

**EMC TEST REPORT for UNII device**  
**No. 140601396SHA-002R01**

Applicant : Aruba Networks, Inc  
1344 Crossman Ave. Sunnyvale, CA,94089  
Manufacturer : Aruba Networks, Inc  
1344 Crossman Ave. Sunnyvale, CA,94089  
Product Name : Wireless Access Point  
Type/Model : APINH103

**SUMMARY**

The equipment complies with the requirements according to the following standard(s):

**47CFR Part 15 (2013):** Radio Frequency Devices (Subpart C)

**ANSI C63.4 (2009):** American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

**RSS-210 Issue 8 (December 2010):** Low-power Licence-exempt Radio communication Devices (All Frequency Bands): Category I Equipment

**RSS-Gen Issue 3 (December 2010):** General Requirements and Information for the Certification of Radio communication Equipment

Date of issue: June. 26, 2014

Prepared by:



Wade Zhang (*Project Engineer*)

Reviewed by:



Daniel Zhao (*Reviewer*)



**FCC ID: Q9DAPINH103**  
**IC: 4675A-APINH103**

## **Description of Test Facility**

Name: Intertek Testing Services Limited Shanghai  
Address: Building 86, No. 1198 Qinzhou Rd., North, Shanghai 200233, P.R. China

FCC Registration Number: 236597  
IC Assigned Code: 2042B-1

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## **1. General Information**

### **1.1 Applicant Information**

Applicant : Aruba Networks, Inc  
1344 Crossman Ave. Sunnyvale, CA,94089  
Name of contact : Rob Hastings  
Tel : (408) 990 2557  
Fax : /  
Email : rhastings@arubanetworks.com  
Manufacturer : Aruba Networks, Inc  
1344 Crossman Ave. Sunnyvale, CA,94089

### **1.2 Identification of the EUT**

Product Name : Wireless Access Point  
Type/model : APINH103  
FCC ID : Q9DAPINH103  
IC : 4675A-APINH103

### 1.3 Technical specification

Operation Frequency : 5180 - 5240 MHz;  
Band

Type of Modulation : OFDM(BPSK,QPSK,16QAM,64QAM)

EUT Modes of : 802.11a;  
Modulation : 802.11n HT20,HT40;

Channel Number : 802.11a & 802.11n HT 20: Channel 36 – 48  
802.11n HT 40: channel 38 – 46.

Description of EUT : The EUT is a wireless access point, and it is a 2×2 MIMO product.

Port identification : power port 1;  
RJ45 ports 5

Antenna : 1: R-AN-WLL-ARB-1:  
Integral, 3.5dBi for 2.4GHz band, 3.7dBi for 5GHz band;  
2: R-AN-WLL-ARB-3:  
Integral, 3.6dBi for 2.4GHz band, 3.3dBi for 5GHz band;

Rating : DC 12V, 1A (Adaptor) or DC 57V, 350 mA(PoE)

Declared : 0°C ~ 40°C  
Temperature range

Category of EUT : Class B

EUT type :  Table top  Floor standing

Sample received date : May. 13, 2014

Sample Identification : /  
No

Date of test : May. 14, 2014 – June. 26, 2014



**MIMO Function and Antenna Description:**

Model	Type	Gain (dBi)	Modulation Type	Beam forming	Array Gain (dBi)	Frequency Band (MHz)
R-AN-WLL-ARB-1	Omni	3.5	802.11b	No	0	2400-2500
			802.11g	No	0	
			802.11n HT20	No	0	
			802.11n HT40	No	0	
		3.7	802.11a	No	0	4900-5875
			802.11n HT20	No	0	
802.11n HT40	No		0			
R-AN-WLL-ARB-3	Omni	3.6	802.11b	No	0	2400-2500
			802.11g	No	0	
			802.11n HT20	No	0	
			802.11n HT40	No	0	
		3.3	802.11a	No	0	4900-5875
			802.11n HT20	No	0	
802.11n HT40	No		0			

*Note 1: For CDD transmissions, according KDB 662911 D01 Multiple Transmitter Output v02r01 f), the power measurements on IEEE 802.11 devices, Array Gain = 0 dB (i.e., no array gain) for  $N_{ANT} \leq 4$ .*

*Note 2: when 802.11n have beam forming function the Beam forming gain should calculate according KDB 662911 D01 Multiple Transmitter Output v02r01 c) (ii).*

## 2. Test Specification

### 2.1 Instrument list

Equipment	Type	Manu.	Internal no.	Cal. Date	Due date
Test Receiver	ESCS 30	R&S	EC 2107	2013-10-21	2014-10-20
Test Receiver	ESIB 26	R&S	EC 3045	2013-10-20	2014-10-19
Test Receiver	ESCI 7	R&S	EC4501	2013-12-29	2014-12-28
Spectrum Analyzer	N9010	Agilent	EC4890	2013-10-21	2014-10-20
Spectrum Analyzer	E4446	Agilent	/	2013-10-21	2014-10-20
Power meter	ML 2495A	Anritsu	EC 4895	2013-10-21	2014-10-20
A.M.N.	ESH2-Z5	R&S	EC 3119	2014-1-9	2015-1-8
Bilog Antenna	CBL 6112D	TESEQ	EC 4206	2014-5-15	2015-5-14
Horn antenna	HF 906	R&S	EC 3049	2014-5-12	2015-5-11
Pre-amplifier	Pre-amp 18	R&S	EC 3222	2014-4-11	2015-4-10
Pre-amplifier	Tpa0118-40	R&S	EC 4792-2	2014-4-11	2015-4-10
Log-period antenna	AT 1080	AR	EC 3044-7	2014-5-21	2015-5-20
Biconical antenna	3109PX	ETS	EC3564	2013-8-25	2014-8-24
Semi-anechoic chamber	-	Albatross project	EC 3048	2014-5-20	2015-5-19
Shielded room	-	Zhongyu	EC 2838	2014-1-12	2015-1-9
Shielded room	-	Zhongyu	EC 2839	2014-1-12	2015-1-9
High Pass Filter	WHKX 1.0/15G-10SS	Wainwright	EC4297-1	2014-2-1	2015-1-31
High Pass Filter	WHKX 2.8/18G-12SS	Wainwright	EC4297-2	2014-2-1	2015-1-31
High Pass Filter	WHKX 7.0/1.8G-8SS	Wainwright	EC4297-3	2014-2-1	2015-1-31
Band Reject Filter	WRCGV 2400/2483-2390/2493-35/10SS	Wainwright	EC4297-4	2014-2-1	2015-1-31

### 2.2 Test Standard

47CFR Part 15:2013  
ANSI C63.4: 2009  
KDB 789033D01 (v01r04)  
KDB 662911 (V02R01)  
RSS-210 Issue 8: 2010  
RSS-Gen Issue 3: 2010

### 2.3 Mode of operation during the test / Test peripherals used

While testing transmitting mode of EUT, the internal modulation and continuously transmission was applied.

The lowest, middle and highest channel were tested as representatives.

Freq. Band	Modulation	Lowest(MHz)	Middle(MHz)	Highest(MHz)
5150~5250MHz	802.11a	5180	5200	5240
	802.11n HT20	5180	5200	5240
	802.11n HT40	5190	/	5230

The following test mode(s) were pre-test:

Mode No.	Main Equipment	2.4G antenna	5G antenna
1	APINH103	R-AN-WLL-ARB-1	R-AN-WLL-ARB-1
2	APINH103	R-AN-WLL-ARB-3	R-AN-WLL-ARB-3

After pre-test, We listed the worst mode (mode 1) test data in the report.

#### Test peripherals used:

Item No	Name	Band and Model	Description	S/No
1	Laptop computer	HP ProBook 6470b	100-240V AC 50/60Hz	NA
2	Controller	Aruba 3600	100-240V AC 50/60Hz	NA
3	AC/DC Adaptor	Sunny SYS1357-1812	Input:100-240V~1.0A MAX,50-60Hz Output:+12V DC 1.0A	NA
4	POE DC Power	PowerDsine PD-6555G300	Input:100-240Vac,50/60Hz,0.5A Output:57VDC 0.35A	NA
5	LAN Cable	/	1.5m un-shielding *2 10m un-shielding *4	NA





**Test software setting:**

The power level setting for 802.11a/n is used with ART software offered by the manufactory.

Freq. Band	Mode 1	Frequency (MHz)	ART Setting	Note
5150~5250MHz	802.11a	5180	12.0	
		5200	12.0	
		5240	11.0	
	802.11n HT20	5180	12.0	
		5200	12.0	
		5240	12.0	
	802.11n HT40	5190	13.0	
5230		13.0		

**Data rate VS Power**

The pre-scan for the conducted power with all rates in each modulation and bands was used, and the worst case was found and used in all test cases.

After this pre-scan, we choose the following table of the data rata as the worst case.

Freq. Band	Modulation	Worst case data rate
5150~5250MHz	802.11a	6Mbps
	802.11n HT20	MCS8
	802.11n HT40	MCS8

**Duty cycle:**

Duty cycle	On(ms)	On+Off (ms)	Duty cycle(x)	Duty cycle factor (dB)
802.11a	1.362	1.408	0.97	0.14
802.11n20	0.662	0.708	0.94	0.29
802.11n40	0.345	0.375	0.92	0.36

### 2.3 Test Summary

**This report applies to tested sample only. This report shall not be reproduced in part without written approval of Intertek Testing Service Shanghai Limited.**

TEST ITEM	FCC REFERANCE	IC REFERANCE	RESULT
Maximum Conducted Output Power & EIRP	15.407(a)	RSS-210 Issue 8 Annex 9.2	Pass
Power spectral density	15.407(a)	RSS-210 Issue 8 Annex 9.2	Pass
Peak excursion radio	15.407(a)	-	Pass
Radiated emission	15.407 (b) 15.205, 15.209	RSS-210 Issue 8 Annex 9.2	Pass
Power line conducted emission	15.207	RSS-Gen Issue 3 Clause 7.2.4	Pass
26 dB Bandwidth	15.403(i)	-	Tested
Emission Bandwidth (99%)	-	RSS-210 Issue 8 Annex 9.2	Tested

### 3. Maximum Conducted Output Power & EIRP

**Test result: Pass**

#### 3.1 Test limit

FCC 15.407(a):

For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50mW or  $4\text{dBm} + 10\log B$ , where B is the 26-dB emission bandwidth in MHz.

If transmitting antennas of directional gain greater than 6dBi are used, the maximum conducted output power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

Frequency range (MHz)	Mode	Min. 26 dB Bandwidth (MHz)	$4 + 10\log B$ (dBm)	Conducted power Limit (dBm)
5150 - 5250	802.11a	22.293	17.48	<b>17.00</b>
	802.11n20	27.155	18.34	<b>17.00</b>
	802.11n40	69.486	22.42	<b>17.00</b>

RSS-210(A9.2):

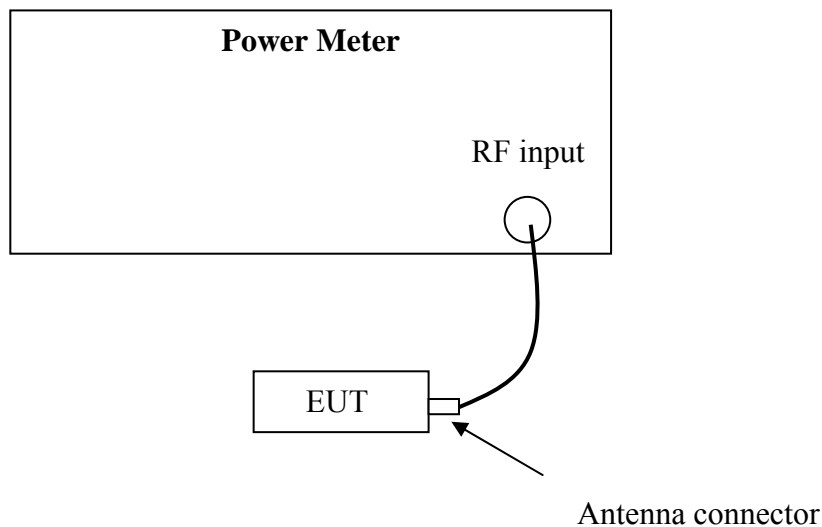
Band 5150-5250 MHz:

The maximum e.i.r.p. shall not exceed 200 mW or  $10 + 10 \log_{10}B$ , dBm, whichever power is less. B is the 99% emission bandwidth in MHz.

Frequency range (MHz)	Mode	Min. 99% bandwidth (MHz)	$10 + 10\log B$ (dBm)	E.I.R.P. Limit (dBm)
5150 - 5250	802.11a	16.8693	22.27	22.27
	802.11n20	17.0493	22.32	22.32
	802.11n40	37.5125	25.74	25.74

Note: The max antenna gain is 3.7 dBi, which is <6dBi, so it's deemed to comply with e.i.r.p. limits if the product complies with conduct limits.

### 3.2 Test Configuration



### 3.3 Test procedure and test setup

The power output per FCC §15.407(a) was measured on the EUT using a 50 ohm RF cable connected to spectrum analyzer and the measurement method refer to KDB 789033D01 v01r04: Method PM.

Method PM(Measurement using an RF average power meter):

(i) Measurements may be performed using a wideband RF power meter with a thermocouple detector or equivalent if all of the conditions listed below are satisfied.

- The EUT is configured to transmit continuously or to transmit with a constant duty cycle.
- At all times when the EUT is transmitting, it must be transmitting at its maximum power control level.
- The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.

(ii) If the transmitter does not transmit continuously, measure the duty cycle,  $x$ , of the transmitter output signal as described in section B).

(iii) Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.

(iv) Adjust the measurement in dBm by adding  $10 \log(1/x)$  where  $x$  is the duty cycle (e.g.,  $10 \log(1/0.25)$  if the duty cycle is 25 percent).

### 3.4 Test protocol

Temperature : 25 °C  
Relative Humidity : 55 %

U-NII 1 Band:

Mode	Freq. (MHz)	Reading (dBm)		Duty cycle factor (dB)	Total Conducted Output Power (dBm)	Limit (dBm)	Margin (dB)
		Port 0	Port 1				
802.11a	5180	11.65	11.51	0.14	14.74	17.00	2.26
	5220	11.81	11.40	0.14	14.76	17.00	2.24
	5240	10.67	10.81	0.14	13.90	17.00	3.10
802.11n20	5180	11.04	10.96	0.29	14.30	17.00	2.70
	5200	11.58	11.03	0.29	14.62	17.00	2.38
	5240	11.56	11.81	0.29	14.99	17.00	2.01
802.11n40	5190	13.65	13.18	0.36	16.79	17.00	0.21
	5230	13.32	13.45	0.36	16.76	17.00	0.24

*The maximum EIRP of the EUT = 16.79dBm + 3.7dBi = 20.49dBm which is lower than the EIRP limit of RSS-210.*

#### 4. Power spectral density

**Test result:** Pass

##### 4.1 Test limit

FCC(15.407a):

For the band 5.15-5.25 GHz, the peak power spectral density shall not exceed 4dBm in any 1-MHz band. If transmitting antennas of directional gain greater than 6dBi are used, the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

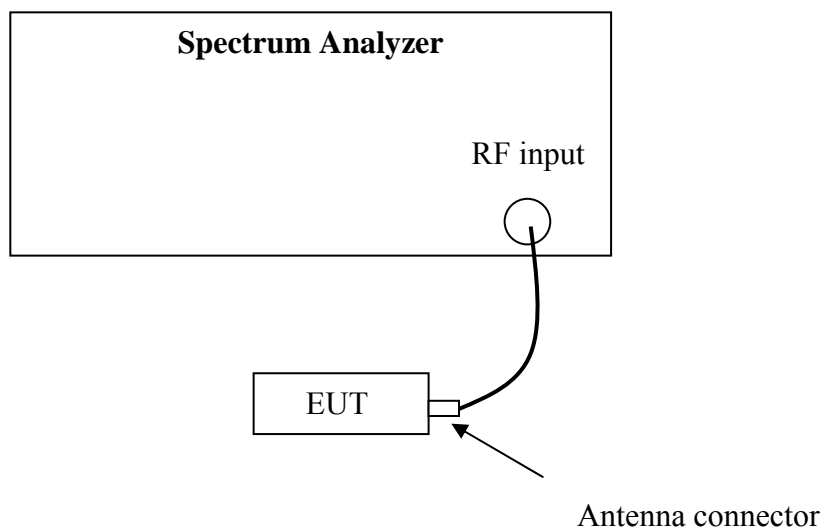
RSS-210(A9.2):

Band 5150-5250 MHz:

The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band.

Note: The max antenna gain is 3.7 dBi, so it is deemed to comply with e.i.r.p. limits if the product complies with conduct limits (4 dBm/MHz).

##### 4.2 Test Configuration





### **4.3 Test procedure and test setup**

The power spectral density per FCC §15.407(a) was measured from the antenna port of the EUT using a 50 ohm spectrum analyzer with the resolution bandwidth set at 1MHz, the video bandwidth set at 3 MHz (measurement method refer to KDB 789033D01 v01r04: section F).

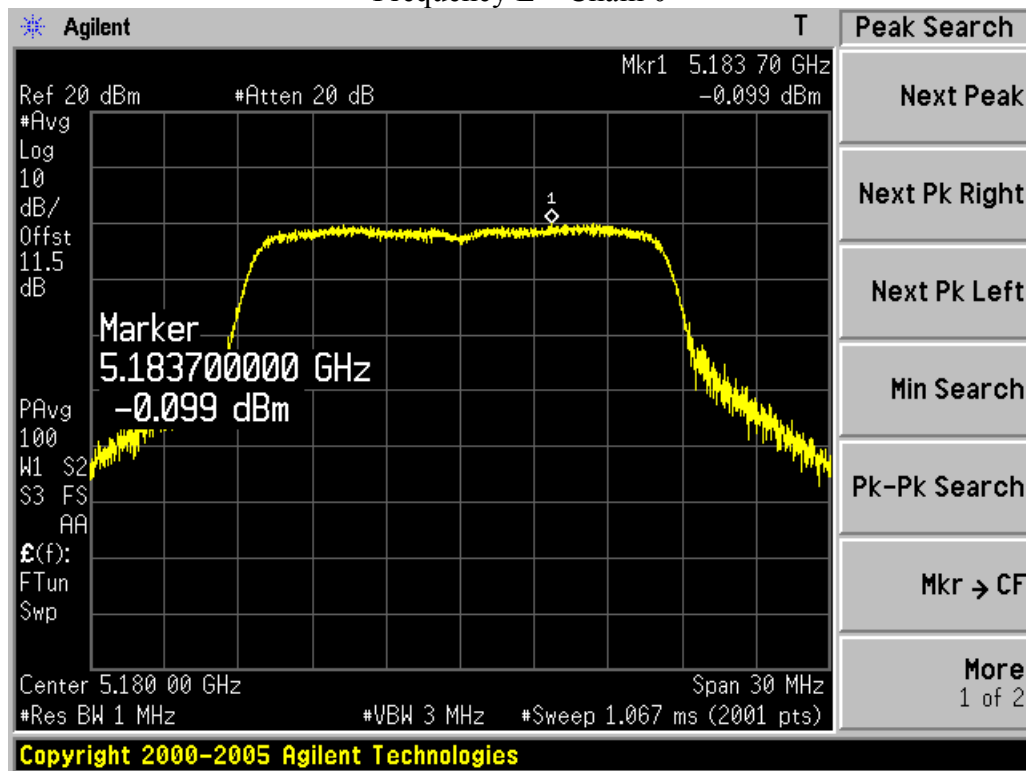
Power spectral density was read directly and cable loss correction was added to the reading to obtain power at the EUT antenna terminals.

#### 4.4 Test Protocol

Temperature : 25 °C  
Relative Humidity : 55 %

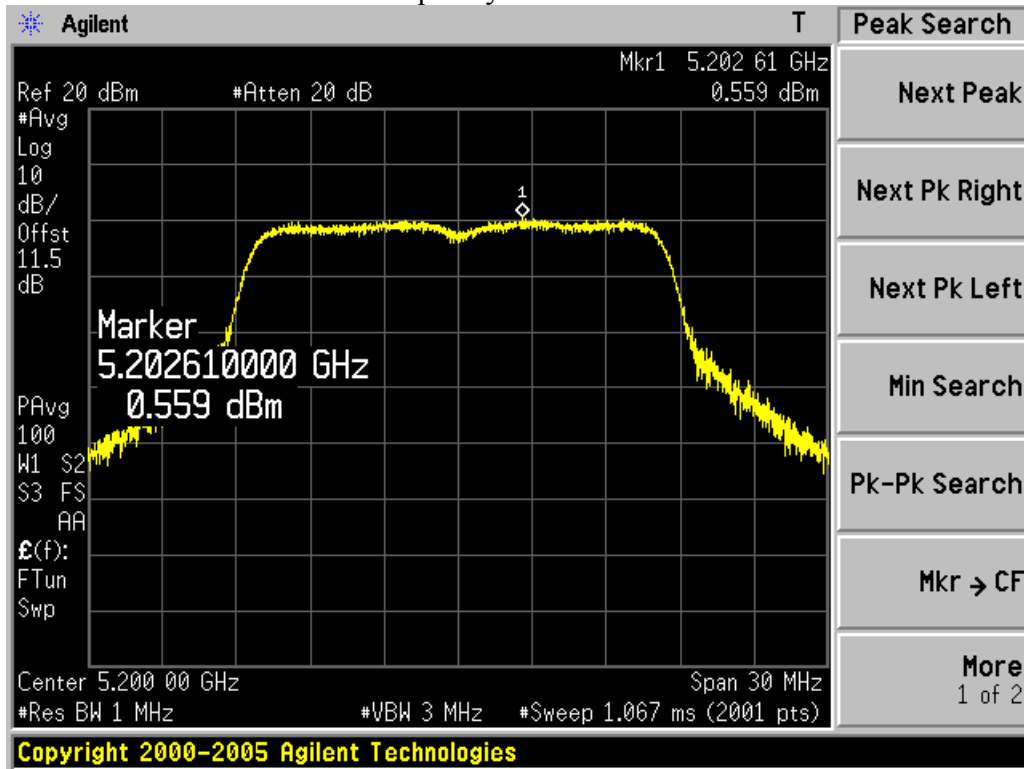
Mode	Freq. (MHz)	PSD (dBm)		Duty cycle factor (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
		Port0	Port 1				
U-NII 1 802.11a	5180	-0.099	0.219	0.14	3.22	4.00	0.78
	5220	0.559	0.215	0.14	3.54	4.00	0.46
	5240	-0.160	0.163	0.14	3.16	4.00	0.84

Frequency L – Chain 0

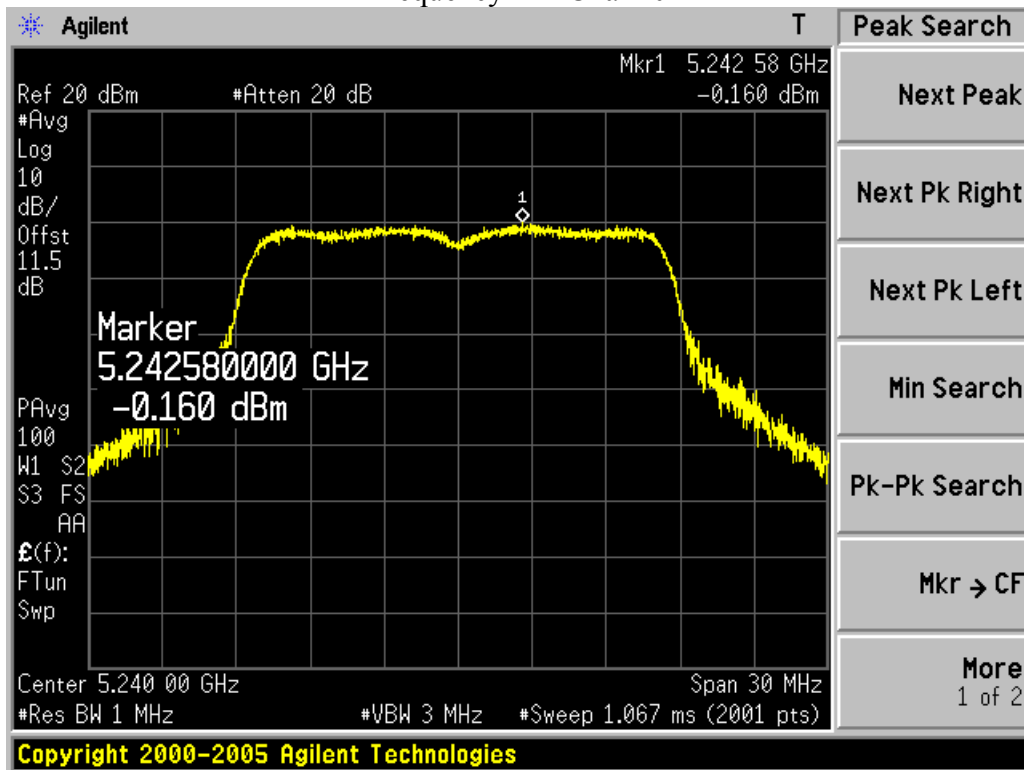




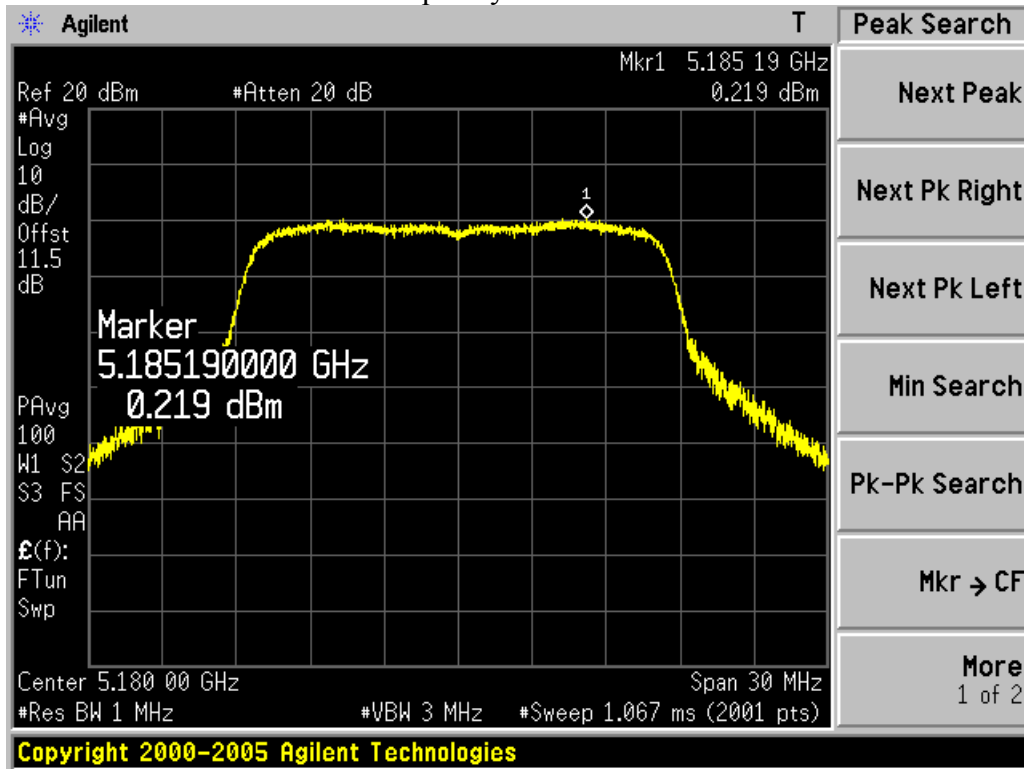
Frequency M – Chain 0



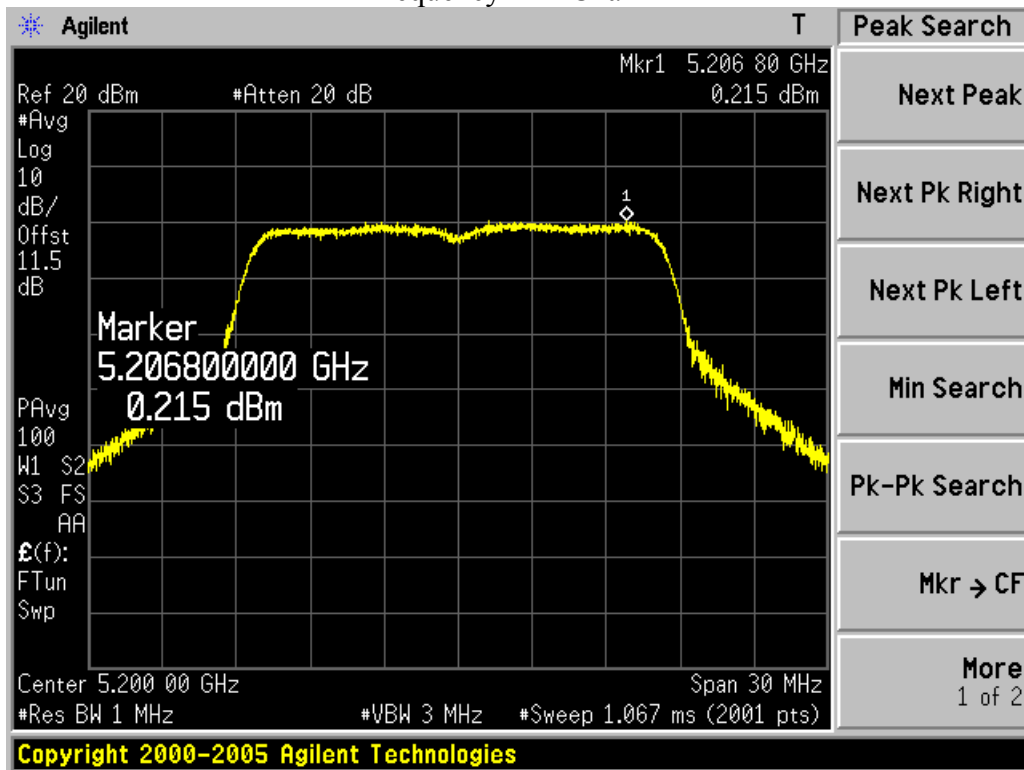
Frequency H – Chain 0



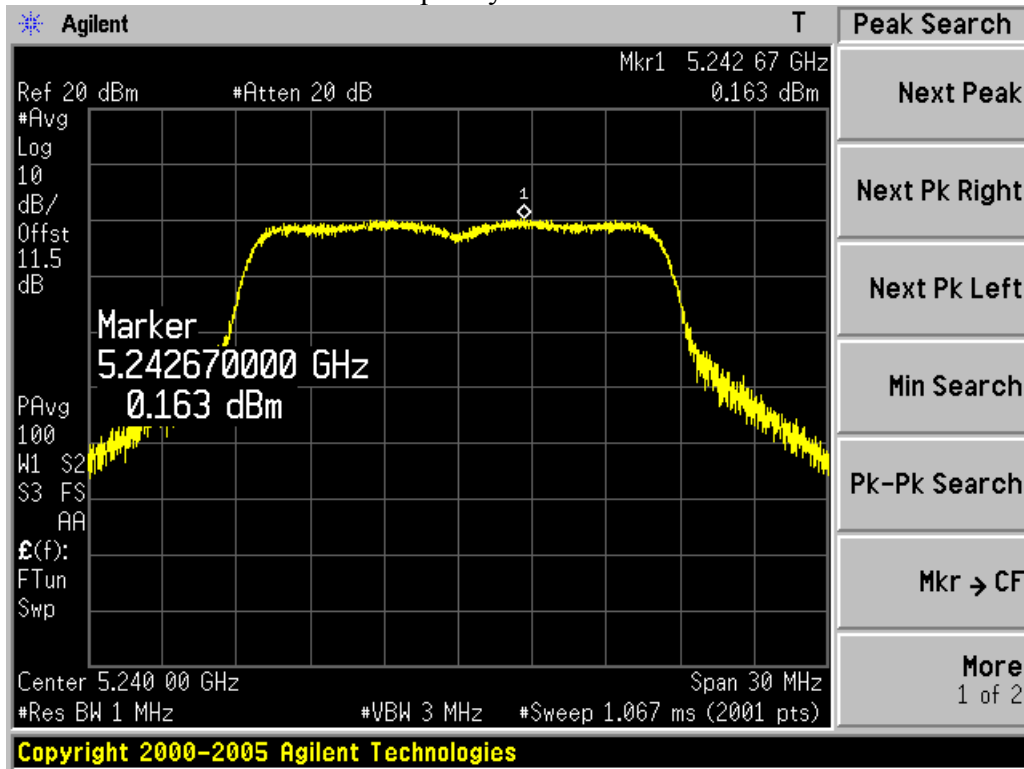
Frequency L – Chain 1



Frequency M – Chain 1

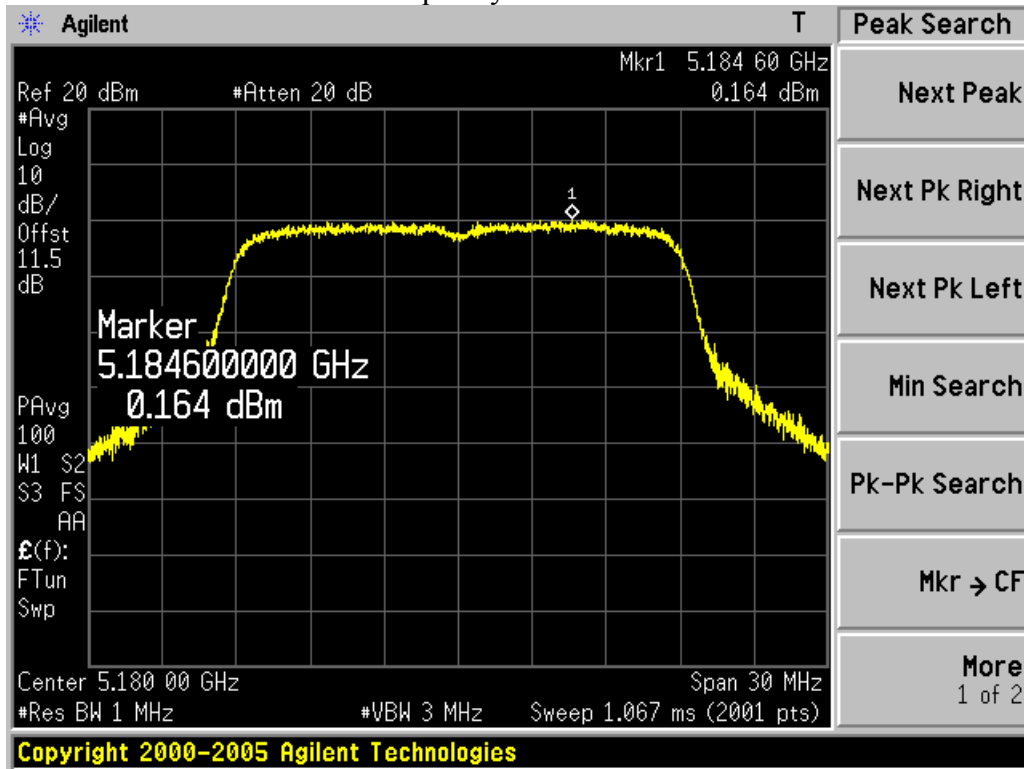


Frequency H – Chain 1

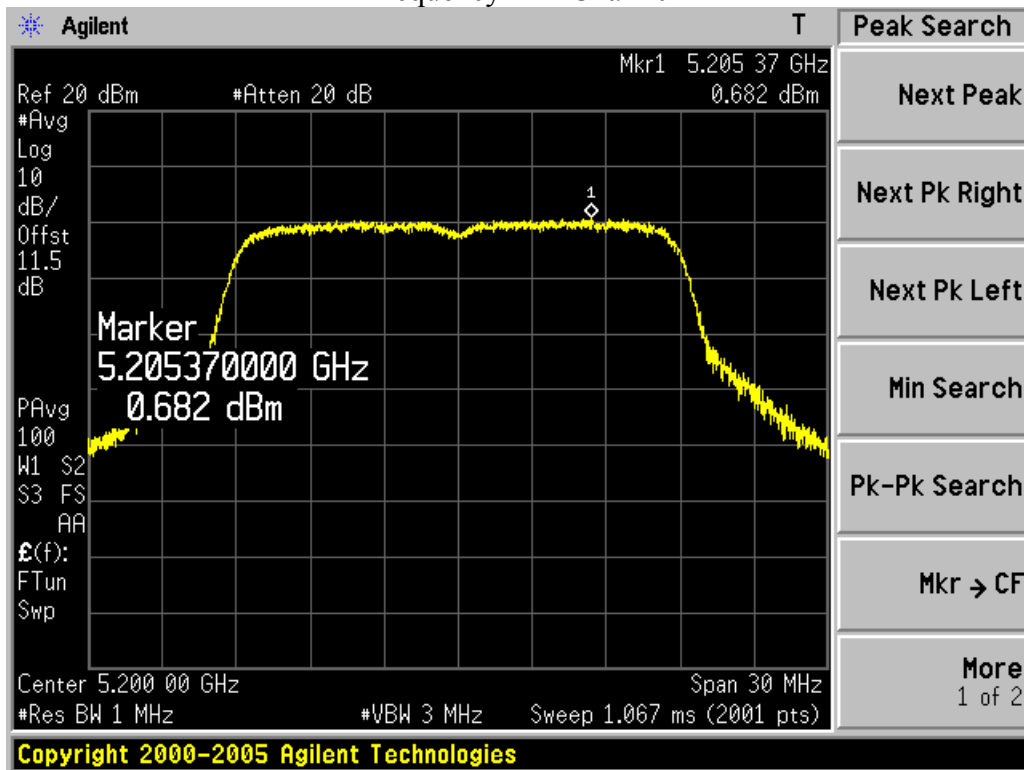


Mode	Freq. (MHz)	PSD (dBm)		Duty cycle factor (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
		Port0	Port 1				
U-NII 1 802.11n20	5180	0.164	-0.707	0.29	3.05	4.00	0.95
	5220	0.682	0.416	0.29	3.85	4.00	0.15
	5240	0.137	0.294	0.29	3.52	4.00	0.48

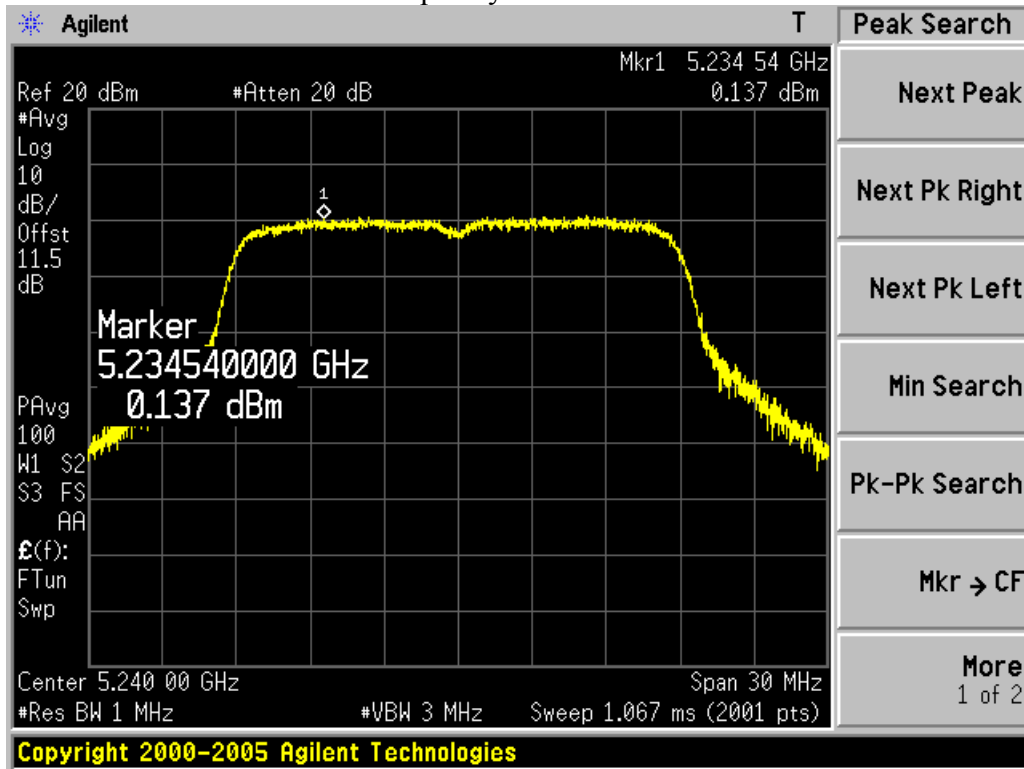
Frequency L – Chain 0



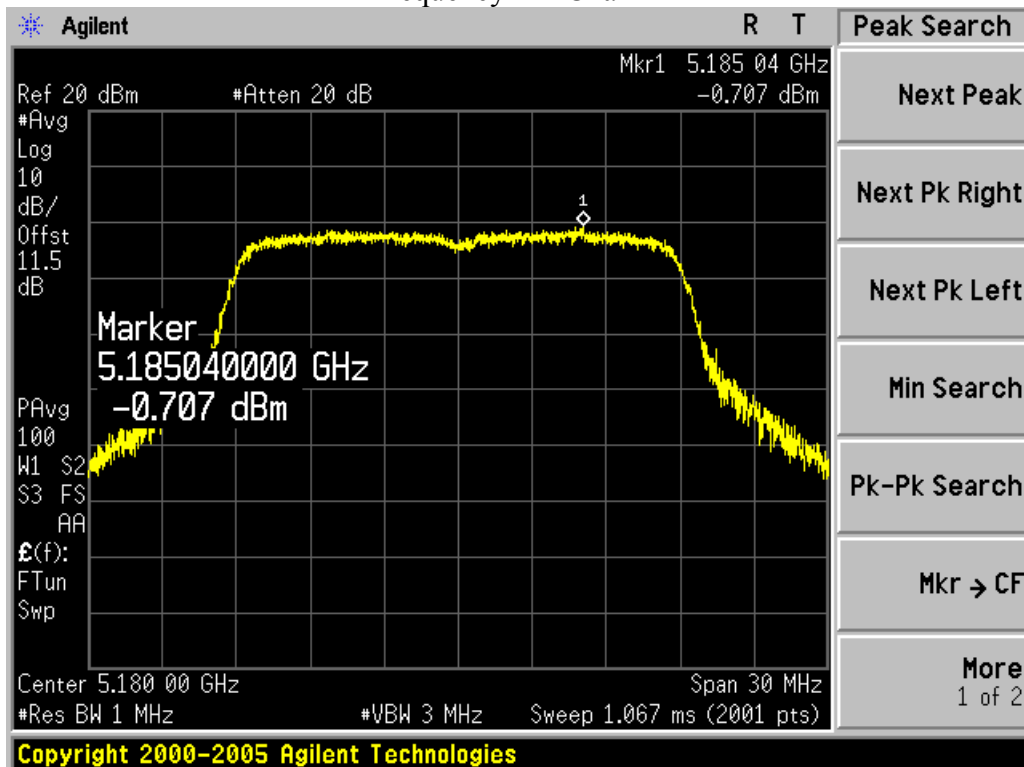
Frequency M – Chain 0



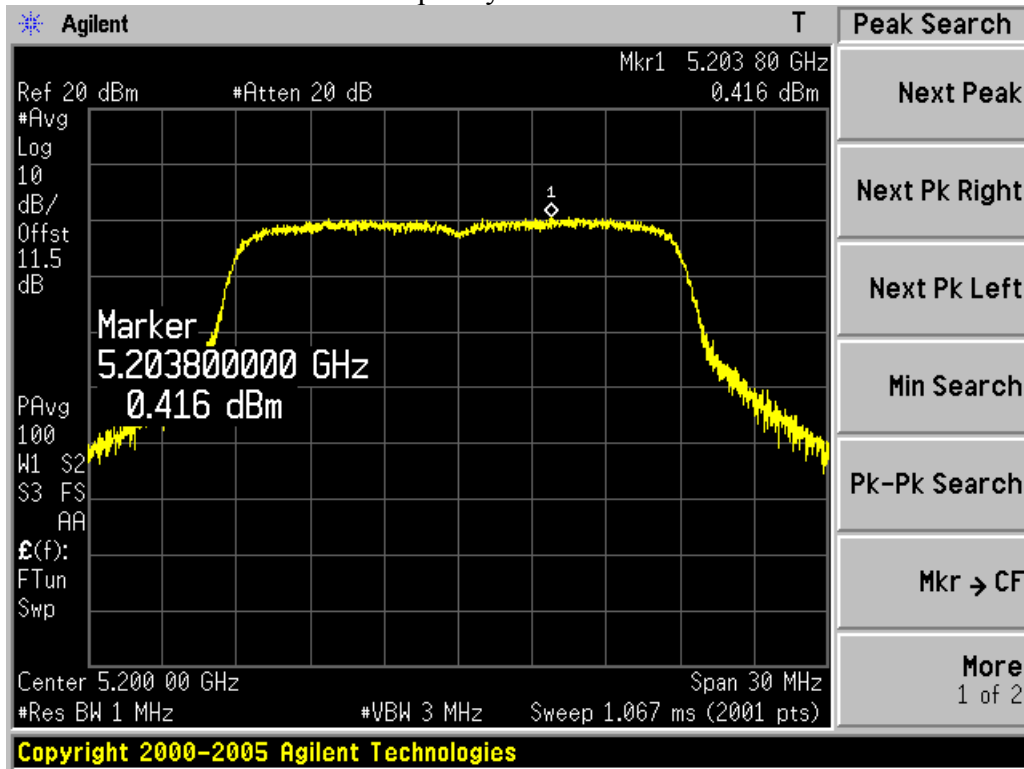
Frequency H – Chain 0



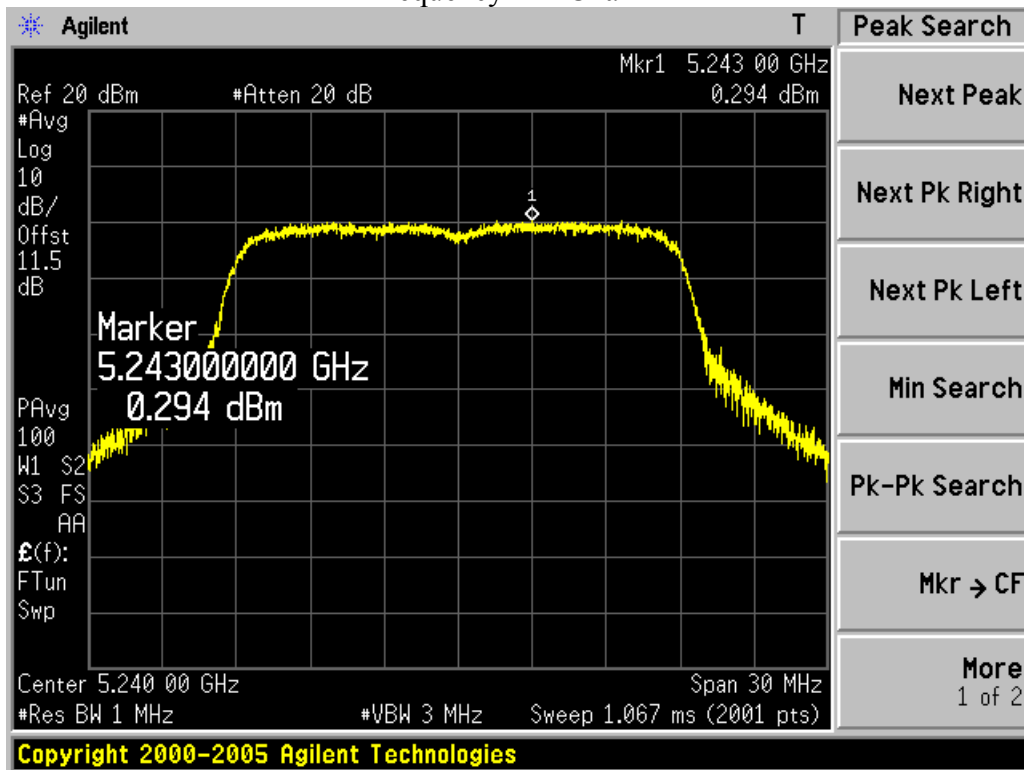
Frequency L – Chain 1



Frequency M – Chain 1

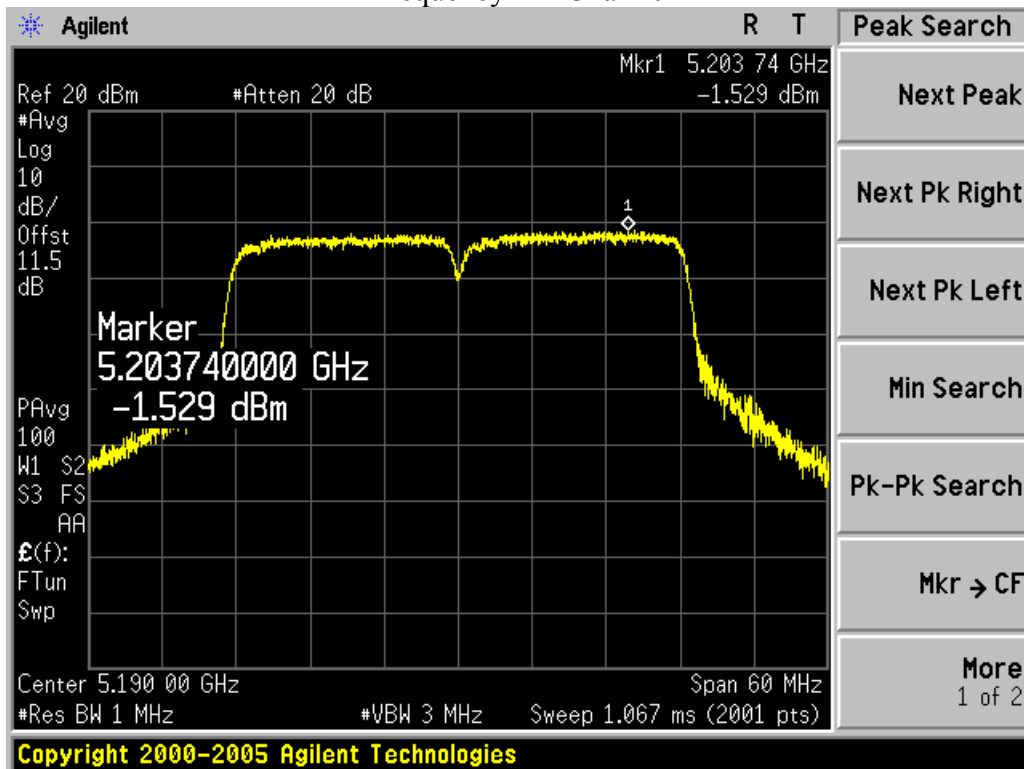


Frequency H – Chain 1

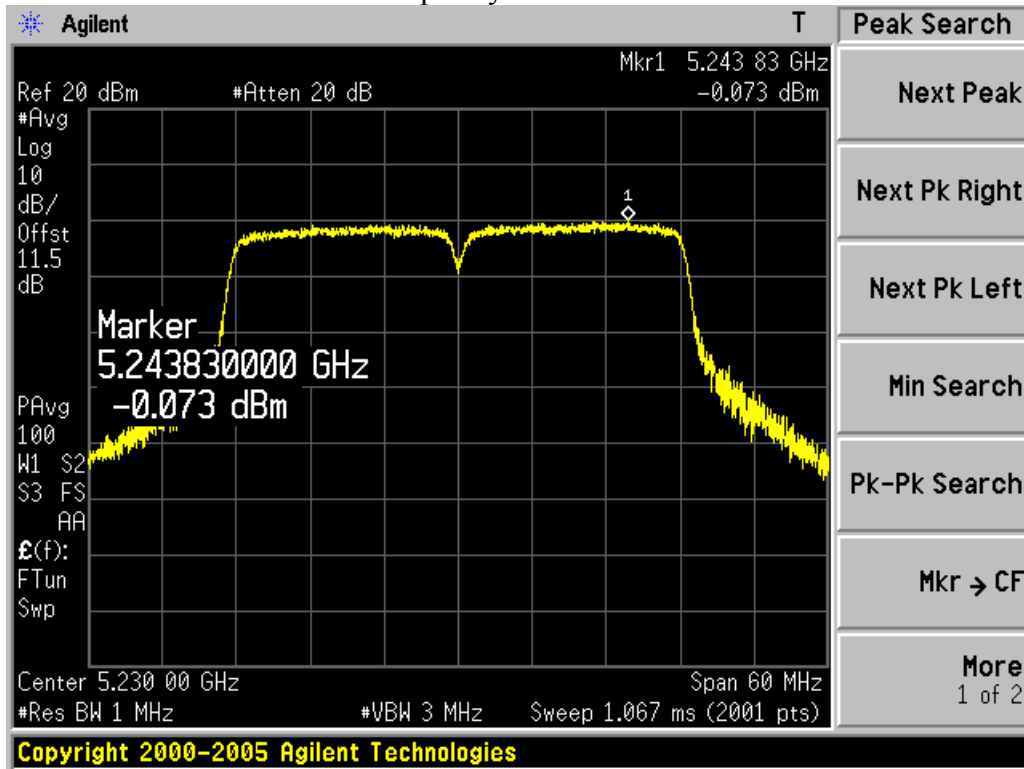


Mode	Freq. (MHz)	PSD (dBm)		Duty cycle factor (dB)	Total PSD (dBm/MHz)	Limit (dBm/MHz)	Margin (dB)
		Port0	Port 1				
U-NII 1 802.11n40	5190	-1.529	-0.736	0.36	2.26	4.00	1.74
	5230	-0.073	-0.513	0.36	3.08	4.00	0.92

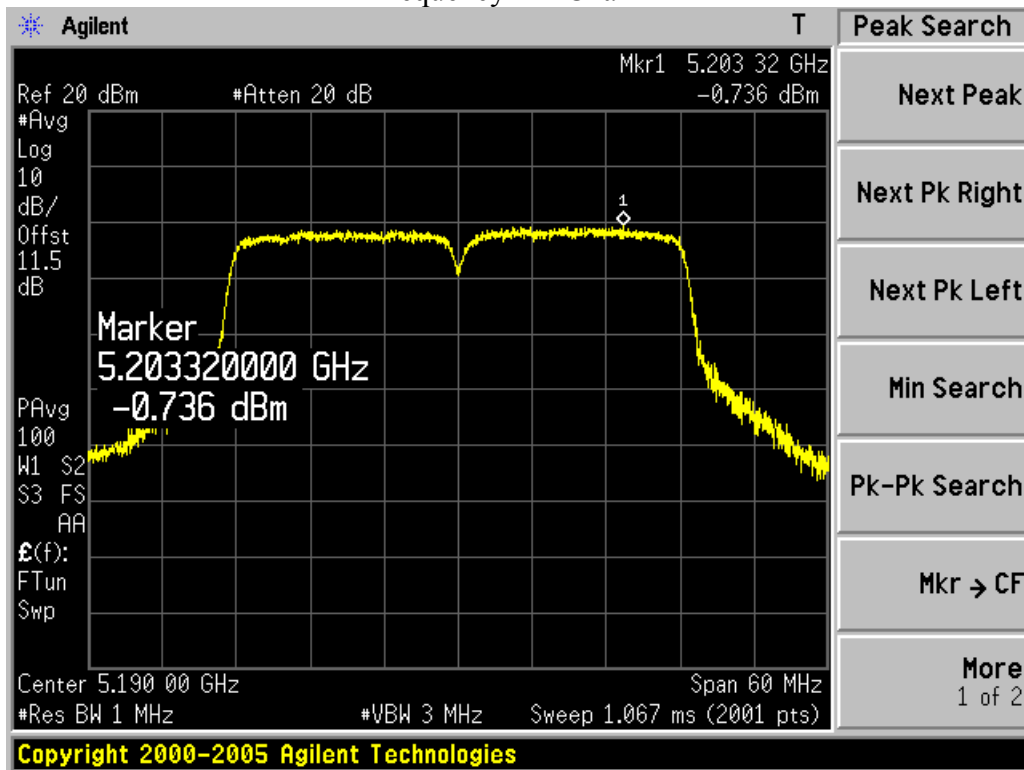
Frequency L – Chain 0



Frequency H – Chain 0

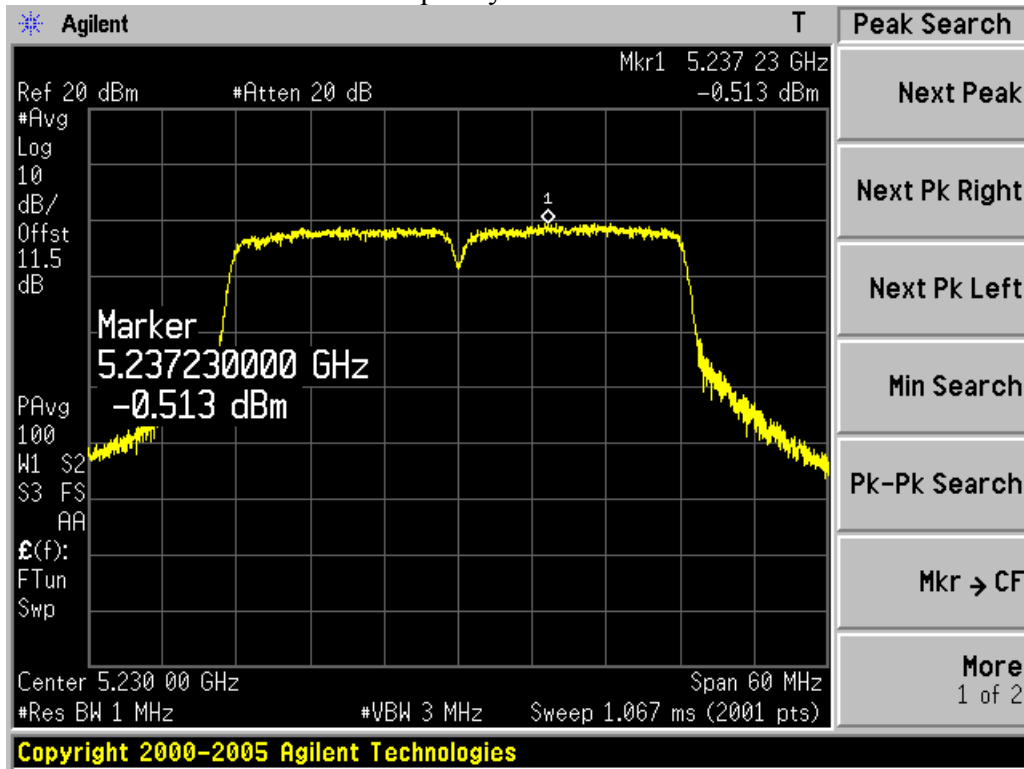


Frequency L – Chain 1





Frequency H – Chain 1



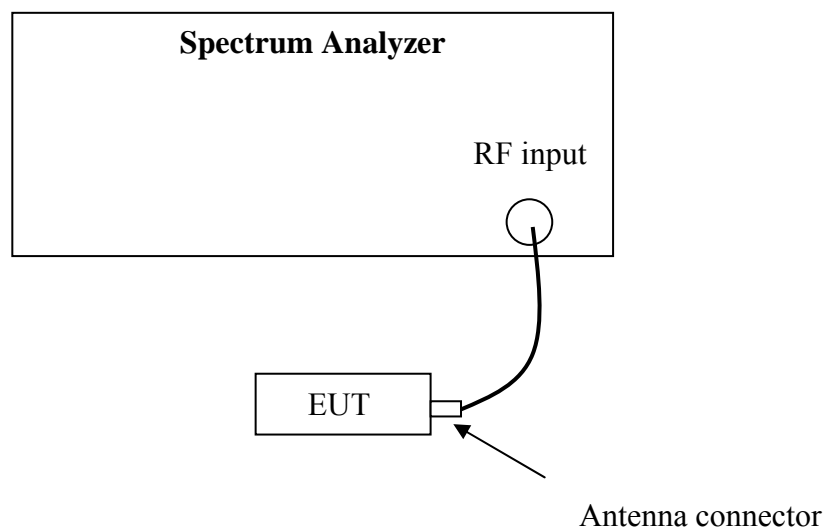
## 5. Peak Excursion Ratio

Test result: PASS

### 5.1 Limit

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### 5.2 Test Configuration



### 5.3 Test Procedure and test setup

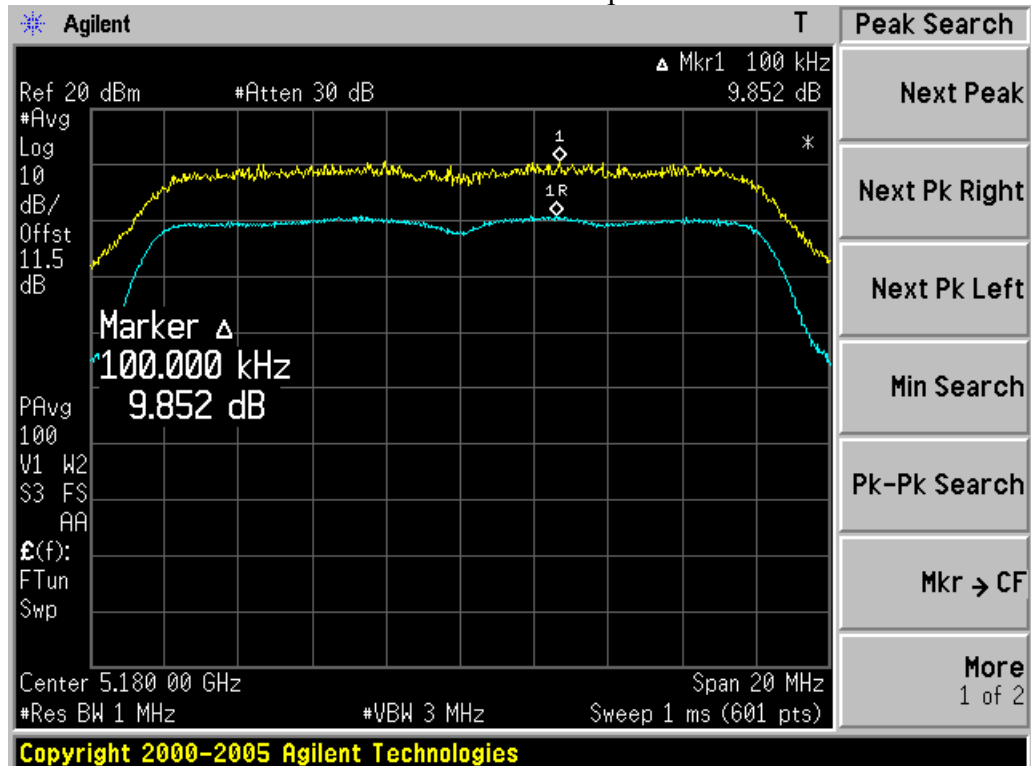
The power spectrum density per FCC §15.407(a)(6) was measured from the antenna port of the EUT. Using a 50ohm spectrum analyzer (measurement method refer to KDB 789033D01 v01r04: Section G) with the RBW=1MHz, VBW=3MHz, Detector=Peak for peak measurement and RBW=1MHz, VBW=3MHz, Detector=RMS for average measurement. And delta-mark peak & average ratio was read directly.

### 5.4 Test Protocol

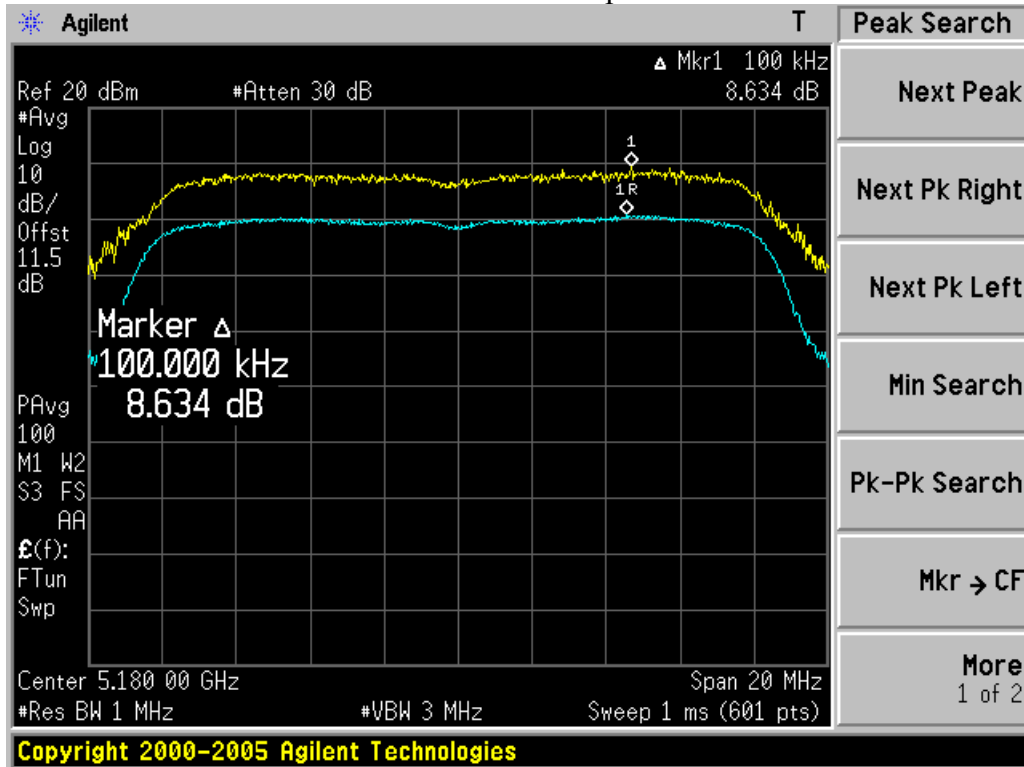
Temperature : 25 °C  
Relative Humidity : 55 %

Band	Mode	Frequency (MHz)	Measured Peak Excursion (dB)							
			6	9	12	18	24	36	48	54
U-NII 1	802.11a	5180	6	9	12	18	24	36	48	54
			9.852	8.634	9.054	8.342	8.839	9.211	9.390	9.316
	802.11n 20	5180	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
			9.522	7.860	9.233	9.572	9.870	9.802	9.916	9.519
	802.11n 40	5190	MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7
			9.828	9.771	9.651	9.489	10.618	8.678	9.304	9.568

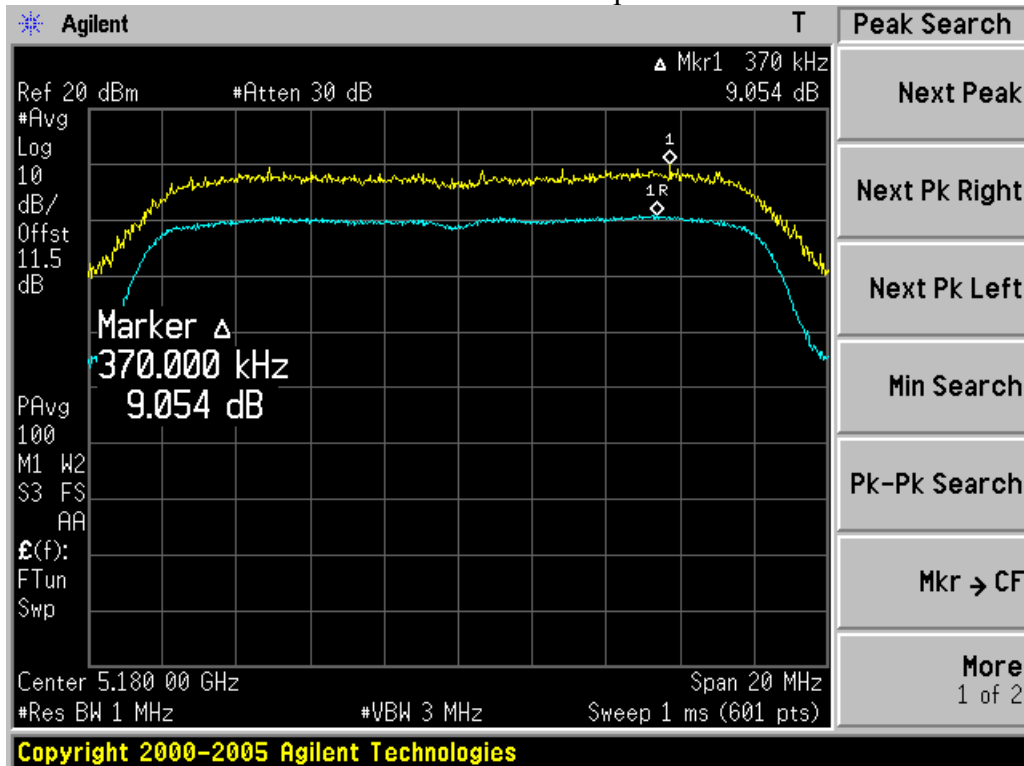
802.11 a – 6Mbps



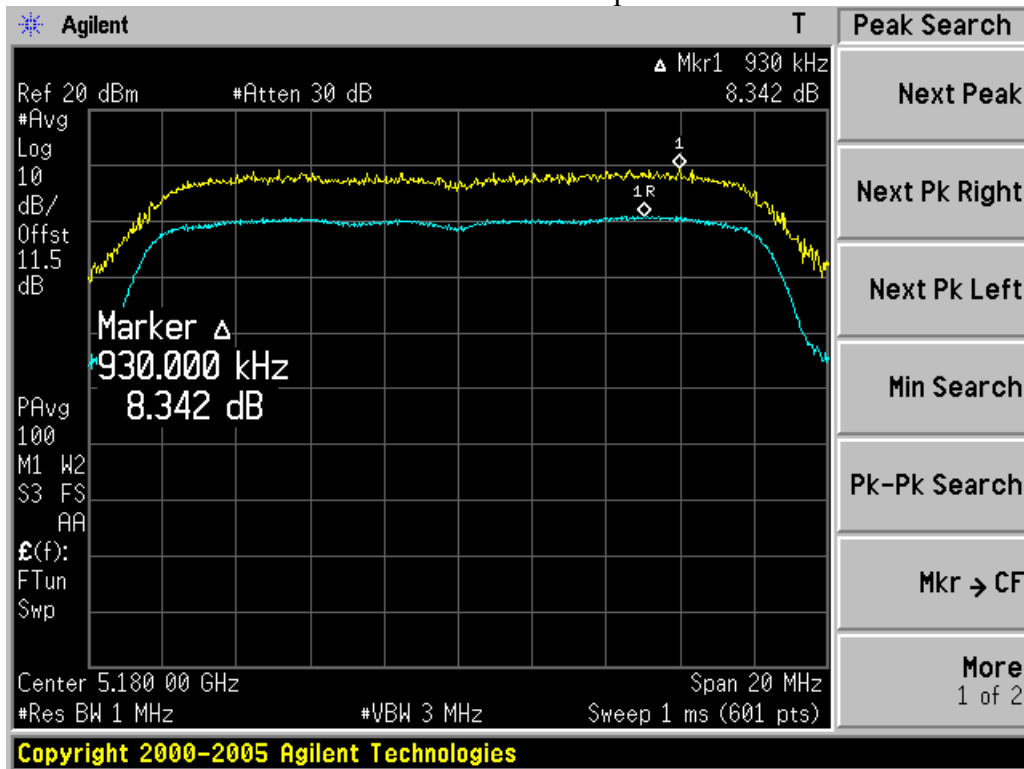
802.11 a – 9Mbps



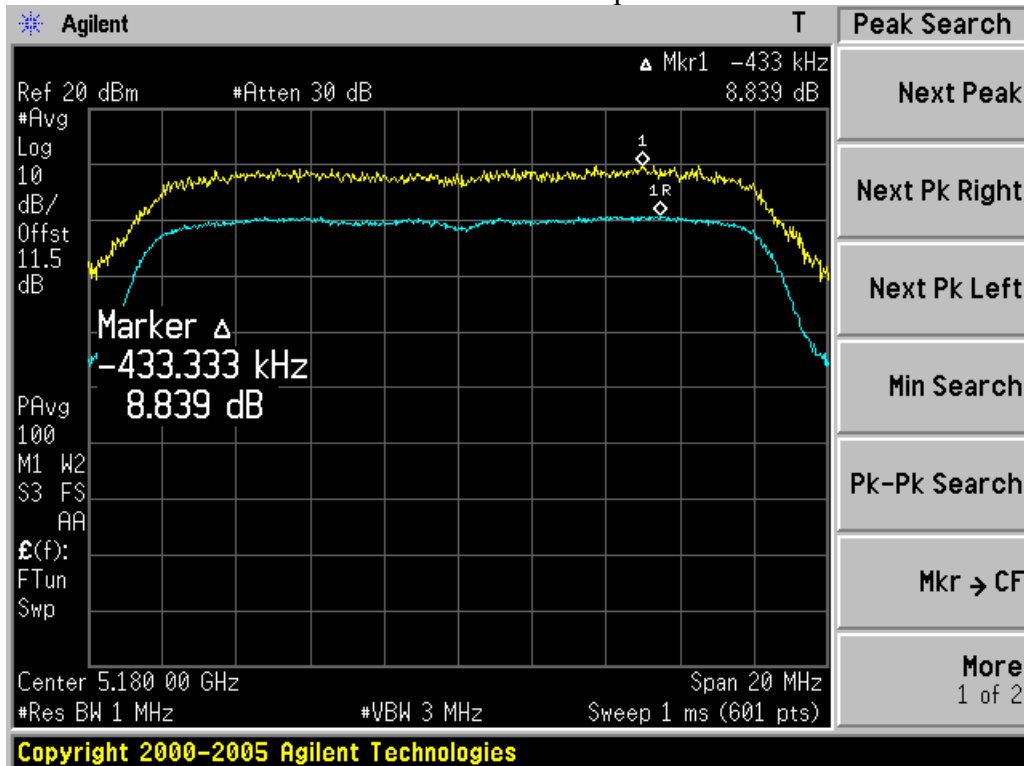
802.11 a – 12Mbps



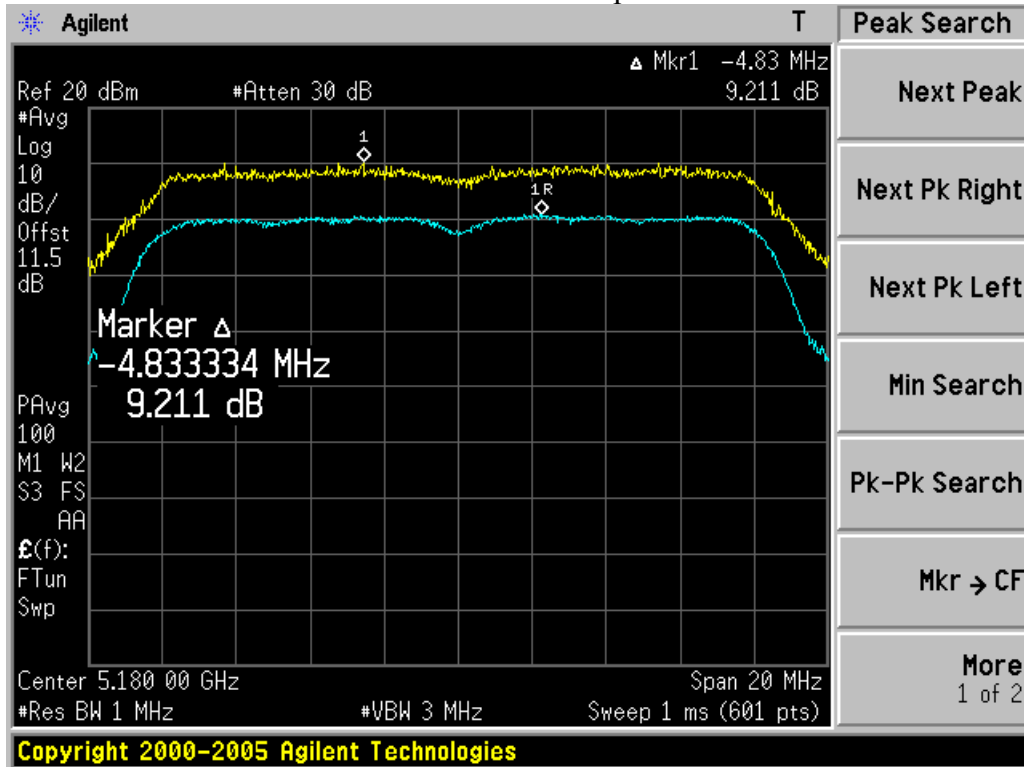
802.11 a – 18Mbps



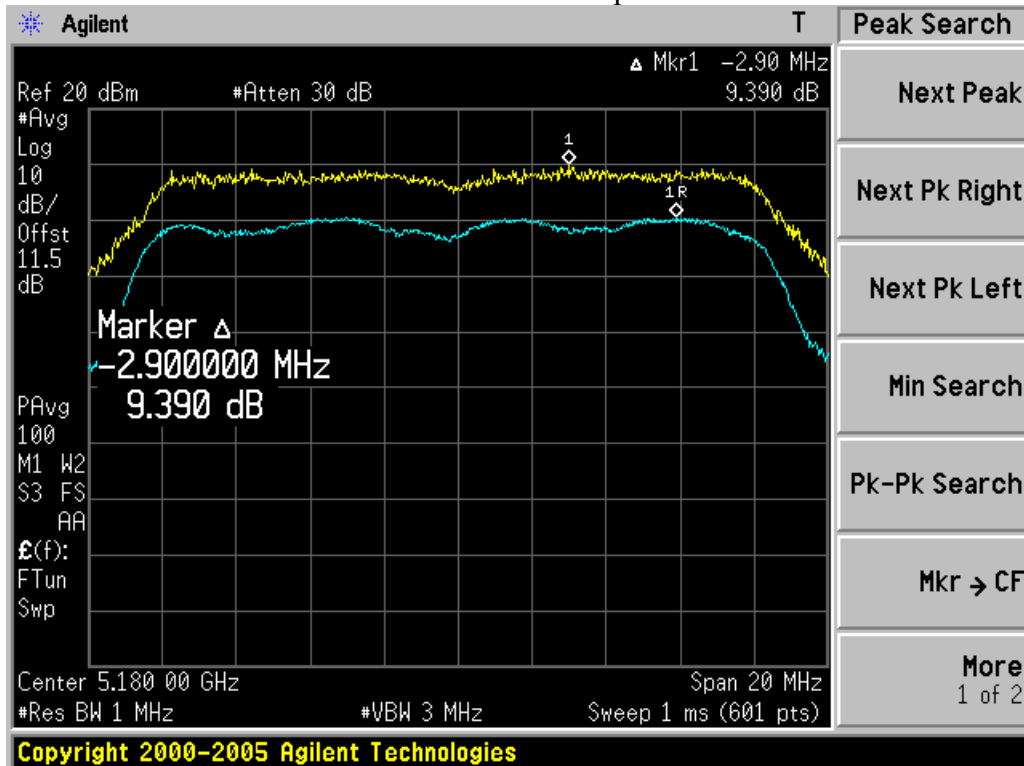
802.11 a – 24Mbps



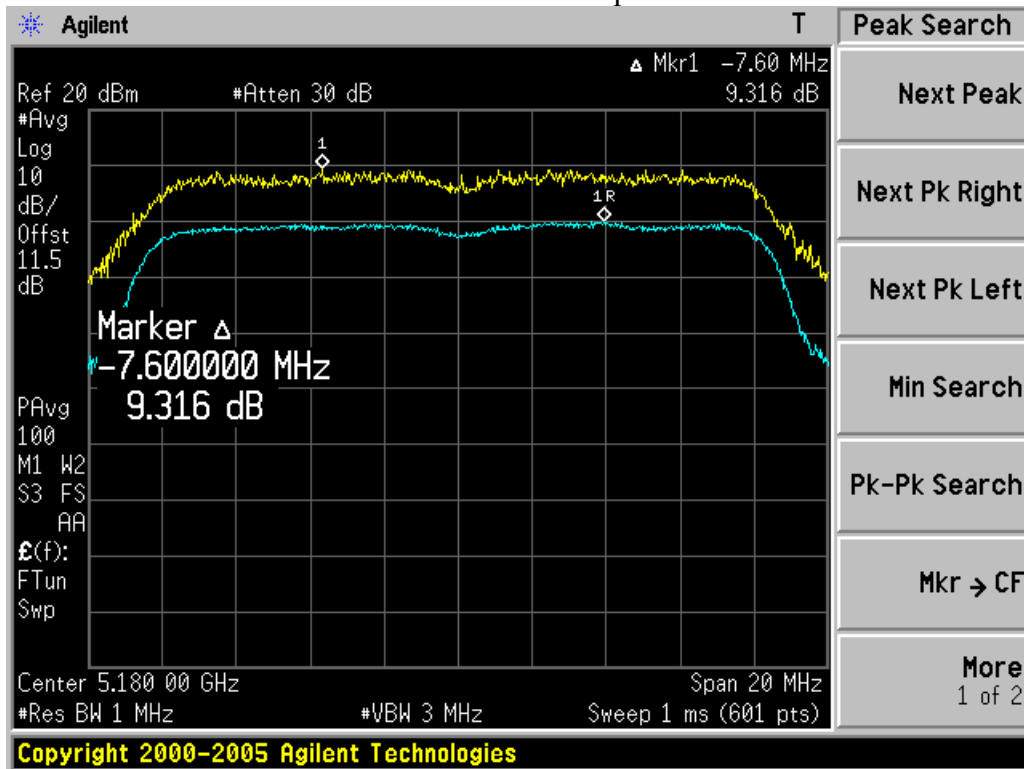
802.11 a – 36Mbps



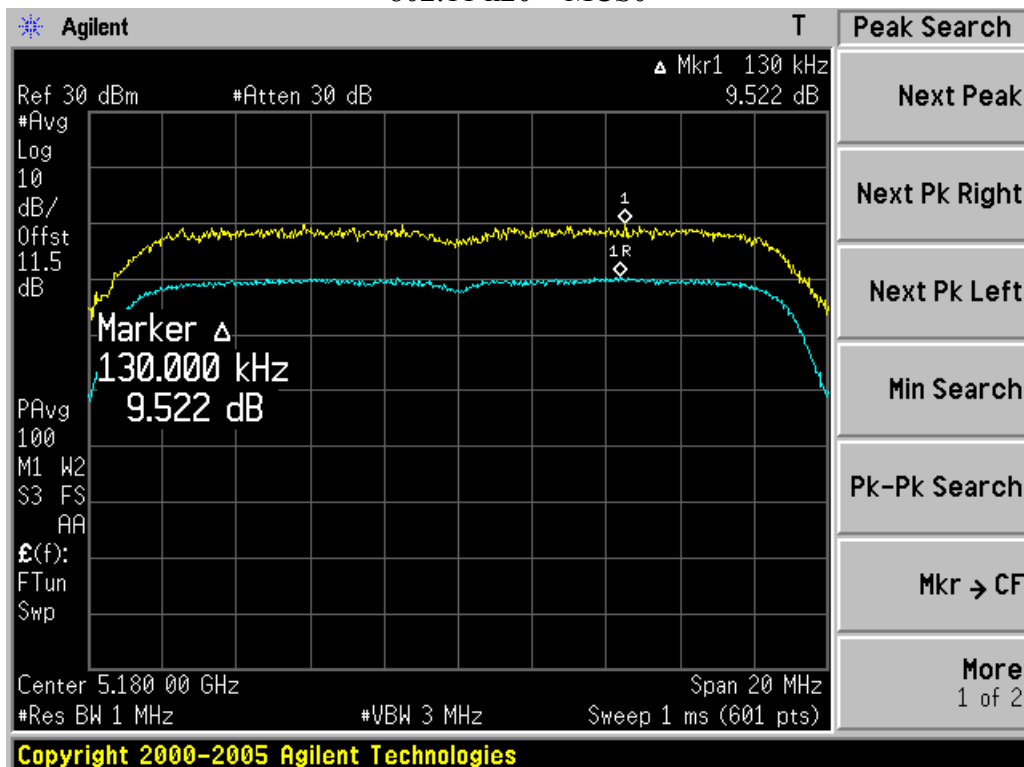
802.11 a – 48Mbps



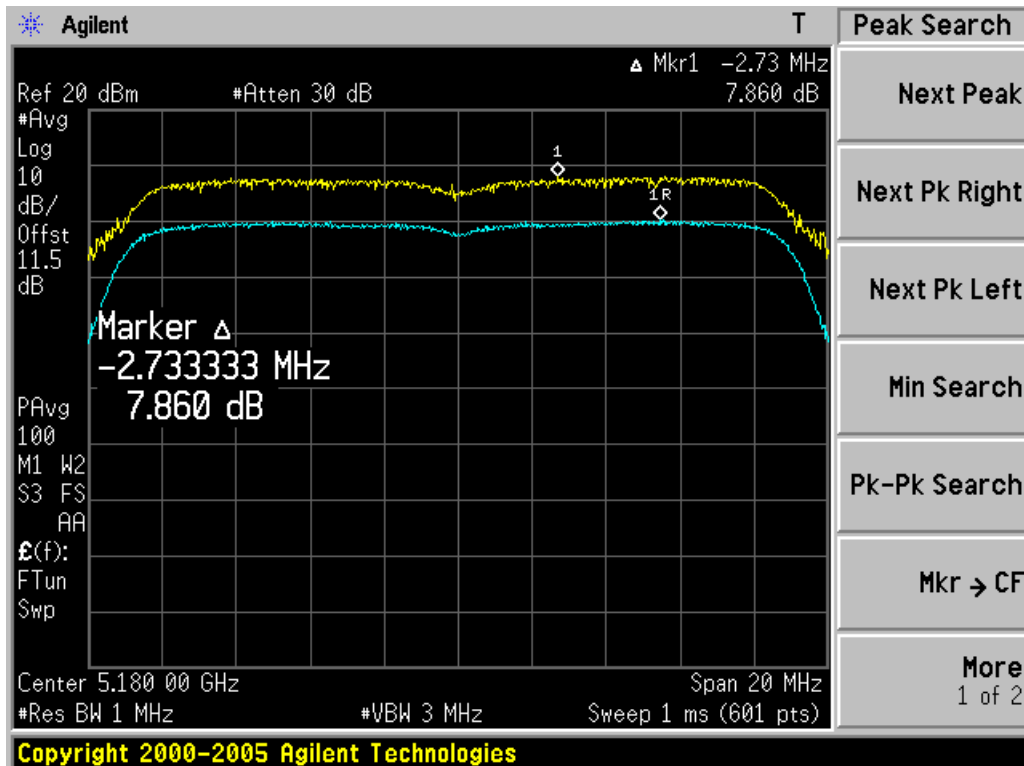
802.11 a – 54Mbps



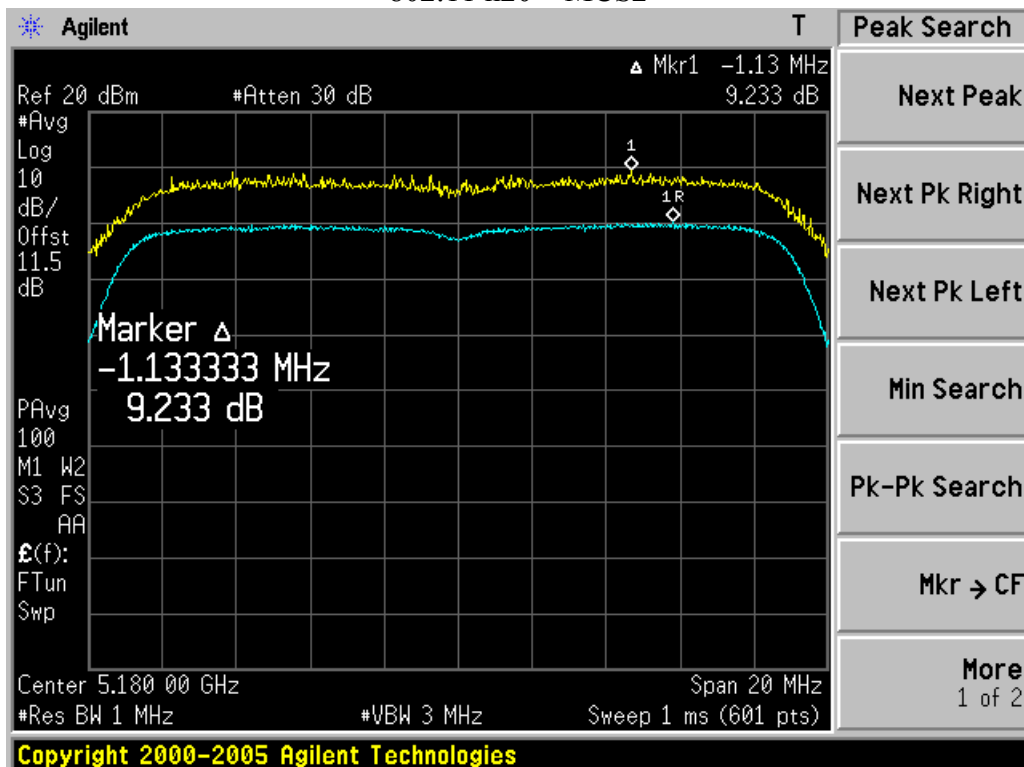
802.11 n20 – MCS0



802.11 n20 – MCS1

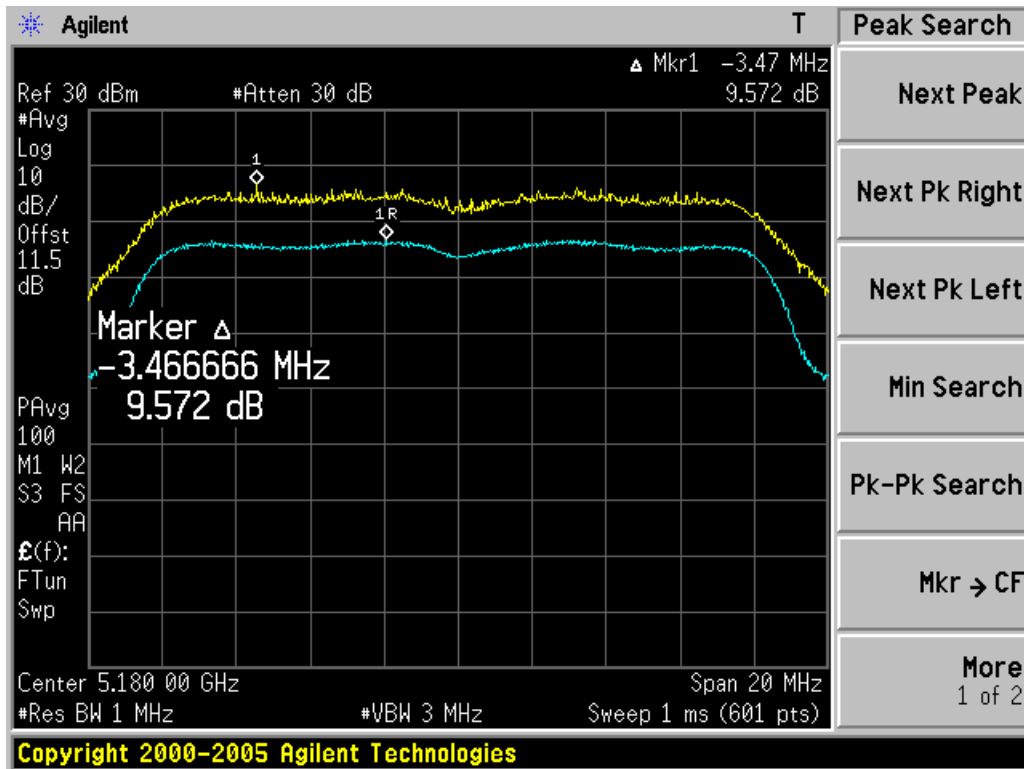


802.11 n20 – MCS2

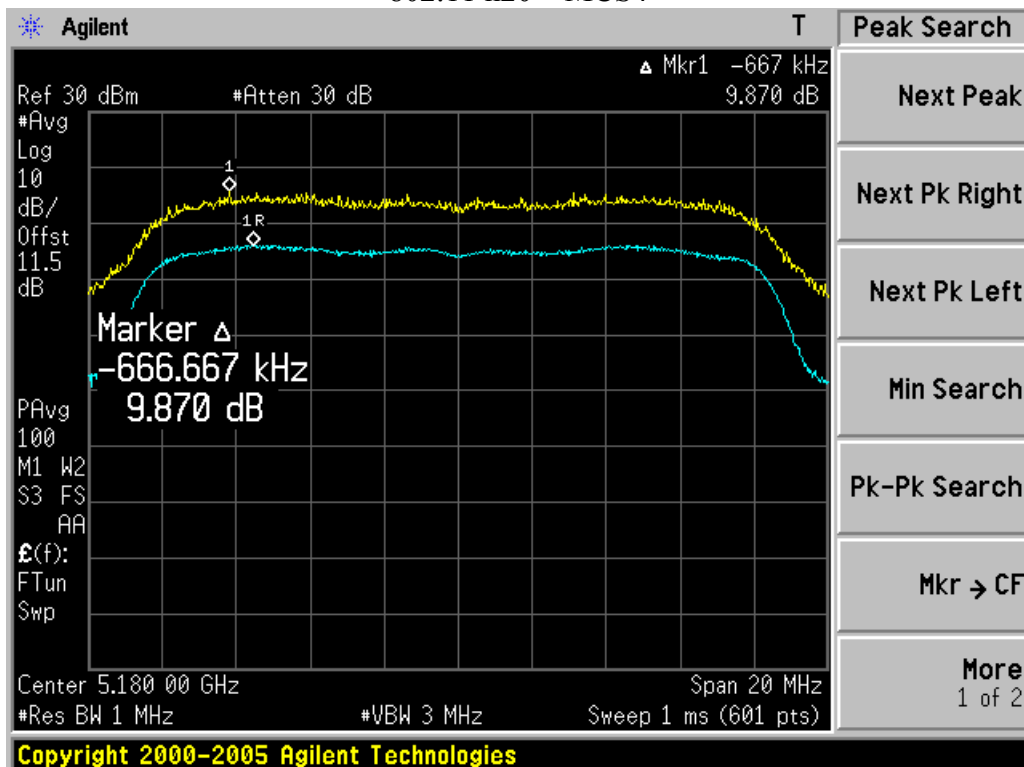




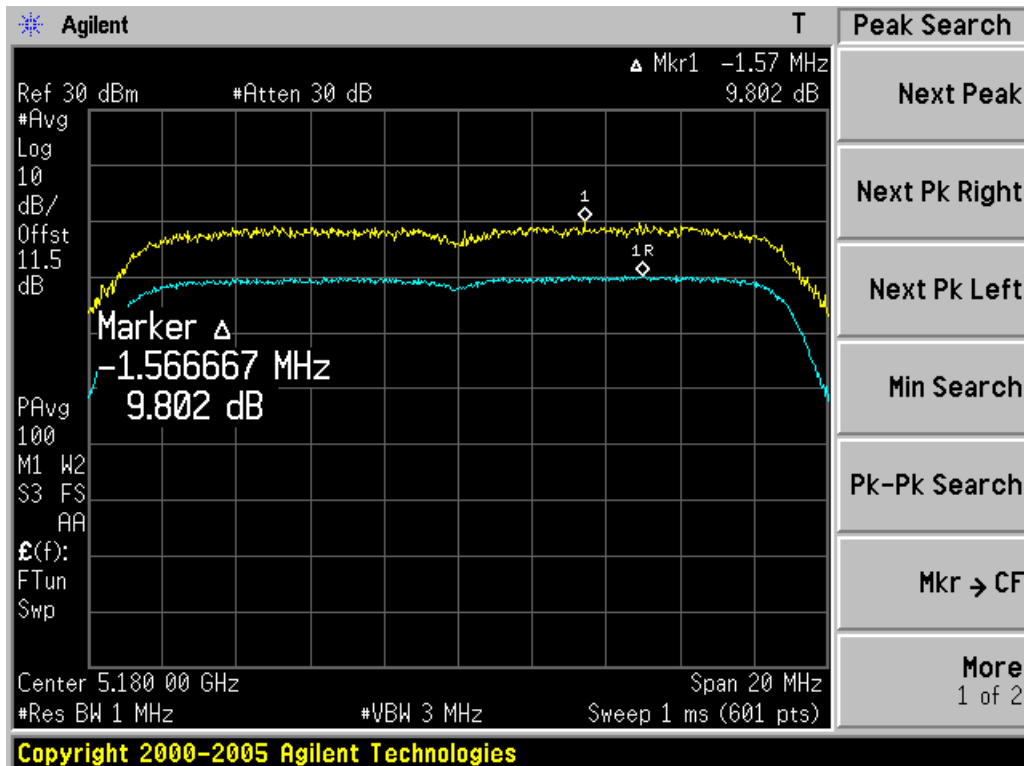
802.11 n20 – MCS3



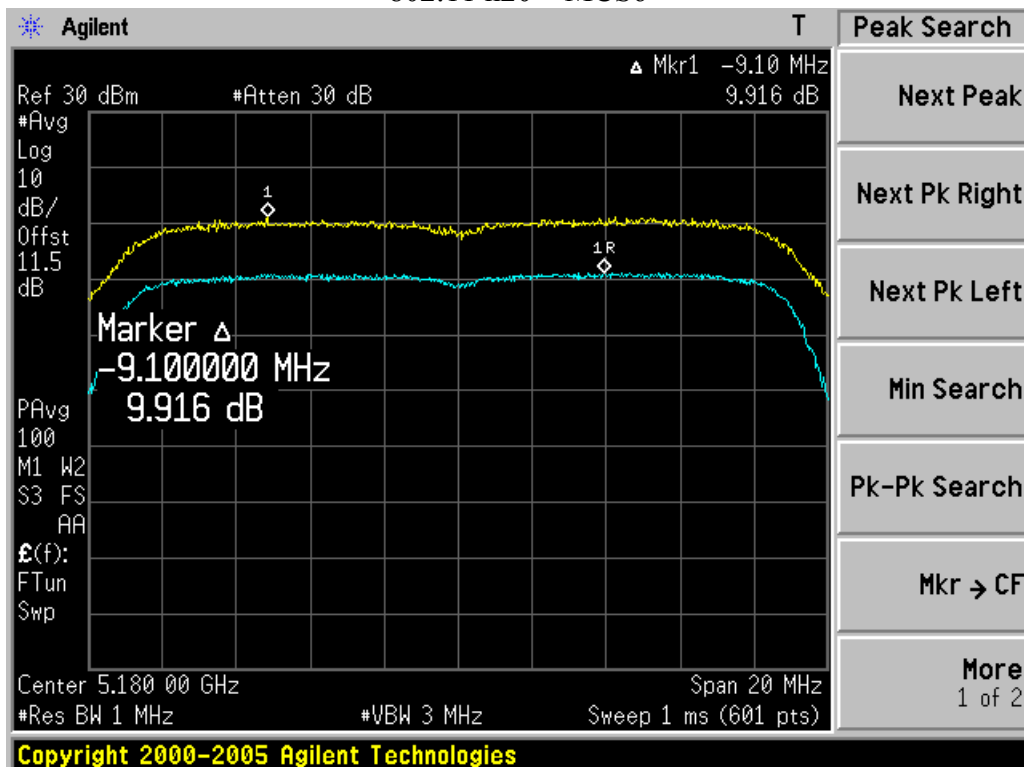
802.11 n20 – MCS4



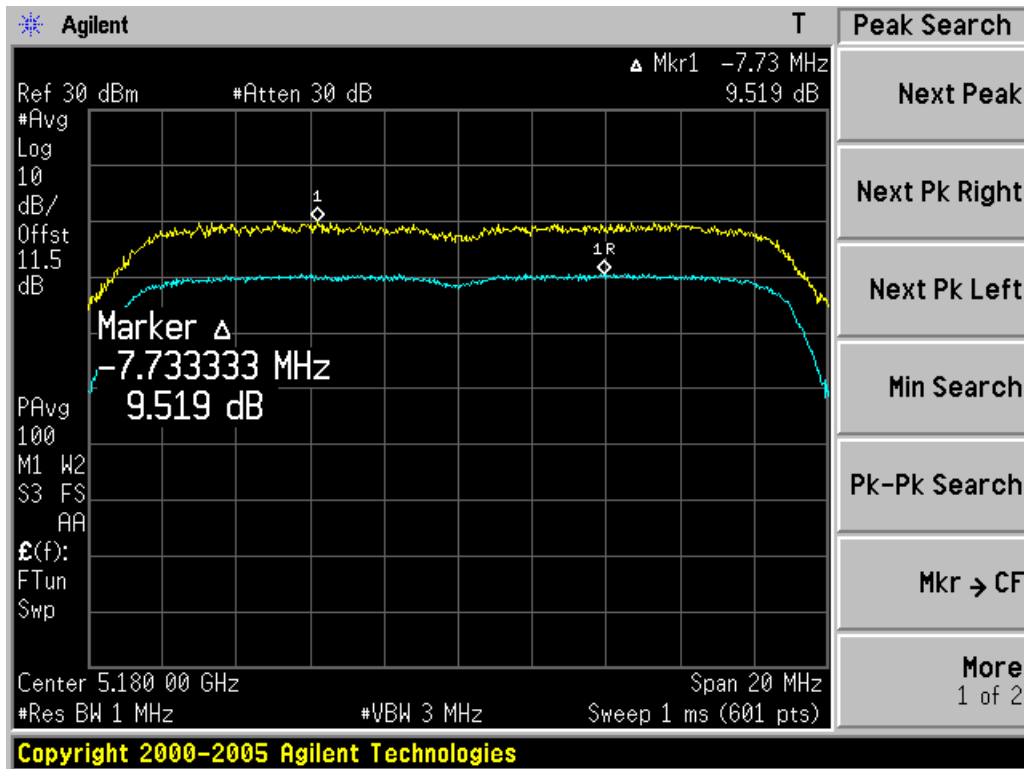
802.11 n20 – MCS5



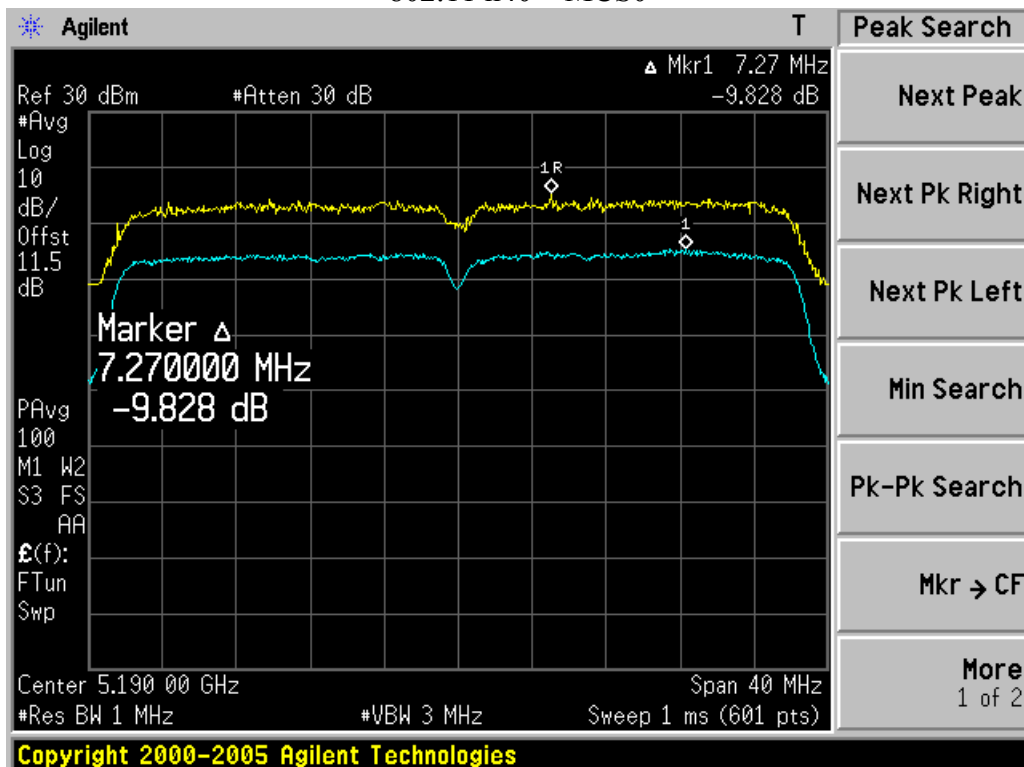
802.11 n20 – MCS6



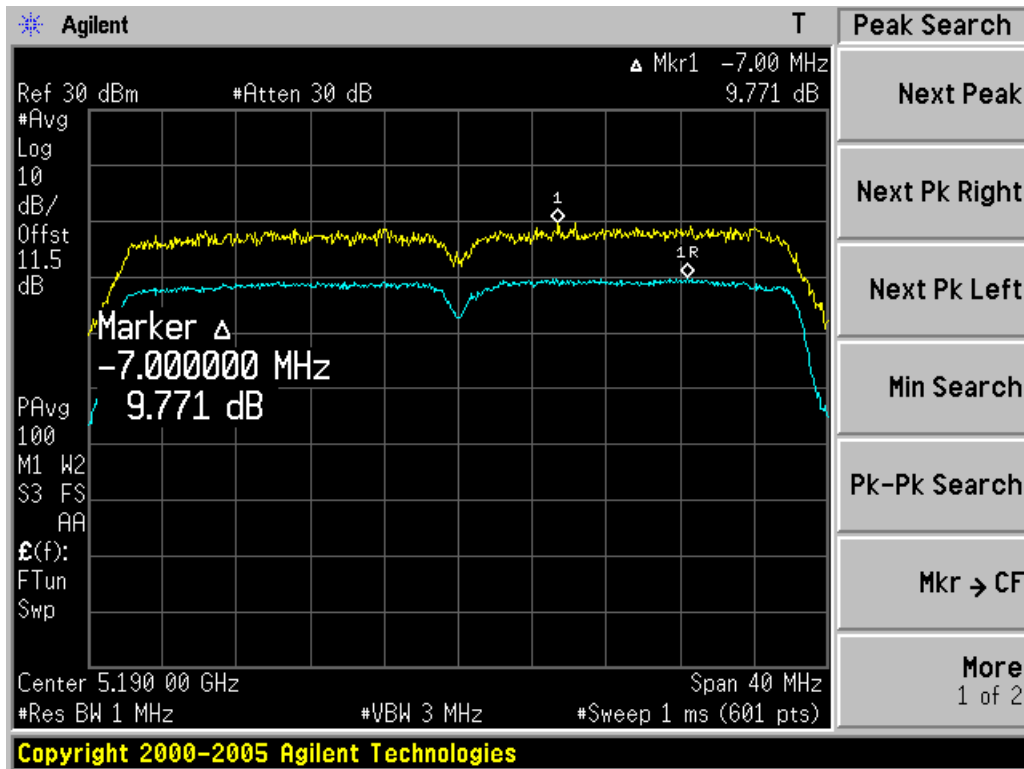
802.11 n20 – MCS7



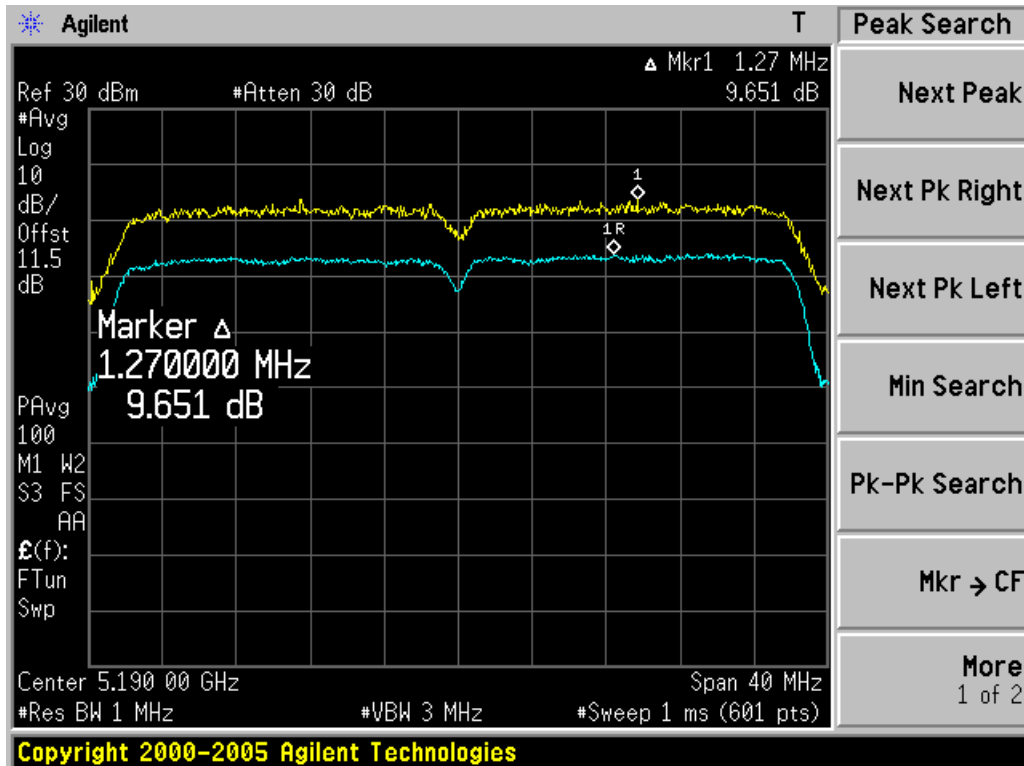
802.11 n40 – MCS0



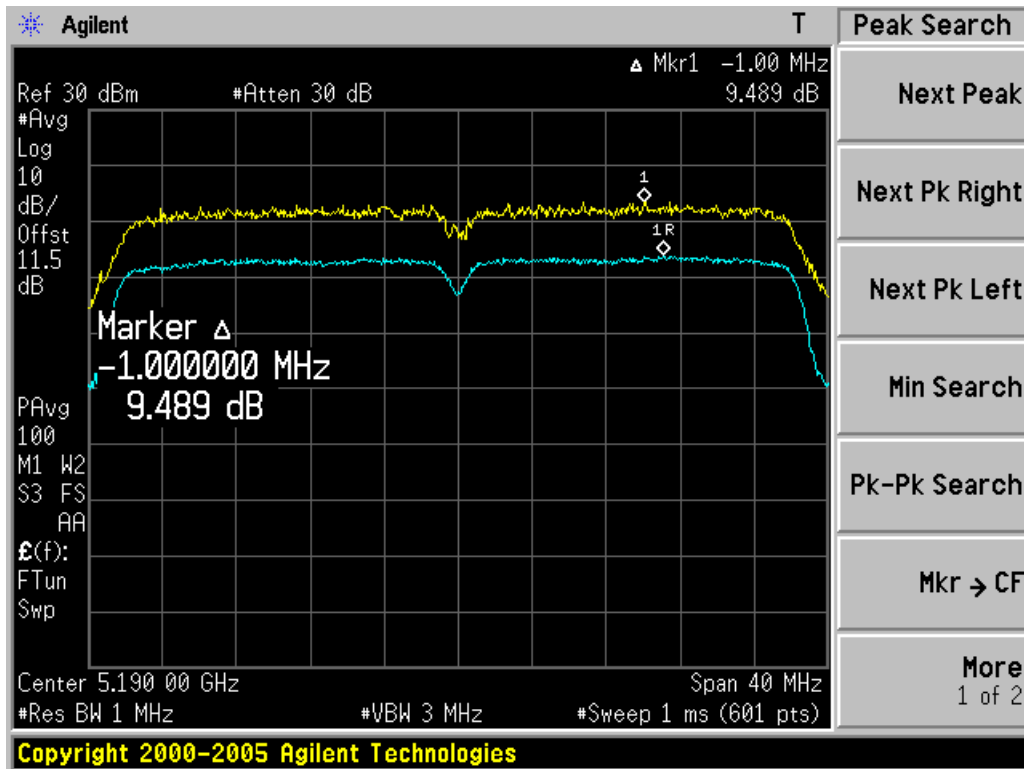
802.11 n40 – MCS1



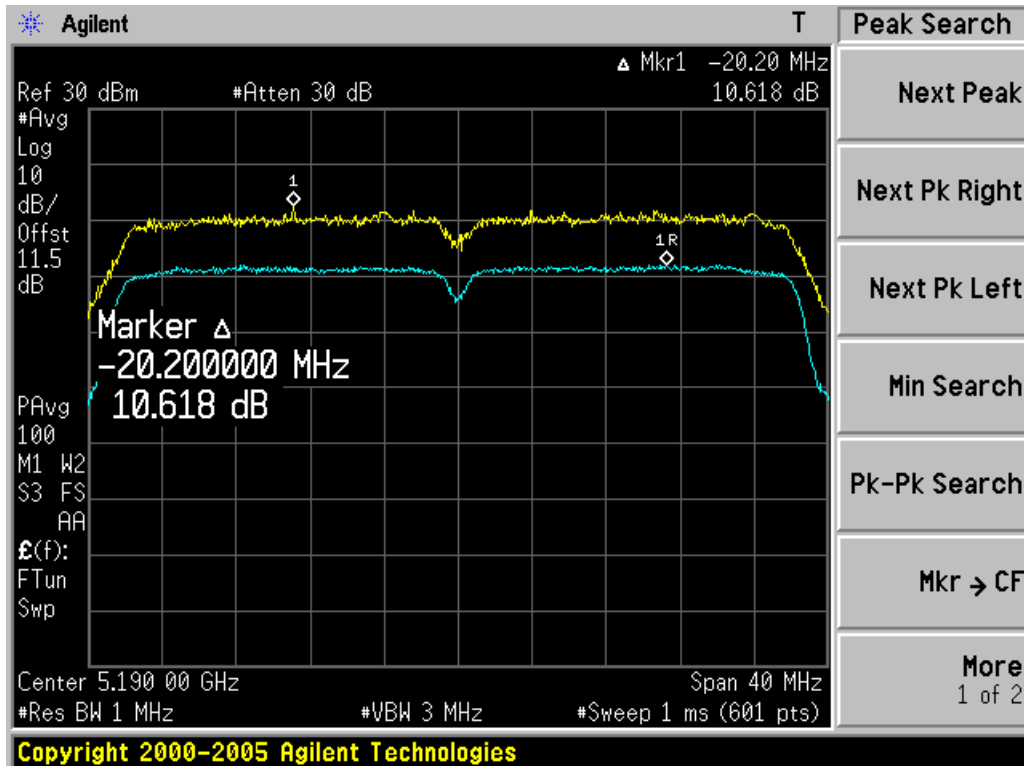
802.11 n40 – MCS2



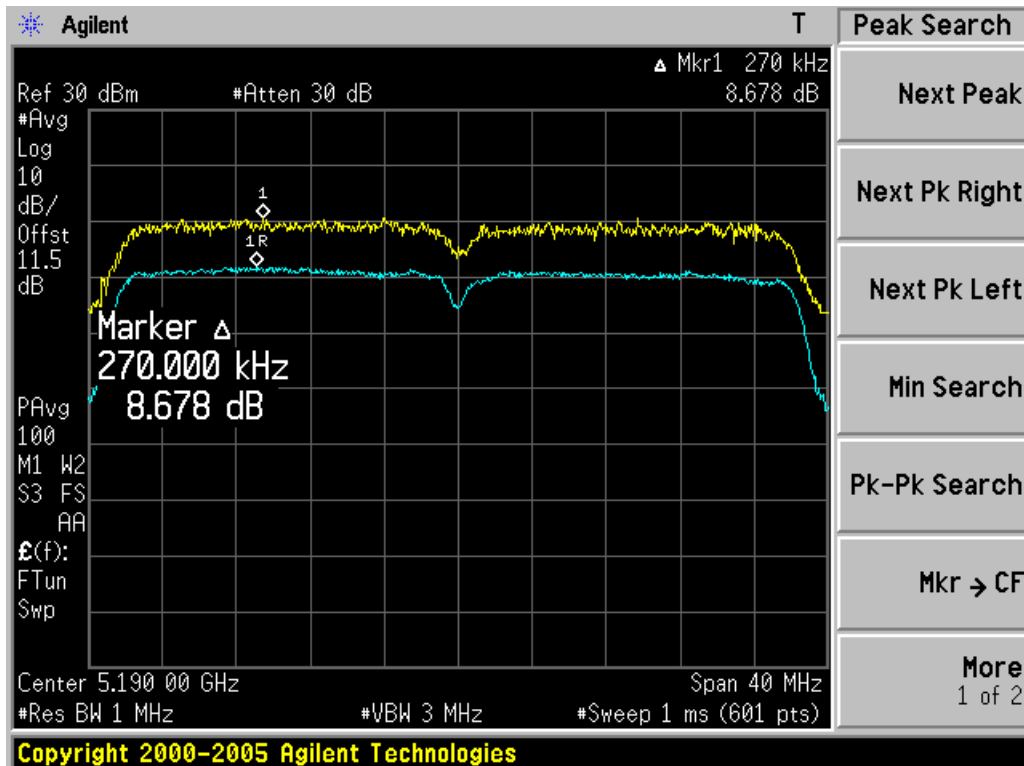
802.11 n40 – MCS3



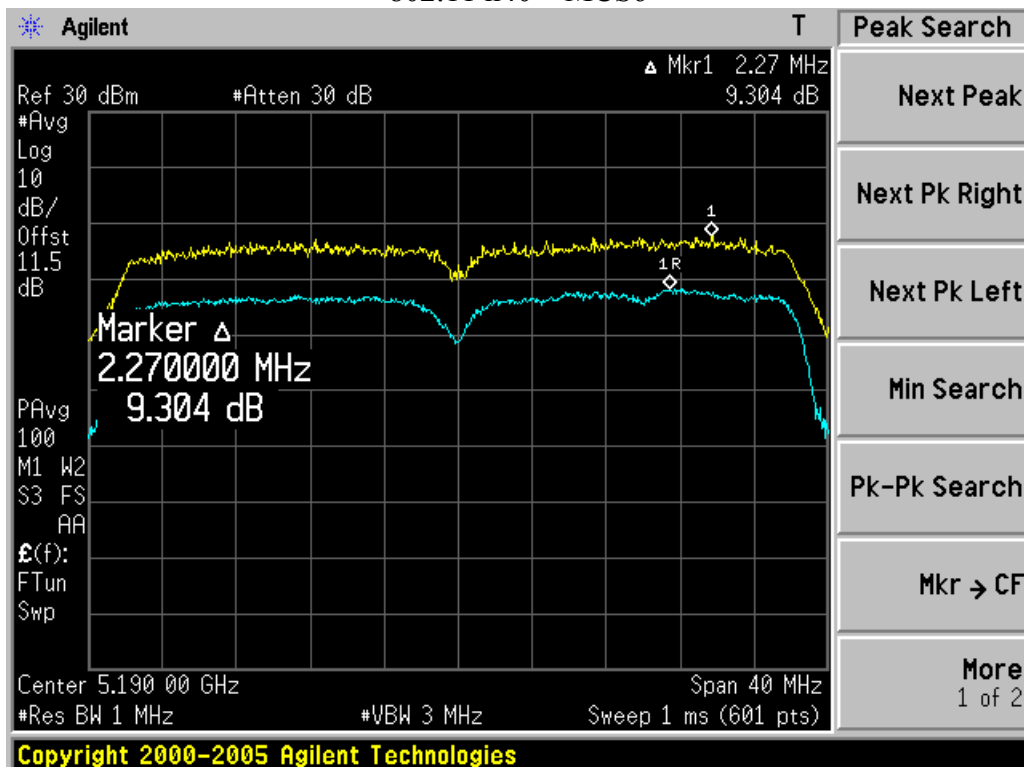
802.11 n40 – MCS4



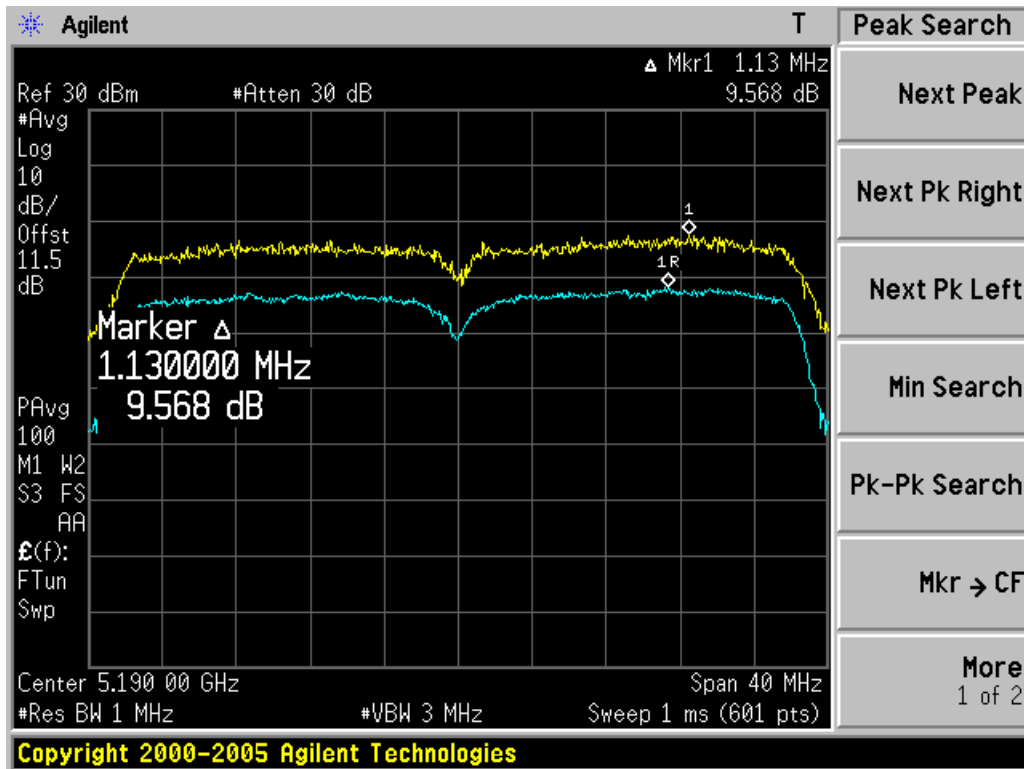
802.11 n40 – MCS5



802.11 n40 – MCS6



802.11 n40 – MCS7



## 6. Radiated emission

**Test result: PASS**

### 6.1 Test limit

6.1.1 The radiated emissions which are lower than 1GHz or fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) showed as below:

Frequency (MHz)	Field Strength (dBuV/m)	Measurement Distance (m)
30 - 88	40.0	3
88 - 216	43.5	3
216 - 960	46.0	3
Above 960	54.0	3

6.1.2 The emission which is outside the restrict bands, should comply with the EIRP limit as below:

(1) For transmitters operating in the 5.15–5.25 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz.

Frequencies (MHz)	EIRP Limit (dBm)	Equivalent Field Strength (3m) (dBμV/m)
1000-5150	-27	68.23
5350-40000	-27	68.23

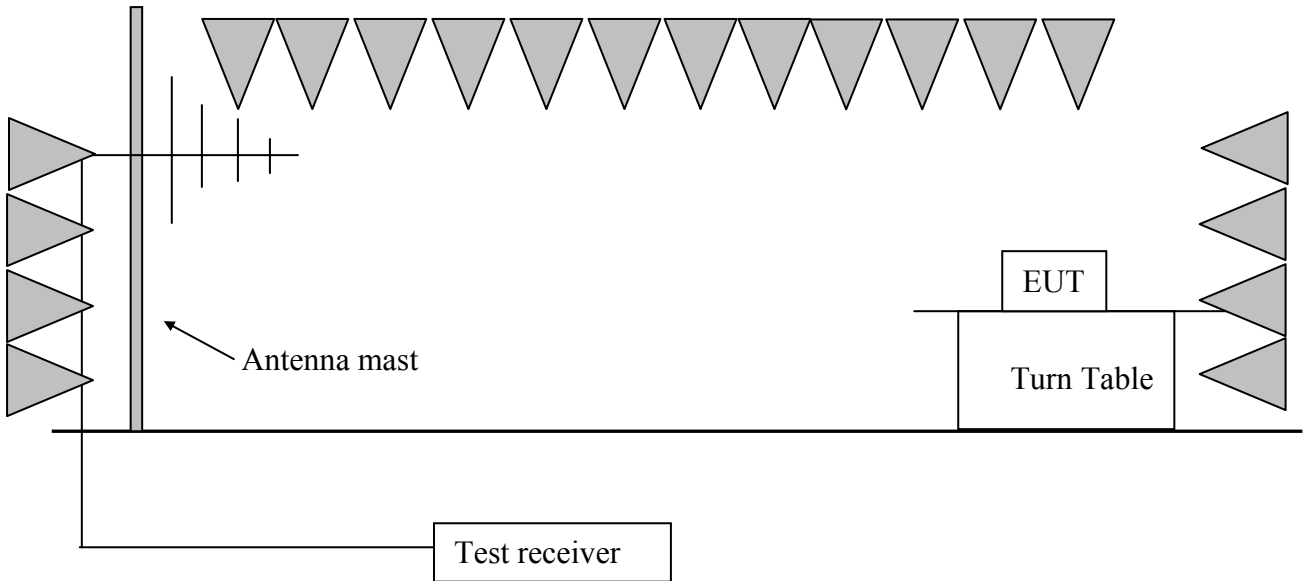
Note: The Equivalent Field Strength is converted from EIRP with the formula:

$$E = (1000000 \sqrt{30P} / 3) \mu\text{V/m}, \text{ where } P \text{ is the EIRP (Watts).}$$

6.1.3 As specified in 15.407(b), emissions above 1000 MHz that are outside of the restricted bands are subject to a peak emission limit of -27 dBm/MHz (or -17 dBm/MHz as specified in 15.407(b)(4)). However, an out-of-band emission that complies with both the average and peak limits of 15.209 is not required to satisfy the -27 dBm/MHz or -17 dBm/MHz peak emission limit.



### 6.2 Test Configuration



### 6.3 Test procedure and test setup

Radiated emission measurements were performed from 30MHz to tenth harmonic or 40GHz. The EUT for testing is arranged on a 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.

Testing settings (refer to KDB 789033 v01r04 section H)

Below 1GHz

- 1, Analyzer center frequency was set to the frequency of the radiated spurious emission.
- 2, Span=encompass the entire emission
- 3, RBW=120KHz
- 4, Detector=Quasi-Peak
- 5, Trace was allowed to stabilize

Peak Measurements above 1GHz

- 1, Analyzer center frequency was set to the frequency of the radiated spurious emission.
- 2, Span=encompass the entire emission
- 3, RBW=1MHz
- 4, VBW=3MHz
- 4, Detector= Peak (Max-hold)
- 5, Trace was allowed to stabilize

Average Measurements above 1GHz

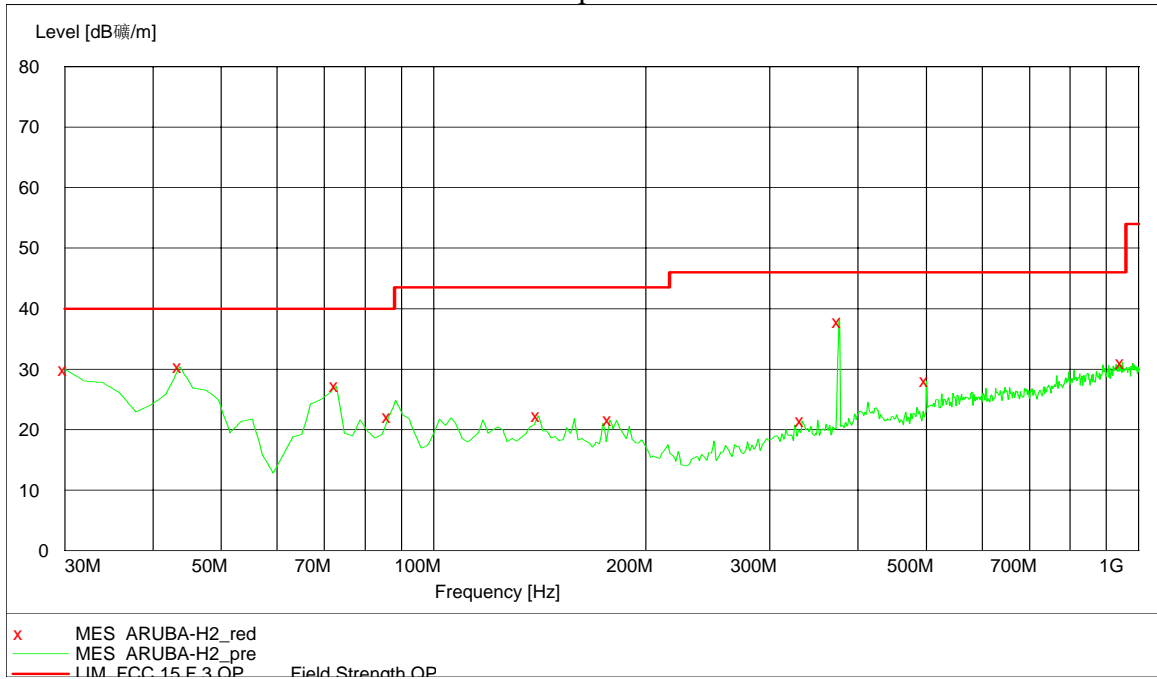
- 1, Analyzer center frequency was set to the frequency of the radiated spurious emission.
- 2, Span=encompass the entire emission
- 3, RBW=1MHz
- 4, VBW=3MHz
- 4, Detector= RMS (Max-hold)
- 5, Trace was allowed to stabilize

### 6.4 Test protocol

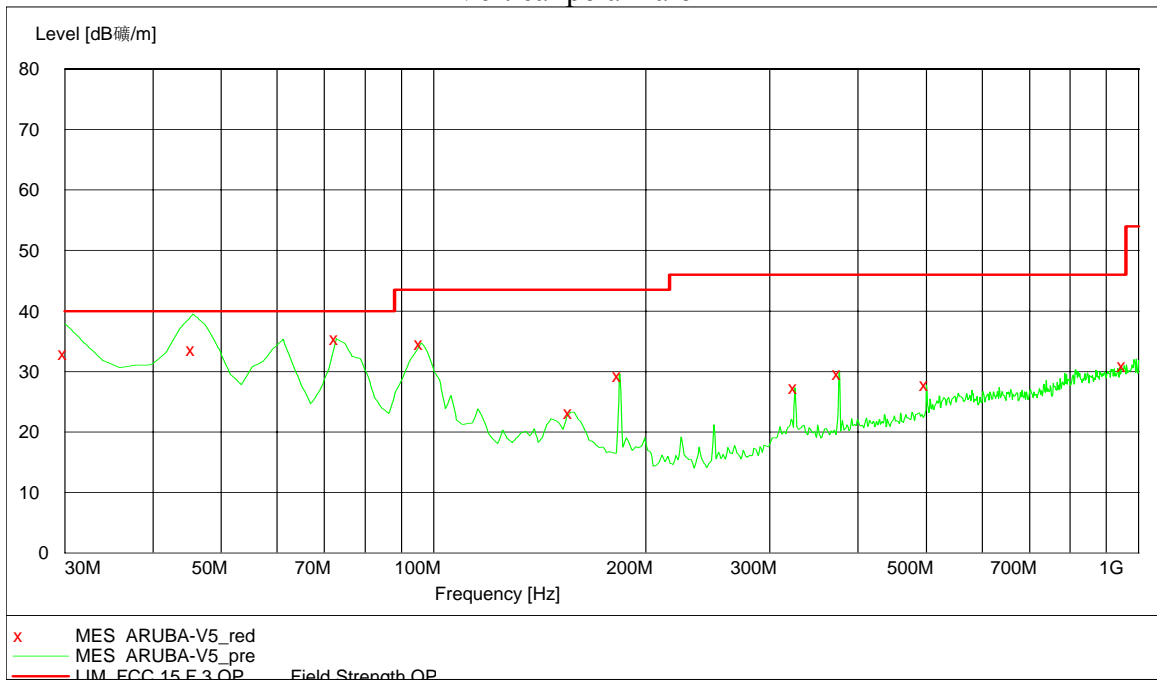
Temperature : 25 °C  
Relative Humidity : 55 %

Test graph < 1GHz: (Worst case: POE Mode)

#### Horizontal polarization



#### Vertical polarization





**Test data:**

Polarization	Frequency (MHz)	Emission level (dB $\mu$ V/m)	Limits (dB $\mu$ V/m)	Margin (dB $\mu$ V/m)	Detector
V	30.00	32.90	40.00	7.10	QP
	45.55	33.50	40.00	6.50	QP
	72.77	35.40	40.00	4.60	PK
	96.09	34.70	43.50	8.80	PK
	183.57	29.30	43.50	14.20	PK
	953.35	31.00	46.00	15.00	PK
H	30.00	29.90	40.00	10.10	PK
	43.61	30.40	40.00	9.60	PK
	72.77	27.20	40.00	12.80	PK
	86.37	22.10	40.00	17.90	PK
	376.01	37.80	46.00	8.20	PK
	949.46	31.10	46.00	14.90	PK

**Test data >1GHz:**

**1: U-NII 1 band 802.11a**

Polarity	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type	Note
H	5150.00	48.24	7.70	-25.76	74.00	40.53	PK	
	5181.55	98.45	57.84	/	74.00	40.62	PK	
	5150.00	35.38	-5.15	-18.62	54.00	40.53	AV	
	5175.88	85.14	44.53	/	54.00	40.61	AV	
	6907.50	38.27	28.84	-35.73	74.00	9.43	PK	
	7502.50	36.92	27.68	-37.08	74.00	9.24	PK	
	8114.50	36.08	26.13	-37.92	74.00	9.95	PK	
	10360.00	38.39	26.97	-35.61	74.00	11.42	PK	
V	15540.00	40.71	20.41	-33.29	74.00	20.29	PK	
	5150.00	49.14	8.65	-24.86	74.00	40.49	PK	
	5174.67	99.72	59.19	/	74.00	40.53	PK	
	5150.00	35.76	-4.73	-18.24	54.00	40.49	AV	
	5174.22	88.44	47.91	/	54.00	40.54	AV	
	10360.00	38.05	26.63	-35.95	74.00	11.42	PK	
Note:	Transmit at 5180MHz.							

Polarity	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type	Note
H	5200.00	96.32	56.10	/	74.00	40.22	PK	
	5200.00	84.44	44.22	/	54.00	40.22	AV	
	10400.00	38.30	26.81	-35.70	74.00	11.49	PK	
	15600.00	40.44	20.61	-33.56	74.00	19.84	PK	
V	5200.00	97.29	57.07	/	74.00	40.22	PK	
	5200.00	86.44	46.22	/	54.00	40.22	AV	
	6907.50	36.23	26.80	-37.77	74.00	9.43	PK	
	7502.50	36.34	27.10	-37.66	74.00	9.24	PK	
	8114.50	37.01	27.06	-36.99	74.00	9.95	PK	
	10400.00	38.49	27.00	-35.52	74.00	11.49	PK	
	15600.00	40.09	20.44	-33.91	74.00	19.66	PK	
Note:	Transmit at 5200MHz.							

Polarity	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type	Note
H	5240.00	95.52	55.30	/	74.00	40.22	PK	
	5240.00	84.54	44.32	/	54.00	40.22	AV	
	10480.00	37.47	25.87	-36.53	74.00	11.60	PK	
	15720.00	41.01	21.33	-32.99	74.00	19.68	PK	
V	5240.00	98.89	58.67	/	74.00	40.22	PK	
	5240.00	88.23	48.01	/	54.00	40.22	AV	
	6907.50	35.66	26.23	-38.34	74.00	9.43	PK	
	7502.50	36.43	27.19	-37.57	74.00	9.24	PK	
	8114.50	37.22	27.27	-36.78	74.00	9.95	PK	
	10480.00	38.09	26.49	-35.91	74.00	11.60	PK	
	15720.00	39.64	20.00	-34.36	74.00	19.64	PK	
Note:	Transmit at 5240MHz.							

2: U-NII 1 band 802.11n20

Polarity	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type	Note
H	5150.00	48.86	8.33	-25.14	74.00	40.53	PK	
	5175.70	97.08	56.47	/	74.00	40.61	PK	
	5150.00	35.56	-4.97	-18.44	54.00	40.53	AV	
	5181.60	81.71	41.09	/	54.00	40.62	AV	
	10360.00	39.32	27.90	-34.68	74.00	11.42	PK	
	15540.00	40.77	20.48	-33.23	74.00	20.29	PK	
V	5150.00	50.55	10.05	-23.45	74.00	40.49	PK	
	5175.25	99.35	58.82	/	74.00	40.53	PK	
	5150.00	35.77	-4.72	-18.23	54.00	40.49	AV	
	5176.29	83.62	43.00	/	54.00	40.61	AV	
	6907.50	35.43	26.00	-38.57	74.00	9.43	PK	
	7502.50	36.46	27.22	-37.54	74.00	9.24	PK	
	8114.50	37.39	27.44	-36.61	74.00	9.95	PK	
	10358.50	40.92	29.48	-33.08	74.00	11.44	PK	
15540.00	40.62	20.57	-33.39	74.00	20.04	PK		
Note:	Transmit at 5180MHz.							

Polarity	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type	Note
H	5200.00	99.21	58.99	/	74.00	40.22	PK	
	5200.00	83.34	43.12	/	54.00	40.22	AV	
	10400.00	38.25	26.76	-35.75	74.00	11.49	PK	
	15600.00	39.73	19.90	-34.27	74.00	19.84	PK	
V	5200.00	95.33	55.11	/	74.00	40.22	PK	
	5200.00	82.12	41.90	/	54.00	40.22	AV	
	6907.50	35.63	26.20	-38.37	74.00	9.43	PK	
	7502.50	36.56	27.32	-37.44	74.00	9.24	PK	
	8114.50	37.74	27.79	-36.26	74.00	9.95	PK	
	10400.00	37.24	25.76	-36.76	74.00	11.49	PK	
	15600.00	39.93	20.27	-34.07	74.00	19.66	PK	
Note:	Transmit at 5200MHz.							

Polarity	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type	Note
H	5240.00	98.31	58.09	/	74.00	40.22	PK	
	5240.00	83.78	43.56	/	54.00	40.22	AV	
	10480.00	36.96	25.36	-37.04	74.00	11.60	PK	
	15720.00	39.55	19.87	-34.45	74.00	19.68	PK	
V	5240.00	96.29	56.07	/	74.00	40.22	PK	
	5240.00	82.53	42.31	/	54.00	40.22	AV	
	6907.50	35.61	26.18	-38.39	74.00	9.43	PK	
	7502.50	36.42	27.18	-37.58	74.00	9.24	PK	
	8114.50	37.32	27.37	-36.68	74.00	9.95	PK	
	10480.00	37.06	25.46	-36.94	74.00	11.60	PK	
	15720.00	40.04	20.40	-33.96	74.00	19.64	PK	
Note:	Transmit at 5240MHz.							

3: U-NII 1 band 802.11n40

Polarity	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type	Note
H	5150.00	56.38	15.85	-17.62	74.00	40.53	PK	
	5199.27	93.04	52.37	/	74.00	40.67	PK	
	5150.00	37.19	-3.35	-16.81	54.00	40.53	AV	
	5202.15	76.70	36.01	/	54.00	40.69	AV	
	10380.00	37.17	25.84	-36.84	74.00	11.32	PK	
	15570.00	41.02	20.56	-32.98	74.00	20.47	PK	
V	5150.00	58.65	18.16	-15.35	74.00	40.49	PK	
	5182.25	95.94	55.41	/	74.00	40.53	PK	
	5150.00	39.82	-0.67	-14.18	54.00	40.49	AV	
	5201.14	79.28	38.72	/	54.00	40.56	AV	
	6907.50	35.64	26.21	-38.36	74.00	9.43	PK	
	7502.50	36.33	27.09	-37.67	74.00	9.24	PK	
	8114.50	37.22	27.27	-36.78	74.00	9.95	PK	
	10380.00	36.83	25.51	-37.17	74.00	11.32	PK	
15570.00	40.37	20.12	-33.63	74.00	20.25	PK		
Note:	Transmit at 5190MHz.							

Polarity	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor	Type	Note
H	5230.00	96.33	55.81	/	74.00	40.52	PK	
	5230.00	81.38	40.86	/	54.00	40.52	AV	
	10460.00	36.74	25.06	-37.26	74.00	11.68	PK	
	15690.00	40.26	20.40	-33.74	74.00	19.85	PK	
V	5230.00	97.21	56.69	/	74.00	40.52	PK	
	5230.00	82.34	41.82	/	54.00	40.52	AV	
	6907.50	35.63	26.20	-38.37	74.00	9.43	PK	
	7502.50	36.53	27.29	-37.47	74.00	9.24	PK	
	8114.50	37.34	27.39	-36.66	74.00	9.95	PK	
	10460.00	36.74	25.07	-37.26	74.00	11.68	PK	
	15690.00	40.14	20.36	-33.86	74.00	19.78	PK	
Note:	Transmit at 5230MHz.							

Remark:

1. For fundamental & restrict emission test, no amplifier is employed.
2. Factor = Antenna Factor + Cable Loss (-Amplifier, is employed);
3. Measure level = Reading Level + Factor;
4. Over Limit = Measure level – limit;
5. If the PK reading is lower than AV limit, the AV test can be elided.

Example:

Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,  
Gain of Preamplifier = 32.00dB, Original Receiver Reading level = 10dBuV.  
Then Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;  
Measure level = 10dBuV + 0.20dB/m = 10.20dBuV/m  
Assuming limit = 54dBuV/m, Measure level = 10.20dBuV/m,  
then Over Limit = 10.20 - 54= -43.80dBuV/m

## 7. Power line conducted emission

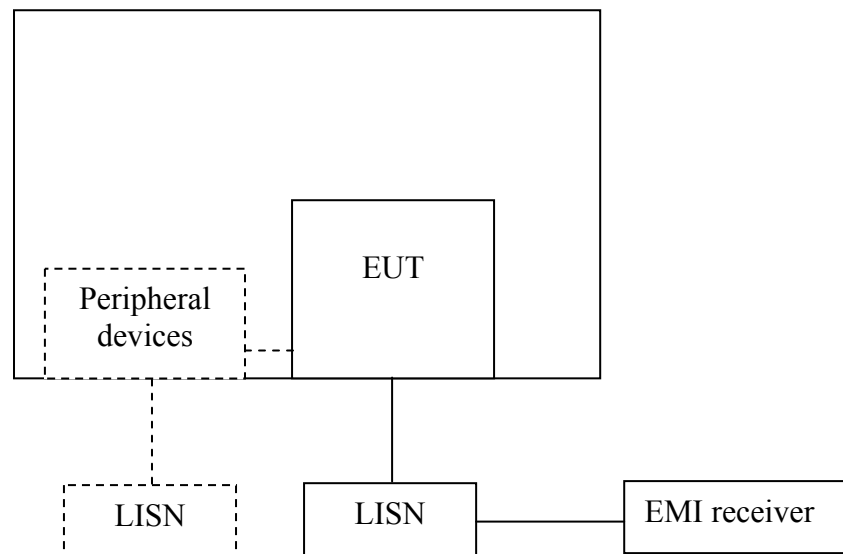
**Test result:** Pass

### 7.1 Limit

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	QP	AV
0.15-0.5	66 to 56*	56 to 46 *
0.5-5	56	46
5-30	60	50

\* Decreases with the logarithm of the frequency.

### 7.2 Test configuration



For table top equipment, wooden support is 0.8m height table

For floor standing equipment, wooden support is 0.1m height rack.



### **7.3 Test procedure and test set up**

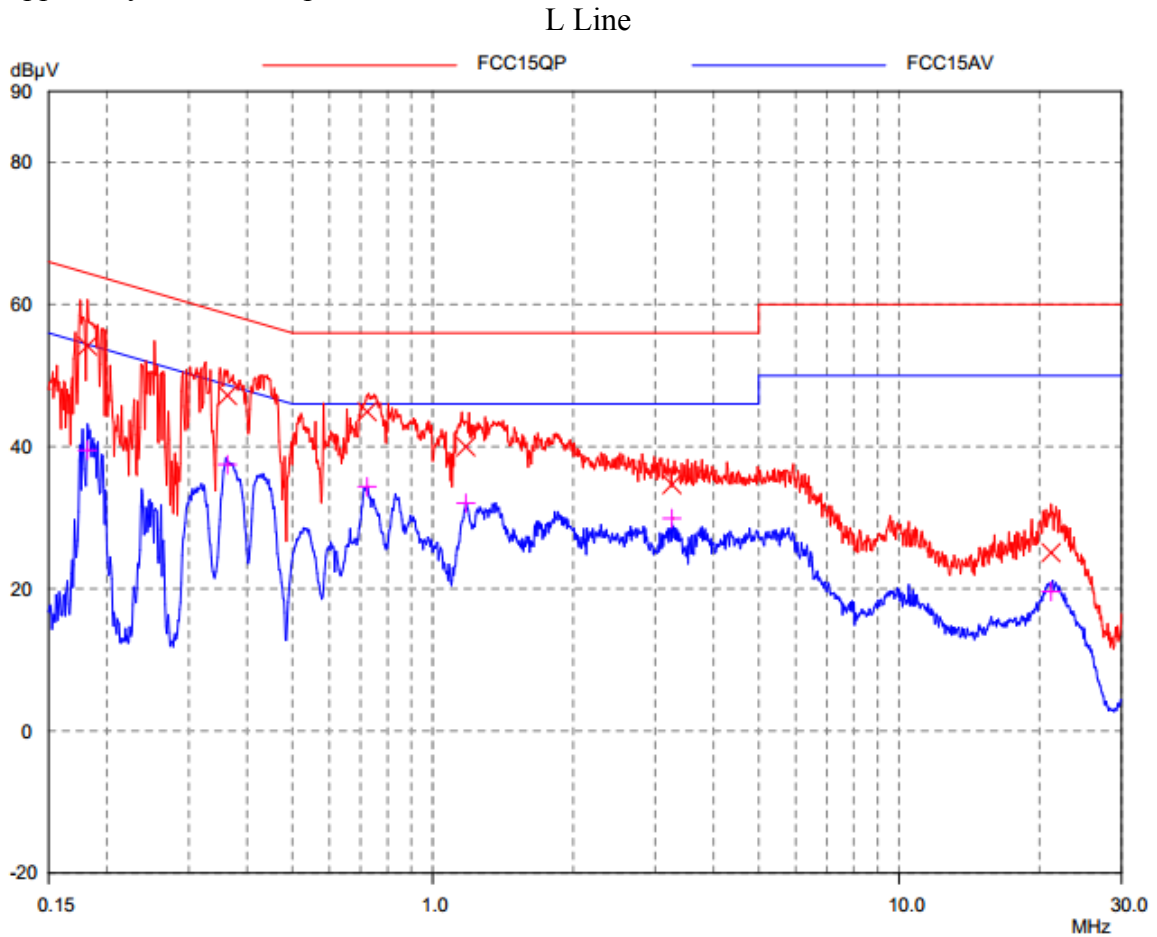
The EUT are connected to the main power through a line impedance stabilization network (LISN). This provides a 50Ω/50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50Ω/50uH coupling impedance with 50Ω termination.

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 on conducted measurement. The bandwidth of the test receiver is set at 9 kHz.

### 7.4 Test protocol

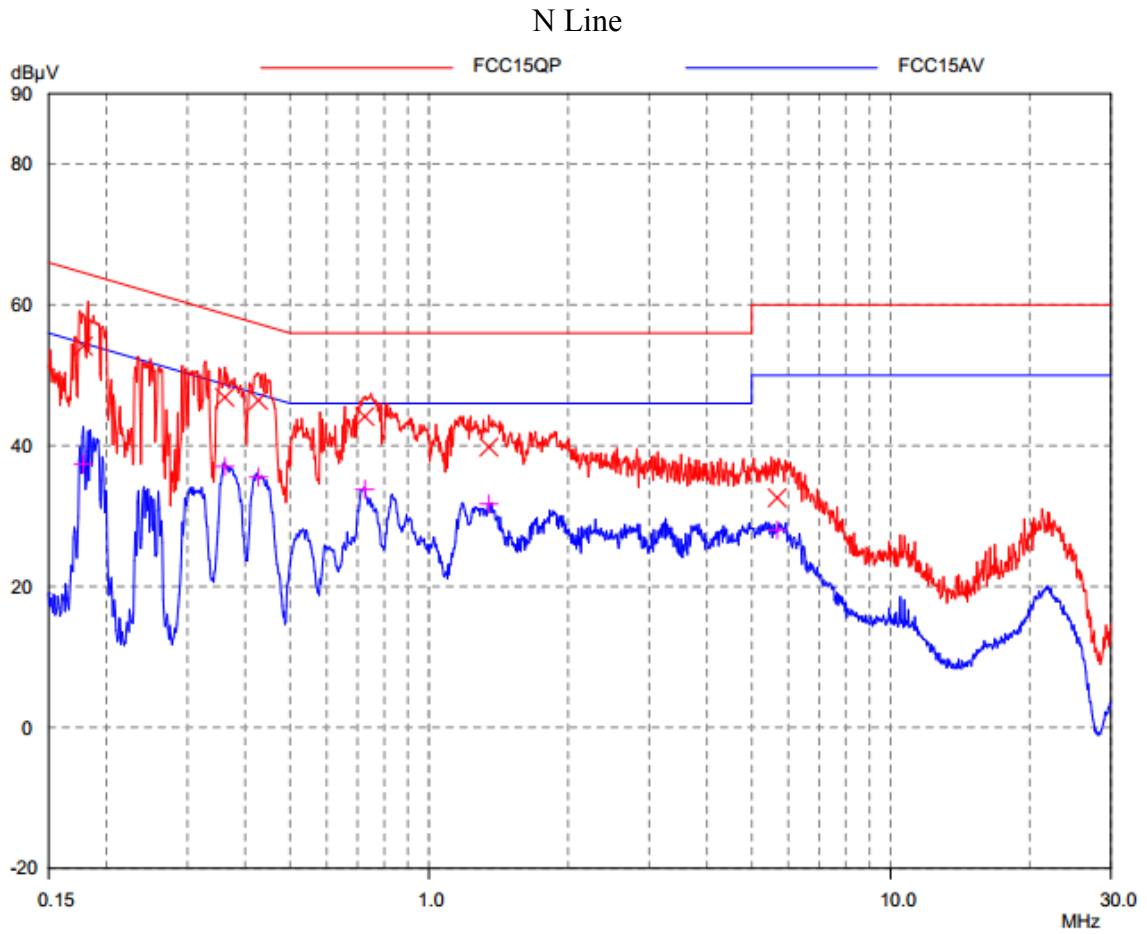
Temperature : 25 °C  
Relative Humidity : 55 %

Supplied by AC-DC adaptor:



### Test Data:

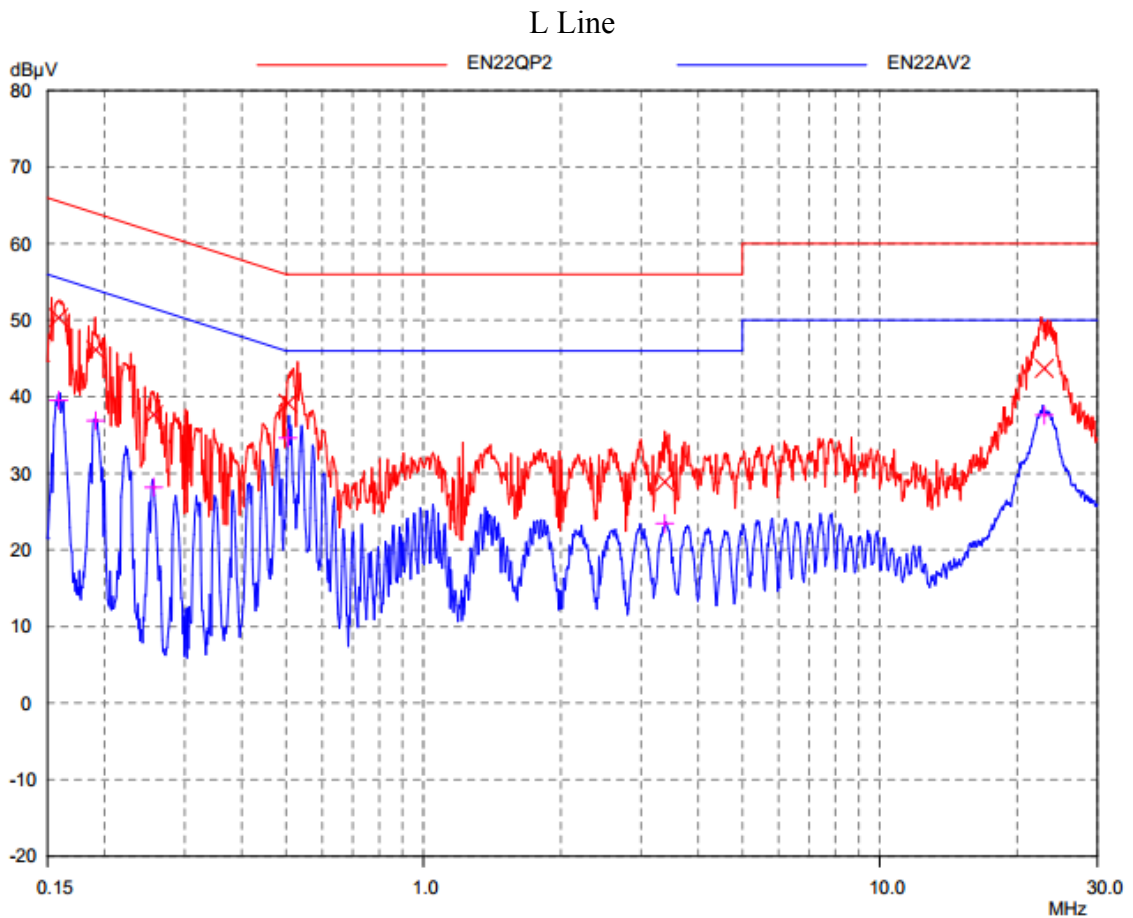
Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.182	54.17	64.41	10.24	39.50	54.41	14.91
0.362	47.23	58.67	11.44	37.48	48.67	11.19
0.723	44.92	56.00	11.08	34.35	46.00	11.65
1.177	39.99	56.00	16.01	32.05	46.00	13.95
3.257	34.68	56.00	21.32	29.89	46.00	16.11
21.178	25.08	60.00	34.92	19.61	50.00	30.39



**Test Data:**

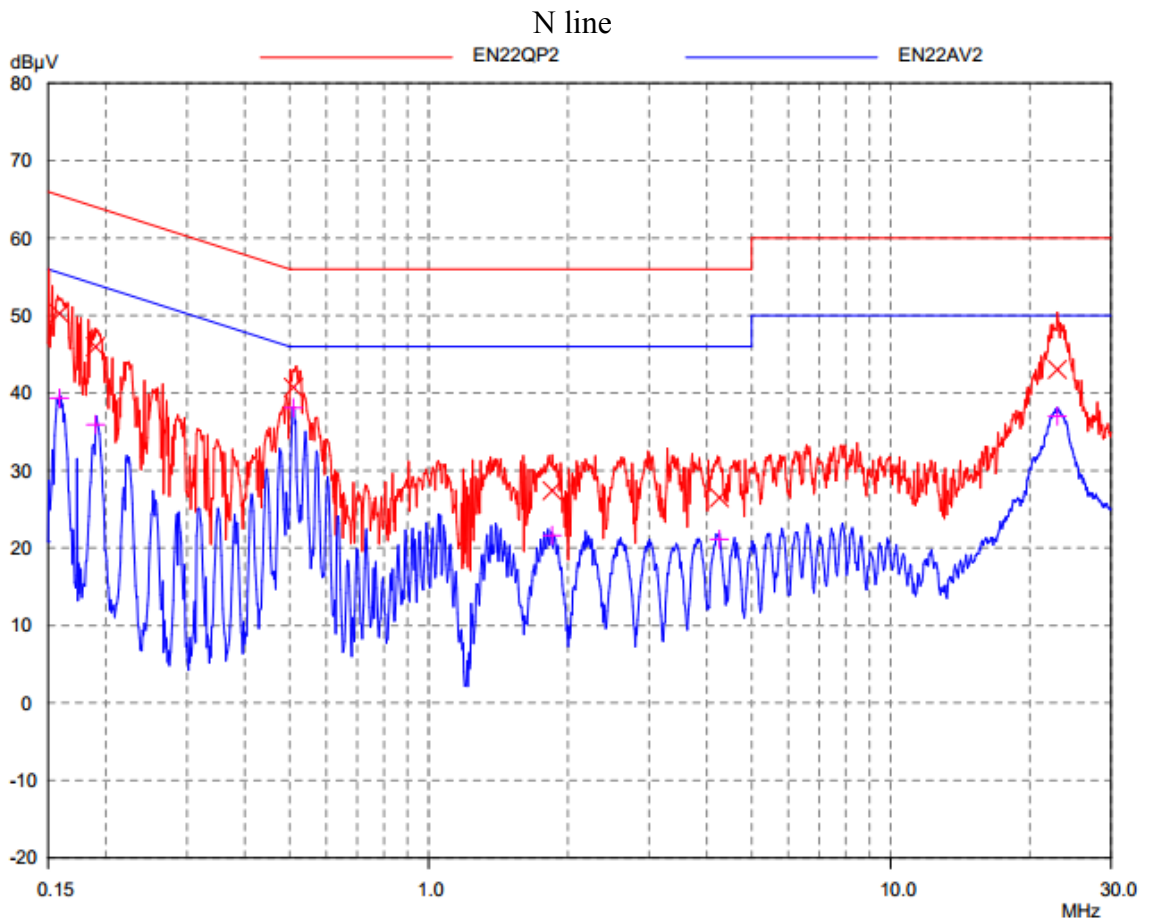
Frequency (MHz)	Quasi-peak			Average		
	level dB(μV)	Limit dB(μV)	Margin (dB)	level dB(μV)	limit dB(μV)	Margin (dB)
0.178	54.16	64.57	10.41	37.40	54.57	17.17
0.361	46.87	58.71	11.84	37.05	48.71	11.66
0.427	46.44	57.31	10.87	35.55	47.31	11.76
0.726	44.14	56.00	11.86	33.81	46.00	12.19
1.348	39.81	56.00	16.19	31.74	46.00	14.26
5.672	32.60	60.00	27.40	28.04	50.00	21.96

Supplied by POE adaptor:



**Test Data:**

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.159	50.33	65.54	15.21	39.55	55.54	15.99
0.191	46.13	63.98	17.85	36.88	53.98	17.10
0.256	37.66	61.56	23.90	28.19	51.56	23.37
0.505	39.16	56.00	16.84	34.62	46.00	11.38
3.376	28.89	56.00	27.11	23.43	46.00	22.57
22.939	43.71	60.00	16.29	37.60	50.00	12.40



**Test Data:**

Frequency (MHz)	Quasi-peak			Average		
	level dB(µV)	Limit dB(µV)	Margin (dB)	level dB(µV)	limit dB(µV)	Margin (dB)
0.159	50.27	65.54	15.27	39.36	55.54	16.18
0.190	45.97	64.04	18.07	35.93	54.04	18.11
0.509	40.73	56.00	15.27	38.10	46.00	7.90
1.848	27.40	56.00	28.60	21.62	46.00	24.38
4.255	26.49	56.00	29.51	21.12	46.00	24.88
22.939	43.03	60.00	16.97	37.02	50.00	12.98

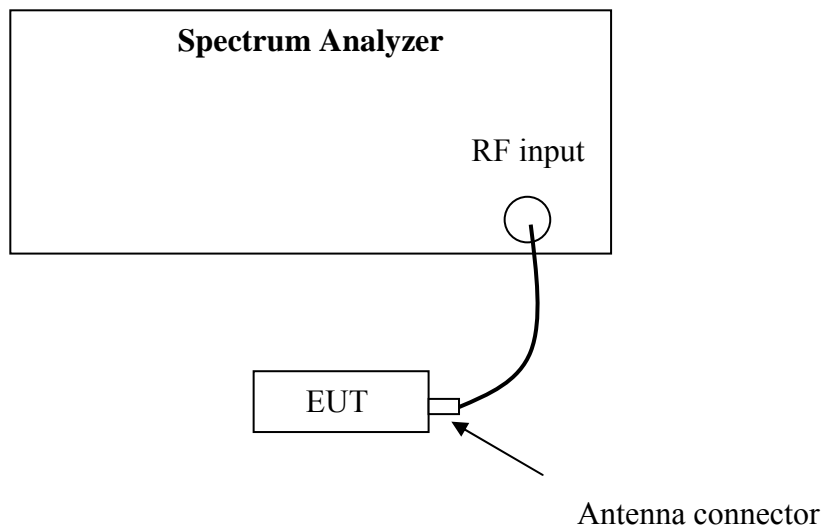
## 8. 26 dB Bandwidth & Emission Bandwidth (99%)

Test Status: Tested

### 8.1 Test limit

None

### 8.2 Test Configuration



### 8.3 Test procedure and test setup

For 26dB bandwidth test:

The measurement methods refer to KDB 789033D01 v01r04: section C.

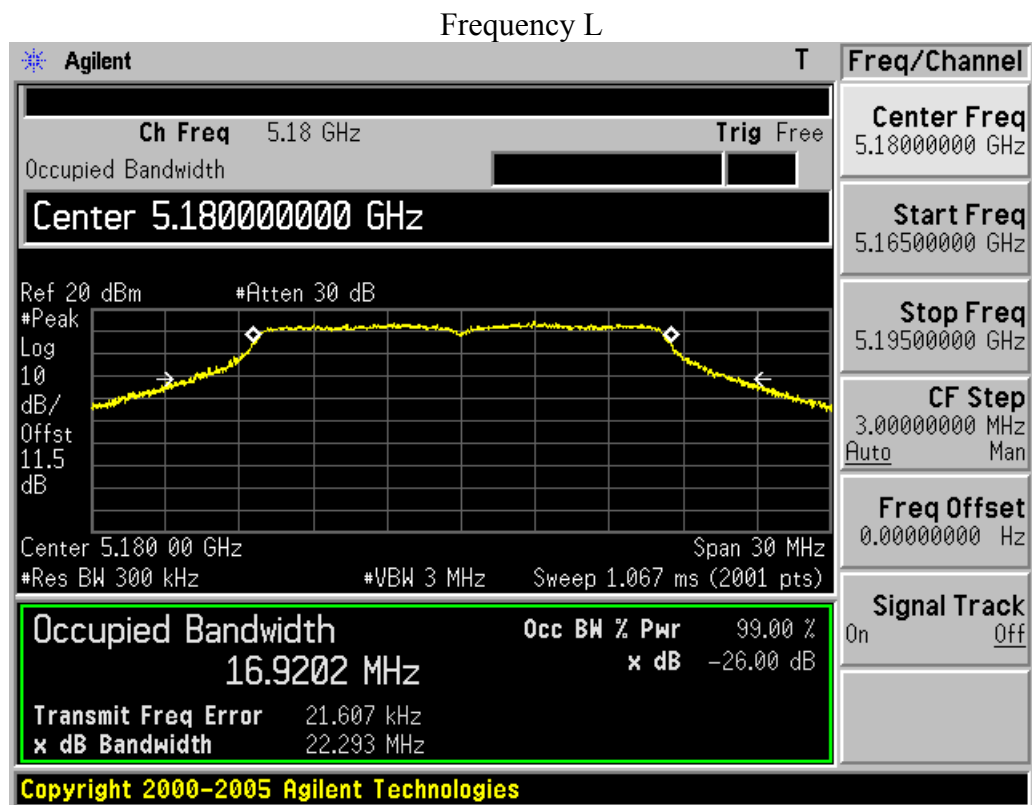
Emission bandwidth:

The emission bandwidth per RSS-Gen Issue 3 Clause 4.6.1 was measured using the Spectrum Analyzer with the resolutions bandwidth set at 1MHz, the video bandwidth set at 3MHz.

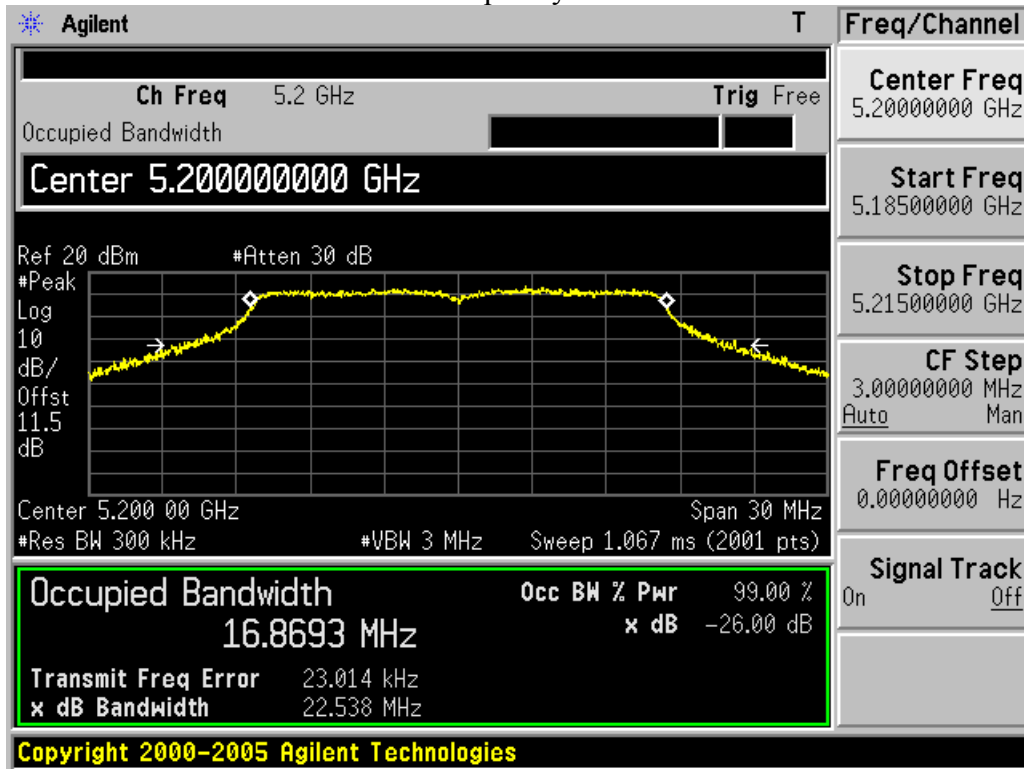
### 8.4 Test protocol

Temperature : 25 °C  
Relative Humidity : 55 %

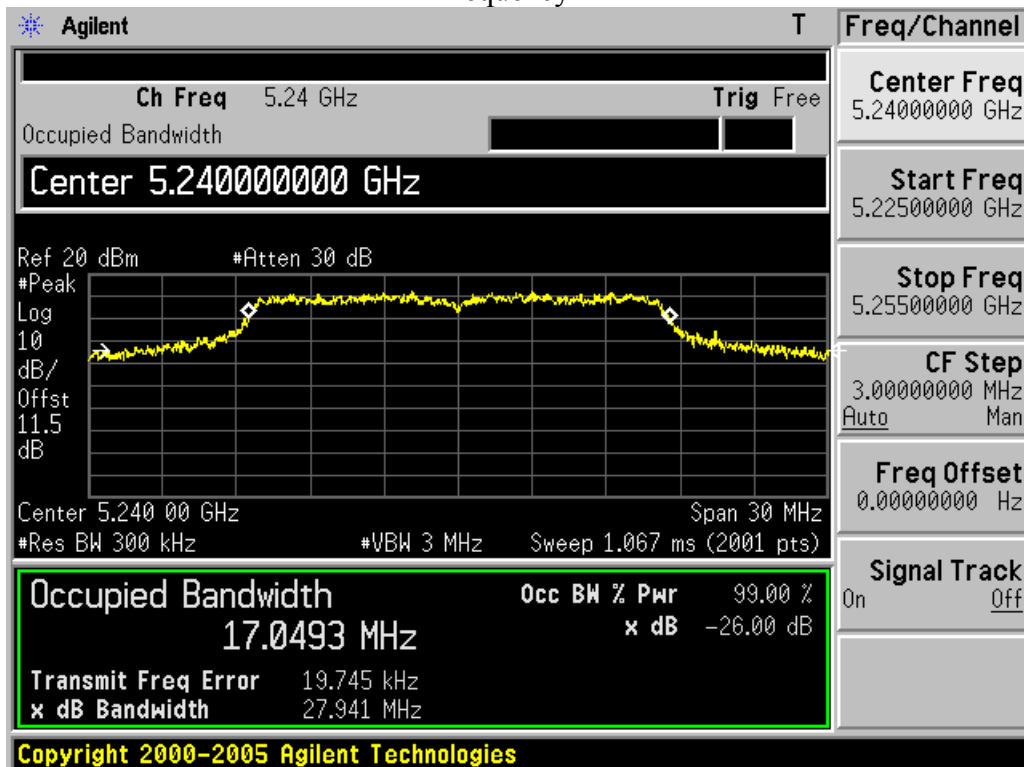
Mode	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Note
U-NII 1 802.11a	5180	22.2930	16.9202	
	5200	22.5380	16.8693	
	5240	27.9410	17.0493	



Frequency M



Frequency H

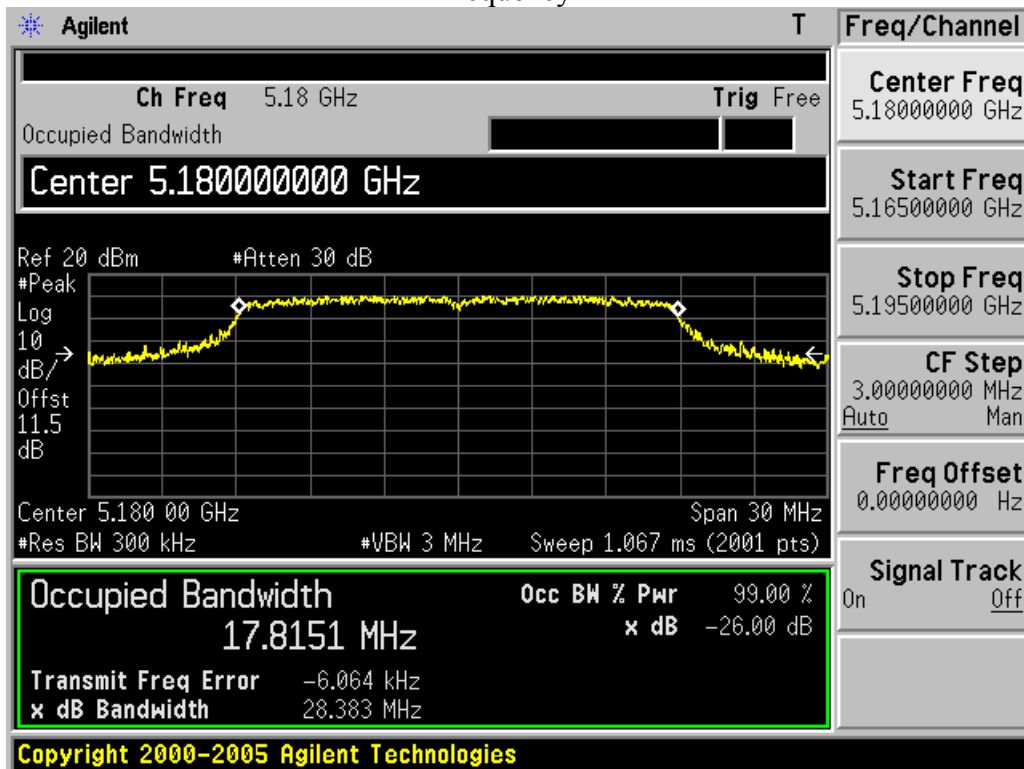




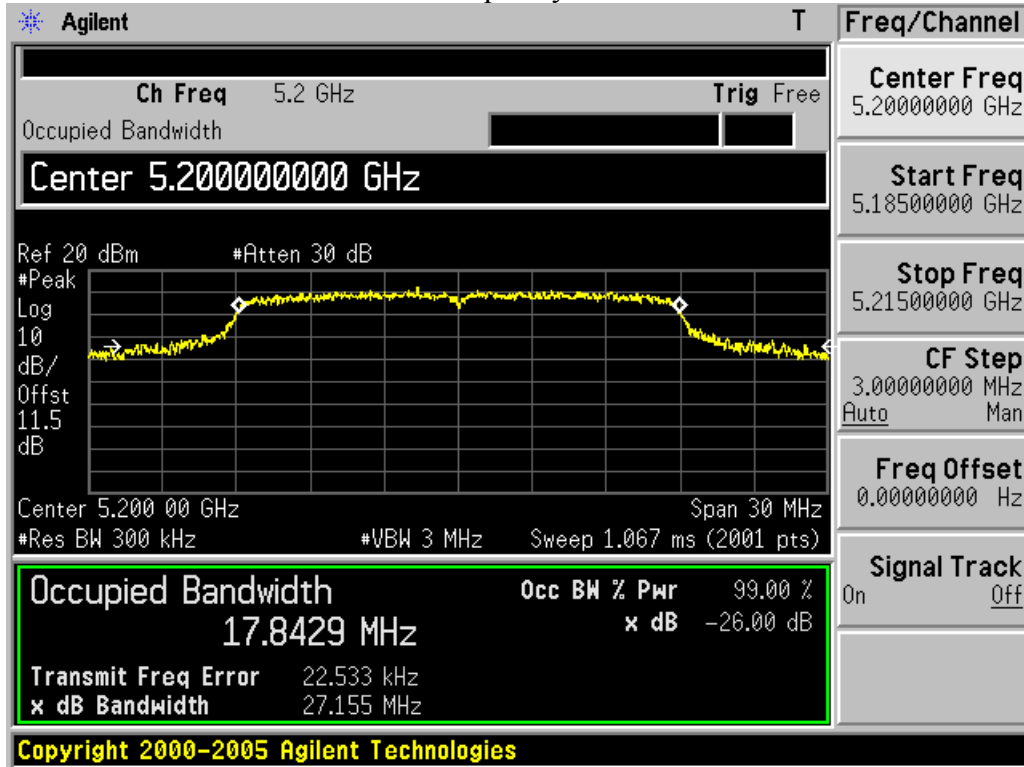


Mode	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Note
U-NII 1 802.11n20	5180	28.3830	17.8151	
	5200	27.1550	17.8249	
	5240	29.9190	17.9876	

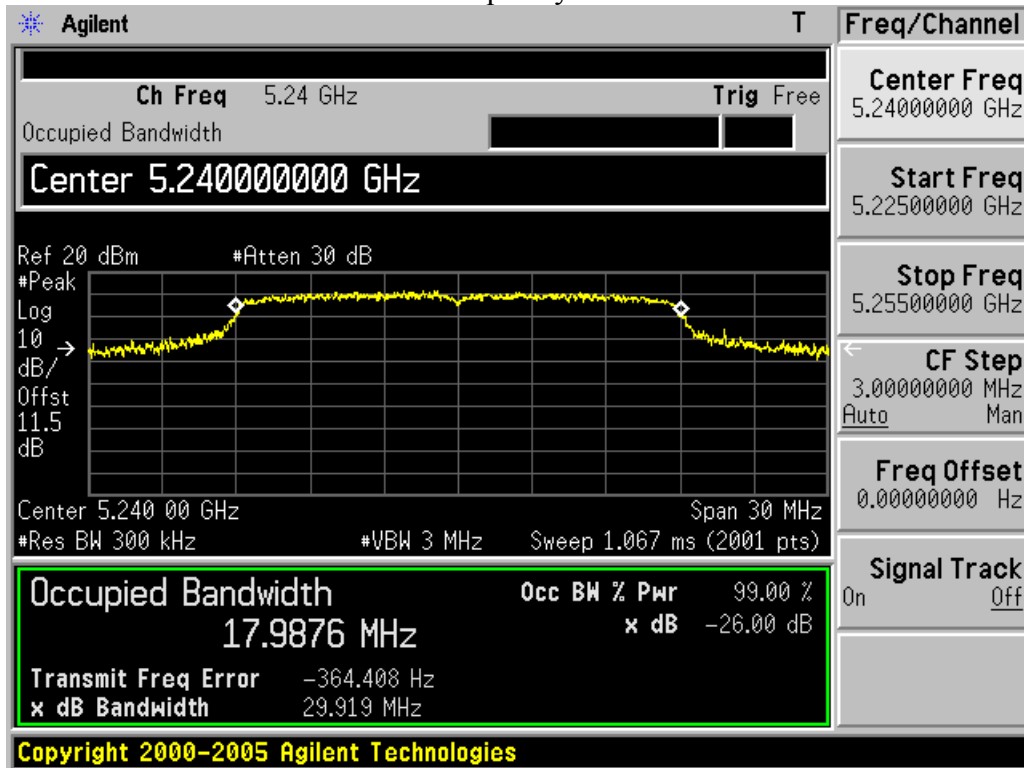
Frequency L



Frequency M



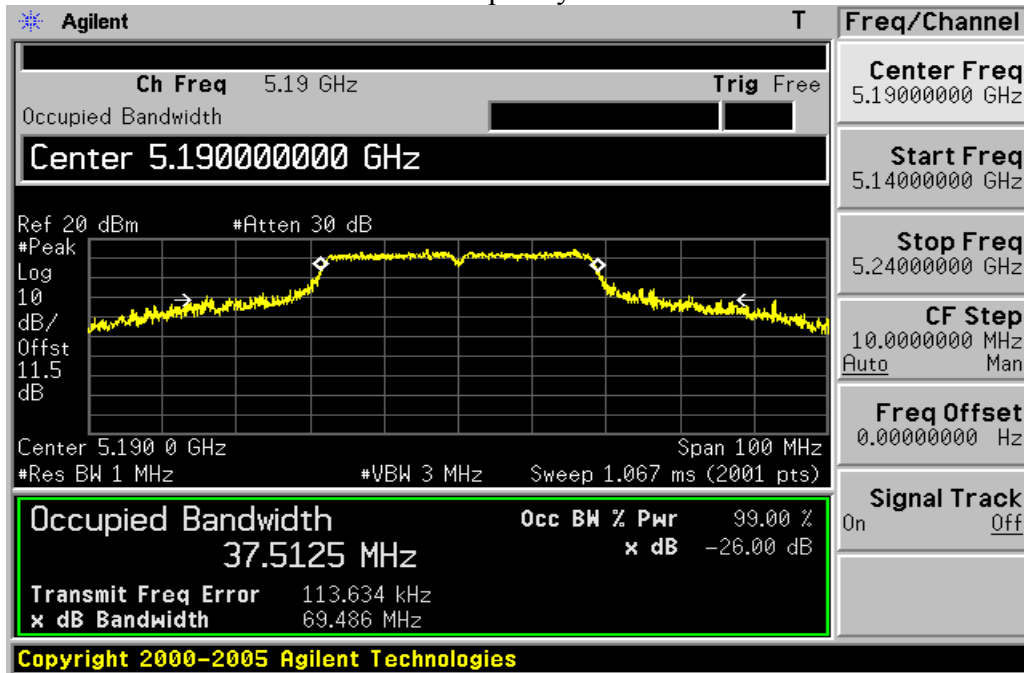
Frequency H



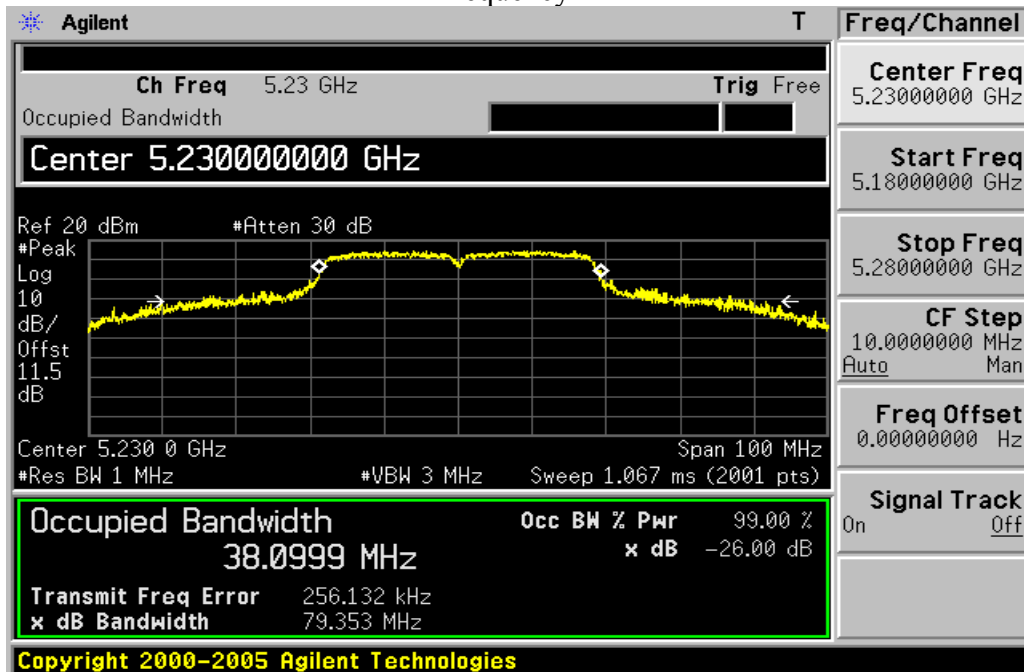


Mode	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)	Note
U-NII 1 802.11n40	5190	69.4860	37.5125	
	5230	79.3530	38.0999	

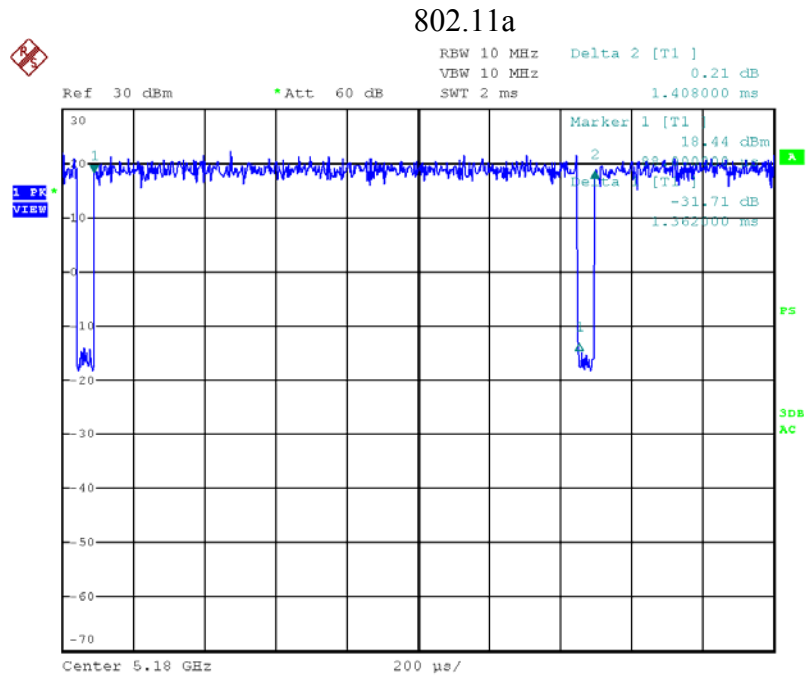
Frequency L



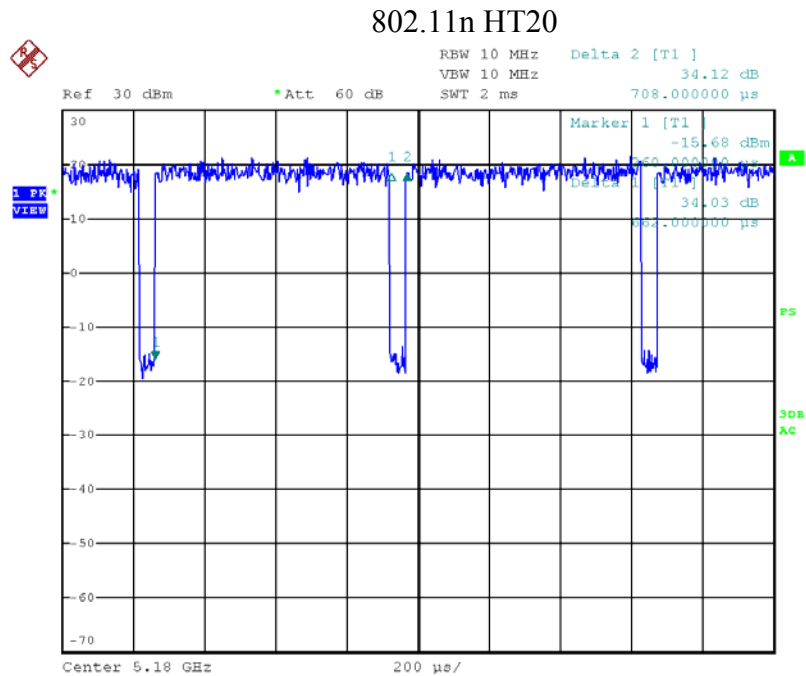
Frequency H



### Appendix: Test Graph of Duty Cycle

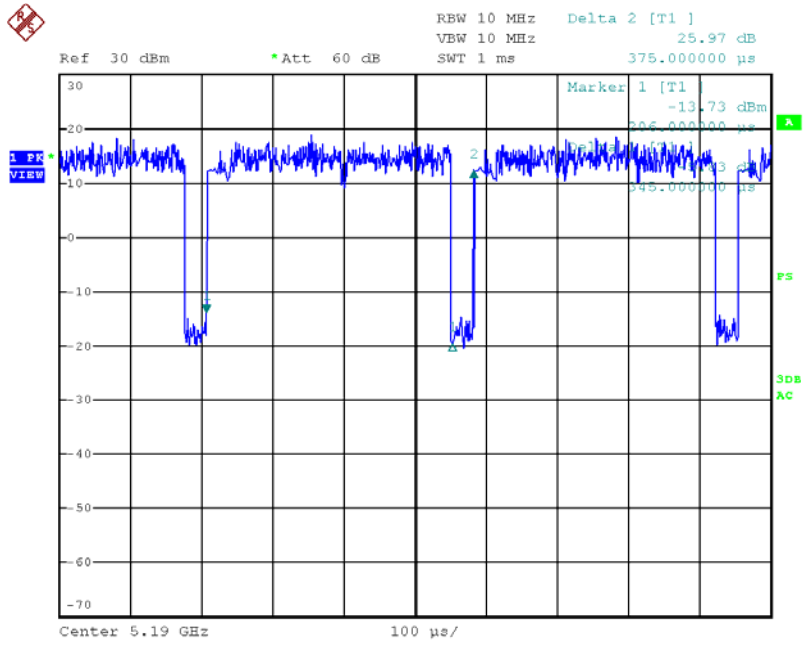


Date: 16.MAY.2014 11:43:22



Date: 16.MAY.2014 11:45:04

802.11n HT40



Date: 16.MAY.2014 11:47:01