Test of Juniper Networks WLA322 Wireless LAN Access Point

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

Test Report Serial No.: JNIP19-U1 Rev A

TEST REPORT

FROM

Test of Juniper Networks WLA322 Wireless LAN Access Point

to

To FCC 47 CFR Part 15.247 & IC RSS-210

Test Report Serial No.: JNIP19-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 WLA322 Wireless Access Point. 5150 – 5250, 5250 – 5350 and 5470 - 5725 MHz test data are reported in MiCOM Labs test report JNIP19-U2

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: 5th June 2012

This Test Report is Issued Under the Authority of;

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TEST CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory

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ACCREDITATION, LISTINGS & RECOGNITION

TESTING ACCREDITATION

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

RECOGNITION

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

Country	Recognition Body	Status	Phase	Identification No.
USA	Federal Communications Commission (FCC)	TCB	-	Listing #: 102167
Canada	Industry Canada (IC)	FCB	APEC MRA 2	Listing #: 4143A-2
Japan	MIC (Ministry of Internal Affairs and Communication)	CAB	APEC MRA 2	210
	VCCI	--	--	No. 2959
Europe	European Commission	NB	EU MRA	NB 2280
Australia	Australian Communications and Media Authority (ACMA)	CAB	APEC MRA 1	US0159
Hong Kong	Office of the Telecommunication Authority (OFTA)	CAB	APEC MRA 1	
Korea	Ministry of Information and Communication Radio Research Laboratory (RRL)	CAB	APEC MRA 1	
Singapore	Infocomm Development Authority (IDA)	CAB	APEC MRA 1	
Taiwan	National Communications Commission (NCC) Bureau of Standards, Metrology and Inspection (BSMI)	CAB	APEC MRA 1	
Vietnam	Ministry of Communication (MIC)	CAB	APEC MRA 1	

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

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

**NB – Notified Body

PRODUCT CERTIFICATION

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

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

DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	5th June 2012	Initial release.

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:	WLA322-US	Fax:	+1 925 462 0306
S/N's:	Conducted S/N MN3512070068: Radiated S/N: MN3512070051		
Test Date(s):	5th to 25th May 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.

ACCREDITED
TEST CERTIFICATE #2381.01

Approved & Released for MiCOM Labs, Inc. by:

Graeme Grieve
Quality Manager MiCOM Labs,

Gordon Hurst
President & CEO MiCOM Labs, Inc.

2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

REF.	PUBLICATION	YEAR	TITLE
i.	FCC 47 CFR Part 15, 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	4th 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

2.2. Test and Uncertainty Procedures

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

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

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

3. PRODUCT DETAILS AND TEST CONFIGURATIONS

3.1. Technical Details

Details	Description
Purpose:	Test of the Juniper Networks WLA322 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:	JNIP19-U1 Rev A
Date EUT received:	5th May 2012
Standard(s) applied:	FCC 47 CFR Part 15.247 & IC RSS-210
Dates of test (from - to):	5th to 25th May 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):	WLA322-US and WLA322-WW
Location for use:	Indoor
Declared Frequency Range(s):	2400 - 2483.5 MHz; 5725 - 5850 MHz
Software Release	7.7.2.0.31
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:	WLA322 has no beam forming capabilities
Rated Input Voltage and Current:	POE 48 Vdc 0.625 A
Operating Temperature Range:	Declared range 0° to +40ºC
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:	5.6 in (H) x 5.4 in (W) x 1.9 in (D),
Weight:	8.5 oz
Primary function of equipment:	Wireless Access Point for transmitting data and voice.

3.2. Scope of Test Program

Juniper Networks WLA322 Wireless Access Point
The scope of the test program was to test the Juniper Networks WLA322 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.

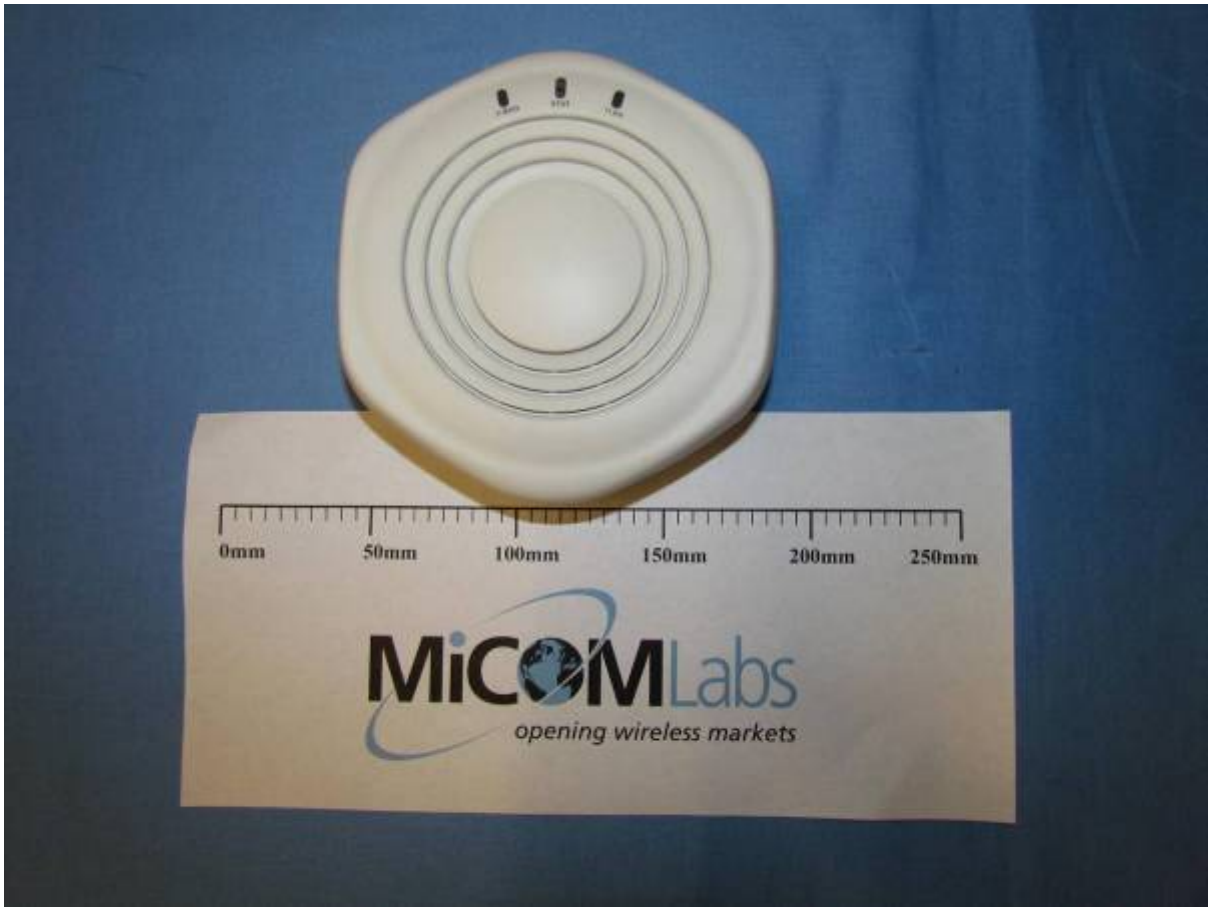
WLA322-US (for US distribution)
WLA322-WW, WLA322-XX (where –XX can be any alphanumeric, for world wide distribution)

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.

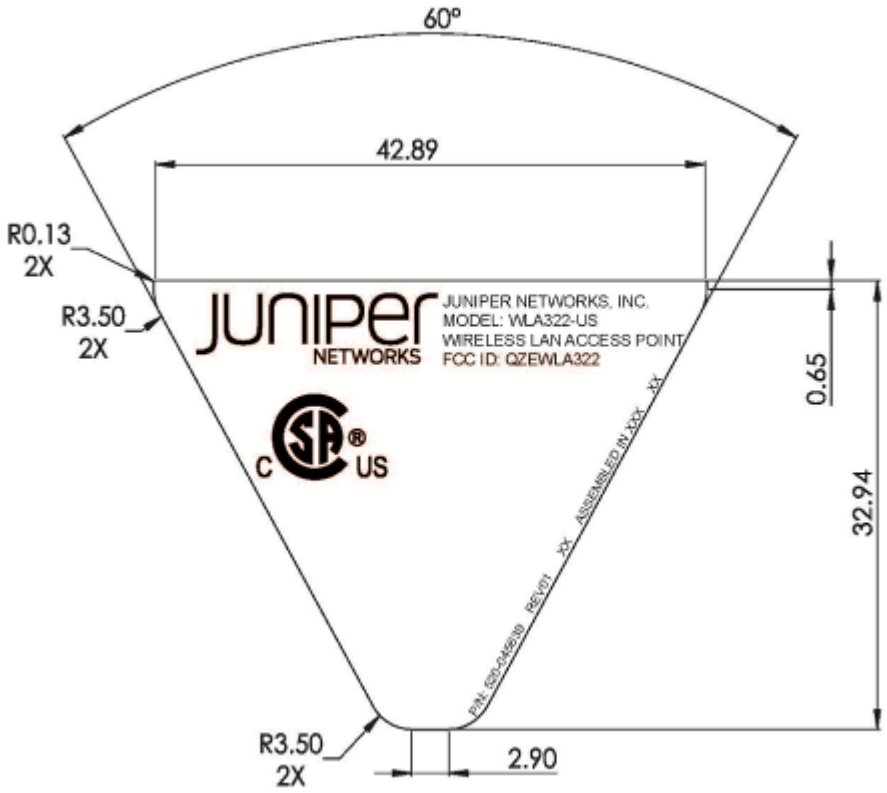
This guidance does not apply to the multiple transmitters included in a composite device, such as a device that combines an 802.11 modem with a cell phone in one enclosure with each driving its own antenna.

WLA322-WW Wireless LAN Access Point



WLA322-WW Wireless LAN Access Point

WLA322-WW Wireless LAN Access Point Label



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	WLA322	Conducted S/N MN3512070068: Radiated S/N: MN3512070051
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)

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 2,437 2,462
g	Legacy	6 MBit/s	
n	HT-20	6.5 (MCS 0)	
	HT-40	13.5 (MCS 0)	2,422 2,437 2,452
a	Legacy	6 MBit/s	5,745 5,785 5,825
n	HT-20	6.5 (MCS 0)	
	HT-40	13.5 (MCS 0)	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

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

5,725 – 5850 MHz

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

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 (18)
		11	2483.5	Maximum (18)
	802.11g	1	2390.0	16
		11	2483.5	14
	802.11n HT-20	1	2390.0	16
		11	2483.5	14
	802.11n HT-40	3	2390.0	14
		9	2483.5	14
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 operational modes;

802.11b 2437 MHz power reduced from 18 to 17

802.11b 2462 MHz power reduced from 18 to 16

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

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

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	*5.1.6.3*
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*

5. TEST RESULTS

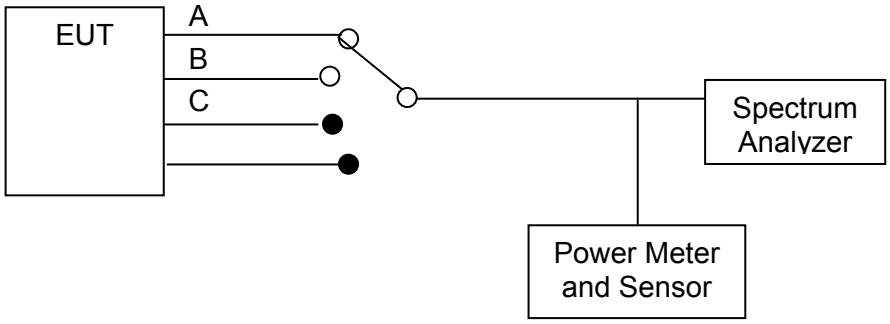
5.1. Device Characteristics

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

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. (ºC):**	19 to 22
TPC:	HIGH	**Pressure (mBars):**	998 to 1003
Modulation:	ON	**Duty Cycle (%):**	100
Beam Forming Gain (Y):	N/A dB	**Antenna Gain:**	0 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

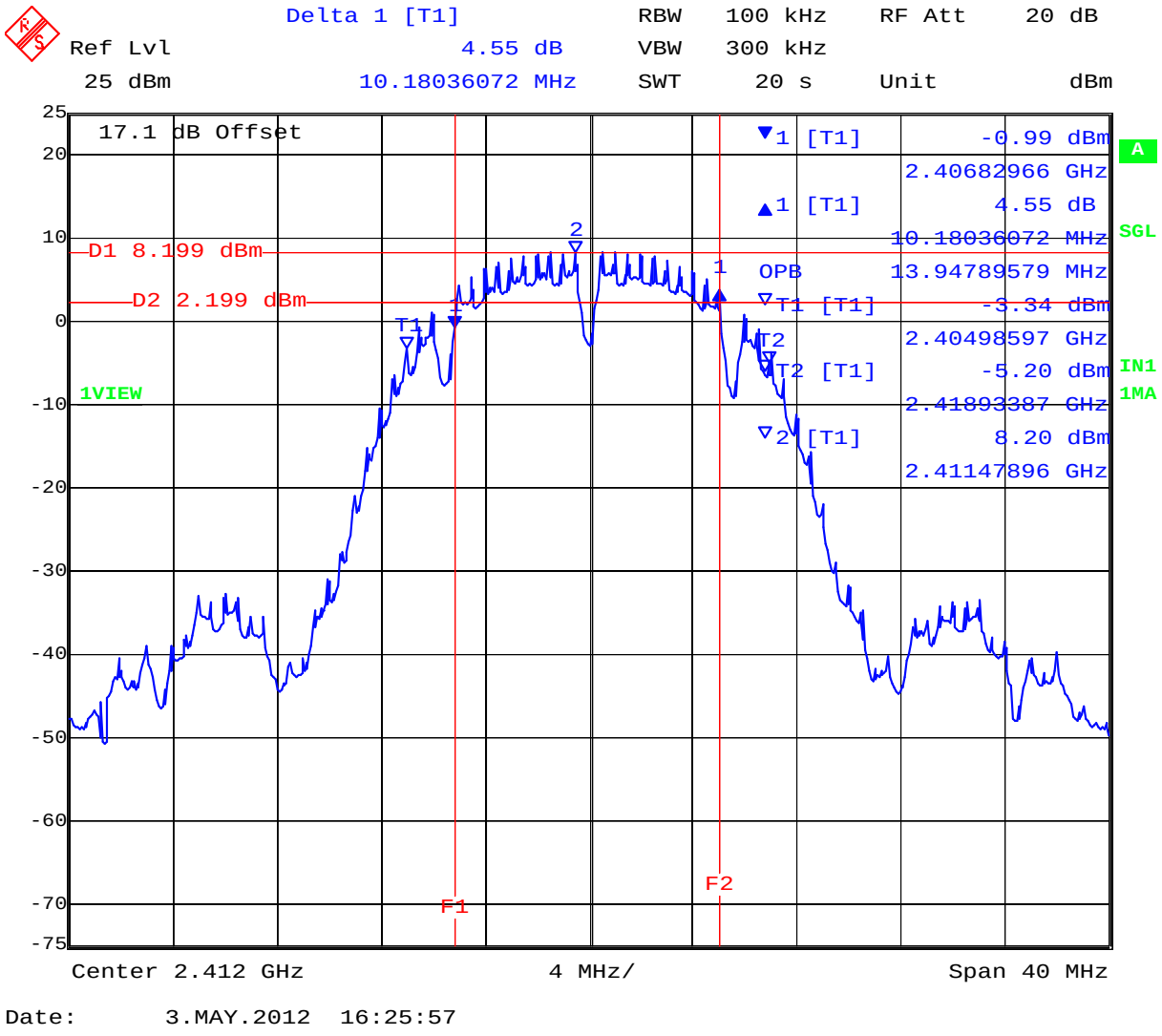
Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	a	b	c	d	kHz	MHz	MHz
2412.000	10.180	10.180	--	--	500	0.5	-9.680
2437.000	10.180	10.180	--	--			-9.680
2462.000	10.180	10.180	--	--			-9.680

99% Bandwidth

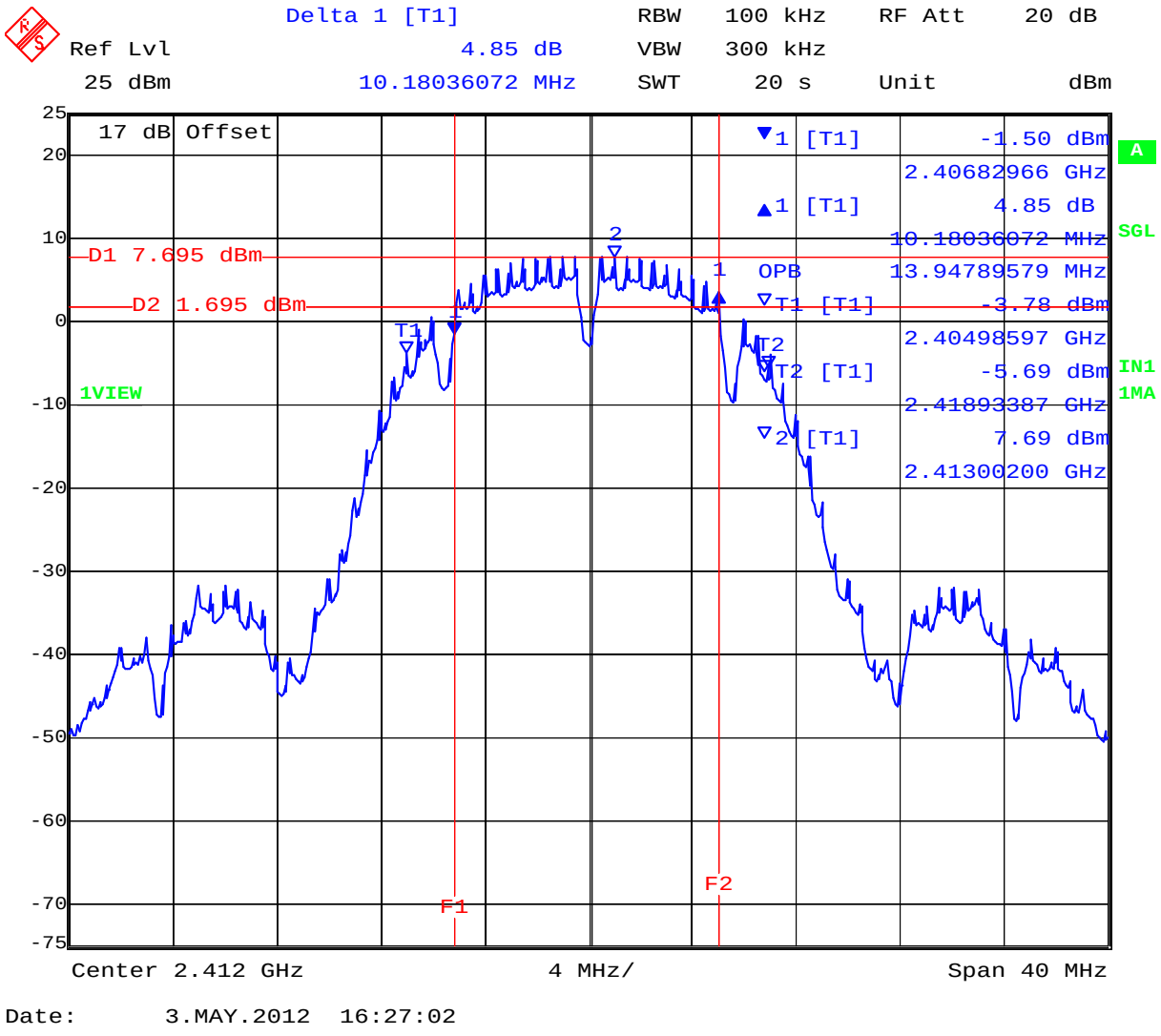
Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
2412.000	13.948	13.948	--	--			
2437.000	14.108	14.188	--	--			
2462.000	14.188	14.188	--	--			

Measurement uncertainty:	±2.81 dB

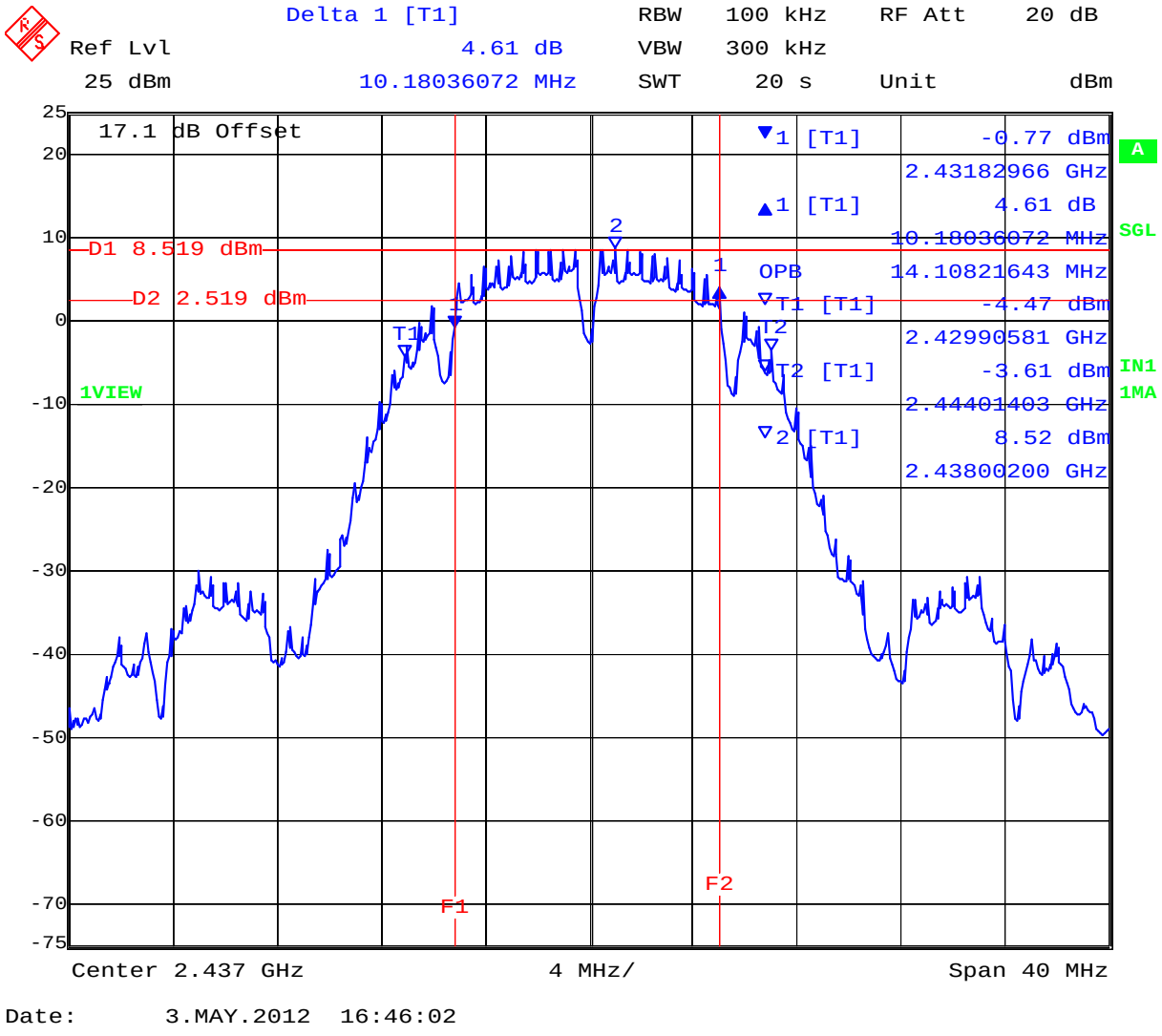
PORT A 2,412 MHz 802.11b Legacy 6 dB and 99% Bandwidth



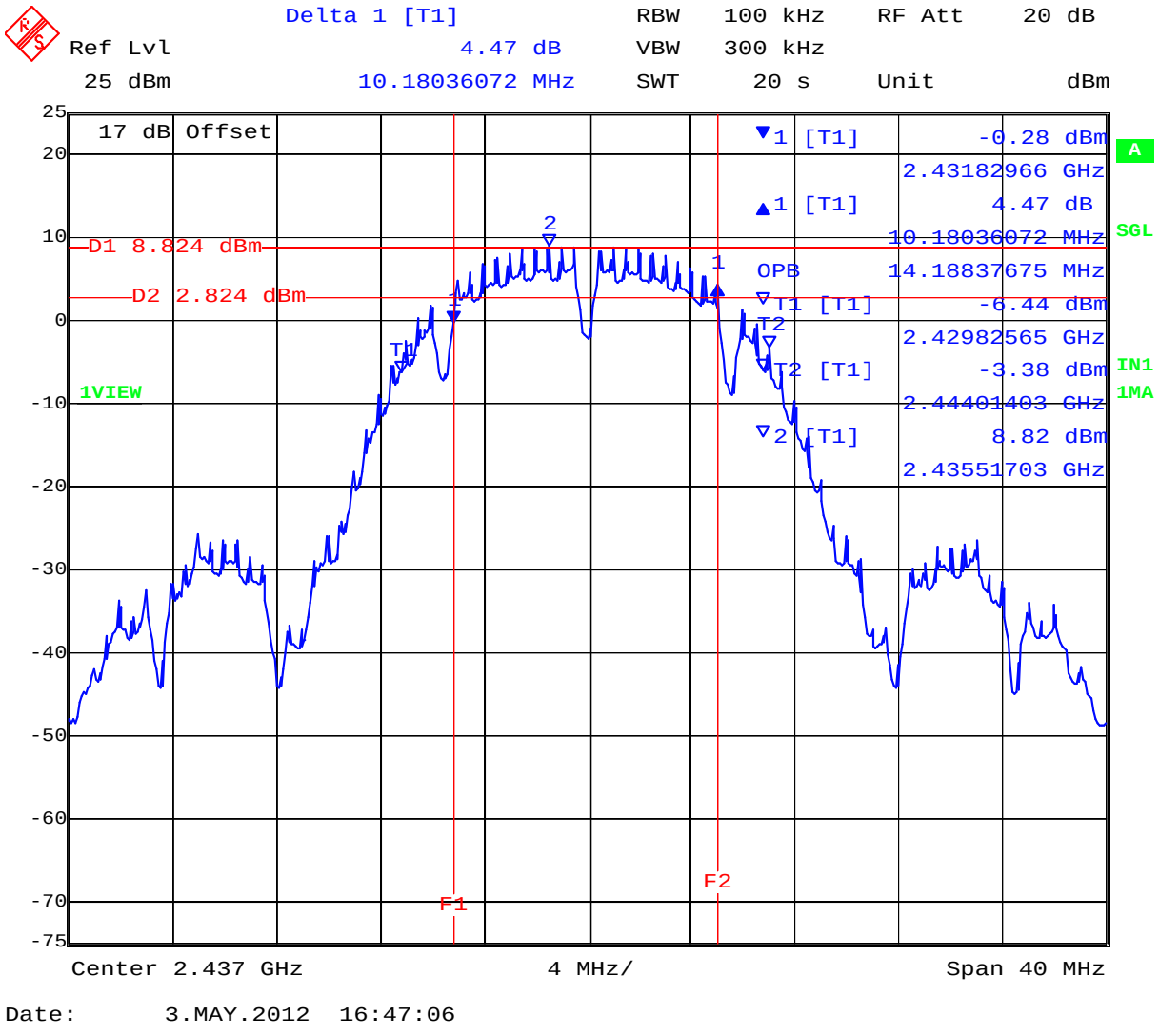
PORT B 2,412 MHz 802.11b Legacy 6 dB and 99% Bandwidth



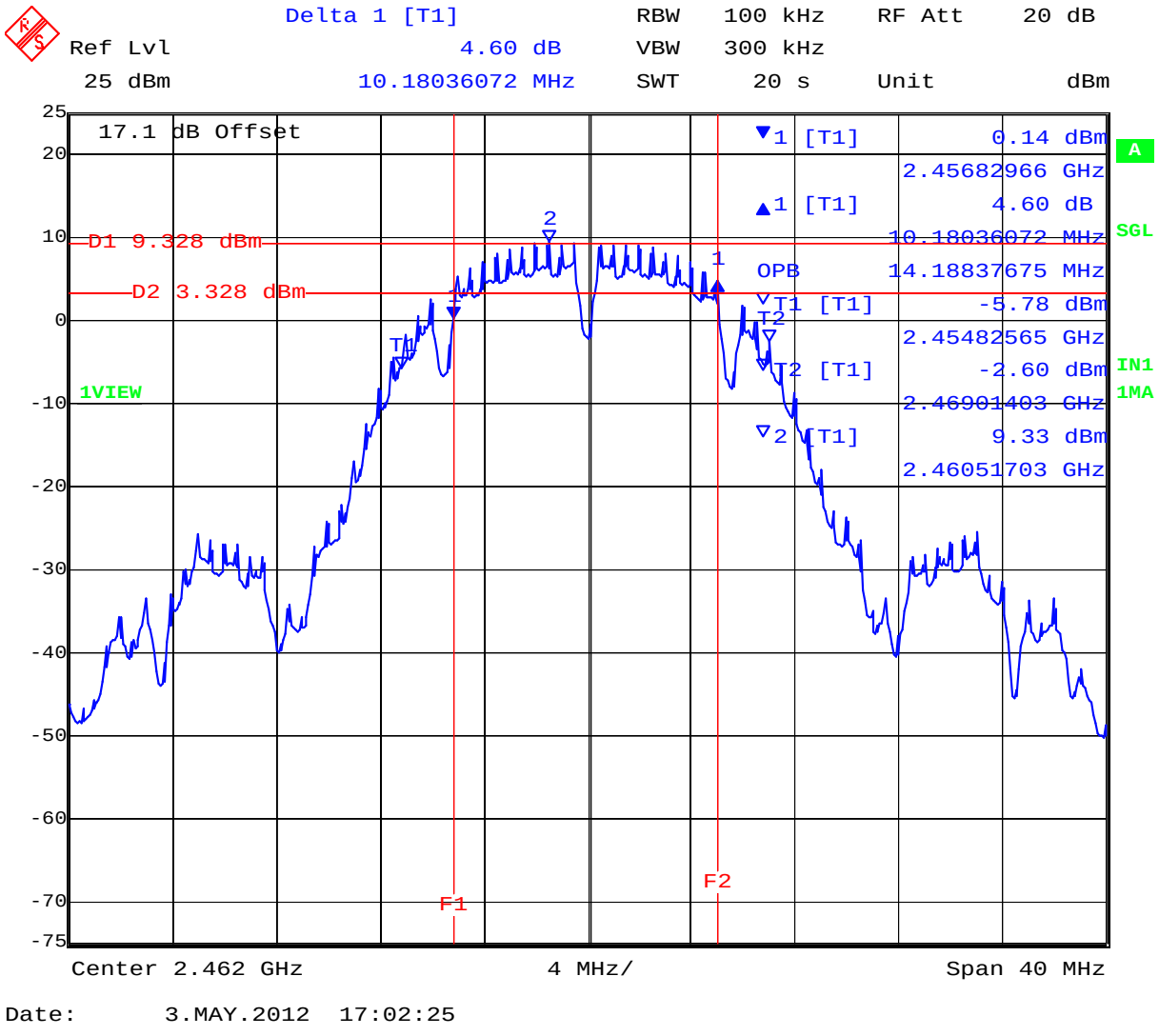
PORT A 2,437 MHz 802.11b Legacy 6 dB and 99% Bandwidth



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



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



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

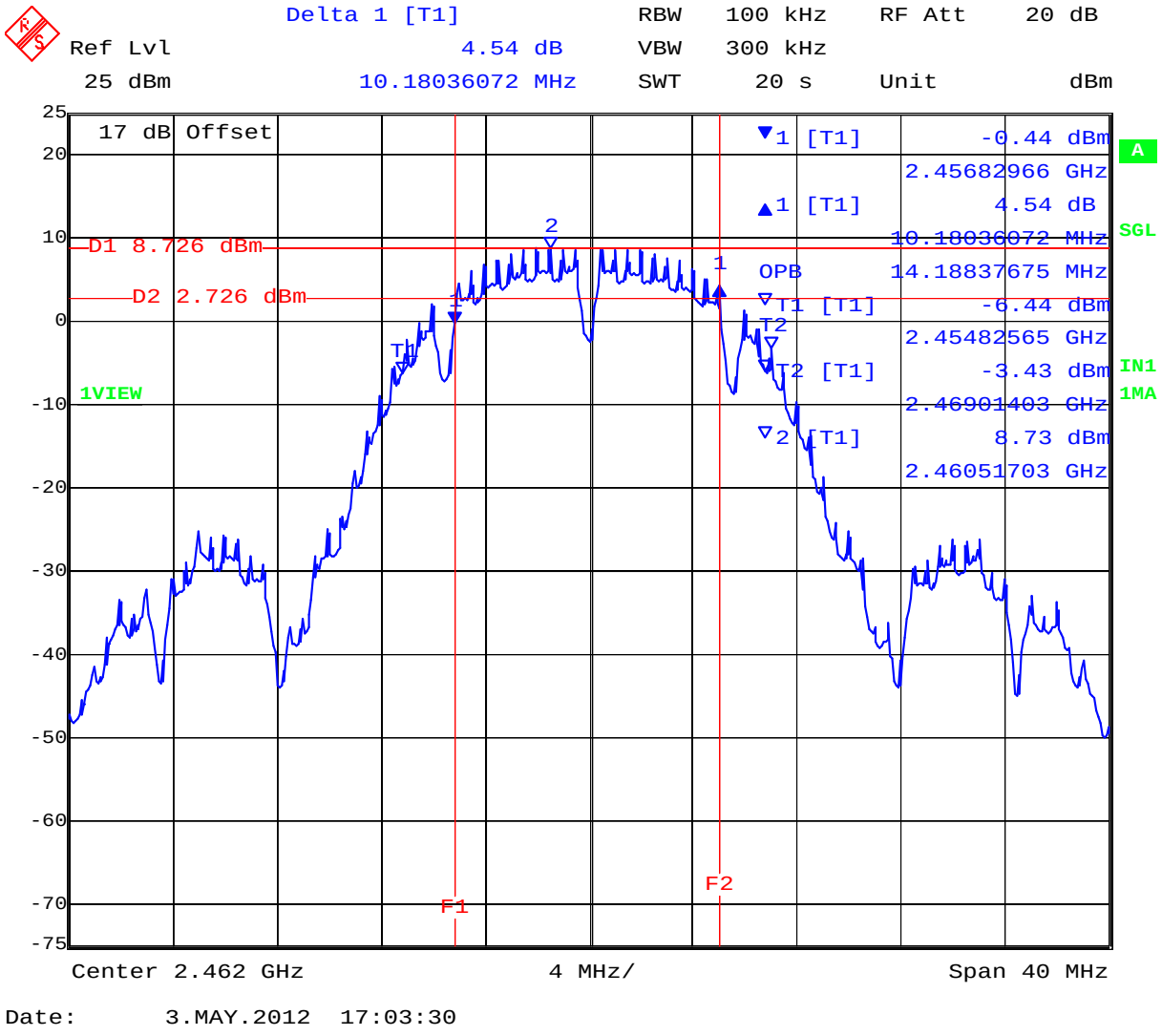


TABLE OF RESULTS – **802.11g Legacy**

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

6 dB Bandwidth

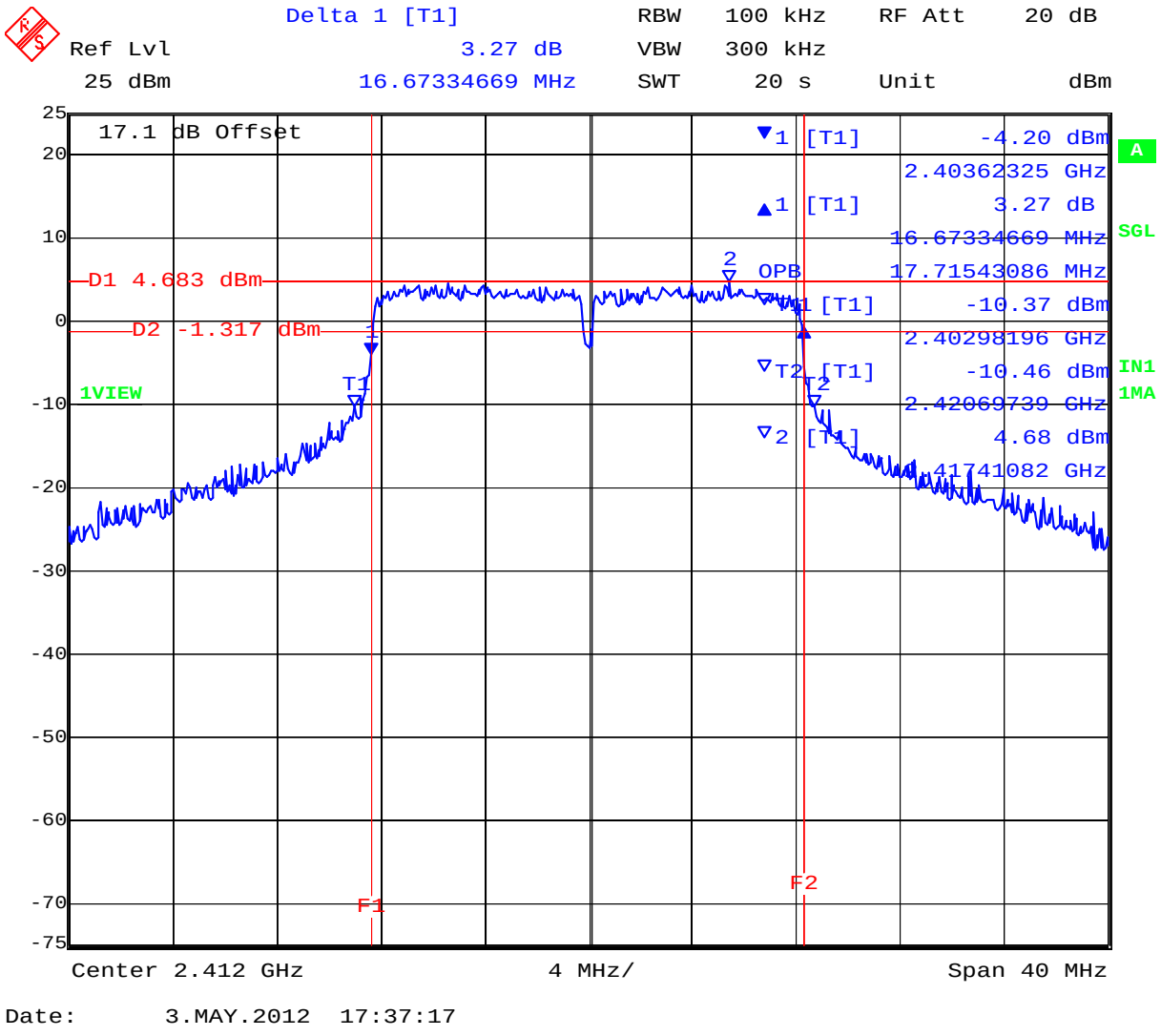
Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	a	b	c	d	kHz	MHz	MHz
2412.000	16.673	16.593	--	--	500	0.5	-16.093
2437.000	16.673	16.593	--	--			-16.093
2462.000	16.593	16.593	--	--			-16.093

99% Bandwidth

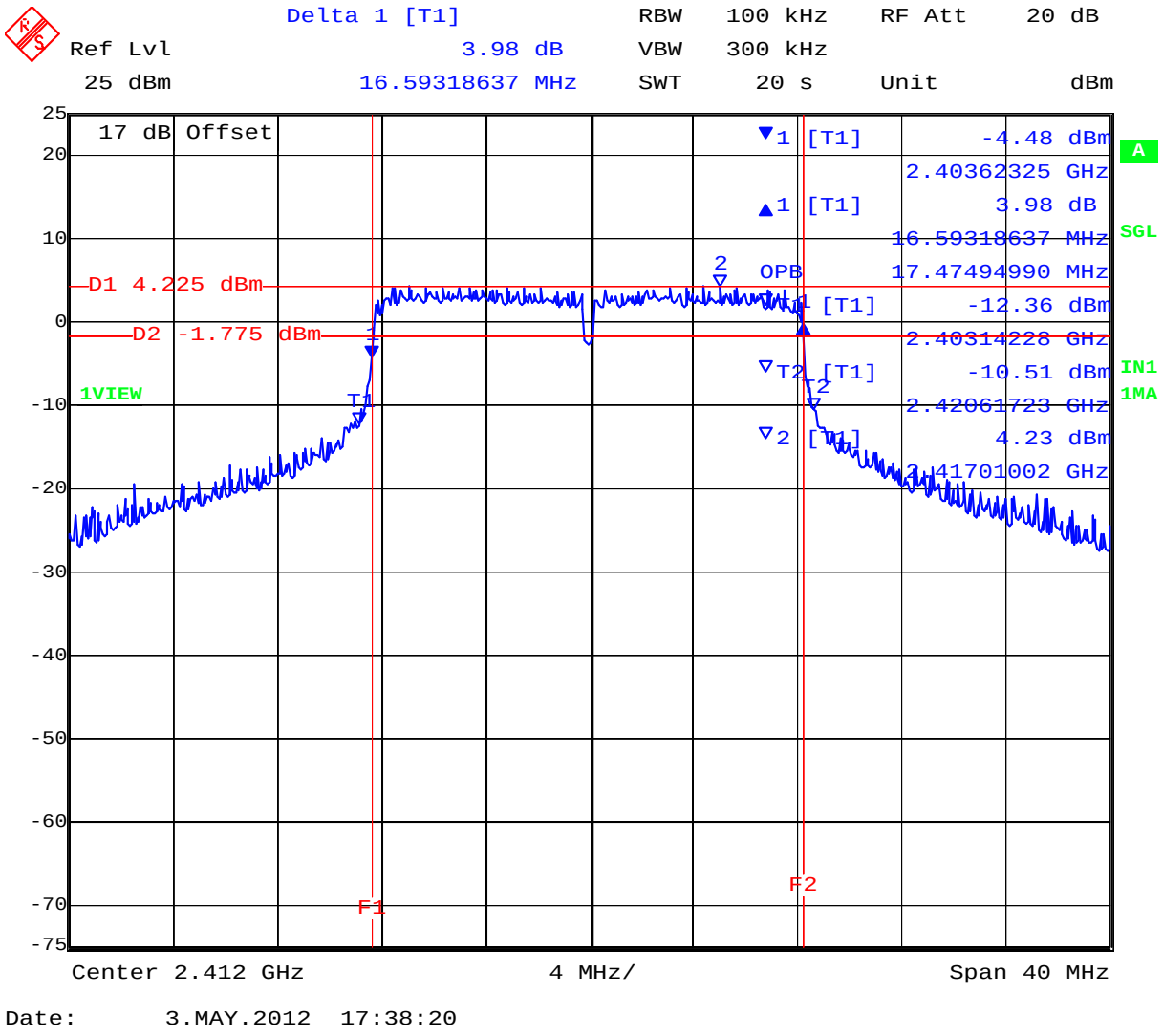
Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
2412.000	17.715	17.475	--	--			
2437.000	17.635	17.876	--	--			
2462.000	18.517	17.956	--	--			

Measurement uncertainty:	±2.81 dB

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

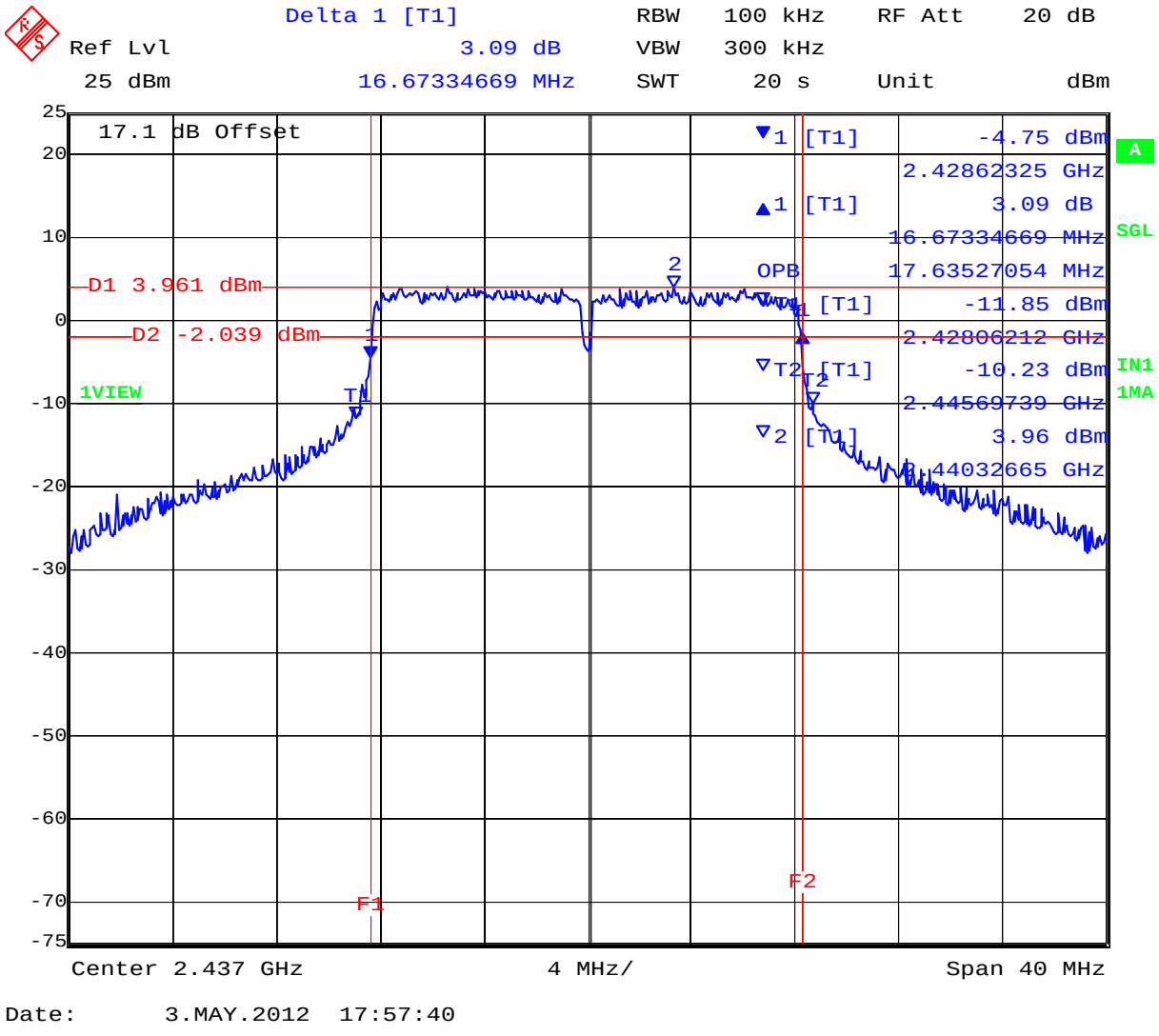


PORT B 2,412 MHz 802.11g Legacy 6 dB and 99% Bandwidth

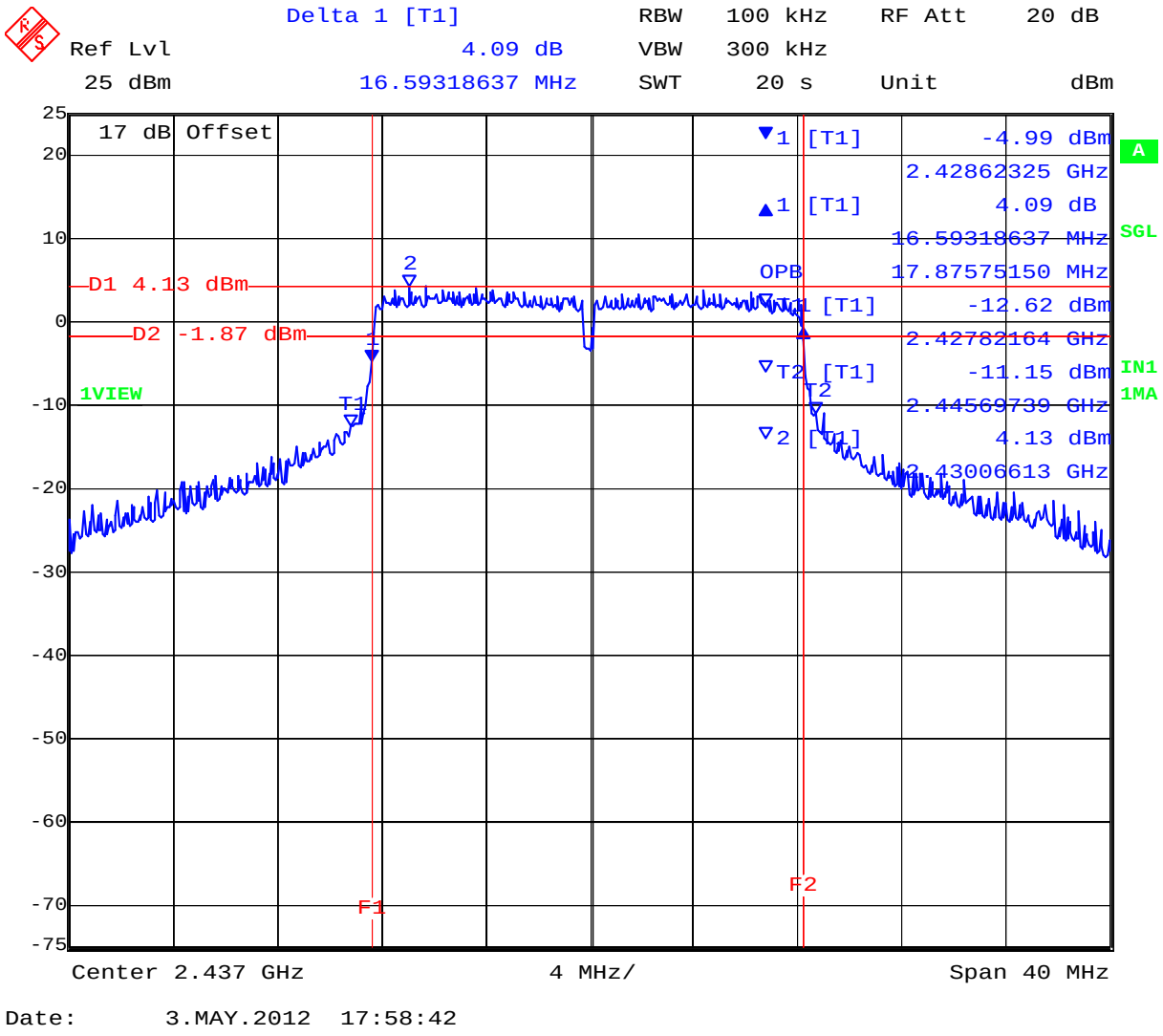


Date: 3.MAY.2012 17:38:20

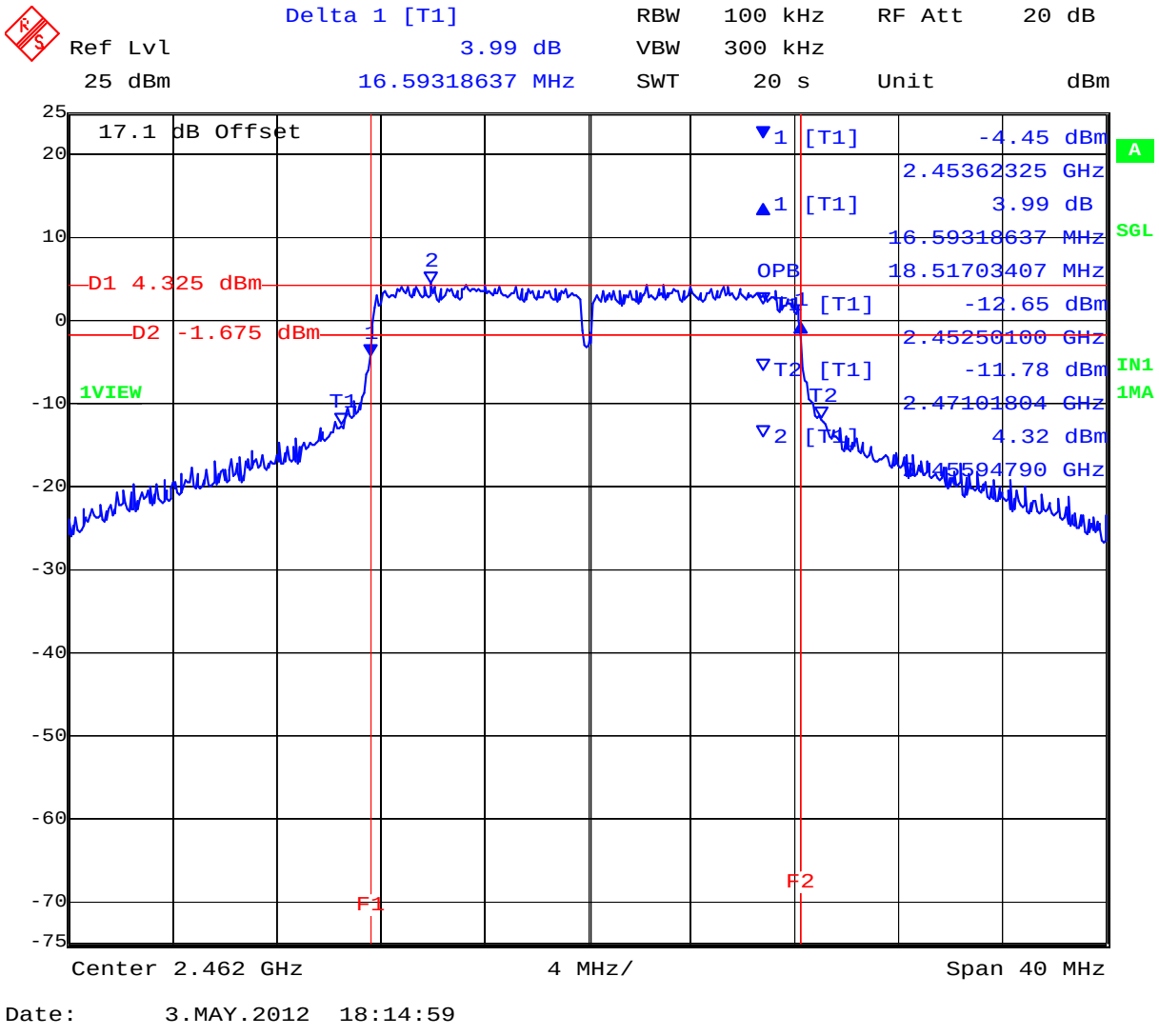
PORT A 2,437 MHz 802.11g Legacy 6 dB and 99% Bandwidth



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



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



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

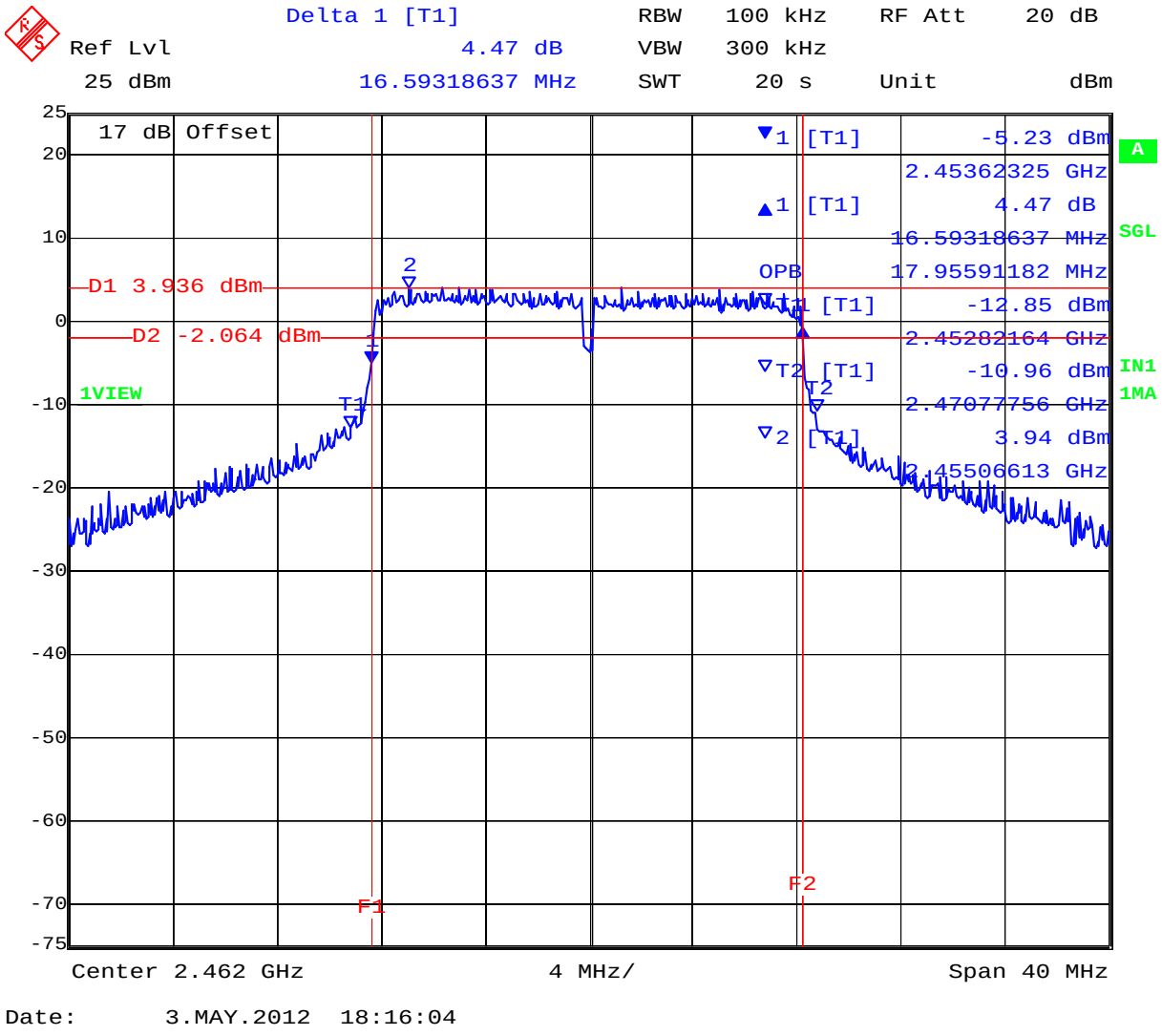


TABLE OF RESULTS – **802.11n HT-20 Legacy**

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

6 dB Bandwidth

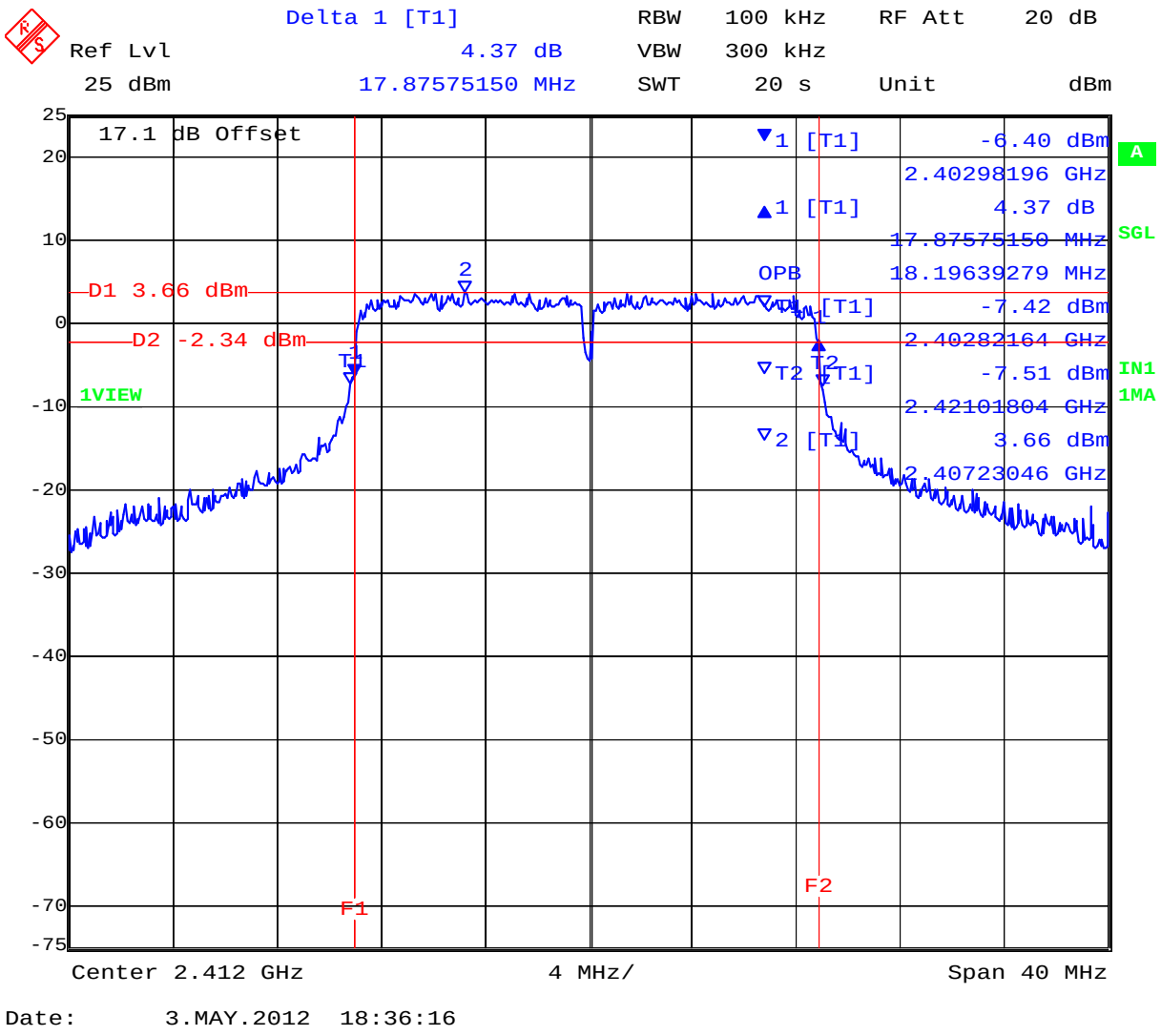
Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	a	b	c	d	kHz	MHz	MHz
2412.000	17.876	17.876	--	--	500	0.5	-17.376
2437.000	17.876	17.876	--	--			-17.376
2462.000	17.876	17.796	--	--			-17.296

99% Bandwidth

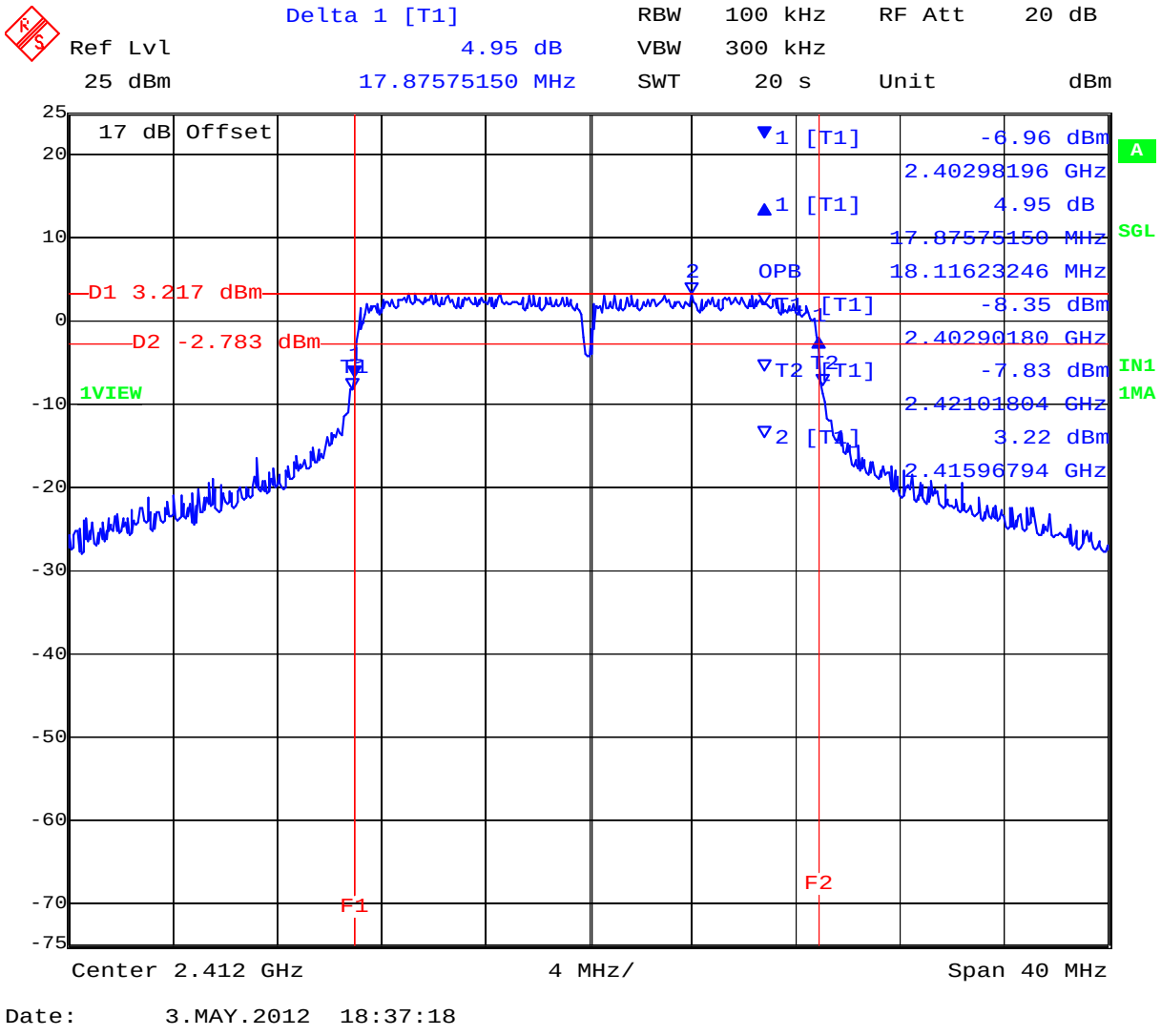
Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
2412.000	18.196	18.116	--	--			
2437.000	18.196	18.196	--	--			
2462.000	18.677	18.277	--	--			

Measurement uncertainty:	±2.81 dB

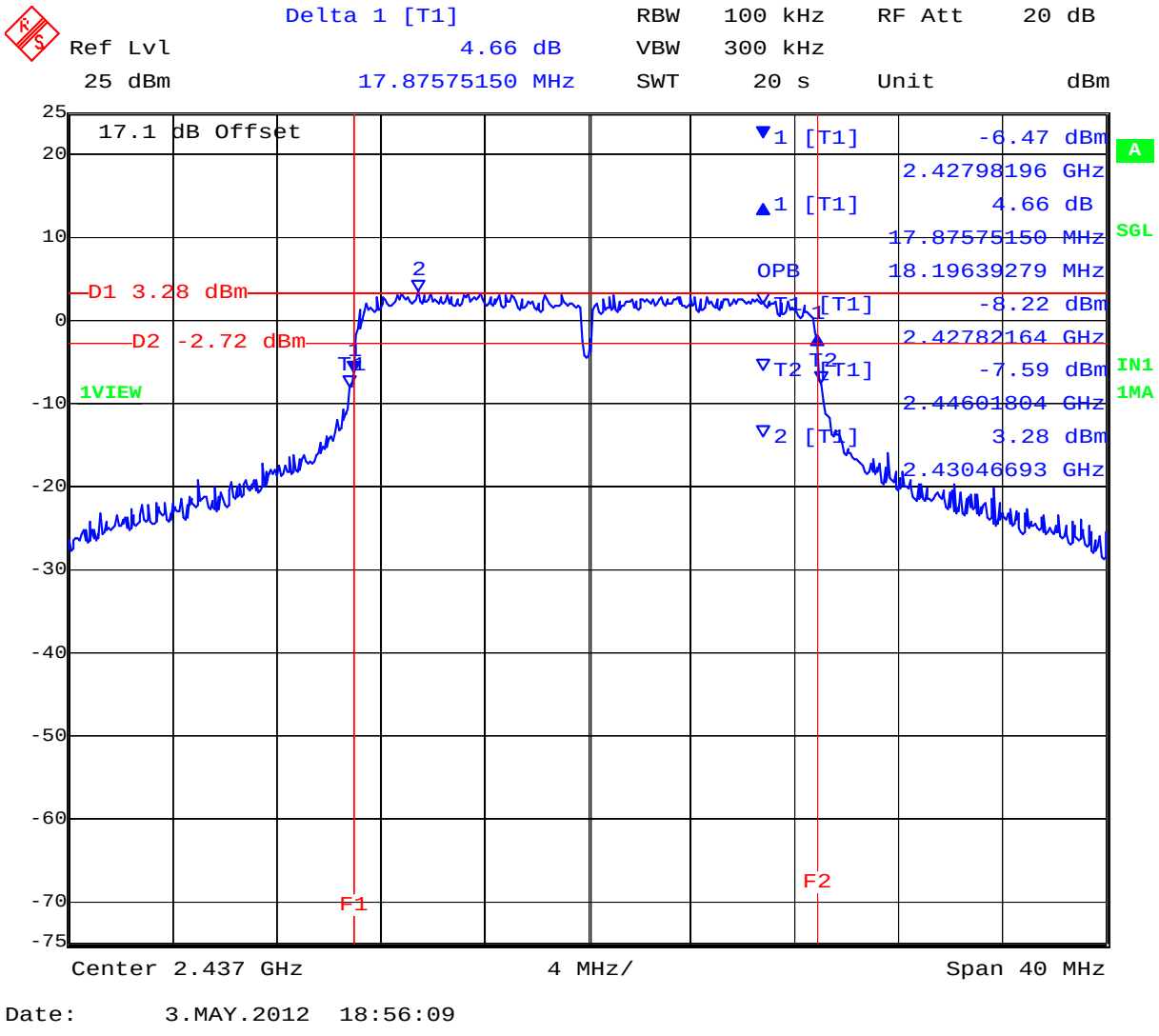
PORT A 2,412 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



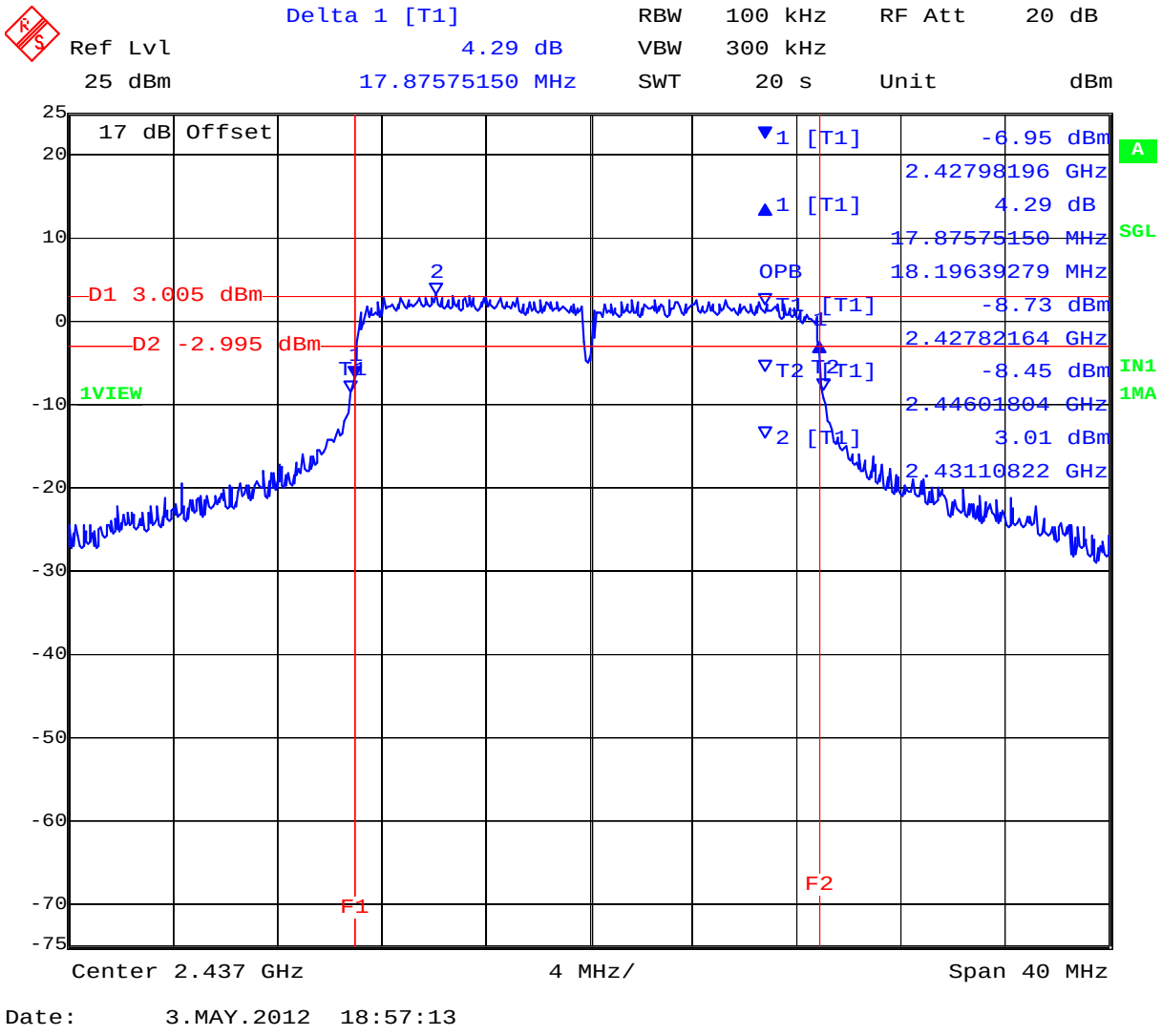
PORT B 2,412 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



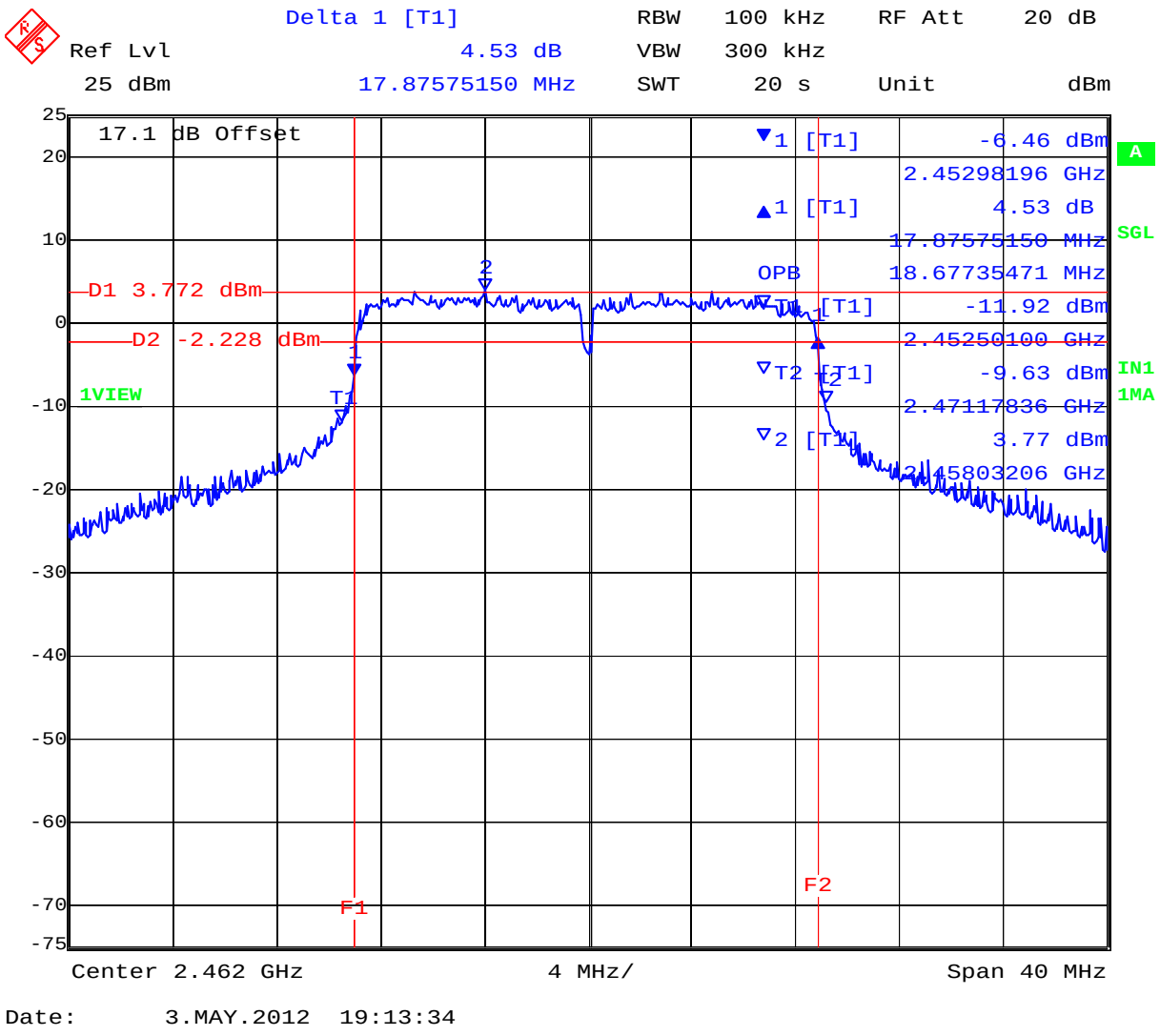
PORT A 2,437 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



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



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



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

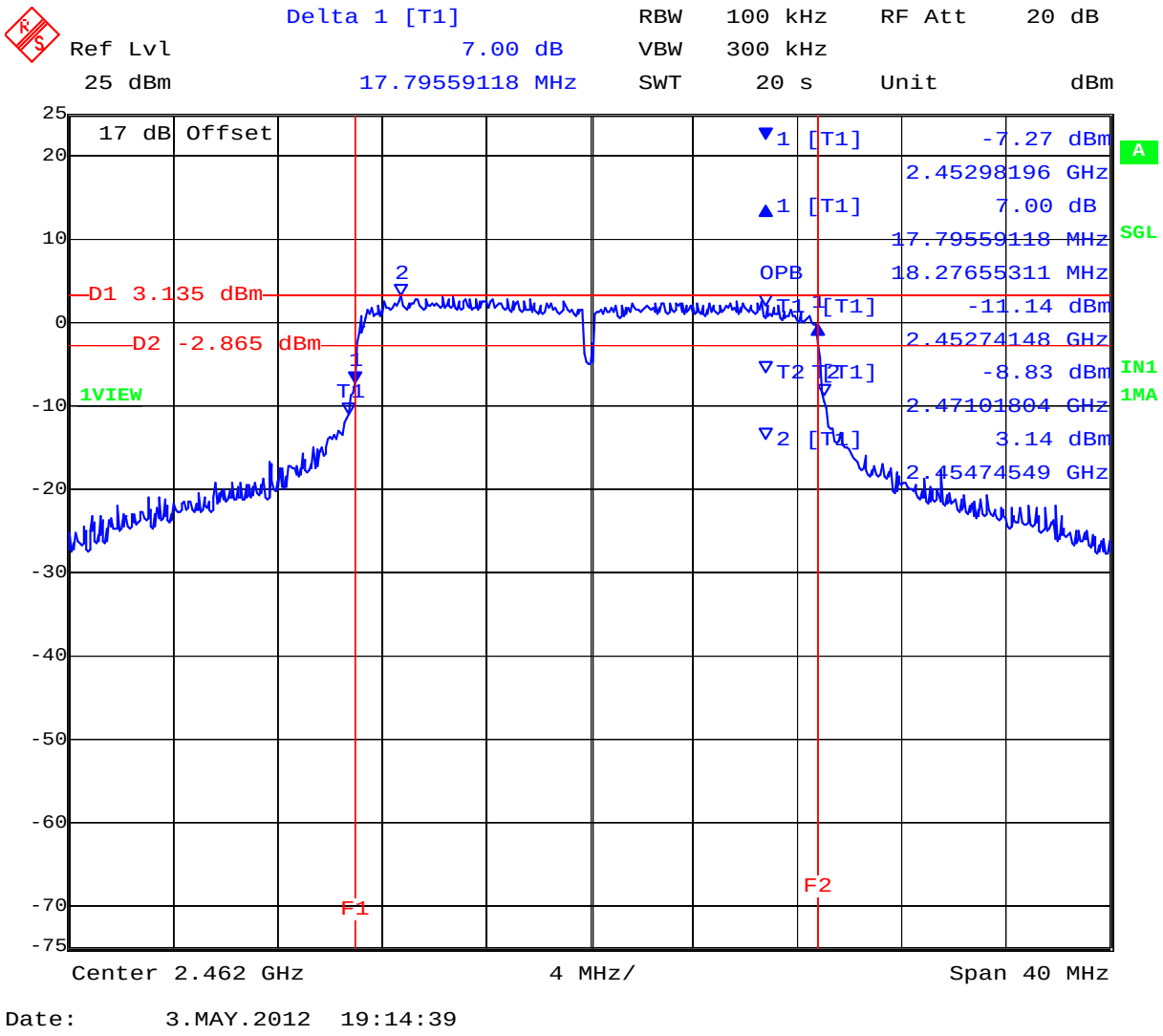


TABLE OF RESULTS – **802.11n HT-40 Legacy**

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

6 dB Bandwidth

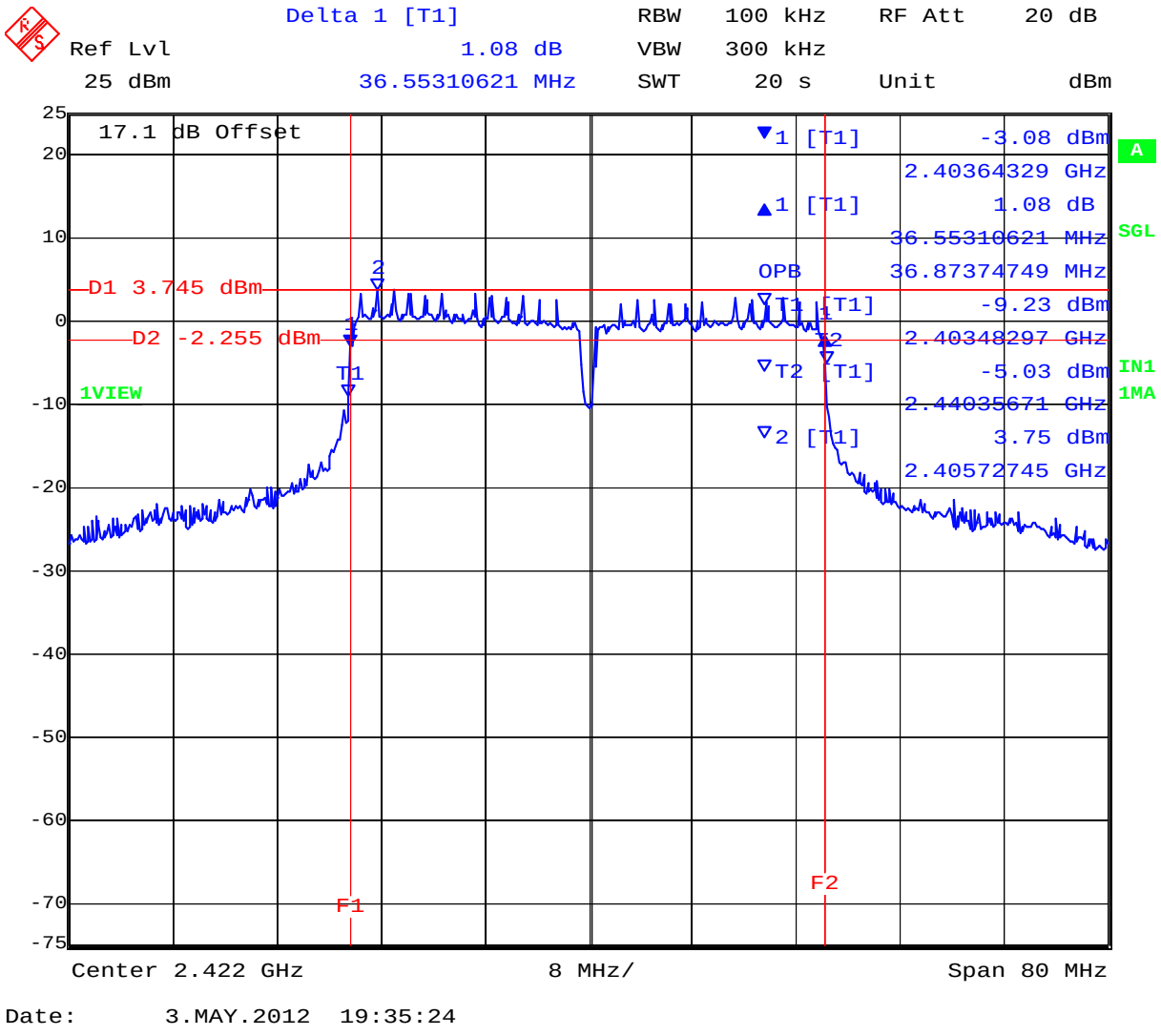
Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
2422.000	36.553	36.553	--	--	500	0.5	-36.053
2437.000	36.553	36.553	--	--			-36.053
2452.000	36.553	36.553	--	--			-36.053

99% Bandwidth

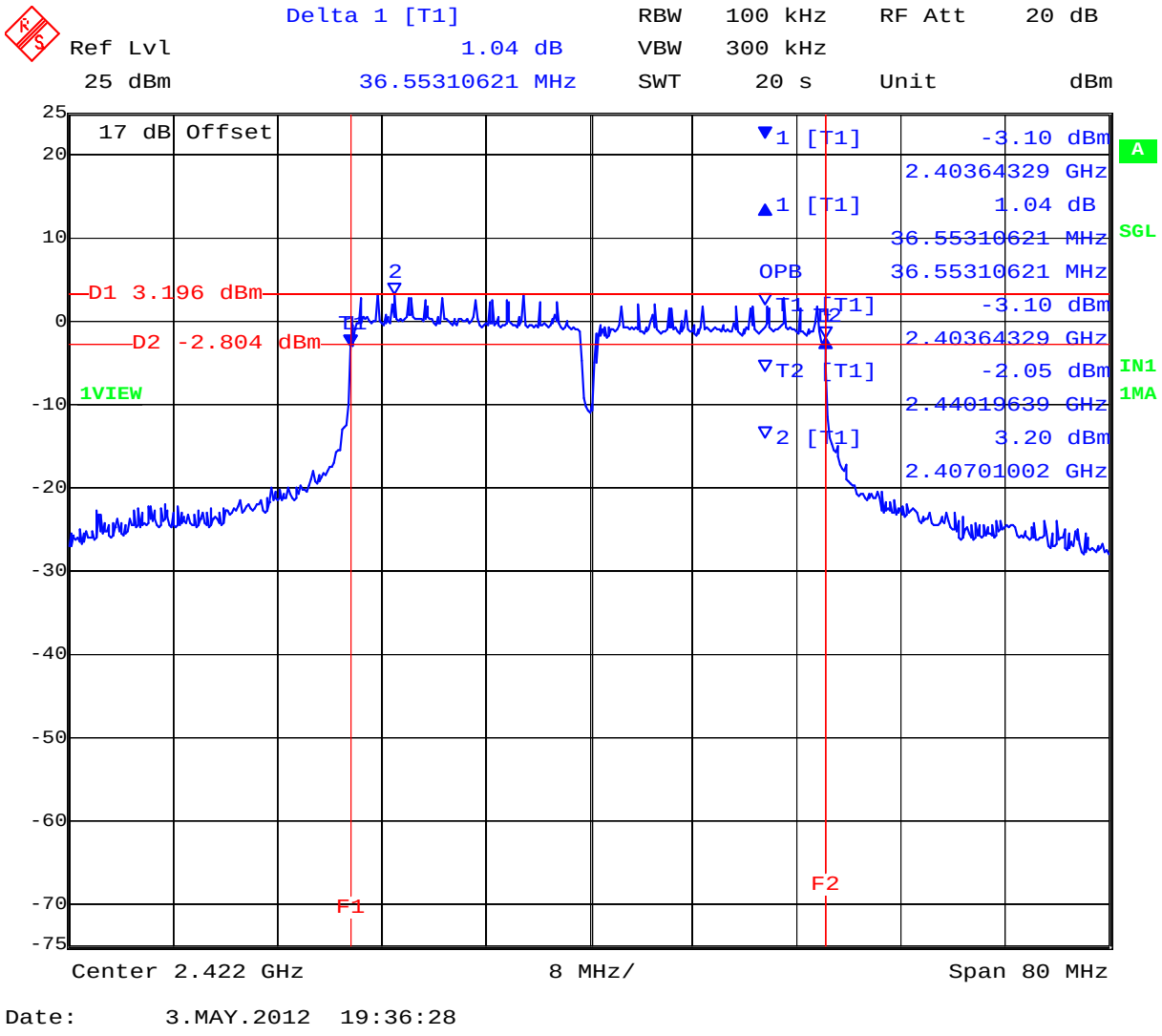
Test Frequency	99 % Bandwidth						
	MHz						
MHz	**a**	**b**	**c**	**d**			
2422.000	36.874	36.553	--	--			
2437.000	36.874	36.713	--	--			
2452.000	36.874	36.874	--	--			

Measurement uncertainty:	±2.81 dB

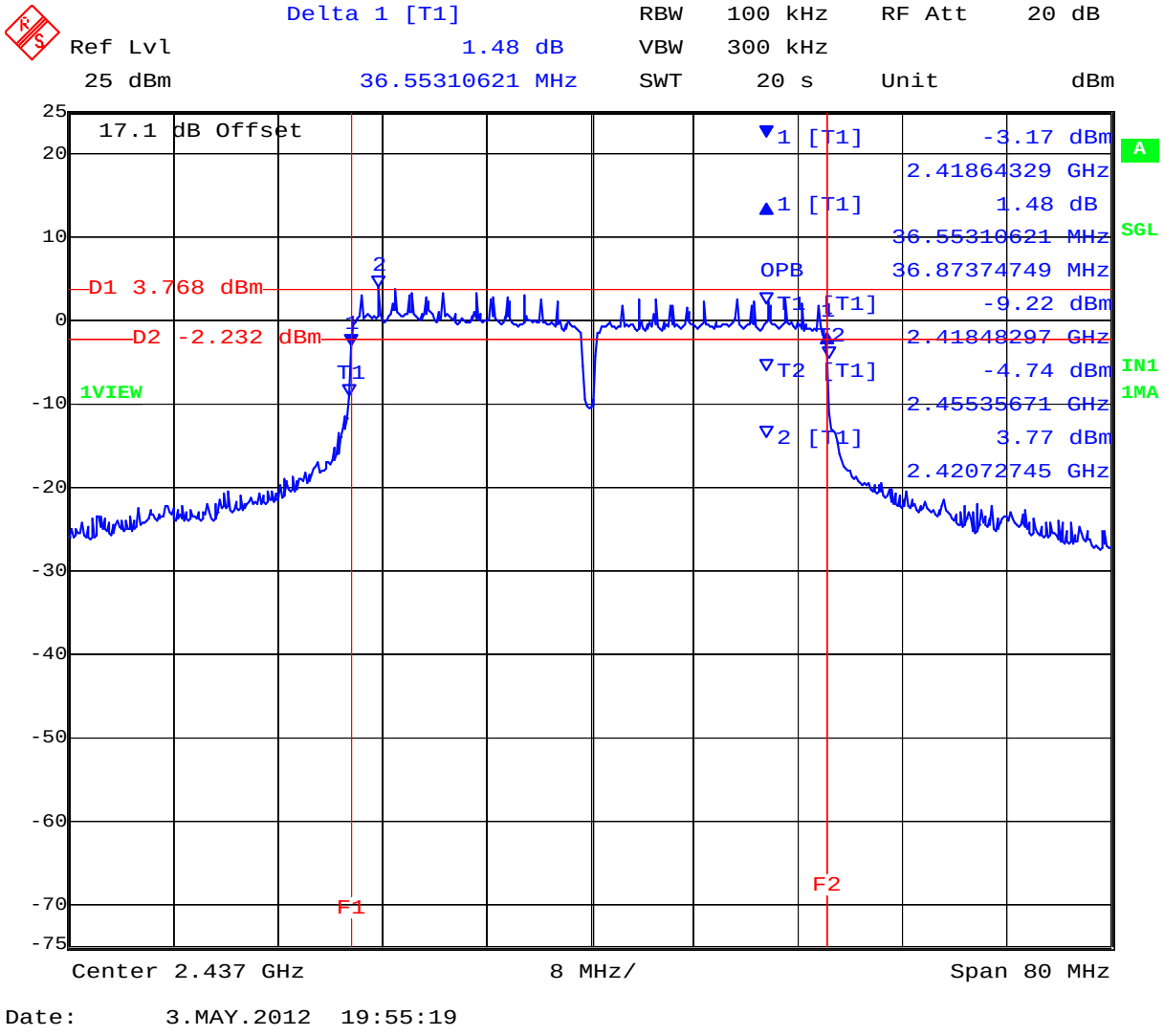
PORT A 2,422 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth



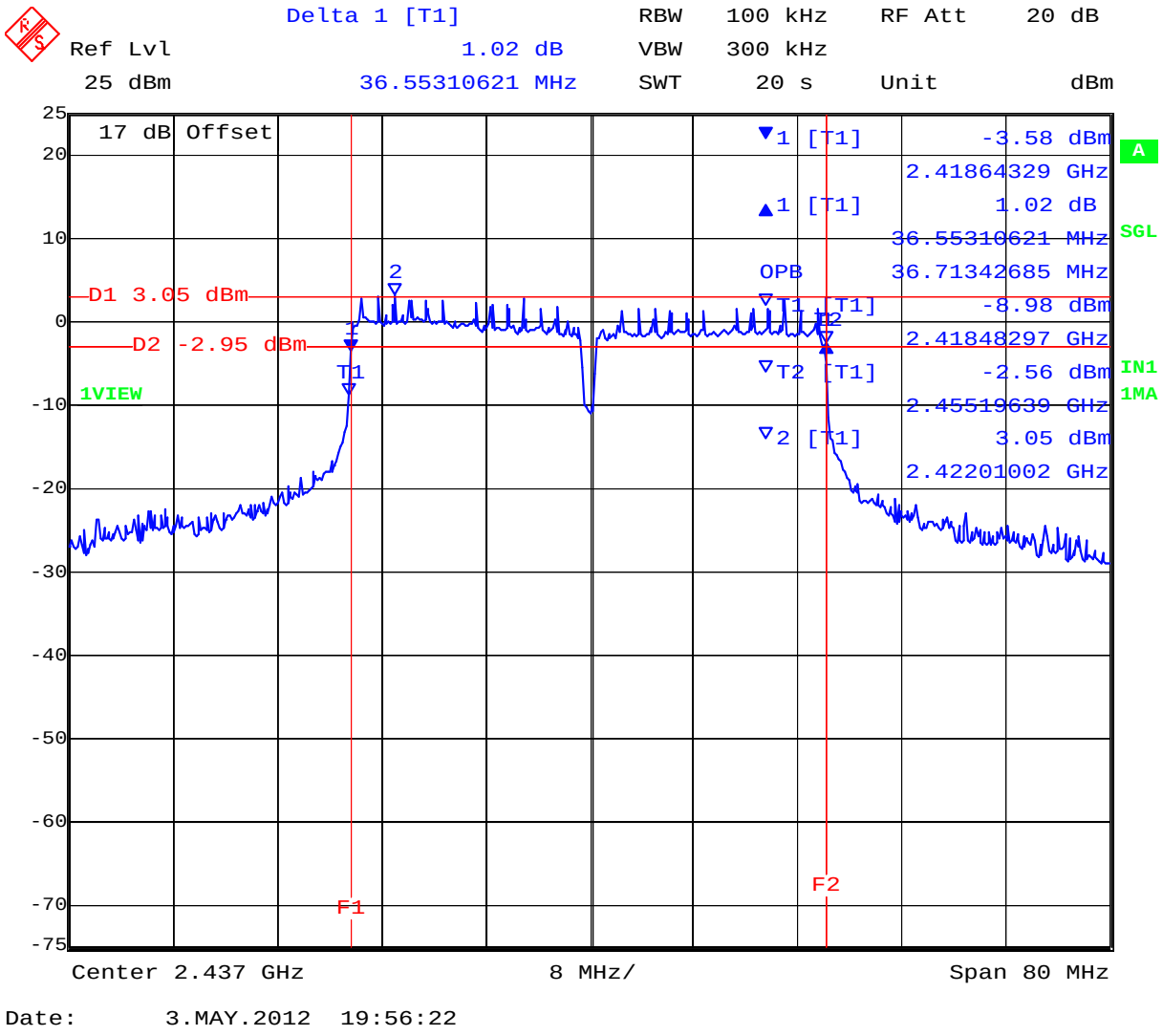
PORT B 2,422 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth



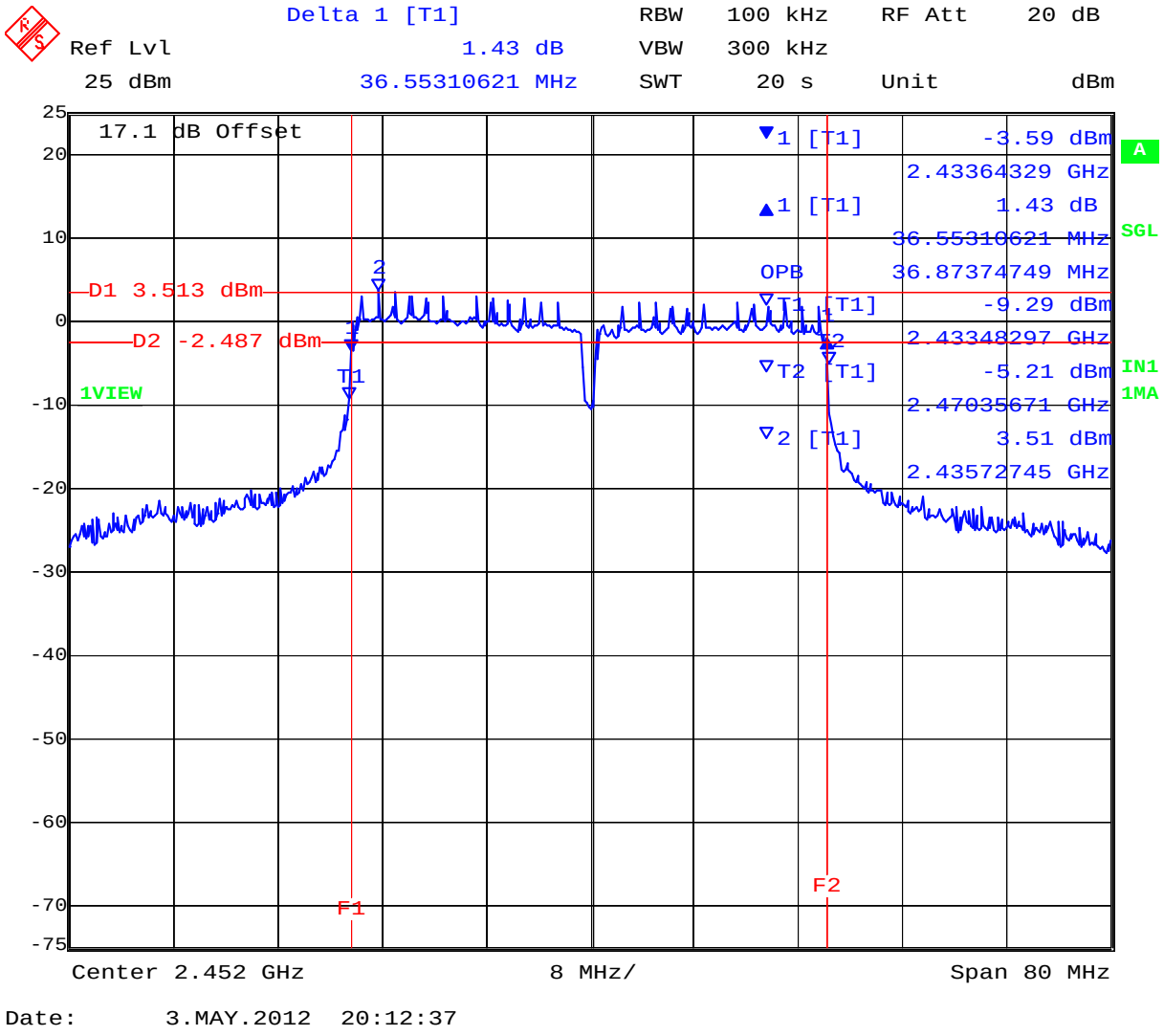
PORT A 2,437 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



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



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



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

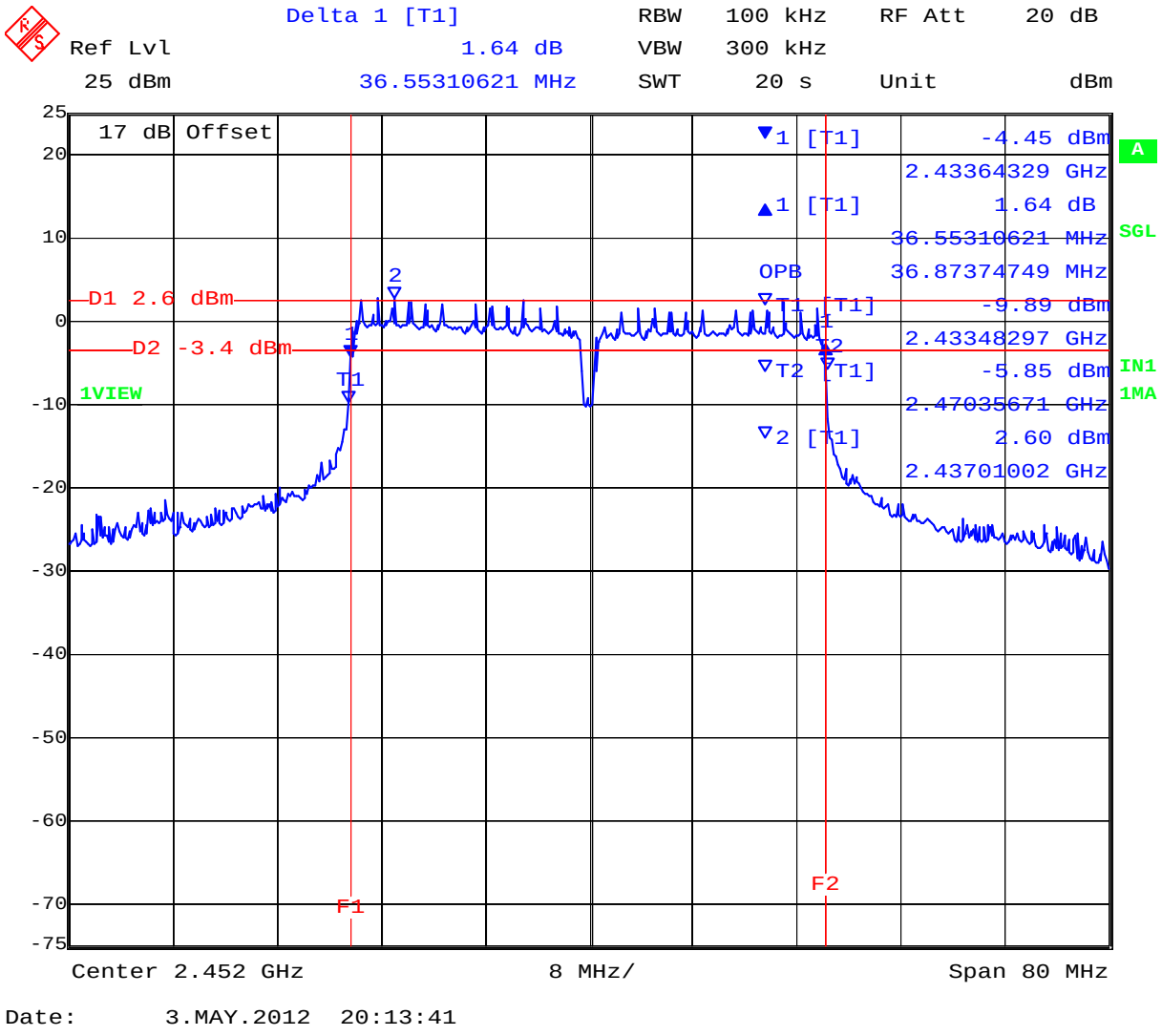


TABLE OF RESULTS – **802.11a - Legacy**

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

6 dB Bandwidth

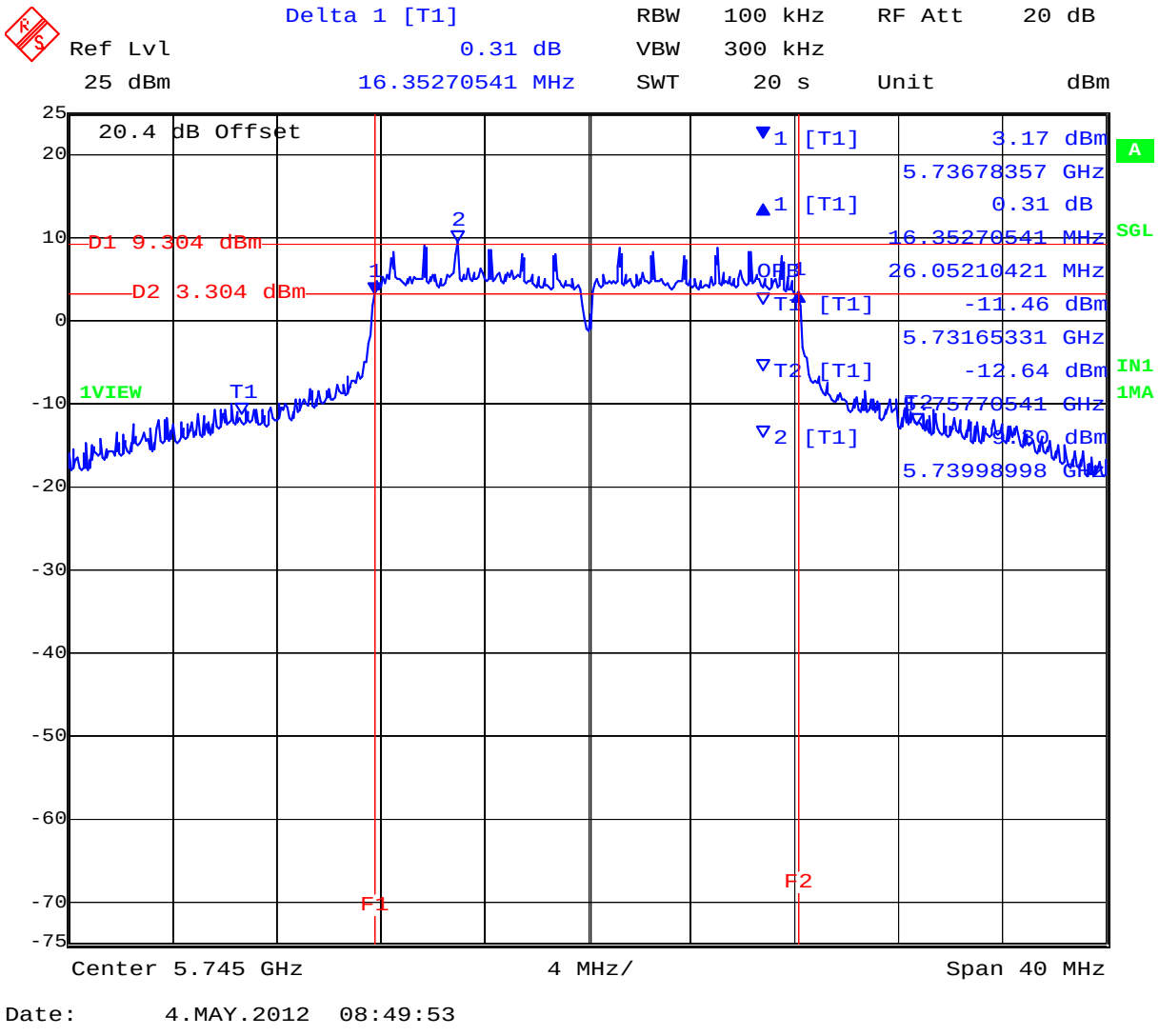
Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
5745.000	16.353	16.433	--	--	500	0.5	-15.853
5785.000	16.433	16.433	--	--			-15.933
5825.000	16.433	16.433	--	--			-15.933

99% Bandwidth

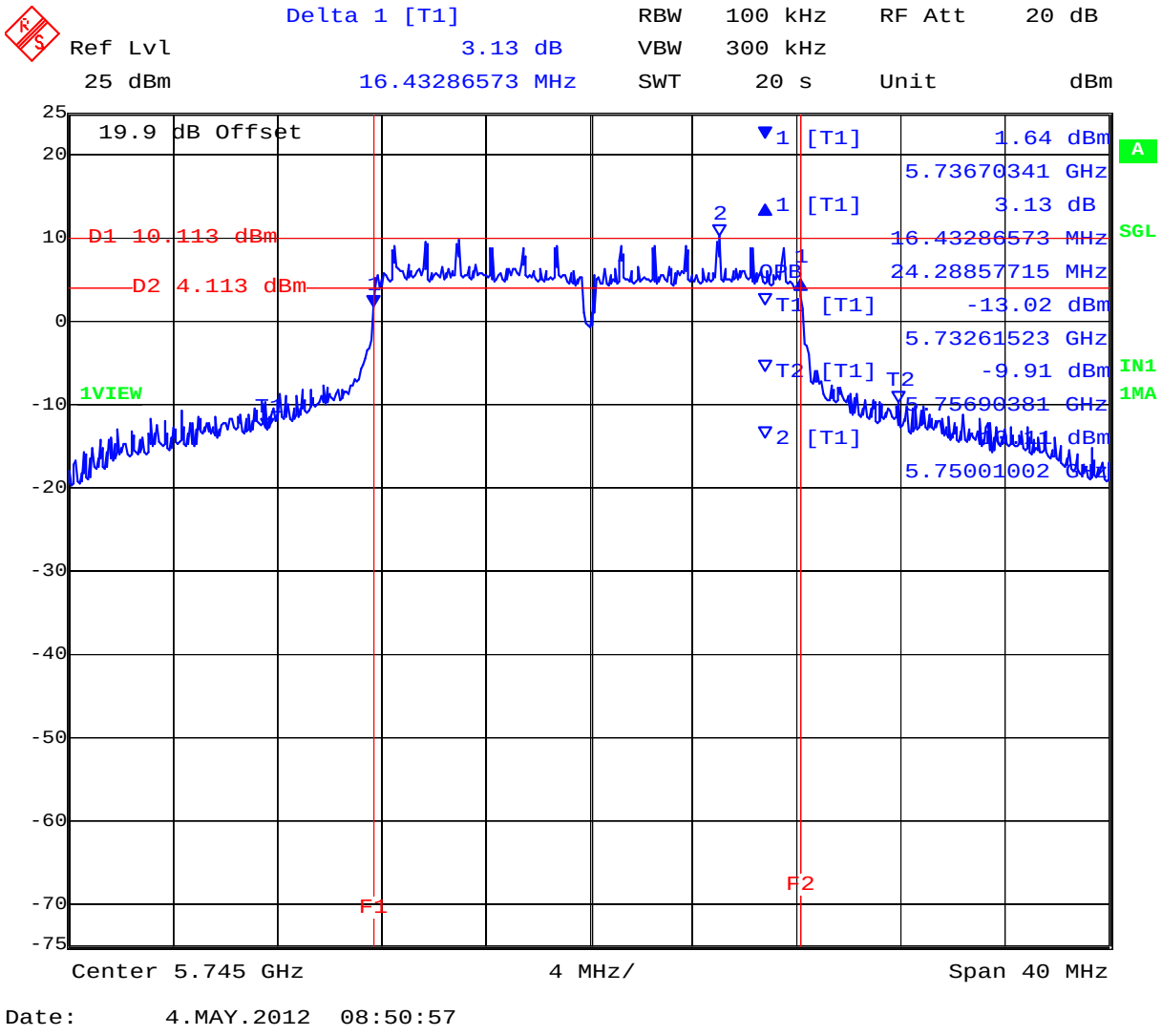
Test Frequency	99 % Bandwidth						
	MHz						
MHz	**a**	**b**	**c**	**d**			
5745.000	26.052	24.289	--	--			
5785.000	21.002	19.800	--	--			
5825.000	20.681	19.719	--	--			

Measurement uncertainty:	±2.81 dB

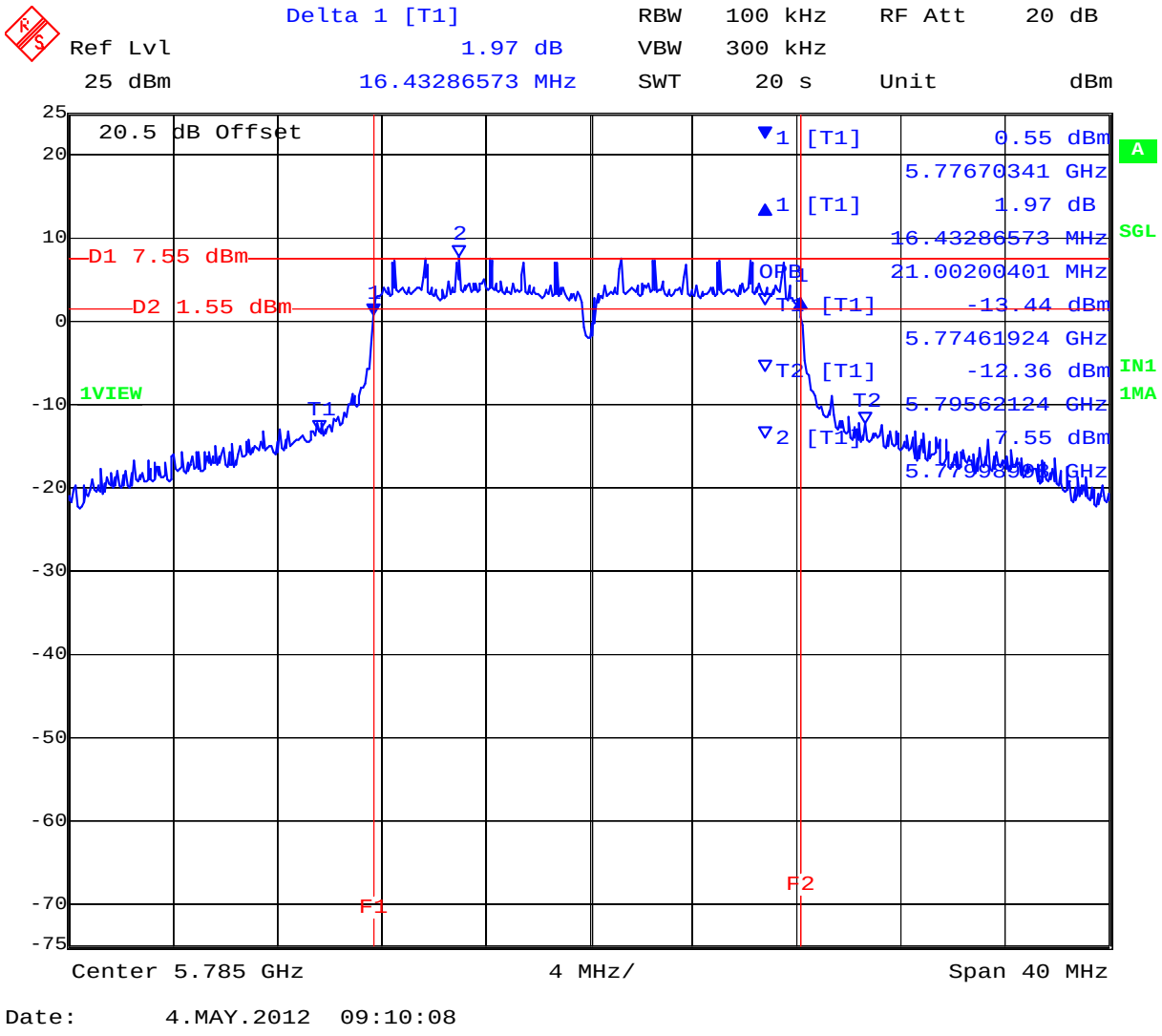
PORT A 5,745 MHz 802.11a Legacy 6 dB and 99% Bandwidth



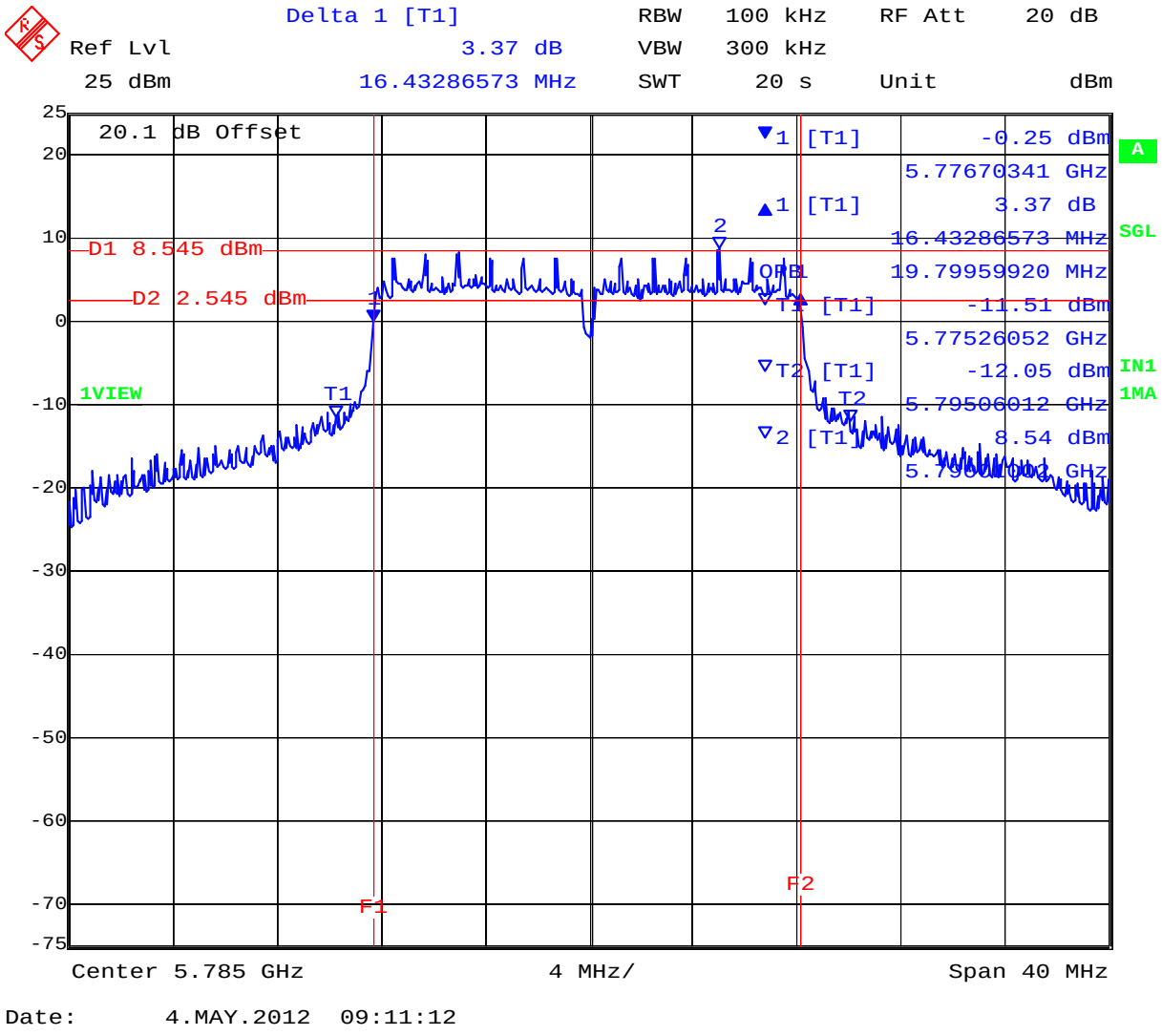
PORT B 5,745 MHz 802.11a Legacy 6 dB and 99% Bandwidth



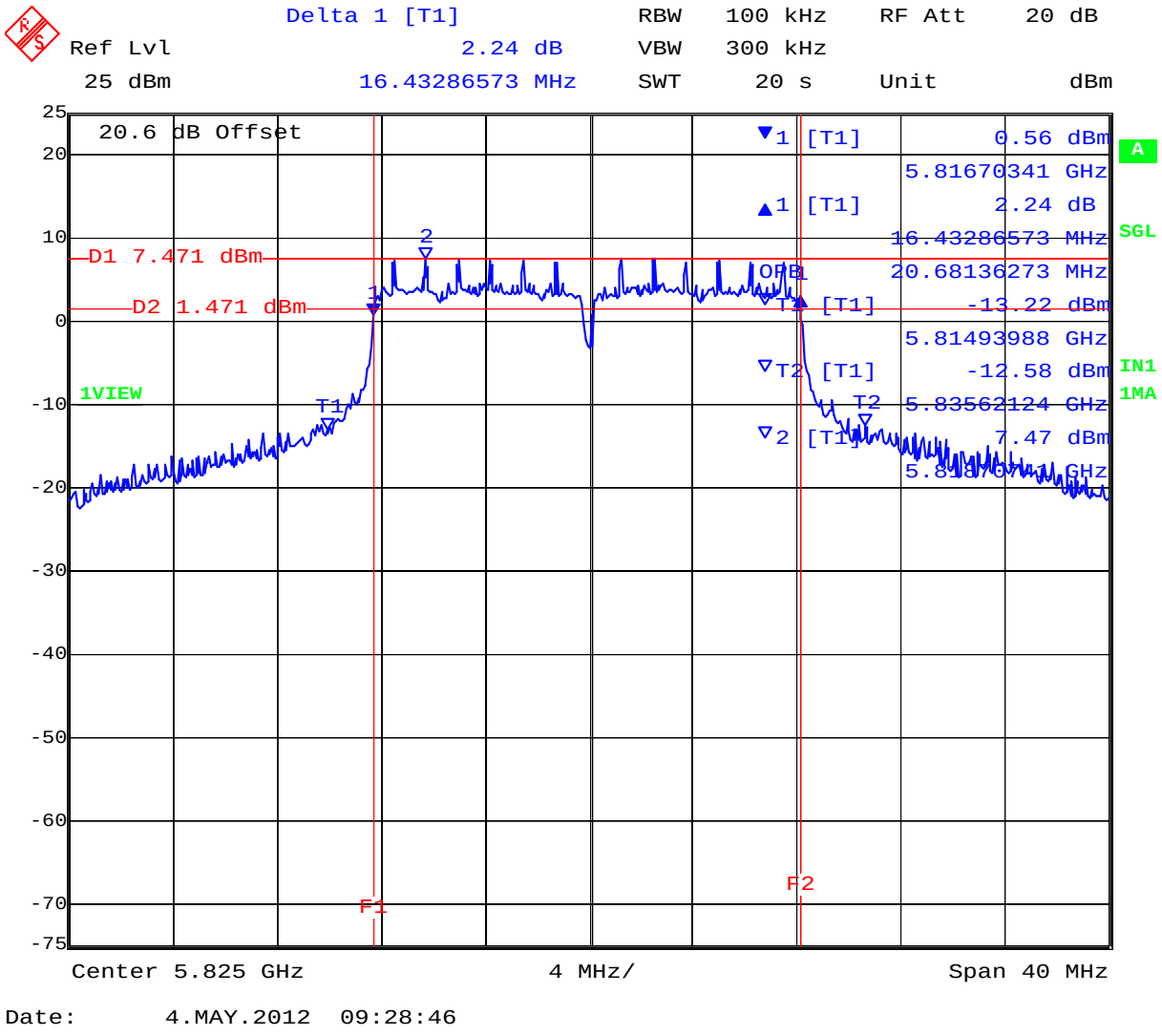
PORT A 5,785 MHz 802.11a Legacy 6 dB and 99% Bandwidth



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



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



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

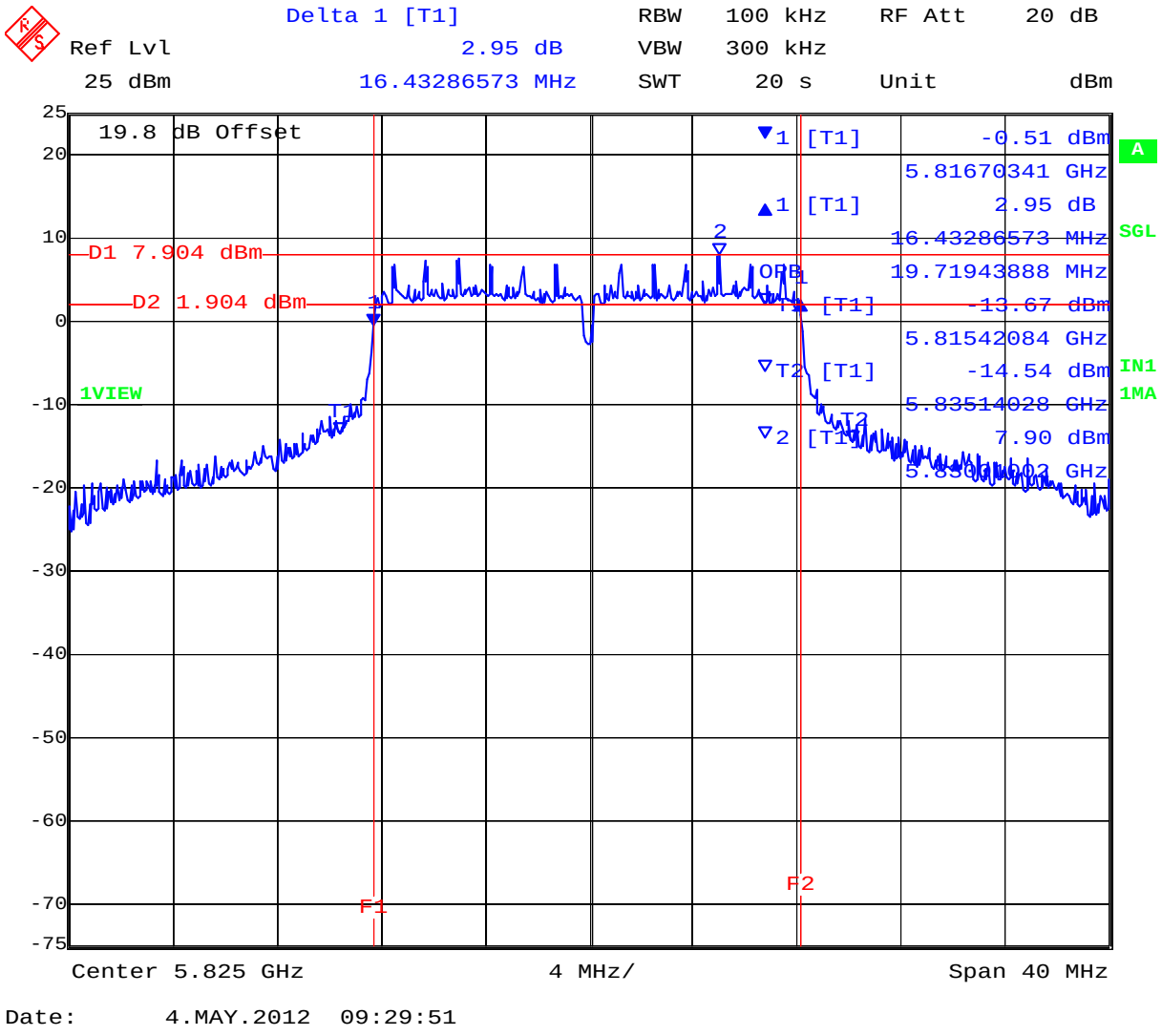


TABLE OF RESULTS – **802.11n HT-20**

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

6 dB Bandwidth

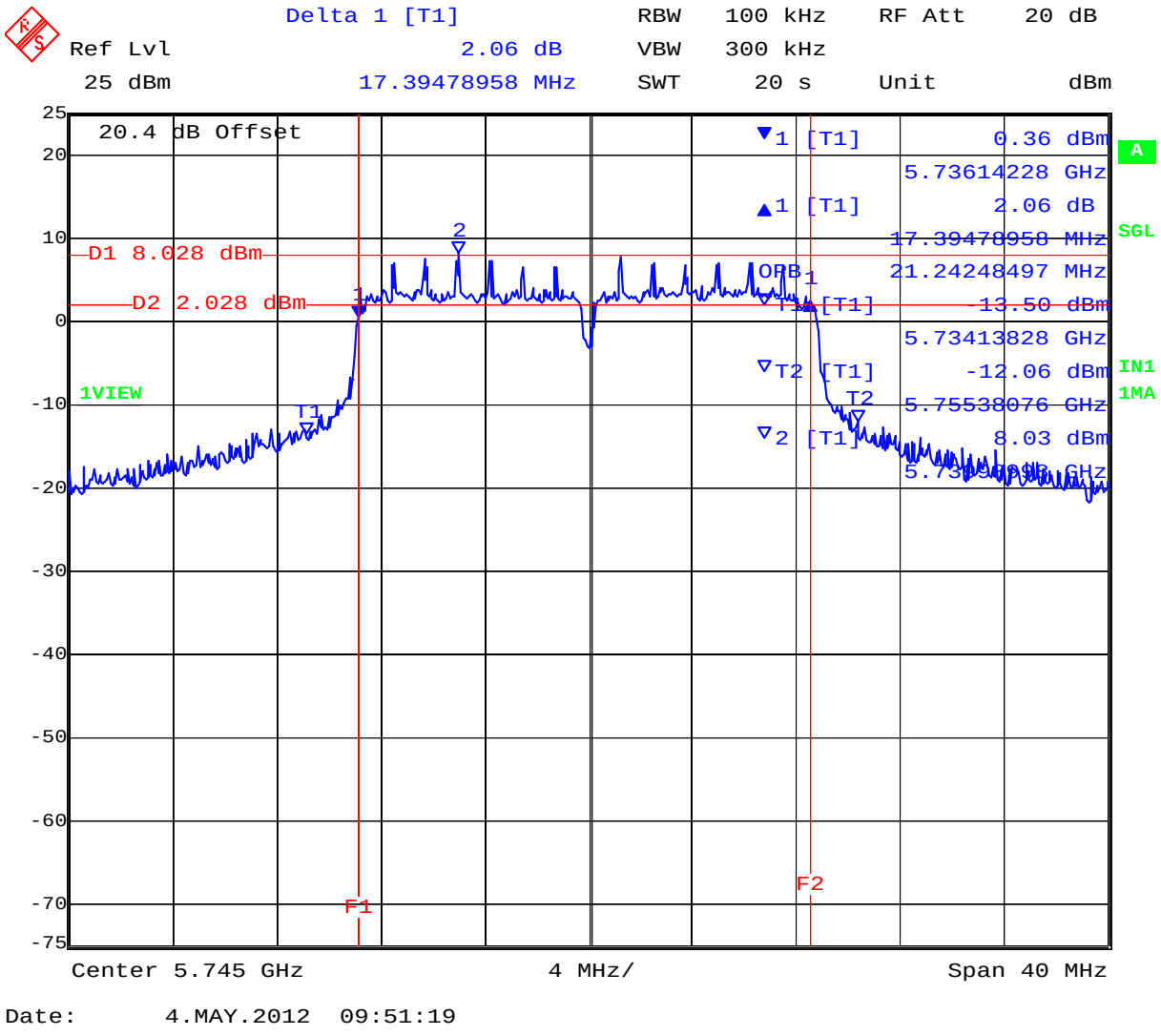
Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	a	b	c	d	kHz	MHz	MHz
5745.000	17.395	17.395	--	--	500	0.5	-16.895
5785.000	17.395	17.635	--	--			-16.895
5825.000	17.635	17.395	--	--			-16.895

99% Bandwidth

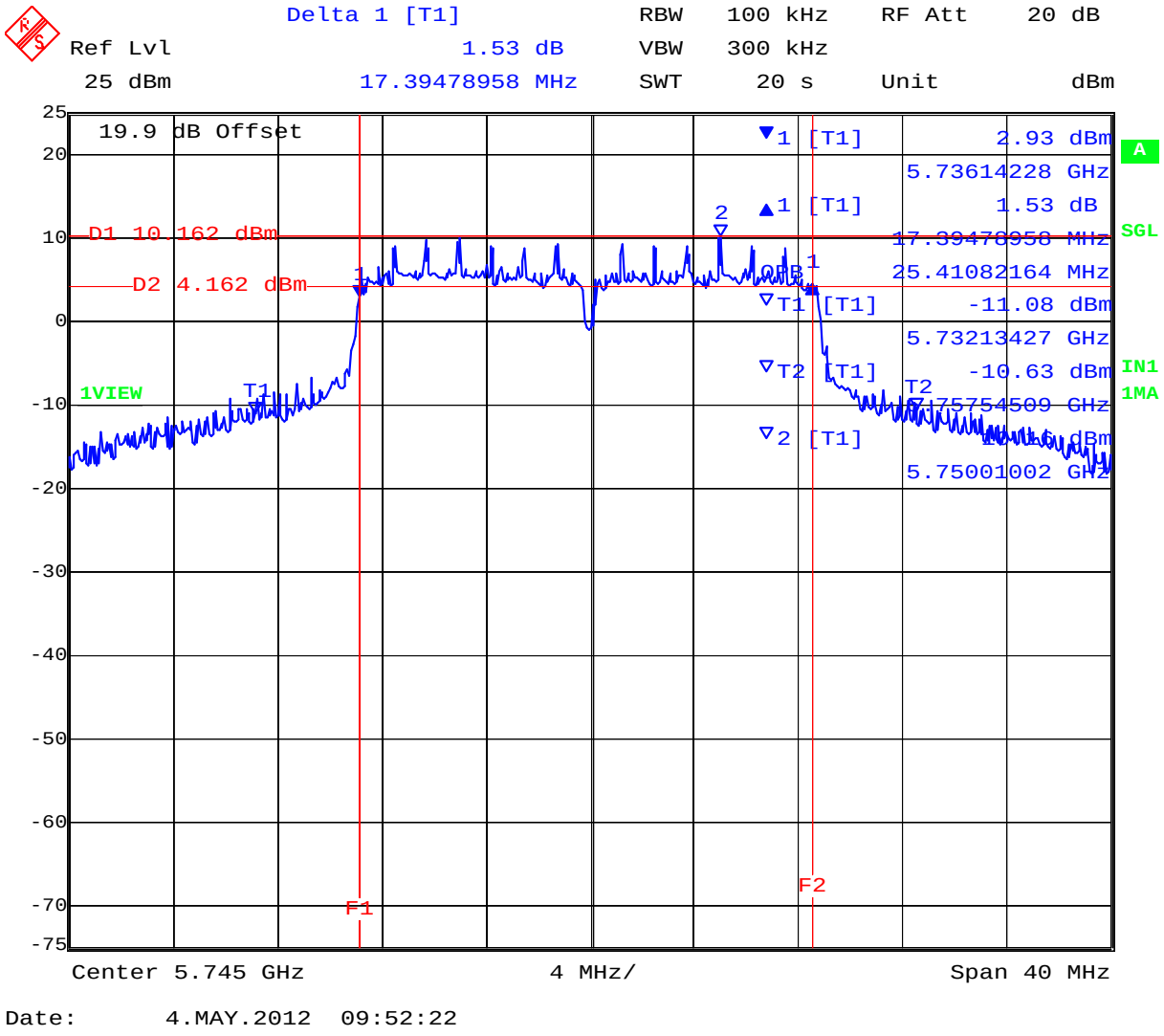
Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
5745.000	21.242	25.411	--	--			
5785.000	20.762	19.800	--	--			
5825.000	20.842	19.880	--	--			

Measurement uncertainty:	±2.81 dB

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

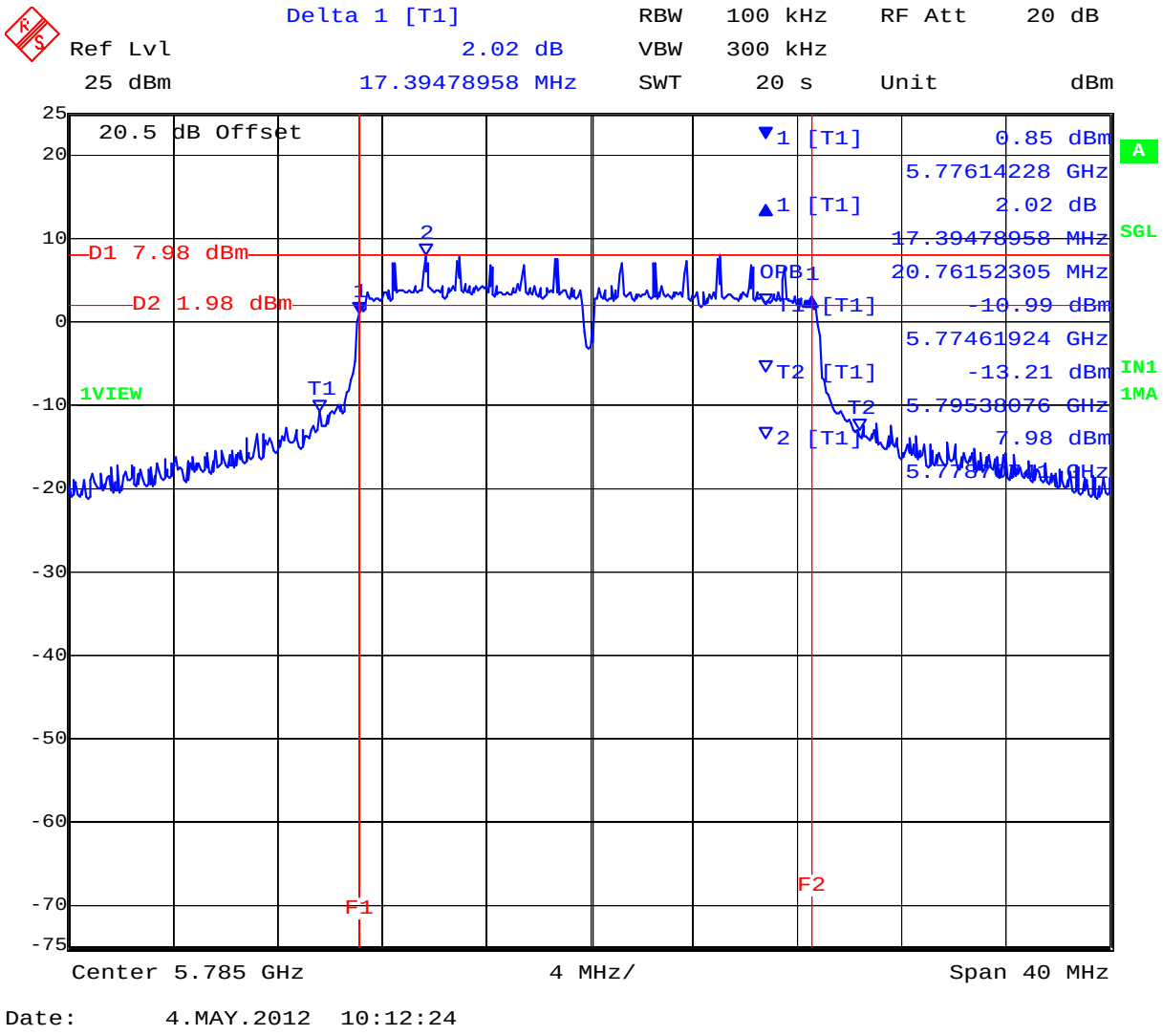


PORT B 5,745 MHz 802.11n HT-20 6 dB and 99% Bandwidth

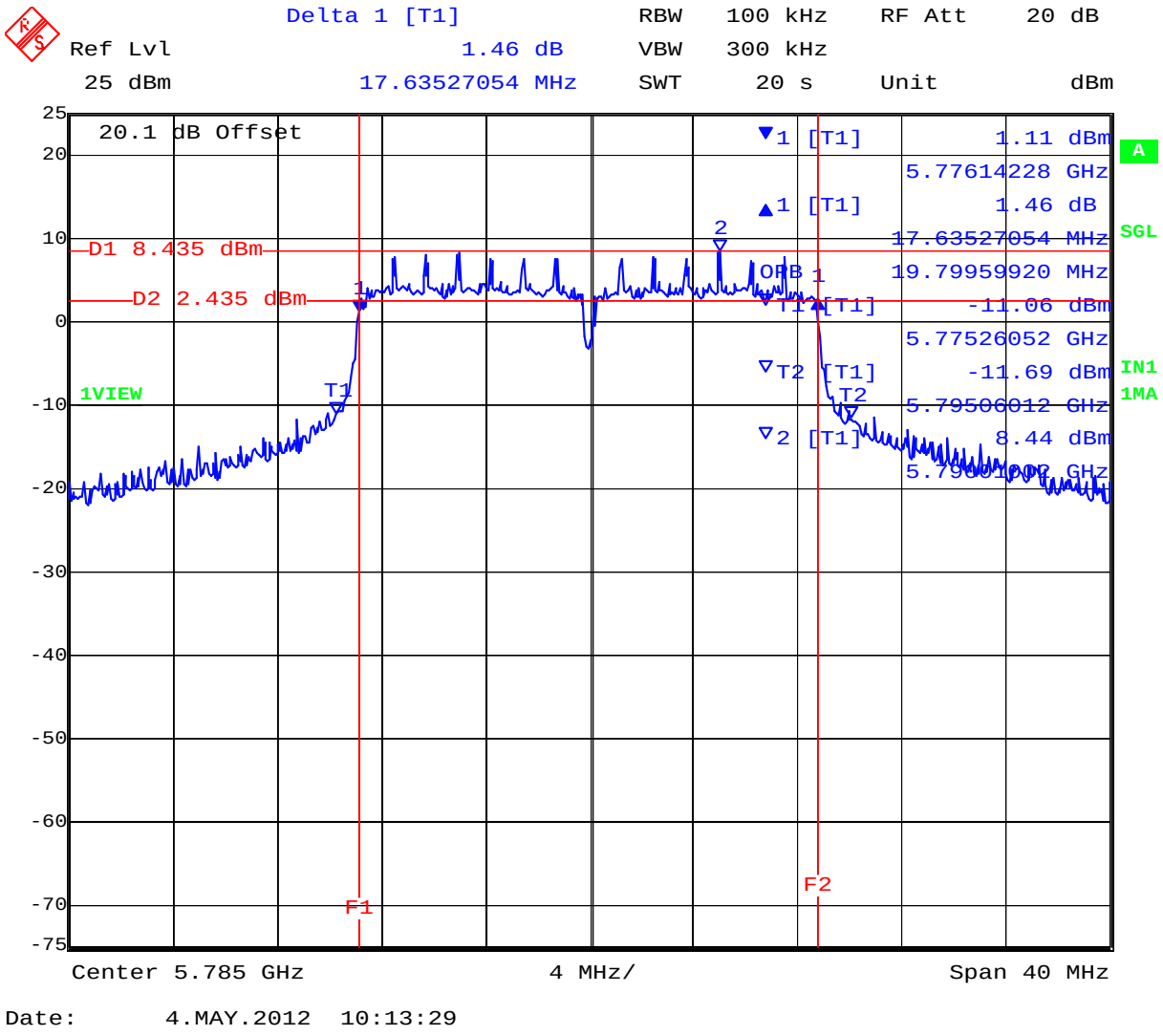


Date: 4.MAY.2012 09:52:22

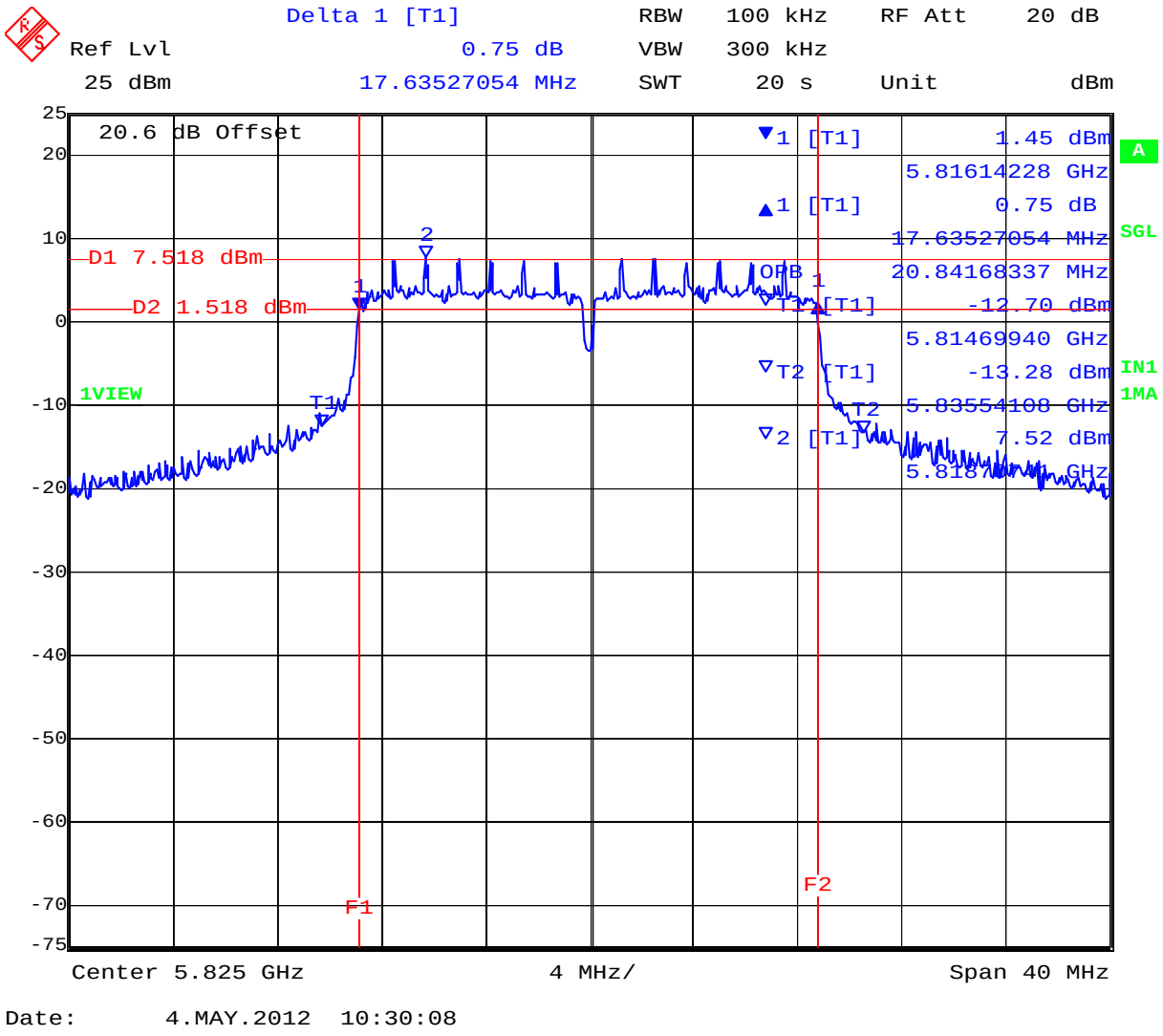
PORT A 5,785 MHz 802.11n HT-20 6 dB and 99% Bandwidth



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



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



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

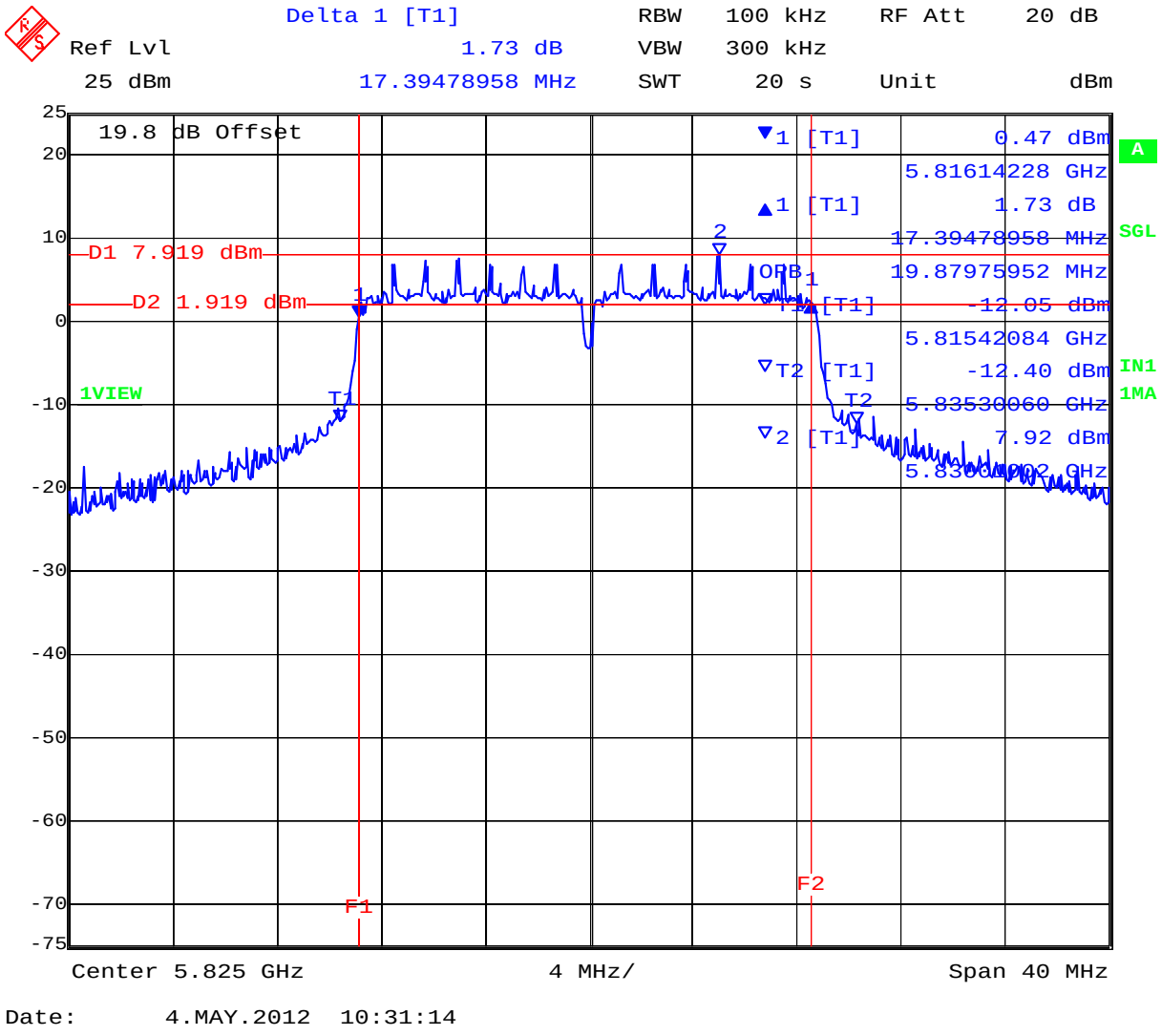


TABLE OF RESULTS – **802.11n - HT-40**

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

6 dB Bandwidth

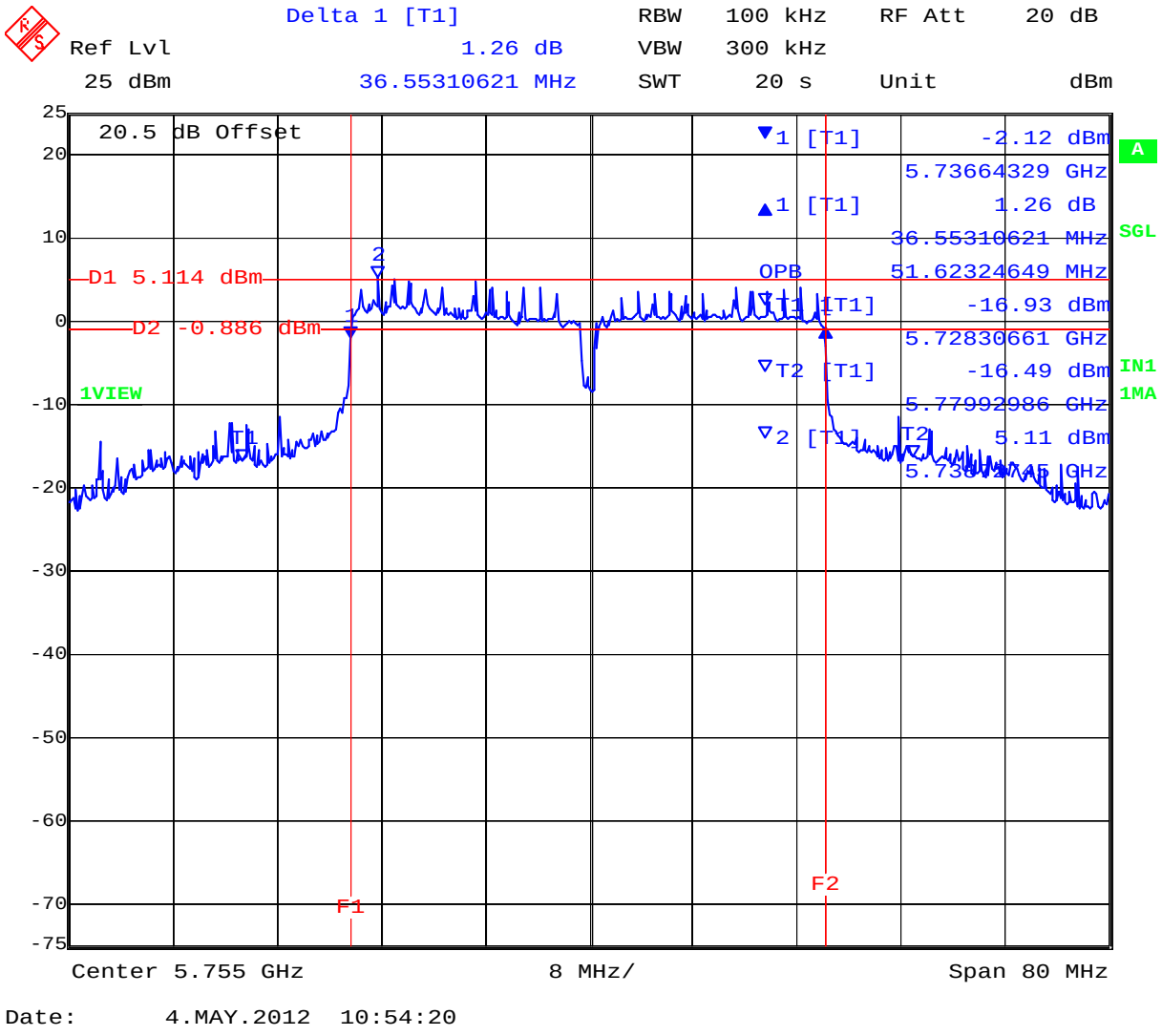
Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
5755.000	36.553	36.553	--	--	500	0.5	-36.053
5795.000	36.553	36.553	--	--			-36.053

99% Bandwidth

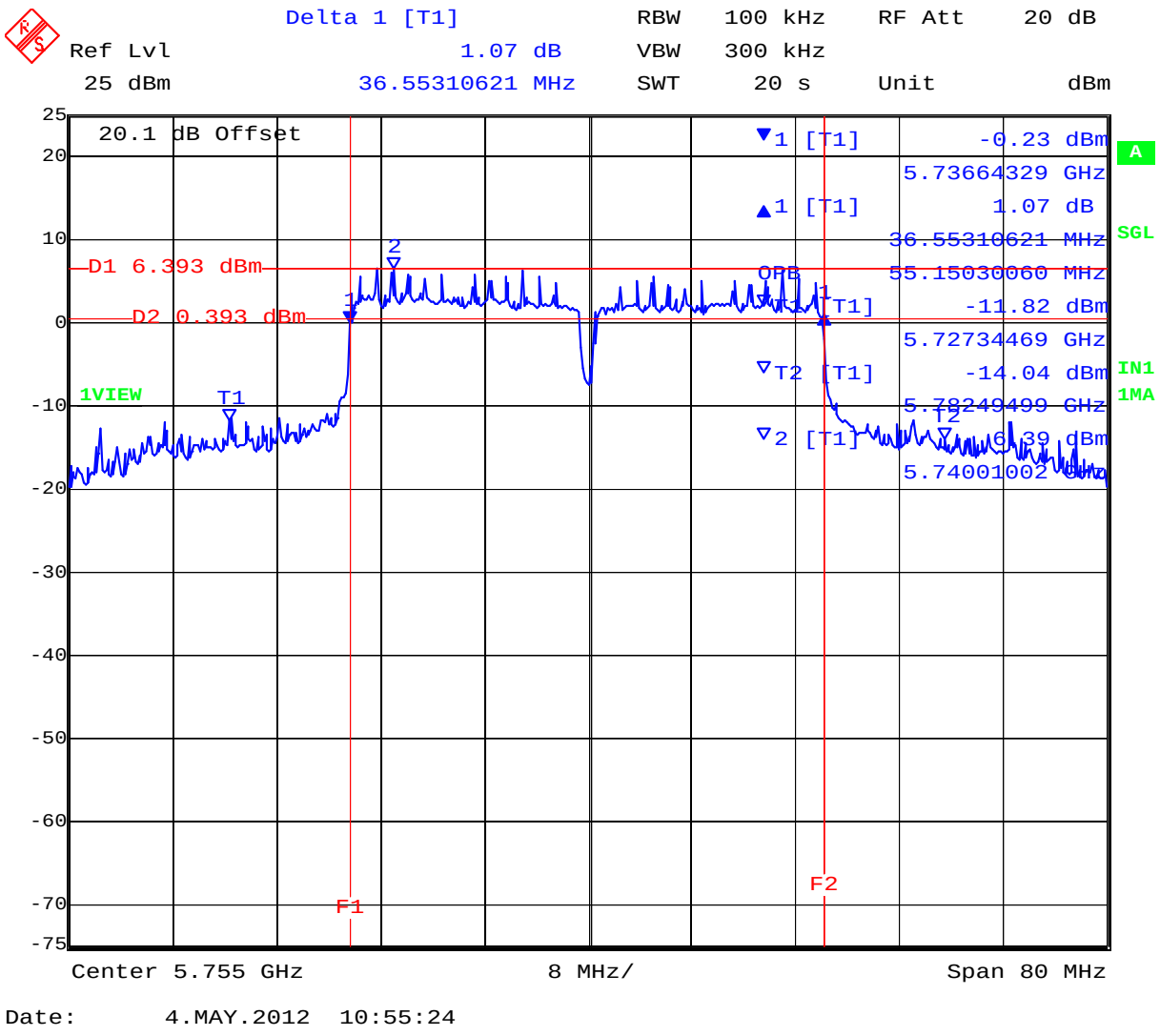
Test Frequency	99 % Bandwidth						
	MHz						
MHz	**a**	**b**	**c**	**d**			
5755.000	51.623	55.150	--	--			
5795.000	48.737	42.164	--	--			

Measurement uncertainty:	±2.81 dB

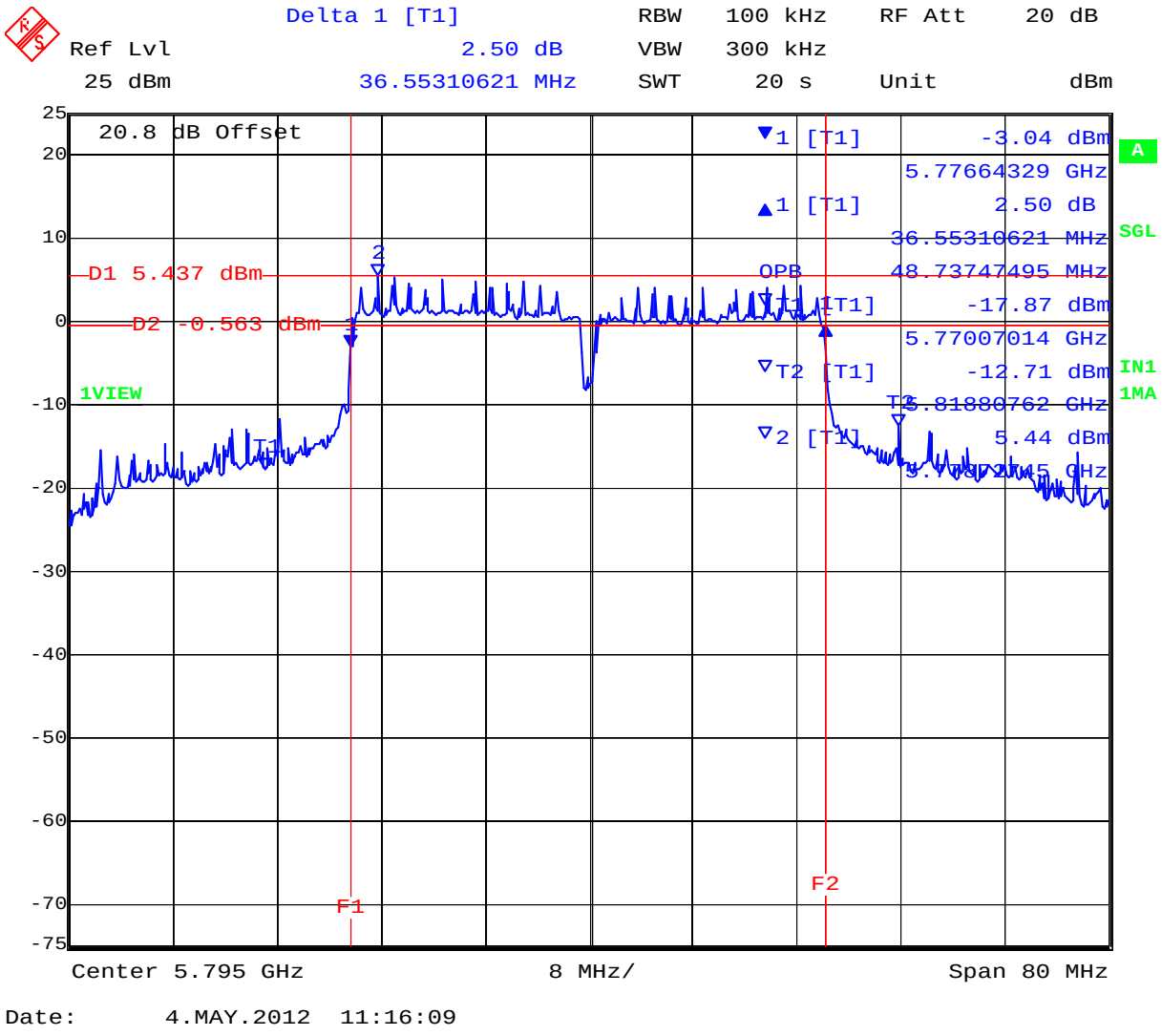
PORTA 5,755 MHz 802.11n HT-40 6 dB and 99% Bandwidth



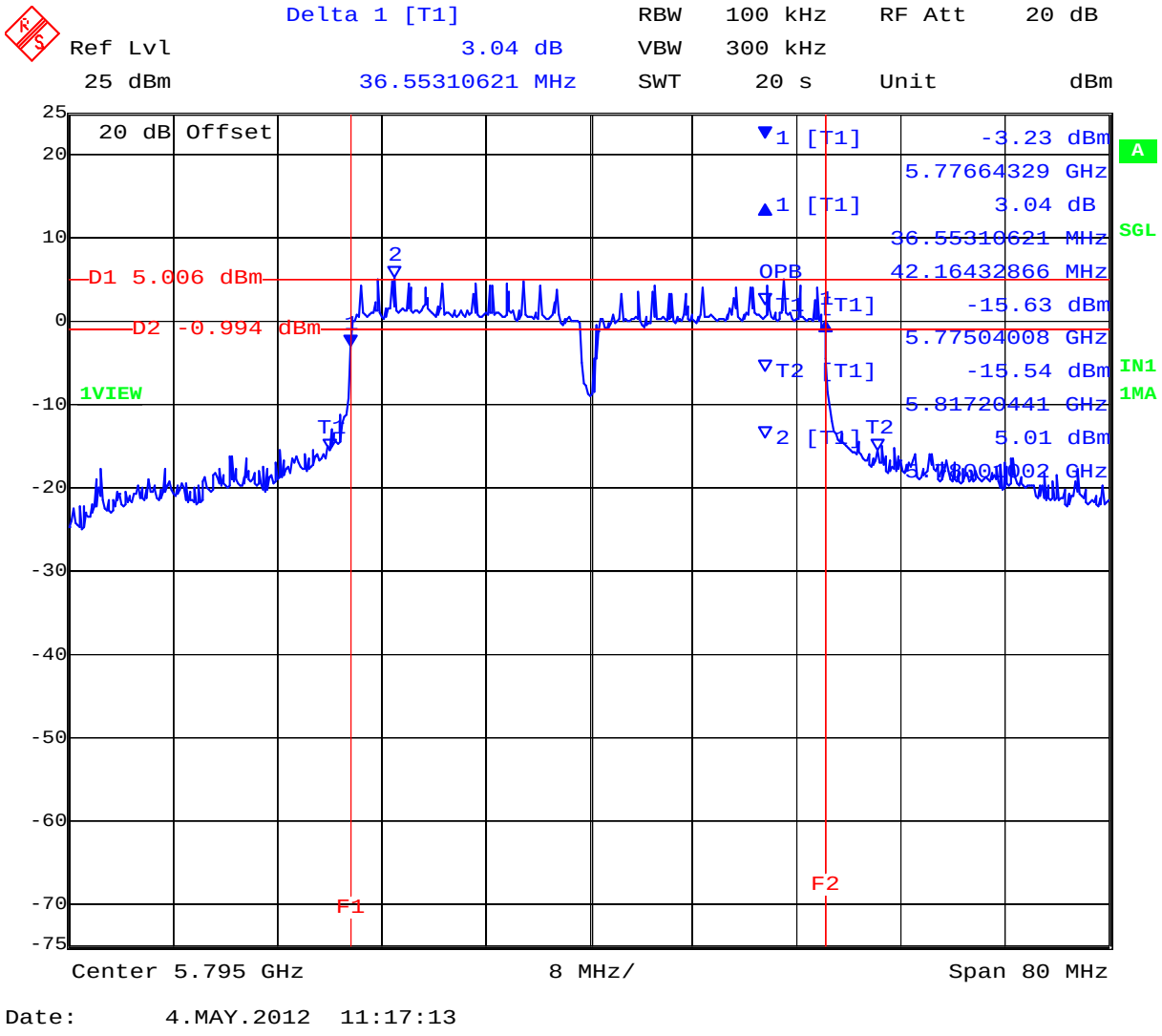
PORTB 5,755 MHz 802.11n HT-40 6 dB and 99% Bandwidth



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



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



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

Traceability

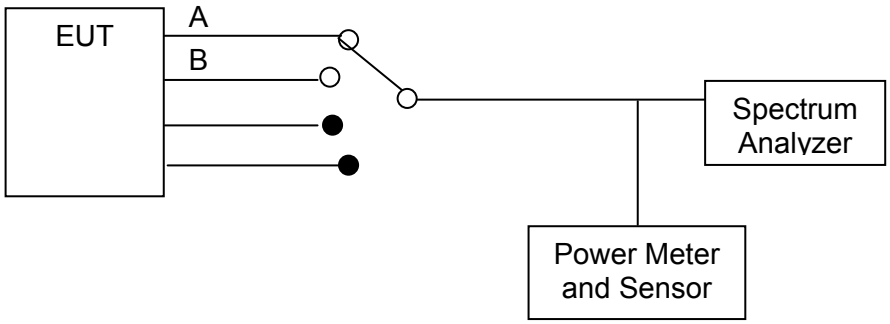
Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0158, 0287, 0252, 0313, 0314, 0070, 0116, 0117

5.1.2. 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 = Total Power [10 Log_{10} ($10^{a/10}$ + $10^{b/10}$)], G = Antenna Gain,
x = 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	Gain	Max. Allowable Conducted Peak Power (dBm)		Maximum EIRP
(dB)	(dBi)	Non-Beam Forming	Beam Forming	(dBm)
Integral	0.0	+30.0	N/A	+36.0

5.8 GHz MIMO Operation (Non-Legacy Operation)

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

Non-MIMO Operation

2.4 GHz Non-MIMO Operation (Legacy)

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

5.8 GHz Non-MIMO Operation (Legacy)

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

TABLE OF RESULTS – **802.11b – Legacy**

The powers reported in the following table are peak power

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

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
2412	20.76	20.81	--	--	N/A	23.80	30.00	-6.20
2437	19.37	19.49	--	--	N/A	22.44	30.00	-7.56
2462	19.08	18.64	--	--	N/A	21.88	30.00	-8.12

Measurement uncertainty:	±1.33 dB

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

The powers reported in the following table are peak power

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

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
2412	23.15	23.15	--	--	N/A	26.16	30.00	-3.84
2437	24.66	25.09	--	--	N/A	27.89	30.00	-2.11
2462	20.95	21.08	--	--	N/A	24.03	30.00	-5.97

Measurement uncertainty:	±1.33 dB

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

The powers reported in the following table are peak power

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 RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
2412	22.68	22.36	--	--	N/A	25.53	30.00	-4.47
2437	24.30	24.01	--	--	N/A	27.17	30.00	-2.83
2462	20.54	20.04	--	--	N/A	23.31	30.00	-6.69

Measurement uncertainty:	±1.33 dB

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

The powers reported in the following table are peak power

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

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
2422	21.14	20.78	--	--	N/A	23.97	30.00	-6.03
2437	24.96	24.46	--	--	N/A	27.73	30.00	-2.27
2452	20.83	20.30	--	--	N/A	23.58	30.00	-6.42

Measurement uncertainty:	±1.33 dB

5.8 GHz Band

TABLE OF RESULTS – **802.11a – Legacy**

The powers reported in the following table are peak power

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

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
5745	25.56	27.79	--	--	N/A	29.83	30.00	-0.17
5785	25.56	26.63	--	--	N/A	29.14	30.00	-0.86
5825	25.59	25.92	--	--	N/A	28.77	30.00	-1.23

Measurement uncertainty:	±1.33 dB

TABLE OF RESULTS – **802.11n – HT-20**

The powers reported in the following table are peak power

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

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	a	b	c	d	Combined	Calculated	dBm	dB
5745	25.52	27.20	--	--	N/A	29.45	30.00	-0.55
5785	25.49	25.96	--	--	N/A	28.74	30.00	-1.26
5825	25.49	25.33	--	--	N/A	28.42	30.00	-1.58

Measurement uncertainty:	±1.33 dB

TABLE OF RESULTS – **802.11n – HT-40**

The powers reported in the following table are peak power

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

Test Frequency	Measured Peak Power RF Port (dBm)				Total Power (dBm)		Limit	Margin
MHz	**a**	**b**	**c**	**d**	**Combined**	**Calculated**	**dBm**	**dB**
5755	25.09	26.81	--	--	N/A	29.04	30.00	-0.96
5795	26.27	26.09	--	--	N/A	29.19	30.00	-0.81

Measurement uncertainty:	±1.33 dB

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.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33 dB

Traceability

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

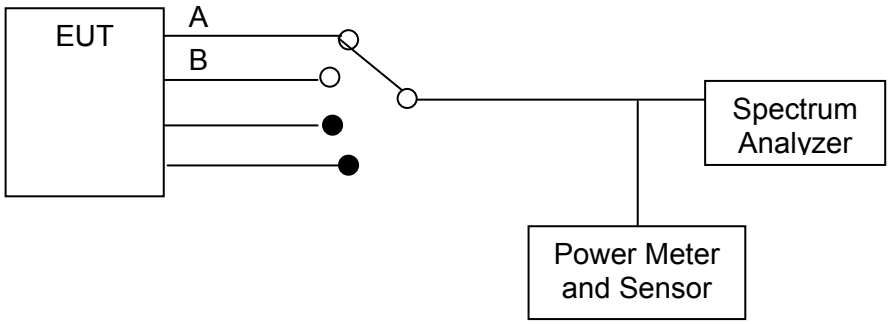
5.1.3. Peak Power Spectral Density

FCC, Part 15 Subpart C §15.247(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 ≥ 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

Peak Power Spectral Density

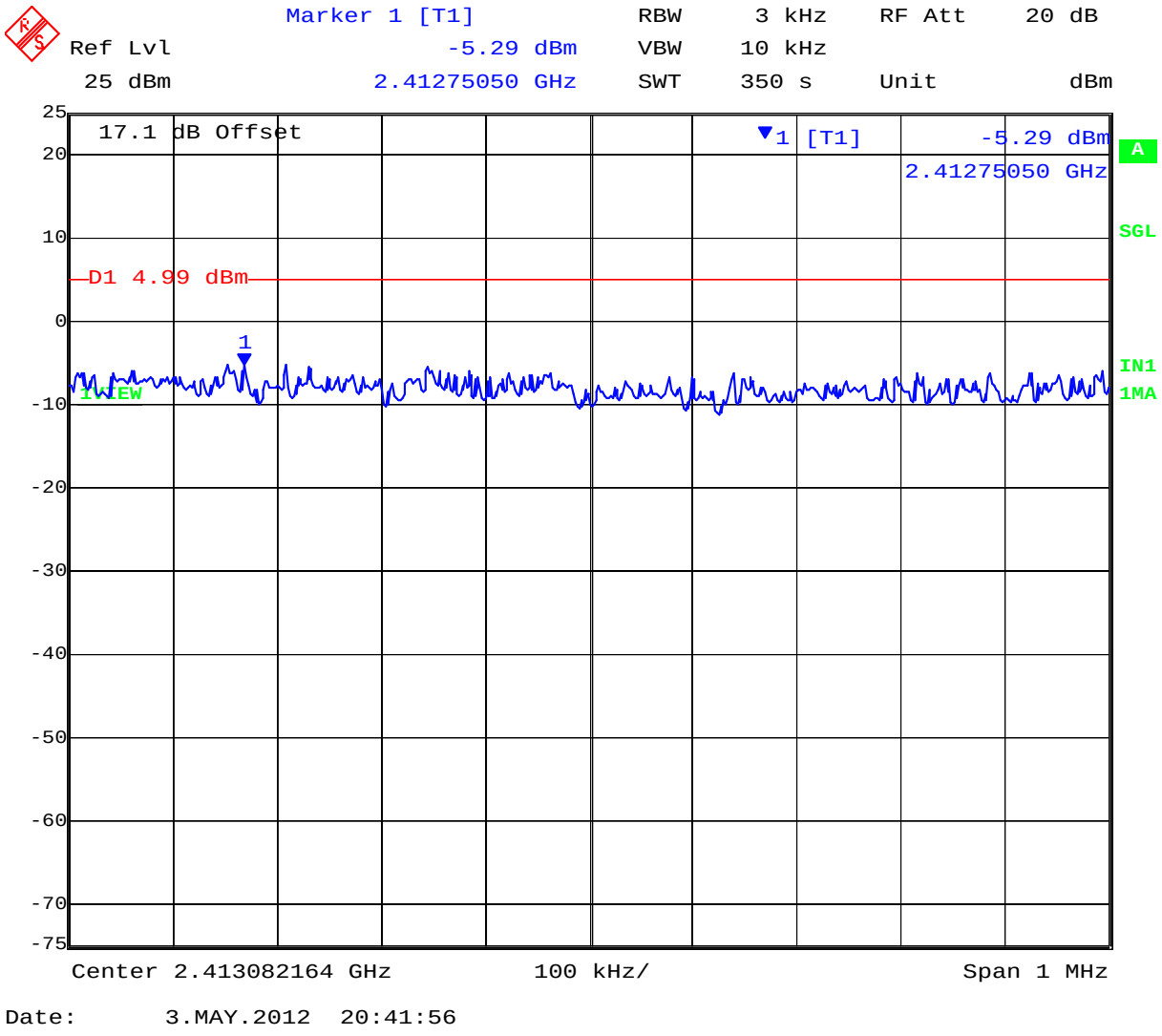
TABLE OF RESULTS – **802.11b**

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

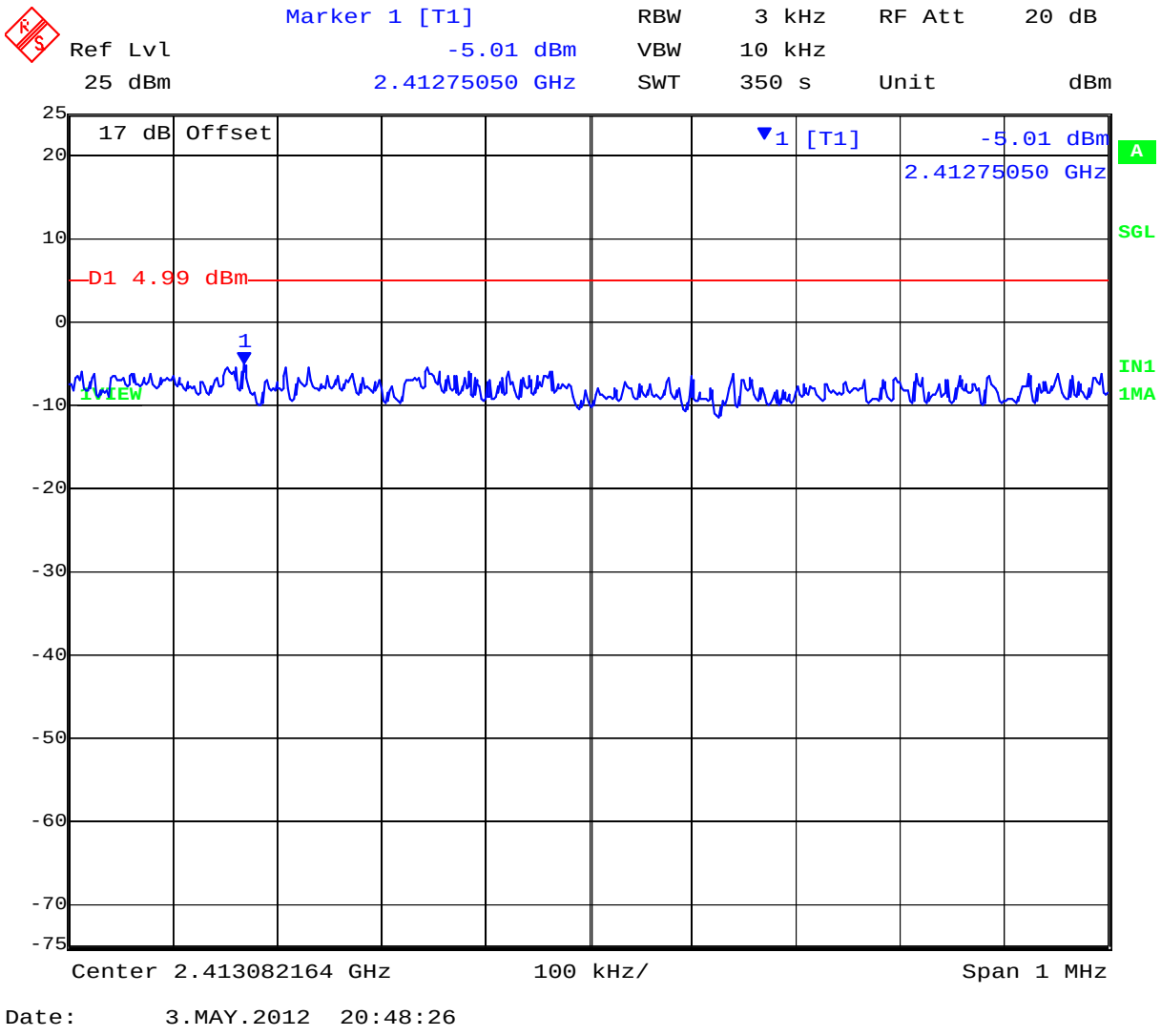
Test Frequency	Measured Power Density RF Port (dBm)				Correction factor	Peak Power Spectral Density	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
2412.000	-5.29	-5.01	--	--	3.01	-2.00	4.99	-6.99
2437.000	-5.74	-5.56	--	--	3.01	-2.55	4.99	-7.54
2462.000	-4.99	-5.45	--	--	3.01	-1.98	4.99	-6.97

Measurement uncertainty:	± 1.33 dB

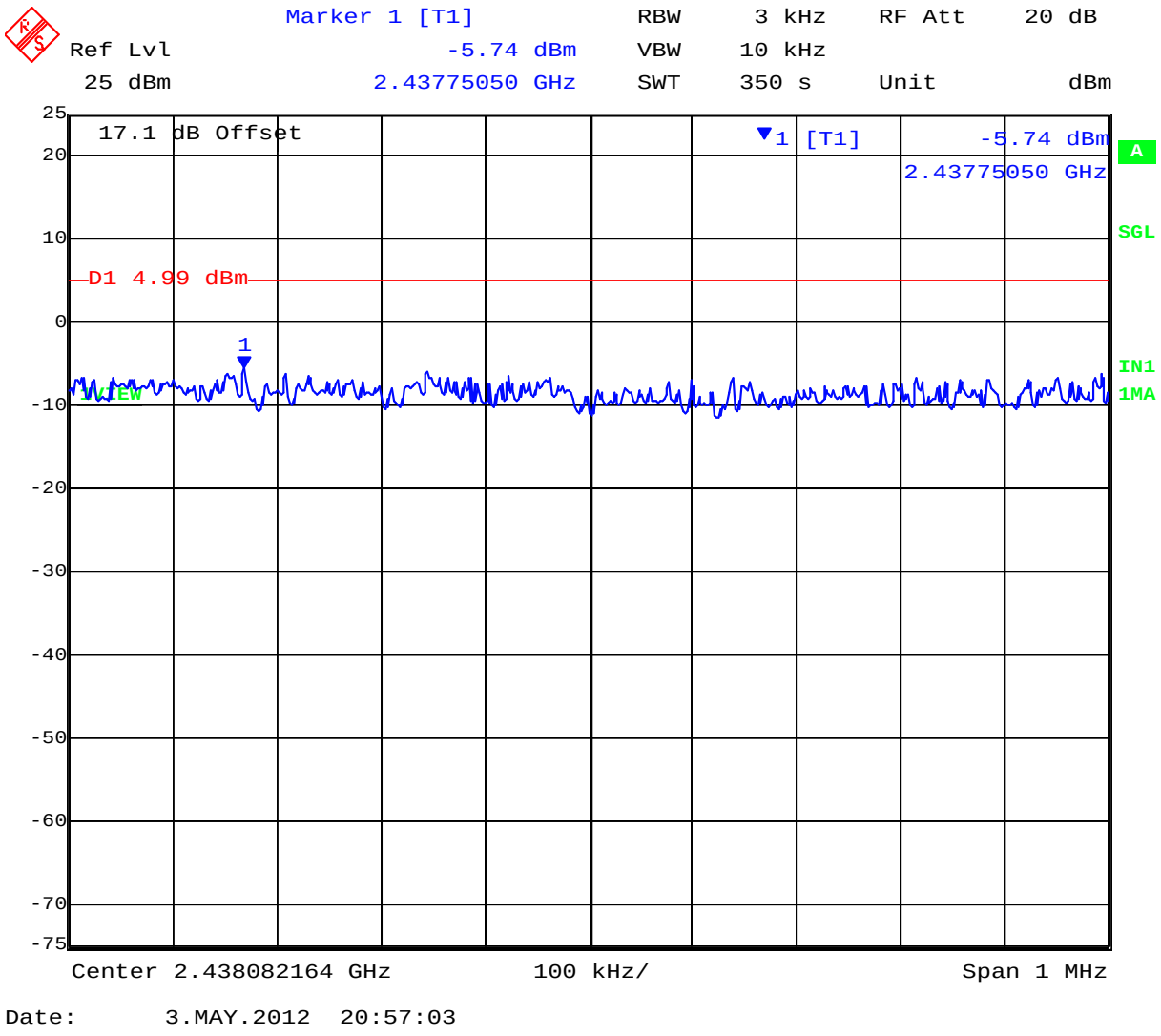
PORT A 2,412 MHz 802.11b - Peak Power Spectral Density



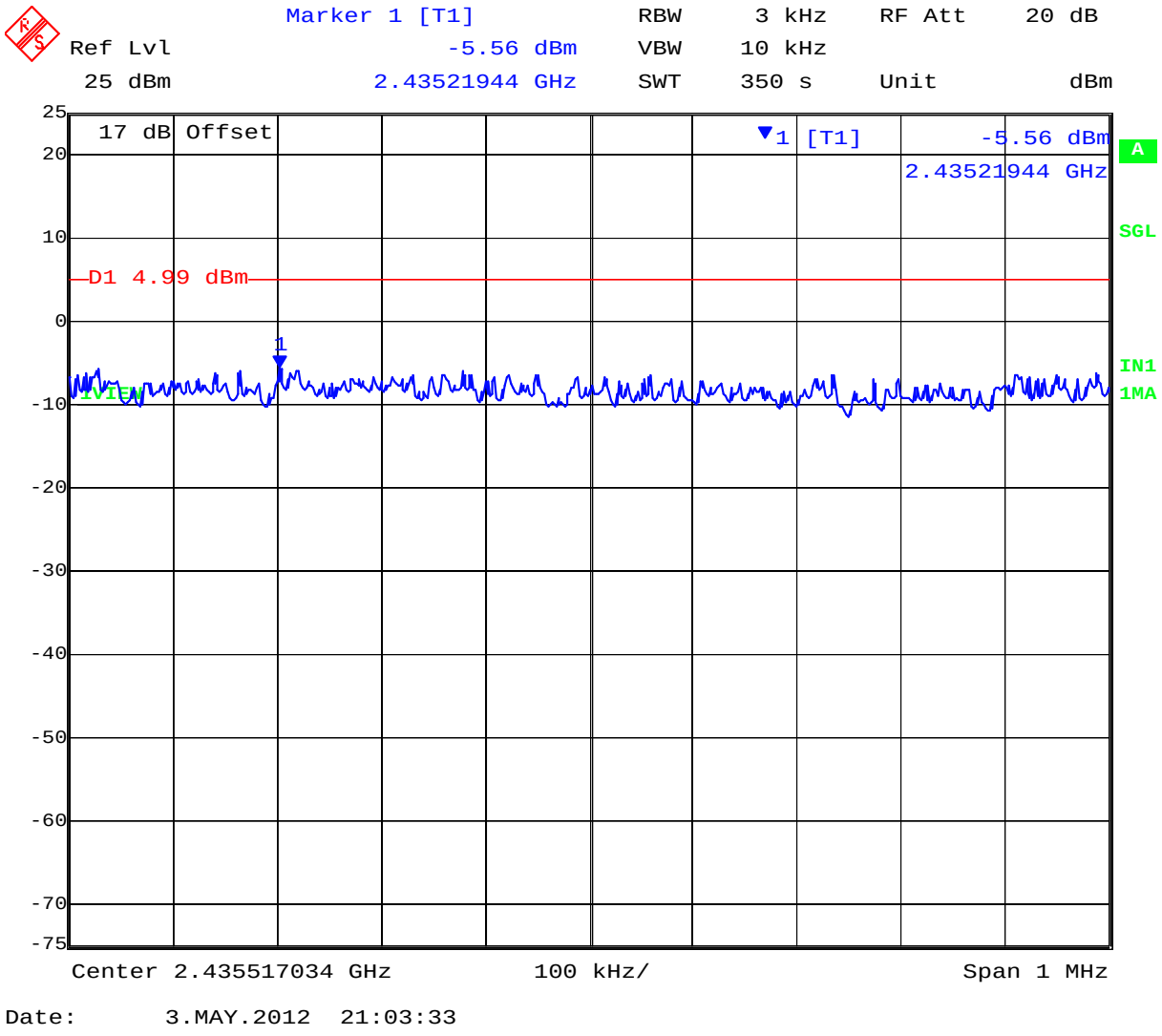
PORT B 2,412 MHz 802.11b - Peak Power Spectral Density



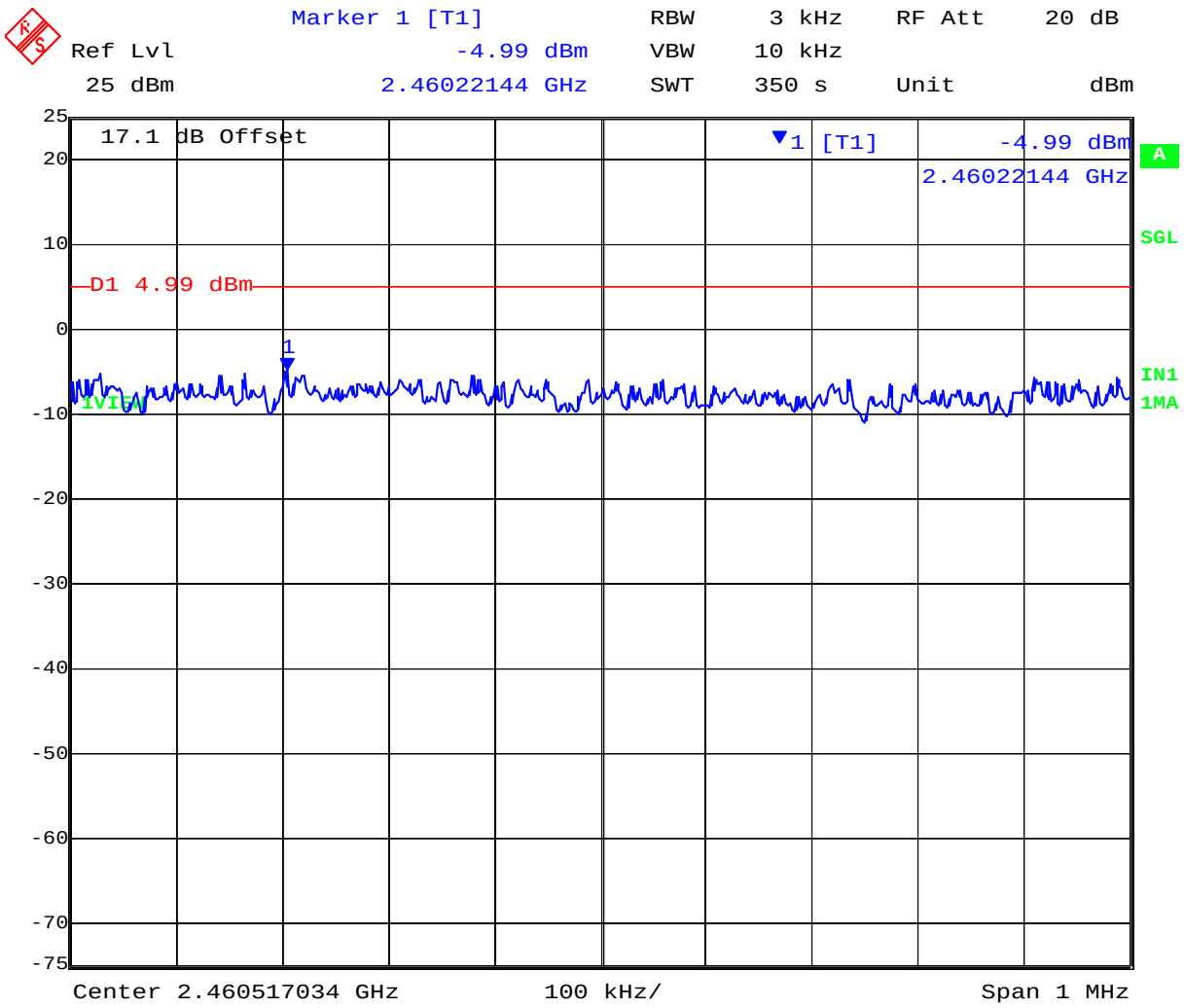
PORT A 2,437 MHz 802.11b - Peak Power Spectral Density



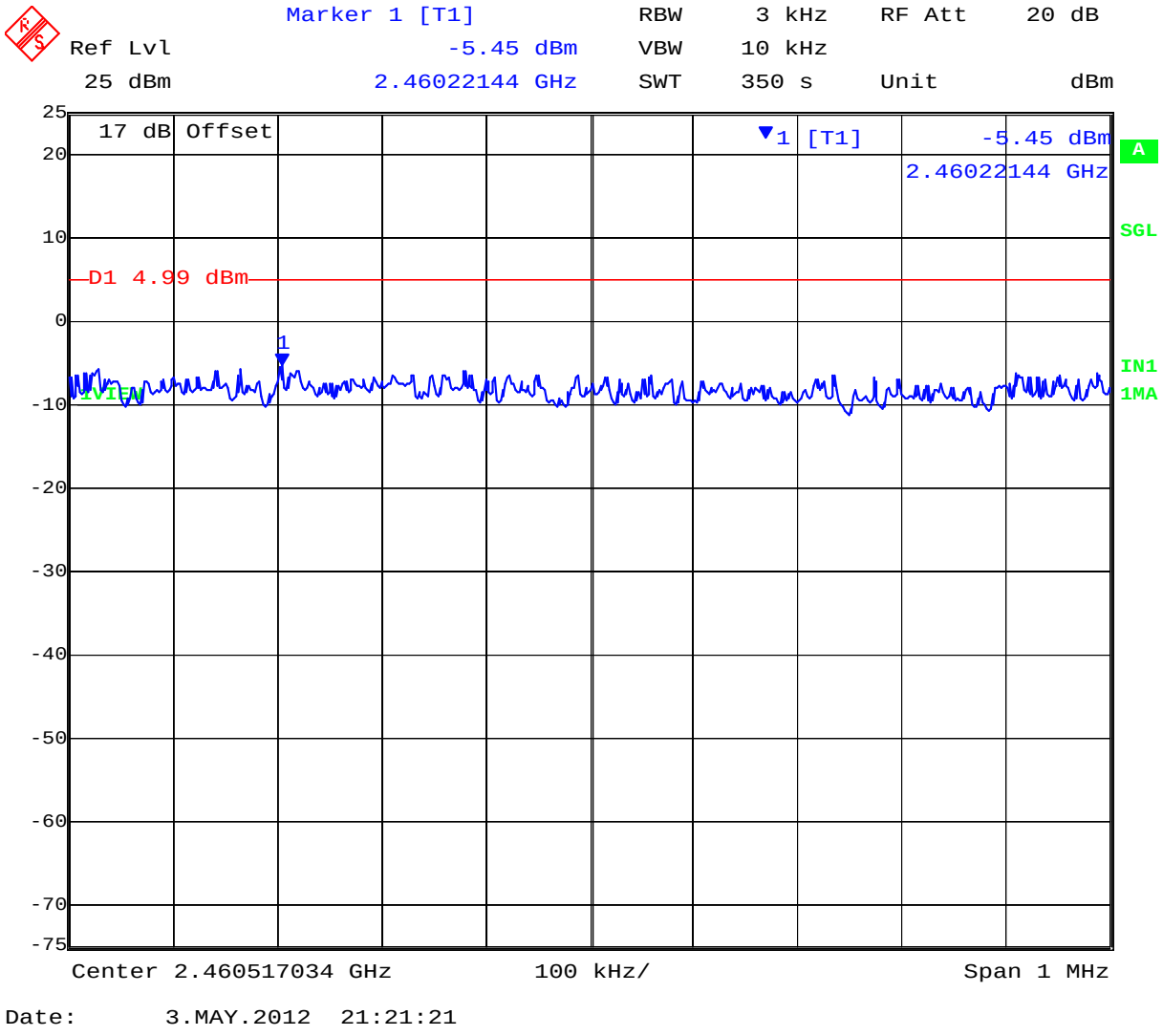
PORT B 2,437 MHz 802.11b - Peak Power Spectral Density



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



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



Peak Power Spectral Density

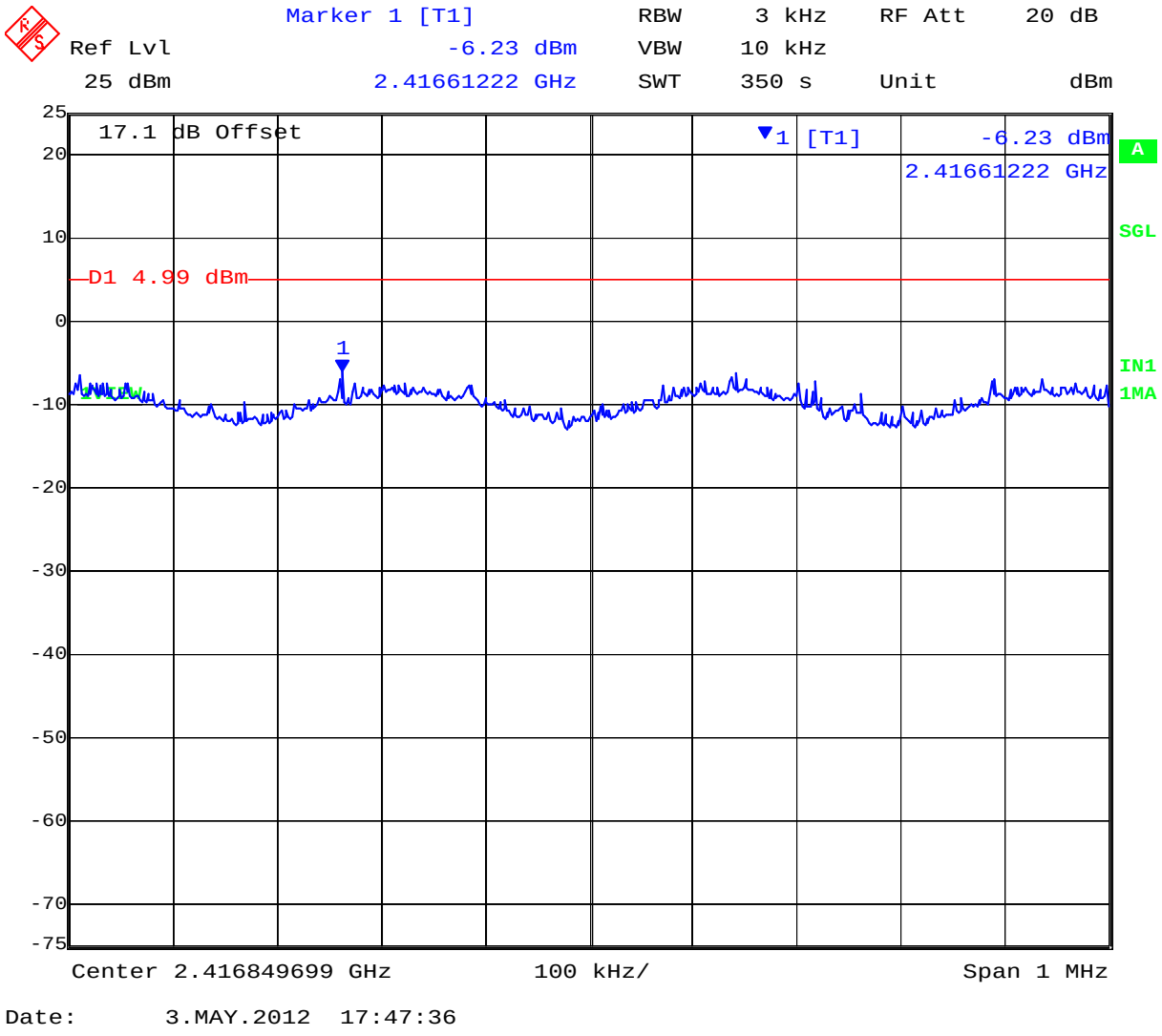
TABLE OF RESULTS – **802.11g Legacy**

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

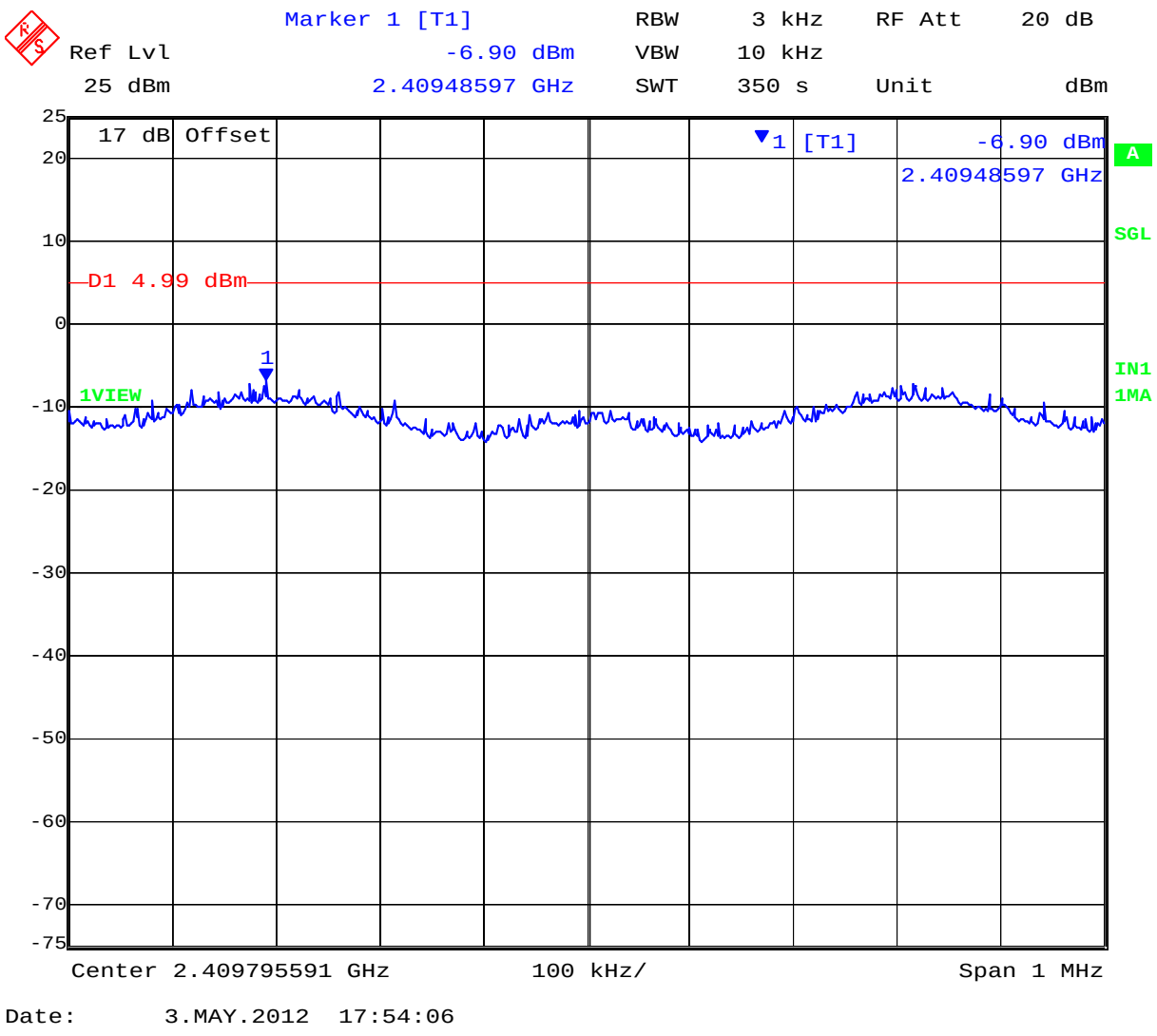
Test Frequency	Measured Power Density RF Port (dBm)				Correction factor	Peak Power Spectral Density	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
2412.000	-6.23	-6.90	--	--	3.01	-3.22	4.99	-8.21
2437.000	-6.28	-6.09	--	--	3.01	-3.08	4.99	-8.07
2462.000	-6.29	-7.11	--	--	3.01	-3.27	4.99	-8.26

Measurement uncertainty:	± 1.33 dB

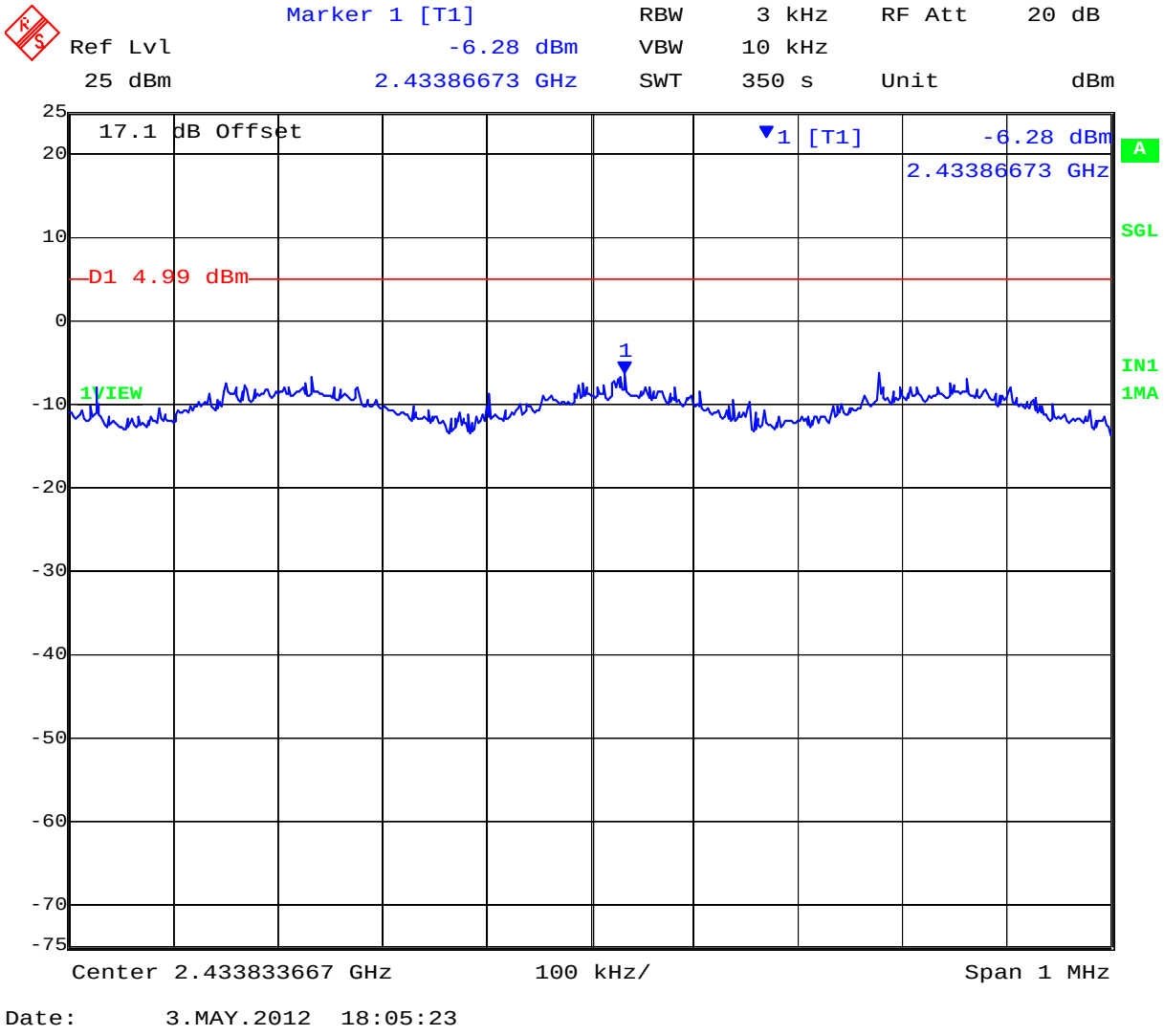
PORT A 2,412 MHz 802.11g Legacy - Peak Power Spectral Density



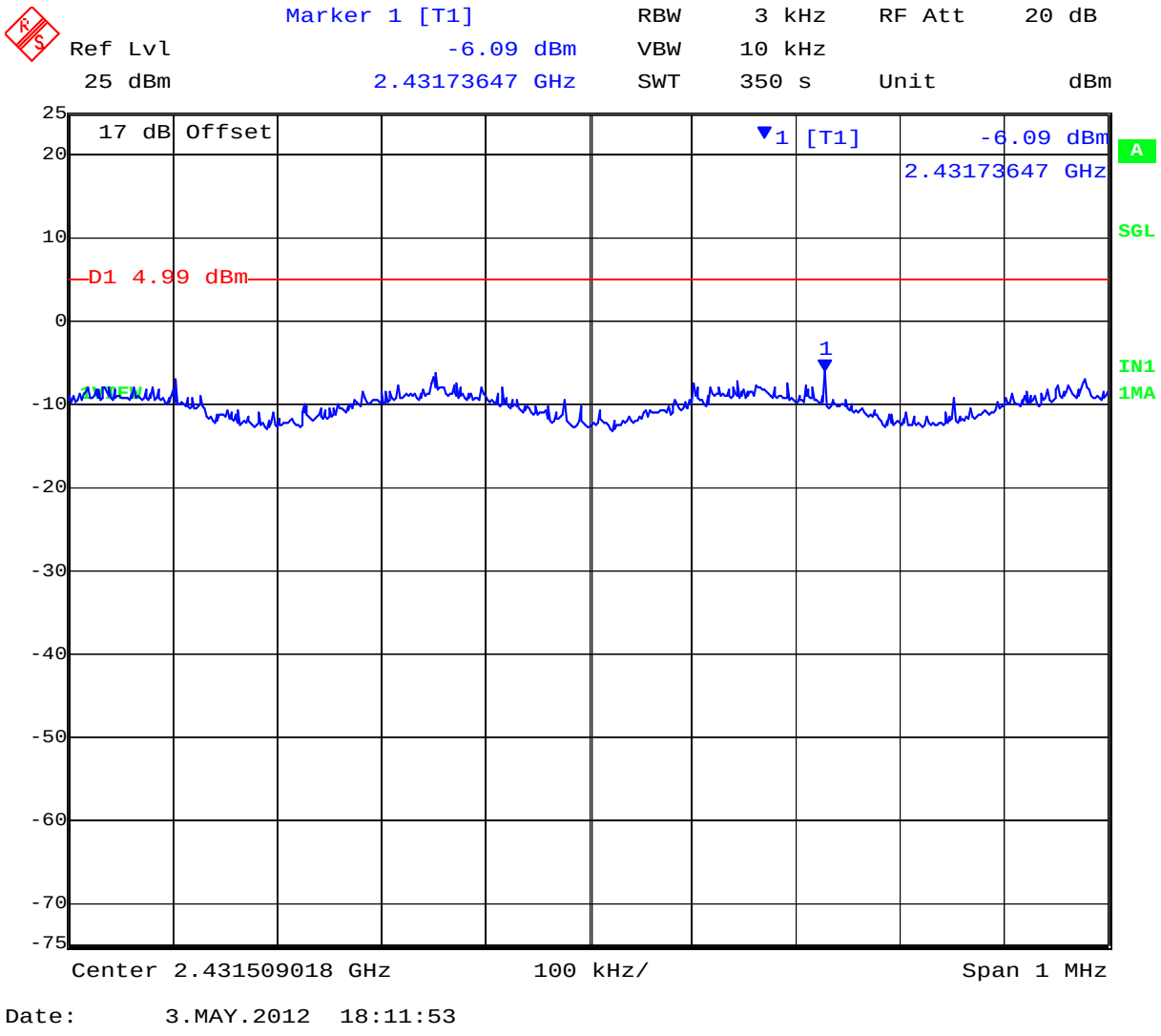
PORT B 2,412 MHz 802.11g Legacy - Peak Power Spectral Density



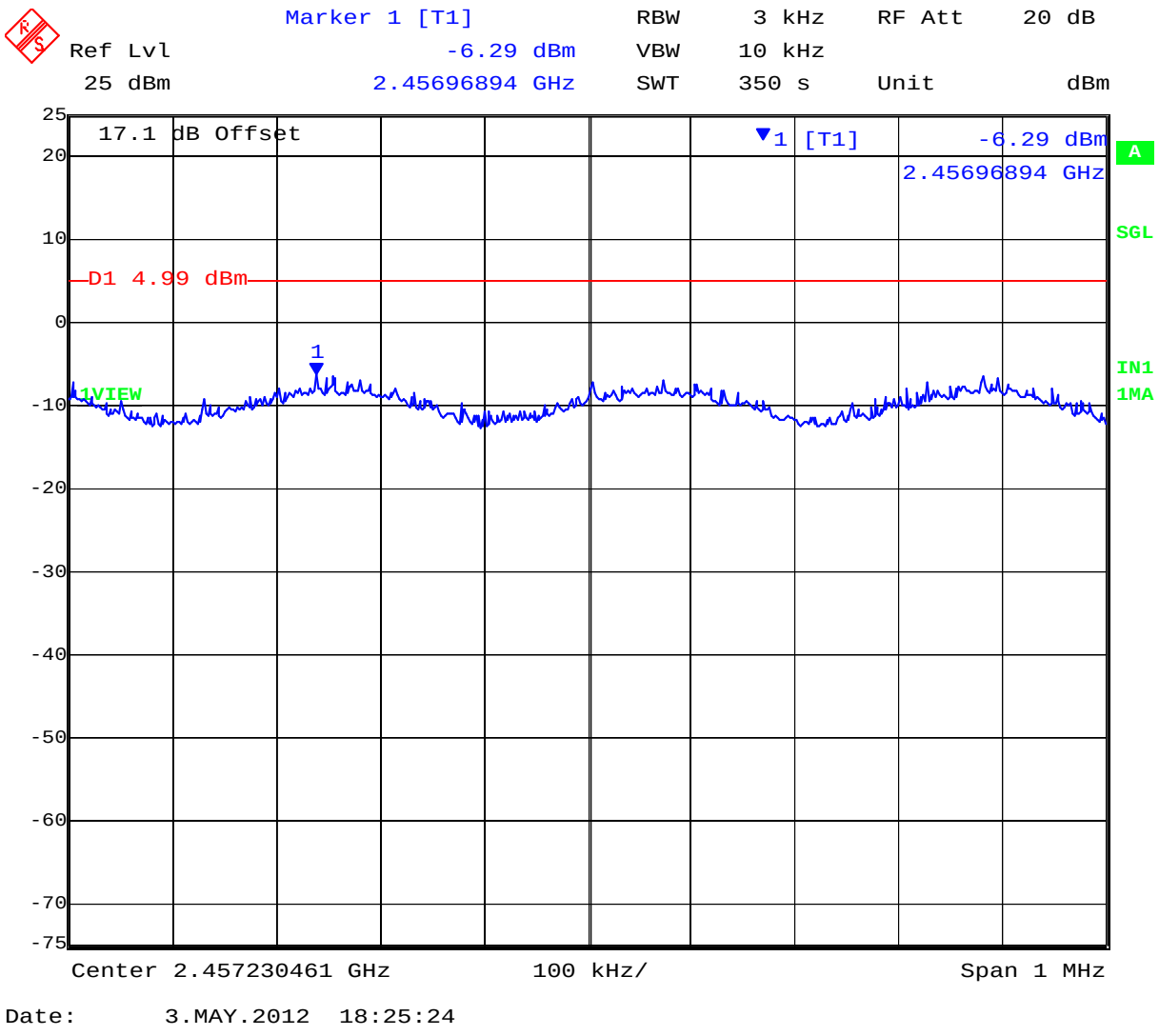
PORT A 2,437 MHz 802.11g Legacy - Peak Power Spectral Density



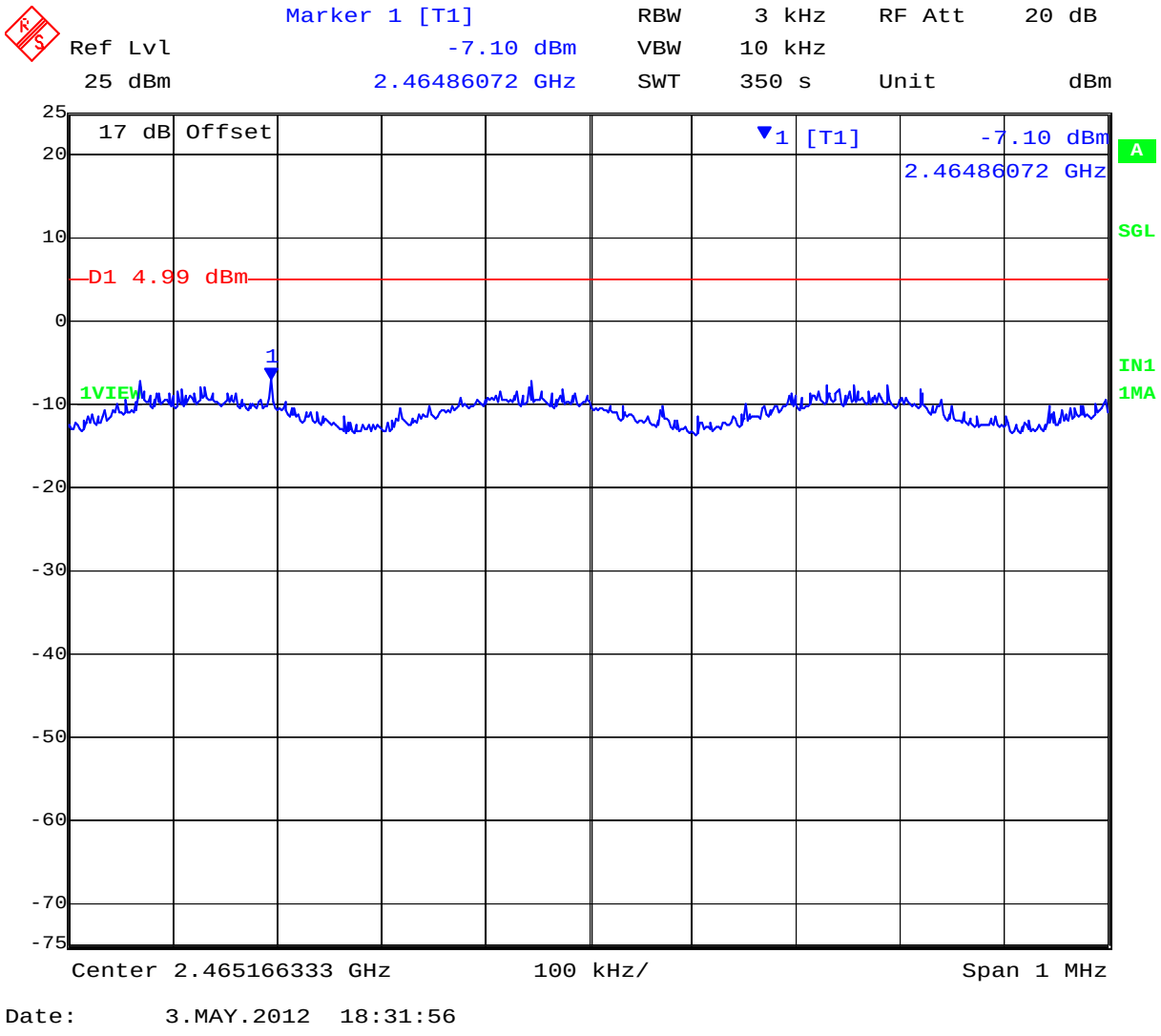
PORT B 2,437 MHz 802.11g Legacy - Peak Power Spectral Density



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



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



Peak Power Spectral Density

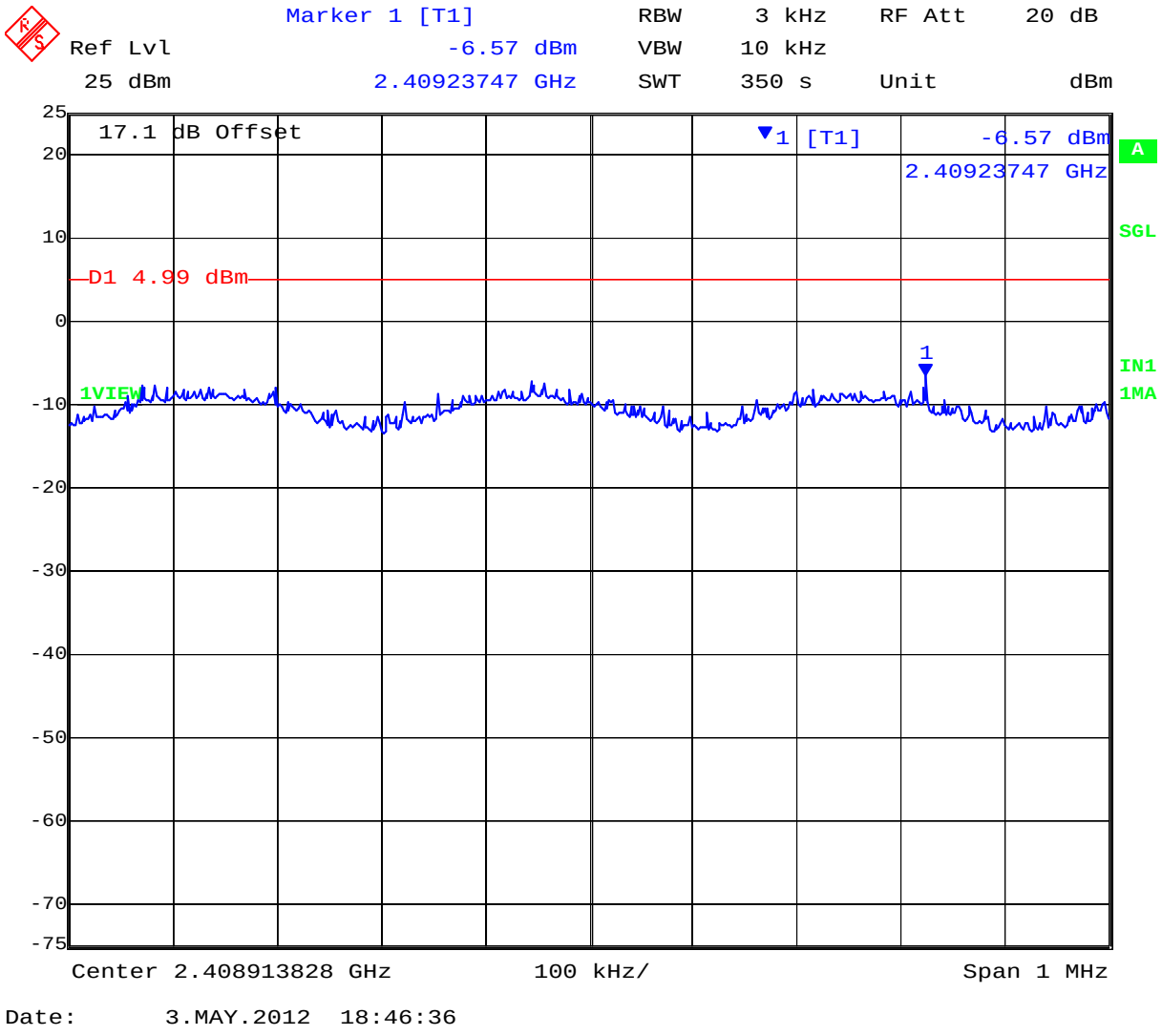
TABLE OF RESULTS – **802.11n HT-20**

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

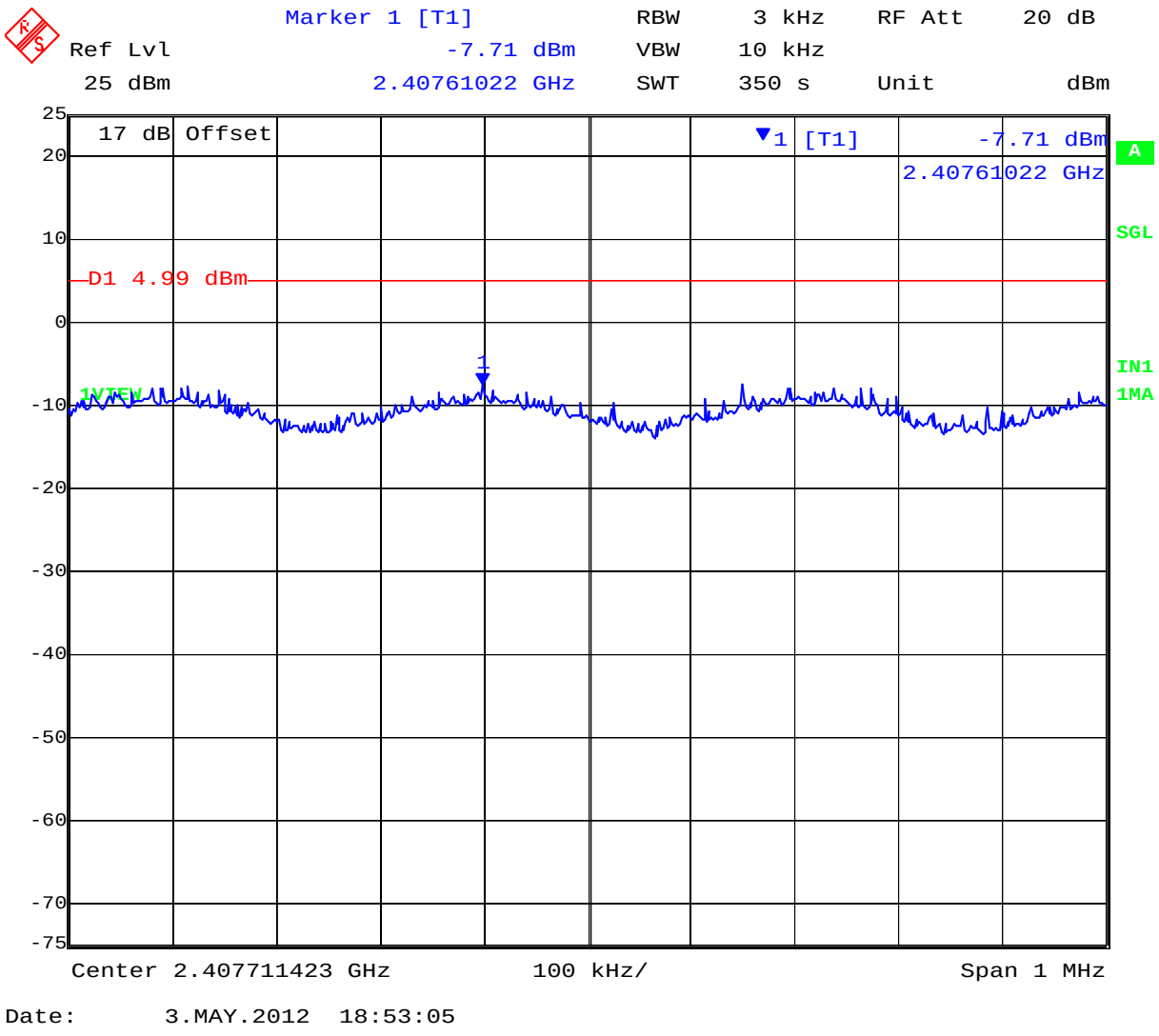
Test Frequency	Measured Power Density RF Port (dBm)				Correction factor	Peak Power Spectral Density	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
2412.000	-6.57	-7.71	--	--	3.01	-3.56	4.99	-8.55
2437.000	-7.32	-7.75	--	--	3.01	-4.31	4.99	-9.30
2462.000	-7.20	-7.70	--	--	3.01	-4.19	4.99	-9.18

Measurement uncertainty:	± 1.33 dB

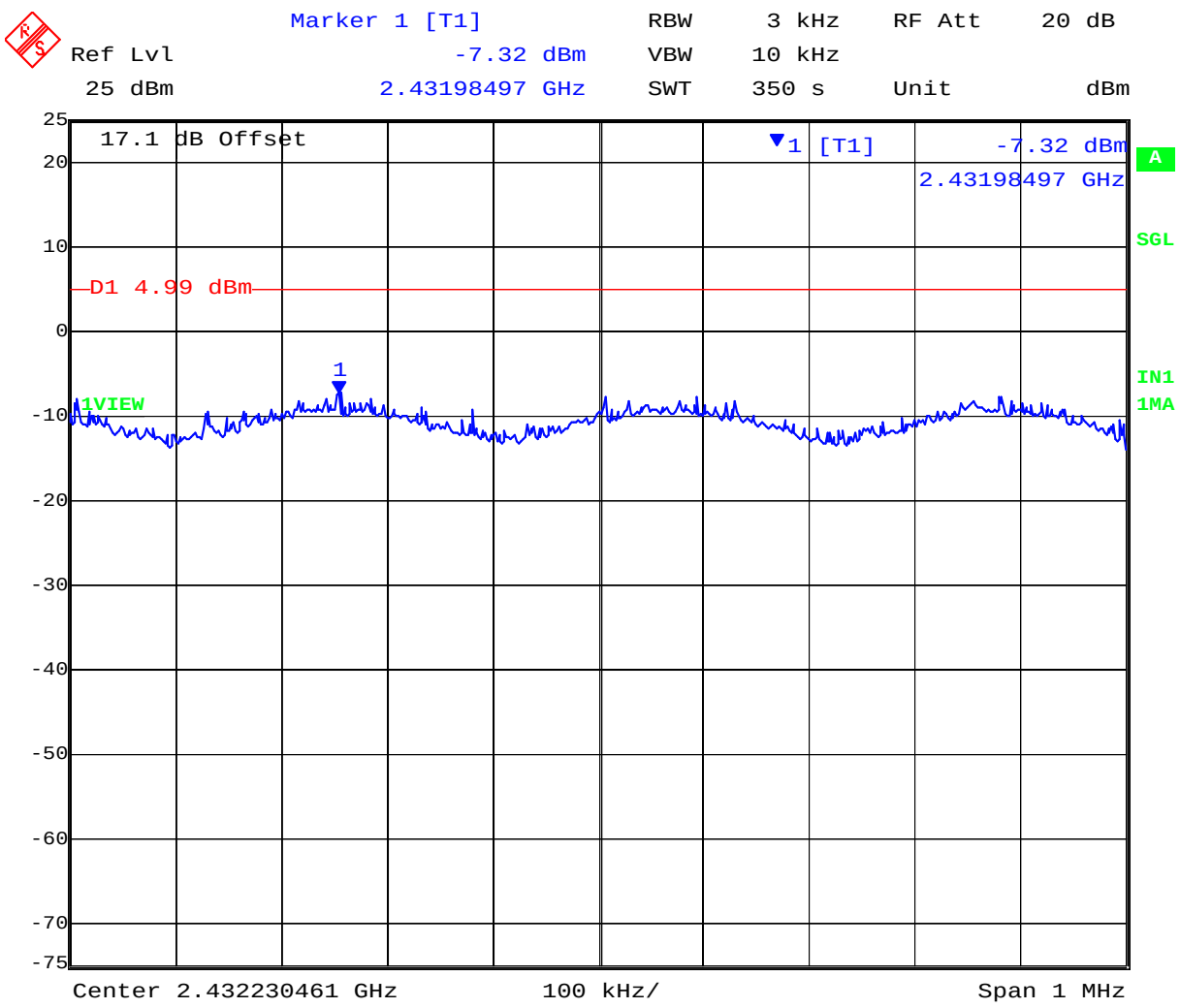
PORT A 2,412 MHz 802.11n HT-20 - Peak Power Spectral Density



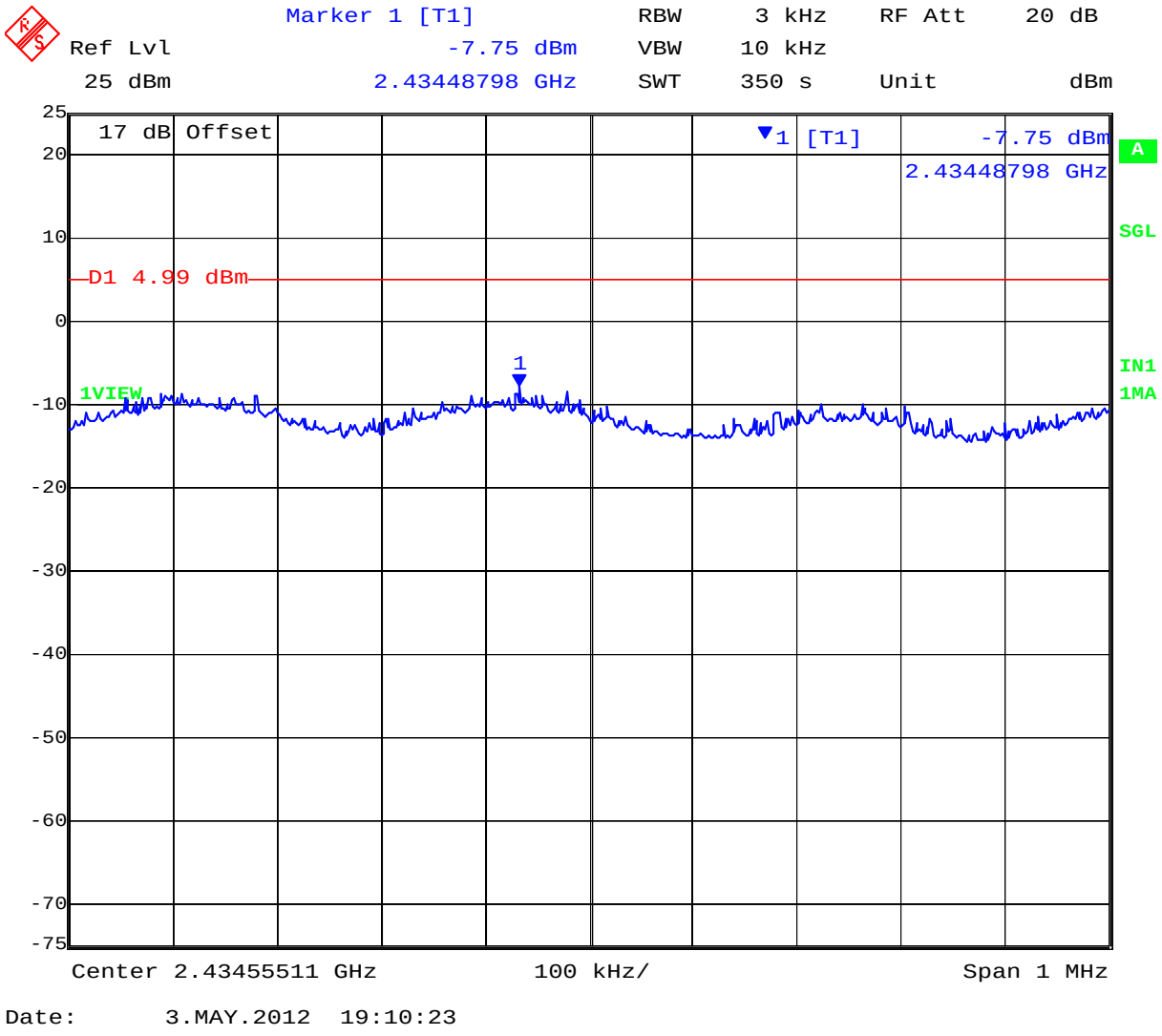
PORT B 2,412 MHz 802.11n HT-20 - Peak Power Spectral Density



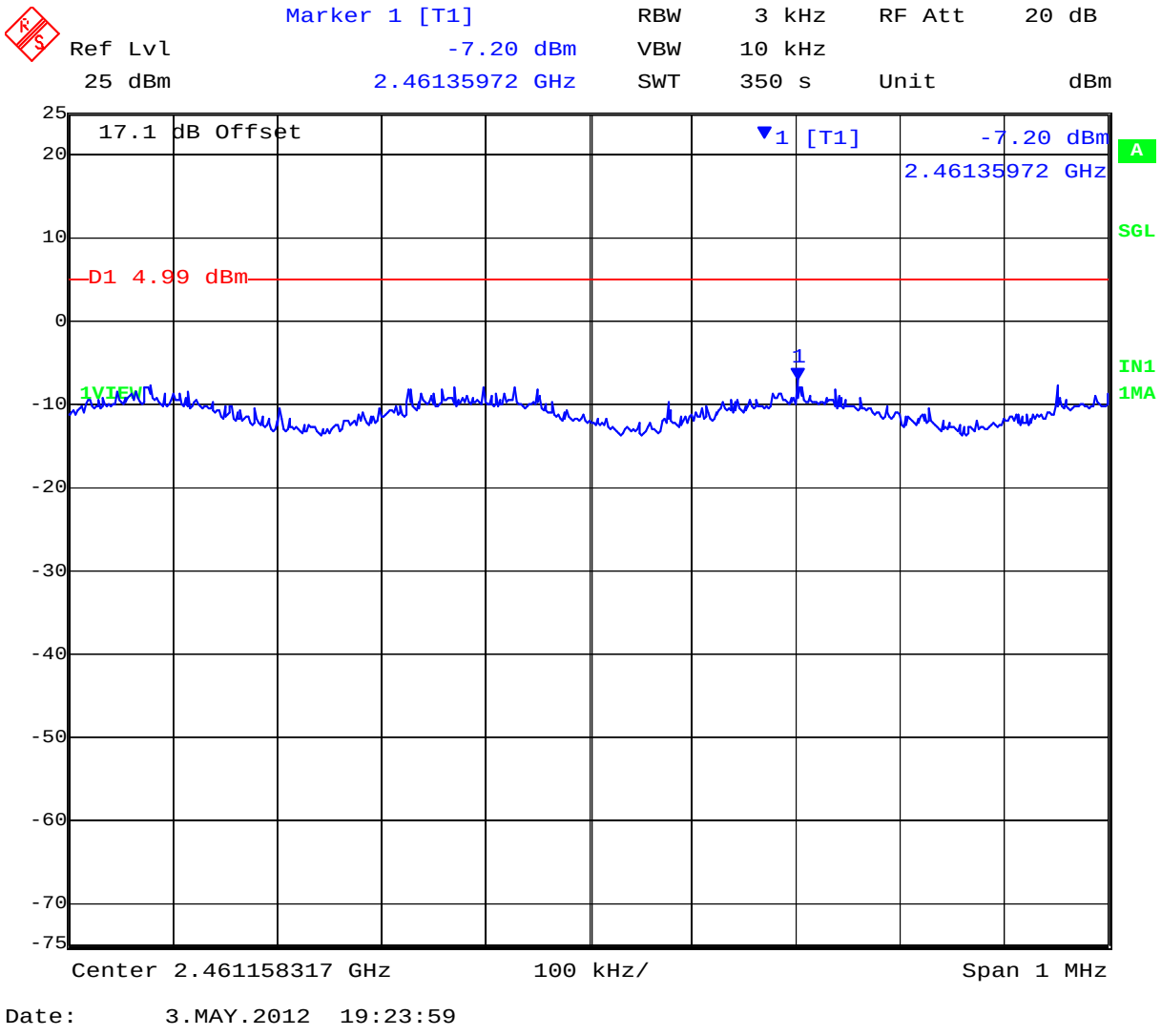
PORT A 2,437 MHz 802.11n HT-20 - Peak Power Spectral Density



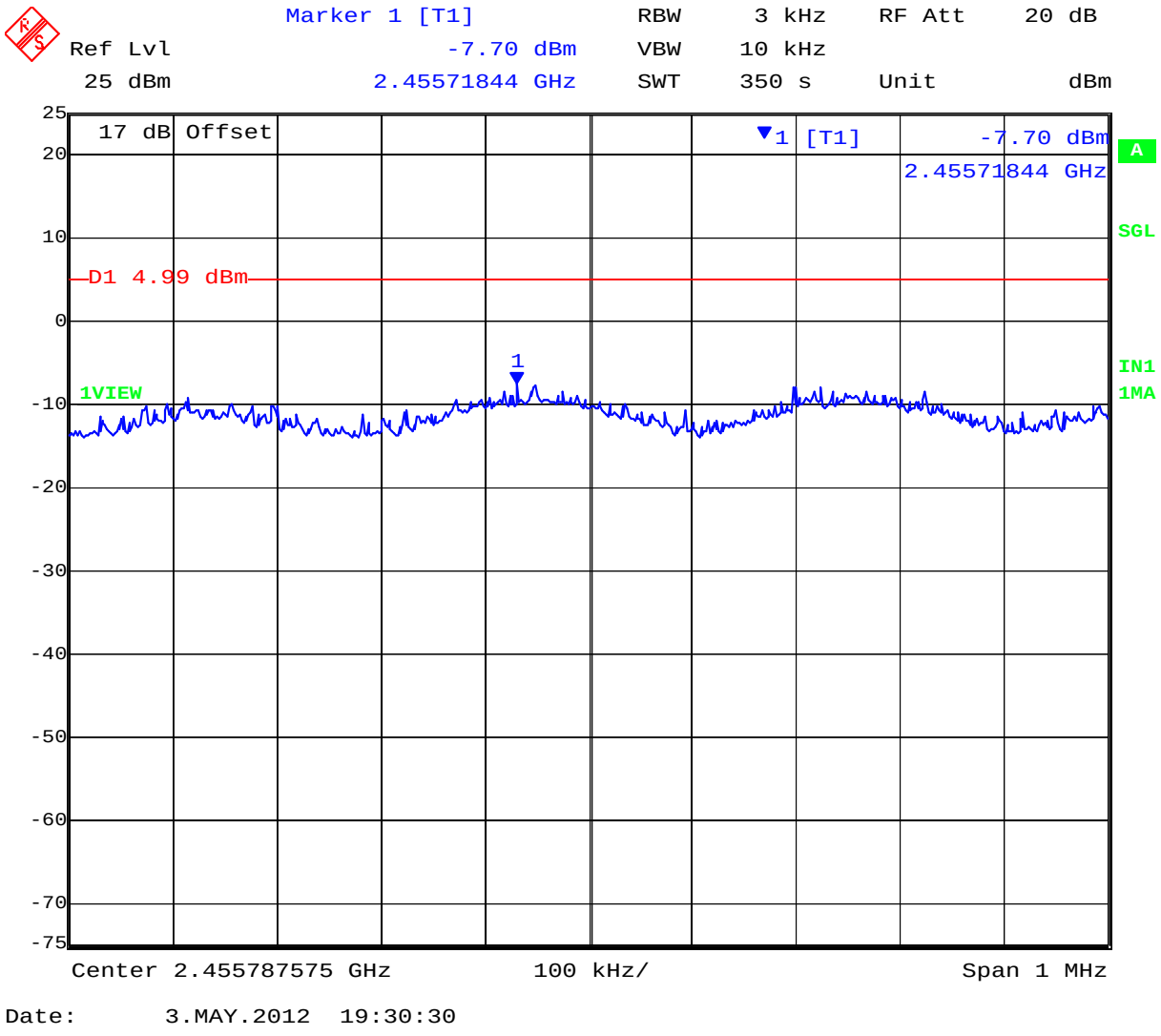
PORT B 2,437 MHz 802.11n HT-20 - Peak Power Spectral Density



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



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



Peak Power Spectral Density

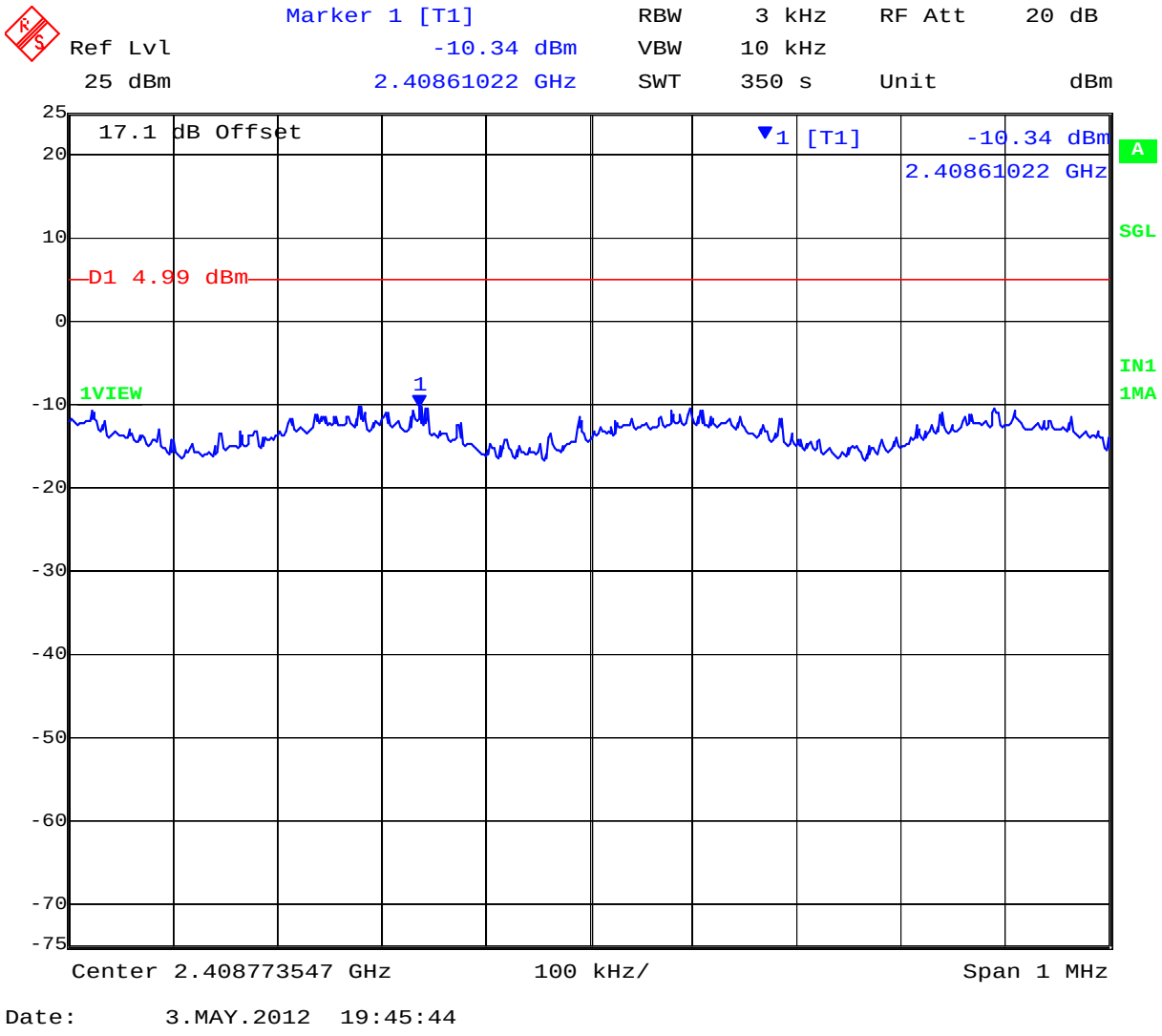
TABLE OF RESULTS – **802.11n HT-40**

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

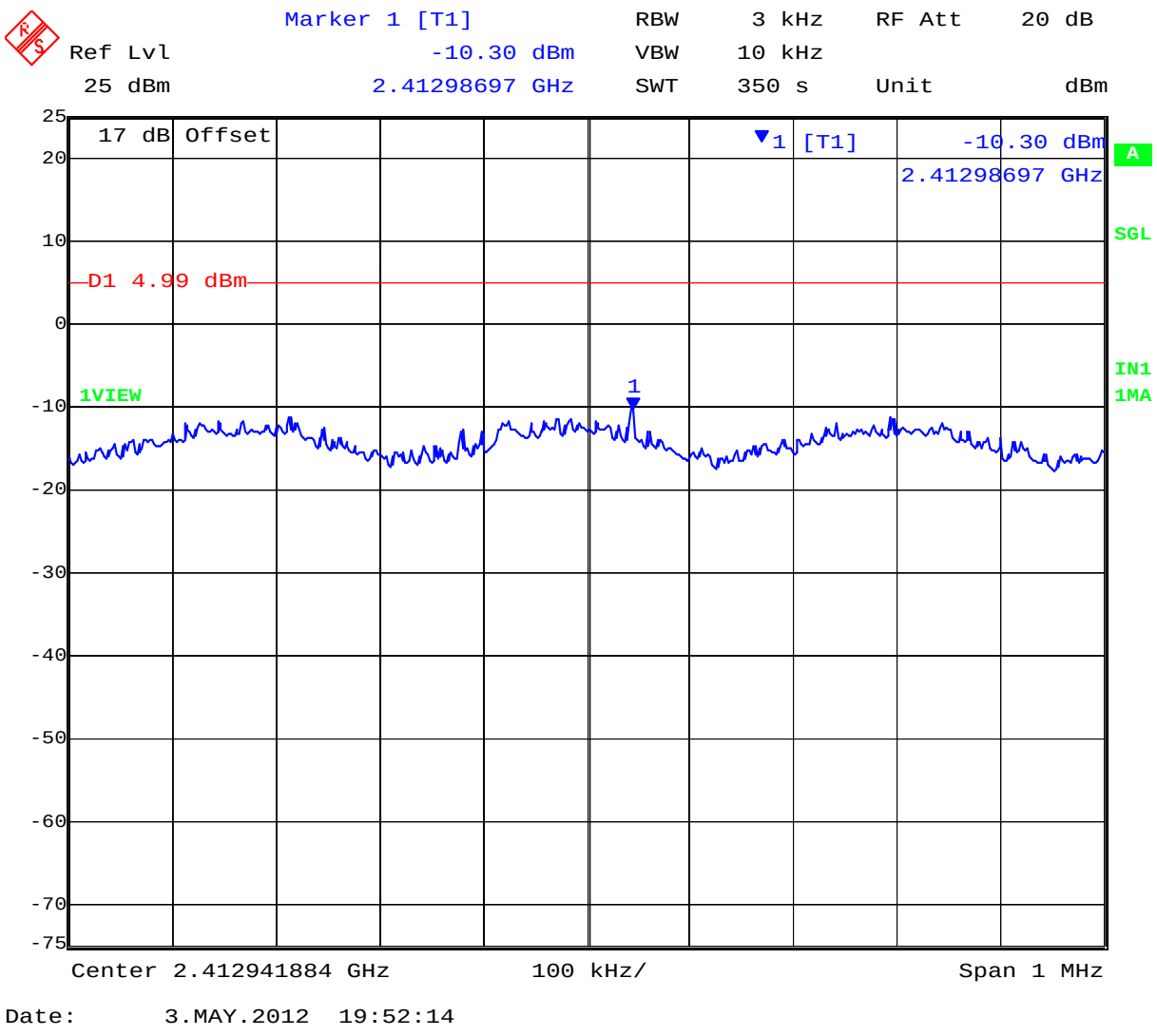
Test Frequency	**Measured Power Density RF Port (dBm)**				**Correction factor**	**Peak Power Spectral Density**	**Limit**	**Margin**
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
2422.000	-10.34	-10.30	--	--	3.01	-7.29	4.99	-12.28
2437.000	-10.33	-8.33	--	--	3.01	-5.31	4.99	-10.30
2452.000	-9.07	-9.98	--	--	3.01	-6.06	4.99	-11.05

Measurement uncertainty:	± 1.33 dB

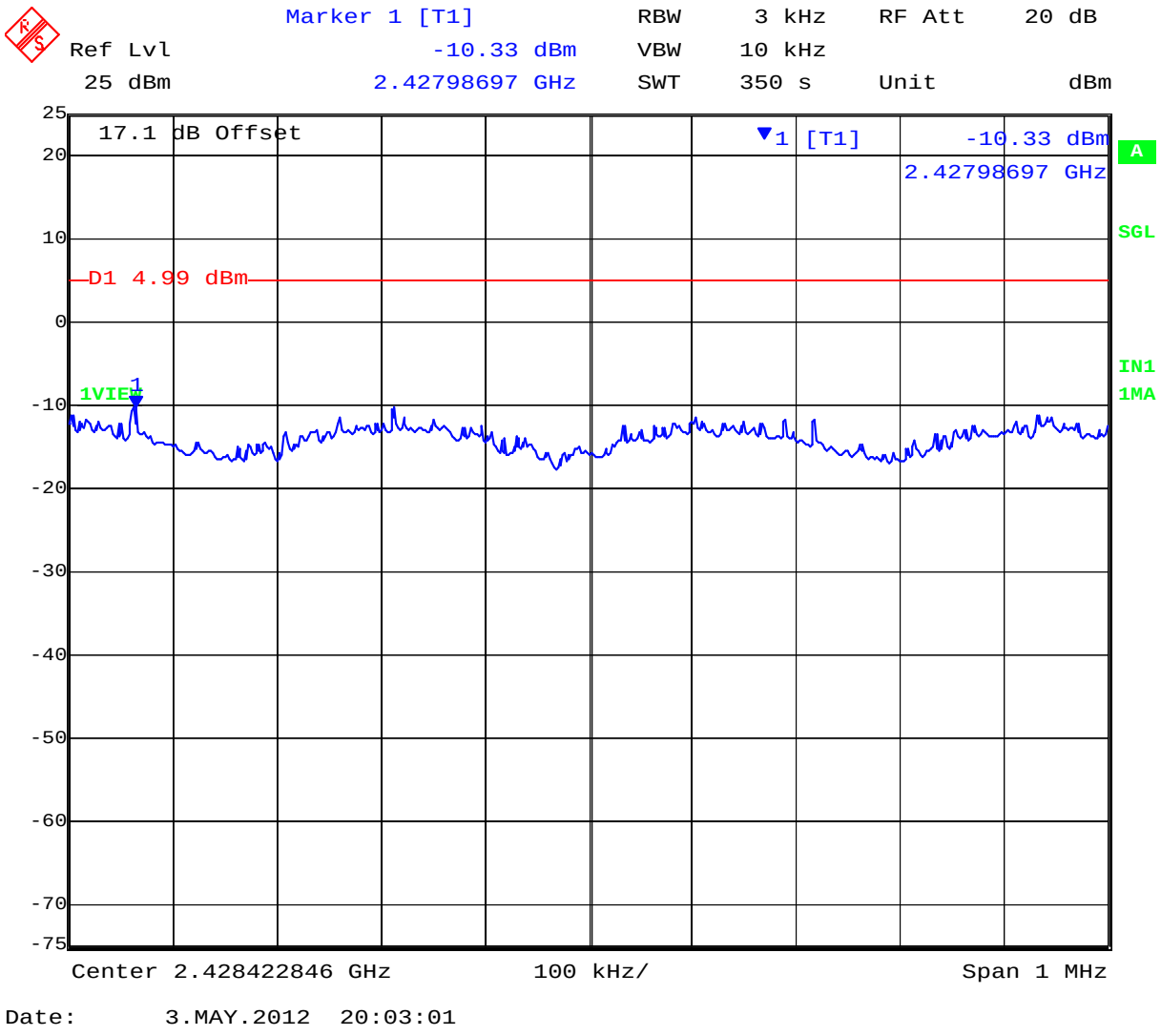
PORT A 2,422 MHz 802.11n HT-40 - Peak Power Spectral Density



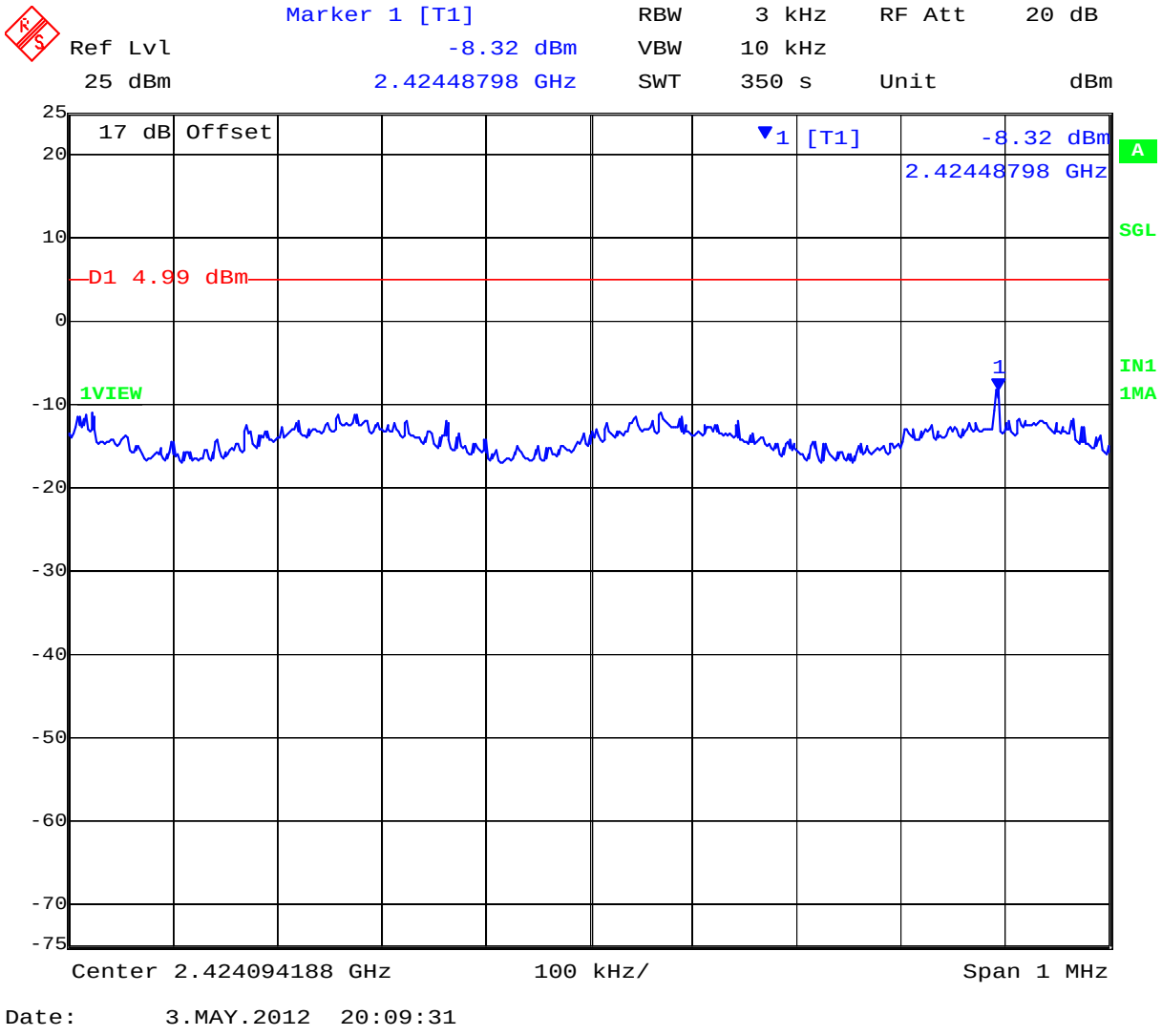
PORT B 2,422 MHz 802.11n HT-40 - Peak Power Spectral Density



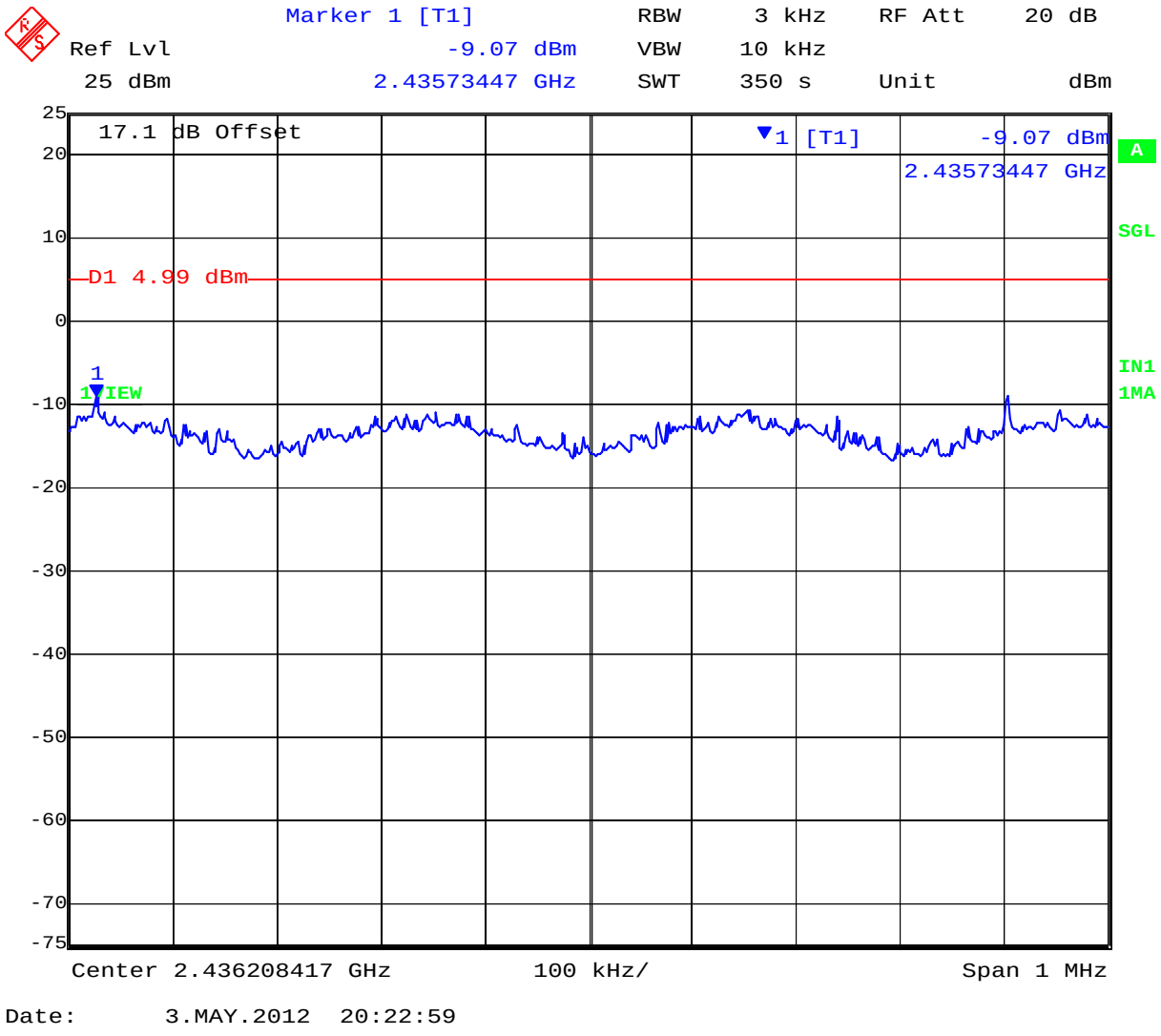
PORT A 2,437 MHz 802.11n HT-40 - Peak Power Spectral Density



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



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



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

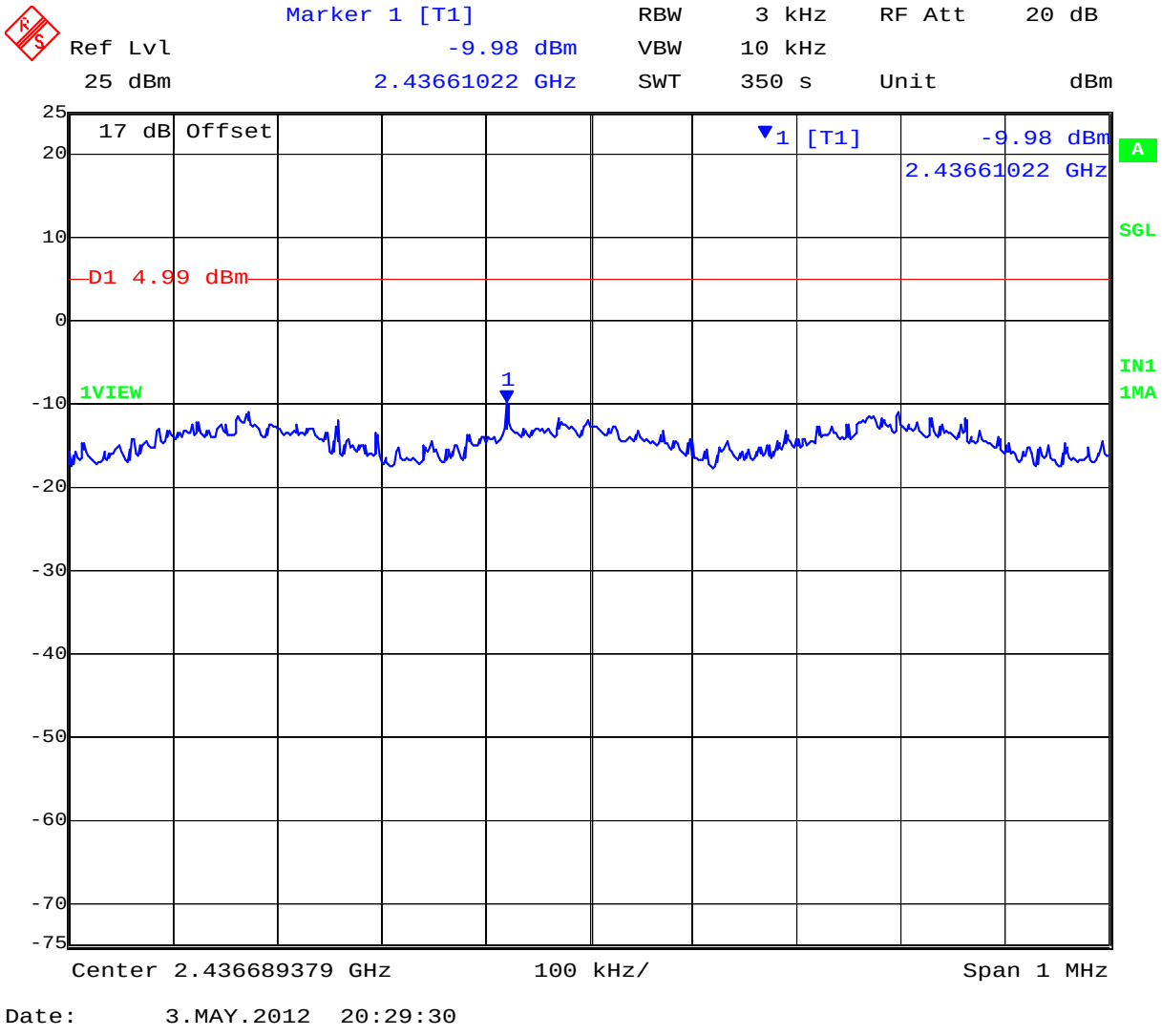


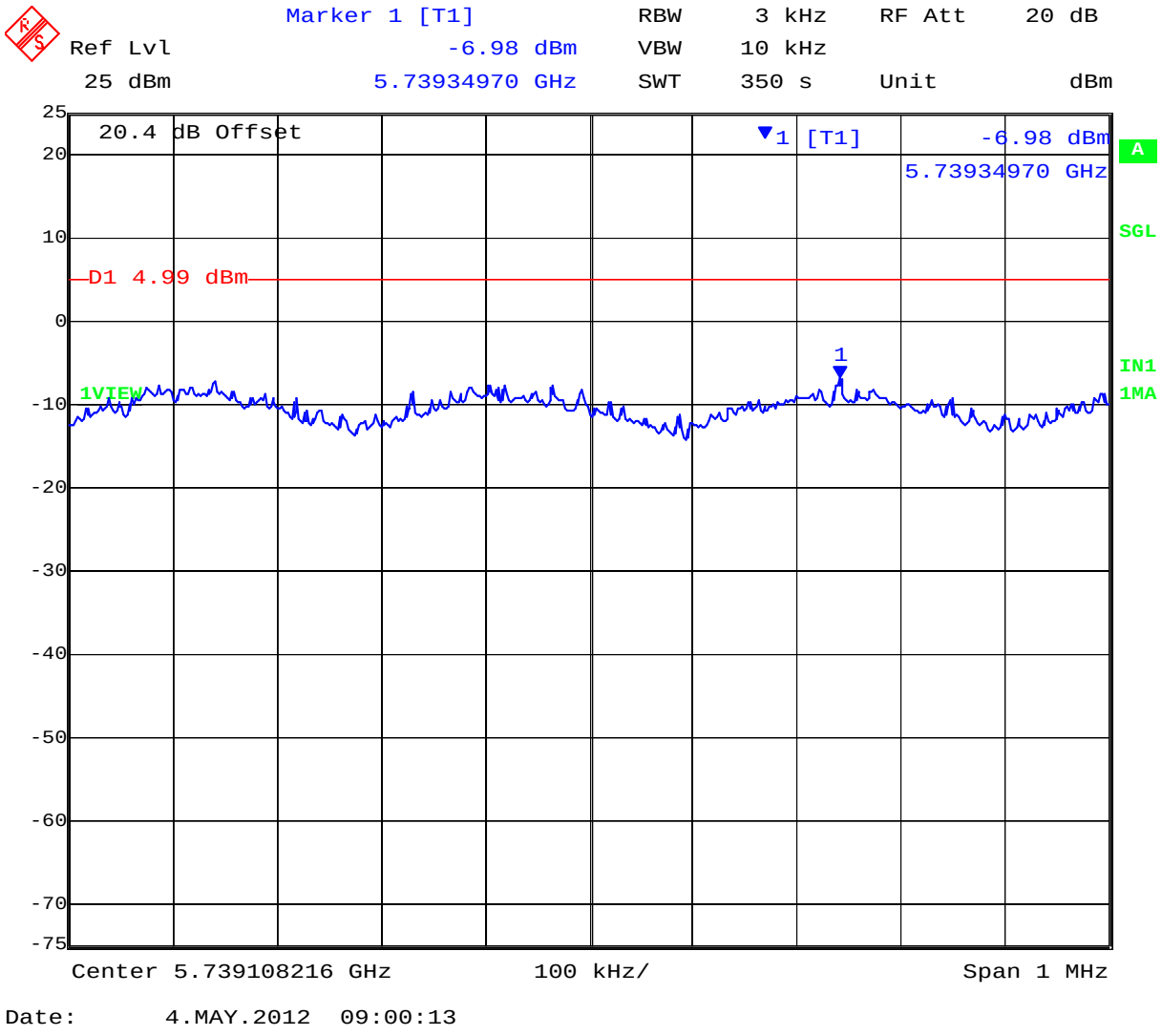
TABLE OF RESULTS – **802.11a Legacy**

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

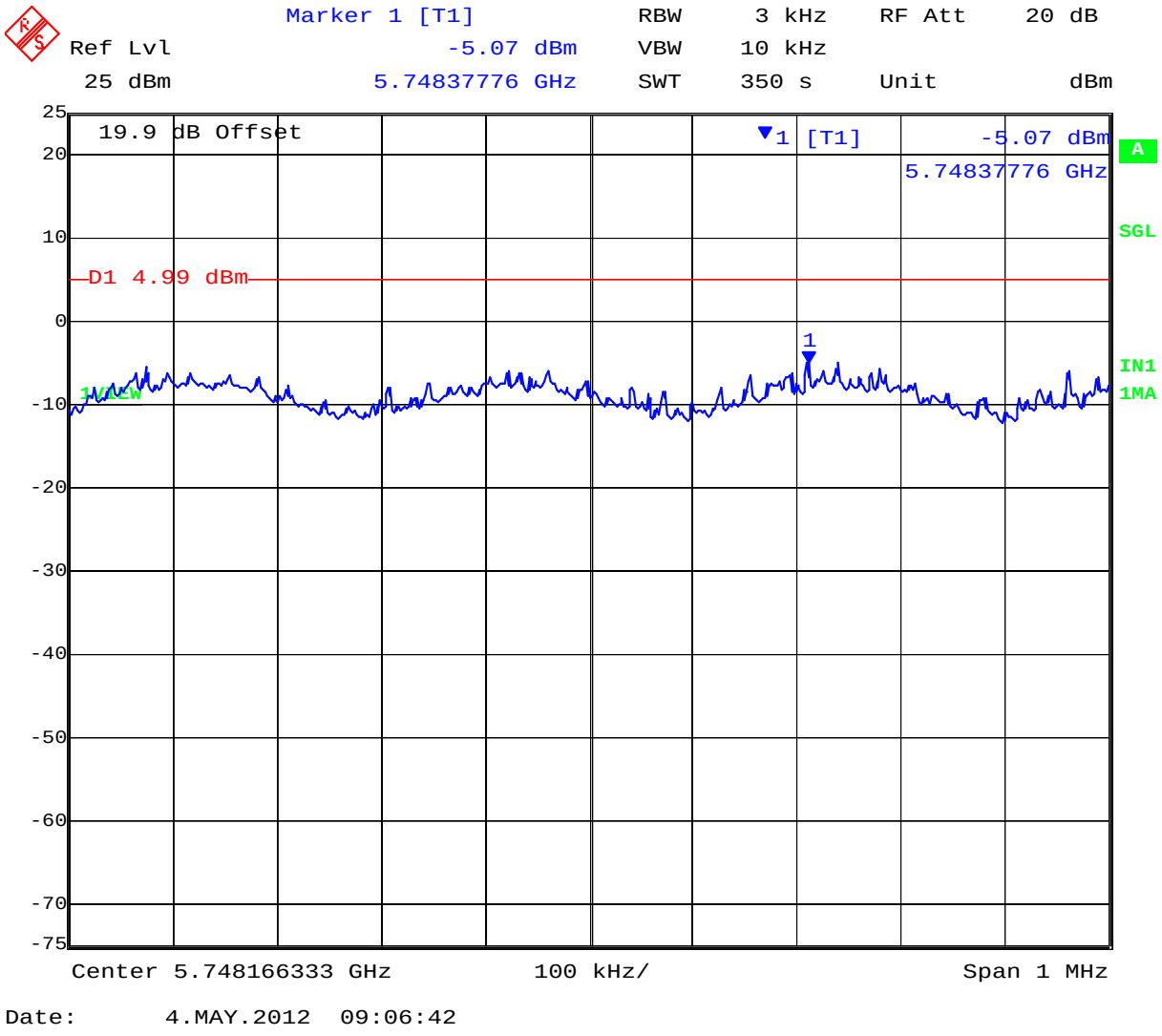
Test Frequency	Measured Power Density RF Port (dBm)				Correction factor	Peak Power Spectral Density	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
5745.000	-6.99	-5.07	--	--	3.01	-2.06	4.99	-7.05
5785.000	-5.93	-6.78	--	--	3.01	-2.92	4.99	-7.91
5825.000	-7.20	-7.25	--	--	3.01	-4.19	4.99	-9.18

Measurement uncertainty:	± 1.33 dB

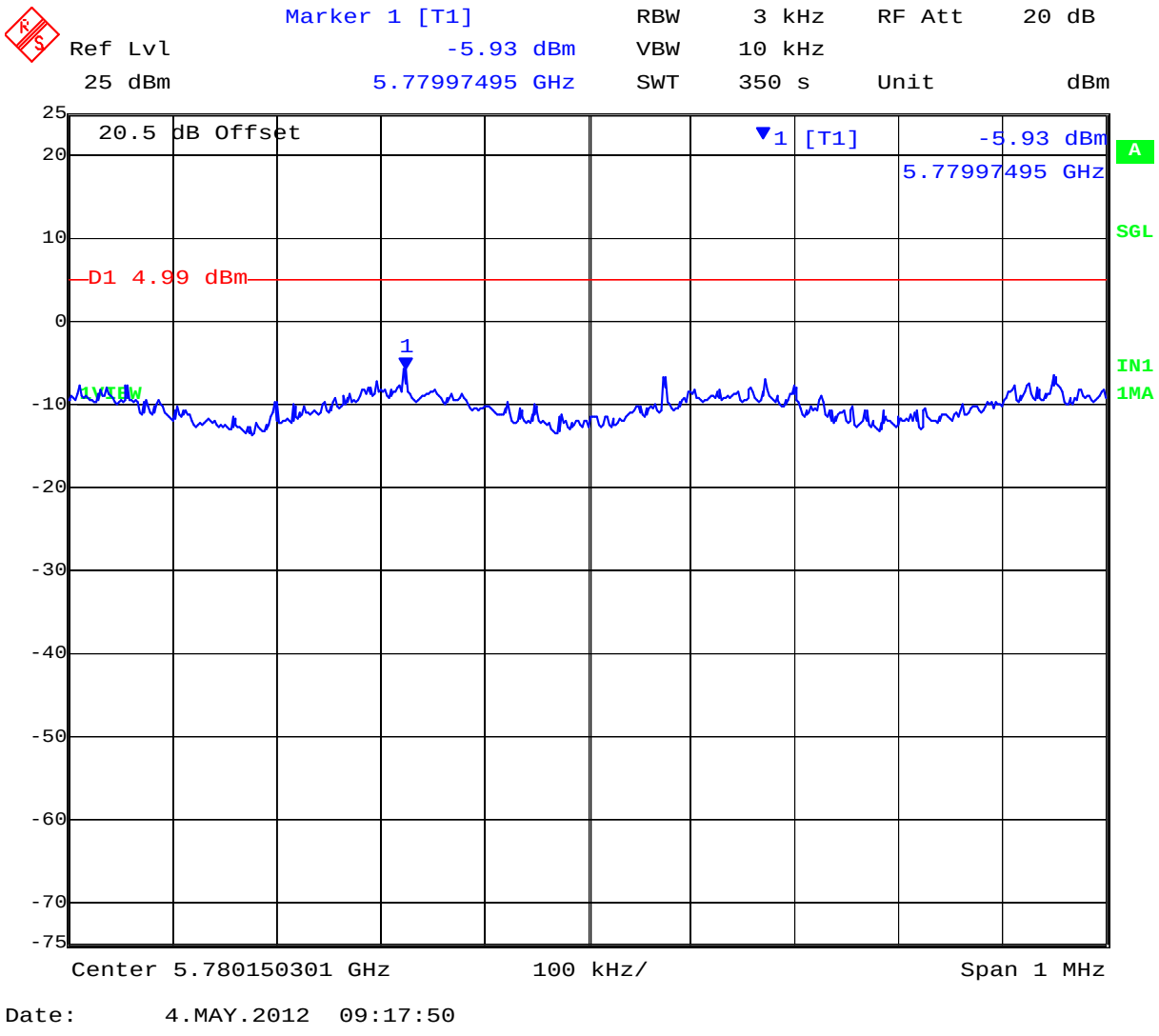
PORT A 5,745 MHz 802.11a Legacy - Peak Power Spectral Density



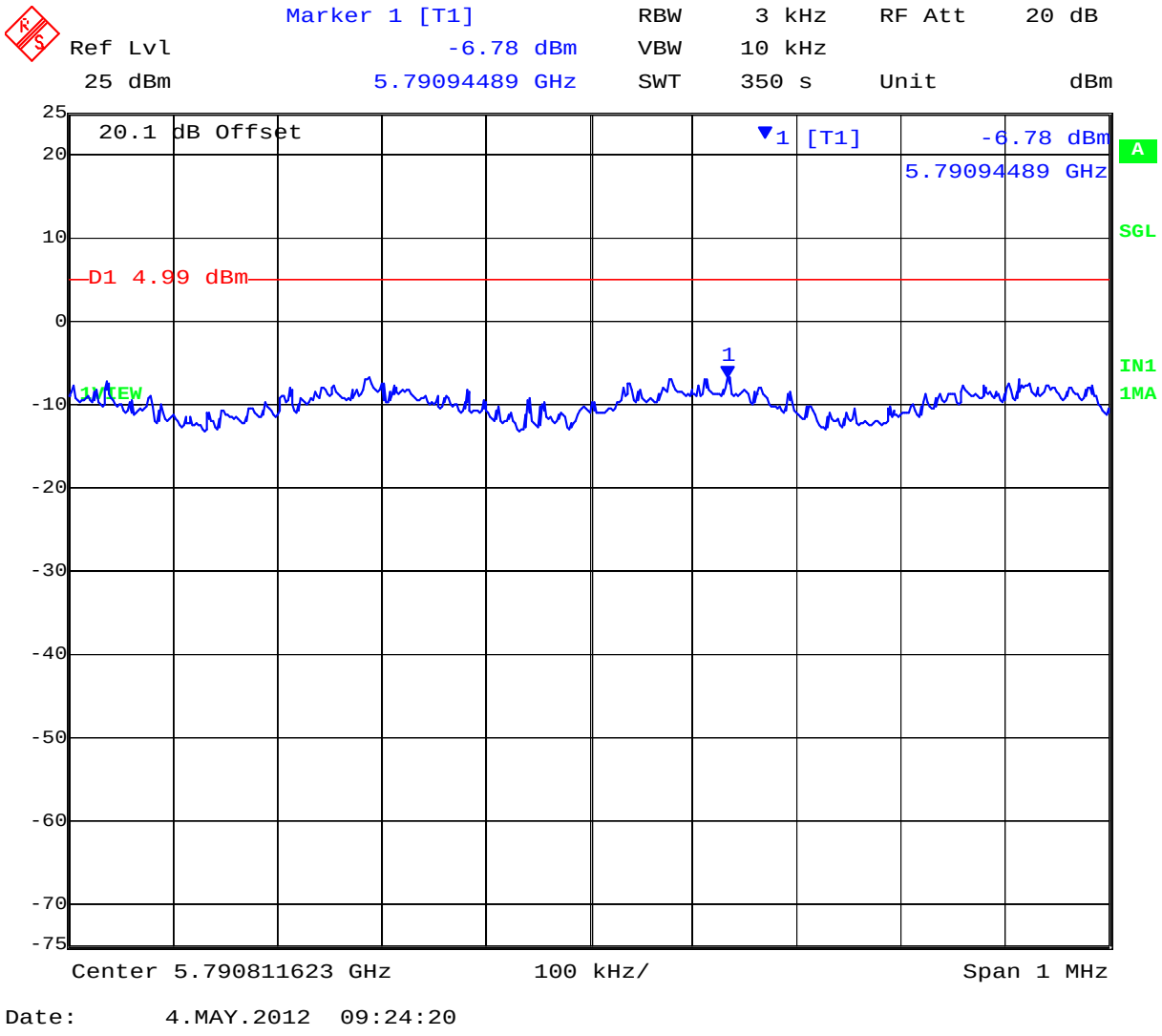
PORT B 5,745 MHz 802.11a Legacy - Peak Power Spectral Density



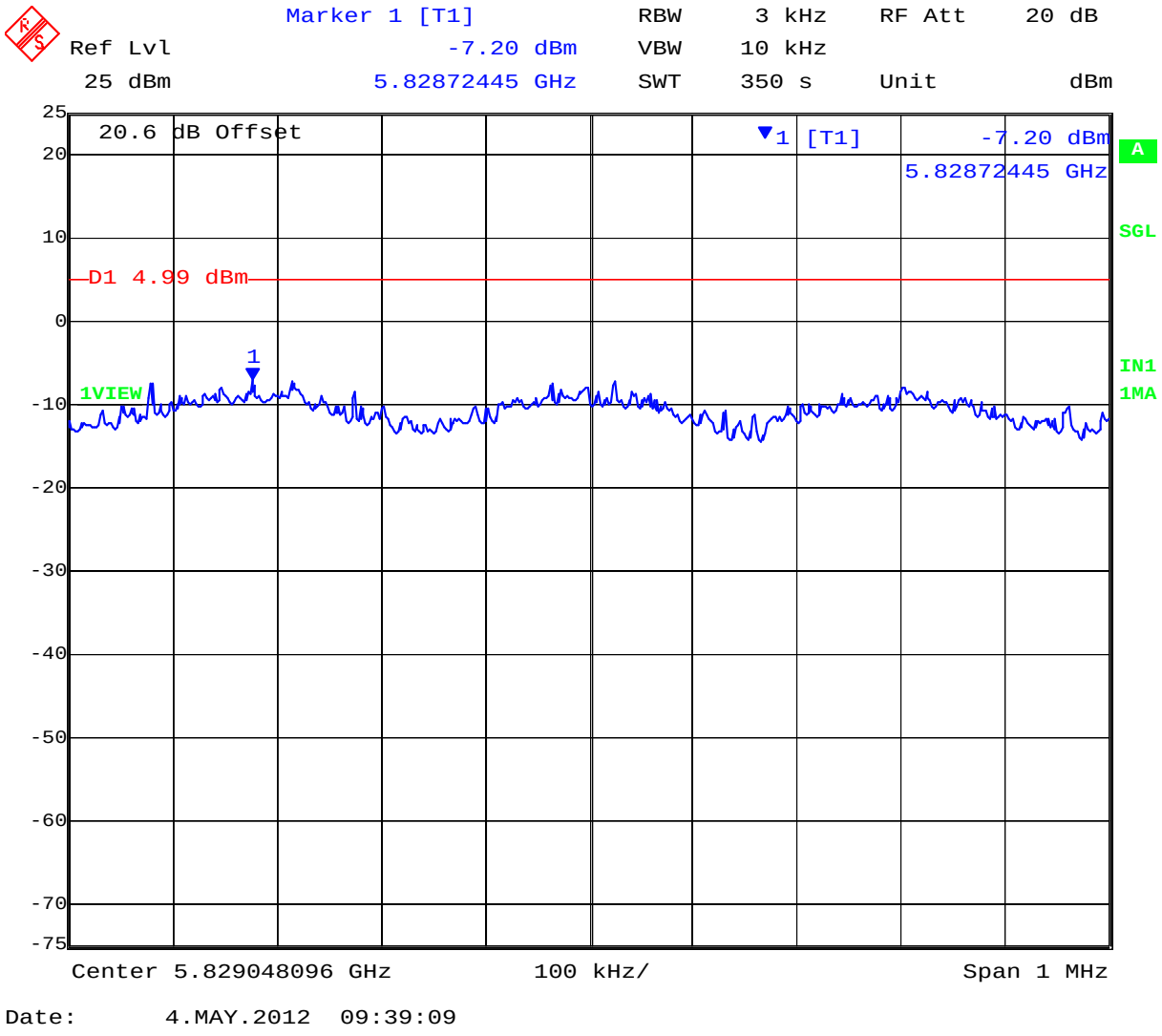
PORT A 5,785 MHz 802.11a Legacy - Peak Power Spectral Density



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



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



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

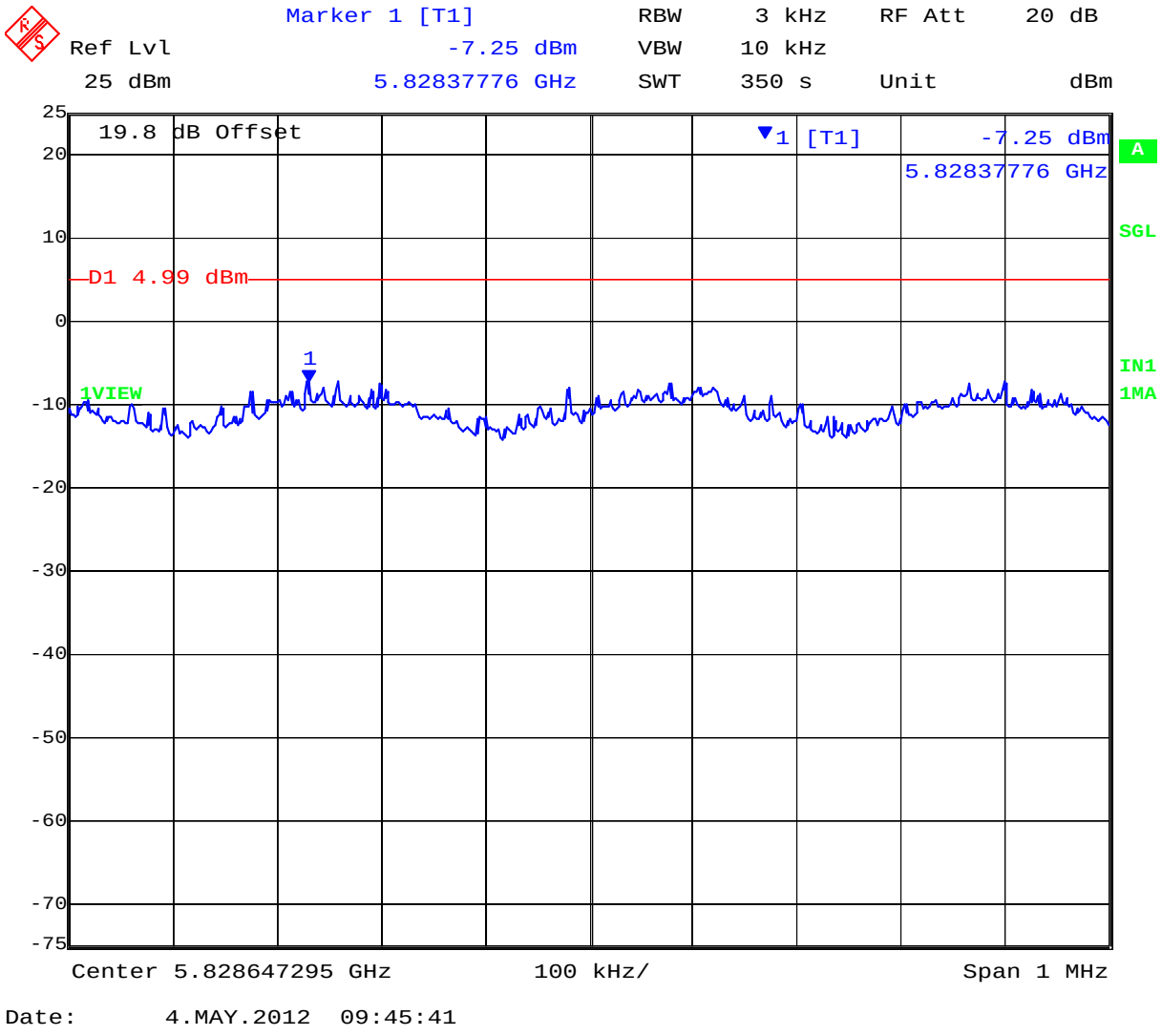


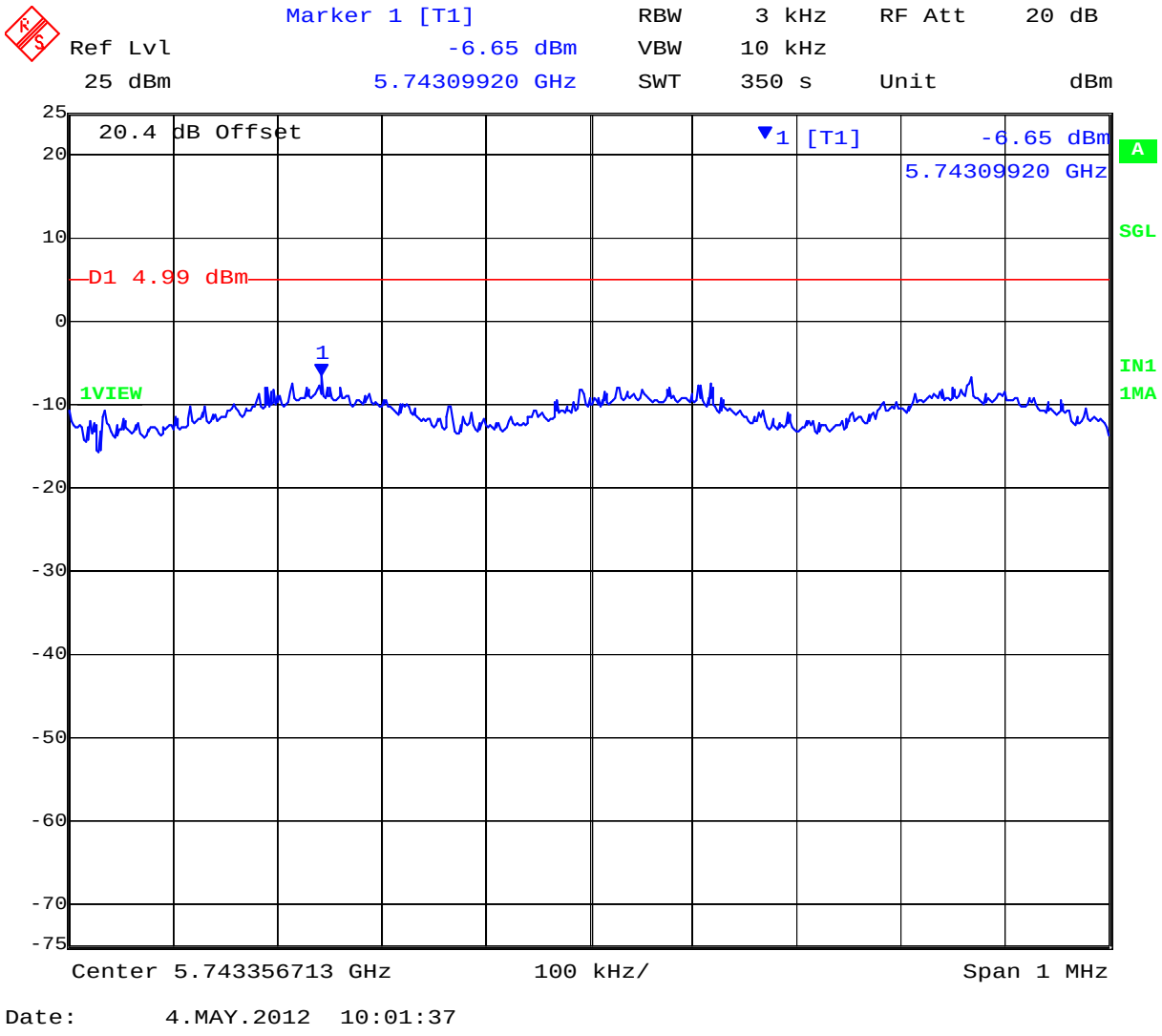
TABLE OF RESULTS – **802.11n HT-20**

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

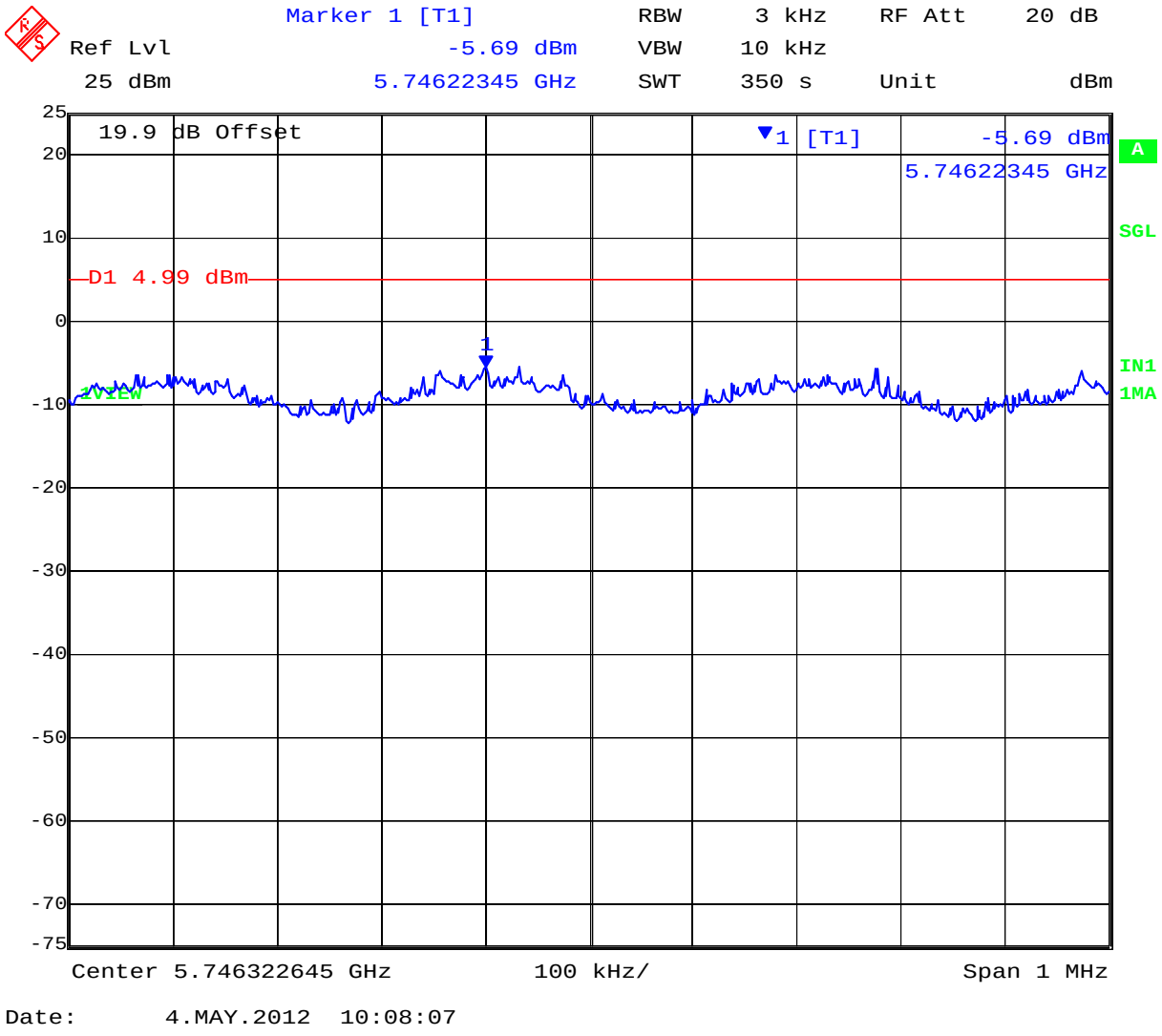
Test Frequency	Measured Power Density RF Port (dBm)				Correction factor	Peak Power Spectral Density	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
5745.000	-6.65	-5.69	--	--	3.01	-2.68	4.99	-7.67
5785.000	-6.87	-6.19	--	--	3.01	-3.18	4.99	-8.17
5825.000	-7.28	-7.17	--	--	3.01	-4.16	4.99	-9.15

Measurement uncertainty:	± 1.33 dB

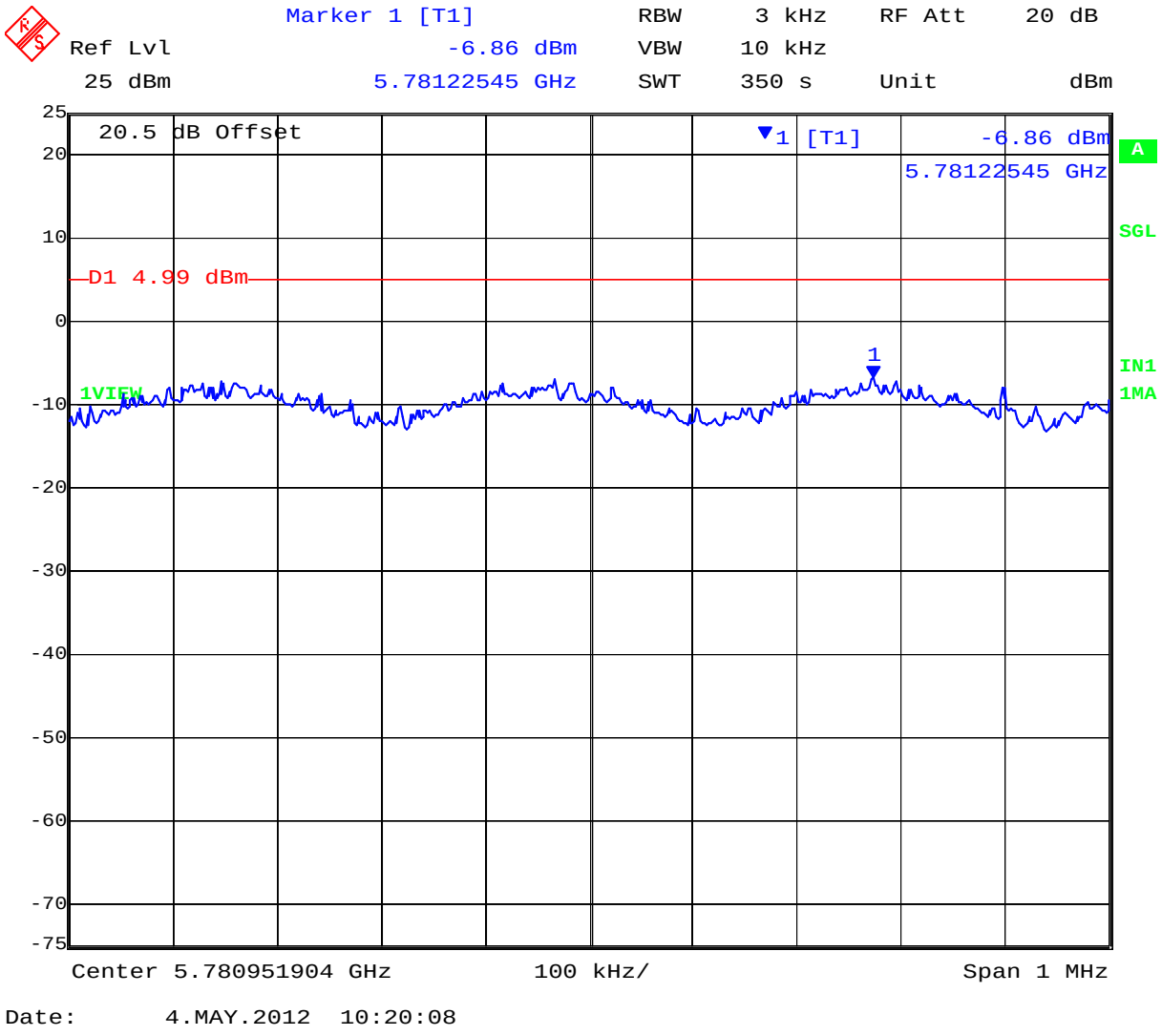
PORT A 5,745 MHz 802.11n HT-20 - Peak Power Spectral Density



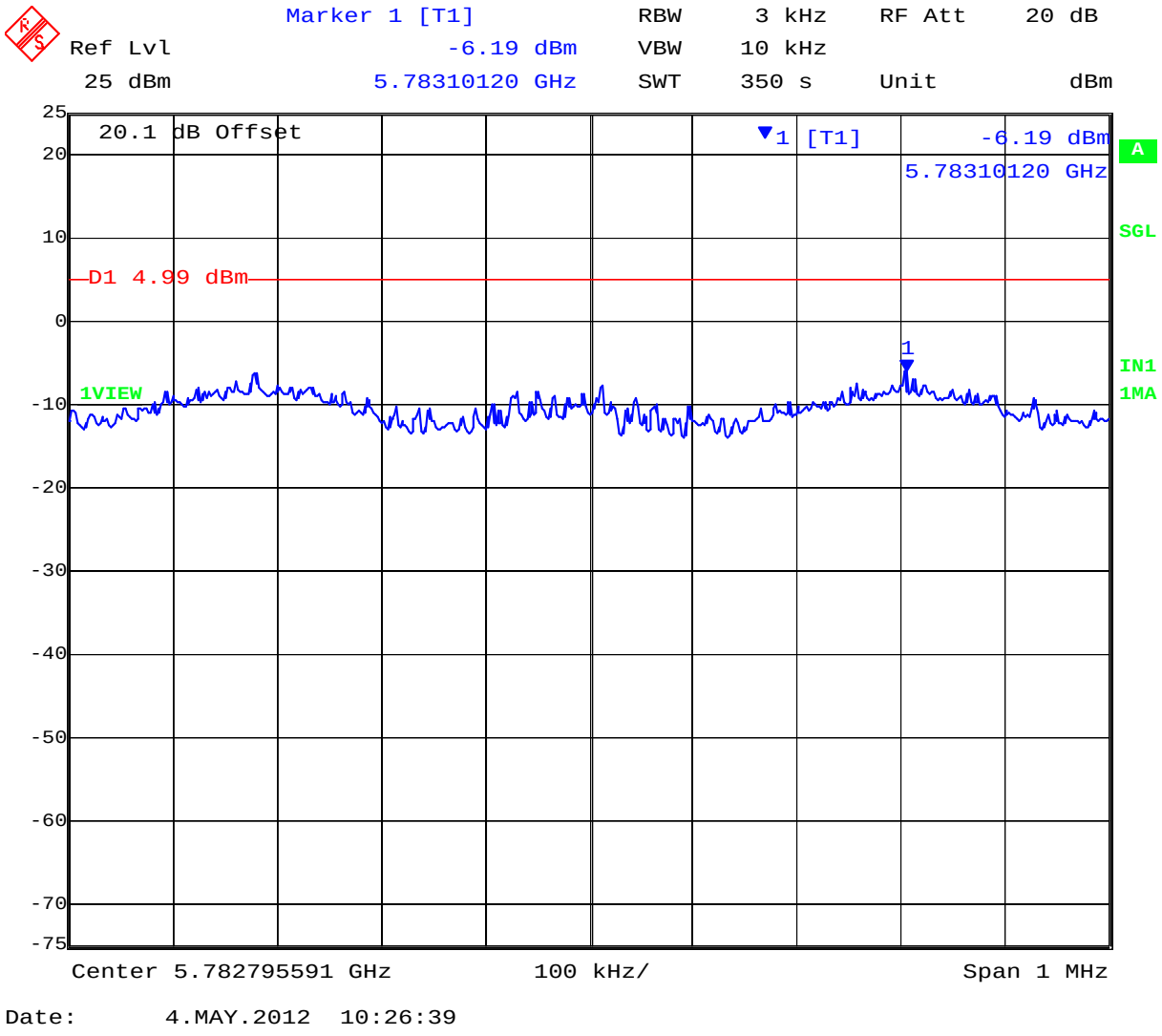
PORT B 5,745 MHz 802.11n HT-20 - Peak Power Spectral Density



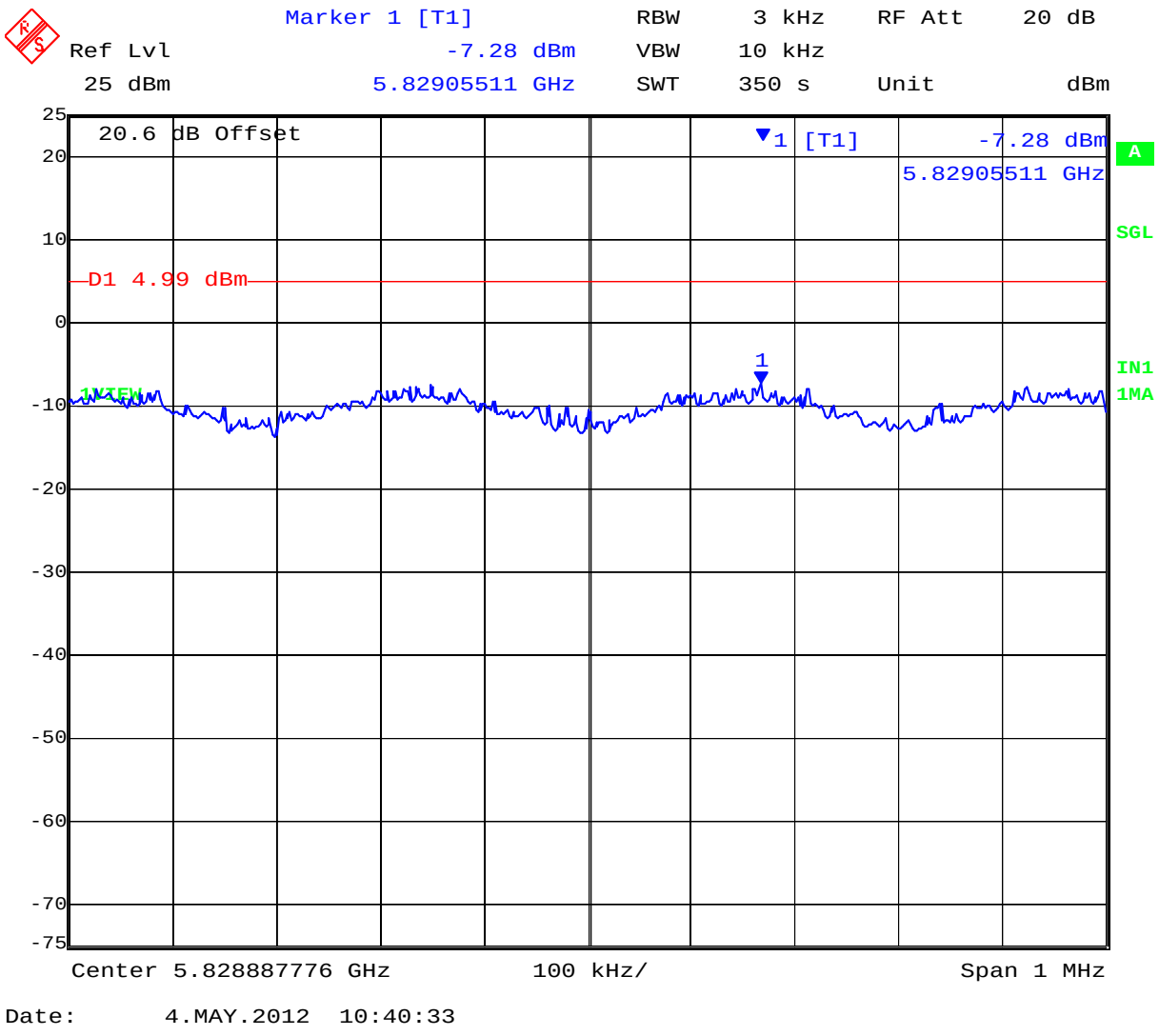
PORT A 5,785 MHz 802.11n HT-20 - Peak Power Spectral Density



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



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



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

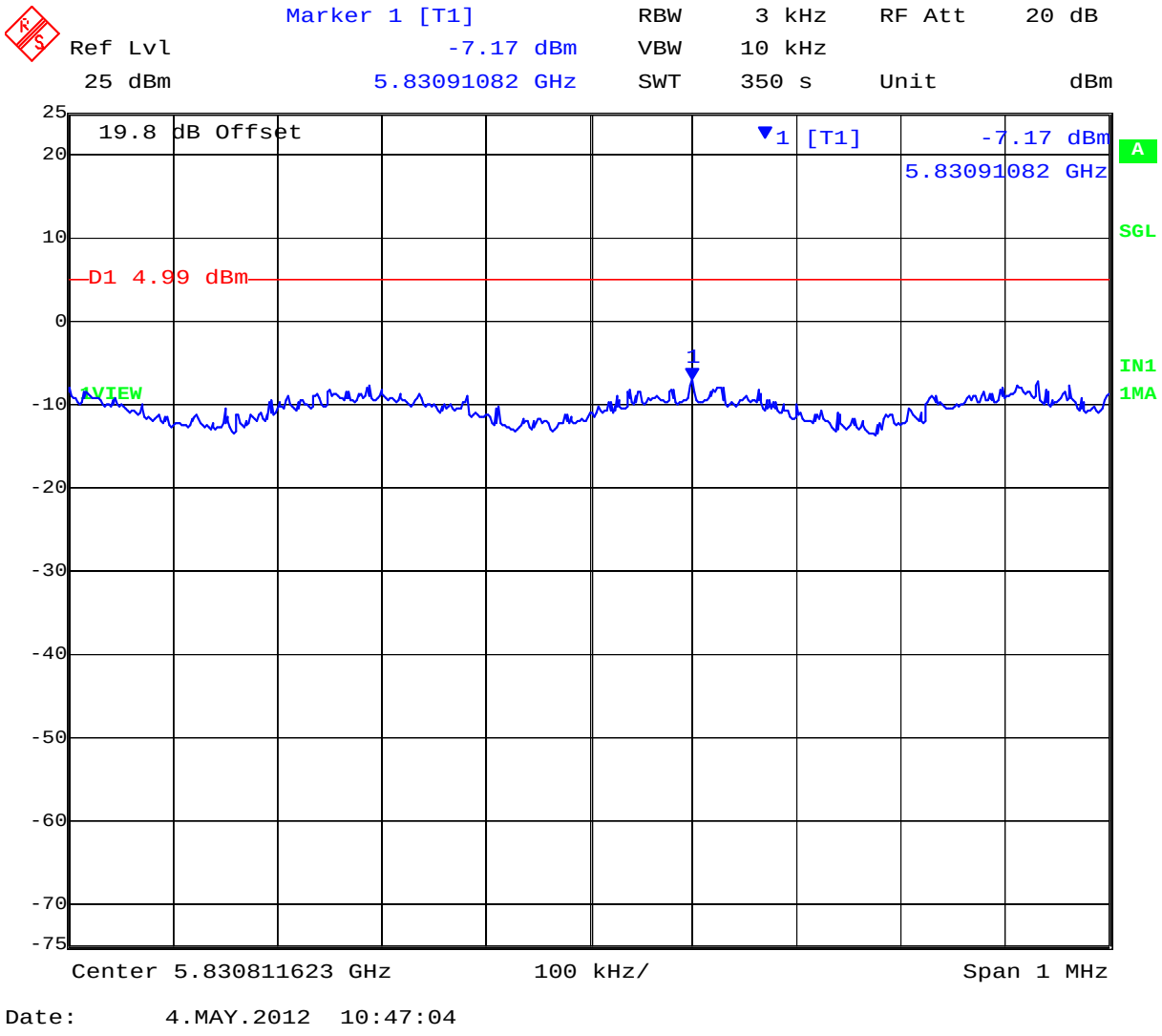


TABLE OF RESULTS – **802.11n HT-40**

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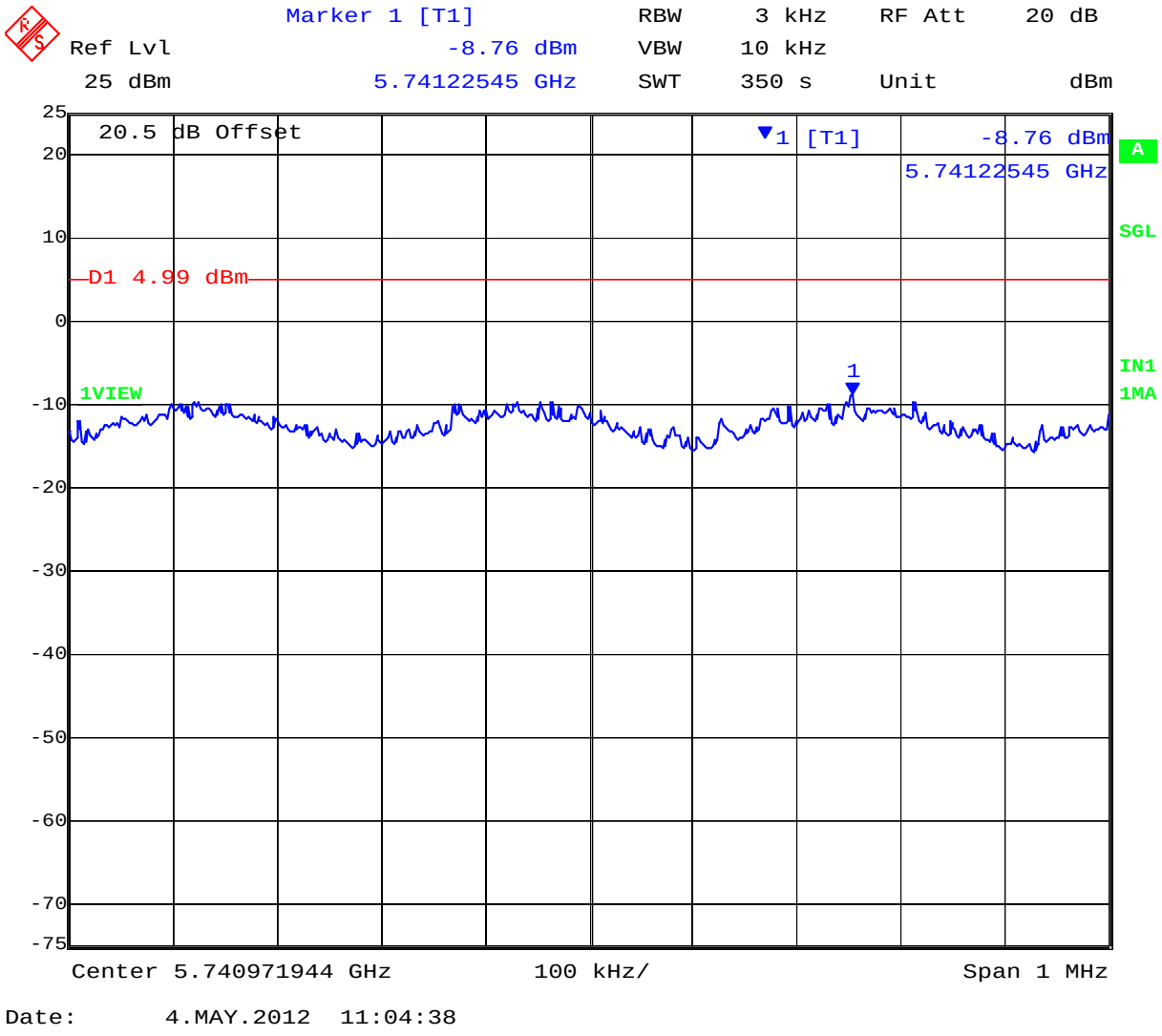
Test Conditions:	15.247 (e)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11n HT-40		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	100	
Beam Forming Gain (Y):	N/A	dB	**Antenna Gain:**	0 dBi	
Applied Voltage:	48.00	Vdc	**Antenna Ports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

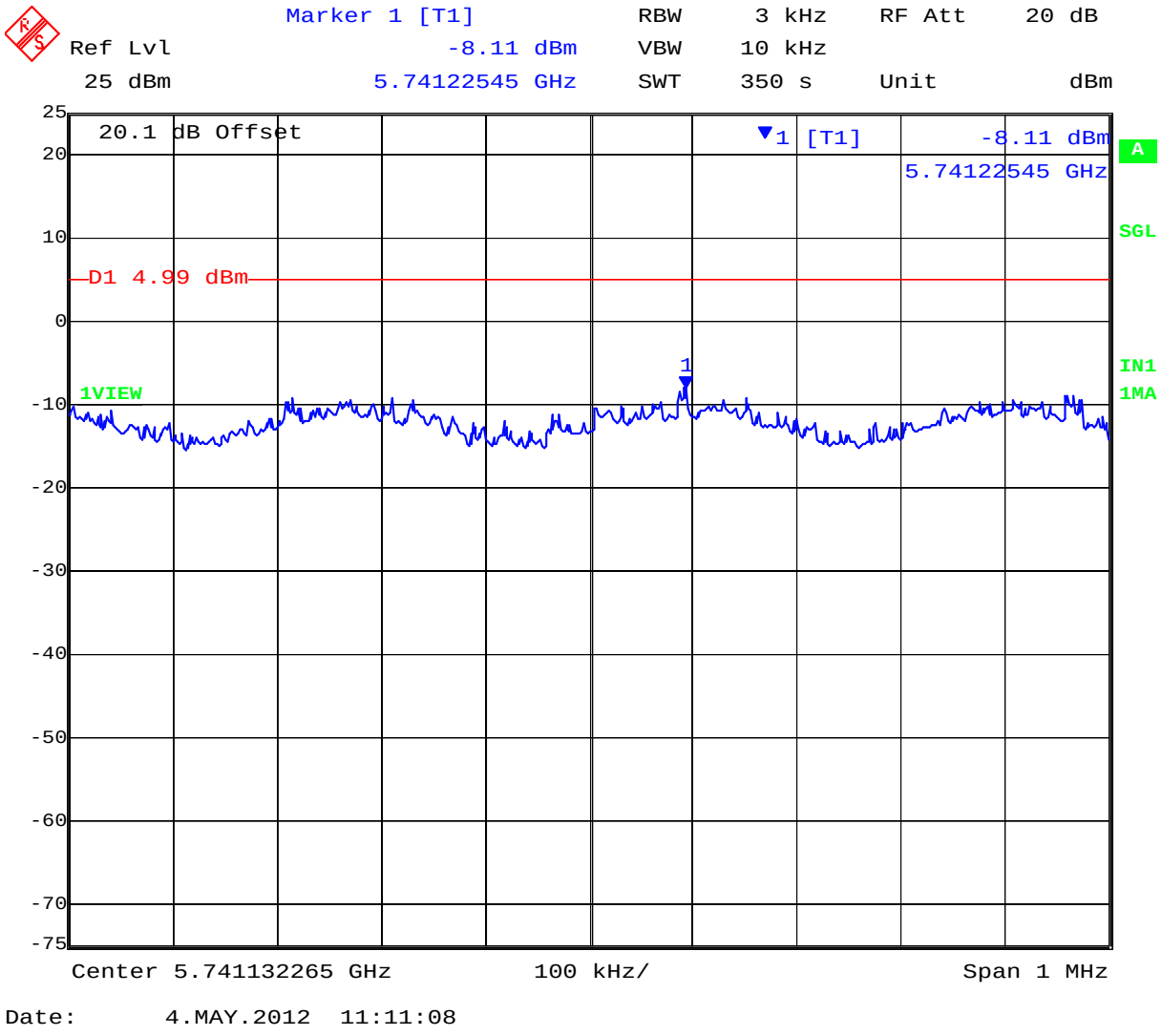
Test Frequency	**Measured Power Density**				**Correction factor**	**Peak Power Spectral Density**	**Limit**	**Margin**
	RF Port (dBm)							
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
5755.000	-8.76	-8.11	--	--	3.01	-5.10	4.99	-10.09
5795.000	-7.58	-8.47	--	--	3.01	-4.57	4.99	-9.56

Measurement uncertainty:	± 1.33 dB

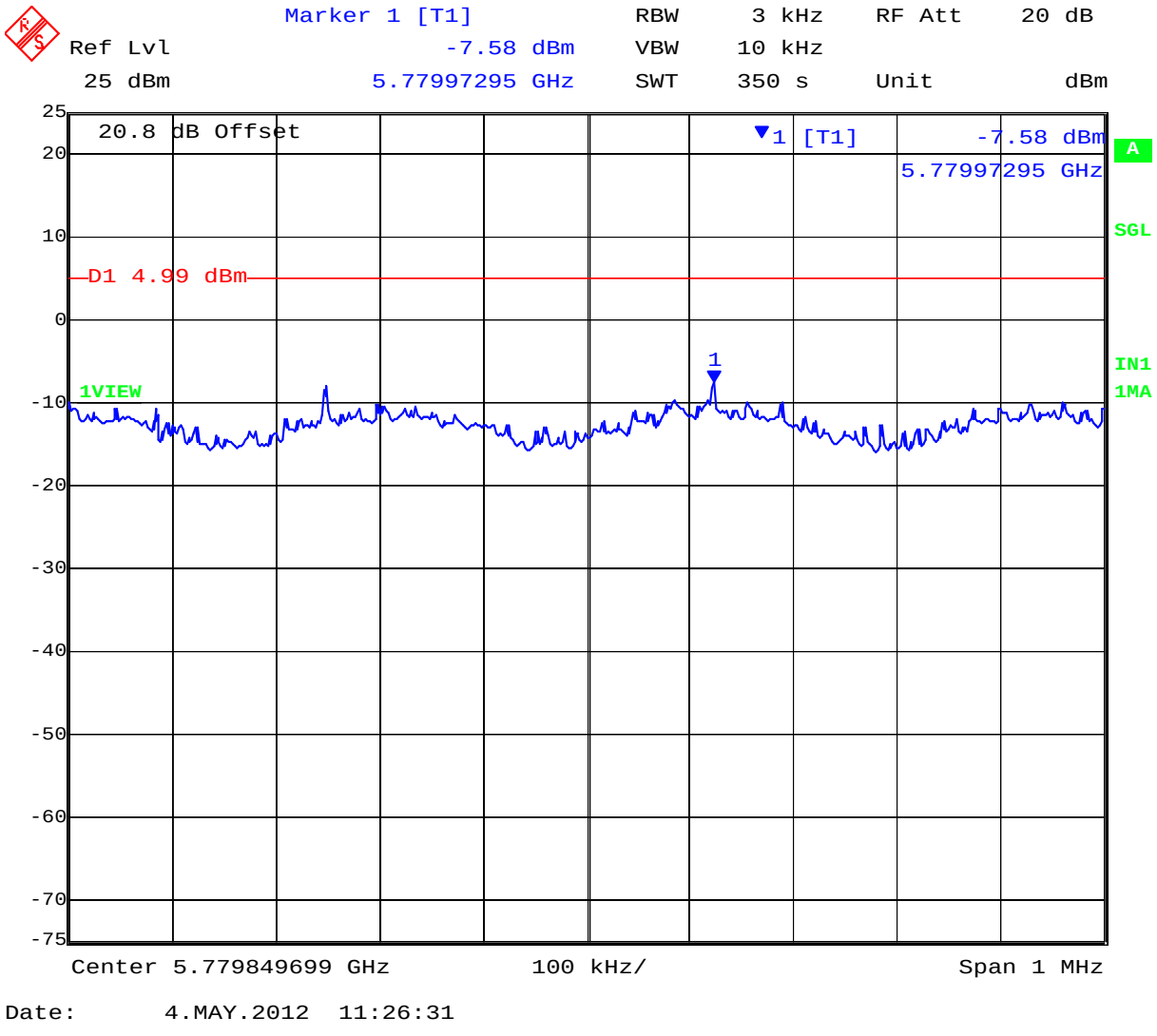
PORT A 5,755 MHz 802.11n HT-40 - Peak Power Spectral Density



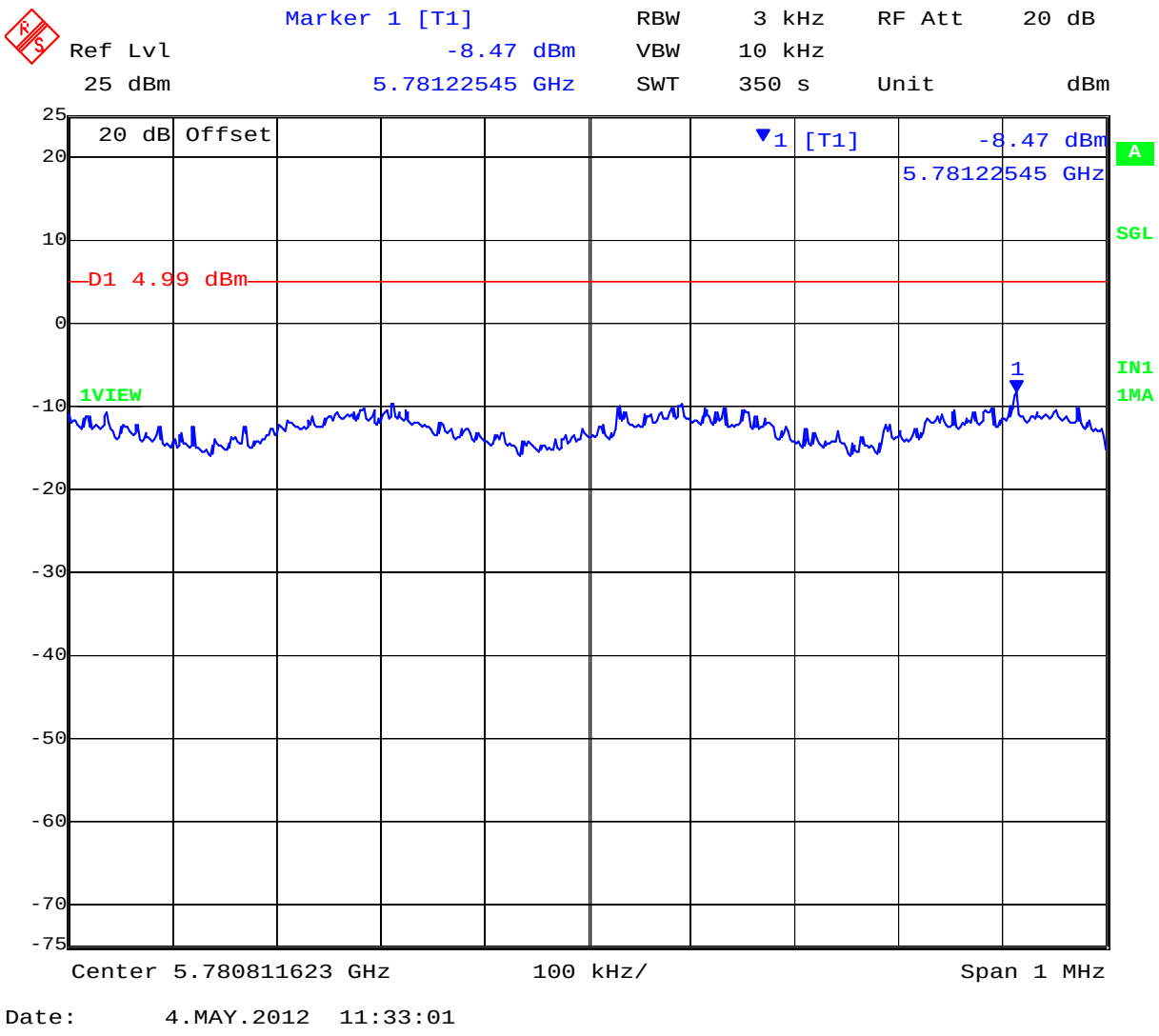
PORT B 5,755 MHz 802.11n HT-40 - Peak Power Spectral Density



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



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



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

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/cm^2) = EIRP/(4πd^2)

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 WLA322 has two transmitters one 2.4 and one 5 GHz. The peak power in the table below is calculated by using maximum power found in the 2.4 GHz and 5.8 GHz bands. The $\sum$ of each transmitter chain is used for calculation purposes.

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

Freq. Band (GHz)	Antenna Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) @ 20 cm	Minimum Separation Distance (cm)
2.4	0.0	1.00	+27.89	615.2	0.122	20.0*
5.8	0.0	1.00	+29.83	961.6	0.191	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 / cm^2 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

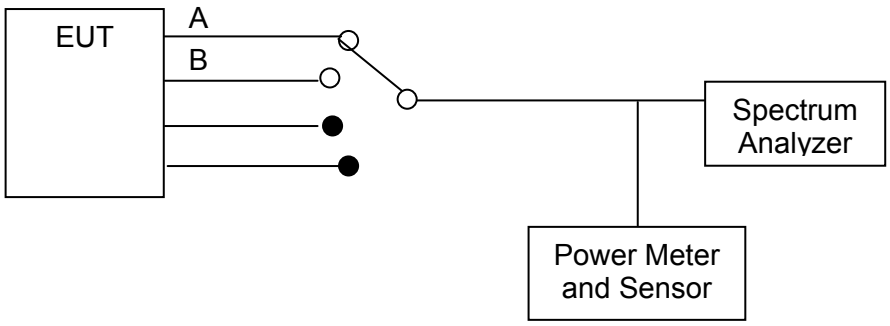
Measurement uncertainty	±1.33 dB

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.

TABLE OF RESULTS – **802.11b – Legacy**

Test Conditions:	15.247 (a)(2)		**Rel. Humidity (%):**	35	to	42
Variant:	802.11b		**Ambient Temp. (ºC):**	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	
MHz	MHz	MHz	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
2412.000	30.00	26000.00	-39.38	-12.08	-42.98	-12.04				
2437.000	30.00	26000.00	-40.85	-12.79	-41.64	-12.62				
2462.000	30.00	26000.00	-41.02	-13.53	-42.57	-12.69				

SE: Maximum spurious emission found

Band-edge Measurement

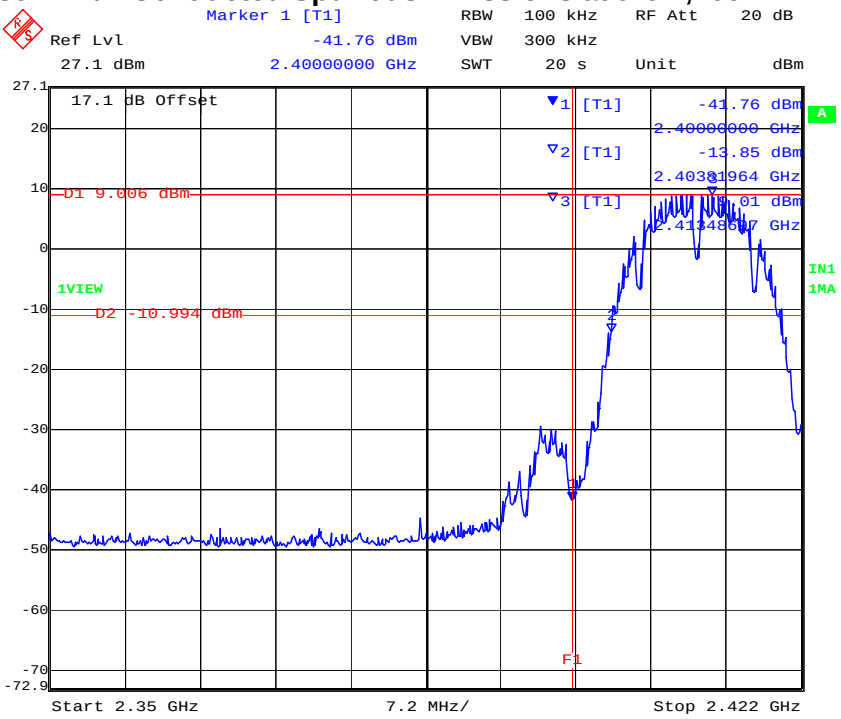
Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2412.000	2400.00	-41.76	-10.99	-32.68	-10.97				
2462.000	2483.50	-45.79	-10.75	-41.41	-11.24				

BE: Maximum Band edge emission found

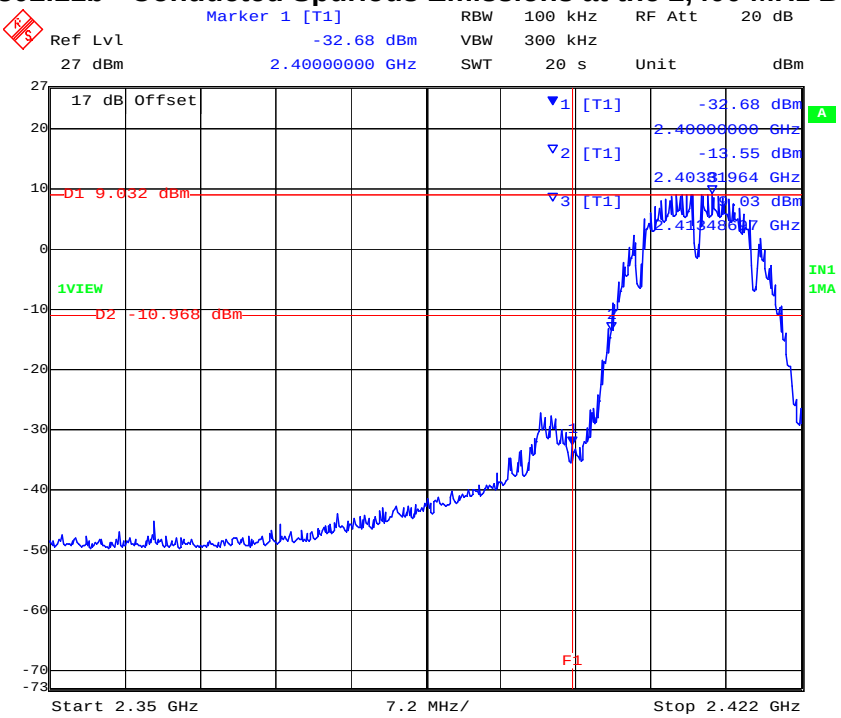
Measurement uncertainty:	±2.81 dB

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

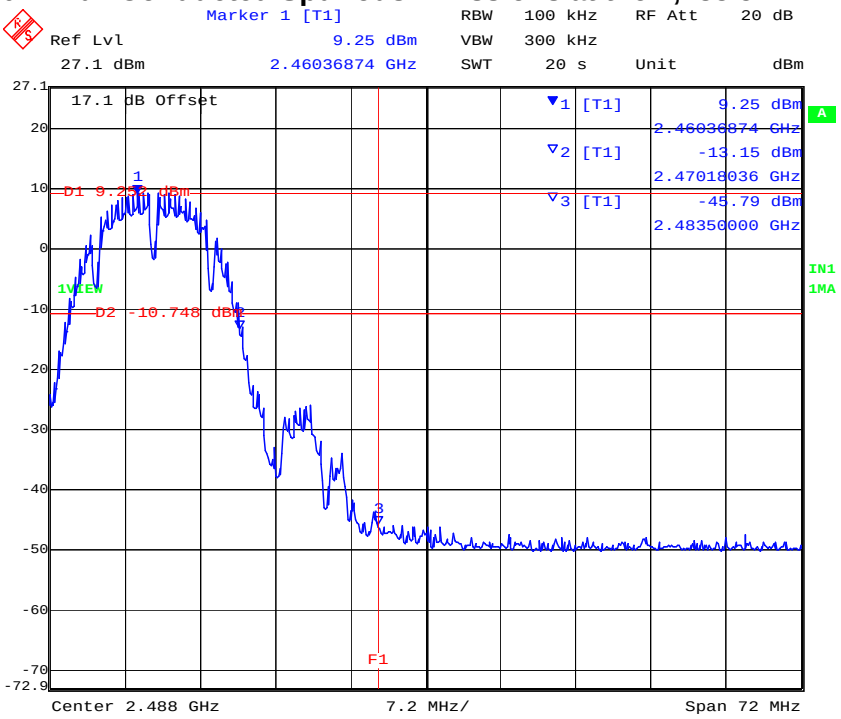
PORT A 802.11b - Conducted Spurious Emissions at the 2,400 MHz Band Edge



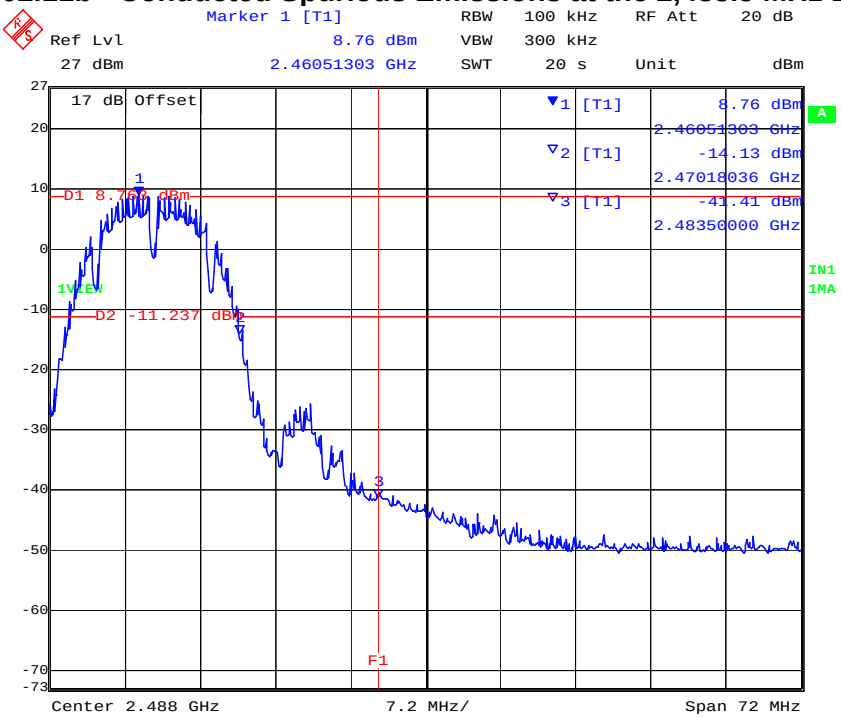
PORT B 802.11b - Conducted Spurious Emissions at the 2,400 MHz Band Edge



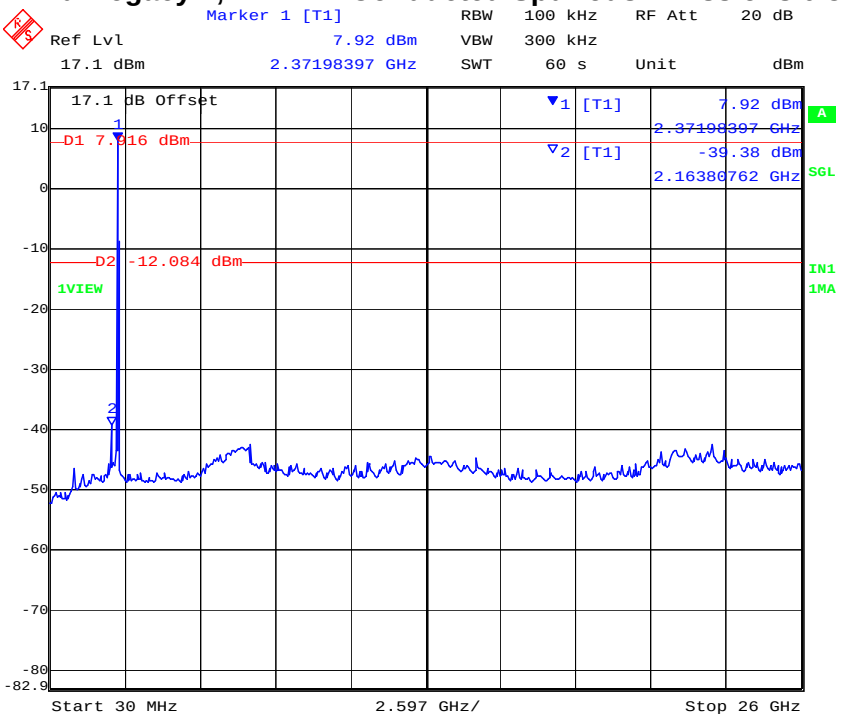
PORT A 802.11b - Conducted Spurious Emissions at the 2,483.5 MHz Band Edge



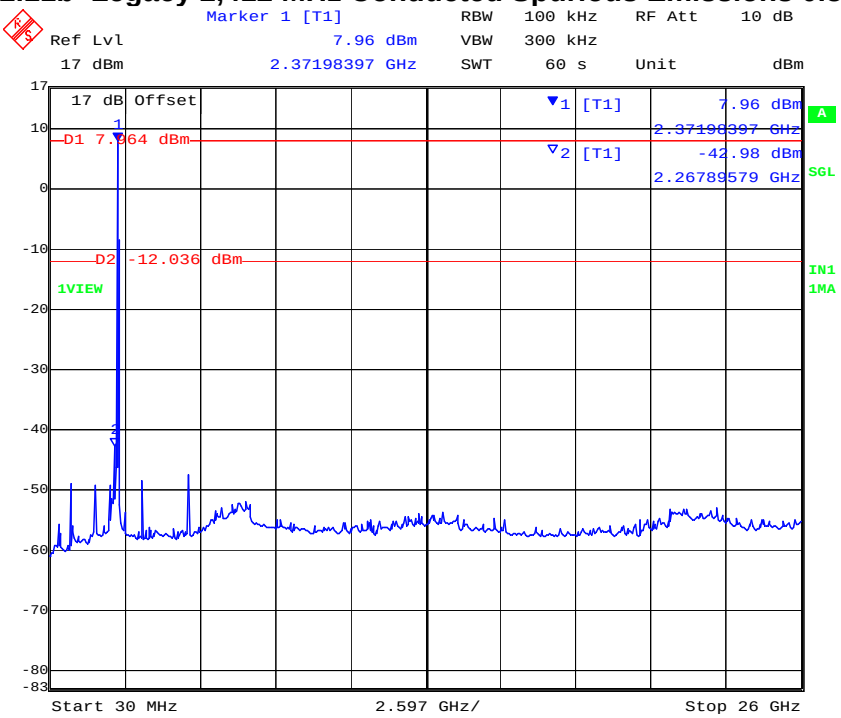
PORT B 802.11b - Conducted Spurious Emissions at the 2,483.5 MHz Band Edge



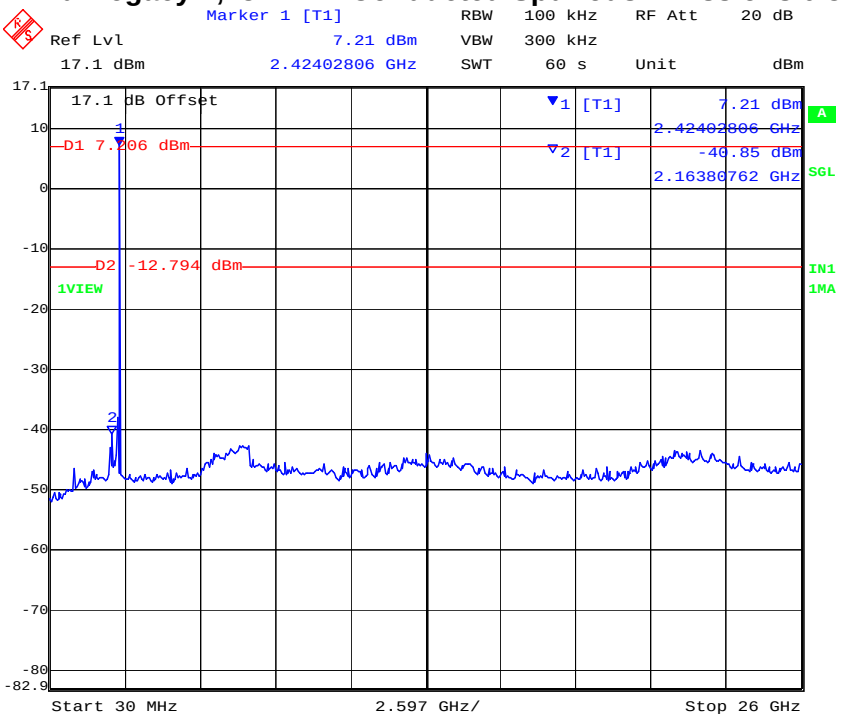
PORT A 802.11b–Legacy 2,412 MHz Conducted Spurious Emissions 0.30 to 26 GHz



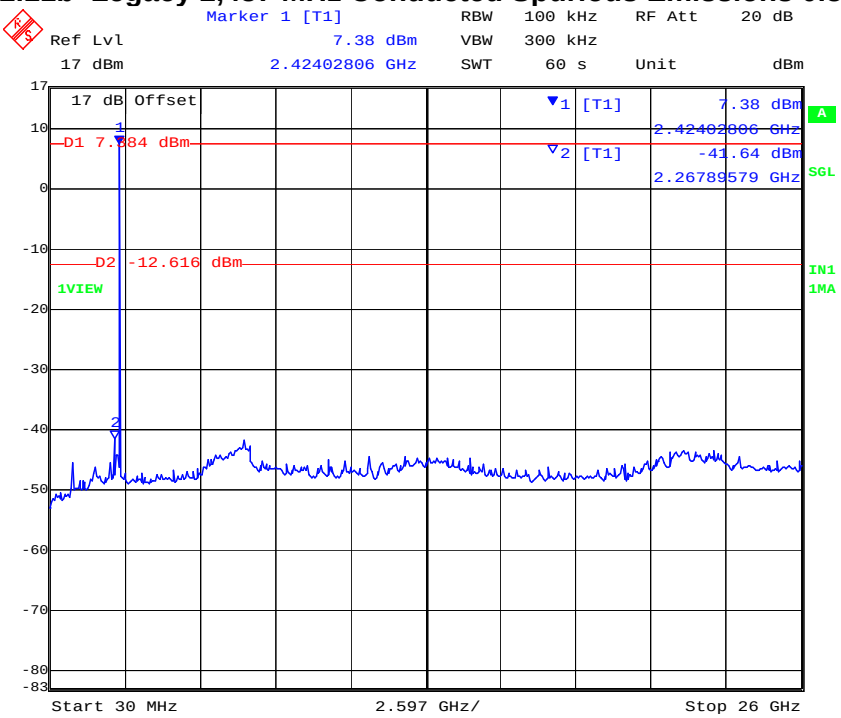
PORT B 802.11b–Legacy 2,412 MHz Conducted Spurious Emissions 0.30 to 26 GHz



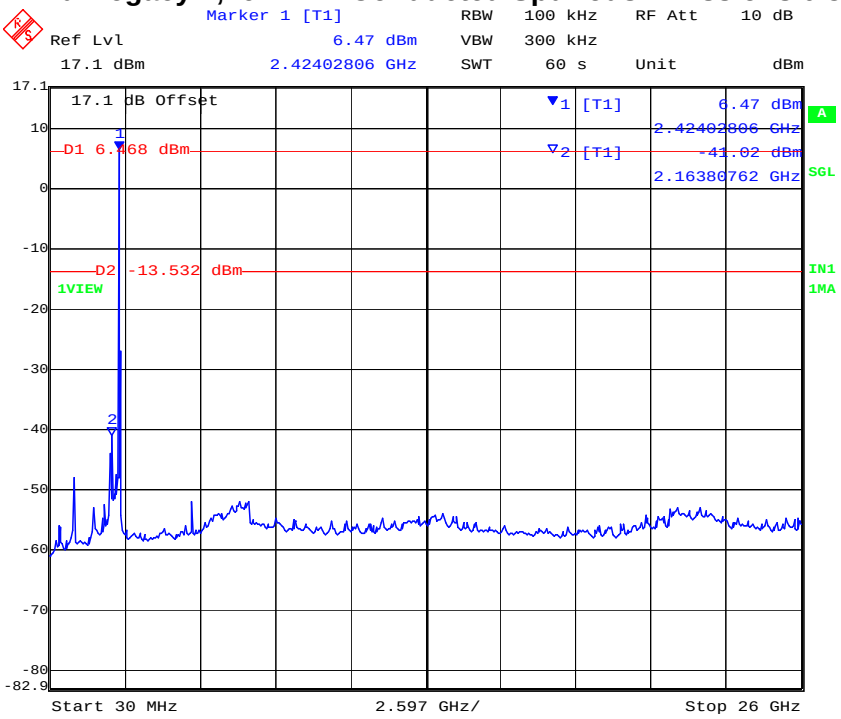
PORT A 802.11b–Legacy 2,437 MHz Conducted Spurious Emissions 0.30 to 26 GHz



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

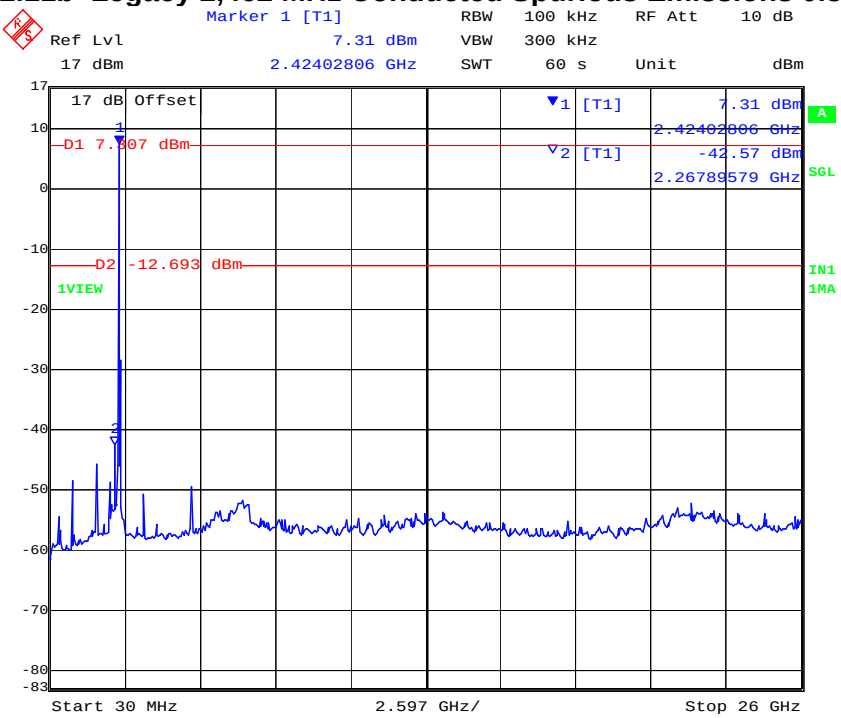


PORT A 802.11b–Legacy 2,462 MHz Conducted Spurious Emissions 0.30 to 26 GHz



Date: 4.MAY.2012 15:58:37

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



Date: 4.MAY.2012 16:00:18

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. (ºC):**	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	
MHz	MHz	MHz	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
2412.000	30.00	26000.00	-40.88	-16.55	-42.40	-16.46				
2437.000	30.00	26000.00	-40.44	-16.61	-40.64	-17.06				
2462.000	30.00	26000.00	-40.51	-17.29	-43.94	-16.36				

SE: Maximum spurious emission found

Band-edge Measurement

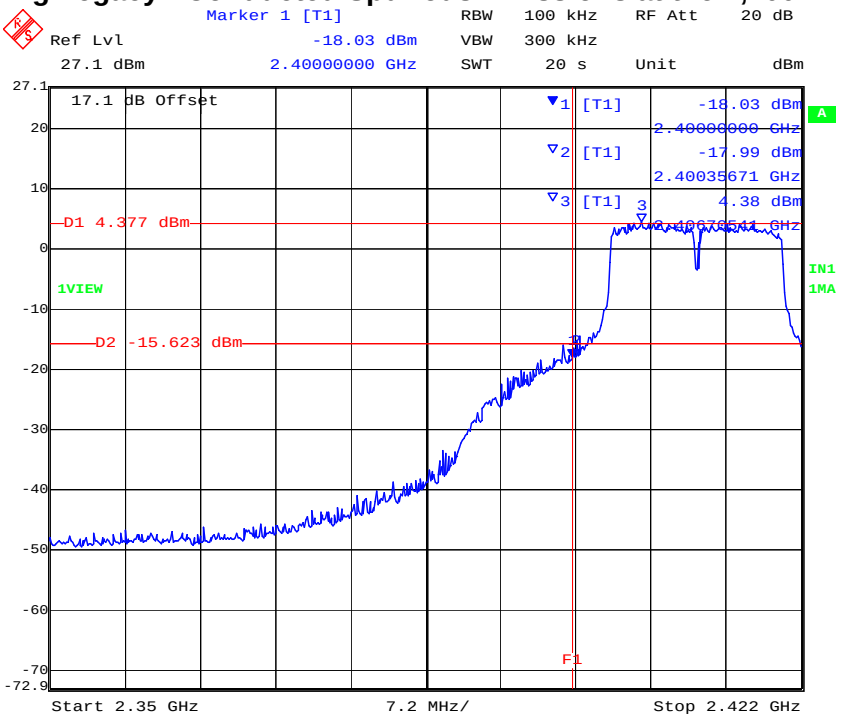
Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2412.000	2400.00	-18.03	-15.62	-17.61	-15.84				
2462.000	2483.50	-28.39	-15.58	-30.32	-16.16				

BE: Maximum Band edge emission found

Measurement uncertainty:	±2.81 dB

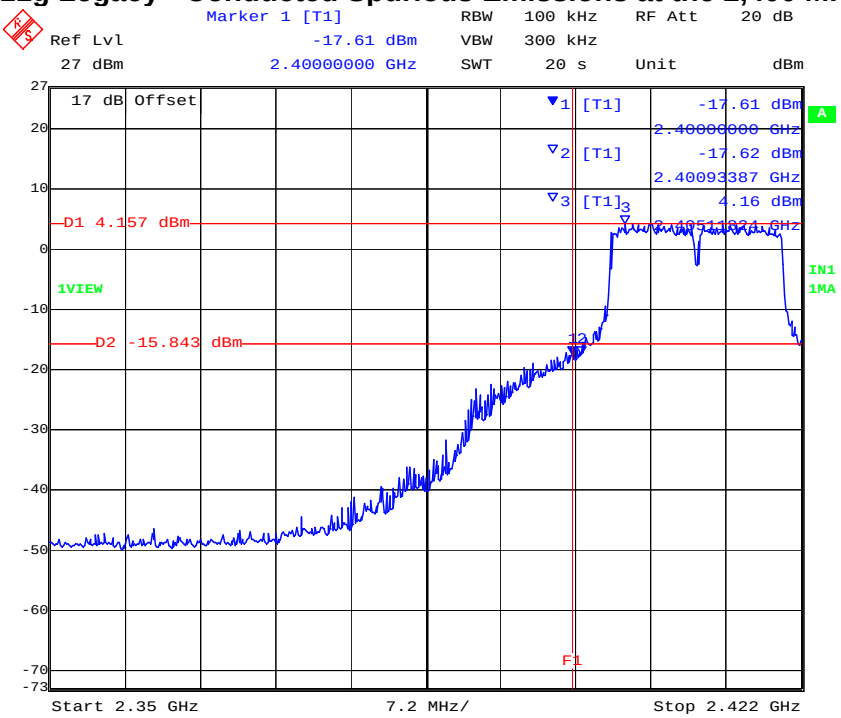
Note: Limit is based on 20dB down from fundamental emission

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



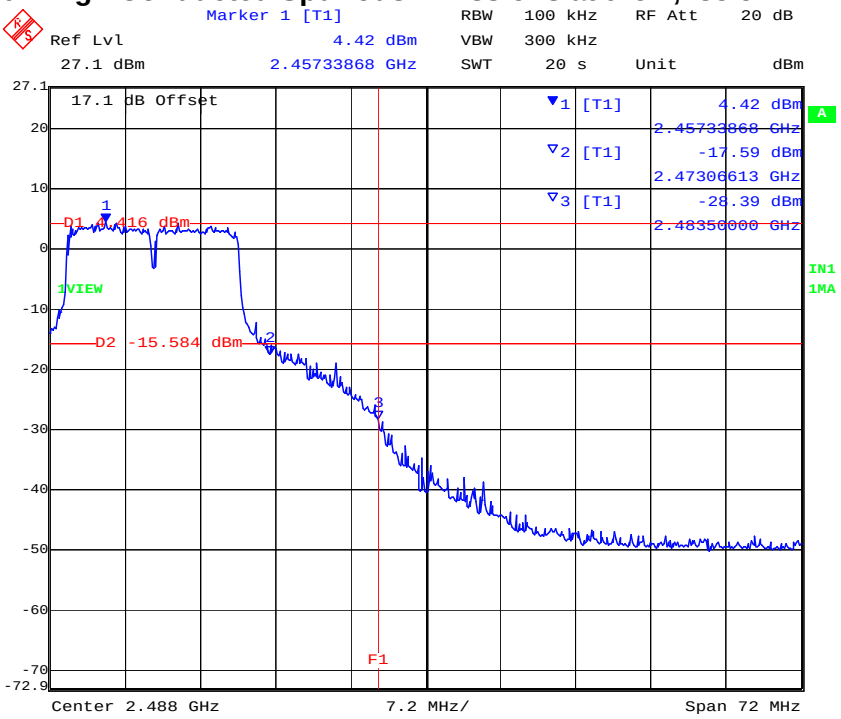
Date: 3.MAY.2012 17:39:44

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



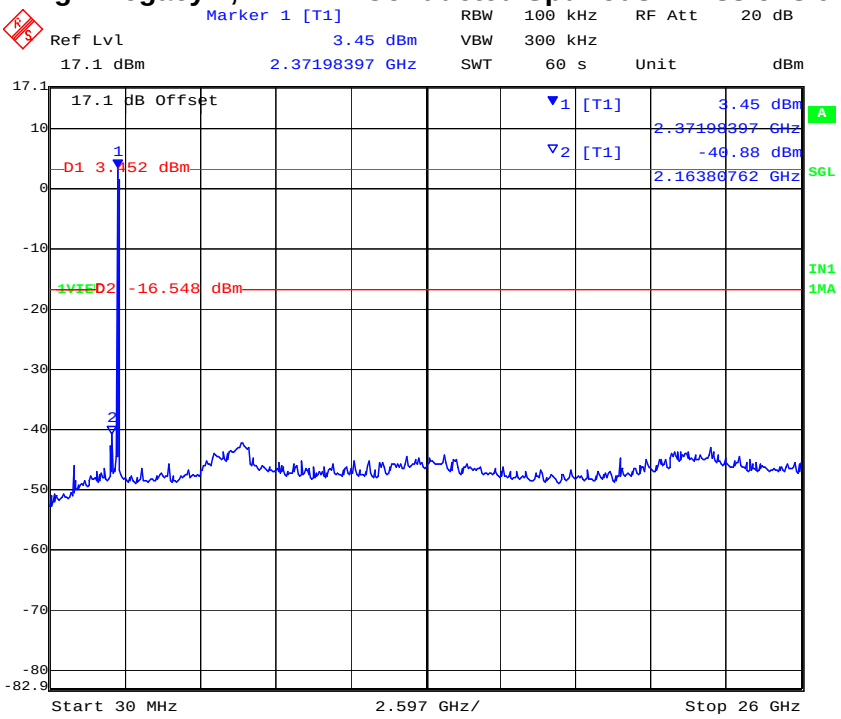
Date: 3.MAY.2012 17:40:59

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

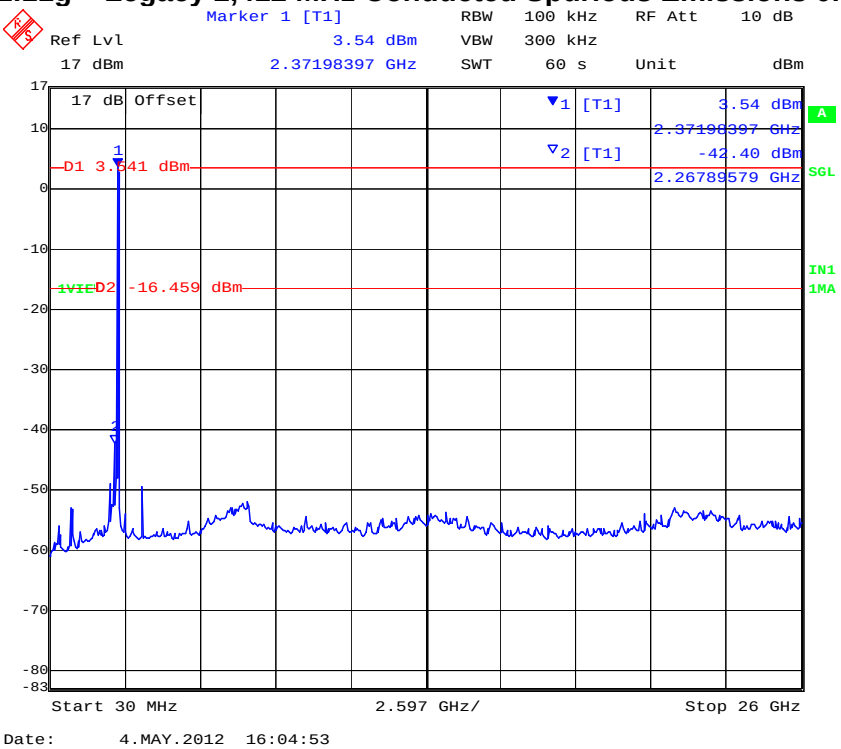


PORT B 802.11g - Conducted Spurious Emissions at the 2,483.5 MHz Band Edge

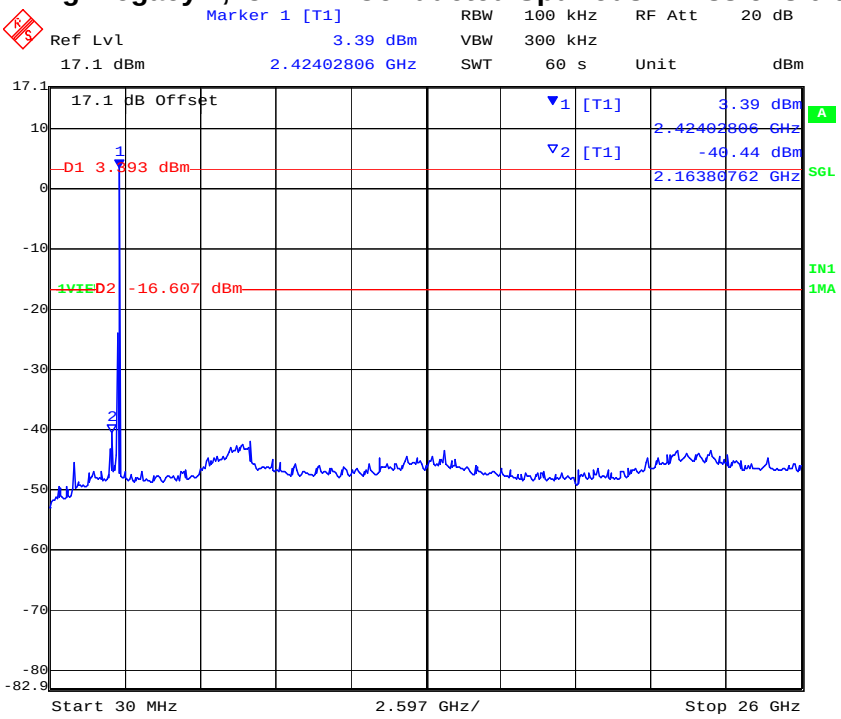
PORT A 802.11g – Legacy 2,412 MHz Conducted Spurious Emissions 0.03 – 26 GHz



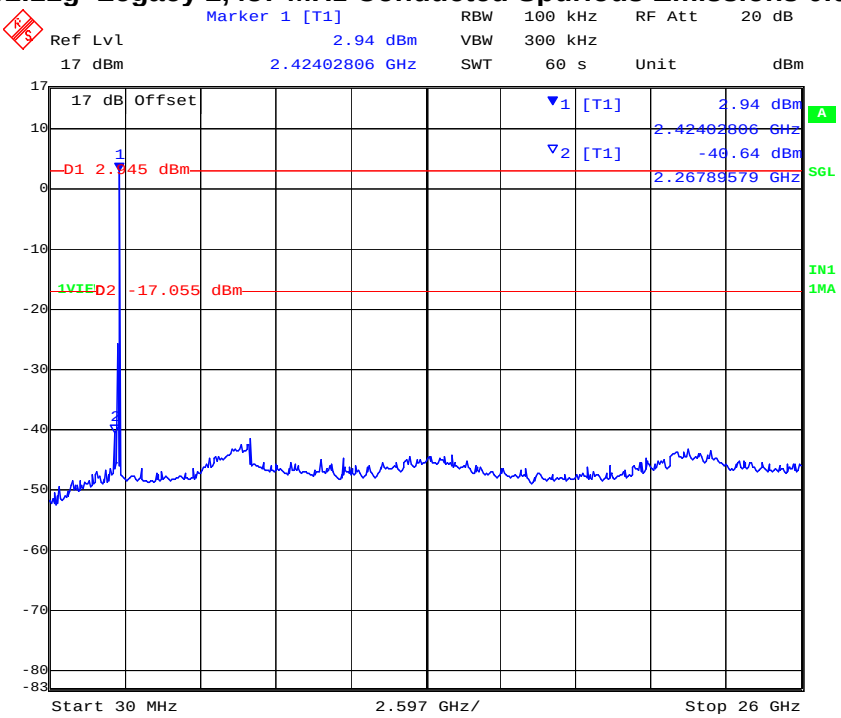
PORT B 802.11g – Legacy 2,412 MHz Conducted Spurious Emissions 0.03 – 26 GHz



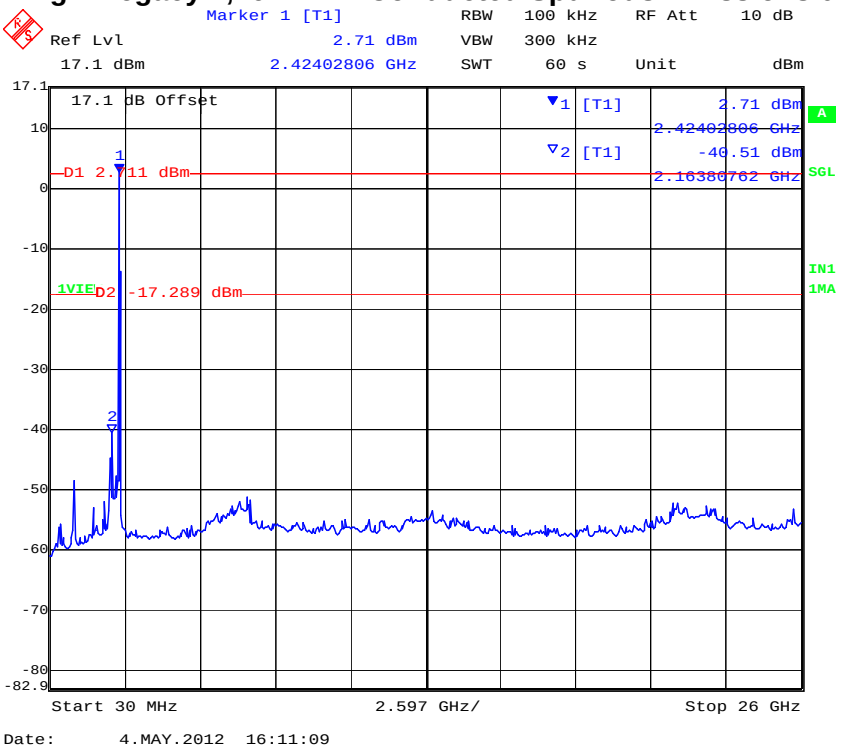
PORT A 802.11g–Legacy 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



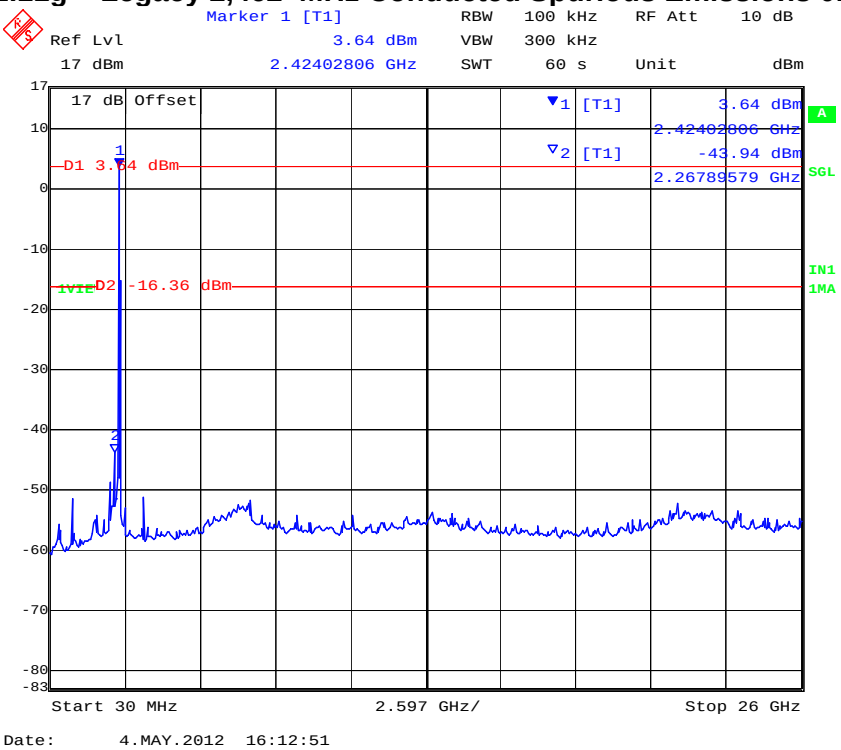
PORT B 802.11g–Legacy 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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



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. (ºC):**	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	
MHz	MHz	MHz	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
2412.000	30.00	26000.00	-40.38	-17.31	-42.54	-17.16				
2437.000	30.00	26000.00	-40.55	-17.52	-42.46	-17.58				
2462.000	30.00	26000.00	-40.64	-17.73	-43.87	-16.82				

SE: Maximum spurious emission found

Band-edge Measurement

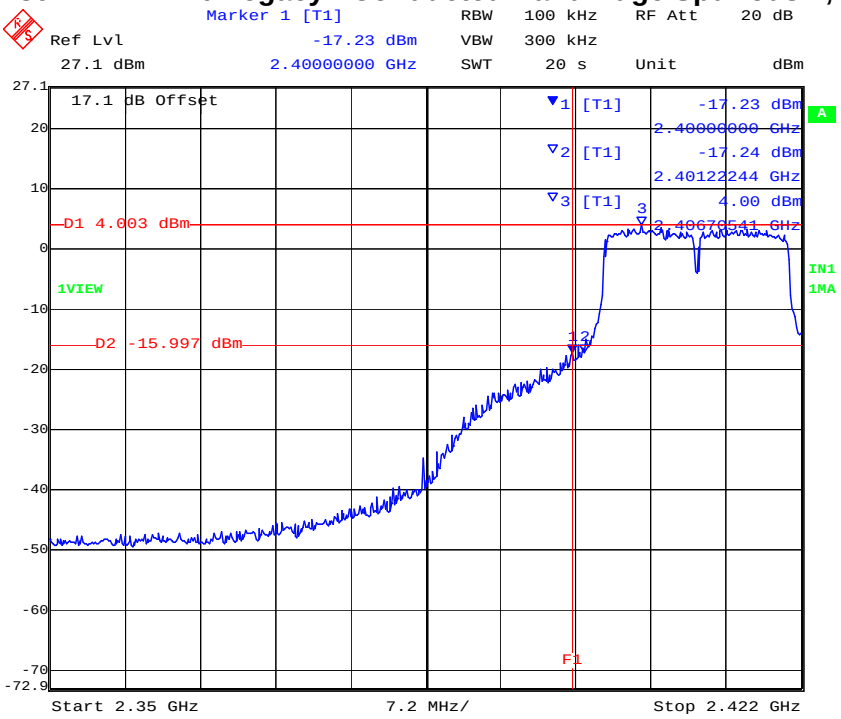
Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2412.000	2400.00	-17.23	-16.00	-19.11	-17.02				
2462.000	2483.50	-27.76	-16.41	-28.90	-16.96				

BE: Maximum Band edge emission found

Measurement uncertainty:	±2.81 dB

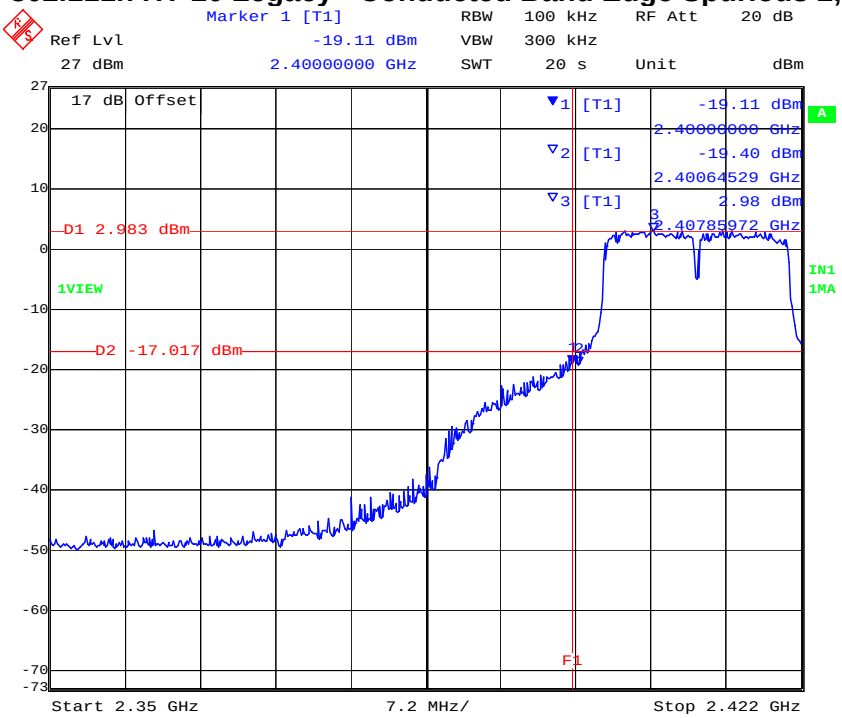
Note: Limit is based on 20dB down from fundamental emission

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



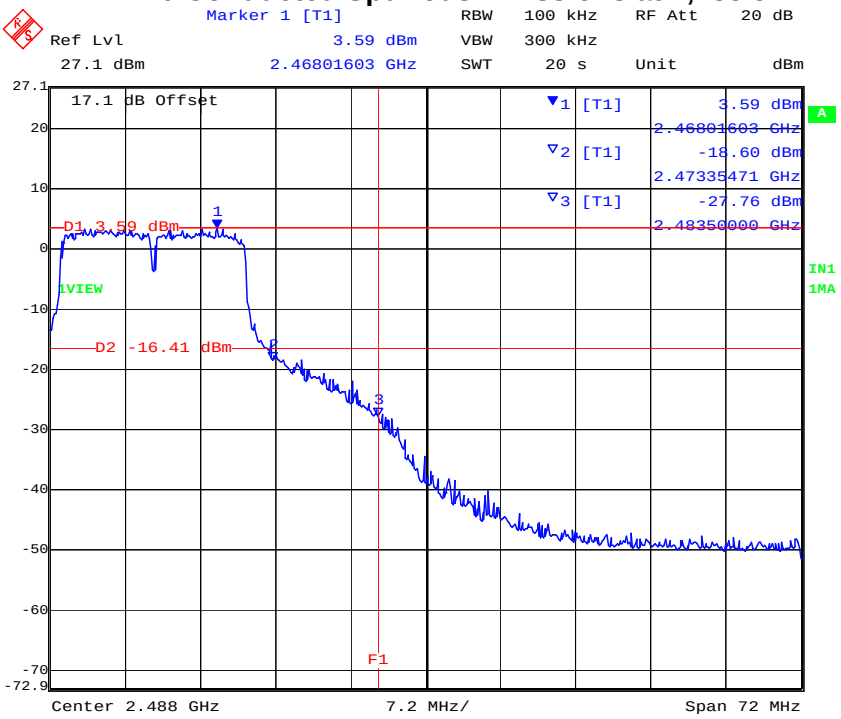
Date: 3.MAY.2012 18:38:43

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

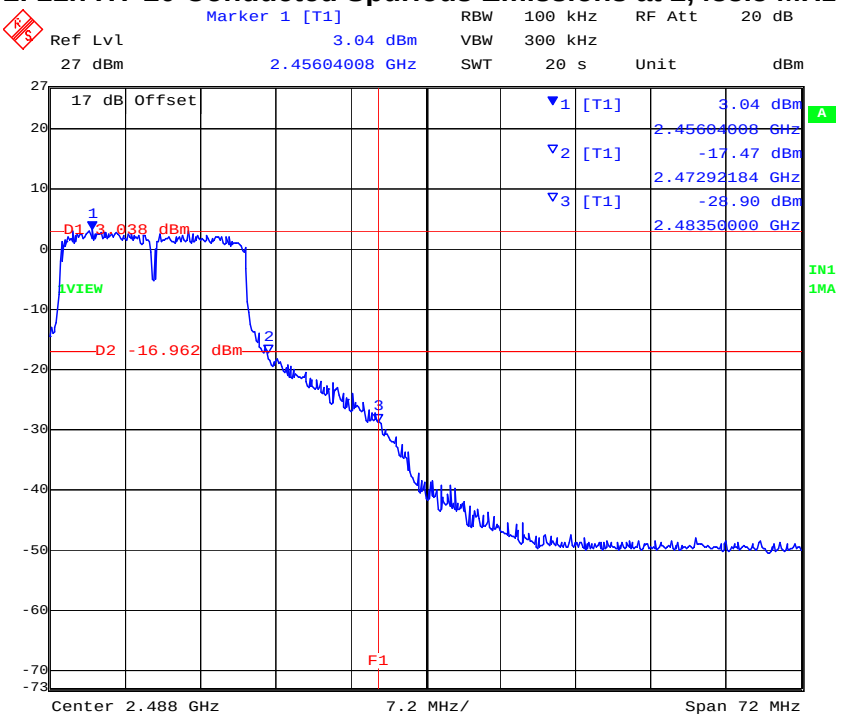


Date: 3.MAY.2012 18:39:59

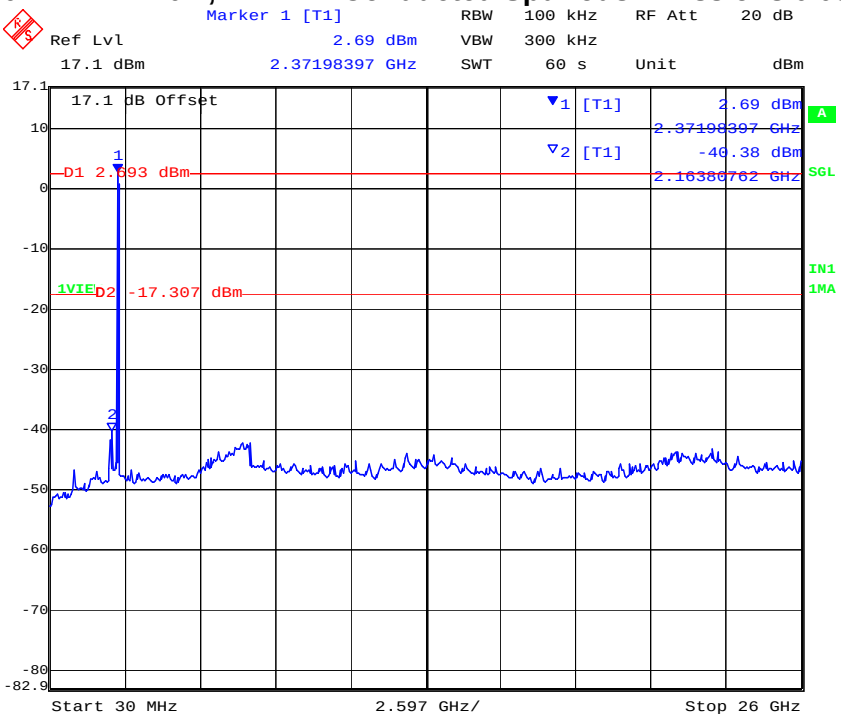
PORT A 802. 11n HT-20 Conducted Spurious Emissions at 2,483.5 MHz Band Edge



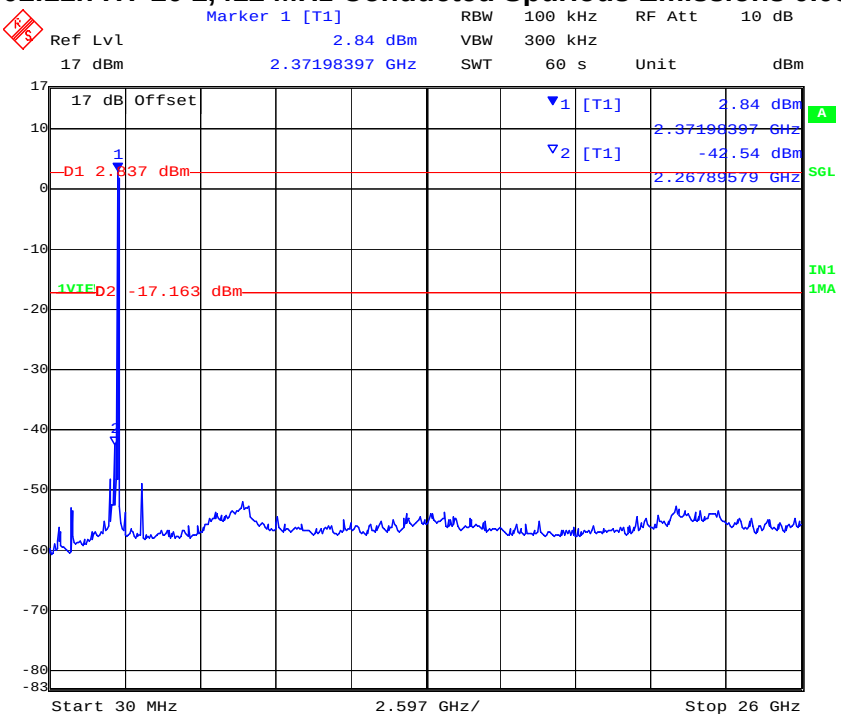
PORT B 802. 11n HT-20 Conducted Spurious Emissions at 2,483.5 MHz Band Edge



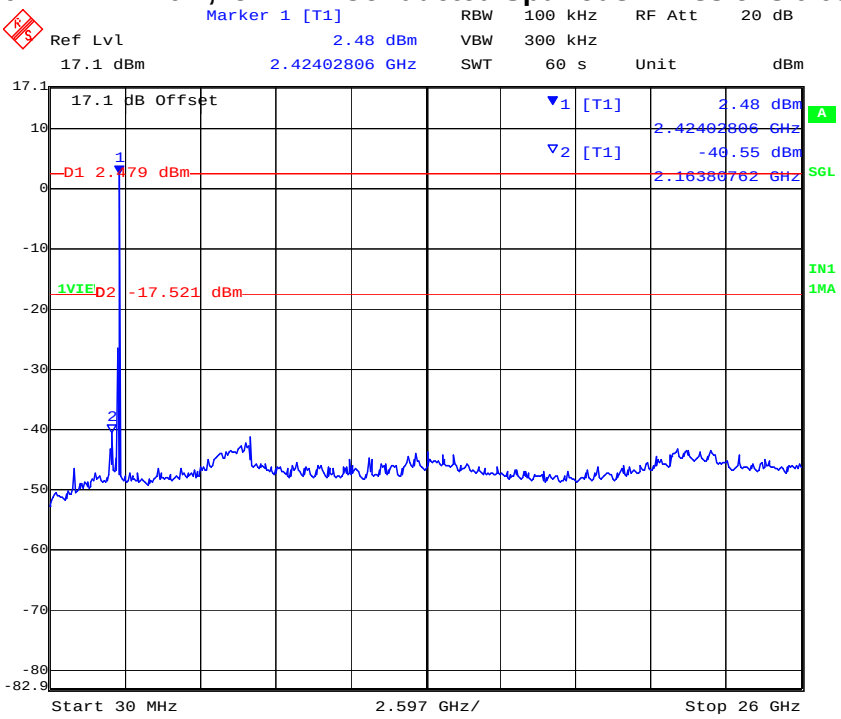
PORT A 802.11n HT-20 2,412 MHz Conducted Spurious Emissions 0.03 – 26 GHz



PORT B 802.11n HT-20 2,412 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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



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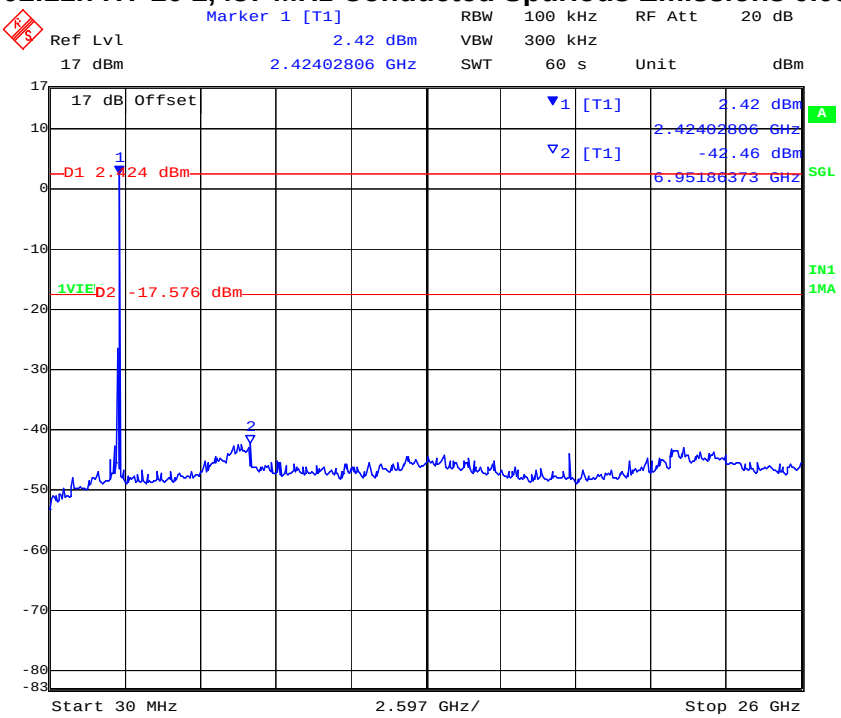
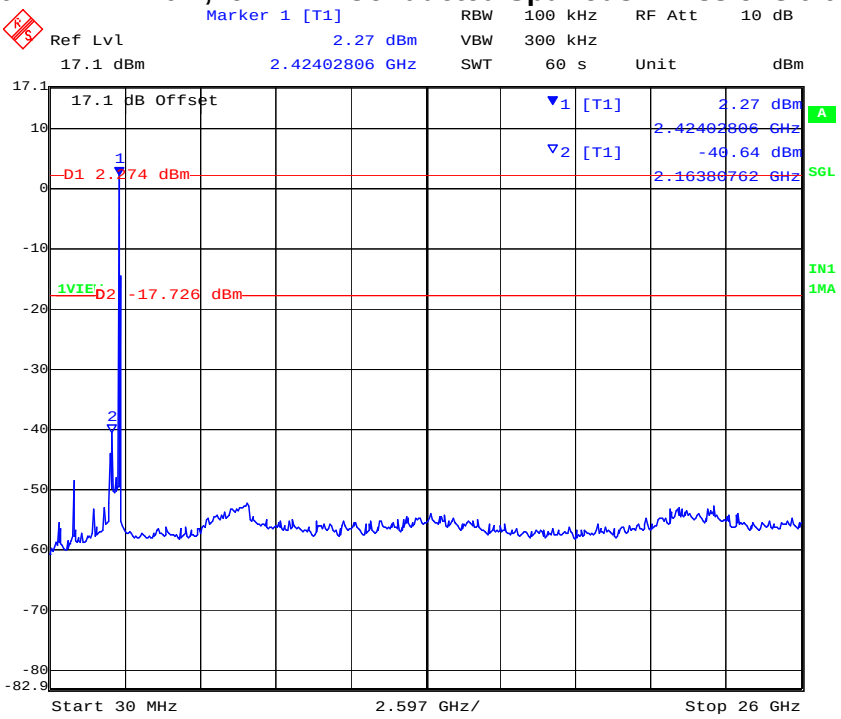
PORT B 802.11n HT-20 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz

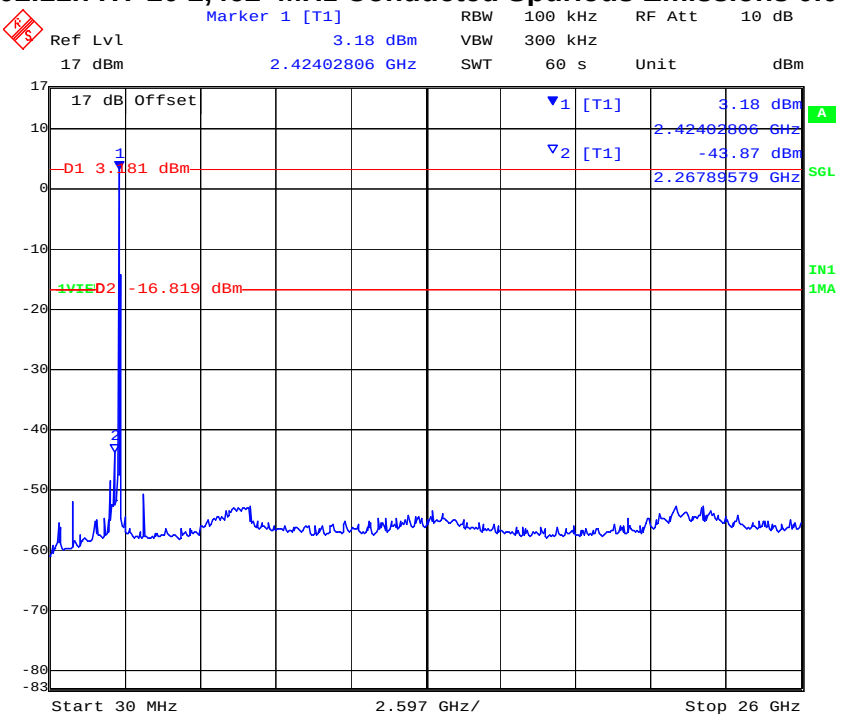


Date: 4.MAY.2012 16:21:12

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



Conducted Spurious Emission Results

TABLE OF RESULTS – **802.11n HT-40**

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Test Conditions:	15.247 (a)(2)		**Rel. Humidity (%):**	35 to 42	
Variant:	802.11n HT-40		**Ambient Temp. (ºC):**	19 to 22	
TPC:	HIGH		**Pressure (mBars):**	998 to 1003	
Modulation:	ON		**Duty Cycle (%):**	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	
MHz	MHz	MHz	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
2422.000	30.00	26000.00	-40.65	-19.77	-42.37	-19.93				
2437.000	30.00	26000.00	-40.46	-20.21	-42.05	-20.30				
2452.000	30.00	26000.00	-40.50	-21.36	-49.29	-20.41				

SE: Maximum spurious emission found

Band-edge Measurement

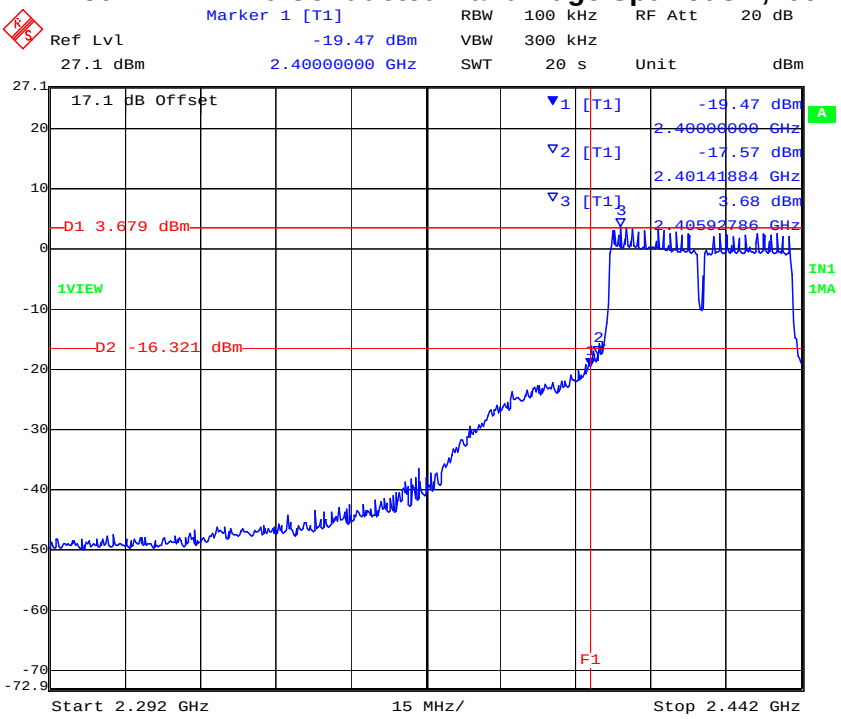
Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2422.000	2400.00	-19.47	-16.32	-20.64	-16.83				
2452.000	2483.50	-24.40	-16.49	-26.25	-17.40				

BE: Maximum Band edge emission found

Measurement uncertainty:	±2.81 dB

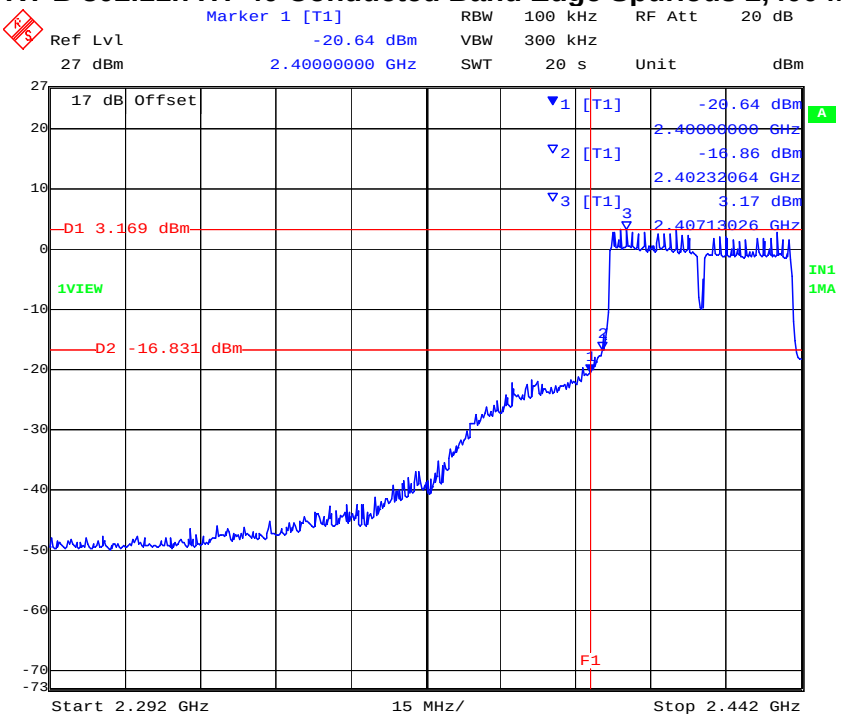
Note: Limit is based on 20dB down from fundamental emission

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



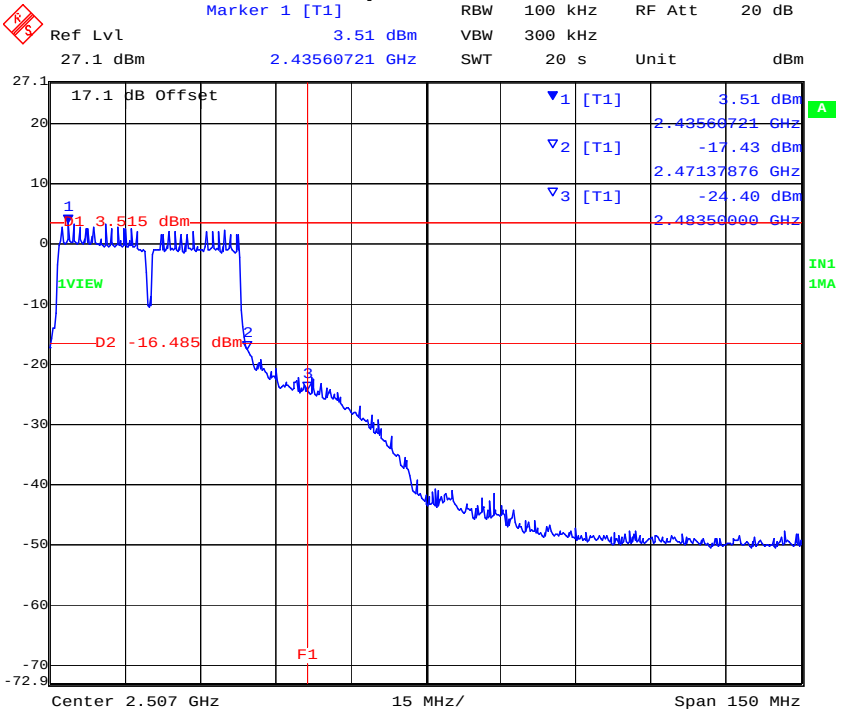
Date: 3.MAY.2012 19:37:51

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

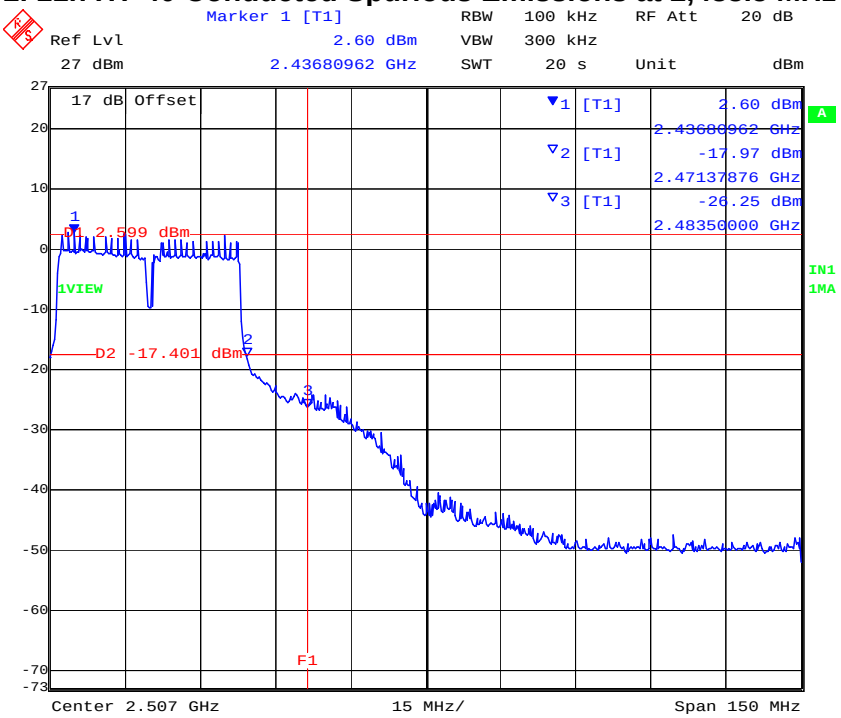


Date: 3.MAY.2012 19:39:08

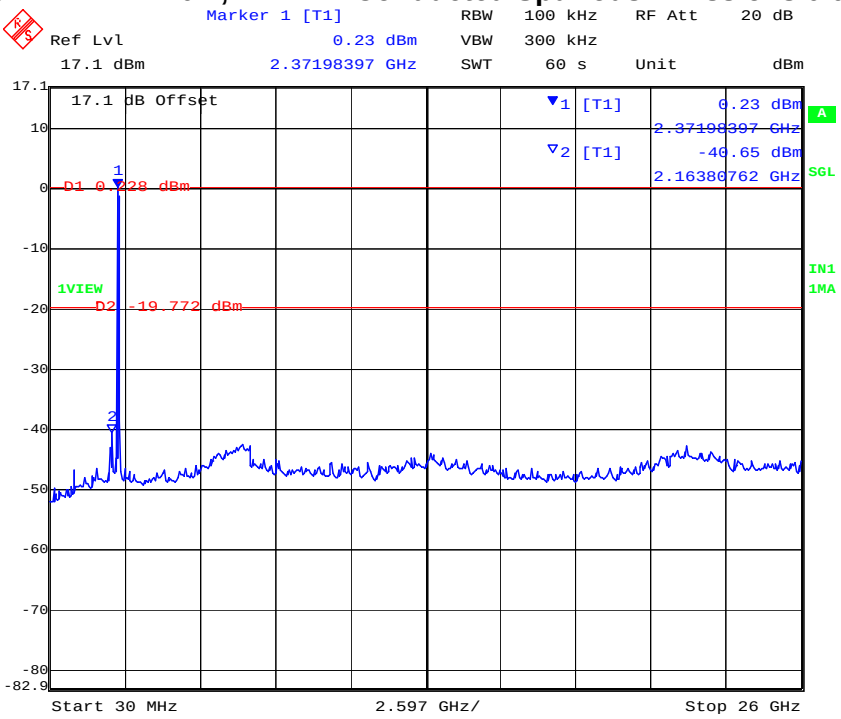
PORT A 802. 11n HT-40 Conducted Spurious Emissions at 2,483.5 MHz Band Edge



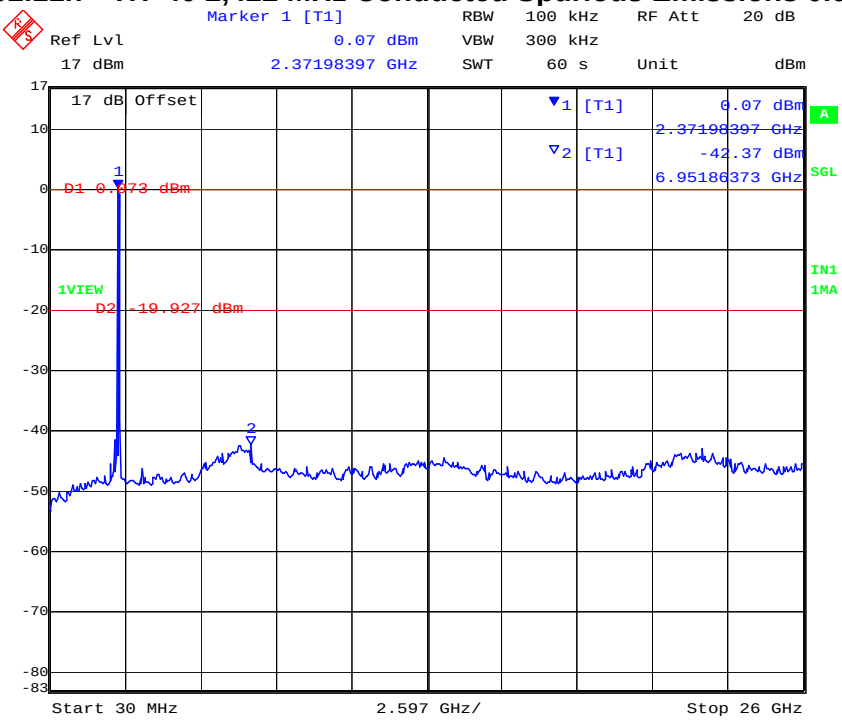
PORT B 802. 11n HT-40 Conducted Spurious Emissions at 2,483.5 MHz Band Edge



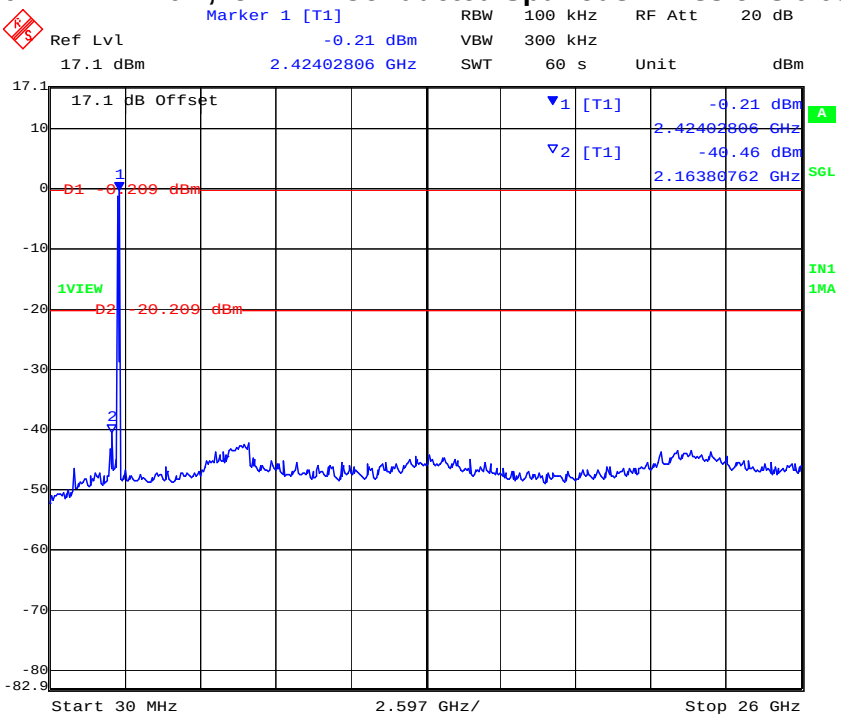
PORT A 802.11n – HT-40 2,422 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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



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



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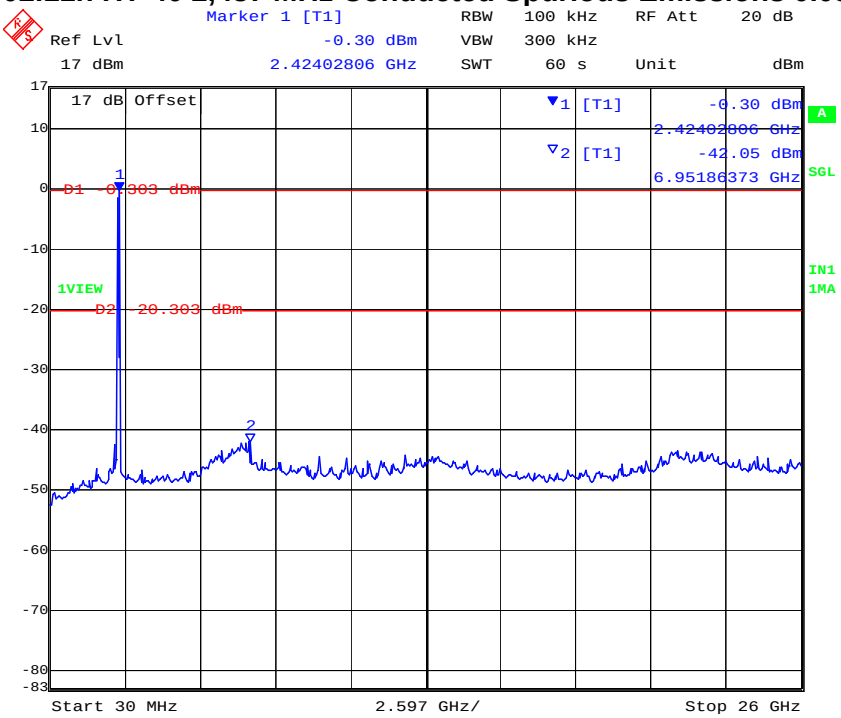
PORT B 802.11n HT-40 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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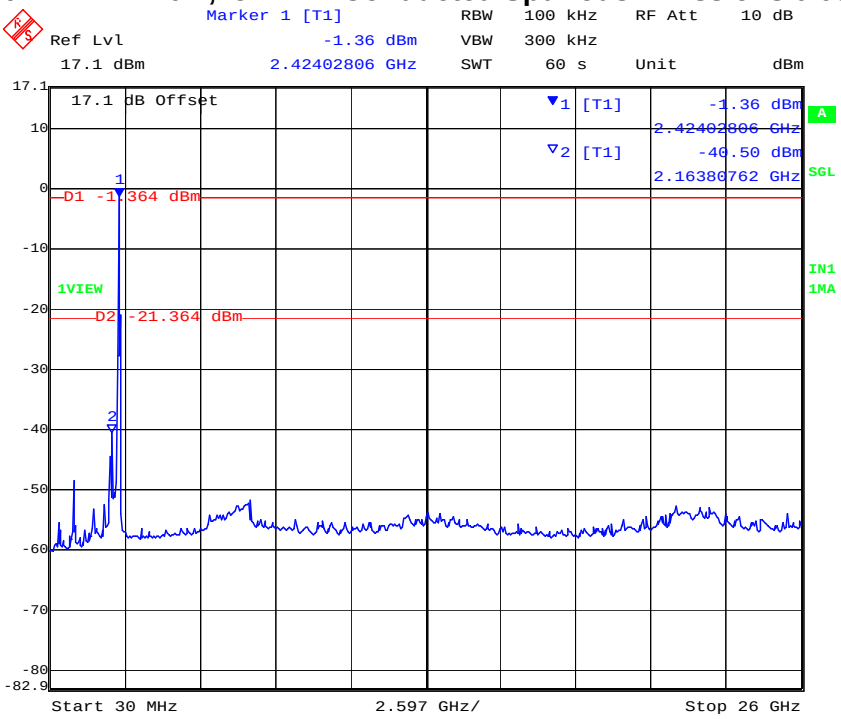
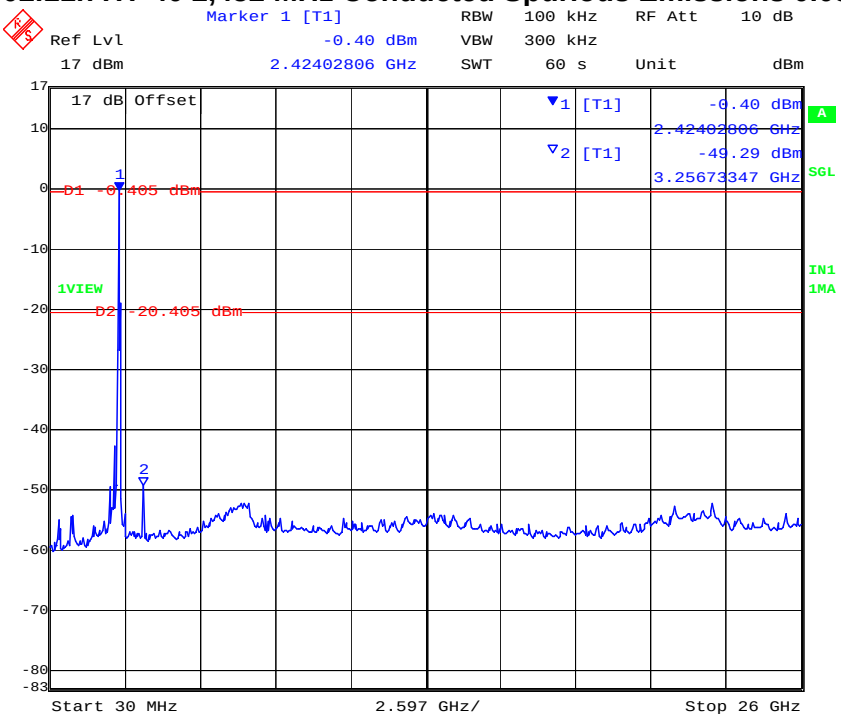
PORT A 802.11n HT-40 2,452 MHz Conducted Spurious Emissions 0.03 – 26 GHz



Date: 4.MAY.2012 16:35:49

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



Date: 4.MAY.2012 16:37:31

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. (ºC):**	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	
MHz	MHz	MHz	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
5745.000	30.00	26000.00	-32.56	-15.35	-31.04	-15.80				
5785.000	30.00	26000.00	-31.93	-15.78	-32.76	-17.12				
5825.000	30.00	26000.00	-32.70	-15.75	-37.10	-18.72				

SE: Maximum spurious emission found

Band-edge Measurement

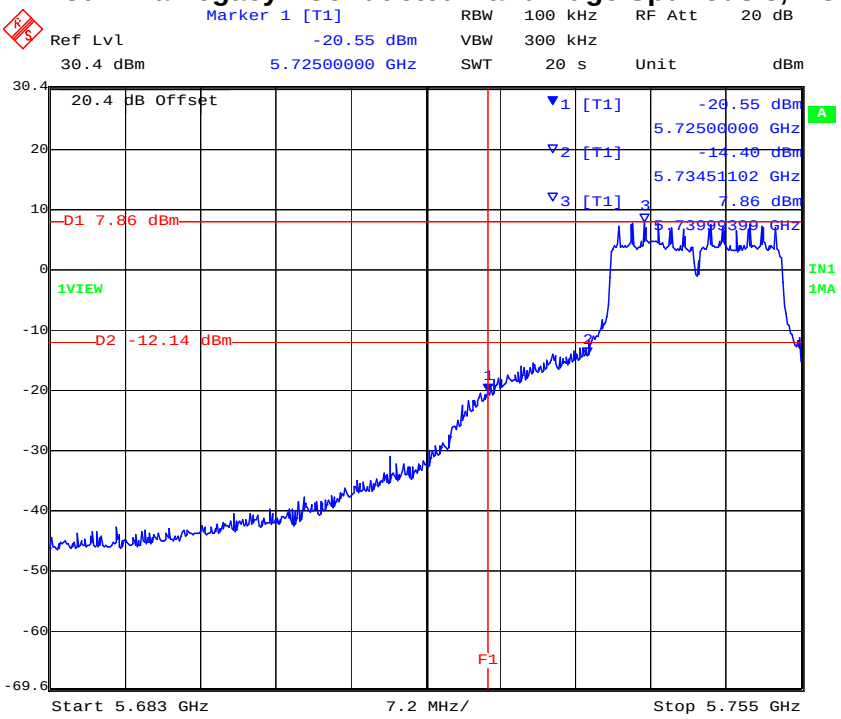
Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
5745.000	5725.00	-20.55	-12.14	-17.11	-9.47				
5825.000	5850.00	-29.00	-12.53	-30.57	-12.06				

BE: Maximum Band edge emission found

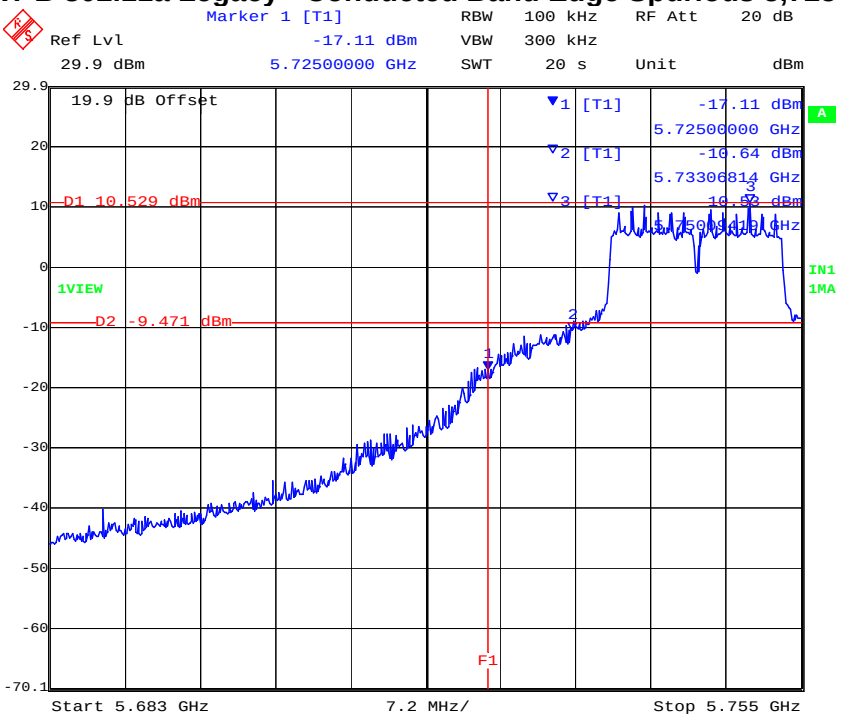
Measurement uncertainty:	±2.81 dB

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

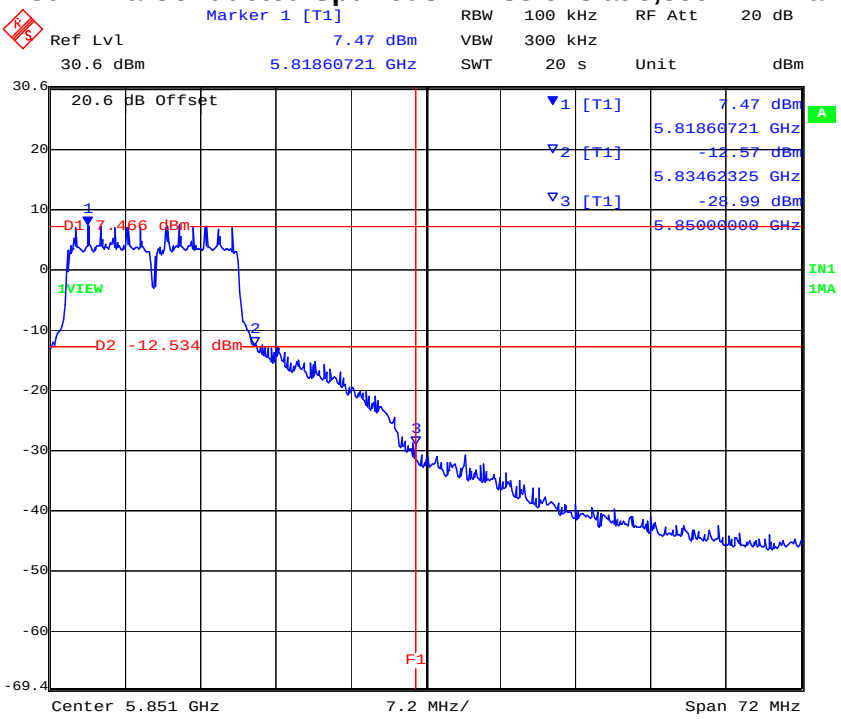
PORT A 802.11a Legacy - Conducted Band Edge Spurious 5,725 MHz



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

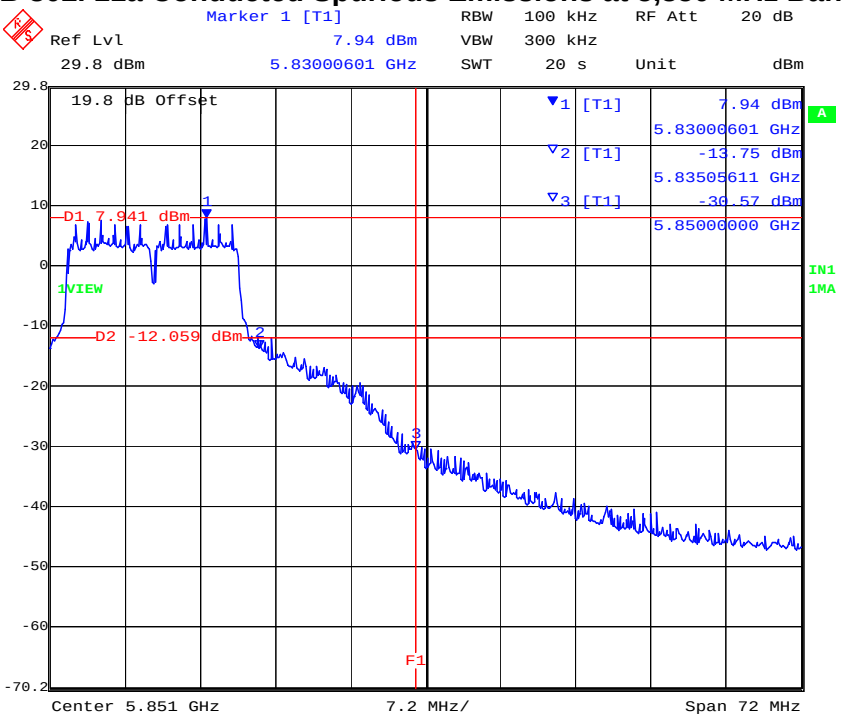


PORT A 802. 11a Conducted Spurious Emissions at 5,850 MHz Band Edge



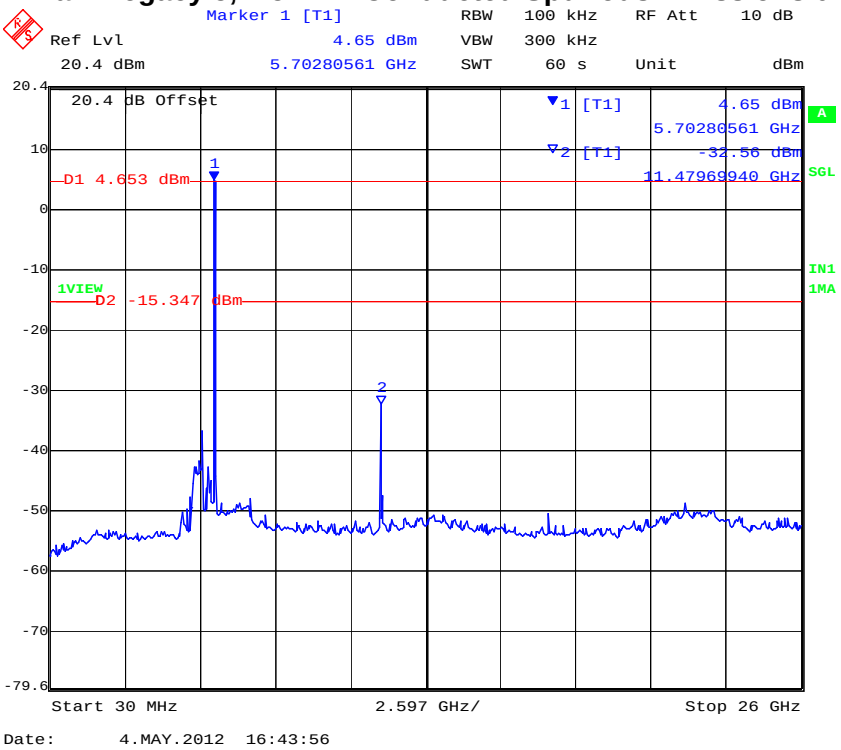
Date: 4.MAY.2012 09:31:15

PORT B 802. 11a Conducted Spurious Emissions at 5,850 MHz Band Edge

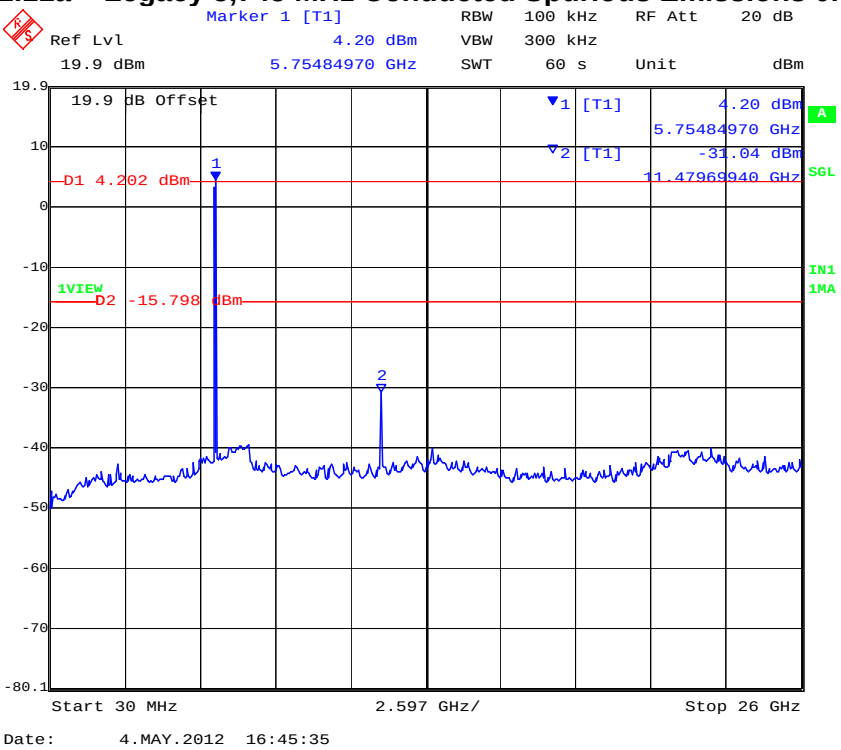


Date: 4.MAY.2012 09:32:33

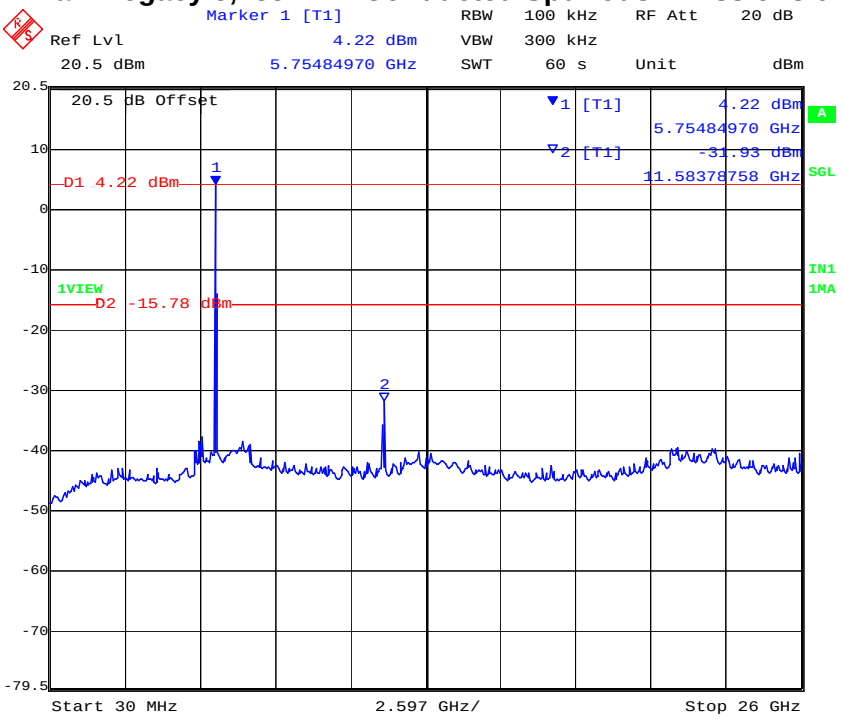
PORT A 802.11a – Legacy 5,745 MHz Conducted Spurious Emissions 0.03 – 40 GHz



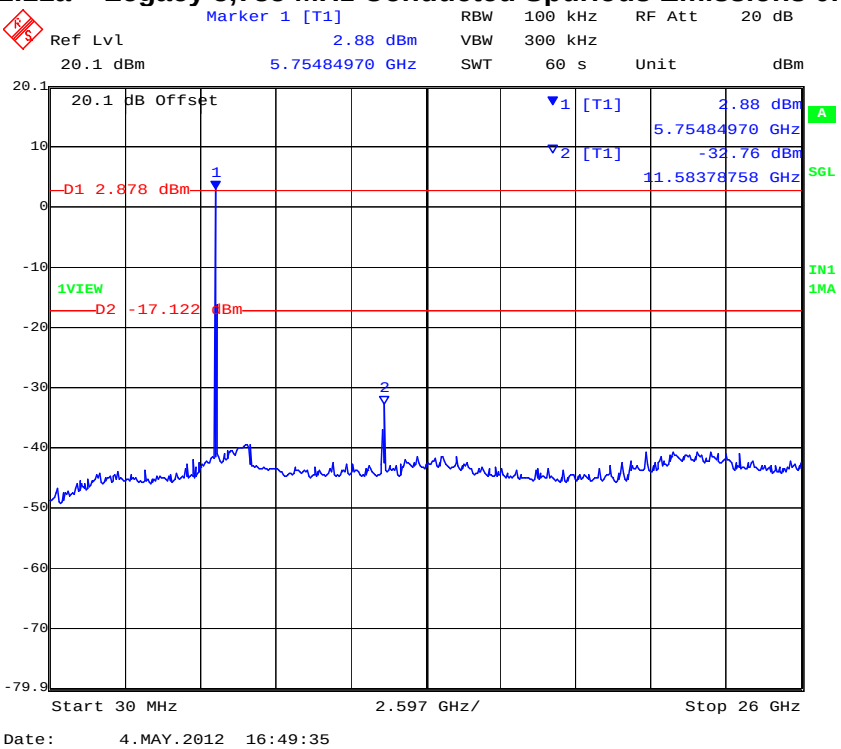
PORT B 802.11a – Legacy 5,745 MHz Conducted Spurious Emissions 0.03 – 40 GHz



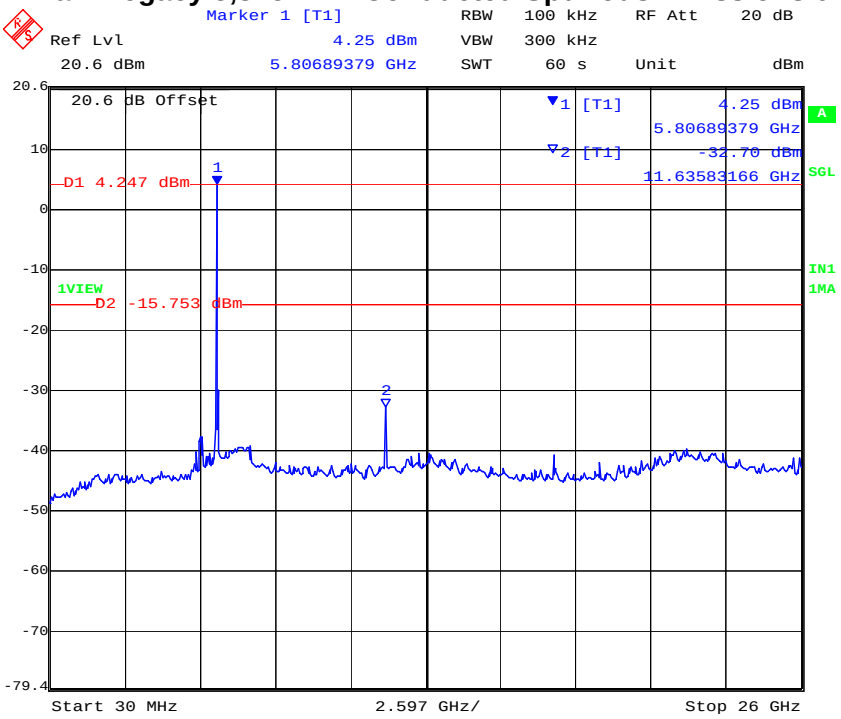
PORT A 802.11a – Legacy 5,785 MHz Conducted Spurious Emissions 0.03 – 40 GHz



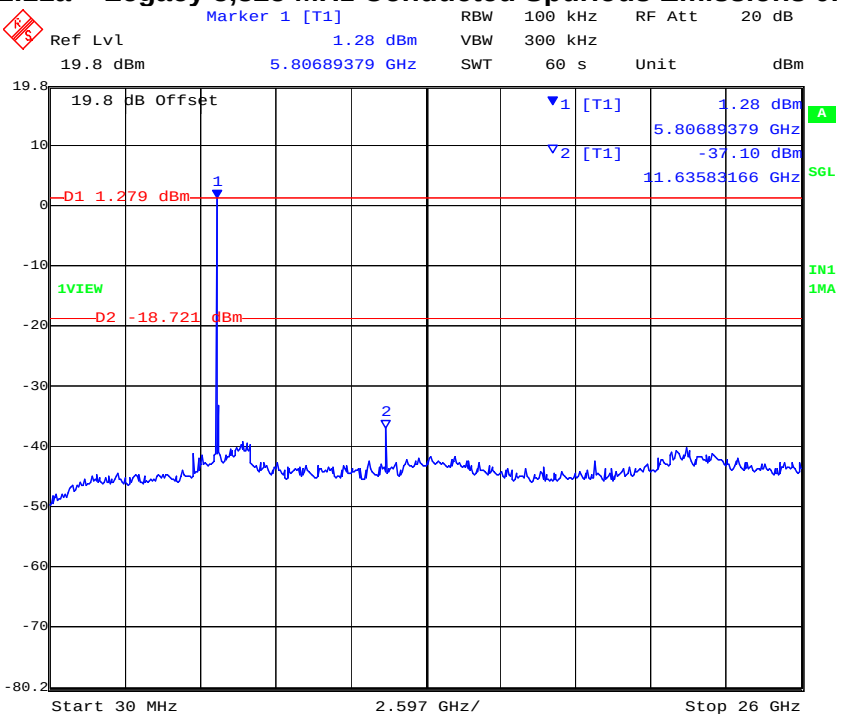
PORT B 802.11a – Legacy 5,785 MHz Conducted Spurious Emissions 0.03 – 40 GHz



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



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. (ºC):**	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	
MHz	MHz	MHz	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
5745.000	30.00	26000.00	-32.16	-16.20	-32.91	-16.93				
5785.000	30.00	26000.00	-32.18	-16.13	-33.35	-17.14				
5825.000	30.00	26000.00	-34.52	-16.26	-39.15	-18.76				

SE: Maximum spurious emission found

Band-edge Measurement

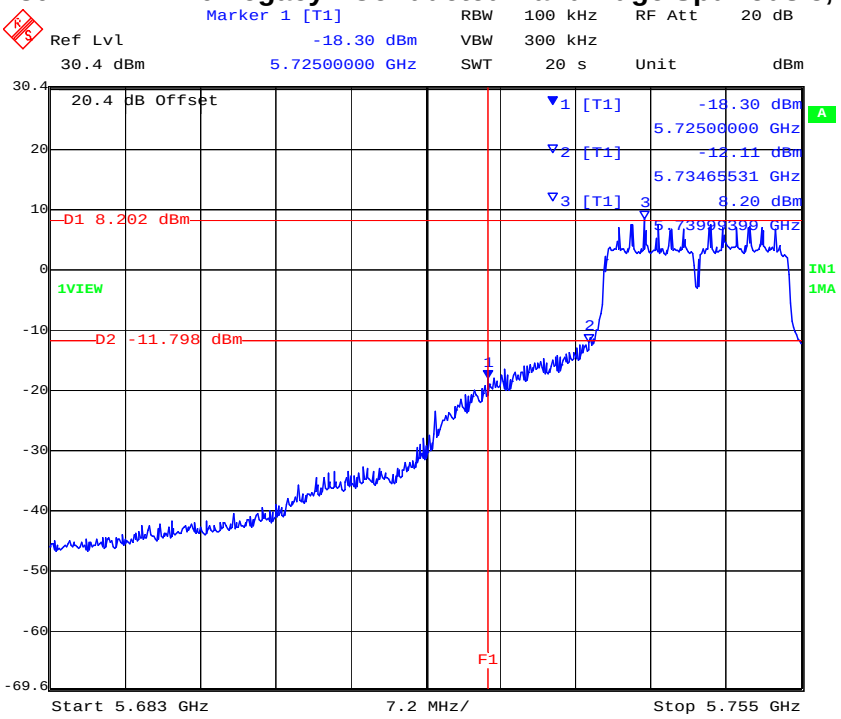
Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
5745.000	5725.00	-18.30	-11.80	-15.84	-9.99				
5825.000	5850.00	-27.69	-12.55	-29.57	-12.06				

BE: Maximum Band edge emission found

Measurement uncertainty:	±2.81 dB

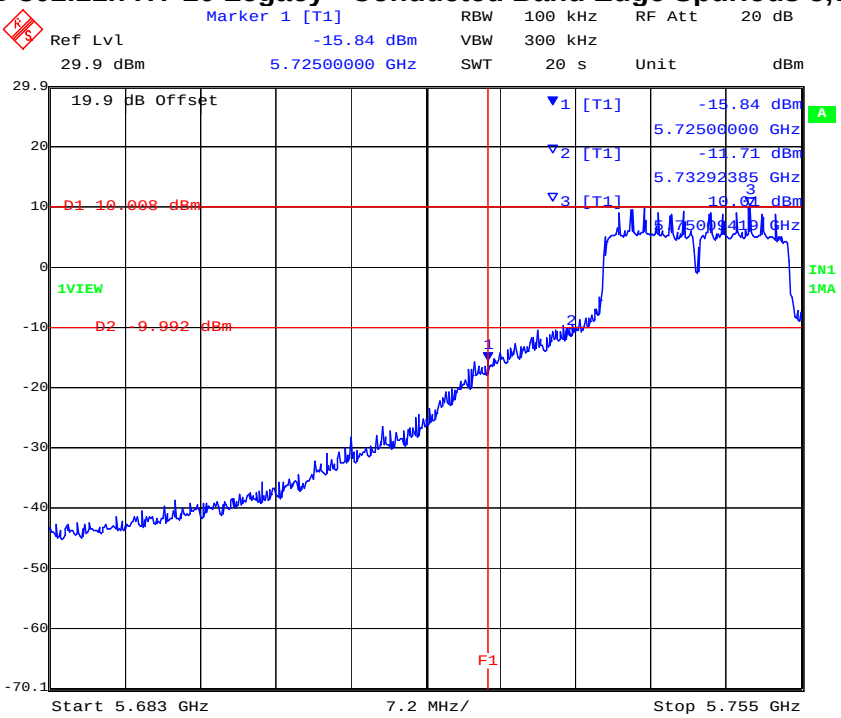
Note: Limit is based on 20dB down from fundamental emission

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



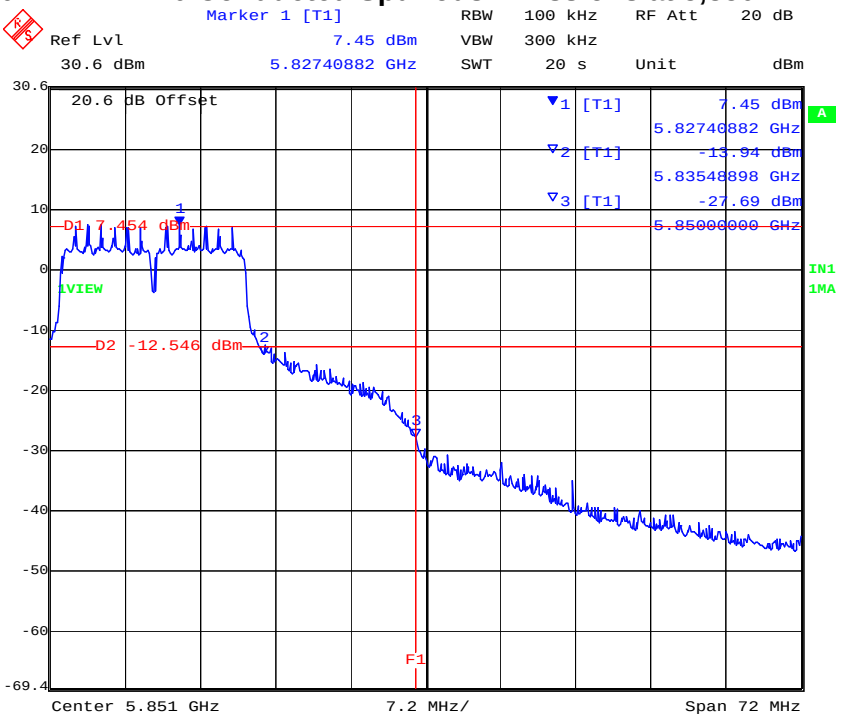
Date: 4.MAY.2012 09:53:45

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

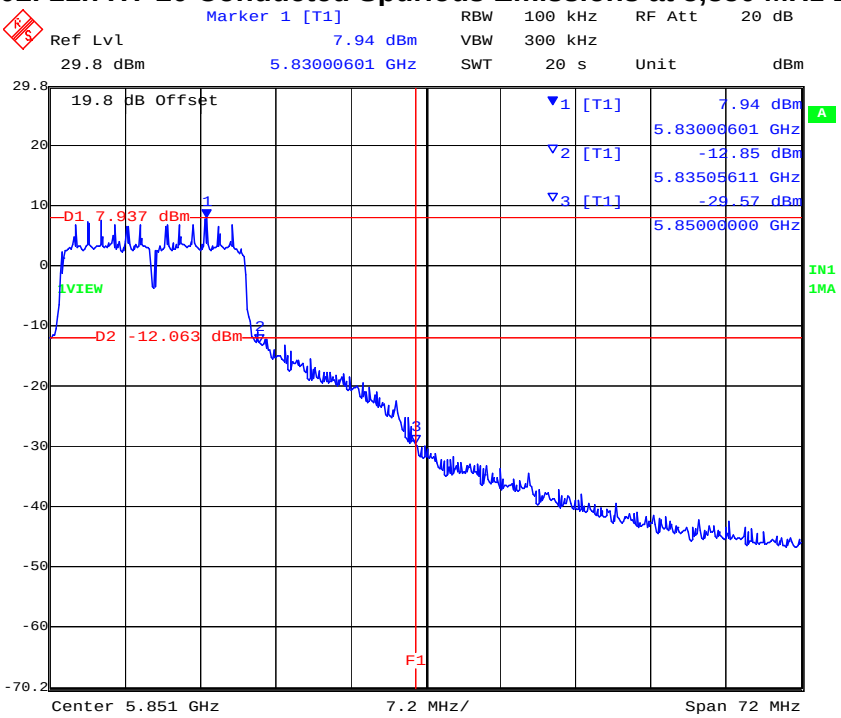


Date: 4.MAY.2012 09:55:01

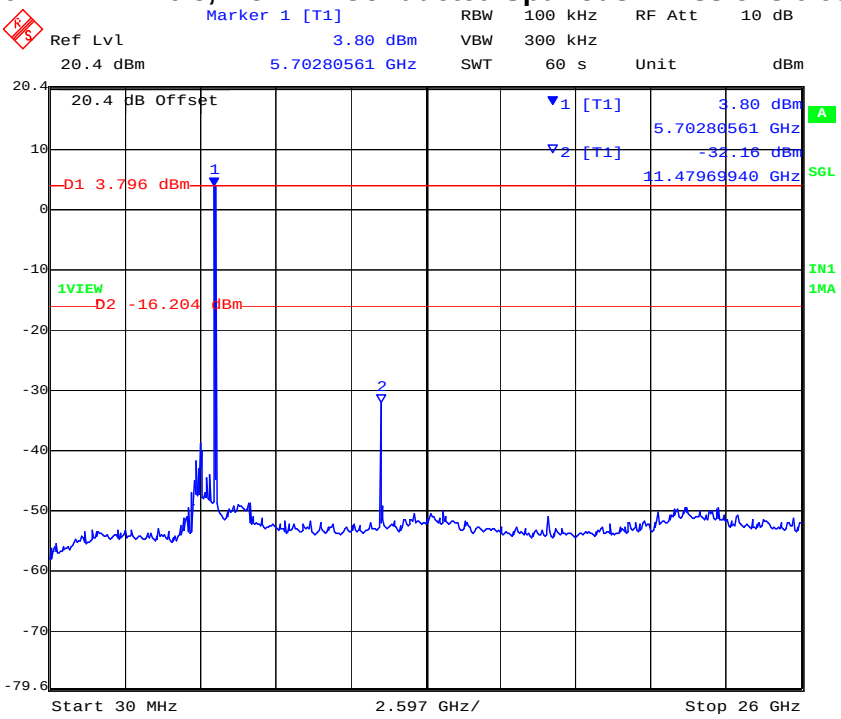
PORT A 802. 11n HT-20 Conducted Spurious Emissions at 5,850 MHz Band Edge



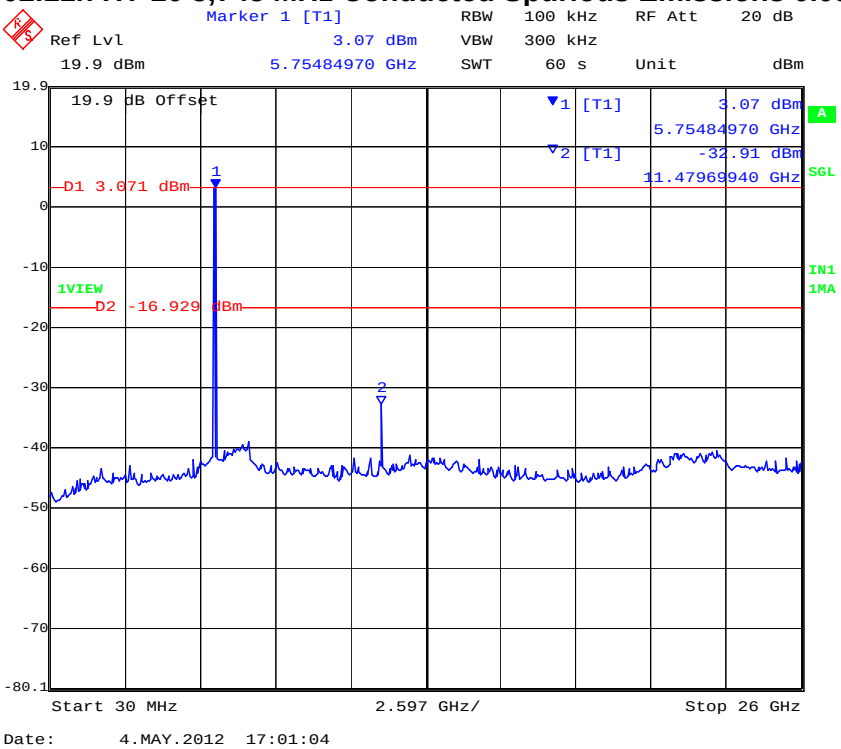
PORT B 802. 11n HT-20 Conducted Spurious Emissions at 5,850 MHz Band Edge



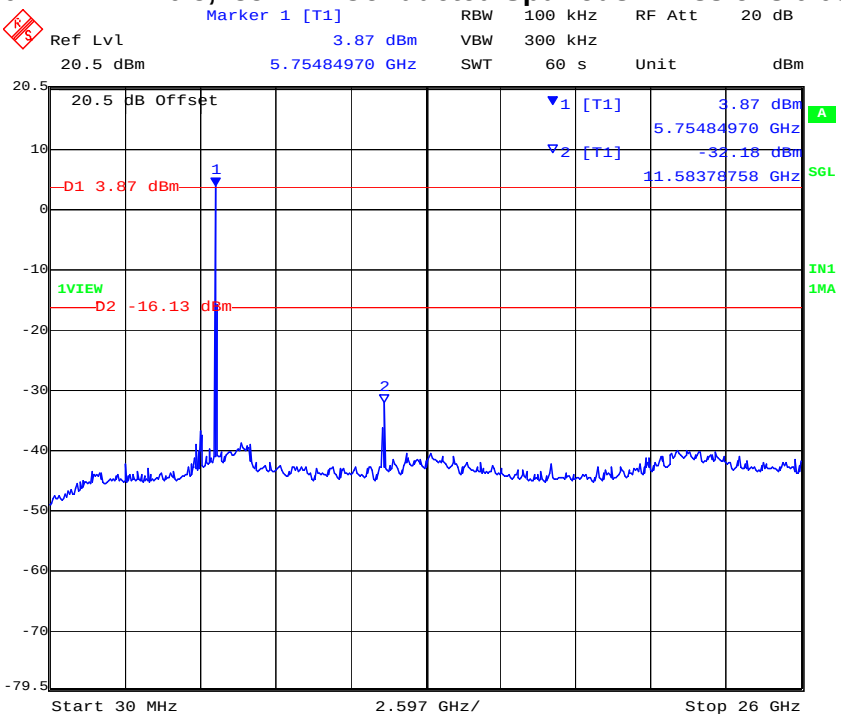
PORT A 802.11n HT-20 5,745 MHz Conducted Spurious Emissions 0.03 – 26 GHz



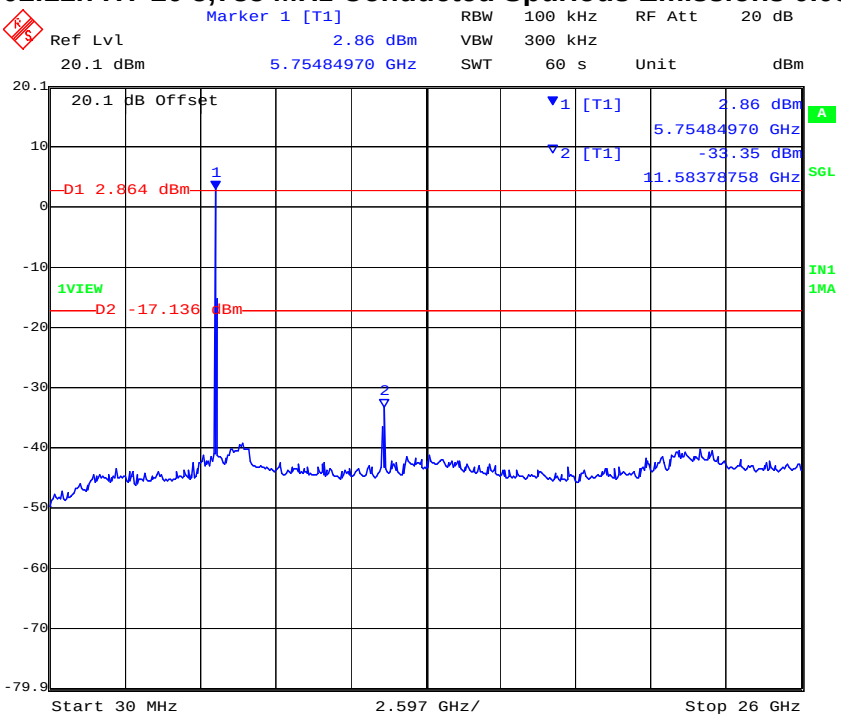
PORT B 802.11n HT-20 5,745 MHz Conducted Spurious Emissions 0.03 – 26 GHz



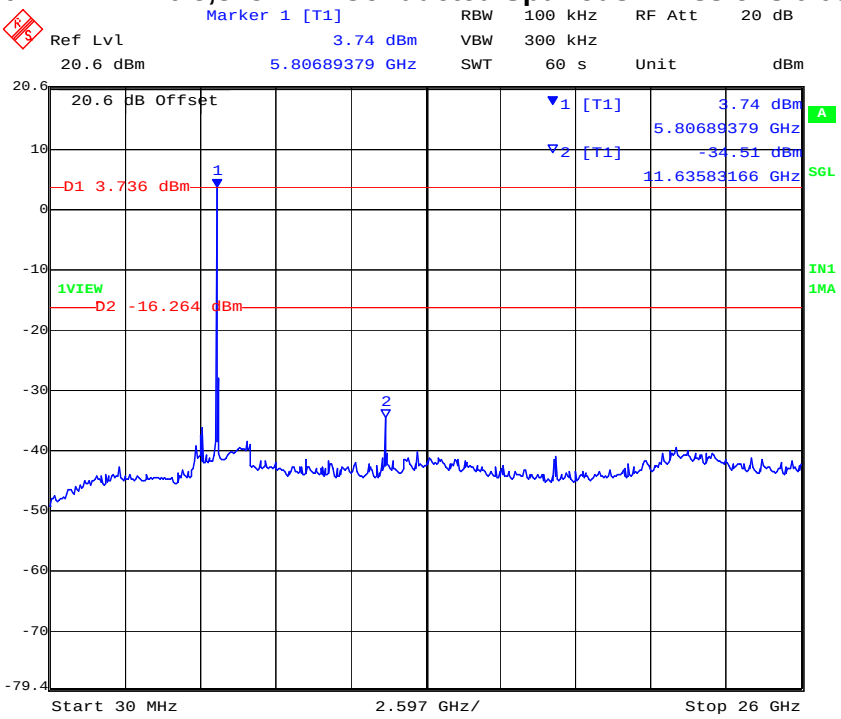
PORT A 802.11n HT-20 5,785 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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



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



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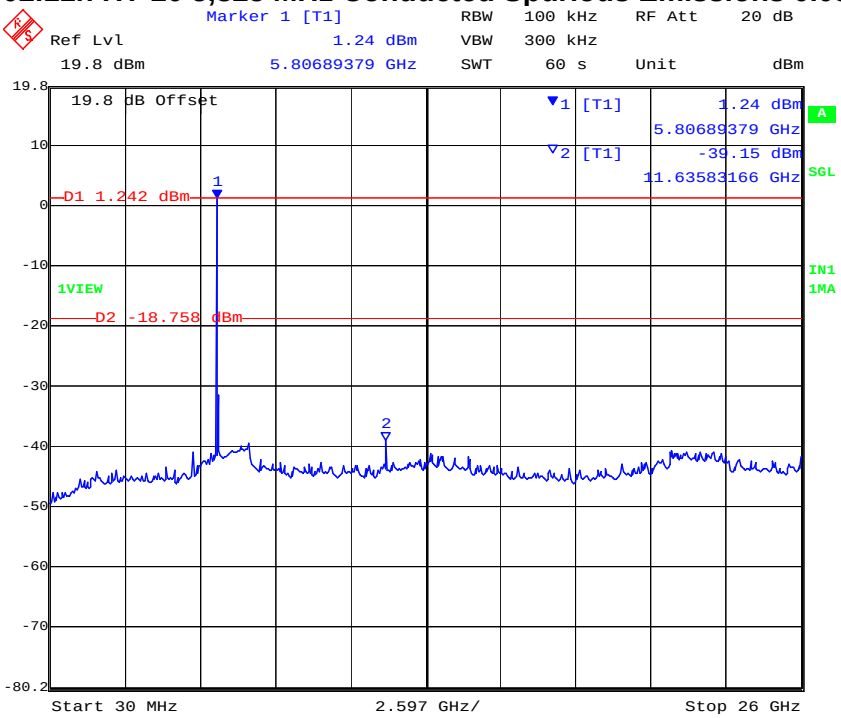
PORT B 802.11n HT-20 5,825 MHz Conducted Spurious Emissions 0.03 – 26 GHz



Date: 4.MAY.2012 17:09:10

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. (ºC):**	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	
MHz	MHz	MHz	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm	SE dBm	Limit dBm
5755.000	30.00	26000.00	-36.96	-18.64	-34.44	-20.11				
5795.000	30.00	26000.00	-35.51	-19.09	-40.47	-21.72				

SE: Maximum spurious emission found

Band-edge Measurement

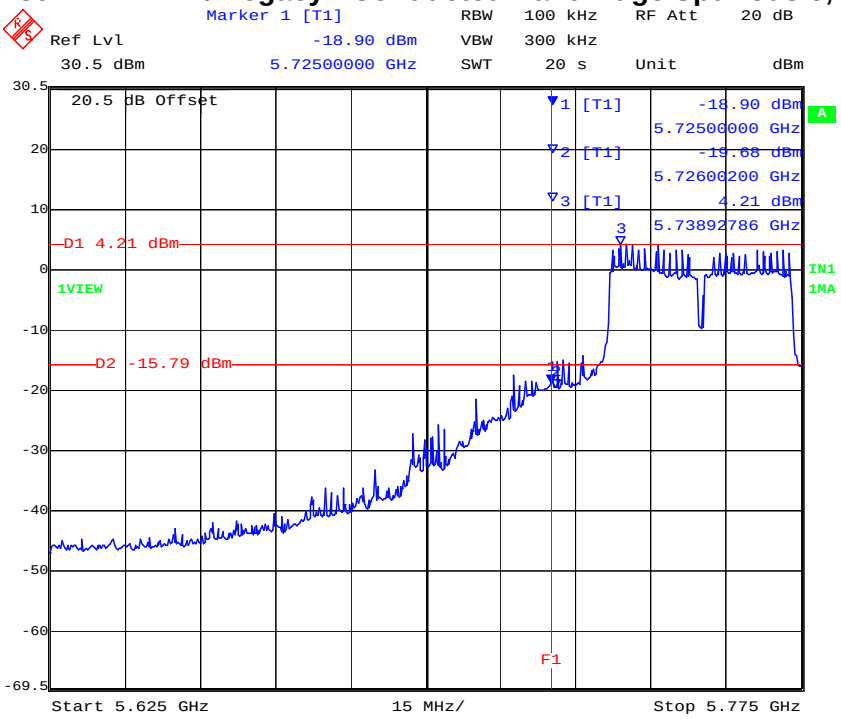
Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
5755.000	5725.00	-18.90	-15.79	-17.38	-14.27				
5795.000	5850.00	-26.89	-14.37	-33.73	-15.01				

BE: Maximum Band edge emission found

Measurement uncertainty:	±2.81 dB

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

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



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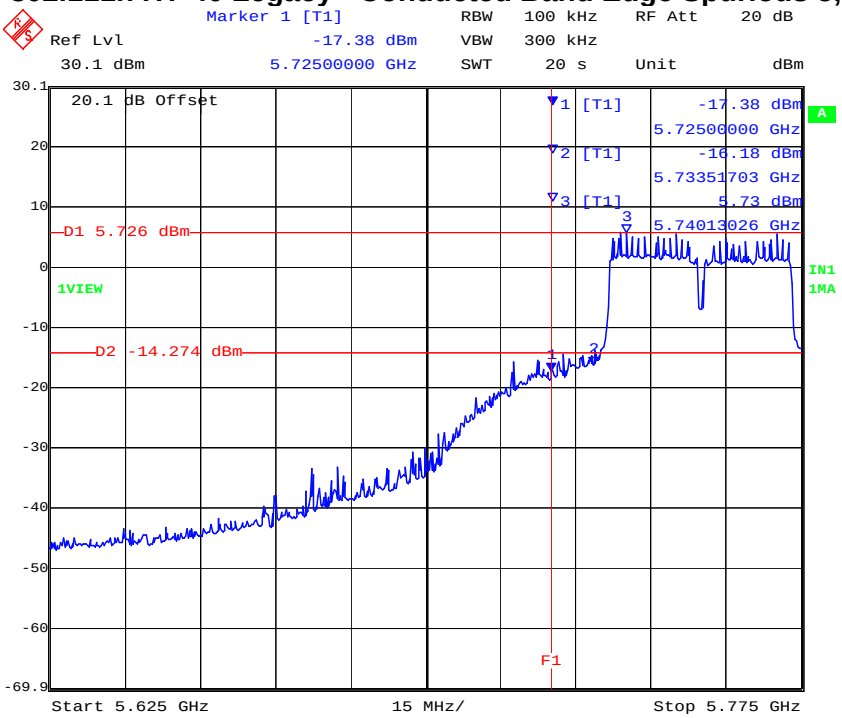
PORT B 802.11n HT-40 Legacy - Conducted Band Edge Spurious 5,725 MHz



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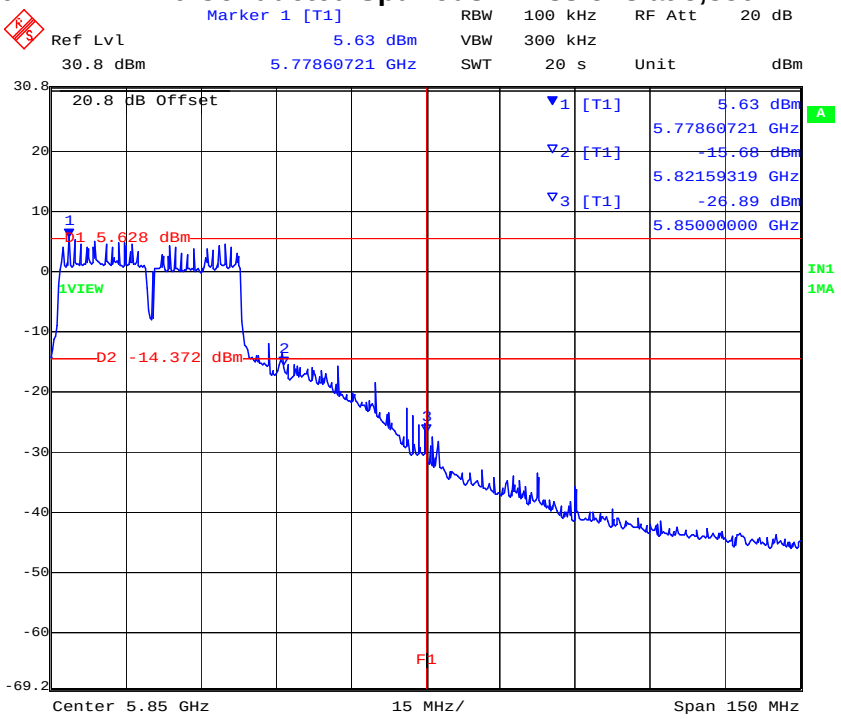
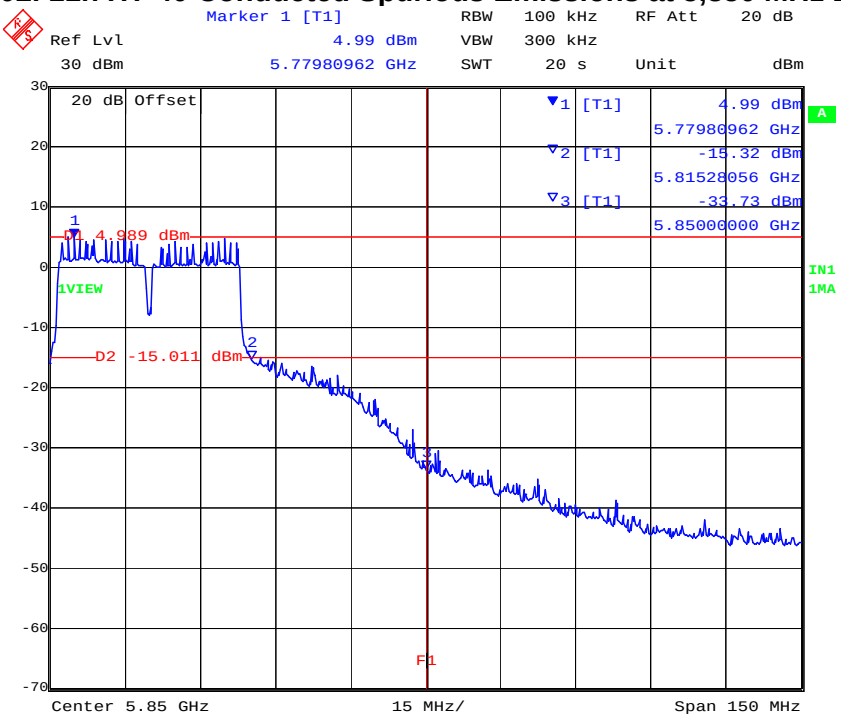
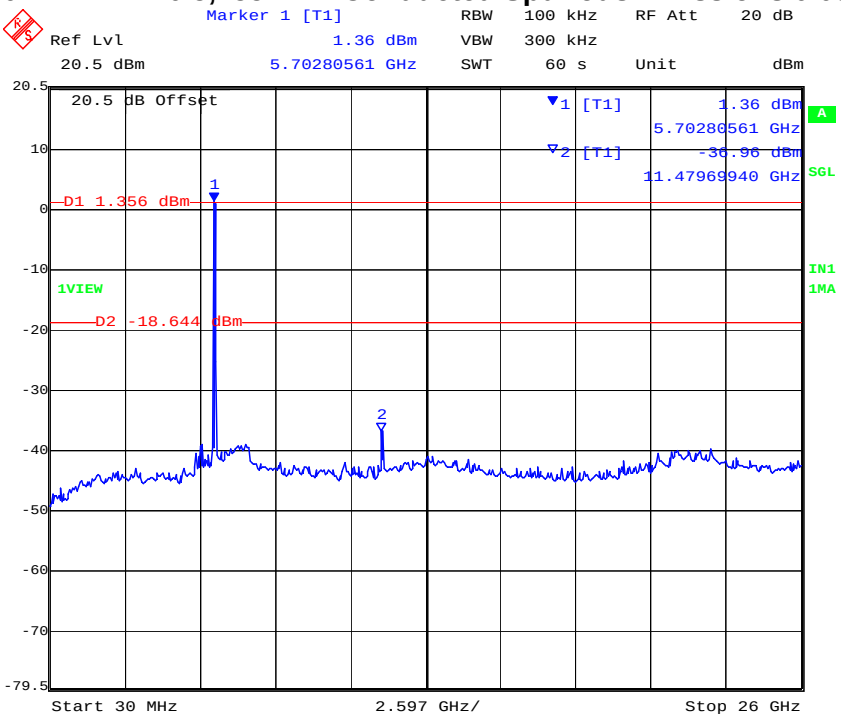
PORT A 802. 11n HT-40 Conducted Spurious Emissions at 5,850 MHz Band Edge



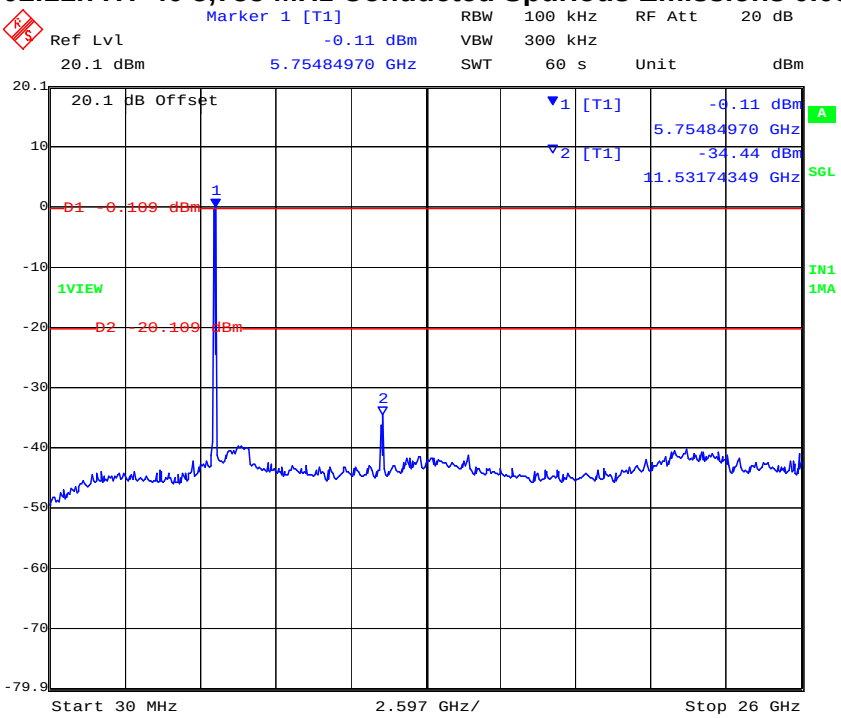
PORT B 802. 11n HT-40 Conducted Spurious Emissions at 5,850 MHz Band Edge



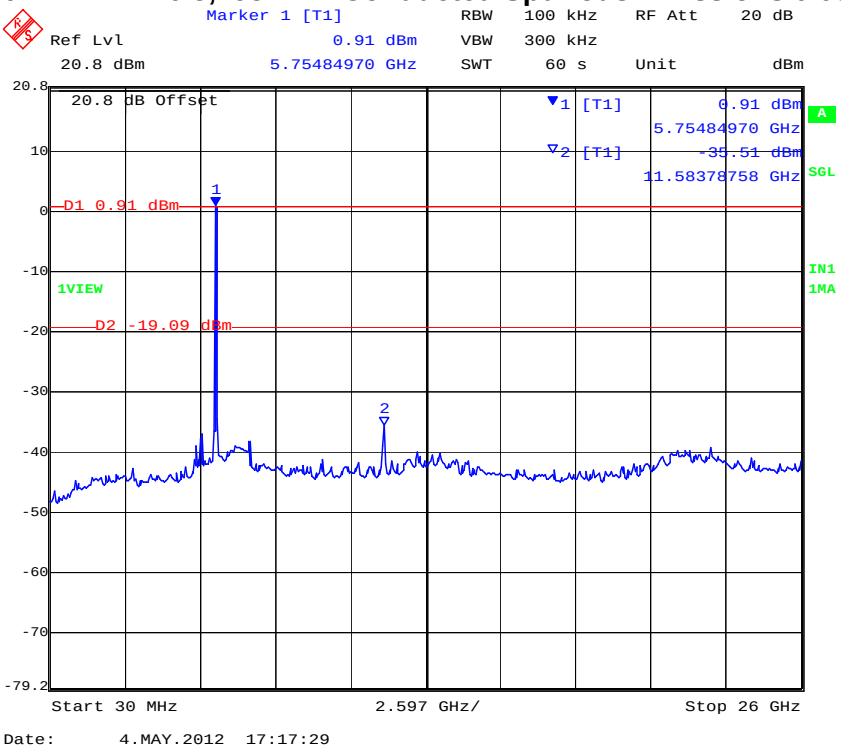
PORT A 802.11n HT-40 5,755 MHz Conducted Spurious Emissions 0.03 – 26 GHz



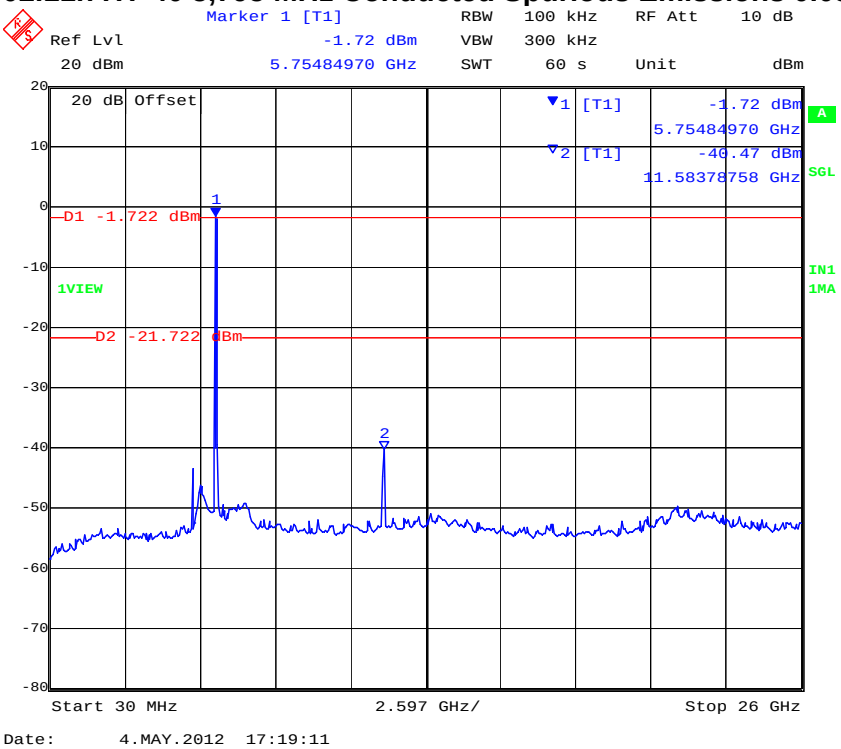
PORT B 802.11n HT-40 5,755 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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



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

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.

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

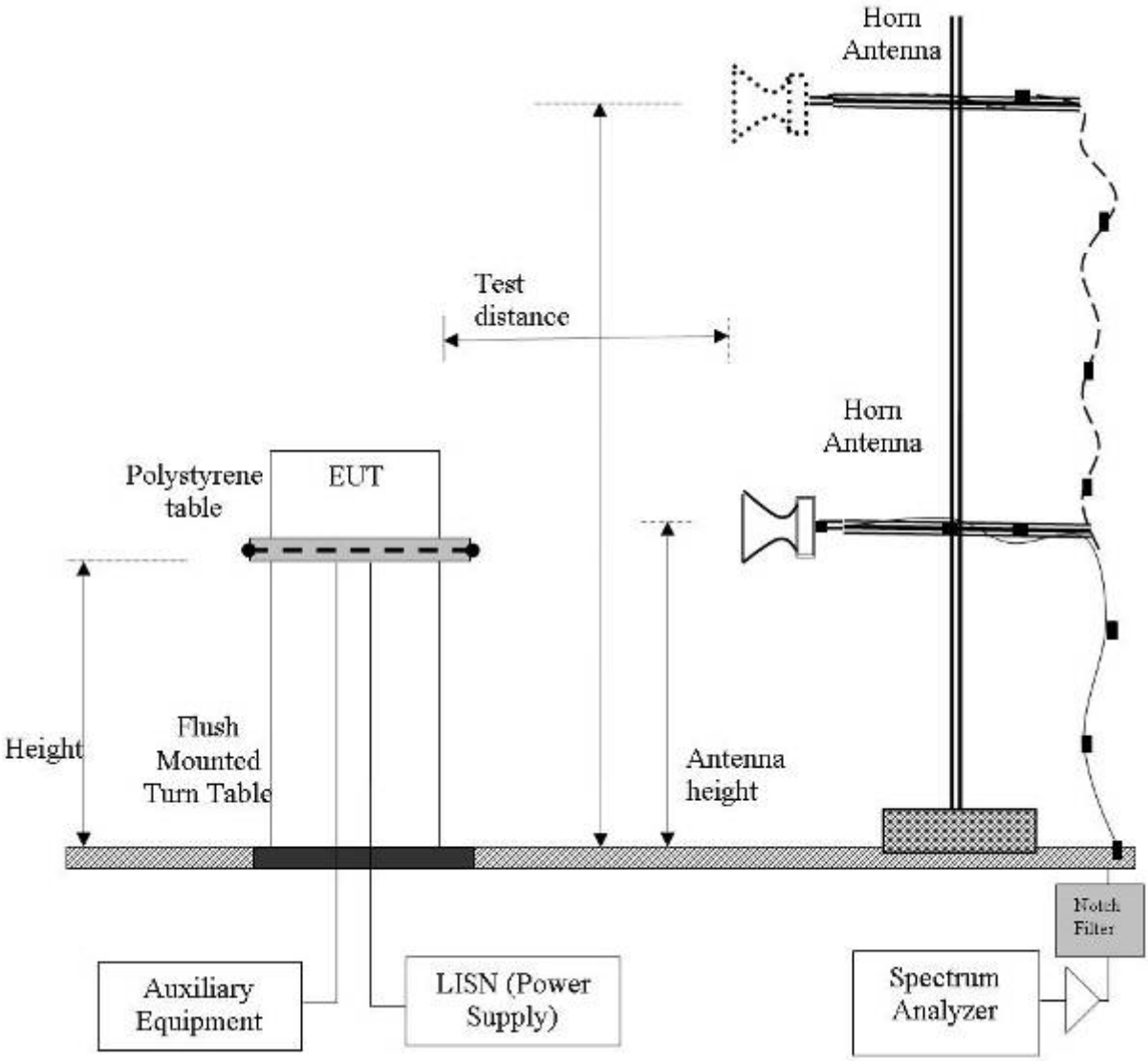
FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

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

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

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

Radiated Emission Measurement Setup – Above 1 GHz

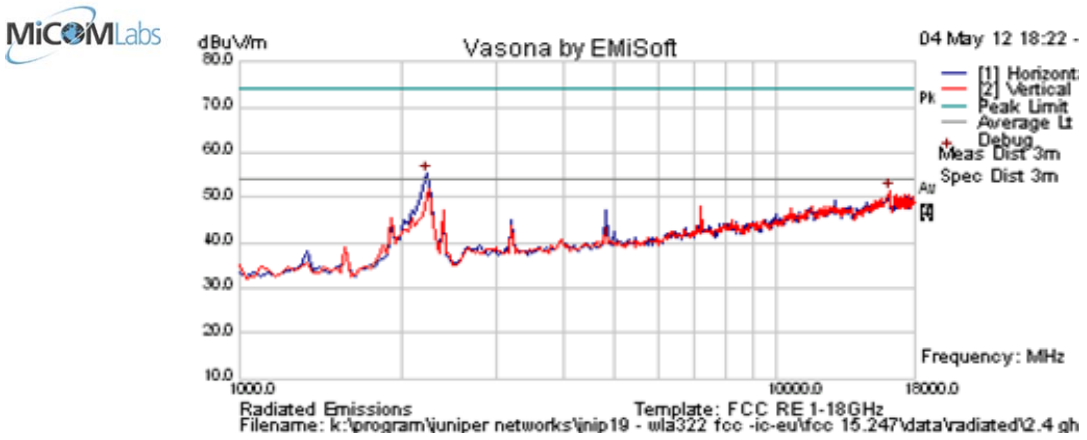


NOTE: KDB 662911 was implemented for Out-of-Band measurements. Where necessary Option (2) Measure and add 10 log (N) dB was implemented

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 (ºC)**	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	NOTE: PASSED AT ART = 16		
Test Notes 2			

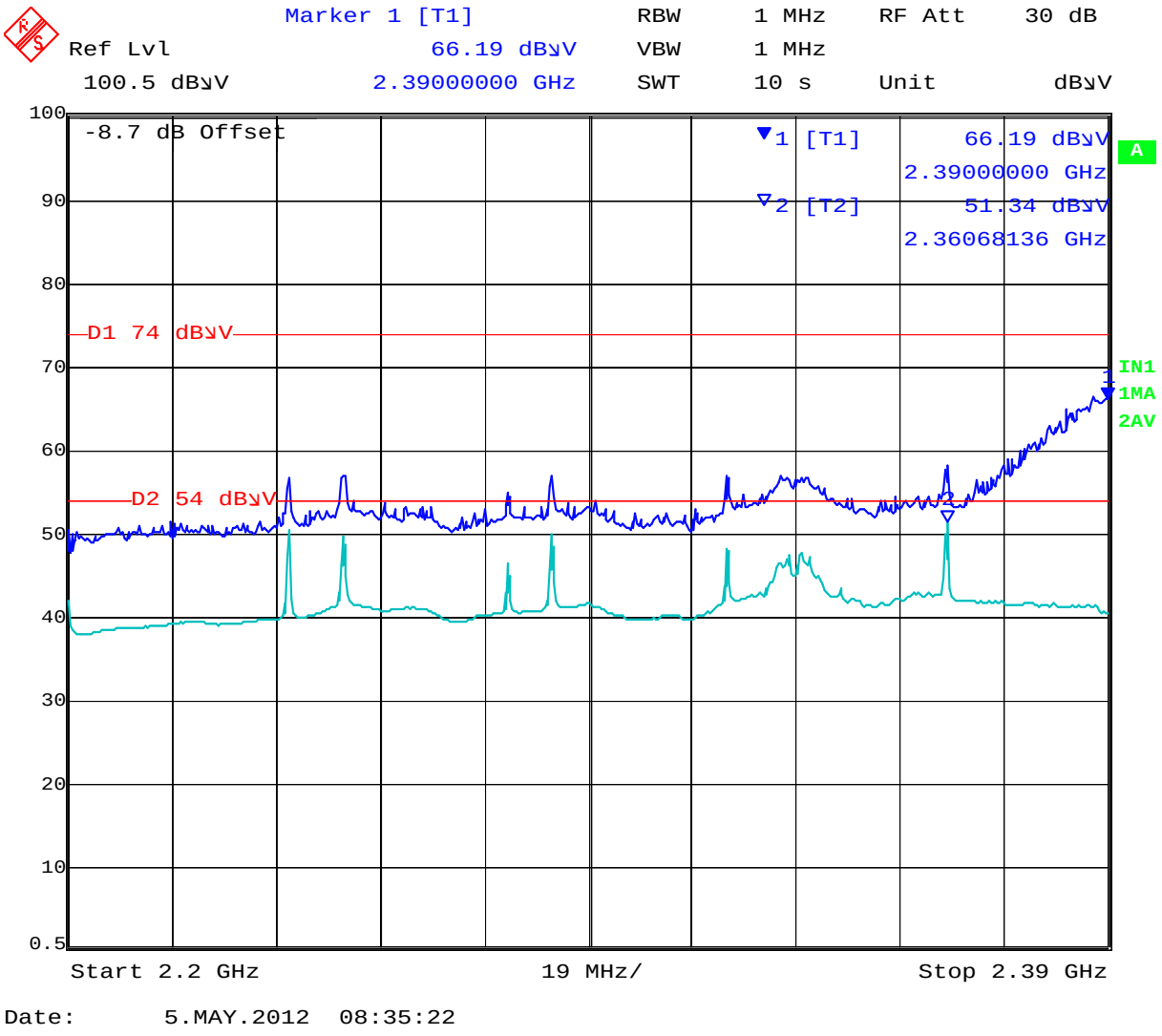


Formally measured emission peaks

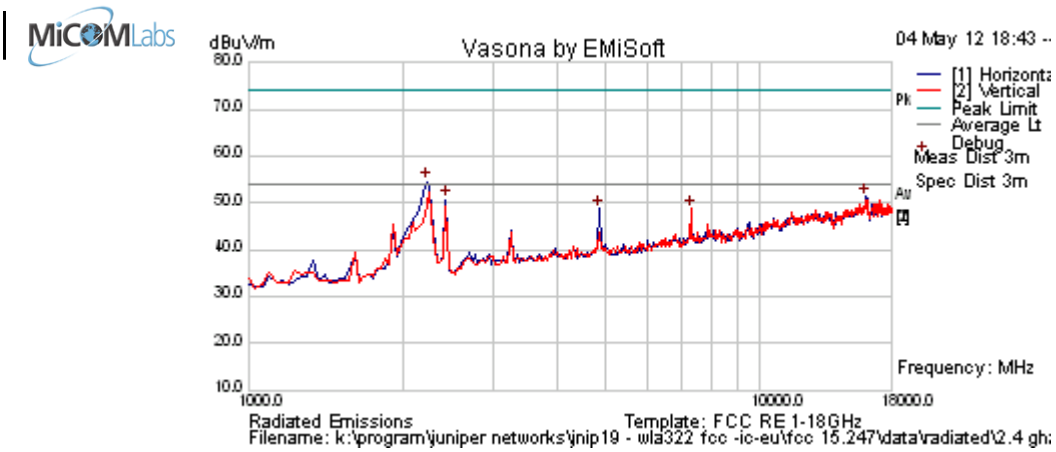
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2226.453	64.2	2.9	-12.0	55.1	Peak [Scan]	H						FUND
16090.662	44.4	9.0	0.3	53.6	Peak Max	V	201	114	74	-20.4	Pass	RB
16090.662	30.6	9.0	0.3	39.8	Average Max	V	201	114	54	-14.2	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

Band Edge



Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11b; 1 Mbs	**Temp (ºC)**	22
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	33
Power Setting	ART = 17	**Press. (mBars)**	1010
Antenna	Internal	**Duty Cycle (%)**	100
Test Notes 1			
Test Notes 2			

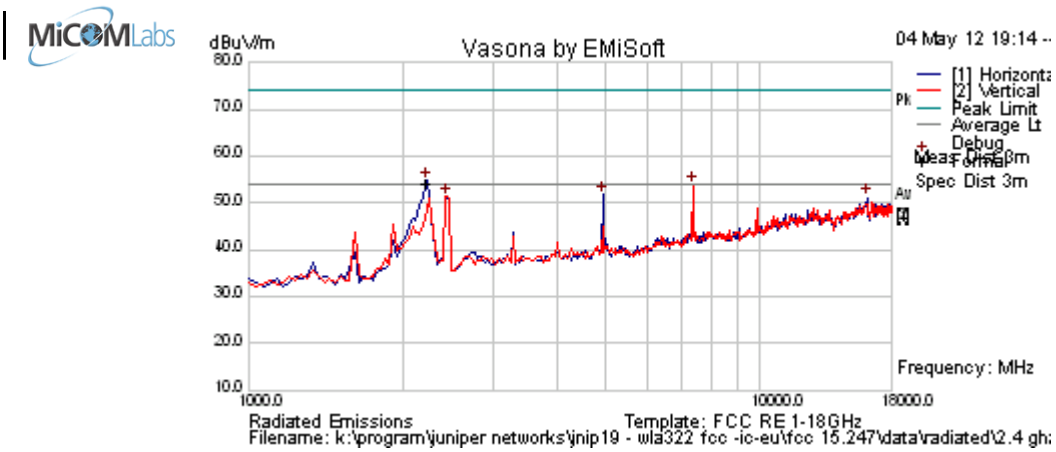


Formally measured emission peaks

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
2226.453	63.7	2.9	-12.0	54.6	Peak [Scan]	H						BE
2430.862	59.3	3.0	-11.6	50.8	Peak [Scan]	H						FUND
4849.699	54.0	4.5	-9.7	48.8	Peak [Scan]	H	100	0	54	-5.2	Pass	RB
16058.116	43.5	9.0	0.3	52.8	Peak Max	H	102	313	74	-21.2	Pass	RB
16058.116	30.5	9.0	0.3	39.8	Average Max	H	102	313	54	-14.2	Pass	RB
7312.906	54.2	5.4	-5.7	54.0	Peak Max	V	98	340	74	-20.0	Pass	RB
7312.906	47.5	5.4	-5.7	47.2	Average Max	V	98	340	54	-6.8	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

Test Freq.	2462 MHz	**Engineer**	GMH
Variant	802.11b; 1 Mbs	**Temp (ºC)**	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			

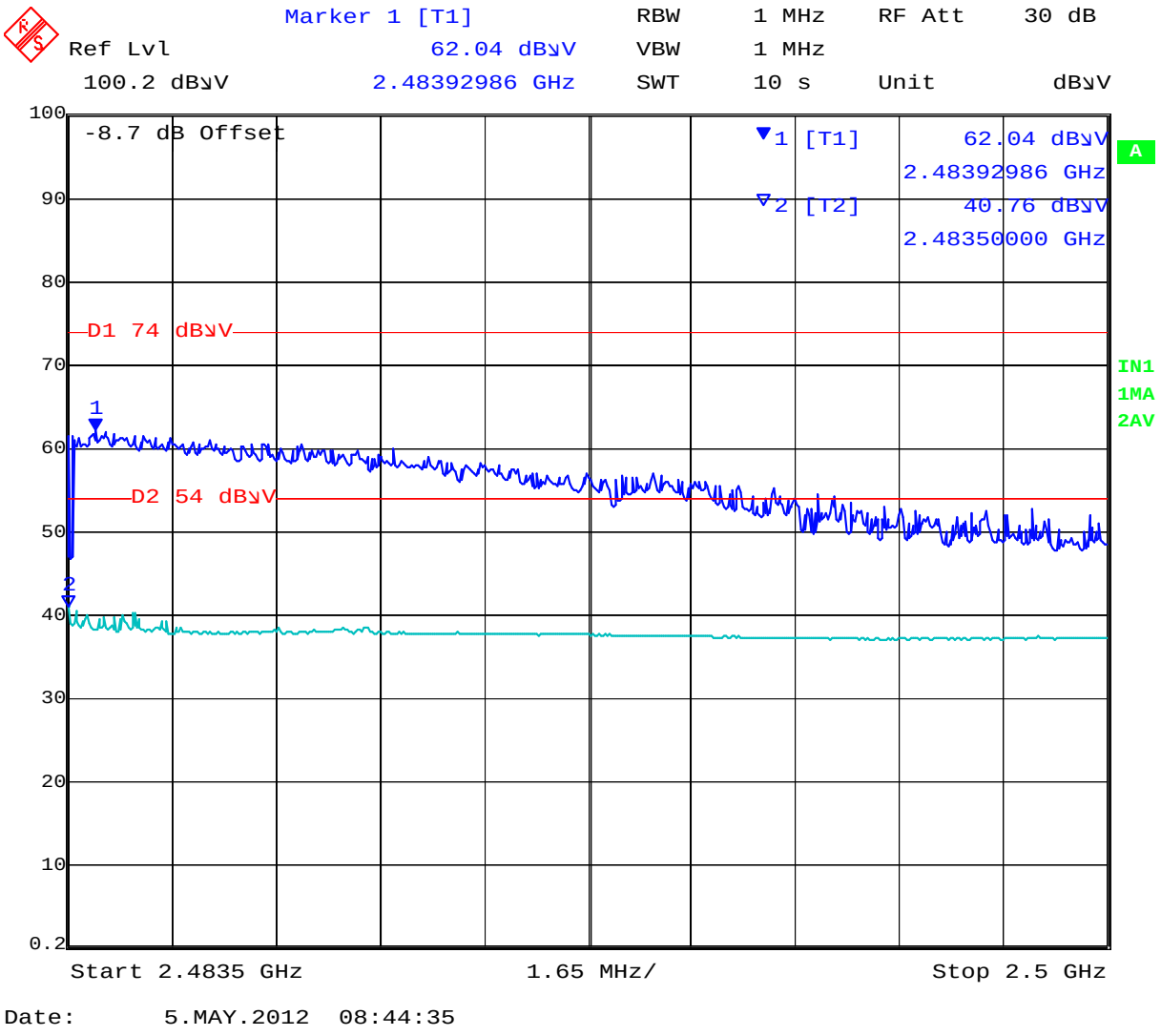


Formally measured emission peaks

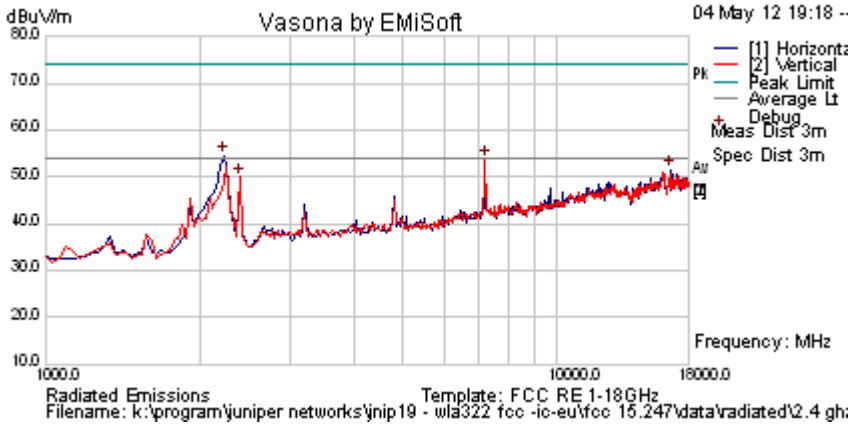
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2226.453	63.4	2.9	-12.0	54.3	Peak [Scan]	H						FUND
15989.980	41.7	9.0	0.1	50.8	Peak [Scan]	H	100	0	54	-3.2	Pass	RB
2430.862	57.9	3.0	-11.6	49.3	Peak [Scan]	V					Pass	BE
7370.741	48.5	5.5	-5.5	48.5	Peak [Scan]	V	100	0	54	-5.5	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

Band Edge



Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (ºC)**	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			

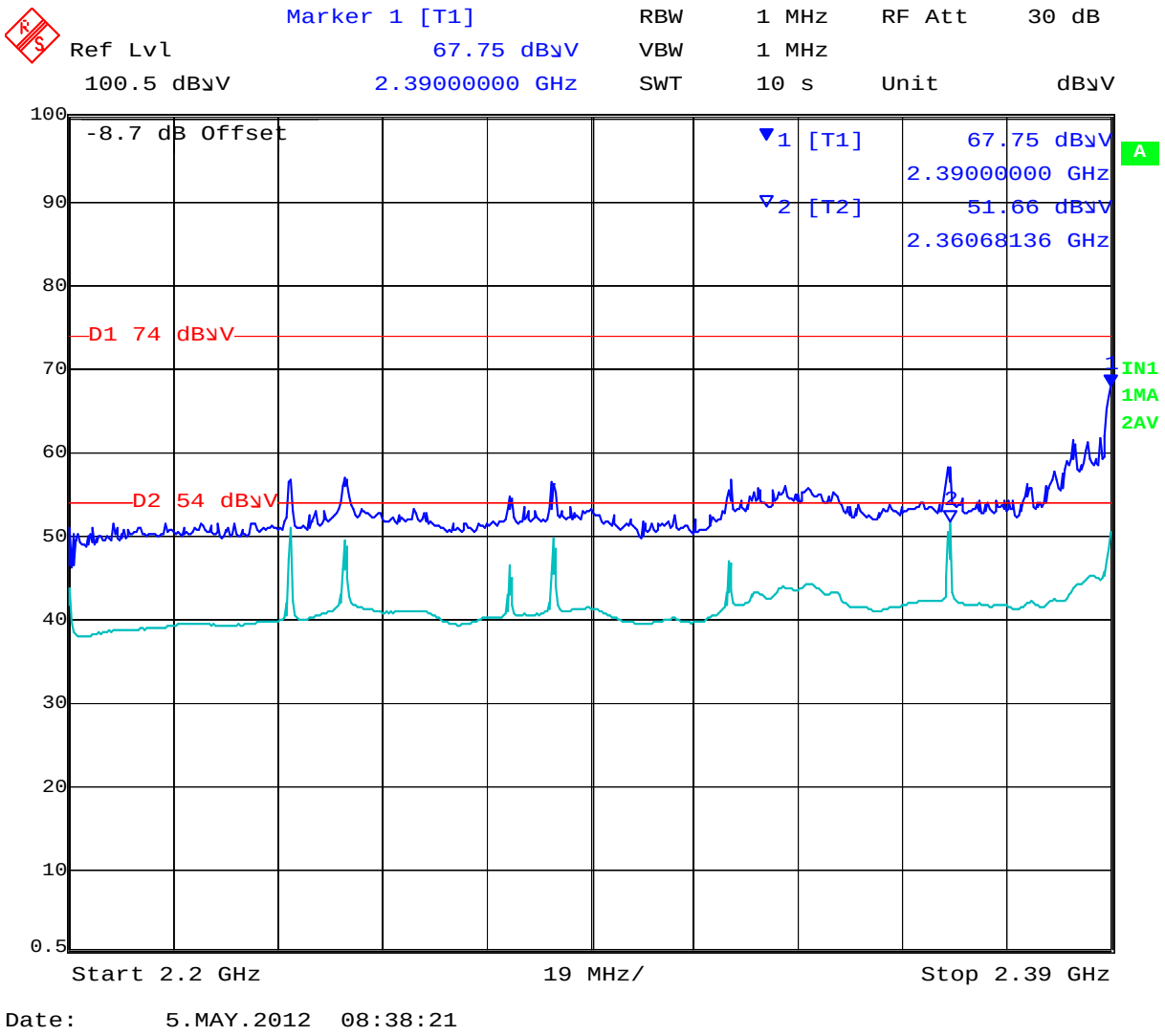


Formally measured emission peaks

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
2226.453	63.6	2.9	-12.0	54.5	Peak [Scan]	H					Pass	BE
7234.469	54.4	5.4	-5.8	54.0	Peak [Scan]	V	100	0	54	0.0	Pass	NRB
16603.206	42.2	8.8	0.6	51.5	Peak [Scan]	H	100	0	54	-2.5	Pass	NOISE
2396.794	58.8	3.0	-11.7	50.0	Peak [Scan]	H						FUND

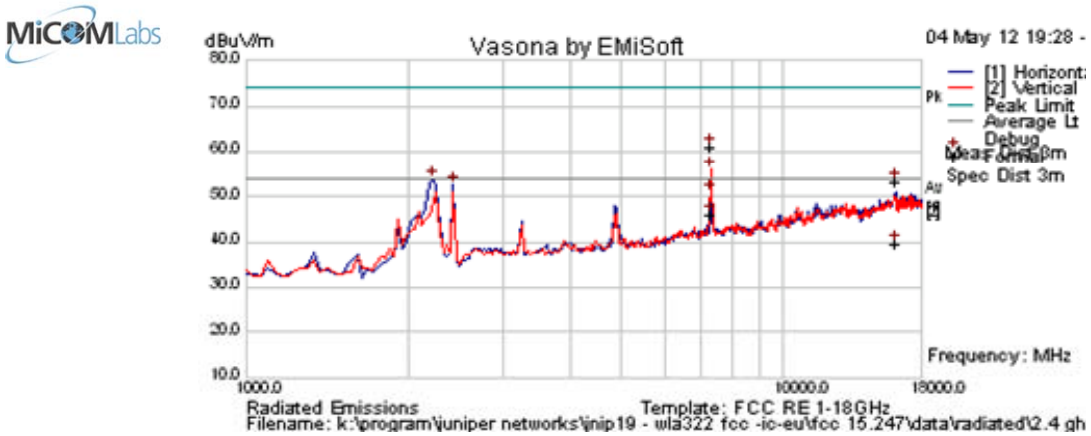
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Band Edge



Power reduction required to bring the band-edge into compliance ART = 16

Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (ºC)**	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			

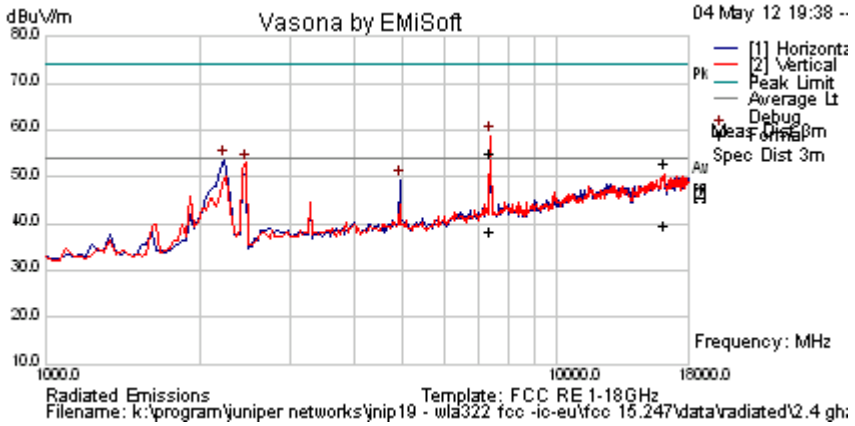


Formally measured emission peaks

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
2226.453	62.9	2.9	-12.0	53.8	Peak [Scan]	H					Pass	BE
2430.862	61.2	3.0	-11.6	52.6	Peak [Scan]	H						FUND
7309.379	61.2	5.4	-5.7	60.9	Peak Max	V	140	325	74	-13.1	Pass	RB
16159.042	44.4	9.0	0.2	53.5	Peak Max	V	153	11	74	-20.5	Pass	RB
7309.379	46.5	5.4	-5.7	46.2	Average Max	V	140	325	54	-7.8	Pass	RB
16159.042	30.4	9.0	0.2	39.6	Average Max	V	153	11	54	-14.5	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

Test Freq.	2462 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (ºC)**	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			

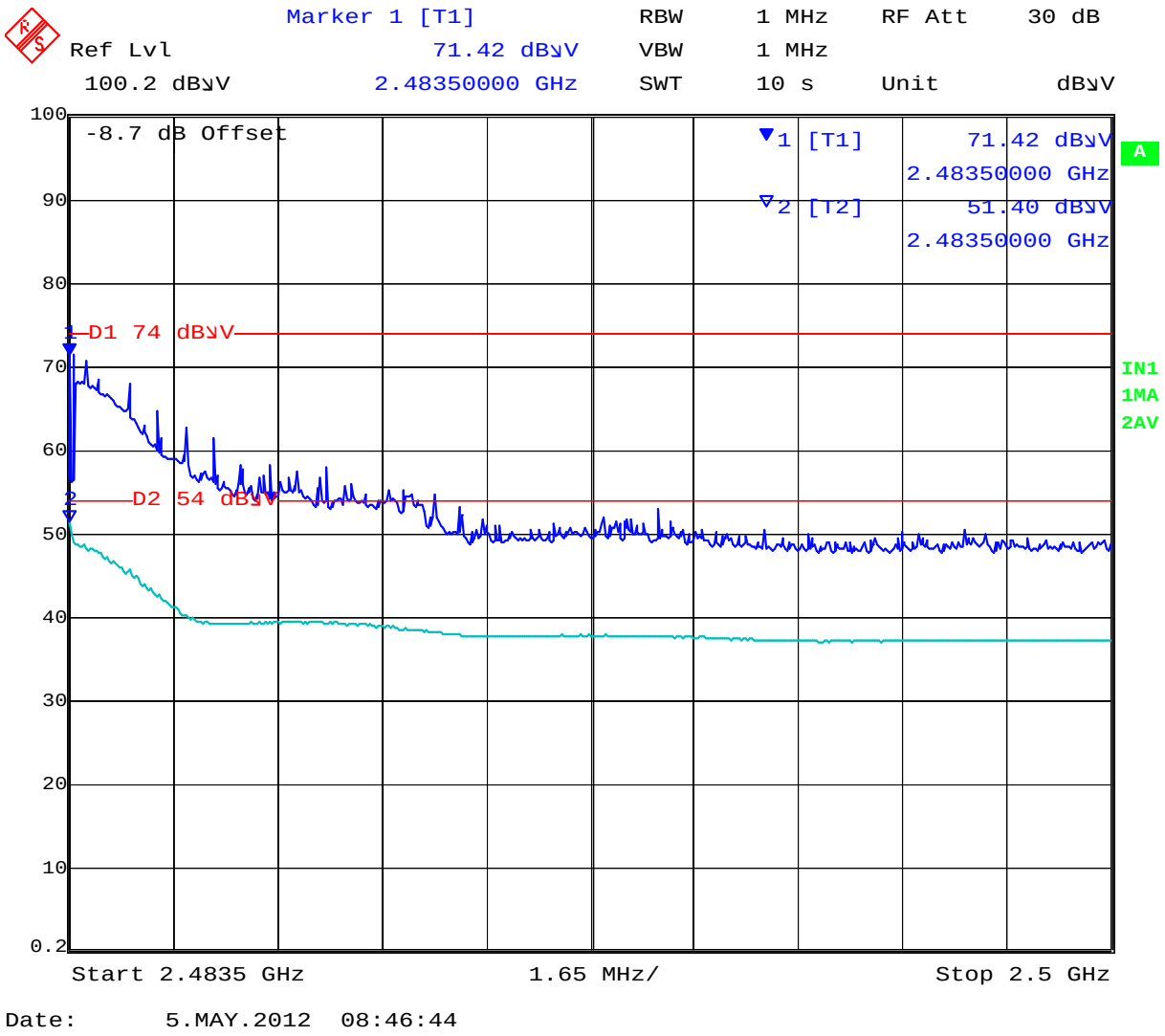


Formally measured emission peaks

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
2226.453	62.9	2.9	-12.0	53.8	Peak [Scan]	H					Pass	BE
2464.930	61.6	3.0	-11.5	53.1	Peak [Scan]	V						FUND
4917.836	54.7	4.6	-9.8	49.4	Peak [Scan]	H	100	0	54	-4.6	Pass	RB
7371.207	55.1	5.5	-5.5	55.1	Peak Max	V	148	324	74	-18.9	Pass	RB
16126.253	43.7	9.0	0.2	52.9	Peak Max	V	110	241	74	-21.1	Pass	RB
7371.207	38.4	5.5	-5.5	38.3	Average Max	V	148	324	54	-15.7	Pass	RB
16126.253	30.4	9.0	0.2	39.6	Average Max	V	110	241	54	-14.4	Pass	RB

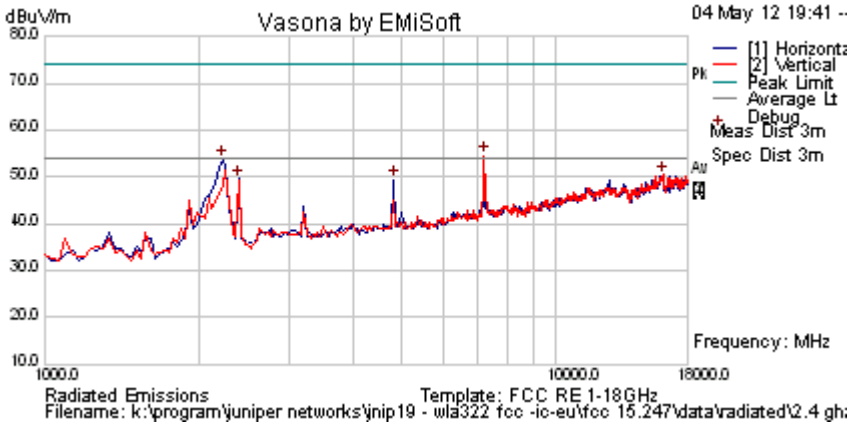
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Band Edge



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

Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	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			

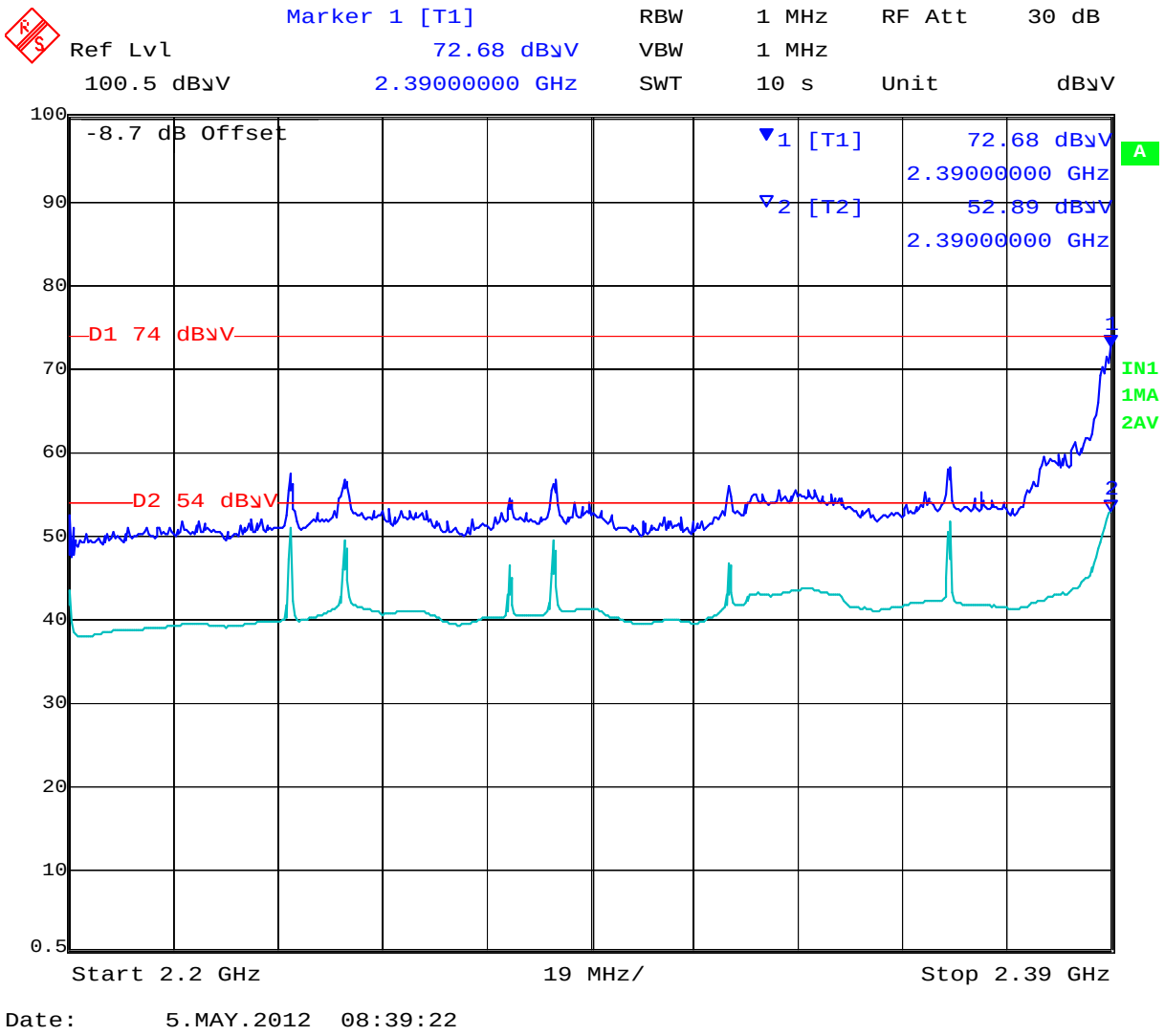


Formally measured emission peaks

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
7234.469	55.0	5.4	-5.8	54.6	Peak [Scan]	V					Pass	NRB
2226.453	63.1	2.9	-12.0	54.0	Peak [Scan]	H					Pass	BE
16160.321	41.4	9.0	0.2	50.5	Peak [Scan]	H	100	0	54	-3.5	Pass	NOISE
2396.794	58.3	3.0	-11.7	49.6	Peak [Scan]	H						FUND
4815.631	54.6	4.5	-9.7	49.4	Peak [Scan]	H	100	0	54	-4.7	Pass	RB

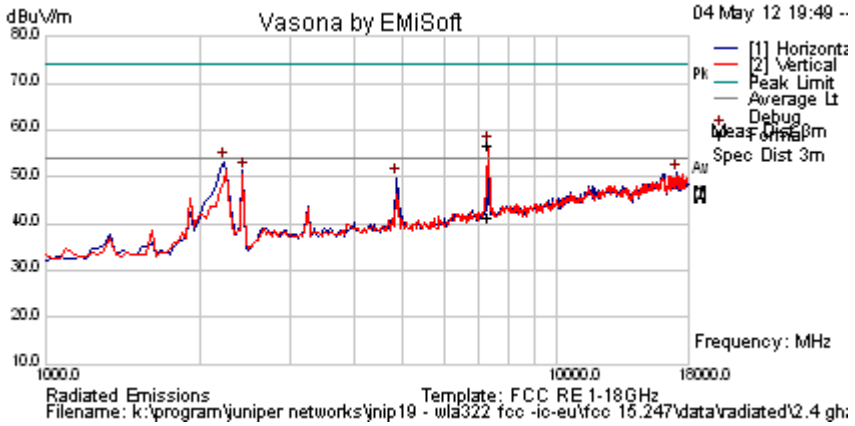
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	* Evaluated as 1600 MHz, RB Emission See Evaluation
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Band Edge



Power reduction required to bring the band-edge into compliance ART = 16

Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	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			

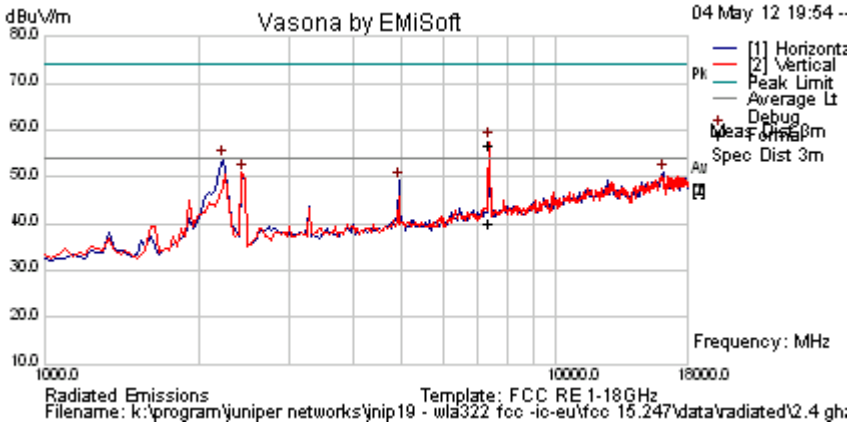


Formally measured emission peaks

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
2226.453	62.3	2.9	-12.0	53.2	Peak [Scan]	H					Pass	BE
2430.862	59.8	3.0	-11.6	51.2	Peak [Scan]	H						FUND
17114.228	41.9	8.5	0.5	50.9	Peak [Scan]	H	100	0	54	-3.1	Pass	NOISE
4849.699	55.0	4.5	-9.7	49.8	Peak [Scan]	H	100	0	54	-4.2	Pass	RB
7302.606	57.0	5.4	-5.7	56.7	Peak Max	V	139	1	74	-17.3	Pass	RB
7302.606	41.7	5.4	-5.7	41.4	Average Max	V	139	1	54	-12.6	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

Test Freq.	2462 MHz	**Engineer**	GMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	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			

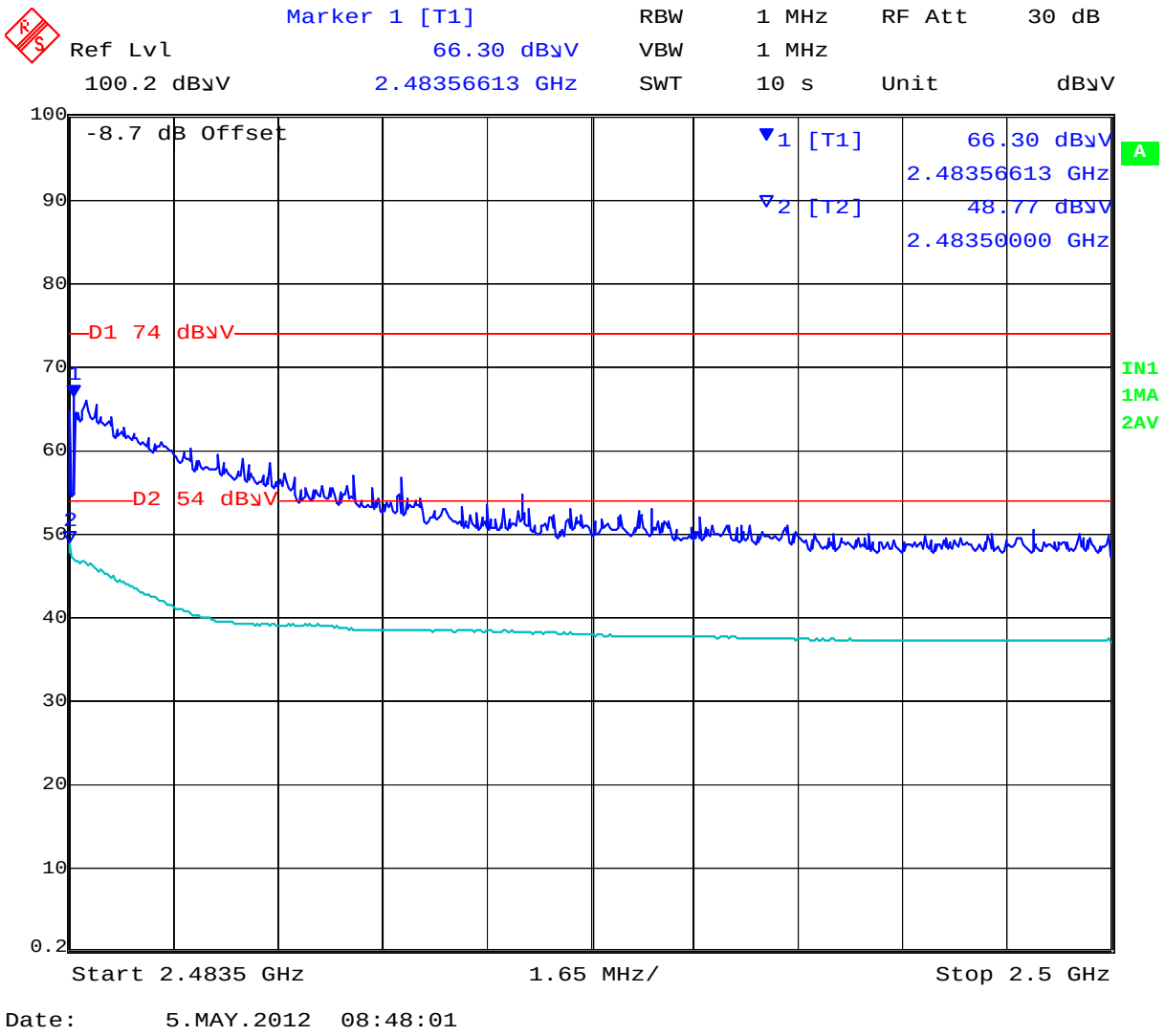


Formally measured emission peaks

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
2226.453	63.0	2.9	-12.0	53.9	Peak [Scan]	H					Pass	BE
16194.389	41.8	8.9	0.2	50.9	Peak [Scan]	H	100	0	54	-3.1	Pass	NOISE
2430.862	59.4	3.0	-11.6	50.8	Peak [Scan]	V						FUND
4917.836	54.5	4.6	-9.8	49.3	Peak [Scan]	H	100	0	54	-4.7	Pass	RB
7370.742	57.0	5.5	-5.5	57.0	Peak Max	V	147	346	74	-17.1	Pass	RB
7370.742	40.2	5.5	-5.5	40.1	Average Max	V	147	346	54	-13.9	Pass	RB

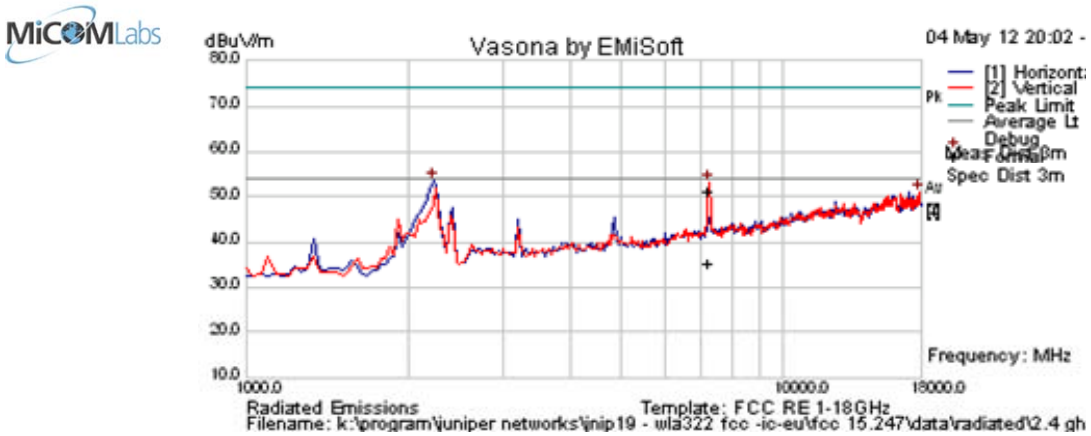
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	* Evaluated as 1600 MHz, RB Emission See Evaluation
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Band Edge



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

Test Freq.	2422 MHz	**Engineer**	GMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	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			

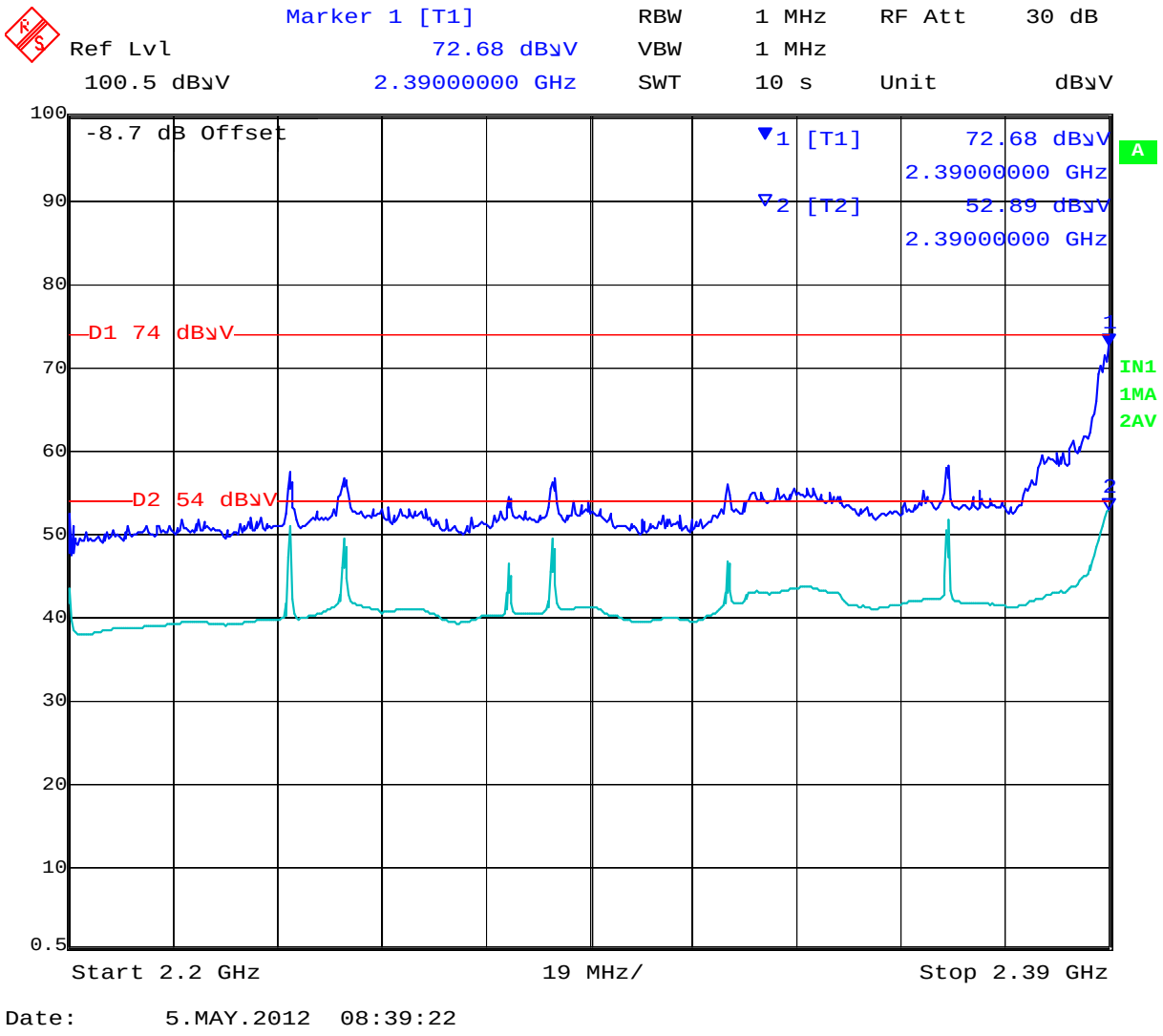


Formally measured emission peaks

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
2226.453	62.6	2.9	-12.0	53.5	Peak [Scan]	H					Pass	BE
17829.659	42.0	8.8	0.2	51.0	Peak [Scan]	V	100	0	54	-3.0	Pass	NOISE
7268.538	51.6	5.4	-5.8	51.3	Peak Max	V	149	335	74	-22.7	Pass	NRB
7268.538	35.9	5.4	-5.8	35.5	Average Max	V	149	335	54	-18.5	Pass	NRB

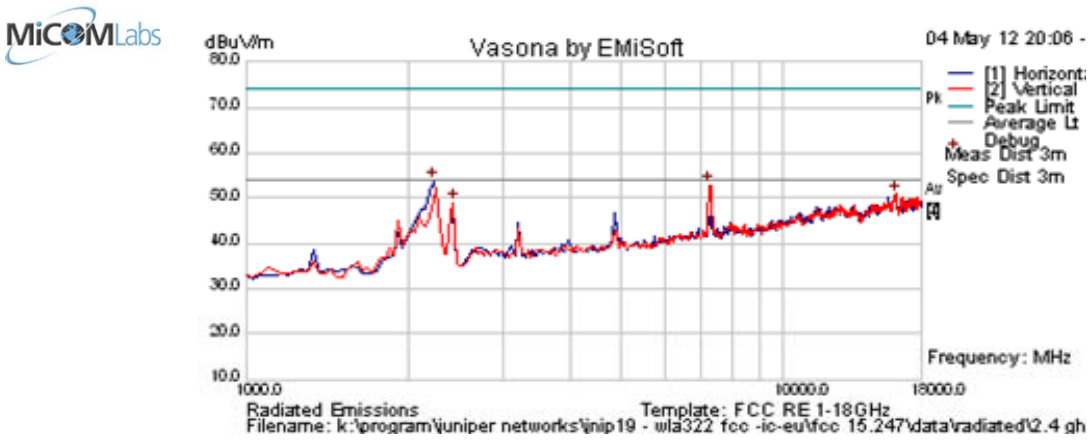
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	* Evaluated as 1600 MHz, RB Emission See Evaluation
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Band Edge



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

Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	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			

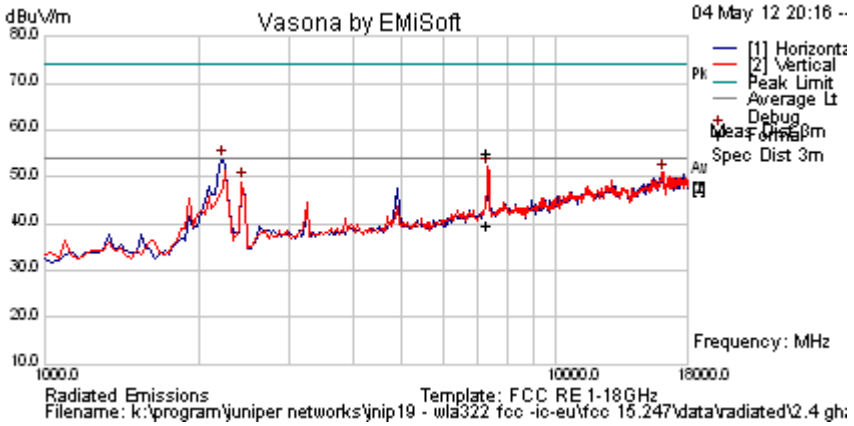


Formally measured emission peaks

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
2226.453	62.7	2.9	-12.0	53.6	Peak [Scan]	H					Pass	BE
16126.253	41.8	9.0	0.2	51.0	Peak [Scan]	V	100	0	54	-3.0	Pass	NOISE
2430.862	57.6	3.0	-11.6	49.0	Peak [Scan]	V						FUND
7291.703	56.0	5.4	-5.7	55.7	Peak Max	V	110	333	74	-18.3	Pass	RB
7291.703	43.0	5.4	-5.7	42.7	Average Max	V	110	333	54	-11.3	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

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	CH11		
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
2226.453	63.0	2.9	-12.0	53.9	Peak [Scan]	H					Pass	BE
16160.321	41.8	9.0	0.2	50.9	Peak [Scan]	V	100	0	54	-3.1	Pass	NOISE
2430.862	57.6	3.0	-11.6	49.0	Peak [Scan]	V						FUND
7322.525	55.1	5.5	-5.7	54.9	Peak Max	V	140	338	74	-19.1	Pass	RB
7322.525	39.8	5.5	-5.7	39.6	Average Max	V	140	338	54	-14.4	Pass	RB

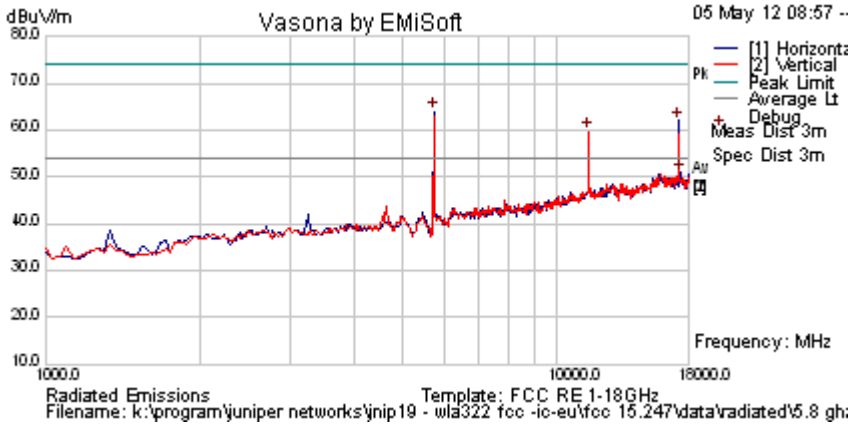
Legend:	TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
	RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Band Edge

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

5.8 GHz Radiated Emission Results

Test Freq.	5745 MHz	**Engineer**	GMH
Variant	802.11a; 6 Mbs	**Temp (ºC)**	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			

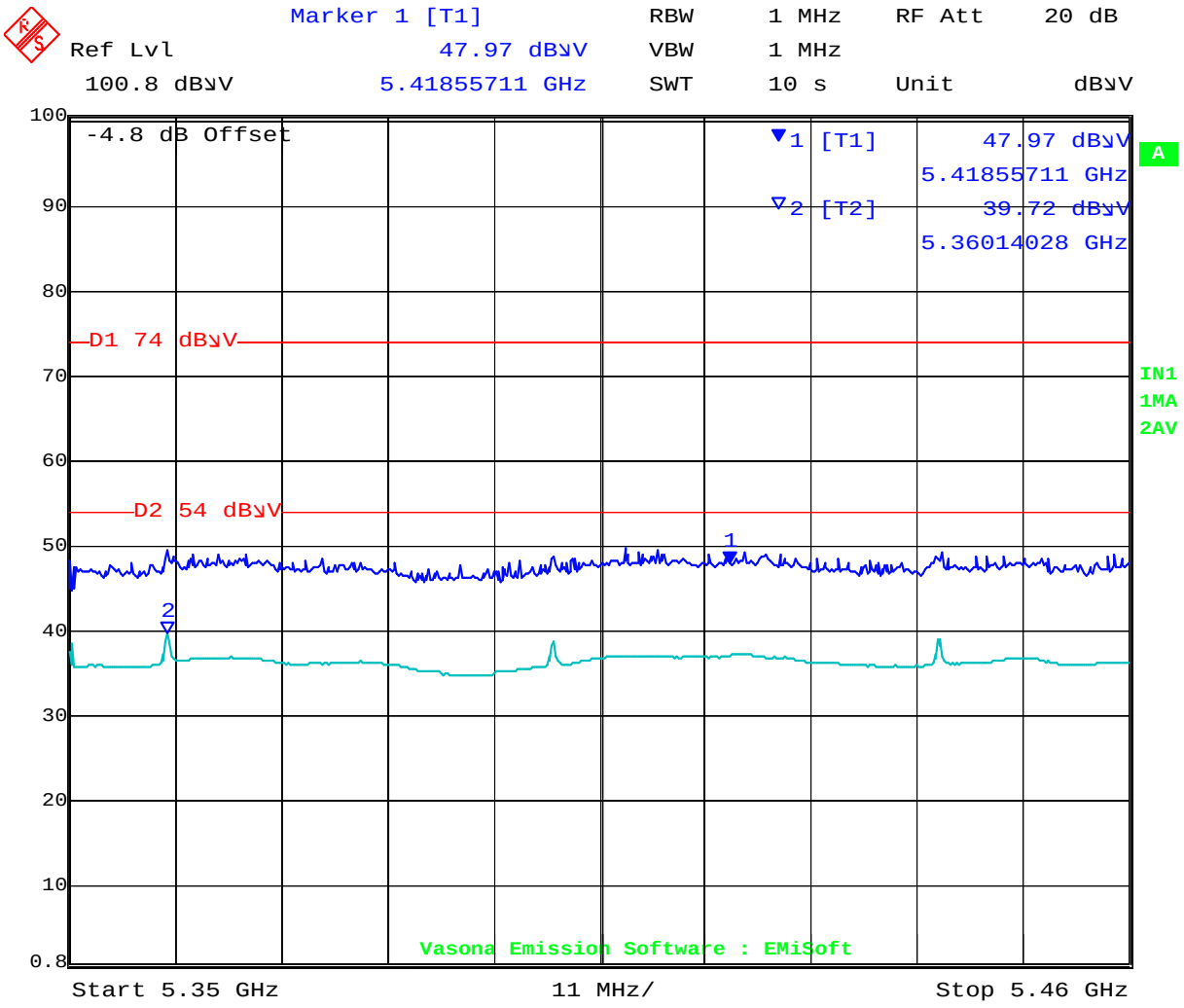


Formally measured emission peaks

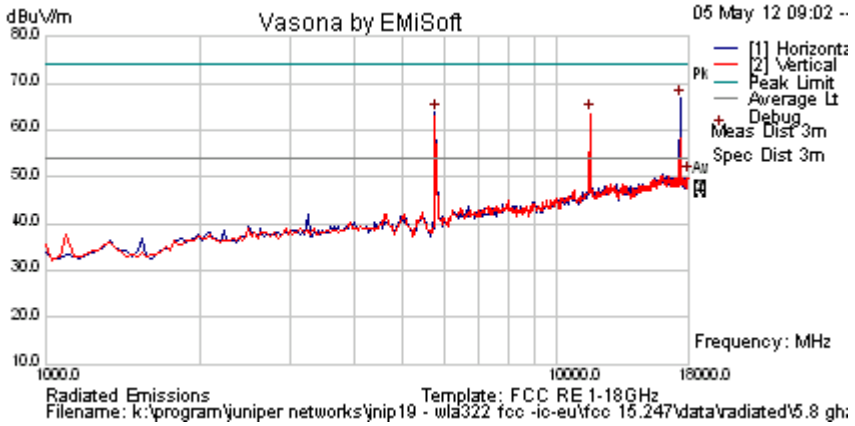
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5735.471	68.9	4.8	-9.5	64.1	Peak [Scan]	H						FUND
17250.501	52.3	8.6	1.0	62.0	Peak [Scan]	H					Pass	NRB
17352.705	41.0	8.7	1.3	51.0	Peak [Scan]	H	100	0	54	-3.0	Pass	NOISE
11492.986	59.7	6.8	-2.0	64.5	Peak Max	H	126	72	74	-9.5	Pass	RB
11492.986	46.1	6.8	-2.0	50.9	Average Max	H	126	72	54	-3.1	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

Band-Edge



Test Freq.	5785 MHz	**Engineer**	GMH
Variant	802.11a; 6 Mbs	**Temp (ºC)**	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			

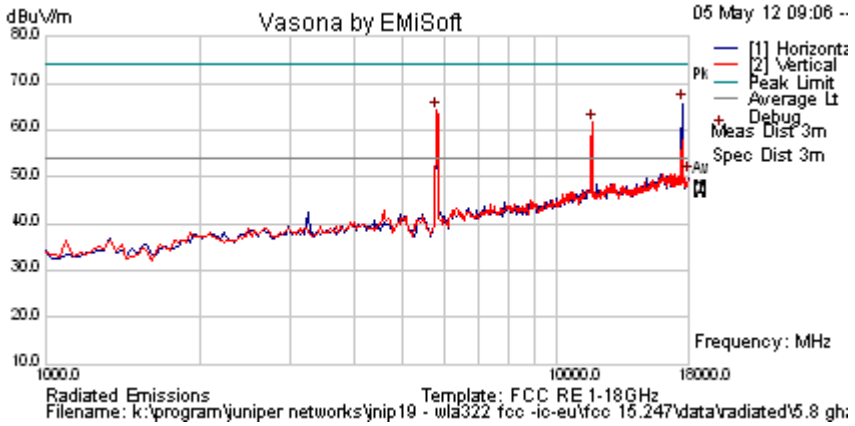


Formally measured emission peaks

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	56.7	8.7	1.3	66.7	Peak [Scan]	H					Pass	NRB
5769.539	68.4	4.8	-9.5	63.7	Peak [Scan]	H						FUND
18000.000	40.6	8.8	0.7	50.2	Peak [Scan]	V	100	0	54	-3.8	Pass	NOISE
11572.906	61.8	6.8	-2.0	66.5	Peak Max	H	98	235	74	-7.5	Pass	RB
11572.906	46.3	6.8	-2.0	51.1	Average Max	H	98	235	54	-2.9	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

Test Freq.	5825 MHz	**Engineer**	GMH
Variant	802.11a; 6 Mbs	**Temp (ºC)**	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			

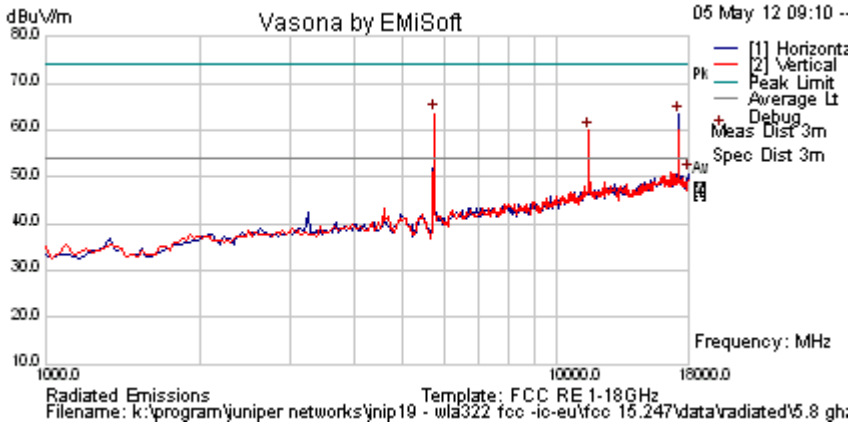


Formally measured emission peaks

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	52.0	8.8	1.0	61.7	Peak [Scan]	V					Pass	NRB
5803.607	68.7	4.8	-9.4	64.1	Peak [Scan]	V						FUND
18000.000	40.7	8.8	0.7	50.3	Peak [Scan]	H	100	0	54	-3.7	Pass	NOISE
11650.421	62.6	6.8	-2.3	67.1	Peak Max	H	112	173	74	-6.9	Pass	RB
11650.421	47.1	6.8	-2.3	51.7	Average Max	H	112	173	54	-2.3	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

Test Freq.	5745 MHz	**Engineer**	GMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	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			

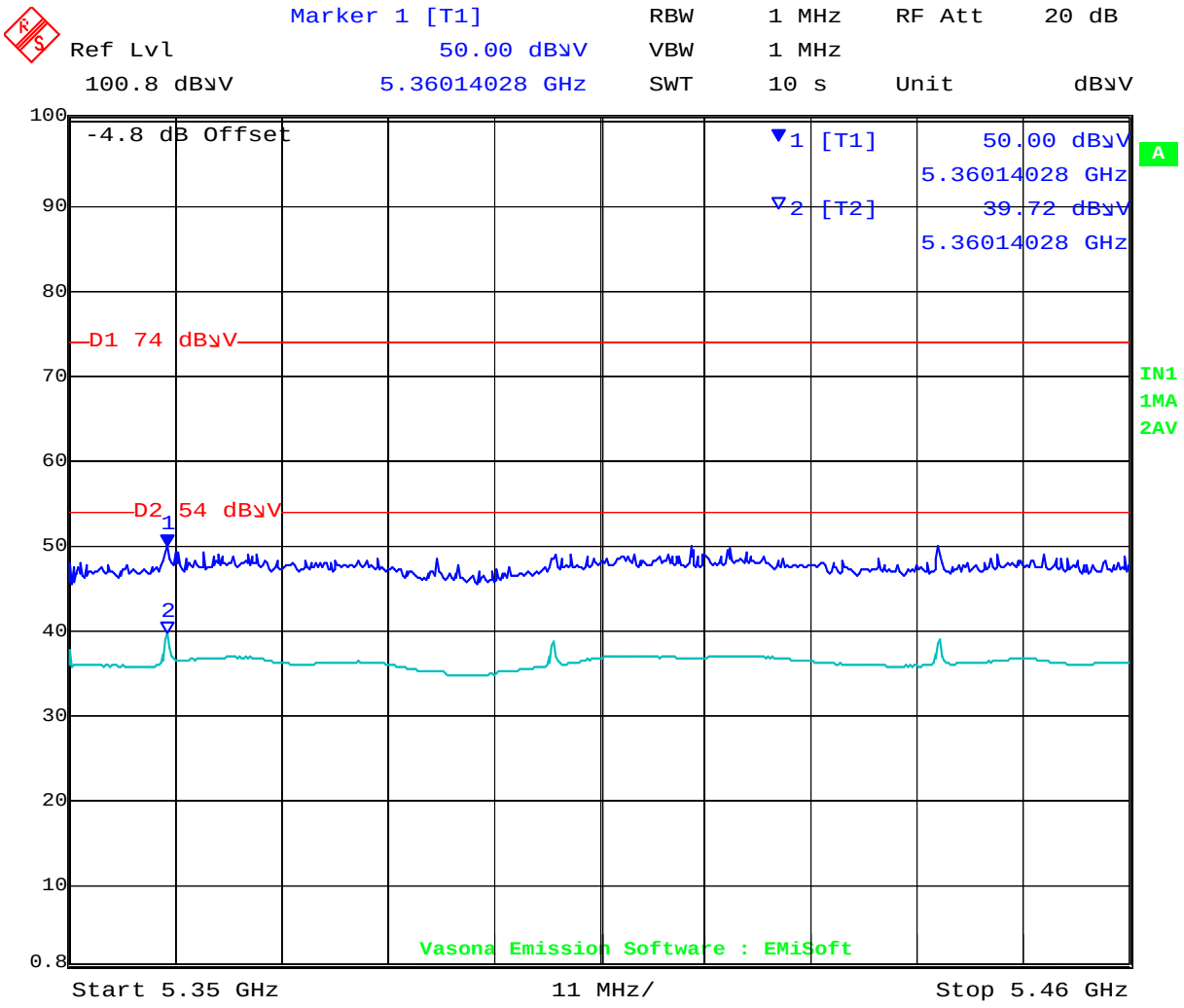


Formally measured emission peaks

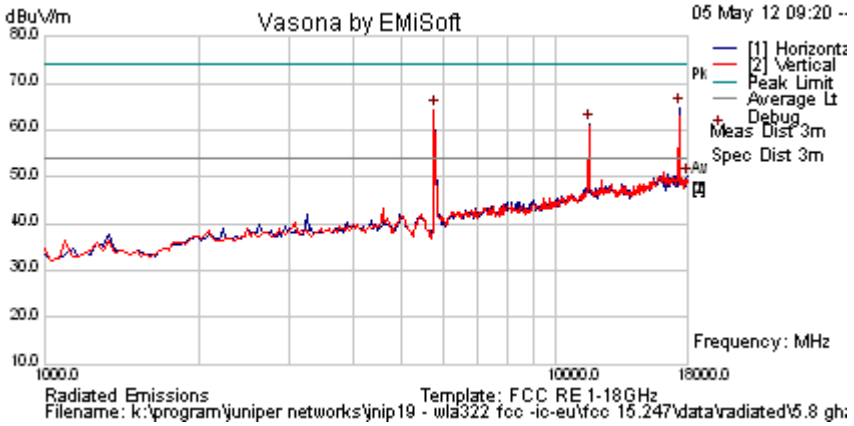
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5735.471	68.3	4.8	-9.5	63.5	Peak [Scan]	H						FUND
17250.501	53.6	8.6	1.0	63.2	Peak [Scan]	H					Pass	NRB
17965.932	41.2	8.8	0.7	50.7	Peak [Scan]	H	100	0	54	-3.3	Pass	NOISE
11483.848	60.5	6.8	-2.0	65.3	Peak Max	H	98	236	74	-8.7	Pass	RB
11483.848	45.4	6.8	-2.0	50.2	Average Max	H	98	236	54	-3.8	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

Band-Edge



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			

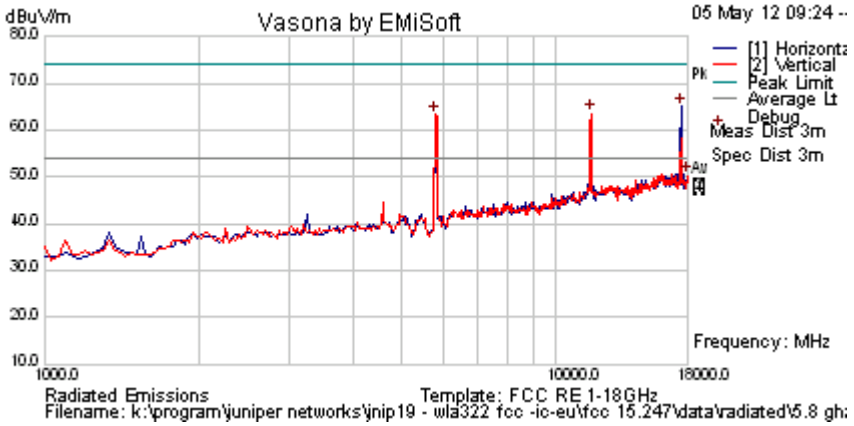


Formally measured emission peaks

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
17386.774	54.7	8.7	1.4	64.9	Peak [Scan]	H					Pass	NRB
5769.539	69.0	4.8	-9.5	64.3	Peak [Scan]	V						FUND
17965.932	40.6	8.8	0.7	50.1	Peak [Scan]	H	100	0	54	-4.0	Pass	NOISE
11578.517	60.6	6.8	-2.0	65.4	Peak Max	H	98	236	74	-8.6	Pass	RB
11578.517	44.7	6.8	-2.0	49.4	Average Max	H	98	236	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

Test Freq.	5825 MHz	**Engineer**	GMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	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			

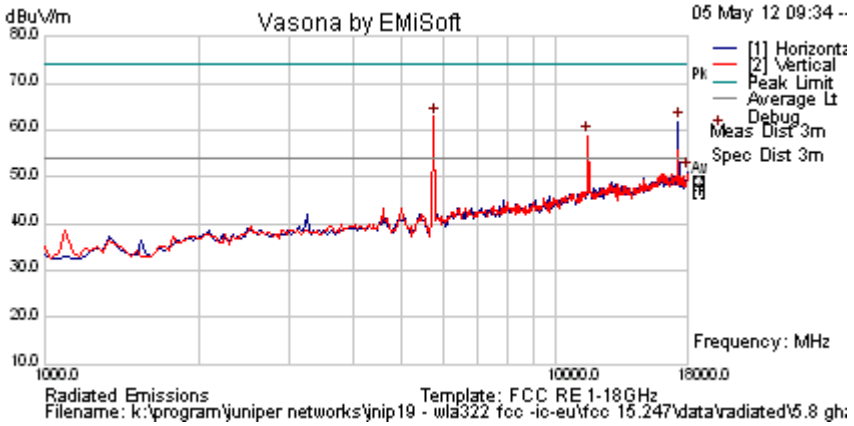


Formally measured emission peaks

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	56.3	8.8	1.0	66.1	Peak [Scan]	H					Pass	NRB
5292.585	60.0	4.6	-9.6	55.0	Peak [Scan]	V					Pass	BE
18000.000	41.5	8.8	0.7	51.0	Peak [Scan]	H	100	0	54	-3.0	Pass	NOISE
11652.185	63.0	6.8	-2.3	67.5	Peak Max	V	98	166	74	-6.5	Pass	RB
11652.185	46.5	6.8	-2.3	51.0	Average Max	V	98	166	54	-3.0	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

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			

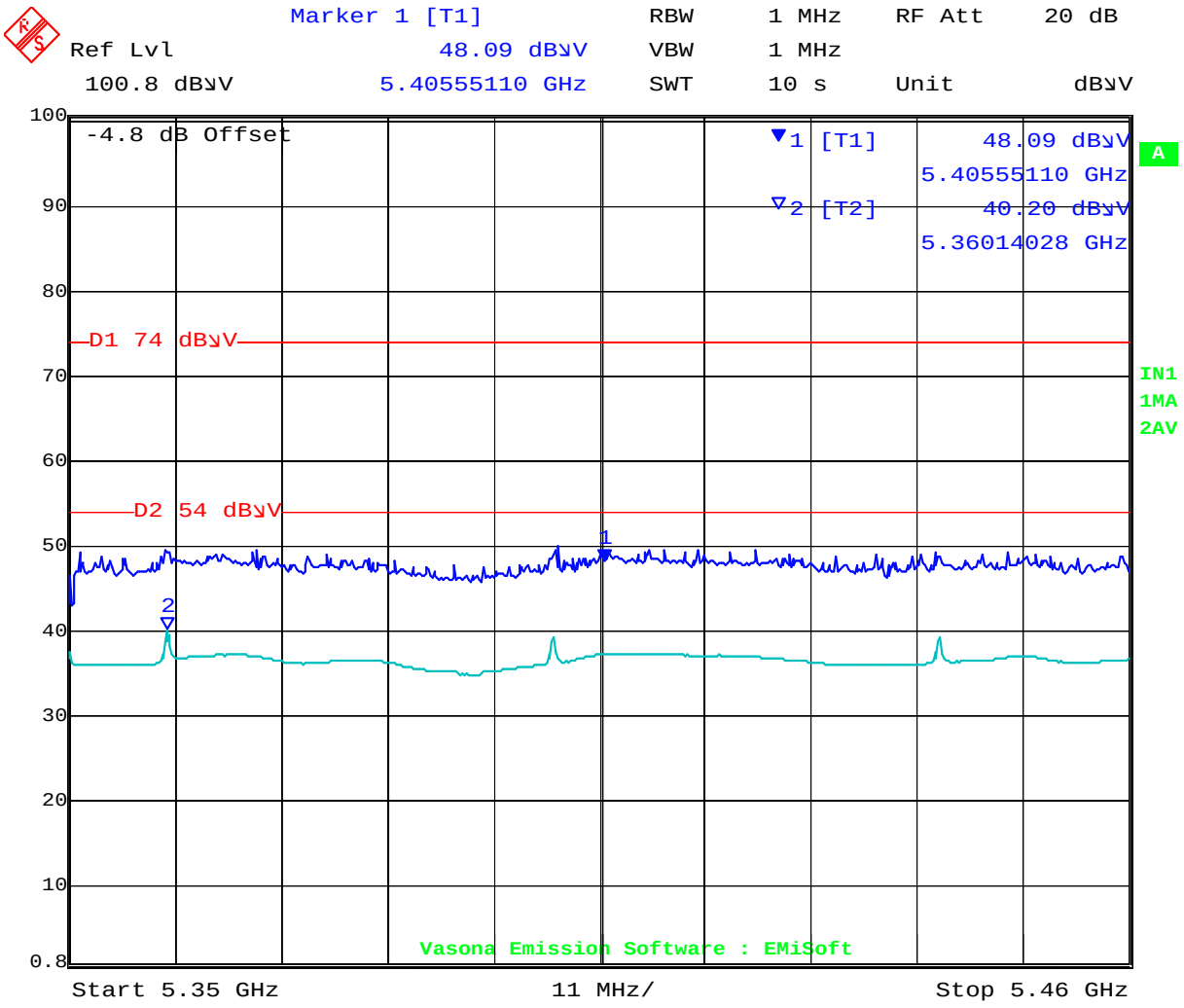


Formally measured emission peaks

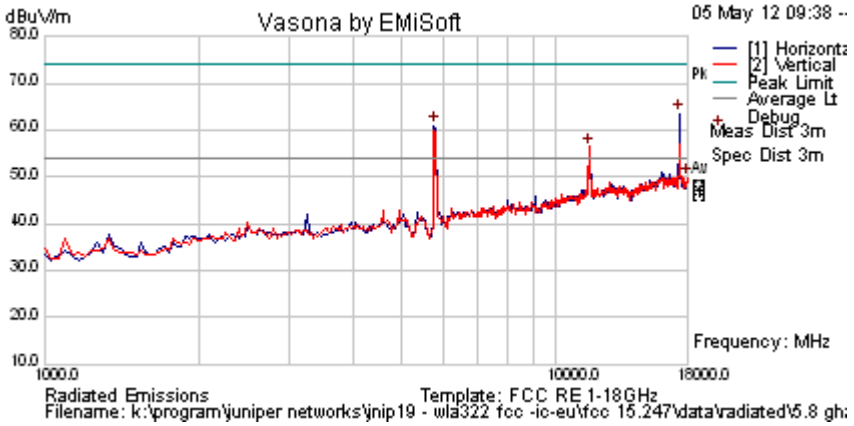
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5769.539	67.5	4.8	-9.5	62.8	Peak [Scan]	V						FUND
17284.569	52.1	8.6	1.1	61.8	Peak [Scan]	H					Pass	NRB
17965.932	41.7	8.8	0.7	51.2	Peak [Scan]	H	100	0	54	-2.8	Pass	NOISE
11650.421	62.6	6.8	-2.3	67.1	Peak Max	H	112	173	74	-6.9	Pass	RB
11650.421	47.1	6.8	-2.3	51.7	Average Max	H	112	173	54	-2.3	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

Band-Edge



Test Freq.	5795 MHz	**Engineer**	GMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	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
17420.842	53.5	8.7	1.3	63.5	Peak [Scan]	H					Pass	NRB
5769.539	65.6	4.8	-9.5	60.9	Peak [Scan]	H						FUND
18000.000	40.6	8.8	0.7	50.1	Peak [Scan]	V	100	0	54	-3.9	Pass	NOISE
11577.154	55.5	6.8	-2.0	60.3	Peak Max	H	98	236	74	-13.7	Pass	RB
11577.154	42.8	6.8	-2.0	47.6	Average Max	H	98	236	54	-6.4	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

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

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.

§15.209 (a) Limit Matrix

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

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

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

5.1.6.2. 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 51.5dBμV; Antenna Factor of 8.5dB; Cable Loss of 1.3dB; Falloff Factor of 0dB, an Amplifier Gain of 26dB and Notch Filter Loss of 1dB. The Field Strength of the measured emission is:

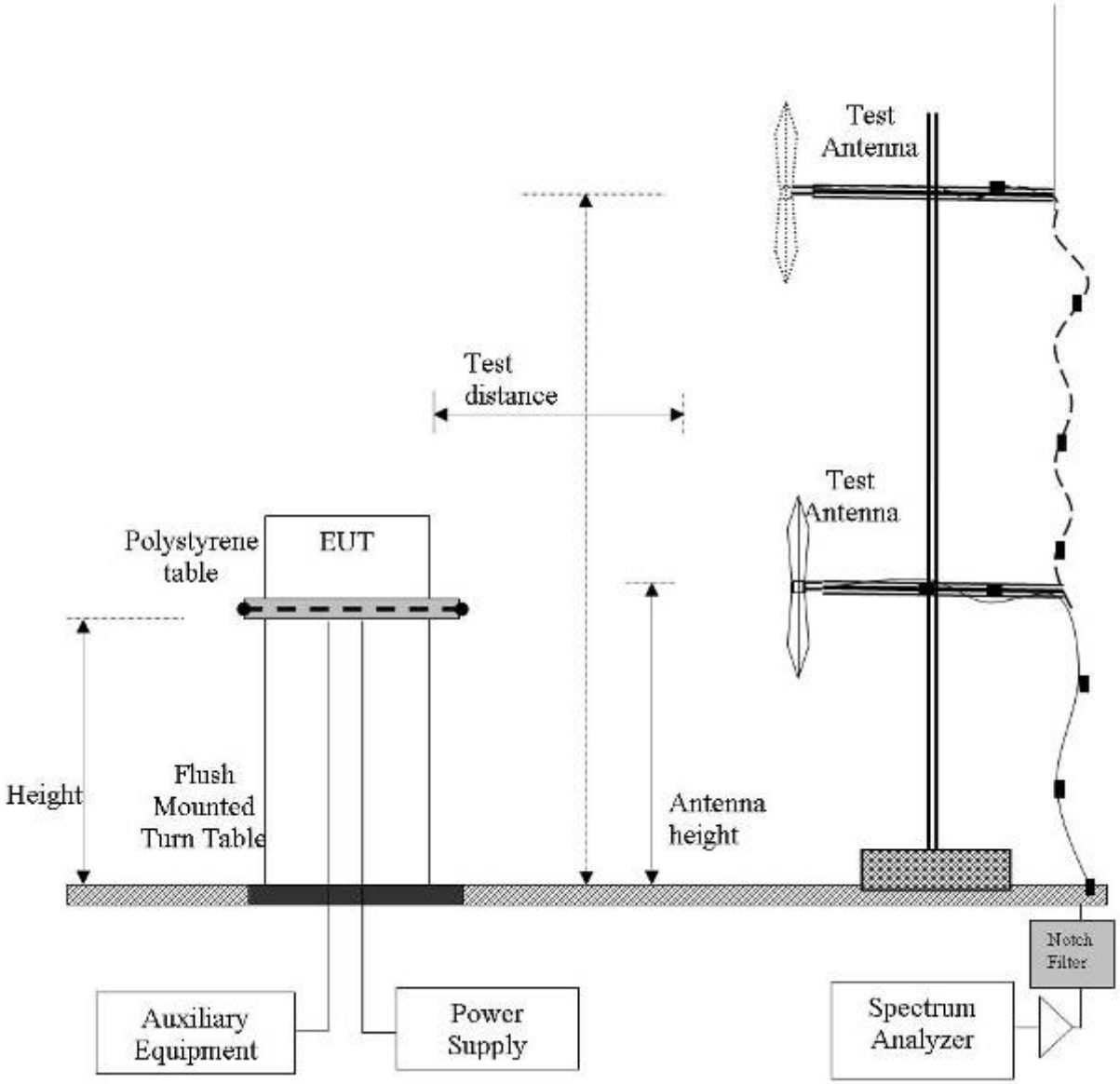
FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3dBμV/m

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

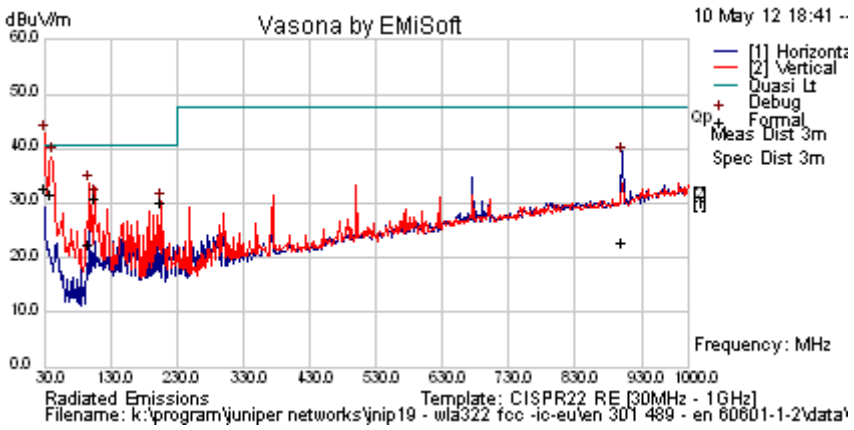
Level (dBμV/m) = 20 * Log (level (μV/m))

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

Radiated Emission Measurement Setup – Below 1 GHz



Test Freq.	N/A	**Engineer**	GMH
Variant	Digital Emissions	**Temp (ºC)**	27.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	30
Power Setting	N/A	**Press. (mBars)**	996
Antenna	Integral antenna 0 dBi average gain		
Test Notes 1	Receiver Operational		
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
106.894	48.8	4.1	-19.4	33.4	Quasi Max	V	102	320	40.5	-7.1	Pass	
30.000	38.9	3.5	-9.7	32.7	Quasi Max	V	101	11	40.5	-7.8	Pass	
39.719	45.2	3.6	-17.3	31.5	Quasi Max	V	111	30	40.5	-9.0	Pass	
204.979	44.2	4.7	-19.6	29.3	Quasi Max	V	216	0	40.5	-11.2	Pass	
97.949	40.2	4.1	-21.9	22.5	Quasi Max	V	122	334	40.5	-18.0	Pass	
900.679	23.7	7.1	-7.8	23.0	Quasi Max	H	291	84	47.5	-24.5	Pass	

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

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

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB

Traceability

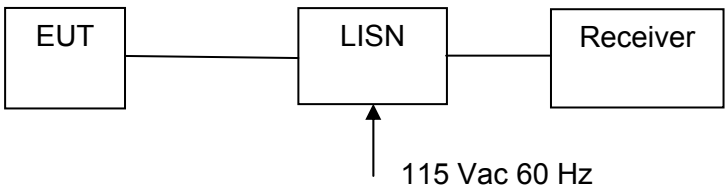
Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

5.1.7. 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 μΩ line impedance stabilization network (LISN), see §15.207 (a) matrix below. Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

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

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

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

* Decreases with the logarithm of the frequency

Laboratory Measurement Uncertainty for Conducted Emissions

Measurement uncertainty	±2.64 dB

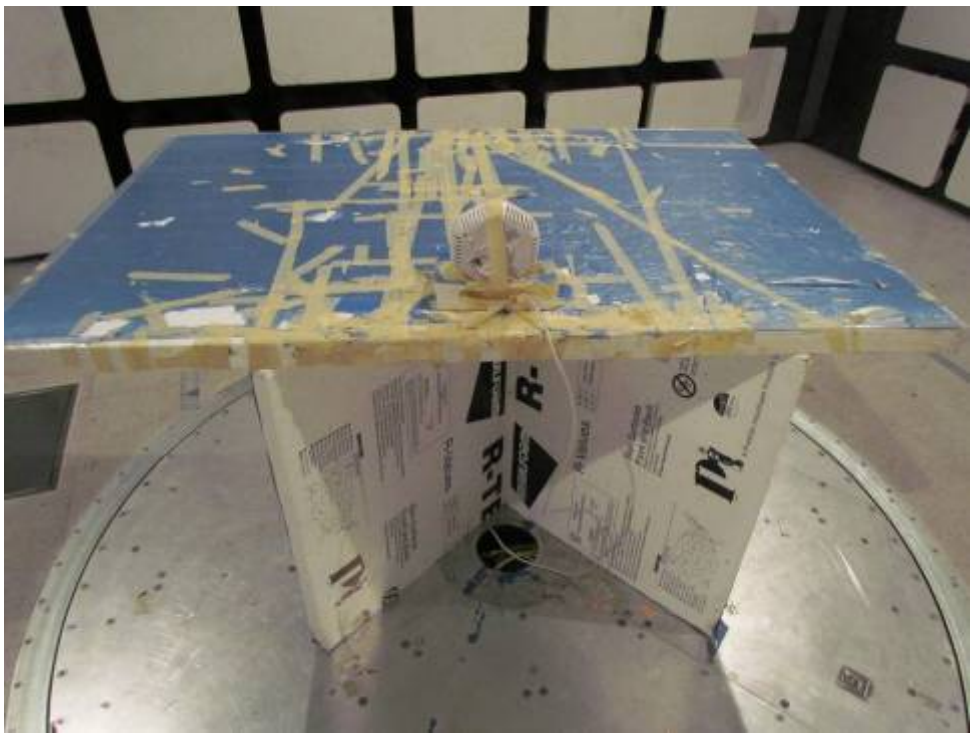
Traceability

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

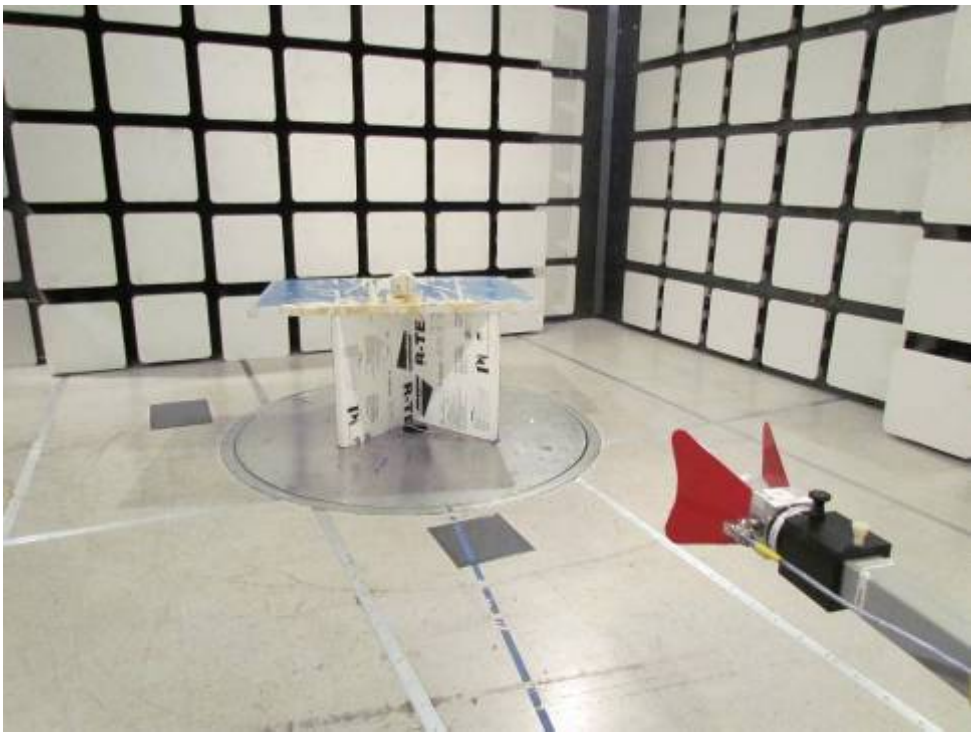
6. PHOTOGRAPHS

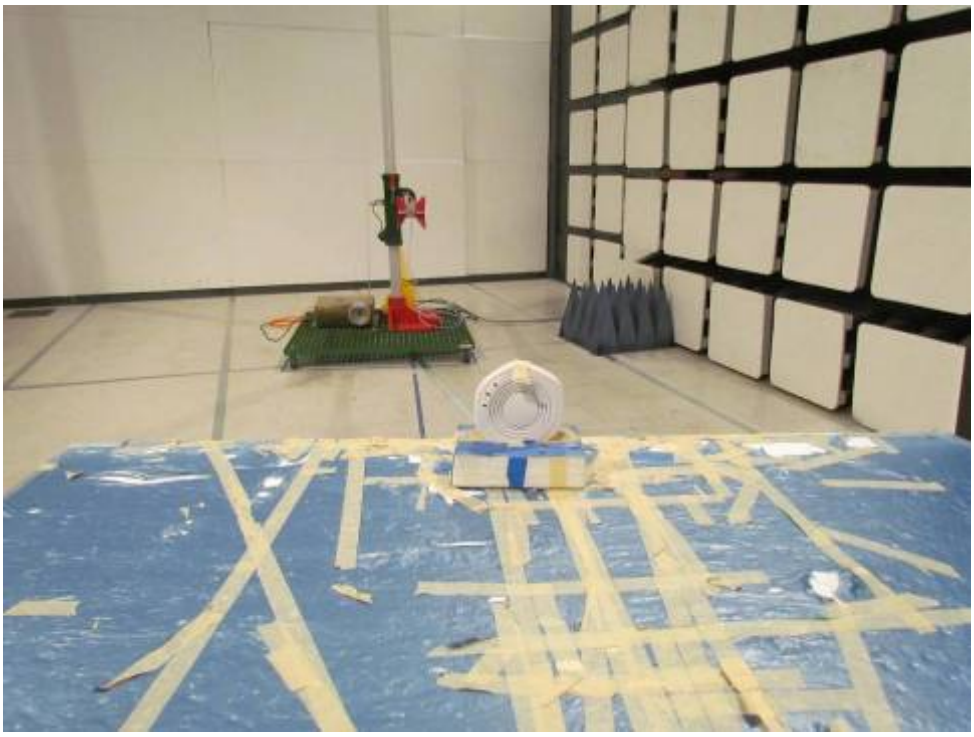
6.1. Conducted Test Setup

6.2. Radiated Test Setup < 1 GHz



6.3. Radiated Test Setup > 1 GHz





7. TEST EQUIPMENT DETAILS

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

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