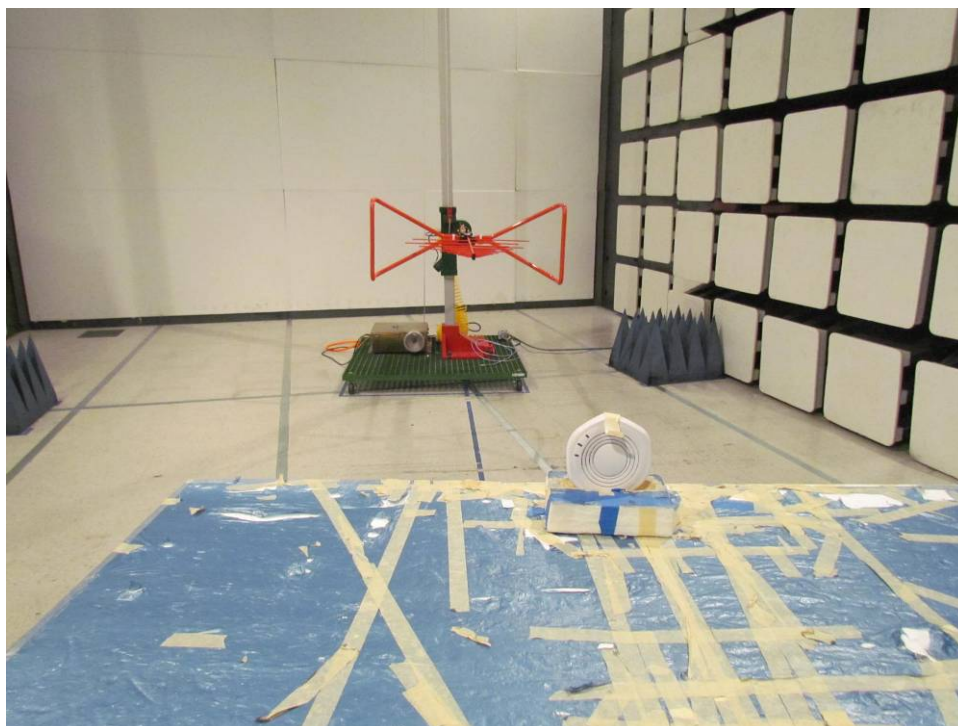
6. PHOTOGRAPHS

6.1. Conducted Test Setup



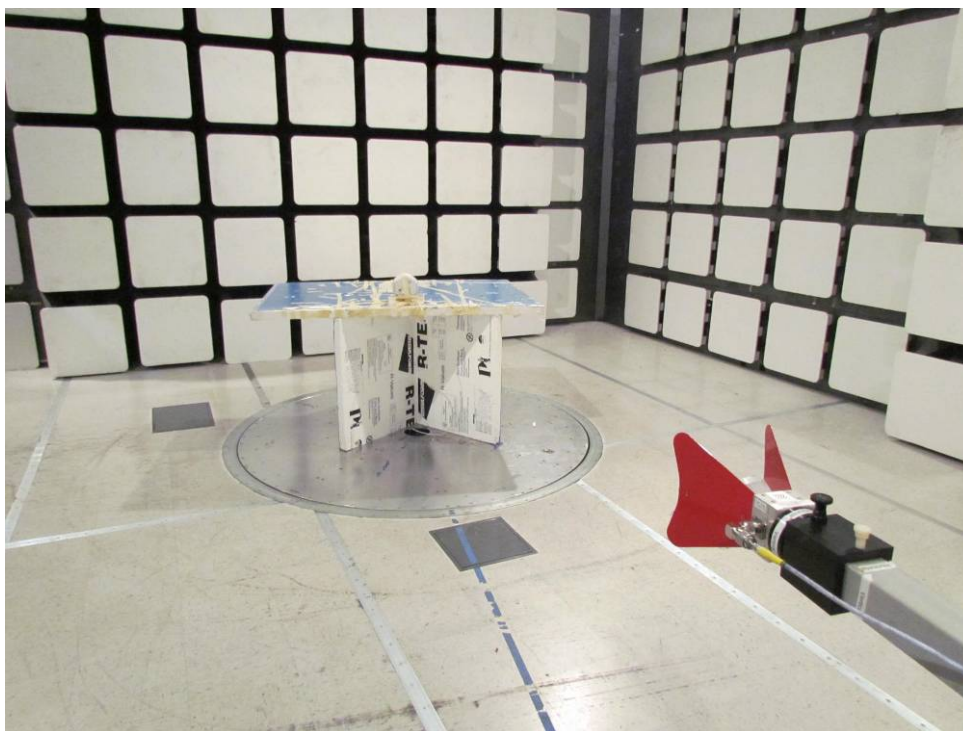
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6.2. Radiated Test Setup < 1 GHz



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6.3. Radiated Test Setup > 1 GHz



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Title: Juniper Networks WLA321 Wireless LAN Access Point
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: JNIP16-U1 Rev A
Issue Date: 28th March 2012
Page: 220 of 221

7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Serial #	Calibration Due Date
0070	Power Meter	Hewlett Packard	437B	3125U11552	28 th Nov 12
0117	Power Sensor	Hewlett Packard	8487D	3318A00371	15 th Nov 12
0223	Power Meter	Hewlett Packard	EPM-442A	US37480256	15 th Nov 12
0374	Power Sensor	Hewlett Packard	8485A	3318A19694	29 th Nov 12
0158	Barometer /Thermometer	Control Co.	4196	E2846	8 th Dec 12
0193	EMI Receiver	Rhode & Schwartz	ESI 7	838496/007	2 nd Dec 12
0287	EMI Receiver	Rhode & Schwartz	ESIB40	100201	16 th Nov 12
0338	30 - 3000 MHz Antenna	Sunol	JB3	A052907	8 th Nov 12
0335	1-18 GHz Horn Antenna	EMCO	3117	00066580	7 th 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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