

Test of Aruba AP-93H 802.11a/b/g/n Wireless AP

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

Test Report Serial No.: ARUB74-U1 Rev A



TEST REPORT

FROM



Test of: Aruba Networks, Inc AP-93H 802.11a/b/g/n Wireless AP

To: FCC 47 CFR Part 15.247 & IC RSS 210

Test Report Serial No.: ARUB74-U1 Rev A

Note: this report contains data with regard to the 2400 to 2483.5 MHz and 5725 to 5850 MHz bands for the Aruba Networks, Inc AP-93H Wireless LAN Access Point. 5,150 to 5,250 MHz test data are reported in MiCOM Labs test report ARUB74-U2.

This report supersedes: NONE

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

Product Function: Wireless LAN Access Point

Copy No: pdf **Issue Date:** 21st December 2011

This Test Report is Issued Under the Authority of:

MiCOM Labs, Inc.

440 Boulder Court, Suite 200

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CERTIFICATE #2381.01

MiCOM Labs is an ISO 17025 Accredited Testing Laboratory



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To: FCC 47 CFR Part 15.247 & IC RSS-210
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1 ACCREDITATION, LISTINGS & RECOGNITION

ACCREDITATION - TESTING

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



The American Association for Laboratory Accreditation

World Class Accreditation

Accredited Product Certification Body

A2LA has accredited

MICOM LABS

Pleasanton, CA

for technical competence as a

Product Certification Body

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



Presented this 24th day of June 2010.

Pete Meyer

President & CEO
For the Accreditation Council
Certificate Number 2381.02
Valid to January 31, 2012
Revised September 2, 2011

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

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RECOGNITION

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

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

**APEC MRA – Asia Pacific Economic Community Mutual Recognition Agreement.

Is a recognition agreement under which test lab is accredited to regulatory standards of the APEC member countries.

- Phase I - recognition for product testing
- Phase II – recognition for both product testing and certification
- N/A – Not Applicable

**EU MRA – European Union Mutual Recognition Agreement.

Is a recognition agreement under which test lab is accredited to regulatory standards of the EU member countries.

**NB – Notified Body



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PRODUCT CERTIFICATION

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



The American Association for Laboratory Accreditation

Accredited Laboratory

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for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 *General Requirements for the Competence of Testing and Calibration Laboratories*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated 8 January 2009).

Presented this 14th day of April 2010.



President & CEO
For the Accreditation Council
Certificate Number 2381.01
Valid to January 31, 2012
Revised September 2, 2011

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

United States of America – Telecommunication Certification Body (TCB)

TCB Identifier – US0159

Industry Canada – Certification Body

CAB Identifier – US0159

Europe – Notified Body

Notified Body Identifier - 2280

Japan – Recognized Certification Body (RCB)

RCB Identifier - 210

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2 DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft		
Rev A	21 st December 2011	Initial Release

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3 TEST RESULT CERTIFICATE

Applicant:	Aruba Networks, Inc 1344 Crossman Avenue Sunnyvale California , 94089, USA	Tested By:	MiCOM Labs, Inc. 440 Boulder Court Suite 200 Pleasanton California, 94566, USA
EUT	Wireless LAN Access Point	Tel:	+1 925 462 0304
Model	AP-93H	Fax:	+1 925 462 0306
S/No's:	AN0000049 (Conducted) AN0000064 (Radiated)		
Test Date(s)	8 th Oct to 5 th Dec 2011 3 rd to 28 th April 2010	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part 15, SubPart 15.247	EQUIPMENT COMPLIES

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

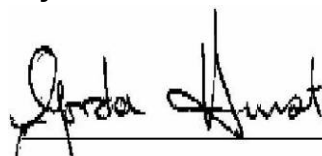
Notes:

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

Approved & Released for MiCOM Labs, Inc. by:



Graeme Grieve
Quality Manager MiCOM Labs,



Gordon Hurst
President & CEO MiCOM Labs, Inc.



CERTIFICATE #2381.01

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4 REFERENCES AND MEASUREMENT UNCERTAINTY

4.1 Normative References

Ref.	Publication	Year	Title
i.	47 CFR Part 15, SubPart 15.247	2009	For Digitally Modulated Intentional Radiators
ii.	Industry Canada RSS-210	Issue 7 June 2007	Low Power License-Exempt Radiocommunication Devices (All Frequency Bands): Category 1 Equipment
iii.	Industry Canada RSS-Gen	Issue 2 June 2007	General Requirements and Information for the Certification of Radiocommunication Equipment
iv.	ANSI C63.4	2003	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
v.	CISPR 22/ EN 55022	2005	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
vi.	M 3003	Edition 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
vii.	LAB34	Edition 1 Aug 2002	The expression of uncertainty in EMC Testing
viii.	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
ix.	A2LA	14 th September 2005	Reference to A2LA Accreditation Status – A2LA Advertising Policy

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4.2 Test and Uncertainty Procedures

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

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

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

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5 TEST SUMMARY

List of Measurements: The following table represents the list of measurements required under **FCC 47 CFR Part 15**, SubPart 15.247

Standard Section(s)	Test Description	Condition	Result	Test Report Section
(a)(2)	6 dB Occupied Bandwidth	Conducted	Compliant	7.1
(b)(3), (b)(4)	Peak Output Power	Conducted	Compliant	7.2
(e)	Peak Power Spectral Density	Conducted	Compliant	7.3
(i)	Maximum Permissible Exposure	Calculation	Compliant	7.4
(d)	Spurious Emissions	Conducted	Compliant	7.5
(d), 15.205, 15.209	Transmitter Radiated Spurious Emissions	Radiated	Compliant	7.6
(d), 15.205, 15.209	Radiated Band-Edge	Radiated	Compliant	7.6
15.205, 15.210	Radiated (Digital) Emissions	Radiated	Compliant	7.6
15.207	AC Wireline Emissions 0.15 – 30 MHz	Conducted	Compliant	7.7

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 6.7 Equipment Modifications highlights the equipment modifications that were required to bring the product into compliance with the above test matrix



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6 PRODUCT DETAILS AND TEST CONFIGURATIONS

6.1 EUT Details

Detail	Description
Purpose:	Test of the Aruba Networks, Inc AP-93H 802.11a/b/g/n Wireless LAN Access Point for compliance against FCC 47 CFR Part 15, SubPart 15.247 and Industry Canada RSS-210 regulations.
Applicant:	Aruba Networks, Inc 1344 Crossman Avenue Sunnyvale , CA 94089 USA
Manufacturer:	As manufacturer
Test Laboratory:	MiCOM Labs, Inc. 440 Boulder Court, Suite 200 Pleasanton, California 94566 USA
Test report reference number:	ARUB51-U1 Rev A
Date EUT received:	6 th October 2011
Dates of test (from - to):	8th Oct to 5th Dec 2011 & 3 rd to 28 th April 2010
No of Units Tested:	2
Product Name:	AP-93H (Integral antenna)
Manufacturers Trade Name:	Aruba Networks, Inc
Equipment Primary Function:	802.11a/b/g/n Wireless LAN Access Point, 2x2 Spatial Multiplexing MIMO configuration
Type of Technology:	802.11
Installation type:	Fixed
Construction/Location for Use:	Indoor only
Software/Firmware Release:	5.0.1.0 ART v0_9-b16ALL
Transmit/Receive Operation:	TDD (Time Div Duplex)
Output Power Type	Stepped
Rated Input Voltage and Current DC:	DC: Nominal: 12V DC Current: 1.25 A ENET: Nominal: 48 V DC Current: 0.350 A
Operating Temperature Range:	Nominal: 20 °C Max: 50 °C Min: 0 °C
ITU Emission Designator(s):	2400 – 2483.5 MHz 802.11b 15M8G1D 2400 – 2483.5 MHz 802.11g 17M7D1D 2400 – 2483.5 MHz 802.11n – HT-20 18M7D1D 2400 – 2483.5 MHz 802.11n – HT-40 36M6D1D 5725 – 5850 MHz 802.11a 17M8D1D 5725 – 5850 MHz 802.11n – HT-20 18M4D1D 5725 – 5850 MHz 802.11n – HT-40 36M6D1D
Long Term Frequency Stability:	±20 ppm
Equipment Dimensions:	12.0 cm x 12.7 cm x 3.2 cm
Weight:	375 grams
Primary function of equipment:	Wireless Access Point for transmitting data and voice

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6.2 Scope of Test Program

Testing

Per manufactures declaration: The AP-93H contains an AP-93 Access Point with the addition of 4 Ethernet port LAN switch functionality to the main board (digital portion modification only). The RF part of the device is not modified.

The scope of the compliance program was to test the Aruba AP-93H wireless LAN access point, 2x2 Spatial Multiplexing MIMO configurations in the frequency ranges 2400 – 2483.5 MHz and 5725-5850 MHz for compliance against FCC 47 CFR Part 15.247 and Industry Canada RSS-210 specifications. This report contains data previous reported in MiCOM Labs test report ARUB51-U1 Rev A Aruba AP-92_93 FCC Part 15.247.

AP-93H Access Point

The AP-93 is a high-speed, affordable, and reliable 802.11n access points for indoor environments. Designed for both ceiling and wall mounting, the compact AP-92 and AP-93 deliver wire-like performance at data rates up to 300Mbps. The AP-92 and AP-93 are built to deliver years of trouble-free operation and are backed by Aruba's limited lifetime warranty program.

Working in conjunction with Aruba's line of centralized Mobility Controllers, the AP-93H delivers high-speed, secure network services that let users finally move to a "wireless where possible, wired where necessary" network access model. The network can then be right sized, with unnecessary ports eliminated to lower operating costs. The key to rightsizing is Aruba's unique Adaptive Radio Management technology, which manages channel, power, and wireless client behavior to deliver wire-like performance and reliability. By rightsizing network infrastructure, organizations significantly enhance user mobility and efficiency while lowering total cost of ownership.

The multifunction AP-93H can be configured through the controller to provide wireless LAN access, air monitoring, remote networking, secure enterprise mesh, and wireless intrusion detection and prevention over the 2.4GHz and 5GHz RF spectrum. The AP-93H feature a 100/1000Base-T Ethernet interface and operate from either standard 802.3af Power over Ethernet (PoE) sources or a 12VDC power supply.



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6.3 Equipment Model(s) and Serial Number(s)

Type (EUT/Support)	Equipment Description (Including Brand Name)	Mfr	Model No.	Serial No.
EUT	802.11a/b/g/n Wireless Access Point	Aruba Networks, Inc	AP-93H	AN0000049 (Conducted) AN0000064 (Radiated)
Support	Laptop PC	IBM	Thinkpad	None

6.4 Antenna Details

Antenna Type:	Manufacturer	Model	Gain (dBi)	Frequency Range (MHz)
Integral	Aruba Networks, Inc	PIFA	2.5	2400 - 2500
Integral	Aruba Networks, Inc	PIFA	5.8	4900 - 5875

6.5 Cabling and I/O Ports

Number and type of I/O ports

Description	Type	Length	Additional Information
ENET	RJ-45 Ethernet Port	Greater than 10m	Ethernet connection; Only non-shielded CAT-5 cable was used during testing. Port not connected to public utility/telecommunication network.
CONSOLE	RJ-45 Serial Port	Greater than 10m	For EUT setup only, not connected during typical EUT operation; Only non-shielded CAT-5 cable was used during testing.
DC Power	DC Power Port	Less than 3m	AC adaptor with attached DC cable supplied with EUT
AC Power	AC Adaptor	Less than 3m	AC adaptor and mains cable supplied with EUT

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6.6 Test Configurations

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

Operational Mode(s) (802.11a/b/g/n)	Variant	Data Rate with Highest Power	Frequencies (MHz)
b	Legacy	1 MBit/s	2,412
g	Legacy	6 MBit/s	2,437
n	HT-20	6.5 MCS	2,462
	HT-40	13.5 MCS	2,422
			2,437
			2,452
a	Legacy	6 MBit/s	5,745
n	HT-20	6.5 MCS	5,785
	HT-40	13.5 MCS	5,825
			5,755
			5,785
			5,815

Legacy – data rates for 802.11abg products

Results for the above configurations are provided in this report



Antenna Test Configurations for Radiated Emissions

Spurious Emission and Band-Edge Test Strategy

When testing radiated spurious emissions and band-edge two identical antennae were connected to the EUT at all times. Transmission during this test process simulated a typical installation. Results for the following configurations are provided in this report.

2,400 – 2483.5 MHz

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

KEY:-

SE – Spurious Emission
BE – Band-Edge
PK - Peak Emission



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5,725 – 5850 MHz

15.247	
	Integral
Legacy	
802.11a	a SE 5745
	a SE 5785
	a SE 5825
	Pk a 5745
	Pk a 5785
	Pk a 5825
	BE a 5460
HT-20	a SE 5745
	a SE 5785
	a SE 5825
	Pk a 5745
	Pk a 5785
	Pk a 5825
	BE a 5460
HT-40	a SE 5755
	a SE 5785
	a SE 5815
	Pk a 5755
	Pk a 5785
	Pk a 5815
	BE a 5460

KEY:-

SE – Spurious Emission
BE – Band-Edge
PK - Peak Emission

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6.7 Equipment Modifications

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

1. NONE

6.8 Deviations from the Test Standard

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

1. NONE

6.9 Subcontracted Testing or Third Party Data

1. NONE

7 TEST RESULTS

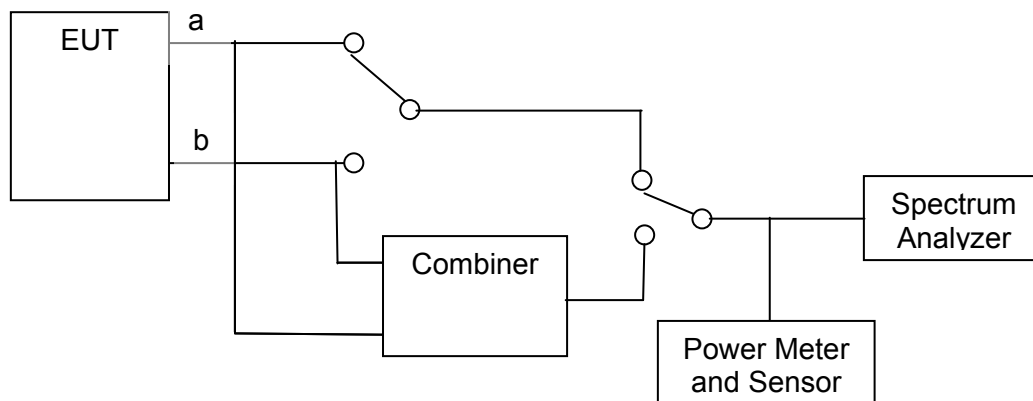
7.1 6 dB and 99% Bandwidth

Test Procedure

The test methodology and conditions utilized for each measurement is referenced in the following test results matrix. 6 dB and 99% bandwidth were measured per the Test Configuration identified below.

Testing was restricted to a single port.

Test Configuration



Test configuration for 6 dB & 99% Bandwidth

Specification

Limits

§15.247 (a)(2)

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

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0158, 0252, 0313, 0314, 0116, 0117, 0287, 0363

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7.1.1 6 dB and 99% Bandwidth Results: 802.11b

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11b	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi		
Applied Voltage:	55.00 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	12.665000	12.585000	--	--	500	0.5	-12.085000
2437.000	12.184000	12.104000	--	--			-11.604000
2462.000	12.104000	12.184000	--	--			-11.604000

99% Bandwidth

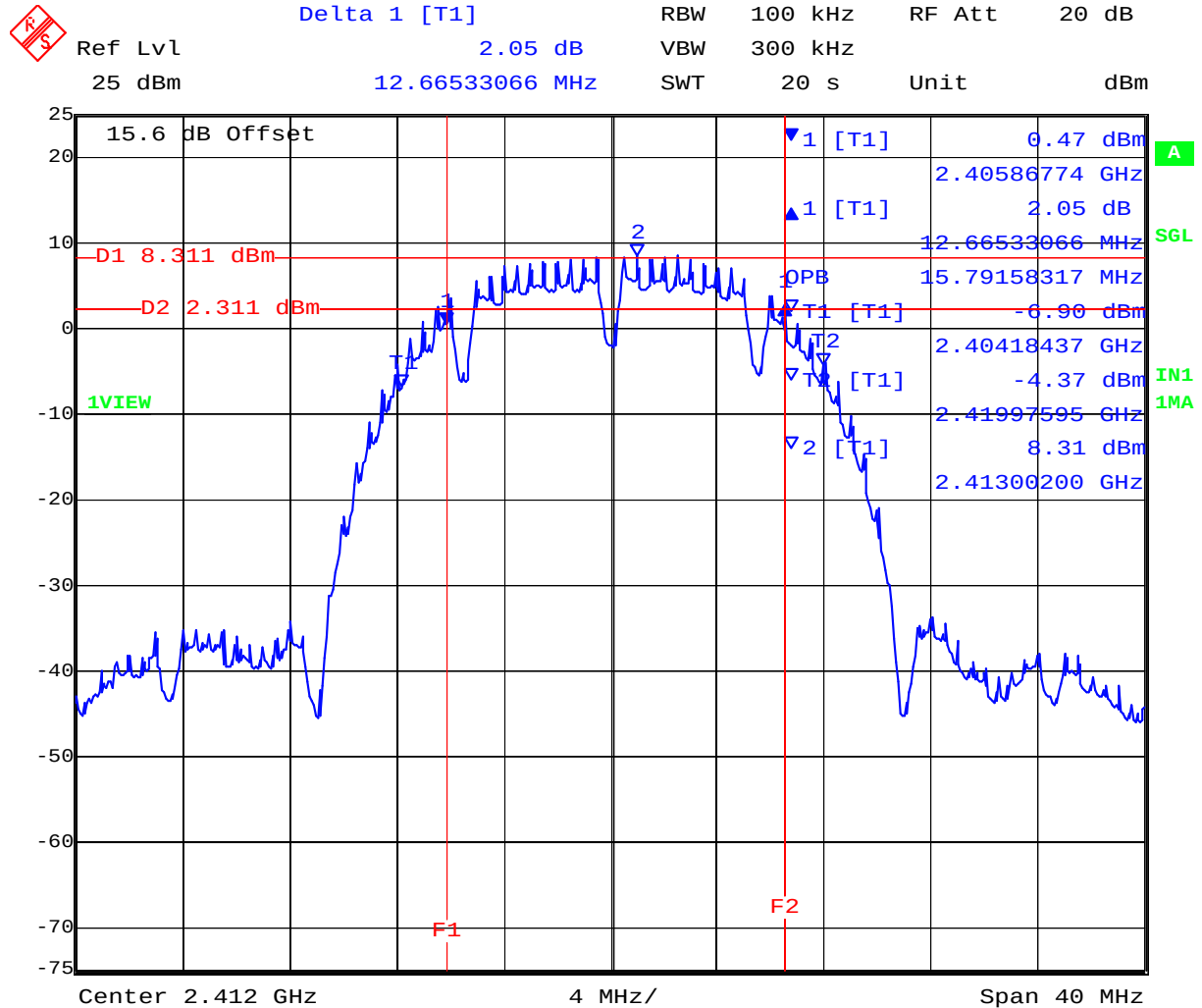
99 % Bandwidth							
Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
2412.000	15.792000	15.872000	--	--			
2437.000	15.711000	15.792000	--	--			
2462.000	15.792000	15.792000	--	--			

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

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CHAIN A



Date: 18.NOV.2011 10:29:06

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CHAIN B

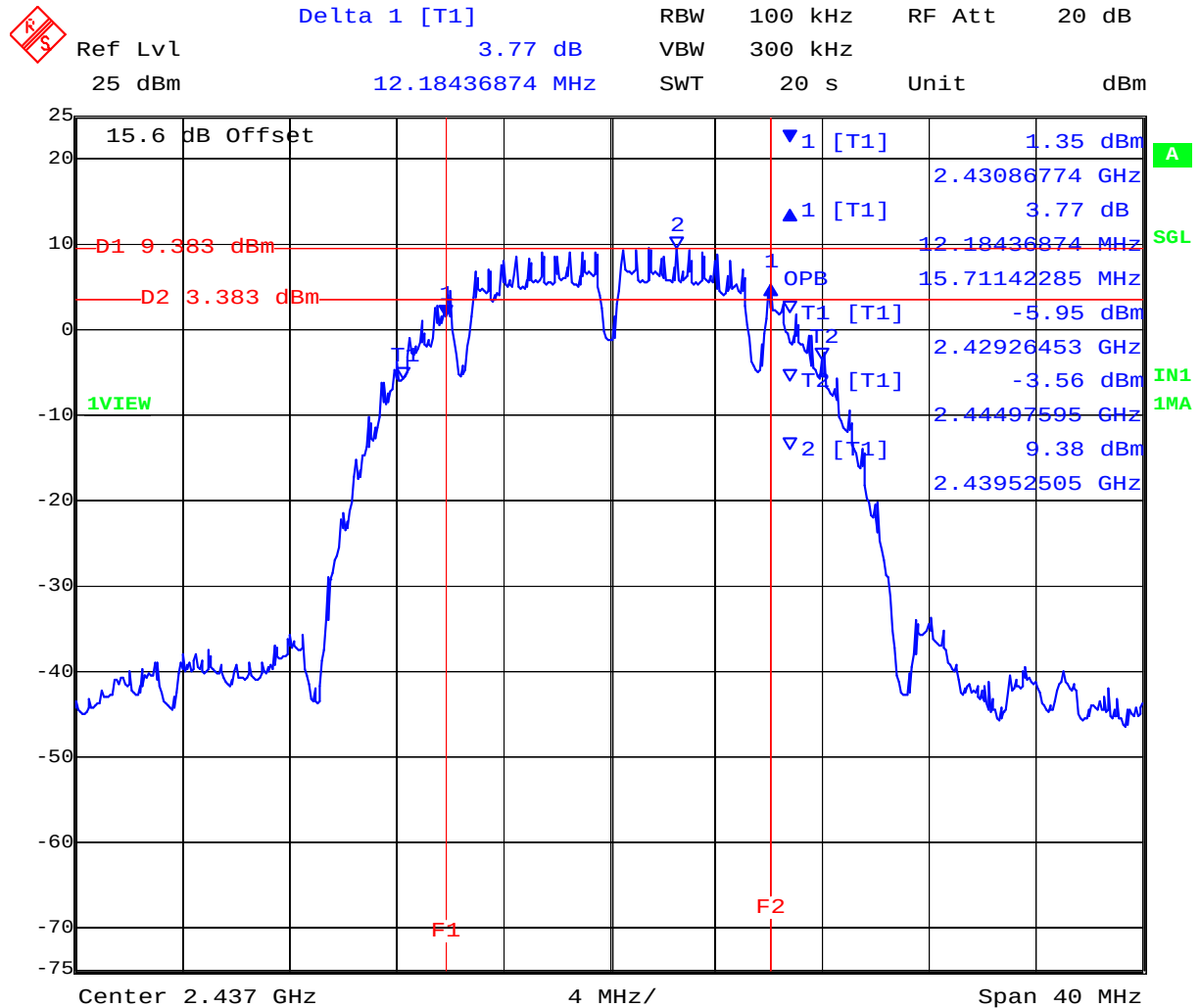


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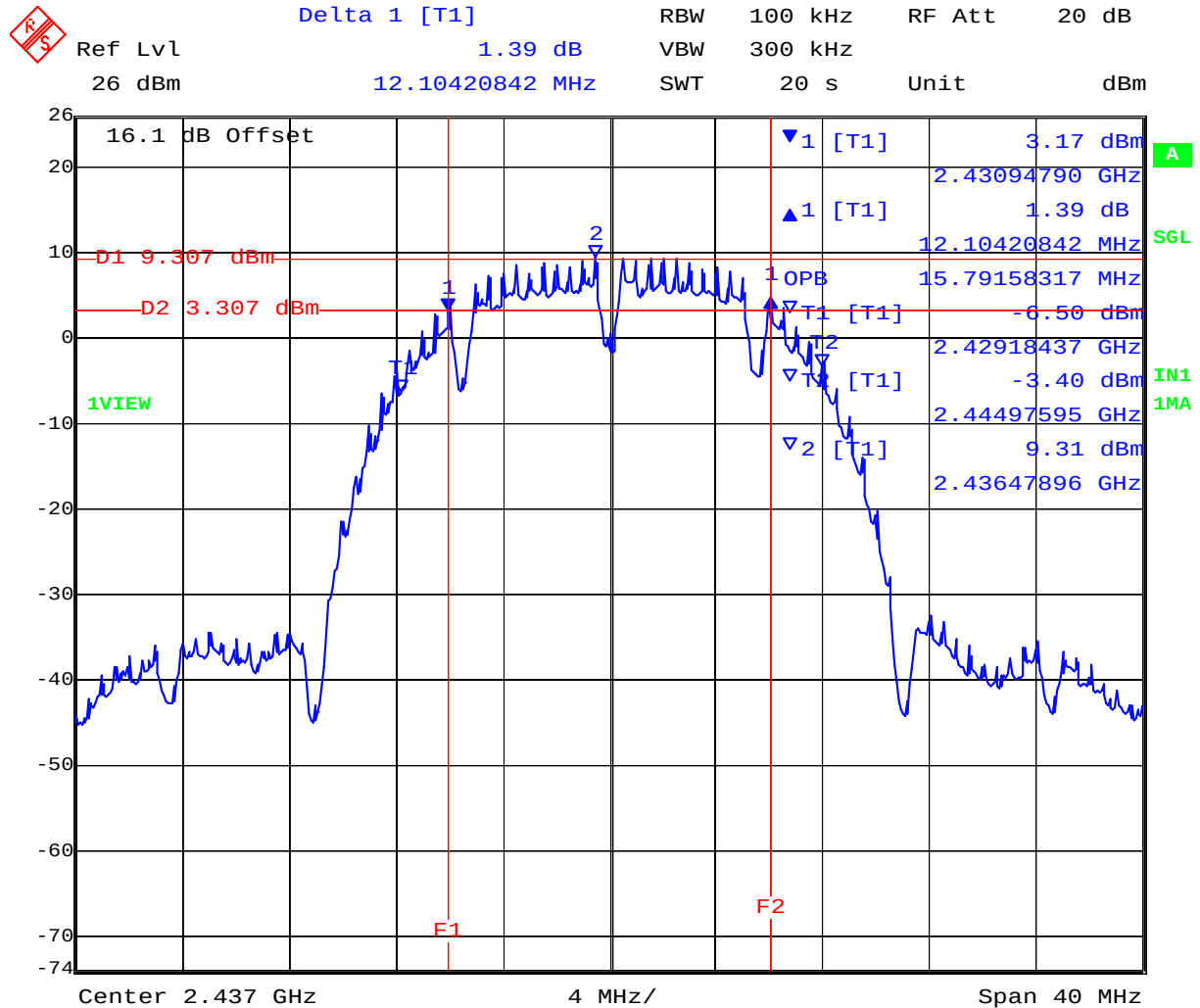
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Date: 18.NOV.2011 11:09:51



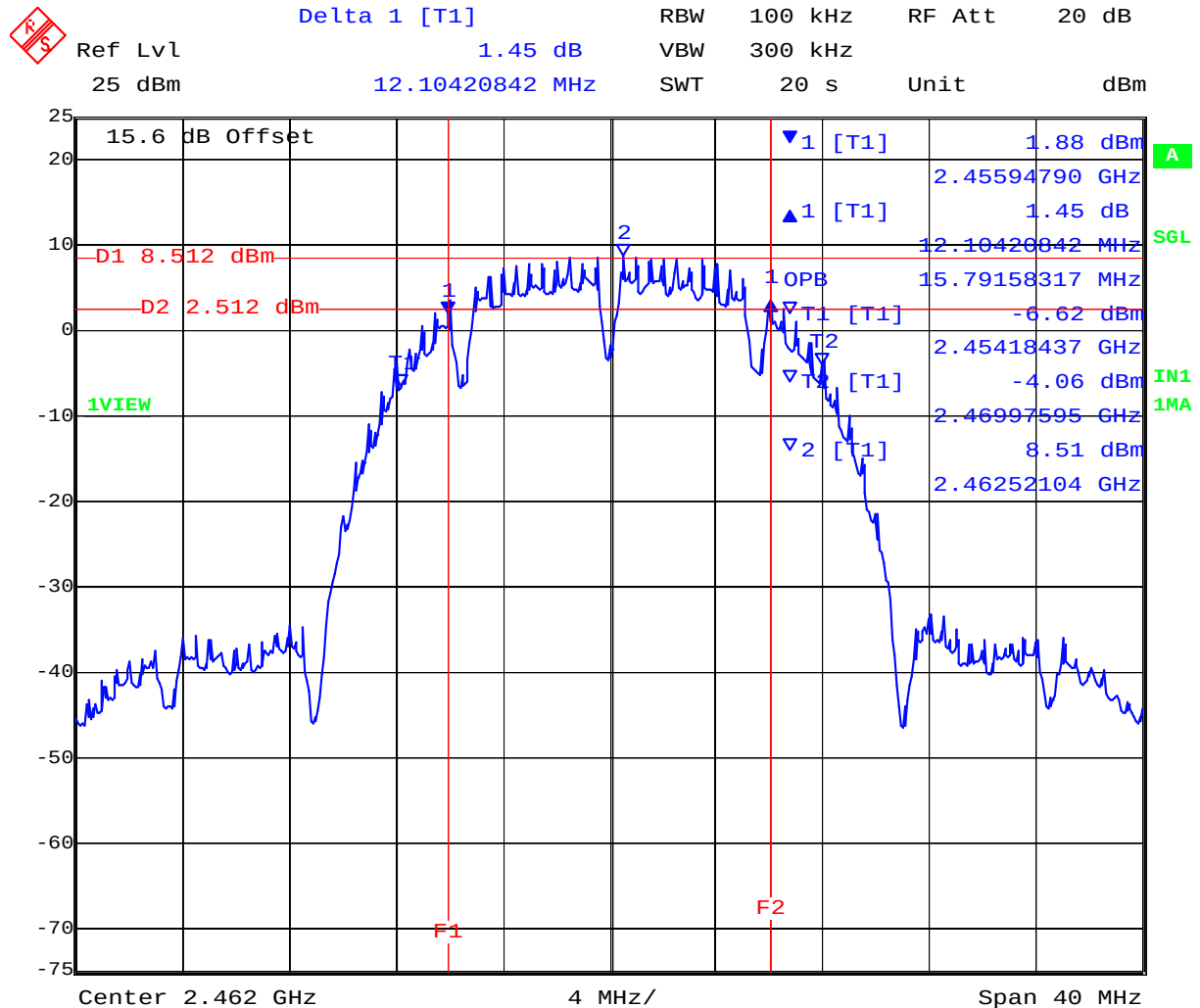
CHAIN B



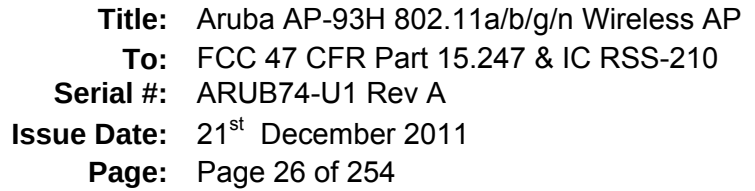
Date: 18.NOV.2011 11:10:57



CHAIN A



Date: 18.NOV.2011 11:29:47



Ref Lvl 26 dBm
 Delta 1 [T1] 2.93 dB
 RBW 100 kHz
 VBW 300 kHz
 RF Att 20 dB
 Unit dBm
 26 dBm
 12.18436874 MHz
 SWT 20 s

16.1 dB Offset
 D1 8.276 dBm
 D2 2.276 dBm
 1VIEW
 A
 SGL
 IN1
 1MA

Marker	Frequency [GHz]	Amplitude [dBm]
1	2.45586774	0.55
2	12.18436874	2.93
3	15.79158317	-7.12
4	2.45410421	-6.89
5	2.46989579	8.28
6	2.46300200	-

Center 2.462 GHz
 4 MHz/
 Span 40 MHz

MiCOM Labs, 440 Boulder Court, Suite 200, Pleasanton, CA 94566 USA, Phone: 925.462.0304, Fax: 925.462.0306, www.micomlabs.com



Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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7.1.2 6 dB and 99% Bandwidth Results: 802.11g

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35 to 42
Variant:	802.11g	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi
Applied Voltage:	55.00 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	16.433000	16.513000	--	--	500	0.5	-15.933000
2437.000	16.433000	16.433000	--	--			-15.933000
2462.000	16.433000	16.433000	--	--			-15.933000

99% Bandwidth

Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
2412.000	16.673000	16.673000	--	--			
2437.000	16.994000	16.673000	--	--			
2462.000	16.754000	16.593000	--	--			

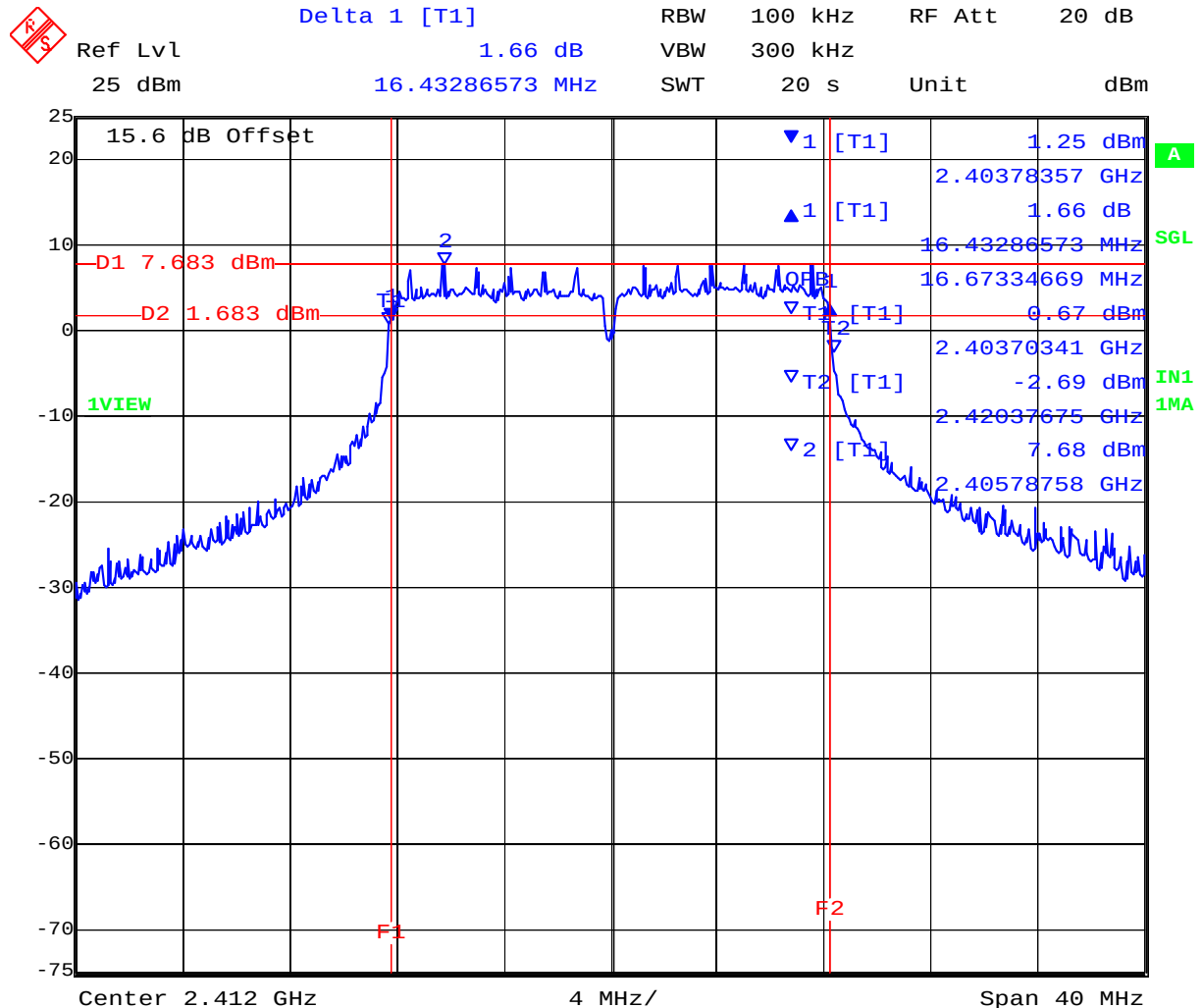
Measurement uncertainty:	±2.81 dB
---------------------------------	----------

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Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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CHAIN A

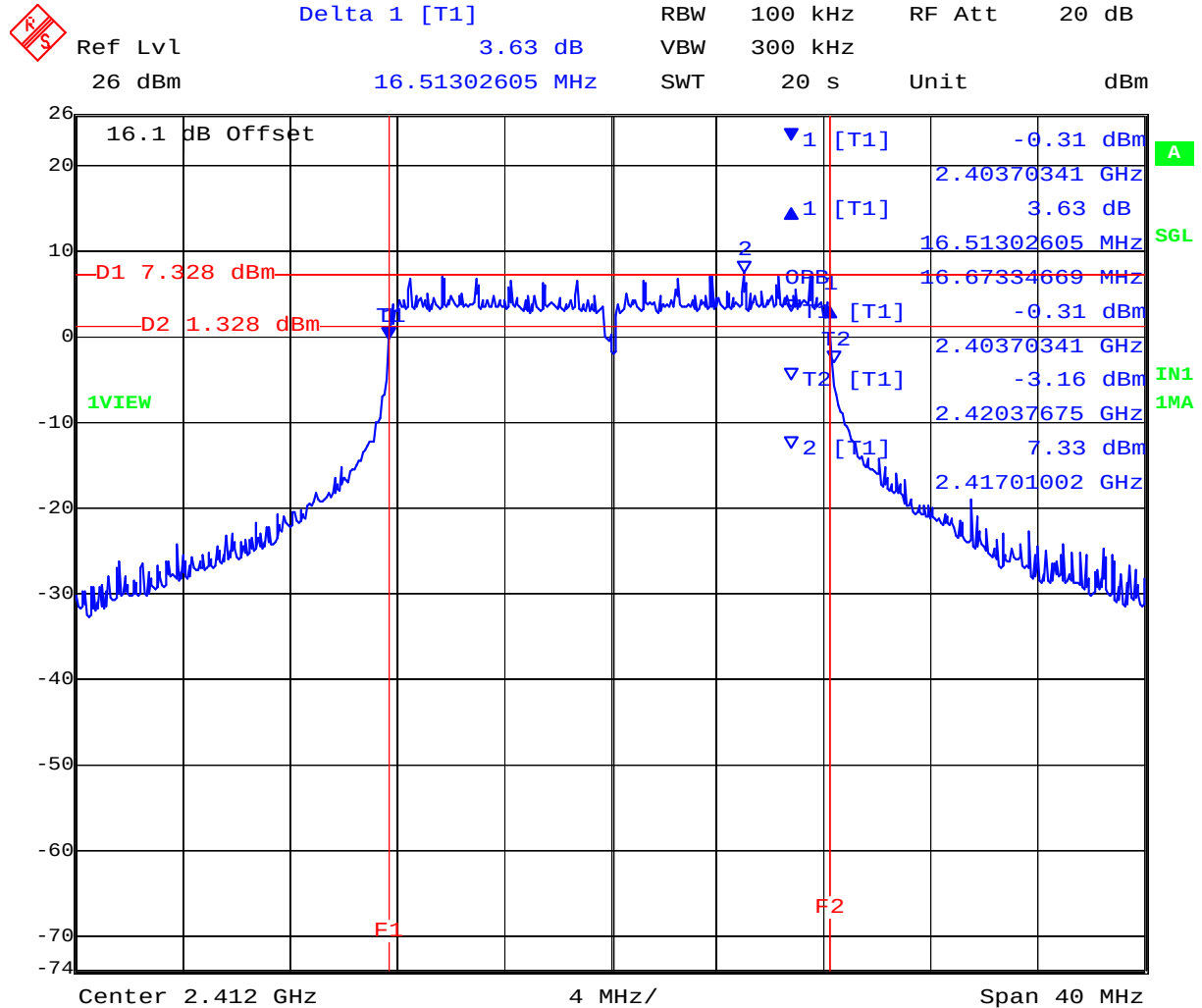


Date: 18.NOV.2011 12:11:46

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CHAIN B

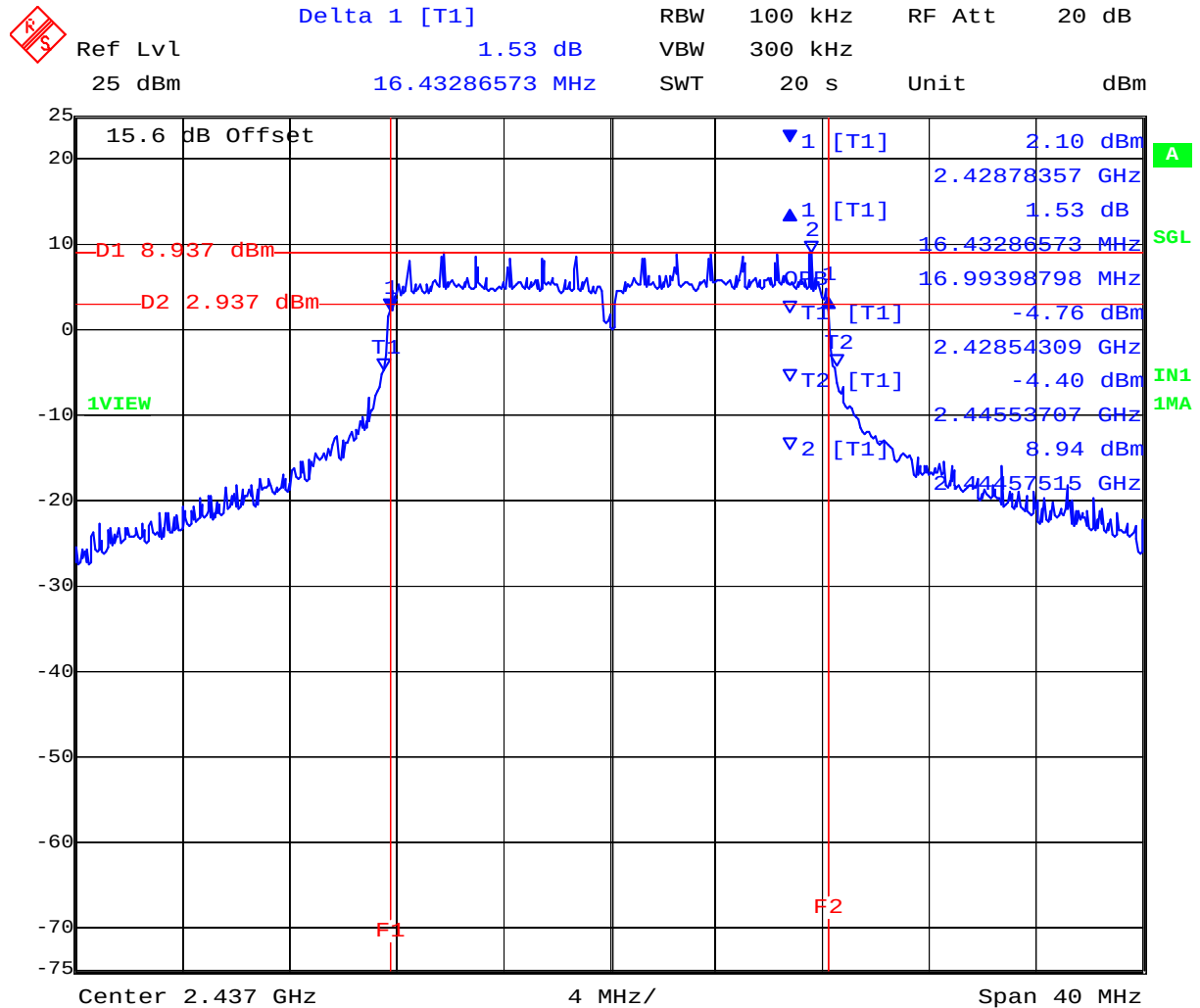


Date: 18.NOV.2011 12:12:52

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CHAIN A

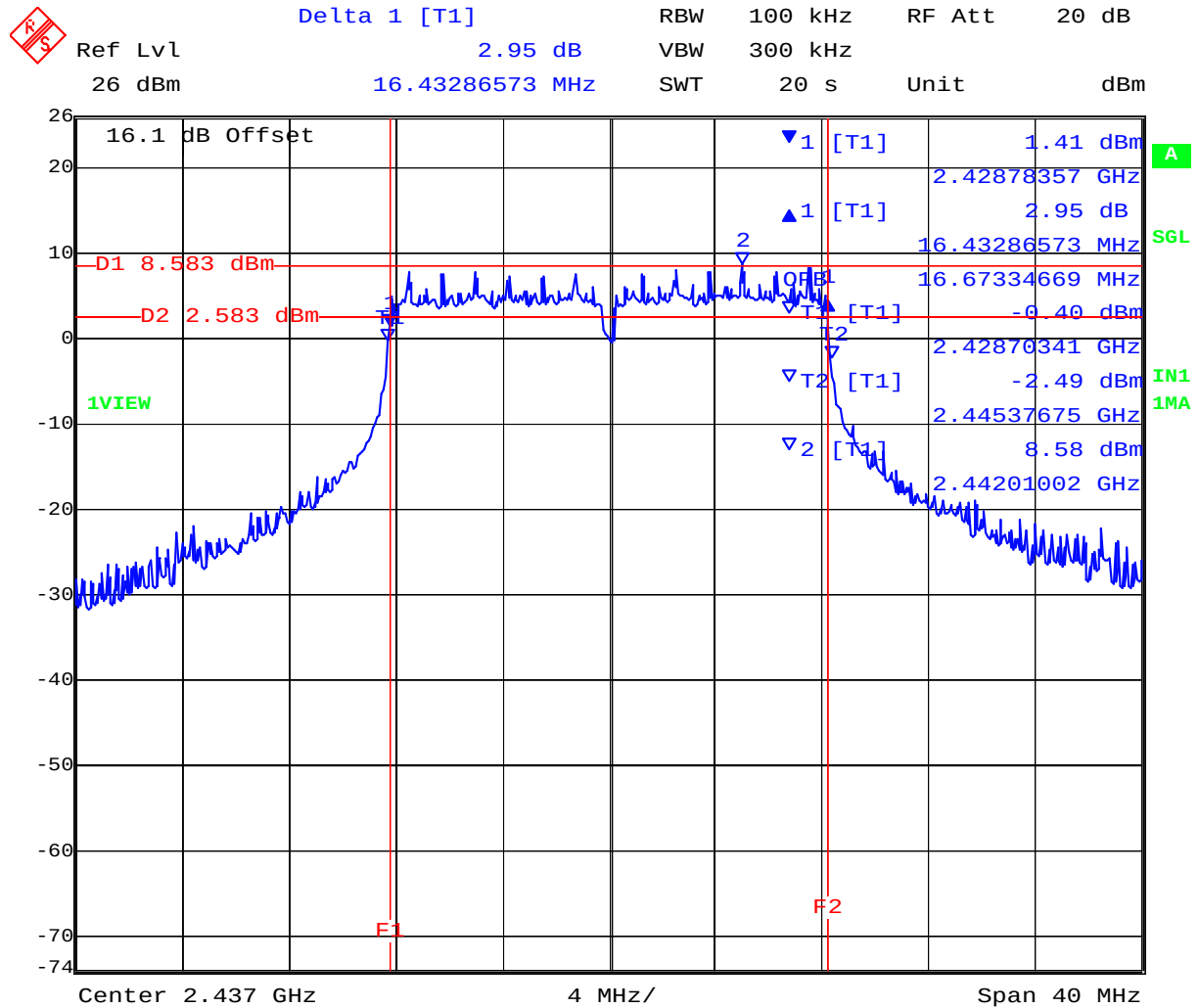


Date: 18.NOV.2011 12:41:18

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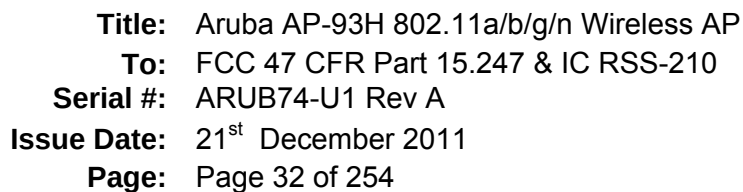


CHAIN B



Date: 18.NOV.2011 12:42:25

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Delta 1 [T1]
 Ref Lvl 25 dBm
 0.81 dB
 16.43286573 MHz
 RBW 100 kHz
 VBW 300 kHz
 SWT 20 s
 RF Att 20 dB
 Unit dBm

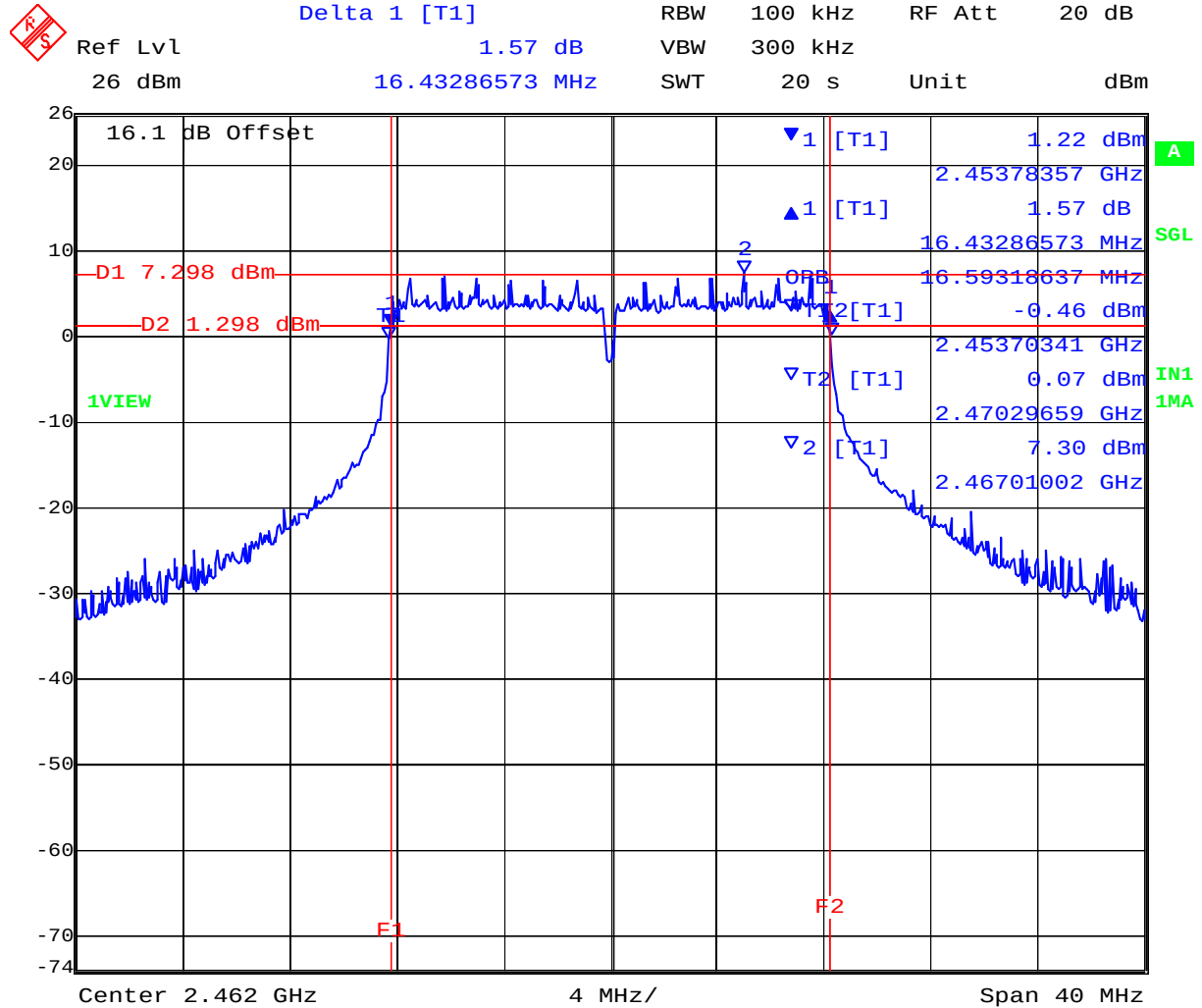
15.6 dB Offset
 D1 7.227 dBm
 D2 1.227 dBm
 1VIEW
 F1
 F2
 Center 2.462 GHz
 4 MHz/
 Span 40 MHz

Marker	Frequency (MHz)	Amplitude (dBm)
1	16.43286573	0.81
2	16.75350701	-4.71
T1	2.45378357	1.21
T2	2.45362325	-3.48
T3	2.47037675	-7.23

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CHAIN B



Date: 18.NOV.2011 14:04:41

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7.1.3 6 dB and 99% Bandwidth Results: 802.11n HT-20

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35 to 42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi
Applied Voltage:	55.00 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	17.715000	17.635000	--	--	500	0.5	-17.135000
2437.000	17.635000	17.635000	--	--			-17.135000
2462.000	17.635000	17.635000	--	--			-17.135000

99% Bandwidth

Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
2412.000	17.956000	17.876000	--	--			
2437.000	18.036000	17.796000	--	--			
2462.000	17.876000	17.876000	--	--			

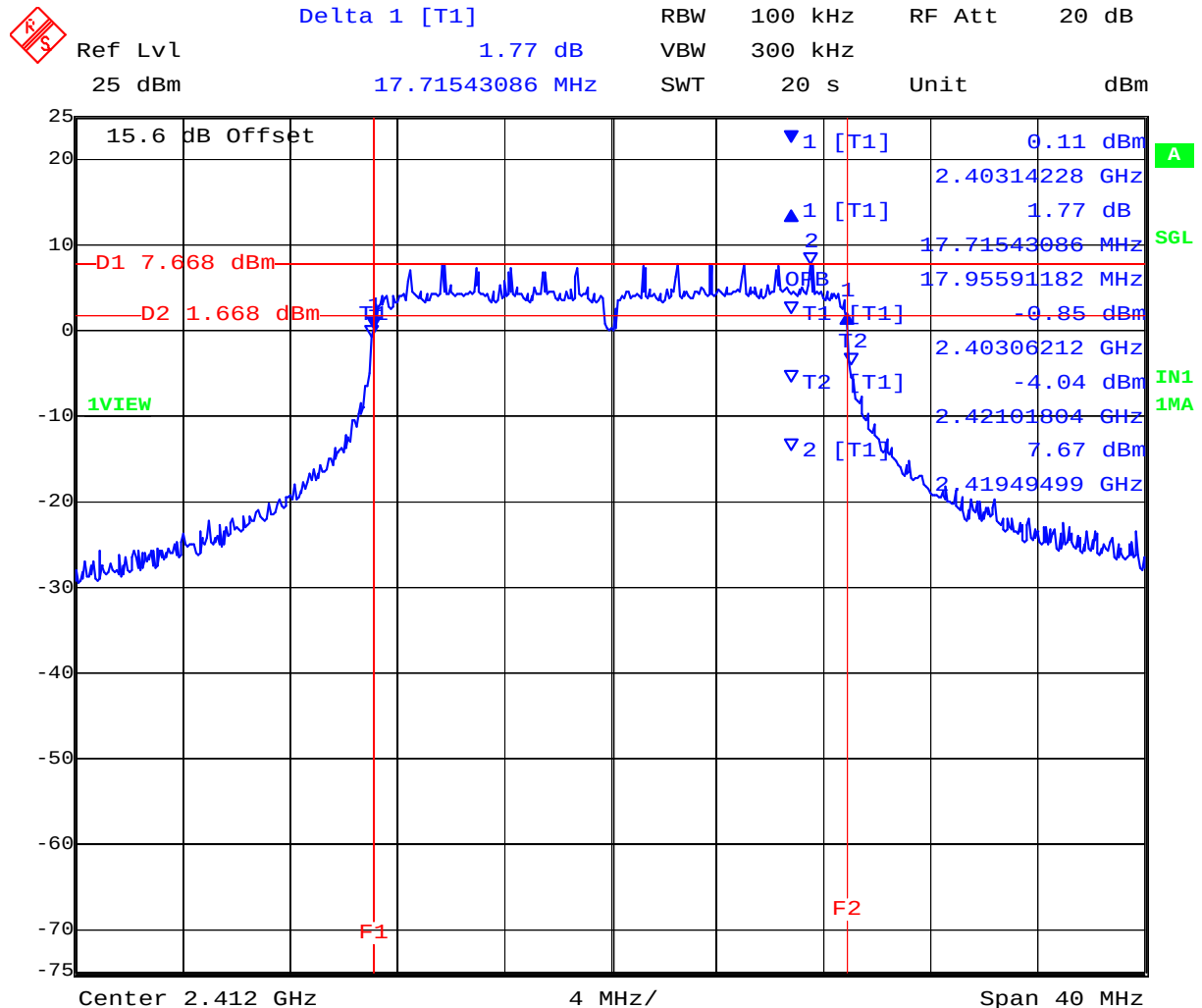
Measurement uncertainty:	±2.81 dB
---------------------------------	----------

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Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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CHAIN A



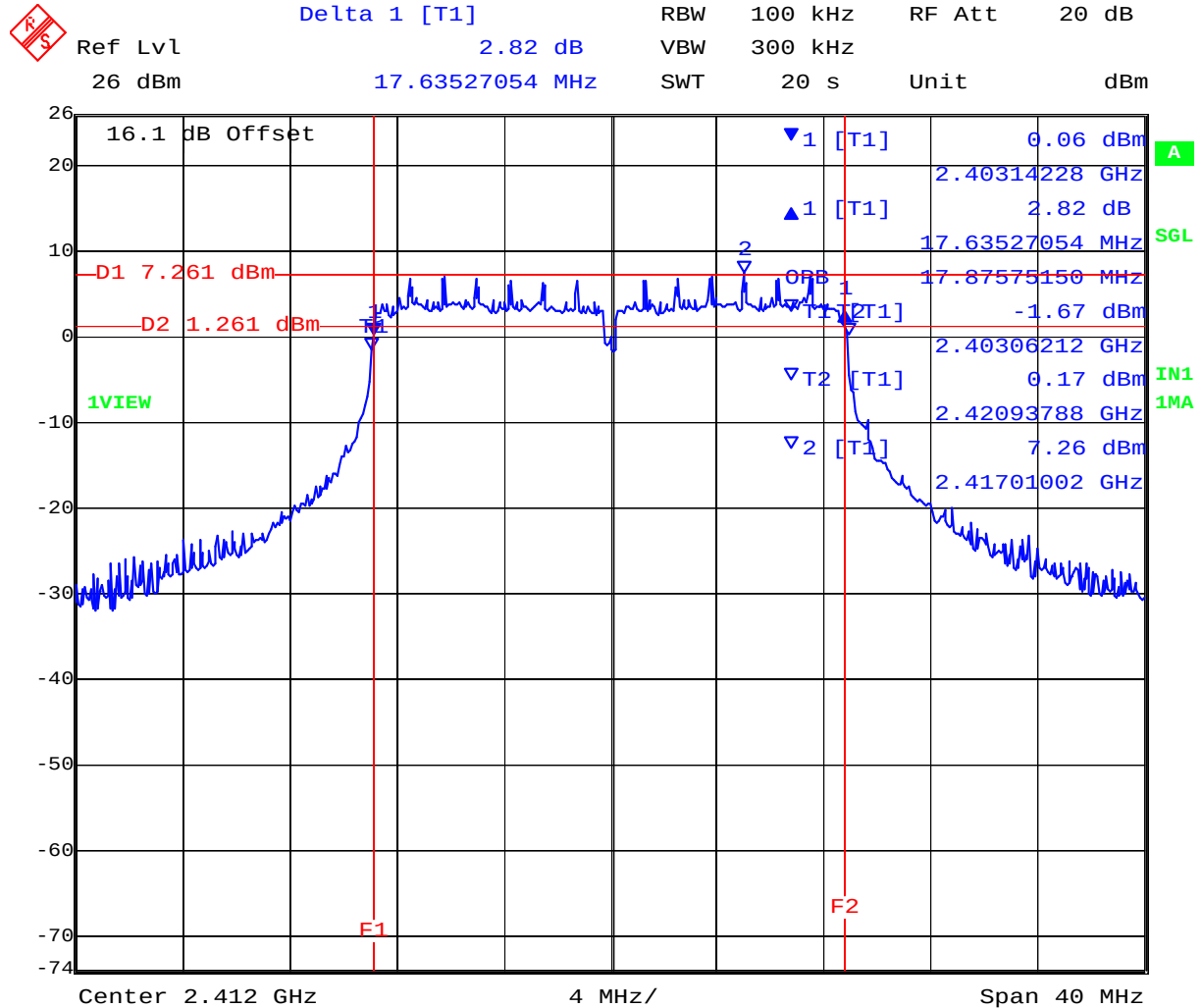
Date: 18.NOV.2011 14:50:23

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CHAIN B

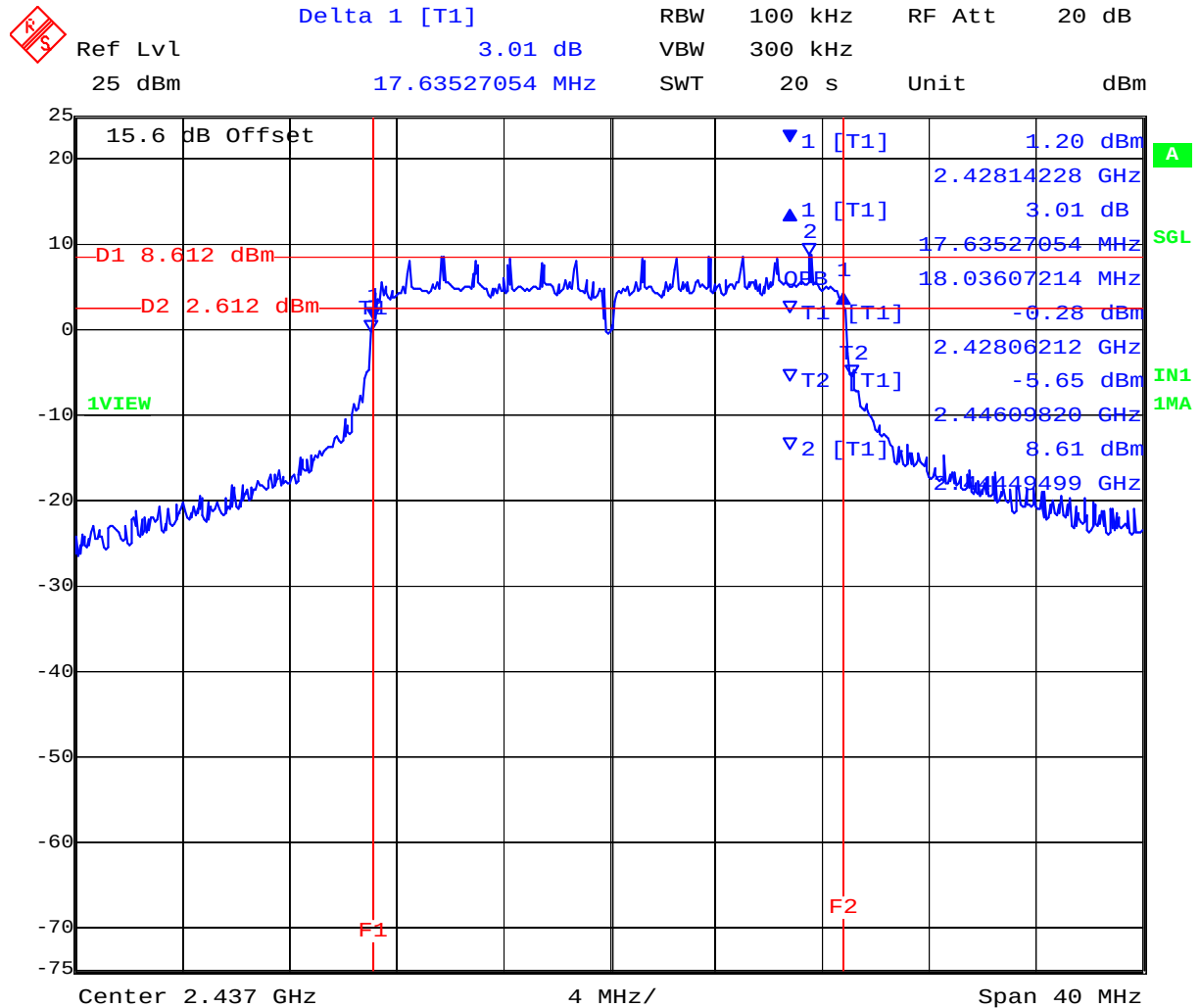


Date: 18.NOV.2011 14:51:28

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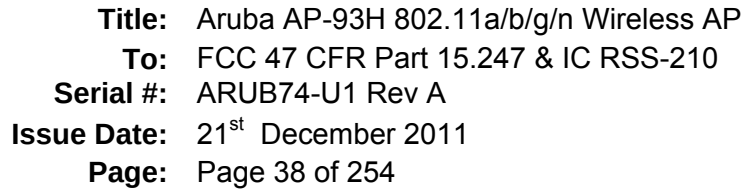


CHAIN A



Date: 18.NOV.2011 15:12:41

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Ref Lvl 26 dBm Delta 1 [T1] 3.44 dB RBW 100 kHz RF Att 20 dB
 26 dBm 17.63527054 MHz VBW 300 kHz Unit dBm

16.1 dB Offset

D1 8.3 dBm D2 2.3 dBm

1VIEW

▼1 [T1] 0.41 dBm
 ▲1 [T1] 3.44 dB
 2 17.63527054 MHz
 OFF 1 17.79559118 MHz
 ▼T1 [T1] 0.41 dBm
 ▼T2 [T1] 2.42814228 GHz
 1.20 dBm
 2.44593788 GHz
 ▼2 [T1] 8.30 dBm
 2.44449499 GHz

F1 F2

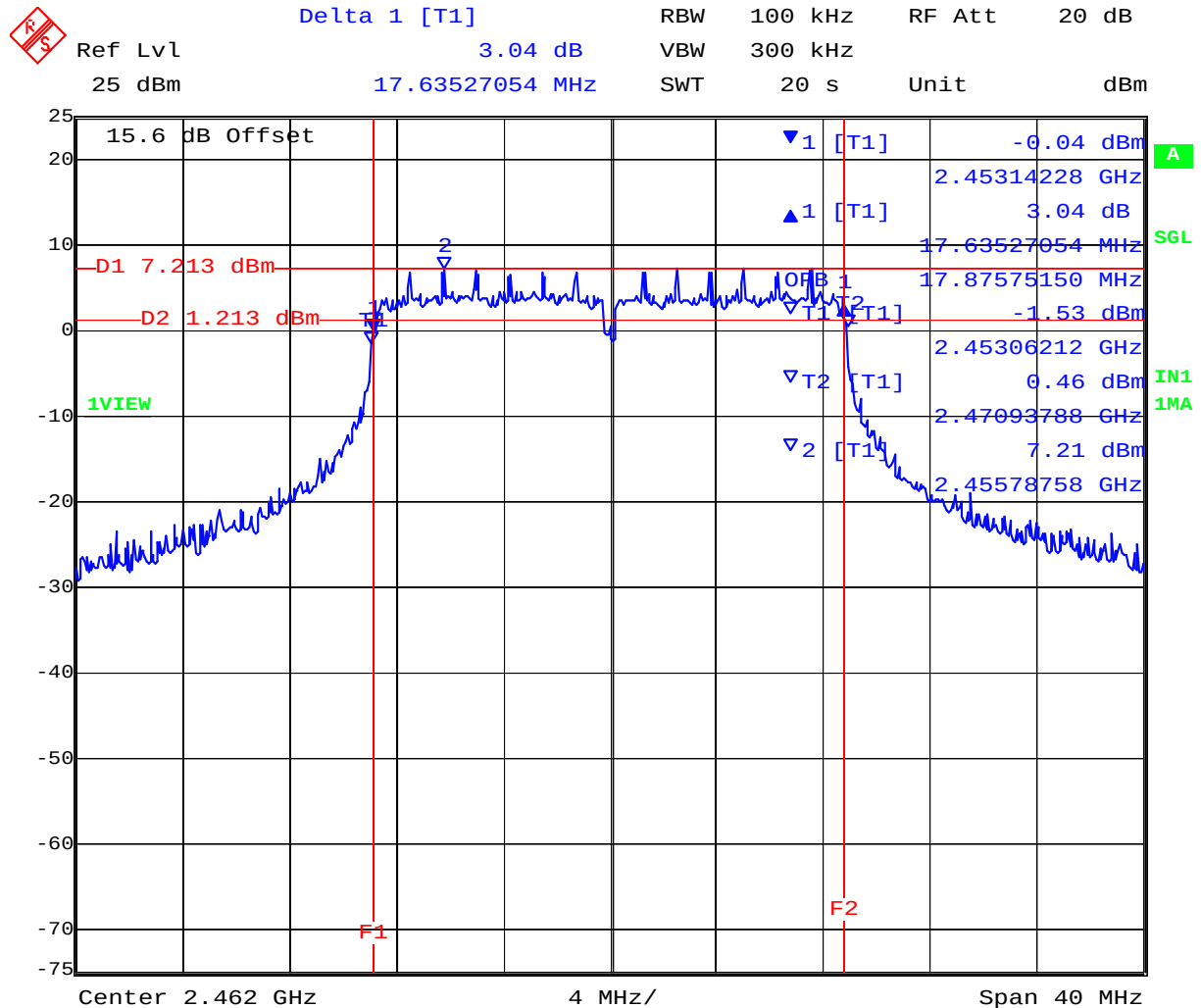
Center 2.437 GHz 4 MHz/ Span 40 MHz

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CHAIN A

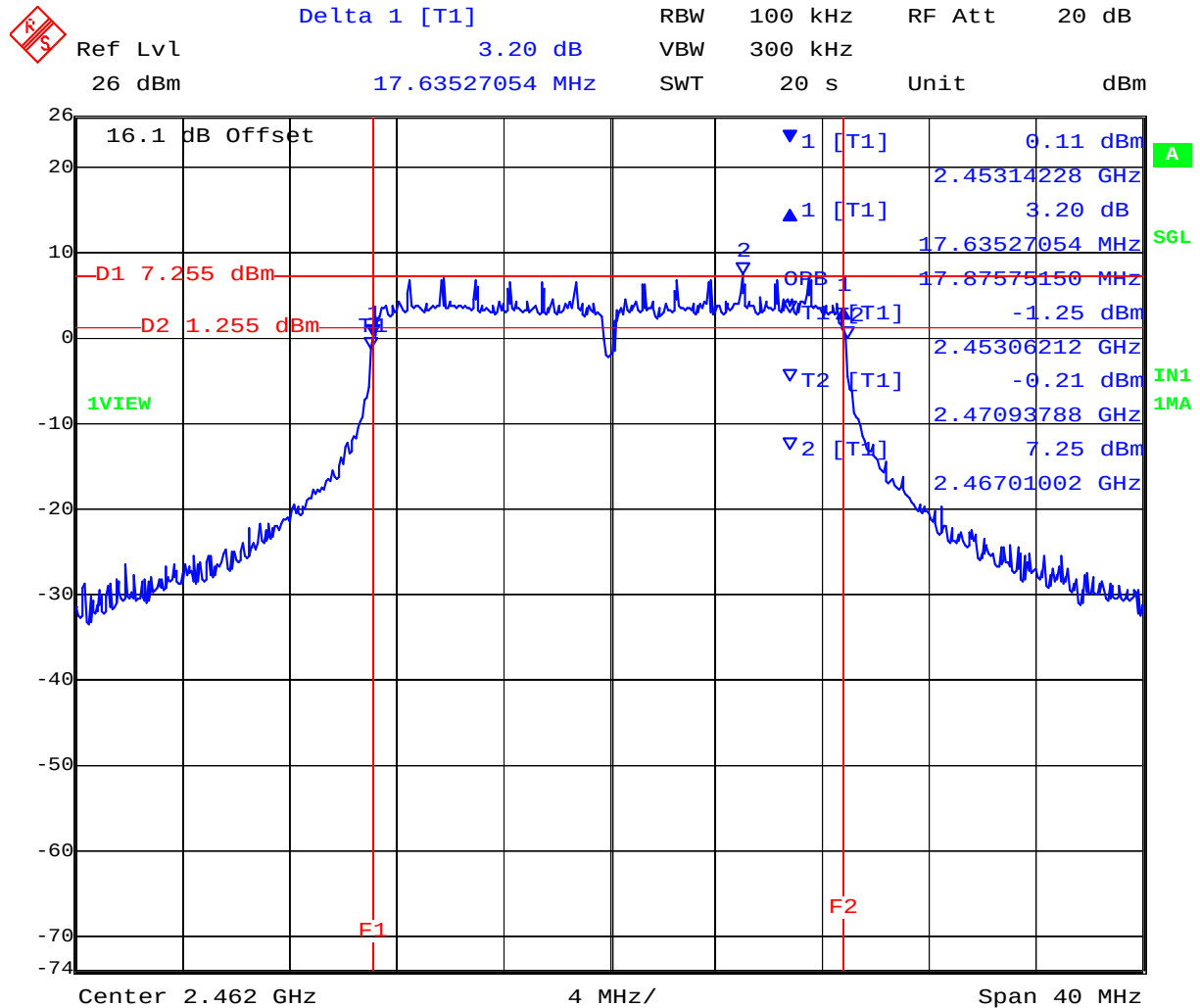


Date: 18.NOV.2011 15:32:24

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CHAIN B



Date: 18.NOV.2011 15:33:30

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7.1.4 6 dB and 99% Bandwidth Results: 802.11n HT-40

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35 to 42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi
Applied Voltage:	55.00 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	36.553000	36.232000	--	--	500	0.5	-35.732000
2437.000	36.553000	36.232000	--	--			-35.732000
2452.000	36.393000	36.553000	--	--			-35.893000

99% Bandwidth

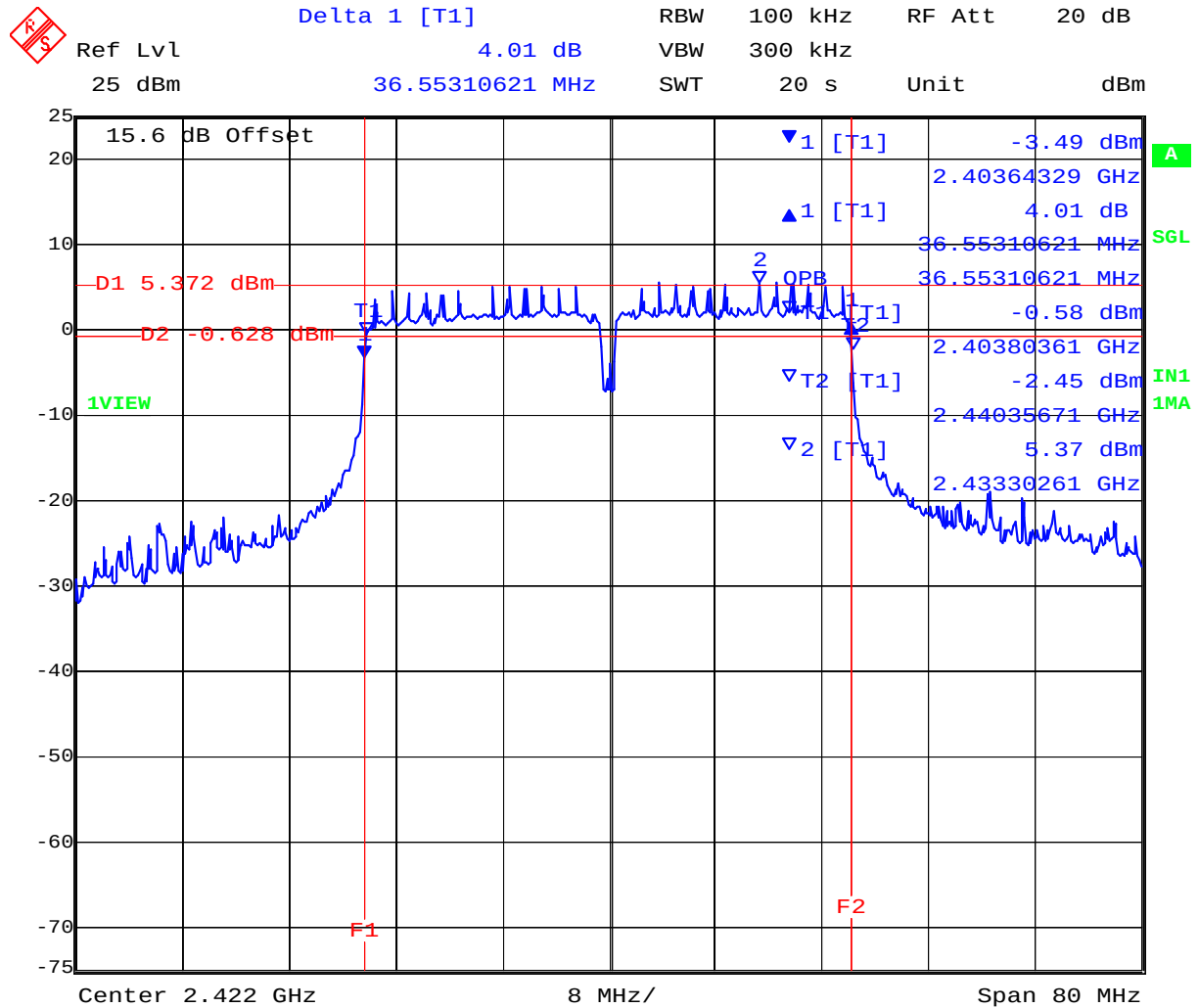
Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
2422.000	36.553000	36.393000	--	--			
2437.000	36.553000	36.393000	--	--			
2452.000	36.393000	36.393000	--	--			

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

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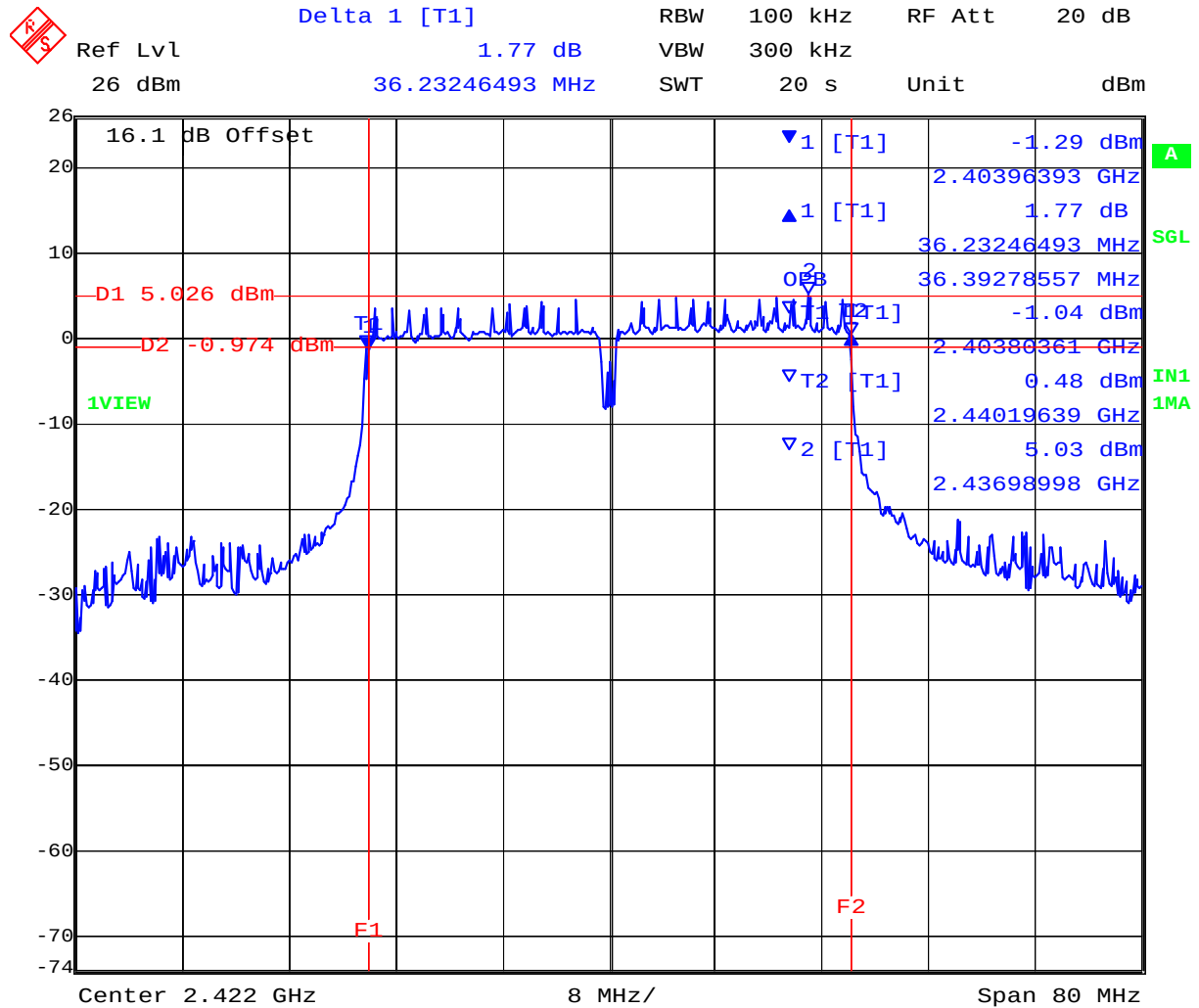
CHAIN A



Date: 18.NOV.2011 15:58:46

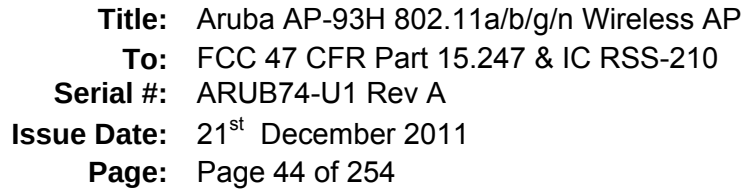


CHAIN B



Date: 18.NOV.2011 15:59:52

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Ref Lvl 25 dBm
 Delta 1 [T1] 4.26 dB
 RBW 100 kHz
 VBW 300 kHz
 SWT 20 s
 RF Att 20 dB
 Unit dBm

15.6 dB Offset
 D1 5.299 dBm
 D2 -0.701 dBm
 1VIEW
 F1
 F2
 Center 2.437 GHz
 8 MHz/
 Span 80 MHz

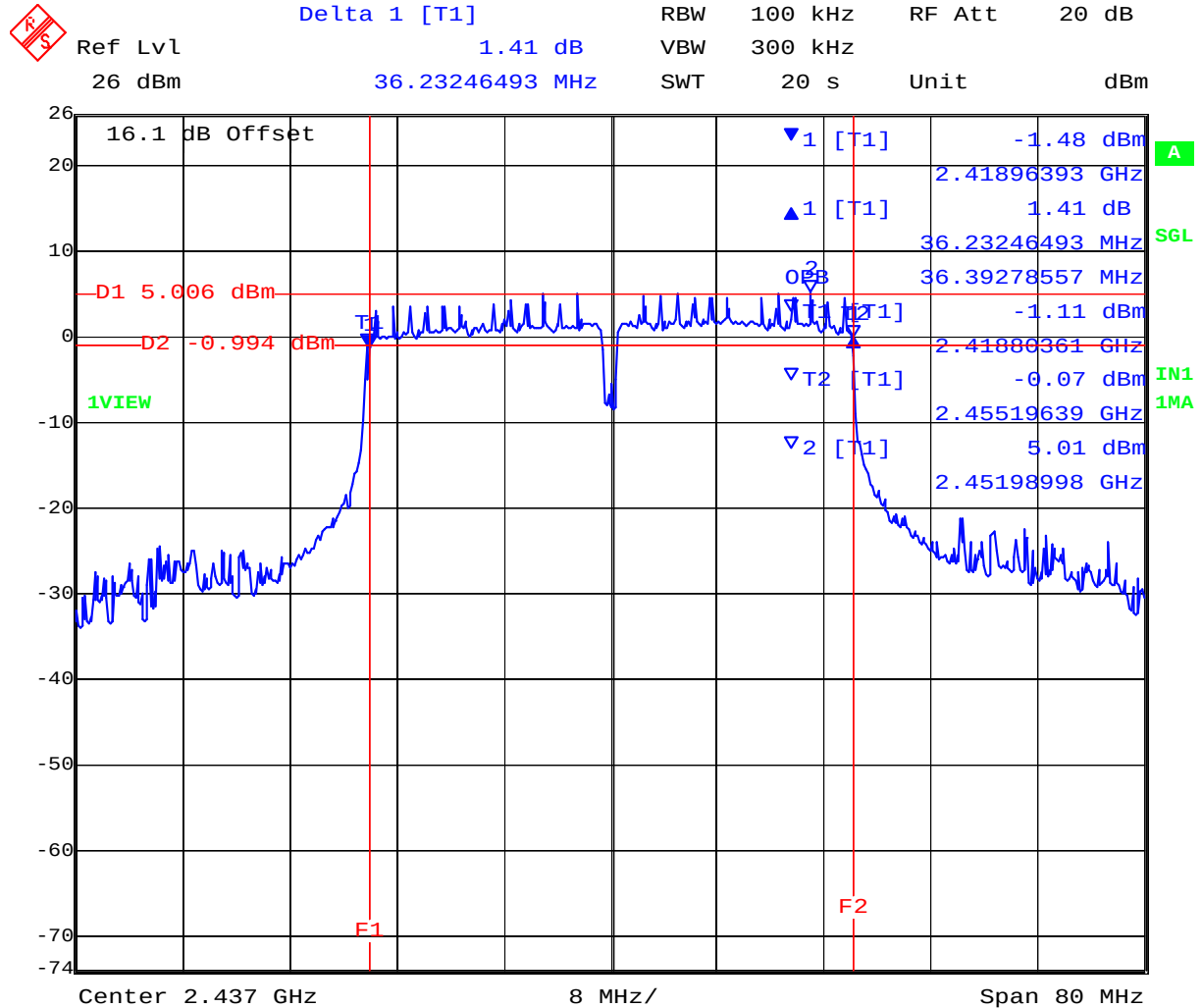
▼1 [T1] -3.49 dBm
 ▲1 [T1] 4.26 dB
 2 36.55310621 MHz
 36.55310621 MHz
 T1 [T1] -0.30 dBm
 T2 [T1] -2.45 dBm
 ▼2 [T1] 5.30 dBm
 2.41864329 GHz
 2.41860361 GHz
 2.45535671 GHz
 2.44958517 GHz

A
 SGL
 IN1
 1MA

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CHAIN B



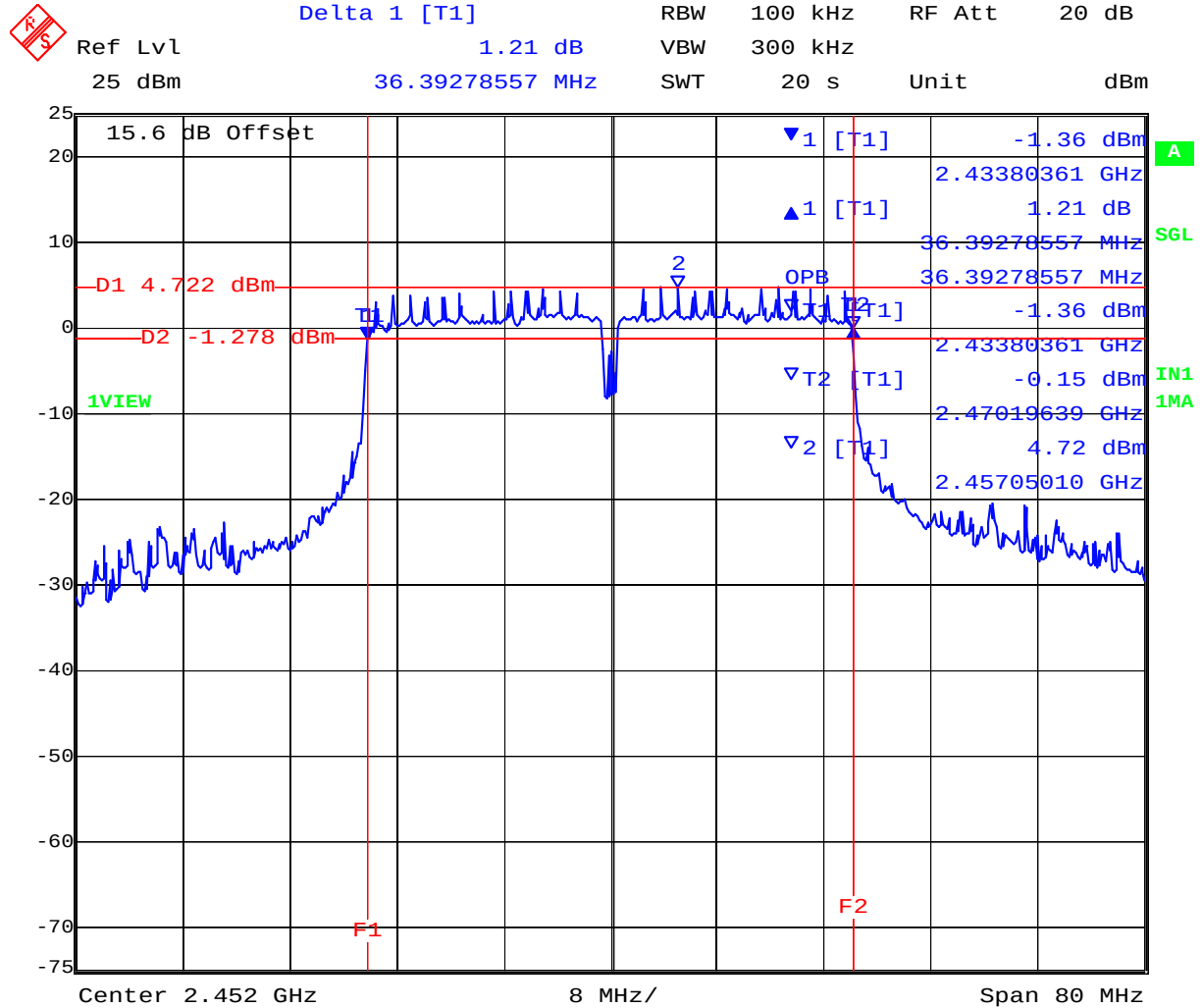
Date: 18.NOV.2011 16:25:41

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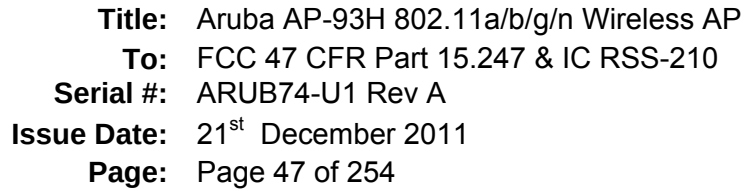
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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CHAIN A



Date: 18.NOV.2011 16:51:33

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Ref Lvl 26 dBm Delta 1 [T1] 4.82 dB RBW 100 kHz RF Att 20 dB
 26 dBm 36.55310621 MHz VBW 300 kHz Unit dBm

16.1 dB Offset

▼1 [T1] -5.02 dBm
 ▲1 [T1] 4.82 dB
 36.55310621 MHz
 2.43364329 GHz
 2.43386361 GHz
 2.47019639 GHz
 2.44694990 GHz

D1 4.89 dBm
 D2 -1.11 dBm

1VIEW

IN1 1MA

Center 2.452 GHz 8 MHz/ Span 80 MHz

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7.1.5 6 dB and 99% Bandwidth Results: 802.11a

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11a	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A	Antenna Gain:	6		dBi
Applied Voltage:	12.0	Vdc			
Notes 1:					
Notes 2:					

6 dB Bandwidth

Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	a	b	c	d	kHz	MHz	MHz
5745	16.433000	16.433000			500	0.5	-15.933000
5785	16.433000	16.433000					-15.933000
5825	16.433000	16.433000					-15.933000

99% Bandwidth

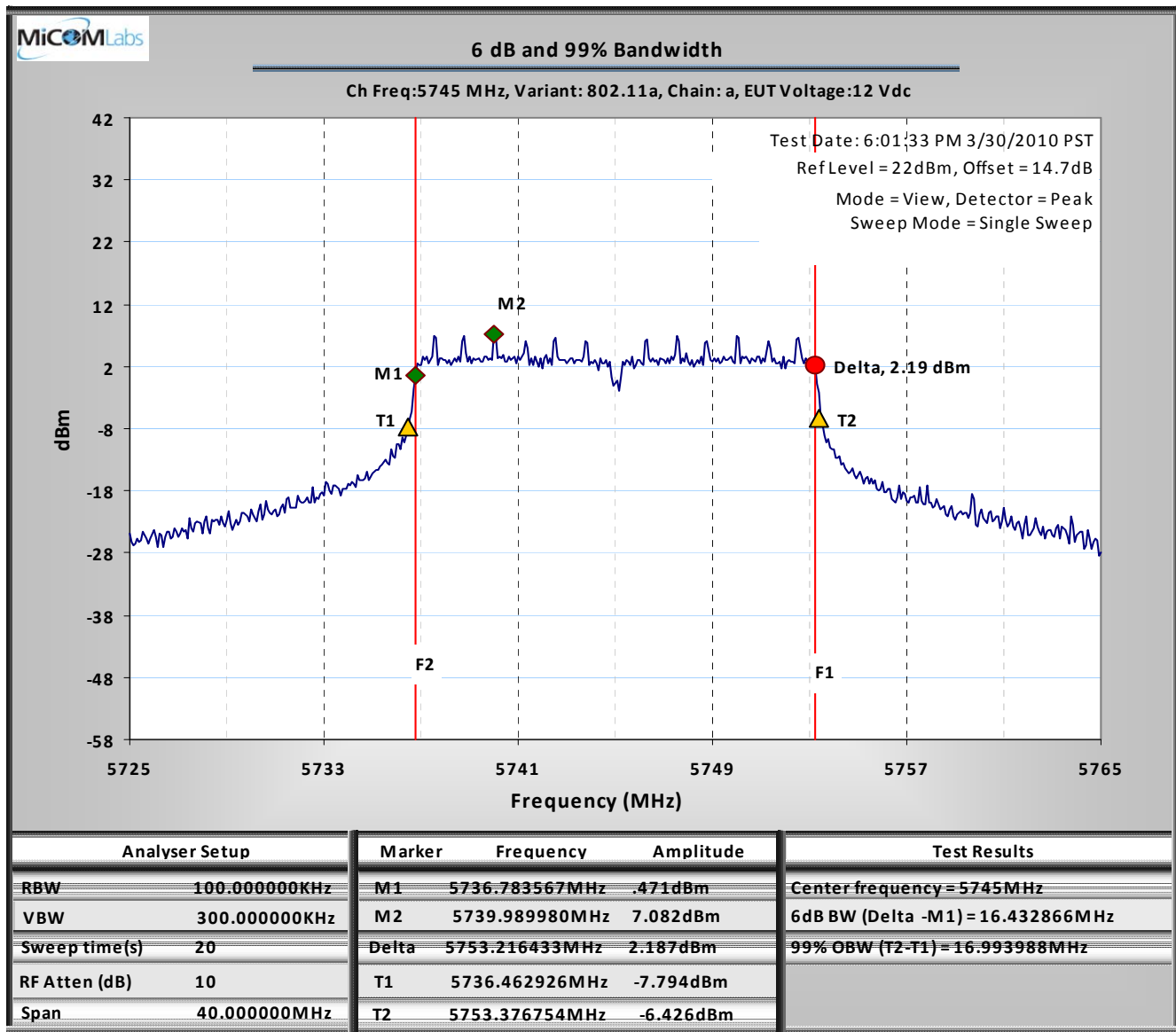
Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
5745	16.994000	17.796000					
5785	16.754000	16.754000					
5825	16.673000	16.673000					

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

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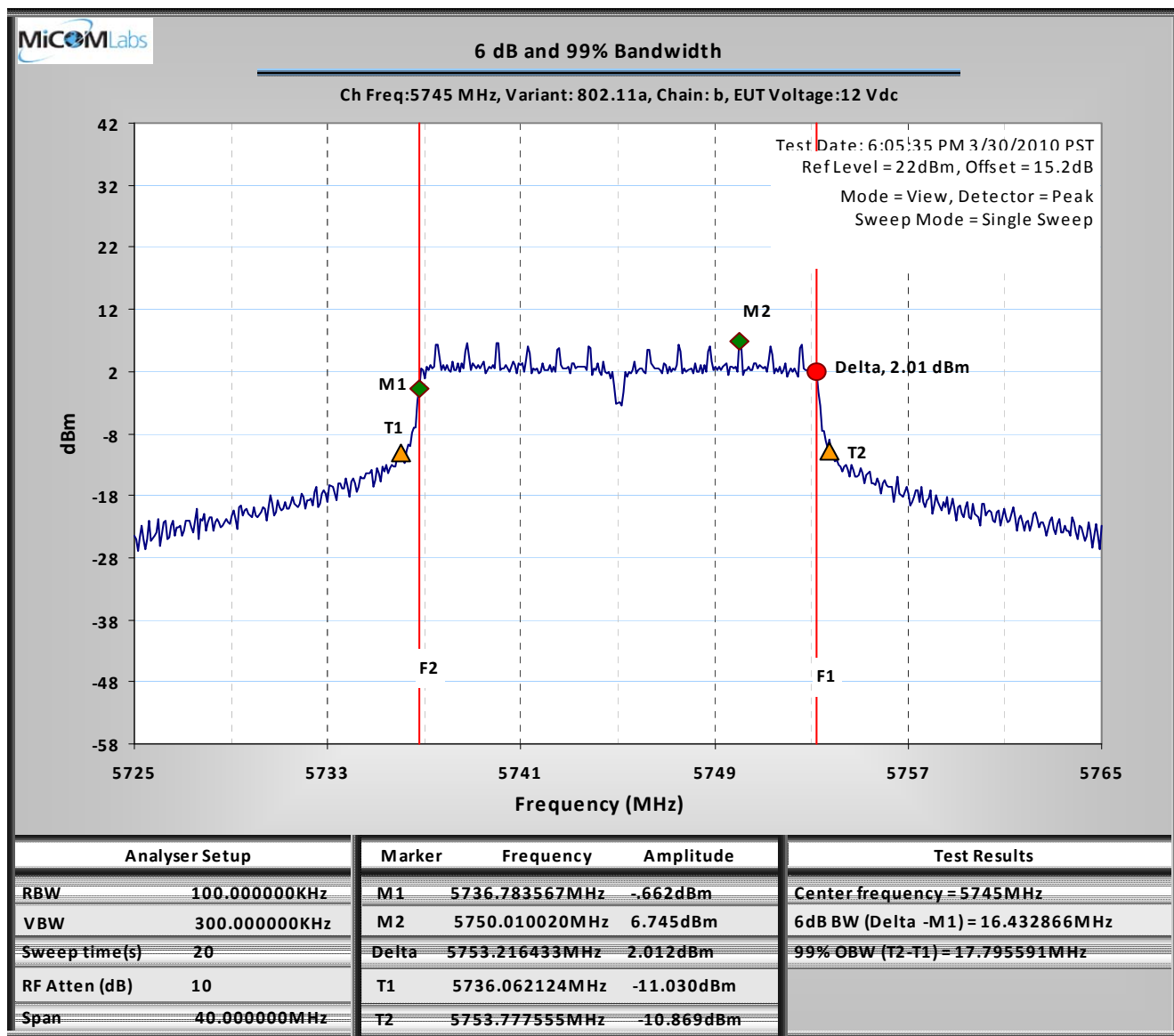
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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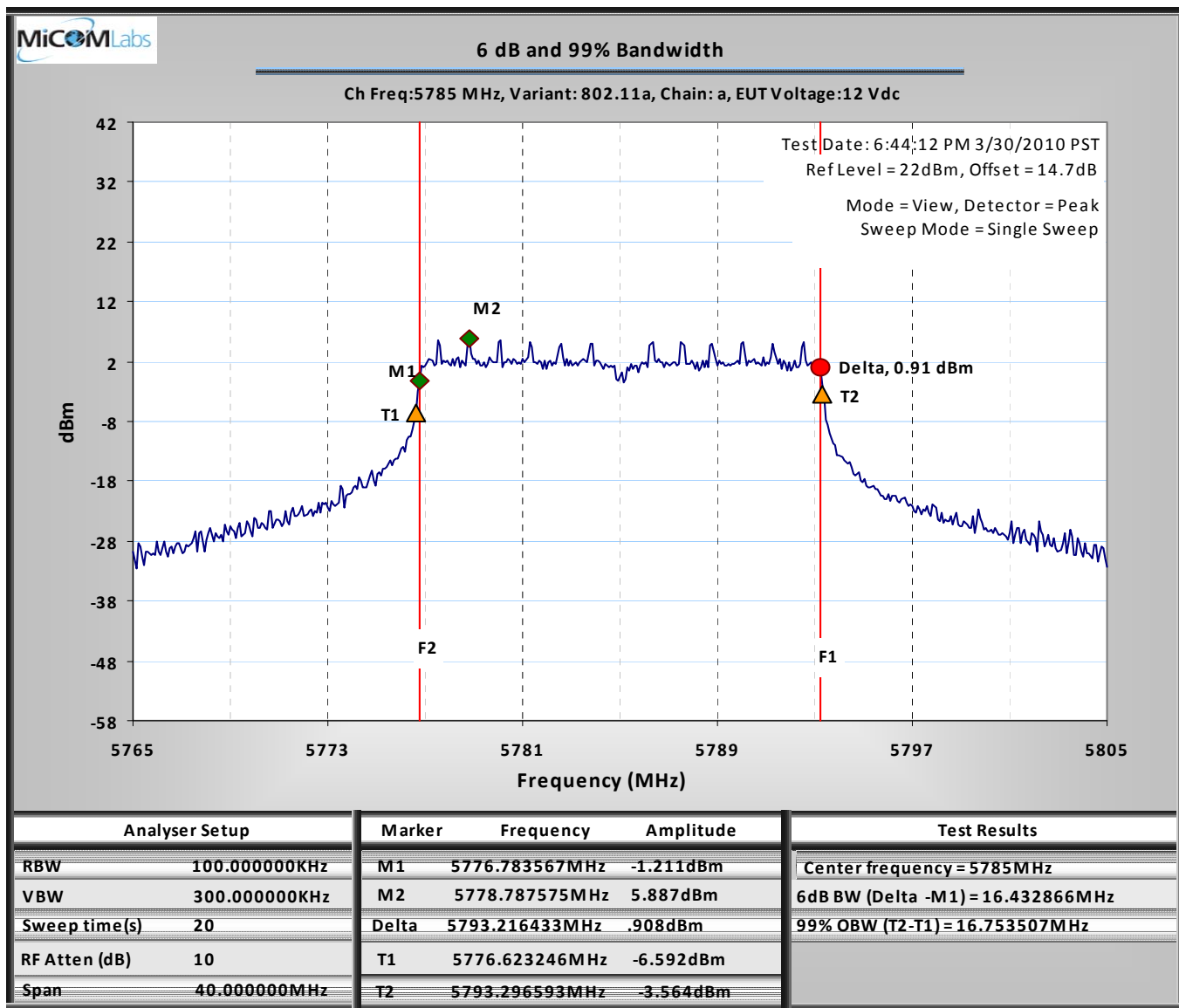
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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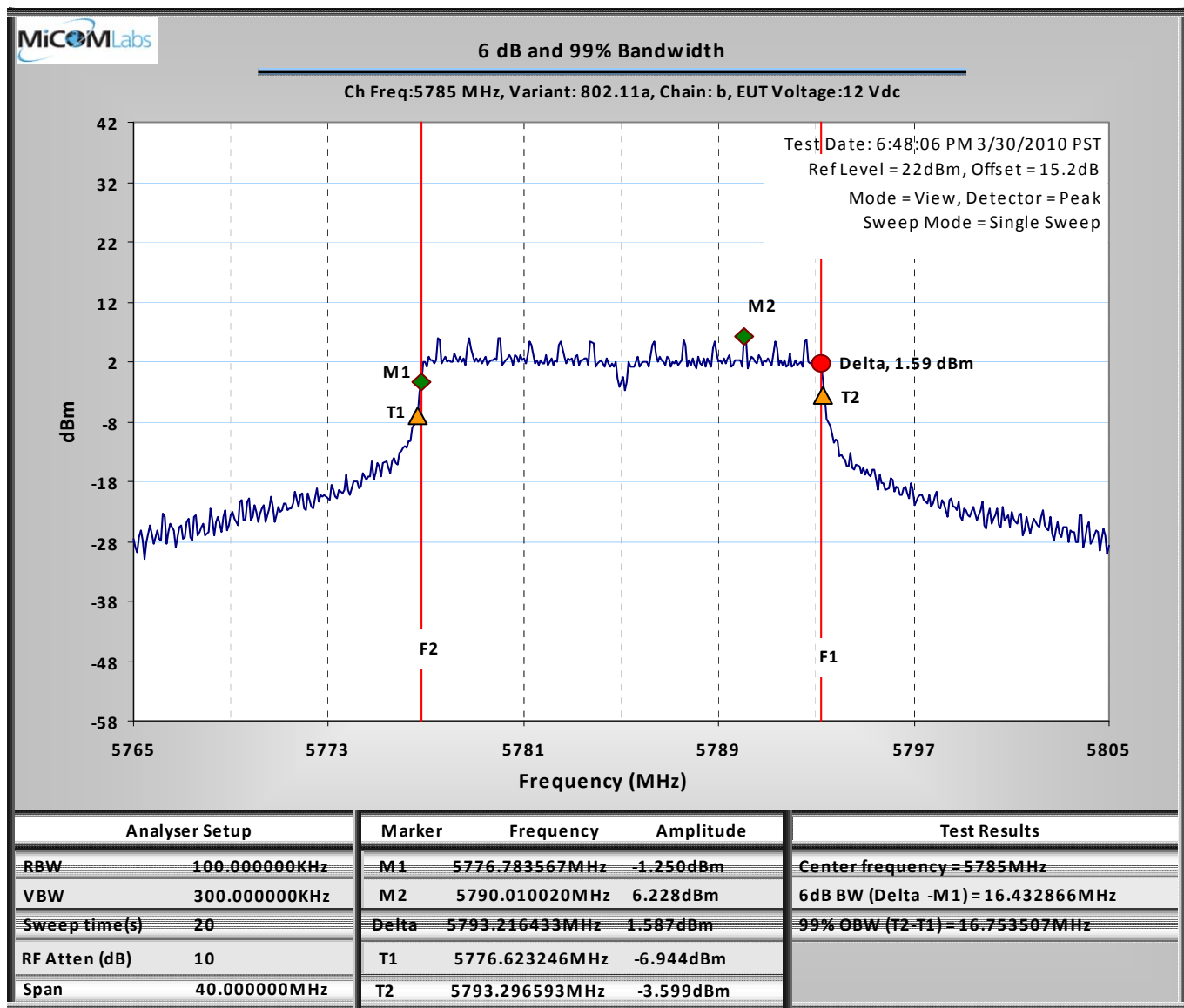
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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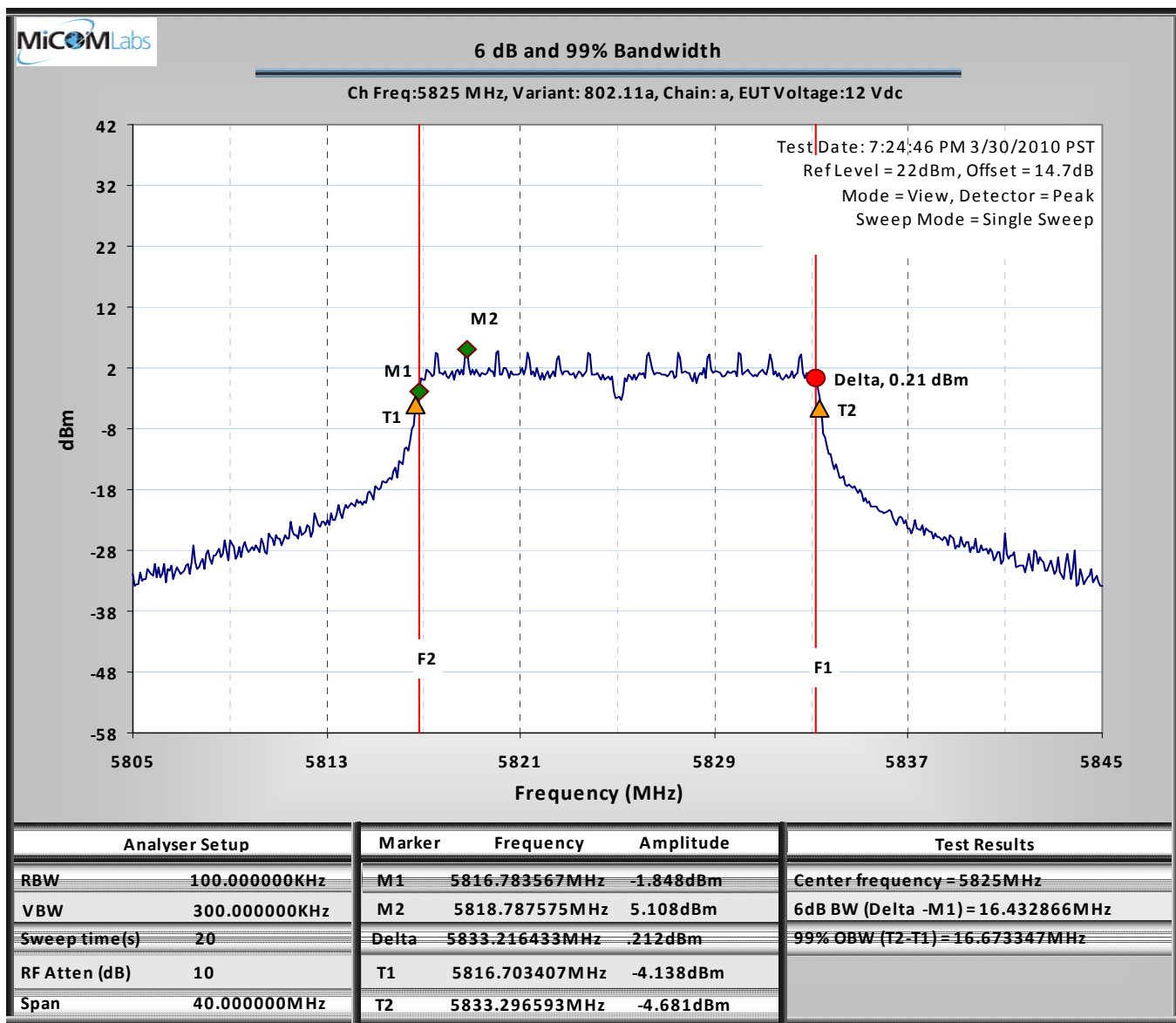
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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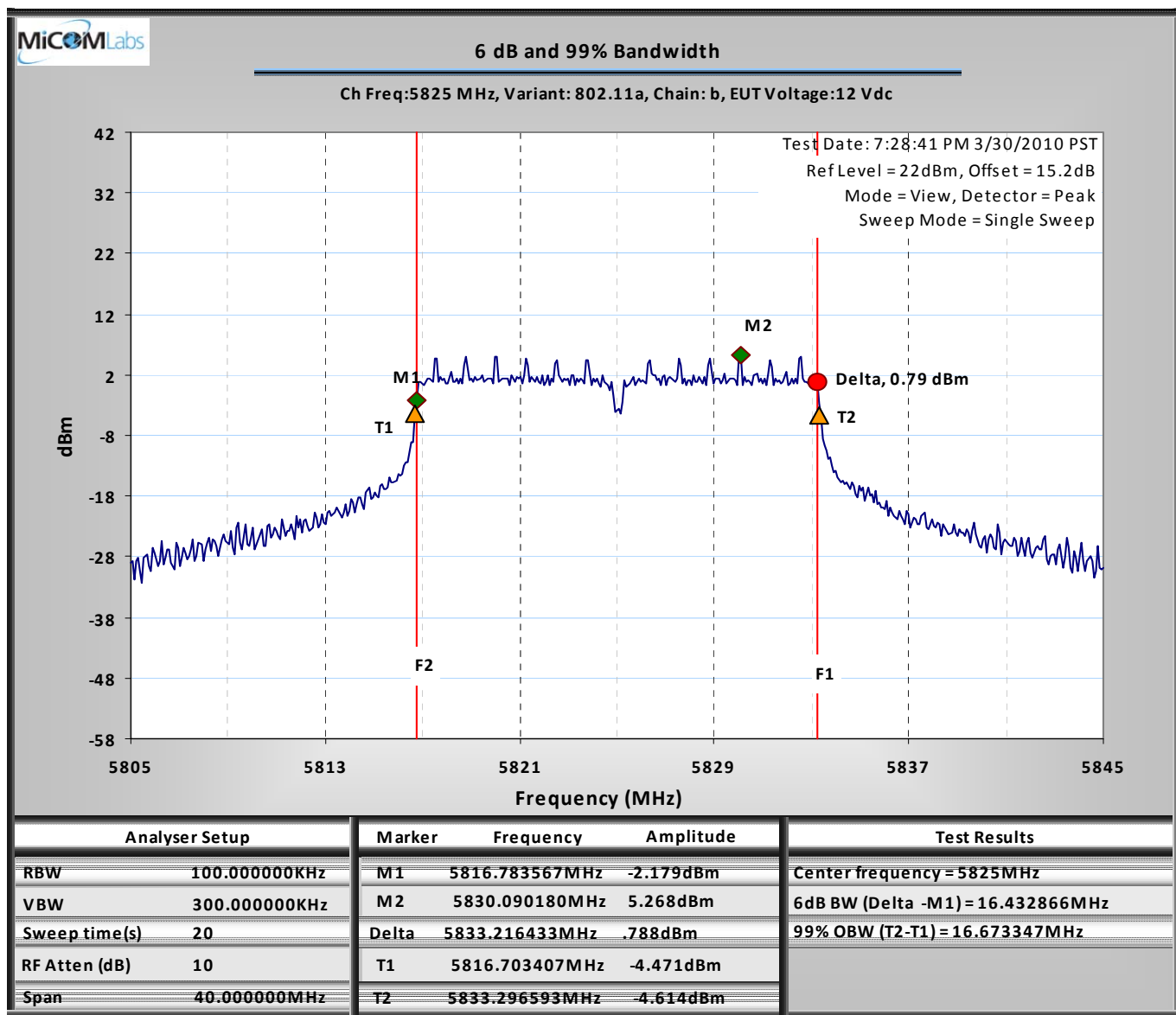
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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7.1.6 6 dB and 99% Bandwidth Results: 802.11n HT20

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35 to 42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19 to 22
TPC:	HIGH	Pressure (mBars):	998 to 1003
Modulation:	ON	Duty Cycle (%):	100
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	6 dBi
Applied Voltage:	12.0 Vdc		
Notes 1:			
Notes 2:			

6 dB Bandwidth

Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz						
MHz	a	b	c	d	kHz	MHz	MHz
5745	17.715000	17.715000			500	0.5	-17.215000
5785	17.635000	17.715000					-17.135000
5825	17.635000	17.715000					-17.135000

99% Bandwidth

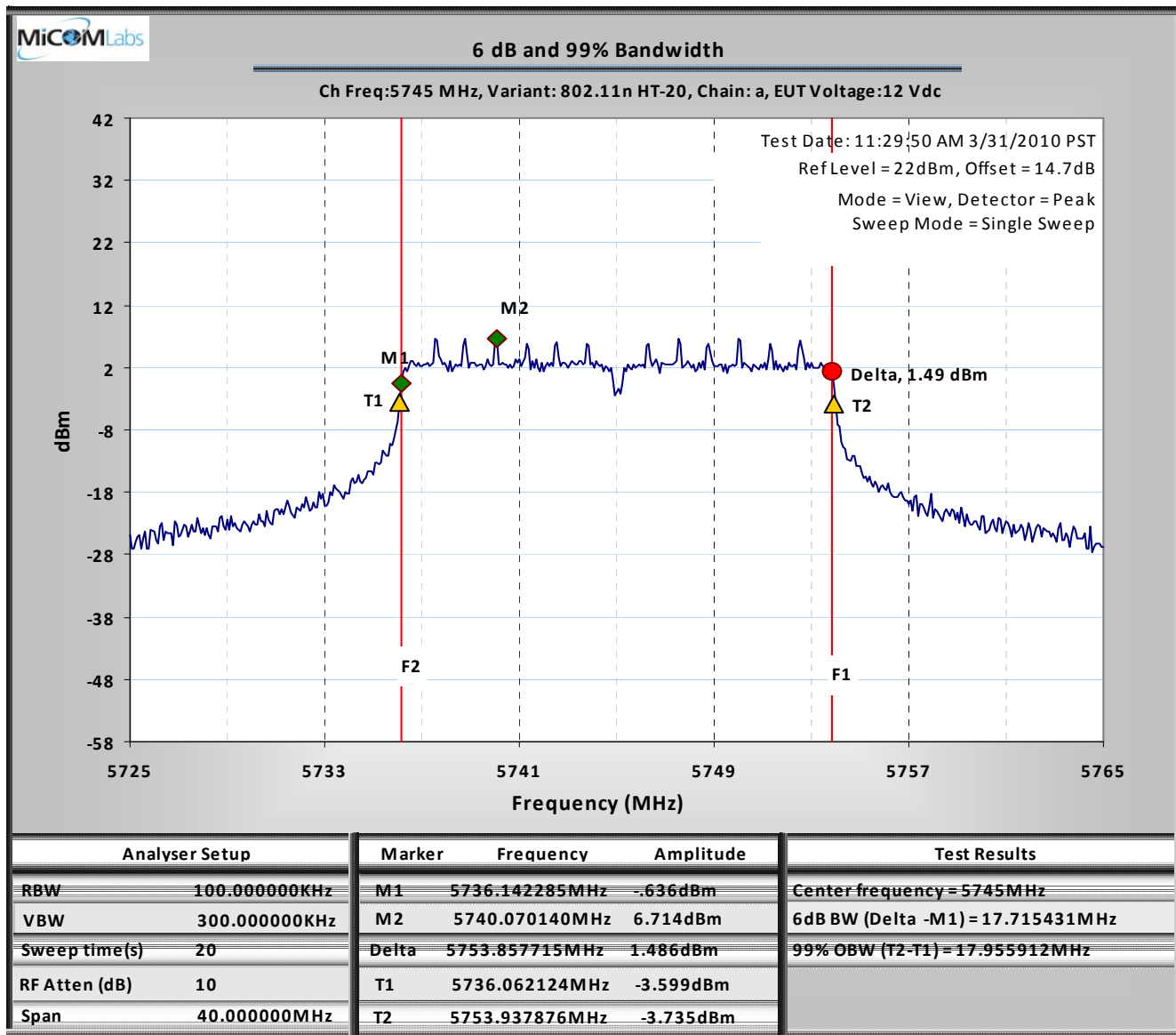
99 % Bandwidth							
Test Frequency	MHz						
	MHz	a	b	c	d		
5745	17.956000	18.357000					
5785	17.876000	17.956000					
5825	17.796000	17.956000					

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

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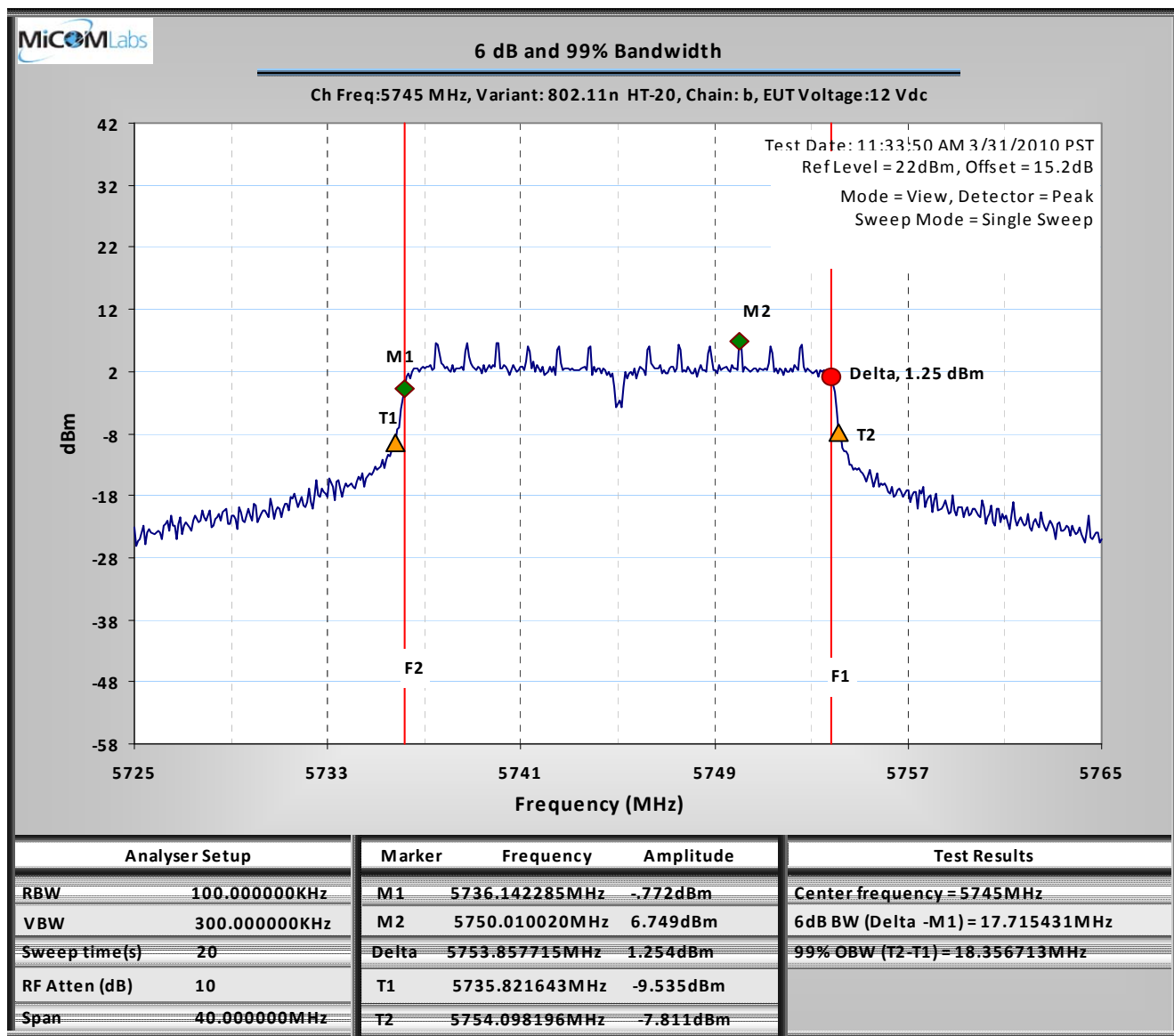
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
To: FCC 47 CFR Part 15.247 & IC RSS-210
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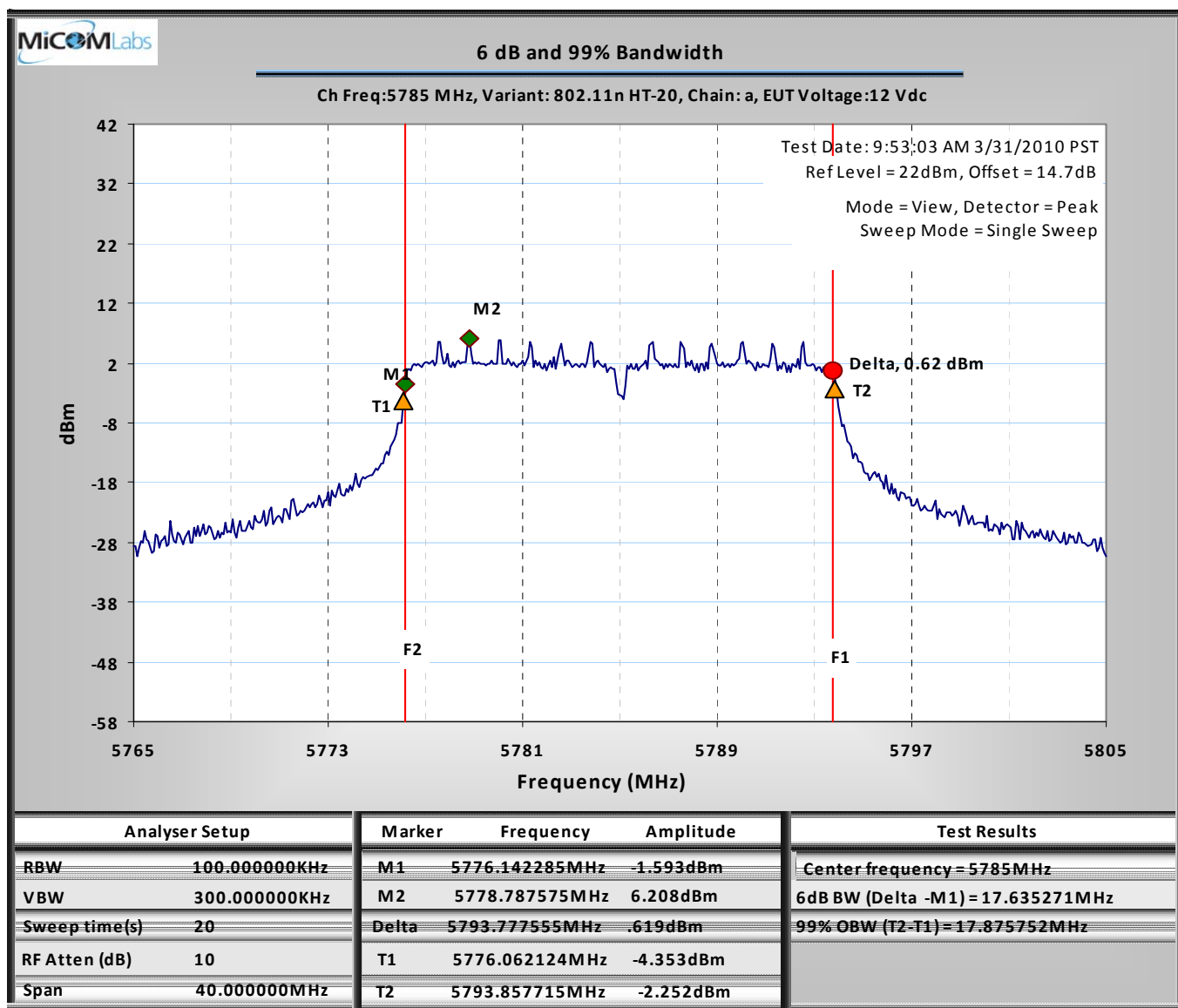
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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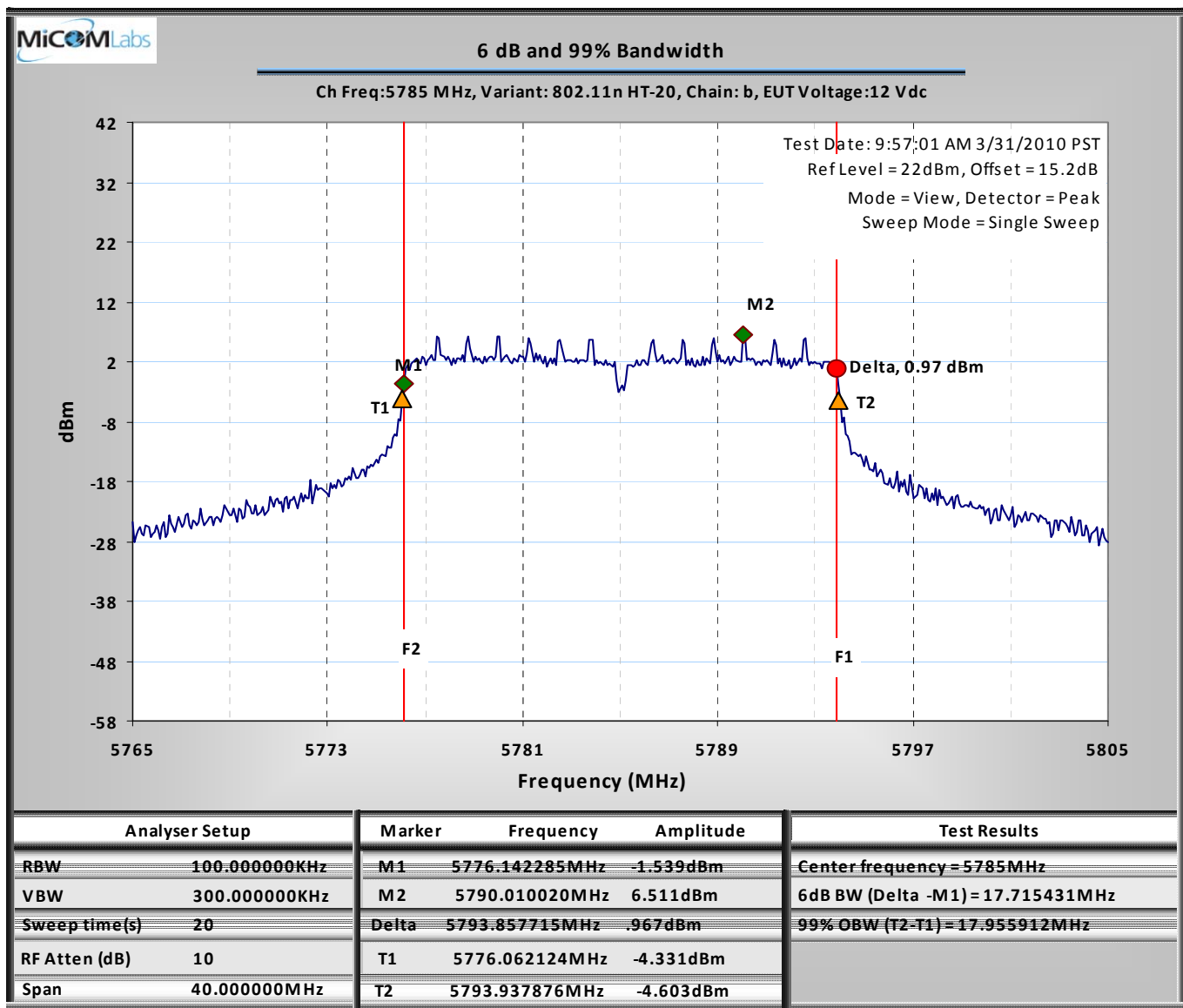
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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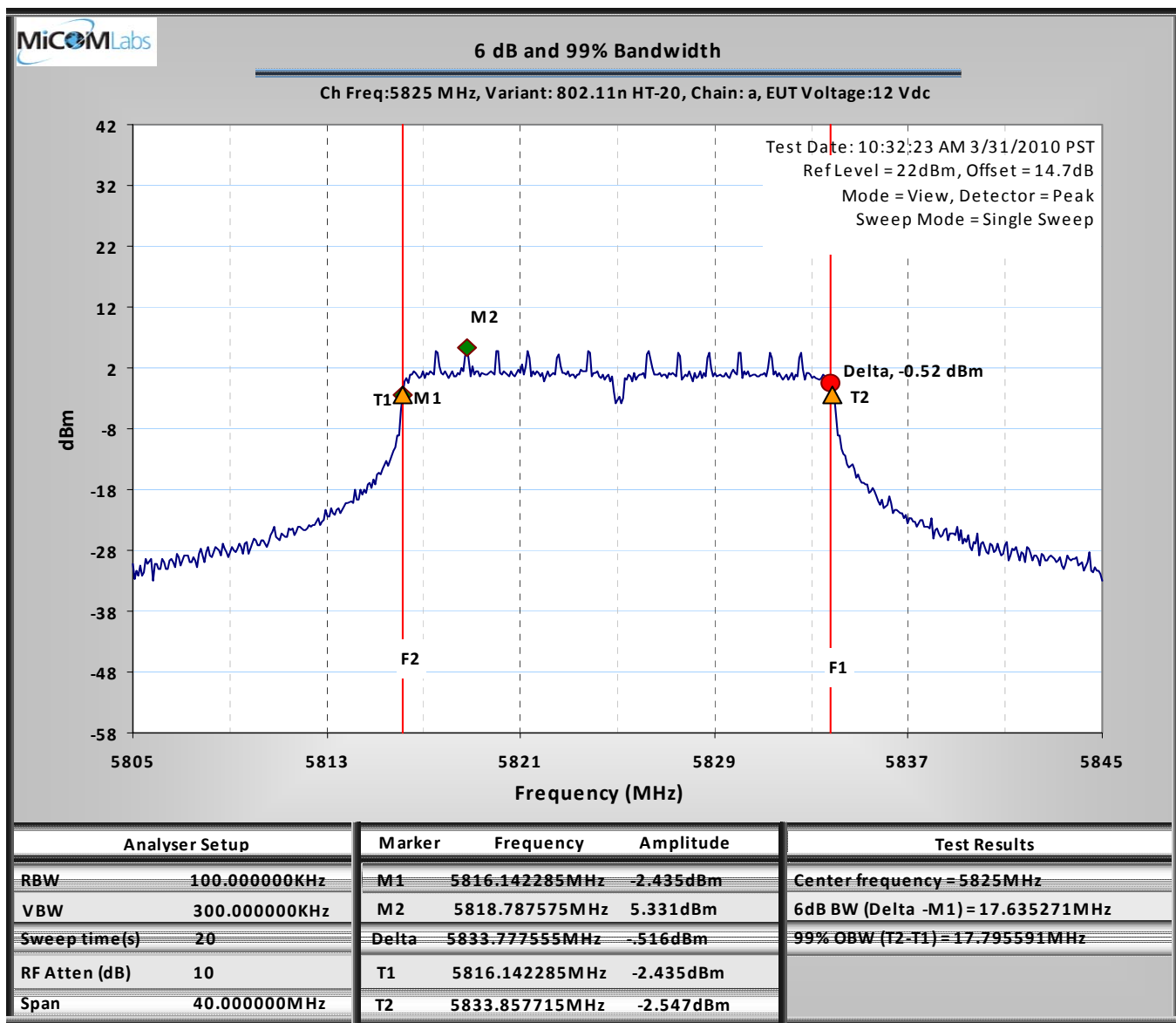
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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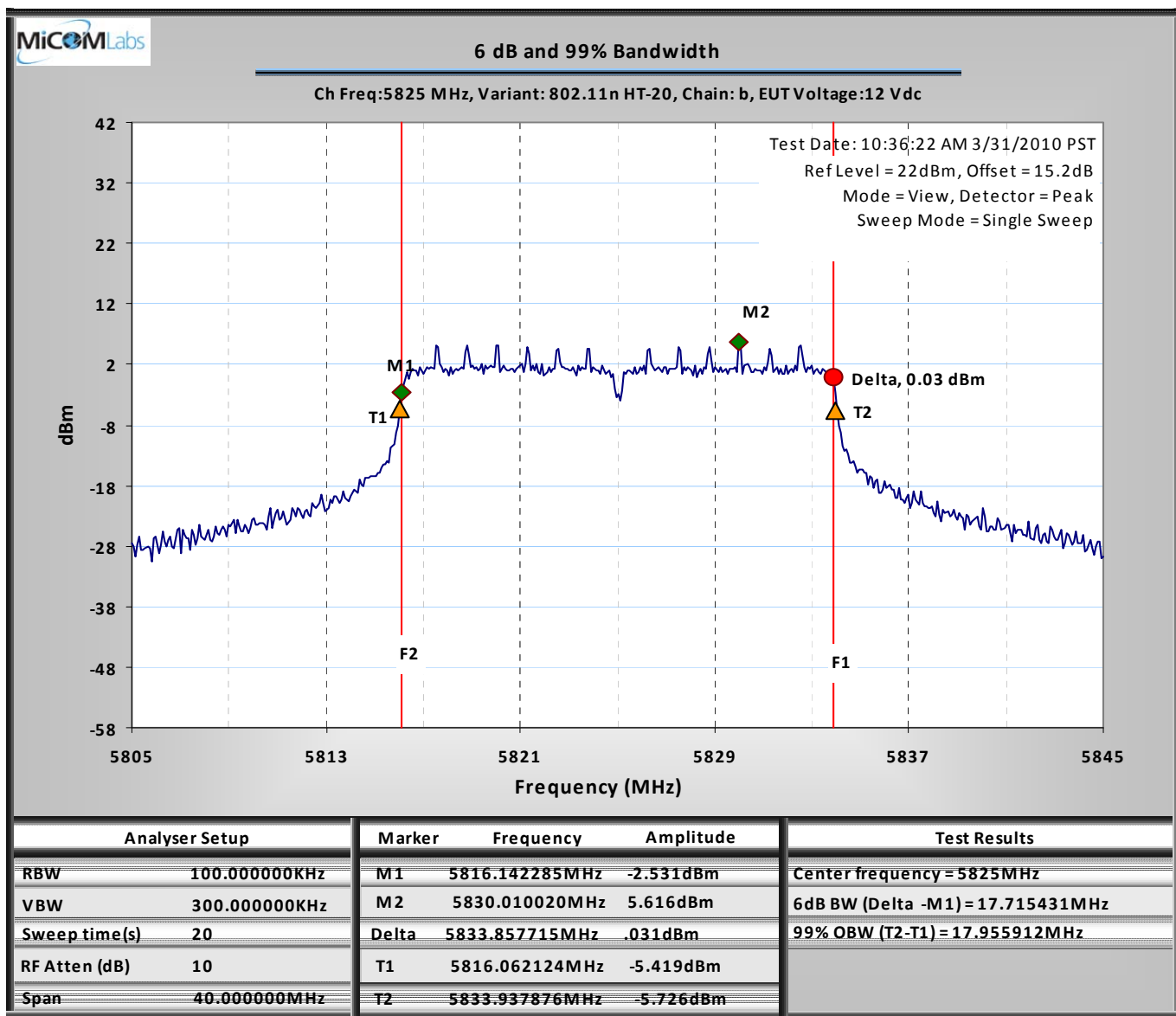
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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7.1.7 6 dB and 99% Bandwidth Results: 802.11n HT-40

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A	Antenna Gain:	6		dBi
Applied Voltage:	12.0				Vdc
Notes 1:					
Notes 2:					

6 dB Bandwidth

Test Frequency	6 dB Bandwidth				Minimum 6dB Bandwidth Limit		Margin
	MHz				kHz	MHz	MHz
MHz	a	b	c	d			
5755	36.232000	36.393000			500	0.5	-35.732000
5785	36.393000	36.232000					-35.732000
5815	36.393000	36.393000					-35.893000

99% Bandwidth

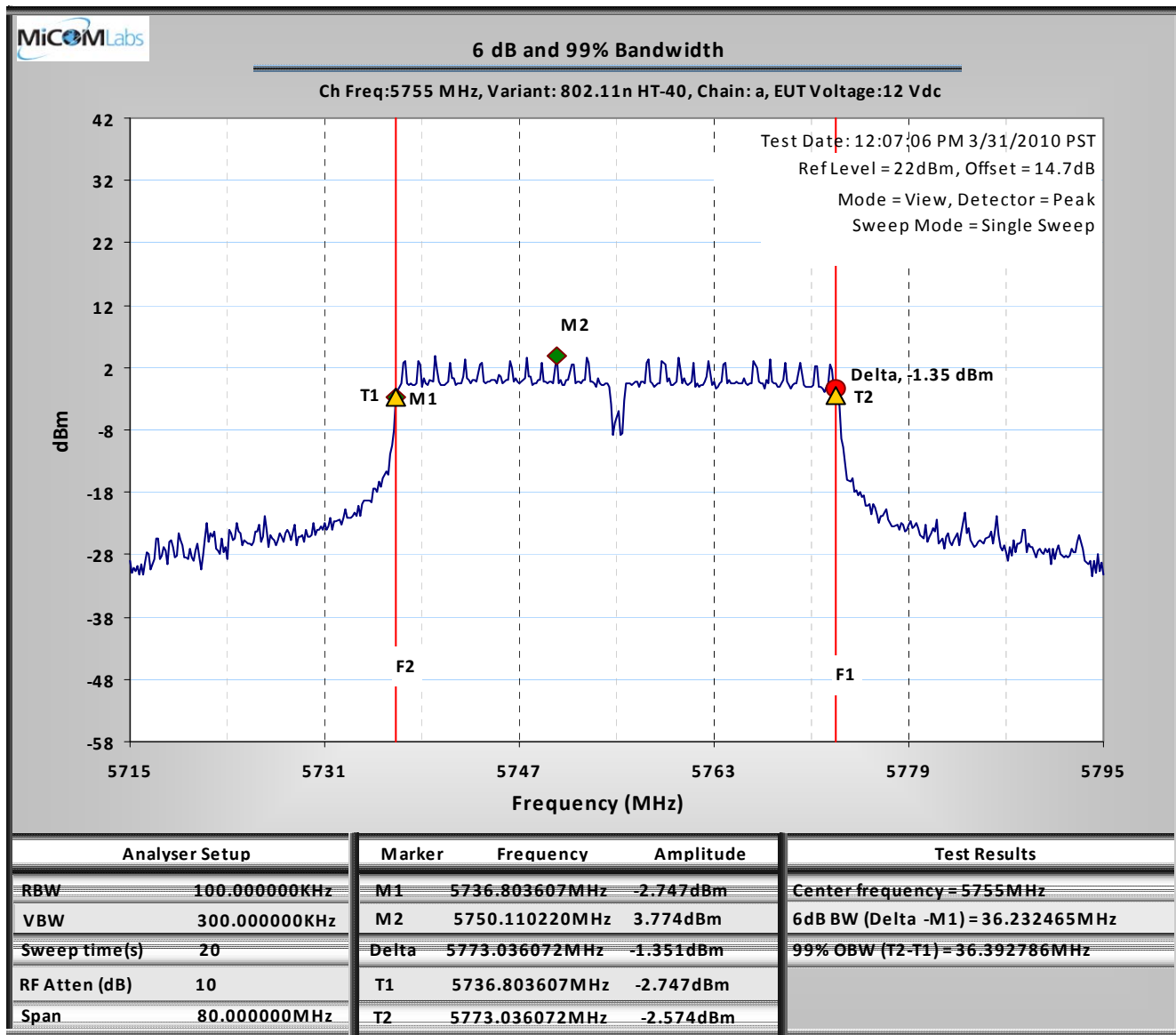
Test Frequency	99 % Bandwidth						
	MHz						
MHz	a	b	c	d			
5755	36.393000	36.553000					
5785	36.393000	36.393000					
5815	36.393000	36.393000					

Measurement uncertainty:	±2.81 dB
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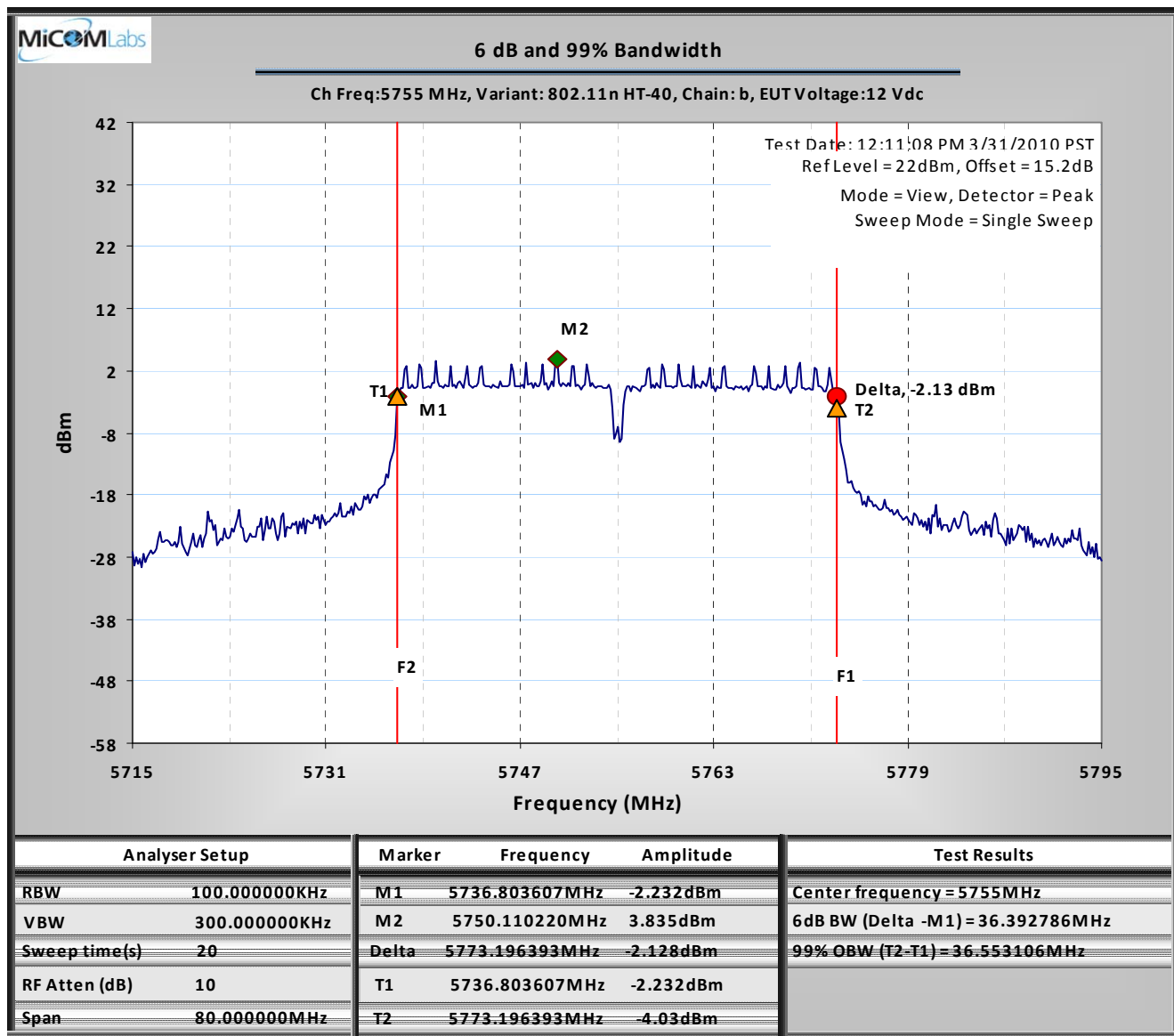
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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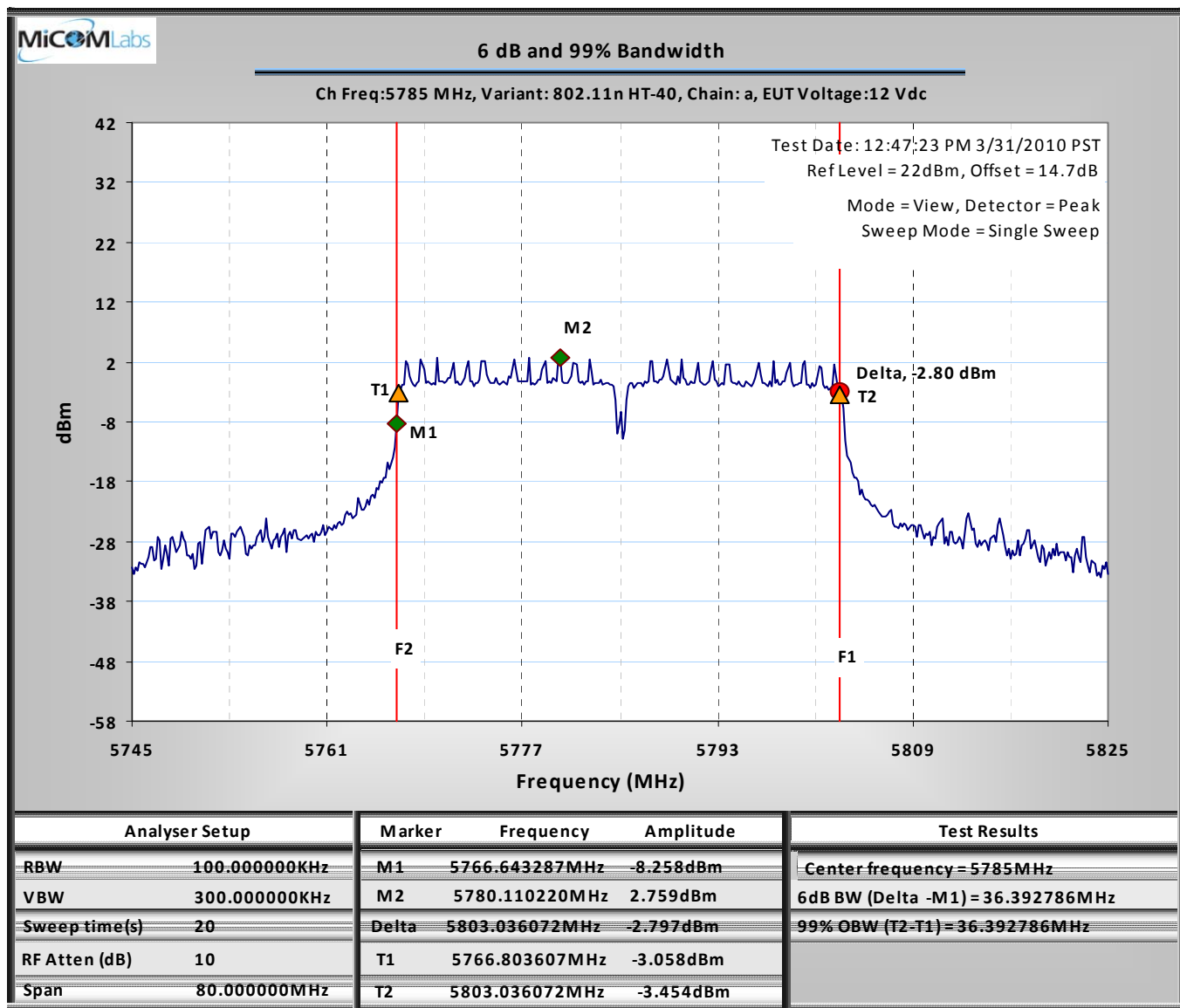
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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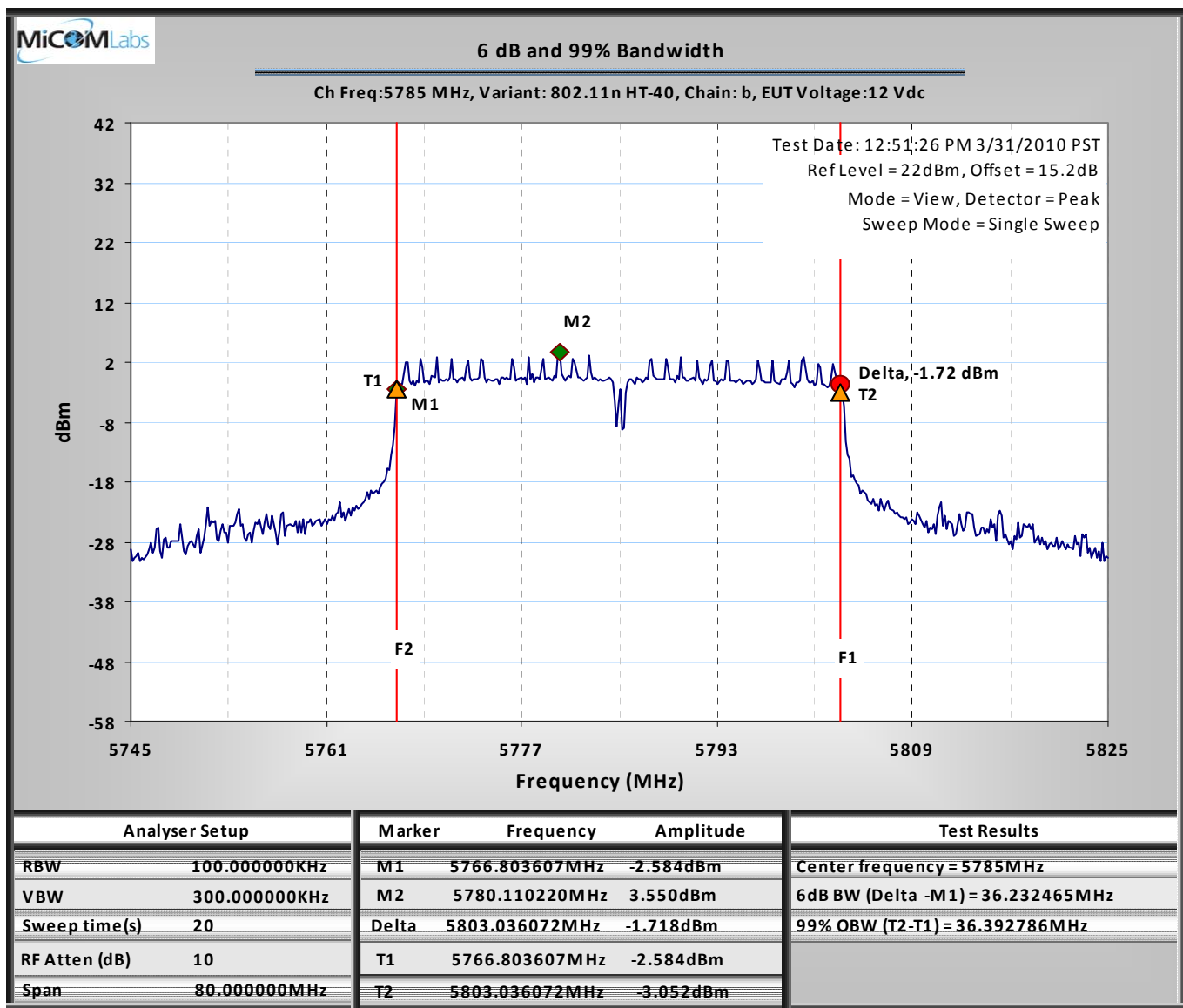
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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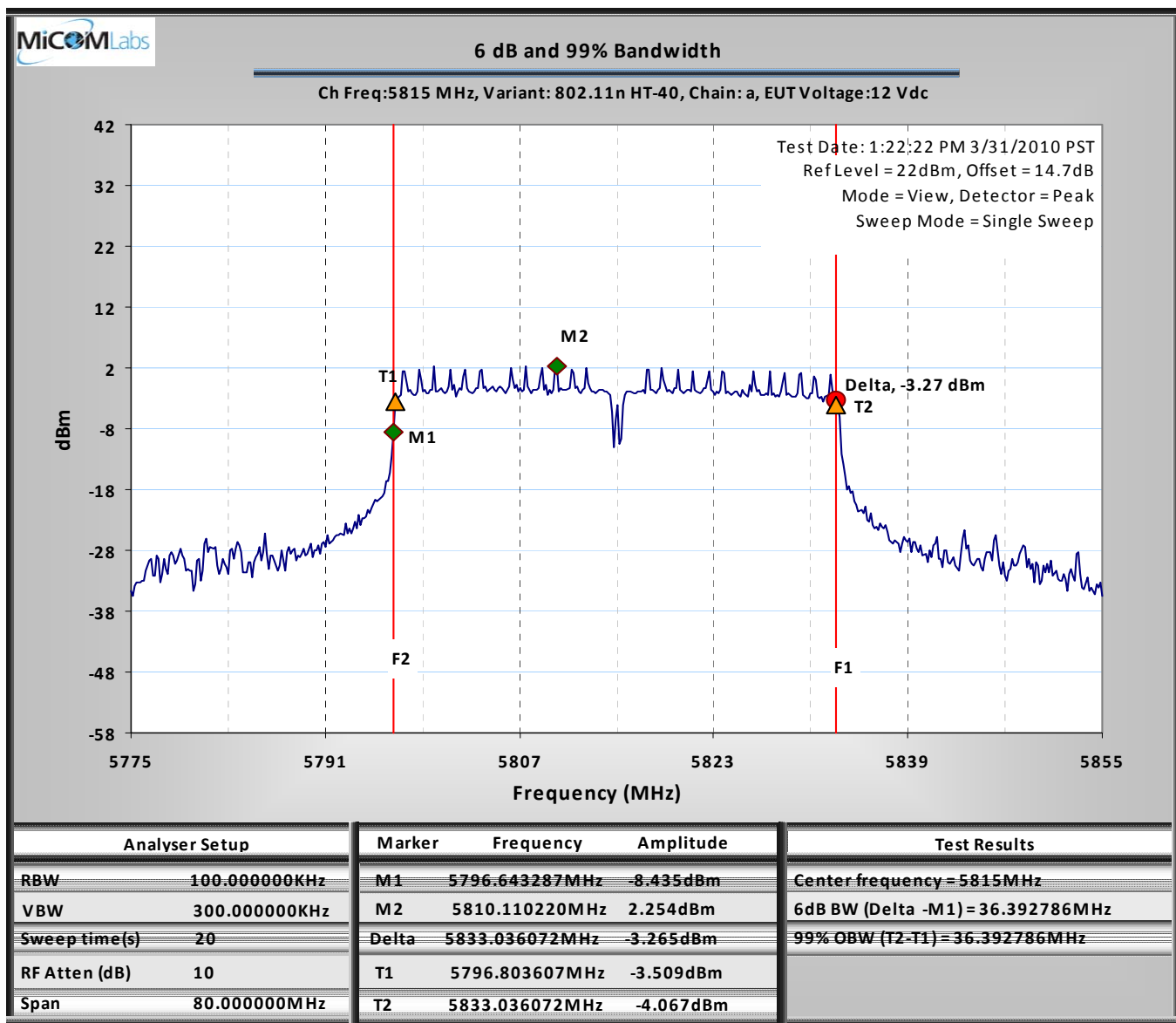
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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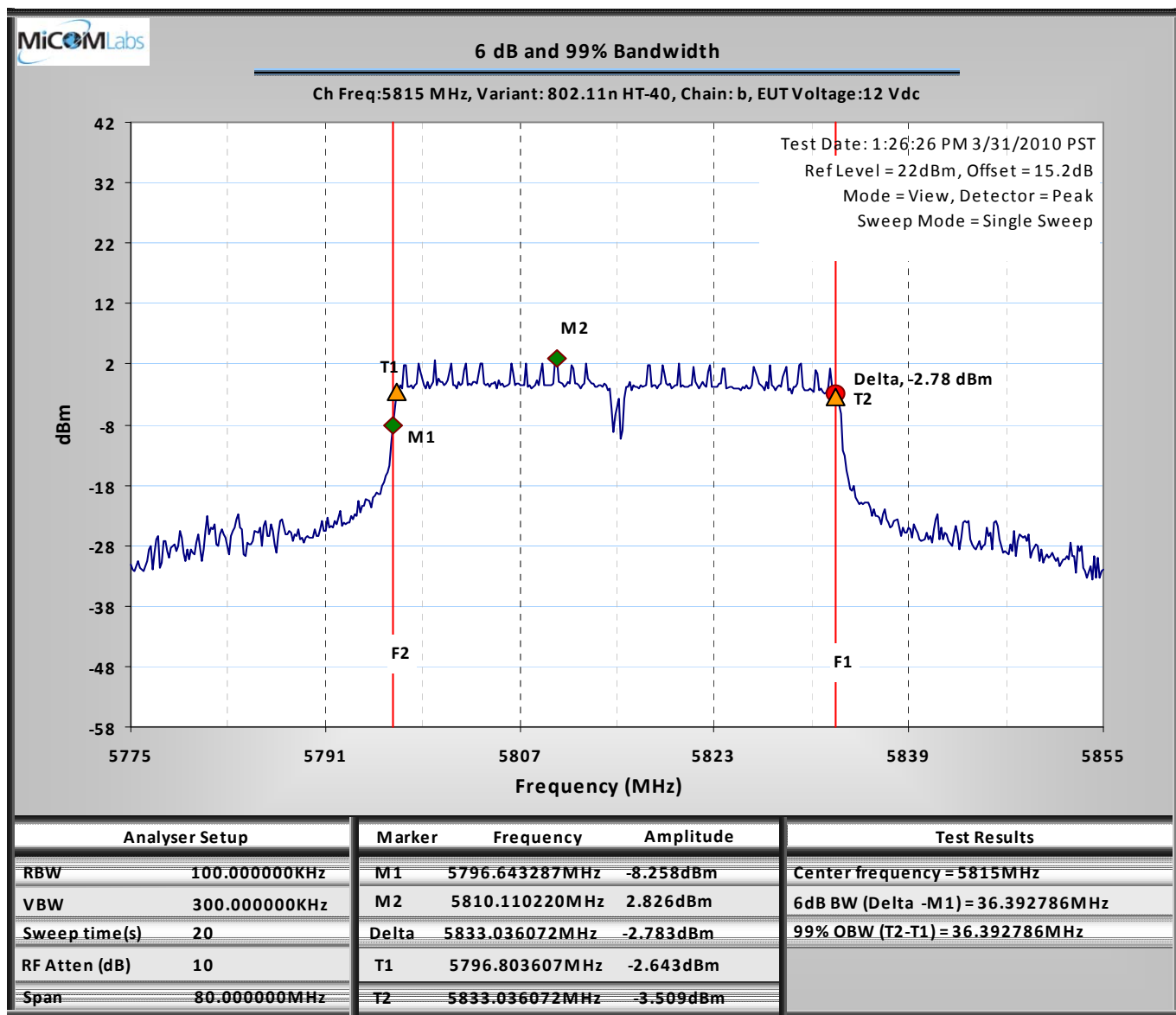
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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7.2 Peak Output Power

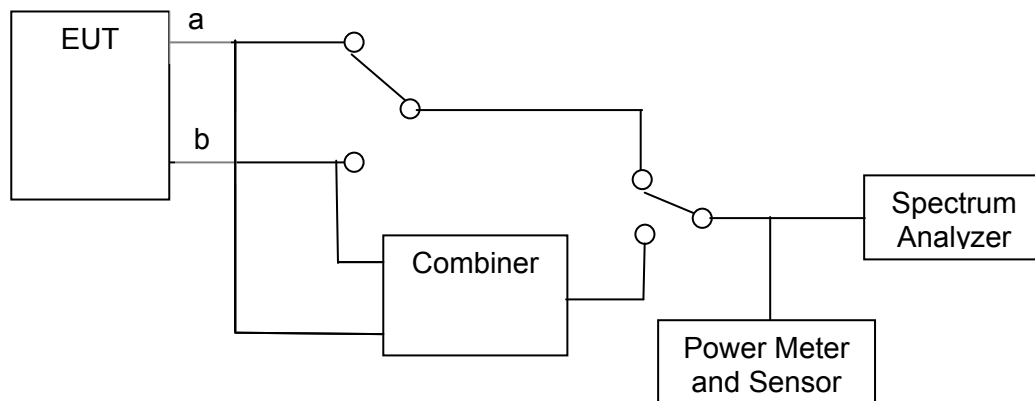
Test Procedure

The test methodology and conditions utilized for each measurement is referenced in the test results matrix. The average output power was measured per the test configuration identified below.

Per the standard measurements were taken at ambient conditions, nominal voltage.

Test Configuration

Only Ports a and b were active



Measurement set-up for Peak Output Power

$$\text{Total Power} = A + G + Y + 10 \log (1/x) \text{ dBm}$$

A = Total Power $[10 \log_{10} (10^{a/10} + 10^{b/10} + 10^{c/10} + 10^{d/10})]$, G = Antenna Gain,
Y = Beam Forming Gain, x = Duty Cycle



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.

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0252, 0313, 0314, 0223, 0116, 0117, 0287, 0363



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7.2.1 Measurement Results for 802.11b

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35	to	42
Variant:	802.11b	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi		
Applied Voltage:	55.00 Vdc				
Notes 1:					
Notes 2:					

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	Combined	Calculated	dBm	dB
2412	17.93	16.76	--	--	N/A	20.39	30.00	-9.61
2437	18.45	18.57	--	--	N/A	21.52	30.00	-8.48
2462	17.32	16.84	--	--	N/A	20.10	30.00	-9.90

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

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7.2.2 Measurement Results for 802.11g

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35	to	42
Variant:	802.11g	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi		
Applied Voltage:	55.00 Vdc				
Notes 1:					
Notes 2:					

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	Combined	Calculated	dBm	dB
2412	18.40	17.79	--	--	N/A	21.12	30.00	-8.88
2437	18.89	18.57	--	--	N/A	21.74	30.00	-8.26
2462	17.91	17.76	--	--	N/A	20.85	30.00	-9.15

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

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7.2.3 Measurement Results for 802.11n HT-20

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi		
Applied Voltage:	55.00 Vdc				
Notes 1:					
Notes 2:					

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	Combined	Calculated	dBm	dB
2412	18.39	17.68	--	--	N/A	21.06	30.00	-8.94
2437	18.85	18.57	--	--	N/A	21.72	30.00	-8.28
2462	17.89	17.75	--	--	N/A	20.83	30.00	-9.17

Measurement uncertainty:	±1.33 dB
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7.2.4 Measurement Results for 802.11n HT-40

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi		
Applied Voltage:	55.00 Vdc				
Notes 1:					
Notes 2:					

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	Combined	Calculated	dBm	dB
2422	17.52	17.66	--	--	N/A	20.60	30.00	-9.40
2437	18.93	18.13	--	--	N/A	21.56	30.00	-8.44
2452	11.51	10.98	--	--	N/A	14.26	30.00	-15.74

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

The above results take into account the power reduction required to bring the product into compliance during radiated band-edge testing.



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7.2.5 Measurement Results for 802.11a

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35	to	42
Variant:	802.11a	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	6		dBi
Applied Voltage:	12.0 Vdc				
Notes 1:					
Notes 2:					

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	Combined	Calculated	dBm	dB
5745	16.61	16.78	--	--	19.13	19.71	30.00	-10.87
5785	16.30	16.82	--	--	19.50	19.58	30.00	-10.50
5825	15.67	15.96	--	--	18.61	18.83	30.00	-11.39

Measurement uncertainty:	±1.33 dB
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7.2.6 Measurement Results for 802.11n HT-20

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	6		dBi
Applied Voltage:	12.0 Vdc				
Notes 1:					
Notes 2:					

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	Combined	Calculated	dBm	dB
5745	16.84	16.97	--	--	19.15	19.92	30.00	-10.85
5785	16.49	16.97	--	--	19.49	19.75	30.00	-10.51
5825	15.84	16.10	--	--	18.82	18.98	30.00	-11.18

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

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7.2.7 Measurement Results for 802.11n HT-40

Test Conditions:	15.247 (b)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	6		dBi
Applied Voltage:	12.0 Vdc				
Notes 1:					
Notes 2:					

Test Frequency	Measured Peak Power				Total Power (dBm)		Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	Combined	Calculated	dBm	dB
5755	16.39	16.61	--	--	19.11	19.51	30.00	-10.89
5785	16.10	16.59	--	--	19.28	19.36	30.00	-10.72
5815	15.61	15.93	--	--	18.55	18.78	30.00	-11.45

Measurement uncertainty:	±1.33 dB
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7.3 Peak Power Spectral Density

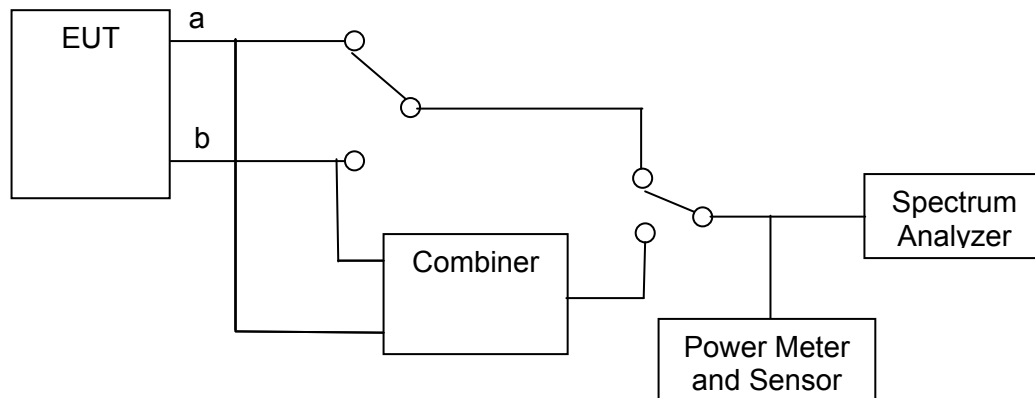
Test Procedure

The test methodology and conditions utilized for each measurement is referenced in the following test results matrix. RF output power, transmit power control and power density were measured per the Test Configuration identified below.

Testing was performed on the highest and lowest power settings of the equipment.

Per the standard measurements were taken at ambient and extreme temperature conditions at nominal and extreme voltage levels.

Test Configuration



Measurement set-up for 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

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0158, 0252, 0313, 0314, 0223, 0116, 0117, 0287, 0363



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7.3.1 Measurement results for 802.11b

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11b	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi		
Applied Voltage:	55.00 Vdc	Antenna Ports (N):	2		
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density				Correction factor	Peak Power Spectral Density	Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	10Log(N)	dBm	dBm	dB
2412.000	-4.54	-5.54	--	--	3.01	-1.53	8.00	-9.53
2437.000	-3.97	-3.81	--	--	3.01	-0.79	8.00	-8.79
2462.000	-4.83	-5.18	--	--	3.01	-1.82	8.00	-9.82

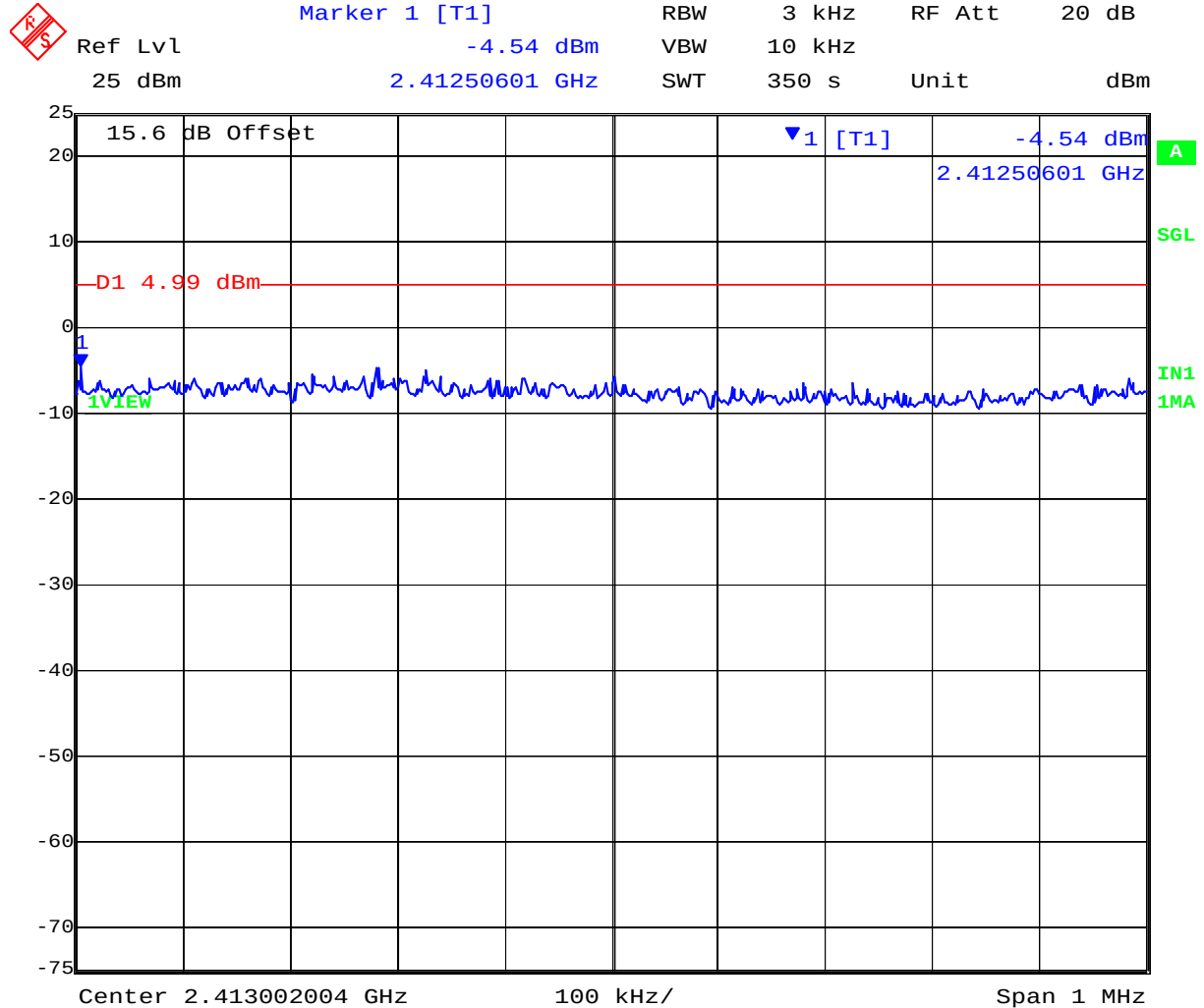
Measurement uncertainty:	± 1.33 dB
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CHAIN A



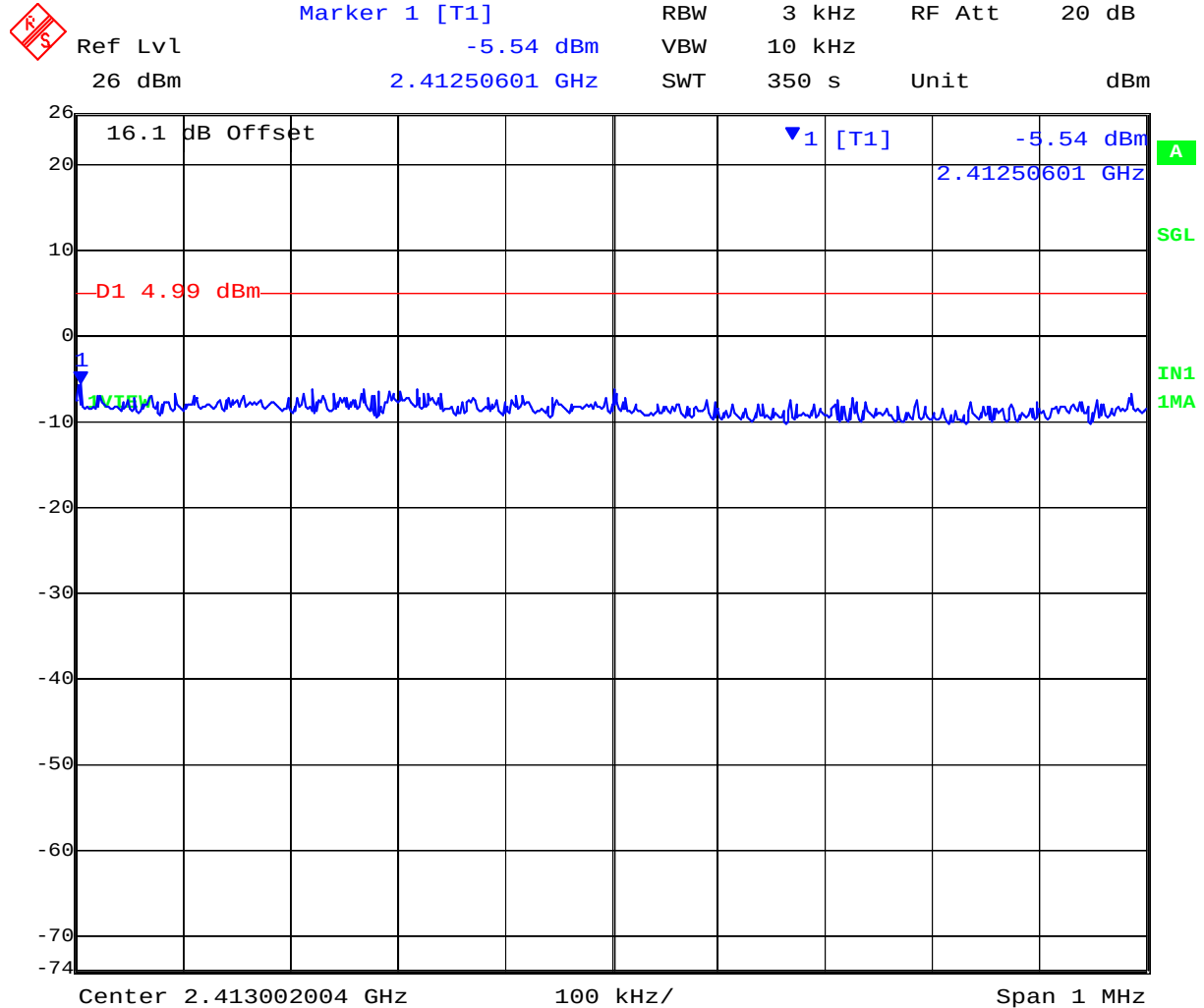
Date: 18.NOV.2011 10:39:23

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CHAIN B



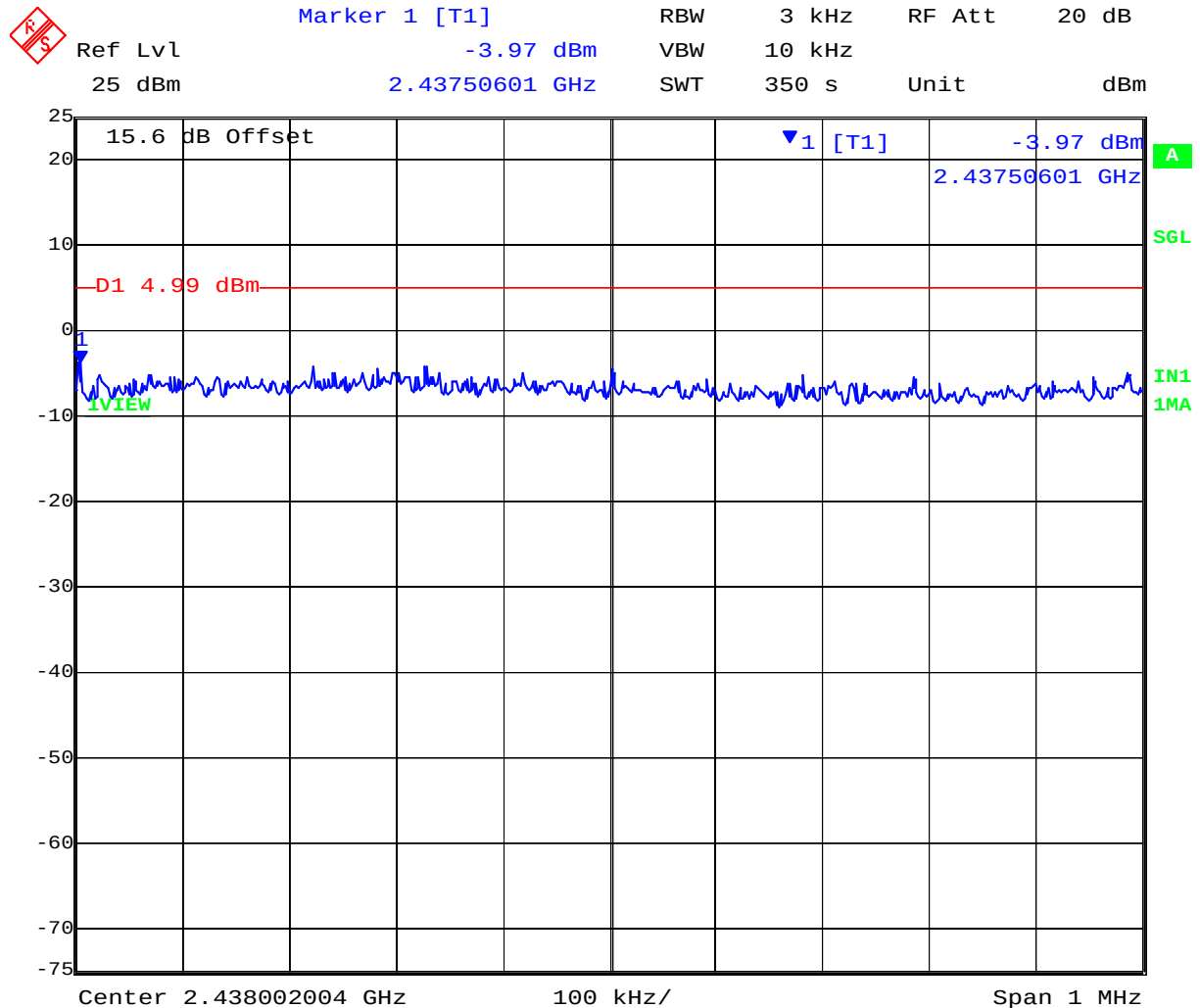
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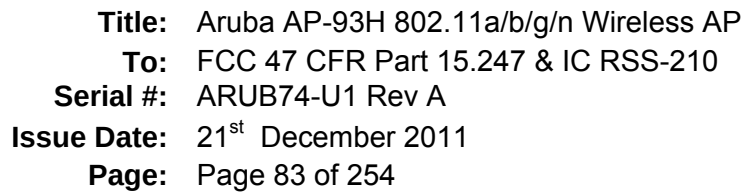
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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CHAIN A



Date: 18.NOV.2011 11:17:31

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Ref Lvl 26 dBm

Marker 1 [T1] -3.80 dBm

RBW 3 kHz

VBW 10 kHz

SWT 350 s

Unit dBm

16.1 dB Offset

▼1 [T1] -3.80 dBm

2.43850802 GHz

D1 4.99 dBm

1VIEW

1

IN1 1MA

Center 2.438082164 GHz

100 kHz/

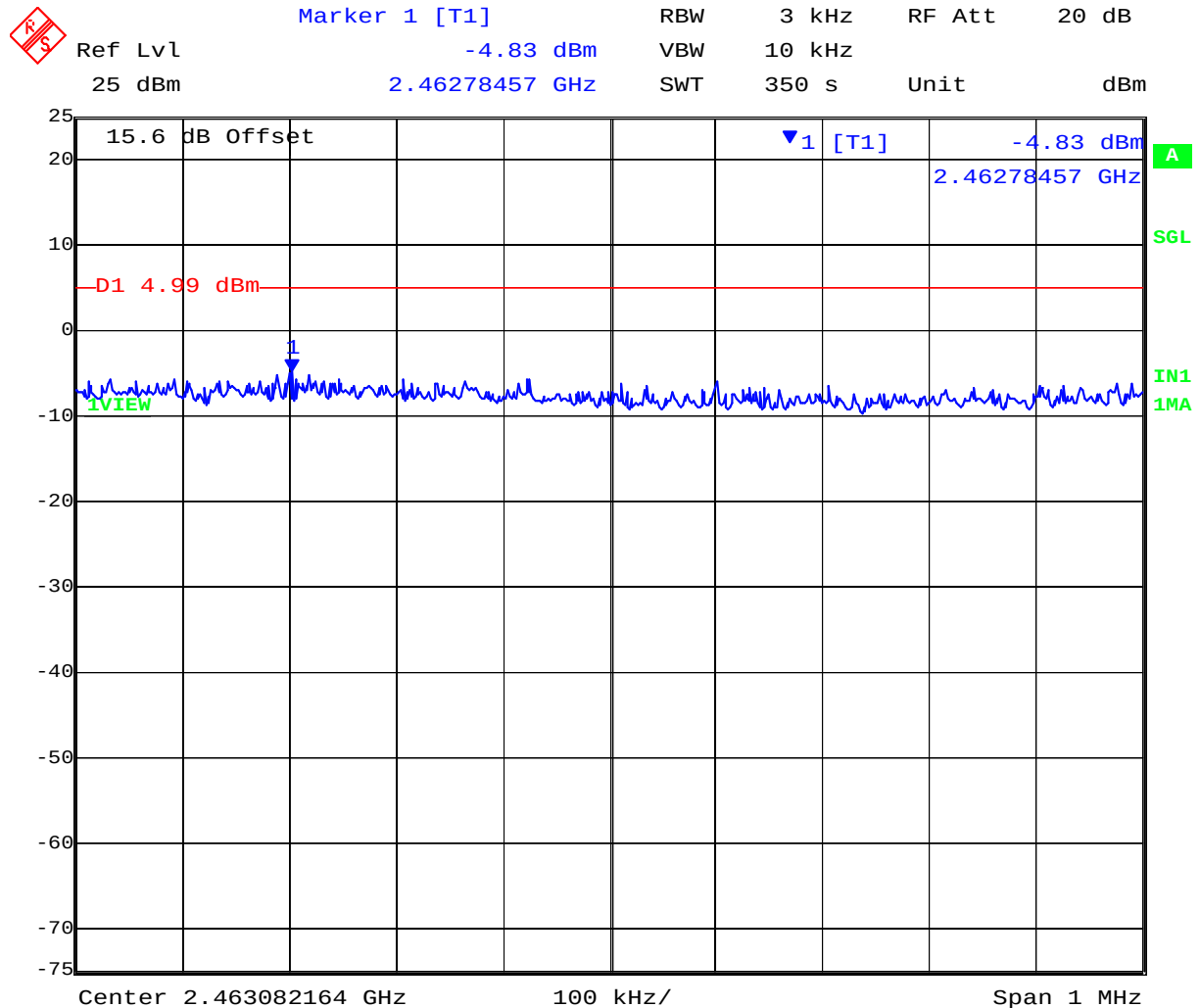
Span 1 MHz

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CHAIN A



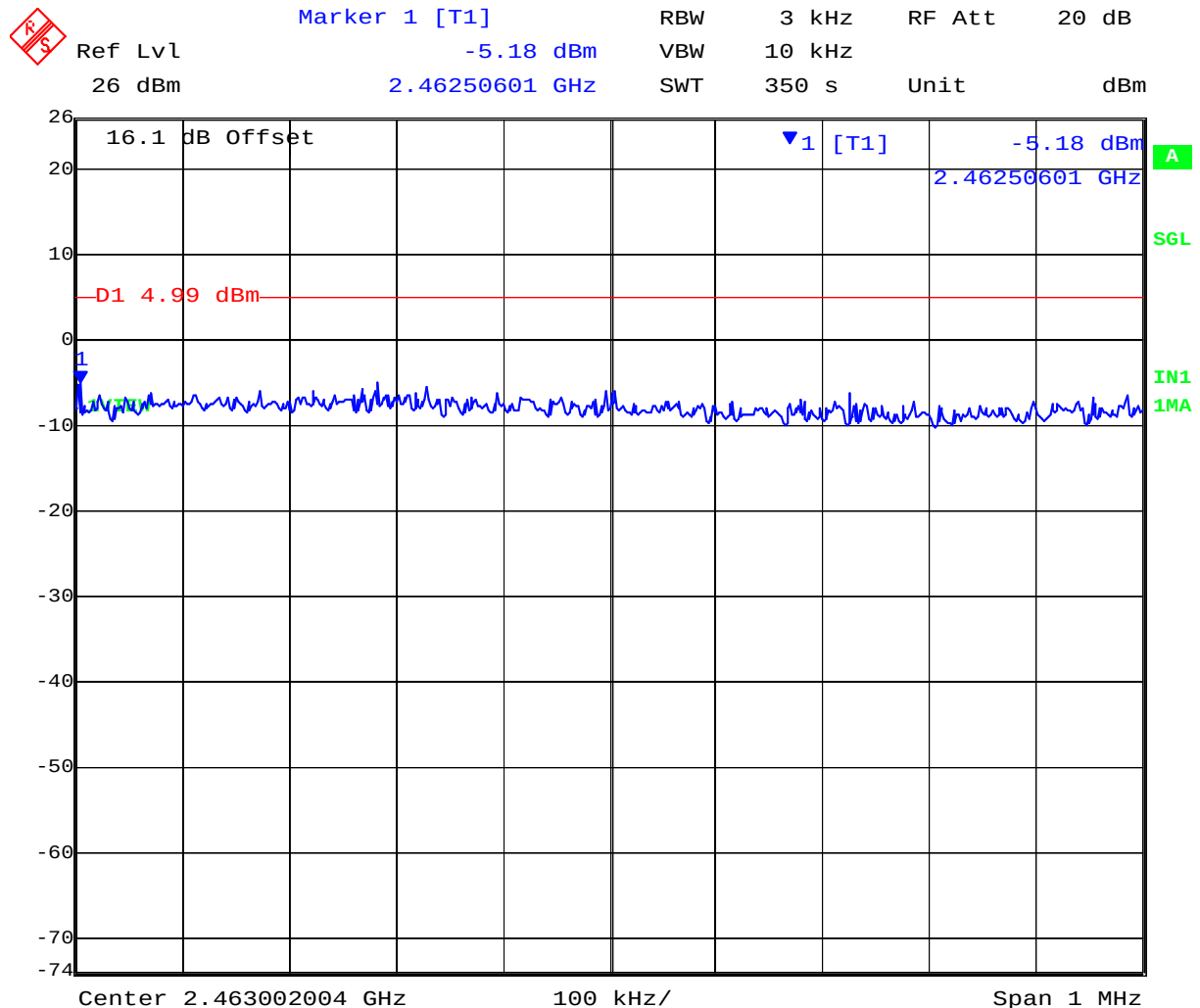
Date: 18.NOV.2011 11:40:12

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Date: 18.NOV.2011 11:46:45

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7.3.2 Measurement results for 802.11g

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11g	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi		
Applied Voltage:	55.00 Vdc	Antenna Ports (N):	2		
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density				Correction factor	Peak Power Spectral Density	Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	10Log(N)	dBm	dBm	dB
2412.000	-5.20	-5.63	--	--	3.01	-2.19	8.00	-10.19
2437.000	-4.60	-4.69	--	--	3.01	-1.59	8.00	-9.59
2462.000	-6.29	-5.83	--	--	3.01	-2.82	8.00	-10.82

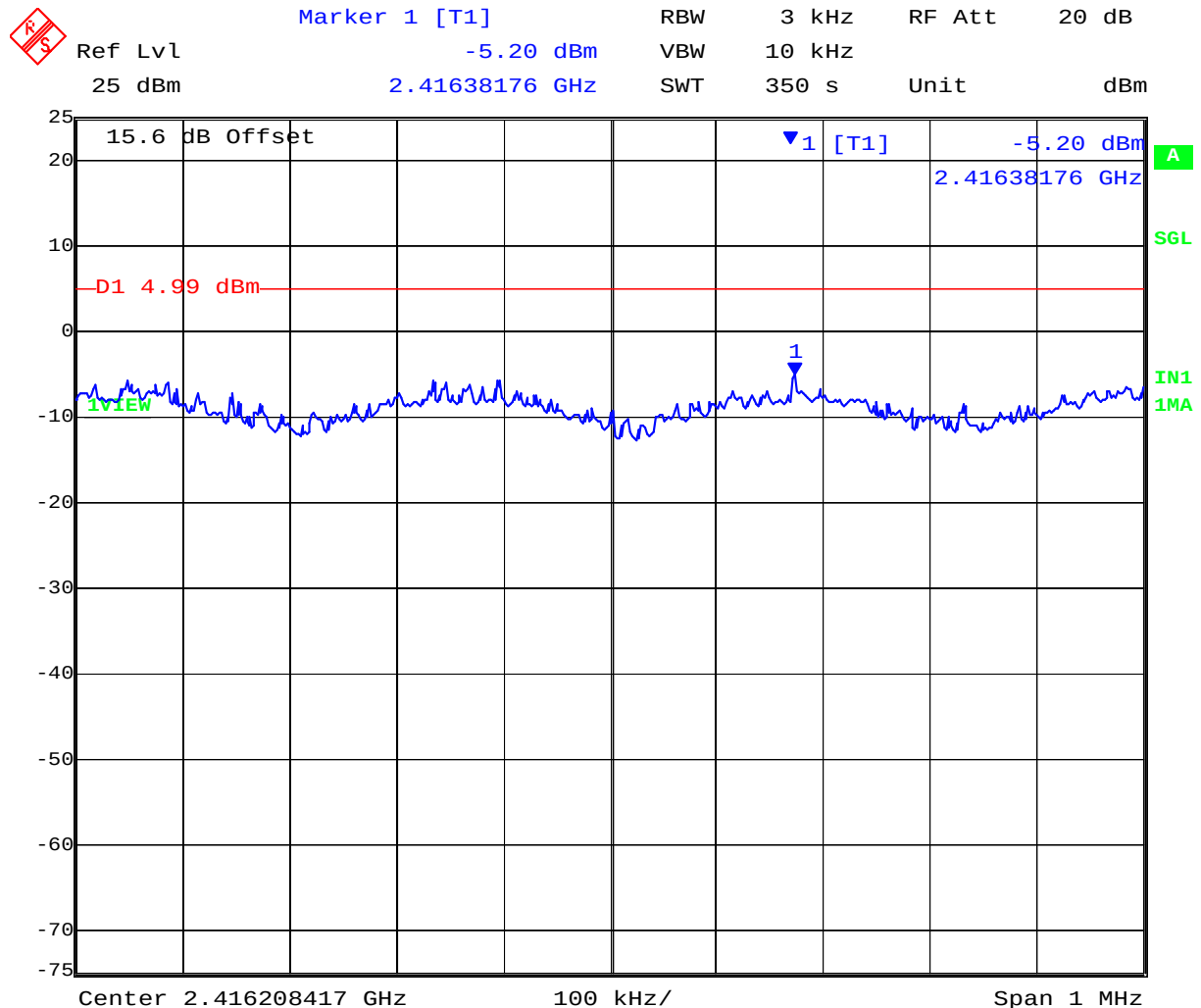
Measurement uncertainty:	± 1.33 dB
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Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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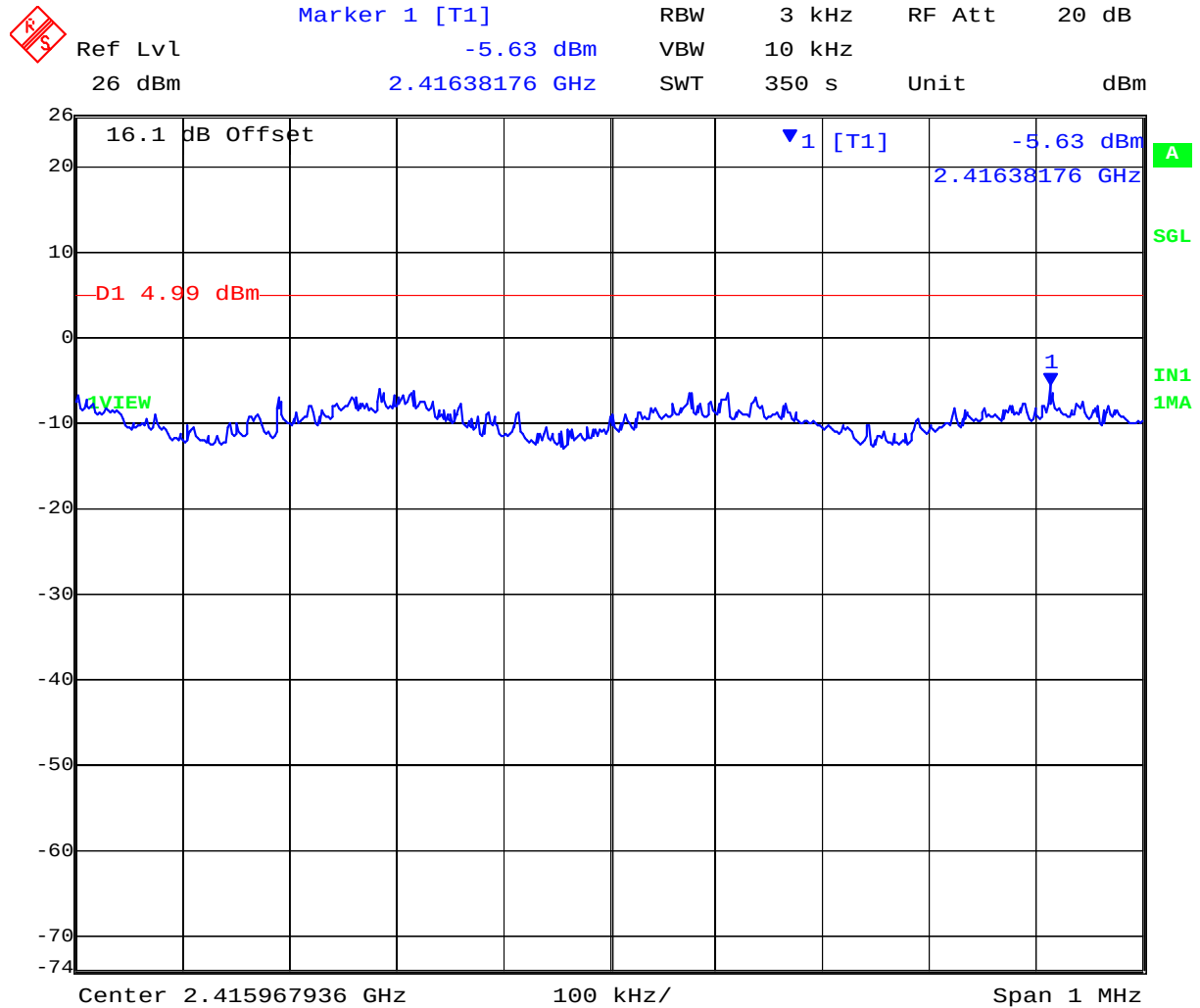
Date: 18.NOV.2011 12:22:03

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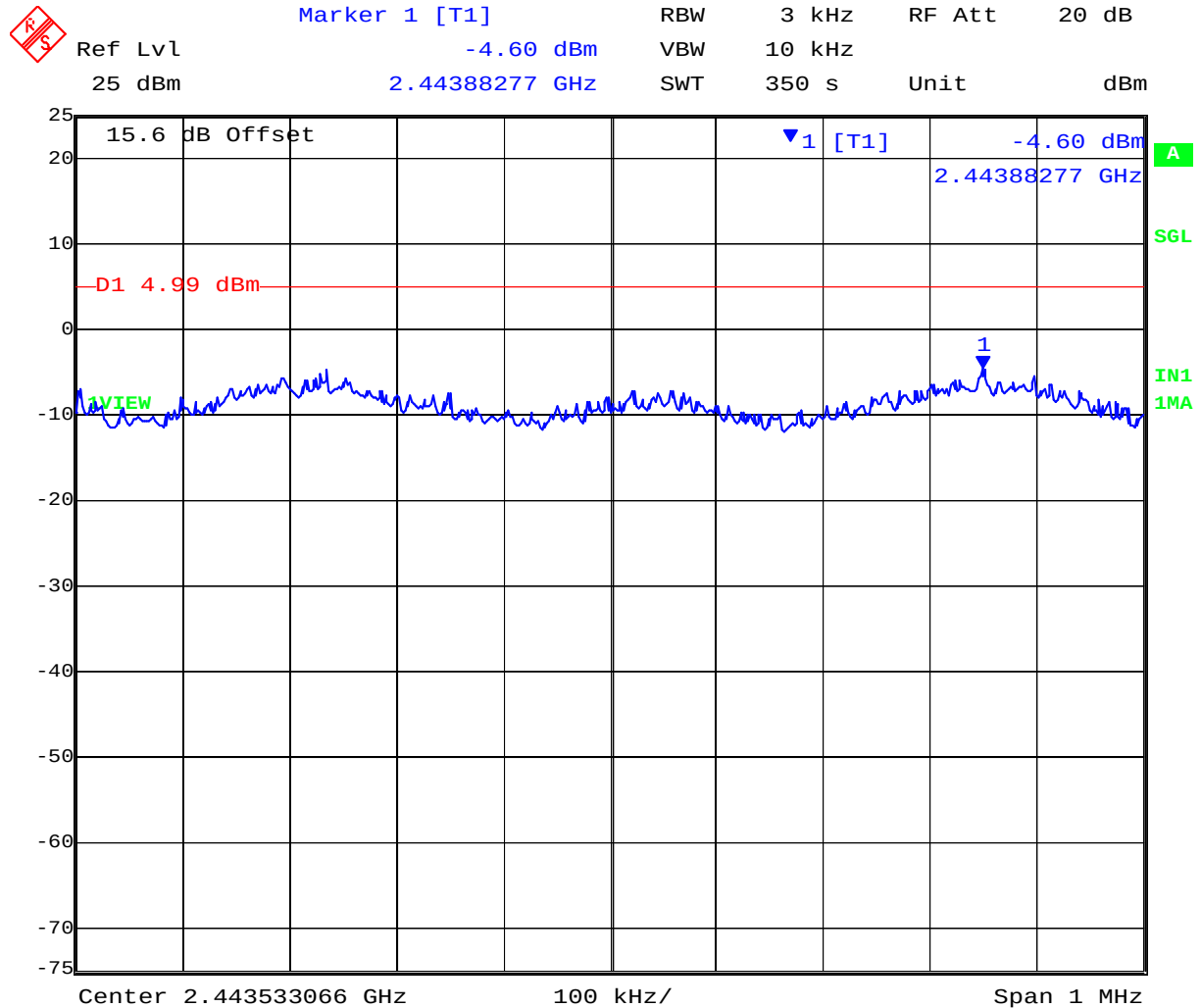
Date: 18.NOV.2011 12:28:35

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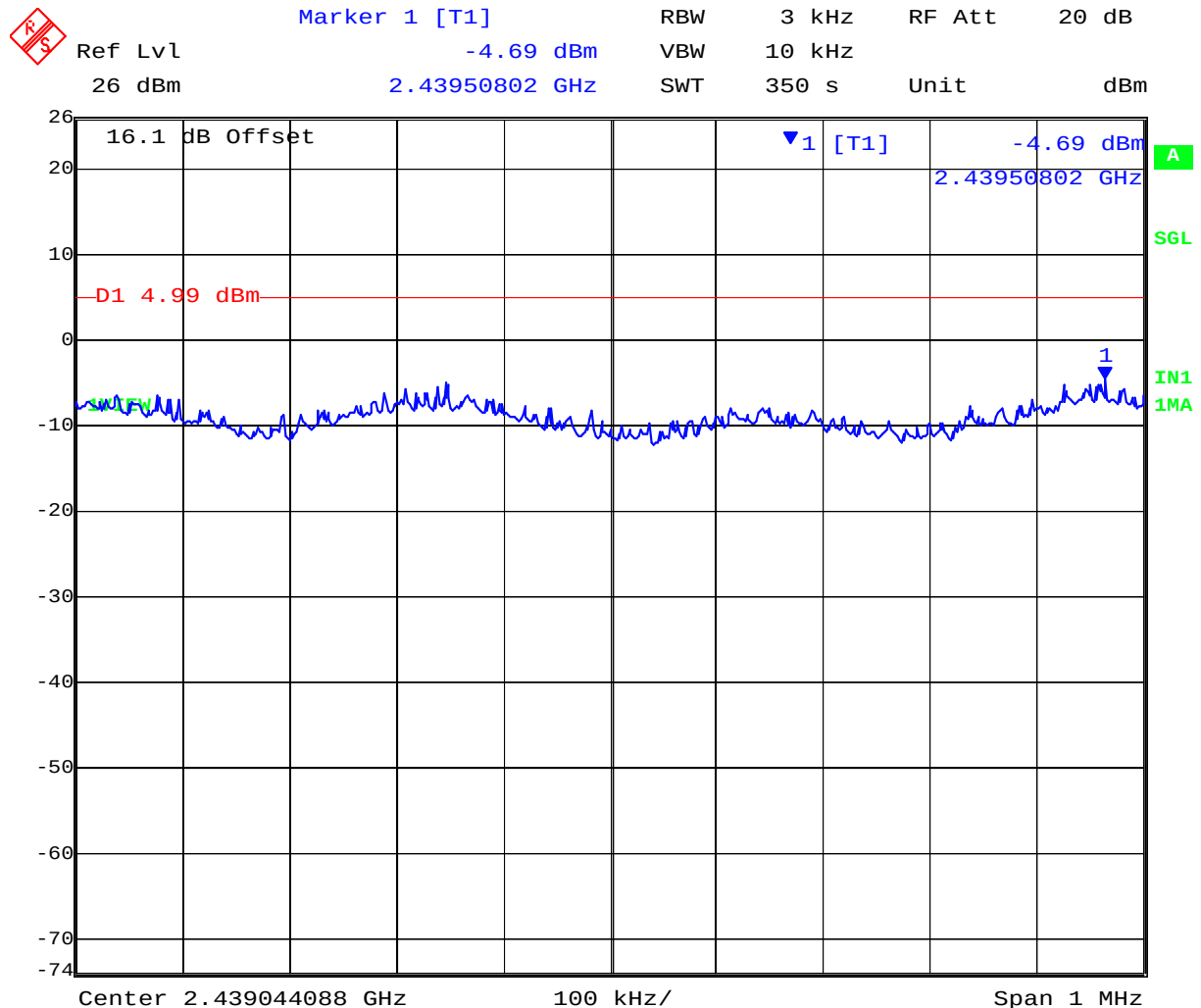
Date: 18.NOV.2011 12:48:59

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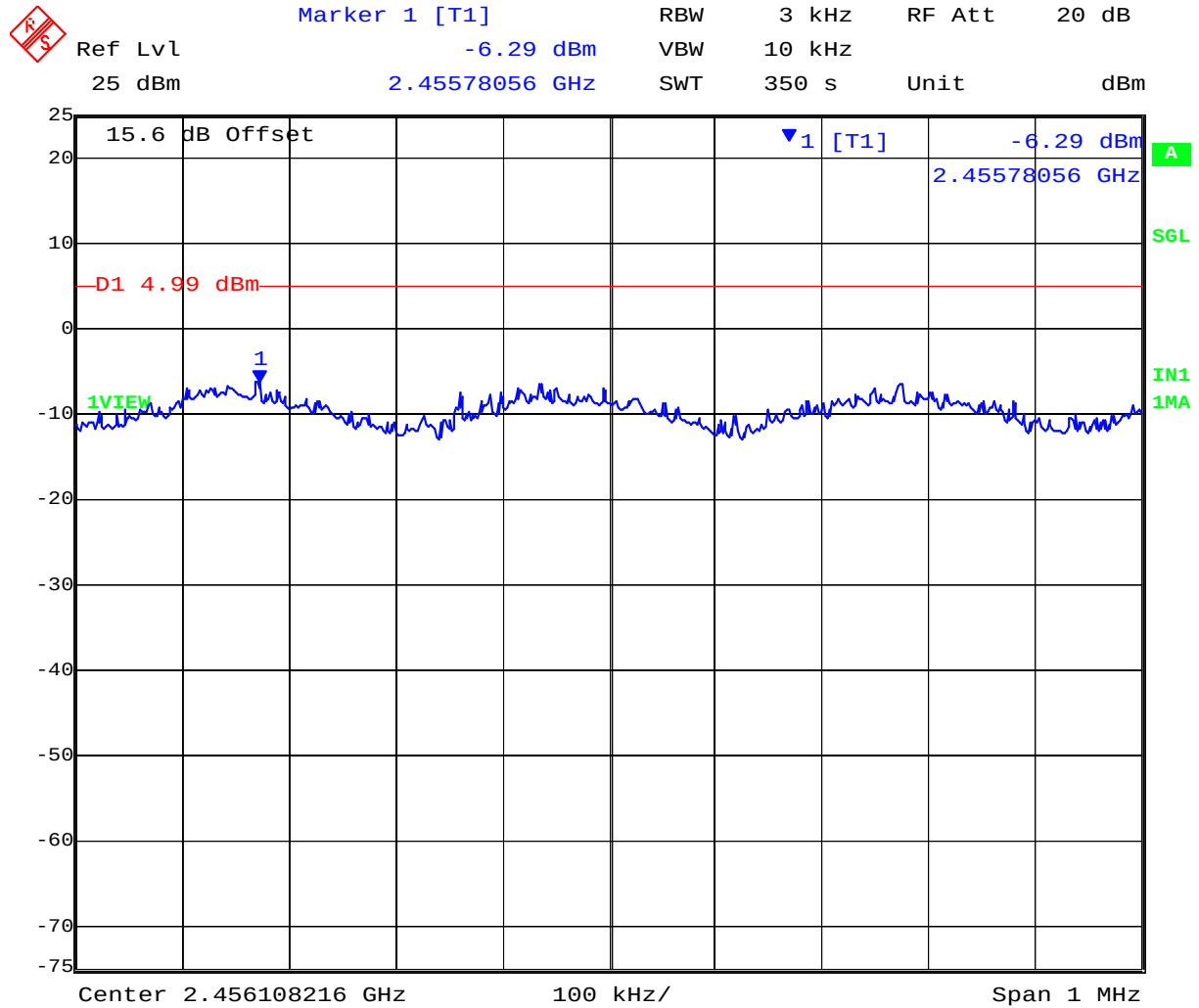
Date: 18.NOV.2011 12:55:32

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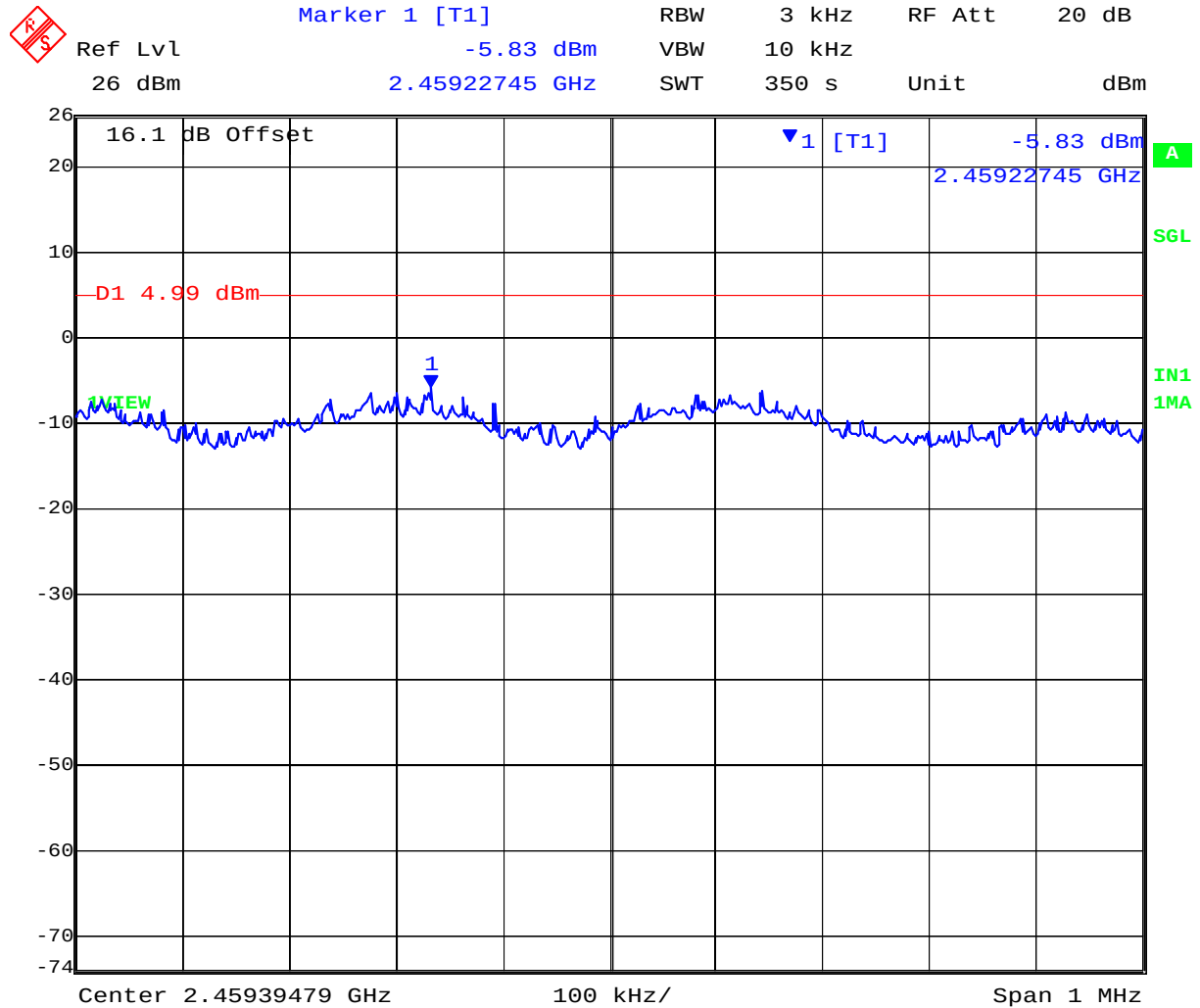
Date: 18.NOV.2011 14:13:59

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7.3.3 Measurement results for 802.11n HT-20

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi		
Applied Voltage:	55.00 Vdc	Antenna Ports (N):	2		
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density				Correction factor	Peak Power Spectral Density	Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	10Log(N)	dBm	dBm	dB
2412.000	-5.53	-6.26	--	--	3.01	-2.52	8.00	-10.52
2437.000	-4.05	-5.31	--	--	3.01	-1.04	8.00	-9.04
2462.000	-6.89	-6.12	--	--	3.01	-3.11	8.00	-11.11

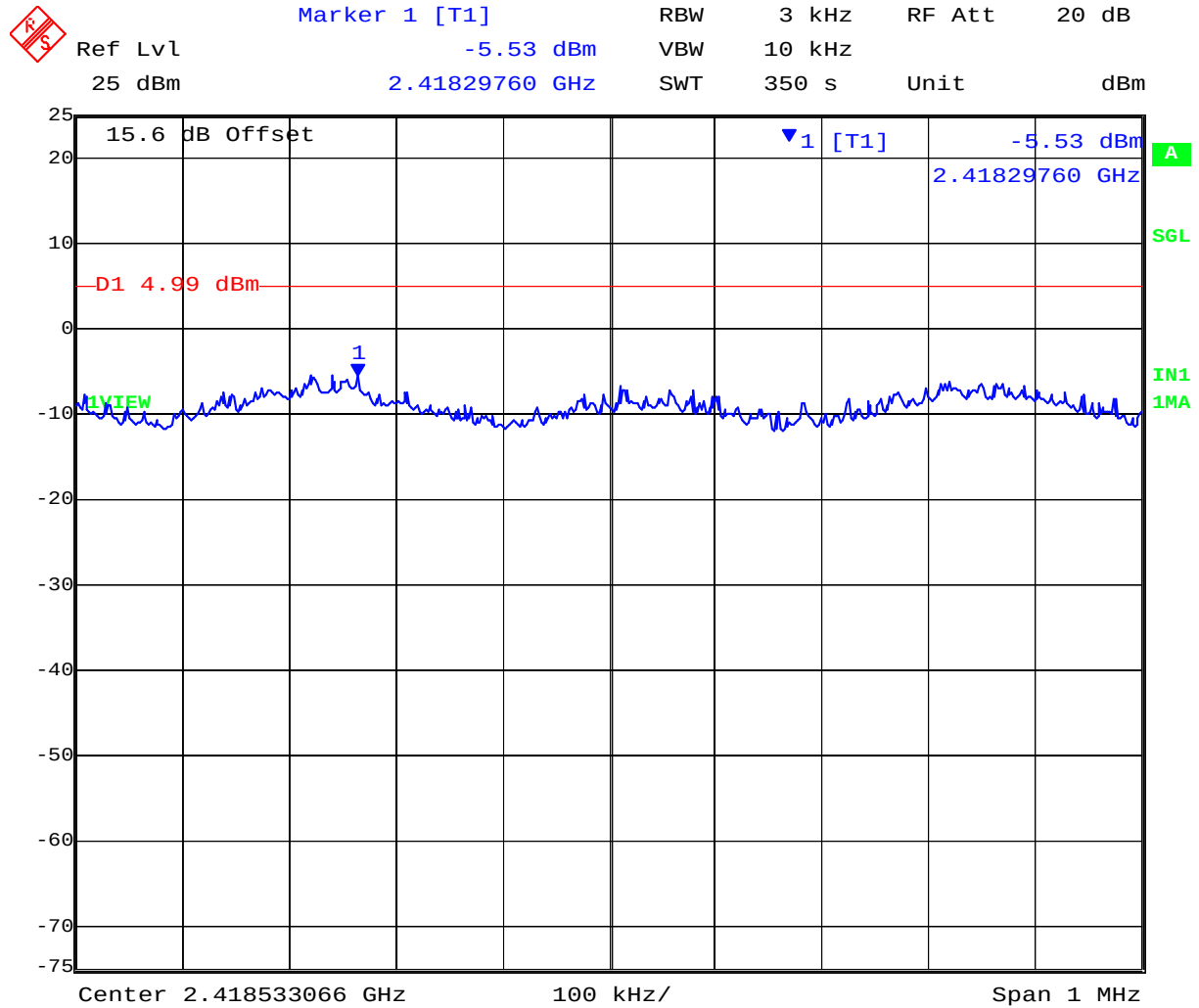
Measurement uncertainty:	± 1.33 dB
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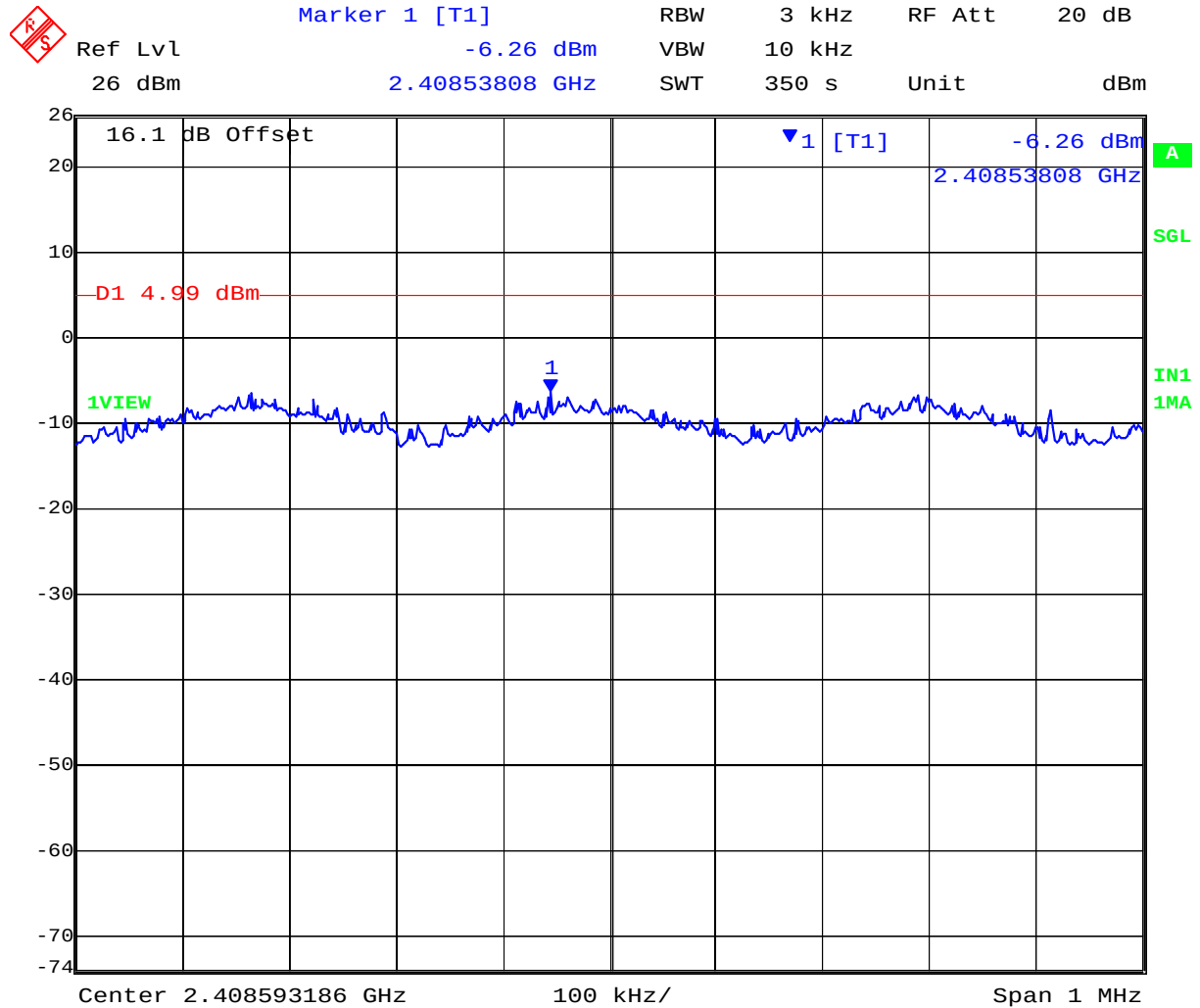
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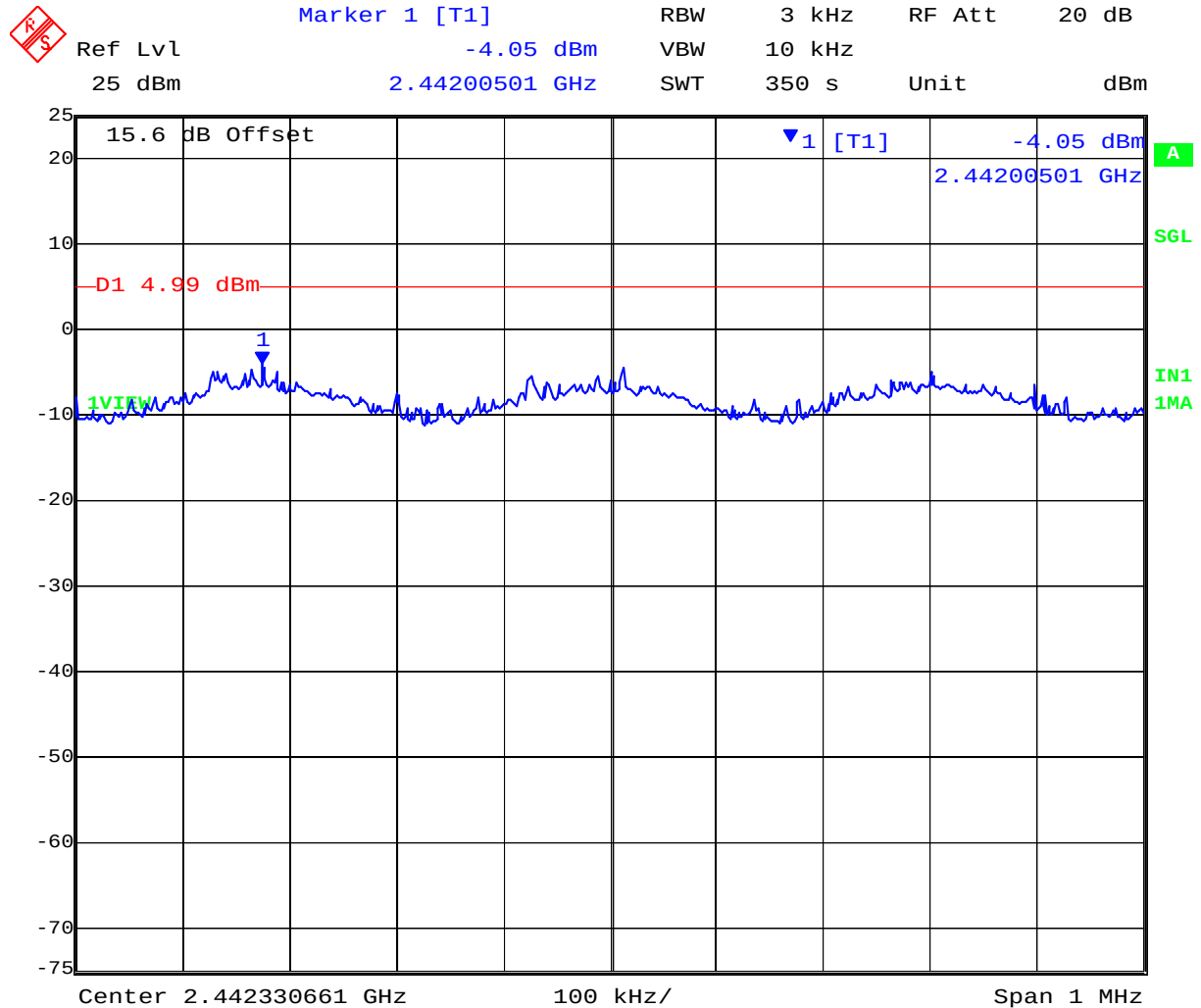
Date: 18.NOV.2011 15:07:12

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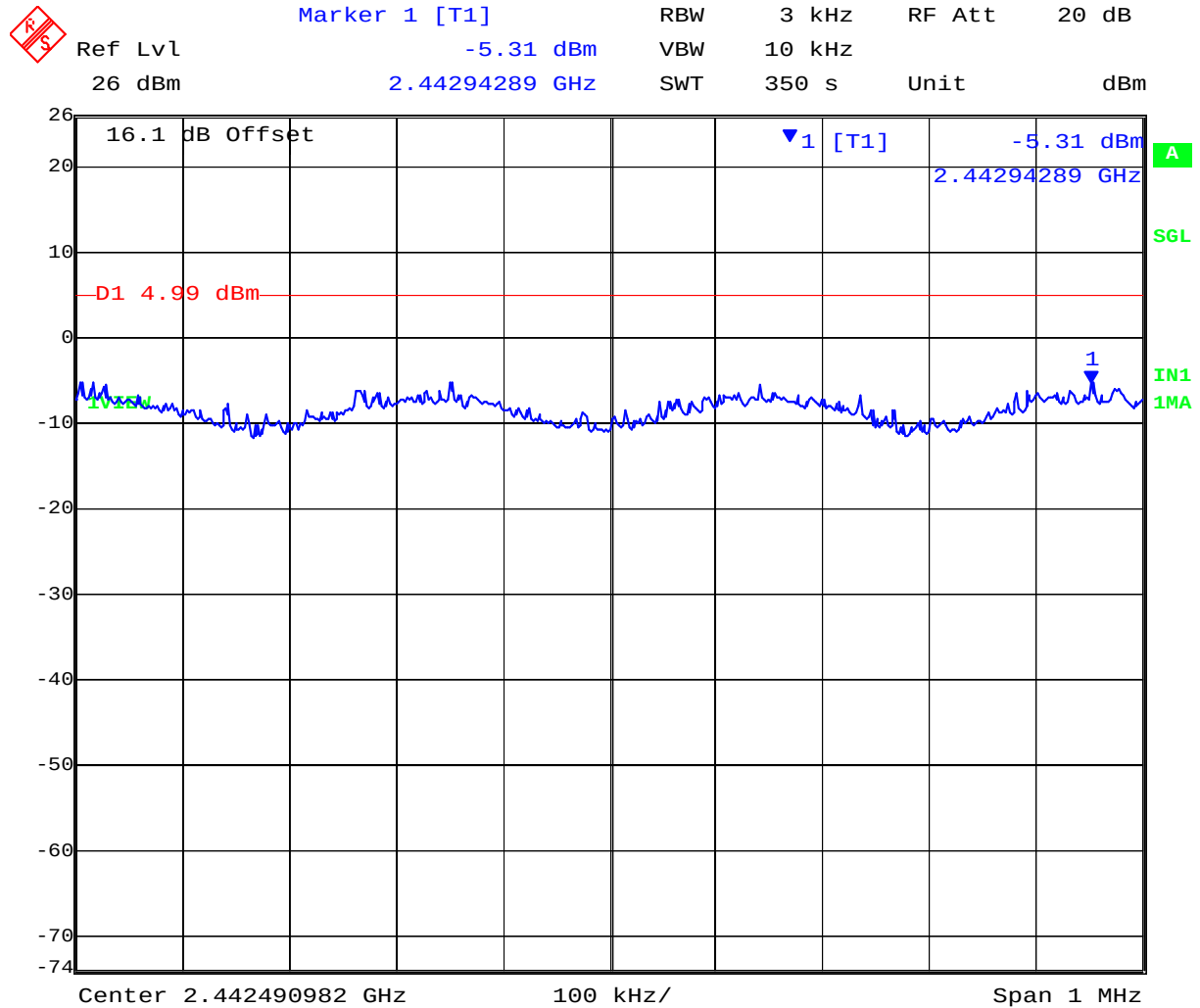
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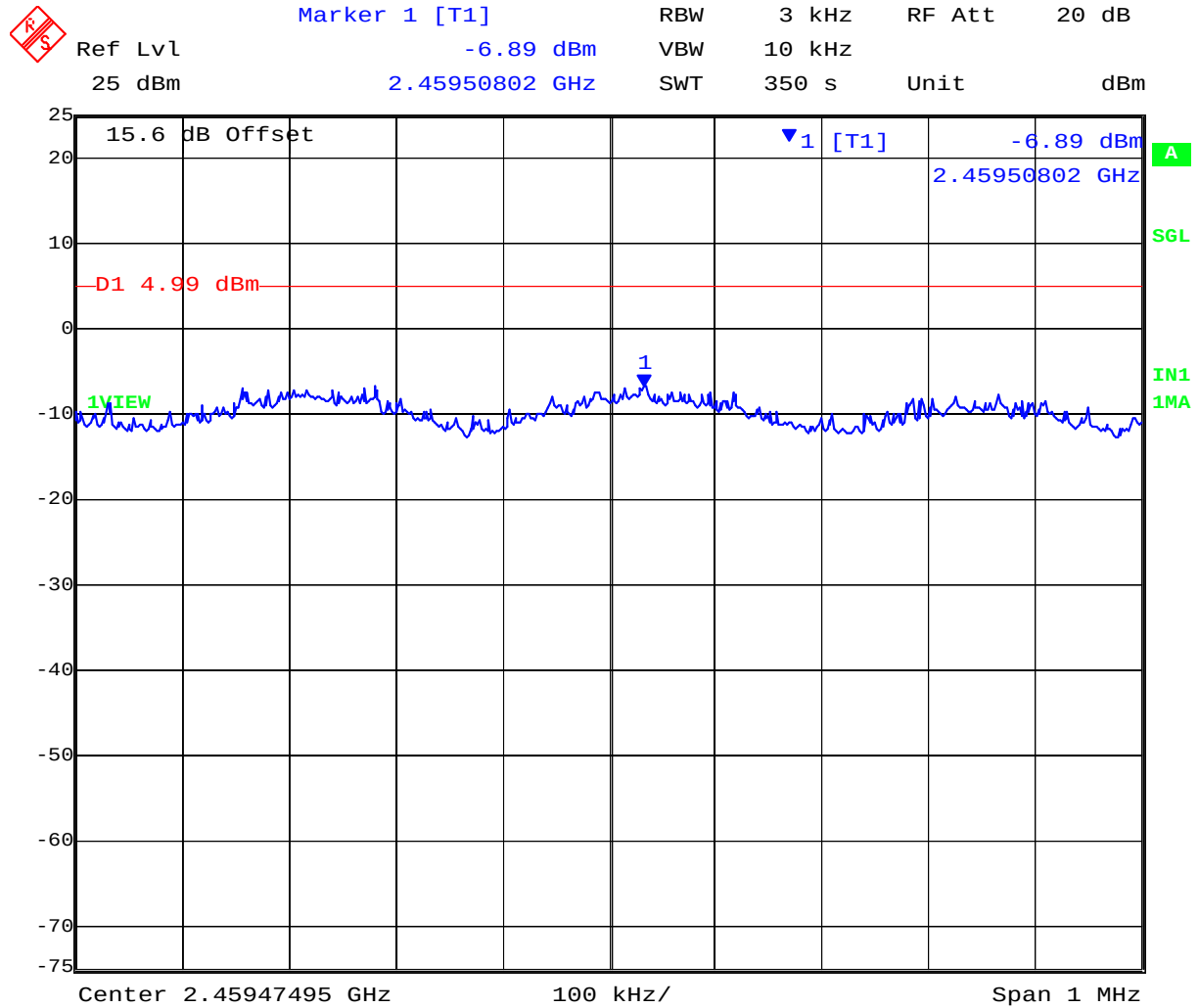
Date: 18.NOV.2011 15:26:54

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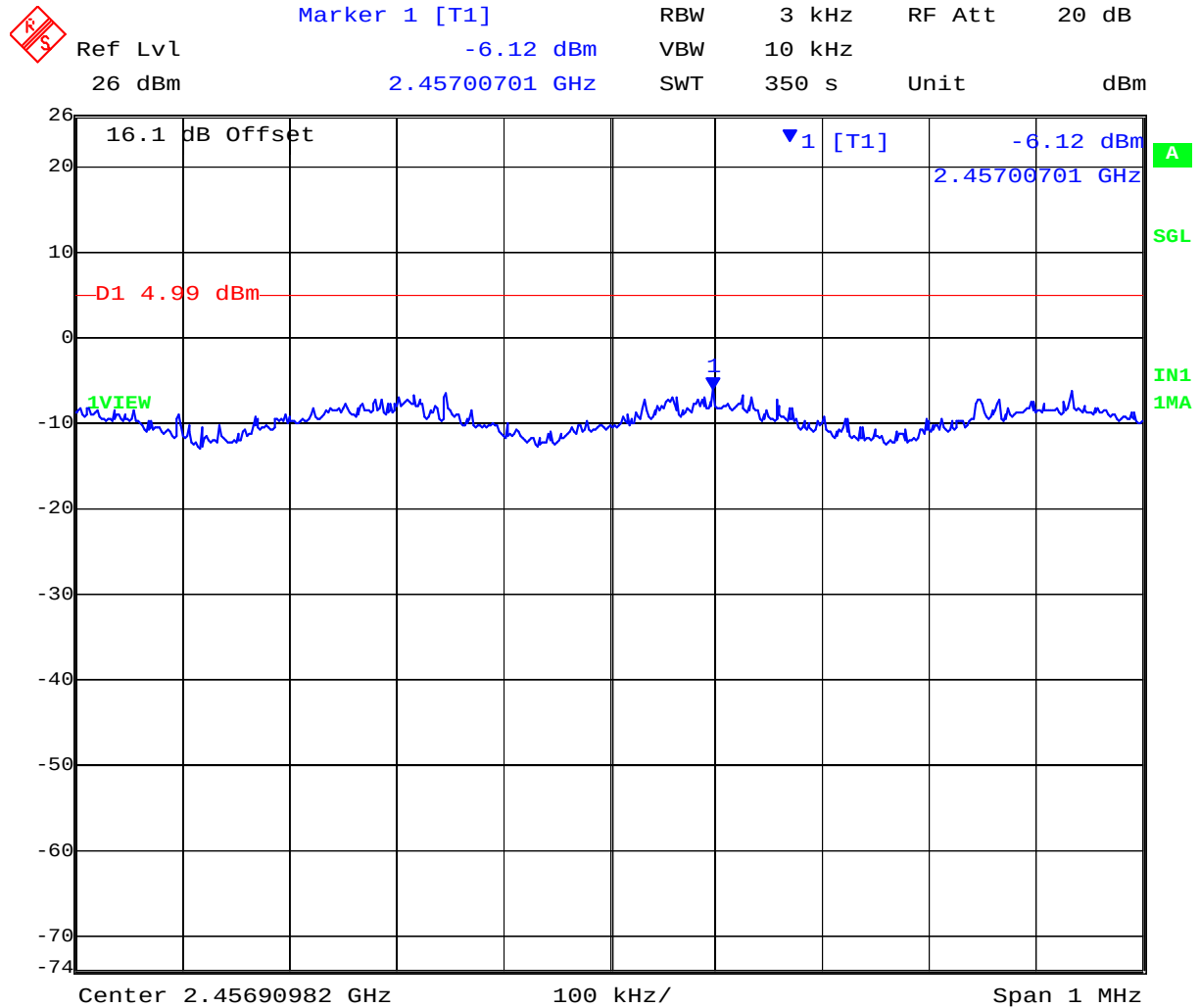
Date: 18.NOV.2011 15:42:49

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7.3.4 Measurement results for 802.11n HT-40

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain (Y):	N/A dB	Antenna Gain:	2.5 dBi		
Applied Voltage:	55.00 Vdc	Antenna Ports (N):	2		
Notes 1:					
Notes 2:					

Test Frequency	Measured Power Density				Correction factor	Peak Power Spectral Density	Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	10Log(N)	dBm	dBm	dB
2422.000	-7.92	-7.32	--	--	3.01	-4.31	8.00	-12.31
2437.000	-6.70	-6.93	--	--	3.01	-3.69	8.00	-11.69
2452.000	-7.14	-7.75	--	--	3.01	-4.13	8.00	-12.13

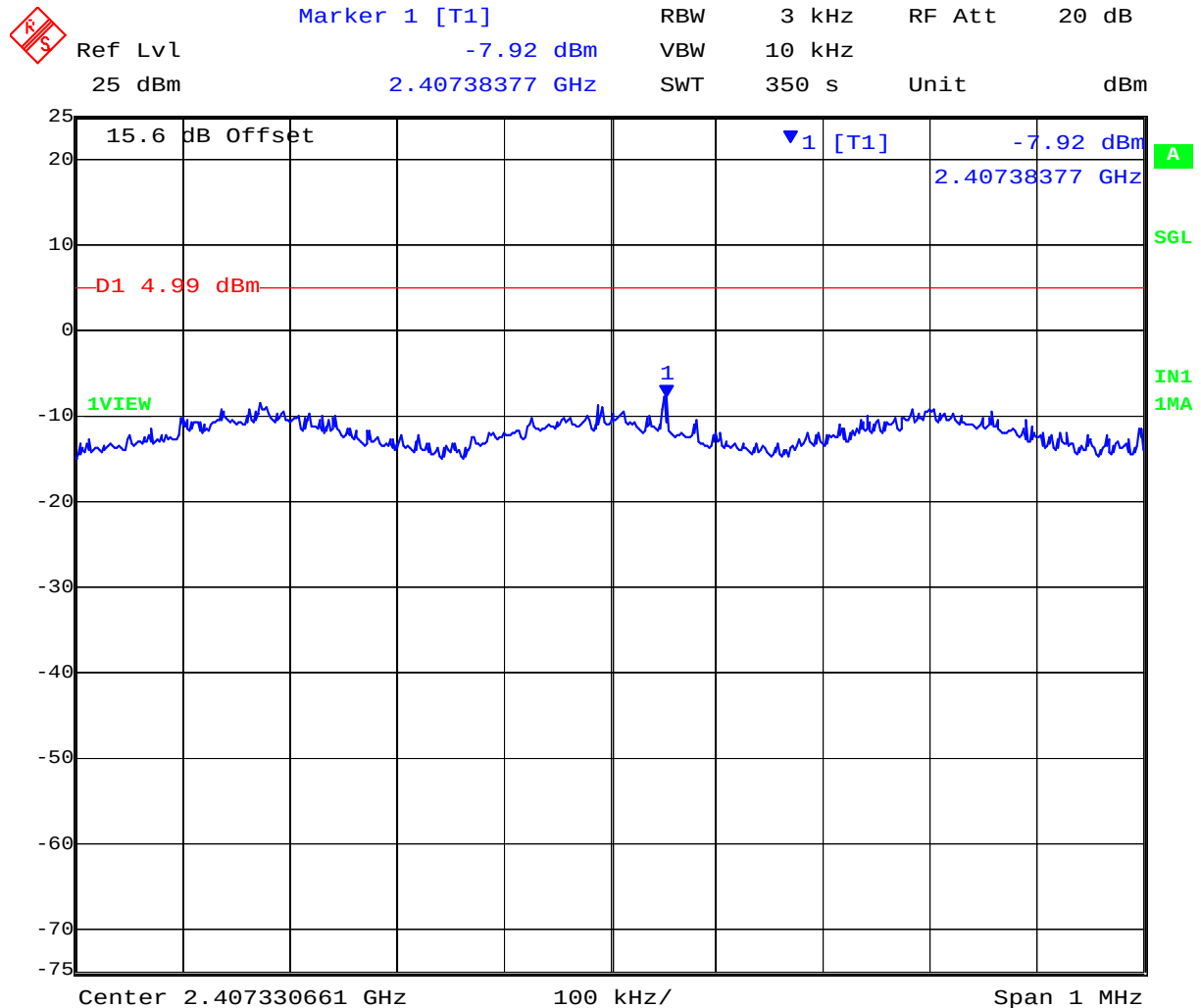
Measurement uncertainty:	± 1.33 dB
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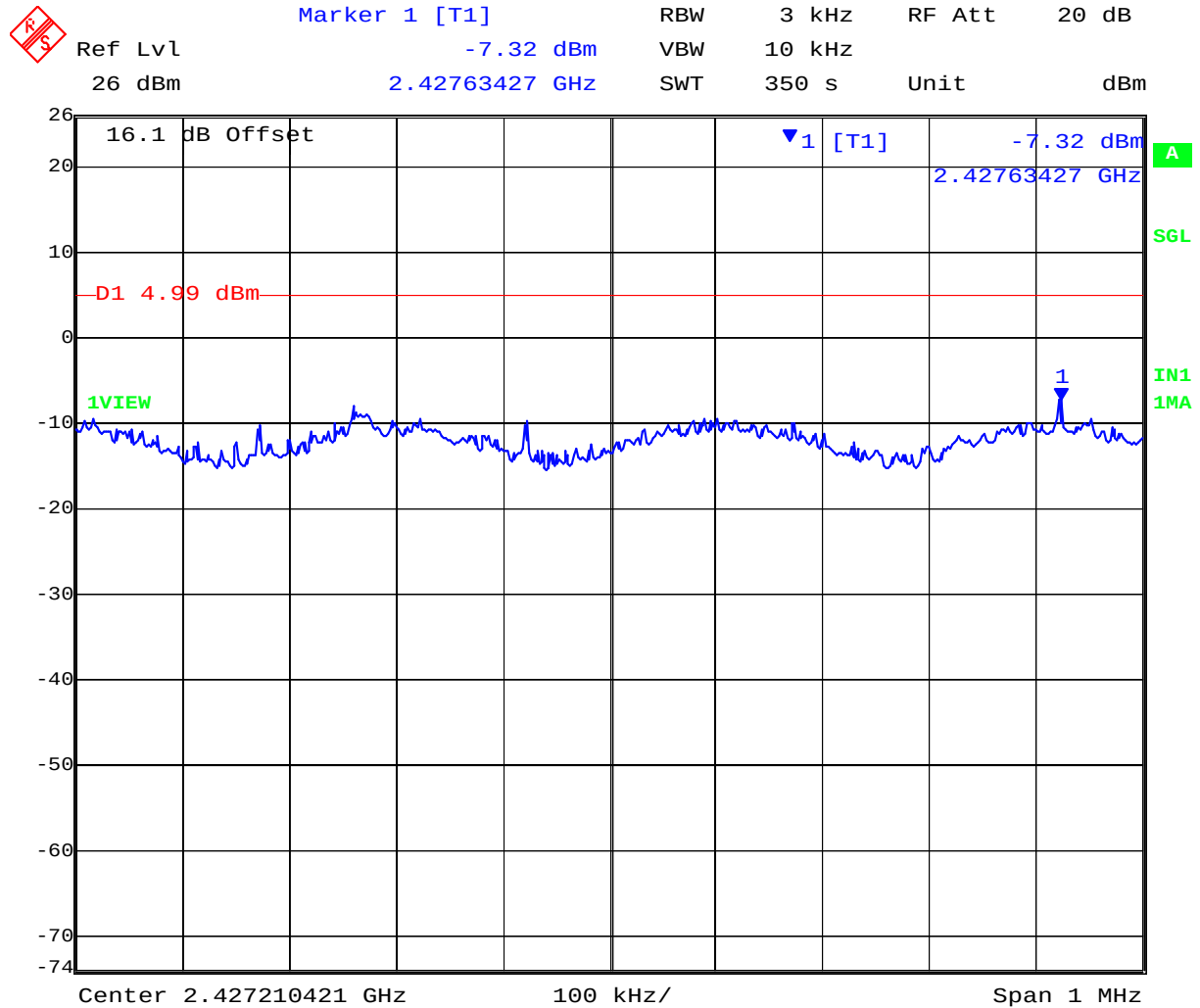
Date: 18.NOV.2011 16:08:59

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Date: 18.NOV.2011 16:15:32

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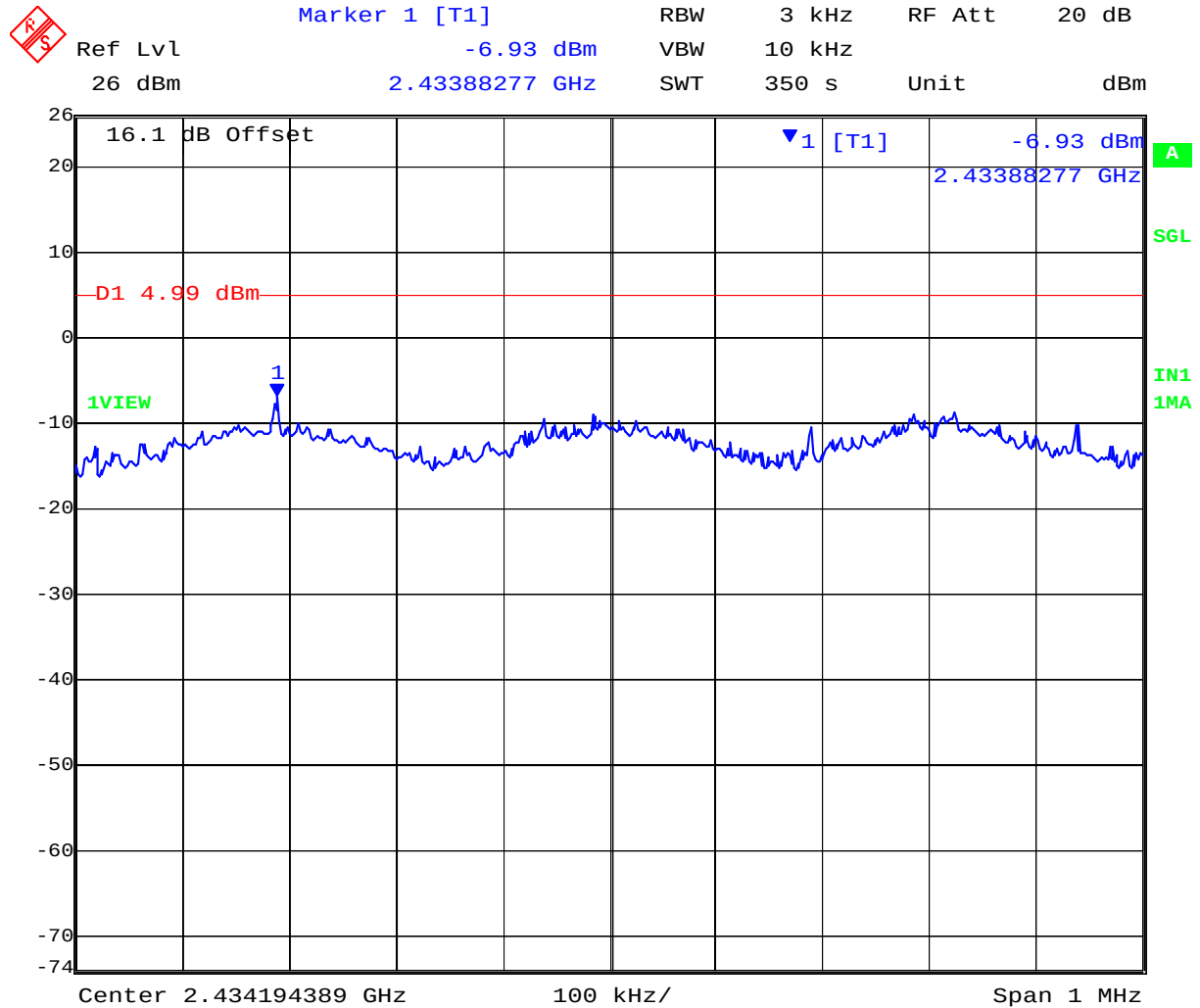
Date: 18.NOV.2011 16:32:14

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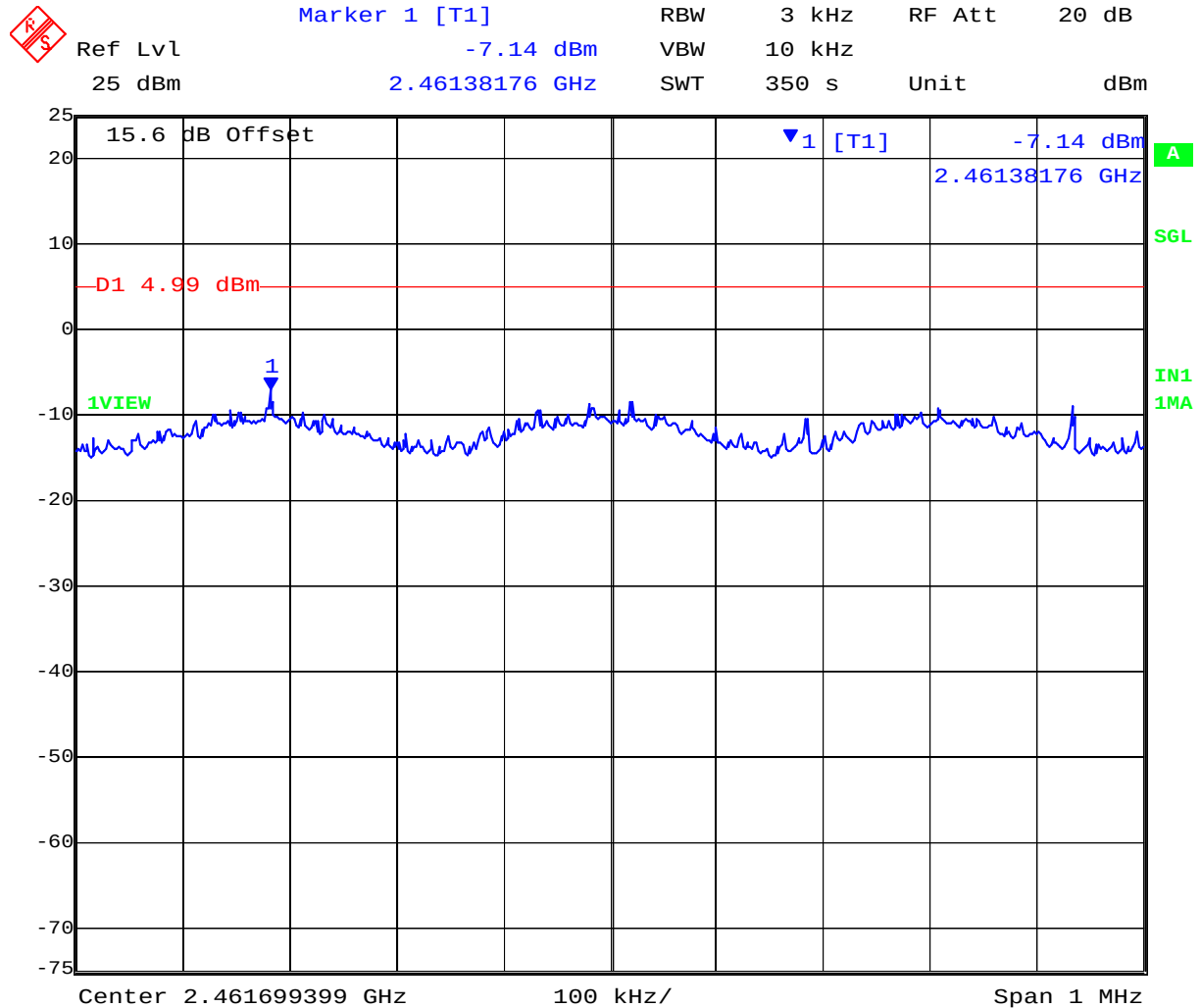
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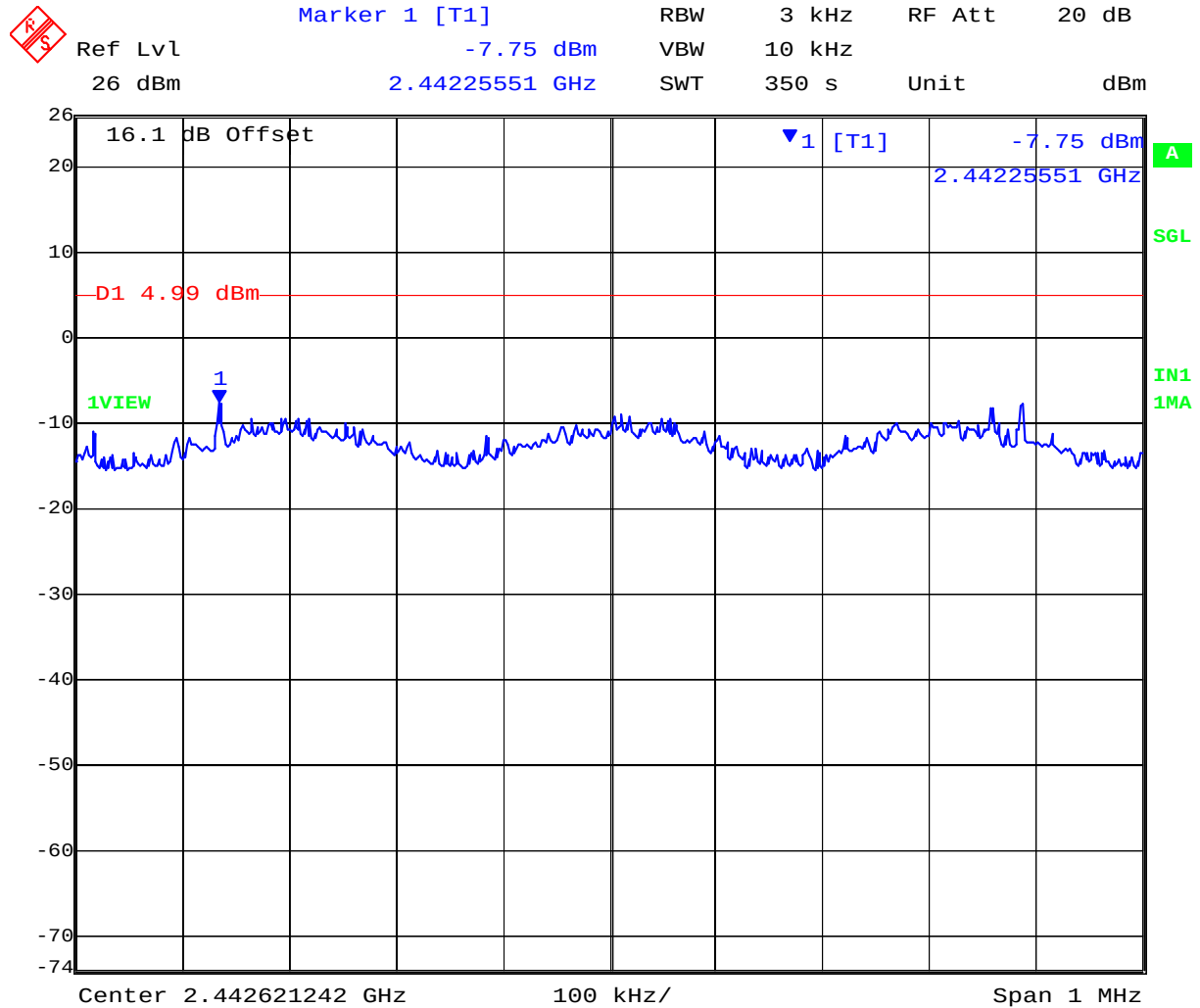
Date: 18.NOV.2011 17:01:53

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7.3.5 Measurement results for 802.11a

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11a	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming	N/A	Antenna Gain:	6		dBi
Applied Voltage:	12.0				Vdc
Notes 1:					
Notes 2:					

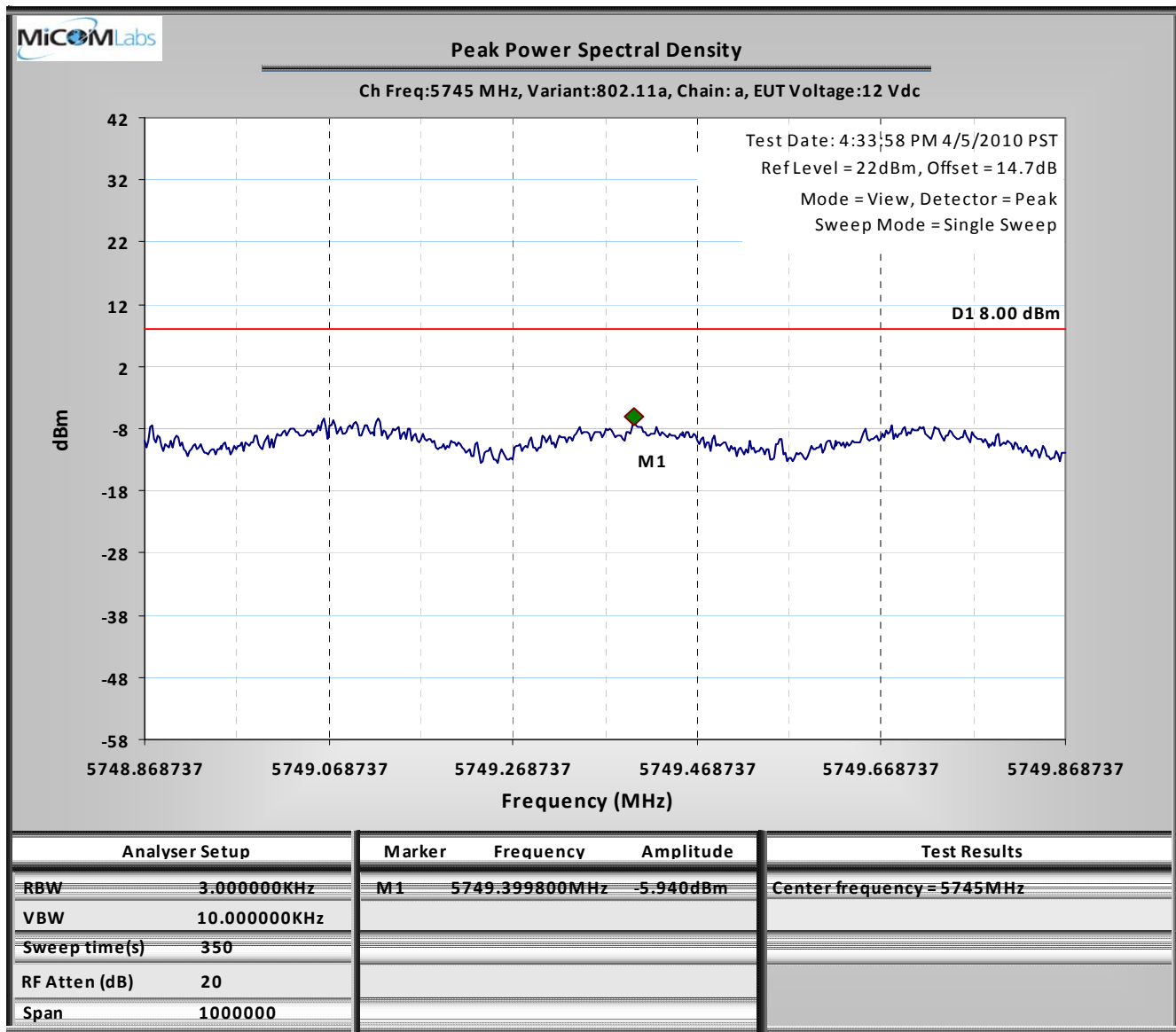
Test Frequency	Measured Power Density				Total Peak Power Spectral Density (dBm)		Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	Combined	Calculated	dBm	dB
5745	-5.94	-8.02	--	--	-2.66	-3.84	8.00	-10.66
5785	-8.40	-8.31	--	--	-2.84	-5.35	8.00	-10.84
5825	-9.01	-7.66	--	--	-3.29	-5.27	8.00	-11.29

Measurement uncertainty:	± 1.33 dB
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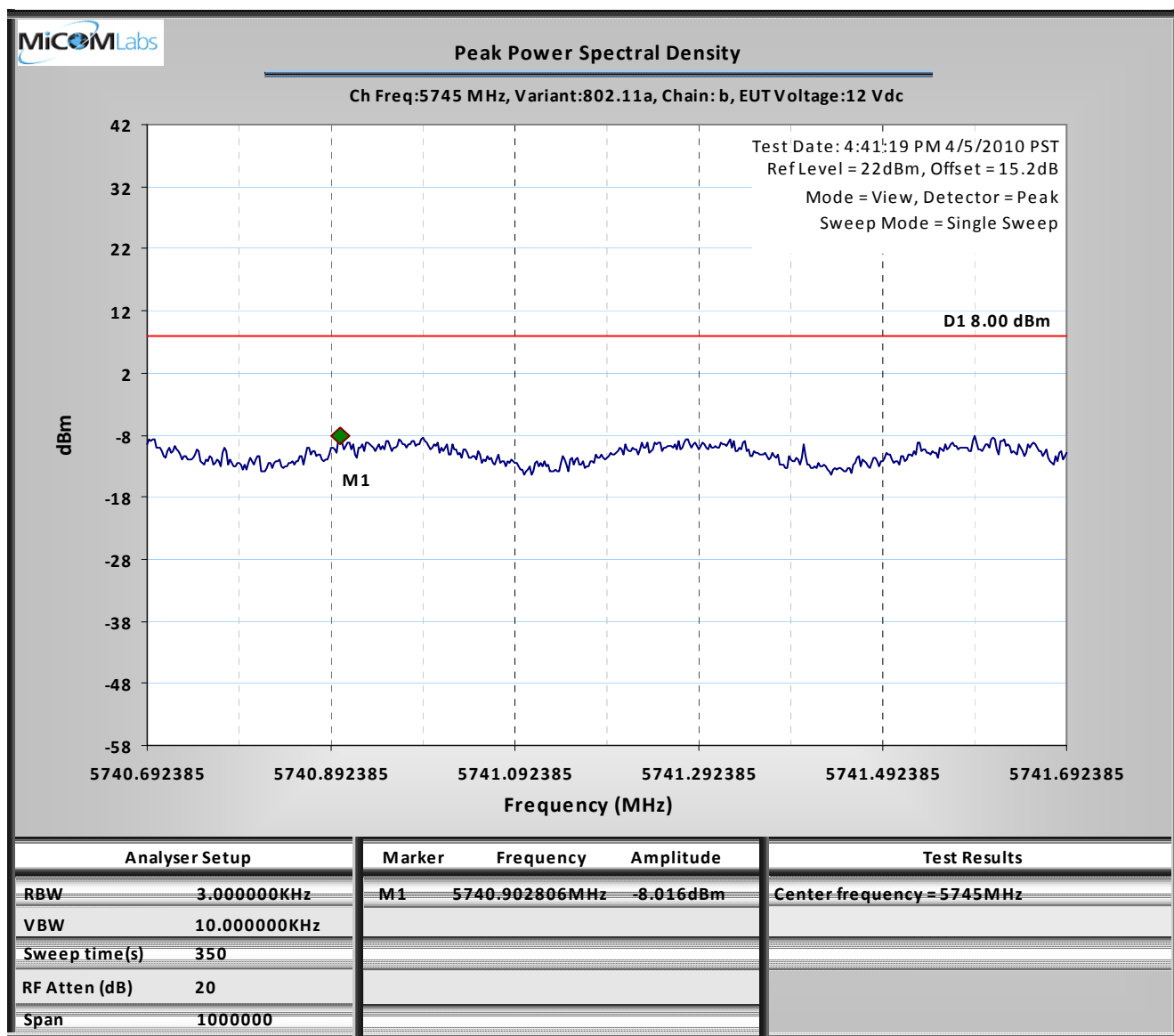
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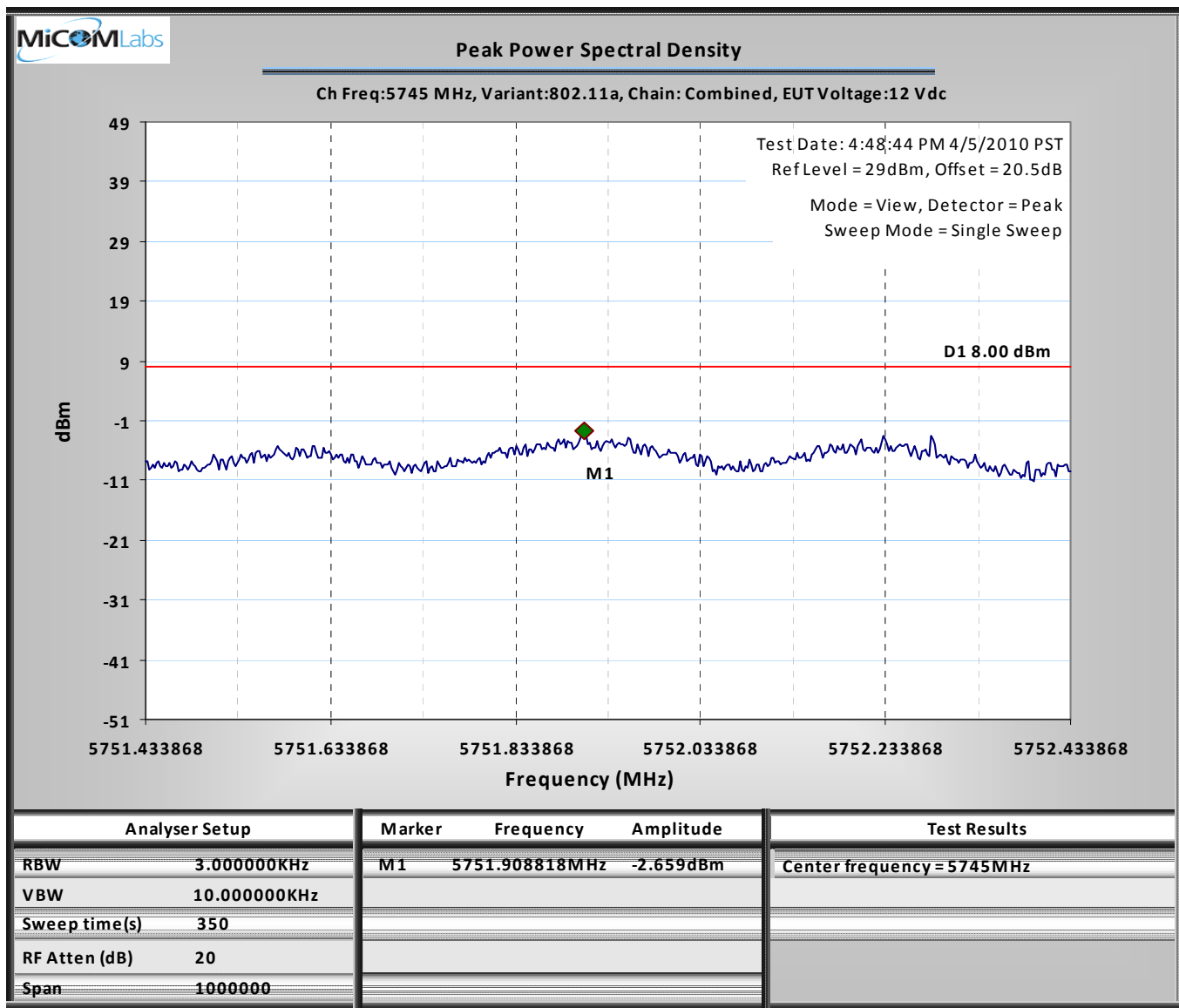
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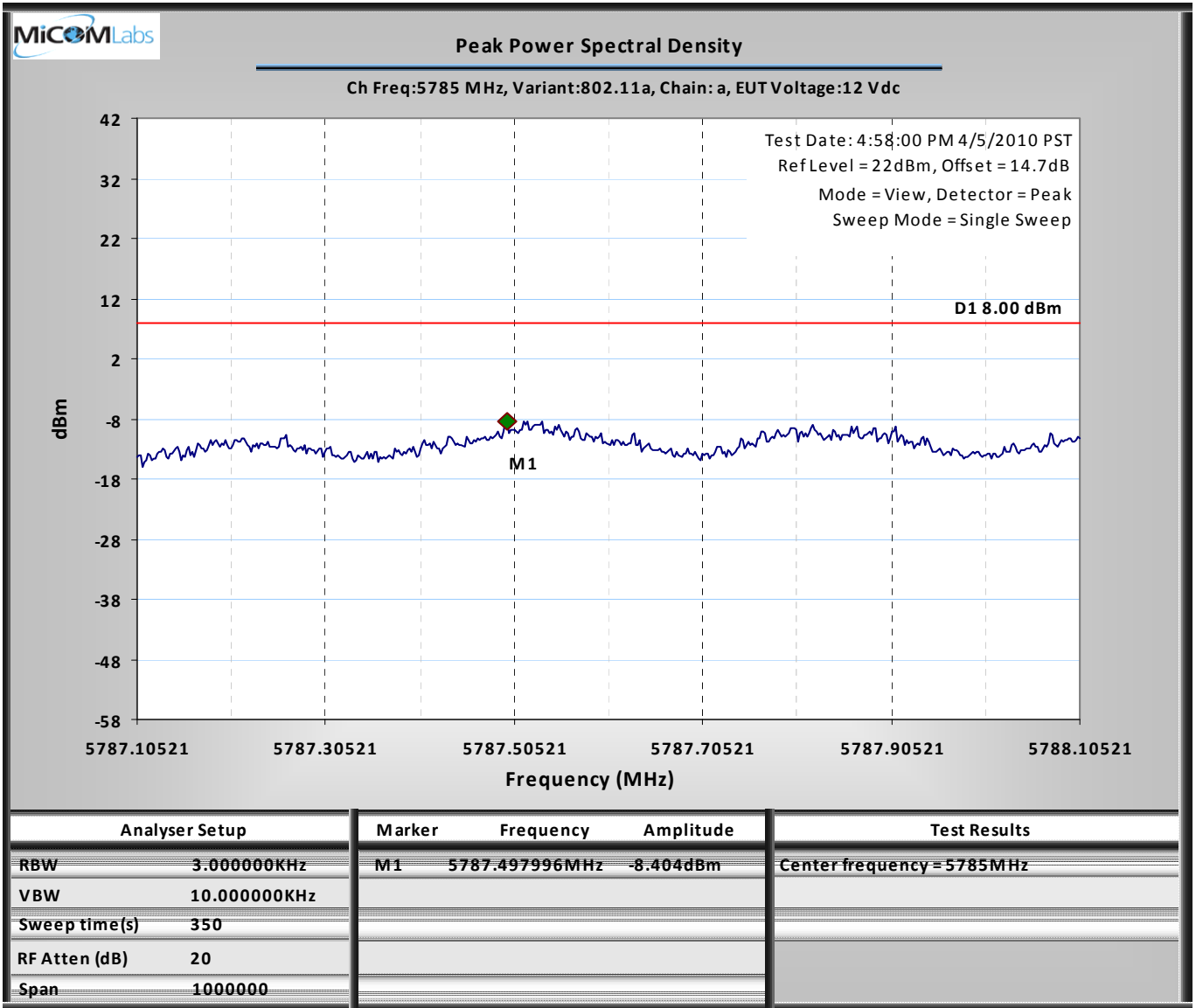
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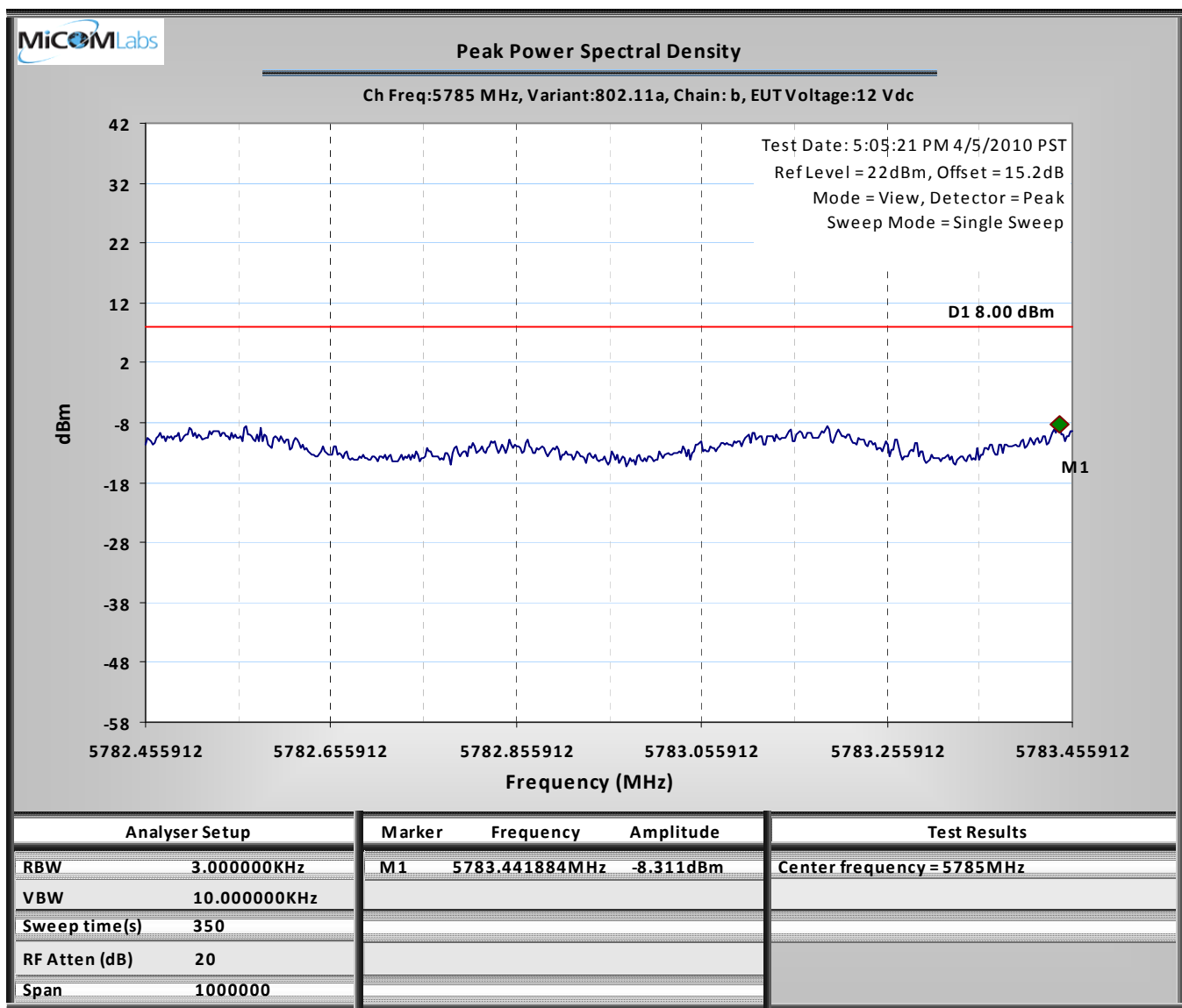
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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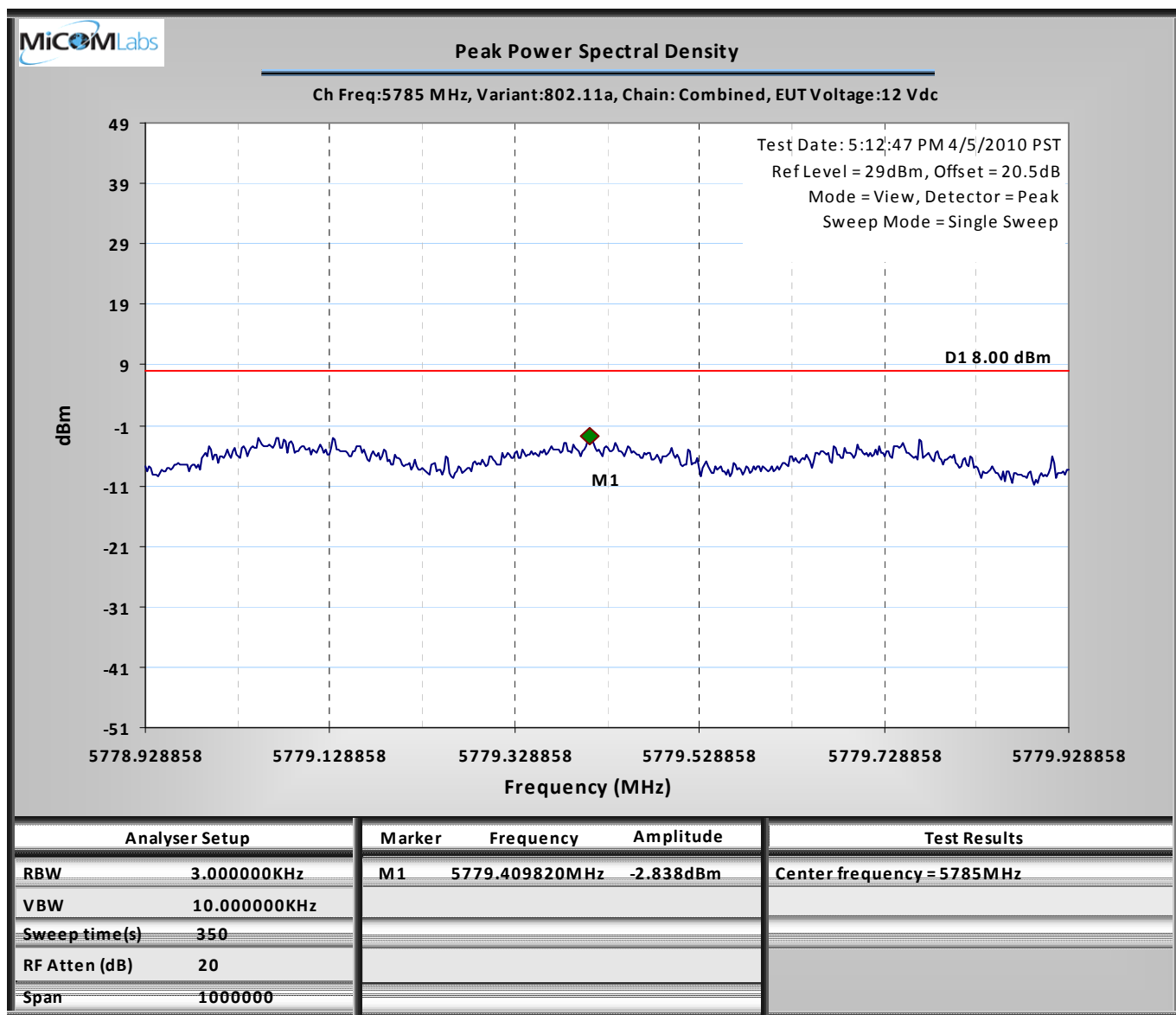
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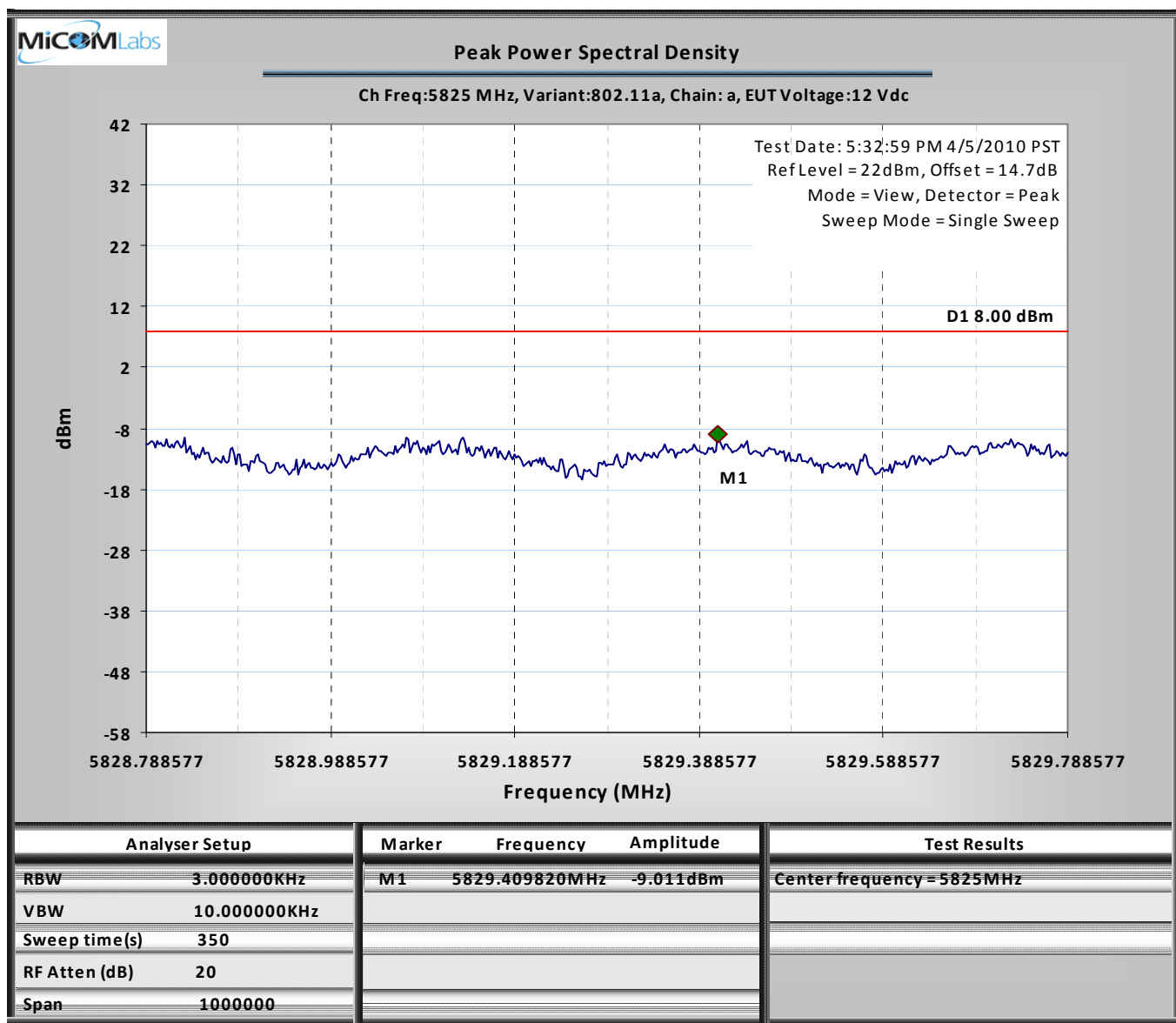
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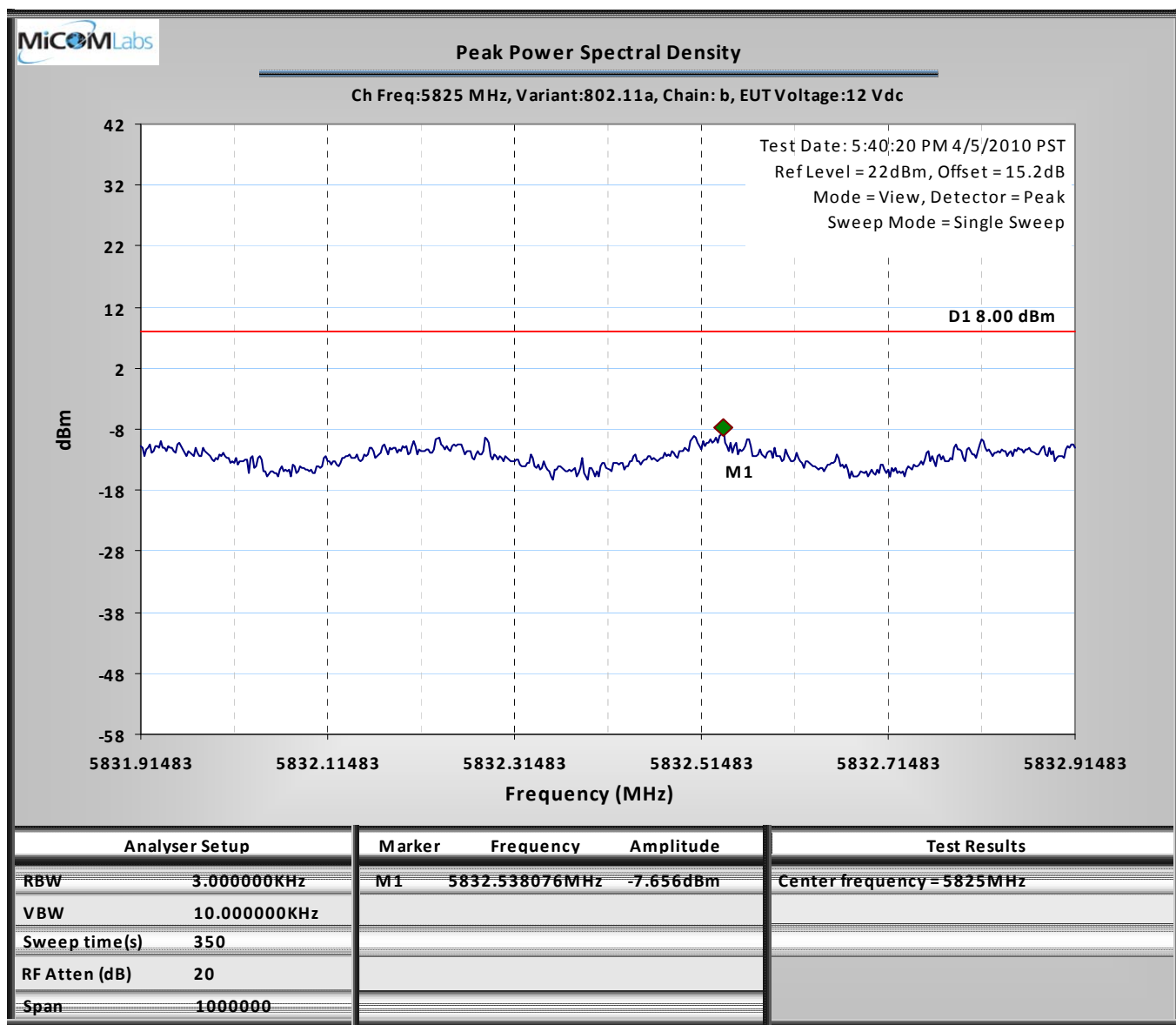
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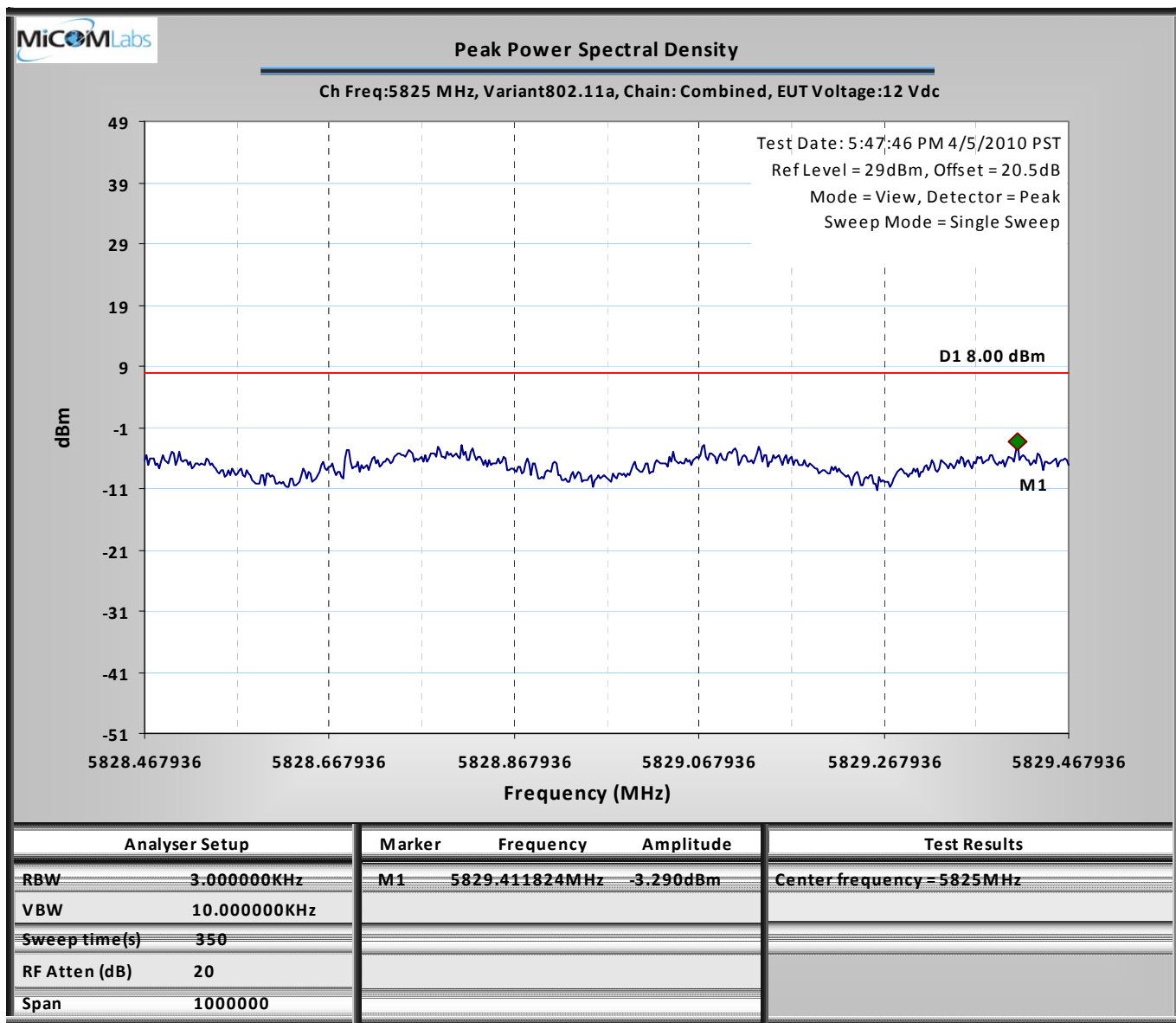
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7.3.6 Measurement results for 802.11n HT-20

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming	N/A	Antenna Gain:	6		dBi
Applied Voltage:	12.0				Vdc
Notes 1:					
Notes 2:					

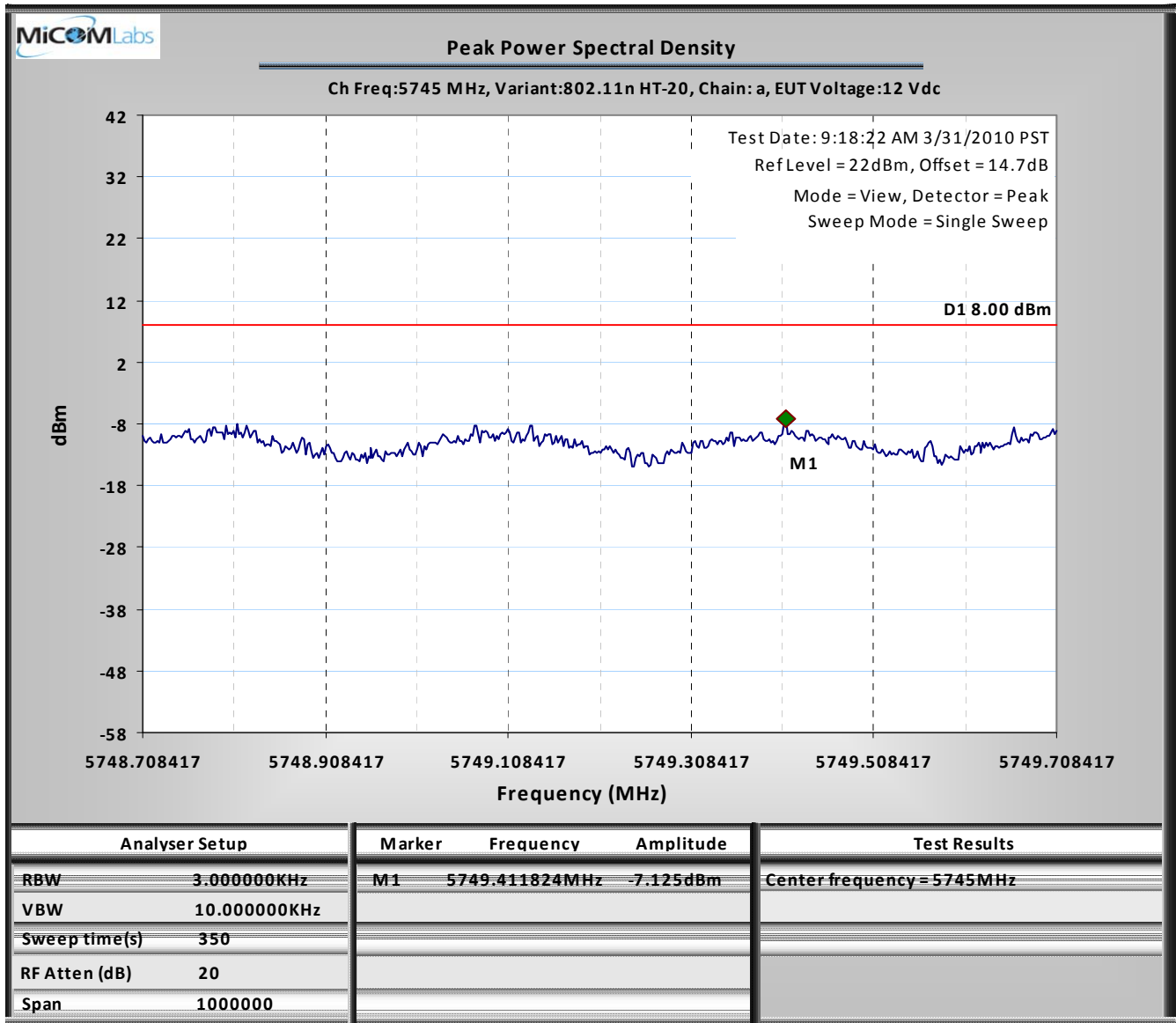
Test Frequency	Measured Power Density				Total Peak Power Spectral Density (dBm)		Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	Combined	Calculated	dBm	dB
5745	-7.13	-6.89			-1.83	-3.99509718	8.00	-9.83
5785	-8.54	-7.52			-2.06	-4.99049858	8.00	-10.06
5825	-9.32	-9.09			-3.13	-6.19323012	8.00	-11.13

Measurement uncertainty:	± 1.33 dB
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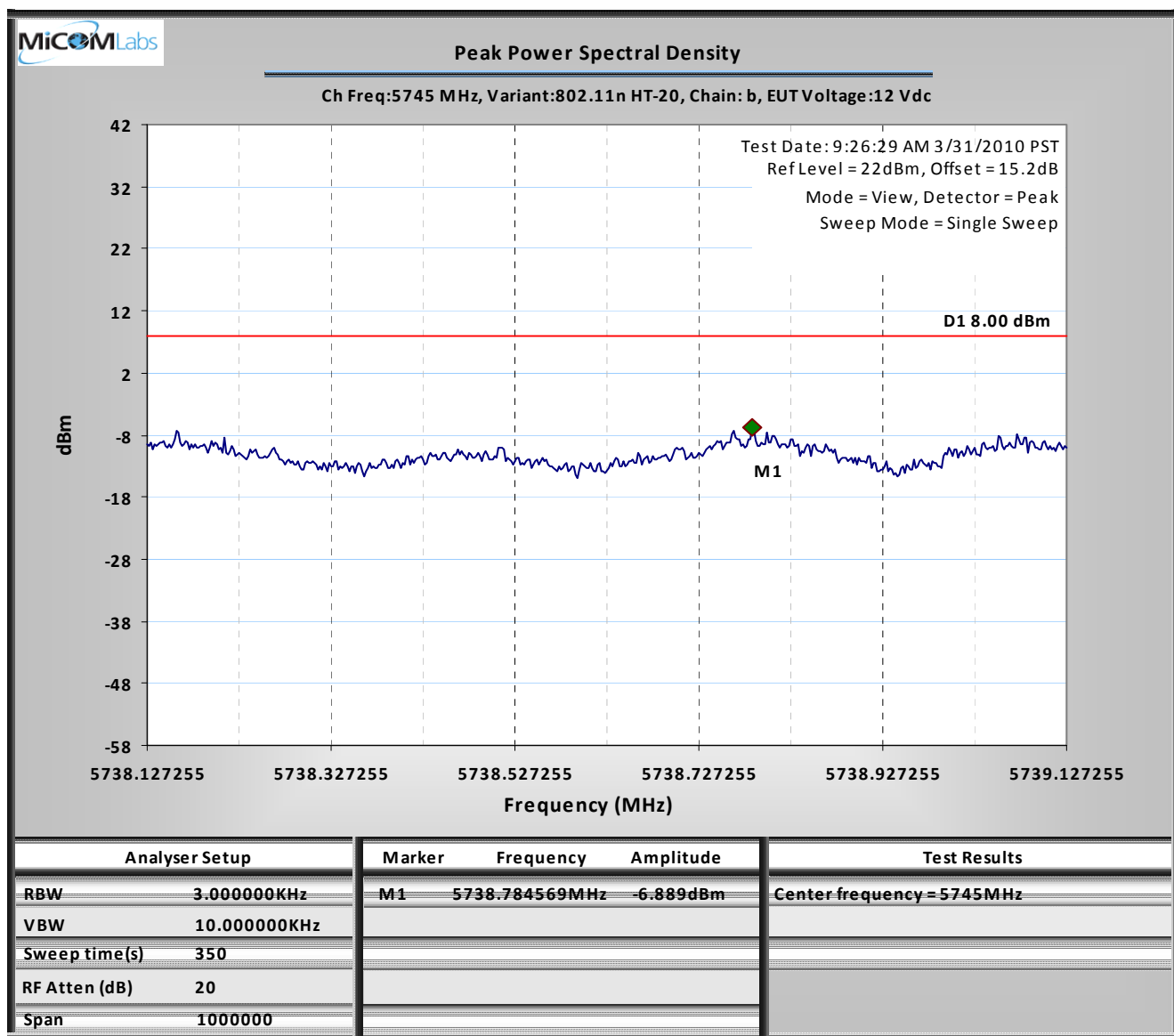
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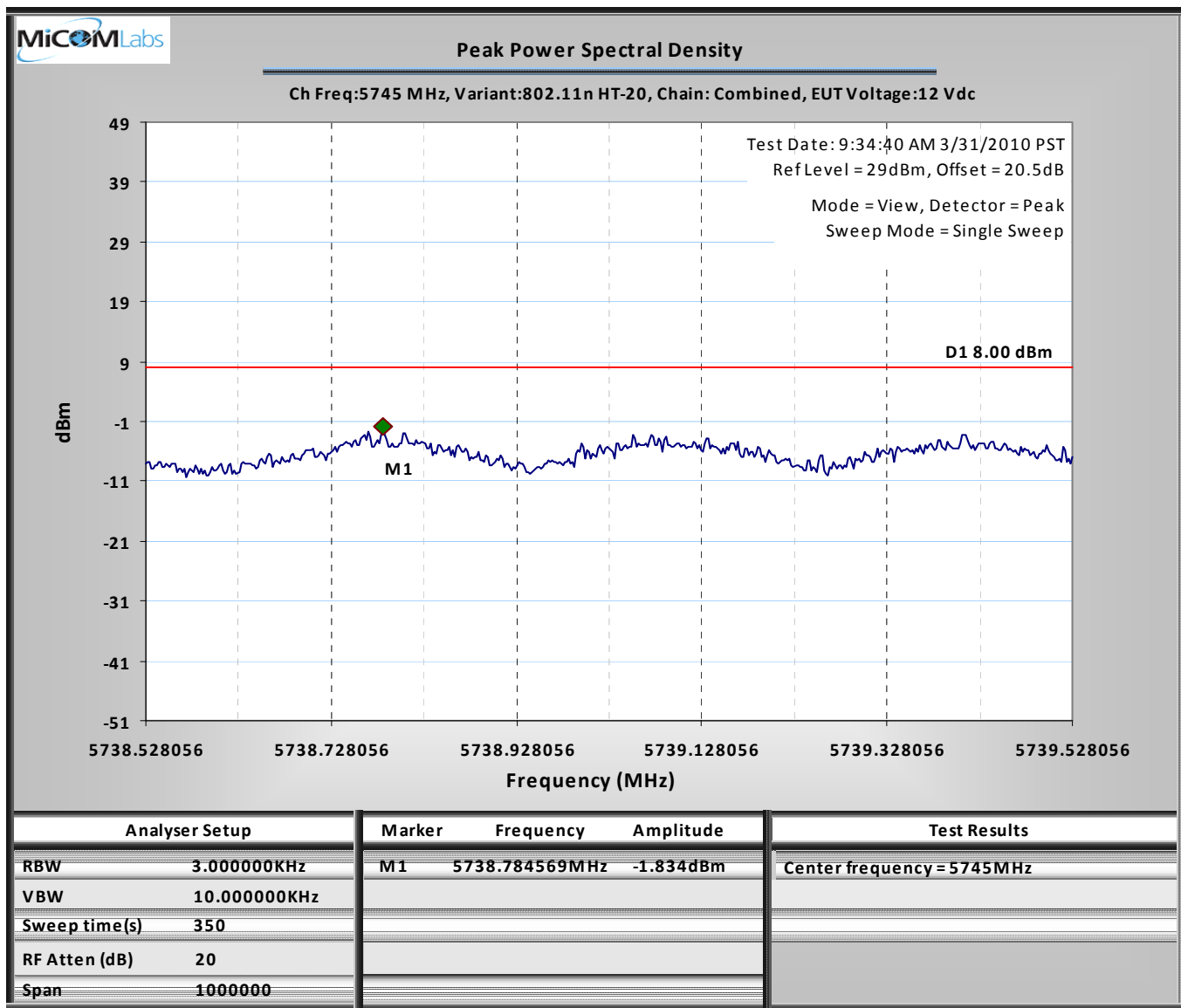
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
To: FCC 47 CFR Part 15.247 & IC RSS-210
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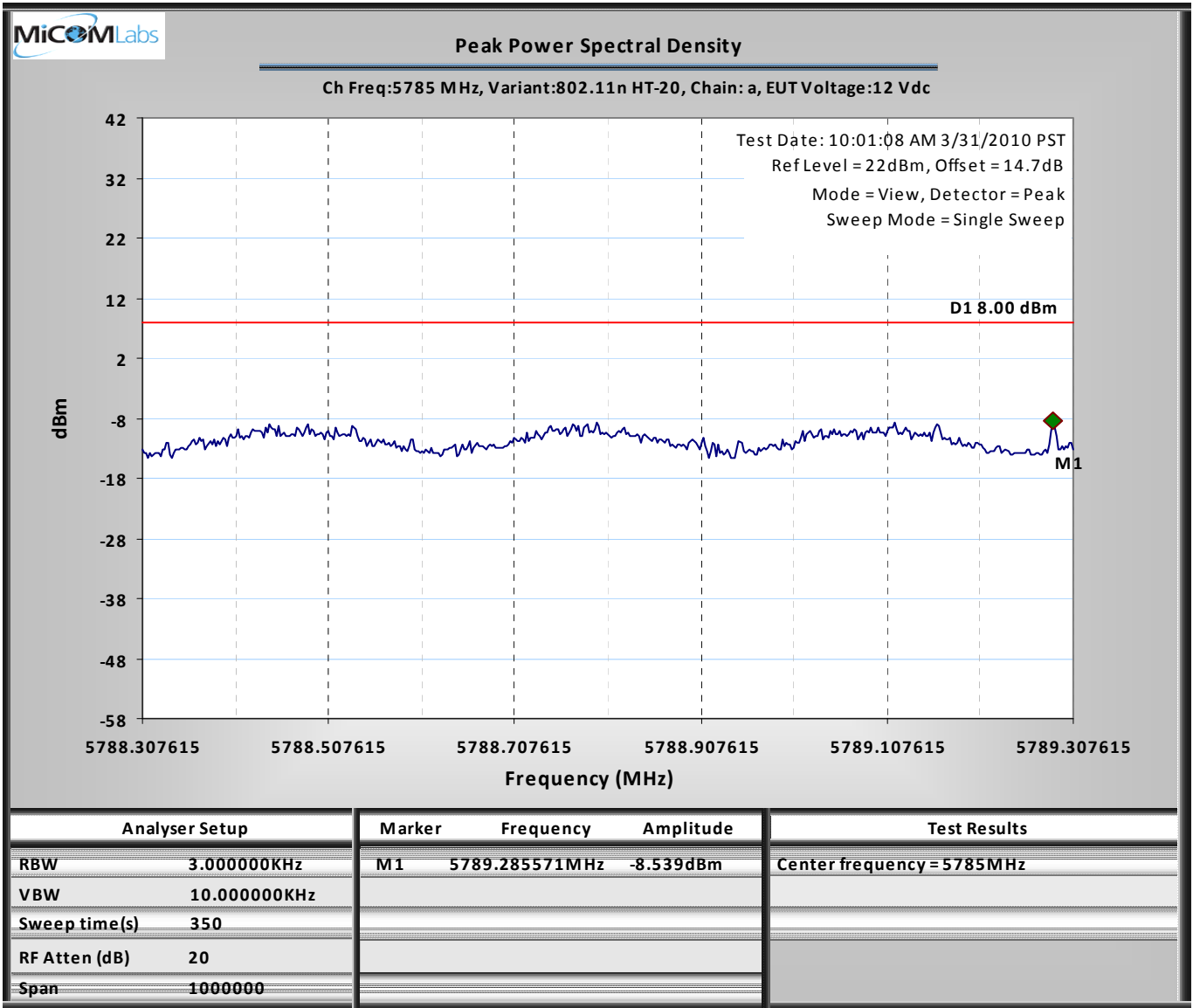
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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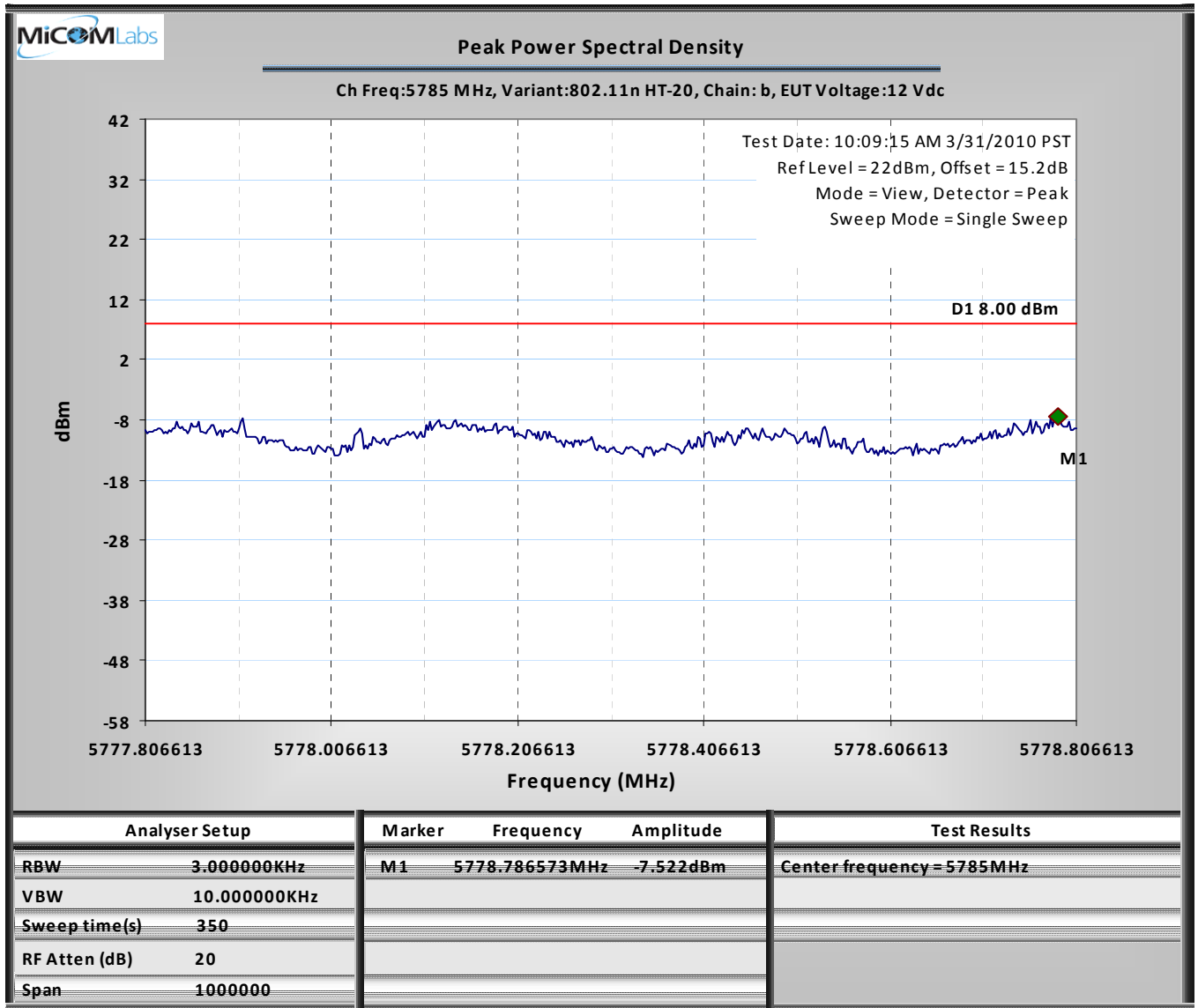
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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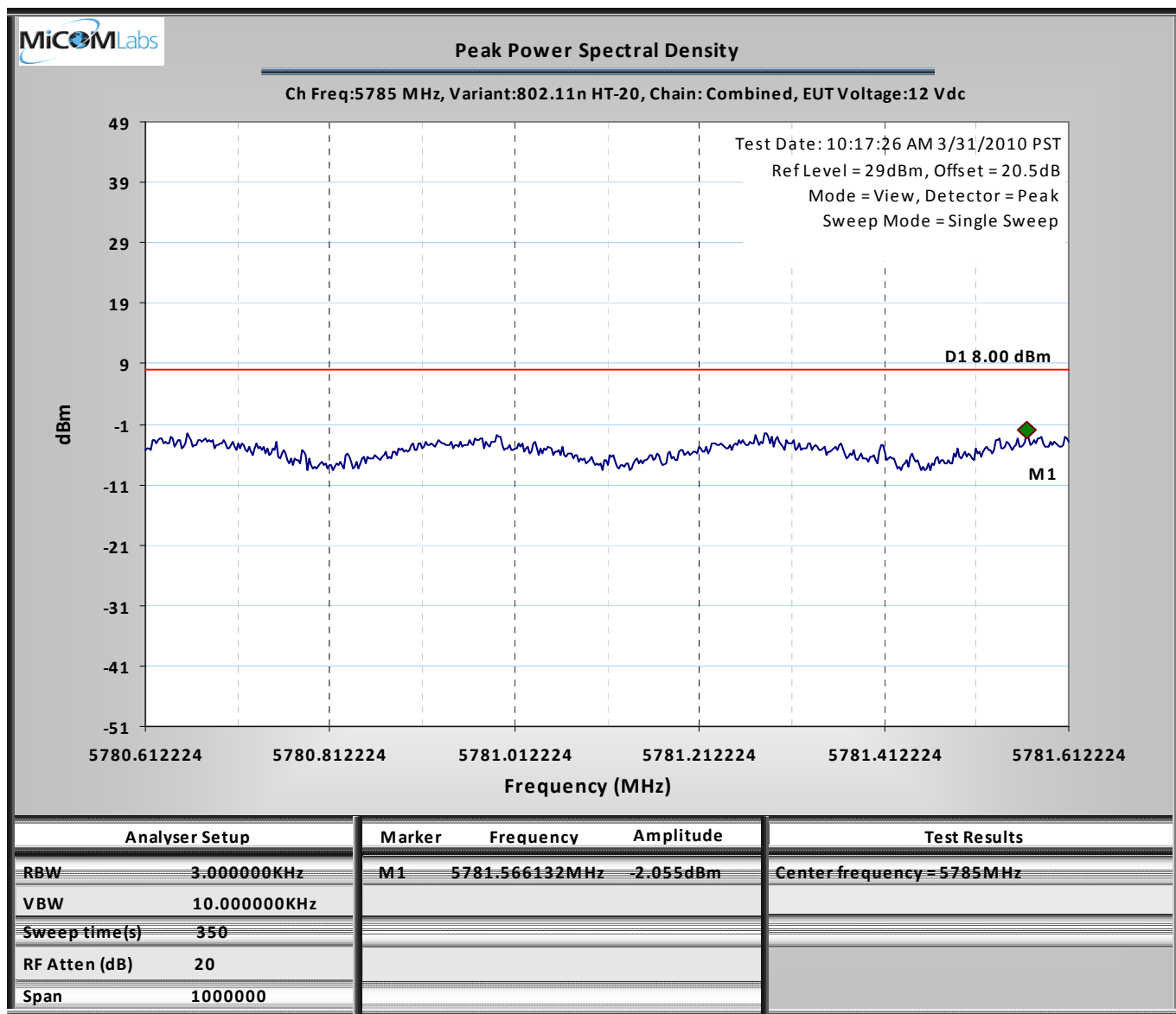
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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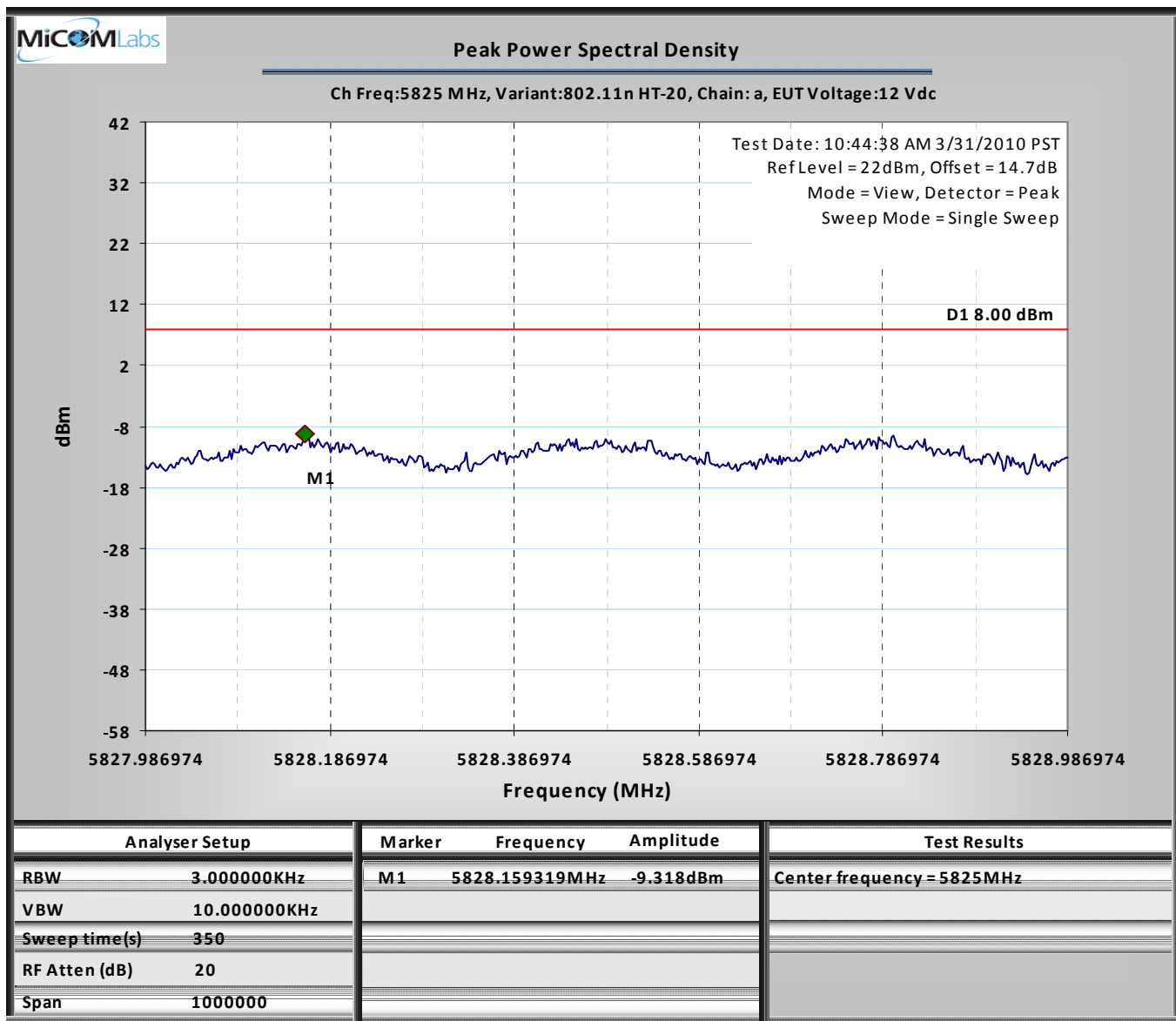
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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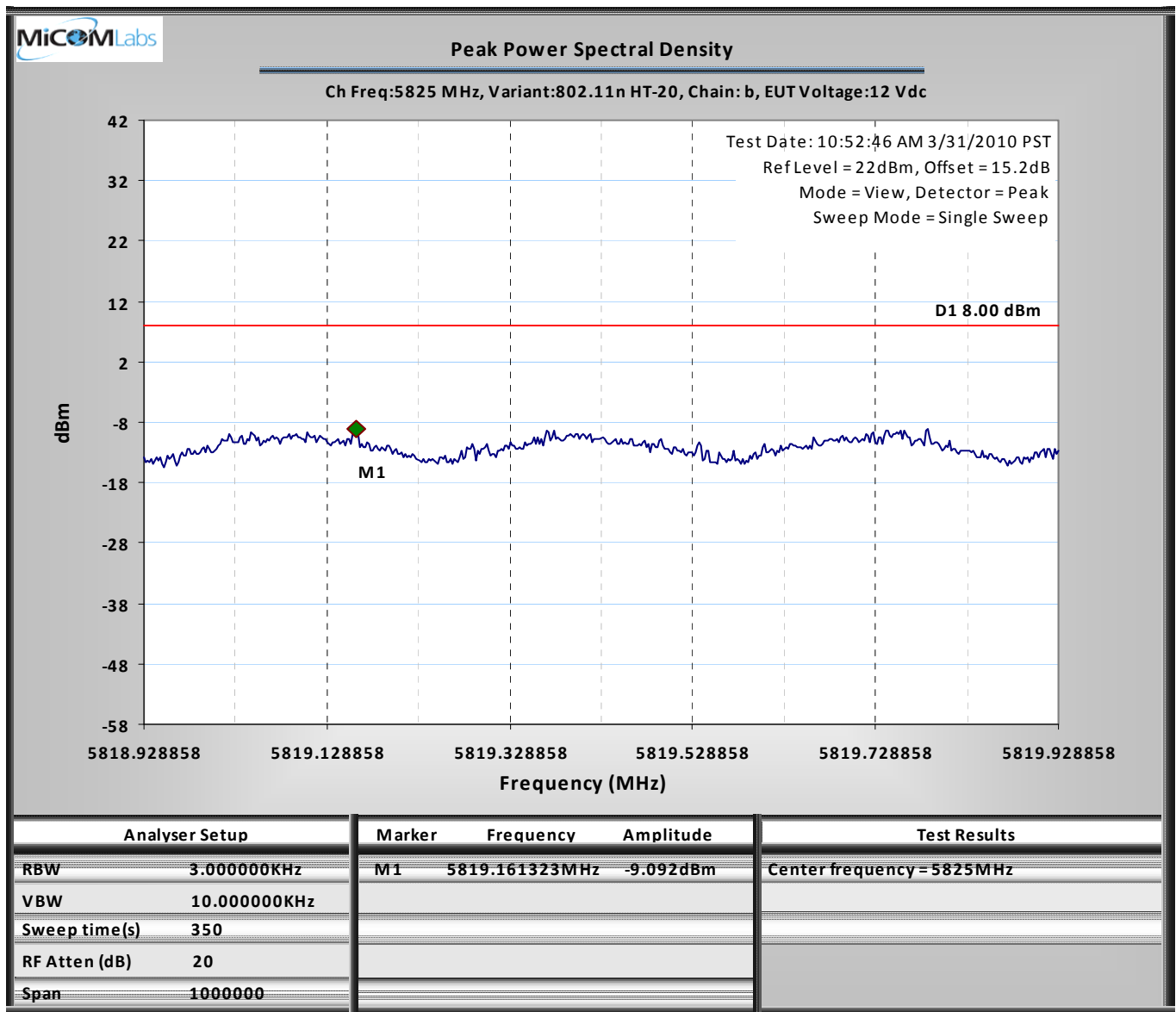
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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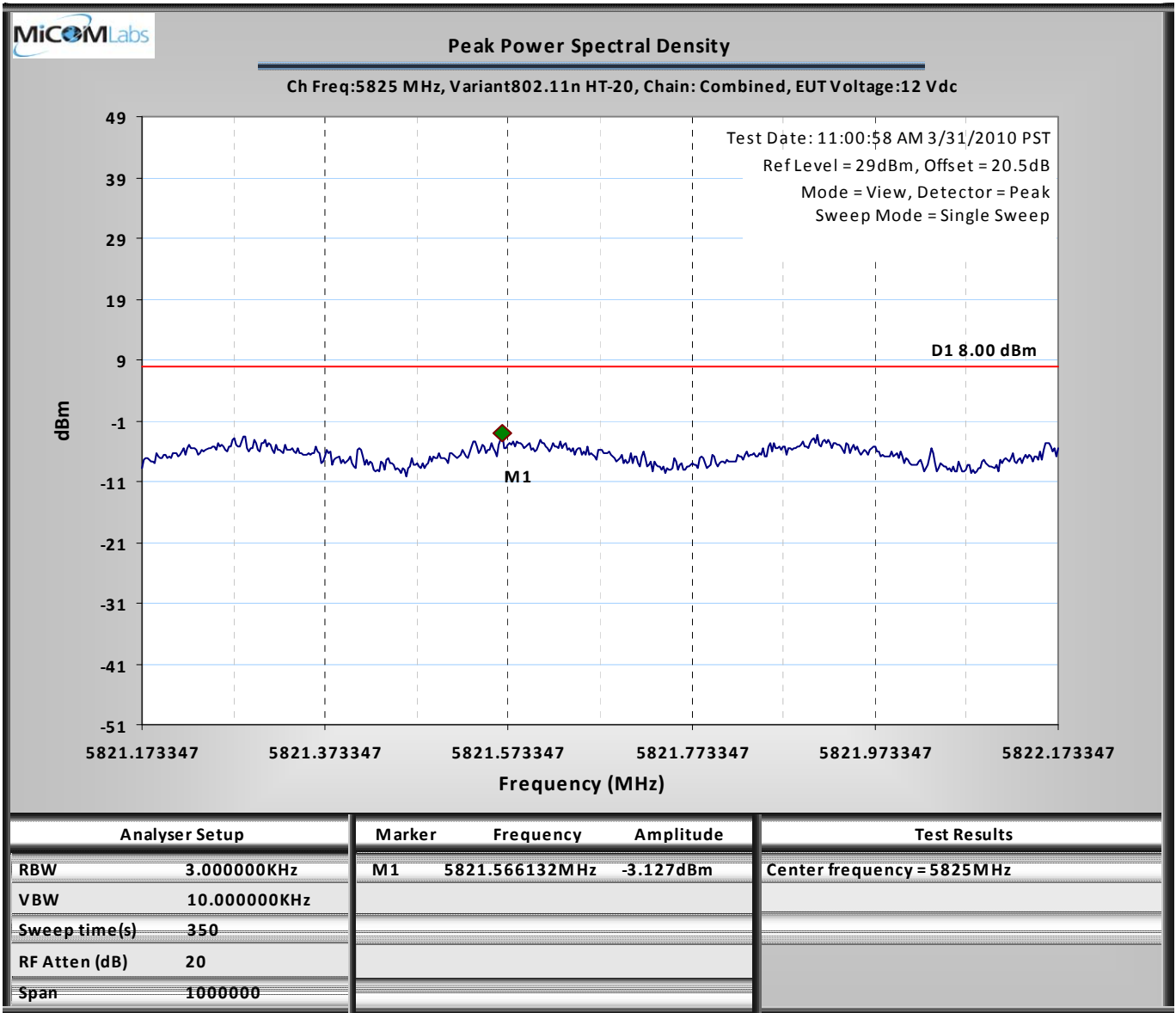
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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7.3.7 Measurement results for 802.11n HT-40

Test Conditions:	15.247 (e)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming	N/A	Antenna Gain:	6		dBi
Applied Voltage:	12.0	Vdc			
Notes 1:					
Notes 2:					

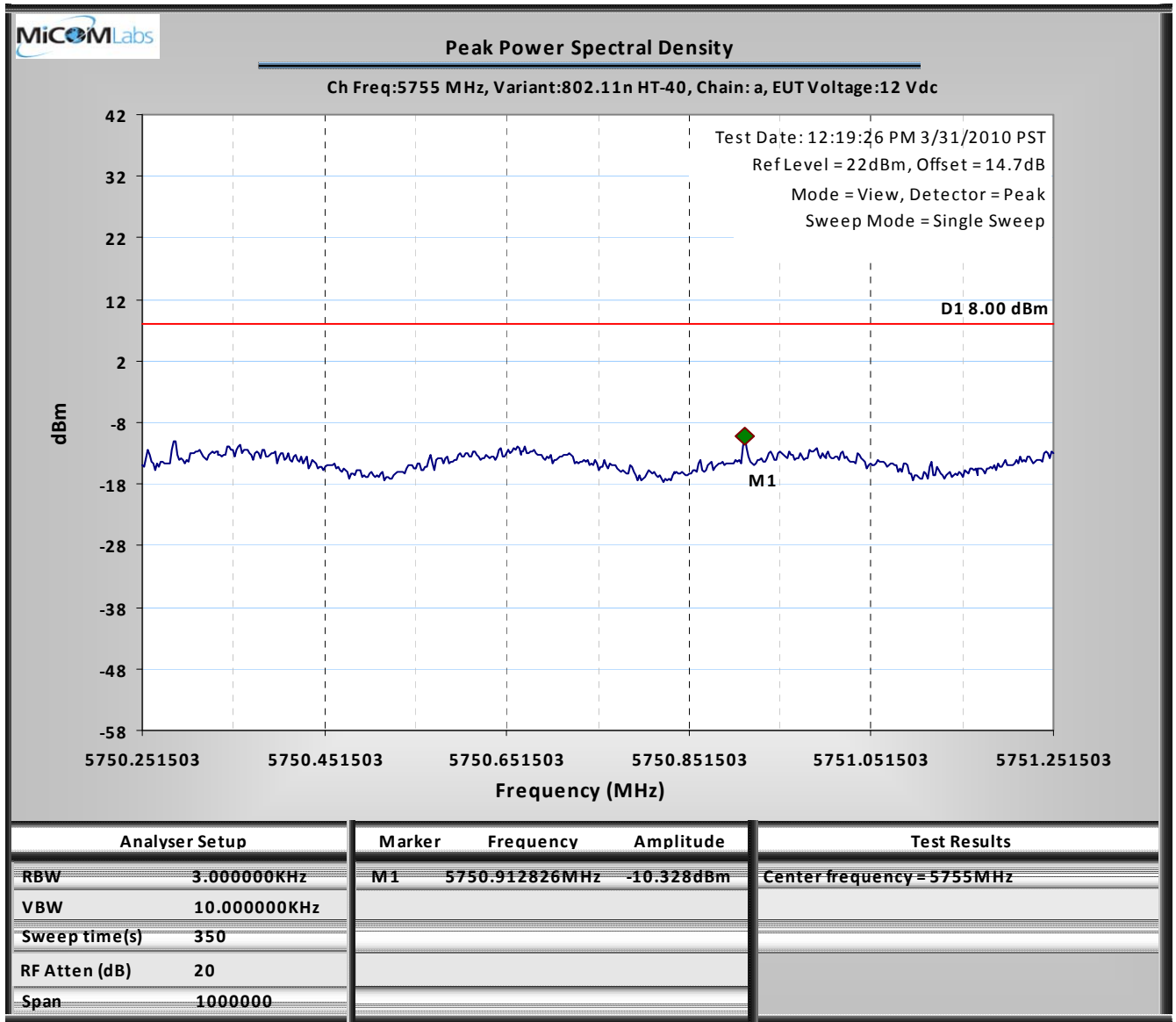
Test Frequency	Measured Power Density				Total Peak Power Spectral Density (dBm)		Limit	Margin
	RF Port (dBm)							
MHz	a	b	c	d	Combined	Calculated	dBm	dB
5755	-10.33	-9.74	--	--	-4.38	-7.01	8.00	-12.38
5785	-10.33	-10.15	--	--	-4.49	-7.23	8.00	-12.49
5815	-10.59	-9.70	--	--	-5.47	-7.11	8.00	-13.47

Measurement uncertainty:	± 1.33 dB
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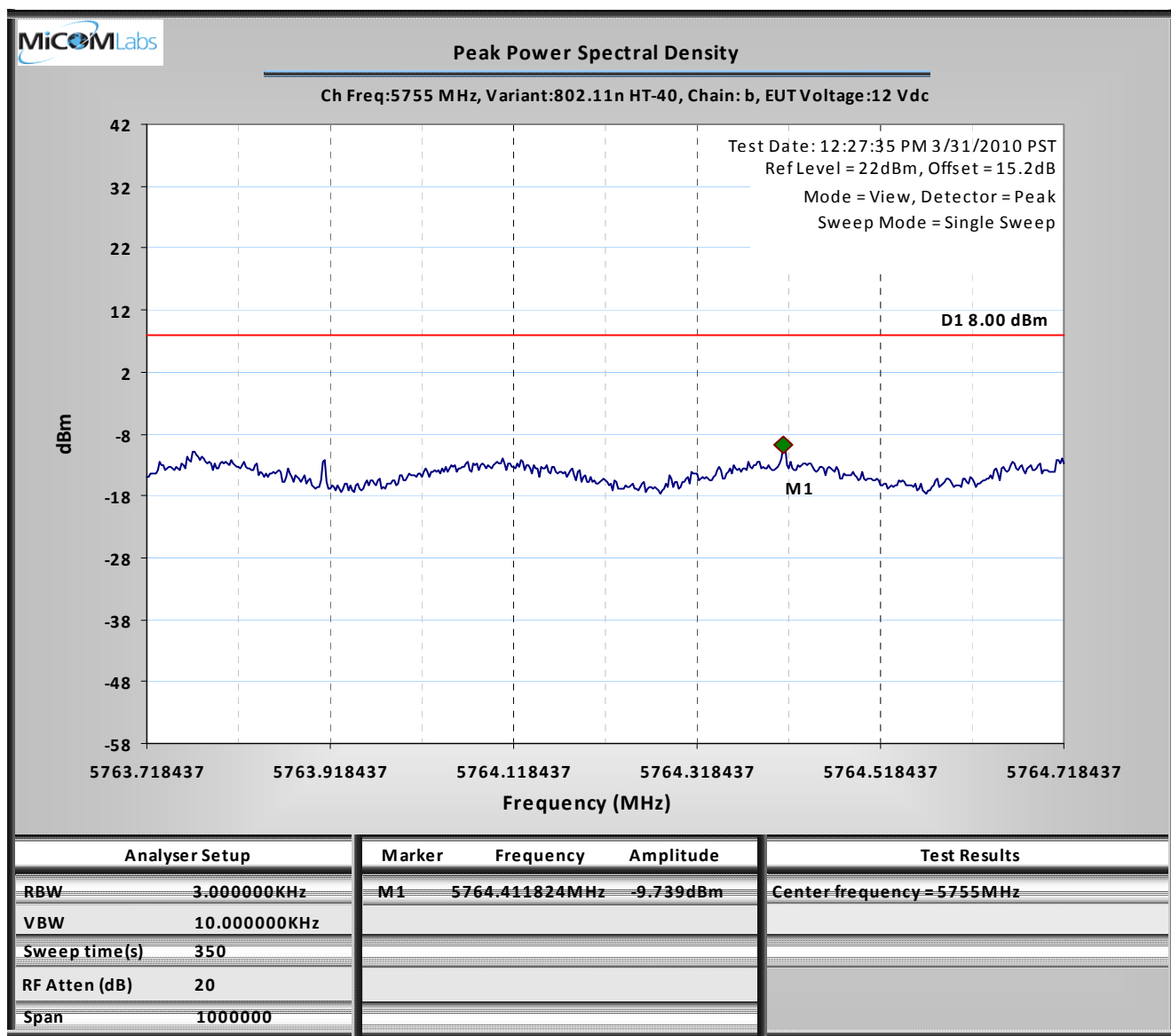
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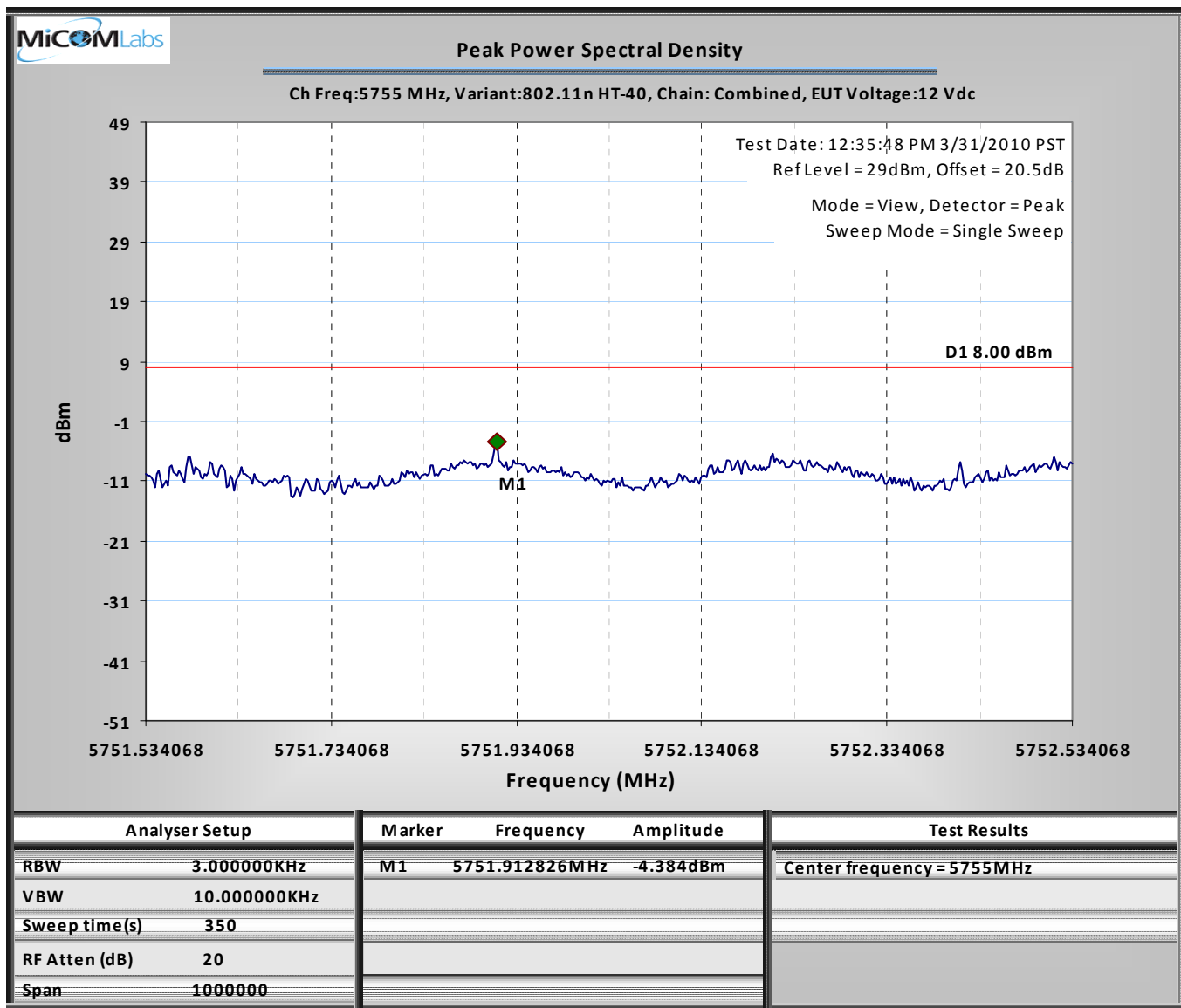
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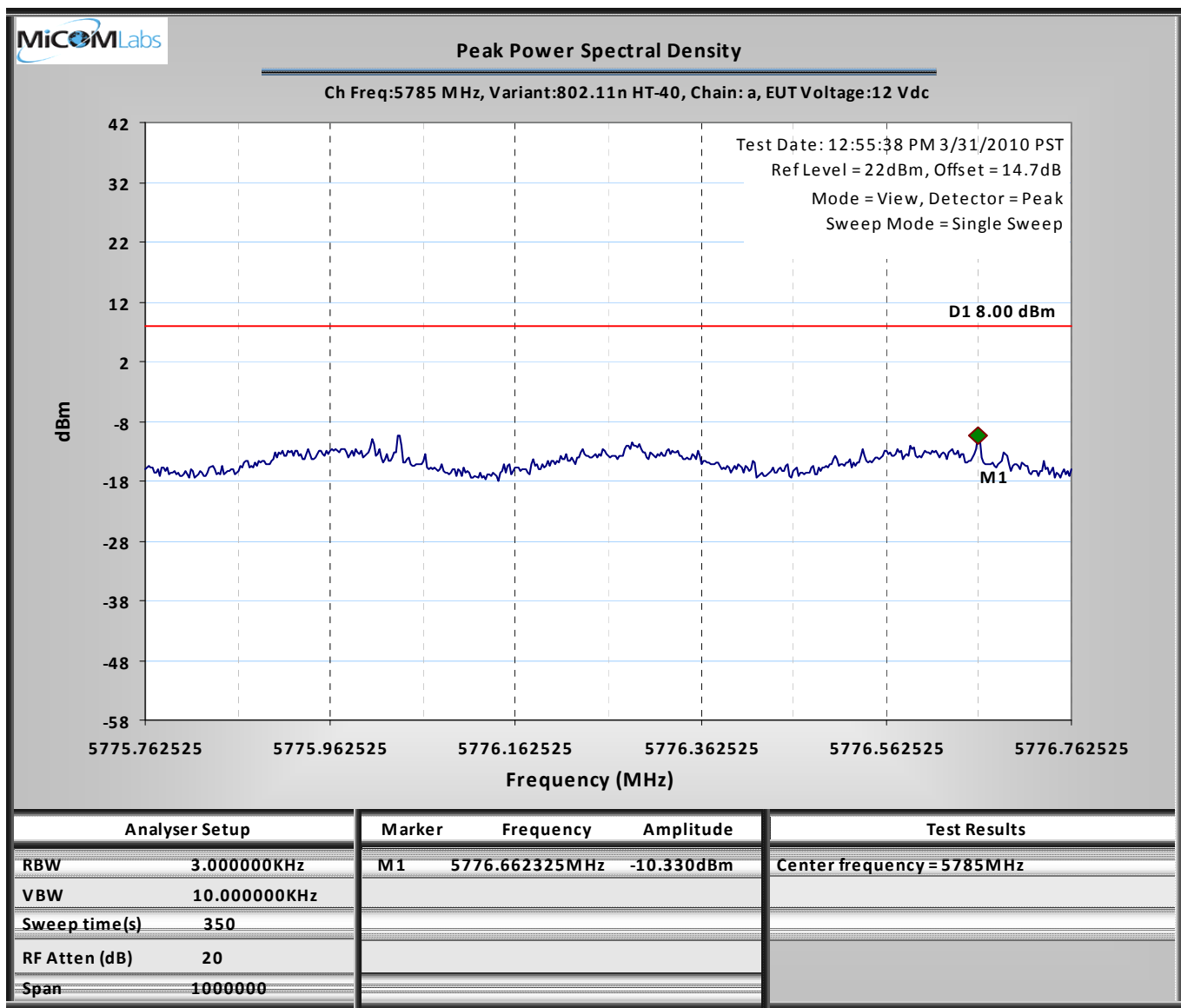
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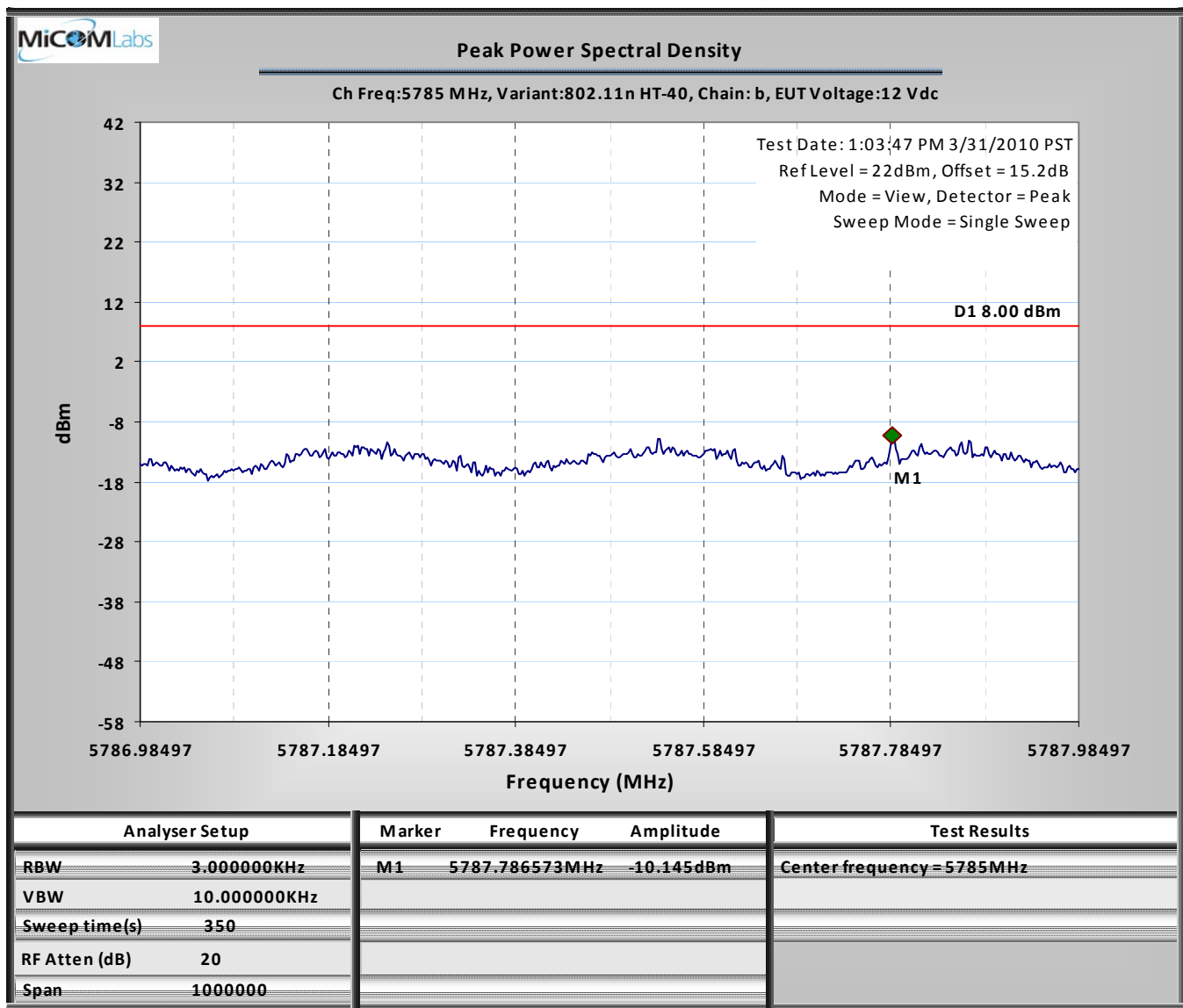
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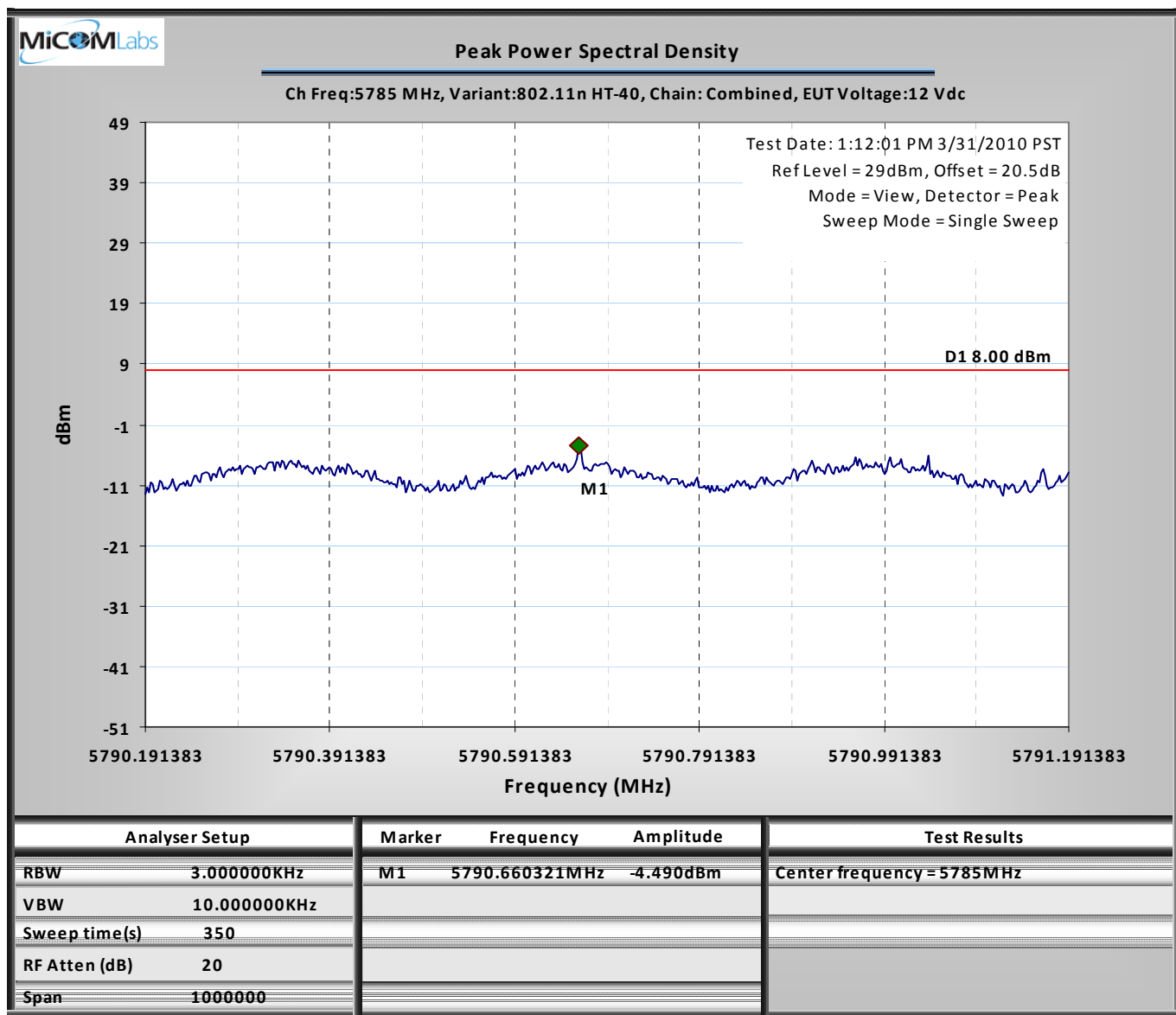
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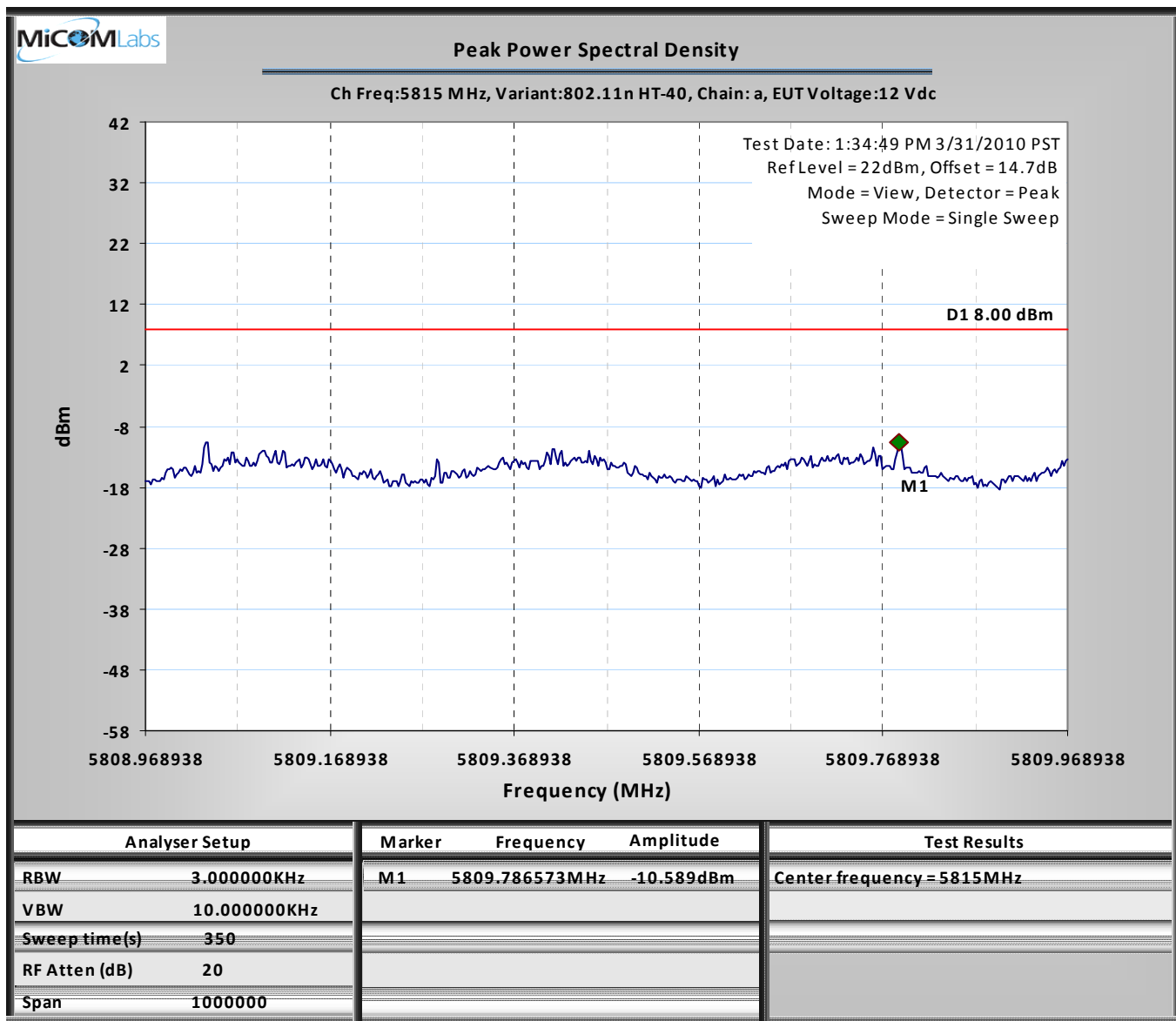
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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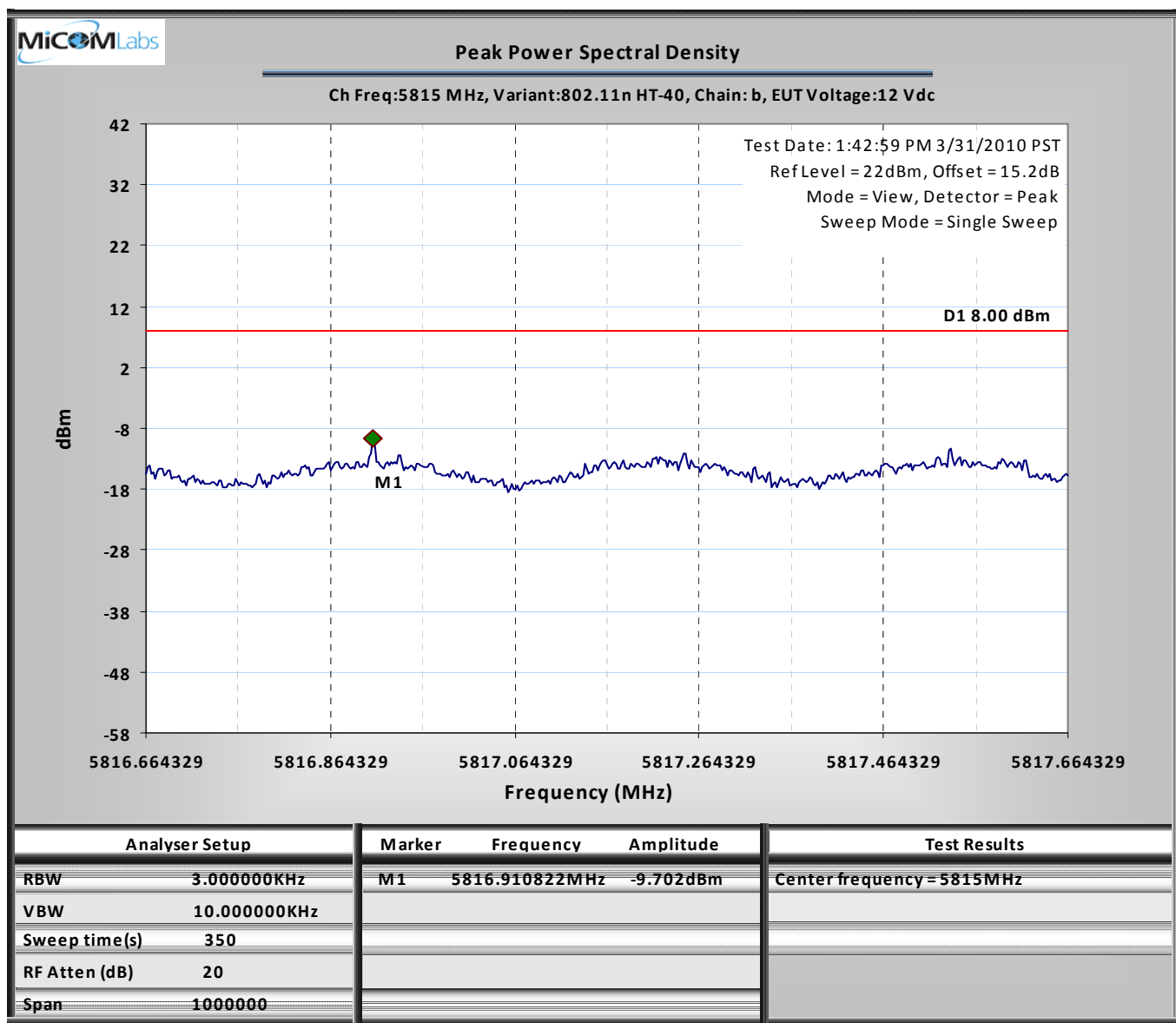
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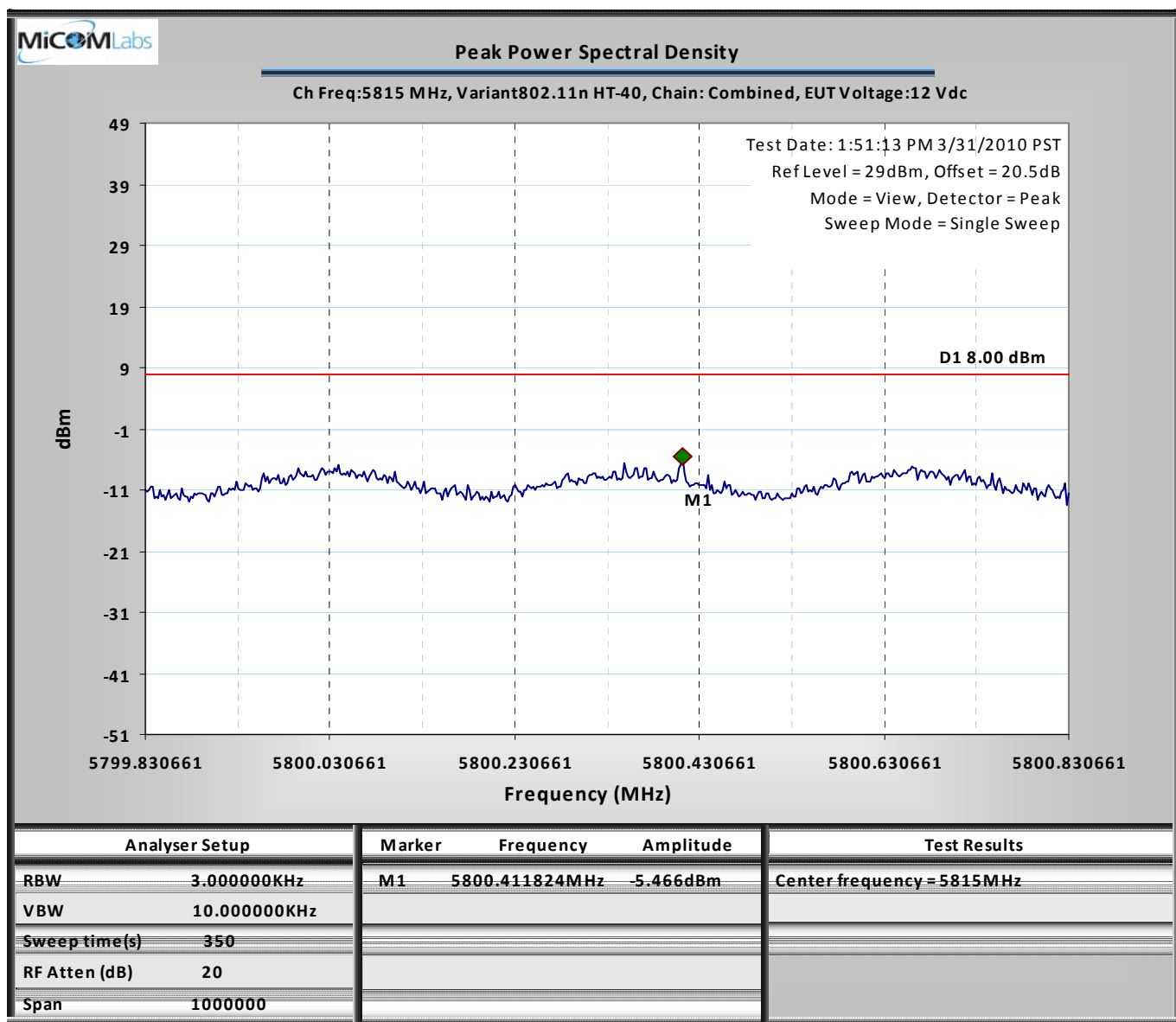
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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7.4 Maximum Permissible Exposure

FCC, Part 15 Subpart C §15.407(f)

Industry Canada RSS-Gen §5.5

Calculations for Maximum Permissible Exposure Levels

$$\text{Power Density} = P_d (\text{mW/cm}^2) = \text{EIRP} / (4\pi d^2)$$

$$\text{EIRP} = P * G * 2$$

P = Peak output power (mW)

G = Antenna numeric gain (numeric)

d = Separation distance (cm)

$$\text{Numeric Gain} = 10^{(G (\text{dBi})/10)}$$

The Aruba AP-93H has two transmitters. The peak power in the table below is calculated by assuming a worst case scenario where the two transmitters are operating simultaneously in the same band. The Peak Power in mW is calculated by taking the maximum conducted power measured in each band and multiplying by 2.

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

Freq. Band (MHz)	Antenna Gain (dBi)	Numeric Gain (numeric)	Peak Output Power (dBm)	Peak Output Power x 2 (mW)	Calculated Safe Distance @ 1mW/cm ² Limit(cm)	Minimum Separation Distance (cm)
2400 – 2500	2.5	1.78	+18.93	78.2	3.33	20.00
5725 - 5850	5.8	3.8	+16.97	49.8	3.88	20.00

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

Specification

Maximum Permissible Exposure Limits

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

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

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty

±1.33 dB

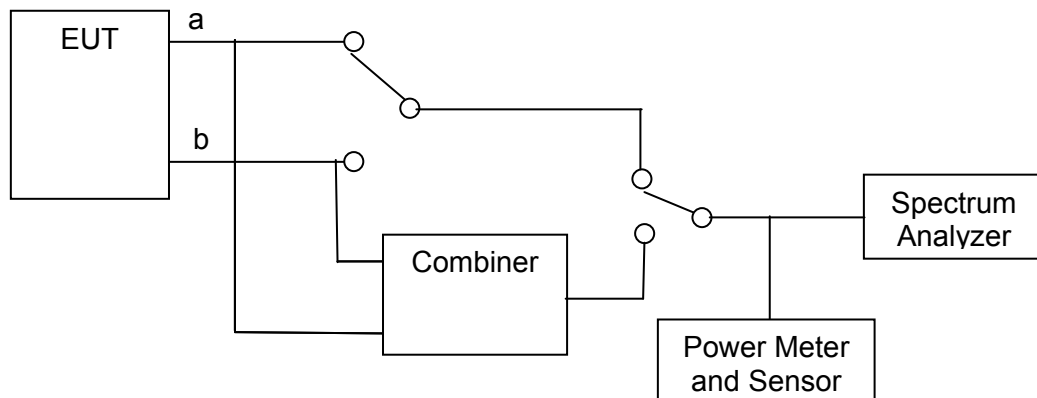
7.5 Conducted Spurious Emissions

Test Procedure

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

Measurements were made using a combiner 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 peak emission.

Test Measurement Set up



Conducted Spurious Emission measurement test configuration



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Specification

Limits Band-Edge

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

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

§15.247(d)

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

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0158, 0252, 0313, 0314, 0223, 0116, 0117, 0287, 0363.

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7.5.1 Measurement results for 802.11b

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11b	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	N/A		dBi
Applied Voltage:	55.00 Vdc	Antenna Ports (N):	2		
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	-43.71	-12.76	-42.26	-12.33				
2437.000	30.00	26000.00	-43.53	-11.87	-41.36	-12.39				
2462.000	30.00	26000.00	-43.06	-13.30	-43.59	-13.26				

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	-35.97	-11.70	-35.58	-12.63				
2462.000	2483.50	-46.77	-11.48	-46.80	-11.80				

BE: Maximum Band edge emission found

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

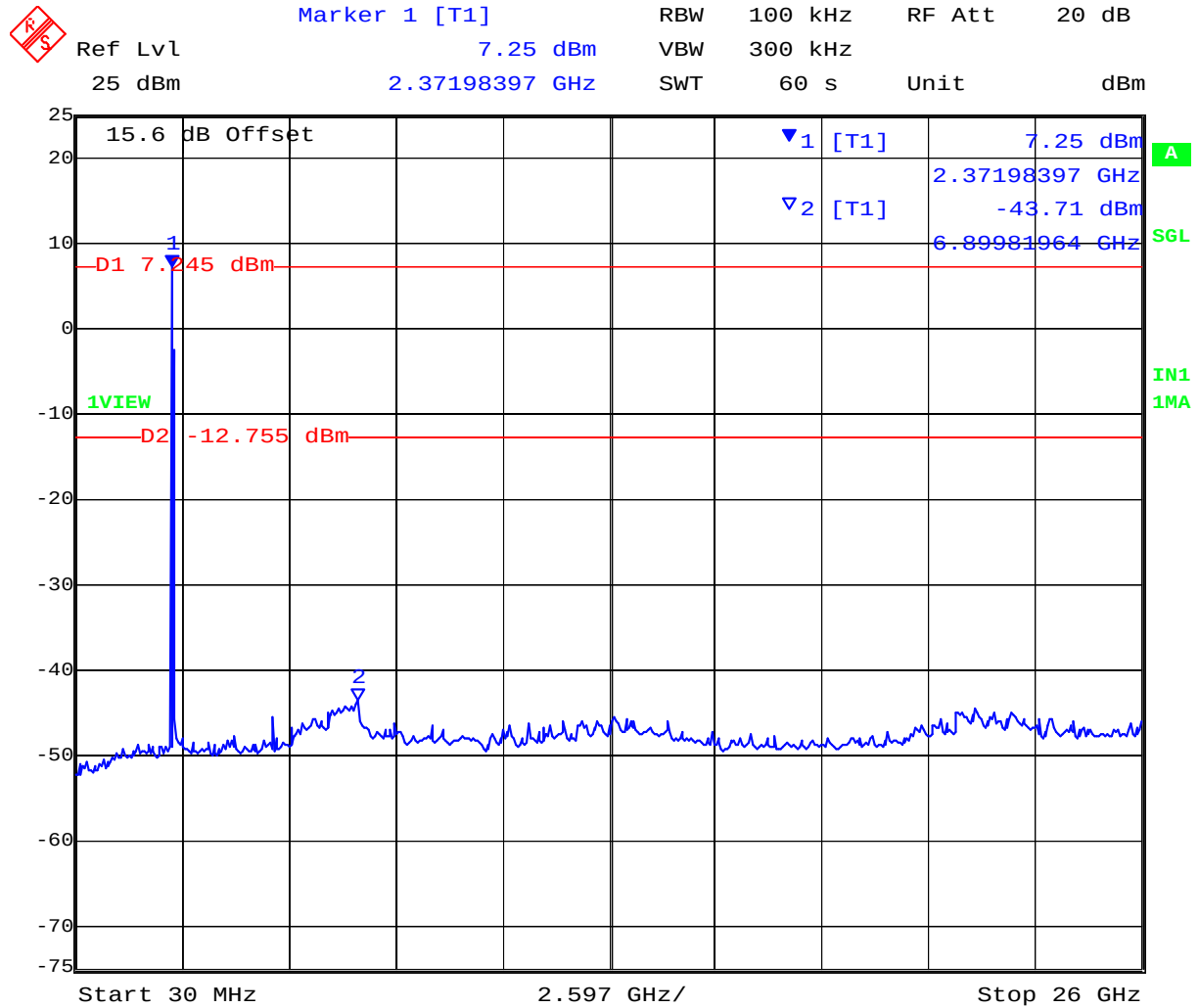
Note: Limit is based on 20dB down from fundamental emissions

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CHAIN A



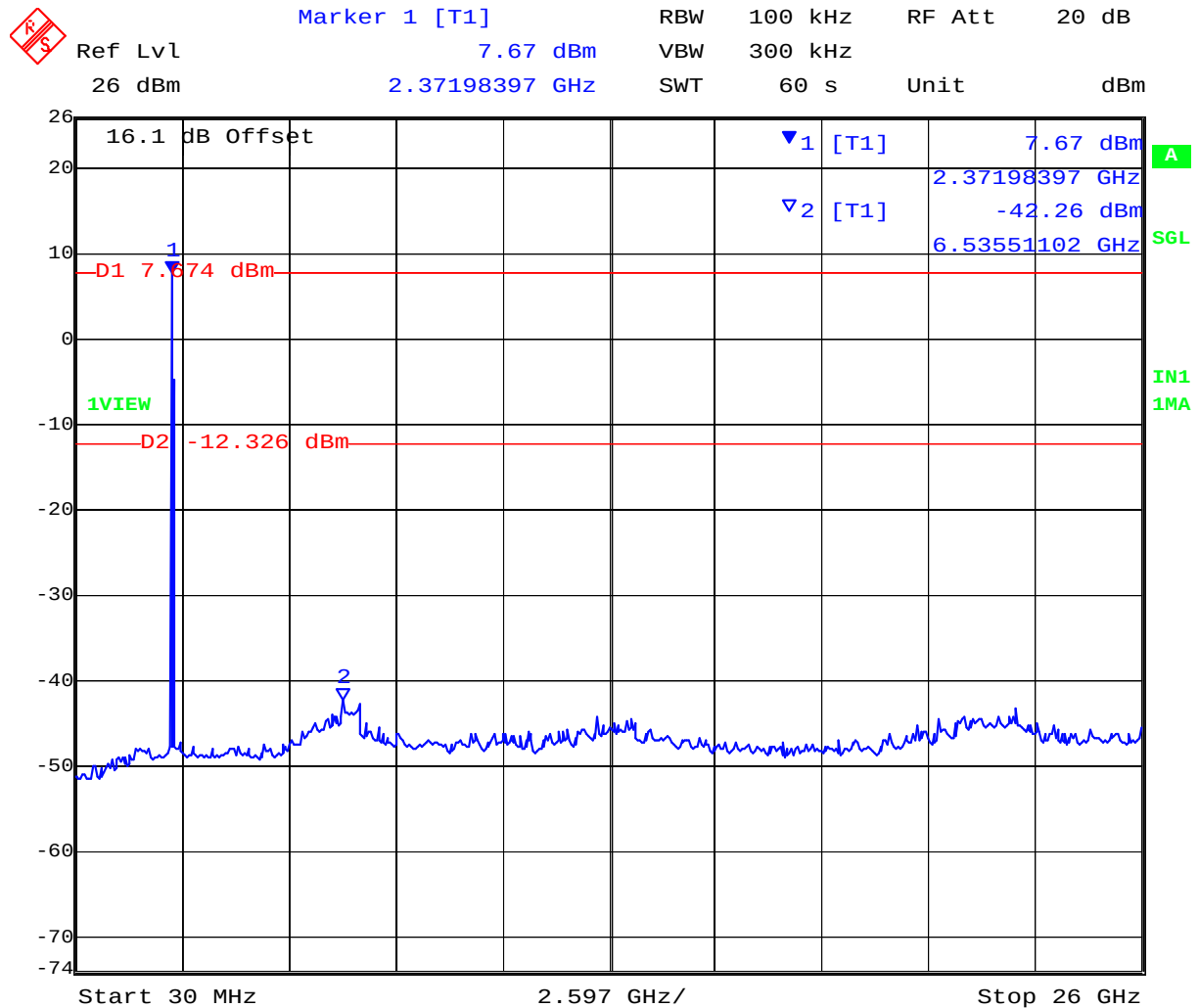
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CHAIN B



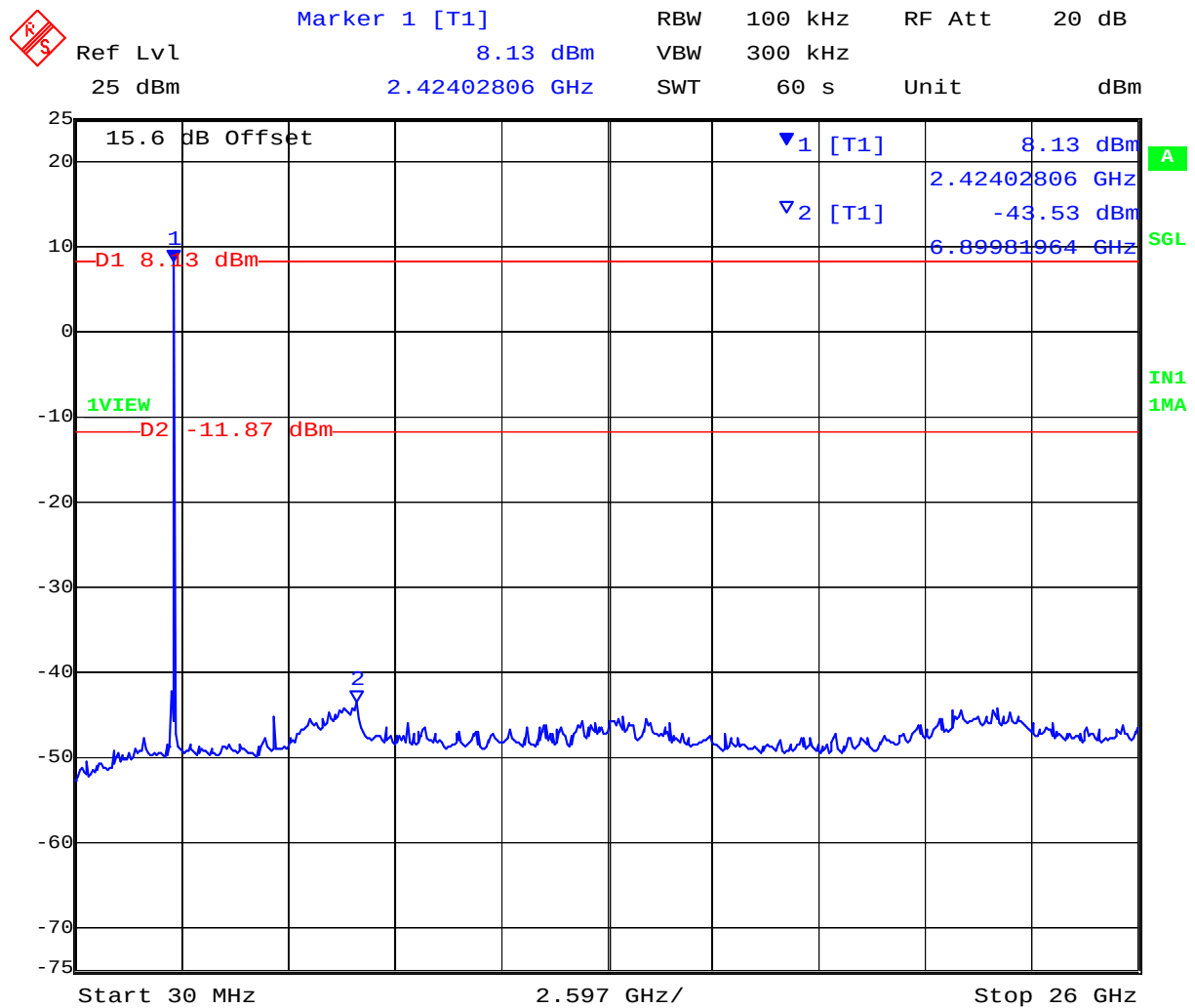
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CHAIN A



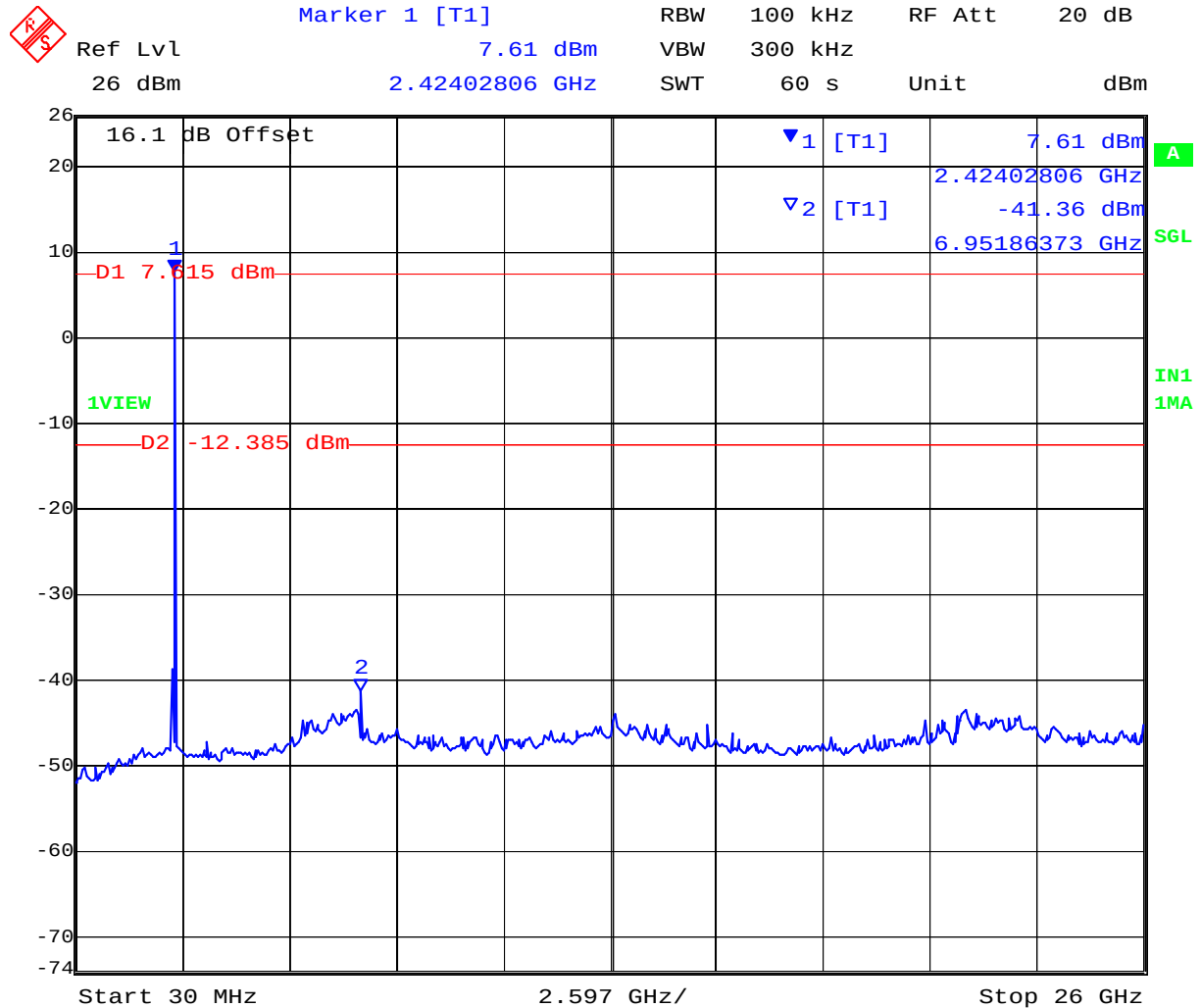
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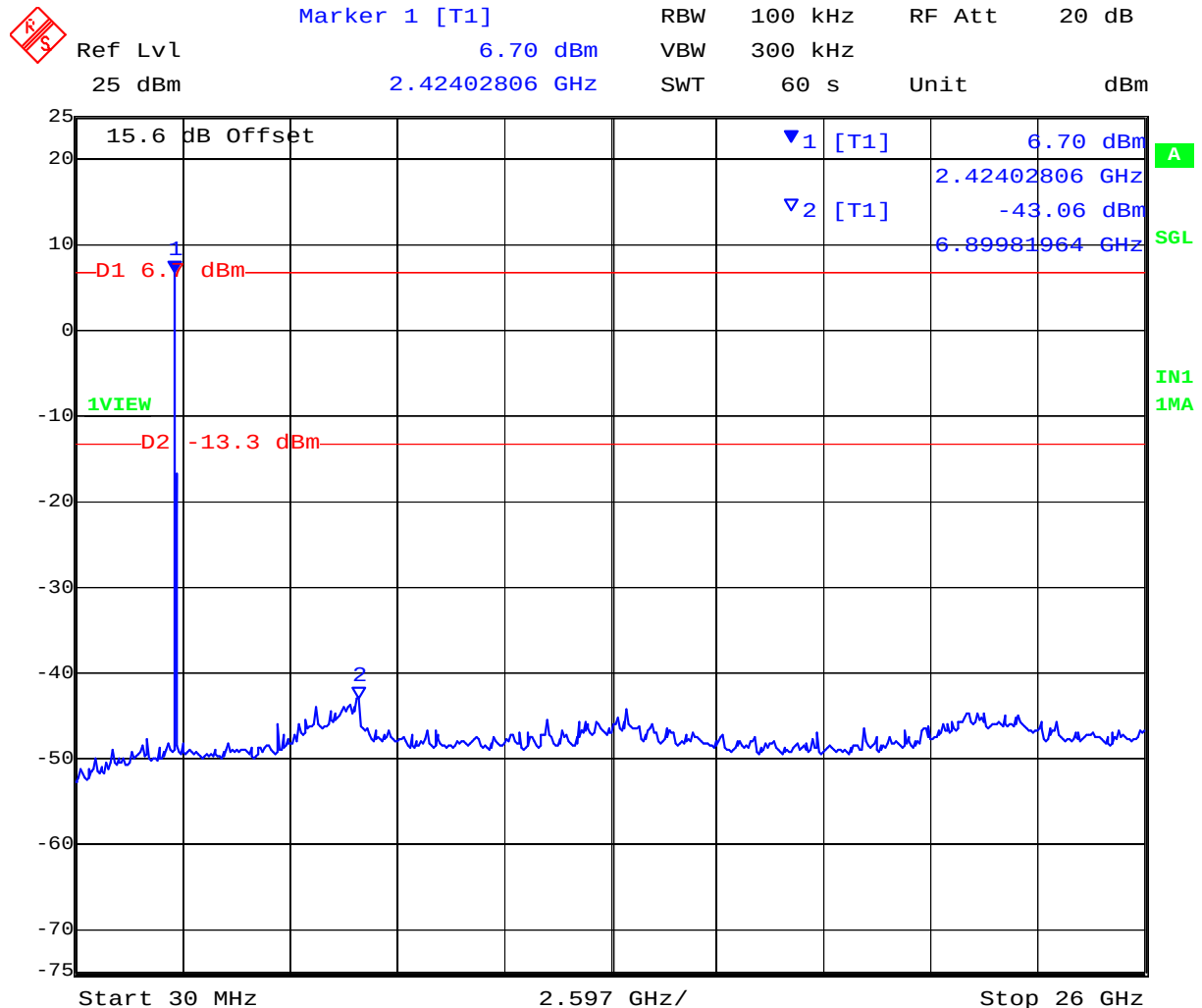
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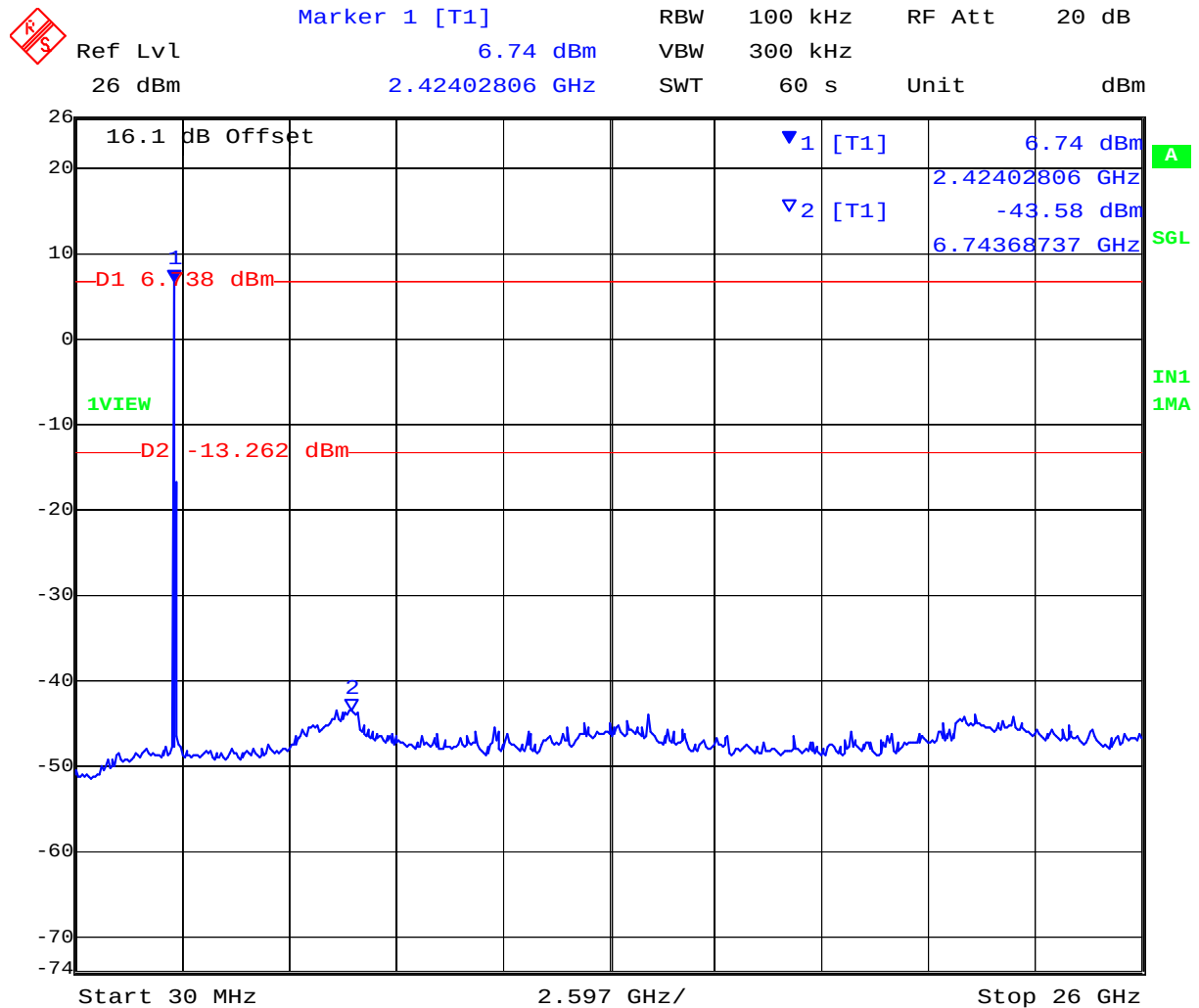
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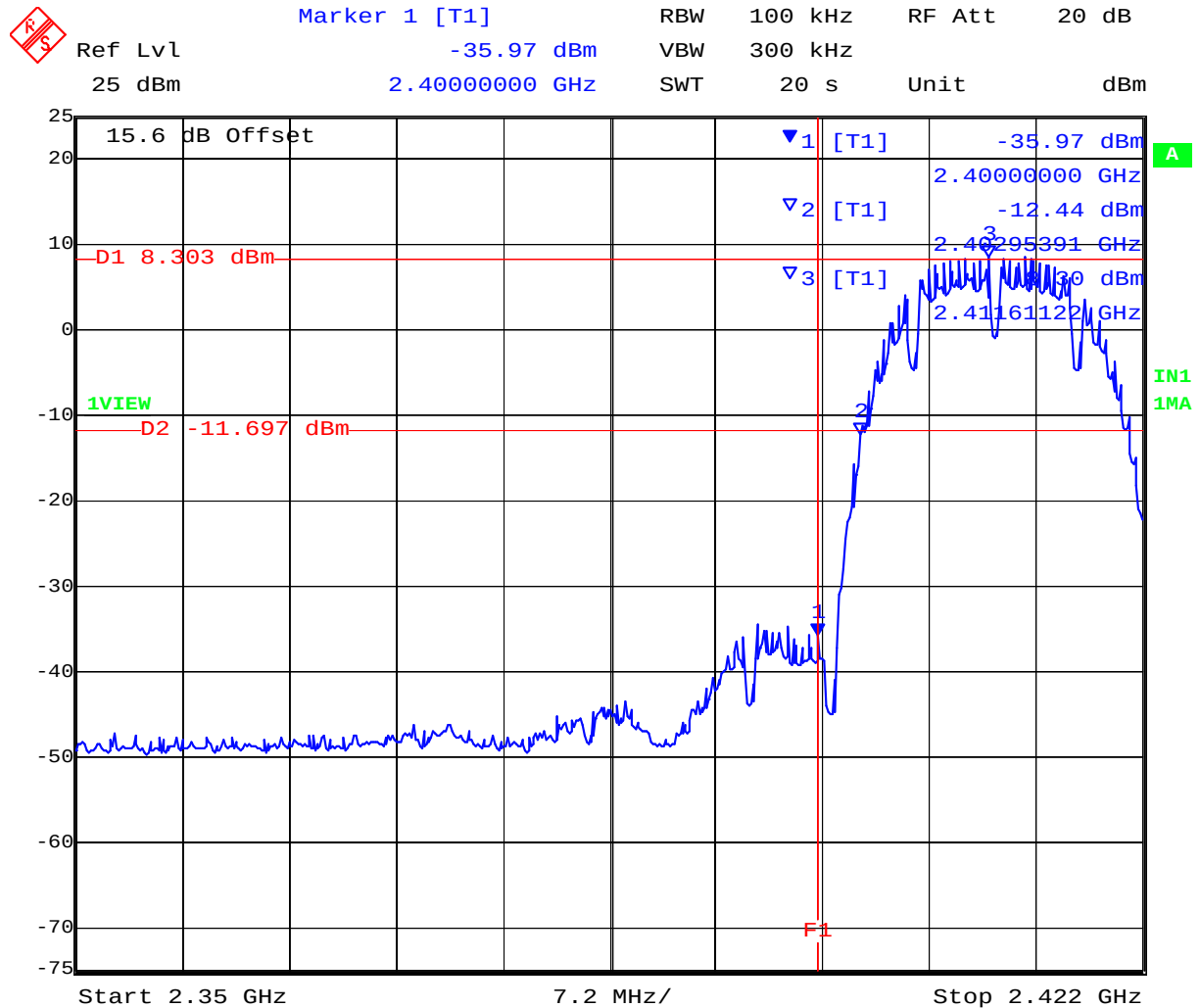
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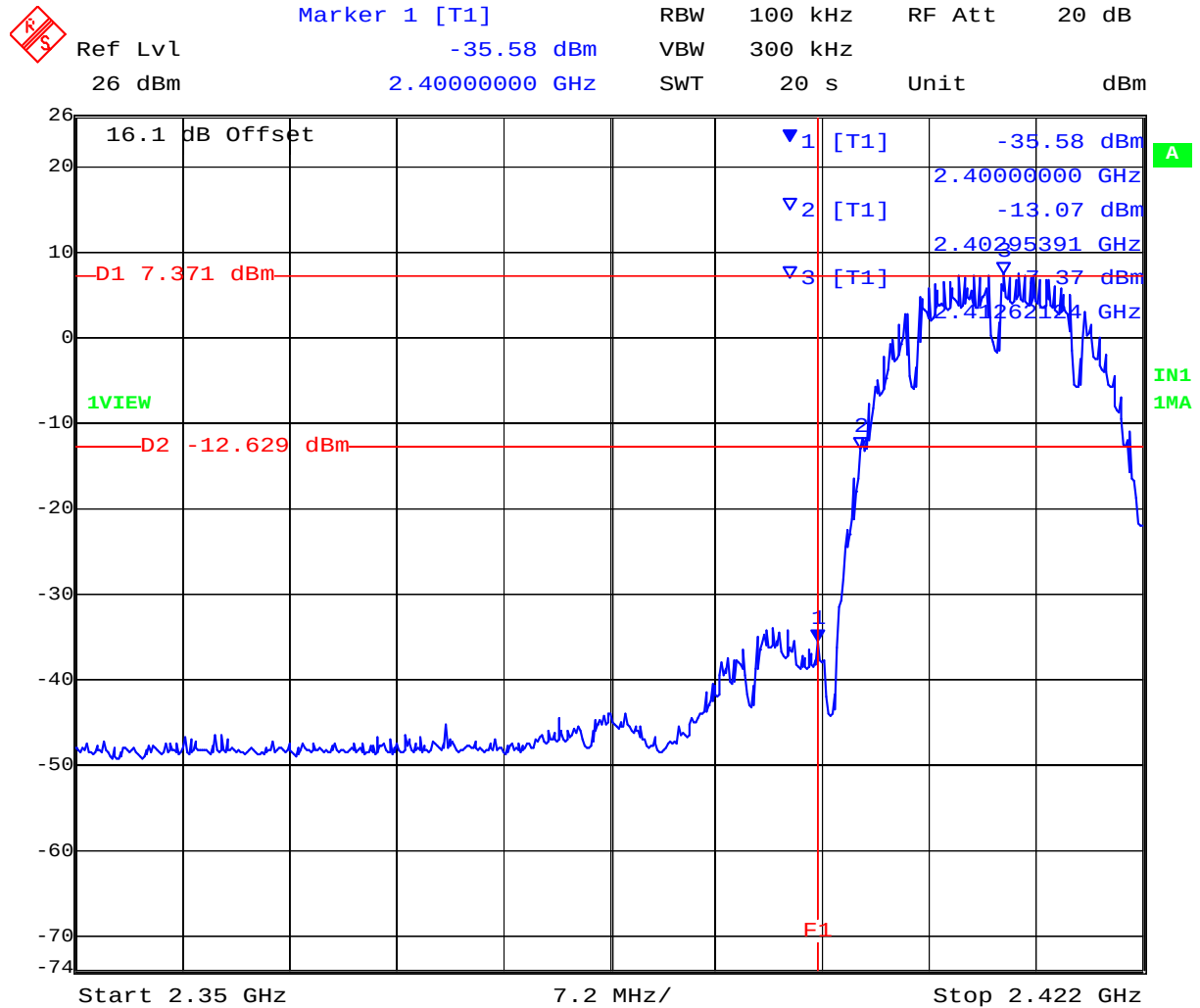
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Date: 18.NOV.2011 11:33:39

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7.5.2 Measurement Results: 802.11g

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11g	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	N/A		dBi
Applied Voltage:	55.00 Vdc	Antenna Ports (N):	2		
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	-43.41	-12.78	-42.21	-13.99				
2437.000	30.00	26000.00	-43.46	-13.00	-41.65	-12.58				
2462.000	30.00	26000.00	-43.21	-13.39	-42.93	-14.11				

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	-20.04	-12.32	-22.22	-12.78				
2462.000	2483.50	-30.66	-12.78	-33.41	-12.63				

BE: Maximum Band edge emission found

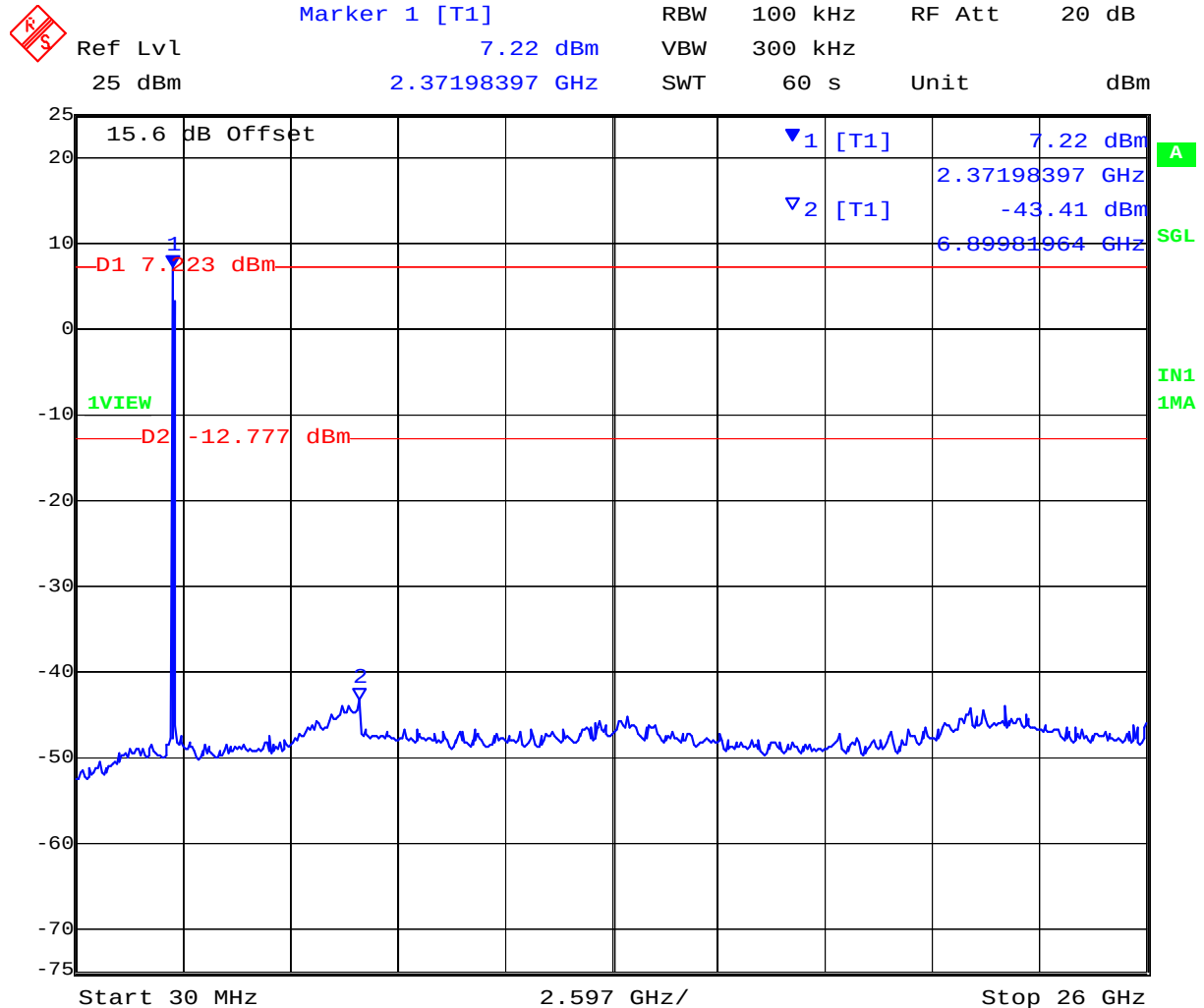
Measurement uncertainty:	±2.81 dB
---------------------------------	----------

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



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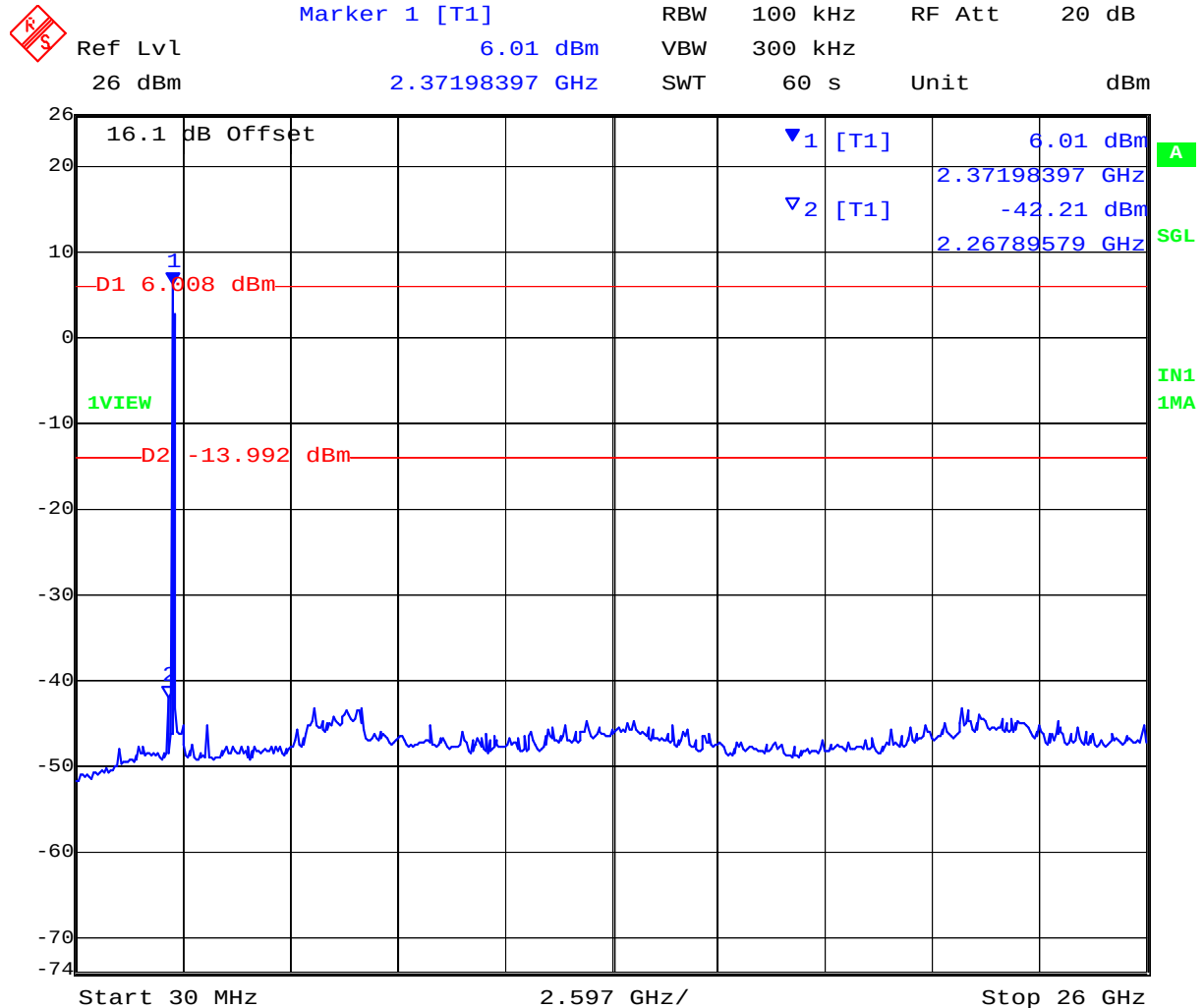
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CHAIN B



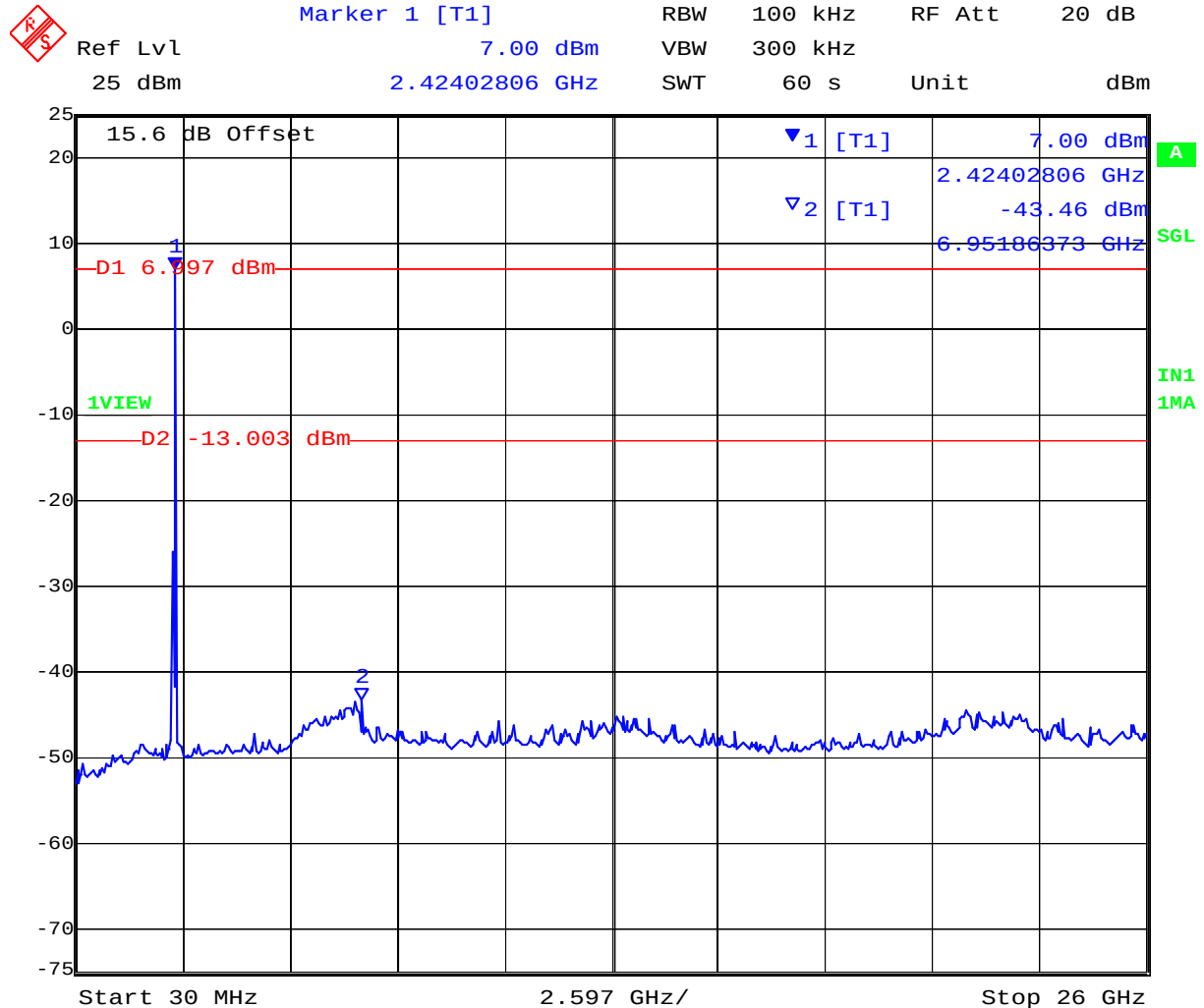
Date: 18.NOV.2011 12:32:34

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



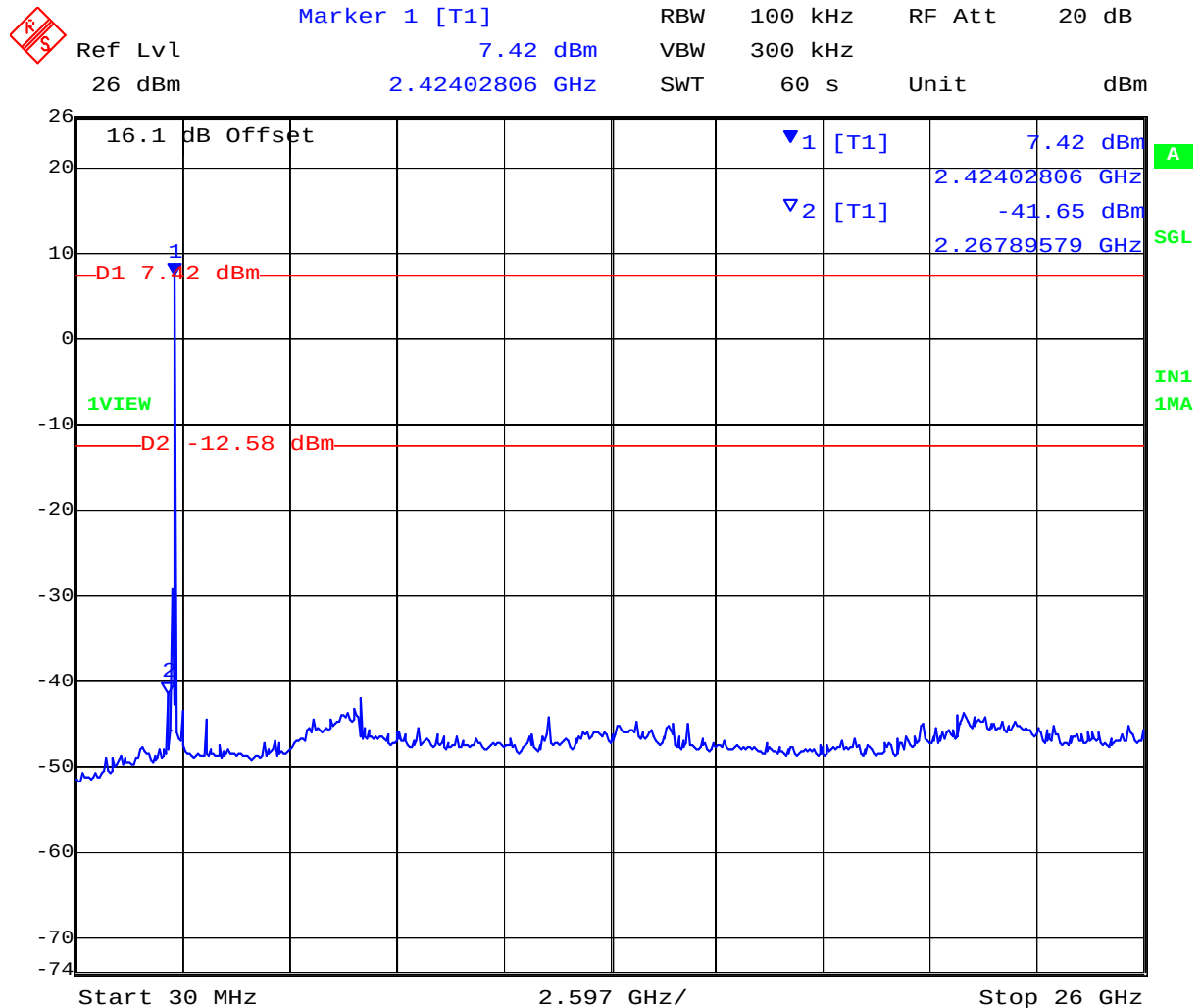
Date: 18.NOV.2011 12:57:48

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CHAIN B



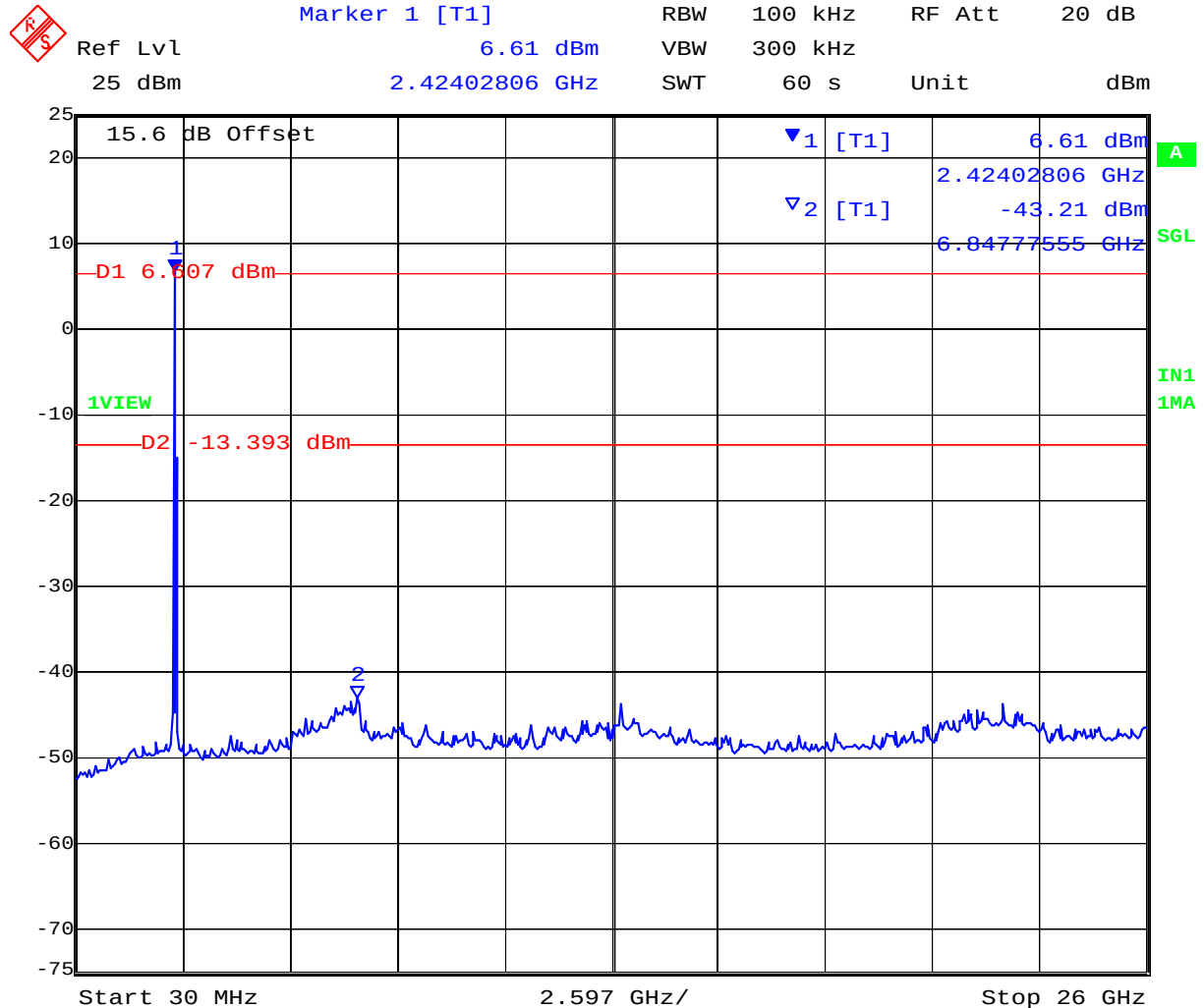
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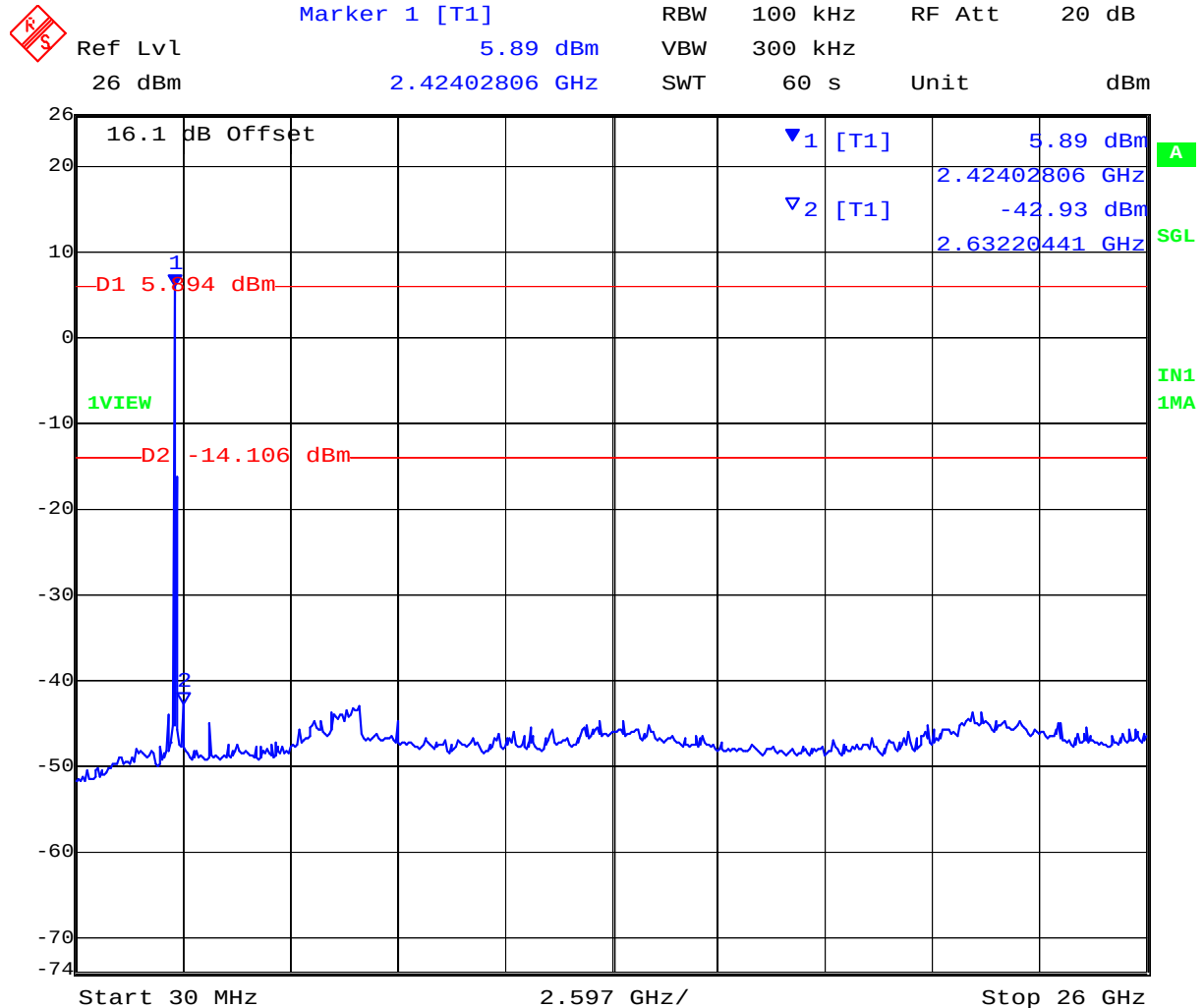
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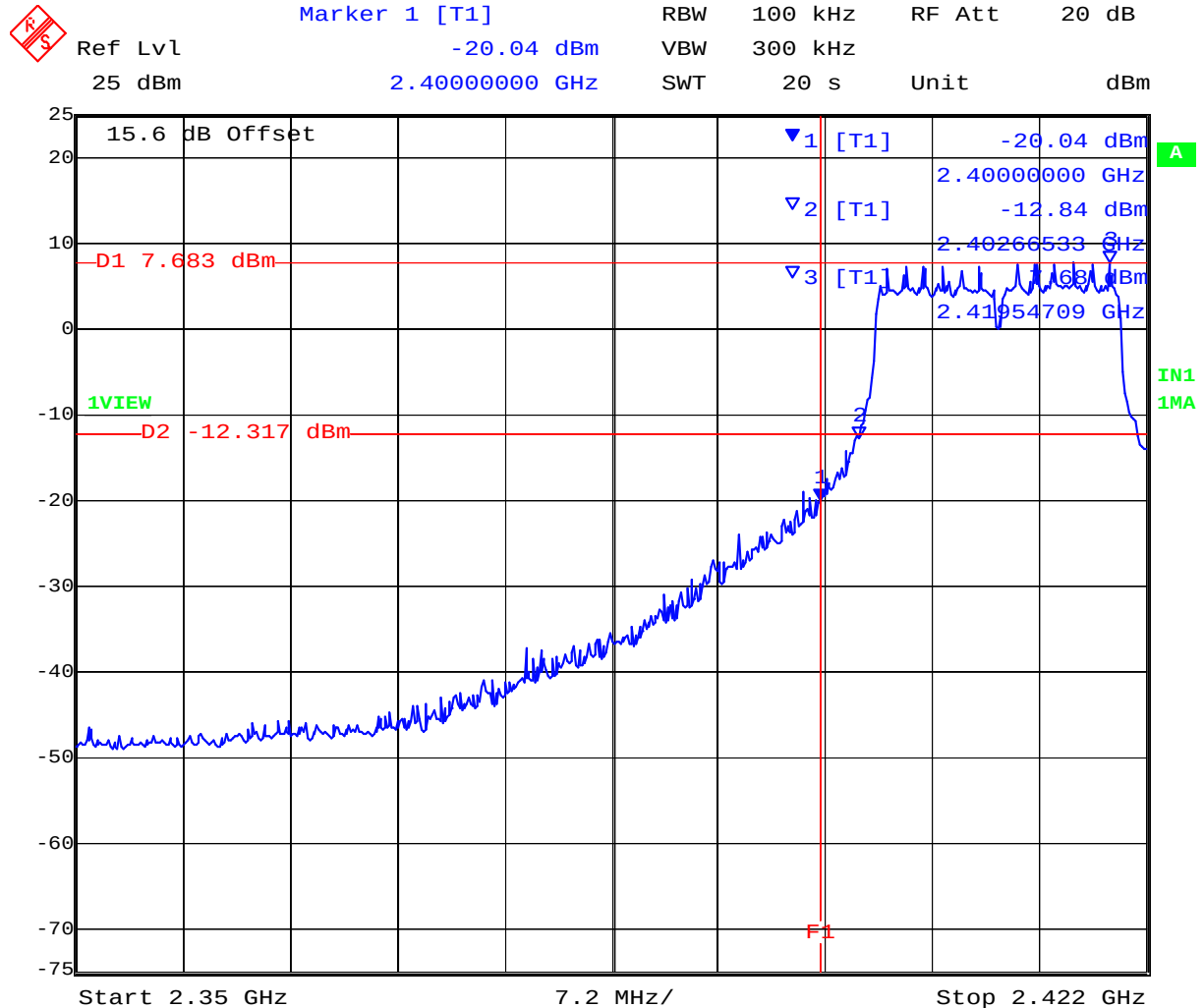
Date: 18.NOV.2011 14:24:37

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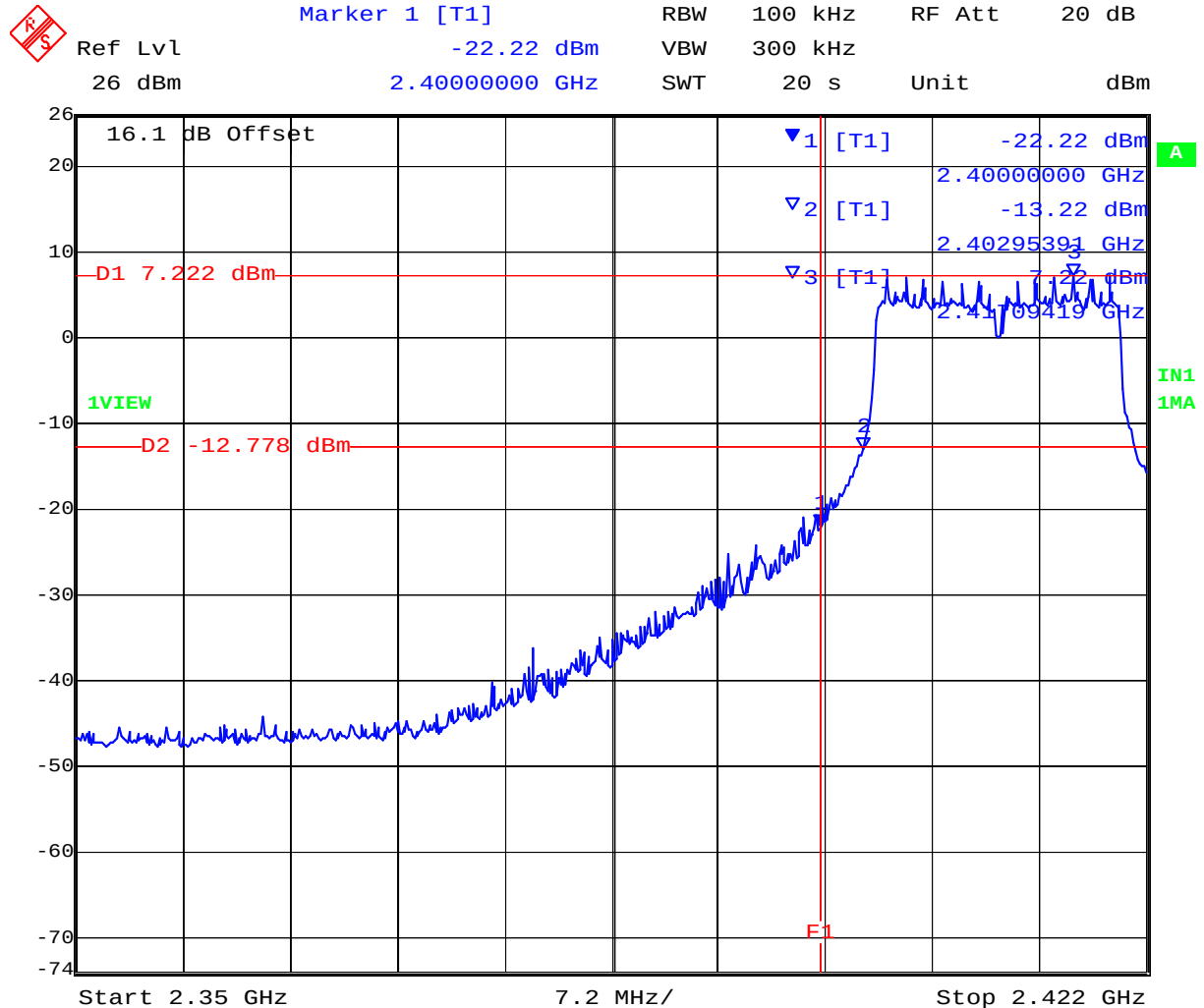
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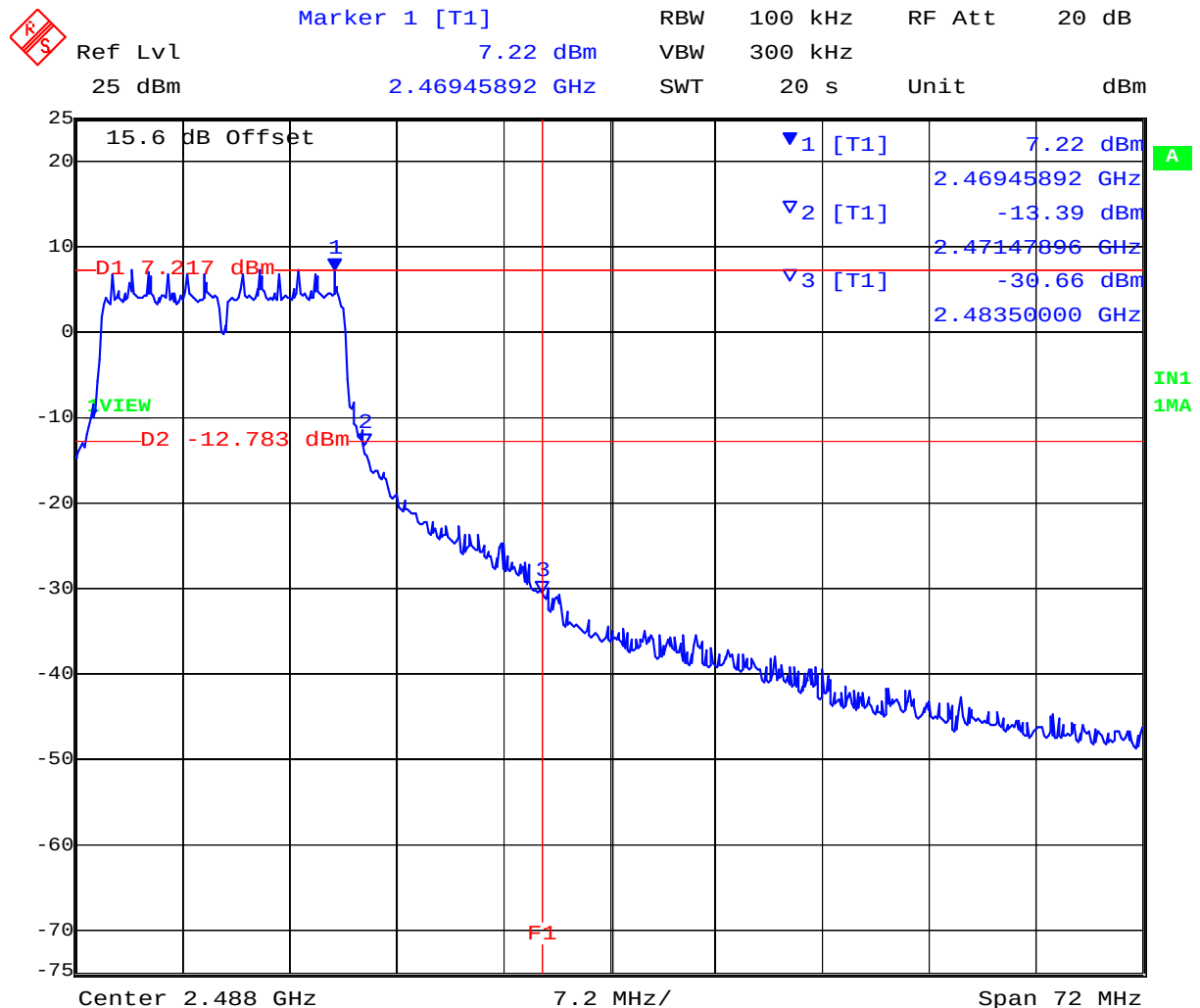


Date: 18.NOV.2011 12:15:30

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CHAIN A



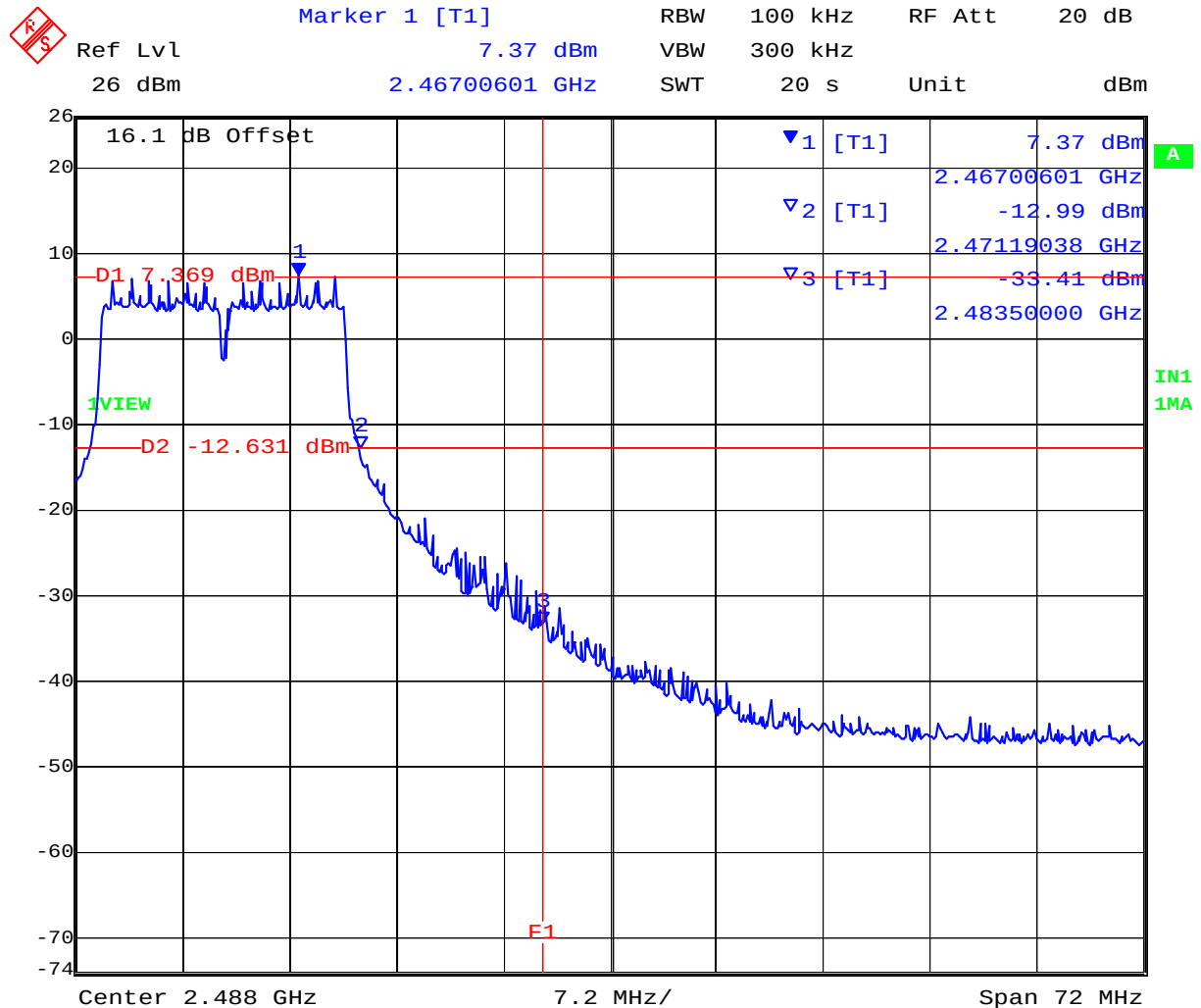
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CHAIN B



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7.5.3 Measurement Results for 802.11n HT-20

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	N/A		dBi
Applied Voltage:	55.00 Vdc	Antenna Ports (N):	2		
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	-43.89	-12.68	-42.32	-15.95				
2437.000	30.00	26000.00	-43.43	-12.10	-42.79	-12.74				
2462.000	30.00	26000.00	-43.16	-13.67	-42.78	-15.55				

SE: Maximum spurious emission found

Band-edge Measurement

Test Freq.	Band-edge freq.	Port A		Port B		Port C		Port D	
MHz	MHz	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm	BE dBm	Limit dBm
2412.000	2400.00	-18.74	-12.35	-20.97	-12.71				
2462.000	2483.50	-29.80	-12.74	-32.69	-12.77				

BE: Maximum Band edge emission found

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

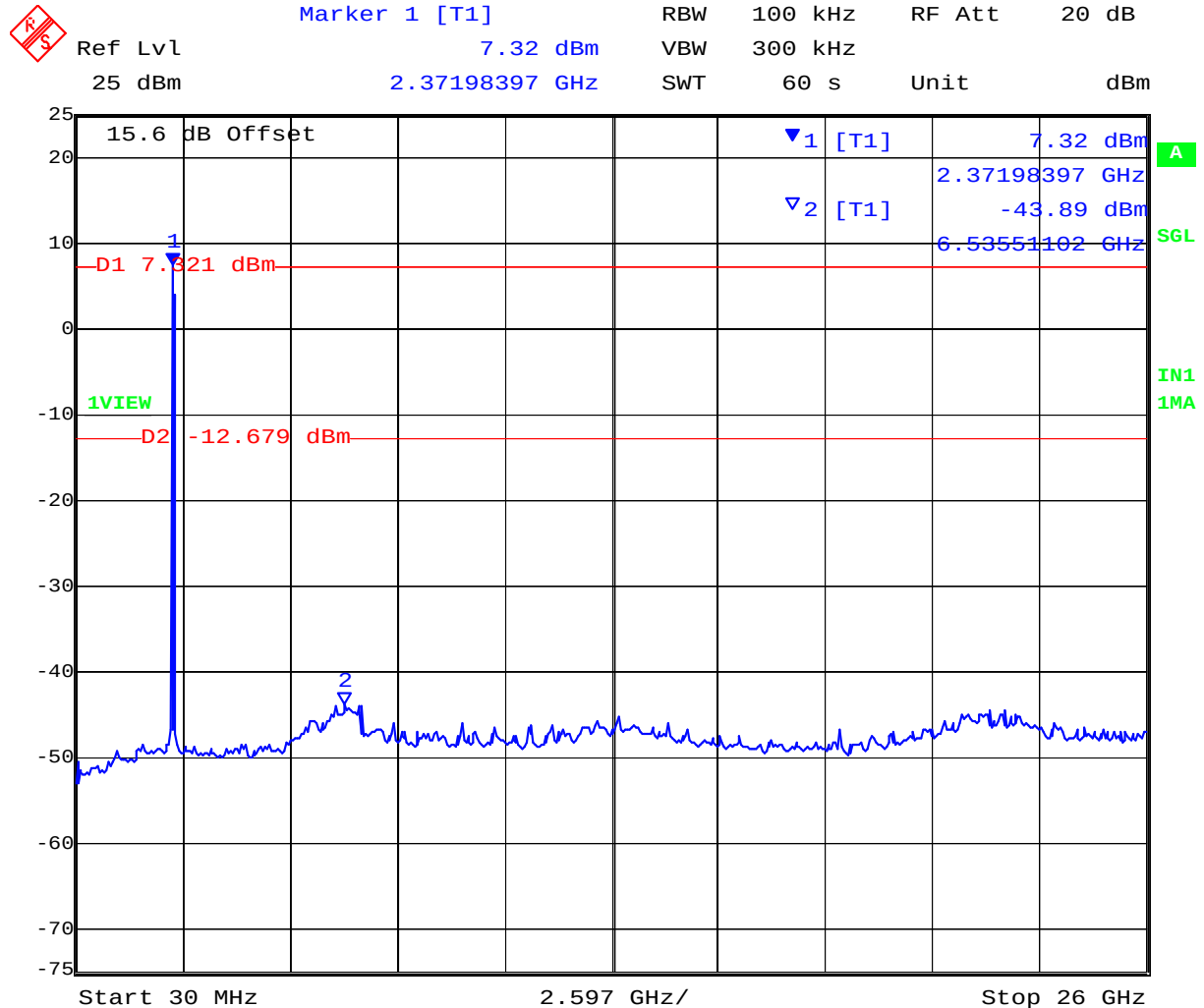
Note: Limit is based on 20dB down from fundamental emissions

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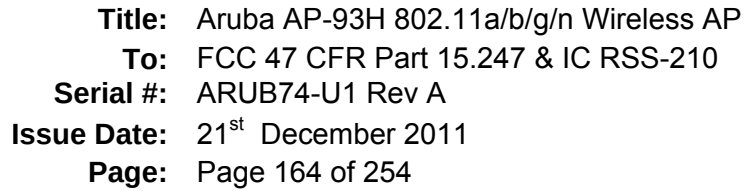
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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Date: 18.NOV.2011 15:09:28

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Ref Lvl 26 dBm Marker 1 [T1] 4.05 dBm RBW 100 kHz RF Att 20 dB Unit dBm

26 dBm 2.37198397 GHz SWT 60 s

16.1 dB Offset

▼1 [T1] 4.05 dBm

▼2 [T1] 2.37198397 GHz -42.32 dBm 2.26789579 GHz

D1 4.054 dBm

D2 -15.946 dBm

1VIEW

IN1 1MA

SGL

Start 30 MHz 2.597 GHz/ Stop 26 GHz

MiCOM Labs, 440 Boulder Court, Suite 200, Pleasanton, CA 94566 USA, Phone: 925.462.0304, Fax: 925.462.0306, www.micomlabs.com



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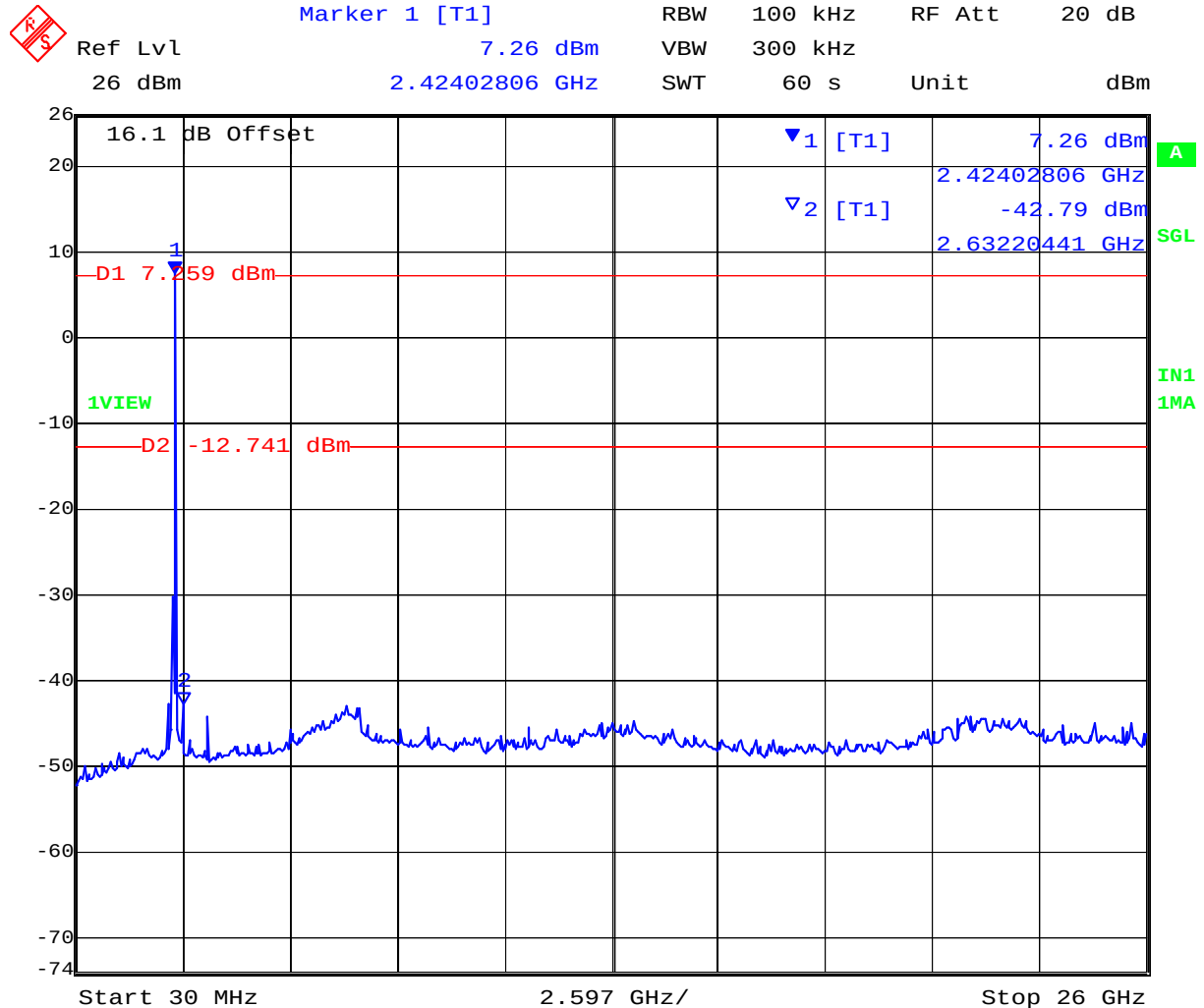
Date: 18.NOV.2011 15:29:10

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CHAIN B



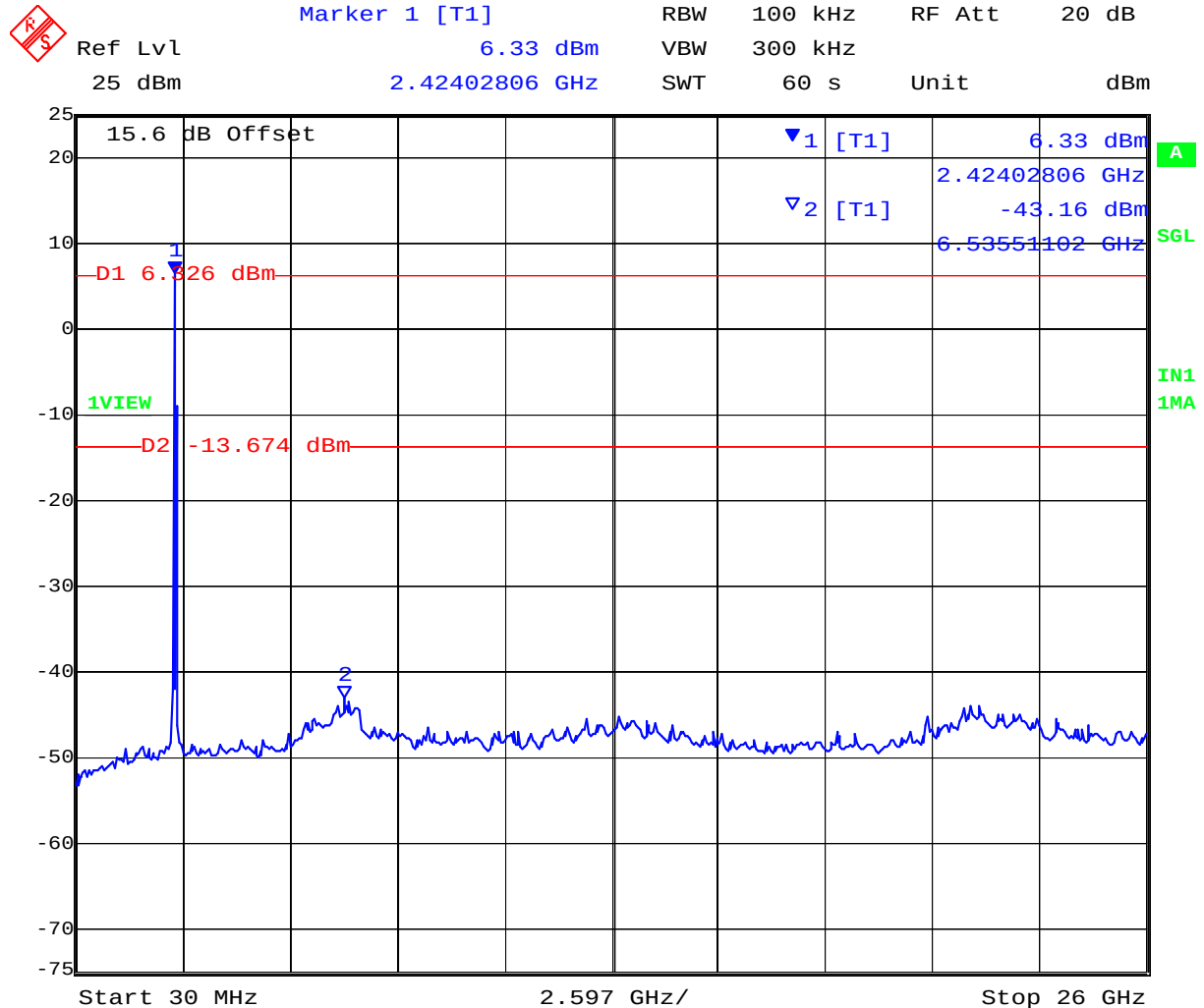
Date: 18.NOV.2011 15:30:54

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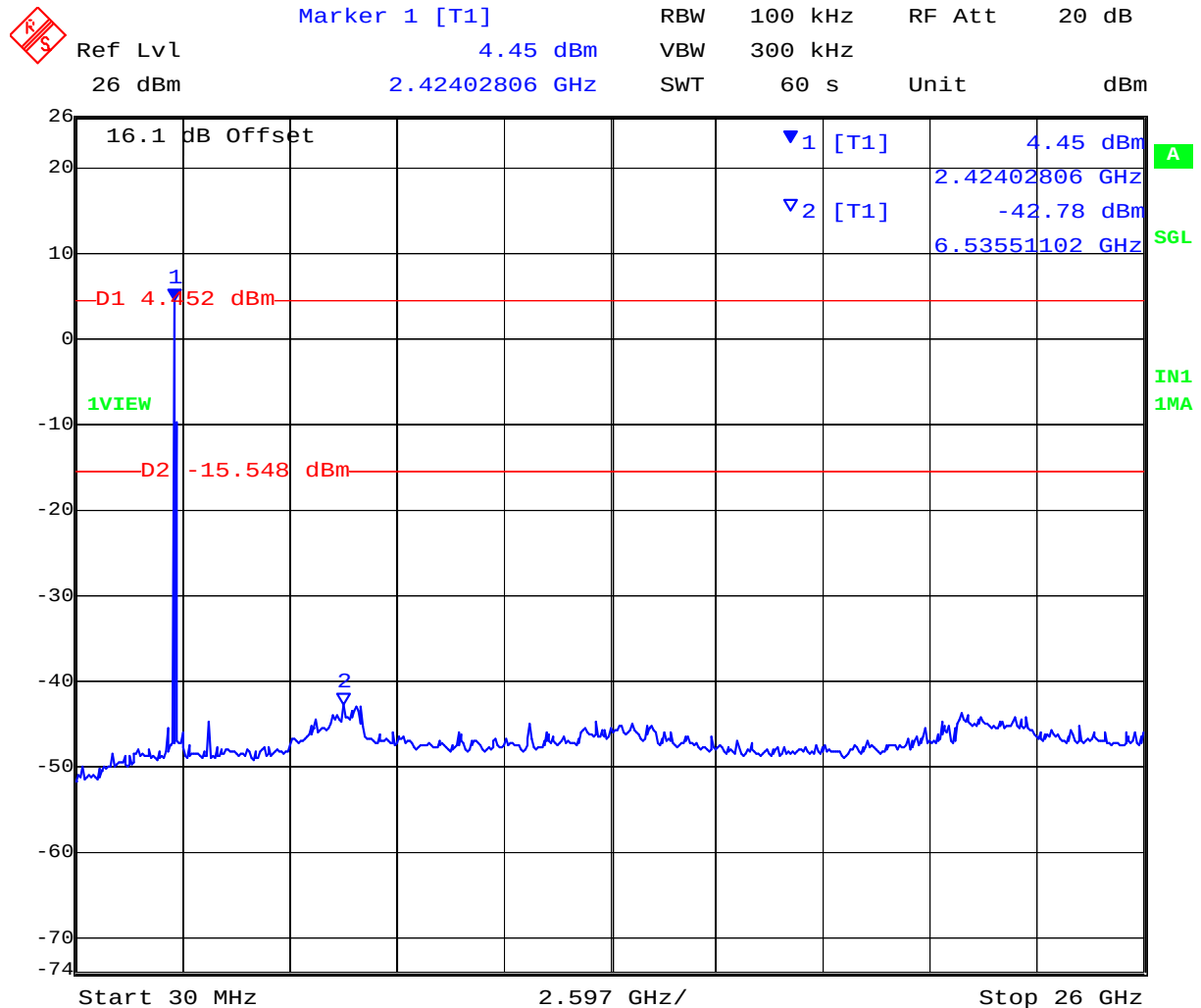
Date: 18.NOV.2011 15:51:40

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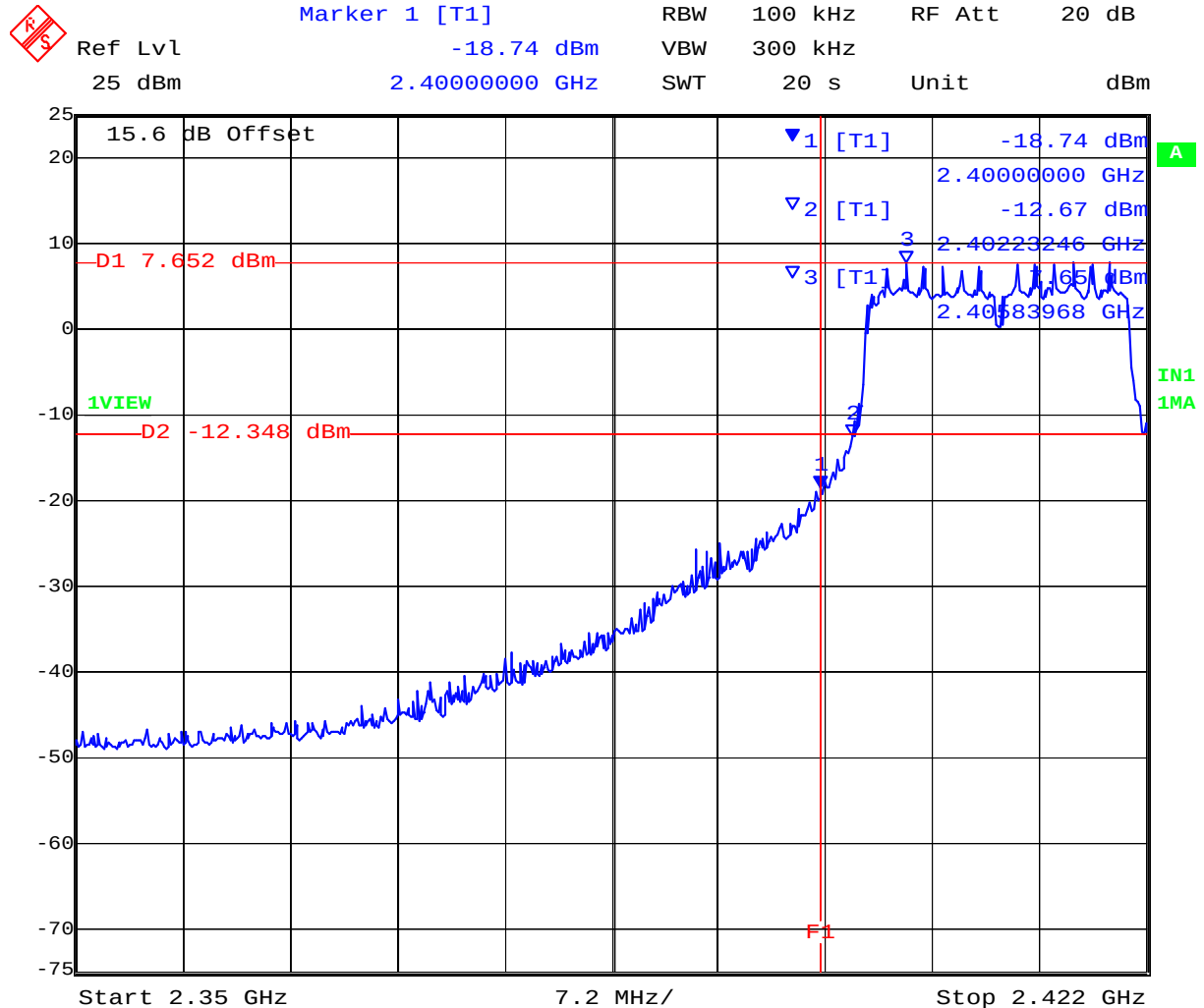
Date: 18.NOV.2011 15:53:26

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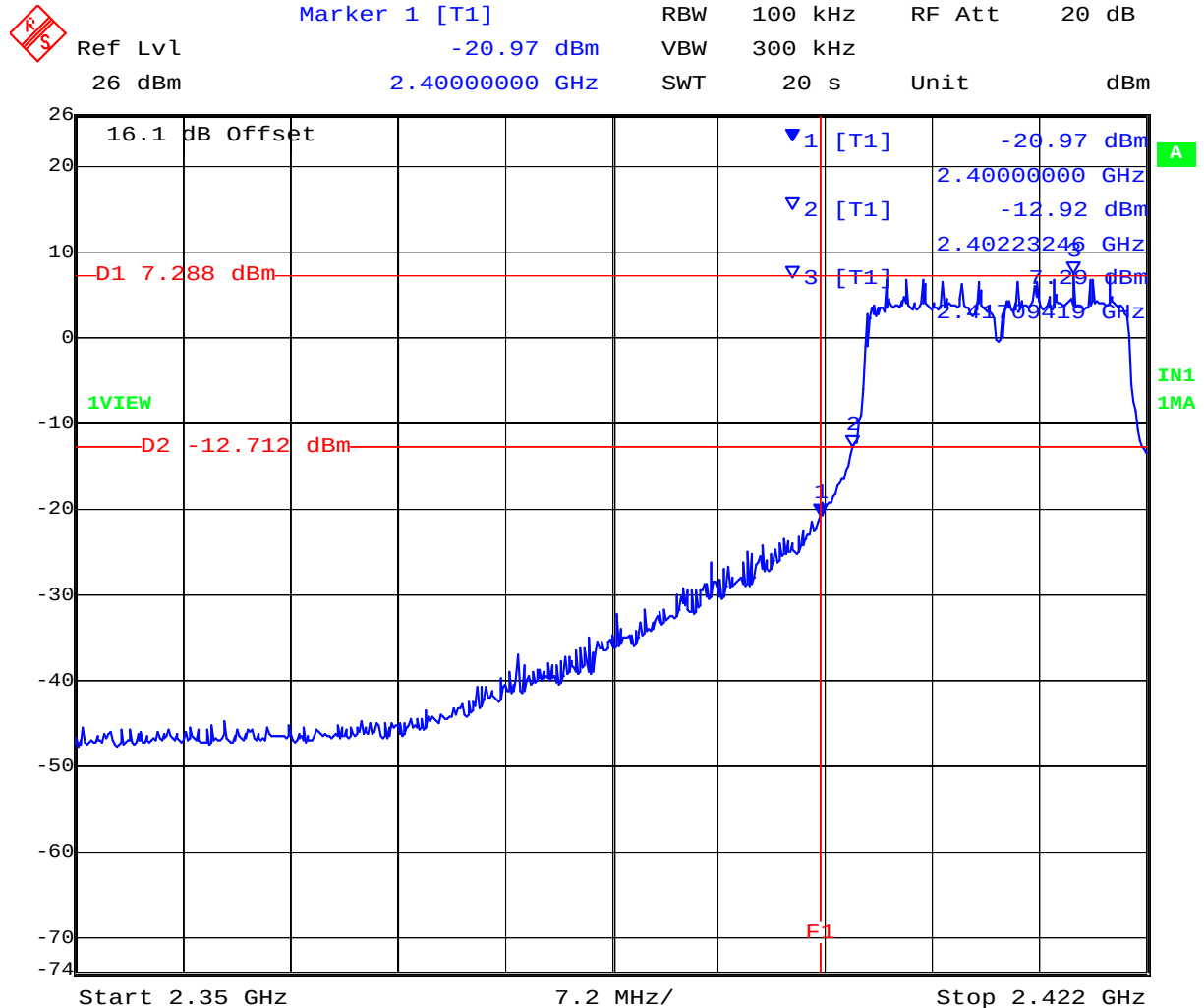
Date: 18.NOV.2011 14:52:48

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CHAIN B



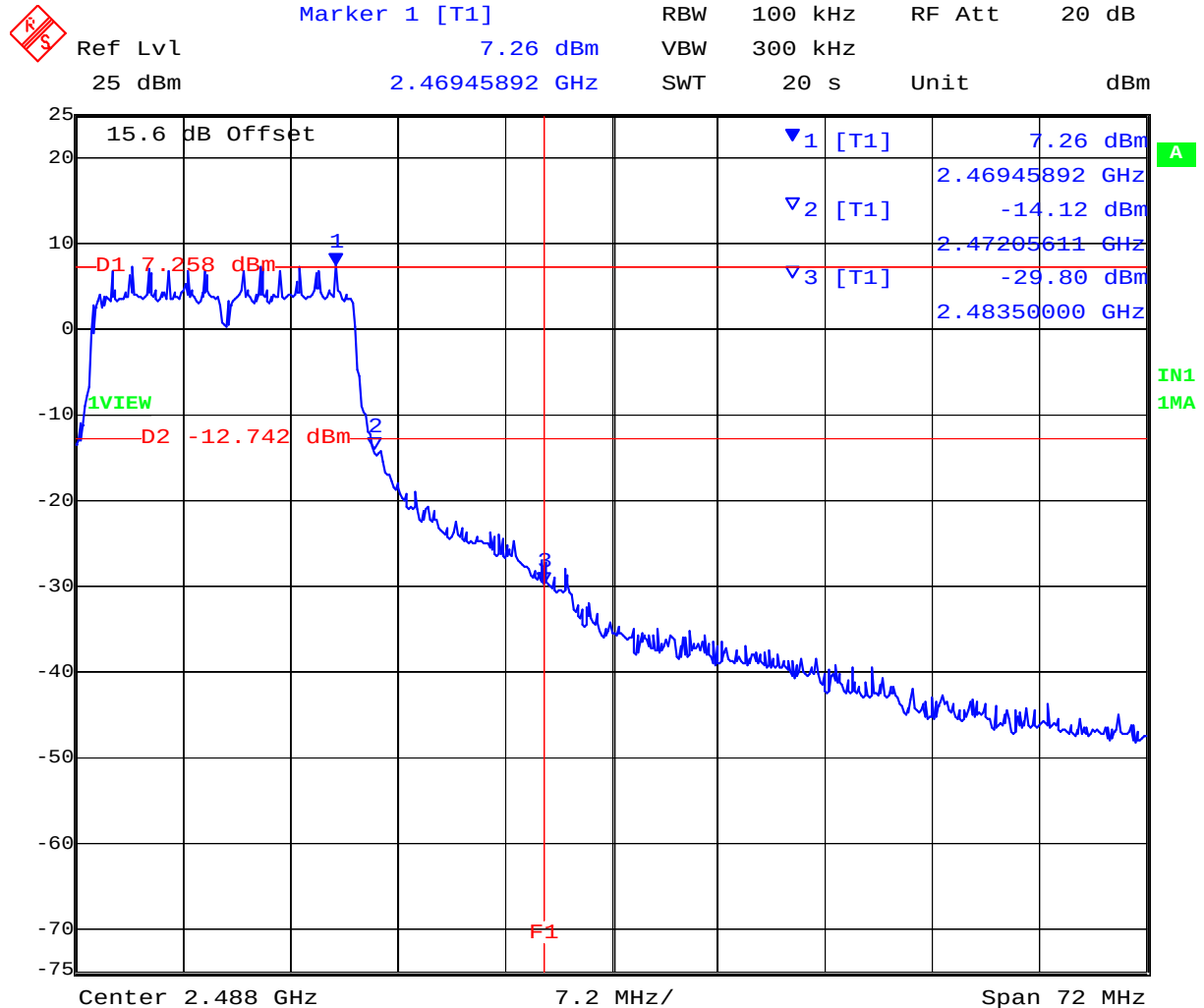
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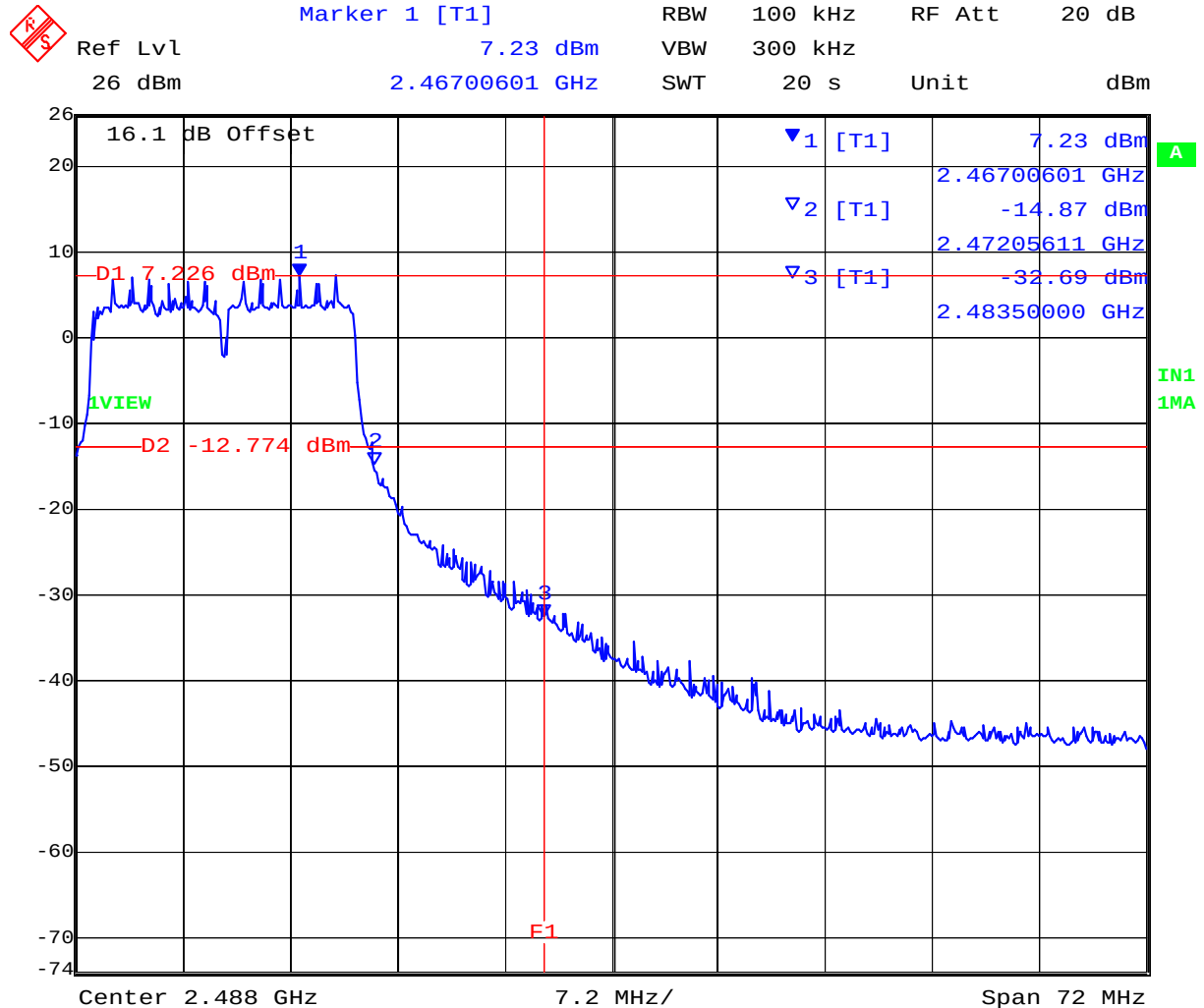
Date: 18.NOV.2011 15:34:53

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7.5.4 Measurement Results for 802.11n HT-40

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A dB	Antenna Gain:	N/A		dBi
Applied Voltage:	55.00 Vdc	Antenna Ports (N):	2		
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	-43.28	-17.62	-43.30	-18.36				
2437.000	30.00	26000.00	-43.52	-17.03	-43.30	-17.86				
2452.000	30.00	26000.00	-43.54	-17.96	-43.49	-15.23				

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	-21.71	-14.75	-23.76	-14.93				
2452.000	2483.50	-24.45	-15.33	-26.38	-15.17				

BE: Maximum Band edge emission found

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

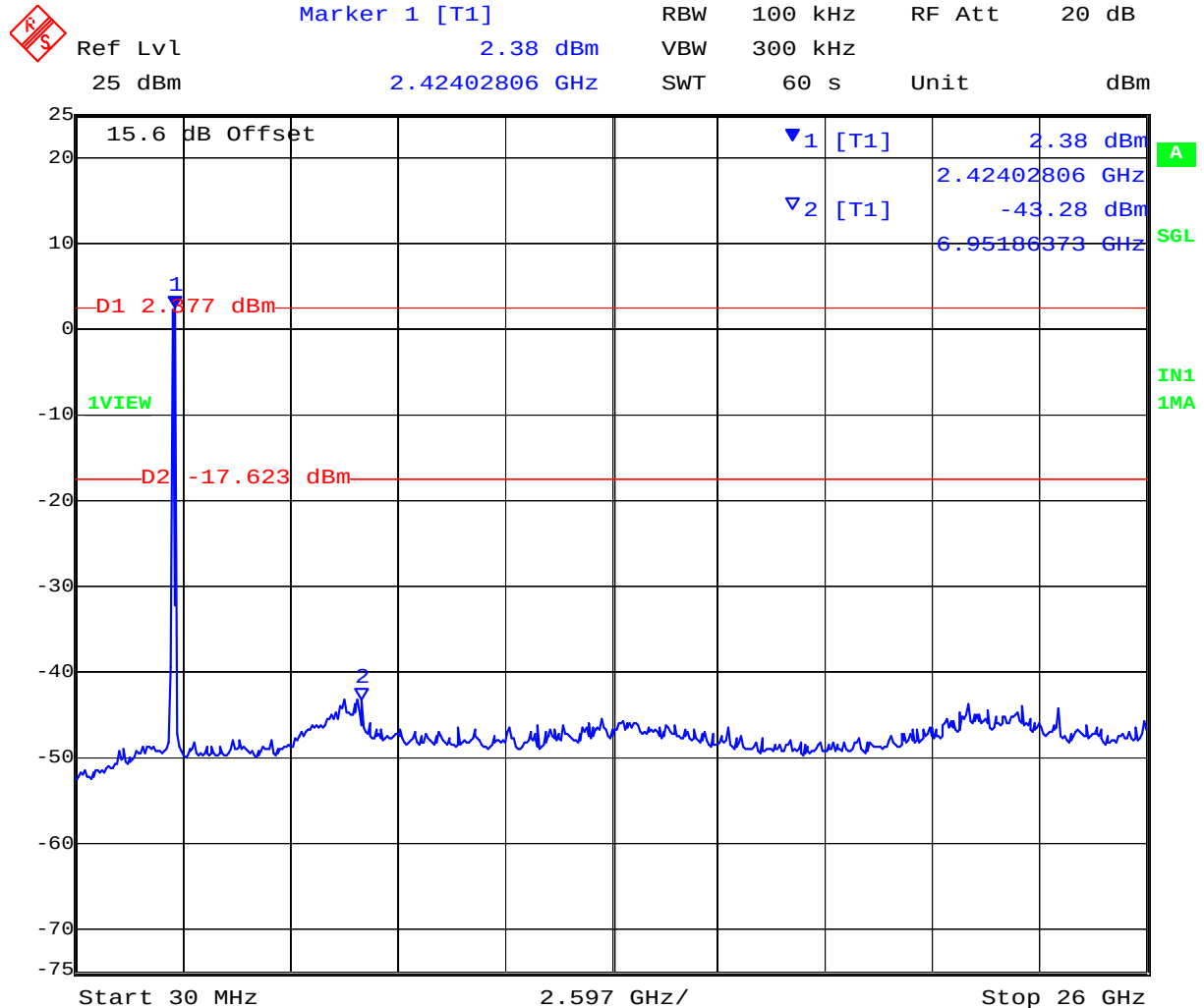
Note: Limit is based on 20dB down from fundamental emissions

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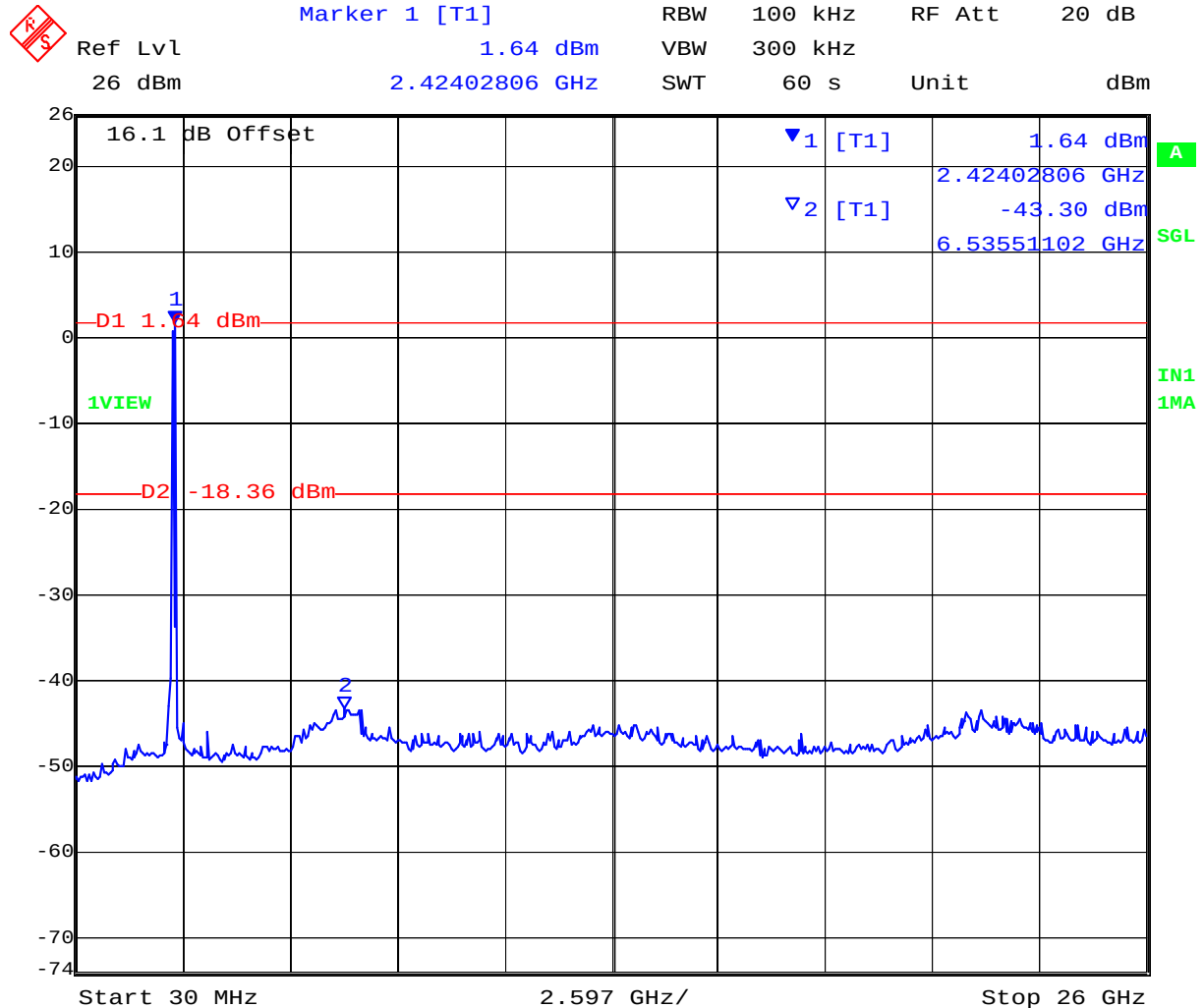
Date: 18.NOV.2011 16:17:48

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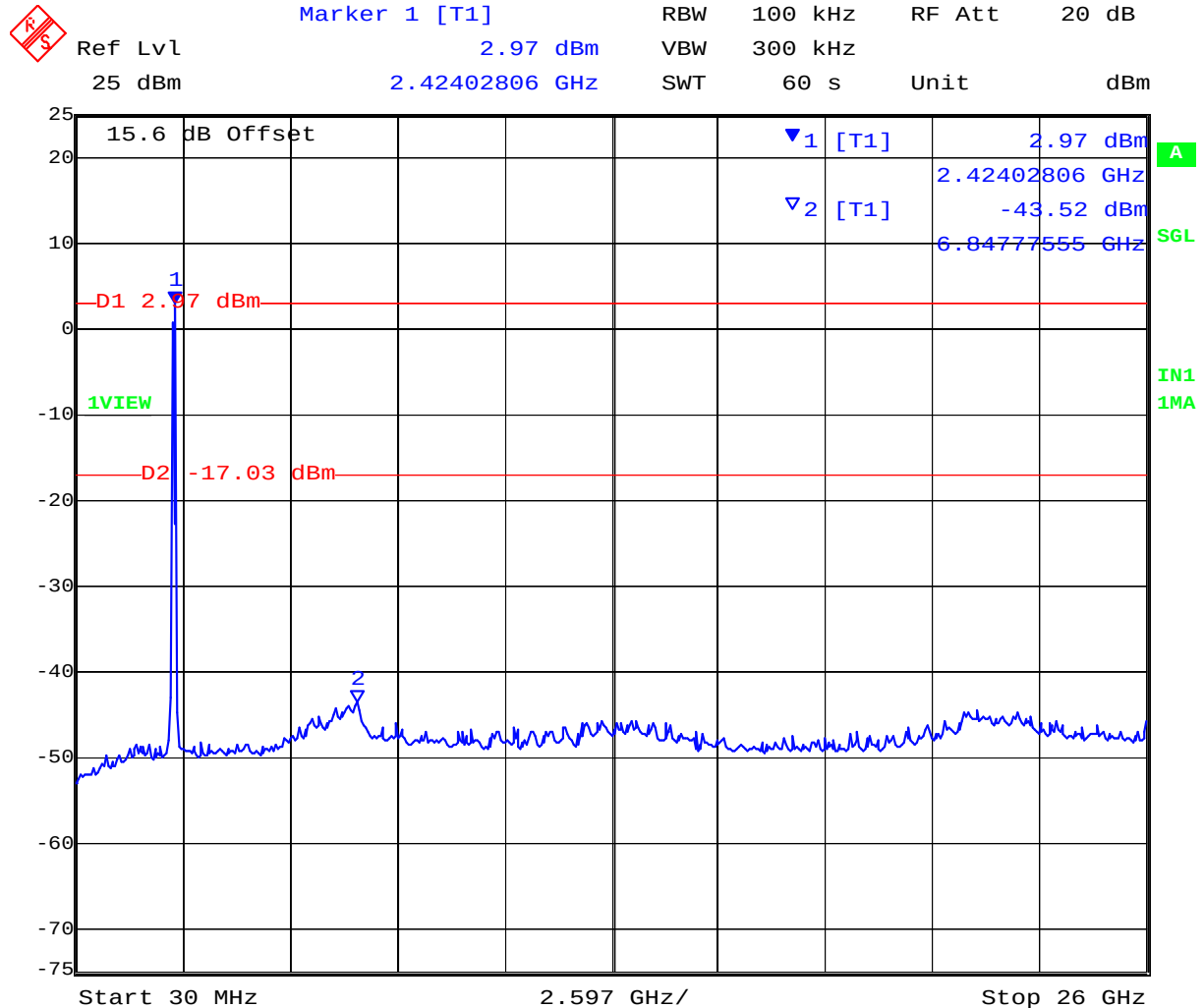
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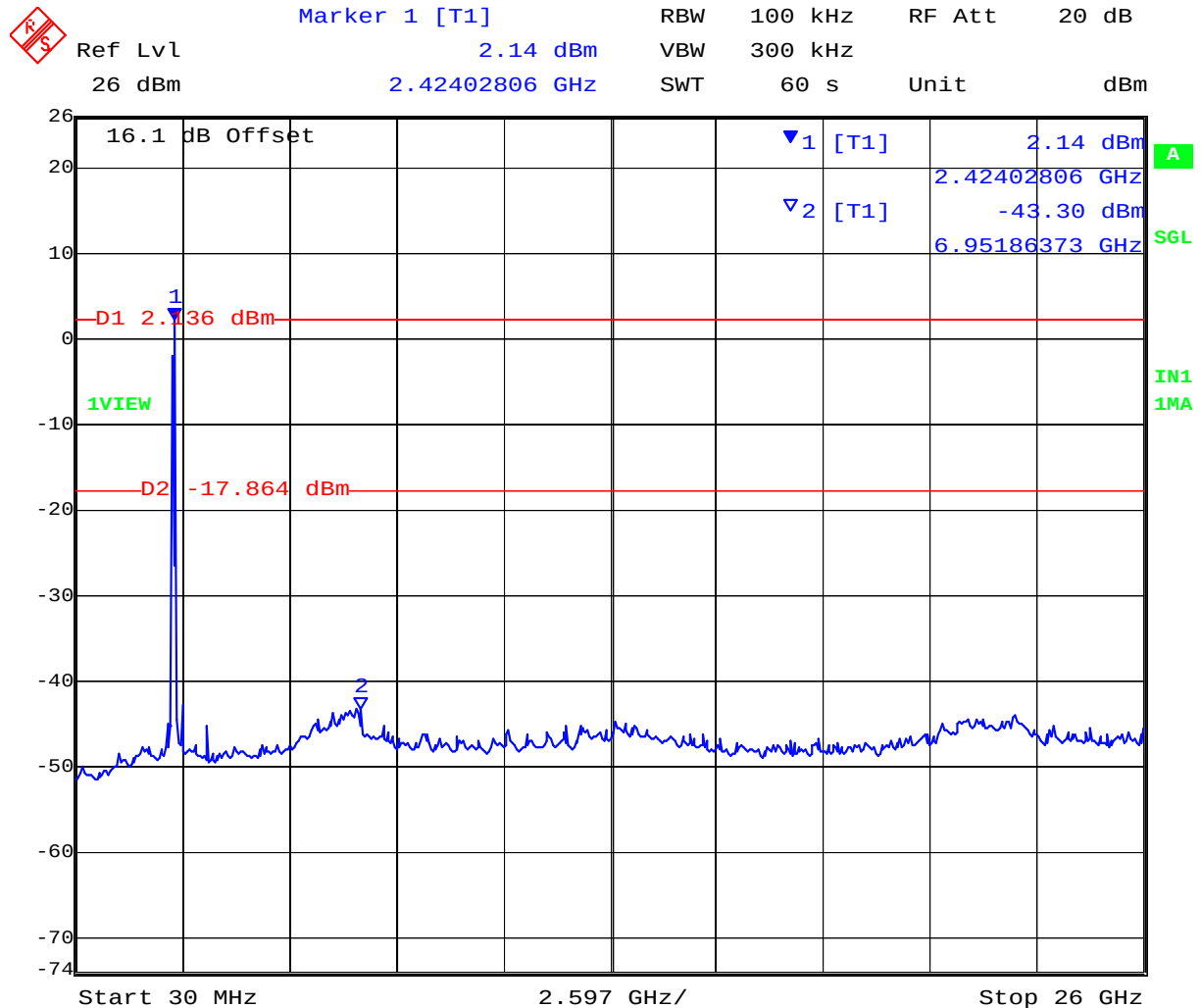
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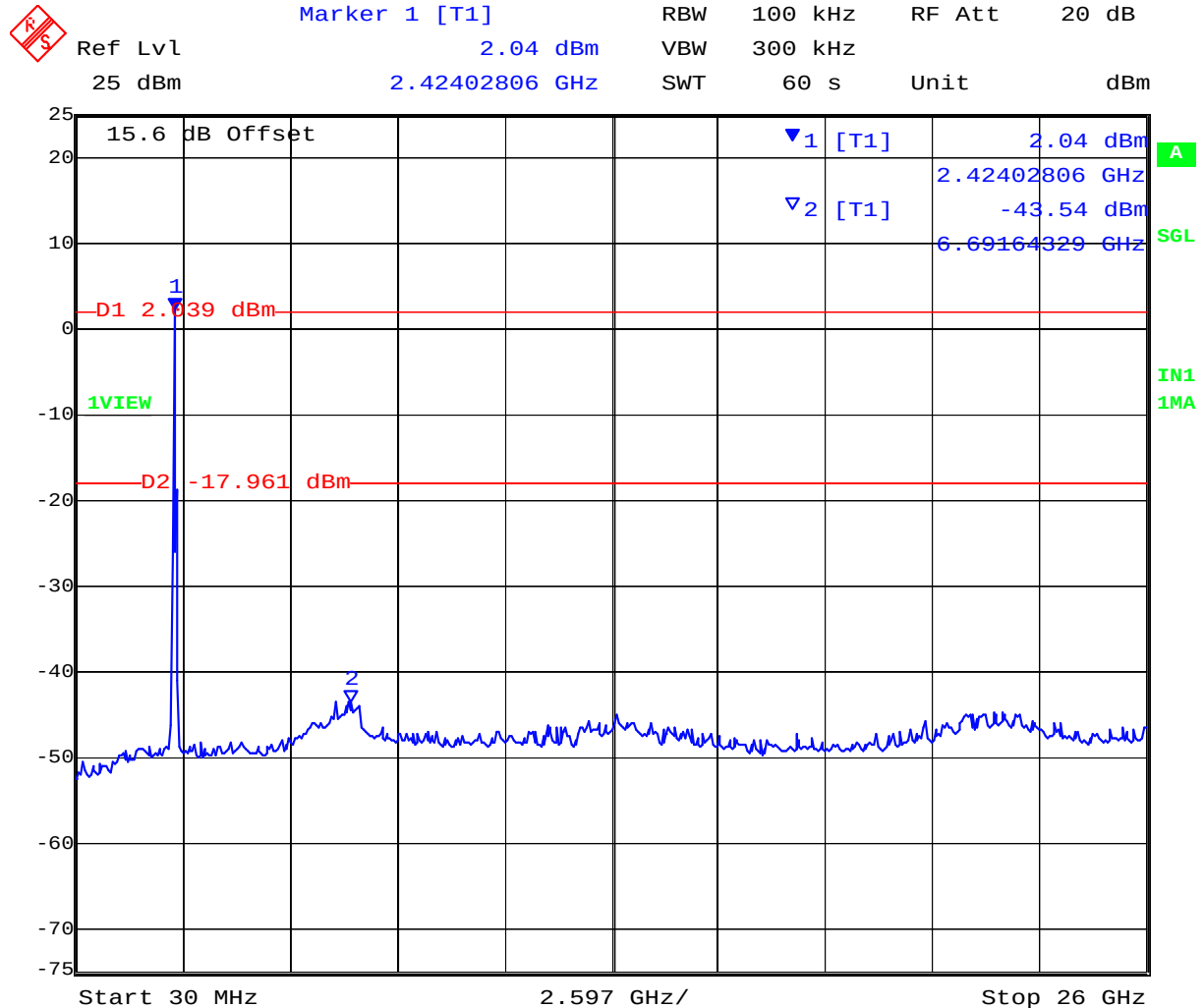
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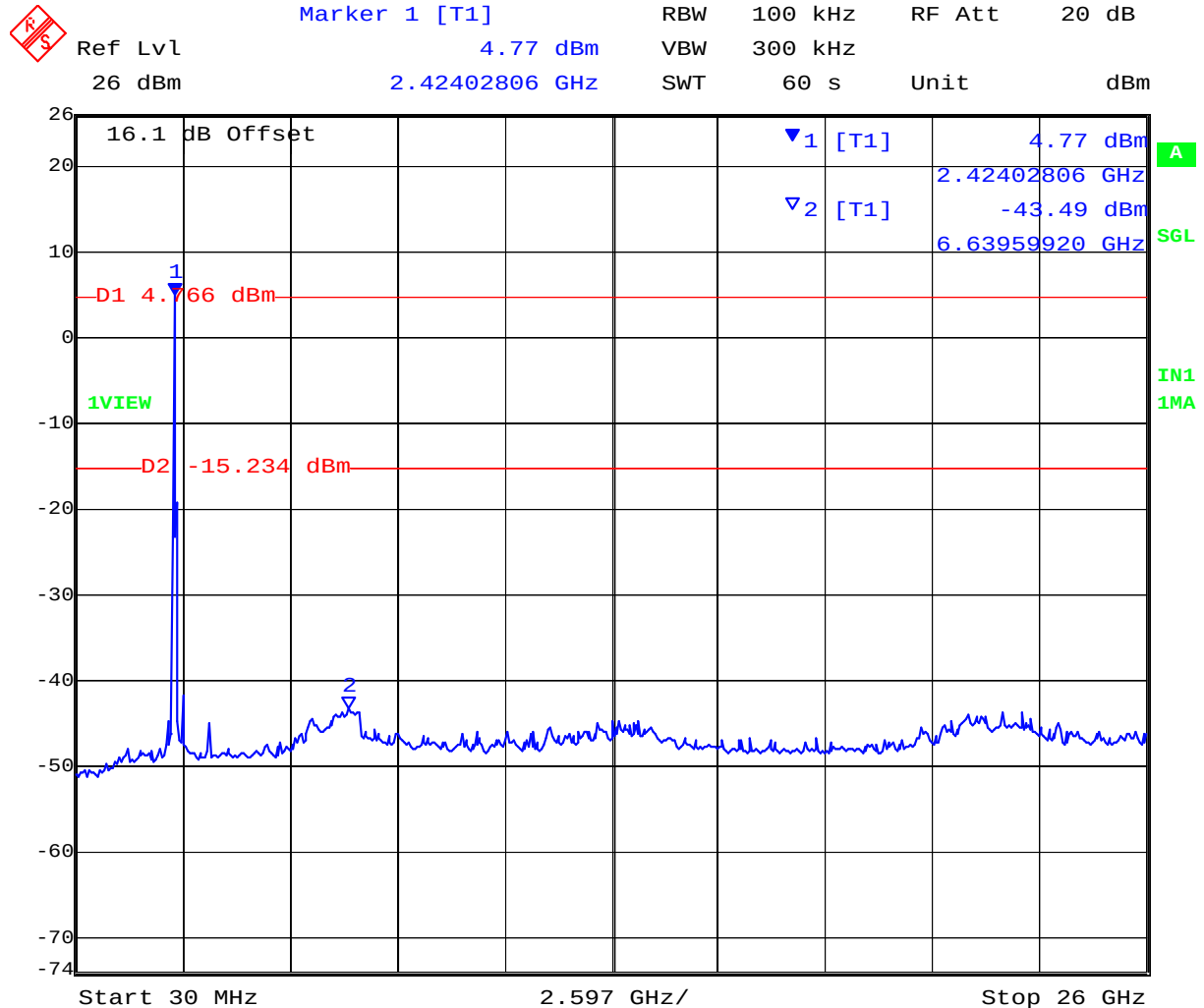
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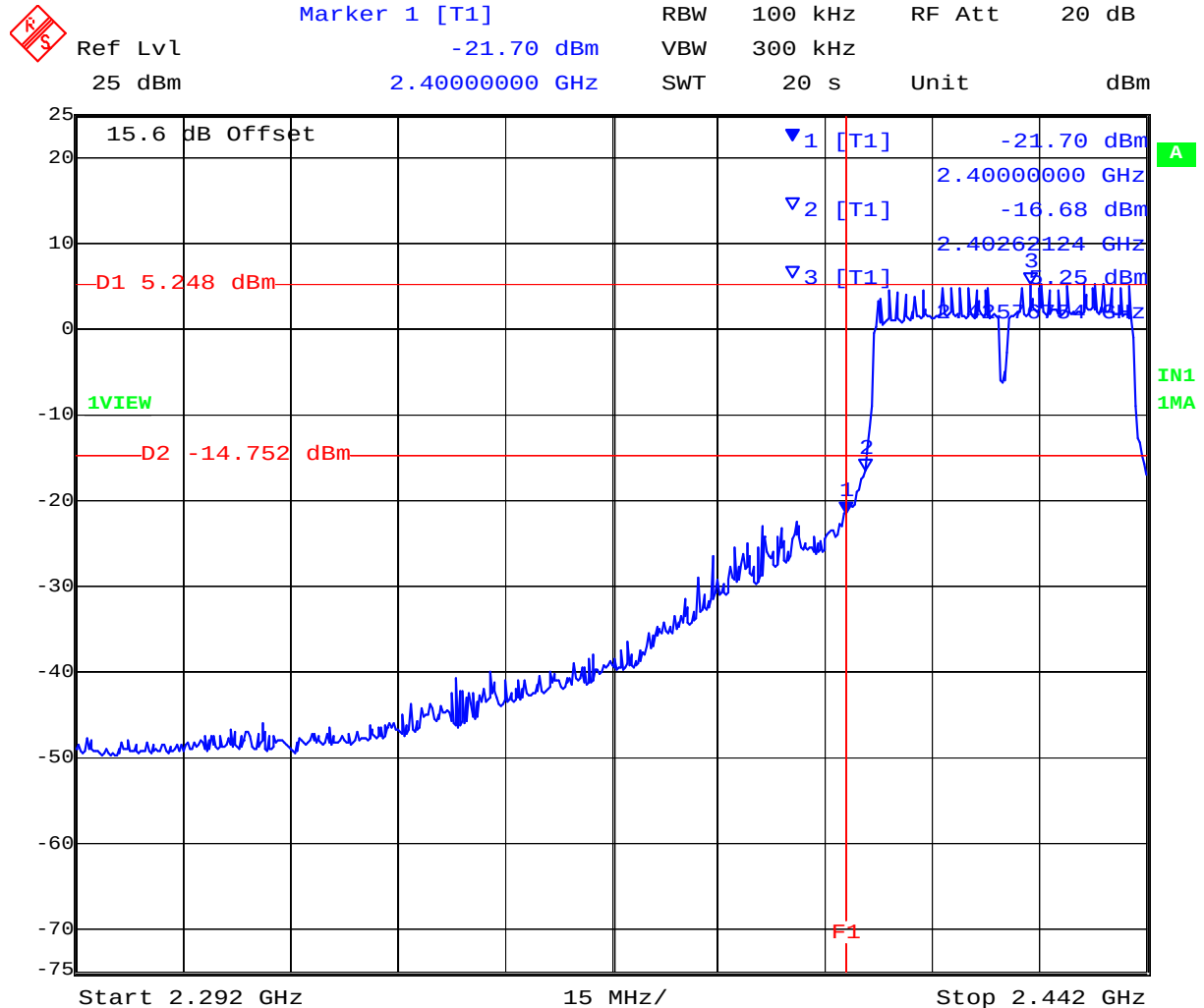
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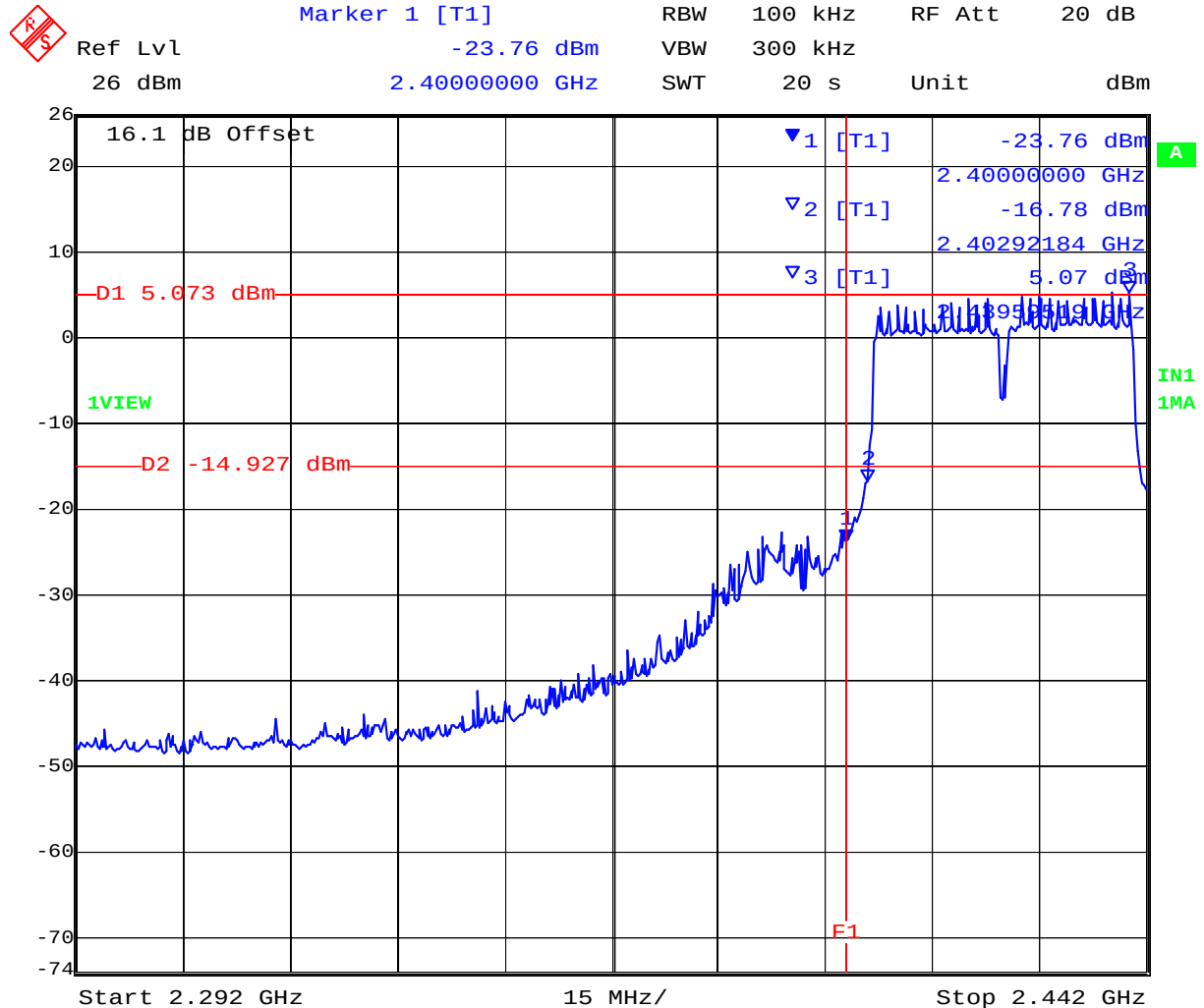
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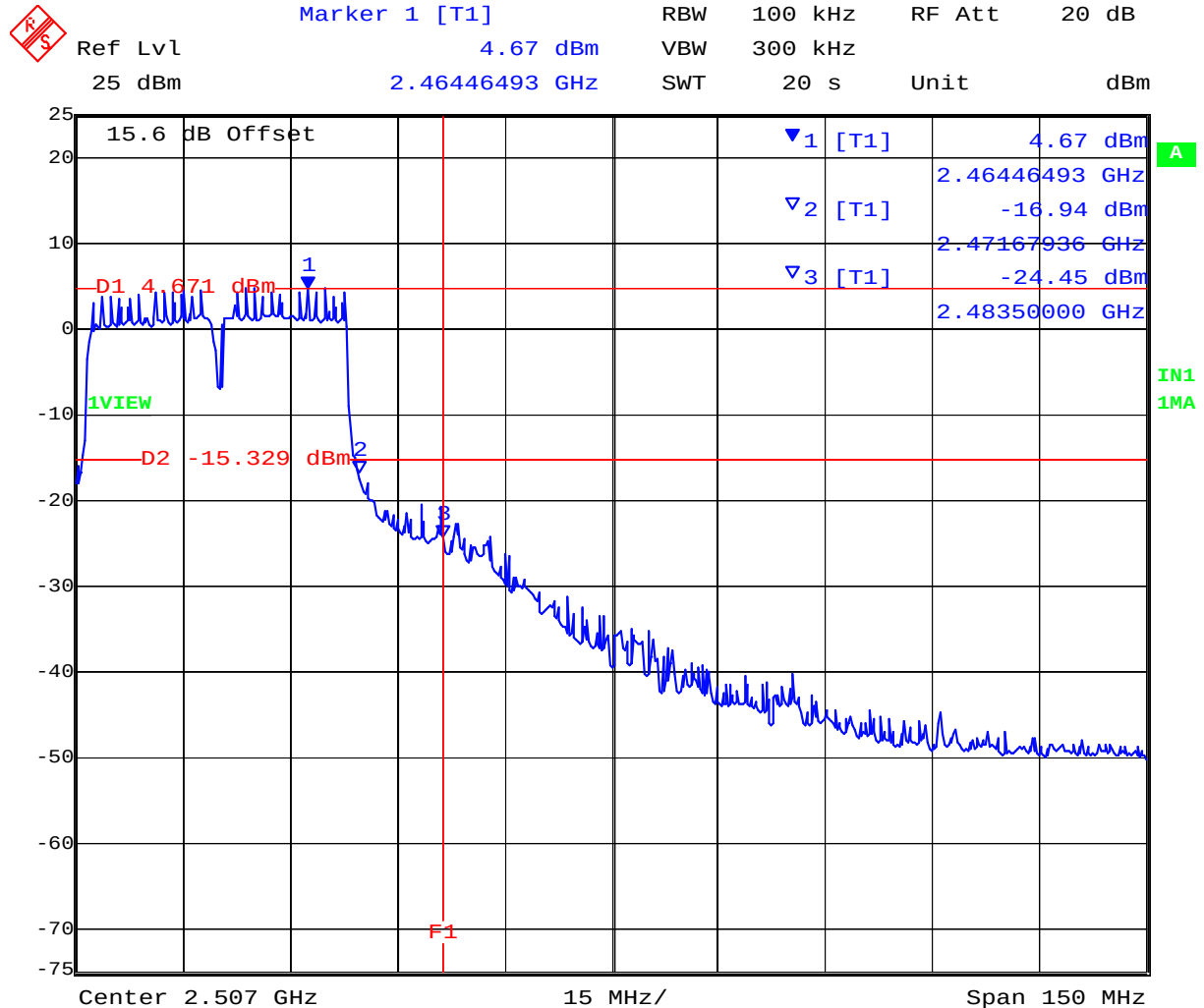
Date: 18.NOV.2011 16:02:27

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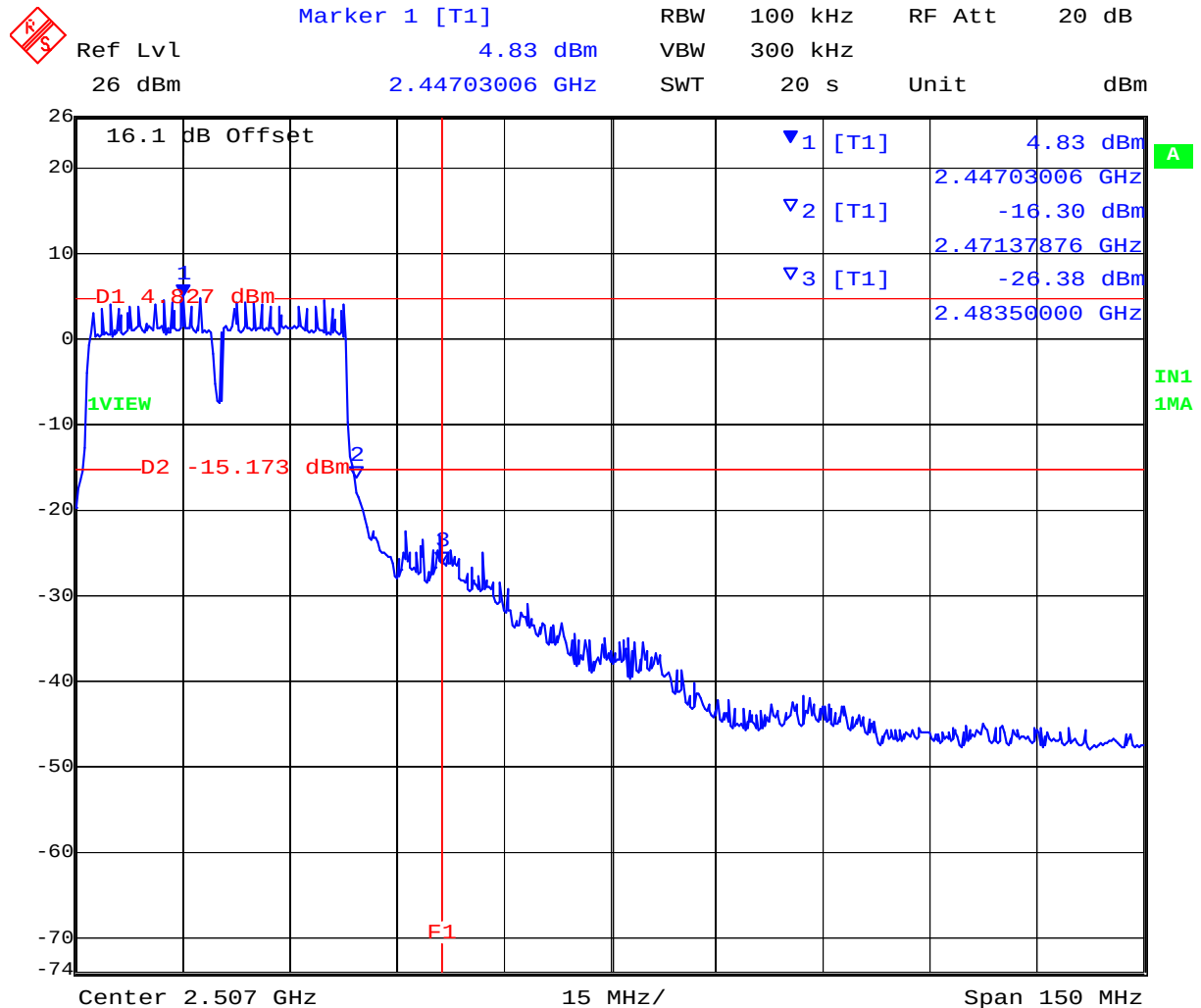
Date: 18.NOV.2011 16:53:59

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7.5.5 Measurement results for 802.11a

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11a	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming	N/A	Antenna Gain:	N/A		dBi
Applied Voltage:	12.00				Vdc
Notes 1:					
Notes 2:					

Conducted Spurious Measurement

Test Frequency	Start Frequency	Stop Frequency	Maximum Observed Emission	Limit (20 dB below peak of fundamental)
MHz	MHz	MHz	dBm	dBm
5745	30.00	40000.00	-40.22	-12.00
5785	30.00	40000.00	-39.57	-13.55
5825	30.00	40000.00	-39.87	-11.78

Band-edge Measurement

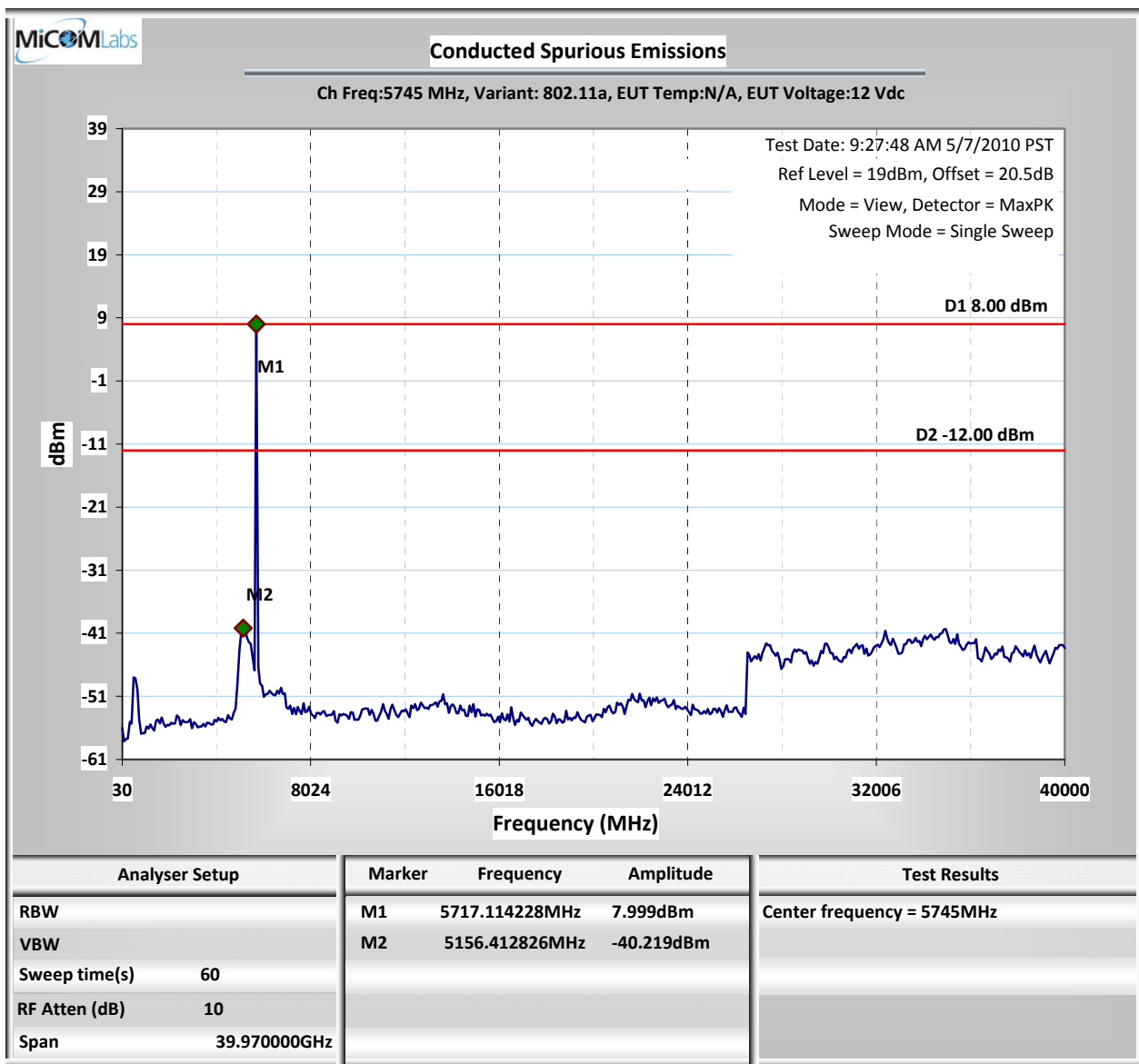
Test Frequency	Band-edge Frequency	Emission Amplitude @ Band-edge	Limit (20 dB below peak of fundamental)	Margin
MHz	MHz	dBm	dBm	dB
5745.00	5725.00	-25.51	-8.86	-16.65
5825.00	5850.00	-37.18	-10.35	-26.84

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

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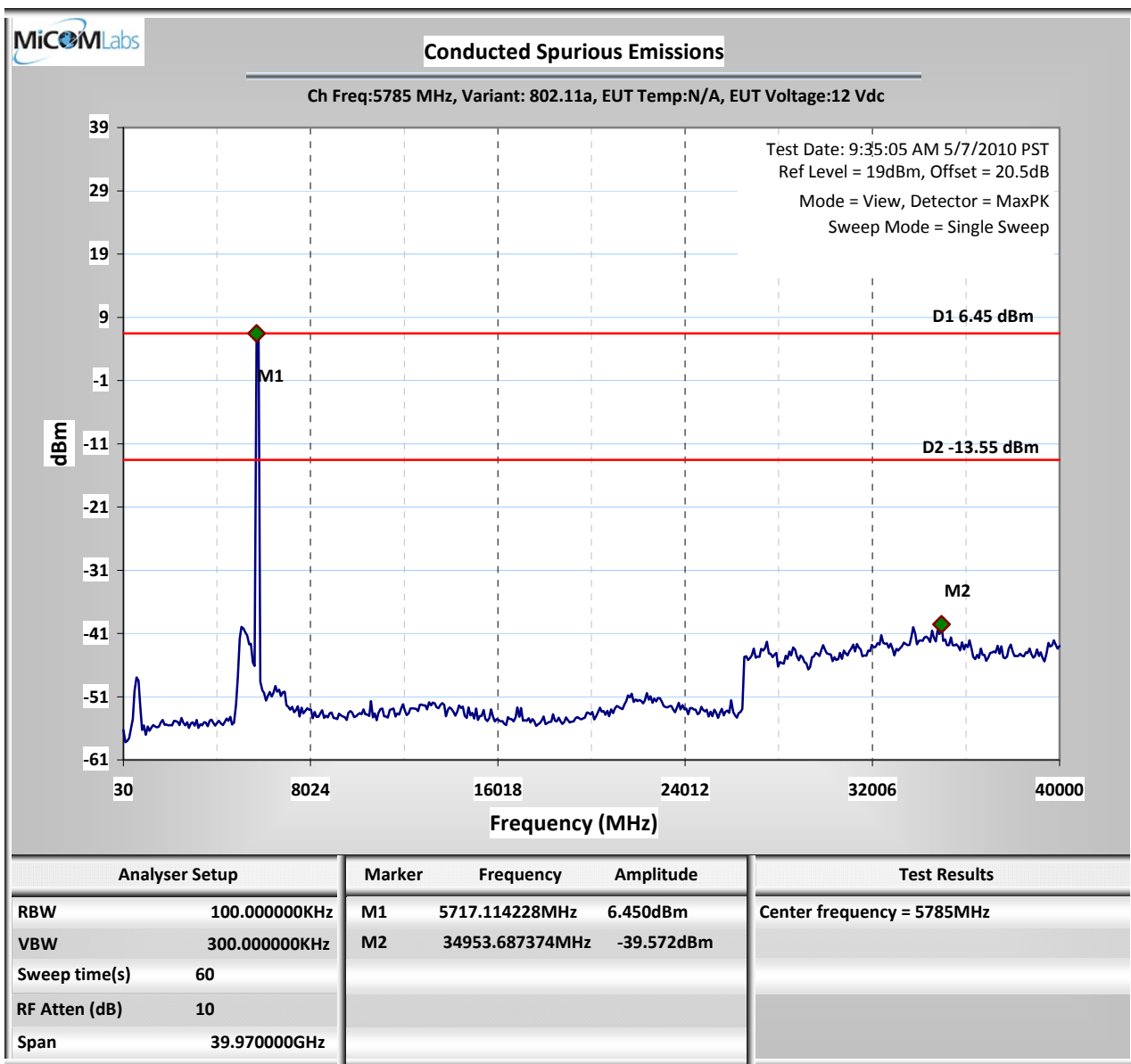
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To: FCC 47 CFR Part 15.247 & IC RSS-210
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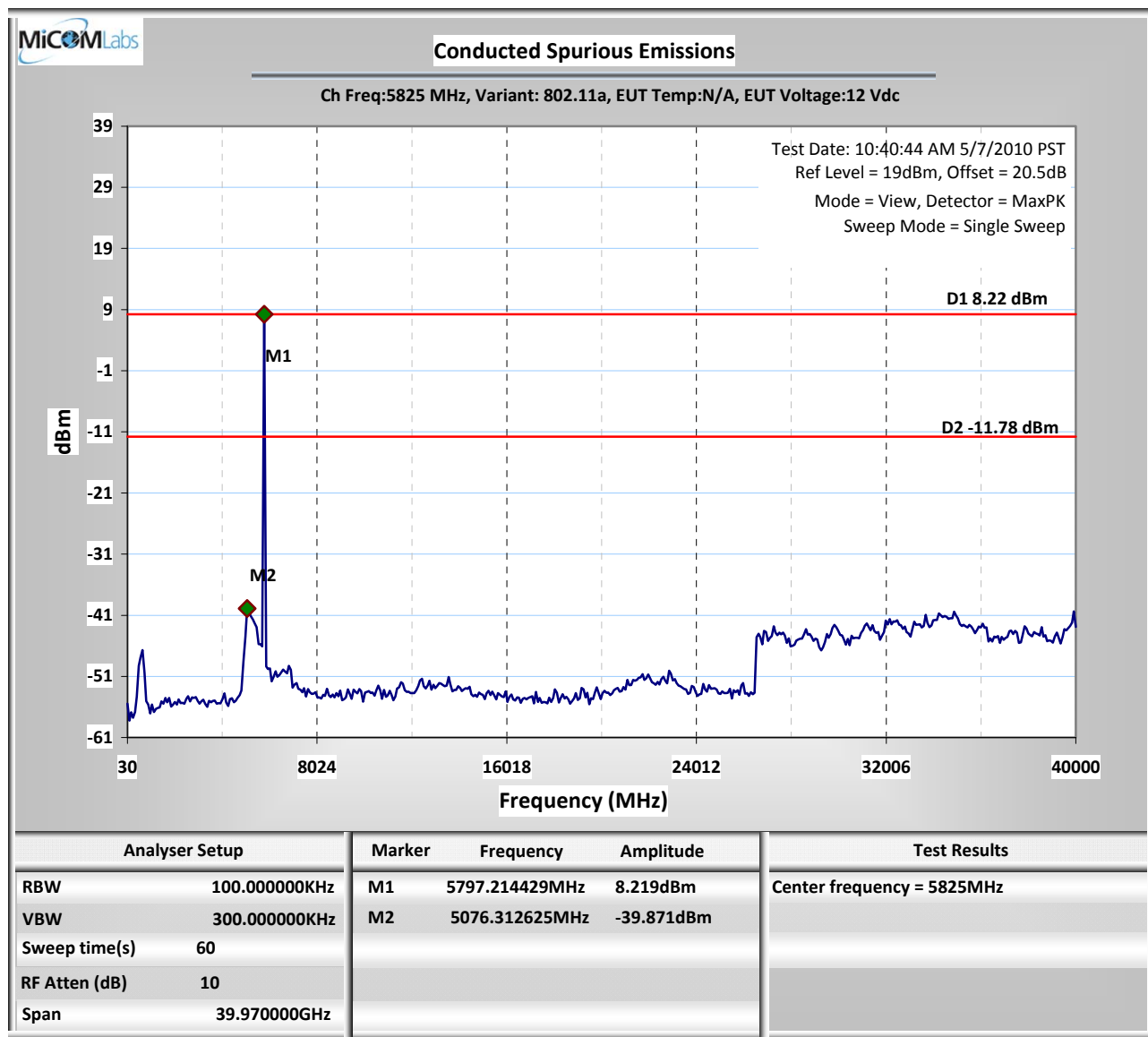
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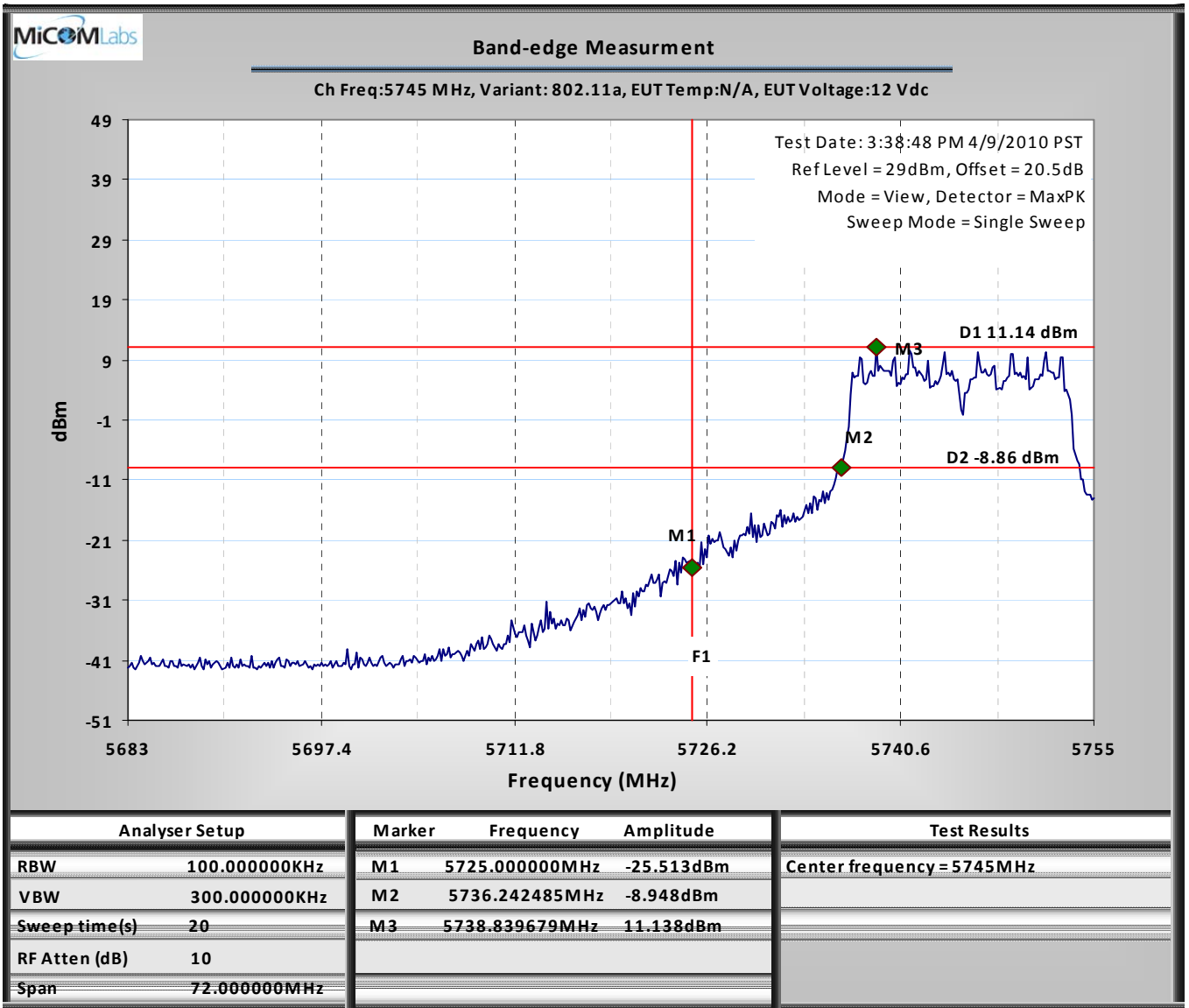
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: ARUB74-U1 Rev A
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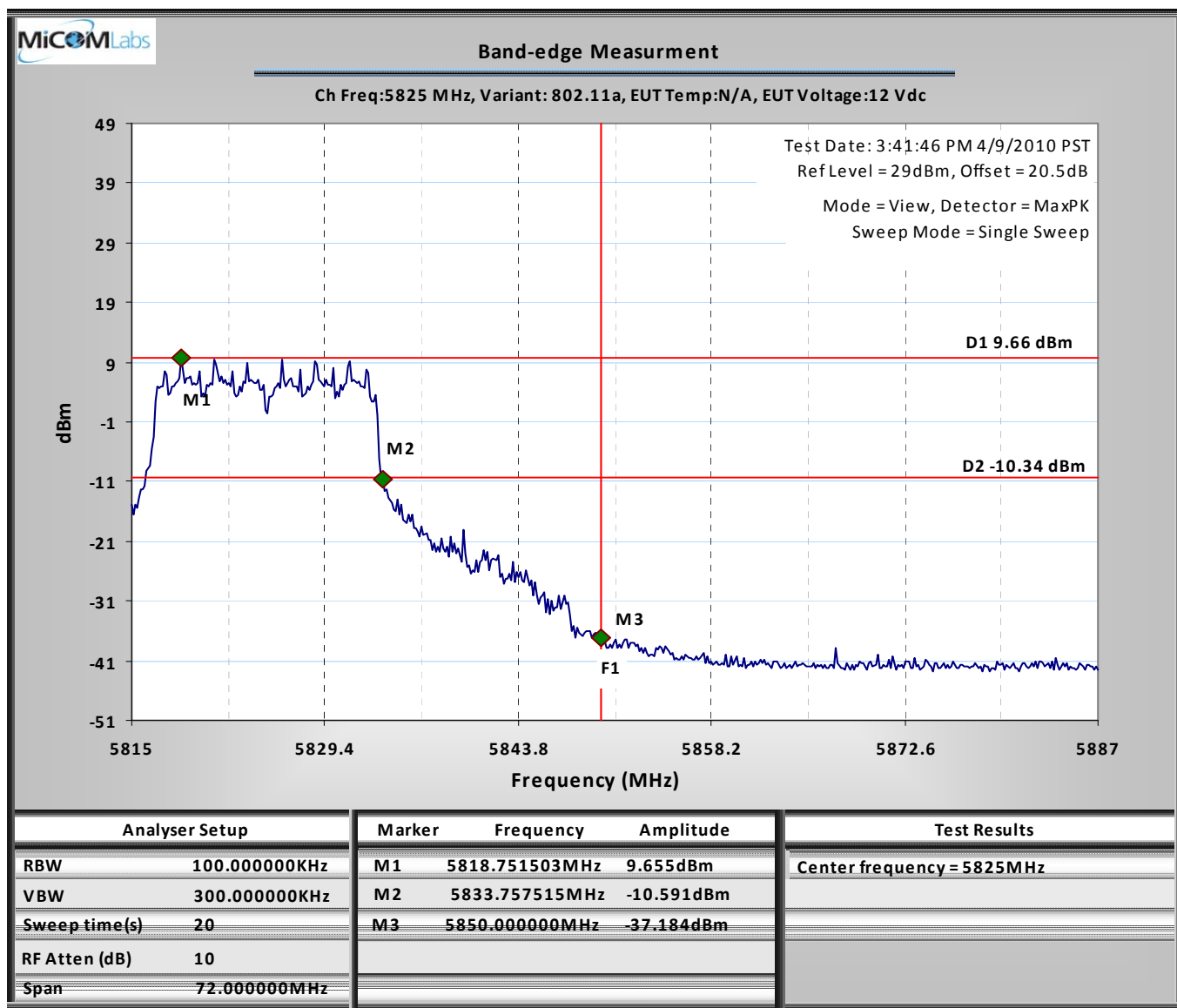
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7.5.6 Measurement Results for 802.11n HT-20

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-20	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A	Antenna Gain:	N/A		dBi
Applied Voltage:	12.00	Vdc			
Notes 1:					
Notes 2:					

Conducted Spurious Measurement

Test Frequency	Start Frequency	Stop Frequency	Maximum Observed Emission	Limit (20 dB below peak of fundamental)
MHz	MHz	MHz	dBm	dBm
5745	30.00	40000.00	-40.47	-14.82
5785	30.00	40000.00	-40.55	-10.37
5825	30.00	40000.00	-39.63	-14.65

Band-edge Measurement

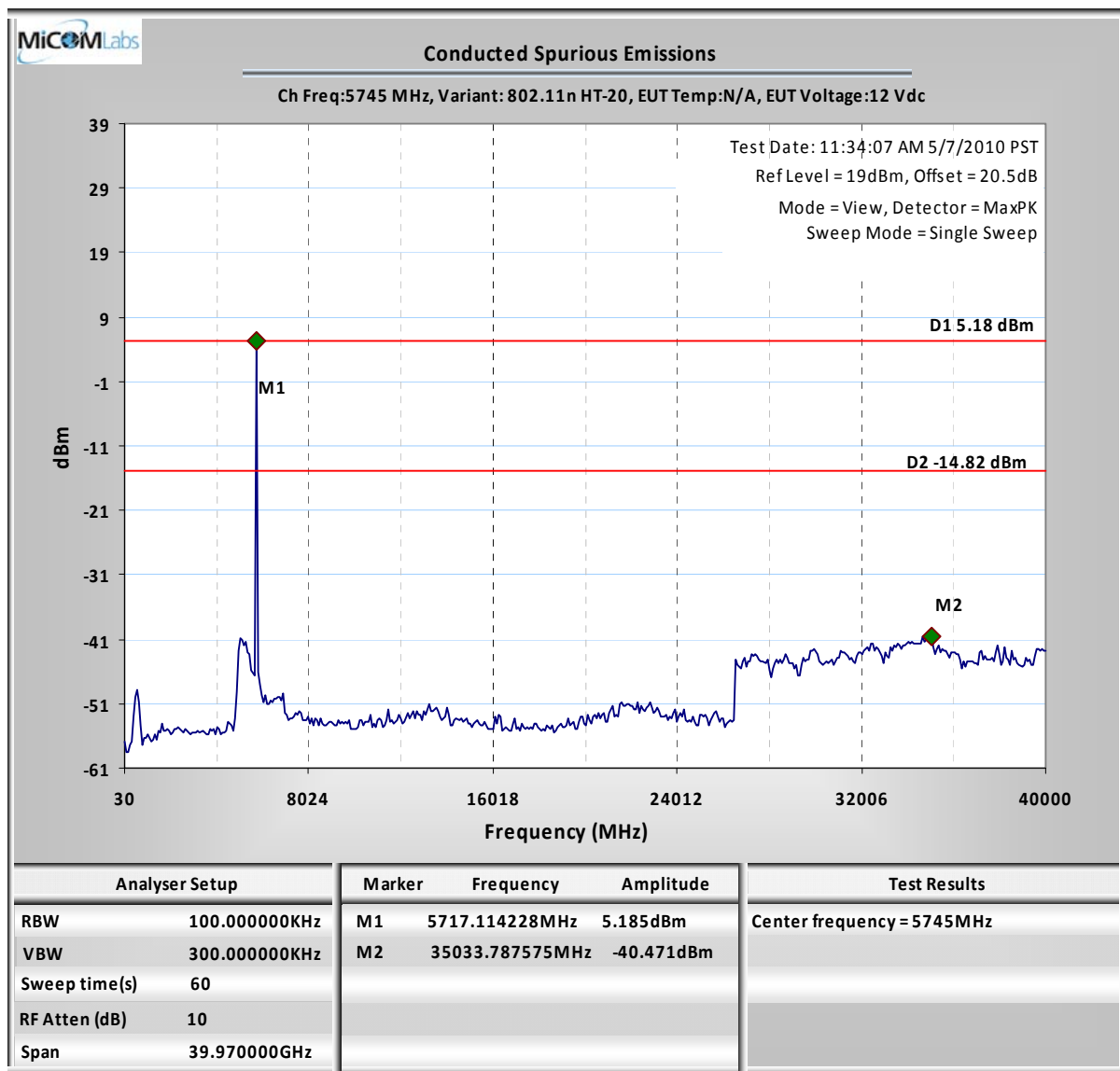
Test Frequency	Band-edge Frequency	Emission Amplitude @ Band-edge	Limit (20 dB below peak of fundamental)	Margin
MHz	MHz	dBm	dBm	dB
5745.00	5725.00	-24.27	-8.86	-15.42
5825.00	5850.00	-36.44	-10.05	-26.39

Measurement uncertainty:	±2.81 dB
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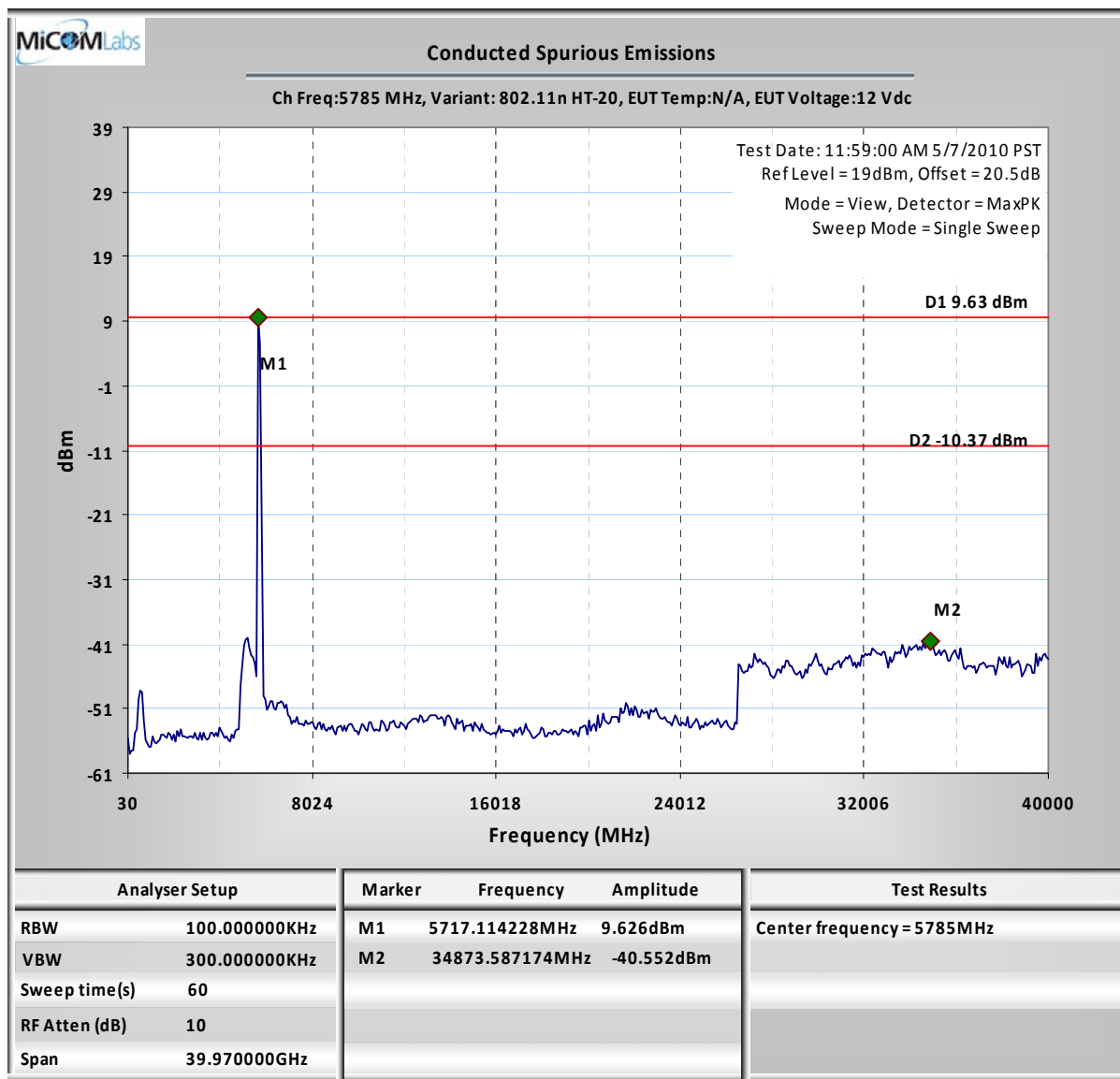
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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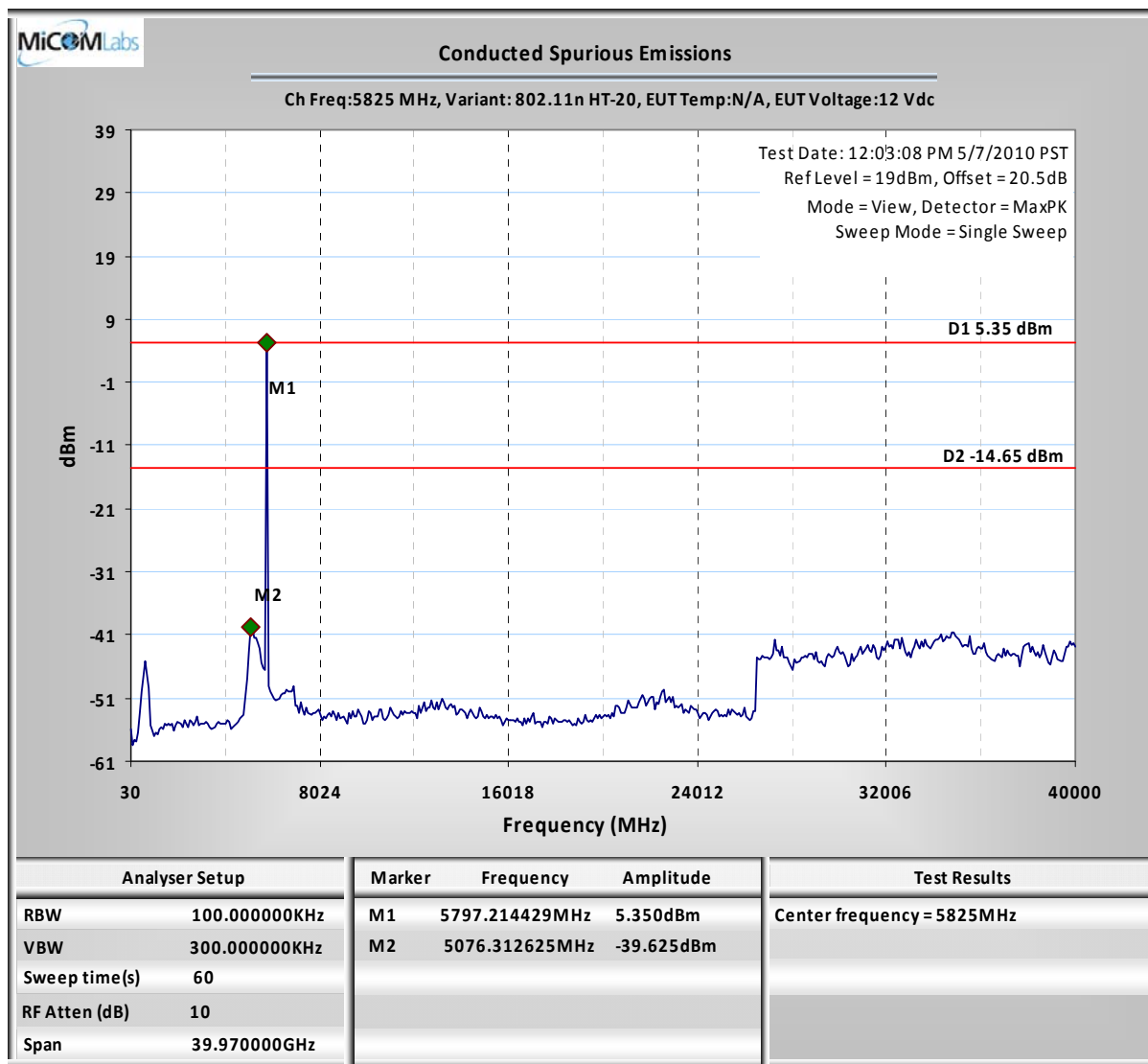
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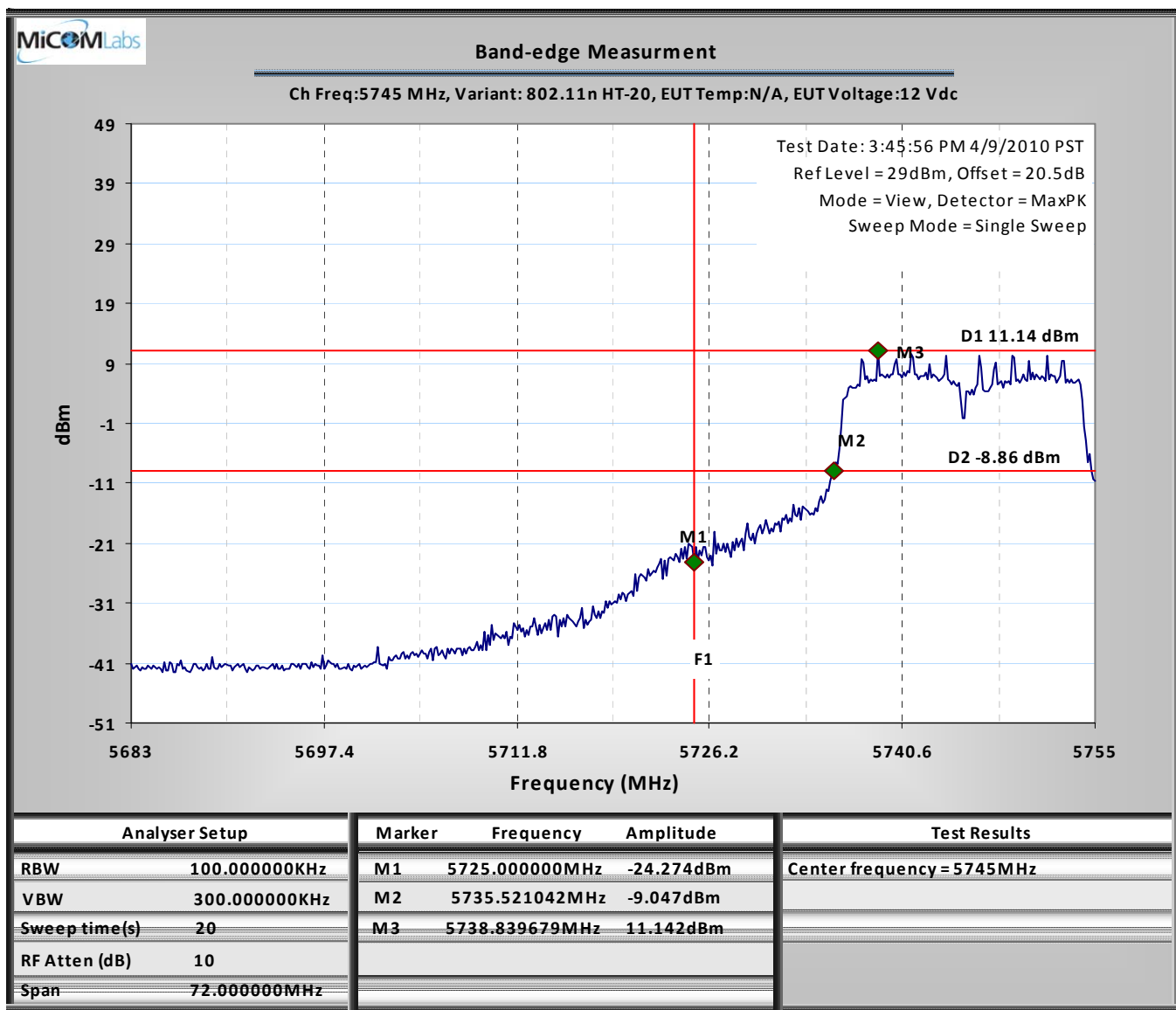
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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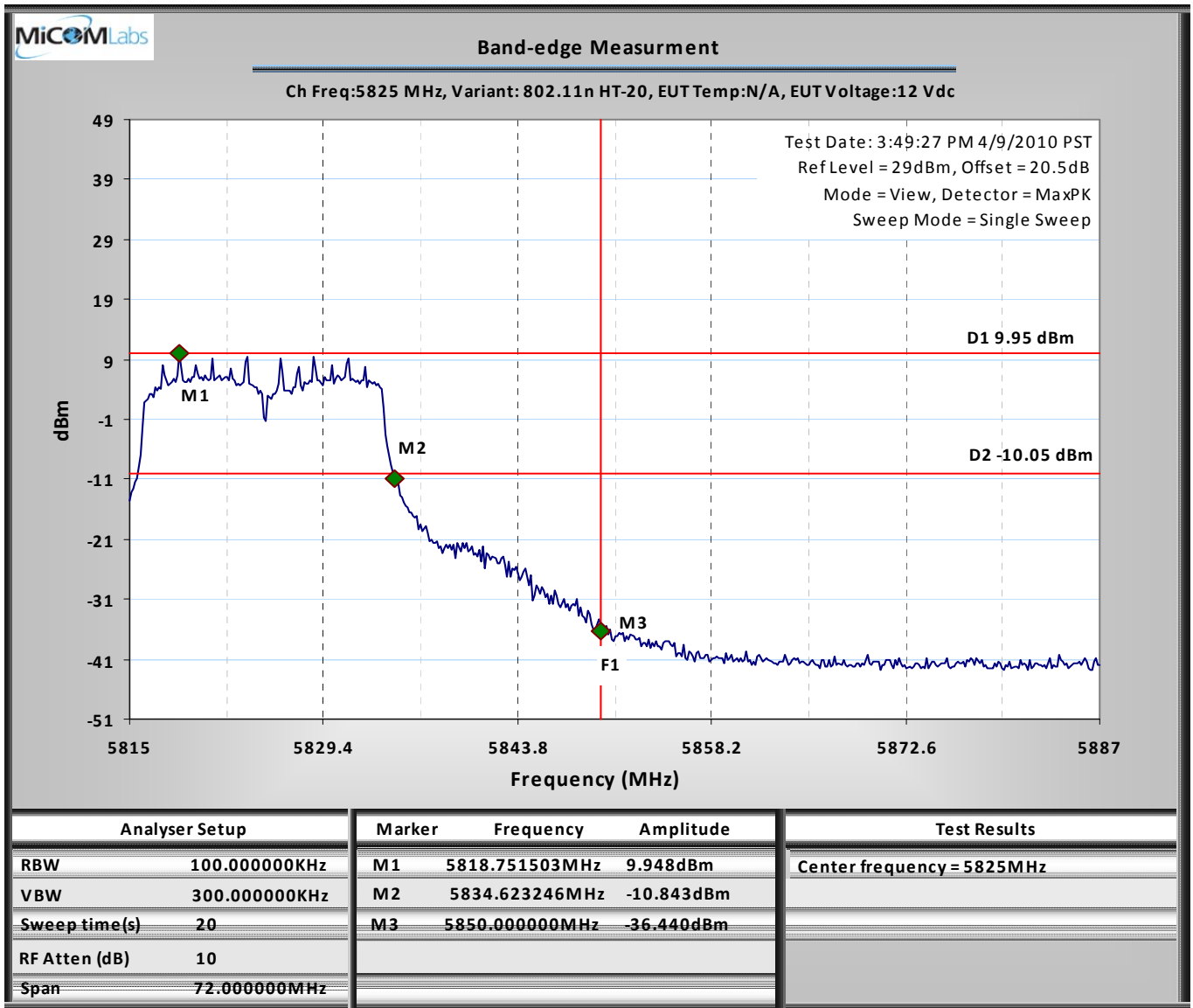
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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7.5.7 Measurement Results for 802.11n HT-40

Test Conditions:	15.247 (a)(2)	Rel. Humidity (%):	35	to	42
Variant:	802.11n HT-40	Ambient Temp. (°C):	19	to	22
TPC:	HIGH	Pressure (mBars):	998	to	1003
Modulation:	ON	Duty Cycle (%):	100		
Beam Forming Gain	N/A	Antenna Gain:	N/A		dBi
Applied Voltage:	12.00				Vdc
Notes 1:					
Notes 2:					

Conducted Spurious Measurement

Test Frequency	Start Frequency	Stop Frequency	Maximum Observed Emission	Limit (20 dB below peak of fundamental)
MHz	MHz	MHz	dBm	dBm
5755	30.00	40000.00	-40.38	-14.06
5785	30.00	40000.00	-39.43	-14.68
5815	30.00	40000.00	-39.20	-15.73

Band-edge Measurement

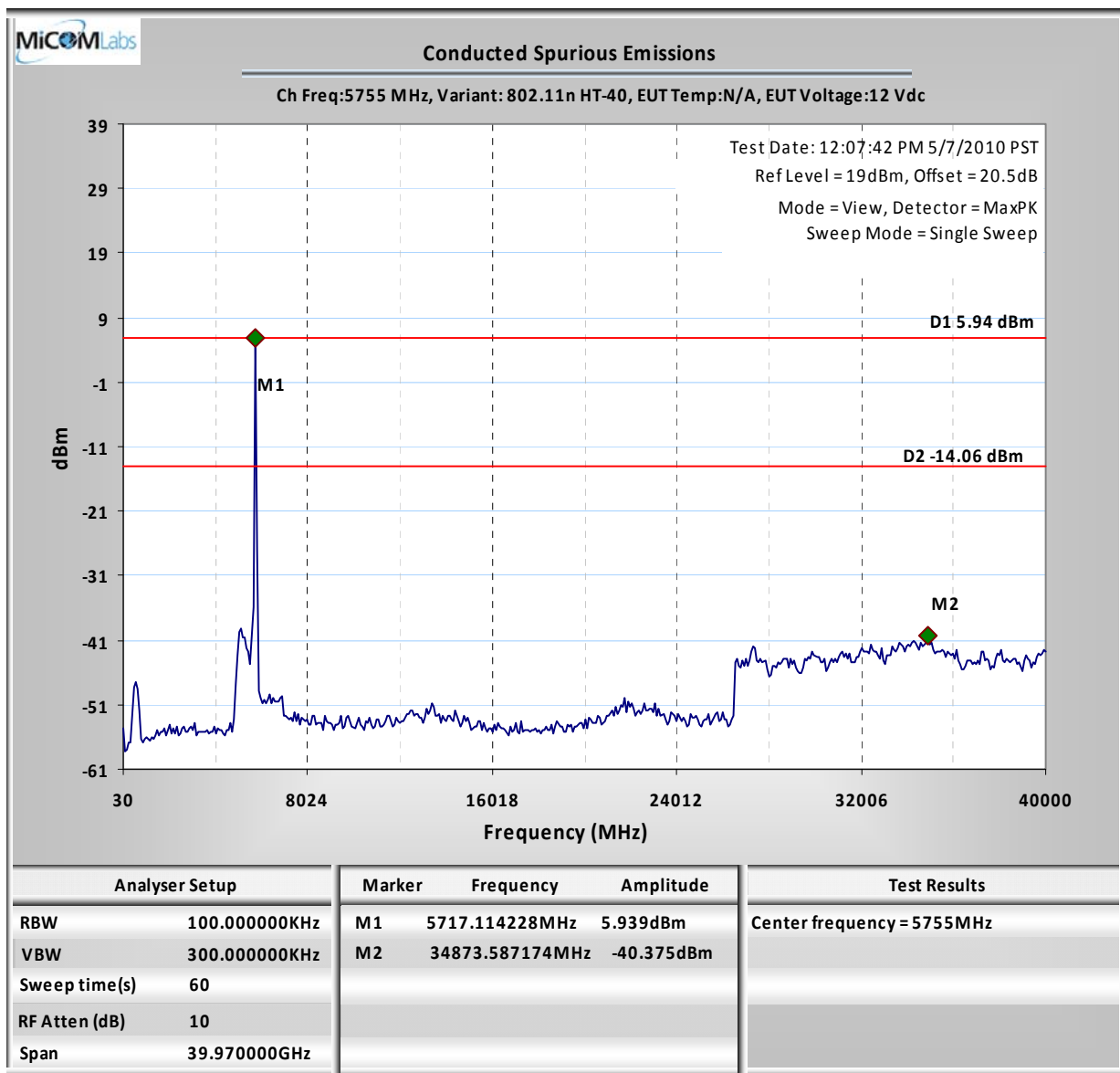
Test Frequency	Band-edge Frequency	Emission Amplitude @ Band-edge	Limit (20 dB below peak of	Margin
MHz	MHz	dBm	dBm	dB
5755.00	5725.00	-22.05	-11.97	-10.08
5815.00	5850.00	-27.53	-12.57	-14.96

Measurement uncertainty:	±2.81 dB
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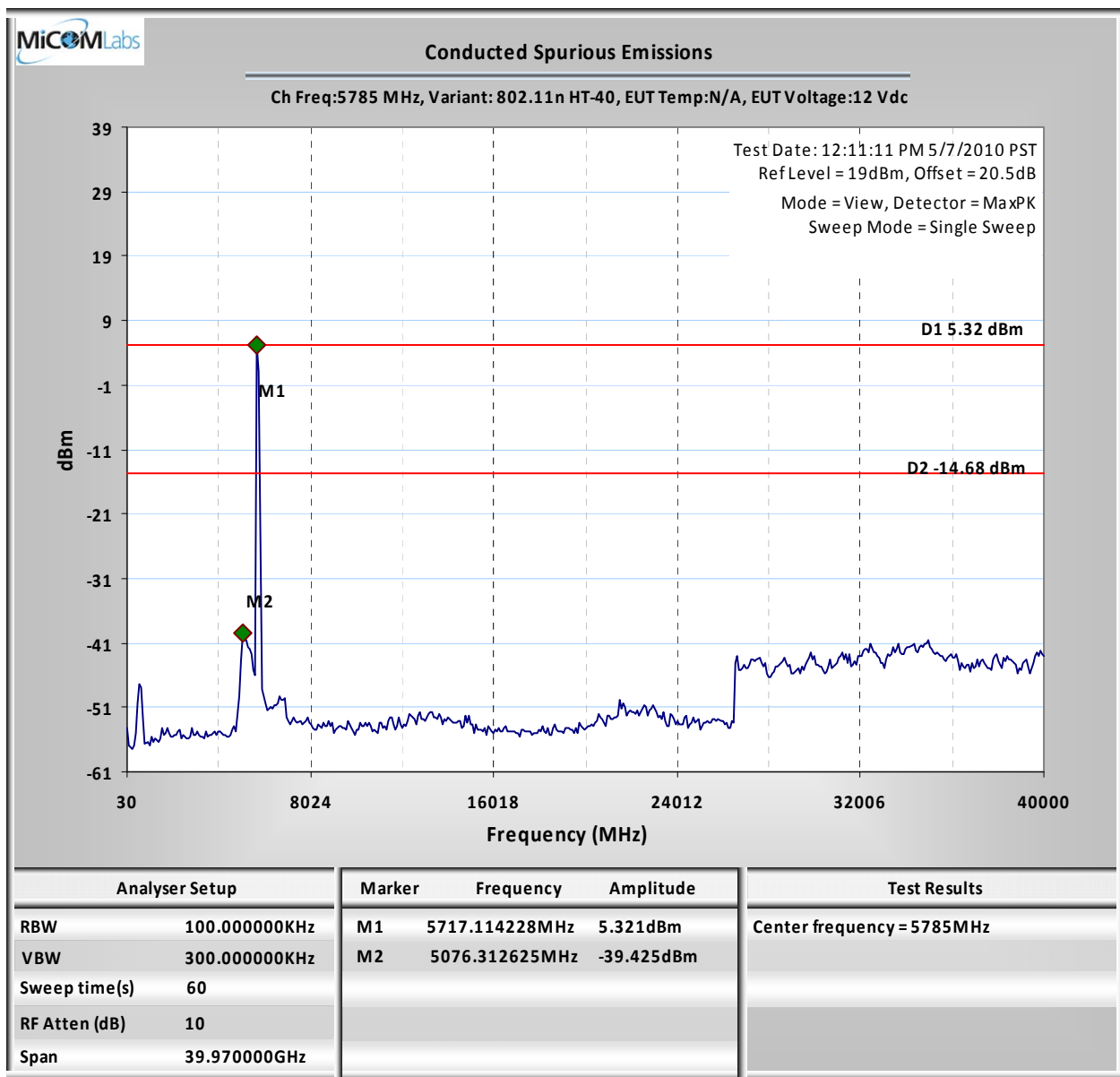
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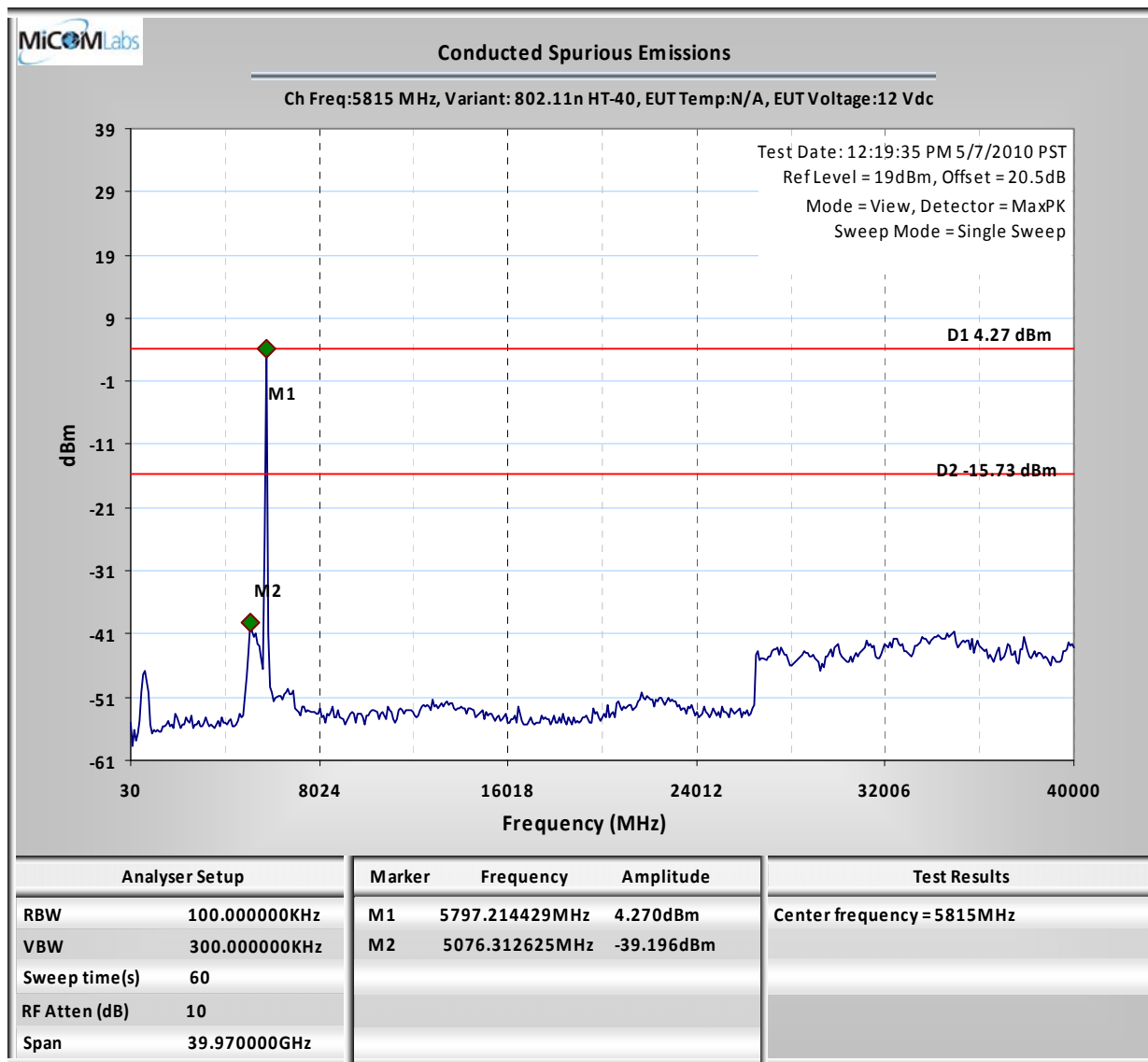
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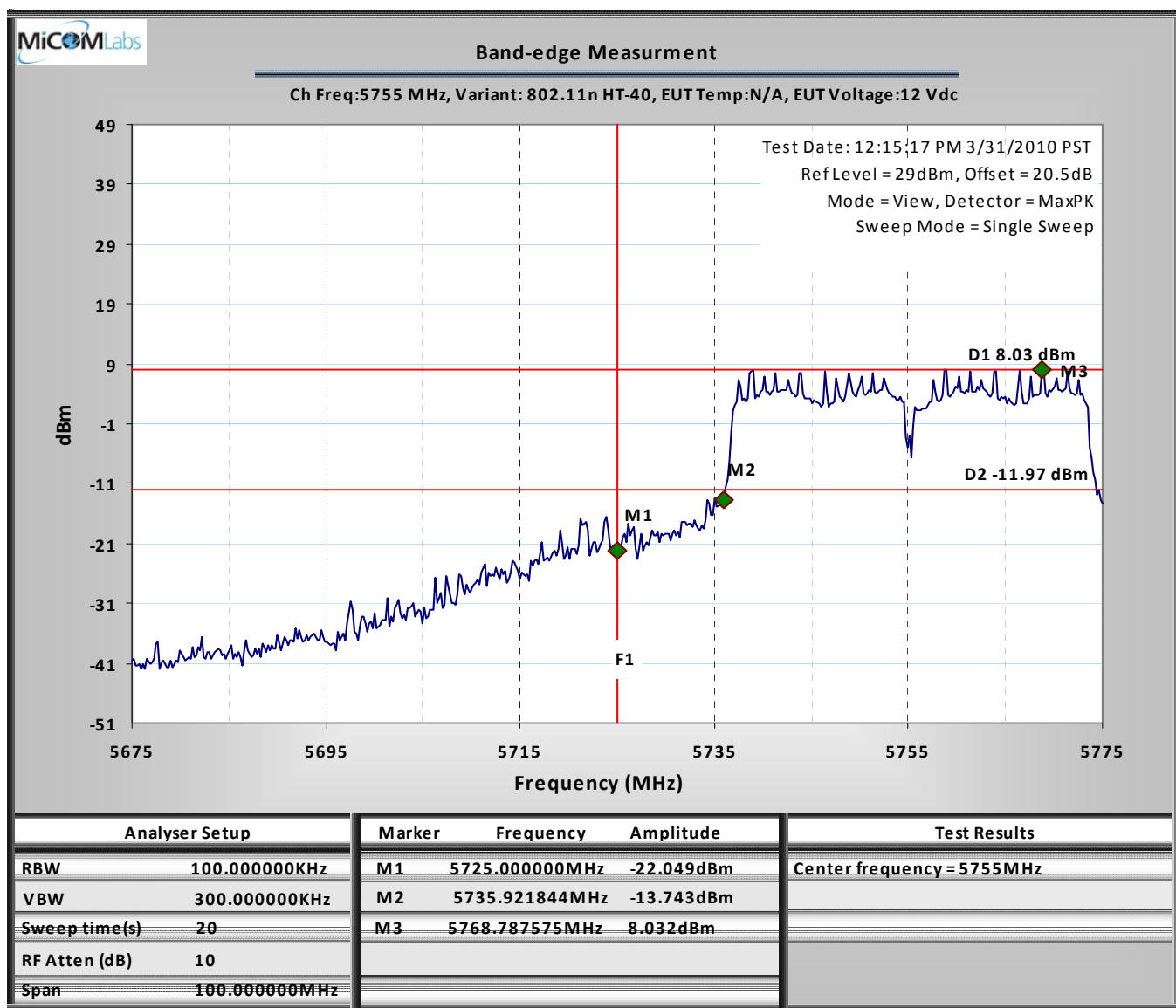
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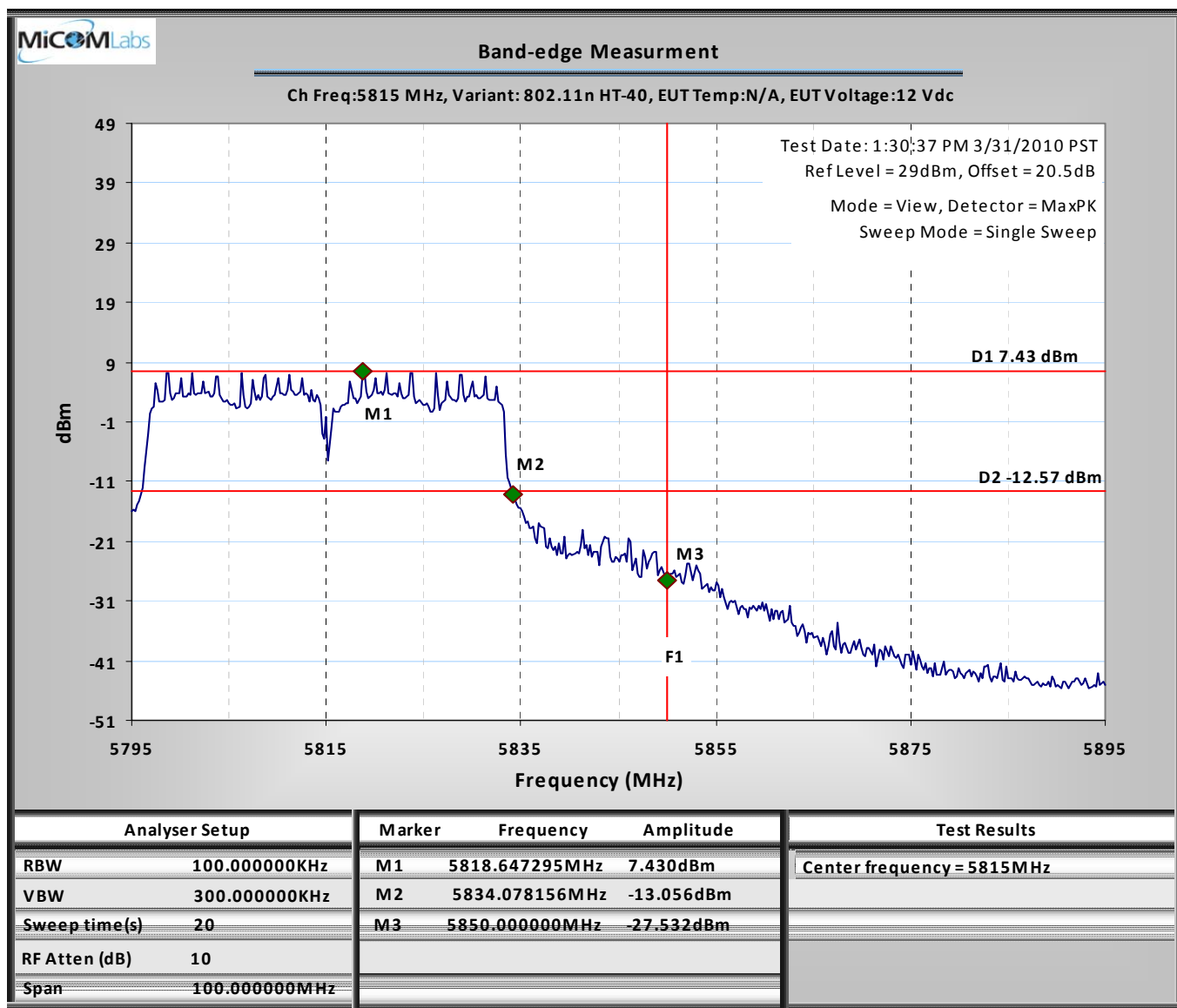
Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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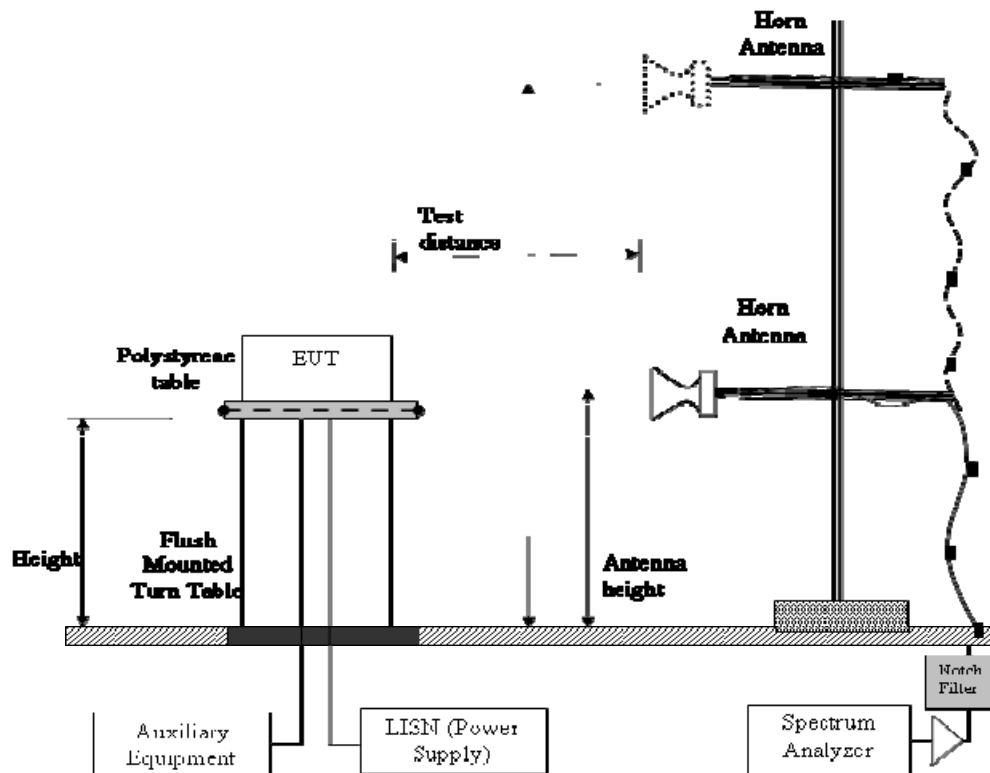
7.6 Radiated Spurious Emissions

Test Procedure

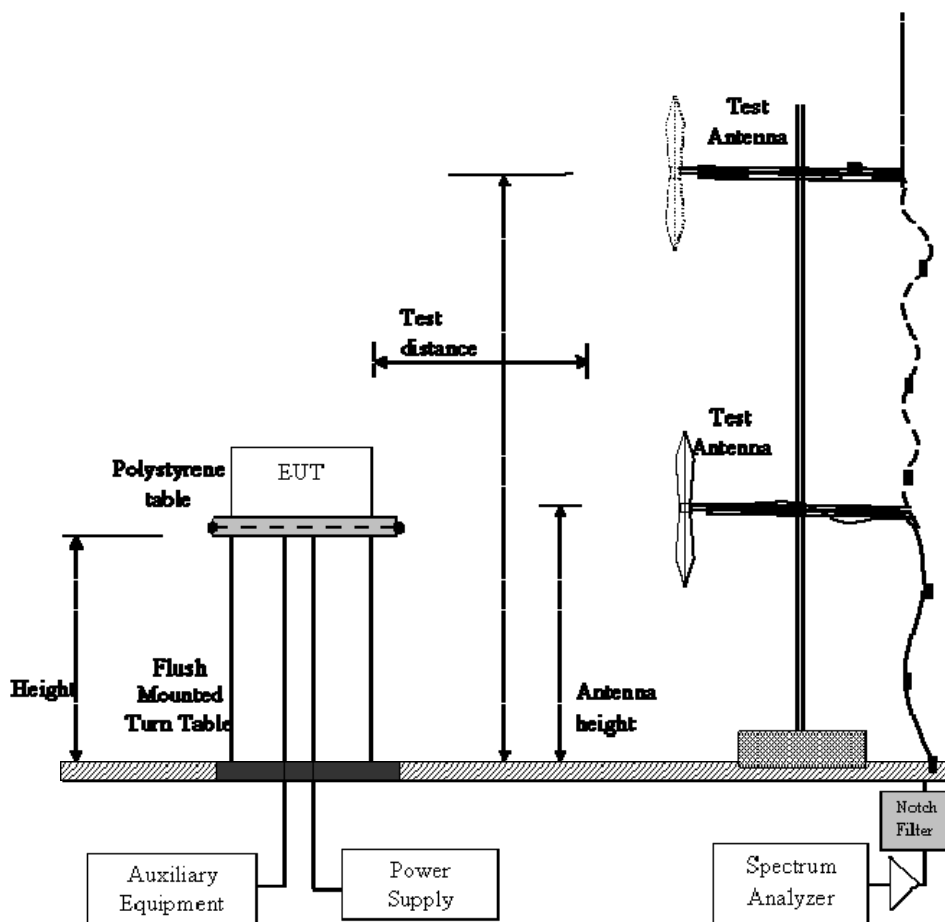
Testing was performed in a 3-meter anechoic chamber. Preliminary radiated emissions were measured on every azimuth and with the receiving antenna in both horizontal and vertical polarizations. Preliminary emissions were recorded with in Spectrum Analyzer mode, using a maximum peak detector while in peak hold mode.

Emissions nearest the limits were chosen for maximization and formal measurement using a CISPR Compliant receiver. Emissions above 1000 MHz are measured utilizing a CISPR compliant average detector with a tuned receiver, using a bandwidth of 1 MHz. Emissions from 30 MHz – 1000 MHz are measured utilizing a CISPR compliant quasi-peak detector with a tuned receiver, using a bandwidth of 120 kHz. Only the highest emissions relative to the limit are listed.

Test Measurement Set Up



Radiated Emission Measurement Setup – Above 1 GHz



Radiated Emission Measurement Setup – Below 1 GHz

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.

$$FS = R + AF + CORR - FO$$

FS = Field Strength

R = Measured Spectrum analyzer Input Amplitude

AF = Antenna Factor



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CORR = Correction Factor = CL – AG + NFL

CL = Cable Loss

AG = Amplifier Gain

FO = Distance Falloff Factor

NFL = Notch Filter Loss or Waveguide Loss

Field Strength Calculation Example:

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

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

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

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

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

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

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Specification

Radiated Spurious Emissions

FCC §15.247(d) 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.

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)).

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

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

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



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Table 1: FCC 15.209 Spurious Emissions Limits

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 Spectrum Measurement

Measurement Uncertainty	+5.6/ -4.5 dB
--------------------------------	---------------

Traceability:

Method	Test Equipment Used
Work instruction WI-03	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

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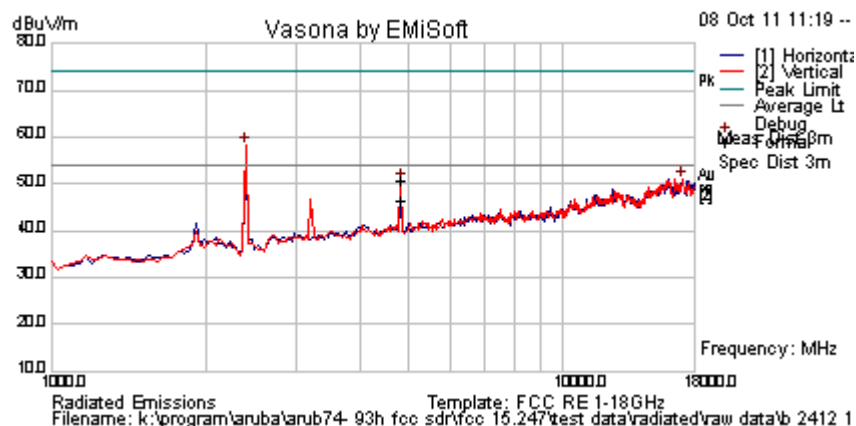


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7.6.1 Integral Antenna - Transmitter Radiated Spurious Emissions – Above 1 GHz

7.6.1.1 2400 – 2483.5 MHz

Test Freq.	2412 MHz	Engineer	GMH
Variant	802.11b; 1 Mbs	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

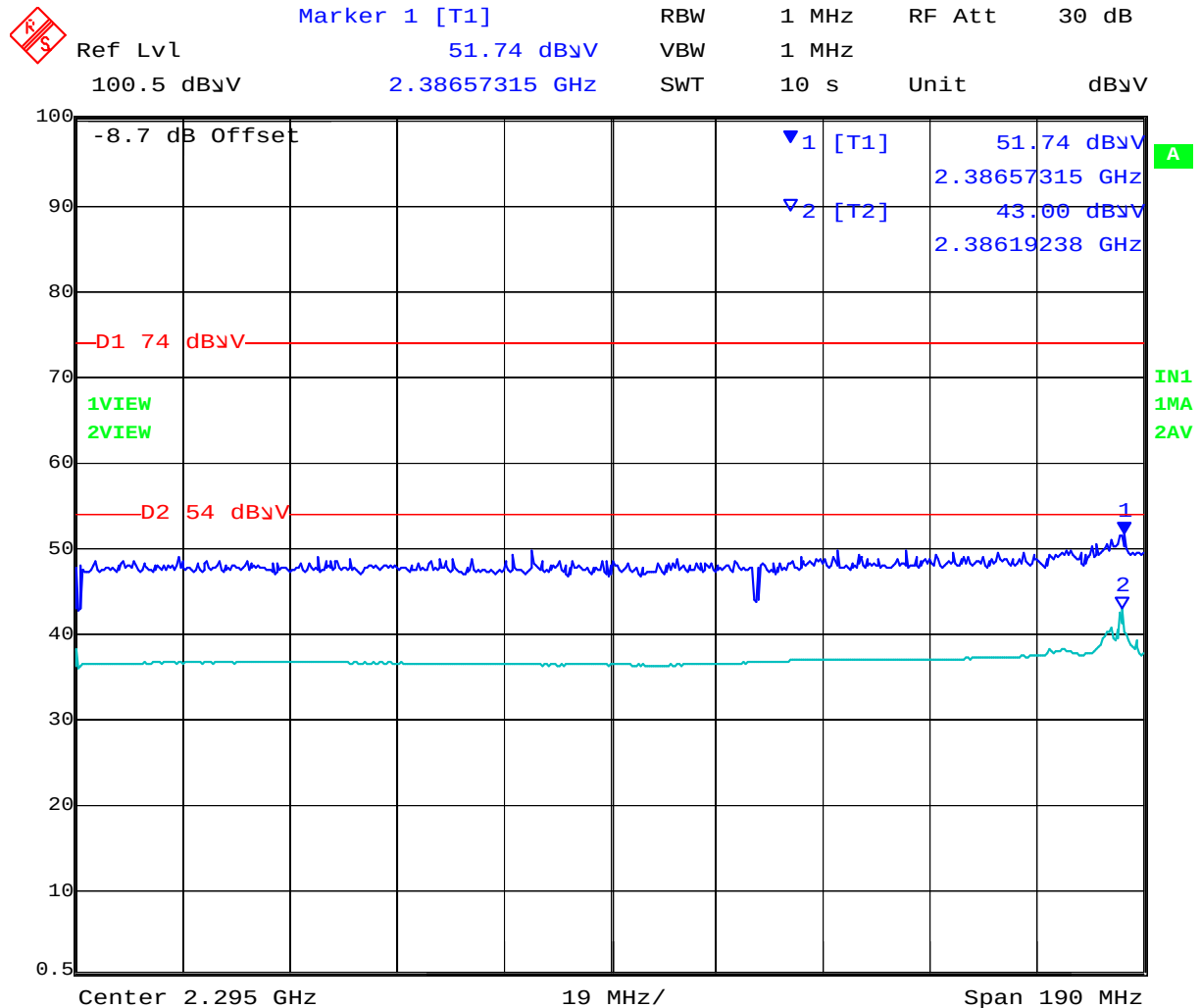
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
4824.018	56.3	4.5	-9.9	50.8	Peak Max	V	98	9	74.0	-23.2	Pass	RB
4824.018	52.0	4.5	-9.9	46.5	Average Max	V	98	9	54.0	-7.5	Pass	RB
2396.794	66.8	3.0	-11.6	58.2	Peak [Scan]	V						FUND
17114.228	41.9	8.5	0.5	50.9	Peak [Scan]	V	100	0	54	-3.1	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												

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Band-Edge 2390 802.11b Tx = 2412 MHz



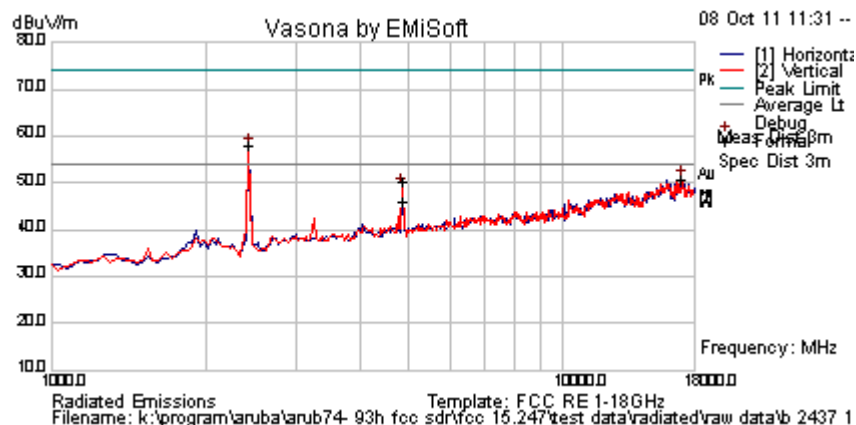
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Test Freq.	2437 MHz	Engineer	GMH
Variant	802.11b; 1 Mbs	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



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
4873.987	55.8	4.5	-10.0	50.3	Peak Max	V	98	26	74.0	-23.7	Pass	RB
4873.987	51.4	4.5	-10.0	45.9	Average Max	V	98	26	54.0	-8.1	Pass	RB
2430.862	66.4	3.0	-11.6	57.8	Peak [Scan]	H						FUND
17114.228	41.7	8.5	0.5	50.7	Peak [Scan]	V	100	0	54	-3.3	Pass	NOISE

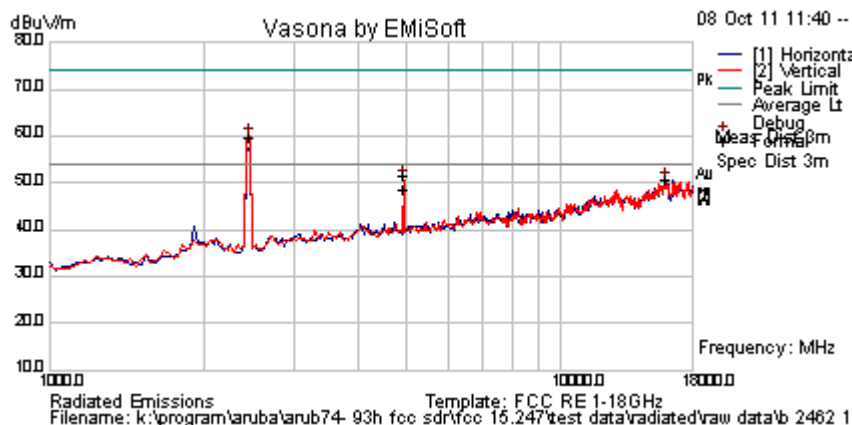
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Test Freq.	2462 MHz	Engineer	GMH
Variant	802.11b; 1 Mbs	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

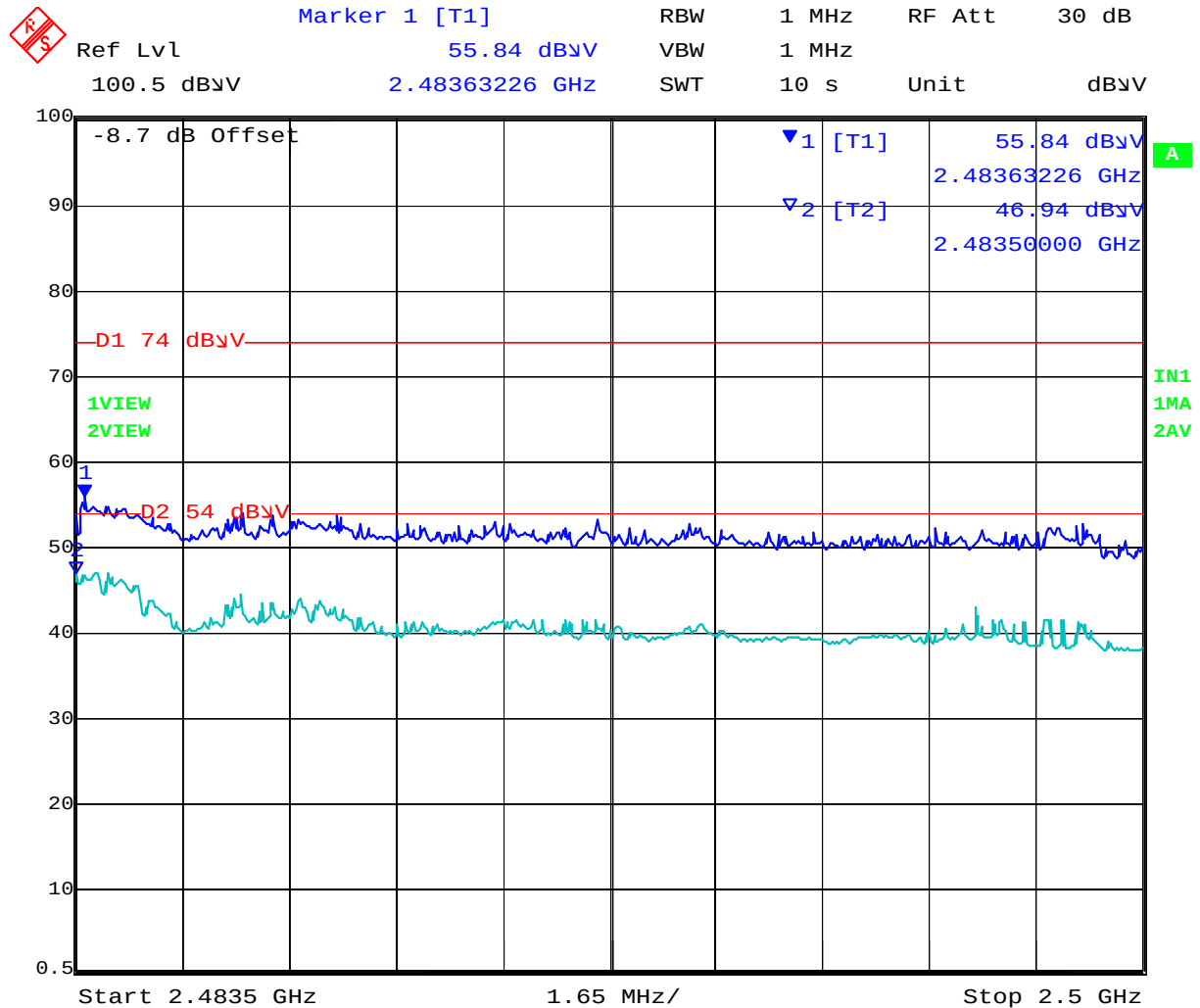
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
4923.973	57.1	4.6	-10.0	51.8	Peak Max	V	102	28	74.0	-22.3	Pass	RB
4923.973	53.8	4.6	-10.0	48.4	Average Max	V	102	28	54.0	-5.6	Pass	RB
2464.930	68.5	3.0	-11.6	59.9	Peak [Scan]	V						FUND
15989.980	41.3	9.0	0.2	50.6	Peak [Scan]	H	100	0	54	-3.5	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												

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Band-Edge 2483.5 802.11b Tx = 2462 MHz



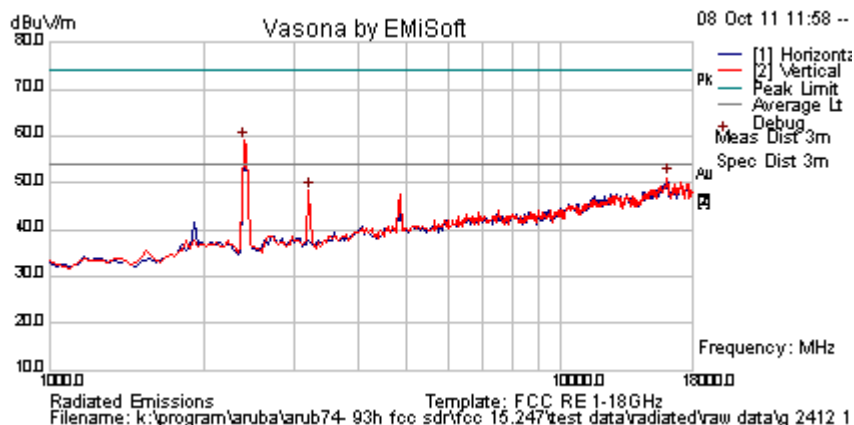
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Test Freq.	2412 MHz	Engineer	GMH
Variant	802.11g; 6 Mbs	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

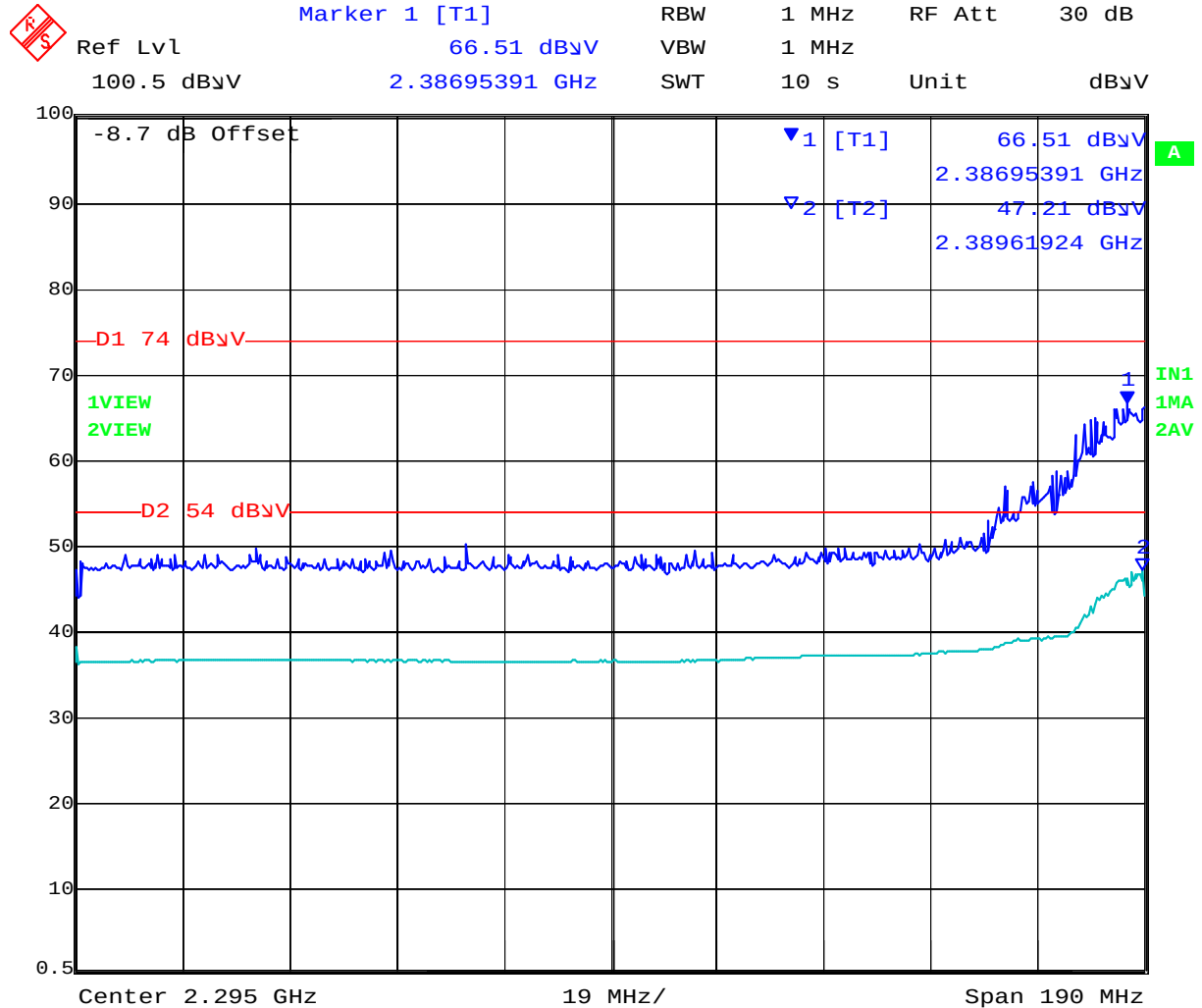
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	67.7	3.0	-11.6	59.0	Peak [Scan]	V						FUND
16092.184	41.9	9.0	0.3	51.2	Peak [Scan]	V	100	0	54.0	-2.8	Pass	NOISE
3214.429	56.3	3.5	-11.6	48.2	Peak [Scan]	V	100	0	54	-5.8	Pass	NRB
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak												

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Band-Edge 2390 802.11g Tx = 2412 MHz



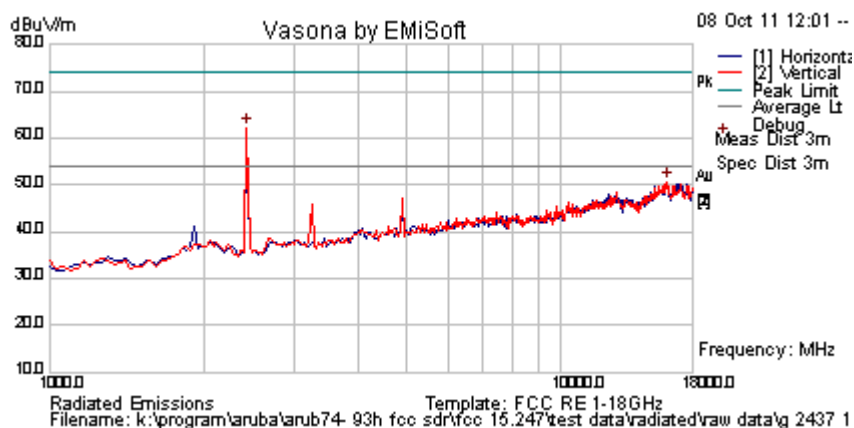
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Test Freq.	2437 MHz	Engineer	GMH
Variant	802.11g; 6 Mbs	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

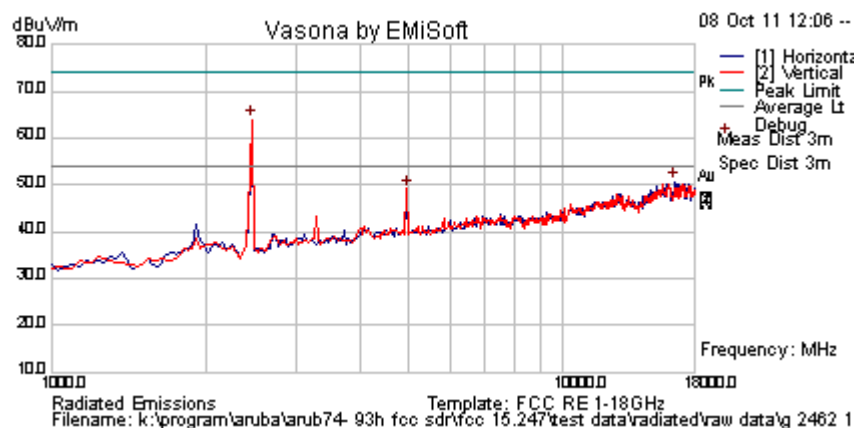
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	69.9	3.0	-11.6	61.3	Peak [Scan]	V						FUND
17080.16	42.0	8.5	0.4	50.9	Peak [Scan]	H	100	0	54.0	-3.1	Pass	NOISE
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak												

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Test Freq.	2462 MHz	Engineer	GMH
Variant	802.11g; 6 Mbs	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

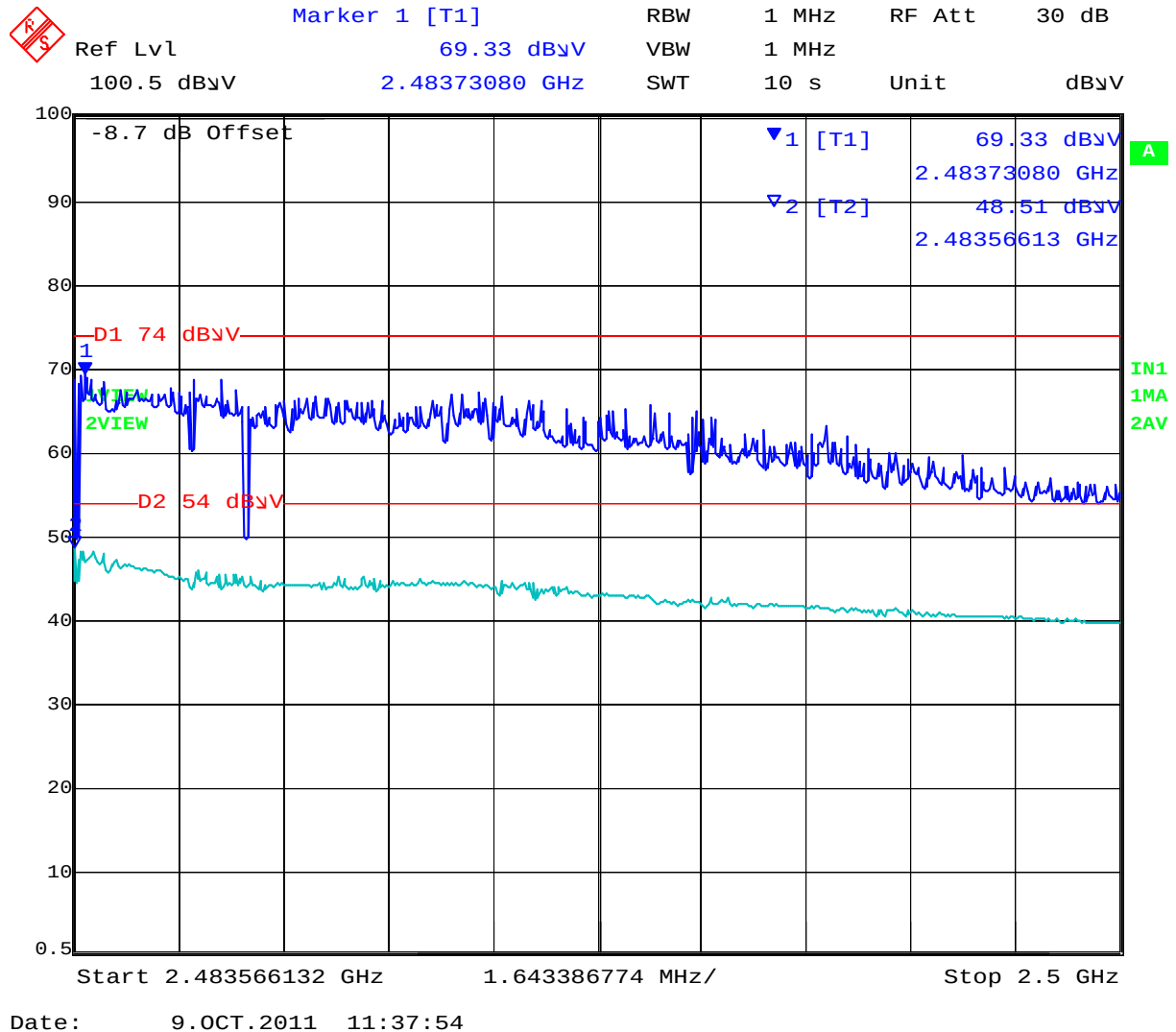
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2464.930	72.5	3.0	-11.6	63.9	Peak [Scan]	V						FUND
16501.002	41.6	8.8	0.2	50.6	Peak [Scan]	H	100	0	54.0	-3.4	Pass	NOISE
4946.929	44.4	4.6	-9.9	39.0	Average Max	V	120	1	54	-15.0	Pass	RB
4946.929	59.1	4.6	-9.9	53.8	Peak Max	V	120	1	74	-20.2	Pass	RB
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak												

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Band-Edge 2483.5 802.11b Tx = 2462 MHz

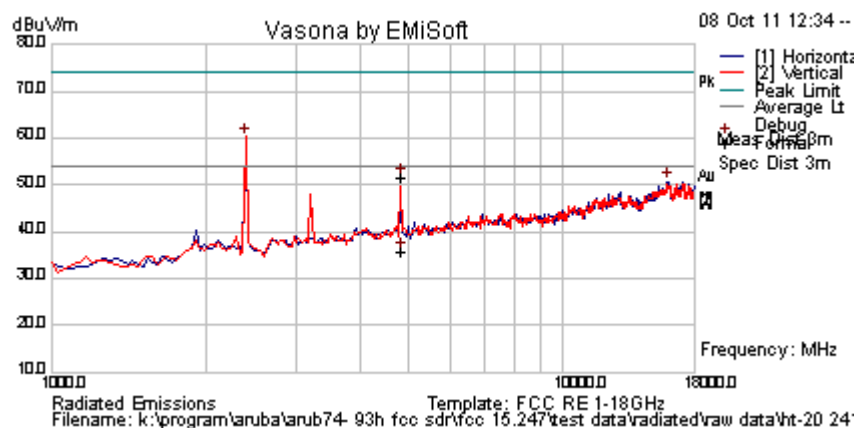


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Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
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Test Freq.	2412 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

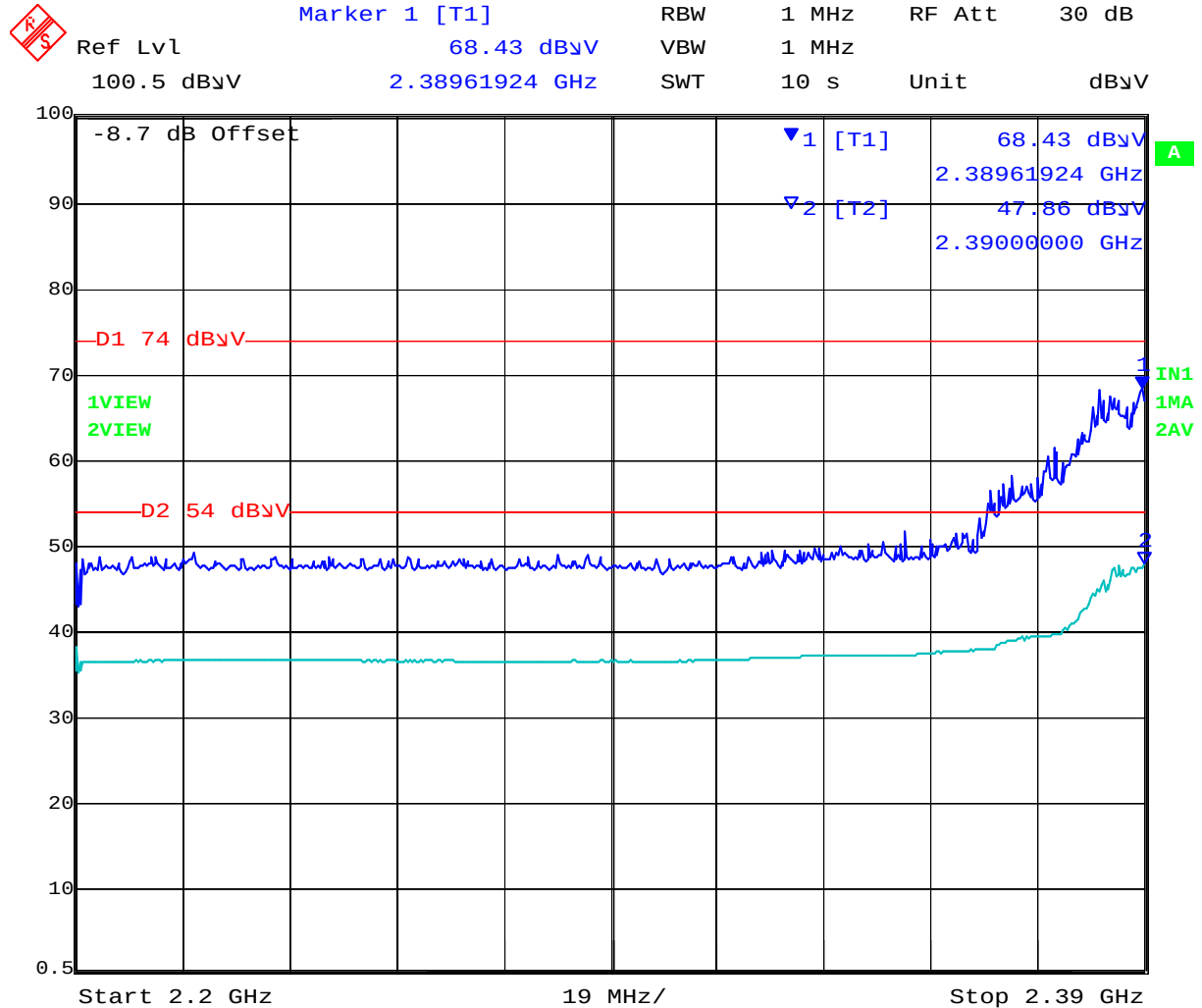
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2396.794	69.0	3.0	-11.6	60.3	Peak [Scan]	V						FUND
16058.116	41.2	9.0	0.4	50.6	Peak [Scan]	H	100	0	54.0	-3.4	Pass	NOISE
4819.937	57.0	4.5	-9.9	51.6	Peak Max	V	141	0	74	-22.4	Pass	RB
4819.937	41.3	4.5	-9.9	35.8	Average Max	V	141	0	54	-18.2	Pass	RB
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak												

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Band-Edge 2390 802.11n HT-20 Tx = 2412 MHz



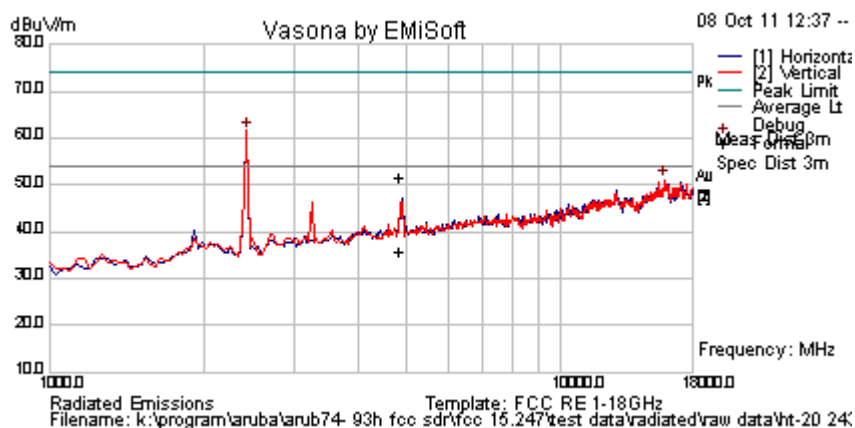
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Test Freq.	2437 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

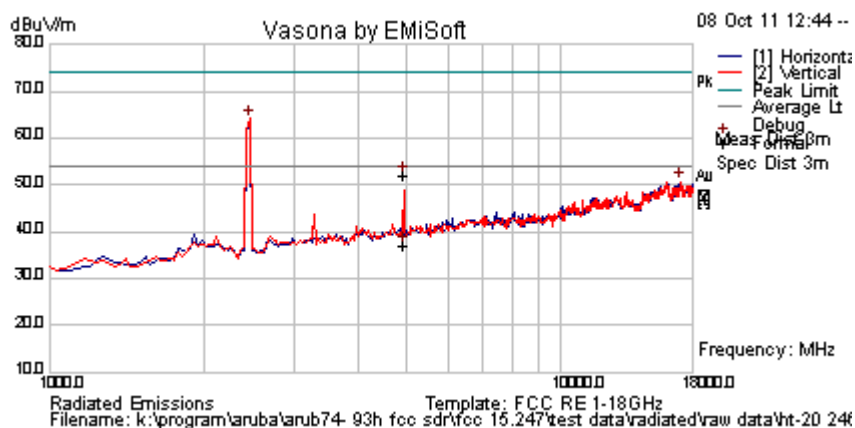
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	70.3	3.0	-11.6	61.7	Peak [Scan]	H						FUND
15853.707	42.6	8.8	-0.3	51.1	Peak [Scan]	V	100	0	54.0	-2.9	Pass	NOISE
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak												

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Test Freq.	2462 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

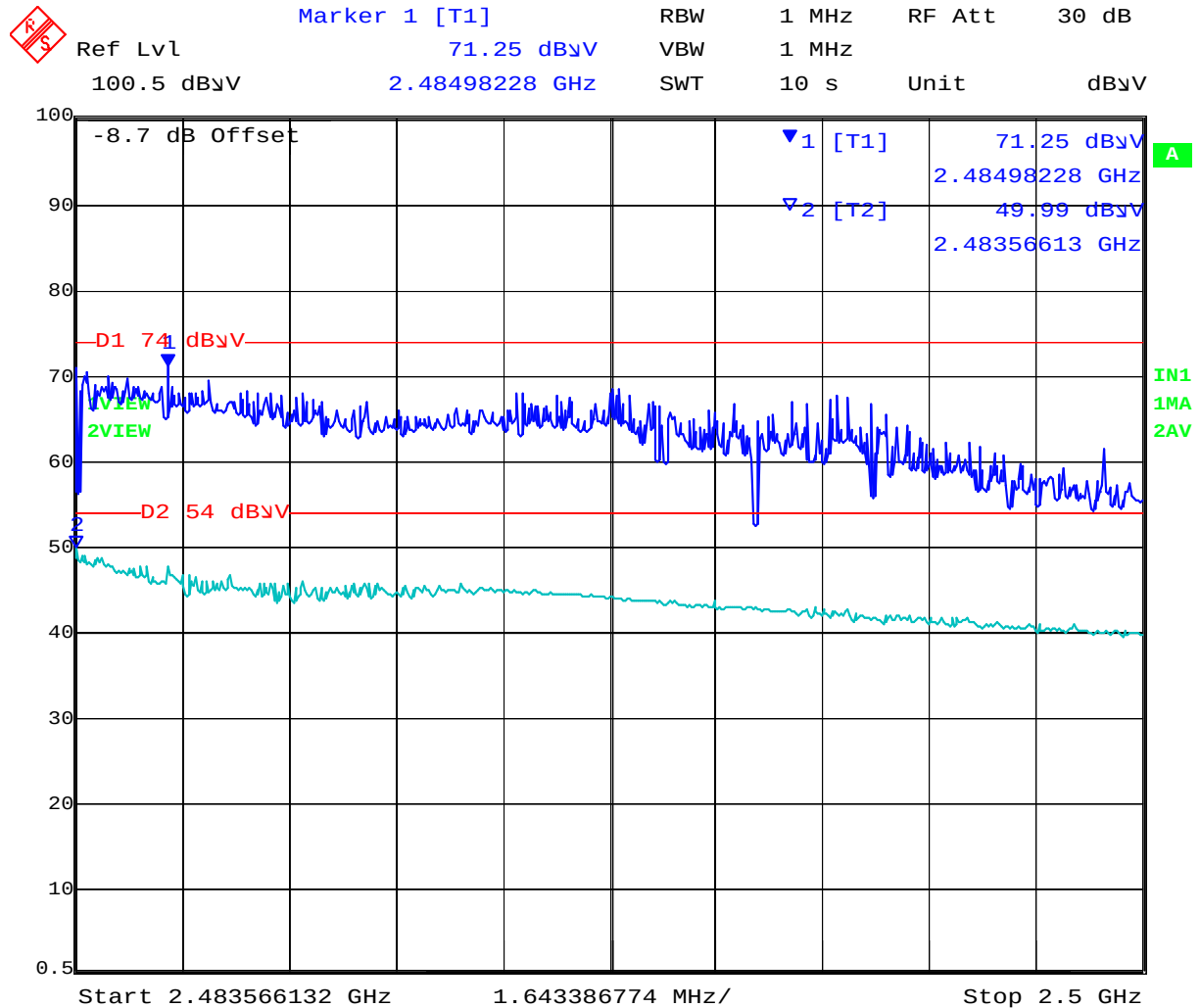
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2464.930	72.7	3.0	-11.6	64.1	Peak [Scan]	V						FUND
17080.16	41.8	8.5	0.4	50.7	Peak [Scan]	V	100	0	54.0	-3.3	Pass	NOISE
4918.727	57.7	4.6	-10.0	52.3	Peak Max	V	109	6	74	-21.8	Pass	RB
4918.727	42.3	4.6	-10.0	36.9	Average Max	V	109	6	54	-17.1	Pass	RB
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak												

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Band-Edge 2483.5 802.11n HT-20 Tx = 2462 MHz



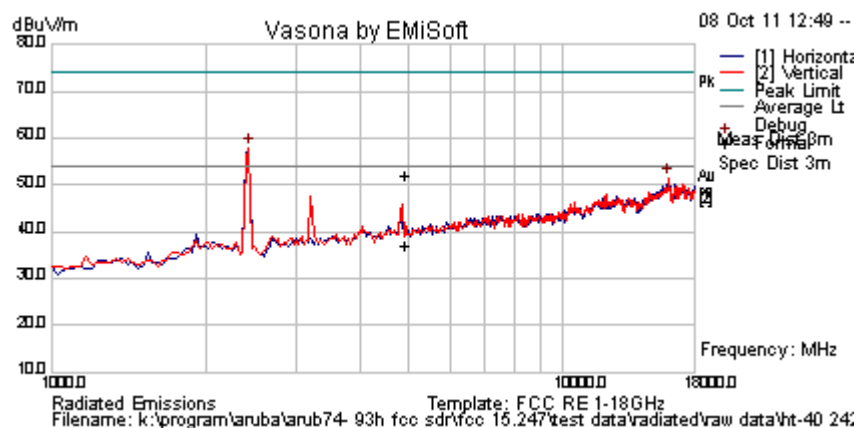
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Test Freq.	2422 MHz	Engineer	GMH
Variant	802.11n; HT-40; 13.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	66.5	3.0	-11.6	57.9	Peak [Scan]	V						FUND
16024.048	42.1	9.0	0.4	51.5	Peak [Scan]	V	100	0	54.0	-2.5	Pass	NOISE

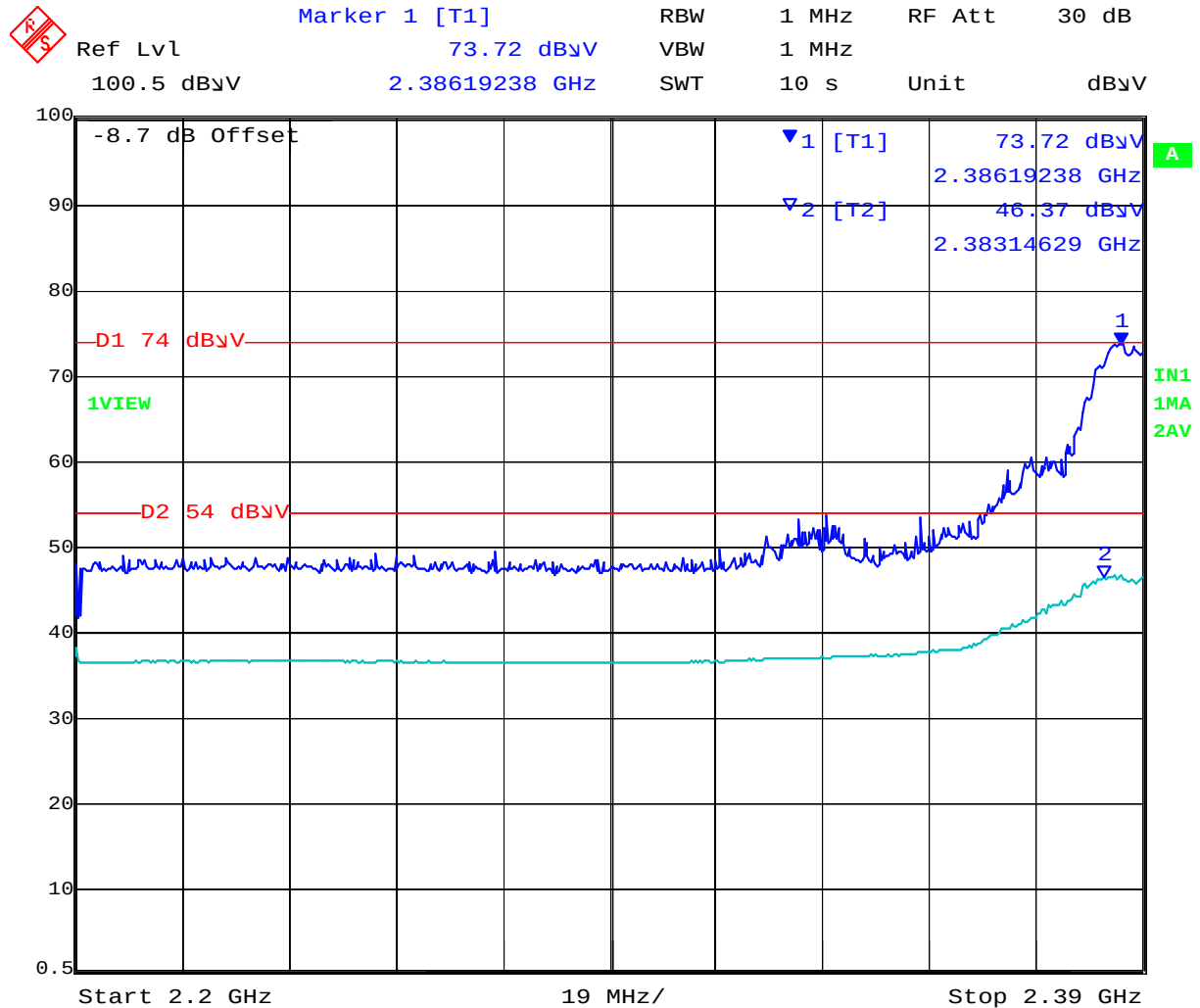
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band-Edge 2390 802.11n HT-40 Tx = 2422 MHz



Date: 9.OCT.2011 11:04:55

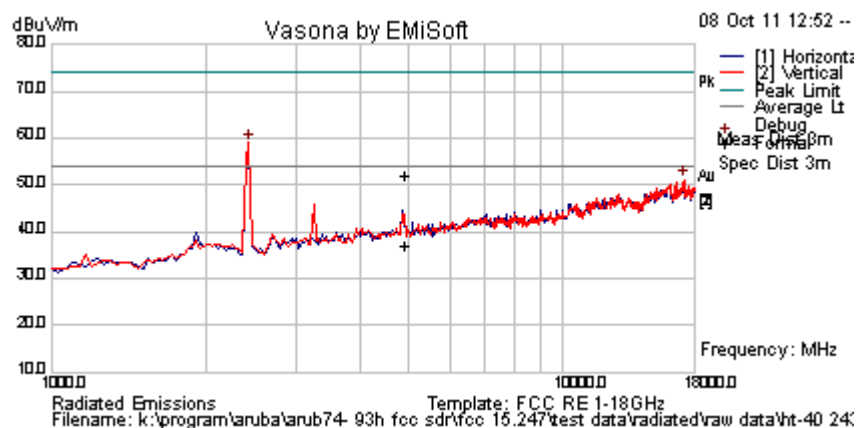
Power Reduction to ART = 16.5

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Test Freq.	2437 MHz	Engineer	GMH
Variant	802.11n; HT-40; 13.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

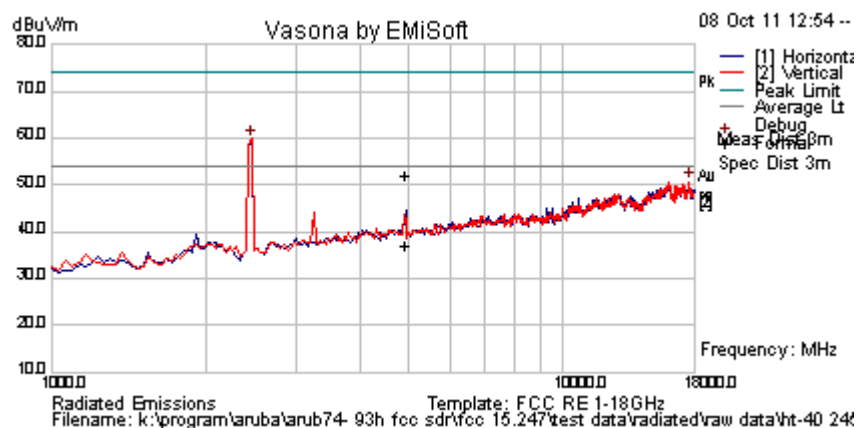
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2430.862	67.5	3.0	-11.6	58.9	Peak [Scan]	V						FUND
17182.365	41.7	8.6	0.8	51.1	Peak [Scan]	V	100	0	54.0	-2.9	Pass	NOISE
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak												

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Test Freq.	2452 MHz	Engineer	GMH
Variant	802.11n; HT-40; 13.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

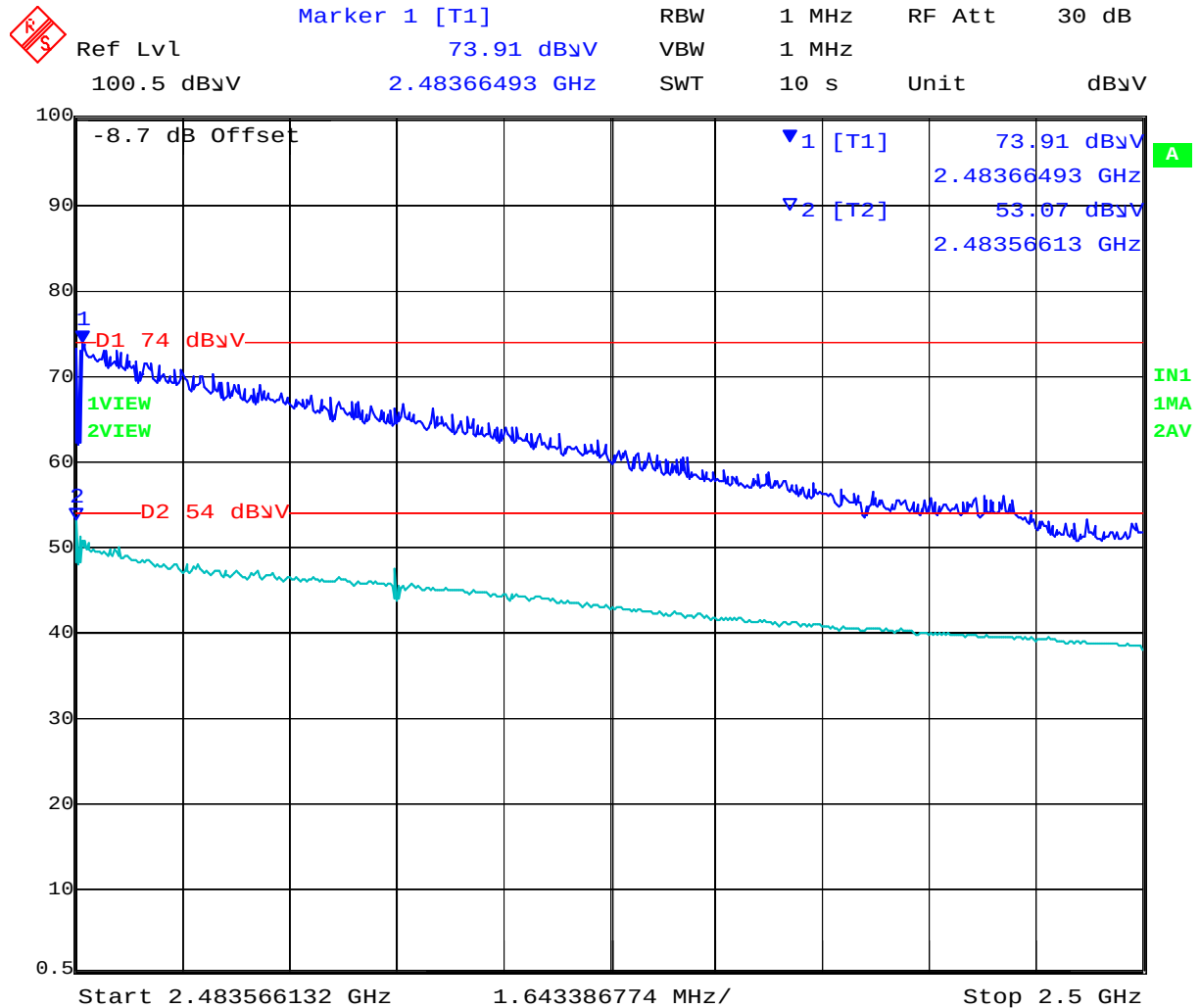
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
2464.930	68.5	3.0	-11.6	59.9	Peak [Scan]	V						FUND
17625.251	41.1	8.8	0.8	50.7	Peak [Scan]	V	100	0	54.0	-3.3	Pass	NOISE
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak												

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Band-Edge 2483.5 802.11n HT-40 Tx = 2452 MHz



Date: 9.OCT.2011 11:41:33

Power Reduction to ART = 10.5

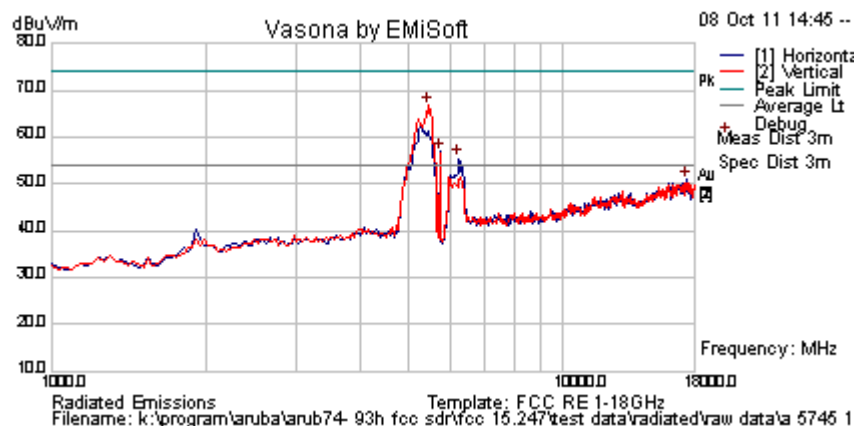
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7.6.1.2 5,725 – 5,850 MHz

Test Freq.	5745 MHz	Engineer	GMH
Variant	802.11a; 6 Mbs	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

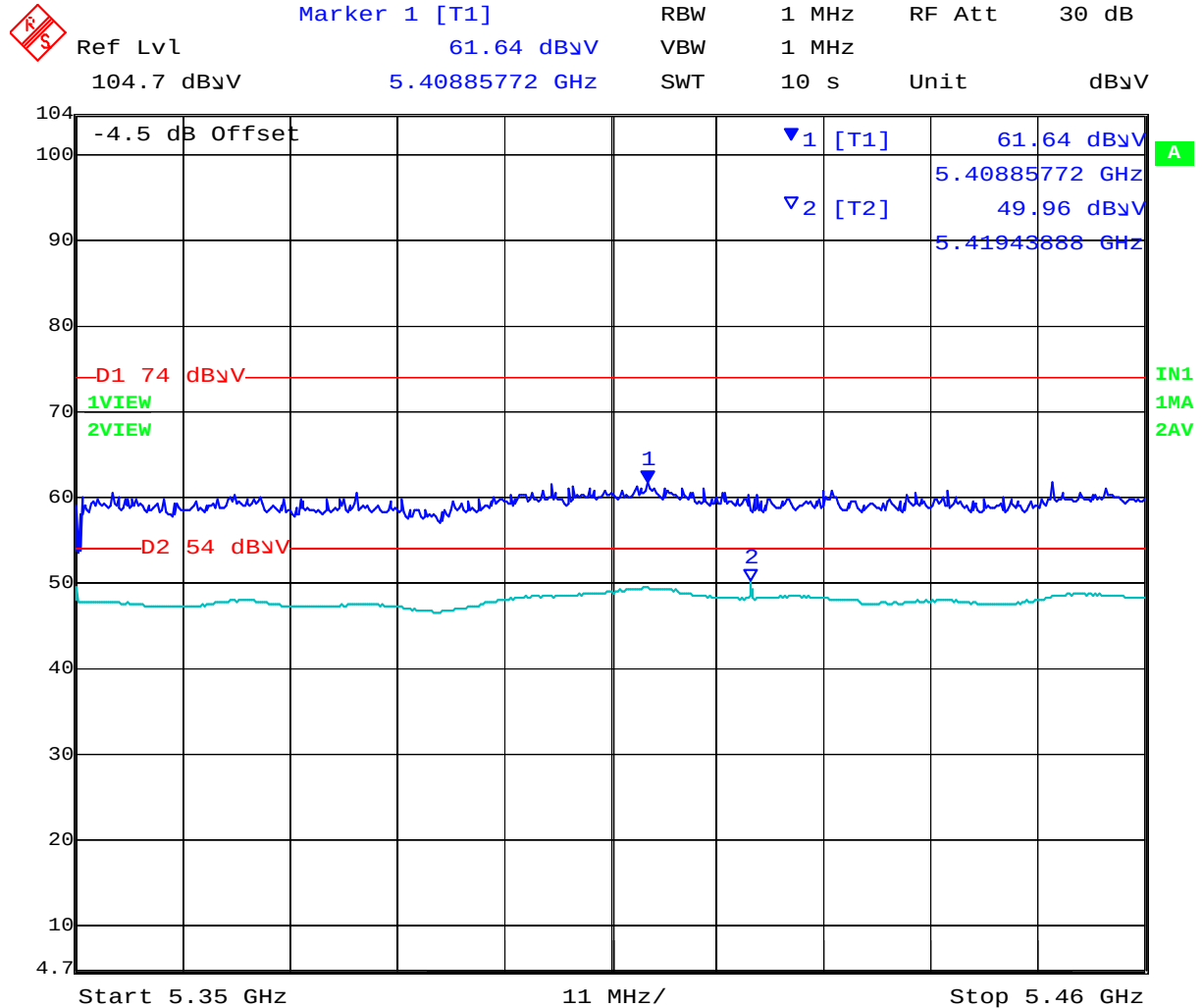
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5428.858	71.5	4.6	-9.3	66.9	Peak [Scan]	V					Pass	BE
5735.47094	61.1	4.8	-8.9	56.9	Peak [Scan]	H						FUND
6246.493	57.9	5.0	-7.5	55.4	Peak [Scan]	H					Pass	BE
17352.705	40.6	8.7	1.6	50.9	Peak [Scan]	H	100	0	54	-3.1	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												

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Band-Edge 5470 802.11a Tx = 5745 MHz



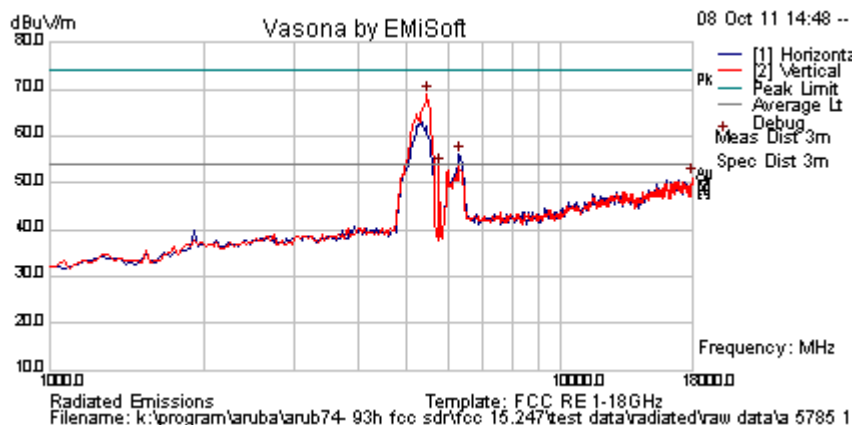
Date: 9.OCT.2011 13:15:19

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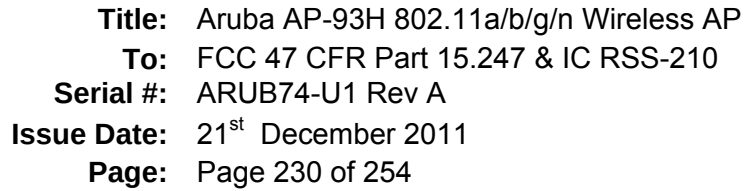
Test Freq.	5785 MHz	Engineer	GMH
Variant	802.11a; 6 Mbs	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



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
5462.926	73.6	4.6	-9.2	68.9	Peak [Scan]	V					Pass	BE
6314.62926	58.6	5.0	-7.5	56.1	Peak [Scan]	H					Pass	BE
5769.539	57.6	4.8	-8.9	53.5	Peak [Scan]	V						FUND
18000.000	41.8	8.8	0.8	51.3	Peak [Scan]	V	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												

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Ref Lvl 104.7 dBμV
 Marker 1 [T1] 65.90 dBμV
 RBW 1 MHz
 VBW 1 MHz
 SWT 10 s
 RF Att 30 dB
 Unit dBμV

-4.5 dB Offset
 D1 74 dBμV
 D2 54 dBμV
 1VIEW
 2VIEW
 1 [T1] 65.90 dBμV
 2 [T2] 53.27 dBμV
 5.39056112 GHz
 5.35000000 GHz

Start 5.35 GHz
 11 MHz/
 Stop 5.46 GHz

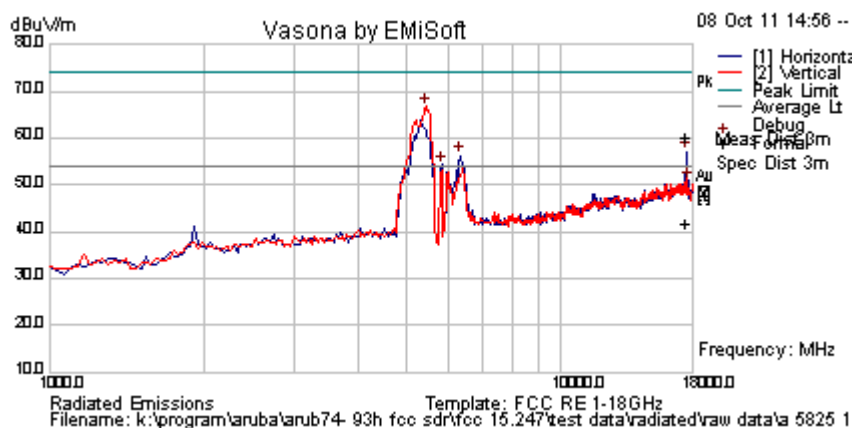
IN1 1MA
 2AV

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Test Freq.	5825 MHz	Engineer	GMH
Variant	802.11a; 6 Mbs	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

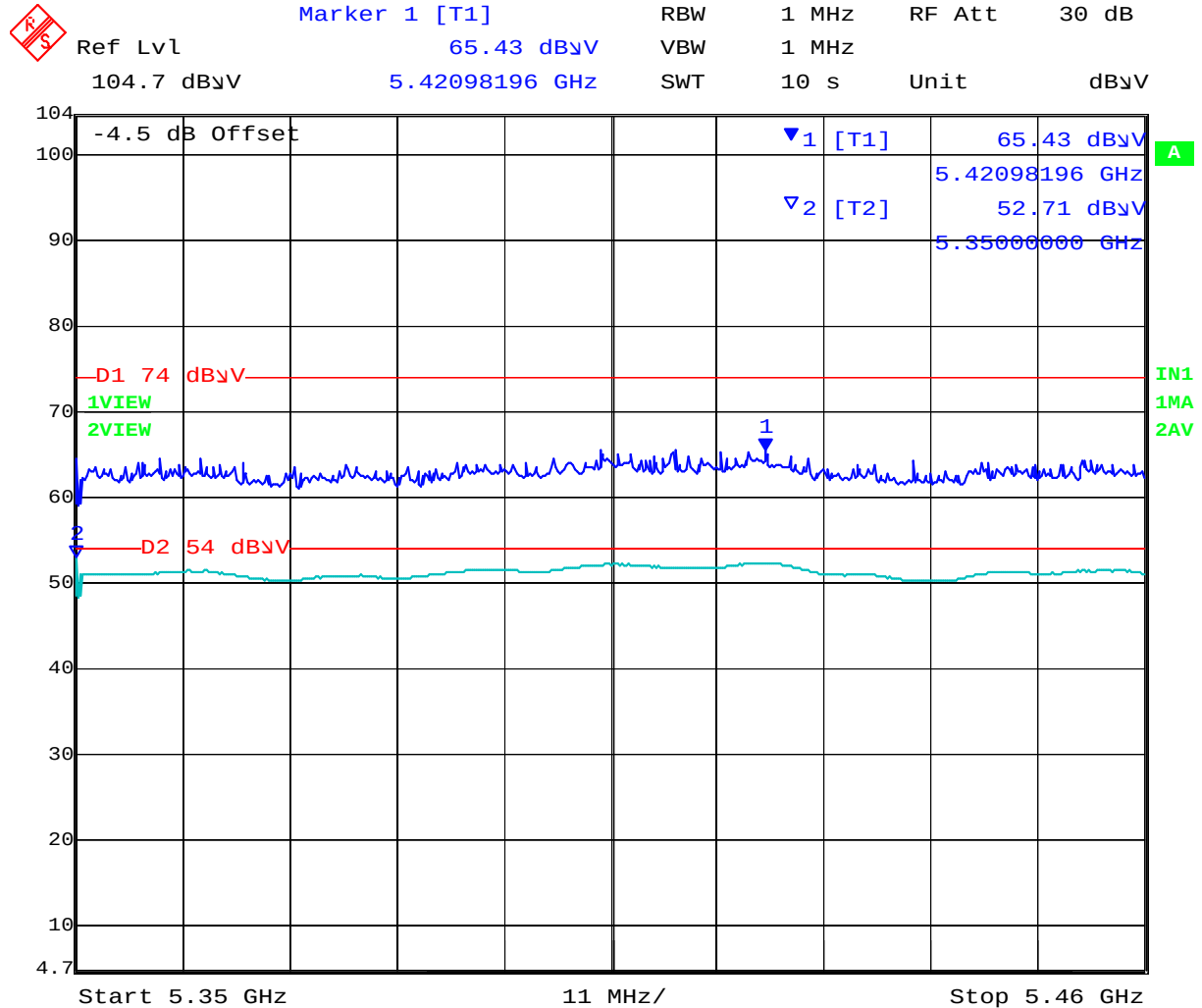
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5428.858	71.5	4.6	-9.3	66.8	Peak [Scan]	V					Pass	BE
6348.6974	58.6	5.1	-7.4	56.2	Peak [Scan]	H					Pass	BE
5837.675	58.3	4.8	-8.8	54.2	Peak [Scan]	H						FUND
17488.978	31.8	8.8	1.2	41.8	Average Max	H	98	20	54	-12.2	Pass	NRB
17488.978	50.3	8.8	1.2	60.3	Peak Max	H	98	20	74	-13.7	Pass	NRB
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission												
RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak												

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Band-Edge 5470 802.11a Tx = 5825 MHz



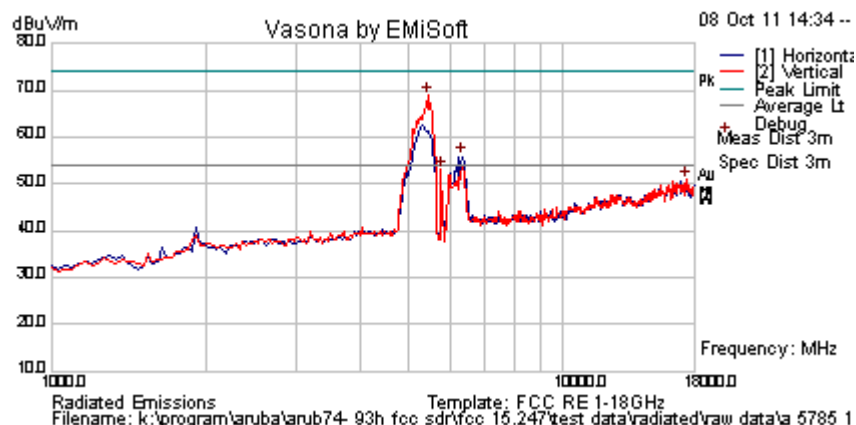
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Test Freq.	5745 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

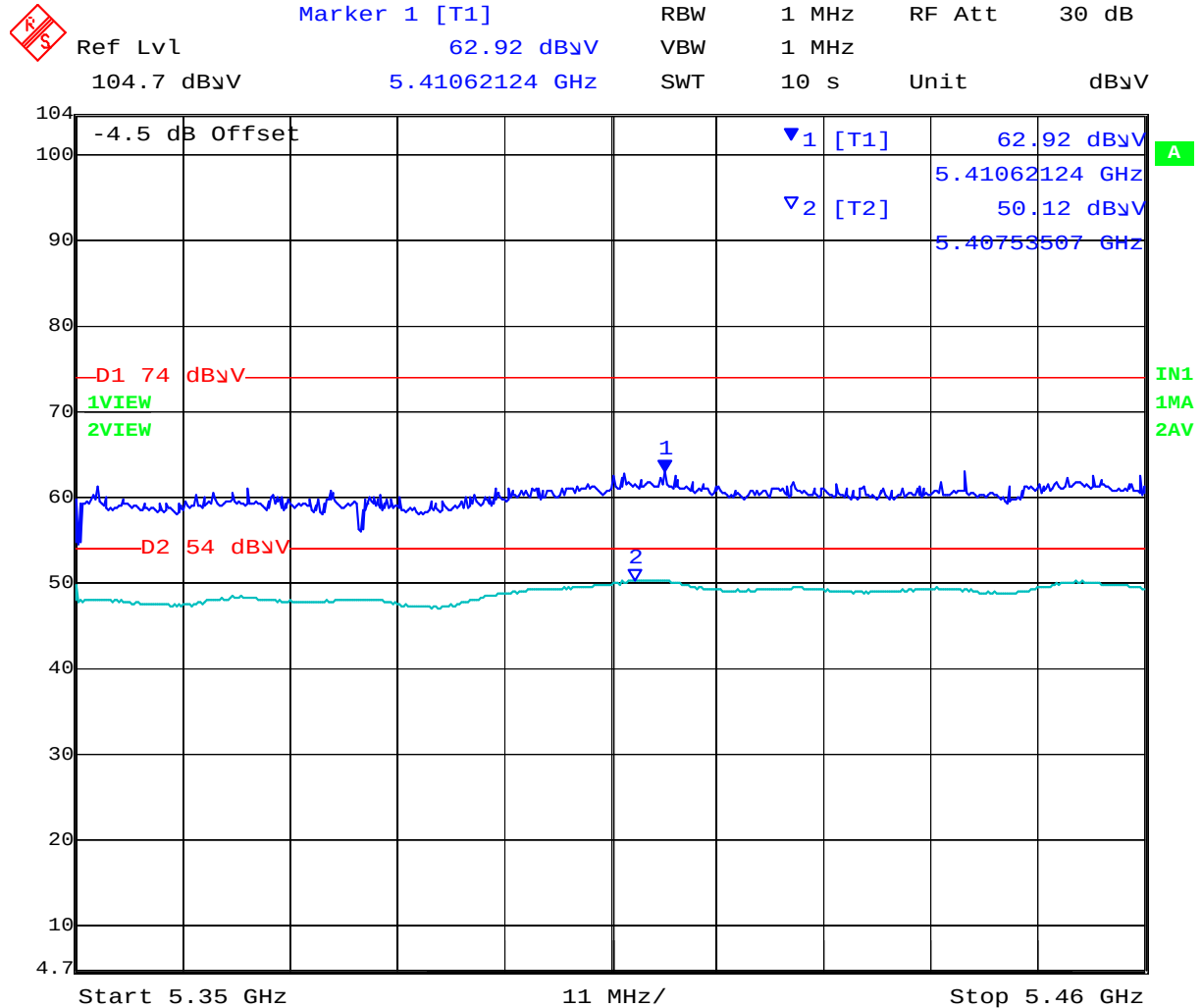
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5462.926	70.4	4.6	-9.2	65.8	Peak [Scan]	V					Pass	BE
5735.47094	60.3	4.8	-8.9	56.2	Peak [Scan]	V						FUND
6246.493	55.8	5.0	-7.5	53.3	Peak [Scan]	H	100	0	54	-0.8	Pass	BE
17216.433	41.0	8.6	1.0	50.6	Peak [Scan]	H	100	0	54	-3.4	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												

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Band-Edge 5470 802.11n HT-20 Tx = 5745 MHz



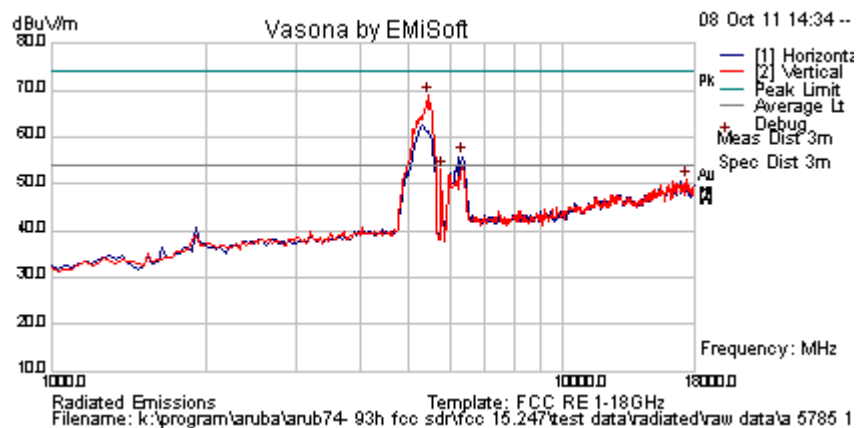
Date: 9.OCT.2011 13:17:32

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Test Freq.	5785 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

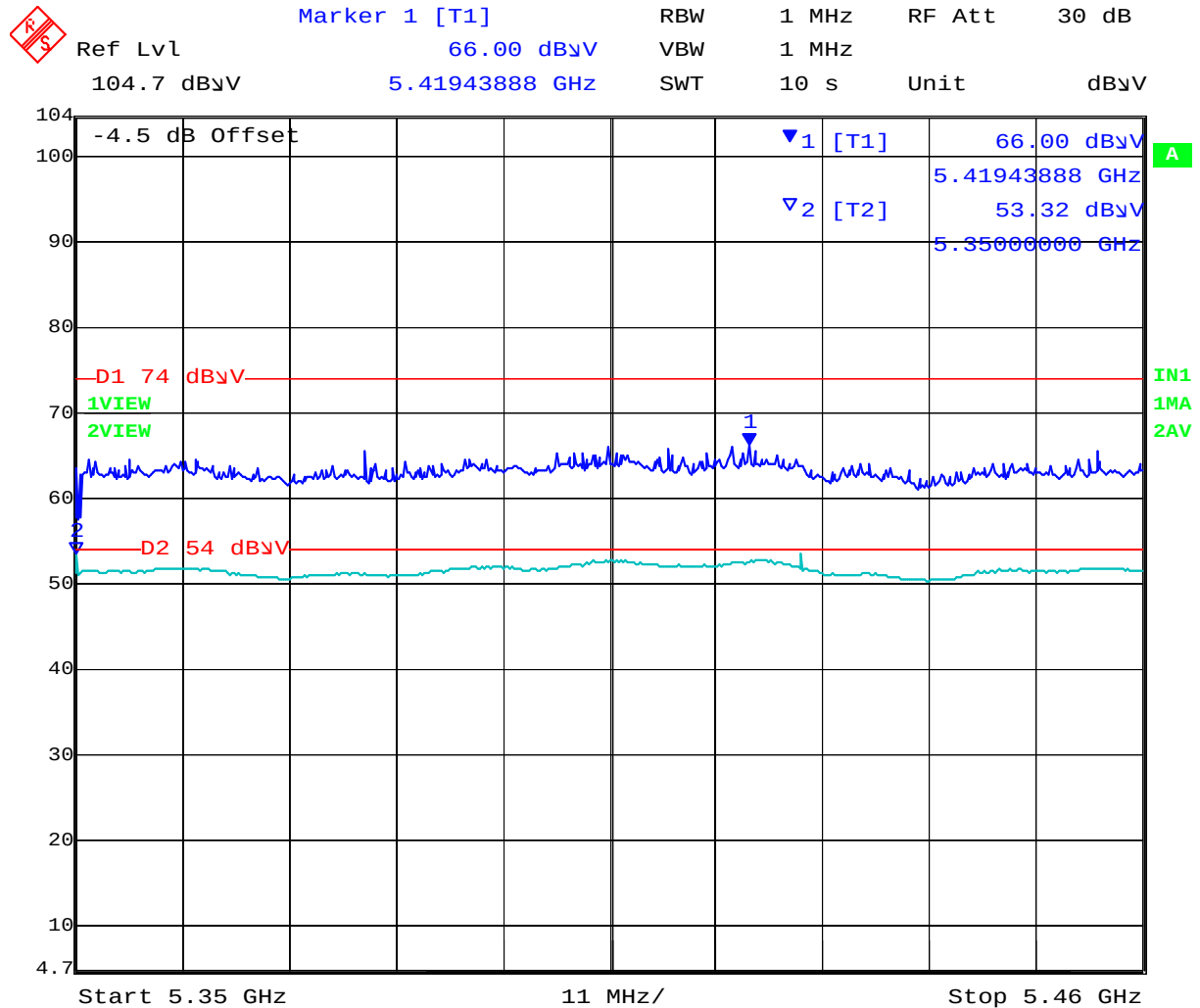
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5428.858	73.5	4.6	-9.3	68.9	Peak [Scan]	V						FUND
6348.6974	58.2	5.1	-7.4	55.8	Peak [Scan]	H					Pass	BE
5769.539	57.3	4.8	-8.9	53.2	Peak [Scan]	V	100	0	54	-0.9	Pass	BE
17352.705	40.6	8.7	1.6	50.8	Peak [Scan]	H	100	0	54	-3.2	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												

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Band-Edge 5470 802.11n HT-20 Tx = 5785 MHz



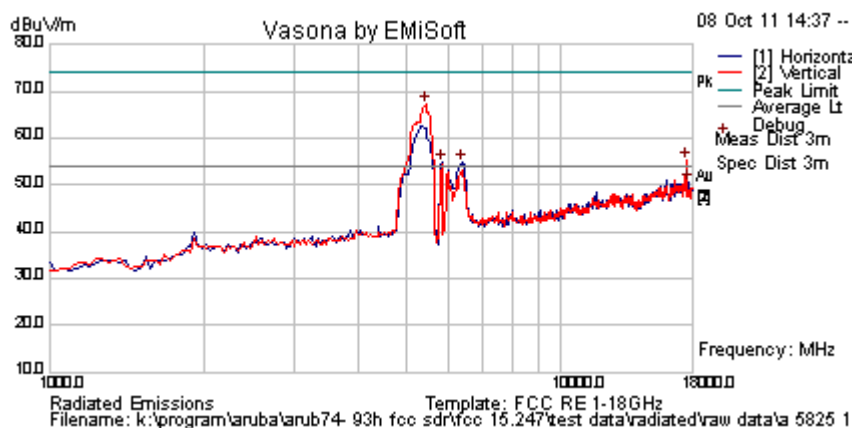
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Test Freq.	5825 MHz	Engineer	GMH
Variant	802.11n; HT-20; 6.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

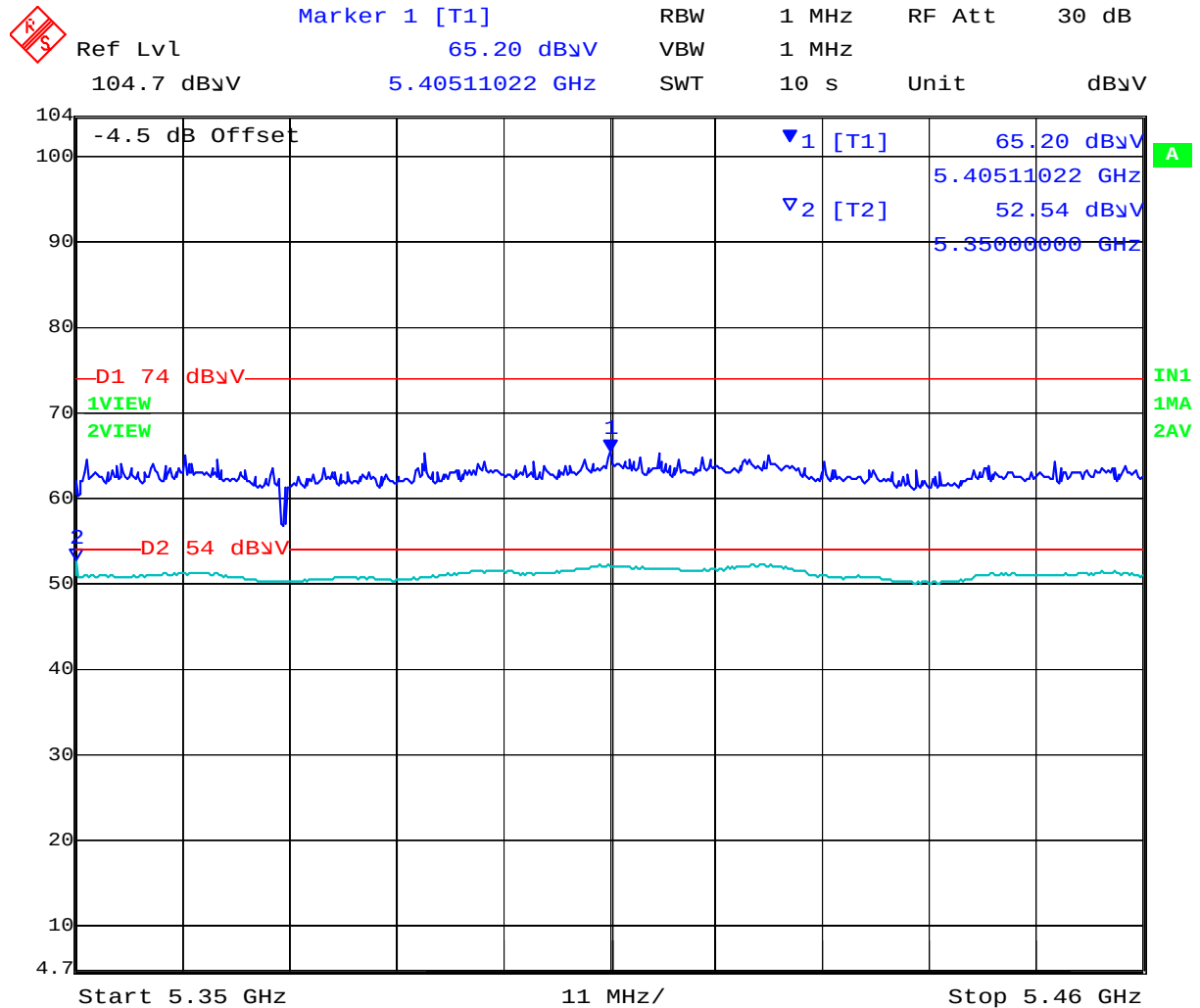
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5428.858	71.8	4.6	-9.3	67.1	Peak [Scan]	V					Pass	BE
5837.675	58.8	4.8	-8.8	54.8	Peak [Scan]	H						FUND
6382.766	57.0	5.1	-7.4	54.7	Peak [Scan]	H					Pass	BE
17659.319	41.0	8.8	0.8	50.5	Peak [Scan]	H	100	0	54	-3.5	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												

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Band-Edge 5470 802.11n HT-20 Tx = 5825 MHz



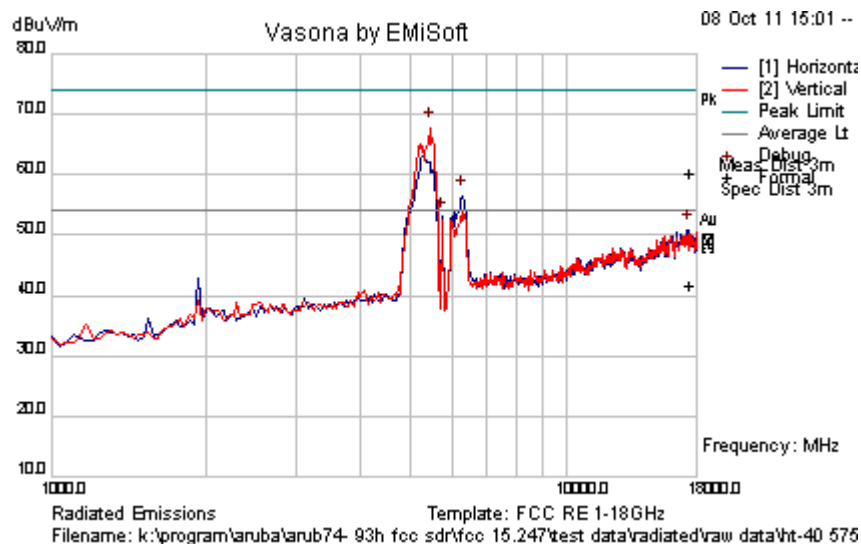
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Test Freq.	5755 MHz	Engineer	GMH
Variant	802.11n; HT-40; 13.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna	Integral	Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

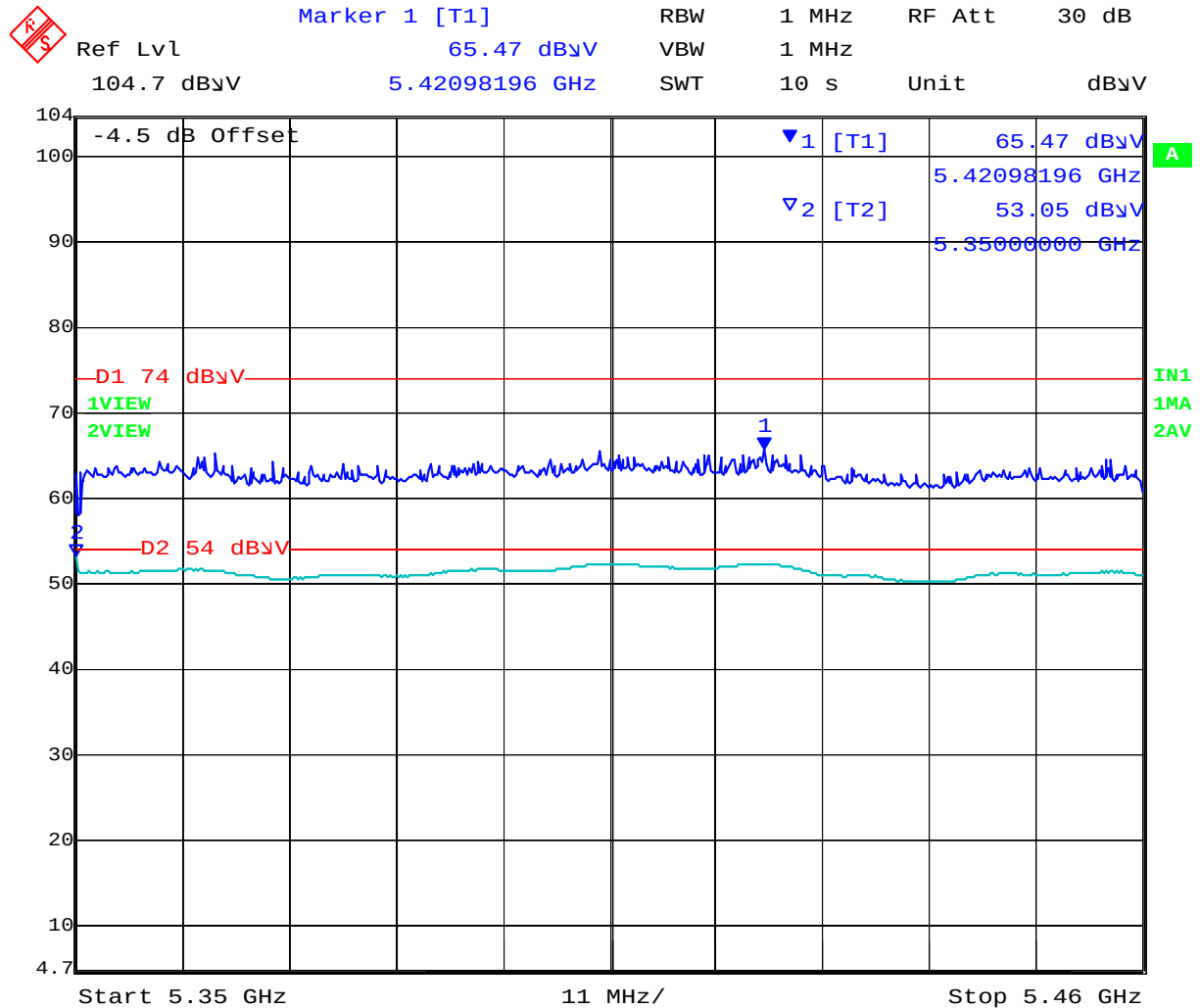
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
5428.858	72.3	4.6	-9.3	67.7	Peak [Scan]	V					Pass	BE
6280.56112	59.1	5.0	-7.5	56.6	Peak [Scan]	H					Pass	BE
5735.471	57.2	4.8	-8.9	53.1	Peak [Scan]	H						FUND
17216.433	41.4	8.6	1.0	50.9	Peak [Scan]	H	100	0	54	-3.1	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												

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Band-Edge 5470 802.11n HT-40 Tx = 5755 MHz



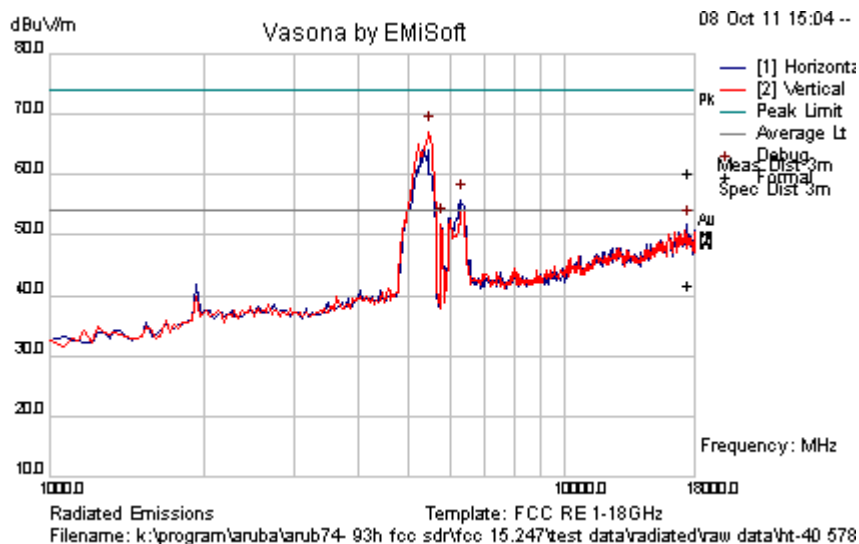
Date: 9.OCT.2011 13:35:43

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Test Freq.	5785 MHz	Engineer	GMH
Variant	802.11n; HT-40; 13.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna		Duty Cycle (%)	
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
5462.926	71.6	4.6	-9.2	67.0	Peak [Scan]	V					Pass	BE
6314.62926	58.2	5.0	-7.5	55.7	Peak [Scan]	H					Pass	BE
5769.539	56.0	4.8	-8.9	51.8	Peak [Scan]	V						FUND
17386.774	41.3	8.7	1.7	51.7	Peak [Scan]	H	100	0	54	-2.3	Pass	NOISE

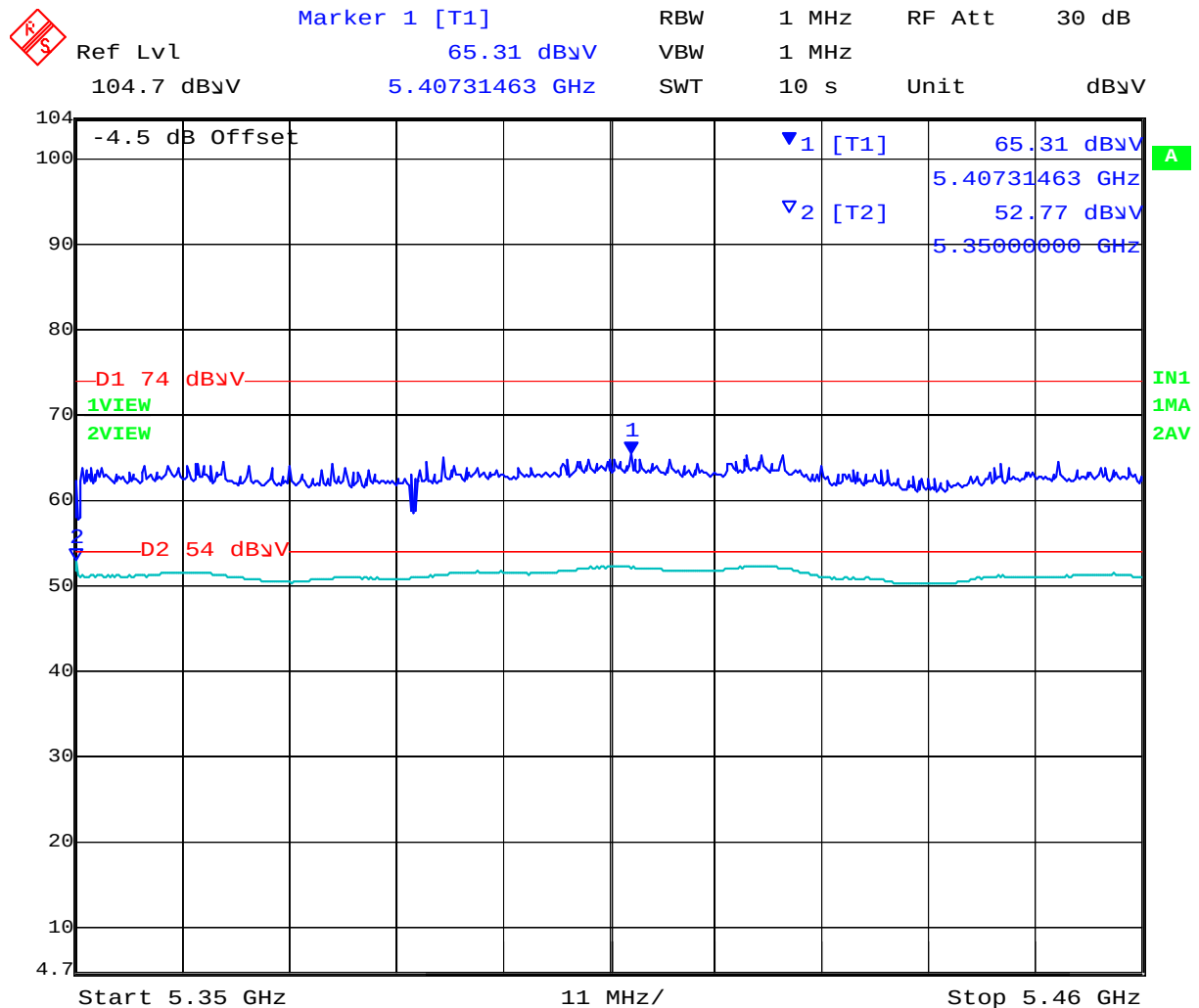
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band-Edge 5470 802.11n HT-40 Tx = 5795 MHz



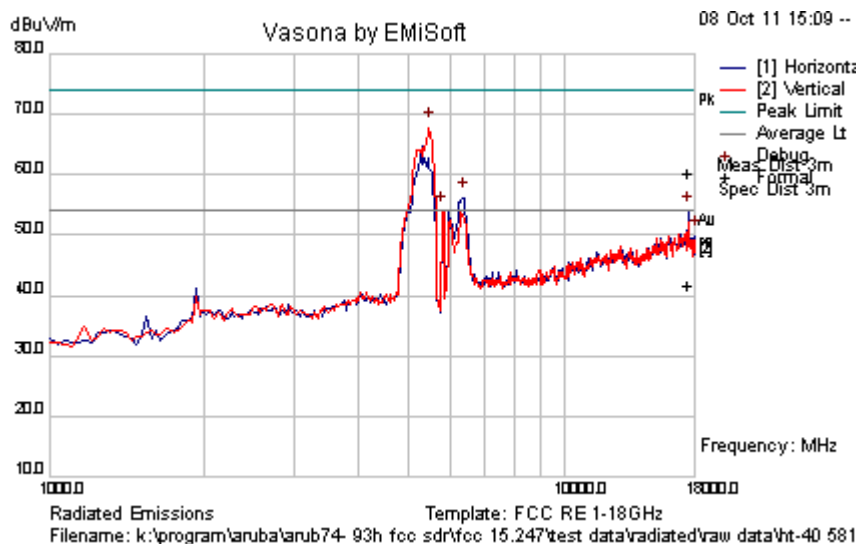
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Test Freq.	5815 MHz	Engineer	GMH
Variant	802.11n; HT-40; 13.5 MCS	Temp (°C)	29
Freq. Range	1000 MHz - 18000 MHz	Rel. Hum.(%)	999
Power Setting	18	Press. (mBars)	30.5
Antenna		Duty Cycle (%)	
Test Notes 1			
Test Notes 2			



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
5462.926	72.4	4.6	-9.2	67.8	Peak [Scan]	V					Pass	BE
6382.76553	58.5	5.1	-7.4	56.2	Peak [Scan]	H					Pass	BE
17454.910	43.9	8.7	1.4	54.0	Peak [Scan]	H	100	0	54	0.0	Pass	NRB
5803.607	58.0	4.8	-8.9	53.9	Peak [Scan]	V						FUND
18000.000	40.4	8.8	0.8	50.0	Peak [Scan]	H	100	0	54	-4.0	Pass	NOISE

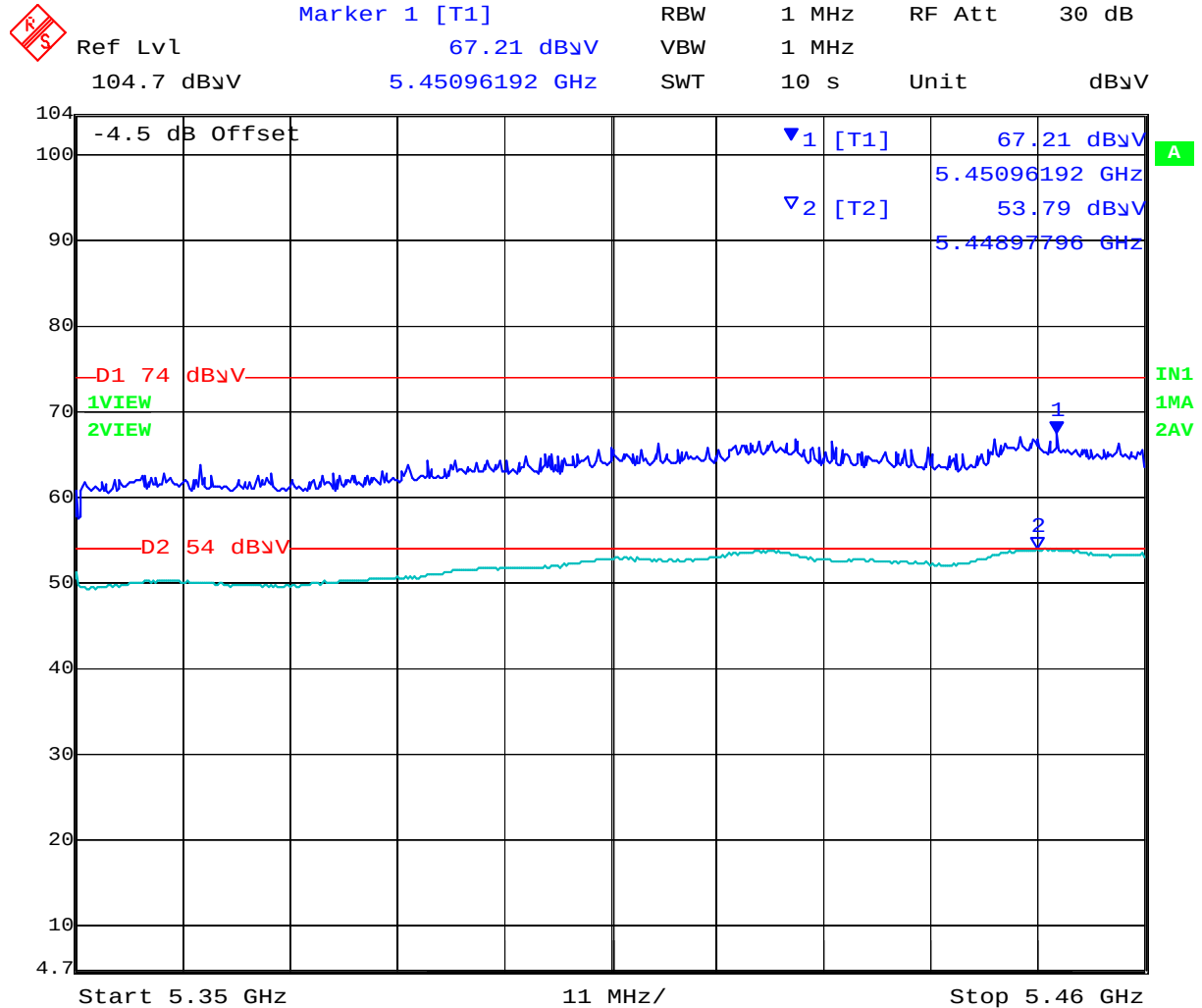
Legend: TX = Transmitter Emissions; DIG = Digital Emissions; FUND = Fundamental; WB = Wideband Emission
 RB = Restricted Band (15.209 Limits); NRB = Non Restricted Band, Limit is 20dB below fundamental peak

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Band-Edge 5470 802.11n HT-20 Tx = 5815 MHz



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7.6.2 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 shall comply with the limits of Table 1.

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Field Strength (dB $\mu\text{V/m}$)	Measurement Distance (meters)
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB
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Traceability

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

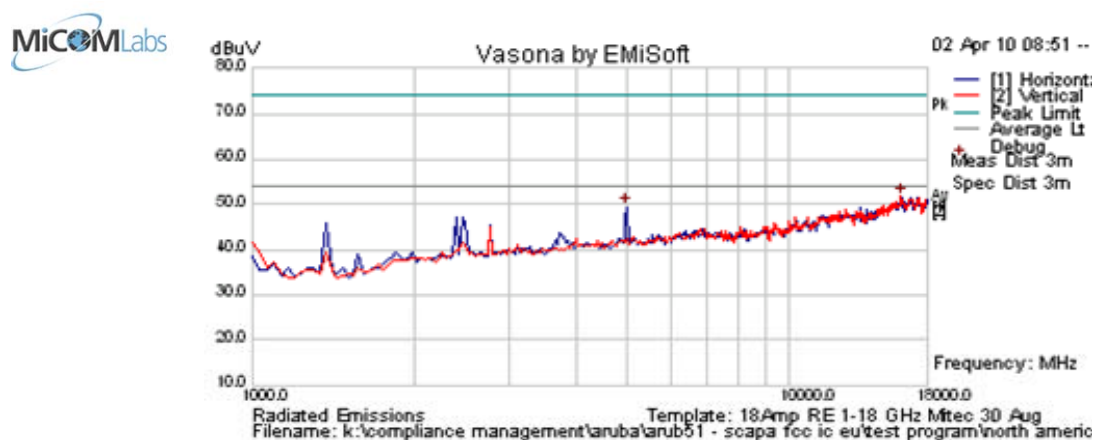
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Measurement Results for Receiver Emissions

Test Freq.	2437 MHz	Engineer	CSB
Variant	Receive in Test Utility	Temp (°C)	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

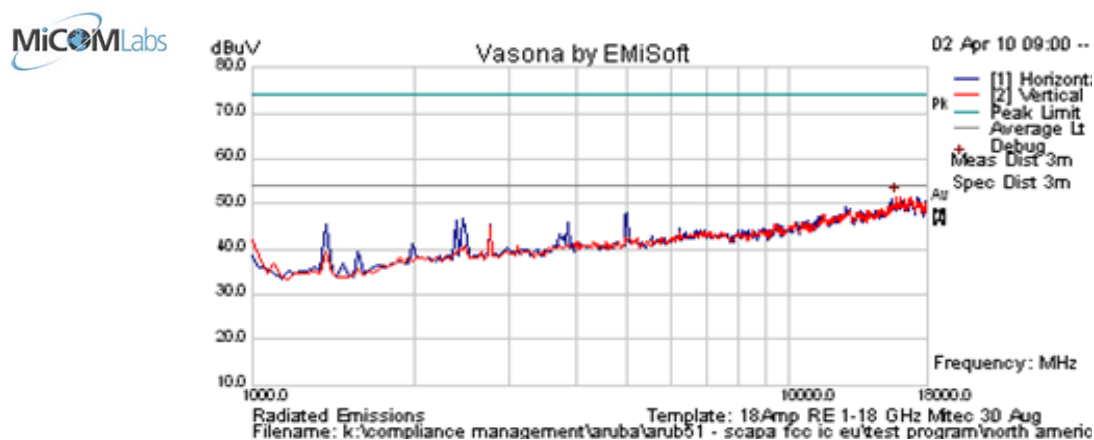
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
No Receiver Emissions within 6dB of limit.												
Legend: TRANS = Transient Emission; RB = Restricted Band; NRB = Non-Restricted Band;												
BE = Emission in Restricted Band Nearest Transmission Band Edge; FUND = Fundamental Freq.												

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Test Freq.	5785 MHz	Engineer	CSB
Variant	Receive in Test Utility	Temp (°C)	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.												

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7.6.3 Measurement Results: Radiated Spurious Emissions – Below 1 GHz

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

Laboratory Measurement Uncertainty for Radiated Emissions

Measurement uncertainty	+5.6/ -4.5 dB
-------------------------	---------------

Traceability

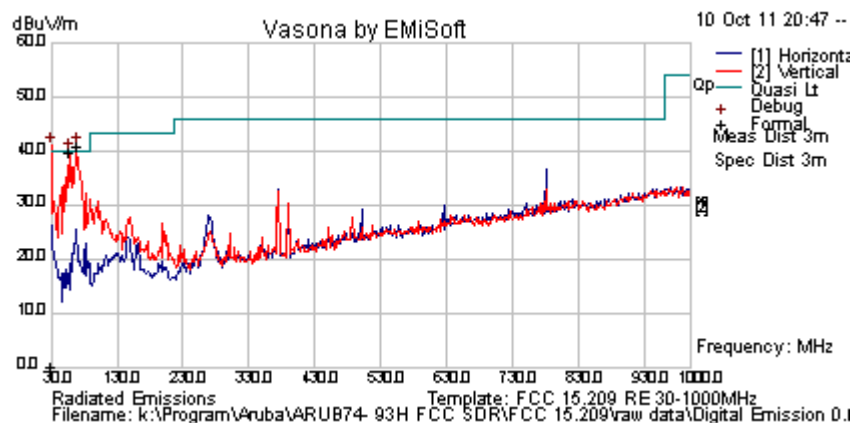
Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of Radiated Emissions'	0088, 0158, 0134, 0304, 0311, 0315, 0310, 0312

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Test Freq.	2442 MHz	Engineer	GMH
Variant	Digital Emissions	Temp (°C)	25
Freq. Range	30 MHz - 1000 MHz	Rel. Hum.(%)	41
Power Setting	Max	Press. (mBars)	1001
Antenna	integral		
Test Notes 1			
Test Notes 2			



Formally measured emission peaks

Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail	Comments
30.000	41.1	3.4	-9.2	35.3	Quasi Max	V	107	297	40	-4.7	Pass	
57.214	56.1	3.8	-23.7	36.2	Quasi Max	V	98	176	40.0	-3.8	Pass	
69.184	58.2	3.9	-23.0	39.1	Quasi Peak	V	130	201	40.0	-0.9	Pass	
Legend: DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency												
NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band												

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7.7 AC Wireline Conducted Emissions (150 kHz – 30 MHz)

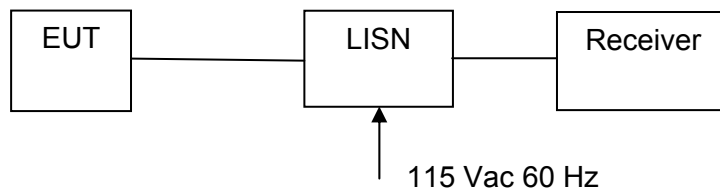
FCC, Part 15 Subpart C §15.407(b)(6)/15.207

Industry Canada RSS-Gen §7.2.2

Test Procedure

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

Test Measurement Set up



Measurement set up for AC Wireline Conducted Emissions Test

Specification

Limit

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

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

RSS-Gen §7.2.2

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



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§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
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Traceability

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

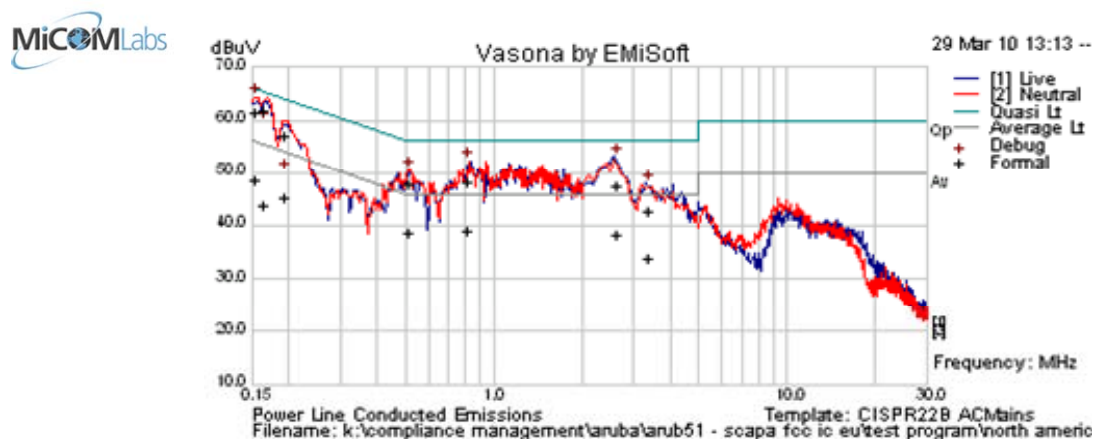
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Measurement Results for AC Wireline Conducted Emissions (150 kHz – 30 MHz)

Test Freq.	2437 - Rx Mode	Engineer	CSB
Variant	AC Line Emissions	Temp (°C)	22
Freq. Range	0.150 MHz - 30 MHz	Rel. Hum.(%)	38
Power Setting	N/A	Press. (mBars)	1006
Antenna	Integral Antennas		
Test Notes 1	AC Powered - 120V AC 60Hz		
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
0.155	38.8	9.9	0.1	48.8	Average	Neutral	55.73	-7.0	Pass	DIG
0.155	51.6	9.9	0.1	61.6	Quasi Peak	Neutral	65.73	-4.2	Pass	DIG
0.167	33.8	9.9	0.1	43.7	Average	Neutral	55.11	-11.4	Pass	DIG
0.167	51.7	9.9	0.1	61.7	Quasi Peak	Neutral	65.11	-3.4	Pass	DIG
0.194	35.4	9.9	0.1	45.3	Average	Neutral	53.86	-8.5	Pass	DIG
0.194	47.2	9.9	0.1	57.1	Quasi Peak	Neutral	63.86	-6.7	Pass	DIG
0.516	28.6	9.9	0.1	38.6	Average	Neutral	46	-7.4	Pass	DIG
0.516	37.8	9.9	0.1	47.9	Quasi Peak	Neutral	56	-8.2	Pass	DIG
0.828	38.4	9.9	0.1	48.4	Quasi Peak	Neutral	56	-7.6	Pass	DIG
0.828	29.1	9.9	0.1	39.1	Average	Neutral	46	-6.9	Pass	DIG
2.661	28.2	10.1	0.1	38.4	Average	Live	46	-7.6	Pass	DIG
2.661	37.3	10.1	0.1	47.6	Quasi Peak	Live	56	-8.5	Pass	DIG
Legend: DIG = Digital Device Emission; TX = Transmitter Emission; FUND = Fundamental Frequency										
NRB = Non-Restricted Band, Limit is 20 dB below Fundamental; RB = Restricted Band										

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Title: Aruba AP-93H 802.11a/b/g/n Wireless AP
To: FCC 47 CFR Part 15.247 & IC RSS-210
Serial #: ARUB74-U1 Rev A
Issue Date: 21st December 2011
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8 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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