EMC
TEST REPORT

Report No. : EME-060590
Model No. : WN6501CEP
Issued Date : Jun. 1, 2006

Applicant : SEIKO EPSON CORPORATION
4897 Shimauchi, Matsumoto-shi, Nagano-ken 390-8640
JAPAN

Test By : Intertek Testing Services Taiwan Ltd.
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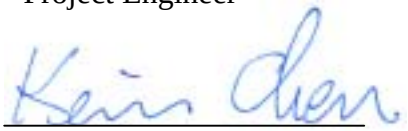
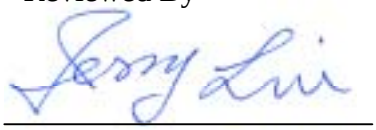
Project Engineer



Kevin Chen

Reviewed By



Jerry Liu

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Summary of Tests

Wireless LAN 802.11a/b/g USB adapter -Model: WN6501CEP
FCC ID: BKMWN6501C

1. 802.11b+g

Test	Reference	Results
Minimum 6dB Bandwidth test	15.247(a)(2)	Pass
Maximum Output Power test	15.247(b)	Pass
RF antenna conducted spurious emission test	15.247 (c)	Pass
Radiated Spurious Emission test	15.205, 15.209	Pass
Power Spectrum Density test	15.247(e)	Pass
Emission on the Band Edge test	15.247(d)	Pass
AC Power Line Conducted Emission test	15.207	Pass

2. 802.11a

Test	Reference	Results
Peak output power test	15.407 (a)(1)/(2)/(3)	Pass
Power Spectrum Density test	15.407 (a)(1)/(2)/(3)	Pass
Peak excursion to average ratio test	15.407(a)(6)	Pass
Radiated spurious emission test	15.407(b)(1)/(2)/(3), 15.209	Pass
AC line conducted emission test	15.407(b)(6) 15.207	Pass

1. General information

1.1 Identification of the EUT

Applicant	: SEIKO EPSON CORPORATION
Product	: Wireless LAN 802.11a/b/g USB adapter
Model No.	: WN6501CEP
FCC ID.	: BKMWN6501C
Frequency Range	: 1. 2412 MHz ~ 2462 MHz 2. 5180 MHz ~ 5320 MHz
Channel Number (802.11 a+b+g)	: 1. 11Channels for 2412 MHz ~ 2462 MHz 2. 8Channels for 5180 MHz ~ 5320 MHz
Frequency of Each Channel (802.11 a+b+g)	: 1. 2412 MHz + 5k MHz, k=0~10 2. 5180 MHz + 20k MHz, k=0~7
Type of Modulation	: DSSS, OFDM
Rated Power	: DC 5V from Notebook PC
Power Cord	: N/A
Sample Received	: Apr. 21, 2006
Test Date(s)	: Apr. 21, 2006 ~ May 22, 2006

FCC Part 15 B report has been issued for this EUT.

1.2 Additional information about the EUT

The EUT is a Wireless LAN 802.11a/b/g USB adapter, and was defined as information technology equipment. It has TPC function.

The EUT meets special requirements for LMA modular approval on FCC Public Notice DA 00-1407 and the device is only for OEM integrator, please refer the test result in this report.

For more detail features, please refer to User's manual as file name “Installation guide.pdf”.

1.3 Antenna description

The EUT uses a permanently connected antenna.

Antenna Type : PCB printed antenna
Connector Type : N/A

USB antenna		G_peak	G_avg	VSWR
2.4GHz	XY plane HP	2.92	-3.00	1.15
2.5GHz	XY plane HP	1.57	-3.48	2.35
4.9GHz	XY plane HP	3.68	-2.08	1.45
5.35GHz	XY plane HP	2.71	-2.20	
5.85GHz	XY plane HP	1.20	-3.58	2.94

1.4 Peripherals equipment

Peripherals	Manufacturer	Product No.	Serial No.	FCC ID
Notebook PC	DELL	PP02X	8Y210A04	FCC DoC Approved
Printer	HP	C2642A	TH86K1N2ZB	ARSCM560S
Modem	Dynalink	V1456VQE	00V230A00051494	FCC DoC Approved

2. Test specifications

2.1 Test standard

The EUT was performed according to the procedures in FCC Part 15 Subpart C Section §15.205、§15.207、§15.209、§15.247 and ANSI C63.4/2003.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

The EUT was performed according to the procedures in FCC Part 15 Subpart E Section §15.207、§15.209 、§15.407 and ANSI C63.4/2001.

The AC power conducted emissions was invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz. (15.207 paragraph)

Radiated emissions were invested cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading recorded also on the report.

The test of radiated measurements according to FCC Part15 Section 15.33(a) had been conducted and the field strength of this frequency band were all meet limit requirement, thus we evaluate the EUT pass the specified test.

The EUT setup configurations please refer to the photo of test configuration in item.

2.2 Operation mode

The EUT was supplied with 5Vdc from Notebook PC and it was running in operating mode.

Plug the EUT into Notebook PC via USB interface, then turn on the Notebook PC power and run the test program “QA” under windows OS, which provide by manufacturer.

The EUT was transmitted continuously during the test.

With individual verifying, the maximum output power was found at 1Mbps data rate for 802.11b mode, 6Mbps data rate for 802.11g mode and 6Mbps data rate for 802.11a mode. The final tests were executed under these conditions and recorded in this report individually.

2.3 Test equipment

Equipment	Brand	Frequency range	Model No.	Intertek ID No.	Next Cal. Date
EMI Test Receiver	Rohde & Schwarz	9kHz~2.75GHz	ESCS 30	EC303	04/17/2007
EMI Test Receiver	Rohde & Schwarz	20Hz~26.5GHz	ESMI	EC317	08/07/2006
Spectrum Analyzer	Rohde & Schwarz	9kHz~30GHz	FSP 30	EC353	07/24/2006
Spectrum Analyzer	Rohde & Schwarz	20Hz~40GHz	FSEK 30	EC365	11/01/2006
Horn Antenna	SCHWARZBECK	1GHz~18GHz	BBHA 9120 D	EC371	12/22/2007
Horn Antenna	SCHWARZBECK	14GHz~40GHz	BBHA 9170	EC351	07/08/2007
Bilog Antenna	SCHWARZBECK	25MHz~2GHz	VULB 9168	EC347	12/23/2007
Pre-Amplifier	MITEQ	100MHz~26.5GHz	919981	EC373	02/11/2007
Wideband Peak Power Meter/ Sensor	Anritsu	100MHz~18GHz	ML2497A/ MA2491A	EC396	11/10/2006
Controller	HDGmbH	N/A	CM 100	EP346	N/A
Antenna Tower	HDGmbH	N/A	MA 240	EP347	N/A
LISN	Rohde & Schwarz	9KHz~30MHz	ESH3-Z5	EC344	01/13/2007

Note: 1. The above equipments are within the valid calibration period.
2. The test antennas (receiving antenna) are calibration per 3 years.

3. Minimum 6dB Bandwidth test (FCC 15.247)

3.1 Operating environment

Temperature:	25	℃
Relative Humidity:	60	%
Atmospheric Pressure:	1023	hPa

3.2 Test setup & procedure

The minimum 6dB bandwidth per FCC §15.247(a)(2) was measured using a 50 ohm spectrum analyzer with the resolutions bandwidth set at 100kHz, the video bandwidth set at 100kHz, and the SPAN>>RBW. The test was performed at 3 channels (lowest, middle and highest channel). The minimum 6-dB modulation bandwidth is in the following Table.

3.3 Measured data of Minimum 6dB Bandwidth test results

Test Mode: 802.11b(DSSS Modulation) operating mode

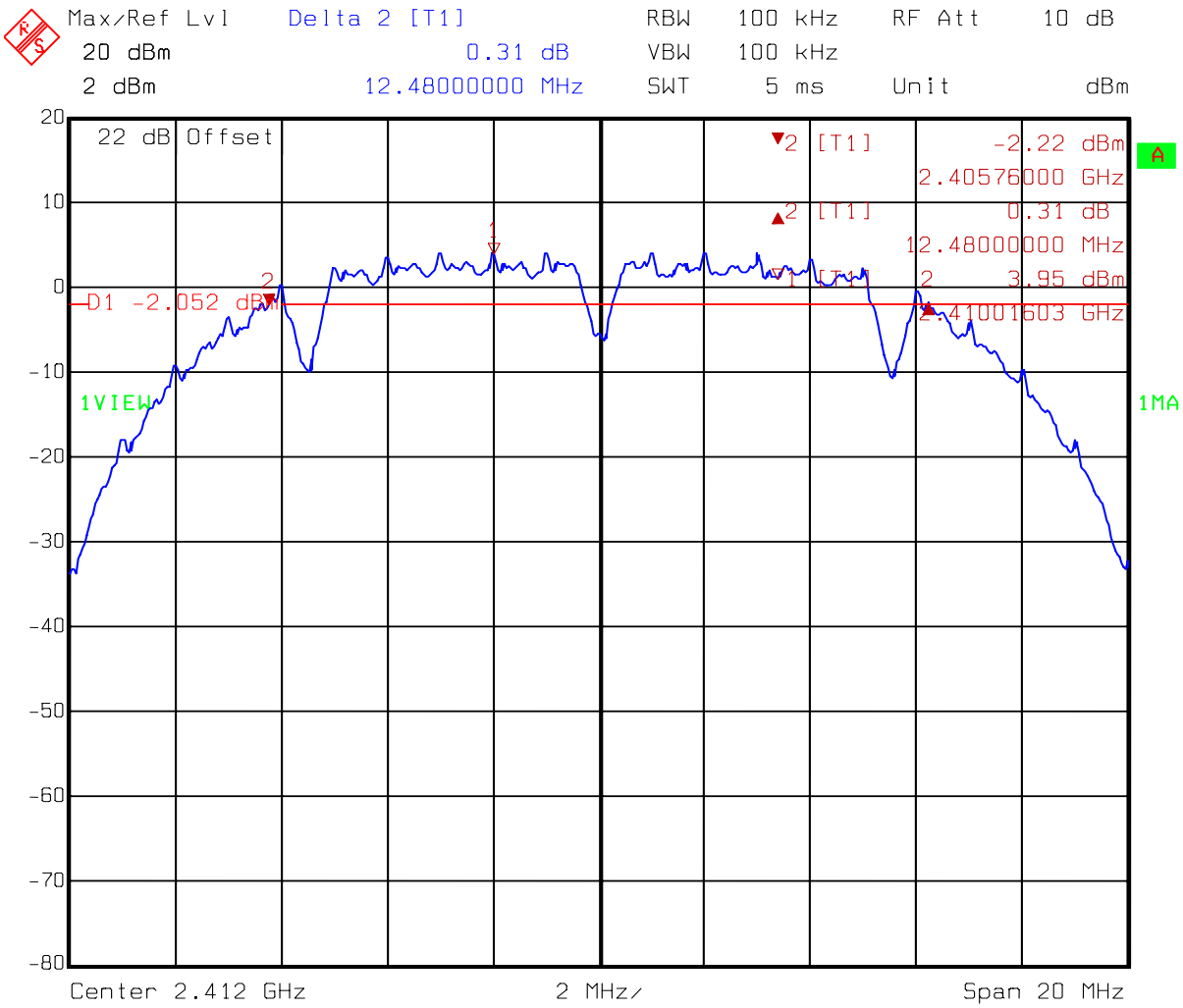
Channel	Frequency (MHz)	Bandwidth (MHz)	Limit
1 (lowest)	2412	12.48	＞500kHz
6 (middle)	2437	12.48	＞500kHz
11 (highest)	2462	12.52	＞500kHz

Test Mode: 802.11g(OFDM Modulation) operating mode

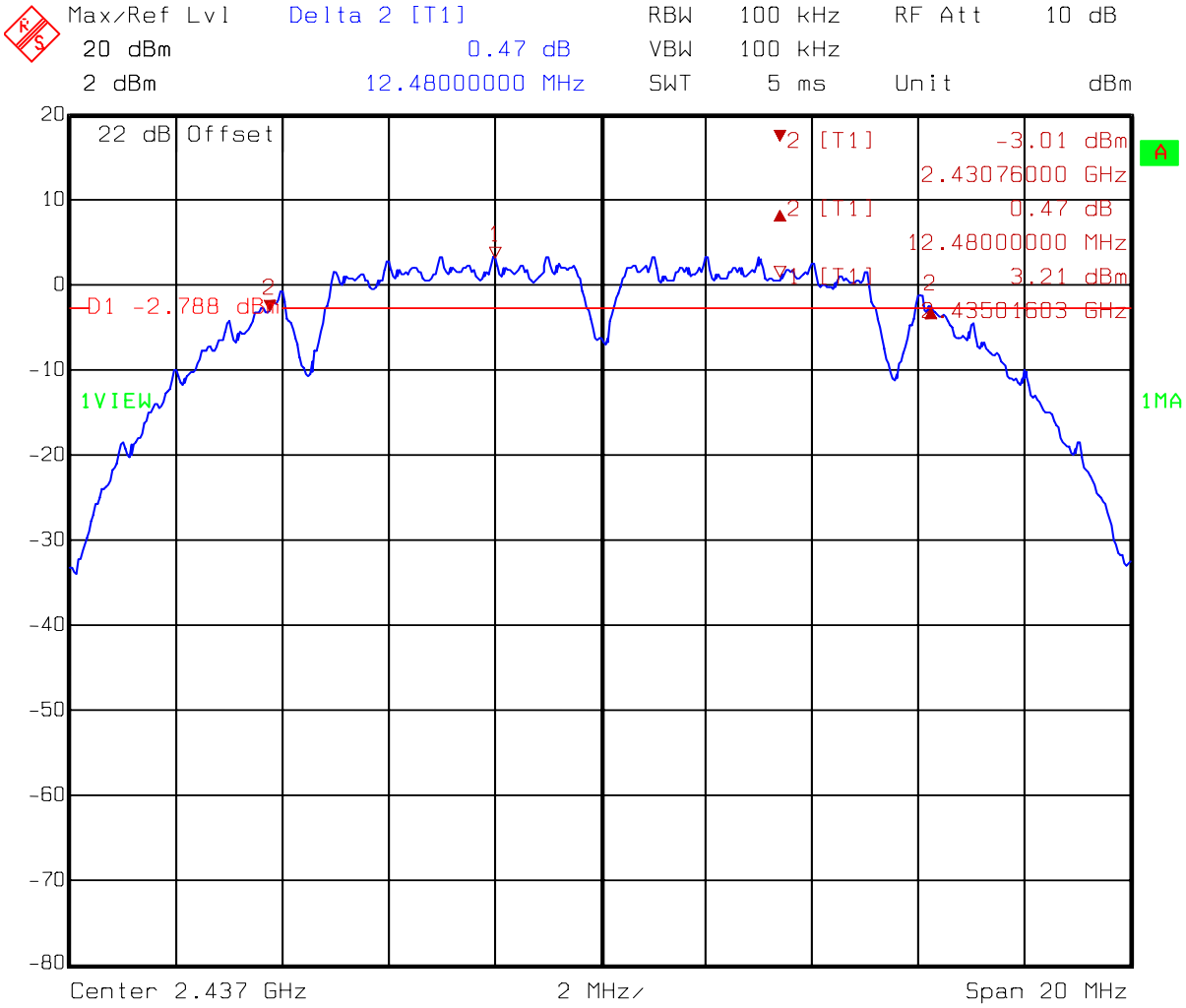
Channel	Frequency (MHz)	Bandwidth (MHz)	Limit
1 (lowest)	2412	16.60	＞500kHz
6 (middle)	2437	16.60	＞500kHz
11 (highest)	2462	16.60	＞500kHz

Please see the plot below.

Test Mode: 802.11b(DSSS Modulation) operating mode



Title: 6dB Bandwidth
Comment A: Channel 01 at 802.11b mode
Date: 21.APR.2006 11:20:00



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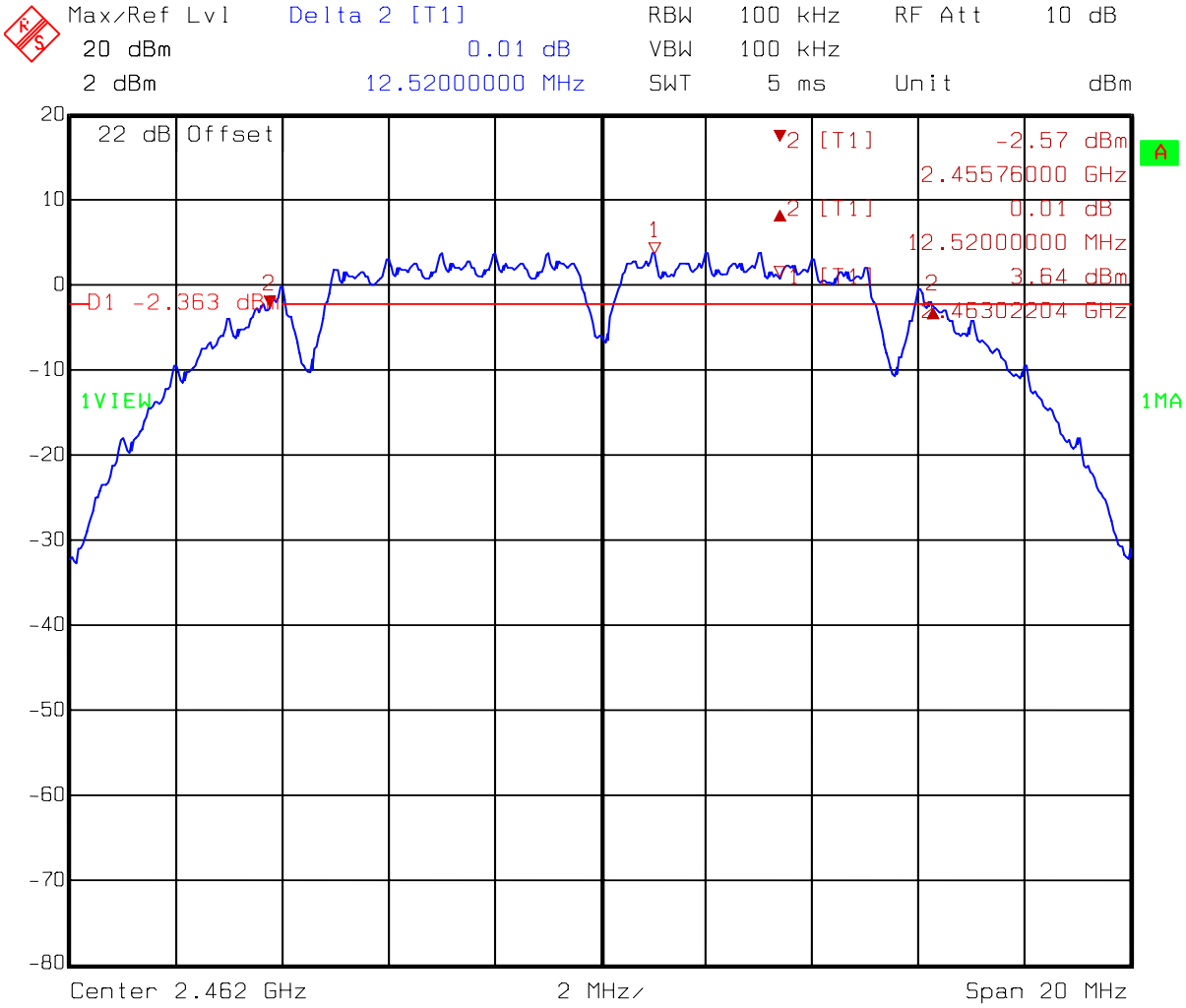
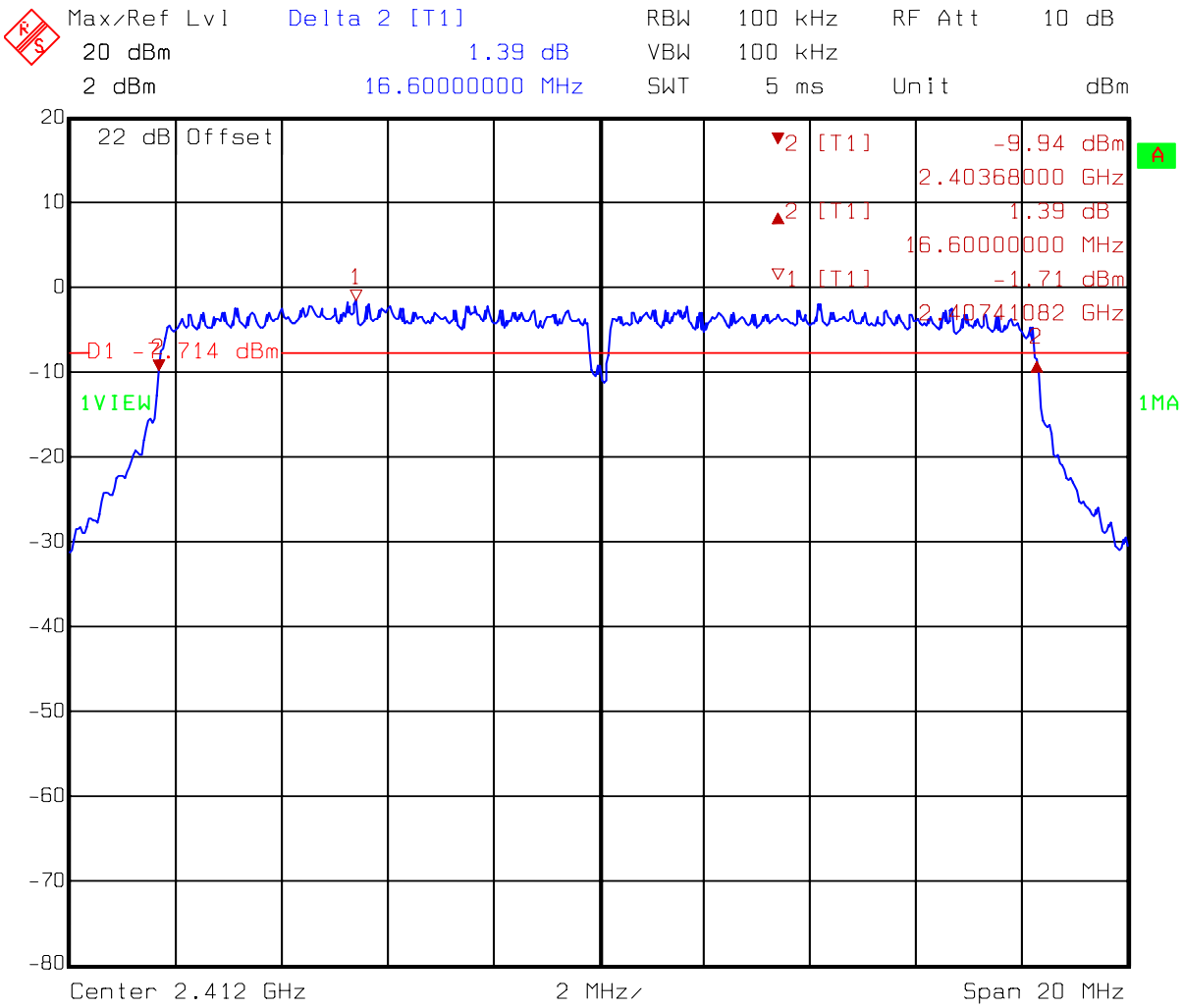
Comment A: Channel 06 at 802.11b mode
Date: 21.APR.2006 11:38:36

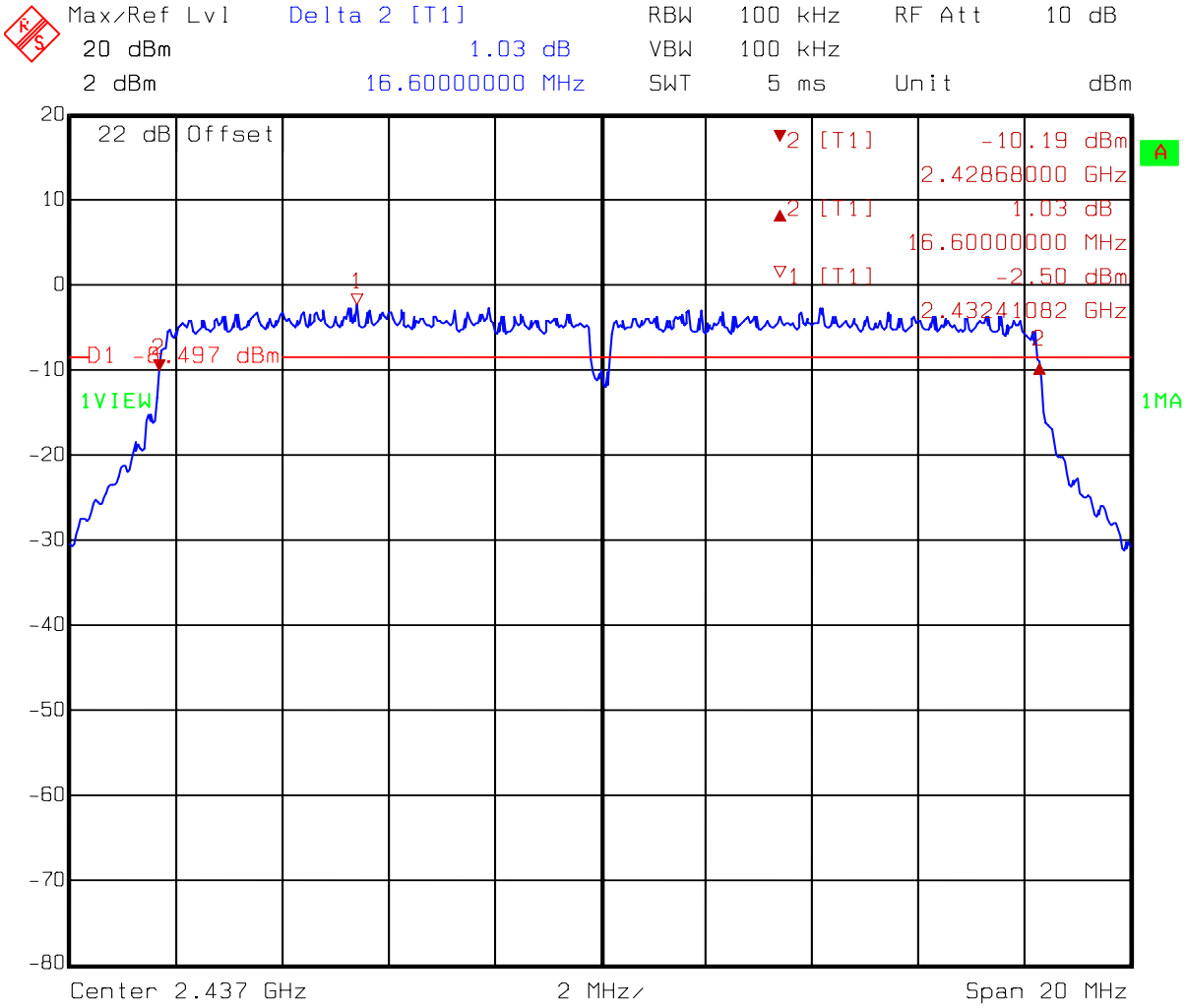


Title: 6dB Bandwidth
Comment A: Channel 11 at 802.11b mode
Date: 21.APR.2006 11:42:44

Test Mode: 802.11g(OFDM Modulation) operating mode



Title: 6dB Bandwidth
Comment A: Channel 01 at 802.11g mode
Date: 21.APR.2006 11:51:47



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Comment A: Channel 06 at 802.11g mode
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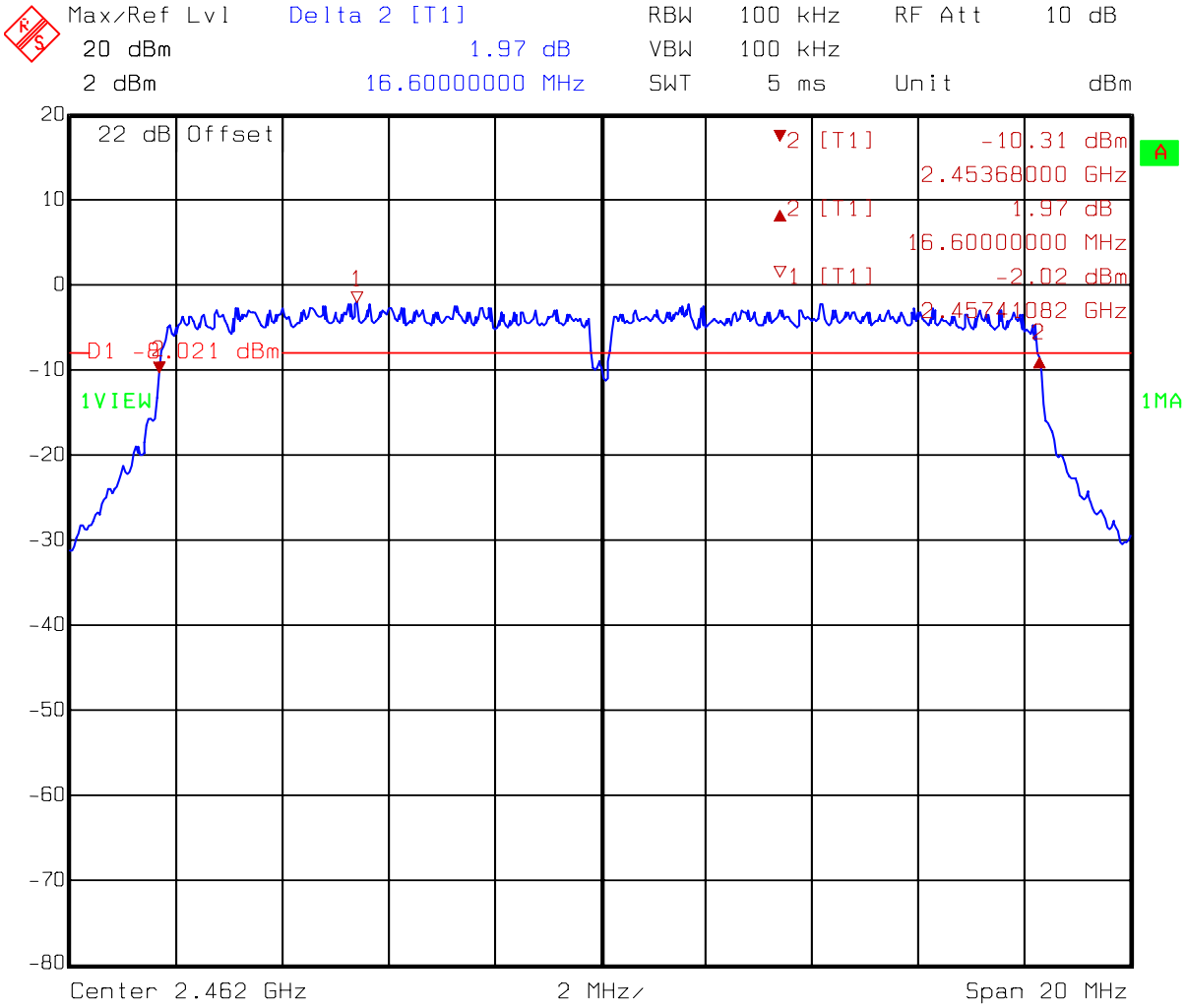


Title: 6dB Bandwidth
Comment A: Channel 11 at 802.11g mode
Date: 21.APR.2006 12:06:14

4. Maximum Output Power test (FCC 15.247)

4.1 Operating environment

Temperature: 25 ℃
Relative Humidity: 60 %
Atmospheric Pressure: 1023 hPa

4.2 Test setup & procedure

The power output per FCC §15.247(b) was measured on the EUT using a 50 ohm SMA cable connected to peak power meter via power sensor. Power was read directly and cable loss correction (2.5 dB) was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel).

4.3 Measured data of Maximum Output Power test results

Test Mode: 802.11b(DSSS Modulation) operating mode

Channel	Freq. (MHz)	C.L. (dB)	Reading (dBm)	Conducted Peak Output Power		Limit (W)
				(dBm)	(mW)	
1 (lowest)	2412	2.5	16.95	19.45	88.10	1
6 (middle)	2437	2.5	15.91	18.41	69.34	1
11 (highest)	2462	2.5	16.47	18.97	78.89	1

Remark:

Conducted Peak Output Power = Reading + C.L.

Test Mode: 802.11g(OFDM Modulation) operating mode

Channel	Freq. (MHz)	C.L. (dB)	Reading (dBm)	Conducted Peak Output Power		Limit (W)
				(dBm)	(mW)	
1 (lowest)	2412	2.5	18.95	21.45	139.64	1
6 (middle)	2437	2.5	18.01	20.51	112.46	1
11 (highest)	2462	2.5	18.42	20.92	123.59	1

Remark:

Conducted Peak Output Power = Reading + C.L.

5. RF Antenna Conducted Spurious test

5.1 Operating environment

Temperature:	25	℃
Relative Humidity:	58	%

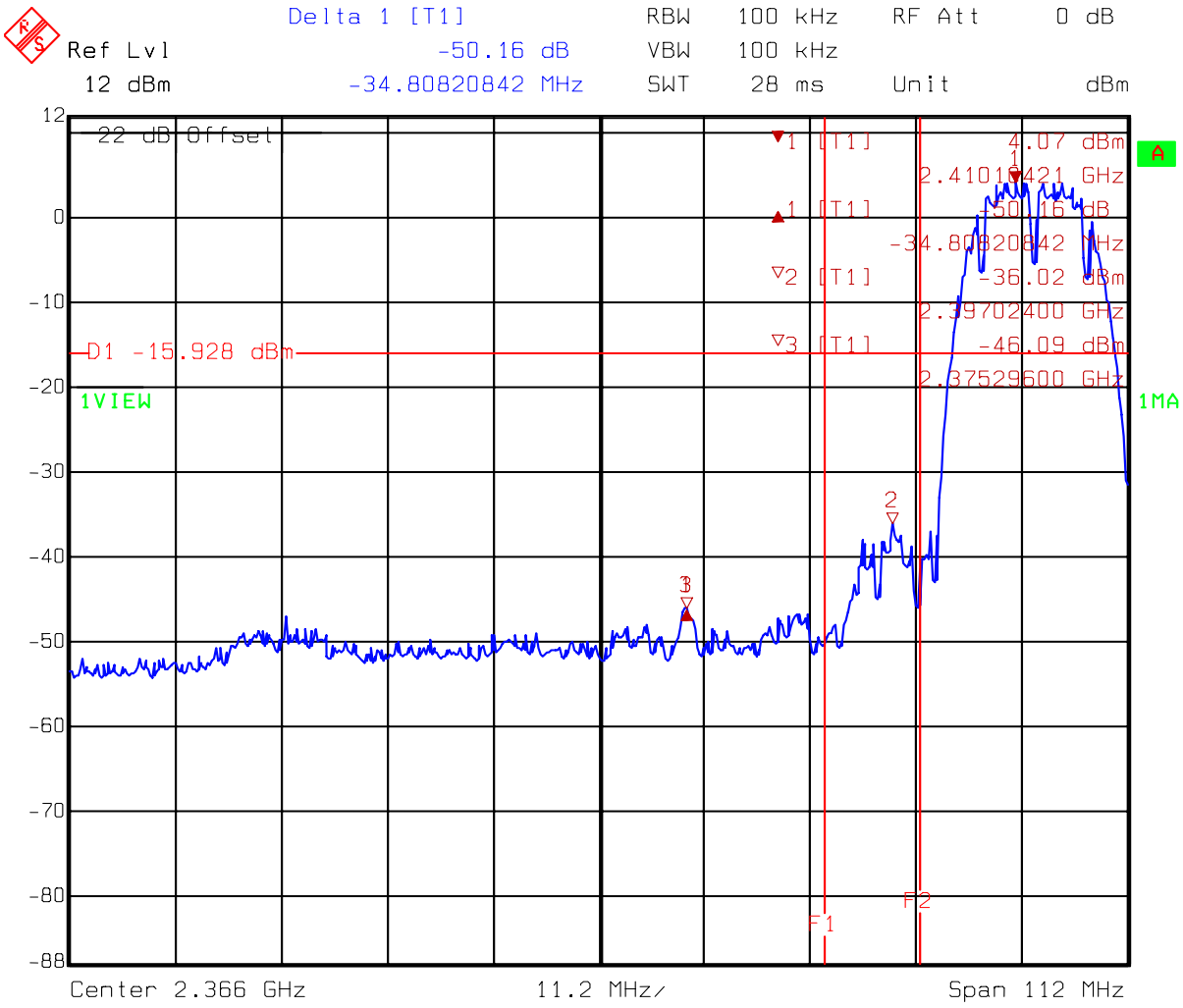
5.2 Test setup & procedure

The measurements were performed from 30MHz to 25GHz RF antenna conducted per FCC 15.247 (c) was measured from the EUT antenna port using a 50ohm spectrum analyzer with the resolution bandwidth set at 100 kHz, and the video bandwidth set at 100 kHz.
Harmonics and spurious noise must be at least 20dB down from the highest emission level within the authorized band as measured with a 100 kHz RBW. The table below is the results from the highest emission for each channel within the authorized band. This table was used to determine the spurious limits for each channel.

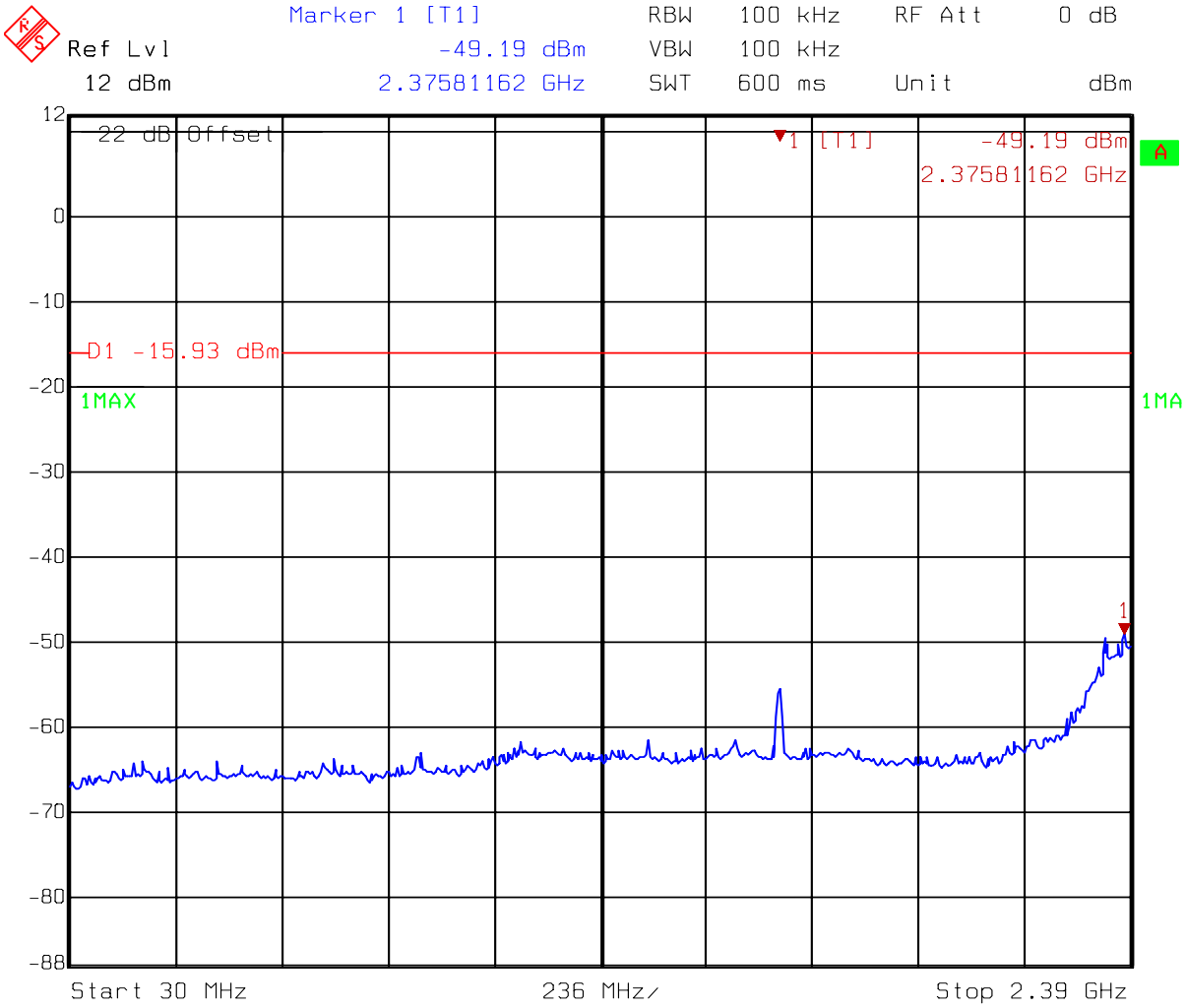
5.3 Measured data of the highest RF Antenna Conducted Spurious test result

The test results please see the plot below.

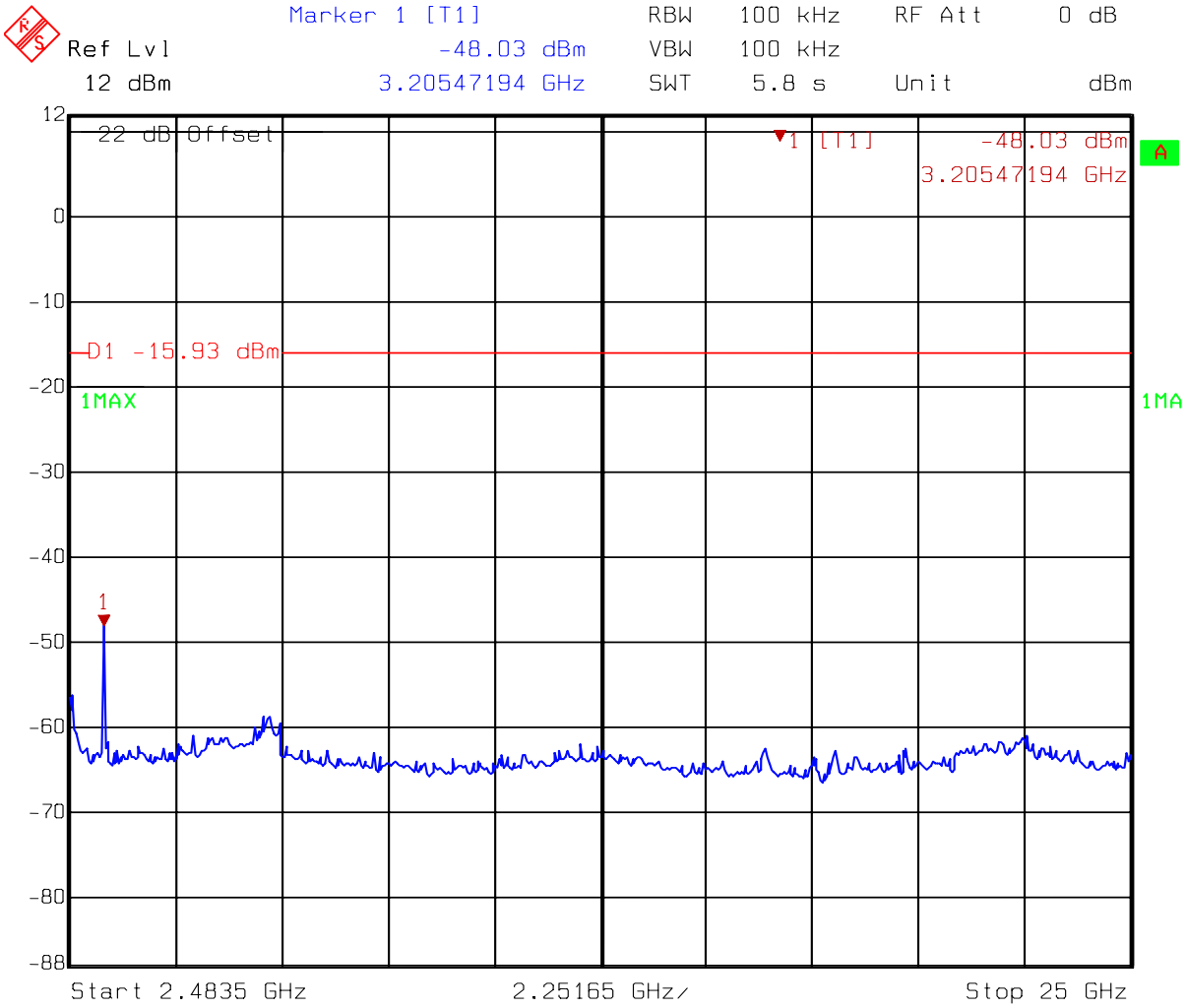
Test Mode: 802.11b(DSSS Modulation) operating mode



Title: Band Edge
Comment A: Channel 01 at 802.11b mode
F1=2390MHz F2=2400MHz (Peak Detect)
Date: 21.APR.2006 11:21:10



Comment A: conducted spurious at 11b ch1
Date: 04.JUL.2006 14:22:43



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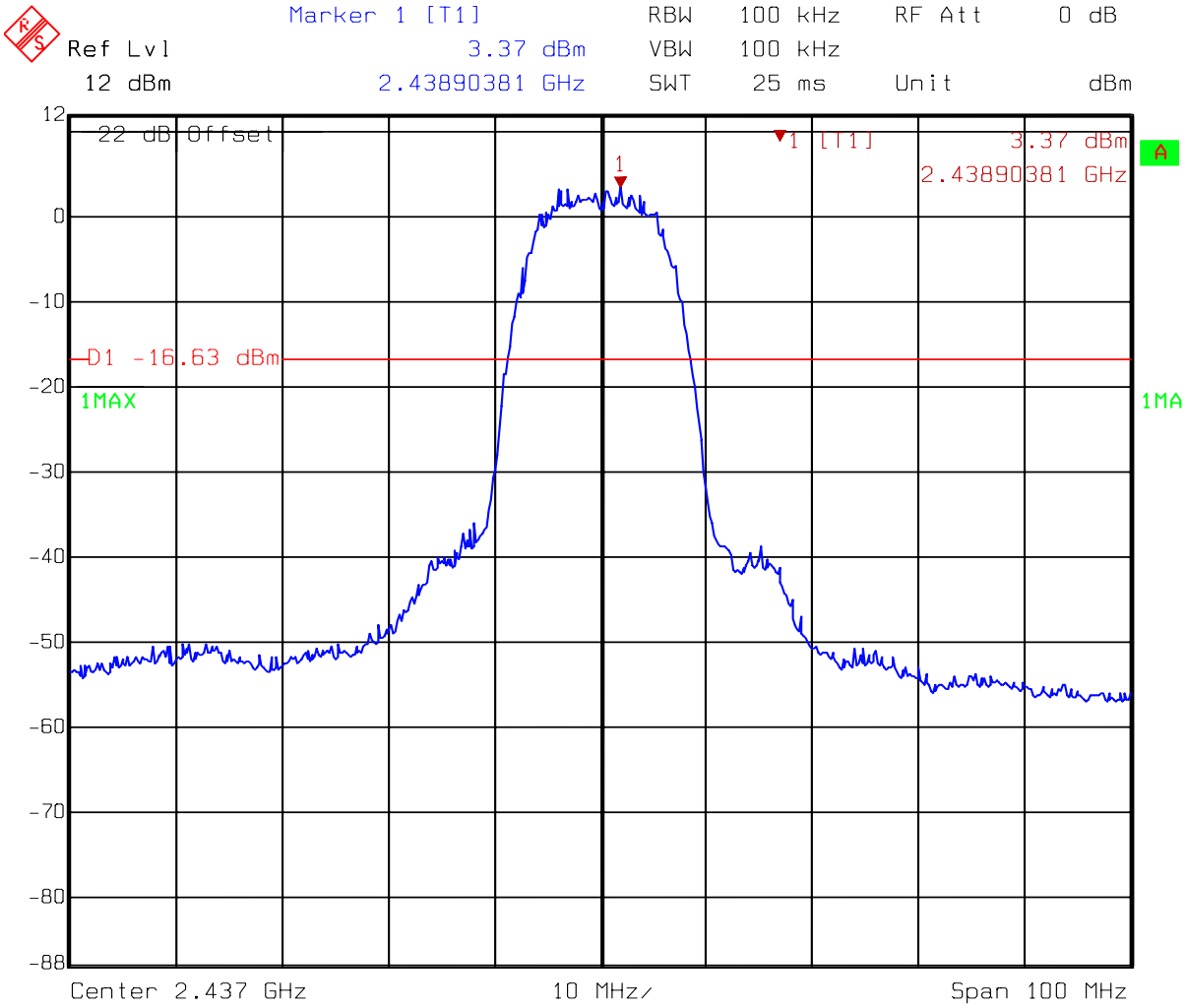
Date: 04.JUL.2006 14:24:43



Comment A: conducted spurious at 11b ch6
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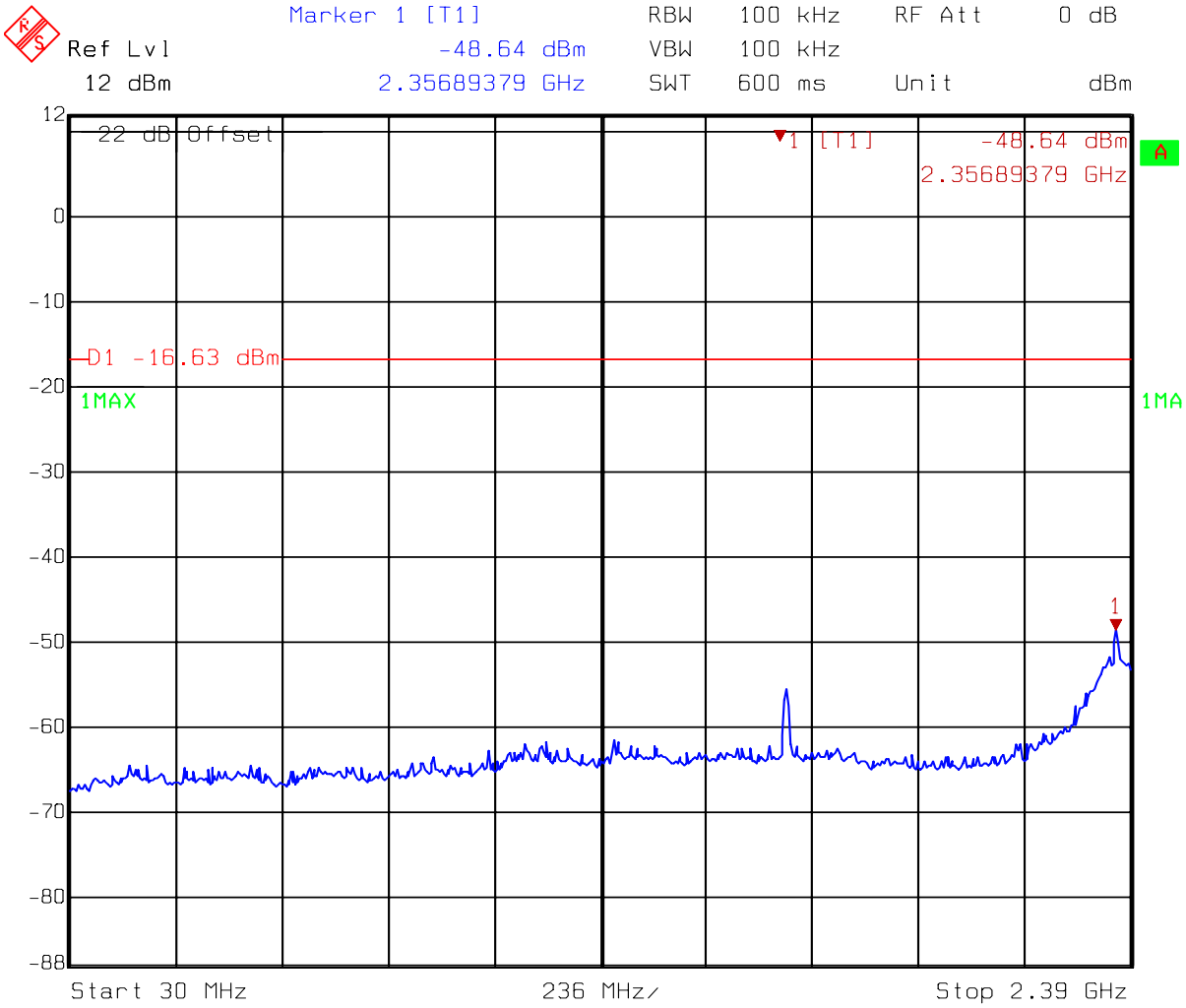

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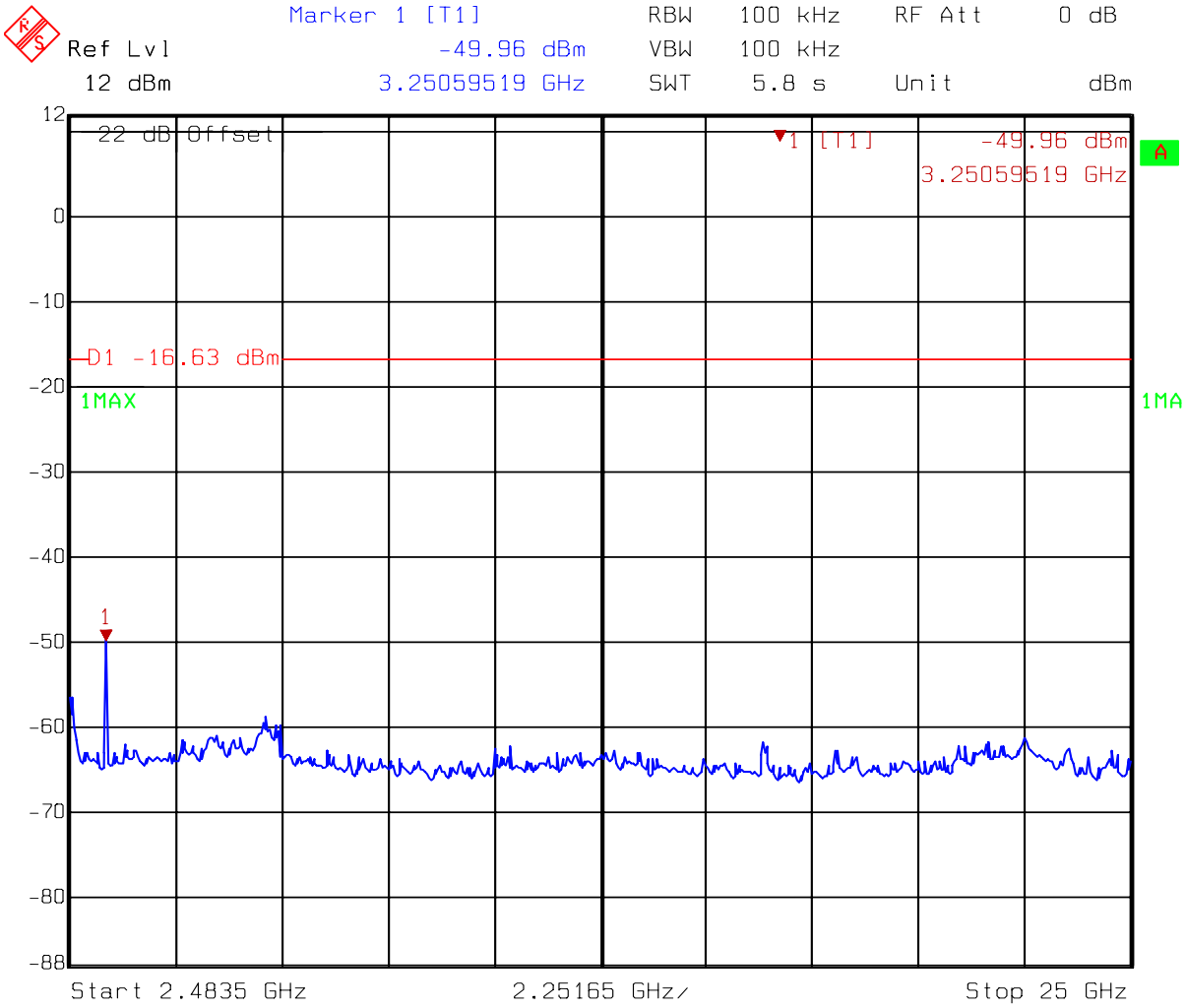

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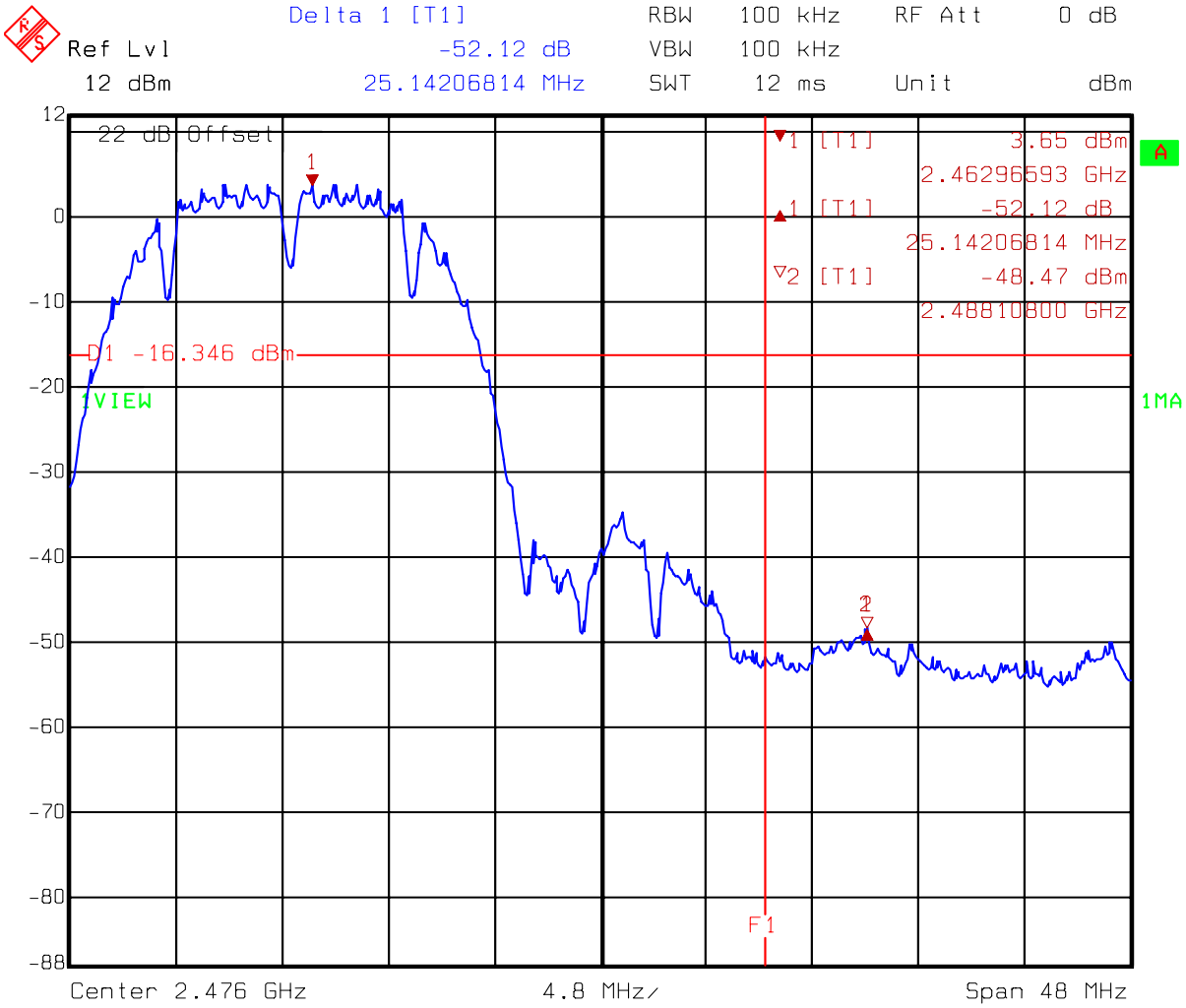

Title: Band Edge
Comment A: Channel 11 at 802.11b mode
F1=2483.5MHz (Peak Detect)
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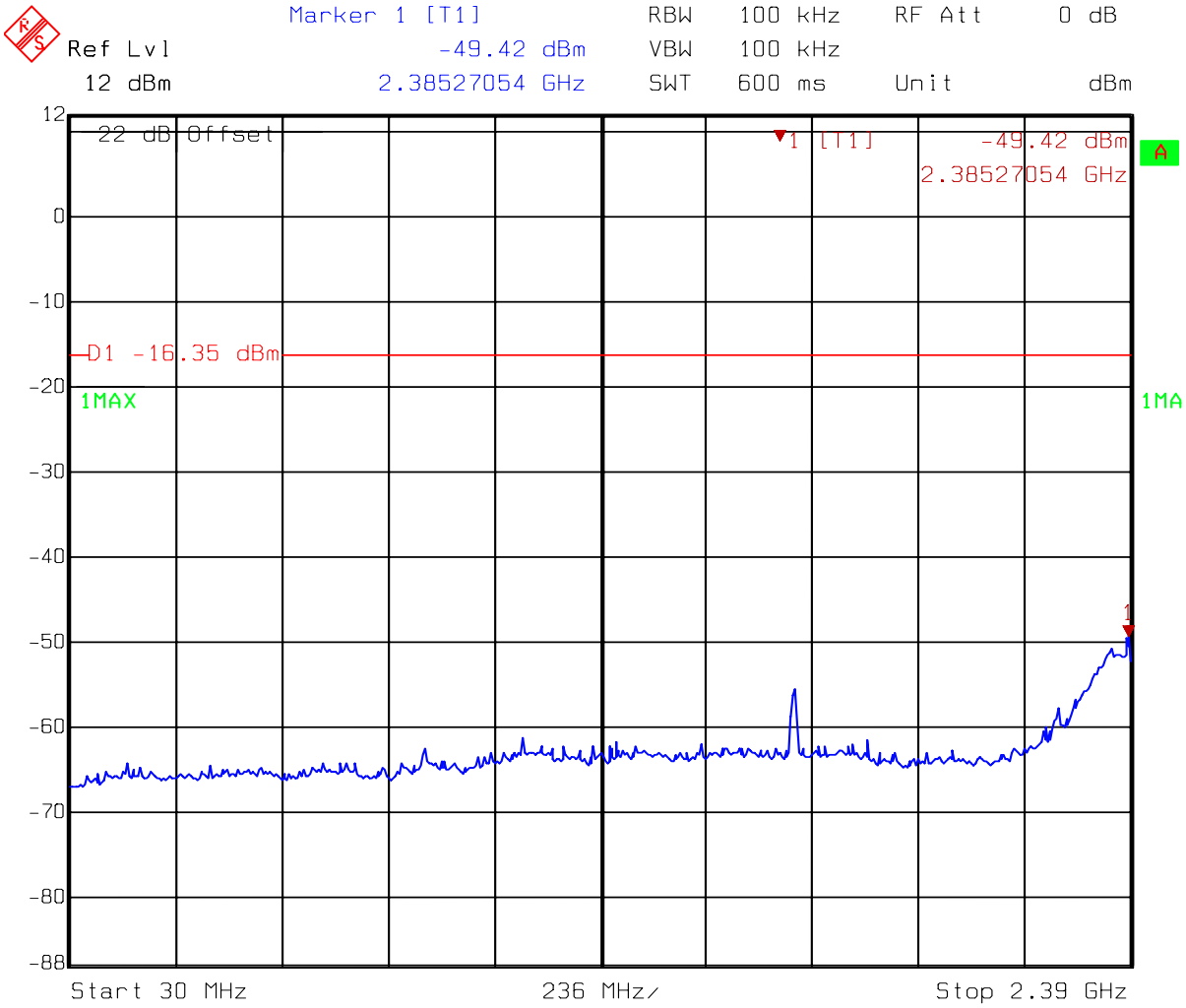

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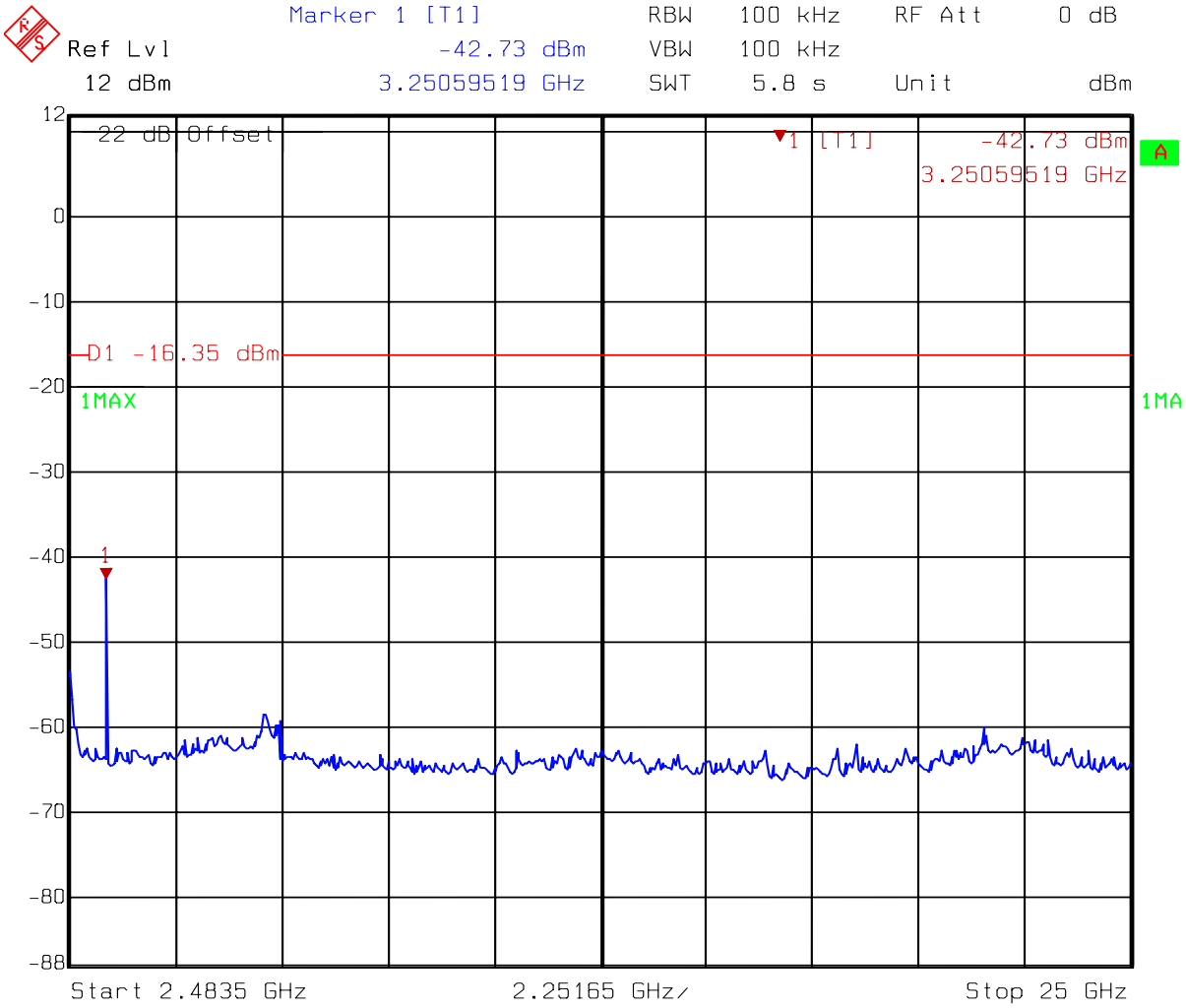
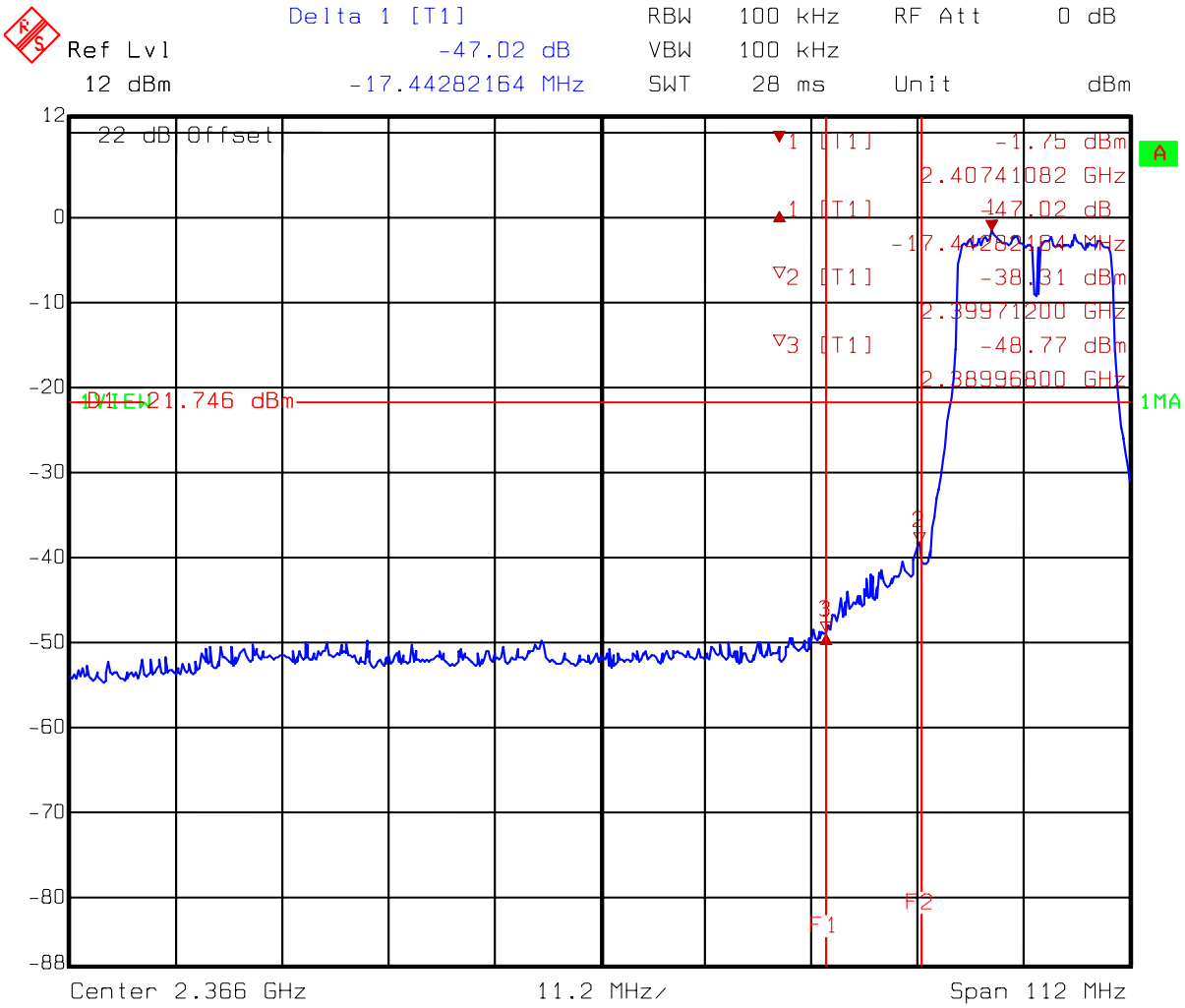


Comment A: conducted spurious at 11b ch11
Date: 04.JUL.2006 14:31:50

Test Mode: 802.11g(OFDM Modulation) operating mode



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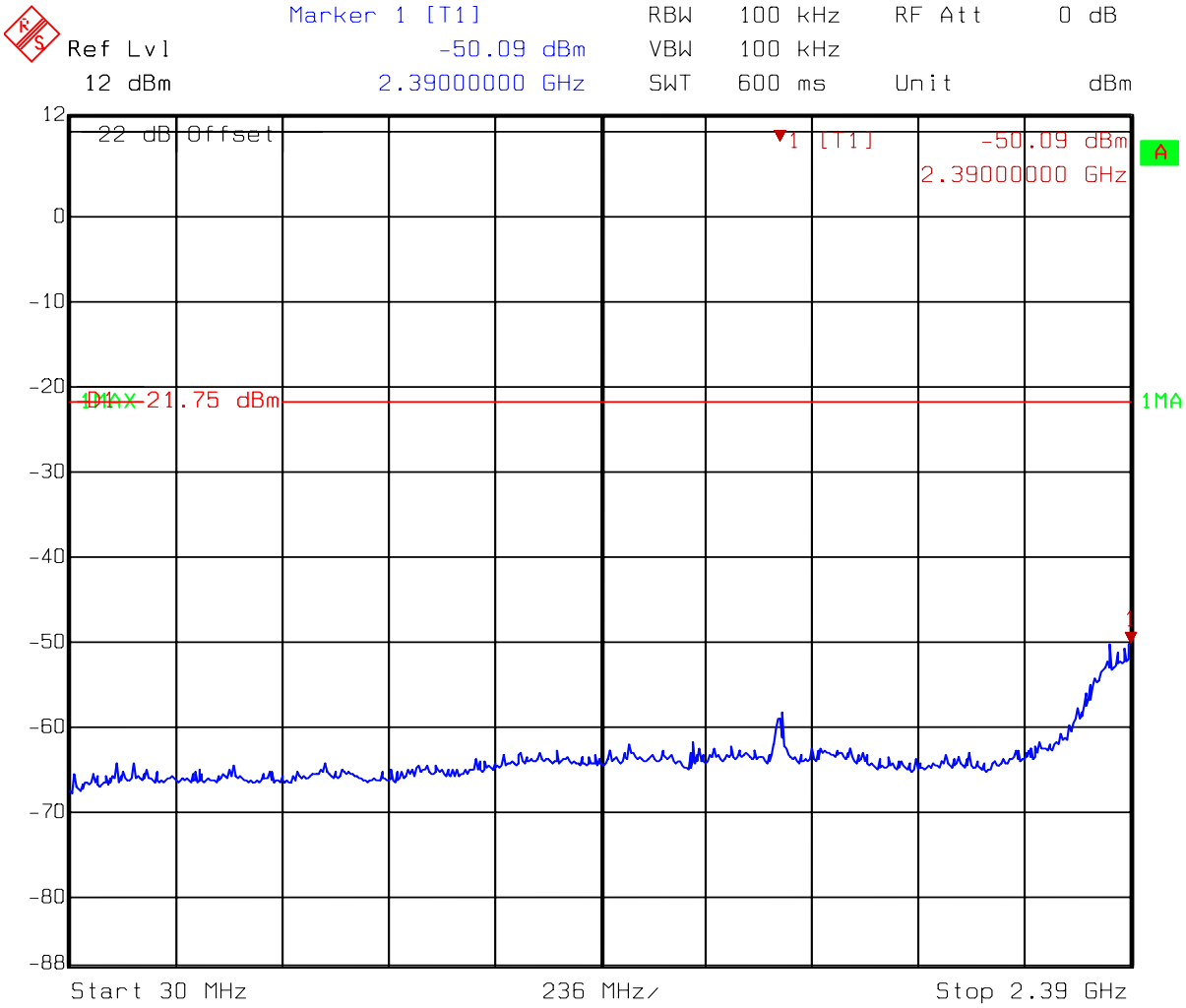
F1=2390MHz F2=2400MHz (Peak Detect)
Date: 21.APR.2006 11:52:41



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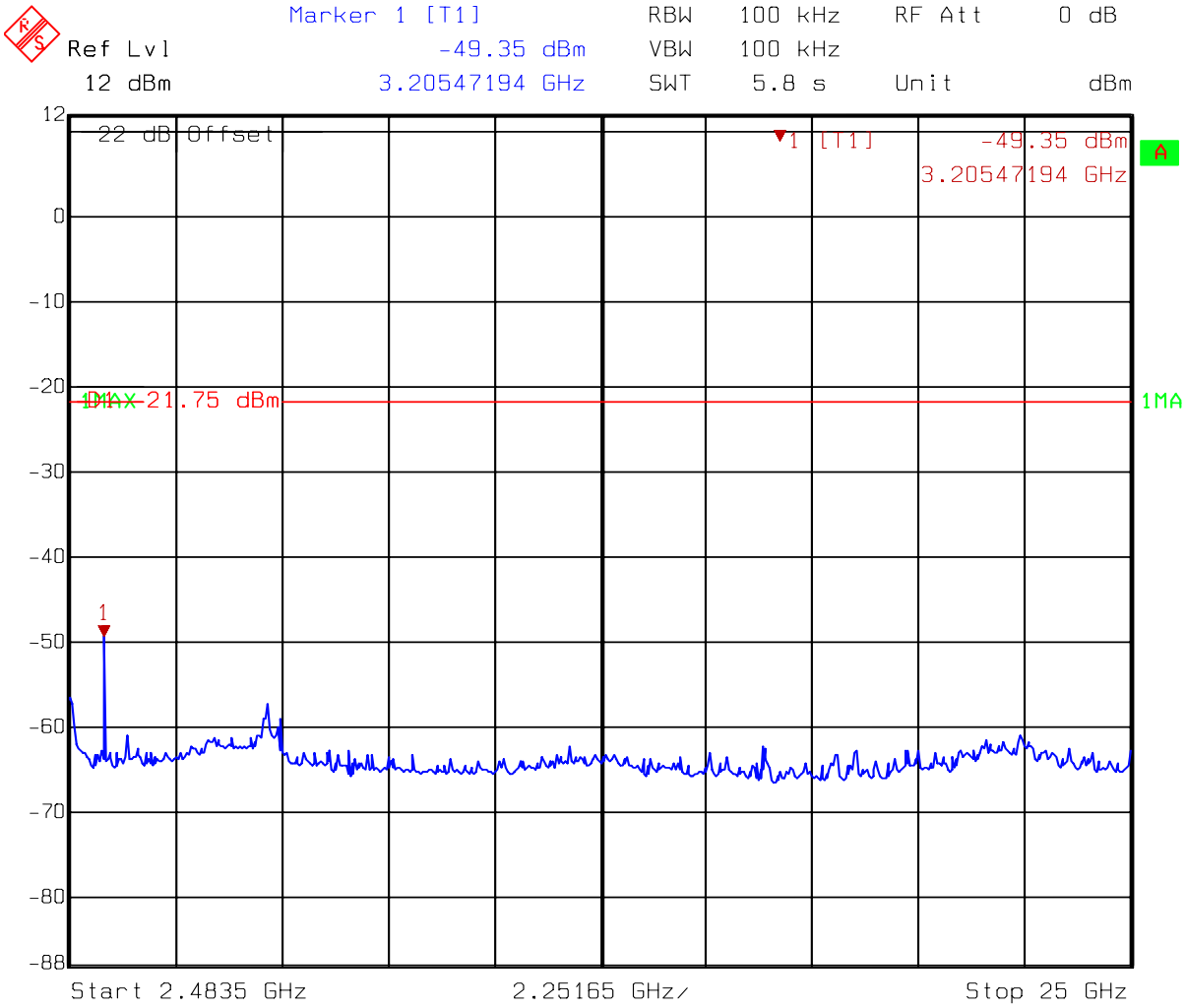

Comment A: conducted spurious at 11g ch1
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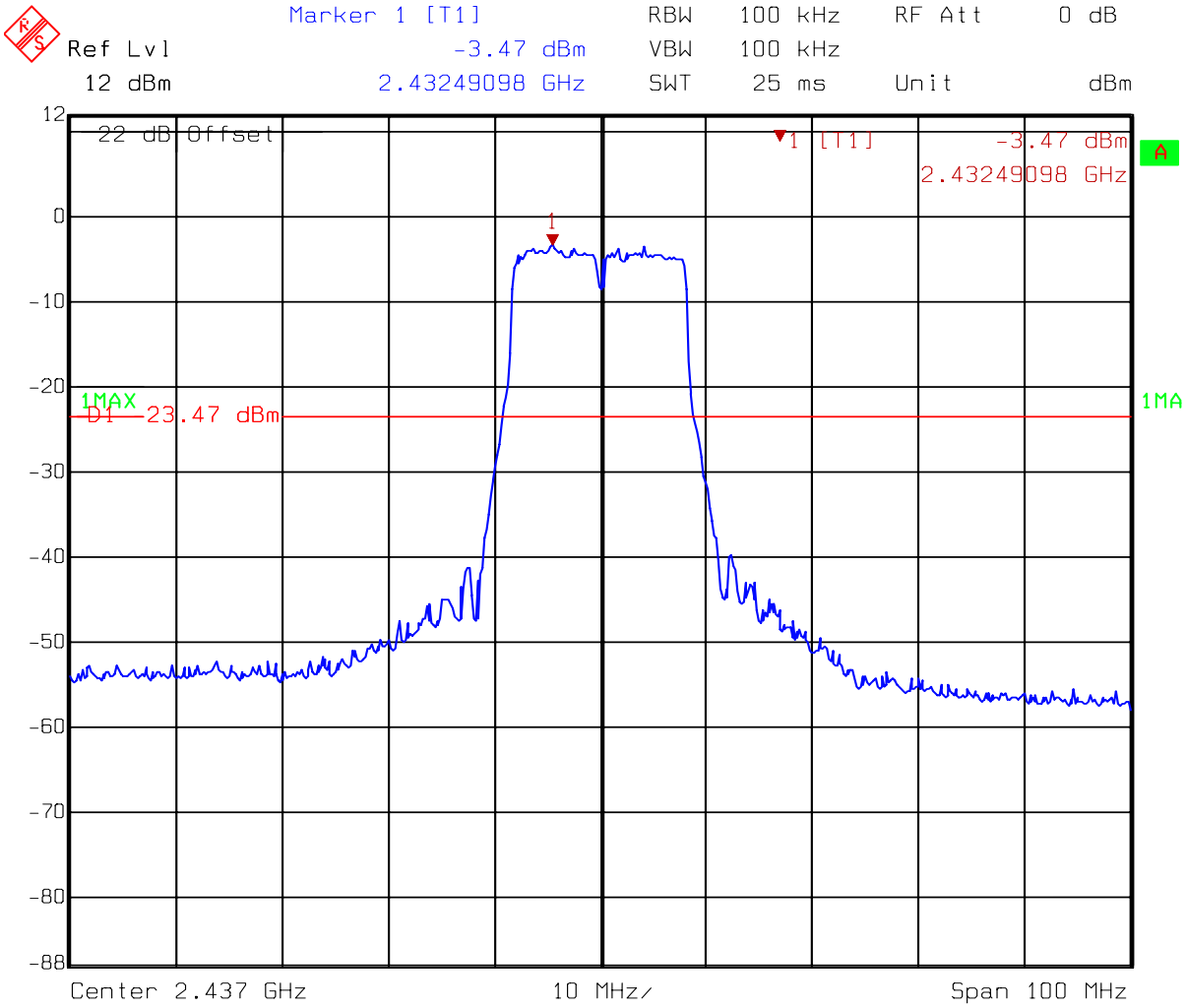

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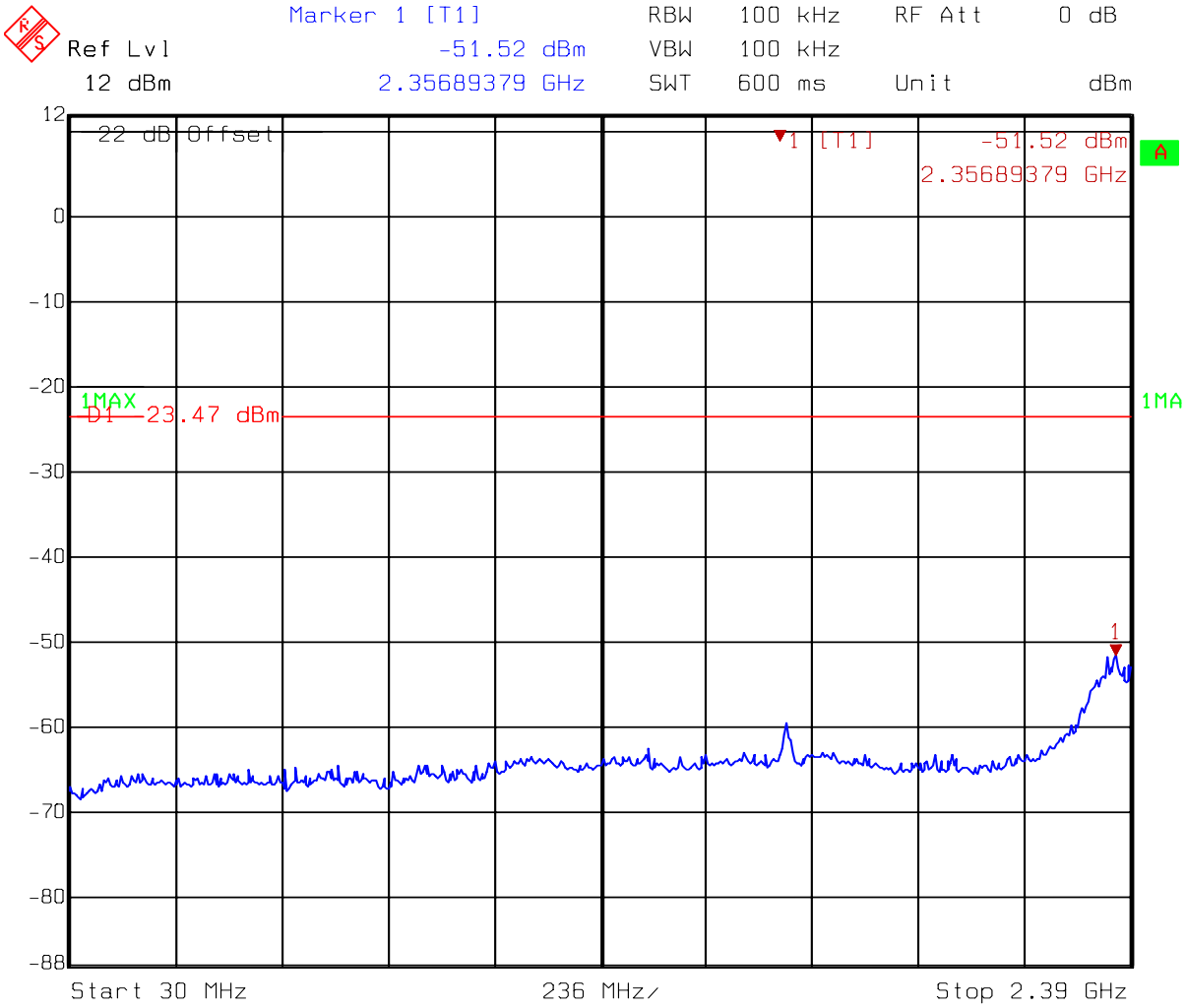

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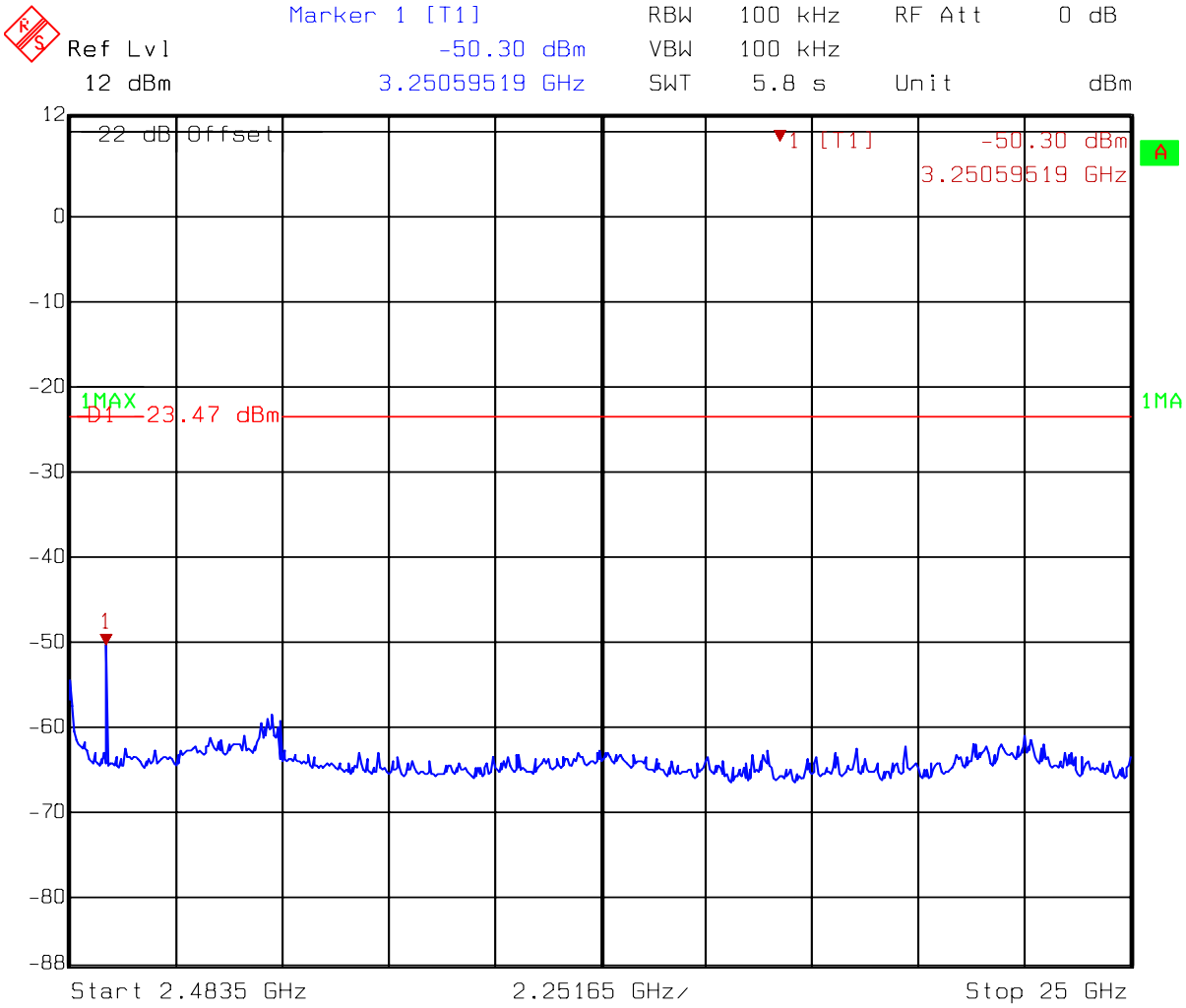
Date: 04.JUL.2006 14:41:21



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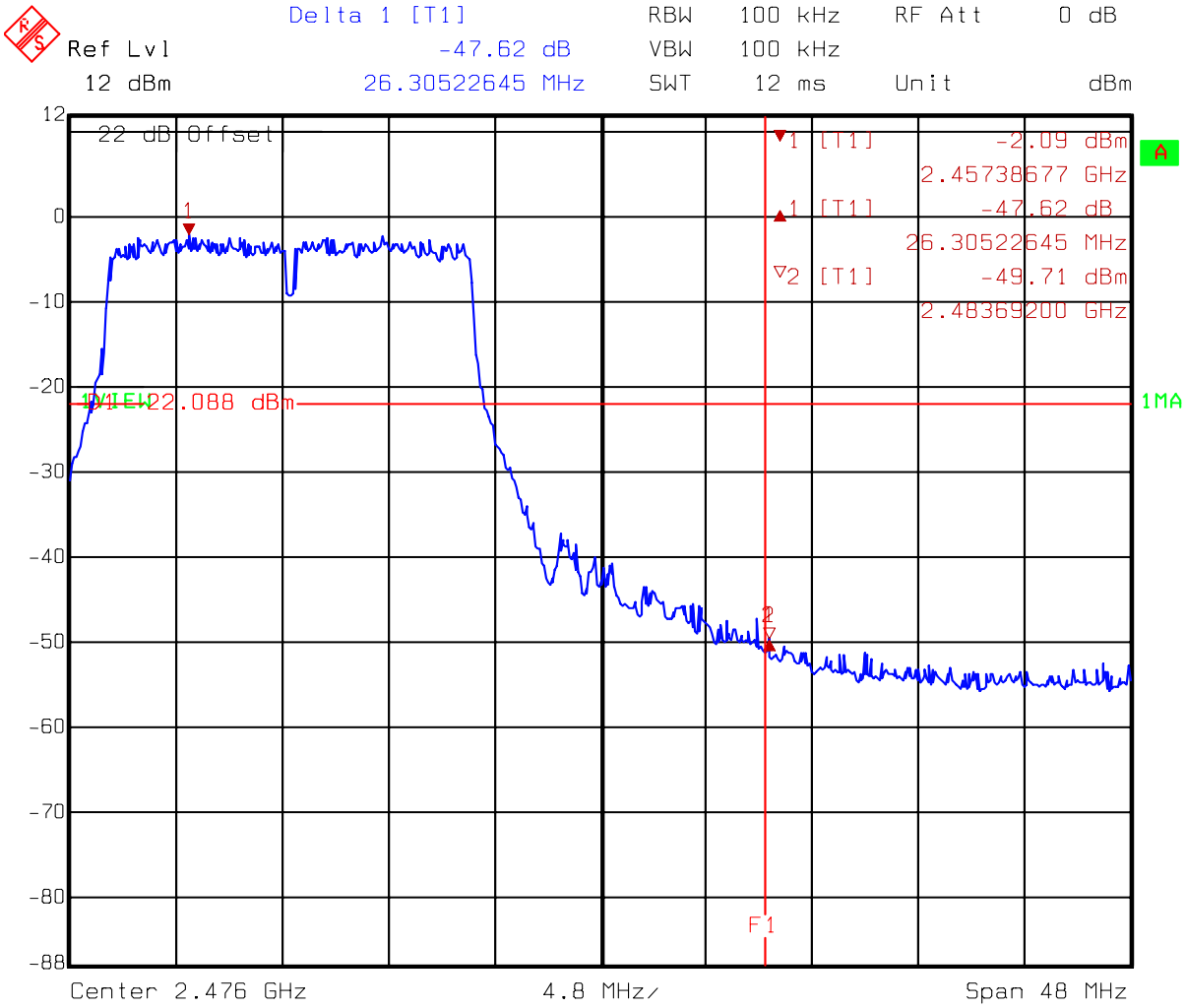
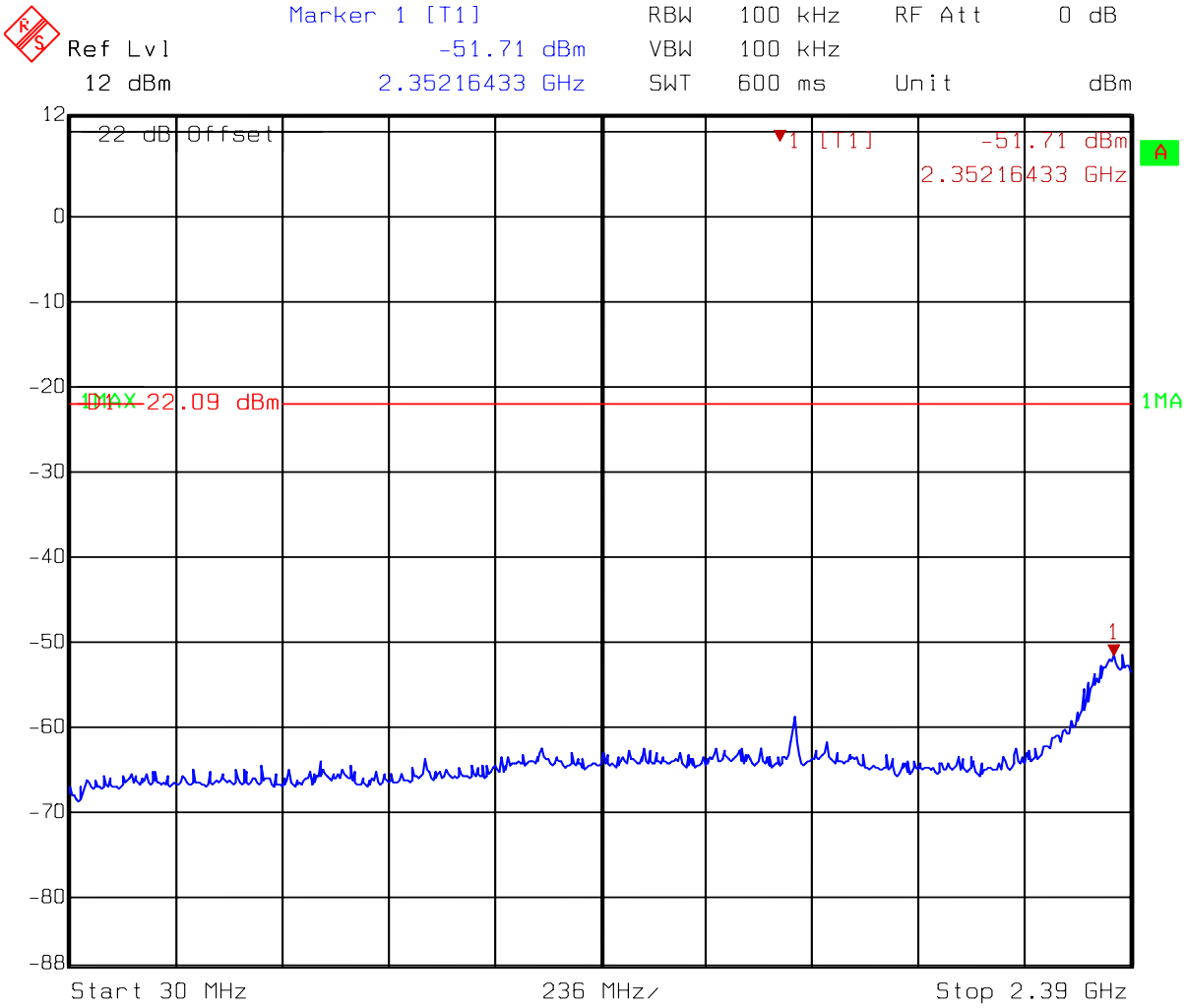
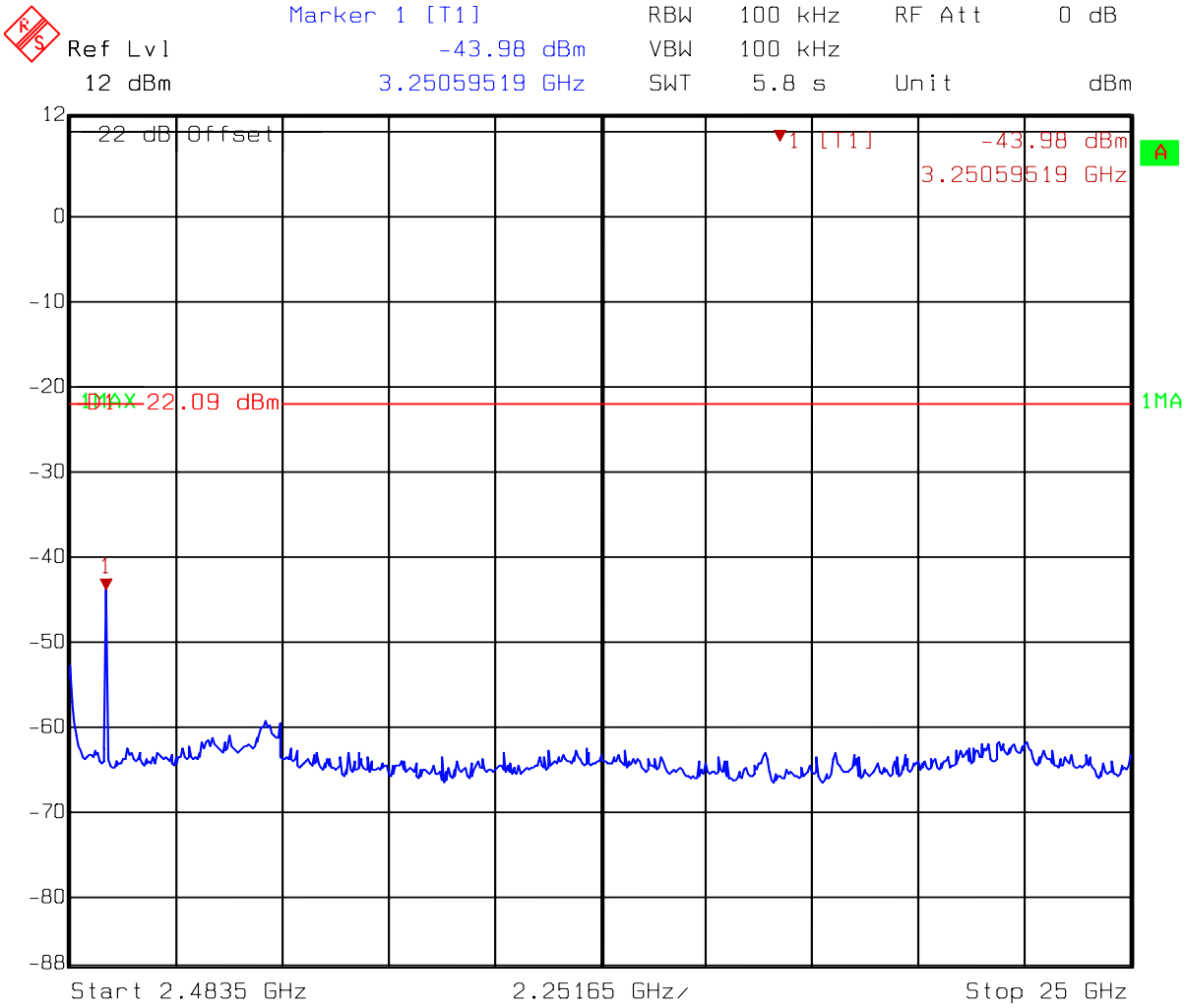


Title: Band Edge
Comment A: Channel 11 at 802.11g mode
F1=2483.5MHz (Peak Detect)
Date: 21.APR.2006 12:07:02



Comment A: conducted spurious at 11g ch11
Date: 04.JUL.2006 14:43:01



Comment A: conducted spurious at 11g ch11
Date: 04.JUL.2006 14:43:49

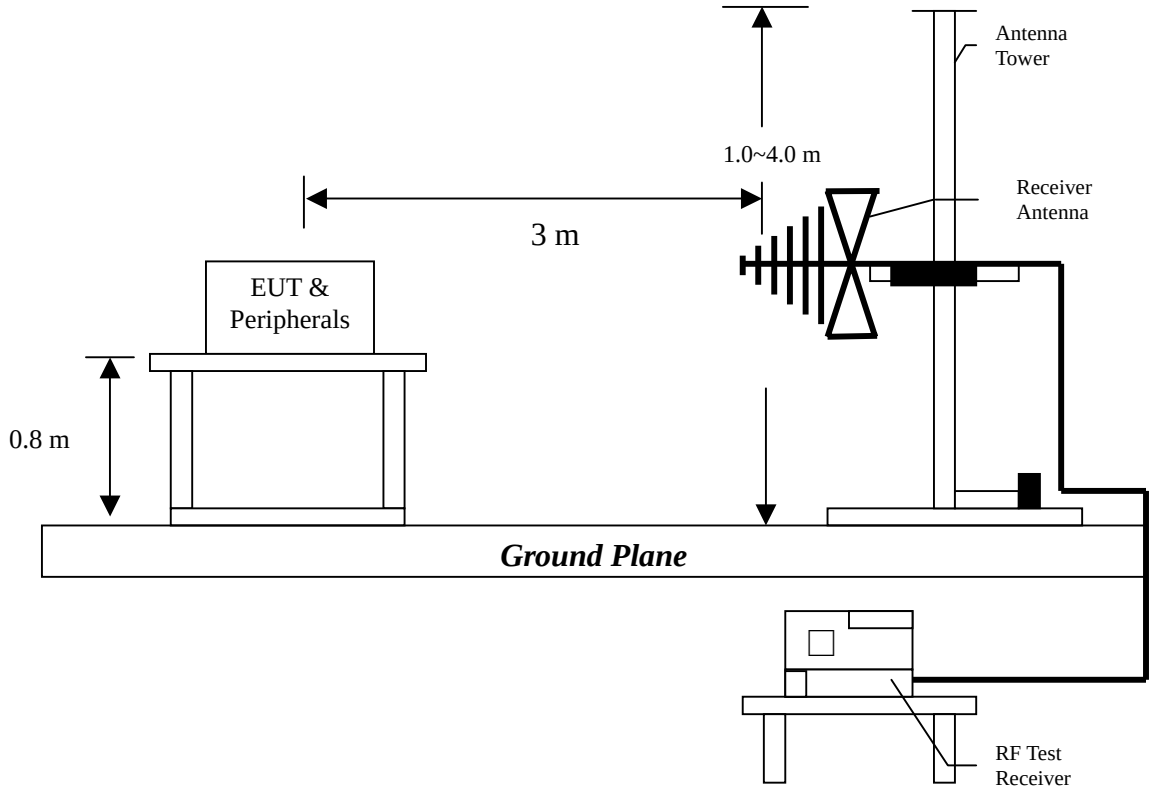
6. Radiated Emission test (FCC 15.247)

6.1 Operating environment

Temperature:	23	℃
Relative Humidity:	58	%
Atmospheric Pressure:	1023	hPa

6.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emissions were invested cover the frequency range from 30MHz to 1000MHz using a receiver RBW of 120kHz record QP reading, and the frequency over 1GHz using a spectrum analyzer RBW of 1MHz and 10Hz VBW record Average reading. (15.209 paragraph), the Peak reading (1MHz RBW/VBW) recorded also on the report.
The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent 3 meter reading using inverse scaling with distance.

The EUT test configuration, please refer to the “Spurious set-up photo.pdf”.

6.3 Emission limits

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency (MHz)	Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of radiated emission measurement is 4.98 dB.

6.4 Radiated spurious emission test data

The maximum radiated spurious emissions is at

Frequency(MHz)	Margin
526.640	-4.49

That is less than uncertainty. This is within the stated measurement uncertainty, this may affect compliance determined in other test arrangements.

6.4.1 Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under 802.11a, 802.11b and 802.11g continuously transmitting mode. Channel 1, 6, 11 were verified. The worst case occurred at 802.11g Tx channel 6.

EUT : WN6501CEP
Worst Case : 802.11g Tx at channel 6

Antenna Polariz. (V/H)	Freq. (MHz)	Receiver Detector	Corr. Factor (dB/m)	Reading (dBuV)	Corrected Level (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
V	84.320	QP	8.50	26.17	34.67	40.00	-5.34
V	237.580	QP	12.18	21.32	33.50	46.00	-12.50
V	518.880	QP	18.56	21.69	40.25	46.00	-5.76
V	526.640	QP	19.46	22.05	41.51	46.00	-4.49
V	575.140	QP	20.71	17.88	38.59	46.00	-7.41
V	666.320	QP	21.50	19.30	40.80	46.00	-5.20
H	235.640	QP	11.74	29.09	40.83	46.00	-5.17
H	332.640	QP	14.40	18.54	32.94	46.00	-13.07
H	526.640	QP	19.65	15.62	35.27	46.00	-10.73
H	575.140	QP	20.84	18.93	39.77	46.00	-6.24
H	798.240	QP	23.52	11.35	34.87	46.00	-11.13
H	959.260	QP	25.54	14.81	40.35	46.00	-5.65

Remark:
1. Corr. Factor = Antenna Factor + Cable Loss
2. Corrected Level = Reading + Corr. Factor

6.4.2 Measurement results: frequency above 1GHz

EUT : WN6501CEP
Test Condition : 802.11b and 802.11g Tx at channel 1, 6, 11

Test Result:
No spurious emission was found above the spectrum analyzer's noise floor.

The noise floor are listed as below:

For PK:
1GHz to 3 GHz: 20dBuV
3GHz to14 GHz: 27dBuV
14GHz to 26.5 GHz: 39dBuV

For AV:
1 GHz to3GHz: 10dBuV
3 GHz to GHz: 16dBuV
14 GHz to 26.5GHz: 28dBuV

7. Power Spectrum Density test (FCC 15.247)

7.1 Operating environment

Temperature:	23	℃
Relative Humidity:	50	%
Atmospheric Pressure	1023	hPa

7.2 Test setup & procedure

The power spectrum density per FCC §15.247(e) was measured from the antenna port of the EUT using a 50ohm spectrum analyzer with the resolution bandwidth set at 3kHz, the video bandwidth set at 10kHz, a span of 300kHz, and the sweep time set at 100 seconds. Power Density was read directly correction was added to the reading to obtain power at the EUT antenna terminals. The test was performed at 3 channels (lowest, middle and highest channel). The Power Spectral Density measured result is in the following table.

7.3 Measured data of Power Spectrum Density test results

Test Mode: 802.11b(DSSS Modulation) operating mode

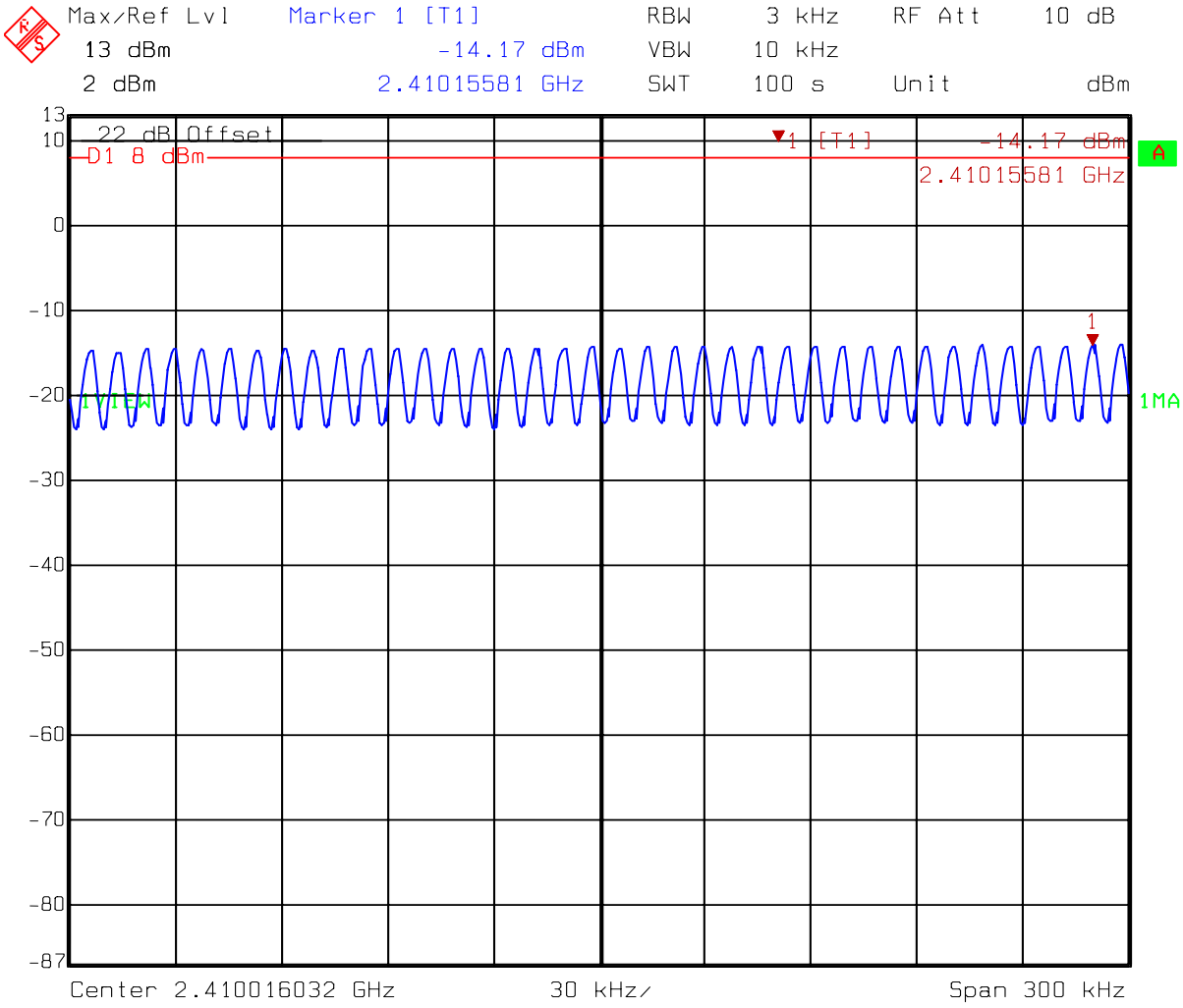
Channel	Frequency (MHz)	Power spectrum density (dBm)	Limit (dBm)
1 (lowest)	2412	-14.17	8
6 (middle)	2437	-14.96	8
11 (highest)	2462	-14.66	8

Test Mode: 802.11g(OFDM Modulation) operating mode

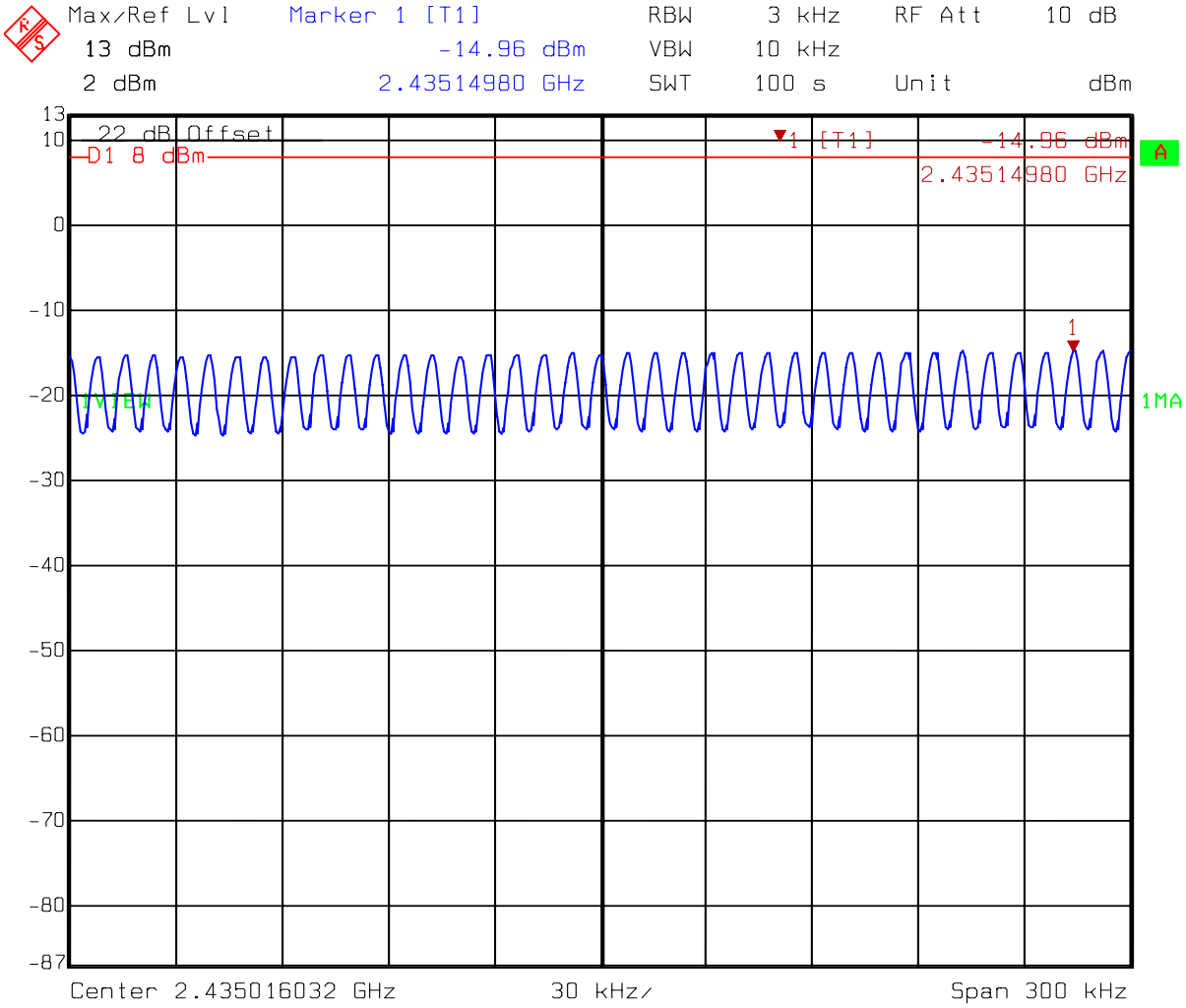
Channel	Frequency (MHz)	Power spectrum density (dBm)	Limit (dBm)
1 (lowest)	2412	-17.09	8
6 (middle)	2437	-17.95	8
11 (highest)	2462	-16.35	8

Please see the plot below.

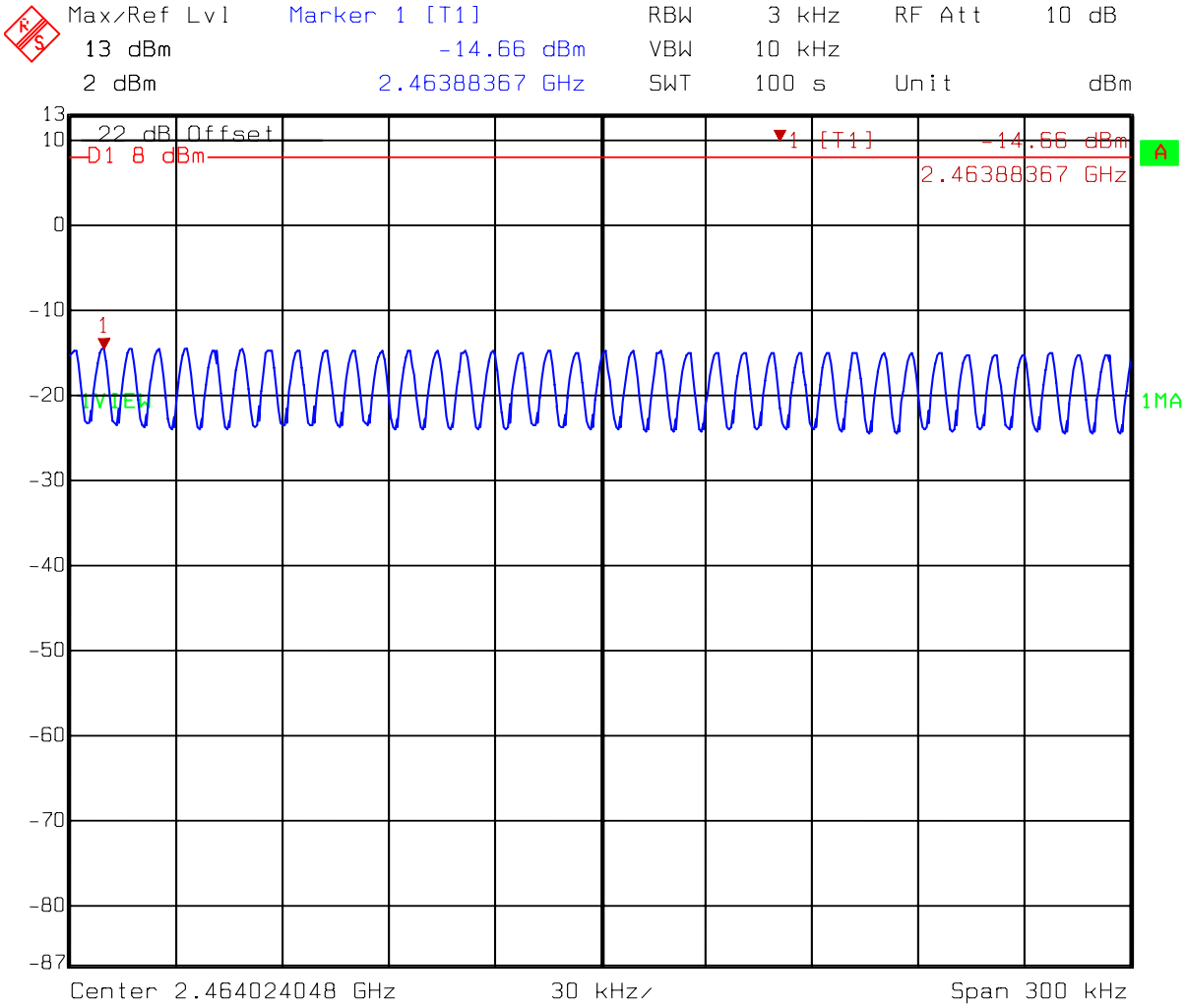
Test Mode: 802.11b(DSSS Modulation) operating mode



Title: Power Spectrum Density
Comment A: Channel 01 at 802.11b mode
Date: 21.APR.2006 11:20:19

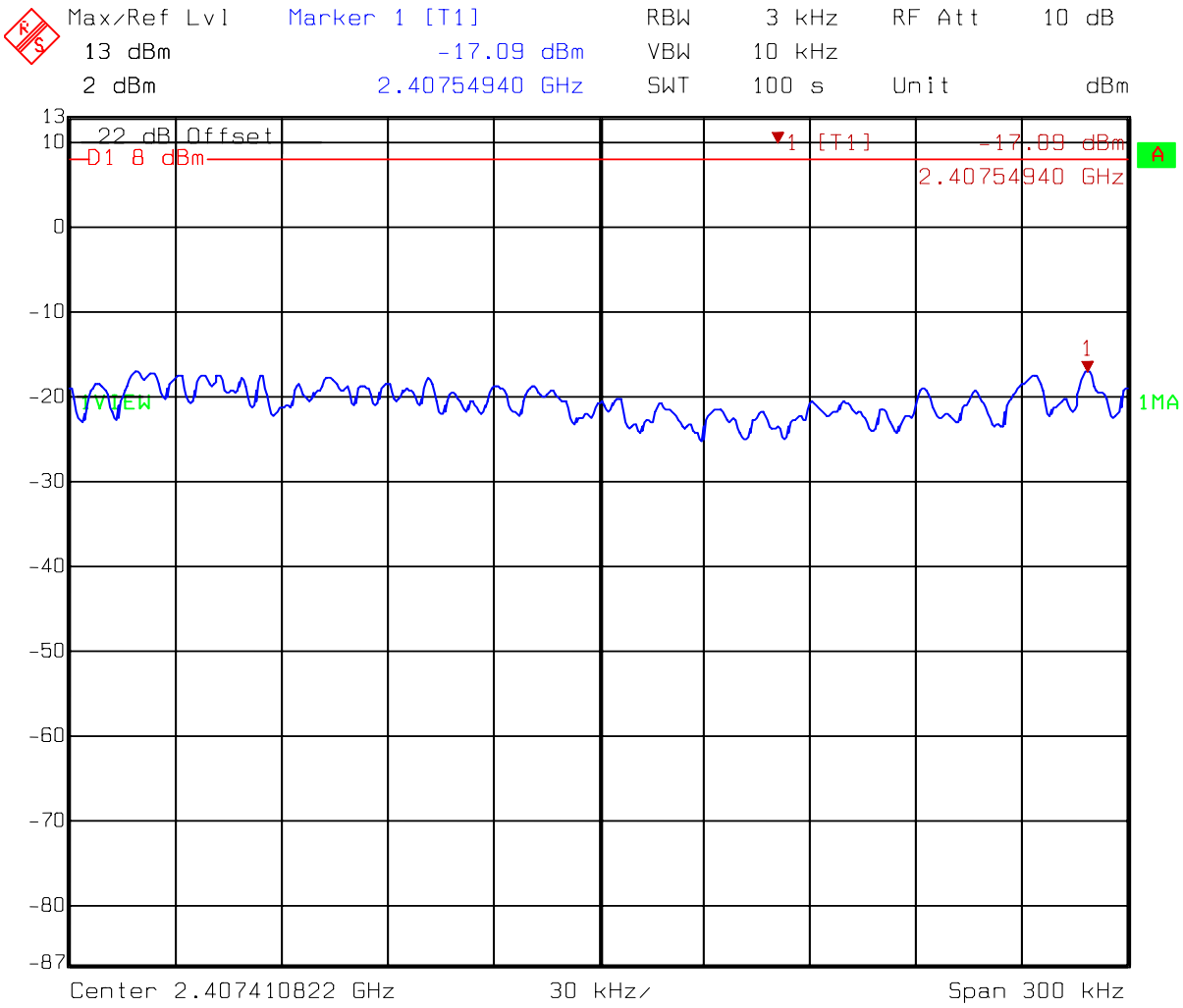


Title: Power Spectrum Density
Comment A: Channel 06 at 802.11b mode
Date: 21.APR.2006 11:38:56

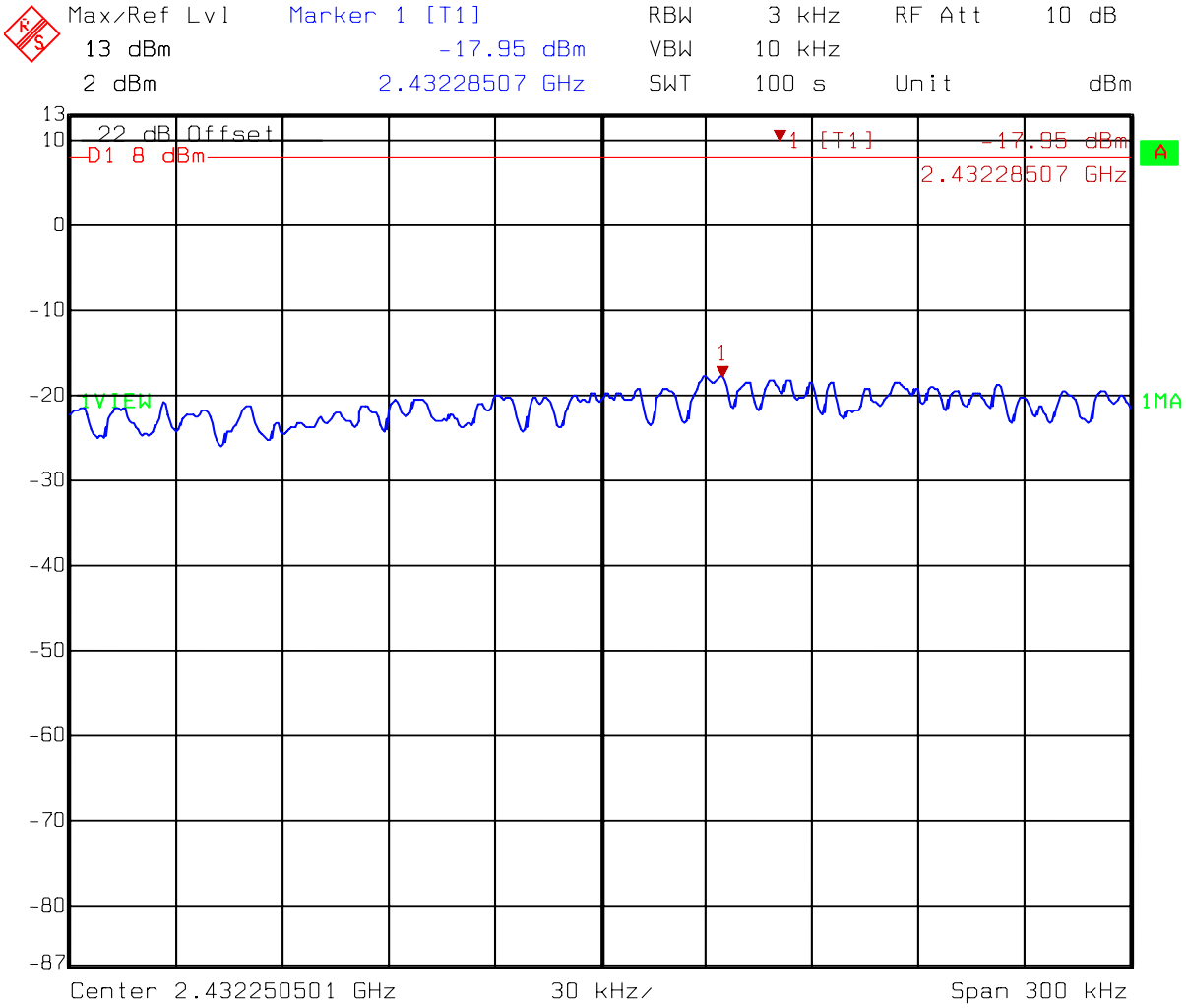


Title: Power Spectrum Density
Comment A: Channel 11 at 802.11b mode
Date: 21.APR.2006 11:43:04

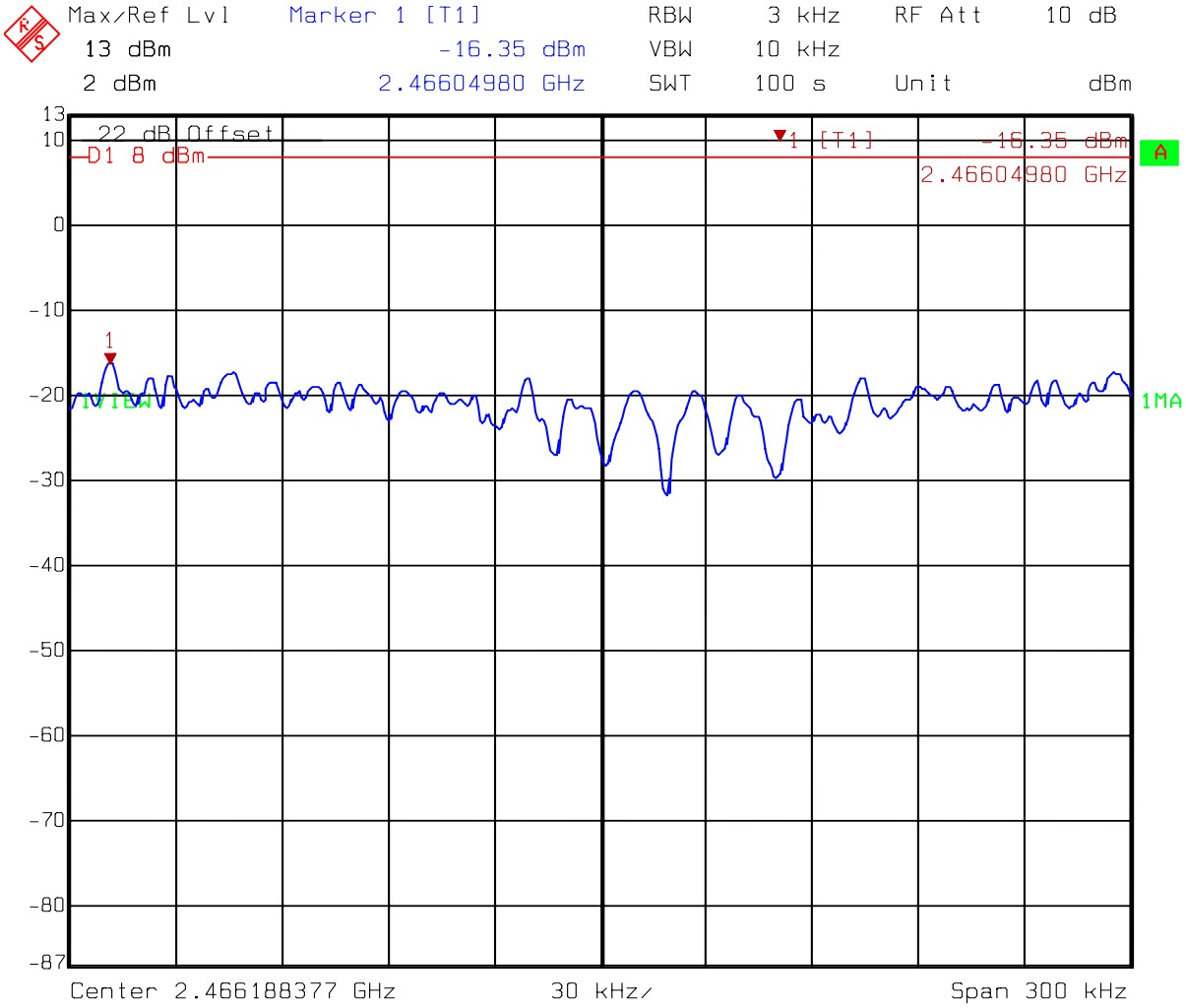
Test Mode: 802.11g(OFDM Modulation) operating mode



Title: Power Spectrum Density
Comment A: Channel 01 at 802.11g mode
Date: 21.APR.2006 11:52:06



Title: Power Spectrum Density
Comment A: Channel 06 at 802.11g mode
Date: 21.APR.2006 12:02:19



Title: Power Spectrum Density
Comment A: Channel 11 at 802.11g mode
Date: 21.APR.2006 12:06:33

8. Emission on the band edge (FCC 15.247)

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 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 a radiated measurement.

8.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure	1023	hPa

8.2 Test setup & procedure

The output of EUT was connected to spectrum analyzer via a 50ohm cable.

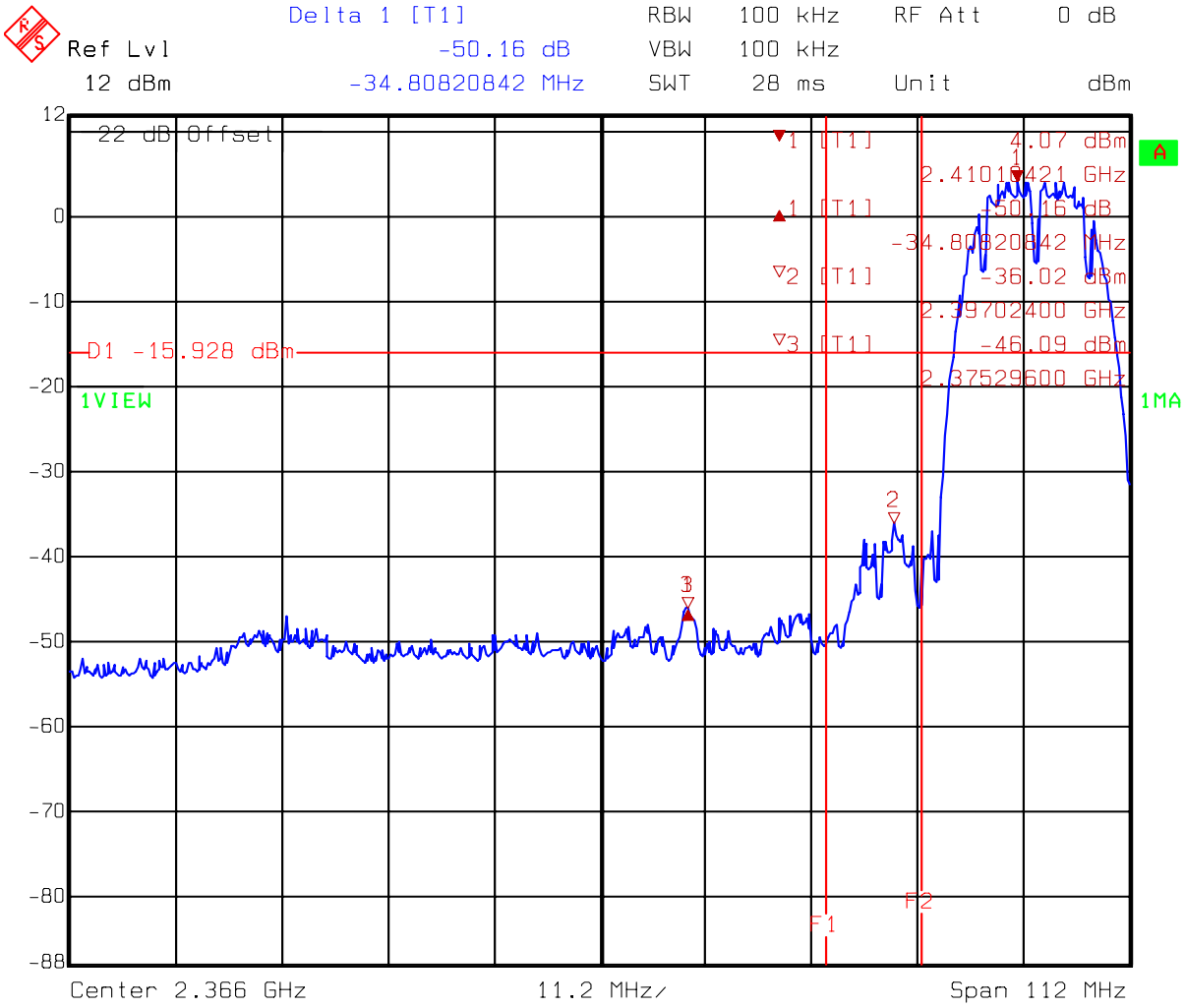
The setting of spectrum analyzer is:

Peak:	RBW = 100kHz ;	VBW = 100kHz
Average:	RBW = 1MHz ;	VBW = 10Hz

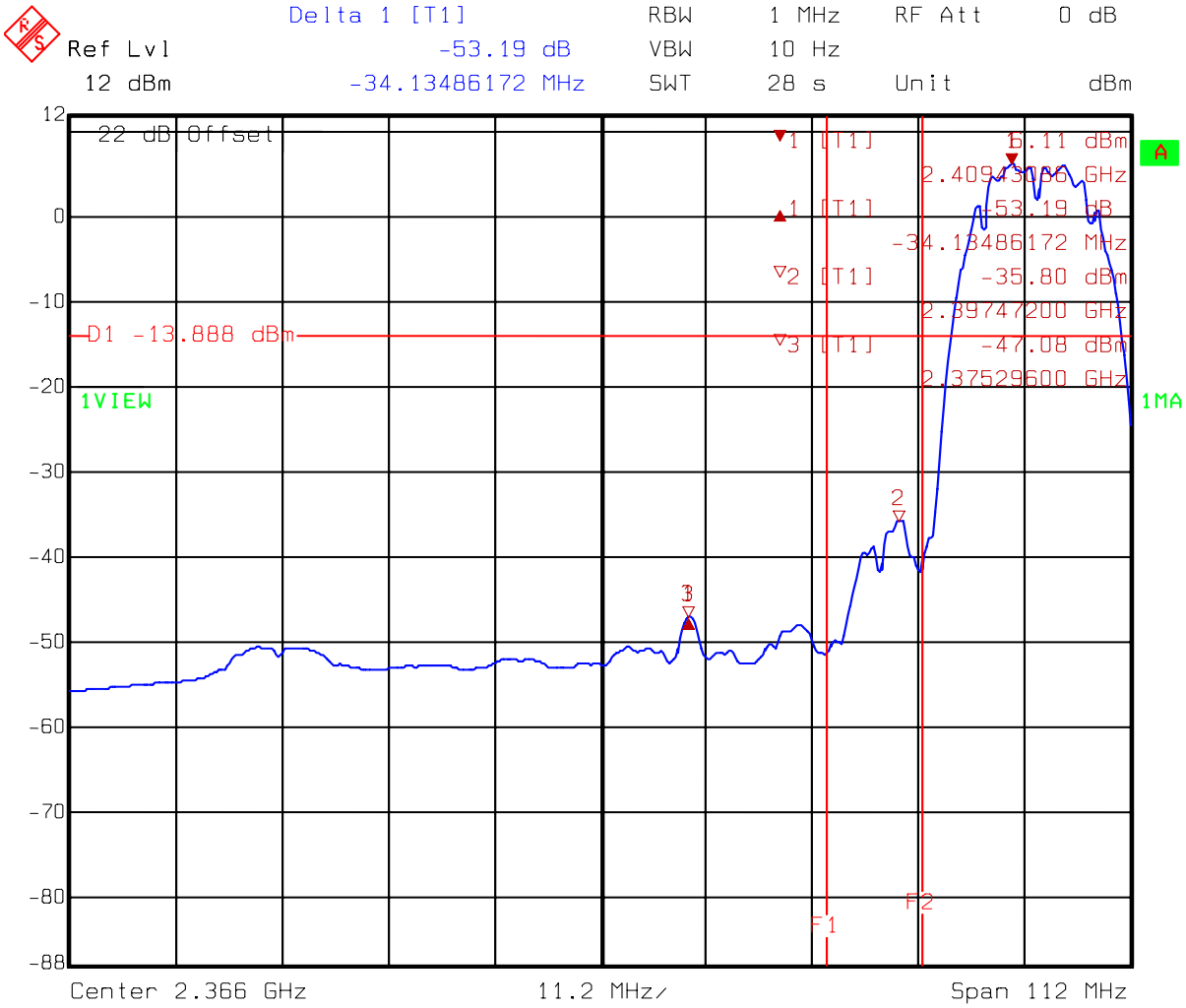
8.3 Test Result

8.3.1 Conducted Method

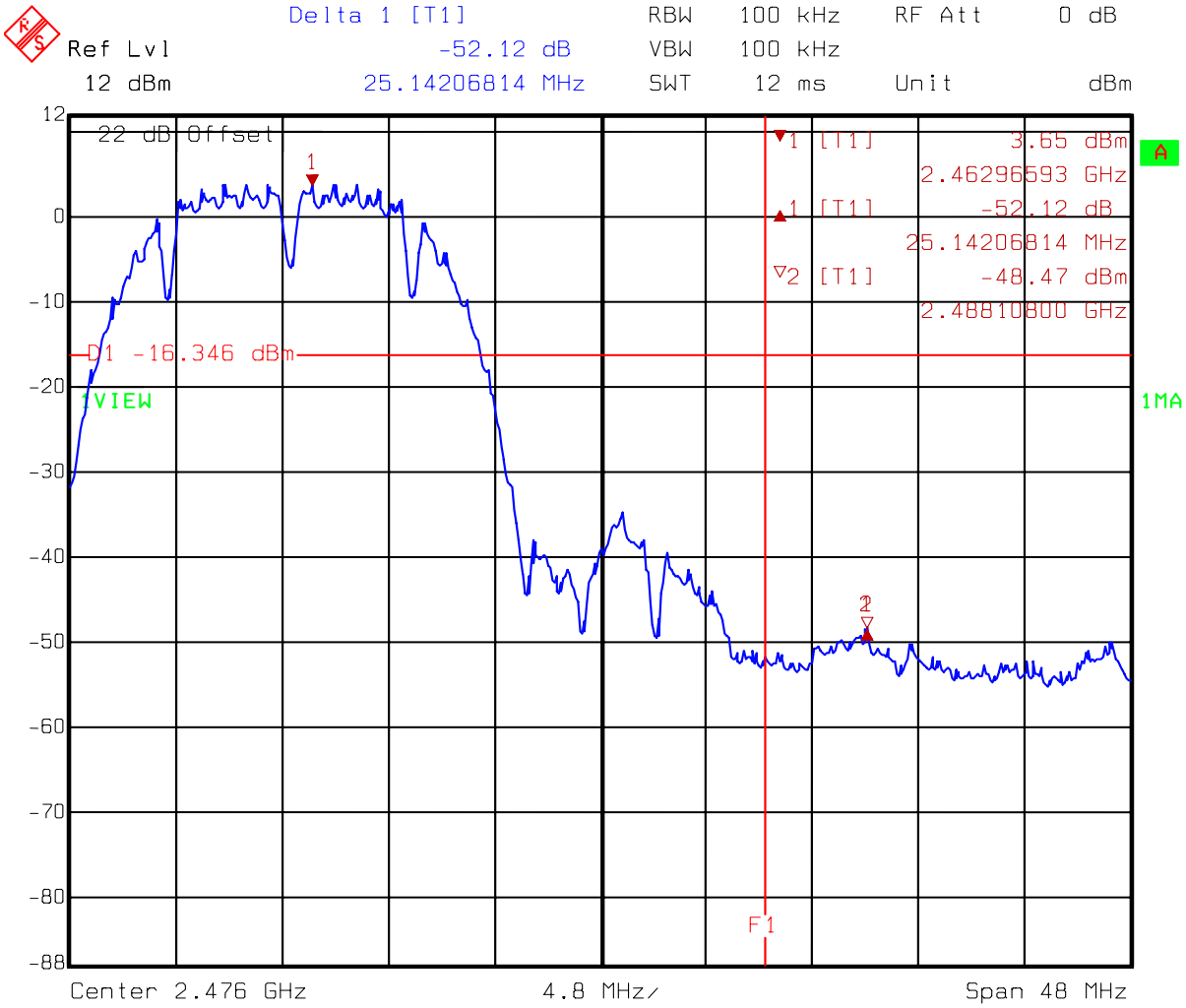
Test Mode: 802.11b(DSSS Modulation) operating mode



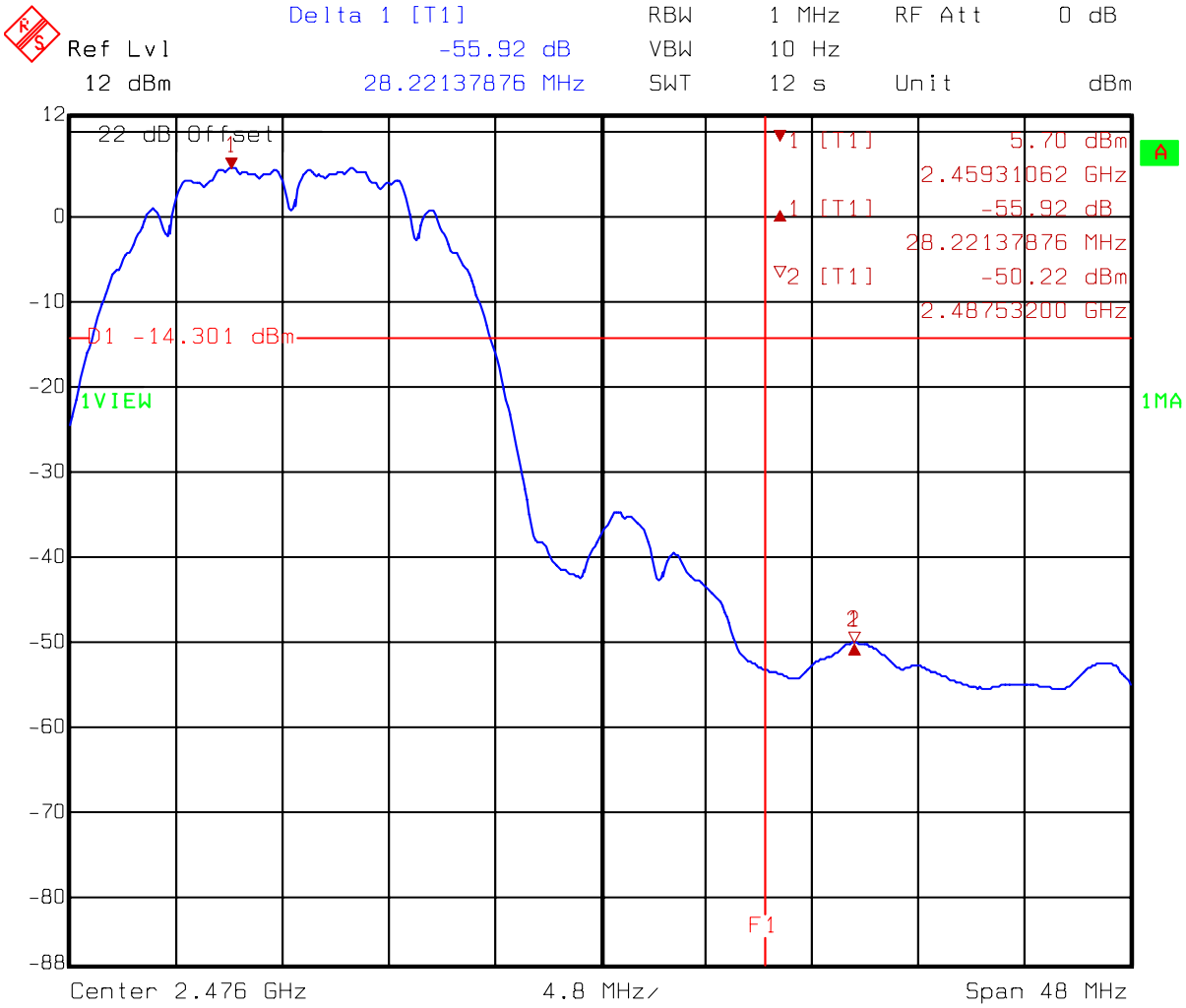
Title: Band Edge
Comment A: Channel 01 at 802.11b mode
F1=2390MHz F2=2400MHz (Peak Detect)
Date: 21.APR.2006 11:21:10



Title: Band Edge
Comment A: Channel 01 at 802.11b mode
F1=2390MHz F2=2400MHz (Average Detect)
Date: 21.APR.2006 11:22:19

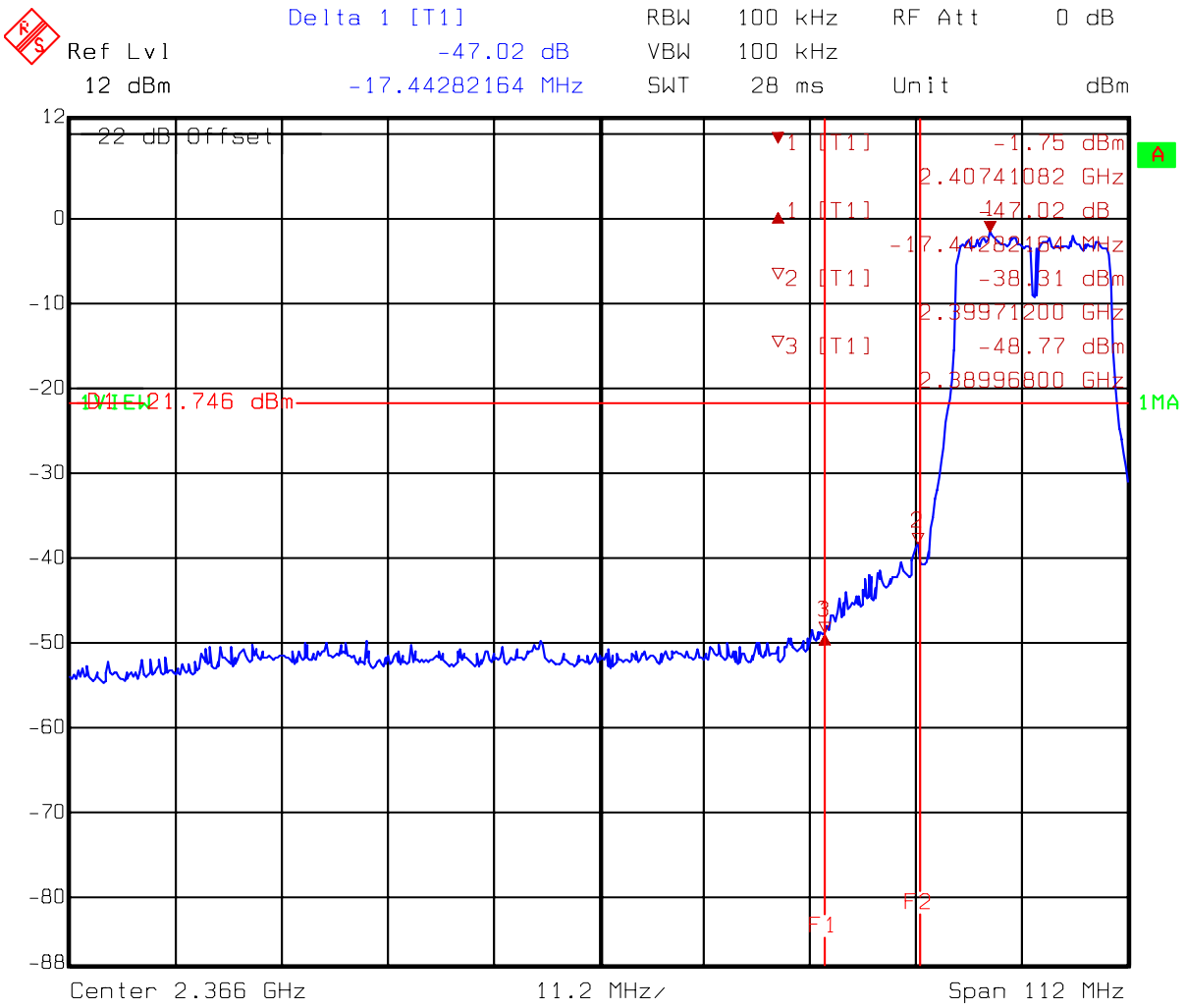


Title: Band Edge
Comment A: Channel 11 at 802.11b mode
F1=2483.5MHz (Peak Detect)
Date: 21.APR.2006 11:43:42

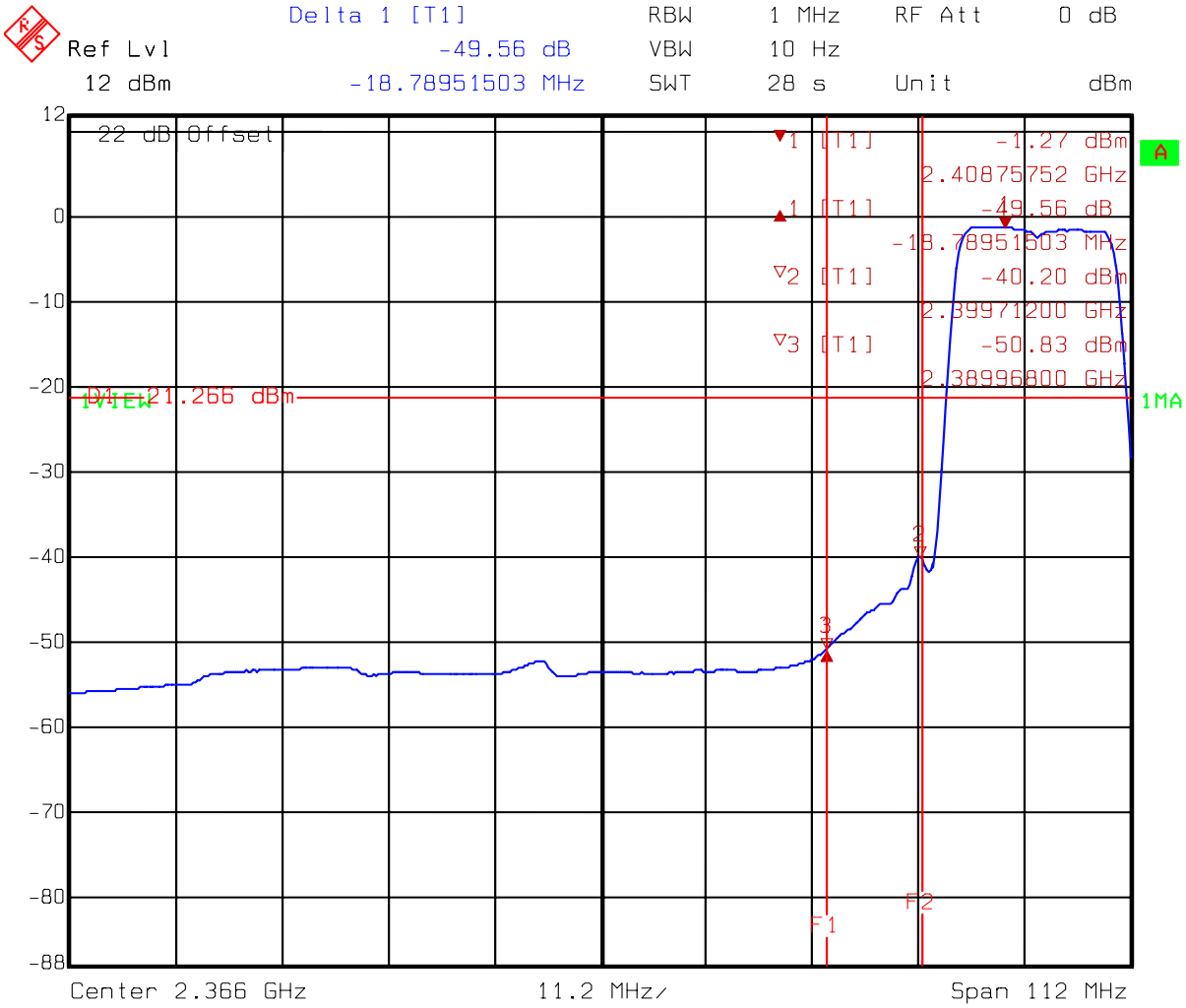


Title: Band Edge
Comment A: Channel 11 at 802.11b mode
F1=2483.5MHz (Average Detect)
Date: 21.APR.2006 11:44:39

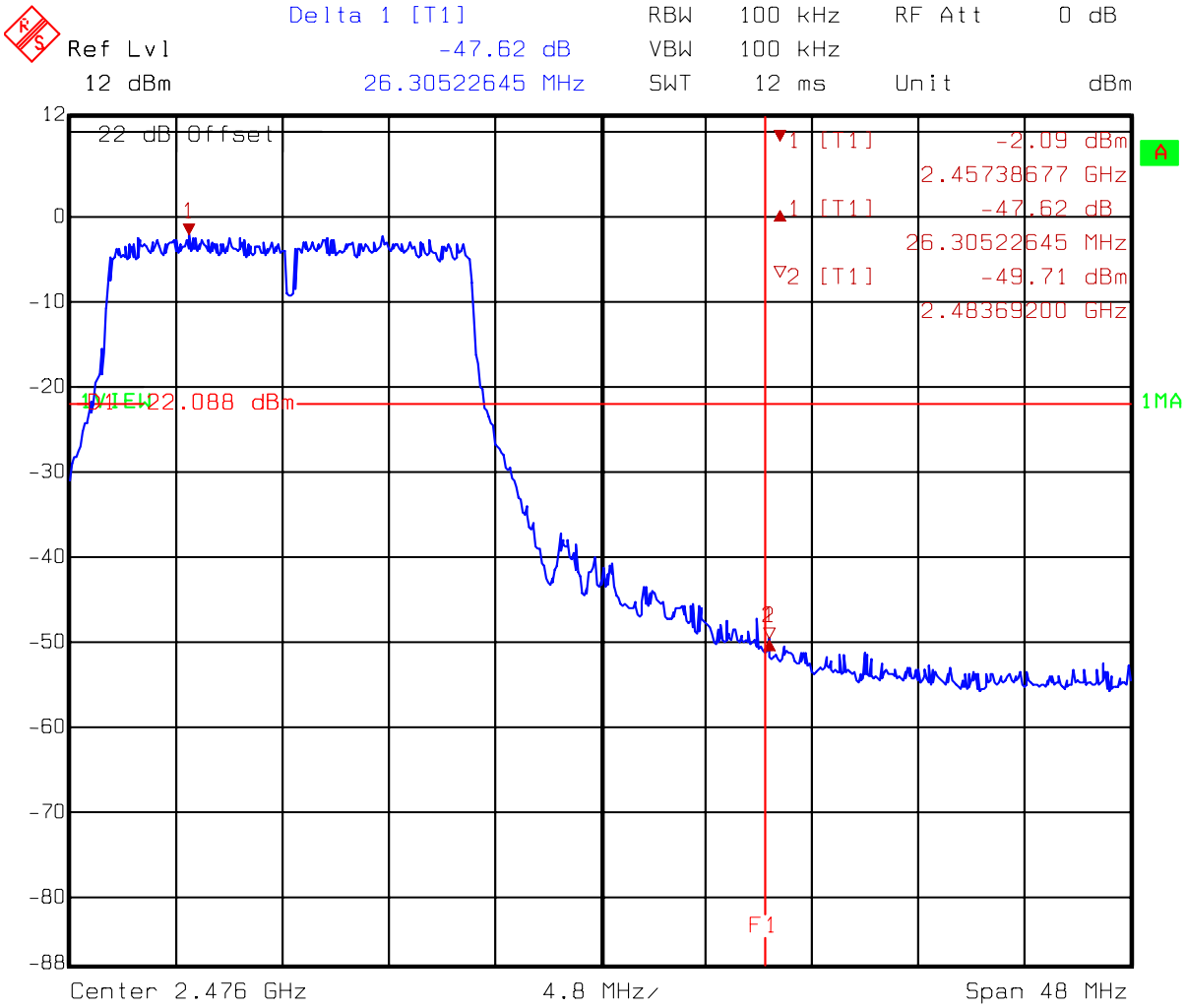
Test Mode: 802.11g(OFDM Modulation) operating mode



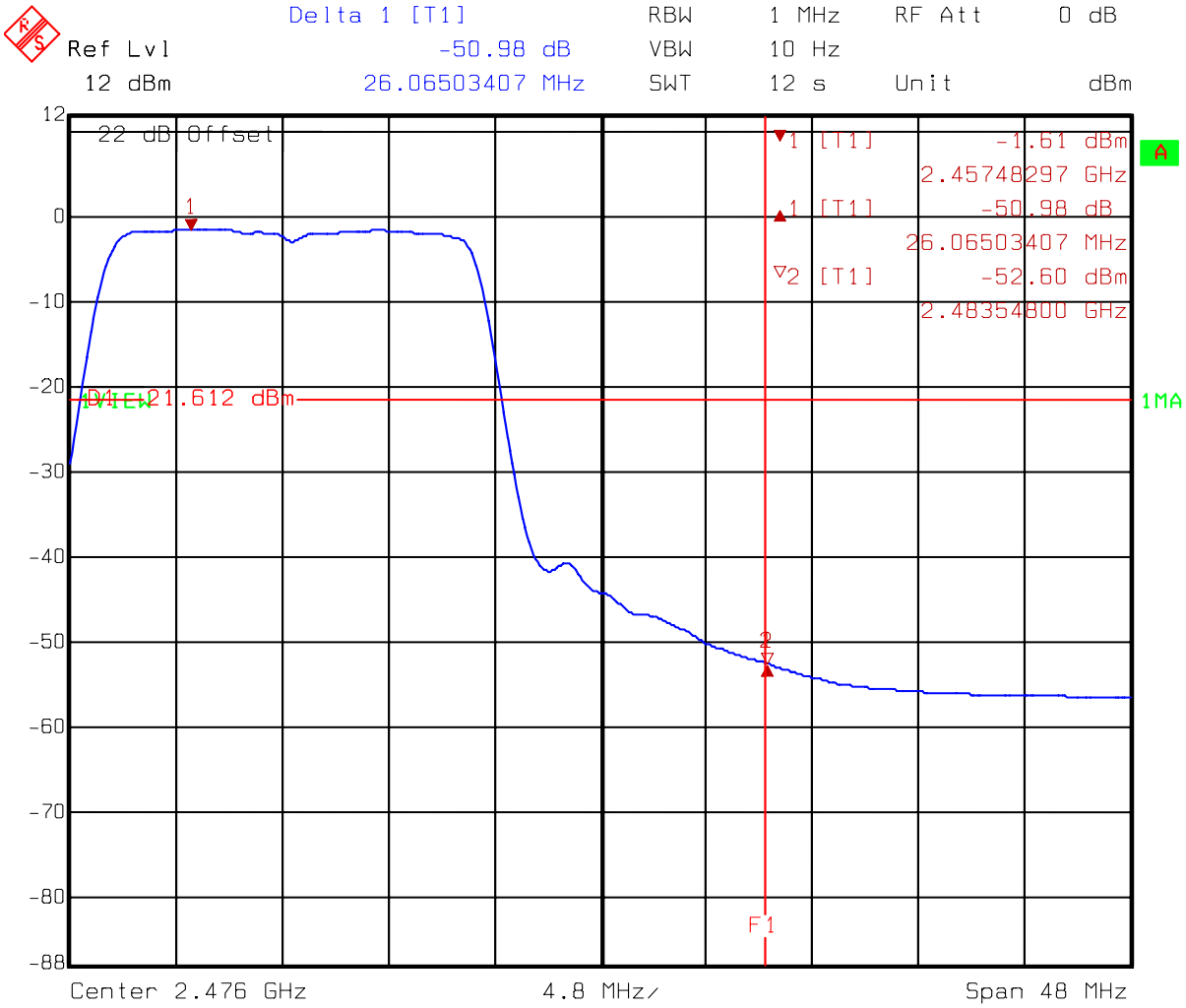
Title: Band Edge
Comment A: Channel 01 at 802.11g mode
F1=2390MHz F2=2400MHz (Peak Detect)
Date: 21.APR.2006 11:52:41



Title: Band Edge
Comment A: Channel 01 at 802.11g mode
F1=2390MHz F2=2400MHz (Average Detect)
Date: 21.APR.2006 11:53:35



Title: Band Edge
Comment A: Channel 11 at 802.11g mode
F1=2483.5MHz (Peak Detect)
Date: 21.APR.2006 12:07:02



Title: Band Edge
Comment A: Channel 11 at 802.11g mode
F1=2483.5MHz (Average Detect)
Date: 21.APR.2006 12:07:50

8.3.2 Radiated Method

Test Mode: 802.11b(DSSS Modulation) operating mode

Channel	Detector	Radiated Method	Conducted Method	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
		Max. Field Strength of Fundamental @3m (dBuV/m)	Between Carrier Max. Power and Local Max. Emission in Restrict Band (dBc)			
		A	B	C	D	E
1 (lowest)	PK	107.03	50.16	56.87	74	-17.13
	AV	103.4	53.19	50.21	54	-3.79
11 (highest)	PK	107.25	52.12	55.13	74	-18.87
	AV	103.66	55.92	47.74	54	-6.26

Remark: 1. C = A – B
2. E = C – D

Test Mode: 802.11g(OFDM Modulation) operating mode

Channel	Detector	Radiated Method	Conducted Method	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
		Max. Field Strength of Fundamental @3m (dBuV/m)	Between Carrier Max. Power and Local Max. Emission in Restrict Band (dBc)			
		A	B	C	D	E
1 (lowest)	PK	104.71	47.02	57.69	74	-16.31
	AV	95.32	49.56	45.76	54	-8.24
11 (highest)	PK	104.65	47.62	57.03	74	-16.97
	AV	95.47	50.98	44.49	54	-9.51

Remark: 1. C = A – B
2. E = C – D

9. Peak Output Power test (FCC 15.407)

9.1 Operating environment

Temperature:	25	℃
Relative Humidity:	50	%
Atmospheric Pressure:	1023	hPa

9.2 Test setup & procedure

The power output per FCC §15.407(a) was measured on the EUT using a 50 ohm SMA cable connected to power meter via power sensor. Power was read directly and cable loss correction (7.0dB) was added to the reading to obtain power at the EUT antenna terminals.

9.3 Limit

Operating Frequency (MHz)	Output power limit
5150~5250	< 50mW (17dBm) or 4dBm+10 log B
5250~5350, 5470~5725	< 250mW (24dBm) or 11dBm+10 log B
5725~5825	< 1W (30dBm) or 17dBm+10 log B

Remark: where B is the –26 dB emission bandwidth in MHz.

9.4 Measured data of Maximum Output Power test results

For Frequency band (5180MHz ~ 5240MHz)

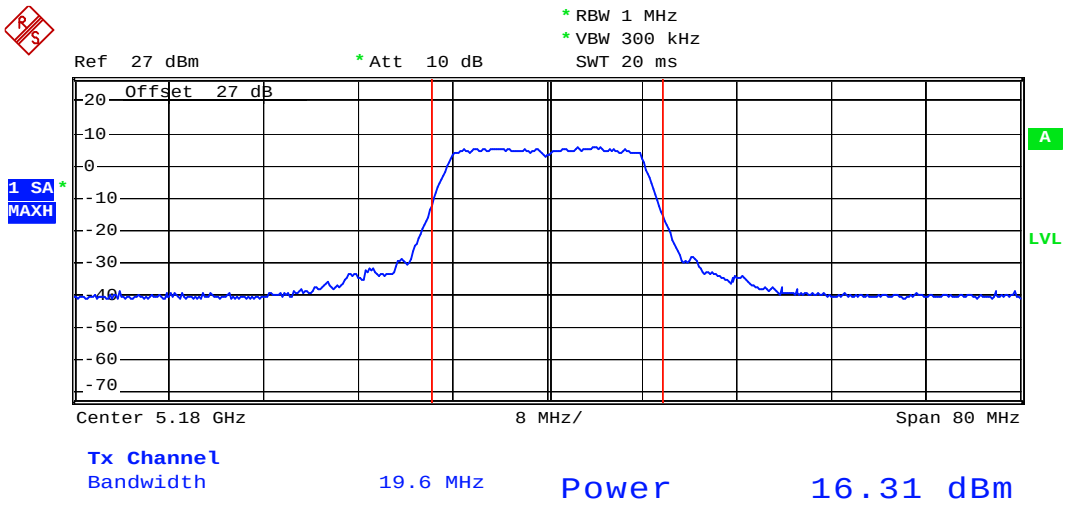
Channel	Frequency (MHz)	Max. Output power (dBm)	Limit (dBm)
36	5180	16.31	17
40	5200	15.68	17
48	5240	15.28	17

For Frequency band (5260MHz ~ 5320MHz)

Channel	Frequency (MHz)	Max. Output power (dBm)	Limit (dBm)
52	5260	15.21	24
60	5300	15.01	24
64	5320	14.67	24

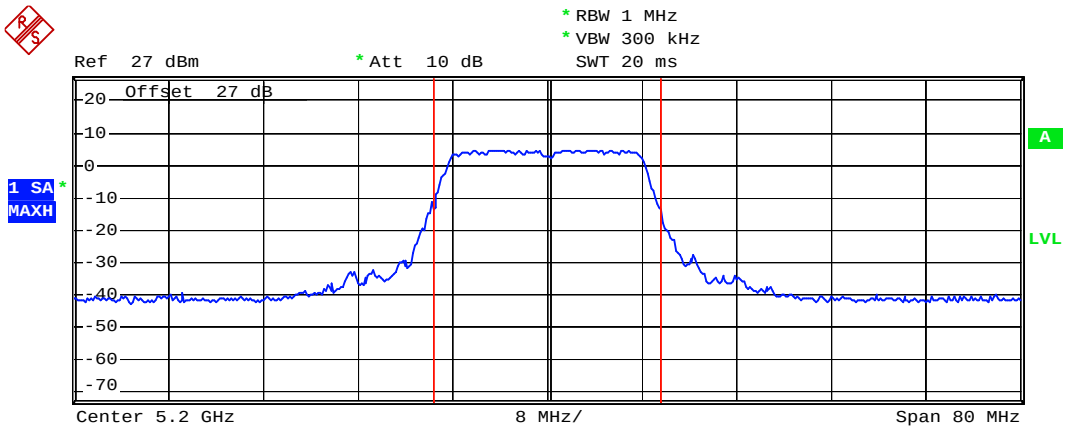
Please see the plot below.

For Frequency band (5150MHz ~ 5250MHz)



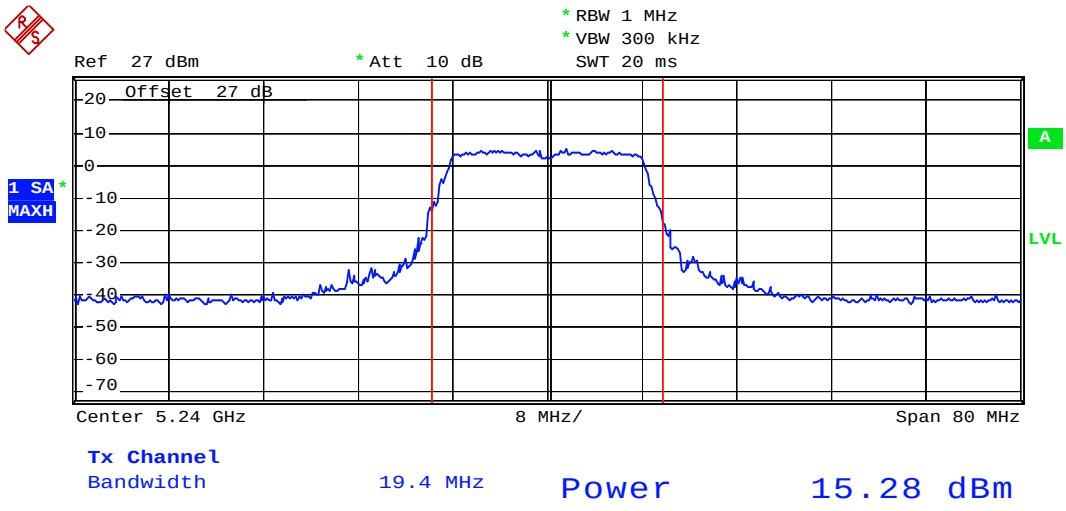
CPO at 5180

Date: 22.MAY.2006 16:54:09



CPO at 5200

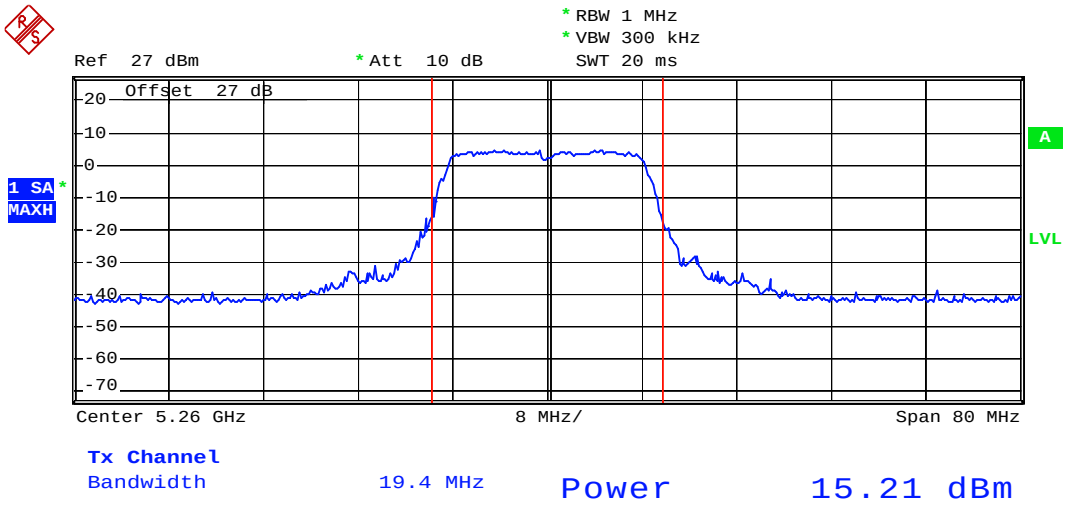
Date: 22.MAY.2006 16:55:55



CPO at 5240

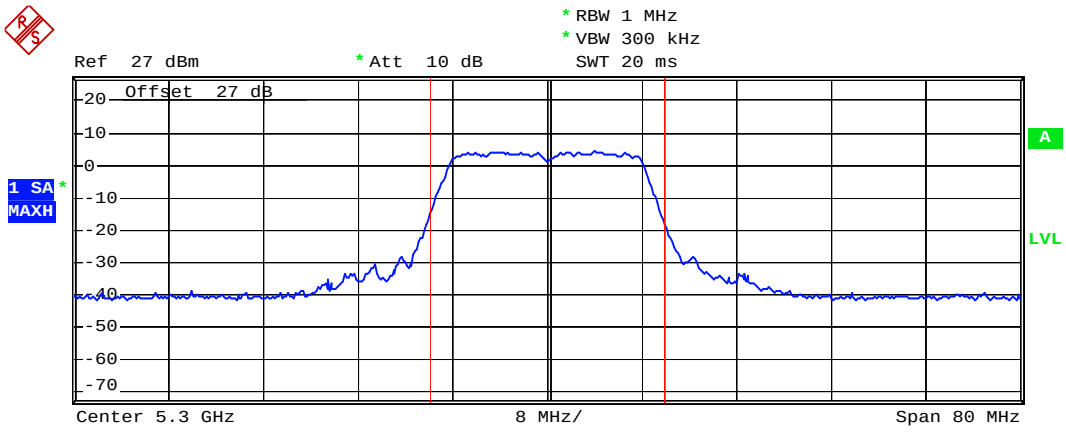
Date: 22.MAY.2006 16:57:12

For Frequency band (5250MHz ~ 5350MHz)



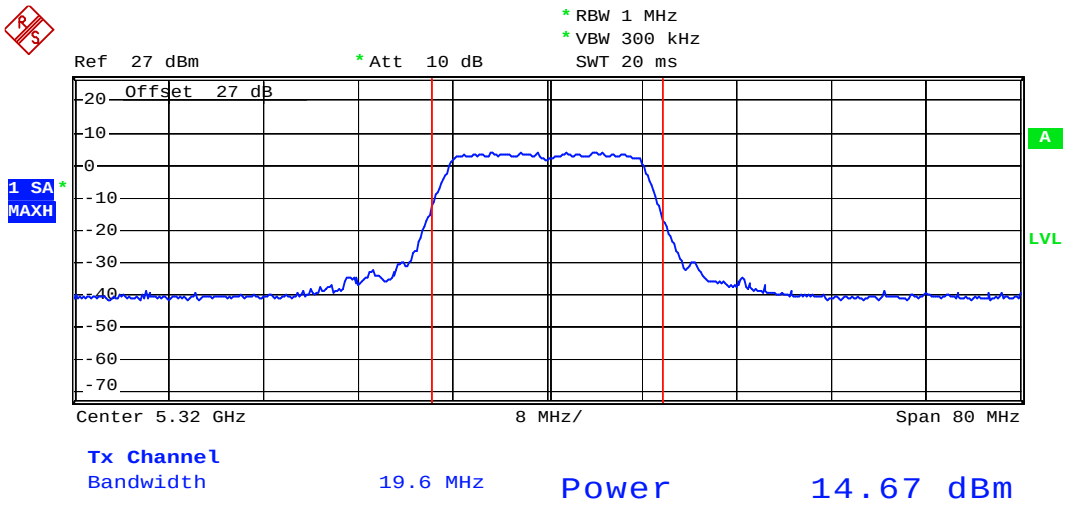
CPO at 5260

Date: 22.MAY.2006 16:58:59



CPO at 5300

Date: 22.MAY.2006 17:02:04



CPO at 5320

Date: 22.MAY.2006 17:05:41

10. Power Spectrum Density test (FCC 15.407)

10.1 Operating environment

Temperature: 25 ℃
Relative Humidity: 50 %
Atmospheric Pressure: 1023 hPa

10.2 Test setup & procedure

The power spectrum density per FCC §15.407(a) was measured from the antenna port of the EUT using a 50ohm spectrum analyzer with the resolution bandwidth set at 1MHz, the video bandwidth set at 3MHz. Power spectrum density was read directly and cable loss (7.0dB)/external attenuator (20dB) correction was added to the reading to obtain power at the EUT antenna terminals.

Limit

Operating Frequency (MHz)	Power density limit
5150~5250	< 4dBm/MHz
5250~5350, 5470~5725	< 11dBm/MHz
5725~5825	< 17dBm/MHz

10.3 Measured data of Power Spectrum Density test results

For Frequency band (5180MHz ~ 5240MHz)

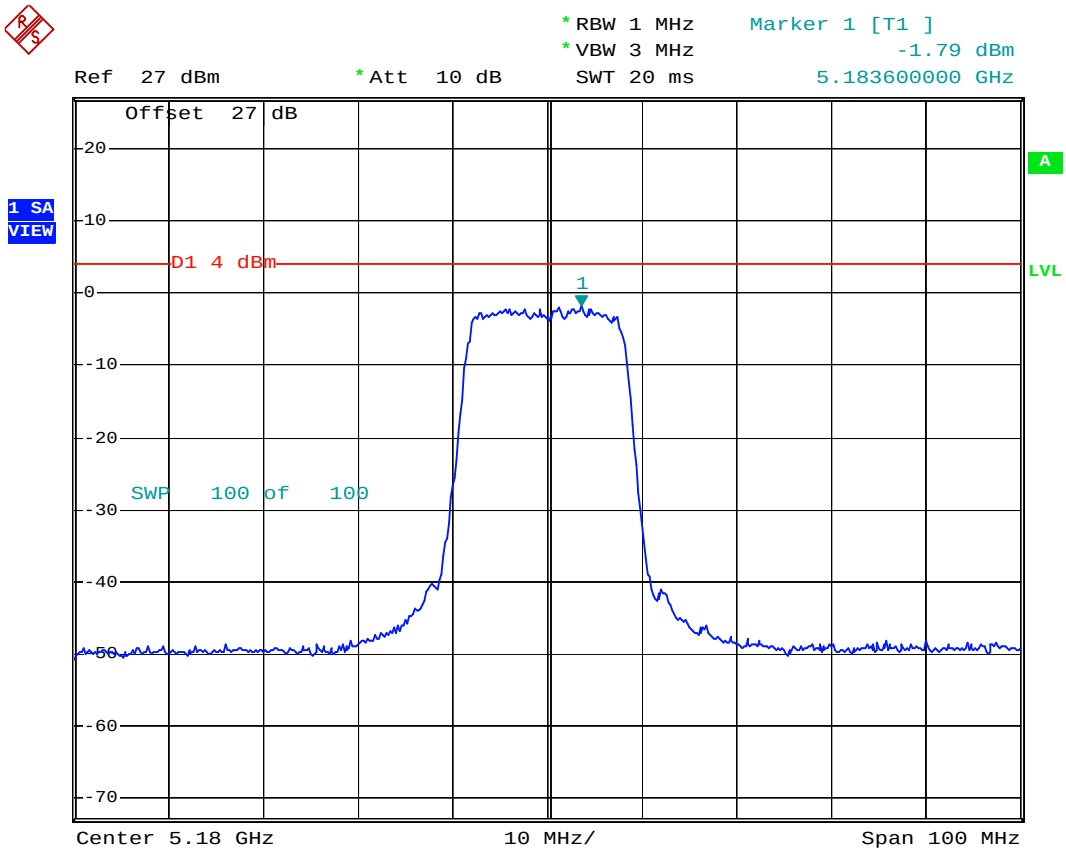
Channel	Frequency (MHz)	Measured level (dBm)	Limit (dBm)
36	5180	-1.79	4
40	5200	-1.47	4
48	5240	-1.82	4

For Frequency band (5260MHz ~ 5320MHz)

Channel	Frequency (MHz)	Measured level (dBm)	Limit (dBm)
52	5260	-1.53	11
60	5300	-2.18	11
64	5320	-2.73	11

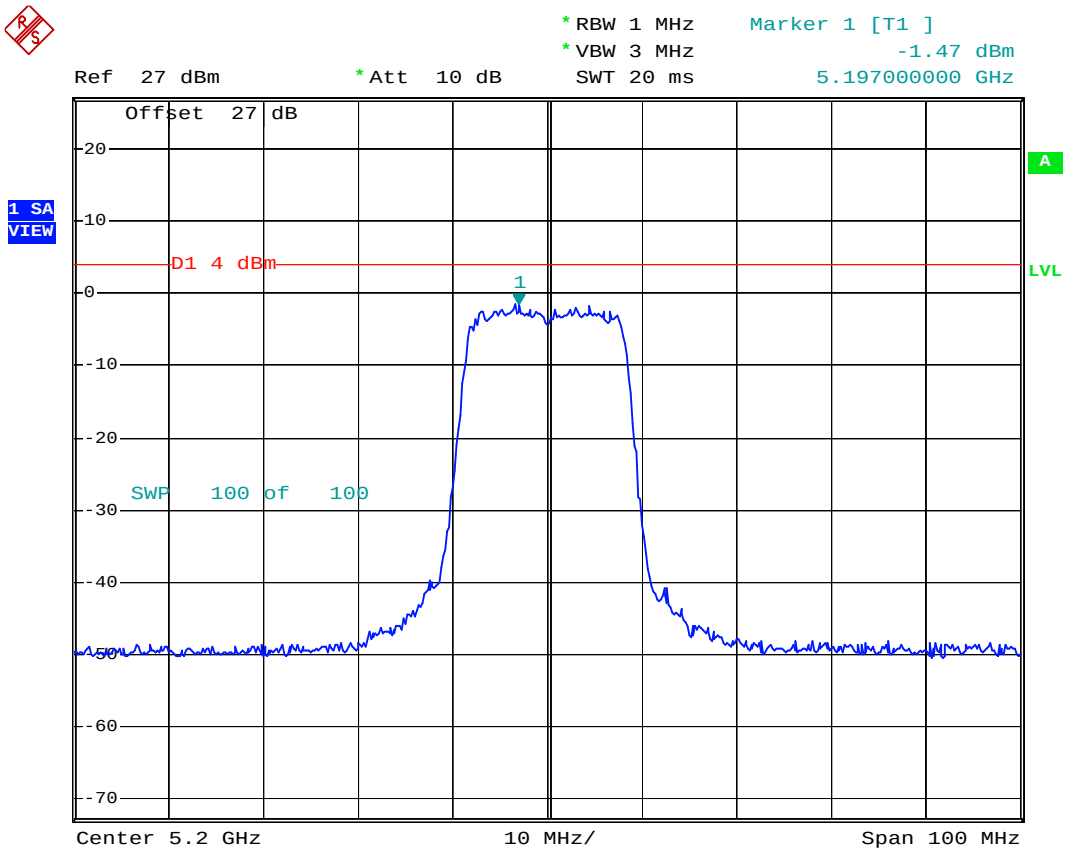
Please see the plot below.

For Frequency band (5180MHz ~ 5240MHz)



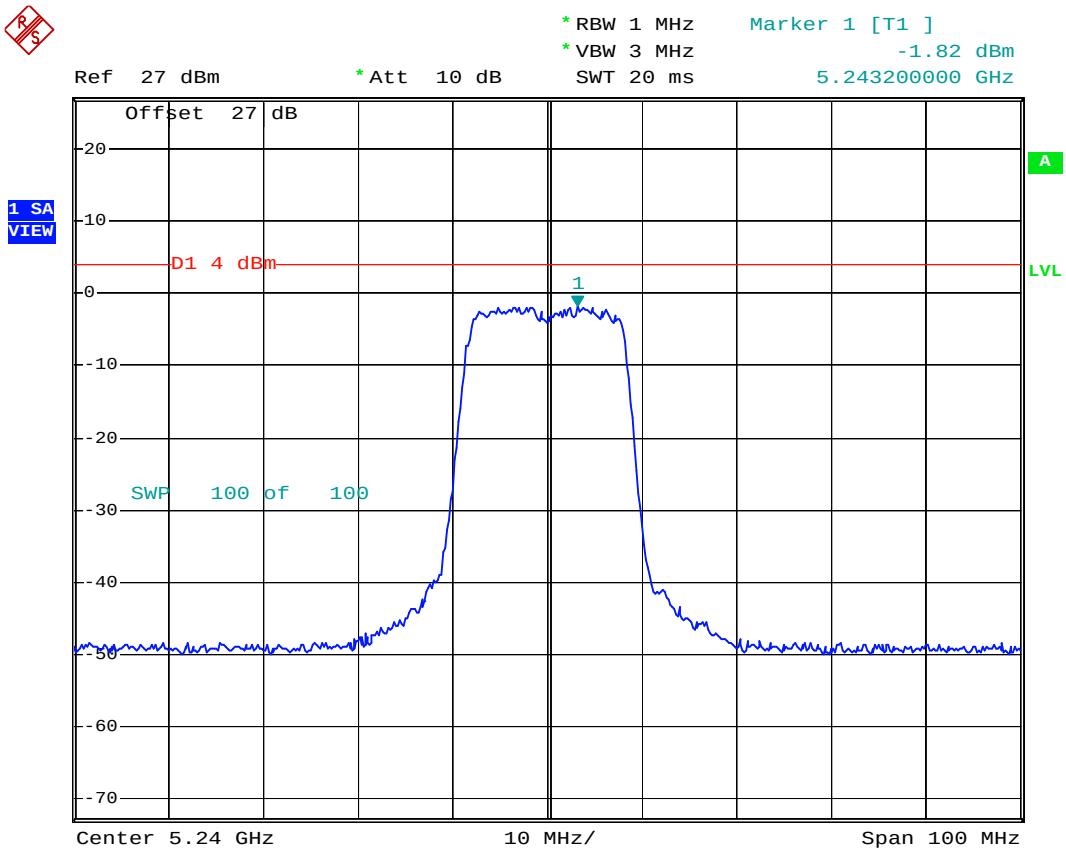
PPSD at 5180

Date: 22.MAY.2006 12:09:39



PPSD at 5200

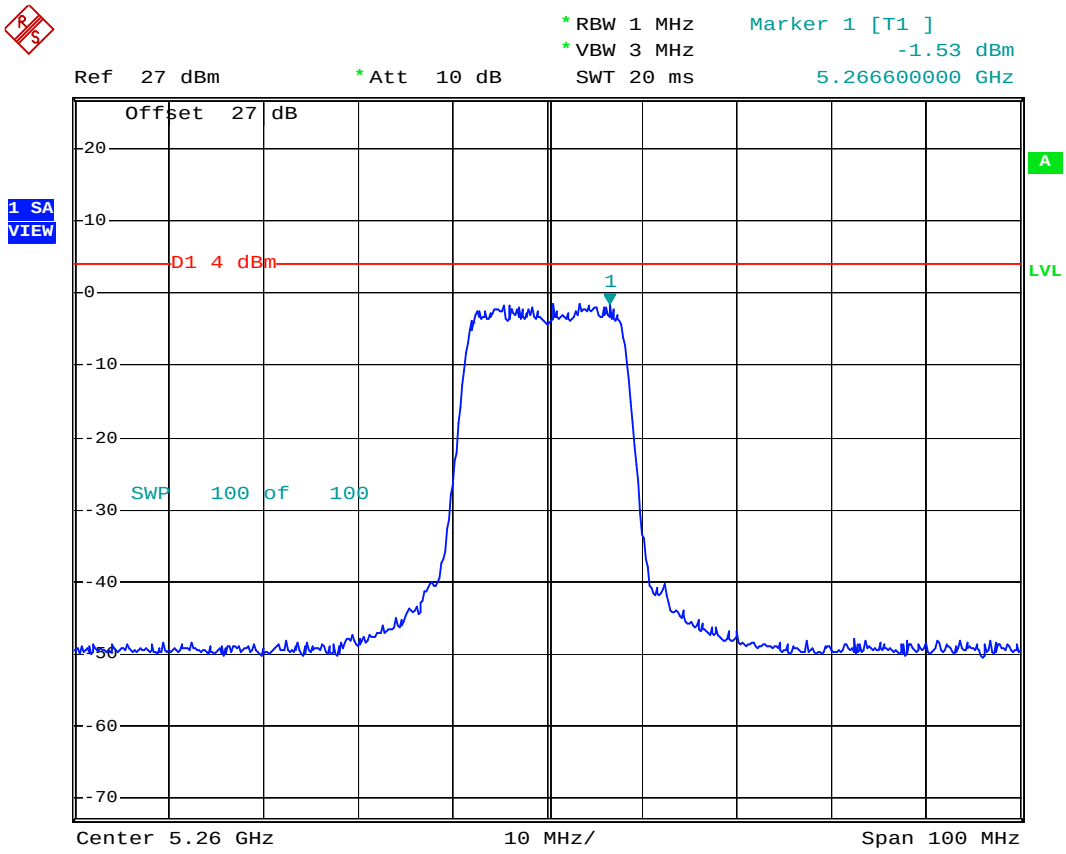
Date: 22.MAY.2006 12:12:12



PPSD at 5240

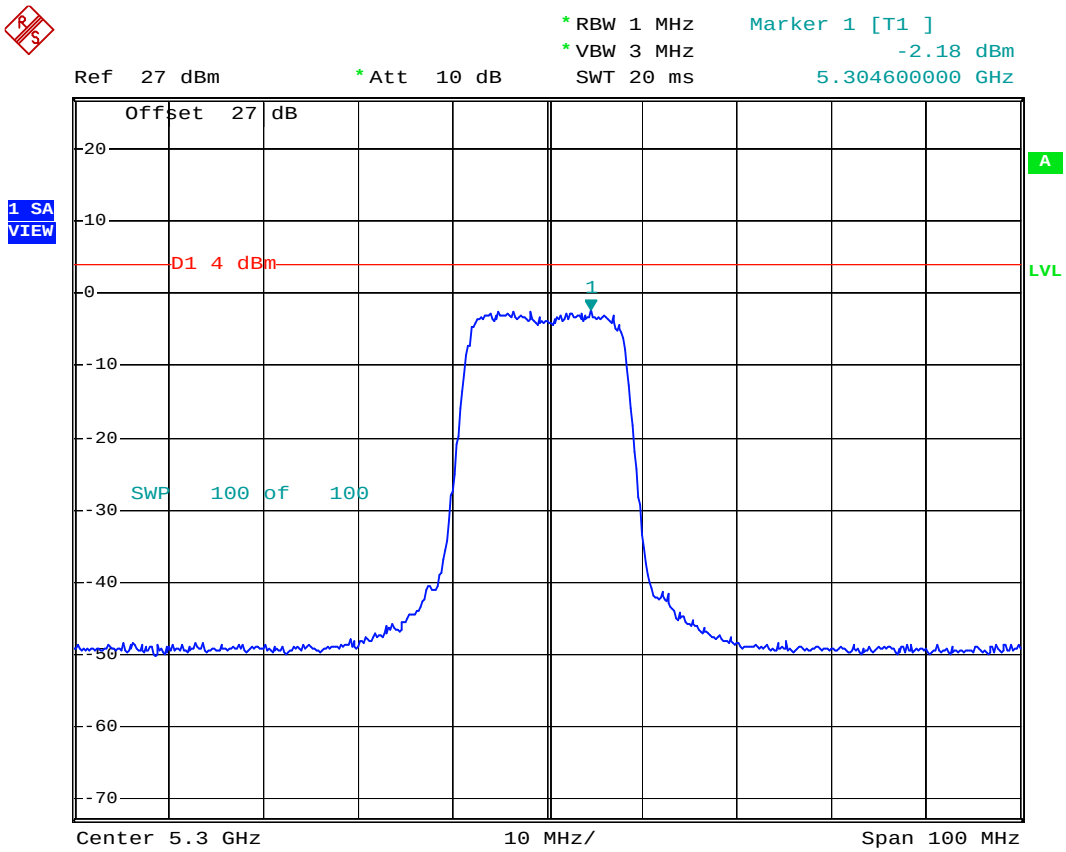
Date: 22.MAY.2006 12:14:38

For Frequency band (5260MHz ~ 5320MHz)



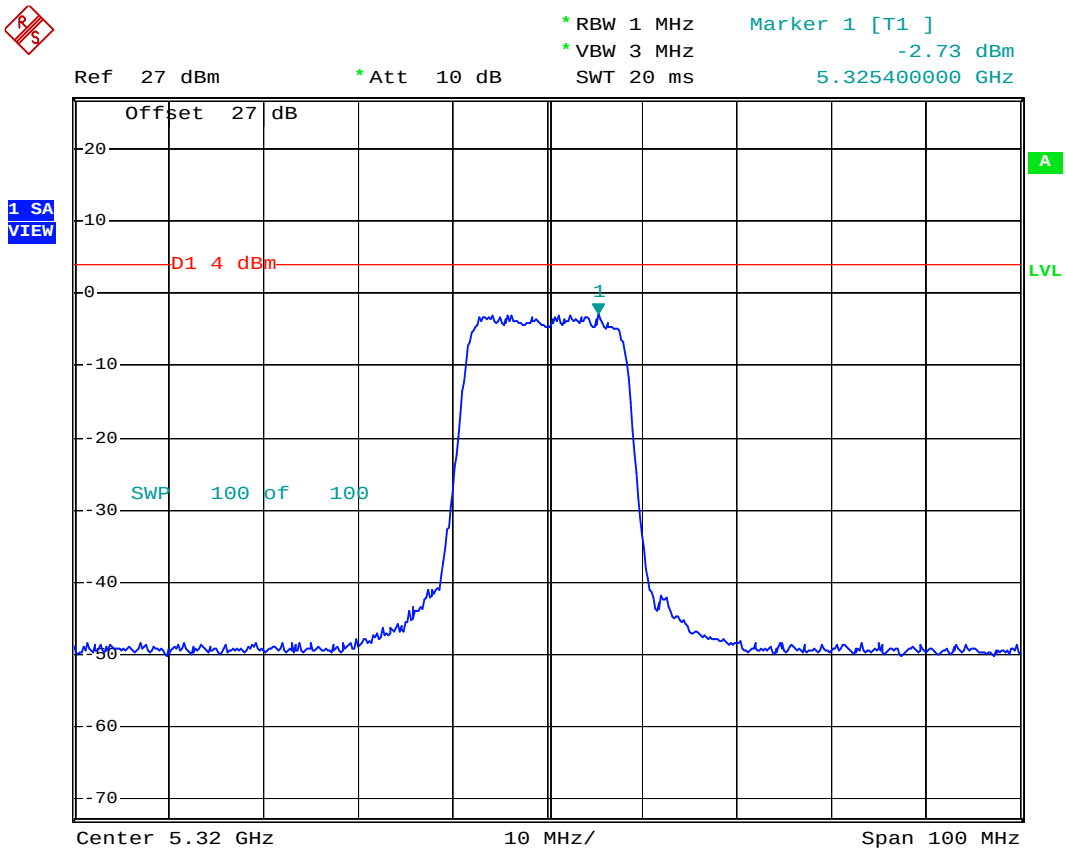
PPSD at 5260

Date: 22.MAY.2006 12:15:43



PPSD at 5300

Date: 22.MAY.2006 12:16:51



PPSD at 5320

Date: 22.MAY.2006 12:17:49

11. Peak excursion to average ratio test (FCC 15.407)

11.1 Operating environment

Temperature: 25 ℃
Relative Humidity: 50 %
Atmospheric Pressure: 1023 hPa

11.2 Test setup & procedure

The power spectrum density per FCC §15.407(a)(6) was measured from the antenna port of the EUT. Using a 50ohm spectrum analyzer with the RBW=VBW=10MHz for peak measurement and RBW=1MHz, VBW=30kHz for average measurement. Peak excursion to average ratio was read directly.

Limit

Operating Frequency (MHz)	Peak excursion to average ratio limit
5150~5250	<13dB
5250~5350, 5470~5725	<13dB
5725~5825	<13dB

11.3 Measured data of Peak excursion to average ratio test results

For Frequency band (5180MHz ~ 5240MHz)

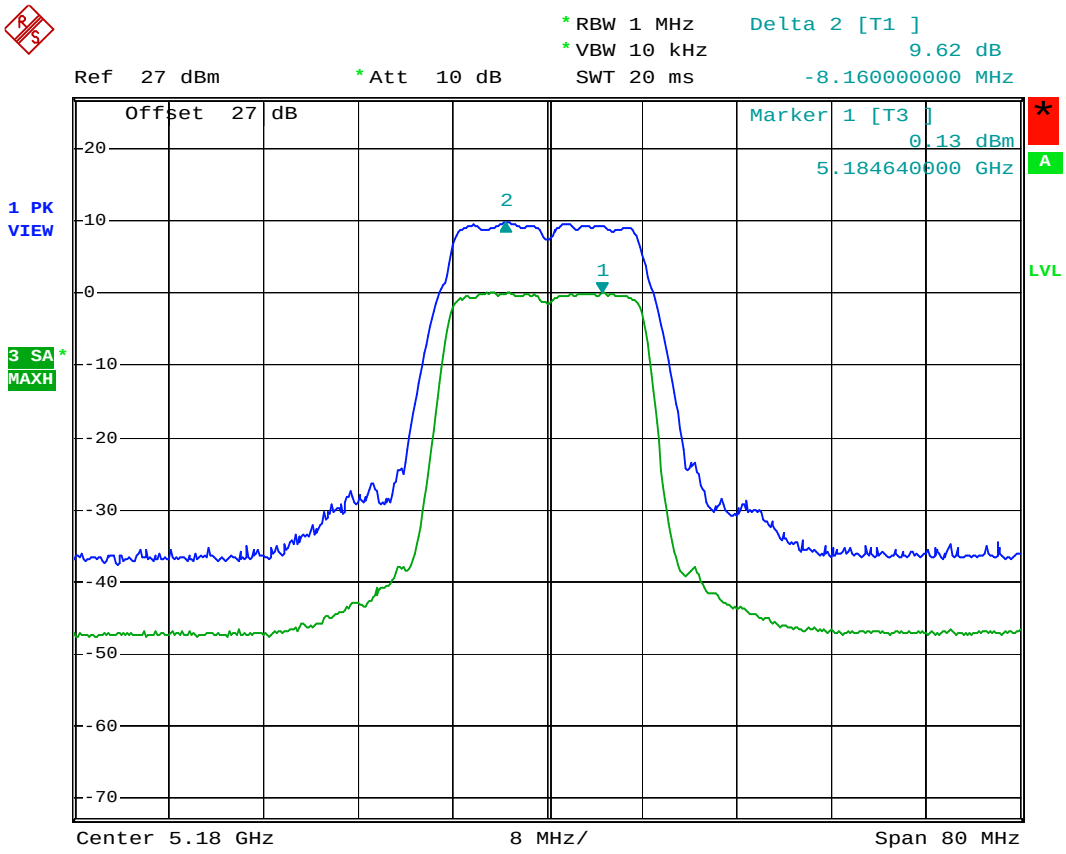
Channel	Frequency (MHz)	Measured peak excursion (dB)	Limit (dB)
36	5180	9.62	13
40	5200	9.43	13
48	5240	9.63	13

For Frequency band (5260MHz ~ 5320MHz)

Channel	Frequency (MHz)	Measured peak excursion (dB)	Limit (dB)
52	5260	9.28	13
60	5300	9.38	13
64	5320	9.49	13

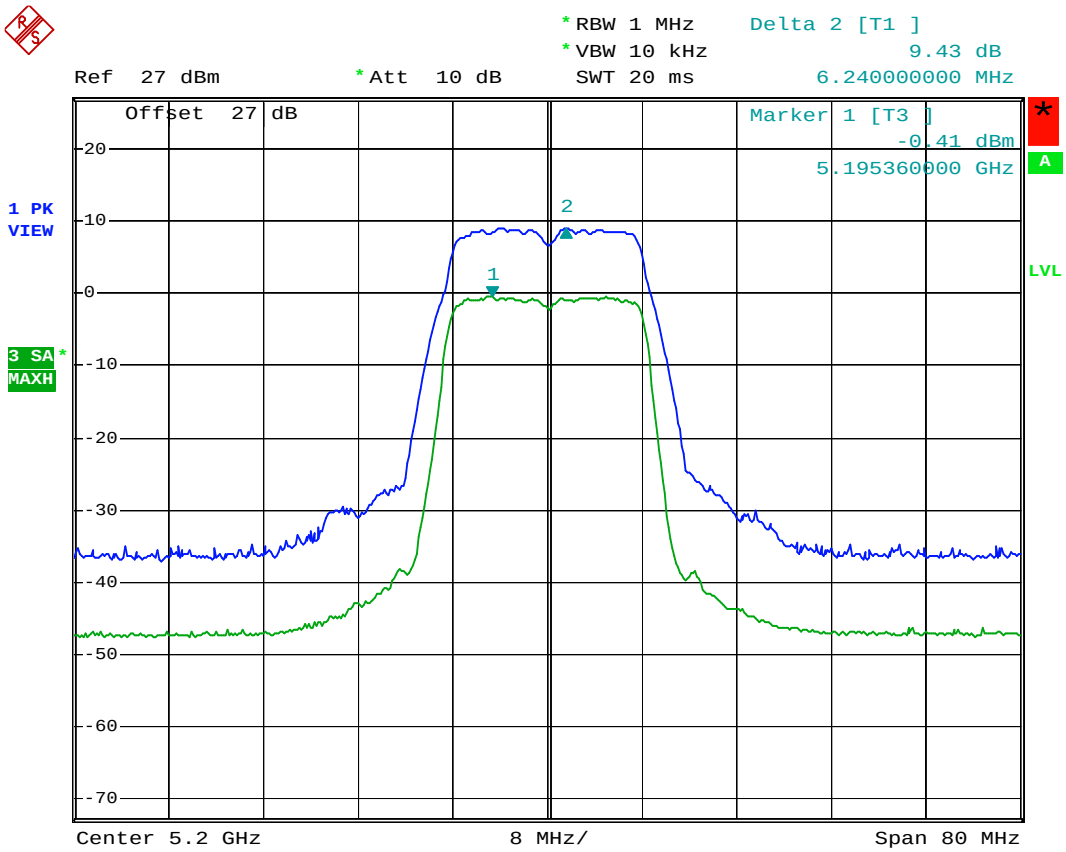
Please see the plot below.

For Frequency band (5180MHz ~ 5240MHz)



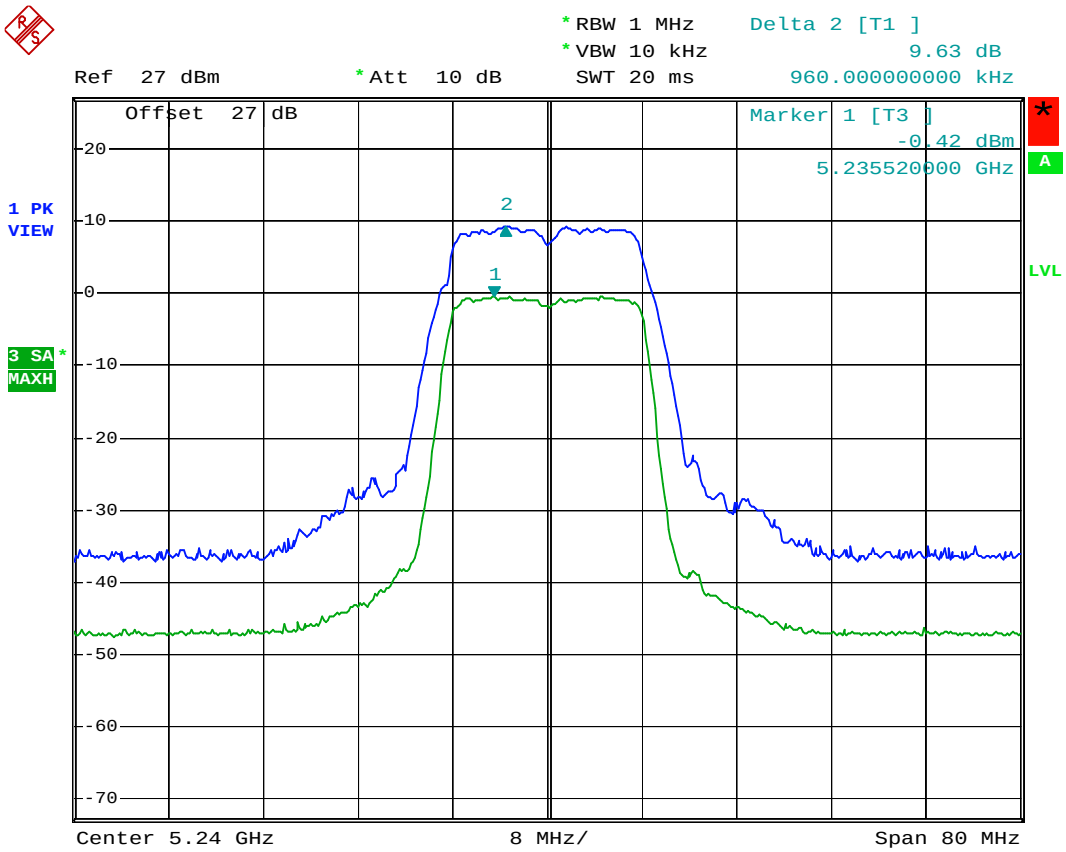
PE at 5180

Date: 22.MAY.2006 13:46:39



PE at 5200

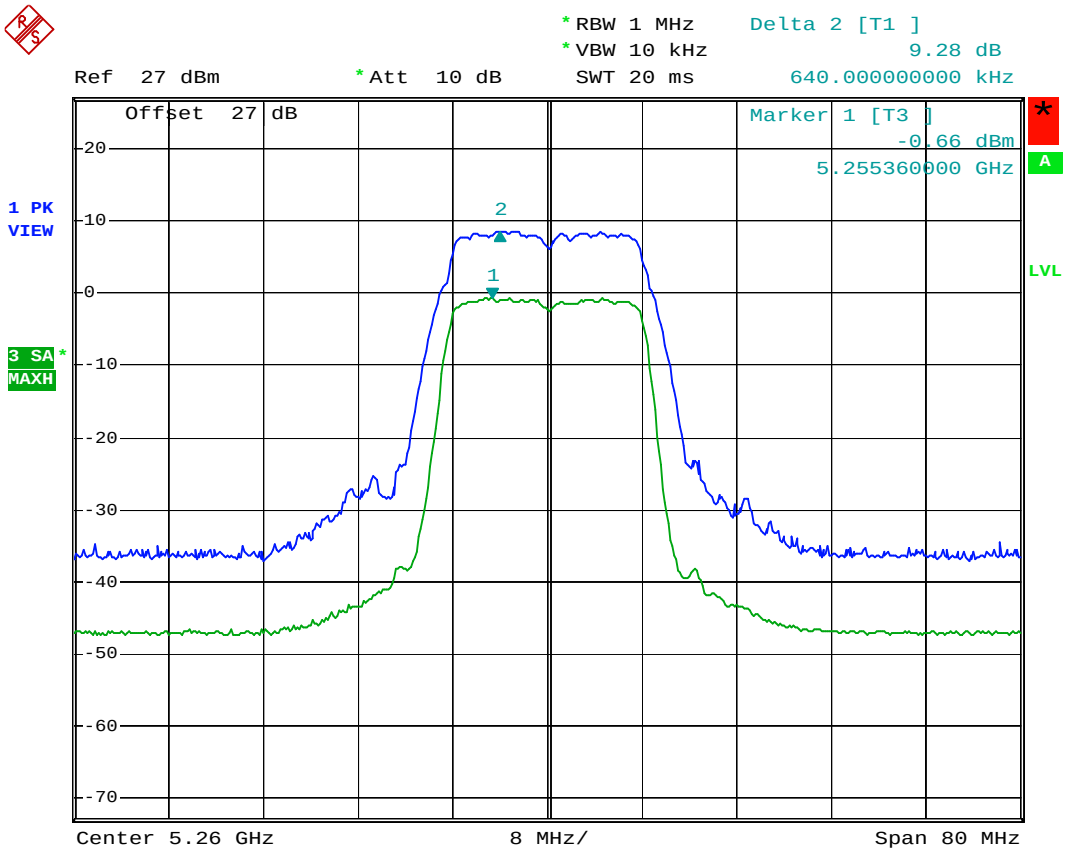
Date: 22.MAY.2006 13:50:06



PE at 5240

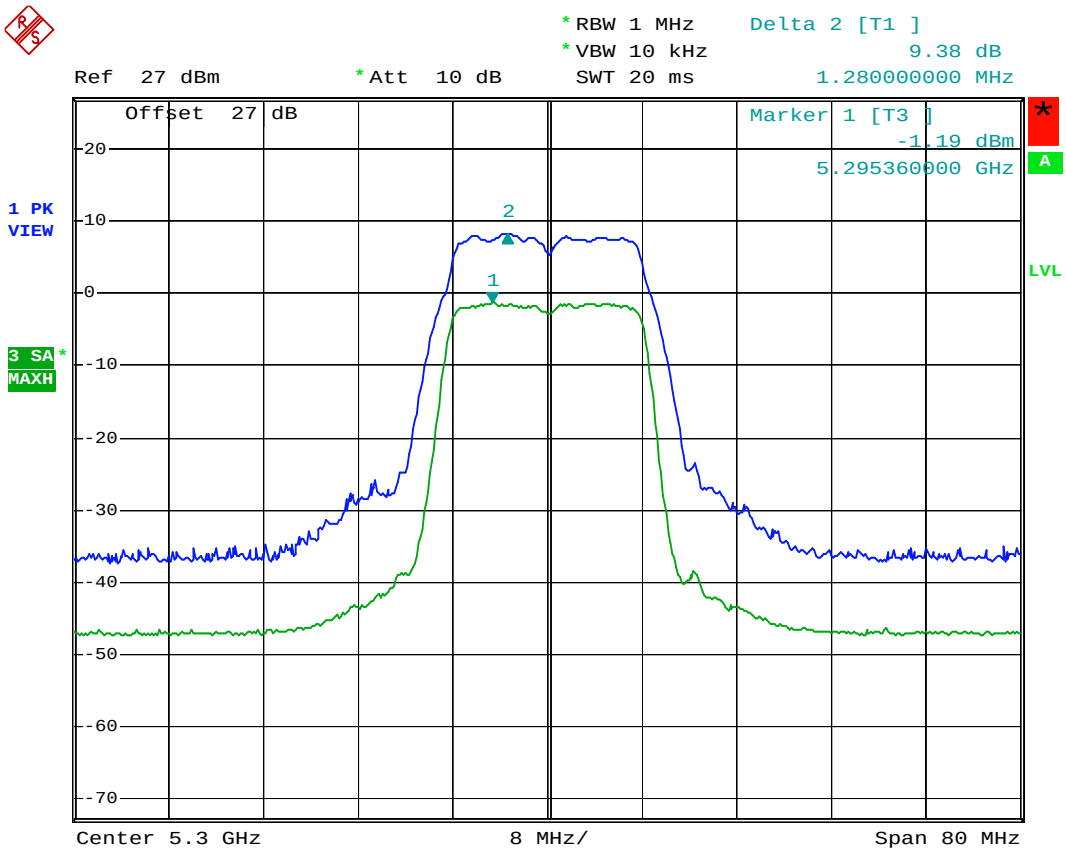
Date: 22.MAY.2006 13:54:55

For Frequency band (5260MHz ~ 5320MHz)



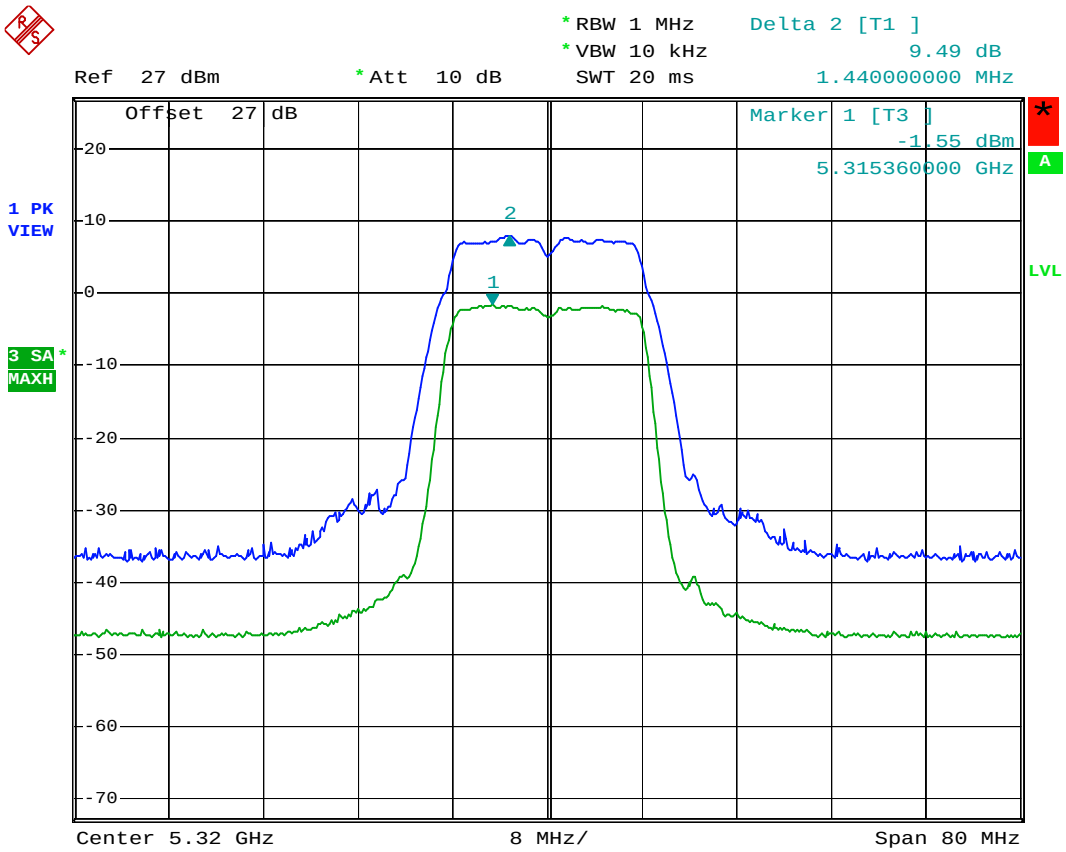
PE at 5260

Date: 22.MAY.2006 13:57:25



PE at 5300

Date: 22.MAY.2006 13:59:45



PE at 5320

Date: 22.MAY.2006 15:31:06

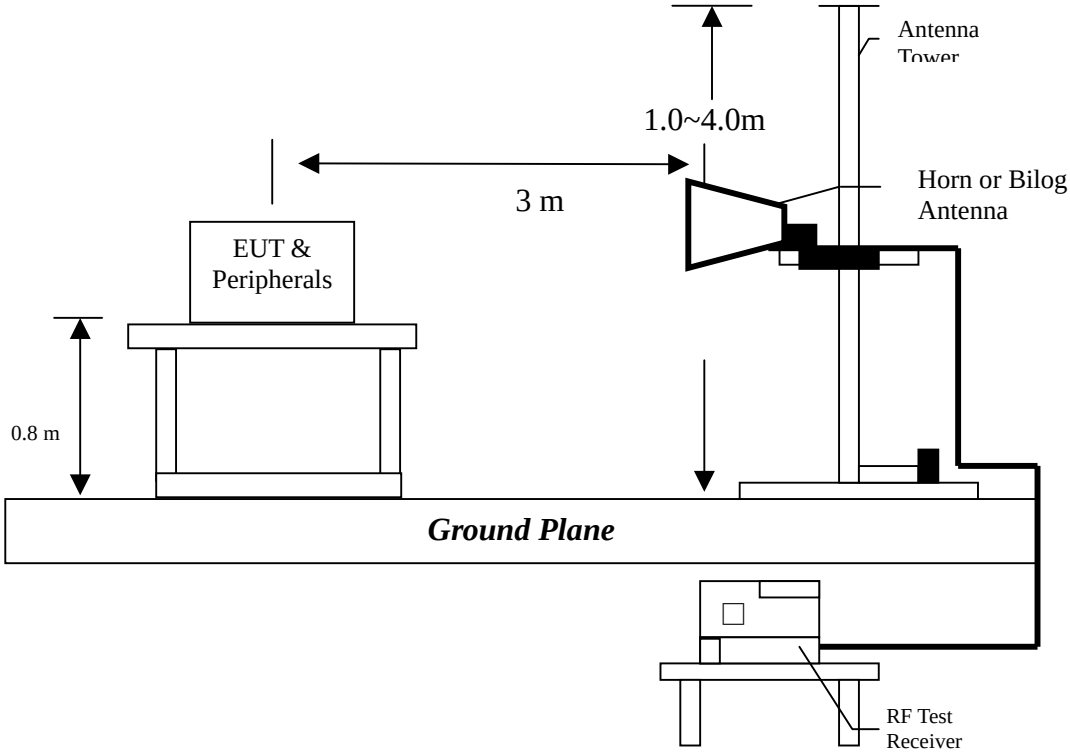
12. Radiated Emission test (FCC 15.205 & 15.209)

12.1 Operating environment

Temperature:	23	℃
Relative Humidity:	58	%
Atmospheric Pressure	1023	hPa

12.2 Test setup & procedure

The Diagram below shows the test setup, which is utilized to make these measurements.



Radiated emission measurements were performed from 30MHz to tenth harmonic or 40GHz. The EUT for testing is arranged on a wooden turntable. If some peripherals apply to the EUT, the peripherals will be connected to EUT and the whole system. During the test, all cables were arranged to produce worst-case emissions. The signal is maximized through rotation. The height of antenna and polarization is changing constantly for exploring for maximum signal level. The height of antenna can be up to 4 meters and down to 1 meter.

The measurement for radiated emission will be done at the distance of three meters unless the signal level is too low to measure at that distance. In the case of the reading under noise floor, a pre-amplifier is used and/or the test is conducted at a closer distance. And then all readings are extrapolated back to the equivalent three meter reading using inverse scaling with distance.

12.3 Emission limits

The spurious Emission shall test through the 10th harmonic. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

Frequency (MHz)	Limits (dB μ V/m@3m)
30-88	40
88-216	43.5
216-960	46
Above 960	54

Remark:
1. In the above table, the tighter limit applies at the band edges.
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system

Uncertainty was calculated in accordance with NAMAS NIS 81.
Expanded uncertainty (k=2) of radiated emission measurement is ±3.078 dB.
Expanded uncertainty (k=2) of conducted emission measurement is ±2.02 dB.

12.4 Radiated spurious emission test data

12.4.1 Measurement results: frequencies equal to or less than 1 GHz

The test was performed on EUT under 802.11a, 802.11b and 802.11g continuously transmitting mode. Channel 1, 6, 11 were verified. The worst case occurred at 802.11g Tx channel 6. Detail data please see the page 21.

12.4.2 Measurement results: frequency above 1GHz

EUT : WN6501CEP
Test Condition : 802.11a

Test Result:
No spurious emission was found above the spectrum analyzer’s noise floor.

The noise floor are listedas below :

For PK:
1GHz-3GHz: 20dBuV
3GHz-14GHz: 27dBuV
14GHz-26.5GHz: 39dBuV
26.5GHz-40GHz: 42dBuV

For AV:
1GHz-3GHz: 10dBuV
3GHz-14GHz: 16dBuV
14GHz-26.5GHz: 28dBuV
26.5GHz-40GHz: 29dBuV

13. Emission on the band edge §FCC 15.205

The measurement was made to the average and peak field strength of the fundamental frequency. And the spurious emission in the restrict band must also comply with the FCC subpart C 15.209.

13.1 Operating environment

Temperature:	22	℃
Relative Humidity:	56	%
Atmospheric Pressure	1023	hPa

13.2 Test setup & procedure

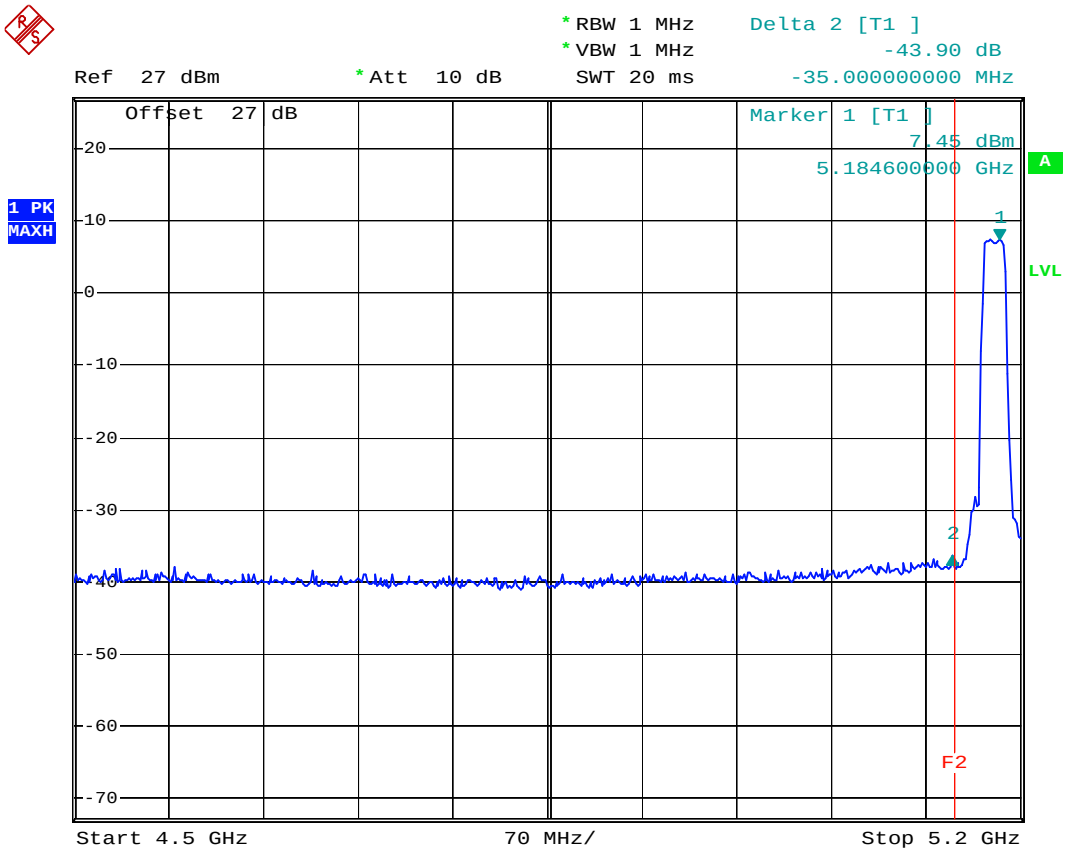
The output of EUT was connected to spectrum analyzer via a 50ohm cable.

The setting of spectrum analyzer is:

Peak:	RBW = 1MHz ;	VBW = 1MHz
Average:	RBW = 1MHz ;	VBW = 10Hz

13.3 Test Result

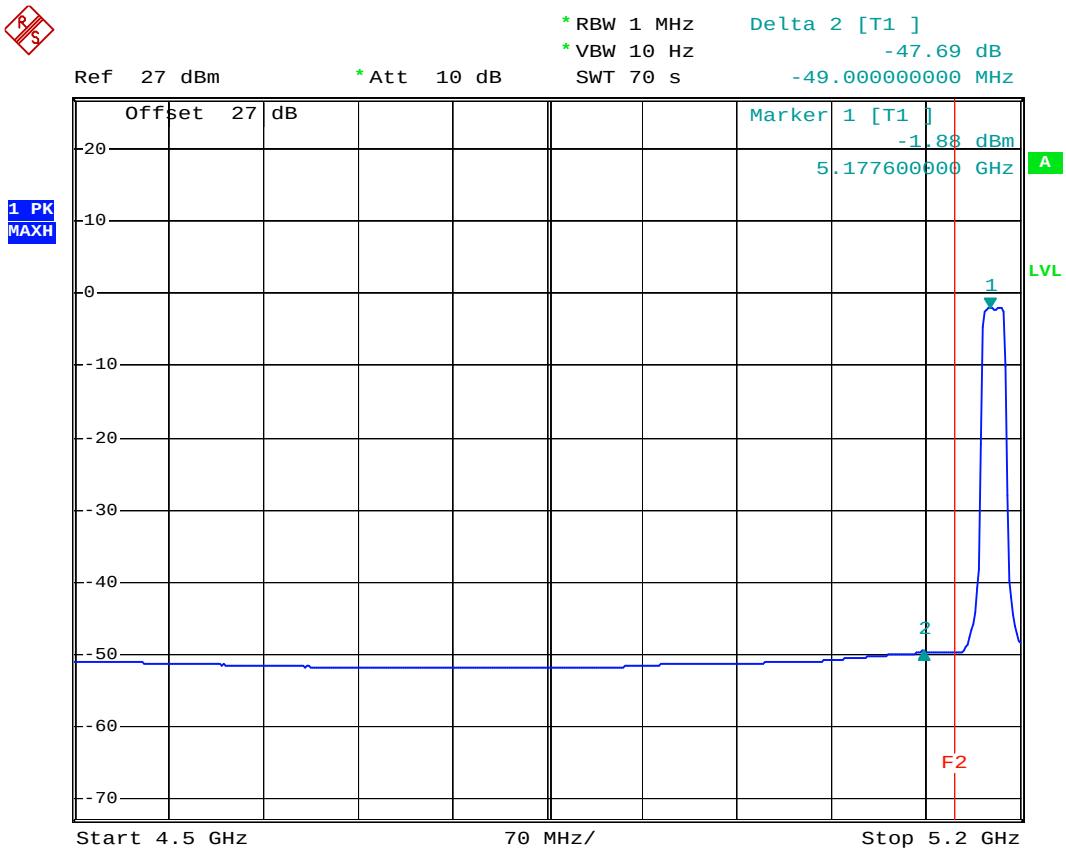
13.3.1 Conducted Method



Band-edge at 5180

PK F2=5150MHz

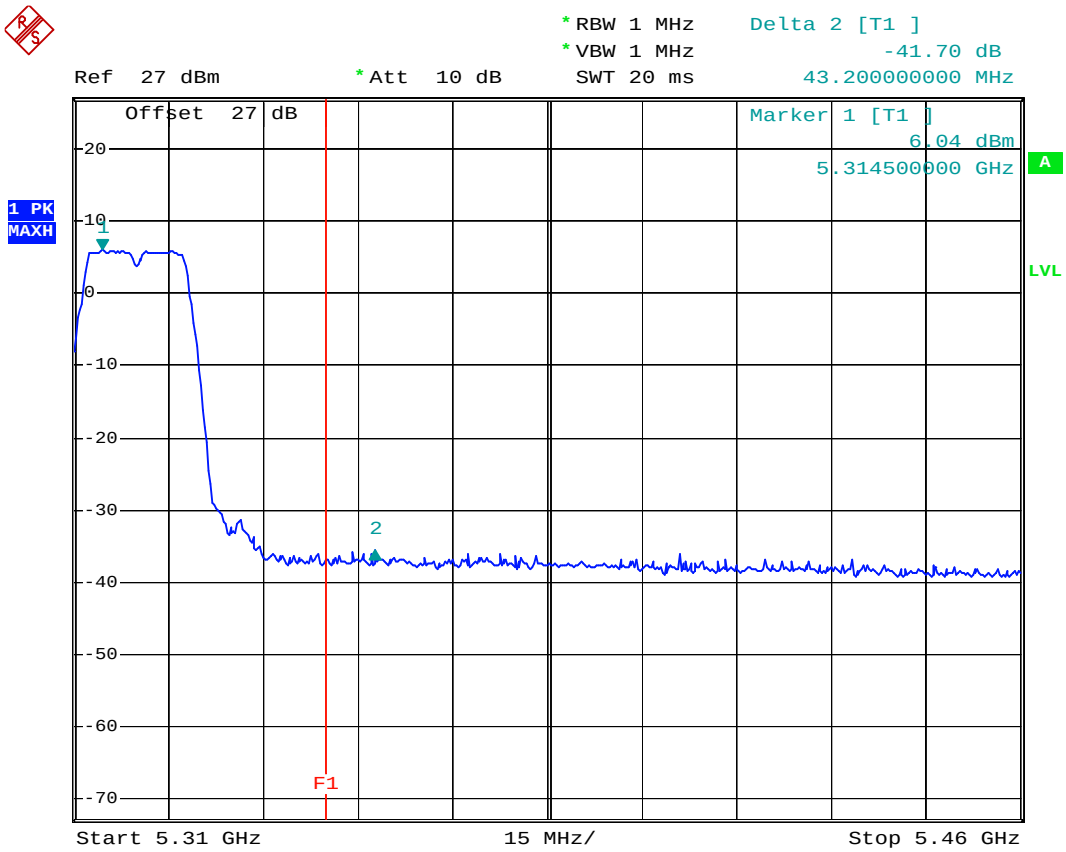
Date: 22.MAY.2006 17:31:24



Band-edge at 5180

PK F2=5150MHz

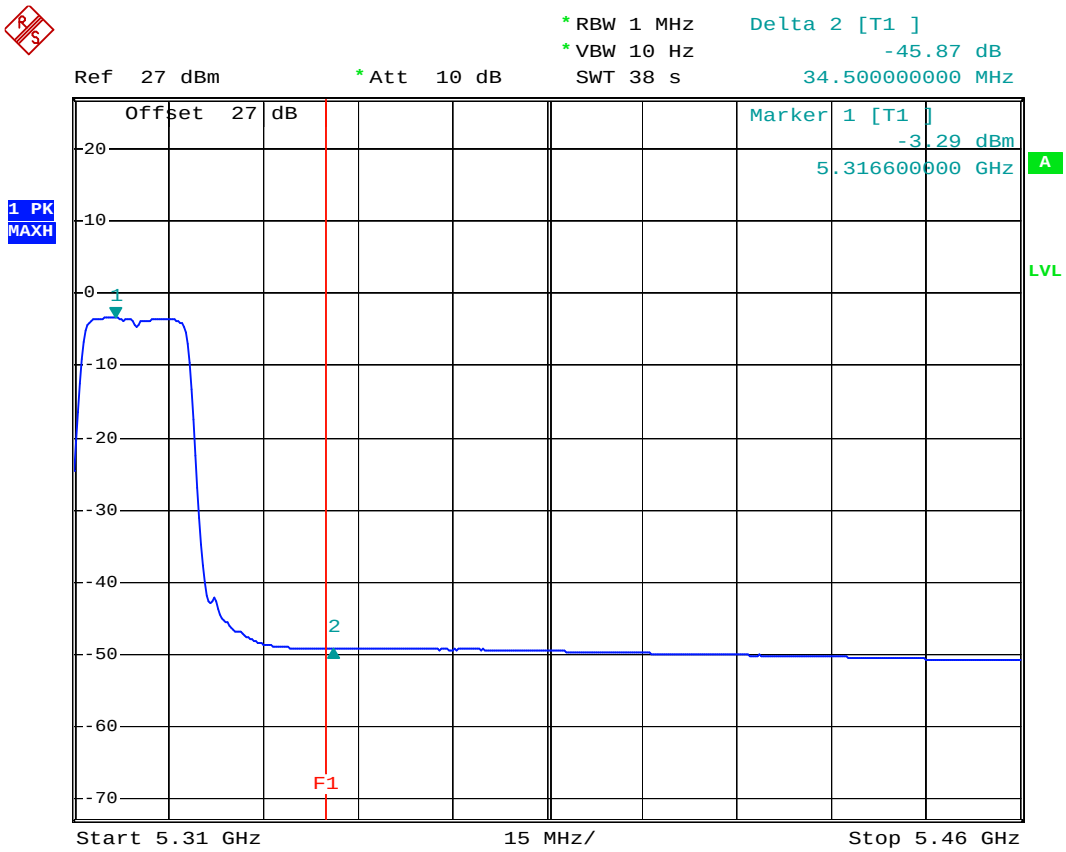
Date: 22.MAY.2006 17:34:53



Band-edge at 5320

PK F1=5350MHz

Date: 22.MAY.2006 17:38:06



Band-edge at 5320

PK F1=5350MHz

Date: 22.MAY.2006 17:40:25

13.3.2 Radiated Method

Test Mode: 802.11a (OFDM Modulation) operating mode

Channel	Detector	Radiated Method	Conducted Method	The Max. Field Strength in Restrict Band (dBuV/m)	Limit @ 3 m (dBuV/m)	Margin (dB)
		Max. Field Strength of Fundamental @3m (dBuV/m)	Between Carrier Max. Power and Local Max. Emission in Restrict Band (dBc)			
		A	B	C	D	E
36 (5180MHz)	PK	103.16	43.90	59.26	74	-14.74
	AV	93.73	47.69	46.04	54	-7.96
64 (5320MHz)	PK	95.00	41.70	53.30	74	-20.70
	AV	85.05	45.87	39.18	54	-14.82

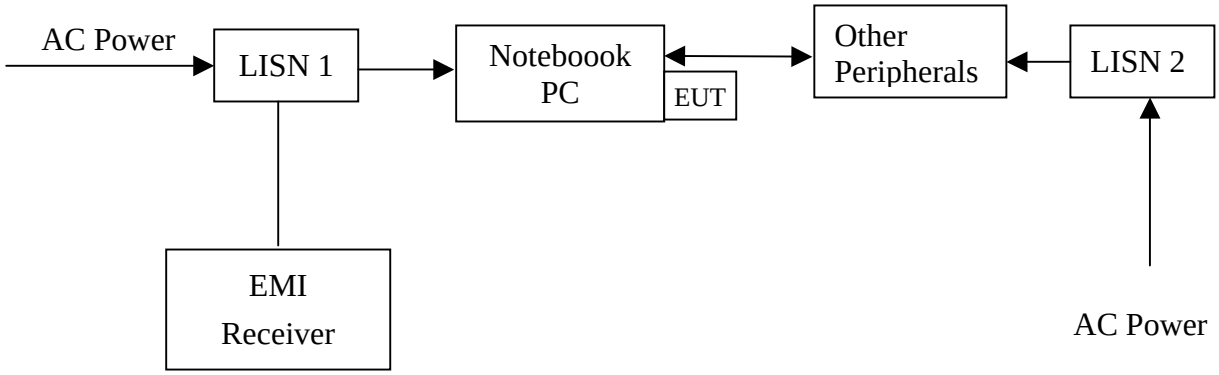
Remark: 1. C = A – B
2. E = C – D

14. Power Line Conducted Emission test §FCC 15.207

14.1 Operating environment

Temperature:	23	℃
Relative Humidity:	58	%
Atmospheric Pressure	1023	hPa

14.2 Test setup & procedure



The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50 ohm/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination.
Both sides (Line and Neutral) of AC line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.4/2003 on conducted measurement.
The bandwidth of the field strength meter (R & S Test Receiver ESCS 30) is set at 9kHz.

The EUT configuration please refer to the “Conducted set-up photo.pdf”.

14.3 Emission limit

Freq. (MHz)	Conducted Limit (dBuV)	
	Q.P.	Ave.
0.15~0.50	66 – 56*	56 – 46*
0.50~5.00	56	46
5.00~30.0	60	50

*Decreases with the logarithm of the frequency.

14.4 Uncertainty of Conducted Emission

Expanded uncertainty (k=2) of conducted emission measurement is ±2.6 dB.

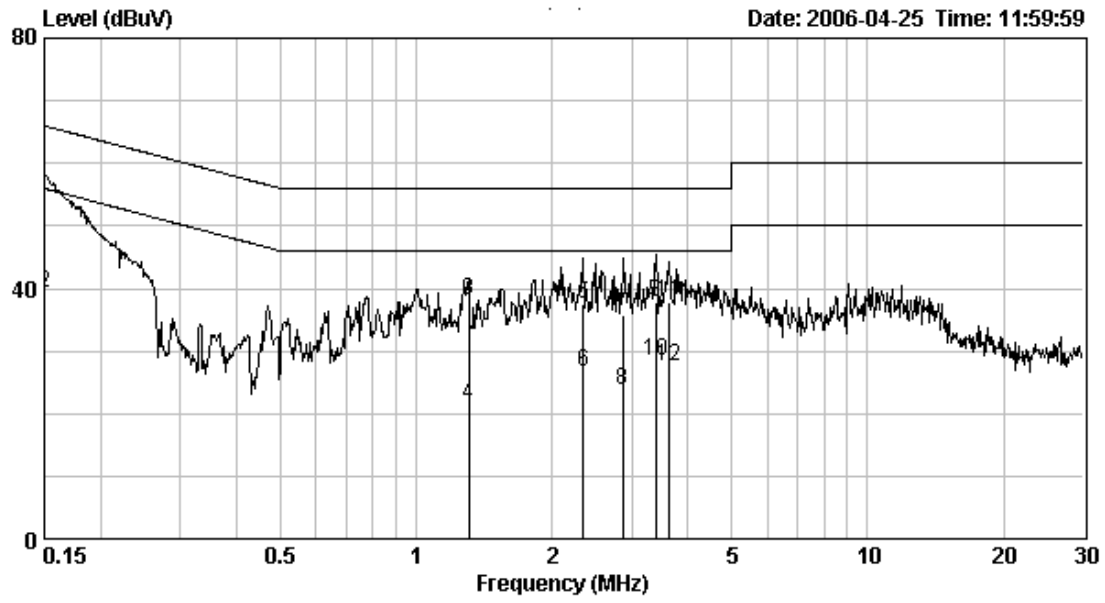
14.5 Power Line Conducted Emission test data

The test was performed on EUT under 802.11b, 802.11g and 802.11a continuously transmitting mode. Channel low, middle and high were verified. The worst case occurred at 802.11g Tx at high channel.

Phase:	Line
Model No.:	WN6501CEP
Test Condition:	802.11g Tx at high channel

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.150	0.10	55.48	66.00	39.33	56.00	-10.52	-16.67
1.310	0.10	38.08	56.00	21.29	46.00	-17.92	-24.71
2.350	0.14	37.37	56.00	26.78	46.00	-18.63	-19.22
2.870	0.17	35.87	56.00	23.76	46.00	-20.13	-22.24
3.400	0.20	37.71	56.00	28.45	46.00	-18.29	-17.55
3.620	0.21	37.73	56.00	27.55	46.00	-18.27	-18.45

Remark:
1. Corr. Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)



Phase: Neutral
Model No.: WN6501CEP
Test Condition: 802.11g Tx at high channel

Frequency (MHz)	Corr. Factor (dB)	Level Qp (dBuV)	Limit Qp (dBuV)	Level AV (dBuV)	Limit Av (dBuV)	Margin (dB) Qp	Margin (dB) Av
0.150	0.10	55.73	66.00	39.58	56.00	-10.27	-16.42
1.830	0.11	32.72	56.00	25.94	46.00	-23.28	-20.06
2.250	0.13	30.49	56.00	23.18	46.00	-25.51	-22.82
2.350	0.14	33.35	56.00	24.95	46.00	-22.65	-21.05
3.380	0.20	33.10	56.00	26.78	46.00	-22.90	-19.22
3.640	0.22	33.20	56.00	25.76	46.00	-22.80	-20.24

Remark:
1. Corr. Factor (dB)= LISN Factor (dB) + Cable Loss (dB)
2. Margin (dB) = Level (dBuV) – Limit (dBuV)