



EMC TEST REPORT for Intentional Radiator No. SH131100392-001

Applicant : Aruba Networks, Inc
1344 Crossman Ave. Sunnyvale, CA,94089
Manufacturer : Aruba Networks, Inc
1344 Crossman Ave. Sunnyvale, CA,94089
Product Name : Access Point
Type/Model : APEX0100, APEX0101

SUMMARY

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

47CFR Part 15: 2012: Radio Frequency Devices;

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;

ANSI C63.10 : 2009: American National Standard for Testing Unlicensed Wireless Devices;

RSS-210 Issue 8: 2010: Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment;

RSS-Gen Issue 3: 2010: General Requirements and Information for the Certification of Radiocommunication Equipment;

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FCC ID: Q9DAPEX0100101

IC: 4675A-APEX0100101

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1. 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 Items	FCC Reference	IC Reference	Result
Minimum 6dB Bandwidth	15.247(a)(2)	RSS-210 Issue 8 Annex 8	Pass
Output power	15.247(b)	RSS-210 Issue 8 Annex 8	Pass
Power spectrum density	15.247(e)	RSS-210 Issue 8 Annex 8	Pass
Emissions in non-restricted frequency bands	15.247(d)	RSS-210 Issue 8 Annex 8	Pass
Emissions in restricted frequency bands	15.247(d) & 15.205 & 15.209	RSS-210 Issue 8 Annex 8, Clause 2	Pass
Occupied bandwidth	-	RSS-Gen Issue 3 Clause 4.6.1	Tested



2. General Information

2.1 Applicant Information

Applicant : Aruba Networks, Inc
1344 Crossman Ave. Sunnyvale, CA,94089
Name of contact : Greg Rocha
Tel : 408-419-4093
Fax : /
Manufacturer : Aruba Networks, Inc
1344 Crossman Ave. Sunnyvale, CA,94089

2.2 Identification of the EUT

Equipment : Access Point
Type/model : APEX0100, APEX0101
FCC ID : Q9DAPEX0100101
IC : 4675A-APEX0100101

2.3 Technical specification

Operation Frequency : 2412~2462 MHz;
Band : 5745~5825 MHz

Type of Modulation : CCK,BPSK,QPSK,DSSS,OFDM

EUT Modes of Modulation : 802.11a/b/g;
802.11n HT20,HT40;
802.11ac VHT80

Channel Number : 11Channel for 2412MHz~2462MHz for 11b,11g,11n HT20;
7 Channel for 2422MHz~2452MHz for 11n HT40;
5 Channel for 5745MHz~5825MHz for 11a,11n HT20;
2 Channel for 5755~5795MHz for 11n HT40;
1 Channel for 5775MHz for 11ac VHT80;

Description of EUT : The EUT is a wireless access point, the device is a MIMO product, it has 4 mode(s) of assembly way with different antennas, they have the same electric mainboard except the antennas types.

Port identification : power port 1;
RJ45 ports 2;
Console USB port 1.

Rating : AC100-240V 50/60Hz 0.6A; DC 48V,0.6A (PoE)

Declared Temperature range : -40°C ~ 65°C

Category of EUT : Class B

EUT type : Table top Floor standing

Sample received date : 2013.10.15

Sample Identification : /
No

Date of test : 2013.10.15~2014.02.13

Antenna Description:

The APEX0100 used Integral antenna with 4dBi gain for 2.4GHz band and 5dBi gain for 5GHz band, the APEX0101 can use the antennas list in the following table:

Model	Type	Gain (dBi)	ModulationType	Beam forming	Beam Forming Gain(dBi)	Frequency Band (MHz)	Remark
ANT-3X3-2005	Omni	5	802.11b	No	0	2400-2500	Note1
			802.11g	No	0		Note2
			802.11n HT20	Yes	3.01		
			802.11n HT40	Yes	3.01		
		NA	NA	NA	NA	4900-5900	
ANT-3X3-5005	Omni	NA	NA	NA	NA	2400-2500	
		5	802.11a	No	0	4900-5875	Note1
			802.11n HT20	Yes	3.01		Note2
			802.11n HT40	Yes	3.01		
			802.11ac VHT80	Yes	3.01		
ANT-2X2-D805	Directional	5	802.11b	No	0	2400-2500	Note1
			802.11g	No	0		Note2
			802.11n HT20	Yes	3.01		
			802.11n HT40	Yes	3.01		
	5	802.11a	No	0	4900-5875	Note1	
		802.11n HT20	Yes	3.01		Note2	
		802.11n HT40	Yes	3.01			
		802.11ac VHT80	Yes	3.01			
ANT-3X3-5712	Directional	NA	NA	NA	NA	2400-2500	
		11.5	802.11a	No	0	4900-6000	Note1
			802.11n HT20	Yes	3.01		Note2
			802.11n HT40	Yes	3.01		
			802.11ac VHT80	Yes	3.01		
ANT-2X2-2314	Directional	14	802.11b	No	0	2400-2500	Note1
			802.11g	No	0		Note2
			802.11n HT20	Yes	3.01		
			802.11n HT40	Yes	3.01		
		NA	NA	NA	NA	4900-5875	
ANT-2X2-5314	Directional	NA	NA	NA	NA	2400-2500	
		14	802.11a	No	0	4900-6000	Note1
			802.11n HT20	Yes	3.01		Note2
			802.11n HT40	Yes	3.01		
			802.11ac VHT80	Yes	3.01		
ANT-2X2-2714	Directional	14	802.11b	No	0	2400-2483	Note1
			802.11g	No	0		Note2
			802.11n HT20	Yes	3.01		
			802.11n HT40	Yes	3.01		
		10	802.11a	No	0	4900-5875	Note1
802.11n HT20	Yes	3.01	Note2				
802.11n HT40	Yes	3.01					
802.11ac VHT80	Yes	3.01					
ANT-2X2-D607	Directional	7	802.11b	No	0	2400-2500	Note1
			802.11g	No	0		Note2
			802.11n HT20	Yes	3.01		
			802.11n HT40	Yes	3.01		
	7	802.11a	No	0	4900-5875	Note1	
		802.11n HT20	Yes	3.01		Note2	
		802.11n HT40	Yes	3.01			
		802.11ac VHT80	Yes	3.01			



ANT-3X3 -D608	Directional	8	802.11b	No	0	2400-2500	Note1
			802.11g	No	0		Note2
			802.11n HT20	Yes	3.01		
			802.11n HT40	Yes	3.01		
		8	802.11a	No	0	4900-5900	Note1
			802.11n HT20	Yes	3.01		Note2
			802.11n HT40	Yes	3.01		
			802.11ac VHT80	Yes	3.01		
ANT-3X3 -D905	Directional	5	802.11b	No	0	2400-2500	Note1
			802.11g	No	0		Note2
			802.11n HT20	Yes	3.01		
			802.11n HT40	Yes	3.01		
		5	802.11a	No	0	4900-5900	Note1
			802.11n HT20	Yes	3.01		Note2
			802.11n HT40	Yes	3.01		
			802.11ac VHT80	Yes	3.01		

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/ac have beamforming function the Beamforming gain should calculate according KDB 662911 D01 Multiple Transmitter Output v02r01 c) (ii).

MIMO Function Description:

Freq. Band	Modulation	Tx/Rx Function
2412-2462MHz	802.11b	3TX/3RX
	802.11g	3TX/3RX
	802.11n HT20	3TX/3RX
	802.11n HT40	3TX/3RX
5745-5825MHz	802.11a	3TX/3RX
	802.11n HT20	3TX/3RX
	802.11n HT40	3TX/3RX
	802.11ac VHT80	3TX/3RX

3. Test Specification

3.1 Instrument list

Selected	Instrument	EC no.	Model	Valid until date
<input checked="" type="checkbox"/>	EMI test receiver	EC 2107	ESCS 30	2014-10-20
<input checked="" type="checkbox"/>	EMI test receiver	EC4501	ESCI 7	2014-12-11
<input checked="" type="checkbox"/>	Spectrum Analyzer	/	FSP 40	2014-10-25
<input checked="" type="checkbox"/>	A.M.N.	EC 3119	ESH2-Z5	2015-1-7
<input checked="" type="checkbox"/>	EMI test receiver	EC 3045	ESIB26	2014-10-20
<input checked="" type="checkbox"/>	Broadband antenna	EC 4206	CBL 6112D	2015-5-15
<input checked="" type="checkbox"/>	Horn antenna	EC 3049	HF906	2014-4-27
<input checked="" type="checkbox"/>	Horn antenna	EC 4792-3	HAP18-26W	2014-4-9
<input checked="" type="checkbox"/>	Pre-amplifier	EC 3222	pre-amp 18	2014-4-9
<input checked="" type="checkbox"/>	Pre-amplifier	EC 4792-2	TPA0118-40	2014-4-11
<input checked="" type="checkbox"/>	Semi anechoic chamber	EC 3048	-	2014-4-23
<input checked="" type="checkbox"/>	Shielded room	EC 2838	GB88	2016-1-10
<input checked="" type="checkbox"/>	Thermo-Hygrograph	EC 3323	ZJ1-2A	2015-1-5
<input checked="" type="checkbox"/>	Thermo-Hygrograph	EC 3783	ZJ1-2A	2015-1-5

3.2 Test Standard

- ✓ 47CFR Part 15 Subpart C 15.247;
- ✓ ANSI C63.4:2009
- ✓ ANSI C63.10:2009;
- ✓ RSS-210 Issue 8;
- ✓ RSS-Gen Issue 3;
- ✓ 558074 D01 DTS Meas Guidance v03r01;
- ✓ 662911 D01 Multiple Transmitter Output v02r01.

3.3 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)
2412-2462MHz	802.11b	2412	2437	2462
	802.11g	2412	2437	2462
	802.11n HT20	2412	2437	2462
	802.11n HT40	2422	2437	2452
5745-5825MHz	802.11a	5745	5785	5825
	802.11n HT20	5745	5785	5825
	802.11n HT40	5755	/	5795
	802.11ac VHT80	/	5775	/

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

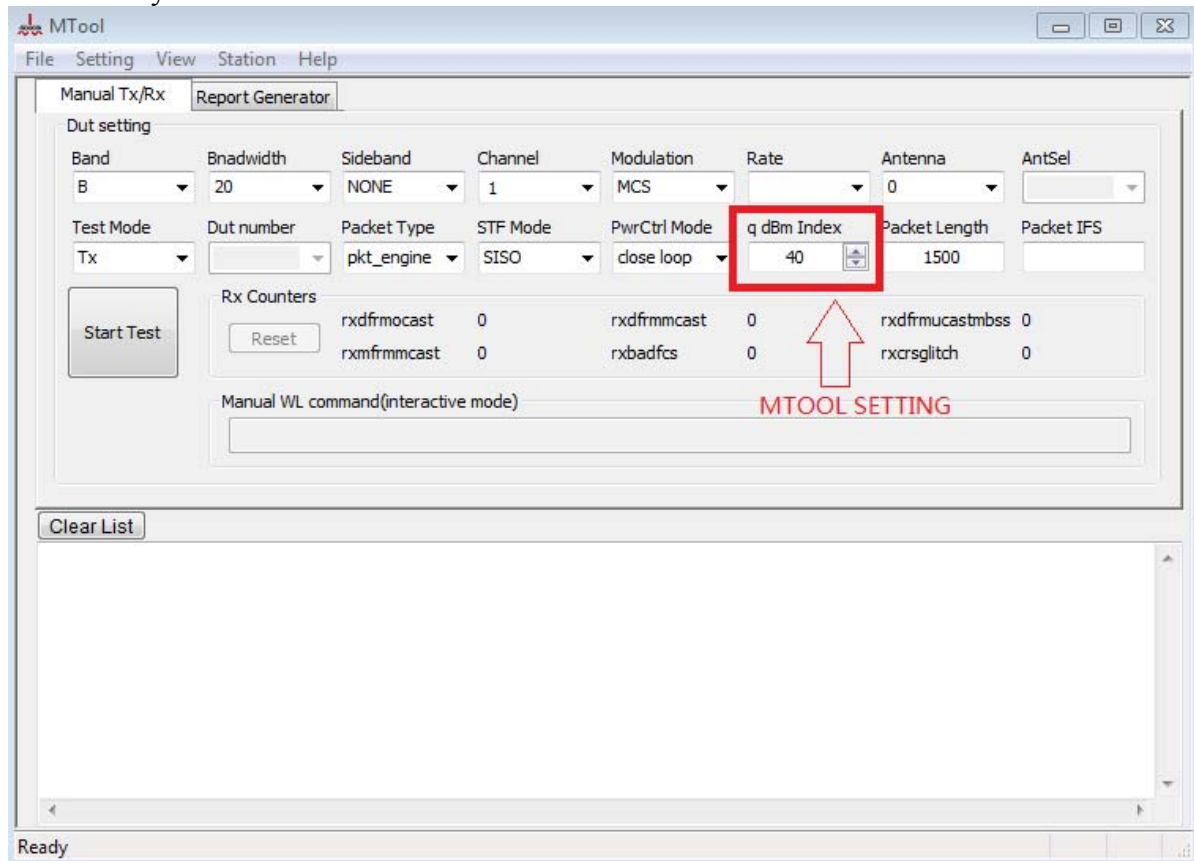
Mode No.	Main Equipment	2.4G antenna	5.8G antenna
1	APEX0100	Integral	Integral
2	APEX0101	ANT-3X3-2005	ANT-3X3-5005
3	APEX0101	ANT-2X2-2314	ANT-2X2-5314
4	APEX0101	/	ANT-3X3-5010

After pre-test, the following test mode were used to the final test:

Final Test case	Test Mode	
	2.4G Band	5.8G Band
Minimum 6dB Bandwidth	Mode 1	Mode 1
Maximum Output power	Mode 1, Mode 2, Mode 3	Mode 1, Mode 3, Mode 4
Power spectrum density	Mode 1	Mode 1
Emissions in non-restricted frequency bands	Mode 1	Mode 1
Radiated Emissions in restricted frequency bands	Mode 1, Mode 2, Mode 3	Mode 1, Mode 2, Mode 3, Mode 4
Occupied bandwidth	Mode 1	Mode 1

Test software Setting:

The power level setting for 802.11a/b/g/n/ac is used with MTOOL software offered by the manufactory.





For 2.4G Band:

Mode 1	Frequency (MHz)	Mtool Setting	Power Expected (dBm)
802.11b	2412	80	20.00
	2437	92	23.00
	2462	84	21.00
802.11g	2412	72	18.00
	2437	92	23.00
	2462	76	19.00
802.11n20	2412	64	16.00
	2437	88	22.00
	2462	72	18.00
802.11n40	2422	56	14.00
	2437	72	18.00
	2452	60	15.00

Mode 2	Frequency (MHz)	Mtool Setting	Power Expected (dBm)
802.11b	2412	78	19.50
	2437	98	23.00
	2462	82	20.50
802.11g	2412	68	17.00
	2437	100	23.00
	2462	72	18.00
802.11n20	2412	54	13.50
	2437	92	23.00
	2462	58	14.50
802.11n40	2422	53	13.25
	2437	91	22.75
	2452	57	14.25

Mode 3	Frequency (MHz)	Mtool Setting	Power Expected (dBm)
802.11b	2412	42	10.50
	2437	64	16.00
	2462	46	11.50
802.11g	2412	32	8.00
	2437	64	16.00
	2462	36	9.00
802.11n20	2412	22	5.50
	2437	54	13.50
	2462	24	6.00
802.11n40	2422	23	5.75
	2437	53	13.25
	2452	23	5.75



For 5.8G Band:

Mode 1	Frequency (MHz)	Mtool Setting	Power Expected (dBm)
802.11a	5745	94	23.00
	5785	94	23.00
	5825	94	23.00
802.11n20	5745	90	22.50
	5785	90	22.50
	5825	90	22.50
802.11n40	5755	91	22.75
	5795	91	22.75
802.11ac80	5775	90	22.50

Mode 2	Frequency (MHz)	Mtool Setting	Power Expected (dBm)
802.11a	5745	94	23.00
	5785	94	23.00
	5825	94	23.00
802.11n20	5745	90	22.50
	5785	90	22.50
	5825	90	22.50
802.11n40	5755	91	22.75
	5795	91	22.75
802.11ac80	5775	90	22.50

Mode 3	Frequency (MHz)	Mtool Setting	Power Expected (dBm)
802.11a	5745	72	18.00
	5785	72	18.00
	5825	72	18.00
802.11n20	5745	59	14.75
	5785	59	14.75
	5825	59	14.75
802.11n40	5755	57	14.25
	5795	57	14.25
802.11ac80	5775	59	14.75



Mode 4	Frequency (MHz)	Mtool Setting	Power Expected (dBm)
802.11a	5745	88	22.00
	5785	88	22.00
	5825	92	23.00
802.11n20	5745	75	18.75
	5785	75	18.75
	5825	79	19.75
802.11n40	5755	73	18.25
	5795	73	18.25
802.11ac80	5775	75	18.75

Test peripherals used:

Item No	Description	Band and Model	S/No
1	Laptop computer	HP ProBook 6470b	NA

3.4 Data rate VS Power

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

2.4GHz Band:

802.11b (2437MHz)	Data rate	1	2	5.5	11	/	/	/	/
	Port 0	24.94	24.90	24.89	24.88	/	/	/	/
	Port 1	25.29	25.12	25.11	25.05	/	/	/	/
	Port 2	24.07	23.89	23.88	23.78	/	/	/	/
802.11g (2437MHz)	Data rate	6	9	12	18	24	36	48	54
	Port 0	24.65	24.54	24.53	24.49	24.45	24.44	24.42	24.39
	Port 1	25.14	25.09	25.06	25.03	25.00	24.98	24.94	24.91
	Port 2	23.95	23.93	23.91	23.89	23.87	23.87	23.86	23.85
802.11n HT20 (2437MHz)	Data rate	MCS16	MCS17	MCS18	MCS19	MCS20	MCS21	MCS22	MCS23
	Port 0+1+2	28.29	28.27	28.24	28.18	28.14	28.13	28.11	28.06
802.11n HT40 (2437MHz)	Data rate	MCS16	MCS17	MCS18	MCS19	MCS20	MCS21	MCS22	MCS23
	Port 0+1+2	23.57	23.55	23.53	23.51	23.50	23.48	23.46	23.45

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

Freq. Band	Modulation	Worst case data rate
2400-2483.5MHz	802.11b	1Mbps
	802.11g	6Mbps
	802.11n HT20	MCS16
	802.11n HT40	MCS16

5.8GHz Band:

802.11a (5785MHz)	Data rate	6	9	12	18	24	36	48	54
	Port 0	24.05	23.54	24.03	24.02	23.98	23.94	23.93	23.91
	Port 1	23.96	23.77	23.9	23.87	23.84	23.81	23.79	23.75
	Port 2	24.00	23.91	23.84	23.82	23.8	23.78	23.78	23.77
802.11n HT20 (5785MHz)	Data rate	MCS16	MCS17	MCS18	MCS19	MCS20	MCS21	MCS22	MCS23
	Port 0+1+2	27.04	27.01	27.00	26.99	26.96	26.93	26.91	26.90
802.11n HT40 (5795MHz)	Data rate	MCS16	MCS17	MCS18	MCS19	MCS20	MCS21	MCS22	MCS23
	Port 0+1+2	27.73	27.70	26.98	26.96	26.95	26.94	26.93	26.90

802.11ac VHT80 (5775MHz)	Data rate	NSS3									
		MCS0	MCS1	MCS2	MCS3	MCS4	MCS5	MCS6	MCS7	MCS8	MCS9
Port	0+1+2	27.59	27.57	27.57	27.56	27.52	27.51	27.51	27.48	27.46	27.41

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

Freq. Band	Modulation	Worst case data rate
5725-5850MHz	802.11a	6Mbps
	802.11n HT20	MCS16
	802.11n HT40	MCS16
	802.11ac VHT80	MCS0NSS3

3.5 Duty cycle

Duty Cycle(X) = (Ton/(Ton+Toff));

Duty cycle factor =10*LOG10(1/ Duty Cycle(X));

Duty Cycle(2.4G band):

	Modulation	On (ms)	On+Off (ms)	Duty cycle(x)	Duty cycle factor
Duty cycle	802.11b	12.48	13.08	0.95	0.20
	802.11g	2.08	2.18	0.95	0.20
	802.11n20	0.78	0.9	0.87	0.62
	802.11n40	0.352	0.452	0.78	1.09

Duty Cycle(5.8G band):

	Modulation	On (ms)	On+Off (ms)	Duty cycle(x)	Duty cycle factor
Duty cycle	802.11a	2.08	2.18	0.95	0.20
	802.11n20	0.679	0.773	0.88	0.56
	802.11n40	0.355	0.453	0.78	1.06
	802.11ac80	0.194	0.222	0.87	0.59

Please refer the test plots in Annex A.

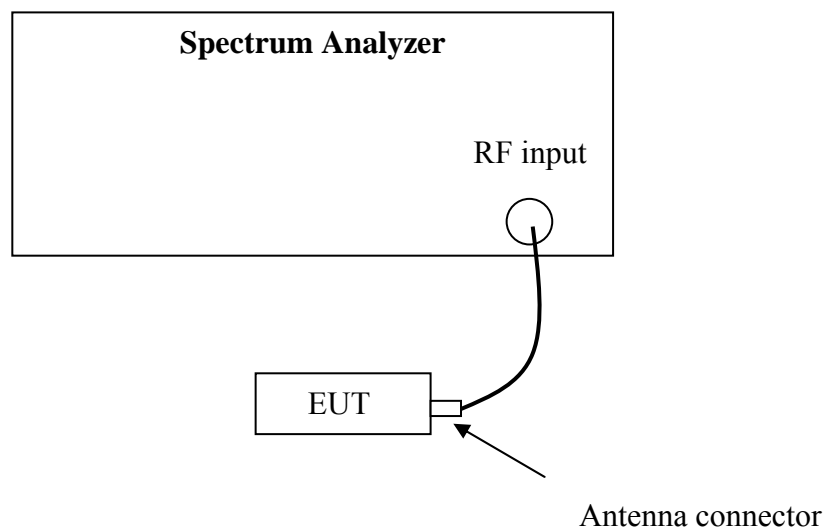
4. Minimum 6dB Bandwidth

Test result: PASS

4.1 Limit

For systems using digital modulation techniques that may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands, the minimum 6 dB bandwidth shall be at least 500 kHz.

4.2 Test Configuration



4.3 Test Procedure and test setup

The minimum 6dB bandwidth per FCC §15.247(a)(2) is measured using the Spectrum Analyzer according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance v03r01” for compliance to FCC 47CFR 15.247 requirements.

- a) Set RBW = 100 kHz.
- b) Set the video bandwidth (VBW) ≥ 3 RBW.
- c) Detector = Peak.
- d) Trace mode = max hold.
- e) Sweep = auto couple.
- f) Allow the trace to stabilize.
- g) Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

4.4 Test Protocol

Temperature:22°C

Relative Humidity:43%

Mode 1:

2.4G Band:

Modulation	Frequency (MHz)	Minimum 6dB Bandwidth (MHz)			Limits (MHz)
		Port0	Port 1	Port 2	
802.11b	2412	8.58	9.00	8.04	> 0.5
	2437	9.06	8.52	8.58	> 0.5
	2462	9.06	8.64	8.58	> 0.5
802.11g	2412	16.32	16.38	16.32	> 0.5
	2437	16.38	16.32	16.32	> 0.5
	2462	16.32	16.38	16.32	> 0.5
802.11n20	2412	17.64	17.64	17.62	> 0.5
	2437	17.34	17.64	17.64	> 0.5
	2462	17.46	17.64	17.64	> 0.5
802.11n40	2422	36.48	36.12	35.92	> 0.5
	2437	36.36	36.48	36.08	> 0.5
	2452	36.08	36.12	36.32	> 0.5

5.8G Band:

Modulation	Frequency (MHz)	Minimum 6dB Bandwidth (MHz)			Limits (MHz)
		Port0	Port 1	Port 2	
802.11a	5745	16.38	16.44	16.44	> 0.5
	5785	16.38	16.38	16.44	> 0.5
	5825	16.44	16.38	16.38	> 0.5
802.11n20	5745	17.64	17.70	17.64	> 0.5
	5785	17.58	17.58	17.64	> 0.5
	5825	17.58	17.64	17.64	> 0.5
802.11n40	5755	36.36	36.48	36.36	> 0.5
	5795	36.36	36.36	36.36	> 0.5
802.11ac80	5775	76.08	76.32	76.32	> 0.5

Note: Please see the plots in the Annex A.

5. Maximum Conducted Output power

Test result: Pass

5.1 Test limit

For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

If the transmitting antenna of directional gain greater than 6dBi is used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi. If there have a beamforming type, the limit should be the minimum of 30dBm and 30+ (6 –antenna gain-beamforming gain).

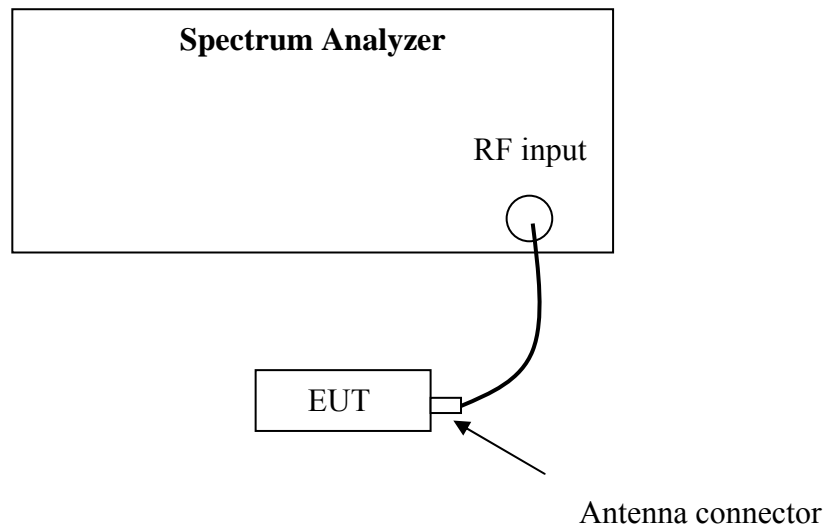
Mode No.	Frequency Band	Antenna Type	Antenna Gain (dBi)	Modulation	Total Gain (dBi)	Total Conducted Power Limit (dBm)	Maximum EIRP (dBm)
1	2.4GHz	Integral	4.00	802.11b	4.00	30.00	34.00
				802.11g	4.00	30.00	34.00
				802.11n20	7.01	28.99	36.00
				802.11n40	7.01	28.99	36.00
	5.8GHz	Integral	5.00	802.11a	5.00	30.00	35.00
				802.11n20	8.01	27.99	36.00
				802.11n40	8.01	27.99	36.00
				802.11ac80	8.01	27.99	36.00
2	2.4GHz	ANT-3X3-2005	5.00	802.11b	5.00	30.00	35.00
				802.11g	5.00	30.00	35.00
				802.11n20	8.01	27.99	36.00
				802.11n40	8.01	27.99	36.00
	5.8GHz	ANT-3X3-5005	5.00	802.11a	5.00	30.00	35.00
				802.11n20	8.01	27.99	36.00
				802.11n40	8.01	27.99	36.00
				802.11ac80	8.01	27.99	36.00
3	2.4GHz	ANT-2X2-2314	14.00	802.11b	14.00	22.00	36.00
				802.11g	14.00	22.00	36.00
				802.11n20	17.01	18.99	36.00
				802.11n40	17.01	18.99	36.00
	5.8GHz	ANT-2X2-5314	14.00	802.11a	14.00	22.00	36.00
				802.11n20	17.01	18.99	36.00
				802.11n40	17.01	18.99	36.00
				802.11ac80	17.01	18.99	36.00
4	5.8GHz	ANT-3X3-5010	10.00	802.11a	10.00	26.00	36.00
				802.11n20	13.01	22.99	36.00
				802.11n40	13.01	22.99	36.00
				802.11ac80	13.01	22.99	36.00

Note: 1. Beamforming gain = $10 \cdot \log(2) = 3.01$

2. Total gain = Antenna Gain + beamforming gain

3. Maximum eirp = Total conducted power limit + Total gain, which is equal to or less than RSS 210 eirp limit (4W (36 dBm)).

5.2 Test Configuration



5.3 Test procedure and test setup

The EUT was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance v03r01” for compliance to FCC 47CFR 15.247 requirements (Measurement Procedure 9.2.2.4 AVGSA-2).

- a) Measure the duty cycle, x , of the transmitter output signal as described in 6.0.
- b) Set span to at least 1.5 times the OBW.
- c) Set RBW = 1-5% of the OBW, not to exceed 1 MHz.
- d) Set VBW $\geq 3 \times$ RBW.
- e) Number of points in sweep $\geq 2 \times$ span / RBW. (This gives bin-to-bin spacing \leq RBW/2, so that narrowband signals are not lost between frequency bins.)
- f) Sweep time = auto.
- g) Detector = RMS (*i.e.*, power averaging), if available. Otherwise, use sample detector mode.
- h) Do not use sweep triggering. Allow the sweep to “free run”.
- i) Trace average at least 100 traces in power averaging (*i.e.*, RMS) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the on and off periods of the transmitter.
- j) Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum.
- k) Add $10 \log(1/x)$, where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add $10 \log(1/0.25) = 6$ dB if the duty cycle is 25 %.

5.4 Test protocol

Temperature: 22 °C

Relative Humidity: 43 %

1: Mode 1, APEX0100 (4dBi gain antenna for 2.4G band)

Test Mode	Frequency (MHz)	Reading (dBm)			Duty cycle factor (dB)	Total Power (mw)	Total Power (dBm)	Limit (dBm)
		Port 0	Port 1	Port 2				
802.11b	2412	20.48	21.07	20.31	0.20	363.71	25.61	30.00
	2437	24.94	25.29	24.07	0.20	948.74	29.77	30.00
	2462	21.54	22.33	21.16	0.20	465.53	26.68	30.00
802.11g	2412	18.20	18.65	18.00	0.20	212.18	23.27	30.00
	2437	24.65	25.14	23.95	0.20	908.31	29.58	30.00
	2462	19.08	19.59	18.73	0.20	258.40	24.12	30.00
802.11n20	2412	16.94	17.34	15.82	0.62	163.64	22.14	28.99
	2437	22.89	23.37	22.36	0.62	673.84	28.29	28.99
	2462	16.76	17.29	16.67	0.62	170.14	22.31	28.99
802.11n40	2422	13.76	14.22	13.91	1.09	96.05	19.82	28.99
	2437	17.48	18.06	17.59	1.09	227.75	23.57	28.99
	2452	14.43	14.96	14.52	1.09	112.20	20.50	28.99

2: Mode 1, APEX0100 (5dBi gain antenna for 5.8G band)

Test Mode	Frequency (MHz)	Reading (dBm)			Duty cycle factor (dB)	Total Power (mw)	Total Power (dBm)	Limit (dBm)
		Port 0	Port 1	Port 2				
802.11a	5745	24.19	23.91	24.05	0.20	799.22	29.03	30.00
	5785	23.85	23.76	23.80	0.20	754.85	28.78	30.00
	5825	23.79	23.73	23.65	0.20	741.11	28.70	30.00
802.11n20	5745	22.19	21.86	21.93	0.56	540.75	27.33	27.99
	5785	21.71	21.80	21.62	0.56	506.40	27.04	27.99
	5825	21.68	21.66	21.47	0.56	494.16	26.94	27.99
802.11n40	5755	21.78	22.00	21.90	1.06	592.13	27.72	27.99
	5795	22.15	21.74	21.80	1.06	592.98	27.73	27.99
802.11ac80	5775	21.99	22.36	22.35	0.59	574.57	27.59	27.99

3: Mode 2, APEX0101 (5dBi gain antenna for 2.4G band)

Test Mode	Frequency (MHz)	Reading (dBm)			Duty cycle factor (dB)	Total Power (mw)	Total Power (dBm)	Limit (dBm)
		Port 0	Port 1	Port 2				
802.11b	2412	19.18	18.44	19.24	0.20	247.94	23.94	30.00
	2437	24.07	23.86	24.53	0.20	819.89	29.14	30.00
	2462	20.05	19.63	20.57	0.20	321.78	25.08	30.00
802.11g	2412	16.59	16.33	17.21	0.20	147.95	21.70	30.00
	2437	24.06	24.05	24.75	0.20	846.13	29.27	30.00
	2462	17.86	17.34	18.31	0.20	191.86	22.83	30.00
802.11n20	2412	13.13	12.72	13.54	0.62	71.38	18.54	27.99
	2437	21.68	21.56	22.33	0.62	532.44	27.26	27.99
	2462	14.31	13.67	14.73	0.62	92.28	19.65	27.99
802.11n40	2422	12.92	12.33	13.18	1.09	73.82	18.68	27.99
	2437	21.67	21.41	22.05	1.09	572.16	27.58	27.99
	2452	13.77	13.35	14.19	1.09	92.06	19.64	27.99

4: Mode 3, APEX0101 (14dBi gain antenna for 2.4G band)

Test Mode	Frequency (MHz)	Reading (dBm)			Duty cycle factor (dB)	Total Power (mw)	Total Power (dBm)	Limit (dBm)
		Port 0	Port 1	Port 2				
802.11b	2412	11.26	10.54	11.14	0.20	39.50	15.97	22.00
	2437	16.18	15.64	16.70	0.20	130.92	21.17	22.00
	2462	12.18	11.62	11.39	0.20	46.97	16.72	22.00
802.11g	2412	8.32	7.32	8.19	0.20	19.68	12.94	22.00
	2437	16.13	15.58	16.64	0.20	129.22	21.11	22.00
	2462	9.38	8.76	9.91	0.20	27.23	14.35	22.00
802.11n20	2412	5.51	4.80	5.52	0.62	11.70	10.68	18.99
	2437	13.40	12.94	13.85	0.62	75.95	18.81	18.99
	2462	6.48	5.42	6.31	0.62	14.08	11.49	18.99
802.11n40	2422	5.03	4.11	4.88	1.09	11.35	10.55	18.99
	2437	13.07	12.42	13.30	1.09	75.91	18.80	18.99
	2452	6.20	4.87	5.90	1.09	14.29	11.55	18.99

5: Mode 3, APEX0101 (14dBi gain antenna for 5.8G band)

Test Mode	Frequency (MHz)	Reading (dBm)			Duty cycle factor (dB)	Total Power (mw)	Total Power (dBm)	Limit (dBm)
		Port 0	Port 1	Port 2				
802.11a	5745	15.33	15.25	17.06	0.20	124.13	20.94	22.00
	5785	15.30	14.93	17.04	0.20	121.14	20.83	22.00
	5825	15.67	15.42	17.10	0.20	128.93	21.10	22.00
802.11n20	5745	12.09	11.74	13.93	0.56	63.55	18.03	18.99
	5785	11.68	11.51	13.92	0.56	60.95	17.85	18.99
	5825	12.42	11.96	13.82	0.56	65.19	18.14	18.99
802.11n40	5755	11.66	11.15	13.28	1.06	62.49	17.96	18.99
	5795	11.17	11.05	13.24	1.06	59.86	17.77	18.99
802.11ac80	5775	12.24	12.20	14.33	0.59	69.17	18.40	18.99

6: Mode 4, APEX0101 (10dBi gain antenna for 5.8G band)

Test Mode	Frequency (MHz)	Reading (dBm)			Duty cycle factor (dB)	Total Power (mw)	Total Power (dBm)	Limit (dBm)
		Port 0	Port 1	Port 2				
802.11a	5745	19.76	19.77	21.47	0.20	345.60	25.39	26.00
	5785	19.54	19.49	21.00	0.20	319.41	25.04	26.00
	5825	19.63	19.48	21.08	0.20	323.63	25.10	26.00
802.11n20	5745	16.47	16.24	18.12	0.56	172.24	22.36	22.99
	5785	16.12	15.86	17.81	0.56	159.23	22.02	22.99
	5825	16.31	15.95	18.31	0.56	170.62	22.32	22.99
802.11n40	5755	15.58	15.57	17.25	1.06	159.87	22.04	22.99
	5795	15.18	15.14	17.05	1.06	148.43	21.72	22.99
802.11ac80	5775	16.15	16.28	18.38	0.59	174.55	22.42	22.99

Note 1:

Reading port x (mW) = $10^{(\text{reading port x (dBm)}/10 + \text{duty cycle factor (dB)}/10)}$;
x = 0, 1, 2.

Total Power (mW) = reading port 0 (mW) + reading port 1 (mW) + reading port 2 (mW)

Total power (dBm) = $10 * \log(\text{Total power(mW)})$

Note 2: Please see the plots in the Annex B.

6. Power spectrum density

Test result: Pass

6.1 Test limit

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3 kHz band during any time interval of continuous transmission.

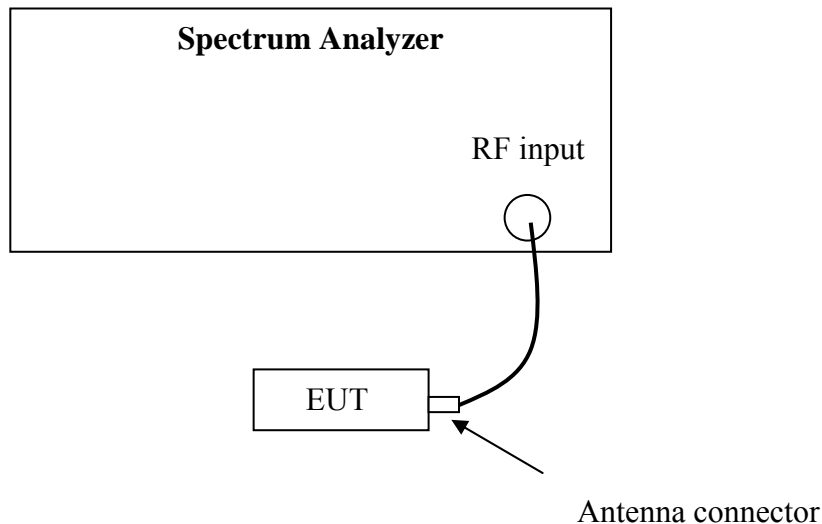
If there have a beamforming type, the strictest limit should be the min of 8dBm/3kHz and $8+(6 - \text{antenna gain} - \text{beamforming gain})$.

Mode No.	Frequency Band	Antenna Type	Gain (dBi)	Modulation	Total Gain (dBi)	Total Power spectrum density Limit (dBm)
1	2.4GHz	Integral	4.00	802.11b	4.00	8.00
				802.11g	4.00	8.00
				802.11n20	7.01	6.99
				802.11n40	7.01	6.99
	5.8GHz	Integral	5.00	802.11a	5.00	8.00
				802.11n20	8.01	5.99
				802.11n40	8.01	5.99
				802.11ac80	8.01	5.99

Note: 1. Beamforming gain = $10 * \log(2) = 3.01$

2. Total gain = Antenna Gain + beamforming gain

6.2 Test Configuration



6.3 Test procedure and test setup

The power output per FCC §15.247(e) was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance v03r01” for compliance to FCC 47CFR 15.247 requirements.

This procedure is applicable when the EUT cannot be configured to transmit continuously (*i.e.*, duty cycle < 98%), and when sweep triggering/signal gating cannot be used to measure only when the EUT is transmitting at its maximum power control level, and when the transmission duty cycle is constant (*i.e.*, duty cycle variations are less than ± 2 percent):

- a) Measure the duty cycle (x) of the transmitter output signal as described in 6.0.
- b) Set instrument center frequency to DTS channel center frequency.
- c) Set span to at least 1.5 times the OBW.
- d) Set RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
- e) Set VBW $\geq 3 \times \text{RBW}$.
- f) Detector = power averaging (RMS) or sample detector (when RMS not available).
- g) Ensure that the number of measurement points in the sweep $\geq 2 \times \text{span}/\text{RBW}$.
- h) Sweep time = auto couple.
- i) Do not use sweep triggering. Allow sweep to “free run”.
- j) Employ trace averaging (RMS) mode over a minimum of 100 traces.
- k) Use the peak marker function to determine the maximum amplitude level.
- l) Add $10 \log(1/x)$, where x is the duty cycle measured in step (a), to the measured PSD to compute the average PSD during the actual transmission time.
- m) If resultant value exceeds the limit, then reduce RBW (no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span in order to meet the minimum measurement point requirement as the RBW is reduced).

6.4 Test Protocol

Temperature: 22 °C

Relative Humidity: 43 %

Mode 1:

1: APEX0100(4dBi gain antenna for 2.4G band)

Test Mode	Frequency (MHz)	PSD Reading(dBm)			Duty cycle factor (dB)	Total PSD (mw)	Total PSD (dBm)	Limit (dBm)
		Port0	Port 1	Port 2				
802.11b	2412	-1.66	-1.01	-1.88	0.20	2.23	3.47	8.00
	2437	2.51	3.00	2.40	0.20	5.78	7.62	8.00
	2462	-0.64	-0.28	-0.87	0.20	2.74	4.39	8.00
802.11g	2412	-6.83	-5.41	-5.97	0.20	0.78	-1.06	8.00
	2437	-0.11	0.54	-0.73	0.20	3.09	4.91	8.00
	2462	-5.90	-4.70	-5.80	0.20	0.90	-0.46	8.00
802.11n20	2412	-9.53	-8.97	-9.49	0.62	0.40	-3.93	6.99
	2437	-0.49	-0.10	-1.28	0.62	3.02	4.80	6.99
	2462	-9.14	-8.12	-7.50	0.62	0.52	-2.81	6.99
802.11n40	2422	-14.50	-12.72	-12.79	1.09	0.18	-7.41	6.99
	2437	-10.33	-9.05	-9.40	1.09	0.43	-3.70	6.99
	2452	-13.67	-12.01	-12.01	1.09	0.22	-6.64	6.99

2:APEX0100 (5dBi gain antenna for 5.8G band)

Test Mode	Frequency (MHz)	PSD (dBm)			Duty cycle factor (dB)	Total PSD (mw)	Total PSD (dBm)	Limit (dBm)
		Port0	Port 1	Port 2				
802.11a	5745	-0.30	-0.14	0.05	0.20	3.05	4.85	8.00
	5785	-0.60	-0.81	-0.74	0.20	2.67	4.26	8.00
	5825	-0.70	-0.91	-0.76	0.20	2.62	4.19	8.00
802.11n20	5745	-2.39	-2.97	-2.62	0.56	1.85	2.68	5.99
	5785	-2.82	-3.10	-2.46	0.56	1.80	2.55	5.99
	5825	-3.23	-3.22	-3.25	0.56	1.62	2.10	5.99
802.11n40	5755	-5.34	-5.43	-5.46	1.06	1.10	0.42	5.99
	5795	-5.89	-5.43	-6.00	1.06	1.01	0.06	5.99
802.11ac80	5775	-8.91	-8.98	-8.92	0.59	0.44	-3.58	5.99

Note 1:

$PSD \text{ port } x \text{ (mW)} = 10^{(PSD \text{ port } x \text{ (dBm)} / 10 + \text{duty cycle factor (dB)} / 10)}$;
x = 0, 1, 2.

Total PSD (mW) = PSD port 0 (mW) + PSD port 1 (mW) + PSD port 2 (mW)

Total PSD (dBm) = $10 * \log(\text{Total PSD (mW)})$

Note 2: Please see the plots in the Annex C.

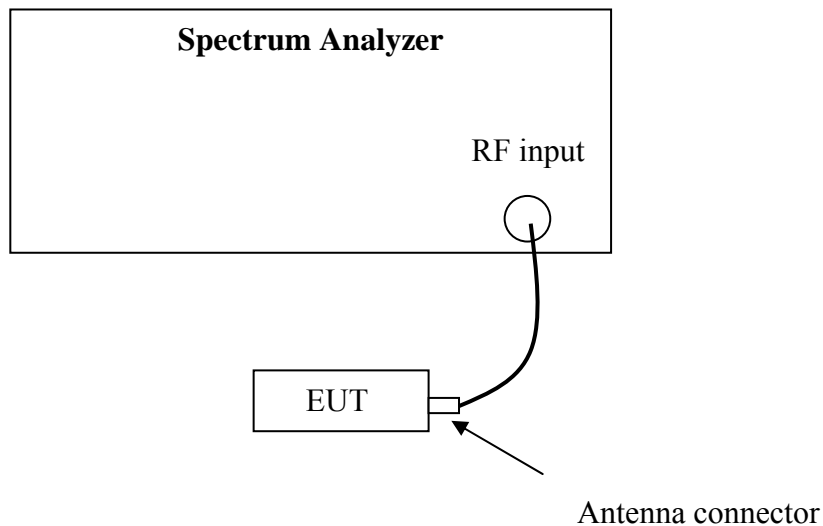
7. Emissions in non-restricted frequency bands

Test result: Pass

7.1 Test limit

If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2 of 558074 D01 DTS Meas Guidance v03r01, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (*i.e.*, 30 dBc).

7.2 Test Configuration



7.3 Test procedure and test setup

The power output per FCC §15.247(d) was tested according to DTS test procedure of “KDB558074 D01 DTS Meas Guidance v03r01” for compliance to FCC 47CFR 15.247 requirements.

If maximum conducted (average) output power was used to demonstrate compliance as described in 9.2, then the peak power in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 30 dB relative to the maximum in-band peak PSD level in 100 kHz (*i.e.*, 30 dBc).

Reference level measurement

Establish a reference level by using the following procedure:

- a) Set instrument center frequency to DTS channel center frequency.
- b) Set the span to ≥ 1.5 times the *DTS bandwidth*.
- c) Set the RBW = 100 kHz.
- d) Set the VBW $\geq 3 \times$ RBW.
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum PSD level.

Note that the channel found to contain the maximum PSD level can be used to establish the reference level.

Emission level measurement

- a) Set the center frequency and span to encompass frequency range to be measured.
- b) Set the RBW = 100 kHz.
- c) Set the VBW $\geq 3 \times$ RBW.
- d) Detector = peak.
- e) Ensure that the number of measurement points \geq span/RBW
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in 11.1 a) or 11.1 b). Report the three highest emissions relative to the limit.

7.4 Test Protocol

Temperature: 22 °C

Relative Humidity: 43 %

Please refer to Annex D for The test plots.

8. Radiated Emissions in restricted frequency bands

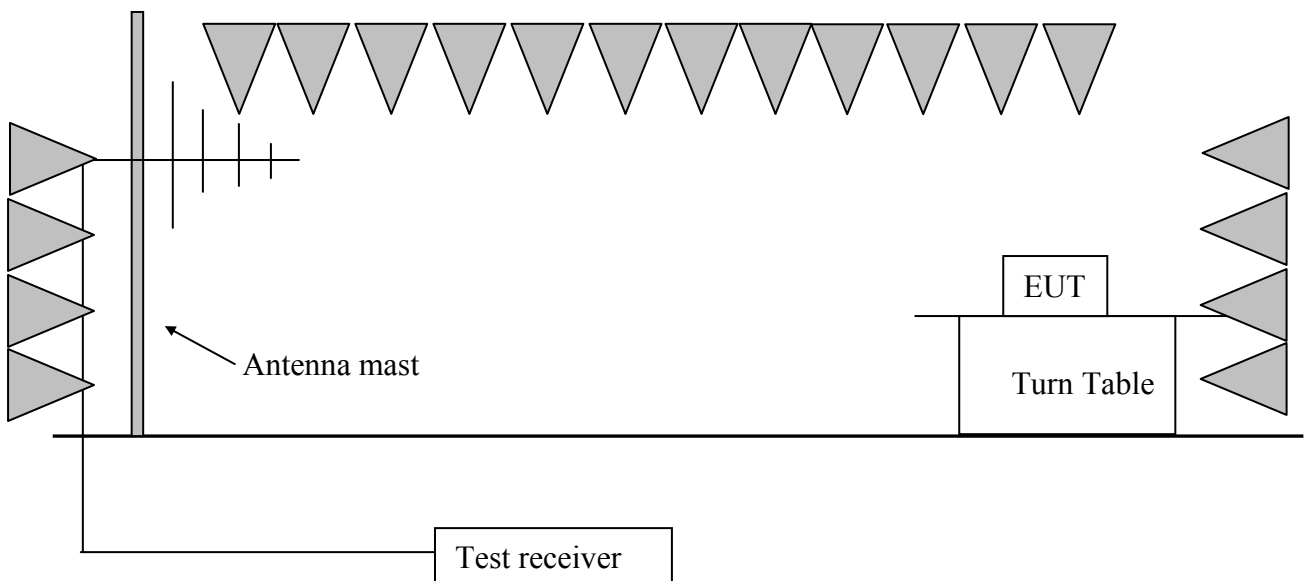
Test result: Pass

8.1 Test limit

The 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) showed as below:

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400/F(kHz)	300
0.490 ~ 1.705	24000/F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

8.2 Test Configuration



8.3 Test procedure and test setup

The measurement was applied in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, if applied, the pre-amplifier would be equipped just at the output terminal of the antenna.

The EUT and simulators were placed on a 0.8m high wooden turntable above the horizontal metal ground plane. The turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna which was mounted on an antenna mast. The antenna moved up and down between from 1meter to 4 meters to find out the maximum emission level.

The EUT was tested according to DTS test procedure of KDB558074 D01 DTS “Meas Guidance v03r01” for compliance to FCC 47CFR 15.247 requirements.

The radiated emission was measured using the Spectrum Analyzer with the resolutions bandwidth set as:

RBW = 100 kHz, VBW = 300 kHz (30MHz-1GHz)
RBW = 1MHz, VBW = 3MHz (>1GHz for PK);
RBW = 1MHz, VBW = 10Hz (>1GHz for AV);

Remark:

1. Factor= Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Measured level= Original Receiver Reading + Factor
3. Margin = limit – Measured level
4. If the PK measured level is lower than AV limit, the AV test can be elided.

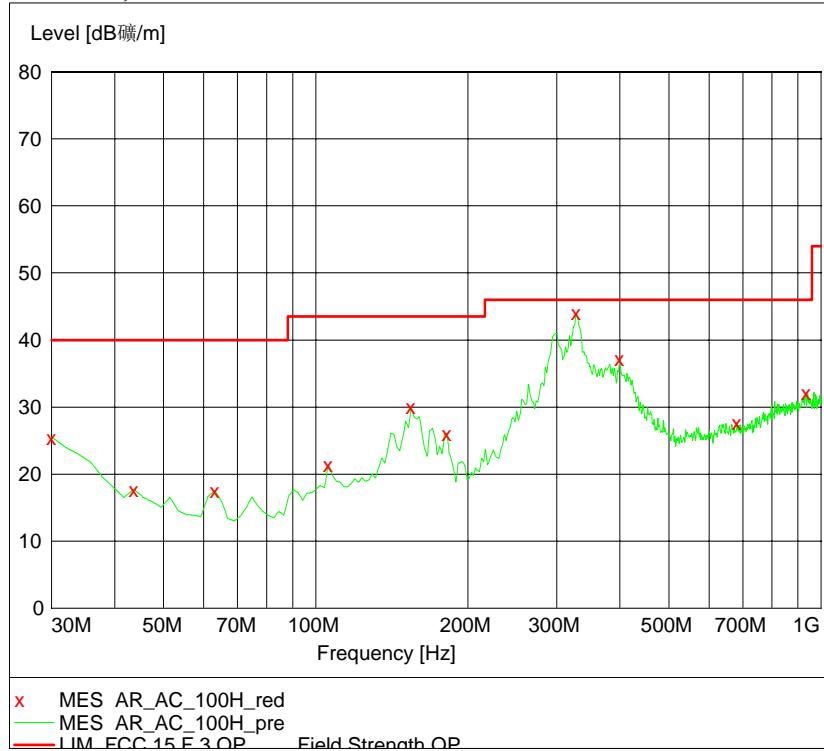
Example:

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

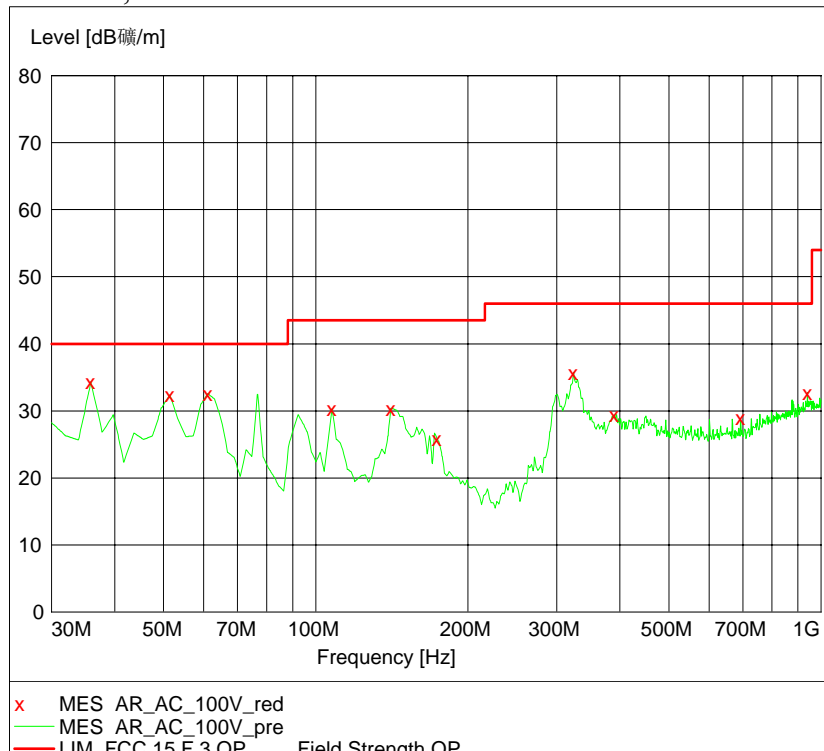
8.4 Test Protocol

Temperature: 22 °C
 Relative Humidity: 43 %

Worst Case Below 1GHz: Mode 1,30MHz~1GHz,Horizontal



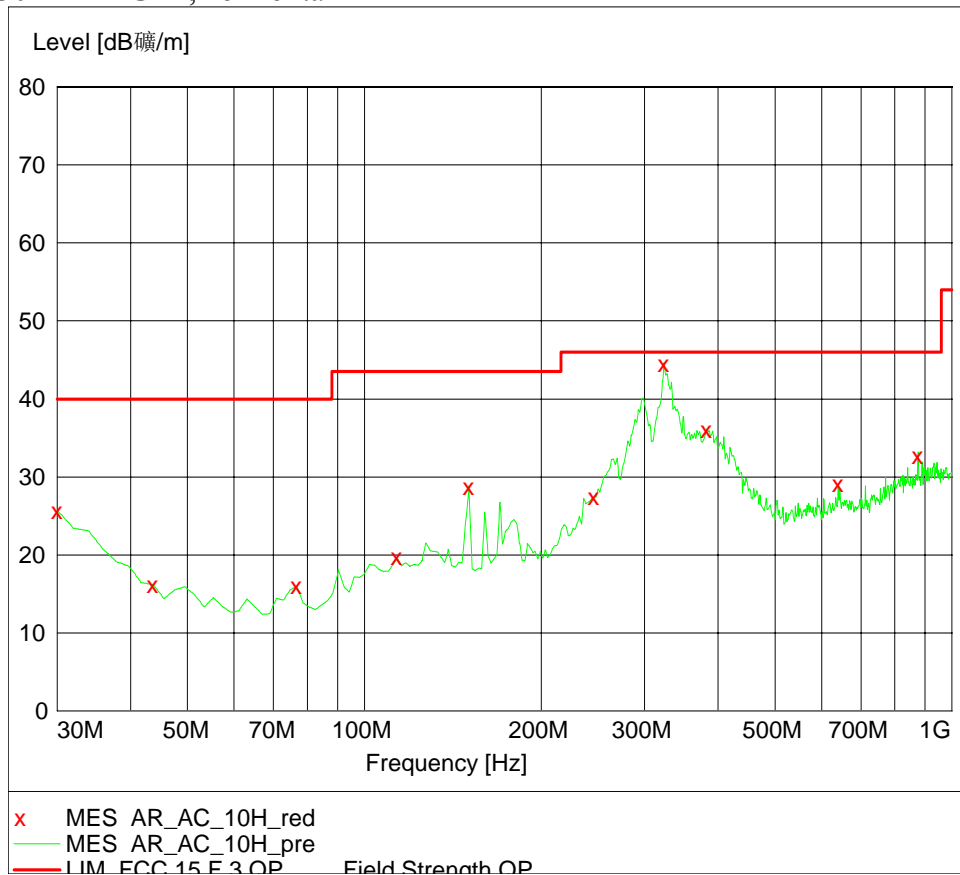
Mode 1,30MHz~1GHz,Vertical



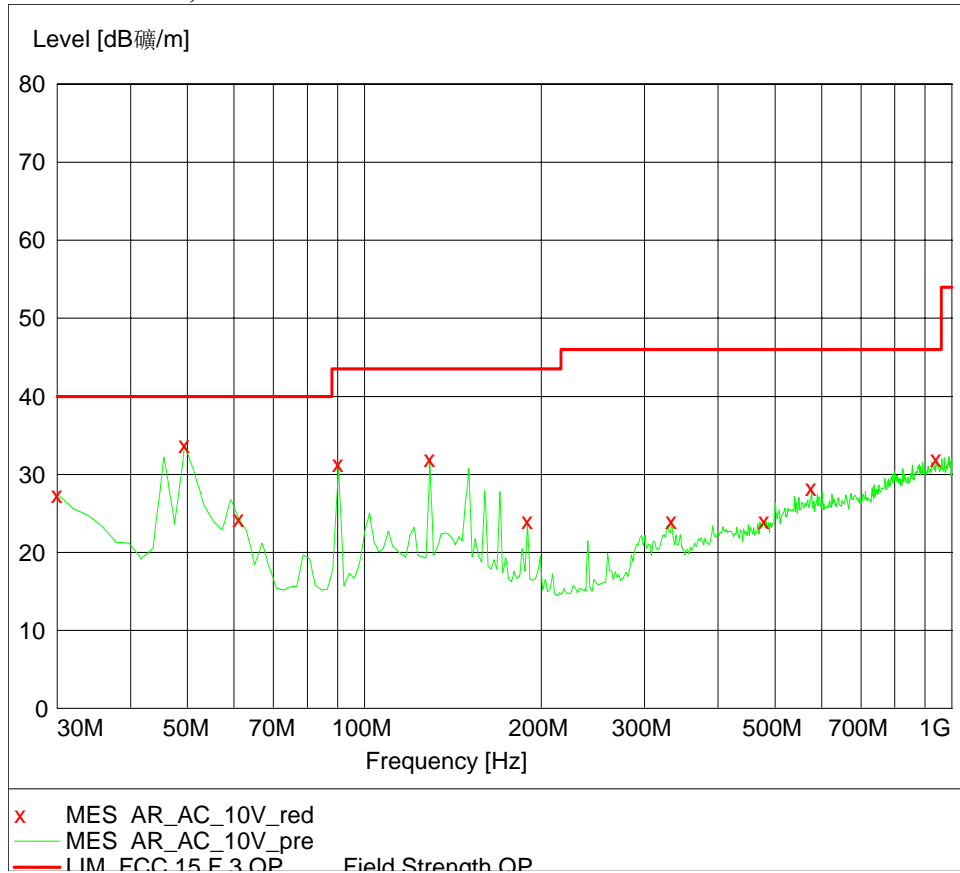
Mode 1,30MHz~1GHz,Test data:

Polarization	Frequency (MHz)	Measured level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Factor (dB)	Detector
H	30.00	25.5	40.0	14.5	22.0	PK
	154.40	30.0	43.5	13.5	14.2	PK
	181.62	26.1	43.5	17.4	26.1	PK
	327.40	44.0	46.0	2.0	16.0	PK
	399.33	37.2	46.0	8.8	19.0	PK
	933.90	32.2	46.0	13.8	25.3	PK
V	35.83	34.3	40.0	5.7	17.8	PK
	51.38	32.4	40.0	7.6	10.7	PK
	61.10	32.6	40.0	7.4	8.2	PK
	107.75	30.3	43.5	13.2	15.3	PK
	140.80	30.4	43.5	13.1	15.1	PK
	323.52	35.6	46.0	10.4	15.8	PK

Mode 2,30MHz~1GHz,Horizontal



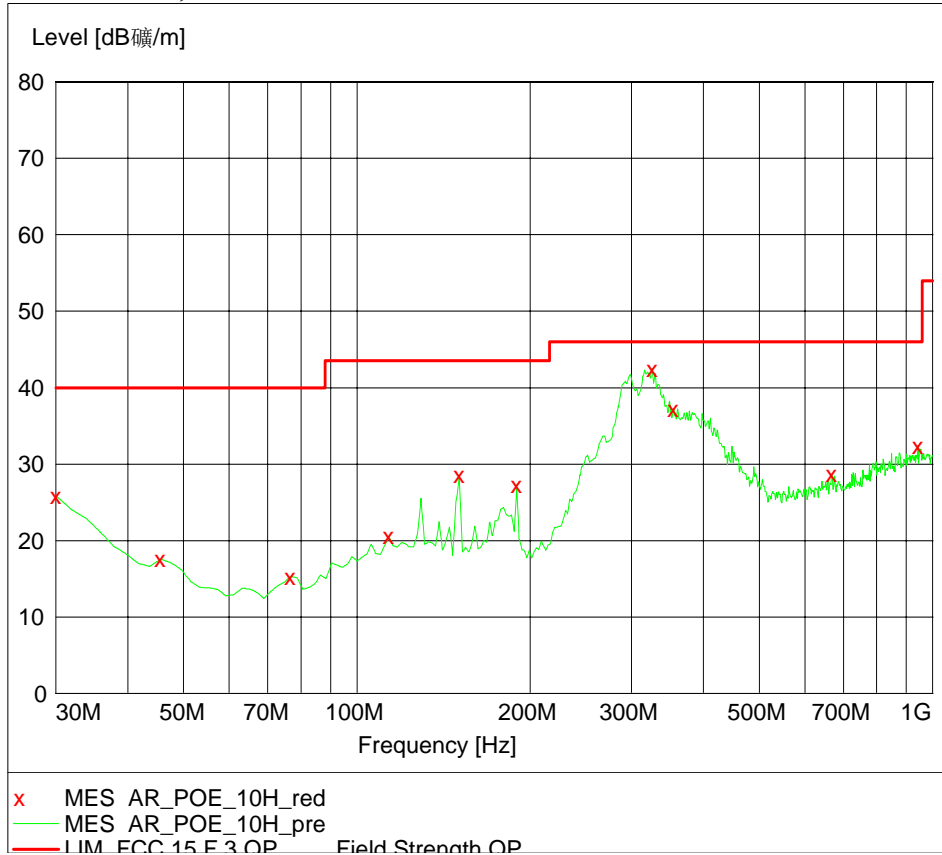
Mode 2,30MHz~1GHz,Vertical



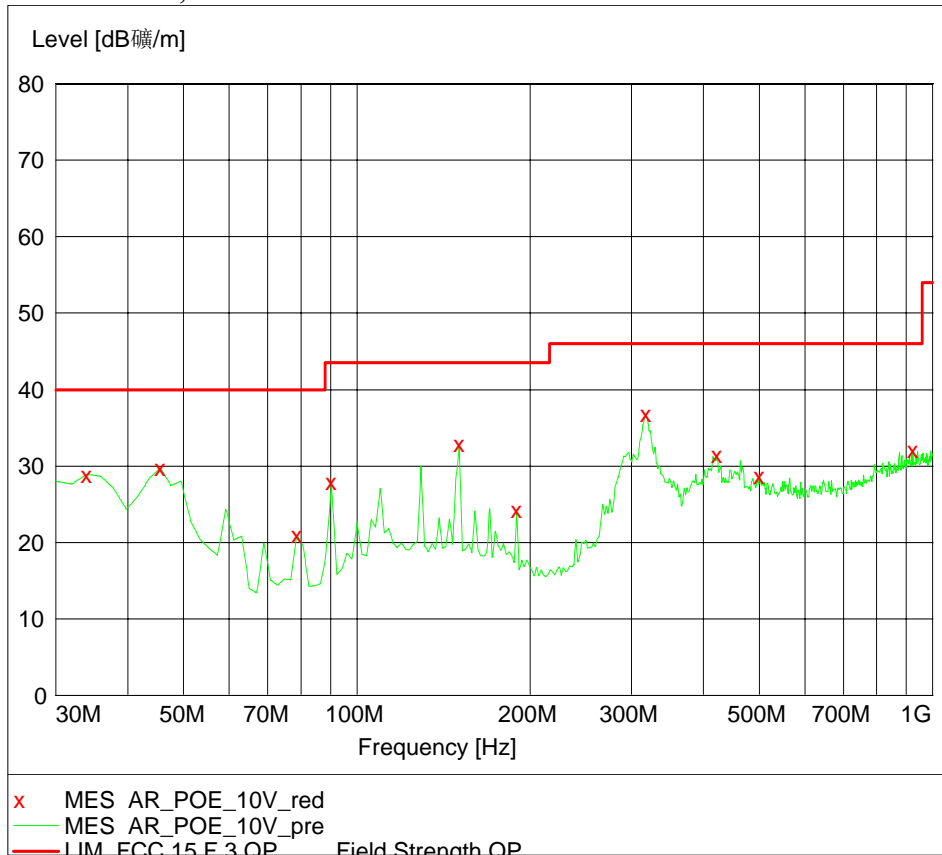
Mode 2,30MHz~1GHz,Test data:

Polarization	Frequency (MHz)	Measured level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Factor (dB)	Detector
H	30.00	25.7	40.0	14.3	22.0	PK
	150.52	28.8	43.5	14.7	14.4	PK
	245.77	27.4	46.0	18.6	13.0	PK
	323.50	44.5	46.0	1.5	15.8	PK
	381.84	36.1	46.0	9.9	18.2	PK
	875.59	32.7	46.0	13.3	24.7	PK
V	30.00	27.4	40.0	12.6	22.0	PK
	49.43	33.7	40.0	6.3	11.3	PK
	61.10	24.3	40.0	15.7	8.2	PK
	90.26	31.4	43.5	12.1	12.2	PK
	129.13	32.0	43.5	11.5	15.9	PK
	939.73	31.9	46.0	14.1	25.3	PK

Mode 3,30MHz~1GHz,Horizontal



Mode 3,30MHz~1GHz,Vertical



Mode 3,30MHz~1GHz,Test data:

Polarization	Frequency (MHz)	Measured level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Factor (dB)	Detector
H	30.00	25.8	40.0	14.2	22.0	PK
	45.55	17.6	43.5	22.4	12.9	PK
	150.52	28.6	43.5	14.9	14.4	PK
	325.47	42.5	46.0	3.5	16.9	PK
	354.62	37.3	46.0	8.7	16.9	PK
	943.62	32.4	46.0	13.6	25.4	PK
V	33.88	28.9	40.0	11.1	19.1	PK
	45.55	29.7	40.0	10.3	12.9	PK
	150.52	32.9	43.5	10.6	14.4	PK
	317.69	36.8	46.0	9.2	15.7	PK
	422.66	31.5	46.0	14.5	19.3	PK
	924.18	32.1	46.0	13.9	25.2	PK

Above 1GHz:

Mode 1:

1: 2.4G band 802.11b (APEX0100 with 4dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	60.20	74	-7.80	100	190	13.8	PK
		46.97	54	-7.80	100	190	7.03	AV
	2412	120.50	-	-7.80	100	190	-	PK
		116.00	-	-7.80	100	190	-	AV
	4824	42.40	74	-2.10	100	190	31.60	PK
		31.60	54	-2.10	100	190	22.40	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	124.20	-	-7.80	100	190	-	PK
		119.80	-	-7.80	100	190	-	AV
	4874	42.30	74	-2.10	100	190	31.70	PK
		32.40	54	-2.10	100	190	21.60	AV
	7311	46.50	74	6.50	100	190	27.50	PK
		37.50	54	6.50	100	190	16.50	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	121.30	-	-7.80	100	190	-	PK
		117.00	-	-7.80	100	190	-	AV
	2483.5	60.72	74	-7.50	100	190	13.28	PK
		48.76	54	-7.50	100	190	5.24	AV
	4924	41.20	74	-2.10	100	190	32.80	PK
		31.60	54	-2.10	100	190	22.40	AV
	7386	45.80	74	6.50	100	190	28.20	PK
		36.40	54	6.50	100	190	17.60	AV
Note:	2462MHz is fundamental signal.							

2: 2.4G band 802.11g (APEX0100 with 4dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	67.82	74	-7.80	100	190	6.18	PK
		50.83	54	-7.80	100	190	3.17	AV
	2412	120.20	-	-7.80	100	190	-	PK
		111.70	-	-7.80	100	190	-	AV
	4824	41.20	74	-2.10	100	190	32.80	PK
		31.40	54	-2.10	100	190	22.60	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	123.20	-	-7.80	100	190	-	PK
		114.70	-	-7.80	100	190	-	AV
	4874	43.60	74	-2.10	100	190	30.40	PK
		34.70	54	-2.10	100	190	19.30	AV
	7311	48.20	74	6.50	100	190	25.80	PK
		39.40	54	6.50	100	190	14.60	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	118.60	-	-7.80	100	190	-	PK
		110.00	-	-7.80	100	190	-	AV
	2483.5	72.28	74	-7.50	100	190	1.72	PK
		52.01	54	-7.50	100	190	1.99	AV
	4924	42.10	74	-2.10	100	190	31.90	PK
		32.70	54	-2.10	100	190	21.30	AV
	7386	45.30	74	6.50	100	190	28.70	PK
		36.40	54	6.50	100	190	17.60	AV
Note:	2462MHz is fundamental signal.							

3: 2.4G band 802.11n20 (APEX0100 with 4dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	67.20	74	-7.80	100	190	6.80	PK
		52.64	54	-7.80	100	190	1.36	AV
	2412	115.30	-	-7.80	100	190	-	PK
		107.10	-	-7.80	100	190	-	AV
	4824	41.30	74	-2.10	100	190	32.70	PK
		32.50	54	-2.10	100	190	21.50	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	120.20	-	-7.80	100	190	-	PK
		112.70	-	-7.80	100	190	-	AV
	4874	45.40	74	-2.10	100	190	28.60	PK
		37.20	54	-2.10	100	190	16.80	AV
	7311	48.10	74	6.50	100	190	25.90	PK
		36.20	54	6.50	100	190	17.80	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	115.40	-	-7.80	100	190	-	PK
		106.10	-	-7.80	100	190	-	AV
	2483.5	68.92	74	-7.50	100	190	5.08	PK
		50.42	54	-7.50	100	190	3.58	AV
	4924	43.60	74	-2.10	100	190	30.40	PK
		34.20	54	-2.10	100	190	19.80	AV
	7386	45.30	74	6.50	100	190	28.70	PK
		36.30	54	6.50	100	190	17.70	AV
Note:	2462MHz is fundamental signal.							

4: 2.4G band 802.11n40 (APEX0100 with 4dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	72.03	74	-7.80	100	190	1.97	PK
		53.53	54	-7.80	100	190	0.47	AV
	2422	112.30	-	-7.80	100	190	-	PK
		102.30	-	-7.80	100	190	-	AV
	4844	41.20	74	-2.10	100	190	32.80	PK
		32.40	54	-2.10	100	190	21.60	AV
	7266	45.20	74	6.50	100	190	28.80	PK
		35.60	54	6.50	100	190	18.40	AV
Note:	2422MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	116.00	-	-7.80	100	190	-	PK
		107.70	-	-7.80	100	190	-	AV
	4874	43.90	74	-2.10	100	190	30.10	PK
		33.50	54	-2.10	100	190	20.50	AV
	7311	46.30	74	6.50	100	190	27.70	PK
		35.60	54	6.50	100	190	18.40	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2452	114.40	-	-7.80	100	190	-	PK
		104.40	-	-7.80	100	190	-	AV
	2483.5	72.00	74	-7.50	100	190	2.00	PK
		51.15	54	-7.50	100	190	2.85	AV
	4904	43.10	74	-2.10	100	190	30.90	PK
		33.20	54	-2.10	100	190	20.80	AV
	7386	46.20	74	6.50	100	190	27.80	PK
		35.40	54	6.50	100	190	18.60	AV
Note:	2452MHz is fundamental signal.							

5: 5.8G band 802.11a (APEX0100 with 5dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5745	121.30	-	0.40	100	190	-	PK
		112.70	-	0.40	100	190	-	AV
	11490	45.50	74	12.90	100	190	28.50	PK
		35.60	54	12.90	100	190	18.40	AV
Note:	5745MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5785	121.30	-	0.40	100	190	-	PK
		113.10	-	0.40	100	190	-	AV
	11570	45.40	74	12.90	100	190	28.60	PK
		35.20	54	12.90	100	190	18.80	AV
Note:	5785MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5825	124.30	-	0.40	100	190	-	PK
		115.00	-	0.40	100	190	-	AV
	11650	45.30	74	12.90	100	190	28.70	PK
		35.30	54	12.90	100	190	18.70	AV
Note:	5825MHz is fundamental signal.							

6: 5.8G band 802.11n20 (APEX0100 with 5dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5745	123.80	-	0.40	100	190	-	PK
		115.50	-	0.40	100	190	-	AV
	11490	46.30	74	12.90	100	190	27.70	PK
		37.40	54	12.90	100	190	16.60	AV
Note:	5745MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5785	124.00	-	0.40	100	190	-	PK
		115.90	-	0.40	100	190	-	AV
	11570	46.10	74	12.90	100	190	27.90	PK
		37.20	54	12.90	100	190	16.80	AV
Note:	5785MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5825	124.00	-	0.40	100	190	-	PK
		114.10	-	0.40	100	190	-	AV
	11650	46.10	74	12.90	100	190	27.90	PK
		36.90	54	12.90	100	190	17.10	AV
Note:	5825MHz is fundamental signal.							

7: 5.8G band 802.11n40 (APEX0100 with 5dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5755	122.40	-	0.40	100	190	-	PK
		113.50	-	0.40	100	190	-	AV
	11510	45.50	74	12.90	100	190	28.50	PK
		37.30	54	12.90	100	190	16.70	AV
Note:	5755MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5795	122.40	-	0.40	100	190	-	PK
		113.80	-	0.40	100	190	-	AV
	11590	45.30	74	12.90	100	190	28.70	PK
		36.80	54	12.90	100	190	17.20	AV
Note:	5795MHz is fundamental signal.							

8: 5.8G band 802.11ac80 (APEX0100 with 5dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5775	119.10	-	0.40	100	190	-	PK
		110.40	-	0.40	100	190	-	AV
	11550	45.10	74	12.90	100	190	28.90	PK
		36.40	54	12.90	100	190	17.60	AV
Note:	5775MHz is fundamental signal.							

Mode 2:

1: 2.4G band 802.11b (APEX0101 with 5dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	73.06	74	-7.80	100	190	0.94	PK
		51.44	54	-7.80	100	190	2.56	AV
	2412	124.50	-	-7.80	100	190	-	PK
		119.00	-	-7.80	100	190	-	AV
	4824	42.10	74	-2.10	100	190	31.90	PK
		31.80	54	-2.10	100	190	22.20	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	126.80	-	-7.80	100	190	-	PK
		119.60	-	-7.80	100	190	-	AV
	4874	42.10	74	-2.10	100	190	31.90	PK
		32.50	54	-2.10	100	190	21.50	AV
	7311	46.60	74	6.50	100	190	27.40	PK
		37.40	54	6.50	100	190	16.60	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	124.30	-	-7.80	100	190	-	PK
		118.50	-	-7.80	100	190	-	AV
	2483.5	72.91	74	-7.50	100	190	1.09	PK
		53.79	54	-7.50	100	190	0.21	AV
	4924	41.10	74	-2.10	100	190	32.90	PK
		31.80	54	-2.10	100	190	22.20	AV
	7386	45.50	74	6.50	100	190	28.50	PK
		36.50	54	6.50	100	190	17.50	AV
Note:	2462MHz is fundamental signal.							

2: 2.4G band 802.11g (APEX0101 with 5dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	73.17	74	-7.80	100	190	0.83	PK
		53.86	54	-7.80	100	190	0.14	AV
	2412	121.20	-	-7.80	100	190	-	PK
		113.70	-	-7.80	100	190	-	AV
	4824	41.30	74	-2.10	100	190	32.70	PK
		31.60	54	-2.10	100	190	22.40	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	125.20	-	-7.80	100	190	-	PK
		116.70	-	-7.80	100	190	-	AV
	4874	43.30	74	-2.10	100	190	30.70	PK
		34.50	54	-2.10	100	190	19.50	AV
	7311	48.10	74	6.50	100	190	25.90	PK
		39.30	54	6.50	100	190	14.70	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	121.60	-	-7.80	100	190	-	PK
		115.00	-	-7.80	100	190	-	AV
	2483.5	73.45	74	-7.50	100	190	0.55	PK
		53.75	54	-7.50	100	190	0.25	AV
	4924	42.20	74	-2.10	100	190	31.80	PK
		32.50	54	-2.10	100	190	21.50	AV
	7386	45.20	74	6.50	100	190	28.80	PK
		36.50	54	6.50	100	190	17.50	AV
Note:	2462MHz is fundamental signal.							

3: 2.4G band 802.11n20 (APEX0101 with 5dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	73.40	74	-7.80	100	190	0.60	PK
		52.60	54	-7.80	100	190	1.40	AV
	2412	120.30	-	-7.80	100	190	-	PK
		109.10	-	-7.80	100	190	-	AV
	4824	41.20	74	-2.10	100	190	32.80	PK
		32.60	54	-2.10	100	190	21.40	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	123.20	-	-7.80	100	190	-	PK
		115.70	-	-7.80	100	190	-	AV
	4874	45.50	74	-2.10	100	190	28.50	PK
		37.50	54	-2.10	100	190	16.50	AV
	7311	48.30	74	6.50	100	190	25.70	PK
		36.50	54	6.50	100	190	17.50	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	120.40	-	-7.80	100	190	-	PK
		111.10	-	-7.80	100	190	-	AV
	2483.5	73.28	74	-7.50	100	190	0.72	PK
		53.19	54	-7.50	100	190	0.81	AV
	4924	43.40	74	-2.10	100	190	30.60	PK
		34.60	54	-2.10	100	190	19.40	AV
	7386	45.40	74	6.50	100	190	28.60	PK
		36.20	54	6.50	100	190	17.80	AV
Note:	2462MHz is fundamental signal.							

4: 2.4G band 802.11n40 (APEX0101 with 5dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	72.56	74	-7.80	100	190	1.44	PK
		53.58	54	-7.80	100	190	0.42	AV
	2422	116.30	-	-7.80	100	190	-	PK
		109.30	-	-7.80	100	190	-	AV
	4844	41.40	74	-2.10	100	190	32.60	PK
		32.10	54	-2.10	100	190	21.90	AV
	7266	45.50	74	6.50	100	190	28.50	PK
		35.50	54	6.50	100	190	18.50	AV
Note:	2422MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	119.20	-	-7.80	100	190	-	PK
		111.70	-	-7.80	100	190	-	AV
	4874	43.70	74	-2.10	100	190	30.30	PK
		33.20	54	-2.10	100	190	20.80	AV
	7311	46.50	74	6.50	100	190	27.50	PK
		35.70	54	6.50	100	190	18.30	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2452	116.40	-	-7.80	100	190	-	PK
		108.40	-	-7.80	100	190	-	AV
	2483.5	73.71	74	-7.50	100	190	0.29	PK
		53.83	54	-7.50	100	190	0.17	AV
	4904	43.30	74	-2.10	100	190	30.70	PK
		33.10	54	-2.10	100	190	20.90	AV
	7386	46.30	74	6.50	100	190	27.70	PK
		35.20	54	6.50	100	190	18.80	AV
Note:	2452MHz is fundamental signal.							

5: 5.8G band 802.11a (APEX0101 with 5dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5745	120.20	-	0.40	100	190	-	PK
		113.70	-	0.40	100	190	-	AV
	11490	45.30	74	12.90	100	190	28.70	PK
		35.80	54	12.90	100	190	18.20	AV
Note:	5745MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5785	119.80	-	0.40	100	190	-	PK
		112.10	-	0.40	100	190	-	AV
	11570	45.50	74	12.90	100	190	28.50	PK
		35.50	54	12.90	100	190	18.50	AV
Note:	5785MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5825	120.30	-	0.40	100	190	-	PK
		112.20	-	0.40	100	190	-	AV
	11650	45.10	74	12.90	100	190	28.90	PK
		35.80	54	12.90	100	190	18.20	AV
Note:	5825MHz is fundamental signal.							

6: 5.8G band 802.11n20 (APEX0101 with 5dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5745	121.20	-	0.40	100	190	-	PK
		113.50	-	0.40	100	190	-	AV
	11490	44.70	74	12.90	100	190	29.30	PK
		37.50	54	12.90	100	190	16.50	AV
Note:	5745MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5785	119.00	-	0.40	100	190	-	PK
		112.30	-	0.40	100	190	-	AV
	11570	45.80	74	12.90	100	190	28.20	PK
		36.20	54	12.90	100	190	17.80	AV
Note:	5785MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5825	121.10	-	0.40	100	190	-	PK
		112.10	-	0.40	100	190	-	AV
	11650	45.10	74	12.90	100	190	28.90	PK
		35.90	54	12.90	100	190	18.10	AV
Note:	5825MHz is fundamental signal.							

7: 5.8G band 802.11n40 (APEX0100 with 5dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5755	118.90	-	0.40	100	190	-	PK
		111.50	-	0.40	100	190	-	AV
	11510	45.50	74	12.90	100	190	28.50	PK
		37.30	54	12.90	100	190	16.70	AV
Note:	5755MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5795	118.70	-	0.40	100	190	-	PK
		110.80	-	0.40	100	190	-	AV
	11590	45.40	74	12.90	100	190	28.60	PK
		36.90	54	12.90	100	190	17.10	AV
Note:	5795MHz is fundamental signal.							

8: 5.8G band 802.11ac80 (APEX0100 with 5dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5775	116.70	-	0.40	100	190	-	PK
		108.40	-	0.40	100	190	-	AV
	11550	45.10	74	12.90	100	190	28.90	PK
		36.30	54	12.90	100	190	17.70	AV
Note:	5775MHz is fundamental signal.							

Mode 3:

1: 2.4G band 802.11b (APEX0101 with 14dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	63.03	74	-7.80	100	190	10.97	PK
		48.80	54	-7.80	100	190	5.20	AV
	2412	120.50	-	-7.80	100	190	-	PK
		111.00	-	-7.80	100	190	-	AV
	4824	42.20	74	-2.10	100	190	31.80	PK
		31.40	54	-2.10	100	190	22.60	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	124.30	-	-7.80	100	190	-	PK
		115.70	-	-7.80	100	190	-	AV
	4874	43.10	74	-2.10	100	190	30.90	PK
		33.50	54	-2.10	100	190	20.50	AV
	7311	46.50	74	6.50	100	190	27.50	PK
		37.60	54	6.50	100	190	16.40	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	120.30	-	-7.80	100	190	-	PK
		113.50	-	-7.80	100	190	-	AV
	2483.5	63.96	74	-7.50	100	190	10.04	PK
		50.08	54	-7.50	100	190	3.92	AV
	4924	42.10	74	-2.10	100	190	31.90	PK
		33.80	54	-2.10	100	190	20.20	AV
	7386	46.50	74	6.50	100	190	27.50	PK
		37.50	54	6.50	100	190	16.50	AV
Note:	2462MHz is fundamental signal.							

2: 2.4G band 802.11g (APEX0101 with 14dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	62.71	74	-7.80	100	190	11.29	PK
		49.16	54	-7.80	100	190	4.84	AV
	2412	118.20	-	-7.80	100	190	-	PK
		108.70	-	-7.80	100	190	-	AV
	4824	43.30	74	-2.10	100	190	30.70	PK
		32.60	54	-2.10	100	190	21.40	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	122.30	-	-7.80	100	190	-	PK
		113.70	-	-7.80	100	190	-	AV
	4874	43.60	74	-2.10	100	190	30.40	PK
		33.50	54	-2.10	100	190	20.50	AV
	7311	47.10	74	6.50	100	190	26.90	PK
		36.30	54	6.50	100	190	17.70	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	118.20	-	-7.80	100	190	-	PK
		111.50	-	-7.80	100	190	-	AV
	2483.5	64.62	74	-7.50	100	190	9.38	PK
		51.10	54	-7.50	100	190	2.90	AV
	4924	43.20	74	-2.10	100	190	30.80	PK
		31.50	54	-2.10	100	190	20.50	AV
	7386	46.20	74	6.50	100	190	27.80	PK
		36.80	54	6.50	100	190	17.20	AV
Note:	2462MHz is fundamental signal.							

3: 2.4G band 802.11n20 (APEX0101 with 14dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	63.62	74	-7.80	100	190	10.38	PK
		49.10	54	-7.80	100	190	4.90	AV
	2412	117.40	-	-7.80	100	190	-	PK
		108.30	-	-7.80	100	190	-	AV
	4824	42.20	74	-2.10	100	190	31.80	PK
		31.60	54	-2.10	100	190	20.40	AV
Note:	2412MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	119.90	-	-7.80	100	190	-	PK
		108.70	-	-7.80	100	190	-	AV
	4874	44.50	74	-2.10	100	190	29.50	PK
		36.50	54	-2.10	100	190	17.50	AV
	7311	47.30	74	6.50	100	190	26.70	PK
		35.50	54	6.50	100	190	18.50	AV
Note:	2437MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2462	116.60	-	-7.80	100	190	-	PK
		104.50	-	-7.80	100	190	-	AV
	2483.5	64.59	74	-7.50	100	190	9.41	PK
		50.92	54	-7.50	100	190	3.08	AV
	4924	44.40	74	-2.10	100	190	29.60	PK
		33.60	54	-2.10	100	190	20.40	AV
	7386	46.40	74	6.50	100	190	27.60	PK
		36.60	54	6.50	100	190	17.40	AV
Note:	2462MHz is fundamental signal.							

4: 2.4G band 802.11n40 (APEX0101 with 14dBi gain antenna for 2.4GHz band)

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2390	69.16	74	-7.80	100	190	4.84	PK
		49.16	54	-7.80	100	190	4.84	AV
	2422	114.20	-	-7.80	100	190	-	PK
		103.30	-	-7.80	100	190	-	AV
	4844	43.40	74	-2.10	100	190	30.60	PK
		31.10	54	-2.10	100	190	20.90	AV
	7266	45.30	74	6.50	100	190	28.70	PK
		35.70	54	6.50	100	190	18.30	AV
Note:	2422MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2437	117.40	-	-7.80	100	190	-	PK
		106.20	-	-7.80	100	190	-	AV
	4874	44.70	74	-2.10	100	190	29.30	PK
		33.50	54	-2.10	100	190	20.50	AV
	7311	47.50	74	6.50	100	190	26.50	PK
		36.70	54	6.50	100	190	17.30	AV
Note:	2437MHz							

Polarity	Frequency (MHz)	Measured level (dBuV/m)	Limit (dBuV/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	2452	113.80	-	-7.80	100	190	-	PK
		102.90	-	-7.80	100	190	-	AV
	2483.5	66.15	74	-7.50	100	190	7.85	PK
		48.82	54	-7.50	100	190	5.18	AV
	4904	43.50	74	-2.10	100	190	30.50	PK
		33.30	54	-2.10	100	190	20.70	AV
	7386	46.70	74	6.50	100	190	27.30	PK
		35.30	54	6.50	100	190	18.70	AV
Note:	2452MHz is fundamental signal.							

5: 5.8G band 802.11a (APEX0101 with 14dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5745	118.80	-	0.40	100	190	-	PK
		111.70	-	0.40	100	190	-	AV
	11490	45.30	74	12.90	100	190	28.70	PK
		35.50	54	12.90	100	190	18.50	AV
Note:	5745MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5785	117.60	-	0.40	100	190	-	PK
		111.20	-	0.40	100	190	-	AV
	11570	45.30	74	12.90	100	190	28.70	PK
		35.50	54	12.90	100	190	18.50	AV
Note:	5785MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5825	117.70	-	0.40	100	190	-	PK
		111.50	-	0.40	100	190	-	AV
	11650	46.10	74	12.90	100	190	27.90	PK
		36.80	54	12.90	100	190	17.20	AV
Note:	5825MHz is fundamental signal.							

6: 5.8G band 802.11n20 (APEX0101 with 14dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5745	118.70	-	0.40	100	190	-	PK
		110.50	-	0.40	100	190	-	AV
	11490	45.70	74	12.90	100	190	28.30	PK
		36.50	54	12.90	100	190	17.50	AV
Note:	5745MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5785	119.20	-	0.40	100	190	-	PK
		113.20	-	0.40	100	190	-	AV
	11570	45.70	74	12.90	100	190	28.30	PK
		36.40	54	12.90	100	190	17.60	AV
Note:	5785MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5825	118.90	-	0.40	100	190	-	PK
		109.10	-	0.40	100	190	-	AV
	11650	45.30	74	12.90	100	190	28.70	PK
		36.90	54	12.90	100	190	17.10	AV
Note:	5825MHz is fundamental signal.							

7: 5.8G band 802.11n40 (APEX0100 with 14dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5755	116.50	-	0.40	100	190	-	PK
		107.50	-	0.40	100	190	-	AV
	11510	46.50	74	12.90	100	190	27.50	PK
		36.30	54	12.90	100	190	17.70	AV
Note:	5755MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5795	115.70	-	0.40	100	190	-	PK
		106.80	-	0.40	100	190	-	AV
	11590	44.70	74	12.90	100	190	29.30	PK
		36.70	54	12.90	100	190	17.30	AV
Note:	5795MHz is fundamental signal.							

8: 5.8G band 802.11ac80 (APEX0100 with 14dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5775	114.60	-	0.40	100	190	-	PK
		103.40	-	0.40	100	190	-	AV
	11550	46.10	74	12.90	100	190	27.90	PK
		36.50	54	12.90	100	190	17.50	AV
Note:	5775MHz is fundamental signal.							

Mode 4:

1: 5.8G band 802.11a (APEX0101 with 10dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5745	117.80	-	0.40	100	190	-	PK
		110.70	-	0.40	100	190	-	AV
	11490	45.20	74	12.90	100	190	28.80	PK
		35.60	54	12.90	100	190	18.40	AV
Note:	5745MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5785	118.60	-	0.40	100	190	-	PK
		112.30	-	0.40	100	190	-	AV
	11570	45.40	74	12.90	100	190	28.60	PK
		35.50	54	12.90	100	190	18.50	AV
Note:	5785MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5825	116.70	-	0.40	100	190	-	PK
		110.50	-	0.40	100	190	-	AV
	11650	46.20	74	12.90	100	190	27.80	PK
		36.20	54	12.90	100	190	17.80	AV
Note:	5825MHz is fundamental signal.							

2: 5.8G band 802.11n20 (APEX0101 with 10dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5745	118.50	-	0.40	100	190	-	PK
		112.50	-	0.40	100	190	-	AV
	11490	45.30	74	12.90	100	190	28.70	PK
		35.50	54	12.90	100	190	18.50	AV
Note:	5745MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5785	117.20	-	0.40	100	190	-	PK
		112.20	-	0.40	100	190	-	AV
	11570	45.40	74	12.90	100	190	28.60	PK
		35.40	54	12.90	100	190	18.60	AV
Note:	5785MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5825	117.90	-	0.40	100	190	-	PK
		109.70	-	0.40	100	190	-	AV
	11650	45.40	74	12.90	100	190	28.60	PK
		35.90	54	12.90	100	190	18.10	AV
Note:	5825MHz is fundamental signal.							

3: 5.8G band 802.11n40 (APEX0100 with 10dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5755	115.50	-	0.40	100	190	-	PK
		106.50	-	0.40	100	190	-	AV
	11510	46.40	74	12.90	100	190	27.60	PK
		36.10	54	12.90	100	190	17.90	AV
Note:	5755MHz is fundamental signal.							

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5795	115.80	-	0.40	100	190	-	PK
		106.50	-	0.40	100	190	-	AV
	11590	44.90	74	12.90	100	190	29.10	PK
		36.20	54	12.90	100	190	17.80	AV
Note:	5795MHz is fundamental signal.							

4: 5.8G band 802.11ac80 (APEX0100 with 10dBi gain antenna for 5.8GHz band)

Polarity	Frequency (MHz)	Measured level (dBuv/m)	Limit (dBuv/m)	Factor (dB)	Antenna (cm)	Turn table (deg)	Margin (dB)	Remark
Ver/Hor	5775	113.60	-	0.40	100	190	-	PK
		104.40	-	0.40	100	190	-	AV
	11550	46.30	74	12.90	100	190	27.70	PK
		36.10	54	12.90	100	190	17.90	AV
Note:	5775MHz is fundamental signal.							

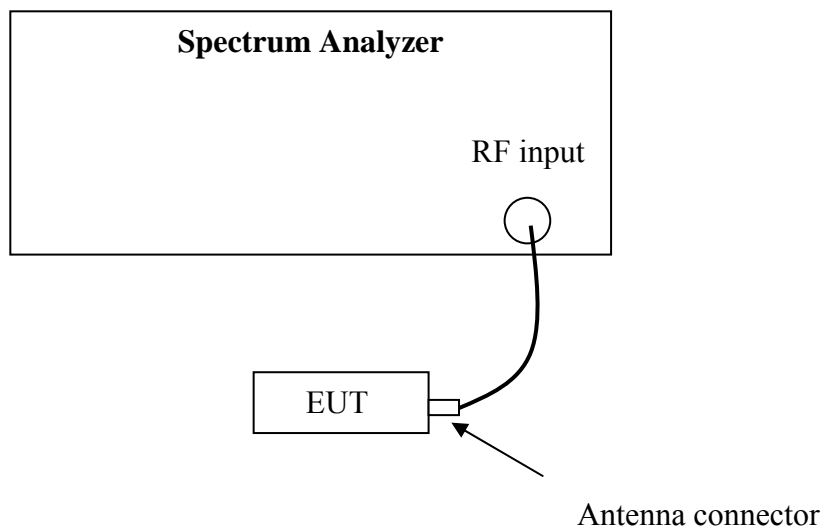
9. Occupied Bandwidth

Test Status: Tested

9.1 Test limit

None

9.2 Test Configuration



9.3 Test procedure and test setup

The occupied 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.

9.4 Test protocol

Temperature: 22 °C

Relative Humidity: 43 %

Test Mode	Frequency (MHz)	99% OBW (MHz)		
		Port0	Port 1	Port 2
802.11b	2412	11.82	11.82	11.82
	2437	12.24	12.18	11.94
	2462	11.82	11.70	11.64
802.11g	2412	16.98	16.92	16.98
	2437	17.16	17.10	17.04
	2462	16.98	16.92	16.98
802.11n20	2412	18.00	17.88	17.88
	2437	18.12	18.06	17.94
	2462	18.00	17.88	17.88
802.11n40	2422	36.60	36.80	36.60
	2437	36.80	36.80	36.60
	2452	36.40	36.80	36.80

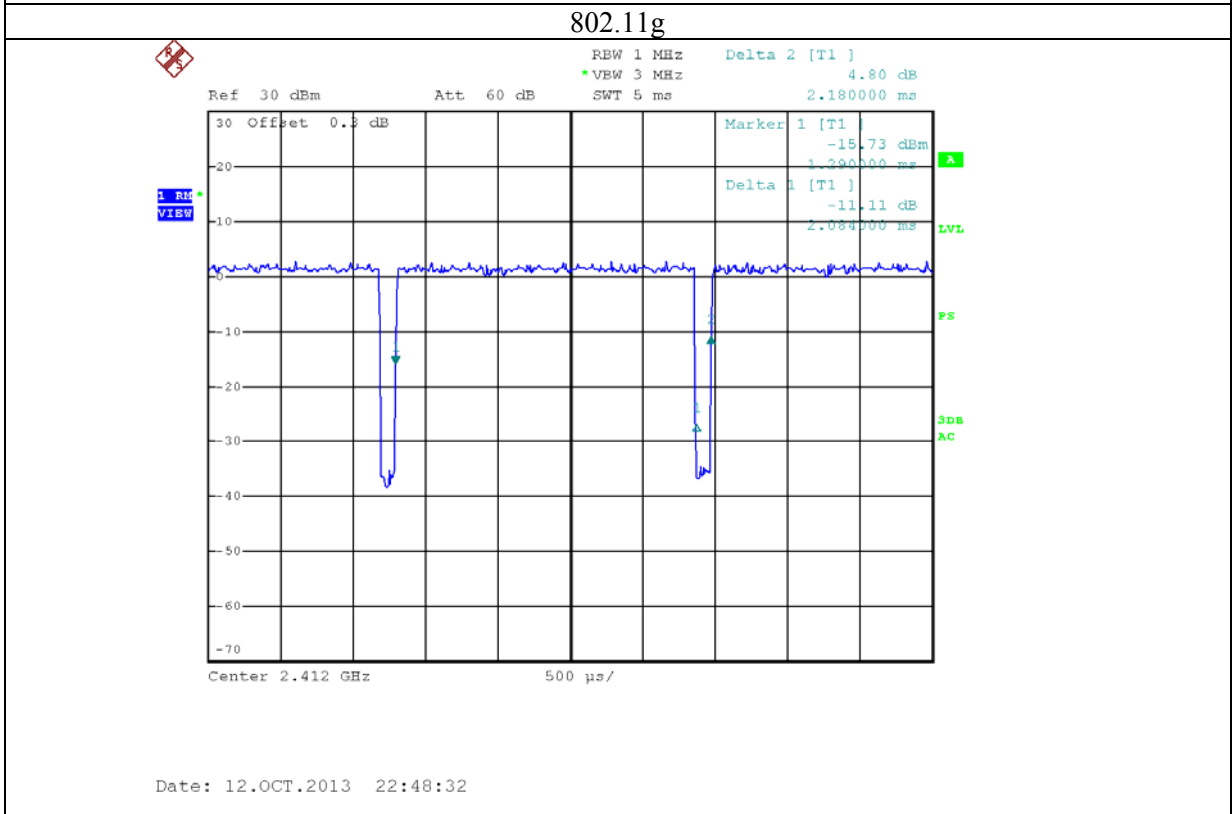
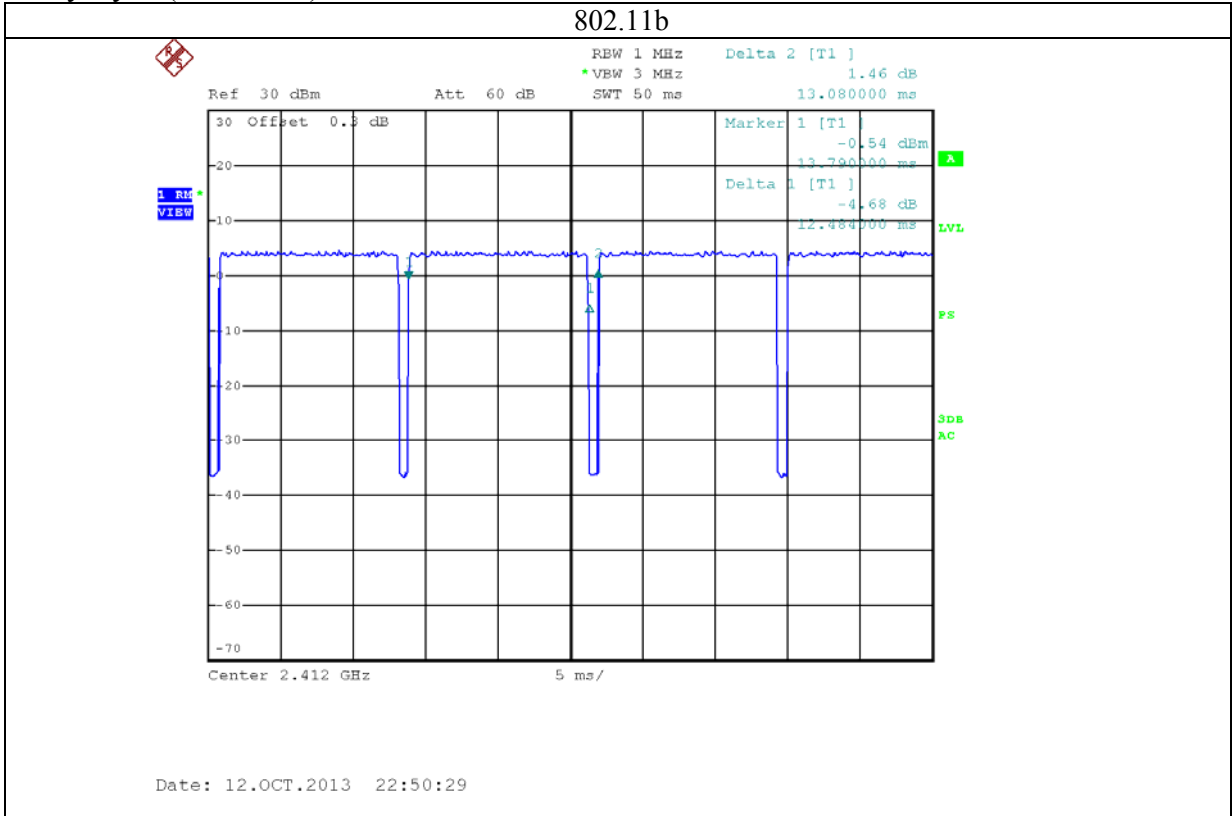
Test Mode	Frequency (MHz)	99% OBW (MHz)		
		Port0	Port 1	Port 2
802.11a	5745	17.10	17.16	17.16
	5785	17.10	17.16	17.16
	5825	17.10	17.16	17.22
802.11n20	5745	18.12	17.88	17.94
	5785	18.12	17.88	17.94
	5825	18.12	17.88	17.94
802.11n40	5755	37.20	37.00	37.00
	5795	37.20	37.20	36.80
802.11ac80	5775	76.00	76.20	76.00

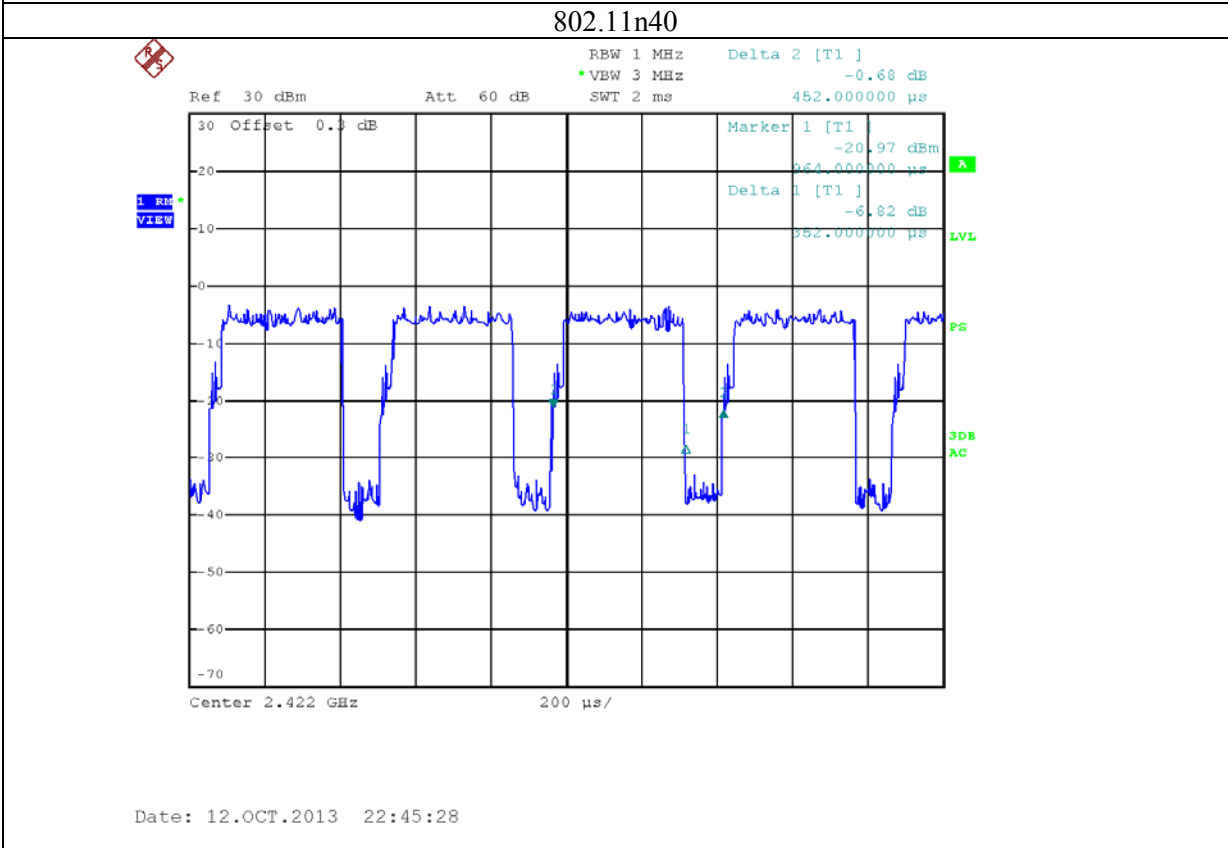
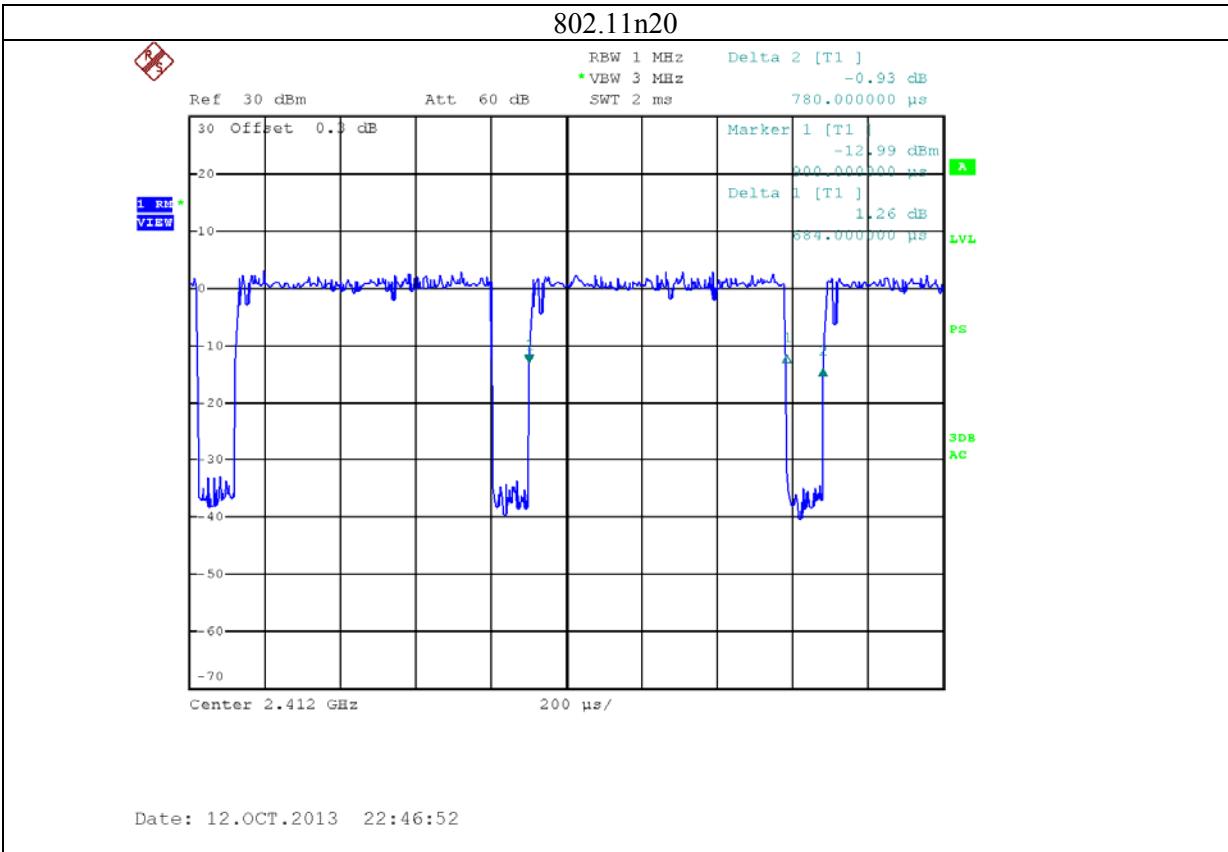
Note: Please see the test plots in Annex A.

Annex A: Test plots 1

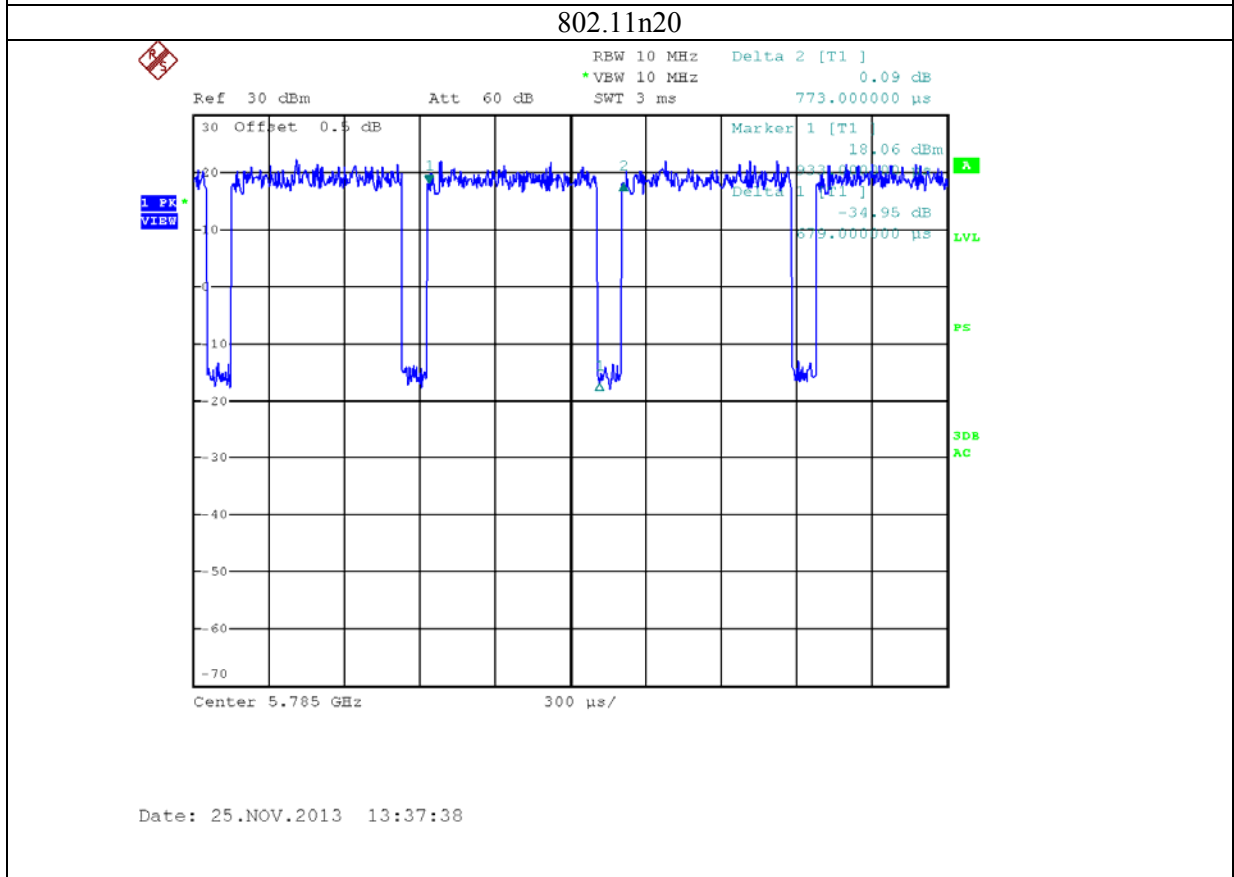
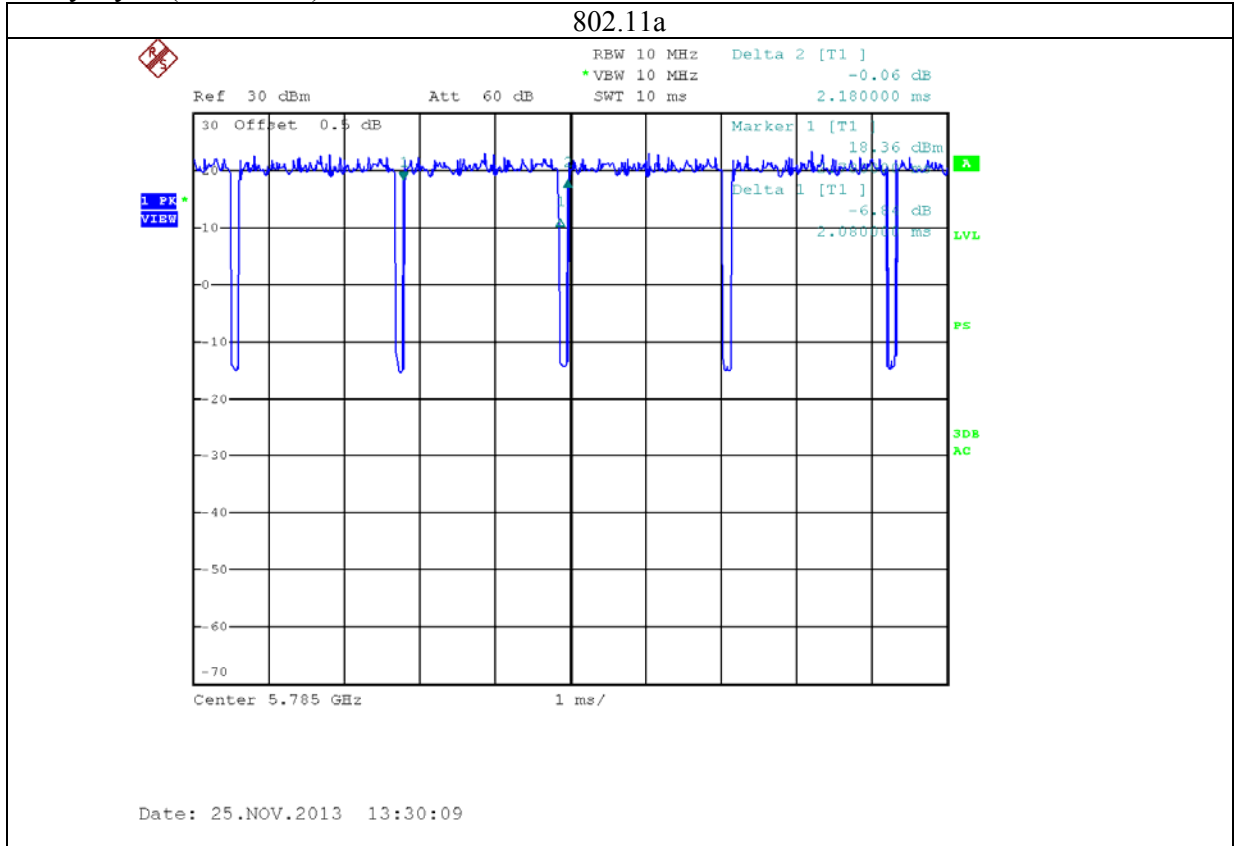
A.1: Duty cycle

Duty Cycle(2.4G band):

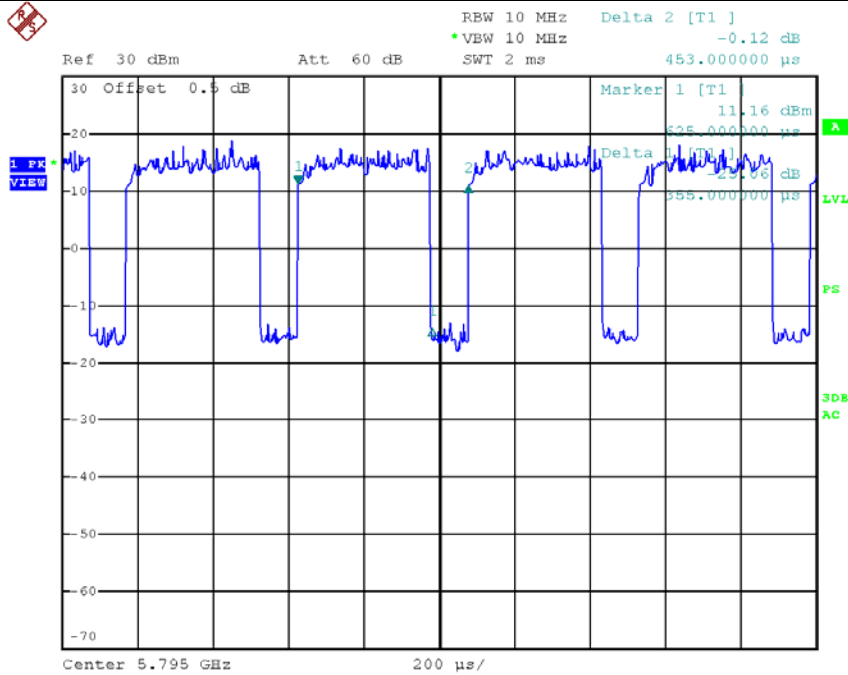




Duty Cycle(5.8G band):

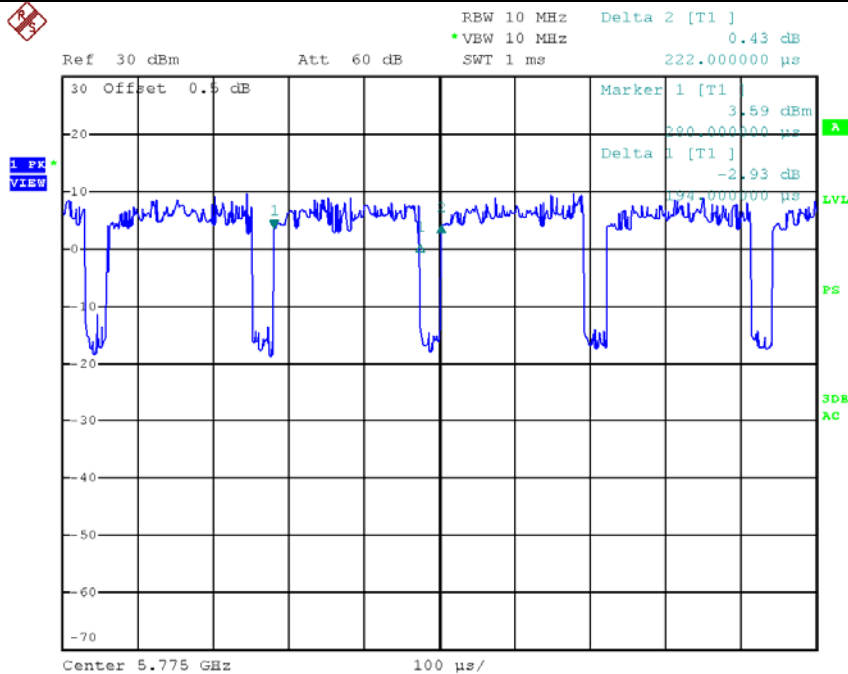


802.11n40



Date: 25.NOV.2013 13:41:50

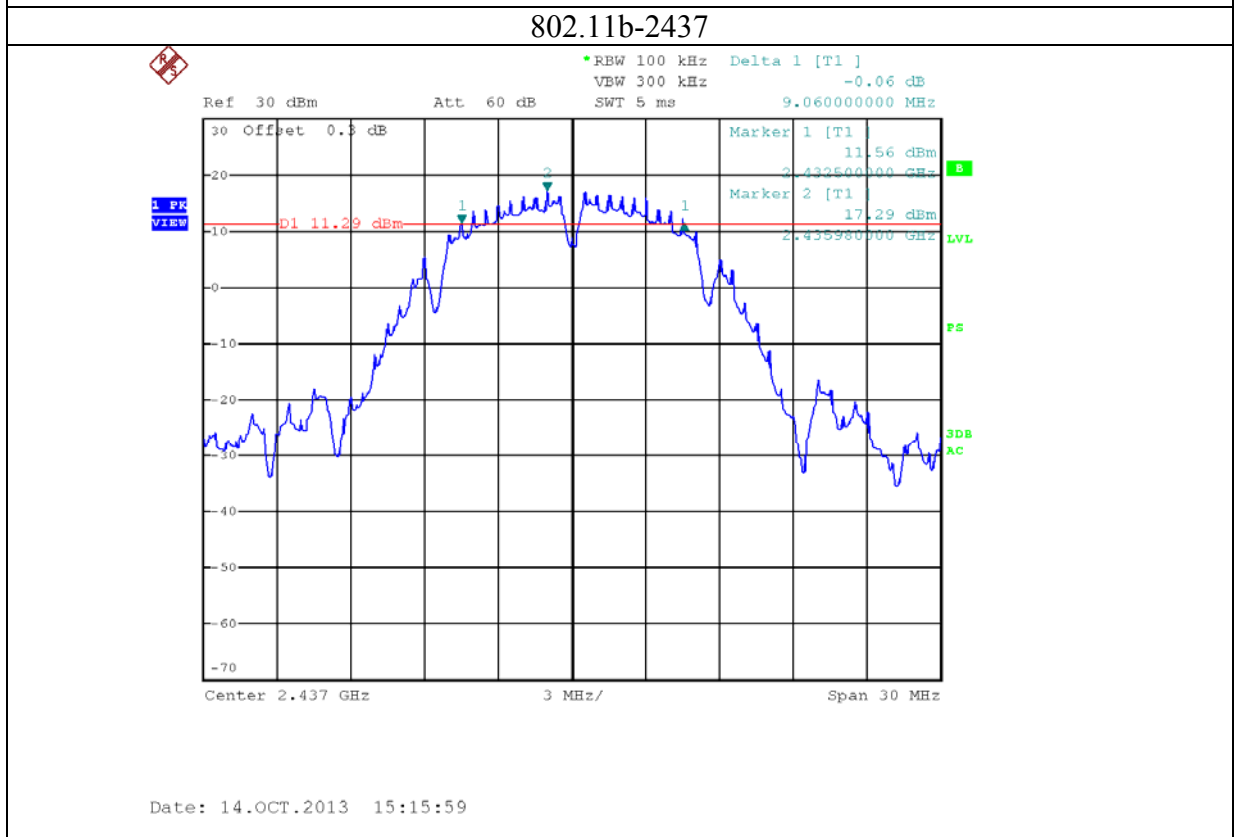
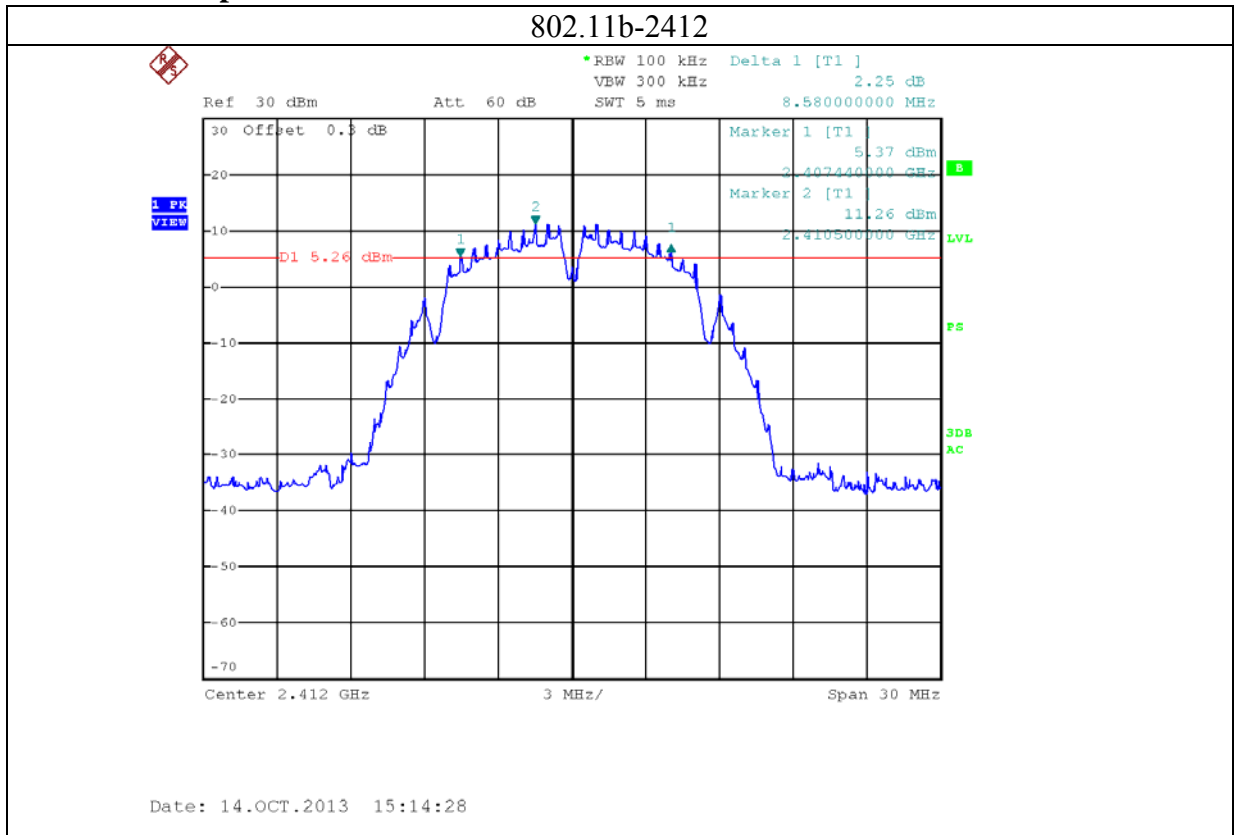
802.11ac80

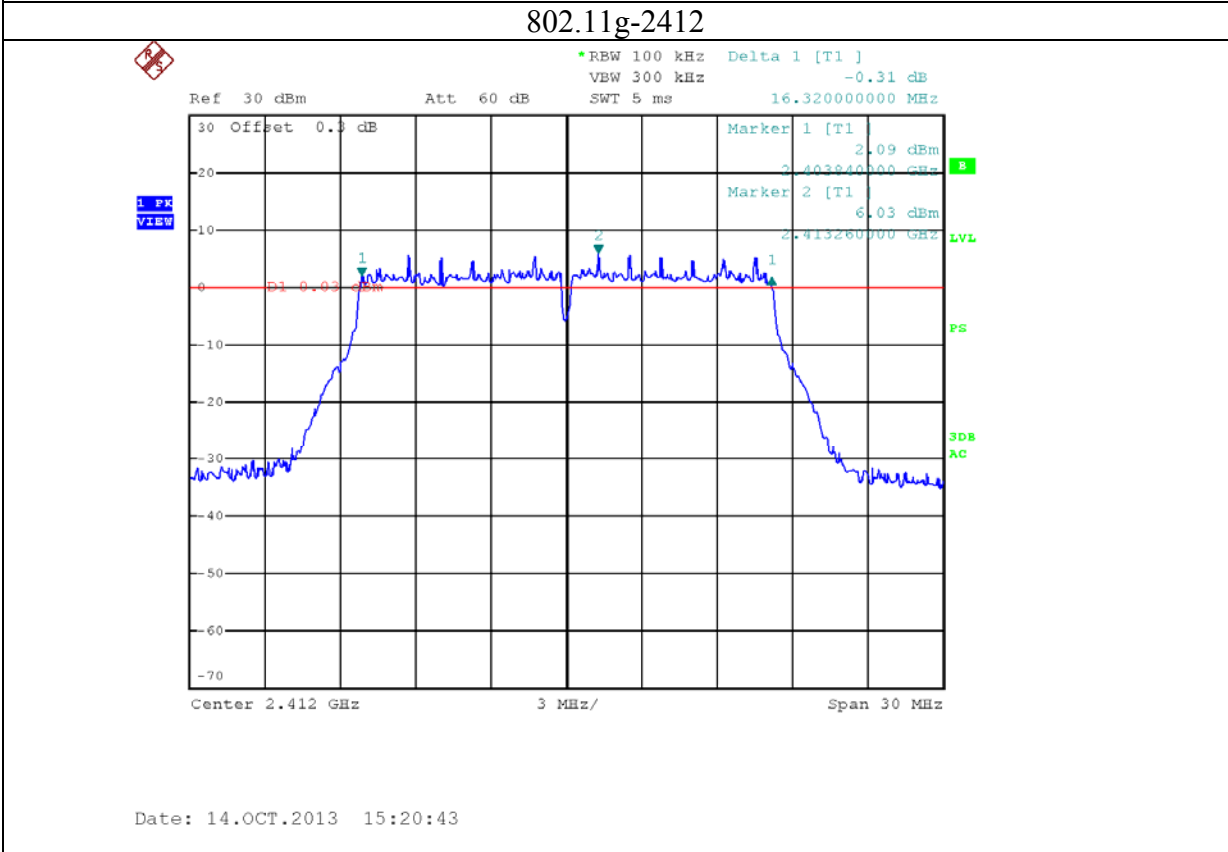
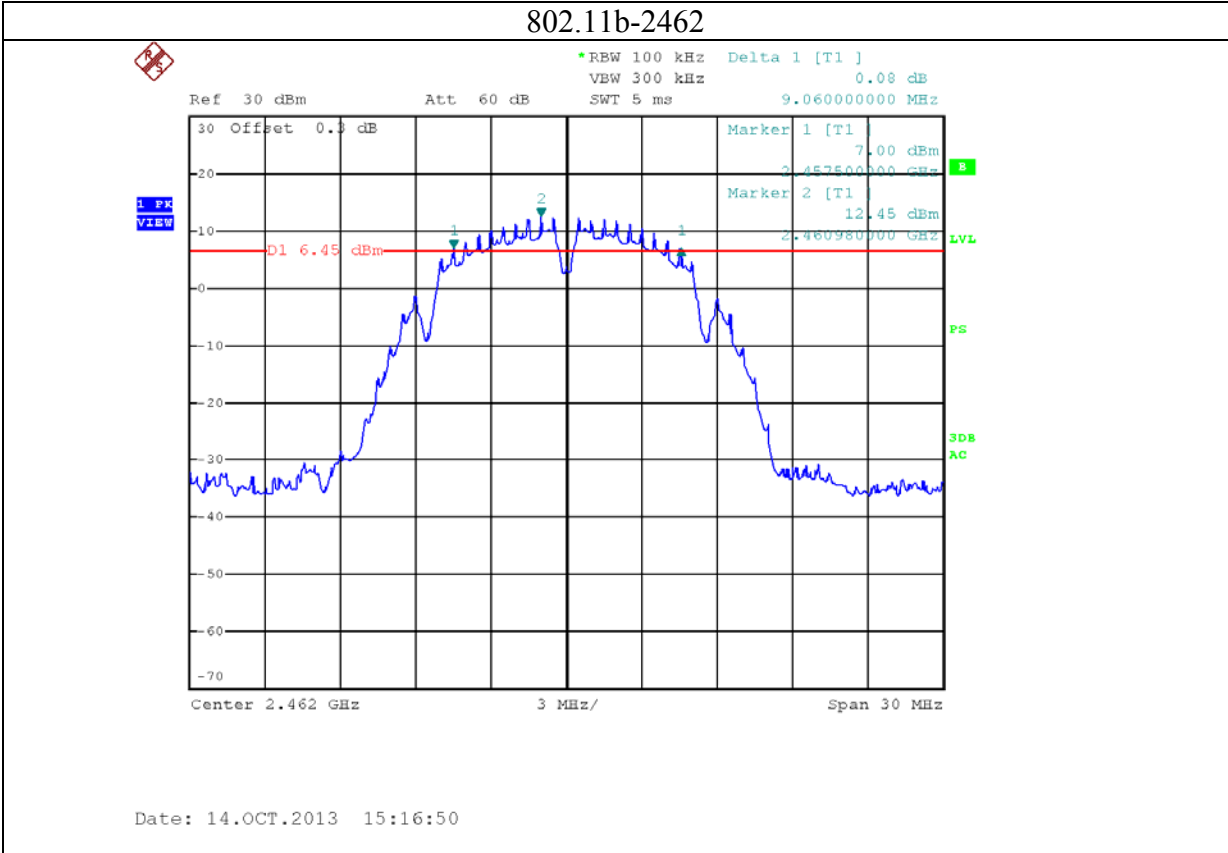


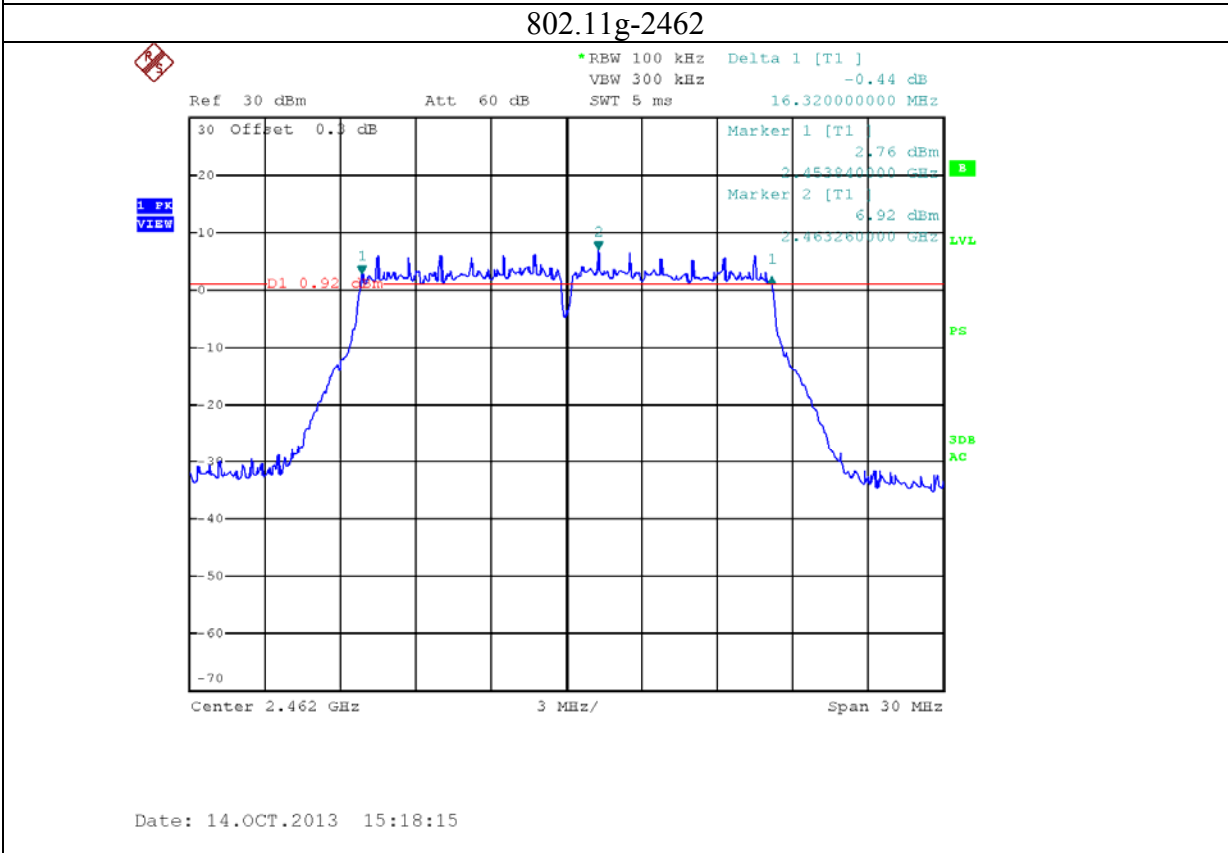
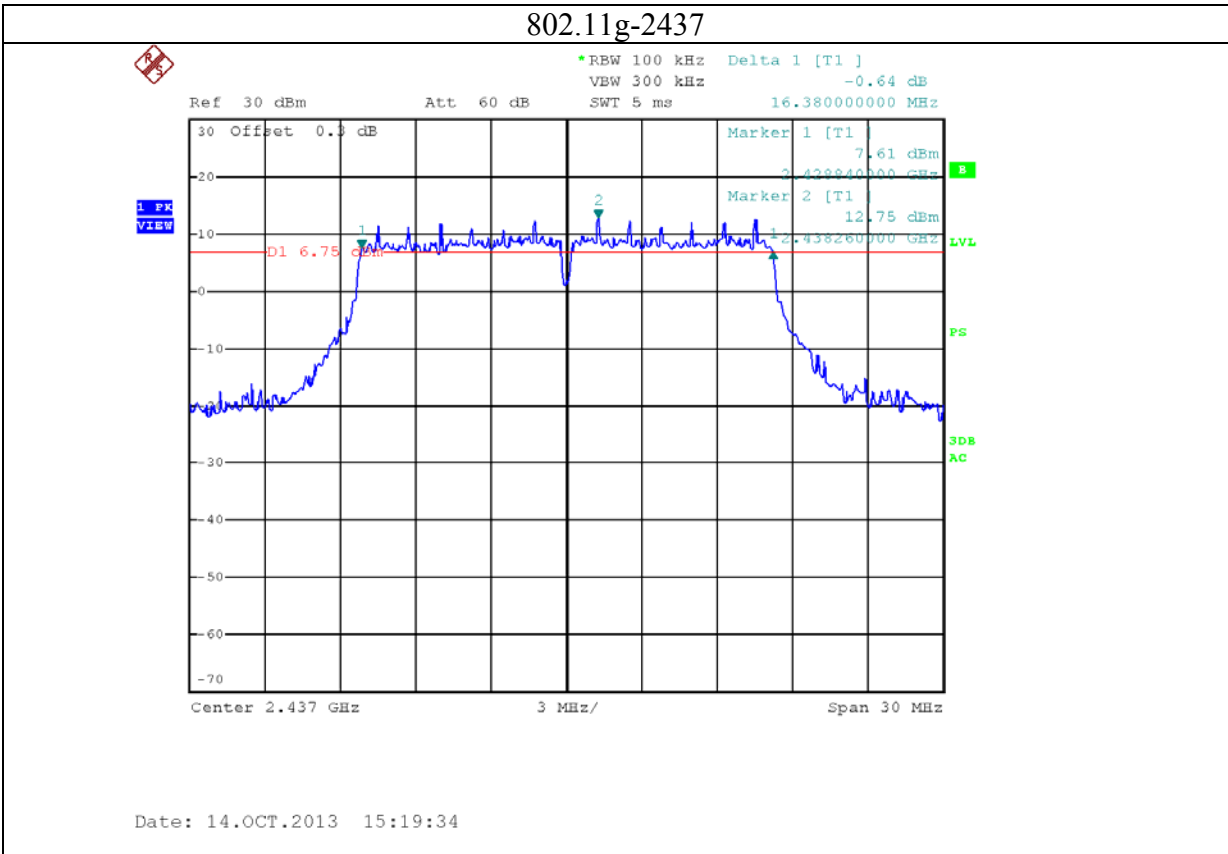
Date: 25.NOV.2013 13:48:57

A.2: Minimum 6dB Bandwidth

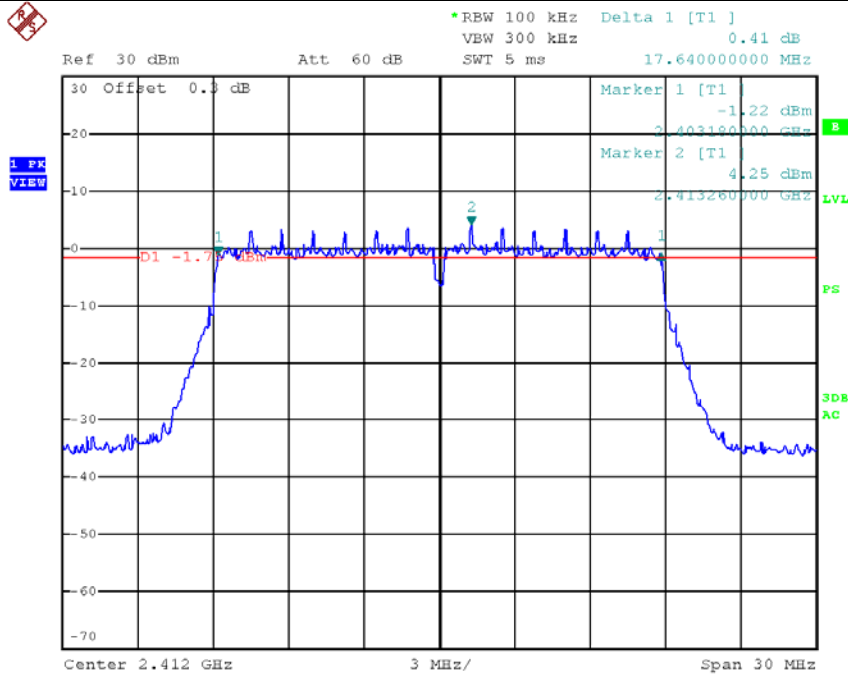
1: 2.4G band port 0





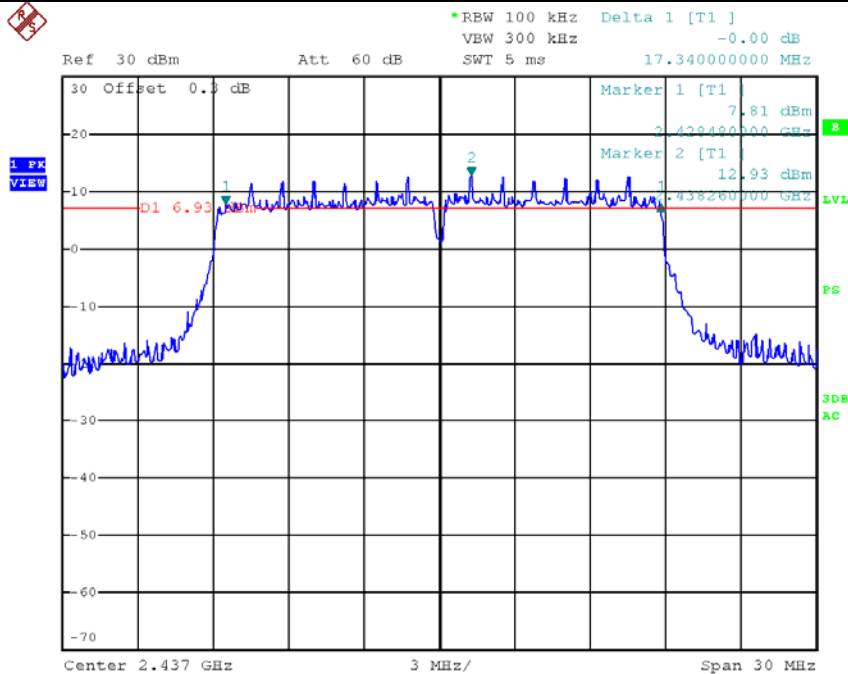


802.11n20-2412



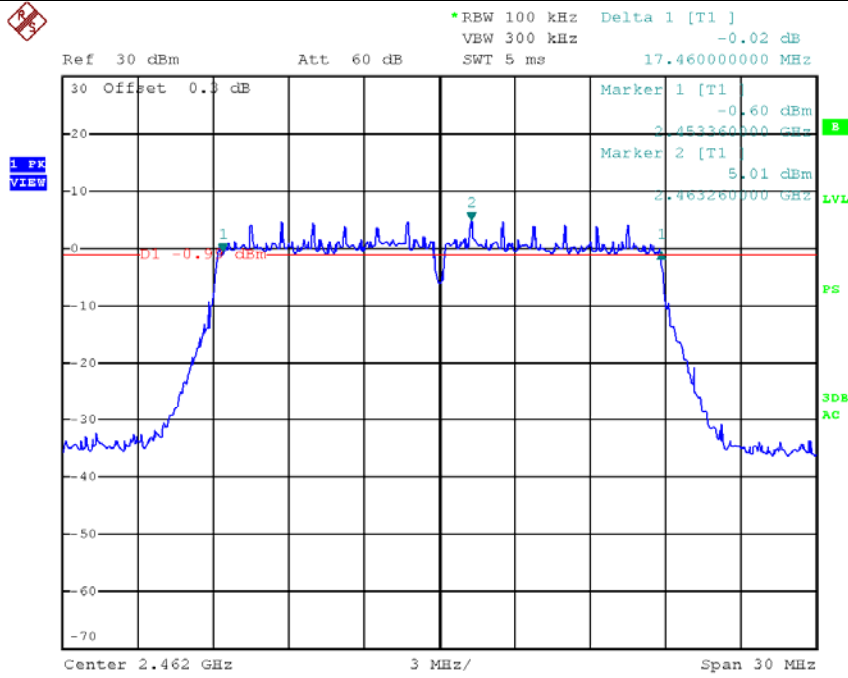
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802.11n20-2437



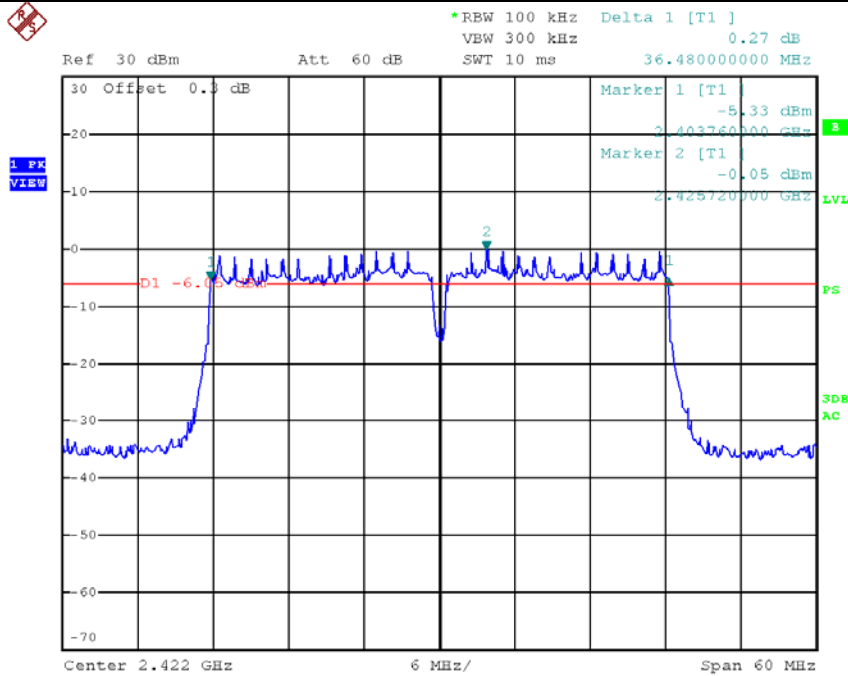
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802.11n20-2462



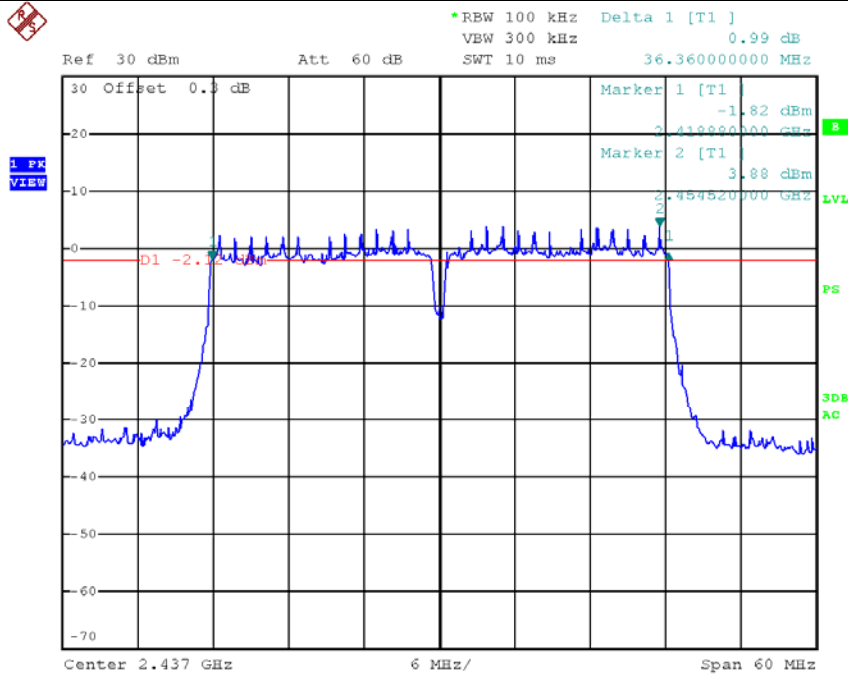
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802.11n40-2422



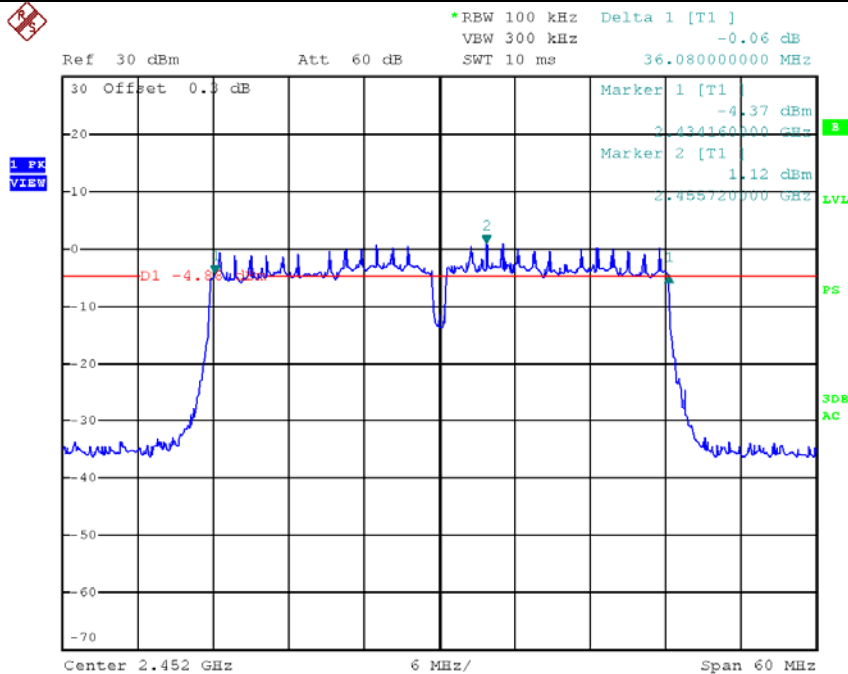
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802.11n40-2437



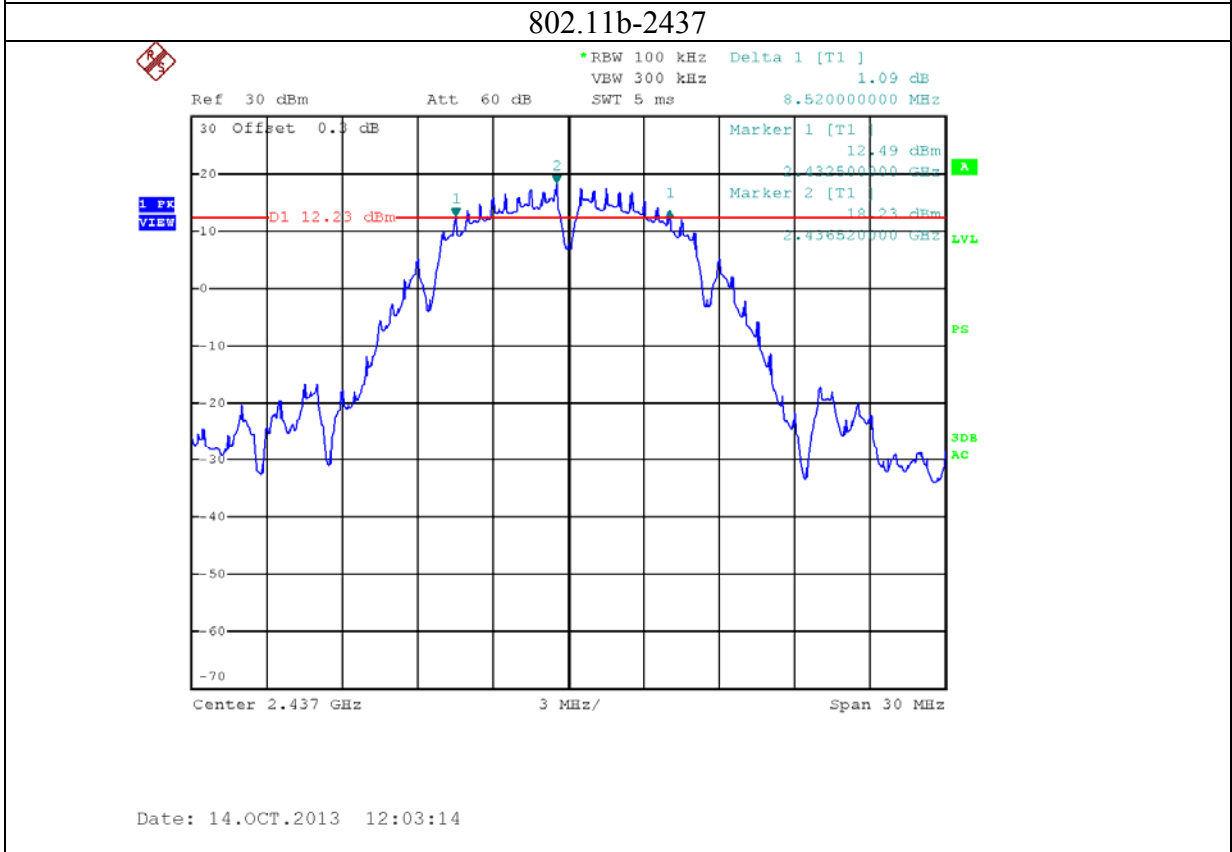
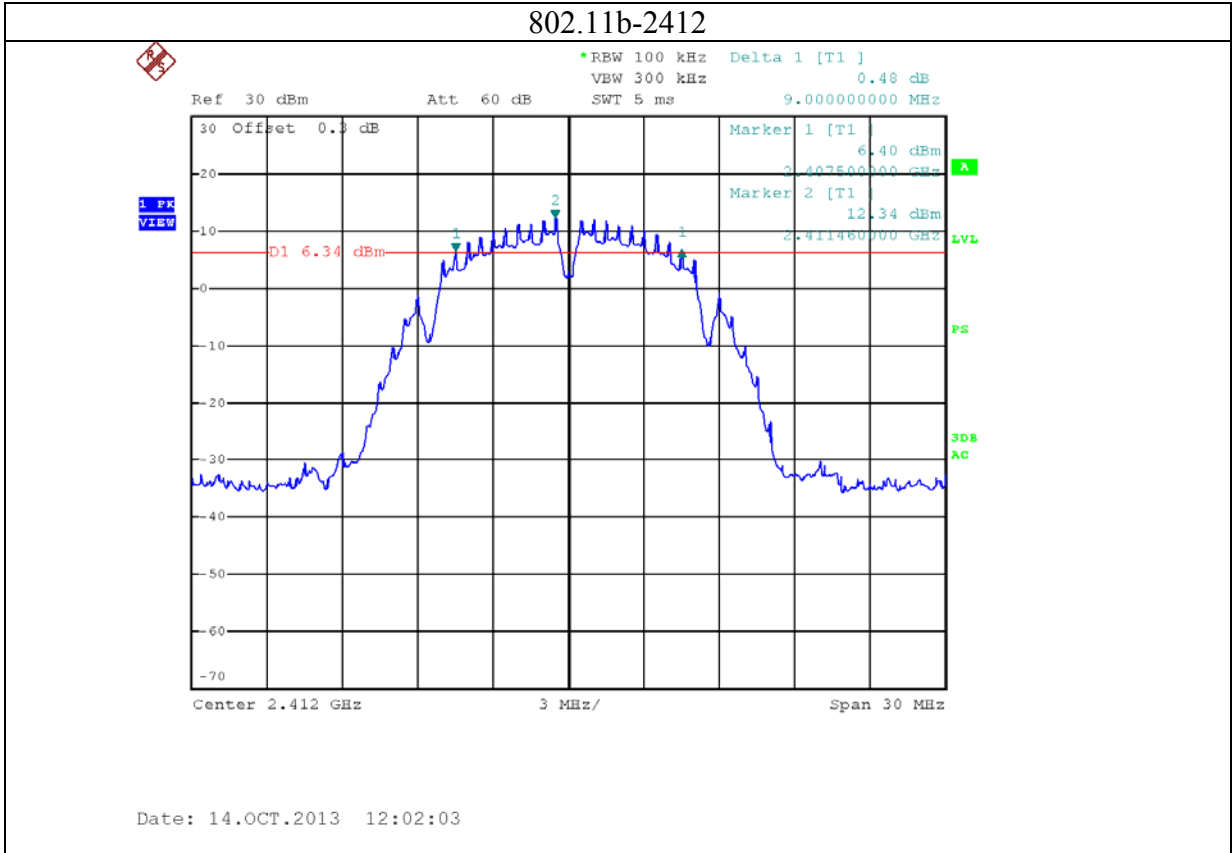
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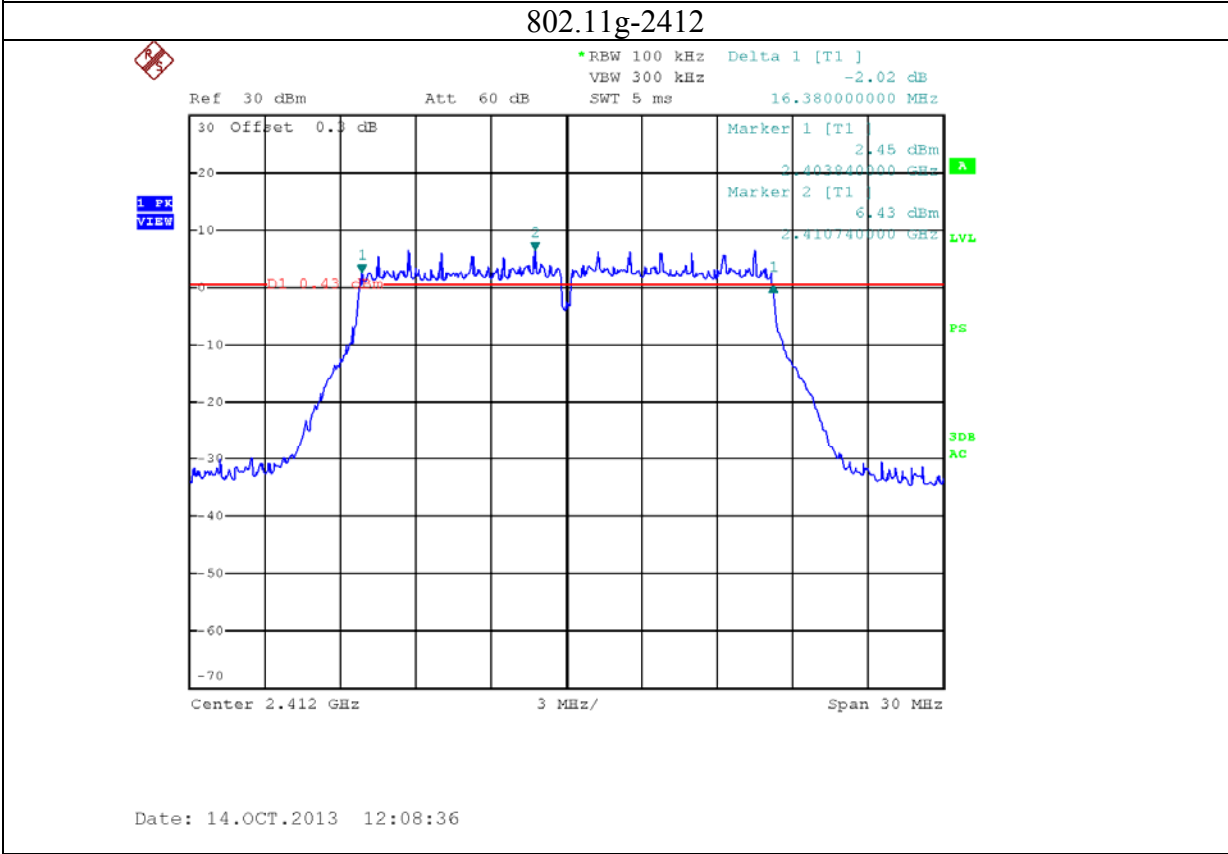
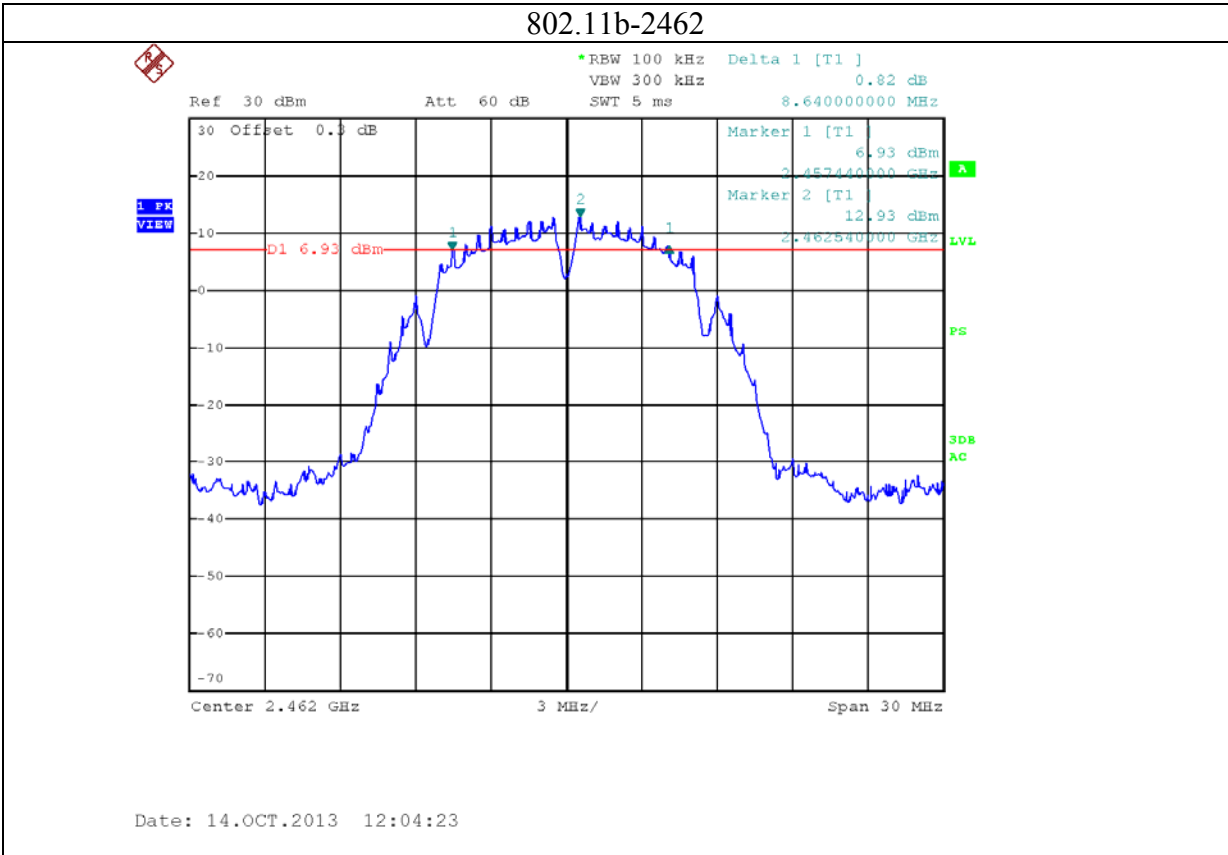
802.11n40-2452

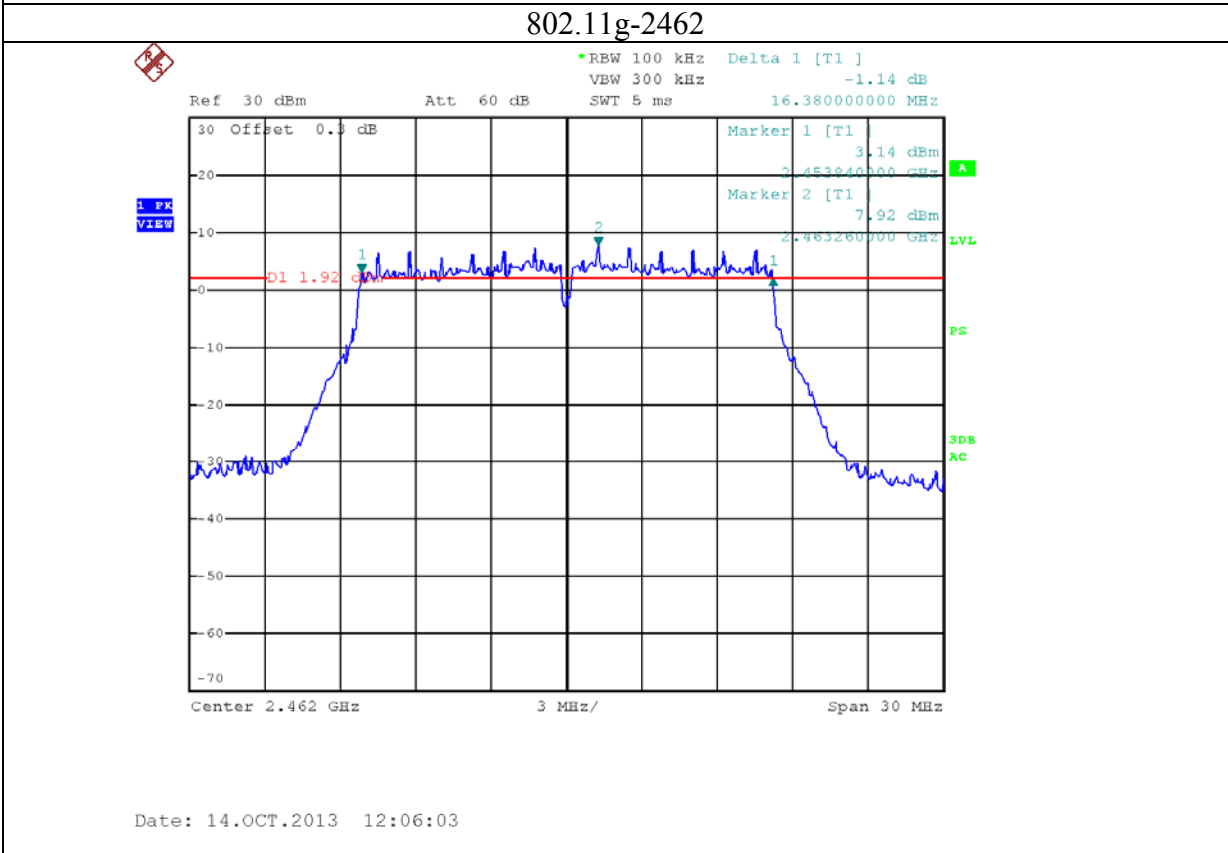
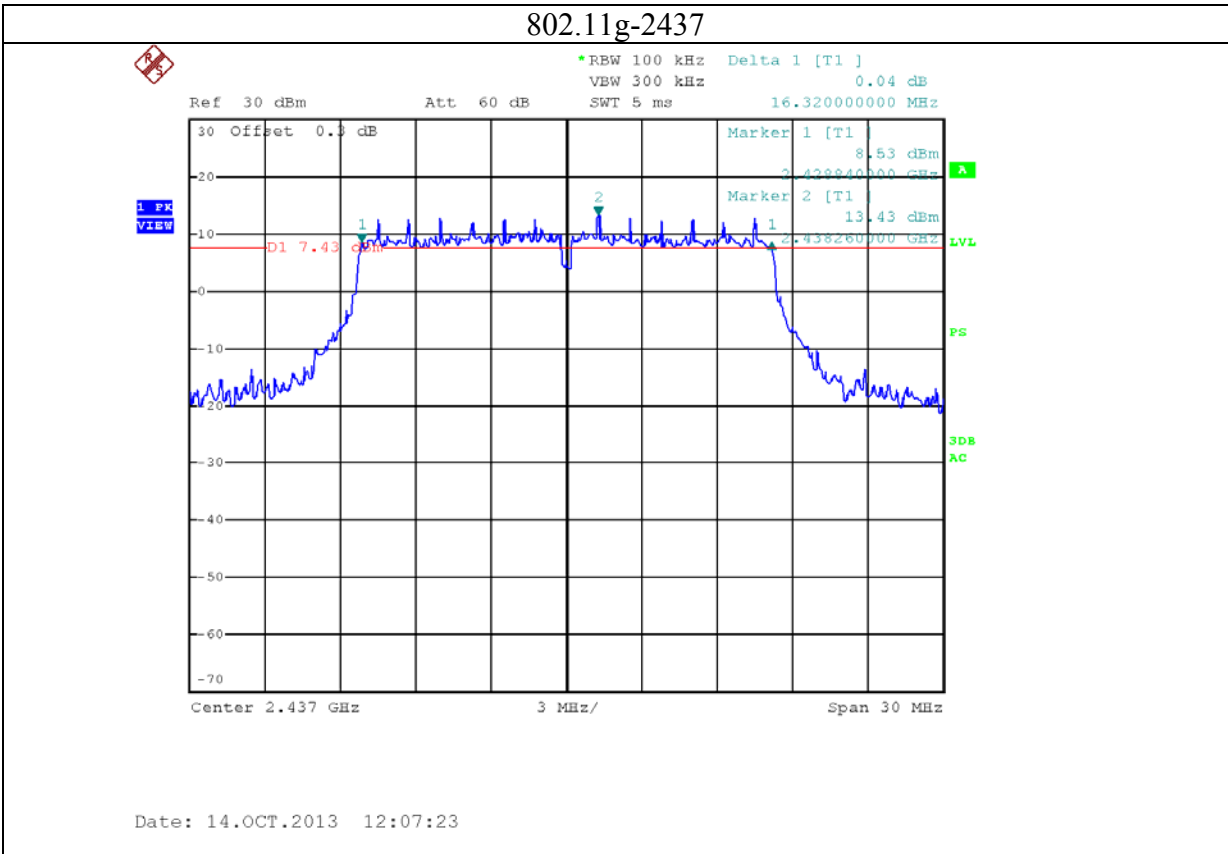


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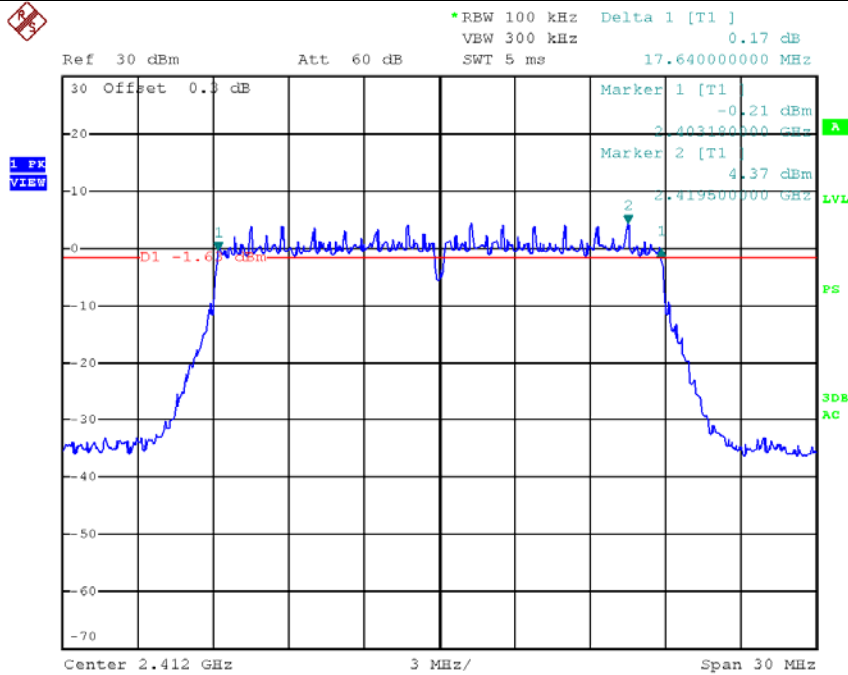
2: 2.4G band port 1





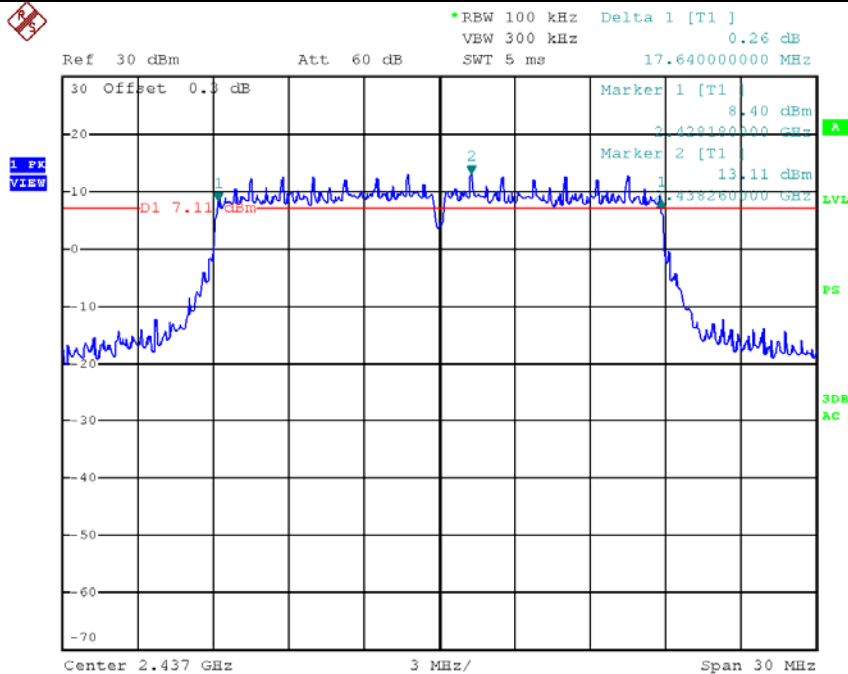


802.11n20-2412



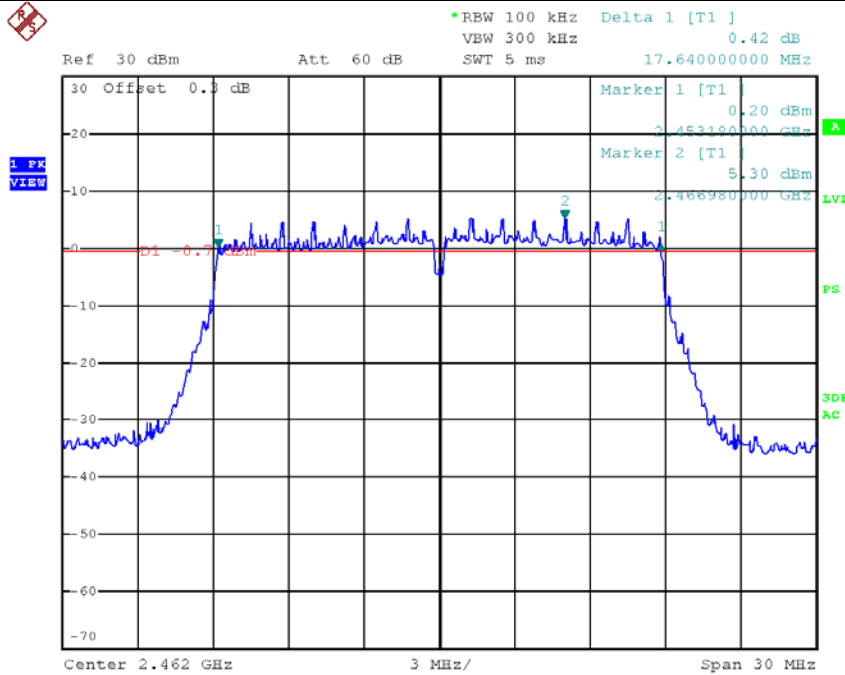
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802.11n20-2437



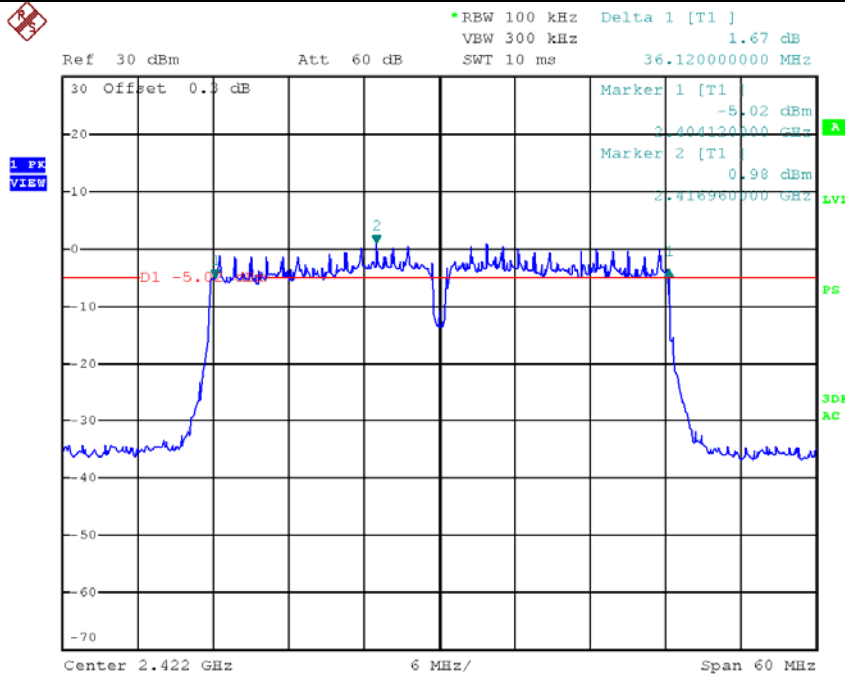
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802.11n20-2462



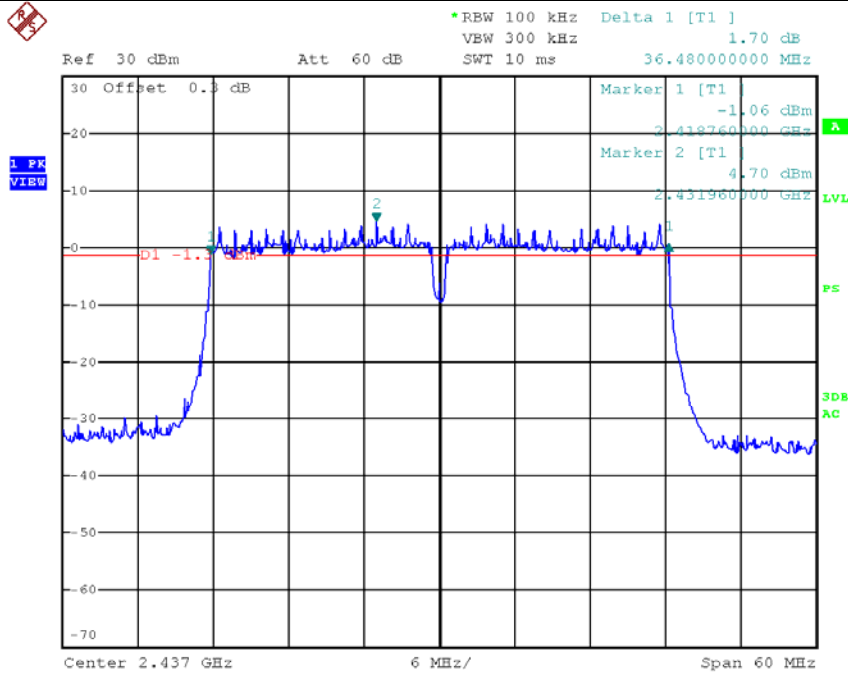
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802.11n40-2422



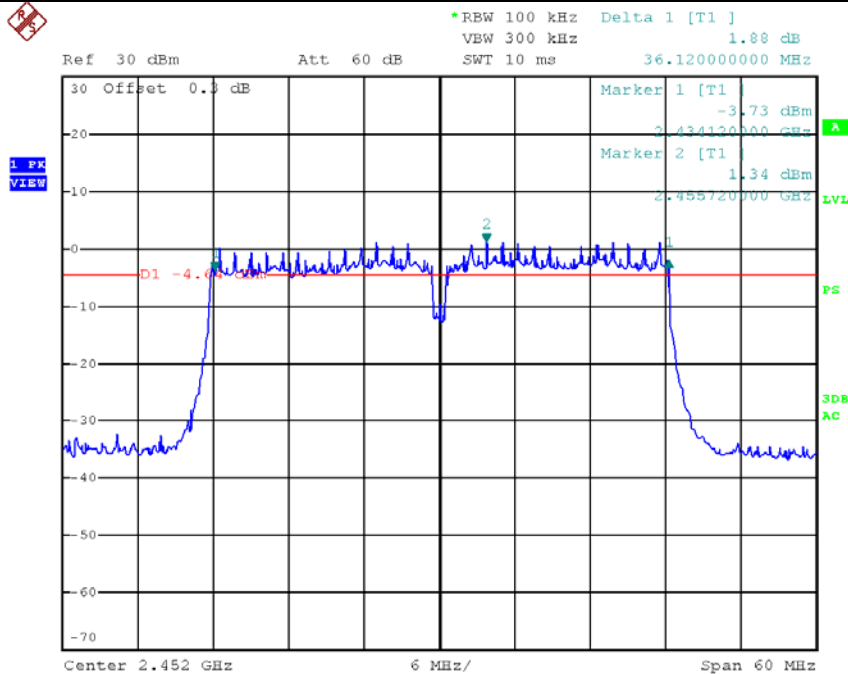
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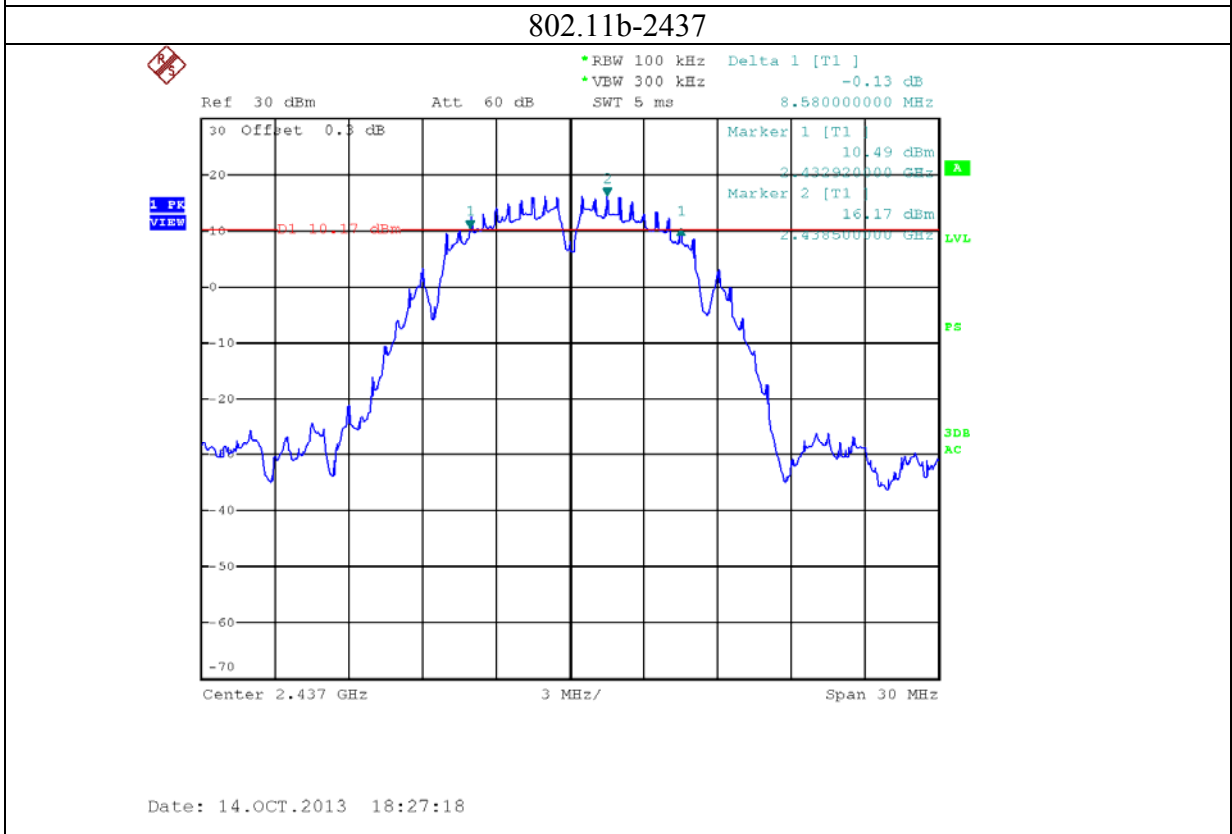
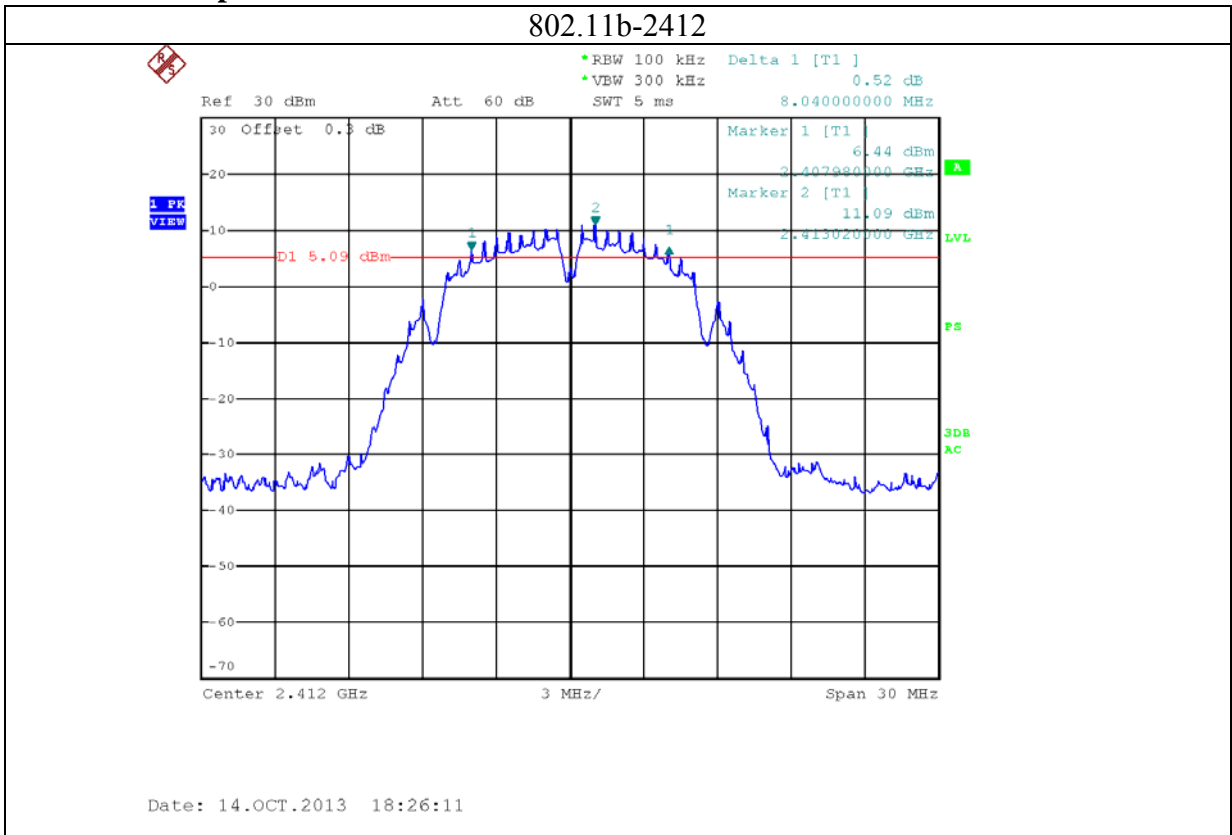
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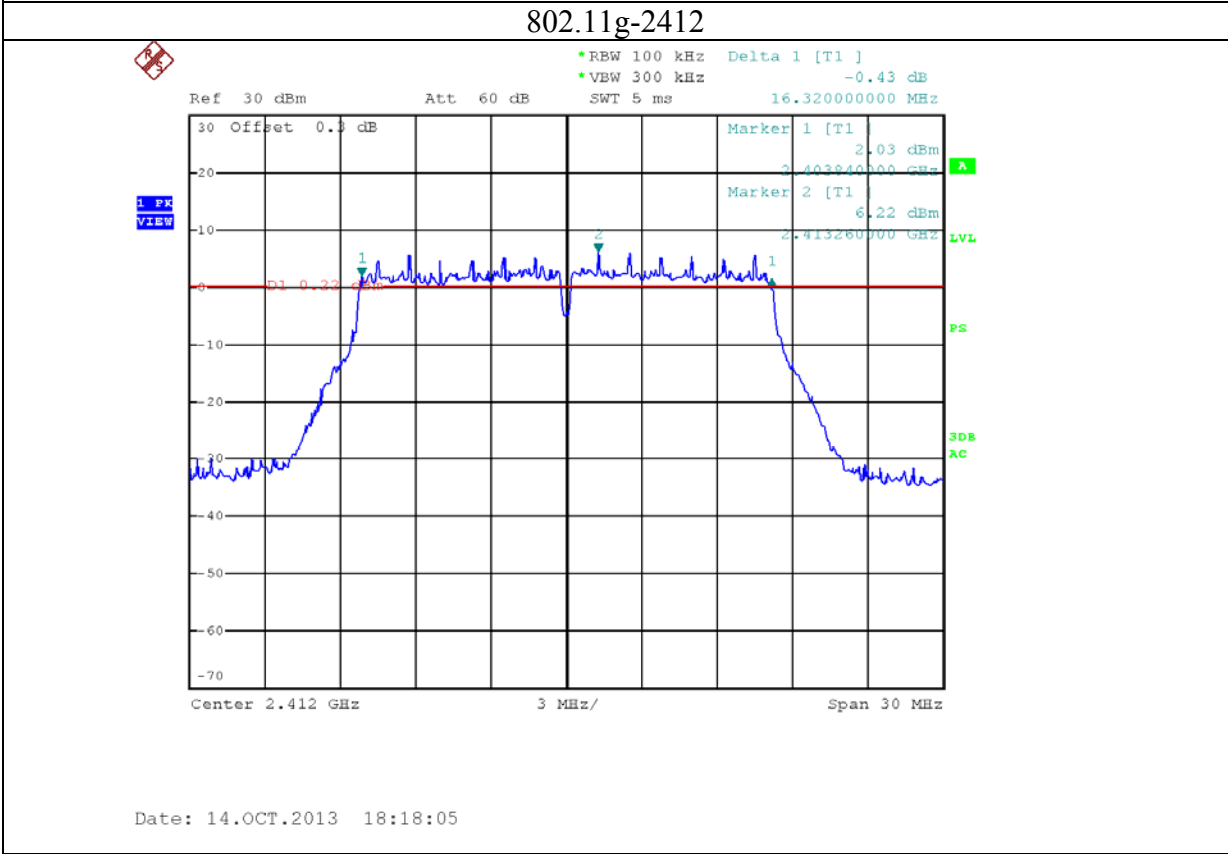
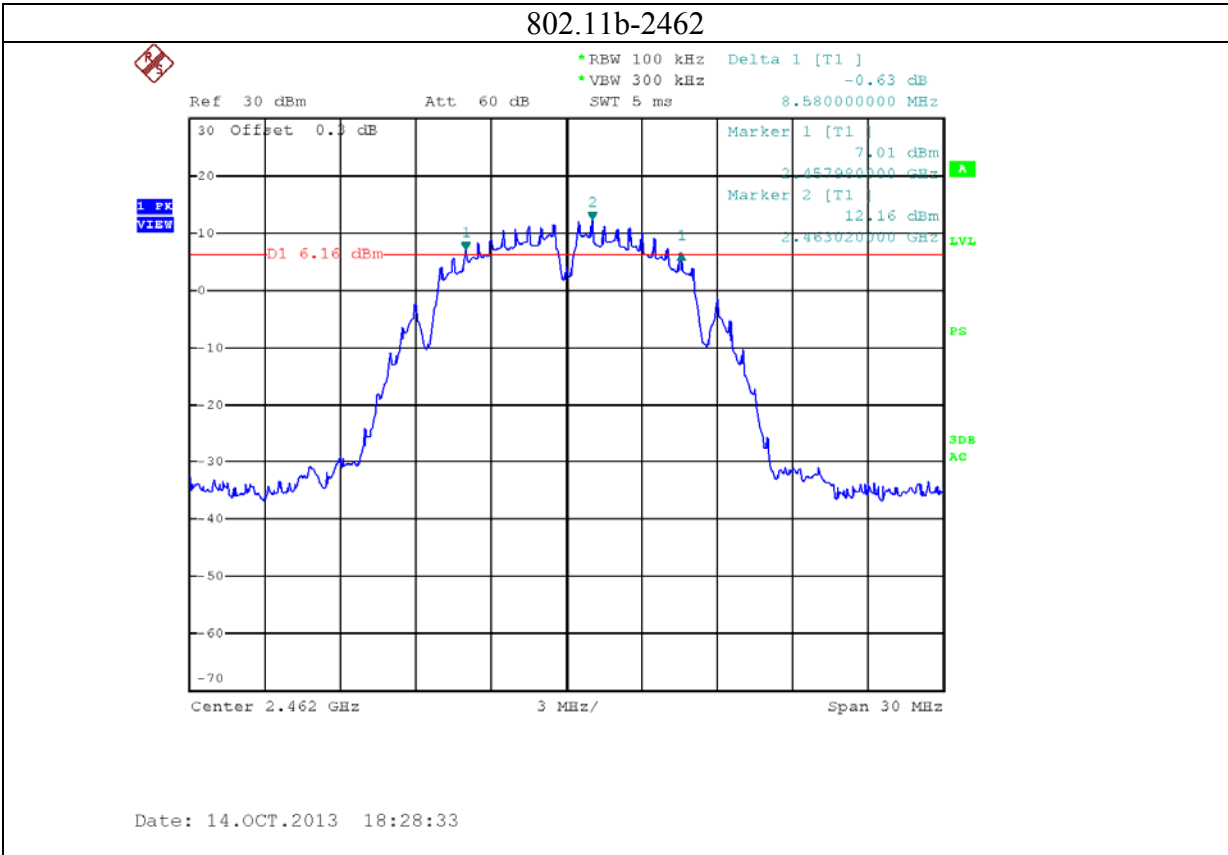
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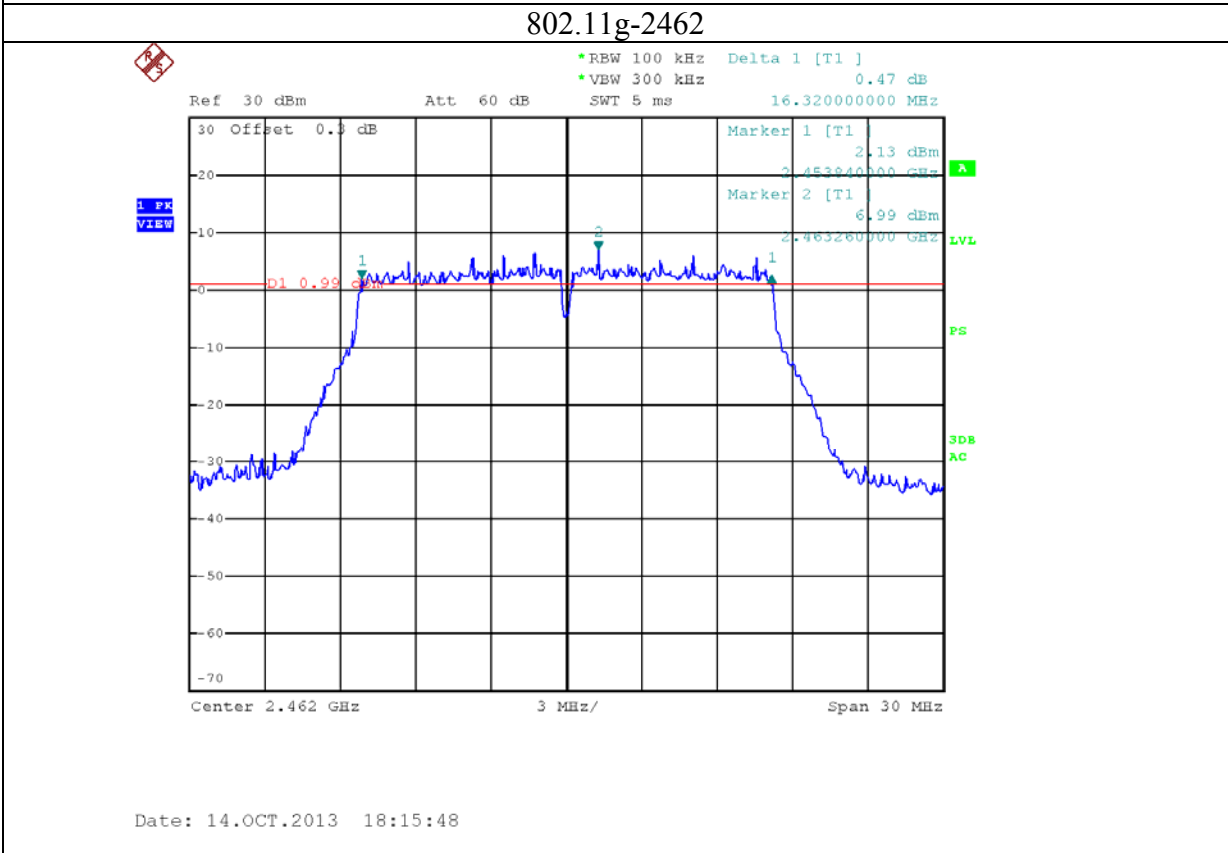
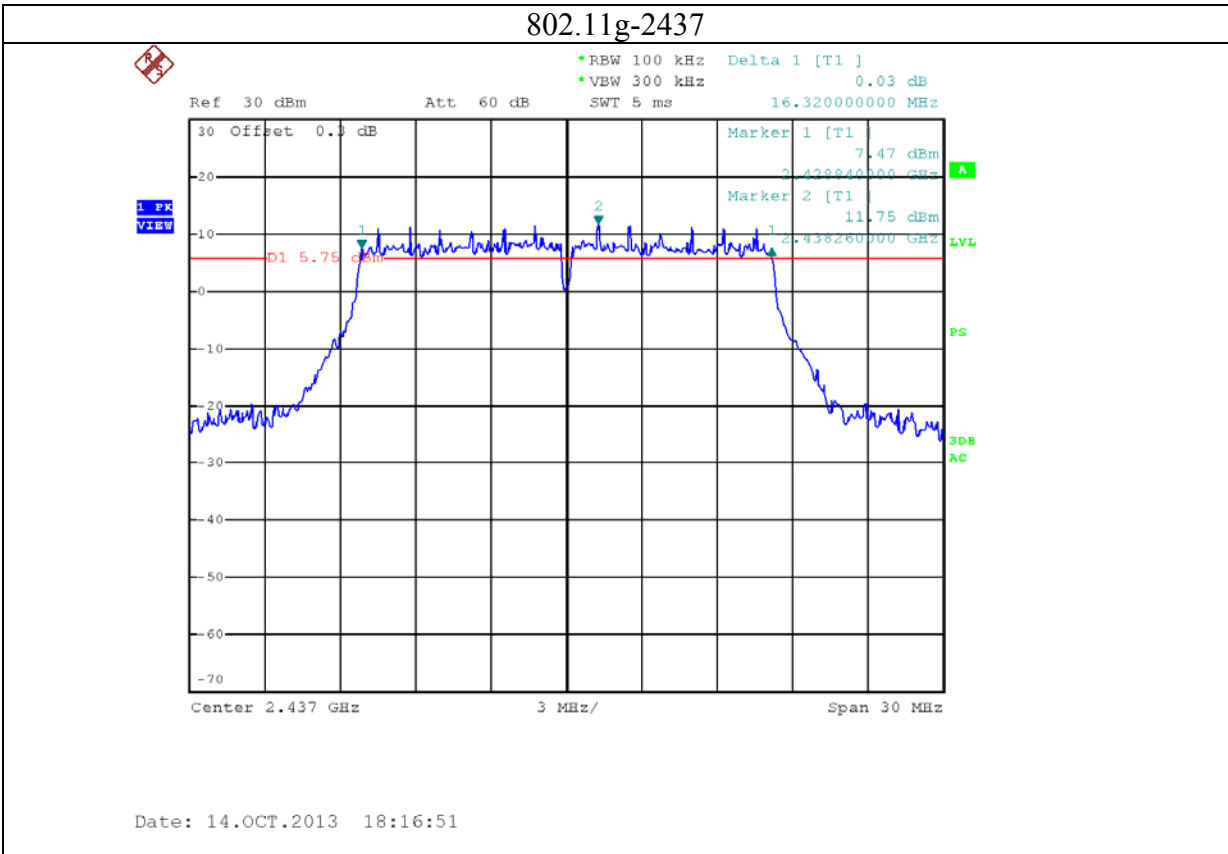


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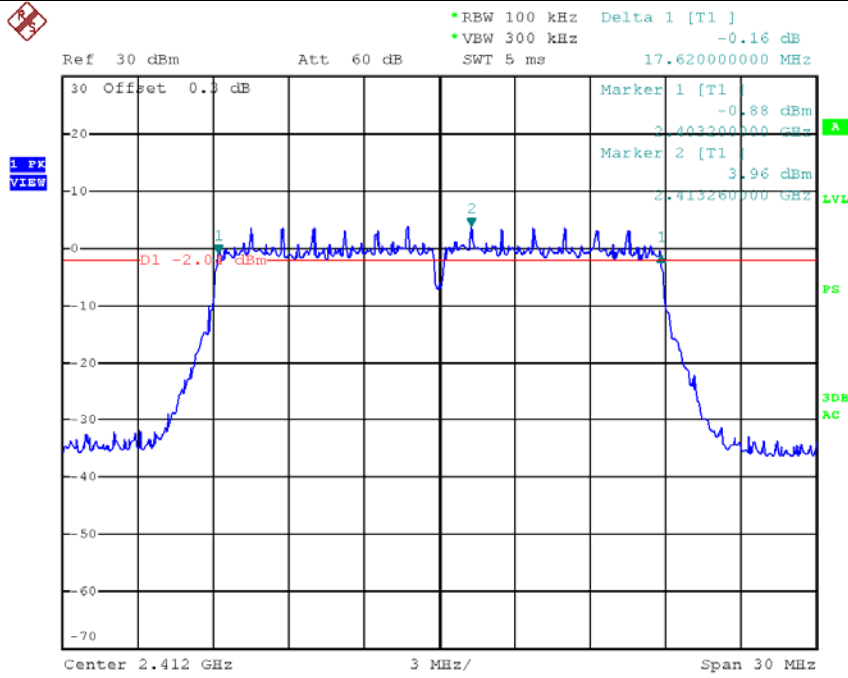
3: 2.4G band port 2





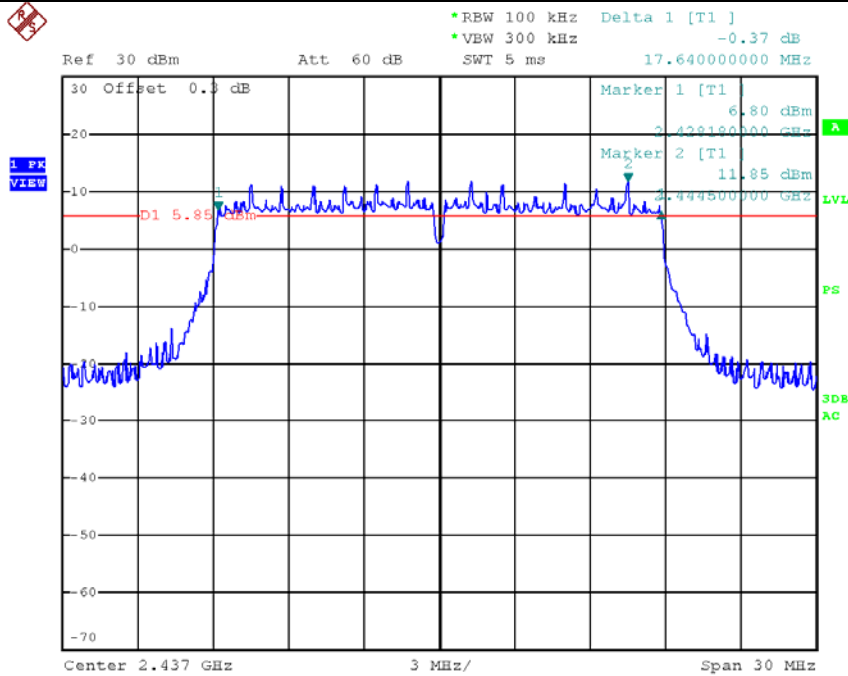


802.11n20-2412



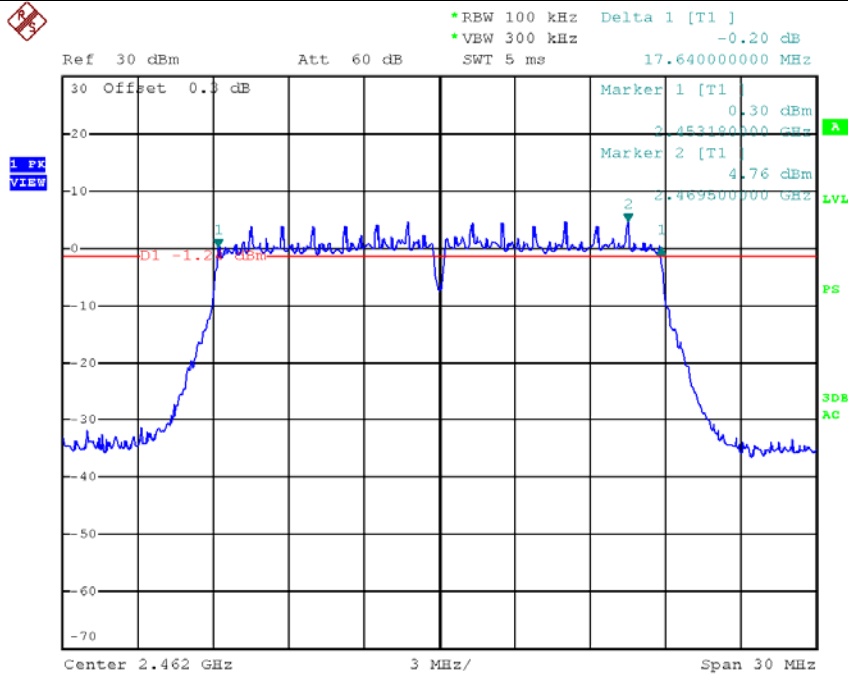
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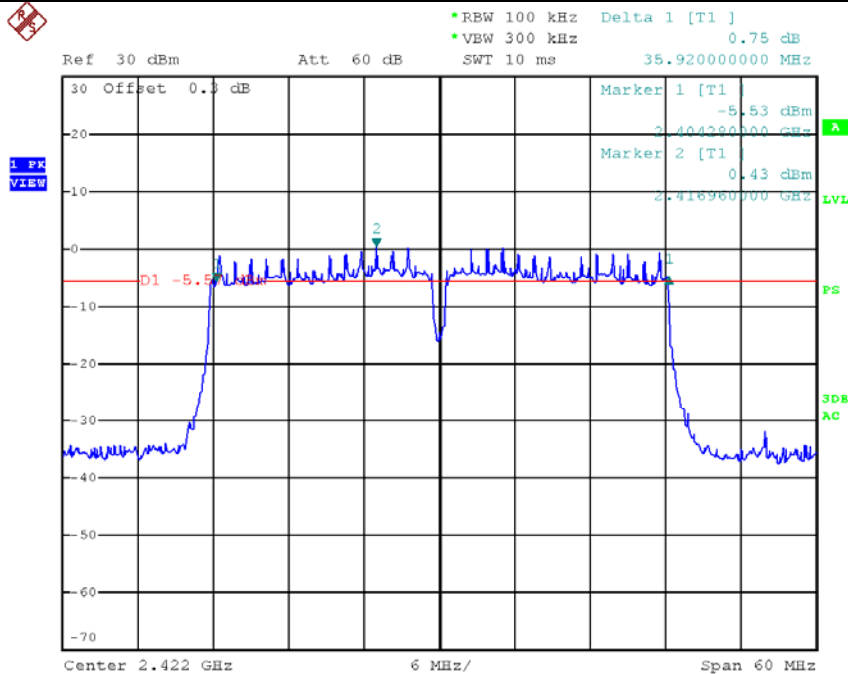


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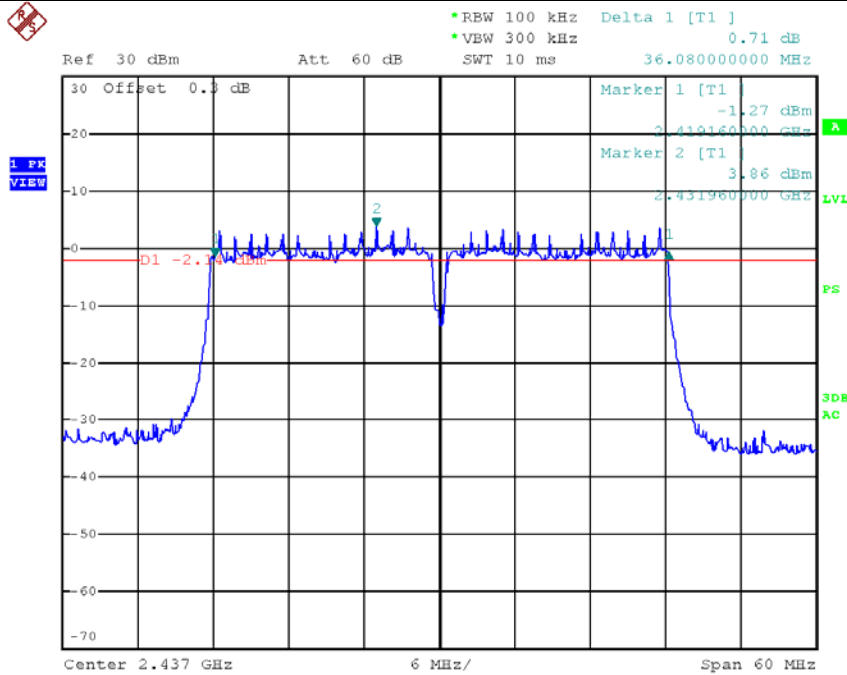
802.11n20-2462



802.11n40-2422

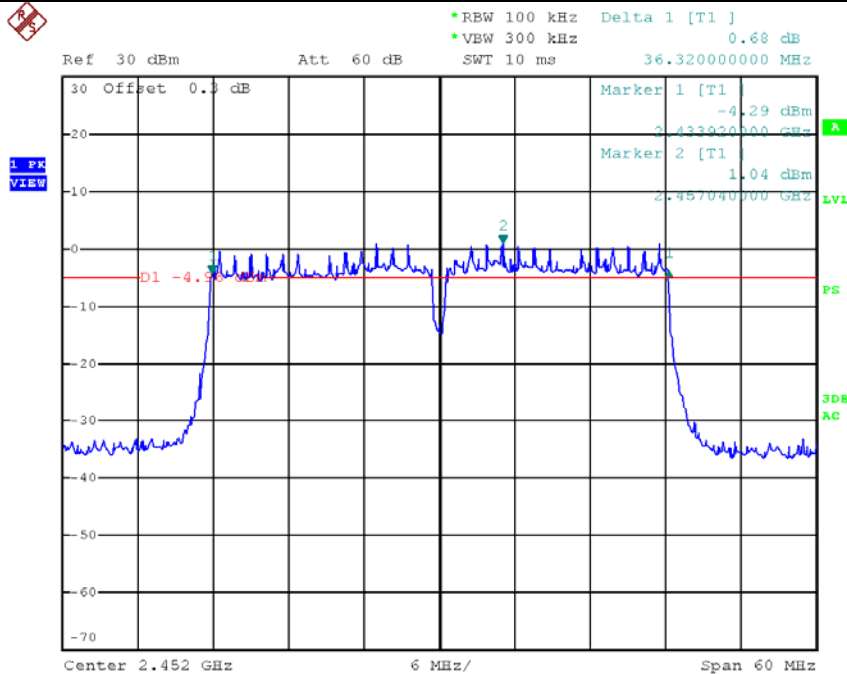


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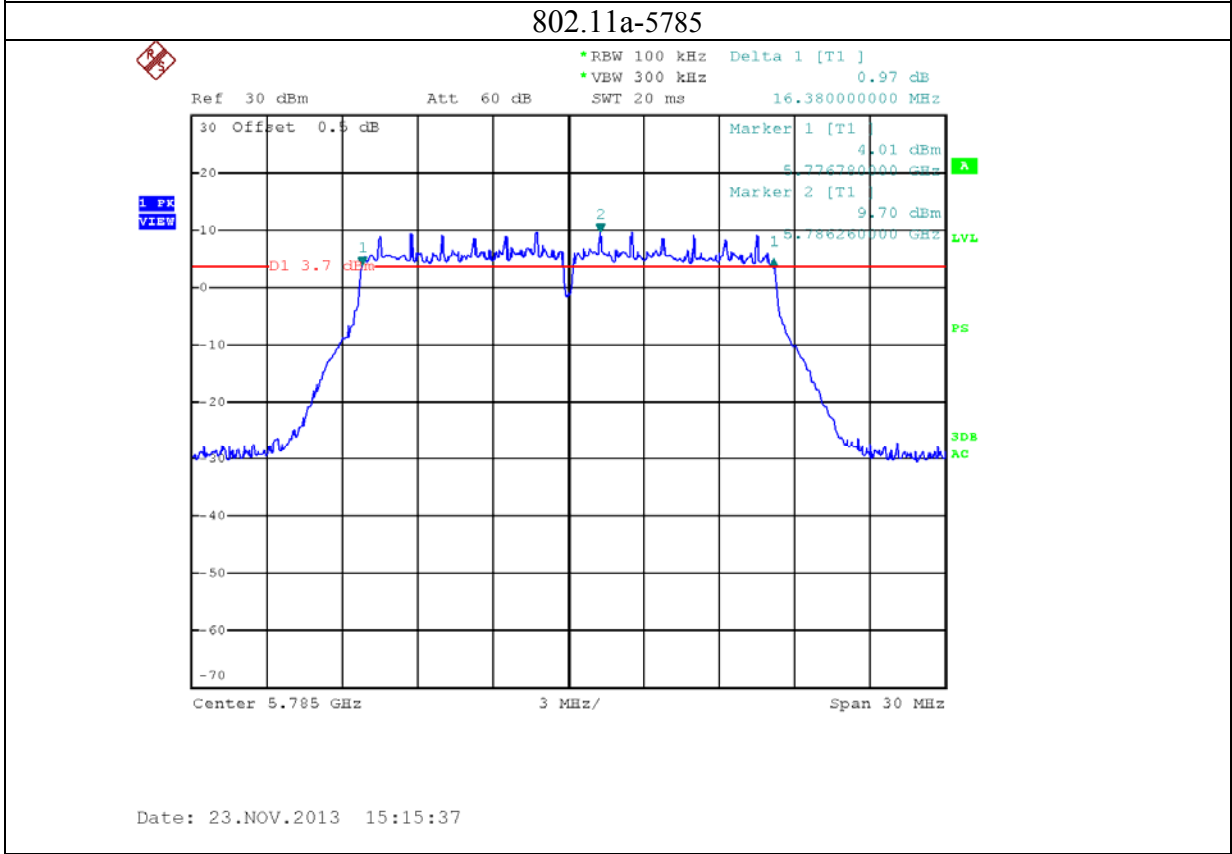
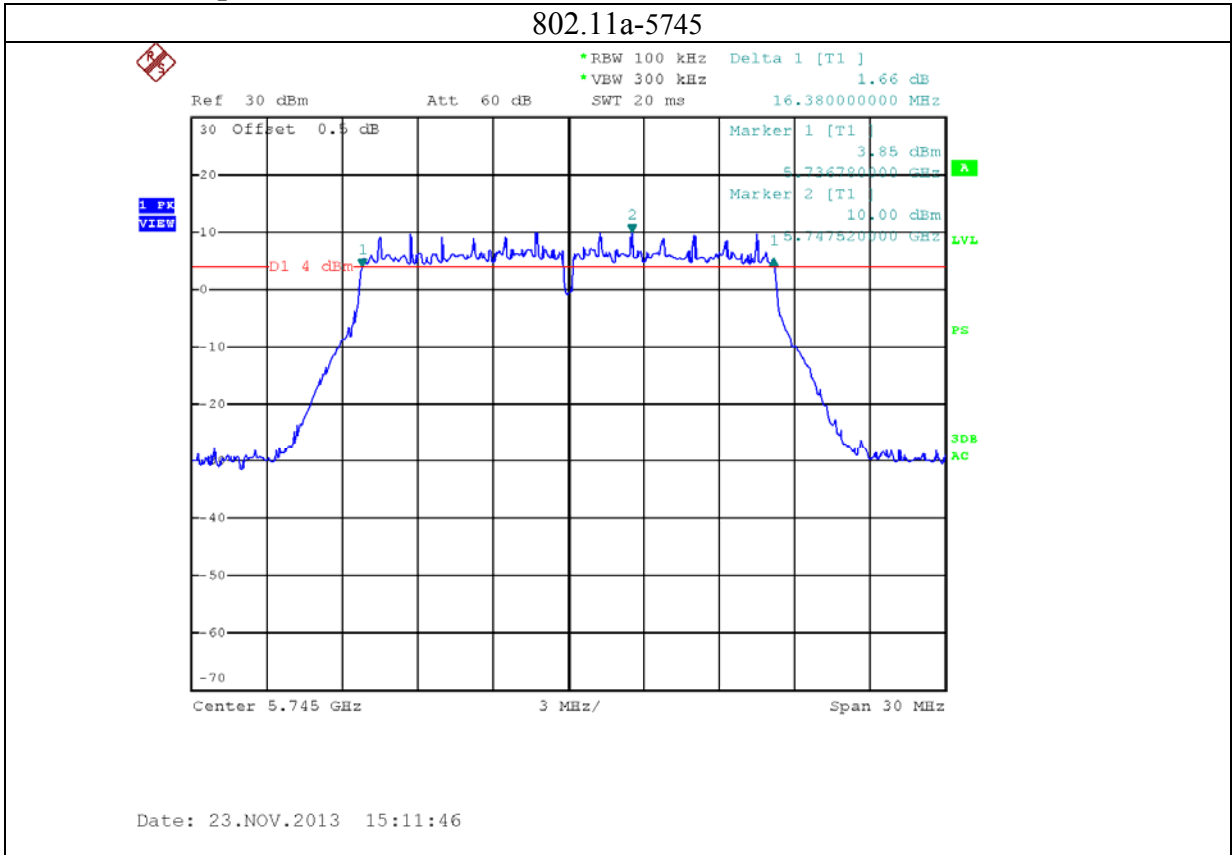
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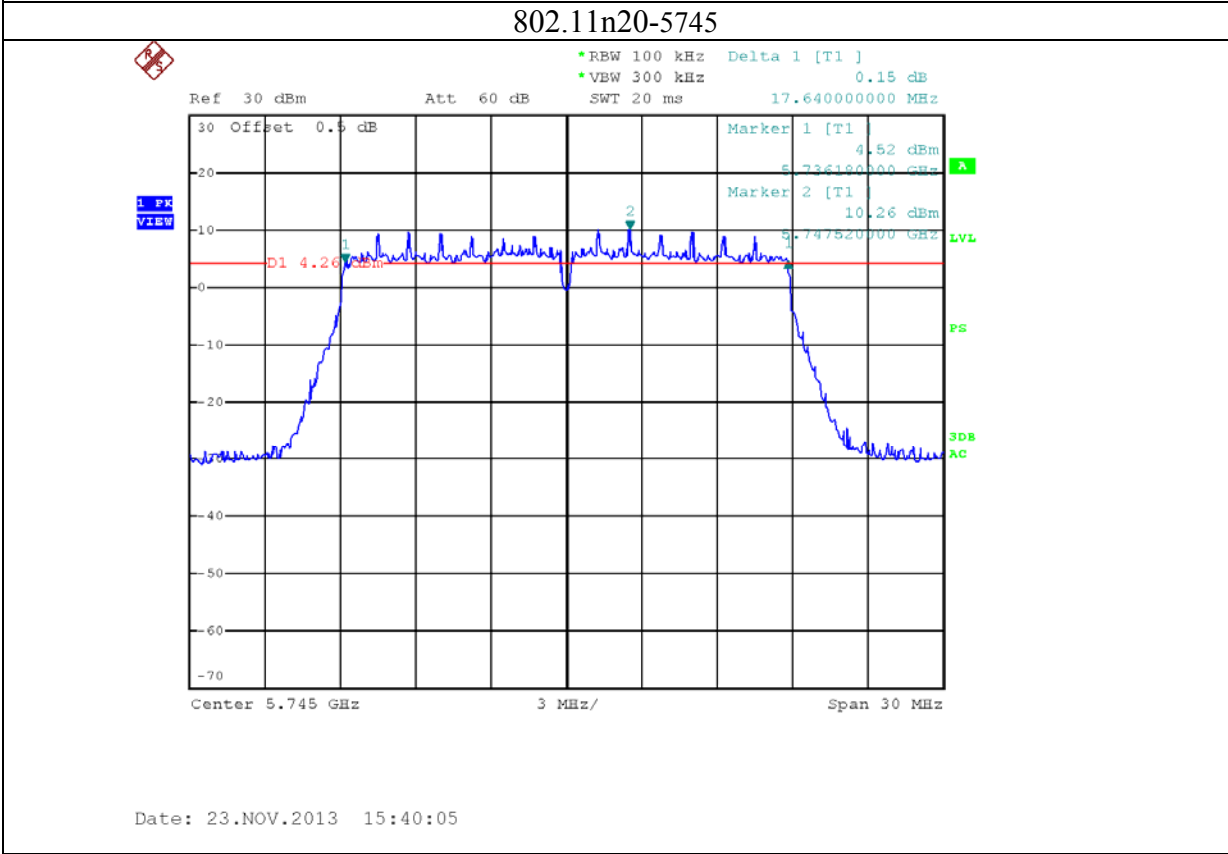
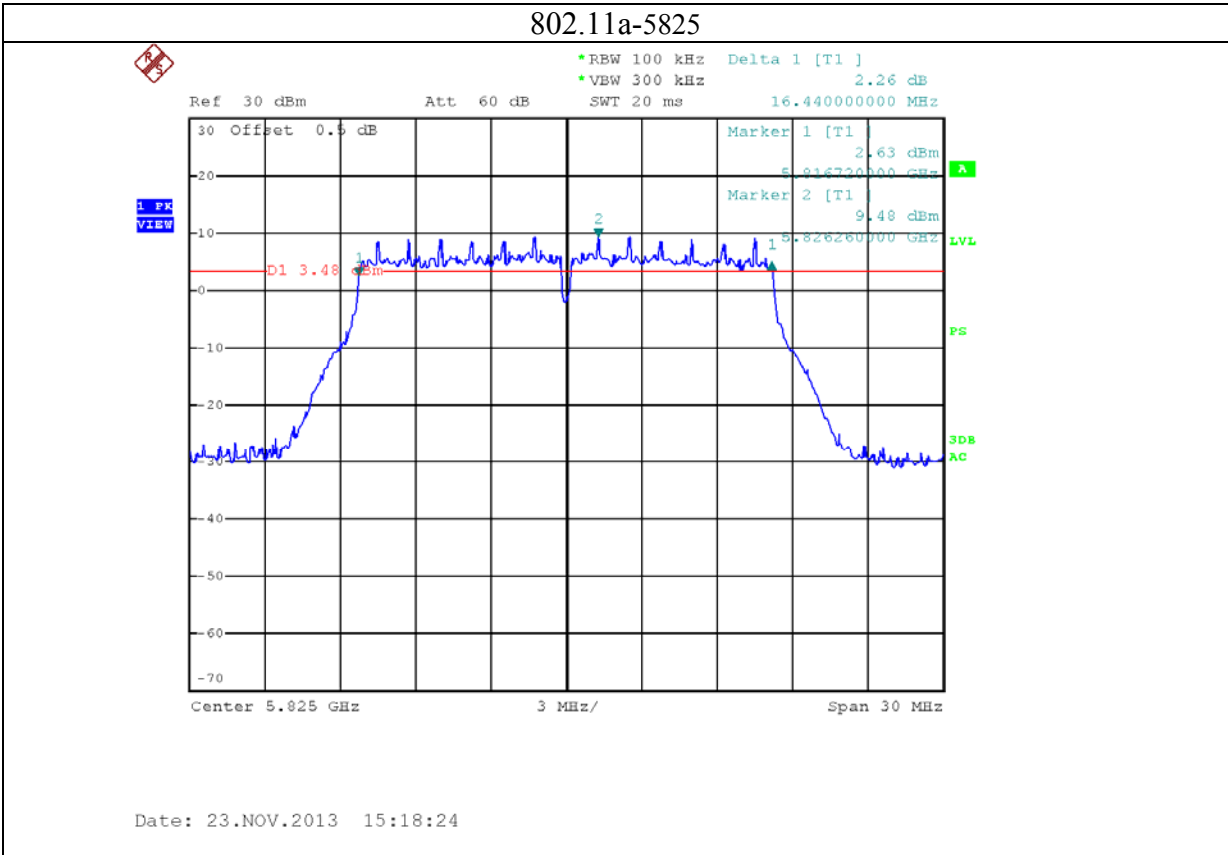
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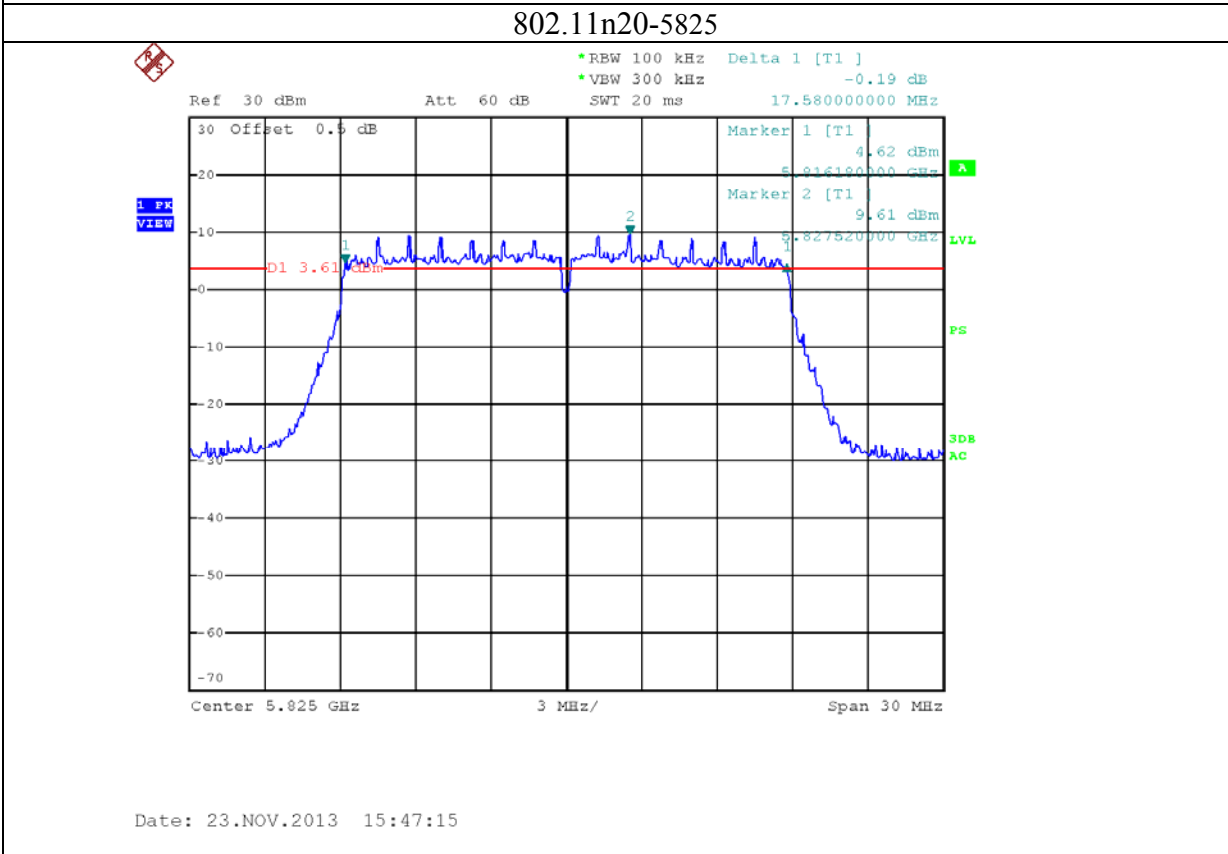
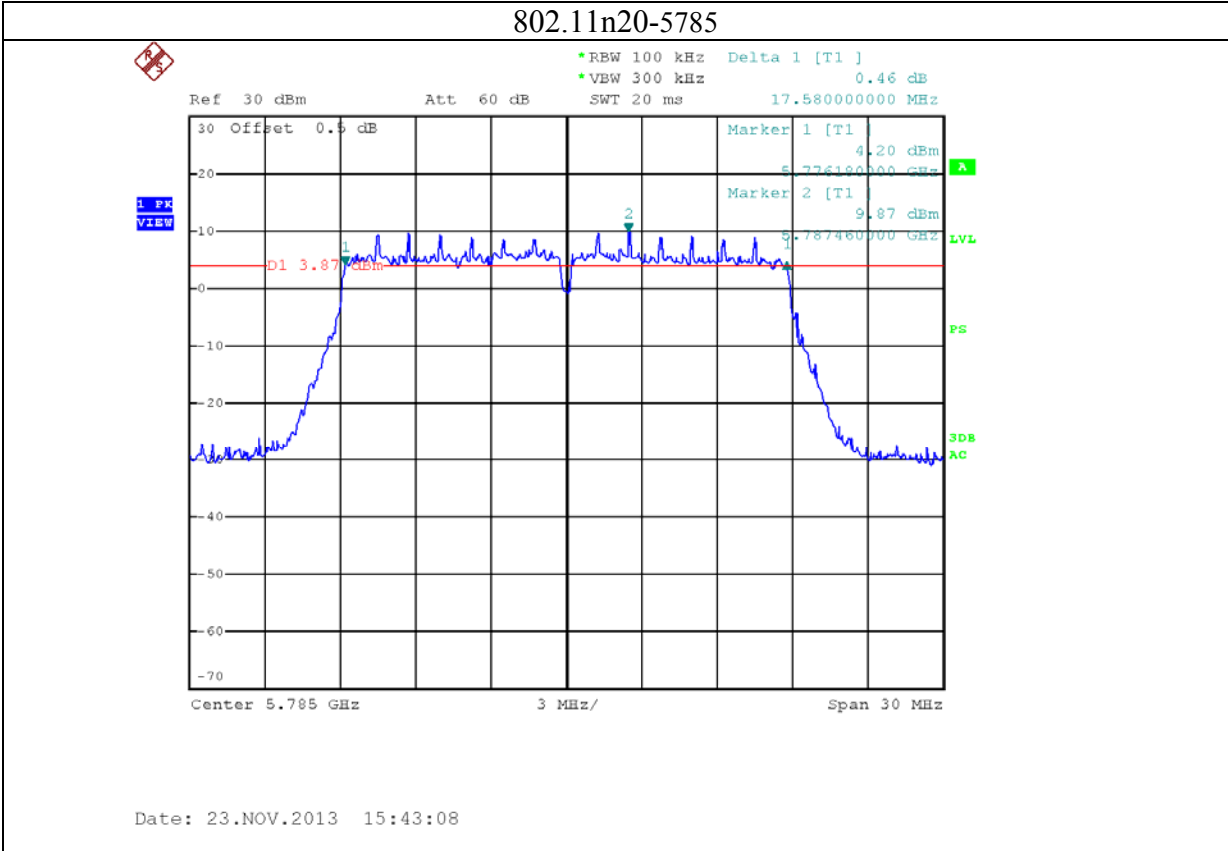


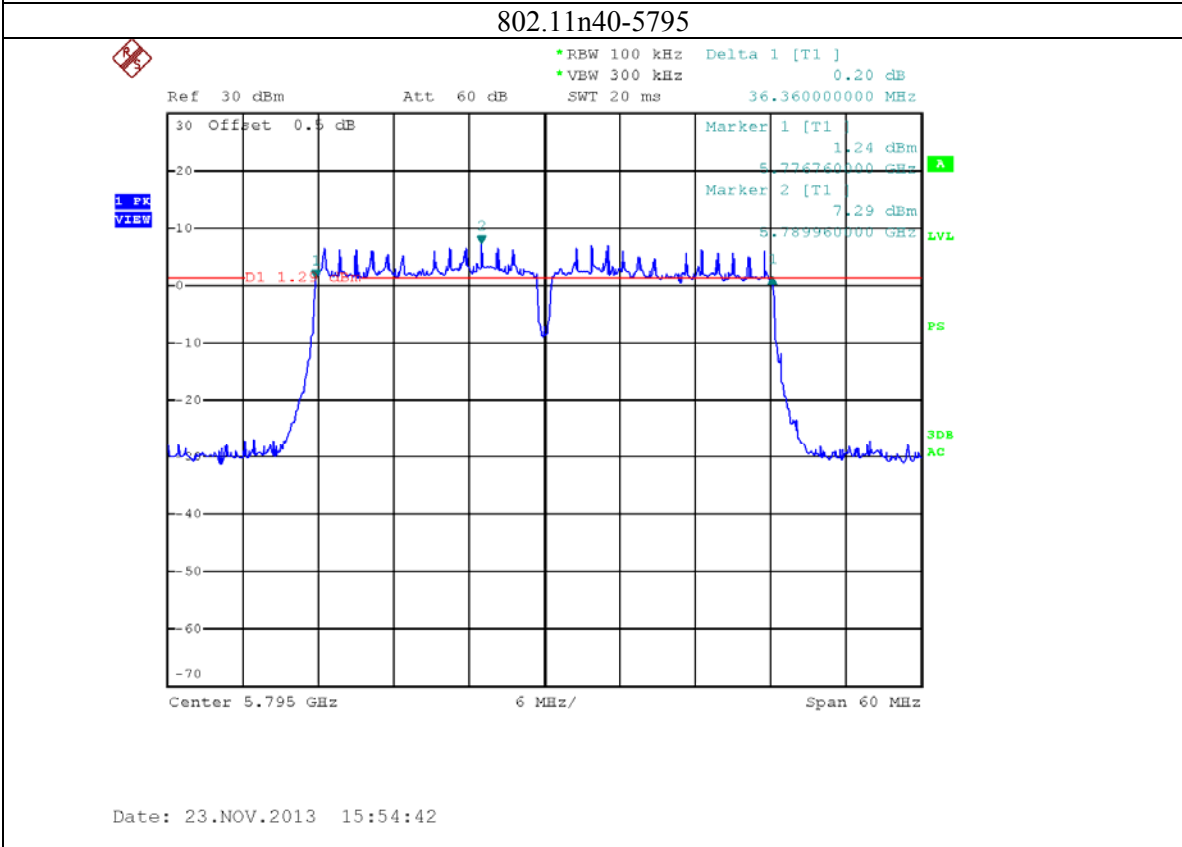
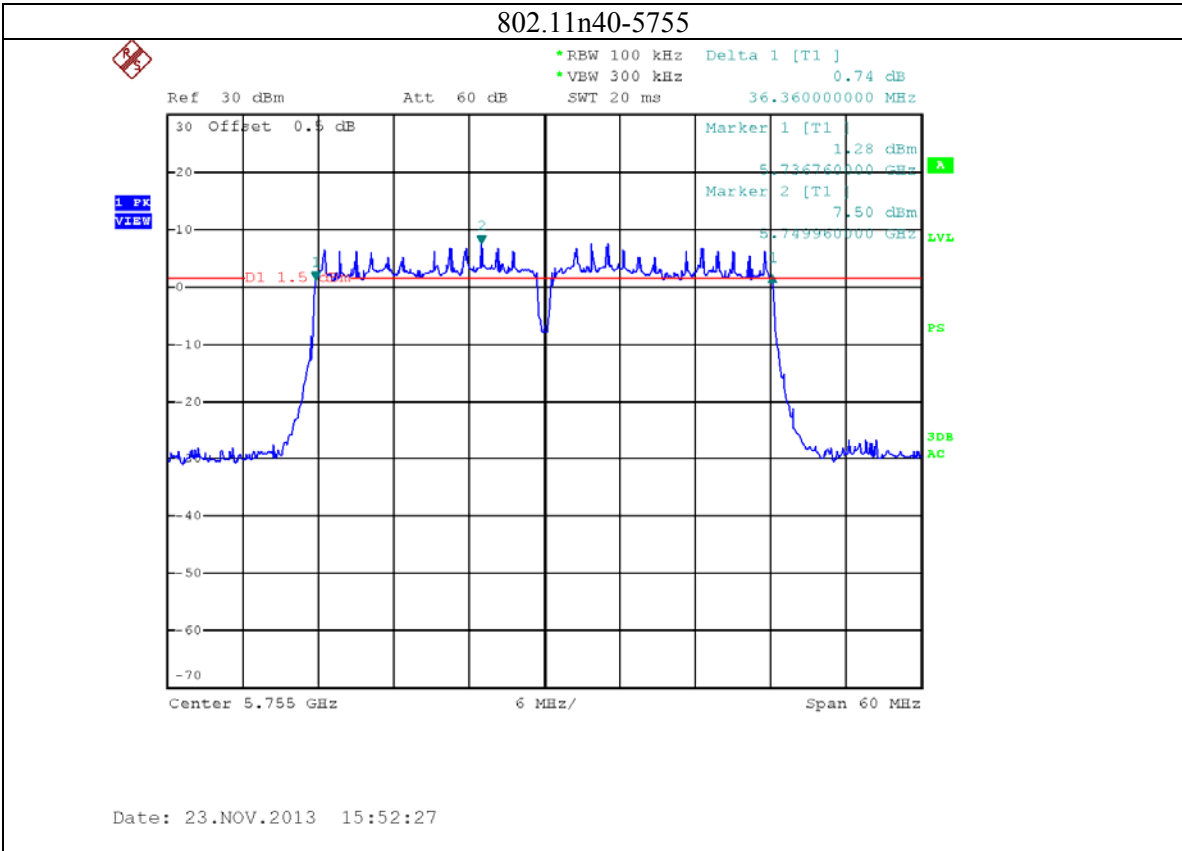
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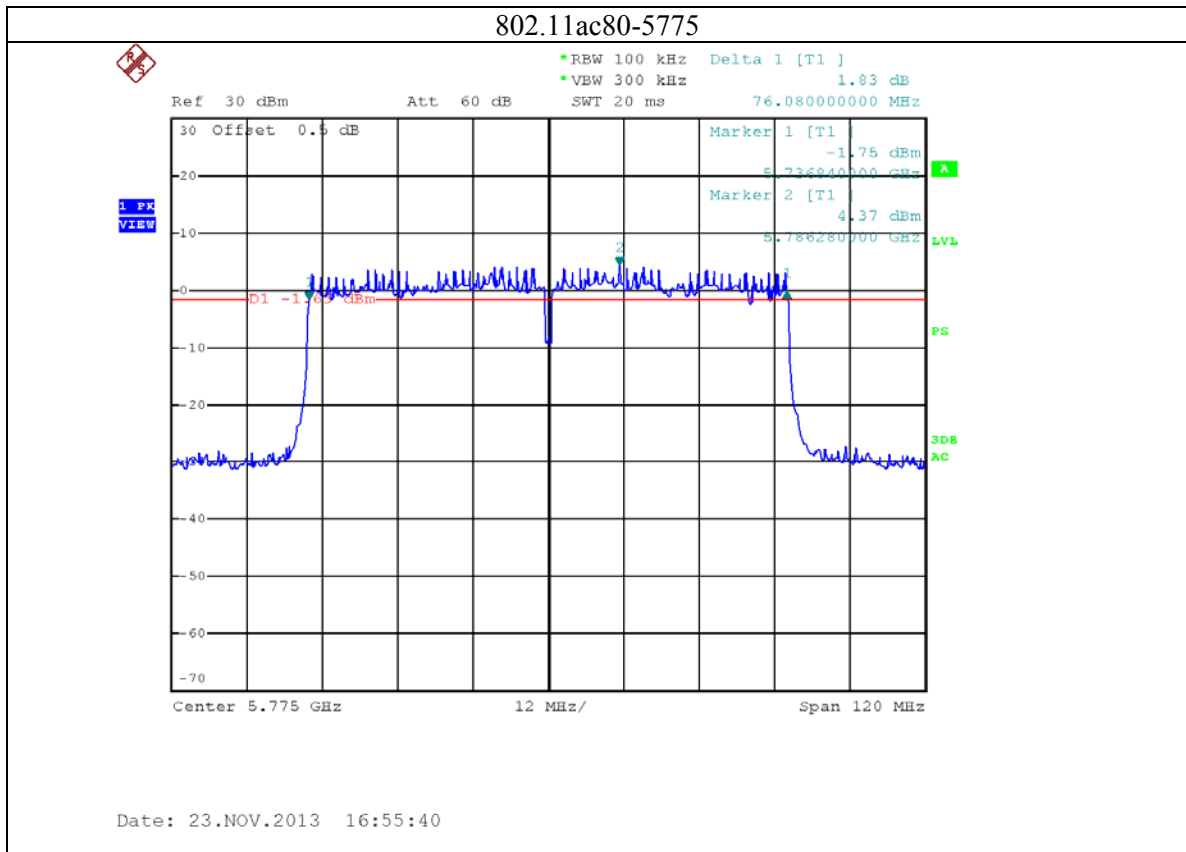
4: 5.8G band port 0



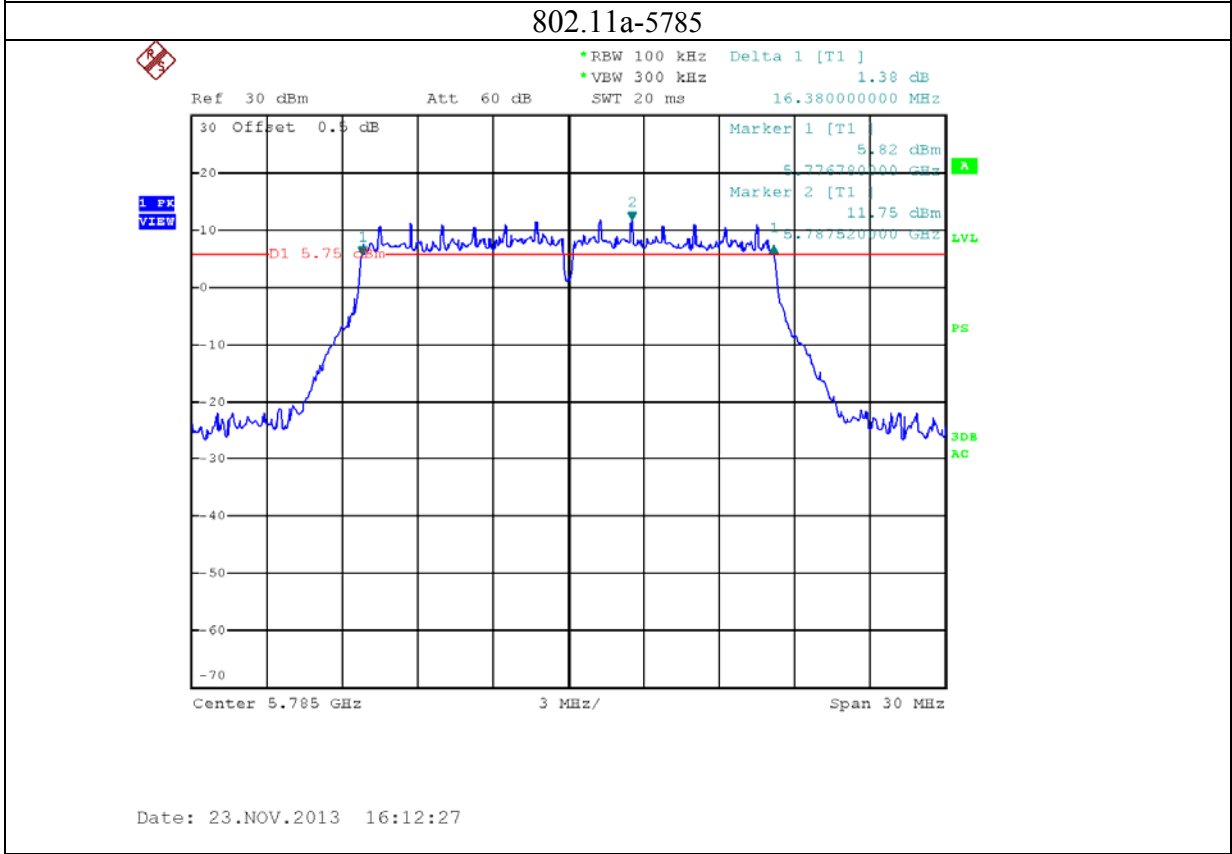
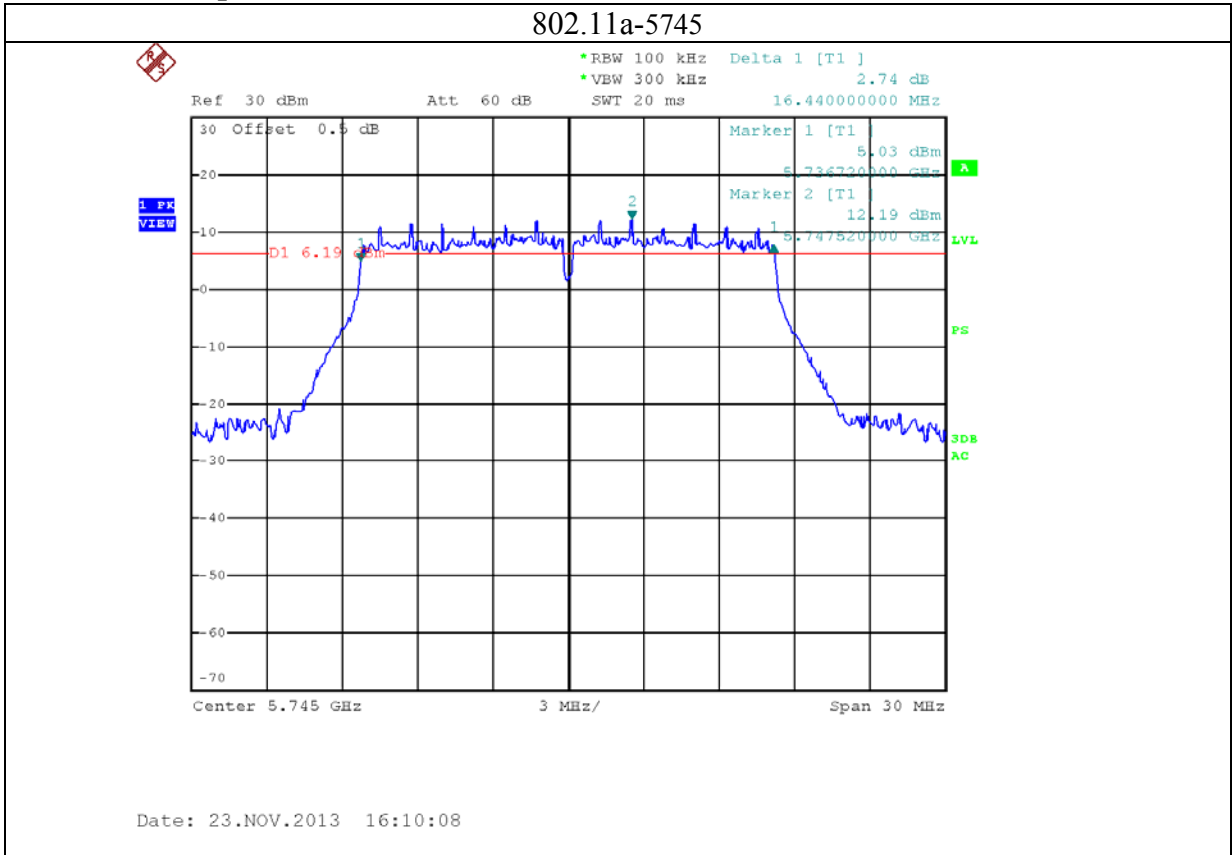


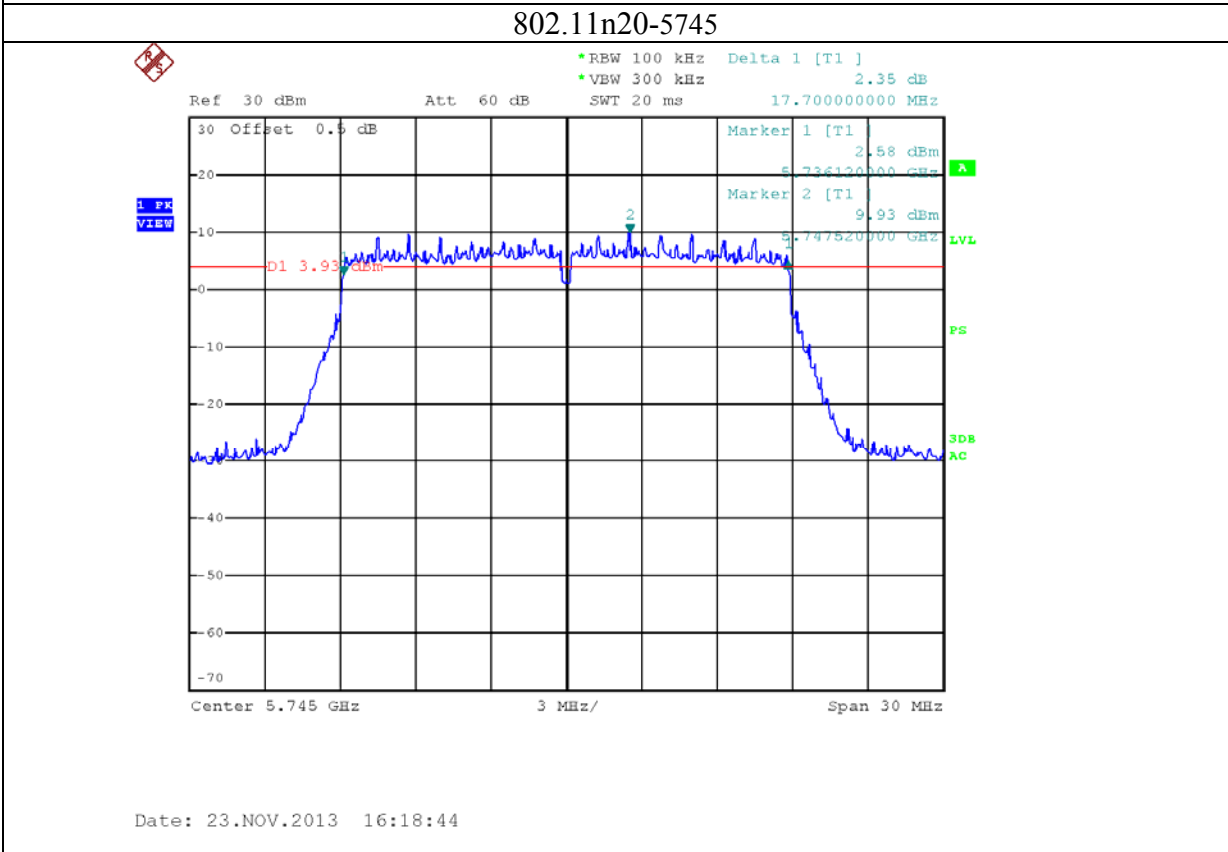
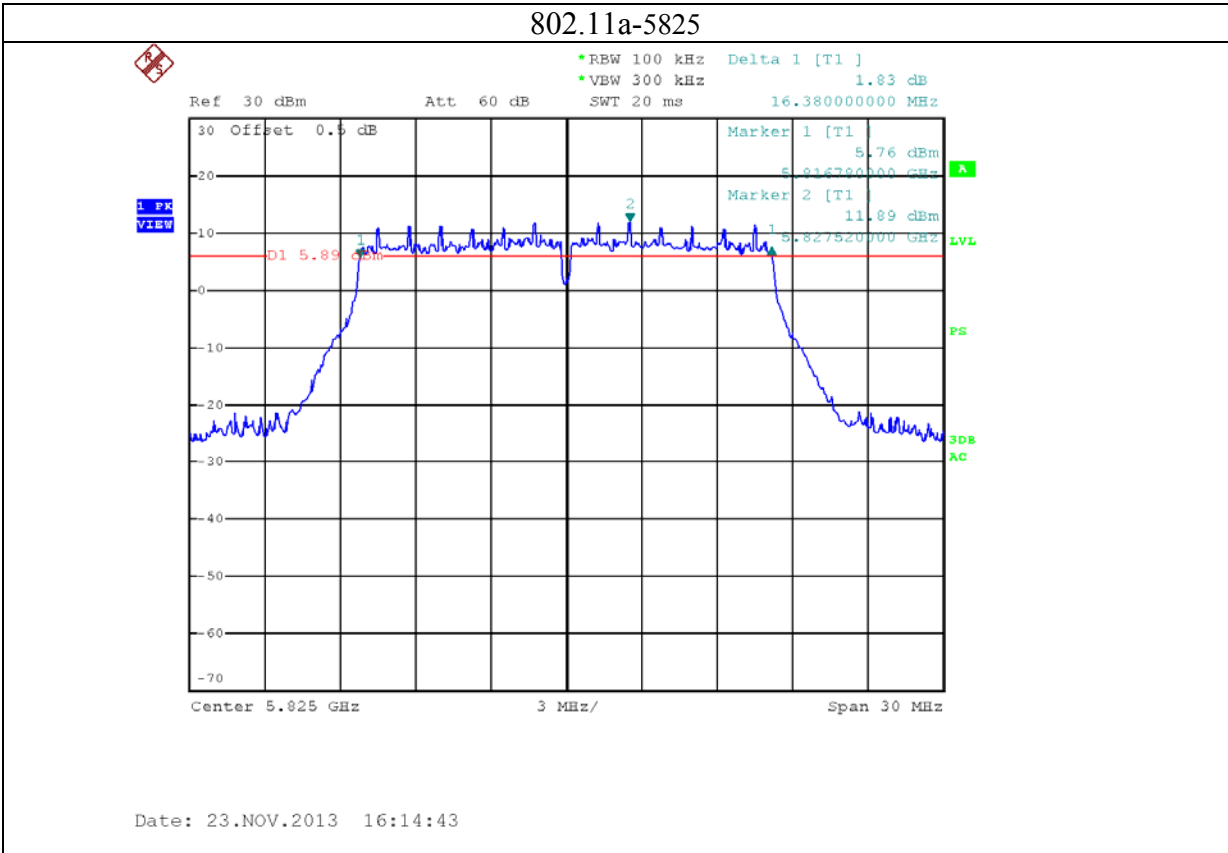


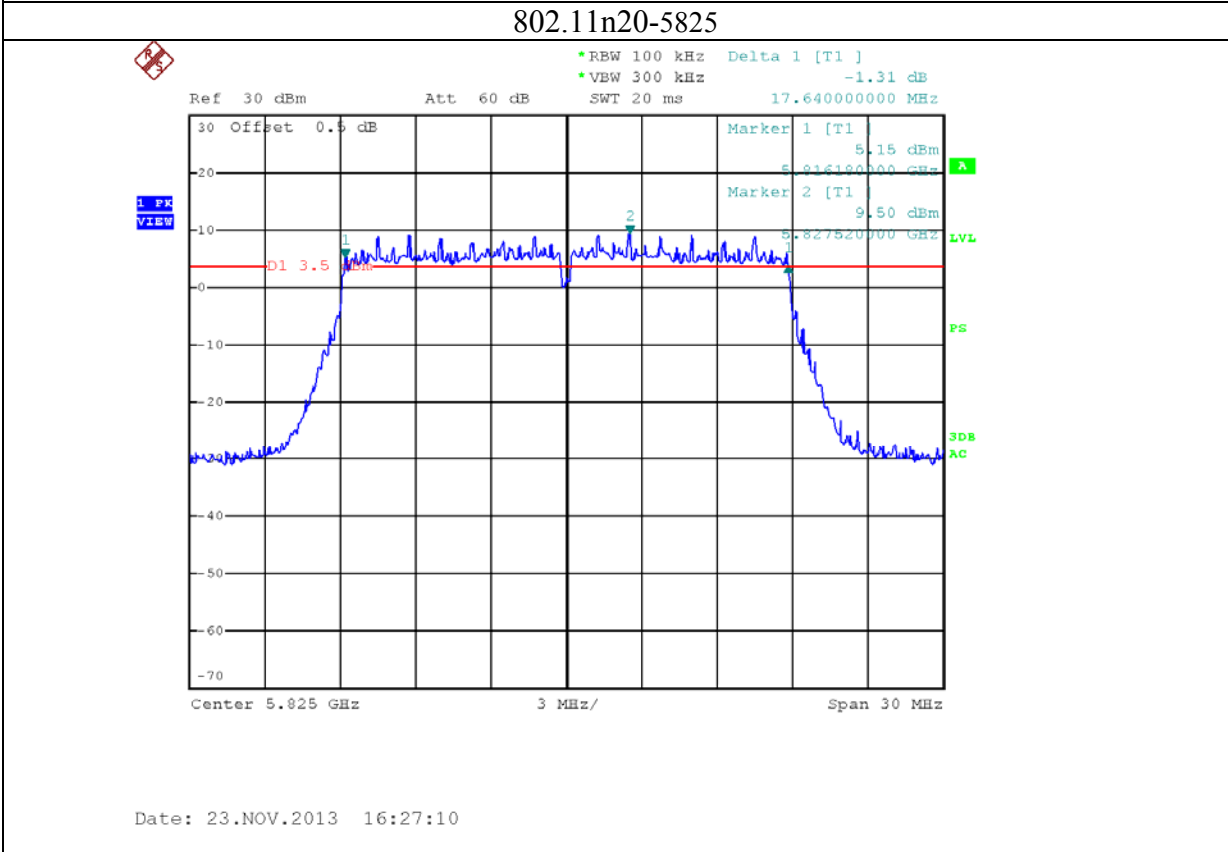
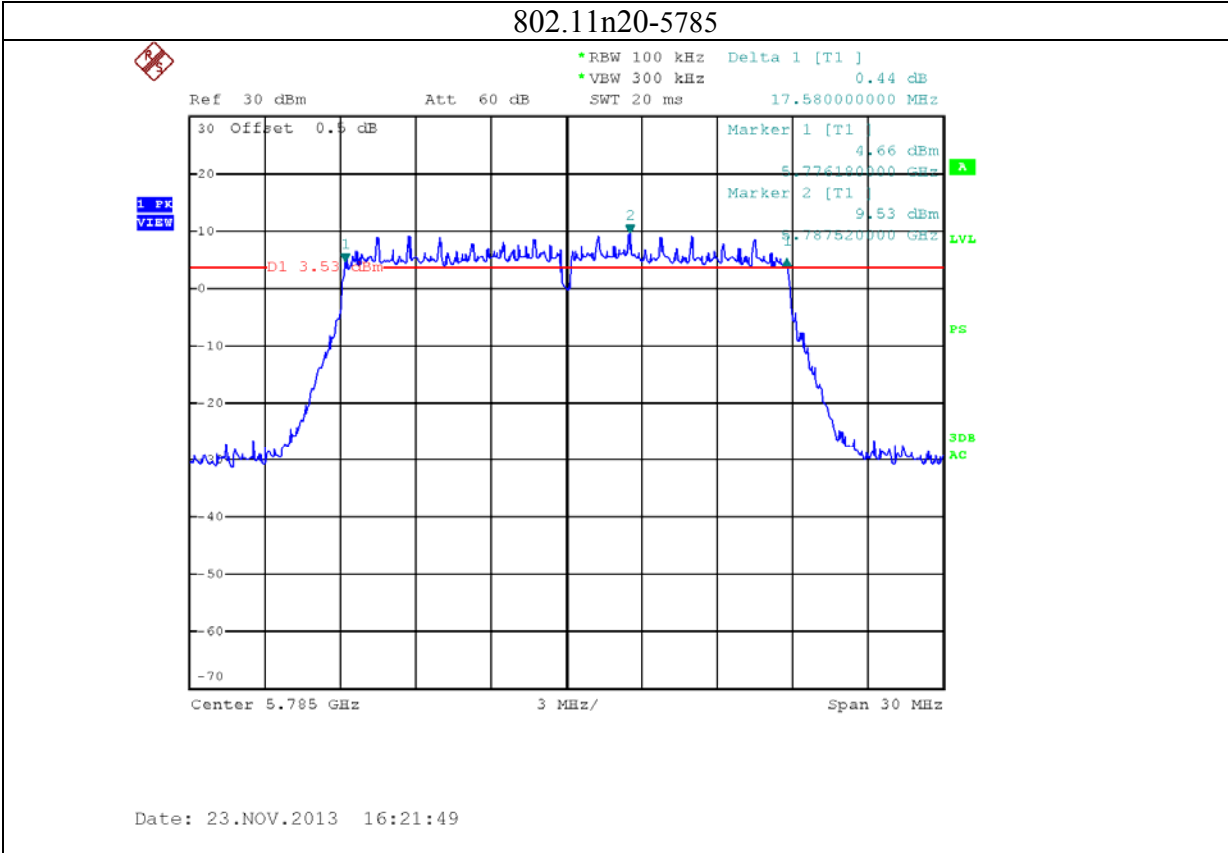


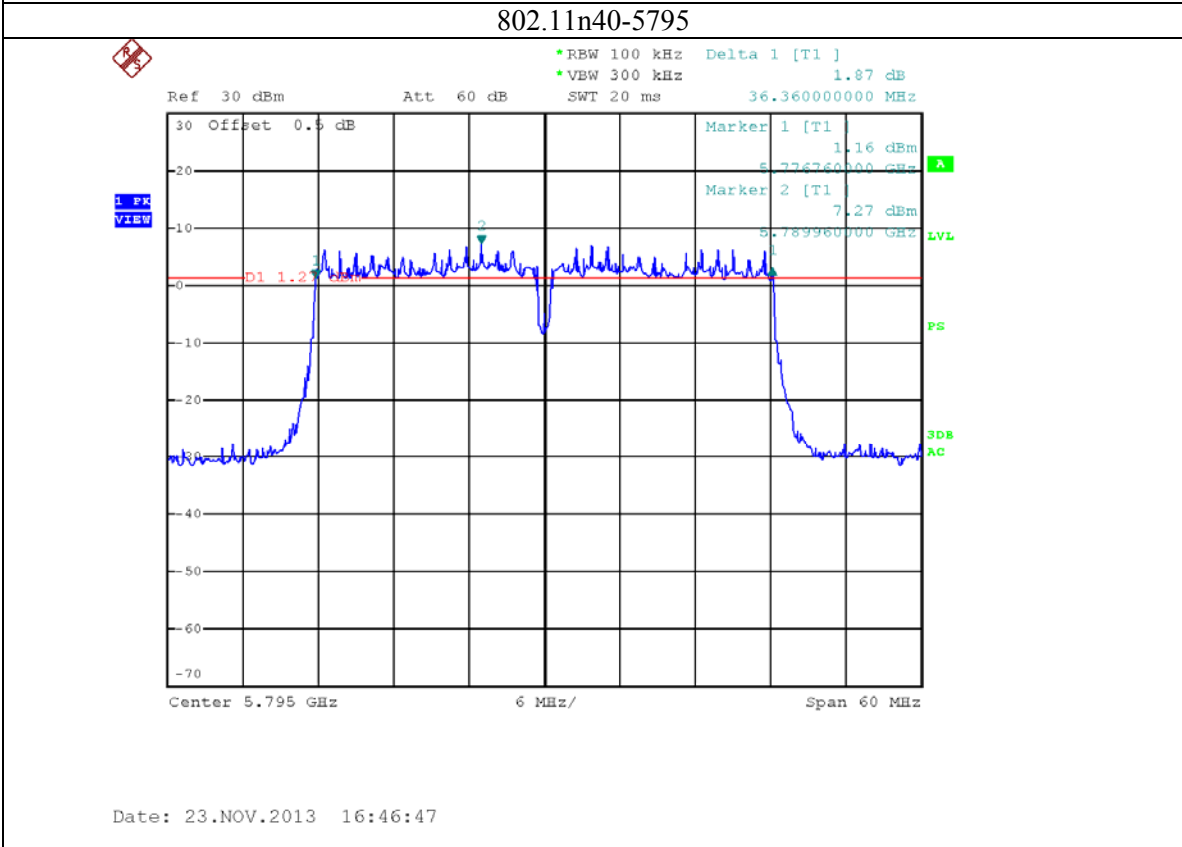
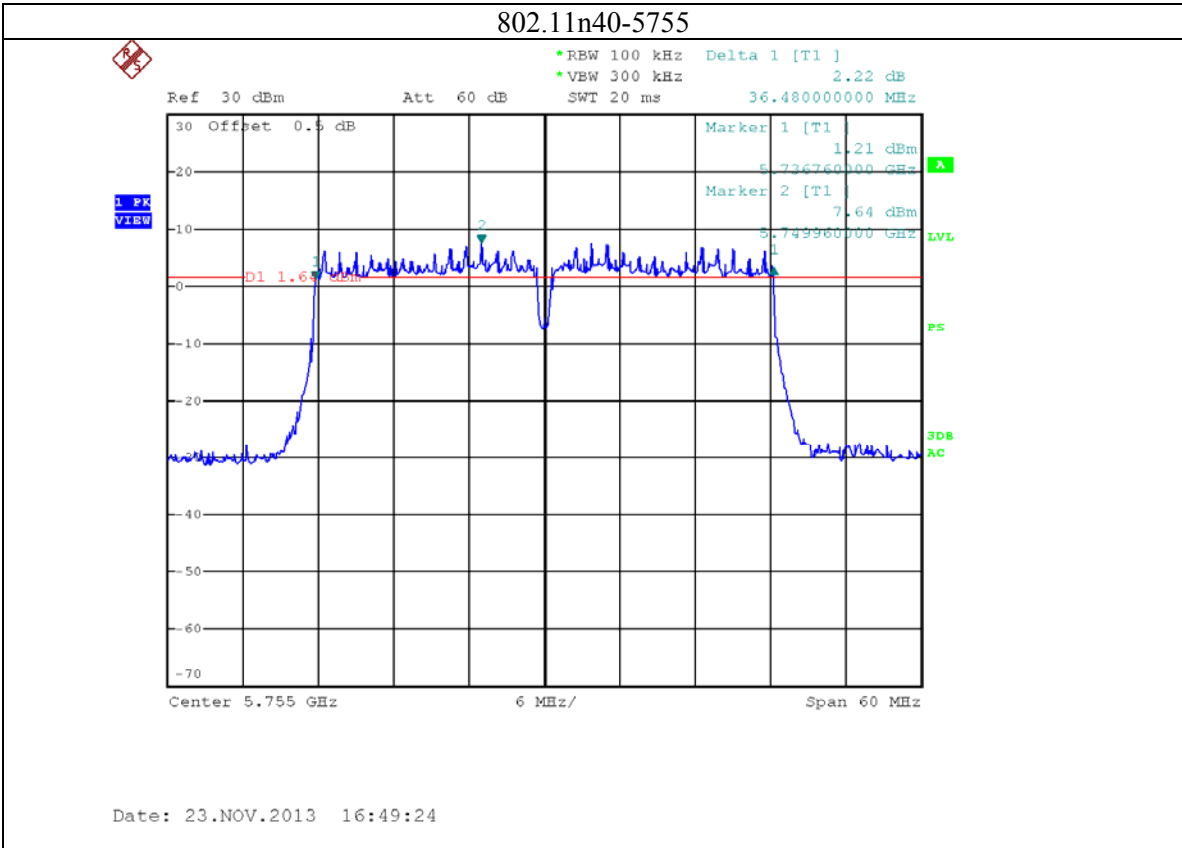


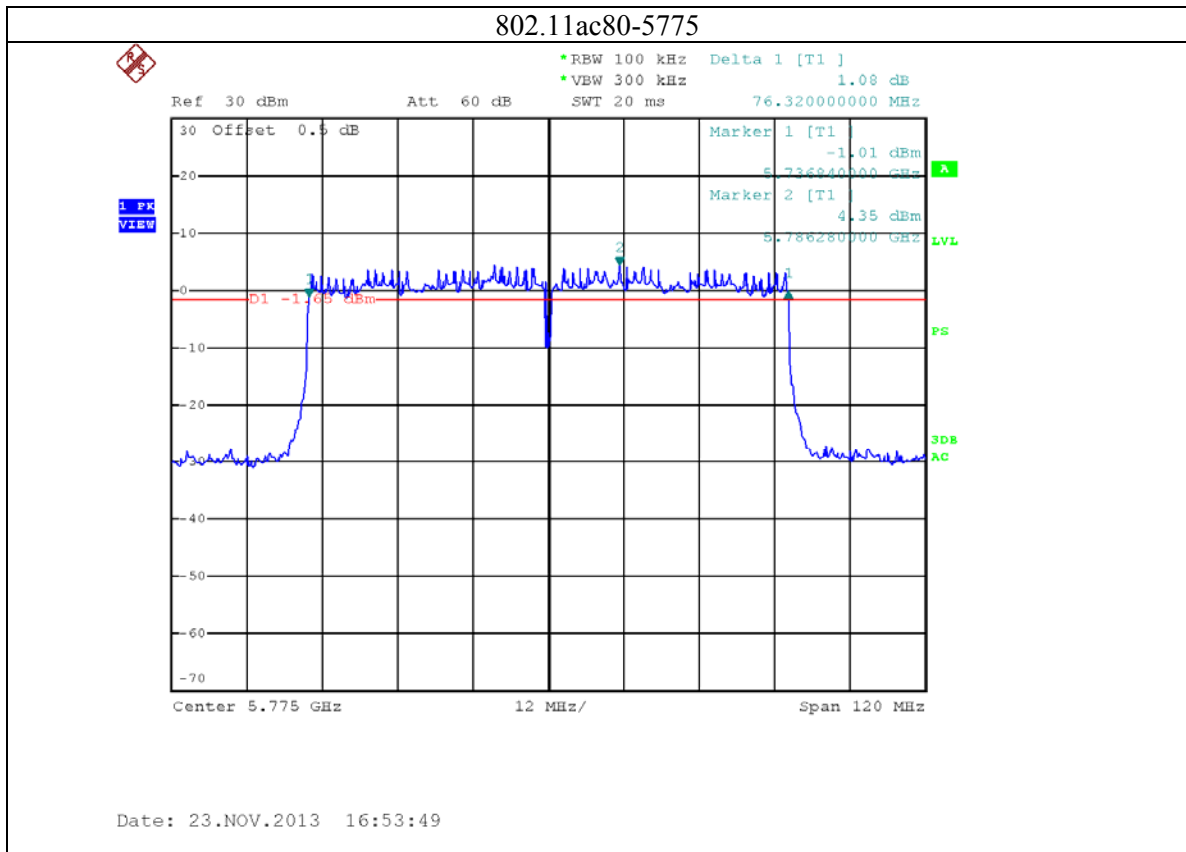
5: 5.8G band port 1



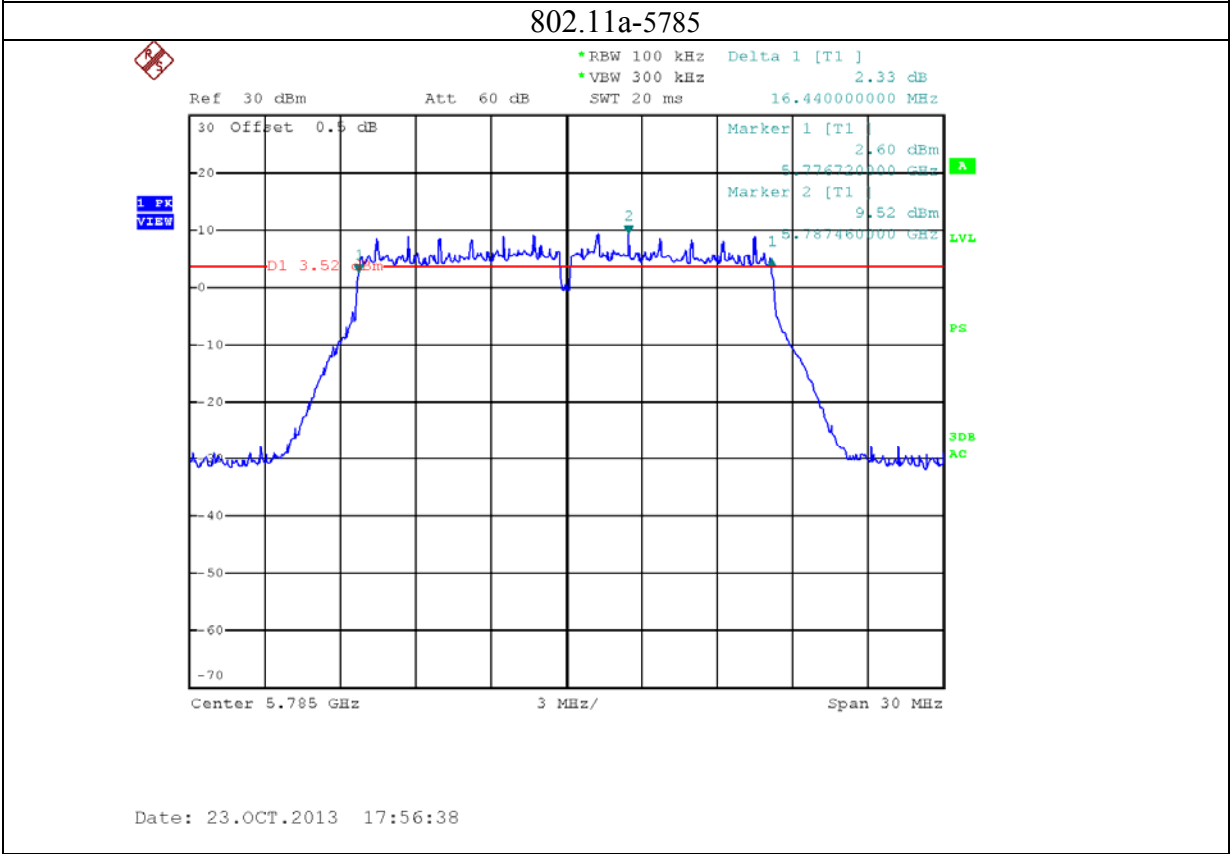
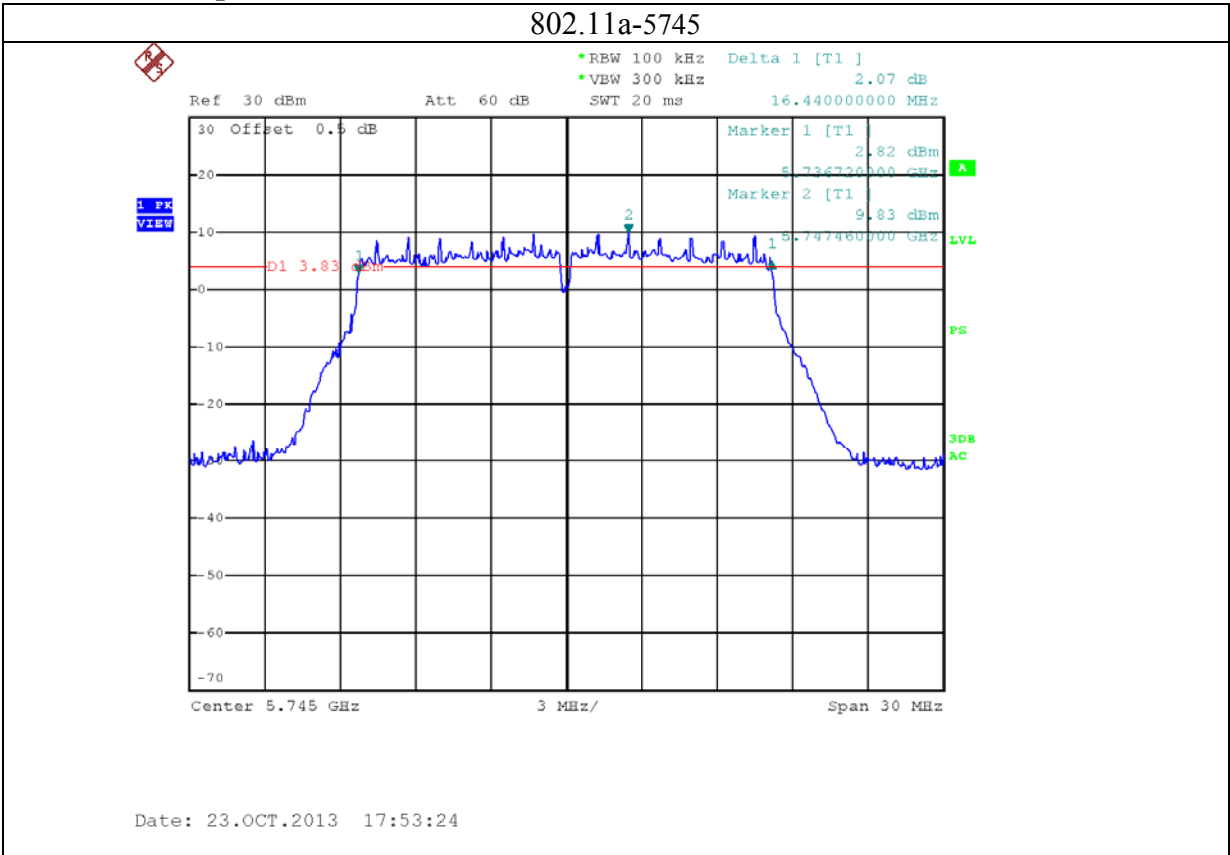


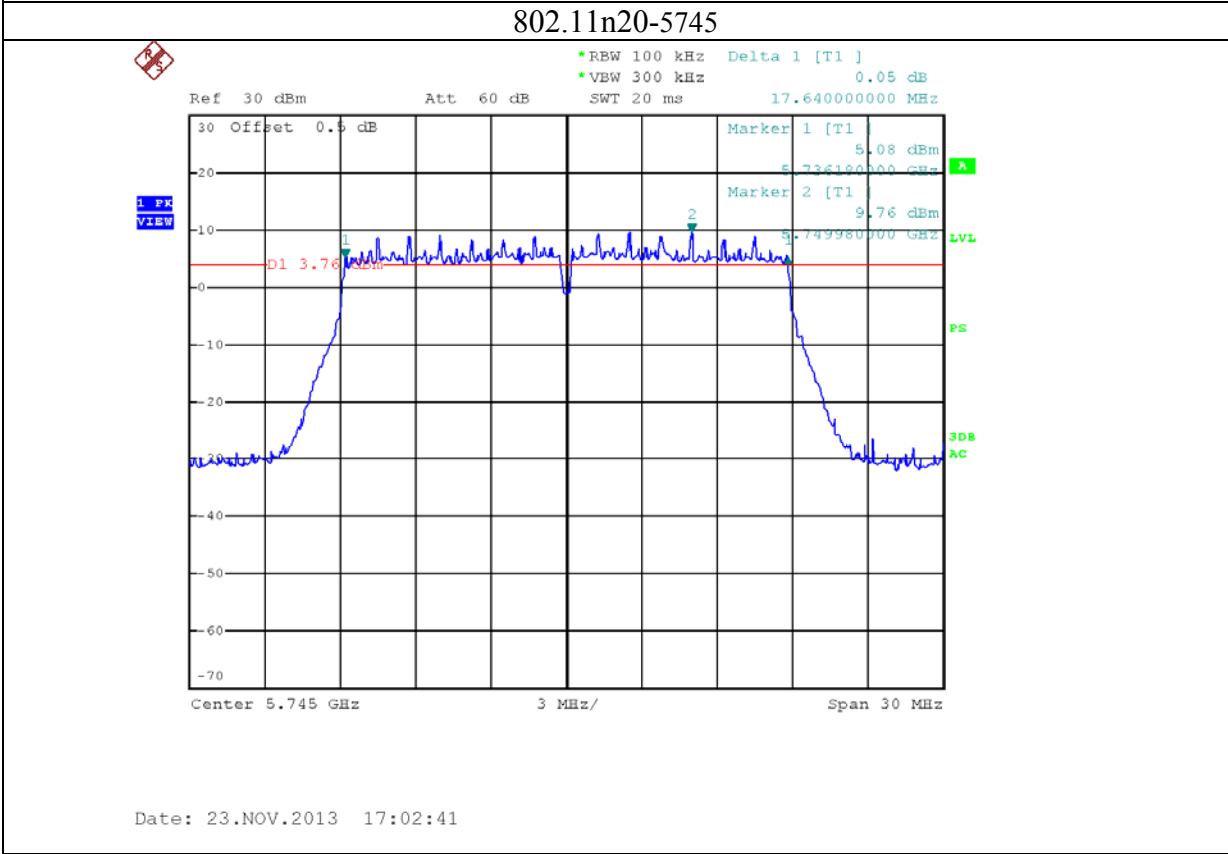
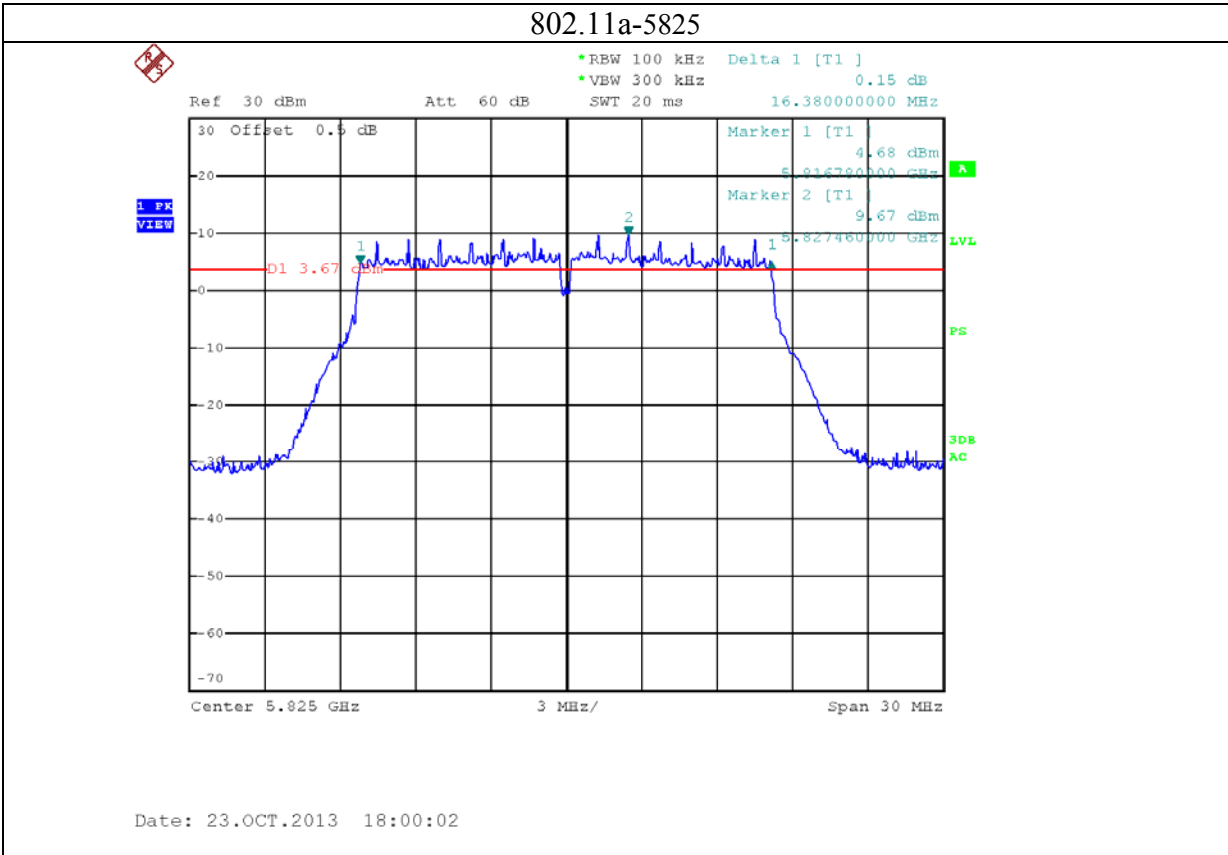


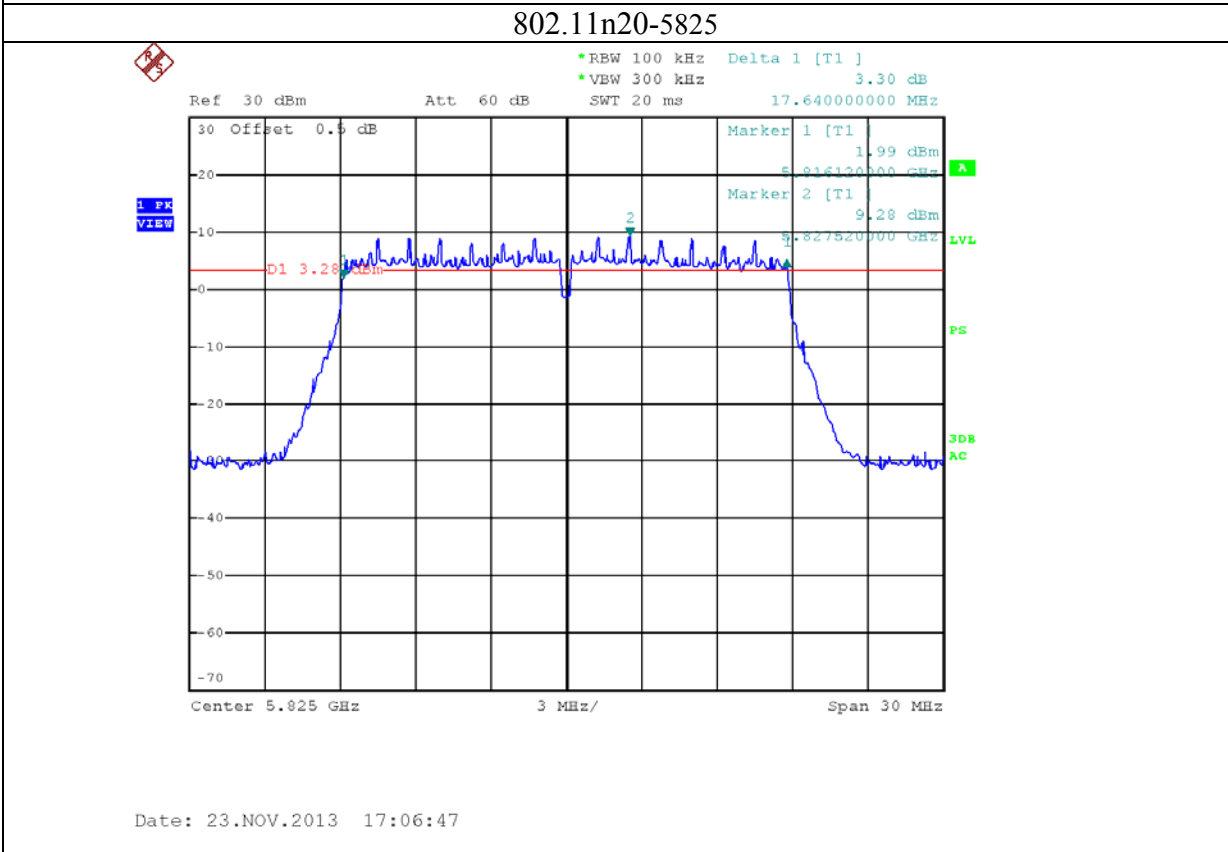
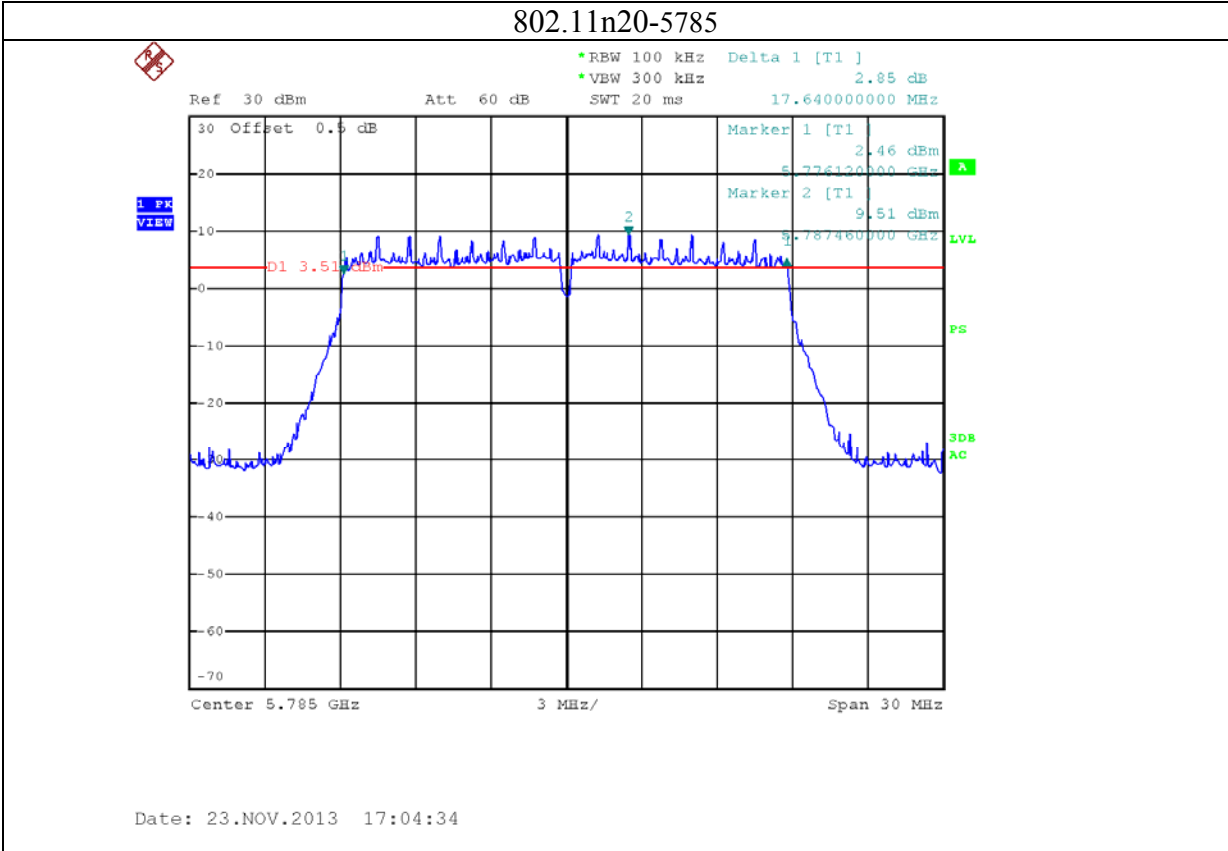


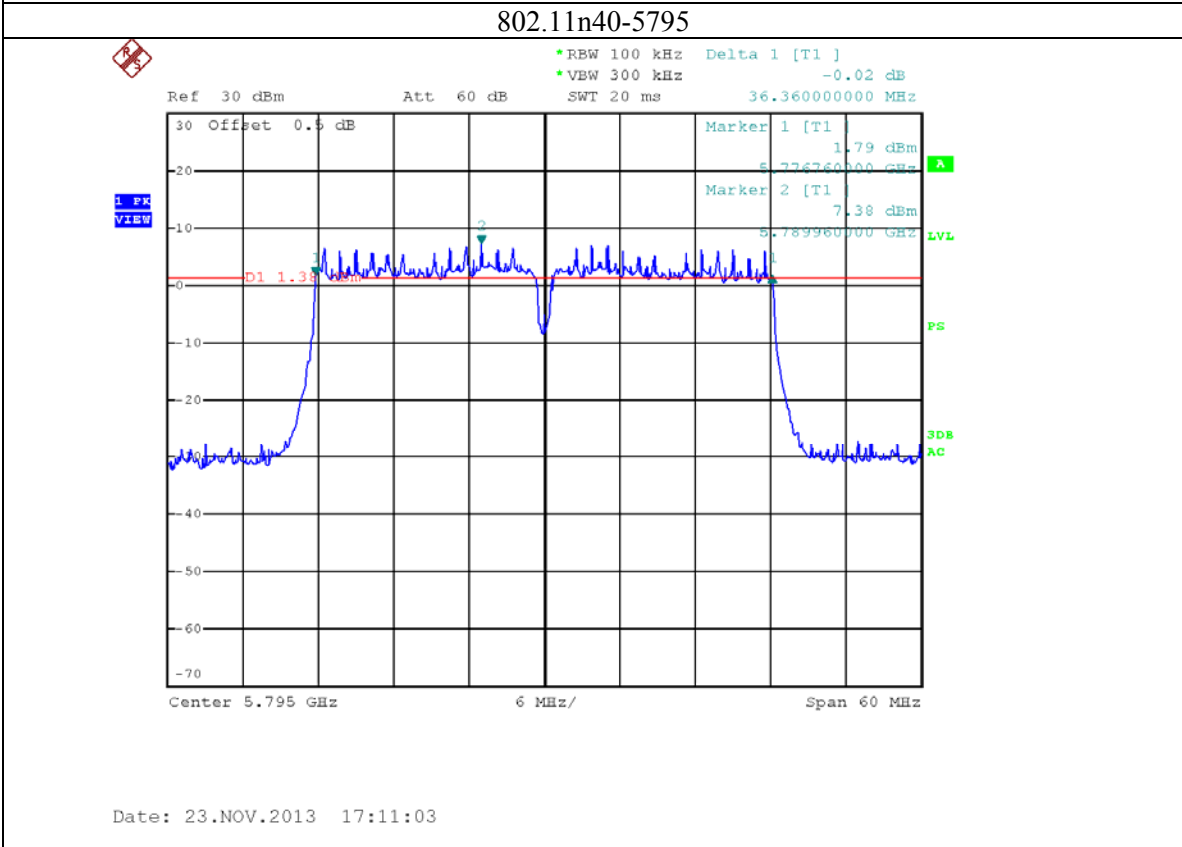
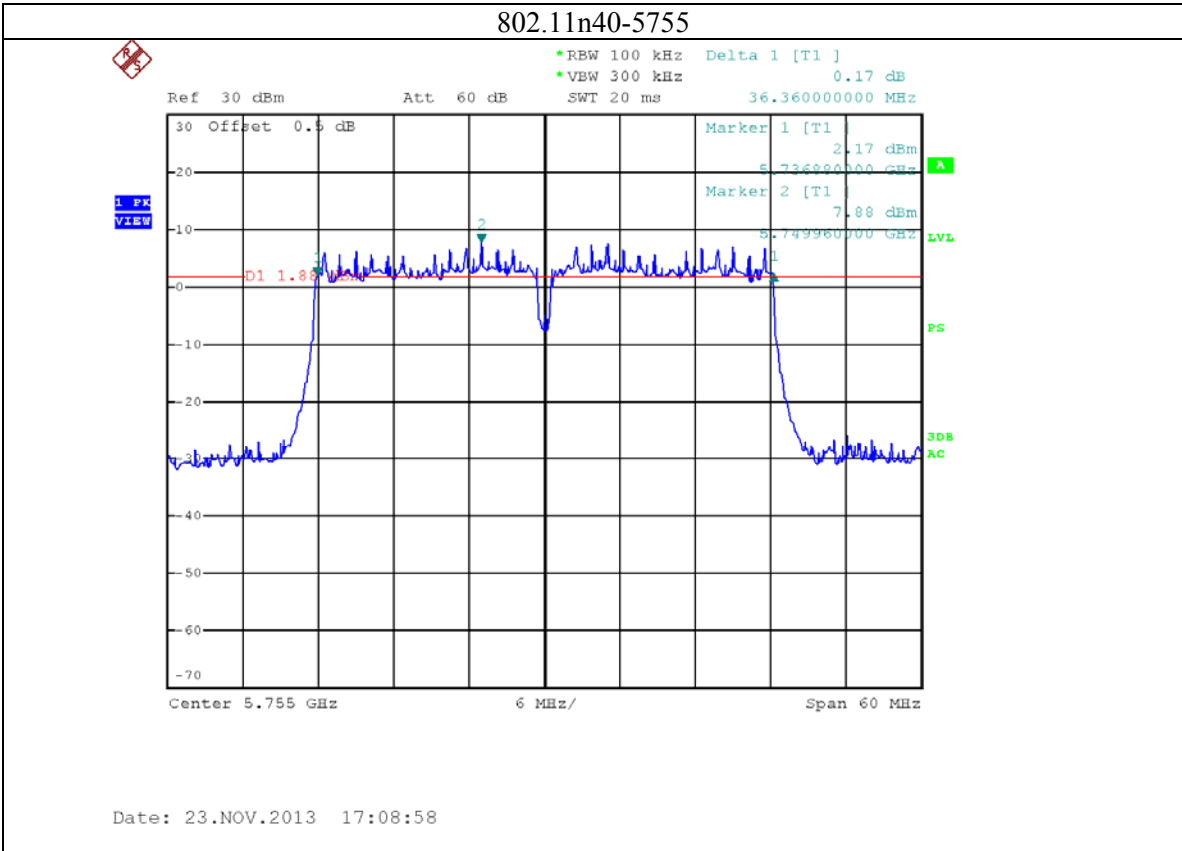


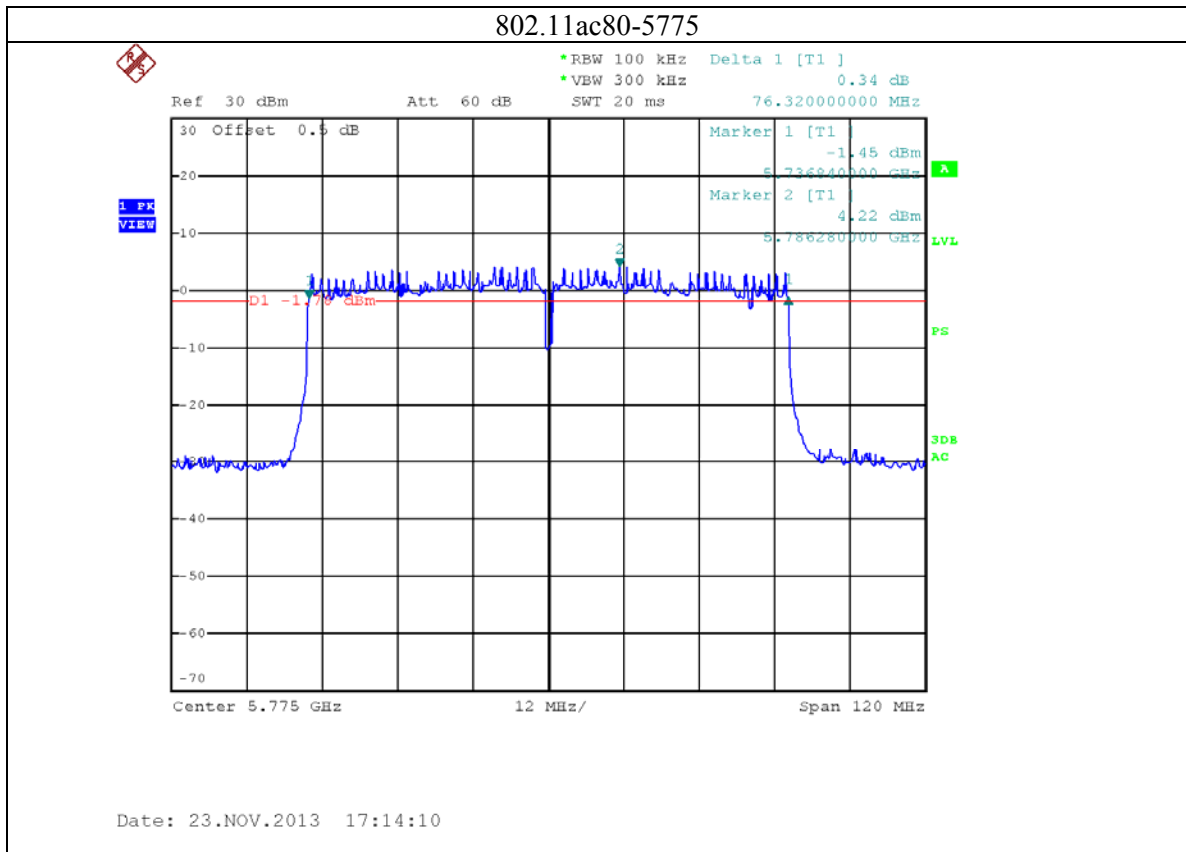
6: 5.8G band port 2





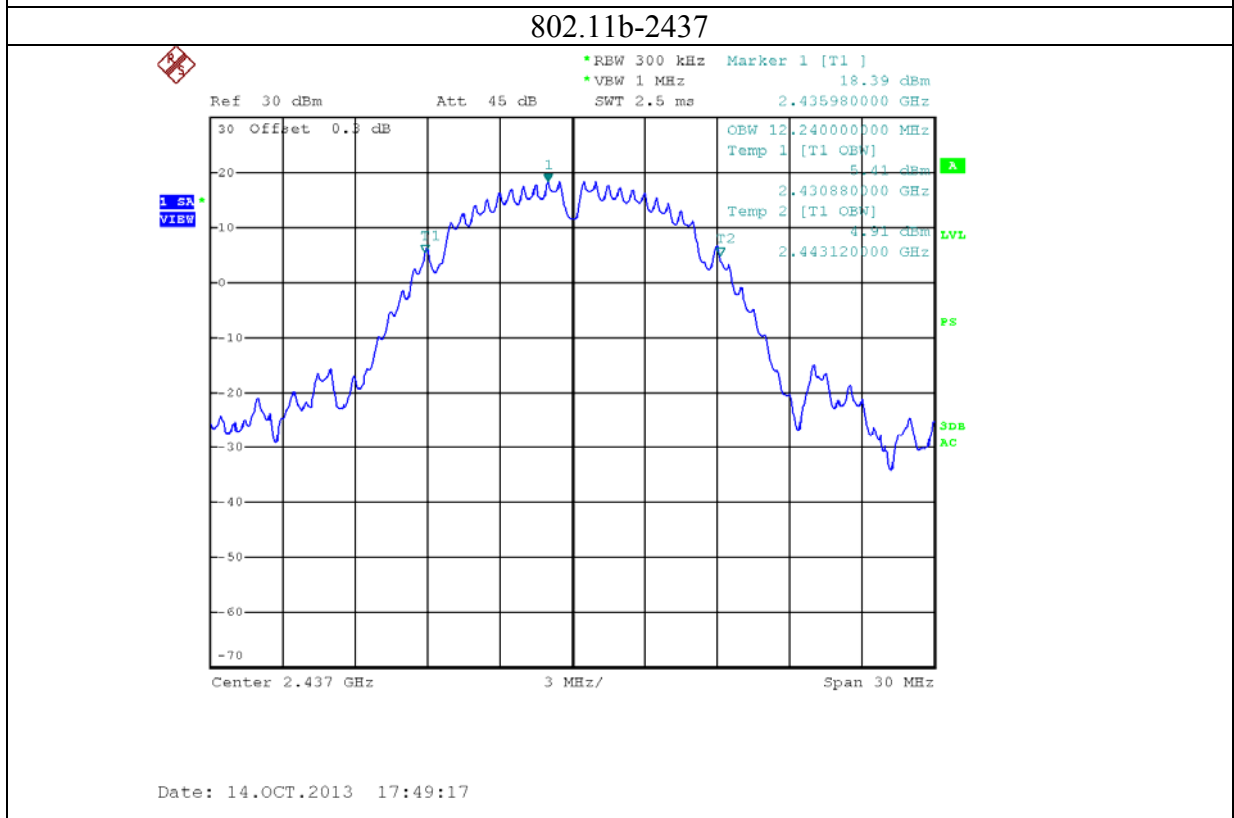
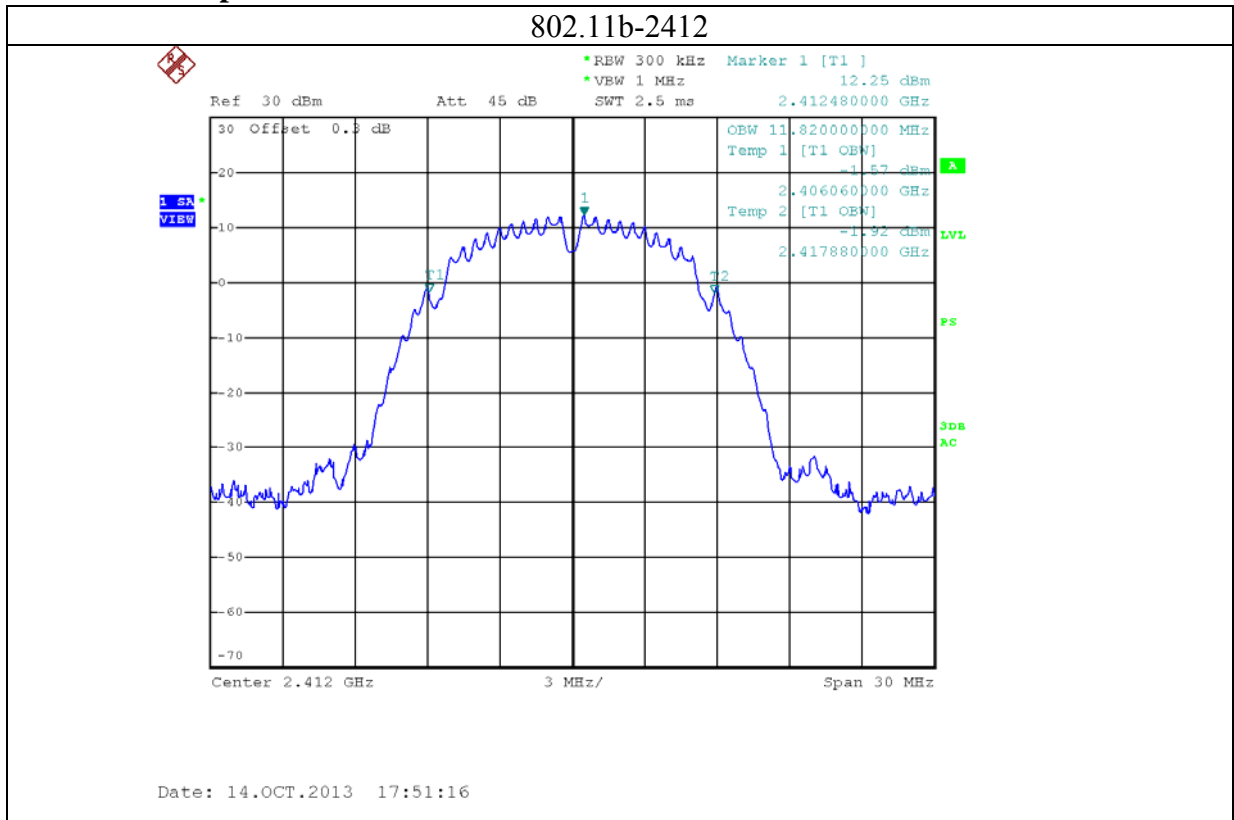


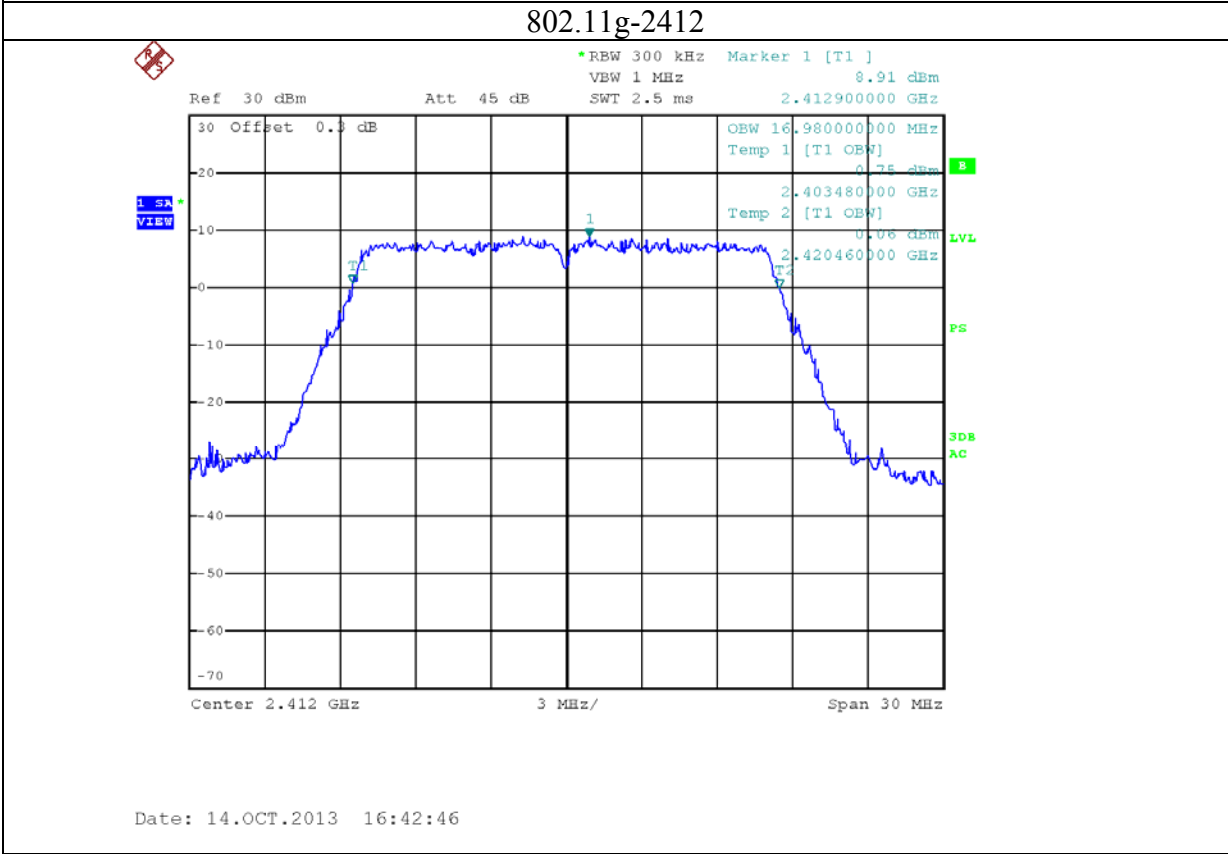
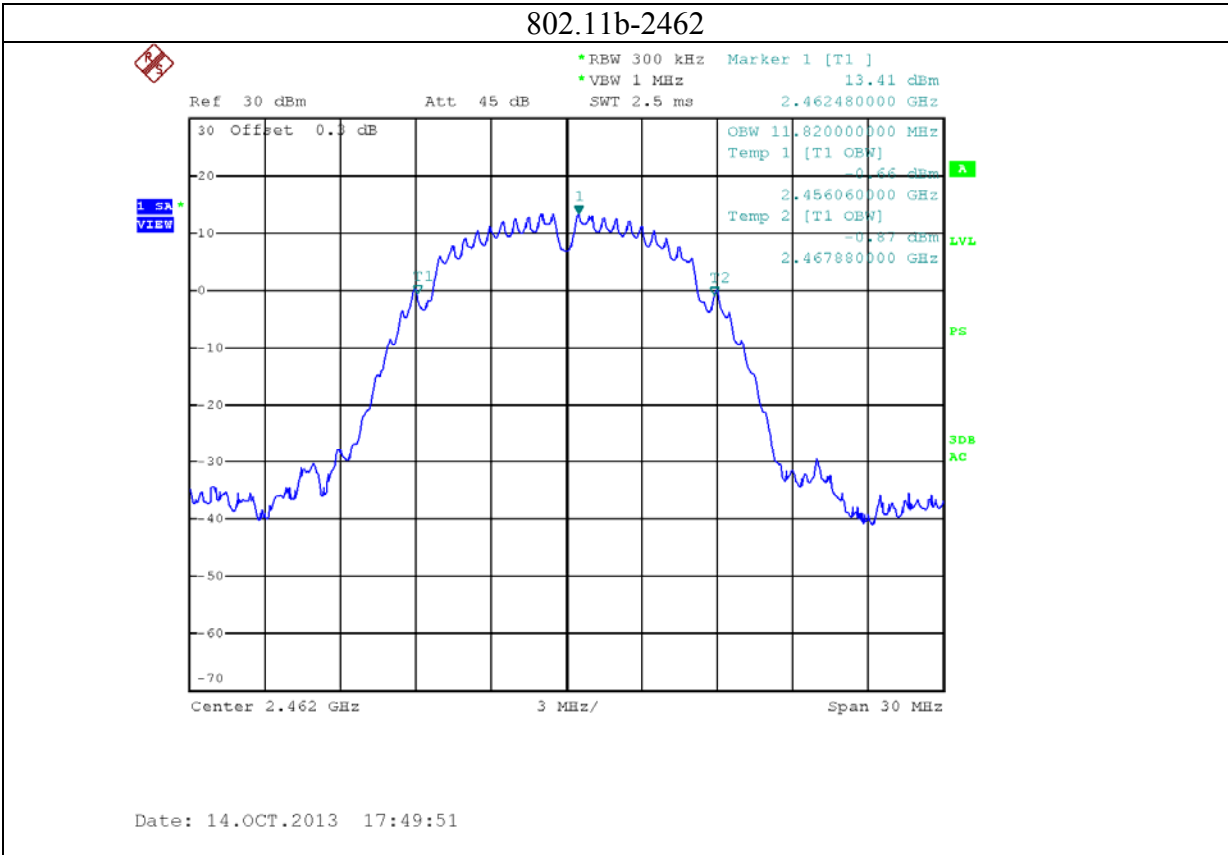


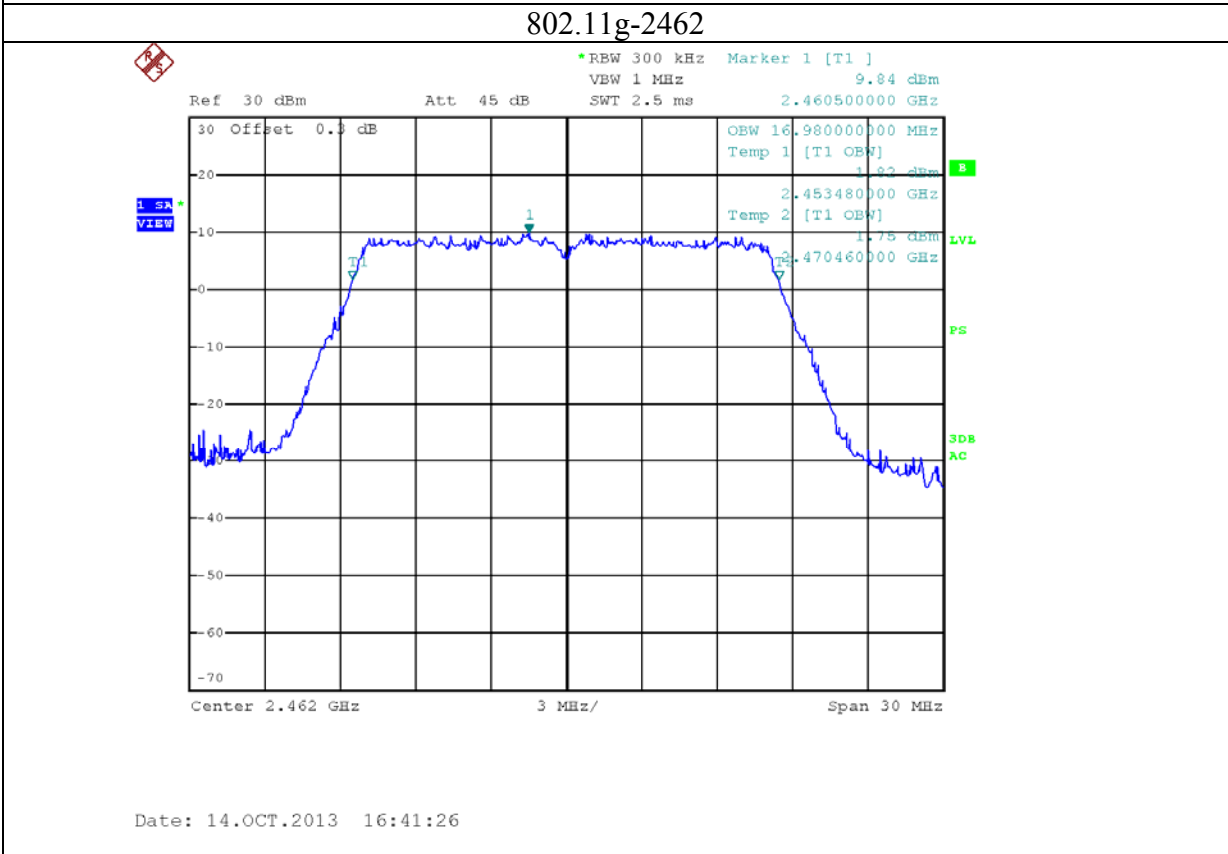
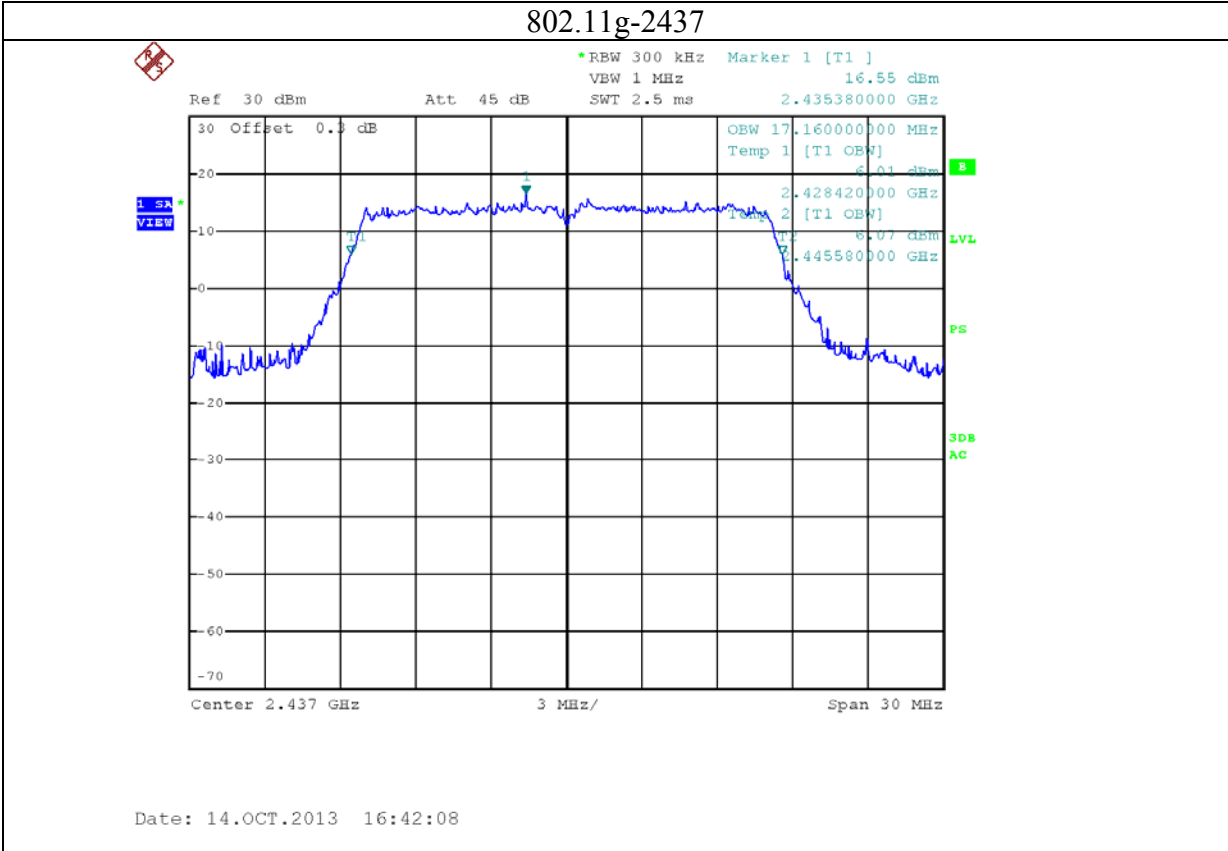


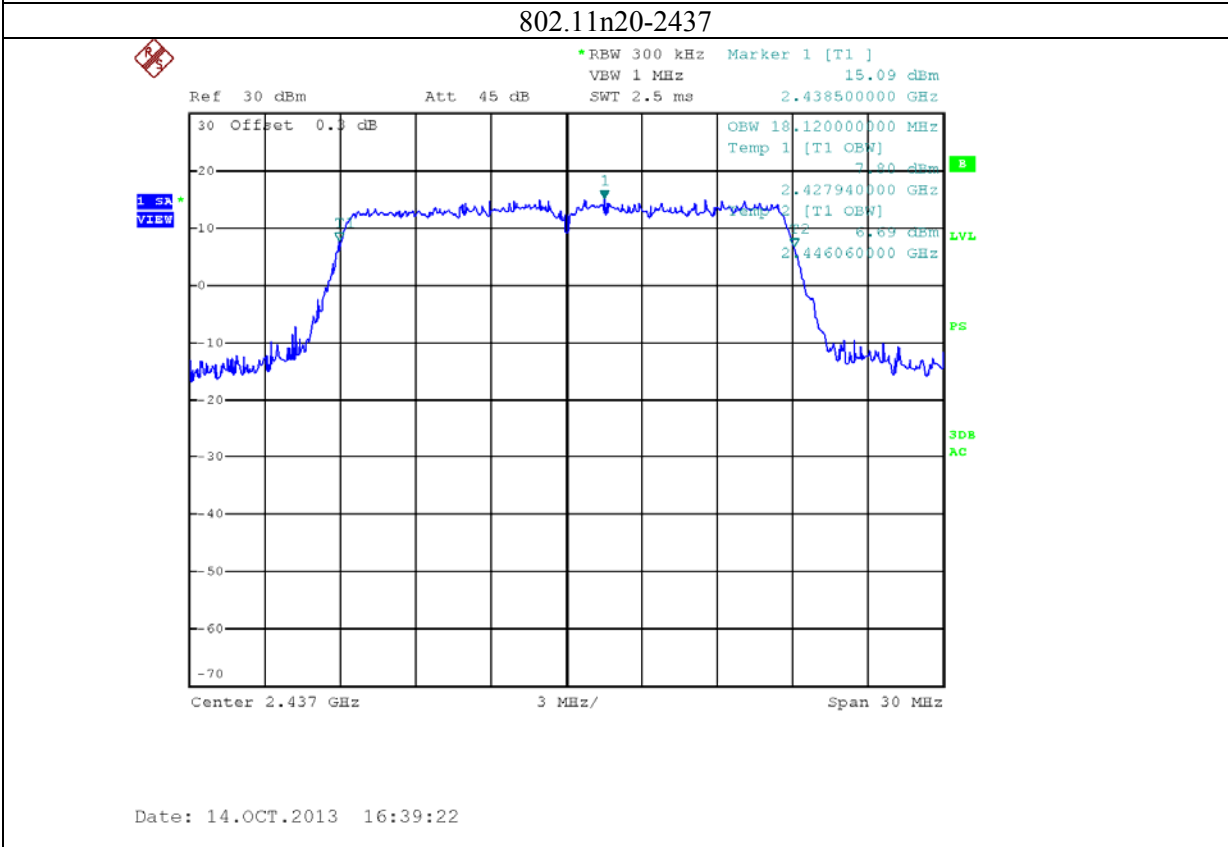
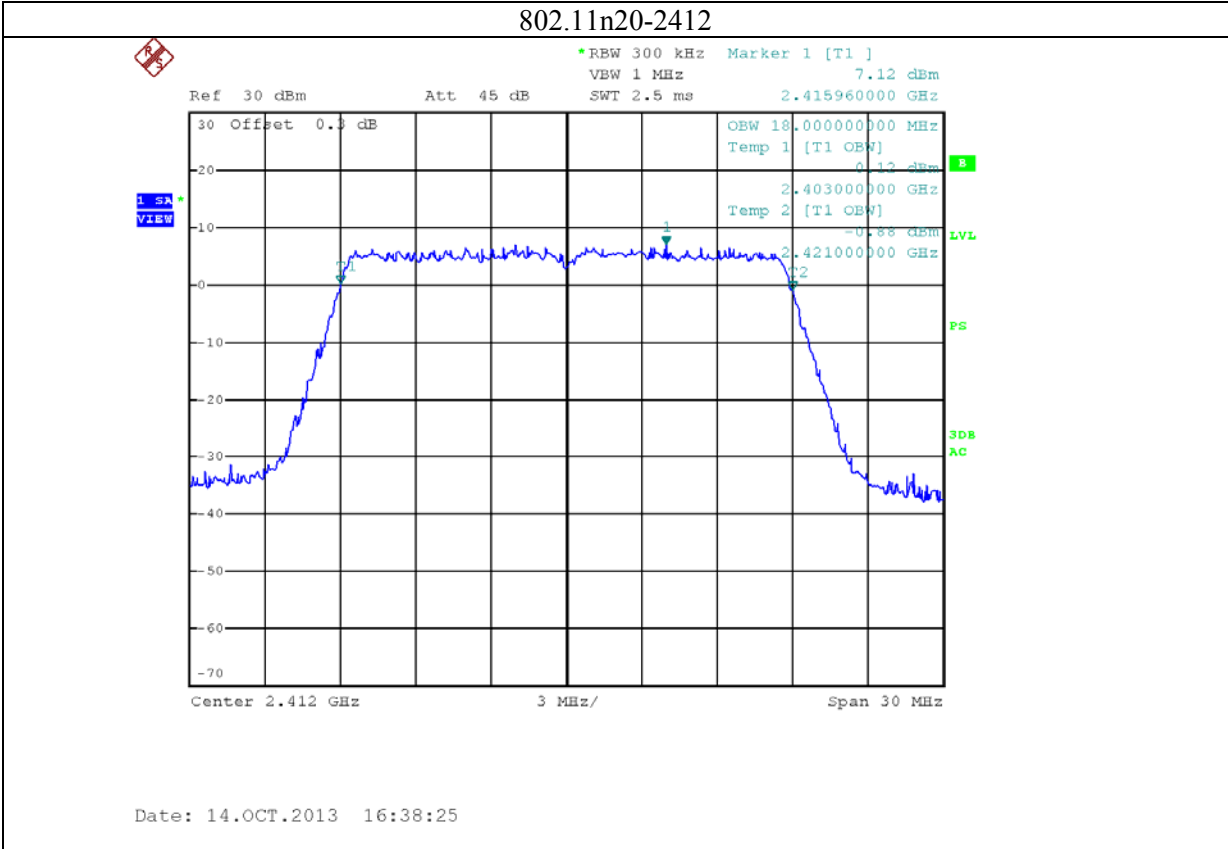
A.3: 99% Occupied bandwidth

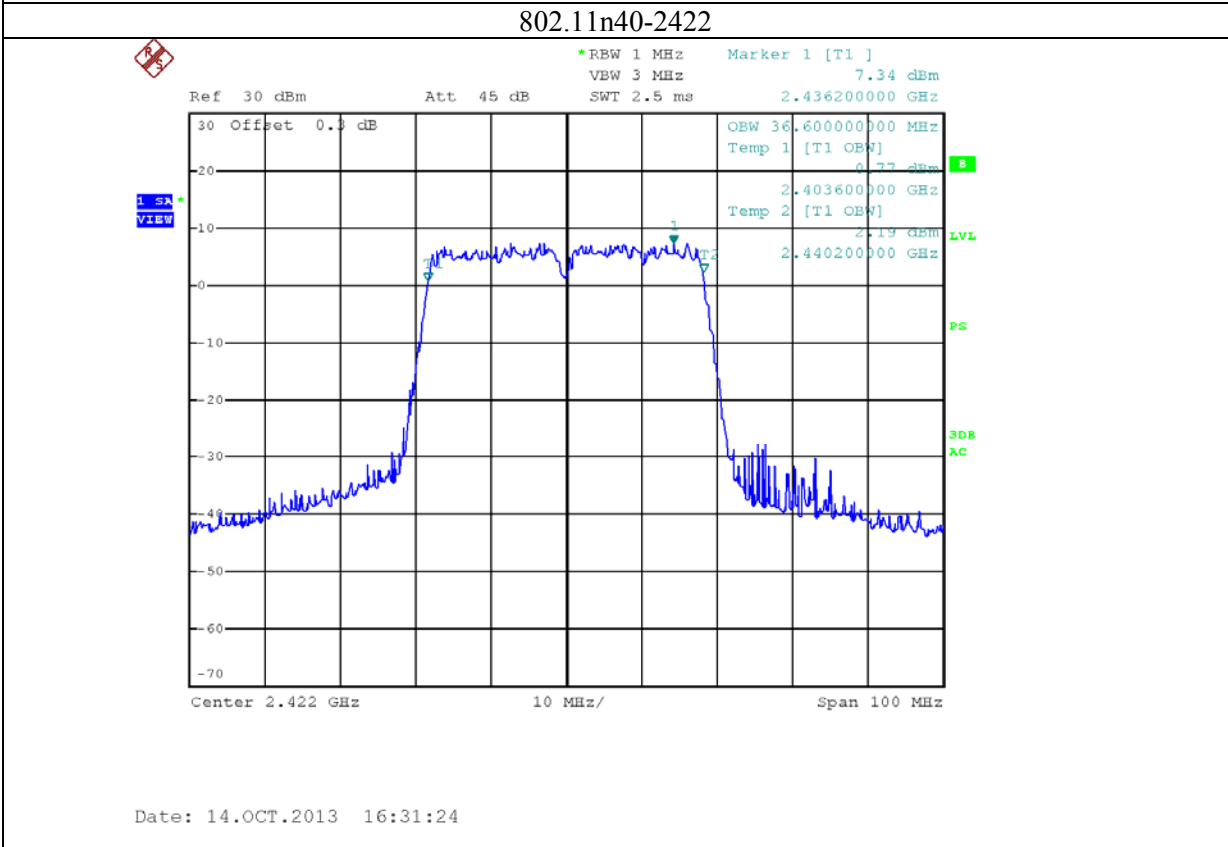
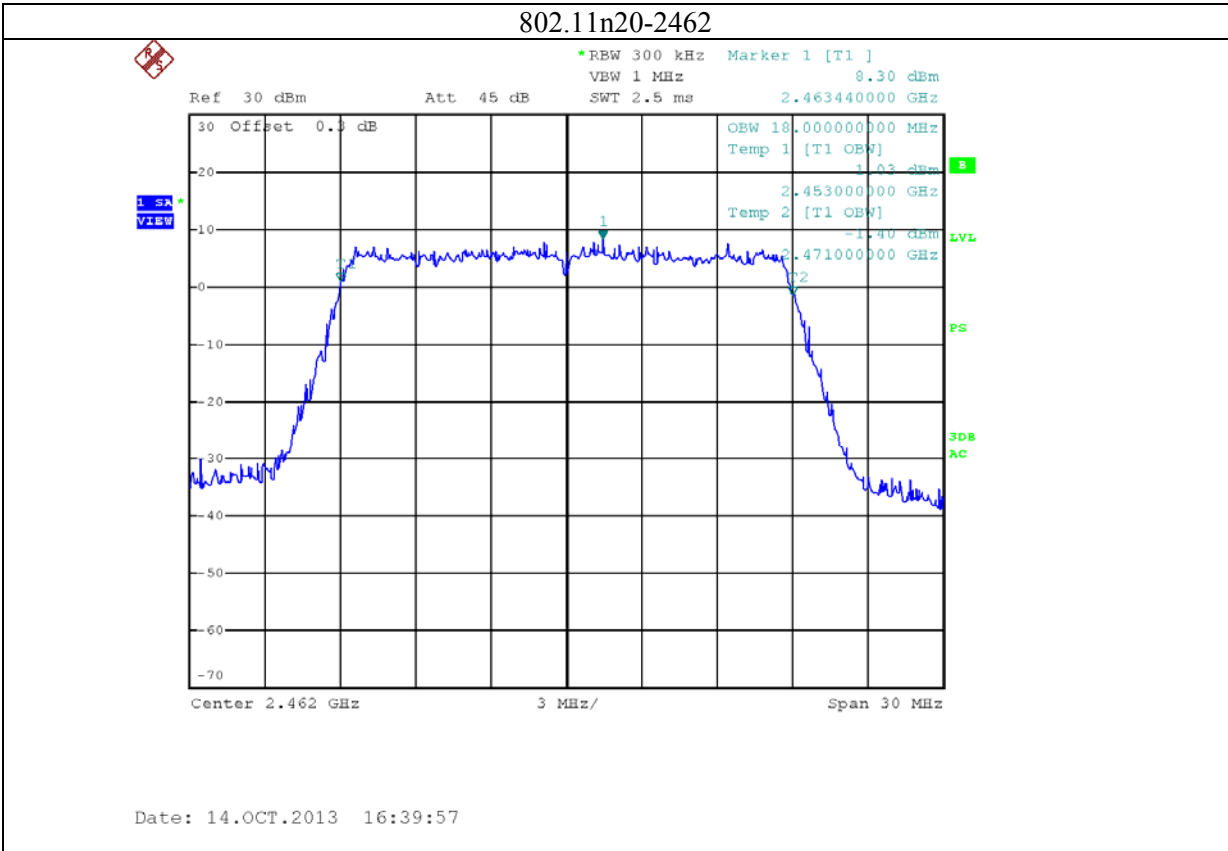
1: 2.4G band port 0

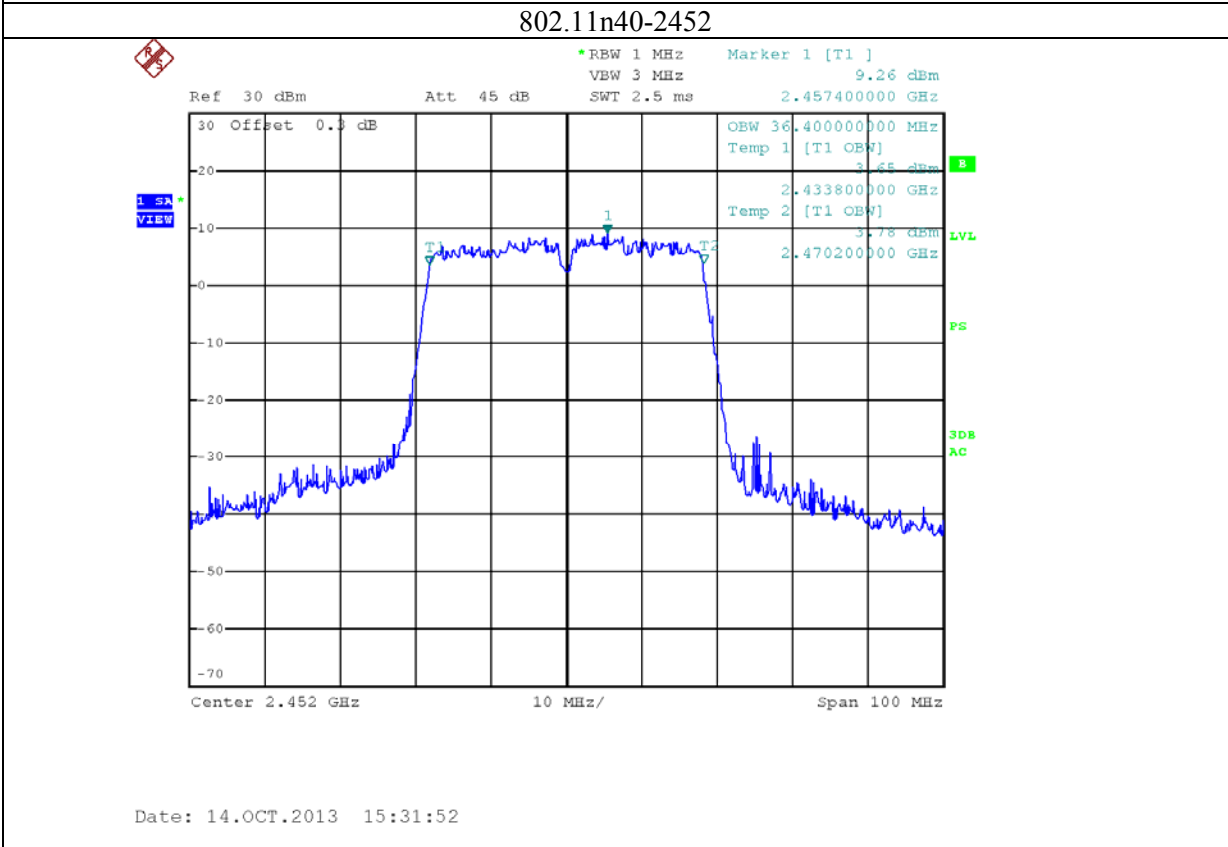
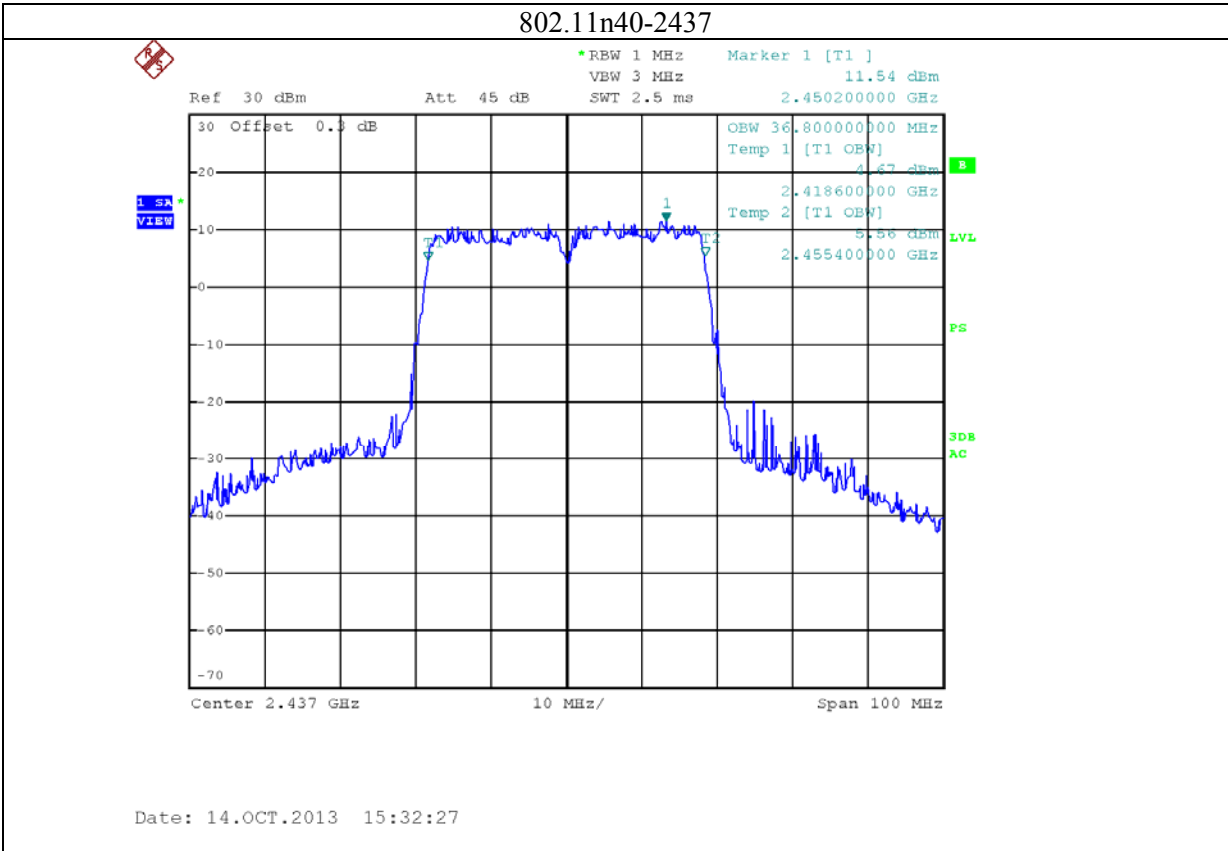




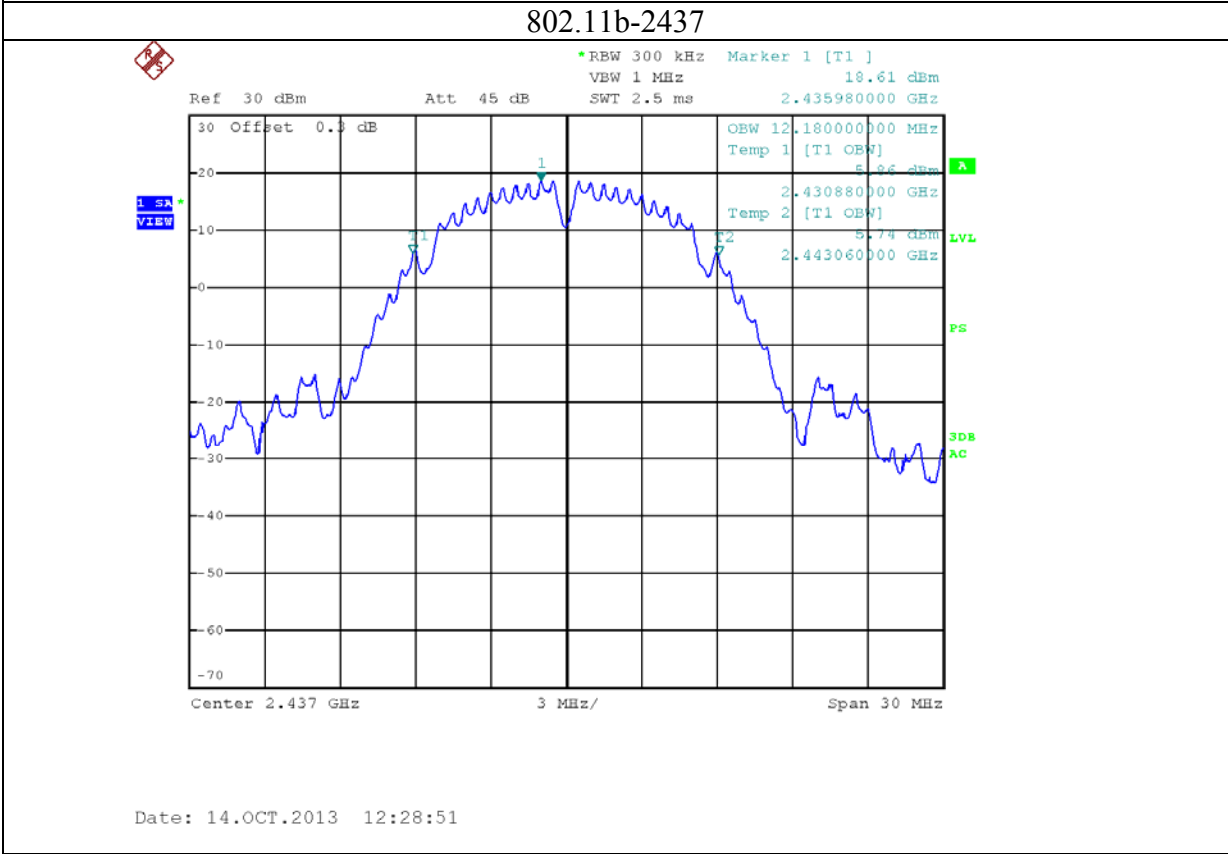
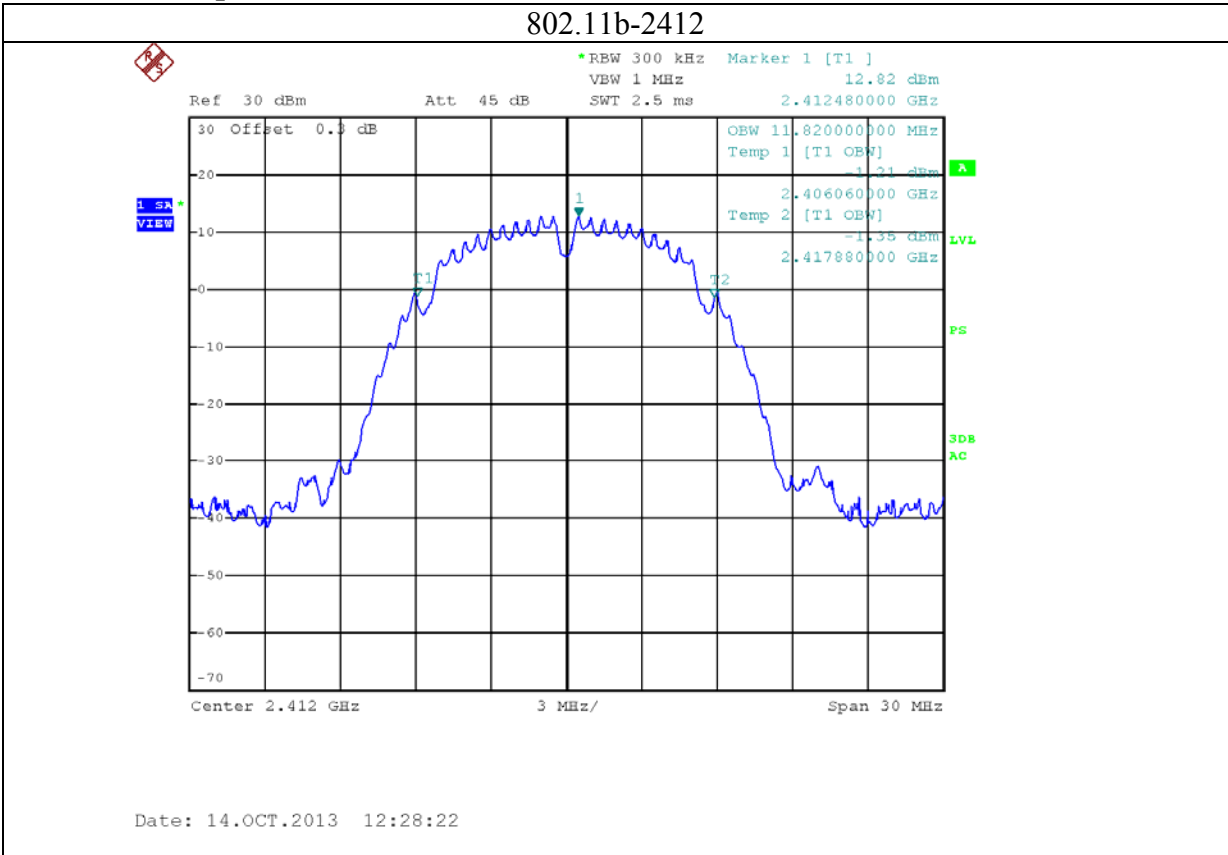


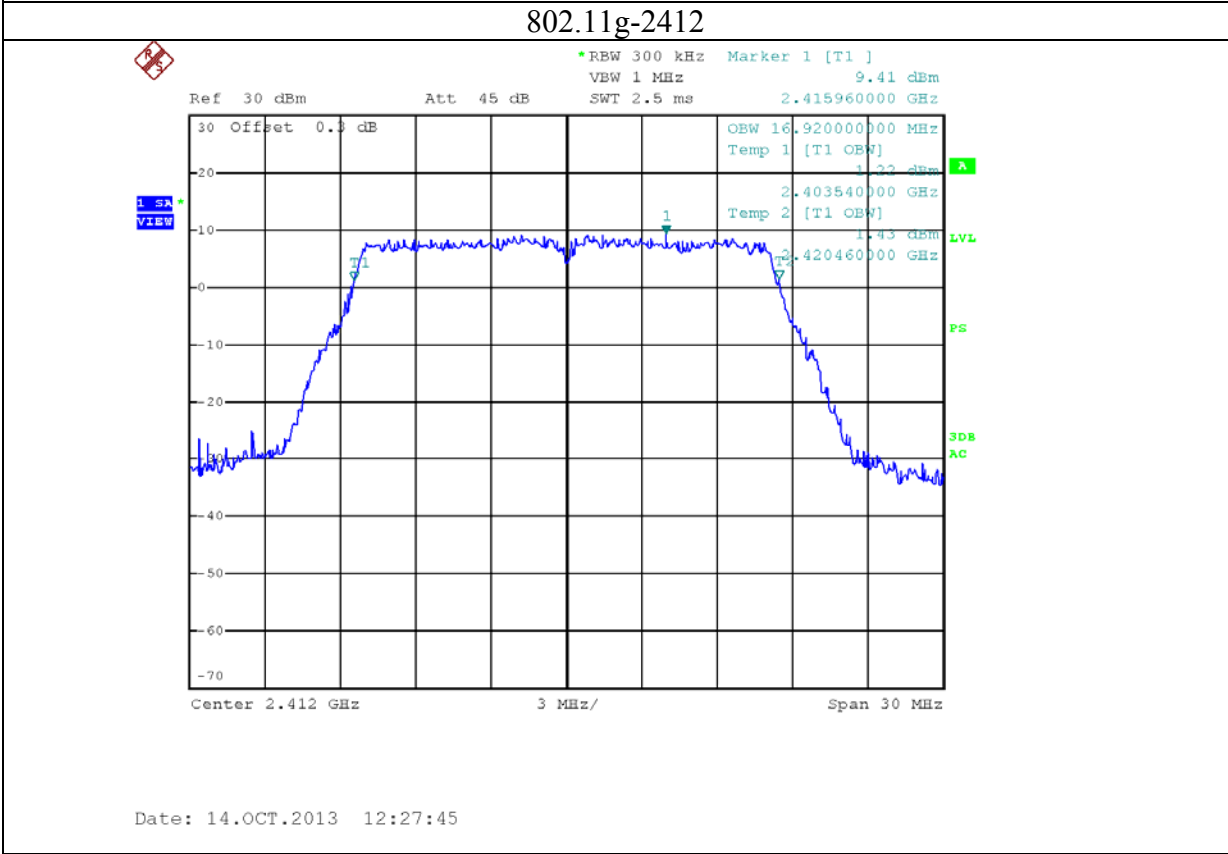
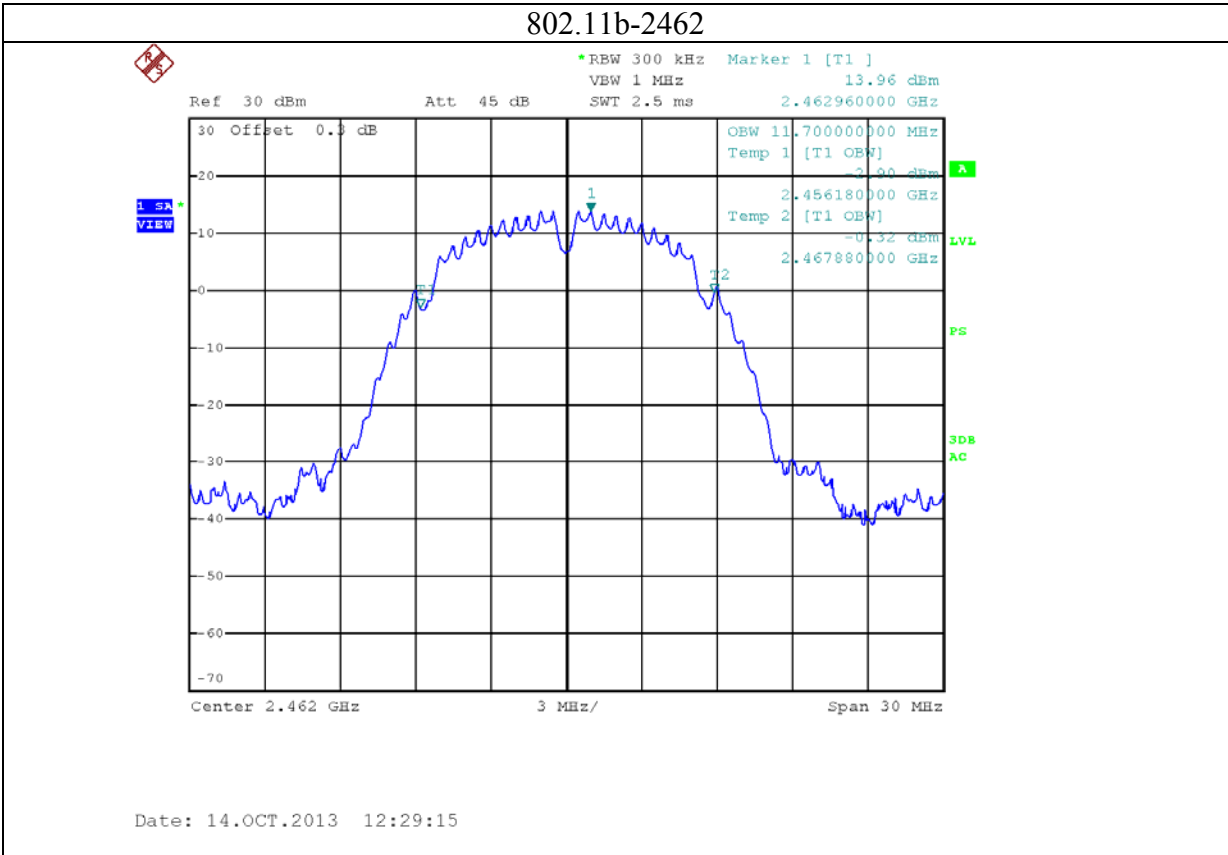


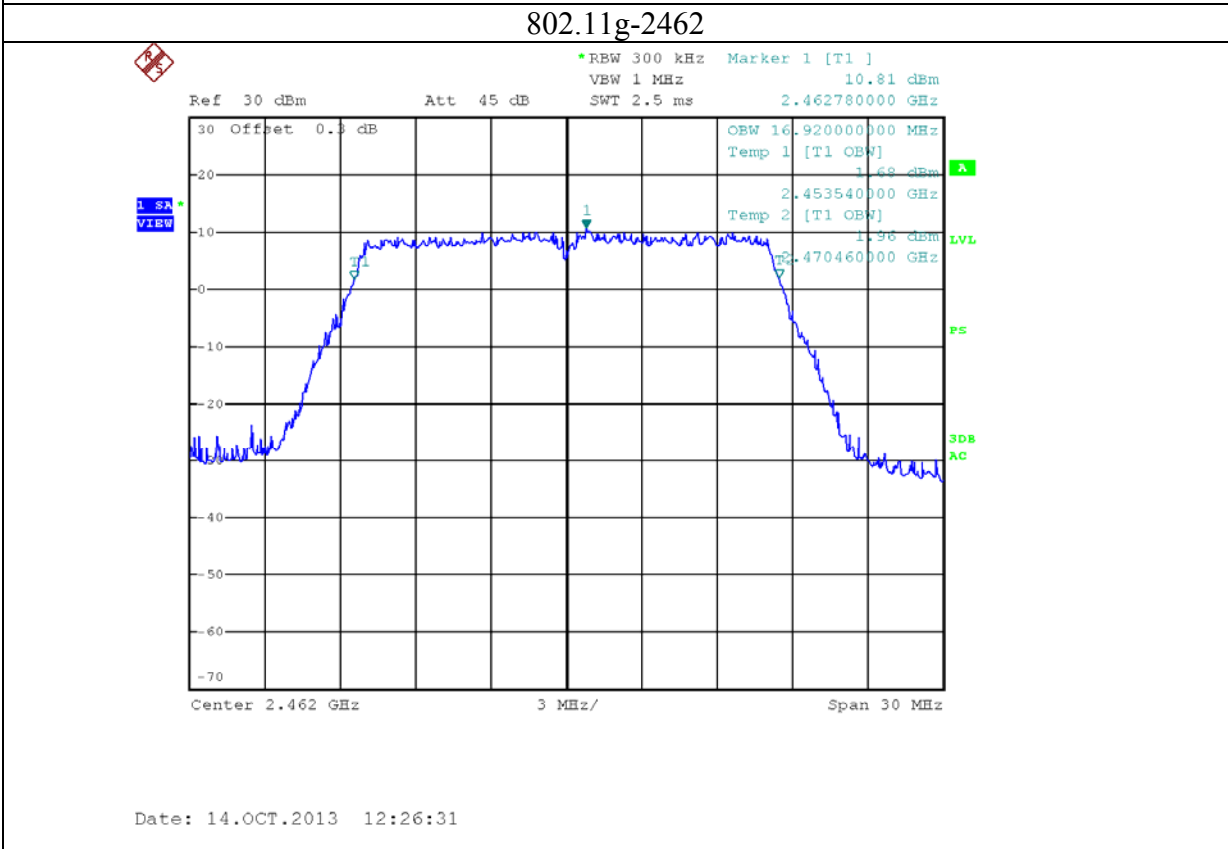
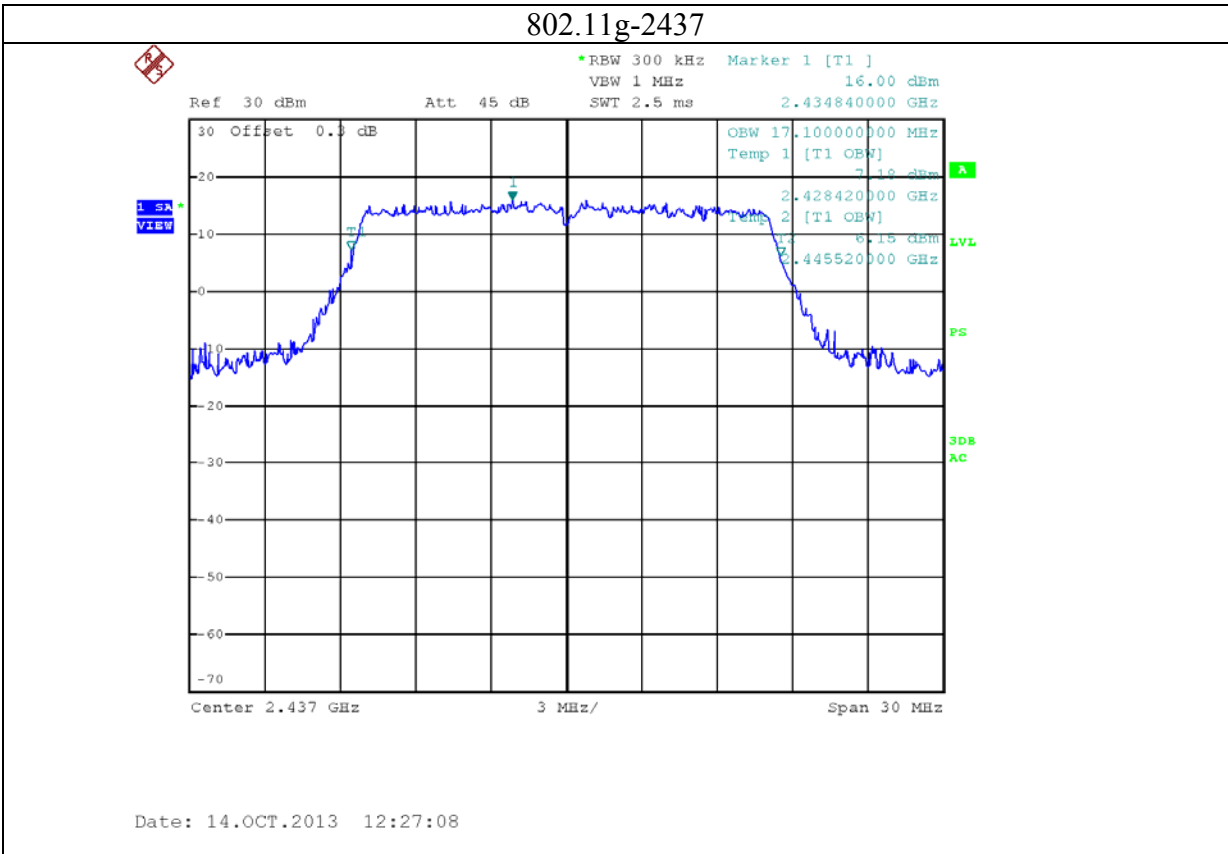




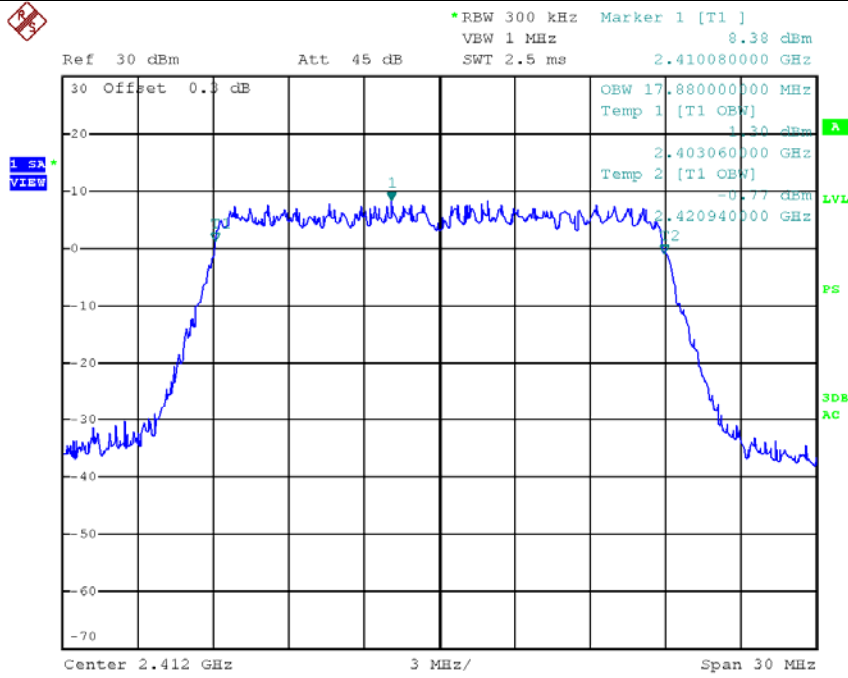
2: 2.4G band port 1





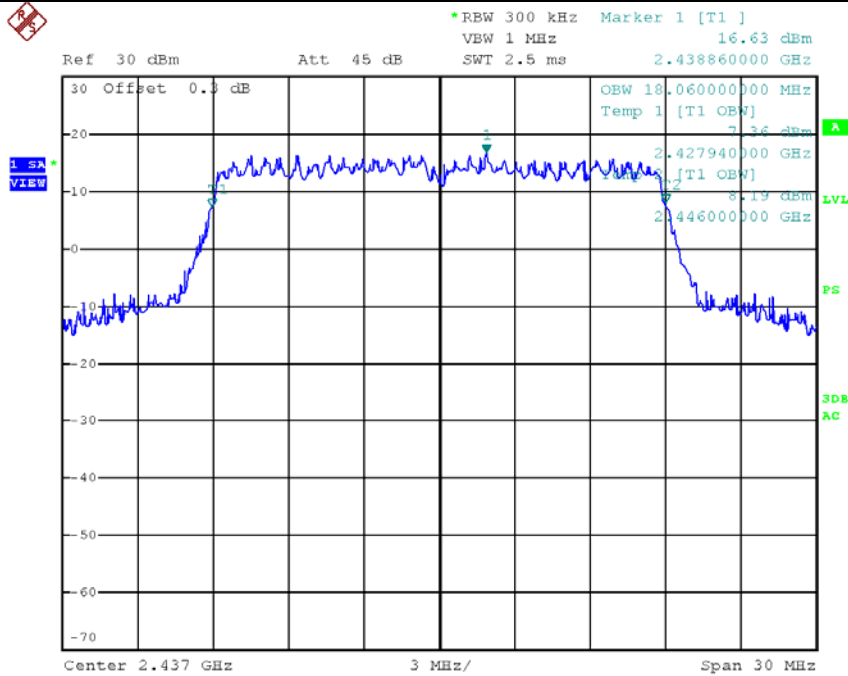


802.11n20-2412



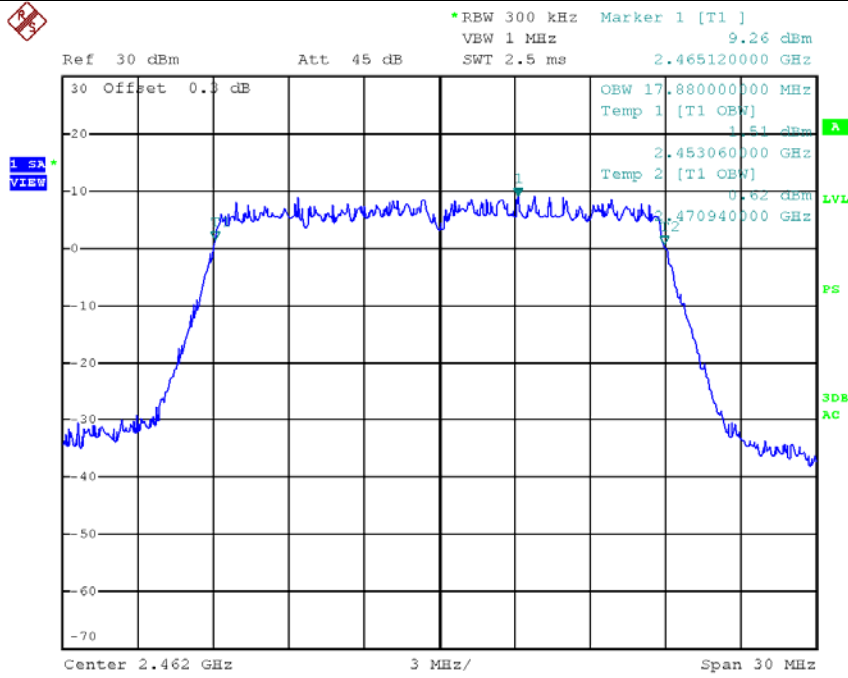
Date: 14.OCT.2013 12:24:28

802.11n20-2437



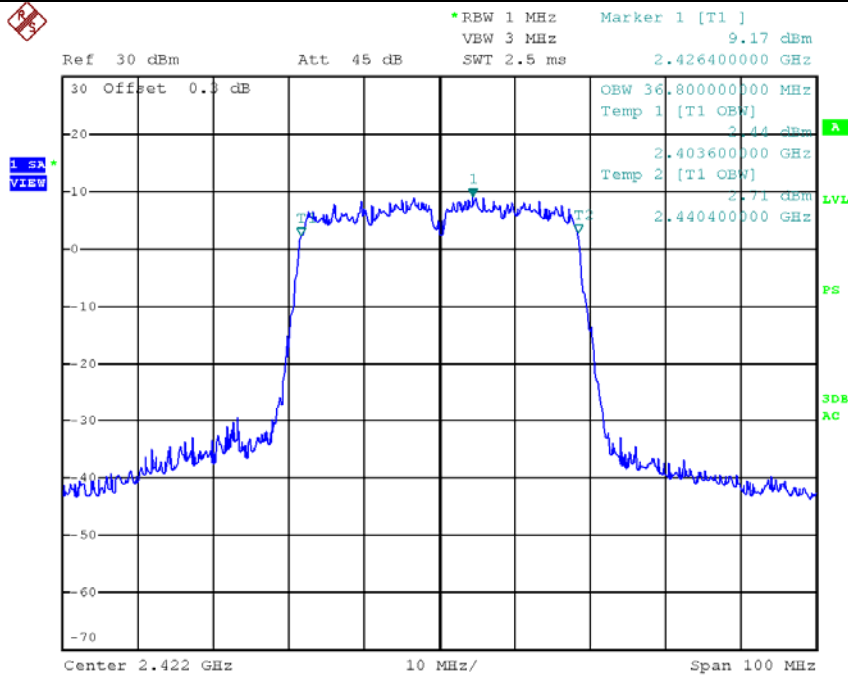
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802.11n20-2462



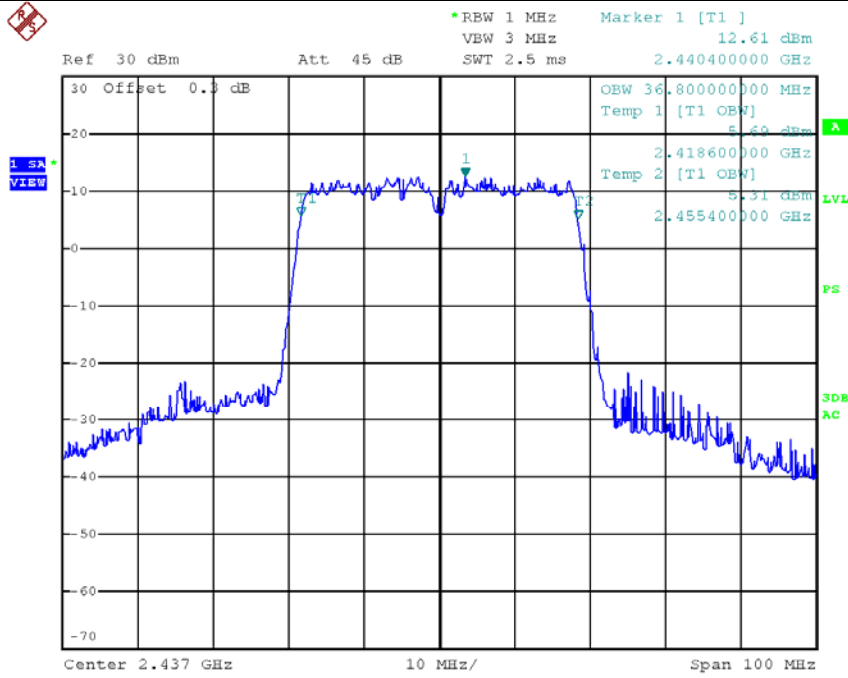
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802.11n40-2422



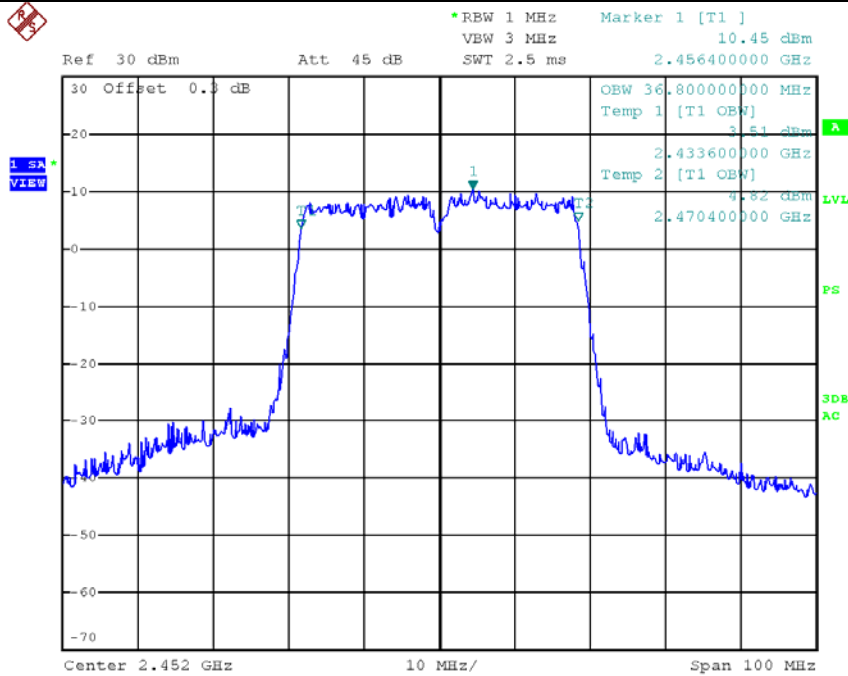
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802.11n40-2437



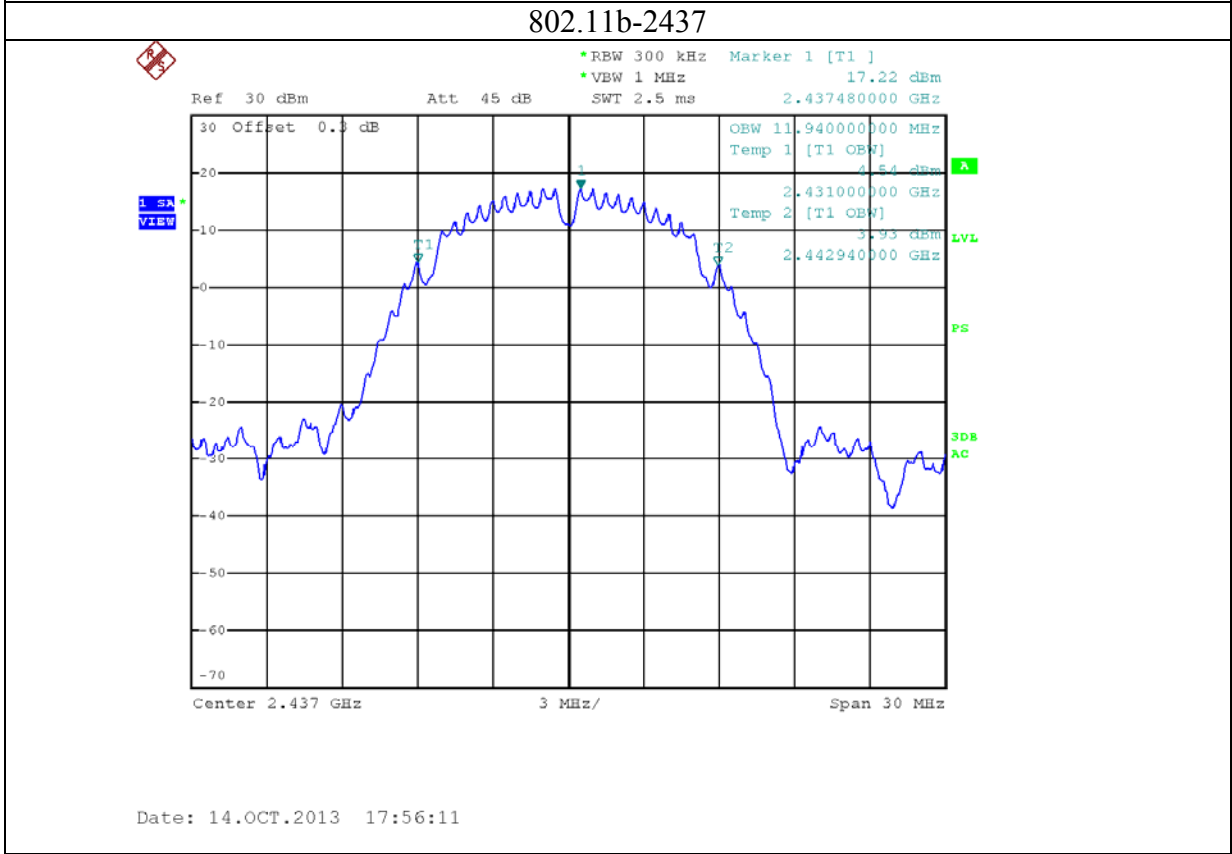
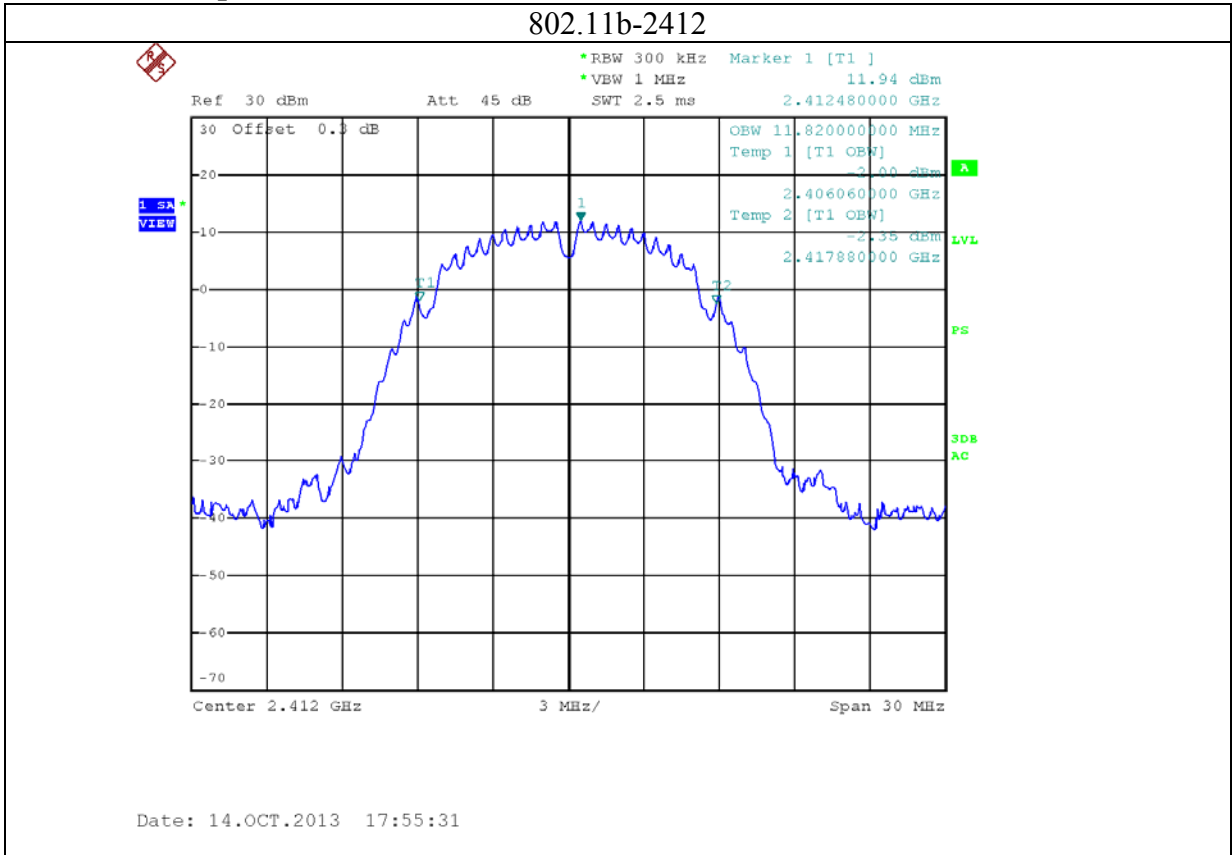
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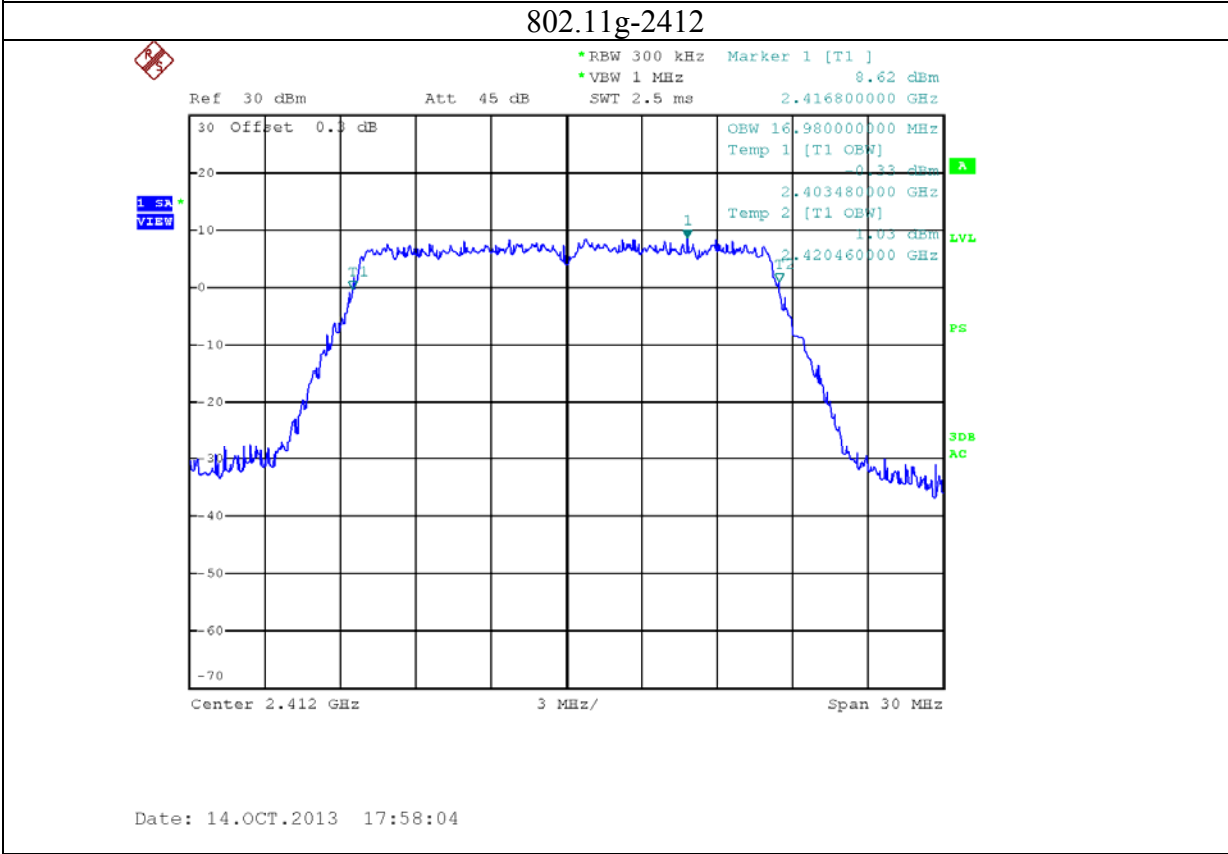
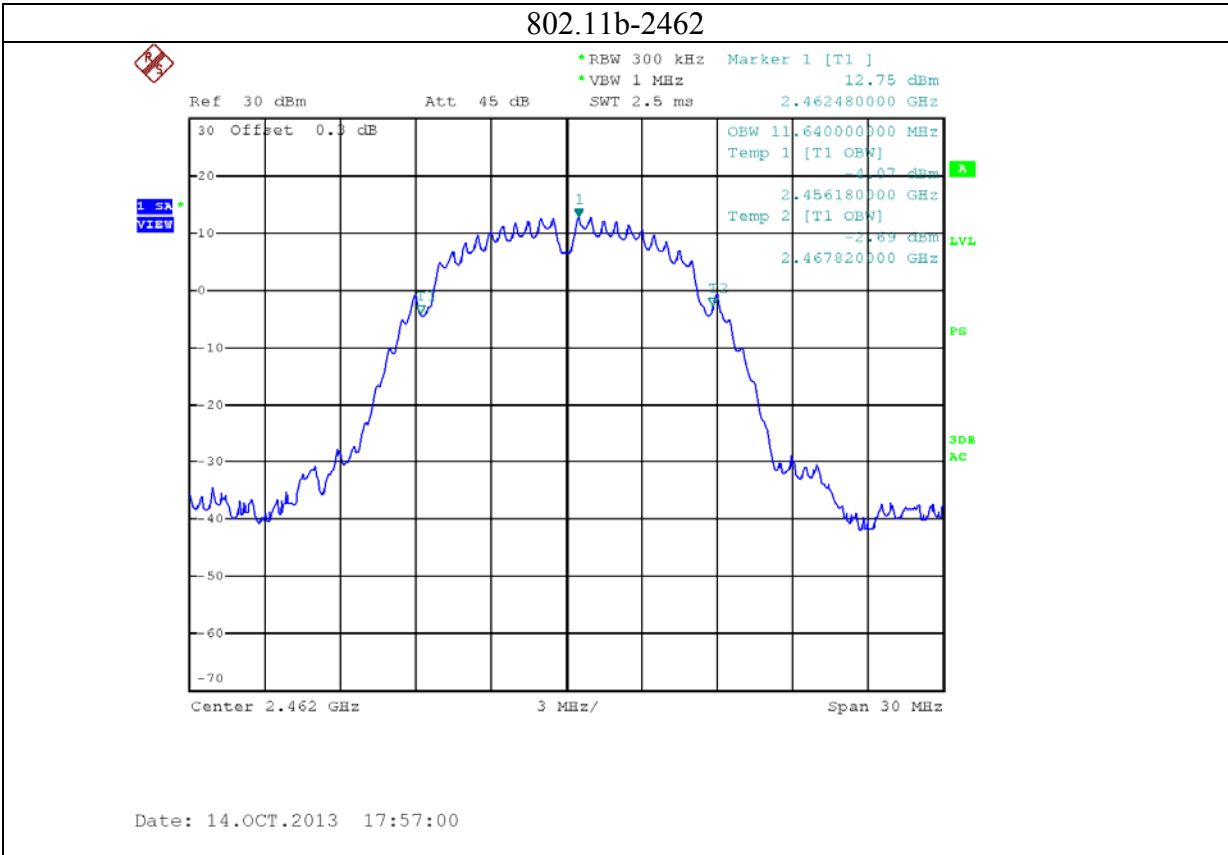
802.11n40-2452

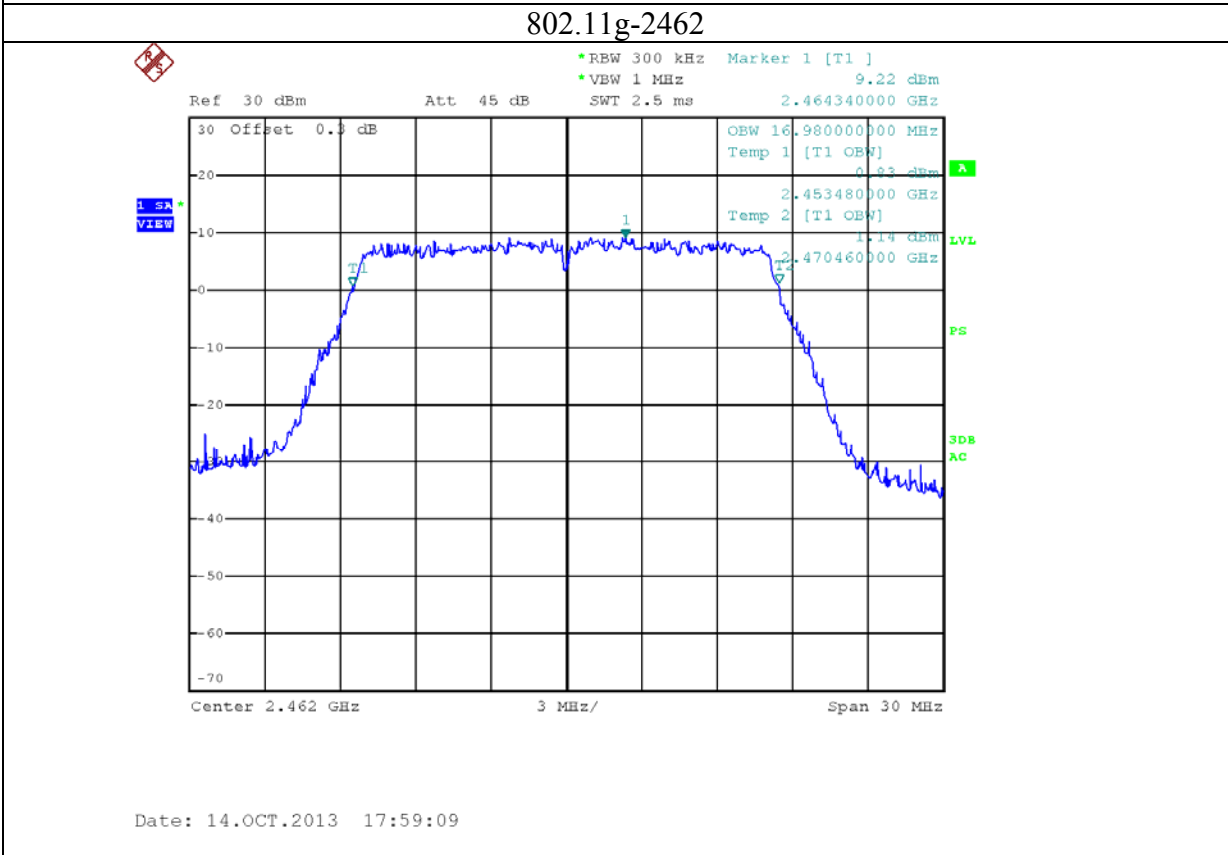
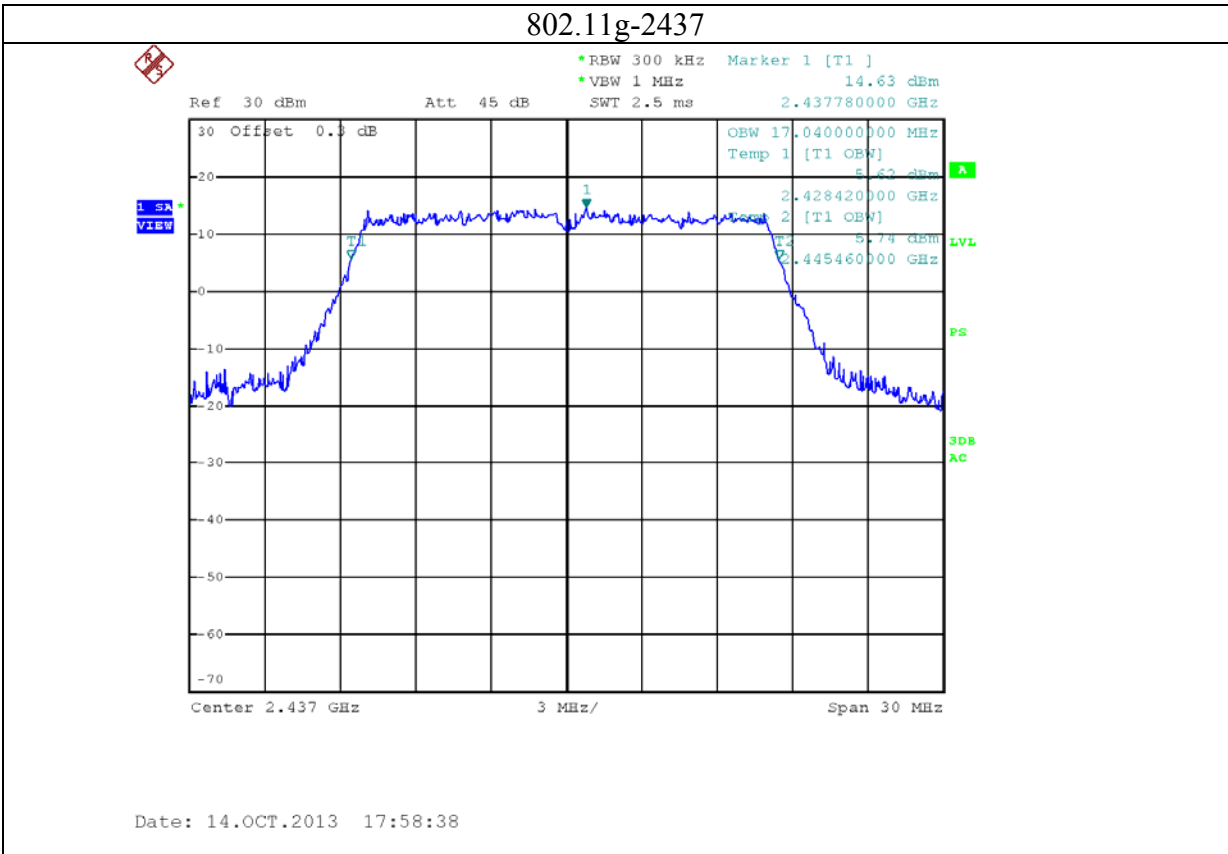


Date: 14.OCT.2013 12:20:17

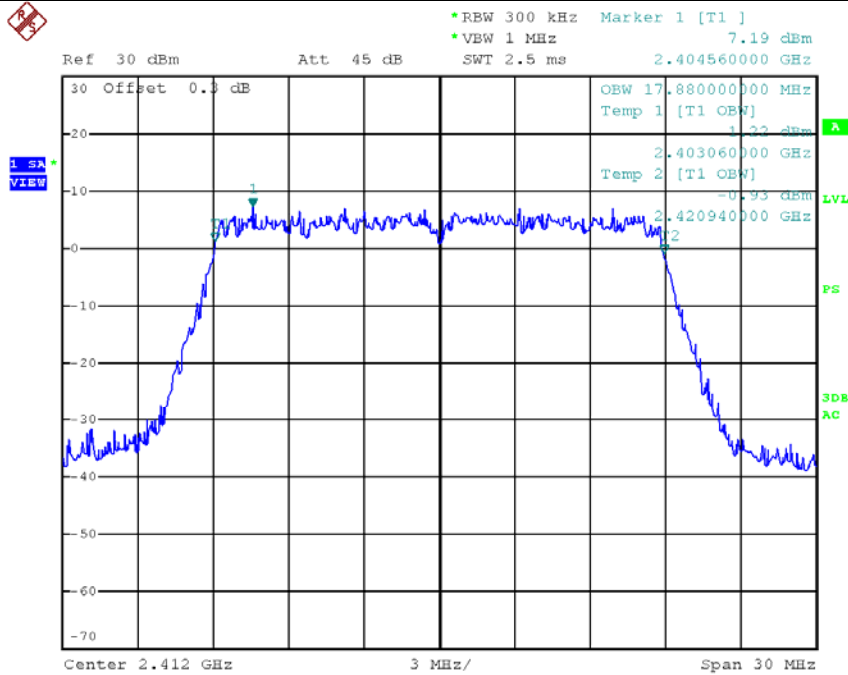
3: 2.4G band port 2





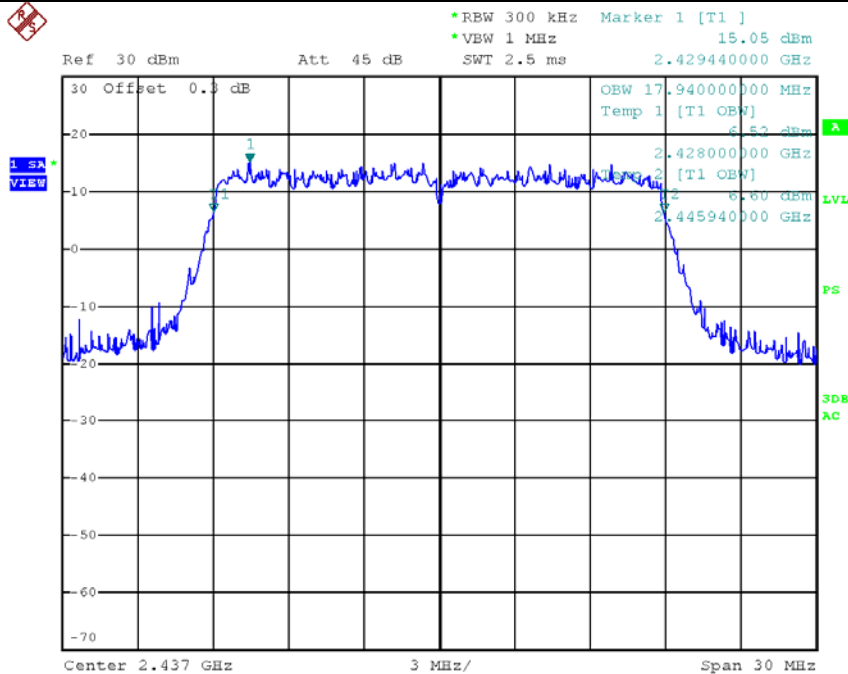


802.11n20-2412



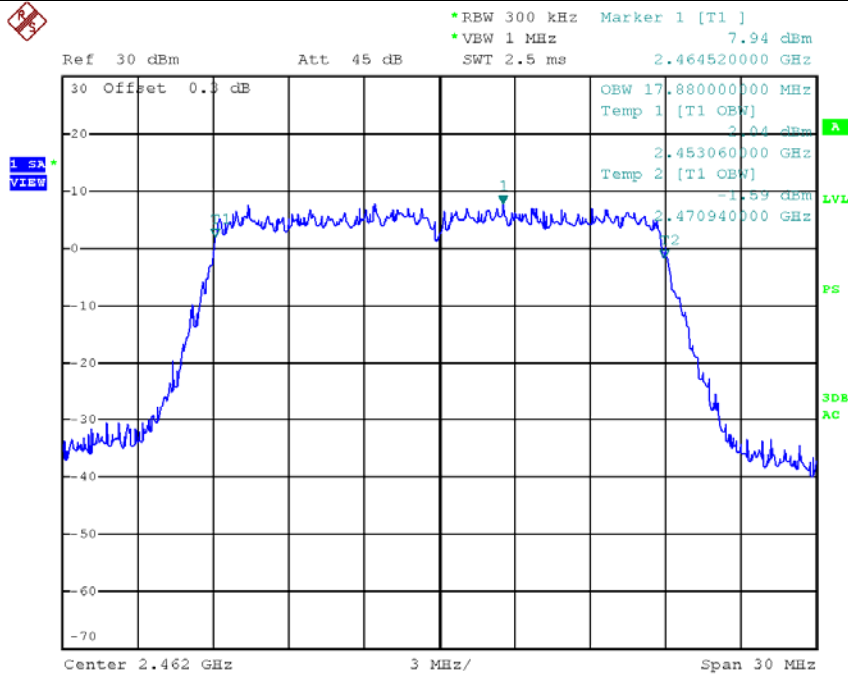
Date: 14.OCT.2013 18:01:08

802.11n20-2437



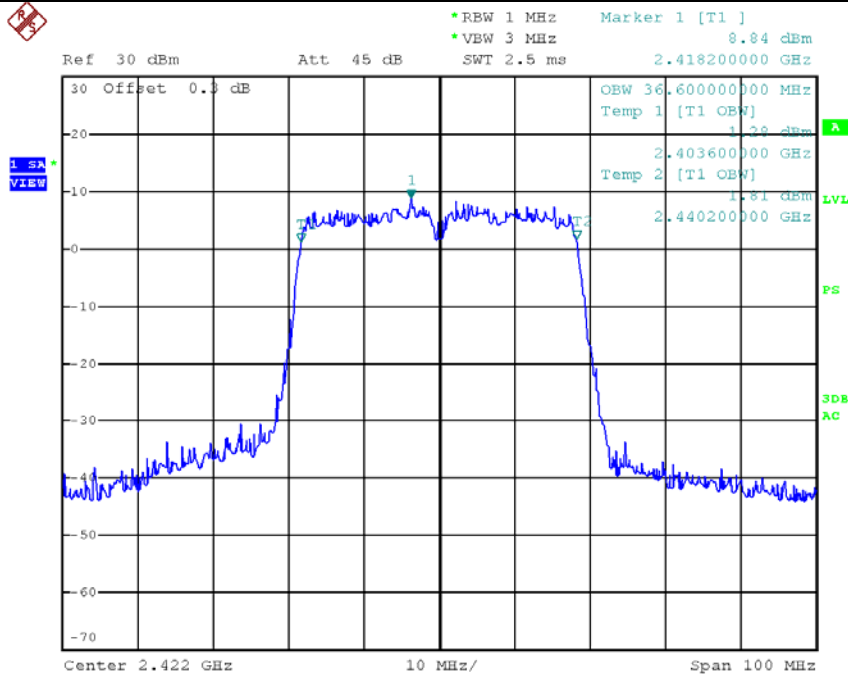
Date: 14.OCT.2013 18:00:44

802.11n20-2462



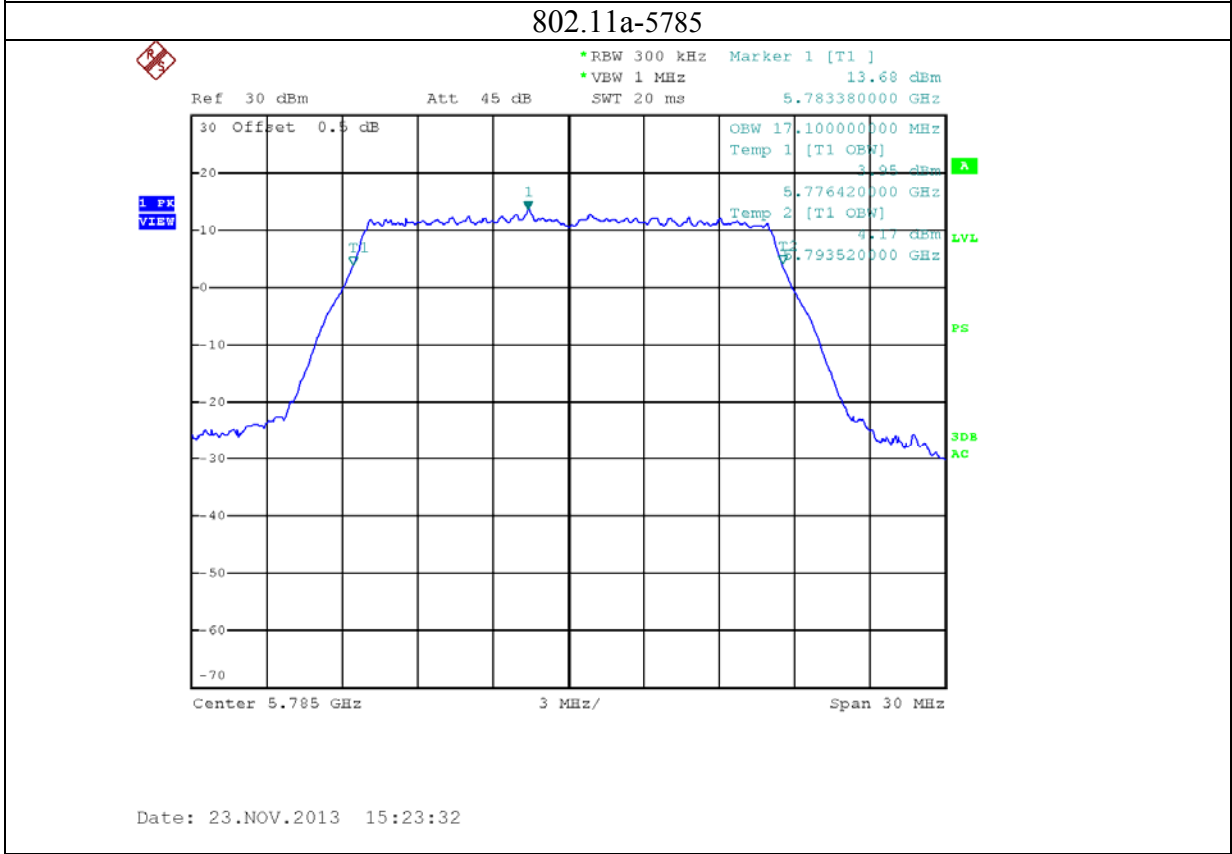
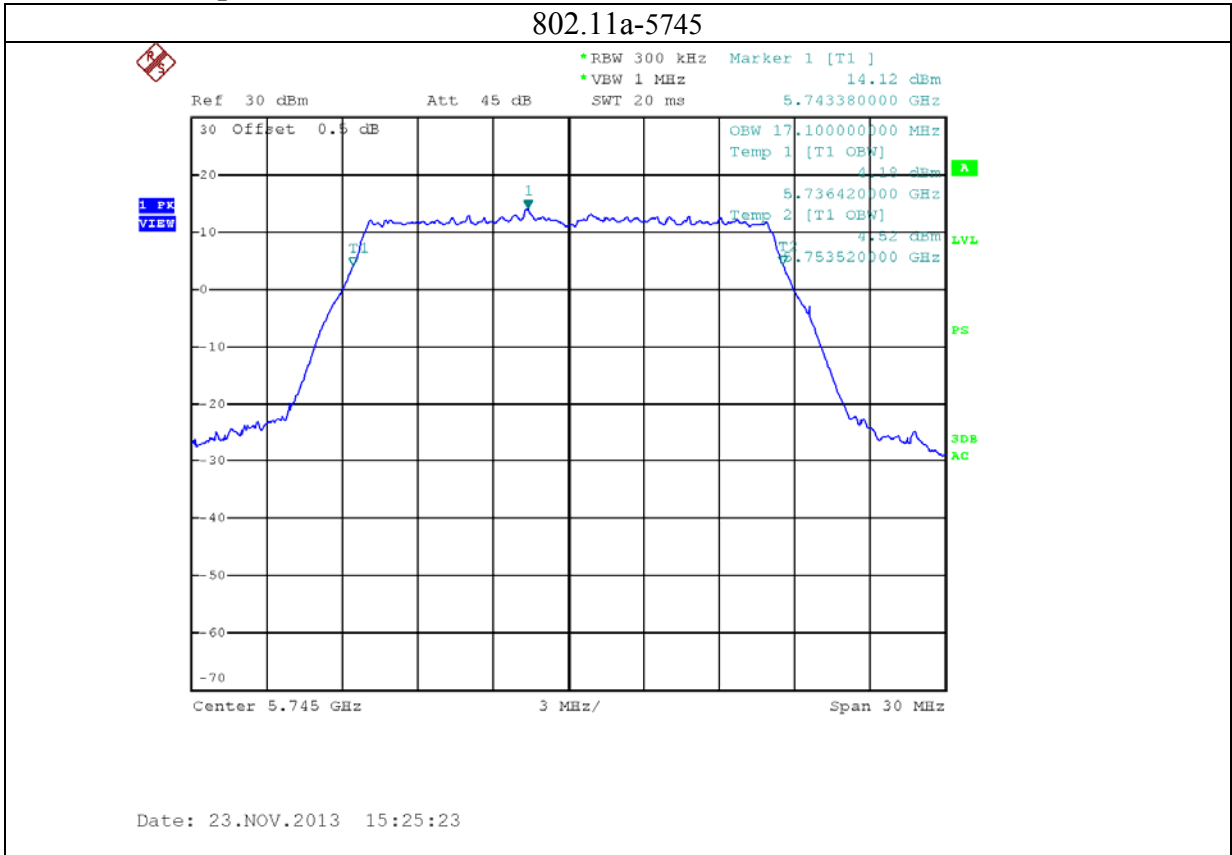
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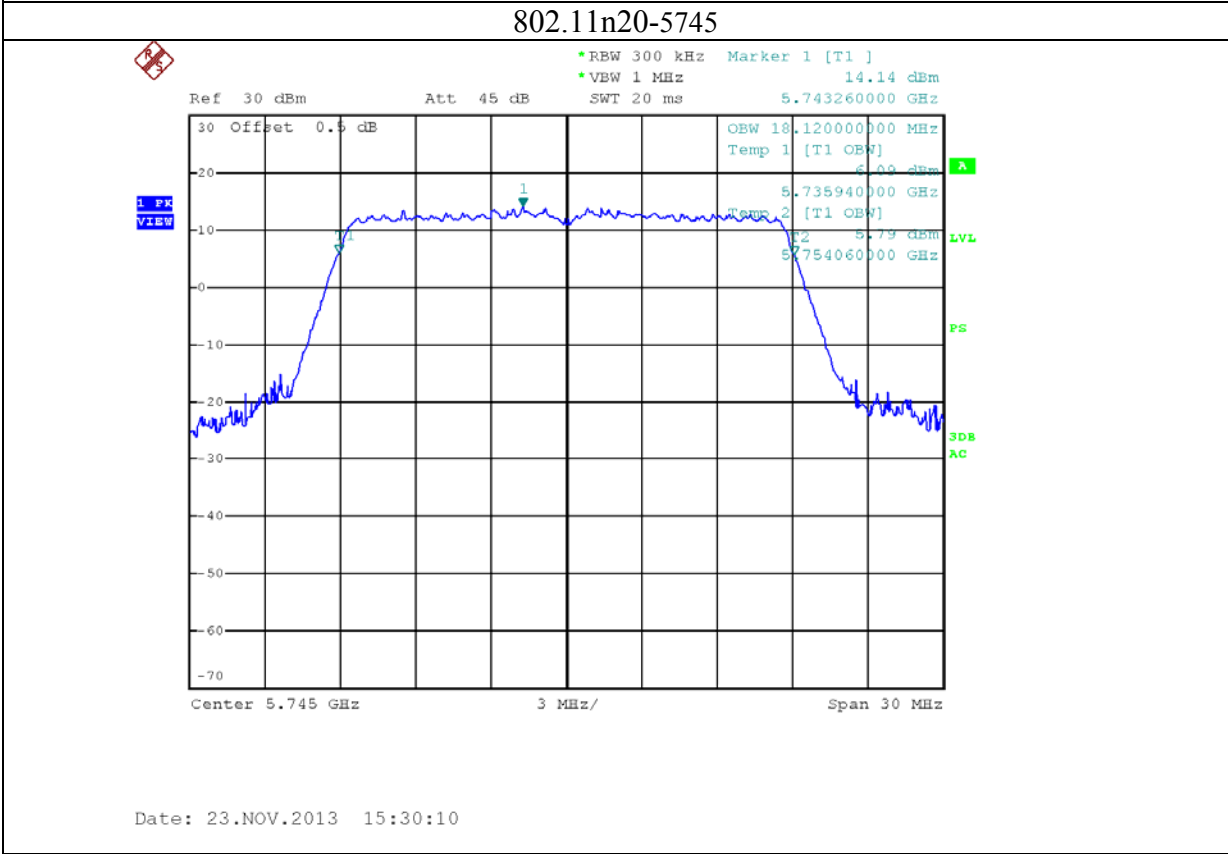
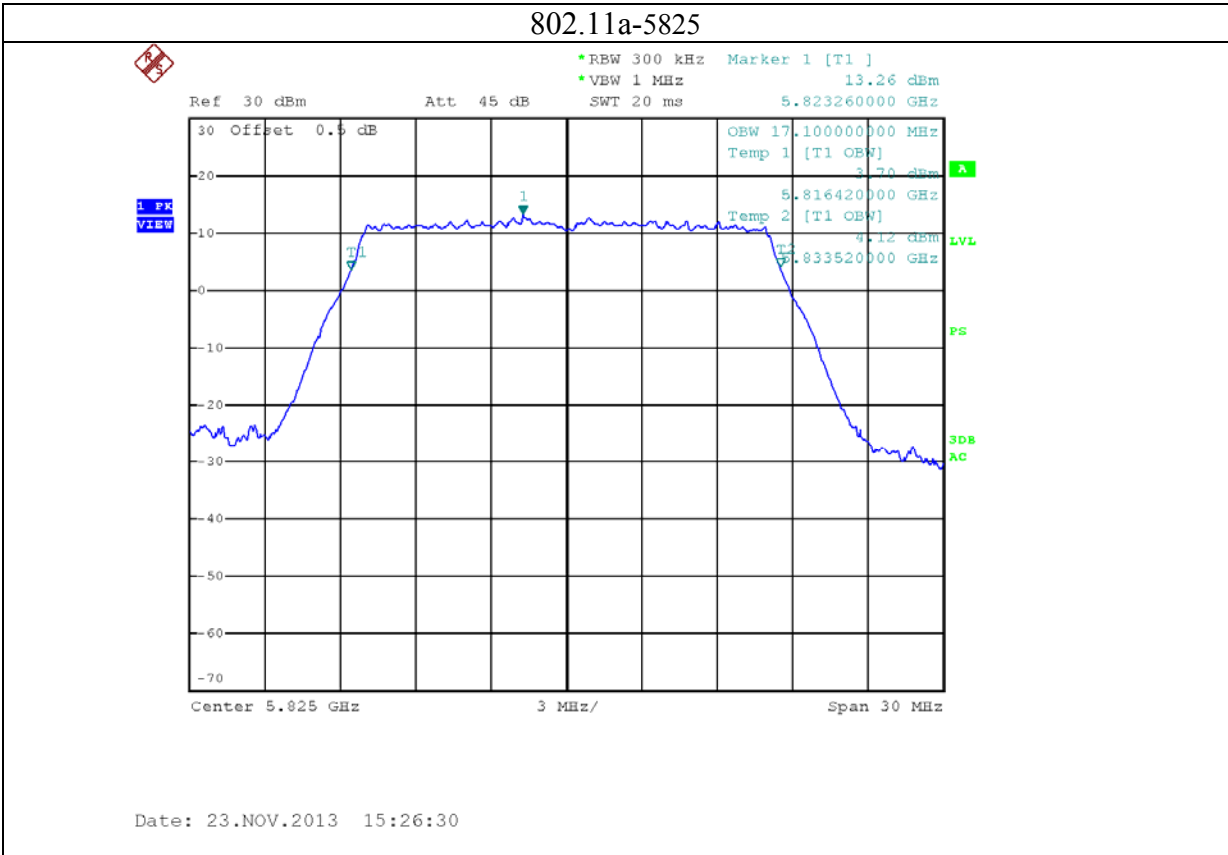
802.11n40-2422

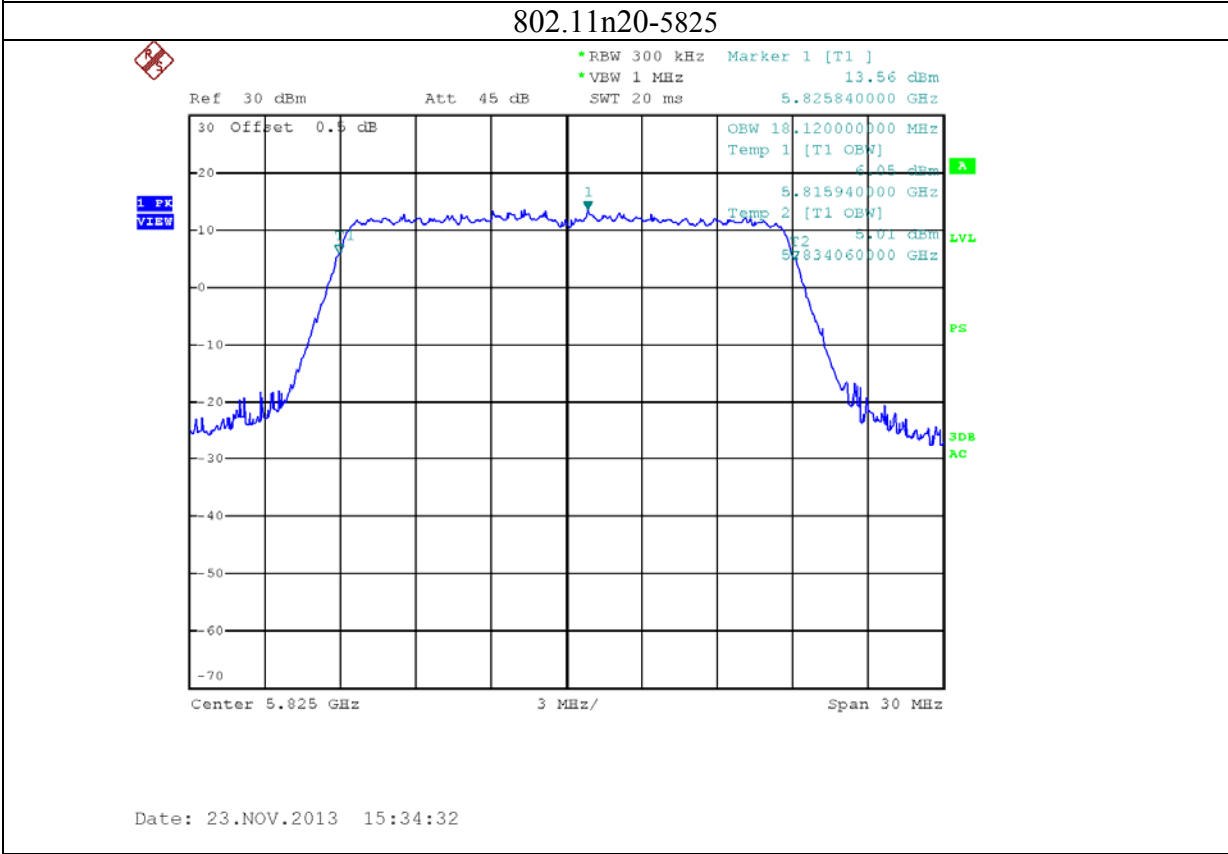
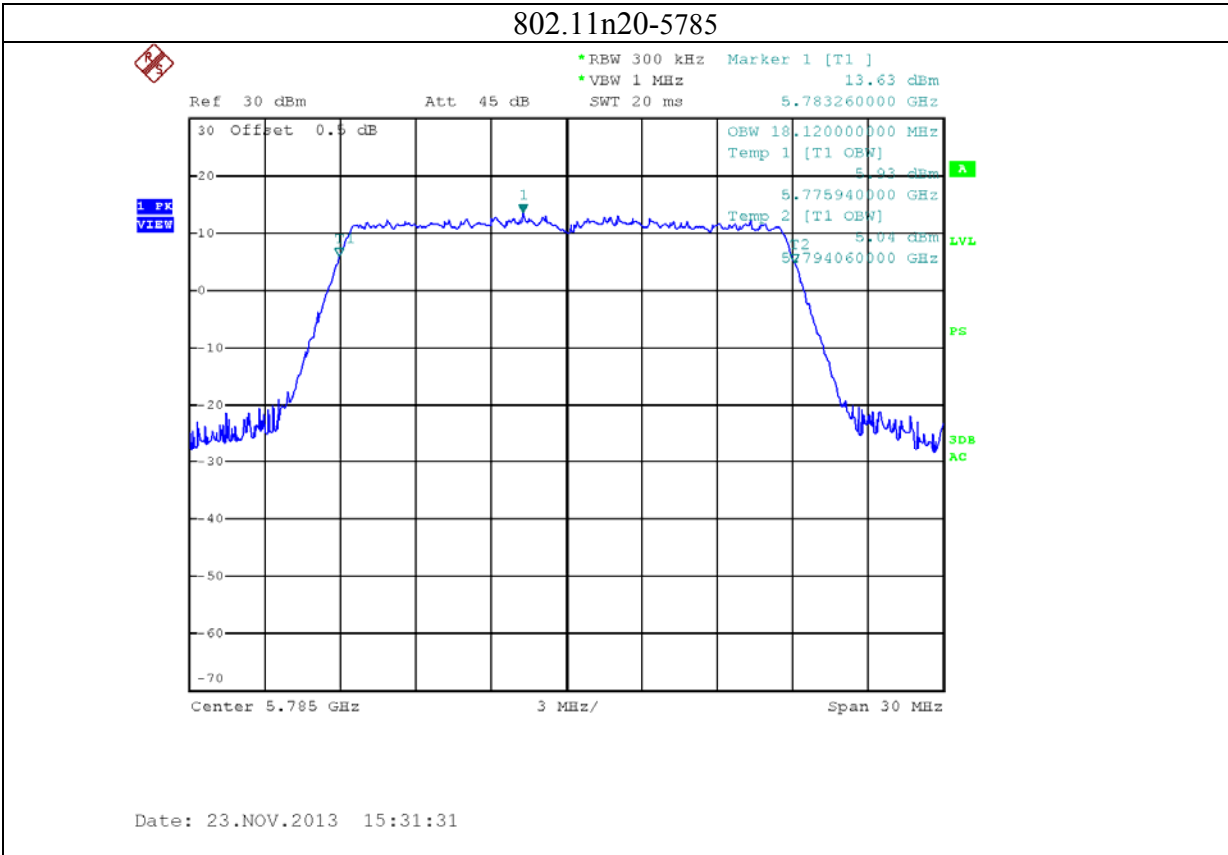


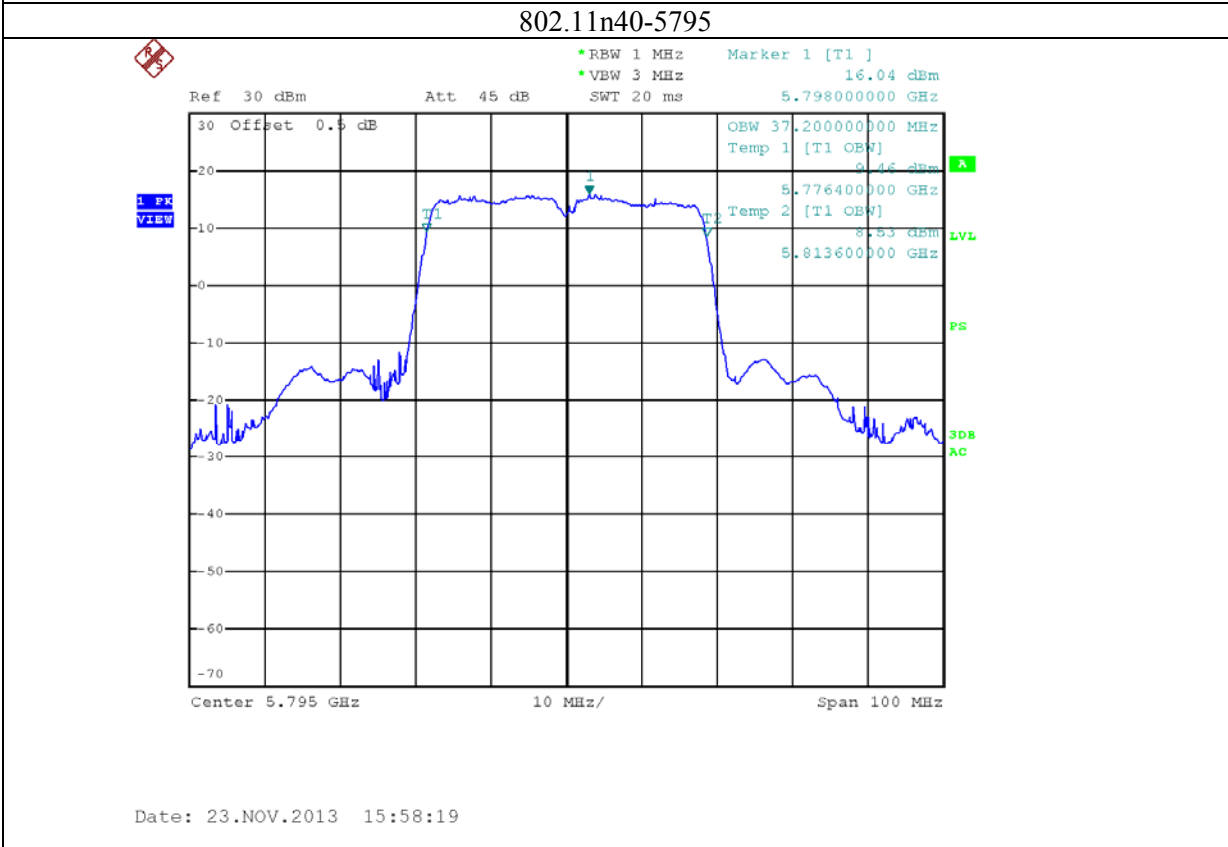
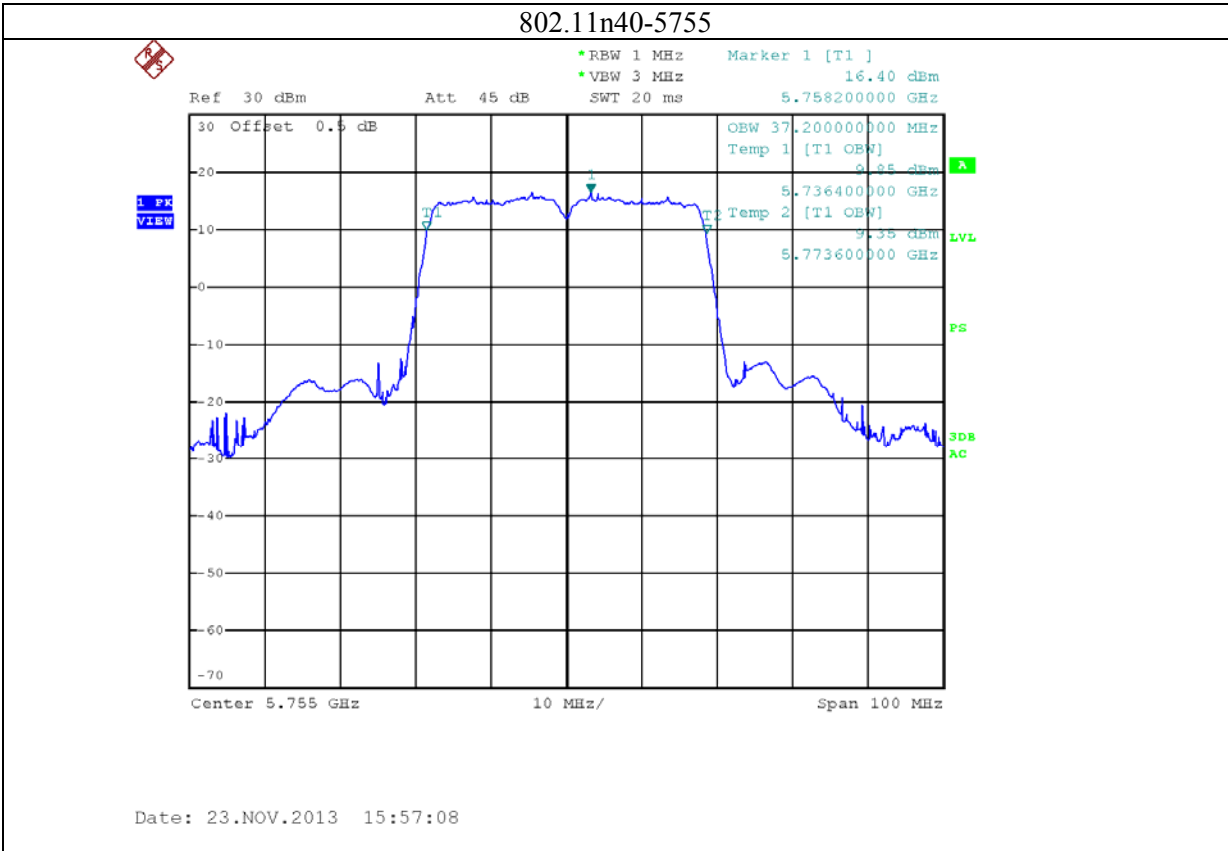
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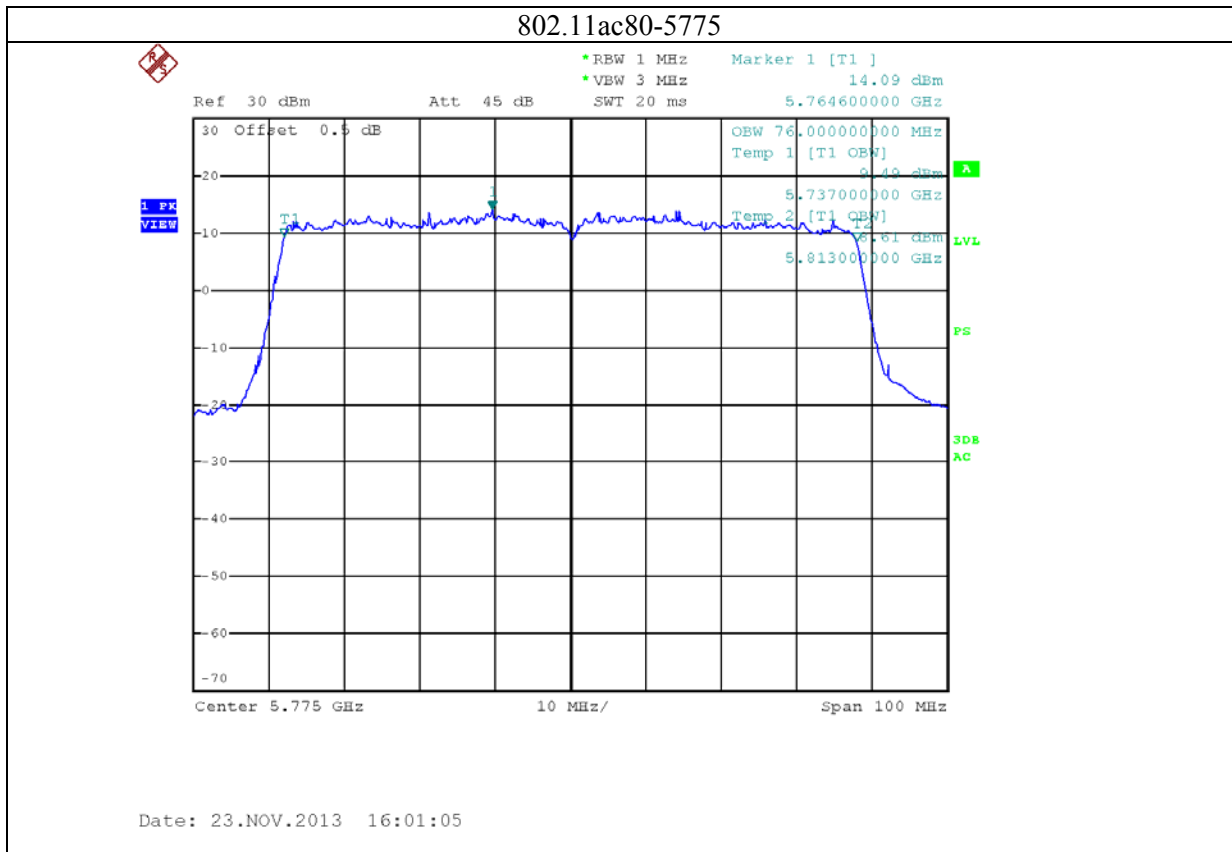
4: 5.8G band port 0



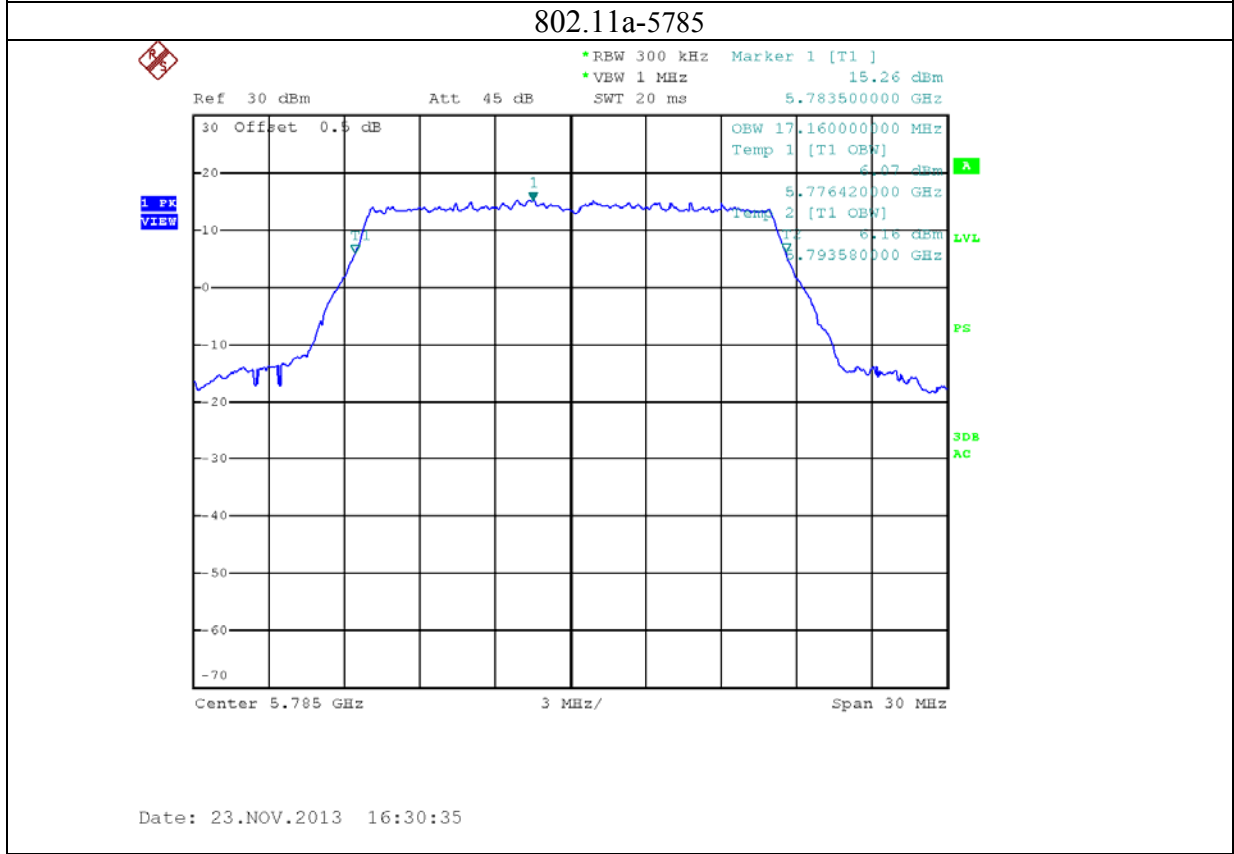
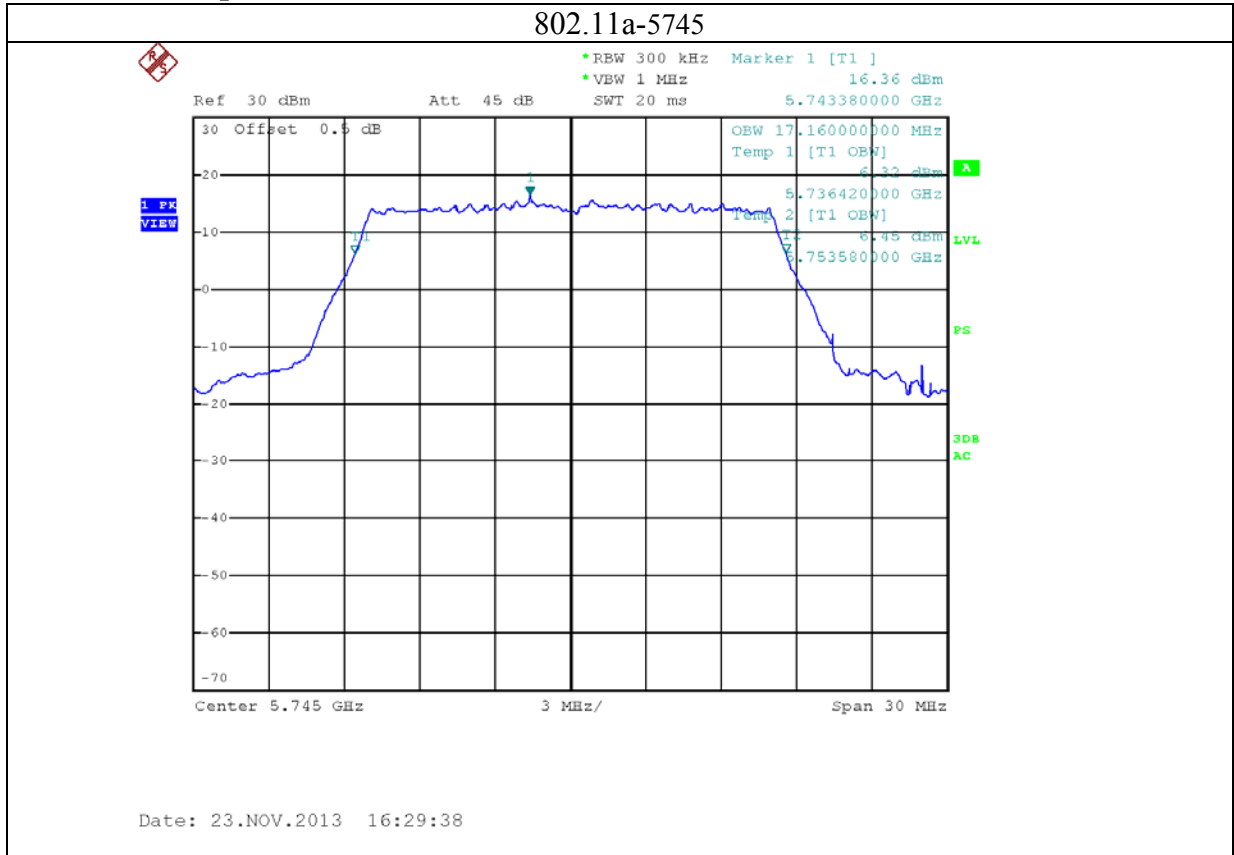


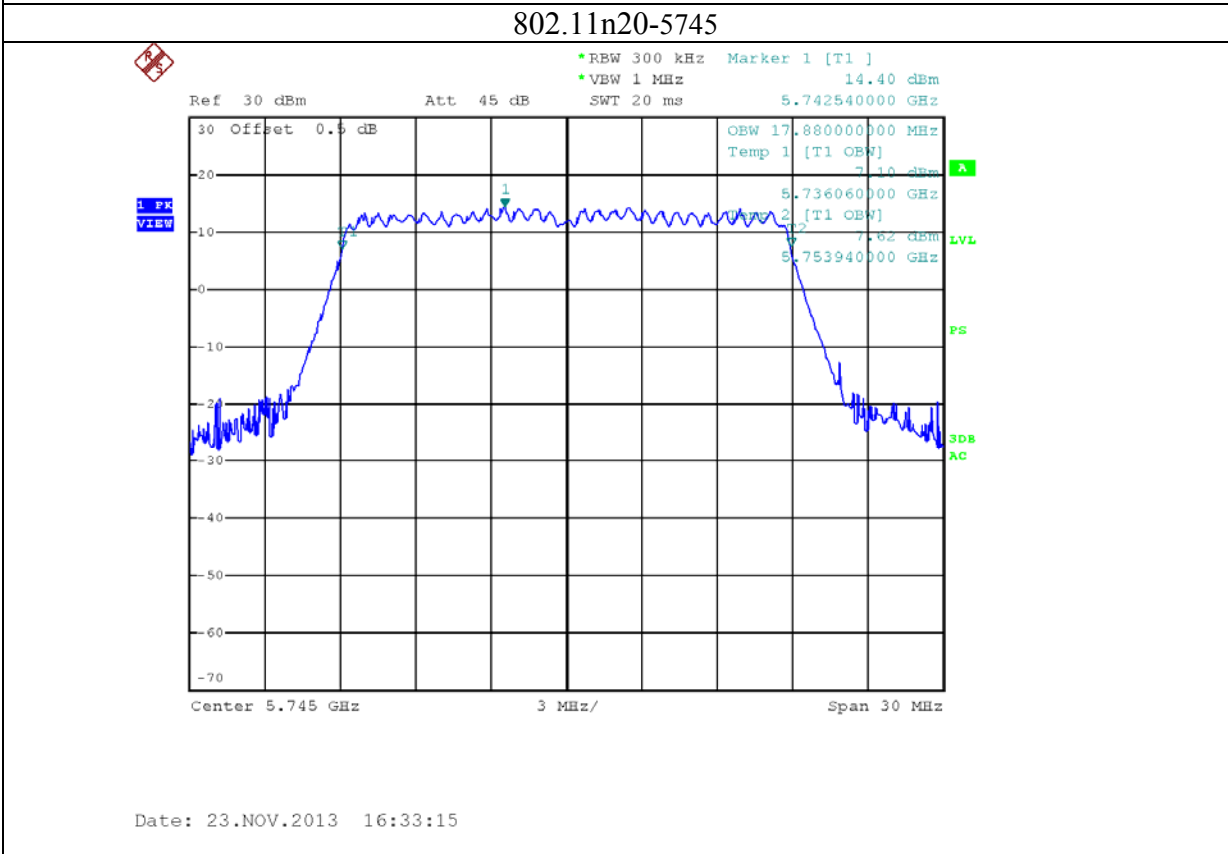
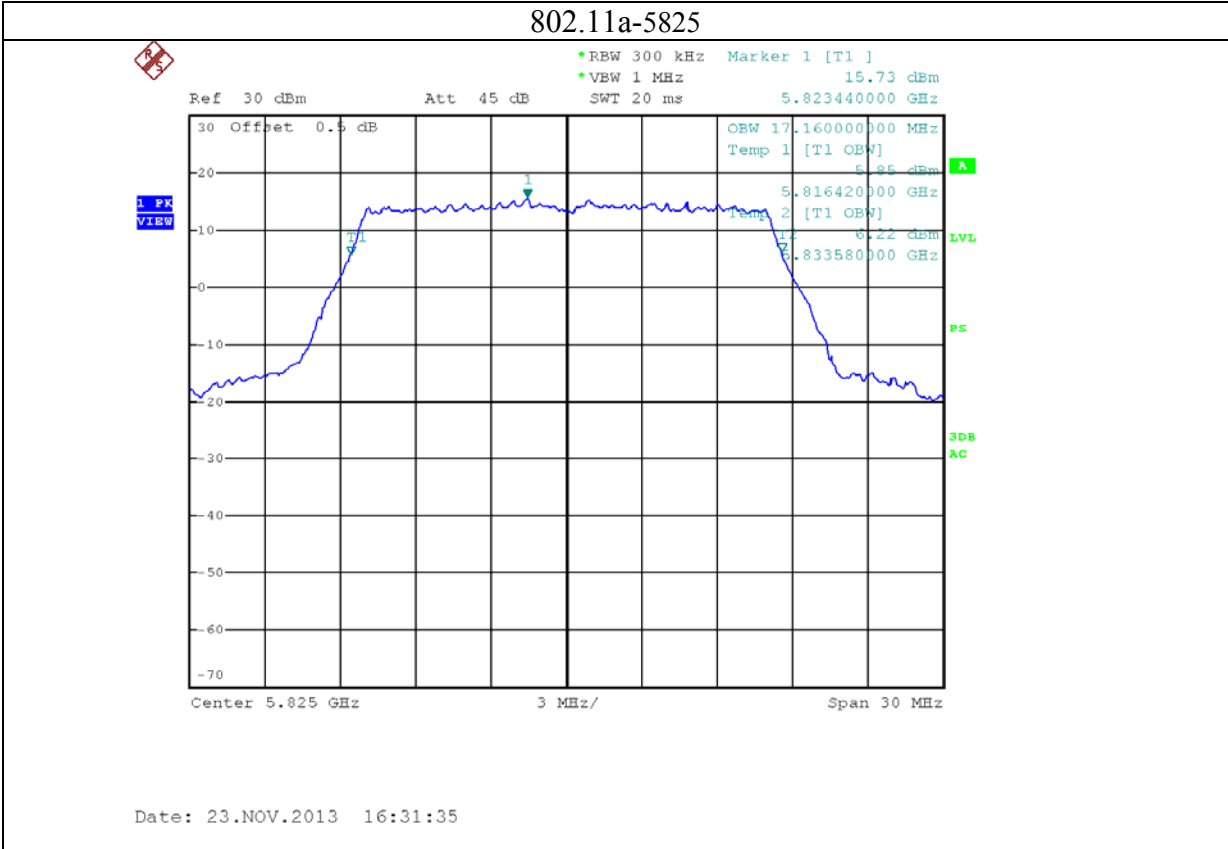


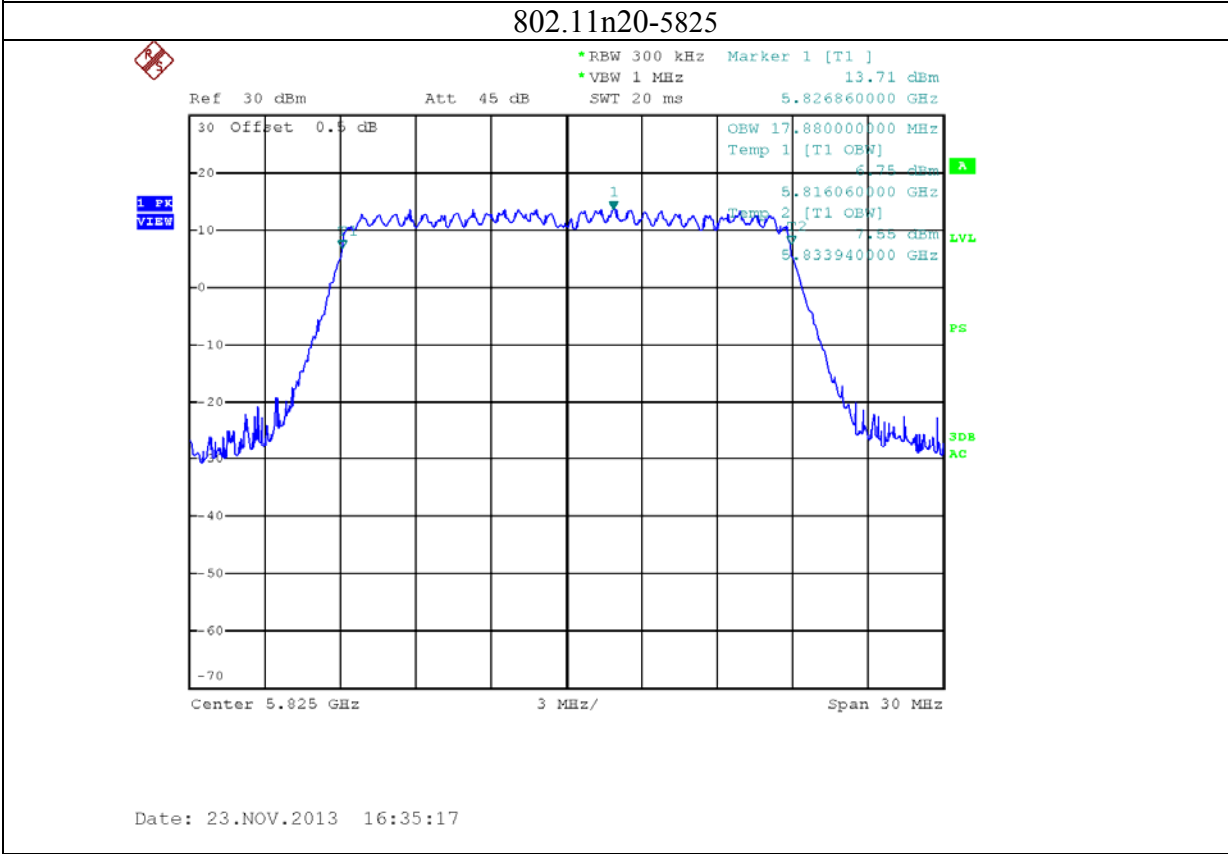
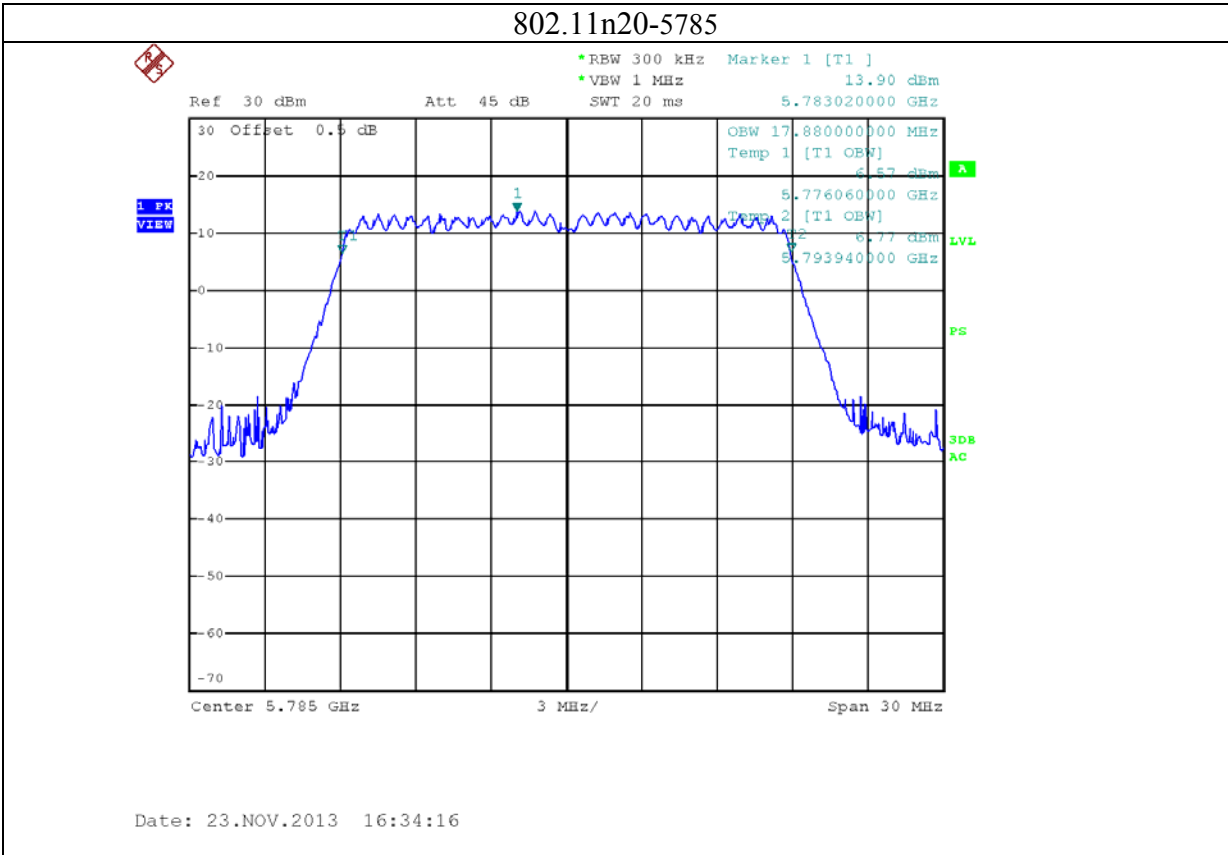


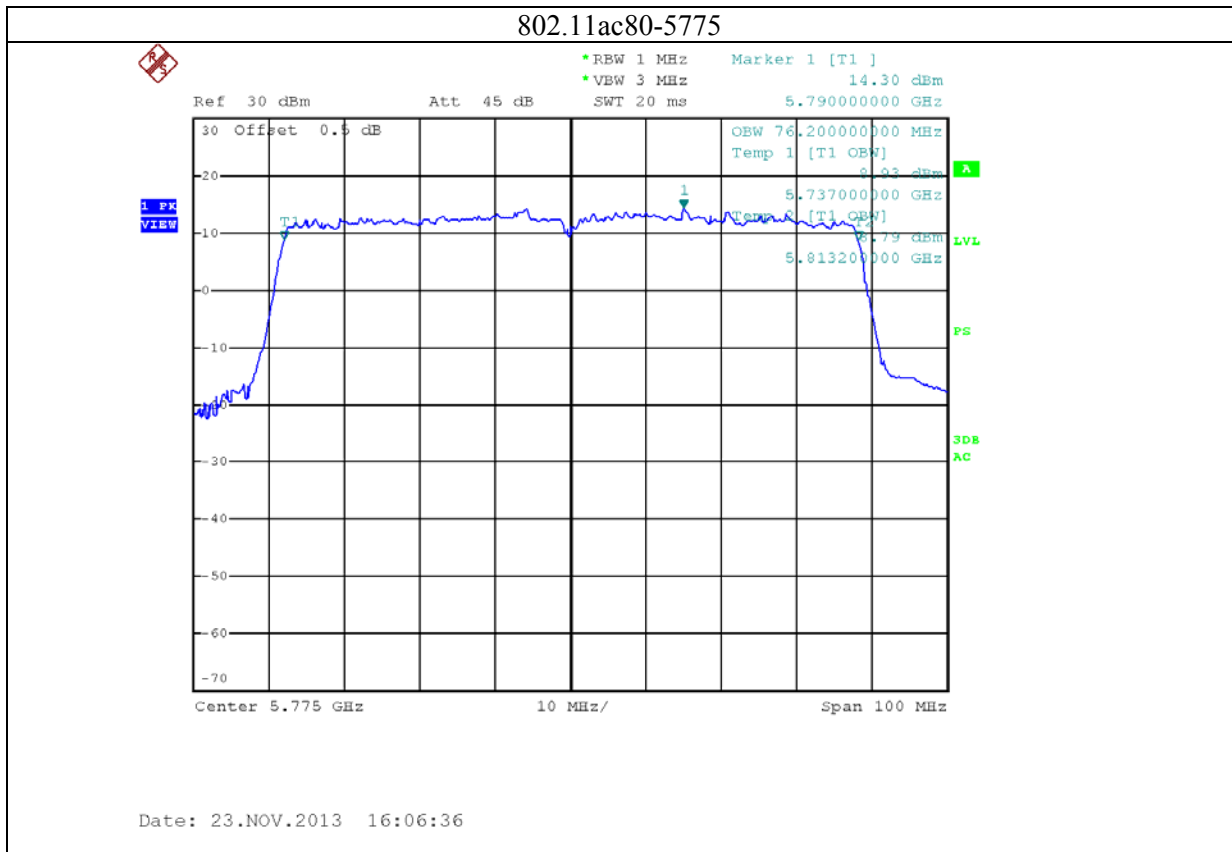


5: 5.8G band port 1









6: 5.8G band port 2

