

EMC TEST REPORT

CFR 47 FCC Part 15.247

Report No. : EME-070917
Model No. : NWD210N
Issued Date : Sep. 27, 2007

Applicant : ZyXEL Communications Corporation
6, Innovation Rd II, Science-Based Industrial Park,
Hsin-Chu, Taiwan

Test By : Intertek Testing Services Taiwan Ltd.
No. 11, Lane 275, Ko-Nan 1 Street, Chia-Tung Li,
Shiang-Shan District, Hsinchu City, Taiwan

This test report consists of 139 pages in total. It may be duplicated completely for legal use with the allowance of the applicant. It shall not be reproduced except in full, without the written approval of Intertek Laboratory. The test result(s) in this report only applies to the tested sample(s).

Project Engineer



Jimmie Liu

Reviewed By



Kevin Chen

Table of Contents

1. Summary of Test Data.....	3
2. General Information.....	4
3. Maximum 6dB Bandwidth.....	7
4. 99% Occupied Bandwidth	20
5. Maximum Output Power.....	33
6. Power Spectral Density	35
7. RF Antenna conducted Spurious.....	49
8. Radiated Spurious Emission	86
9. Emission on Band Edge	103
Appendix A: 2.1046 - RF Power Output	133
Appendix B: 2.1049 - Occupied Bandwidth.....	134
Appendix C: 2.1051 - Spurious Emission at Antenna Terminal	135
Appendix D: 2.1053 – Field Strength of Spurious Radiation	136
Appendix E: 15.207 – AC power line conducted emission	138
Appendix F: Test Equipment List	140

1. Summary of Test Data

Test/Requirement Description	Applicable Rule	Result
Minimum 6dB Bandwidth	15.247(a)(2)	Pass
Maximum Output Power	15.247(b)	Pass
Power Spectral Density	15.247(e)	Pass
RF Antenna Conducted Spurious	15.247(d)	Pass
Radiated Spurious Emission	15.247(d), 15.205, 15.209	Pass
Emission on the Band Edge	15.247(d), 15.205	Pass
AC Power Line Conducted Emission	15.207	Pass

2. General Information

Identification of the EUT

Applicant : ZyXEL Communications Corporation.
Product : Wireless N USB Adapter
Model No. : NWD210N
FCC ID. : I88NWD210N
Frequency Range : 2412MHz to 2462MHz for 802.11b, 802.11g, 802.11n 20MHz
2422MHz to 2452MHz for 802.11n 40MHz
Channel Number : 11 channels for 802.11b, 802.11g, 802.11n 20MHz
: 7 channels for 802.11n 40MHz
Rated Power : DC 5V
Power Cord : N/A
Sample Received : Sep. 04, 2007
Test Date(s) : Sep. 05, 2007 ~ Sep. 20, 2007

Description of EUT

The EUT is a Wireless N USB Adapter, it supports two transmission and receive functions, and was defined as information technology equipment.

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

Description of Peripherals

Peripherals	Manufacturer	Product No.	Serial No.
Wireless AP	SMC	SMC2655W	S25028NU05021
Notebook PC	DELL	Latitude D610	HXWZK1S
Printer	HP	DeskJet 400	TH86I1K30S
Modem	Dynalink	V1456VQE	00V230A00116311

Antenna description

DAC0

The EUT uses a permanently connected antenna.

Antenna Gain : -1.31dBi max
Antenna Type : PCB Printed
Connector Type : N/A

DAC1

The EUT uses a permanently connected antenna.

Antenna Gain : -1.31dBi max
Antenna Type : PCB Printed
Connector Type : N/A

Operation mode

With individual verifying, the maximum output power was found out 1Mbps data rate for 802.11b mode and 6Mbps data rate for 802.11g mode, 6.5Mbps data rate for 802.11n HT 20 mode, 13.5Mbps data rate for 802.11n HT 40 mode. The final tests were executed under these conditions recorded in this report individually. Please refer the details below.

802.11b ch11_DA0 (single tx)	
Date rate	PK power (dBm)
1M	19.97
2M	19.56
5.5M	19.21
11M	18.85
802.11g ch11_DA0 (single tx)	
6M	23.54
9M	23.13
12M	22.98
18M	22.76
24M	22.51
36M	22.36
48M	22.11
54M	21.96

802.11n 20M ch11_DA0 (single tx)	
Date rate	PK power (dBm)
6.5M	23.23
13M	22.84
19.5M	22.21
26M	21.97
39M	21.86
52M	21.63
58.5M	21.43
65M	21.19
802.11n 40M ch11_DA0 (single tx)	
13M	22.78
26M	22.43
39M	22.15
52M	21.84
78M	21.63
103M	21.18
117M	20.96
130M	20.85

802.11n 20M ch1 (dual tx)	
Date rate	PK power (dBm)
13M	25.86
26M	25.57
39M	25.50
52M	25.48
78M	25.23
104M	25.13
117M	24.89
130M	24.28
802.11n 40M ch6 (dual tx)	
26M	25.45
52M	25.37
78M	25.27
104M	25.12
156M	24.98
206M	24.65
234M	24.54
260M	24.38

3. Maximum 6dB Bandwidth

Name of Test	Maximum 6dB Bandwidth
Base Standard	FCC 15.247 a(2)

Tested By: Jimmie Liu
Test Date: Sep. 20, 2007

Test Equipment: EC365

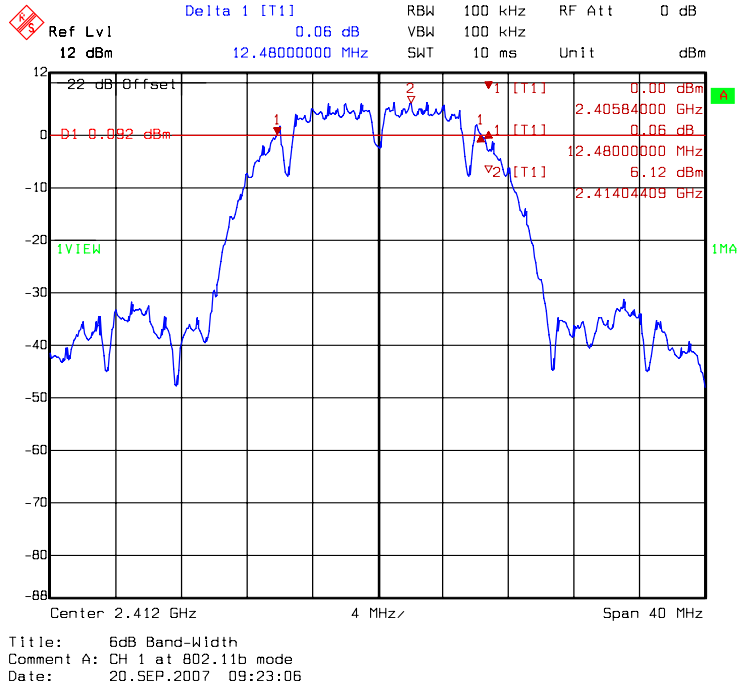
Test Result: Complies
Test Method: See Appendix B
Measurement Data: See Table & plots below

Note: The EUT was tested while in a continuous transmit mode. The EUT was tuned to a low, middle and high channel.

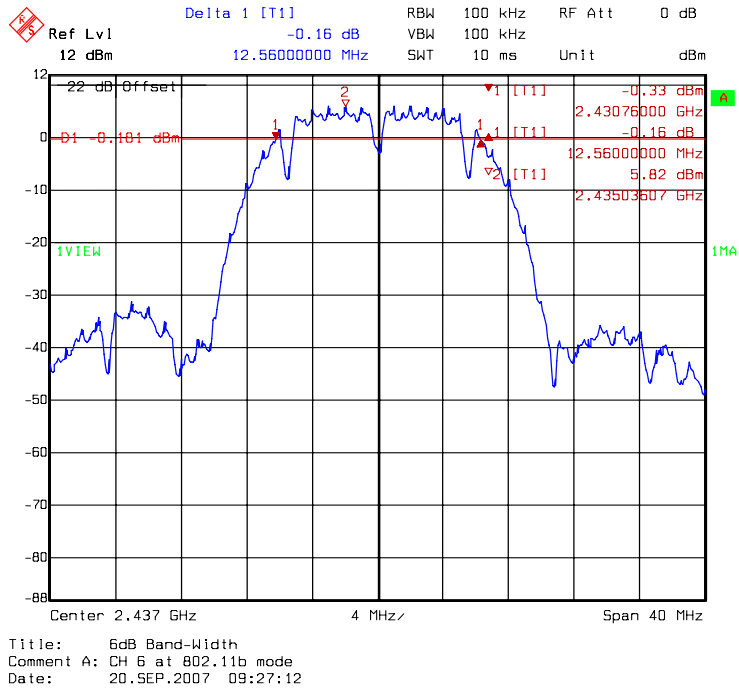
Table1. Maximum 6dB Bandwidth

Mode	Channel	Frequency (MHz)	6dB Bandwidth (MHz)		Min. Limit (MHz)	Pass/Fail
			DAC0	DAC1		
802.11b	1	2412	12.48	12.56	0.5	Pass
	6	2437	12.56	12.64	0.5	Pass
	11	2462	12.72	12.72	0.5	Pass
802.11g	1	2412	16.80	16.80	0.5	Pass
	6	2437	16.80	16.80	0.5	Pass
	11	2462	16.80	16.80	0.5	Pass
802.11n 20MHz	1	2412	17.92	17.84	0.5	Pass
	6	2437	17.92	17.84	0.5	Pass
	11	2462	17.84	17.84	0.5	Pass
802.11n 40MHz	3	2422	36.90	36.78	0.5	Pass
	6	2437	36.90	36.90	0.5	Pass
	9	2452	36.90	36.78	0.5	Pass

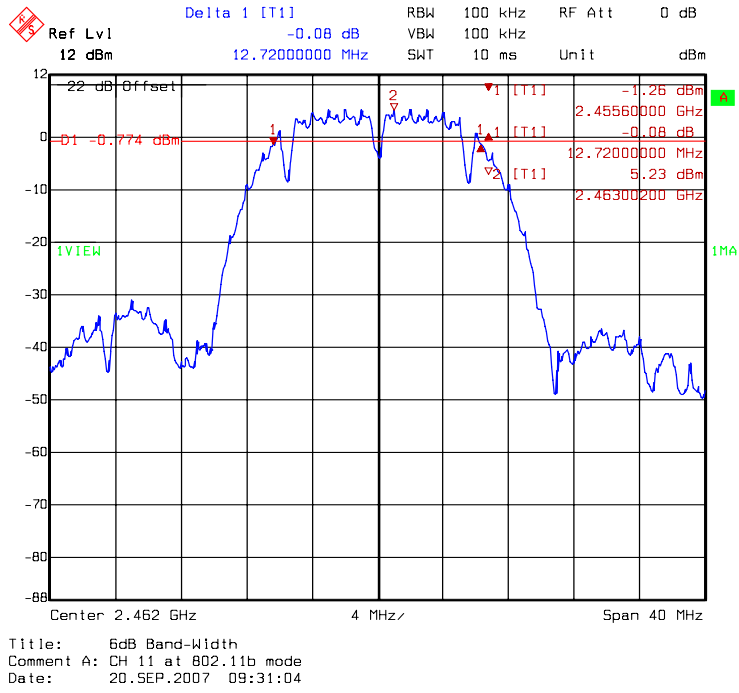
DAC0: 6dB Bandwidth @ 802.11b mode channel 1



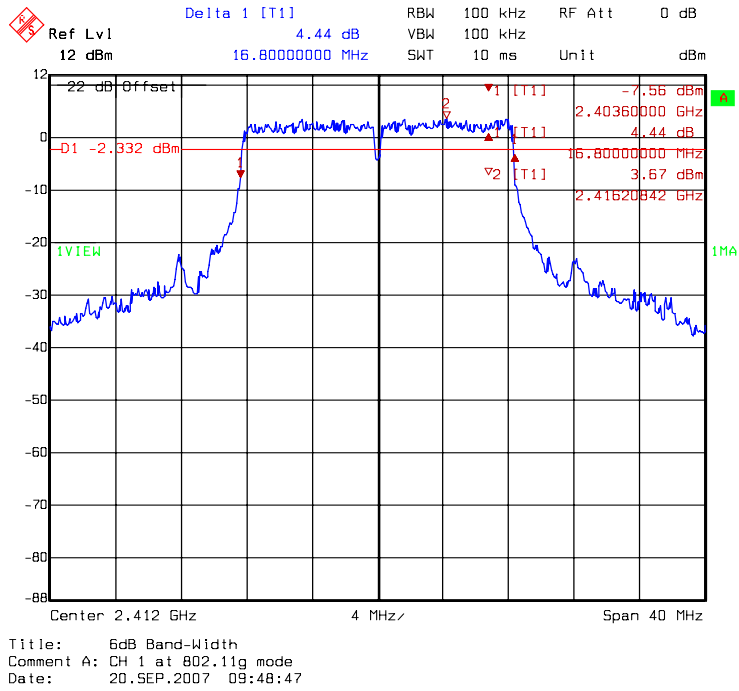
DAC0: 6dB Bandwidth @ 802.11b mode channel 6



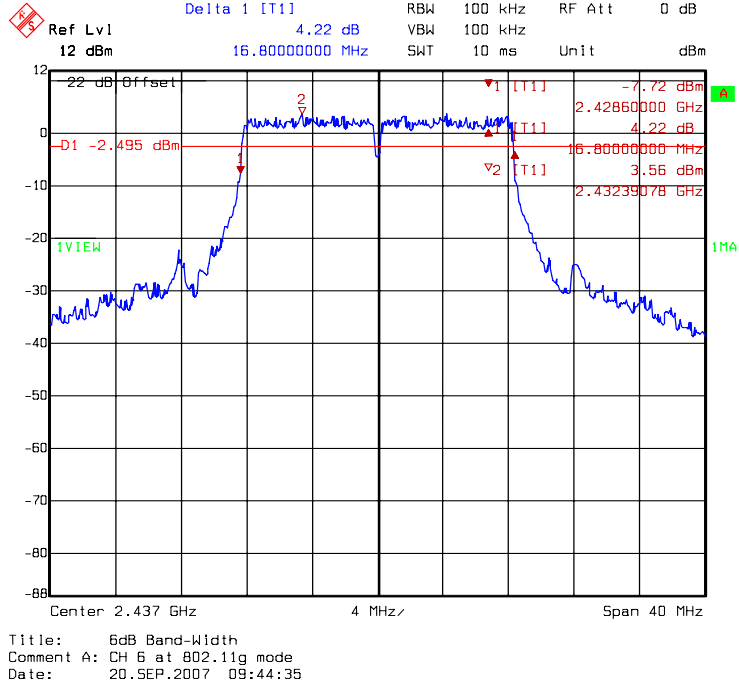
DAC0: 6dB Bandwidth @ 802.11b mode channel 11



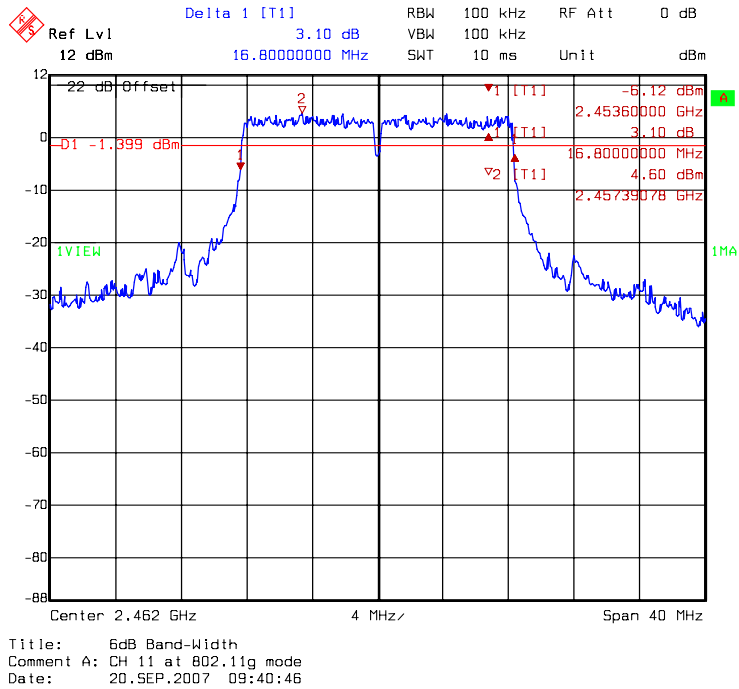
DAC0: 6dB Bandwidth @ 802.11g mode channel 1



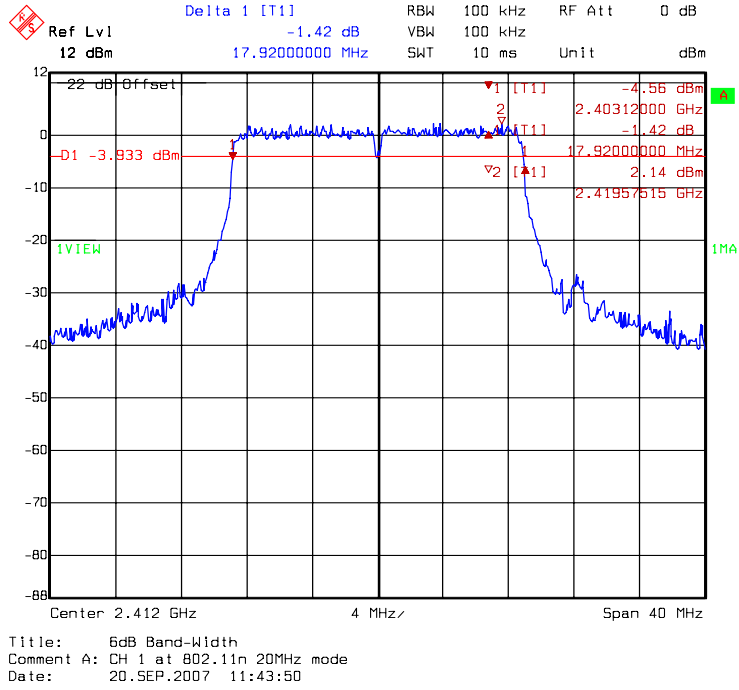
DAC0: 6dB Bandwidth @ 802.11g mode channel 6



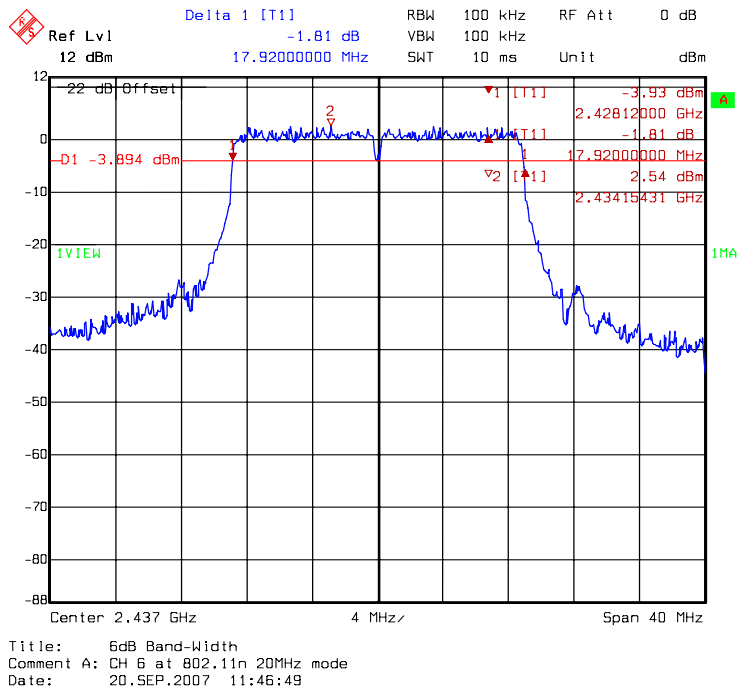
DAC0: 6dB Bandwidth @ 802.11g mode channel 11



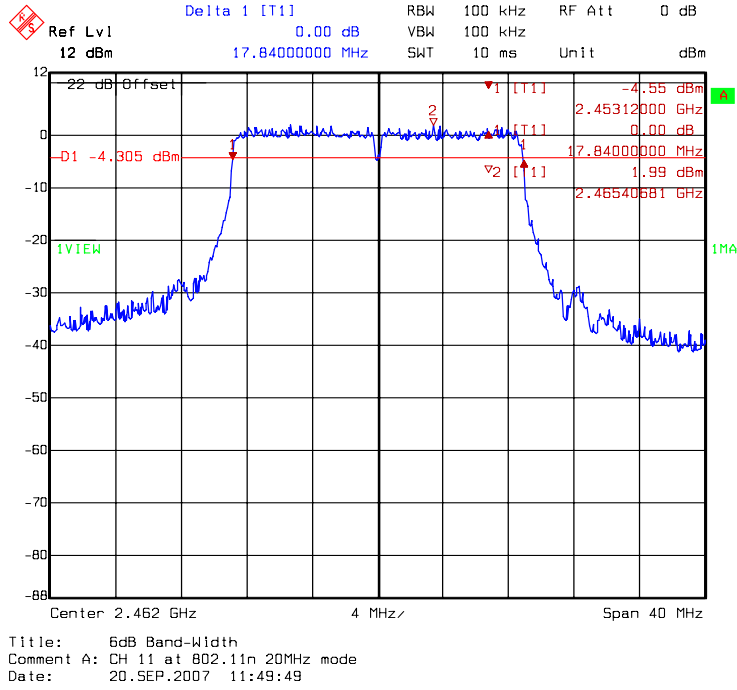
DAC0: 6dB Bandwidth @ draft 802.11n 20MHz mode channel 1



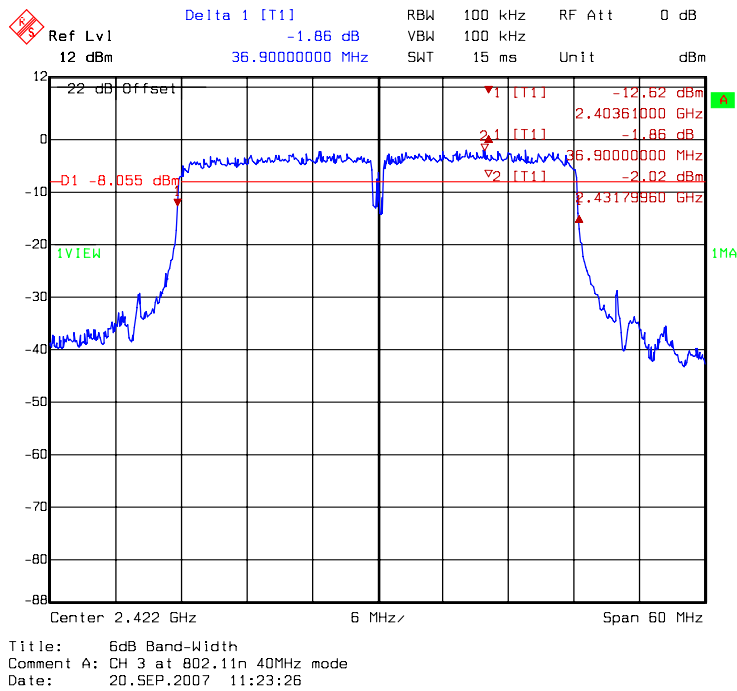
DAC0: 6dB Bandwidth @ draft 802.11n 20MHz mode channel 6



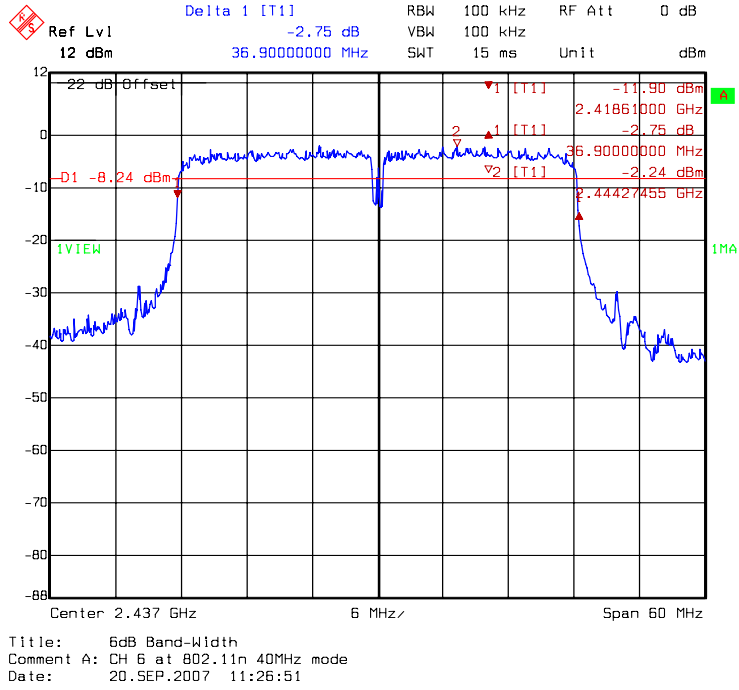
DAC0: 6dB Bandwidth @ draft 802.11n 20MHz mode channel 11



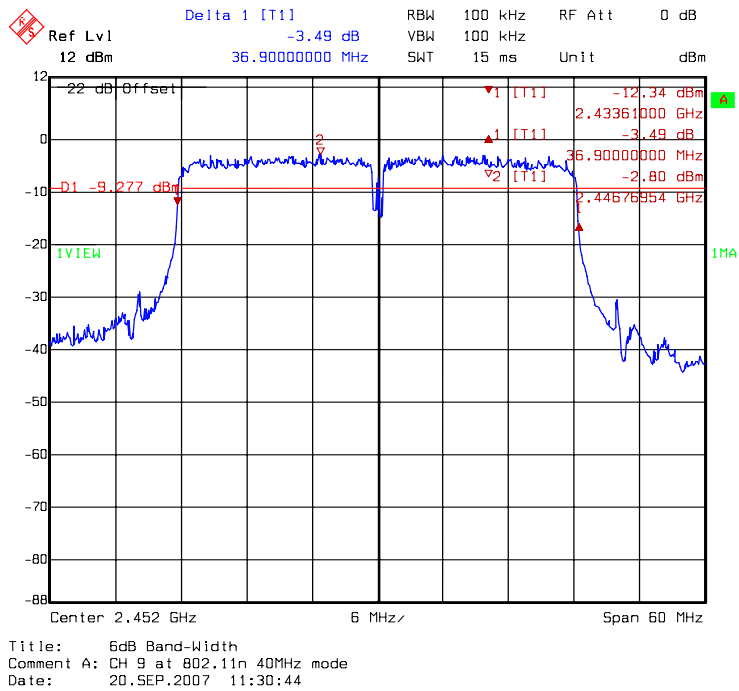
DAC0: 6dB Bandwidth @ draft 802.11n 40MHz mode channel 3



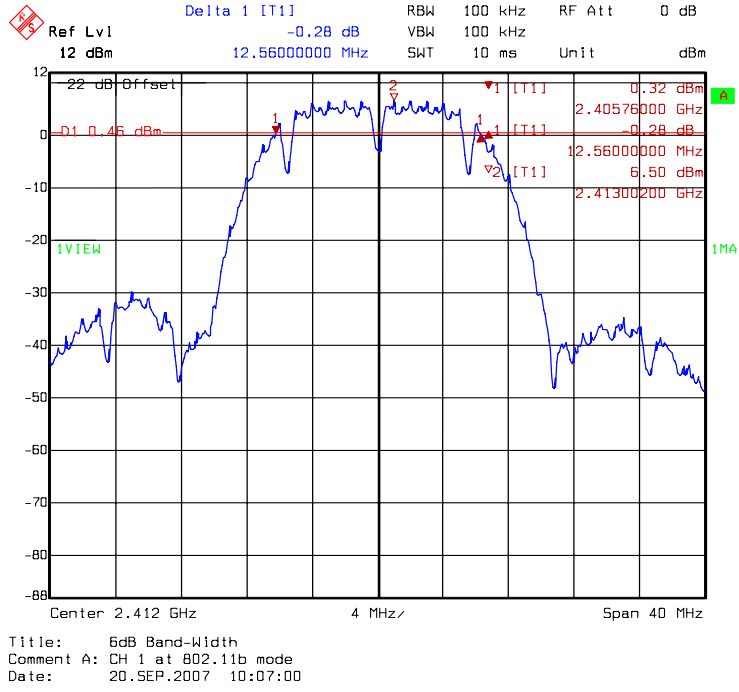
DAC0: 6dB Bandwidth @ draft 802.11n 40MHz mode channel 6



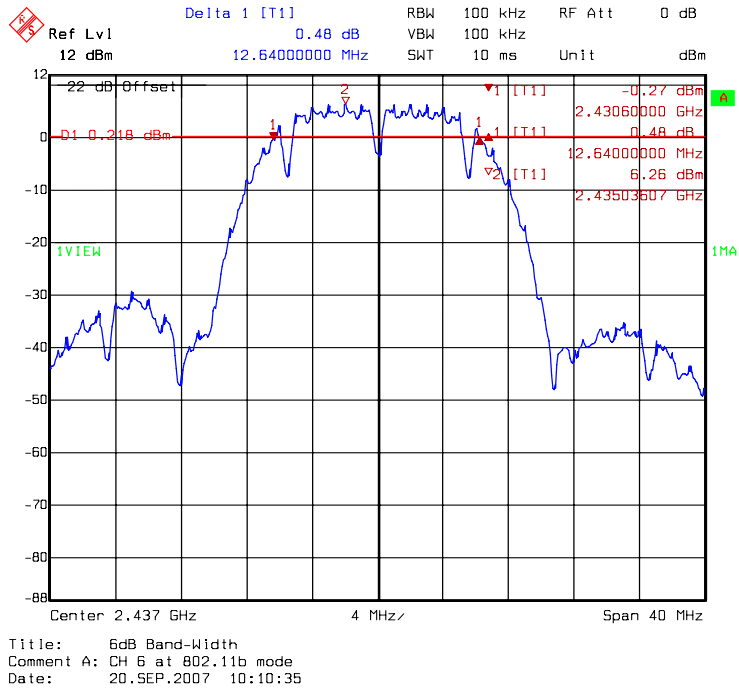
DAC0: 6dB Bandwidth @ draft 802.11n 40MHz mode channel 9



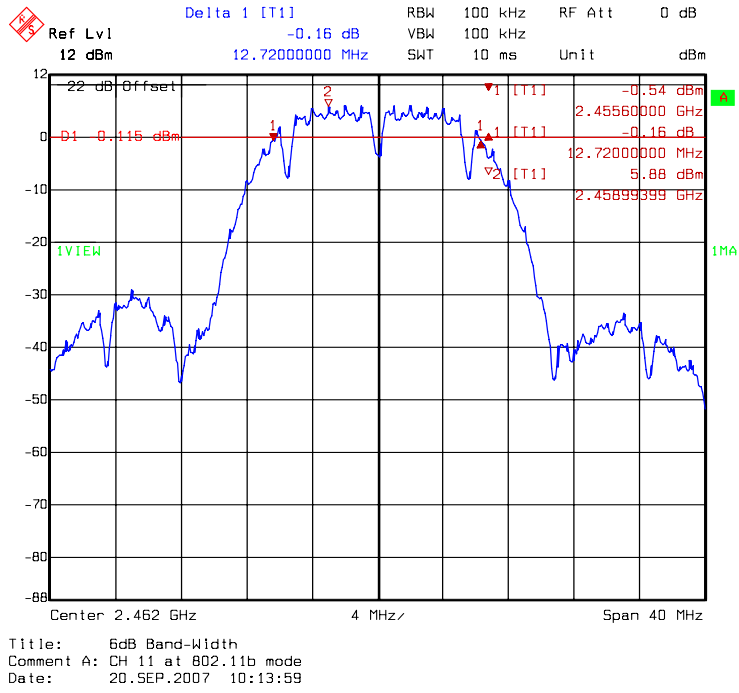
DAC1: 6dB Bandwidth @ 802.11b mode channel 1



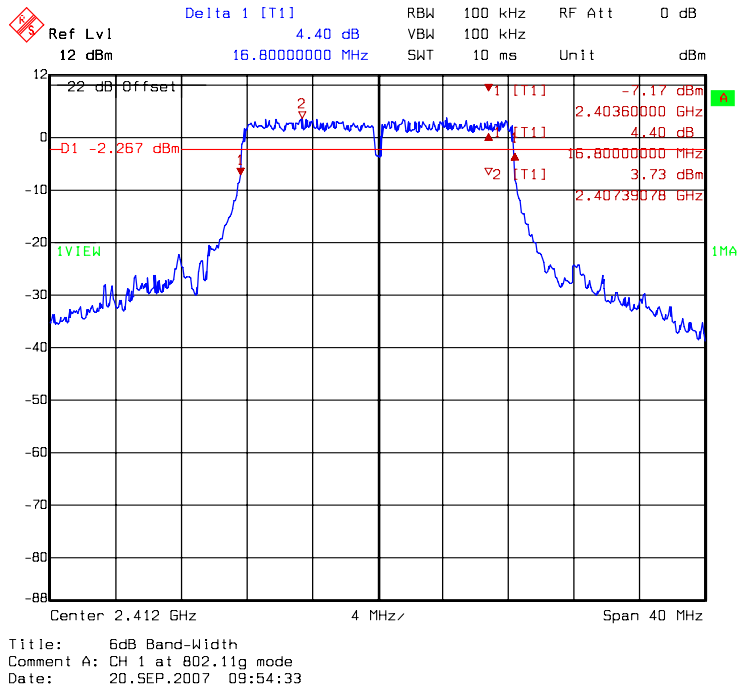
DAC1: 6dB Bandwidth @ 802.11b mode channel 6



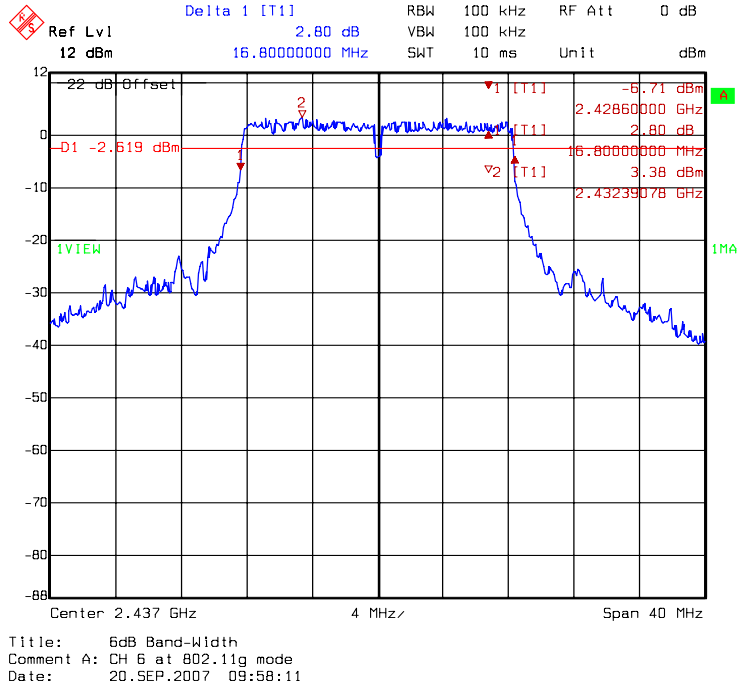
DAC1: 6dB Bandwidth @ 802.11b mode channel 11



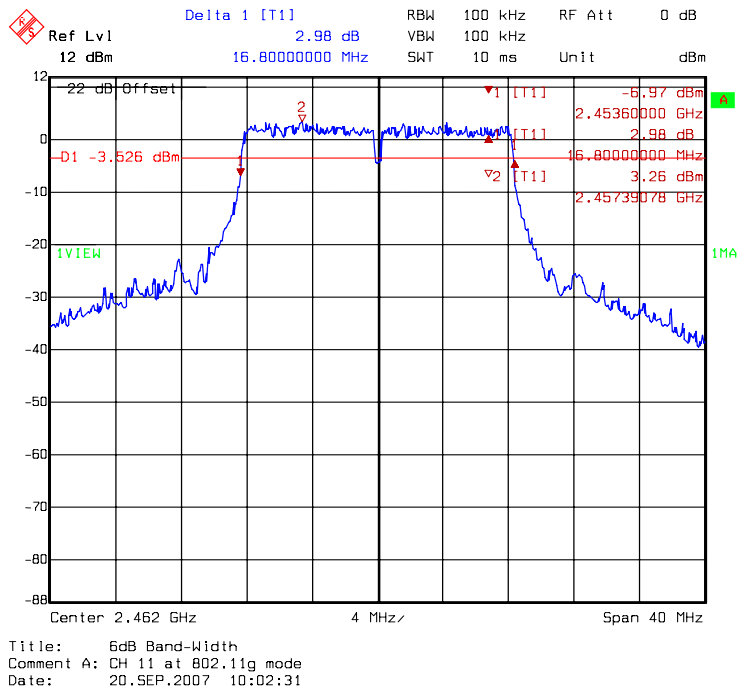
DAC1: 6dB Bandwidth @ 802.11g mode channel 1



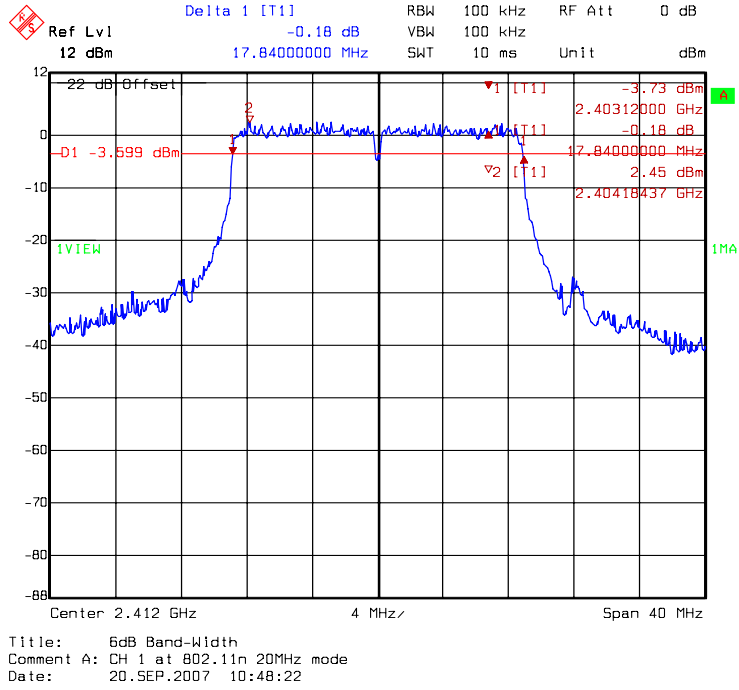
DAC1: 6dB Bandwidth @ 802.11g mode channel 6



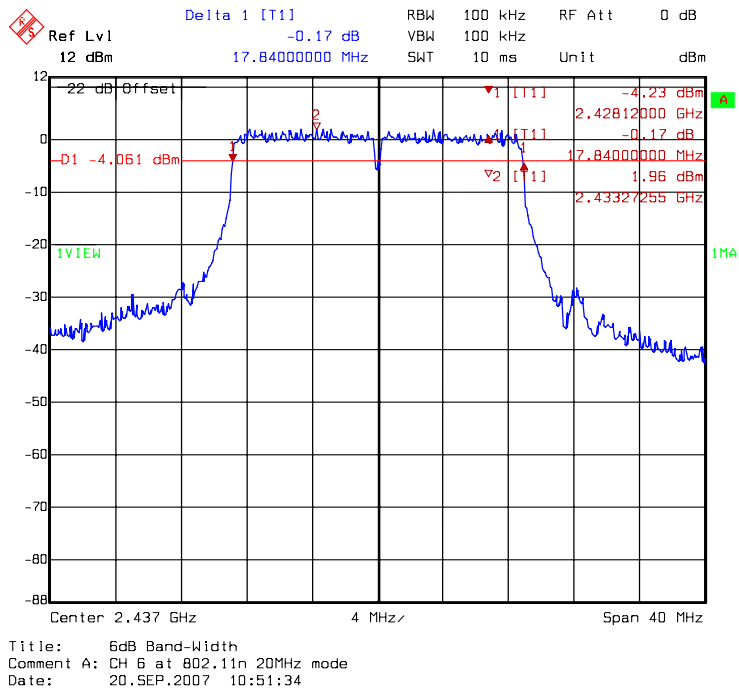
DAC1: 6dB Bandwidth @ 802.11g mode channel 11



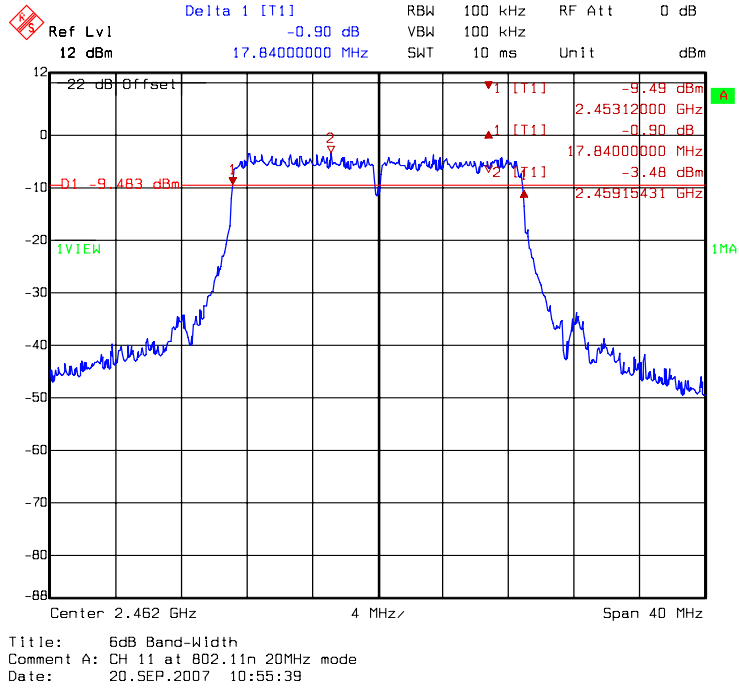
DAC1: 6dB Bandwidth @ draft 802.11n 20MHz mode channel 1



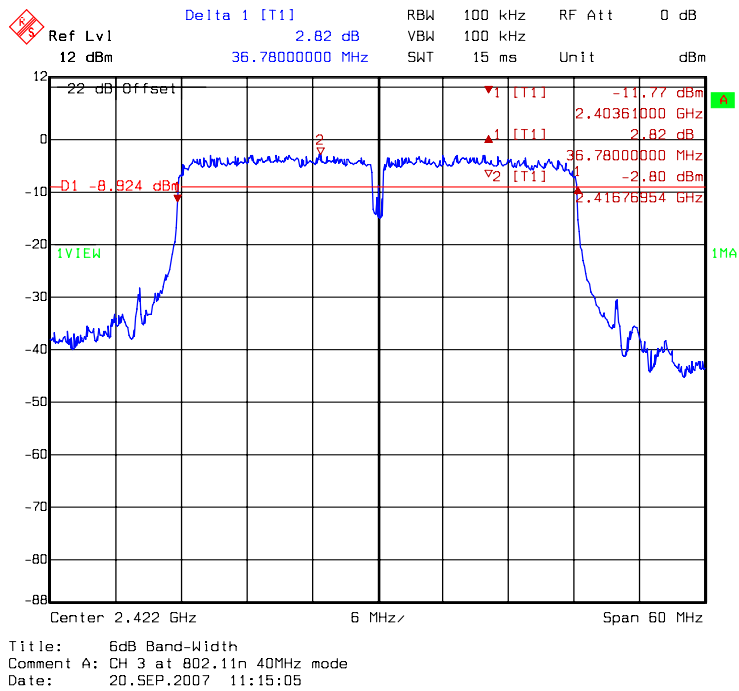
DAC1: 6dB Bandwidth @ draft 802.11n 20MHz mode channel 6



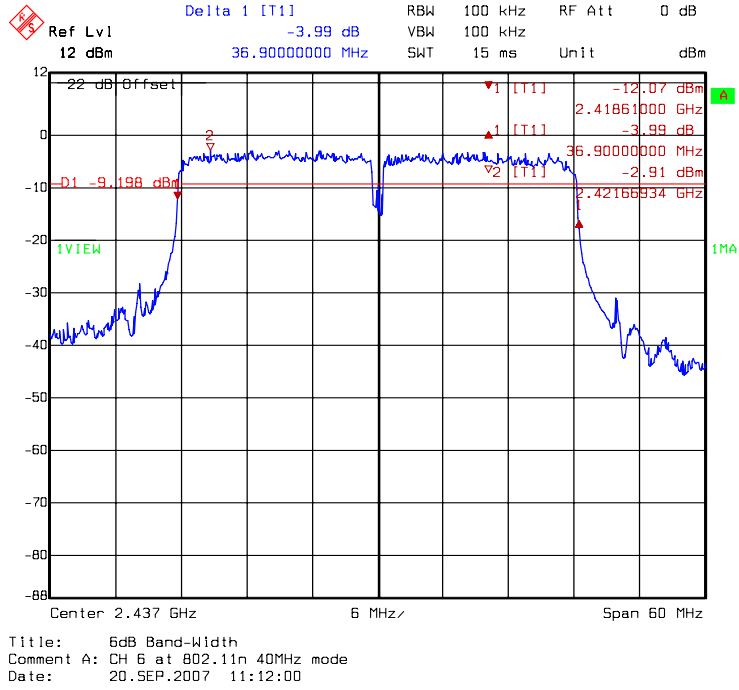
DAC1: 6dB Bandwidth @ draft 802.11n 20MHz mode channel 11



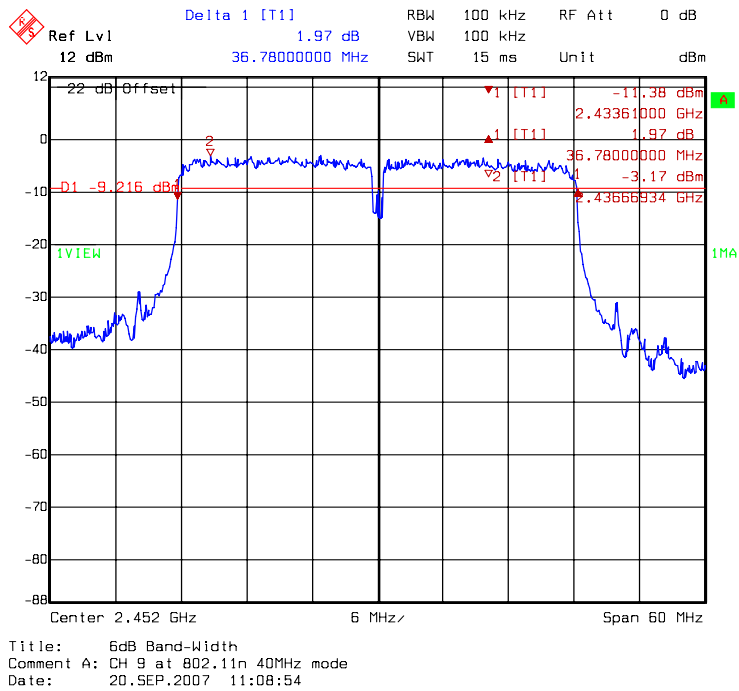
DAC1: 6dB Bandwidth @ draft 802.11n 40MHz mode channel 3



DAC1: 6dB Bandwidth @ draft 802.11n 40MHz mode channel 6



DAC1: 6dB Bandwidth @ draft 802.11n 40MHz mode channel 9



4. 99% Occupied Bandwidth

Name of Test	99% Occupied Bandwidth
Base Standard	None; for reporting purposes only

Tested By: Jimmie Liu
Test Date: Sep. 20, 2007

Test Equipment: EC365

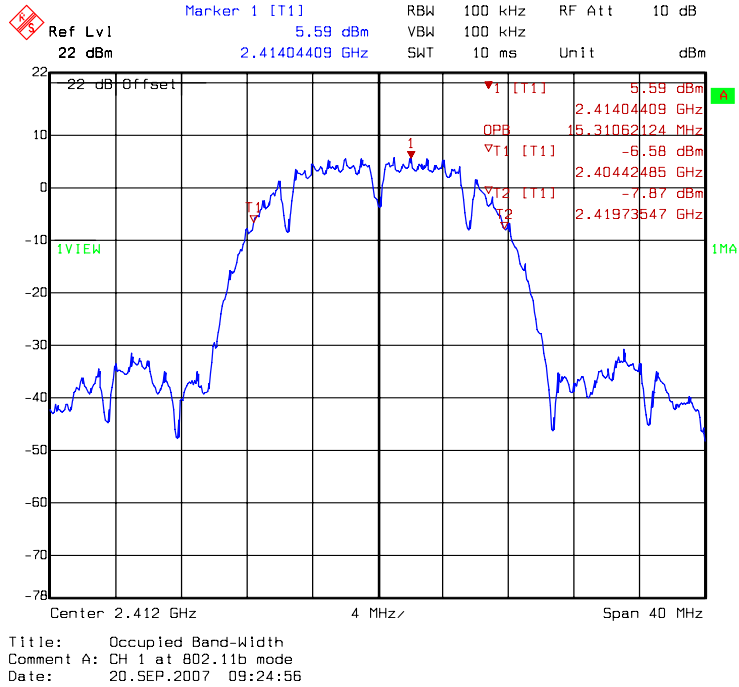
Test Result: Complies
Test Method: See Appendix B
Measurement Data: See Table & plots below

Note: The EUT was tested while in a continuous transmit mode. The EUT was tuned to a low, middle and high channel.

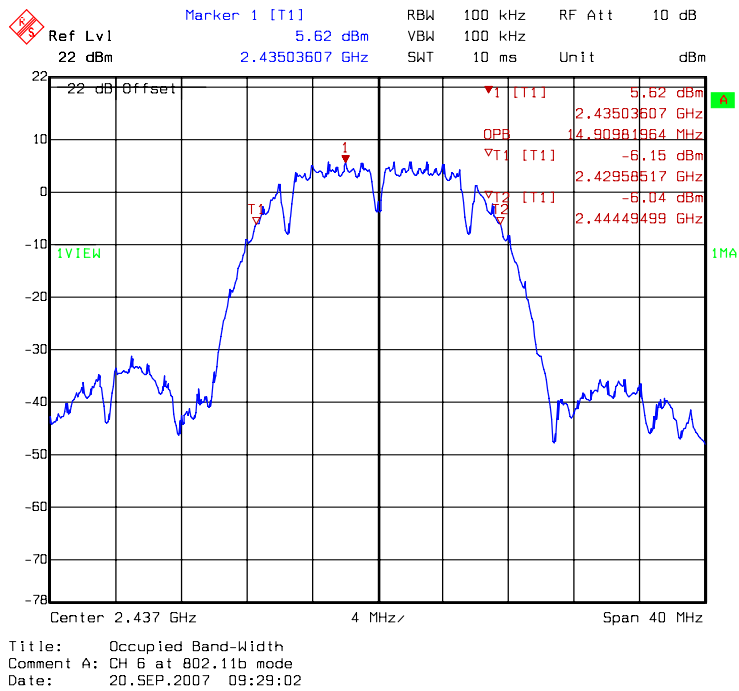
Table2. 99% Occupied Bandwidth

Mode	Channel	Frequency (MHz)	99% Bandwidth (MHz)	
			DAC0	DAC1
802.11b	1	2412	15.31	14.91
	6	2437	14.91	14.91
	11	2462	14.91	14.91
802.11g	1	2412	16.51	16.56
	6	2437	16.51	16.59
	11	2462	16.51	16.59
802.11n 20MHz	1	2412	17.64	17.64
	6	2437	17.64	17.64
	11	2462	17.64	17.64
802.11n 40MHz	3	2422	36.07	36.19
	6	2437	36.07	36.19
	9	2452	36.07	36.19

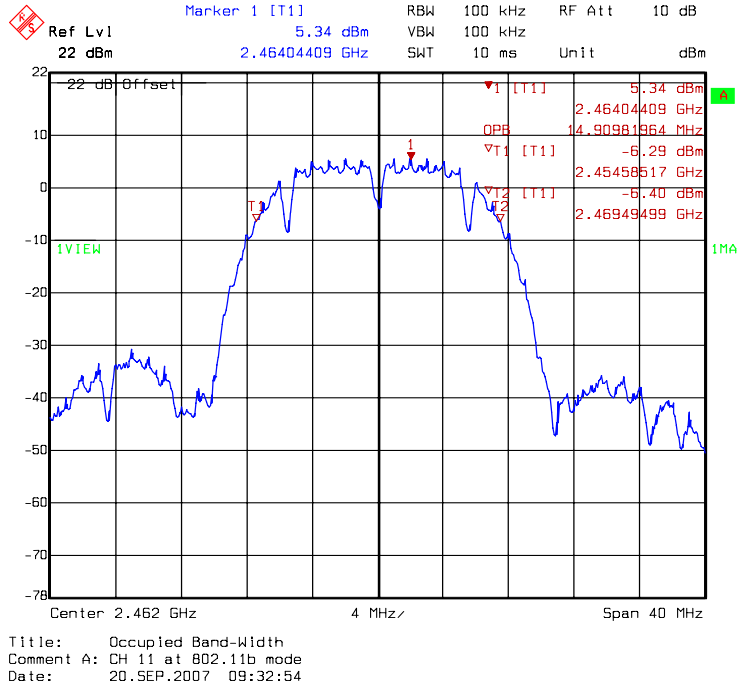
DAC0: 99% Occupied Bandwidth @ 802.11b mode channel 1



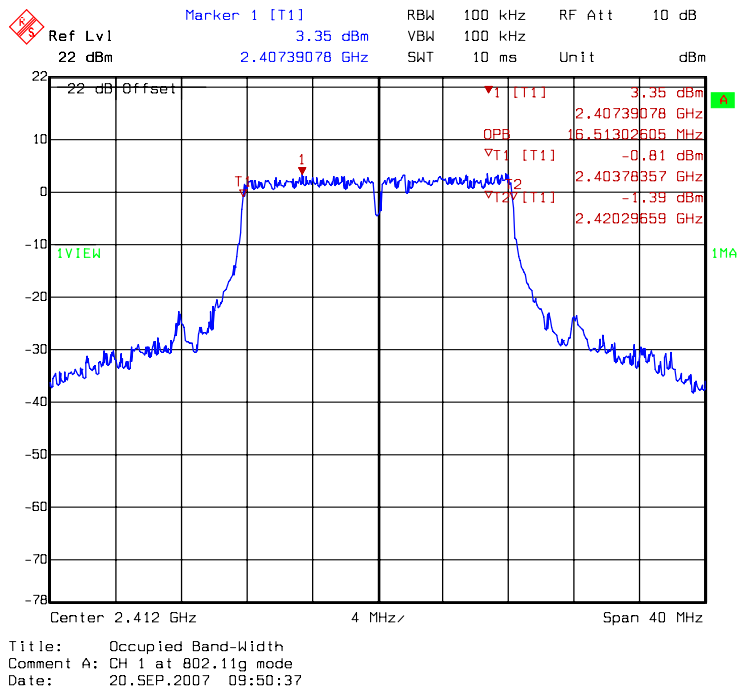
DAC0: 99% Occupied Bandwidth @ 802.11b mode channel 6



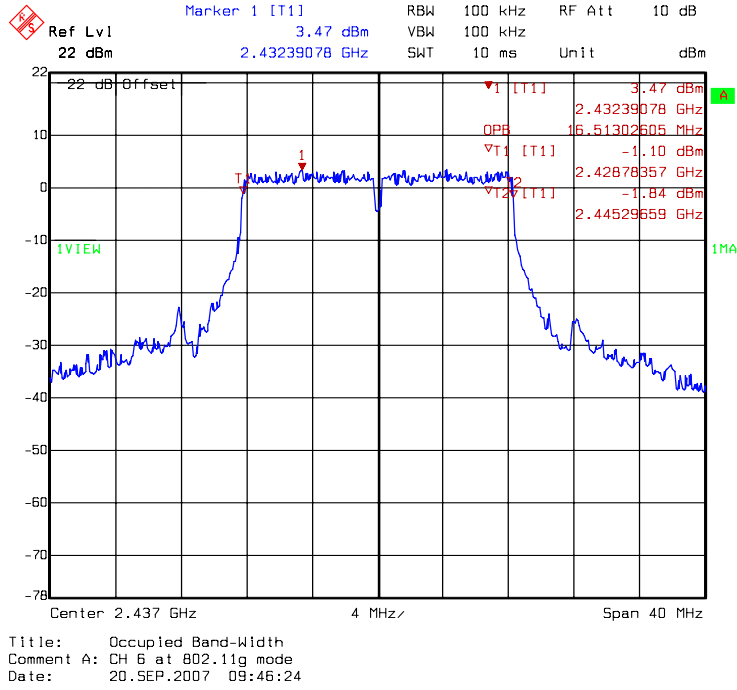
DAC0: 99% Occupied Bandwidth @ 802.11b mode channel 11



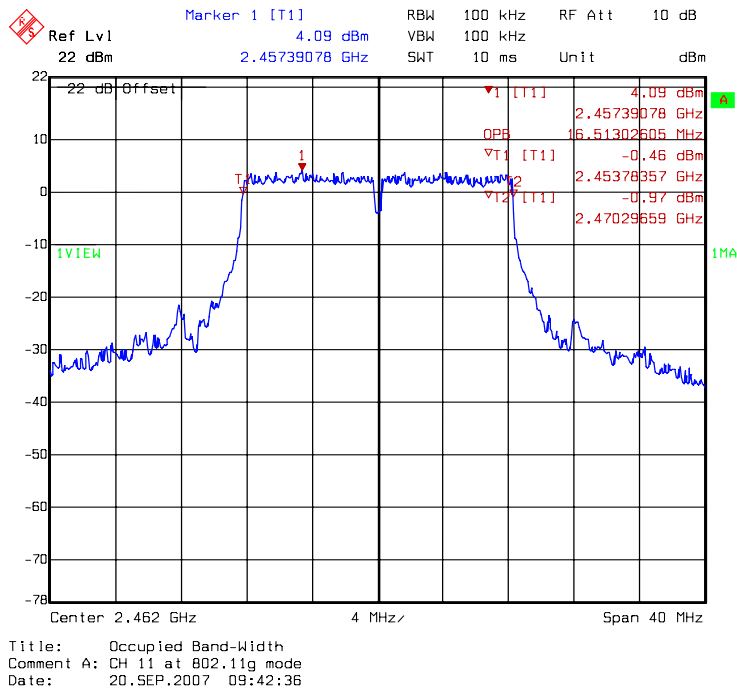
DAC0: 99% Occupied Bandwidth @ 802.11g mode channel 1



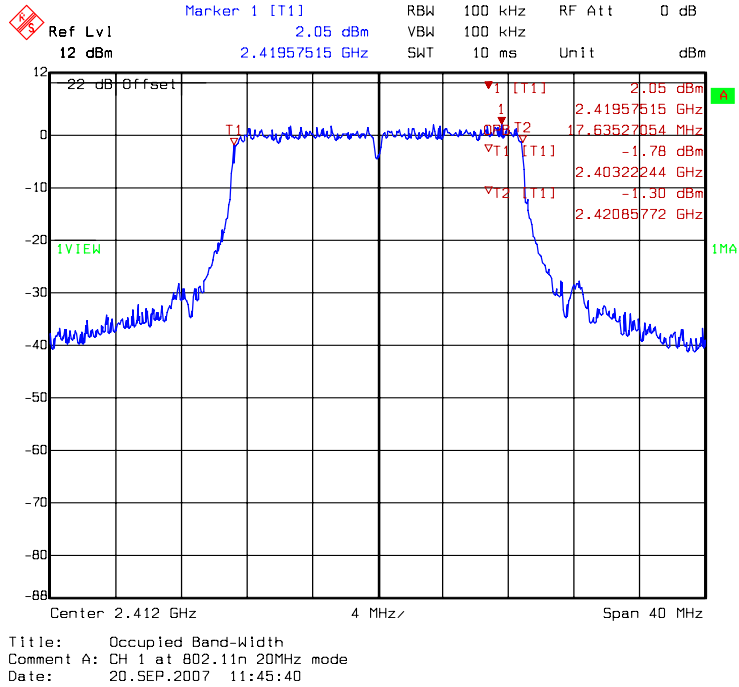
DAC0: 99% Occupied Bandwidth @ 802.11g mode channel 6



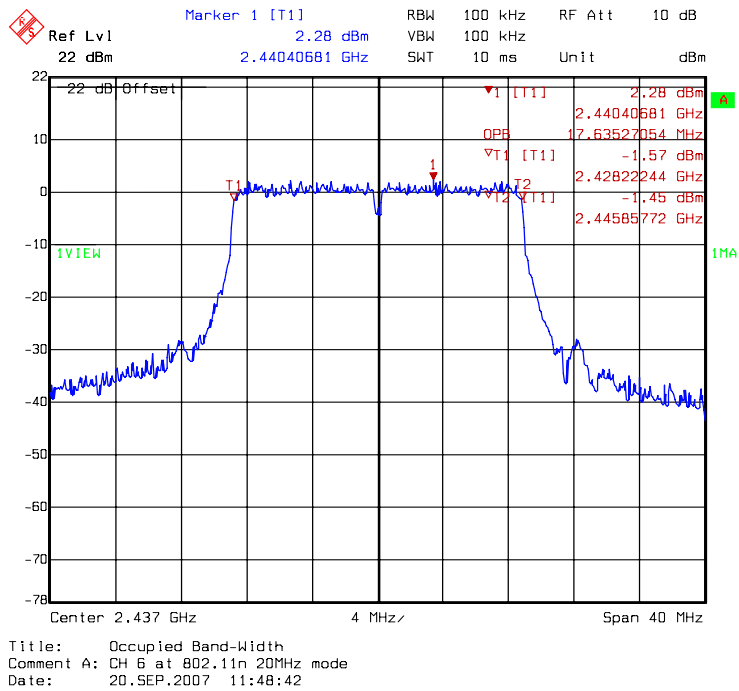
DAC0: 99% Occupied Bandwidth @ 802.11g mode channel 11



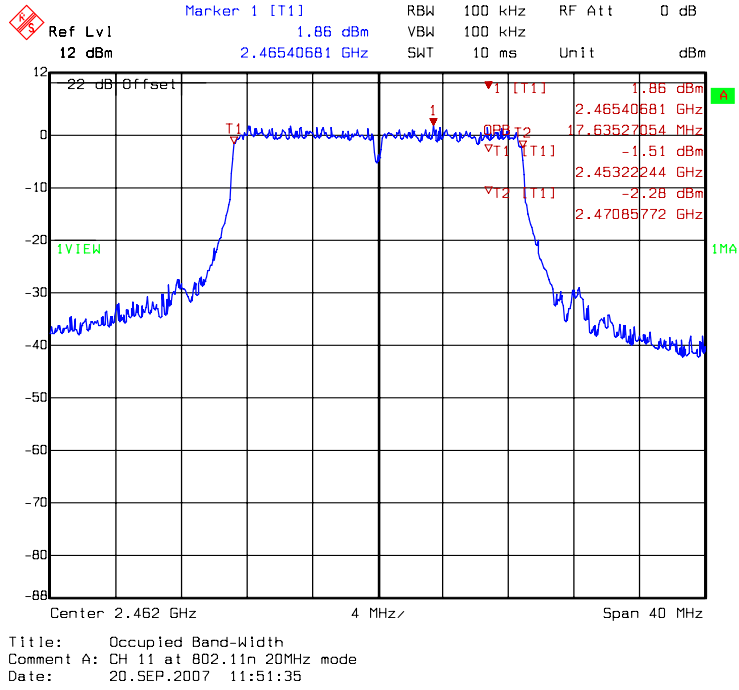
DAC0: 99% Occupied Bandwidth @ draft 802.11n 20MHz mode channel 1



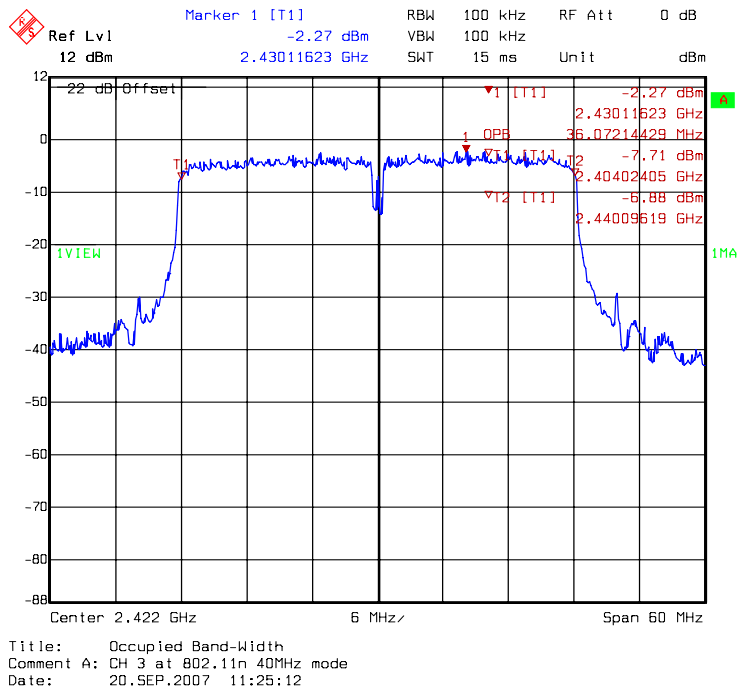
DAC0: 99% Occupied Bandwidth @ draft 802.11n 20MHz mode channel 6



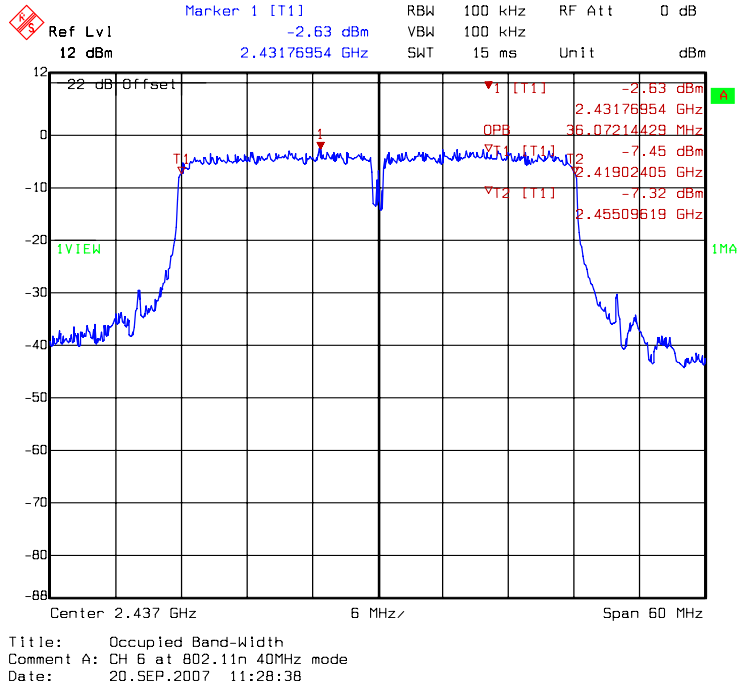
DAC0: 99% Occupied Bandwidth @ draft 802.11n 20MHz mode channel 11



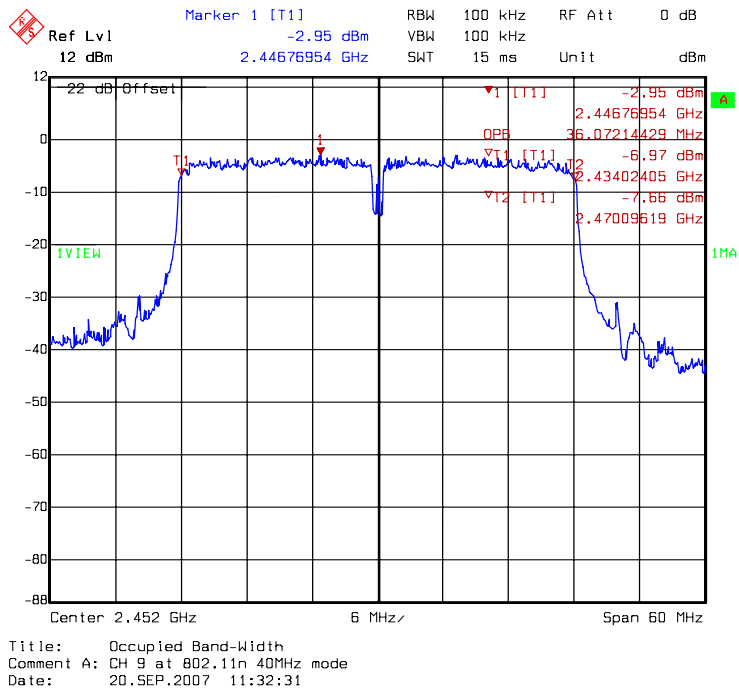
DAC0: 99% Occupied Bandwidth @ draft 802.11n 40MHz mode channel 3



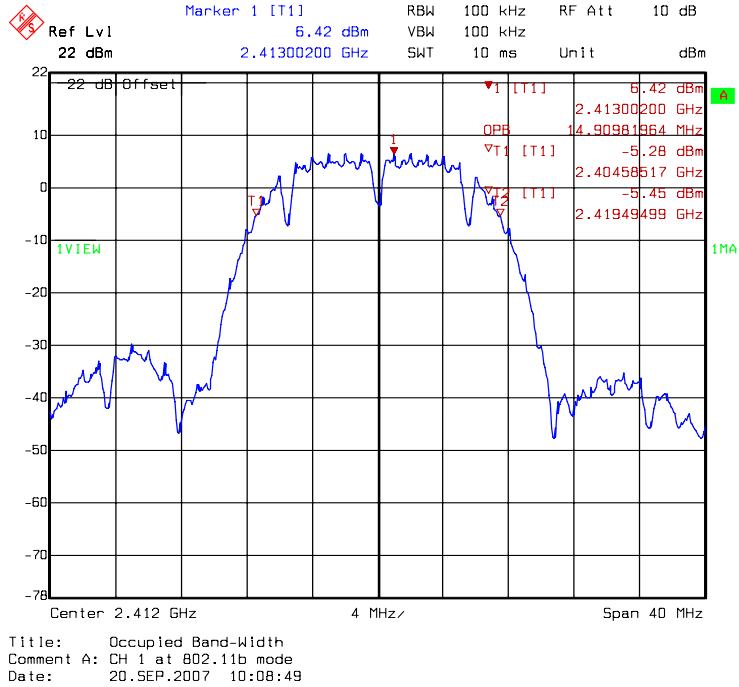
DAC0: 99% Occupied Bandwidth @ draft 802.11n 40MHz mode channel 6



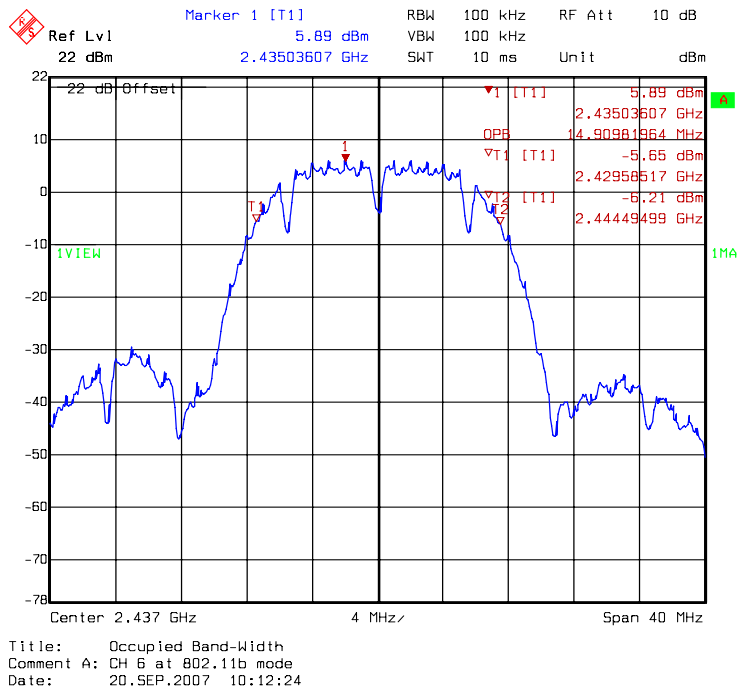
DAC0: 99% Occupied Bandwidth @ draft 802.11n 40MHz mode channel 9



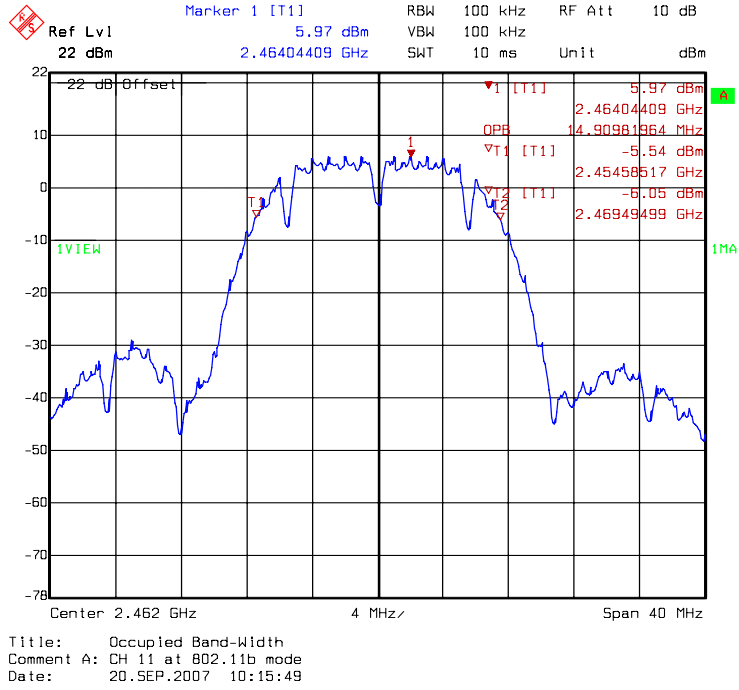
DAC1: 99% Occupied Bandwidth @ 802.11b mode channel 1



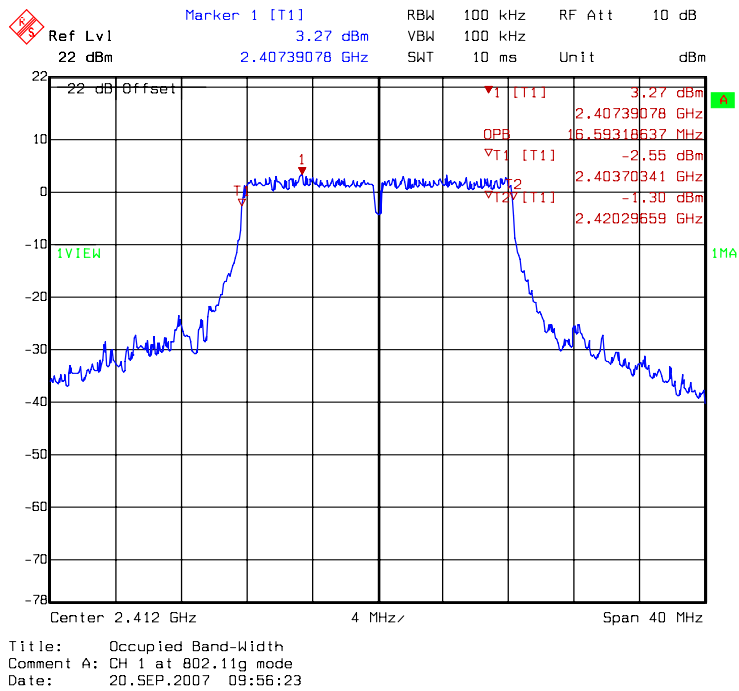
DAC1: 99% Occupied Bandwidth @ 802.11b mode channel 6



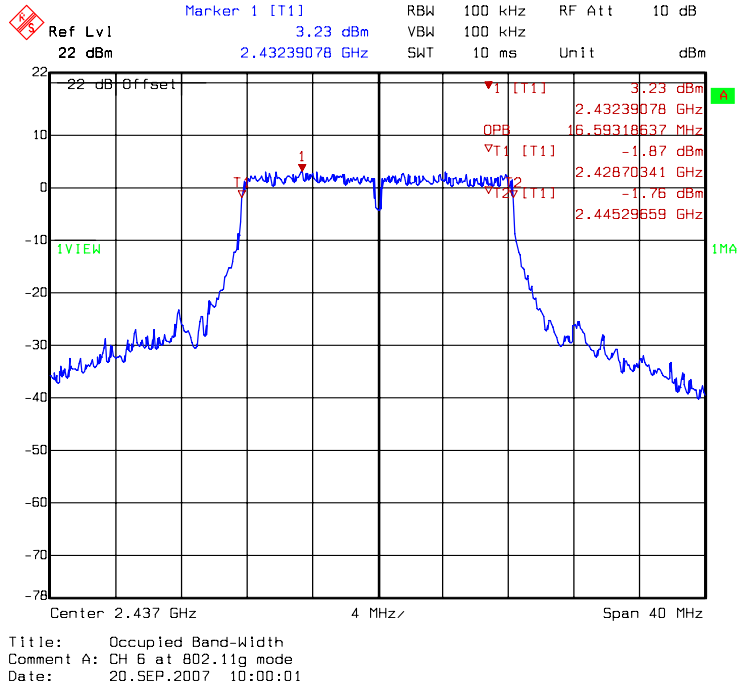
DAC1: 99% Occupied Bandwidth @ 802.11b mode channel 11



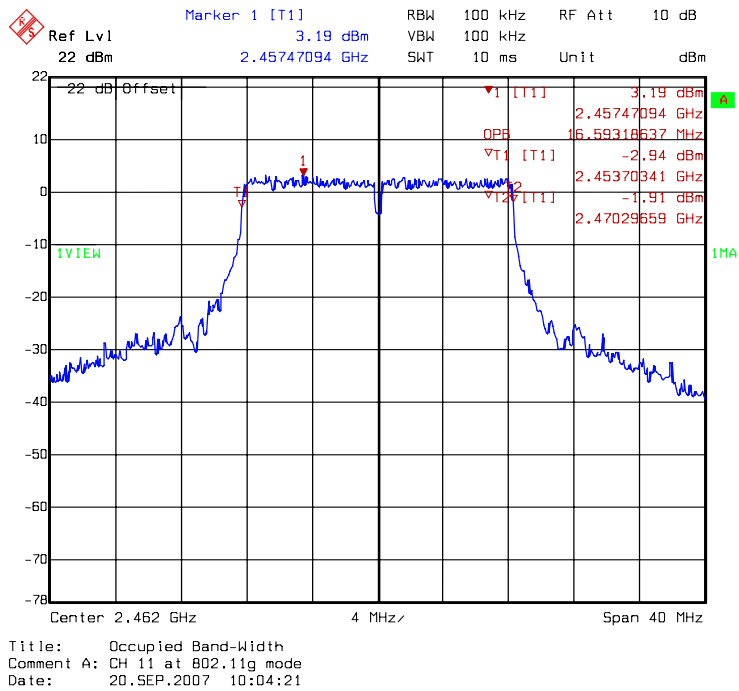
DAC1: 99% Occupied Bandwidth @ 802.11g mode channel 1



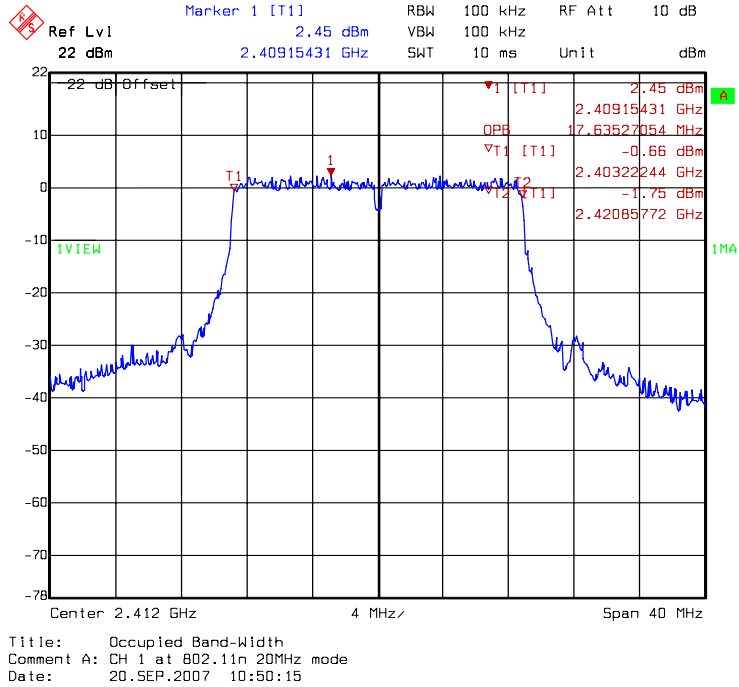
DAC1: 99% Occupied Bandwidth @ 802.11g mode channel 6



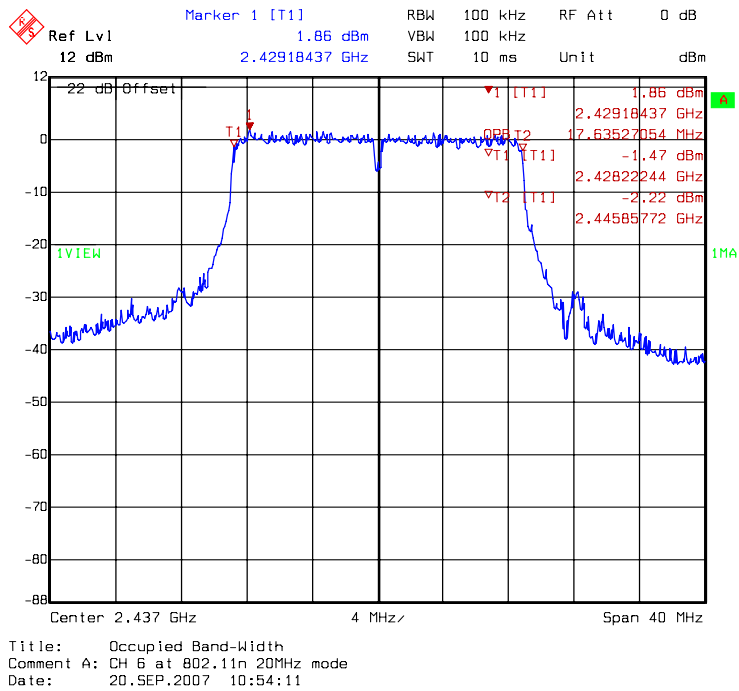
DAC1: 99% Occupied Bandwidth @ 802.11g mode channel 11



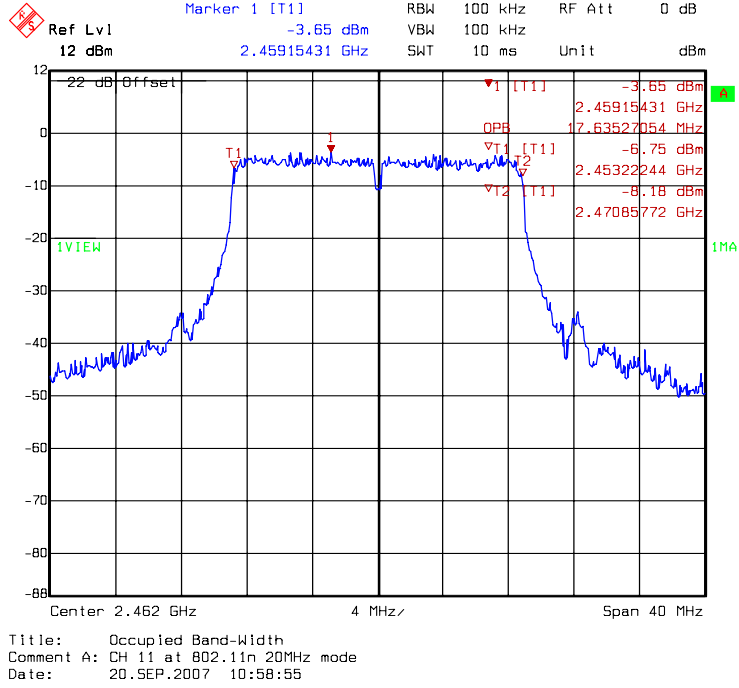
DAC1: 99% Occupied Bandwidth @ draft 802.11n 20MHz mode channel 1



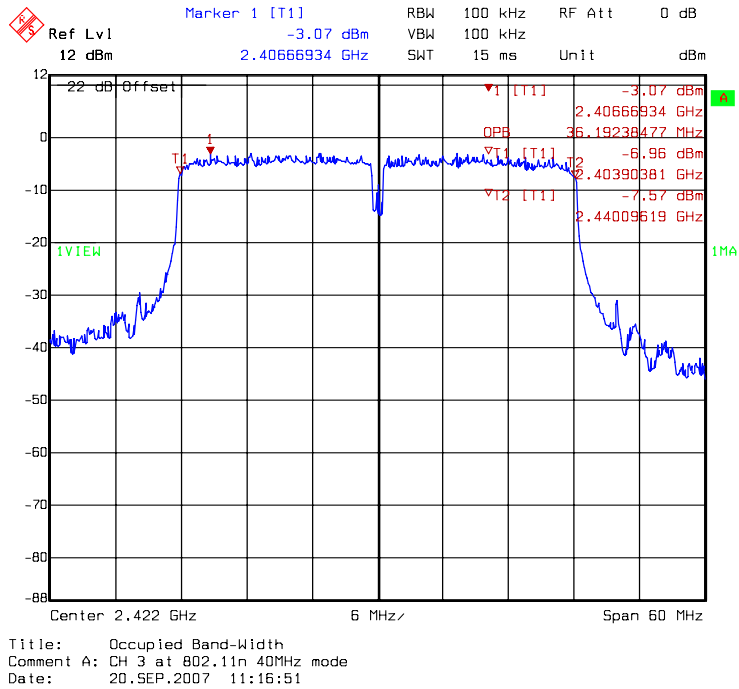
DAC1: 99% Occupied Bandwidth @ draft 802.11n 20MHz mode channel 6



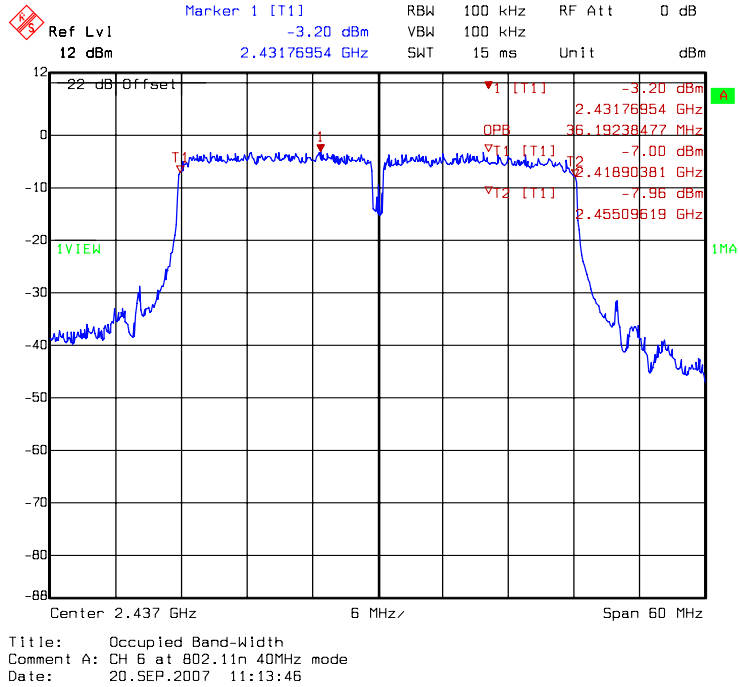
DAC1: 99% Occupied Bandwidth @ draft 802.11n 20MHz mode channel 11



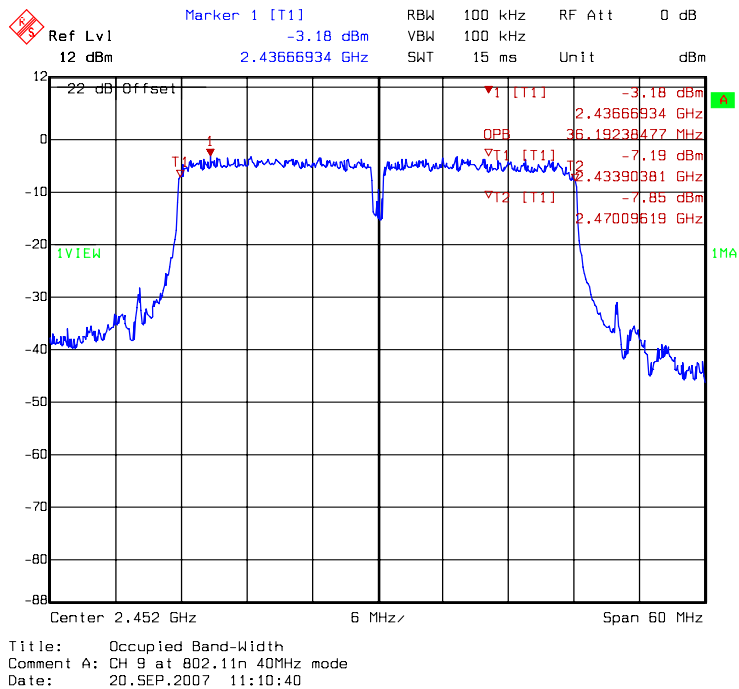
DAC1: 99% Occupied Bandwidth @ draft 802.11n 40MHz mode channel 3



DAC1: 99% Occupied Bandwidth @ draft 802.11n 40MHz mode channel 6



DAC1: 99% Occupied Bandwidth @ draft 802.11n 40MHz mode channel 9



5. Maximum Output Power

Name of Test	Maximum output power
Base Standard	FCC 15.247(b)

Tested By: Jimmie Liu
Test Date: Sep. 17, 2007

Test Equipment: EC396, EC396-1
Measurement Uncertainty: ±2dB (k=2)

Test Result: Complies
Test Method: See Appendix A
Measurement Data: See Table below

Note: The EUT was tested while in a continuous transmit mode. The EUT was tuned to a low, middle and high channel.

Table3. Maximum output power
Single Tx

Mode	Channel	Frequency (MHz)	Output Power (dBm)				Limit (dBm)	Margin (dB)
			DAC0		DAC1			
			PK	AV	PK	AV		
802.11b	1	2412	19.83	17.12	19.60	16.94	30	-9.44
	6	2437	19.85	17.05	19.35	16.85	30	-9.40
	11	2462	19.97	17.02	19.28	16.75	30	-9.40
802.11g	1	2412	23.25	16.02	23.25	15.92	30	-5.66
	6	2437	23.44	16.10	23.16	15.92	30	-5.26
	11	2462	23.54	16.01	23.09	15.94	30	-5.53
802.11n 20MHz	1	2412	22.85	14.93	23.01	15.01	30	-6.28
	6	2437	23.17	15.04	22.69	14.62	30	-6.00
	11	2462	23.23	14.89	22.12	13.92	30	-6.09
802.11n 40MHz	3	2422	22.50	13.76	22.35	13.86	30	-9.90
	6	2437	22.72	13.92	22.18	13.62	30	-9.74
	9	2452	22.78	13.82	22.12	13.75	30	-9.78

Dual Tx

Mode	Channel	Frequency (MHz)	Output Power (dBm)				Total Power (PK)		Total Power (AV)		Limit (dBm)
			DAC0		DAC1		mW	dBm	mW	dBm	
			PK	AV	PK	AV					
802.11n 20MHz	1	2412	22.78	14.52	22.92	14.83	385.56	25.86	58.72	17.69	30
	6	2437	23.04	14.72	22.6	14.42	383.34	25.84	57.32	17.58	30
	11	2462	23.16	14.74	22.1	13.82	369.20	25.67	53.88	17.31	30
802.11n 40MHz	3	2422	22.23	13.4	22.19	13.81	332.69	25.22	45.92	16.62	30
	6	2437	22.72	13.78	22.15	13.52	351.13	25.45	46.37	16.66	30
	9	2452	22.69	13.75	22.08	13.67	347.22	25.41	46.99	16.72	30

6. Power Spectral Density

Name of Test	Power Spectral Density
Base Standard	FCC 15.247(e)

Tested By: Jimmie Liu
Test Date: Sep. 20, 2007

Test Equipment: EC365

Test Result: Complies
Test Method: See Appendix A
Measurement Data: See Table & plots below

Note: The EUT was tested while in a continuous transmit mode. The EUT was tuned to a low, middle and high channel.

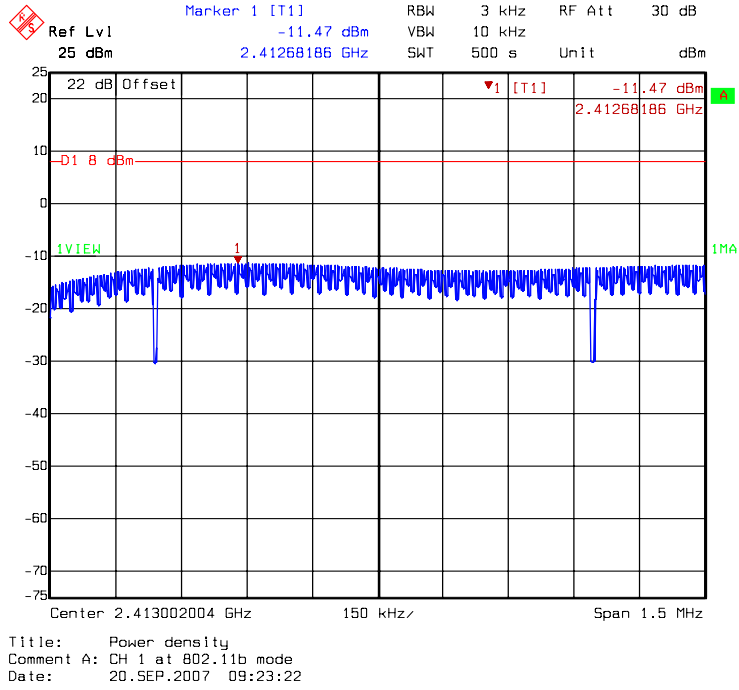
Table4. Power Spectral Density
Single Tx

Mode	Channel	Frequency (MHz)	PSD (dBm)		Limit (dBm)	Margin (dB)
			DAC0	DAC1		
802.11b	1	2412	-11.47	-11.25	30	-9.44
	6	2437	-11.51	-11.27	30	-9.40
	11	2462	-11.86	-11.27	30	-9.40
802.11g	1	2412	-11.18	-10.33	30	-5.66
	6	2437	-10.21	-11.16	30	-5.26
	11	2462	-10.13	-10.96	30	-5.53
802.11n 20MHz	1	2412	-11.65	-10.53	30	-6.28
	6	2437	-12.24	-10.91	30	-6.00
	11	2462	-10.95	-17.96	30	-6.09
802.11n 40MHz	3	2422	-15.87	-16.09	30	-9.90
	6	2437	-16.03	-16.15	30	-9.74
	9	2452	-16.11	-16.18	30	-9.78

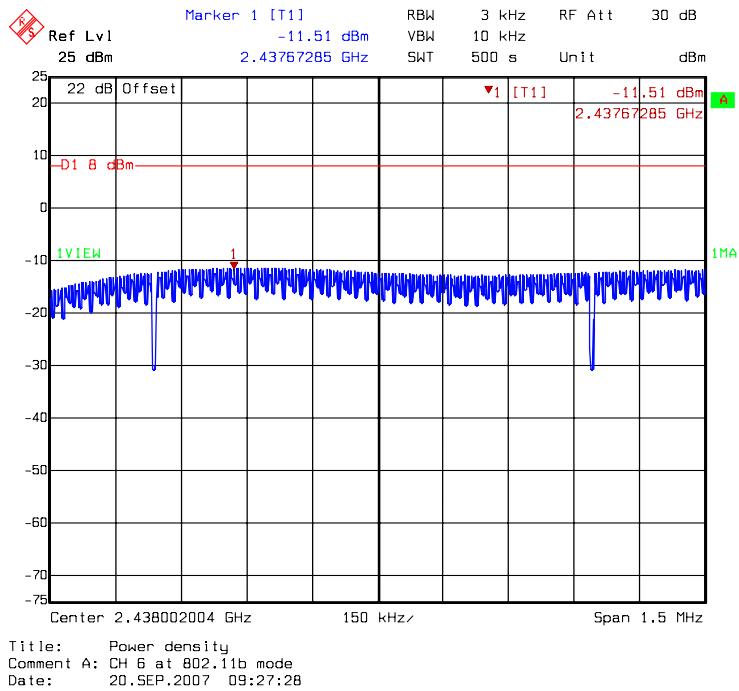
Dual Tx

Mode	Channel	Frequency (MHz)	PSD (dBm)		Total Power		Limit (dBm)	Margin (dB)
			DAC0	DAC1	mW	dBm		
802.11n 20MHz	1	2412	-11.65	-10.53	0.16	-8.04	8	-21.74
	6	2437	-12.24	-10.91	0.14	-8.51	8	-23.24
	11	2462	-10.95	-17.96	0.10	-10.16	8	-22.93
802.11n 40MHz	3	2422	-15.87	-16.09	0.05	-12.97	8	-26.37
	6	2437	-16.03	-16.15	0.05	-13.08	8	-26.60
	9	2452	-16.11	-16.18	0.05	-13.13	8	-26.76

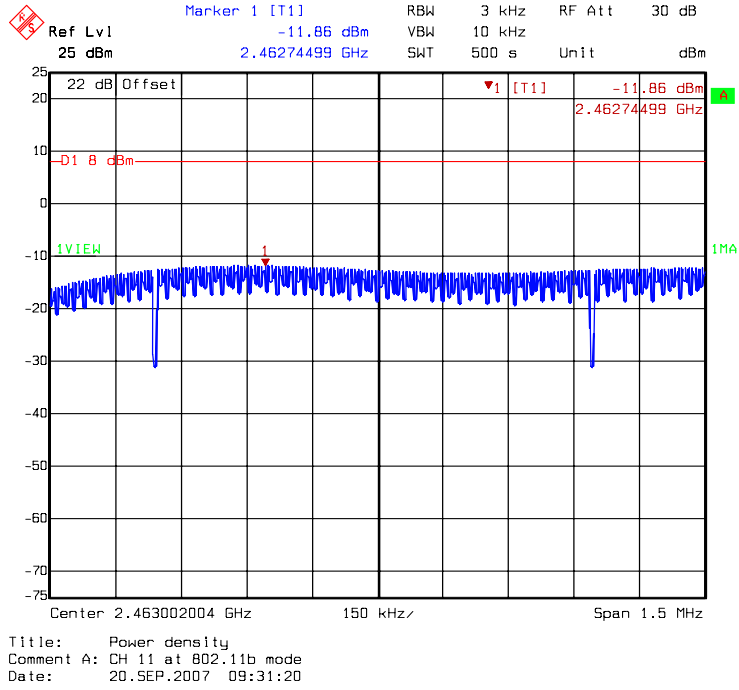
DAC0: Power Spectral Density @ 802.11b mode channel 1



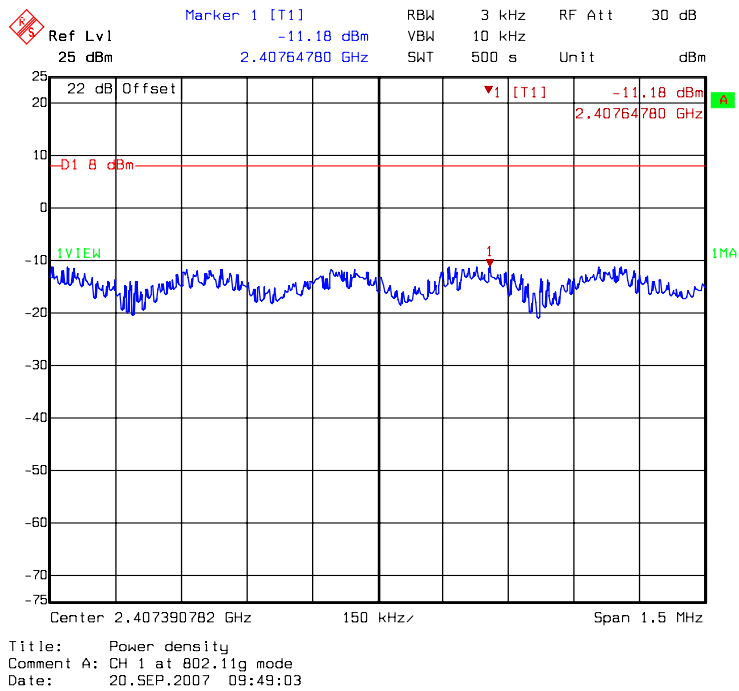
DAC0: Power Spectral Density @ 802.11b mode channel 6



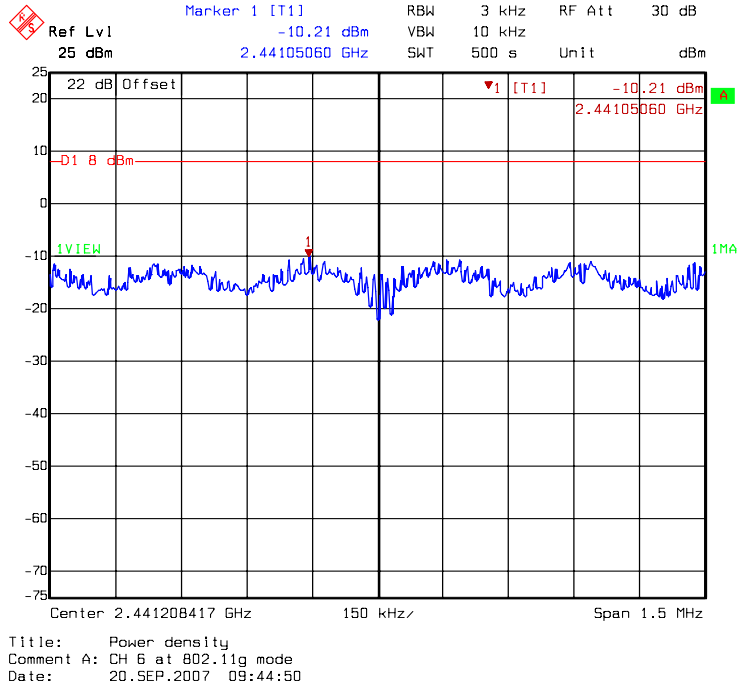
DAC0: Power Spectral Density @ 802.11b mode channel 11



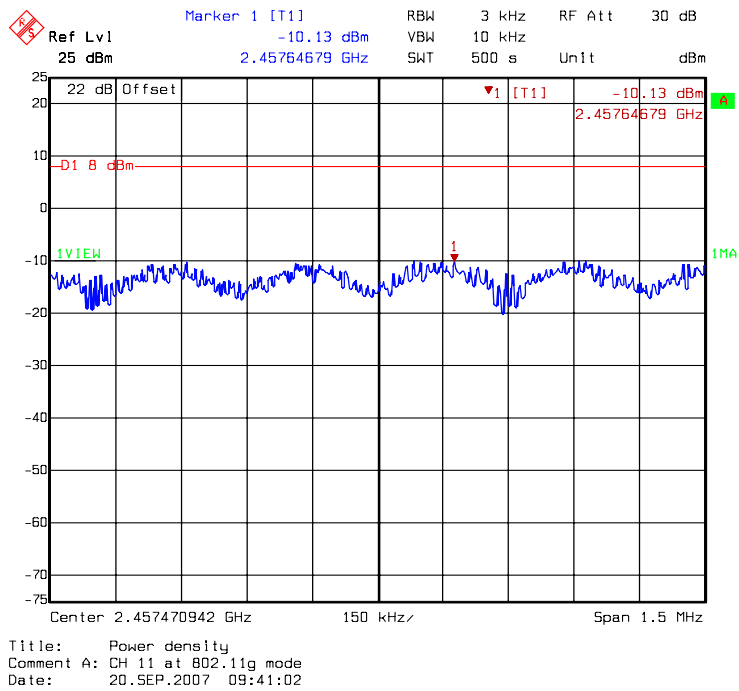
DAC0: Power Spectral Density @ 802.11g mode channel 1



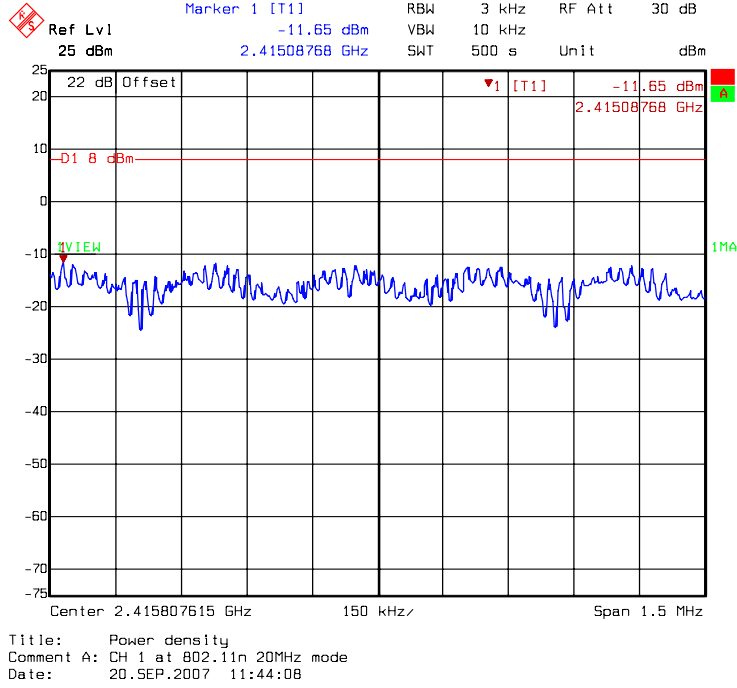
DAC0: Power Spectral Density @ 802.11g mode channel 6



DAC0: Power Spectral Density @ 802.11g mode channel 11



DAC0: Power Spectral Density @ draft 802.11n 20MHz mode channel 1



DAC0: Power Spectral Density @ draft 802.11n 20MHz mode channel 6

