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Test of CISCO 74-3625, 802.11b/g Wireless Module

To FCC 47 CFR Part15.247 & IC RSS-210

Test Report Serial No.: TUVR47-A1 Rev C

TEST REPORT

FROM

MiCOM Labs

Test of CISCO 74-3625, 802.11b/g Wireless Module

To FCC 47 CFR Part15.247 & IC RSS-210

Test Report Serial No.: TUVR47-A1 Rev C

This report supersedes: TUVR47-A1 Rev B

Manufacturer: Cisco Systems
170 W. Tasman Ave
San Jose
California 95134, USA

Product Function: 802.11b/g Wireless Access Point

Copy No: pdf **Issue Date:** 15th March '05

This Test Report is Issued Under the Authority of;

MiCOM Labs, Inc.
3922 Valley Avenue, Suite B
Pleasanton, California 94566, USA
Phone: 925.462.0304
Fax: 925.462.0306
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UKAS TESTING
2106

MiCOM Labs is a UKAS (United Kingdom Accreditation Service)

Accredited Test Laboratory

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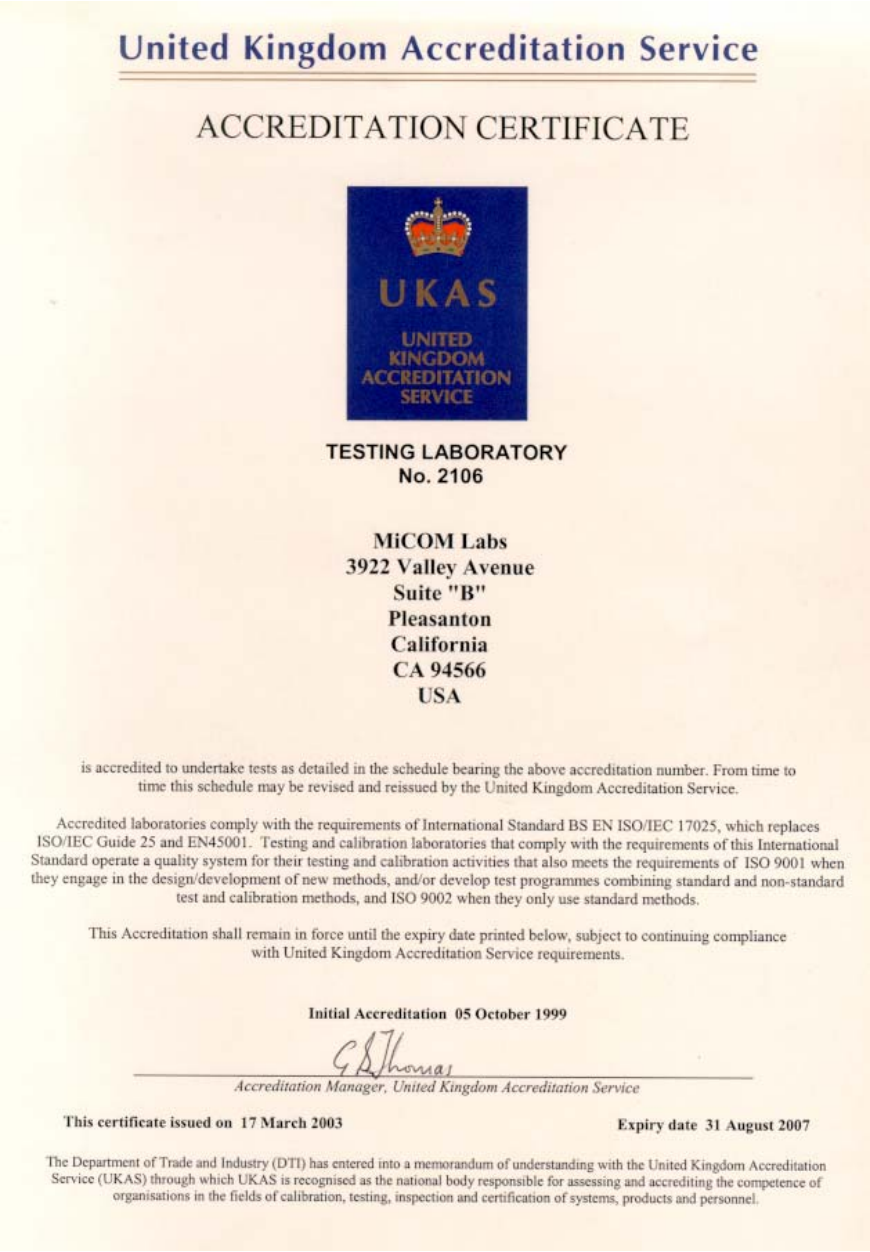
ACCREDITATION & LISTINGS

MiCOM Labs, Inc. an accredited laboratory complies with the international standard BS EN ISO/IEC 17025. The company is accredited by the United Kingdom Accreditation Service (UKAS) www.ukas.org test laboratory number 2106. MiCOM Labs test schedule is available at the following URL;
http://www.ukas.org/testing/lab_detail.asp?lab_id=875&location_id=&vMenuOption=3 .



United Kingdom Accreditation Service

ACCREDITATION CERTIFICATE

UKAS
UNITED KINGDOM ACCREDITATION SERVICE

TESTING LABORATORY
No. 2106

MiCOM Labs
3922 Valley Avenue
Suite "B"
Pleasanton
California
CA 94566
USA

is accredited to undertake tests as detailed in the schedule bearing the above accreditation number. From time to time this schedule may be revised and reissued by the United Kingdom Accreditation Service.

Accredited laboratories comply with the requirements of International Standard BS EN ISO/IEC 17025, which replaces ISO/IEC Guide 25 and EN45001. Testing and calibration laboratories that comply with the requirements of this International Standard operate a quality system for their testing and calibration activities that also meets the requirements of ISO 9001 when they engage in the design/development of new methods, and/or develop test programmes combining standard and non-standard test and calibration methods, and ISO 9002 when they only use standard methods.

This Accreditation shall remain in force until the expiry date printed below, subject to continuing compliance with United Kingdom Accreditation Service requirements.

Initial Accreditation 05 October 1999

G B Thomas
Accreditation Manager, United Kingdom Accreditation Service

This certificate issued on 17 March 2003 Expiry date 31 August 2007

The Department of Trade and Industry (DTI) has entered into a memorandum of understanding with the United Kingdom Accreditation Service (UKAS) through which UKAS is recognised as the national body responsible for assessing and accrediting the competence of organisations in the fields of calibration, testing, inspection and certification of systems, products and personnel.

LISTINGS

MiCOM Labs test facilities are listed by the following organizations;

North America

United States of America
Federal Communications Commission (FCC) Listing #: **102167**

Canada
Industry Canada (IC) Listing #: **4143**

DOCUMENT HISTORY

Document History		
Revision	Date	Comments
Draft	2nd February '05	
Rev A	9th February '05	
Rev B	10th March '05	Update to the following Sections; 5.1.2 Peak Output Power 5.1.4 Maximum Permissible Exposure 5.1.6.2 Radiated Band Edge
Rev C	15th March '05	Updated Section 3.4 Antenna Details Increased gain of AIR-ANT5959 to 2.35 dBi

1. TEST RESULT CERTIFICATE

Manufacturer:	Cisco Systems 170 W. Tasman Ave San Jose California 95134, USA	Tested By:	MiCOM Labs, Inc. 3922 Valley Avenue 'B' Pleasanton California, 94566, USA
EUT:	802.11b/g Wireless Module	Tel:	+1 925 462 0304
Model #:	CISCO 74-3625	Fax:	+1 925 462 0306
S/N:	Not Available		
Test Date(s):	9th Sept - 5th Mar '05	Website:	www.micomlabs.com

STANDARD(S)	TEST RESULTS
FCC 47 CFR Part15.247 & IC RSS-210	EQUIPMENT COMPLIES

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

Notes:

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

Approved & Released for MiCOM Labs, Inc. by:

UKAS TESTING
2106

Graeme Grieve
Quality Manager MiCOM Labs, Inc.

Gordon Hurst
President & CEO MiCOM Labs, Inc.

2. REFERENCES AND MEASUREMENT UNCERTAINTY

2.1. Normative References

Ref.	Publication	Year	Title
(i)	FCC 47 CFR Part 15.247	2004	Code of Federal Regulations
(ii)	Industry Canada RSS-210	Issue 5 Nov. 2001	Low Power License-Exempt Radiocommunication Devices (All Frequency Bands)
(iii)	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 9KHz to 40GHz
(iv)	CISPR 22/ EN 55022	1997 1998	Limits and Methods of Measurements of Radio Disturbance Characteristics of Information Technology Equipment
(v)	M 3003	Edit 1 Dec. 1997	Expression of Uncertainty and Confidence in Measurements
(vi)	LAB34	Edition 1 Aug2002	The expression of uncertainty in EMC Testing
(vii)	ETSI TR 100 028	ETSI TR 100 028	Parts 1 and 2 Electromagnetic compatibility and Radio Spectrum Matters (ERM); Uncertainties in the measurement of mobile radio equipment characteristics
(viii)	UKAS LAB 1	Edition 4 May 2004	Reference to Accreditation for Laboratories.
(ix)	DTI URN 98/997	1998	Conditions for the use of National Accreditation Marks by UKAS and UKAS Accredited Organizations.

2.2. Test and Uncertainty Procedures

Conducted and radiated emission measurements were conducted in accordance with American National Standards Institute ANSI C63.4, Normative Reference (iii).

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, Normative Reference (v).

3. PRODUCT DETAILS AND TEST CONFIGURATIONS

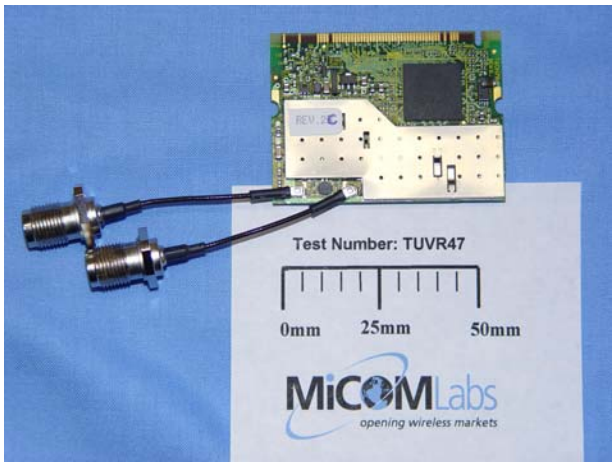
3.1. Technical Details

Details	Description
Purpose:	Test of the CISCO 74-3625 wireless module to FCC and Industry Canada regulations
Applicant:	TUV Rheinland of N. America 1279 Quarry Lane Suite A California, 94566,USA
Manufacturer:	Cisco Systems 170 W. Tasman Ave San Jose California 95134, USA
Laboratory performing the tests:	MiCOM Labs, Inc. 3922 Valley Avenue, Suite "B" Pleasanton, California 94566 USA
Test report reference number:	TUVR47-A1 Rev C
Date EUT received:	6th September '04
Standard(s) applied:	FCC 47 CFR Part15.247 & IC RSS-210
Dates of test (from - to):	9th Sept - 5th Mar '05
Type of Equipment:	802.11b,g Wireless Access Point
Manufacturers Trade Name:	CISCO 74-3625
Model:	CISCO 74-3625
Location for use:	Indoor use only
Declared Frequency Range(s):	2,412 – 2,462MHz
Type of Modulation:	Per 802.11b – DBPSK, DQPSK, CCK Per 802.11g – OFDM
Client Declared Nominal Output Power:	802.11b: +18 dBm (peak) 802.11g: +18 dBm (peak), see Section 5.1.2 Peak Output Power for exception
Transmit/Receive Operation:	Simplex
Rated Input Voltage and Current:	3.3Vdc nominal, 800mA
Operating Temperature Range:	0 ºC - +35ºC
ITU Emission Designator:	802.11b – 15M3W7D 802.11g – 16M8W7D
Microprocessor(s) Model:	Atheros AR5213
Clock/Oscillator(s):	40MHz
Frequency Stability:	±20ppm
Equipment Dimensions:	2" X 2.5"
Weight:	0.2lbs
Primary function of equipment:	To initiate and receive data transmissions, telemetry, and telecommand.

3.2. Scope of Test Program

The scope of the test program was to test the CISCO 74-3625, 802.11b/g Wireless Module against the current FCC and Industry Canada specifications FCC Part 15.247 and IC RSS-210, Normative References (i) & (ii).

CISCO 74-3625 2.4GHz 802.11b/g Wireless Access Point Module



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

Name	Manufacturer	Model No.	Serial No.
CISCO 74-3625	Foxconn	T60H786	Not Available
Laptop	IBM	600E	78-PKNMO
AC Adapter	IBM		11S02K67492J 1MN33631NN

3.4. Antenna Details

Antenna Type	Gain (dBi)	Manufacturer	Model No.	Serial No.
Swivel Mount Dipole Antenna	2.2	Radial	AIR-ANT4941	Not Available
Diversity Omni Ceiling	2.35	Cushcraft	AIR-ANT5959	Not Available
Ceiling Mount Omni	5.2	Cushcraft	AIR-ANT1728	Not Available

3.5. Cabling and I/O Ports

Number and type of I/O ports

1.

3.6. Test Configurations

Matrix of test configurations

Operational Mode (802.11)	Operating Channel / Frequencies (MHz)	Maximum Data Rates (Mbps)	Data Rate(s) Selected for Test Purposes (Mbps)
b	1 / 2,412 6 / 2,437 11 / 2,462	11	11
g		54	54

Only worst case plots are provided for each test parameter are identified within this report. Plots not included are held on file by the test laboratory and available upon request with client permission.

Conducted testing on the CISCO 74-3625 wireless module was not performed in a host device therefore host software was not exercised. Maximum output power was set available via the Atheros software. A host device was used for radiated emission testing.

3.7. Equipment Modifications

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

1. Antennas AIR-ANT5959 and AIR-ANT1728 had difficulty meeting the band edge restricted bands at full output power for 802.11g operational mode. Power reduction was required in order to comply with the restricted band requirements, see Section 5.1.2 Peak Output Power.

2. System output power reduction was required as a result of transmitter harmonic emission issues.

3.8. Deviations from the Test Standard

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

1. NONE

3.9. Subcontracted Testing

Radiated emissions 30MHz-1GHz (Section 5.1.6.3) and AC Wireline Emissions (Section 5.1.7) were subcontracted to the following test facility;

Sanmina-SCI
Homologation Services
EMI Test Laboratory
2305 Mission College Blvd.
Santa Clara, California 95054
USA

Sanmina-SCI, NVLAP (National Voluntary Laboratory Accreditation Program) Lab Code 100411-0 is ISO/IEC 17025 accredited for emission testing.

Sanmina SCI: FCC Registration Number - **90844**

Sanmina SCI: Industry Canada Registration Number – **IC5541**

4. TEST SUMMARY

List of Measurements

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

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.247(a)(2) **5.9.1**	6dB and 99% Bandwidth	>=500KHz	Conducted	Complies	5.1.1
15.247(b) **15.31(e)** **6.2.2 (o) (b)**	Peak Output Power Voltage Variation	Shall not exceed 1W Variation of supply voltage 85% -115%	Conducted	Complies	5.1.2
15.247(d) **6.2.2 (o) (b)**	Peak Power Spectral Density	Shall not be greater than +8dBm in any 3kHz band	Conducted	Complies	5.1.3
15.247(b)(5) **14**	Maximum Permissible Exposure	Exposure to radio frequency energy levels	Conducted	Complies	5.1.4
15.247(c) **15.205(a) / 15.209(a)** **6.2.2 (o) (e1)**	Conducted Spurious Emissions (30-26GHz)	Band Edge Emission shall be at least 20dB below the highest in-band spectral density	Conducted	Complies	5.1.5
5.205(a) / 15.209(a) **6.3**	Radiated Emissions	Restricted Bands	Radiated	Complies	5.1.6
	Transmitter Radiated Spurious Emissions	Emissions >1GHz (1-26GHz)		Complies	*5.1.6.1*
	Radiated Band Edge	Band edge results		Complies	*5.1.6.2*
	Radiated Emissions	Emissions <1GHz (30M-1GHz)		Complies	*5.1.6.3*

Section(s)	Test Items	Description	Condition	Result	Test Report Section
15.207 **6.6**	AC Wireline Conducted Emissions 150kHz–30MHz	Conducted Emissions	Conducted	Complies	5.1.7

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

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

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

5. TEST RESULTS

5.1. Device Characteristics

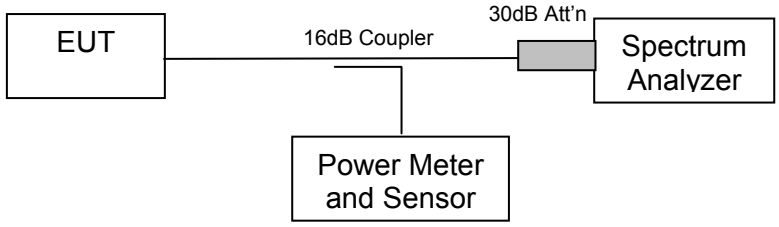
5.1.1. 6dB and 99% Bandwidth

FCC, Part 15 Subpart C §15.247(a)(2)
Industry Canada RSS-210 §5.9.1

Test Procedure
The bandwidth at 6dB and 99% is measured with a spectrum analyser connected to the antenna terminal, while EUT is operating in transmission mode at the appropriate center frequency. Using a 6dB resolution bandwidth filter setting the spectrum analyzer was set to the following for both 6dB BW and 99% BW measurements;

RBW=1MHz, VBW=1 MHz, Span=50 or 75MHz, Sweep = auto

Test Measurement Set up



Measurement set up for 6dB and 99% Bandwidth test

Measurement Results for 6dB and 99% Operational Bandwidth(s)

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57% Pressure: 999 to 1009 mbar

TABLE OF RESULTS – **802.11b 11Mbps**

Center Frequency (MHz)	6dB Bandwidth (MHz)	6dB Plot #	99% BW (MHz)	99% BW Plots
2,412	12.5250	On File	15.7314	On File
2,437	12.5751	On File	15.7314	On File
2,462	12.7254	01	15.7314	02

TABLE OF RESULTS – **802.11g 54Mbps**

Center Frequency (MHz)	6dB Bandwidth (MHz)	6dB Plot #	99% BW (MHz)	99% BW Plots
2,412	17.1342	On File	18.4869	On File
2,437	17.1342	On File	18.6372	On File
2,462	17.1342	03	18.9378	04

Specification

Limits

§**15.247 (a)(2) For direct sequence systems the minimum 6dB bandwidth shall be at least 500KHz**

Laboratory Measurement Uncertainty for Spectrum Measurement

Measurement uncertainty	±2.81dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-03 'Measurement of RF Spectrum Mask'	0156, 0193, 0252, 0313, 0314

5.1.2. Peak Output Power

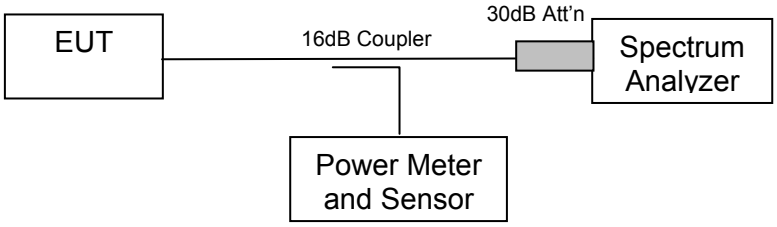
FCC, Part 15 Subpart C §15.247(b)
Industry Canada RSS-210 §6.2.2(o)(b)

Test Procedure

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

Measurements were made while EUT was operating in a continuous transmission mode i.e. 100% duty cycle at the appropriate center frequency. Spectrum analyzer settings: RBW=1MHz, VBW=10MHz, Span=50 or 75MHz, Sweep = 200mS

Test Measurement Set up



Measurement set up for Transmitter Peak Output Power

Antenna Gain - Maximum Permissible Power Level

If transmitting antennas of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the stated values by the amount in dB that the directional gain of the antenna exceeds 6dBi.

For antennas greater than 6 dBi;
Maximum permissible peak power = +30 dBm – (Antenna Gain – 6dBi)

Antenna Type	Antenna No.	Gain (dBi)	Antenna Gain >6dBi (dB)	Max. Permissible Peak Power (dBm)
Swivel Mount Dipole	4941	2.2	0	+30.0
Ceiling Mount Omni	1728	5.2	0	+30.0
Diversity Omni Ceiling	5959	2.0	0	+30.0

Measurement Results for Peak Output Power

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57% Pressure: 999 to 1009 mbar

TABLE OF RESULTS – **802.11b 11MBit/s**

Center Frequency (MHz)	Measurement Bandwidth (MHz)	Peak Power (dBm)	Peak Power Plot #
2,412	15.7314	17.51	On File
2,437	15.7314	17.85	On File
2,462	15.7314	18.09	05

PEAK POWER EIRP

Maximum Peak Power EIRP = maximum conducted power + antenna gain (dBi)

Antenna No.	Gain (dBi)	Max. Peak Power EIRP (dBm)
AIR-ANT4941	2.2	+20.29
AIR-ANT5959	2.0	+20.09
AIR-ANT1728	5.2	+23.29

TABLE OF RESULTS – **802.11g 54Mbps**

Center Frequency (MHz)	Measurement Bandwidth (MHz)	Peak Power (dBm)	Peak Power Plot #
2,412	18.9378	14.34	On File
2,437	18.9378	17.97	06
2,462	18.9378	15.04	On File

PEAK POWER EIRP

Max. Peak Power EIRP = max. conducted power + antenna gain (dBi)

Antenna No.	Gain (dBi)	Max. Peak Power EIRP (dBm)
AIR-ANT4941	2.2	+20.17
AIR-ANT5959	2.0	+19.97
AIR-ANT1728	5.2	+23.17

Supply Voltage Variation

The supply voltage was varied between 97.75VAC and 132.25VAC. The system operated as intended at either extreme with no change in the above measurement bandwidths.

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 902-928MHz, 2400-2483.5MHz and 5725-5850MHz bands: 1watt

§15.247 (b) (4) Except as shown in paragraphs (b)(3)(i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b) (1) or (b)(2) of this section, as appropriate by the amount in dB that the directional gain of the antenna exceeds 6dBi.

§6.2.2(o)(b) For the band 2400-2483.5 MHz, the transmitter output power shall not exceed 1.0 watt

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0156, 0193, 0252, 0313, 0314

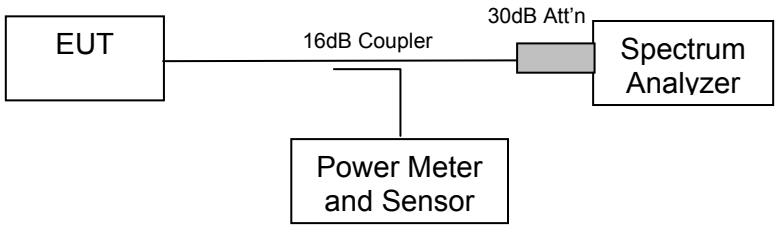
5.1.3. Peak Power Spectral Density

FCC, Part 15 Subpart C §15.247(d)
Industry Canada RSS-210 §6.2.2(o)(b)

Test Procedure
The transmitter output was connected to a spectrum analyser and the maximum level in a 3KHz bandwidth was measured. A peak value was found over the full emission bandwidth and the frequency span reduced to obtain enhanced resolution. Sweep time => span / 3KHz with video averaging turned off. The Peak Power Spectral Density is the highest level found across the emission in a 3KHz resolution bandwidth. Spectrum analyzer settings:

RBW= 3kHz, VBW=10kHz, Span= <=500KHz, Sweep time=500s, RBW Filter=3dB

Test Measurement Set up



Measurement set up for Peak Power Spectral Density

Measurement Results for Peak Power Spectral Density

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57% Pressure: 999 to 1009 mbar

TABLE OF RESULTS – **802.11b 11MBit/s**

Center Frequency (MHz)	Peak Frequency (MHz)	PPSD (dBm)	Plot #
2,412	2411.99	-2.08	07
2,437	2436.97	-2.31	On File
2,462	2461.98	-2.49	On File

TABLE OF RESULTS – **802.11g 54MBit/s**

Center Frequency (MHz)	Peak Frequency (MHz)	PPSD (dBm)	Plot #
2,412	2404.20	-9.59	On File
2,437	2436.99	-7.60	08
2,462	2461.99	-7.77	On File

Specification

Peak Power Spectral Density Limits

§15.247 (d) For direct sequence systems the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than +8dBm in any 3KHz band during any time interval of continuous transmission

RSS-210 §**6.2.2(o)(b)** The transmitter power spectral density (into the antenna) shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0 second duration.

Laboratory Measurement Uncertainty Spectral Density

Measurement uncertainty	±1.33dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-01 'Measuring RF Output Power'	0156, 0193, 0252, 0313, 0314

5.1.4. Maximum Permissible Exposure

FCC, Part 15 Subpart C §15.247(b)(5)
Industry Canada RSS-210 §14

Calculations for Maximum Permissible Exposure Levels

Power Density = Pd (mW/cm^2) = $EIRP/(4\pi d^2)$

EIRP = P * G

P = Peak output power (mW)

G = Antenna numeric gain (numeric)

d = Separation distance (cm)

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

P (worst case) = +**18.09 dBm, 64.42 mW,** Antenna Gain = 5.2 dBi / **3.31 numeric**

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

Antenna Gain (Numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated RF Exposure at d=20cm (mW/cm^2)	Limit (mW/cm^2)
3.31	+18.09	64.42	0.04	1

Specification

Maximum Permissible Exposure Limits

§15.247 (b)(5) Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency levels in excess of the Commission's guidelines. See §1.1307 (b)(1) of this chapter.

Limit S = $1mW / cm^2$ from 1.310 Table 1

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

RSS-210 §14 Before equipment certification is granted, the procedures of RSS-102 must be followed concerning exposure of humans to RF fields.

Laboratory Measurement Uncertainty for Power Measurements

Measurement uncertainty	±1.33dB

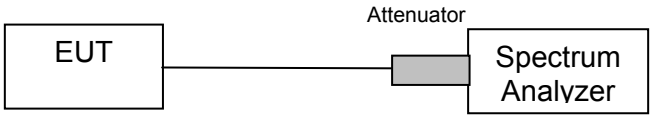
5.1.5. Conducted Spurious Emissions

FCC, Part 15 Subpart C §15.247(c)
Industry Canada RSS-210 §5.9.1, §6.2.2 (o)(e1)

Test Procedure
The band-edge if measured at 20 dB below the highest in-band spectral density measured with a spectrum analyzer connected to the antenna terminal. Measurements were made while EUT was operating in a continuous transmission mode i.e. 100% duty cycle at the appropriate center frequency.

The spectrum analyzer is set to:
RBW=100kHz, VBW=300kHz, Span=110MHz, Sweep = 200mS

Test Measurement Set up



Band-edge measurement test configuration

Measurement Results of Conducted Spurious Emissions

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57% Pressure: 999 to 1009 mbar

Band-Edge Results

TABLE OF RESULTS – **802.11b 11Mbps**

Center Frequency (MHz)	Band edge Frequency (MHz)	Limit @ 20dB below peak	Amplitude @ Band edge (dBm)	Plot #	Margin (dB)
2,412	2,400	-11.96	-29.96	09	-18.00
2,462	2,483.5	-10.76	-41.76	10	-31.00

TABLE OF RESULTS – **802.11g 54Mbps**

Center Frequency (MHz)	Band edge Frequency (MHz)	Limit @ 20dB below peak	Amplitude @ Band edge (dBm)	Plot #	Margin (dB)
2,412	2,400	-17.00	-21.95	11	-4.95
2,462	2,483.5	-17.10	-33.92	12	-16.82

Spurious Emissions (1-26GHz)

Conducted spurious emissions (1-26GHz) are provided indicated by the following matrix. Measurements were performed with the transmitter tuned to the channel closest to the band-edge being measured. All emissions were maximized during measurement. Limits which were derived from the band-edge measurements provided below are drawn on each plot.

Worst case results are reported, other results and plots are kept on file

TABLE OF RESULTS – **802.11b 11Mbps**

Start Frequency (MHz)	Stop Frequency (MHz)	Maximum Emission Observed (dBm)	Limit (dBm)	Plot #	Margin (dB)
30	1,000	-45.01	-11.96	13	-33.05
1,000	2,400	-30.15	-11.96	14	-18.19
2,483.5	4,000	-44.54	-11.96-	15	-32.58
4,000	13,200	-38.73	-11.96	16	-26.77
13,200	25,000	-53.06	-11.96	17	-41.10

TABLE OF RESULTS – **802.11g 54Mbps**

Start Frequency (MHz)	Stop Frequency (MHz)	Maximum Emission Observed (dBm)	Limit (dBm)	Plot #	Margin (dB)
30	1,000	-45.46	-17.1	18	-28.36
1,000	2,400	-26.04	-17.1	19	-8.94
2,483.5	4,000	-44.57	-17.1	20	-27.47
4,000	13,200	-45.23	-17.1	21	-28.13
13,200	25,000	-52.06	-17.1	22	-34.96

Specification

Limits Band-Edge

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

§**15.247(c)** In any 100KHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or radiated measurement. Attenuation below the general limits specified in §**15.209(a)** is not required.

§**6.2.2 (o)(e1)** In any 100 kHz bandwidth outside the operating frequency bands, between 30 MHz and 5 times the carrier frequency, the unwanted emission spectral density shall be either at least 20 dB below the in-band spectral density, or shall not exceed the levels specified in Table 3, whichever is less stringent.

Measurement Uncertainty Conducted Spurious Emissions

Measurement uncertainty	±2.37dB

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0156, 0193, 0088, 0252, 0313, 0314

5.1.6. Radiated Emissions

5.1.6.1. Transmitter Radiated Spurious Emissions (above 1GHz)

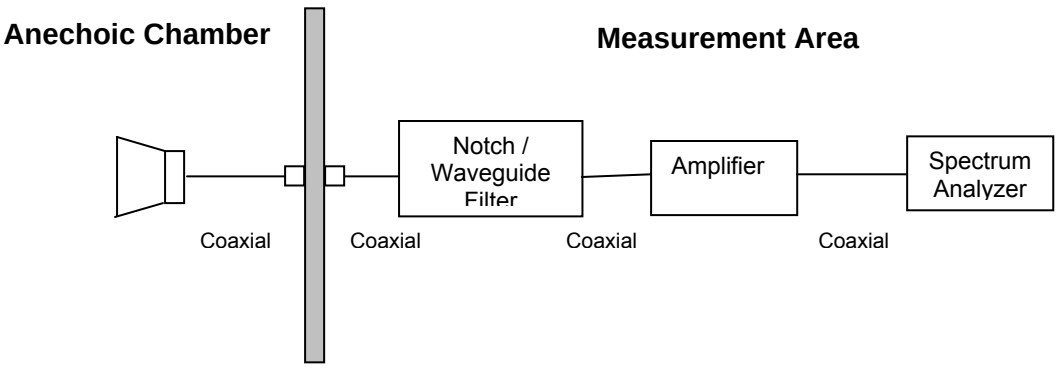
FCC, Part 15 Subpart C §15.247(c)
Industry Canada RSS-210 §6.3

Test Procedure

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

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

Test Measurement Set up



Measurement set up for Radiated Emission Test

Field Strength Calculation

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

FS = R + AF + CORR - FO

where:

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

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

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

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

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

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

Measurement Results Transmitter Radiated Spurious Emissions 1GHz - 26GHz

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57% Pressure: 999 to 1009 mbar

Radio parameters.
Transmission: Communicating and passing data with support equipment

ANTENNA: AIR-ANT4941 Swivel Mount Dipole (2.2 dBi)

TABLE OF RESULTS – **802.11b 11MBit/s**

CH.	Freq. (MHz)	Pol. (H/V)	Peak Reading (dBµV/m)	Ave Reading (dBµV/m)	Corr'n Factor (dB)	Corr'd Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1	1200.00	V	54.67	51.67	-4.82	46.85	54.00	-7.15
6	1200.30	V	53.15	51.83	-4.82	47.01	54.00	-6.99
1	7236.45	V	54.65	34.70	10.26	44.96	54.00	-9.04
6	7311.62	V	59.45	35.26	10.49	45.75	54.00	-8.25
6	7312.20	H	55.10	34.26	10.49	44.75	54.00	-9.25
11	7392.26	V	56.40	34.28	10.49	44.75	54.00	-8.89

TABLE OF RESULTS – **802.11g 54MBit/s**

CH.	Freq. (MHz)	Pol. (H/V)	Peak Reading (dBµV/m)	Ave Reading (dBµV/m)	Corr'n Factor (dB)	Corr'd Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
6	7308.98	V	59.2	33.78	10.49	44.27	54.00	-9.73
6	4825.25	V	54.5	35.92	7.35	43.27	54.00	-10.73
11	4924.18	V	51.2	37.36	7.52	44.88	54.00	-9.12
11	7388.70	V	51.9	36.19	10.76	46.95	54.00	-7.05

ANTENNA: AIR-ANT5959 Diversity Omni Ceiling Antenna (2.0 dBi)

TABLE OF RESULTS – **802.11b 11MBit/s**

CH.	Freq. (MHz)	Pol. (H/V)	Peak Reading (dBµV/m)	Ave Reading (dBµV/m)	Corr'n Factor (dB)	Corr'd Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
6	4873.96	V	63.55	40.75	7.43	48.18	54.00	-5.82
6	7309.34	V	68.85	39.52	10.51	50.03	54.00	-3.97
6	4874.10	H	61.61	38.43	7.43	45.86	54.00	-8.14
6	7311.81	H	67.42	38.71	10.52	49.23	54.00	-4.77
11	4924.18	H	61.32	37.36	7.52	44.88	54.00	-9.12
11	7384.97	H	65.92	38.08	10.75	48.83	54.00	-5.17

TABLE OF RESULTS – **802.11g 54MBit/s**

CH.	Freq. (MHz)	Pol. (H/V)	Peak Reading (dBµV/m)	Ave Reading (dBµV/m)	Corr'n Factor (dB)	Corr'd Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
1	7239.48	V	61.54	35.41	10.3	45.71	54.00	-8.29
6	7328.33	V	62.65	35.13	10.57	45.70	54.00	-8.30
6	7319.54	H	61.95	35.30	10.55	45.85	54.00	-8.15
11	7388.70	V	64.61	36.19	10.76	46.95	54.00	-7.05
11	7399.34	H	62.35	35.46	10.79	46.25	54.00	-7.75
6	9130.98	V	65.36	33.40	14.94	48.34	54.00	-5.66

ANTENNA: AIR-ANT1728 Omni Ceiling Antenna (5.2 dBi)

TABLE OF RESULTS – **802.11b 11MBit/s**

CH.	Freq. (MHz)	Pol. (H/V)	Peak Reading (dBµV/m)	Ave Reading (dBµV/m)	Corr'n Factor (dB)	Corr'd Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
6	7307.49	H	67.35	36.56	10.51	47.07	54	-6.93
6	7309.41	V	65.23	37.35	10.51	47.86	54	-6.14
11	7382.28	H	66.78	37.54	10.74	48.28	54	-5.72
11	7382.09	V	63.45	37.72	10.74	48.46	54	-5.54

TABLE OF RESULTS – **802.11g 54MBit/s**

CH.	Freq. (MHz)	Pol. (H/V)	Peak Reading (dBµV/m)	Ave Reading (dBµV/m)	Corr'n Factor (dB)	Corr'd Field Strength (dBµV/m)	Limit (dBµV/m)	Margin (dB)
6	7307.91	H	64.31	36.16	10.51	46.67	54	-7.33
6	7309.63	V	62.16	35.98	10.52	46.5	54	-7.50
11	7383.86	H	65.43	36.60	10.74	47.34	54	-6.66
11	7387.20	V	66.12	36.37	10.75	47.12	54	-6.88

Spurious emission plots are available in Section 8 Graphical Results

5.1.6.2. Radiated Band Edge Results – Restricted Bands

In making band-edge measurements, there can be a problem obtaining meaningful data since a measurement instrument that is tuned to a band-edge frequency may also capture some in-band signals when using the resolution bandwidth (RBW) required by measurement procedure ANSI C63.4-1992 (hereafter C63.4). In an effort to compensate for this problem, the following technique sanctioned by the FCC for determining band-edge compliance has been developed.

Equipment was operated on the frequency channel closest to the restricted band in each case.

STEP 1) Perform an in-band field strength measurement of the fundamental emission using the RBW and detector function required by C63.4 and the Rules for the frequency being measured.

STEP 2) Encompass both the peak of the fundamental emission and the band-edge emission under investigation. Set the analyzer RBW to 1% of the total span, never using a RBW less than 30 kHz. Use a video bandwidth equal to or greater than the RBW. Record the peak levels of the fundamental emission and the relevant band-edge emission. Observe the stored trace and measure the amplitude delta between the peak of the fundamental and the peak of the band-edge emission. This is not a field strength measurement, it is only a relative measurement to determine how much the emission drops at the band-edge relative to the highest fundamental emission level.

STEP 3) Subtract the delta measured in step (2) from the field strengths measured in step (1). The resultant field strengths (CISPR QP, average, or peak, as appropriate) are then used to determine band-edge compliance as required by either 15.249(c) or 15.205.

STEP 4) You can use the above "delta" measurement technique for measuring emissions that are up to two "standard" bandwidths away from the band-edge, where a "standard" bandwidth is the bandwidth specified by C63.4 for the frequency being measured. For example, for band-edge measurements in the restricted band that begins at 2483.5 MHz, C63.4 specifies a measurement bandwidth of at least 1 MHz. Therefore you may use the "delta" technique for measuring emissions up to 2 MHz removed from the band-edge. Radiated emissions that are removed by more than two bandwidths must be measured in the conventional manner.

Corrected Reading

Corrected Peak Band Edge$_{PBE}$ = Peak Reading + Antenna Gain - Delta

Corrected Average Band Edge$_{ABE}$ = Average Reading + Antenna Gain - Delta

Antenna Gain @ 2.4GHz = 30.7dB/m

Note:

Amplifier gain and cable loss over the band of interest (2,390 to 2.483.5 MHz), -29.7dB was included as a spectrum analyzer offset

ANTENNA: AIR-ANT4941 Swivel Mount Dipole (2.2 dBi)

TABLE OF RESULTS – **802.11b 11MBit/s**

Direct Test Methodology for Band Edge 2,390 MHz

Tx Freq. (MHz)	Restricted Band Edge Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Plot #	Margin (dB)
$2{,}412_{PEAK}$	2,390	53.81	74.00	26	-20.19
$2{,}412_{AVE}$	2,390	44.03	54.00	26	-9.97

Indirect Test Methodology for Band Edge 2,483.5 MHz

Tx Freq. MHz	Restricted Band Frequency MHz	Limit (dBuV/m)	Measured (dBuV/m)	Delta dB	Corrected Reading dBuV/m	Plot #	Margin dB
$2{,}462_{PEAK}$	2,483.5	74.00	80.95	55.09	66.36	On File	-7.64
$2{,}462_{AVE}$	2,483.5	54.00	60.96	55.09	36.57	On File	-17.43

TABLE OF RESULTS – **802.11g 54 MBit/s**

Direct Test Methodology for Band Edge 2,390 MHz

Tx Freq. (MHz)	Restricted Band Edge Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Plot #	Margin (dB)
$2{,}412_{PEAK}$	2,390	60.43	74.00	On File	-13.57
$2{,}412_{AVE}$	2,390	32.40	54.00	On File	-21.60

Indirect Test Methodology for Band Edge 2,483.5 MHz

Tx Freq. MHz	Restricted Band Frequency MHz	Limit (dBuV/m)	Measured (dBuV/m)	Delta dB	Corrected Reading dBuV/m	Plot #	Margin dB
$2{,}462_{PEAK}$	2,483.5	74.00	78.21	49.04	59.87	On File	-14.13
$2{,}462_{AVE}$	2,483.5	54.00	50.38	49.04	32.04	On File	-21.96

ANTENNA: AIR-ANT5959 Diversity Omni Ceiling Antenna (2.0 dBi)

TABLE OF RESULTS – **802.11b 11 MBit/s**

Direct Test Methodology for Band Edge 2,390 MHz

Tx Freq. (MHz)	Restricted Band Edge Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Plot #	Margin (dB)
$2{,}412_{PEAK}$	2,390	59.34	74.00	On File	-14.66
$2{,}412_{AVE}$	2,390	50.06	54.00	On File	-3.94

Indirect Test Methodology for Band Edge 2,483.5 MHz

Tx Freq. MHz	Restricted Band Frequency MHz	Limit (dBuV/m)	Measured (dBuV/m)	Delta dB	Corrected Reading dBuV/m	Plot #	Margin dB
$2{,}462_{PEAK}$	2,483.5	74.00	110.50	58.23	52.27	On File	-21.73
$2{,}462_{AVE}$	2,483.5	54.00	105.85	58.23	47.62	On File	-6.38

TABLE OF RESULTS – **802.11g 54 MBit/s**

Direct Test Methodology for Band Edge 2,390 MHz

Tx Freq. (MHz)	Restricted Band Edge Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Plot #	Margin (dB)
$2{,}412_{PEAK}$	2,390	64.50	74.00	27	-9.5
$2{,}412_{AVE}$	2,390	49.26	54.00	27	-4.74

Indirect Test Methodology for Band Edge 2,483.5 MHz

Tx Freq. MHz	Restricted Band Frequency MHz	Limit (dBuV/m)	Measured (dBuV/m)	Delta dB	Corrected Reading dBuV/m	Plot #	Margin dB
$2{,}462_{PEAK}$	2,483.5	74.00	105.01	41.34	63.67	On File	-10.33
$2{,}462_{AVE}$	2,483.5	54.00	95.2	41.34	53.86	On File	-0.14

ANTENNA: AIR-ANT1728 Omni Ceiling Antenna (5.2 dBi)

TABLE OF RESULTS – **802.11b 11 MBit/s**

Direct Test Methodology for Band Edge 2,390 MHz

Tx Freq. (MHz)	Restricted Band Edge Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Plot #	Margin (dB)
$2{,}412_{PEAK}$	2,390	50.87	74.00	On File	-23.13
$2{,}412_{AVE}$	2,390	38.00	54.00	On File	-16.0

Indirect Test Methodology for Band Edge 2,483.5 MHz

Tx Freq. MHz	Restricted Band Frequency MHz	Limit (dBuV/m)	Measured (dBuV/m)	Delta dB	Corrected Reading dBuV/m	Plot #	Margin dB
$2{,}462_{PEAK}$	2,483.5	74.00	103.64	57.23	46.41	On File	-27.59
$2{,}462_{AVE}$	2,483.5	54.00	99.11	57.23	41.88	On File	-12.12

TABLE OF RESULTS – **802.11g 54 MBit/s**

Direct Test Methodology for Band Edge 2,390 MHz

Tx Freq. (MHz)	Restricted Band Edge Frequency (MHz)	Measured (dBuV/m)	Limit (dBuV/m)	Plot #	Margin (dB)
$2{,}412_{PEAK}$	2,390	61.42	74.00	On File	-12.58
$2{,}412_{AVE}$	2,390	45.36	54.00	On File	-8.64

Indirect Test Methodology for Band Edge 2,483.5 MHz

Tx Freq. MHz	Restricted Band Frequency MHz	Limit (dBuV/m)	Measured (dBuV/m)	Delta dB	Corrected Reading dBuV/m	Plot #	Margin dB
$2{,}462_{PEAK}$	2,483.5	74.00	103.85	39.27	64.58	28	-9.42
$2{,}462_{AVE}$	2,483.5	54.00	92.86	39.27	53.59	28	-0.41

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 1000MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, 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.

Frequency (MHz)	Field Strength (µV/m)	Field Strength (dBµV/m)	Measurement Distance (meters)
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Measurement Uncertainty Radiated Emissions

Measurement uncertainty (dB)	+5.6/ -4.5

Traceability

Method	Test Equipment Used
Measurements were made per work instruction WI-05 'Measurement of Spurious Emissions'	0088, 0156, 0134, 0304, 0311, 0315, 0310, 0312

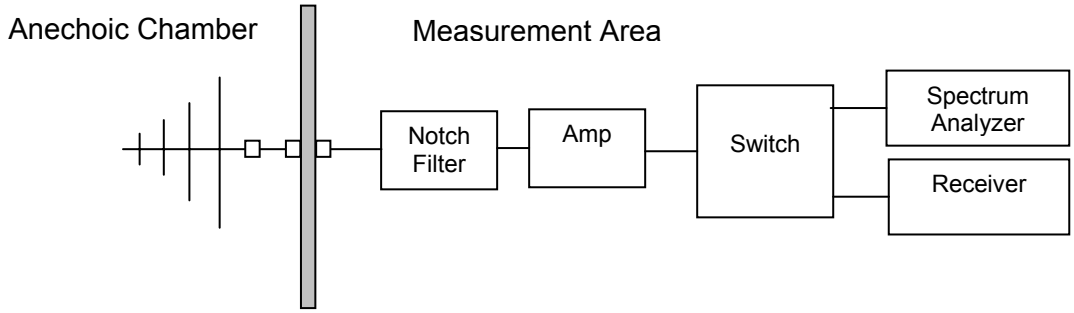
5.1.6.3. Radiated Emissions (30M-1GHz)

FCC, Part 15 Subpart C §15.247(c)/ §15.209
Industry Canada RSS-210 §6.2.2(q1)(ii)

Test Procedure

Testing 30M-1GHz was subcontracted to the company identified in Section 3.9 Subcontracted Testing. Preliminary radiated emissions are measured in the anechoic chamber at a 10-meter distance on every azimuth in both horizontal and vertical polarity. The emissions are recorded with a spectrum analyzer in peak hold mode. Emissions closest to the limits are measured in the quasi-peak mode with the tuned receiver using a bandwidth of 120kHz. Only the highest emissions relative to the limit are listed. The anechoic chamber test set-up is identified in Section 6 Test Set-Up Photographs.

Test Measurement Set up



Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Loss, and subtracting Amplifier Gain from the measured reading. In this test facility, the Antenna Factor, Cable Loss, and Amplifier Gains are loaded into the Rohde & Schwarz Receiver and the corrected field strength can be read directly on the receiver.

$$FS = R + AF + CORR$$

where:

FS = Field Strength
R = Measured Receiver Input Amplitude
AF = Antenna Factor
CORR = Correction Factor = CL – AG + NFL
CL = Cable Loss
AG = Amplifier Gain

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

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

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

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

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

Measurement Results for Spurious Emissions (30MHz – 1GHz)

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57% Pressure: 999 to 1009 mbar

Radio parameters.
Data Rate(s): 11Mbps
Transmission:

TABLE OF RESULTS

Freq. (MHz)	Peak (dBuV/m)	QP (dBuV/m)	QP Lmt (dBuV/m)	QP Margin (dB)	Angle (deg)	Hgt (cm)	Pol	Total Corr'n Factor
74.9970	34.58	34.45	40.00	-5.55	90	394	Vert	-24.04
124.994	35.60	34.74	40.00	-5.26	311	100	Vert	-23.08
174.998	32.57	30.46	40.00	-9.54	109	102	Vert	-20.22
224.999	33.47	32.80	40.00	-7.20	266	102	Vert	-18.02
525.001	40.73	40.12	47.00	-6.88	40	200	Horz	-8.57
800.001	42.07	39.55	47.00	-7.45	68	102	Horz	-4.43

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 1000MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, 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.

Frequency (MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance (meters)
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Measurement Uncertainty Radiated Emissions

Measurement uncertainty (dB)	+5.6/ -4.5

Traceability

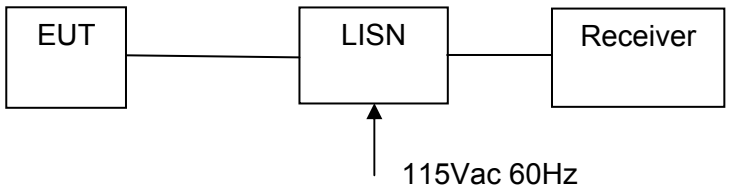
Method	SANMINA Test Equipment Used
Measurements were made per Sanmina work instruction	8546A HP Receiver and RF Filter, HP Pre-amp, Antenna EMCO Biconilog

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

FCC, Part 15 Subpart C §15.207
Industry Canada RSS-210 §6.6(b), §7.4

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 9KHz. The emissions are maximized further by cable manipulation. The highest emissions relative to the limit are listed.

Test Measurement Set up



Measurement set up for AC Wireline Conducted Emissions Test

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

Ambient conditions.
Temperature: 19 to 26 °C Relative humidity: 31 to 57% Pressure: 999 to 1009 mbar

Radio parameters.
Data Rate(s): 11Mbps

TABLE OF RESULTS

LINE - LIVE

Frequency (MHz)	Peak (dBµV)	QP (dBµV)	QP Limit (dBµV)	QP Margin (dB)	Ave. (dBµV)	Ave. Limit (dBµV)	Ave. Margin (dB)
0.585810	45.04	--.--	56.00	--.--	--.--	46.00	--.--
0.708195	45.29	--.--	56.00	--.--	--.--	46.00	--.--
0.955950	45.12	--.--	56.00	--.--	--.--	46.00	--.--
1.141020	43.05	--.--	56.00	--.--	--.--	46.00	--.--
1.242510	43.28	--.--	56.00	--.--	--.--	46.00	--.--
1.367880	43.03	--.--	56.00	--.--	--.--	46.00	--.--

LINE – NEUTRAL

Frequency (MHz)	Peak (dBμV)	QP (dBμV)	QP Limit (dBμV)	QP Margin (dB)	Ave. (dBμV)	Ave. Limit (dBμV)	Ave. Margin (dB)
15.182460	42.20	--.--	60.00	--.--	--.--	50.00	--.--
15.558570	42.06	--.--	60.00	--.--	--.--	50.00	--.--
15.677970	42.77	--.--	60.00	--.--	--.--	50.00	--.--
15.803340	42.24	--.--	60.00	--.--	--.--	50.00	--.--
17.042115	42.38	--.--	60.00	--.--	--.--	50.00	--.--
17.286885	42.35	--.--	60.00	--.--	--.--	50.00	--.--

Emission plots are provided in Section 8, Graphical Results

Specification

Limit

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150KHz to 30MHz shall not exceed the limits in the following table, as measured using a 50μΩ 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.

6.6(b) On any frequency or frequencies within the band of 0.15-30 MHz, the measured RF voltage (CISPR meter) shall not exceed 250μV, 48dBμV (across 50 ohms)

Transmitters marketed for use only in a commercial, industrial or business environment and not intended for use in homes are permitted a limit of 1000 μV (60dBμV, 0.45 - 1.705 MHz) and 3000 μV (69.5dBμV, 1.705 - 30 MHz).

§15.207 (a) 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	±2.64dB

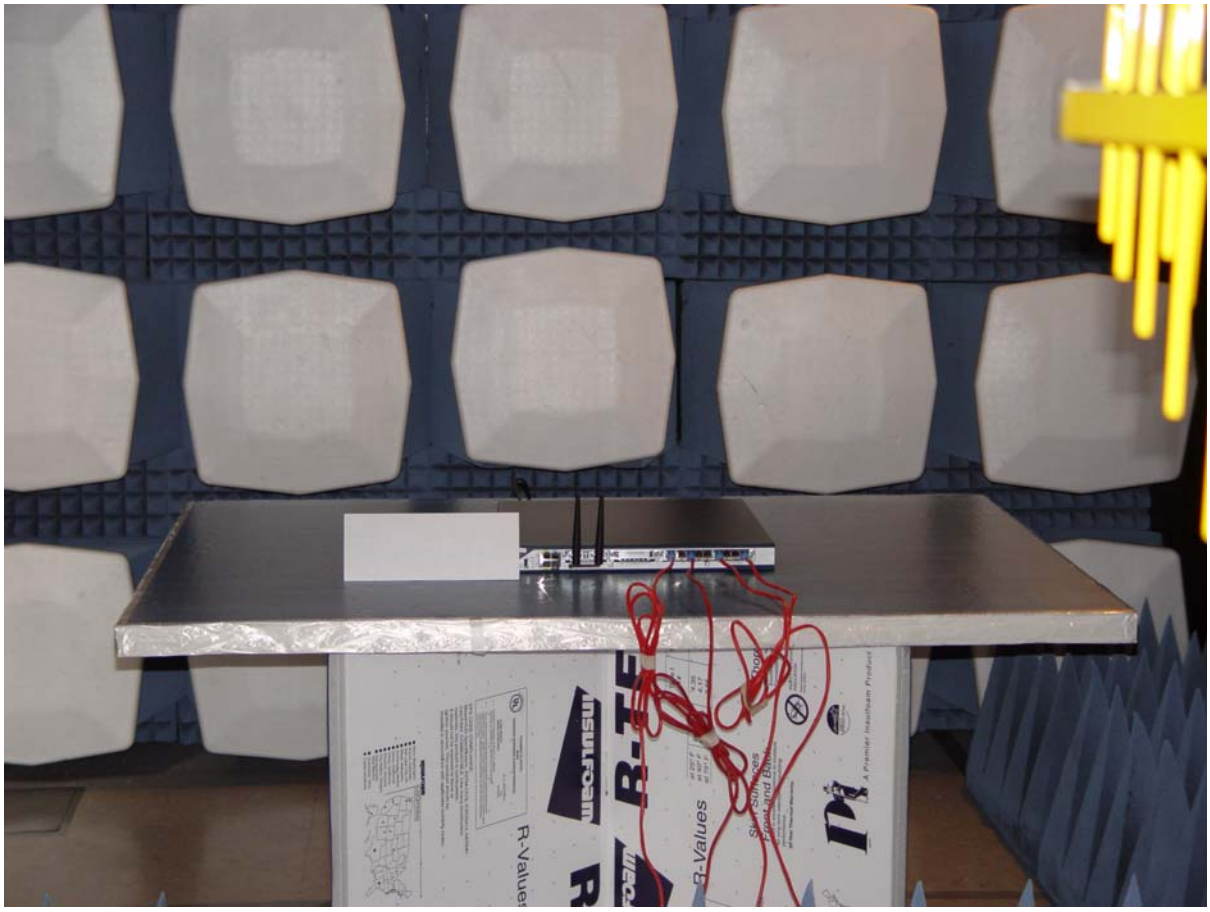
Traceability

Method	SANMINA Test Equipment Used
Measurements were made per Sanmina work instruction	8546A HP Receiver and RF Filter, HP Pre-amp

6. TEST SET-UP PHOTOGRAPHS

6.1. Radiated Emissions (30MHz-1GHz)

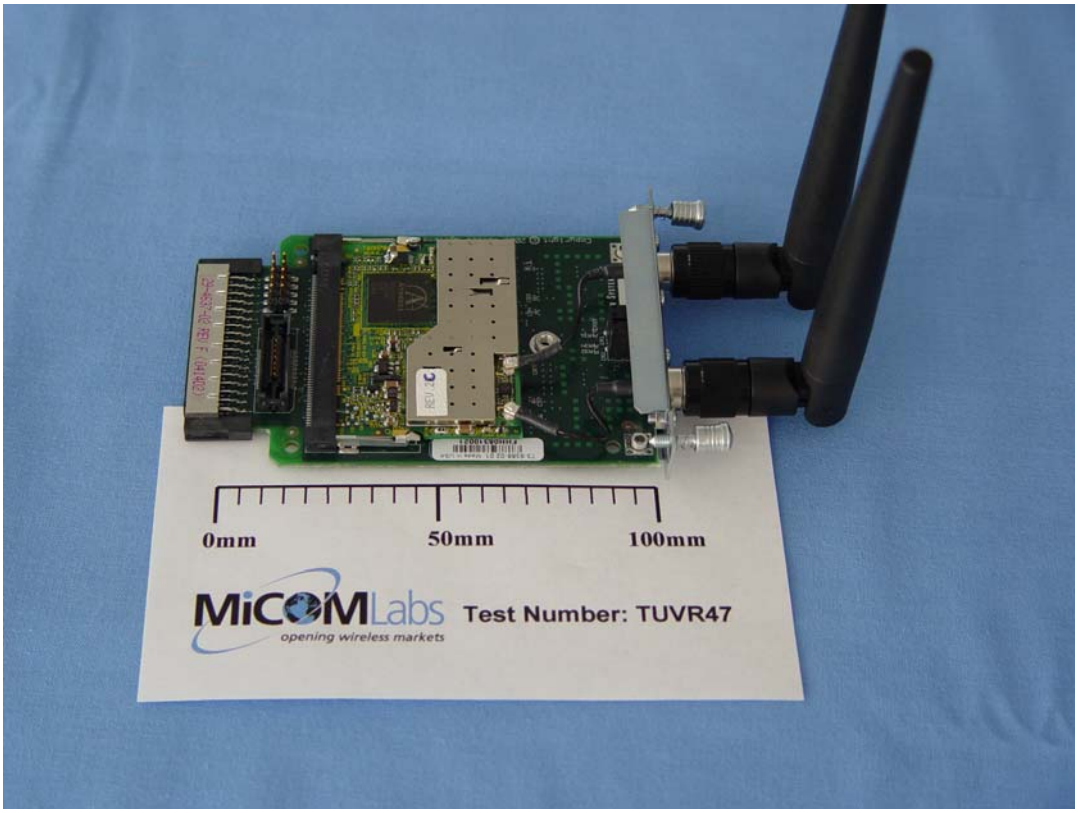
6.2. Spurious Emissions >1GHz



6.3. Conducted Emissions (150KHz - 30MHz)

6.4. General Measurement Test Set-Up

6.5. CISCO 74-3625 802.11b/g Wireless Module



7. TEST EQUIPMENT DETAILS

Asset #	Instrument	Manufacturer	Part #	Calibration Due Date	Serial #
0070	Power Meter	Hewlett Packard	437B	13th May '05	3125U13554
0078	Antenna (30M-2GHz)	Schaffner and Chase	CBLG140A	Not Applicable	1195
0088	Spectrum Analyzer	Hewlett Packard	8564E	15th May '05	
0104	1-18GHz Horn Antenna	The Electro-Mechanics Company	3115	12th Aug '05	9205-3882
0107	26.5GHz-40GHz	Northeast Microwave System	261A1599	30th Apr '05	971716-027
0116	Power Sensor	Hewlett Packard	R8485A	16th Mar '05	3318A19694
0134	Amplifier	Com Power	PA 122	1st Sept '05	181910
0145	18GHz-26.5GHz	Millimeter Products	261K	30th Apr '05	595
0156	Barometer /Thermometer	Control Co.	4196	12th Aug '05	E2844
0184	Pulse Limiter	Rhode & Schwartz	ESH3Z2	1st Dec '05	357.8810.52
0190	LISN	Rhode & Schwartz	ESH3Z5	3rd Apr '05	836679/006
0193	EMI Receiver	Rhode & Schwartz	ESI 7	16th Mar '05	838496/007
0213	20-300MHz Antenna	Schwarzbeck	VHBB 9124	6th Apr '05	9124/0257
0250	230MHz-1GHz Antenna	Schwarzbeck	VUSLP9111	6th Apr '05	186
0251	SMA Cable	Megaphase	Sucoflex 104	18th Jun '05	Unknown
0252	SMA Cable	Megaphase	Sucoflex 104	18th Jun '05	Unknown
0253	SMA Cable	Megaphase	Sucoflex 104	18th Jun '05	Unknown
0256	SMA Cable	Megaphase	Sucoflex 104	18th Jun '05	Unknown
0293	BNC Cable	Megaphase	Unknown	18th Jun '05	Unknown
0304	2.4GHz Notch Filter	Micro-Tronics	--	N/A	--
0307	BNC Cable	Megaphase	Unknown	18th Jun '05	Unknown
0310	2m SMA Cable	Micro-Coax	UFA210A-0-0787-3G03G0	16th Dec '05	209089-001
0311	12-18GHz High Pass Filter	CMT	--	--	--
0312	3m SMA Cable	Micro-Coax	UFA210A-1-1181-3G0300	16th Dec '05	209092-001
0313	Coupler	Hewlett Packard	86205A	N/A	1623
0314	30dB N-Type Attenuator	NARDA	32319	N/A	--
0315	17-26.5GHz High Pass Filter	HP	--	--	--

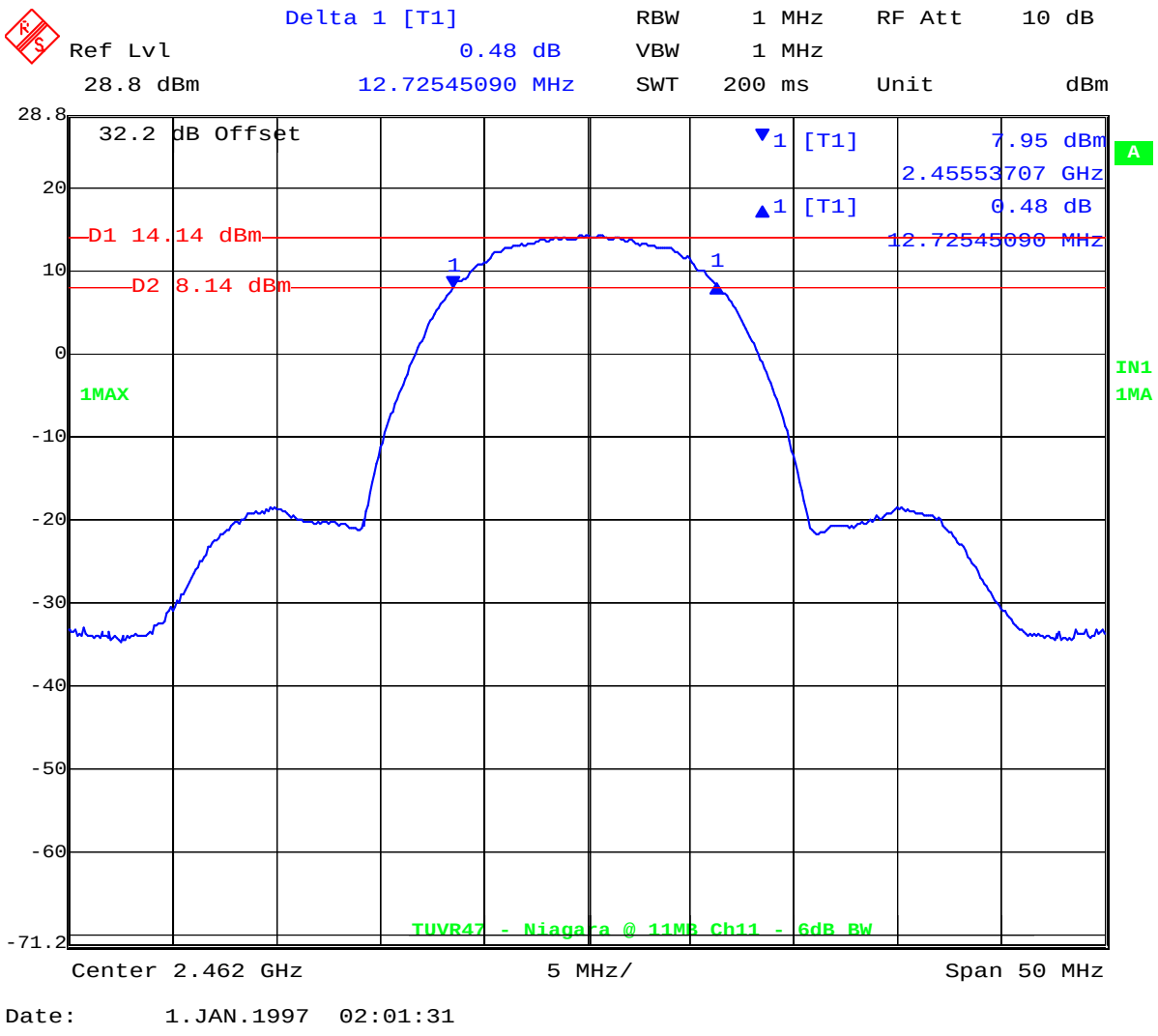
8. GRAPHICAL RESULTS

This report contains the following plots as referenced in the test results, Section 5 of this report. Only worst case plots are reported. All additional plots are held on file in the laboratory.

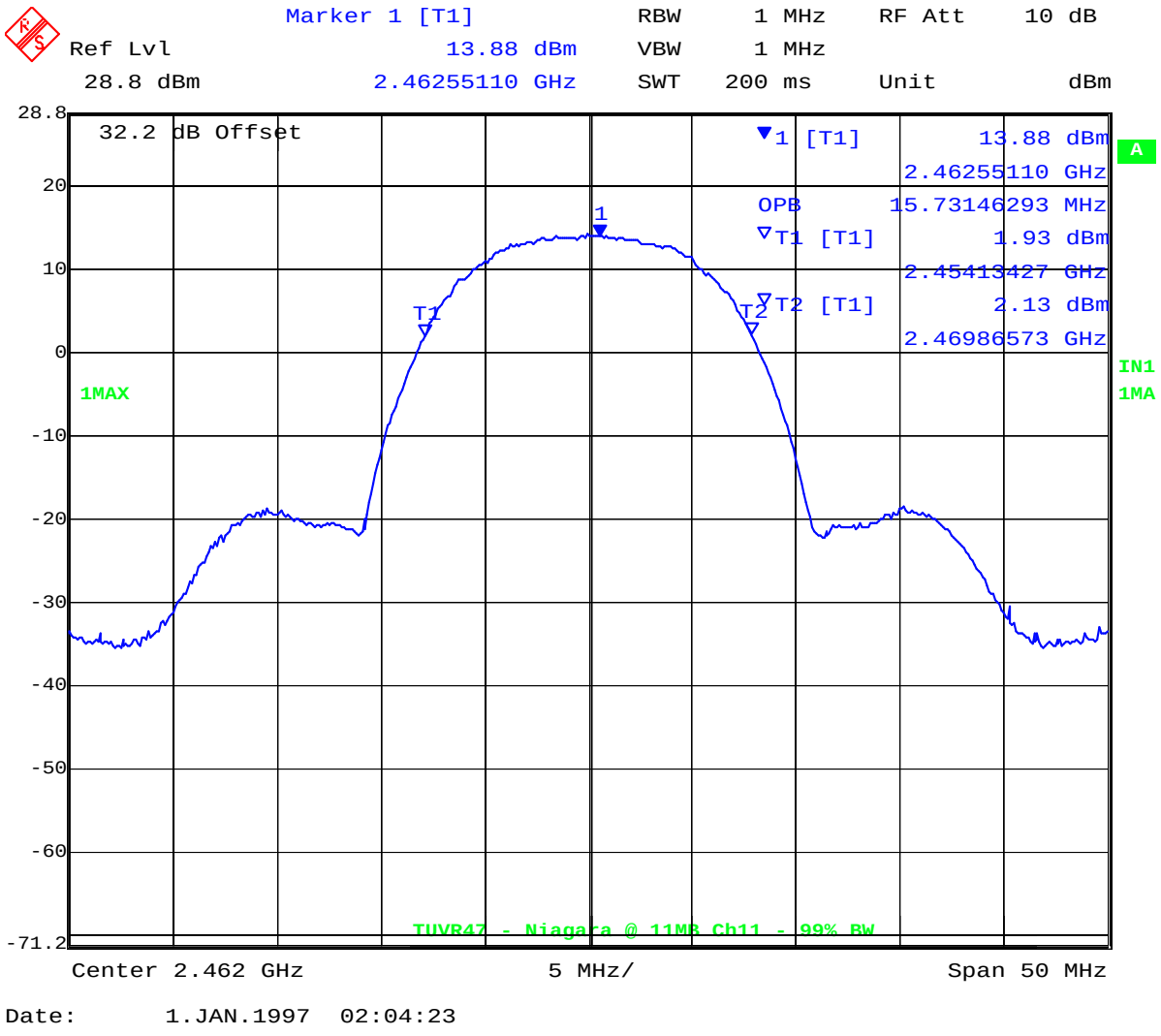
2.4GHz 802.11b/g	
Parameter	**Plot No.**
Section 5.1.1 6dB Bandwidth	
802.11b, Channel 11 (2,462MHz)	01
802.11g, Channel 11 (2,462MHz)	03
Section 5.1.1 99% Bandwidth	
802.11b, Channel 11 (2,462MHz)	02
802.11g, Channel 11 (2,462MHz)	04
Section 5.1.2 Peak Output Power	
802.11b, Channel 1 (2,462MHz)	05
802.11g, Channel 6 (2,437MHz)	06
Section 5.1.3 Peak Power Spectral Density	
802.11b, Channel 1 (2,412MHz)	07
802.11g, Channel 6 (2,437MHz)	08
Section 5.1.5 Conducted Spurious Emissions	
802.11b	
Lower Band Edge 2,400MHz	09
Upper Band Edge 2,483.5MHz	10
1-26GHz conducted spurious emissions	
30 – 1,000MHz	13
1,000 - 2,400MHz	14
2,483.5 – 4,000MHz	15
4,000 – 13,000MHz	16
13,000 – 26,000MHz	17
802.11g	
Lower Band Edge 2,400MHz	11
Upper Band Edge 2,483.5MHz	12
30 – 1,000MHz	18
1,000 - 2,400MHz	19
2,483.5 – 4,000MHz	20
4,000 – 13,000MHz	21
13,000 – 26,000MHz	22

2.4GHz 802.11b/g	
Parameter	**Plot No.**
Section 5.1.6 Radiated Spurious Emissions	
5.1.6.1 Transmitter Radiated Spurious Emissions 1-26GHz	
802.11b Channel 1 (2,412MHz)	23
802.11b Channel 6 (2,437MHz)	24
802.11b Channel 11 (2,462MHz)	25
5.1.6.2 Radiated Band Edge	
AIR-ANT4941 802.11b 2,390 MHz Peak & Average	26
AIR-ANT5959 802.11g 2,390 MHz Peak & Average	27
AIR-ANT1728 802.11g 2,483.5 MHz Peak, Average & Delta	28
5.1.6.3 Radiated Spurious Emissions 30M-1GHz	29
Section 5.1.7 AC Wireline Conducted Emissions Live & Neutral	30

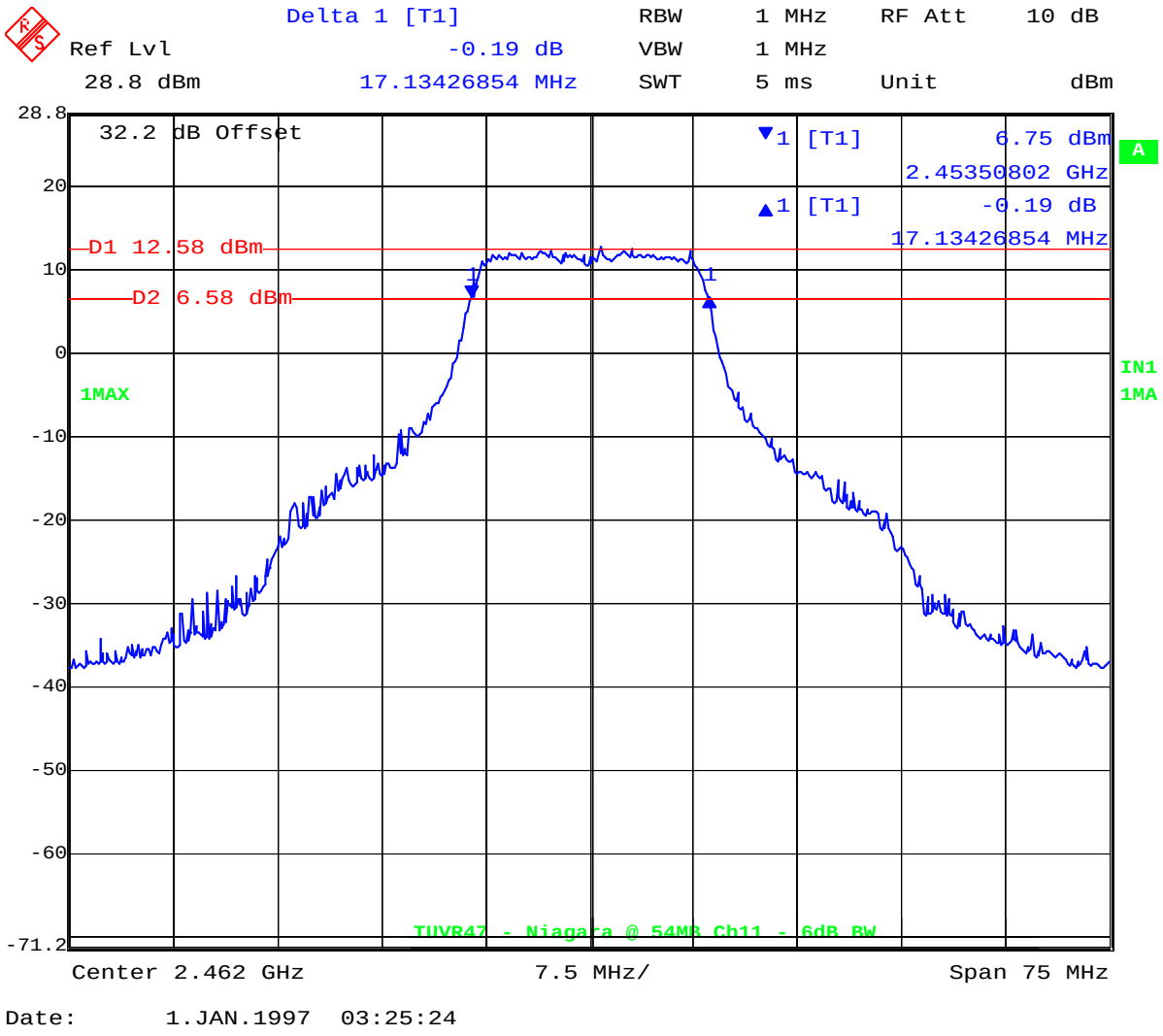
Plot 01 - 6dB Bandwidth 802.11b CH 11 (2,462MHz)



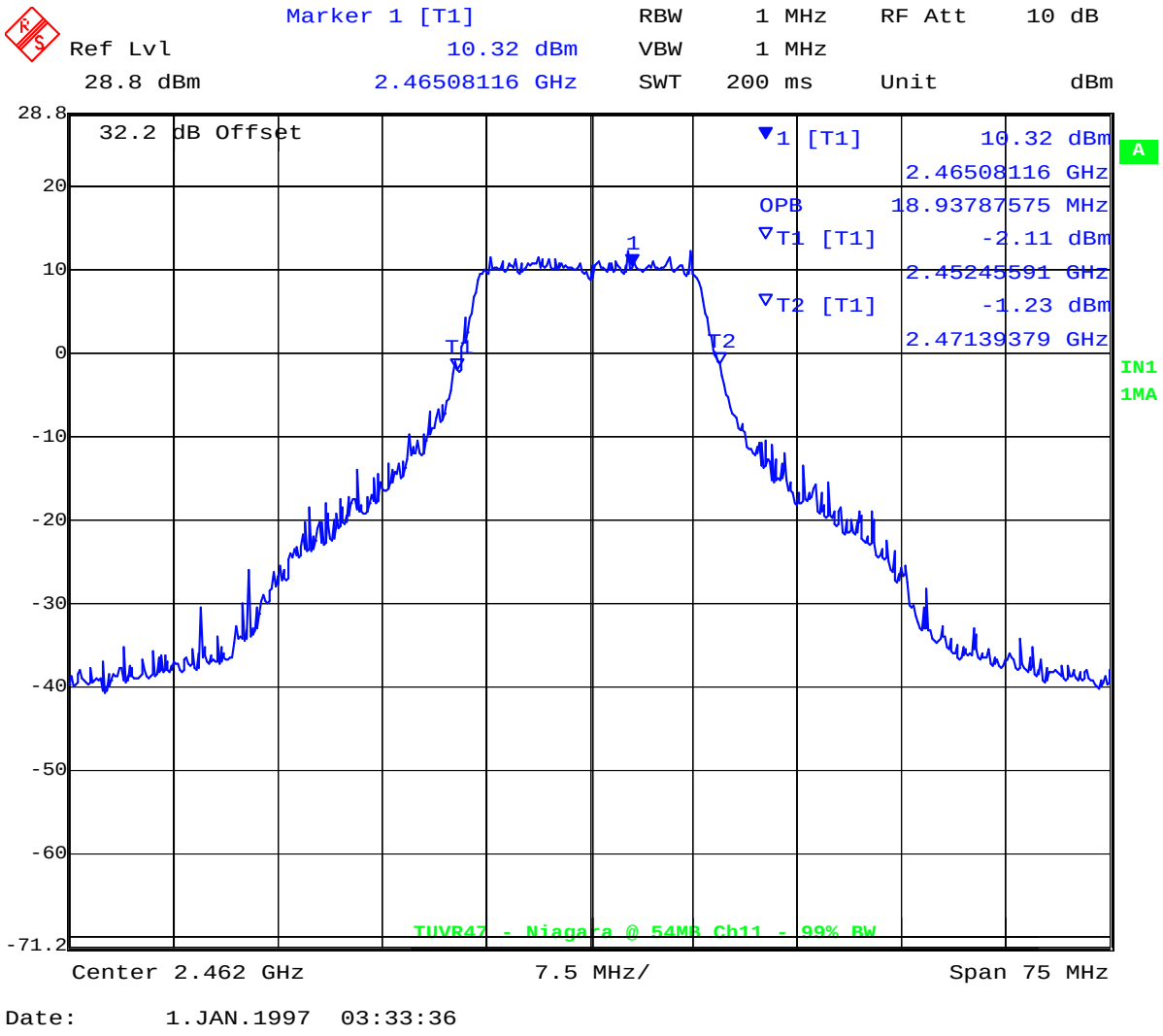
Plot 02 - 99% Bandwidth 802.11b CH 11 (2,462MHz)



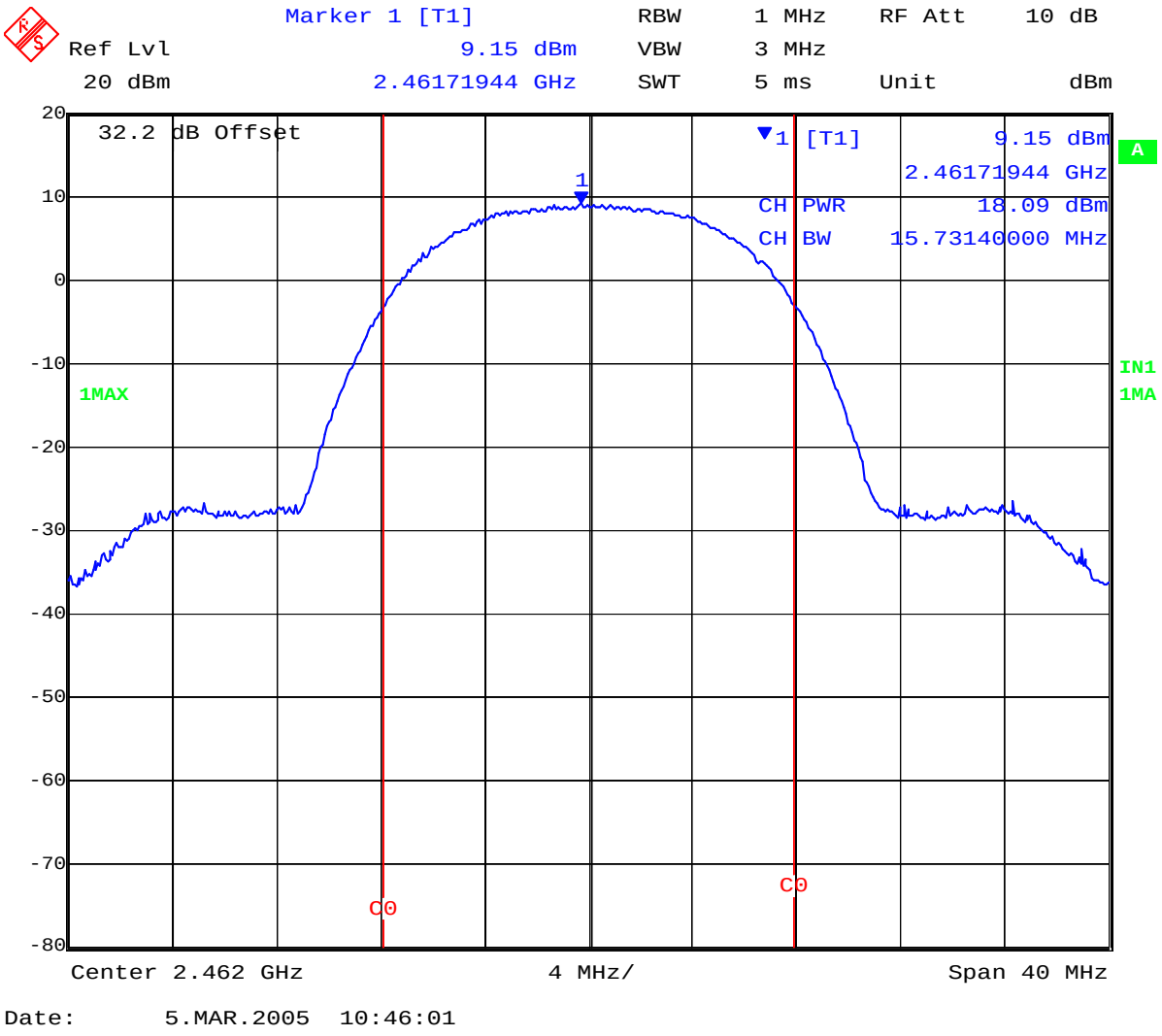
Plot 03 - 6dB Bandwidth 802.11g CH 11 (2,462MHz)



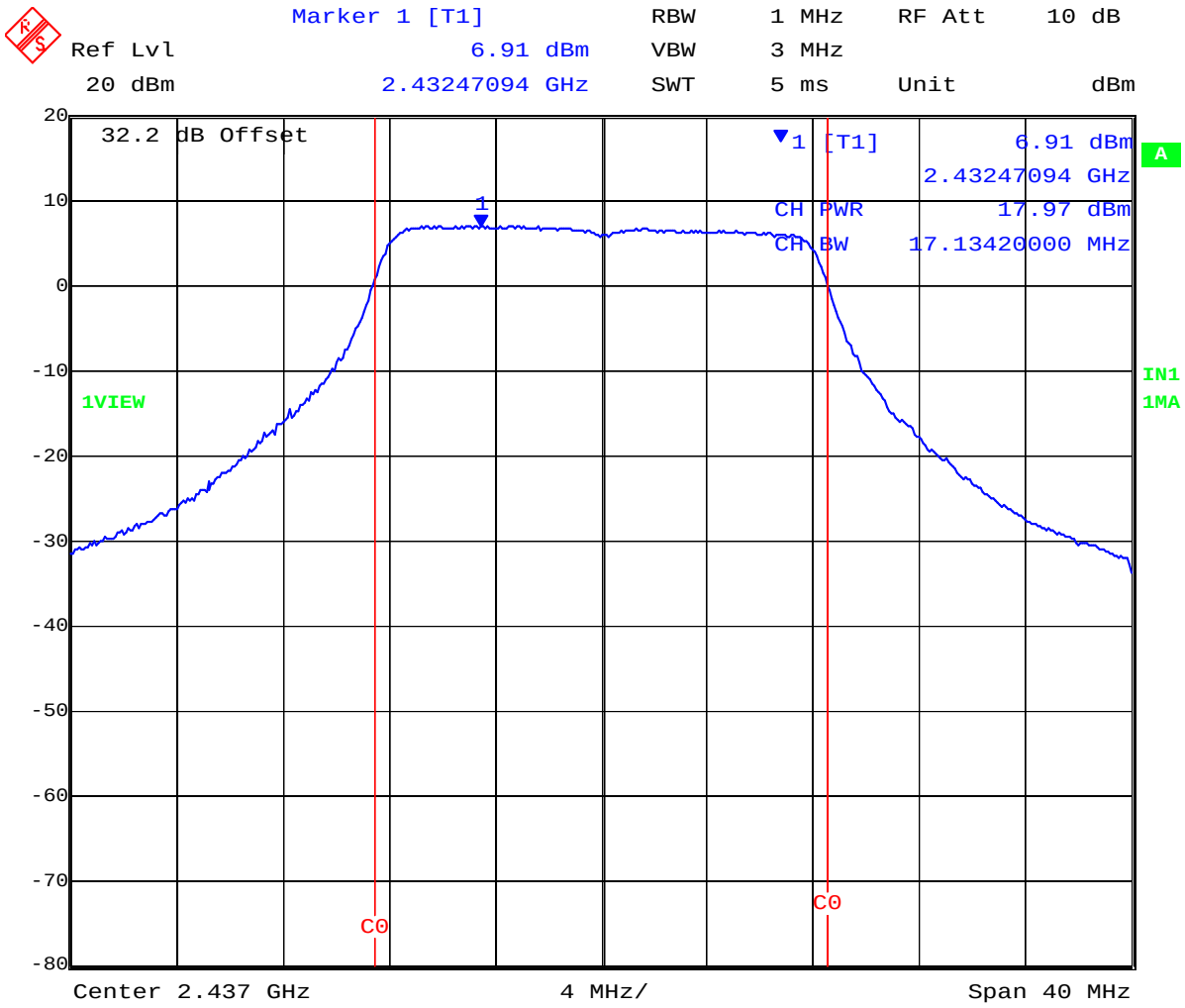
Plot 04 - 99% Bandwidth 802.11g CH 11 (2,462MHz)



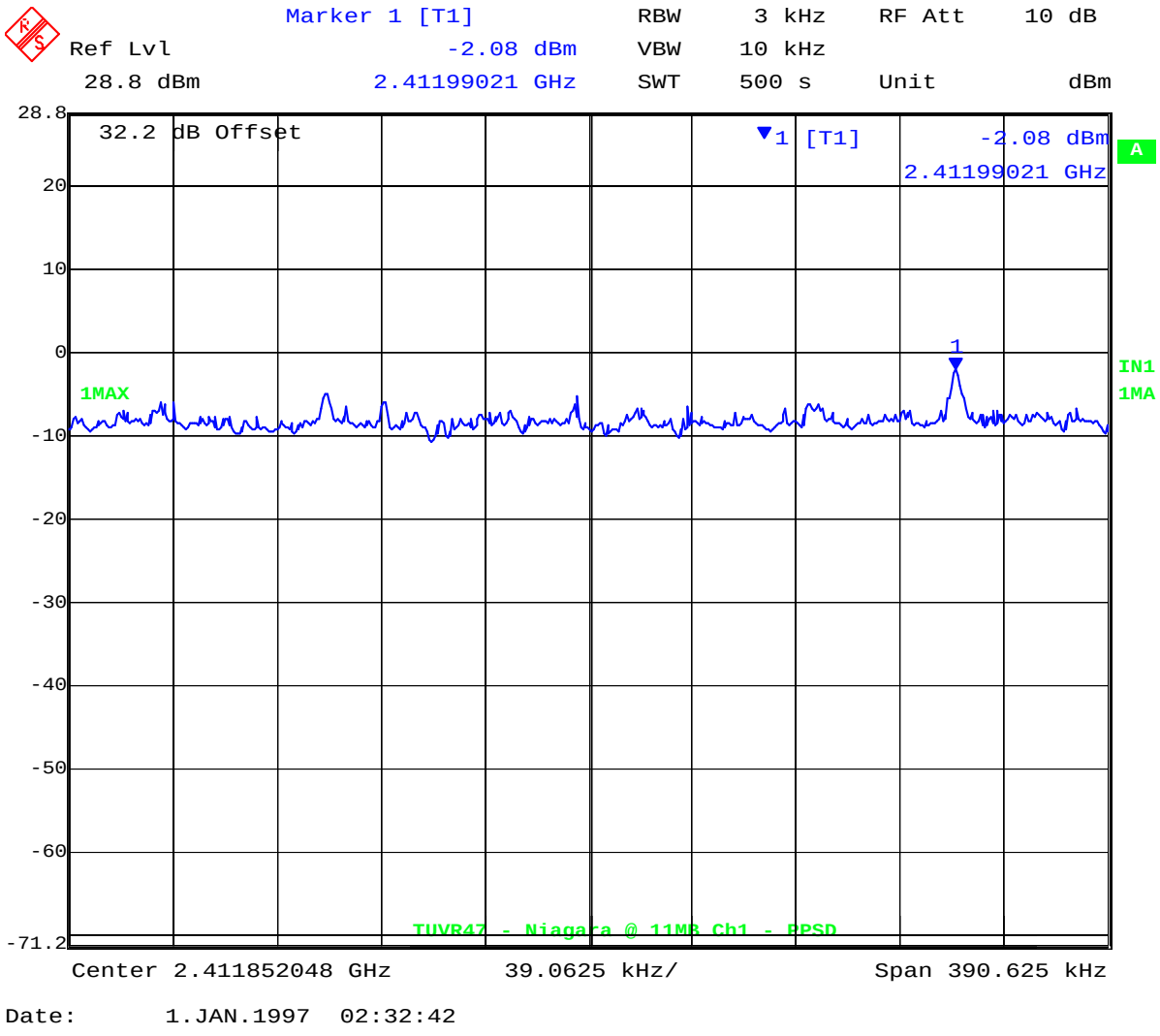
Plot 05 - Peak Output Power 802.11b CH 1 (2,412MHz)



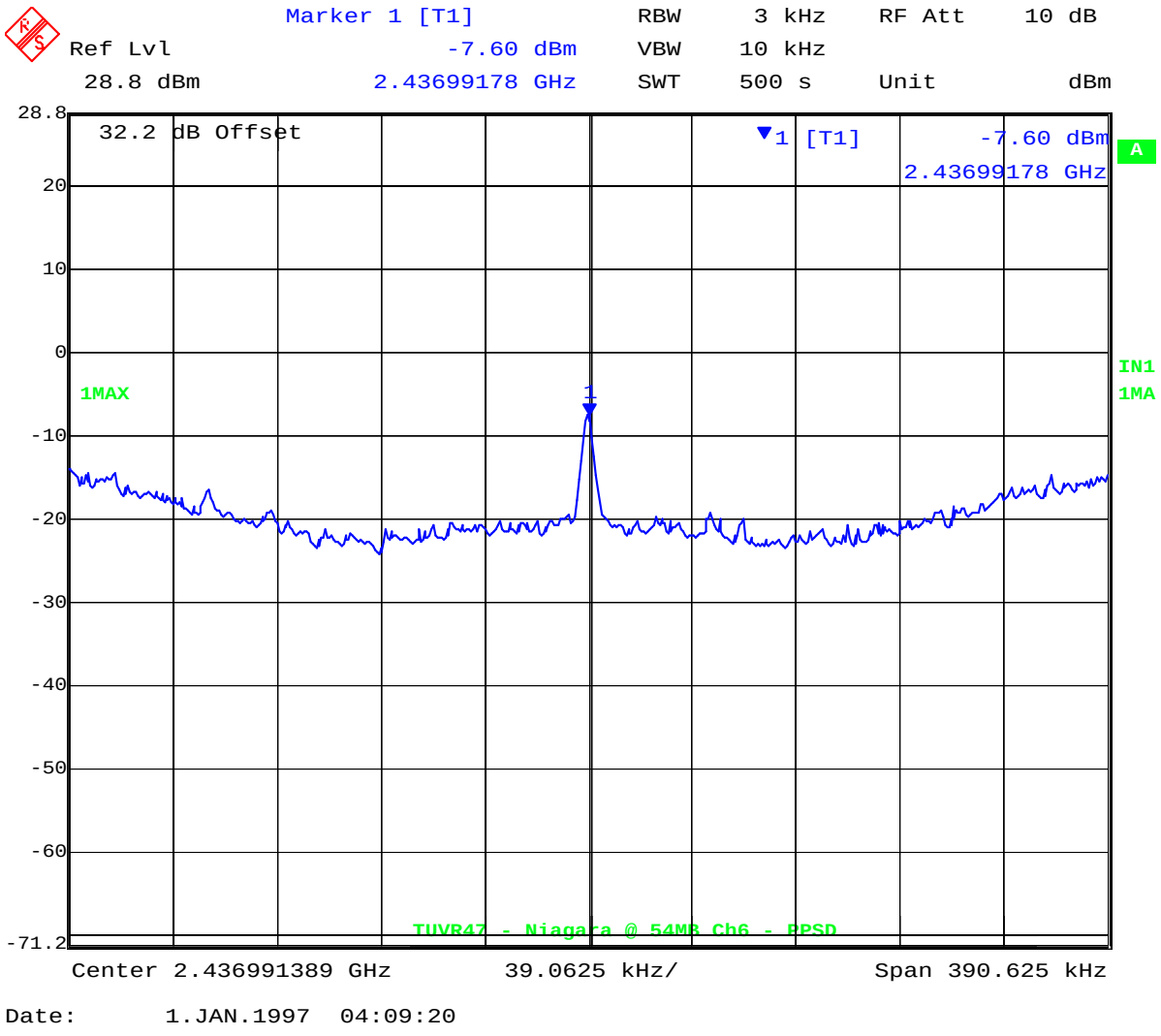
Plot 06 - Peak Output Power 802.11g CH 6 (2,437MHz)



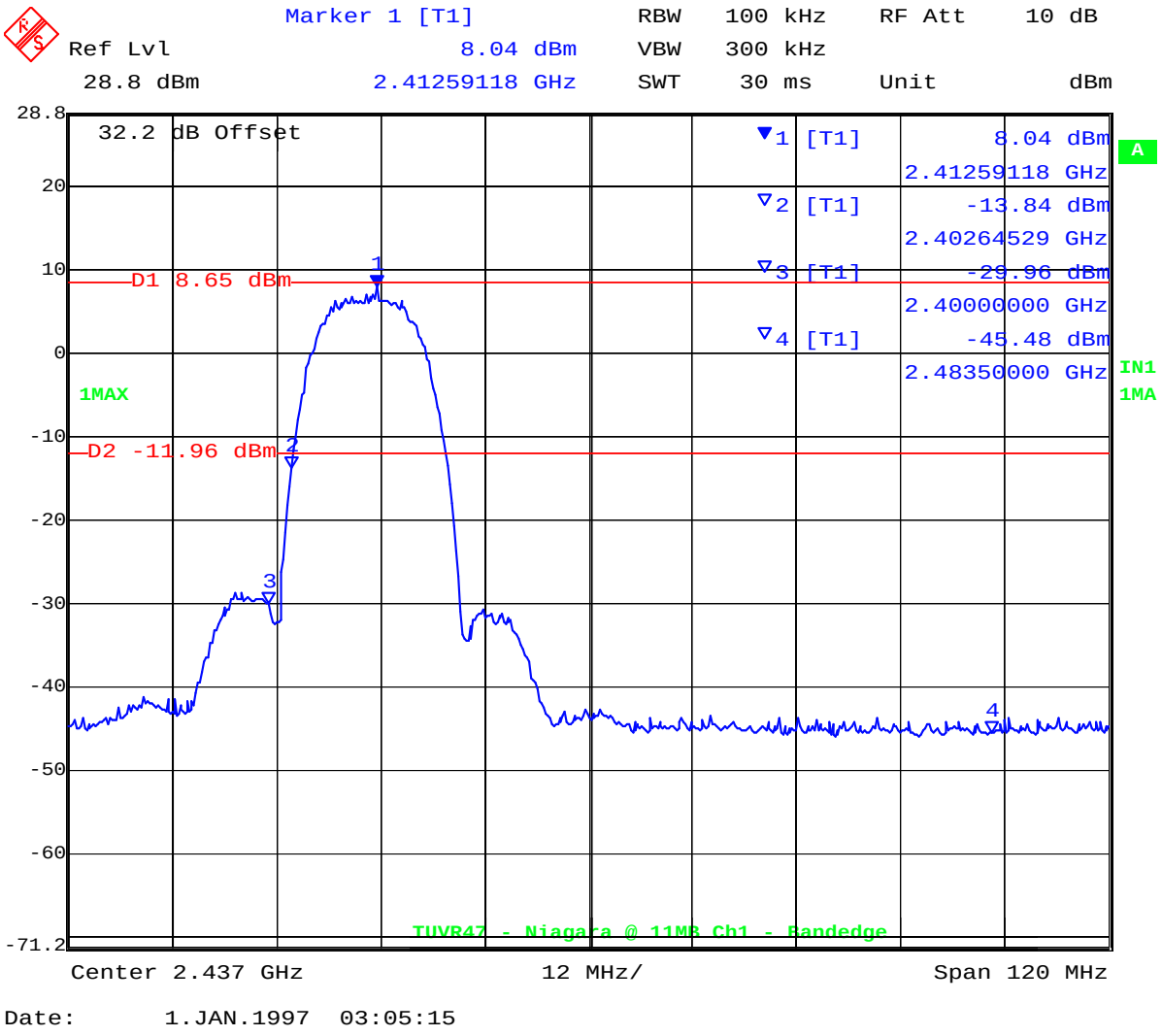
Plot 07 - Peak Power Spectral Density 802.11b CH 1 (2,412MHz)



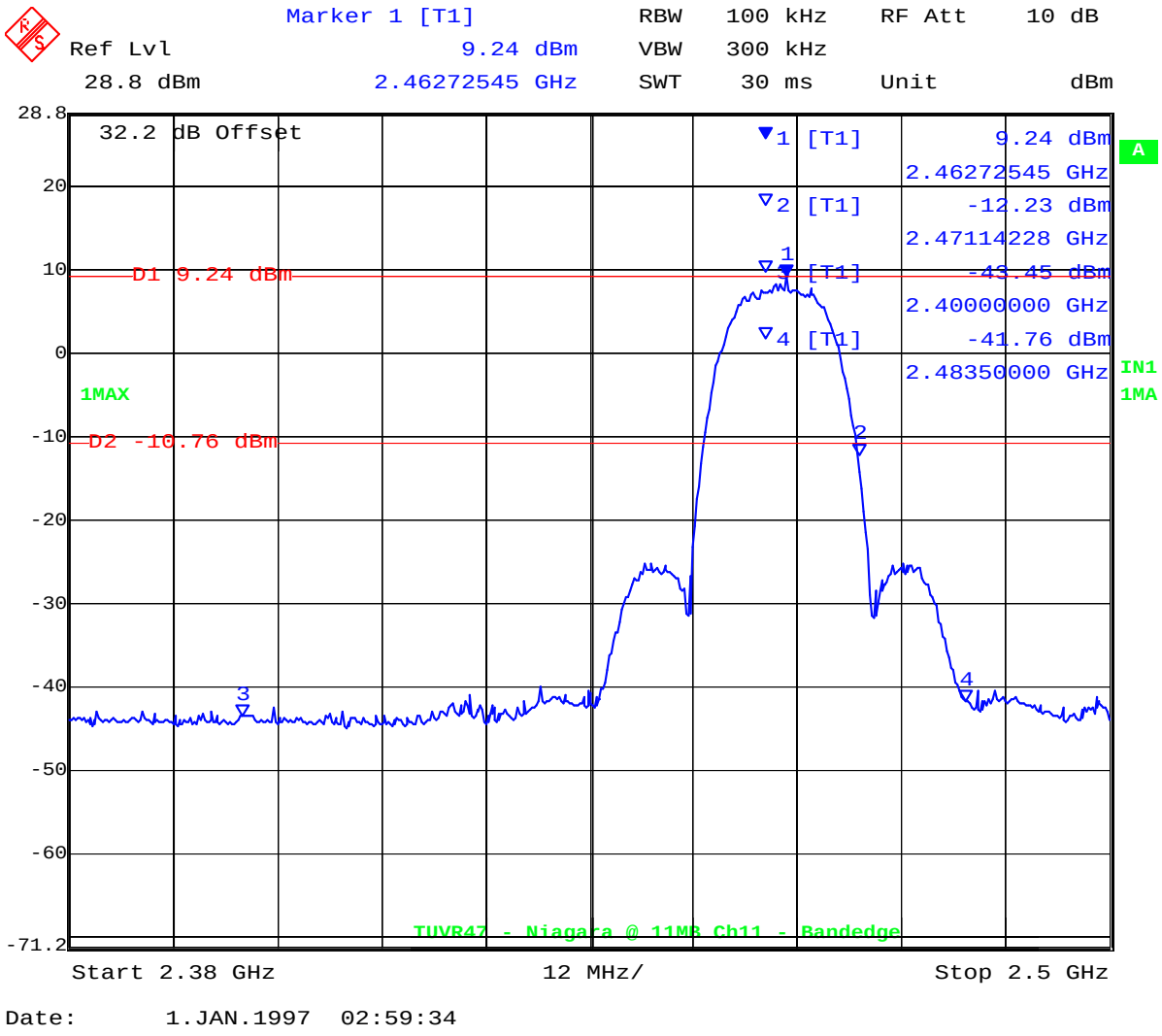
Plot 08 - Peak Power Spectral Density 802.11g CH 6 (2,437MHz)



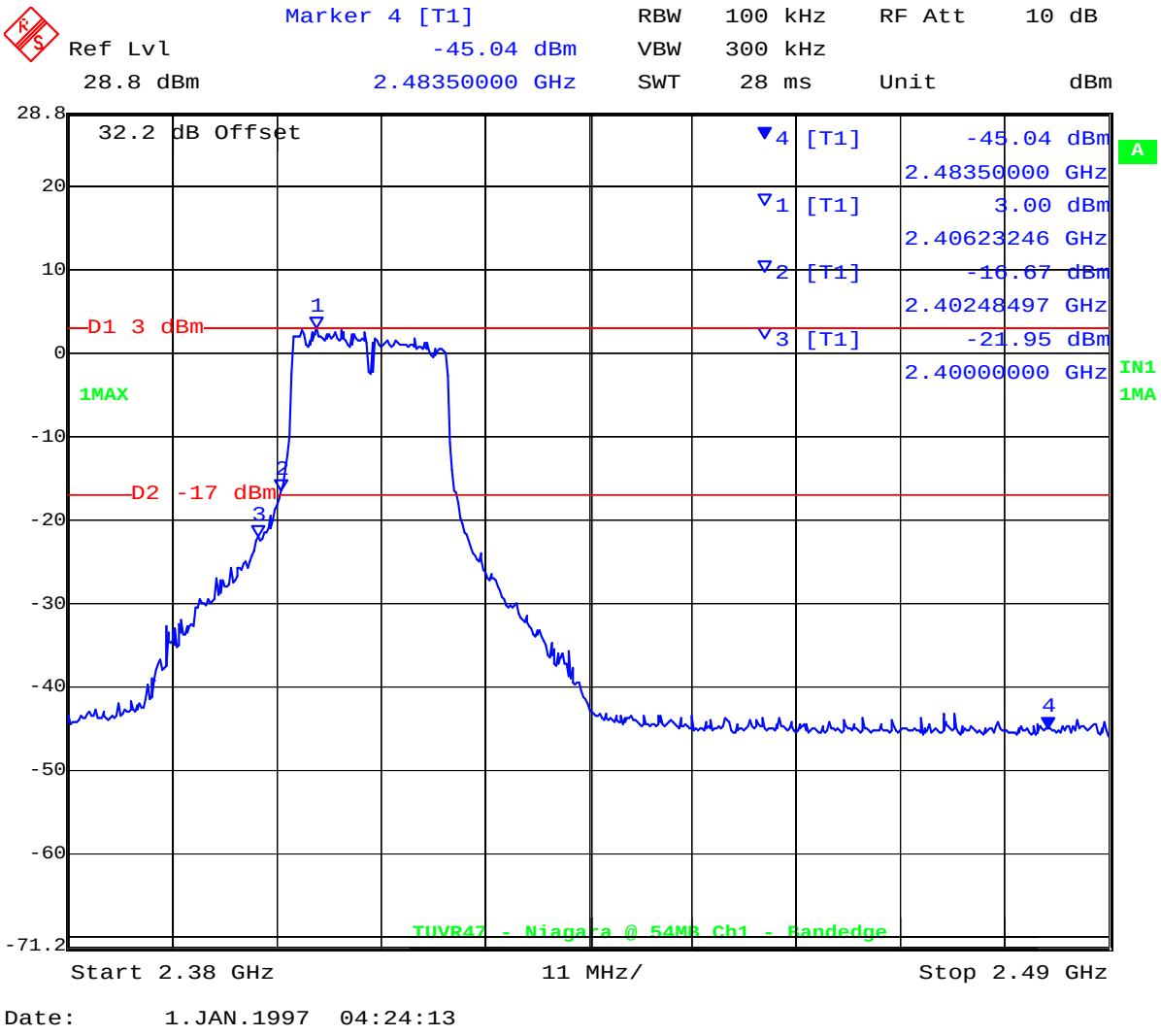
Plot 09 - Conducted Lower Band Edge 802.11b



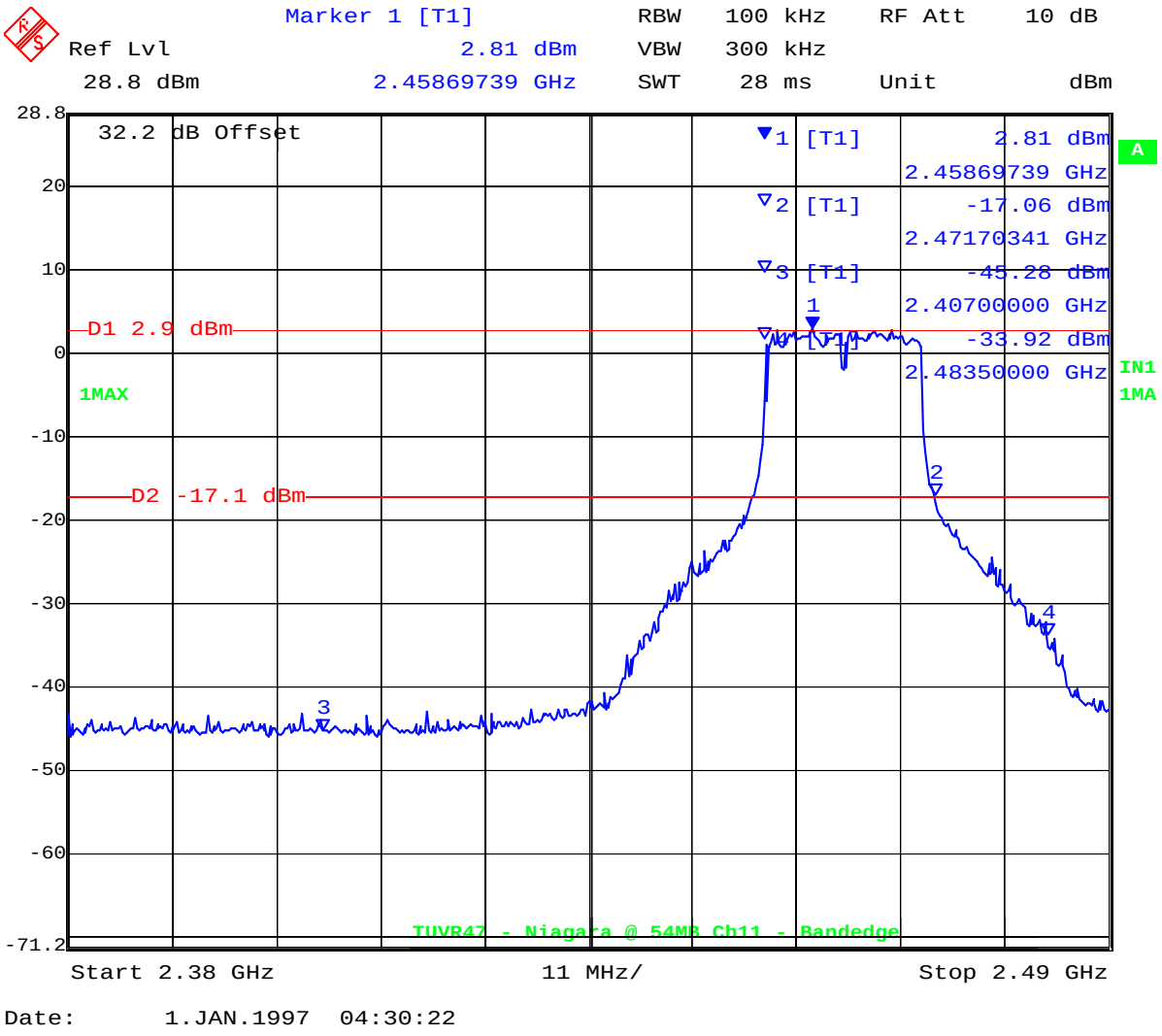
Plot 10 - Conducted Upper Band Edge 802.11b



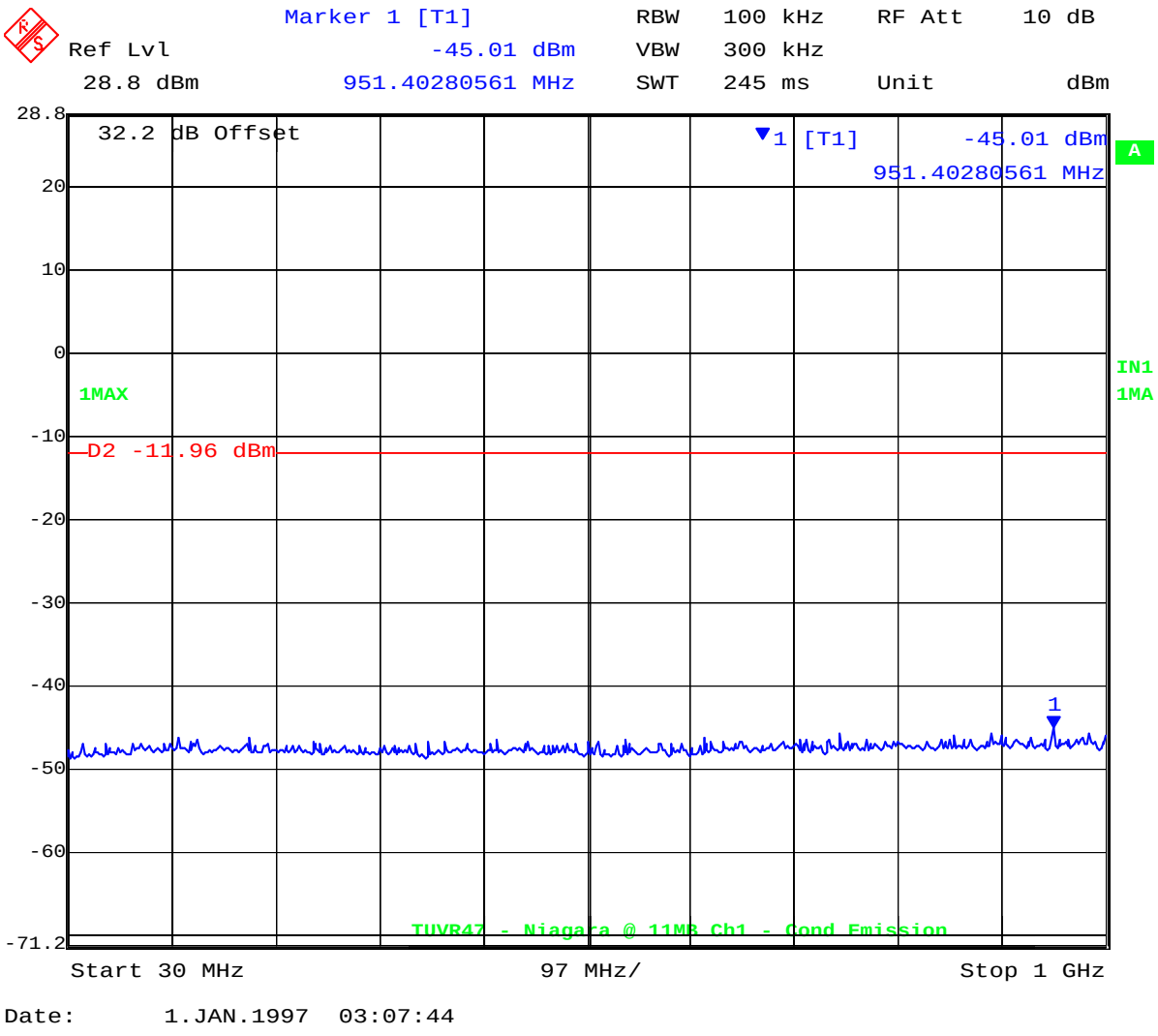
Plot 11 - Conducted Lower Band Edge 802.11g



Plot 12 - Conducted Upper Band Edge 802.11g

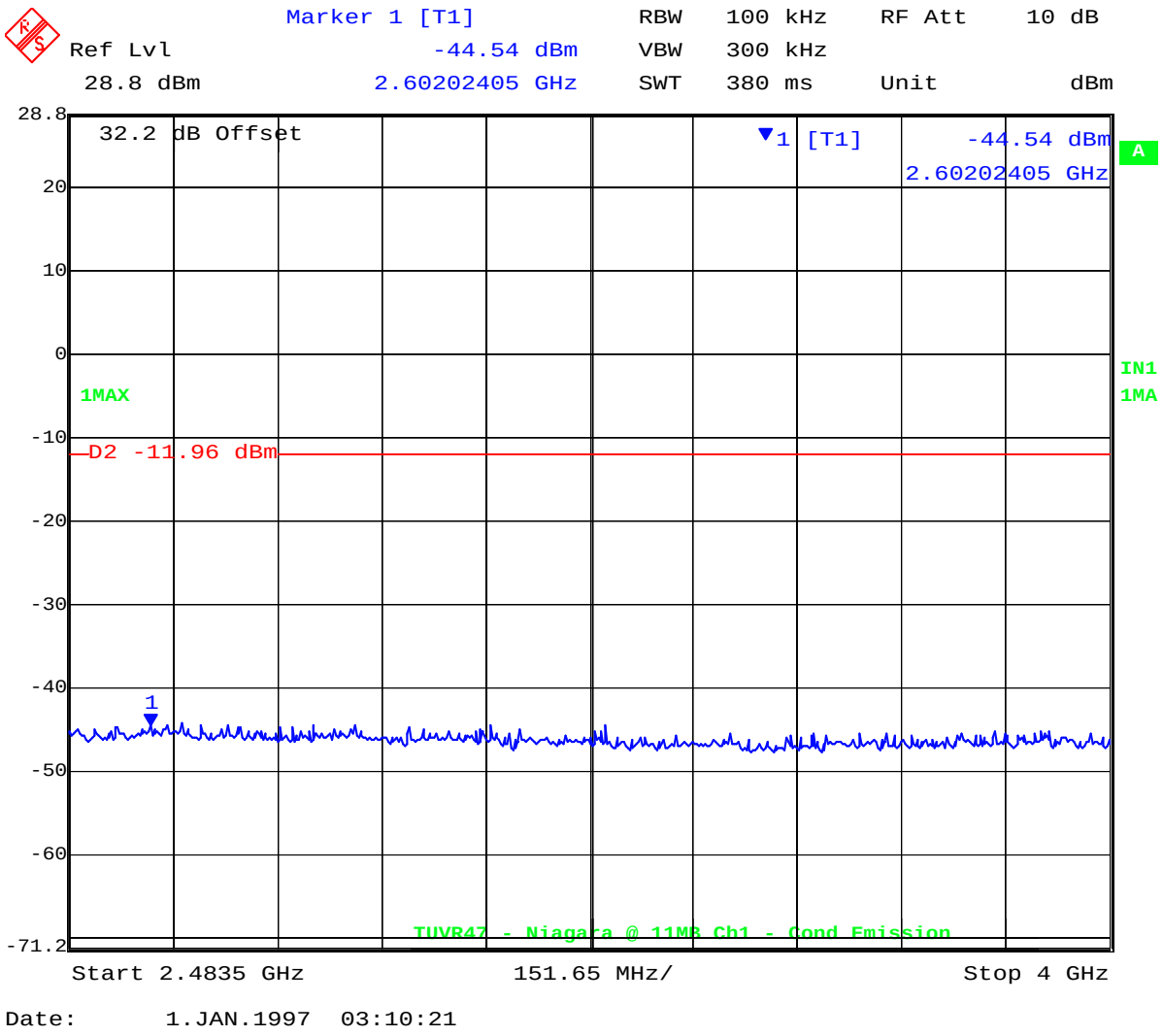


Plot 13 – 802.11b Conducted Spurious Emissions (30-1,000MHz)

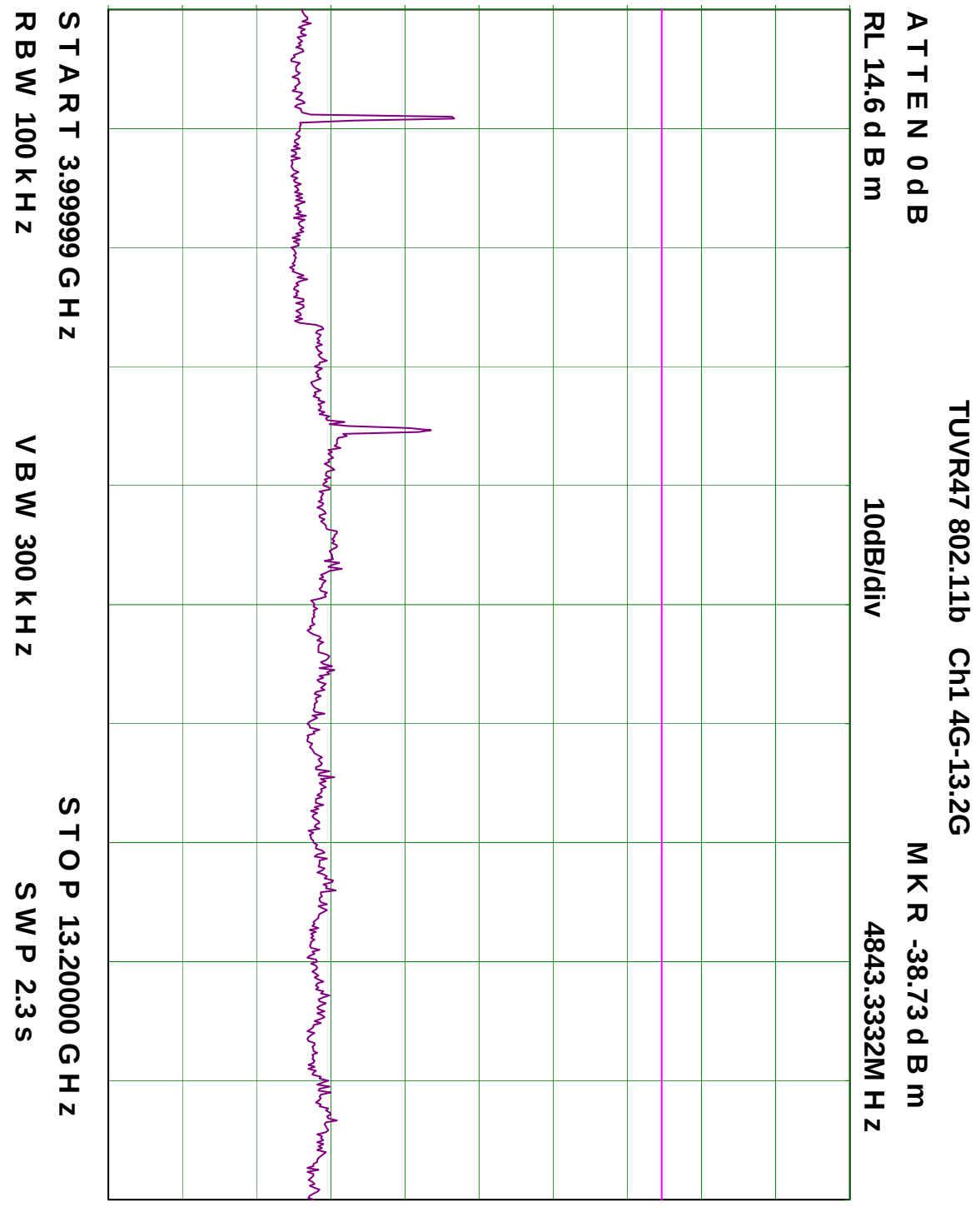


Plot 14 - 802.11b Conducted Spurious Emissions (1,000-2,400MHz)

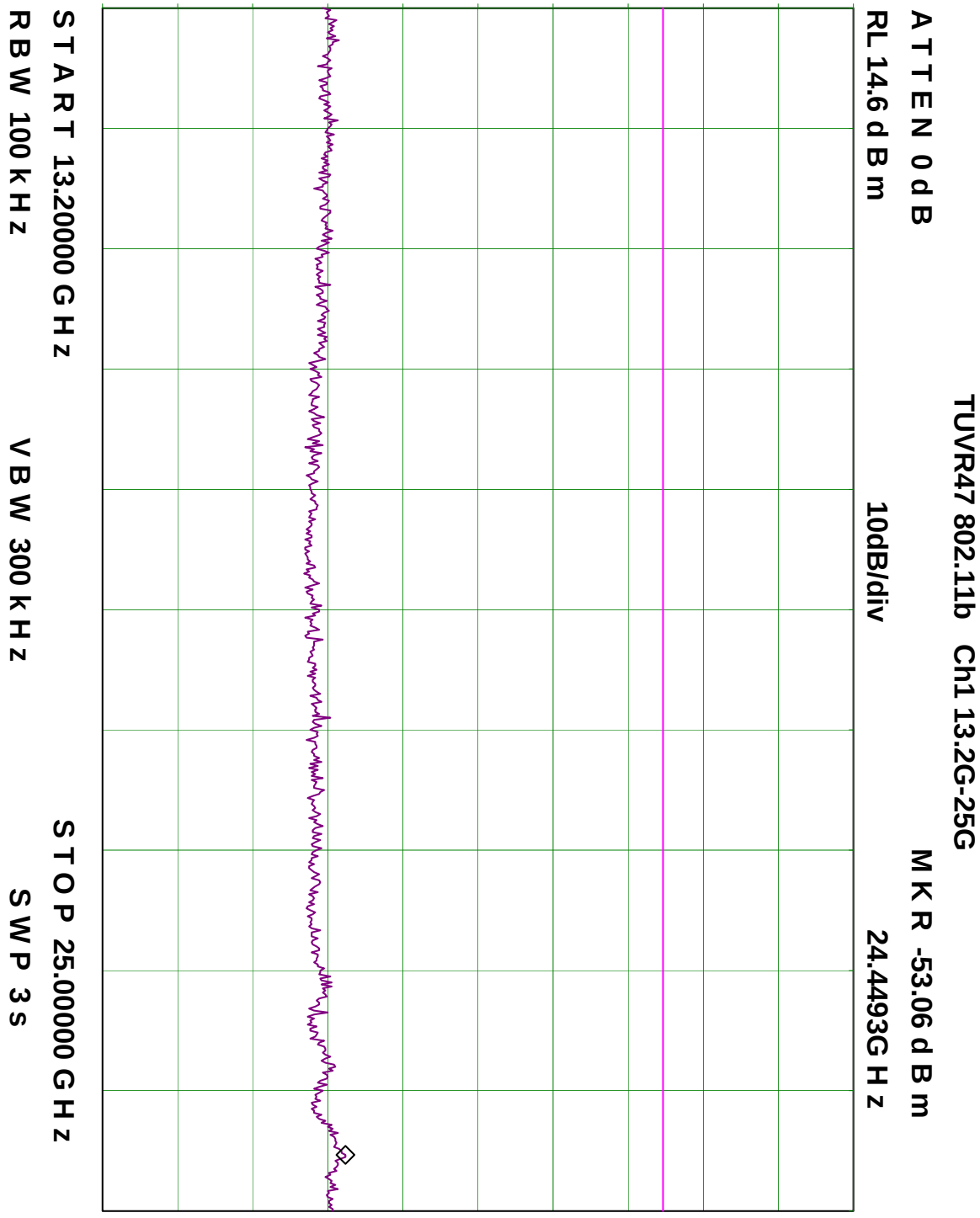
Plot 15 - 802.11b Conducted Spurious Emissions (2,483.5-4,000MHz)



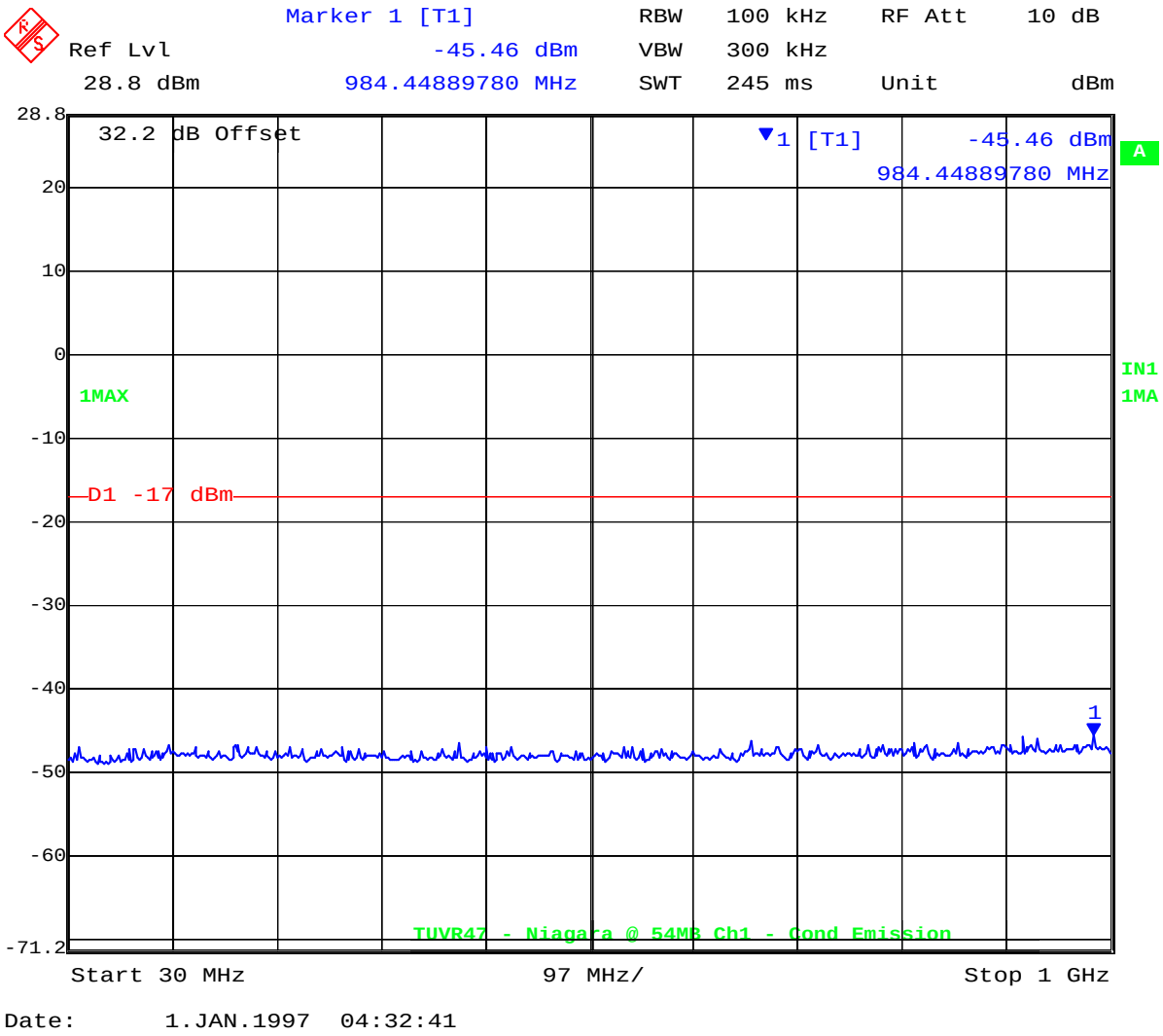
Plot 16 - 802.11b Conducted Spurious Emissions (4,000-13,200MHz)



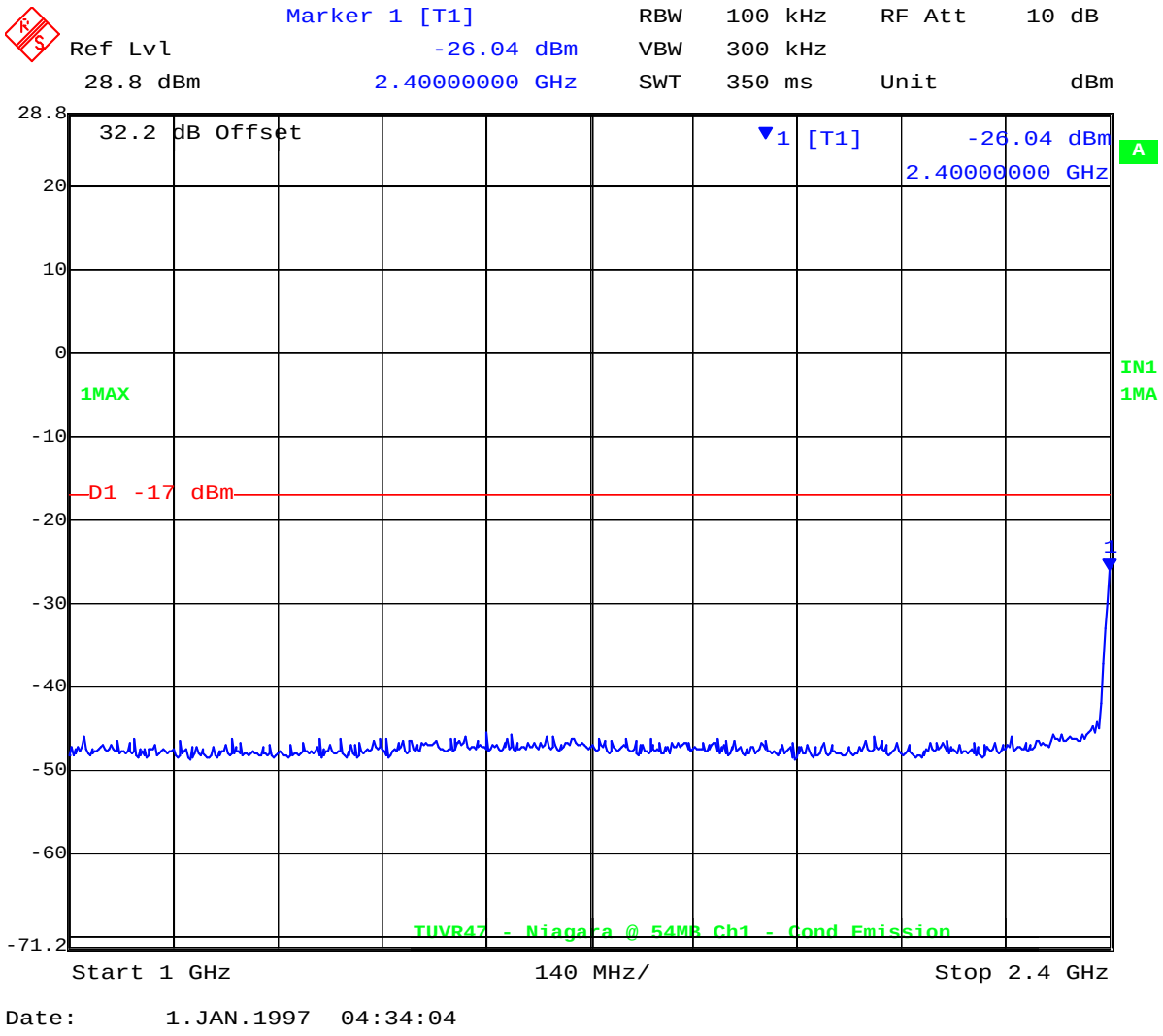
Plot 17 - 802.11b Conducted Spurious Emissions (13,200-25,000MHz)



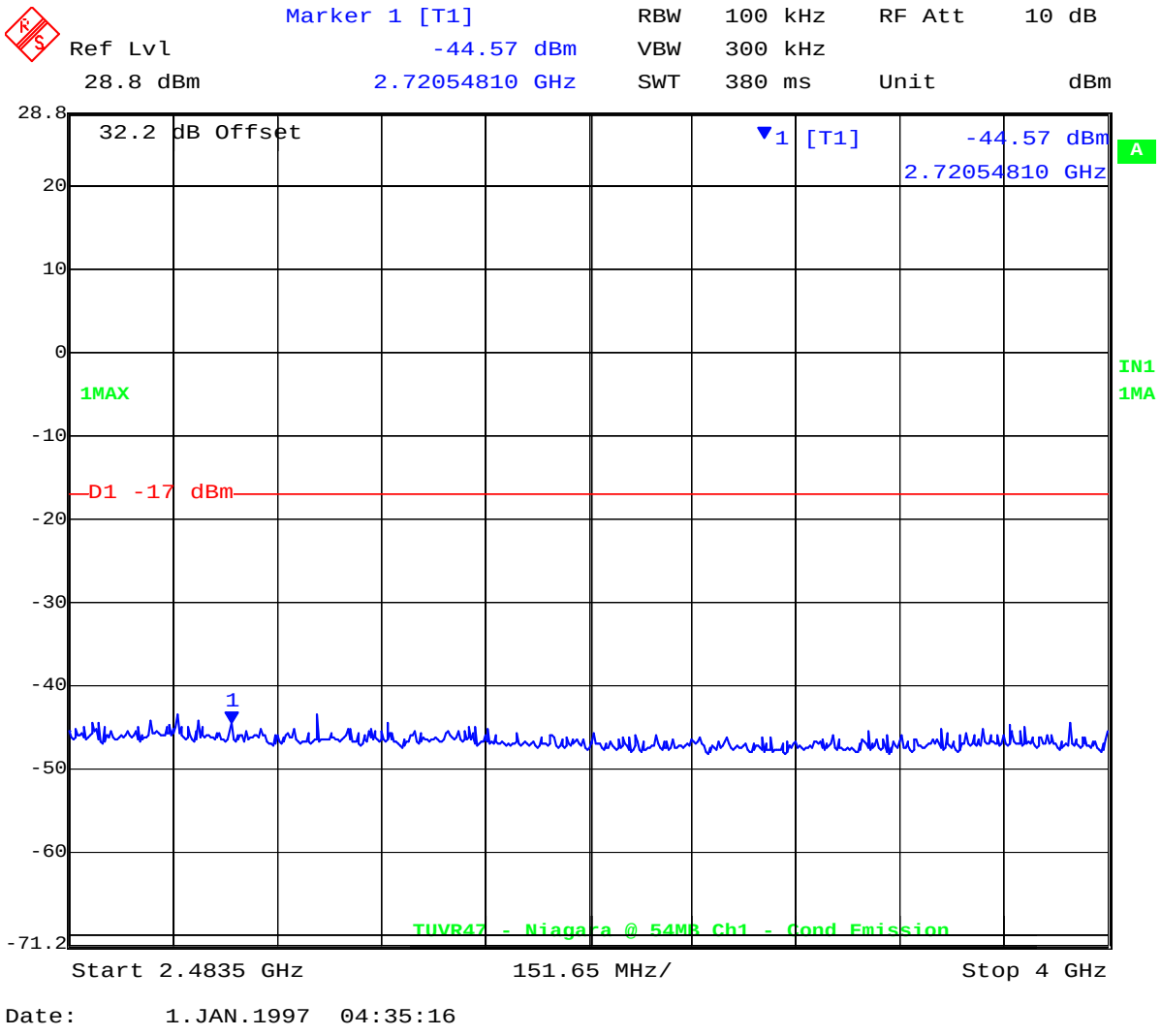
Plot 18 - 802.11g Conducted Spurious Emissions (30-1,000MHz)



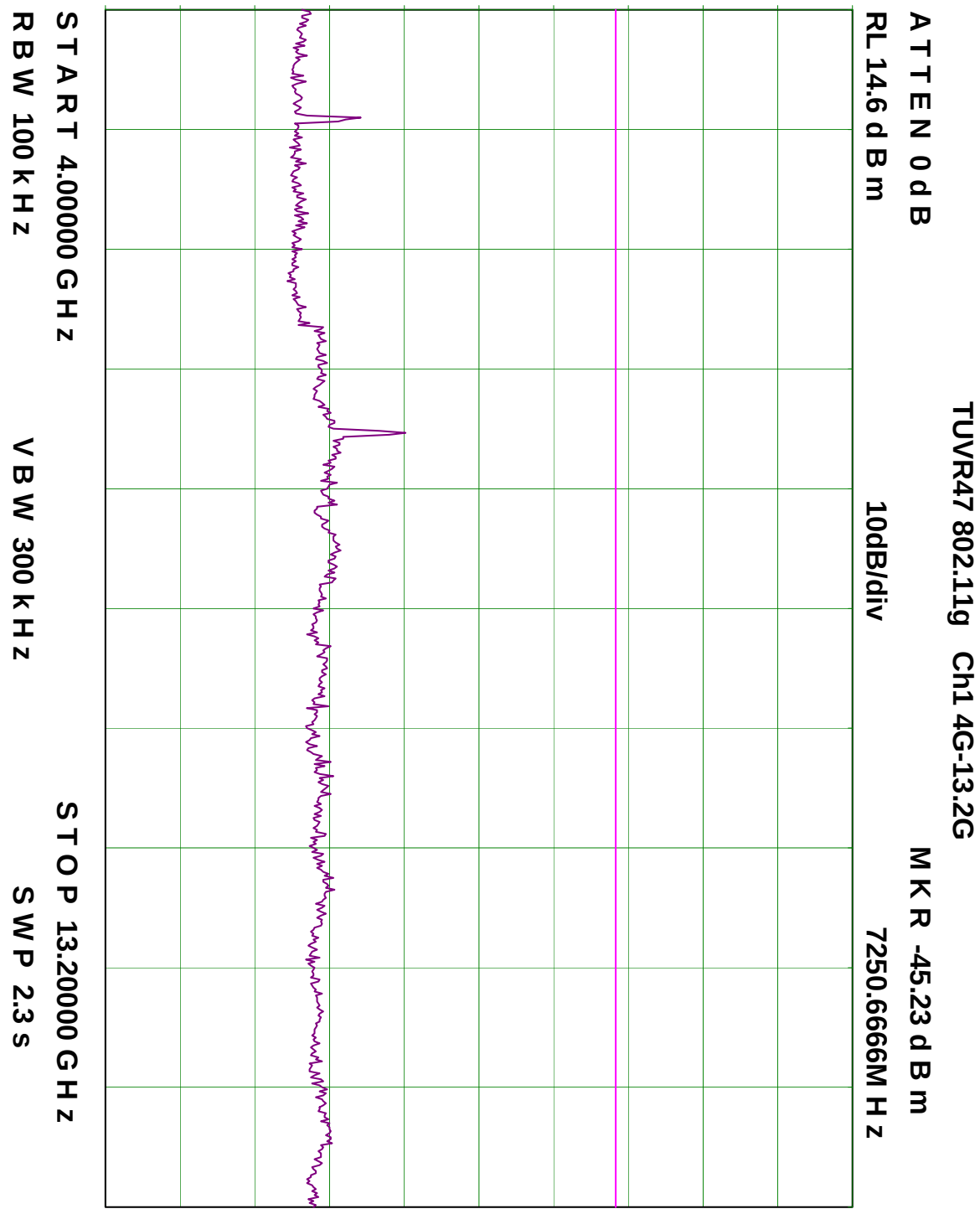
Plot 19 - 802.11g Conducted Spurious Emissions (1,000-2,400MHz)



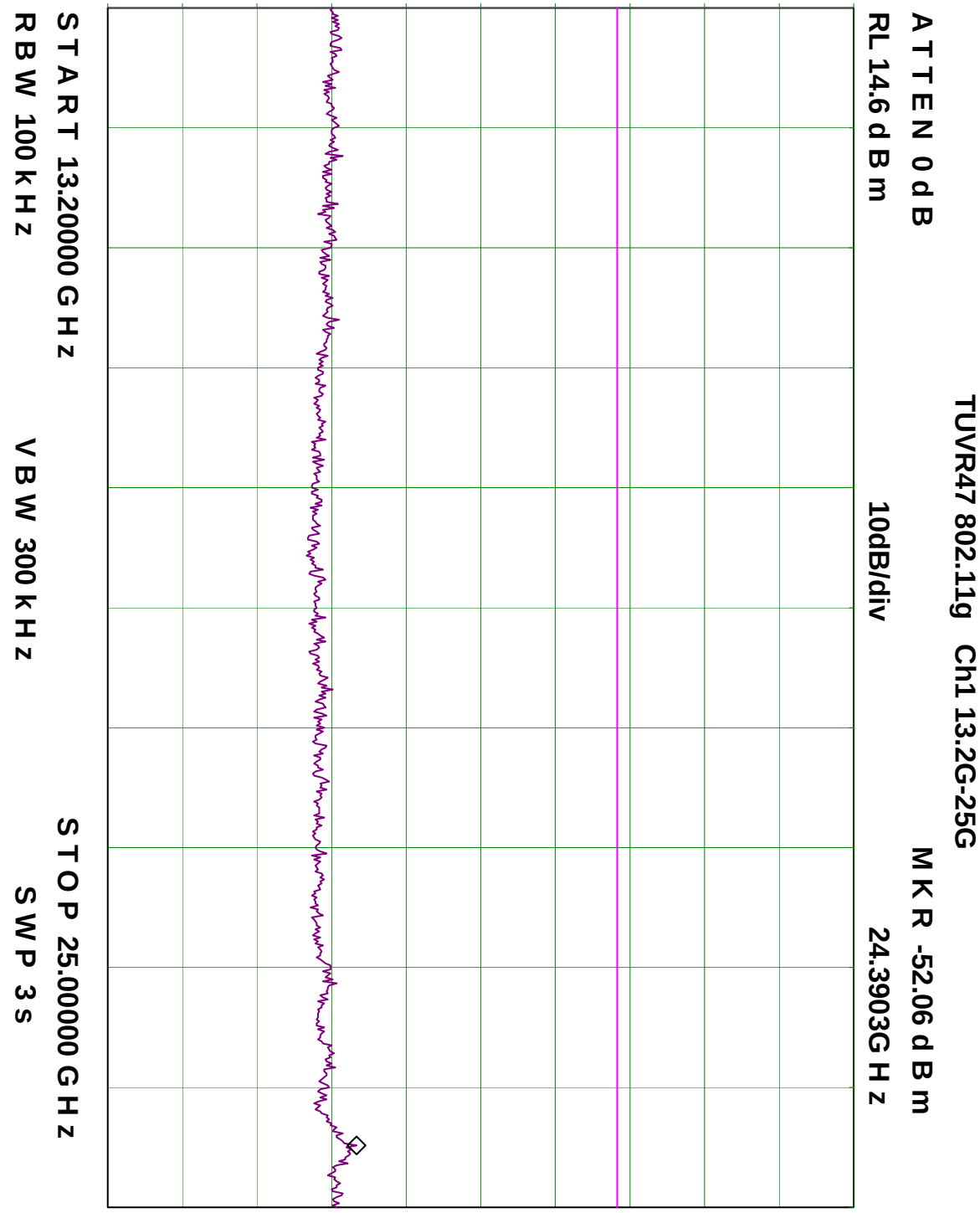
Plot 20 - 802.11g Conducted Spurious Emissions (2,483.5-4,000MHz)



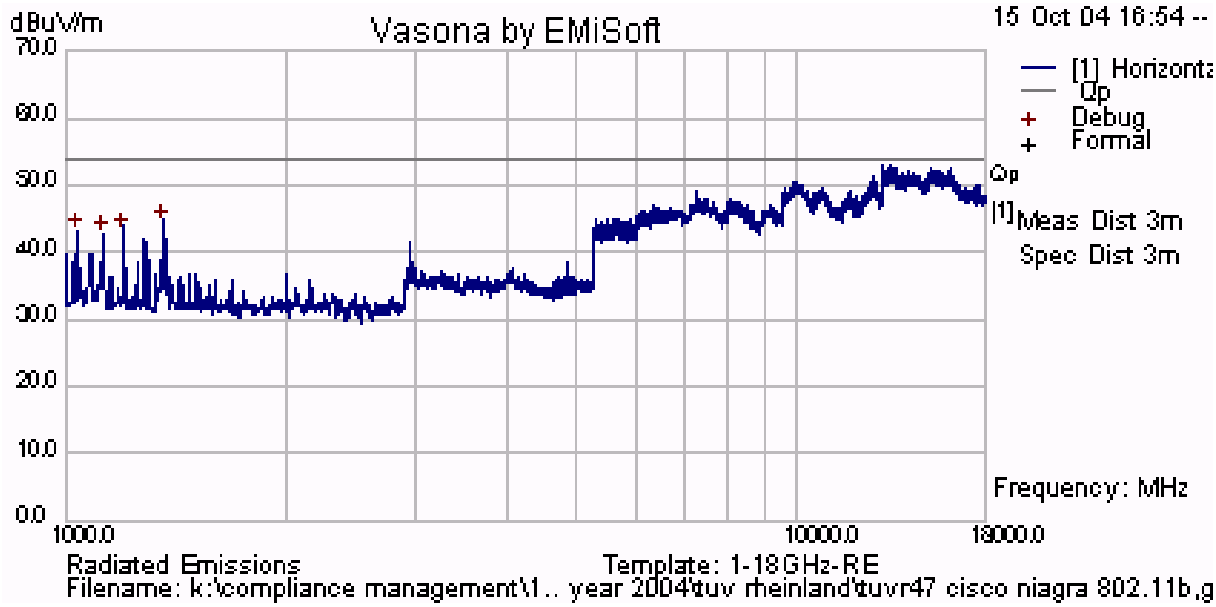
Plot 21 - 802.11g Conducted Spurious Emissions (4,000-13,200MHz)

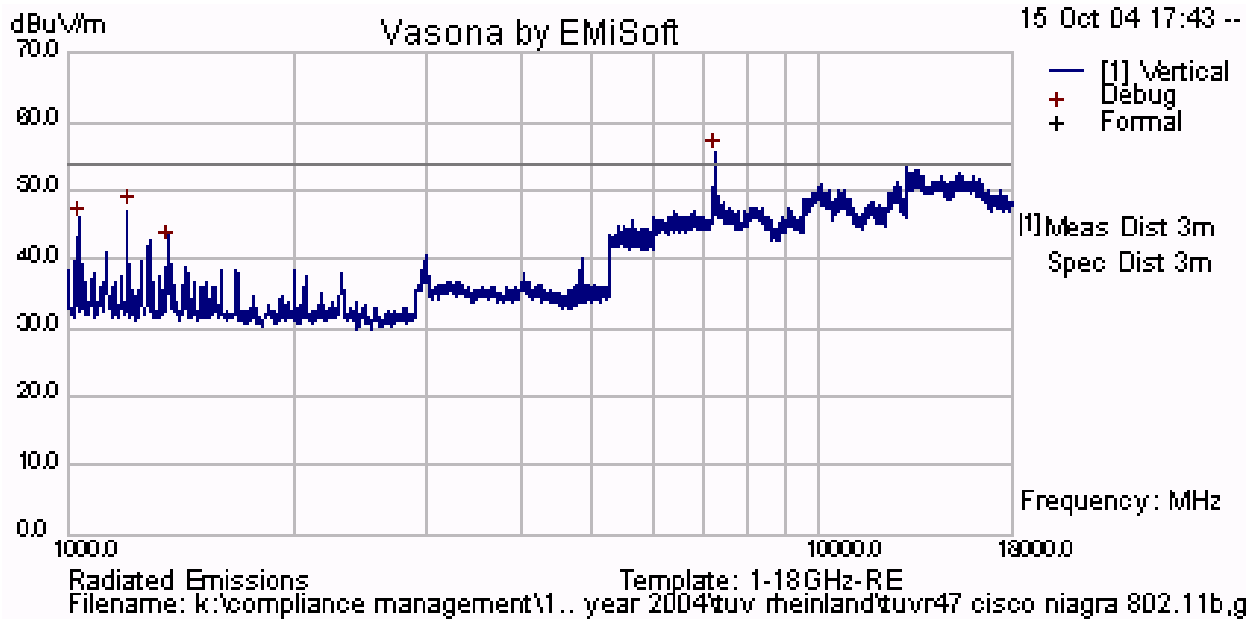


Plot 22 - 802.11g Conducted Spurious Emissions (13,200-25,000MHz)

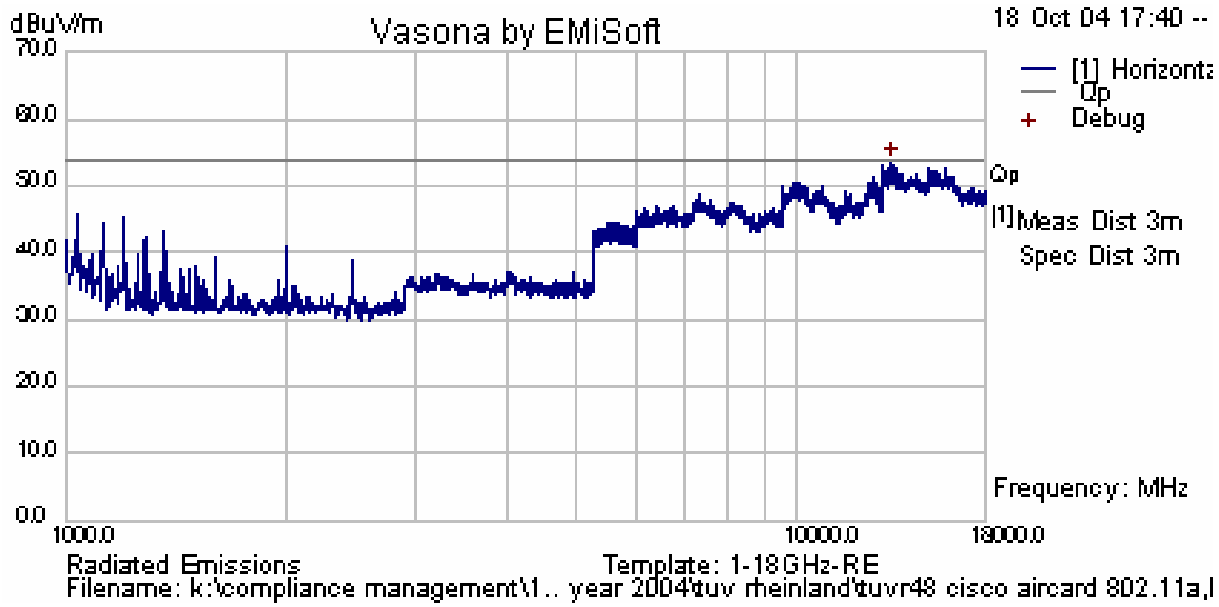


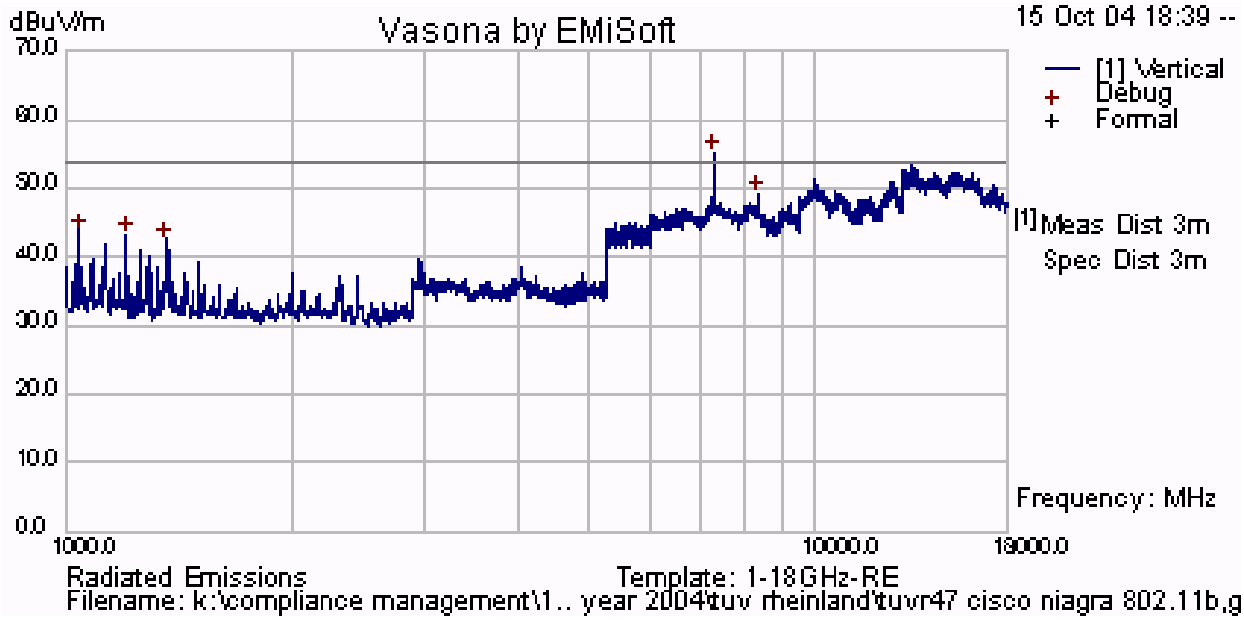
Plot 23 – Transmitter Spurious Emissions 1-26GHz 802.11b CH 1



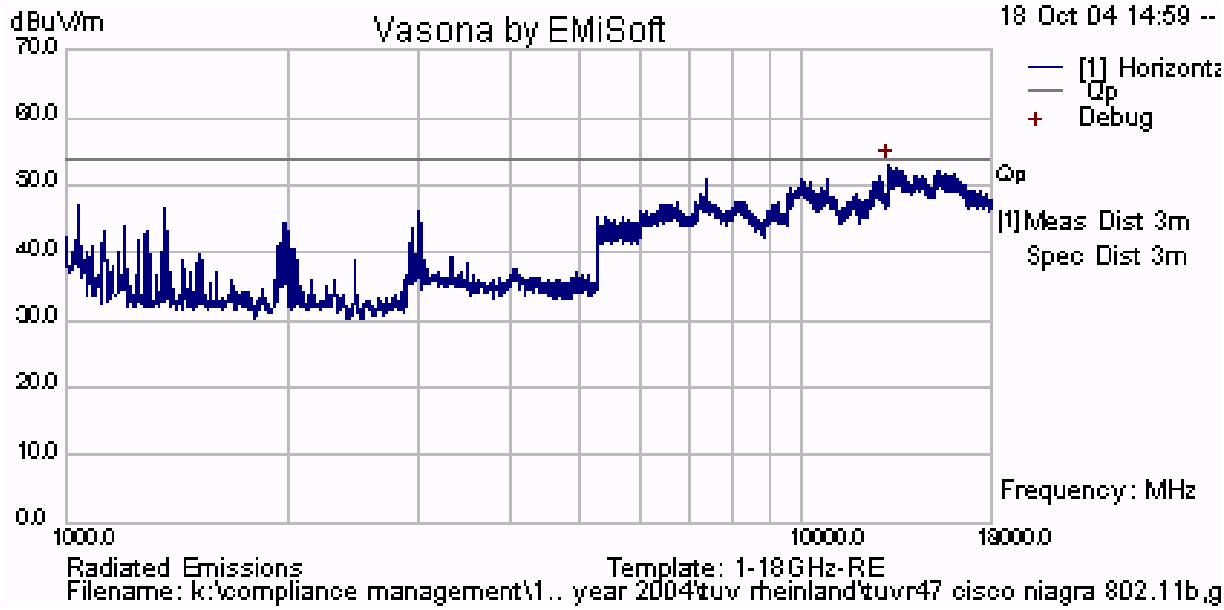


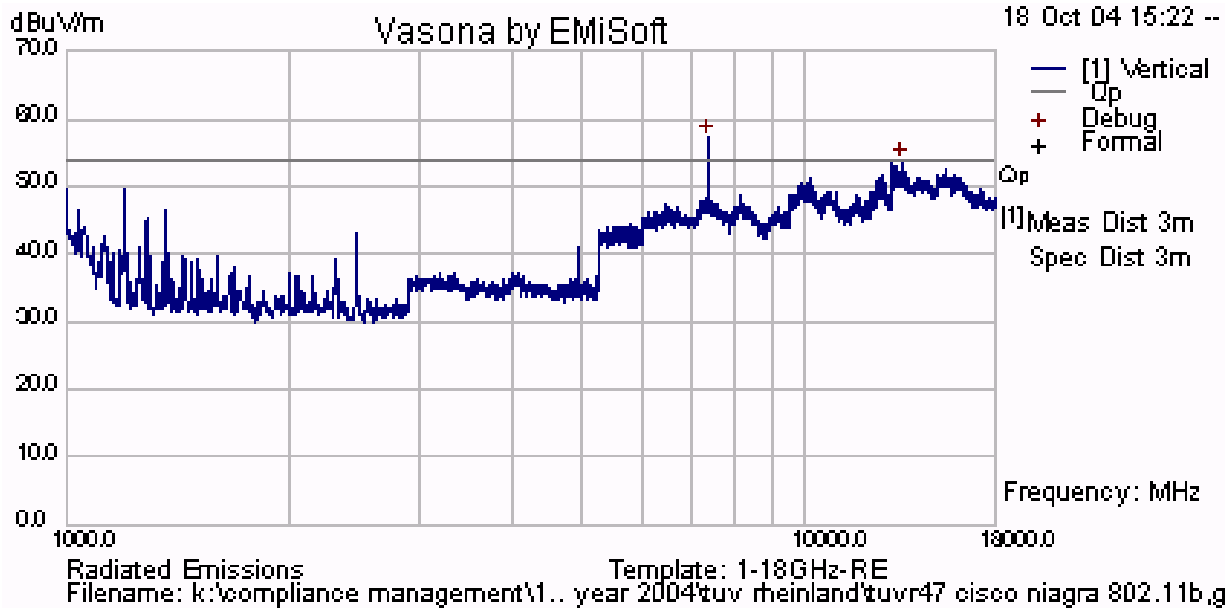
Plot 24 – Transmitter Spurious Emissions 1-26GHz 802.11b CH 6





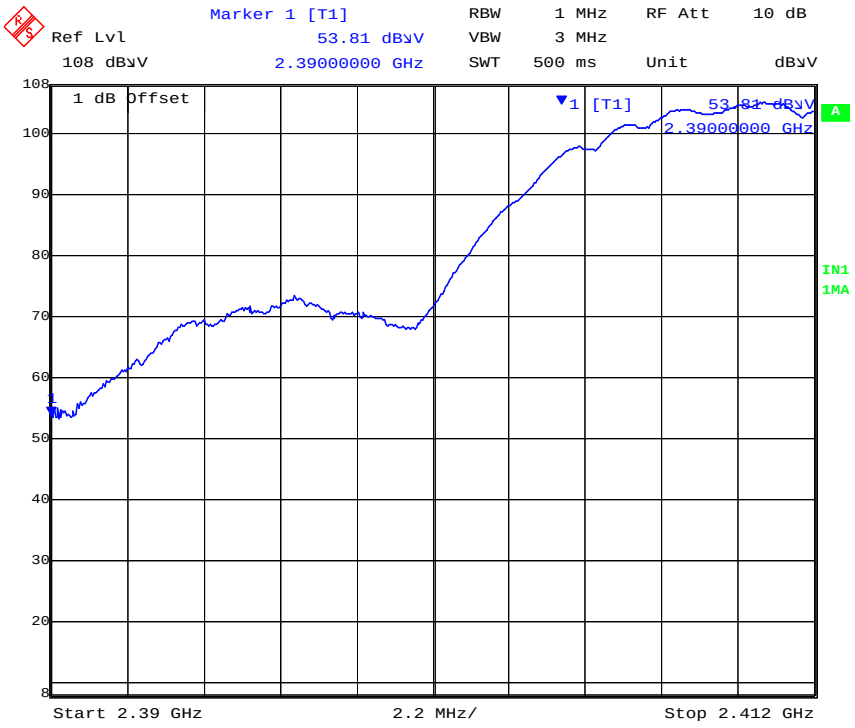
Plot 25 – Transmitter Spurious Emissions 1-26GHz 802.11b CH 11





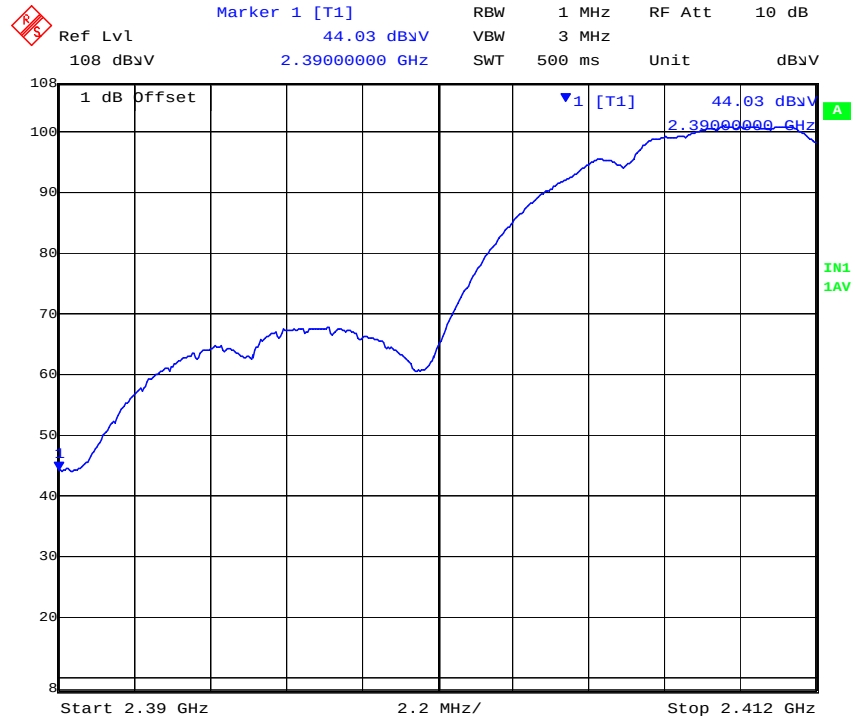
Plot 26 - Radiated Band Edge 802.11b 2,390 MHz Peak & Ave

Antenna AIR-ANT4941



Peak 53.81 dBµV/m

Date: 17.JAN.2005 18:01:13

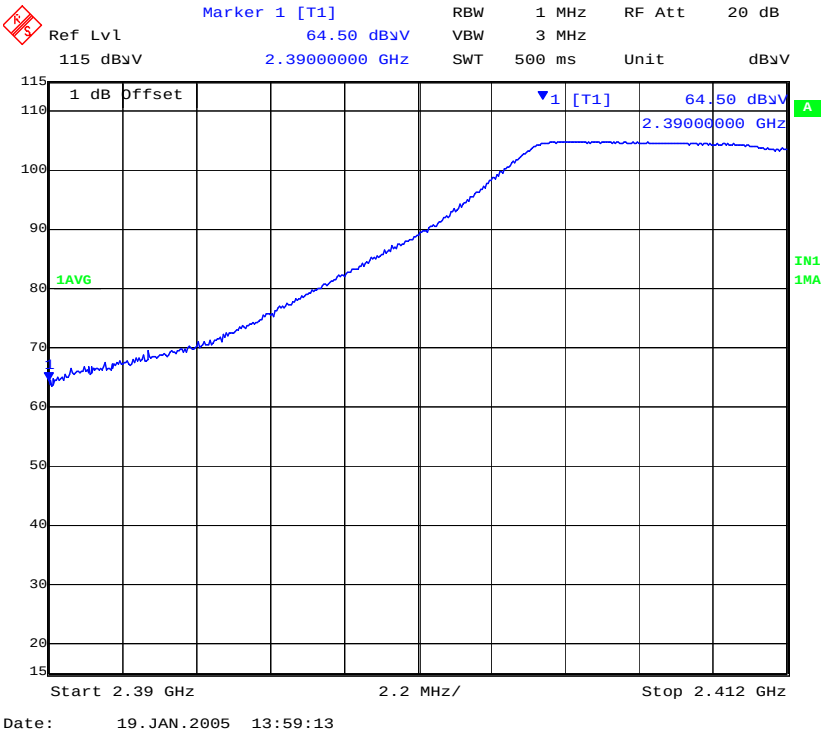


Ave 44.03 dBµV/m

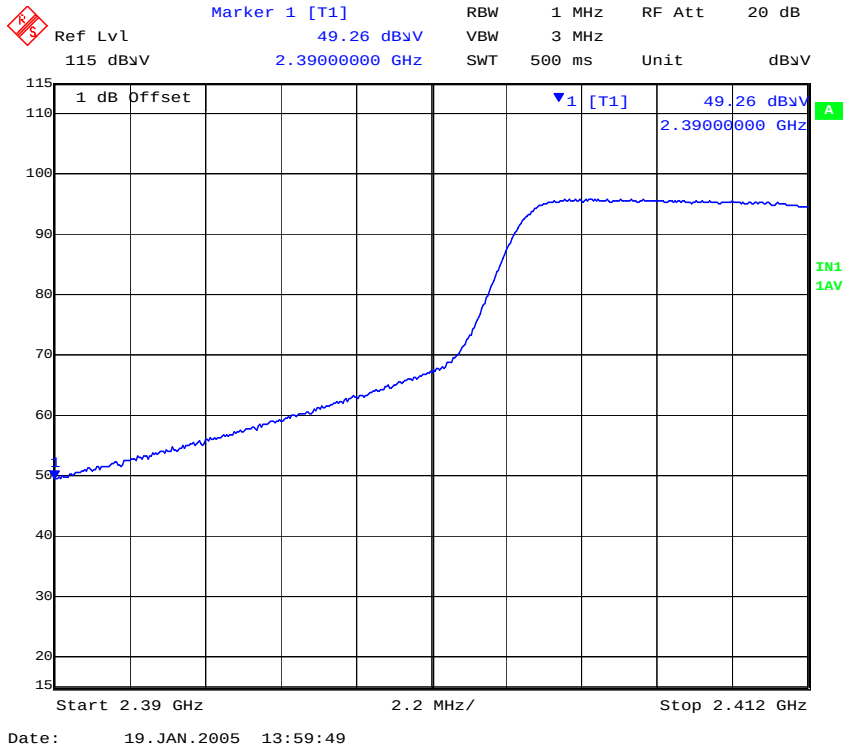
Date: 17.JAN.2005 17:50:08

Plot 27 - Radiated Band Edge 802.11g 2,390 MHz Peak & Ave

Antenna AIR-ANT5959



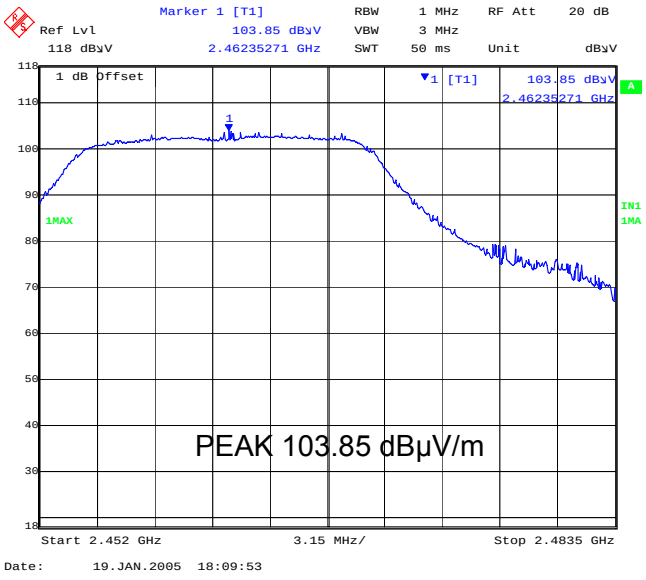
Peak 64.50 dBµV/m

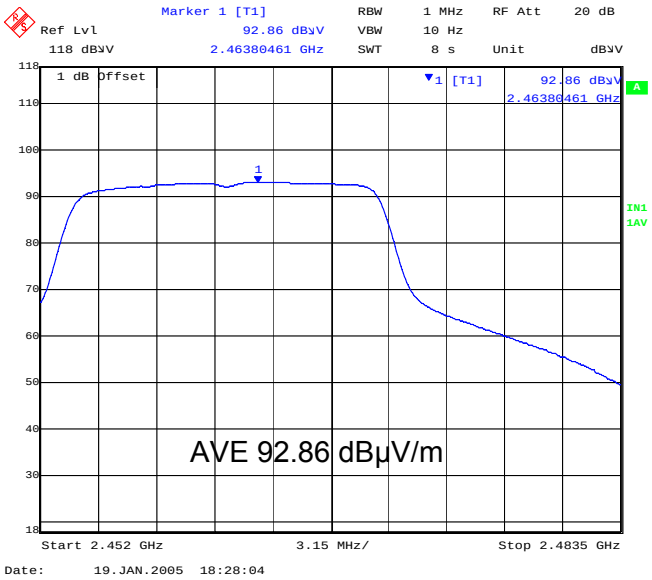


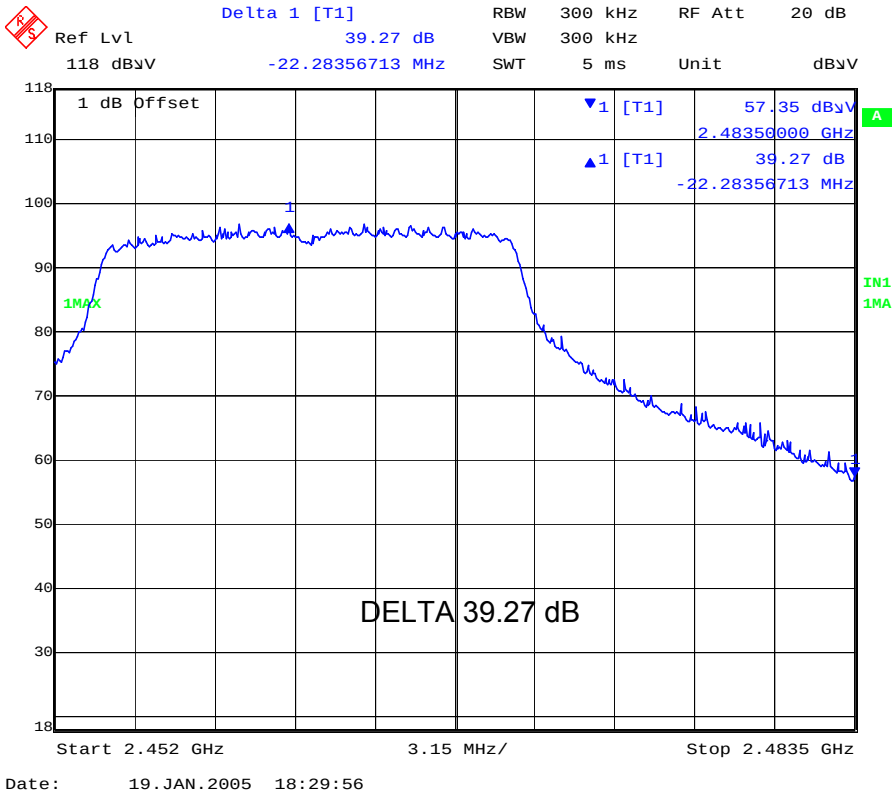
Ave 49.26 dBµV/m

Plot 28 - Radiated Band Edge 802.11g 2,483.5 MHz Peak, Ave & Delta

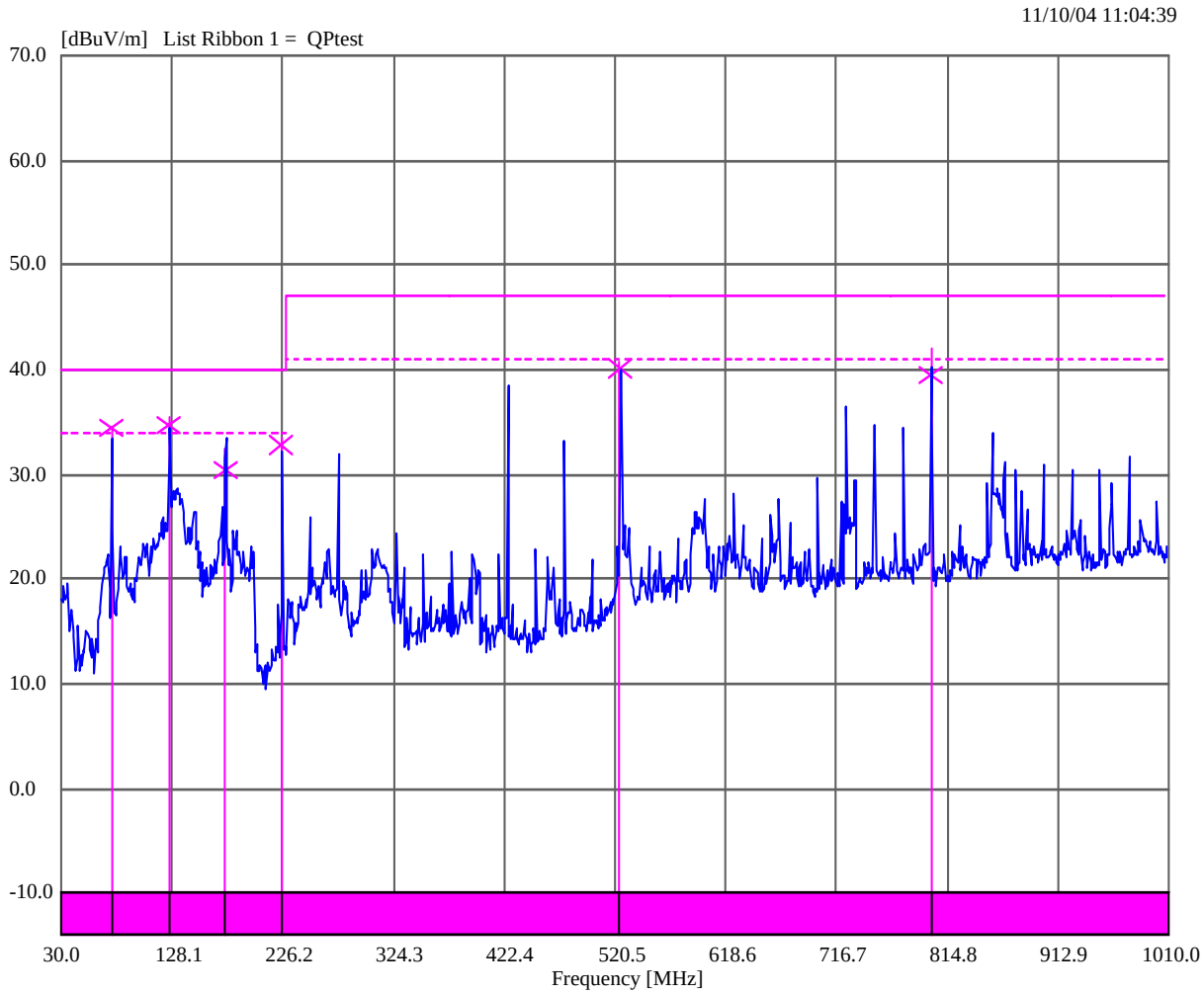
Antenna AIR-ANT1728





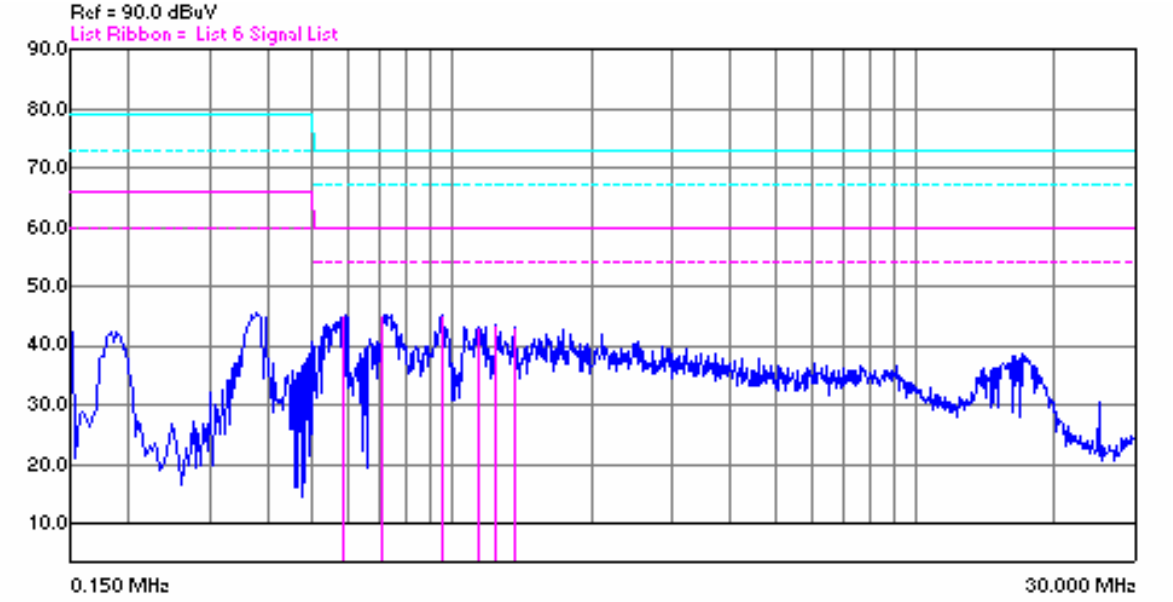


Plot 29 - Radiated Emissions 30M-1GHz

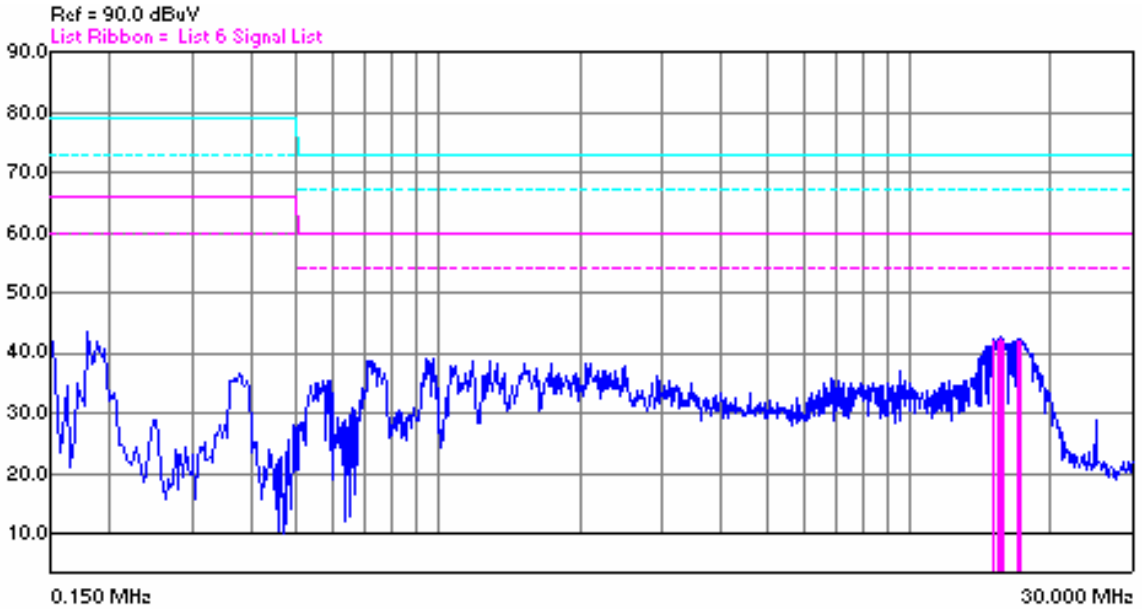


Plot 30 - AC Wireline Conducted Emissions (Live & Neutral Lines)

LINE - LIVE



LINE - NEUTRAL



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