Electromagnetic Compatibility
Test Report

Test Report No: QAP 020406
Issued on: April 02, 2006

Product Name

WLS-2100F

FCC ID: T3G-WLS-2100F-000

Tested According to

FCC 47 CFR, Part 15, Subparts B & C

Tests Performed for

Go Networks Ltd.

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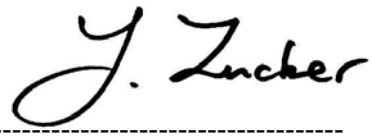

Report Reviewed By: ----------
Y. Zucker
QA and Lab. Manager
QualiTech EMC Laboratory

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1633.01

Test Report details:

Test commencement date:	05.03.2006
Test completion date:	20.03.2006
Customer's Representative:	Ronen Akerman
Issued on:	**02.04.2006**

Assessment information:

This report contained an assessment of the EUT against Electromagnetic Compatibility based upon tests carried out on the samples submitted. The results contained in this report relate only to the items tested. Manufactured products will not necessarily give identical results due to production and measurement tolerances. QualiTech, EMC Lab does not assume responsibility for any conclusion and generalization drawn from the test results with regards to other specimens or samples of type of the equipment represented by test item.

The EUT was set up and exercised using the configuration, modes of operation and arrangements defined in this report only.

Modifications:

Modifications made to the EUT

None.

Modifications made to the Test Standard

None.

Summary of Compliance Status

Test Spec. Clause	Test Case	Remarks	Notes
§15.247 (a) (2)	6 dB Bandwidth	**Comply**	*Measured*
§15.247 (b) (3)	Peak Output Power	**Comply**	*Measured*
§15.247 (c) (2)(ii)(A)	Peak Output Power, antenna gain & limit	**Comply**	*Calculated*
§15.247 (c) (2)(iii)	Peak Output Power, antenna gain & limit	**Comply**	*Calculated*
§15.247 (e)	Peak power spectral density	**Comply**	*Measured*
§15.247 (d)	Conducted Spurious Emissions	**Comply**	*Measured*
§15.247 (d) & §15.205	Radiated Emissions, Restricted Bands	**Comply**	*Measured*
§15.109/209	Radiated Emissions	**Comply**	*Measured*
§15.107/207	Power Line Conducted Emissions	**Comply**	*Measured*
§15.203	Antenna Connector requirement	**Comply**	-
§15.247(i) & §1.1307(b)(1)	Maximum Permissible exposure (MPE)	**Comply**	*Calculated*

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Table of Content

1. General Description

1.1. Description of the EUT system/test Item:

Product name: WLS-2100F

S/N: G1001025

FCC ID: T3G-WLS-2100F-0

Description:

The EUT was tested and investigated with maximum transmitted power from all antenna connectors, and antenna gain at bore-site (0 degrees steering) was taken into the calculation. Channels 1 (2.412 GHz), 6 (2.437 GHz) and 11 (2.462 GHz) were investigated. All data rates were investigated and worst-case rates were selected and plotted.

Data Rates:

Rate [Mbps]	Protocol
6	802.11g
9	
12	
18	
24	
36	
48	
54	
1	802.11b
2	
5.5	
11	

2. Setup of EUT

Support equipment:

A Laptop was used to manage EUT's parameter such as Modulation rate and selection of transmitted frequency etc.

I/O Cables:

1. AC line
2. Ground cable
3. Ethernet Cat.5 cable (management)

Test Setup:

The EUT was provided with S/W that enabled rate selection and continuous transmission during testing.

3. Method of Measurements

3.1. Conducted Measurements:

The transmitter output was directly connected to the input of the Spectrum analyzer through a specialized antenna connector provided by the manufacturer, and an attenuator as specified. The external attenuator and cable loss were added to the reading. Worst-case results of in the various modulation modes were reported.

For spurious emissions measurement, the spectrum from 1MHz to 25GHz was investigated with the transmitter set to the lowest, middle and highest channel frequencies.

For power output measurements, the power was integrated across a bandwidth of 26dB EBW of the signal, using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges.

For PSD, emission peak was zoomed within the pass band with spectrum analyzer's settings as reported.

3.2. Radiated Emission measurements:

Measurements were performed at a 3-meter measurement distance in the semi-anechoic chamber in order to evaluate the radiated electromagnetic interference characteristics of the EUT. The EUT was placed on a non-metallic table/support, 0.8m above the turntable, was configured, arranged and operated in a manner consistent with typical application and load conditions. The test program of exercising the equipment ensured that various parts of the EUT were exercised to permit detection of all EUT disturbances.
An appropriate antenna depending upon the frequency range, per ANSI C63.4-2003 clause 4.1.5 was used. While the turntable was being rotated, the height of the antenna was varied from 1 to 4m for the frequency range of 30MHz to 1GHz. The highest radiated emission was detected by manipulating the system cables to the worst-case position. This process was repeated for both antenna polarizations. The spectrum up to 25GHz was investigated for spurious emissions, using a band-reject filter where appropriate.
The amplitudes of worst-case emission were measured with the detector modes and resolution bandwidths over various frequency ranges according to the requirements of ANSI C63.4-2003 clause 4.2.

3.3. Power line Emission measurements:

The EUT was placed on a non-conductive table/support 80 cm above the reference ground plane. The EUT was configured in accordance with ANSI C63.4-2003 using a 50µH/50 ohm LISN.

Compliance with the provisions was based on the measurements of the radio frequency voltage between each line and the ground at the power terminal.

4. Report of Measurements and examinations

4.1. 6 dB Bandwidth

Reference document:	**47 CFR §15.247 (a) (2)**		
Test Requirements:	Systems using digital modulation techniques may operate in 2400-2483.5 MHz band. The minimum 6dB bandwidth shall be at least 500 kHz.		
Date of Test:	05.03.2006	**Comply**	
Test setup:	See sec 3.1, 20dB attenuator		
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100kHz, VBW: 300kHz		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.1.1 to Plot 4.1.6	

Test results

Frequency [MHz]	Data Rate [Mbps]	6 dB Bandwidth [kHz]	Limit [kHz]	Margin [kHz]	Ref Plot
802.11b Mode					
2412	11	12750	>500	12250	4.1.1
2437	11	13875	>500	13375	4.1.2
2462	11	11500	>500	11000	4.1.3
802.11g Mode					
2412	54	16500	>500	16000	4.1.4
2437	54	16500	>500	16000	4.1.5
2462	54	16500	>500	16000	4.1.6

4.2. Peak Output Power

Reference document:	**47 CFR §15.247 (b) (3) & §15.247 (c) (2)(ii)(A) & §15.247 (c) (2)(iii)**		
Test Requirements:	The maximum peak output power of the intentional radiator for systems using digital modulation in the 2400-2483.5 MHz band shall not exceed 1 Watt. Transmitters operating in the 2400-2483.5 MHz band that emits multiple directional beams but does not emit multiple directional beams simultaneously, the total output power conducted to the arrays, i.e. the sum of the power sullied to the antenna elements, shall not exceed the limit calculated below. The total conducted output power shall be reduced by 1dB below the specified limit for each 3 dB that the directional gain of the antenna array exceeds 6dBi. The directional gain shall be calculated as the sum of 10log(# of elements) having the highest gain plus the directional gain of the element having the highest gain. If a transmitter employs an antenna that operates simultaneously on multiple directional beams using the same or different frequency channels, and if the transmitted beams overlap, the power shall be reduced to ensure that their aggregate power transmitted simultaneously on all beams does not exceed the limit calculated above by more than 8dB.		
Date of Test:	05.03.2006	**Comply**	
Test setup:	See sec 3.1, 20dB attenuator		
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1MHz, VBW: 3MHz		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	**See below**	See Plot 4.2.1 to Plot 4.2.12	

Directional gain Calculation:
Access Channel 1:
Number of antenna elements: 4
Gain of each antenna element: 9.8dBi
Directional Gain, Gm = 9.8dBi + 10Log4 = 15.8 dBi

Access Channel 0:
Number of antenna elements: 4
Gain of each antenna element: 11.8dBi
Directional Gain, Gm = 11.8dBi + 10Log4 = 17.8dBi

Single Access Channel 1, Output Power limit:

$$P_L = 30dBi - \frac{Gm - 6}{3} = 26.8 \text{ dBm}$$

Single Access Channel 0, Output Power limit:

$$P_L = 30dBi - \frac{Gm - 6}{3} = 26.2 \text{ dBm}$$

Dual Access Channels, Overlapped Output Power limit:

P_L +8dB = 34.8 dBm

Test Results:

For 15.8 dBi Antenna Array

Frequency [MHz]	Data Rate [Mbps]	Peak Power per element [dBm]	Peak Power per element [mW]	Total Output Power, 4 elements [mW]	Total Output Power, 4 elements [dBm]	Limit (P_L) [dBm]	Margin [dB]	Ref Plot
802.11b Mode								
2412	1	18.1	64.57	258.26	24.12	26.8	2.68	4.2.1
2437	1	17.79	60.12	240.47	23.81	26.8	2.99	4.2.2
2462	1	17.56	57.02	228.07	23.58	26.8	3.22	4.2.3
802.11g Mode								
2412	6	15.84	38.37	153.48	21.86	26.8	4.94	4.2.4
2437	6	15.71	37.24	148.96	21.73	26.8	5.07	4.2.5
2462	6	15.31	33.96	135.85	21.33	26.8	5.47	4.2.6

For 17.8 dBi Antenna Array

Frequency [MHz]	Data Rate [Mbps]	Peak Power per element [dBm]	Peak Power per element [mW]	Total Output Power, 4 elements [mW]	Total Output Power, 4 elements [dBm]	Limit (P_L) [dBm]	Margin [dB]	Ref Plot
802.11b Mode								
2412	1	18.1	64.57	258.26	24.12	26.2	2.08	4.2.1
2437	1	17.79	60.12	240.47	23.81	26.2	2.39	4.2.2
2462	1	17.56	57.02	228.07	23.58	26.2	2.62	4.2.3
802.11g Mode								
2412	6	15.84	38.37	153.48	21.86	26.2	4.34	4.2.4
2437	6	15.71	37.24	148.96	21.73	26.2	4.47	4.2.5
2462	6	15.31	33.96	135.85	21.33	26.2	4.87	4.2.6

For Overlapped Antenna Array

Frequency [MHz]	Data Rate [Mbps]	Peak Power per element [dBm]	Peak Power per element [mW]	Total Output Power, 8 elements [mW]	Total Output Power, 8 elements [dBm]	Limit (P_L) [dBm]	Margin [dB]	Ref Plot
802.11b Mode								
2412	1	11.32	13.55	108.42	20.35	34.8	14.45	4.2.7
2437	1	11.91	15.52	124.19	20.94	34.8	13.86	4.2.8
2462	1	12.16	16.44	131.55	21.19	34.8	13.61	4.2.9
802.11g Mode								
2412	6	11.38	13.74	109.92	20.41	34.8	14.39	4.2.10
2437	6	12.23	16.71	133.69	21.26	34.8	13.54	4.2.11
2462	6	11.71	14.83	118.60	20.74	34.8	14.06	4.2.12

4.3. Peak power spectral density

Reference document:	**47 CFR §15.247 (e)**		
Test Requirements:	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.		
Date of Test:	07.03.2006	**Comply**	
Test setup:	See sec 3.1, 20dB attenuator		
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 3 kHz, VBW: 10 kHz, Sweep Time: 100s		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.3.1 to 4.3.12	

Test results:

Frequency [MHz]	Data Rate [Mbps]	PSD per element [dBm/3kHz]	PSD, 4 elements [dBm/3kHz]	Limit [dBm]	Margin [dB]	Plot Ref
802.11b Mode						
2412	1	-3.859	2.162	8	5.838	4.3.1
2437	1	0.0006	6.021	8	1.979	4.3.2
2462	1	1.259	7.280	8	0.720	4.3.3
802.11g Mode						
2412	6	-5.392	0.629	8	7.371	4.3.4
2437	6	0.155	6.176	8	1.824	4.3.5
2462	6	-0.678	5.343	8	2.657	4.3.6

For Overlapped Antenna Array

Frequency [MHz]	Data Rate [Mbps]	Power spectral density per element [dBm/3kHz]	Power spectral density, 8 elements [dBm/3kHz]	Limit [dBm]	Margin [dB]	Plot Ref
802.11b Mode						
2412	1	-14.07	-5.04	8	13.04	4.3.7
2437	1	-9.54	-0.51	8	8.51	4.3.8
2462	1	-13.26	-4.23	8	12.23	4.3.9
802.11g Mode						
2412	6	-11.6	-2.57	8	10.57	4.3.10
2437	6	-9.59	-0.56	8	8.56	4.3.11
2462	6	-8.61	0.42	8	7.58	4.3.12

4.4. Conducted Spurious emissions

Reference document:	**47 CFR §15.247 (d)**		
Test Requirements:	In any 100 kHz bandwidth outside the frequency band in which the digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30dB instead of 20dB. Attenuation below the general limits specified in Section §15.209(a) is not required. 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) (See §15.205(c).		
Date of Test:	07.03.2006	**Comply**	
Test setup:	See sec 3.1, 20dB attenuator		
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 100kHz, VBW:300kHz		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.4.1 to 4.4.16	

Test results:
Measurements were done for single and Dual Access Channels; the results show the worst cases.

Spurious

Frequency [MHz]	Data Rate [Mbps]	Delta value [dBc]	Delta value Limit [dBc]	Reference	Result
802.11b Mode					
2412	1	*	-20	4.4.1	Comply
2437	1	*	-20	4.4.2	Comply
2462	1	*	-20	4.4.3	Comply
2412	11	*	-20	4.4.4	Comply
2437	11	*	-20	4.4.5	Comply
2462	11	*	-20	4.4.6	Comply
802.11g Mode					
2412	6	*	-20	4.4.7	Comply
2437	6	*	-20	4.4.8	Comply
2462	6	*	-20	4.4.9	Comply
2412	54	*	-20	4.4.10	Comply
2437	54	*	-20	4.4.11	Comply
2462	54	*	-20	4.4.12	Comply

*All emission at least 20 dB below the limit (40 dBc)

Band edge

Frequency [MHz]	Data Rate [Mbps]	Delta value [dBc]	Delta value Limit [dBc]	Reference	Result
802.11b Mode					
2412	11	-39.75	-20	4.4.13	Comply
2462	11	-43	-20	4.4.14	Comply
802.11g Mode					
2412	54	-41.81	-20	4.4.15	Comply
2462	54	-37.3	-20	4.4.16	Comply

4.5. Radiated Emissions, restricted Bands

Reference document:	**47 CFR §15.247 (d) & §15.205**		
Test Requirements:	Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in section 15.209(a) (See section 5.205(c)).		
Date of Test:	13.03.2006	**Comply**	
Test setup:	See sec 3.2, 26dB attenuator		
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1MHz, VBW: 3MHz, Average: VBW: 10 Hz		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.5.1 to 4.5.16	

Test results:
Measurements were done for single and Dual Access Channels; the results show the worst cases.

Frequency [MHz]	Data Rate [Mbps]	Antenna Gain [dBi]	Emission frequency [MHz]	Detector Type	Pol. V/H	Emission Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
802.11b Mode								
2412	11	17.6	2390	Avg	H	47.78	54	6.22
2412	11	17.6	2386.18	Peak	V	60.55	74	13.45
2462	11	17.6	2483.58	Avg	V	50.34	54	3.66
2462	11	17.6	2485.77	Peak	V	62.83	74	11.17
802.11g Mode								
2412	54	17.6	2389.55	Avg	V	49.26	54	4.74
2412	54	17.6	2369.75	Peak	H	59.14	74	14.86
2462	54	17.6	2483.5	Avg	V	52.36	54	1.64
2462	54	17.6	2483.67	Peak	V	66.65	74	7.35
All other emission at least 20 dB below the limit								

Note: Spurious Emission [dBµV/m] = measured [dBµV] + Correction-factor [dB (1/m)]
Correction Factor = Antenna factor + Cable Loss

4.6. Spurious Emission- Radiated (Transmitter)

Reference document:	**47 CFR §15.247 (d) & §15.209(a)**		
Test Requirements:	The emissions from an intentional radiator shall not exceed the field strength levels specified in §15.209(a).		
Date of Test:	19.03.2006	**Comply**	
Test setup:	See sec 3.2, Band Reject filter		
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 1MHz, VBW: 3MHz		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.6.1 to 4.6.48	

Test result

All measurements were done in horizontal and vertical polarizations for single and Dual Access Channels; the results show the worst cases.

Frequency [MHz]	Data Rate [Mbps]	Antenna Gain	Spurious frequency [MHz]	Detector Type	Pol. V/H	Spurious Level [dBµV/m]	Limit [dBµV/m]	Margin [dB]
802.11b Mode								
2412	11	17.6	4824	Avg	H	27.6	54	26.4
2437	11	17.6	4874	Avg	H	28.2	54	25.8
2462	11	17.6	4924	Avg	H	26.3	54	27.7
2412	11	17.6	4824	Peak	H	40.3	74	33.7
2437	11	17.6	4874	Peak	H	42.7	74	31.3
2462	11	17.6	4924	Peak	H	42.5	74	31.5
All other emissions at least 30 dB below the limit								
802.11g Mode								
2462	54	10.5	4929	Avg	H	25.6	54	28.4
2462	54	10.5	4929	Peak	H	40.8	74	33.2
All other emission at least 30 dB below the limit								

Note: Spurious Emission [dBµV/m] = measured [dBµV] + Correction-factor [dB (1/m)]
Correction Factor = Antenna factor + Cable Loss +Filter I/L.

4.7. Radiated Emission

Reference document:	**47 CFR §15.109/209**		
Test Requirements:	Emission Level shall not exceed §15.109 & §15.209(a) limits		
Date of Test:	09.03.2006	**Comply**	
Test setup:	See sec 3.2,		
Method of testing:	Radiated		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 120kHz,VBW**:** 300kHz		
Mode of operation:	Receive		
Environment conditions:	Ambient Temperature: 22°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.7.1 to Plot 4.7.4	

Test results:

Measurements were done for single and Dual Access Channels; the results show the worst cases.

Frequency [MHz]	Emission Level [dBµV/m]	Detector Type	Pol. V/H	Limit [dBµV/m]	Margin [dB]
43.778400	30.0	QP	V	40	-10
45.257000	26.3	QP	V	40	-13.7
225.010519	29.6	QP	H	40	-10.4
250.003600	32.6	QP	H	47	-14.4
324.996100	39.9	QP	H	47	-7.1
374.994450	36.9	QP	H	47	-10.1

Note: Emission Level [dBµV/m] = measured [dBµV] + Correction-factor [dB (1/m)]
Correction Factor = Antenna factor + Cable Loss

4.8. Power line Conducted Emission

Reference document:	**47 CFR §15.107/207**		
Test Requirements:	For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in §15.107 & §15.207.		
Date of Test:	20.03.2006	**Comply**	
Test setup:	See sec 3.3,		
Method of testing:	Conducted		
Operating conditions:	Under normal test conditions		
S.A. Settings:	RBW: 9kHz,VBW**:** 30 kHz,		
Mode of operation:	Receive/Transmit		
Environment conditions:	Ambient Temperature: 21°c	Relative Humidity: 48%	Atmospheric Pressure: 1011.4 hPa
Test Result:	See below	See Plot 4.8.1 – Plot 4.8.2	

Test Result

110VAC, "Phase" Lead

Frequency [MHz]	Measured Result [dBµV]		Limit [dBµV]		Margin [dB]		Result
	QP	AVR	QP	AVR	QP	AVR	
0.21971	54.5	21.3	62.83	52.83	-8.33	-31.53	Comply
0.276552	49.5	16.8	60.92	50.92	-11.42	-34.12	Comply
0.529913	30.5	30	56.00	46.00	-25.50	-16.00	Comply
0.970253	30.7	29.5	56.00	46.00	-25.30	-16.50	Comply
4.147413	27.4	24.1	56.00	46.00	-28.60	-21.90	Comply
19.15	26.8	22.1	60.00	50.00	-33.20	-27.90	Comply

110VAC, "Neutral" Lead

Frequency [MHz]	Measured Result [dBµV]		Limit [dBµV]		Margin [dB]		Result
	QP	AVR	QP	AVR	QP	AVR	
0.15	52.2	21.3	66.00	56.00	-13.80	-34.70	Comply
0.269230	45.6	18.9	61.14	51.14	-15.54	-32.24	Comply
0.331907	37.7	5.8	59.40	49.40	-21.70	-43.60	Comply
0.529477	31.8	31.4	56.00	46.00	-24.20	-14.60	Comply
0.705984	31.5	31.1	56.00	46.00	-24.50	-14.90	Comply
11.21	28.4	23.8	60.00	50.00	-31.60	-26.20	Comply

4.9. Antenna Connector Requirements

Reference document:	**47 CFR §15.203**	
Test Requirements:	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with provisions of this section.	
Result:	The WLS-2100F employs an internal antenna with a unique MCX connector and needs professional installation.	**Comply**

4.10. Maximum Permissible Exposure (MPE)

Reference document:	**47 CFR §15.247(i) & §1.1307(b)(1)**	
Test Requirements:	According to §1.1307(b)(1), 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 energy level in excess of the commission's guideline.	
Limit	1mW/cm^2	**Comply**
Calculation Result*:	Power Density = 0.78 mW/cm^2 at a sphere of 20cm. The SAR measurement is not required.	

* Equation (3) given in OET Bulletin 65 is used to estimate the MPE distance.

$$S = \frac{PG}{4\pi R^2}$$

S=power density, in mW/cm^2
P=power input to the antenna, in mW
G=numeric gain of the antenna,
R= distance to the center of the antenna, in cm

MPE levels at 20cm are calculated as follows:

Frequency [MHz]	Data Rate [Mbps]	MPE Distance [cm]	Total Output Power, 4 elements [mW]	Antenna Gain [dBi]	Power density [mW/cm^2]	Limit [mW/cm^2]	Margin [mW/cm^2]
Single Access Channel, Worst-Case							
2412	1	20	258	11.8	0.78	1	0.22
2437	1	20	240	11.8	0.72	1	0.28
2462	1	20	228	11.8	0.69	1	0.31
Dual Access Channels							
2412	1	20	54.2	9.8	0.10	1	0.90
2437	1	20	62.08	9.8	0.12	1	0.88
2462	1	20	65.76	9.8	0.13	1	0.87
2412	6	20	54.96	11.8	0.17	1	0.83
2437	6	20	66.84	11.8	0.20	1	0.80
2462	6	20	59.32	11.8	0.18	1	0.82

MPE distance is calculated as follows:

Frequency [MHz]	Data Rate [Mbps]	Power density [mW/cm^2]	Total Output Power, 4 elements [mW]	Antenna Gain [dBi]	MPE Distance [cm]	Limit [cm]	Margin [cm]
Single Access Channel, Worst-Case							
2412	1	1	258	11.8	17.64	20	2.36
2437	1	1	240	11.8	17.02	20	2.98
2462	1	1	228	11.8	16.58	20	3.42
Dual Access Channels							
2412	1	1	54.2	9.8	6.42	20	13.58
2437	1	1	62.1	9.8	6.87	20	13.13
2462	1	1	65.8	9.8	7.07	20	12.93
2412	6	1	55.0	11.8	8.14	20	11.86
2437	6	1	66.8	11.8	8.98	20	11.02
2462	6	1	59.3	11.8	8.45	20	11.55

When operating as single access channel, the worst case MPE occurs at 2412 MHz, 1 Mbps, 24.12 dBm power, 11.8 dBi antenna gain. The maximum exposure level in this scenario is of 0.78 mW/cm^2 at a distance of 20 cm. To maintain compliance, installations will assure a separation distance of at least 20 cm even if the calculations indicate that the MPE distance may be less.

When operating as dual access channel with overlapping, the worst case MPE occurs at 2462 MHz, 1 Mbps, 17.34 dBm power, 9.8 dBi antenna gain and 2437 MHz, 6 Mbps, 18.25 dBm power, 11.8 dBi antenna gain. The maximum exposure level in this scenario is of 0.30 mW/cm^2 at a distance of 20 cm. To maintain compliance, installations will assure a separation distance of at least 20 cm even if the calculations indicate that the MPE distance may be less.

5. Appendix

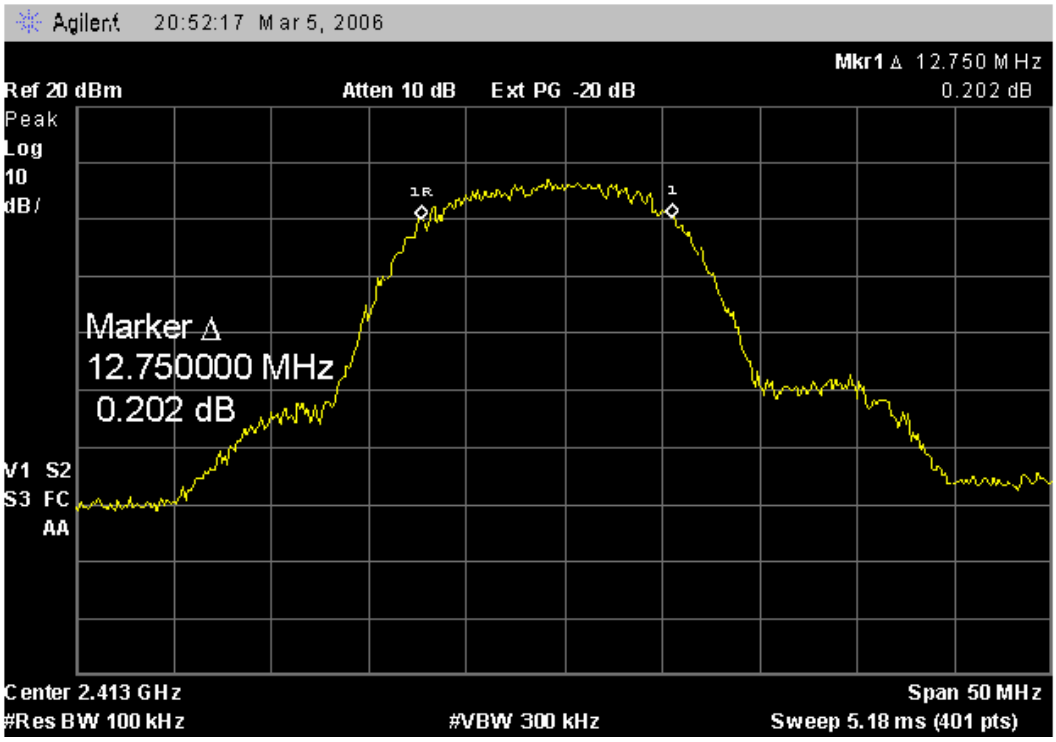
Appendix A: List of Measuring Equipment used:

Equipment	Manufacturer/ Model	Serial Number	Due date
CISPR16 EMI Receiver	HP8546A	3710A00392	30-06-06
Spectrum Analyzer 9kHz ÷ 22 GHz	HP 8593EM	3536A00131	30-06-06
Spectrum Analyzer 100 Hz ÷ 26.5 GHz	Agilent E7405A	US41160436	30-06-06
LNA Amplifier 1 GHz ÷ 18 GHz	AMP – 5D-010180-30-10P-GW	618653	30-06-06
Dual Ridged Guide Ant.1-18 GHz	EMCO 3115	9602-4677	30-06-06
Antenna 18 GHz ÷ 26.5 GHz	Alpha Industry 861A/599	505	30-06-06
Turn table	HD100	100/693	-
Antenna Mast	HD 100	100/693	-
Biconical 20 –200 MHz	Schwarzbeck VHBB9124	9124/0255	16-05-06
Log-Periodic 200 – 1000 MHz	Schwarzbeck VUSLP9111	VUSLP9111184	16-05-06
Pre-Amplifier	MiTeq, AMF-5F-18002650-30-10P	945372	30-06-06
LISN	Fischer 50/250-25-2	-	30-06-06
Transient Limiter	HP11947A	-	30-06-06
Notch Filter	Micro-Tronics BRM50702-05	0001	30-06-06

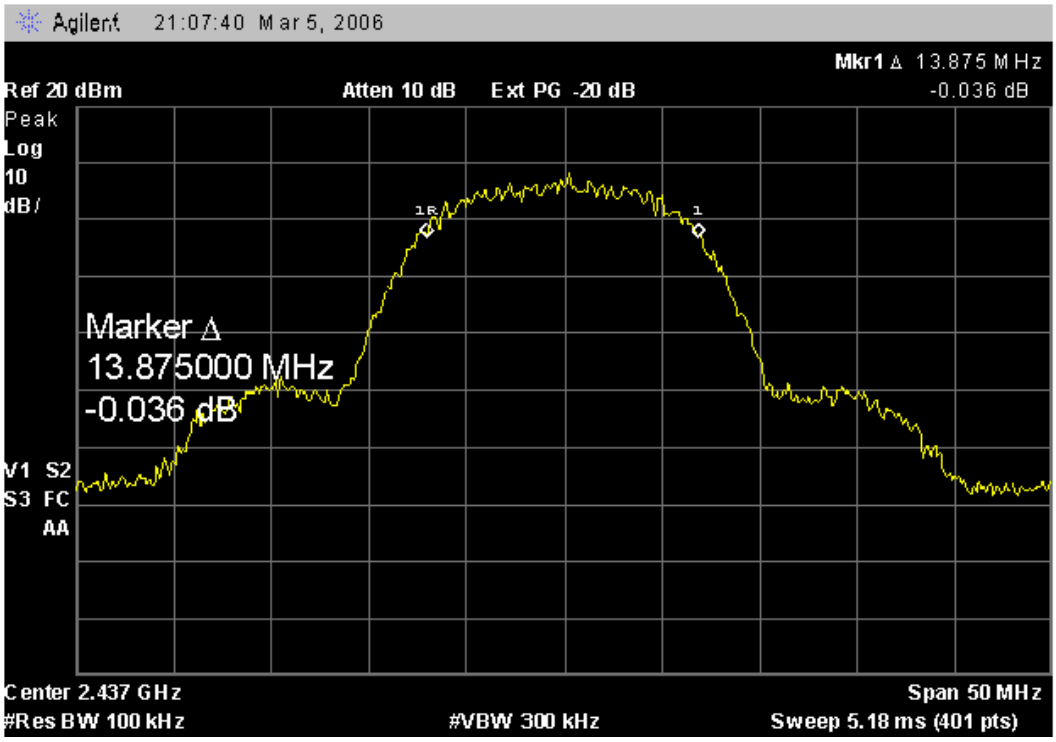
Appendix B: Uncertainty of Measurement:

Test Name	Test Method & Range	Uncertainty	
		Combined std. Uc(y) [dB]	Expanded U [dB]
Radiated Emission	30MHz÷230MHz, Horiz. polar. 30MHz÷230MHz, Ver. polar. 230MHz÷1000MHz, Horiz. polar. 230MHz÷1000MHz, Vert. polar.	1.8 1.967 1.487 1.499	3.6 3.934 2.973 2.998
Conducted Emission	9 kHz÷150 kHz 150 kHz÷30MHz	1.378 1.095	2.756 2.190

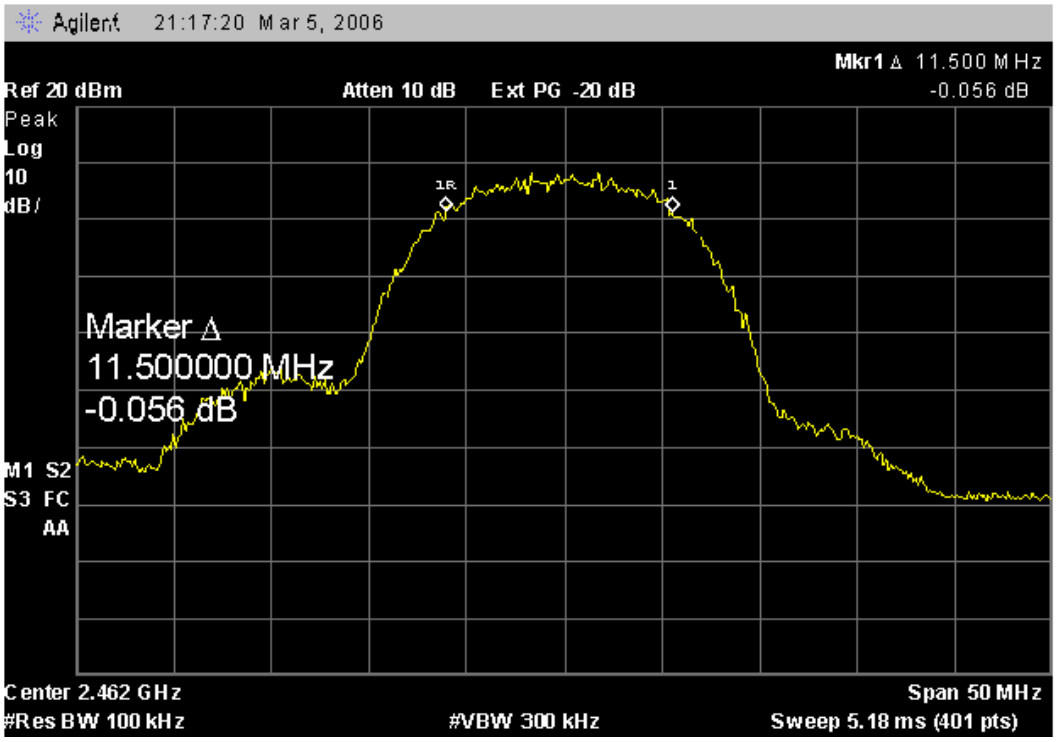
4.1: 6dB Bandwidth
802.11b Mode
Plot 4.1.1



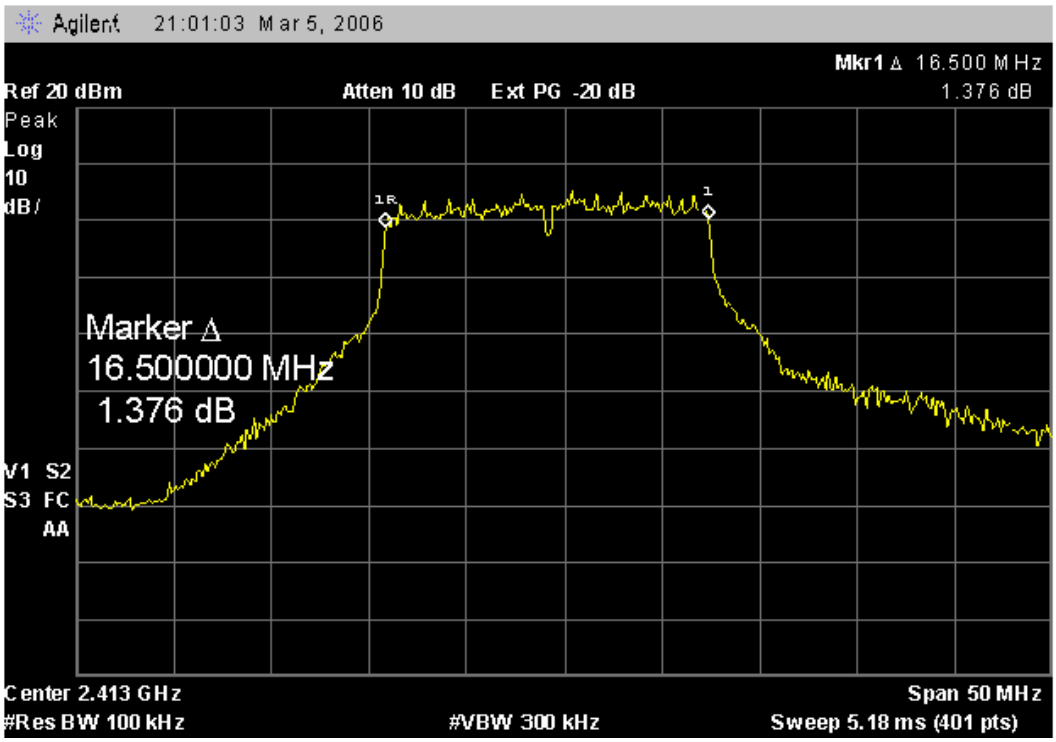
Plot 4.1.2



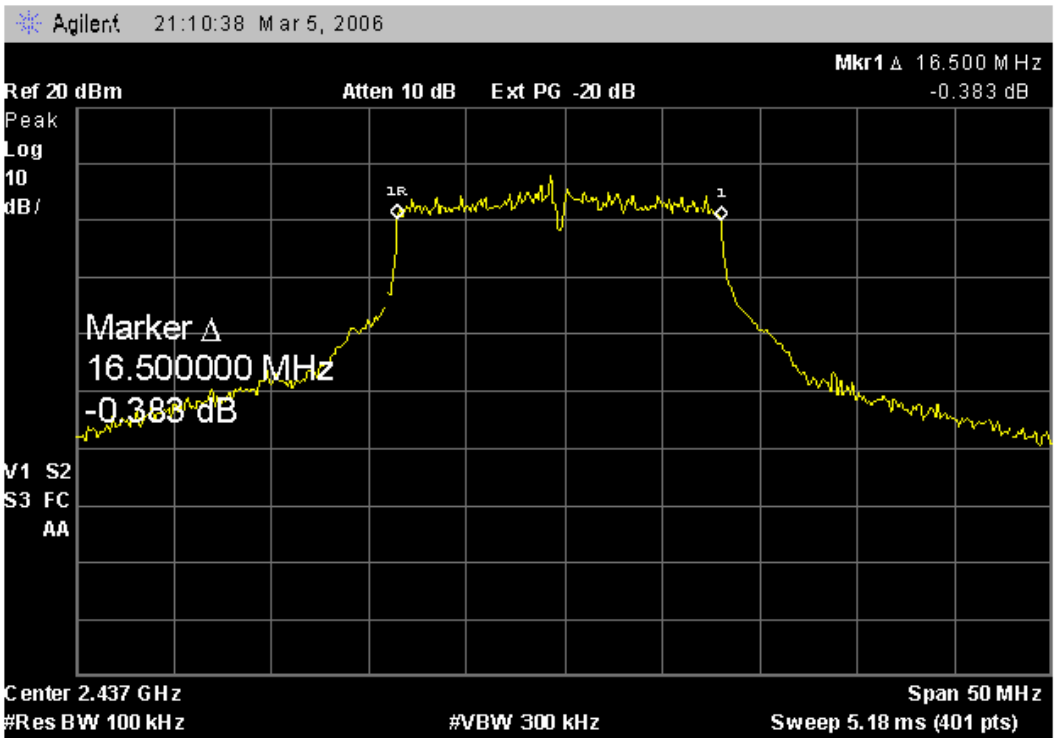
Plot 4.1.3



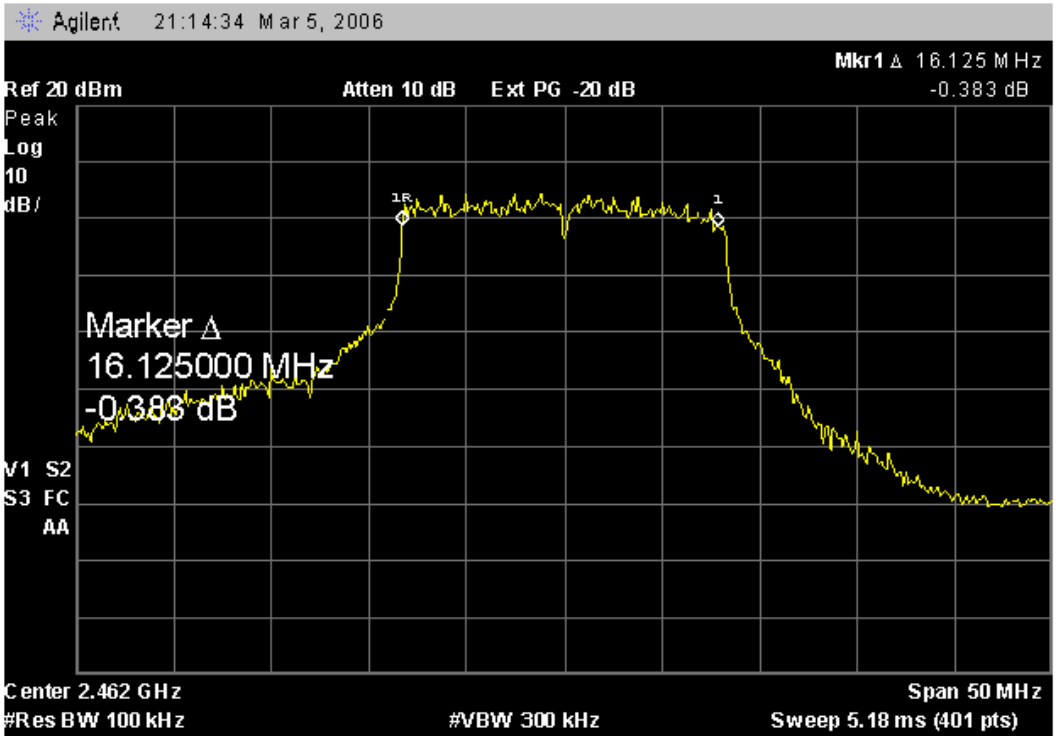
802.11g Mode
Plot 4.1.4



Plot 4.1.5

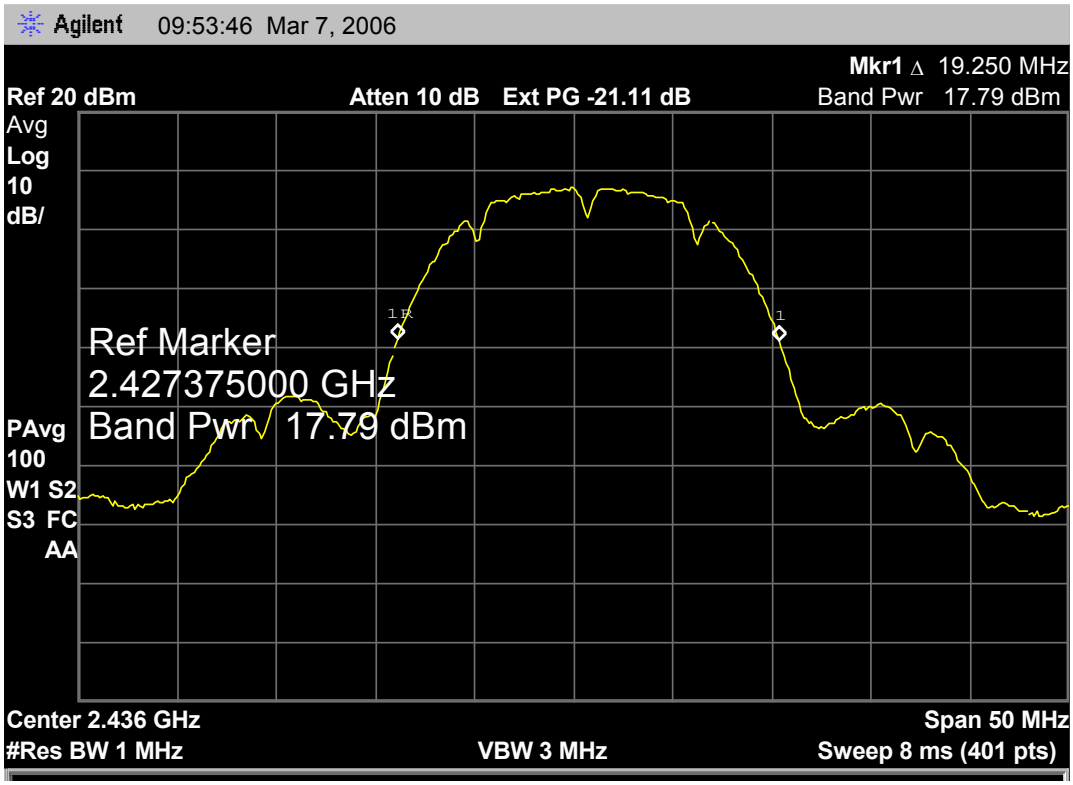


Plot 4.1.6

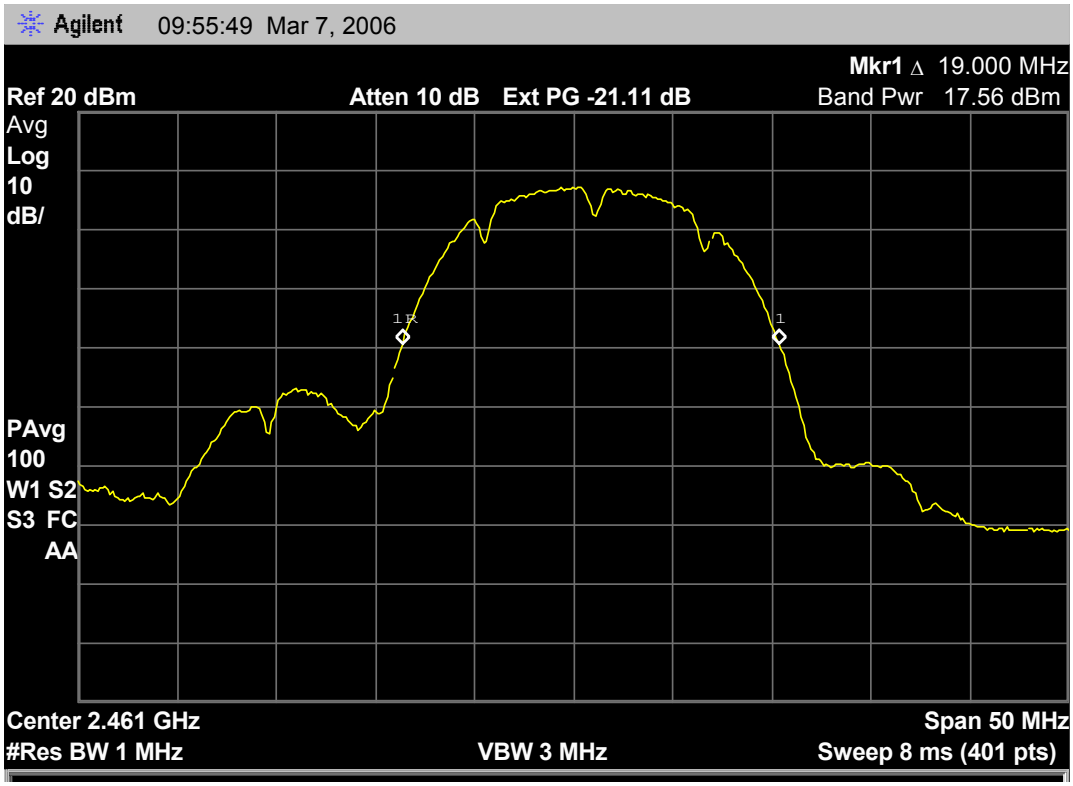


Peak output power
For 15.6 dBi & 17.6 dBi Antenna Array
802.11b Mode
Plot 4.2.1

Plot 4.2.2



Plot 4.2.3

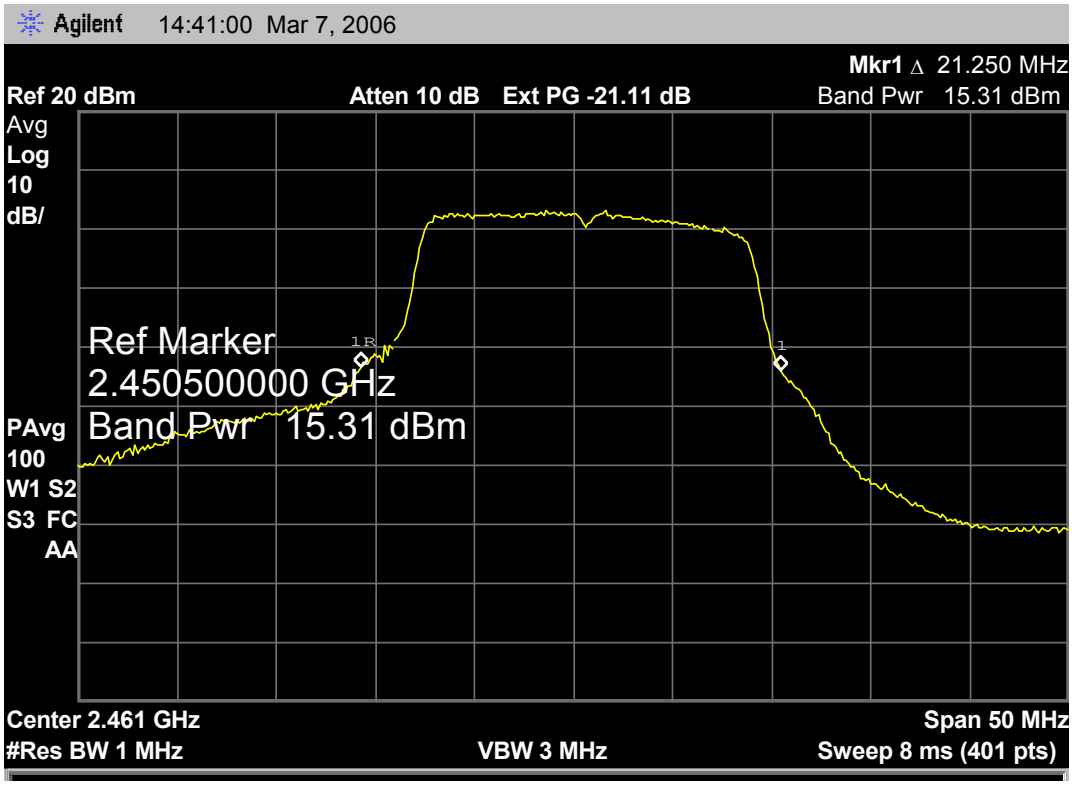


802.11g Mode

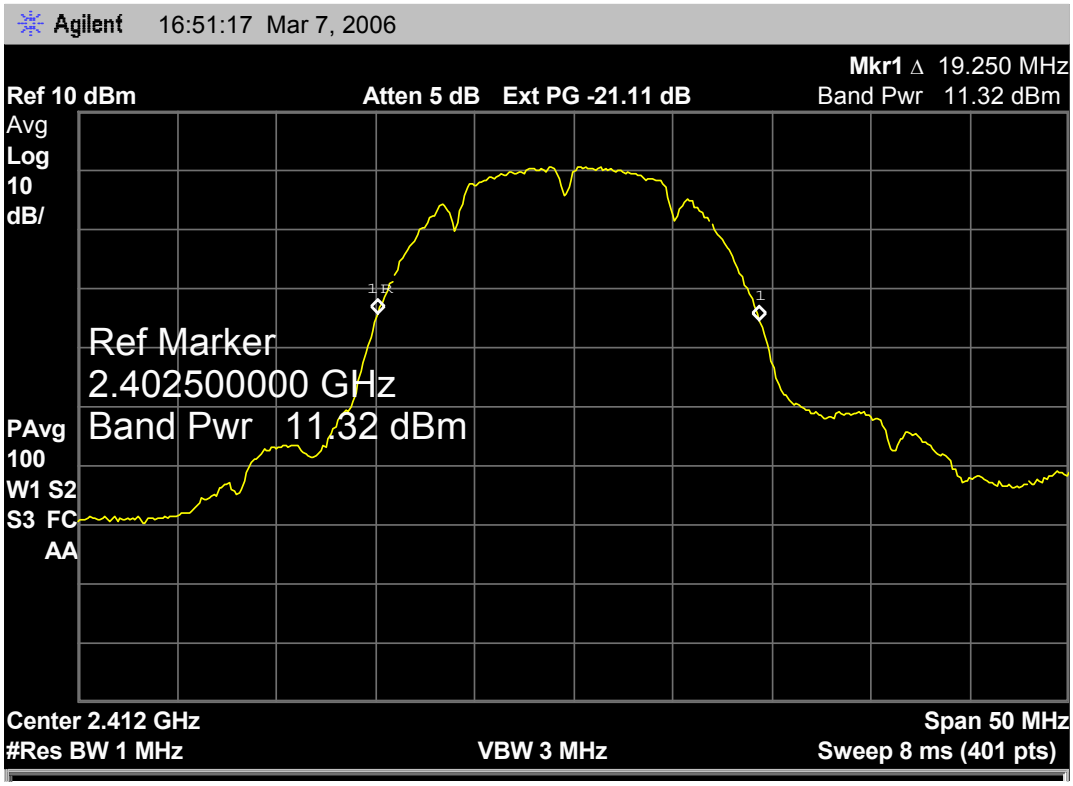
Plot 4.2.4

Plot 4.2.5

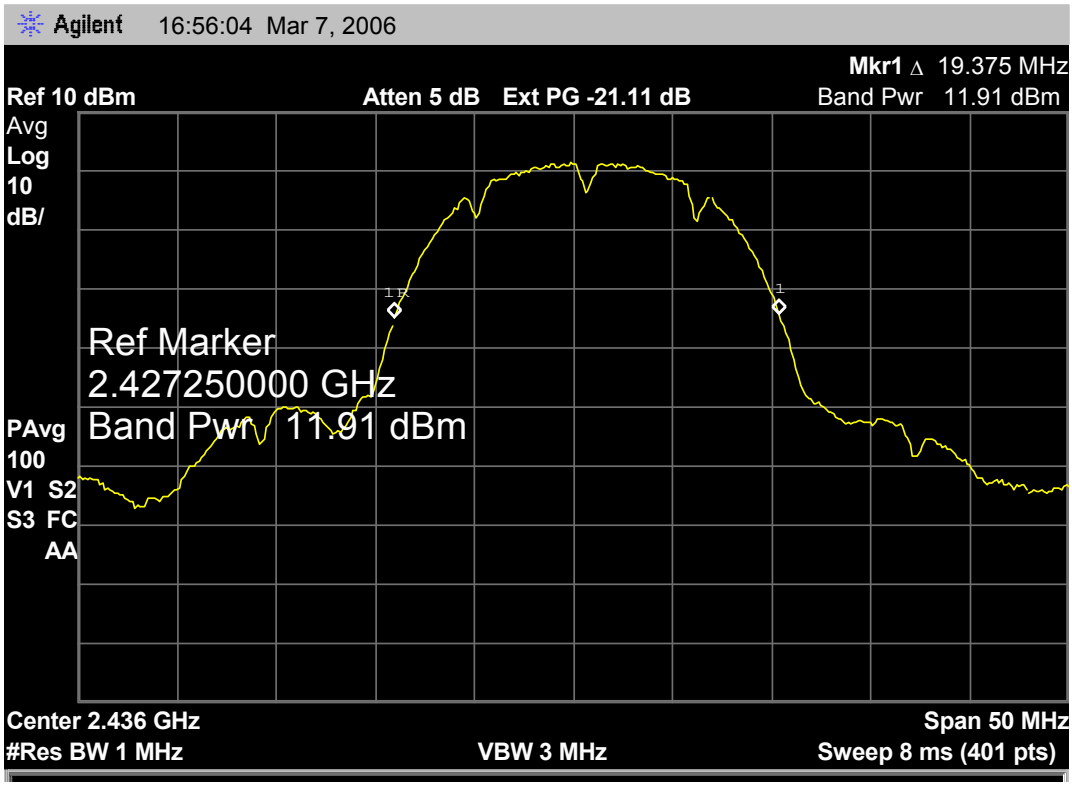
Plot 4.2.6



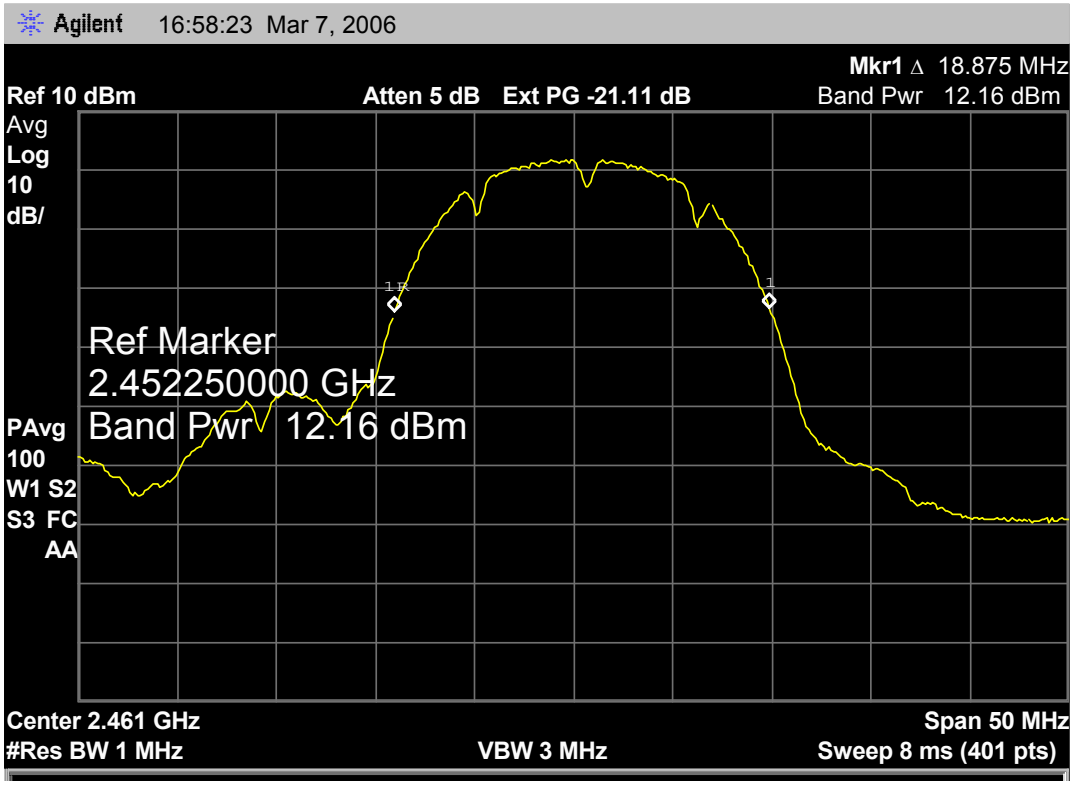
For overlapped antenna array
802.11b Mode
Plot 4.2.7



Plot 4.2.8

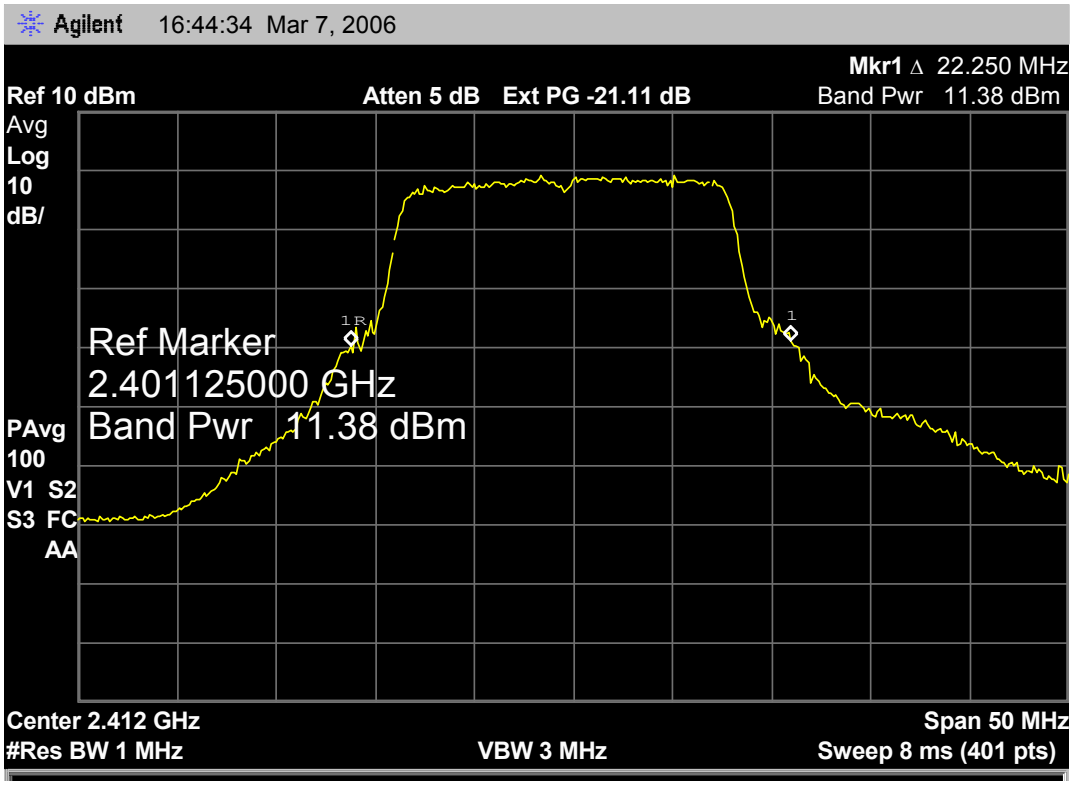


Plot 4.2.9

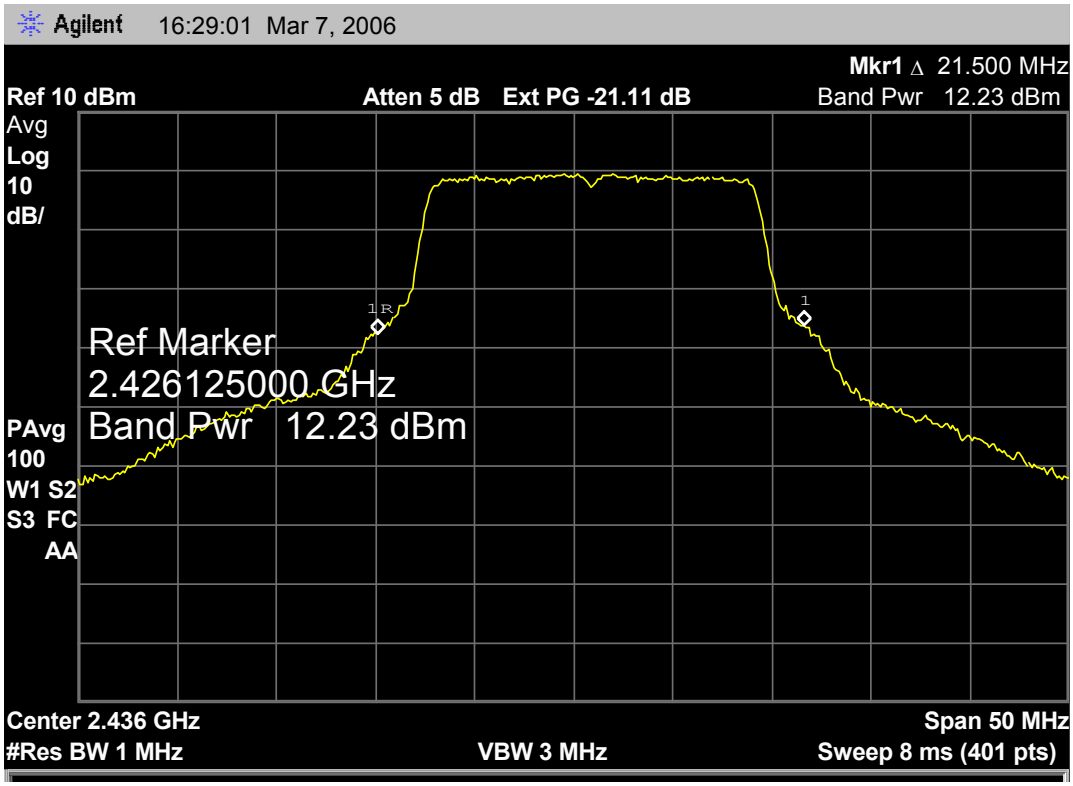


802.11g Mode

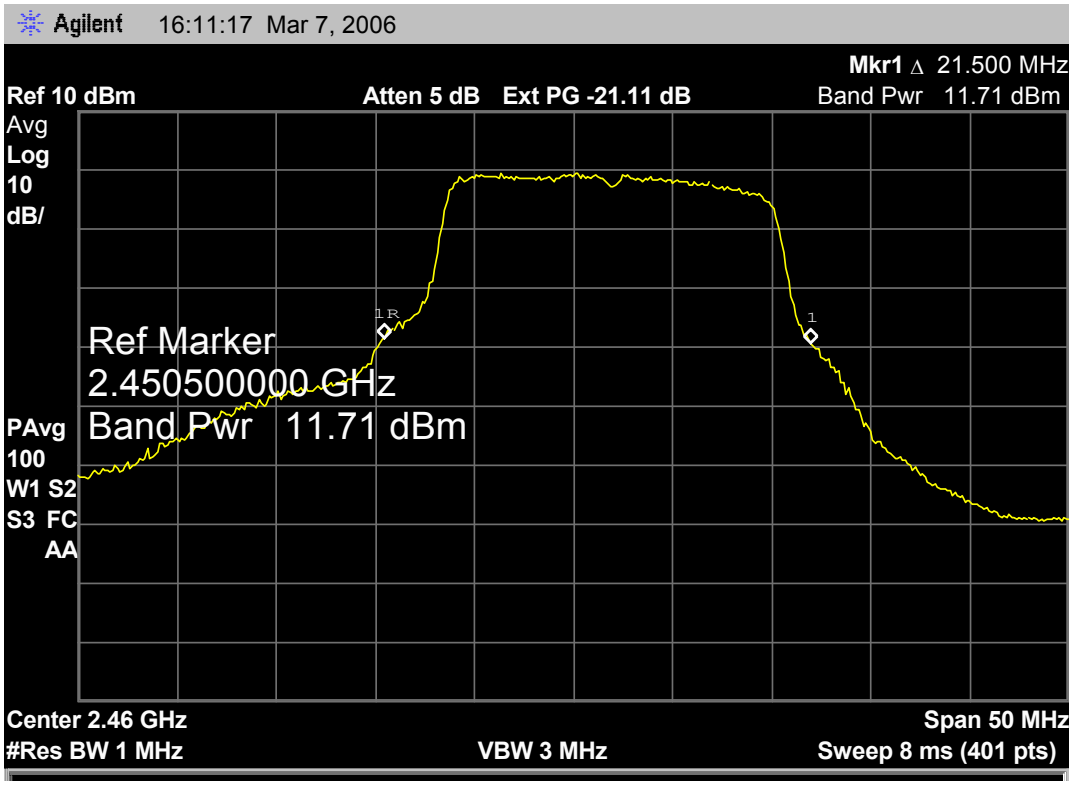
Plot 4.2.10



Plot 4.2.11



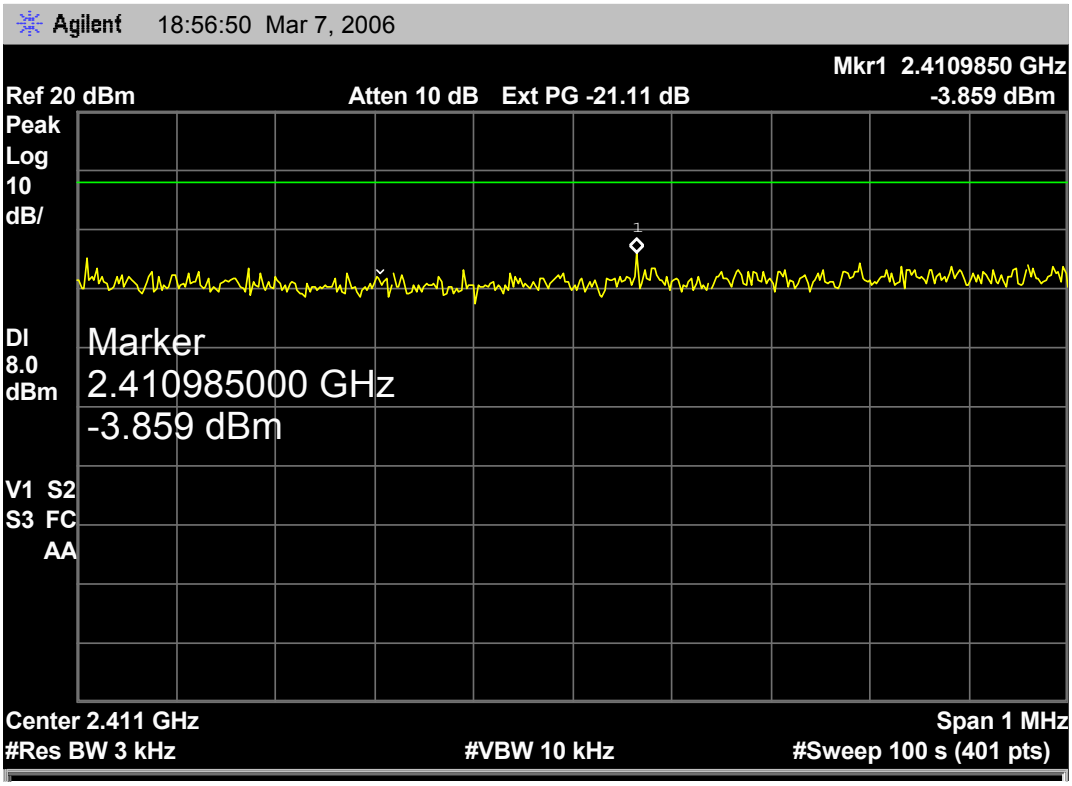
Plot 4.2.12



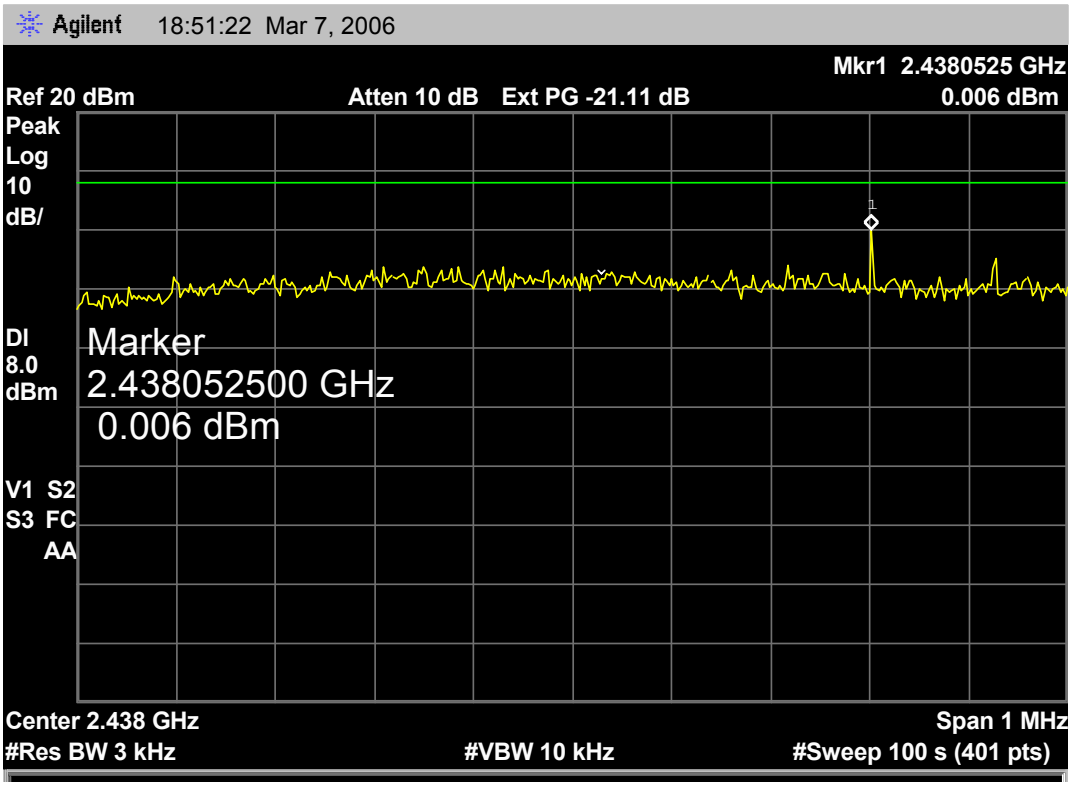
4.3: Peak Power Spectral Density

802.11b Mode

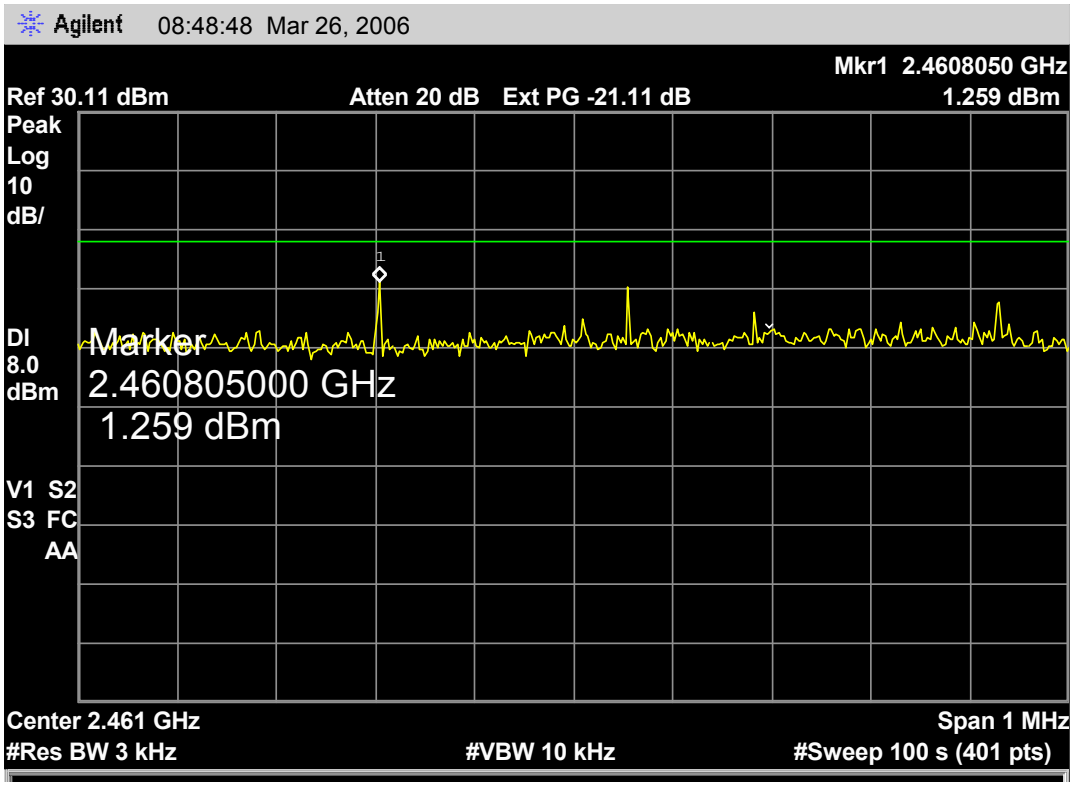
Plot 4.3.1



Plot 4.3.2

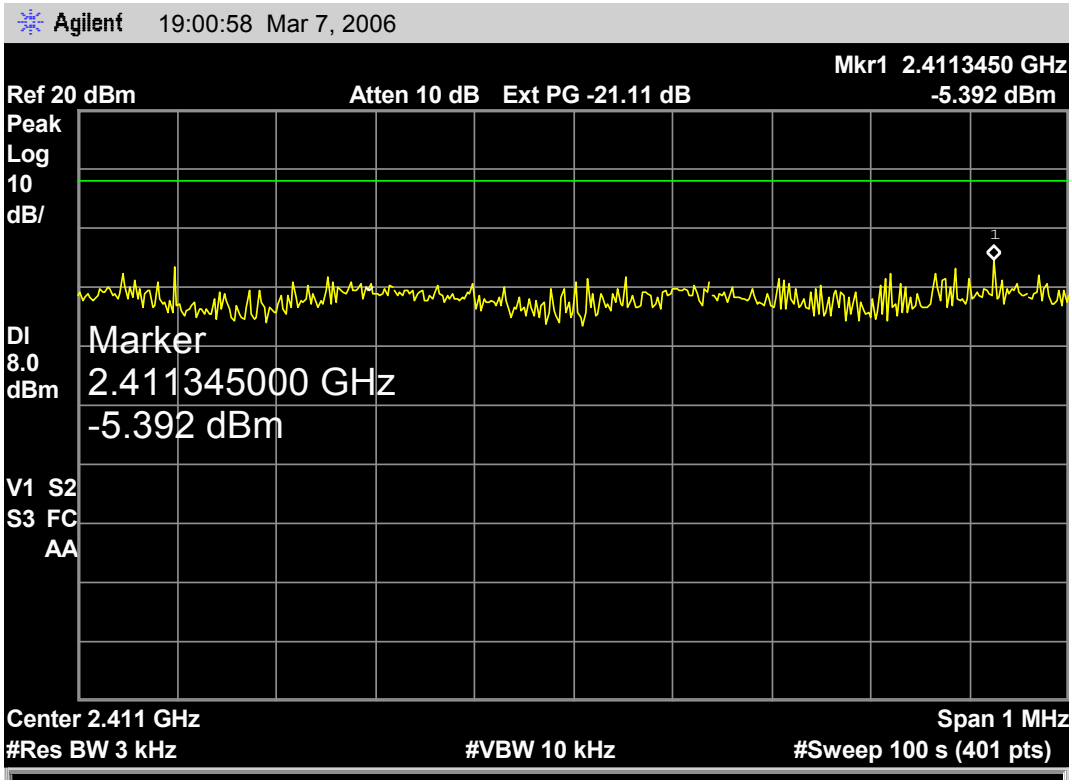


Plot 4.3.3

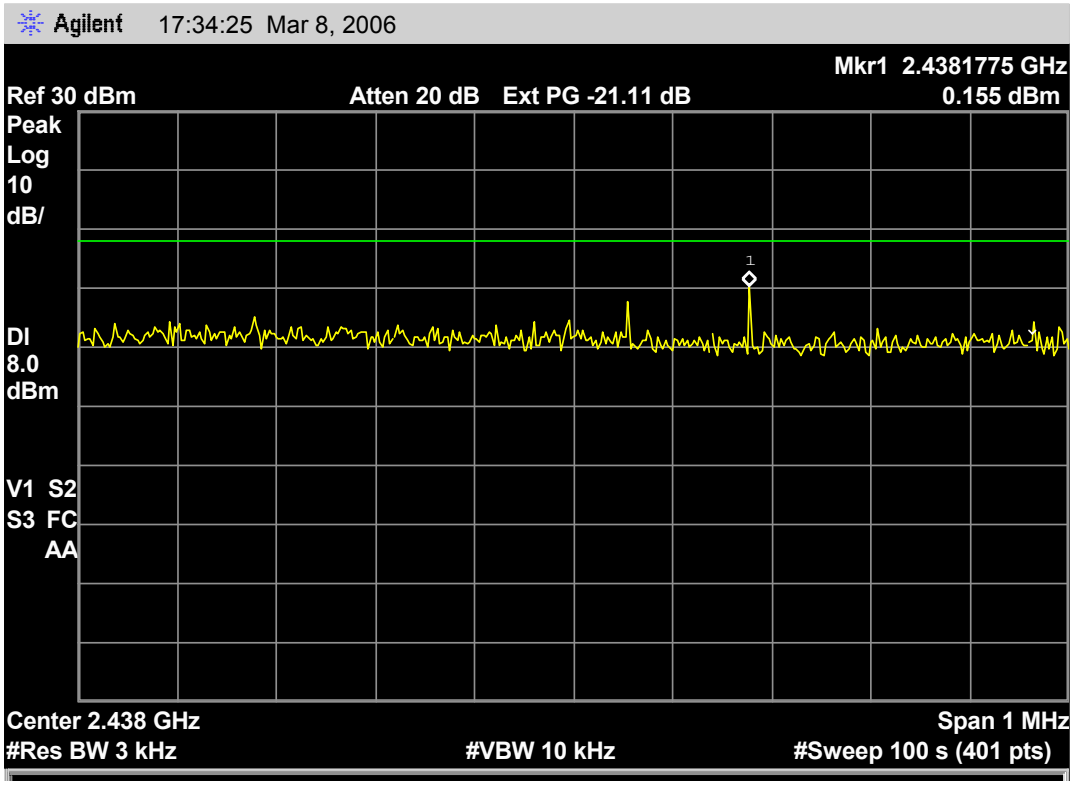


802.11g Mode

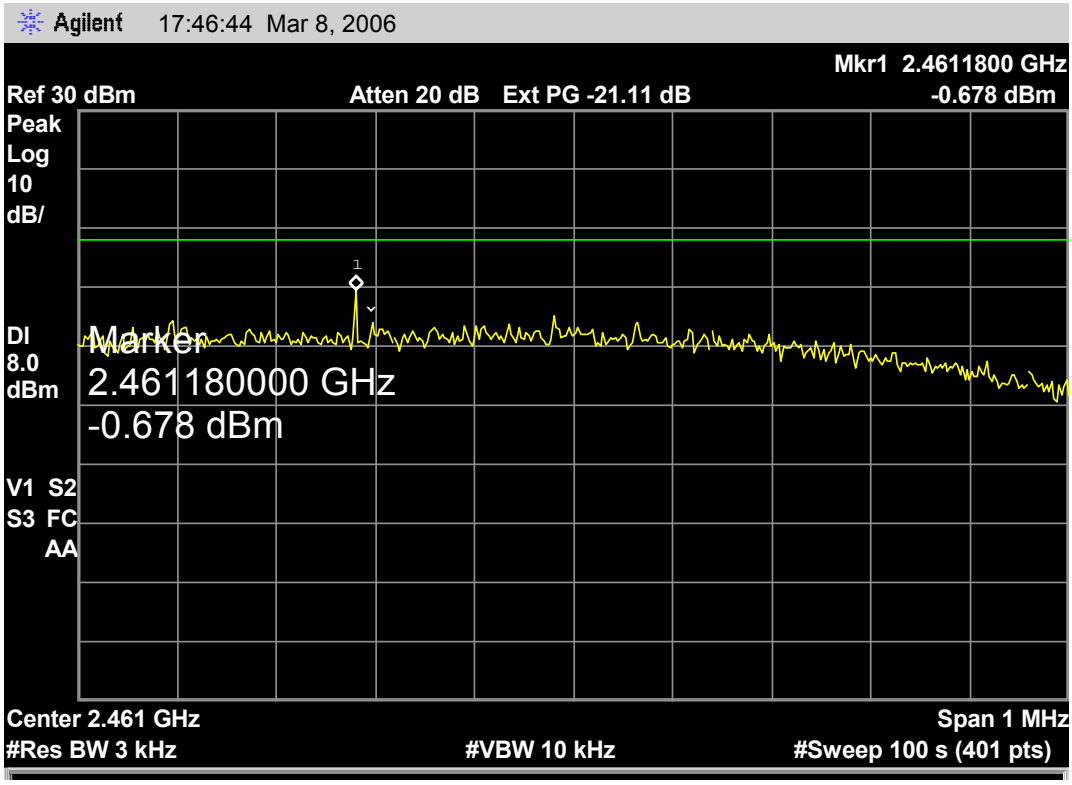
Plot 4.3.4



Plot 4.3.5

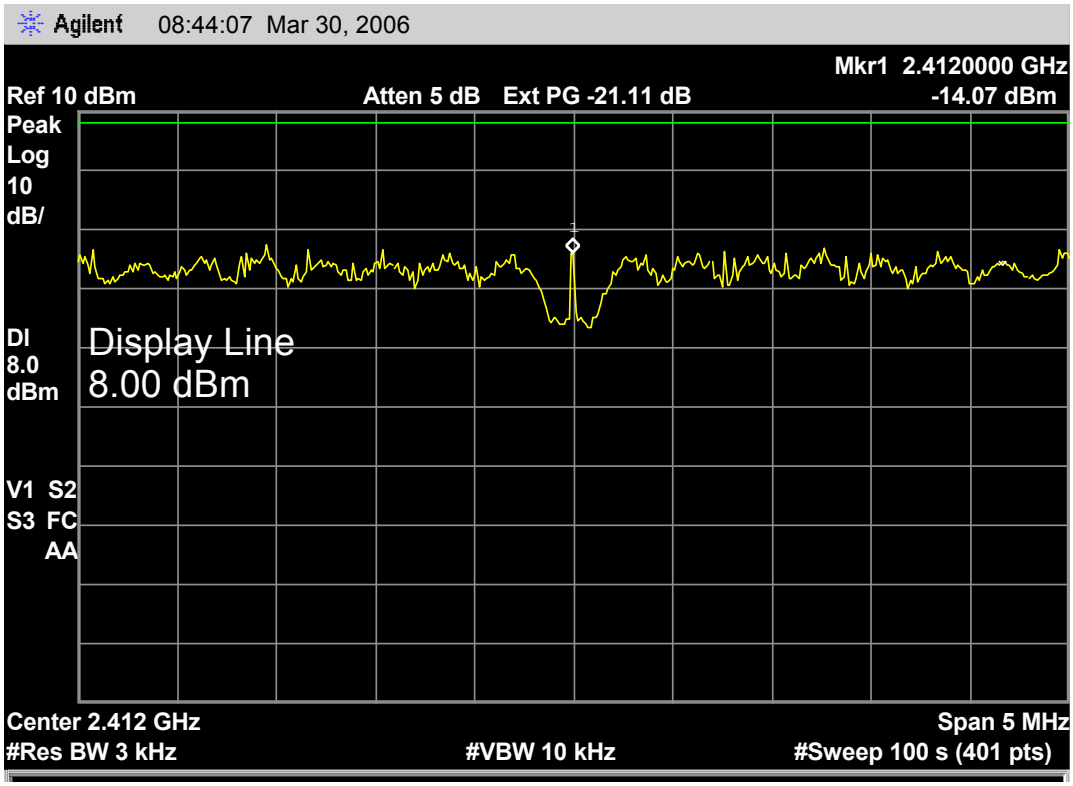


Plot 4.3.6

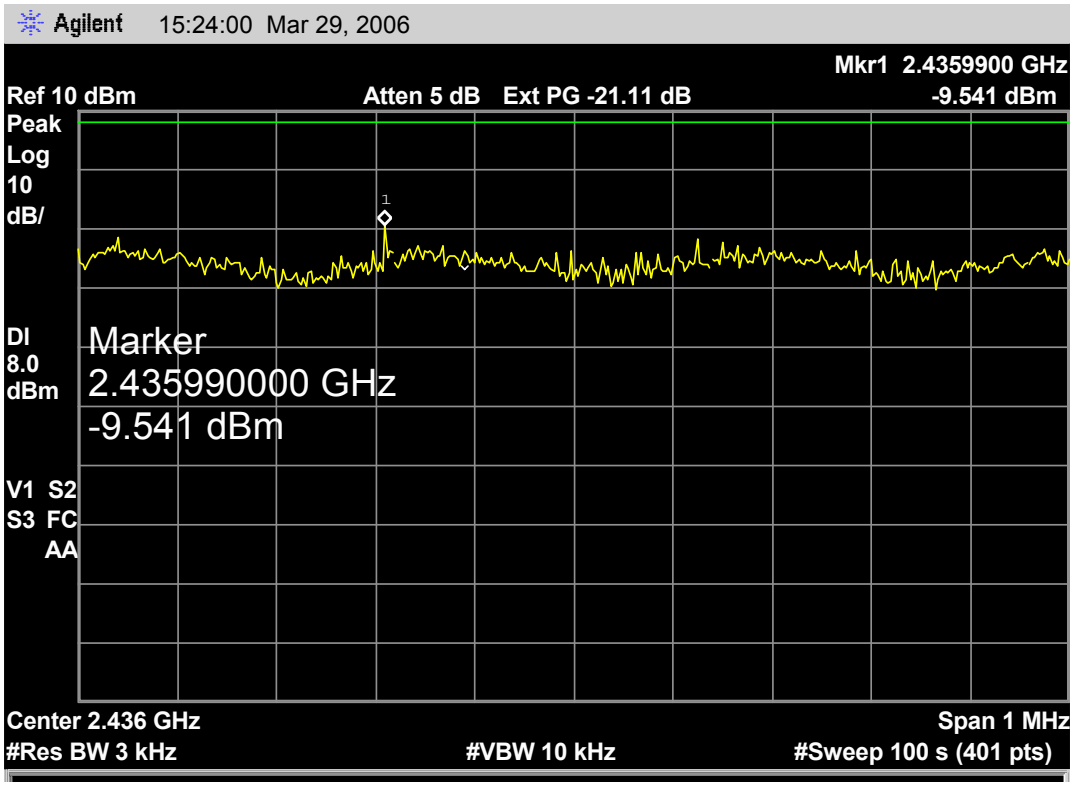


802.11b Mode For Overlapped antenna Array

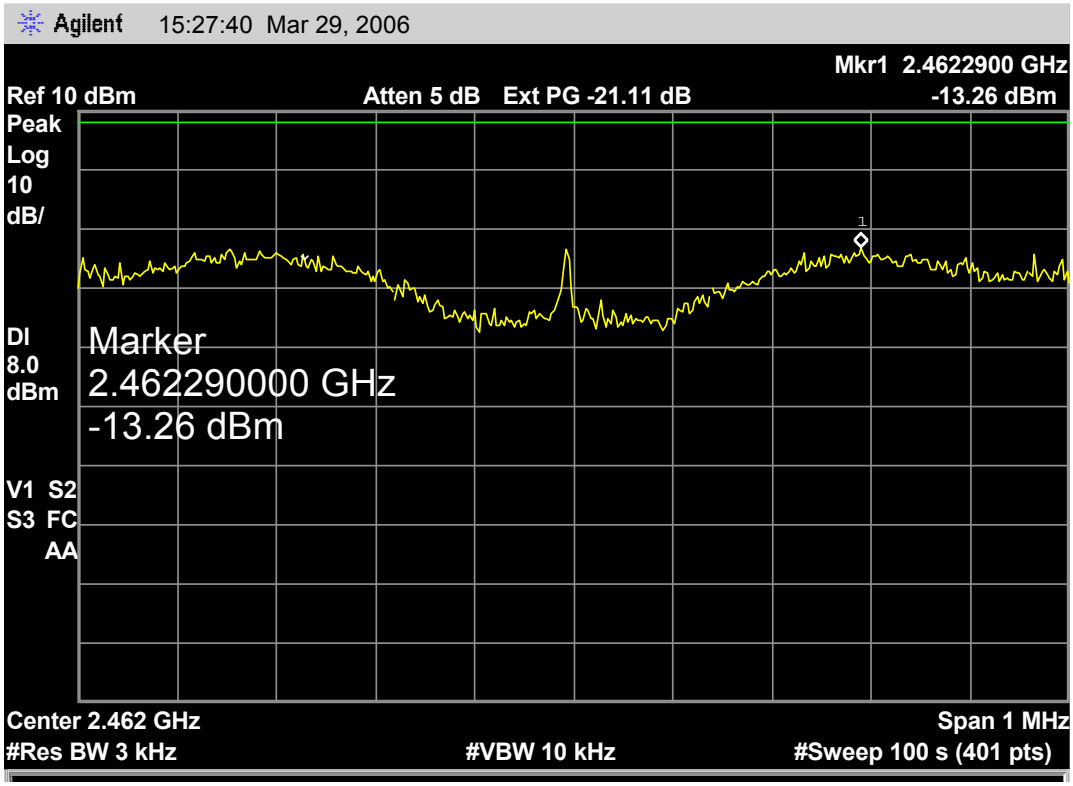
Plot 4.3.7



Plot 4.3.8

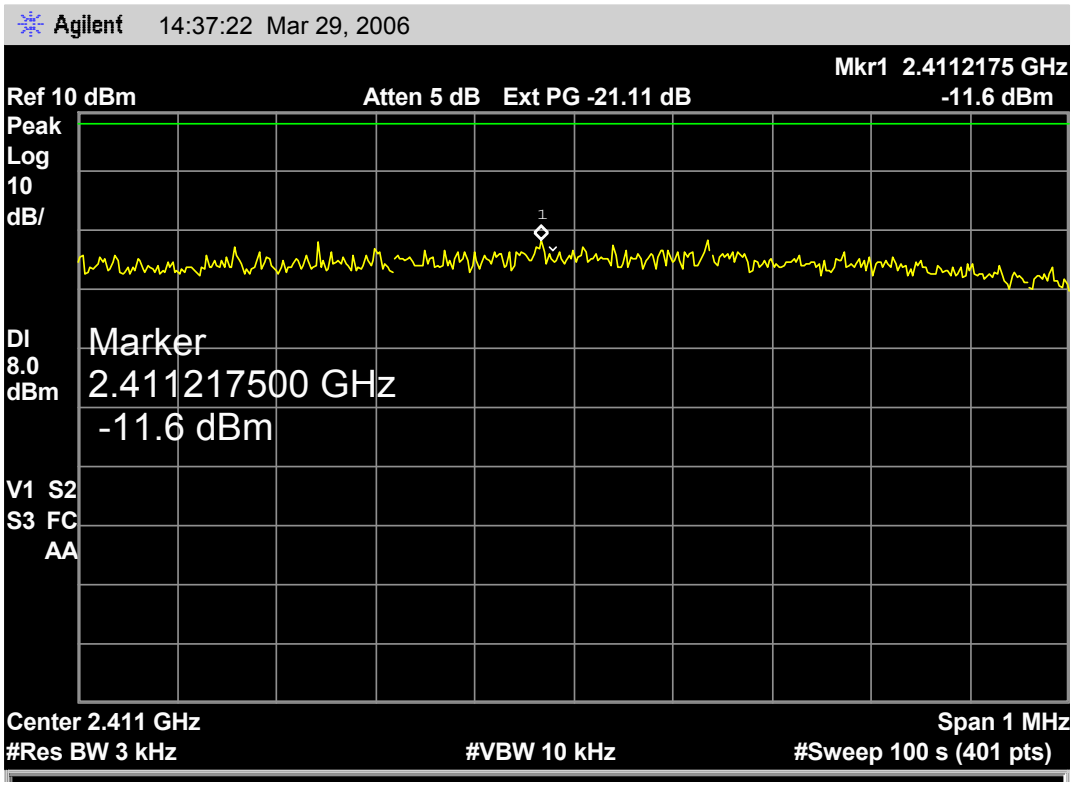


Plot 4.3.9

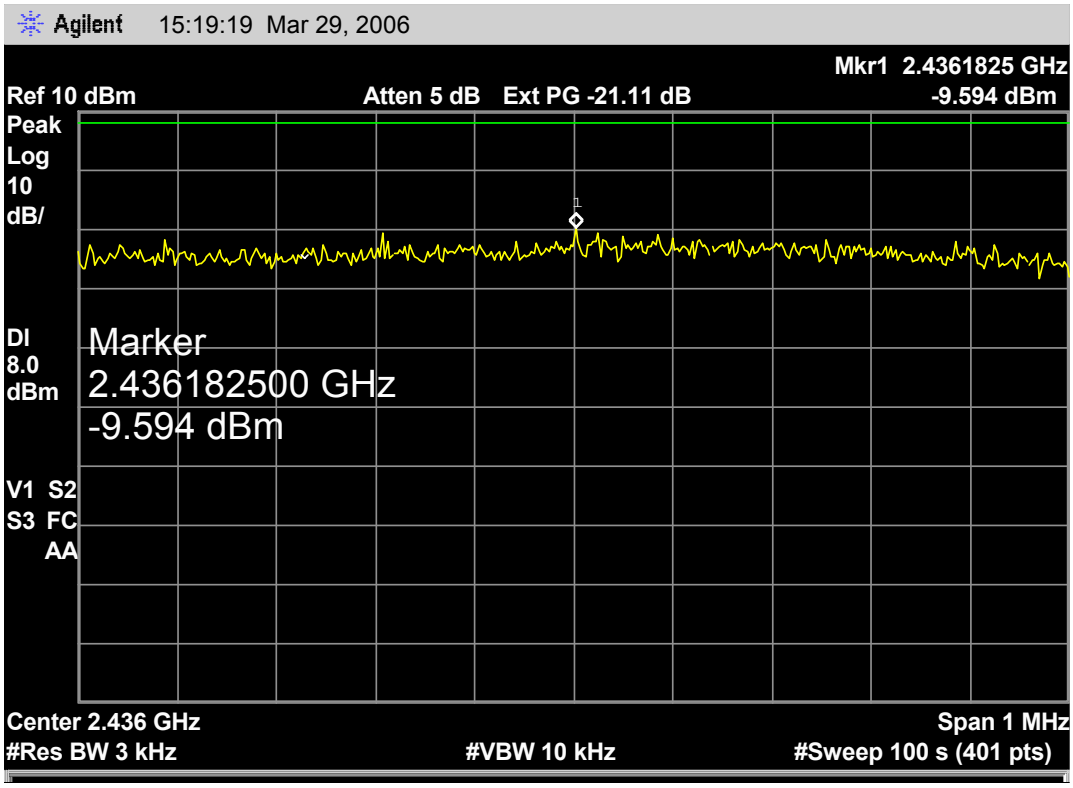


802.11g Mode For Overlapped antenna Array

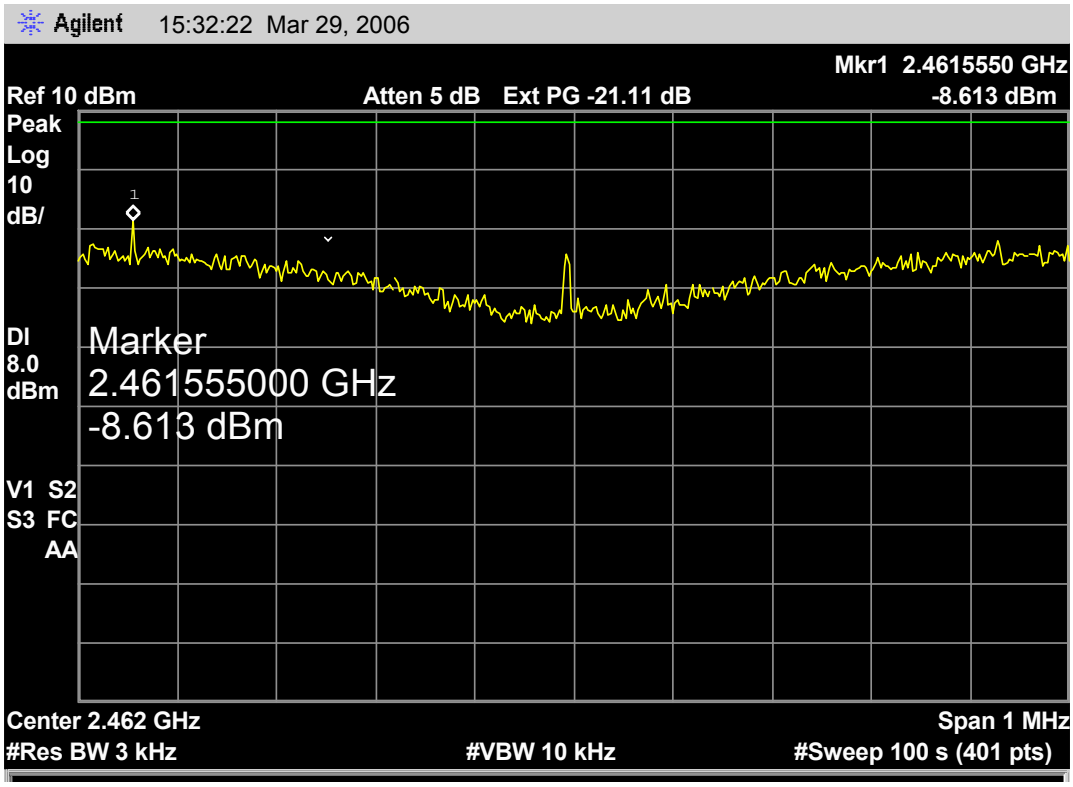
Plot 4.3.10



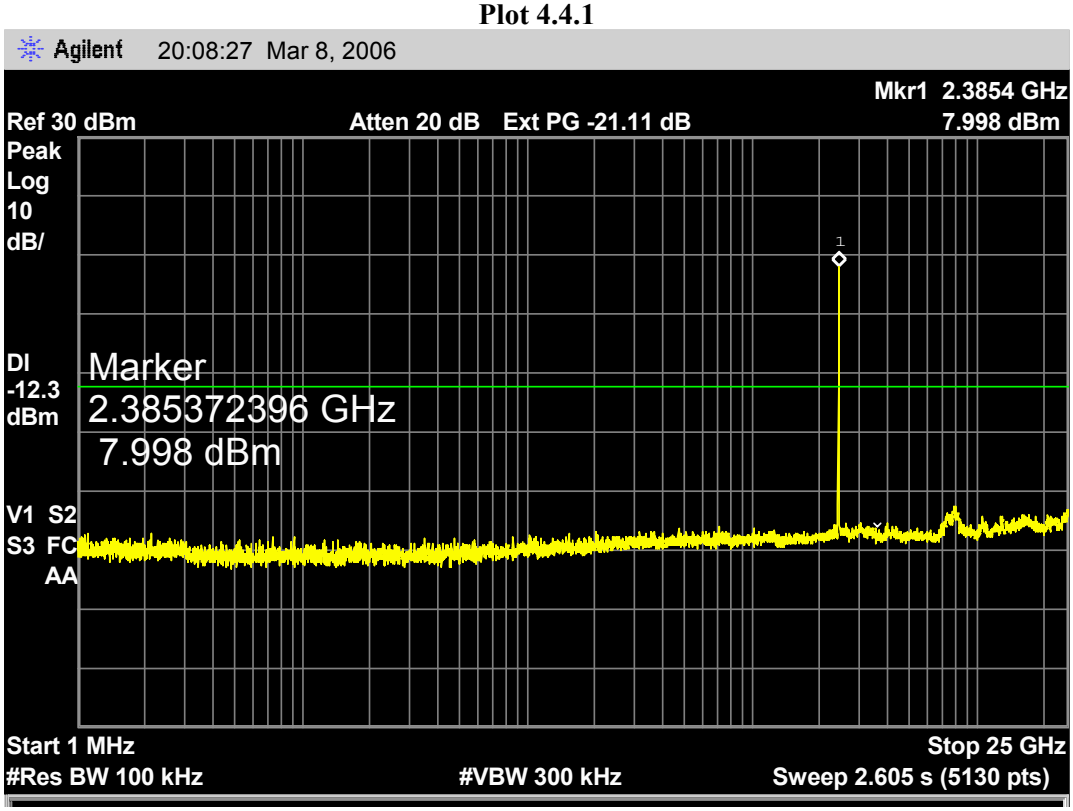
Plot 4.3.11



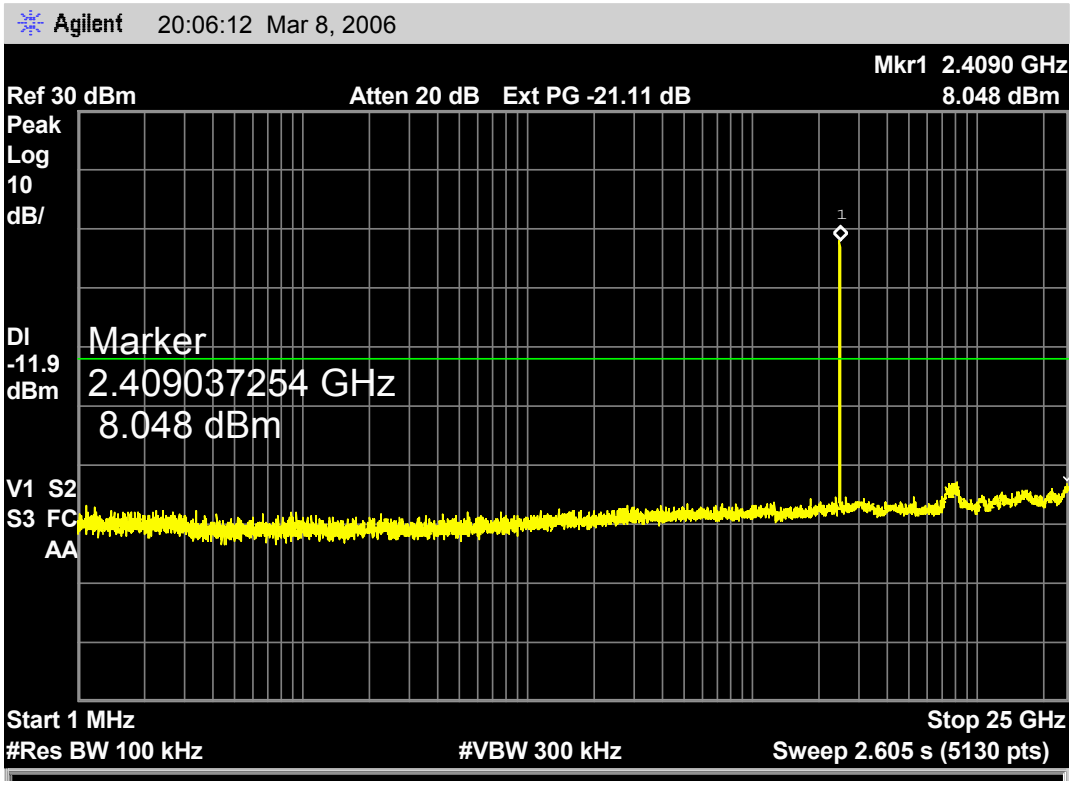
Plot 4.3.12



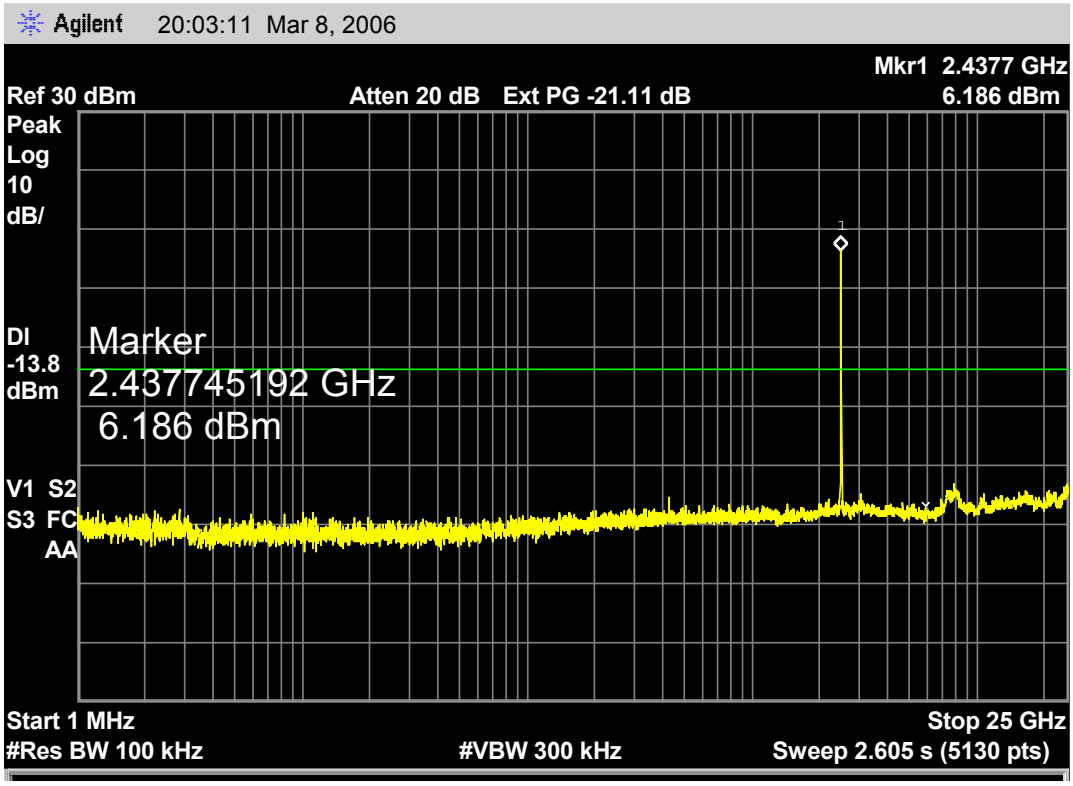
4.4: Conducted Spurious emissions
Spurious 802.11b Mode
Plot 4.4.1



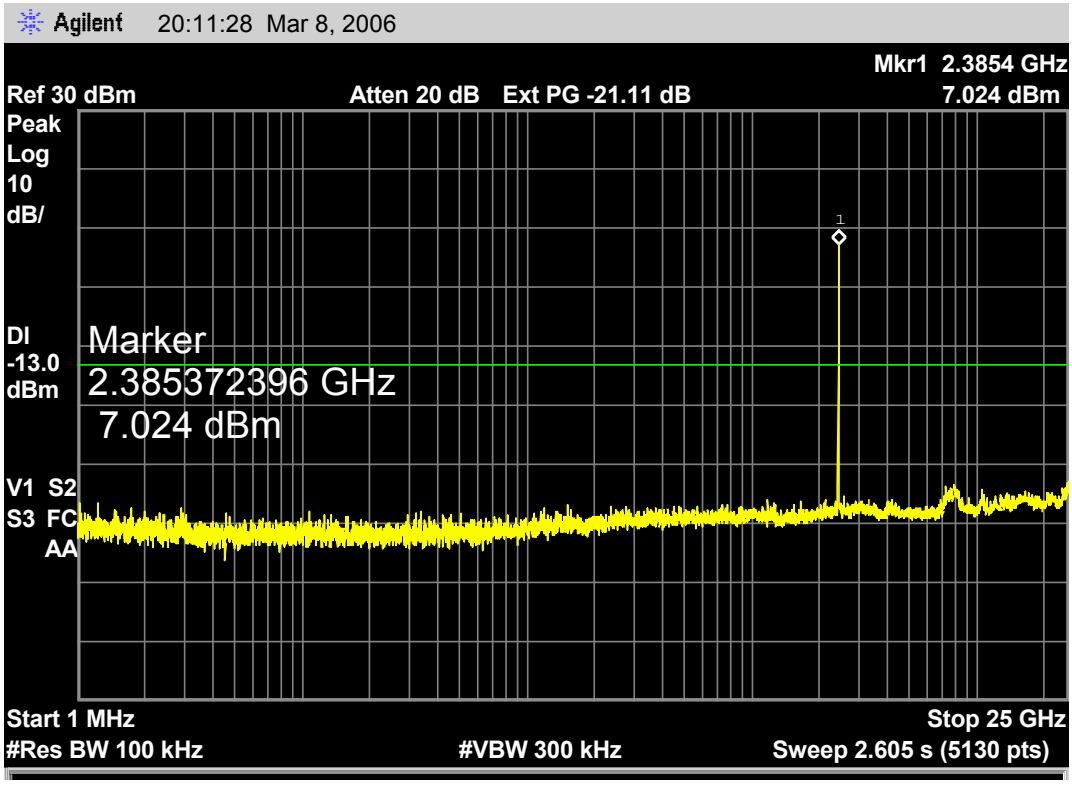
Plot 4.4.2



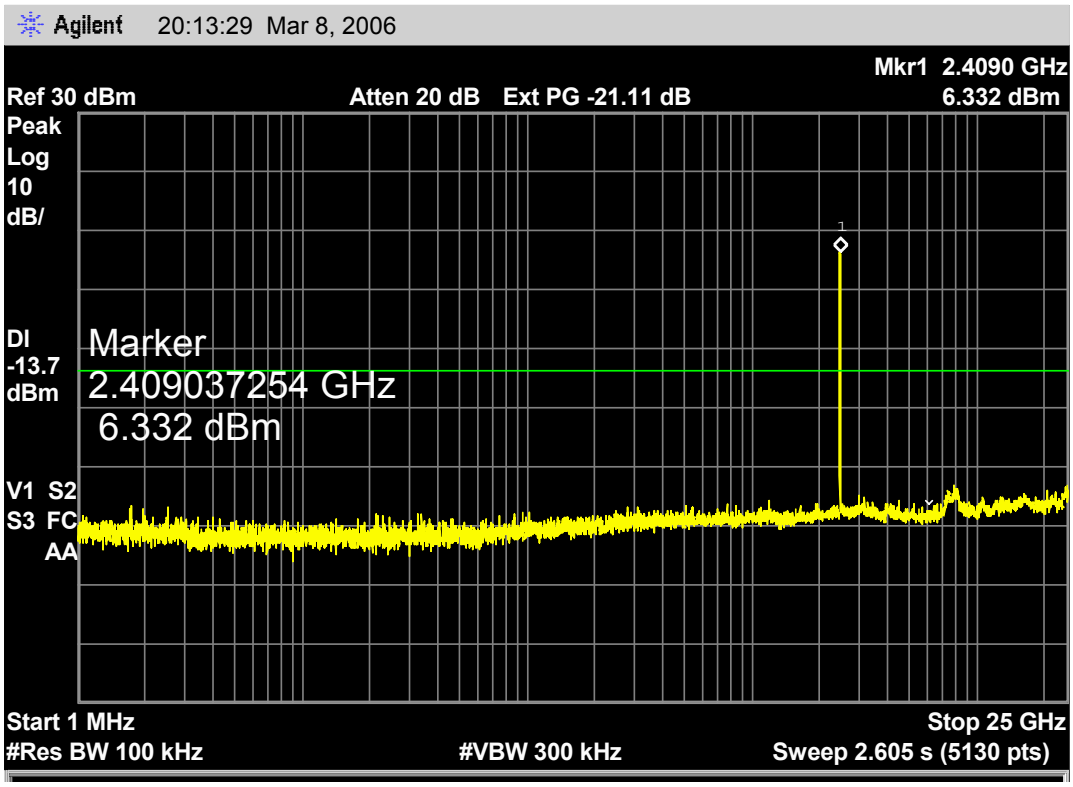
Plot 4.4.3



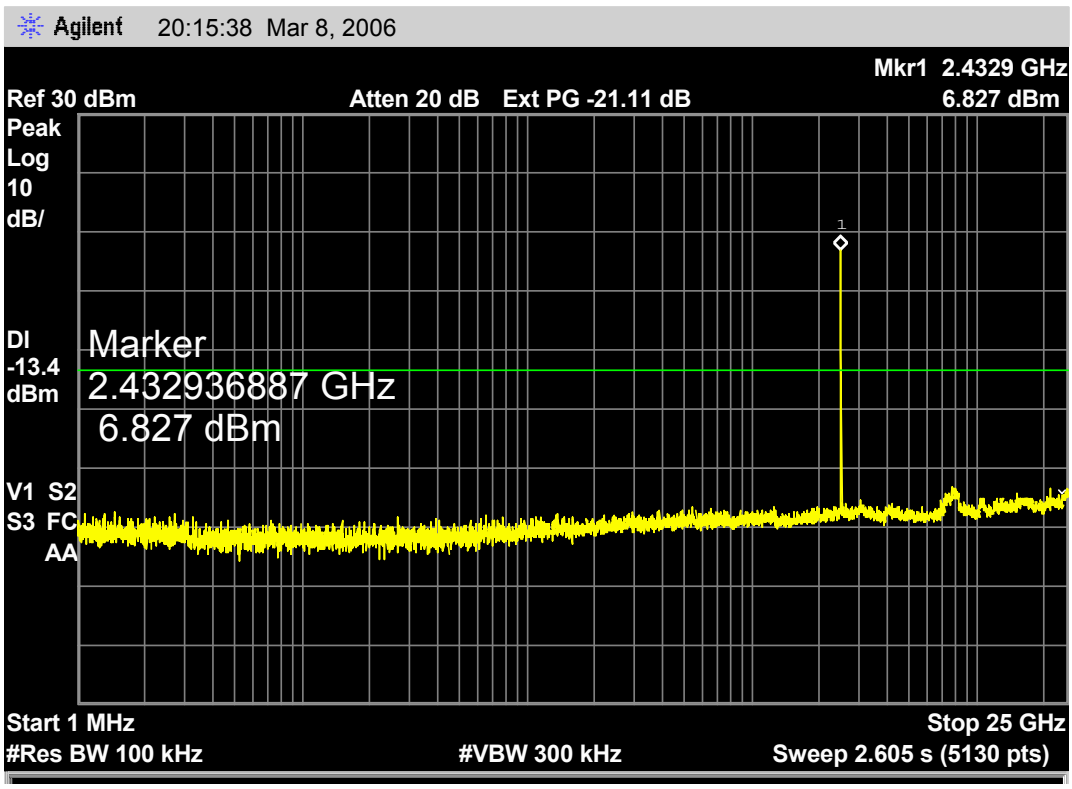
Plot 4.4.4



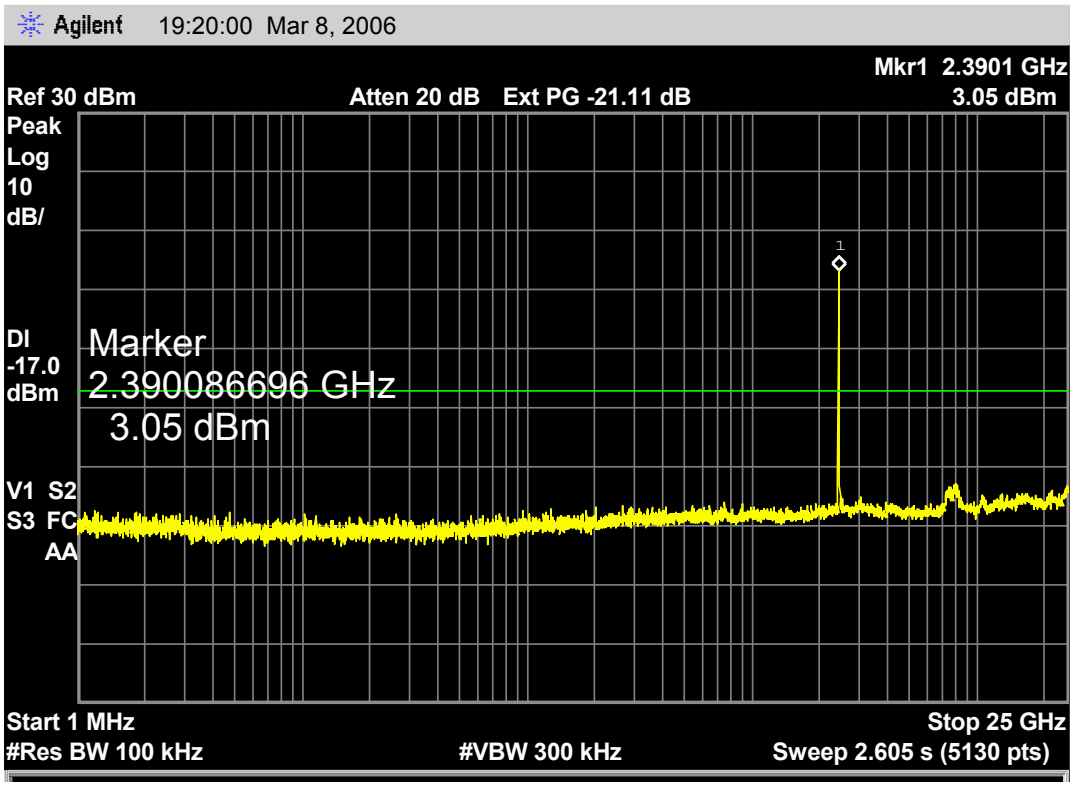
Plot 4.4.5



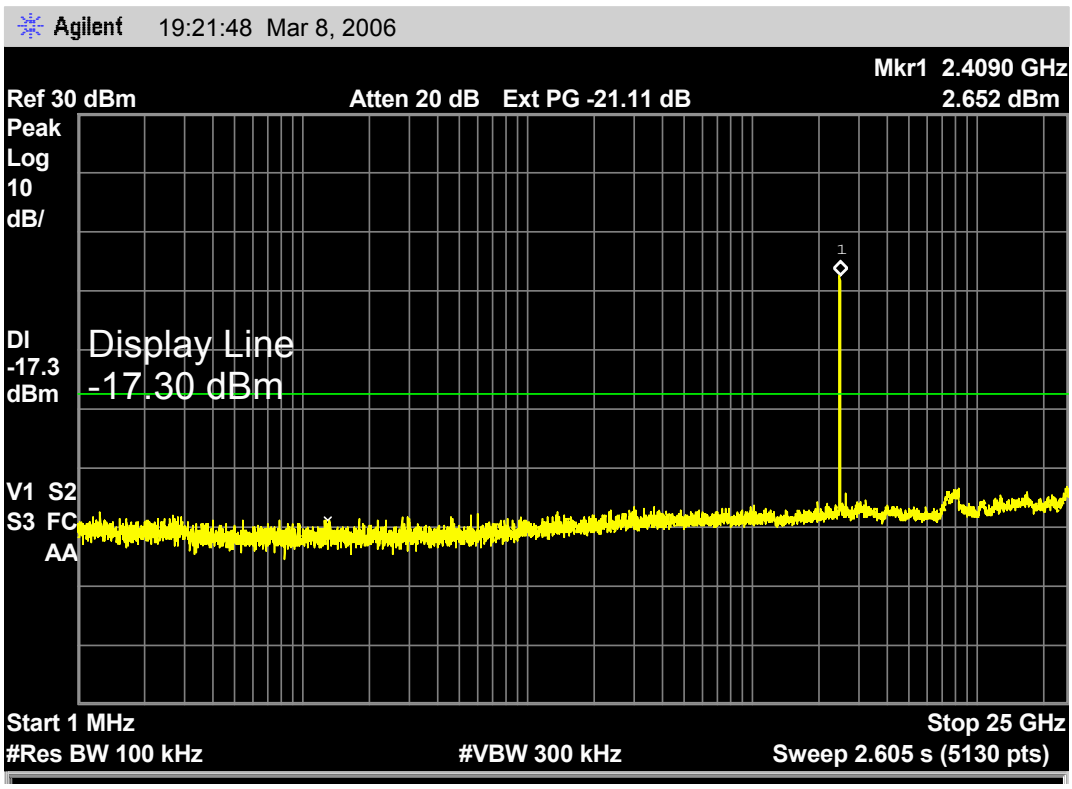
Plot 4.4.6



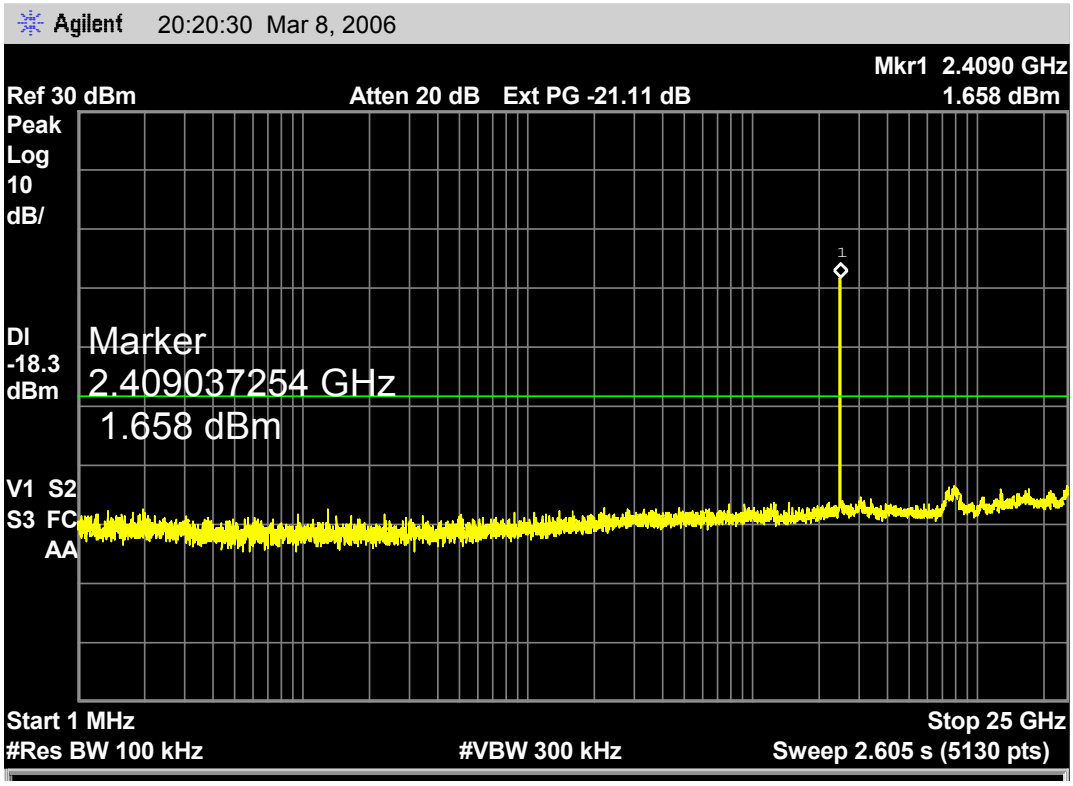
Spurious 802.11g Mode
Plot 4.4.7



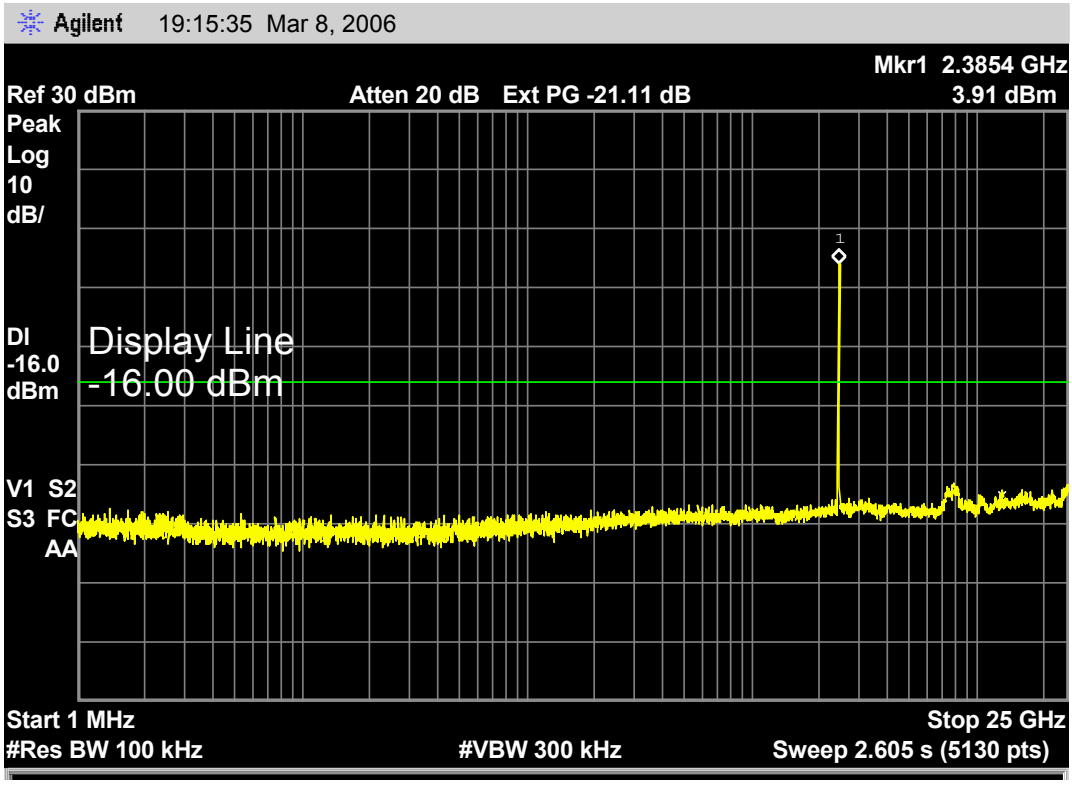
Plot 4.4.8



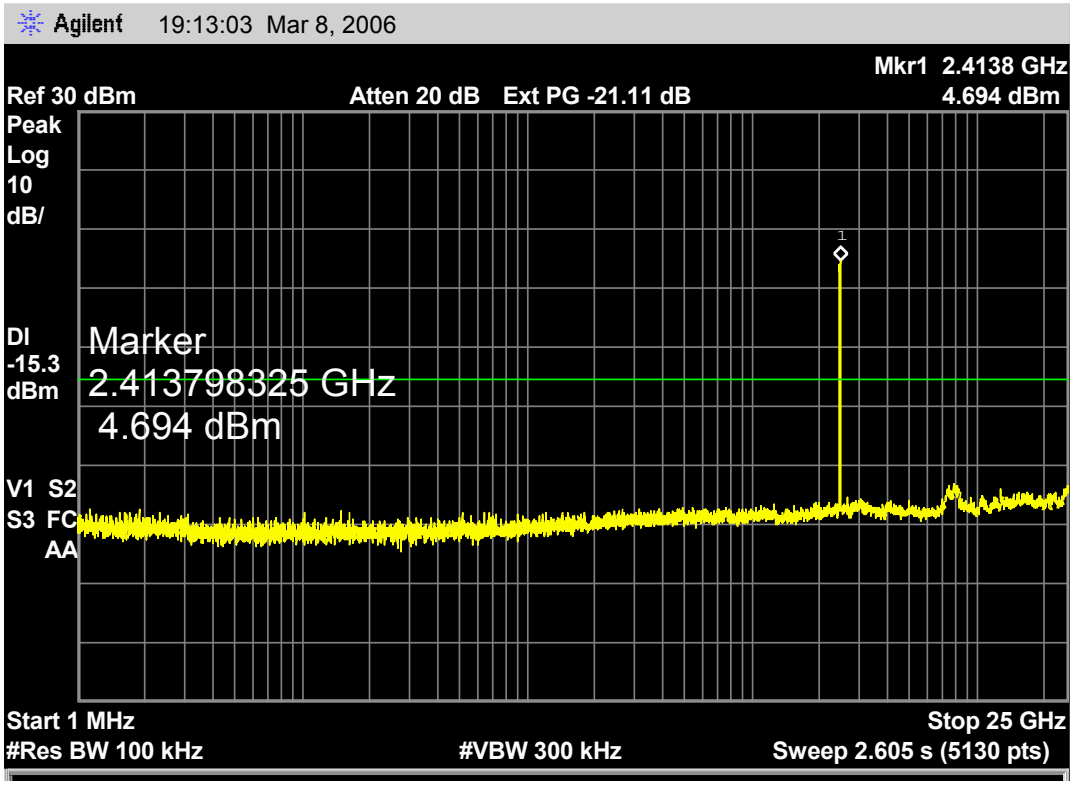
Plot 4.4.9



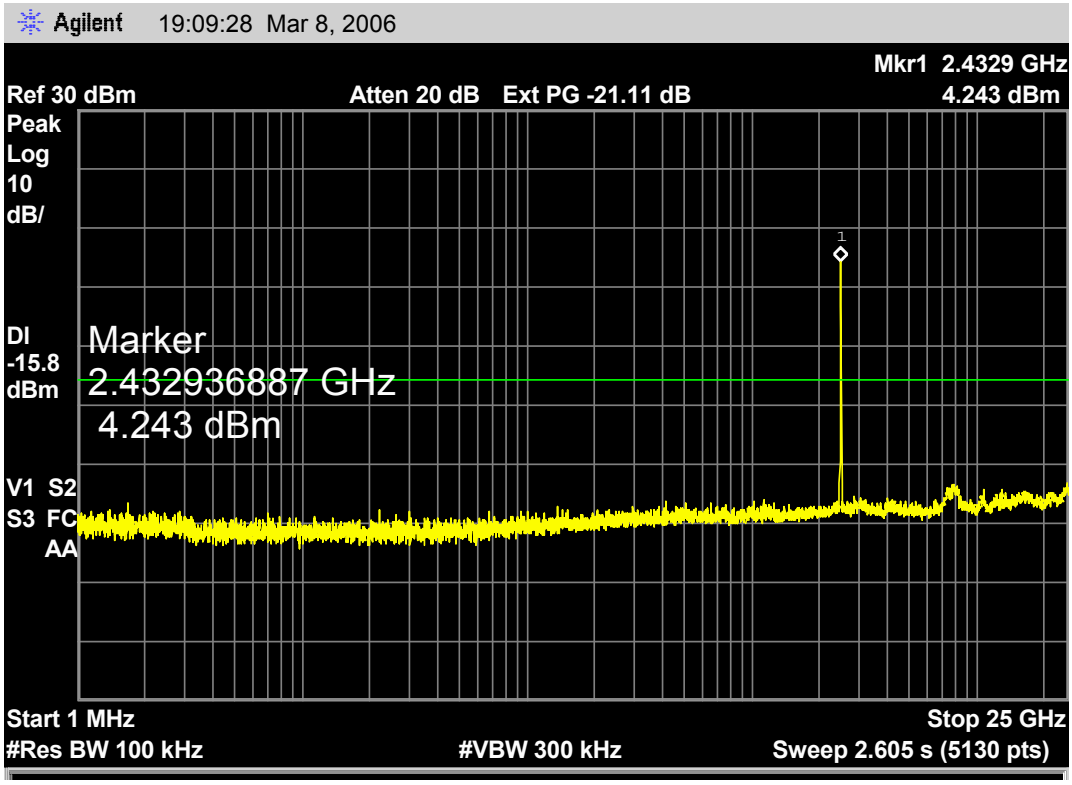
Plot 4.4.10



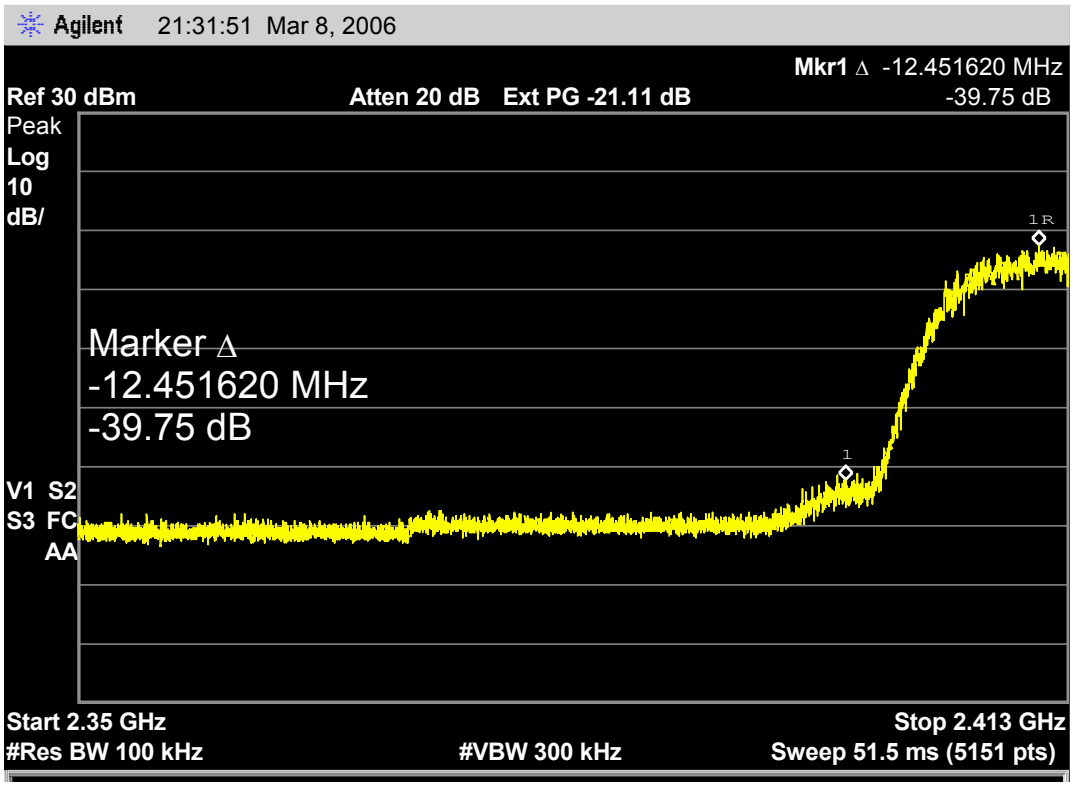
Plot 4.4.11



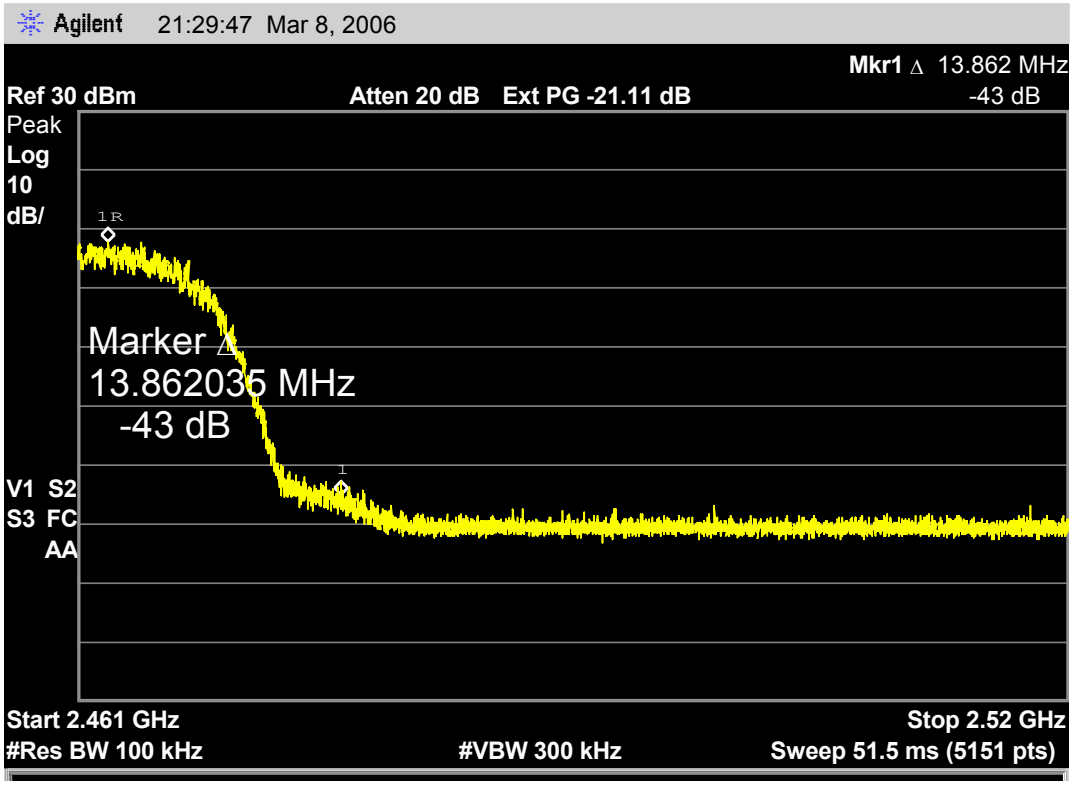
Plot 4.4.12



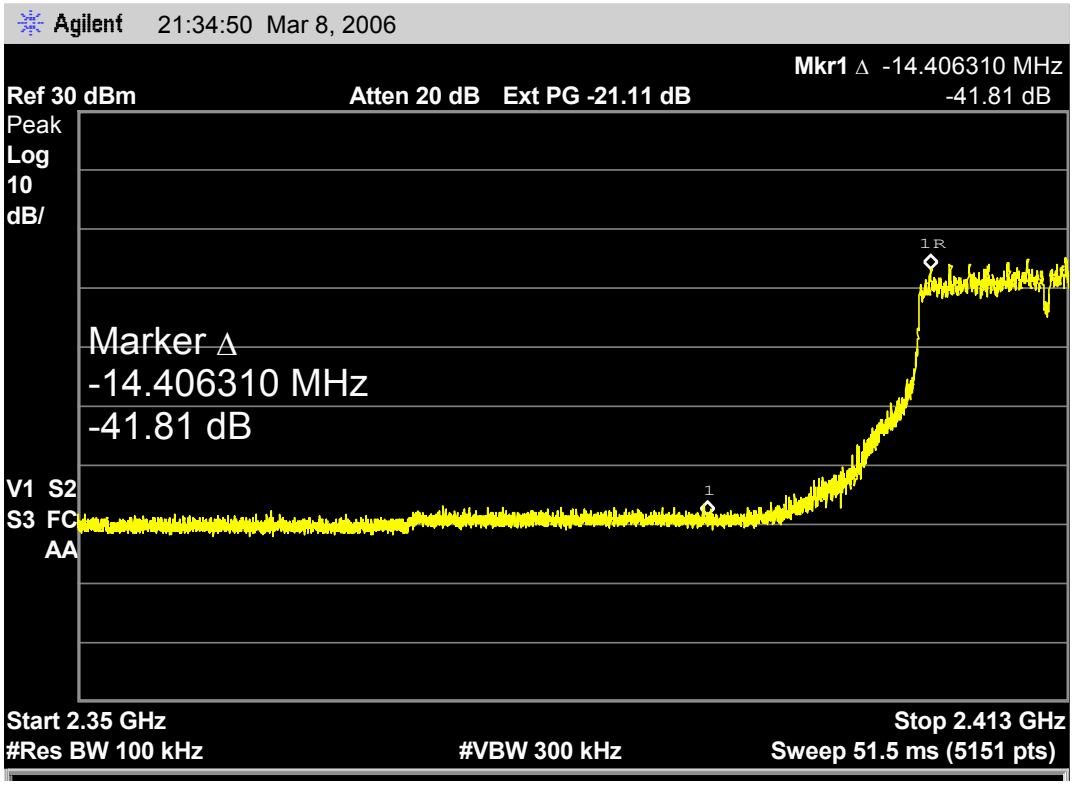
Band edge 802.11b Mode
Plot 4.4.13



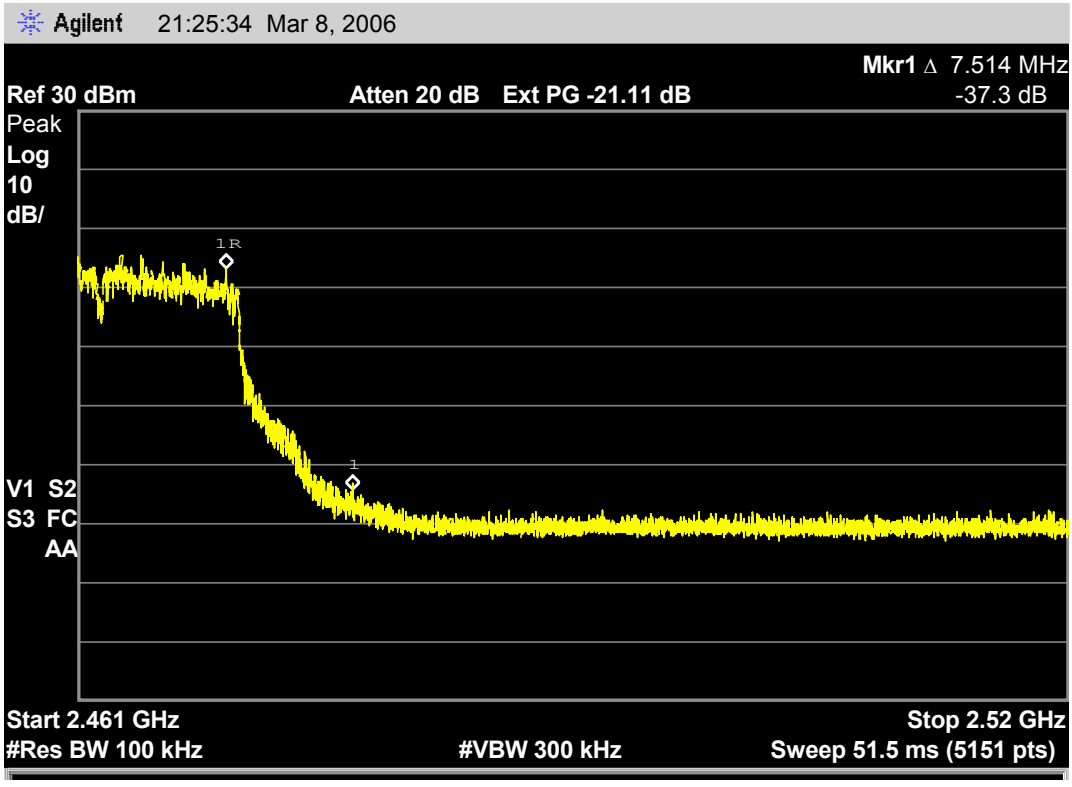
Plot 4.4.14



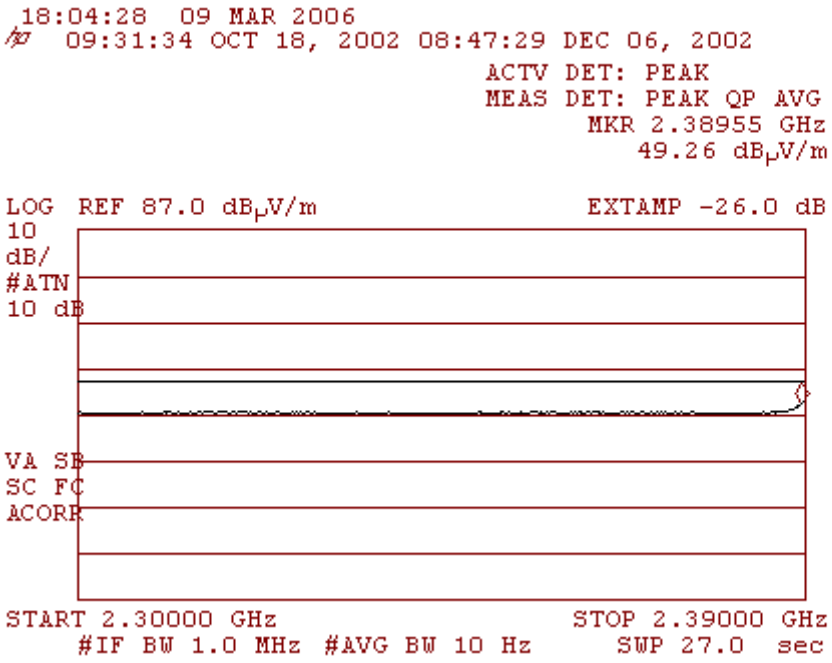
Band edge 802.11g Mode
Plot 4.4.15



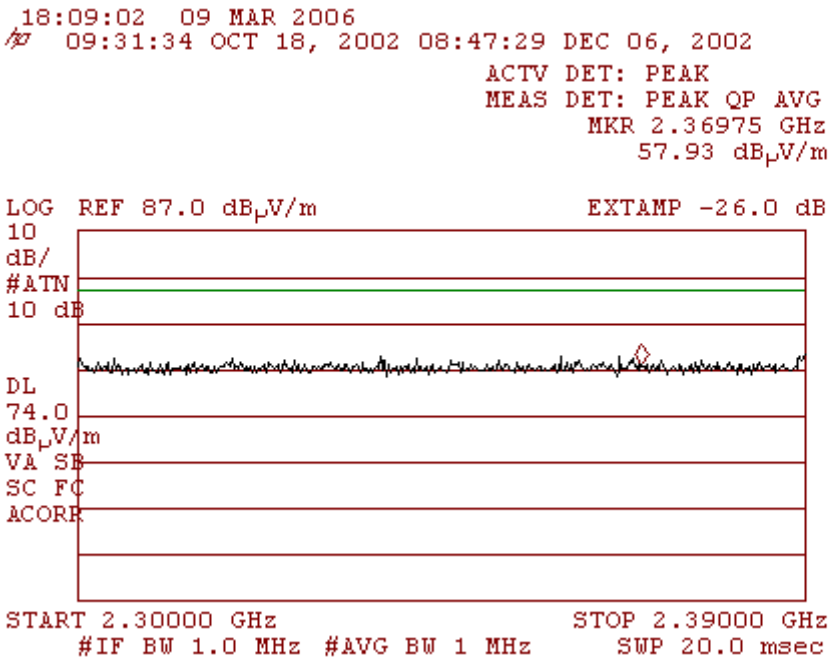
Plot 4.4.16



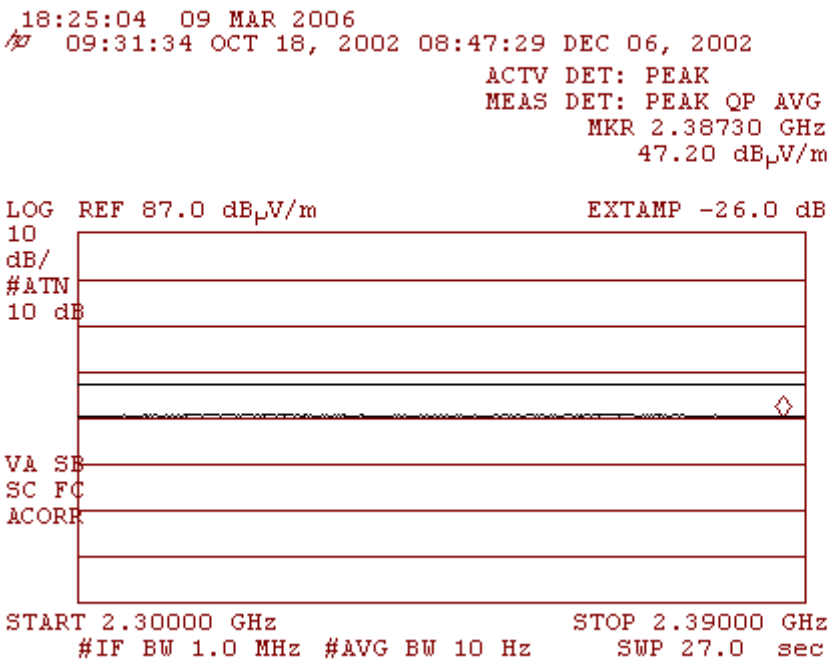
4.5: Radiated Emissions, restricted Bands
CH1, 54 Mbit, Lowest Frequency
Vertical Polarization
Average
Plot 4.5.1



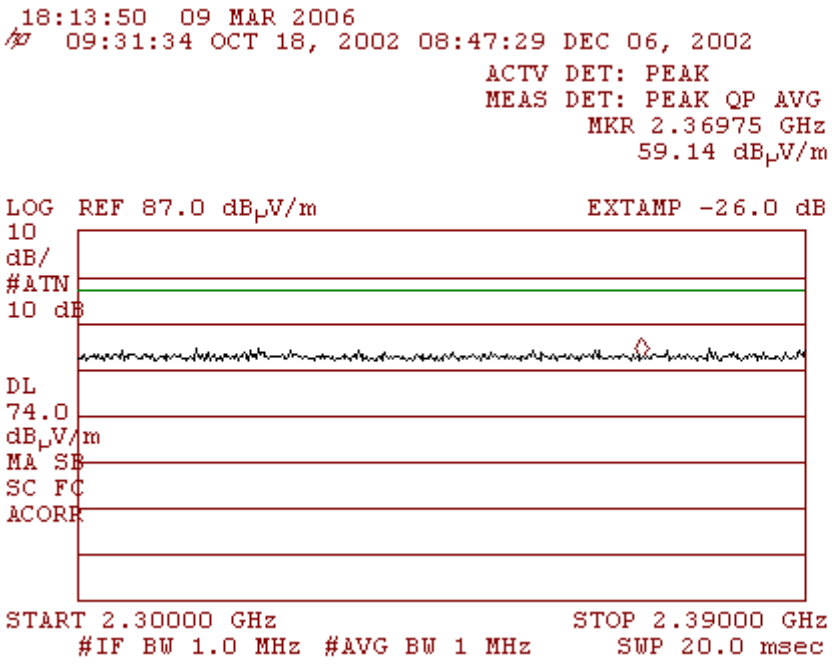
Peak
Plot 4.5.2



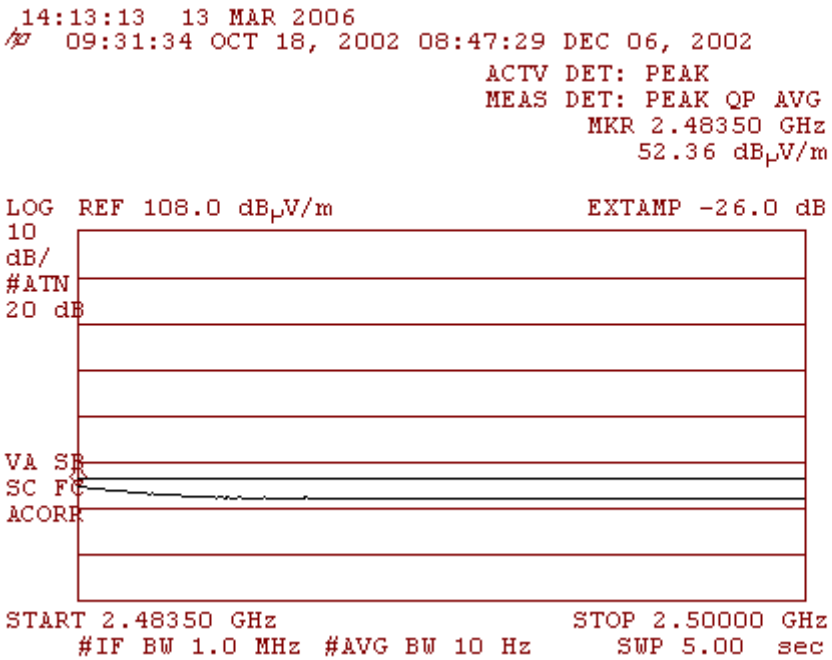
Horizontal Polarization
Average
Plot 4.5.3



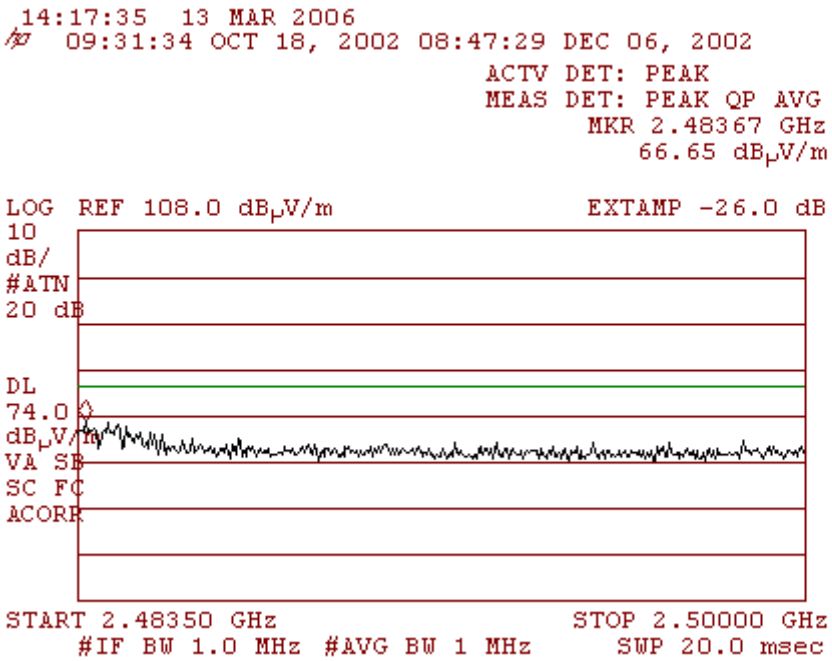
Peak
Plot 4.5.4



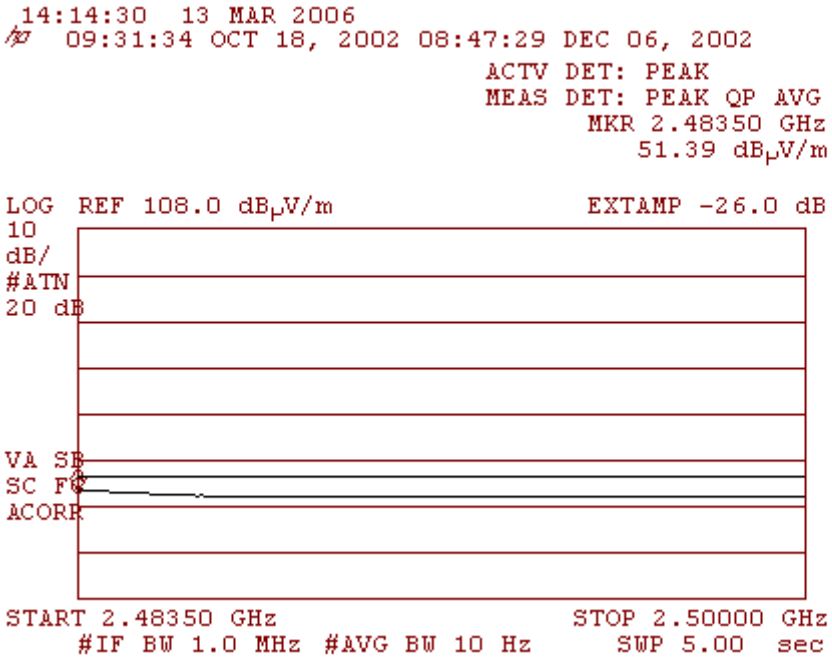
CH11, 54 Mbit, Highest Frequency
Vertical Polarization
Average
Plot 4.5.5



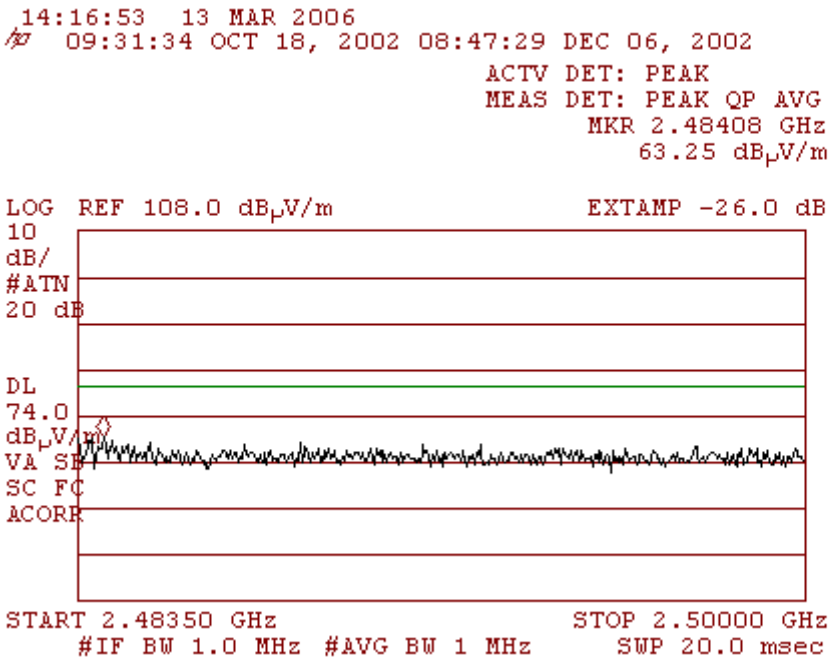
Peak
Plot 4.5.6



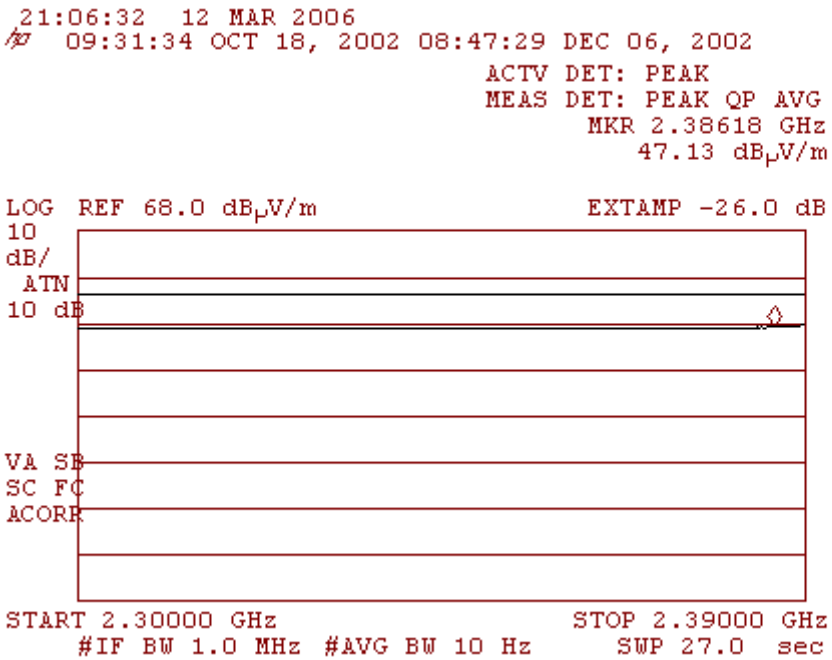
Horizontal Polarization
Average
Plot 4.5.7



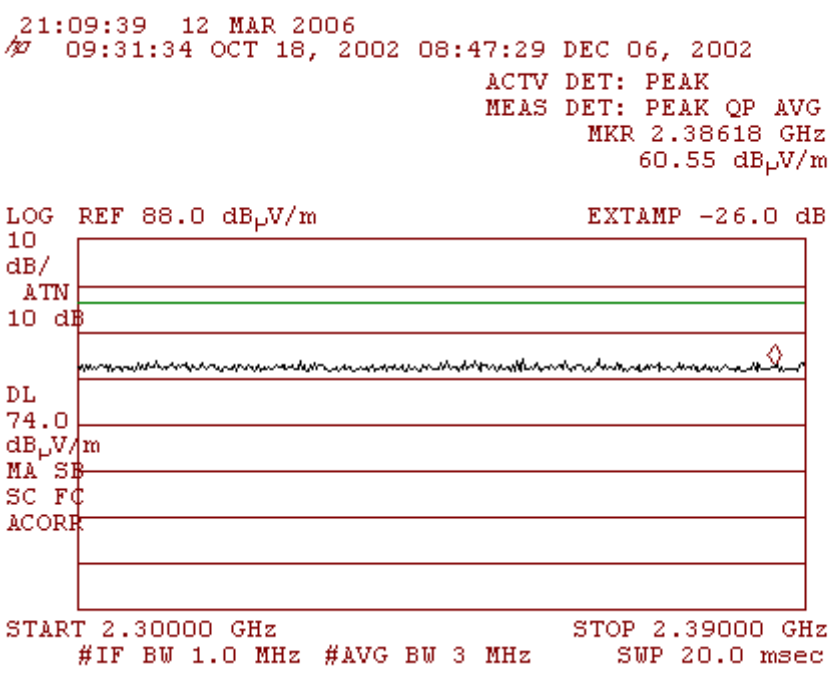
Peak
Plot 4.5.8



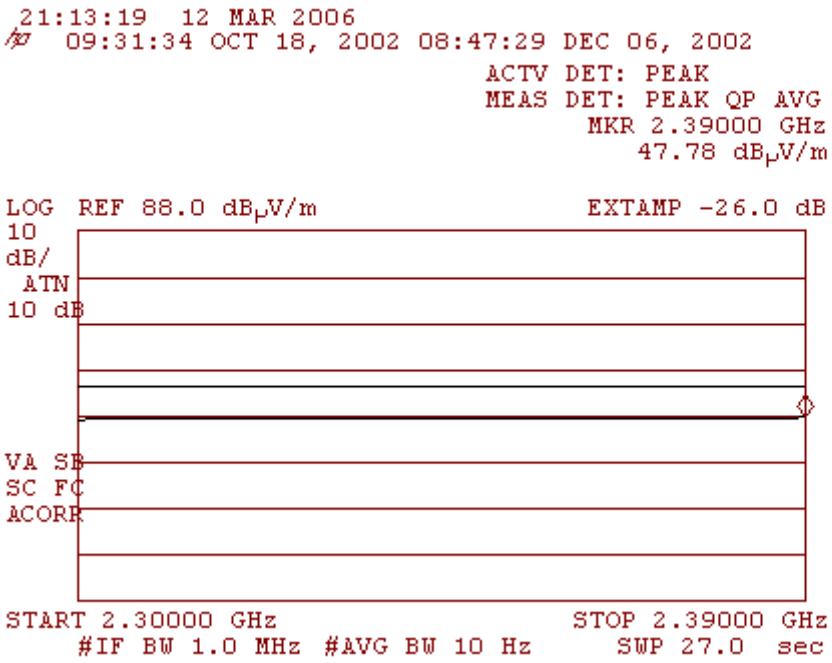
CH1, 11 Mbit, Lowest Frequency
Vertical Polarization
Average
Plot 4.5.9



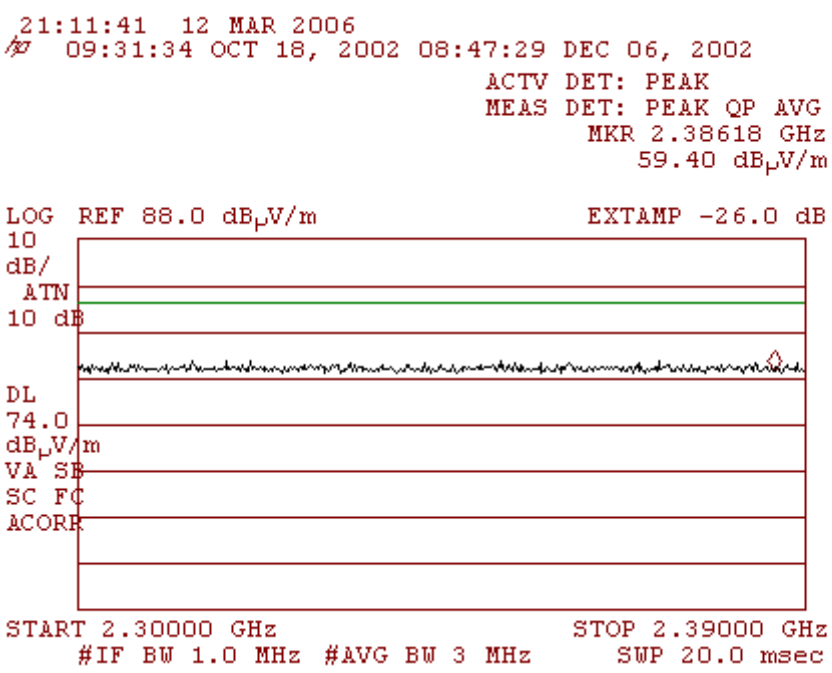
Peak
Plot 4.5.10



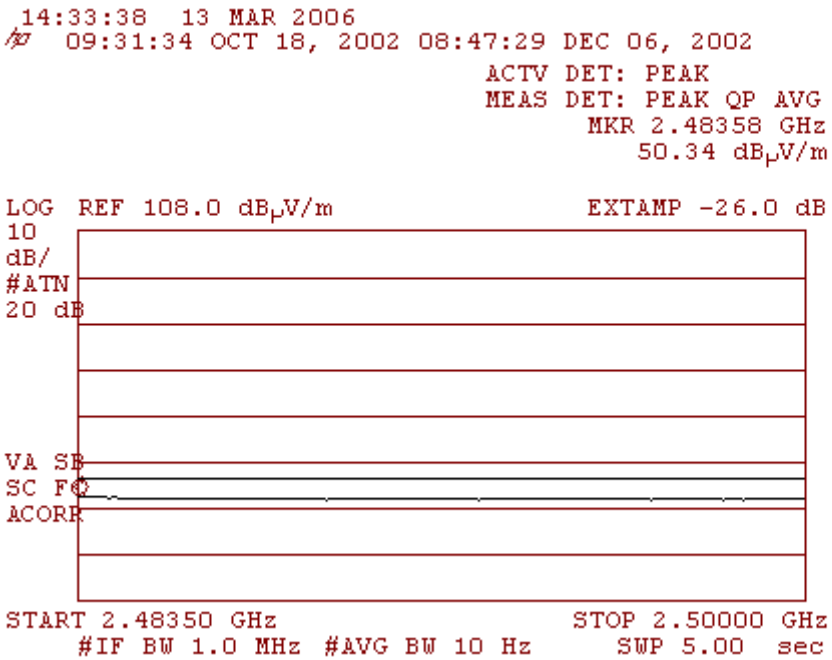
Horizontal Polarization
Average
Plot 4.5.11



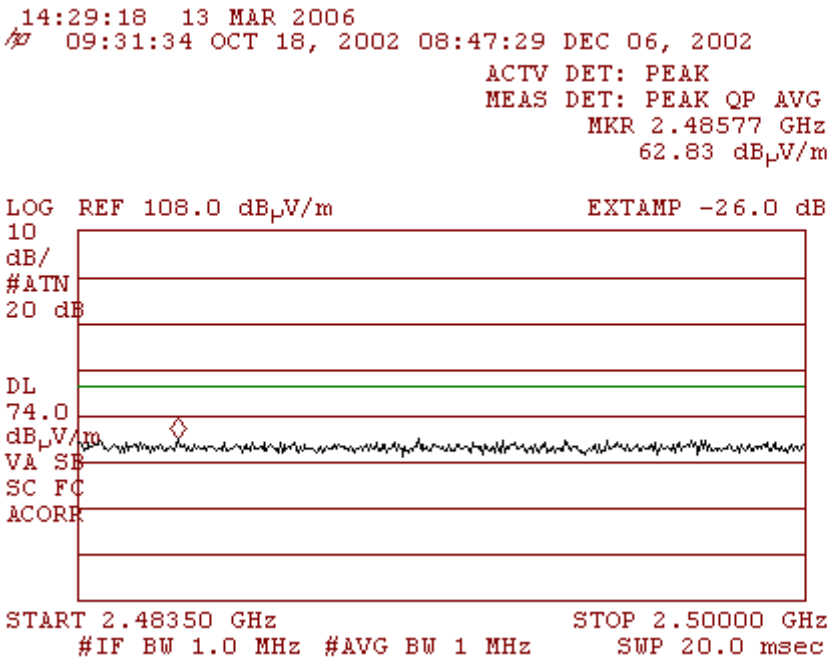
Peak
Plot 4.5.12



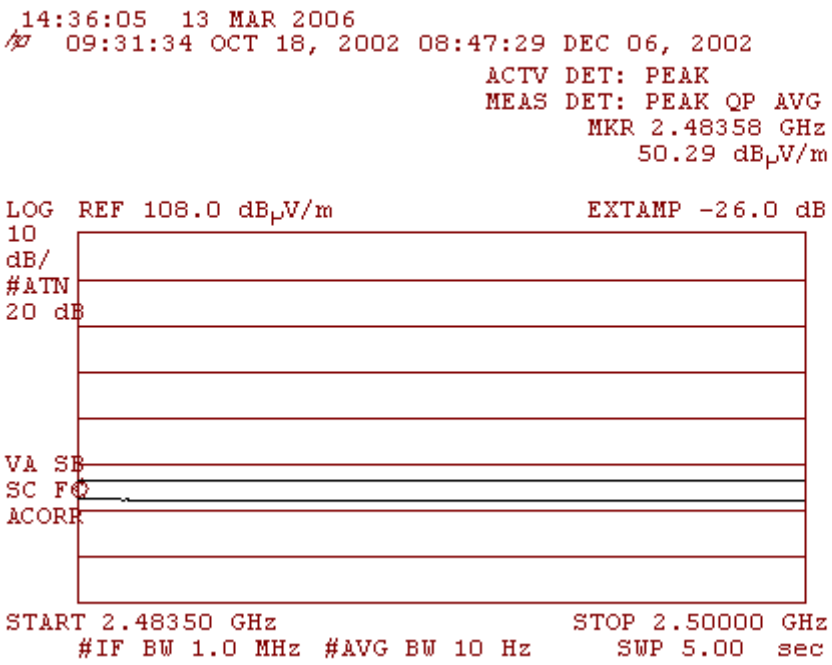
CH1, 11 Mbit, Highest Frequency
Vertical Polarization
Average
Plot 4.5.13



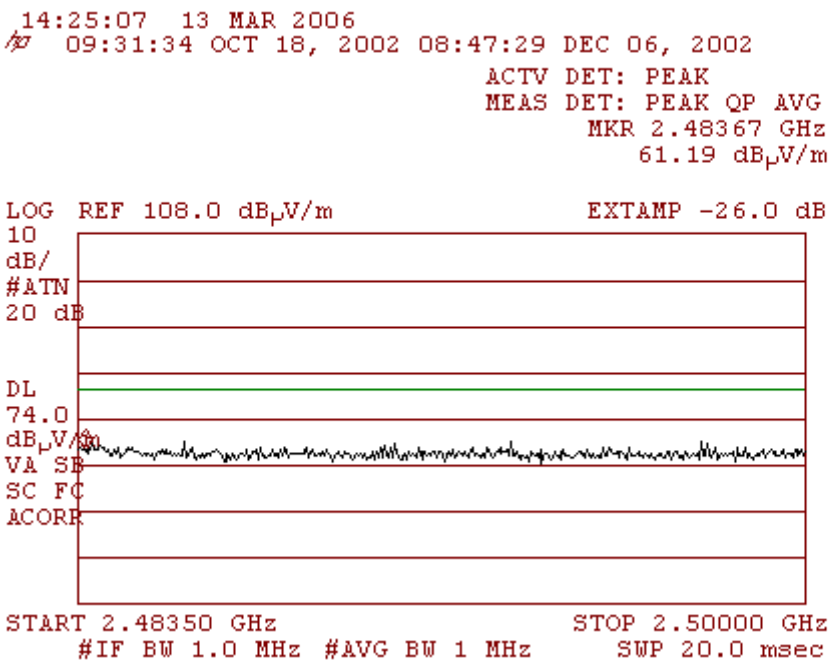
Peak
Plot 4.5.14



Horizontal Polarization
Average
Plot 4.5.15

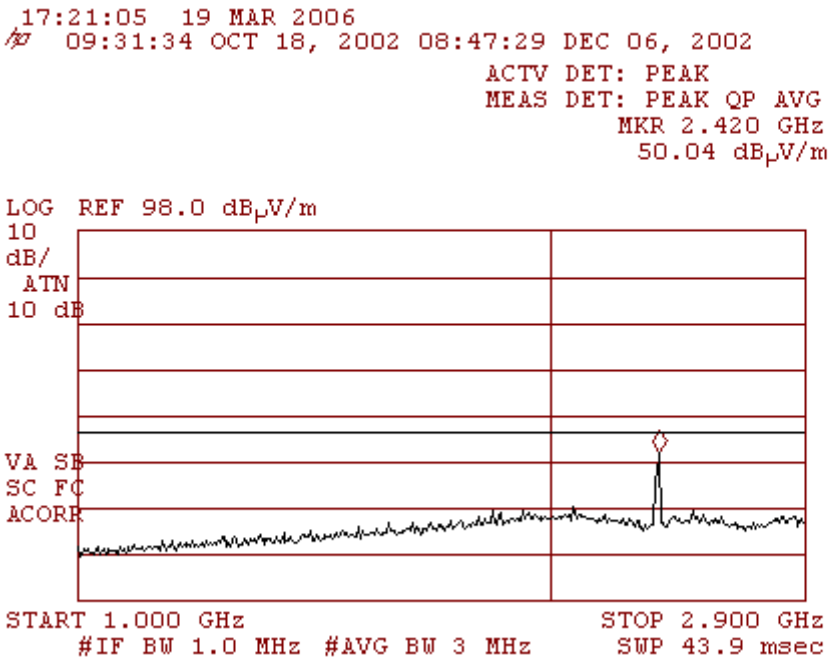


Peak
Plot 4.5.16

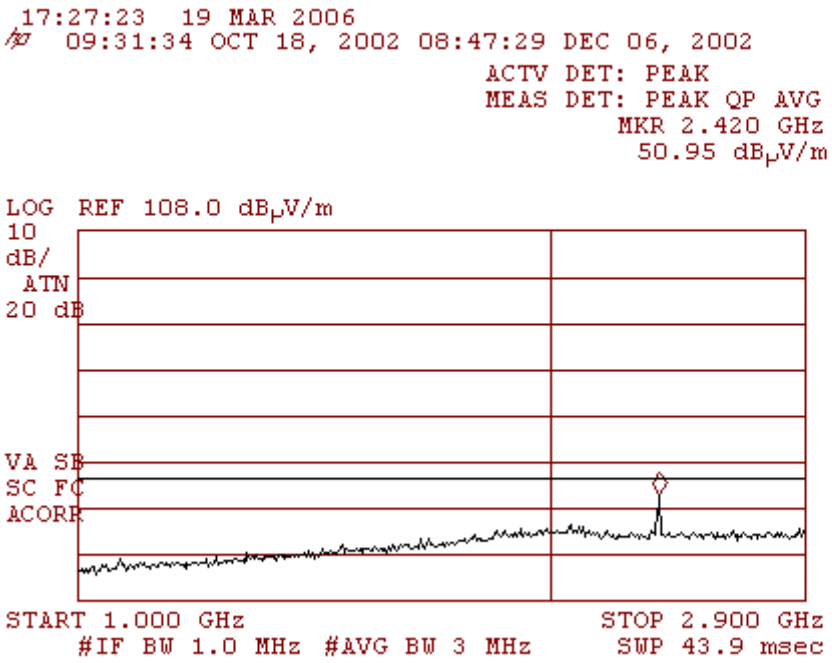


4.6: Spurious Emission – Radiated (Transmitter)

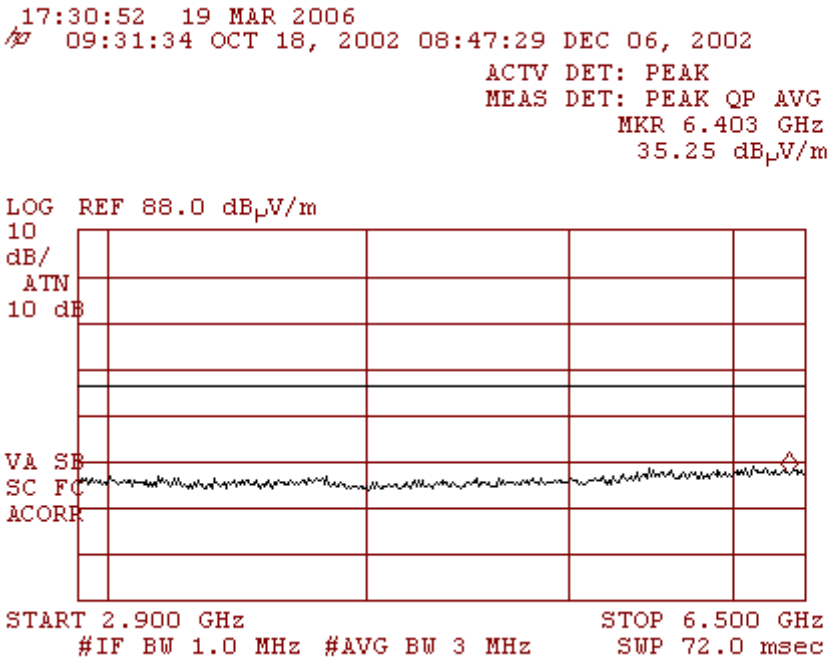
54 Mbit
Lowest Frequency
Vertical
Plot 4.6.1



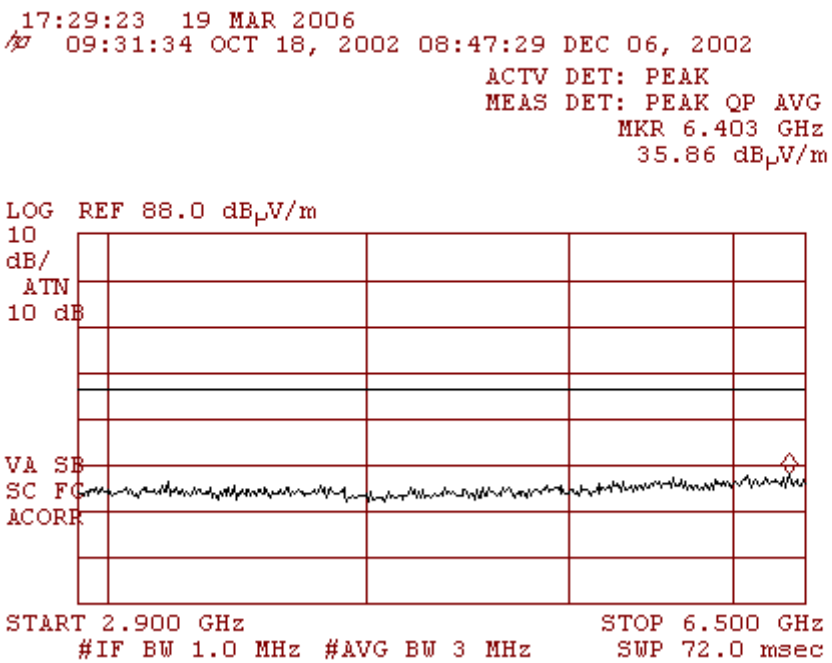
Horizontal
Plot 4.6.2



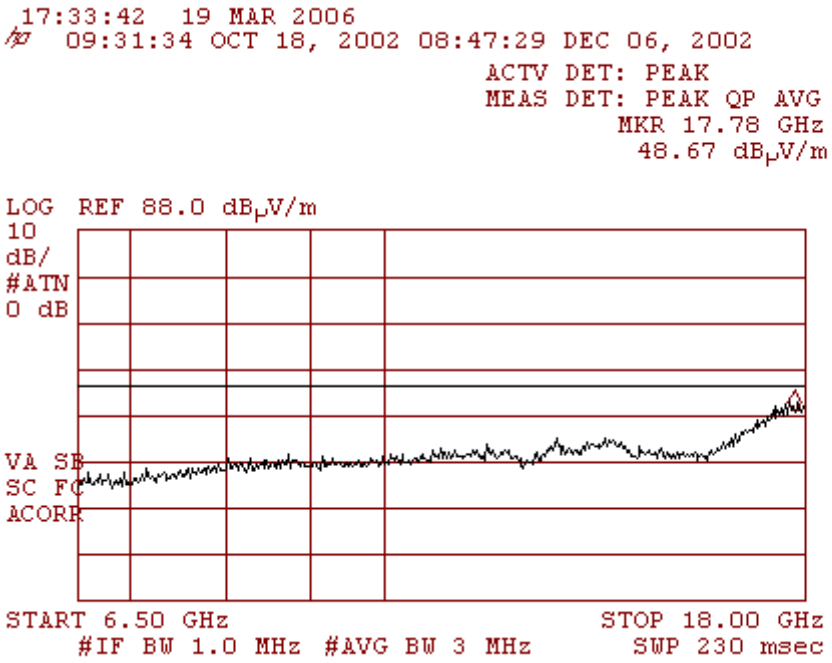
Vertical
Plot 4.6.3



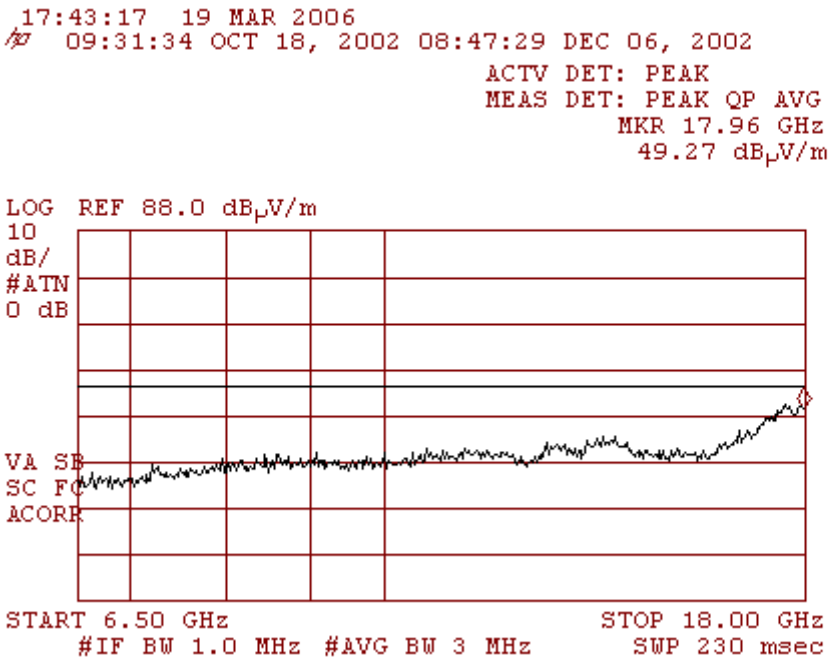
Horizontal
Plot 4.6.4



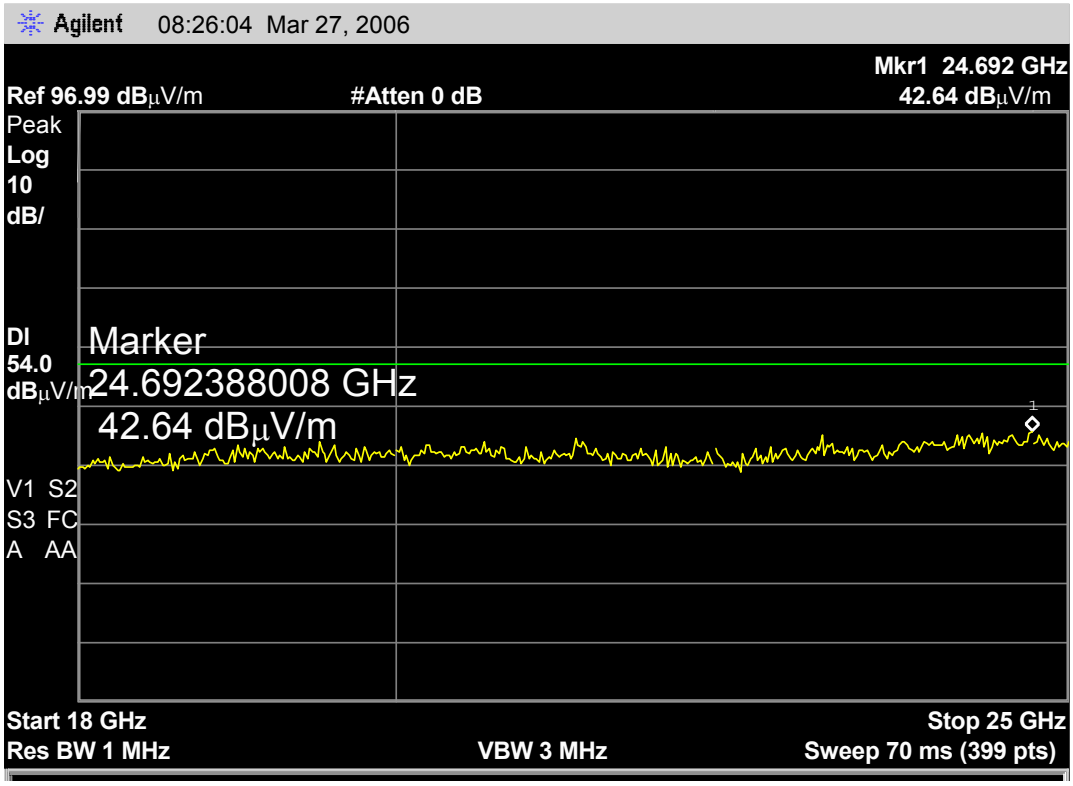
Vertical
Plot 4.6.5



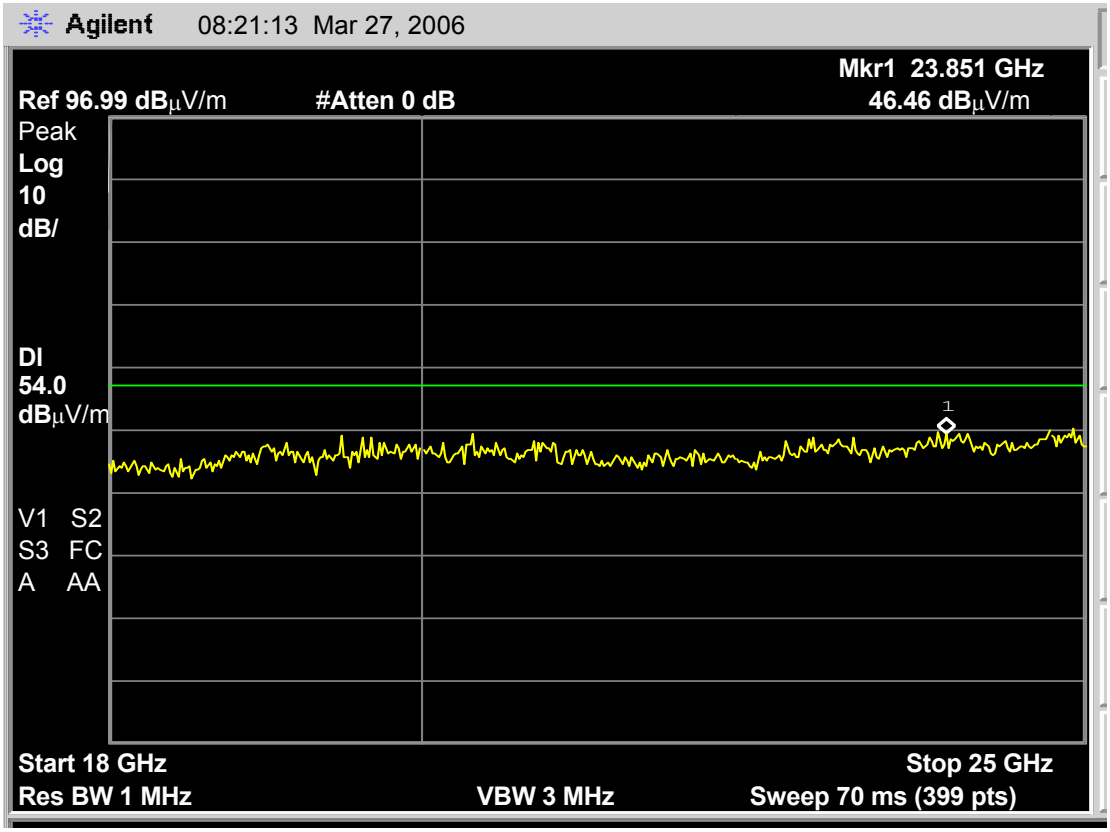
Horizontal
Plot 4.6.6



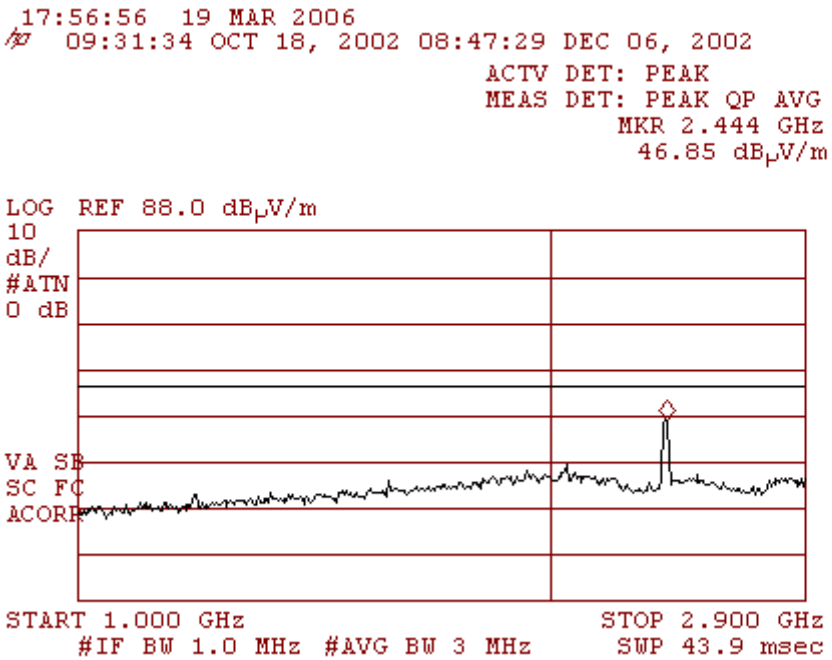
Vertical
Plot 4.6.7



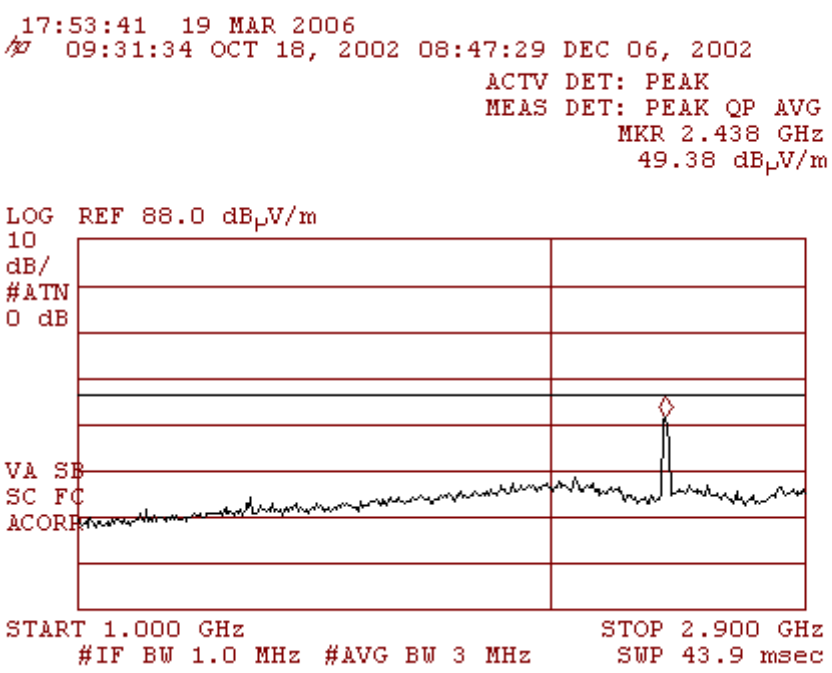
Horizontal
Plot 4.6.8



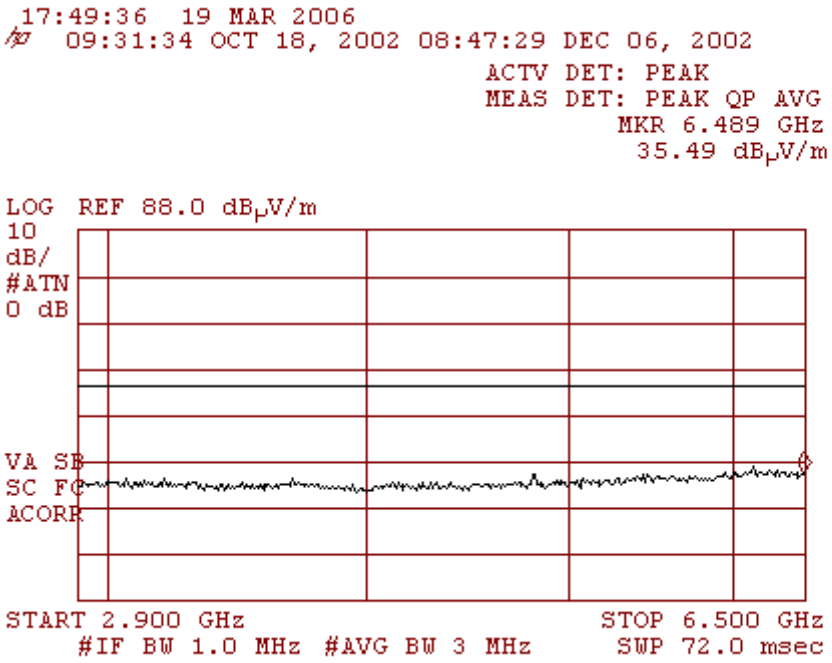
54 Mbit
Middle Frequency
Vertical
Plot 4.6.9



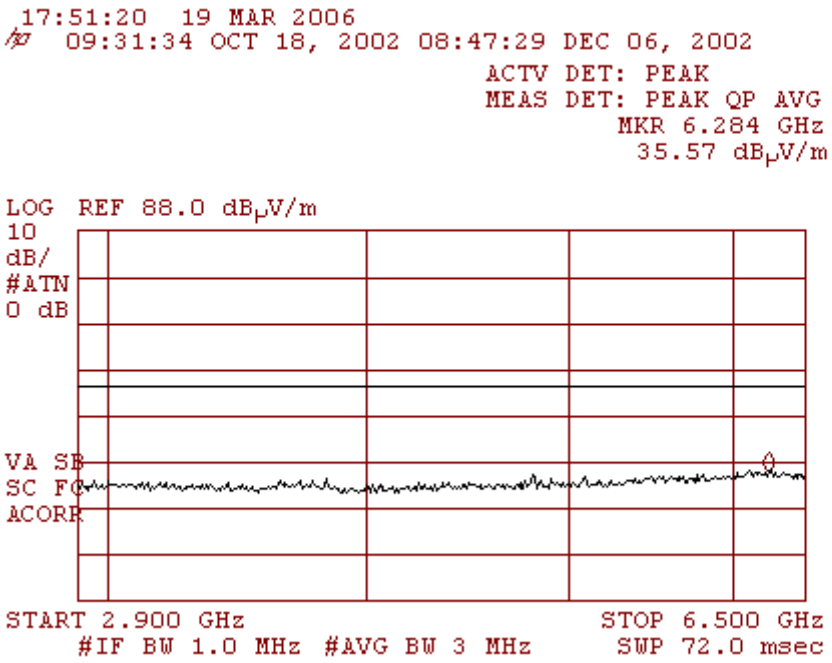
Horizontal
Plot 4.6.10



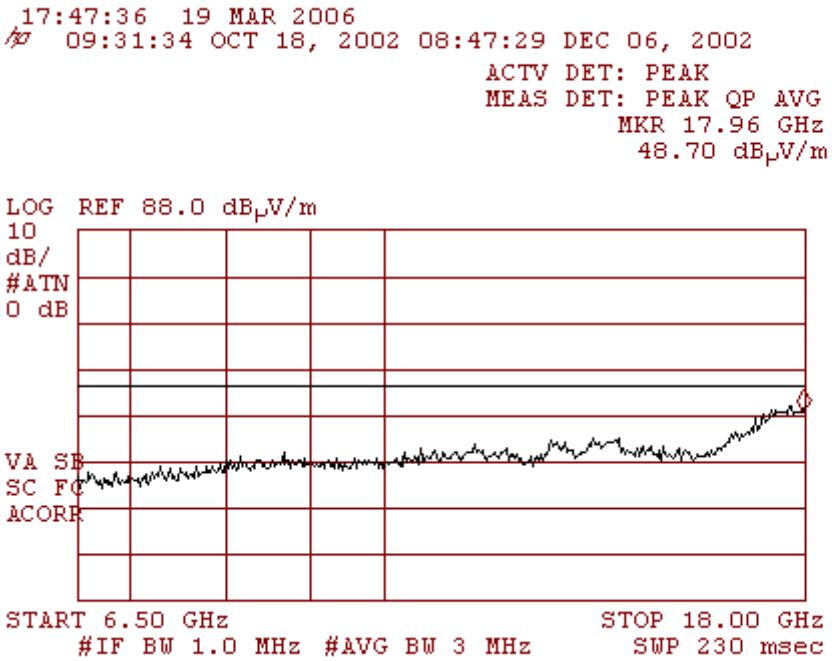
Vertical
Plot 4.6.11



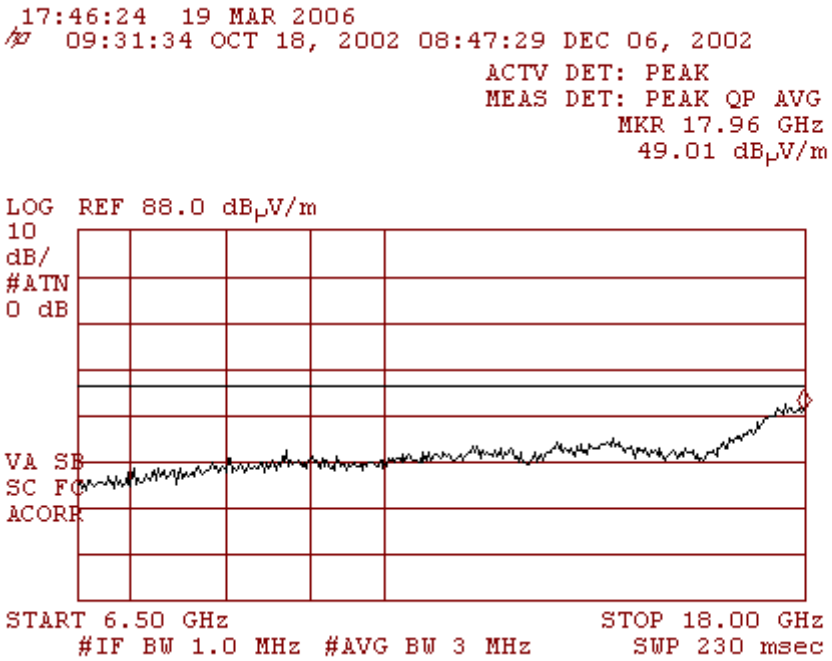
Horizontal
Plot 4.6.12



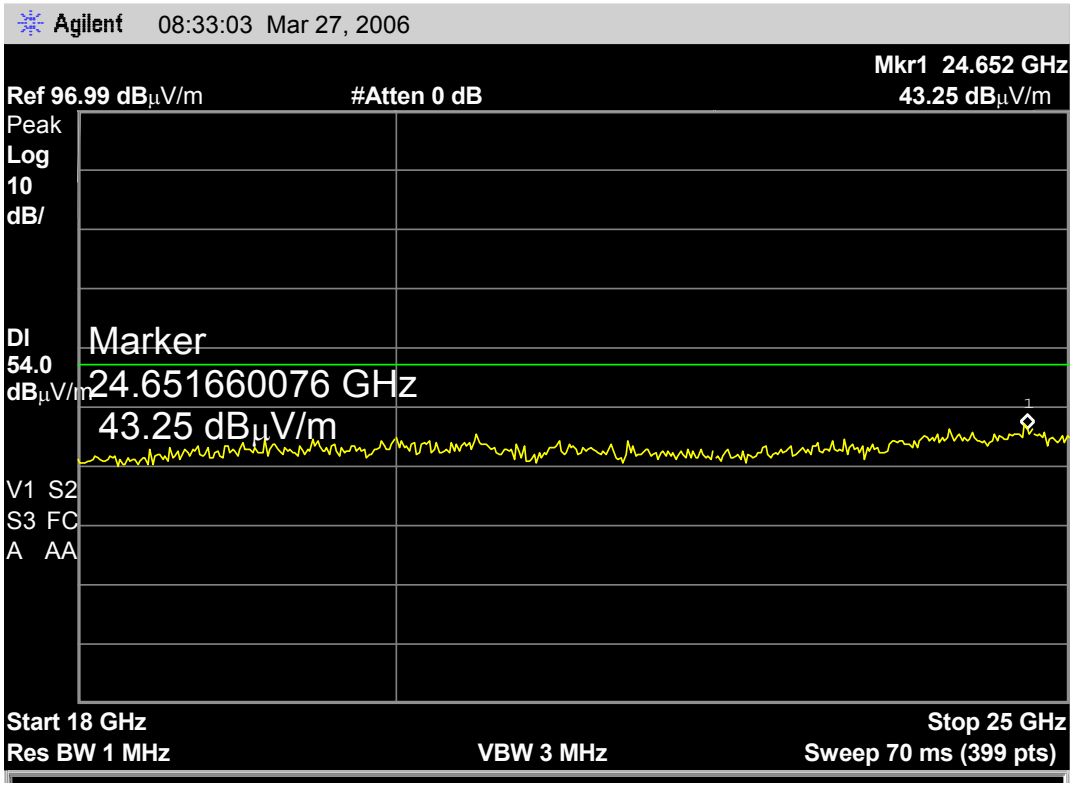
Vertical
Plot 4.6.13



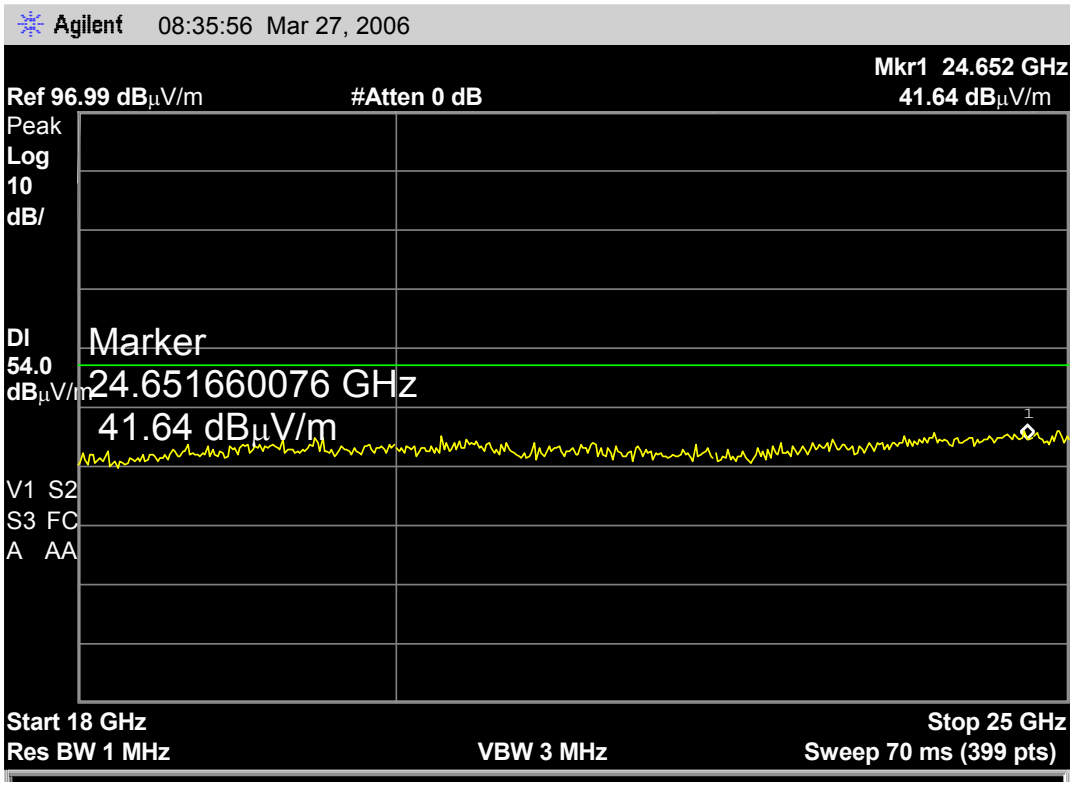
Horizontal
Plot 4.6.14



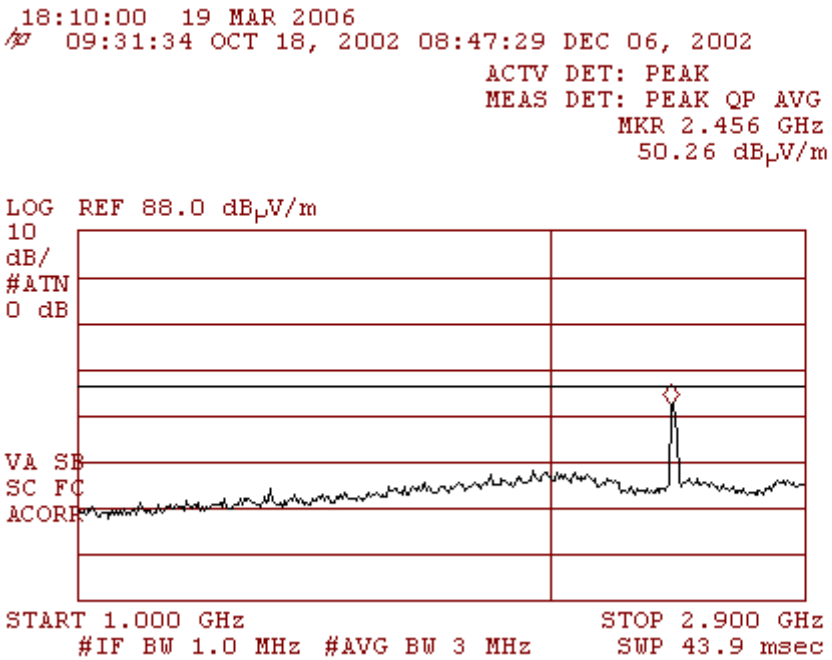
Vertical
Plot 4.6.15



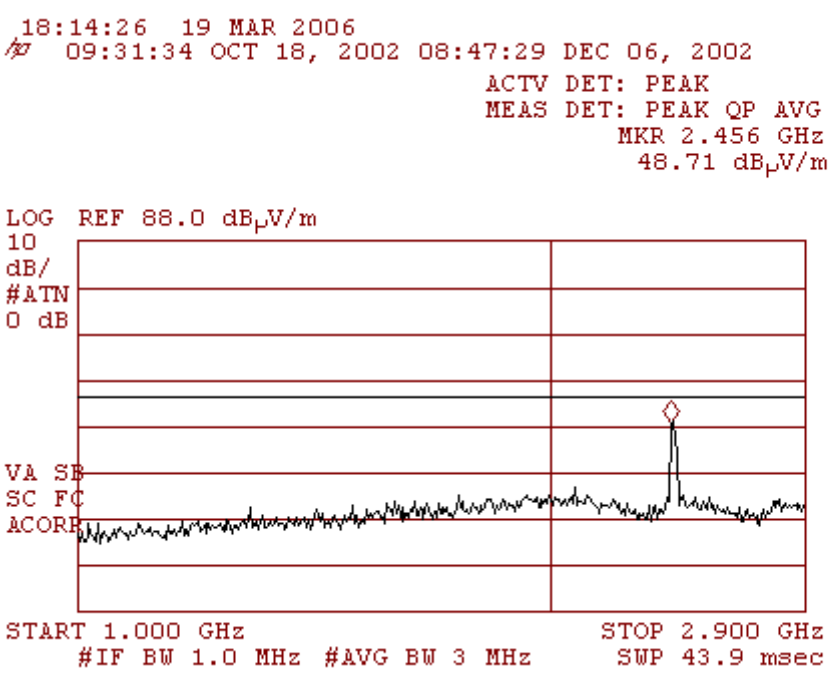
Horizontal
Plot 4.6.16



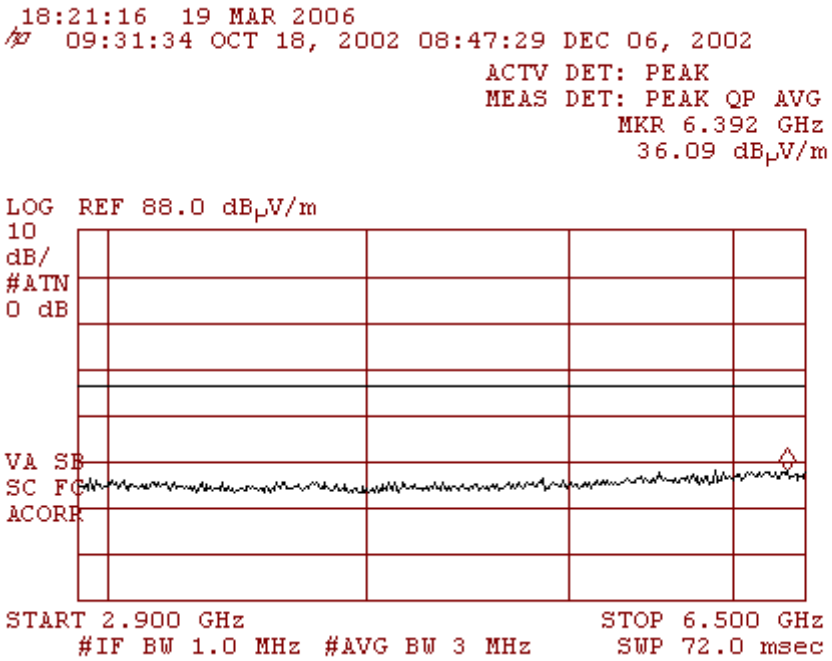
54 Mbit
Highest Frequency
Vertical
Plot 4.6.17



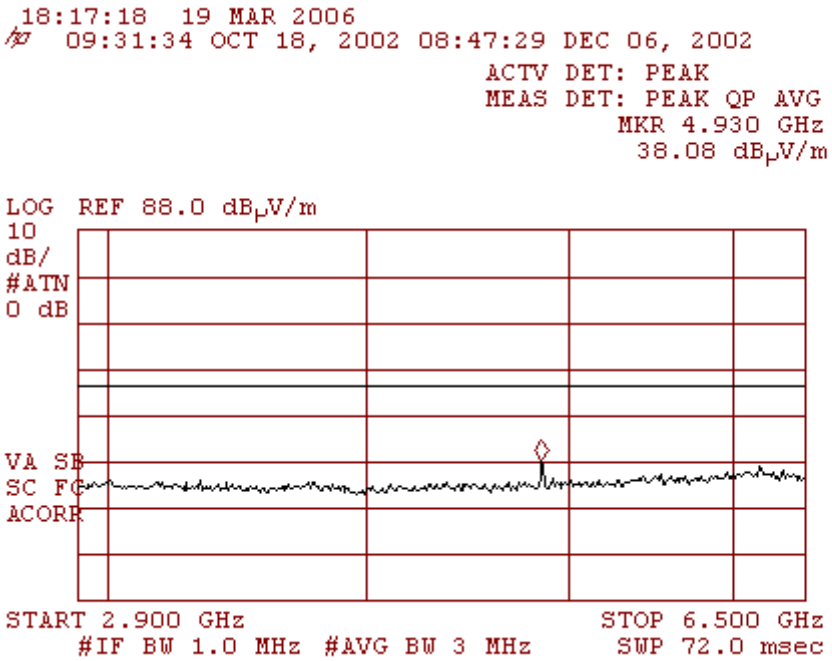
Horizontal
Plot 4.6.18



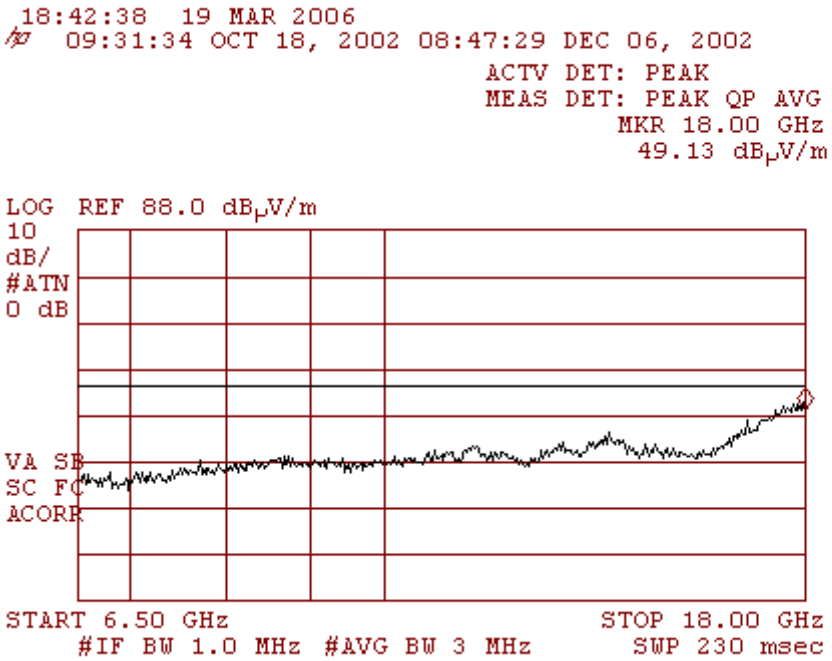
Vertical
Plot 4.6.19



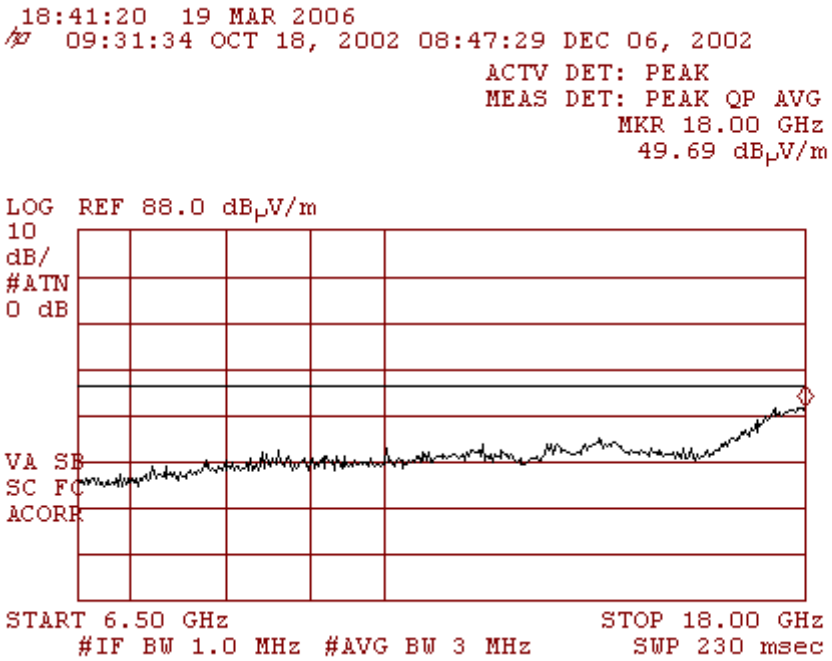
Horizontal
Plot 4.6.20



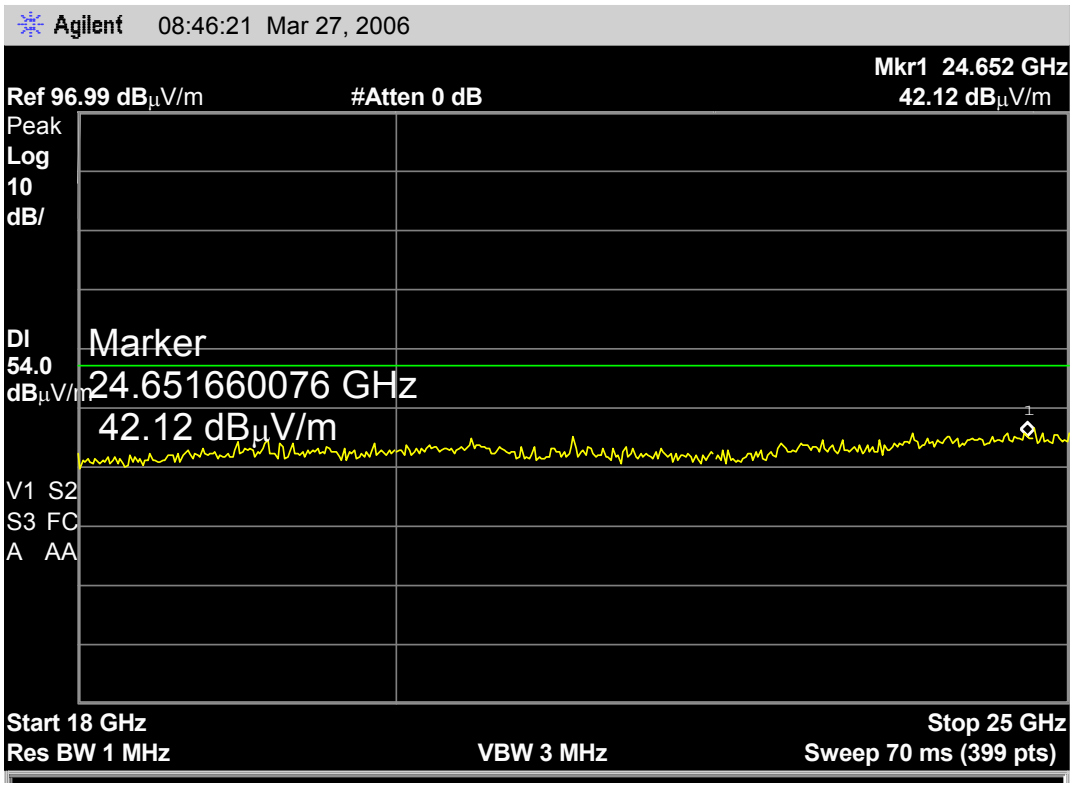
Vertical
Plot 4.6.21



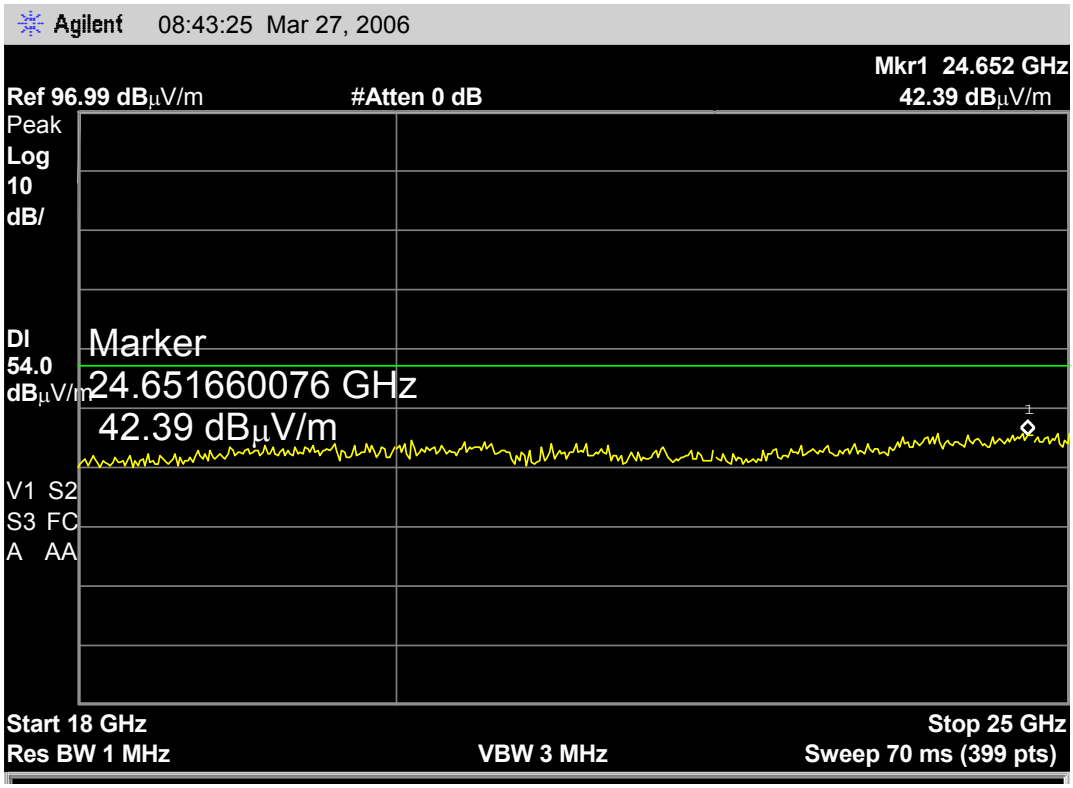
Horizontal
Plot 4.6.22



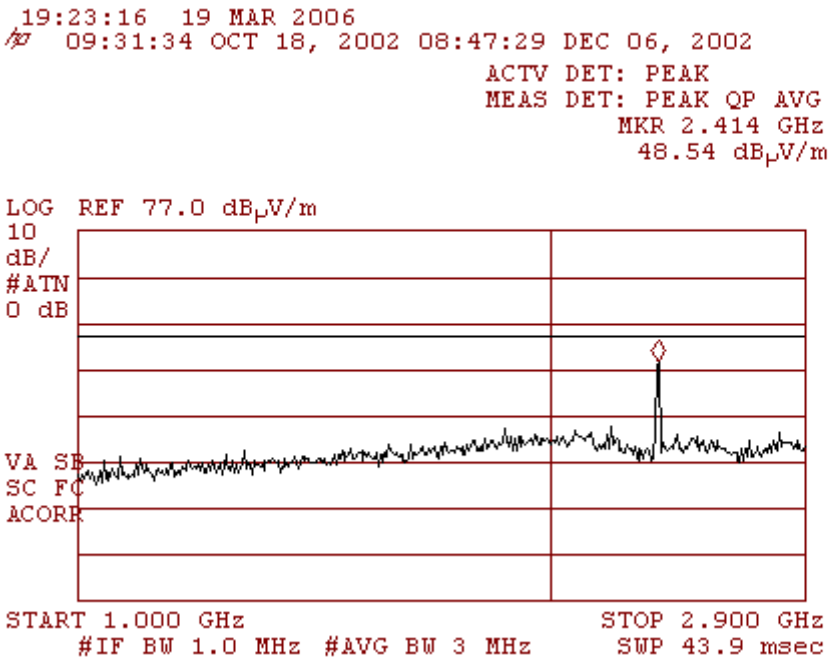
Vertical
Plot 4.6.23



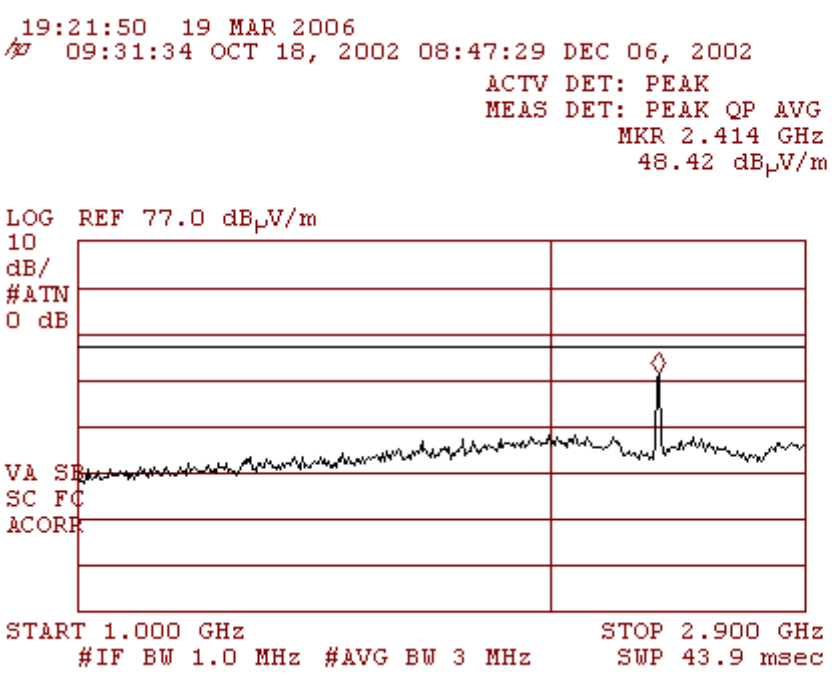
Horizontal
4.6.24



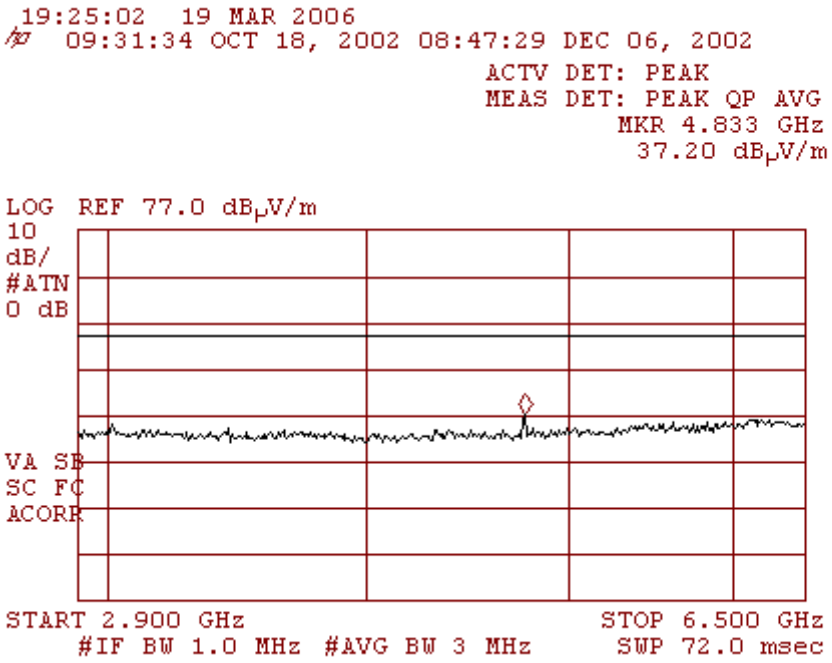
11 Mbit
Lowest Frequency
Vertical
Plot 4.6.25



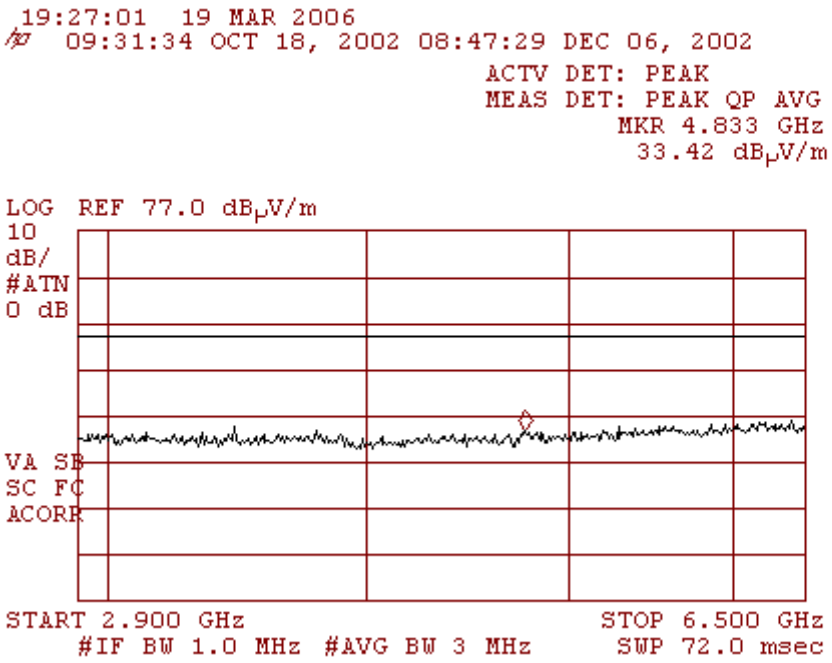
Horizontal
Plot 4.6.26



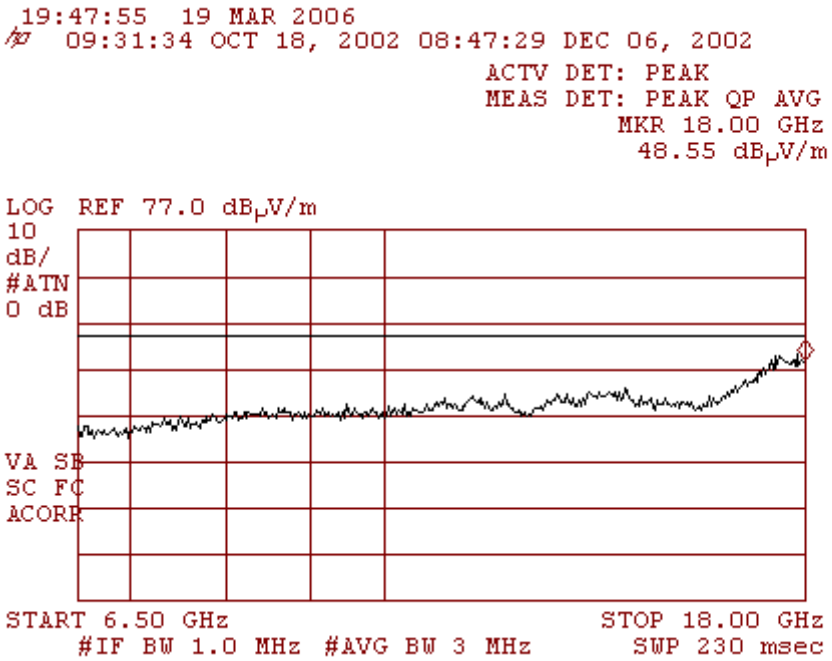
Vertical
Plot 4.6.27



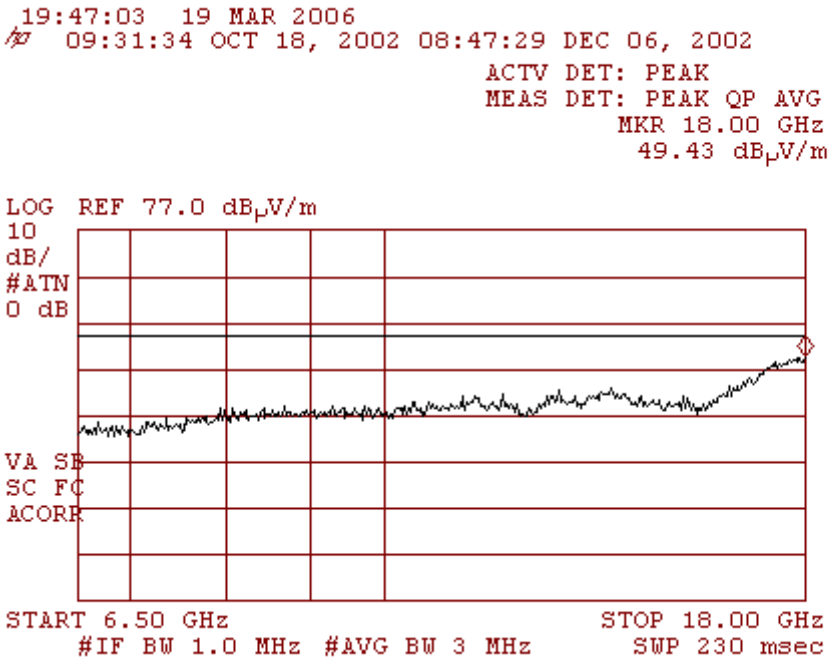
Horizontal
Plot 4.6.28



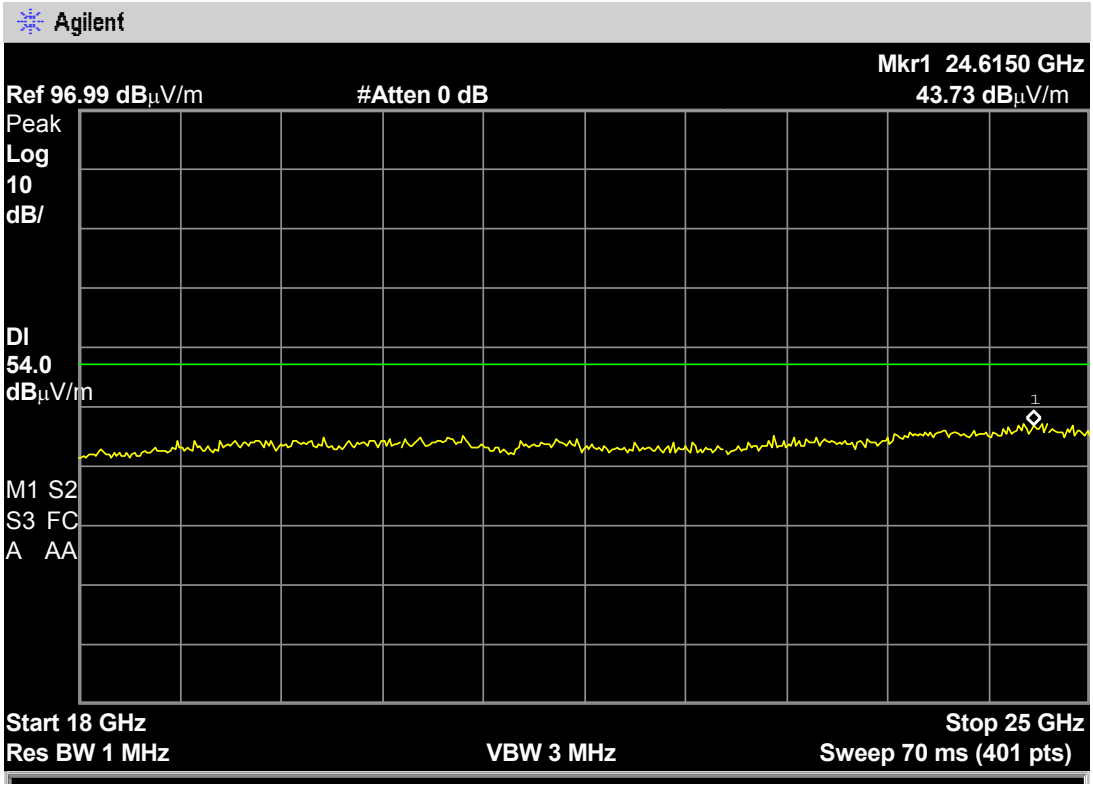
Vertical
Plot 4.6.29



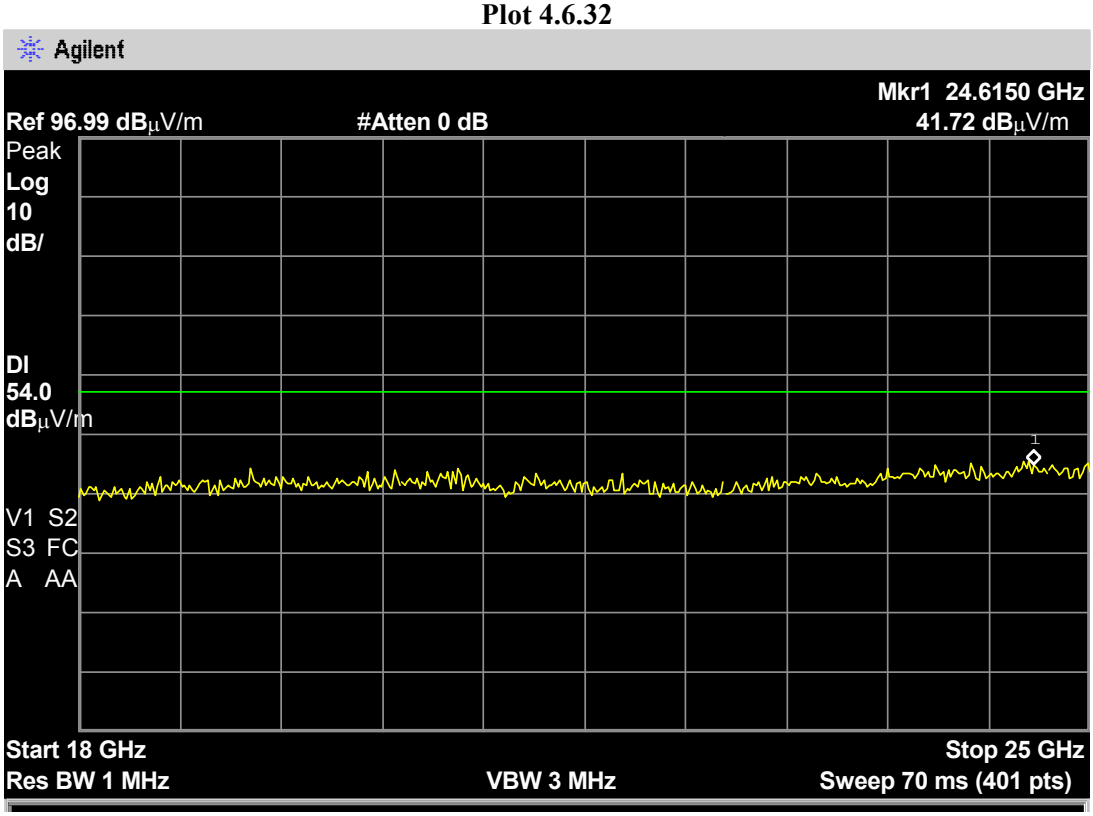
Horizontal
Plot 4.6.30



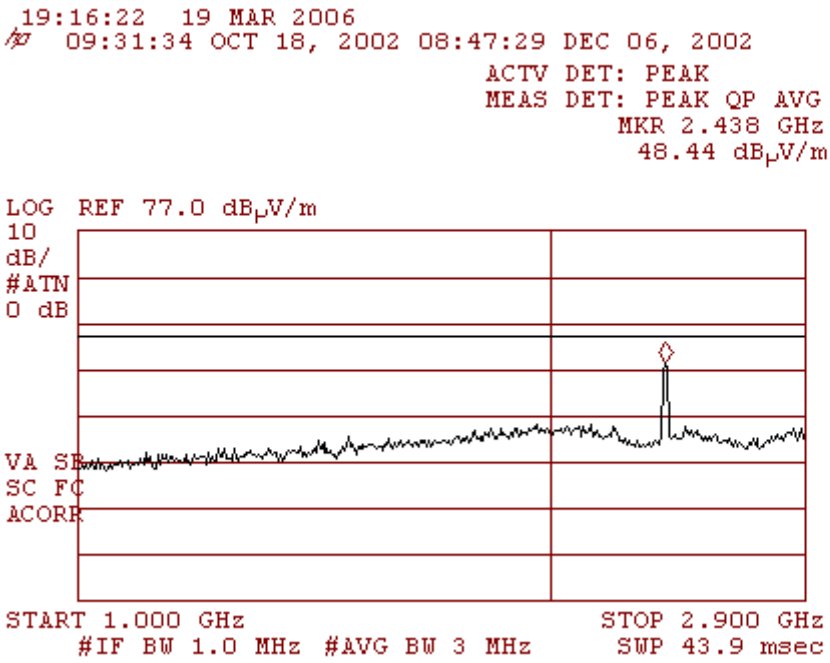
Vertical
Plot 4.6.31



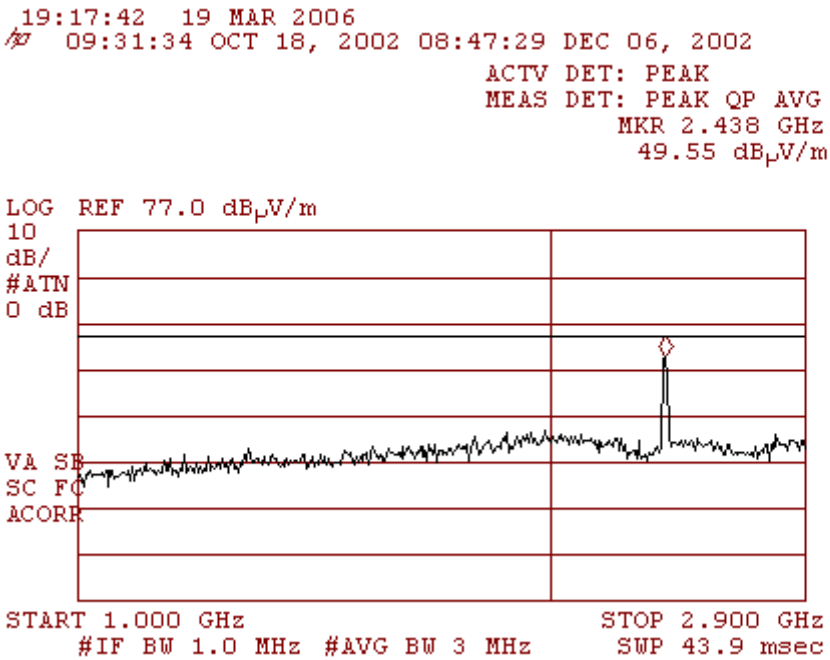
Horizontal
Plot 4.6.32



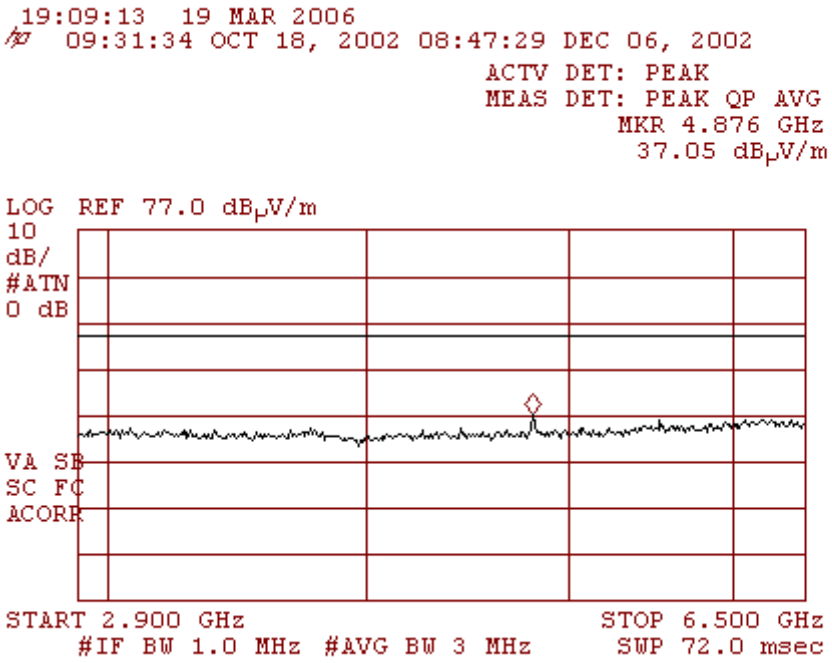
11 Mbit
Middle Frequency
Vertical
Plot 4.6.33



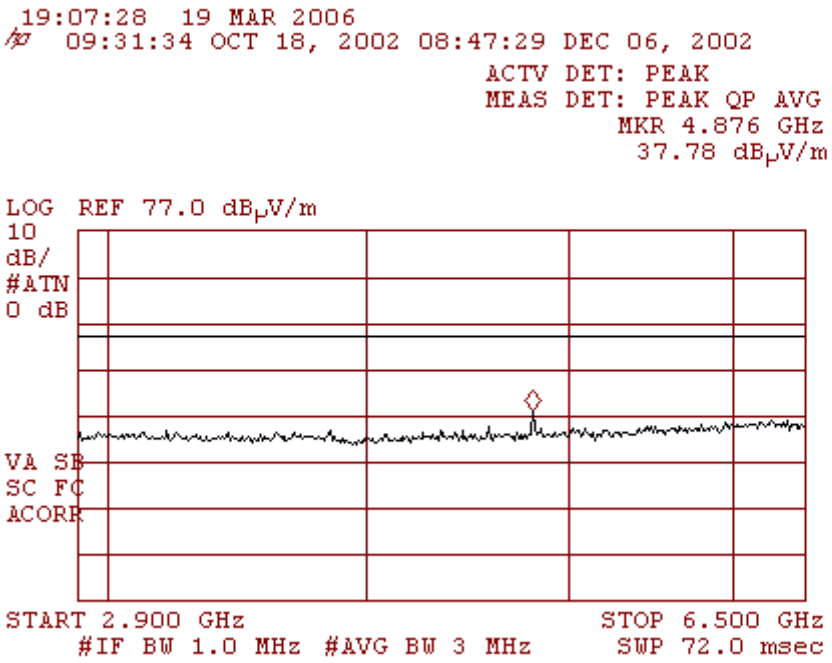
Horizontal
Plot 4.6.34



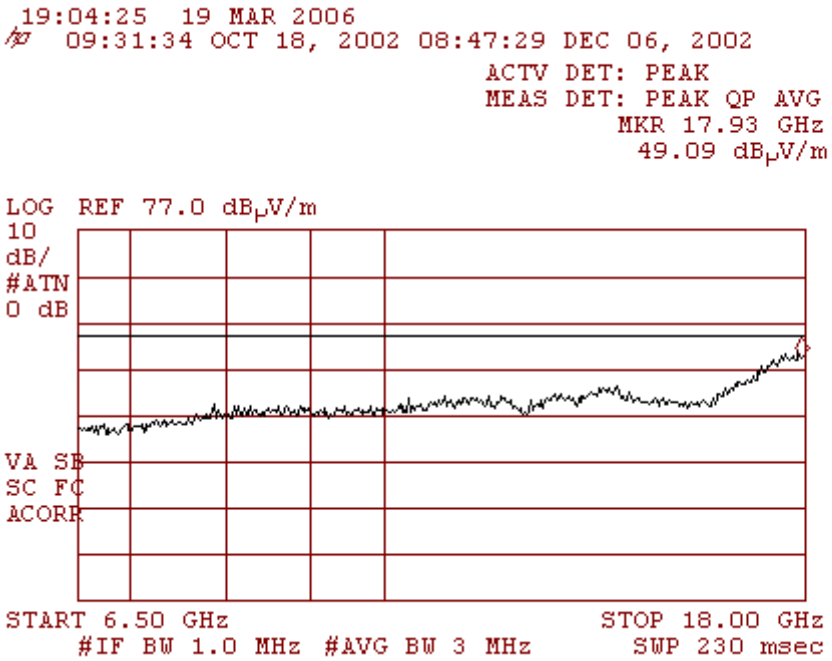
Vertical
Plot 4.6.35



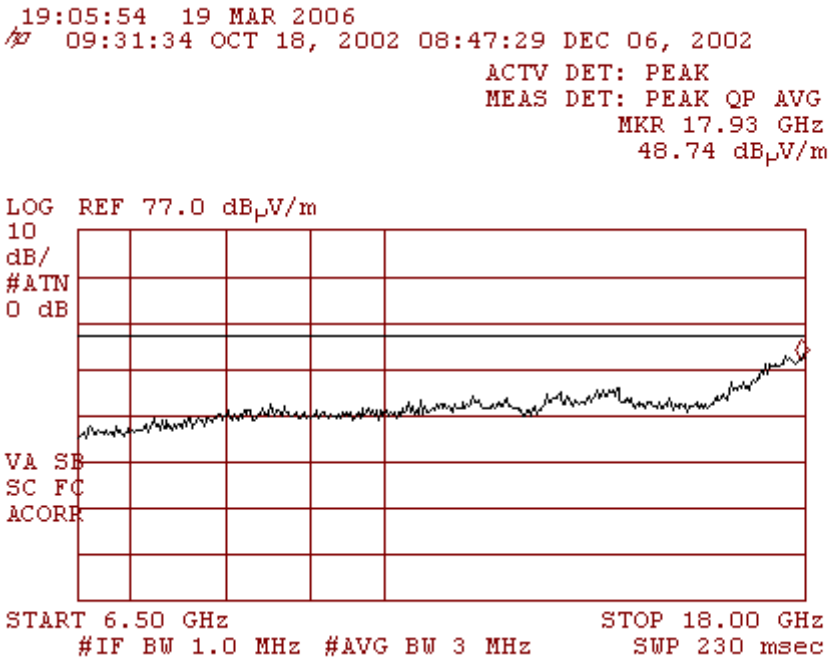
Horizontal
Plot 4.6.36



Vertical
Plot 4.6.37

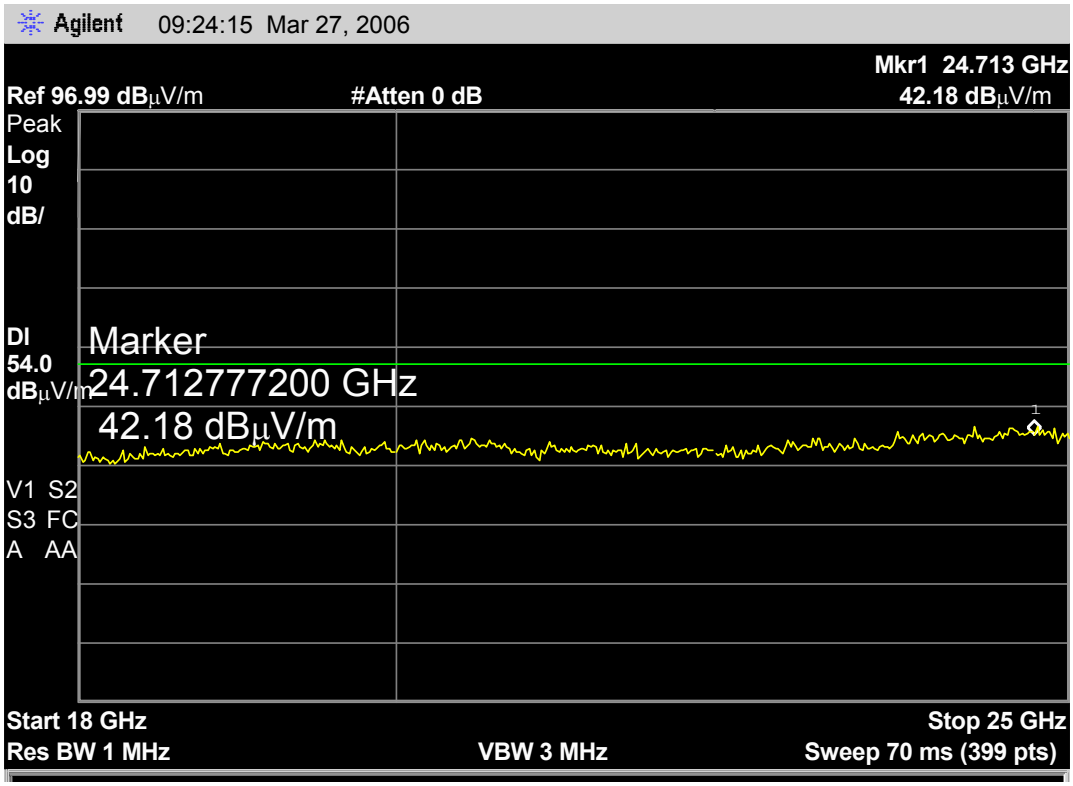


Horizontal
Plot 4.6.38

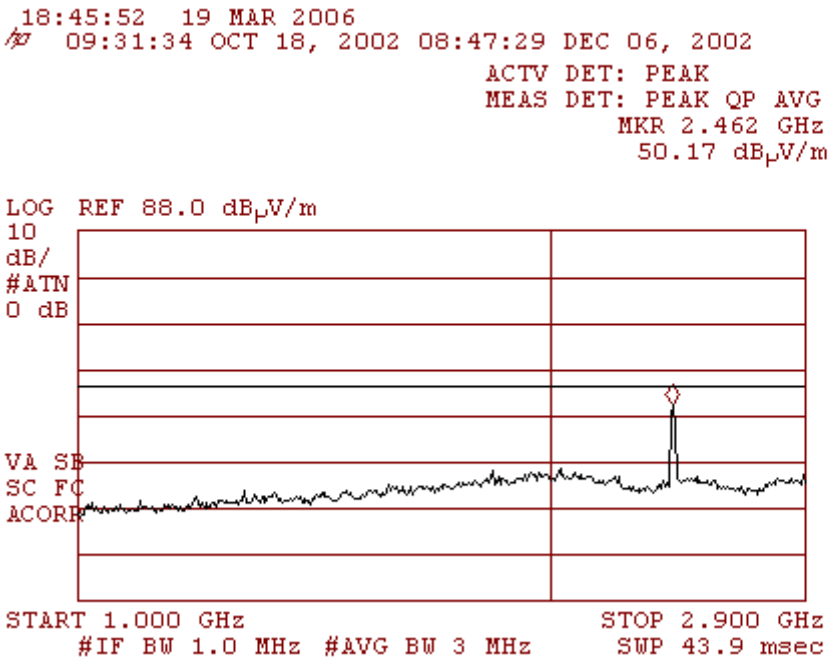


Vertical
Plot 4.6.39

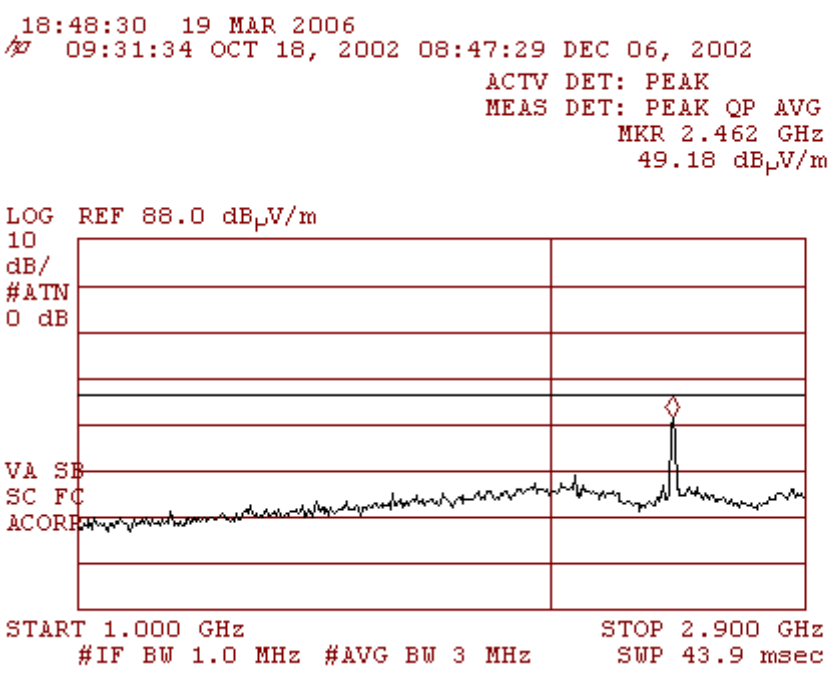
Horizontal
Plot 4.6.40



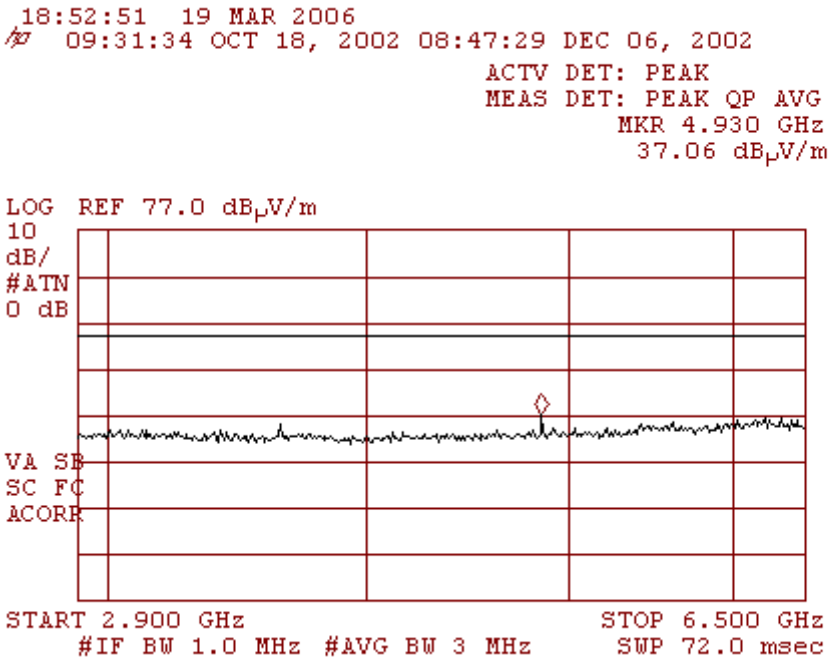
11 Mbit
Highest Frequency
Vertical
Plot 4.6.41



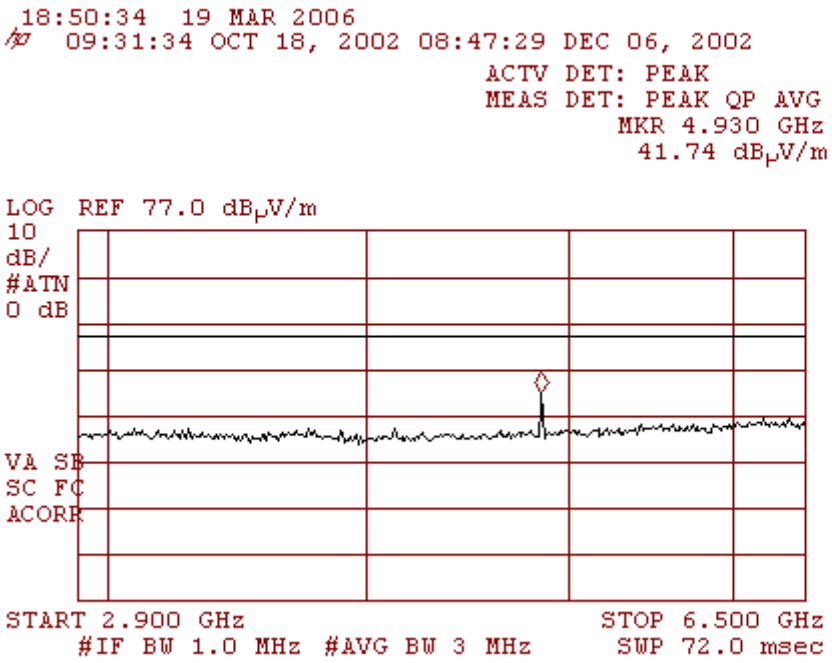
Horizontal
Plot 4.6.42



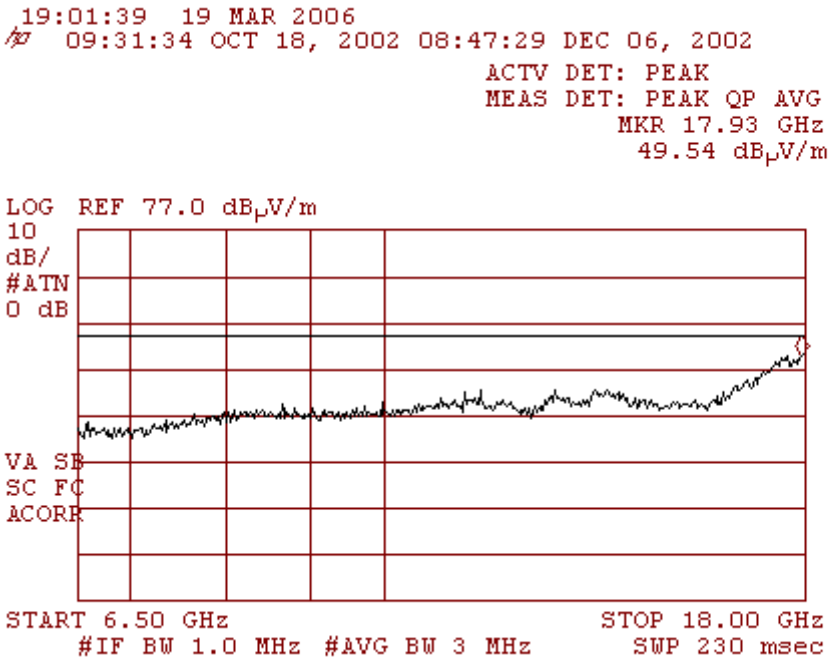
Vertical
Plot 4.6.43



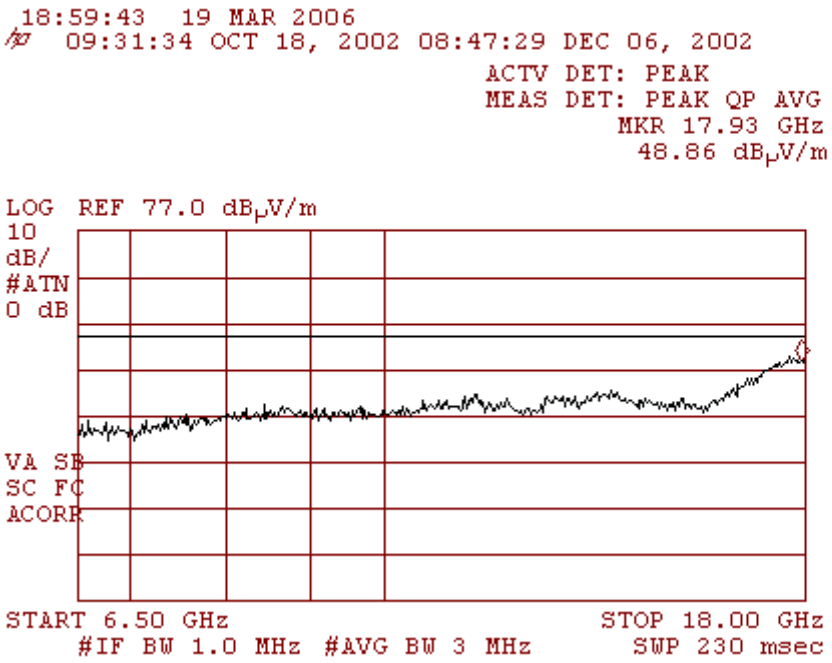
Horizontal
Plot 4.6.44



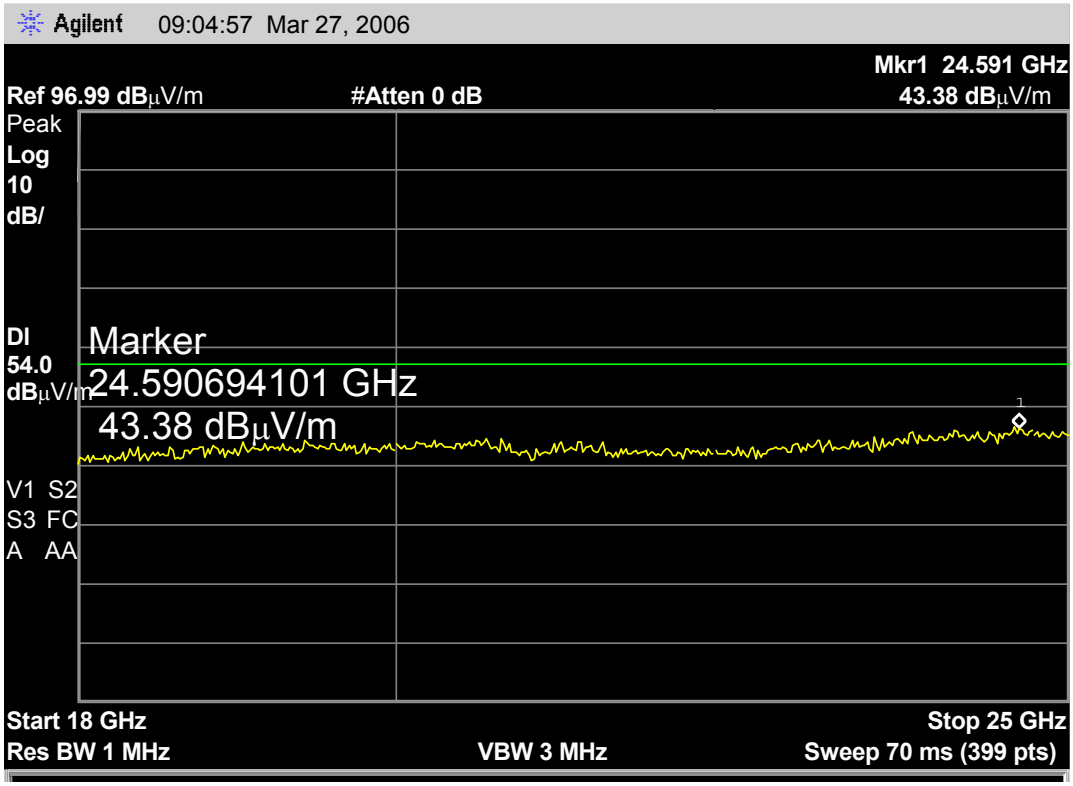
Vertical
Plot 4.6.45



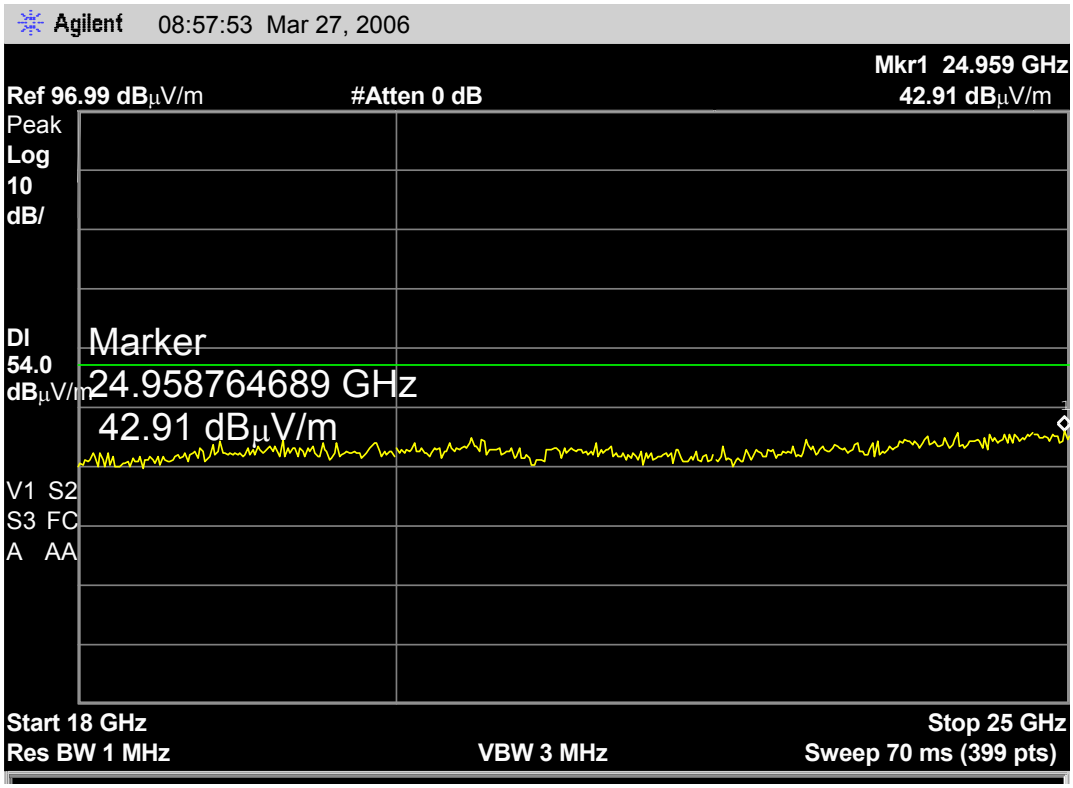
Horizontal
Plot 4.6.46



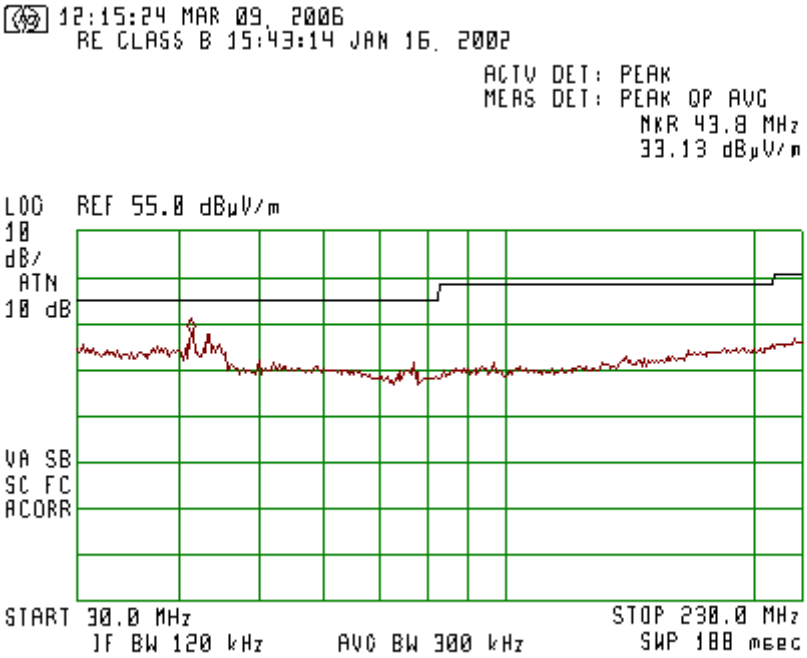
Vertical
Plot 4.6.47



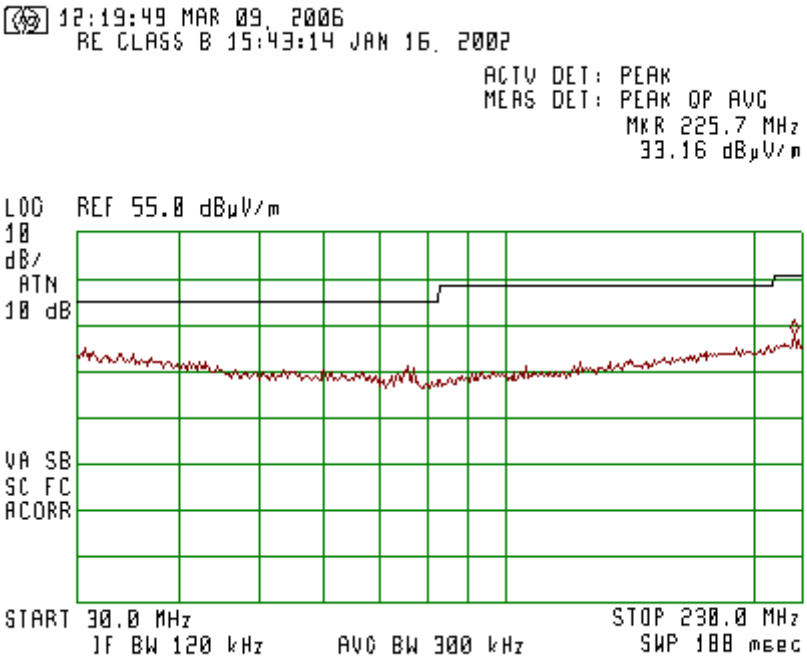
Horizontal
Plot 4.6.48



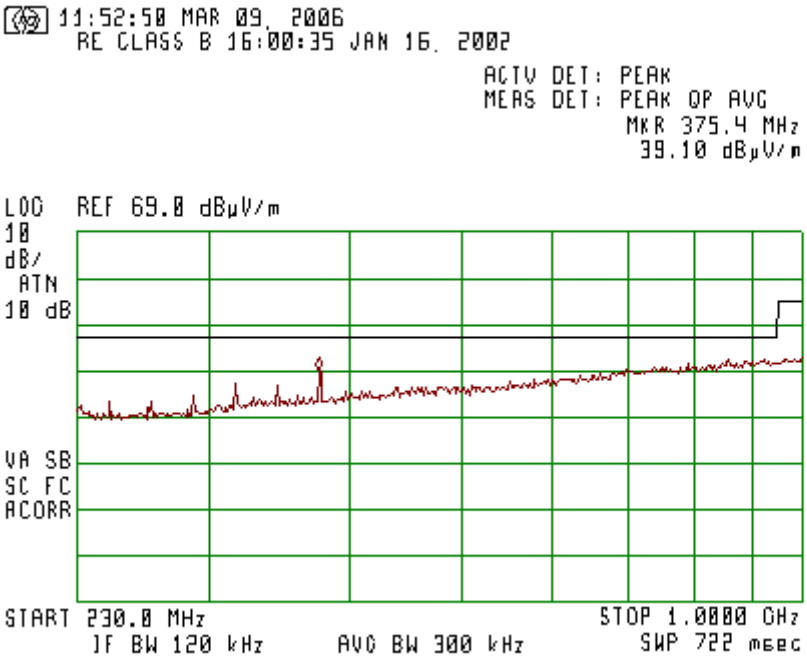
4.7: Radiated Emission (Receive)
802.11b Mode & 802.11g Mode
Vertical
Plot 4.7.1



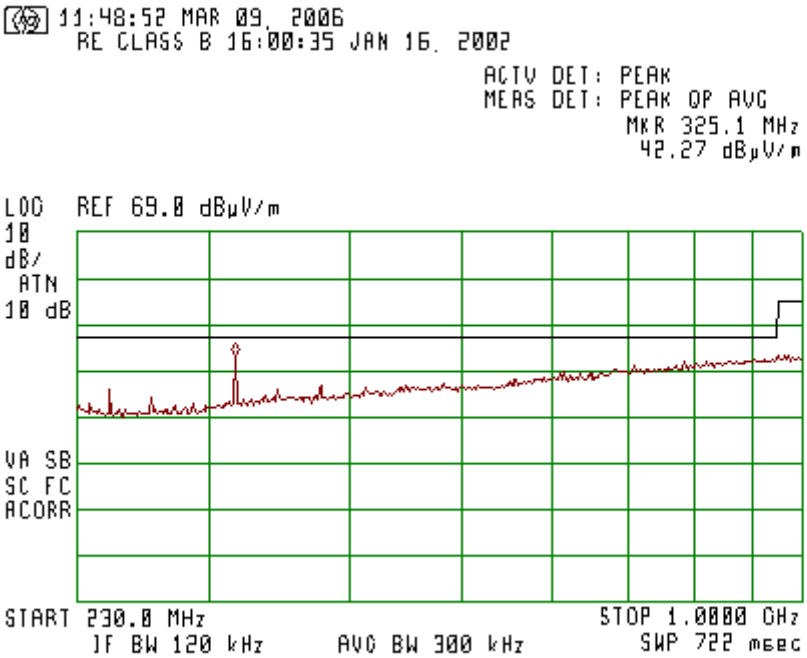
Horizontal
Plot 4.7.2



Vertical
Plot 4.7.3

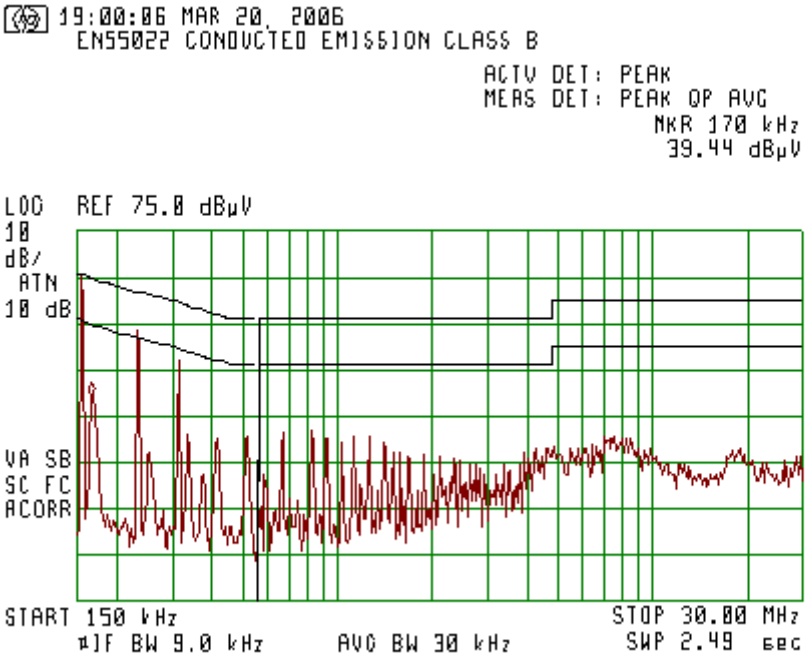


Horizontal
Plot 4.7.4

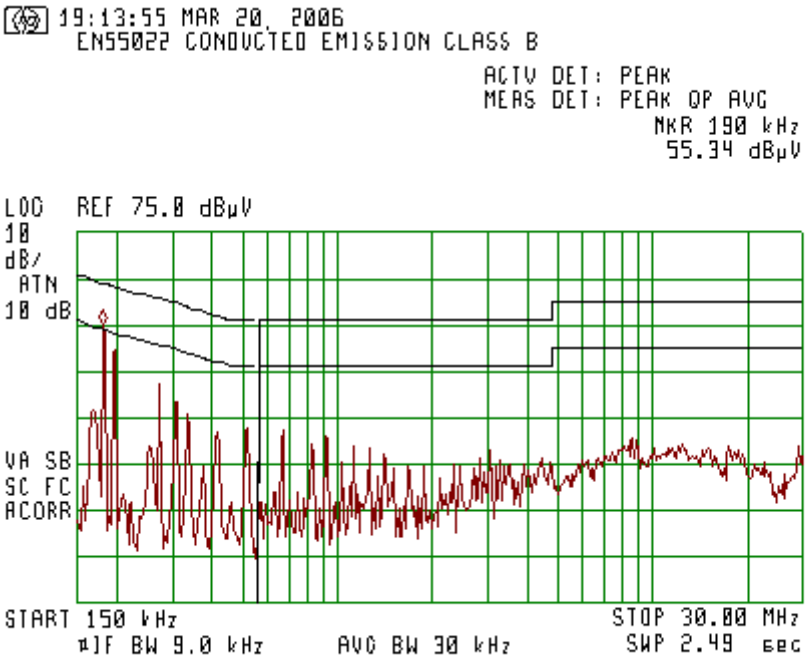


4.8: Power line Conducted Emission (Receive)

Phase
Plot 4.8.1



Neutral
Plot 4.8.2



End of the Test Report