Test of Wavion WBSn-2400 Wireless LAN Access Point

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

Test Report Serial No.: WAVI11-U1 Rev A

TEST REPORT

FROM

Test of Wavion WBSn-2400 Wireless LAN Access Point

to

To FCC 47 CFR Part 15.247 & IC RSS-210

Test Report Serial No.: WAVI11-U1 Rev A

This report supersedes: NONE

Applicant: Wavion Ltd
15 Hamada Street
Yoqneam Illit
Israel 20692

Product Function: Wireless LAN Access Point

Copy No: pdf Issue Date: 19th April 2012

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
440 Boulder Court, Suite 200
Pleasanton, CA 94566 USA
Phone: +1 (925) 462-0304
Fax: +1 (925) 462-0306
www.micomlabs.com

ACCREDITED
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	19th April 2012	Initial Release

1. TEST RESULT CERTIFICATE

Manufacturer :	Wavion Ltd 15 Hamada Street Yoqneam Illit Israel 20692	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT:	802.11b/g/n Wireless LAN Access Point	Telephone:	+1 925 462 0304
Model:	WBSn-2400	Fax:	+1 925 462 0306
S/N's:	1153R00131581, 1153R00131583		
Test Date(s):	2nd to 5th April 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.	DA 00-705	2000	FCC DA 00-705 "Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems" released March 30, 2000
v.	RSS-GEN	2010	Radio Standards Specification-Gen, Issue 3, General Requirements and Information for the Certification of Radiocommunication Equipment
vi.	FCC 47 CFR Part 15, Subpart B	2010	47 CFR Part 15, SubPart B; Unintentional Radiators
vii.	ICES-003	2004	Spectrum Management and Telecommunications Policy Interference-Causing Equipment Standard Digital Apparatus; Issue 4
viii.	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
ix.	CISPR 22/ EN 55022	2008 2006+A1:2007	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
x.	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
xi.	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
xii.	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
xiii.	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

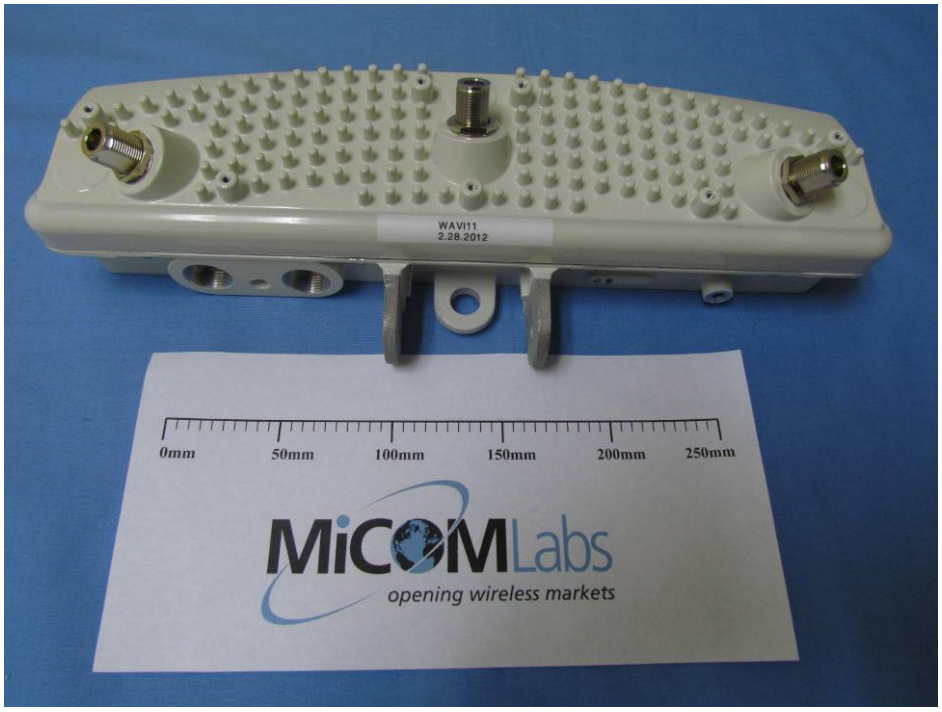
3.1. Technical Details

Details	Description
Purpose:	Test of the Wavion WBSn-2400 Wireless LAN Access Point to FCC Part 15.247 and Industry Canada RSS-210 regulations.
Applicant:	Wavion Ltd 15 Hamada Street Yoqneam Illit, Israel 20692
Manufacturer:	As applicant.
Laboratory performing the tests:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	WAVI11-U1 Rev A
Date EUT received:	5th March 2012
Standard(s) applied:	FCC 47 CFR Part 15.247 & IC RSS-210
Dates of test (from - to):	2nd to 5th April 2012
No of Units Tested:	2
Type of Equipment:	802.11b/g/n Wireless Access Point, 3x3 Spatial Multiplexing MIMO configuration
Manufacturers Trade Name:	Wireless Access Point
Model(s):	WBSn-2400
Location for use:	Indoor/Outdoor
Declared Frequency Range(s):	2400 - 2483.5 MHz
Software Release	NART
Type of Modulation:	Per 802.11 –CCK, BPSK, QPSK, DSSS, OFDM
Declared Nominal Average Output Power:	2.4 GHz 802.11b: +28 dBm 802.11g:. +28 dBm 802.11 n HT-20: +28 dBm 802.11 n HT-40: +28 dBm
EUT Modes of Operation:	Legacy 802.11b/g, 802.11n HT-20, HT-40
Transmit/Receive Operation:	Time Division Duplex
Rated Input Voltage and Current:	POE 55 Vdc
Operating Temperature Range:	Client Declared range -40° to +55ºC
ITU Emission Designator:	2400 – 2483.5 MHz 802.11b 14M0G1D 2400 – 2483.5 MHz 802.11g 17M7D1D 2400 – 2483.5 MHz 802.11n – HT-20 18M3D1D 2400 – 2483.5 MHz 802.11n – HT-40 40M4D1D
Frequency Stability:	±20 ppm max
Equipment Dimensions:	OMNI: 38cm x 14cm x 9.5cm (Excluding Antenna's) Sector: 38cm x 14cm x 39.5cm
Weight:	OMNI: 1.4 kg Sector: 2.4 kg
Primary function of equipment:	Outdoor WiFi.

3.2. Scope of Test Program

The scope of the test program was to test the Wavion WBSn-2400 Wireless LAN Access Point 3x3 Spatial Multiplexing MIMO configurations in the frequency range 2400 - 2483.5 MHz for compliance against FCC 47 CFR Part 15.247 and Industry Canada RSS-210 specifications.

Wavion Ltd
WBSn-2400 O (OMNI) 802.11 b/g/n Wireless Access Point



Wavion Ltd
WBSn-2400 S (Sector) 802.11 b/g/n Wireless Access Point

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

Type (EUT/ Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	802.11b/g/n Wireless Access Point	Wavion	WBSn-2400	1153R00131565
EUT	802.11b/g/n Wireless Access Point	Wavion	WBSn-2400	1206R00144608
Support	POE	PhiHong	POE61U-560DG	--
Support	Laptop PC	IBM	Thinkpad	None

3.4. Antenna Details

Antenna Type:	Manufacturer	Model No.	Type	Gain (dBi)	Frequency Range (MHz)
External	MTI Wireless Edge Ltd	MT-952021	Omni	7.4	2400 – 2483.5
Integral	Self	None	Sector	12.0	2400 – 2483.5

3.5. Cabling and I/O Ports

Number and type of I/O ports

1. 1 x 10/100/1000 Ethernet, includes POE (+55 Vdc)
2. USB (local maintenance terminal)

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) (802.11 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

Legacy – data rates for 802.11b/g 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

KEY;-

SE – Spurious Emission
BE – Band-Edge

3.7. Equipment Modifications

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

NONE

3.8. Deviations from the Test Standard

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

1. NONE

3.9. Subcontracted Testing or Third Party Data

1. NONE

4. TEST SUMMARY

List of Measurements

The following table represents the list of measurements required under the **FCC CFR47 Part 15.247** 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	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	*5.1.6.1/2*
15.205 / **15.209** **2.2**	Radiated Spurious Emissions	Emissions <1 GHz (30M-1 GHz)	Radiated	Complies	*5.1.6.3*
Industry Canada only **RSS-Gen §4.10, §6**	Receiver Radiated Spurious Emissions	Emissions above 1 GHz		Complies	*5.1.6.4*
15.207 **7.2.2**	AC Wireline Conducted Emissions 150 kHz–30 MHz	Conducted Emissions	Conducted	Complies	*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

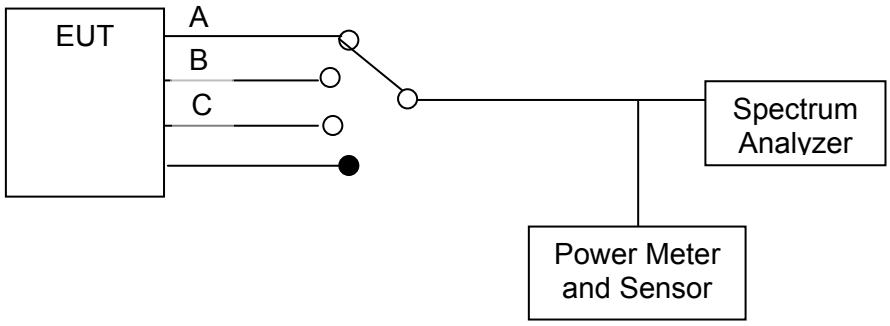
5.1. Device Characteristics

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: ART

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:**	7.4 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

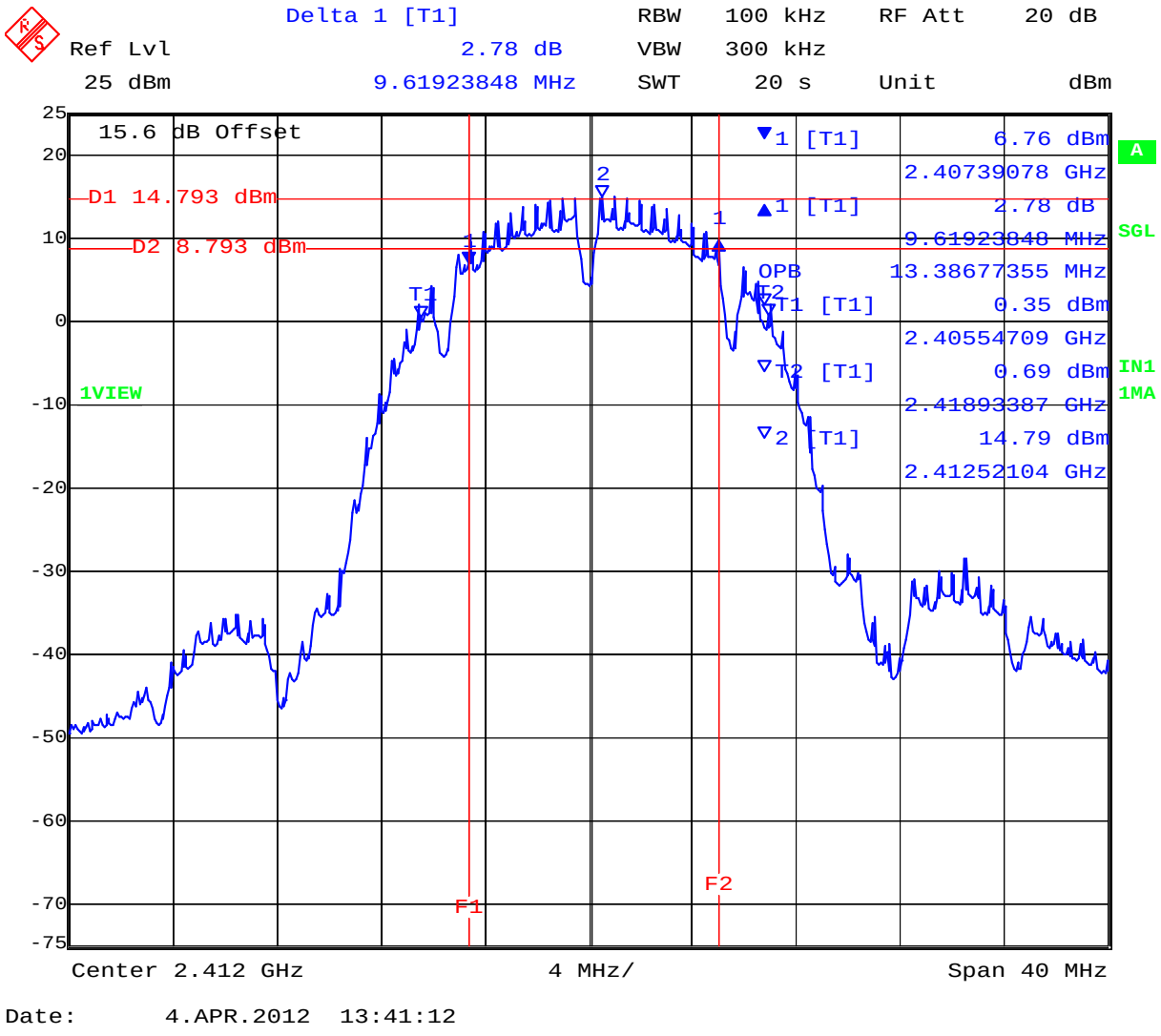
Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
2412.000	9.619	10.100	10.100	--	500	0.5	-9.119000
2437.000	10.180	10.180	10.180	--			-9.680000
2462.000	10.180	10.180	10.180	--			-9.680000

99% Bandwidth

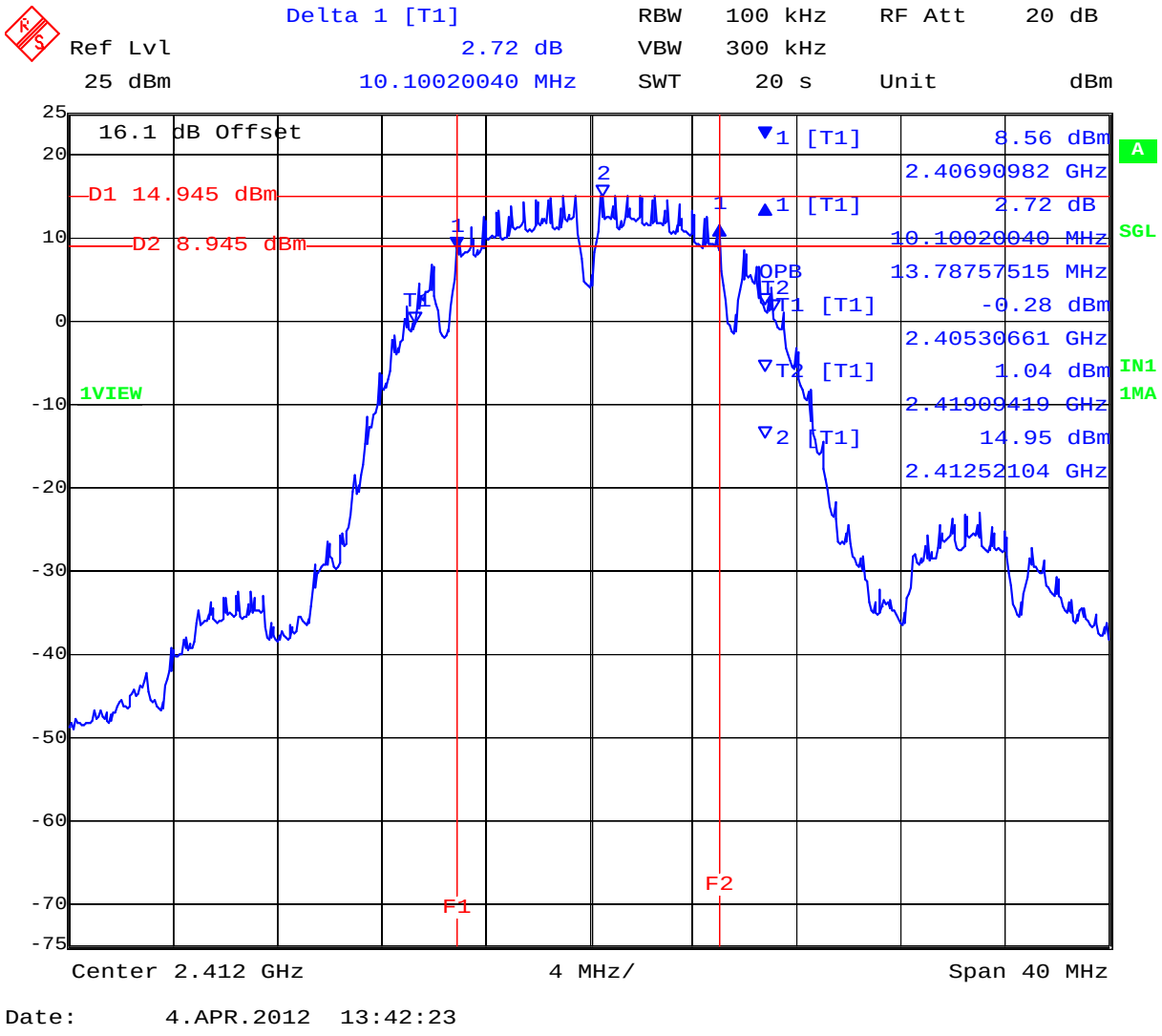
Test Frequency	99 % Bandwidth						
	MHz						
MHz	**a**	**b**	**c**	**d**			
2412.000	13.387	13.788	13.788	--			
2437.000	14.028	13.948	14.028	--			
2462.000	13.627	13.868	13.707	--			

Measurement uncertainty:	±2.81 dB

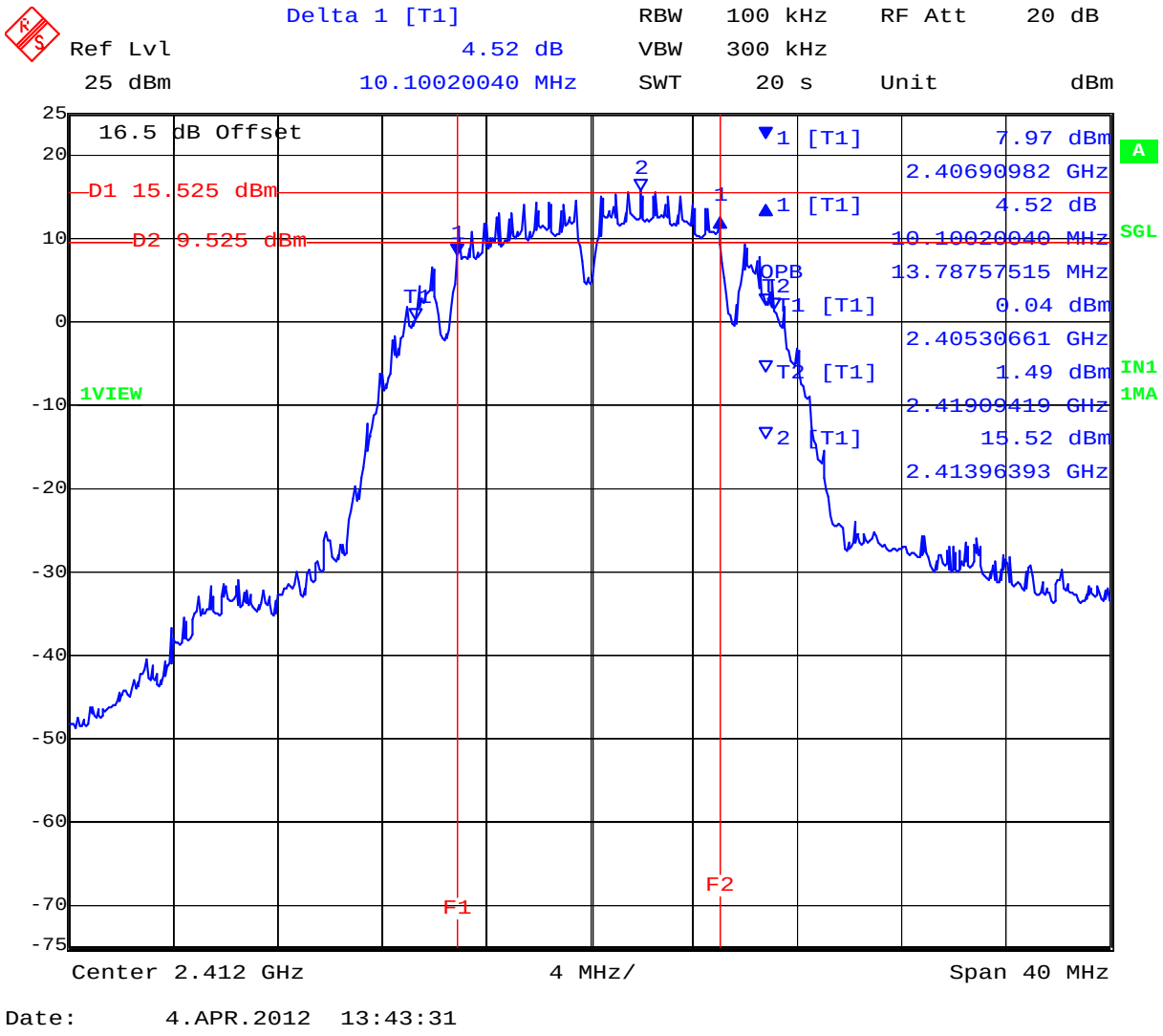
PORT A 2,412 MHz 802.11b Legacy 6 dB and 99% Bandwidth



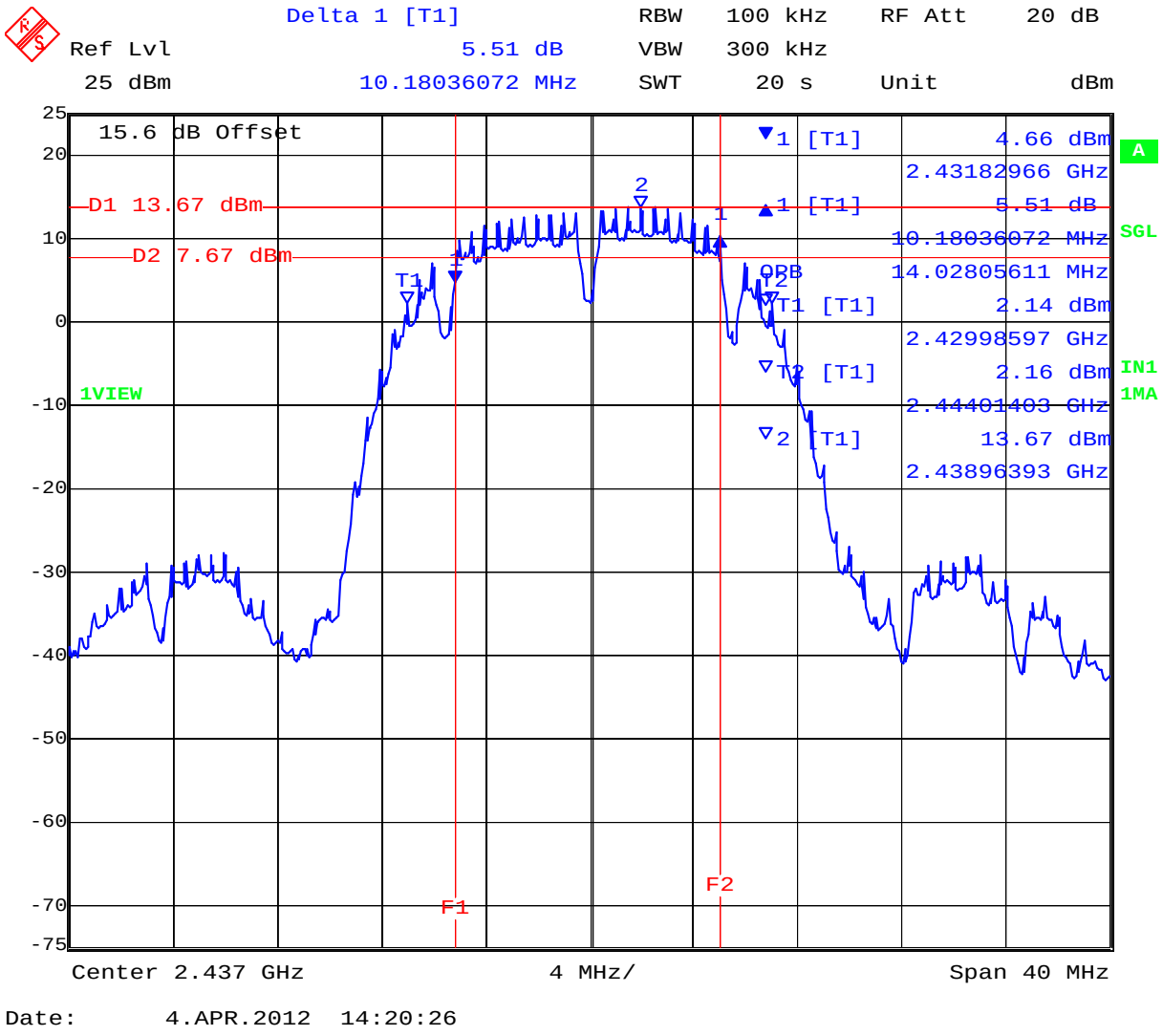
PORT B 2,412 MHz 802.11b Legacy 6 dB and 99% Bandwidth



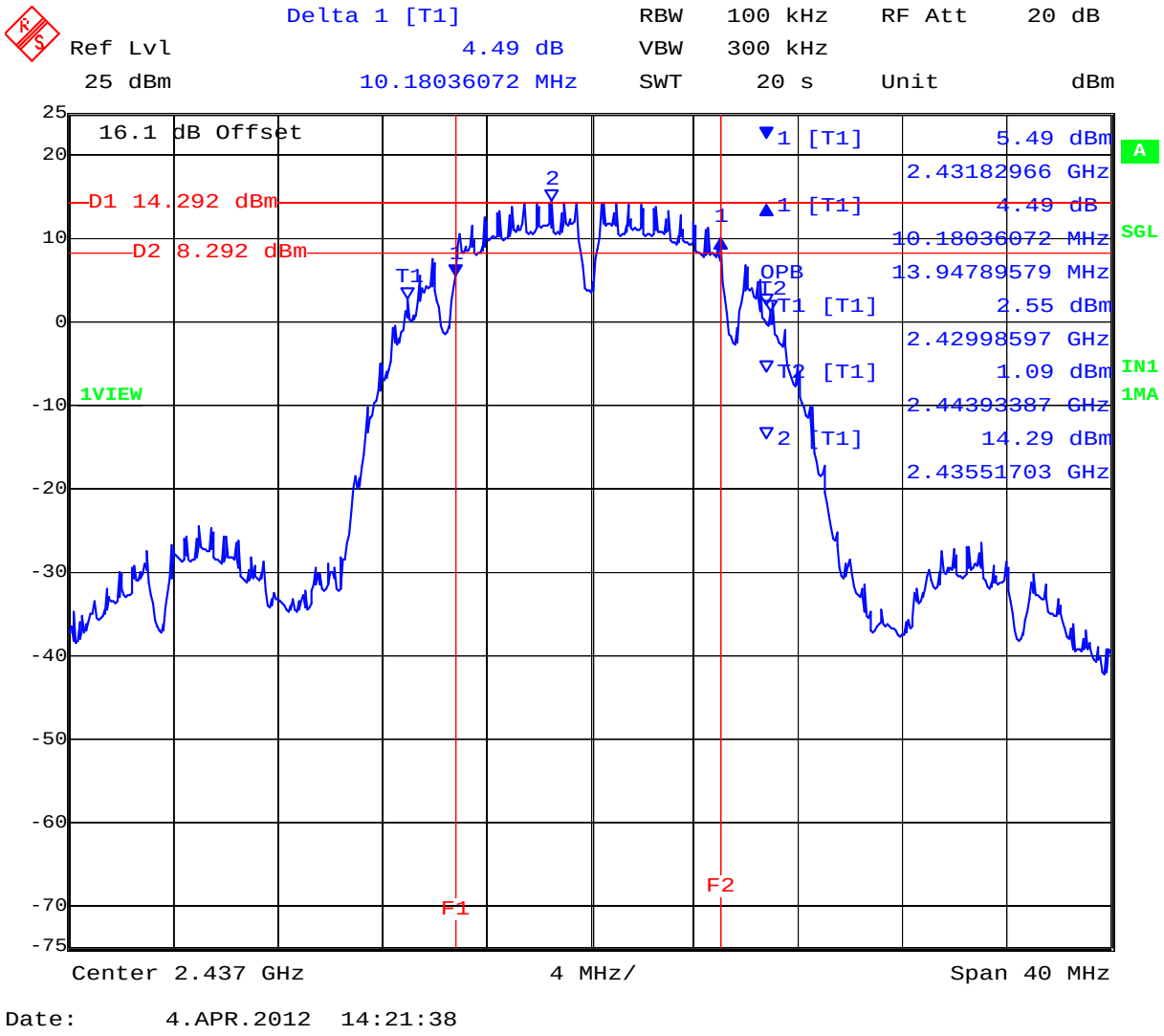
PORT C 2,412 MHz 802.11b Legacy 6 dB and 99% Bandwidth



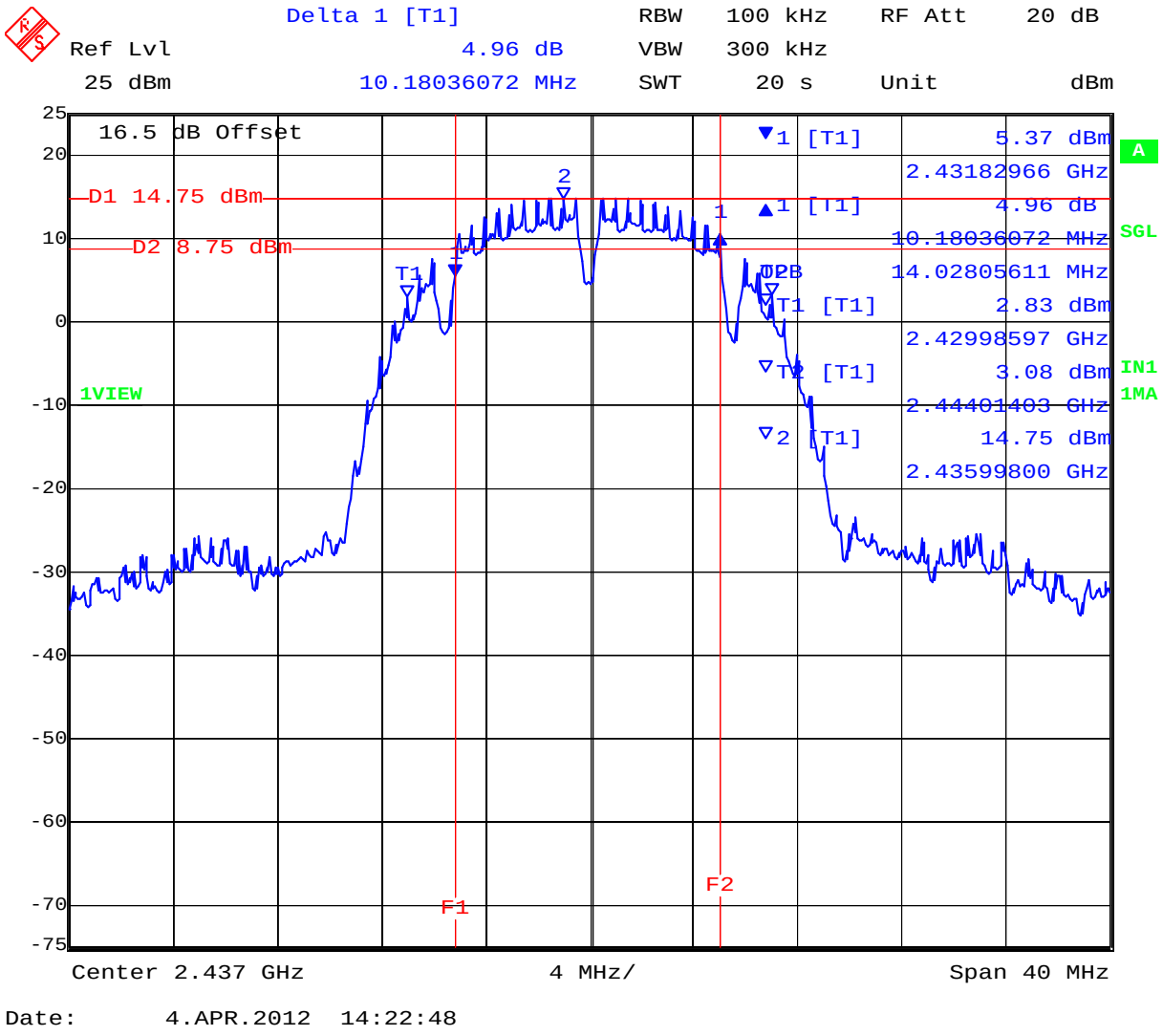
PORT A 2,437 MHz 802.11b Legacy 6 dB and 99% Bandwidth



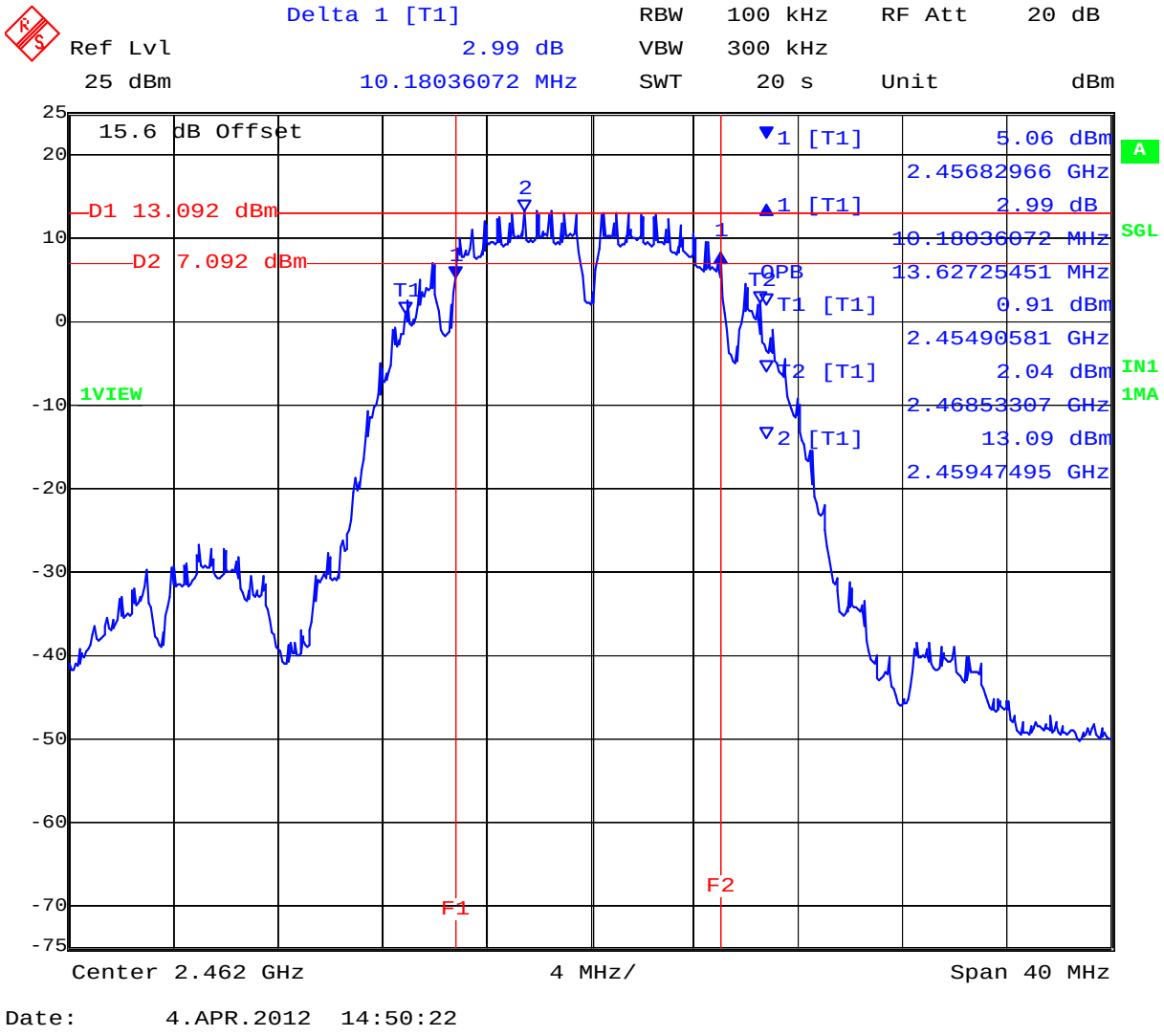
PORT B 2,437 MHz 802.11b Legacy 6 dB and 99% Bandwidth



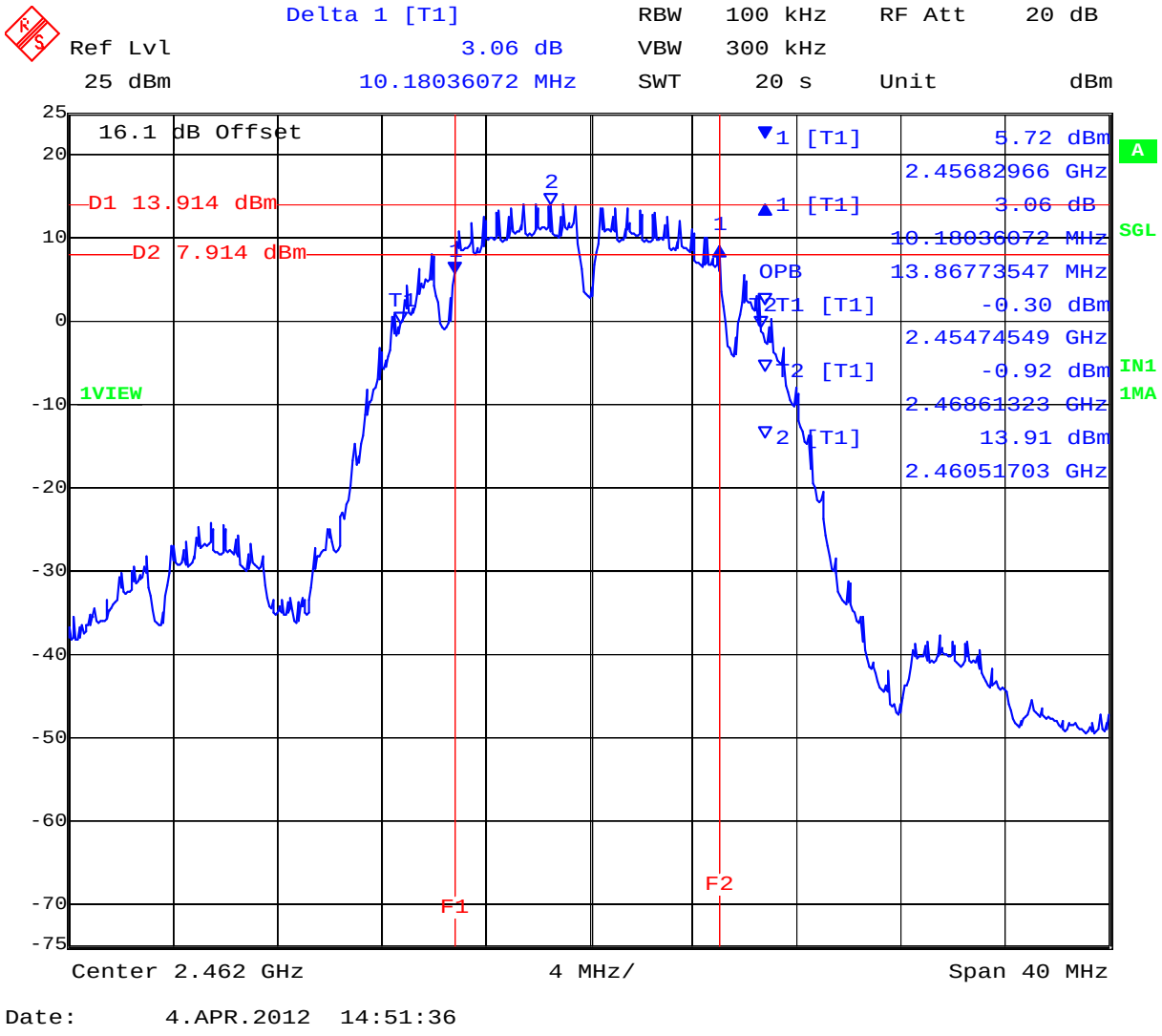
PORT C 2,437 MHz 802.11b Legacy 6 dB and 99% Bandwidth



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



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

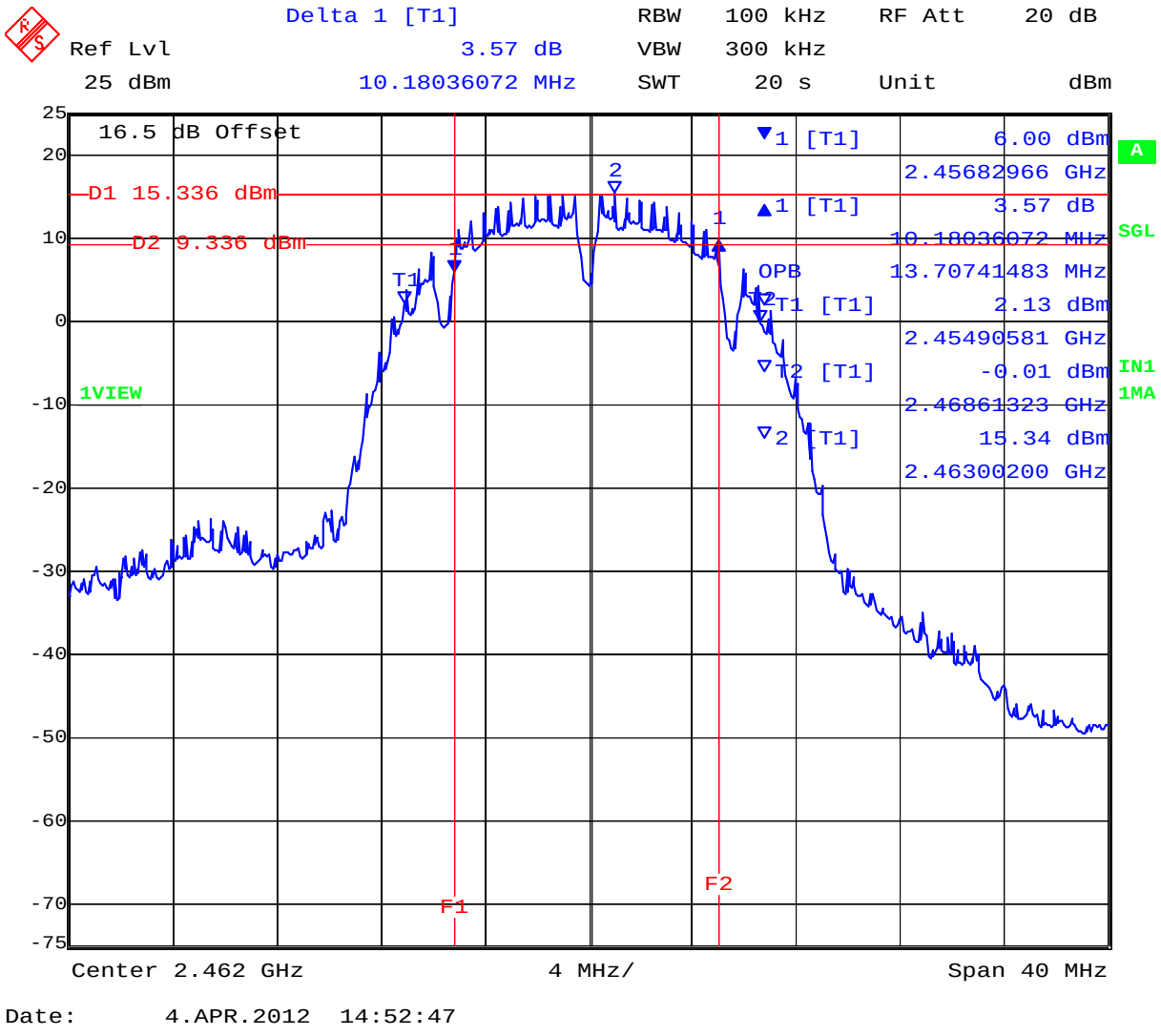


TABLE OF RESULTS – **802.11g Legacy**

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:**	7.4 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

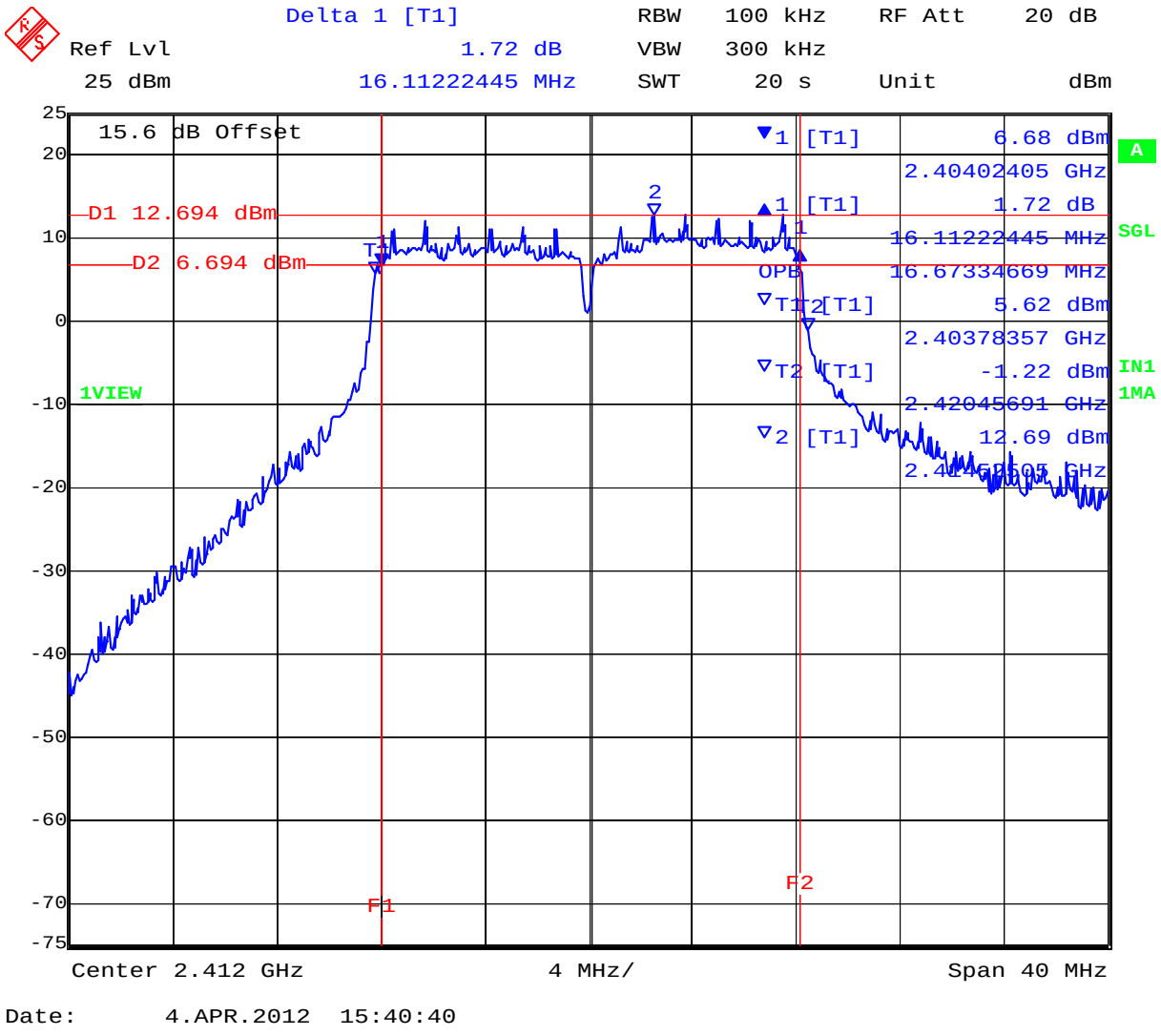
Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
2412.000	16.112000	15.792000	15.792000	--	500	0.5	-15.292000
2437.000	16.433000	16.433000	16.353000	--			-15.853000
2462.000	15.792000	15.792000	15.872000	--			-15.292000

99% Bandwidth

Test Frequency	99 % Bandwidth						
	MHz						
MHz	**a**	**b**	**c**	**d**			
2412.000	16.673000	17.555000	17.475000	--			
2437.000	16.754000	16.754000	17.555000	--			
2462.000	16.673000	17.395000	17.635000	--			

Measurement uncertainty:	±2.81 dB

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



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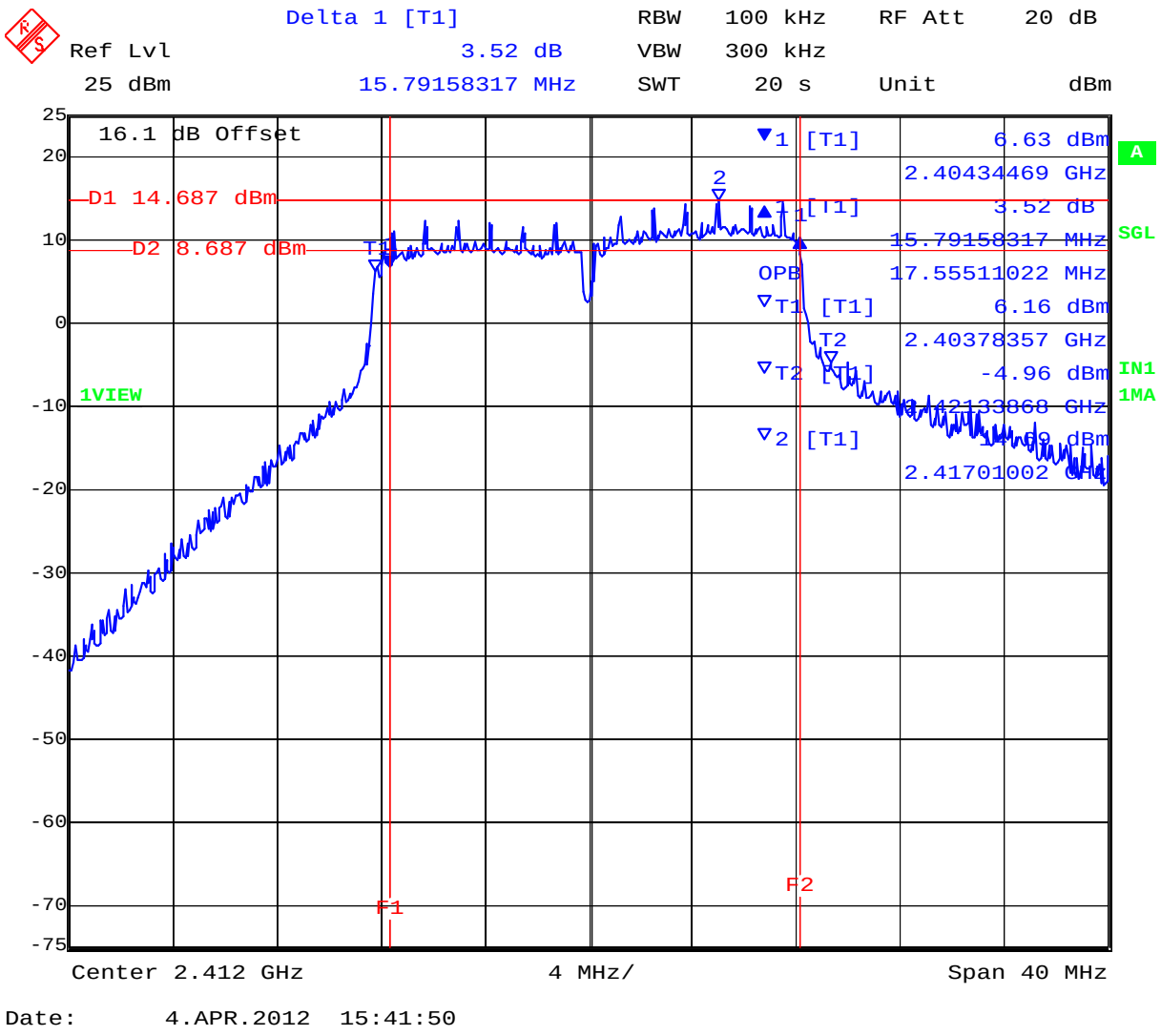
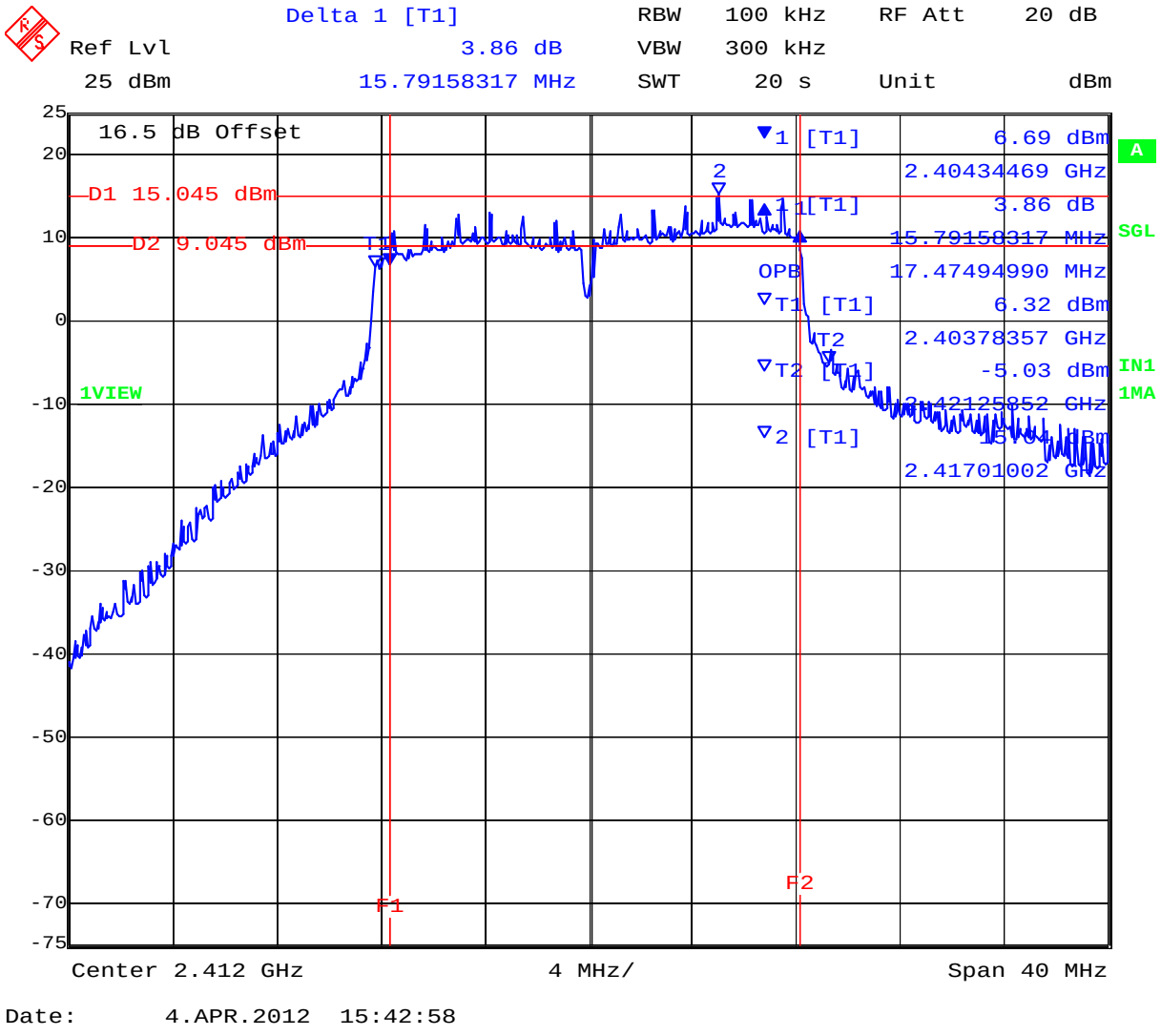
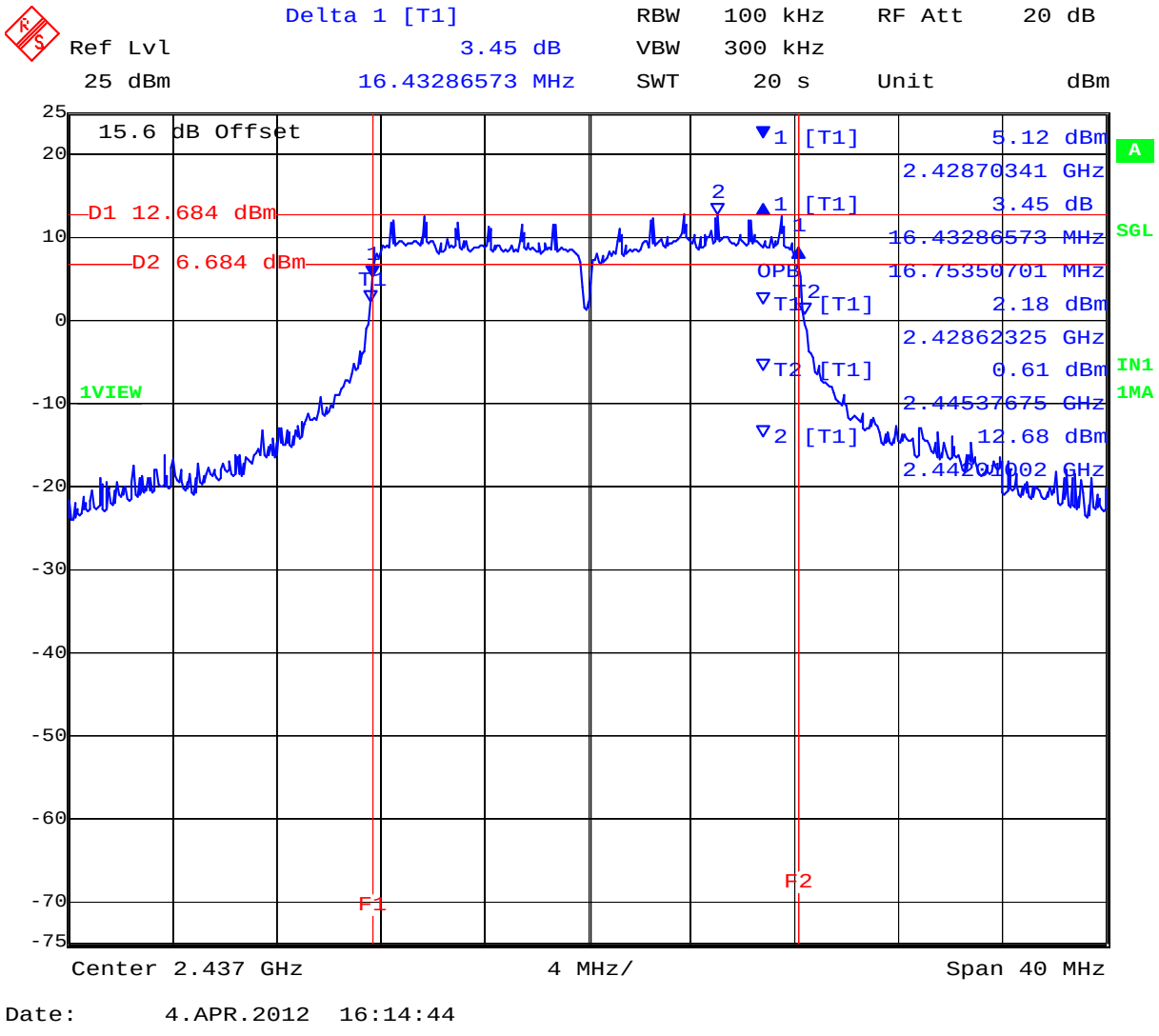
PORT B 2,412 MHz 802.11g Legacy 6 dB and 99% Bandwidth



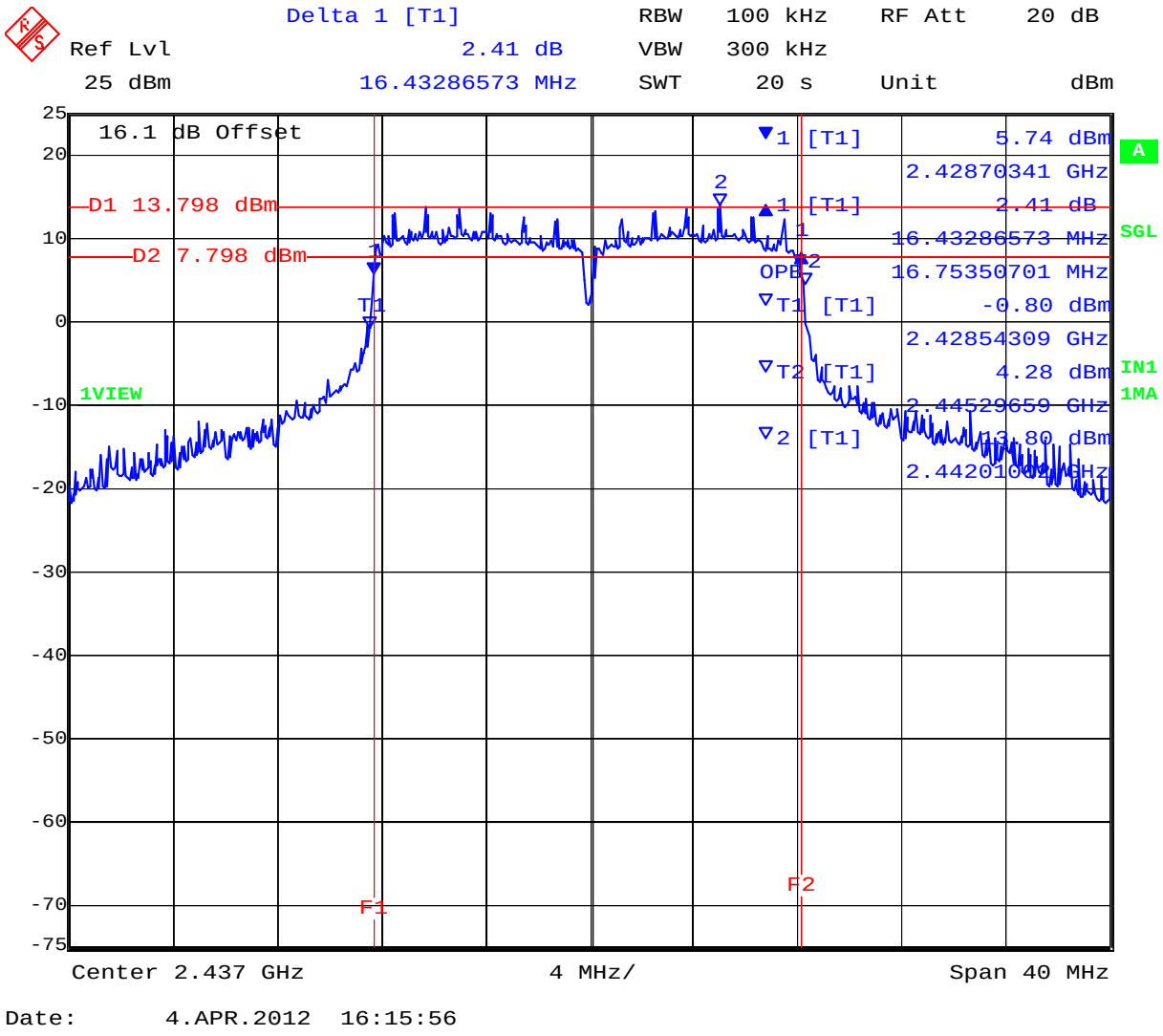
PORT C 2,412 MHz 802.11g Legacy 6 dB and 99% Bandwidth



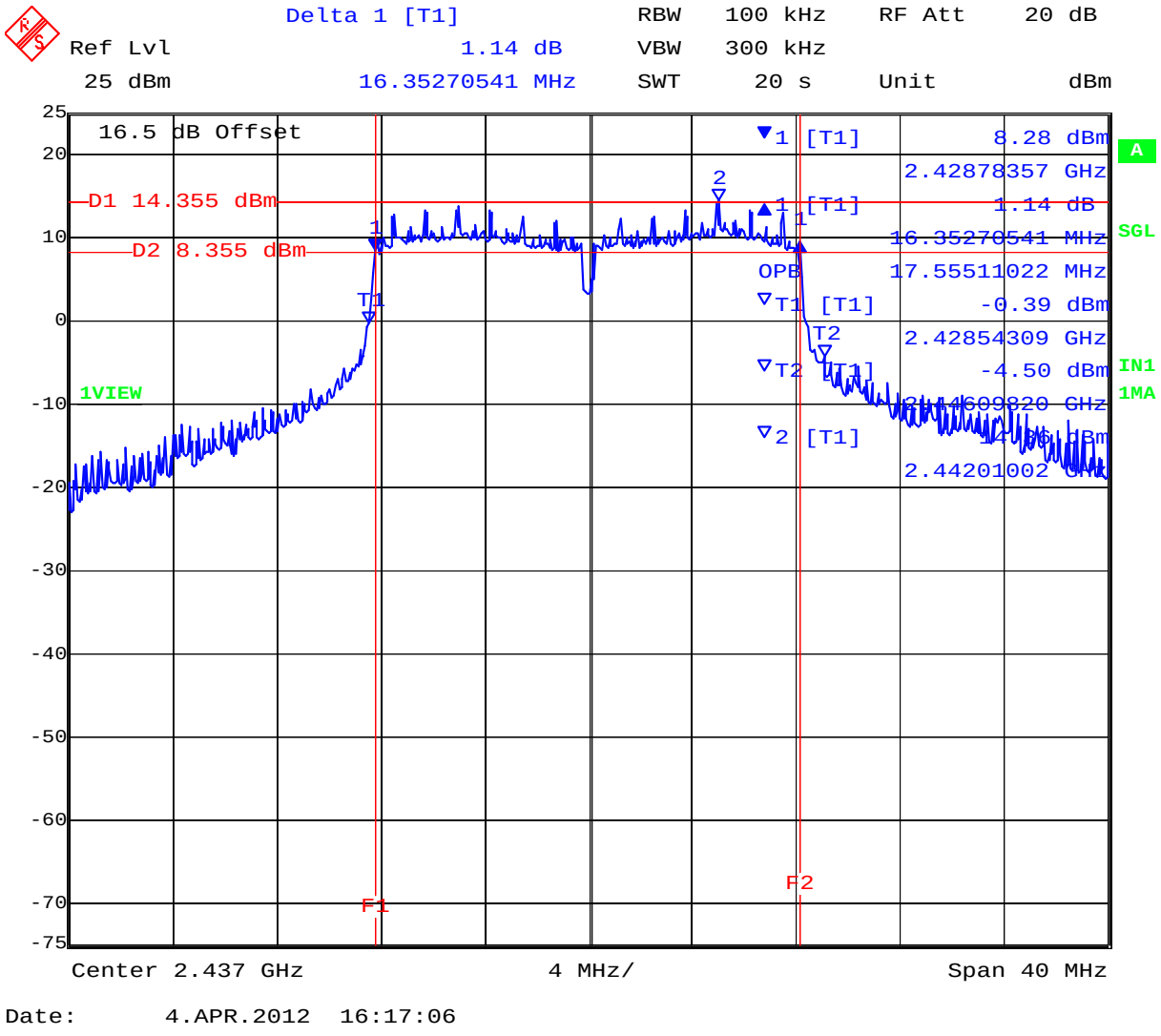
PORT A 2,437 MHz 802.11g Legacy 6 dB and 99% Bandwidth



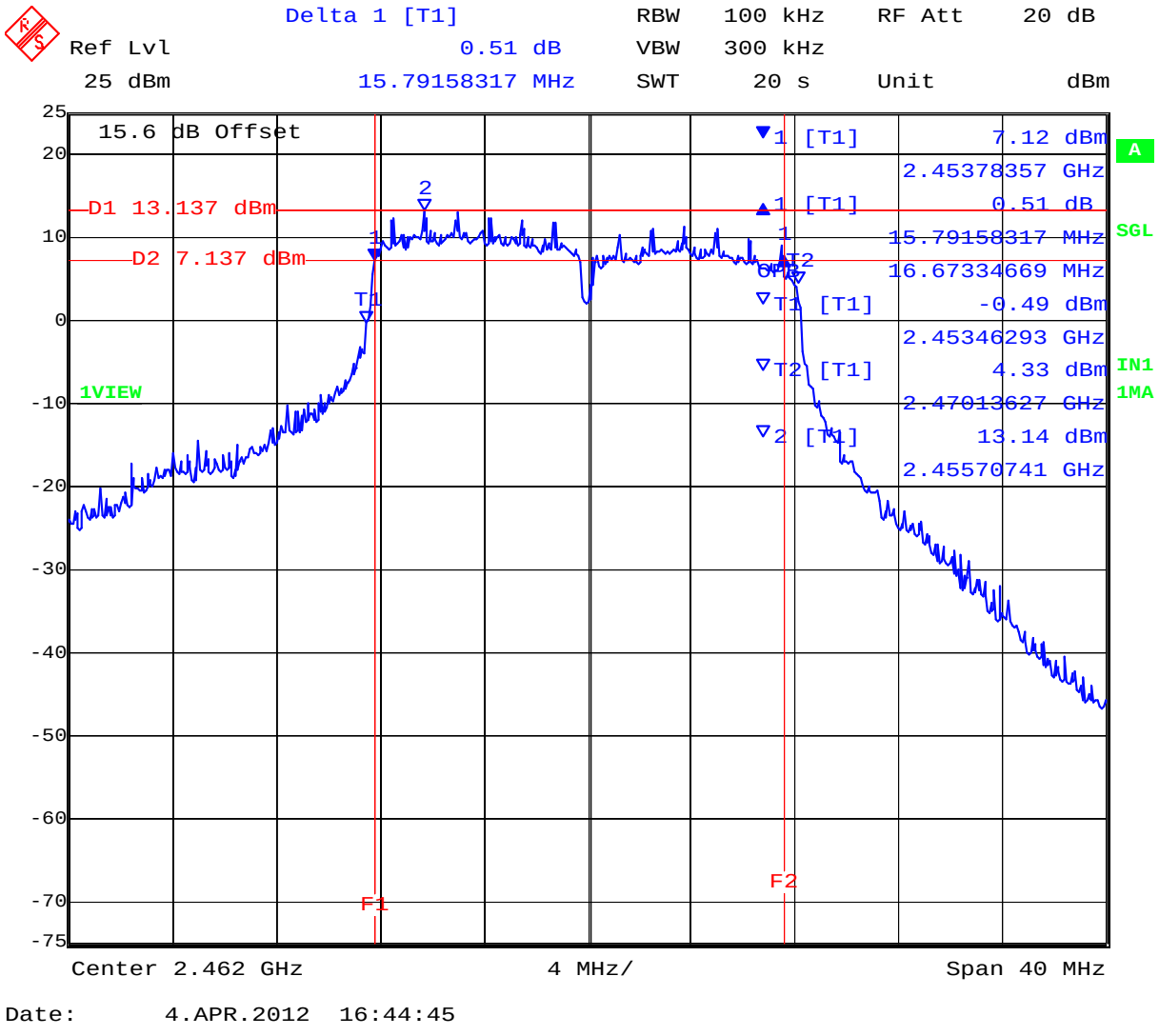
PORT B 2,437 MHz 802.11g Legacy 6 dB and 99% Bandwidth



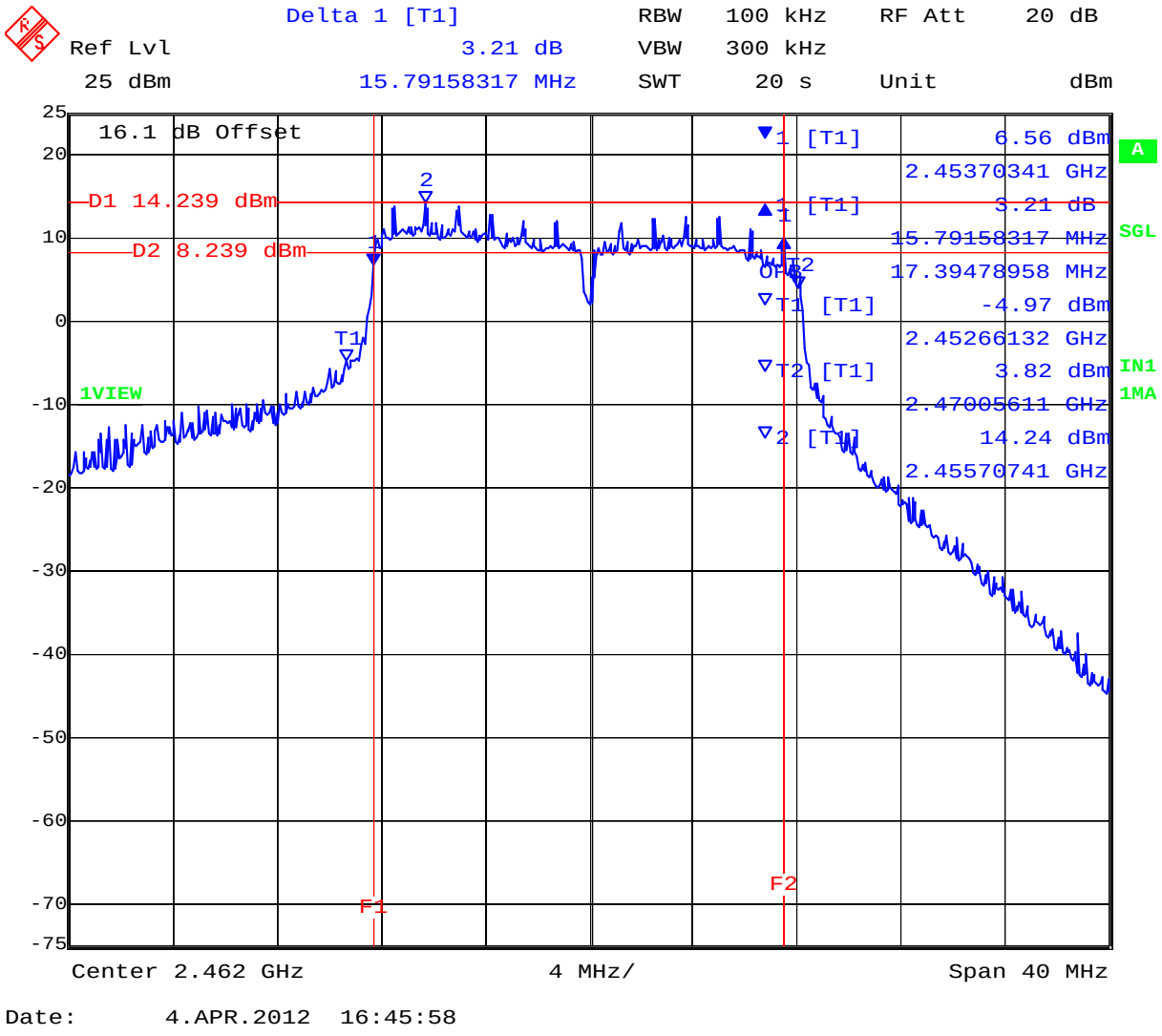
PORT C 2,437 MHz 802.11g Legacy 6 dB and 99% Bandwidth



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



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

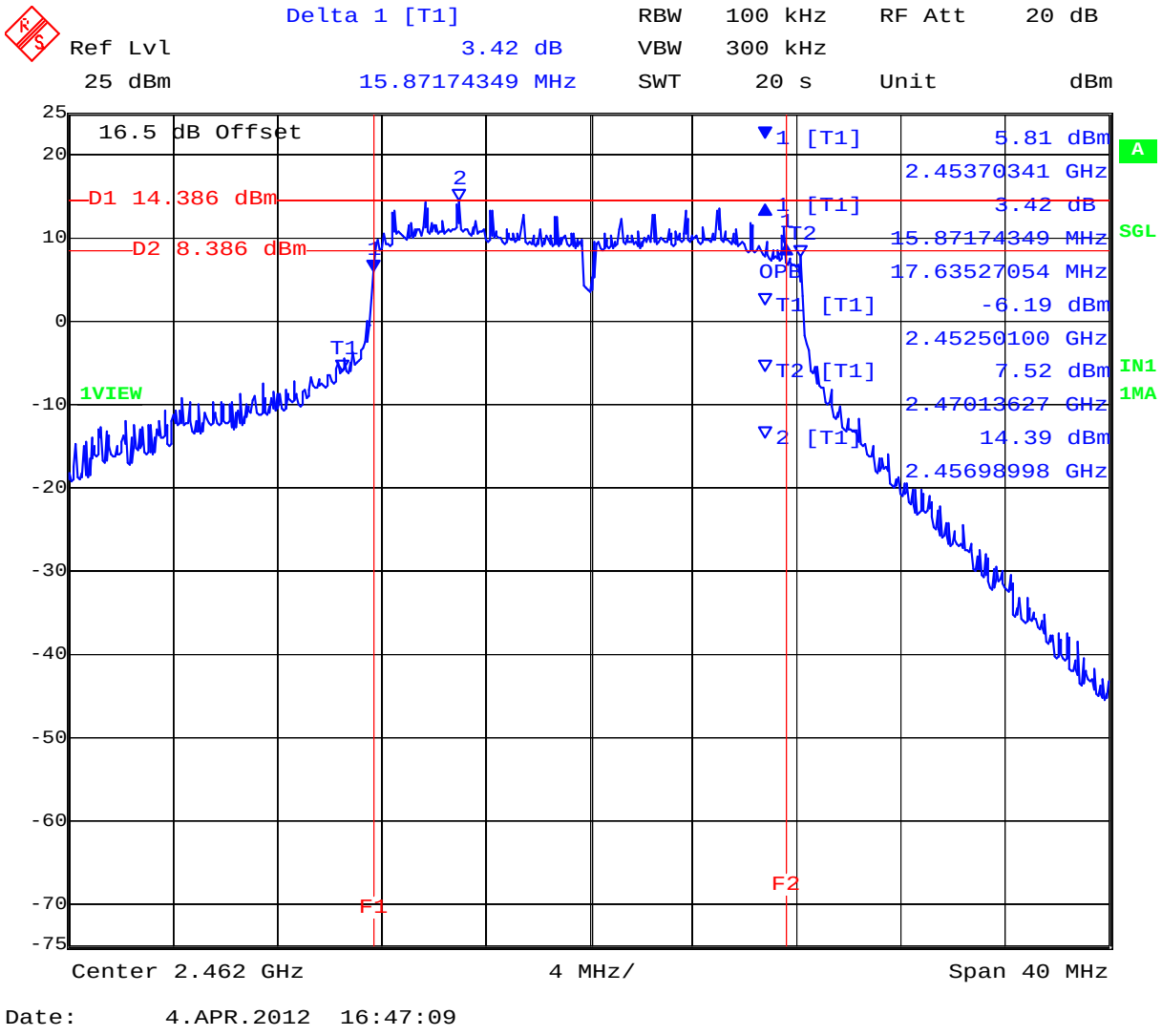


TABLE OF RESULTS – **802.11n HT-20**

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:**	7.4 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

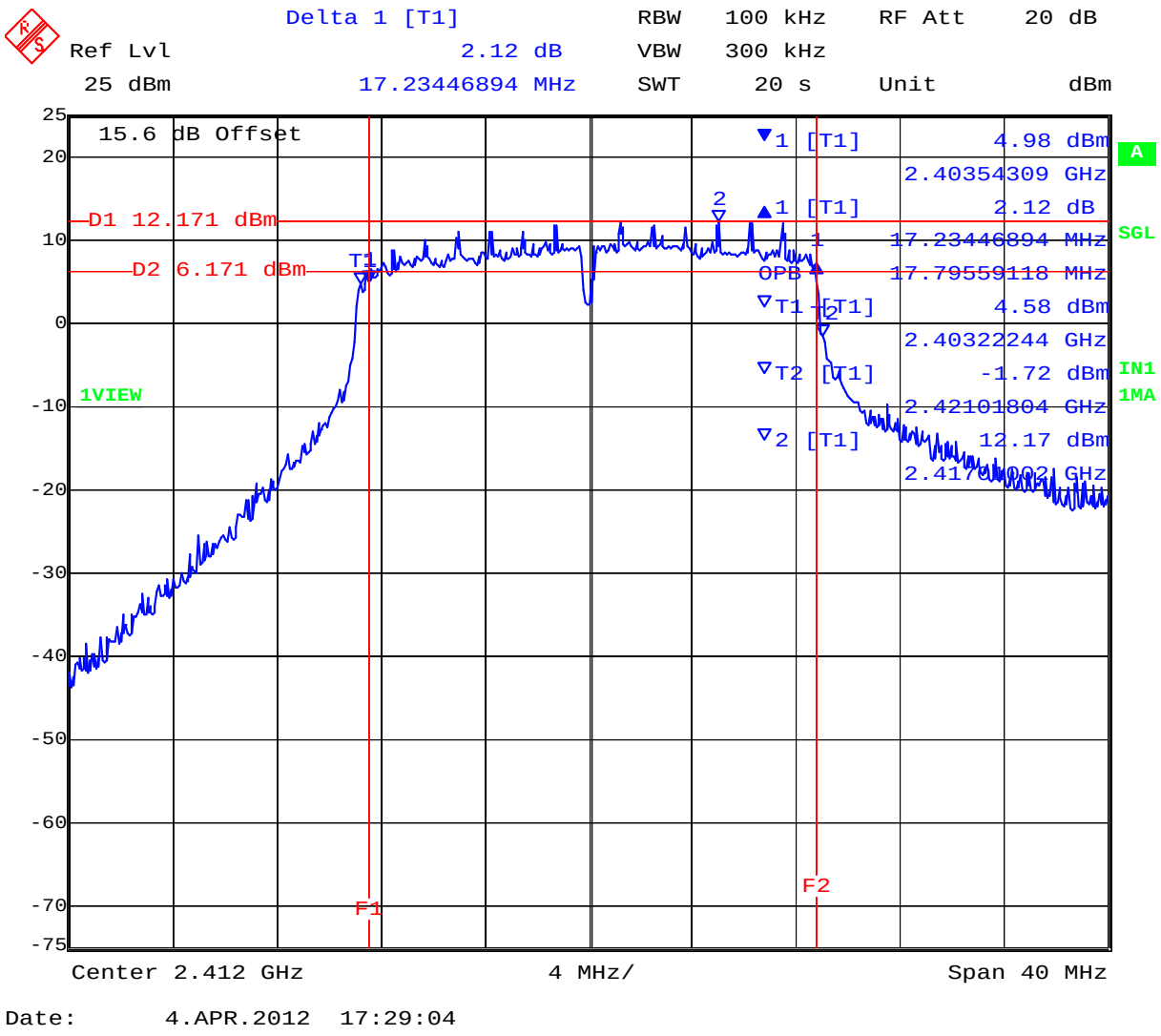
Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
2412.000	17.234000	16.433000	16.433000	--	500	0.5	-15.933000
2437.000	17.635000	17.635000	17.635000	--			-17.135000
2462.000	16.433000	16.433000	16.754000	--			-15.933000

99% Bandwidth

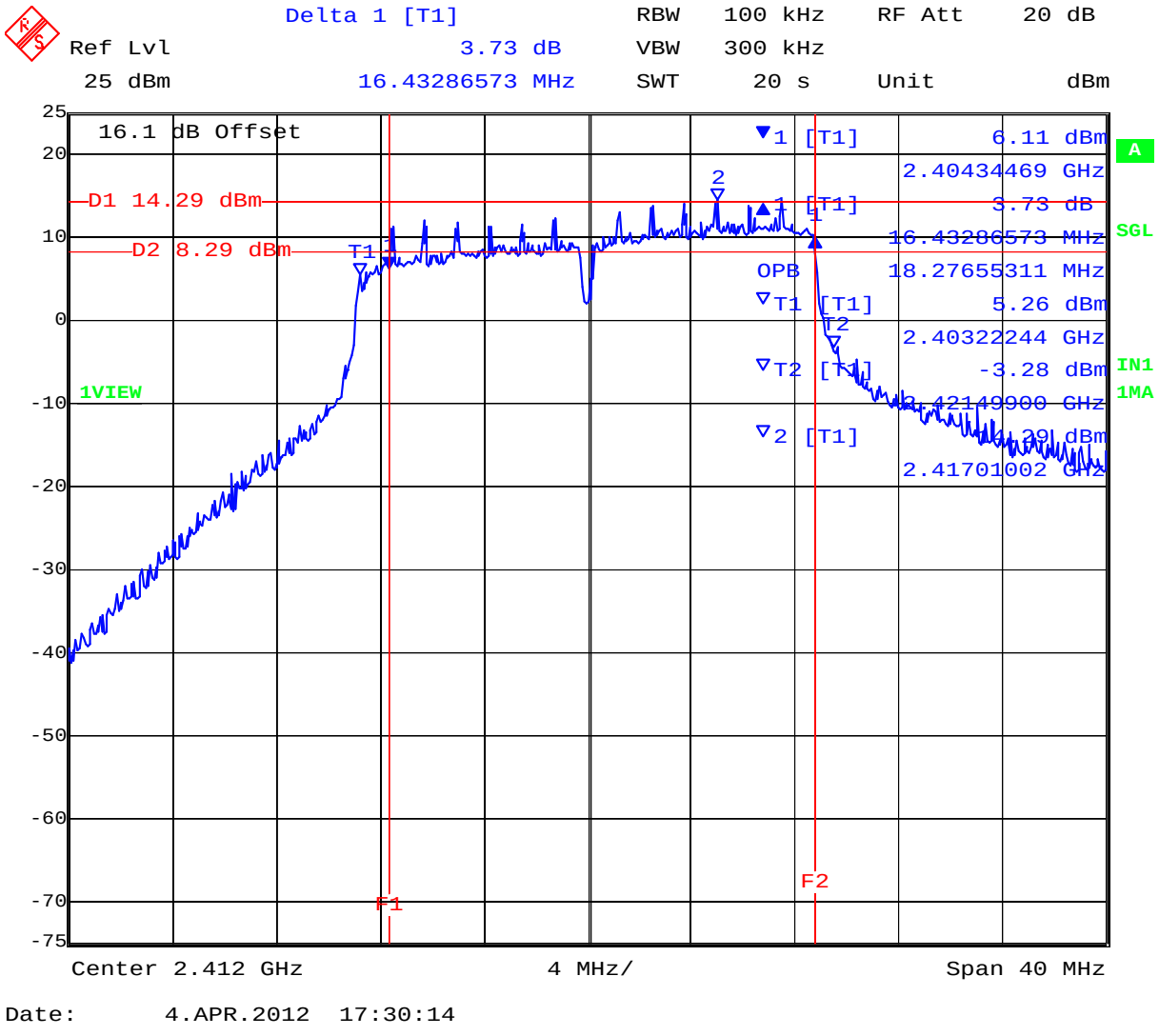
Test Frequency	99 % Bandwidth						
	MHz						
MHz	**a**	**b**	**c**	**d**			
2412.000	17.796000	18.277000	18.116000	--			
2437.000	17.876000	17.876000	18.196000	--			
2462.000	17.635000	18.196000	18.116000	--			

Measurement uncertainty:	±2.81 dB

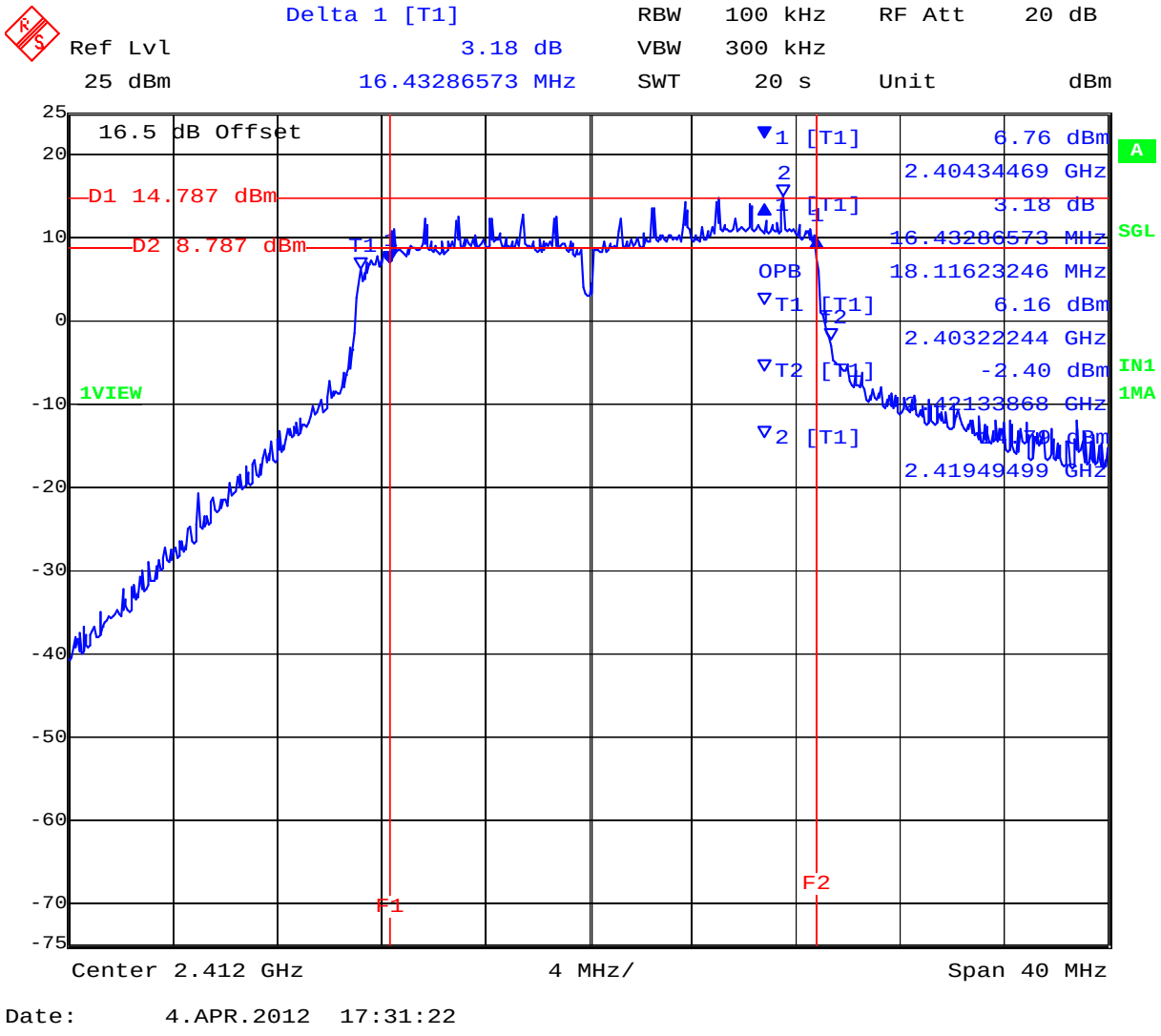
PORT A 2,412 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



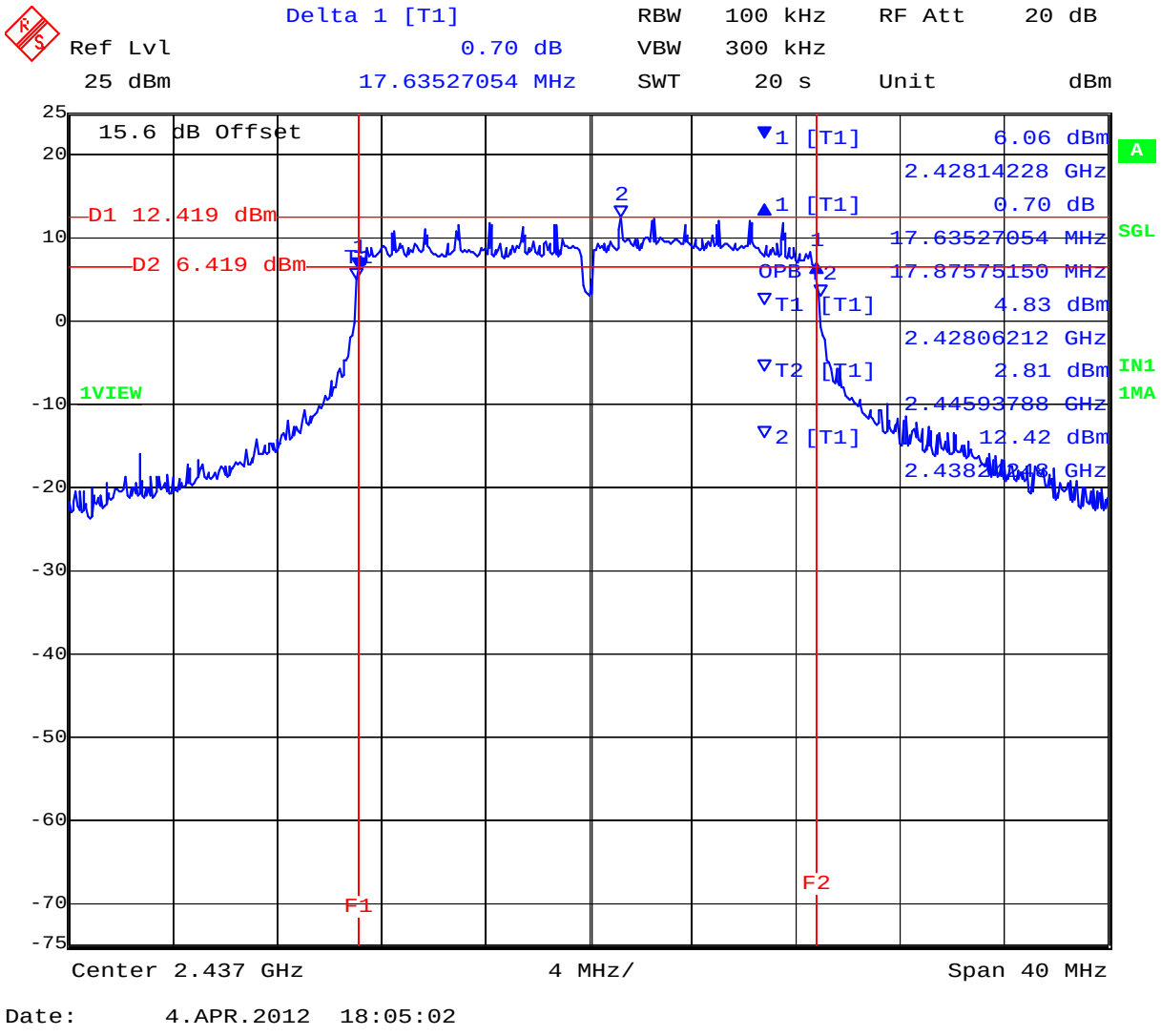
PORT B 2,412 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



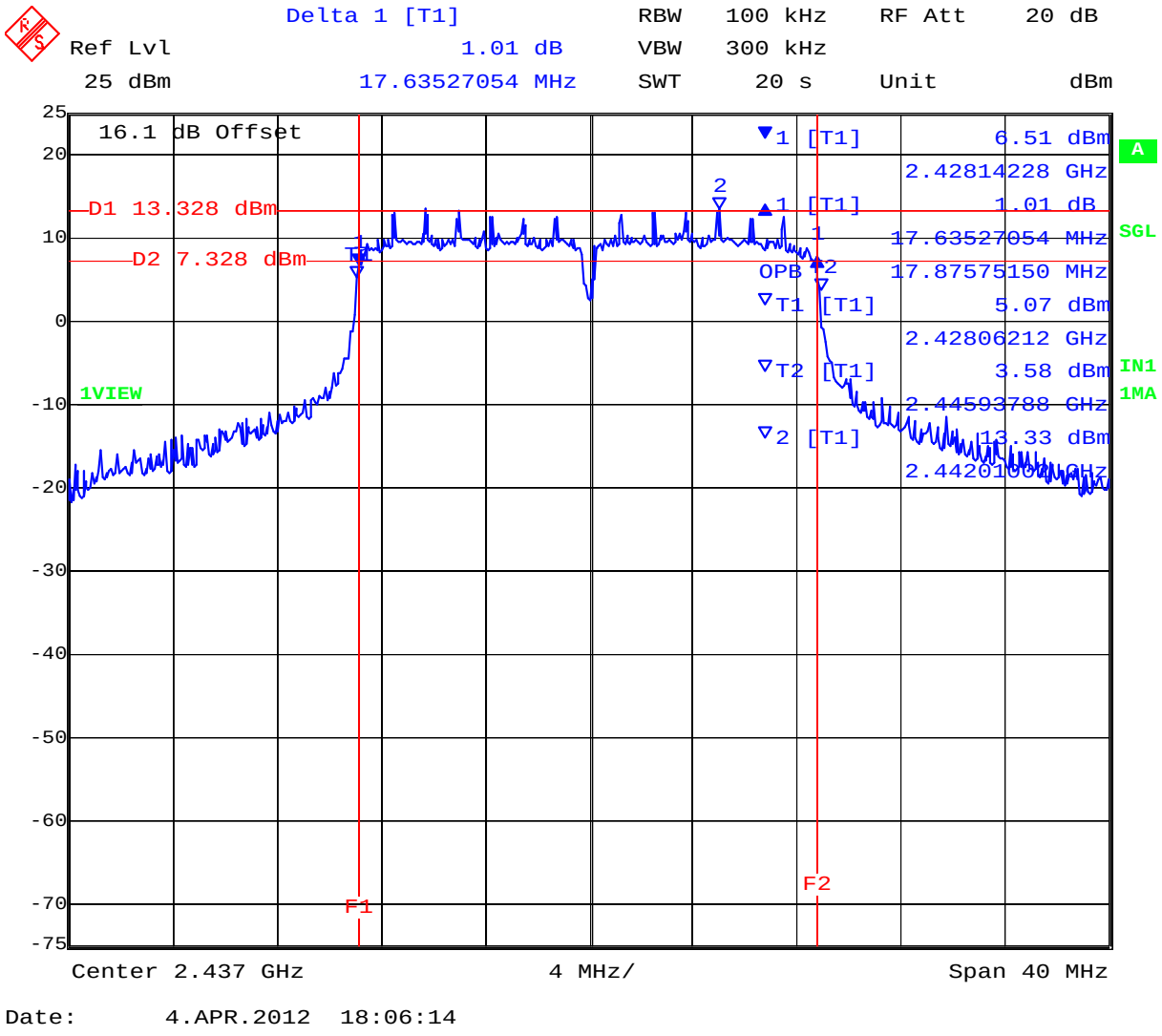
PORT C 2,412 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



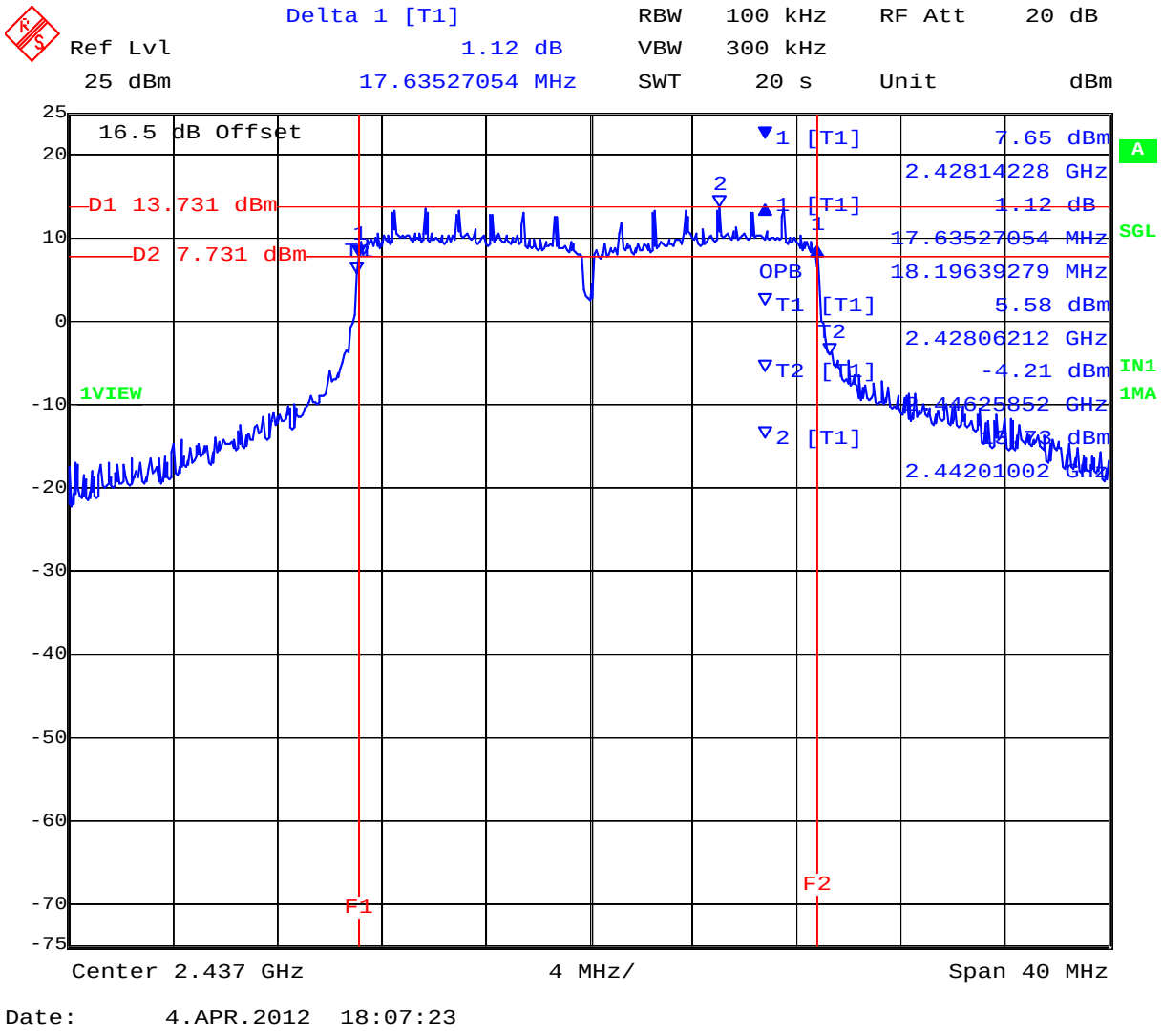
PORT A 2,437 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



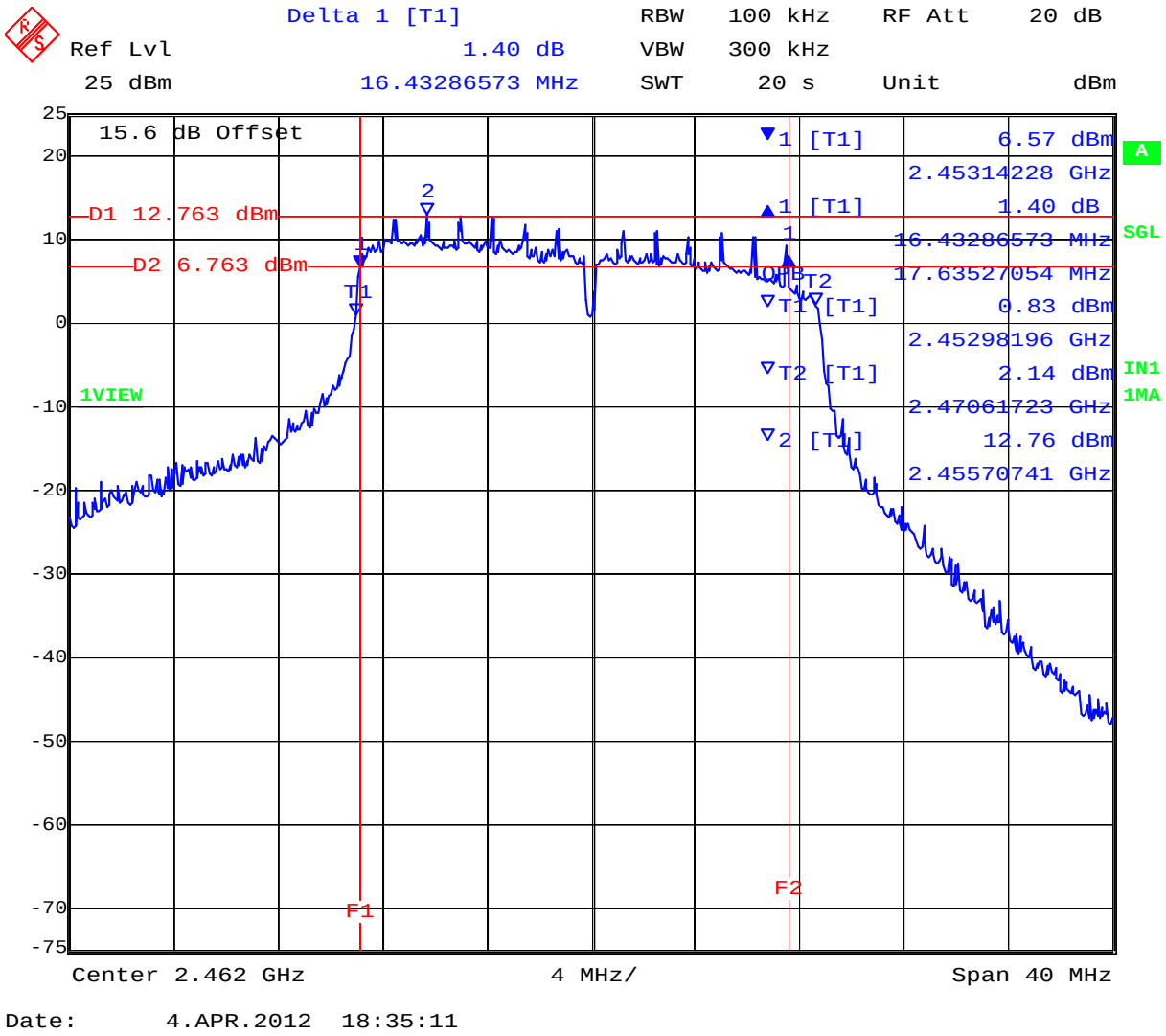
PORT B 2,437 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



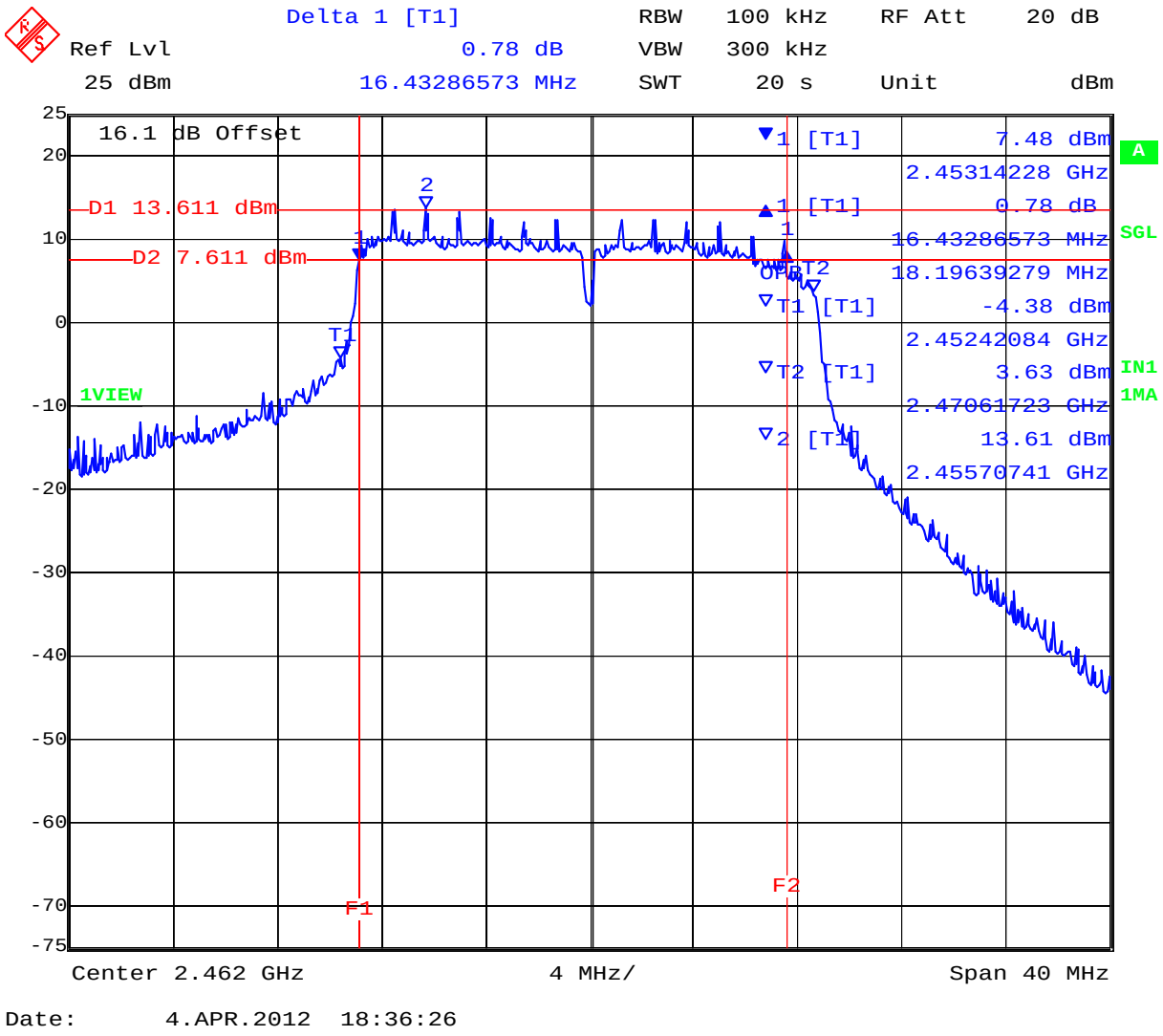
PORT C 2,437 MHz 802.11n HT-20 Legacy 6 dB and 99% Bandwidth



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



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

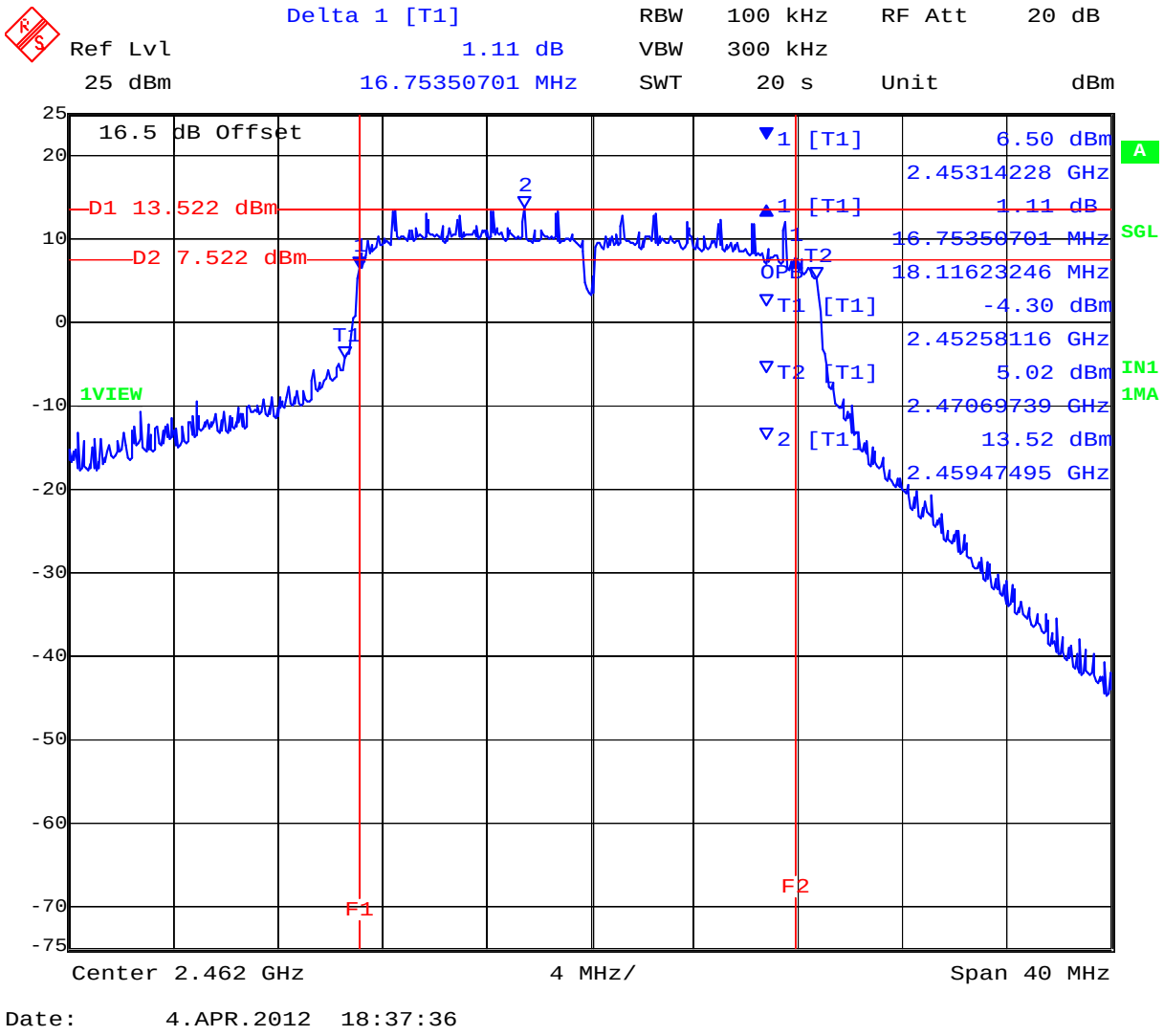


TABLE OF RESULTS – **802.11n HT-40**

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:**	7.4 dBi
Applied Voltage:	48.00 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

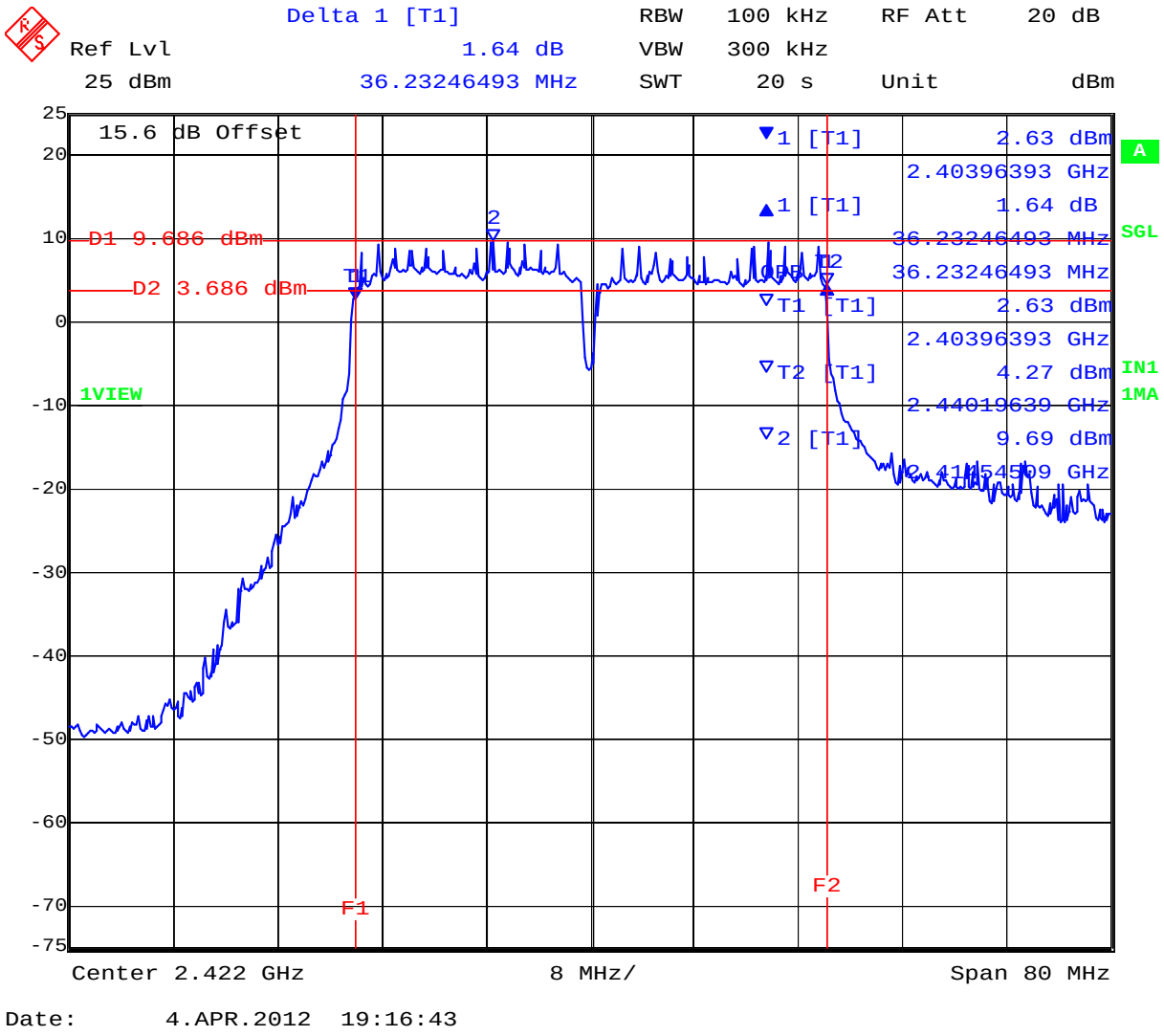
Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	**a**	**b**	**c**	**d**	**kHz**	**MHz**	**MHz**
2422.000	36.232000	34.629000	35.912000	--	500	0.5	-34.129000
2437.000	36.232000	35.912000	36.553000	--			-35.412000
2452.000	35.912000	33.347000	36.232000	--			-32.847000

99% Bandwidth

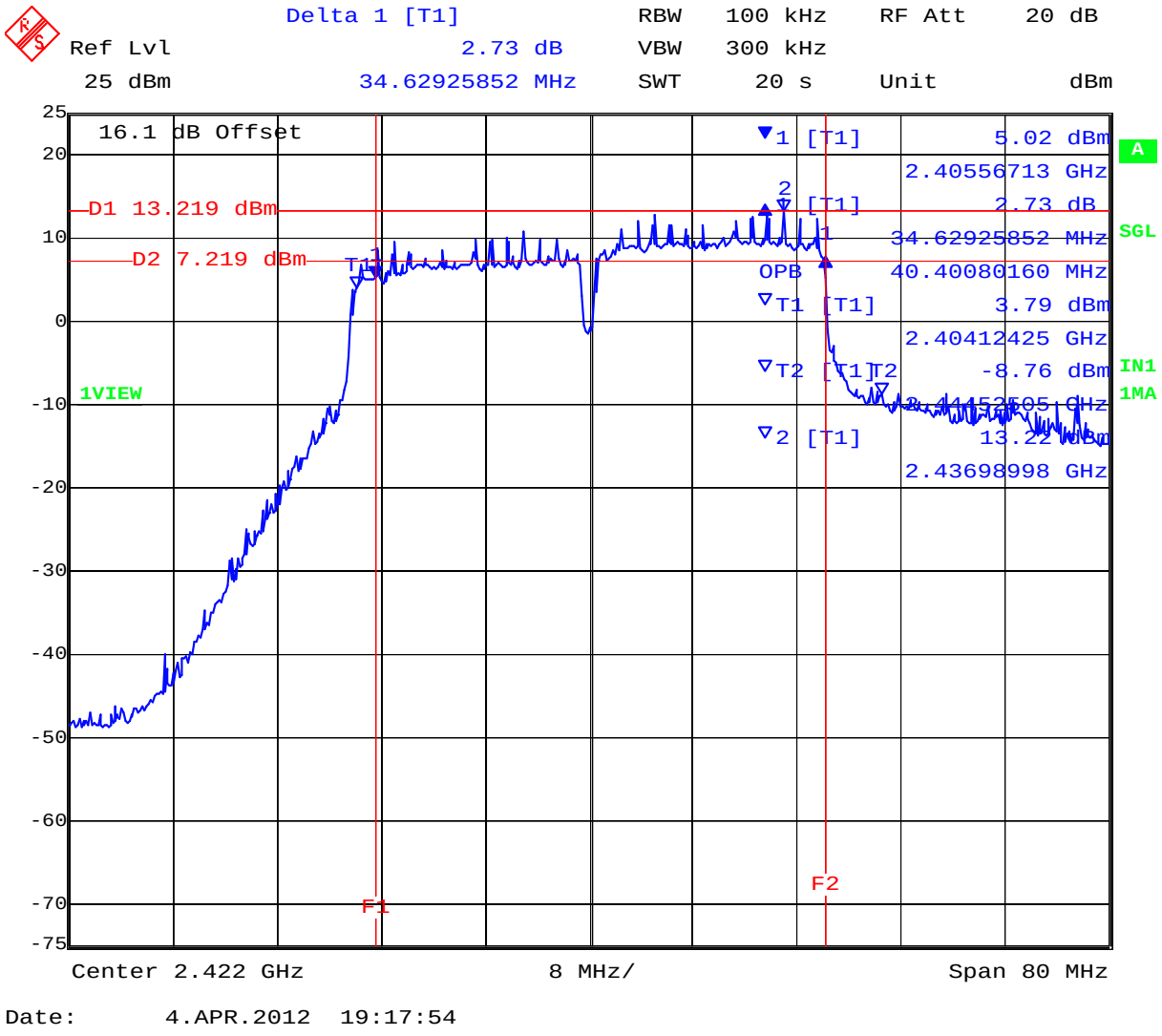
Test Frequency	99 % Bandwidth						
	MHz						
MHz	**a**	**b**	**c**	**d**			
2422.000	36.232000	40.401000	39.920000	--			
2437.000	36.553000	36.232000	36.553000	--			
2452.000	36.072000	36.232000	36.393000	--			

Measurement uncertainty:	±2.81 dB

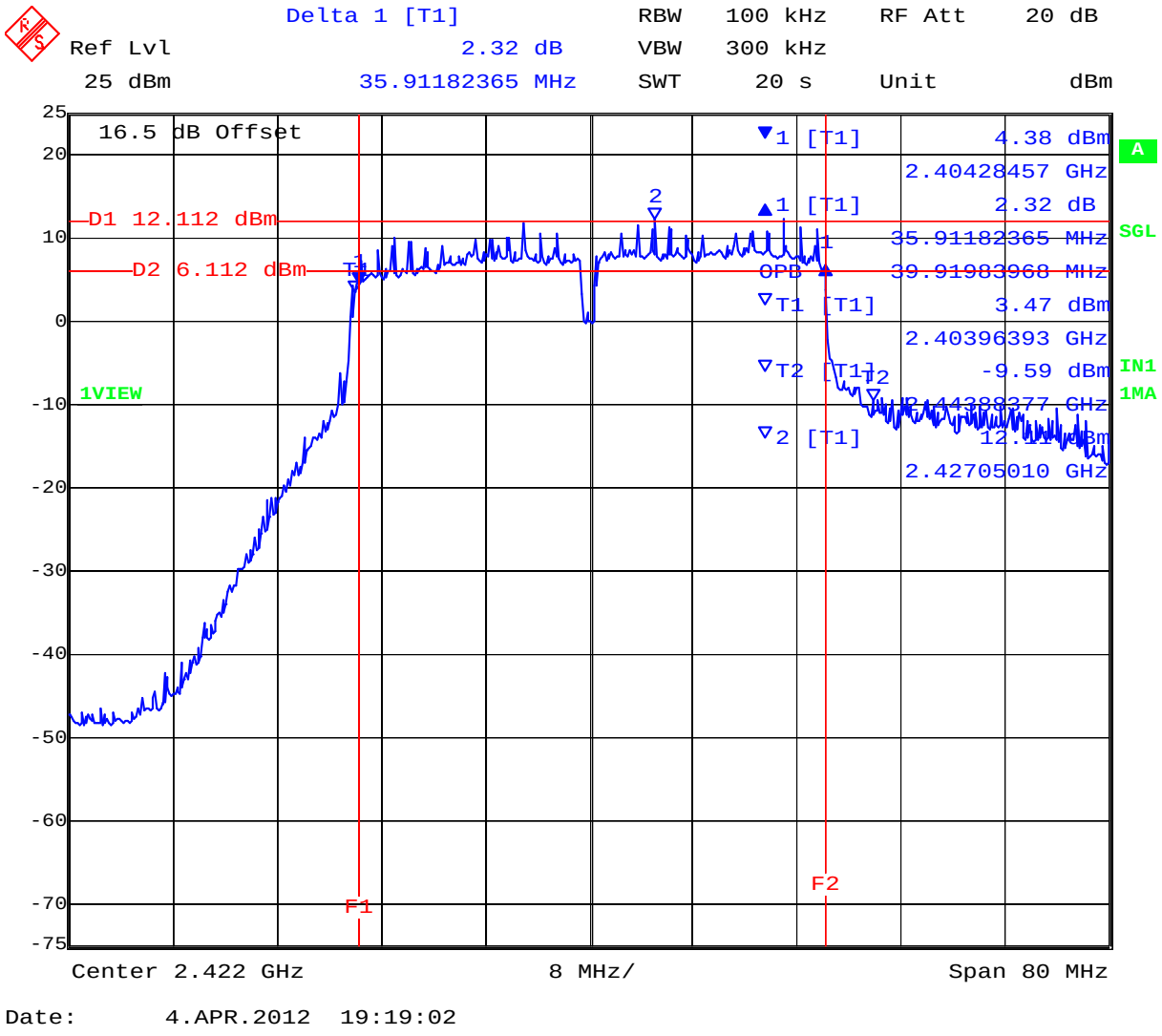
PORT A 2,422 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth



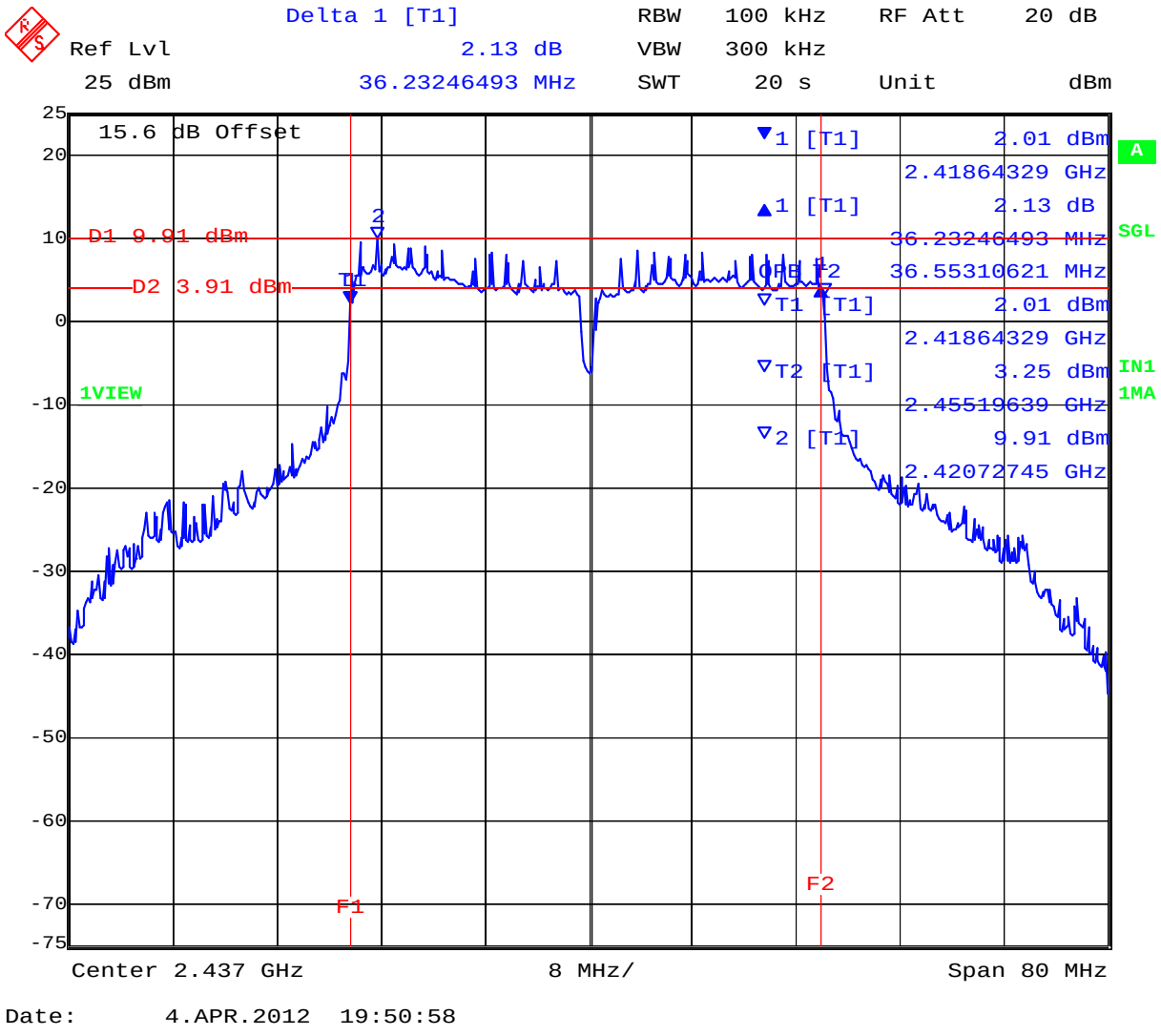
PORT B 2,422 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth



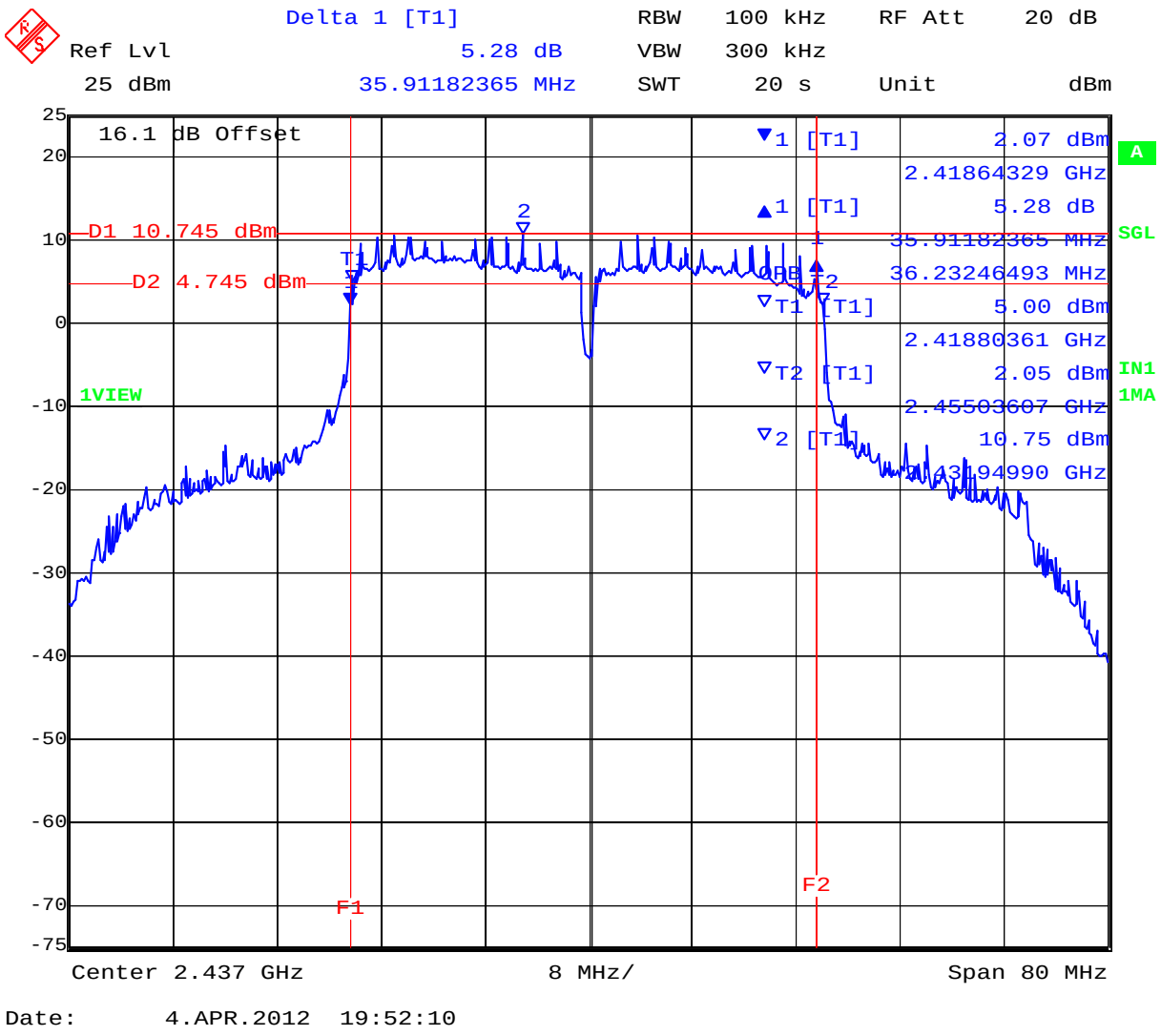
PORT C 2,422 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth



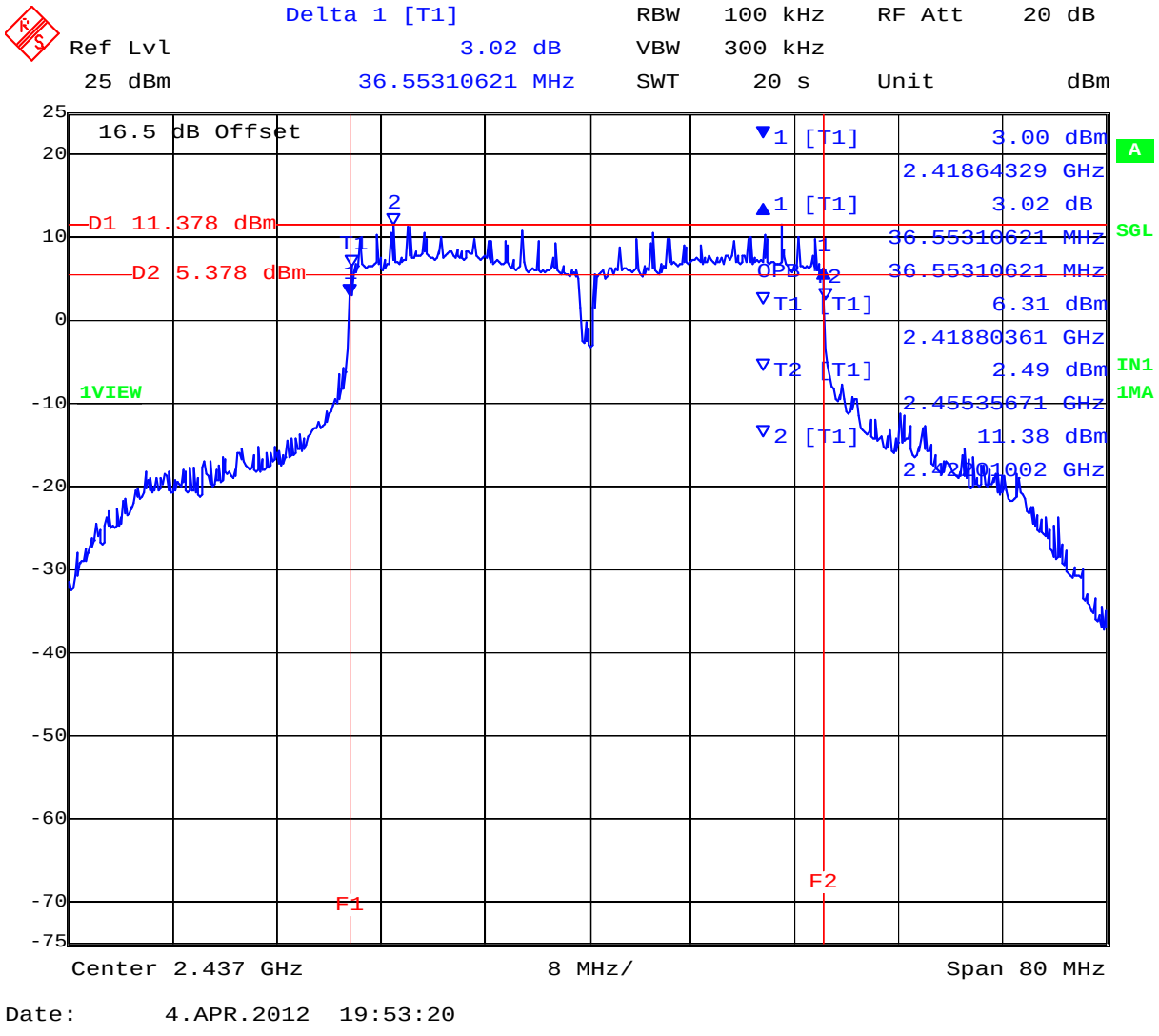
PORT A 2,437 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth



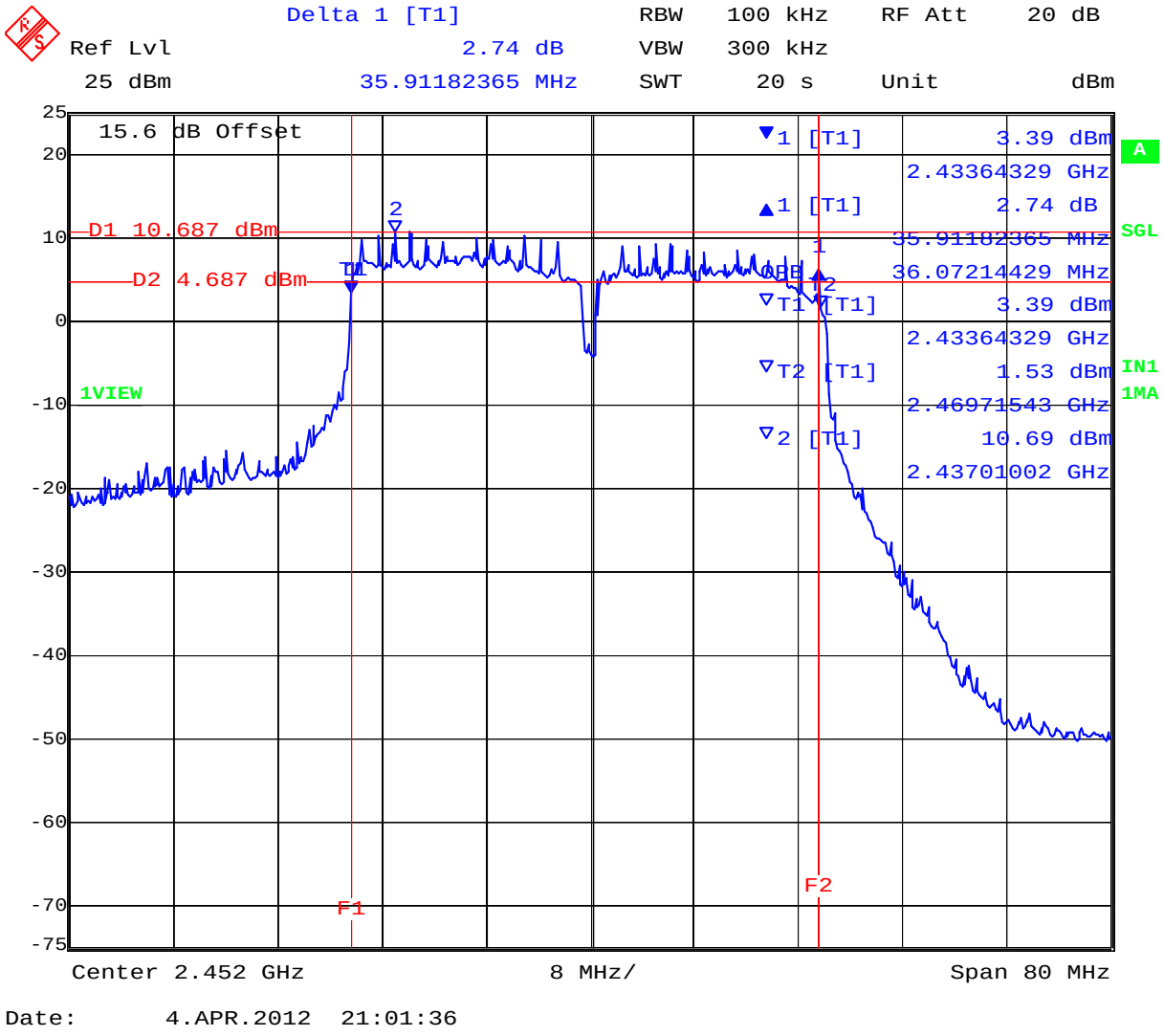
PORT B 2,437 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth



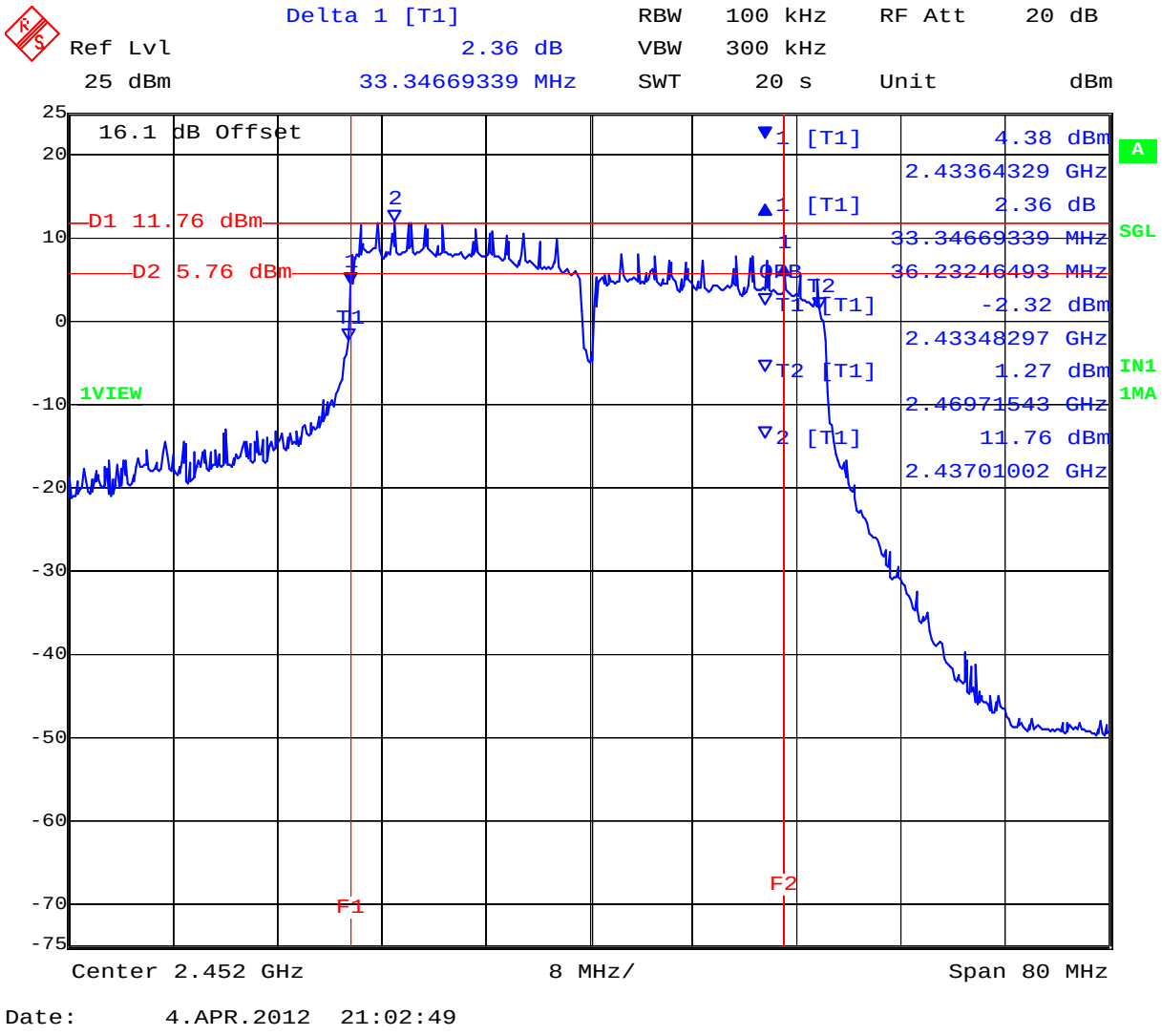
PORT C 2,437 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth



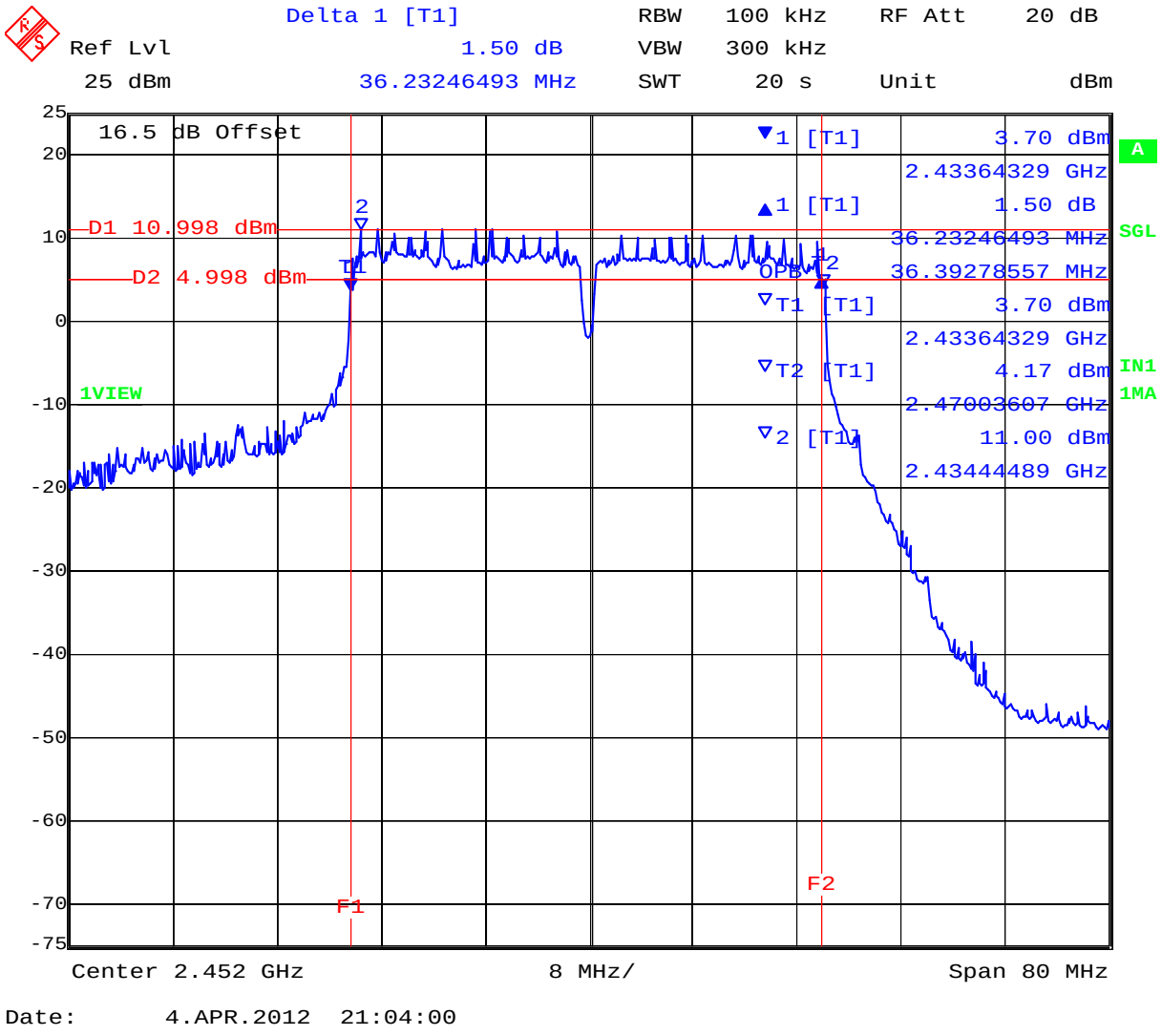
PORT A 2,452 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth



PORT B 2,452 MHz 802.11n HT-40 Legacy 6 dB and 99% Bandwidth



PORT C 2,452 MHz 802.11n HT-40 Legacy 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

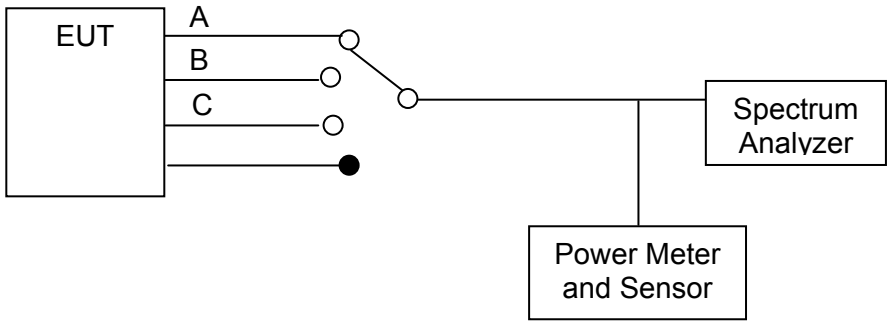
Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0158, 0287, 0252, 0313, 0314, 0070, 0116, 0117

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

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

A = Total Power [$10 \text{ Log}_{10} (10^{a/10} + 10^{b/10} + 10^{c/10})$], 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.

5.1.2.1. Limits Peak Output Power

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

(3) For systems using digital modulation in the 2400–2483.5 MHz, and band: 1 Watt. As an alternative to a peak power measurement, compliance with the 1 Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antennas and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antennas and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the *maximum conducted output power* is the highest total transmit power occurring in any mode.

(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), 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)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

(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 peak 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.

(iii) Fixed, point-to-point operation, as used in paragraphs (b)(3)(i) of this section, excludes the use of point-to-multipoint systems, omni-directional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

(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.

(iii) Fixed, point-to-point operation, as used in paragraphs (c)(1)(i) of this section, excludes the use of point-to-multipoint systems, omni-directional applications, and multiple co-located intentional radiators transmitting the same information. The operator of the spread spectrum or digitally modulated intentional radiator or, if the equipment is professionally installed, the installer is responsible for ensuring that the system is used exclusively for fixed, point-to-point operations. The instruction manual furnished with the intentional radiator shall contain language in the installation instructions informing the operator and the installer of this responsibility.

(2) In addition to the provisions in paragraphs (b)(3), (b)(4) and (c)(1)(i) of this section, transmitters operating in the 2400–2483.5 MHz band that emit multiple directional beams, simultaneously or sequentially, for the purpose of directing signals to individual receivers or to groups of receivers provided the emissions comply with the following:

(i) Different information must be transmitted to each receiver.

(ii) If the transmitter employs an antenna system that emits multiple directional beams but does not do emit multiple directional beams simultaneously, the total output power conducted to the array or arrays that comprise the device, i.e., the sum of the power supplied to all antennas, antenna elements, staves, etc. and summed across all carriers or frequency channels, shall not exceed the limit specified in paragraph (b)(3) of this section, as applicable. However, the total conducted output power shall be reduced by 1 dB below the specified limits for each 3 dB that the directional gain of the antenna/antenna array exceeds 6 dBi. The directional antenna gain shall be computed as follows:

(A) The directional gain shall be calculated as the sum of 10 log (number of array elements or staves) plus the directional gain of the element or stave having the highest gain.

(B) A lower value for the directional gain than that calculated in paragraph (c)(2)(ii)(A) of this section will be accepted if sufficient evidence is presented, e.g., due to shading of the array or coherence loss in the beam-forming.

(iii) If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, the power supplied to each emission beam is subject to the power limit specified in paragraph (c)(2)(ii) of this section. If transmitted beams overlap, the power shall be reduced to ensure that their aggregate power does not exceed the limit specified in paragraph (c)(2)(ii) of this section. In addition, the aggregate power transmitted simultaneously on all beams shall not exceed the limit specified in paragraph (c)(2)(ii) of this section by more than 8 dB.

(iv) Transmitters that emit a single directional beam shall operate under the provisions of paragraph (c)(1) of this section.

WBSn-2400 - 802.11 b/g/n Wireless Access Point, 3x3 Spatial Multiplexing MIMO configuration

2.4 GHz Operation

Antenna	Gain (dBi)	Maximum Total Conducted Peak Power (dBm)	
		Total	Per Chain
OMNI	7.4	+28.0	+23.23
SECTOR	12.0	+26.4	+21.63

Per chain value = Maximum Total Conducted Peak Power – 4.77 dB

Output power measurements were performed on the OMNI (N-Type connector) device. Assumption: both the OMNI and SECTOR (integral antenna) power settings were identical.

5.1.2.2. 802.11b

TABLE OF RESULTS – **802.11b – Legacy**
OMNI ANTENNA MEASUREMENT RESULTS

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:**	7.4	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	22.57	23.52	23.45	--	N/A	27.97	28.00	-0.03
2437	22.30	22.94	23.33	--	N/A	27.65	28.00	-0.35
2462	21.95	22.64	23.79	--	N/A	27.63	28.00	-0.37

Measurement uncertainty:	±1.33 dB

SECTOR ANTENNA MEASUREMENT RESULTS

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:**	12	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	20.94	21.98	21.76	--	N/A	26.35	26.40	-0.05
2437	20.56	21.65	21.99	--	N/A	26.21	26.40	-0.19
2462	20.35	21.06	22.32	--	N/A	26.09	26.40	-0.31

Measurement uncertainty:	±1.33 dB

5.1.2.3. 802.11g

TABLE OF RESULTS – **802.11g – Legacy**
OMNI ANTENNA MEASUREMENT RESULTS

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:**	7.4 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	22.41	23.32	23.61	--	N/A	27.91	28.00	-0.09
2437	22.72	23.25	23.45	--	N/A	27.92	28.00	-0.08
2462	22.23	23.05	23.68	--	N/A	27.80	28.00	-0.20

Measurement uncertainty:	±1.33 dB

SECTOR ANTENNA MEASUREMENT RESULTS

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:**	12 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	20.22	22.05	21.93	--	N/A	26.25	26.40	-0.15
2437	20.35	22.11	21.68	--	N/A	26.21	26.40	-0.19
2462	20.17	21.67	21.65	--	N/A	25.99	26.40	-0.41

Measurement uncertainty:	±1.33 dB

5.1.2.4. 802.11n HT-20

TABLE OF RESULTS – **802.11n – HT-20**
OMNI ANTENNA MEASUREMENT RESULTS

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:**	7.4 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	22.38	23.41	23.67	--	N/A	27.96	28.00	-0.04
2437	22.66	23.27	23.54	--	N/A	27.94	28.00	-0.06
2462	21.92	22.81	23.60	--	N/A	27.60	28.00	-0.40

Measurement uncertainty:	±1.33 dB

SECTOR ANTENNA MEASUREMENT RESULTS

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:**	12 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	21.01	22.07	21.45	--	N/A	26.30	26.40	-0.10
2437	20.82	21.87	21.33	--	N/A	26.13	26.40	-0.27
2462	20.77	21.86	21.34	--	N/A	26.12	26.40	-0.28

Measurement uncertainty:	±1.33 dB

5.1.2.5. 802.11n HT-40

TABLE OF RESULTS – **802.11n – HT-40**
OMNI ANTENNA MEASUREMENT RESULTS

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:**	7.4 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	21.54	23.79	23.82	--	N/A	27.94	28.00	-0.06
2437	21.89	23.50	23.85	--	N/A	27.93	28.00	-0.07
2452	22.91	23.13	23.56	--	N/A	27.98	28.00	-0.02

Measurement uncertainty:	±1.33 dB

SECTOR ANTENNA MEASUREMENT RESULTS

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:**	12 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	20.31	22.07	21.93	--	N/A	26.28	26.40	-0.12
2437	20.37	21.87	21.79	--	N/A	26.17	26.40	-0.23
2452	20.34	21.97	21.67	--	N/A	26.15	26.40	-0.25

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

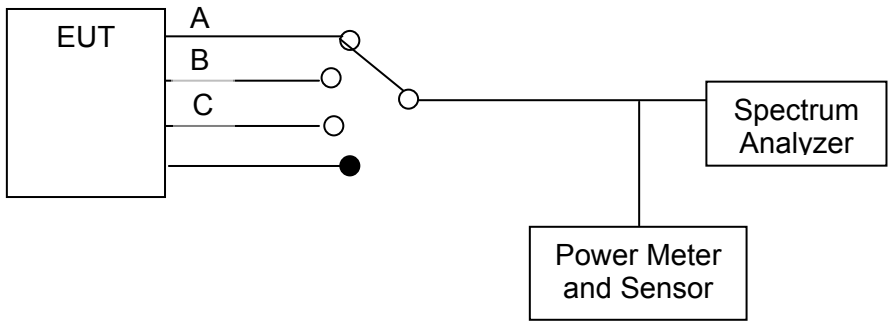
5.1.3. Peak Power Spectral Density

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

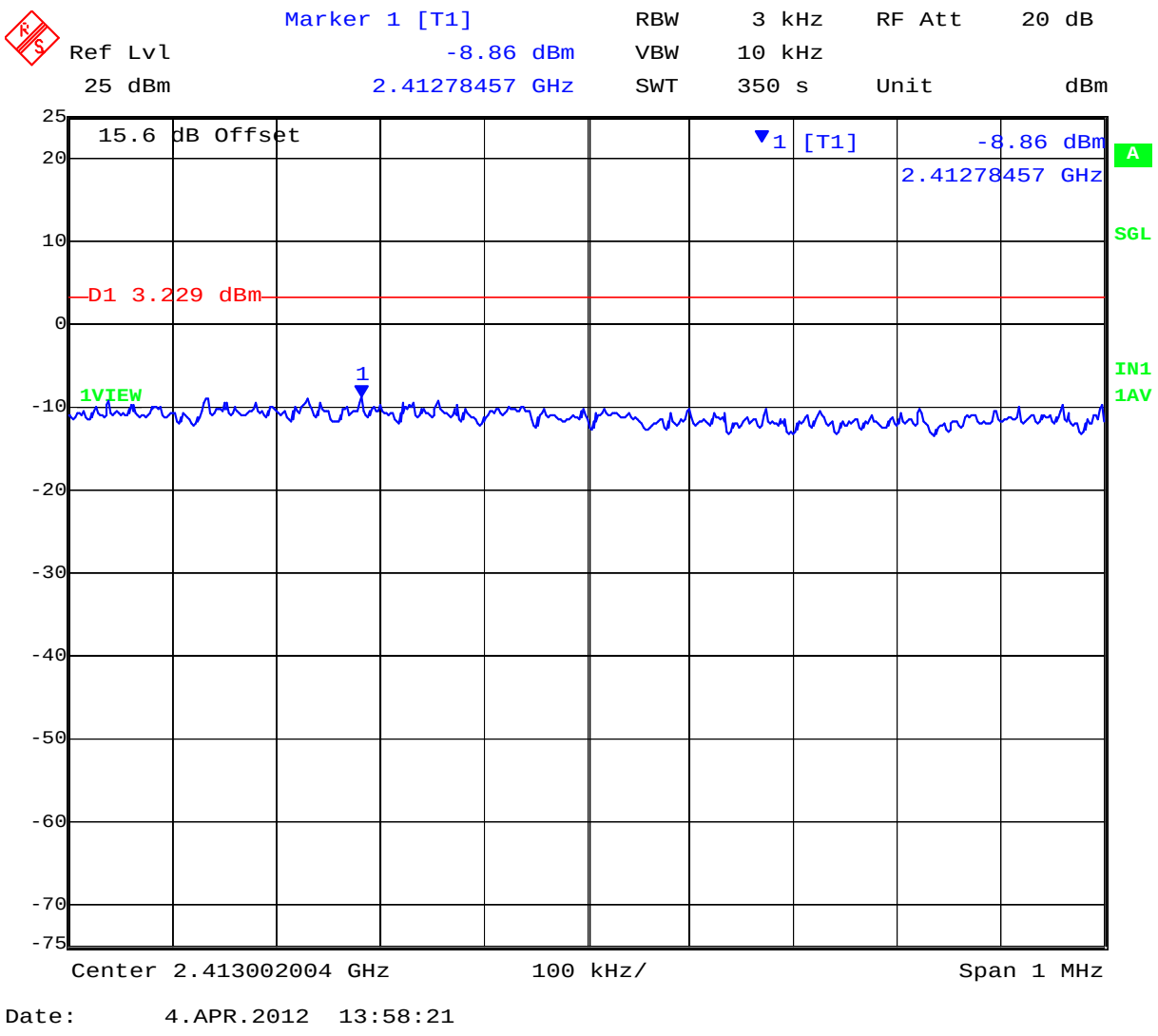
TABLE OF RESULTS – **802.11b**

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:**	N/A dBi
Applied Voltage:	48.00 Vdc	**Antenna Ports (N):**	3
Notes 1:			
Notes 2:			

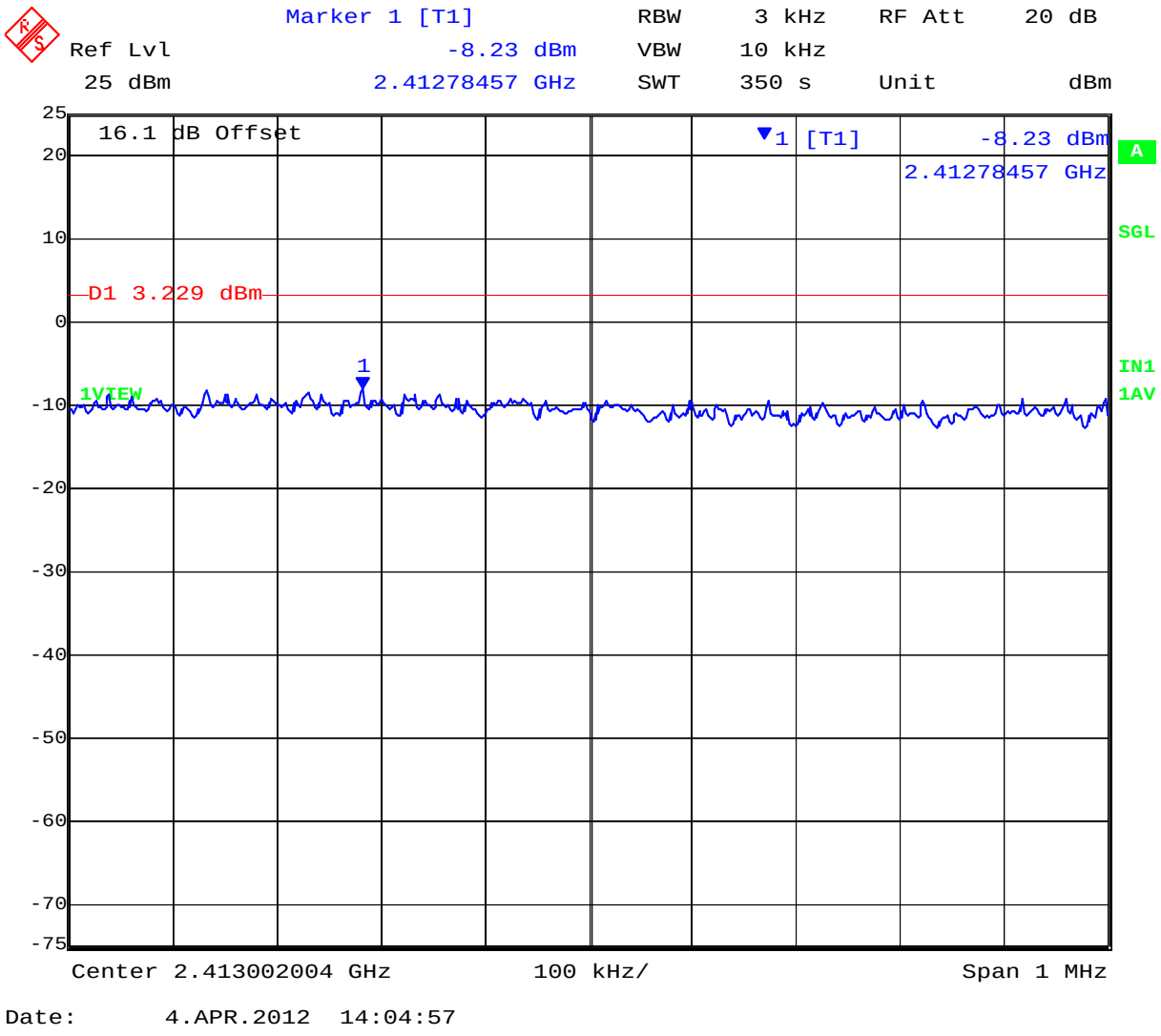
Test Frequency	Measured Power Density RF Port (dBm)				Correction factor	Maximum Peak Power Spectral Density	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
2412.000	-8.86	-8.23	-8.21	--	4.77	-8.21	3.23	-11.44
2437.000	-9.91	-9.44	-8.62	--	4.77	-8.62	3.23	-11.85
2462.000	-10.61	-9.60	-7.92	--	4.77	-7.92	3.23	-11.15

Measurement uncertainty:	± 1.33 dB

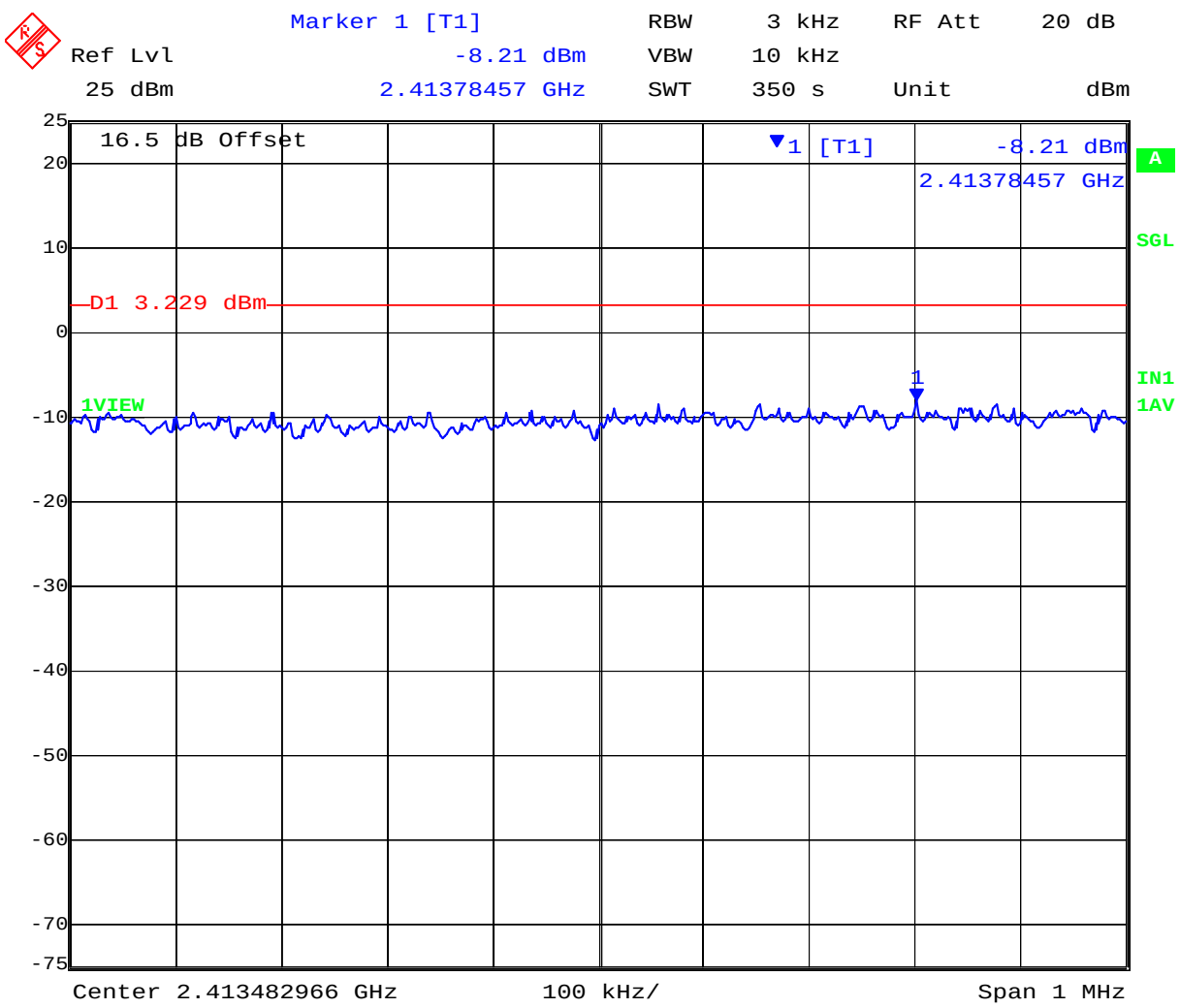
PORT A 2,412 MHz 802.11b - Peak Power Spectral Density



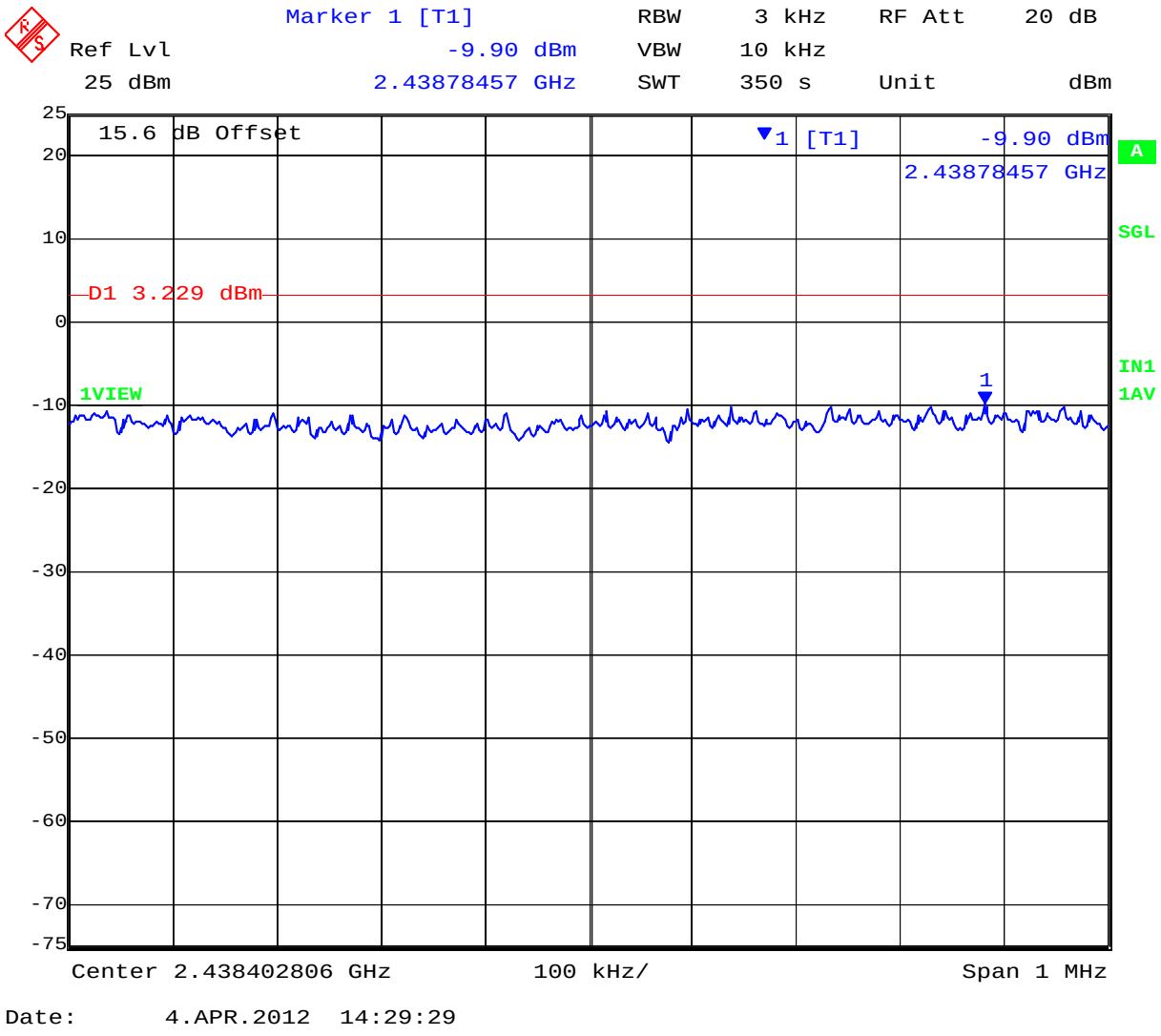
PORT B 2,412 MHz 802.11b - Peak Power Spectral Density



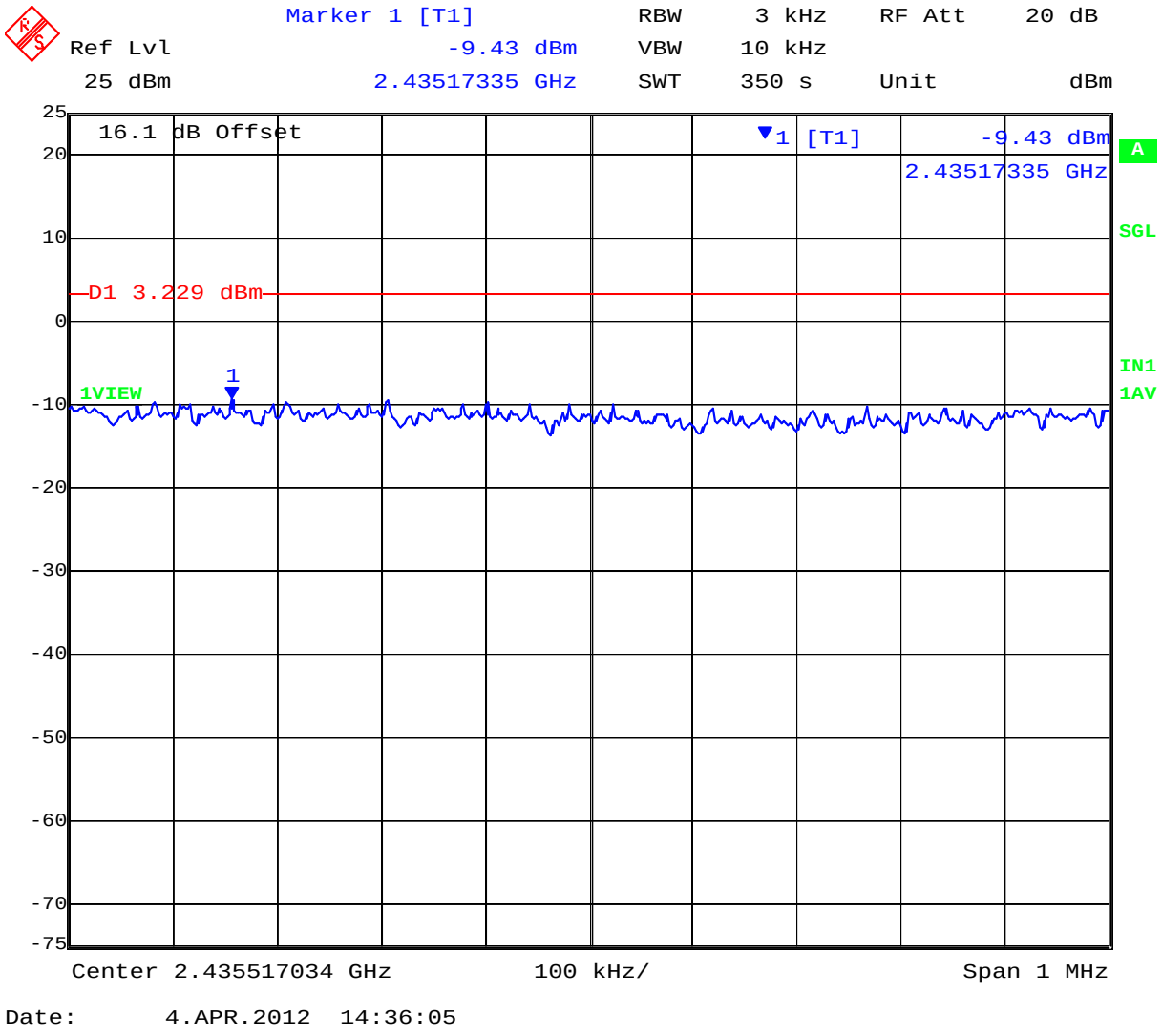
PORT C 2,412 MHz 802.11b - Peak Power Spectral Density



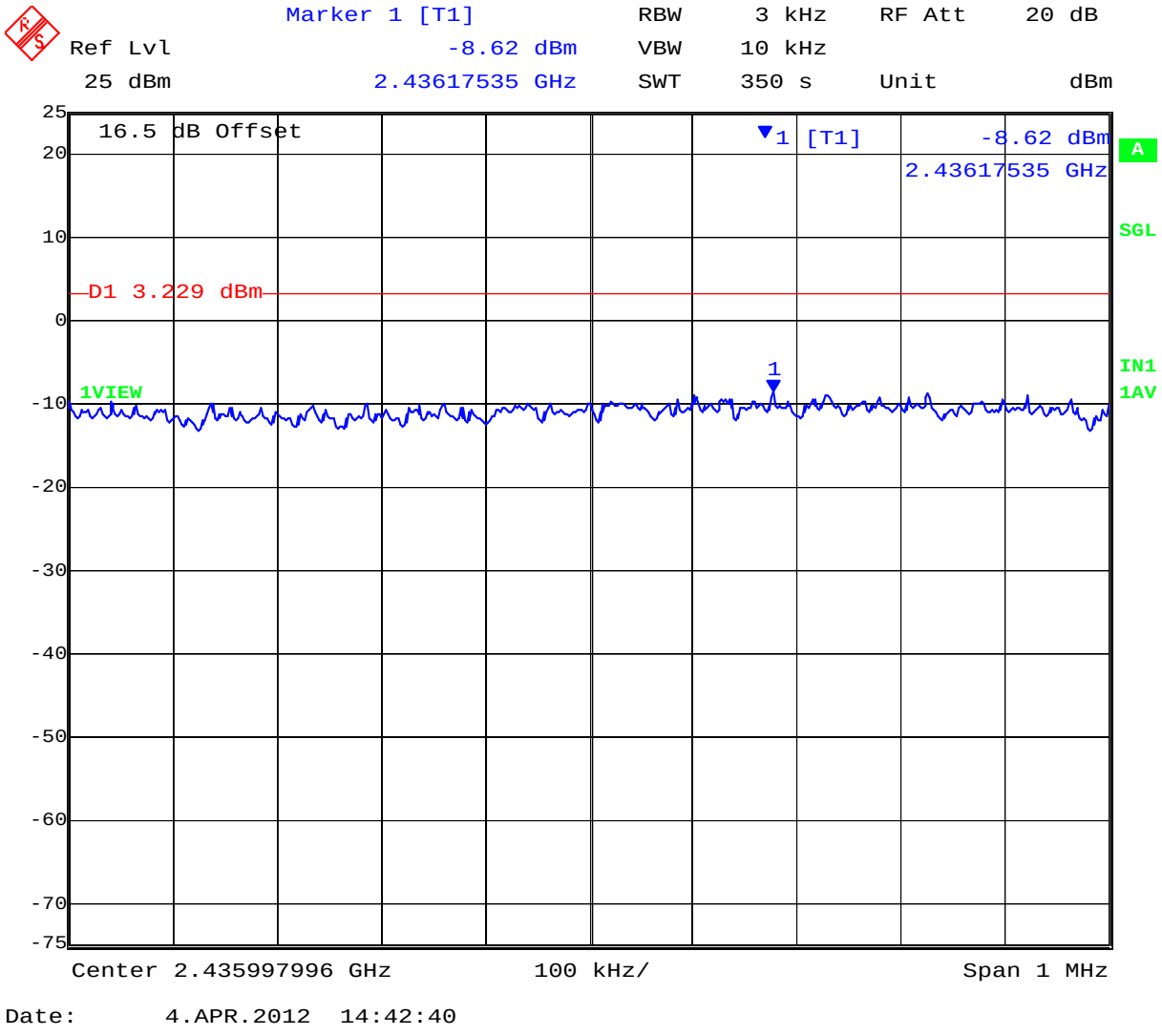
PORT A 2,437 MHz 802.11b - Peak Power Spectral Density



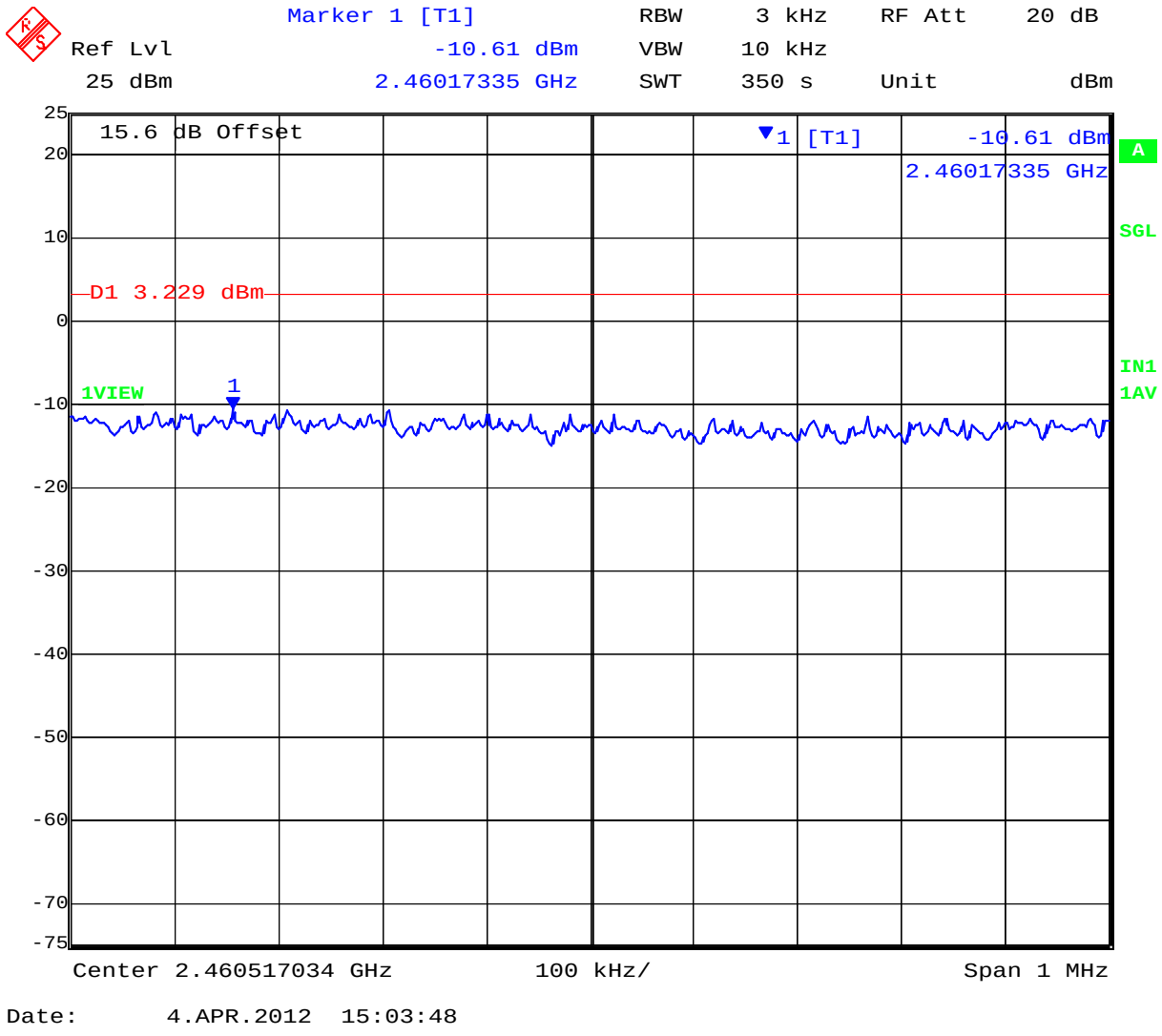
PORT B 2,437 MHz 802.11b - Peak Power Spectral Density



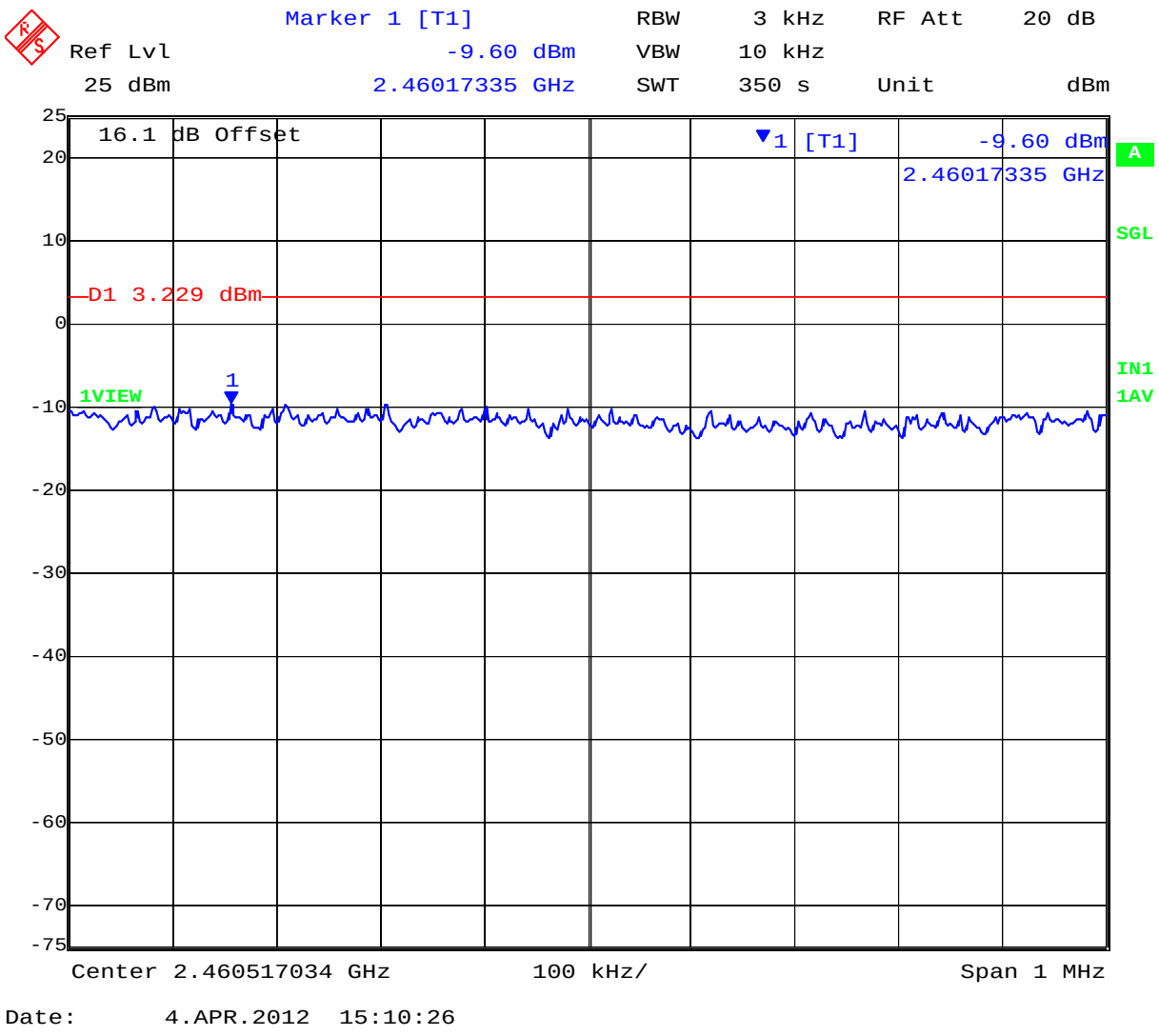
PORT C 2,437 MHz 802.11b - Peak Power Spectral Density



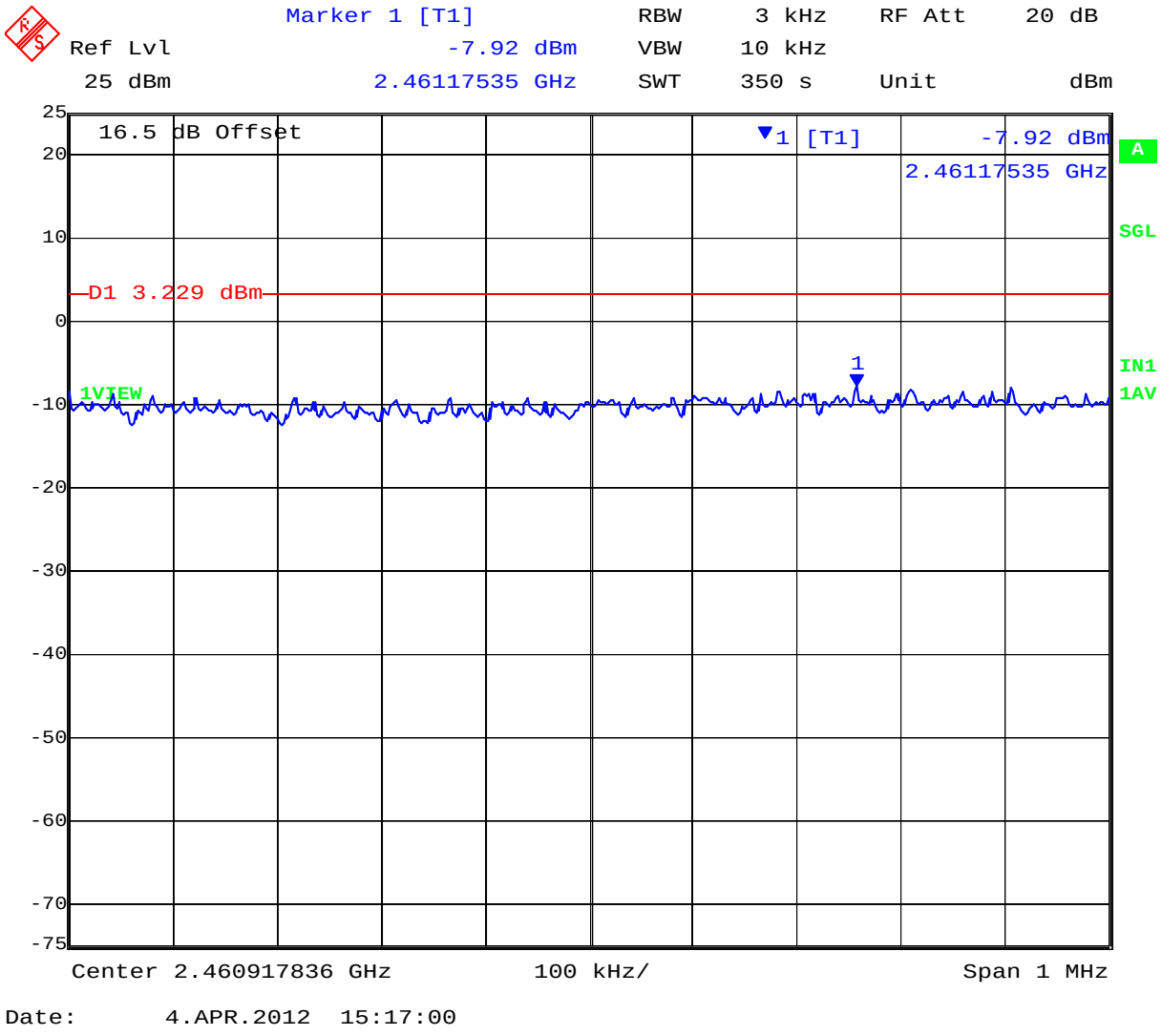
PORT A 2,462 MHz 802.11b - Peak Power Spectral Density



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



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



Peak Power Spectral Density

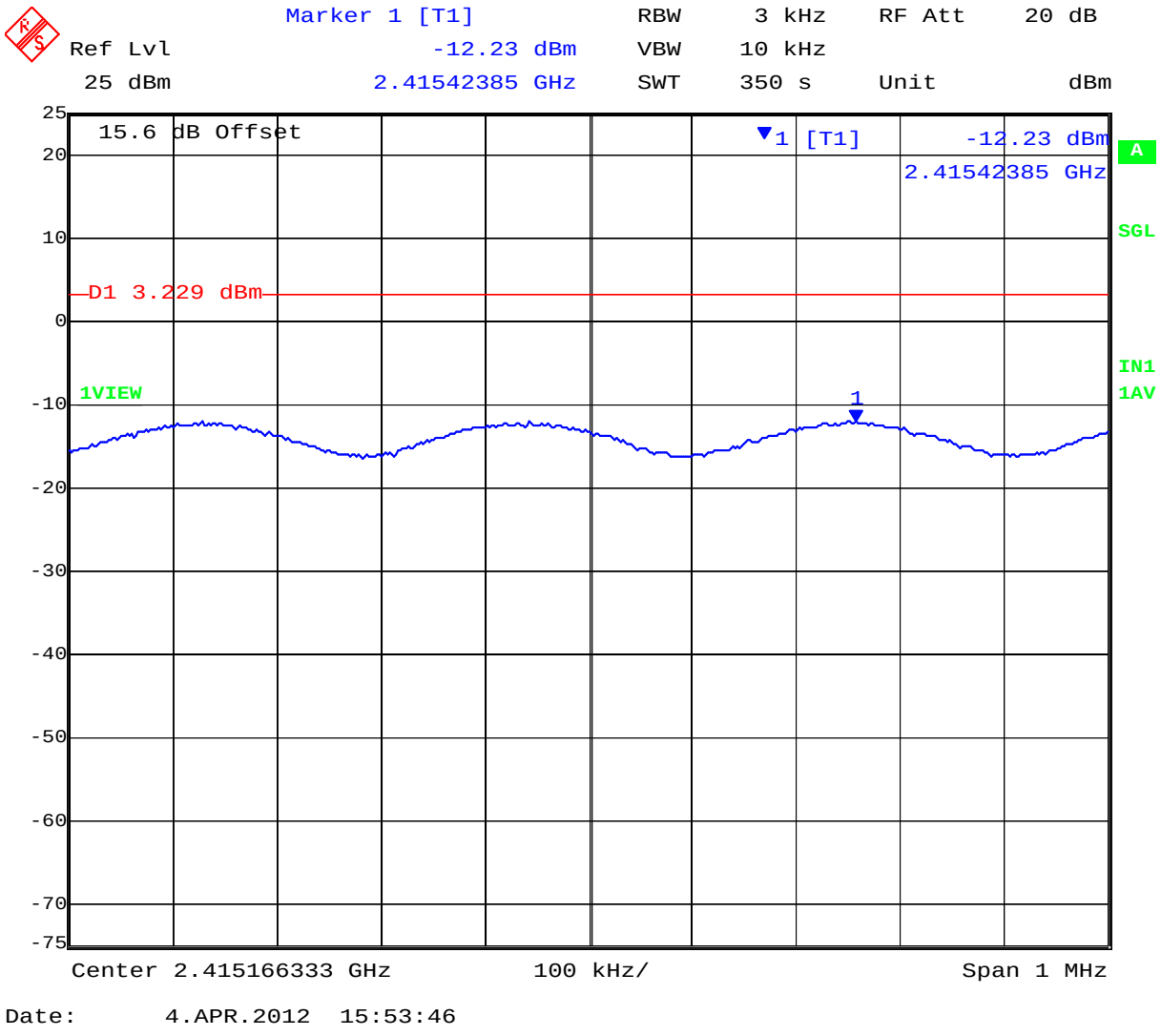
TABLE OF RESULTS – **802.11g Legacy**

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:**	N/A dBi
Applied Voltage:	48.00 Vdc	**Antenna Ports (N):**	3
Notes 1:			
Notes 2:			

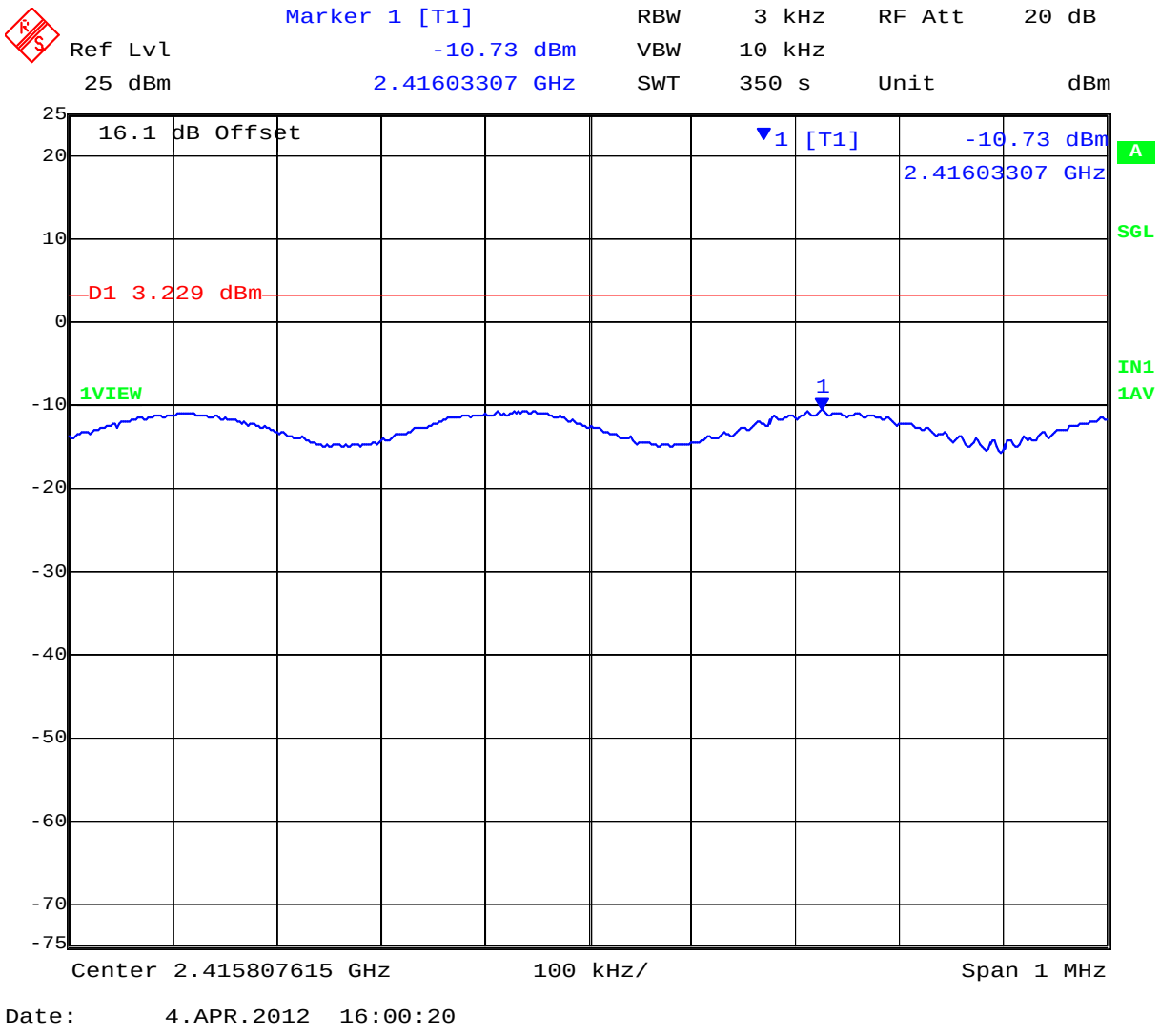
Test Frequency	Measured Power Density RF Port (dBm)				Correction factor	Maximum Peak Power Spectral Density	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
2412.000	-12.23	-10.73	-10.10	--	4.77	-10.10	3.23	-13.33
2437.000	-11.85	-11.10	-11.97	--	4.77	-11.10	3.23	-14.33
2462.000	-11.96	-9.83	-10.37	--	4.77	-9.83	3.23	-13.06

Measurement uncertainty:	± 1.33 dB

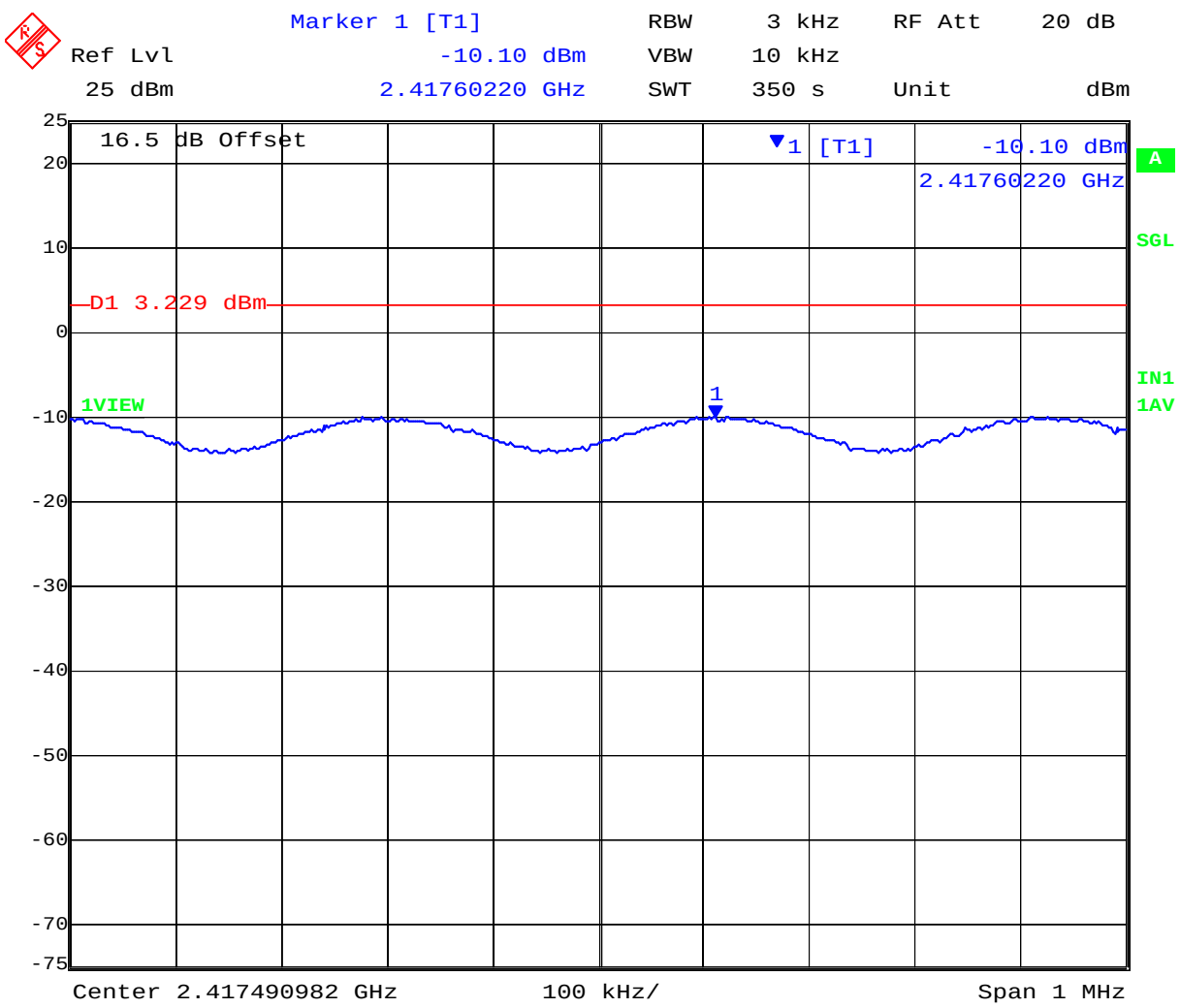
PORT A 2,412 MHz 802.11g Legacy - Peak Power Spectral Density



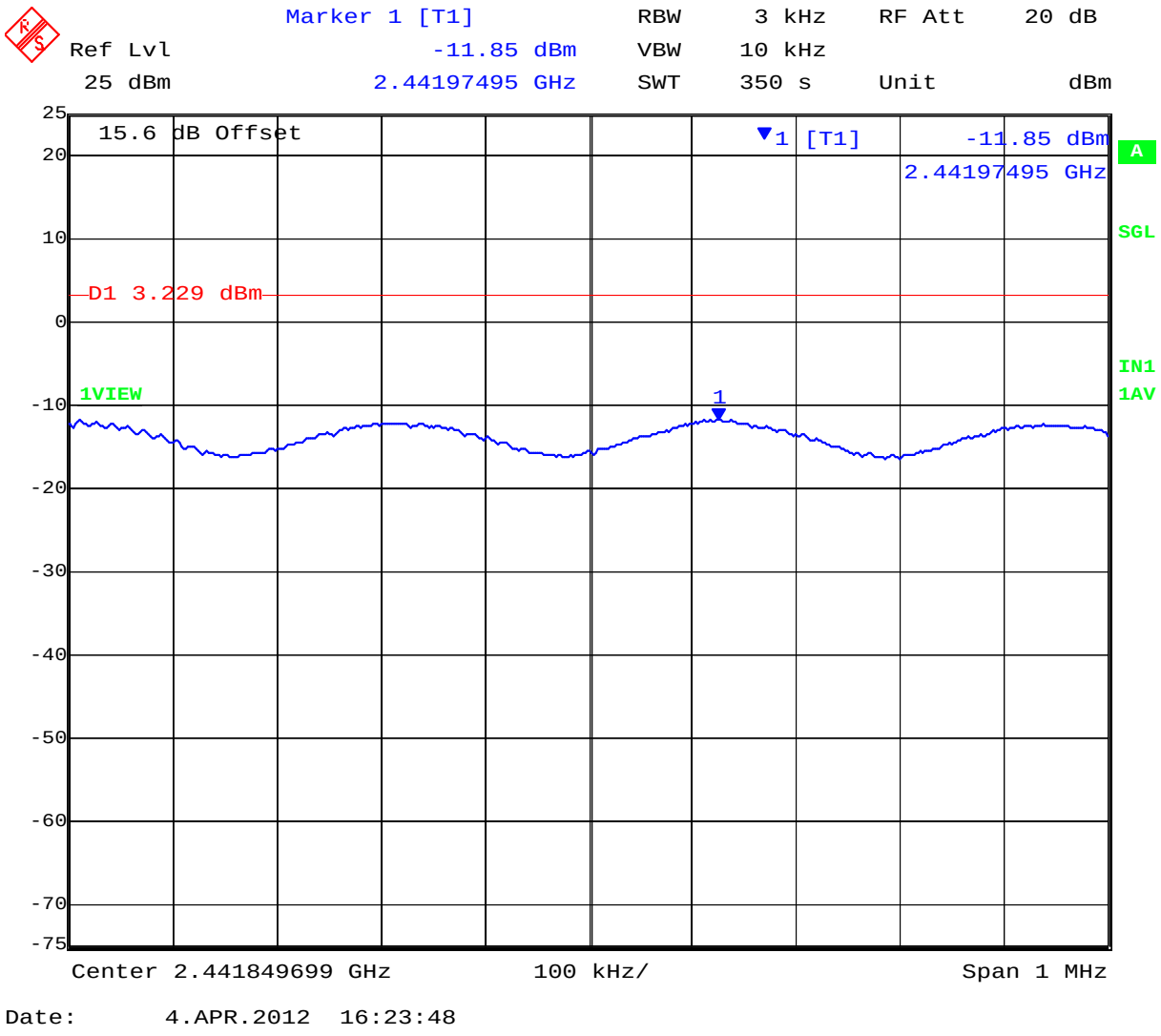
PORT B 2,412 MHz 802.11g Legacy - Peak Power Spectral Density



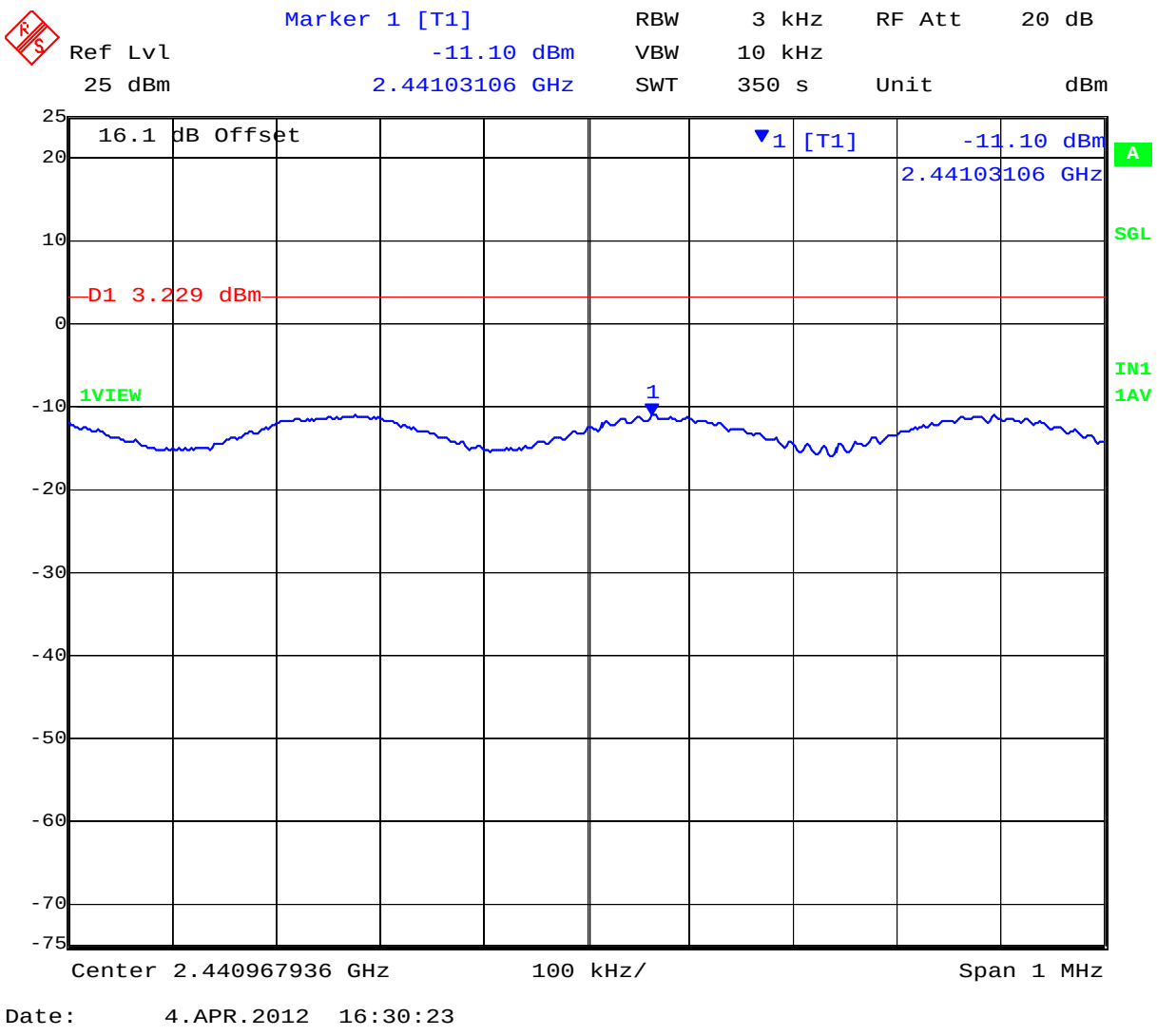
PORT C 2,412 MHz 802.11g Legacy - Peak Power Spectral Density



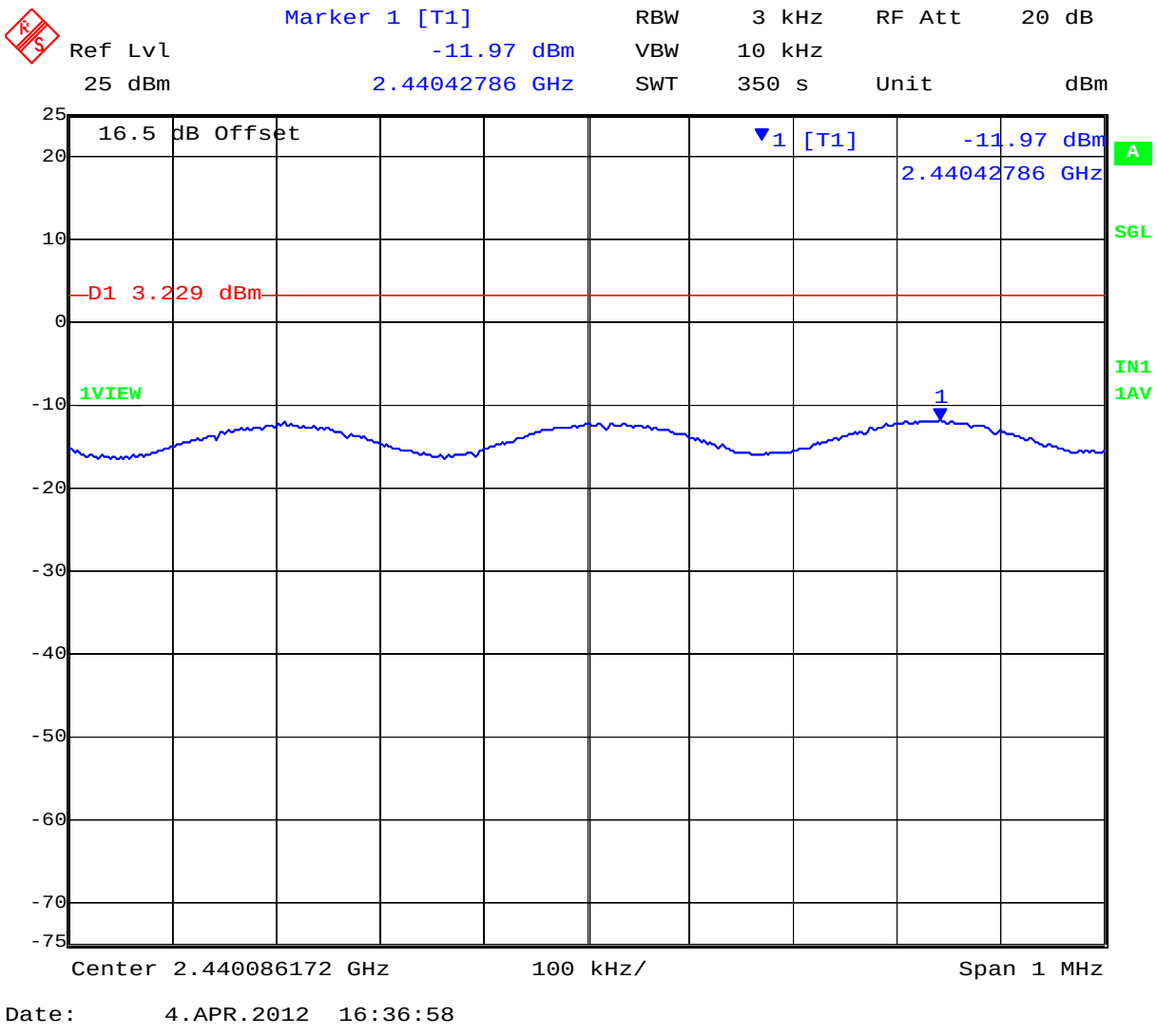
PORT A 2,437 MHz 802.11g Legacy - Peak Power Spectral Density



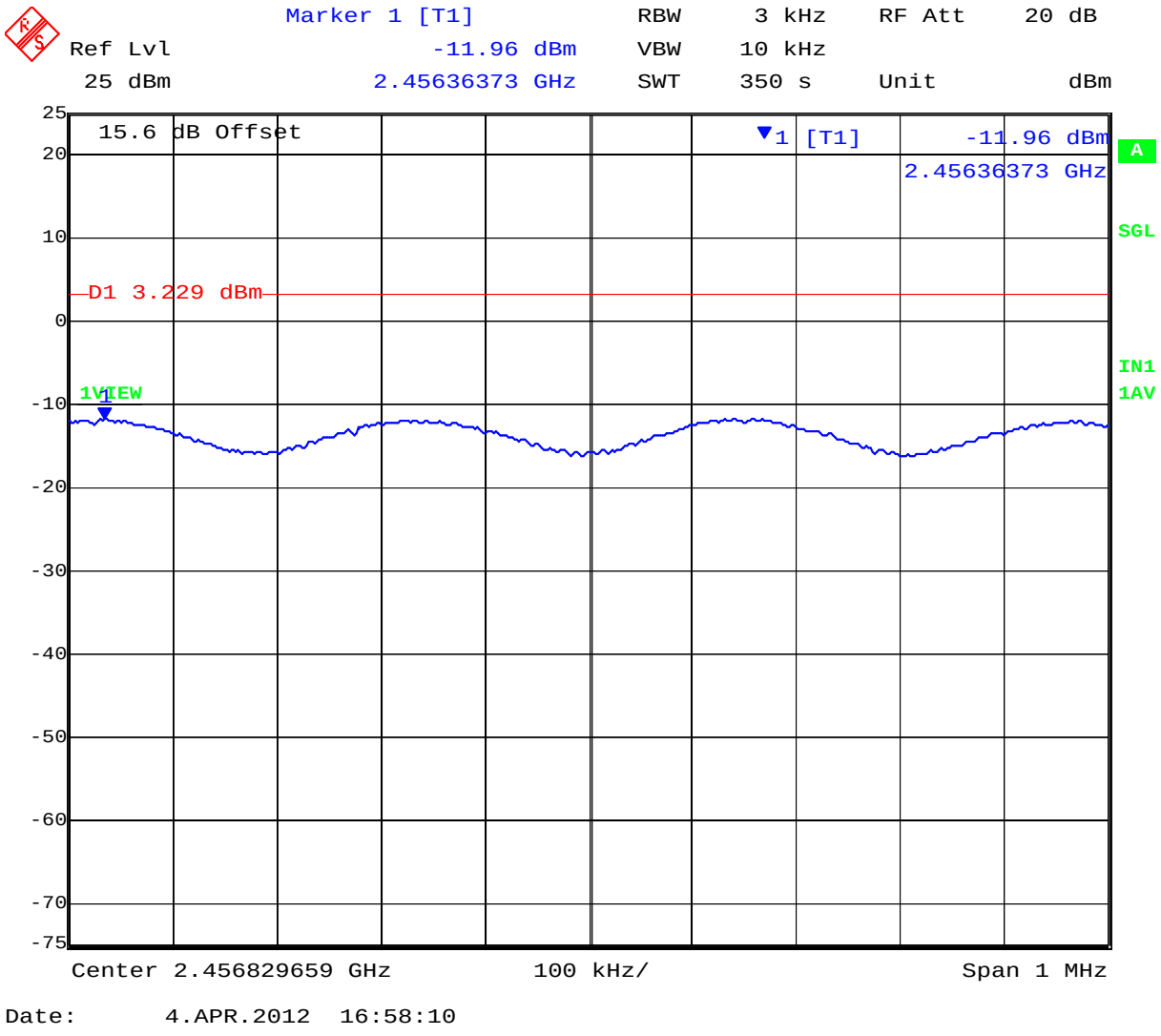
PORT B 2,437 MHz 802.11g Legacy - Peak Power Spectral Density



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

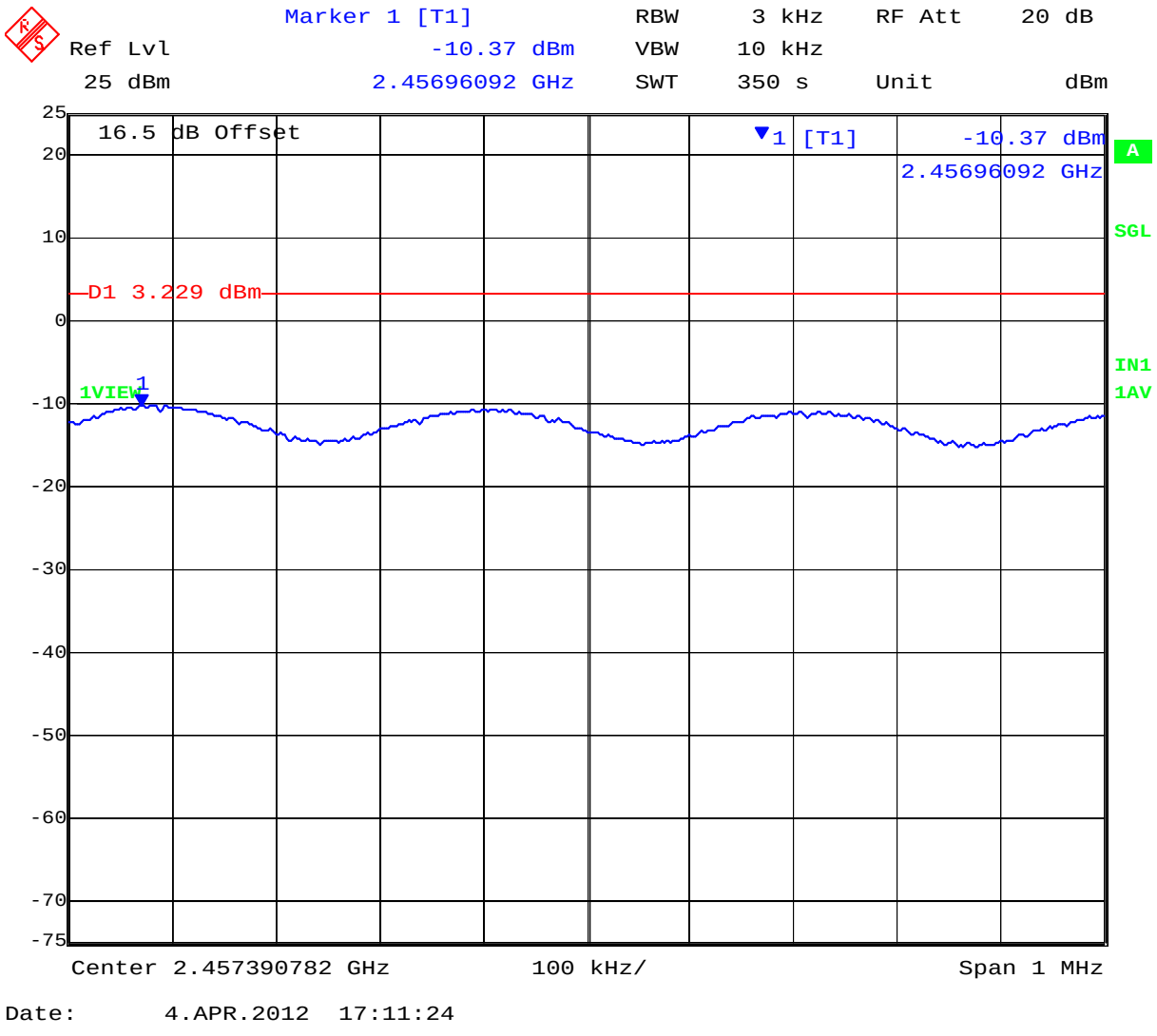


PORT A 2,462 MHz 802.11g Legacy - Peak Power Spectral Density



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

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



Peak Power Spectral Density

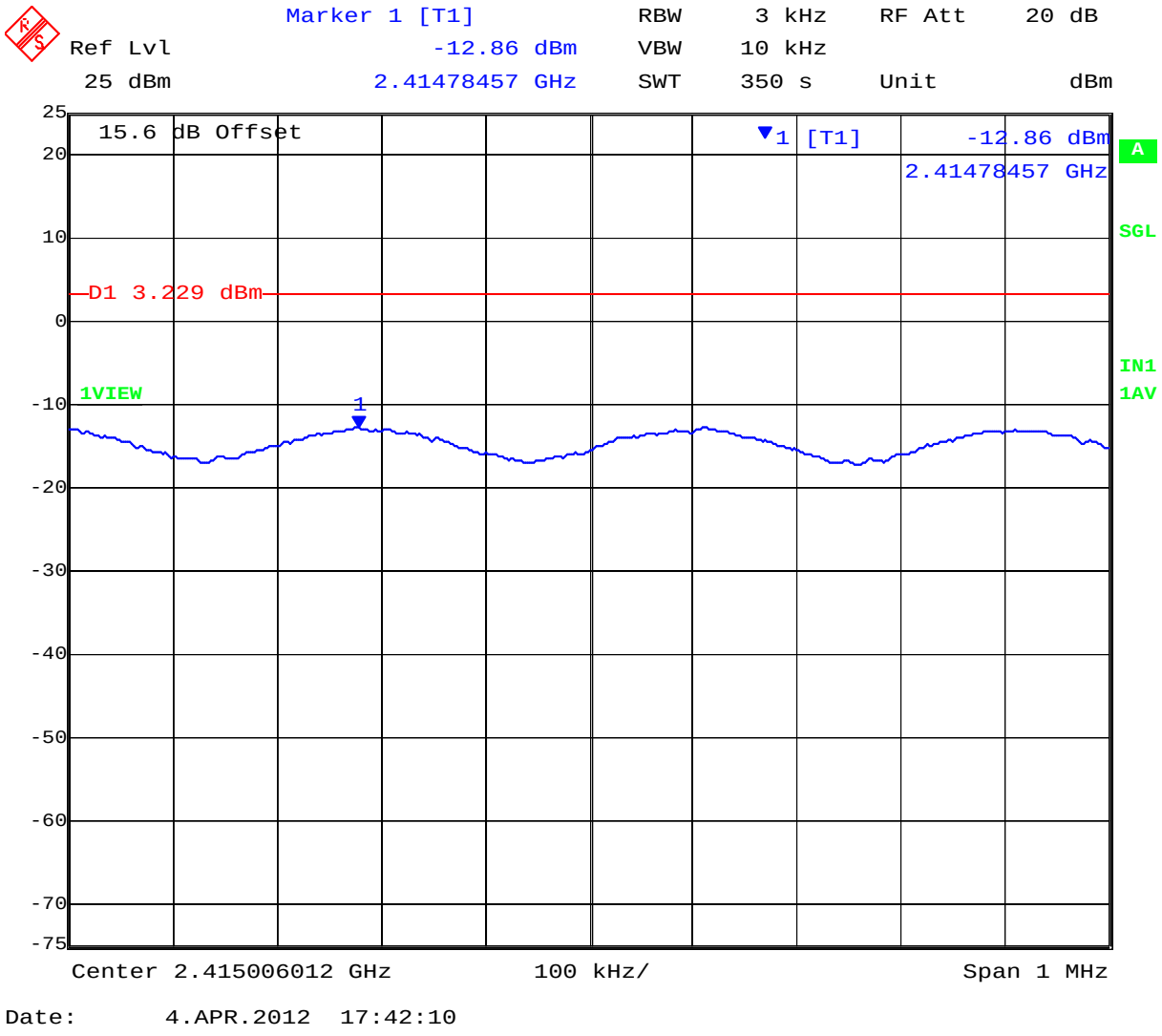
TABLE OF RESULTS – **802.11n HT-20**

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:**	N/A dBi
Applied Voltage:	48.00 Vdc	**Antenna Ports (N):**	3
Notes 1:			
Notes 2:			

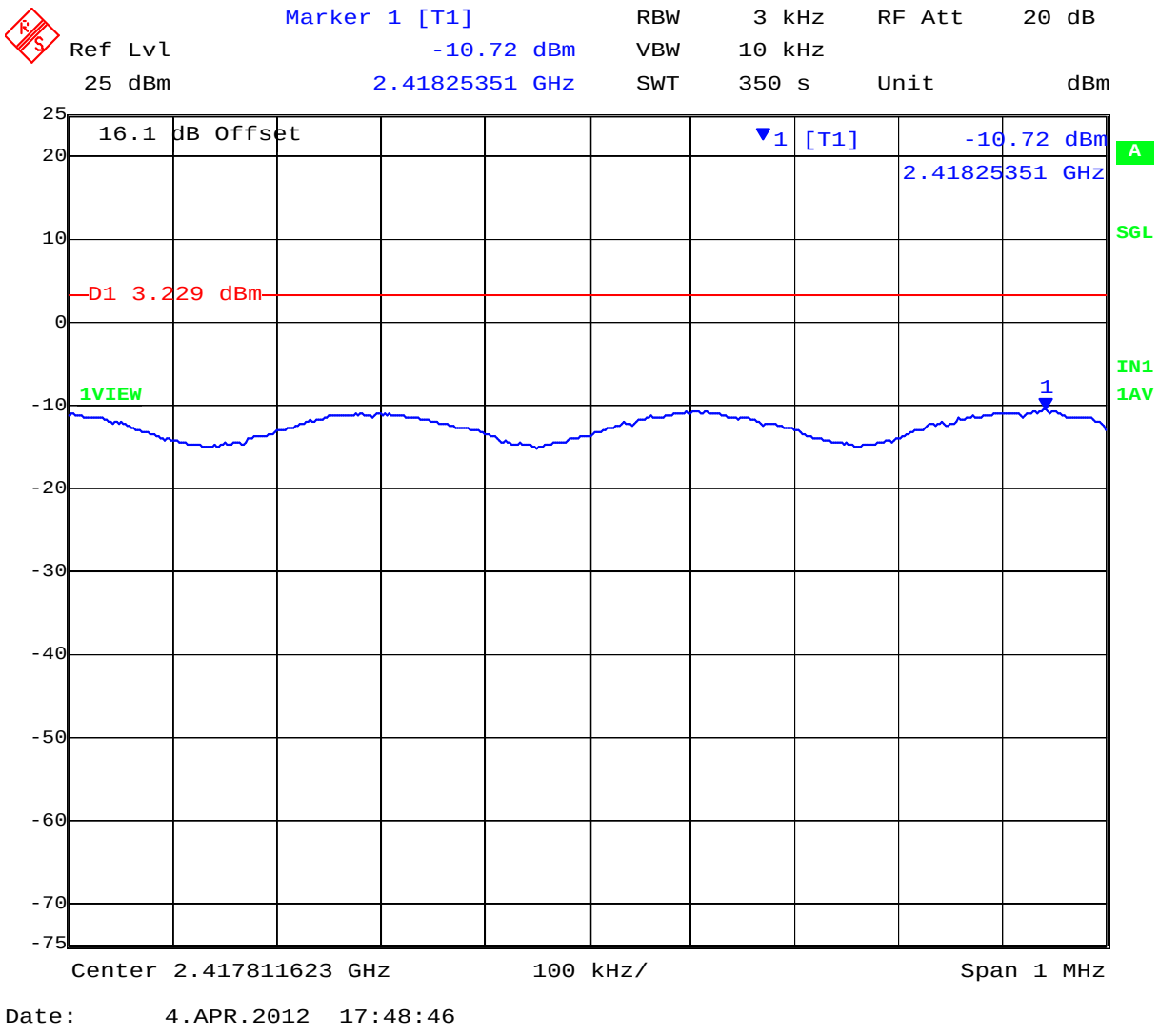
Test Frequency	Measured Power Density RF Port (dBm)				Correction factor	Maximum Peak Power Spectral Density	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
2412.000	-12.86	-10.72	-10.23	--	4.77	-10.23	3.23	-13.46
2437.000	-10.54	-11.90	-11.74	--	4.77	-10.54	3.23	-13.77
2462.000	-10.94	-12.44	-11.21	--	4.77	-10.94	3.23	-14.17

Measurement uncertainty:	± 1.33 dB

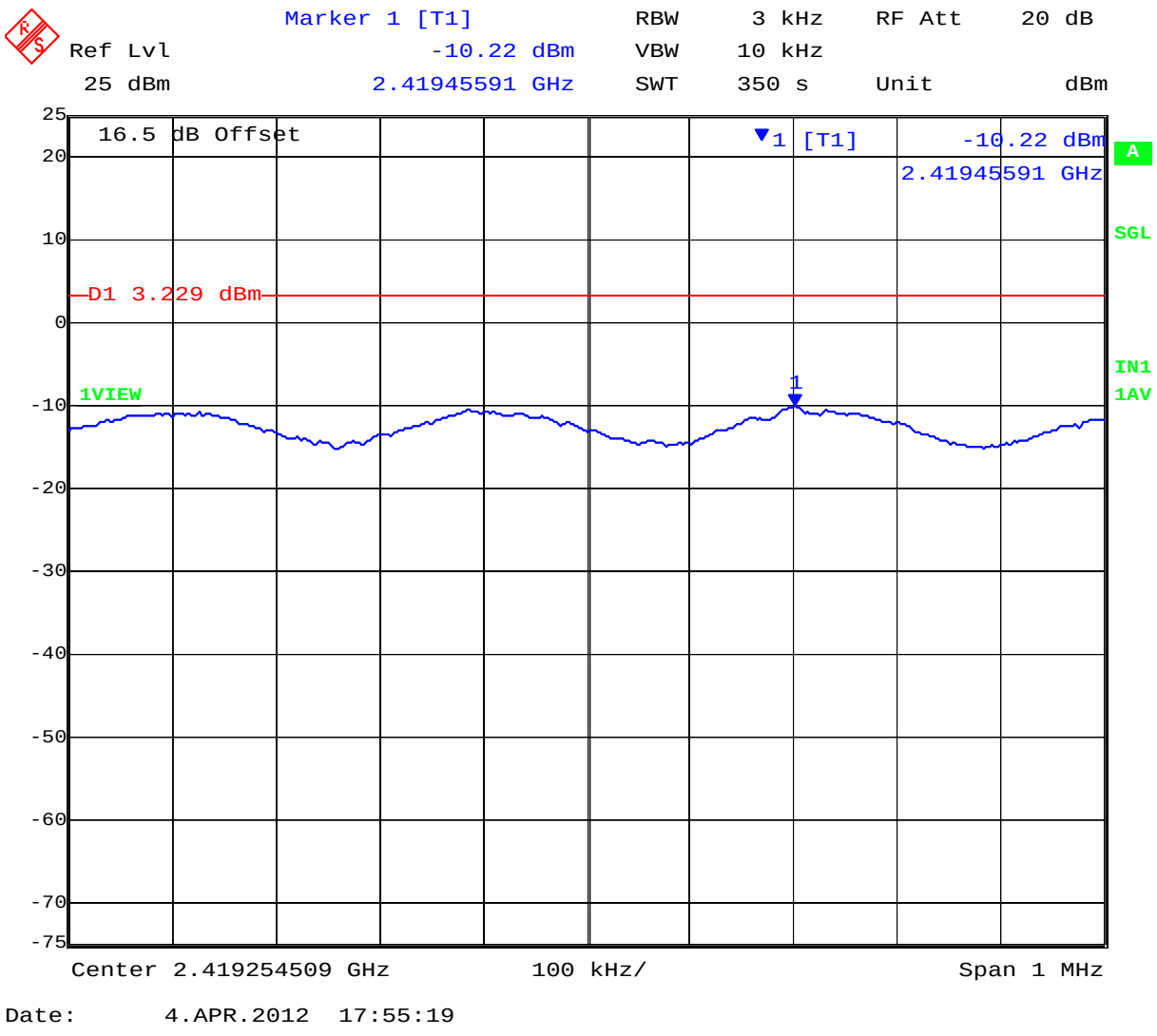
PORT A 2,412 MHz 802.11n HT-20 - Peak Power Spectral Density



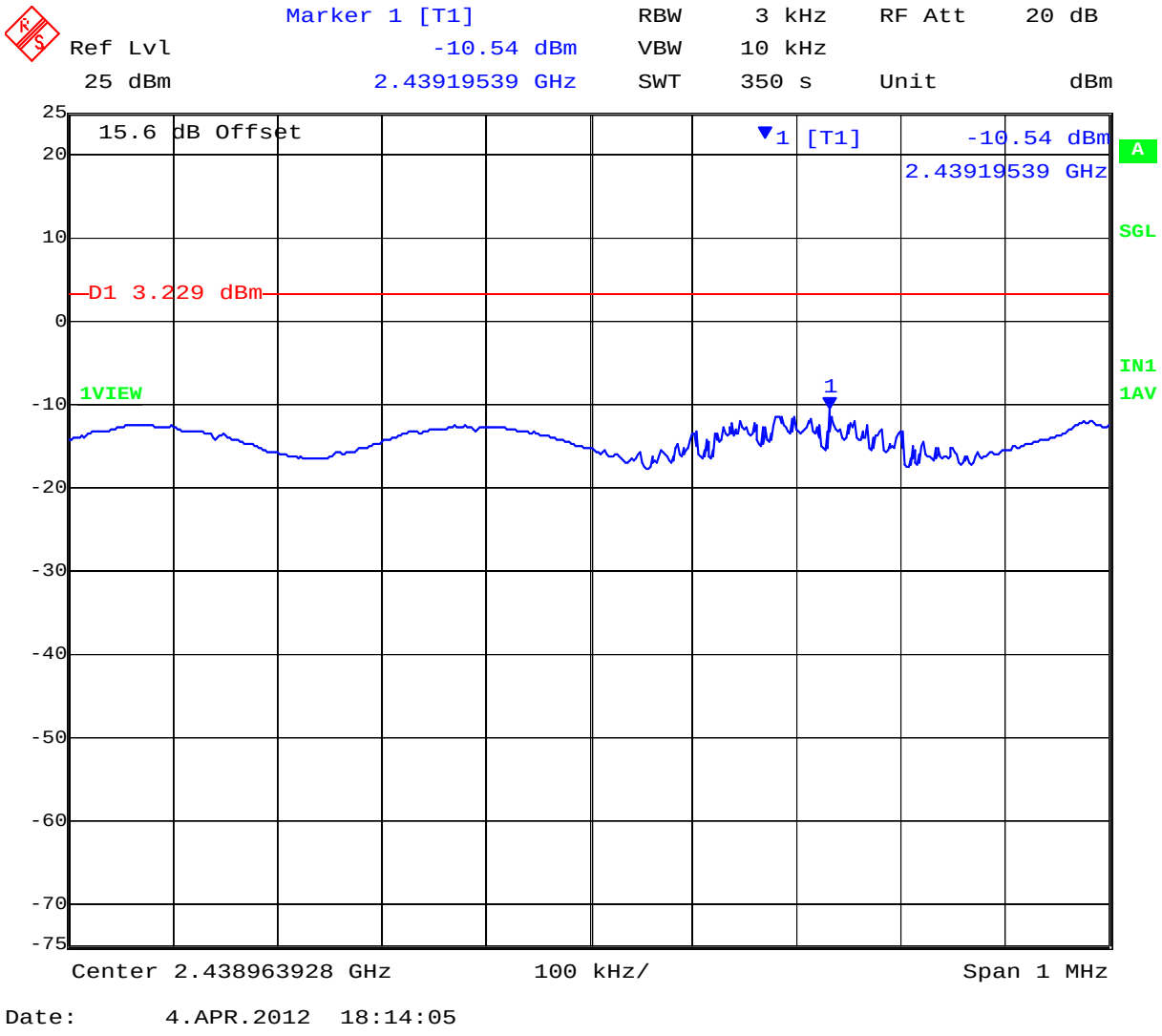
PORT B 2,412 MHz 802.11n HT-20 - Peak Power Spectral Density



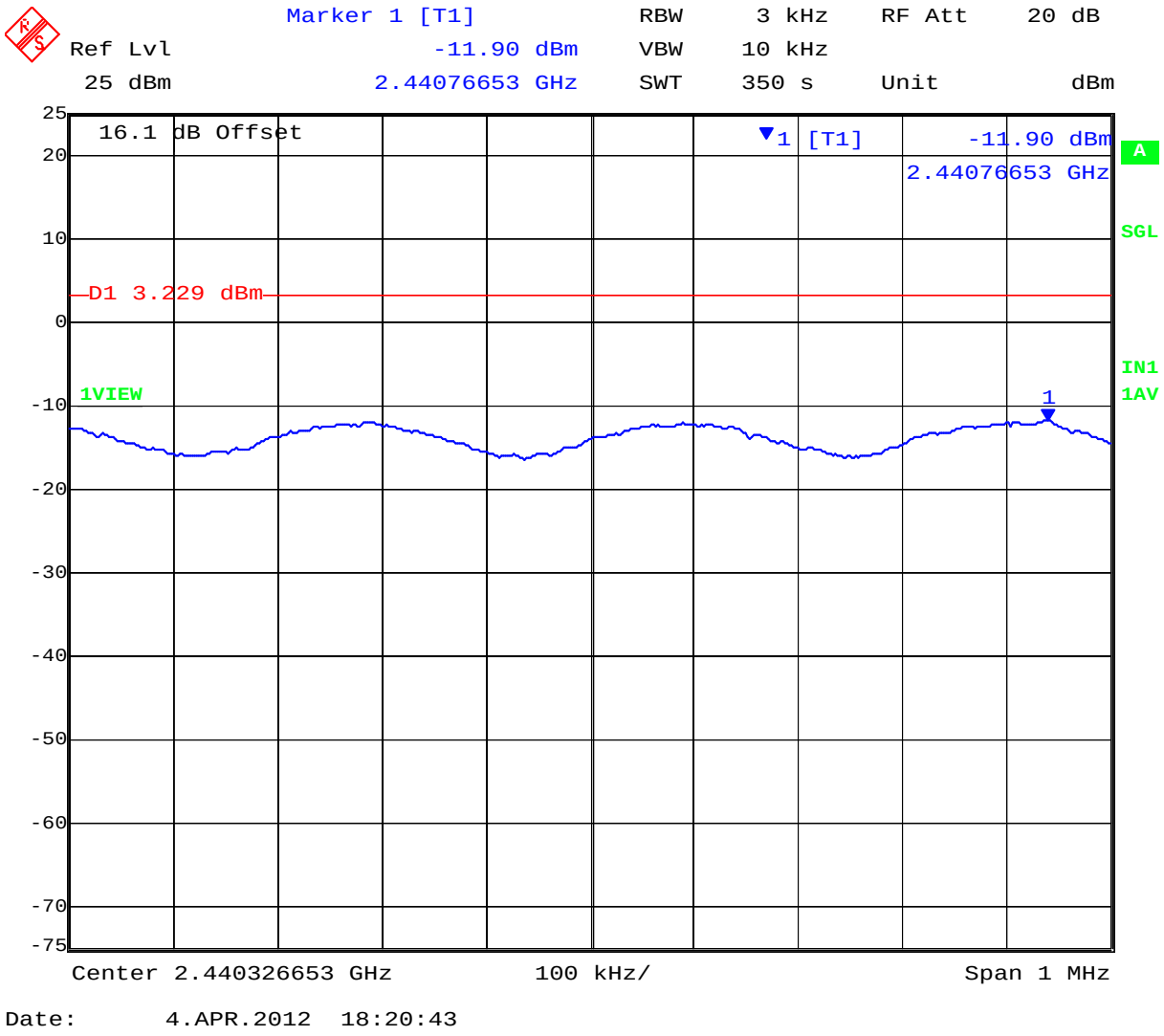
PORT C 2,412 MHz 802.11n HT-20 - Peak Power Spectral Density



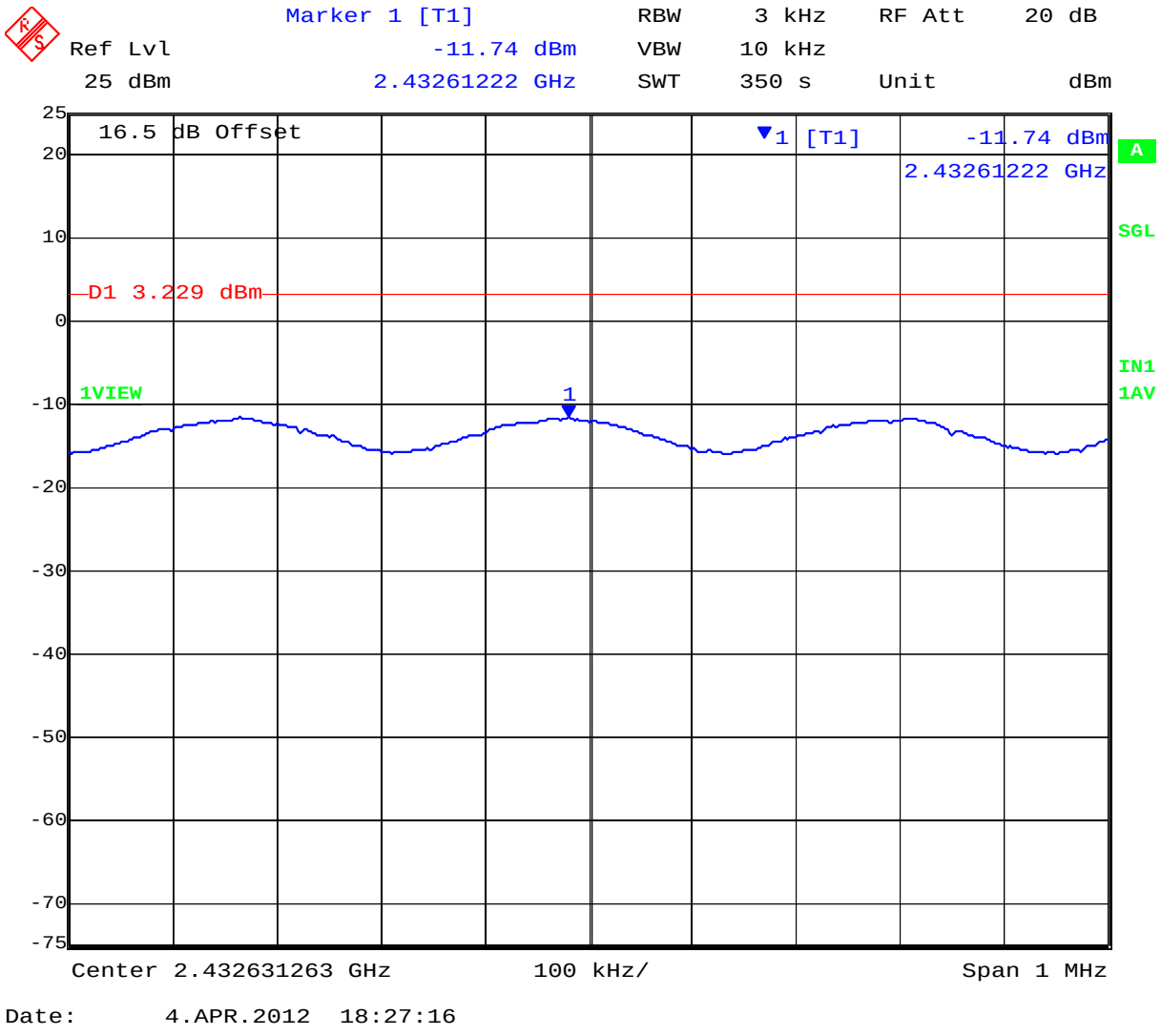
PORT A 2,437 MHz 802.11n HT-20 - Peak Power Spectral Density



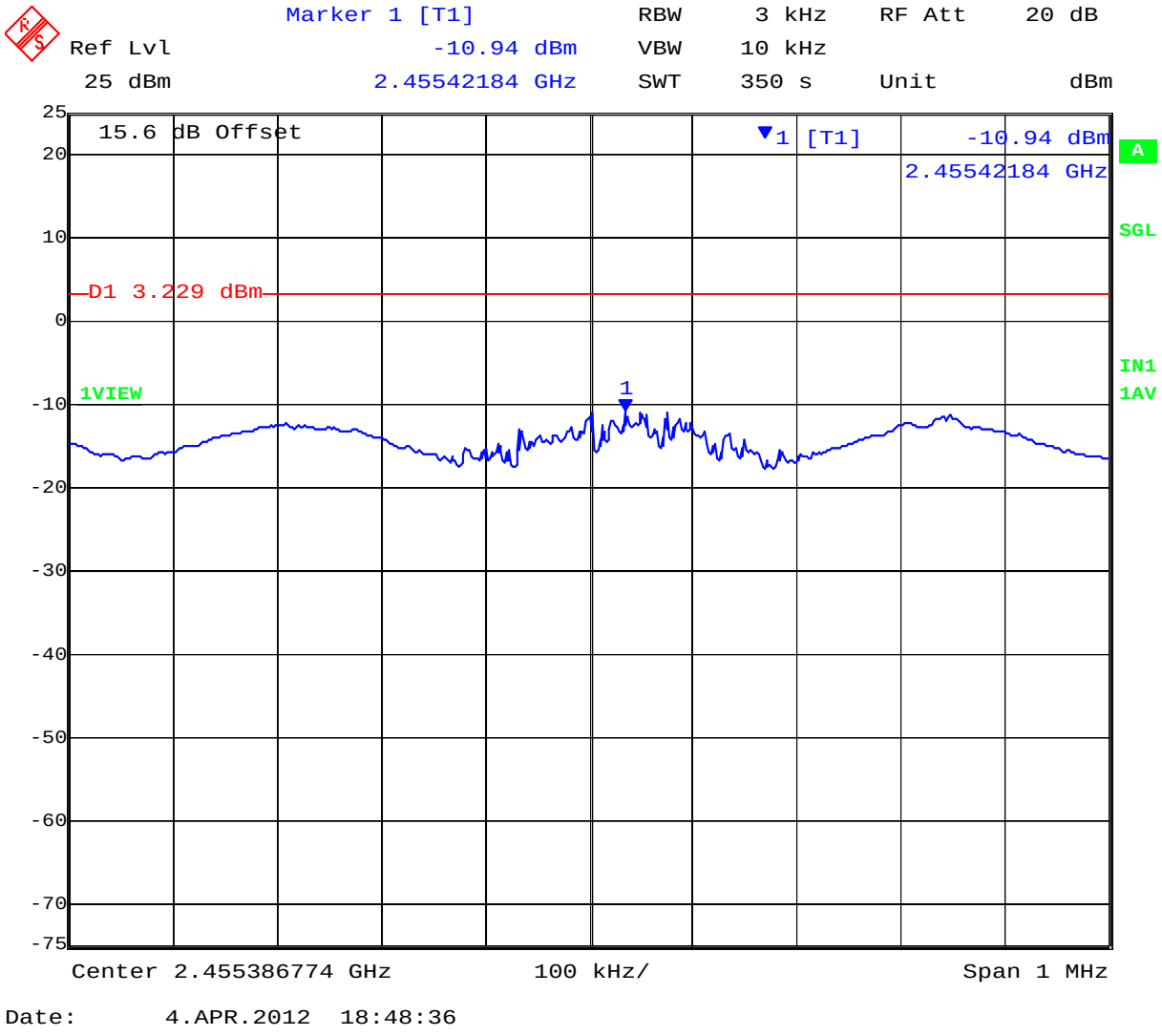
PORT B 2,437 MHz 802.11n HT-20 - Peak Power Spectral Density



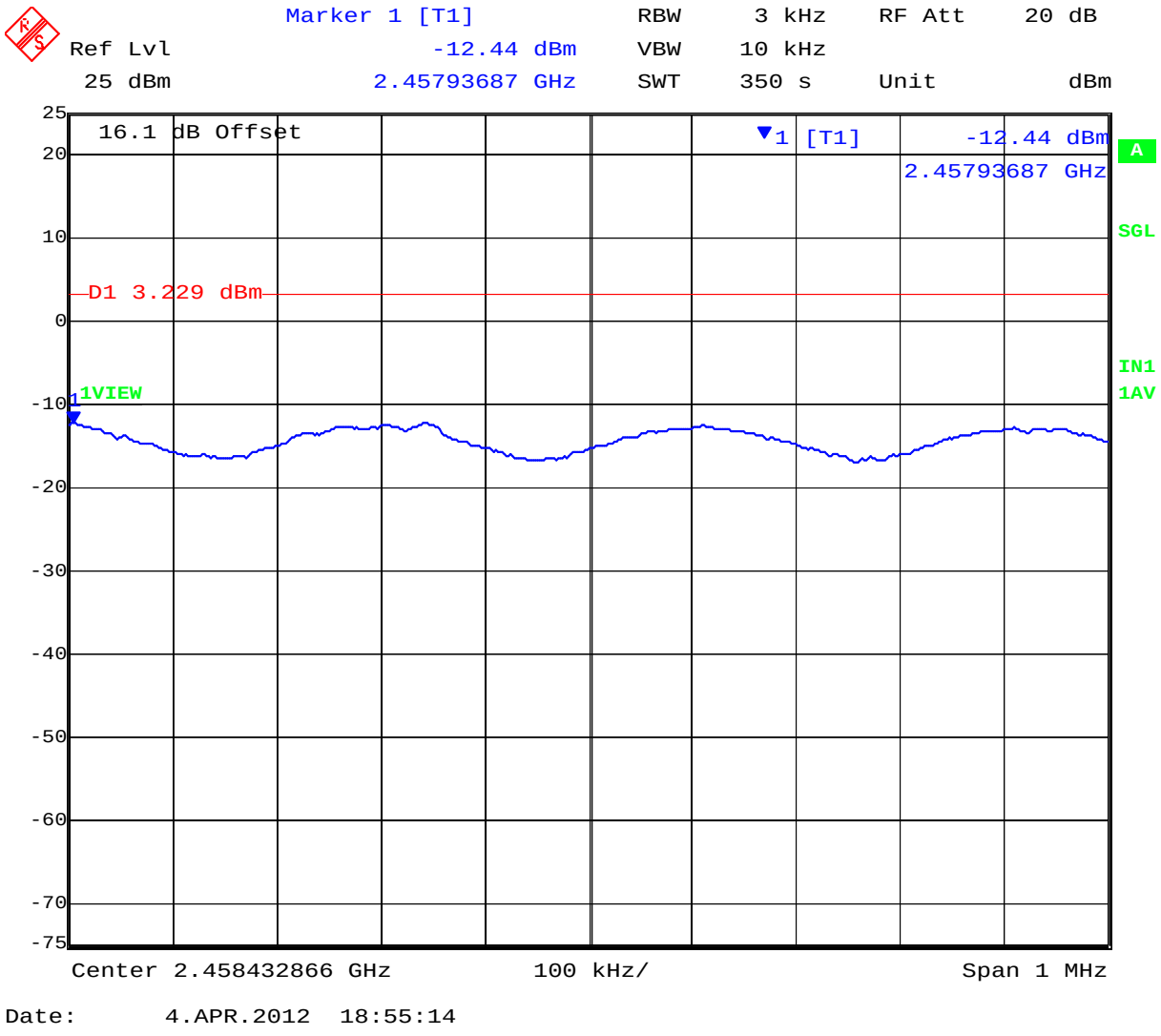
PORT C 2,437 MHz 802.11n HT-20 - Peak Power Spectral Density



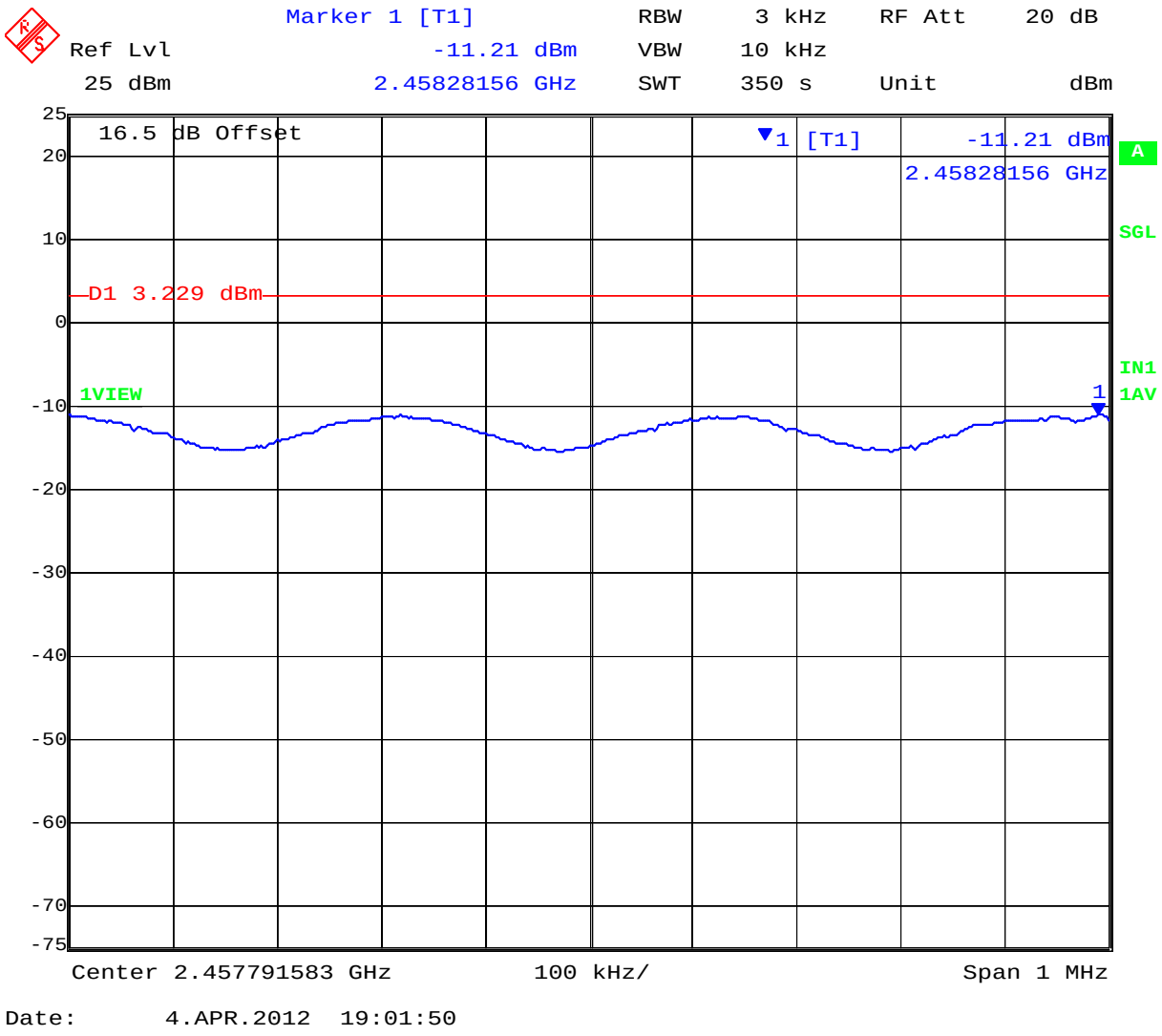
PORT A 2,462 MHz 802.11n HT-20 - Peak Power Spectral Density



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



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



Peak Power Spectral Density

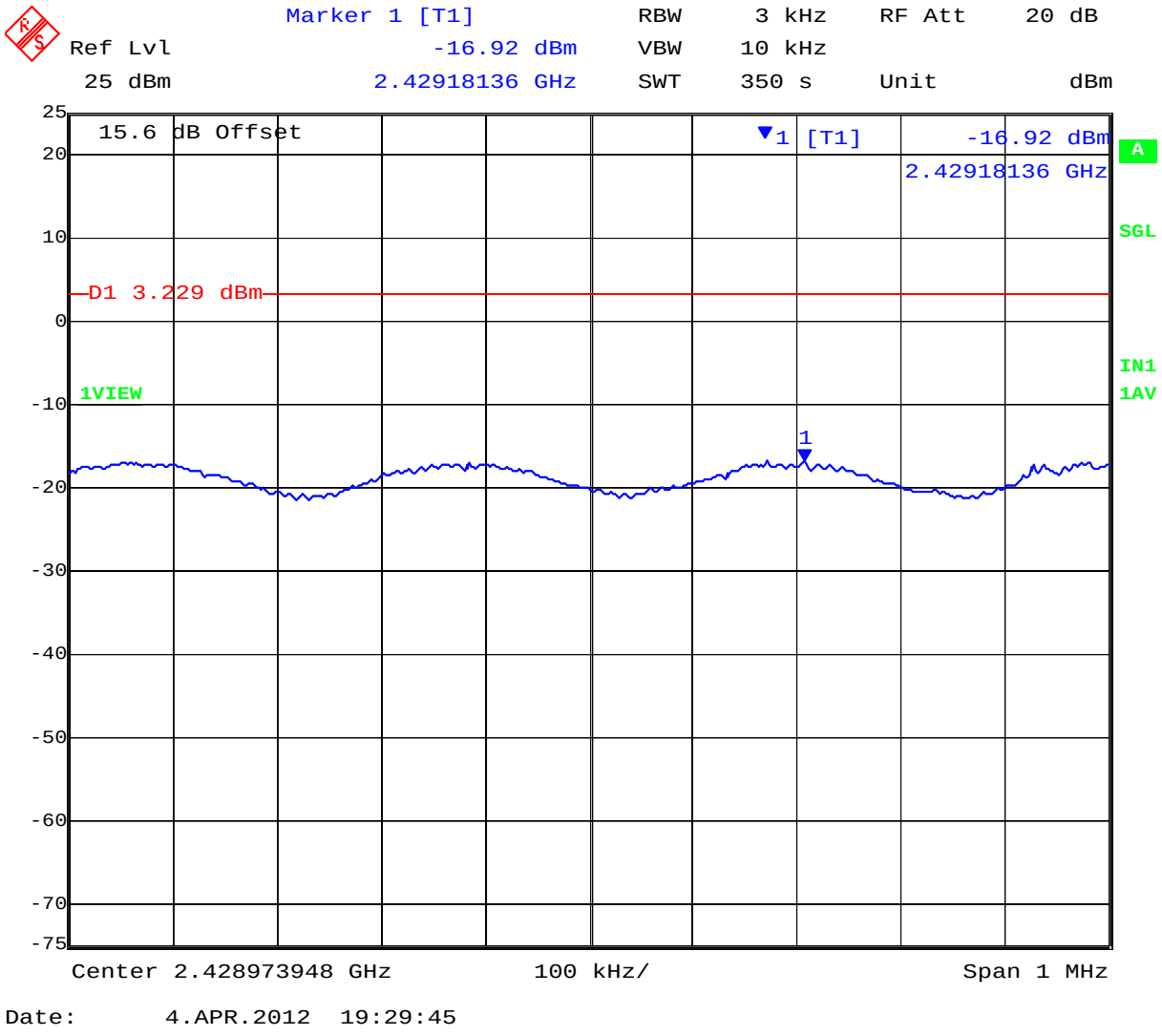
TABLE OF RESULTS – **802.11n HT-40**

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:**	N/A dBi
Applied Voltage:	48.00 Vdc	**Antenna Ports (N):**	3
Notes 1:			
Notes 2:			

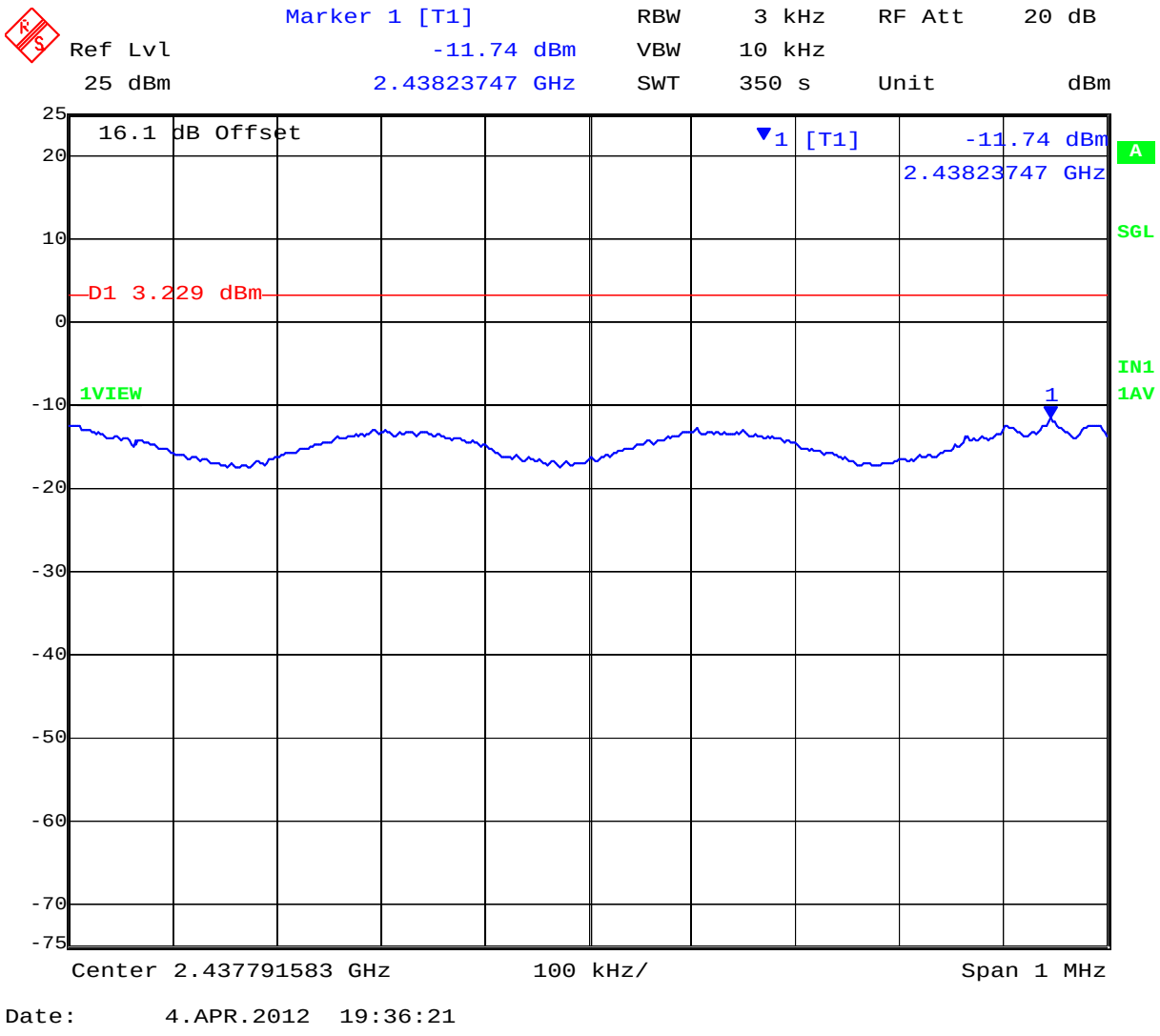
Test Frequency	Measured Power Density RF Port (dBm)				Correction factor	Maximum Peak Power Spectral Density	Limit	Margin
MHz	**a**	**b**	**c**	**d**	**10Log(N)**	**dBm**	**dBm**	**dB**
2422.000	-16.92	-11.74	-13.38	--	4.77	-11.74	3.23	-14.97
2437.000	-14.50	-14.97	-14.27	--	4.77	-14.27	3.23	-17.50
2452.000	-14.04	-13.15	-14.39	--	4.77	-13.15	3.23	-16.38

Measurement uncertainty:	± 1.33 dB

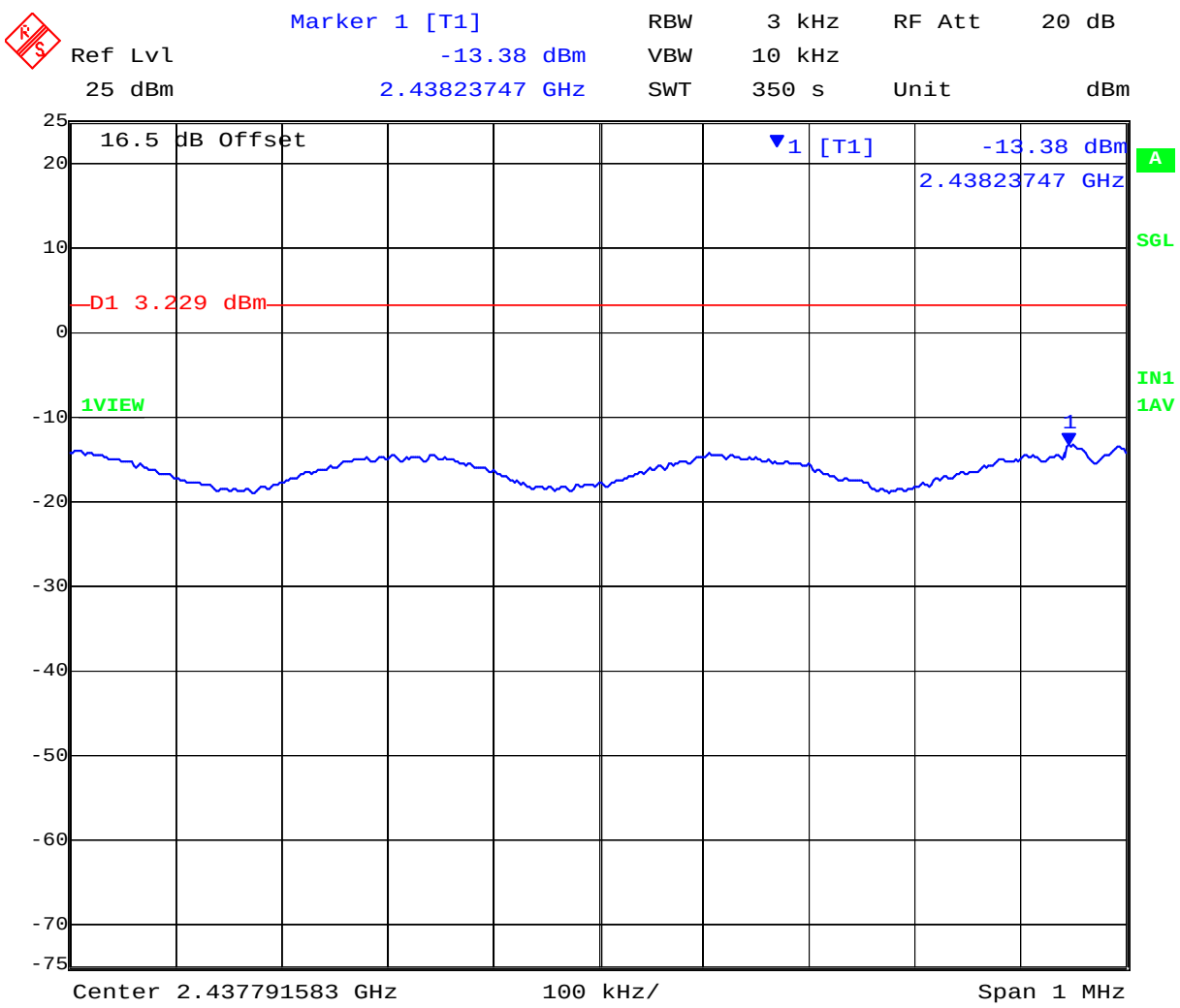
PORT A 2,422 MHz 802.11n HT-40 - Peak Power Spectral Density



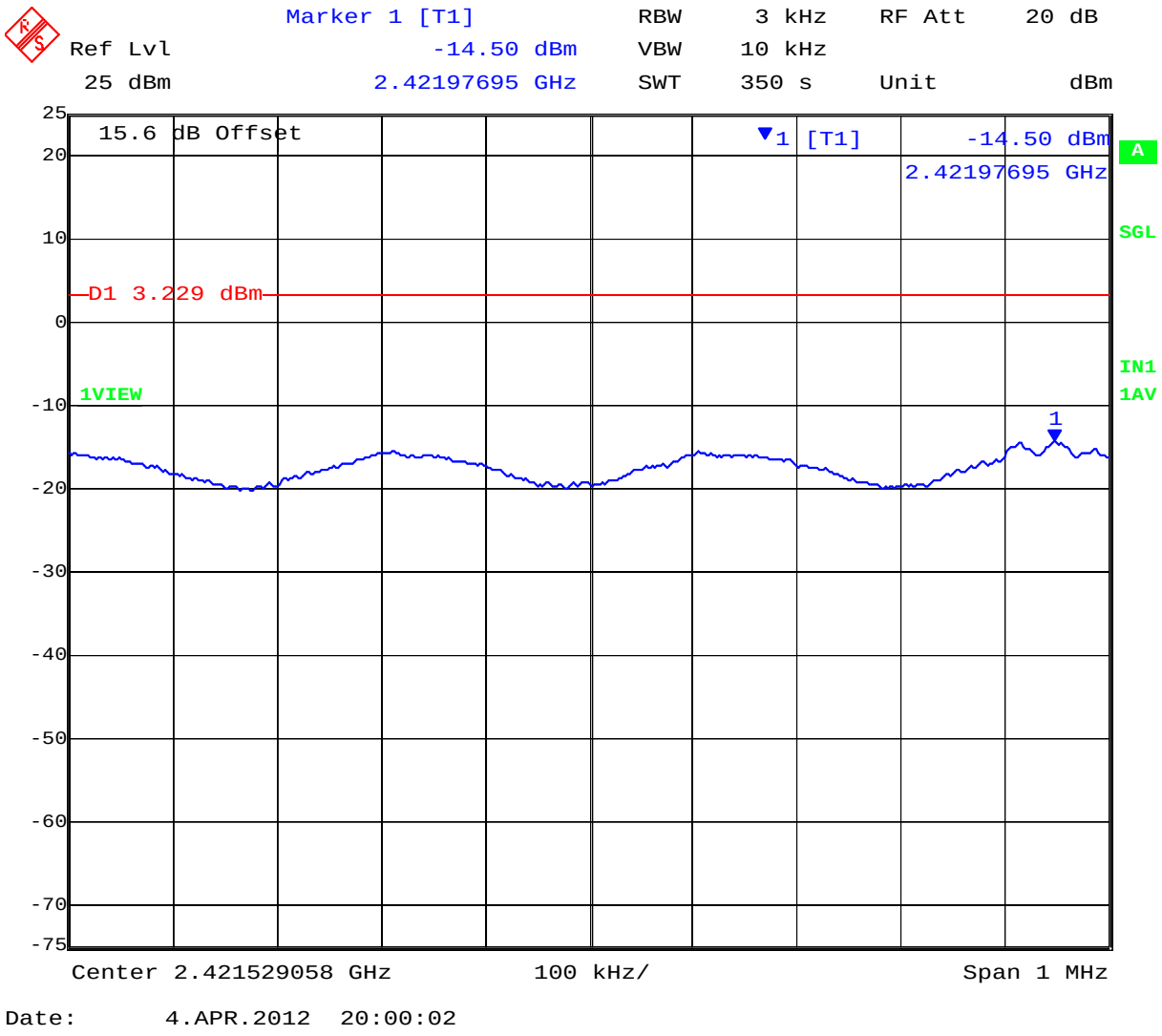
PORT B 2,422 MHz 802.11n HT-40 - Peak Power Spectral Density



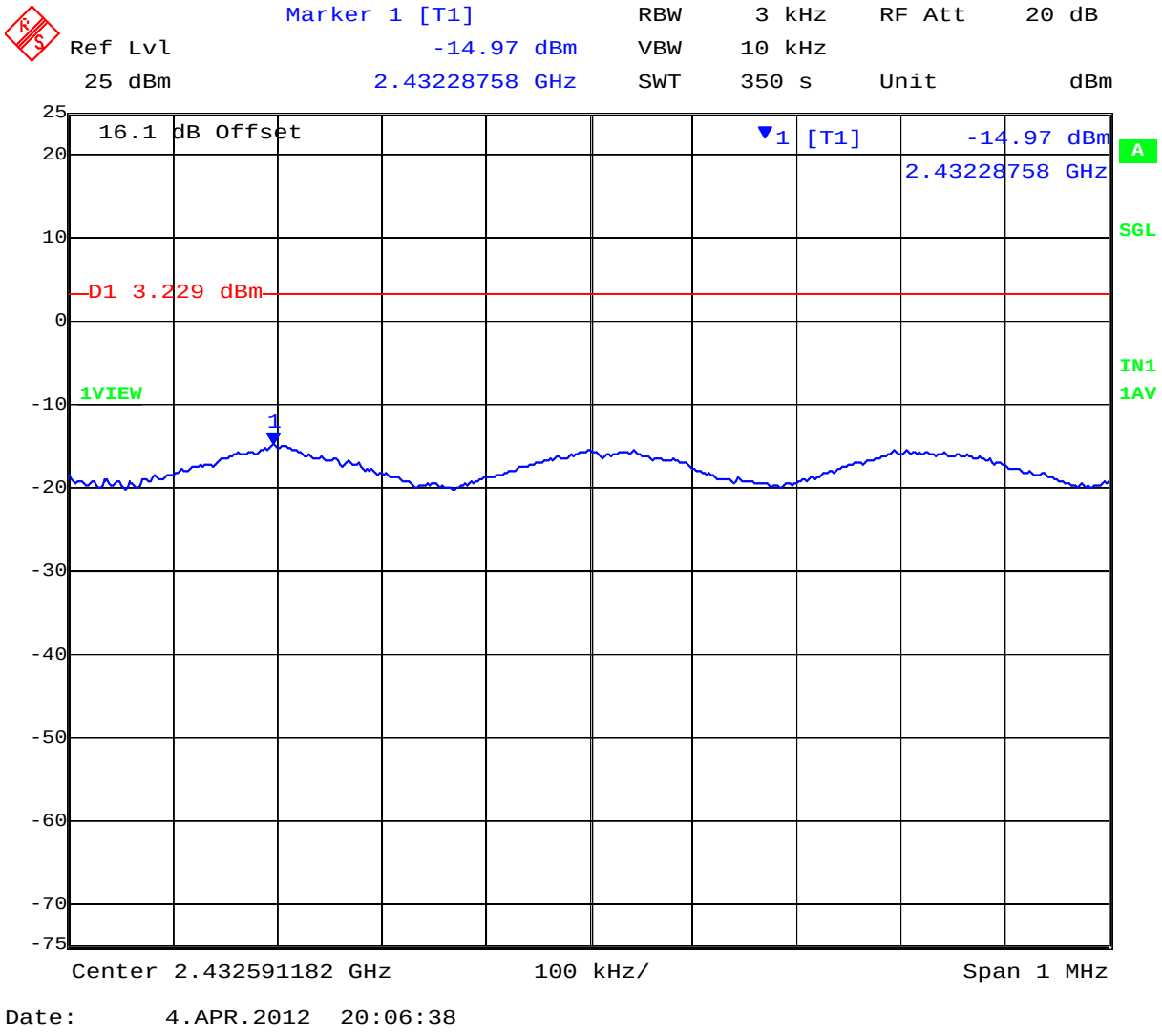
PORT C 2,422 MHz 802.11n HT-40 - Peak Power Spectral Density



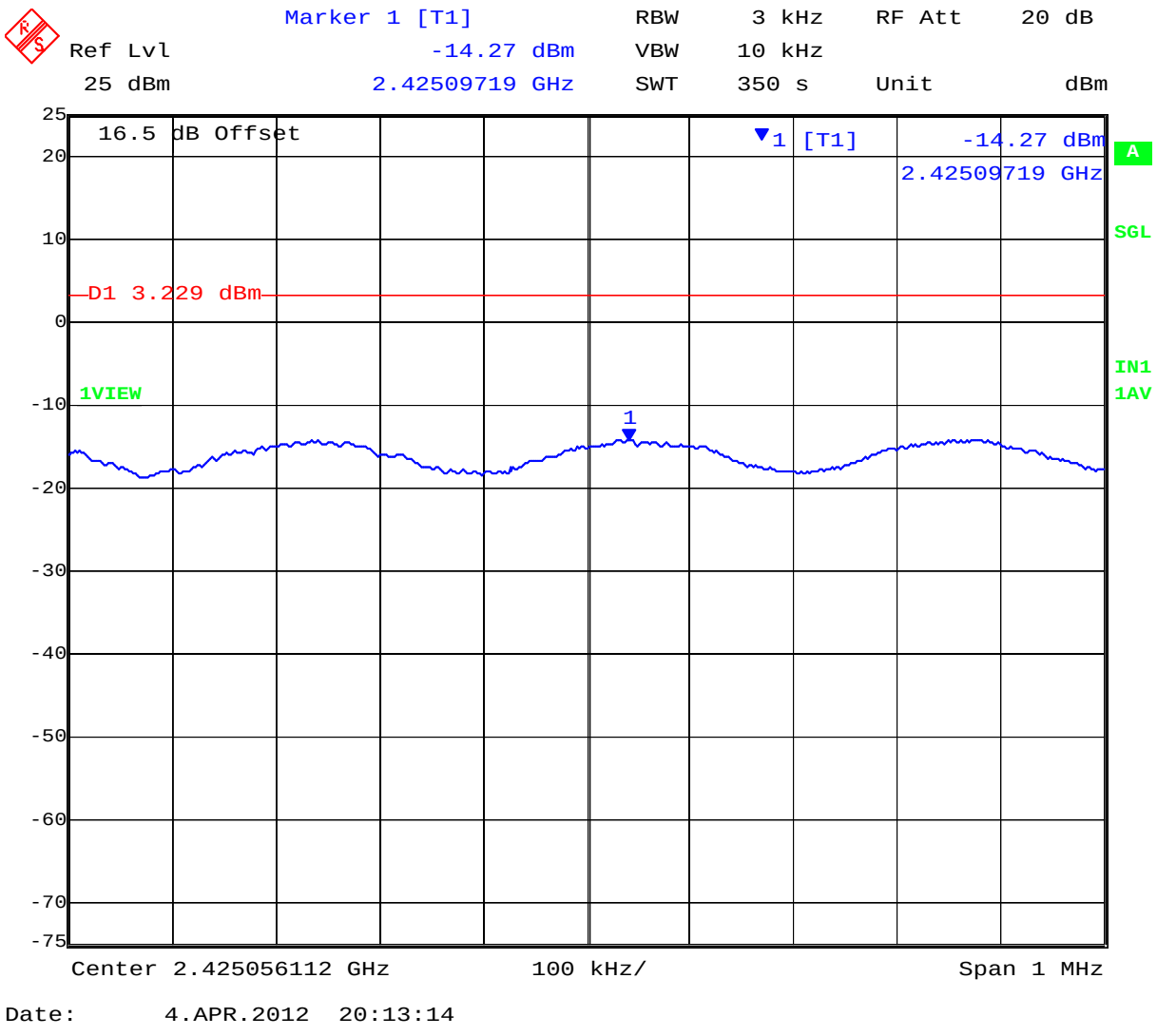
PORT A 2,437 MHz 802.11n HT-40 - Peak Power Spectral Density



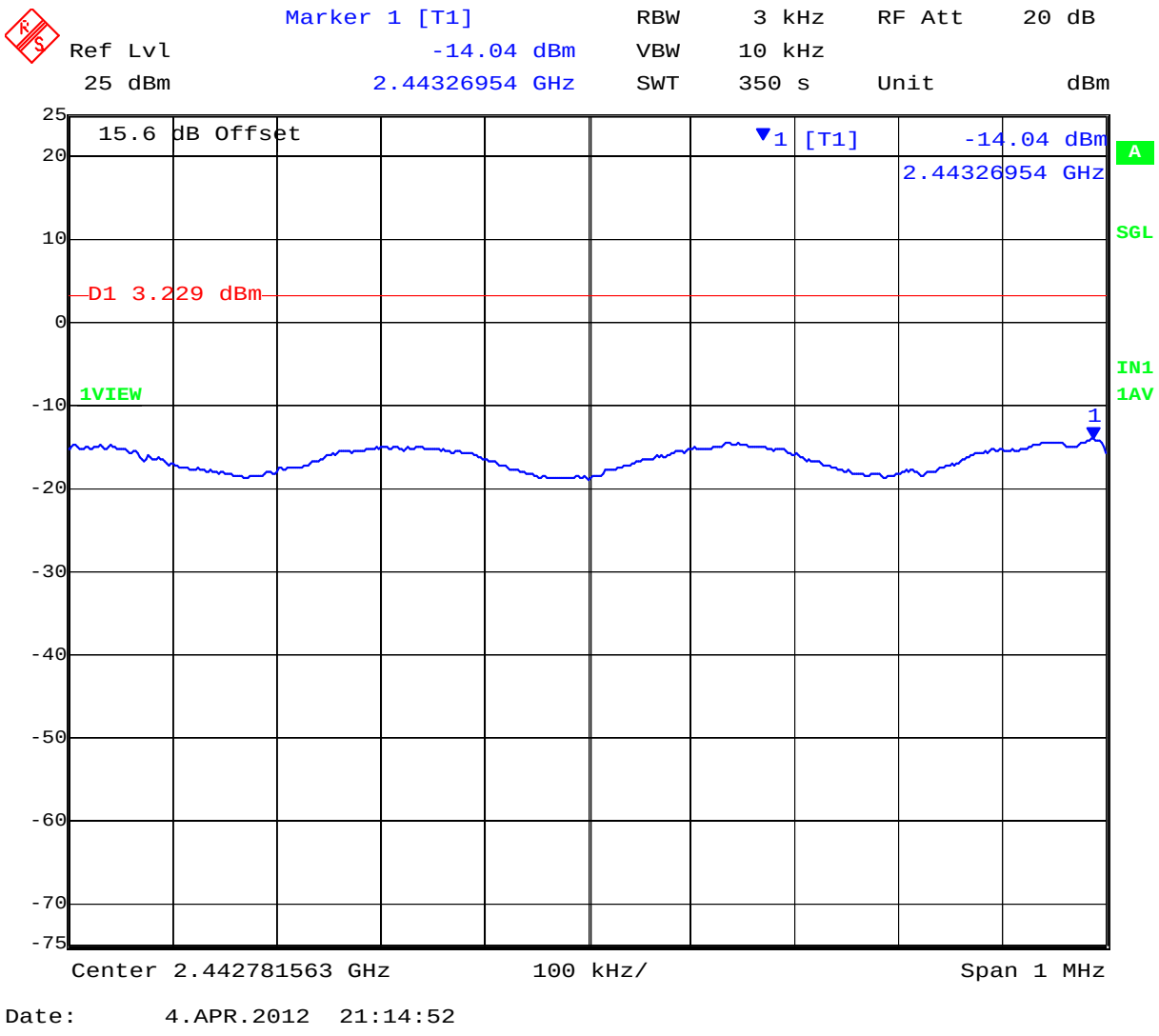
PORT B 2,437 MHz 802.11n HT-40 - Peak Power Spectral Density



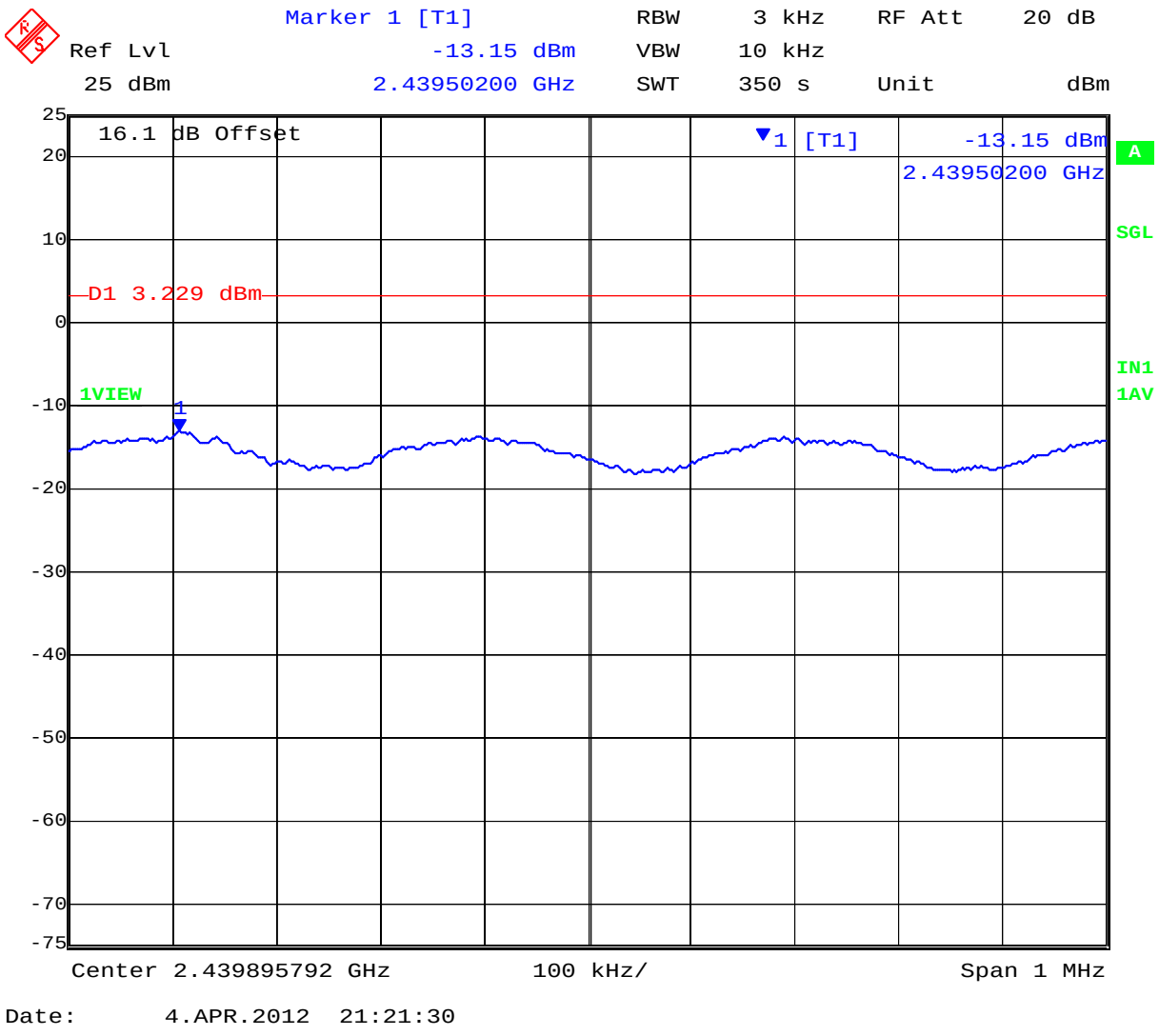
PORT C 2,437 MHz 802.11n HT-40 - Peak Power Spectral Density



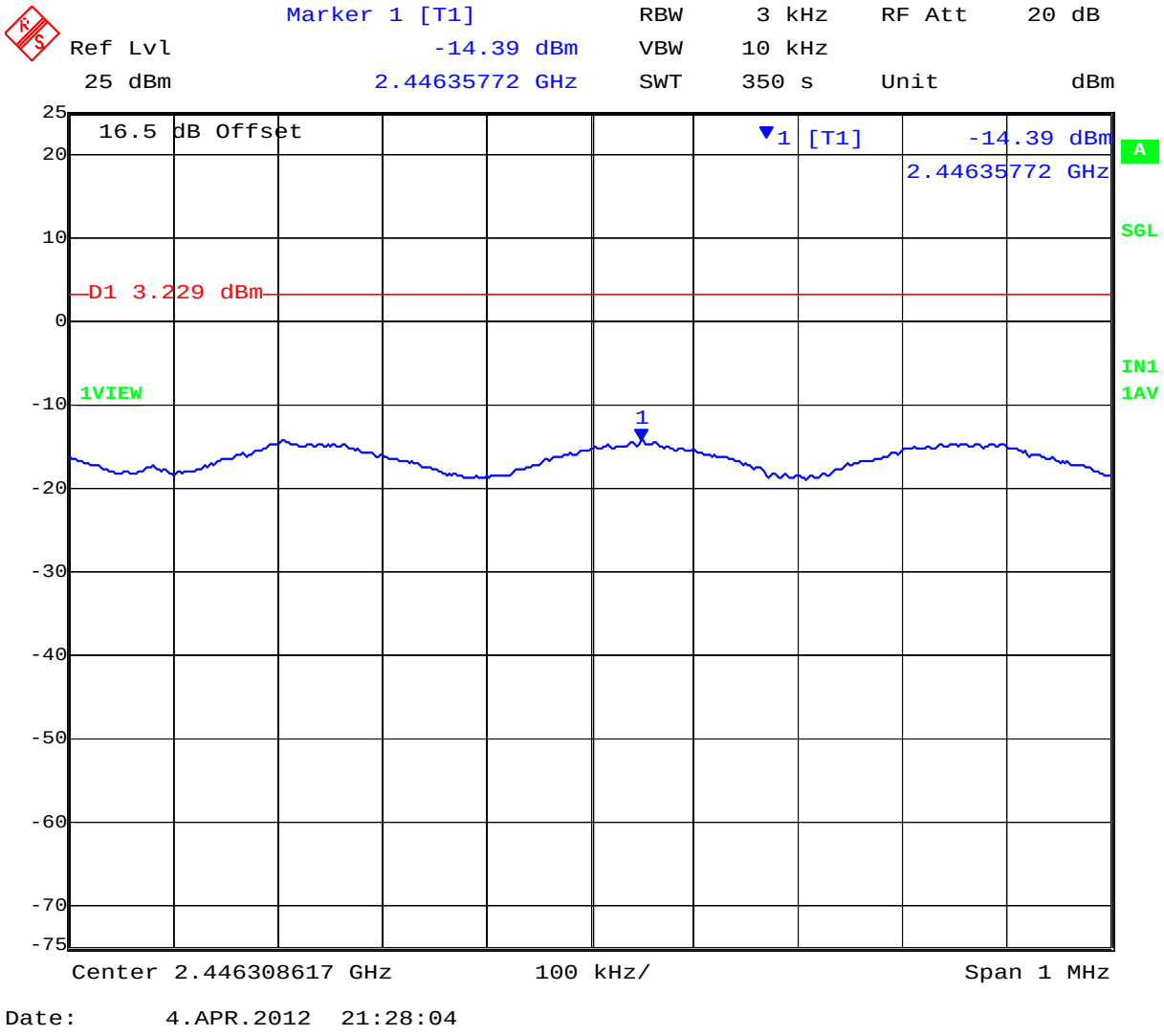
PORT A 2,452 MHz 802.11n HT-40 - Peak Power Spectral Density



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



PORT C 2,452 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 Wavion WBSn-2400 Wireless LAN Access Point has three transmitters in each frequency band. The peak power in the table below is calculated by assuming a worst case scenario where all transmitters are operating simultaneously on the same channel therefore the $\sum$ of all chain power was used to calculate MPE.

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)	Calculated Power Density @ 20cm (mW/cm^2)	Minimum Separation Distance (cm)
2.4 OMNI	7.4	5.5	+27.98	628.05	0.69	20.0*
2.4 SECTOR	12.0	15.8	+26.35	431.52	1.36	23.3

*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

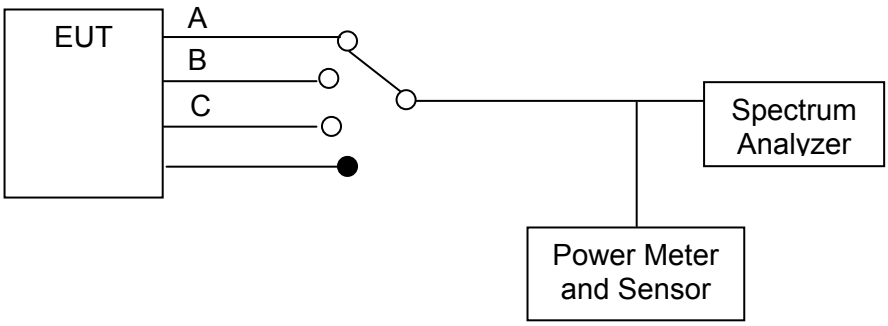
Measurement uncertainty	±1.33 dB

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 30 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	-56.59	-40.87	-56.59	-39.52	-56.59	-39.44		
2437.000	30.00	26000.00	-56.59	-40.51	-56.59	-39.76	-56.59	-39.40		
2462.000	30.00	26000.00	-56.59	-41.39	-56.59	-40.39	-56.59	-39.37		

SE: Maximum spurious emission found

Band-edge Measurement

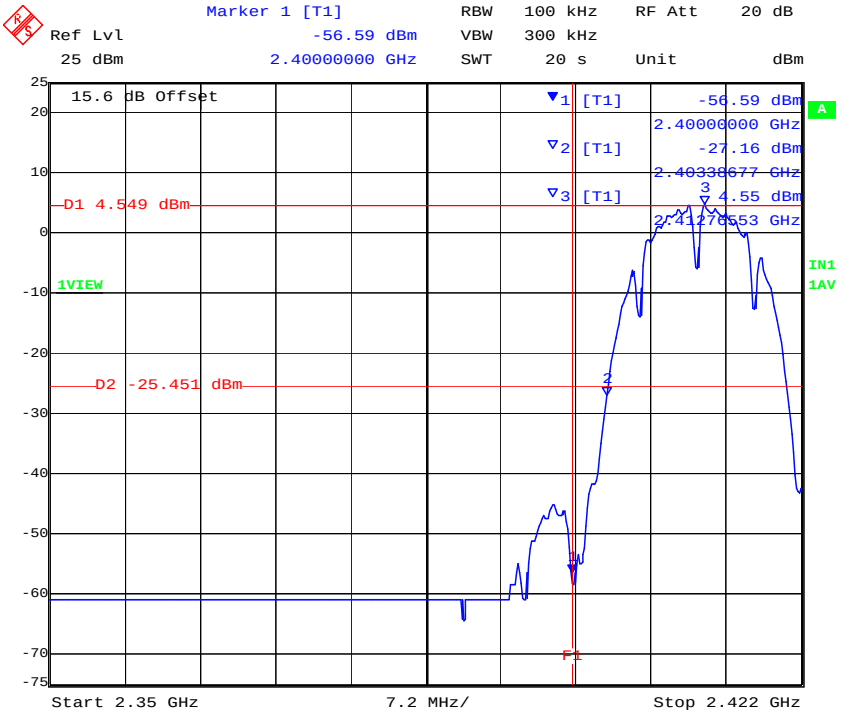
Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2412.000	2400.00	-56.59	-25.45	-56.59	-25.03	-55.00	-24.71		
2462.000	2483.50	-64.55	-27.02	-61.02	-26.02	-61.02	-24.69		

BE: Maximum Band edge emission found

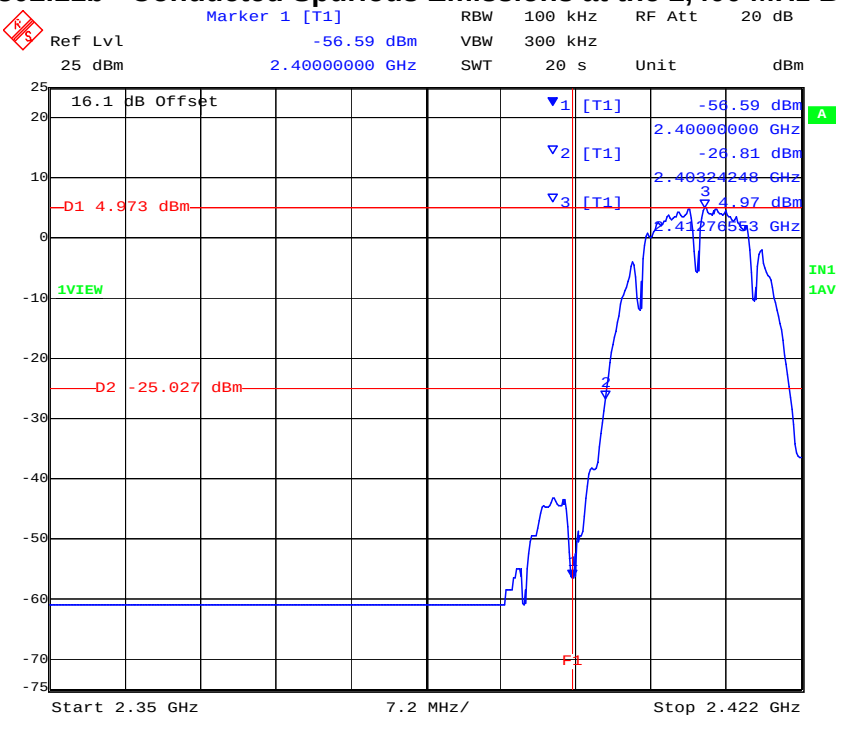
Measurement uncertainty:	±2.81 dB

Note: Limit is based on 30dB down from fundamental emission

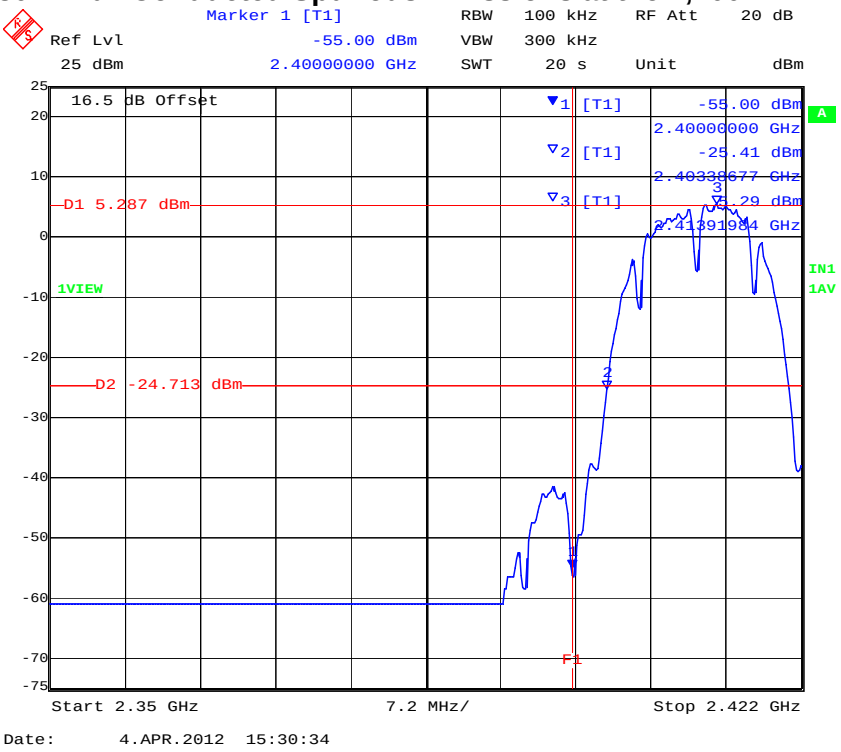
PORT A 802.11b - Conducted Spurious Emissions at the 2,400 MHz Band Edge



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

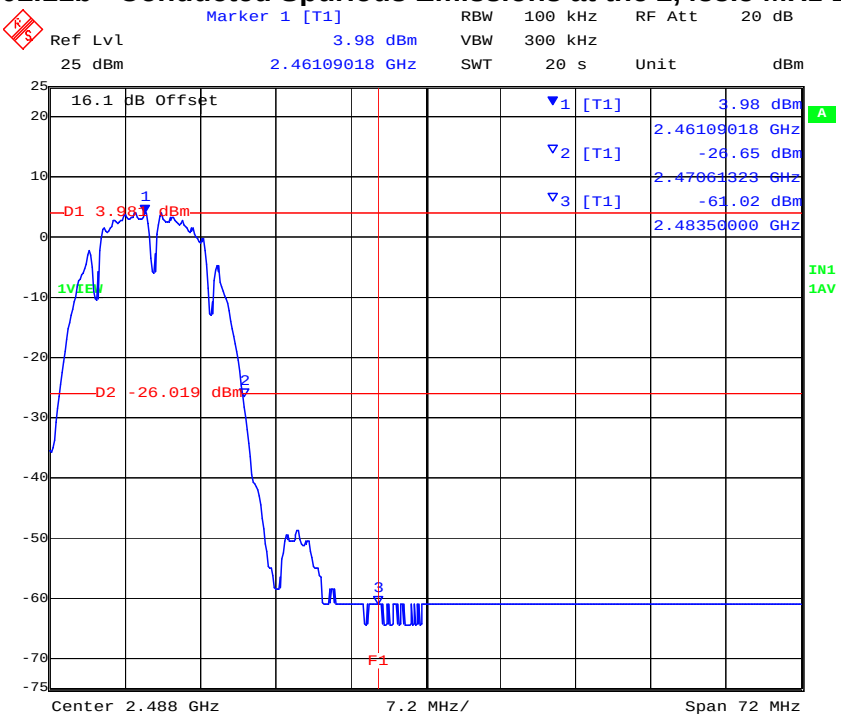


PORT C 802.11b - Conducted Spurious Emissions at the 2,400 MHz Band Edge

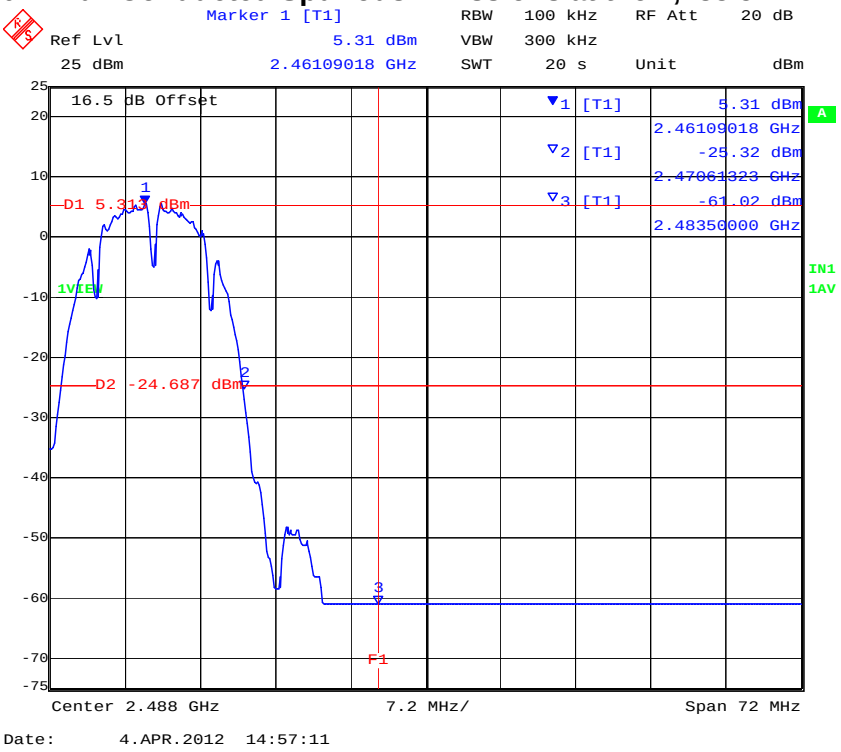


PORT A 802.11b - Conducted Spurious Emissions at the 2,483.5 MHz Band Edge

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

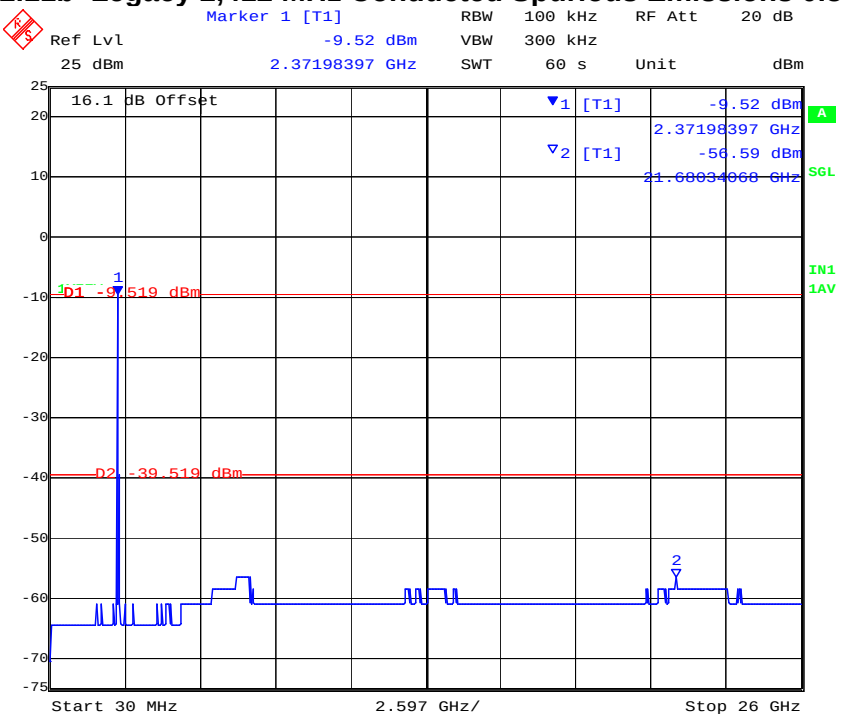


PORT C 802.11b - Conducted Spurious Emissions at the 2,483.5 MHz Band Edge

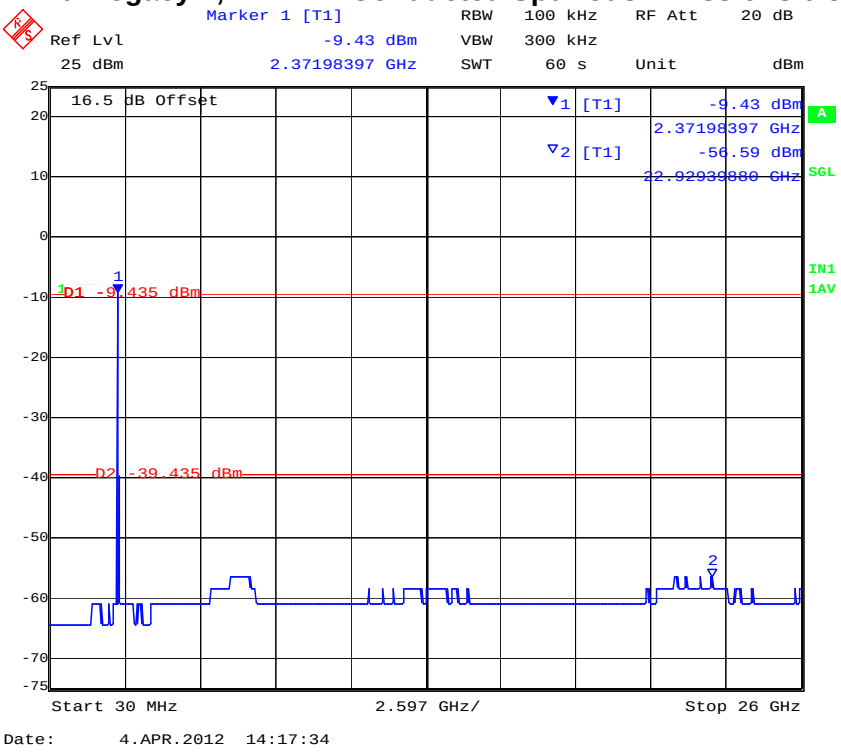


PORT A 802.11b–Legacy 2,412 MHz Conducted Spurious Emissions 0.30 to 26 GHz

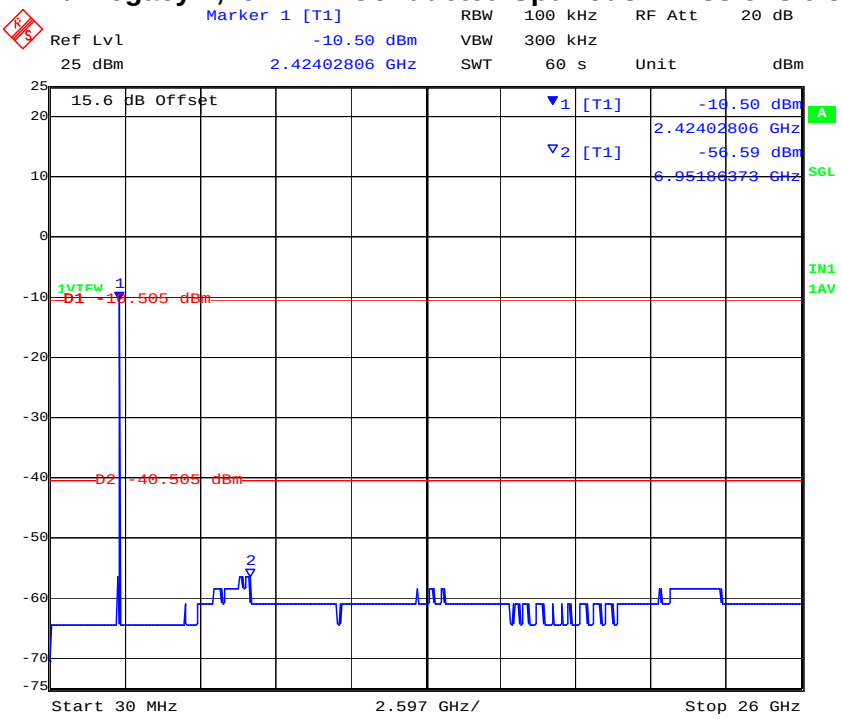
PORT B 802.11b–Legacy 2,412 MHz Conducted Spurious Emissions 0.30 to 26 GHz



PORT C 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

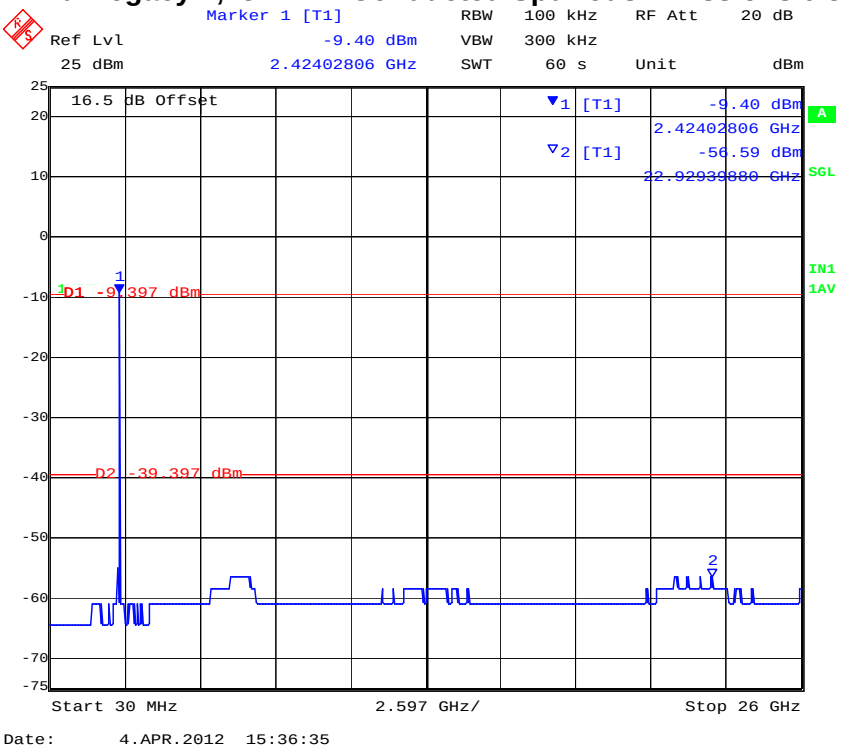


Date: 4.APR.2012 15:33:03

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

Date: 4.APR.2012 15:34:49

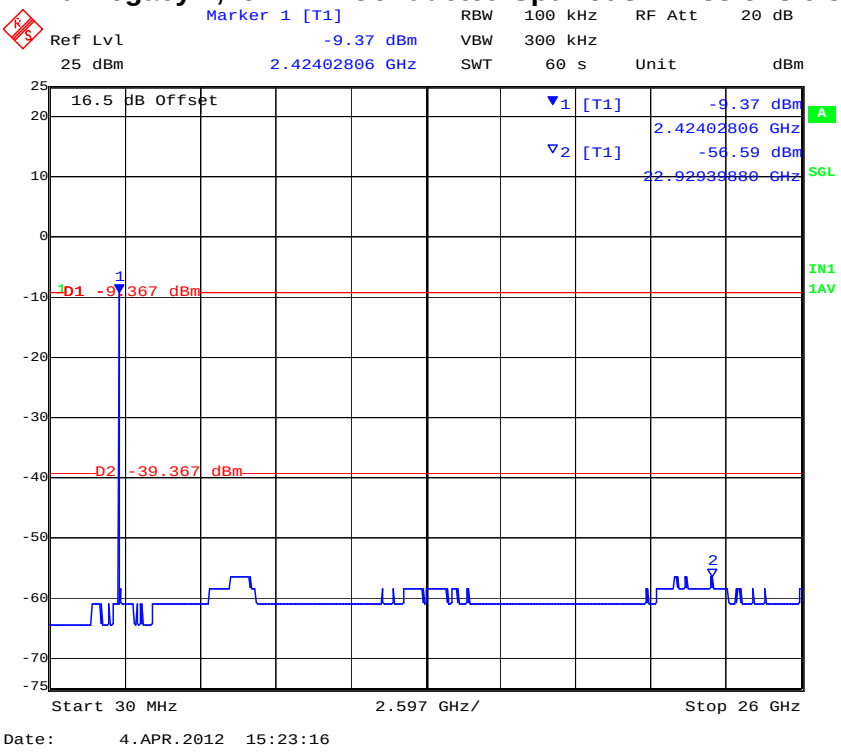
PORT C 802.11b–Legacy 2,437 MHz Conducted Spurious Emissions 0.30 to 26 GHz



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

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

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



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	-56.59	-40.05	-56.59	-38.90	-56.59	-38.65		
2437.000	30.00	26000.00	-56.59	-38.86	-56.59	-37.80	-56.59	-37.73		
2462.000	30.00	26000.00	-56.59	-39.91	-56.59	-38.74	-55.00	-38.15		

SE: Maximum spurious emission found

Band-edge Measurement

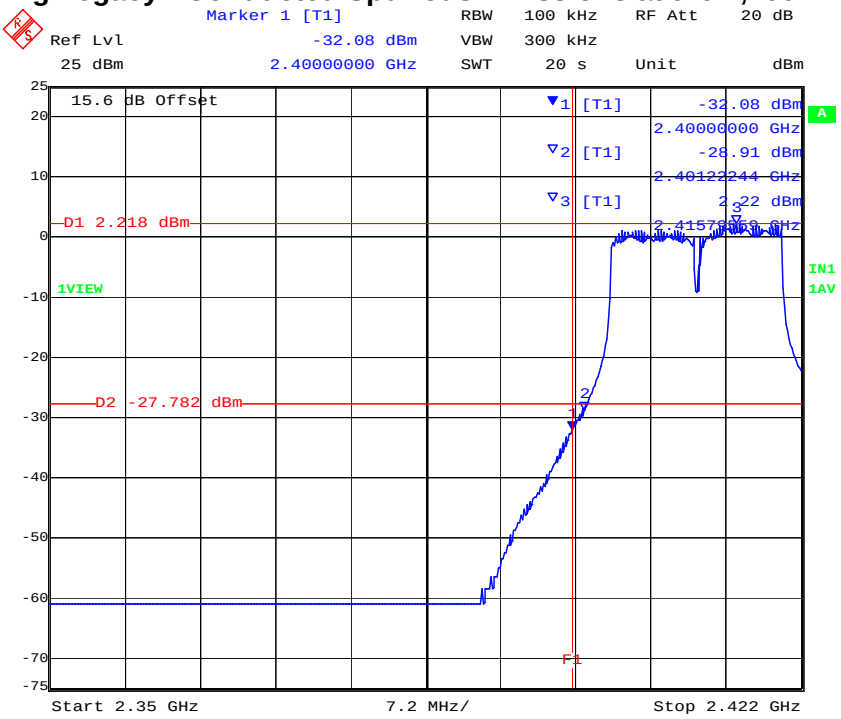
Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2412.000	2400.00	-32.08	-27.78	-29.43	-26.35	-28.15	-25.79		
2462.000	2483.50	-61.02	-27.69	-61.02	-26.75	-61.02	-26.17		

BE: Maximum Band edge emission found

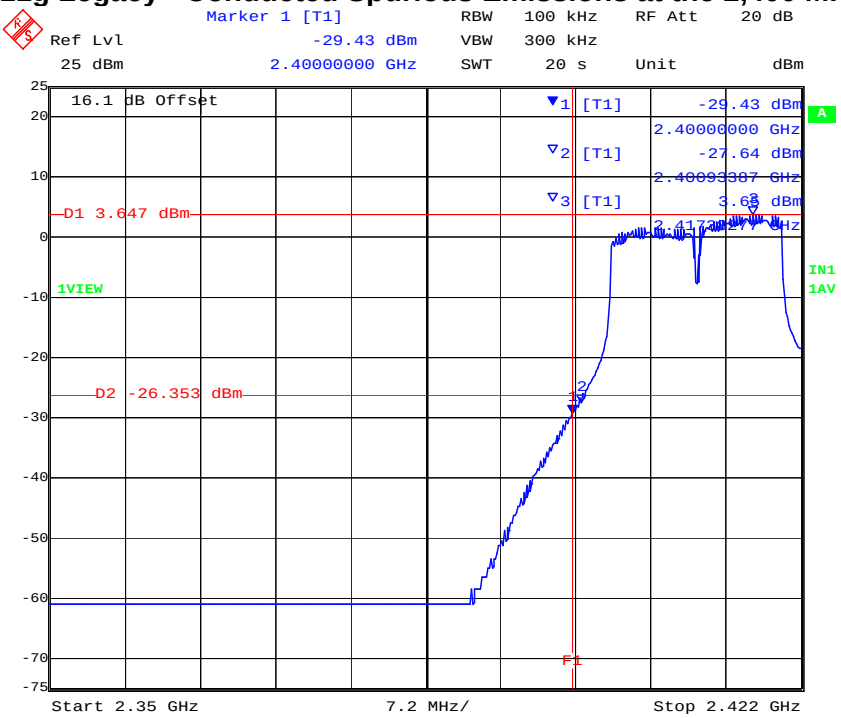
Measurement uncertainty:	±2.81 dB

Note: Limit is based on 30dB down from fundamental emission

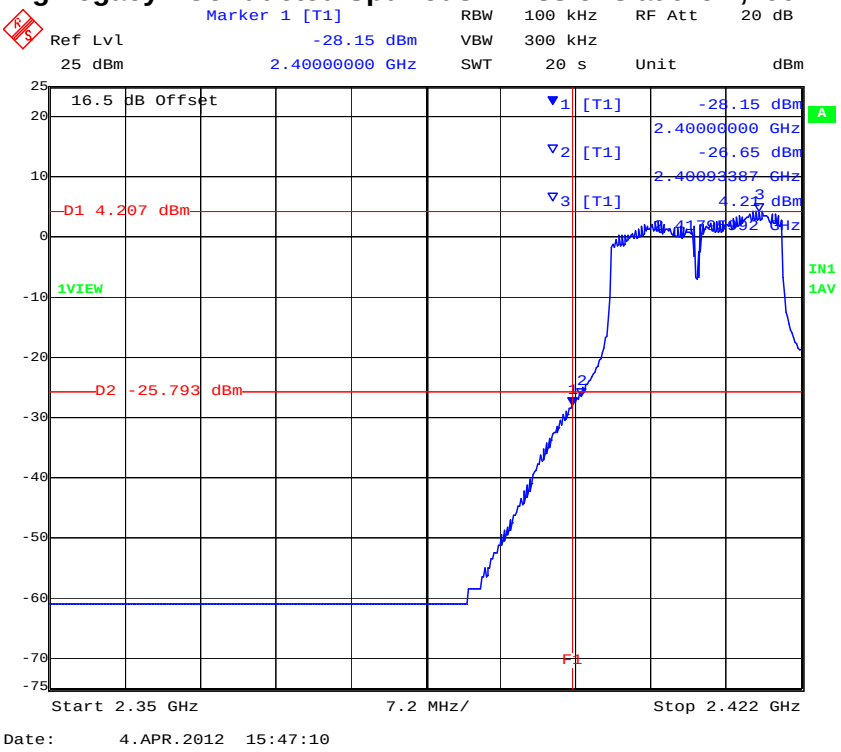
PORT A 802.11g Legacy - Conducted Spurious Emissions at the 2,400 MHz Band Edge



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



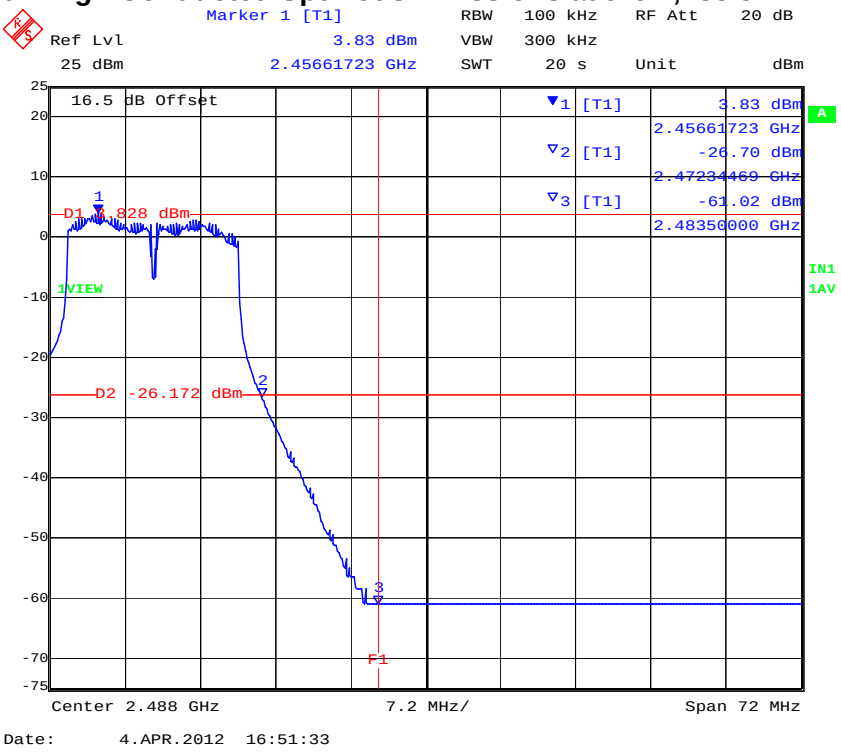
PORT C 802.11g Legacy - Conducted Spurious Emissions at the 2,400 MHz Band Edge



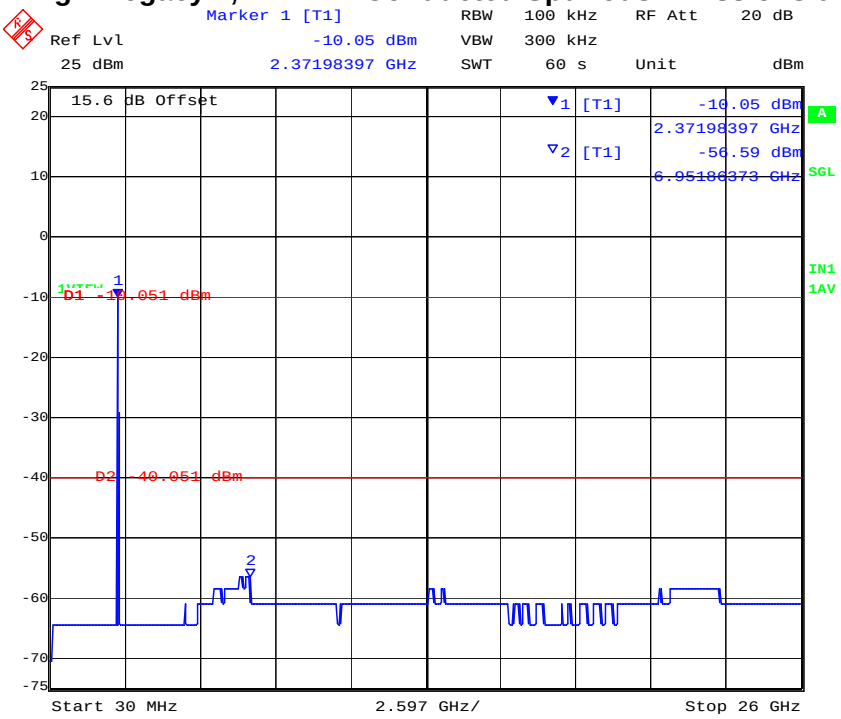
PORT A 802.11g - Conducted Spurious Emissions at the 2,483.5 MHz Band Edge

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

PORT C 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



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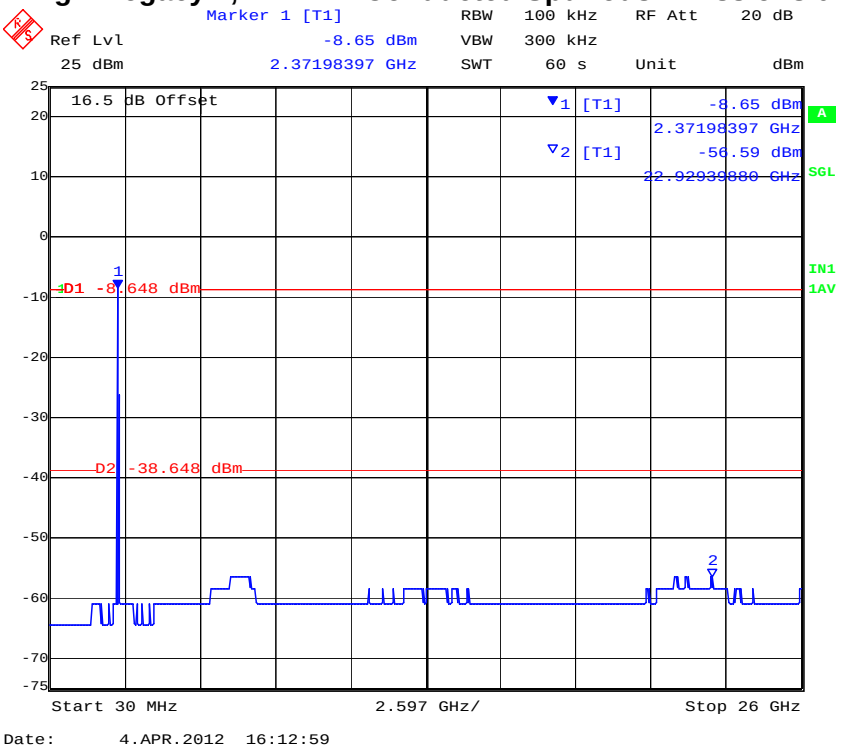
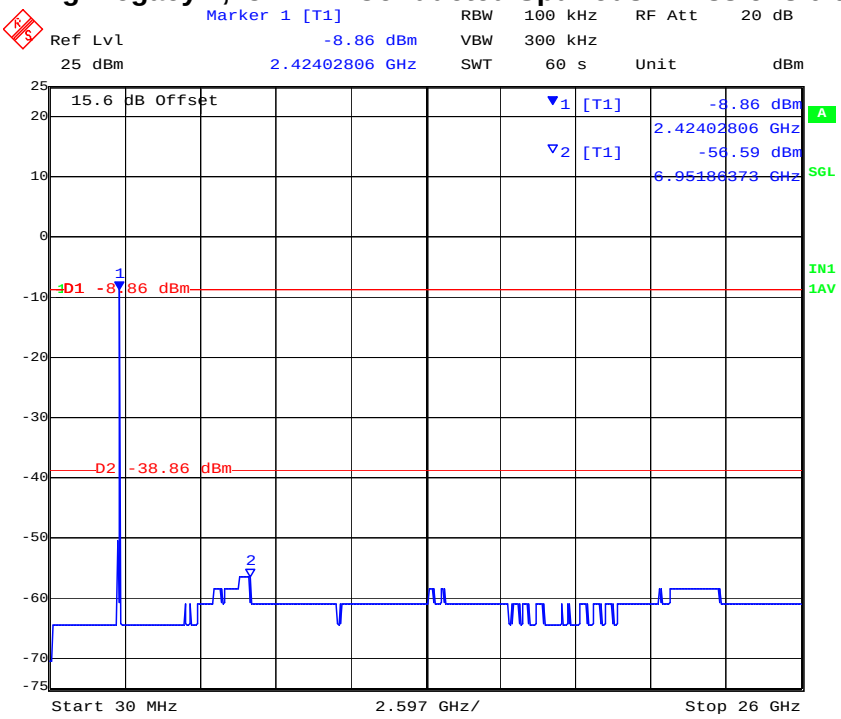
PORT B 802.11g – Legacy 2,412 MHz Conducted Spurious Emissions 0.03 – 26 GHz

Date: 4.APR.2012 16:11:14

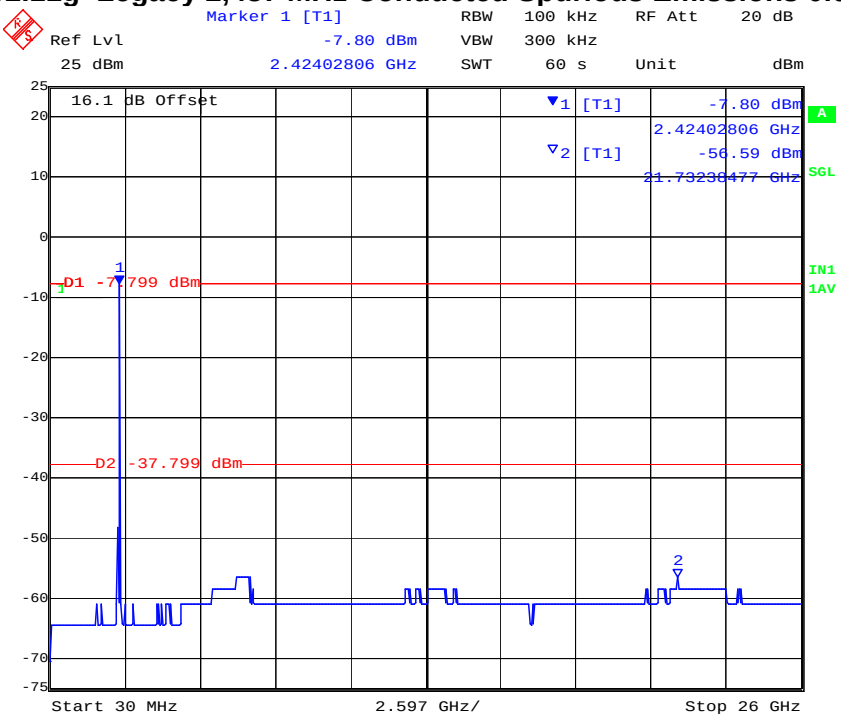
PORT C 802.11g – Legacy 2,412 MHz Conducted Spurious Emissions 0.03 – 26 GHz



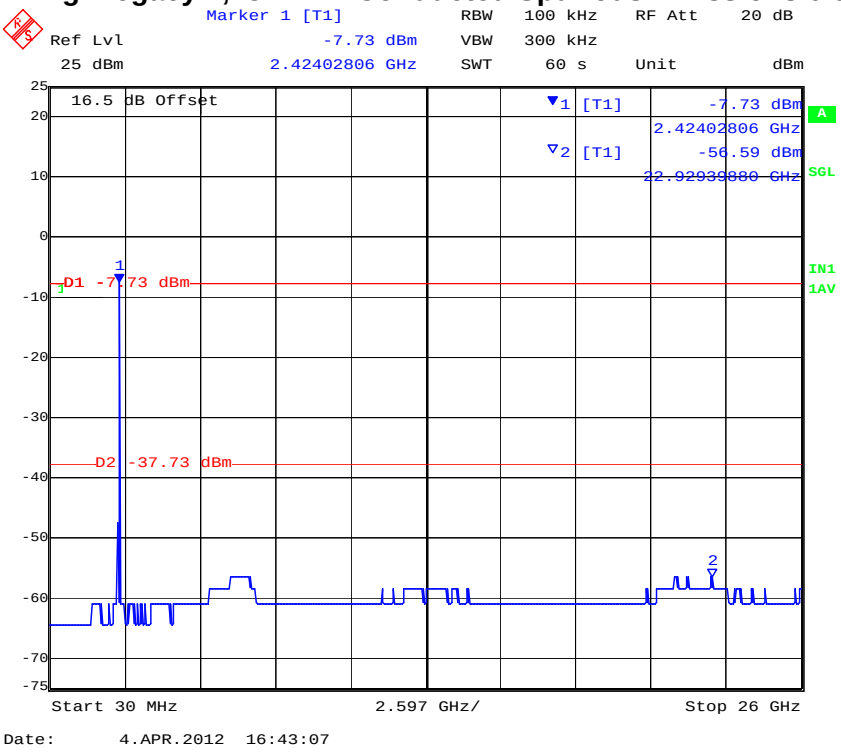
PORT A 802.11g–Legacy 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



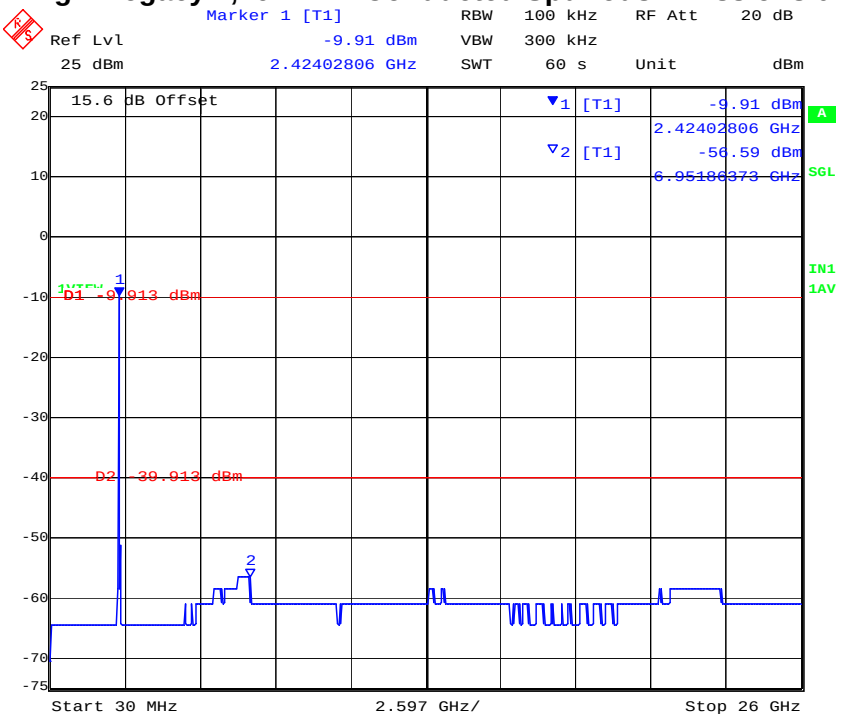
PORT B 802.11g–Legacy 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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

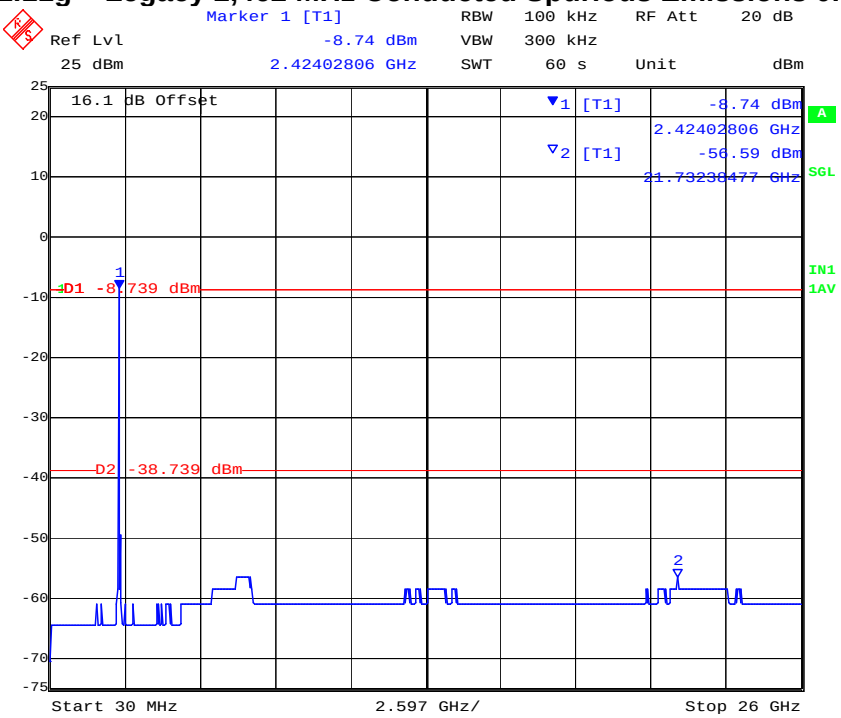


PORT A 802.11g – Legacy 2,462 MHz Conducted Spurious Emissions 0.03 – 26 GHz



Date: 4.APR.2012 19:13:16

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



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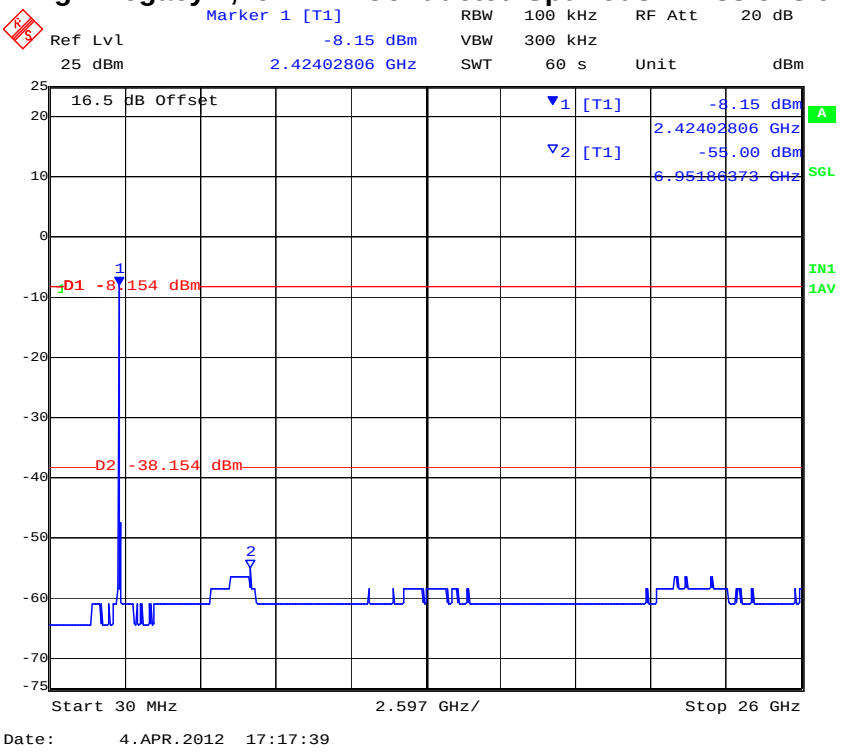
PORT C 802.11g – Legacy 2,462 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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	-56.59	-40.14	-56.59	-39.29	-56.59	-38.92		
2437.000	30.00	26000.00	-56.59	-38.65	-56.59	-37.79	-56.59	-37.43		
2462.000	30.00	26000.00	-56.59	-39.98	-56.59	-38.75	-56.59	-38.11		

SE: Maximum spurious emission found

Band-edge Measurement

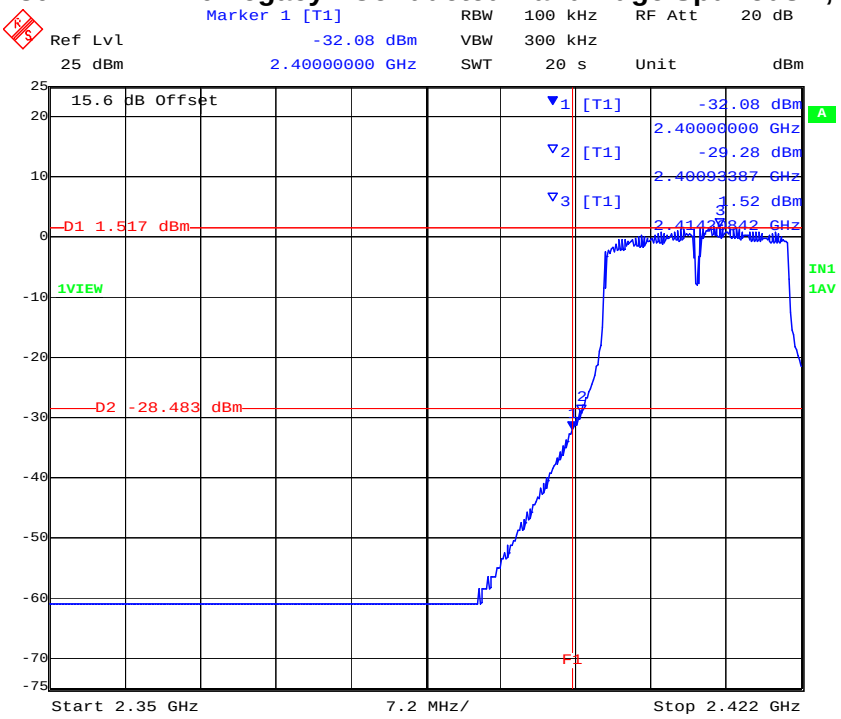
Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2412.000	2400.00	-32.08	-28.48	-29.28	-26.43	-28.29	-26.44		
2462.000	2483.50	-61.02	-28.06	-61.02	-27.62	-61.02	-26.84		

BE: Maximum Band edge emission found

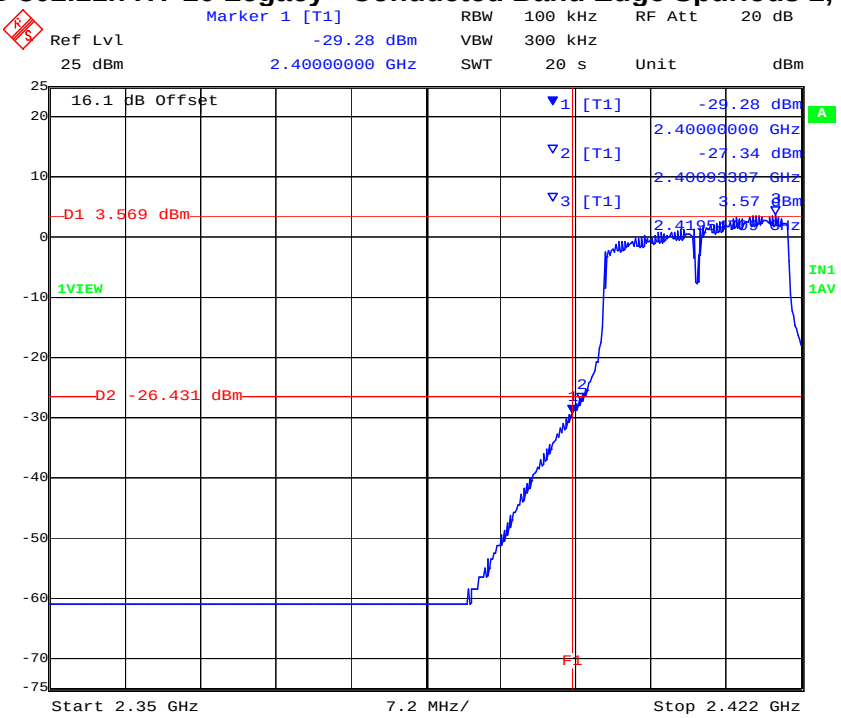
Measurement uncertainty:	±2.81 dB

Note: Limit is based on 30dB down from fundamental emission

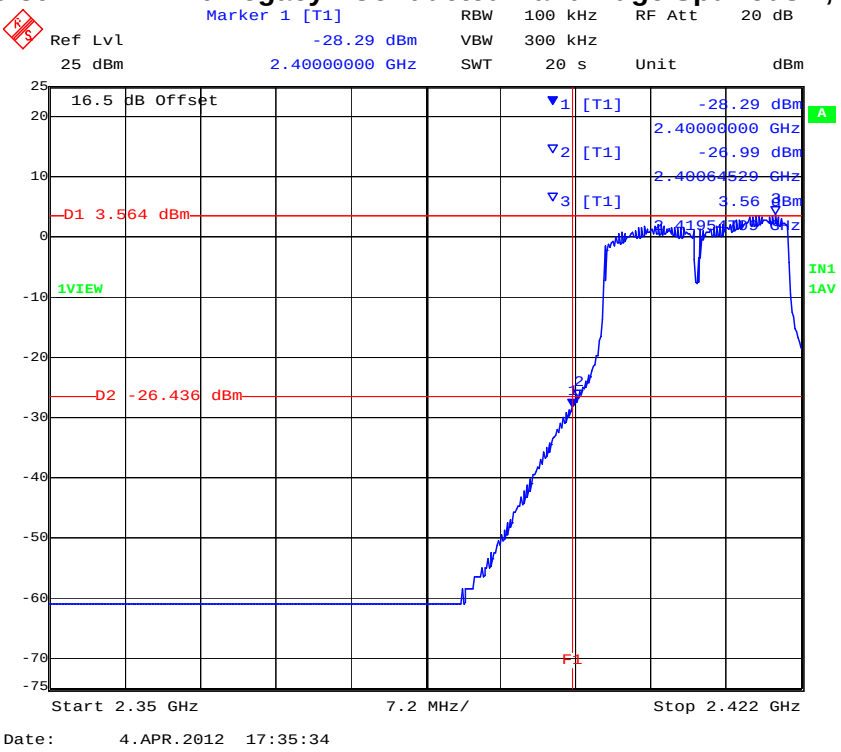
PORT A 802.11n HT-20 Legacy - Conducted Band Edge Spurious 2,400 MHz



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



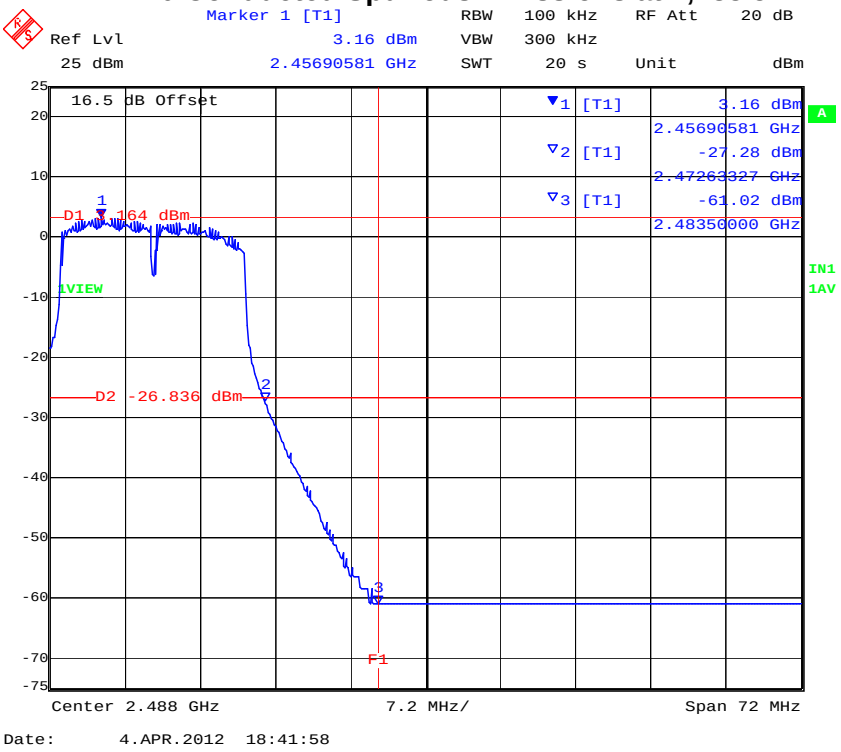
PORT C 802.11n HT-20 Legacy - Conducted Band Edge Spurious 2,400 MHz



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

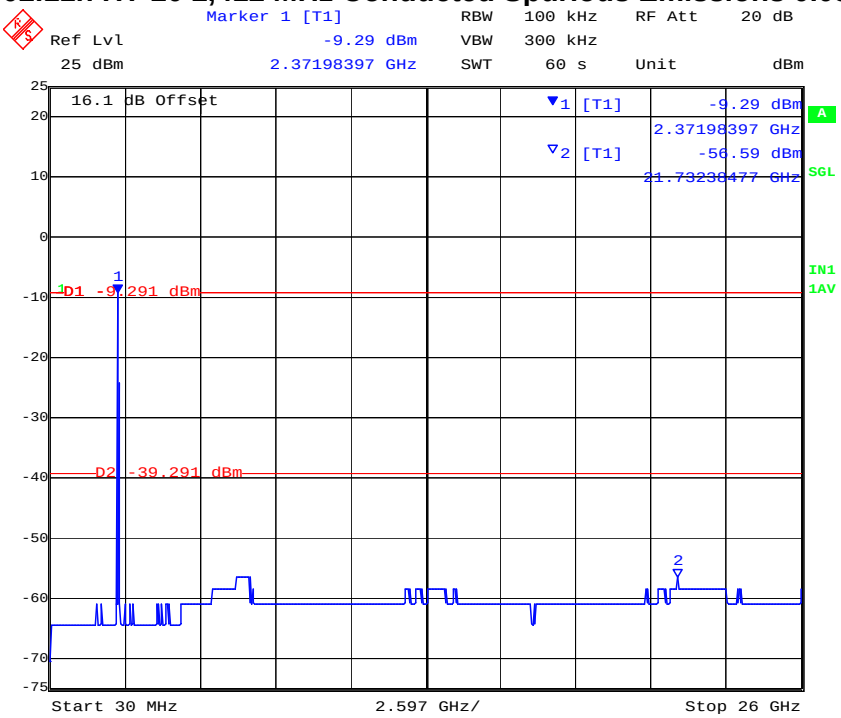
PORT C 802. 11n HT-20 Conducted Spurious Emissions at 2,483.5 MHz Band Edge



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

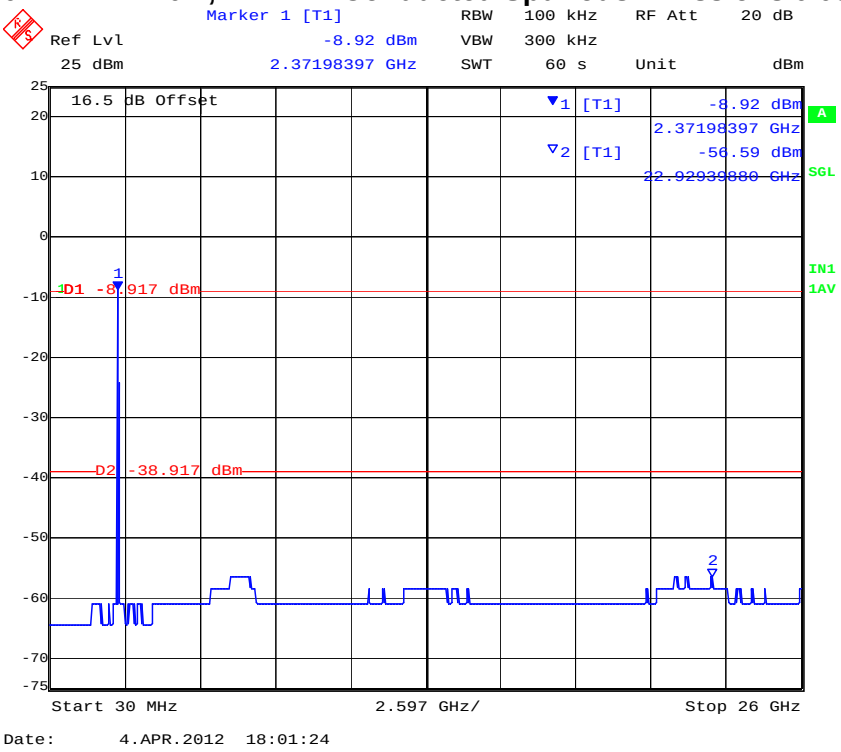
Date: 4.APR.2012 17:57:54

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

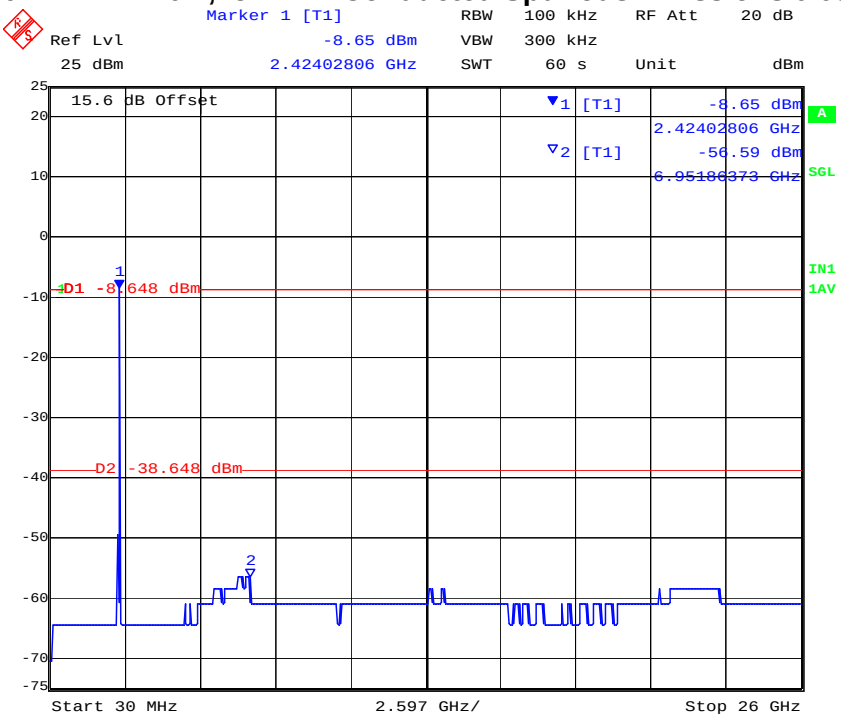


Date: 4.APR.2012 17:59:40

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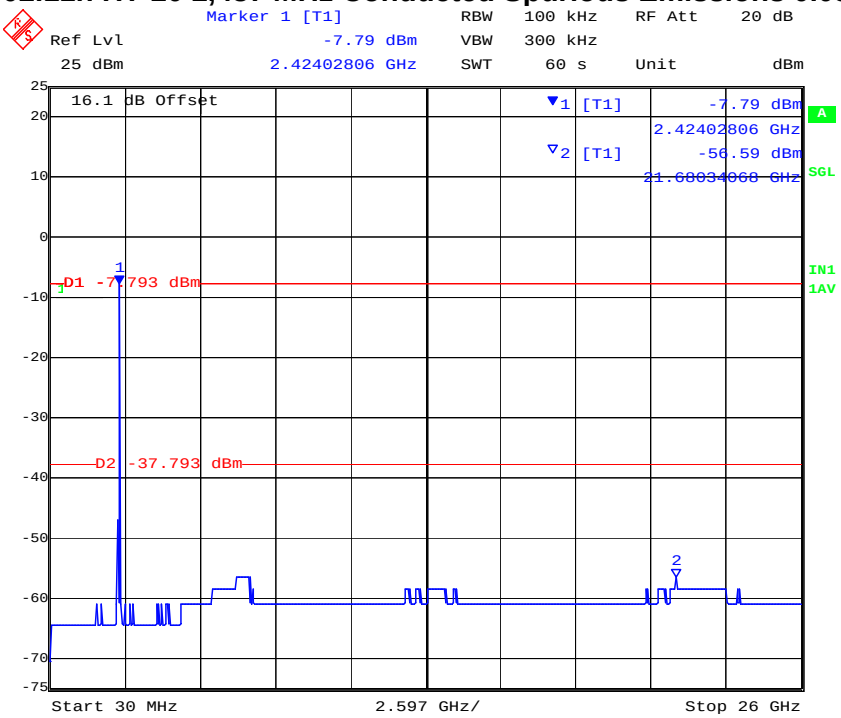
PORT B 802.11n HT-20 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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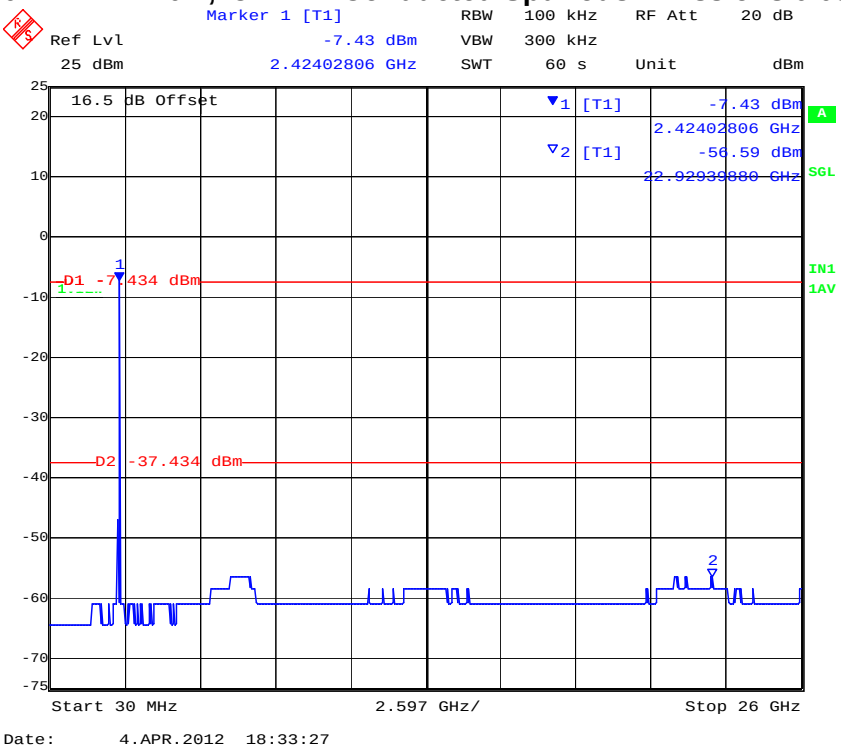
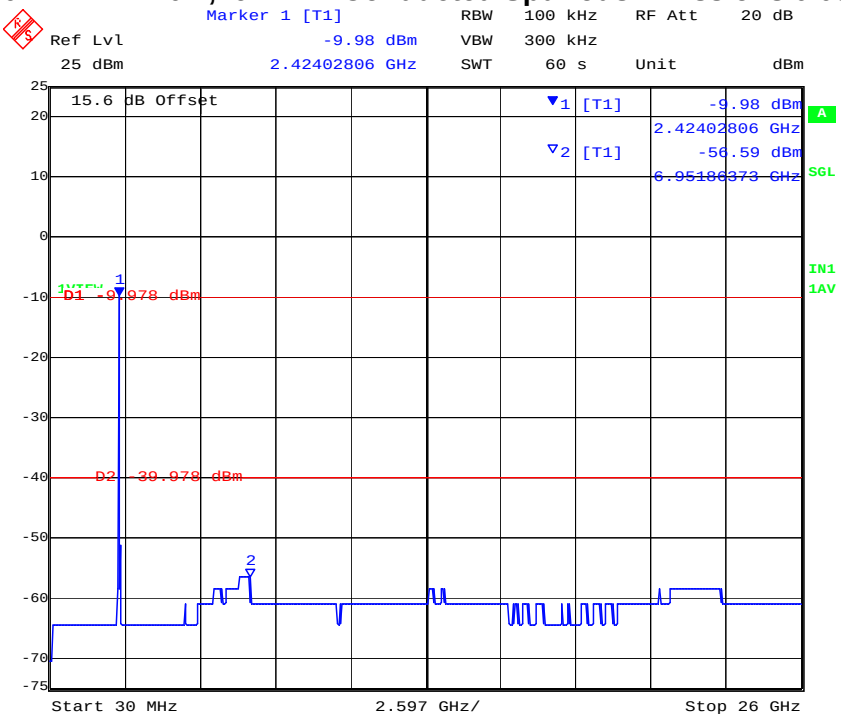
PORT C 802.11n HT-20 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz

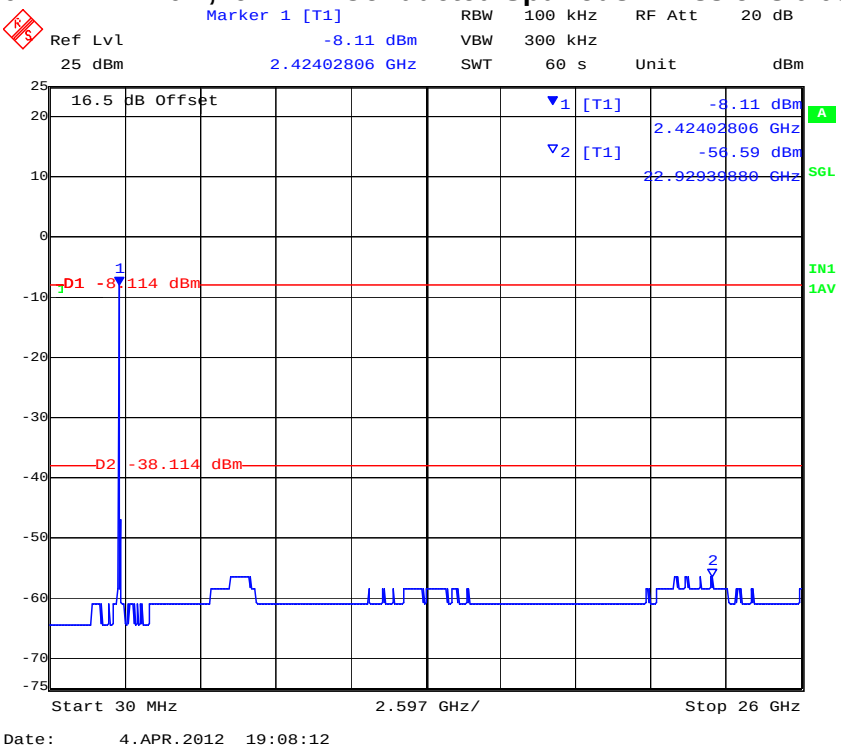


PORT A 802.11n HT-20 2,462 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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

PORT C 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**

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	-56.59	-41.34	-56.59	-37.37	-56.59	-38.27		
2437.000	30.00	26000.00	-56.59	-37.07	-56.59	-35.31	-56.59	-34.93		
2452.000	30.00	26000.00	-56.59	-35.76	-56.59	-35.59	-56.59	-34.48		

SE: Maximum spurious emission found

Band-edge Measurement

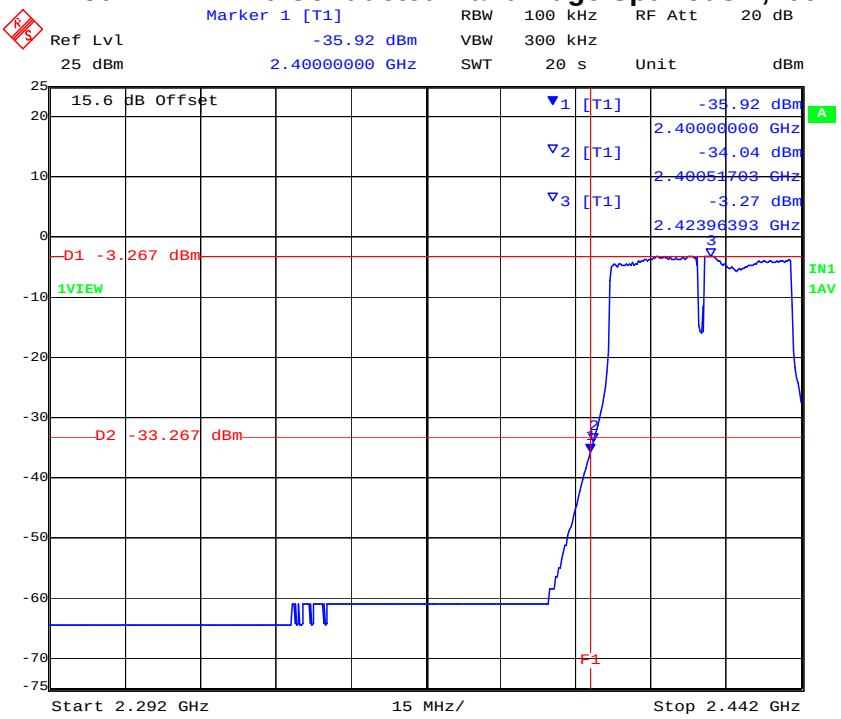
Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2422.000	2400.00	-35.92	-33.27	-30.74	-29.72	-31.39	-30.77		
2452.000	2483.50	-61.02	-30.93	-61.02	-30.08	-58.52	-30.39		

BE: Maximum Band edge emission found

Measurement uncertainty:	±2.81 dB

Note: Limit is based on 30dB down from fundamental emission

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



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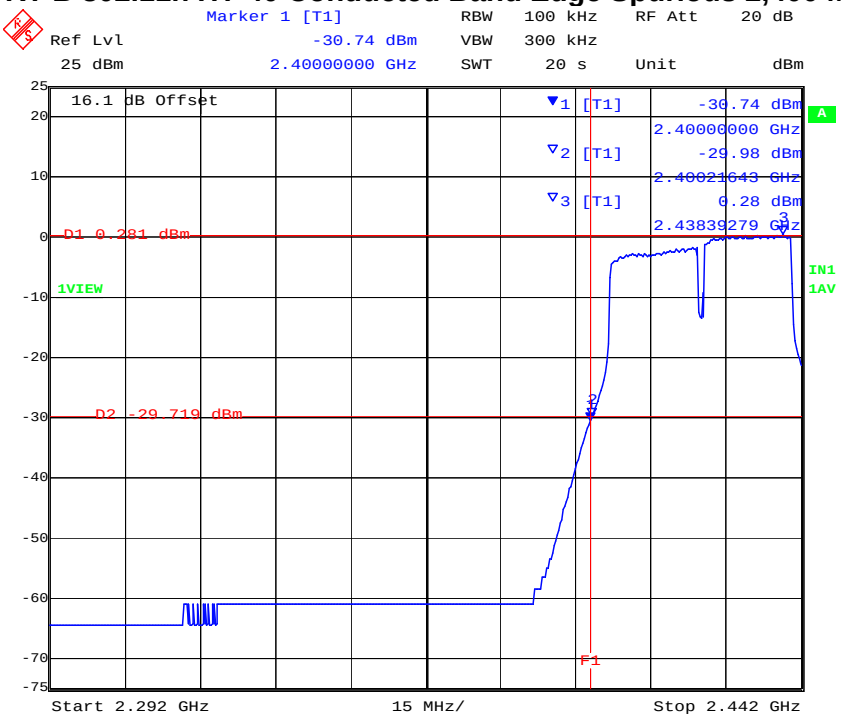
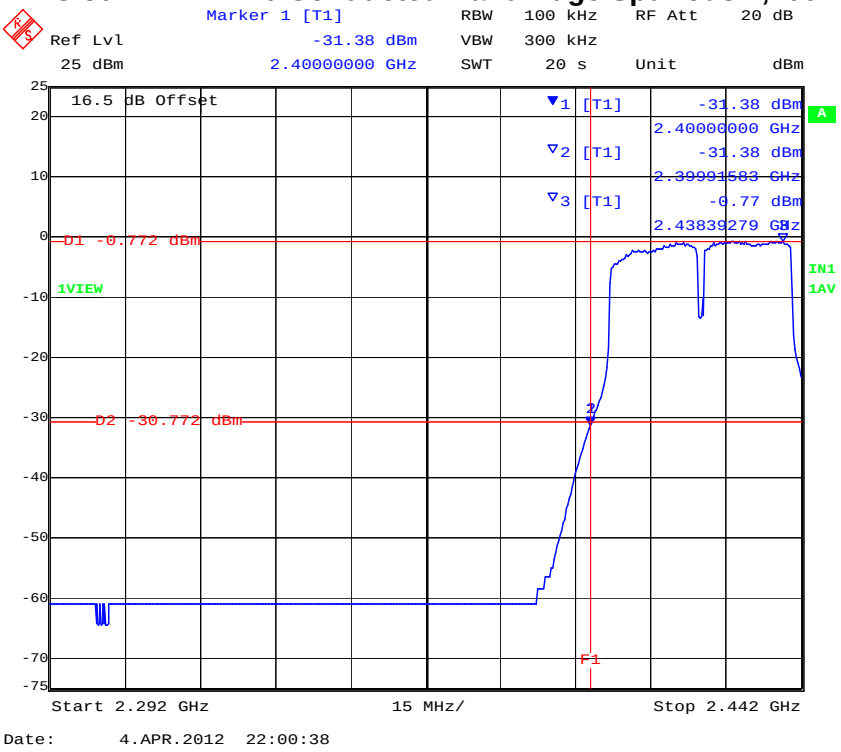
PORT B 802.11n HT-40 Conducted Band Edge Spurious 2,400 MHz

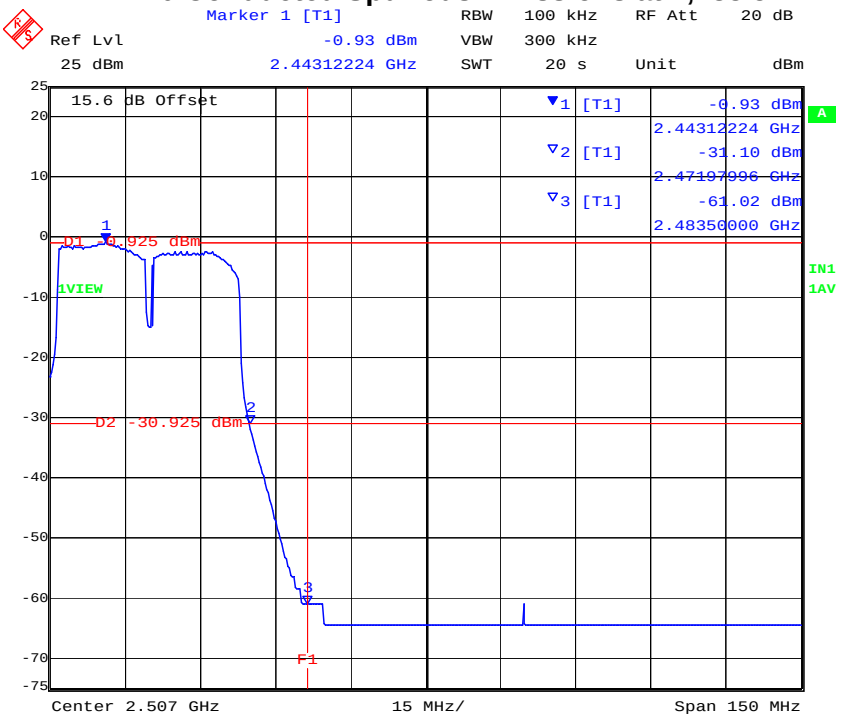


Date: 4.APR.2012 21:59:19

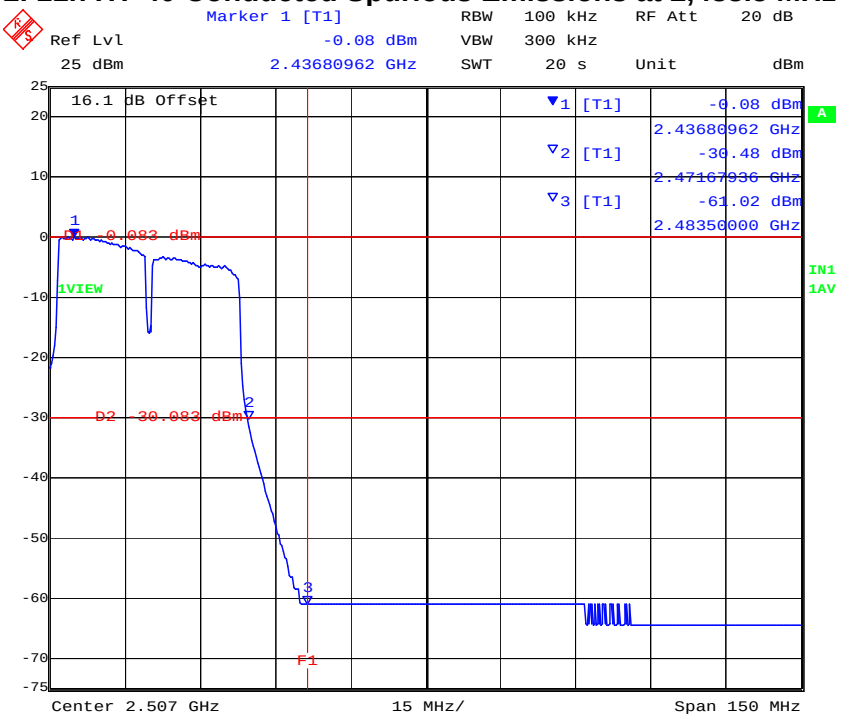
PORT C 802.11n HT-40 Conducted Band Edge Spurious 2,400 MHz



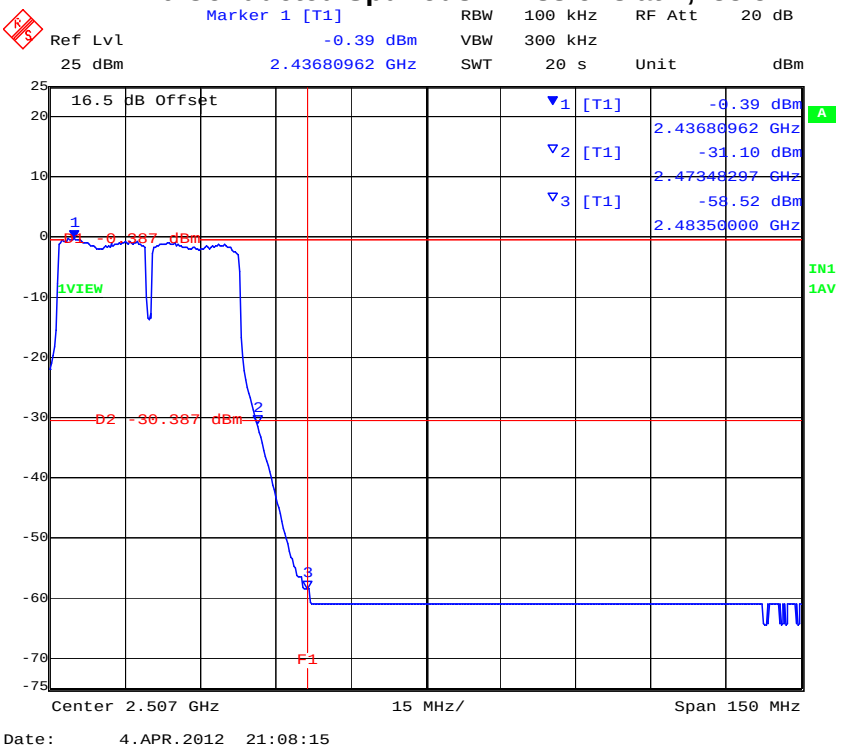
PORT A 802. 11n HT-40 Conducted Spurious Emissions at 2,483.5 MHz Band Edge



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

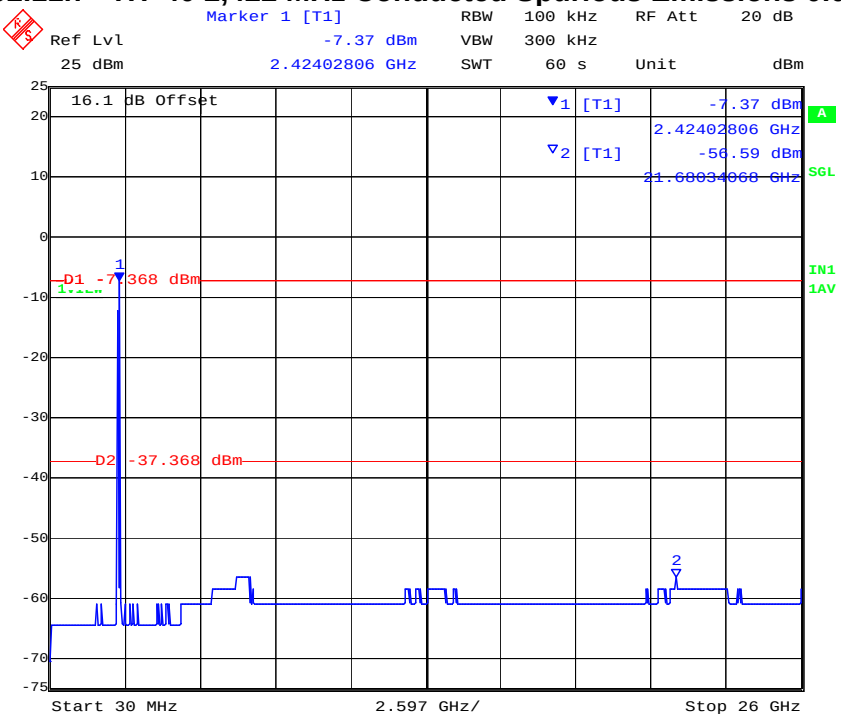


PORT C 802. 11n HT-40 Conducted Spurious Emissions at 2,483.5 MHz Band Edge

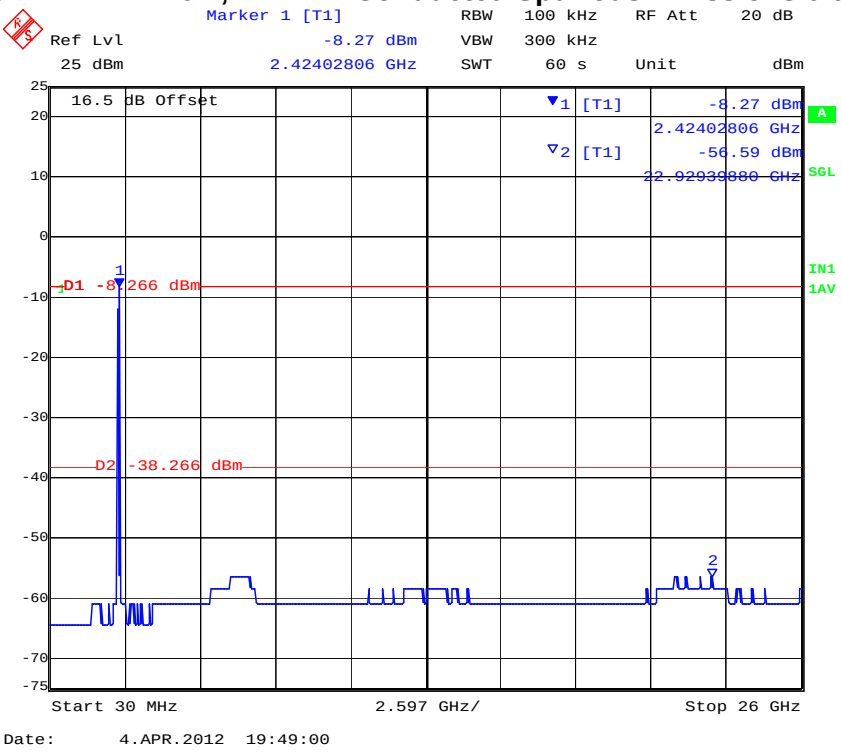


PORT A 802.11n – HT-40 2,422 MHz Conducted Spurious Emissions 0.03 – 26 GHz

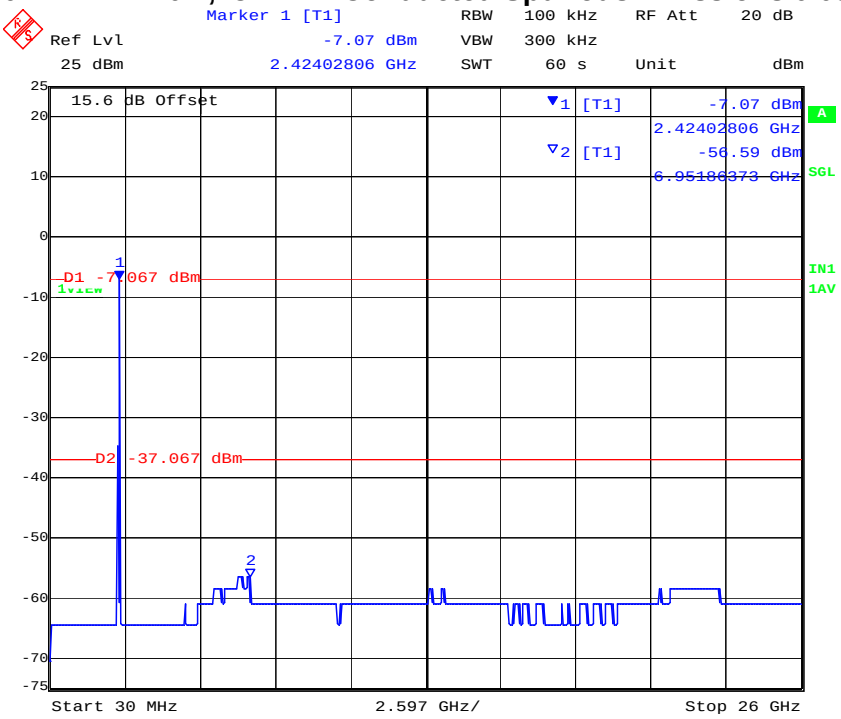
PORT B 802.11n – HT-40 2,422 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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

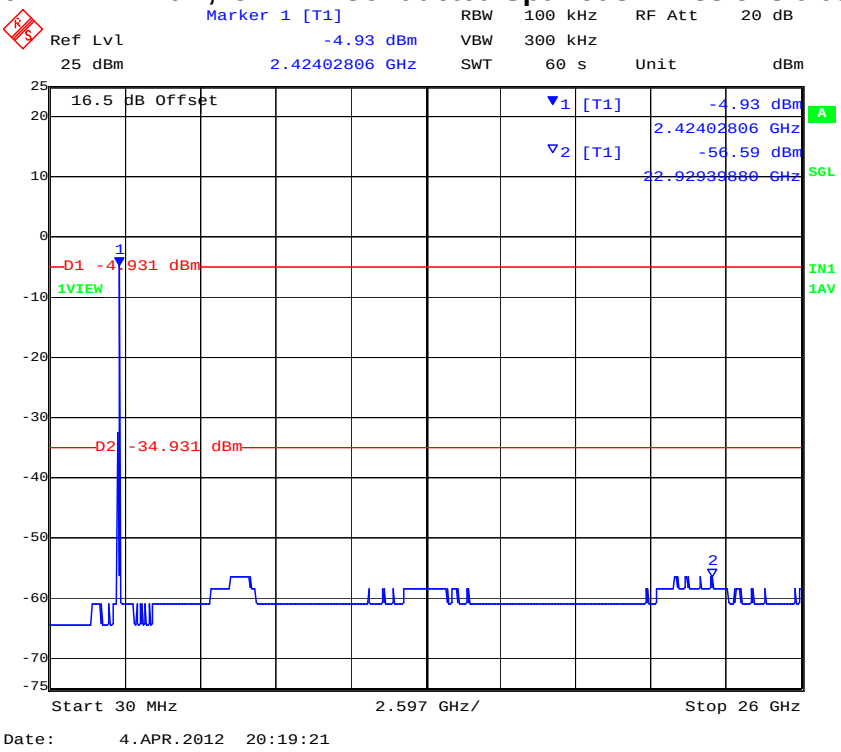


PORT A 802.11n HT-40 2,437 MHz Conducted Spurious Emissions 0.03 – 26 GHz



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

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



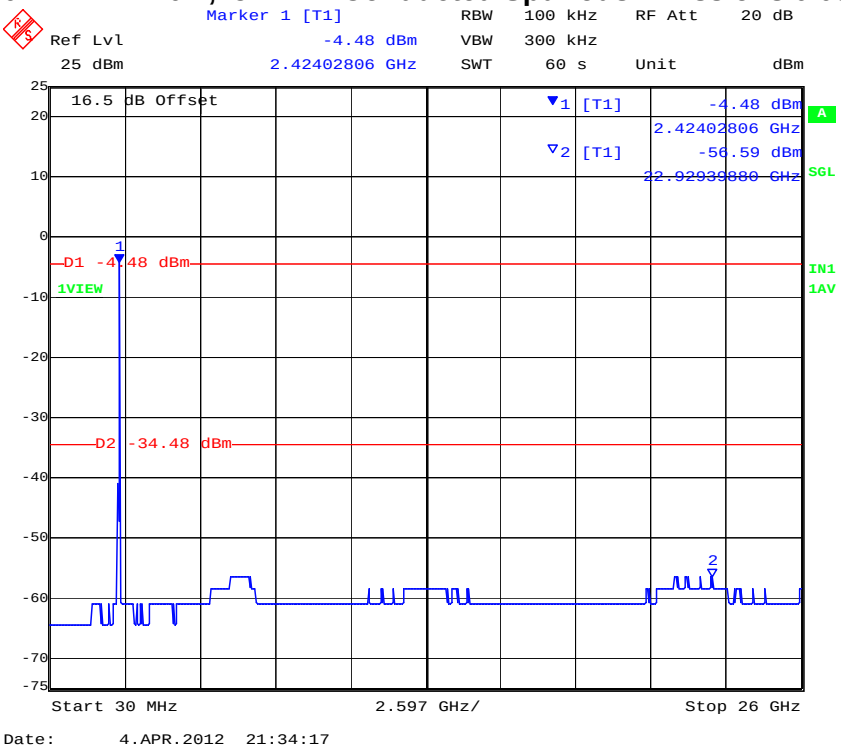
PORT A 802.11n HT-40 2,452 MHz Conducted Spurious Emissions 0.03 – 26 GHz

Date: 4.APR.2012 21:30:42

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

Date: 4.APR.2012 21:32:32

PORT C 802.11n HT-40 2,452 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

§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 30 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:

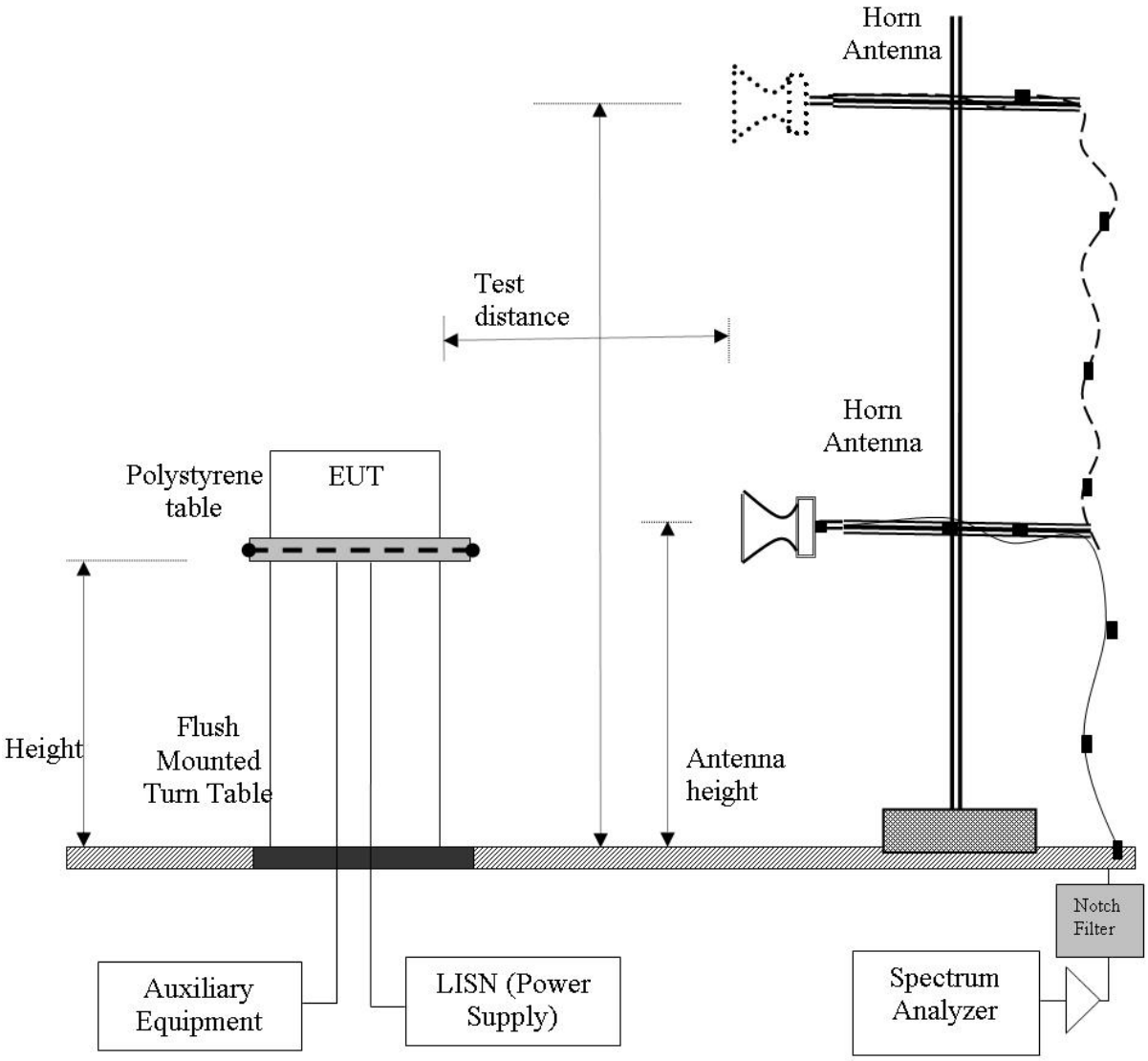
FS = 51.5 + 8.5 + 1.3 - 26.0 +1 = 36.3 dBμV/m

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

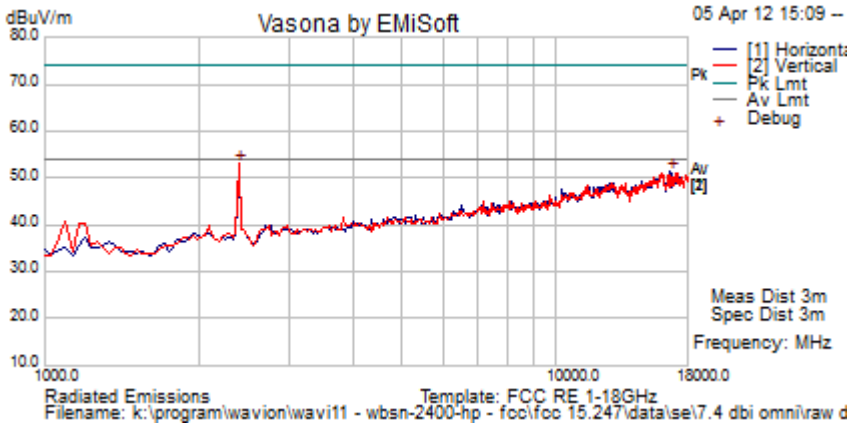
Radiated Emission Measurement Setup – Above 1 GHz



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. Omni Antenna

Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11b; 1 Mbs	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

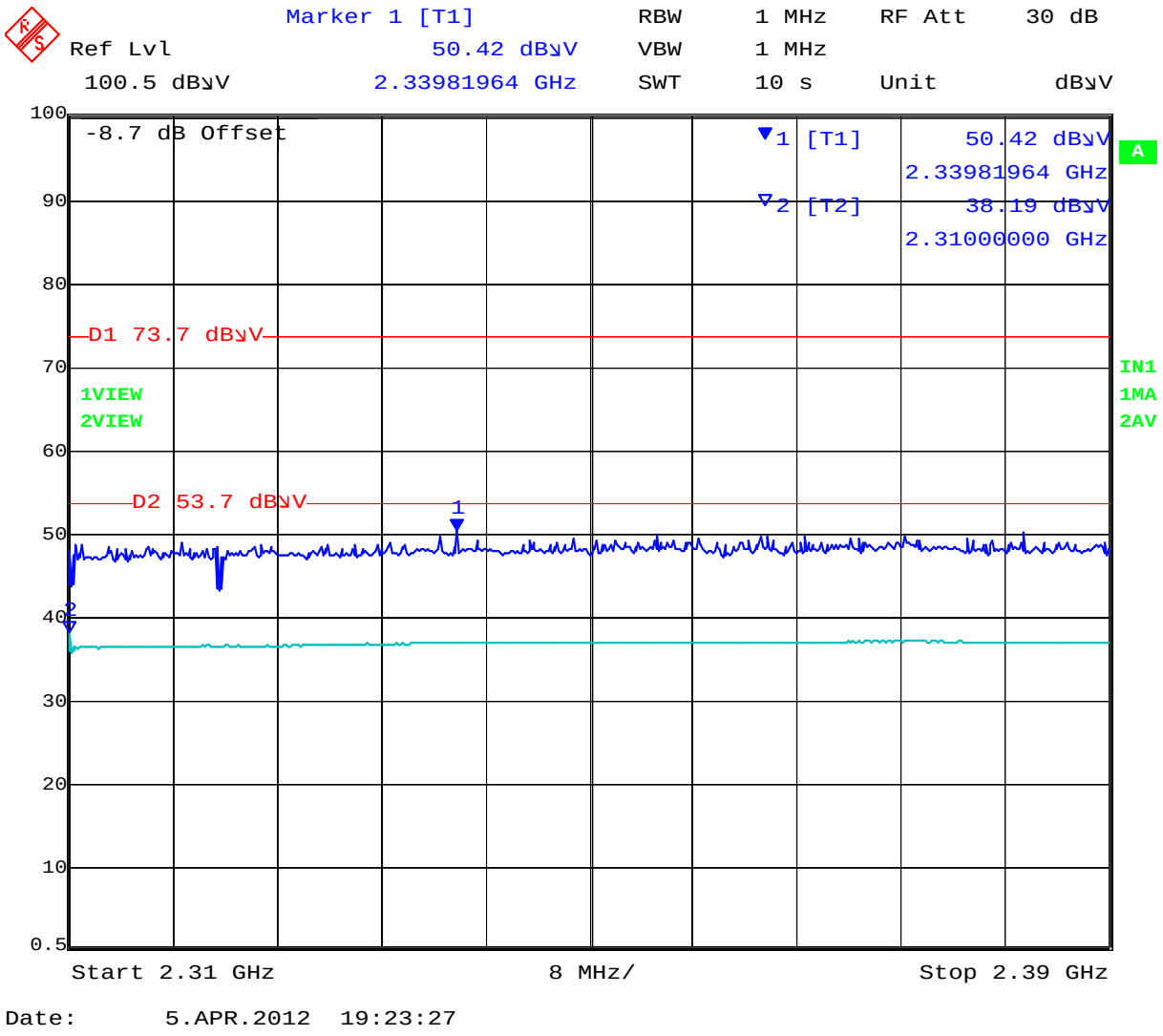


Formally measured emission peaks

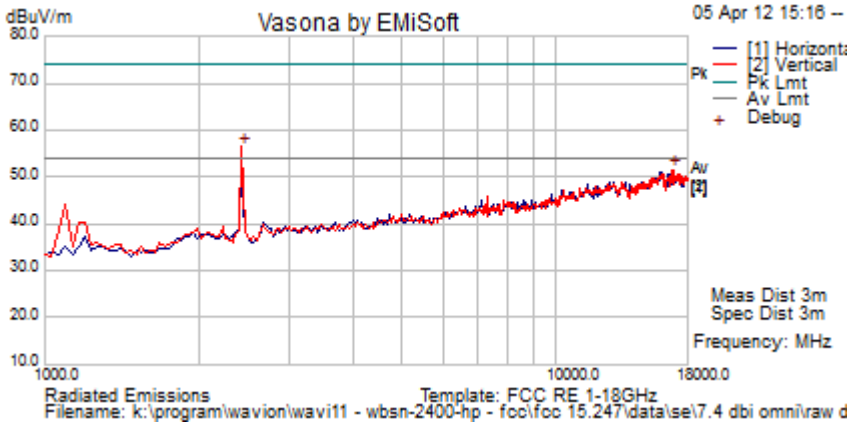
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	61.7	3.0	-11.7	53.0	Peak [Scan]	V						FUND
16671.343	41.9	8.7	0.7	51.3	Peak [Scan]	H	150	0	54.0	-2.7	Pass	NOISE

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

Restricted Band-Edge Plot 802.11b 2310 – 2390 MHz



Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11b; 1 Mbs	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

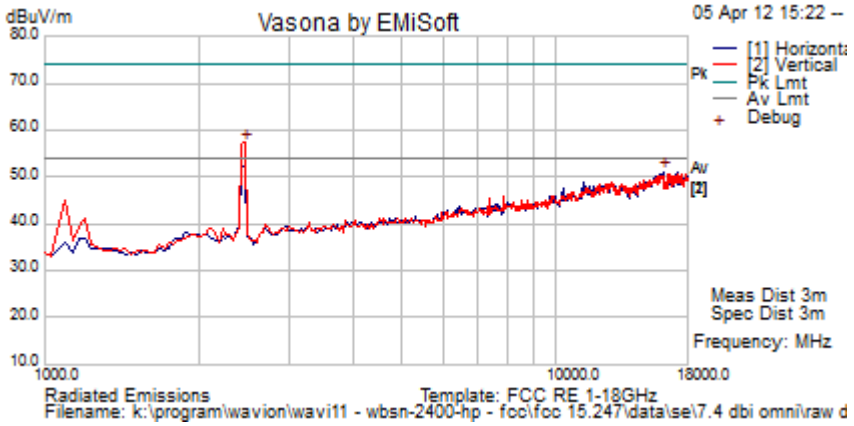


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	65.0	3.0	-11.6	56.5	Peak [Scan]	V						FUND
16875.752	42.3	8.6	0.7	51.5	Peak [Scan]	V	150	0	54.0	-2.5	Pass	NOISE

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)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

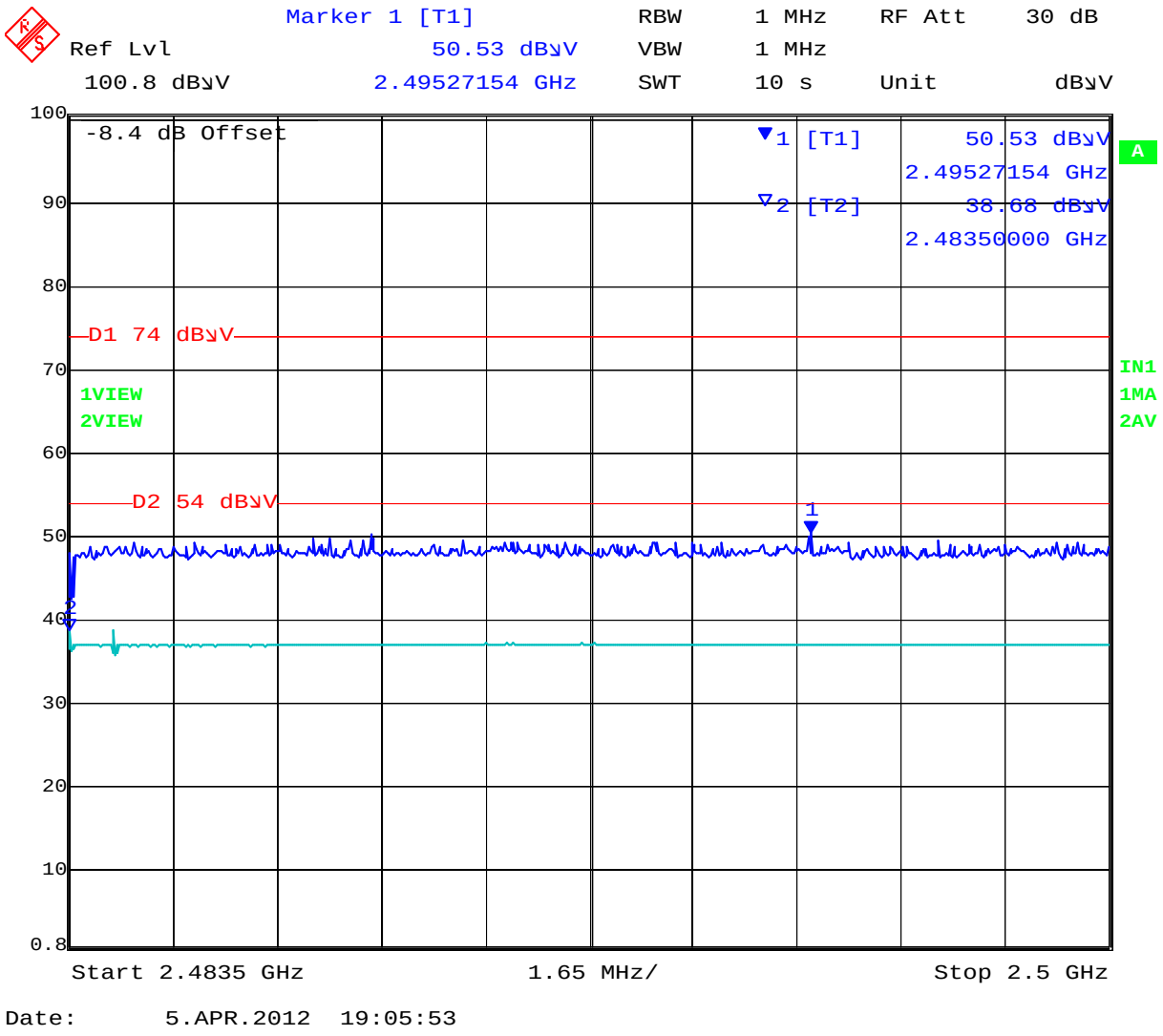


Formally measured emission peaks

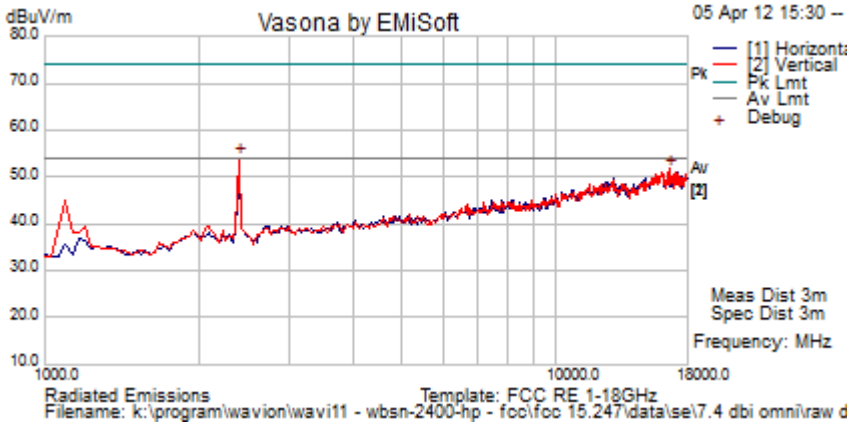
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2464.930	65.9	3.0	-11.5	57.3	Peak [Scan]	V						FUND
16126.253	41.9	9.0	0.2	51.1	Peak [Scan]	H	200	0	54.0	-2.9	Pass	NOISE

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

Restricted Band-Edge Plot 802.11b 2483.5 - 2500 MHz



Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (ºC)**	24
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	31
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

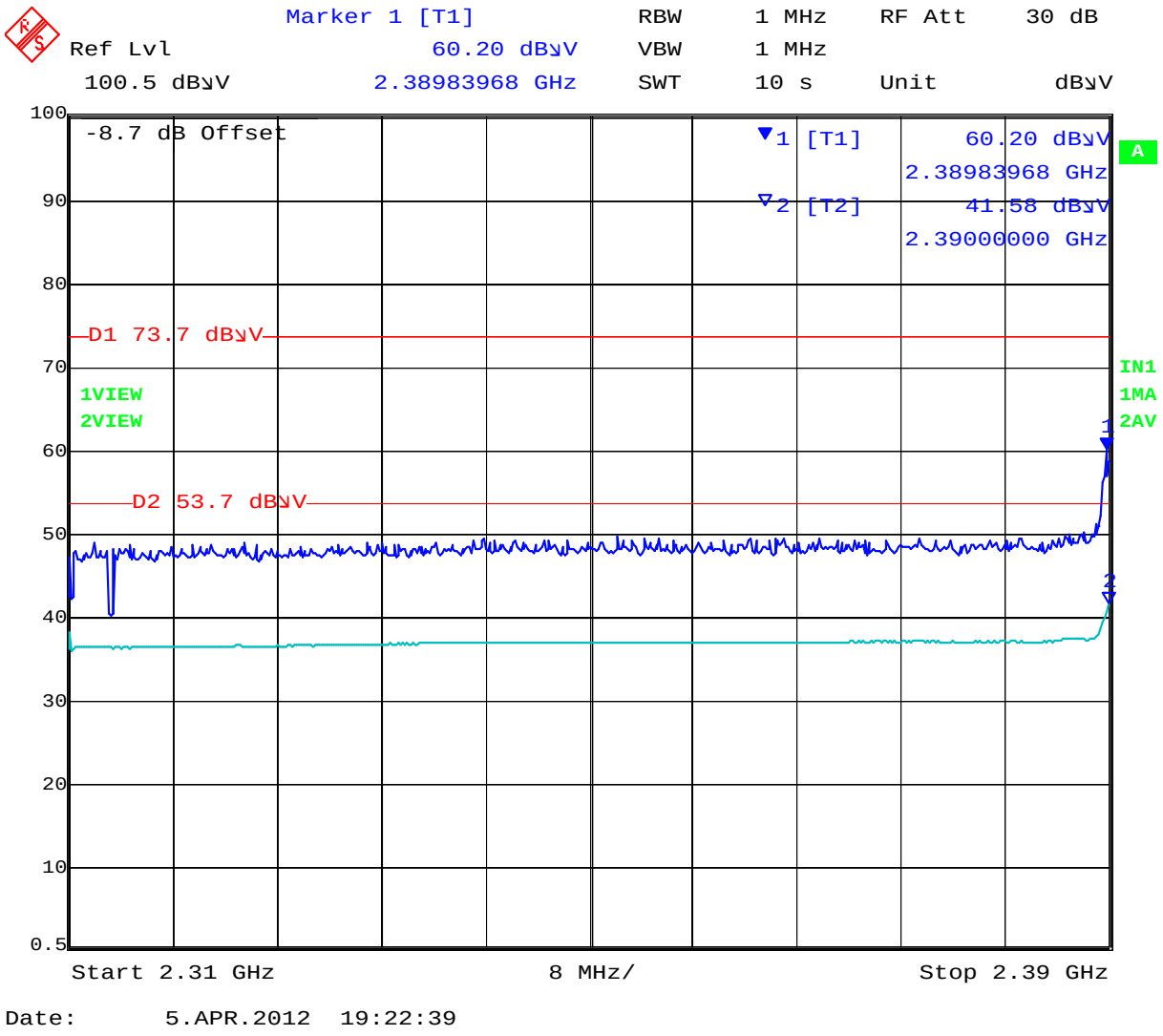


Formally measured emission peaks

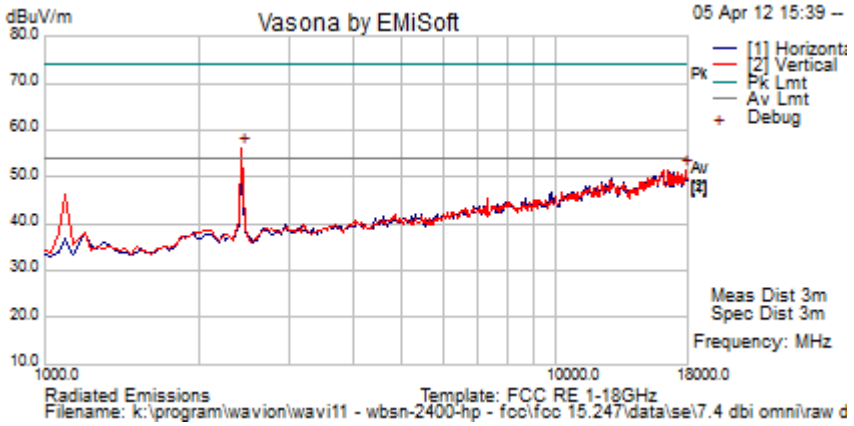
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	62.7	3.0	-11.7	54.0	Peak [Scan]	V						FUND
16569.138	42.4	8.8	0.5	51.7	Peak [Scan]	V	150	0	54.0	-2.3	Pass	NOISE

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

Restricted Band-Edge Plot 802.11g 2310 – 2390 MHz



Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (ºC)**	24
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	31
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

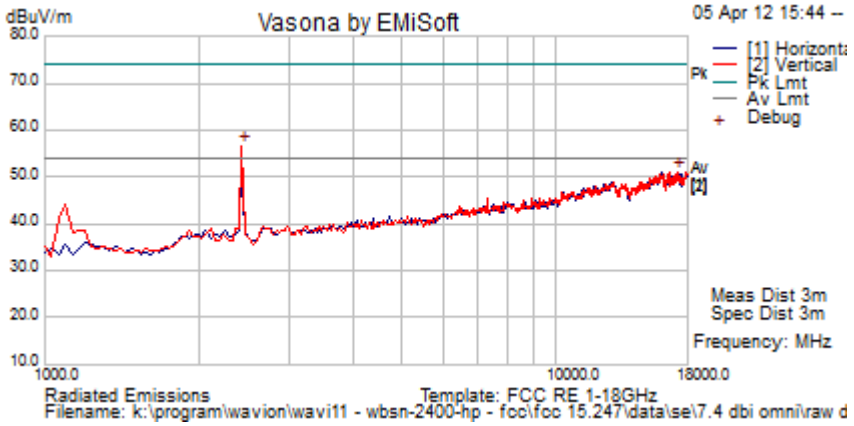


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	64.9	3.0	-11.6	56.3	Peak [Scan]	V						FUND
17897.796	42.3	8.8	0.5	51.6	Peak [Scan]	V	200	0	54.0	-2.4	Pass	NOISE

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)**	24
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	31
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

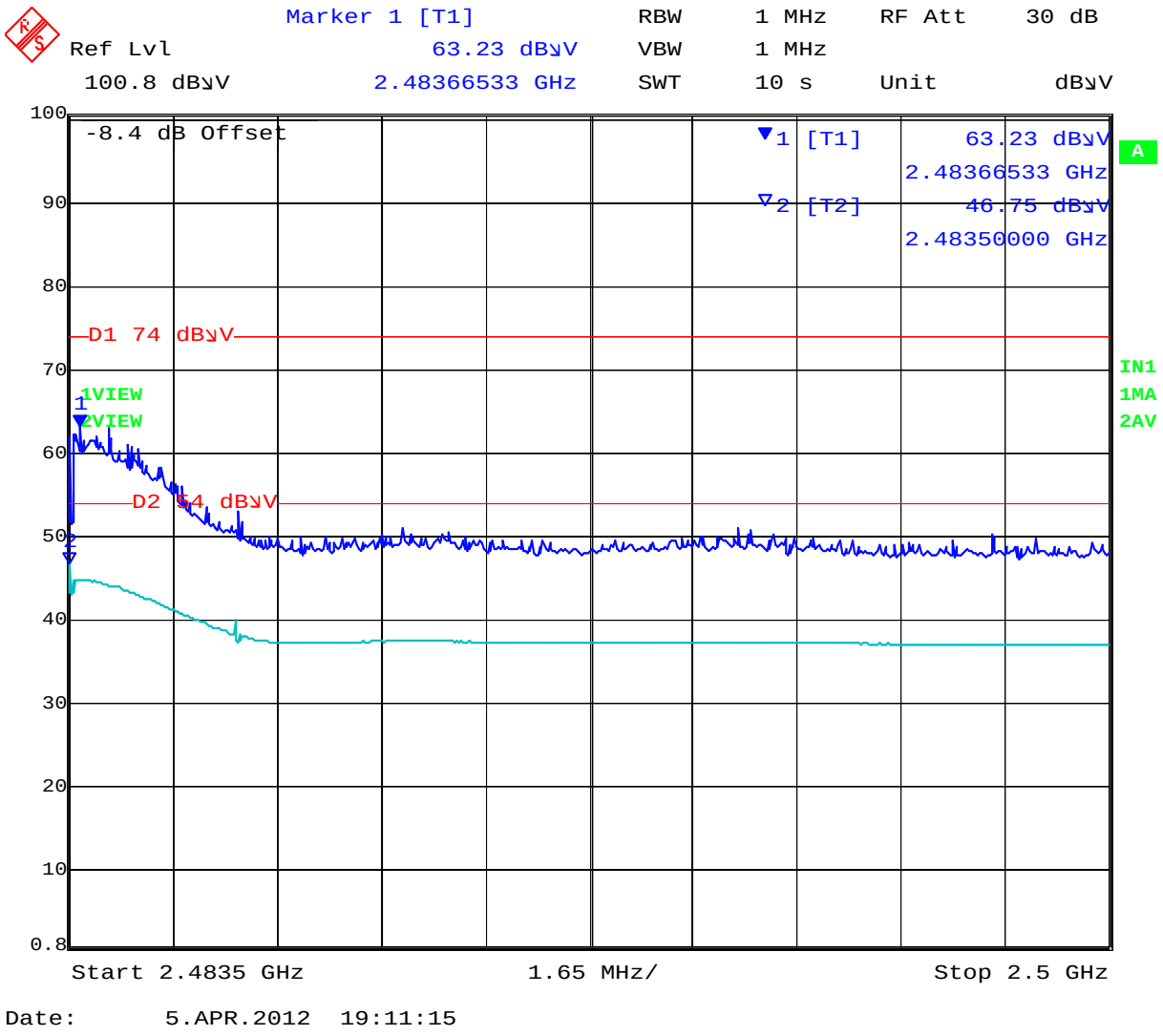


Formally measured emission peaks

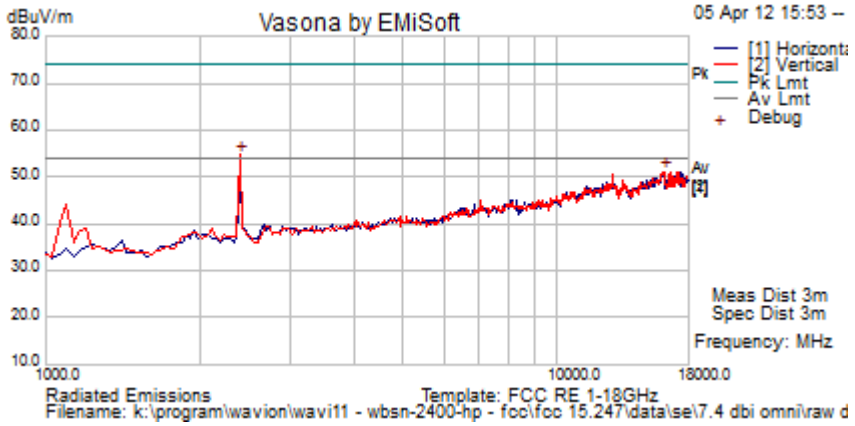
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	65.3	3.0	-11.6	56.7	Peak [Scan]	V						FUND
17216.433	41.7	8.6	0.9	51.2	Peak [Scan]	V	150	0	54.0	-2.8	Pass	NOISE

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

Restricted Band-Edge Plot 802.11g 2483.5 - 2500 MHz



Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

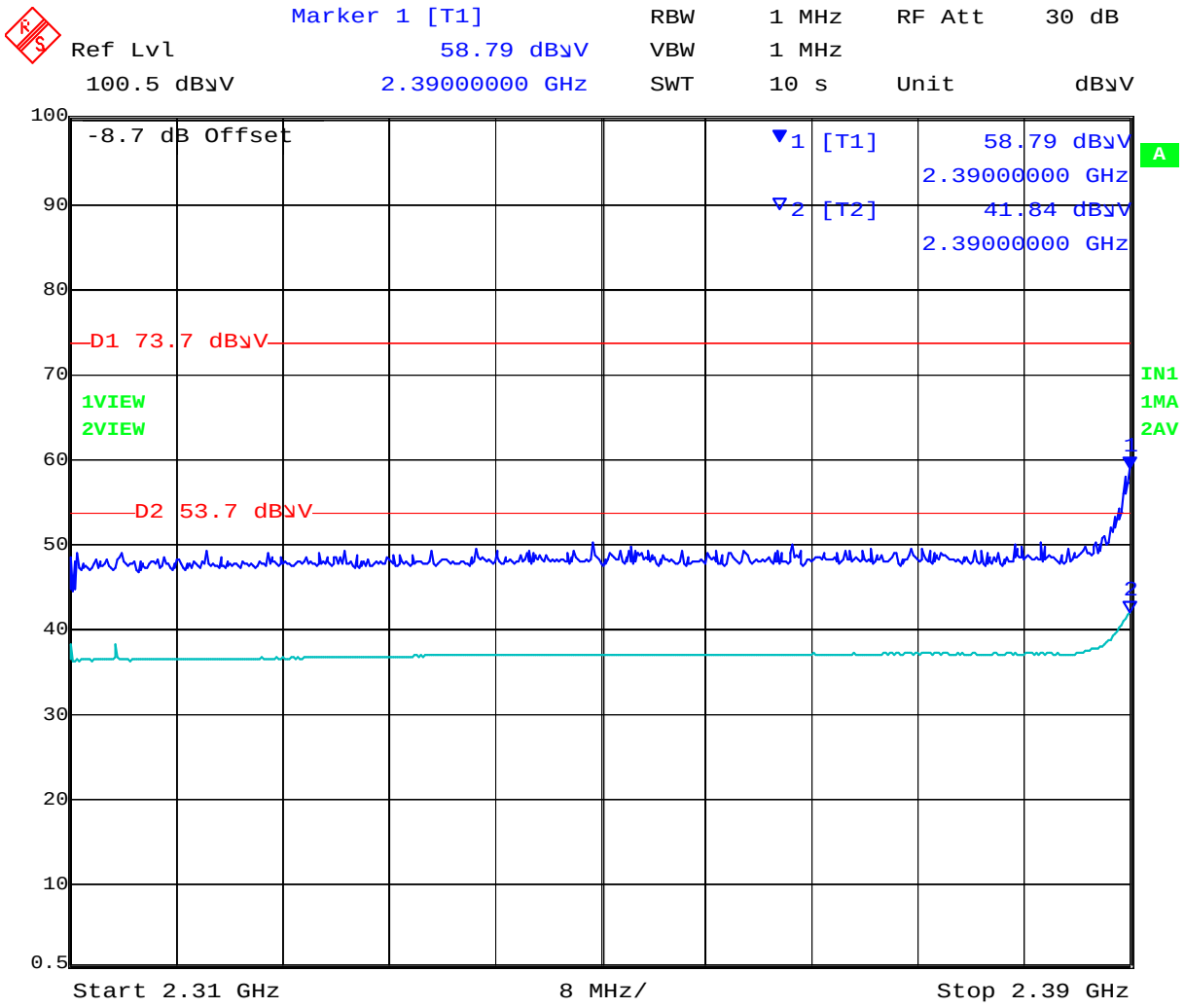


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	63.4	3.0	-11.7	54.7	Peak [Scan]	V						FUND
16160.321	42.1	9.0	0.2	51.2	Peak [Scan]	V	200	0	54.0	-2.8	Pass	NOISE

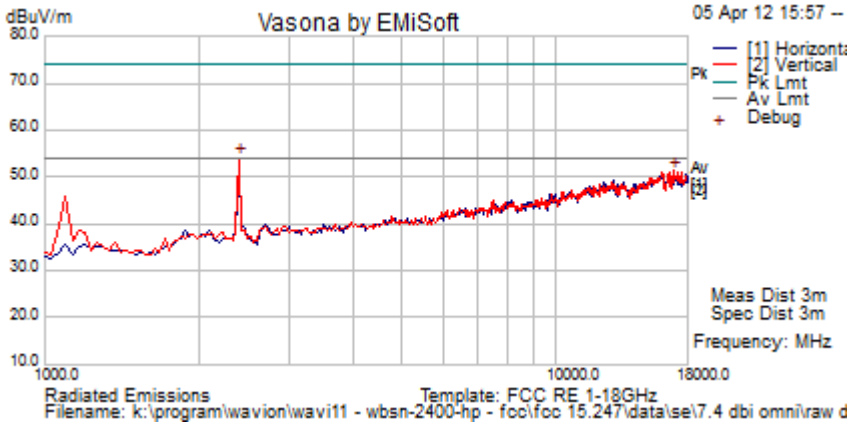
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Restricted Band-Edge Plot 802.11nHT-20 2310 – 2390 MHz



Date: 5.APR.2012 19:21:47

Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

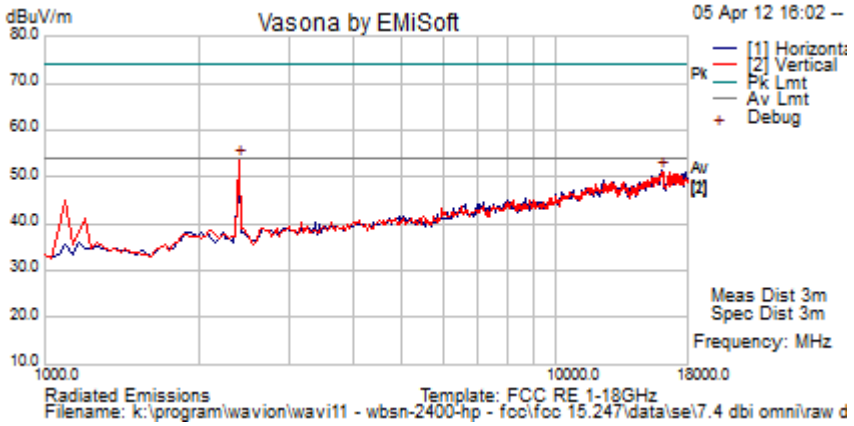


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	62.9	3.0	-11.7	54.2	Peak [Scan]	V						FUND
16909.82	42.2	8.5	0.6	51.3	Peak [Scan]	V	150	0	54.0	-2.7	Pass	NOISE

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	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

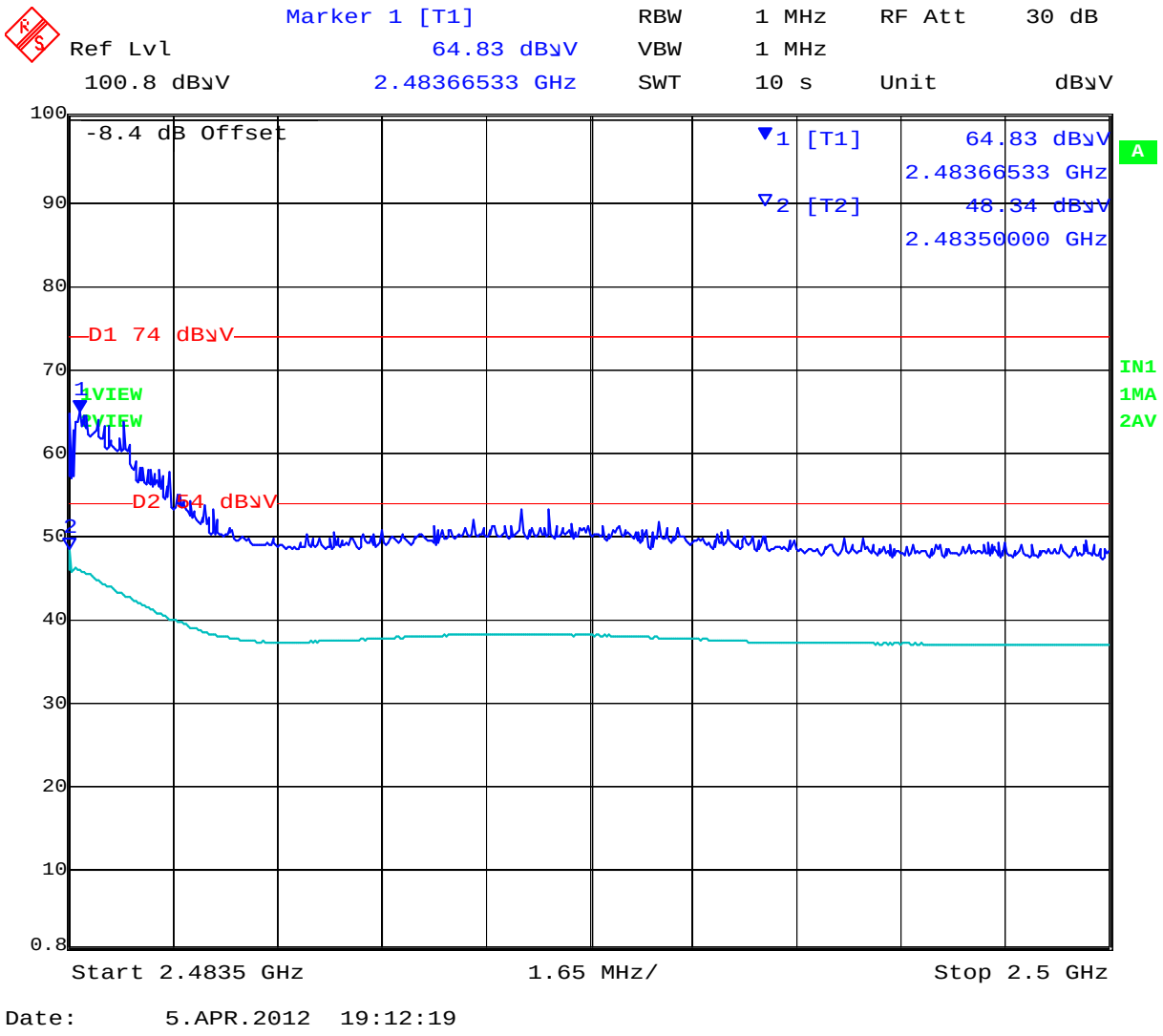


Formally measured emission peaks

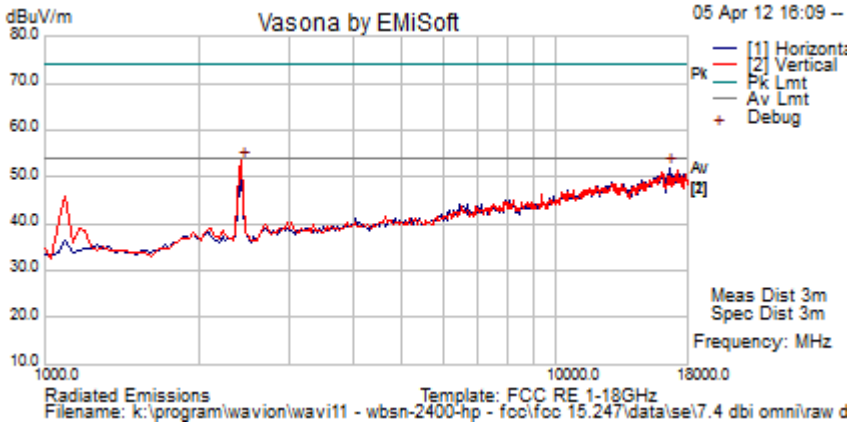
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	62.3	3.0	-11.7	53.6	Peak [Scan]	V						FUND
16058.116	42.0	9.0	0.3	51.3	Peak [Scan]	H	100	0	54.0	-2.7	Pass	NOISE

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

Restricted Band-Edge Plot 802.11n HT-20 2483.5 - 2500 MHz



Test Freq.	2422 MHz	**Engineer**	GMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

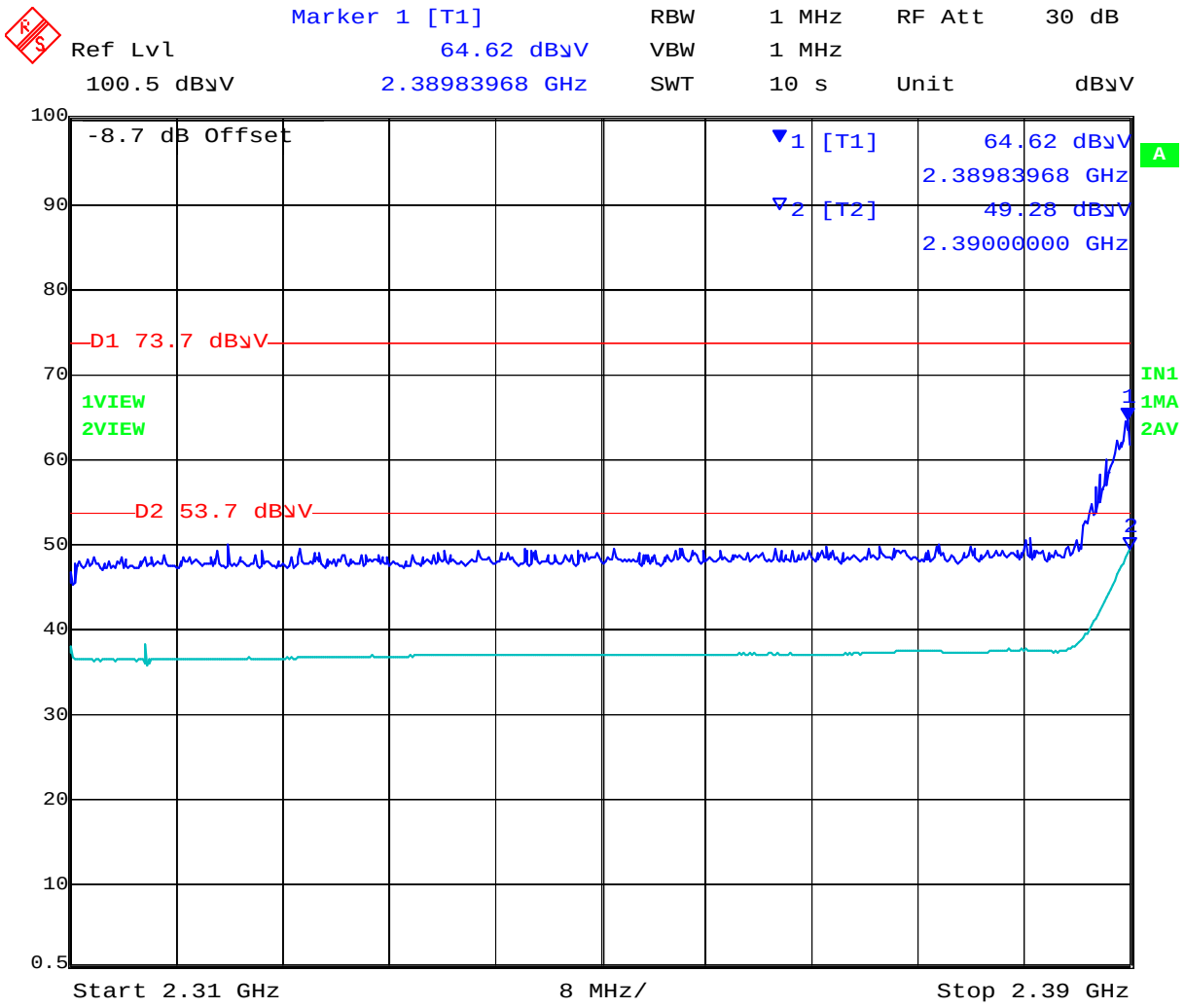


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	62.1	3.0	-11.6	53.5	Peak [Scan]	V						FUND
16569.138	42.7	8.8	0.5	51.9	Peak [Scan]	H	150	0	54.0	-2.1	Pass	NOISE

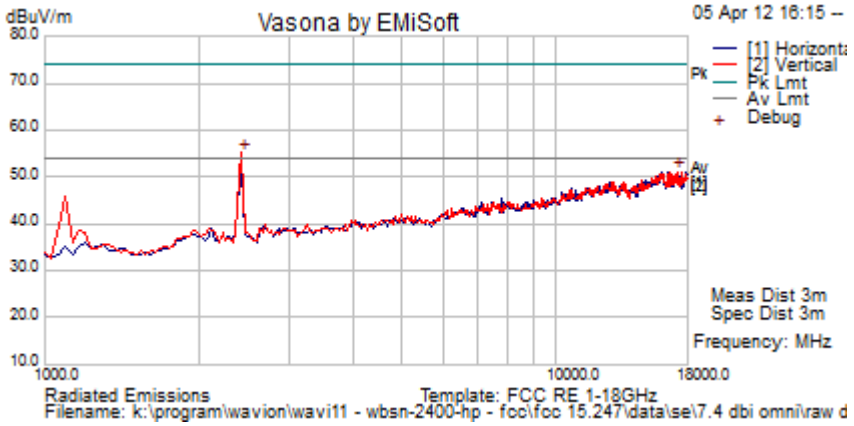
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

Restricted Band-Edge Plot 802.11n HT-40 2310 – 2390 MHz



Date: 5.APR.2012 19:17:34

Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

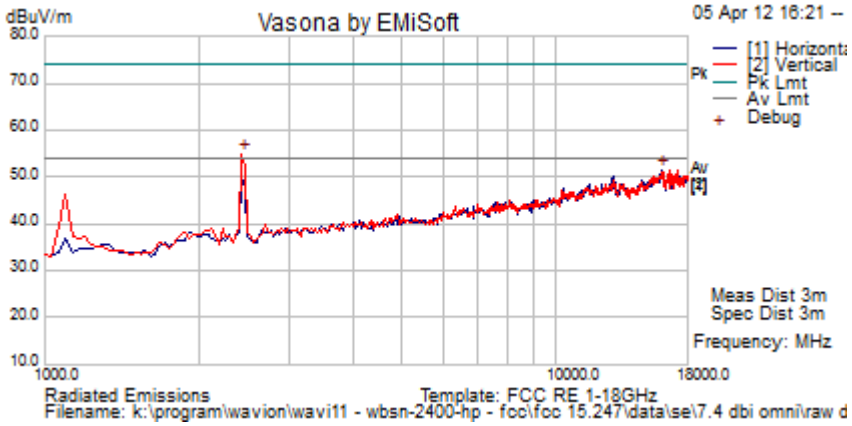


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	63.7	3.0	-11.6	55.1	Peak [Scan]	V						FUND
17182.365	41.9	8.6	0.7	51.2	Peak [Scan]	V	100	0	54.0	-2.8	Pass	NOISE

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.	2452 MHz	**Engineer**	GMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	7.4 OMNI	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131581		
Test Notes 2			

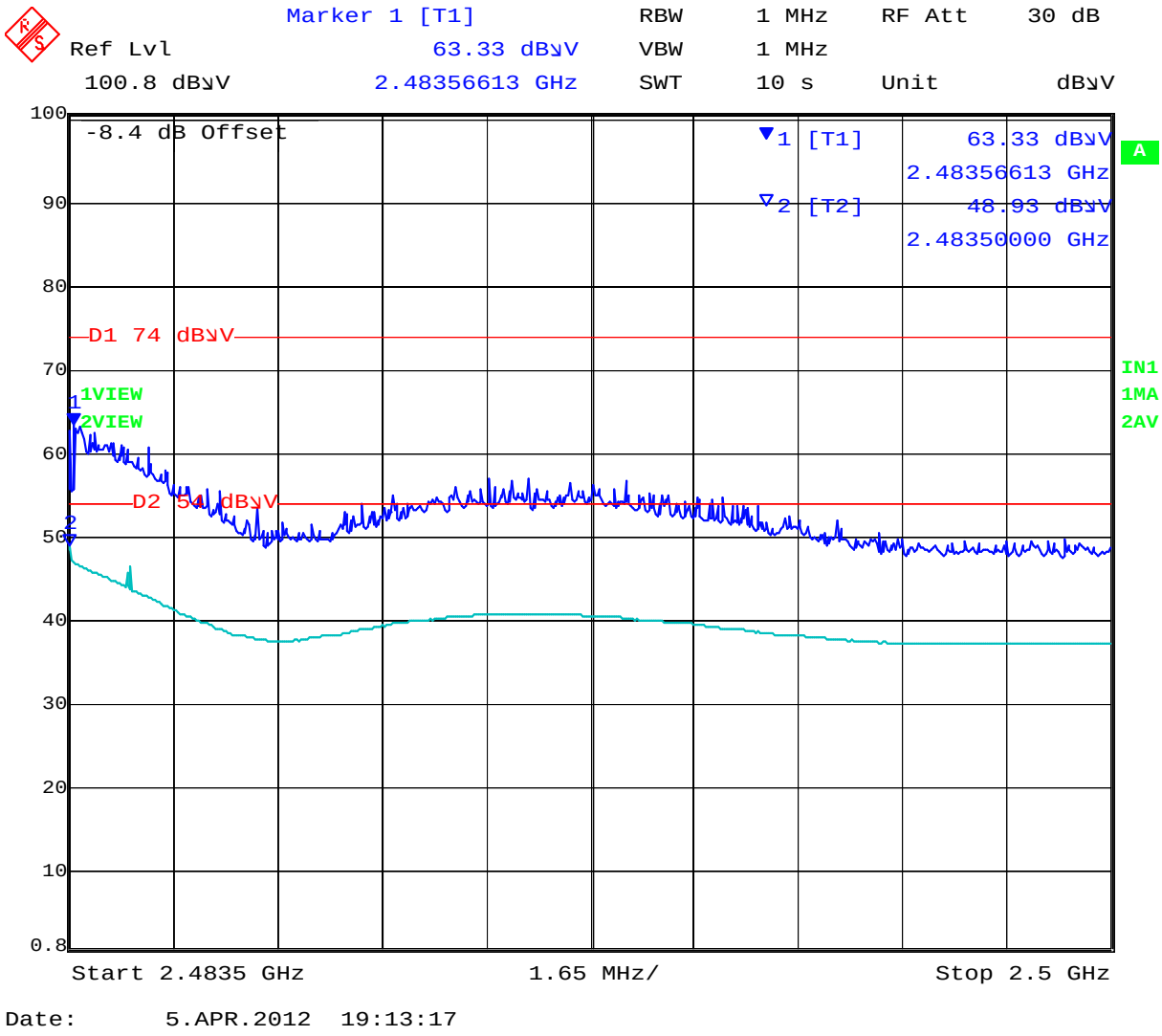


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	63.5	3.0	-11.6	54.9	Peak [Scan]	V						FUND
16058.116	42.3	9.0	0.3	51.6	Peak [Scan]	H	150	0	54.0	-2.4	Pass	NOISE

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

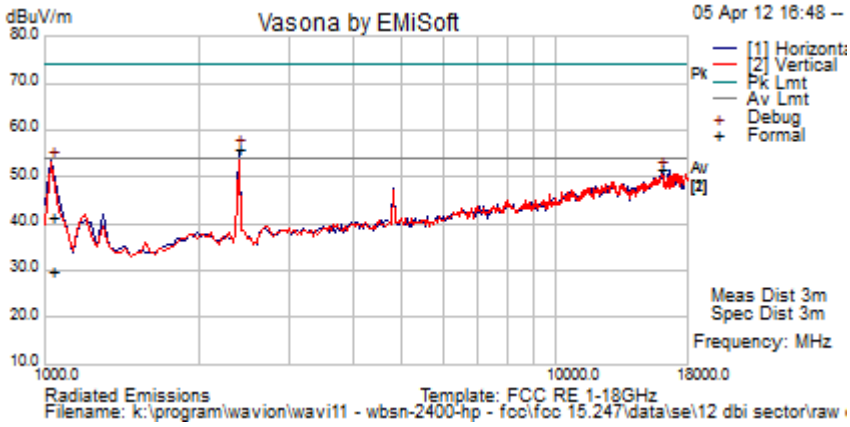
Restricted Band-Edge Plot 802.11n HT-40 2483.5 - 2500 MHz



5.1.6.2. Sector Antenna

Note: when testing the Sector antenna there was a constant restricted band (RB) emission at frequency 1036.146 MHz. This emission was evaluated in the initial plot below and the results used for all subsequent plots.

Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11b; 1 Mbs	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

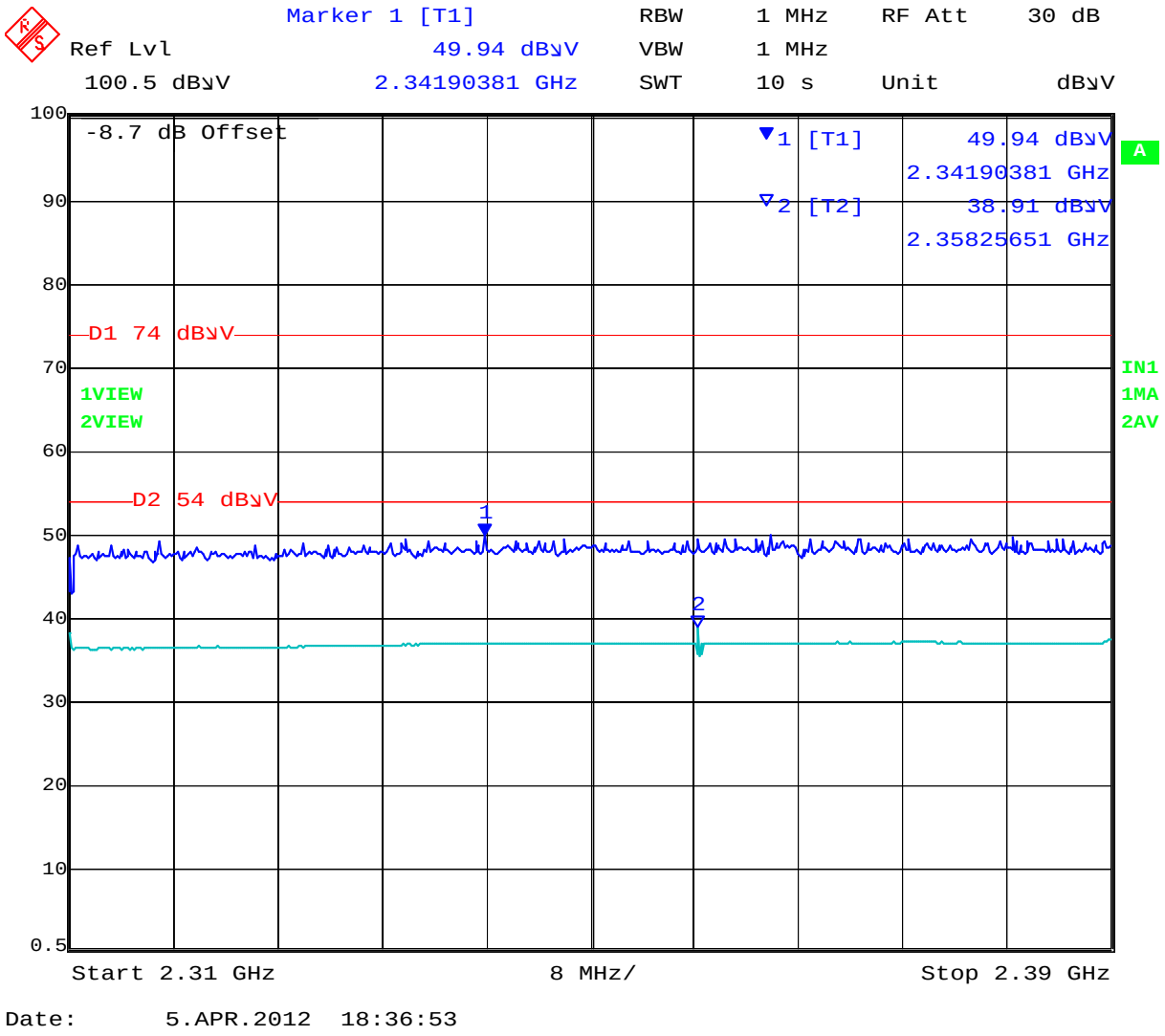


Formally measured emission peaks

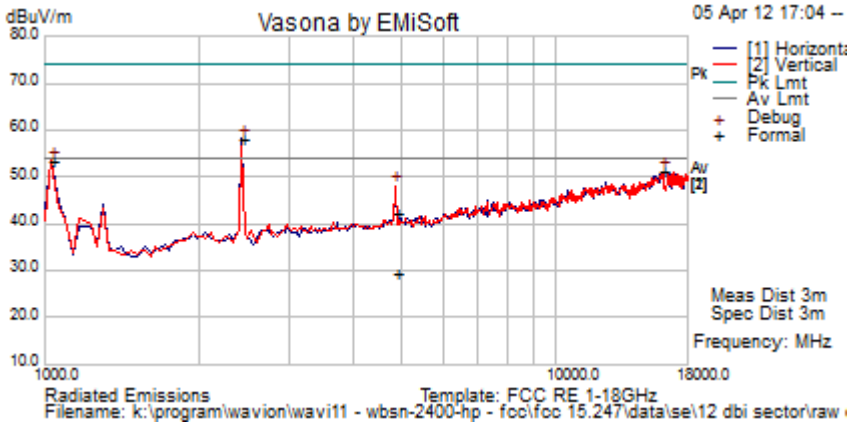
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB
2396.794	64.5	3.0	-11.7	55.8	Peak [Scan]	H						FUND
16058.116	42.2	9.0	0.3	51.5	Peak [Scan]	H	100	0	54	-2.6	Pass	NOISE

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

Restricted Band-Edge Plot 802.11b 2310 – 2390 MHz



Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11b; 1 Mbs	**Temp (°C)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

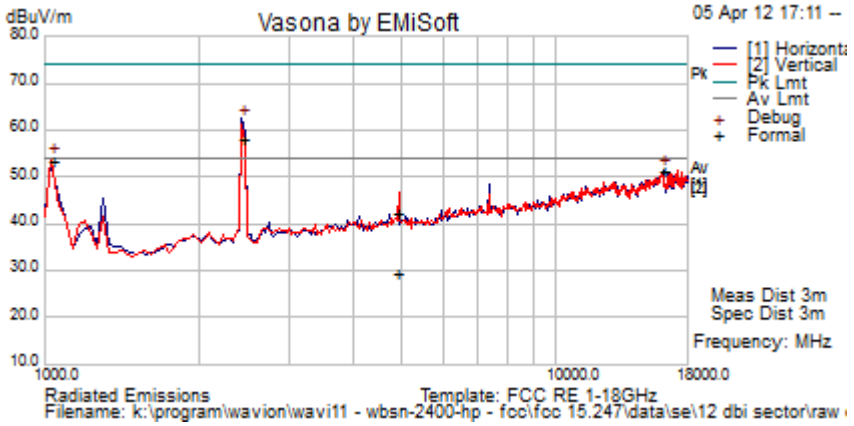


Formally measured emission peaks

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
4873.782	47.2	4.5	-9.7	42.0	Peak Max	V	159	208	74.0	-32.0	Pass	RB
4873.782	34.5	4.5	-9.7	29.3	Average Max	V	159	208	54.0	-24.7	Pass	RB
2430.862	66.9	3.0	-11.6	58.3	Peak [Scan]							FUND
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB*
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB*
16092.184	41.8	9.0	0.3	51.1	Peak [Scan]	V	100	0	54	-2.9	Pass	NOISE

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)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

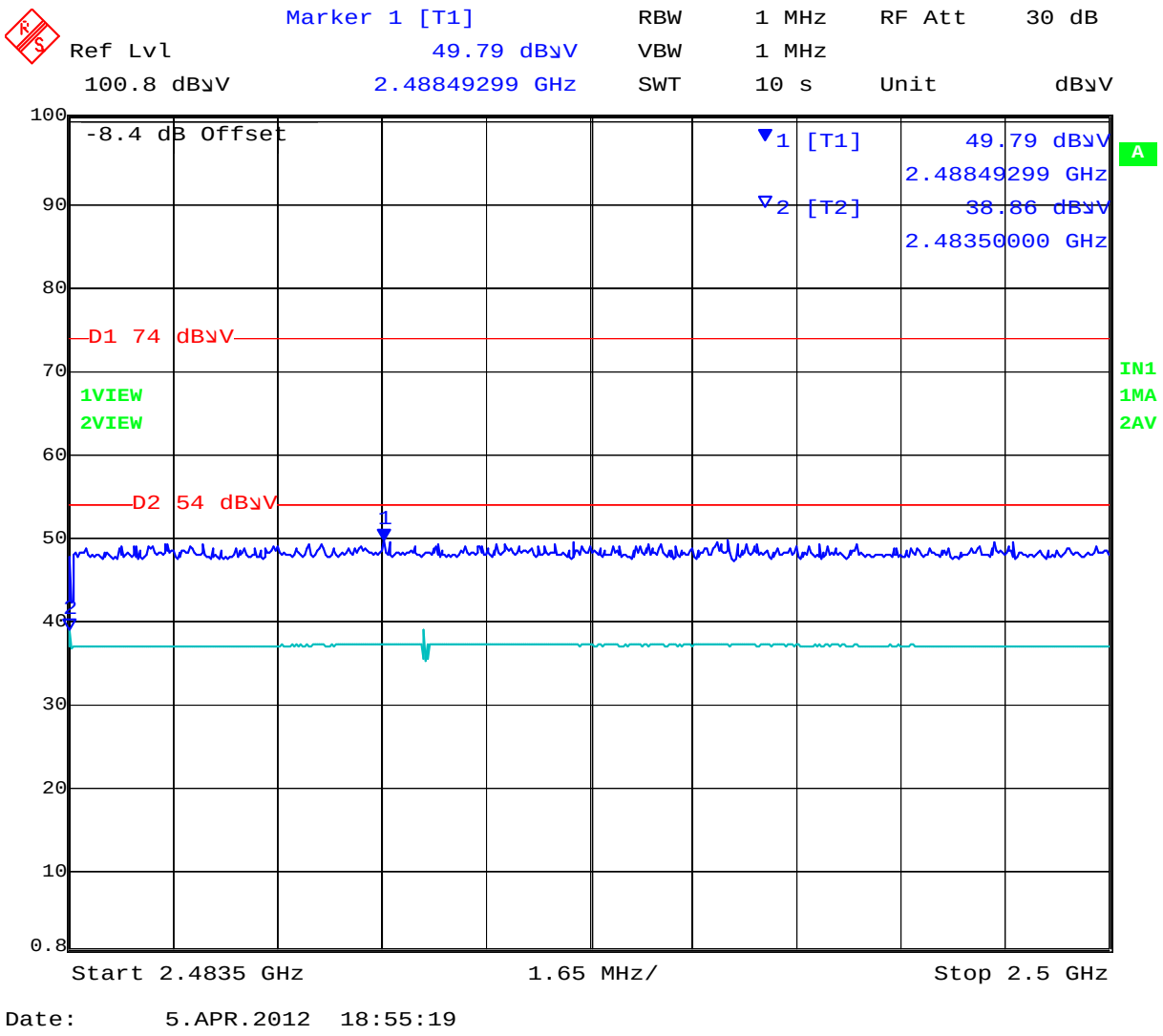


Formally measured emission peaks

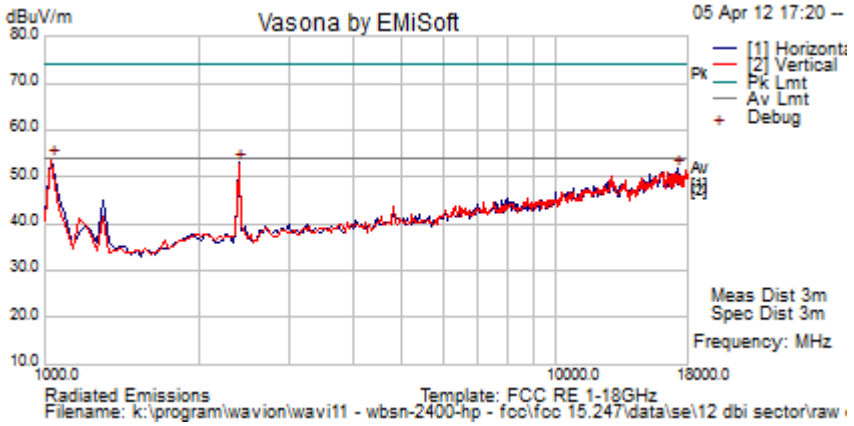
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	71.0	3.0	-11.6	62.4	Peak [Scan]	H						FUND
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB*
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB*
16160.321	42.3	9.0	0.2	51.5	Peak [Scan]	H	200	0	54	-2.5	Pass	NOISE

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

Restricted Band-Edge Plot 802.11b 2483.5 - 2500 MHz



Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

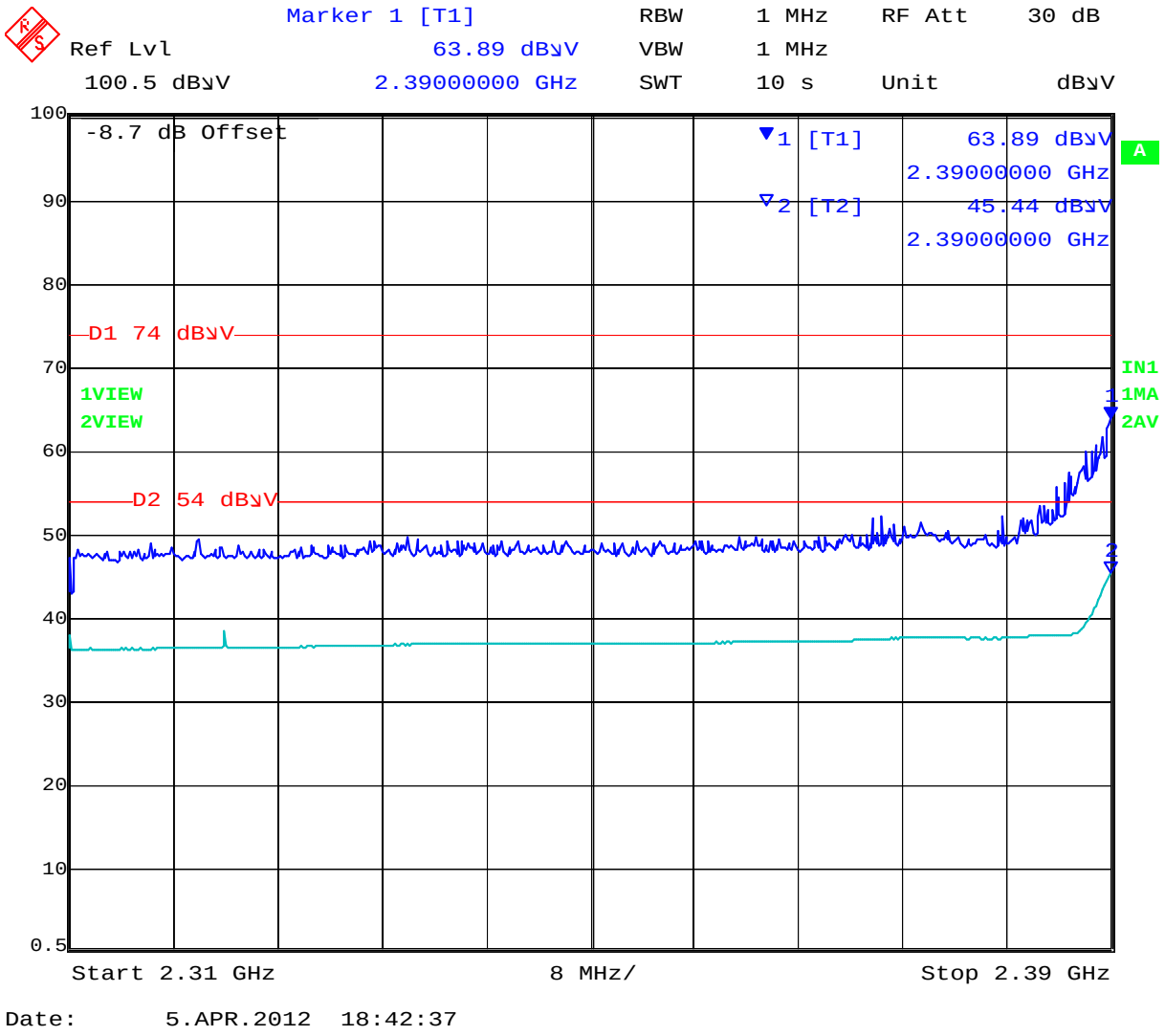


Formally measured emission peaks

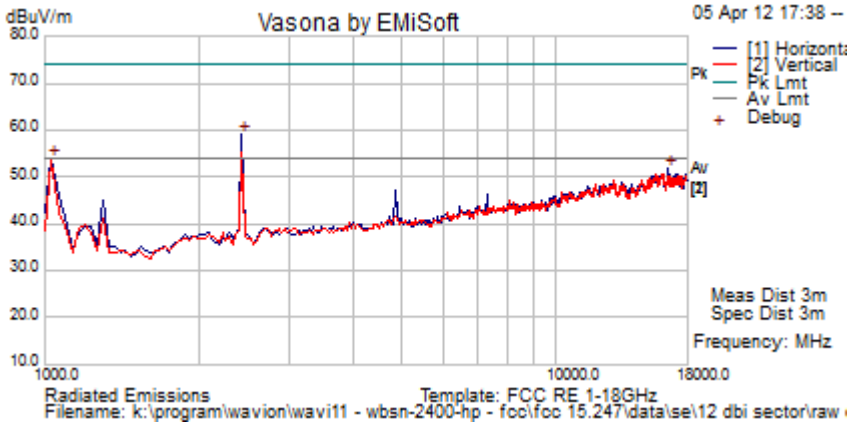
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB*
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB*
2396.79359	61.8	3.0	-11.7	53.0	Peak [Scan]	H	100	0	54.0	-1.0	Pass	FUND
17182.365	42.5	8.6	0.7	51.8	Peak [Scan]	H	100	0	54	-2.2	Pass	NOISE

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

Restricted Band-Edge Plot 802.11g 2310 – 2390 MHz



Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11g; 6 Mbs	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

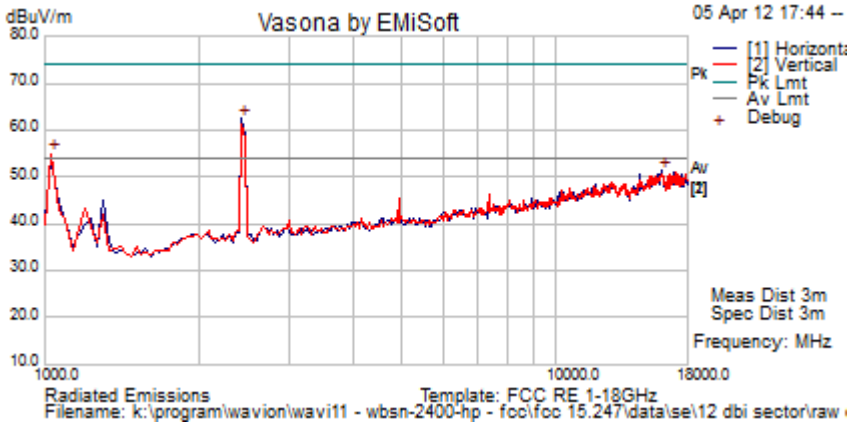


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	67.7	3.0	-11.6	59.1	Peak [Scan]							FUND
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB*
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB*
16535.070	42.5	8.8	0.4	51.7	Peak [Scan]	H	100	0	54	-2.3	Pass	NOISE

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)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

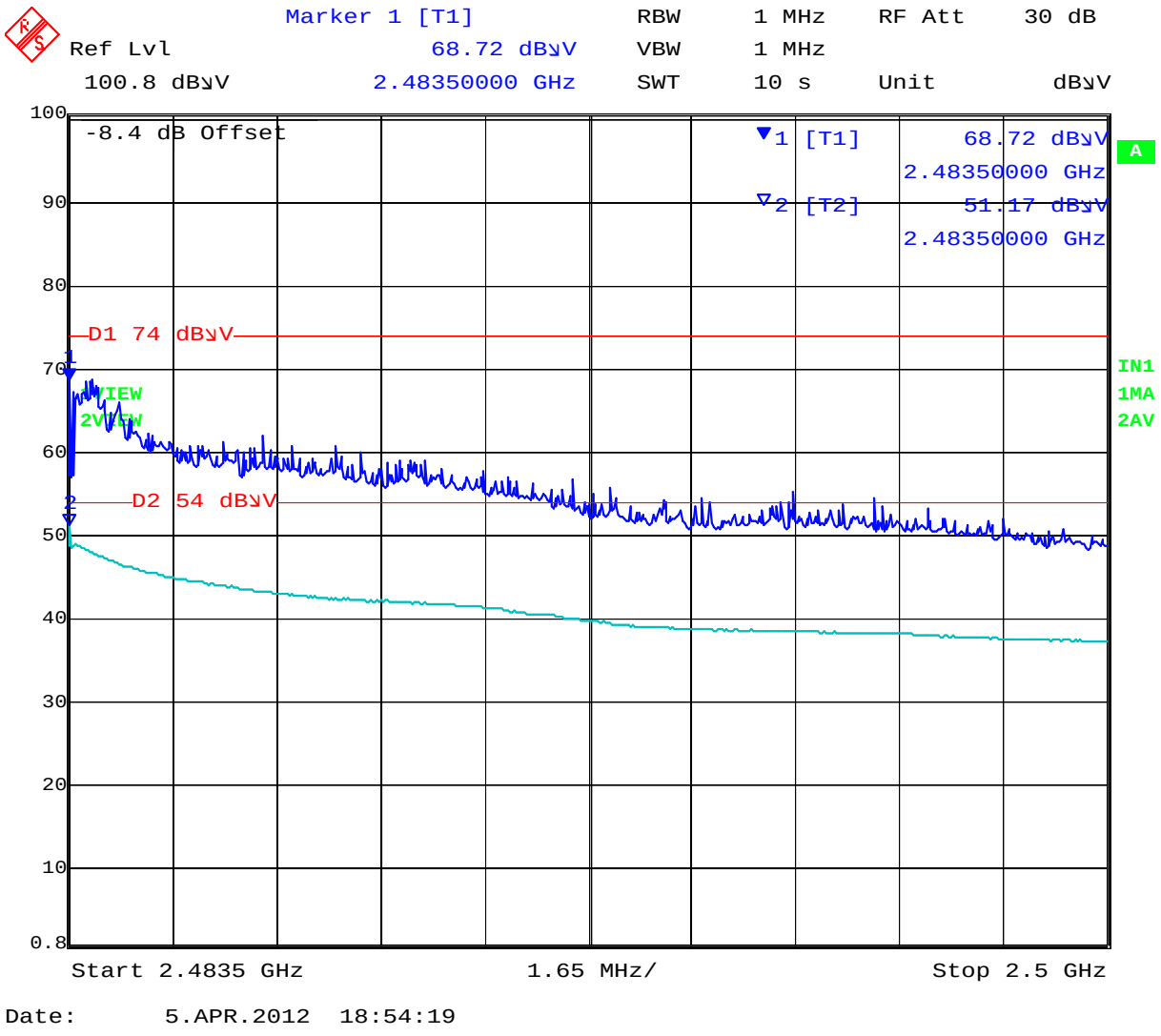


Formally measured emission peaks

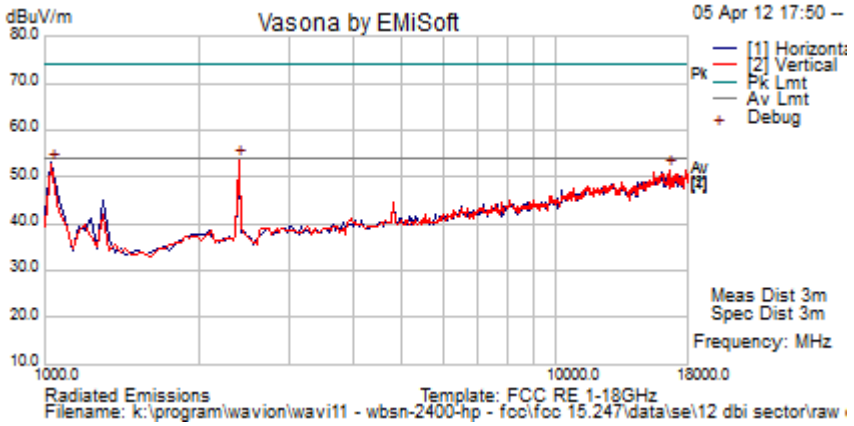
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	71.1	3.0	-11.6	62.5	Peak [Scan]	H						FUND
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB*
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB*
16092.184	42.0	9.0	0.3	51.3	Peak [Scan]	H	100	0	54	-2.7	Pass	NOISE

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

Restricted Band-Edge Plot 802.11g 2483.5 - 2500 MHz



Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

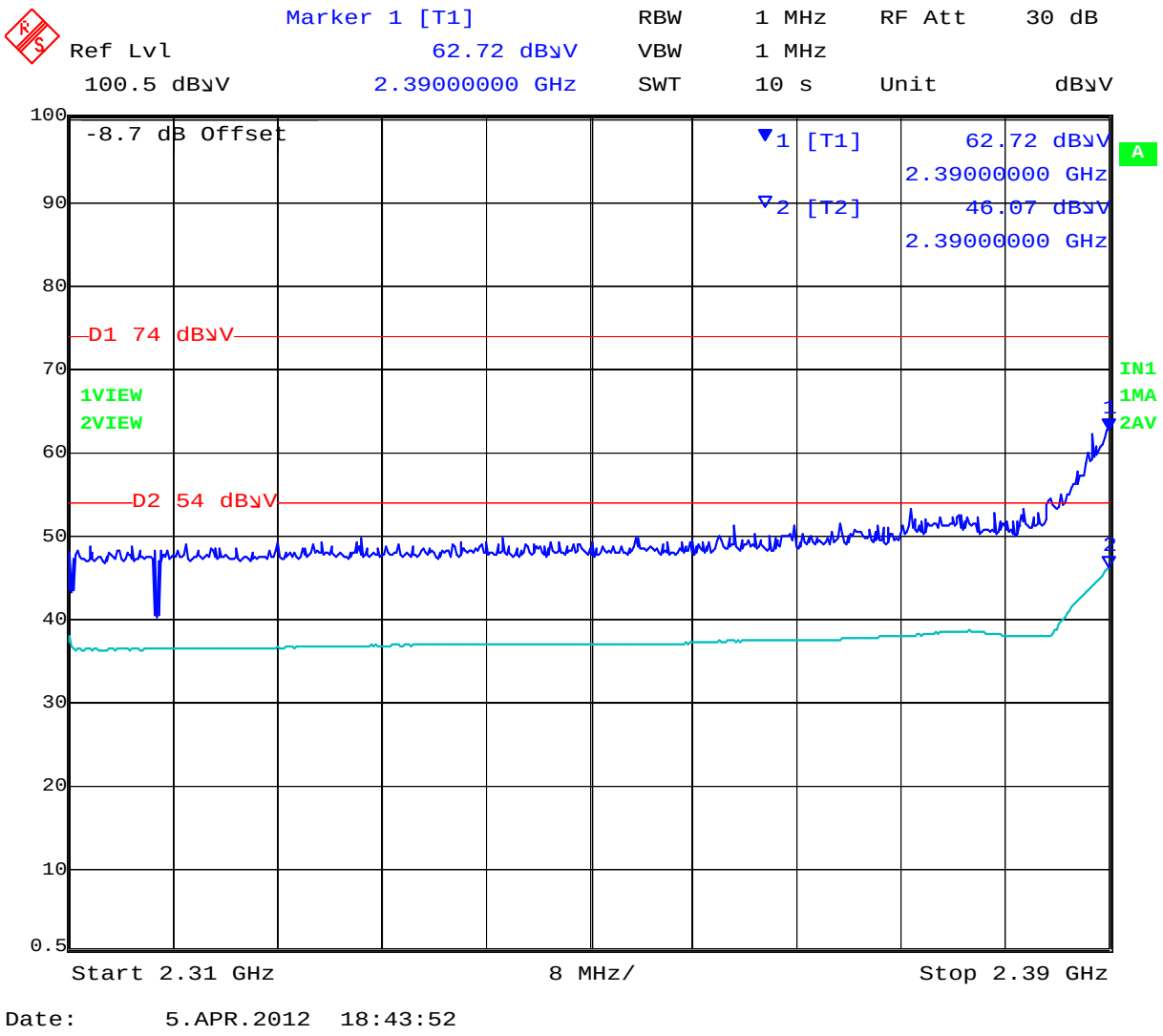


Formally measured emission peaks

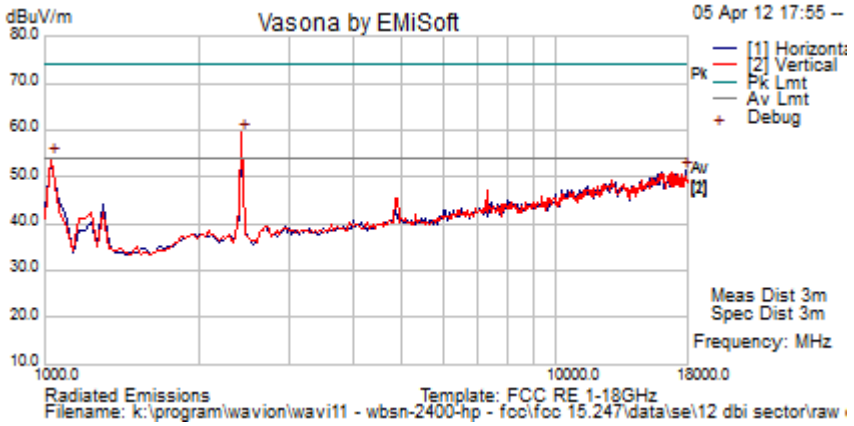
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	62.3	3.0	-11.7	53.6	Peak [Scan]	V						FUND
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB*
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB*
16569.138	42.2	8.8	0.5	51.5	Peak [Scan]	V	150	0	54	-2.5	Pass	NOISE

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

Restricted Band-Edge Plot 802.11n HT-20 2310 – 2390 MHz



Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

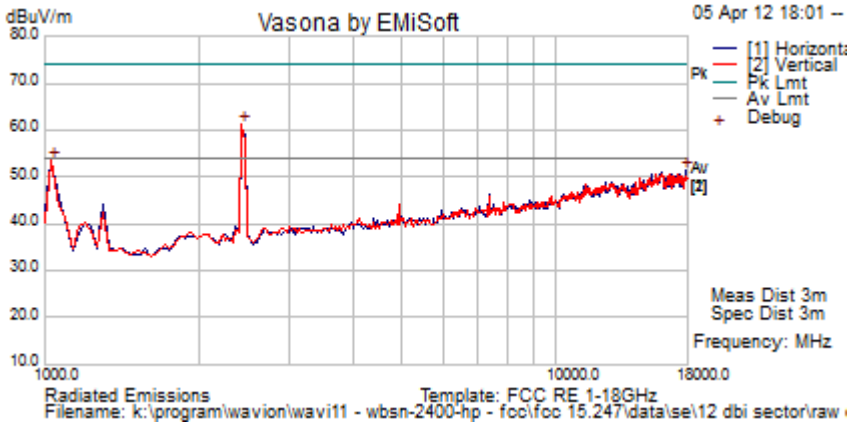


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	68.0	3.0	-11.6	59.4	Peak [Scan]	V						FUND
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB*
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB*
17897.796	42.0	8.8	0.5	51.2	Peak [Scan]	H	100	0	54	-2.8	Pass	NOISE

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	802.11n; HT-20; 6.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

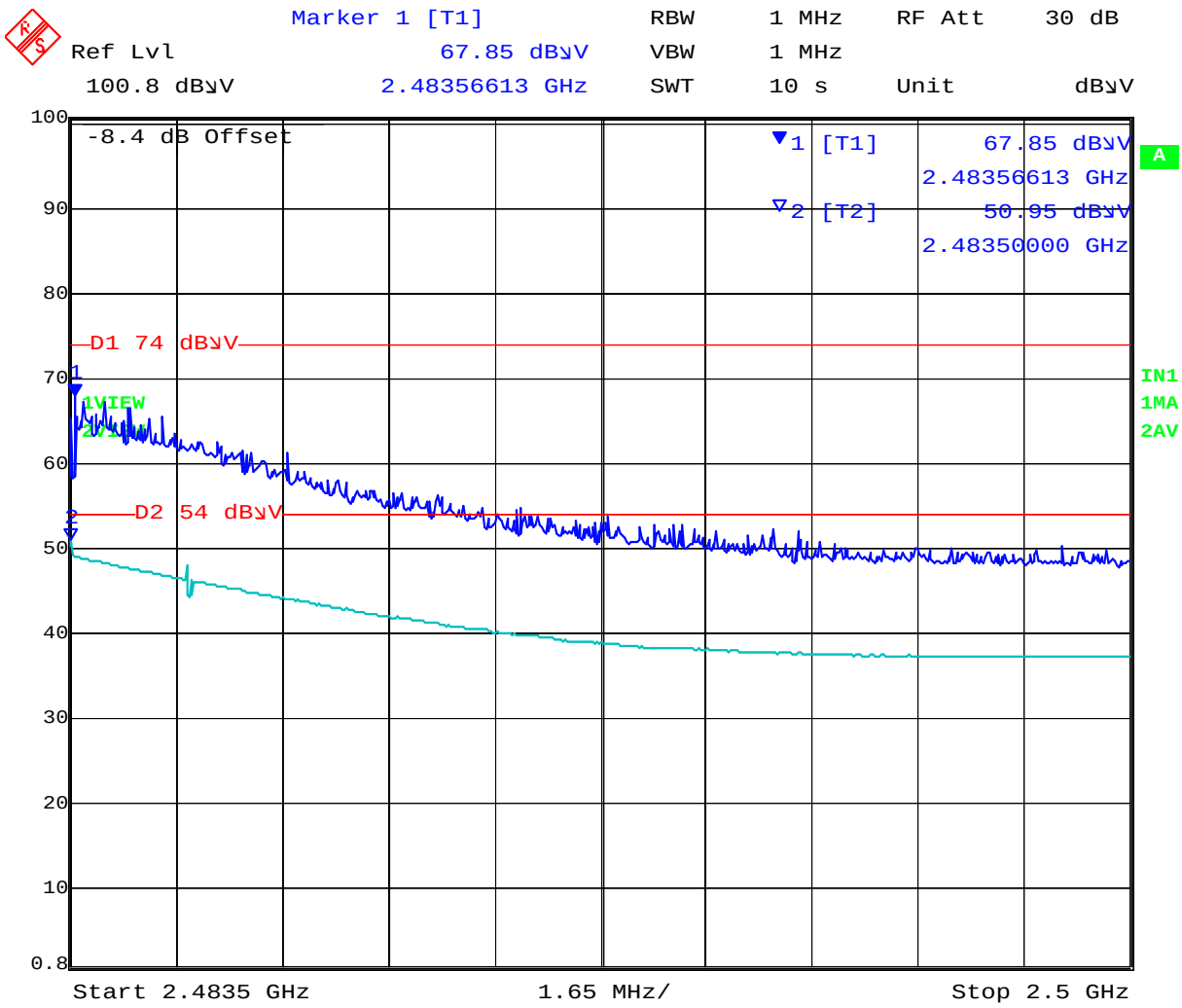


Formally measured emission peaks

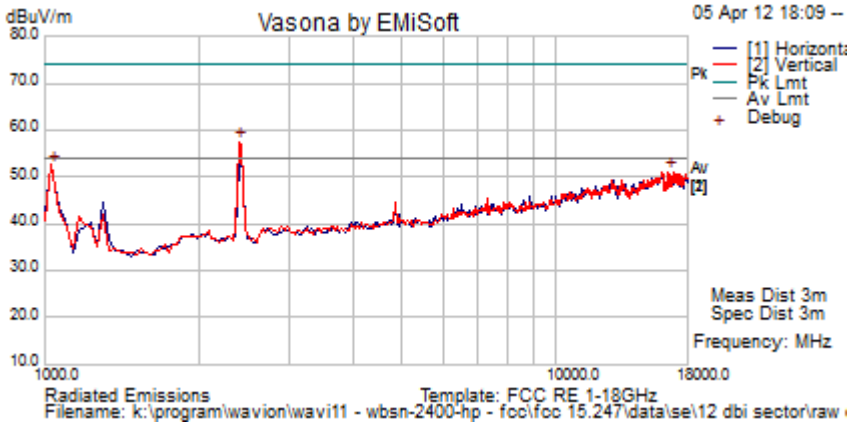
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	69.8	3.0	-11.6	61.3	Peak [Scan]	V						FUND
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB*
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB*
17897.796	42.1	8.8	0.5	51.3	Peak [Scan]	H	100	0	54	-2.7	Pass	NOISE

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

Restricted Band-Edge Plot 802.11n HT-20 2483.5 - 2500 MHz



Test Freq.	2422 MHz	**Engineer**	GMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

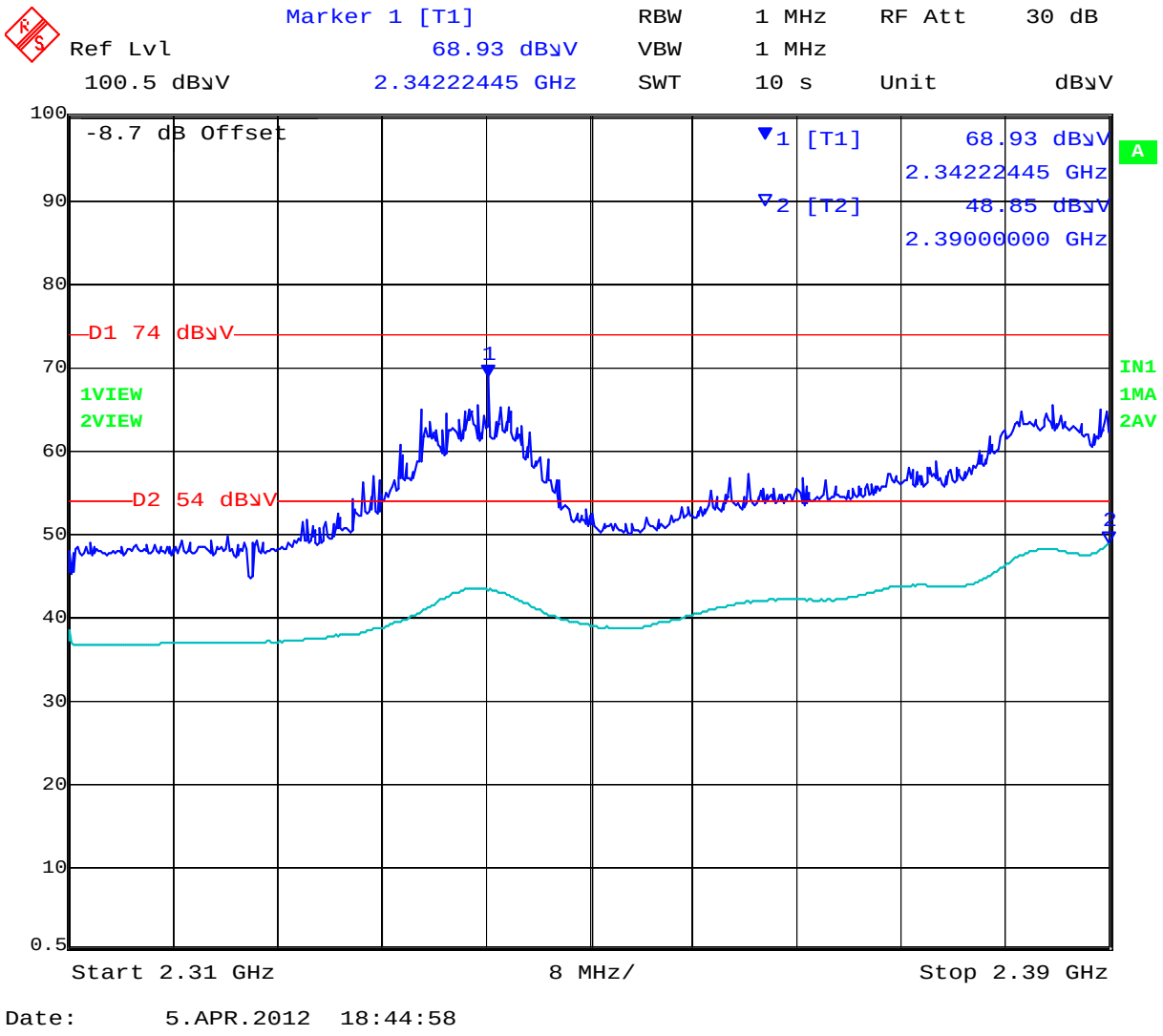


Formally measured emission peaks

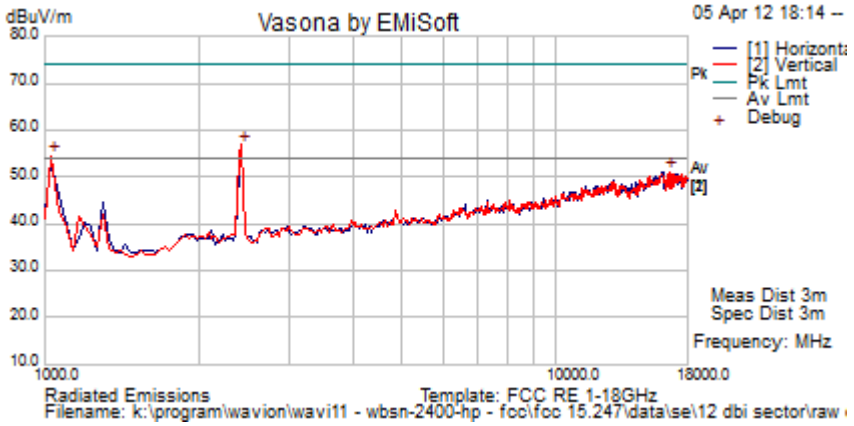
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	66.3	3.0	-11.7	57.6	Peak [Scan]	V						FUND
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB*
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB*
16535.070	41.9	8.8	0.4	51.1	Peak [Scan]	V	150	0	54	-2.9	Pass	NOISE

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

Restricted Band-Edge Plot 802.11n HT-40 2310 – 2390 MHz



Test Freq.	2437 MHz	**Engineer**	GMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

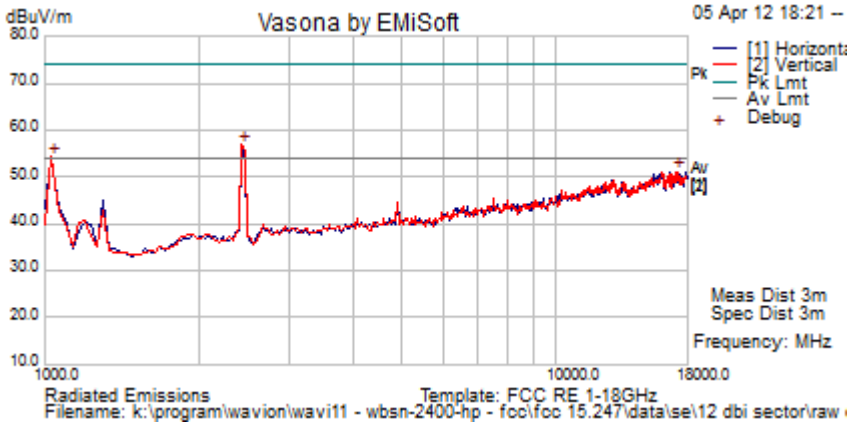


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	65.4	3.0	-11.6	56.8	Peak [Scan]	V						FUND
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB*
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB*
16637.275	41.8	8.7	0.6	51.1	Peak [Scan]	V	200	0	54	-2.9	Pass	NOISE

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.	2452 MHz	**Engineer**	GMH
Variant	802.11n; HT-40; 13.5 MCS	**Temp (ºC)**	22.5
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	32
Power Setting	Maximum	**Press. (mBars)**	1005
Antenna	12 dBi Sector	**Duty Cycle (%)**	100
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			

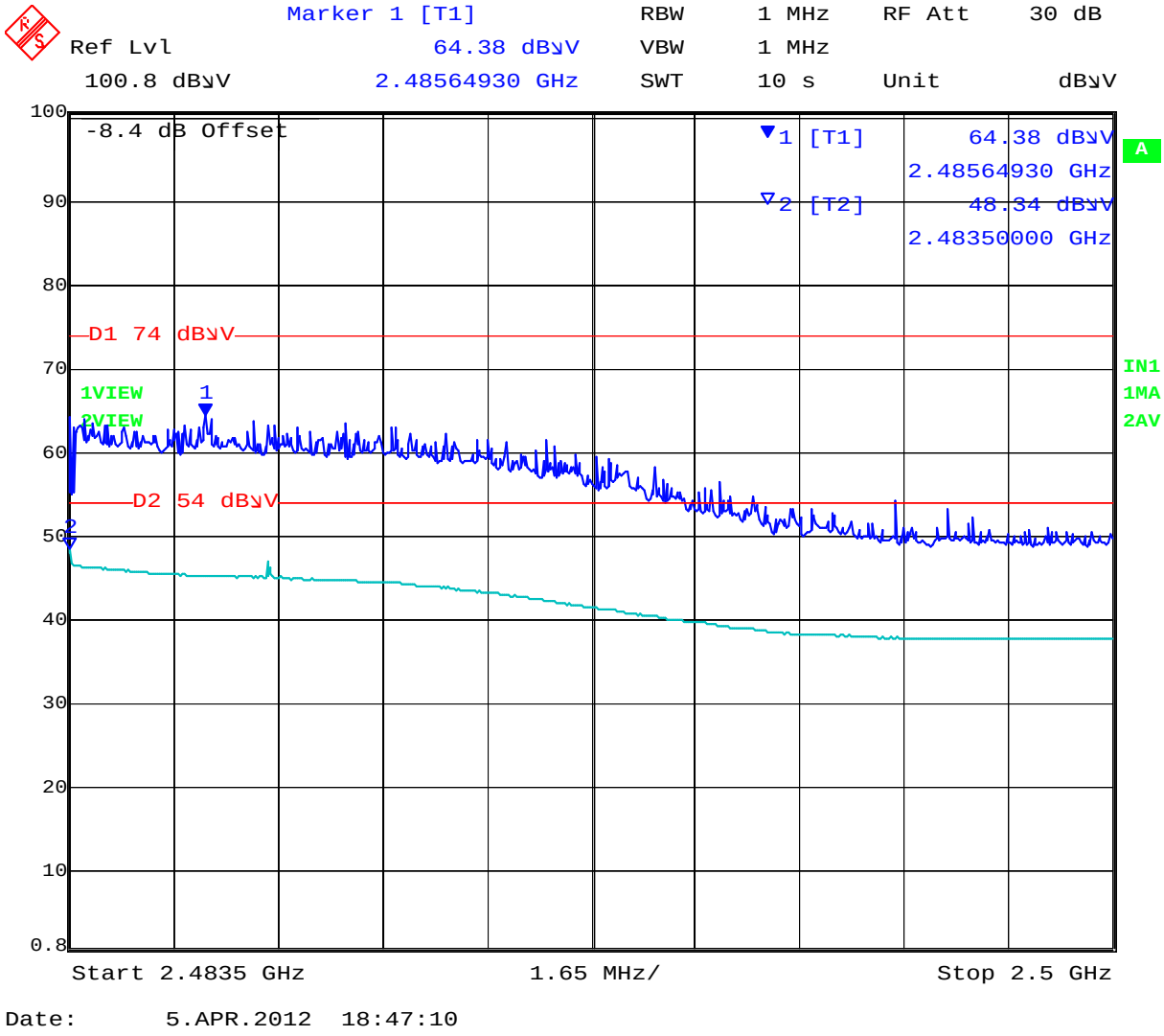


Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	65.6	3.0	-11.6	57.0	Peak [Scan]	V	100	0	54.0	3.0	Fail	
1036.146	55.0	2.0	-15.8	41.2	Peak Max	H	170	17	74.0	-32.8	Pass	RB*
1036.146	43.7	2.0	-15.8	29.9	Average Max	H	170	17	54.0	-24.1	Pass	RB*
17250.501	41.5	8.6	1.0	51.1	Peak [Scan]	V	200	0	54	-2.9	Pass	

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

Restricted Band-Edge Plot 802.11n HT-40 2483.5 - 2500 MHz



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

5.1.6.3. 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.

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:

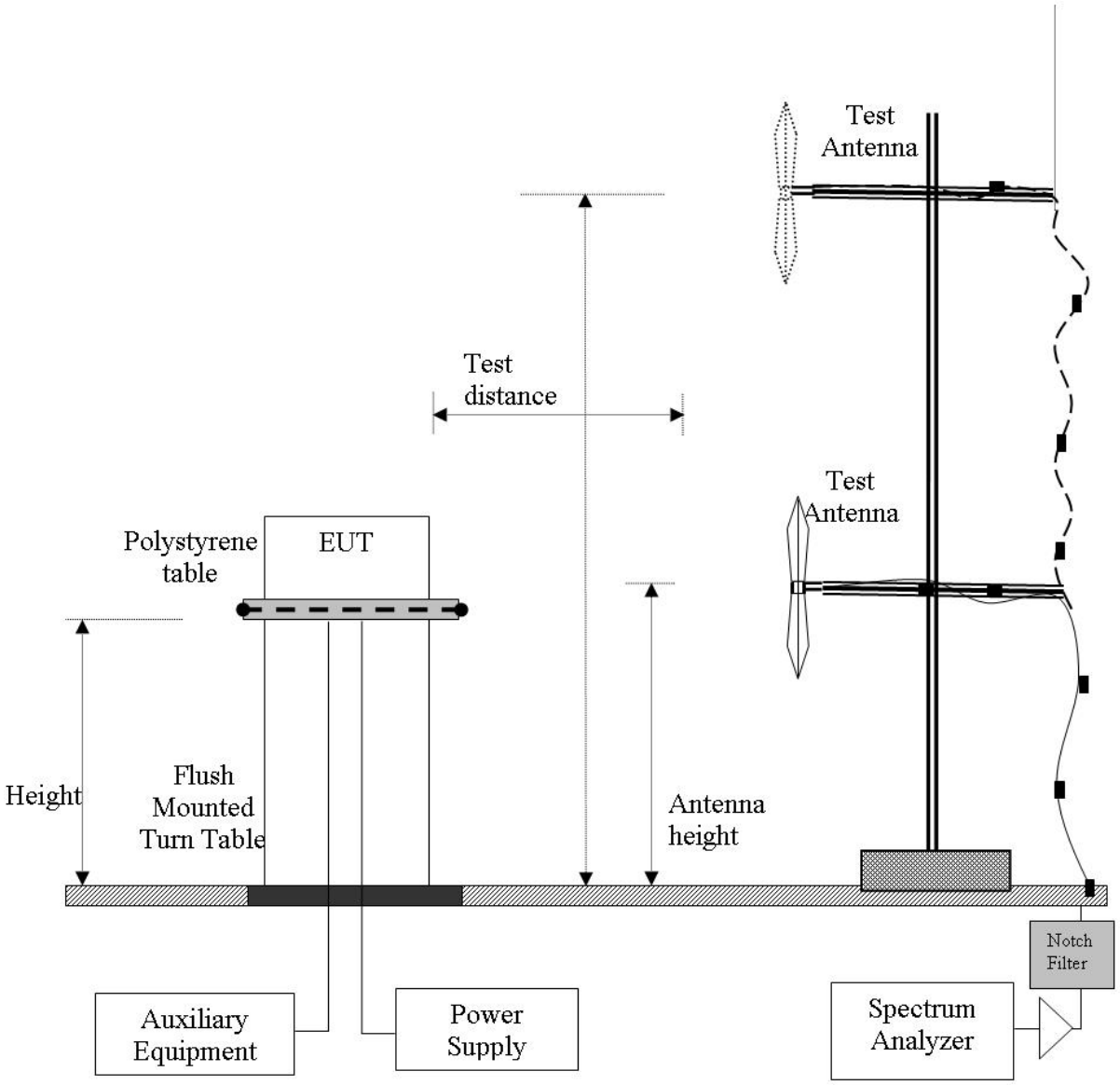
$$FS = 51.5 + 8.5 + 1.3 - 26.0 + 1 = 36.3 dB\mu V/m$$

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

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

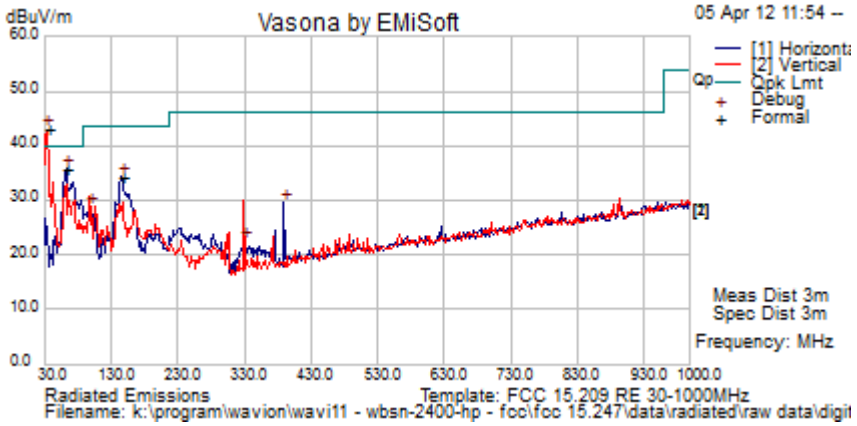
40 dBμV/m = 100μV/m
48 dBμV/m = 250μV/m

Radiated Emission Measurement Setup – Below 1 GHz



The EUT was powered via Power over Ethernet (POE).

Test Freq.	2412 MHz	**Engineer**	GMH
Variant	802.11b	**Temp (°C)**	19.5
Freq. Range	30 MHz - 1000 MHz	**Rel. Hum.(%)**	33
Power Setting	Maximum	**Press. (mBars)**	1006
Antenna	7.4 dBi OMNI		
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
34.029	49.2	3.6	-12.9	39.8	Quasi Max	V	100	0	40.0	-0.2	Pass	
63.041	54.1	3.8	-23.7	34.2	Quasi Max	H	300	0	40.0	-5.8	Pass	
146.420	47.3	4.4	-18.7	33.0	Quasi Max	H	98	360	43.5	-10.5	Pass	
389.596	39.3	5.4	-15.2	29.5	Peak [Scan]	H	98	360	46.0	-16.5	Pass	
329.605	33.6	5.2	-16.5	22.3	Peak [Scan]	V	98	360	46.0	-23.7	Pass	
98.379	46.5	4.1	-21.7	28.9	Peak [Scan]	V	98	360	43.5	-14.6	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

5.1.6.4. Receiver Radiated Spurious Emissions

Specification

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

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

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

Laboratory Measurement Uncertainty for Radiated Emissions

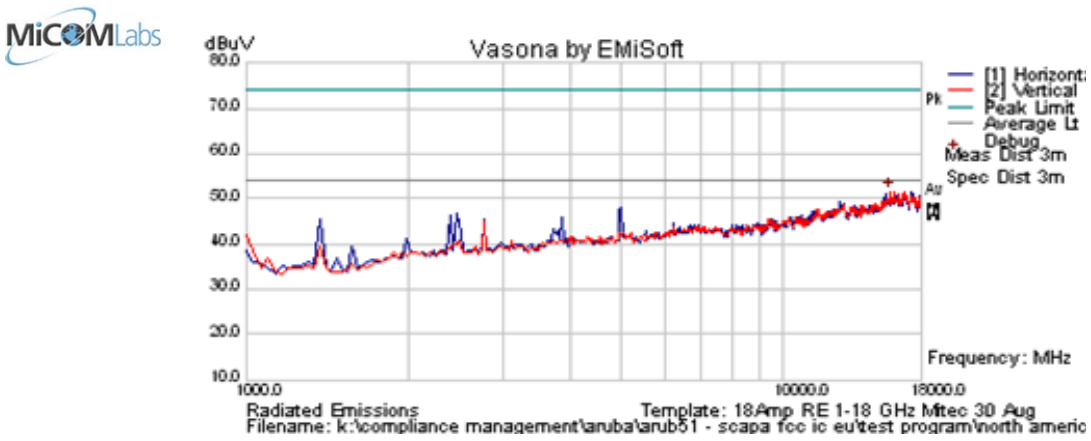
Measurement uncertainty	+5.6/ -4.5 dB

Traceability

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

Measurement Results for Receiver Emissions

Test Freq.	2412 MHz	**Engineer**	GMH
Variant	Receive in Test Utility	**Temp (ºC)**	19
Freq. Range	1000 MHz - 18000 MHz	**Rel. Hum.(%)**	35
Power Setting	Not Applicable in Receive Mode	**Press. (mBars)**	1011
Antenna	Integral Antenna's connected during testing		
Test Notes 1	AC Powered		
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
No Receiver Emissions within 6dB of limit.												

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

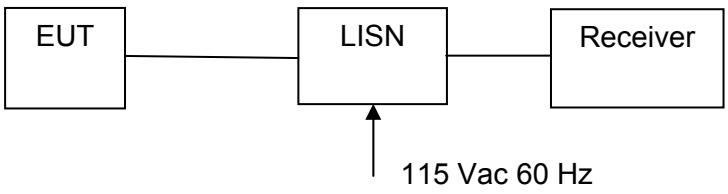
5.1.7. AC Wireline Conducted Emissions (150 kHz – 30 MHz)

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

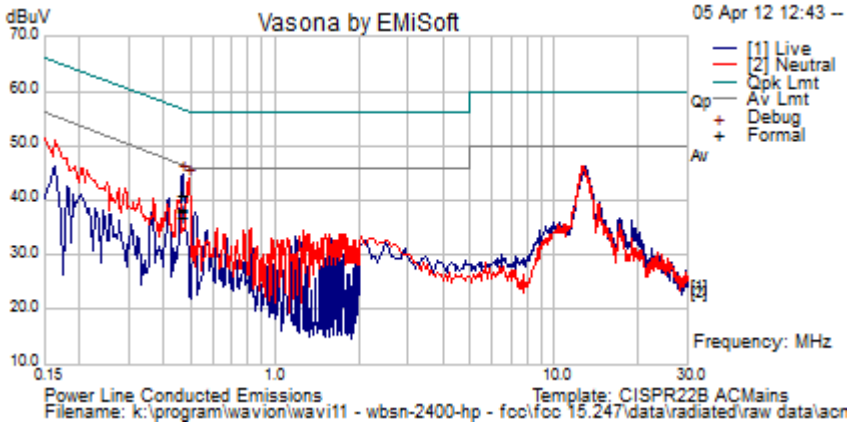


Measurement set up for AC Wireline Conducted Emissions Test

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

Test Freq.	2412 MHz	**Engineer**	GMH
Variant	AC Line Emissions	**Temp (ºC)**	19.5
Freq. Range	0.150 MHz - 30 MHz	**Rel. Hum.(%)**	33
Power Setting	Maximum	**Press. (mBars)**	1006
Antenna	7.4 dBi OMNI		
Test Notes 1	EUT Serial #: 1153R00131583		
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	Factors dB	Level dBuV	Measurement Type	Line	Limit dBuV	Margin dB	Pass /Fail	Comments
0.459	30.8	9.9	0.1	40.8	Quasi Peak	Live	56.71	-15.9	Pass	
0.458	28.1	9.9	0.1	38.0	Quasi Peak	Neutral	56.73	-18.7	Pass	
0.459	28.4	9.9	0.1	38.4	Average	Live	46.71	-8.3	Pass	
0.458	26.9	9.9	0.1	36.9	Average	Neutral	46.73	-9.8	Pass	

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

Specification

Limit

§15.207 (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

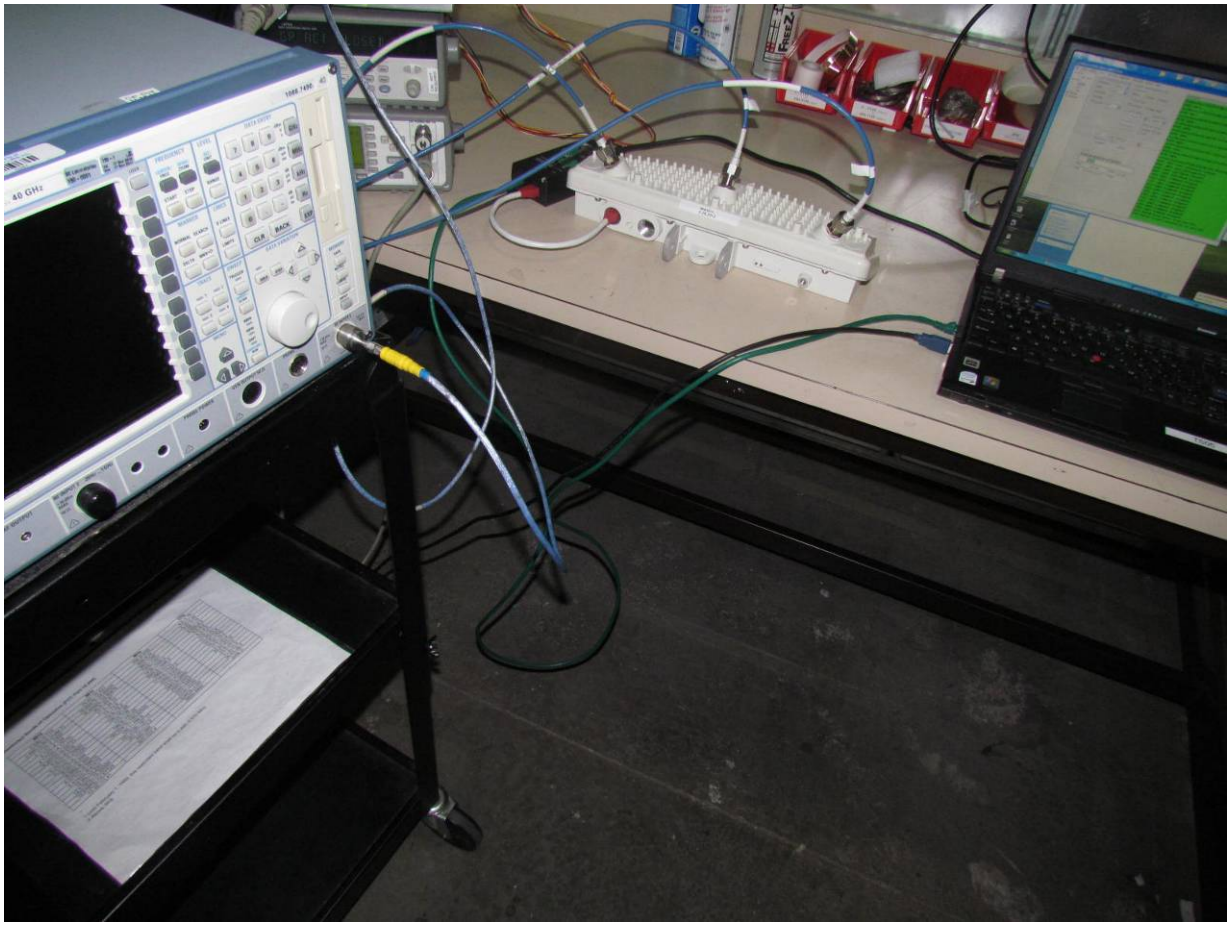
Measurement uncertainty	±2.64 dB

Traceability

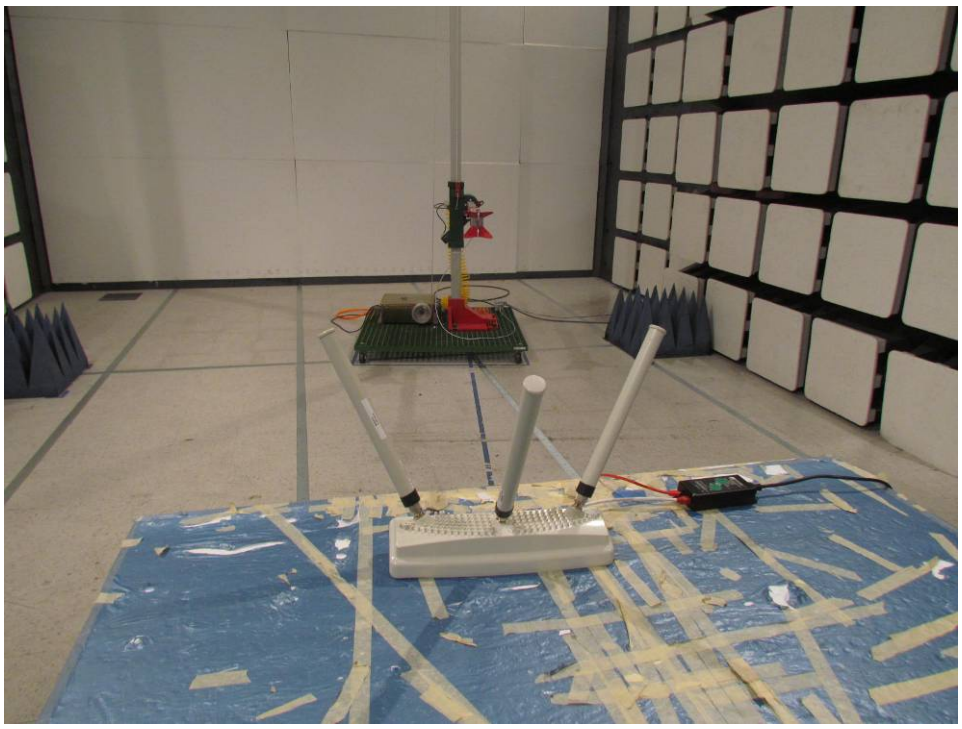
Method	Test Equipment Used
Measurements were made per work instruction WI-EMC-01 'Measurement of Conducted Emissions'	0158, 0184, 0287, 0190, 0293, 0307

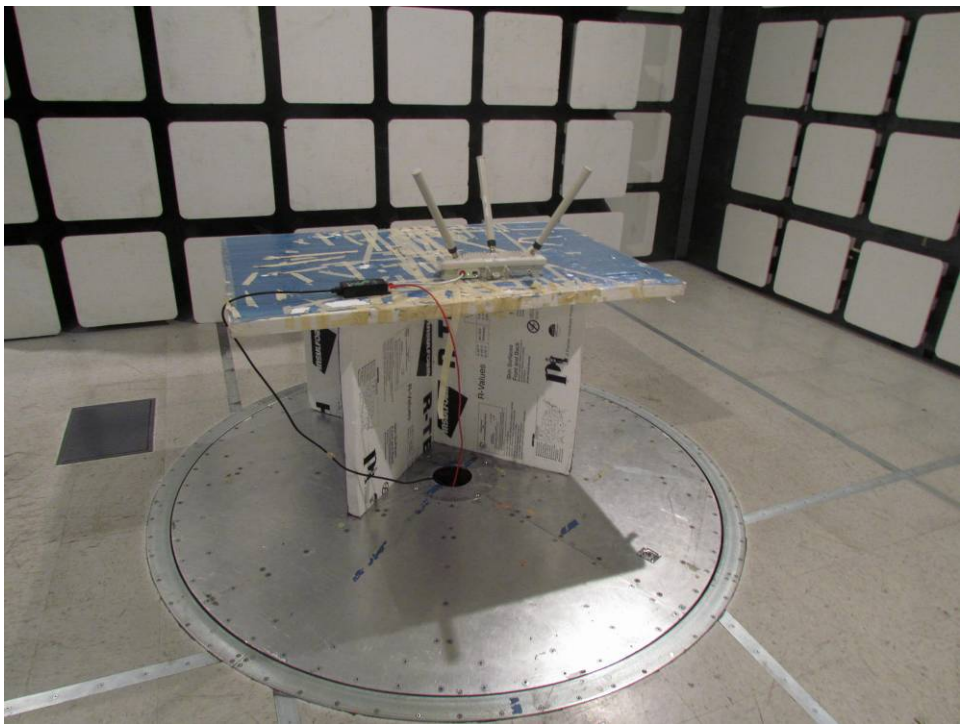
6. PHOTOGRAPHS

6.1. Conducted Test Setup

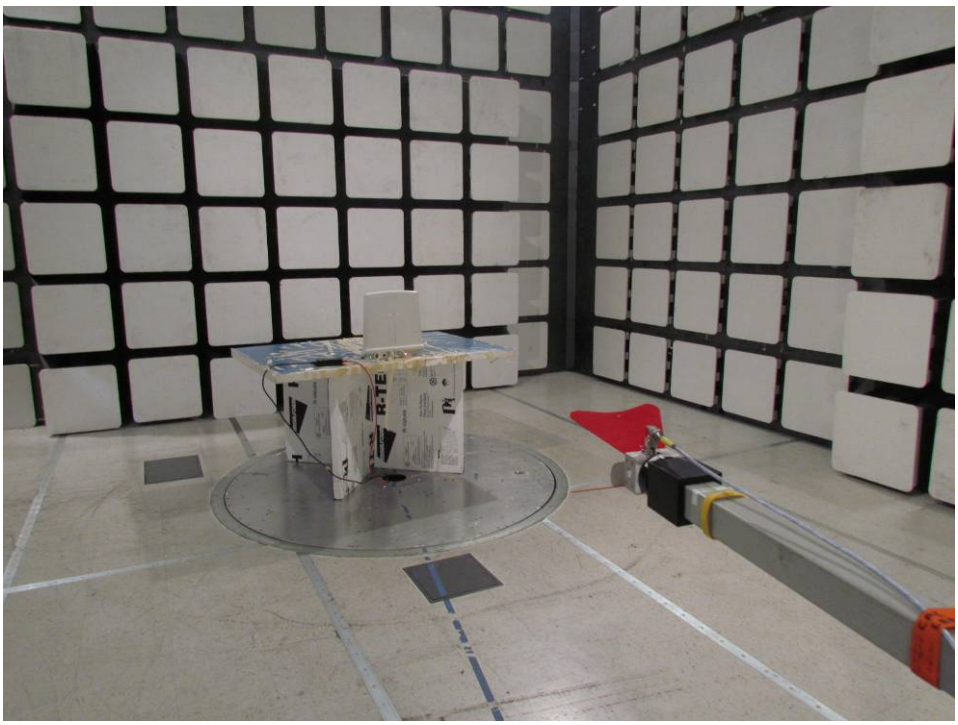


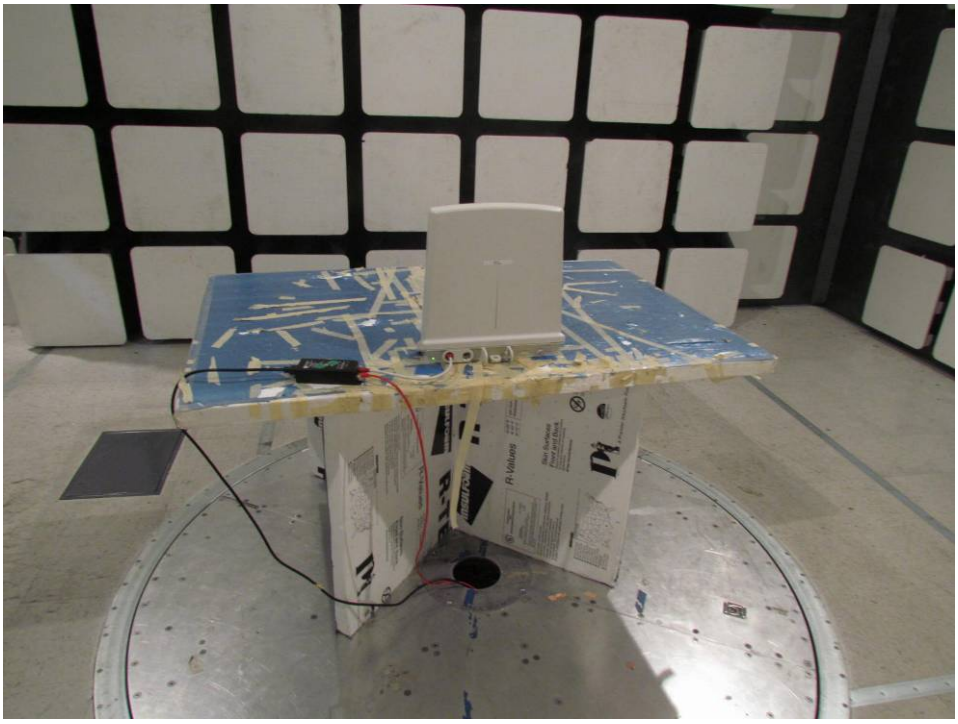
6.2. Radiated Test Setup > 1 GHz OMNI



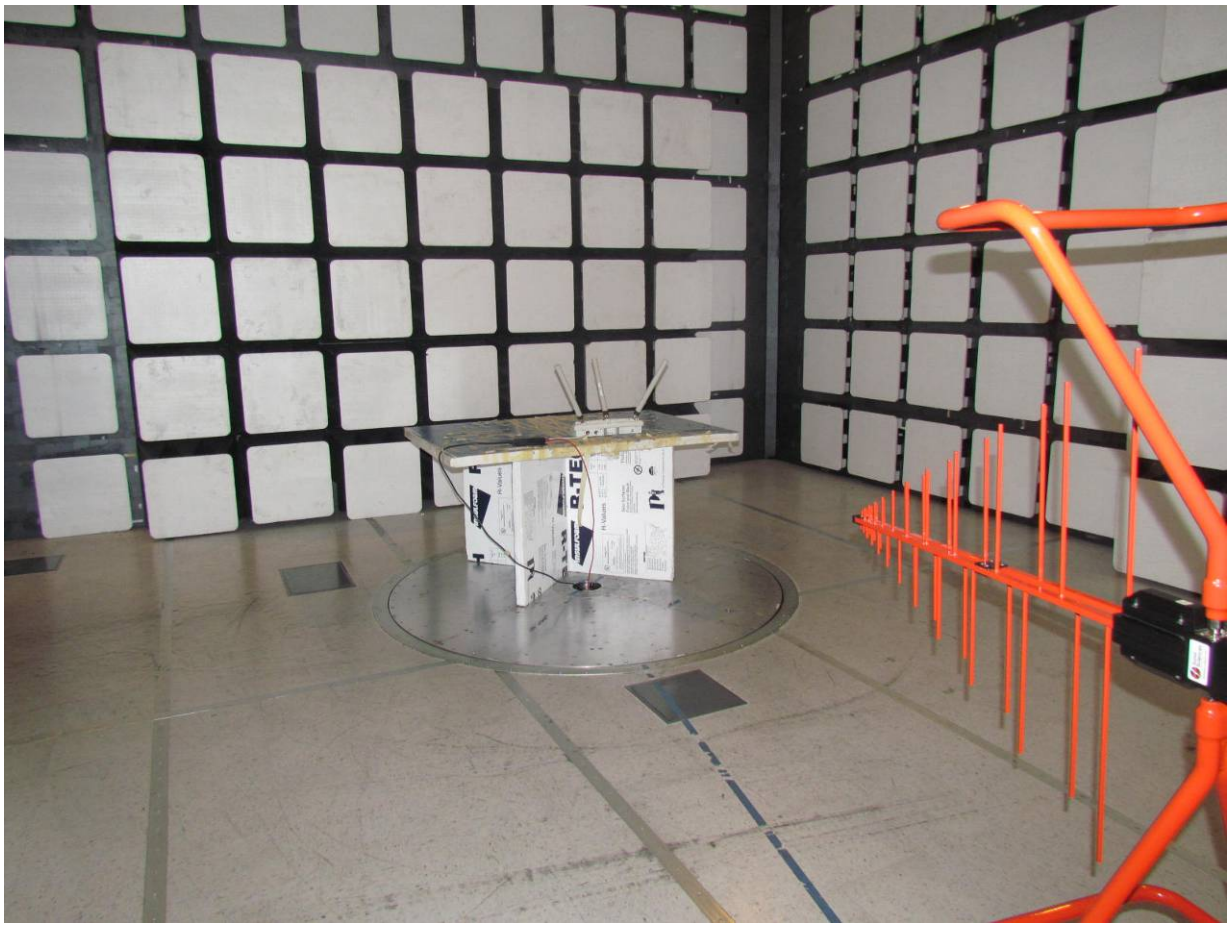


6.3. Radiated Test Setup > 1 GHz SECTOR

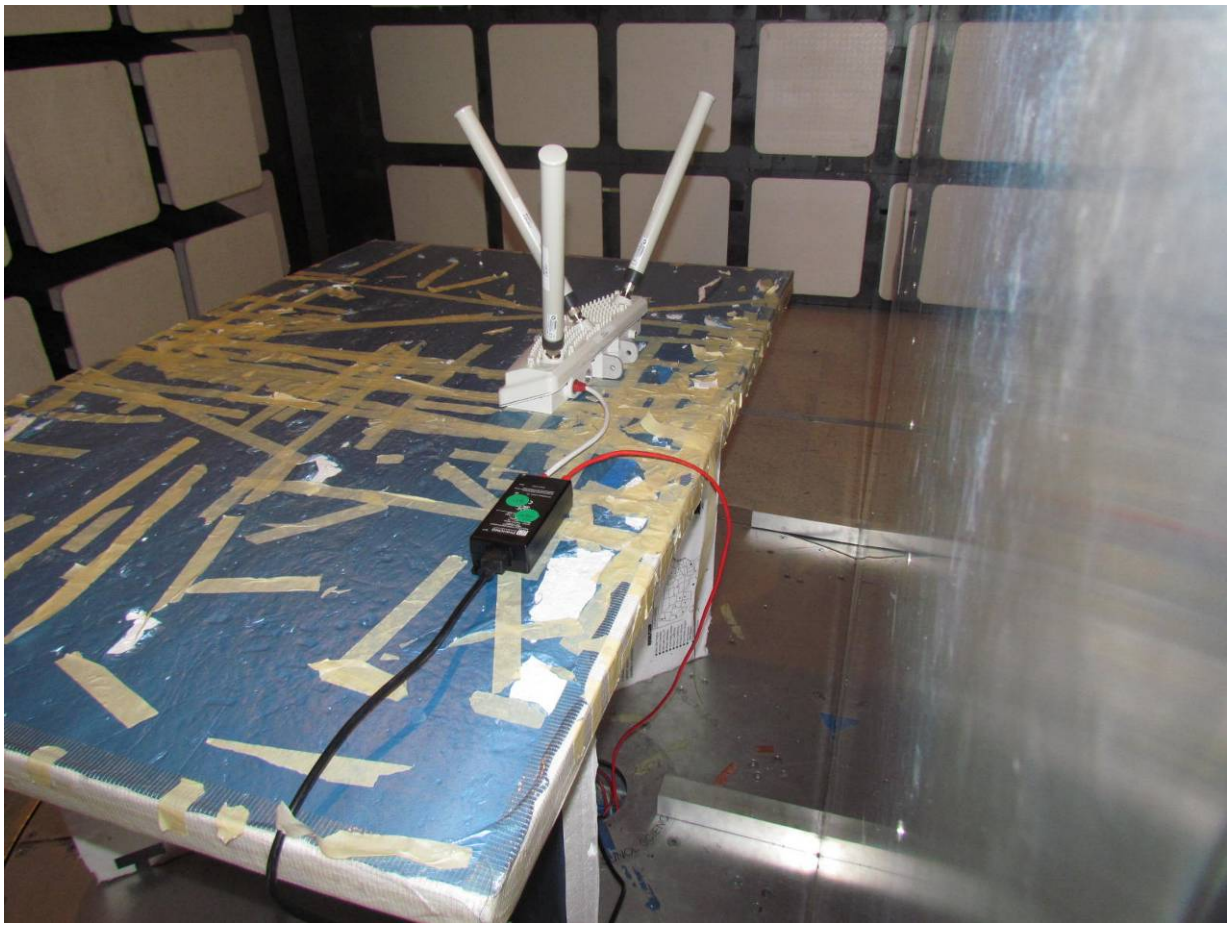




6.4. Radiated Test Setup below 1 GHz OMNI



6.5. AC Wireline Emissions



7. TEST EQUIPMENT DETAILS

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

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