

FCC

RF

TEST REPORT

ISSUED BY
Shenzhen BALUN Technology Co., Ltd.



FOR
Mobile Phone

ISSUED TO
GUANGDONG OPPO MOBILE TELECOMMUNICATIONS
CORP., LTD

NO.18 HAIBIN ROAD, WUSHA, CHANG'AN, DONGGUAN,
GUANGDONG, CHINA



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Date Sep. 21, 2015

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Date Sep. 21, 2015

Report No.: BL-SZ1570289-605

EUT Type: Mobile Phone

Model Name: OPPO R7sf

Brand Name: OPPO

Test Standard: 47 CFR Part 15 Subpart E

FCC ID: R9C-R7SF

Test conclusion: Pass

Test Date: Aug. 25, 2015 ~ Sep. 8, 2015

Date of Issue: Sep. 21, 2015

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Revision History

Version	Issue Date	Revisions
Rev. 01	Sep. 15, 2015	Initial Issue
Rev. 02	Sep. 21, 2015	The Second Issue

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1 ADMINISTRATIVE DATA (GENERAL INFORMATION)

1.1 Identification of the Testing Laboratory

Company Name	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Phone Number	+86 755 6683 3402
Fax Number	+86 755 6182 4271

1.2 Identification of the Responsible Testing Location

Test Location	Shenzhen BALUN Technology Co., Ltd.
Address	Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China
Accreditation Certificate	The laboratory has been listed by Industry Canada to perform electromagnetic emission measurements. The recognition numbers of test site are 11524A-1. The laboratory has been listed by US Federal Communications Commission to perform electromagnetic emission measurements. The recognition numbers of test site are 832625. The laboratory has met the requirements of the IAS Accreditation Criteria for Testing Laboratories (AC89), has demonstrated compliance with ISO/IEC Standard 17025:2005. The accreditation certificate number is TL-588. The laboratory is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L6791.
Description	All measurement facilities used to collect the measurement data are located at Block B, FL 1, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province, P. R. China 518055

1.3 Announce

- (1) The test report reference to the report template version v1.0.
- (2) The test report is invalid if not marked with the signatures of the persons responsible for preparing and approving the test report.
- (3) The test report is invalid if there is any evidence and/or falsification.
- (4) The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein.
- (5) This document may not be altered or revised in any way unless done so by BALUN and all revisions are duly noted in the revisions section.
- (6) Content of the test report, in part or in full, cannot be used for publicity and/or promotional purposes without prior written approval from the laboratory.

2 PRODUCT INFORMATION

2.1 Applicant

Applicant	GUANGDONG OPPO MOBILE TELECOMMUNICATIONS CORP., LTD
Address	NO.18 HAIBIN ROAD, WUSHA, CHANG'AN, DONGGUAN, GUANGDONG, CHINA

2.2 Manufacturer

Manufacturer	GUANGDONG OPPO MOBILE TELECOMMUNICATIONS CORP., LTD
Address	NO.18 HAIBIN ROAD, WUSHA, CHANG'AN, DONGGUAN, GUANGDONG, CHINA

2.3 General Description for Equipment under Test (EUT)

EUT Type	Mobile Phone
Model Name	OPPO R7sf
Hardware Version	11
Software Version	ColorOS V2.1.0i
Network and Wireless connectivity	GSM Network: GPRS/EDGE 850/900/1800/1900 MHz WCDMA Network: HSDPA/HSUPA/HSPA+ I/II/IV/V/VIII FDD-LTE Network Band: 1/2/4/7/17 Bluetooth 3.0, Bluetooth 4.0 Low Energy (BLE) WIFI 802.11a, 802.11b, 802.11g, 802.11n(HT20/40) and 802.11ac GLONASS, GPS
About the Product	The equipment is mobile phone, intended for used with information technology equipment.

2.4 Technical Information

Frequency Range	Band I: 5150 MHz to 5250 MHz, Band II: 5250 MHz to 5350 MHz, Band III: 5470 MHz to 5725 MHz Band IV: 5725 MHz to 5850 MHz
Modulation technology	OFDM
Modulation Type	256QAM, 64QAM, 16QAM, BPSK, QPSK
Transfer Rate (Mbps)	802.11a: 54/ 48/ 36 / 24 / 18 / 9/ 6 Mbps 802.11n: up to 135 Mbps 802.11ac: up to V9
Channel Bandwidth	802.11a: 20 MHz 802.11n: 20 MHz, 40 MHz 802.11ac: 20 MHz, 40 MHz, 80 MHz
Maximum Output Power	Band I: 10.22 dBm Band II: 9.39 dBm Band III: 10.33 dBm Band IV: 10.61 dBm
Antenna Type	PIFA Antenna

Antenna Gain	1.1 dBi
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2.5 Ancillary Equipment

Ancillary Equipment 1	Battery	
	Brand Name	OPPO
	Model No.	BLP603
	Serial No.	N/A
	Capacitance	2980 mAh
	Rated Voltage	3.8 V
	Extreme Voltage	Low: 3.6 V / High: 4.35 V
Ancillary Equipment 2	Charger	
	Brand Name	OPPO
	Model No.	AK775
	Rated Input	100-240 V~, 0.6 A, 50/60 Hz
	Rated Output	5 V = 2 A or 5 V = 4 A for VOOC Flash Charger
Ancillary Equipment 3	Earphone	
	Length	1.1 m
Ancillary Equipment 4	USB Data Cable	
	Length	1.0 m

2.6 Channel List

20 MHz		40 MHz		80 MHz	
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
36	5180	38	5190	42	5210
40	5200	46	5230	58	5290
44	5220	54	5270	106	5530
48	5240	62	5310	155	5775
52	5260	102	5510		
56	5280	110	5550		
60	5300	134	5670		
64	5320	151	5755		
100	5500	159	5790		
104	5520				
108	5540				
112	5560				
116	5580				
132	5660				
136	5680				
140	5700				
149	5745				
153	5765				
157	5785				
161	5805				
165	5825				

The Lowest frequency, the middle frequency and the highest frequency of channel were selected to perform the test, and the selected channel see below:

For 802.11a/n(HT20)/ac(HT20)

Band I (5150 - 5250 MHz)			Band II (5250 - 5350 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
36	Low	5180	52	Low	5260
44	Mid	5220	56	Mid	5280
48	High	5240	64	High	5320

Band III (5470 - 5725 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
100	Low	5500	149	Low	5745
116	Mid	5580	157	Mid	5785
140	High	5700	161	High	5805

For 802.11n(HT40)/ac(HT40)

Band I (5150 - 5250 MHz)			Band II (5250 - 5350 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
38	Low	5190	54	Low	5270
46	Mid	5230	62	Mid	5310

Band III (5150 - 5250 MHz)			Band IV (5725 - 5850 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
102	Low	5510	151	Low	5755
134	Mid	5670	159	Mid	5795

For 802.11ac(HT80)

Band I (5150 - 5250 MHz)			Band II (5250 - 5350 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
42	Low	5210	58	Low	5290

Band III (5150 - 5250 MHz)			Band IV (5470 - 5725 MHz)		
Channel Number	Channel	Frequency (MHz)	Channel Number	Channel	Frequency (MHz)
106	Low	5530	155	Low	5775

Note: Preliminary tests were performed in different data rate in above table to find the worst radiated emission. The data rate shown in the table below is the worst-case rate with respect to the specific test item. Investigation has been done on all the possible configurations for searching the worst cases. The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate	Modulation Technology	Modulation Type	Band I	Band II	Band III	Band IV
					Channel	Channel	Channel	Channel
RF Output Power	11a	6	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11n(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11n(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(80 MHz)	V0	OFDM	BPSK	42	58	106	155
Emission Band width	11a	6	OFDM	BPSK	48/44/36	64/56/52	144/140/116/100	161/157/149/144
	11n(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	144/140/116/100	161/157/149

& 99% Occupied Bandwidth	11n(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(80 MHz)	V0	OFDM	BPSK	42	58	106	155
6 dB bandwidth	11a	6	OFDM	BPSK	N/A	N/A	N/A	161/157/149
	11n(20 MHz)	6.5	OFDM	BPSK	N/A	N/A	N/A	161/157/149
	11n(40 MHz)	13.5	OFDM	BPSK	N/A	N/A	N/A	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	N/A	N/A	N/A	161/157/149 /144
	11ac(40 MHz)	13.5	OFDM	BPSK	N/A	N/A	N/A	159/151
	11ac(80 MHz)	V0	OFDM	BPSK	N/A	N/A	N/A	155
Power Spectral Density	11a	6	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11n(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11n(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(80 MHz)	V0	OFDM	BPSK	42	58	106	155
Conducted Spurious Emissions	11a	6	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11n(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11n(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(80 MHz)	V0	OFDM	BPSK	42	58	106	155
Radiated Spurious	11a	6	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11n(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149

US Emissions	11n(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(80 MHz)	V0	OFDM	BPSK	42	58	106	155
Frequency Stability	11a	6	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11n(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11n(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(20 MHz)	6.5	OFDM	BPSK	48/44/36	64/56/52	140/116/100	161/157/149
	11ac(40 MHz)	13.5	OFDM	BPSK	46/38	62/54	134/102	159/151
	11ac(80 MHz)	V0	OFDM	BPSK	42	58	106	155
Band Edge	11a	6	OFDM	BPSK	36	--	64	100
	11n(20 MHz)	6.5	OFDM	BPSK	36	--	64	100
	11n(40 MHz)	13.5	OFDM	BPSK	38	--	62	102
	11ac(20 MHz)	6.5	OFDM	BPSK	36	--	64	100
	11ac(40 MHz)	13.5	OFDM	BPSK	38	--	62	102
	11ac(80 MHz)	V0	OFDM	BPSK	--	--	58	106

3 SUMMARY OF TEST RESULTS

3.1 Test Standards

No.	Identity	Document Title
1	47 CFR Part 15 Subpart E	Unlicensed National Information Infrastructure Devices
2	KDB Publication 789033 D02v01	Guidelines for Compliance Testing of Unlicensed National Information Infrastructure (U-NII) Devices Part 15, Subpart E
3	KDB Publication 662911 D02v02r01	Emissions Testing of Transmitters with Multiple Outputs in the Same Band (e.g., MIMO, Smart Antenna, etc)
4	ANSI C63.4-2014	American National Standard for 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
5	ANSI C63.10-2013	American National Standard for Testing Unlicensed Wireless Devices

3.2 Verdict

No.	Description	FCC Part No.	Test Result	Verdict
1	Antenna Requirement	15.203	--	Pass ^{Note 1}
2	RF Output Power	15.407(a)	ANNEX A.1	Pass
3	Emission Bandwidth & 99% Occupied Bandwidth	15.407(a)	ANNEX A.2	Pass
4	6 dB bandwidth	15.407(e)	ANNEX A.3	Pass
5	Power Spectral Density	15.407(a)	ANNEX A.4	Pass
6	Conducted Emission	15.207	ANNEX A.5	Pass
7	Conducted Spurious Emissions	15.407(b) 15.209	ANNEX A.6	Pass
8	Radiated Spurious Emissions and Band Edge	15.407(b)	ANNEX A.7	Pass
9	Frequency Stability	FCC §2.1055 FCC §90.213	ANNEX A.8	Pass

Note 1: The EUT has a permanently and irreplaceable attached antenna, which complies with the requirement FCC 15.203.

4 GENERAL TEST CONFIGURATIONS

4.1 Test Environments

During the measurement, the normal environmental conditions were within the listed ranges:

Relative Humidity	45% - 55%	
Atmospheric Pressure	100 kPa - 102 kPa	
Temperature	NT (Normal Temperature)	+22°C to +25°C
	LT (Low Temperature)	-10°C
	HT (High Temperature)	+45°C
Working Voltage of the EUT	NV (Normal Voltage)	3.8 V
	LV (Low Voltage)	3.6 V
	HV (High Voltage)	4.35 V

4.2 Test Equipment List

Description	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-30	103118	2015.07.16	2016.07.15
Vector Signal Generator	ROHDE&SCHWARZ	SMBV100A	177746	2015.07.16	2016.07.15
Signal Generator	ROHDE&SCHWARZ	SMB100A	260592	2015.07.16	2016.07.15
Switch Unit with OSP-B157	ROHDE&SCHWARZ	OSP120	101270	2015.07.16	2016.07.15
Spectrum Analyzer	AGILENT	E4440A	MY45304434	2014.10.18	2015.10.17
Spectrum Analyzer	ROHDE&SCHWARZ	FSV-40	101008	2014.10.18	2015.10.17
EMI Receiver	ROHDE&SCHWARZ	ESRP	101036	2015.07.14	2016.07.13
LISN	SCHWARZBECK	NSLK 8127	8127-687	2015.07.01	2016.06.30
Bluetooth Tester	ROHDE&SCHWARZ	CBT	101005	2015.07.16	2016.07.15
Power Splitter	KMW	DCPD-LDC	1305003215	2015.07.01	2016.06.30
Power Sensor	ROHDE&SCHWARZ	NRP-Z21	103971	2015.07.21	2016.07.20
Attenuator (20 dB)	KMW	ZA-S1-201	110617091	--	--
Attenuator (6 dB)	KMW	ZA-S1-61	1305003189	--	--
DC Power Supply	ROHDE&SCHWARZ	HMP2020	018141664	2015.07.17	2016.07.16
Temperature Chamber	ANGELANTIONI SCIENCE	NTH64-40A	1310	2015.08.07	2016.08.06
Test Antenna-Loop(9 kHz-30 MHz)	SCHWARZBECK	FMZB 1519	1519-037	2015.07.22	2017.07.21
Test Antenna-Bi-Log(30 MHz-3 GHz)	SCHWARZBECK	VULB 9163	9163-624	2015.07.22	2017.07.21
Test Antenna-Horn(1-18 GHz)	SCHWARZBECK	BBHA 9120D	9120D-1148	2015.07.22	2017.07.21
Test Antenna-Horn(18-40 GHz)	SCHWARZBECK	BBHA 9170	9170-1025	2015.07.22	2017.07.21
Anechoic Chamber	RAINFORD	9m*6m*6m	N/A	2015.02.28	2016.02.27
Shielded Enclosure	ChangNing	CN-130701	130703	--	--

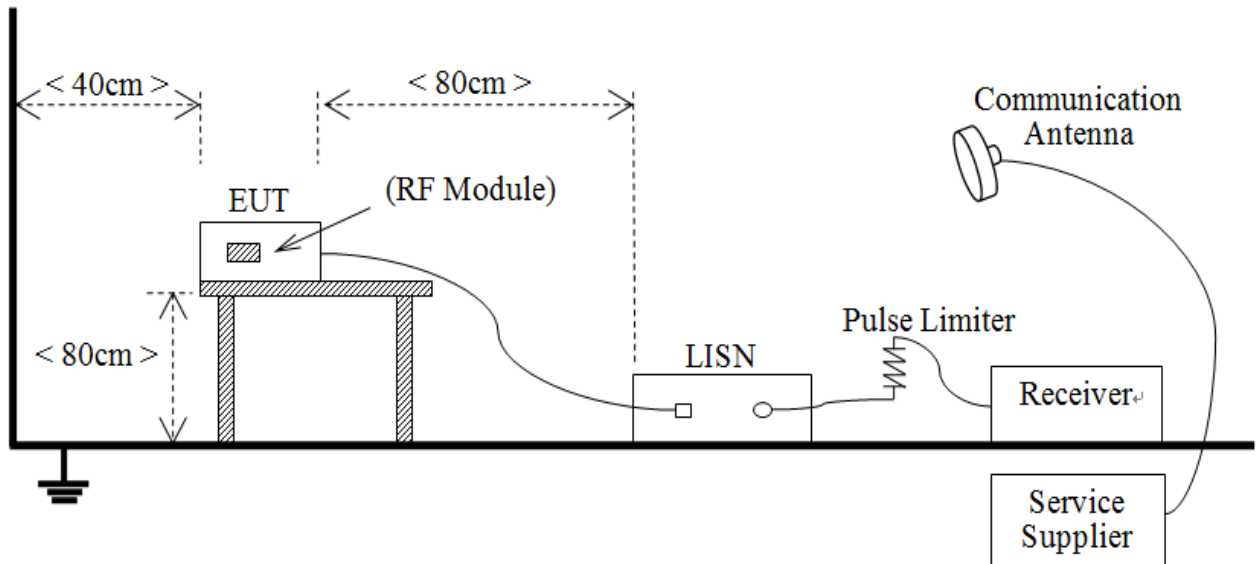
4.3 Description of Test Setup

4.3.1 For Antenna Port Test



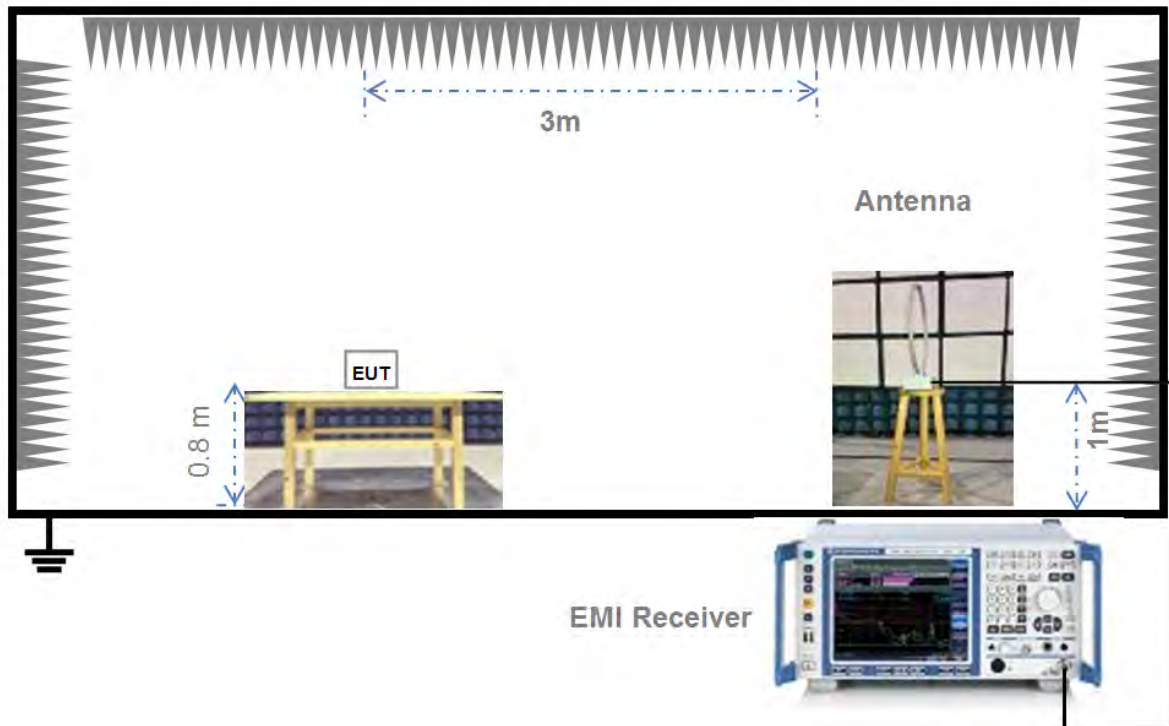
(Diagram 1)

4.3.2 For AC Power Supply Port Test



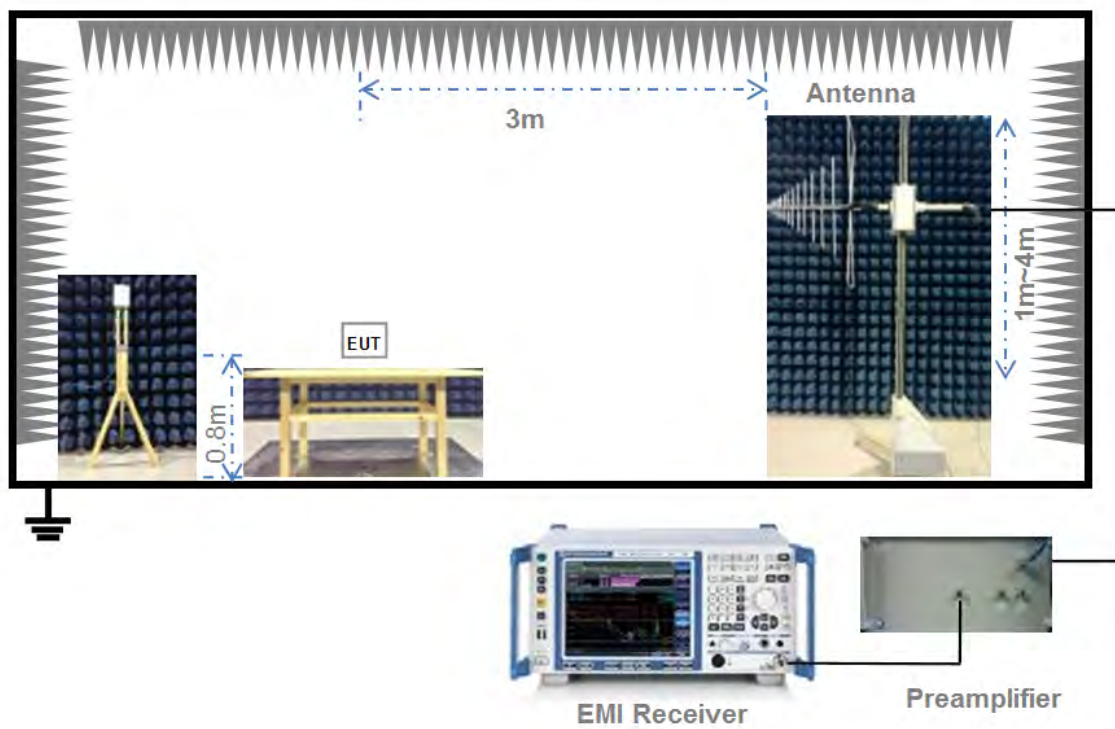
(Diagram 2)

4.3.3 For Radiated Test (Below 30 MHz)



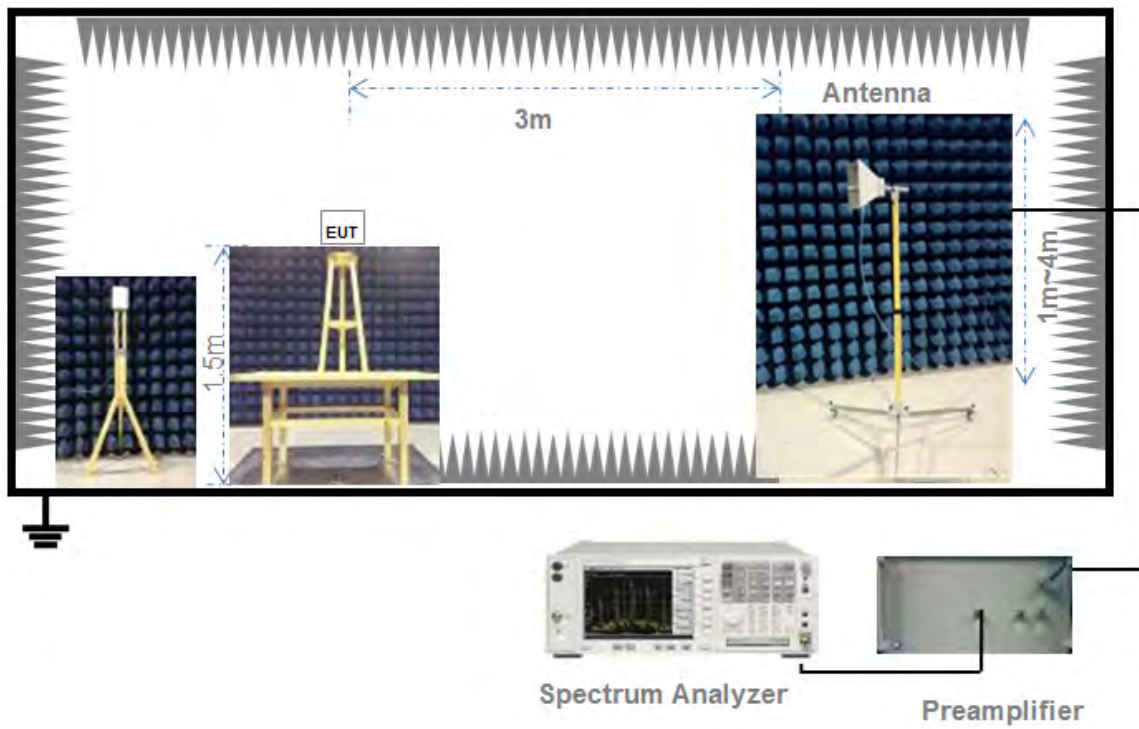
(Diagram 3)

4.3.4 For Radiated Test (30 MHz-1 GHz)



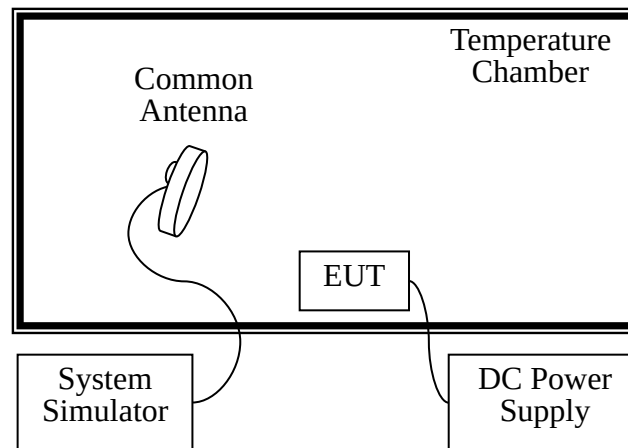
(Diagram 4)

4.3.5 For Radiated Test (Above 1 GHz)



(Diagram 5)

4.3.6 For Frequency Stability Test



(Diagram 6)

5 TEST ITEMS

5.1 RF Output Power

5.1.1 Test Limit

FCC §15.407(a)

The maximum conducted output power should not exceed:

Frequency Band (MHz)	Limit
5150-5250	250 mW
5250-5350	250 mW or 11 dBm + 10log B
5470-5725	250 mW or 11 dBm + 10log B
5725-5850	1 W
Note: Where "B" is the 26 dB emissions bandwidth in MHz.	

5.1.2 Test Setup

The section 4.3.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.1.3 Test Procedure

Maximum peak conducted output power

The maximum peak conducted output power may be measured using a broadband Average RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the emission bandwidth and utilize a fast-responding diode detector.

5.1.4 Test Result

Please refer to ANNEX A.1.

5.2 Emission Bandwidth and 6 dB Bandwidth

5.2.1 Limit

FCC §15.407(a)

Within the 5.725-5.85 GHz band, the minimum 6 dB bandwidth of U-NII devices shall be at least 500 kHz.

5.2.2 Test Setup

The test setup photo please refer to 4.3.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.2.3 Test Procedure

Emission bandwidth

1. Set RBW = approximately 1% of the emission bandwidth.
2. Set VBW $\geq 3 \times$ RBW,
3. Detector = Peak.
4. Trace mode = Max hold.
5. Measure the maximum width of the emission that is 26 dB down from the peak of the emission.

Occupied Bandwidth

1. Set Span = 1.5 times to 5.0 times the OBW
2. Set RBW = 1% to 5% of the OBW.
3. Set VBW $\geq 3 \times$ RBW, Detector = Peak.
4. Trace mode = Max hold.
5. Use the 99% power bandwidth function of the instrument.

6 dB bandwidth

1. Set RBW = 100 kHz, VBW = 300 kHz.
2. Detector = Peak. Trace mode = Max hold.
3. Allow the trace to stabilize.
4. 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.

5.2.4 Test Result

Please refer to ANNEX A.2 and ANNEX A.3.

5.3 Power Spectral density (PSD)

5.3.1 Limit

FCC §15.407(a)

Frequency Band (MHz)	Limit
5150-5250	11 dBm/MHz
5250-5350	11 dBm/MHz
5470-5725	11 dBm/MHz
5725-5850	30 dBm/500kHz
Note: "B" is the 26 dB emission bandwidth in MHz.	

5. 3. 2 Test Setup

The section 4.3.1 (Diagram 1) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5. 3. 3 Test Procedure

Set the spectrum analyzer or EMI receiver span to view the entire emission bandwidth.

1. Set RBW = 510 kHz/1 MHz, VBW $\geq 3 \times$ RBW, Sweep time = Auto, Detector = RMS.
2. Allow the sweeps to continue until the trace stabilizes.
3. Use the peak marker function to determine the maximum amplitude level.

5. 3. 4 Test Result

Please refer to ANNEX A.4.

5. 4 Conducted Emission

5. 4. 1 Limit

FCC §15.207

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μ H/50 Ω line impedance stabilization network (LISN).

Frequency range (MHz)	Conducted Limit (dB μ V)	
	Quai-peak	Average
0.15 - 0.50	66 to 56	56 to 46
0.50 - 5	56	46
0.50 - 30	60	50

5. 4. 2 Test Setup

The section 4.4.2 (Diagram 2) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5. 4. 3 Test Procedure

The maximum conducted interference is searched using Peak (PK), if the emission levels more than the AV and QP limits, and that have narrow margins from the AV and QP limits will be re-measured with AV and QP detectors. Tests for both L phase and N phase lines of the power mains connected to the EUT are performed. Refer to recorded points and plots below.

5. 4. 4 Test Result

Please refer to ANNEX A.5.

5.5 Conducted Spurious Emission

5.5.1 Limit

FCC §15.407(b)

Un-restricted band emissions	
Frequency Band (MHz)	Limit
5150 - 5250	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5250 - 5350	Outside of the 5.15-5.35 GHz band: e.i.r.p. -27 dBm
5470 - 5725	Outside of the 5.47-5.725 GHz band: e.i.r.p. -27 dBm
5725 - 5850	5715 -5725 MHz: e.i.r.p. -17 dBm 5850 -5860 MHz: e.i.r.p. -17 dBm Other un-restricted band: e.i.r.p. -27 dBm

5.5.2 Test Setup

See section 4.4.2 (Diagram 2) for test setup description for the antenna port. The photo of test setup please refer to ANNEX B.

5.5.3 Test Procedure

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize

5.5.4 Test Result

Please refer to ANNEX A.6.

5.6 Transmitter Radiated and Band Edge

5.6.1 Limit

FCC §15.209 & 15.407(b)

Frequency (MHz)	Field Strength ($\mu\text{V/m}$)	Measurement Distance (m)
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

Note 1: The Limit for radiated test was performed according to FCC Part 15C

Note 2: The tighter limit applies at the band edge.

Un-restricted band emissions	
Out Operating Band (MHz)	Limit
5150 - 5250	e.i.r.p. -27 dBm (68.2 dBuV/m@3m)
5250 - 5350	e.i.r.p. -27 dBm (68.2 dBuV/m@3m)
5470 - 5725	e.i.r.p. -27 dBm (68.2 dBuV/m@3m)
5725 - 5850	5715 -5725 MHz: e.i.r.p. -17 dBm (78.2 dBuV/m@3m) 5850 -5860 MHz: e.i.r.p. -17 dBm (78.2 dBuV/m@3m) Other un-restricted band: e.i.r.p.(68.2 dBuV/m@3m)

Note: The following formula is used to convert the equipment isotropic radiated power (eirp) to field strength.

5.6.2 Test Setup

The section 4.3 (Diagram 3 - Diagram 5) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.6.3 Test Procedure

Since the emission limits are specified in terms of radiated field strength levels, measurements performed to demonstrate compliance have traditionally relied on a radiated test configuration. Radiated measurements remain the principal method for demonstrating compliance to the specified limits; however antenna-port conducted measurements are also now acceptable to demonstrate compliance (see below for details). When radiated measurements are utilized, test site requirements and procedures for maximizing and measuring radiated emissions that are described in ANSI C63.10 shall be followed.

Antenna-port conducted measurements may also be used as an alternative to radiated measurements for demonstrating compliance in the restricted frequency bands. If conducted measurements are performed, then proper impedance matching must be ensured and an additional radiated test for cabinet/case spurious emissions is required.

General Procedure for conducted measurements in restricted bands

- a) Measure the conducted output power (in dBm) using the detector specified (see guidance regarding measurement procedures for determining quasi-peak, peak, and average conducted output power, respectively).
- b) Add the maximum transmit antenna gain (in dBi) to the measured output power level to determine the EIRP level (see guidance on determining the applicable antenna gain)
- c) Add the appropriate maximum ground reflection factor to the EIRP level (6 dB for frequencies ≤ 30 MHz, 4.7 dB for frequencies between 30 MHz and 1000 MHz, inclusive and 0 dB for frequencies > 1000 MHz).
- d) For devices with multiple antenna-ports, measure the power of each individual chain and sum the EIRP of all chains in linear terms (e.g., Watts, mW).
- e) Convert the resultant EIRP level to an equivalent electric field strength using the following relationship:

$$E = \text{EIRP} - 20 \log D + 104.8$$

where:

E = electric field strength in dB μ V/m,

EIRP = equivalent isotropic radiated power in dBm

D = specified measurement distance in meters.

- f) Compare the resultant electric field strength level to the applicable limit.
- g) Perform radiated spurious emission test.

Quasi-Peak measurement procedure

The specifications for measurements using the CISPR quasi-peak detector can be found in Publication 16 of the International Special Committee on Radio Frequency Interference (CISPR) of the International Electrotechnical Commission.

As an alternative to CISPR quasi-peak measurement, compliance can be demonstrated to the applicable emission limits using a peak detector.

Peak power measurement procedure

Peak emission levels are measured by setting the instrument as follows:

- a) RBW = as specified in Table 1.
- b) VBW $\geq 3 \times$ RBW.
- c) Detector = Peak.
- d) Sweep time = auto.
- e) Trace mode = max hold.
- f) Allow sweeps to continue until the trace stabilizes. (Note that the required measurement time may be longer for low duty cycle applications).

Table 1—RBW as a function of frequency

Frequency	RBW
9-150 kHz	200-300 Hz
0.15-30 MHz	9-10 kHz
30-1000 MHz	100-120 kHz
> 1000 MHz	1 MHz

If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

Trace averaging across on and off times of the EUT transmissions followed by duty cycle correction

If continuous transmission of the EUT (i.e., duty cycle ≥ 98 percent) cannot be achieved and the duty cycle is constant (i.e., duty cycle variations are less than ± 2 percent), then the following procedure shall be used:

- a) The EUT shall be configured to operate at the maximum achievable duty cycle.
- b) Measure the duty cycle, x , of the transmitter output signal as described in section 6.0.
- c) RBW = 1 MHz (unless otherwise specified).
- d) VBW $\geq 3 \times$ RBW.
- e) Detector = RMS, if $\text{span}/(\# \text{ of points in sweep}) \leq (\text{RBW}/2)$. Satisfying this condition may require increasing the number of points in the sweep or reducing the span. If this condition cannot be satisfied, then the detector mode shall be set to peak.
- f) Averaging type = power (i.e., RMS).
 - 1) As an alternative, the detector and averaging type may be set for linear voltage averaging.
 - 2) Some instruments require linear display mode in order to use linear voltage averaging. Log or dB averaging shall not be used.
- g) Sweep time = auto.
- h) Perform a trace average of at least 100 traces.
- i) A correction factor shall be added to the measurement results prior to comparing to the emission limit in order to compute the emission level that would have been measured had the test been performed at 100 percent duty cycle. The correction factor is computed as follows:
 - 1) If power averaging (RMS) mode was used in step f), then the applicable correction factor is $10 \log(1/x)$, where x is the duty cycle.
 - 2) If linear voltage averaging mode was used in step f), then the applicable correction factor is $20 \log(1/x)$, where x is the duty cycle.
 - 3) If a specific emission is demonstrated to be continuous (≥ 98 percent duty cycle) rather than turning on and off with the transmit cycle, then no duty cycle correction is required for that emission.

NOTE: Reduction of the measured emission amplitude levels to account for operational duty factor is not permitted. Compliance is based on emission levels occurring during transmission - not on an average across on and off times of the transmitter.

Determining the applicable transmit antenna gain

A conducted power measurement will determine the maximum output power associated with a restricted band emission; however, in order to determine the associated EIRP level, the gain of the transmitting antenna (in dBi) must be added to the measured output power (in dBm).

Since the out-of-band characteristics of the EUT transmit antenna will often be unknown, the use of a conservative antenna gain value is necessary. Thus, when determining the EIRP based on the measured conducted power, the upper bound on antenna gain for a device with a single RF output shall be selected as the maximum in-band gain of the antenna across all operating bands, or 2 dBi, whichever is greater. However, for devices that operate in multiple frequency bands while using the same transmit antenna, the highest gain of the antenna within the operating band nearest in frequency to the restricted band emission being measured may be used in lieu of the overall highest gain when the emission is at a frequency that is within 20 percent of the nearest band edge frequency, but in no case shall a value less than 2 dBi be used.

See KDB 662911 for guidance on calculating the additional array gain term when determining the effective antenna gain for a EUT with multiple outputs occupying the same or overlapping frequency ranges in the same band.

Radiated spurious emission test

An additional consideration when performing conducted measurements of restricted band emissions is that unwanted emissions radiating from the EUT cabinet, control circuits, power leads, or intermediate circuit elements will likely go undetected in a conducted measurement configuration. To address this concern, a radiated test shall be performed to ensure that emissions emanating from the EUT cabinet (rather than the antenna port) also comply with the applicable limits.

For these cabinet radiated spurious emission measurements the EUT transmit antenna may be replaced with a termination matching the nominal impedance of the antenna. Procedures for performing radiated measurements are specified in ANSI C63.10. All detected emissions shall comply with the applicable limits.

The measurement frequency range is from 30 MHz to the 10th harmonic of the fundamental frequency. The Turn Table is actuated to turn from 0° to 360°, and both horizontal and vertical polarizations of the Test Antenna are used to find the maximum radiated power. Mid channels on all channel bandwidth verified. Only the worst RB size/offset presented.

The power of the EUT transmitting frequency should be ignored.

All Spurious Emission tests were performed in X, Y, Z axis direction. And only the worst axis test condition was recorded in this test report.

Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

5. 6. 4 Test Result

Please refer to ANNEX A.7 and Please refer to ANNEX A.9

5.7 Frequency Stability

5.7.1 Limit

FCC §15.407(g)

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

5.7.2 Test Setup

The section 4.3.1 (Diagram 6) test setup description was used for this test. The photo of test setup please refer to ANNEX B.

5.7.3 Test Procedure

The EUT is installed in an environment test chamber with external power source.

Set the chamber to operate at 50 centigrade and external power source to output at nominal voltage of EUT.

A sufficient stabilization period at each temperatures is used prior to each frequency measurement.

When temperature is stabled, measure the frequency stability.

The test shall be performed under -30 to 50 centigrade and 85 to 115 percent of the nominal voltage.

Change setting of chamber and external power source to complete all conditions.

5.7.4 Test Result

Please refer to ANNEX A.8.

ANNEX A TEST RESULT

A.1 RF Output Power

Test Data

Band I (5150 - 5250 MHz)						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power(mW)	Limit (mW)	Verdict
11a	CH36	5180	10.22	10.52	250	Pass
11a	CH44	5220	9.44	8.79	250	Pass
11a	CH48	5240	9.22	8.36	250	Pass
11n (HT20)	CH36	5180	10.36	10.86	250	Pass
11n (HT20)	CH44	5220	9.45	8.81	250	Pass
11n (HT20)	CH48	5240	9.13	8.18	250	Pass
11n (HT40)	CH38	5190	8.10	6.46	250	Pass
11n (HT40)	CH46	5230	7.16	5.20	250	Pass
11ac (HT20)	CH36	5180	10.09	10.21	250	Pass
11ac (HT20)	CH44	5220	9.24	8.39	250	Pass
11ac (HT20)	CH48	5240	8.90	7.76	250	Pass
11ac (HT40)	CH38	5190	7.70	5.89	250	Pass
11ac (HT40)	CH46	5230	6.85	4.84	250	Pass
11ac (HT80)	CH42	5210	6.60	4.57	250	Pass

Band II (5250 - 5350 MHz)						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Limit (mW)	Verdict
11a	CH52	5260	9.07	8.07	250	Pass
11a	CH56	5280	9.08	8.09	250	Pass
11a	CH64	5320	9.32	8.55	250	Pass
11n (HT20)	CH52	5260	8.91	7.78	250	Pass
11n (HT20)	CH56	5280	9.22	8.36	250	Pass
11n (HT20)	CH64	5320	9.39	8.69	250	Pass
11n (HT40)	CH54	5270	7.01	5.02	250	Pass
11n (HT40)	CH62	5310	7.25	5.31	250	Pass
11ac (HT20)	CH52	5260	8.80	7.59	250	Pass
11ac (HT20)	CH56	5280	9.07	8.07	250	Pass
11ac (HT20)	CH64	5320	9.27	8.45	250	Pass
11ac (HT40)	CH52	5260	6.63	4.60	250	Pass
11ac (HT40)	CH56	5280	6.96	4.97	250	Pass
11ac (HT80)	CH58	5290	6.13	4.10	250	Pass

Band III (5470 - 5725 MHz)						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Limit (mW)	Verdict
11a	CH100	5500	10.22	10.52	250	Pass
11a	CH116	5580	10.16	10.38	250	Pass
11a	CH140	5700	9.90	9.77	250	Pass
11n (HT20)	CH100	5500	10.33	10.79	250	Pass
11n (HT20)	CH116	5580	10.30	10.72	250	Pass
11n (HT20)	CH140	5700	10.08	10.19	250	Pass
11n (HT40)	CH102	5510	8.29	6.75	250	Pass
11n (HT40)	CH134	5670	7.80	6.03	250	Pass
11ac (HT20)	CH100	5500	10.14	10.33	250	Pass
11ac (HT20)	CH116	5580	10.18	10.42	250	Pass
11ac (HT20)	CH140	5700	9.89	9.75	250	Pass
11ac (HT40)	CH102	5510	7.93	6.21	250	Pass
11ac (HT40)	CH134	5670	7.40	5.50	250	Pass
11ac (HT80)	CH106	5530	7.24	5.30	250	Pass

Band IV (5725 - 5850 MHz)						
Mode	Channel	Frequency (MHz)	Conducted Power (dBm)	Conducted Power (mW)	Limit (W)	Verdict
11a	CH149	5745	10.08	10.19	1.00	Pass
11a	CH157	5785	10.52	11.27	1.00	Pass
11a	CH161	5825	10.61	11.51	1.00	Pass
11n (HT20)	CH149	5745	10.12	10.28	1.00	Pass
11n (HT20)	CH157	5785	10.45	11.09	1.00	Pass
11n (HT20)	CH161	5825	10.55	11.35	1.00	Pass
11n (HT40)	CH151	5755	8.35	6.84	1.00	Pass
11n (HT40)	CH159	5795	8.52	7.11	1.00	Pass
11ac (HT20)	CH149	5745	9.98	9.95	1.00	Pass
11ac (HT20)	CH157	5785	10.22	10.52	1.00	Pass
11ac (HT20)	CH161	5805	10.42	11.02	1.00	Pass
11ac (HT40)	CH151	5755	8.10	6.46	1.00	Pass
11ac (HT40)	CH159	5795	8.24	6.67	1.00	Pass
11ac (HT80)	CH155	5775	7.51	5.64	1.00	Pass

A.2 Emission Bandwidth & 99% Bandwidth

Test Data

Band I Band I (5150 - 5250 MHz)				
Mode	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH36	5180	22.065	16.9305
11a	CH44	5220	21.661	16.8717
11a	CH48	5240	22.308	16.8824
11n (HT20)	CH36	5180	22.402	18.0535
11n (HT20)	CH44	5220	21.820	17.9667
11n (HT20)	CH48	5240	21.834	17.9807
11n (HT40)	CH38	5190	43.108	36.0999
11n (HT40)	CH46	5230	43.393	36.0890
11ac (HT20)	CH36	5180	21.742	17.9184
11ac (HT20)	CH44	5220	21.949	17.8895
11ac (HT20)	CH48	5240	22.040	17.9346
11ac (HT40)	CH38	5190	41.515	36.1023
11ac (HT40)	CH46	5230	42.604	36.0484
11ac (HT80)	CH42	5210	83.380	74.7364

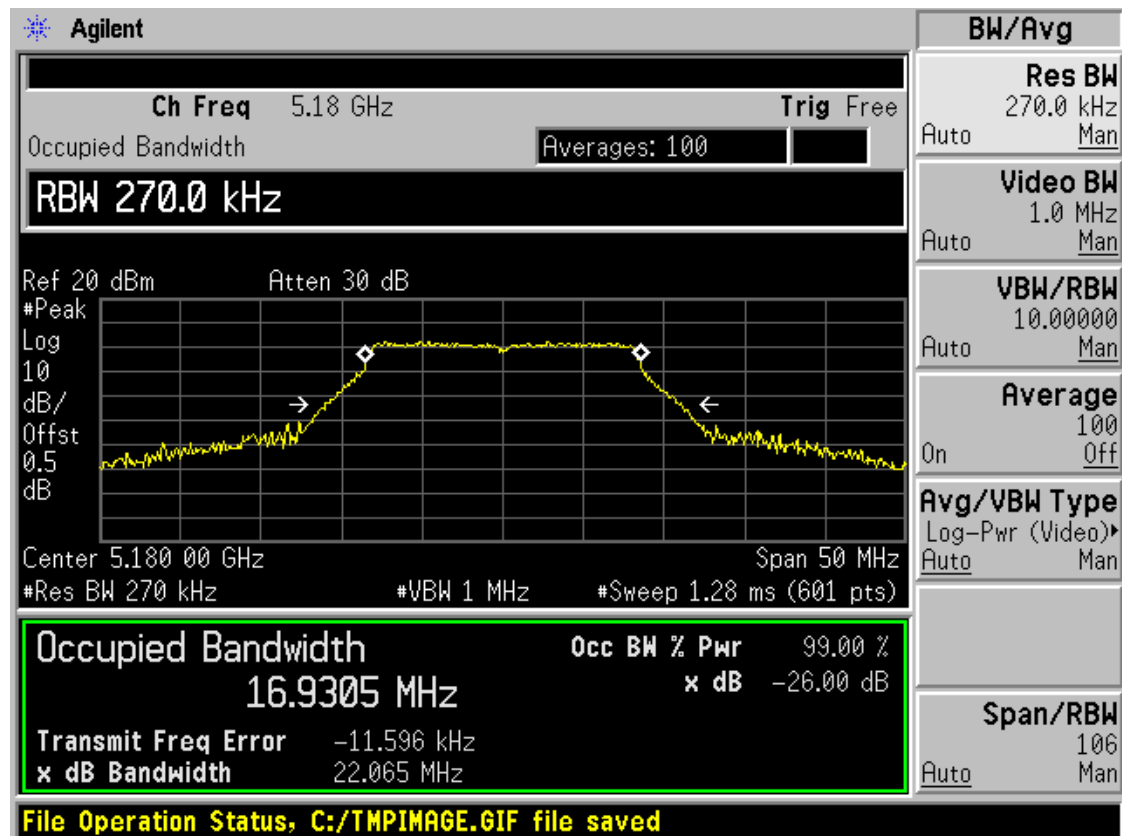
Band II (5250 - 5350 MHz)				
Mode	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH52	5260	22.080	16.9917
11a	CH56	5280	22.342	16.9500
11a	CH64	5320	21.856	17.0252
11n (HT20)	CH52	5260	22.187	17.9729
11n (HT20)	CH56	5280	22.155	17.8801
11n (HT20)	CH64	5320	22.118	17.9233
11n (HT40)	CH54	5270	42.441	36.0381
11n (HT40)	CH62	5310	42.740	36.0560
11ac (HT20)	CH52	5260	22.296	17.9529
11ac (HT20)	CH56	5280	21.674	17.8824
11ac (HT20)	CH64	5320	21.600	17.9429
11ac (HT40)	CH52	5260	41.755	36.1245
11ac (HT40)	CH56	5280	42.289	36.0933
11ac (HT80)	CH58	5290	83.380	74.7364

Band III (5470 - 5725 MHz)				
Mode	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH100	5500	21.561	16.8894
11a	CH116	5580	21.678	16.9685
11a	CH140	5700	21.583	16.8651
11n (HT20)	CH100	5500	22.504	18.0266
11n (HT20)	CH116	5580	22.610	17.9989
11n (HT20)	CH140	5700	22.077	17.9251
11n (HT40)	CH102	5510	42.501	36.0422
11n (HT40)	CH134	5670	42.711	36.1371
11ac (HT20)	CH100	5500	22.135	17.9887
11ac (HT20)	CH116	5580	22.159	17.9930
11ac (HT20)	CH140	5700	22.274	17.9414
11ac (HT40)	CH102	5510	42.272	36.1169
11ac (HT40)	CH134	5670	42.553	36.0939
11ac (HT80)	CH106	5530	82.886	74.7526

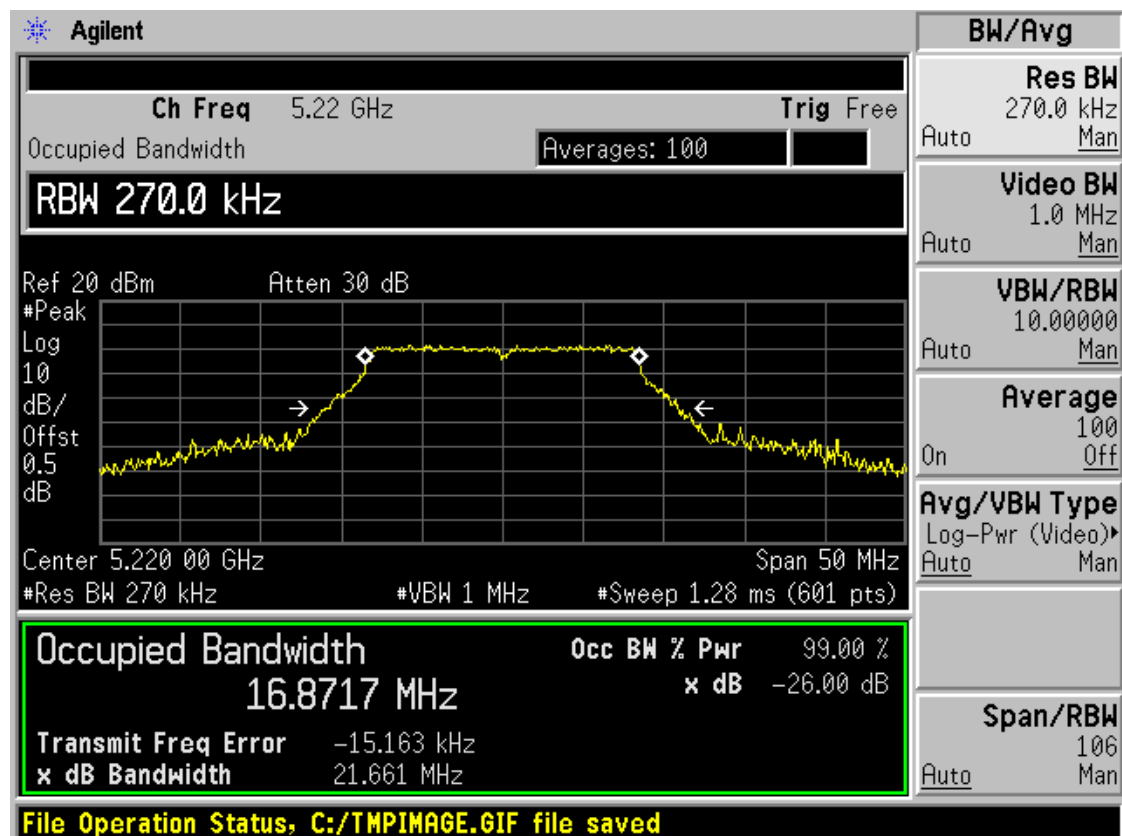
Band IV (5725 - 5850 MHz)				
Mode	Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
11a	CH149	5745	21.782	16.9432
11a	CH157	5785	21.636	16.8720
11a	CH161	5825	21.811	16.8335
11n (HT20)	CH149	5745	22.106	17.9153
11n (HT20)	CH157	5785	22.213	17.8495
11n (HT20)	CH161	5825	21.962	17.9125
11n (HT40)	CH151	5755	42.636	36.0958
11n (HT40)	CH159	5795	43.179	36.1606
11ac (HT20)	CH149	5745	22.003	17.9730
11ac (HT20)	CH157	5785	21.890	18.0284
11ac (HT20)	CH161	5805	22.068	17.9633
11ac (HT40)	CH151	5755	42.558	36.2120
11ac (HT40)	CH159	5795	42.536	36.2128
11ac (HT80)	CH155	5775	82.602	74.6089

Test Plots

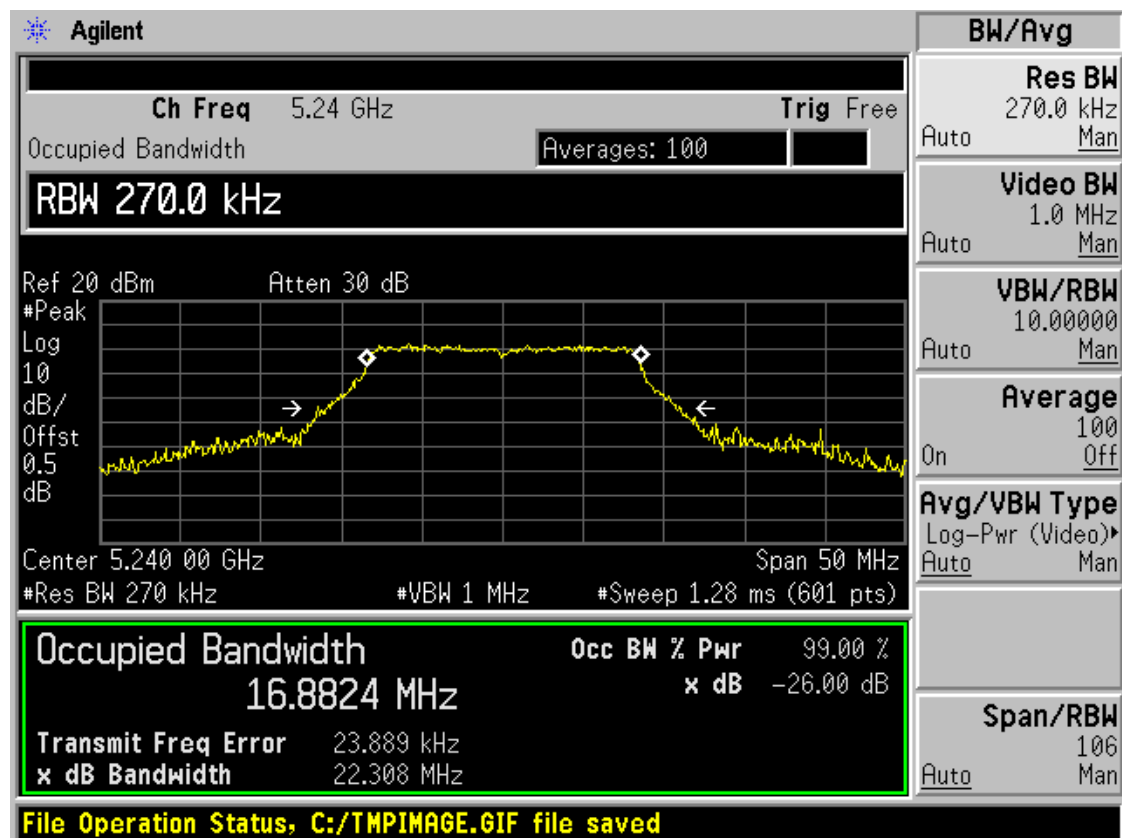
Band I 11a CH36



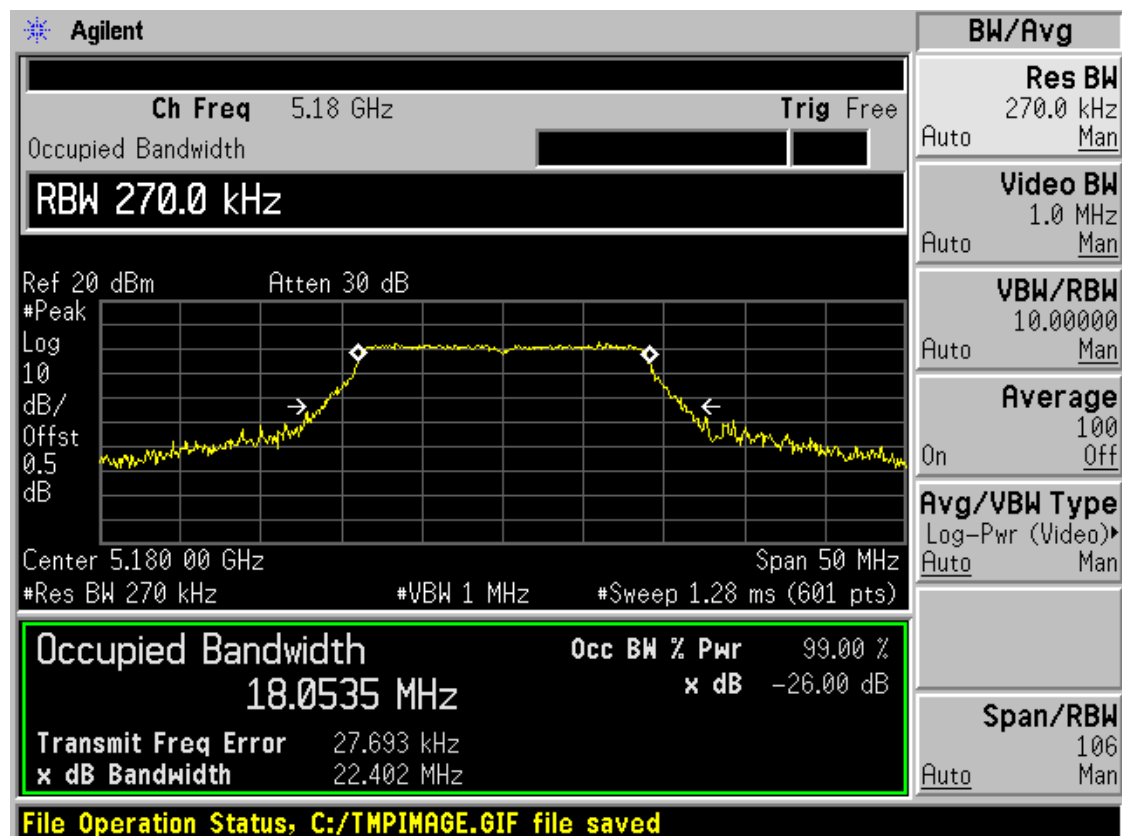
Band I 11a CH44



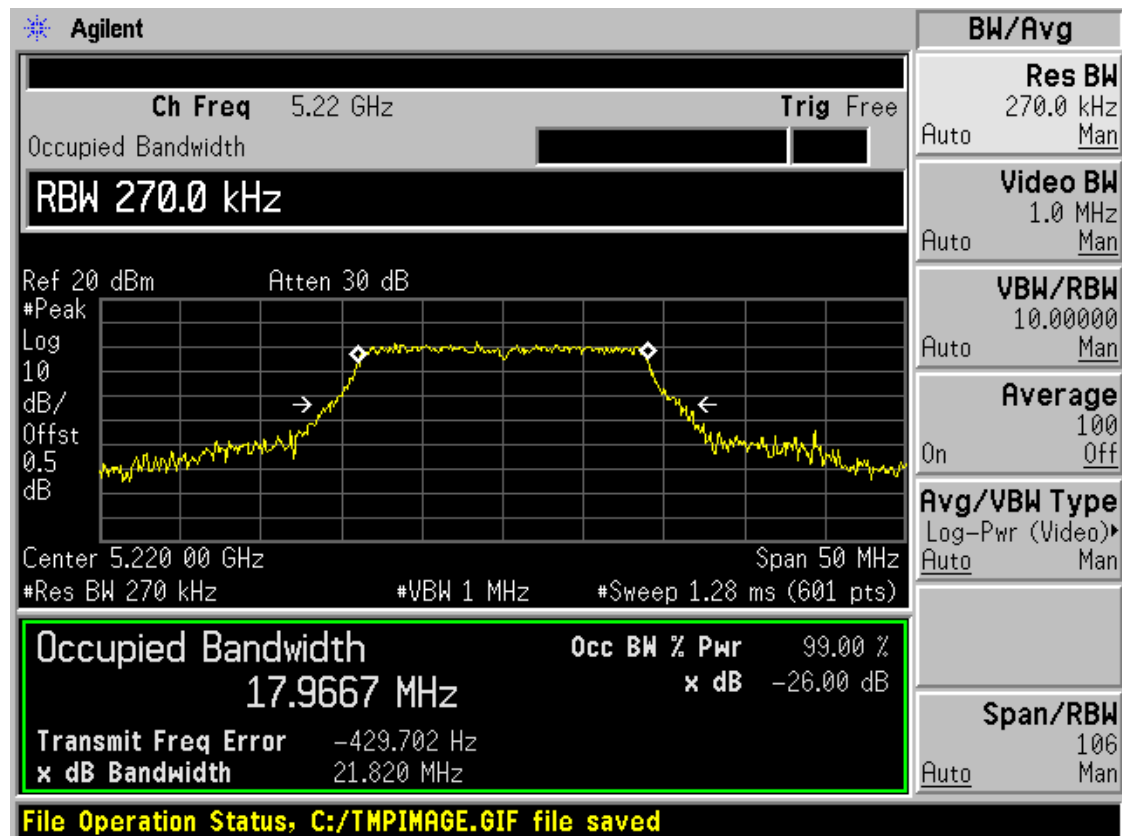
Band I 11a CH48



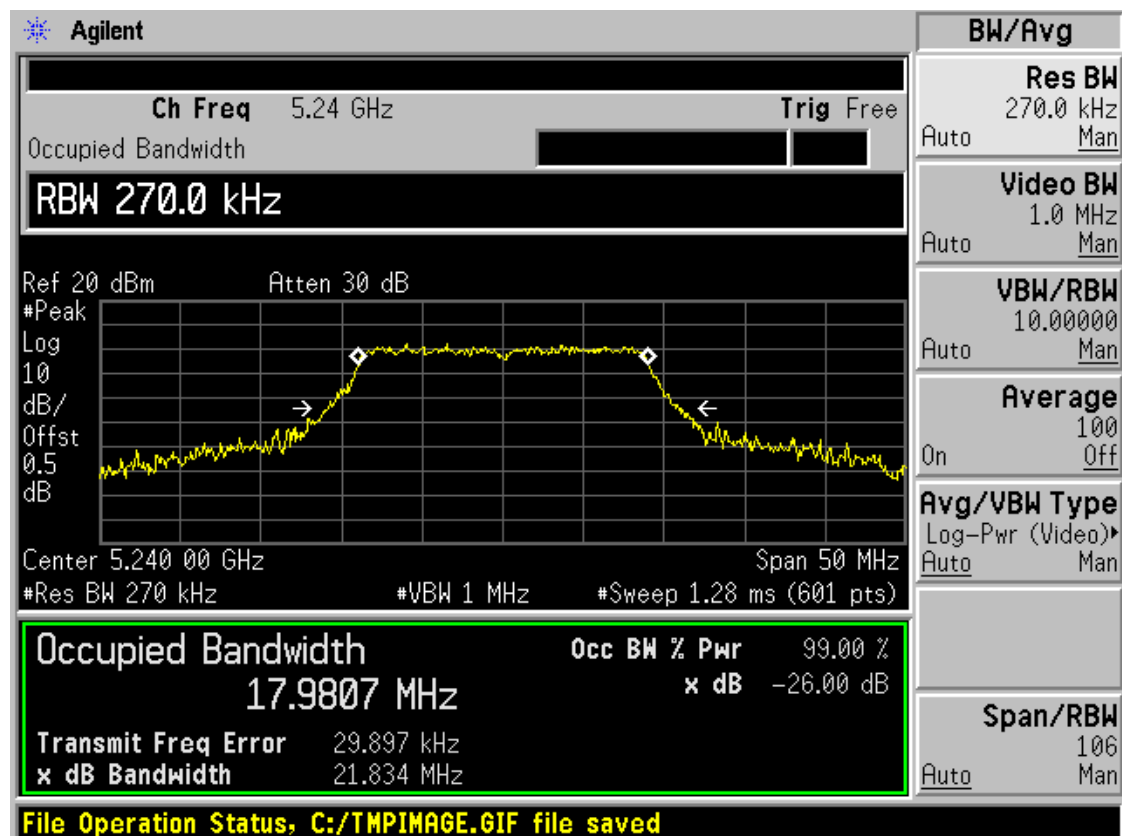
Band I 11n(HT20) CH36



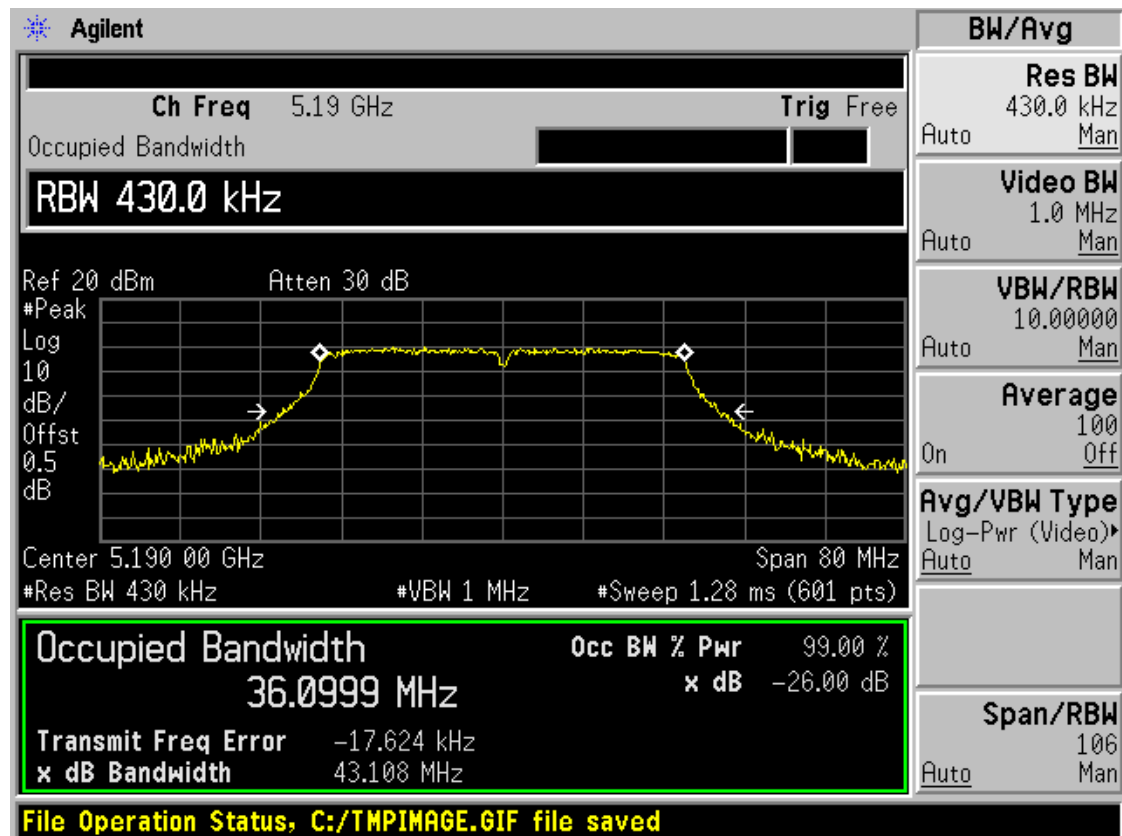
Band I 11n(HT20) CH44



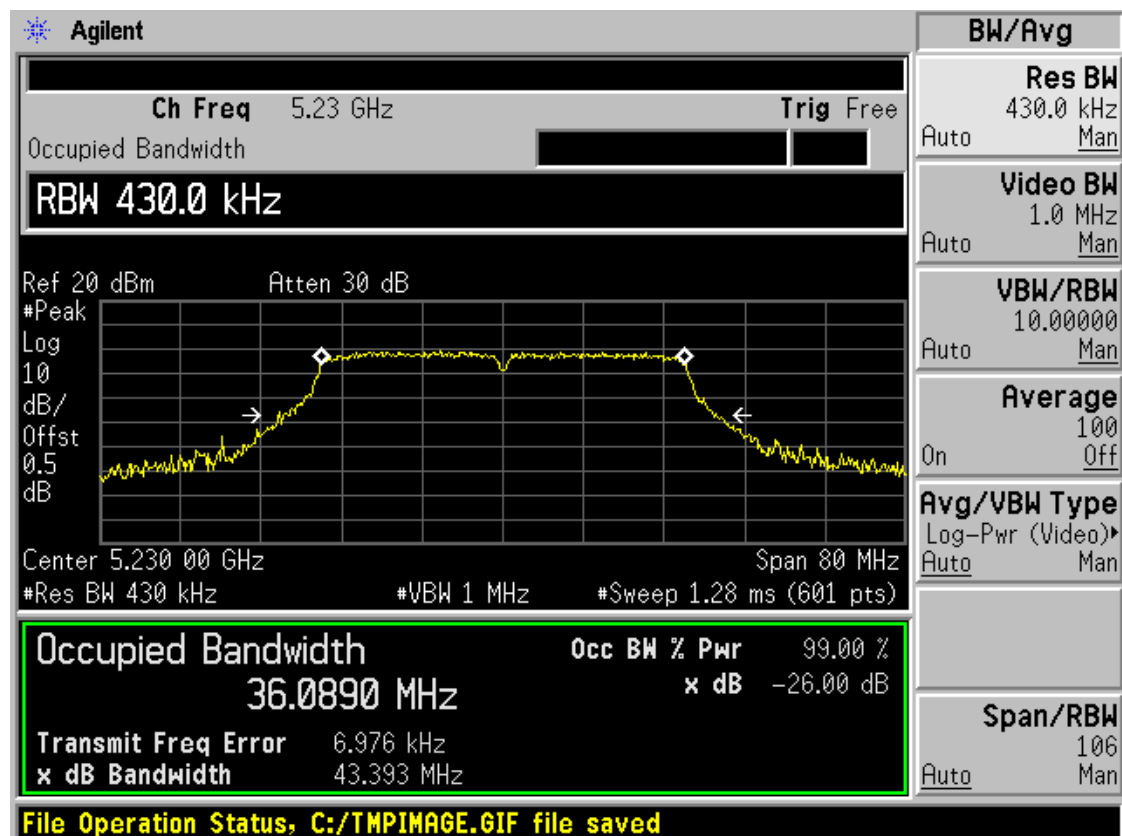
Band I 11n(HT20) CH48



Band I 11n(HT40) CH38



Band I 11n(HT40) CH46



Agilent

Ch Freq 5.18 GHz **Trig** Free

Occupied Bandwidth

RBW 270.0 kHz

Ref 20 dBm Atten 30 dB

#Peak Log 10 dB/Offst 0.5 dB

Center 5.180 00 GHz Span 50 MHz

#Res BW 270 kHz #VBW 1 MHz #Sweep 1.28 ms (601 pts)

Occupied Bandwidth 17.9184 MHz

Transmit Freq Error 2.352 kHz

x dB Bandwidth 21.742 MHz

Occ BW % Pwr 99.00 %

x dB -26.00 dB

BW/Avg

Res BW 270.0 kHz

Auto Man

Video BW 1.0 MHz

Auto Man

VBW/RBW 10.00000

Auto Man

Average 100

On Off

Avg/VBW Type Log-Pwr (Video)

Auto Man

Span/RBW 106

Auto Man

File Operation Status, C:/TMPIMAGE.GIF file saved

Agilent

Ch Freq 5.22 GHz **Trig** Free

Occupied Bandwidth

RBW 270.0 kHz

Ref 20 dBm Atten 30 dB

#Peak Log 10 dB/Offst 0.5 dB

Center 5.220 00 GHz Span 50 MHz

#Res BW 270 kHz #VBW 1 MHz #Sweep 1.28 ms (601 pts)

Occupied Bandwidth 17.8895 MHz

Occ BW % Pwr 99.00 %

x dB Bandwidth 21.949 MHz

Transmit Freq Error -16.848 kHz

x dB Bandwidth 21.949 MHz

File Operation Status, C:/TMPIMAGE.GIF file saved

BW/Avg
Res BW 270.0 kHz
Auto Man

Video BW
1.0 MHz
Auto Man

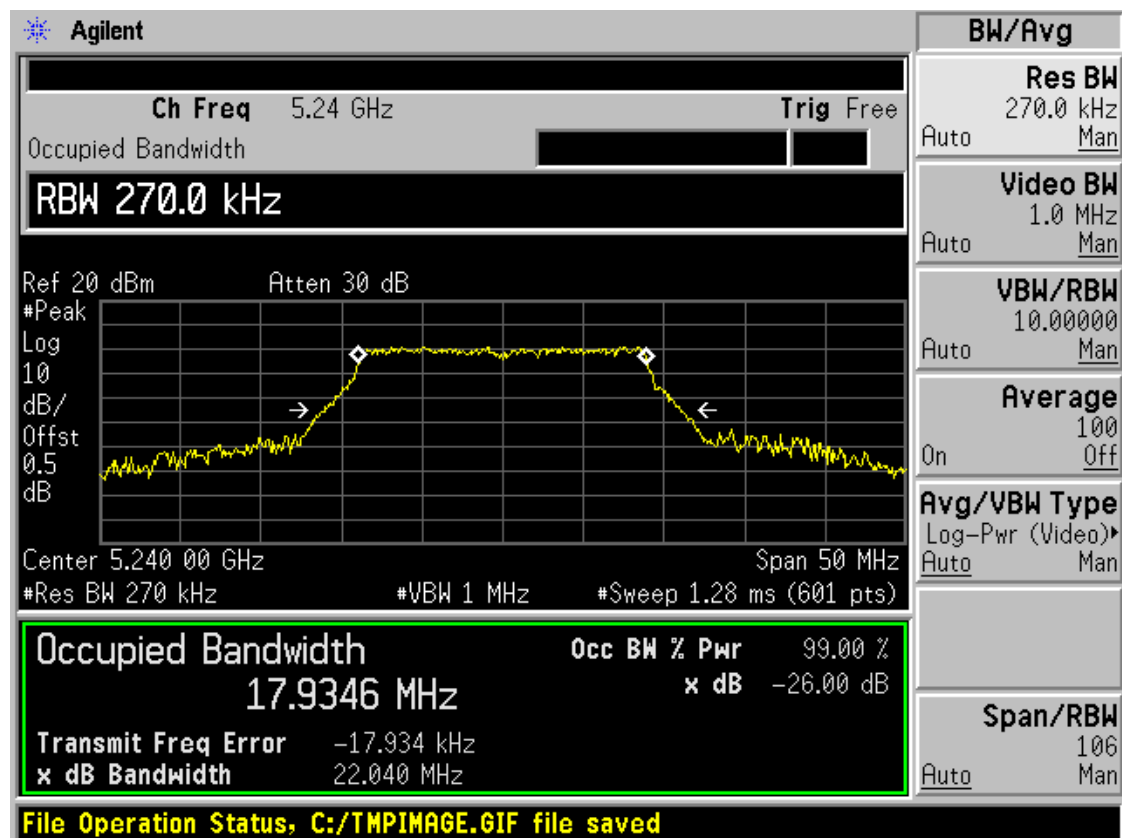
VBW/RBW
10.00000
Auto Man

Average
100
On Off

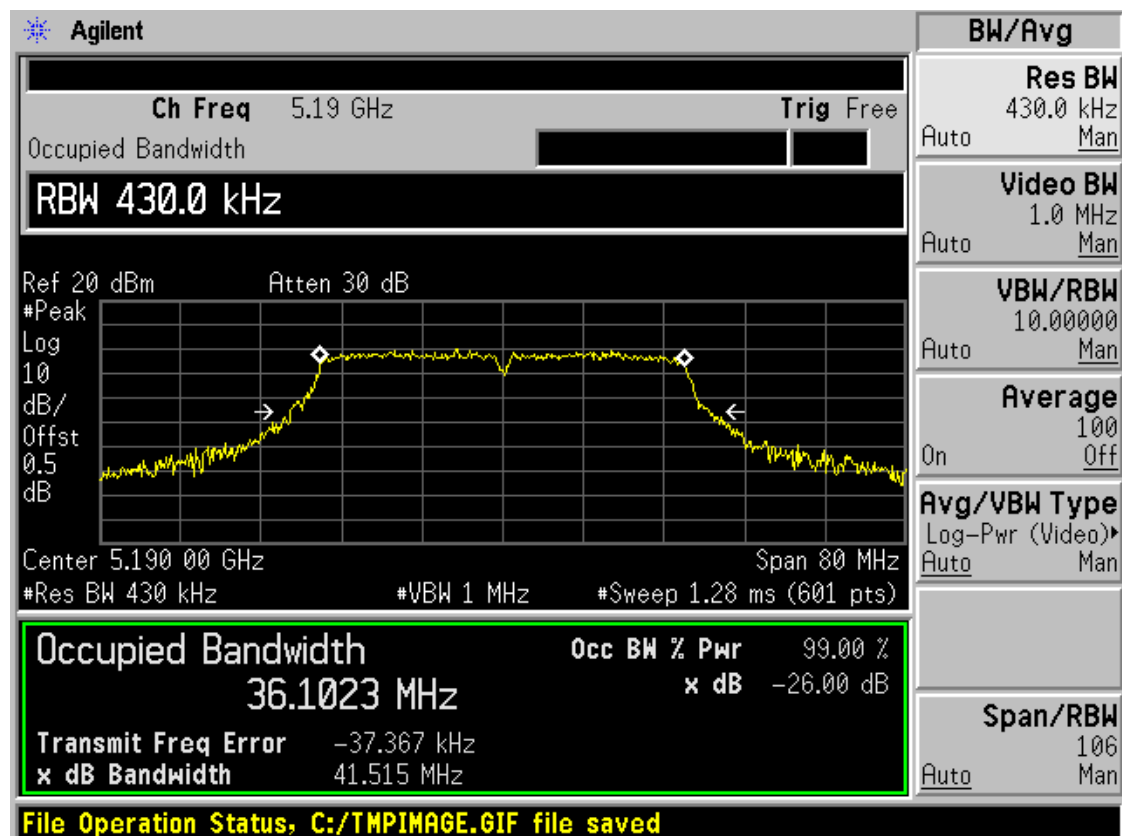
Avg/VBW Type
Log-Pwr (Video) Auto Man

Span/RBW
106
Auto Man

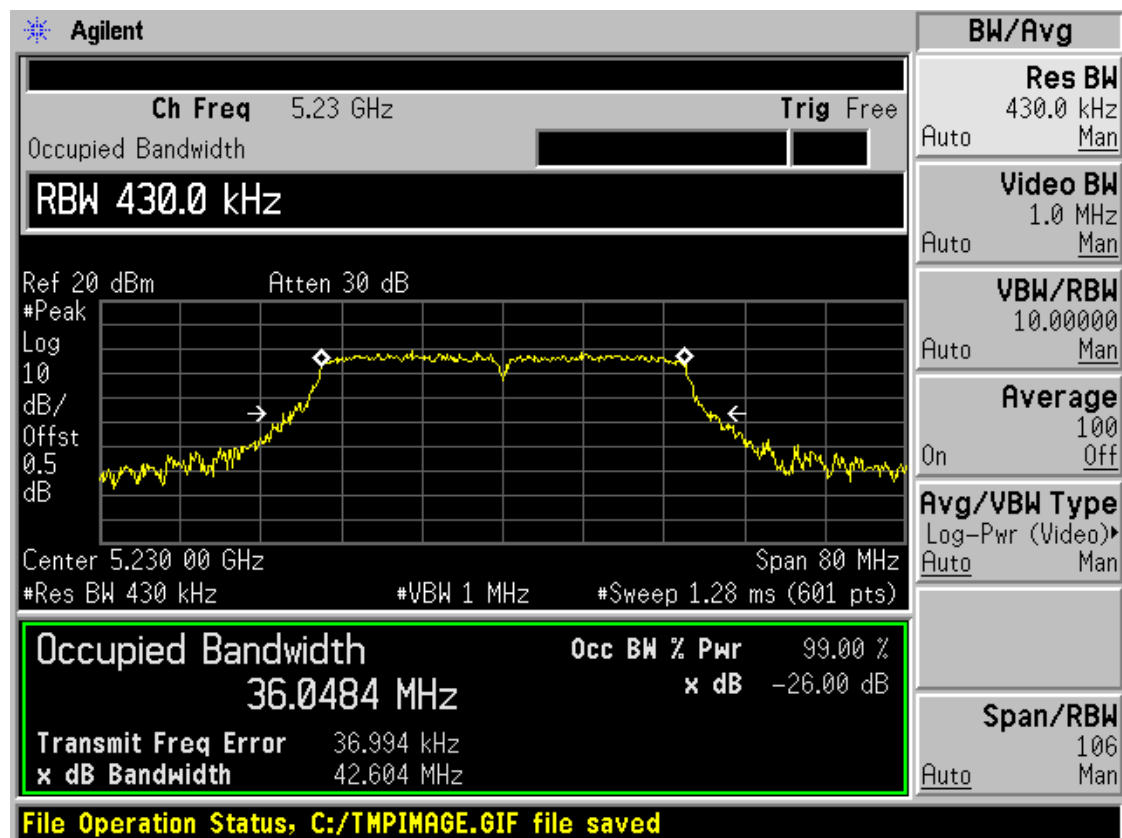
Band I 11ac(HT20) CH48



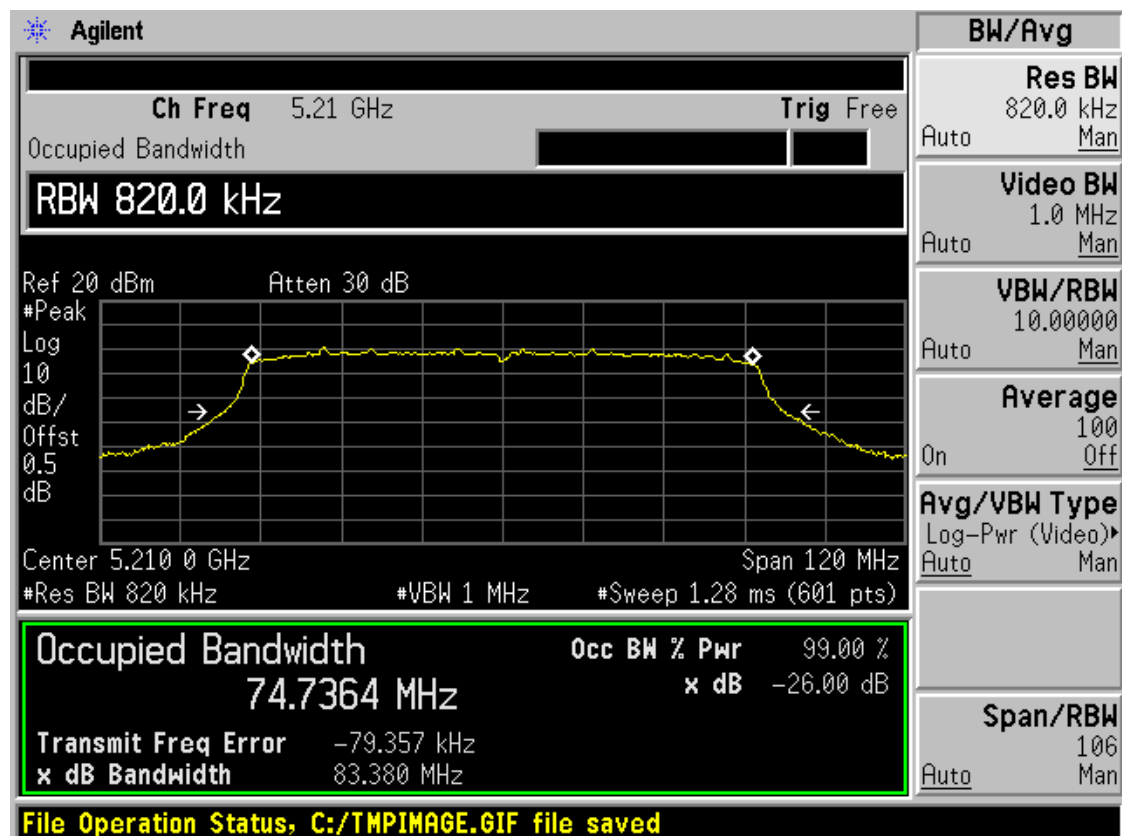
Band I 11ac(HT40) CH38



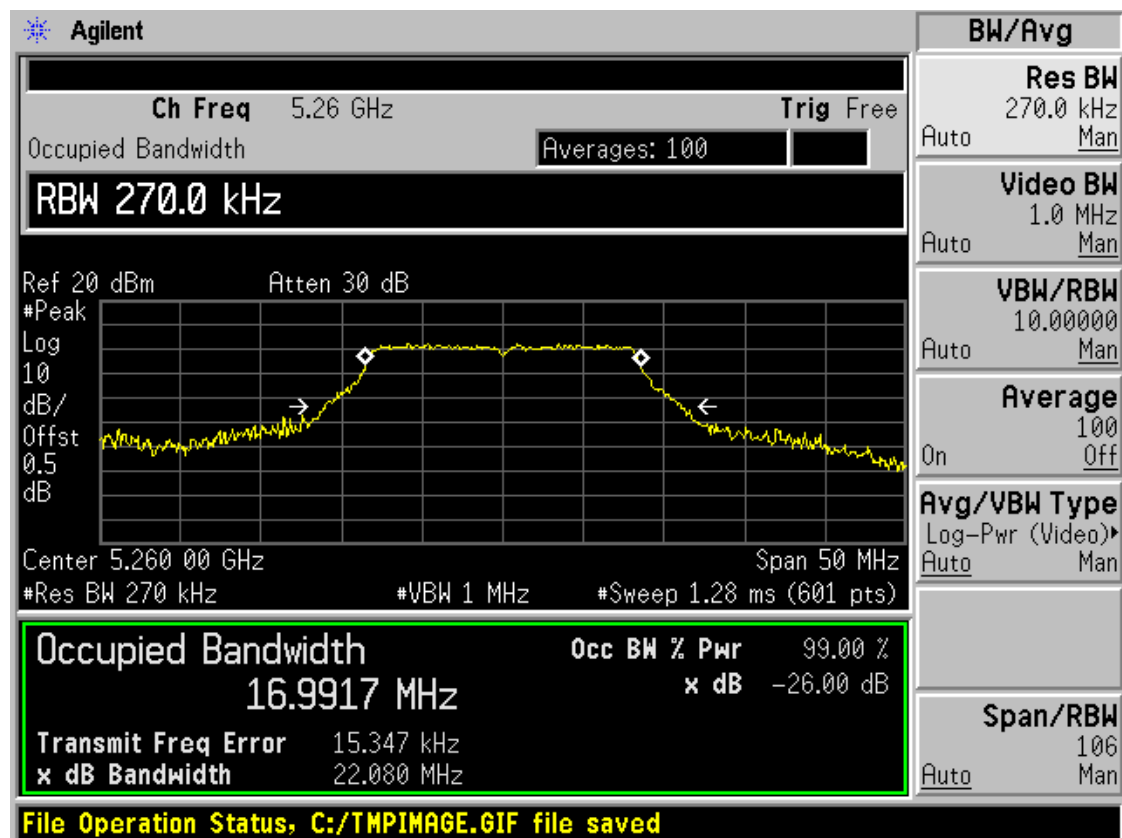
Band I 11ac(HT40) CH46



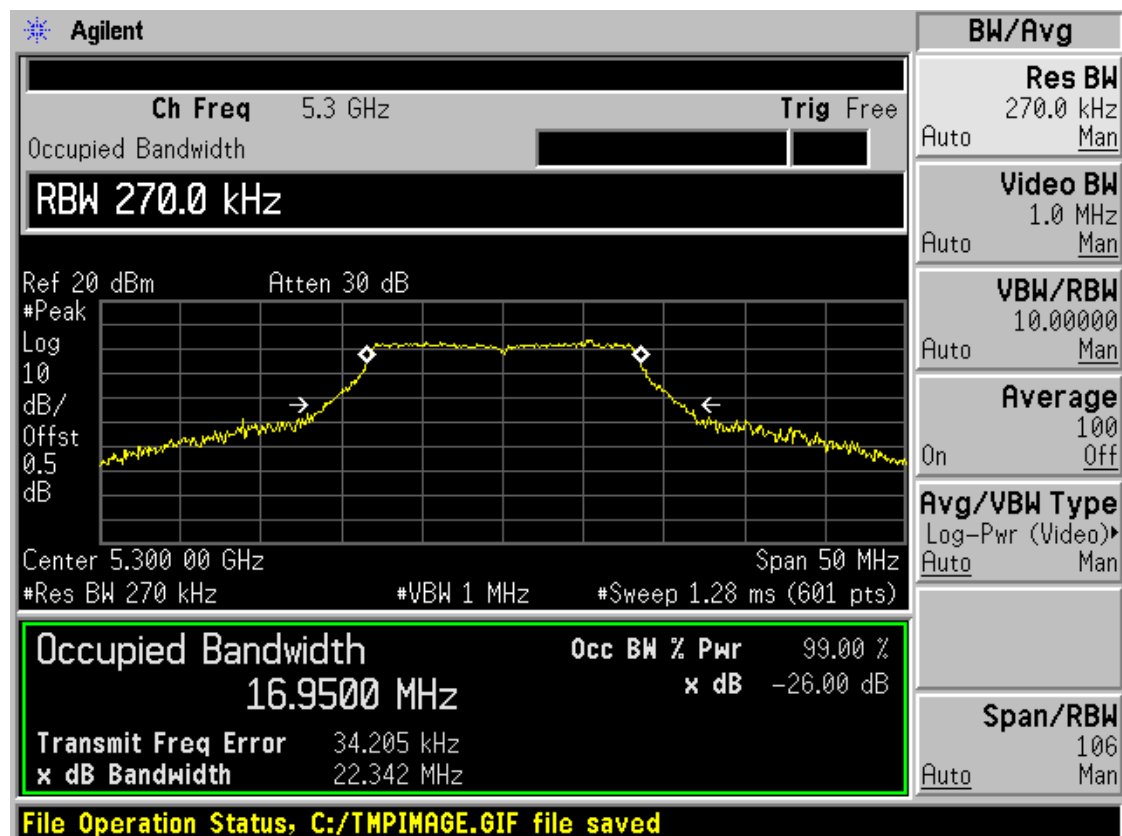
Band I 11ac(HT80) CH42



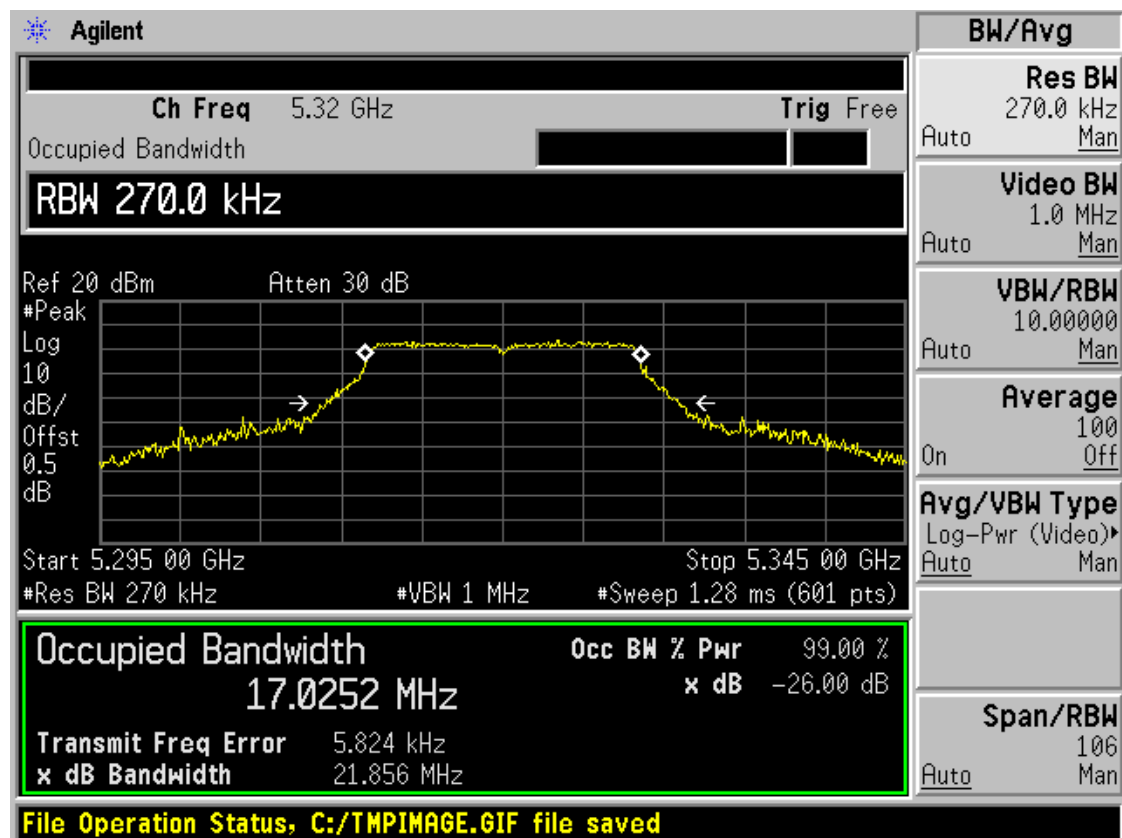
Band II 11a CH52



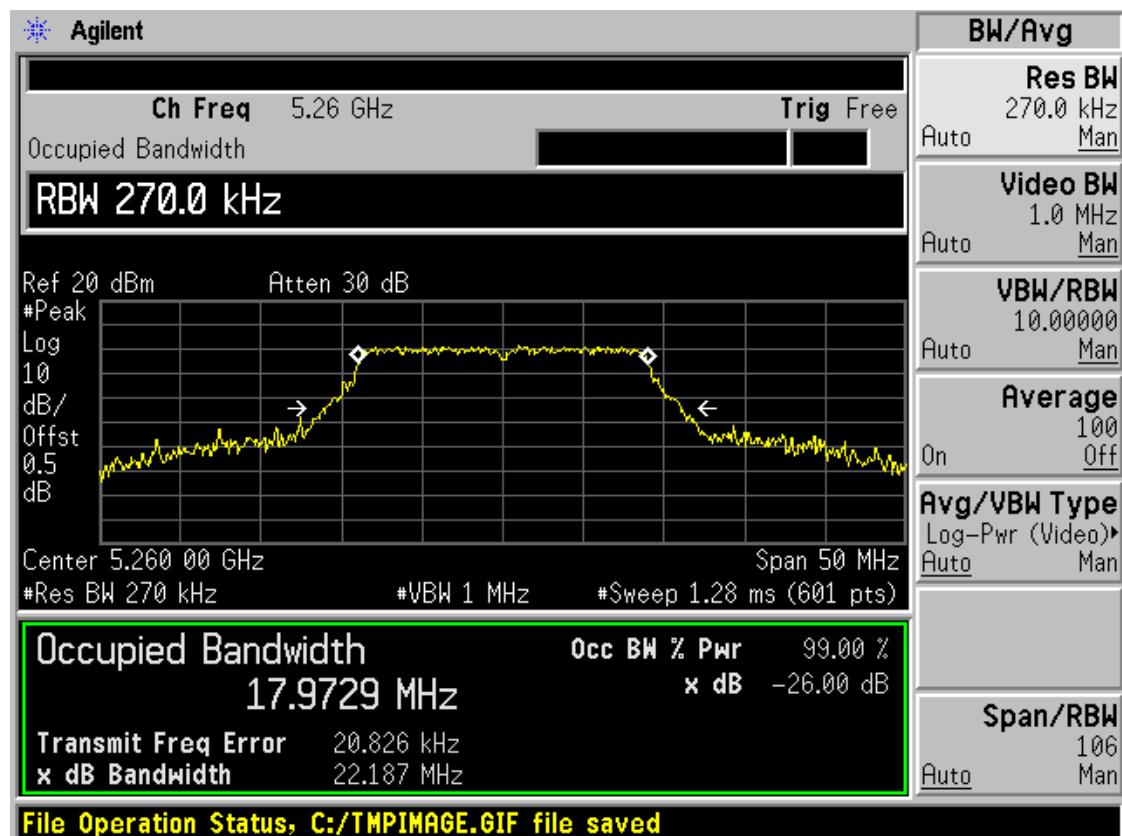
Band II 11a CH56



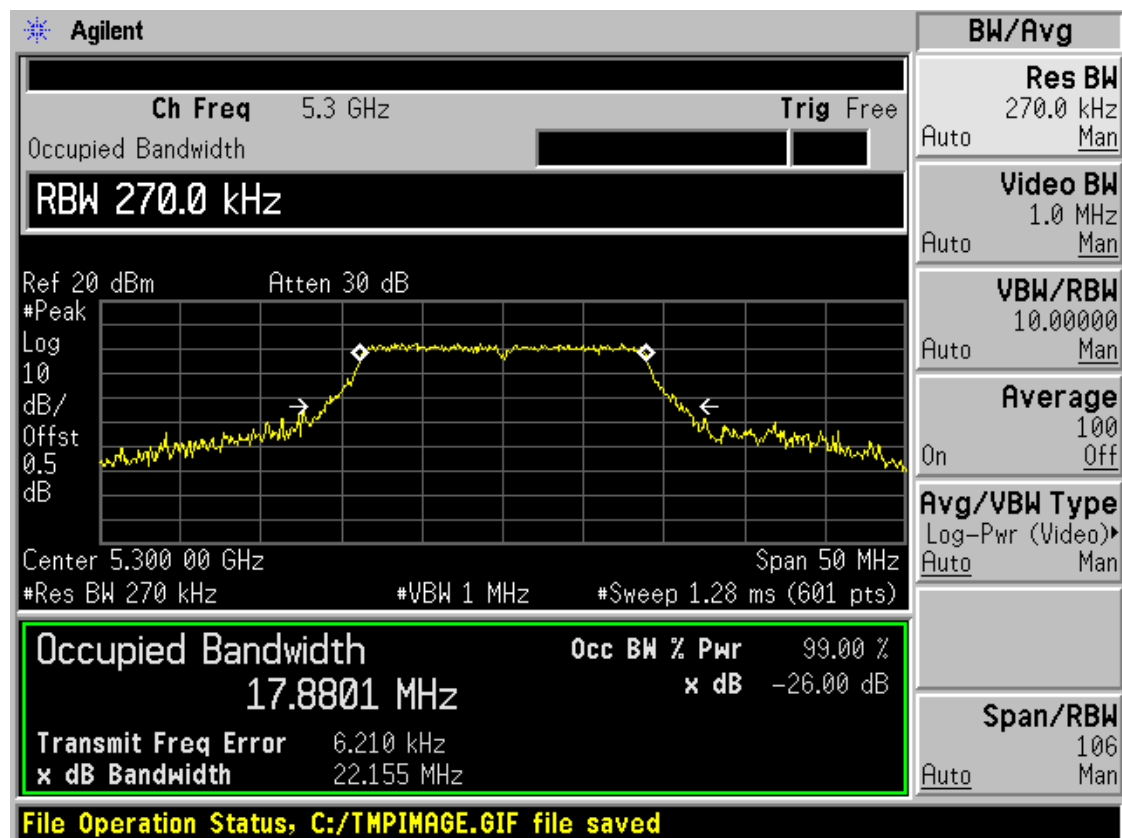
Band II 11a CH64



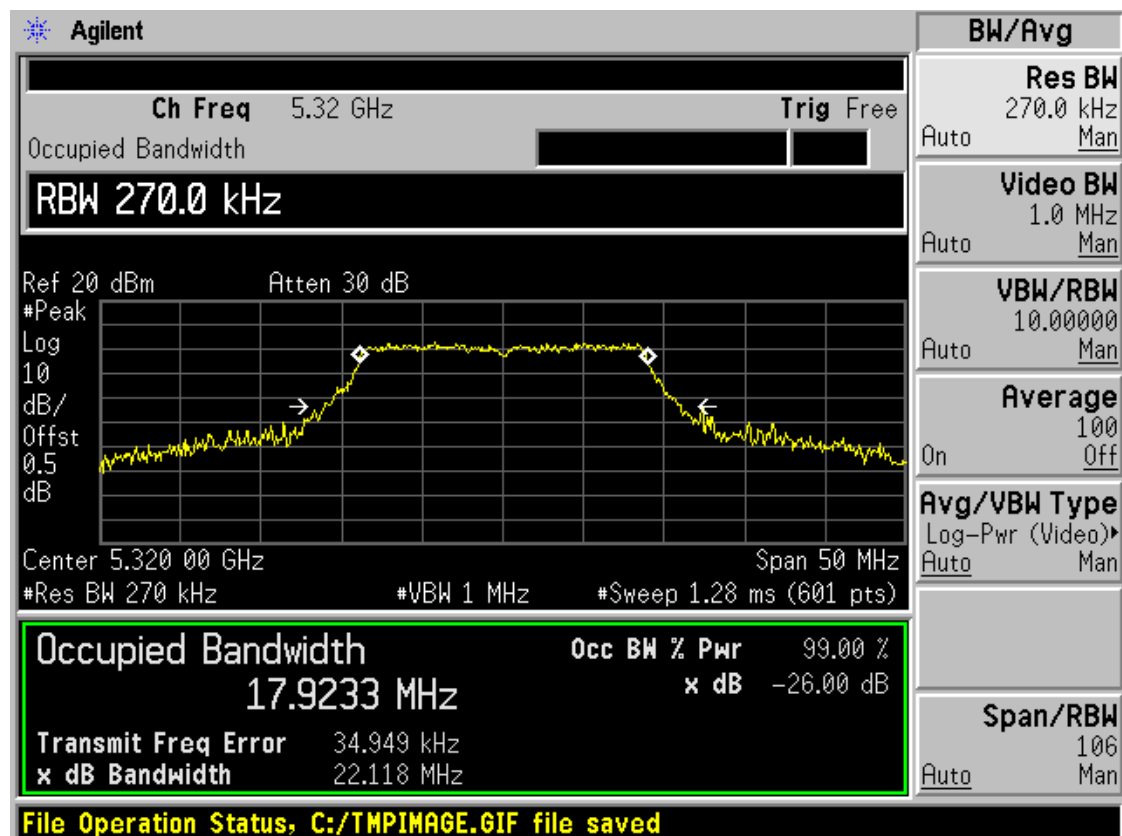
Band II 11n(HT20) CH52



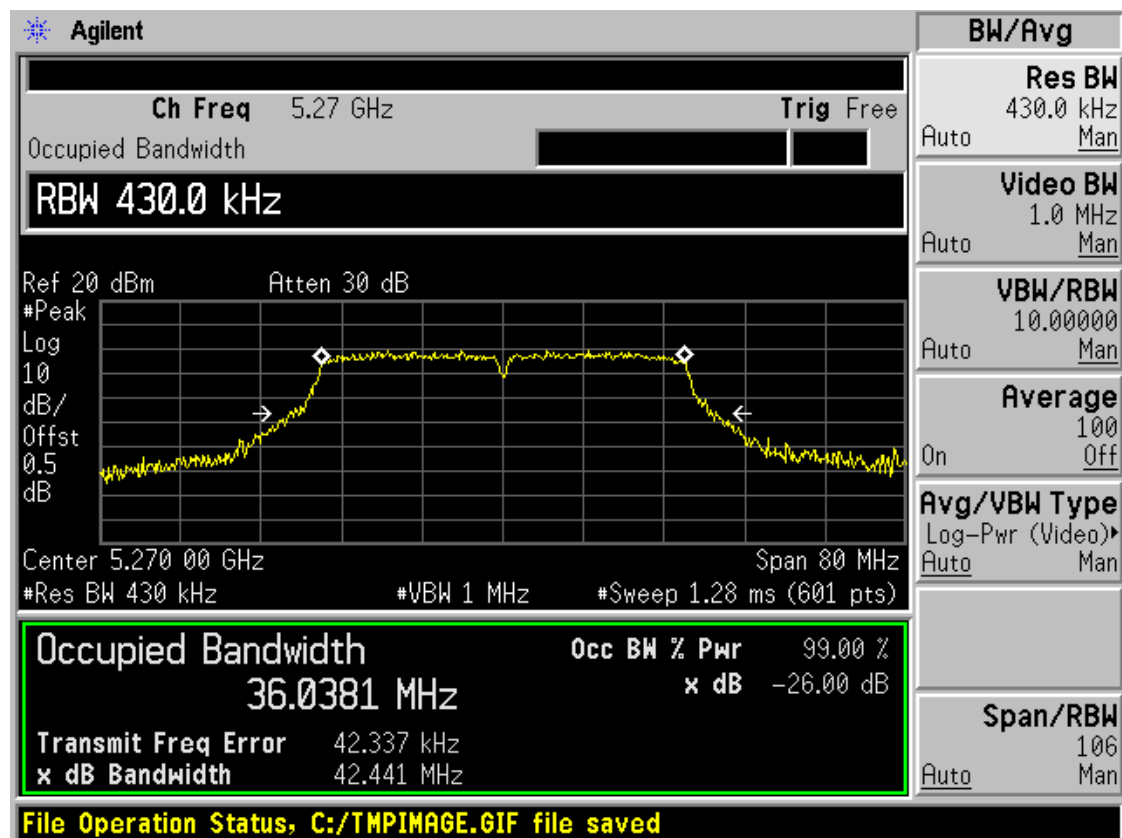
Band II 11n(HT20) CH56



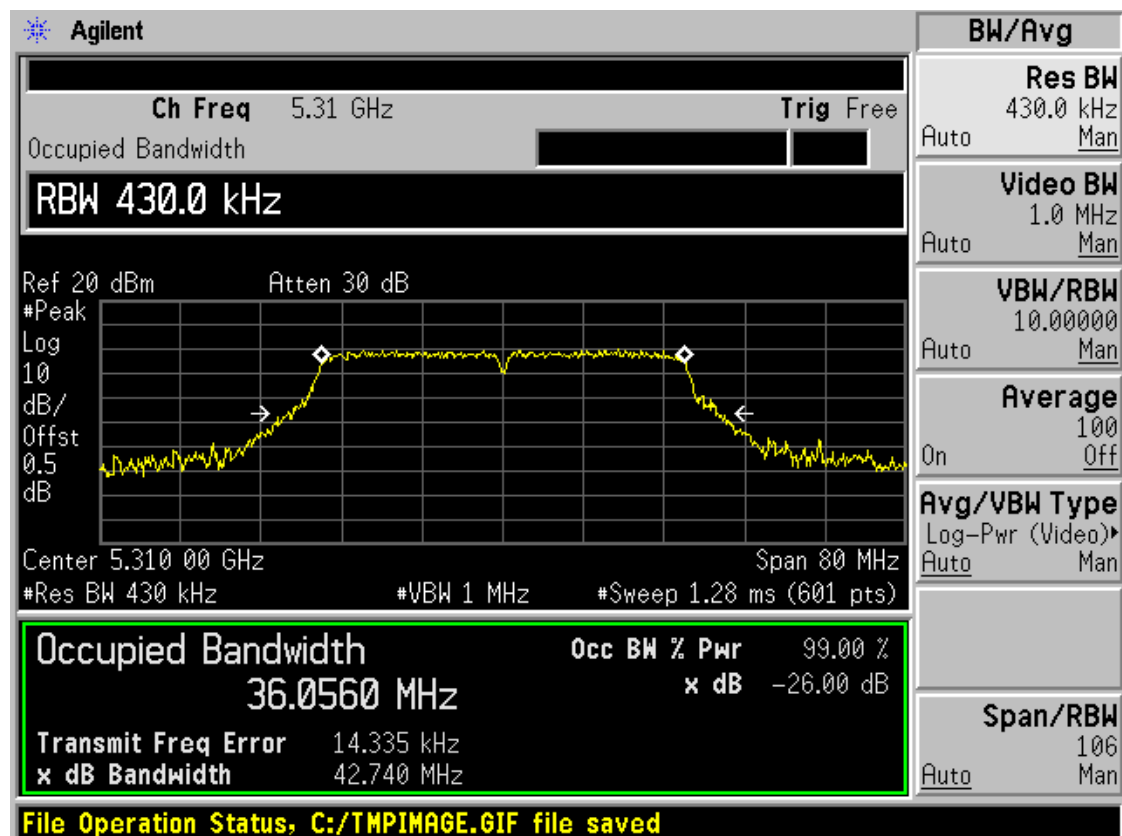
Band II 11n(HT20) CH64



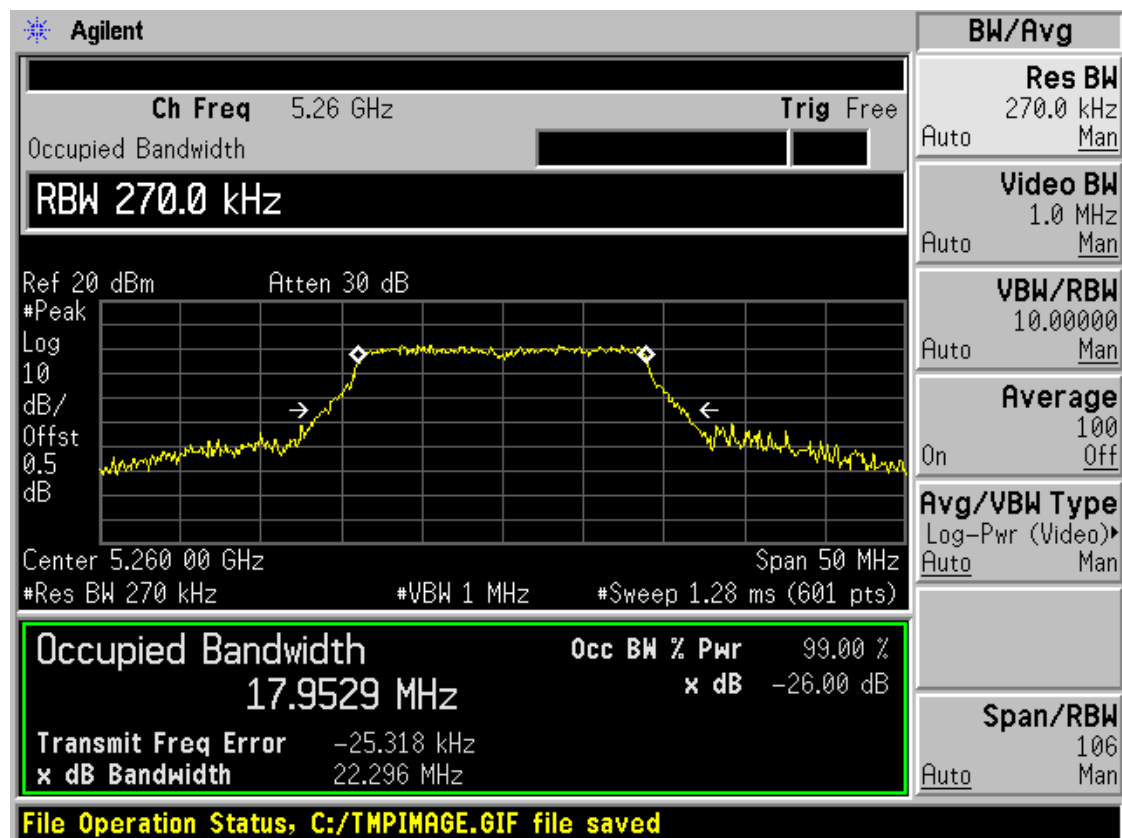
Band II 11n(HT40) CH54



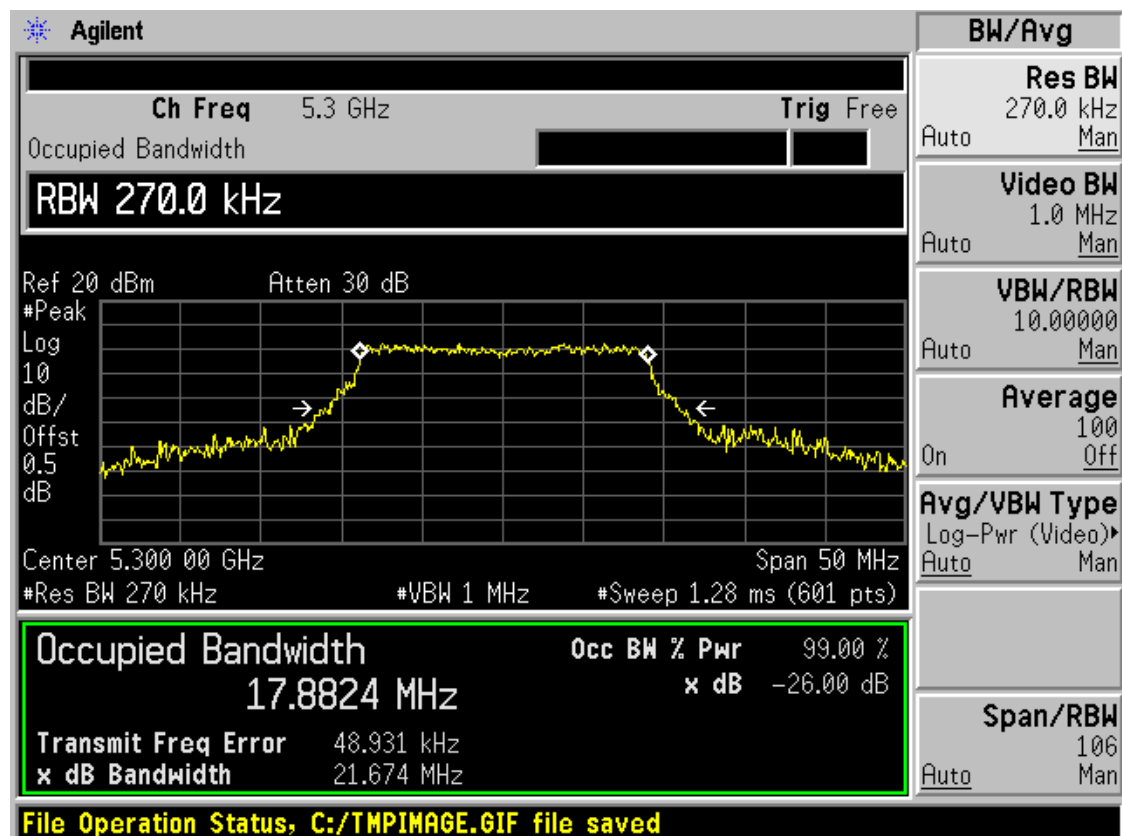
Band II 11n(HT40) CH62



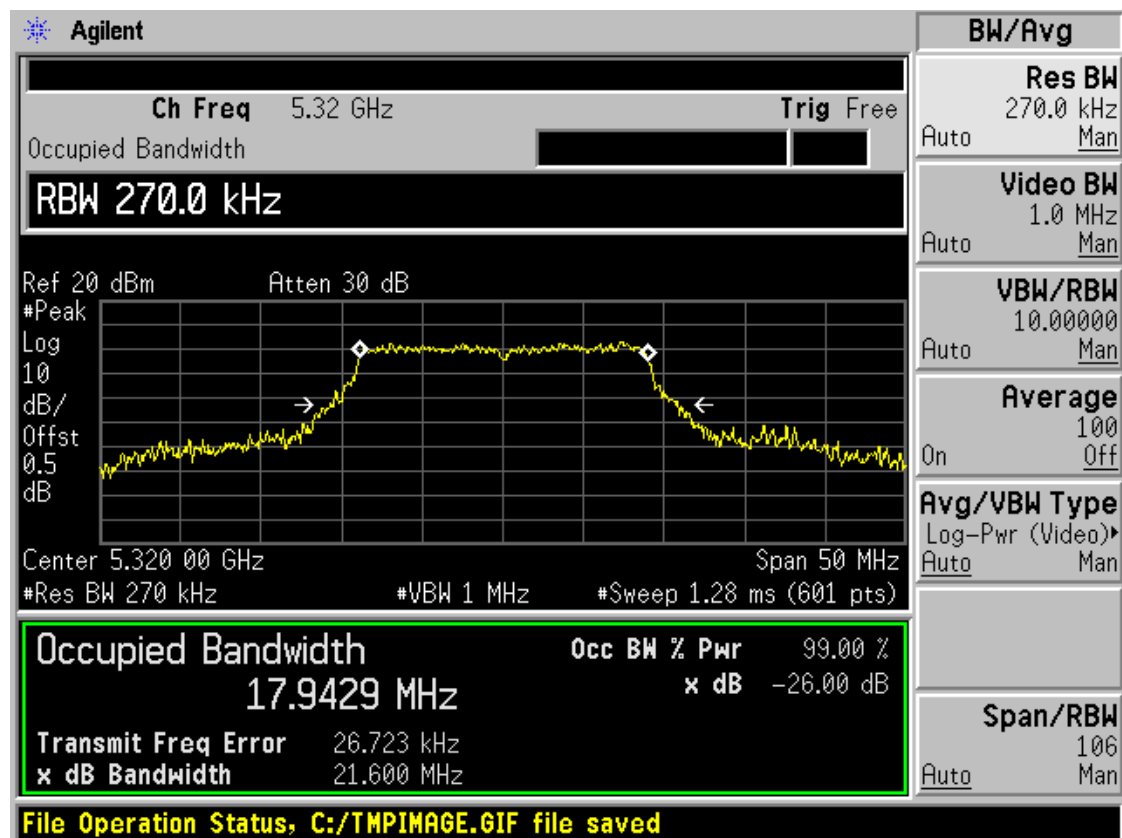
Band II 11ac(HT20) CH52



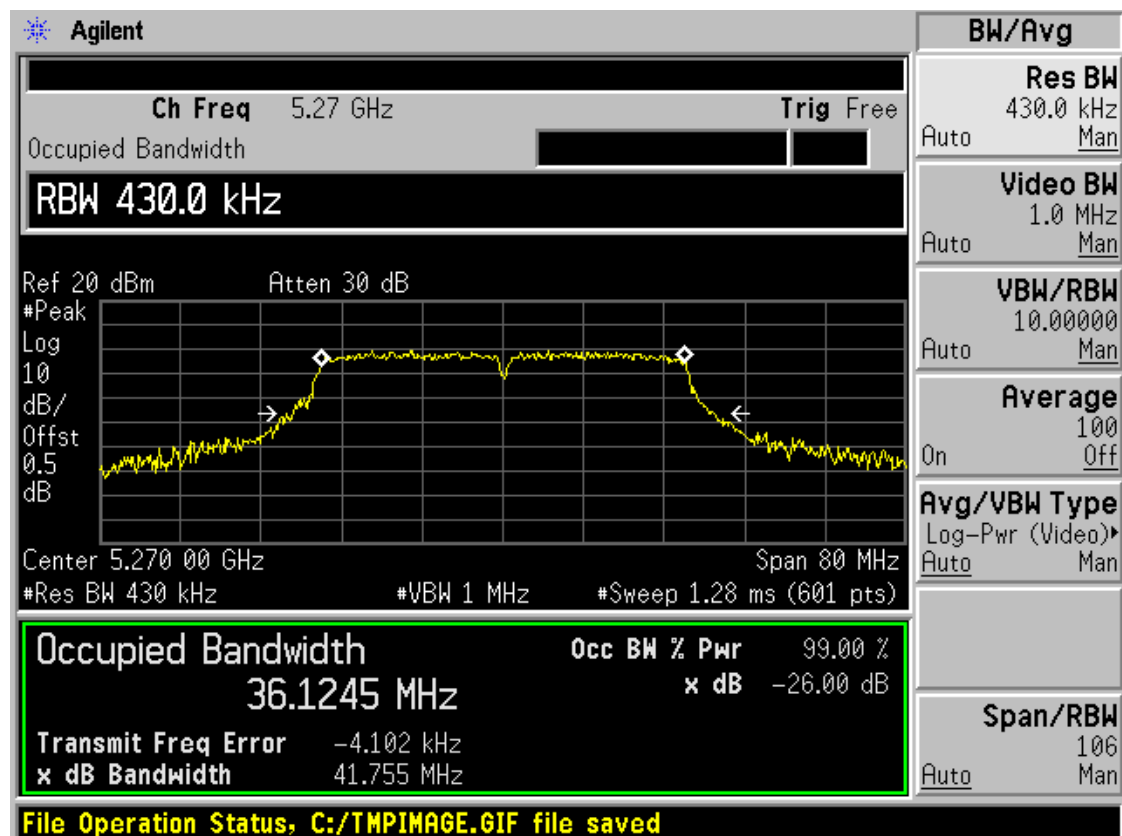
Band II 11ac(HT20) CH56



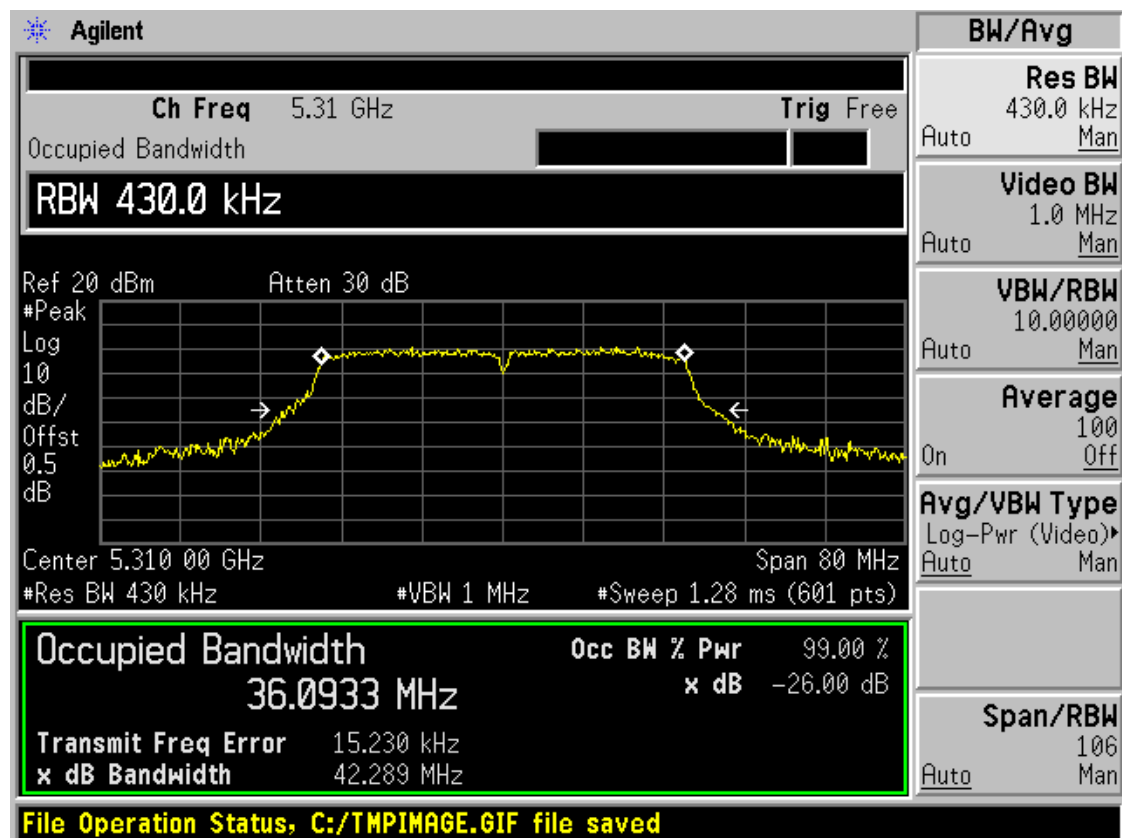
Band II 11ac(HT20) CH64



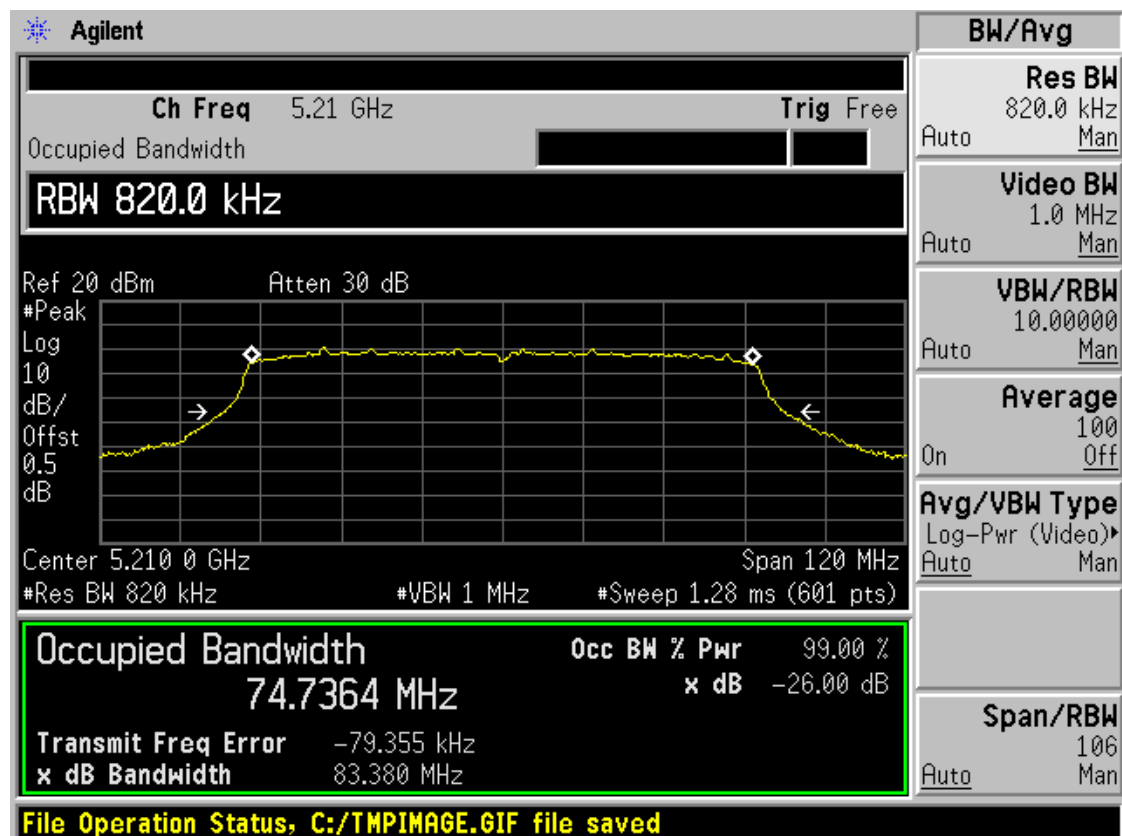
Band II 11ac(HT40) CH54



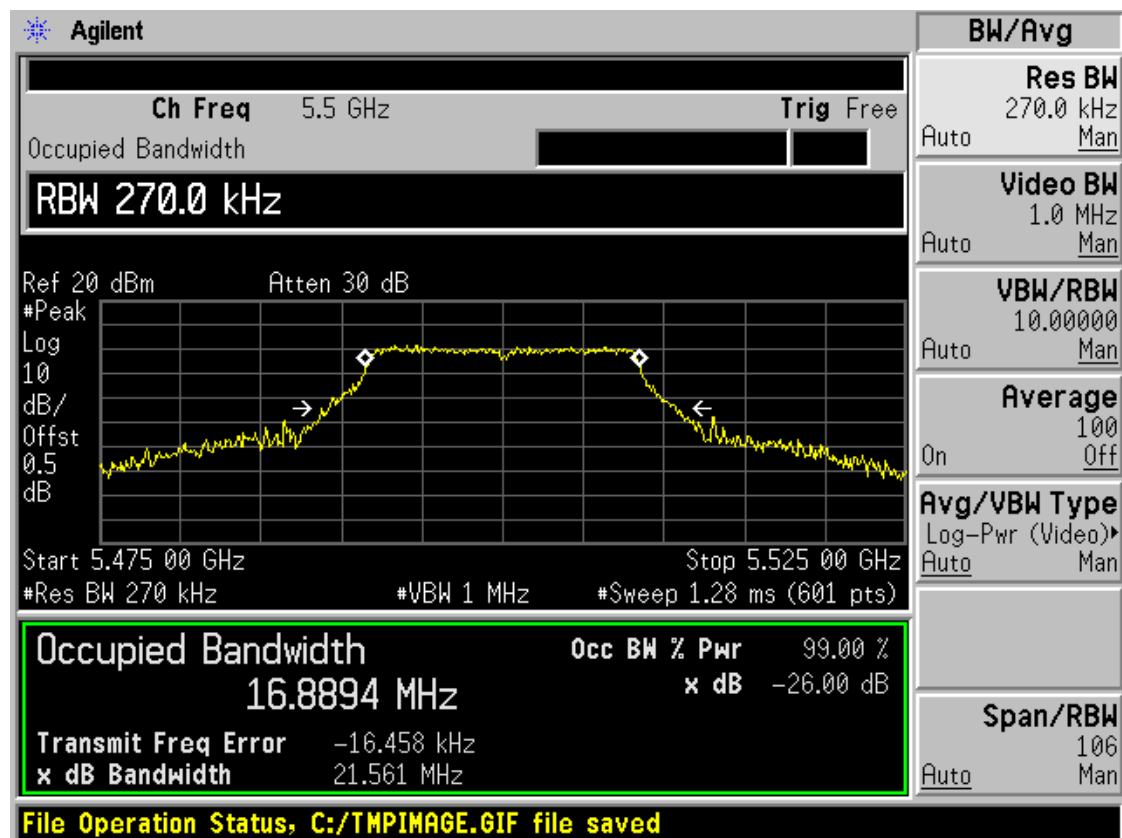
Band II 11ac(HT40) CH62



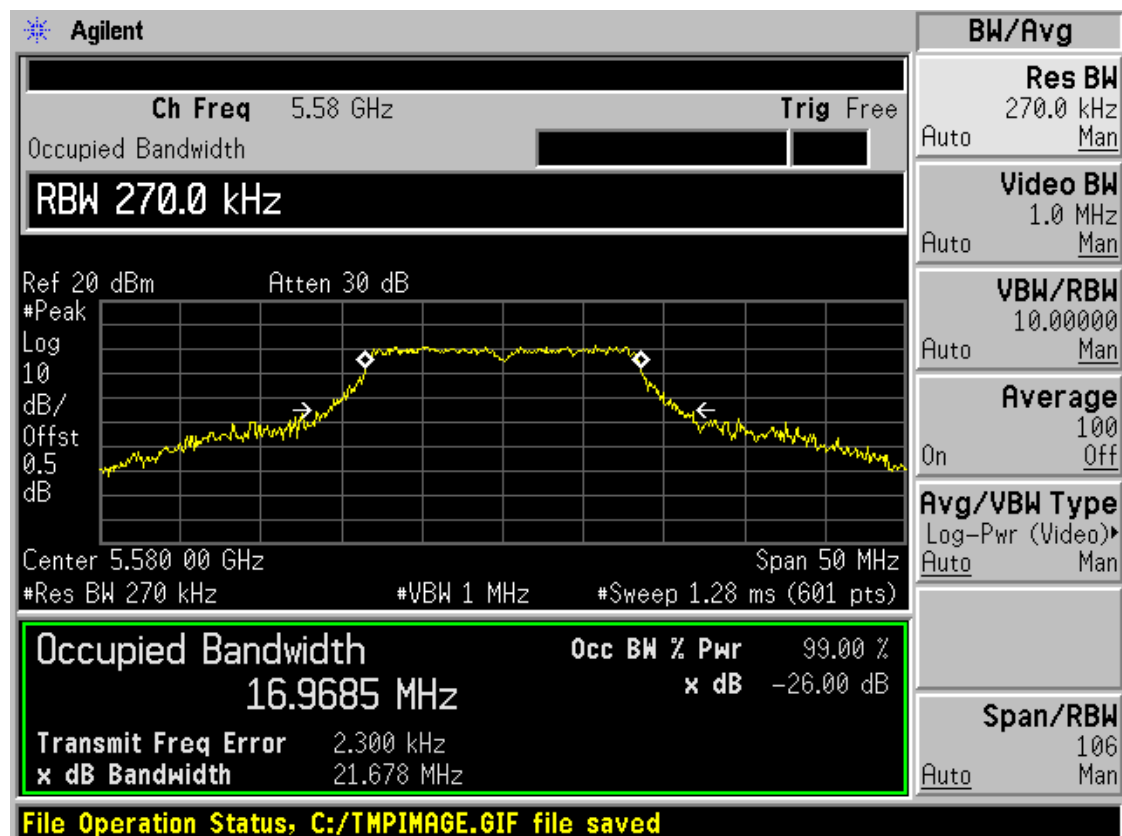
Band II 11ac(HT80) CH58



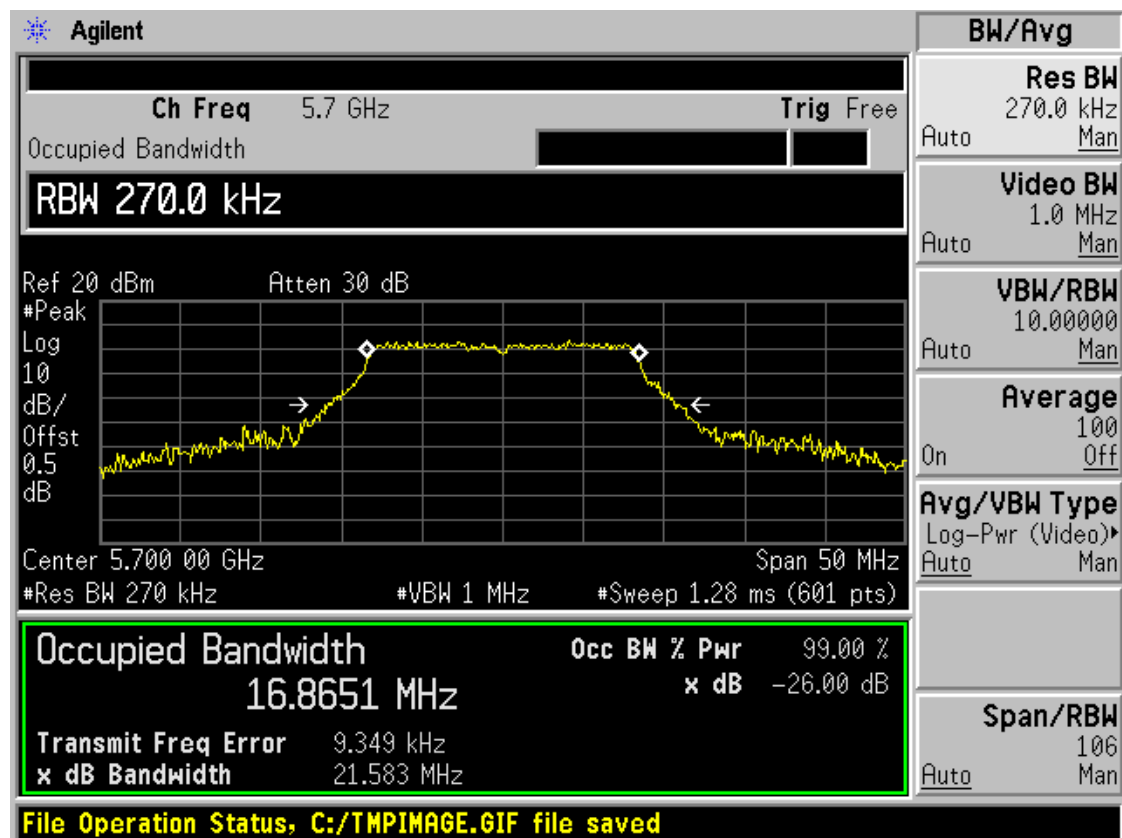
Band III 11a CH100



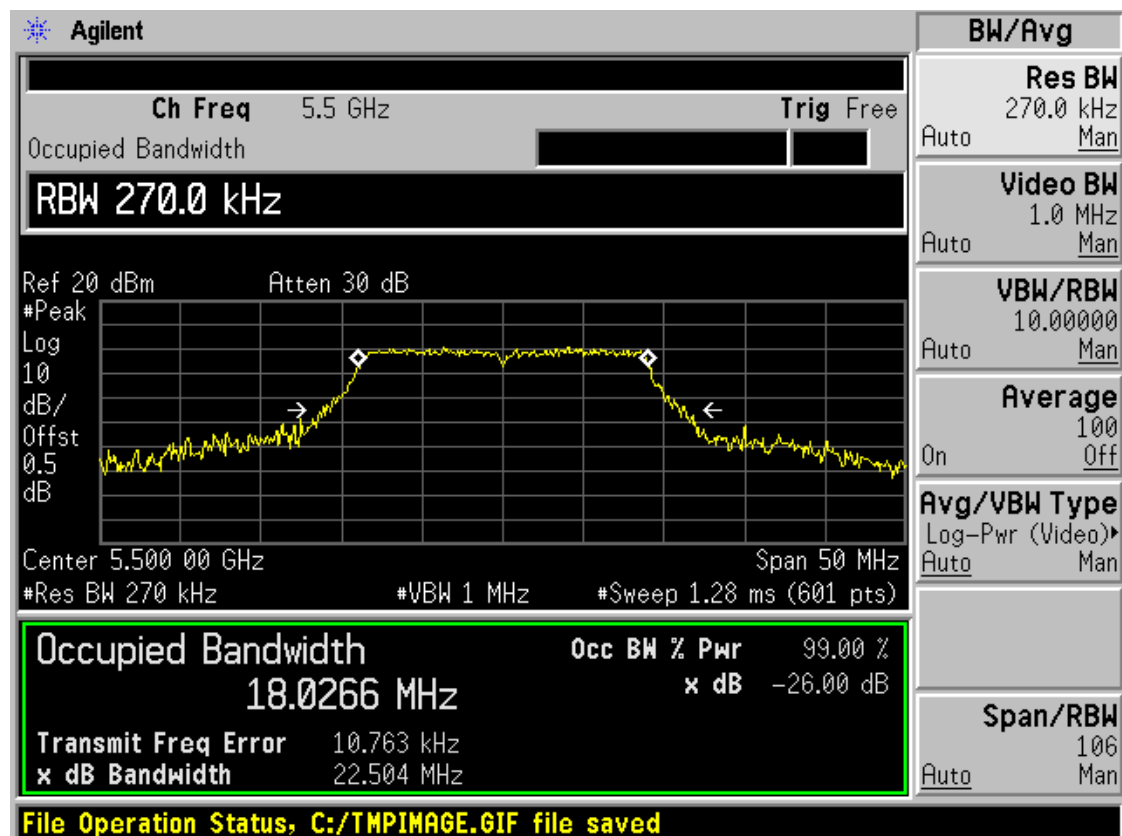
Band III 11a CH116



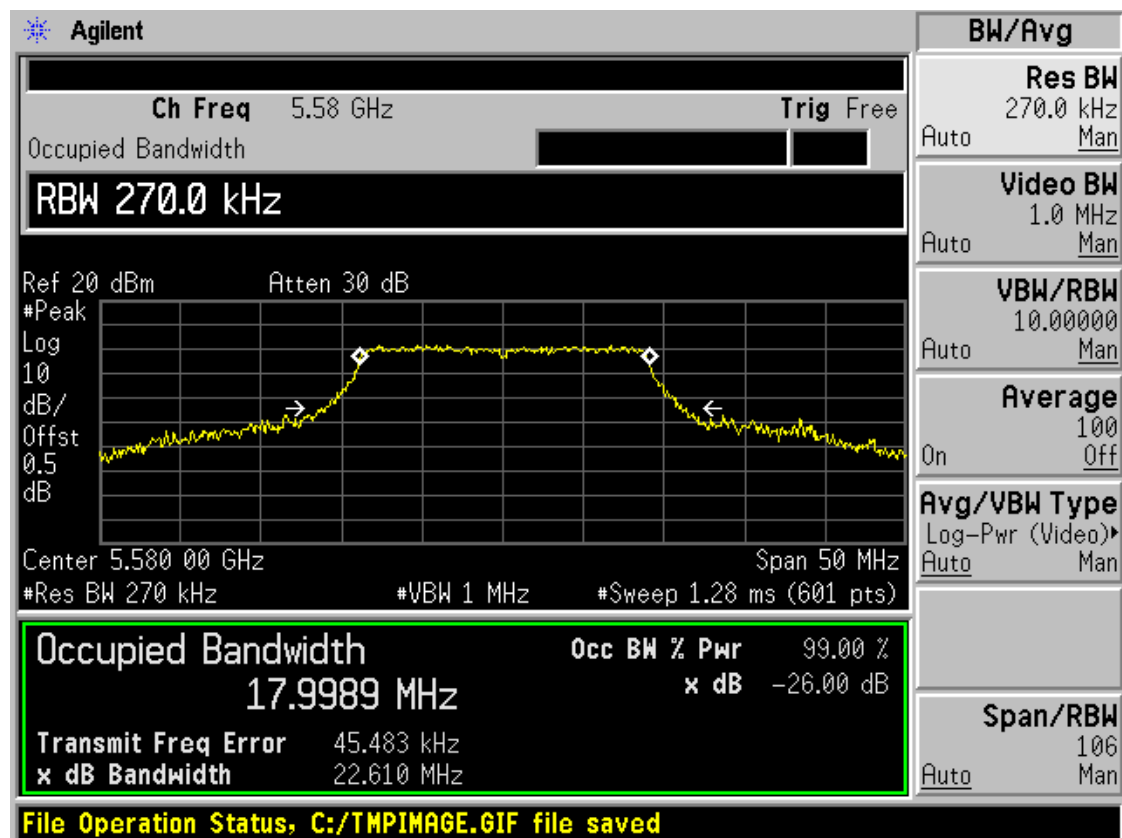
Band III 11a CH140



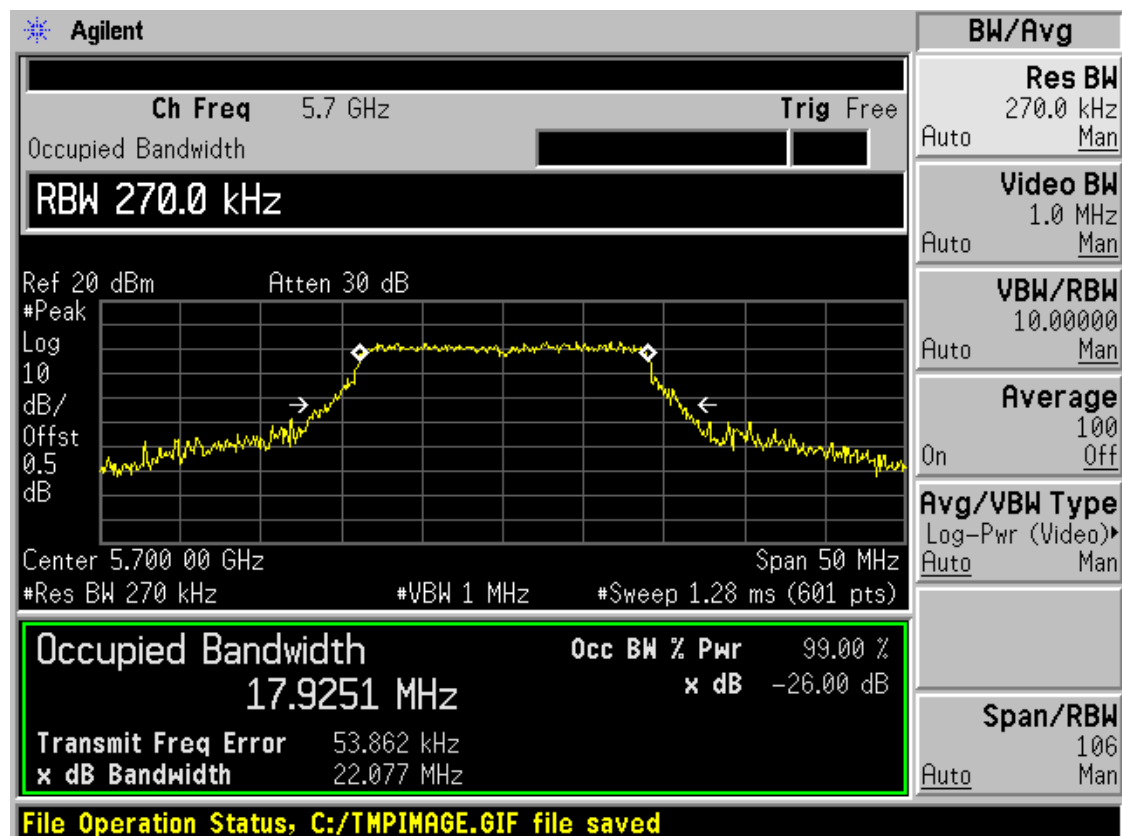
Band III 11n(HT20) CH100



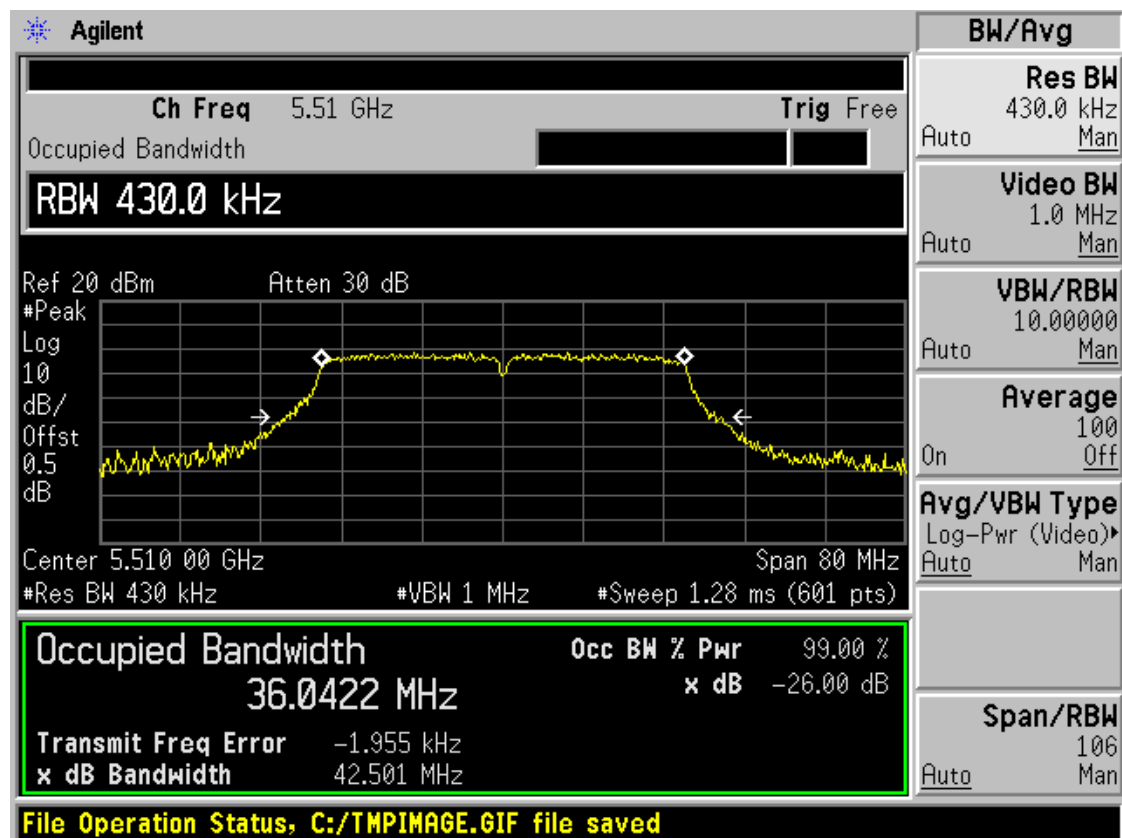
Band III 11n(HT20) CH116



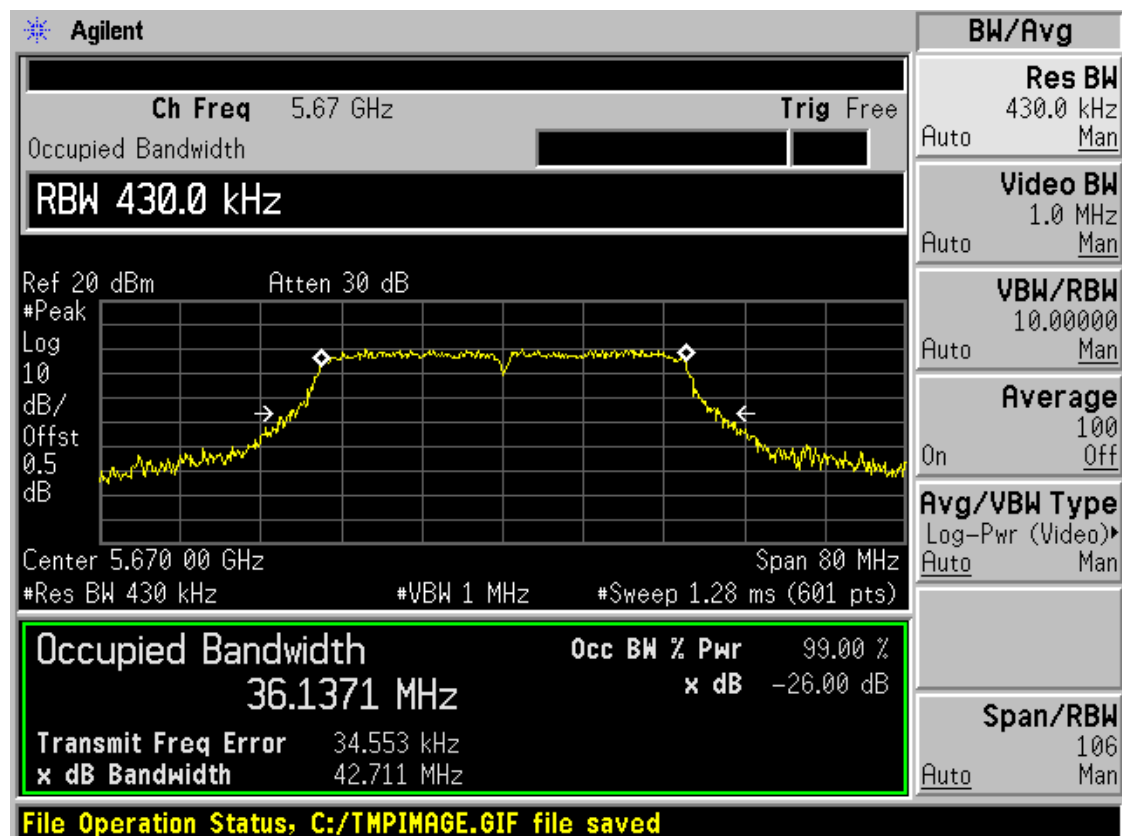
Band III 11n(HT20) CH140



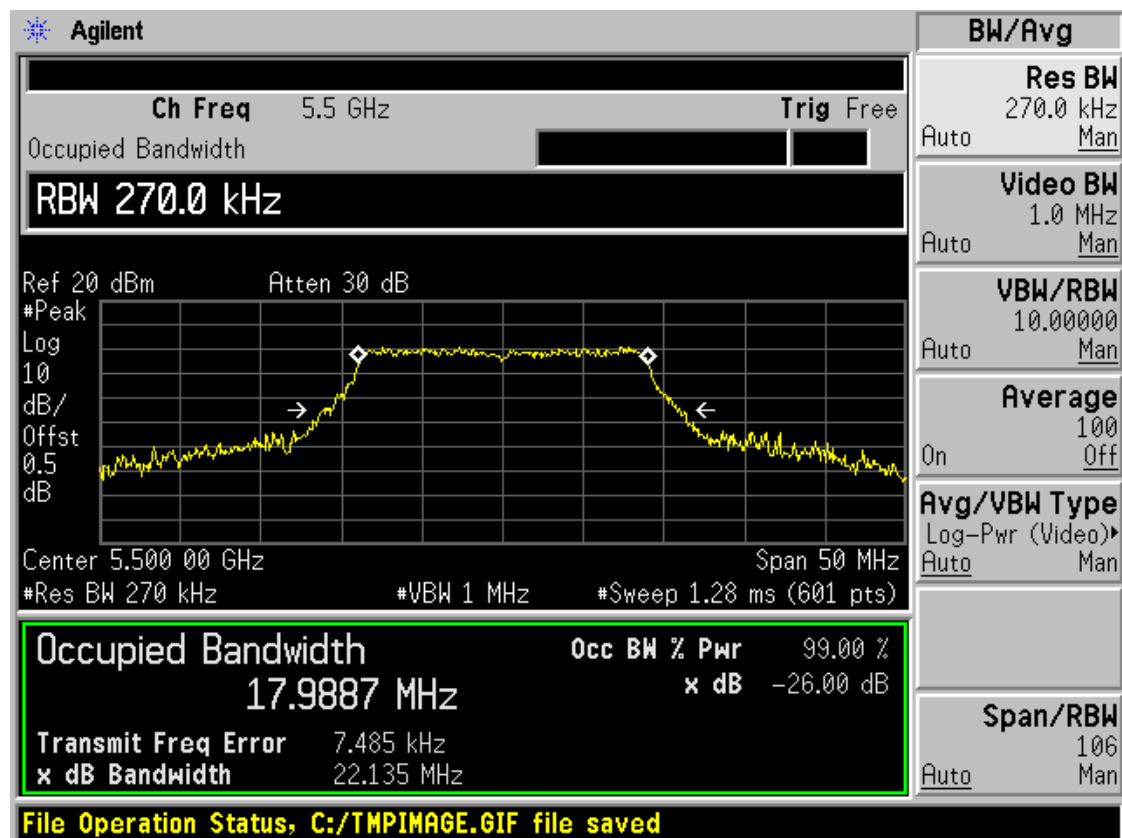
Band III 11n(HT40) CH102



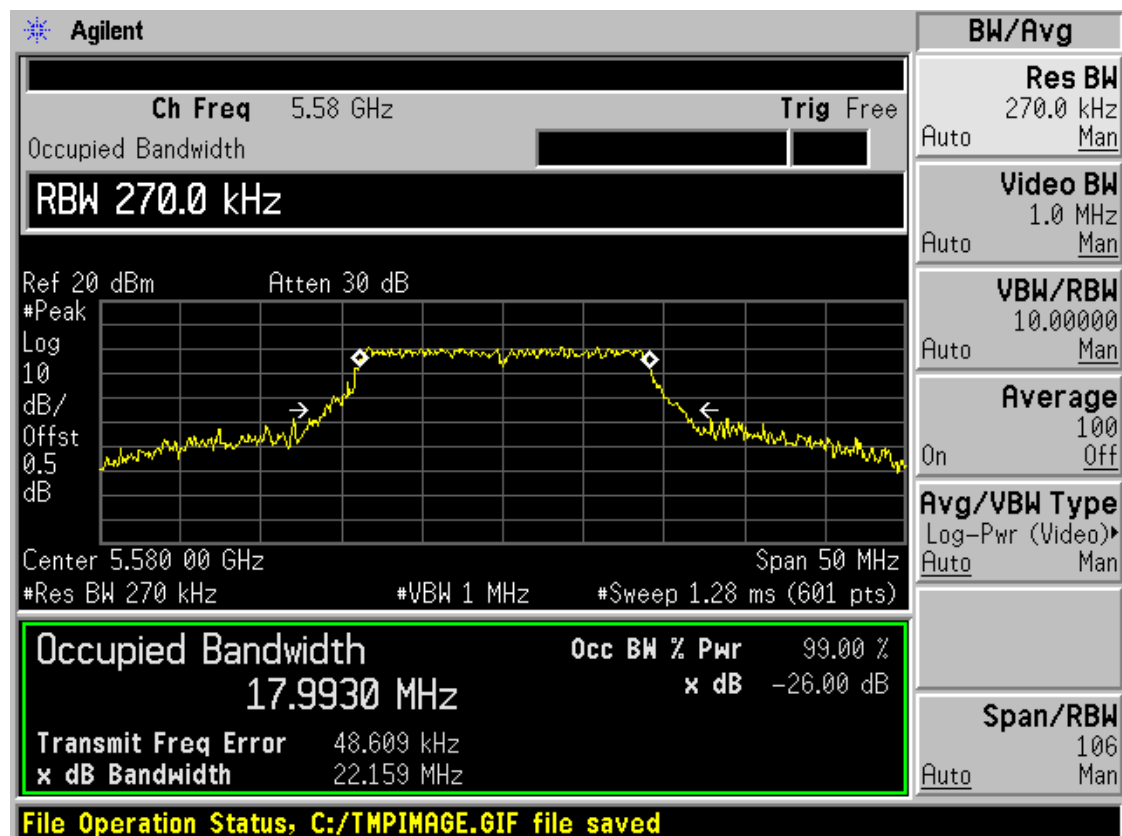
Band III 11n(HT40) CH134



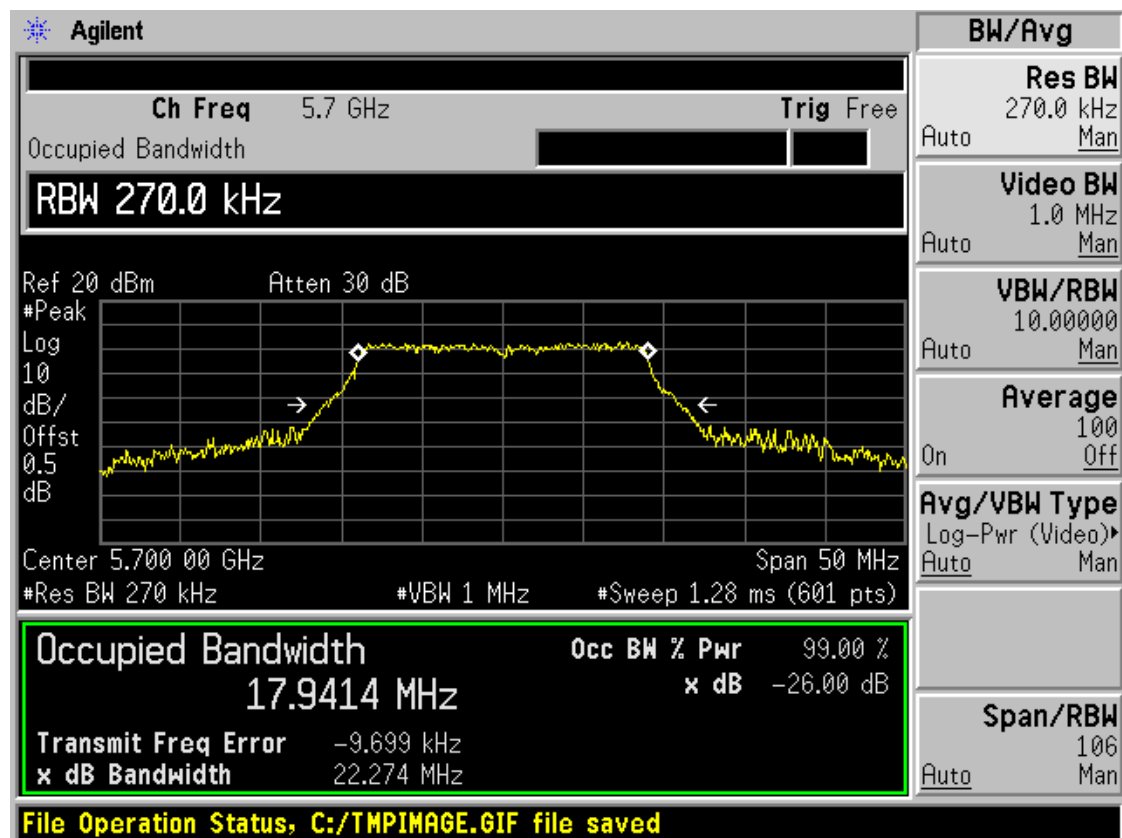
Band III 11ac(HT20) CH100



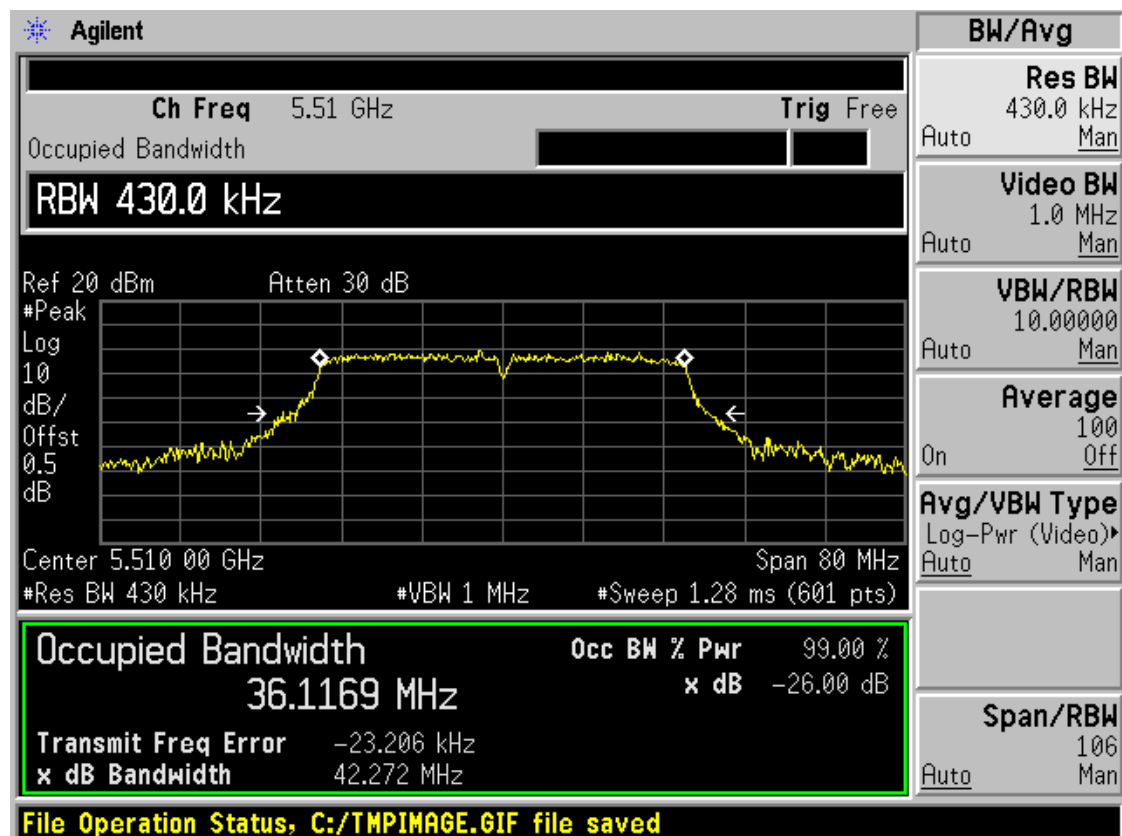
Band III 11ac(HT20) CH116



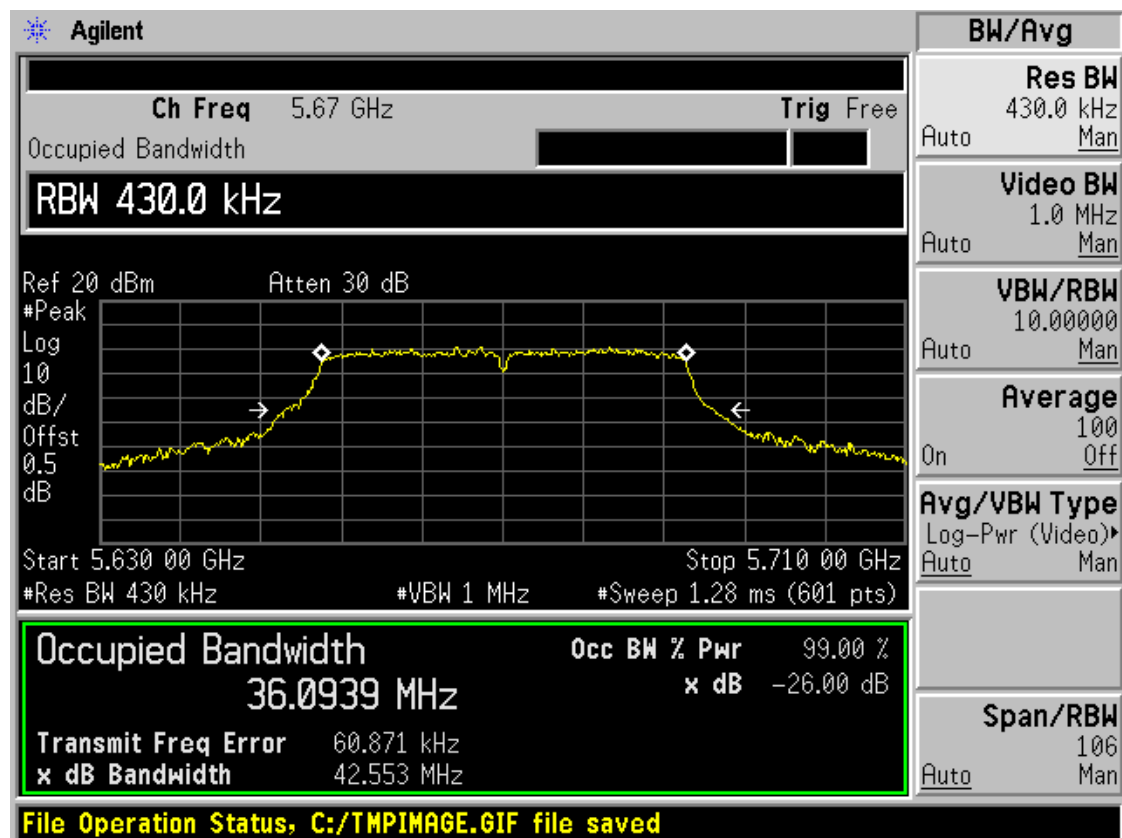
Band III 11ac(HT20) CH140



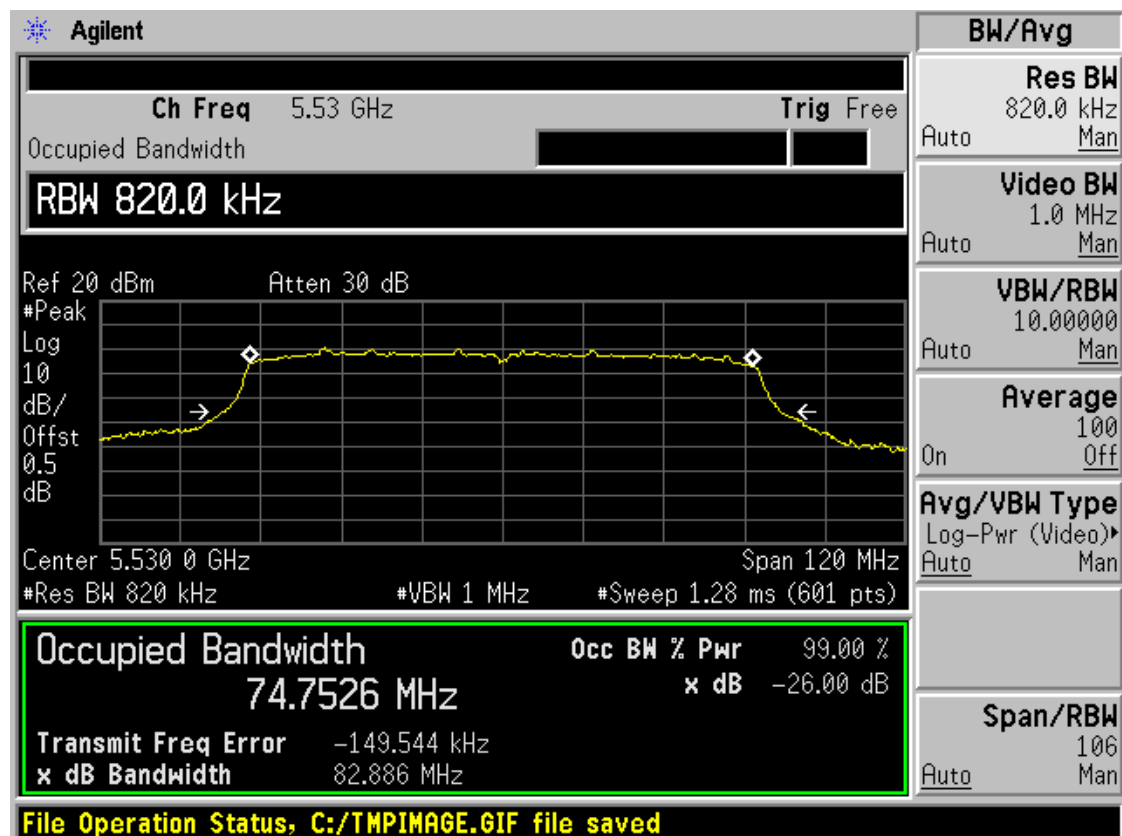
Band III 11ac(HT40) CH102



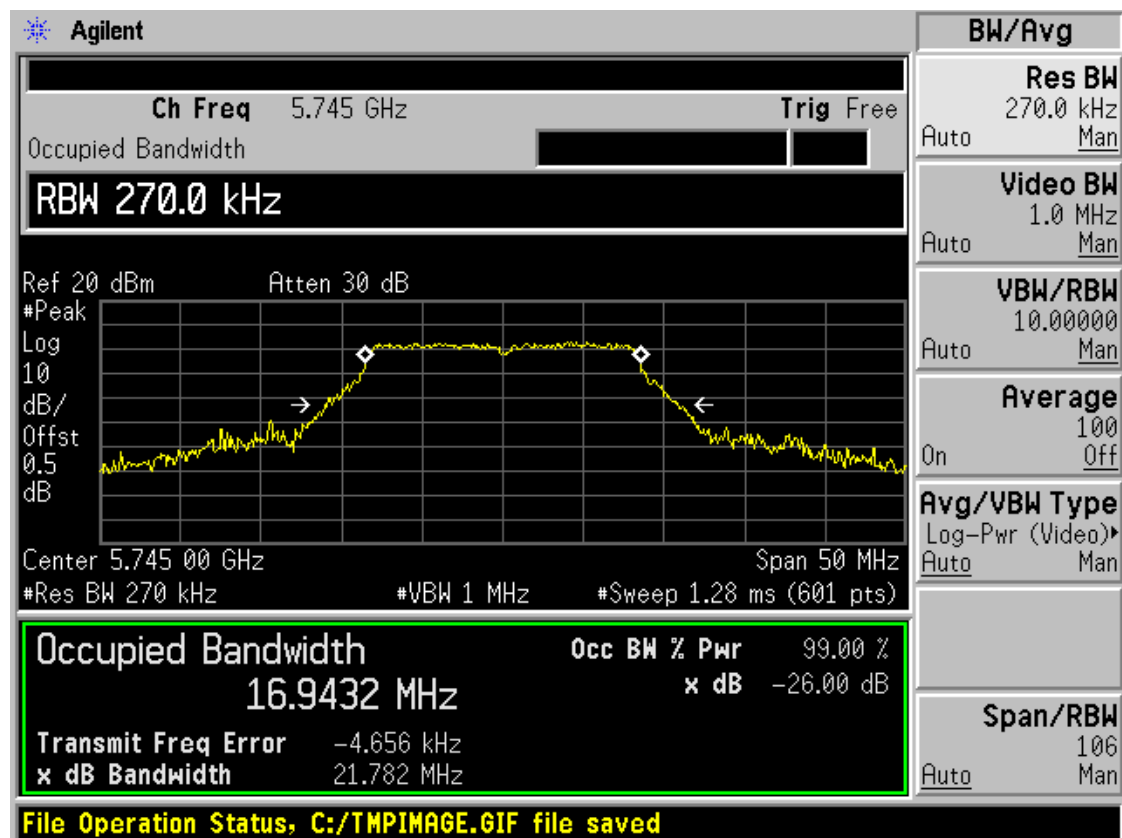
Band III 11ac(HT40) CH134



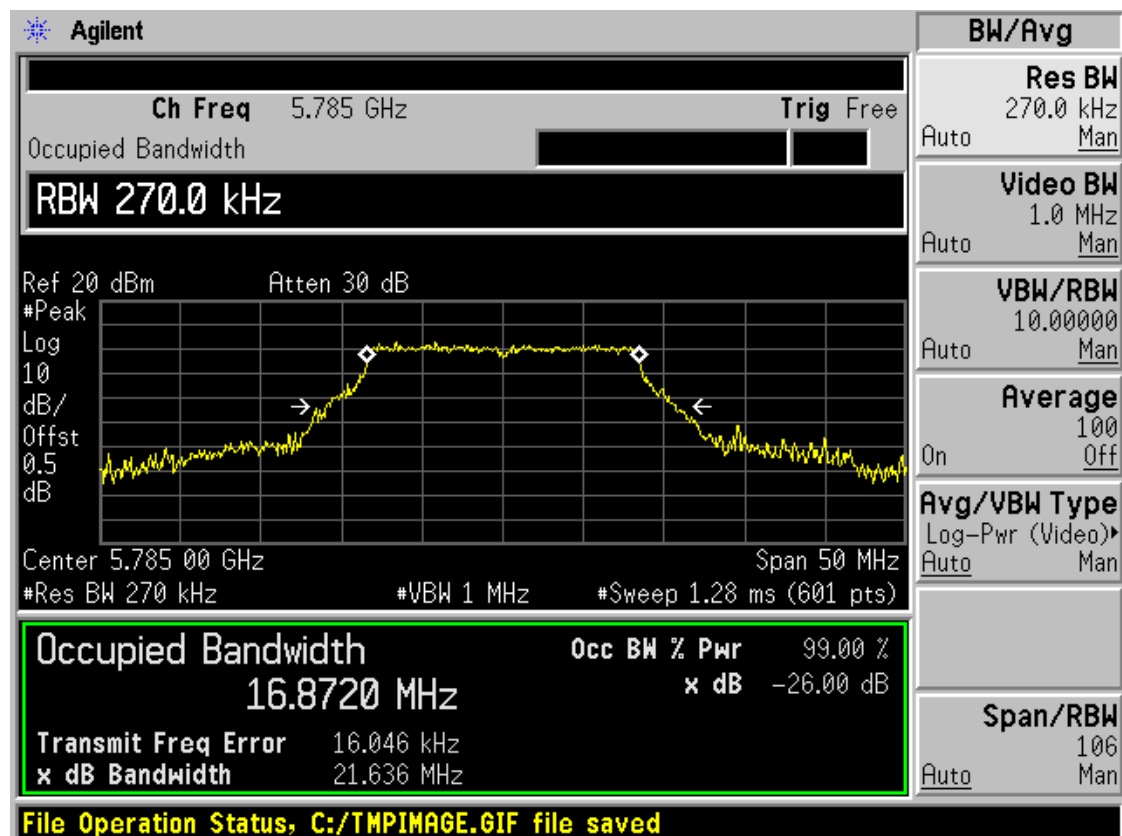
Band III 11ac(HT80) CH106



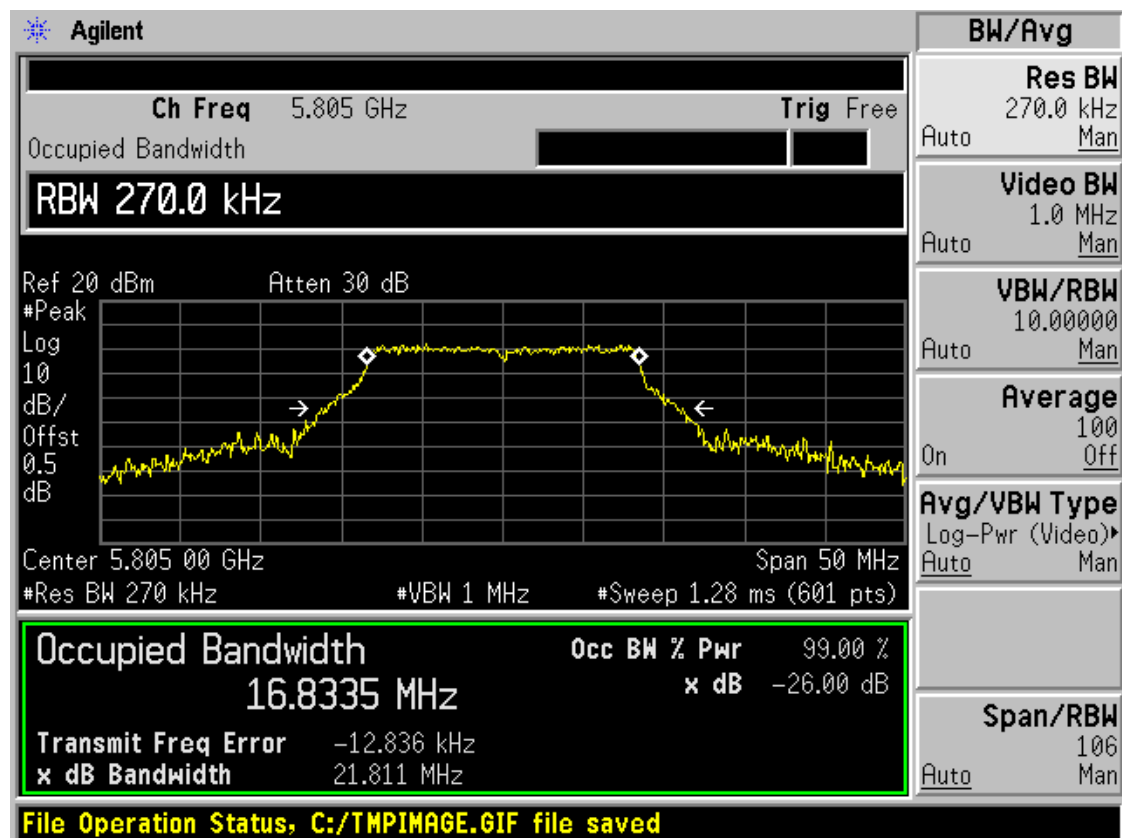
Band IV 11a CH149



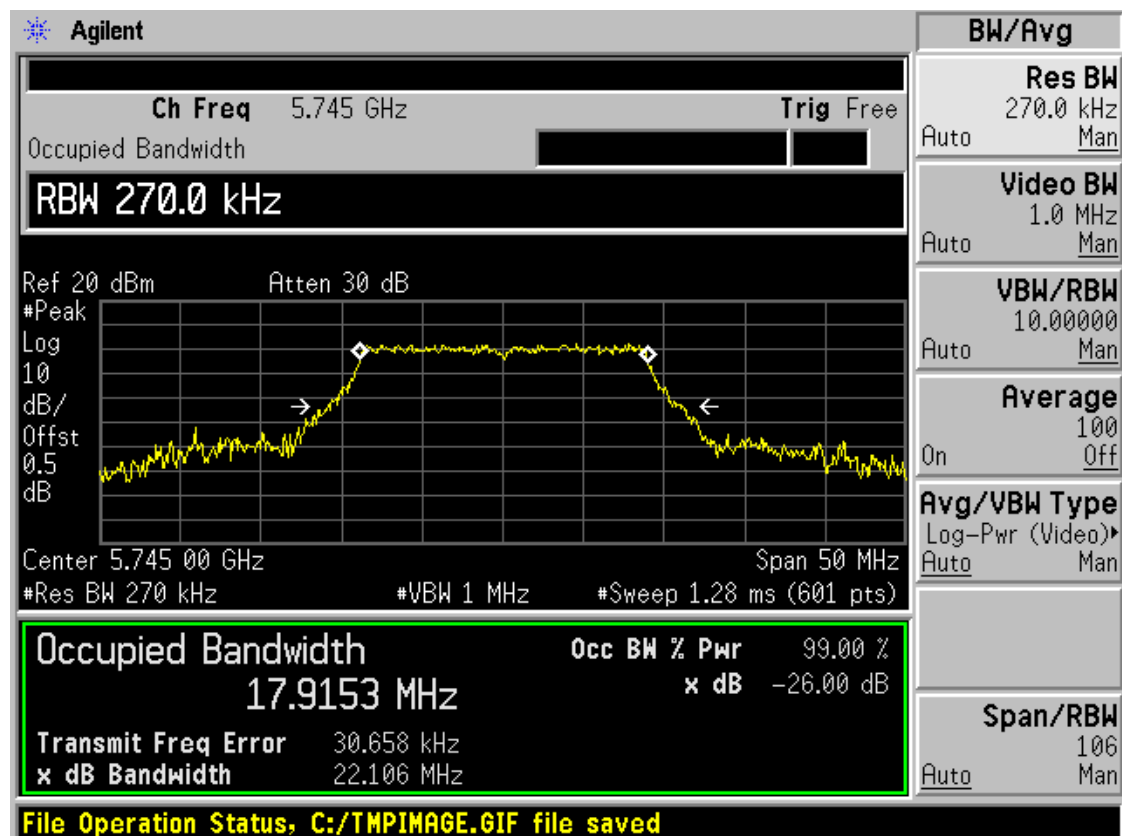
Band IV 11a CH157



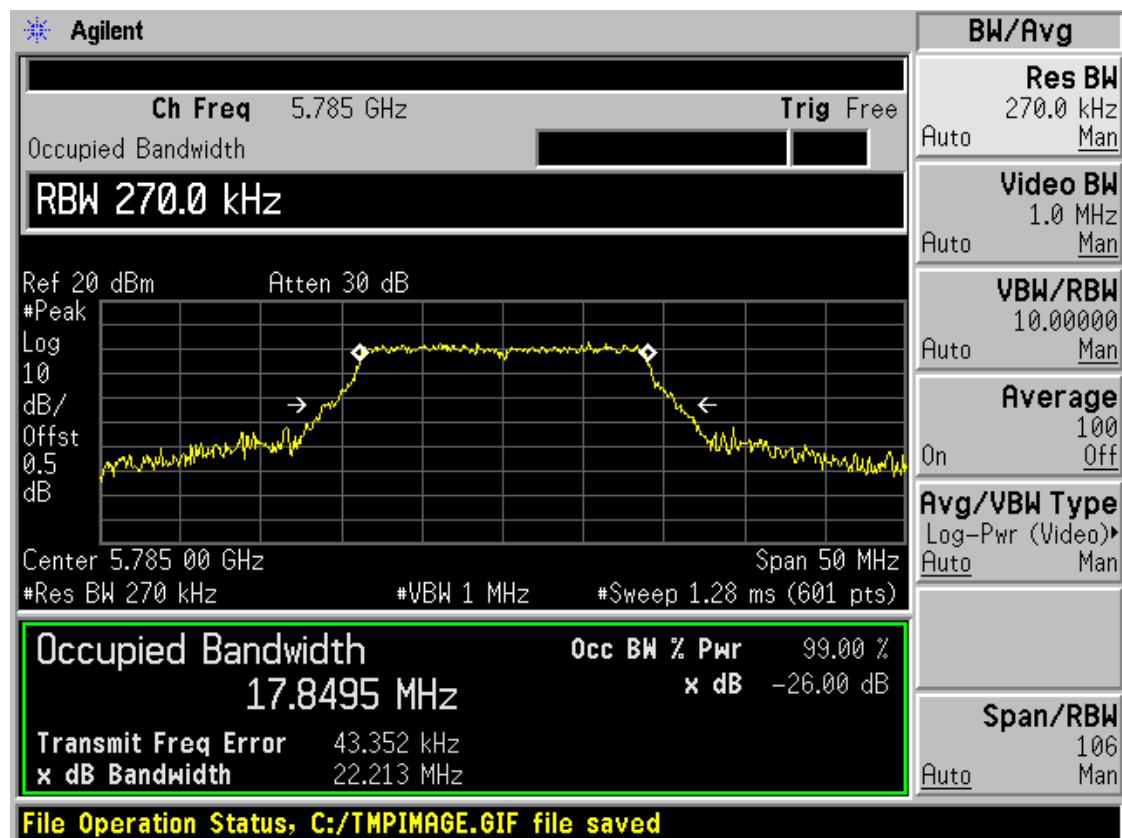
Band IV 11a CH161



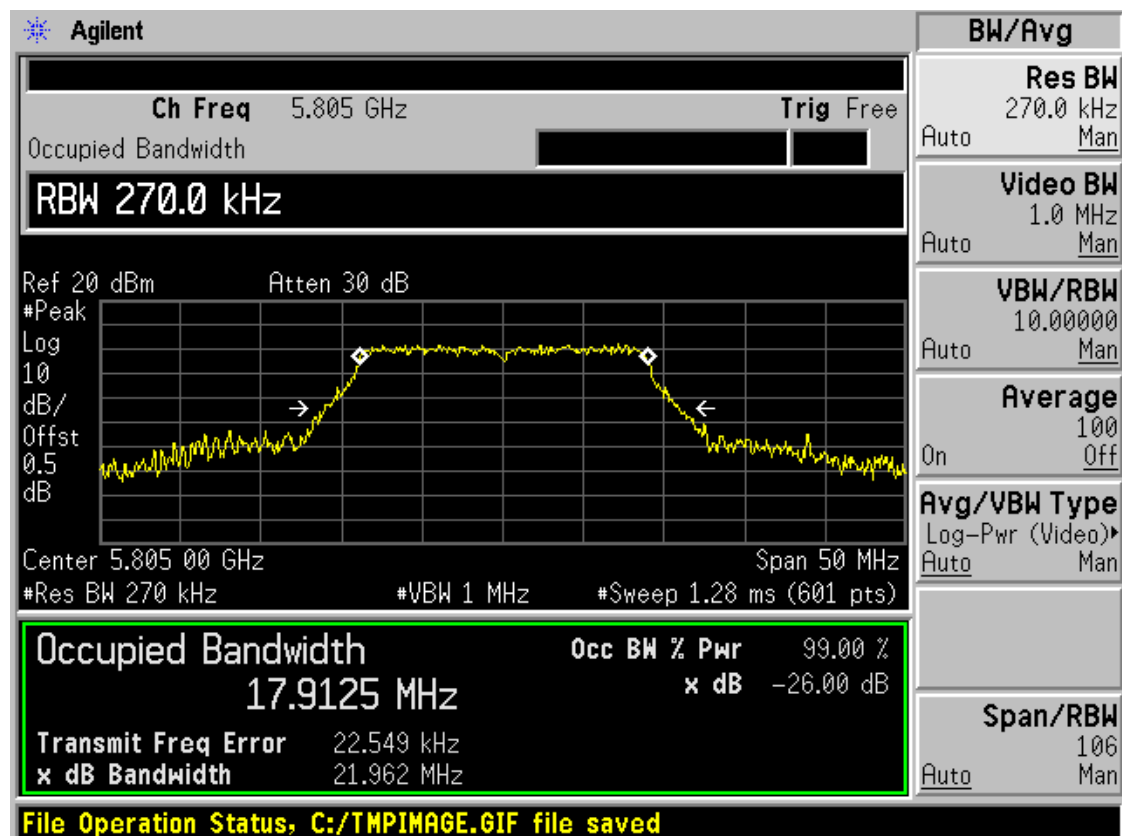
Band IV 11n(HT20) CH149



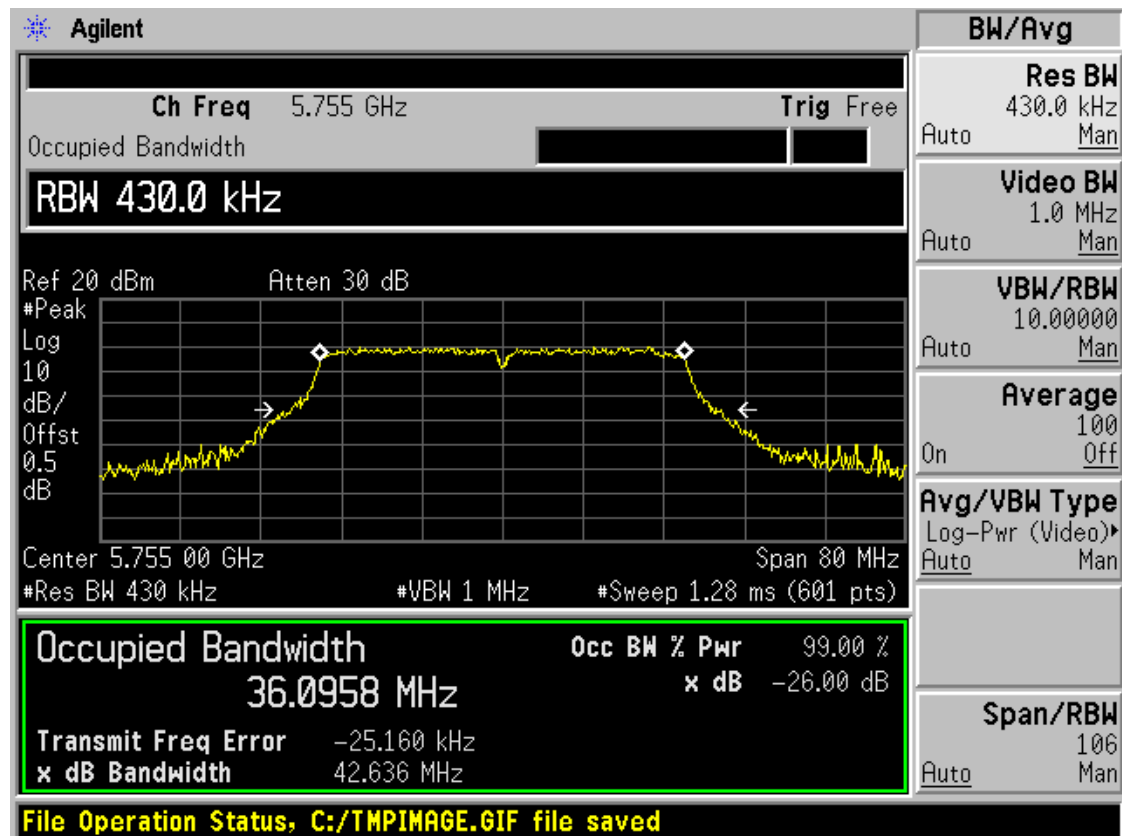
Band IV 11n(HT20) CH157



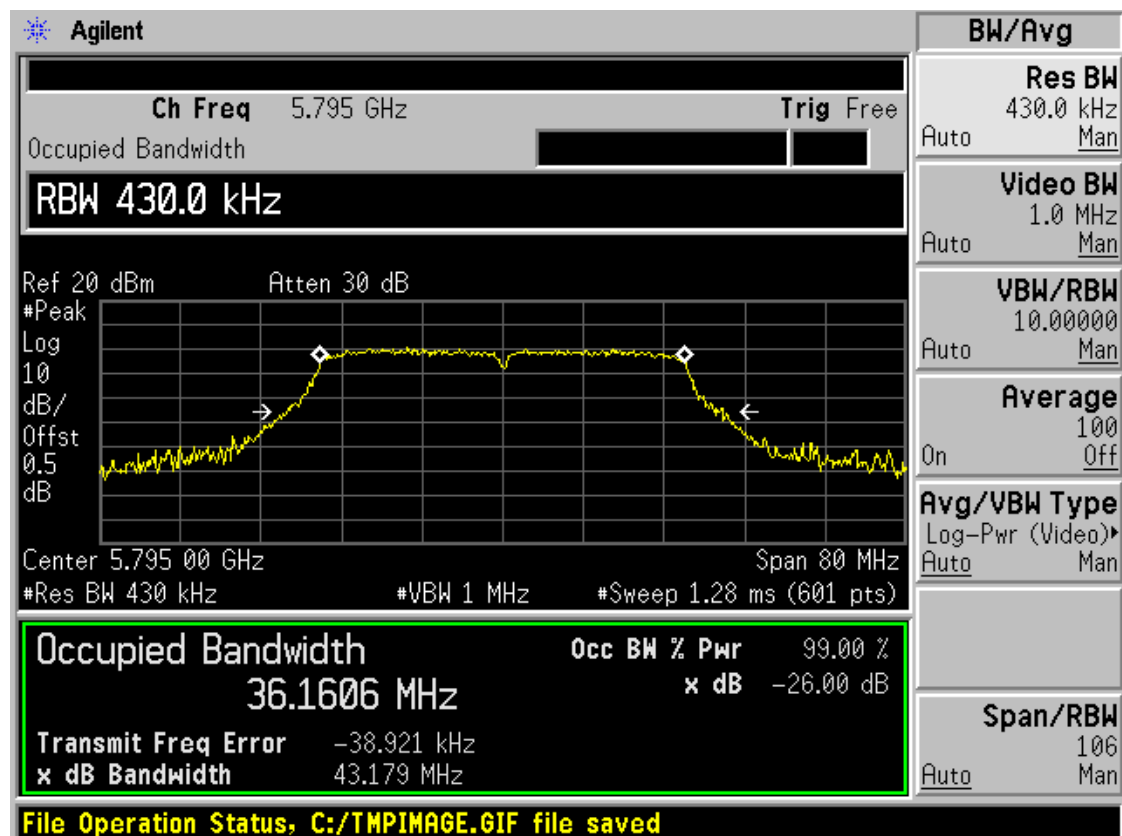
Band IV 11n(HT20) CH161



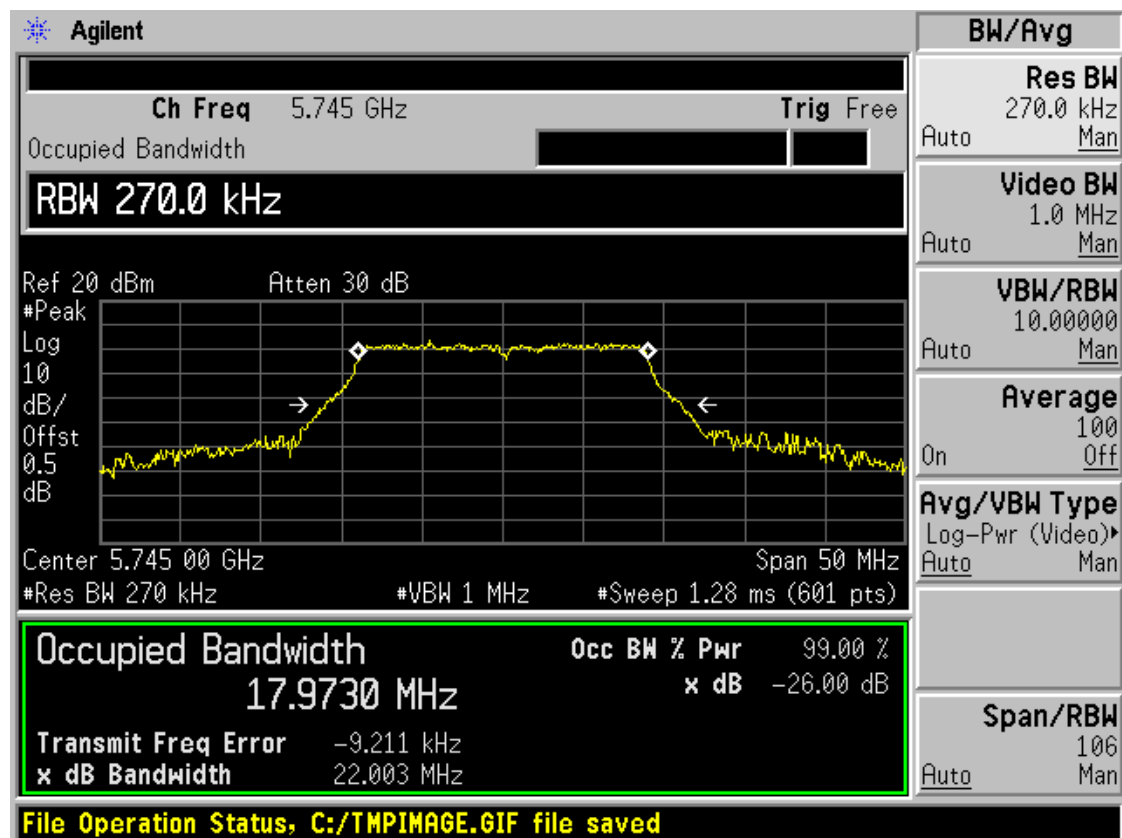
Band IV 11n(HT40) CH151



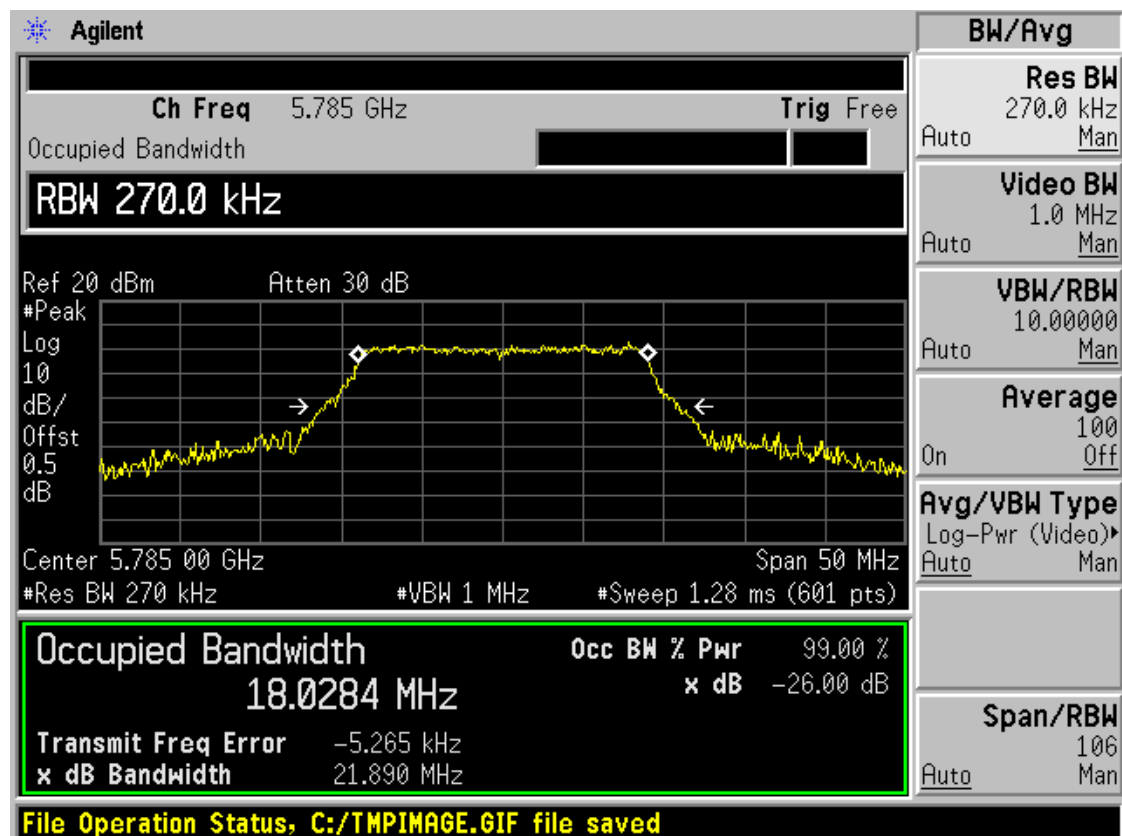
Band IV 11n(HT40) CH159



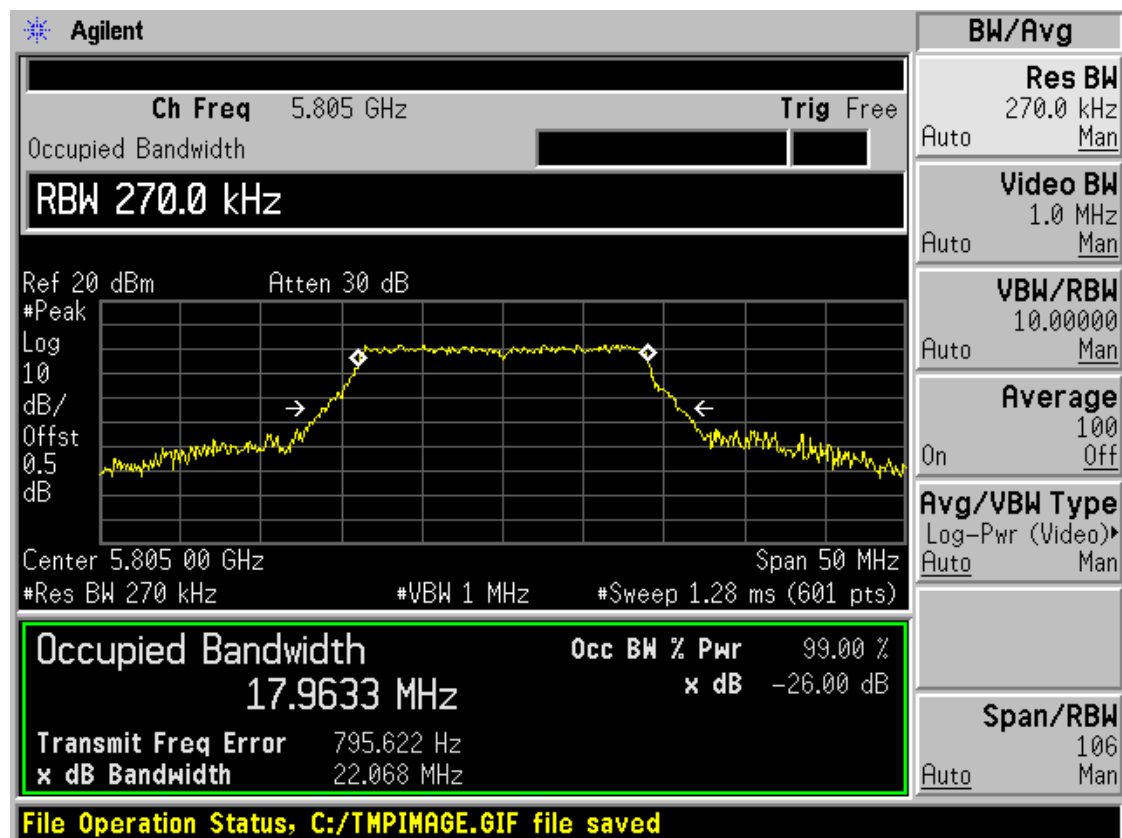
Band IV 11ac(HT20) CH149



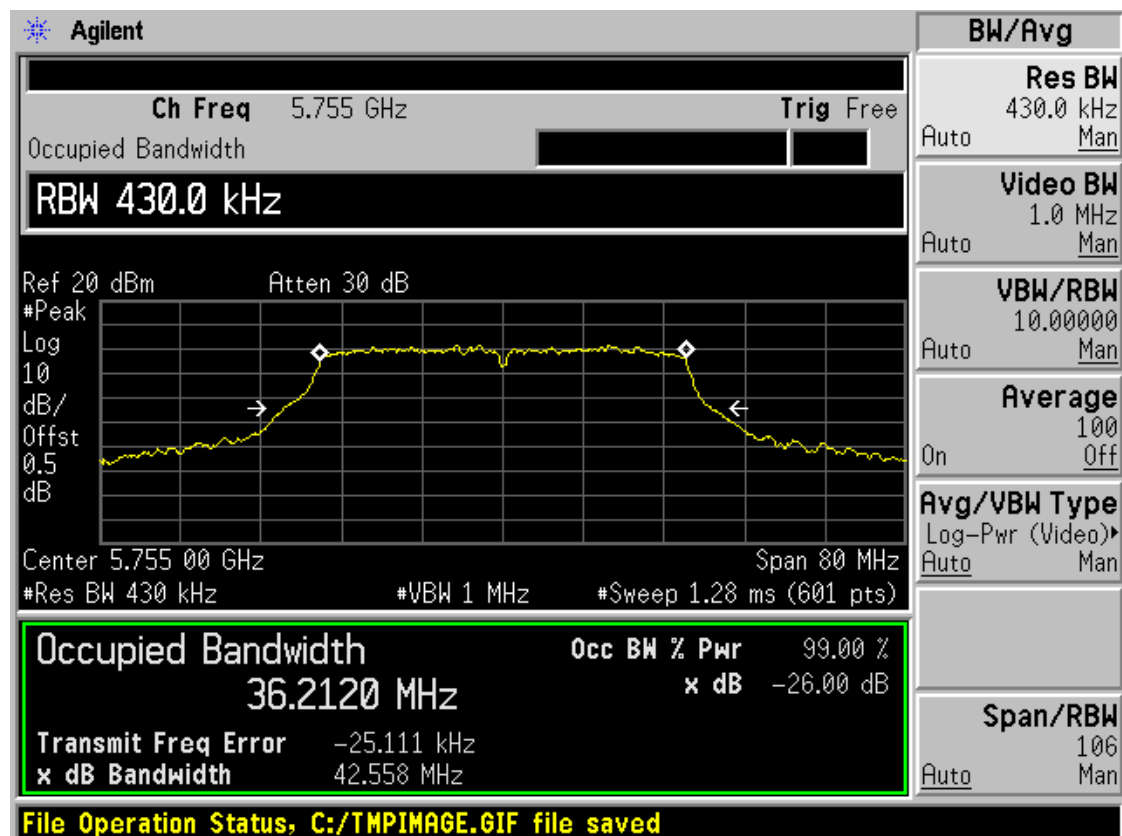
Band IV 11ac(HT20) CH157



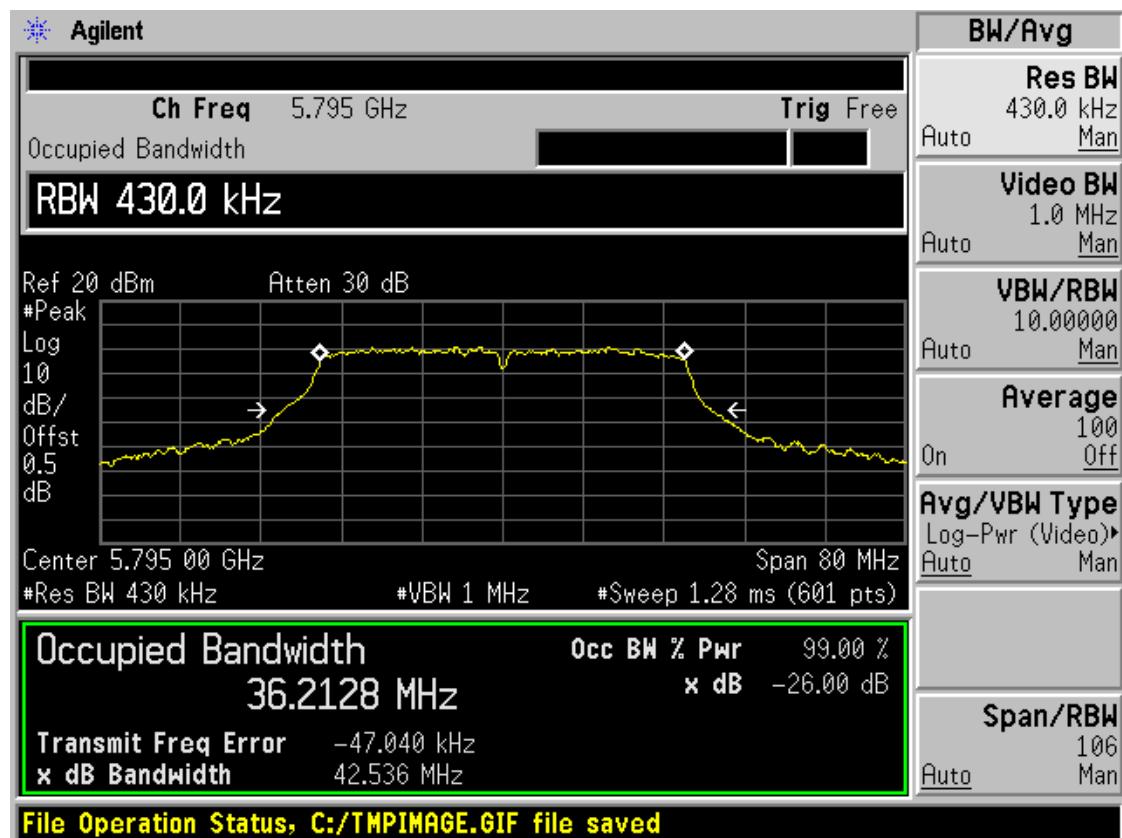
Band IV 11ac(HT20) CH161



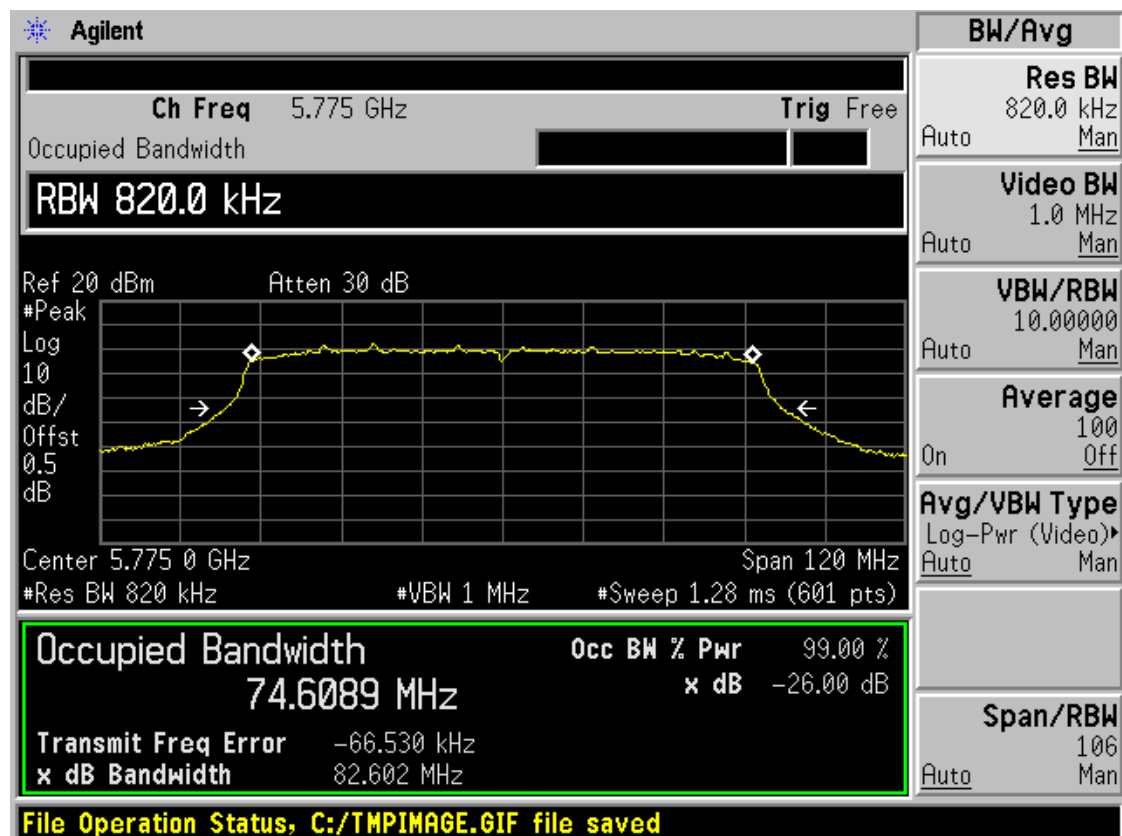
Band IV 11ac(HT40) CH151



Band IV 11ac(HT40) CH159



Band IV 11ac(HT80) CH155



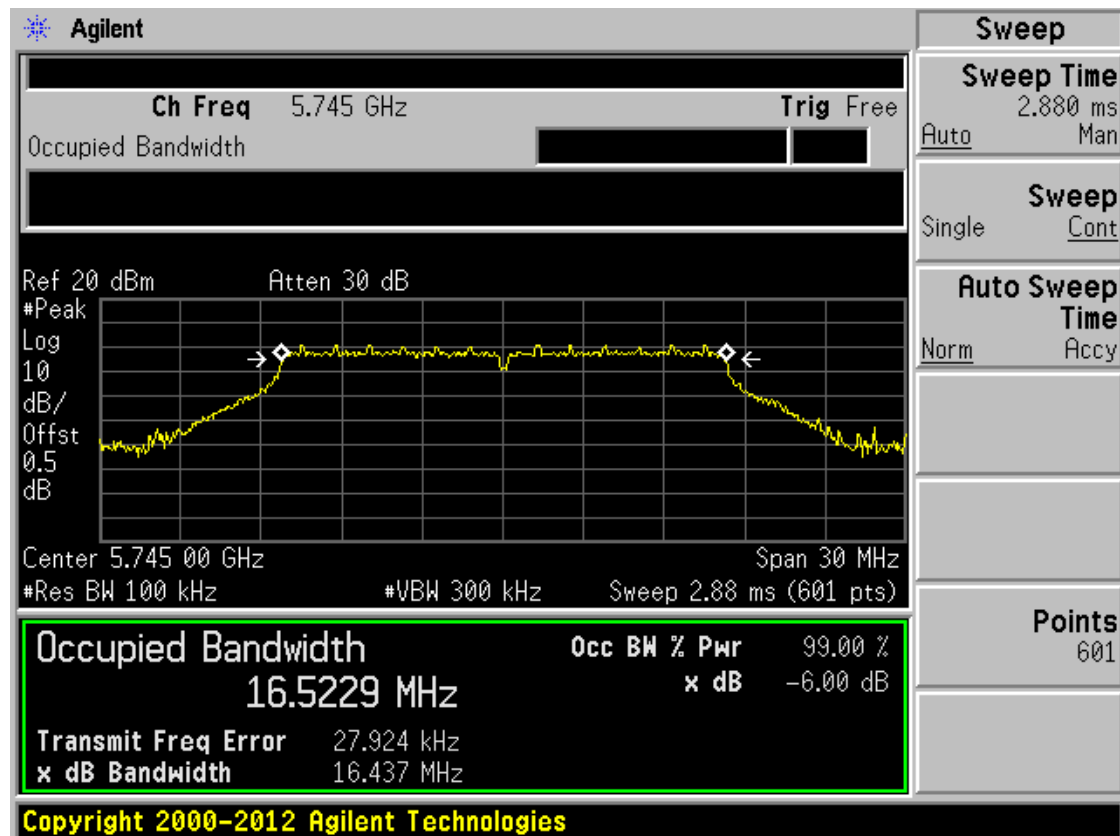
A.3 6 dB Bandwidth

Test Data

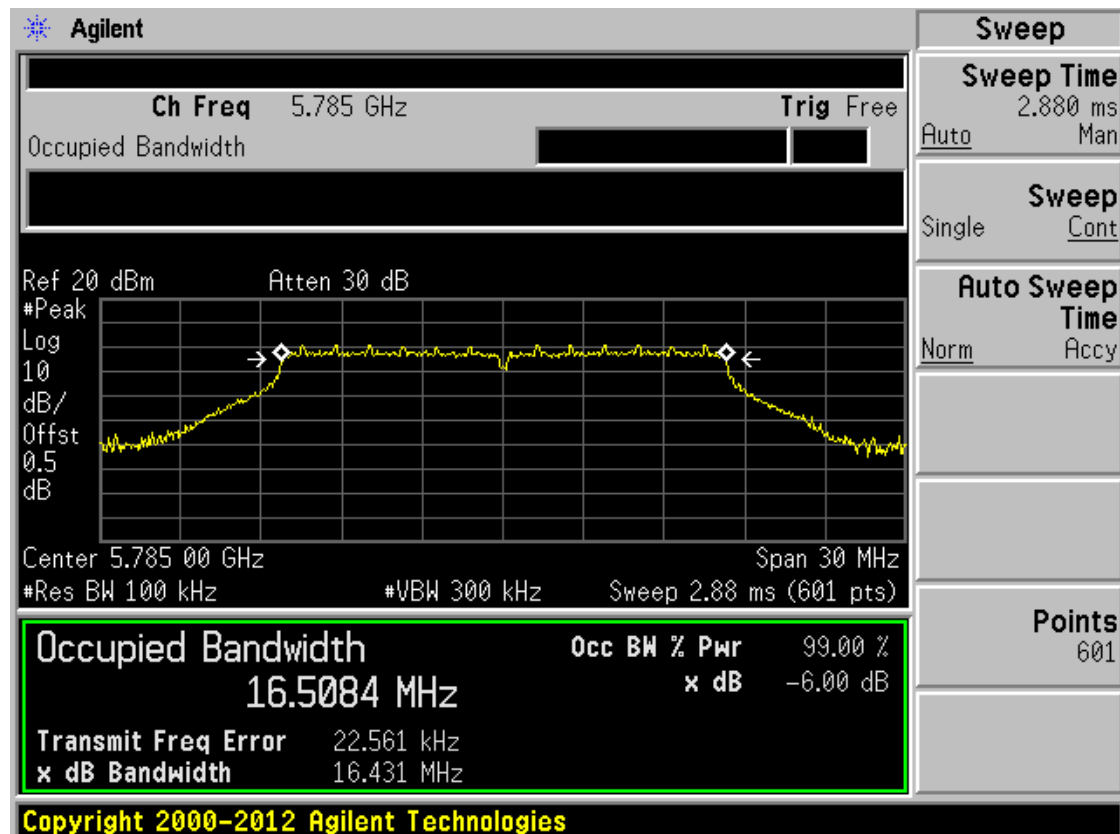
Band IV (5725 - 5850 MHz)					
Mode	Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Limit (MHz)	Verdict
11a	CH149	5745	16.437	0.5	Pass
11a	CH157	5785	16.431	0.5	Pass
11a	CH161	5825	16.417	0.5	Pass
11n (HT20)	CH149	5745	17.625	0.5	Pass
11n (HT20)	CH157	5785	17.660	0.5	Pass
11n (HT20)	CH161	5825	17.625	0.5	Pass
11n (HT40)	CH151	5755	35.315	0.5	Pass
11n (HT40)	CH159	5795	35.460	0.5	Pass
11ac (HT20)	CH149	5745	17.617	0.5	Pass
11ac (HT20)	CH157	5785	17.628	0.5	Pass
11ac (HT20)	CH161	5805	17.616	0.5	Pass
11ac (HT40)	CH151	5755	35.383	0.5	Pass
11ac (HT40)	CH159	5795	35.425	0.5	Pass
11ac (HT80)	CH155	5775	75.170	0.5	Pass

Test Plots

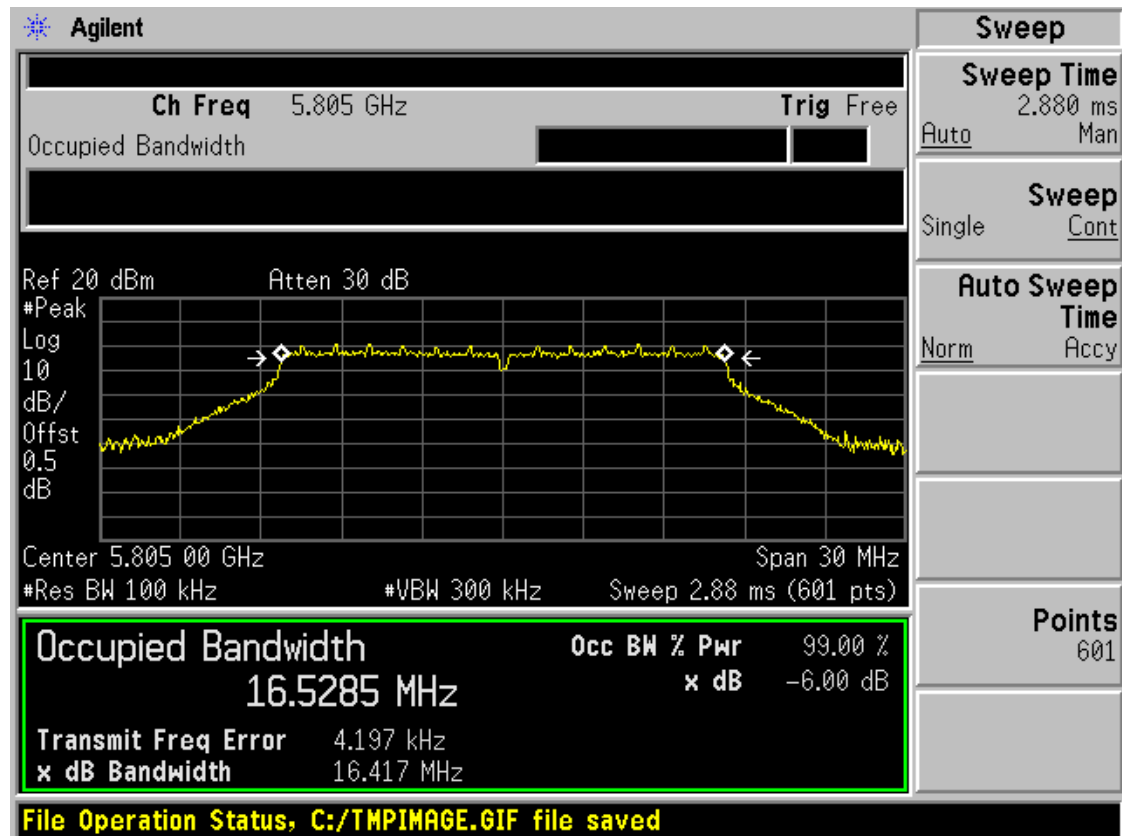
Band IV 11a CH149



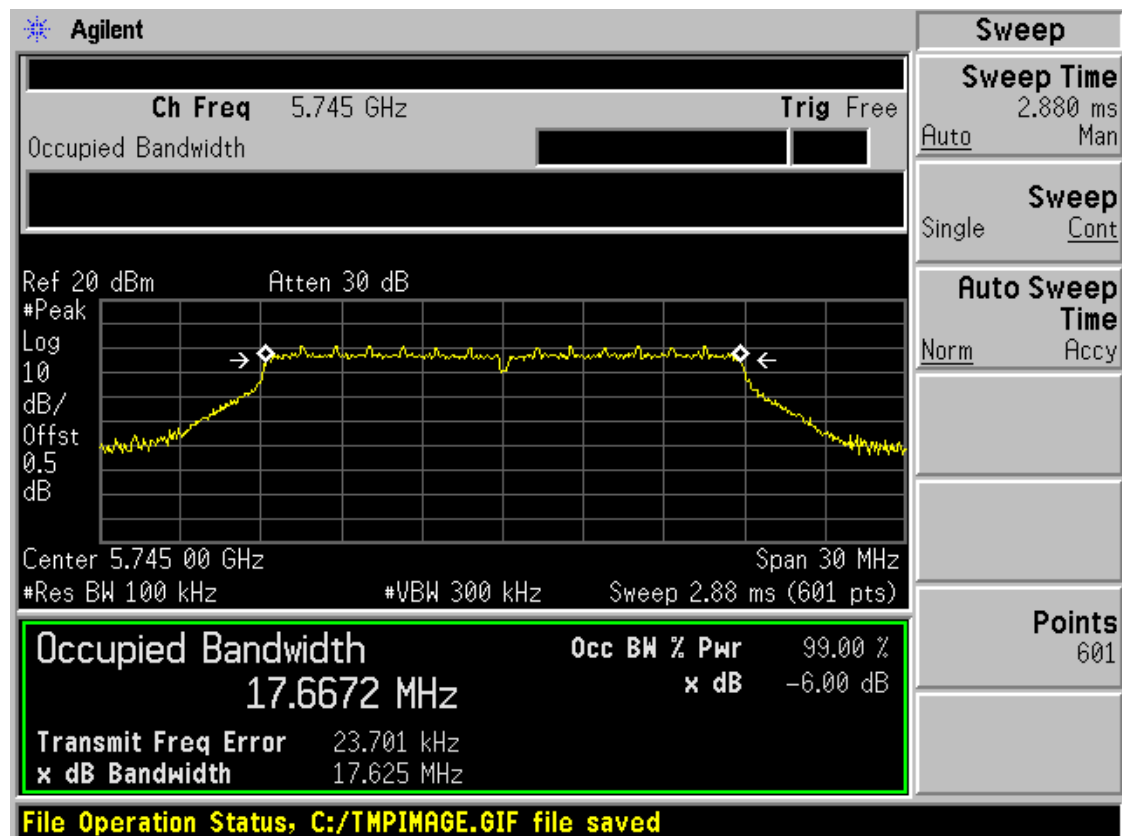
Band IV 11a CH157



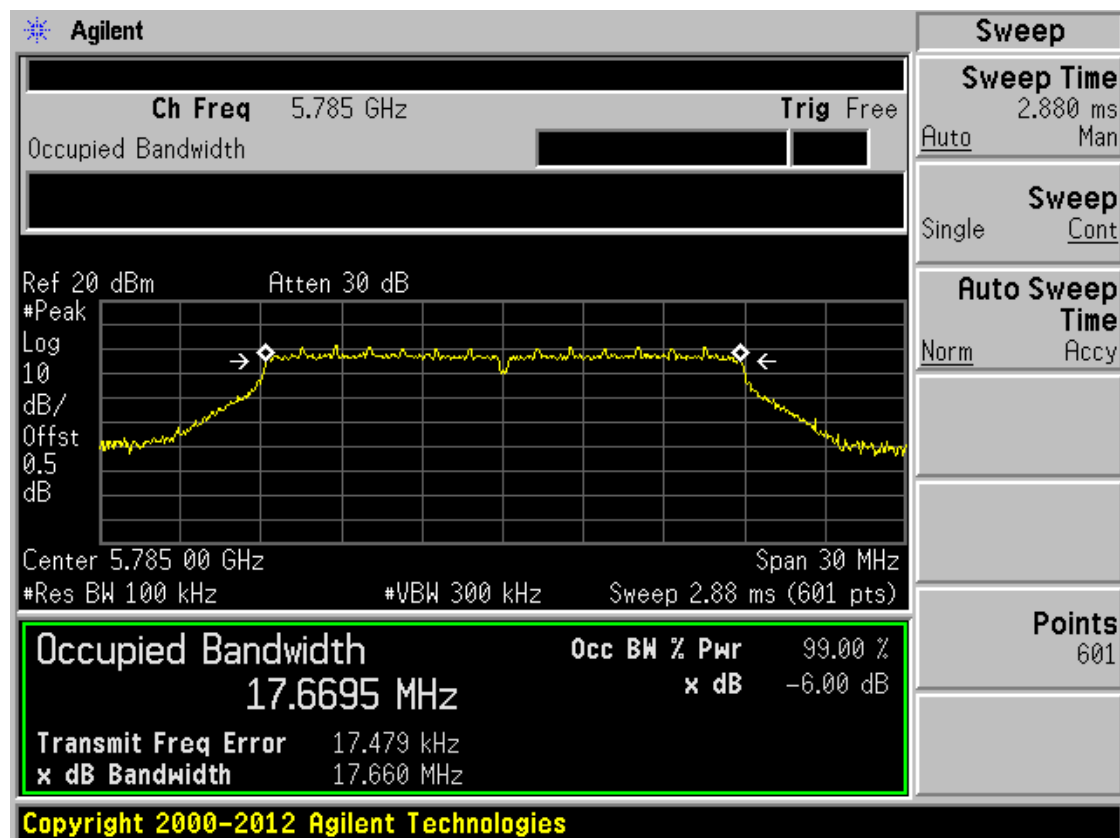
Band IV 11a CH161



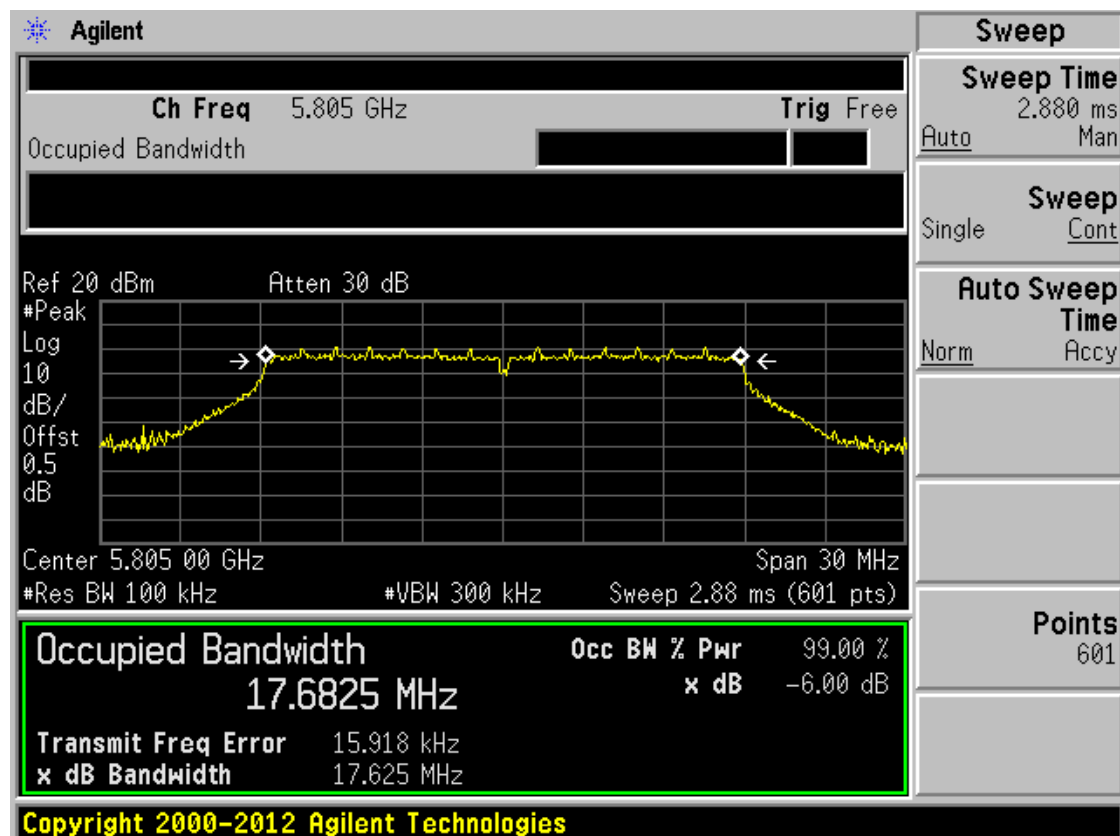
Band IV 11n(HT20) CH149



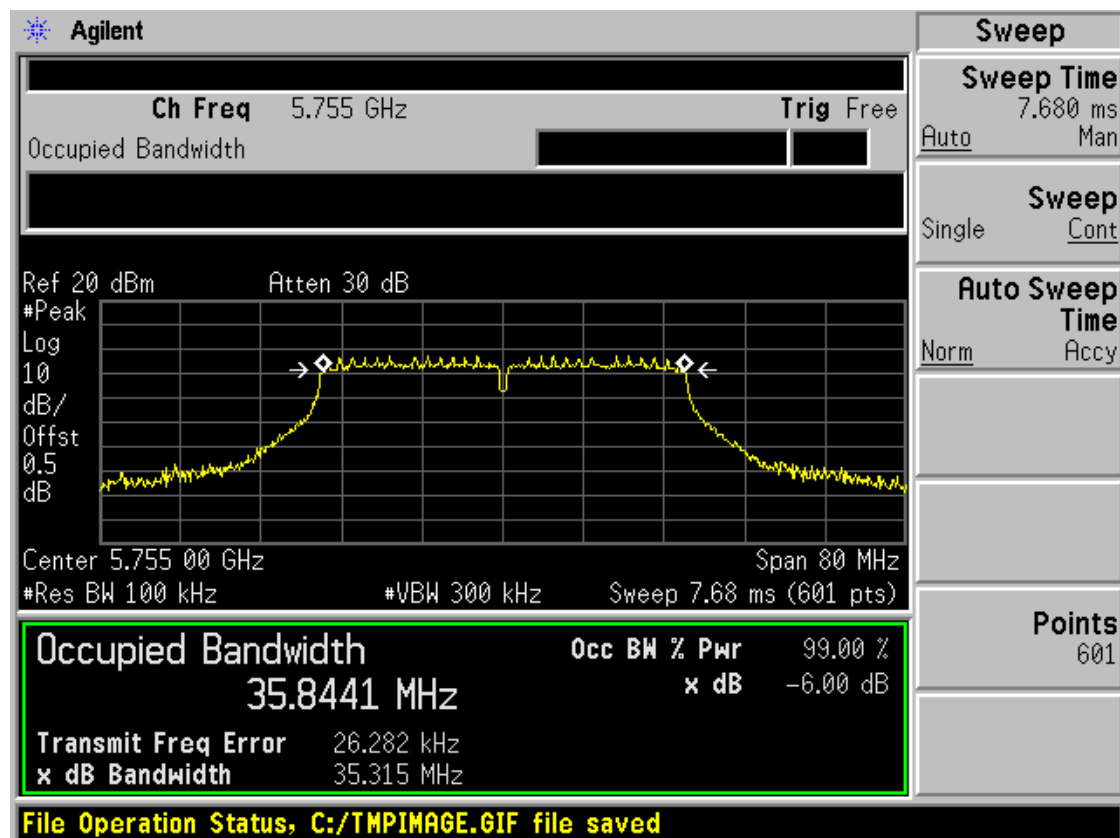
Band IV 11n(HT20) CH157



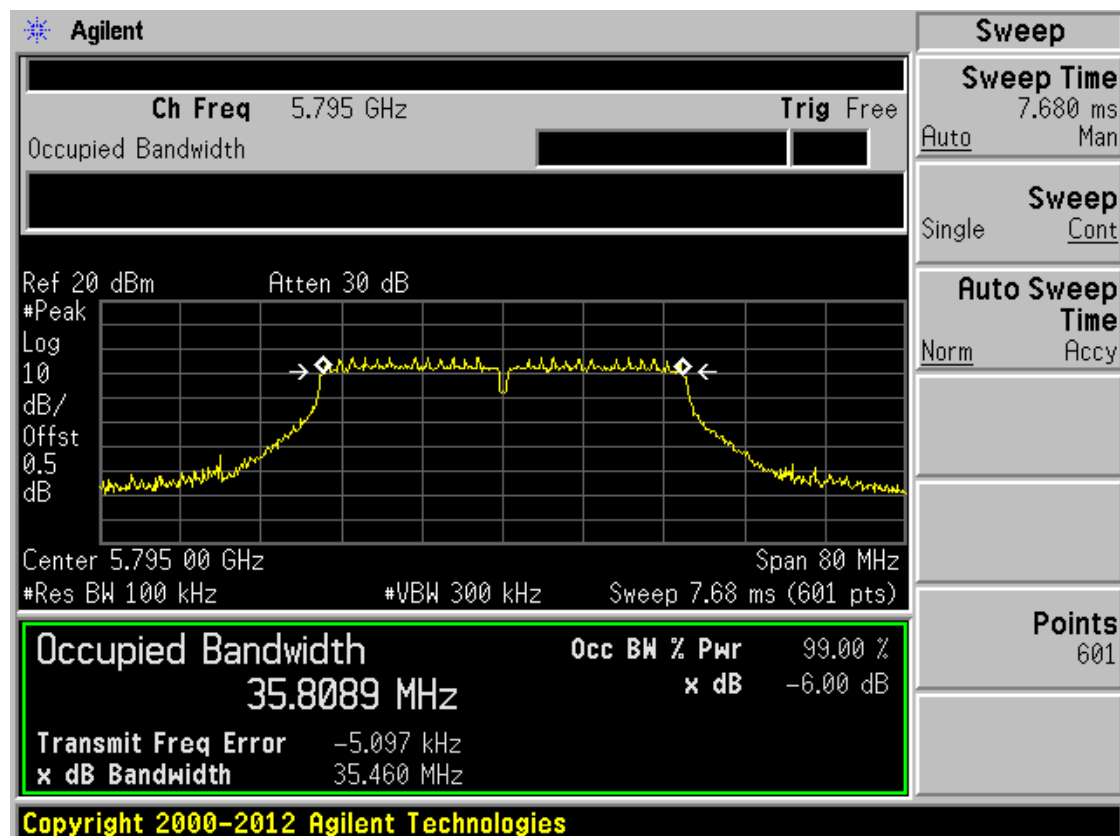
Band IV 11n(HT20) CH161



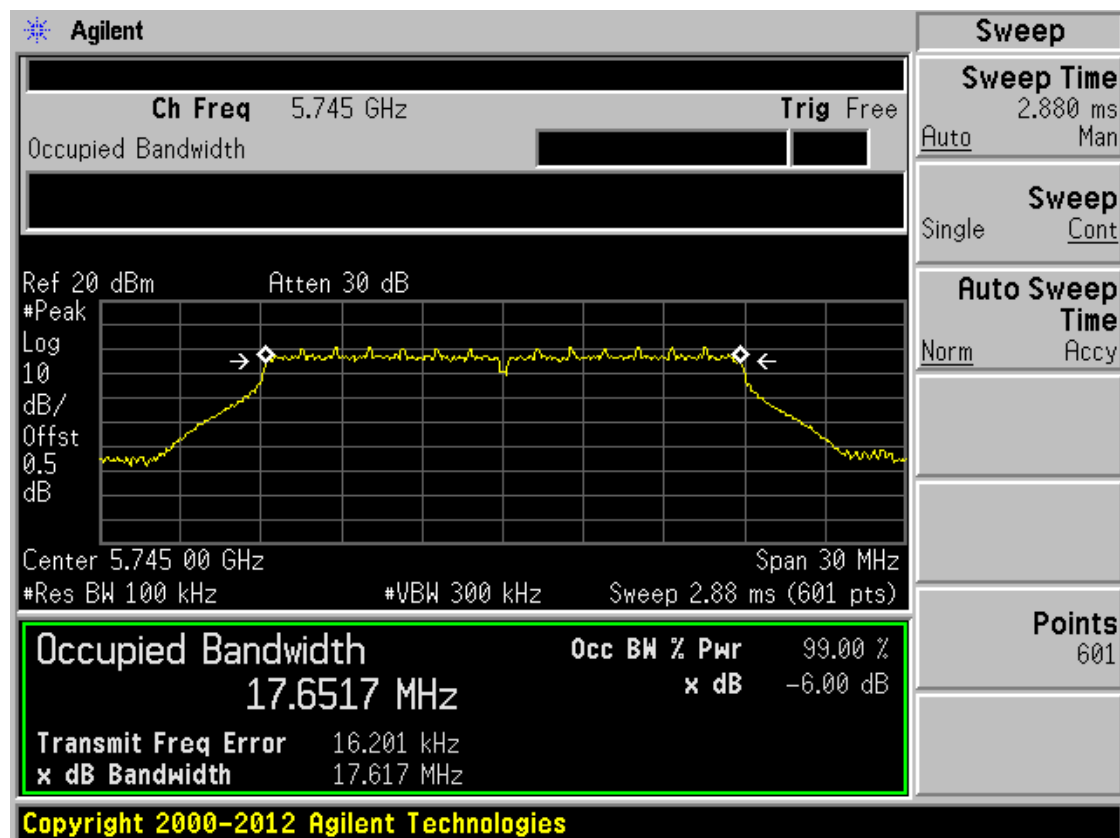
Band IV 11n(HT40) CH151



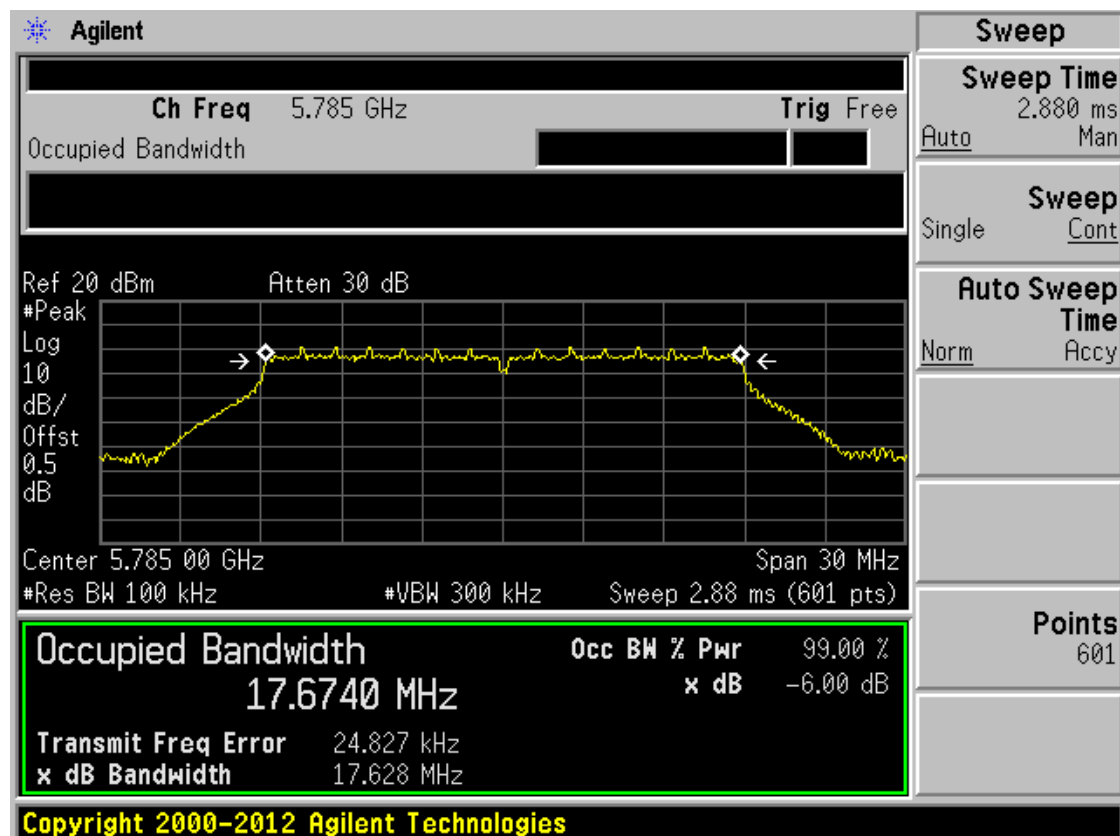
Band IV 11n(HT40) CH159



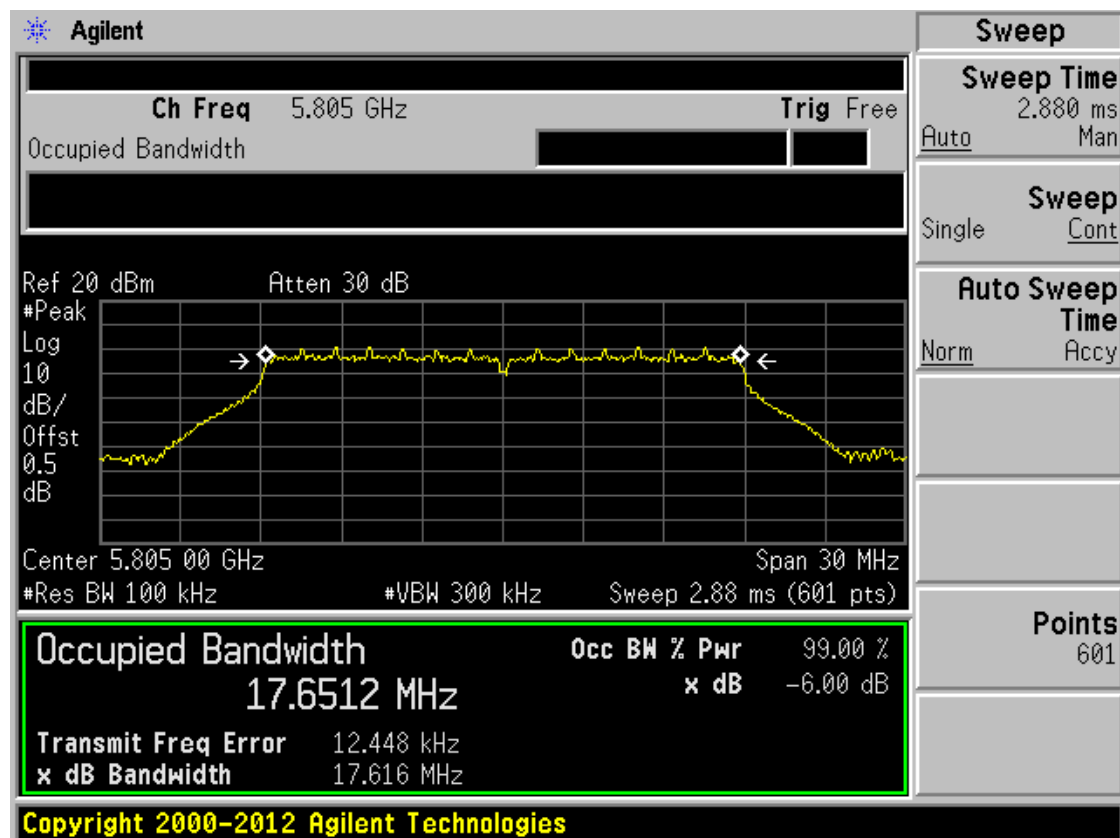
Band IV 11ac(HT20) CH149



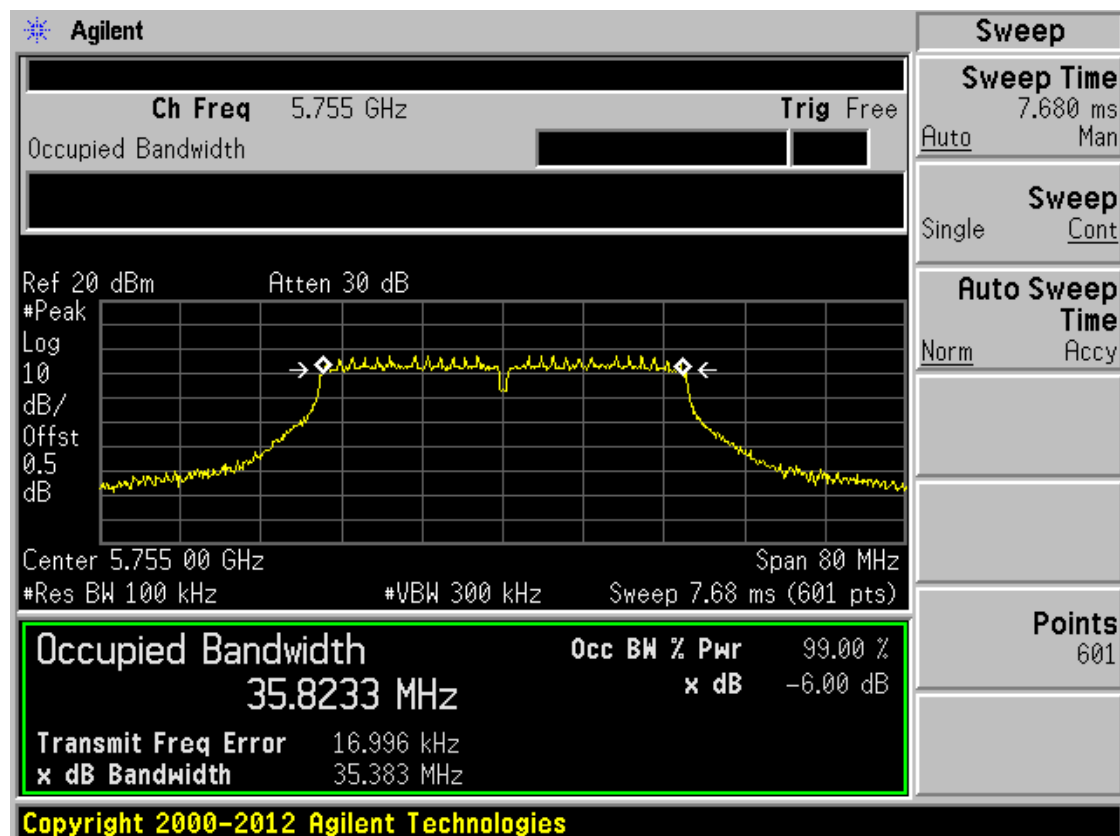
Band IV 11ac(HT20) CH157



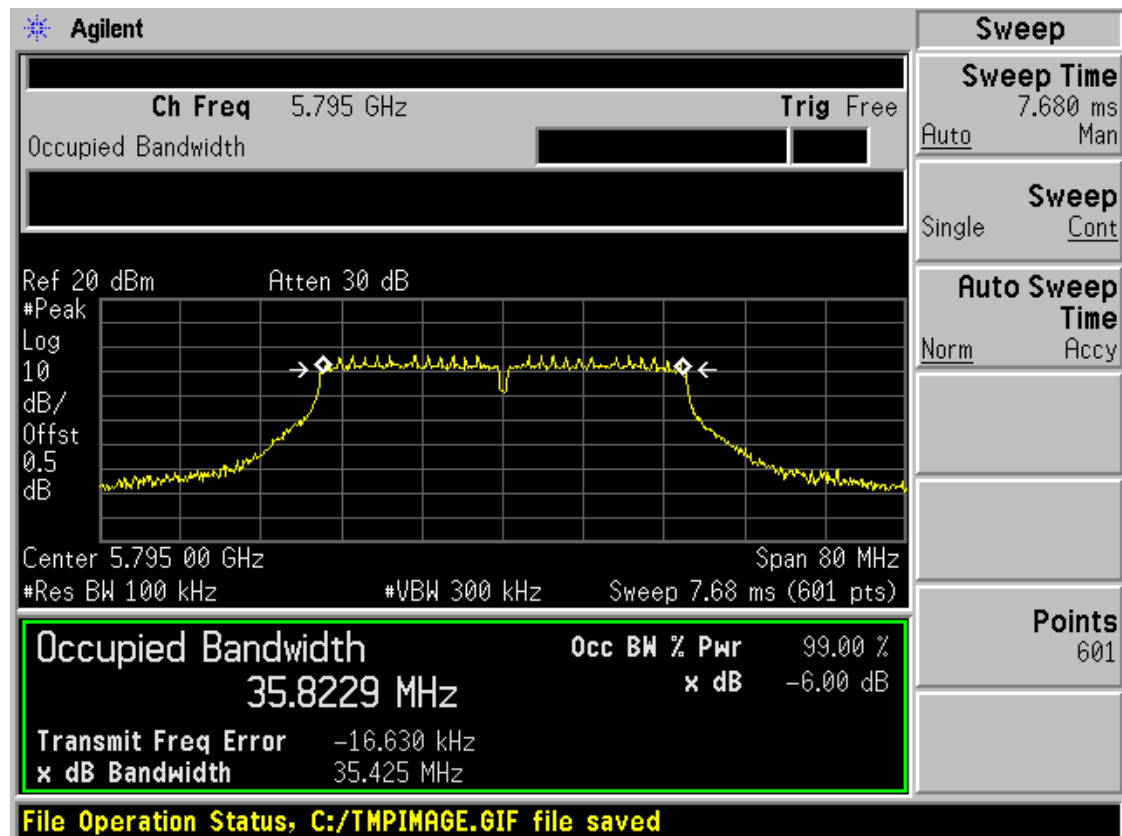
Band IV 11ac(HT20) CH65



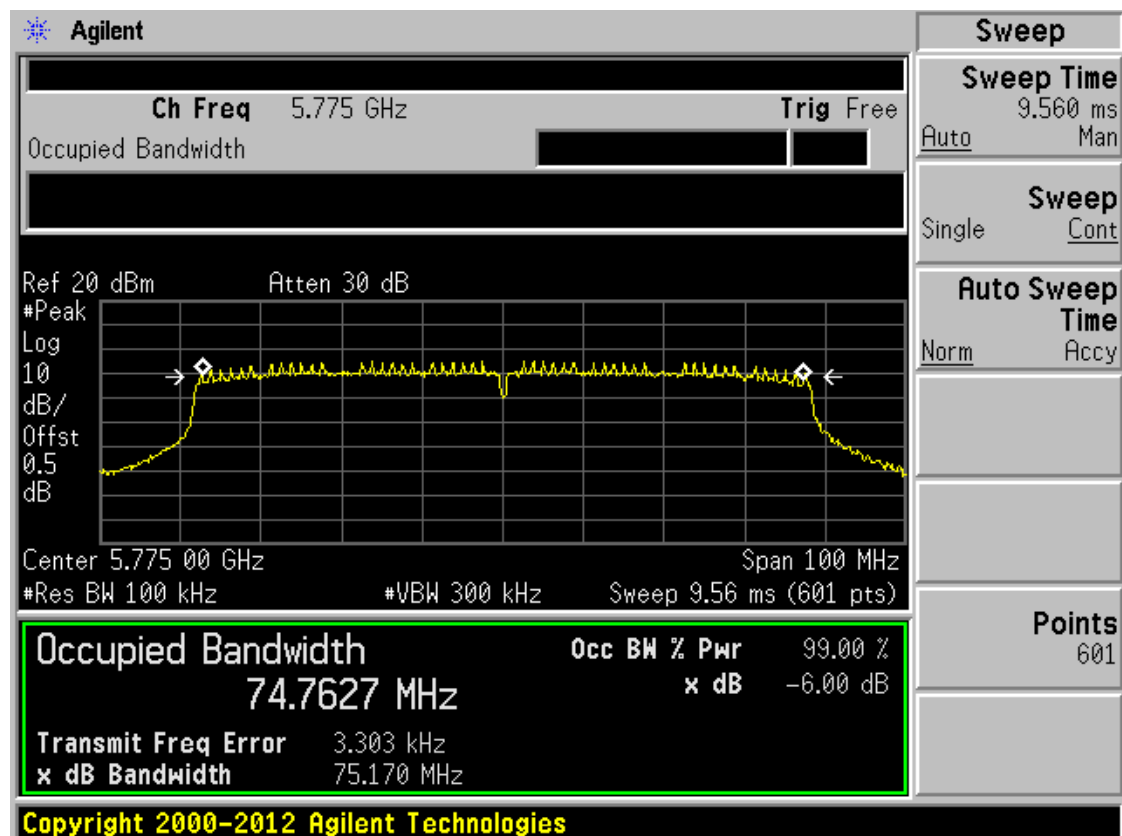
Band IV 11ac(HT40) CH151



Band IV 11ac(HT40) CH159



Band IV 11ac(HT80) CH155



A.4 Power Spectral Density

Test Data

Band I (5150 - 5250 MHz)					
Mode	Channel	Frequency (MHz)	PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
11a	CH36	5180	9.28	11	Pass
11a	CH44	5220	8.36	11	Pass
11a	CH48	5240	8.46	11	Pass
11n (HT20)	CH36	5180	8.49	11	Pass
11n (HT20)	CH44	5220	7.78	11	Pass
11n (HT20)	CH48	5240	7.85	11	Pass
11n (HT40)	CH38	5190	4.26	11	Pass
11n (HT40)	CH46	5230	3.67	11	Pass
11ac (HT20)	CH36	5180	7.15	11	Pass
11ac (HT20)	CH44	5220	8.03	11	Pass
11ac (HT20)	CH48	5240	7.41	11	Pass
11ac (HT40)	CH38	5190	3.48	11	Pass
11ac (HT40)	CH46	5230	2.96	11	Pass
11ac (HT80)	CH42	5210	1.06	11	Pass

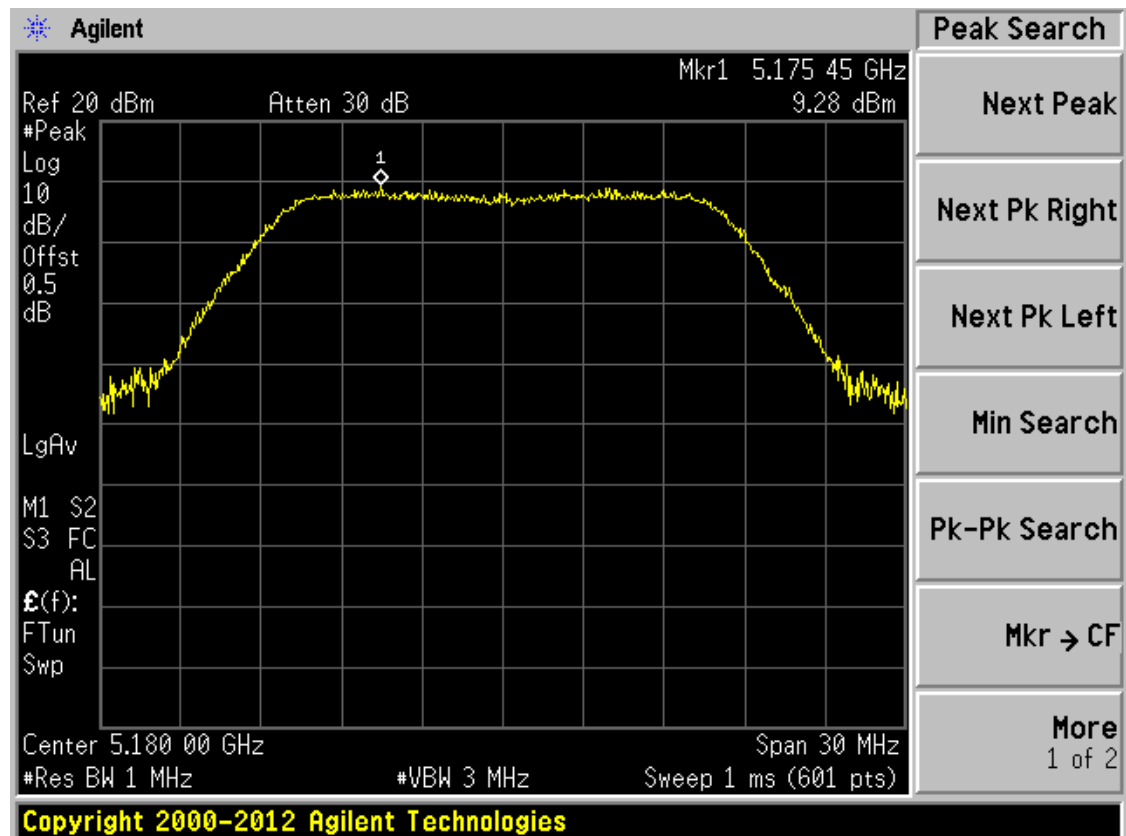
Band II (5250 - 5350 MHz)					
Mode	Channel	Frequency (MHz)	PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
11a	CH52	5260	8.20	11	Pass
11a	CH56	5280	9.24	11	Pass
11a	CH64	5320	9.90	11	Pass
11n (HT20)	CH52	5260	8.45	11	Pass
11n (HT20)	CH56	5280	8.95	11	Pass
11n (HT20)	CH64	5320	9.76	11	Pass
11n (HT40)	CH54	5270	4.33	11	Pass
11n (HT40)	CH62	5310	5.12	11	Pass
11ac (HT20)	CH52	5260	7.44	11	Pass
11ac (HT20)	CH56	5280	8.14	11	Pass
11ac (HT20)	CH64	5320	8.56	11	Pass
11ac (HT40)	CH54	5260	3.51	11	Pass
11ac (HT40)	CH62	5280	4.36	11	Pass
11ac (HT80)	CH58	5290	1.72	11	Pass

Band III (5470 - 5725 MHz)					
Mode	Channel	Frequency (MHz)	PSD (dBm/MHz)	Limit (dBm/MHz)	Verdict
11a	CH100	5500	8.72	11	Pass
11a	CH116	5580	9.35	11	Pass
11a	CH140	5700	10.23	11	Pass
11n (HT20)	CH100	5500	7.86	11	Pass
11n (HT20)	CH116	5580	8.48	11	Pass
11n (HT20)	CH140	5700	9.79	11	Pass
11n (HT40)	CH102	5510	4.71	11	Pass
11n (HT40)	CH134	5670	5.15	11	Pass
11ac (HT20)	CH100	5500	6.92	11	Pass
11ac (HT20)	CH116	5580	7.56	11	Pass
11ac (HT20)	CH140	5700	9.23	11	Pass
11ac (HT40)	CH102	5510	3.51	11	Pass
11ac (HT40)	CH134	5670	4.31	11	Pass
11ac (HT80)	CH106	5530	1.53	11	Pass

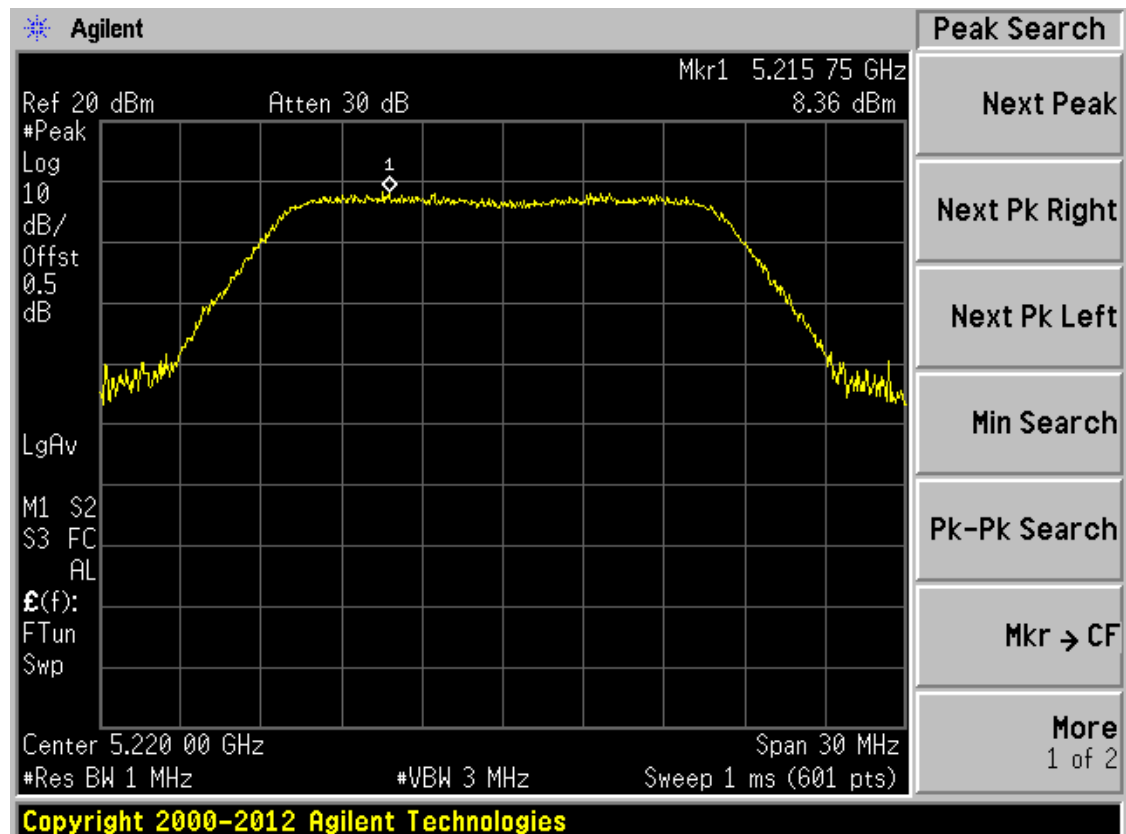
Band IV (5725 - 5850 MHz)					
Mode	Channel	Frequency (MHz)	PSD (dBm/500kHz)	Limit (dBm/500kHz)	Verdict
11a	CH149	5745	9.82	30	Pass
11a	CH157	5785	10.33	30	Pass
11a	CH161	5825	10.07	30	Pass
11n (HT20)	CH149	5745	9.49	30	Pass
11n (HT20)	CH157	5785	9.90	30	Pass
11n (HT20)	CH161	5825	9.40	30	Pass
11n (HT40)	CH151	5755	6.27	30	Pass
11n (HT40)	CH159	5795	5.86	30	Pass
11ac (HT20)	CH149	5745	8.69	30	Pass
11ac (HT20)	CH157	5785	9.73	30	Pass
11ac (HT20)	CH161	5805	8.23	30	Pass
11ac (HT40)	CH151	5755	5.14	30	Pass
11ac (HT40)	CH159	5795	4.78	30	Pass
11ac (HT80)	CH155	5775	2.61	30	Pass

Test Plots

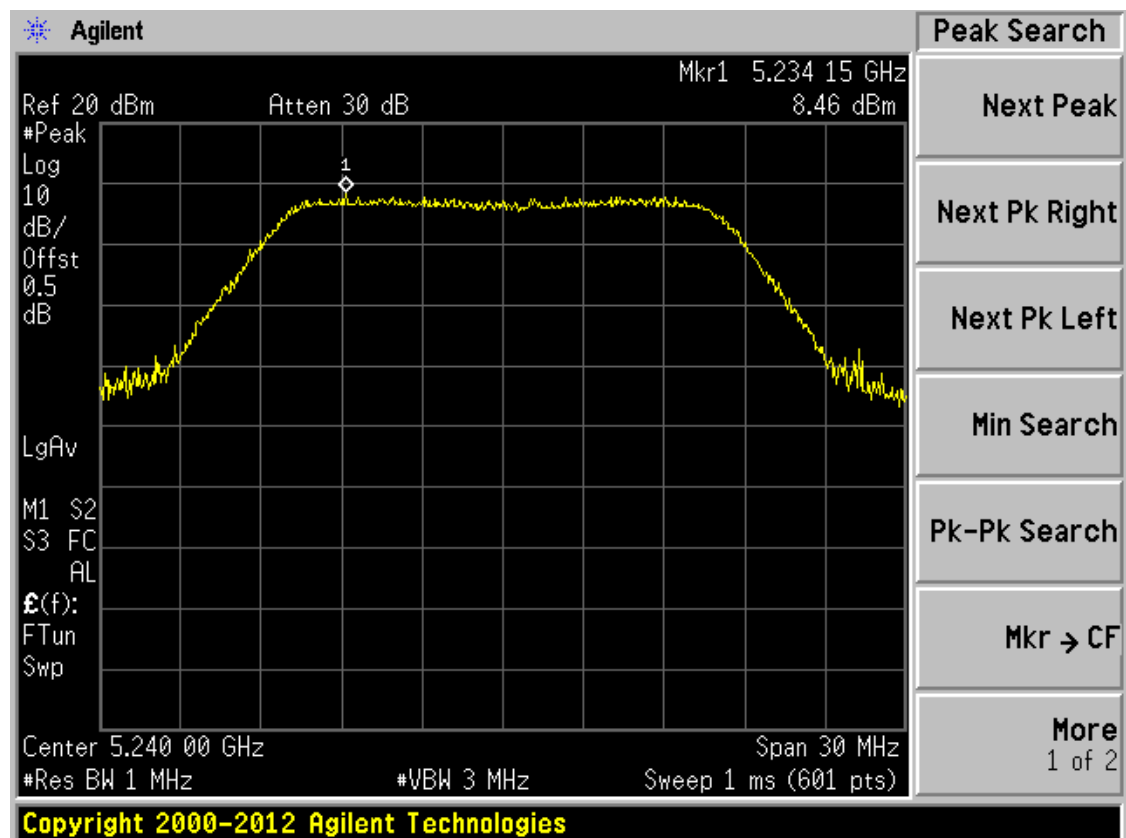
Band I 11a CH36



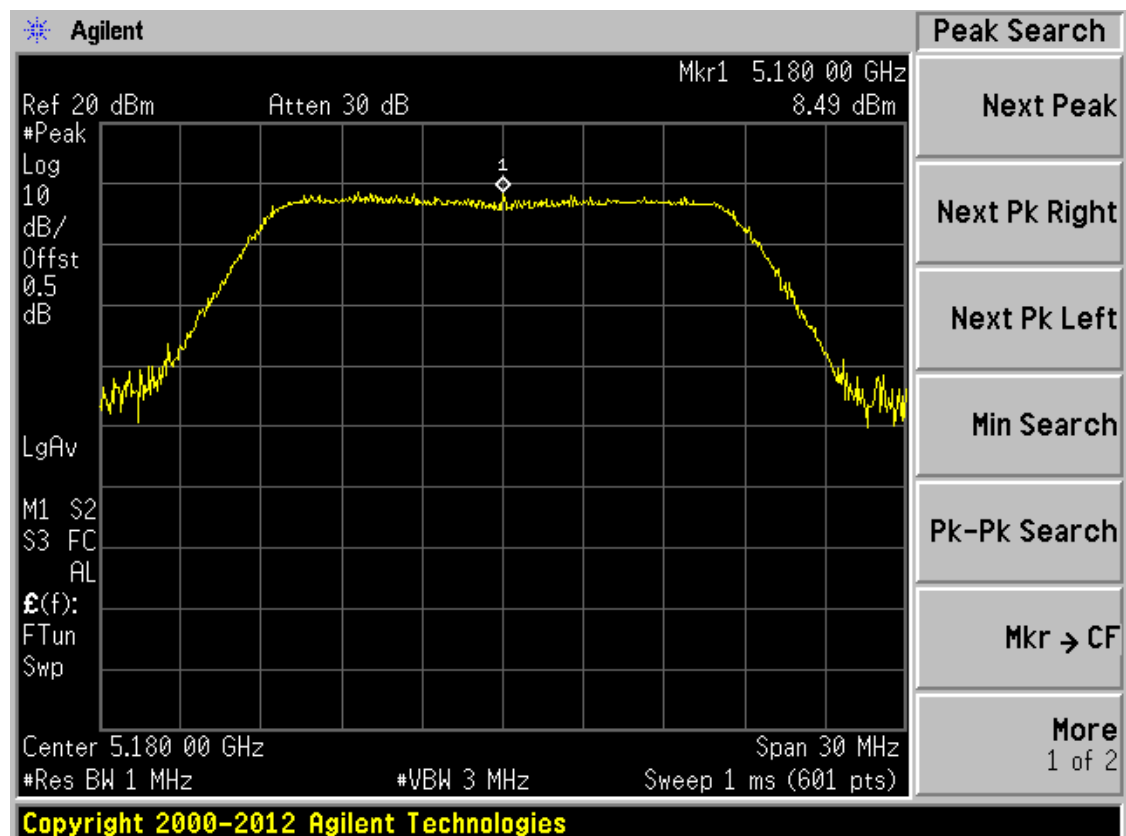
Band I 11a CH44



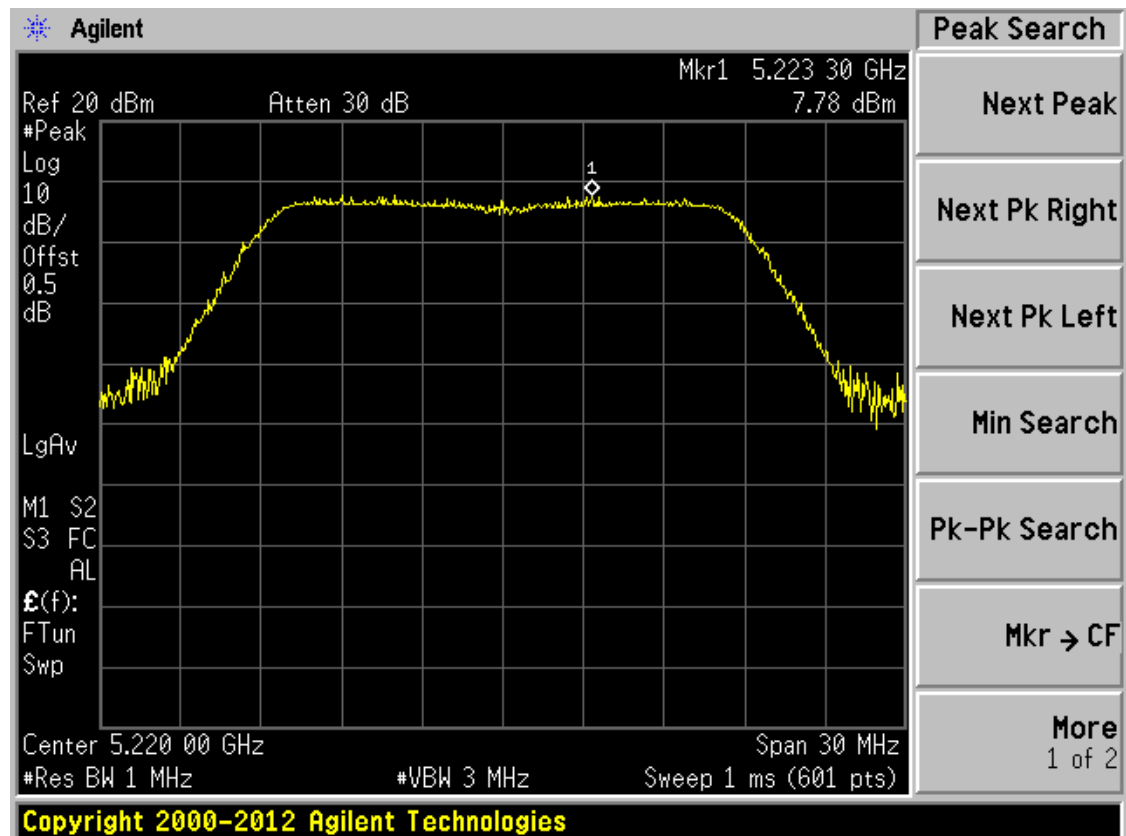
Band I 11a CH48



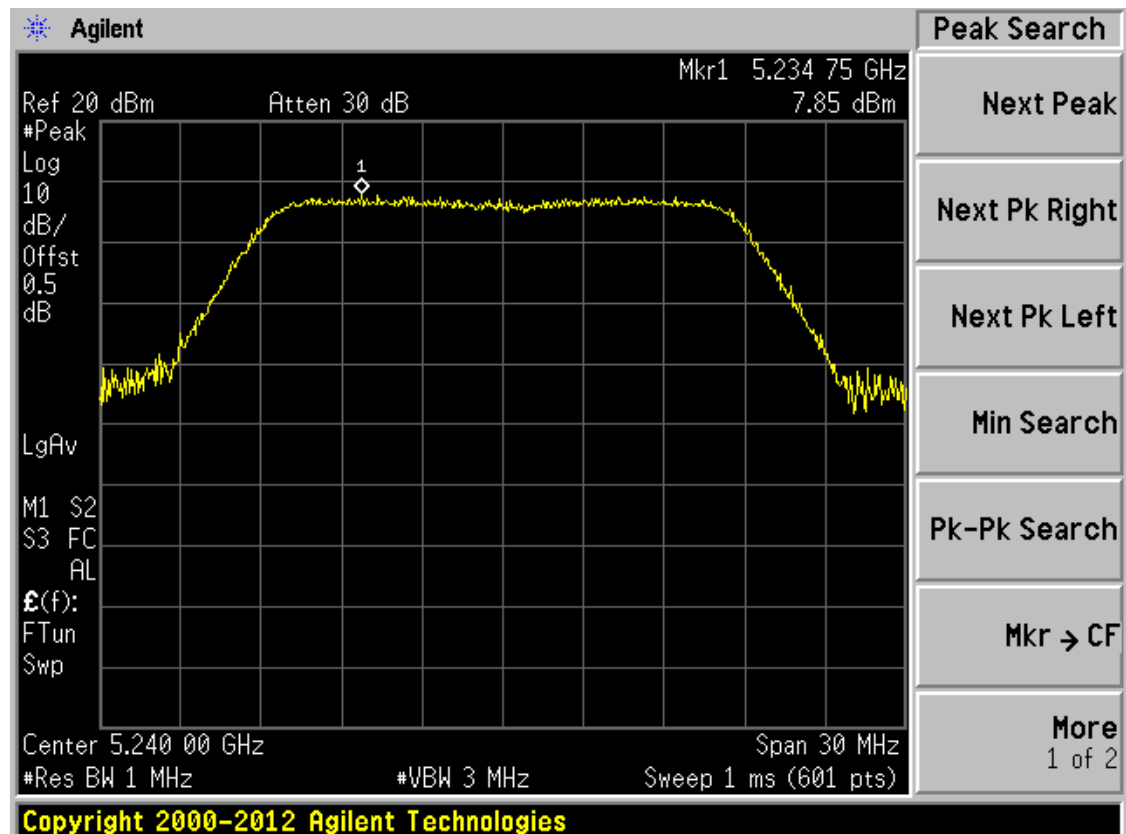
Band I 11n(HT20) CH36



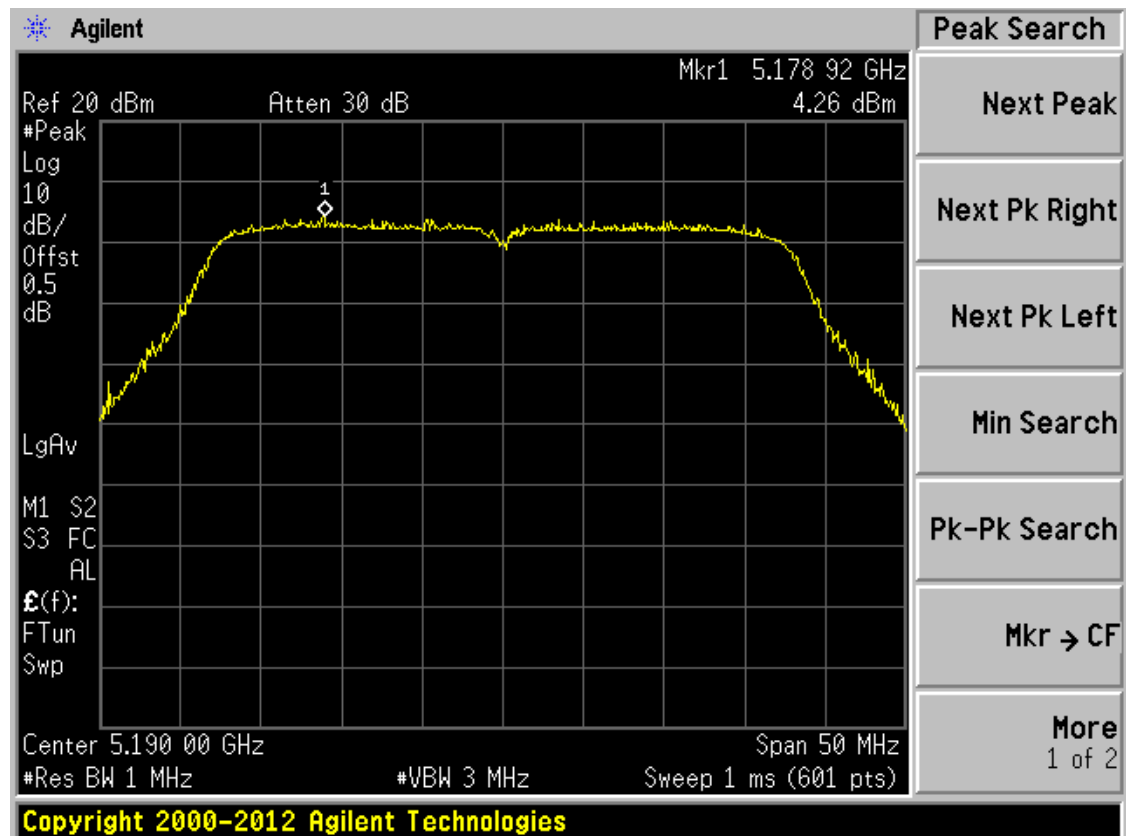
Band I 11n(HT20) CH44



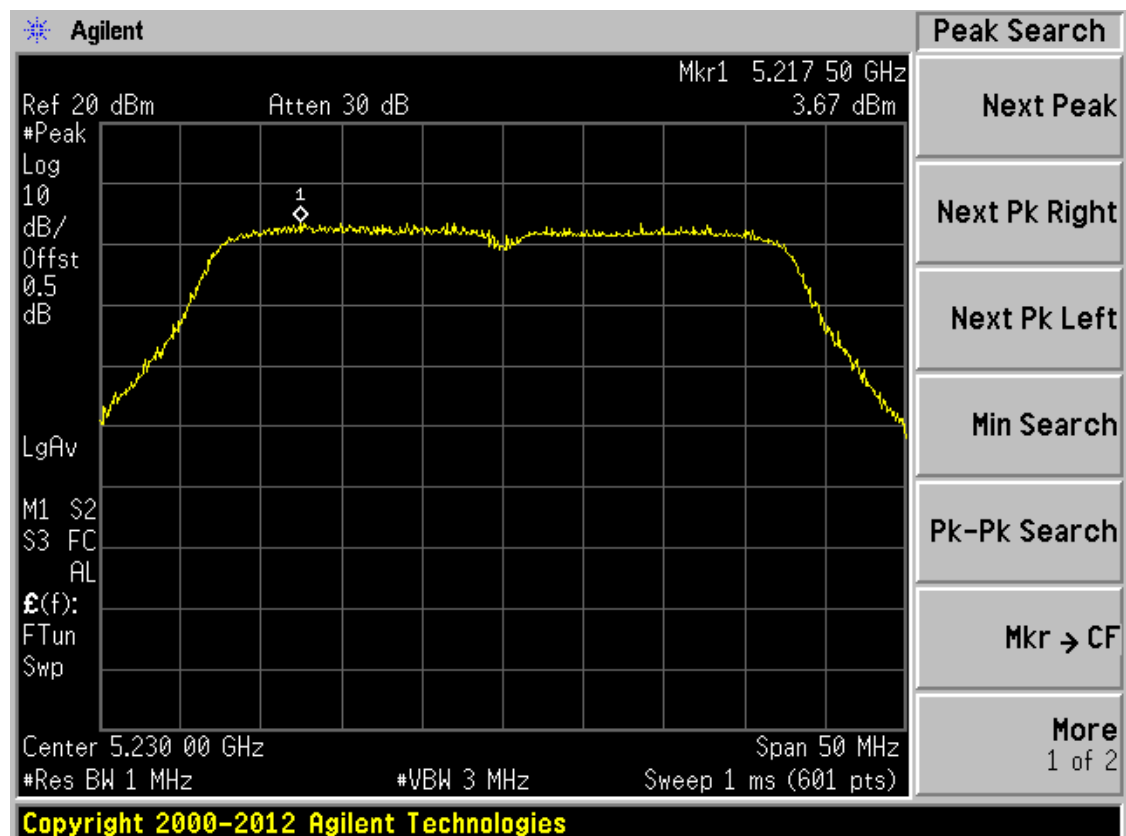
Band I 11n(HT20) CH48



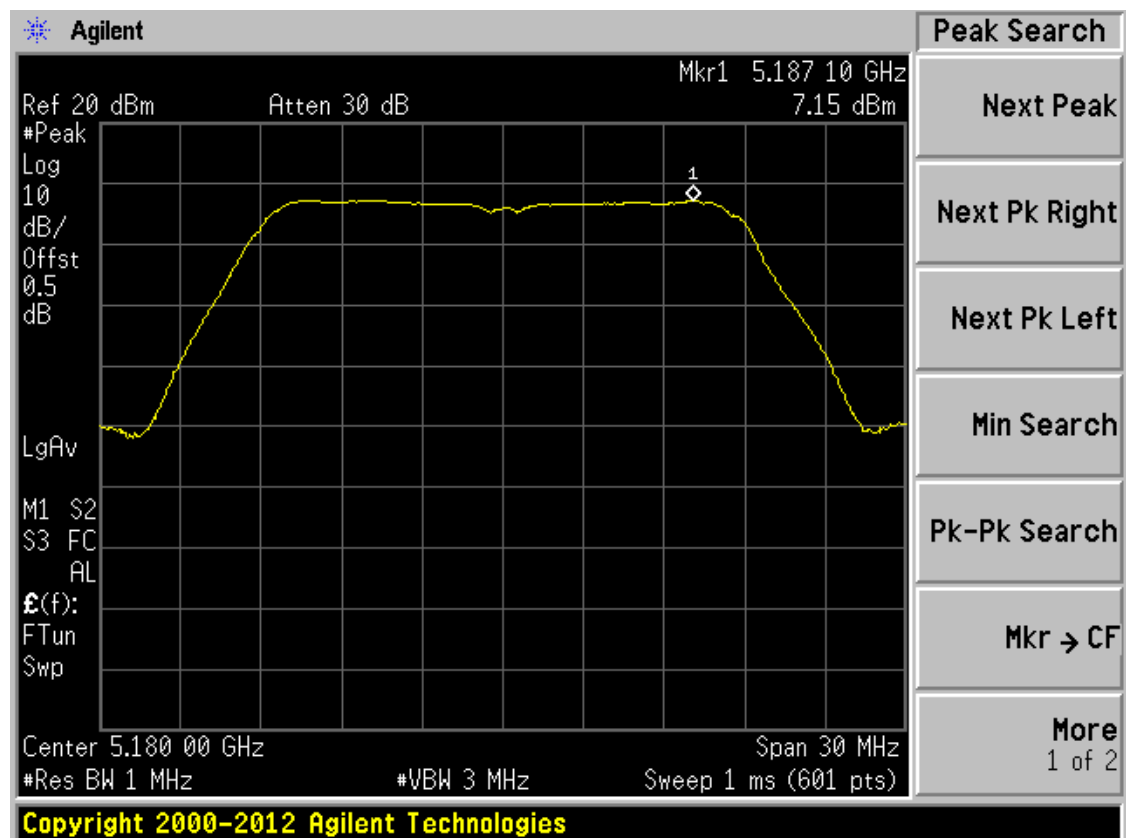
Band I 11n(HT40) CH38



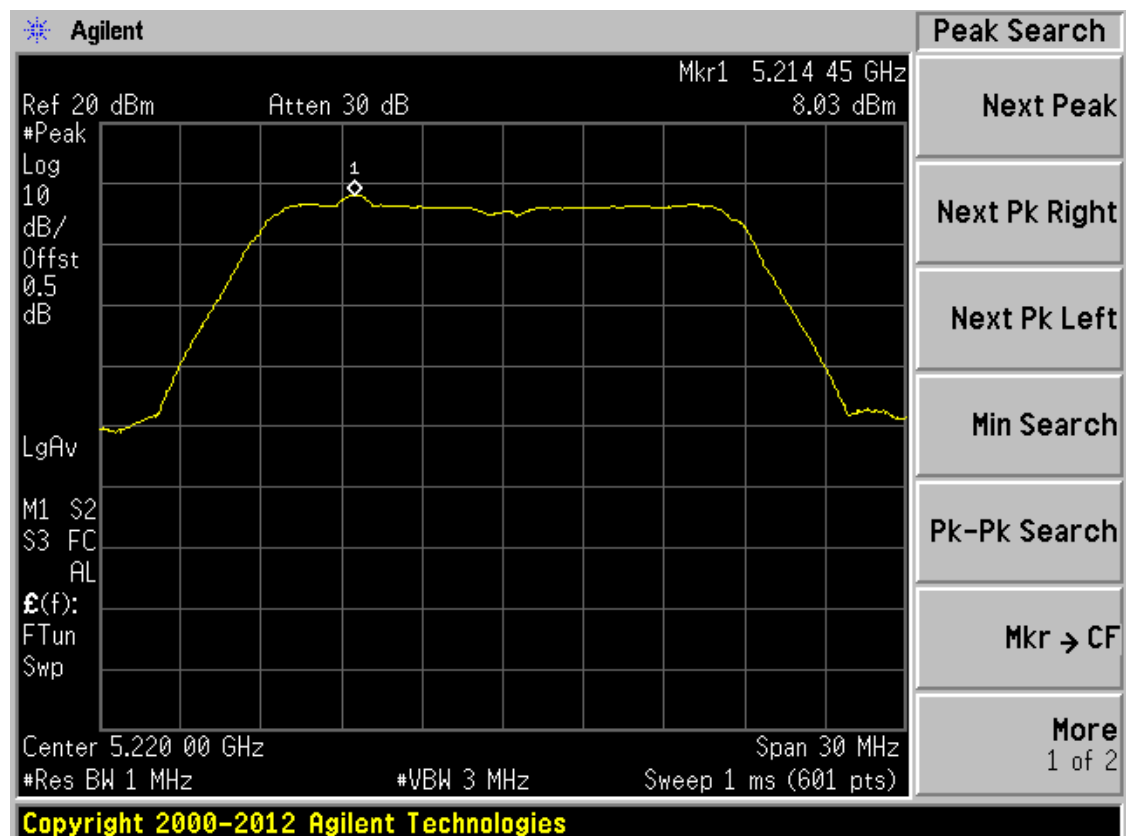
Band I 11n(HT40) CH46



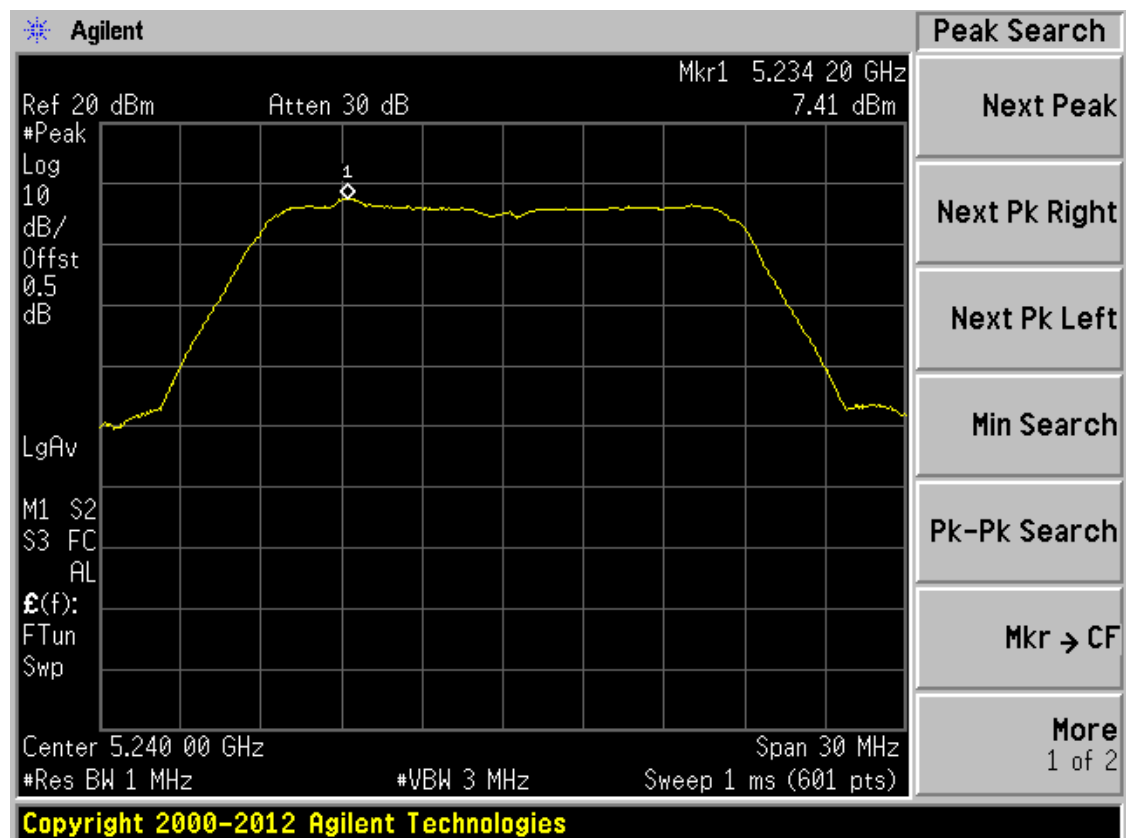
Band I 11ac(HT20) CH36



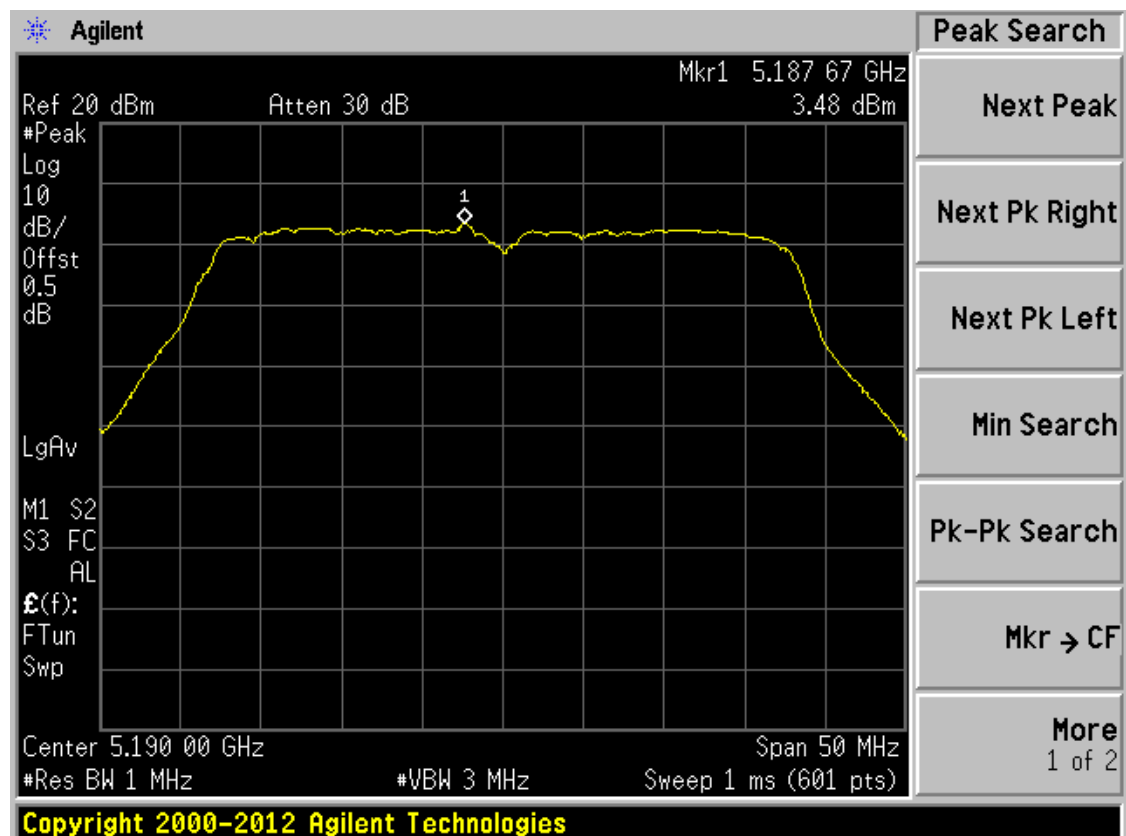
Band I 11ac(HT20) CH44



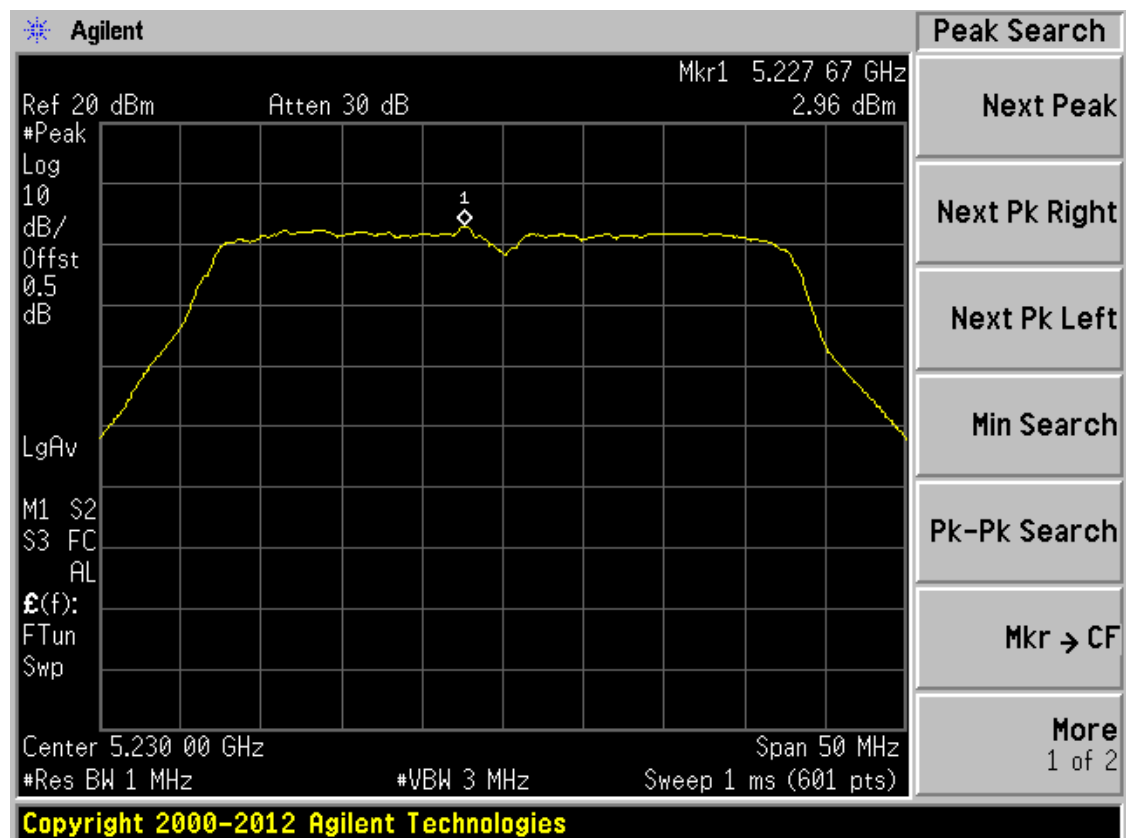
Band I 11ac(HT20) CH48



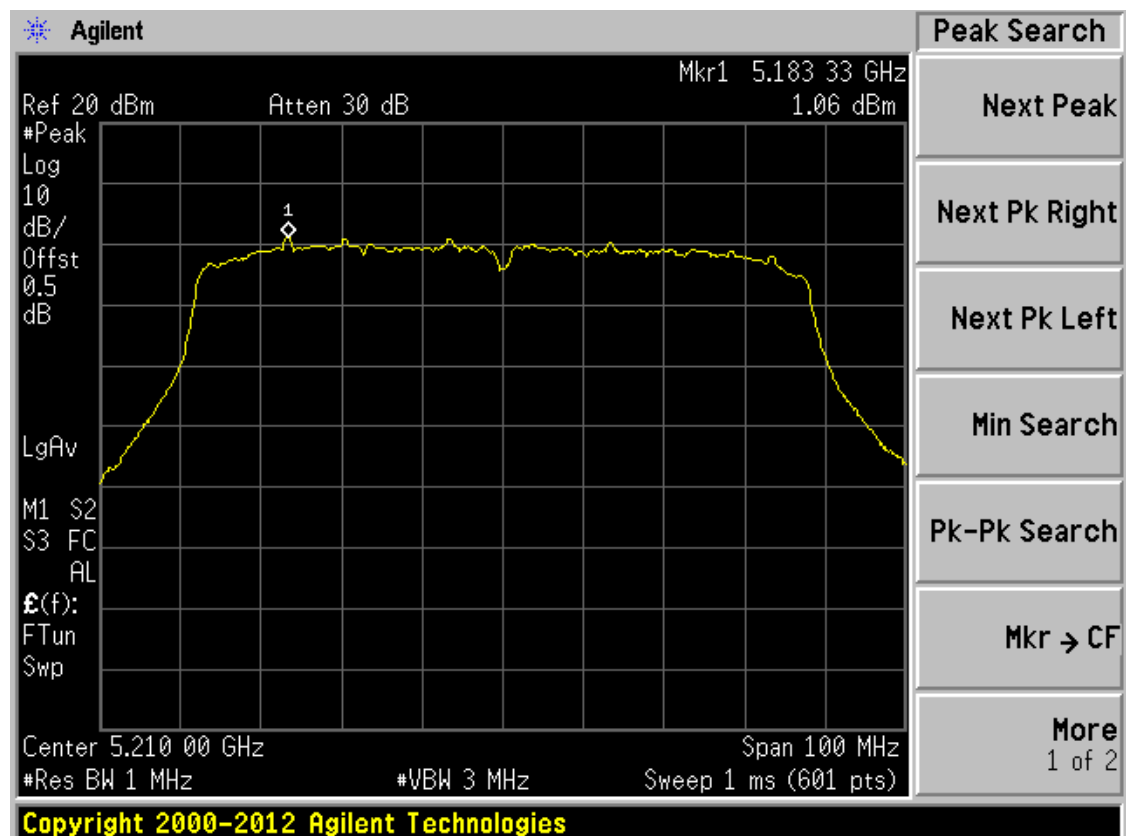
Band I 11ac(HT40) CH38



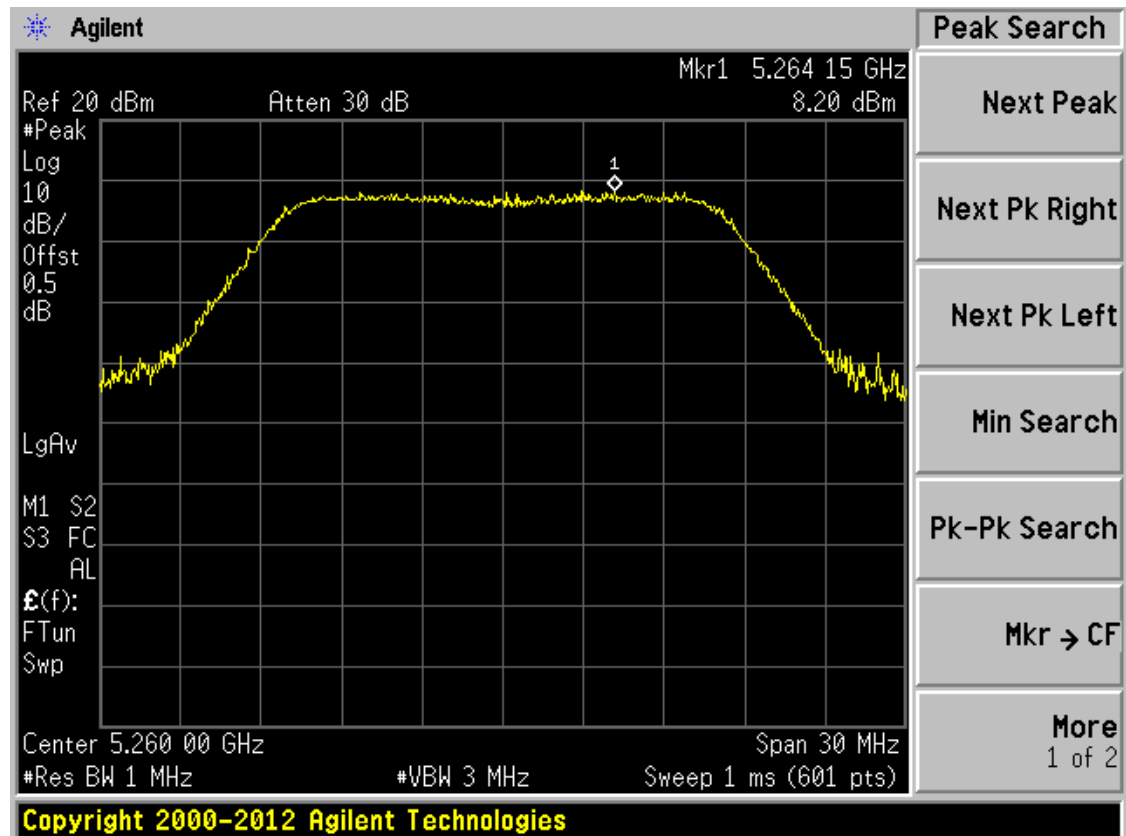
Band I 11ac(HT40) CH46



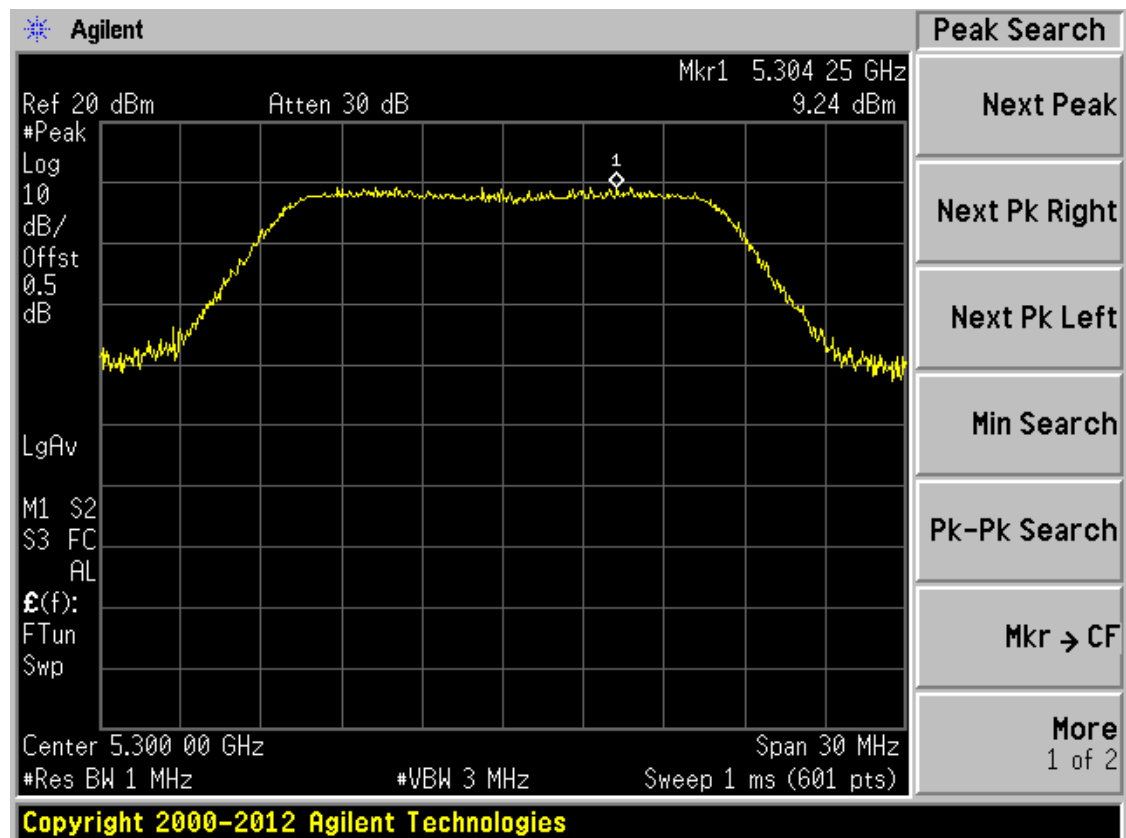
Band I 11ac(HT80) CH42



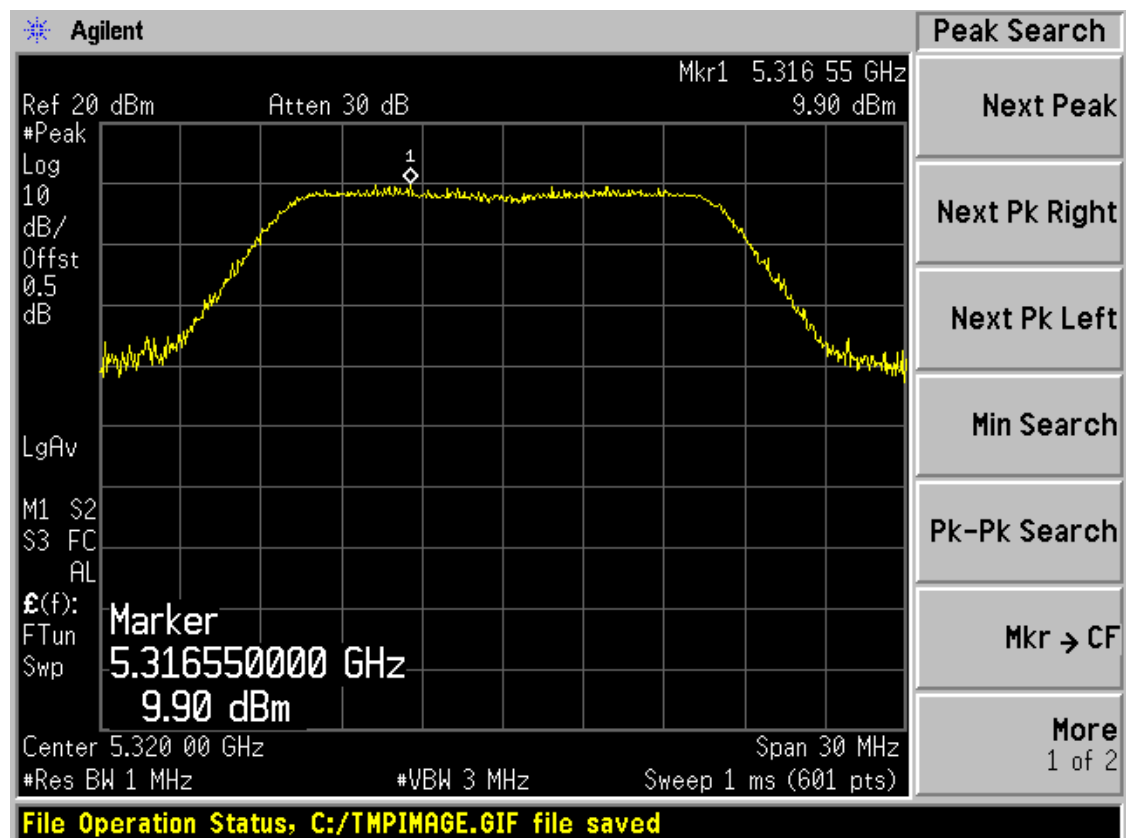
Band II 11a CH52



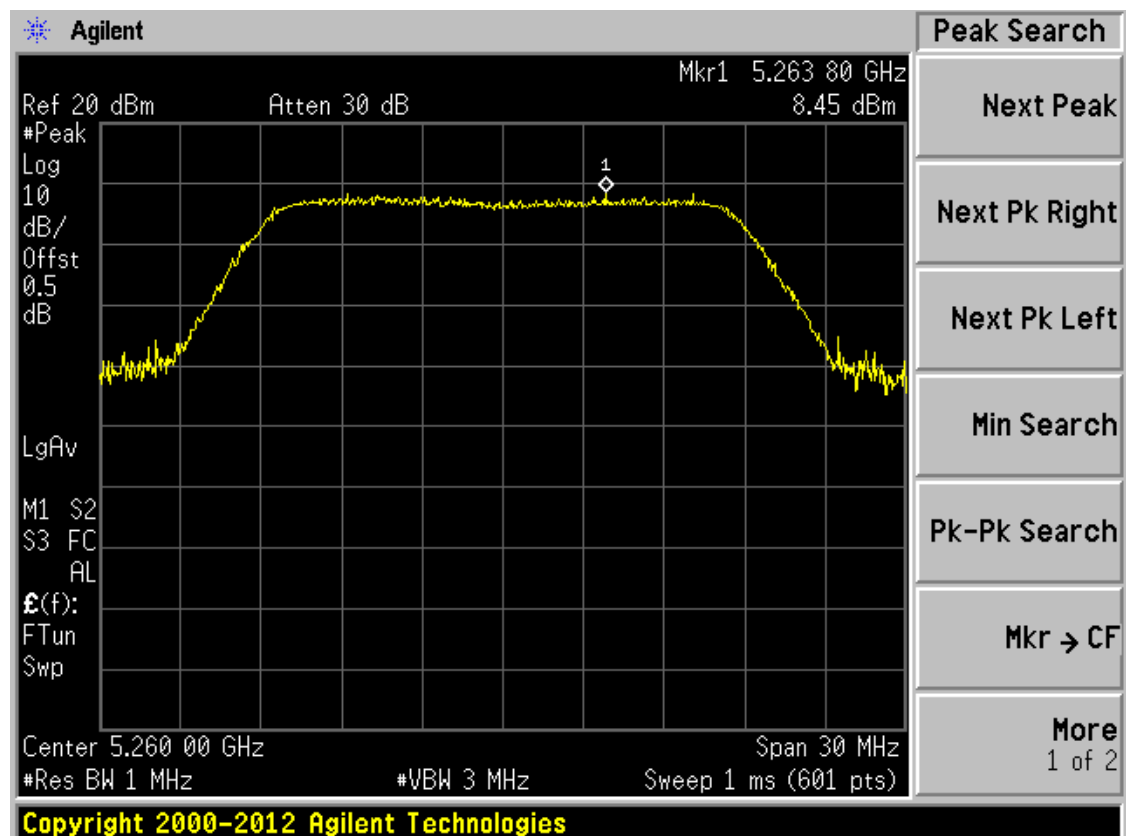
Band II 11a CH56



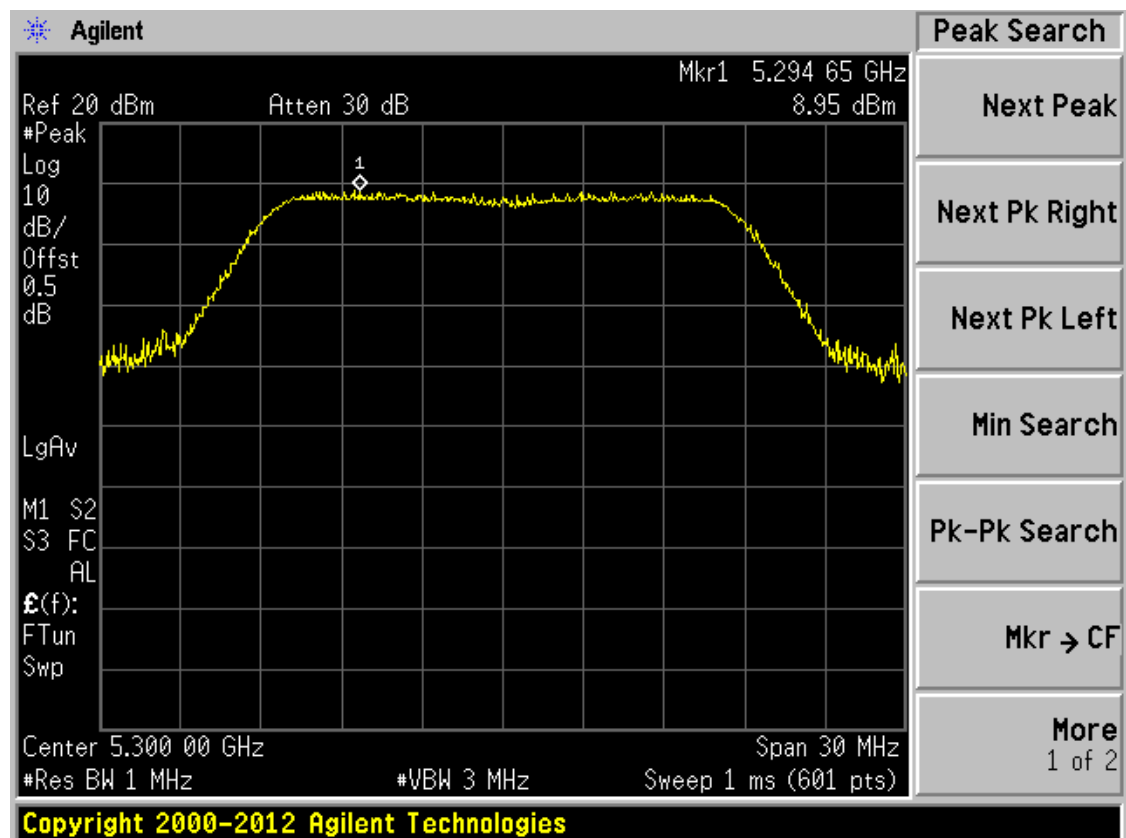
Band II 11a CH64



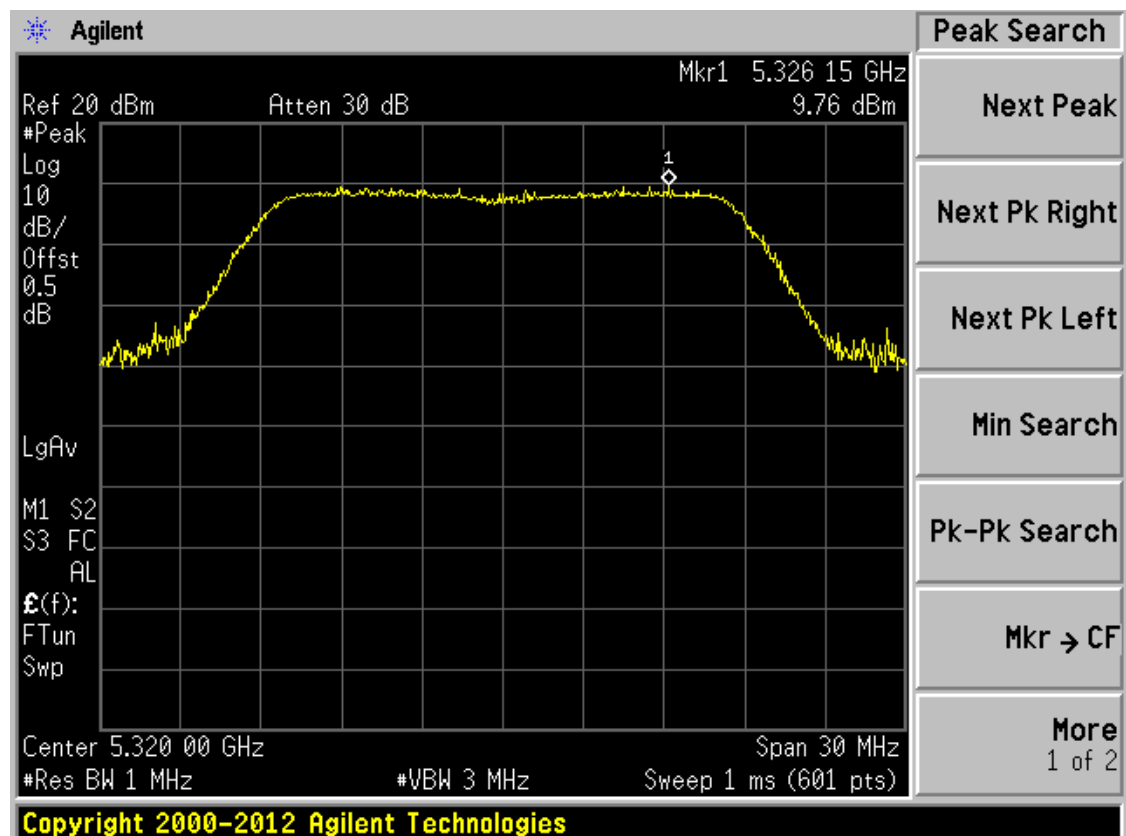
Band II 11n(HT20) CH52



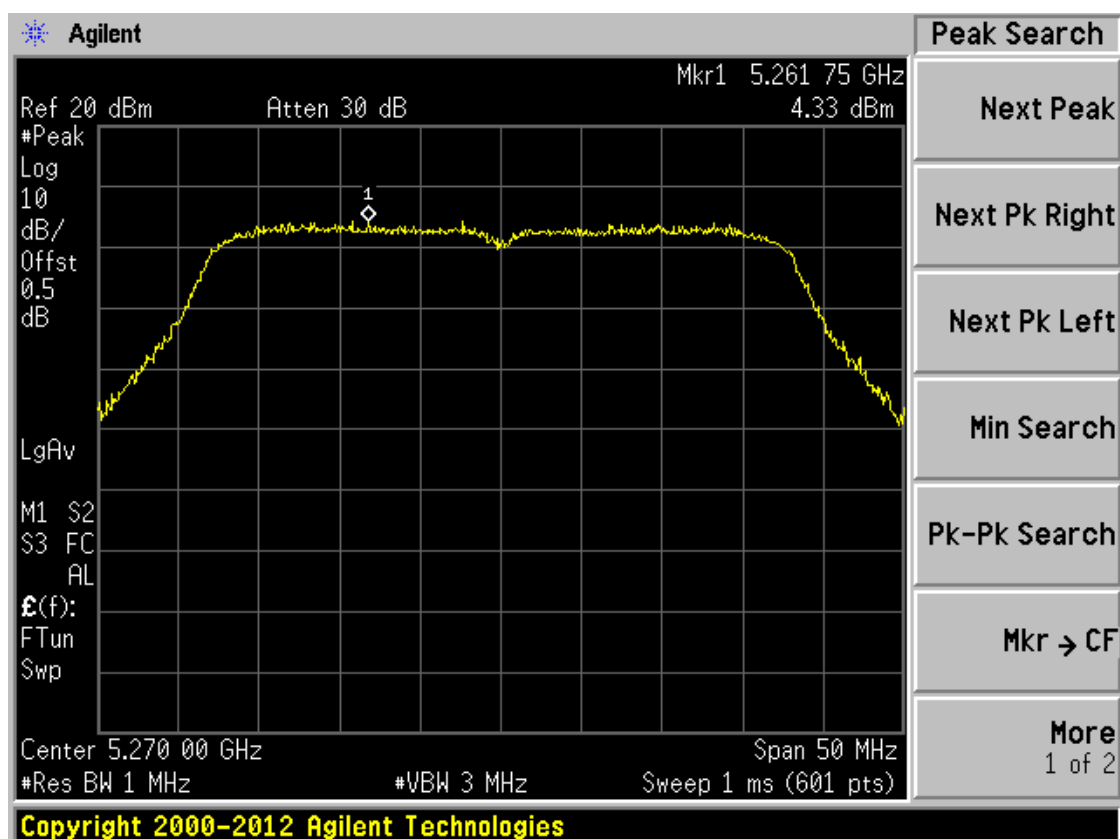
Band II 11n(HT20) CH56



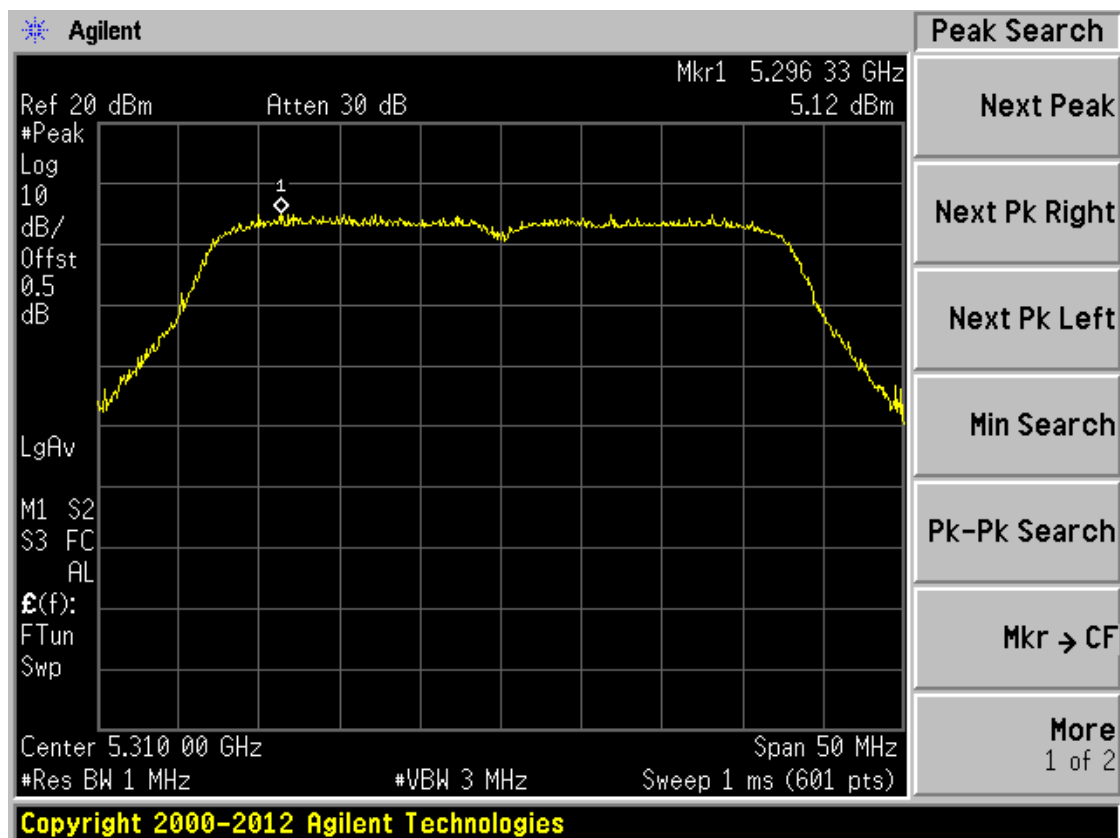
Band II 11n(HT20) CH64



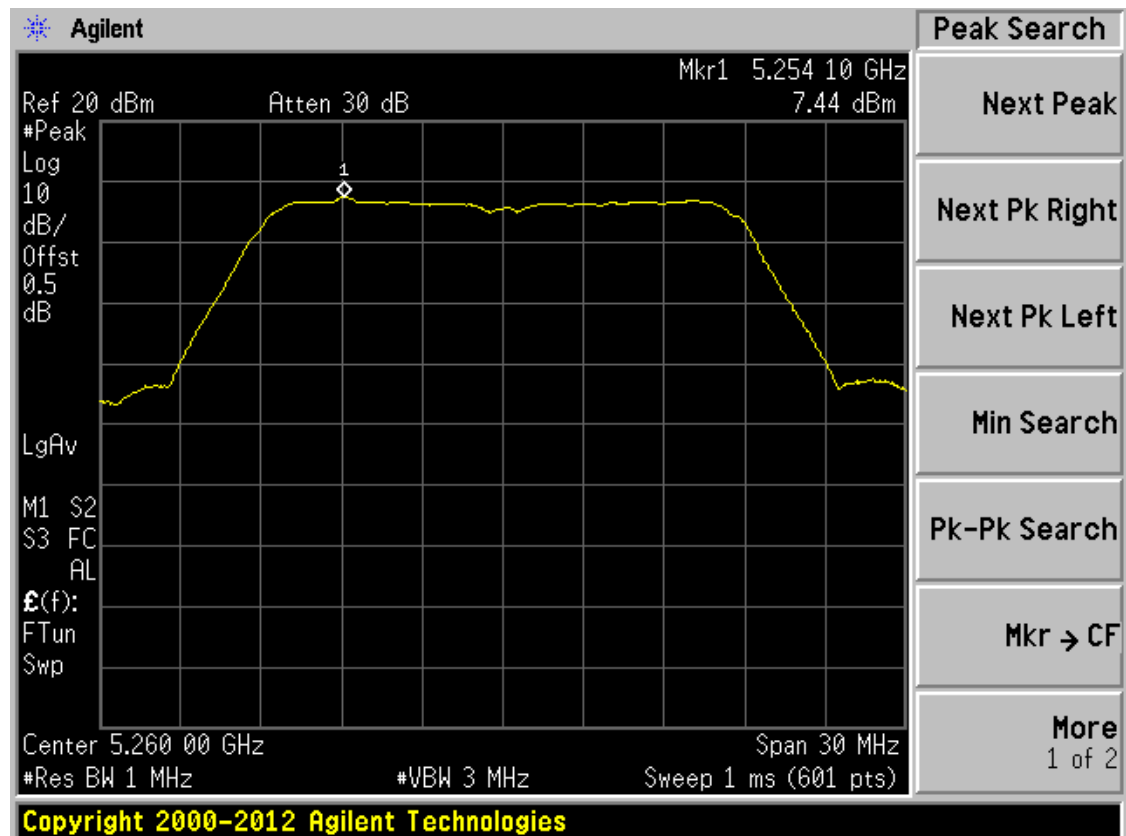
Band II 11n(HT40) CH54



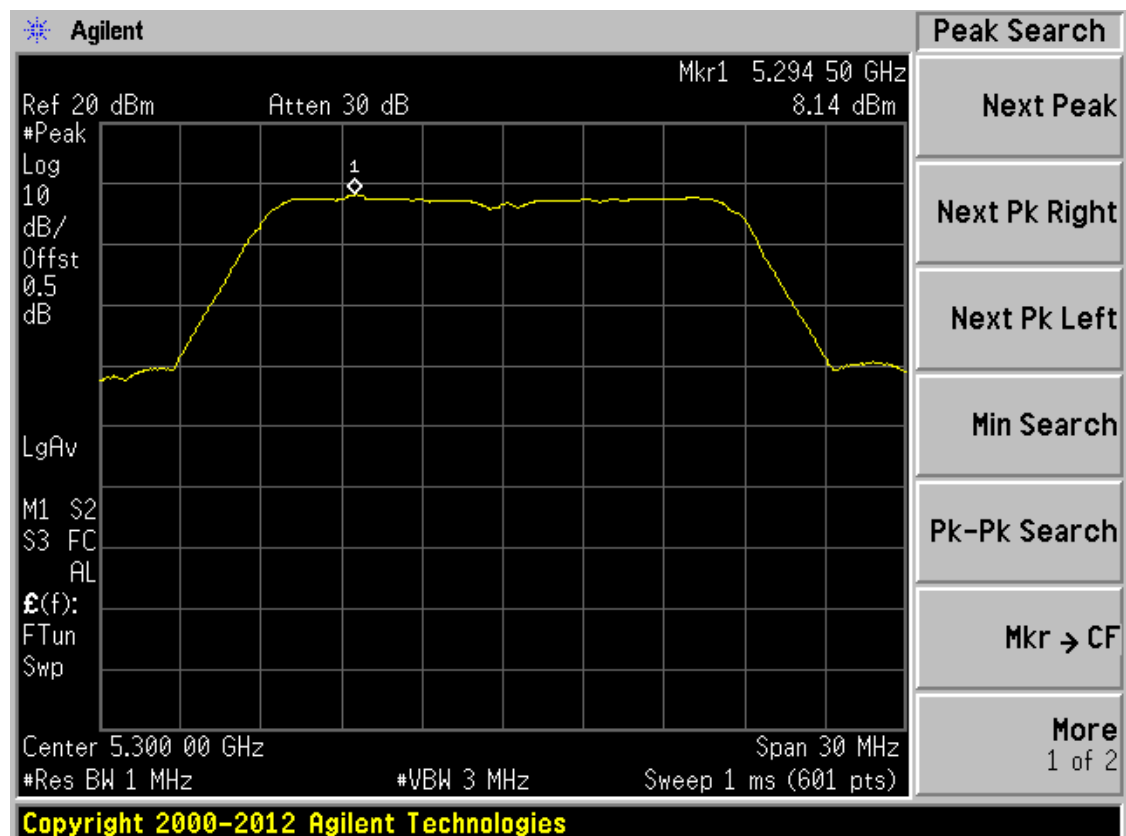
Band II 11n(HT40) CH62



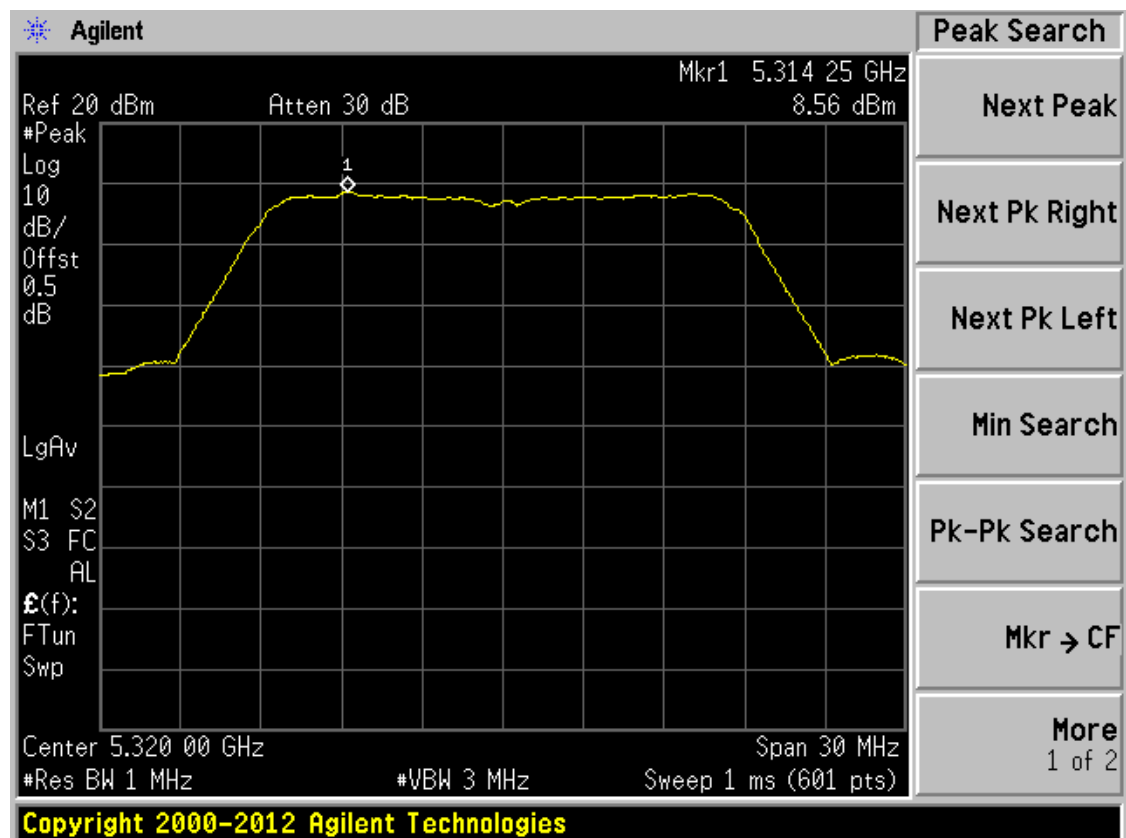
Band II 11ac(HT20) CH52



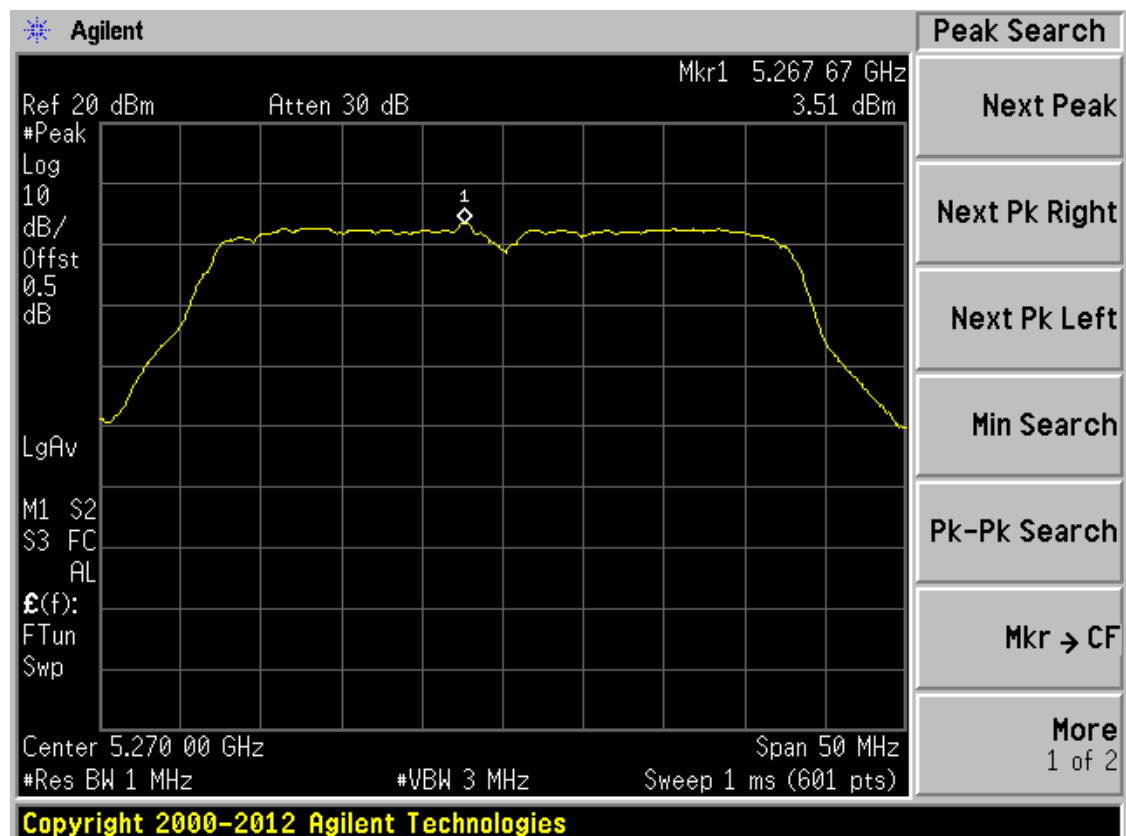
Band II 11ac(HT20) CH54



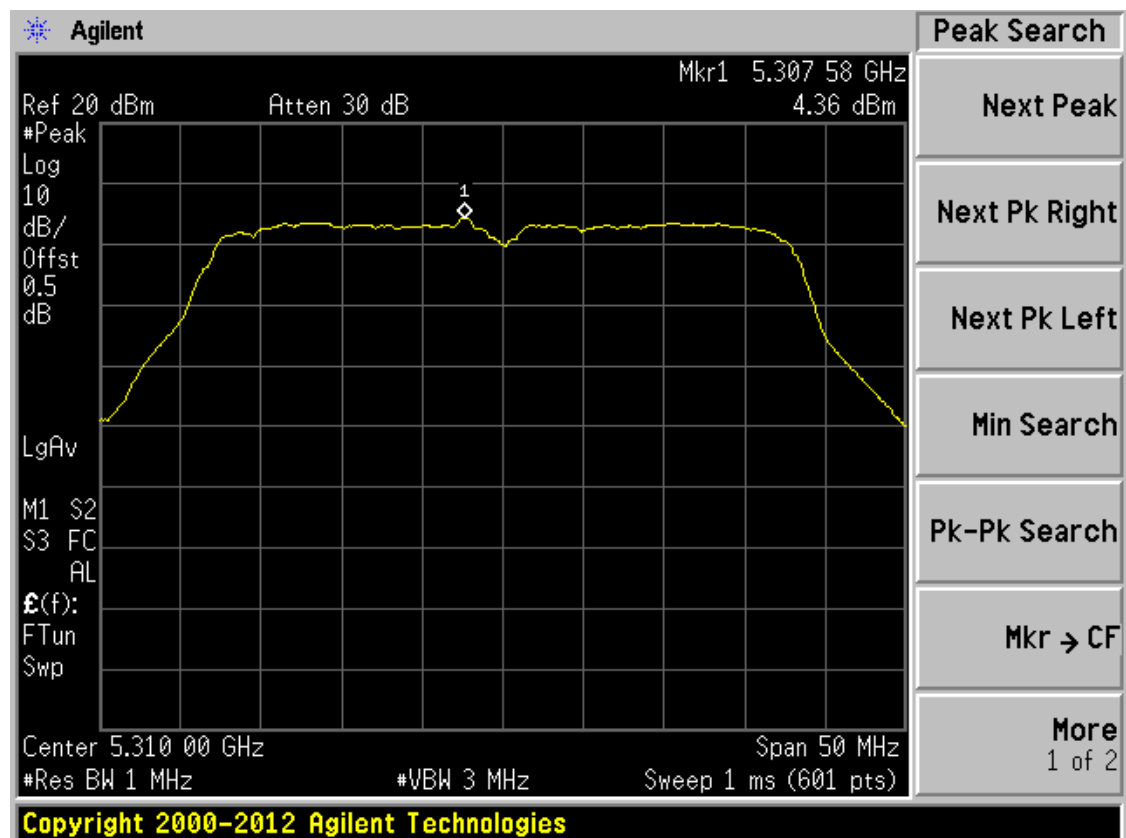
Band II 11ac(HT20) CH64



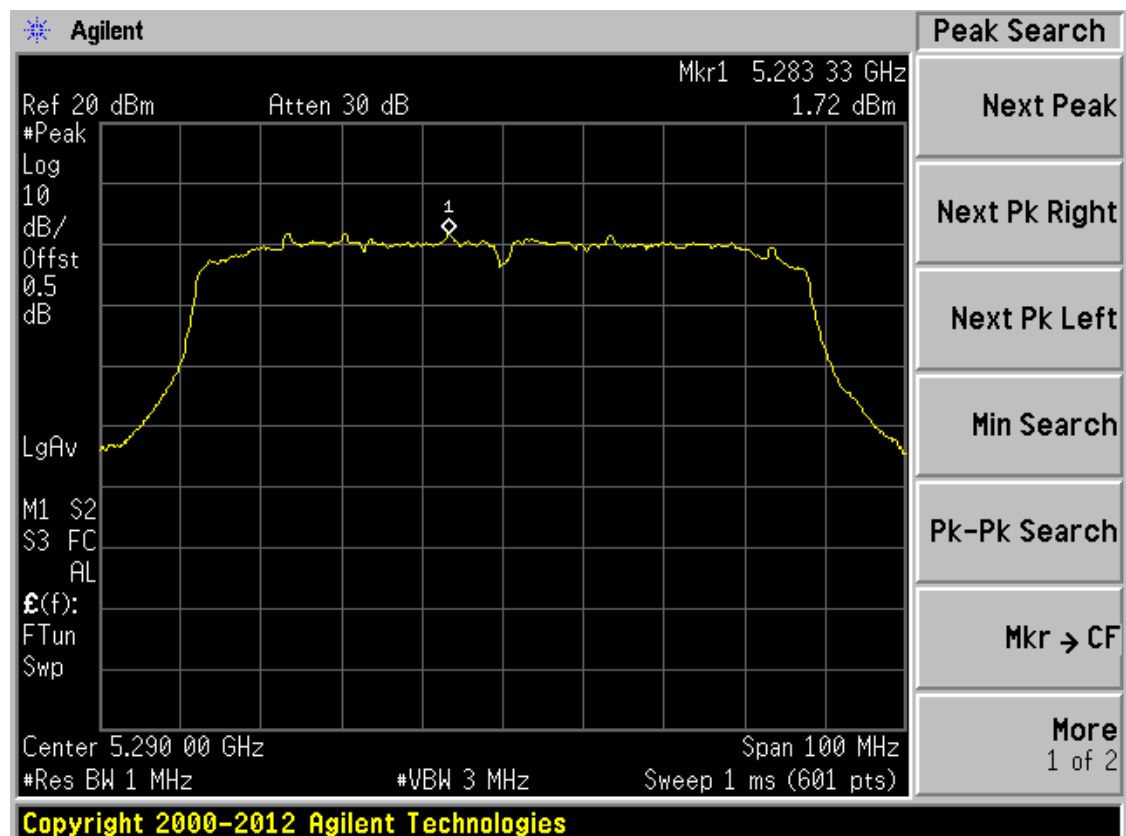
Band II 11ac(HT40) CH54



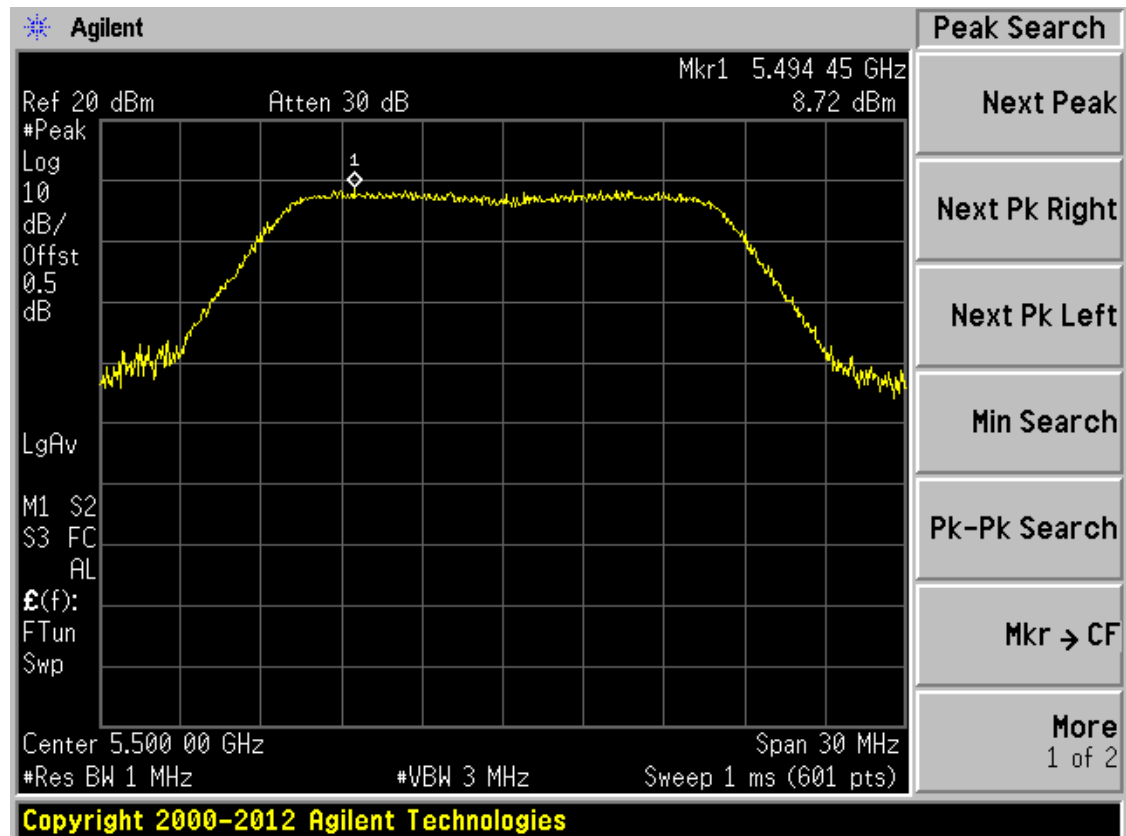
Band II 11ac(HT40) CH62



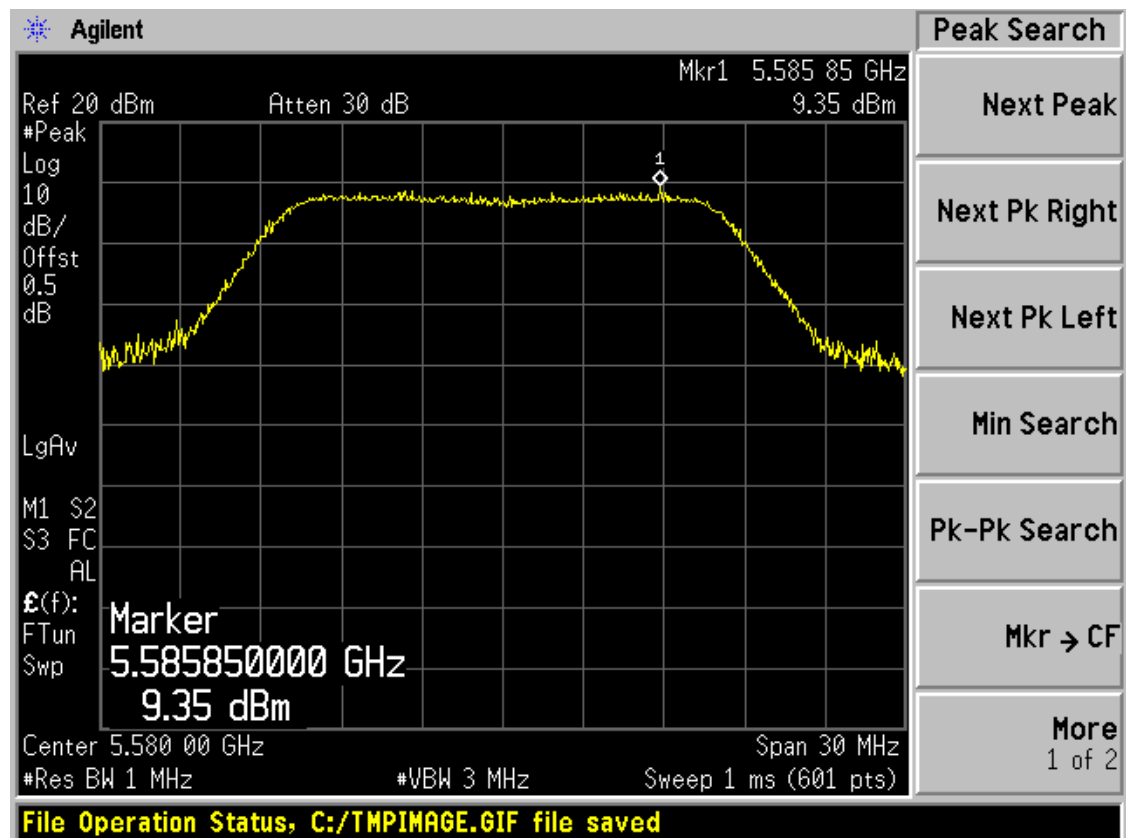
Band II 11ac(HT80) CH58



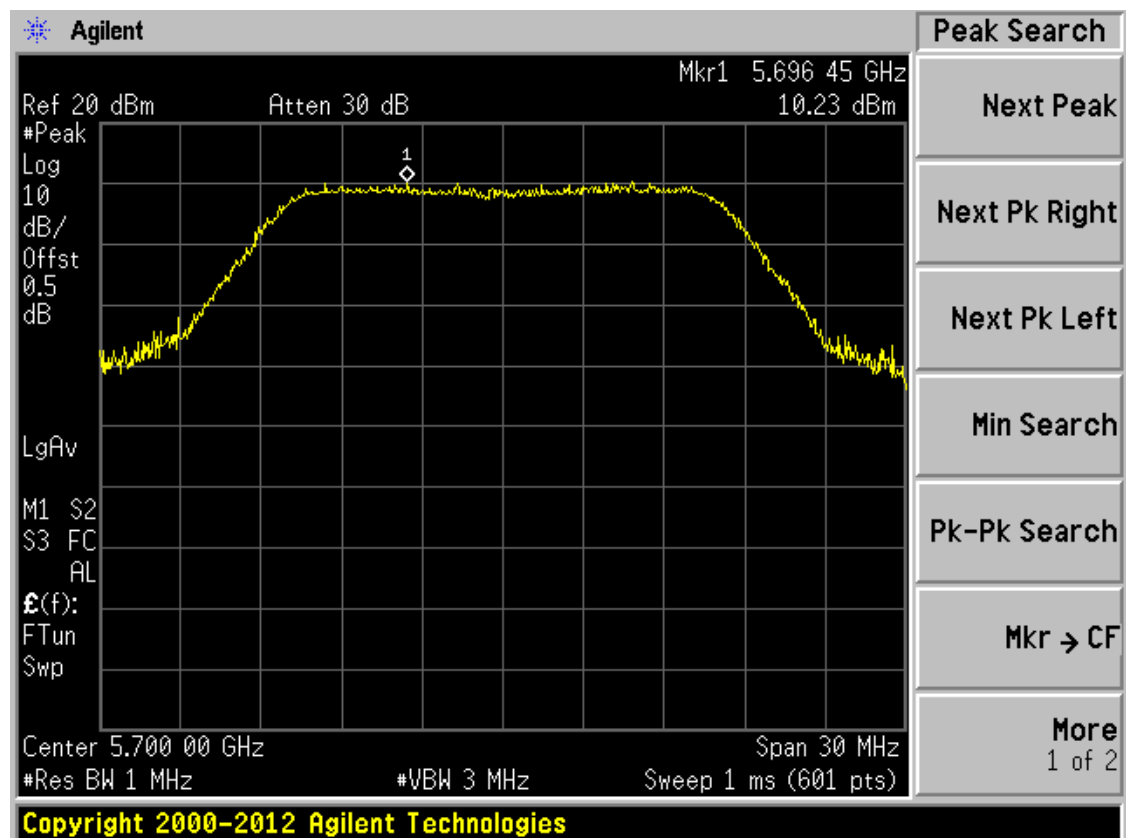
Band III 11a CH100



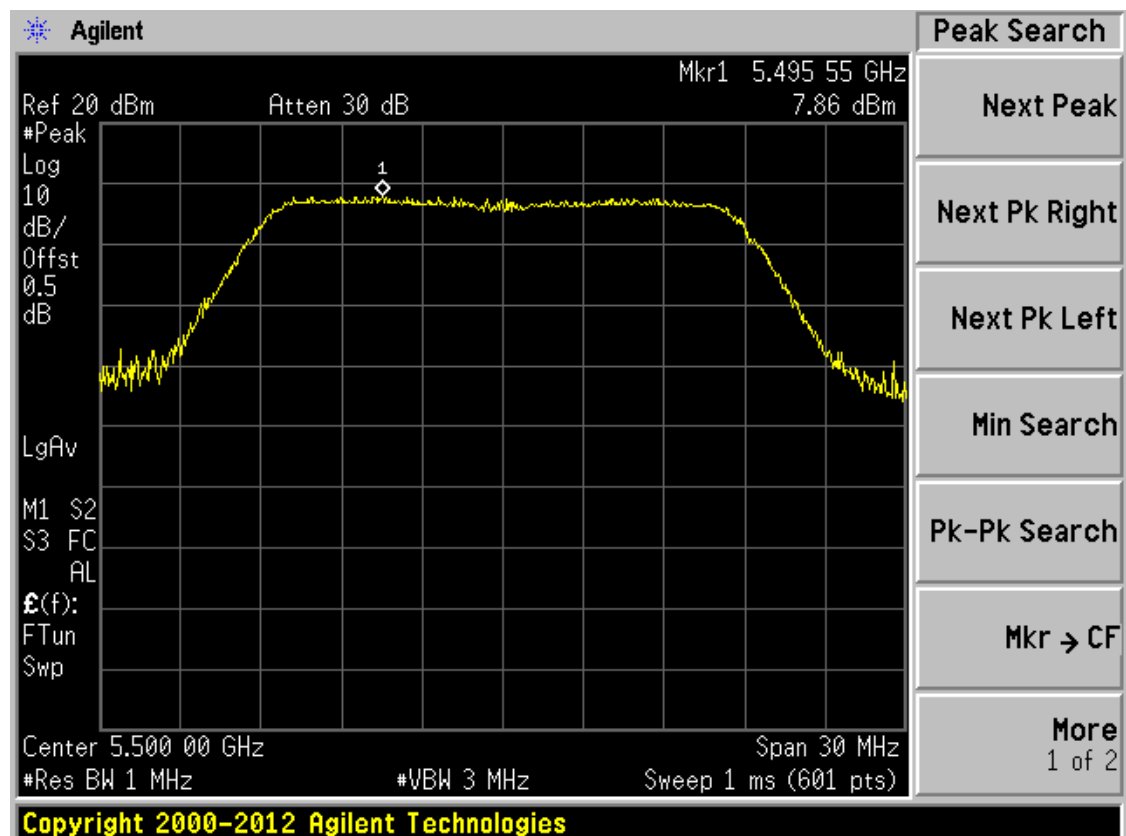
Band III 11a CH116



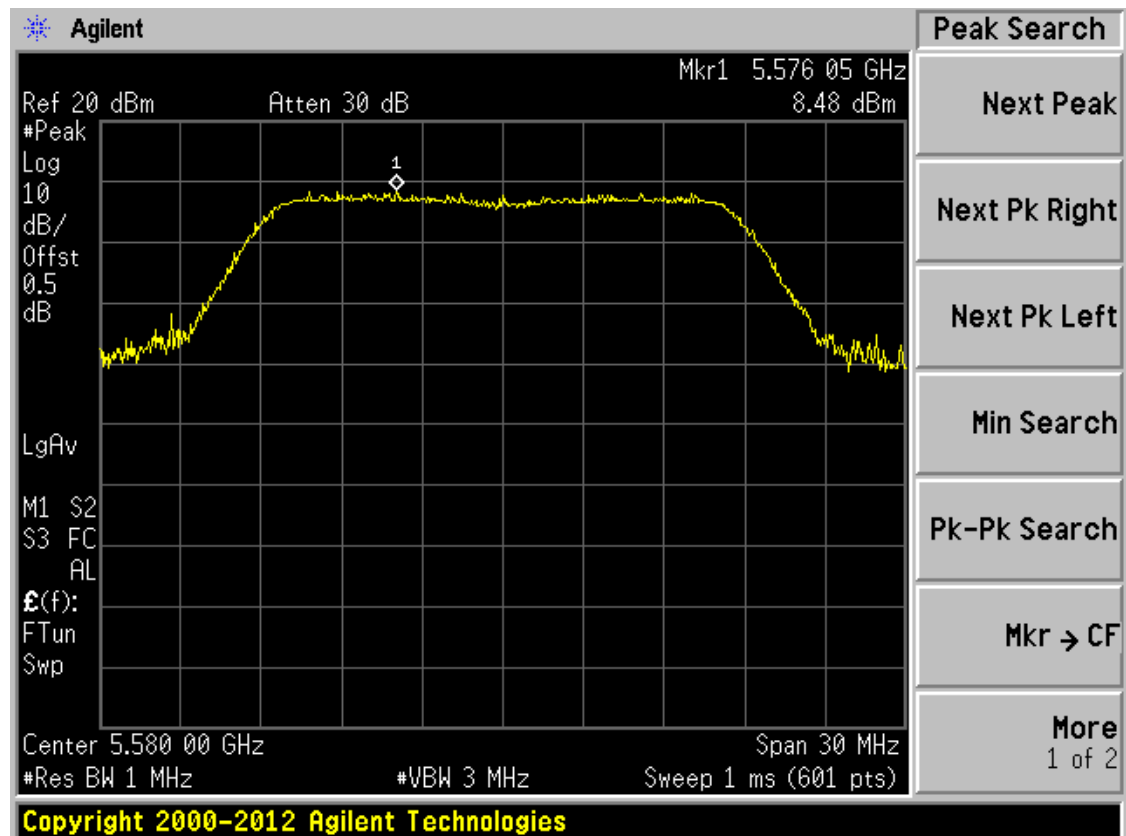
Band III 11a CH140



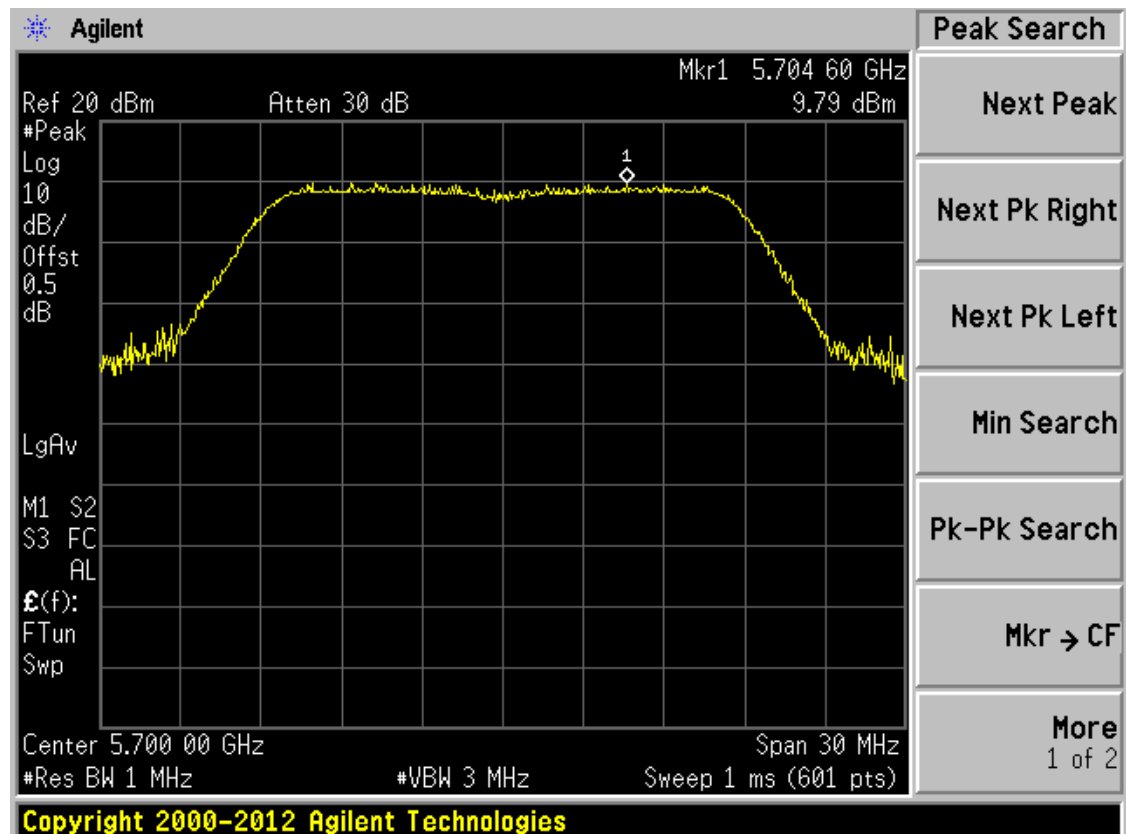
Band III 11n(HT20) CH100



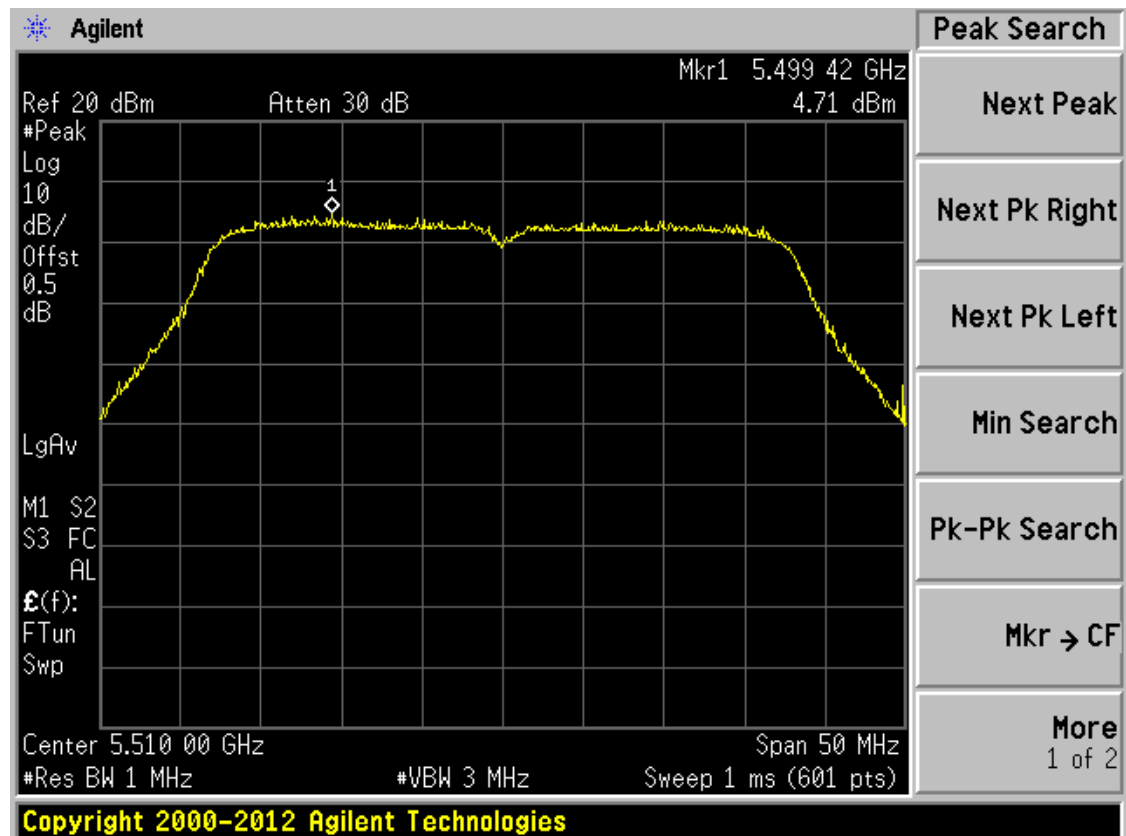
Band III 11n(HT20) CH116



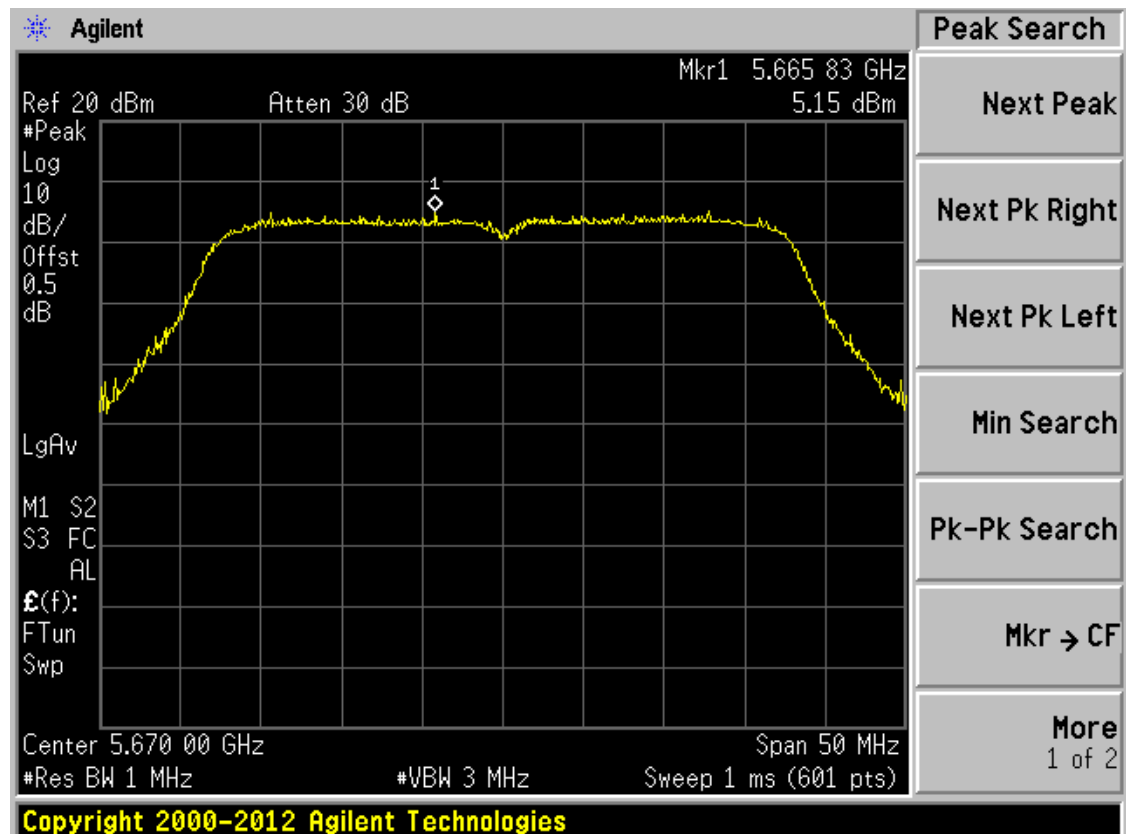
Band III 11n(HT20) CH140



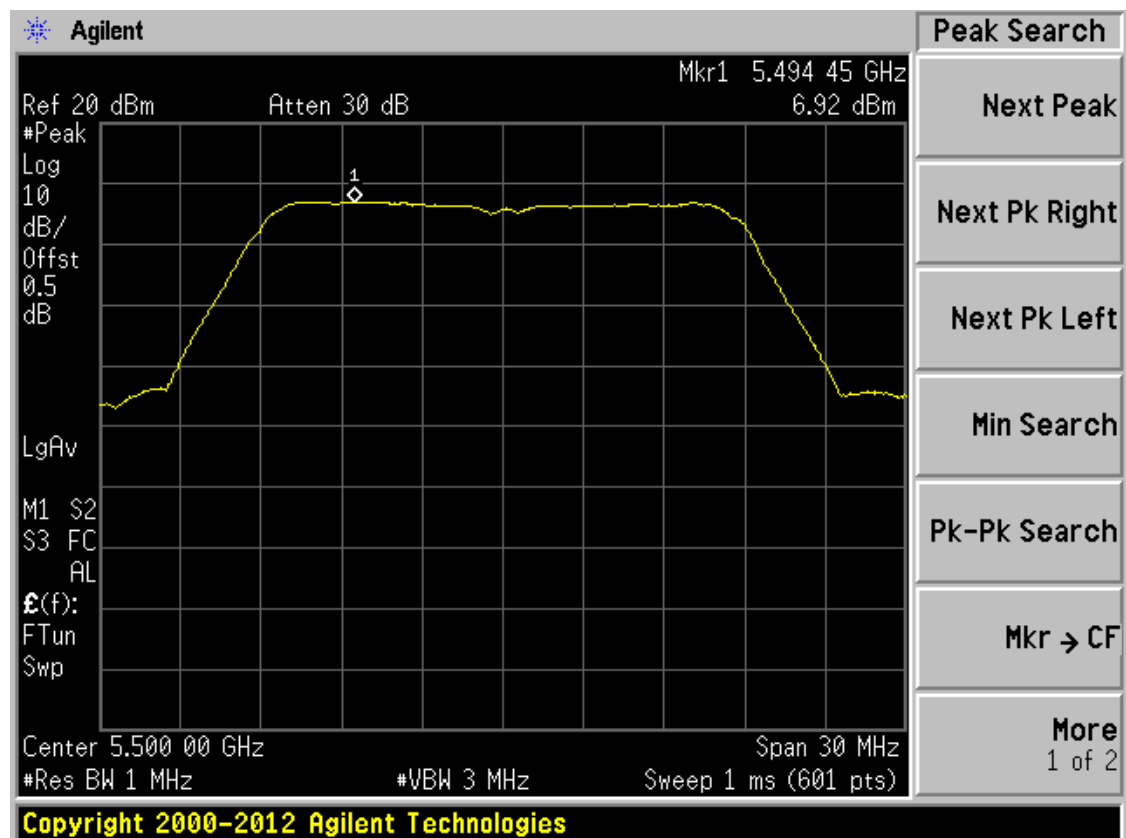
Band III 11n(HT40) CH102



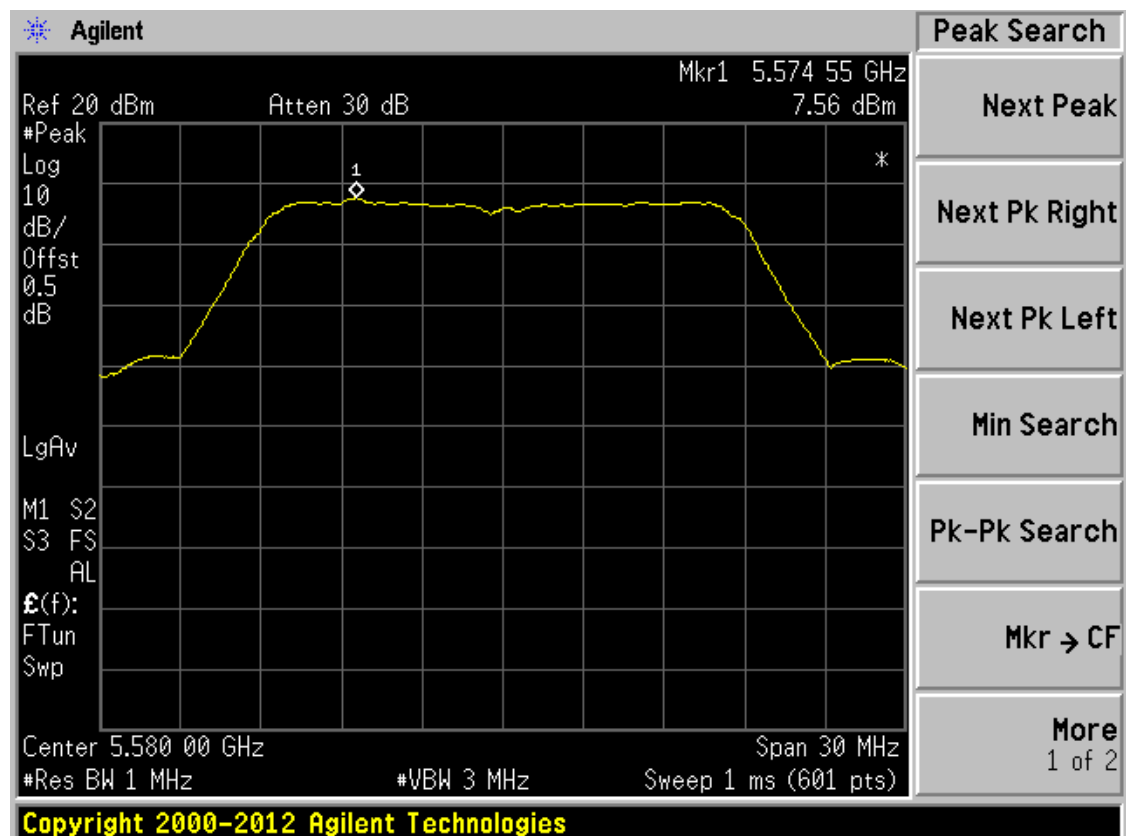
Band III 11n(HT40) CH134



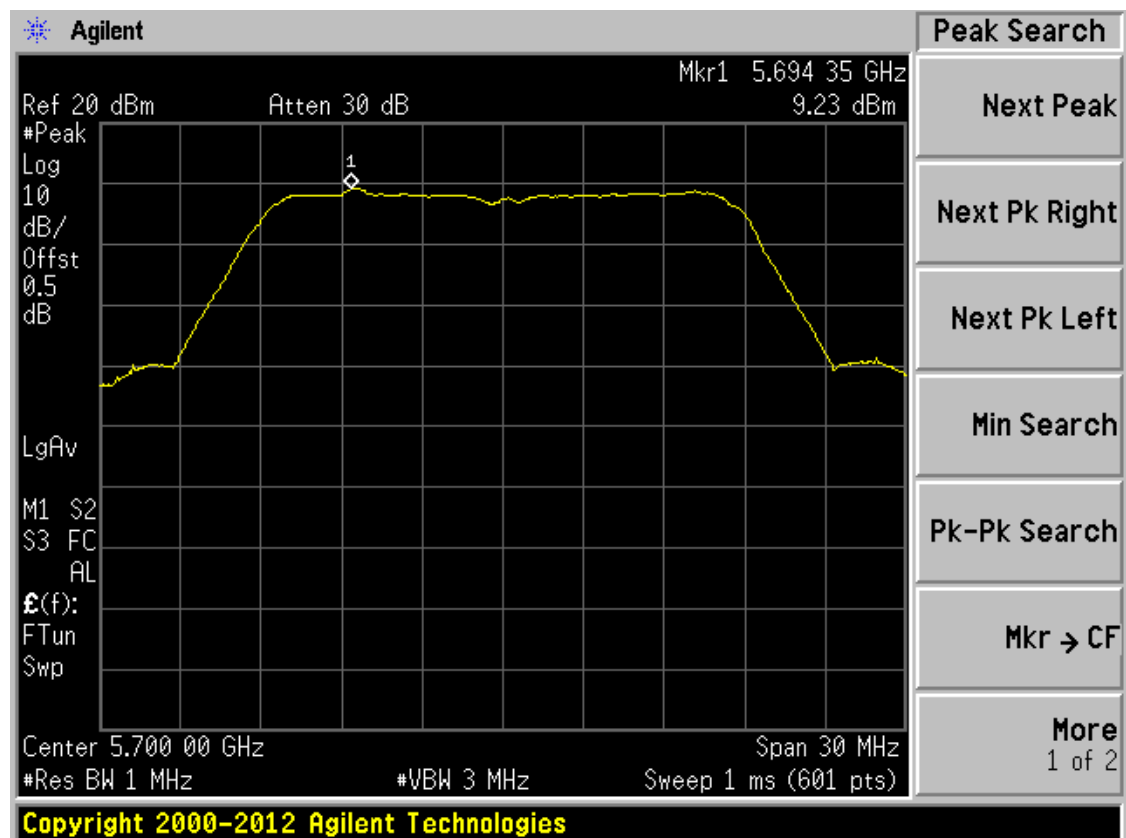
Band III 11ac(HT20) CH100



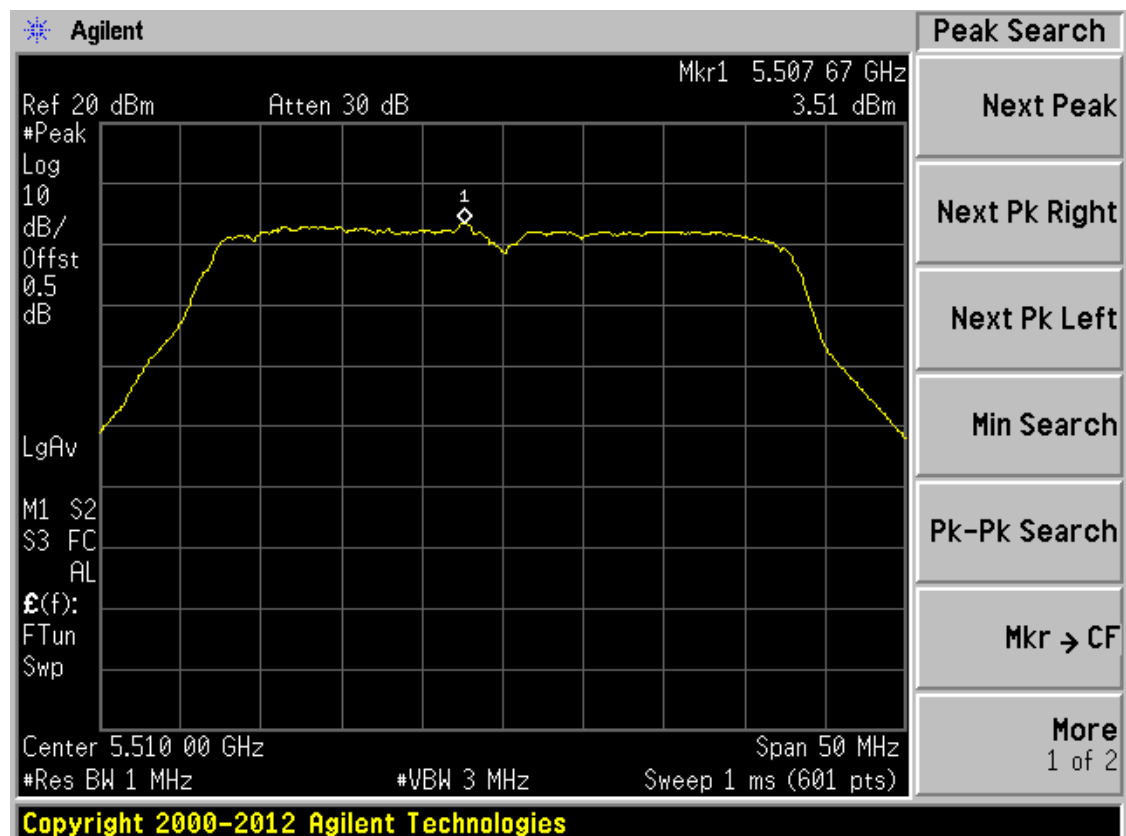
Band III 11ac(HT20) CH116



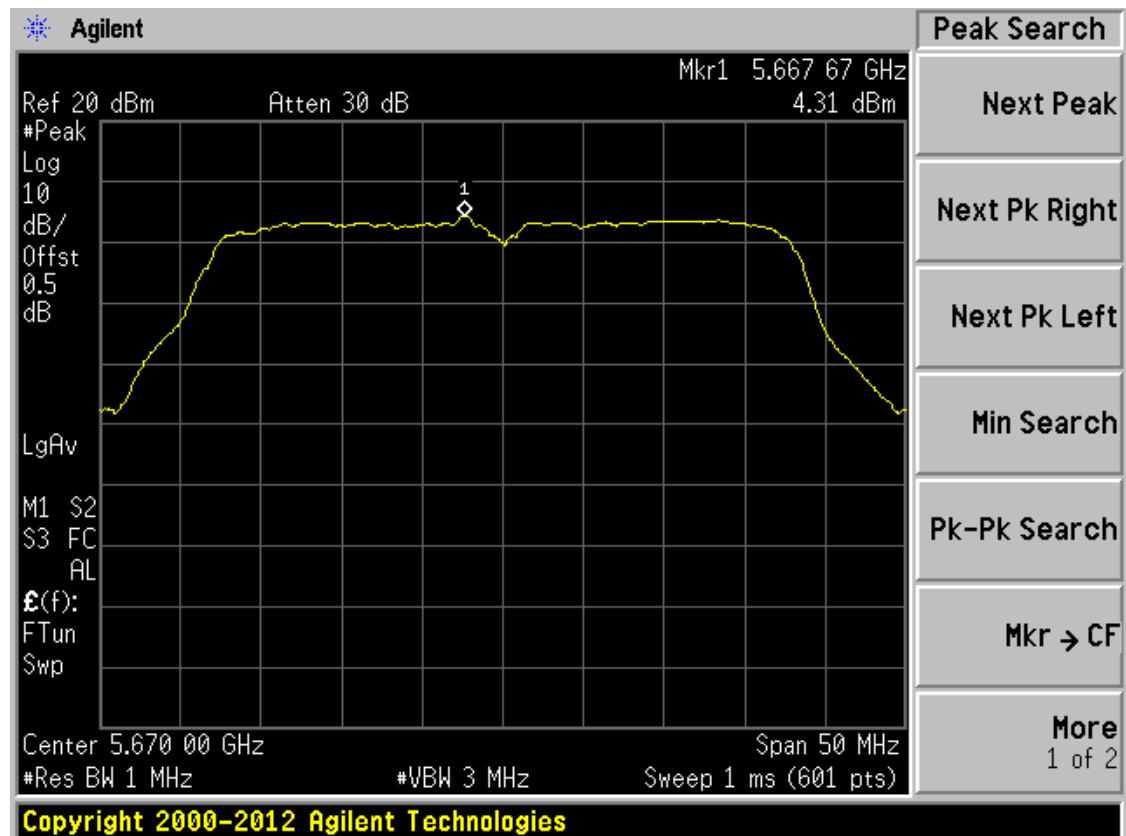
Band III 11ac(HT20) CH140



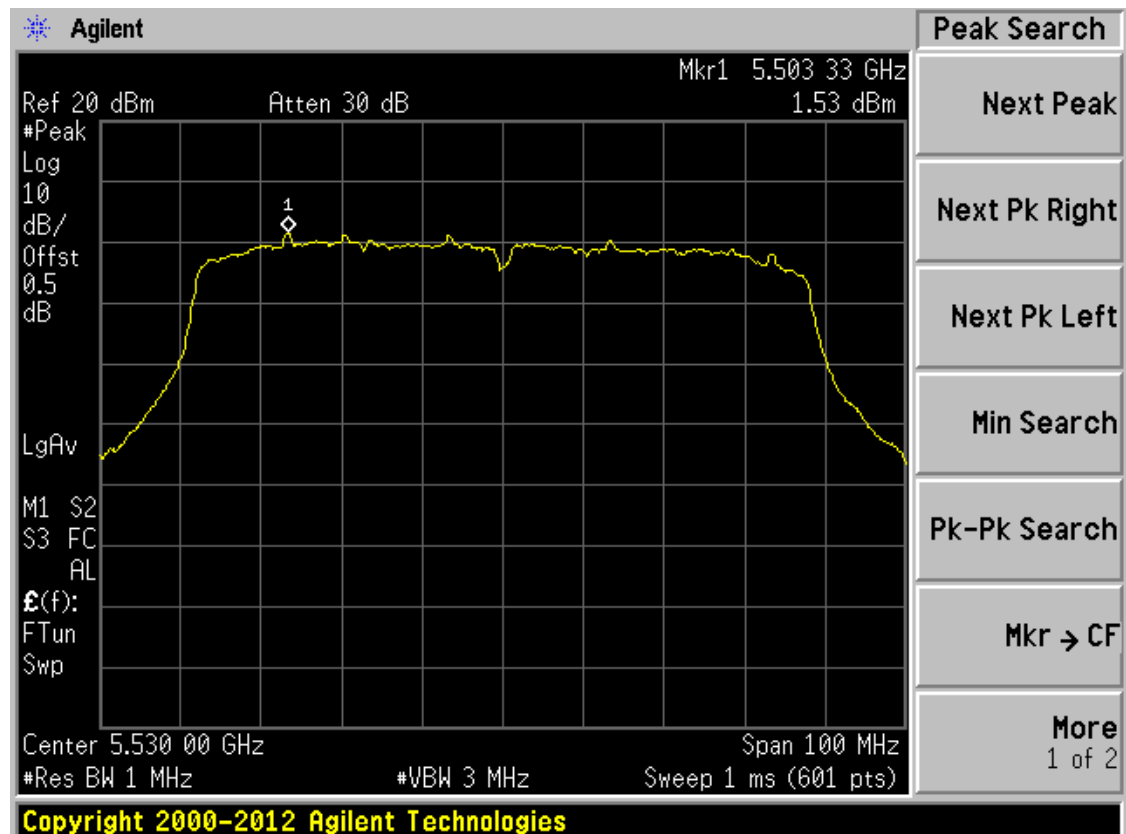
Band III 11ac(HT40) CH102



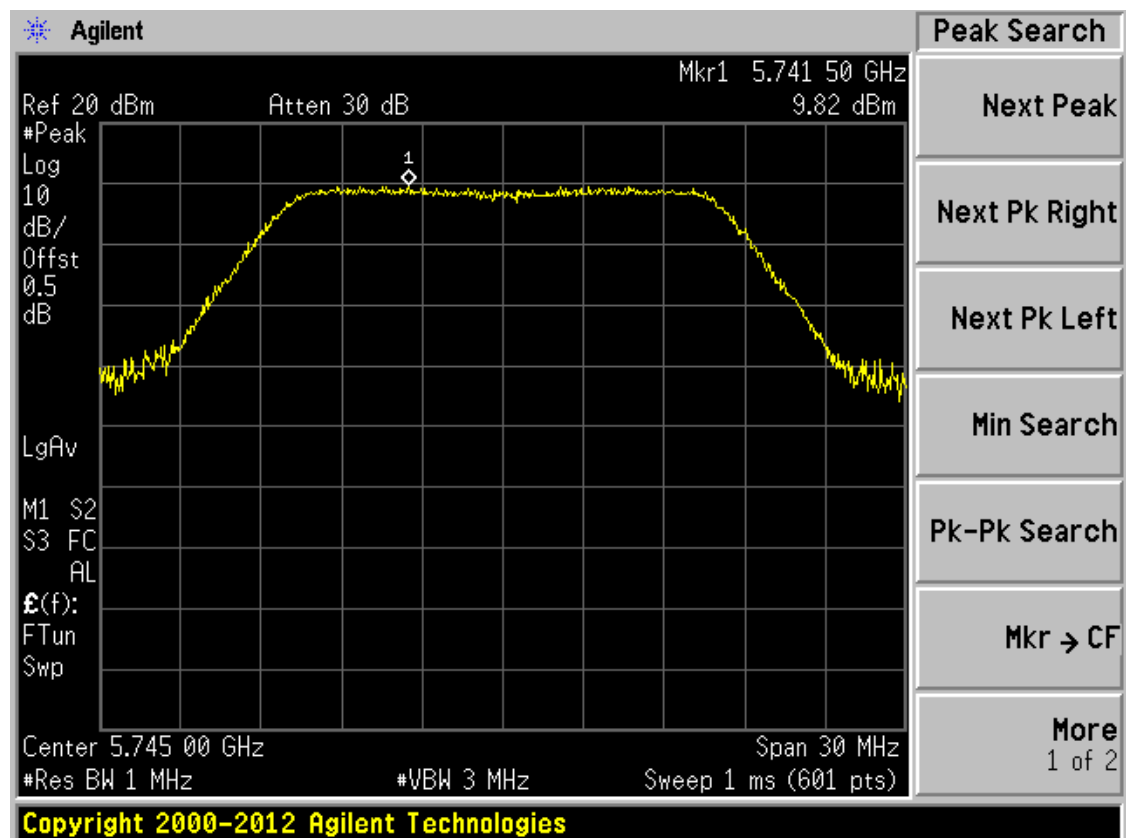
Band III 11ac(HT40) CH134



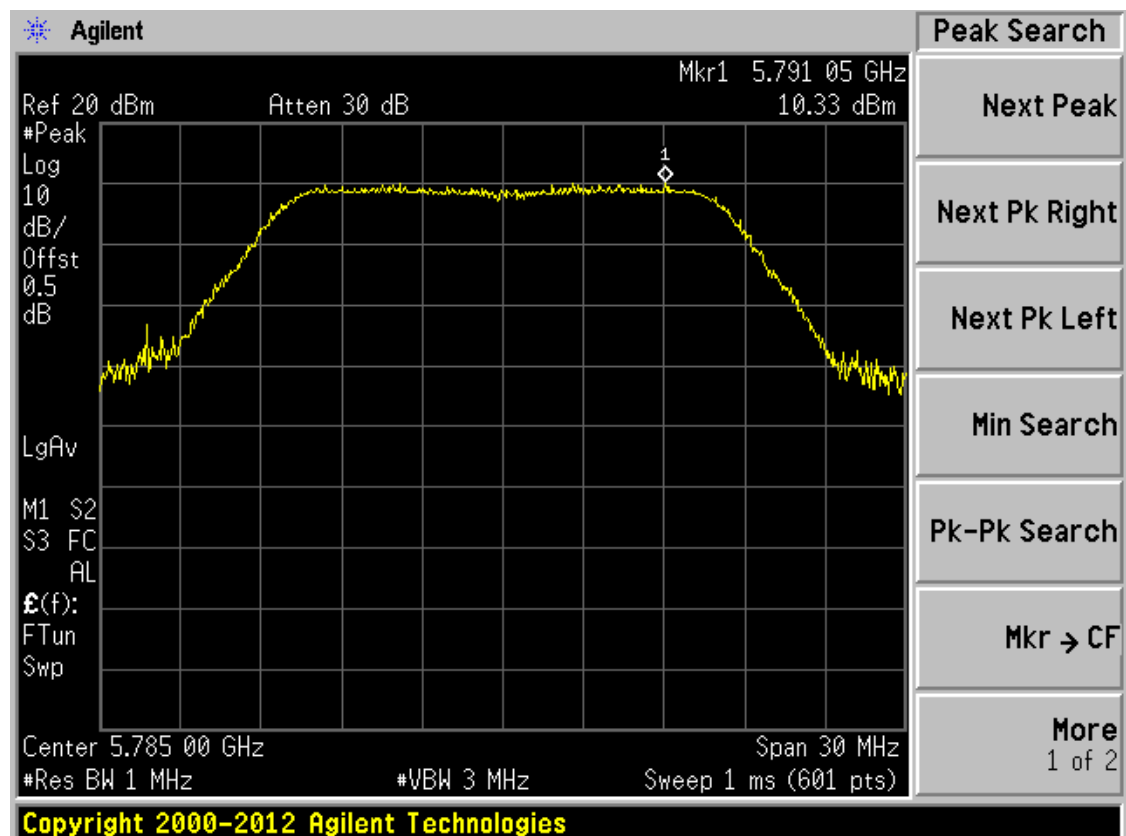
Band III 11ac(HT80) CH106



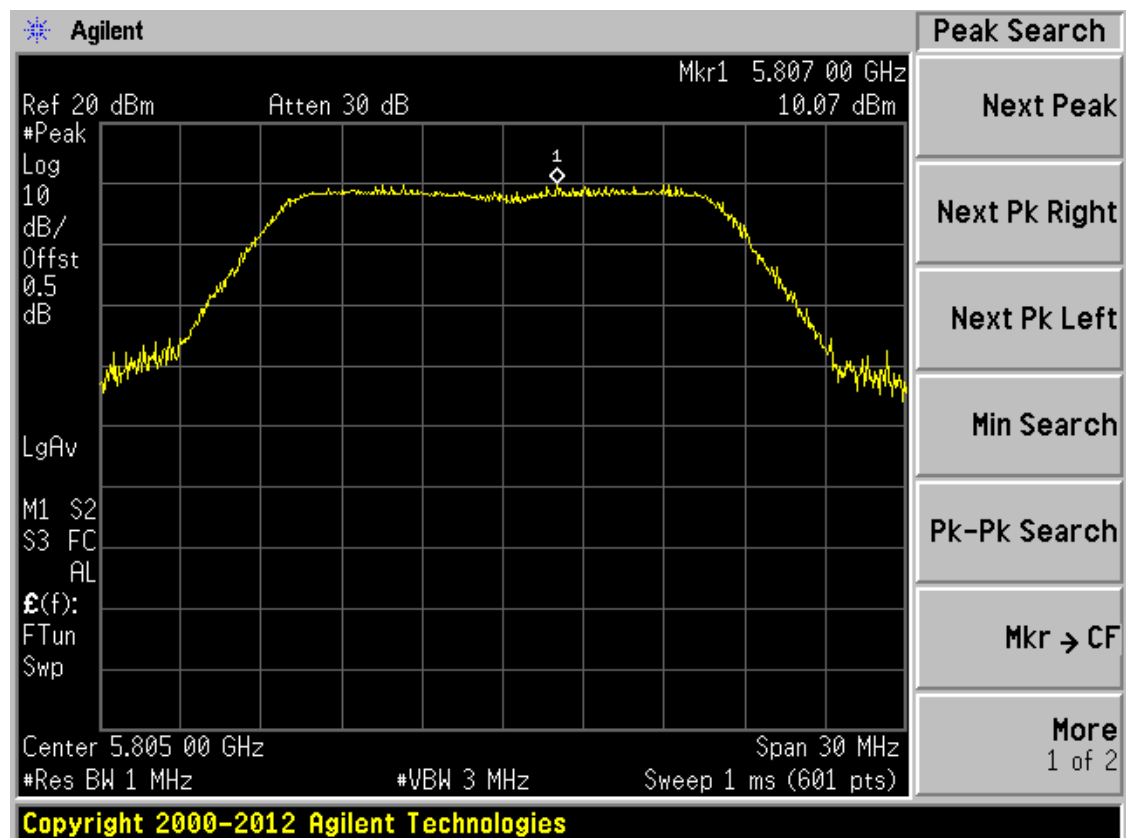
Band IV 11a CH149



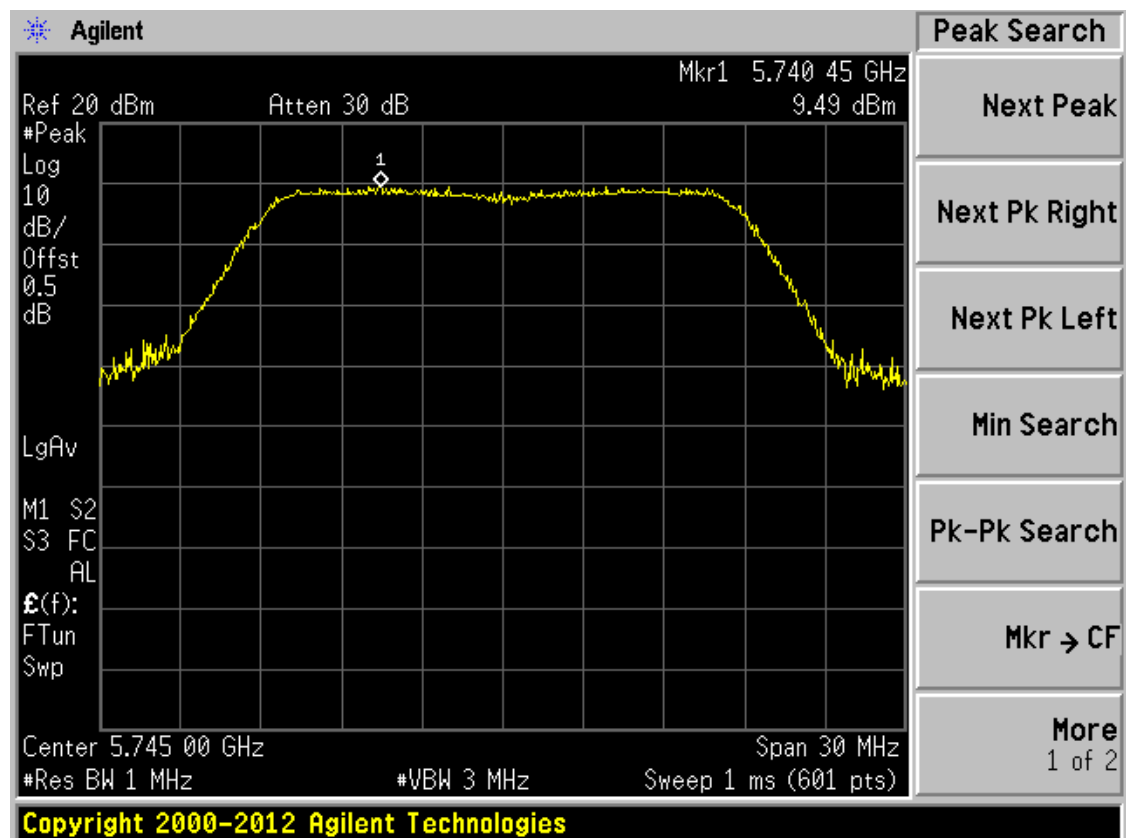
Band IV 11a CH157



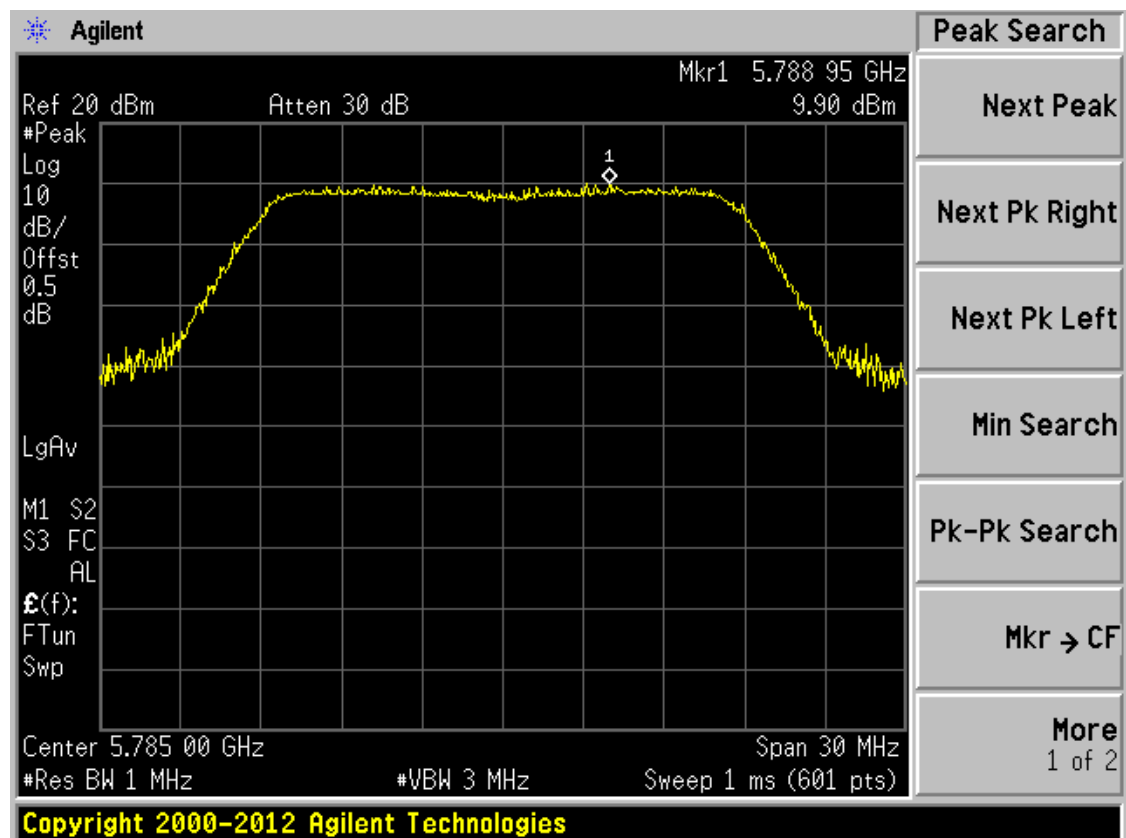
Band IV 11a CH161



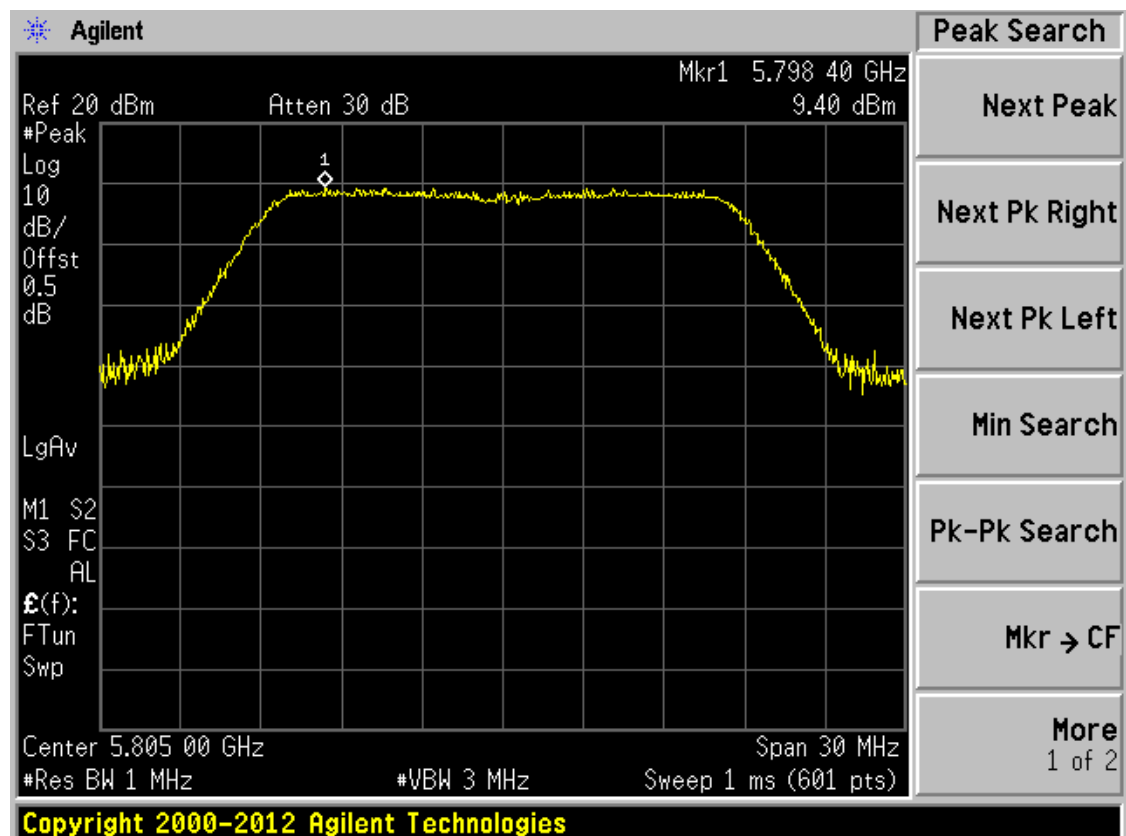
Band IV 11n(HT20) CH149



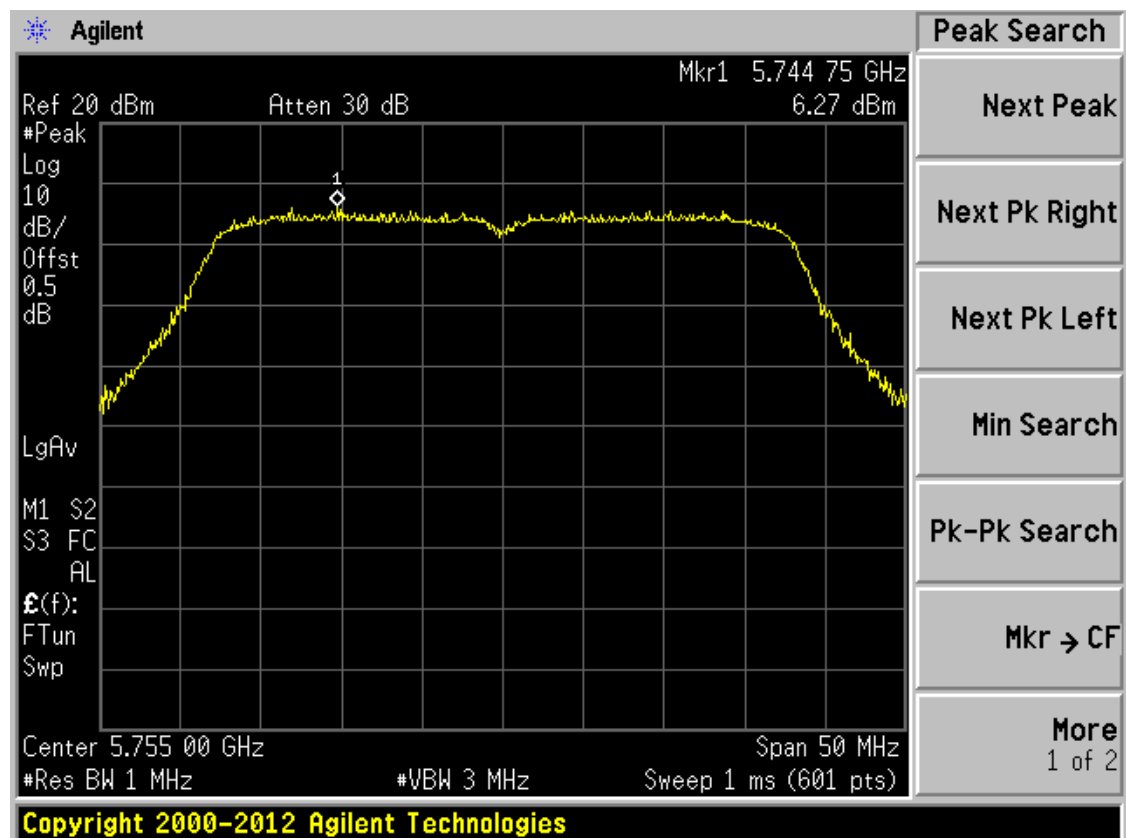
Band IV 11n(HT20) CH157



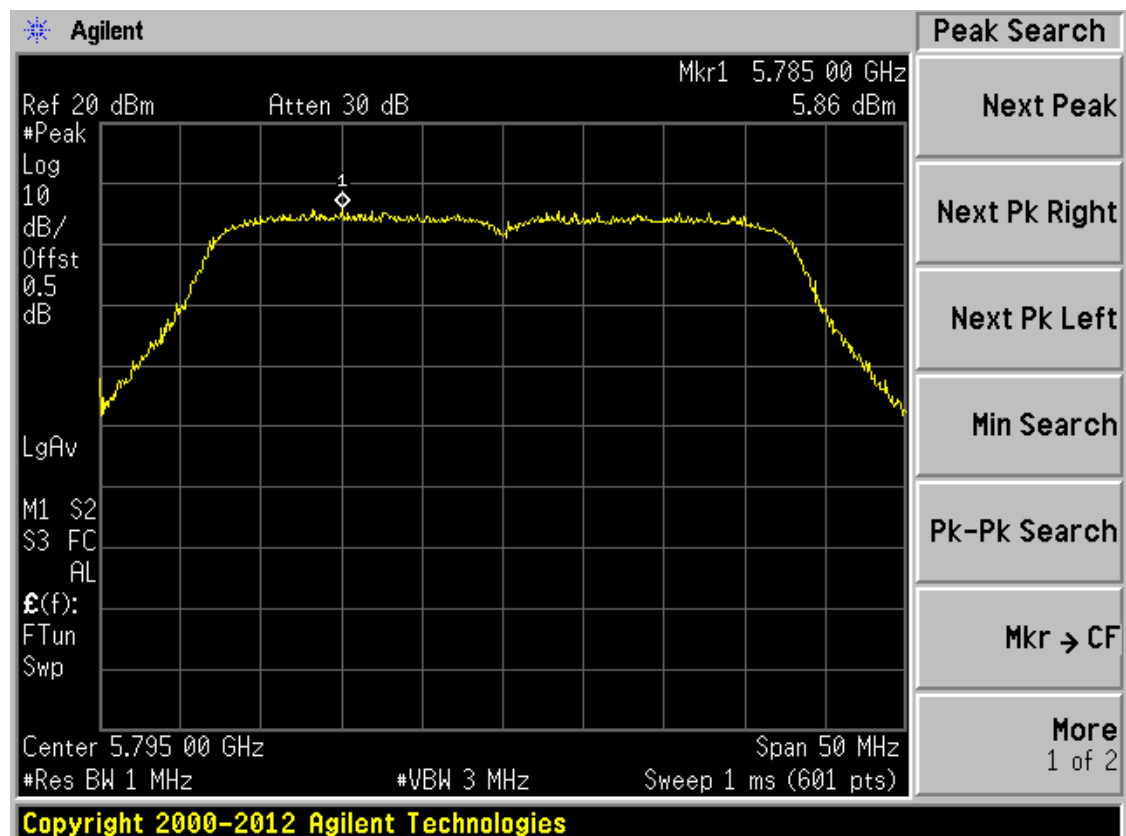
Band IV 11n(HT20) CH161



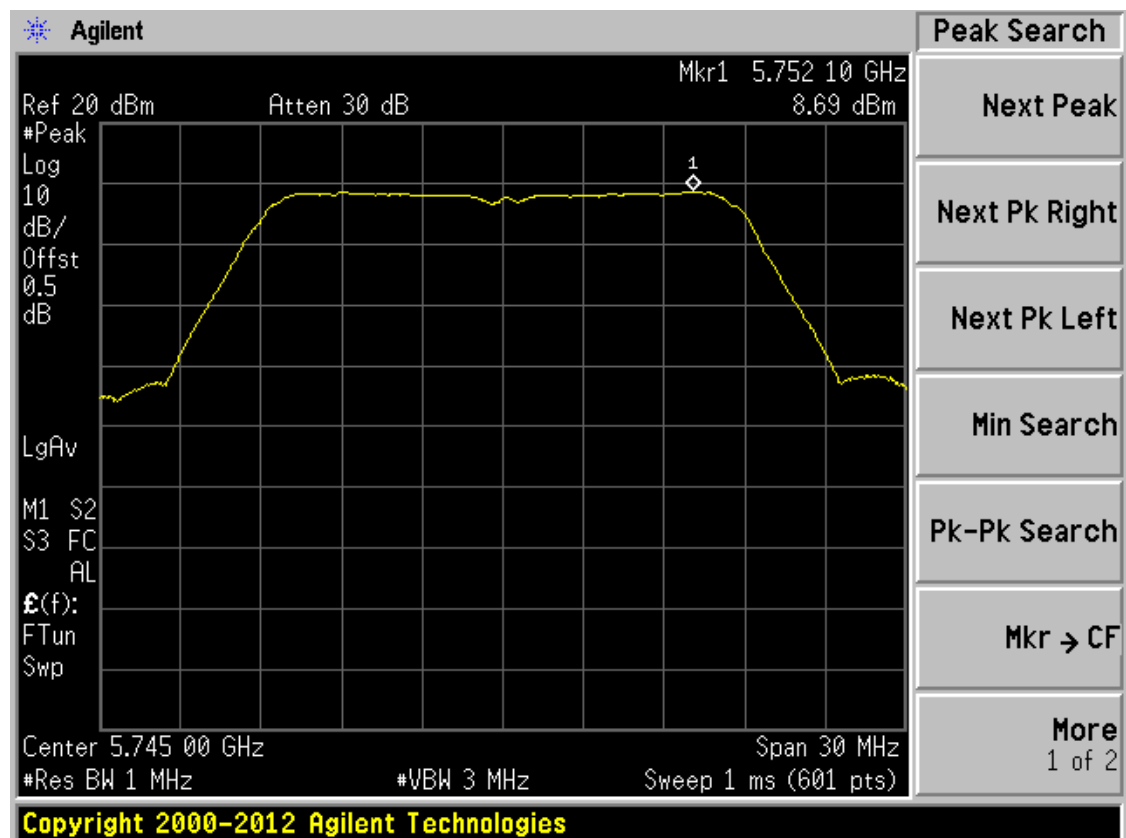
Band IV 11n(HT40) CH151



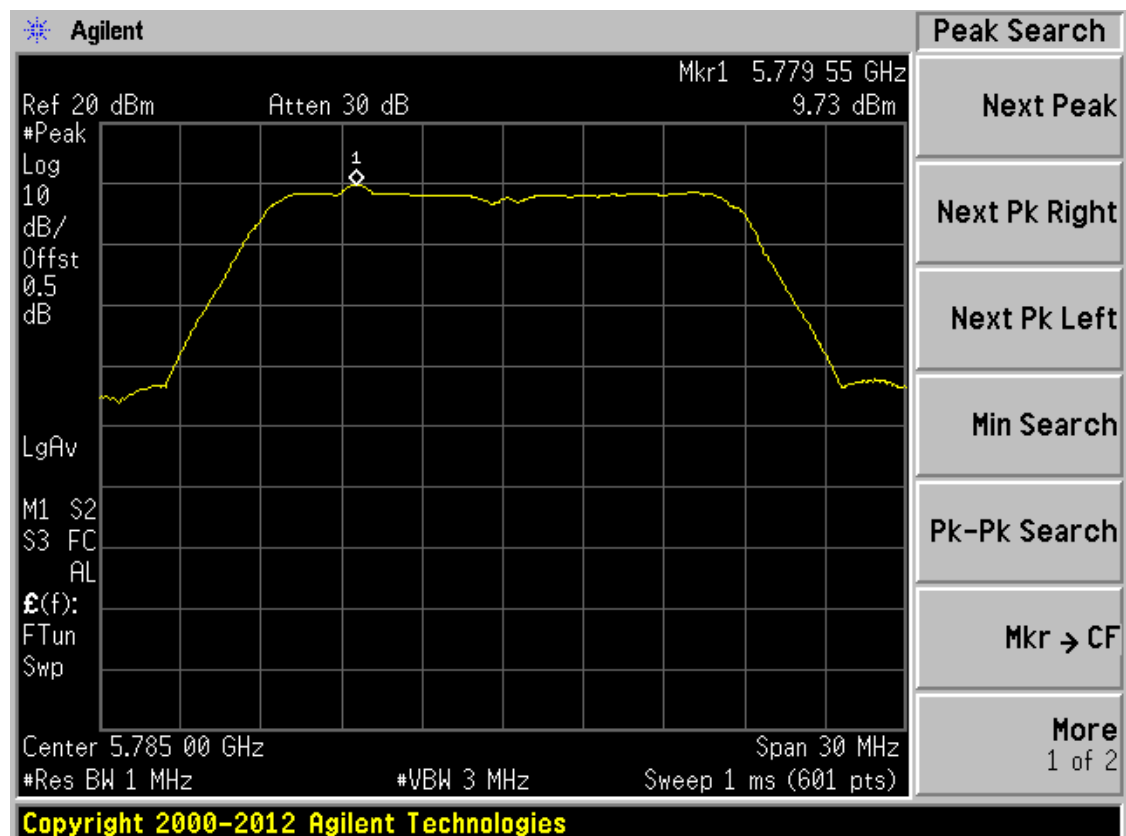
Band IV 11n(HT40) CH159



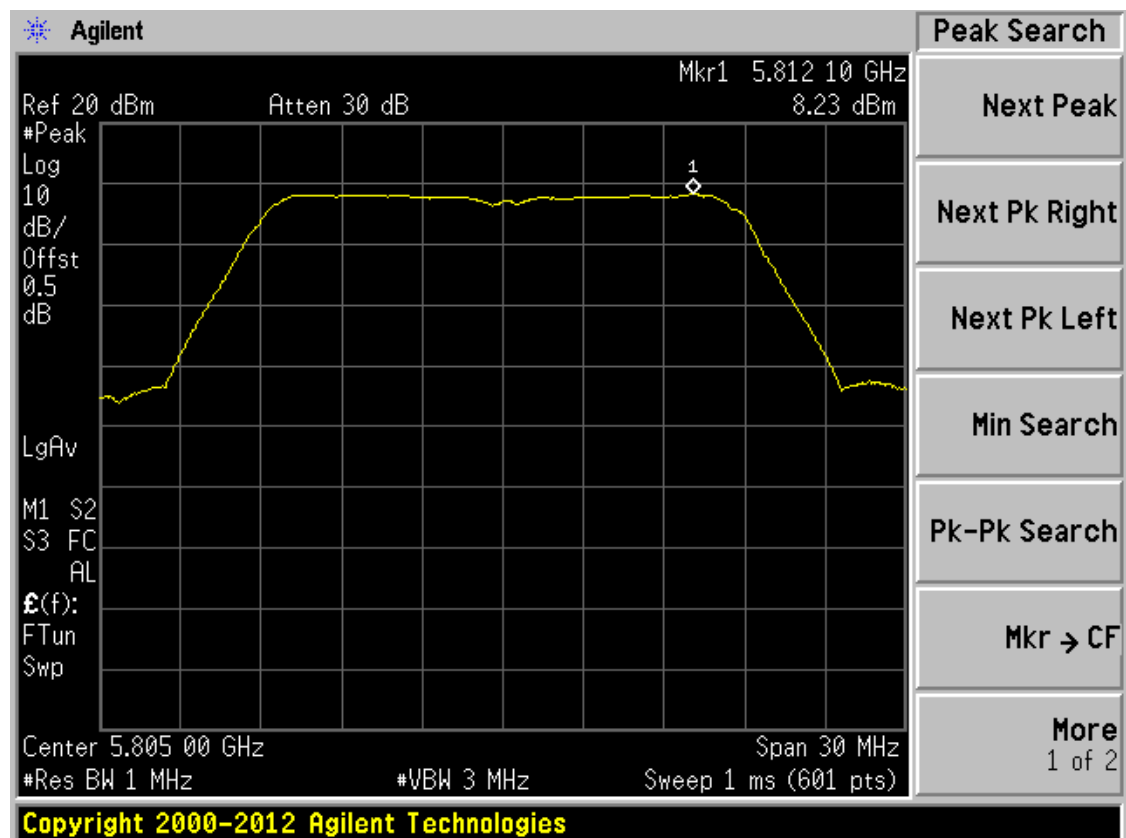
Band IV 11ac(HT20) CH149



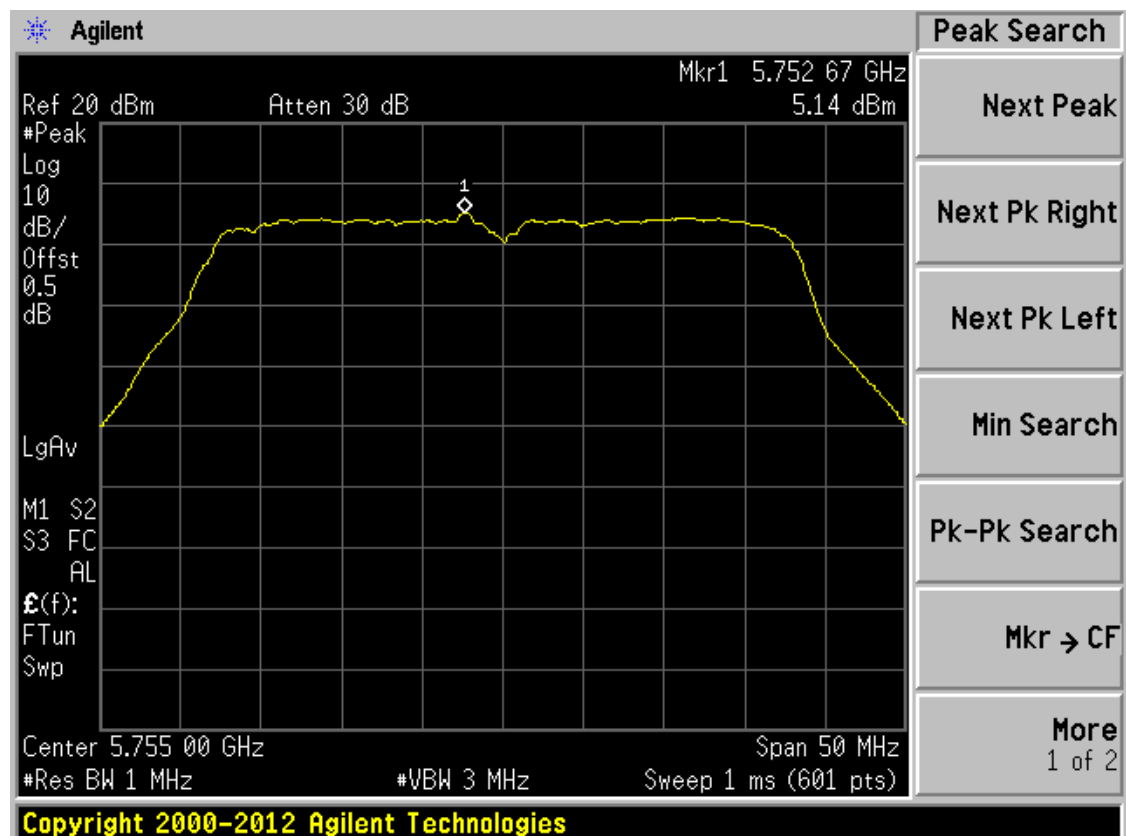
Band IV 11ac(HT20) CH157



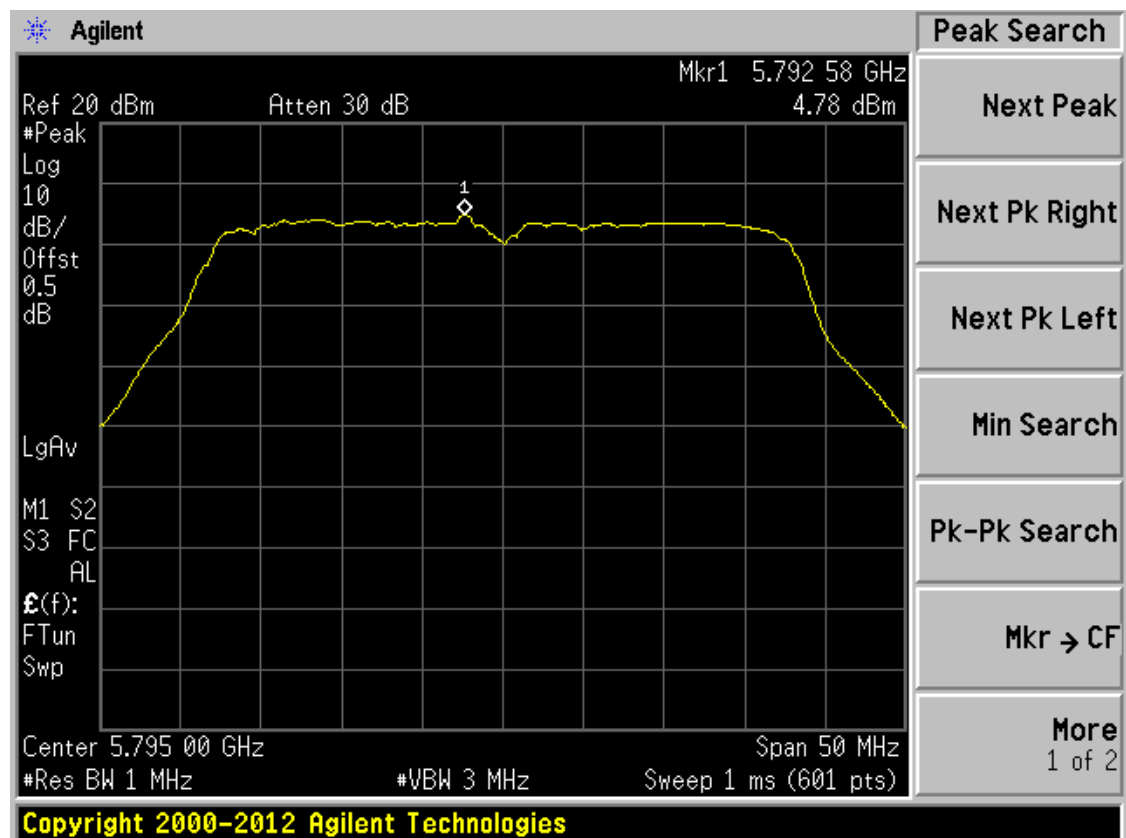
Band IV 11ac(HT20) CH65



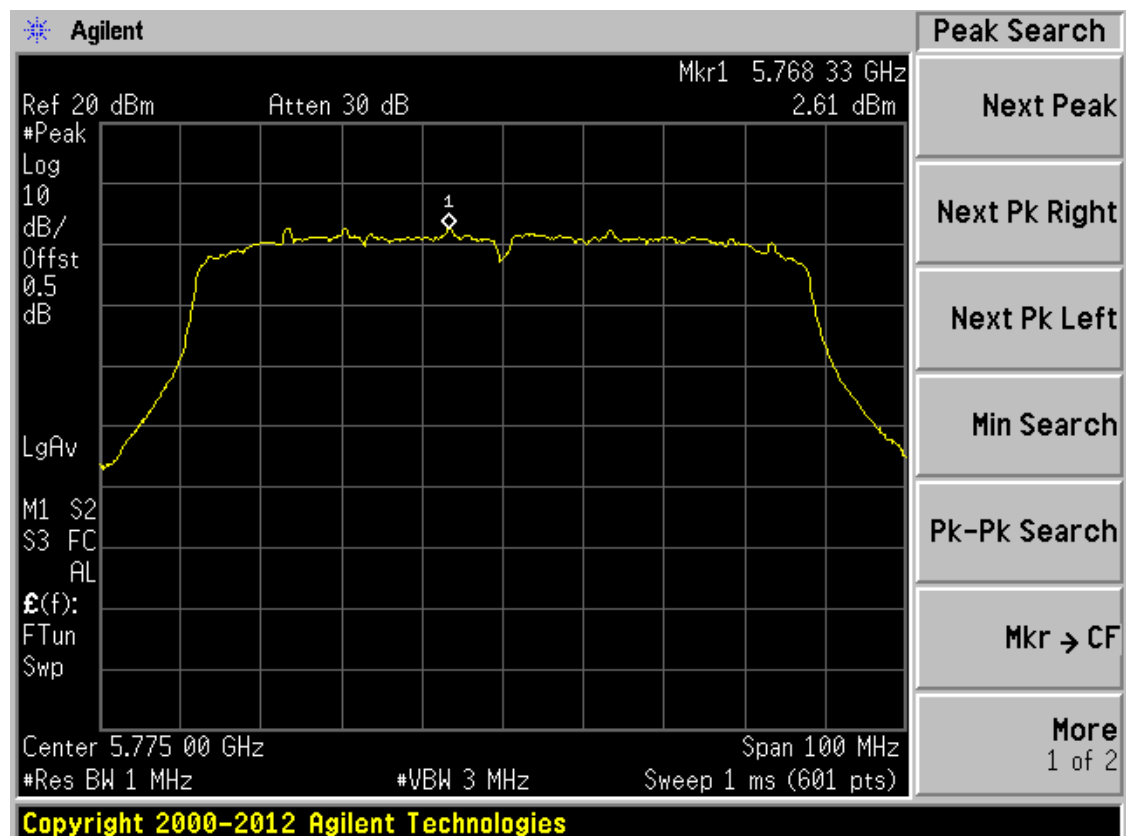
Band IV 11ac(HT40) CH151



Band IV 11ac(HT40) CH159



Band IV 11ac(HT80) CH155



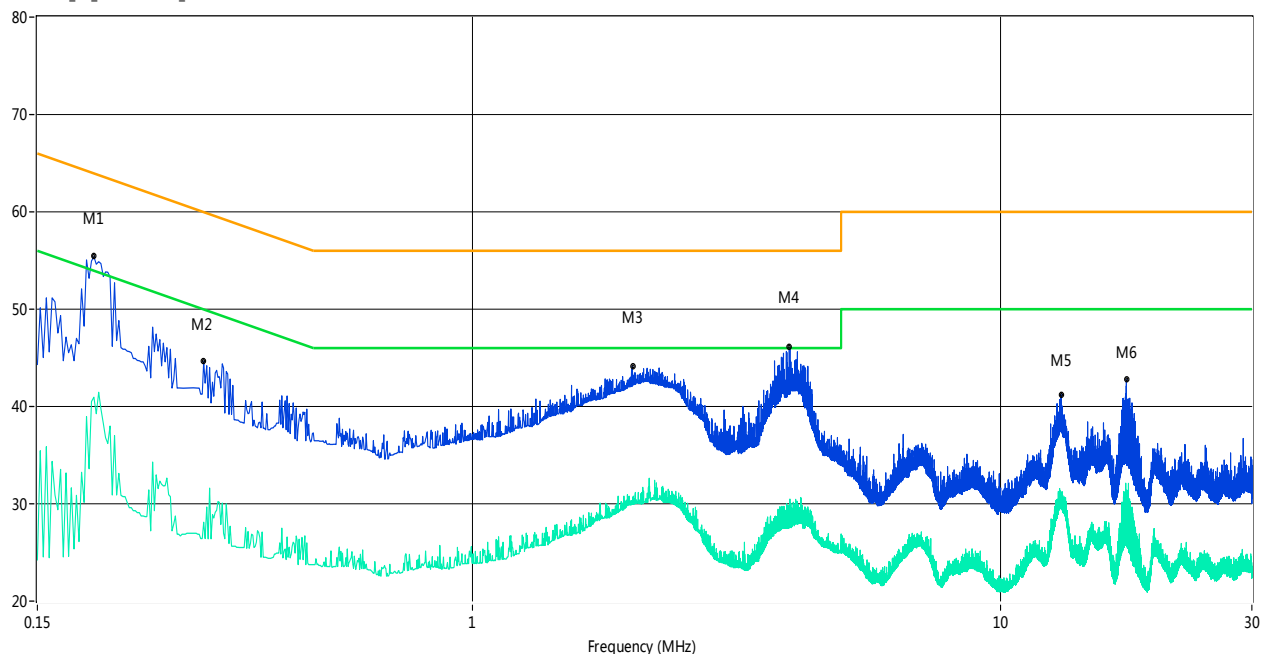
A.5 Conducted Emissions

Note: All configurations have been tested, only the worst configuration shown here.

Test Data and Plots

PHASE L

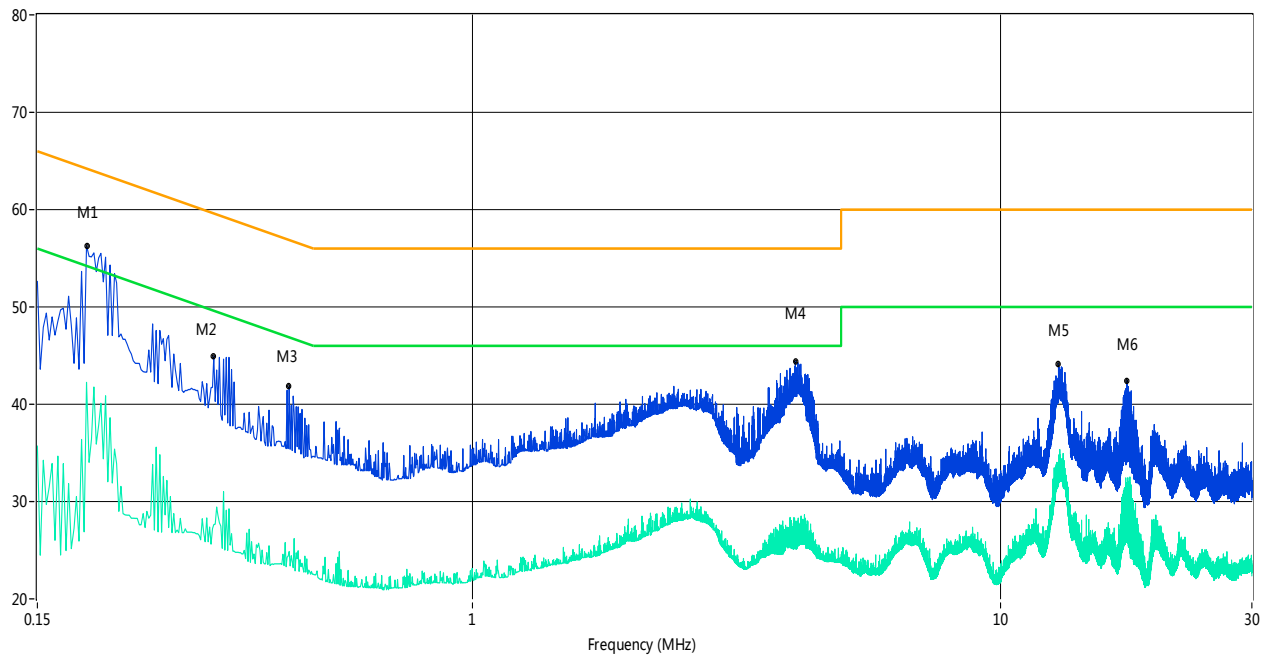
CE Test case_CE_FCC PART 15_ Class B



No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.19	55.4	13.00	64.8	9.40	Peak	L Line	Pass
1**	0.19	41.0	13.00	54.8	13.80	AV	L Line	Pass
2	0.31	44.6	13.00	61.4	16.80	Peak	L Line	Pass
2**	0.31	28.1	13.00	51.4	23.30	AV	L Line	Pass
3	2.01	44.1	13.00	56.0	11.90	Peak	L Line	Pass
3**	2.01	30.1	13.00	46.0	15.90	AV	L Line	Pass
4	3.99	46.1	13.00	56.0	9.90	Peak	L Line	Pass
4**	3.99	27.4	13.00	46.0	18.60	AV	L Line	Pass
5	13.06	41.2	13.00	60.0	18.80	Peak	L Line	Pass
5**	13.06	30.9	13.00	50.0	19.10	AV	L Line	Pass
6	17.36	42.8	13.00	60.0	17.20	Peak	L Line	Pass
6**	17.36	31.3	13.00	50.0	18.70	AV	L Line	Pass

PHASE N

CE Test case_CE_FCC PART 15_ Class B

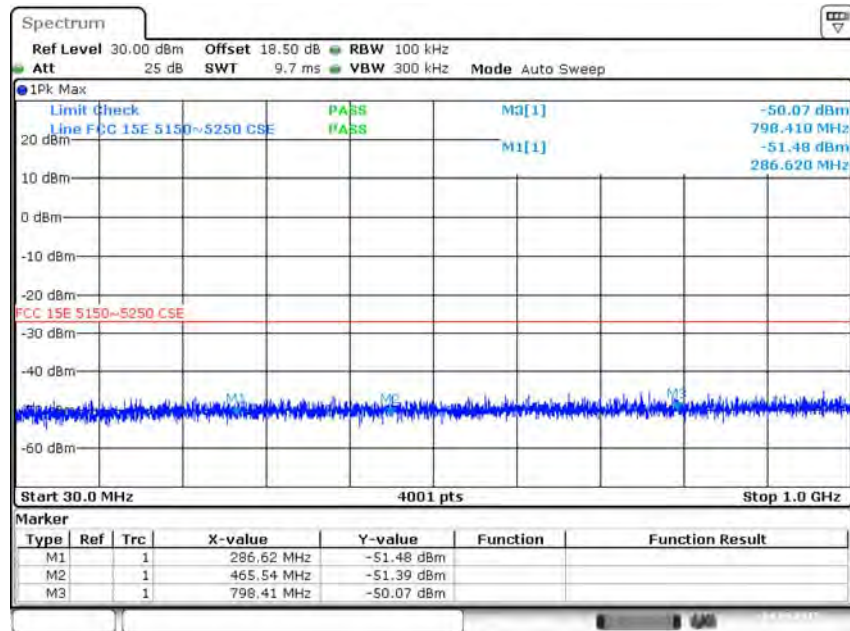


No.	Frequency (MHz)	Results (dBuV)	Factor (dB)	Limit (dBuV)	Margin (dB)	Detector	Line	Verdict
1	0.19	56.3	13.00	65.0	8.70	Peak	N Line	Pass
1**	0.19	42.3	13.00	55.0	12.70	AV	N Line	Pass
2	0.32	44.9	13.00	61.0	16.10	Peak	N Line	Pass
2**	0.32	27.6	13.00	51.0	23.40	AV	N Line	Pass
3	0.45	41.9	13.00	57.4	15.50	Peak	N Line	Pass
3**	0.45	24.9	13.00	47.4	22.50	AV	N Line	Pass
4	4.09	44.4	13.00	56.0	11.60	Peak	N Line	Pass
4**	4.09	27.6	13.00	46.0	18.40	AV	N Line	Pass
5	12.91	44.2	13.00	60.0	15.80	Peak	N Line	Pass
5**	12.91	33.6	13.00	50.0	16.40	AV	N Line	Pass
6	17.40	42.4	13.00	60.0	17.60	Peak	N Line	Pass
6**	17.40	30.8	13.00	50.0	19.20	AV	N Line	Pass

A.6 Conducted Spurious Emission

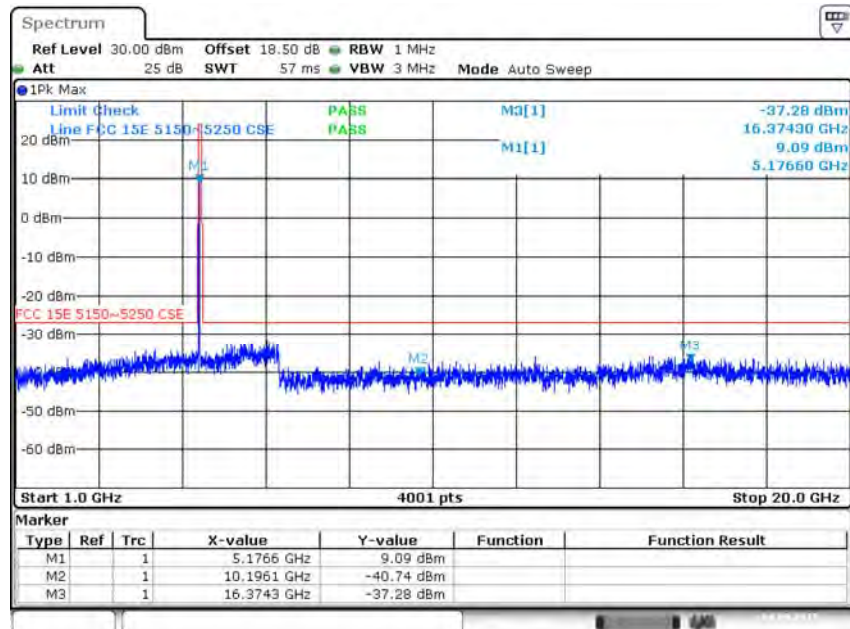
Note: In 30 MHz-1000 MHz and 20 GHz-40 GHz, all configurations have been tested, only the worst configuration shown here.

Band I 11a CH36 (30 ~ 1000 MHz)



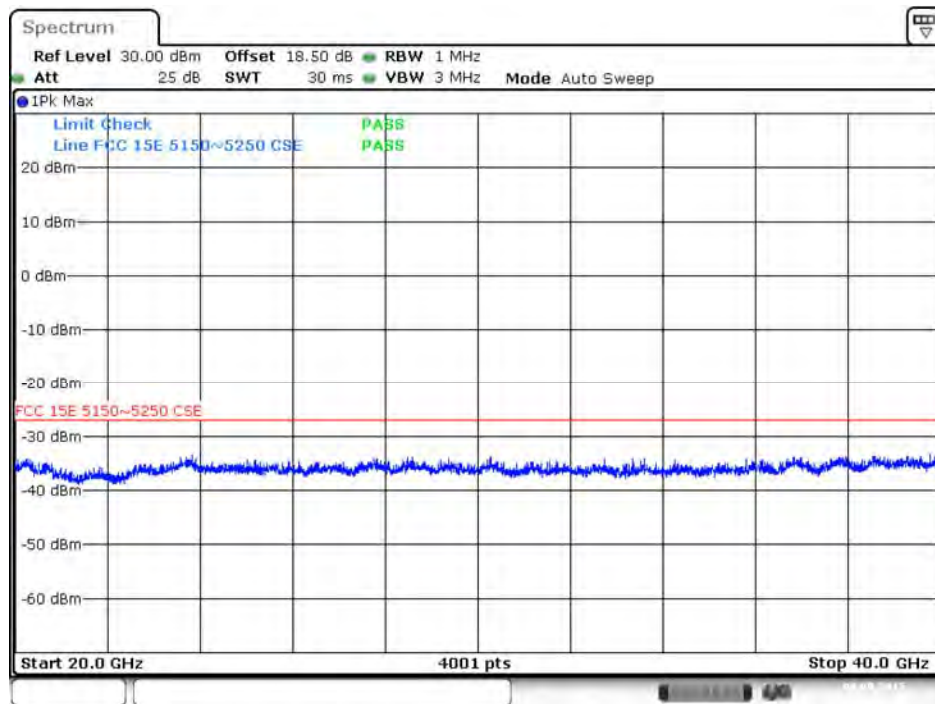
Date: 4 SEP.2015 15:01:57

Band I 11a CH36 (1 ~ 20 GHz)



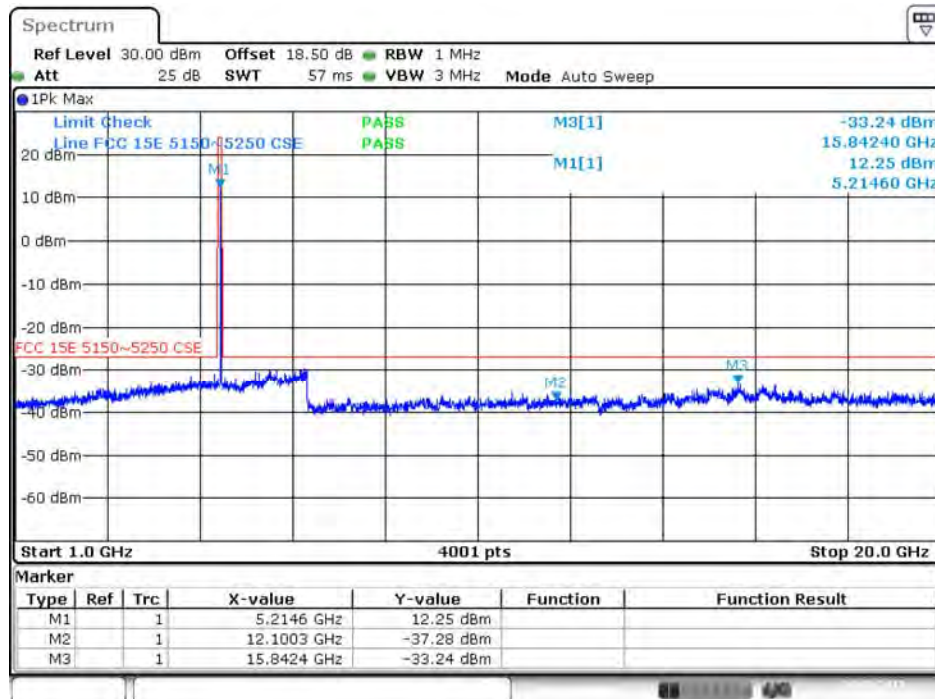
Date: 4 SEP.2015 15:20:16

Band I 11a CH36 (20 ~ 40 GHz)



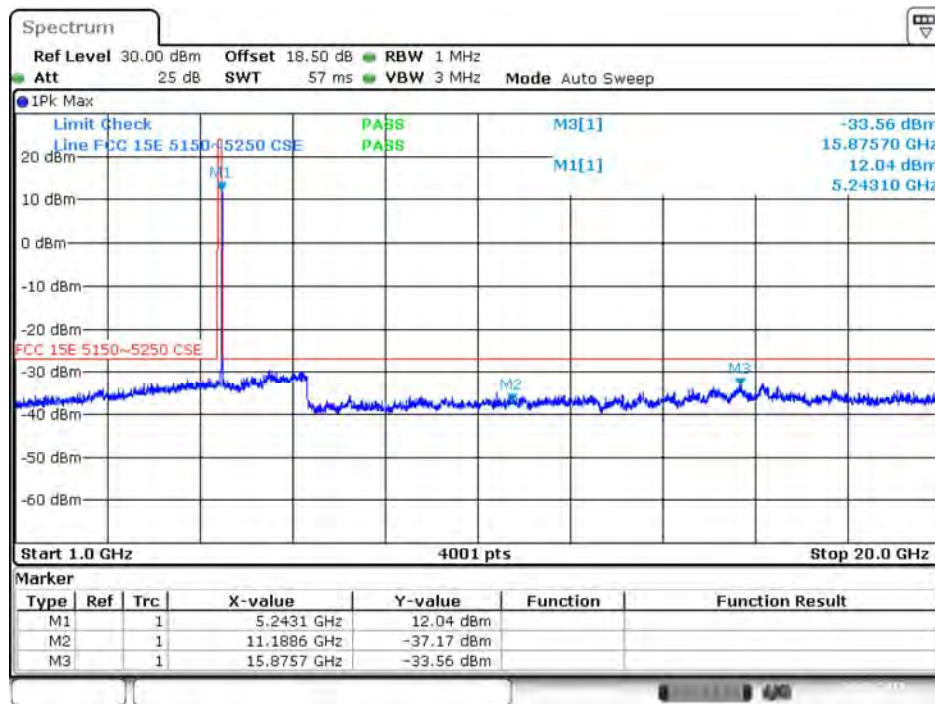
Date: 4.SEP.2015 15:09:50

Band I 11a CH44 (1 ~ 20 GHz)



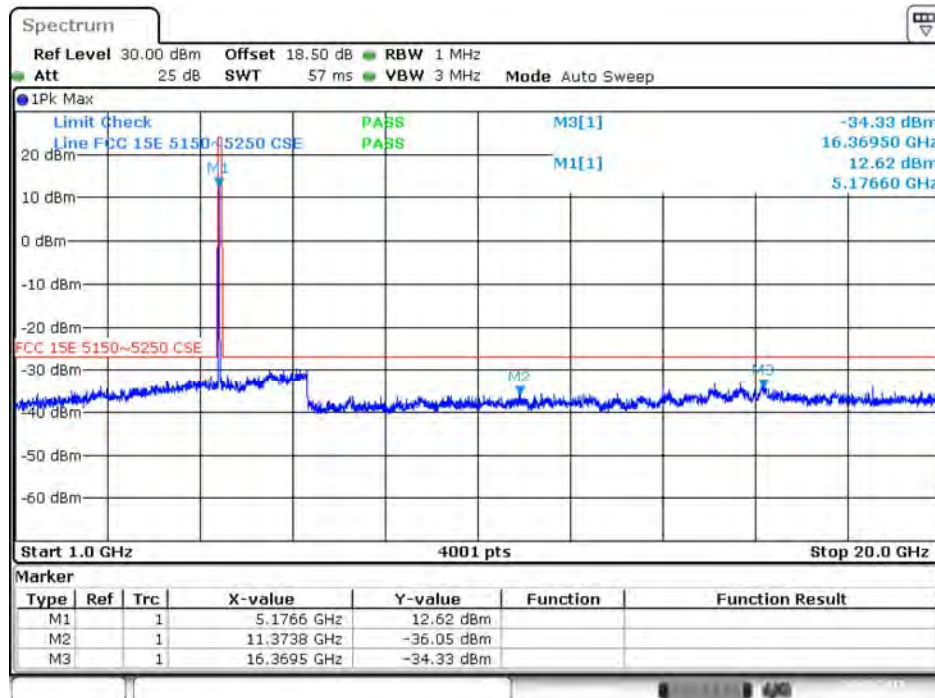
Date: 4.SEP.2015 15:21:57

Band I 11a CH48 (1 ~ 20 GHz)



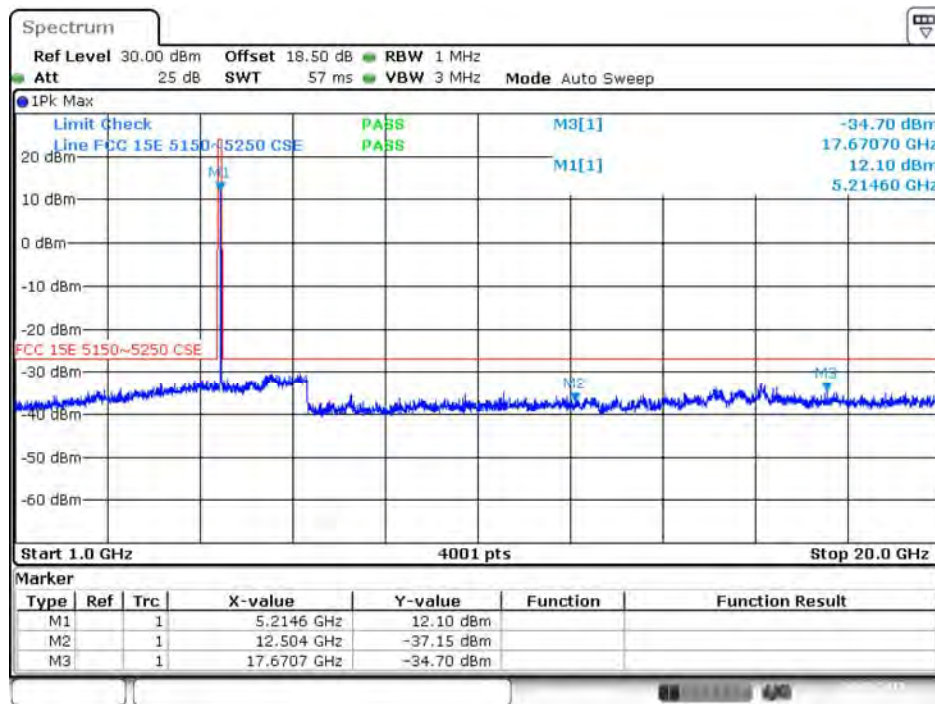
Date: 4.SEP.2015 15:26:42

Band I 11n(HT20) CH36 (1 ~ 20 GHz)



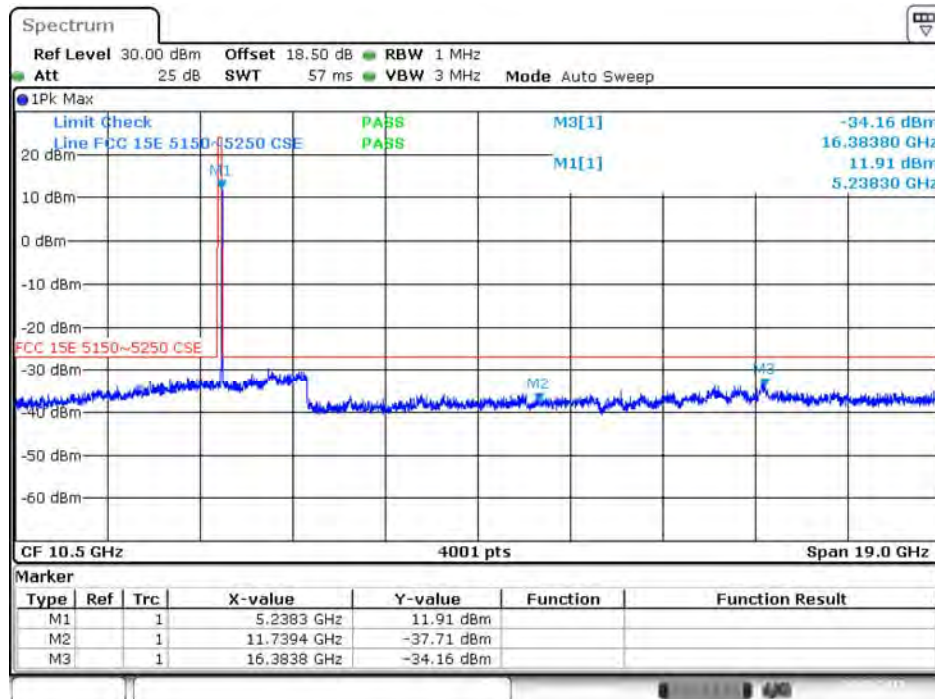
Date: 4.SEP.2015 15:27:49

Band I 11n(HT20) CH44 (1 ~ 20 GHz)



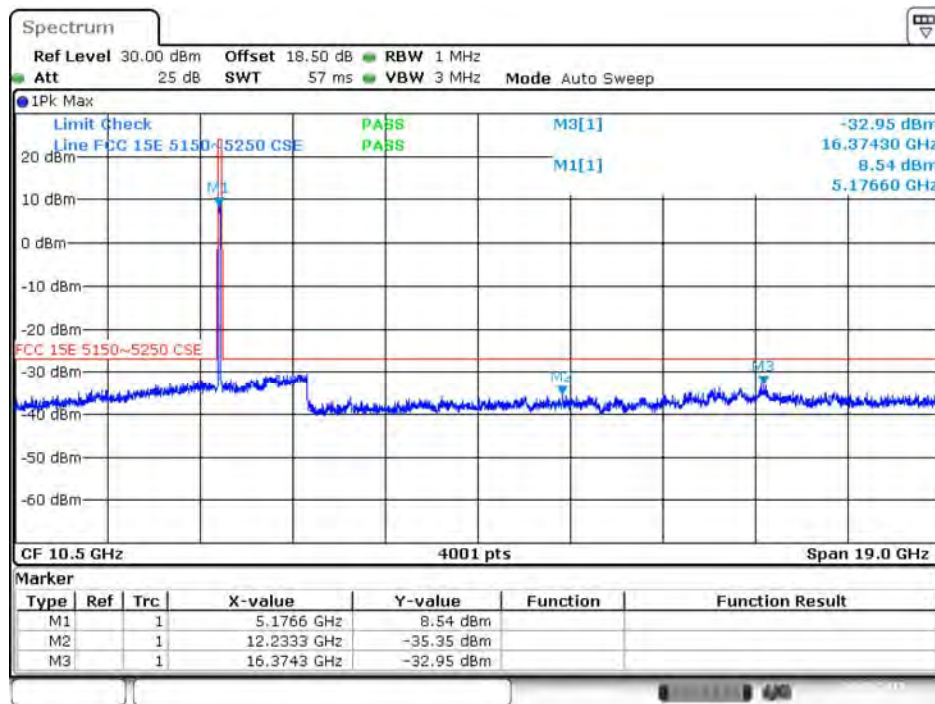
Date: 4.SEP.2015 15:28:30

Band I 11n(HT20) CH48 (1 ~ 20 GHz)



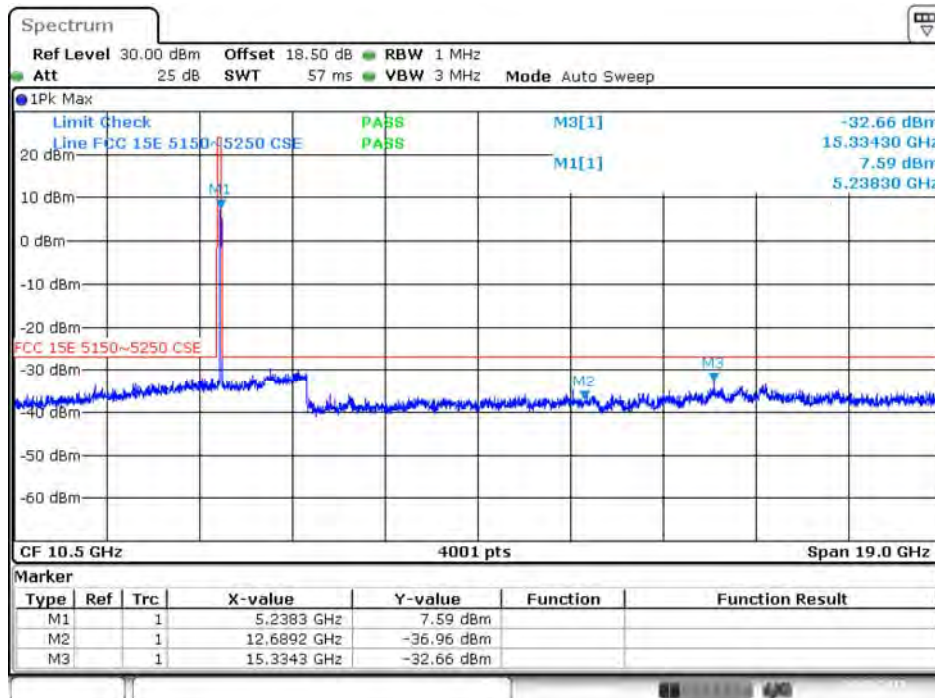
Date: 4.SEP.2015 15:29:15

Band I 11n(HT40) CH38 (1 ~ 20 GHz)



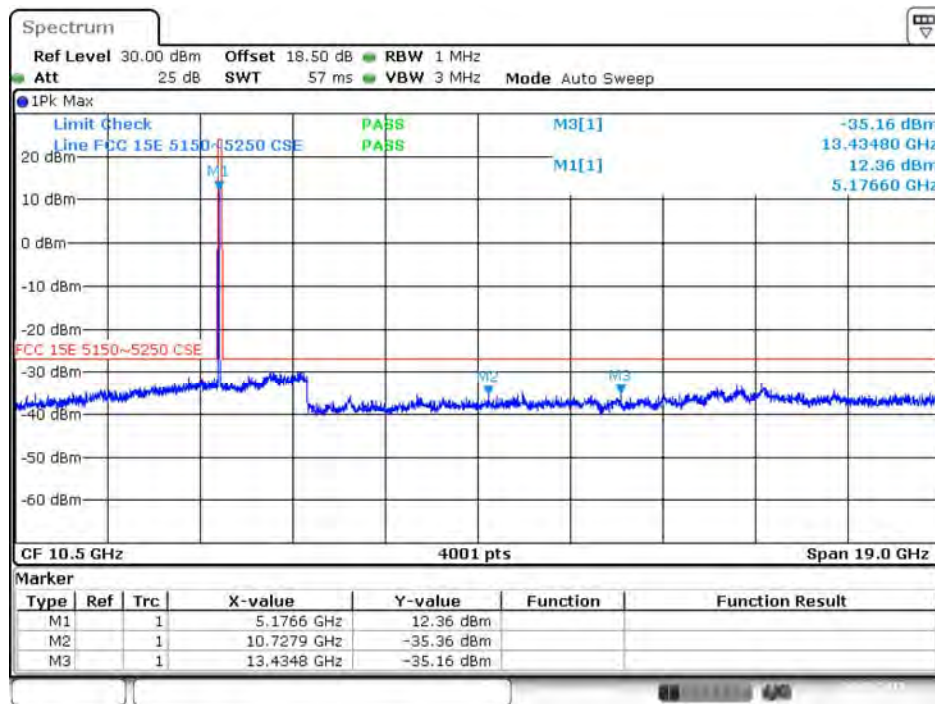
Date: 4.SEP.2015 15:30:30

Band I 11n(HT40) CH46 (1 ~ 20 GHz)



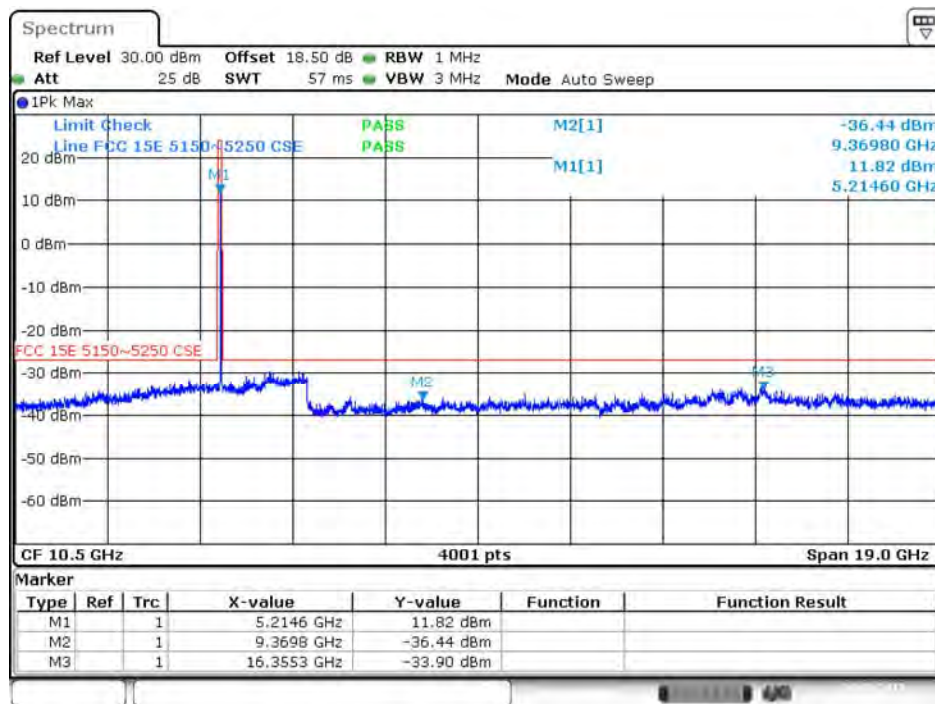
Date: 4.SEP.2015 15:35:55

Band I 11ac(HT20) CH36 (1 ~ 20 GHz)



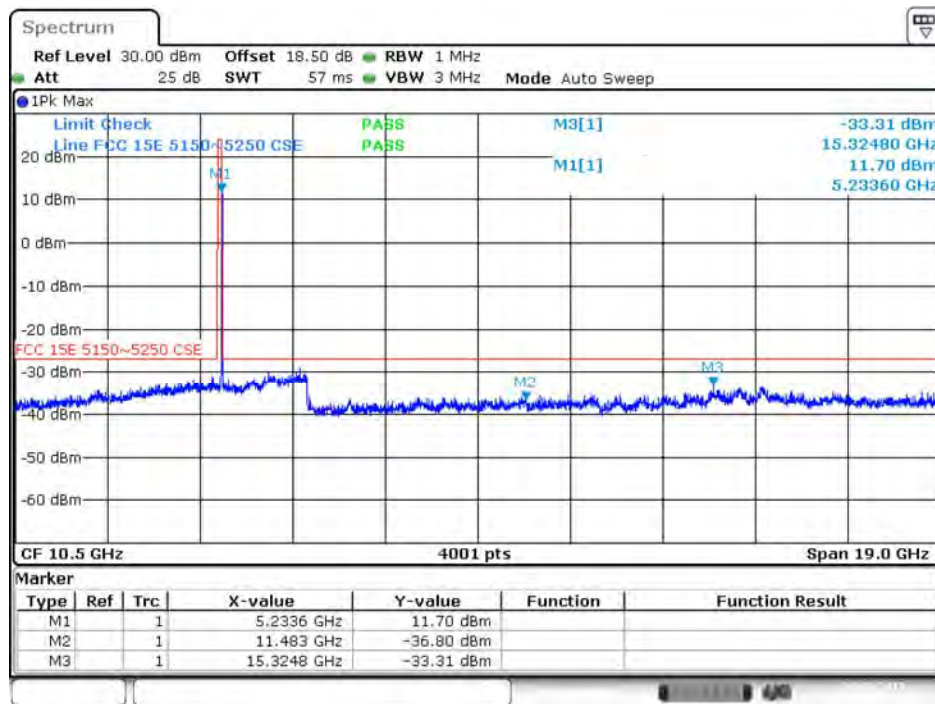
Date: 4.SEP.2015 15:32:35

Band I 11ac(HT20) CH44 (1 ~ 20 GHz)



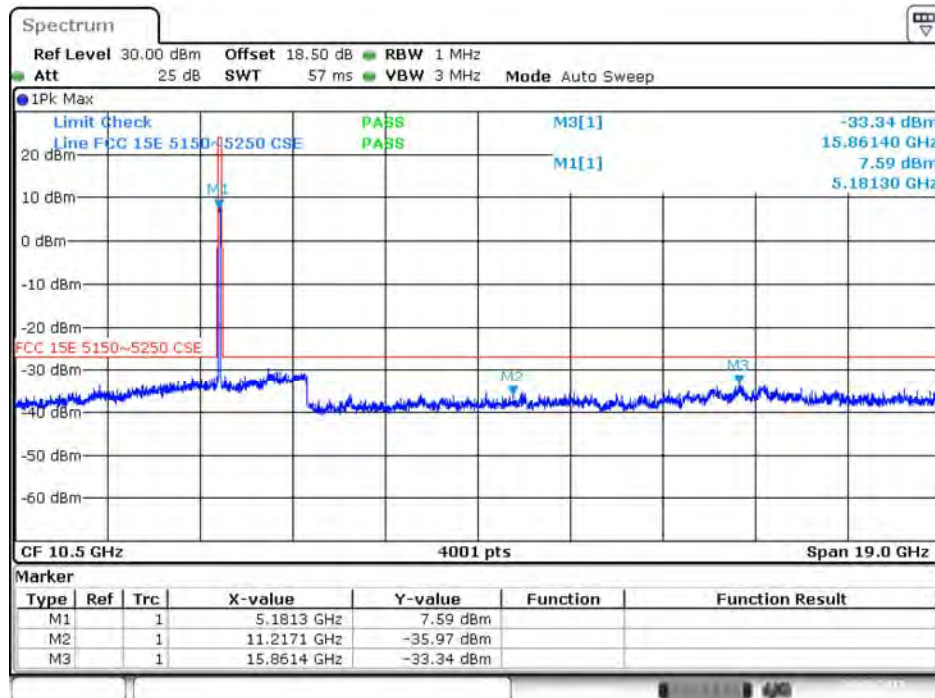
Date: 4.SEP.2015 15:33:23

Band I 11ac(HT20) CH48 (1 ~ 20 GHz)



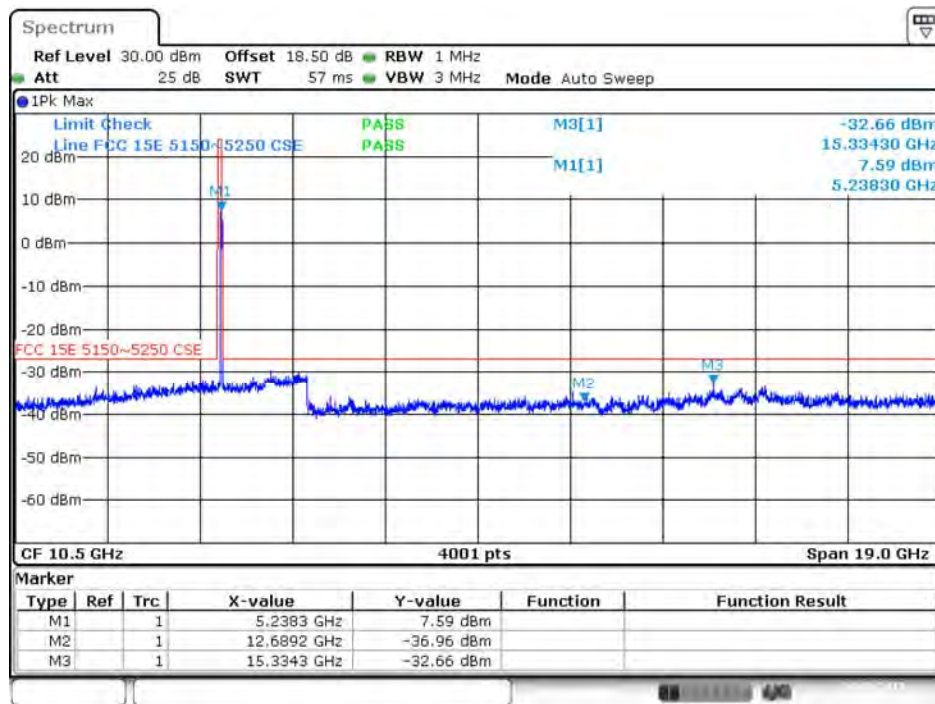
Date: 4.SEP.2015 15:34:09

Band I 11ac(HT40) CH38 (1 ~ 20 GHz)



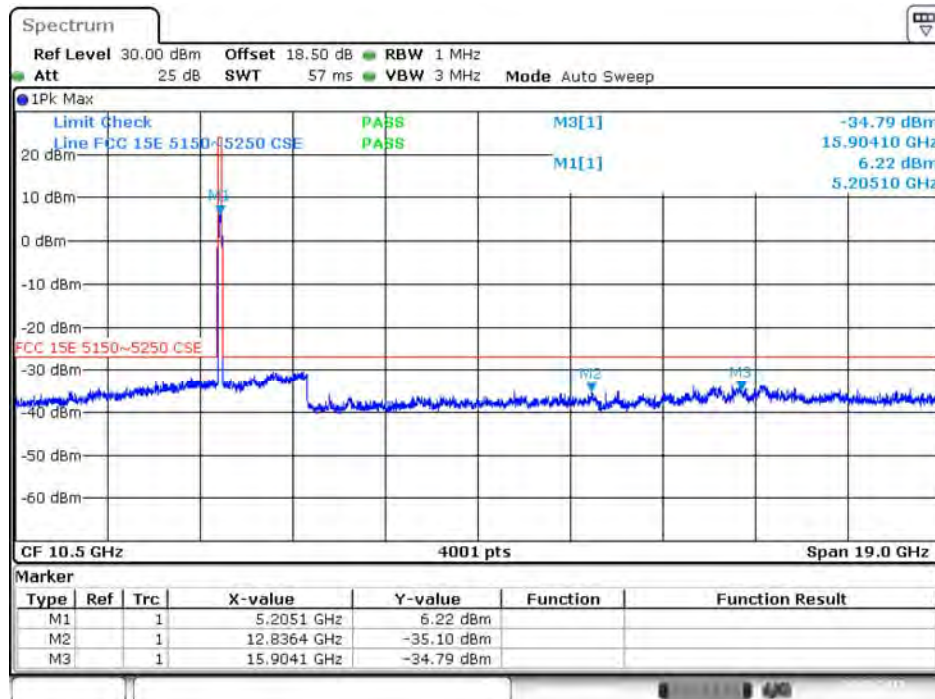
Date: 4.SEP.2015 15:35:01

Band I 11ac(HT40) CH46 (1 ~ 20 GHz)



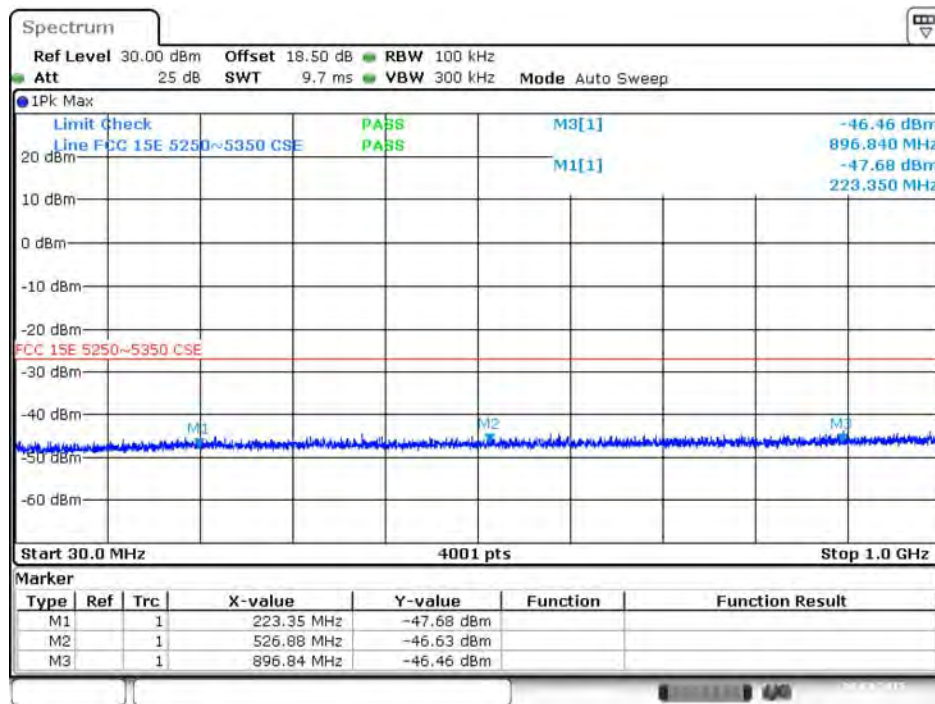
Date: 4.SEP.2015 15:35:55

Band I 11ac(HT80) CH42 (1 ~ 20 GHz)



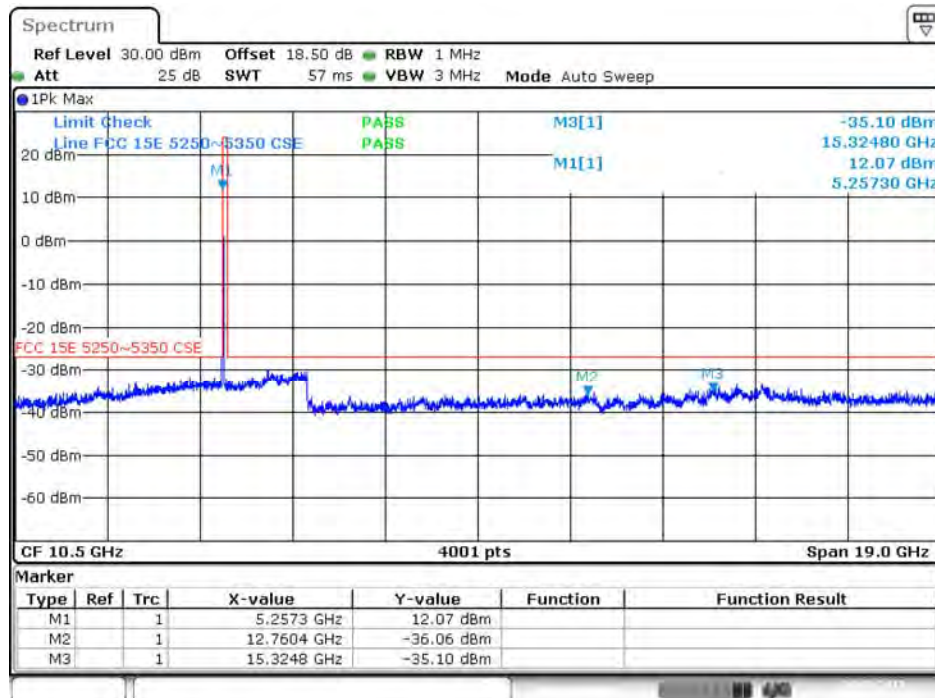
Date: 4.SEP.2015 15:37:03

Band II 11a CH52 (30 ~ 1000 MHz)



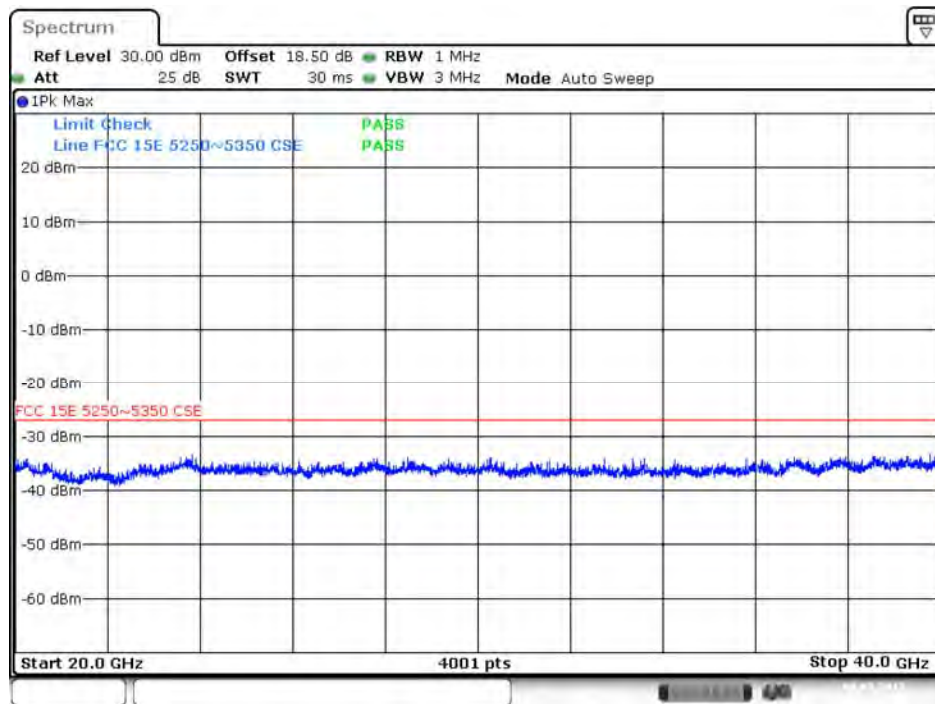
Date: 4.SEP.2015 15:03:16

Band II 11a CH52 (1 ~ 20 GHz)



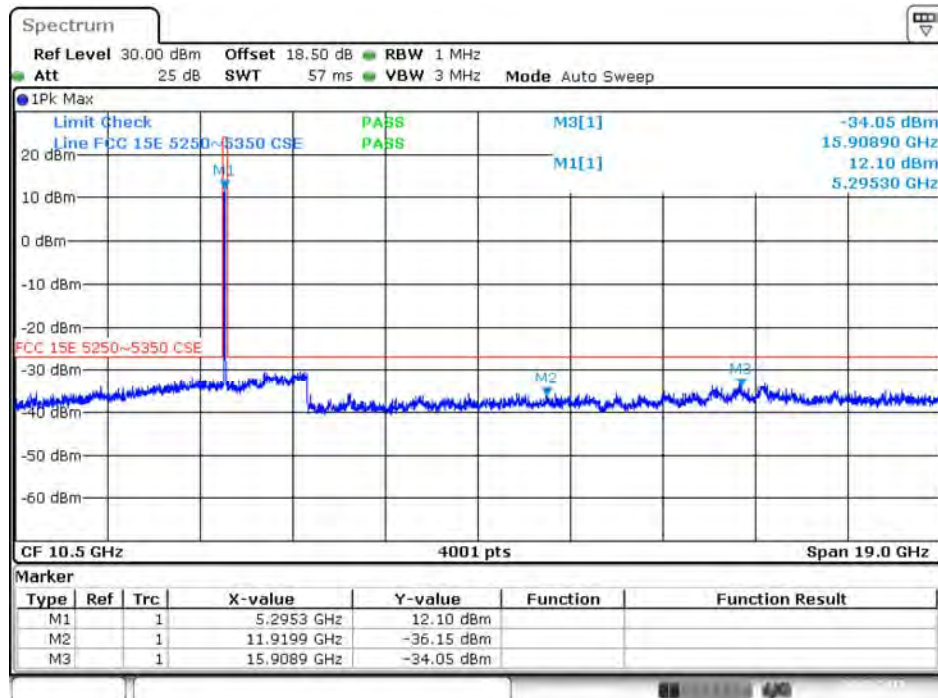
Date: 4.SEP.2015 15:39:14

Band II 11a CH52 (20 ~ 40 GHz)



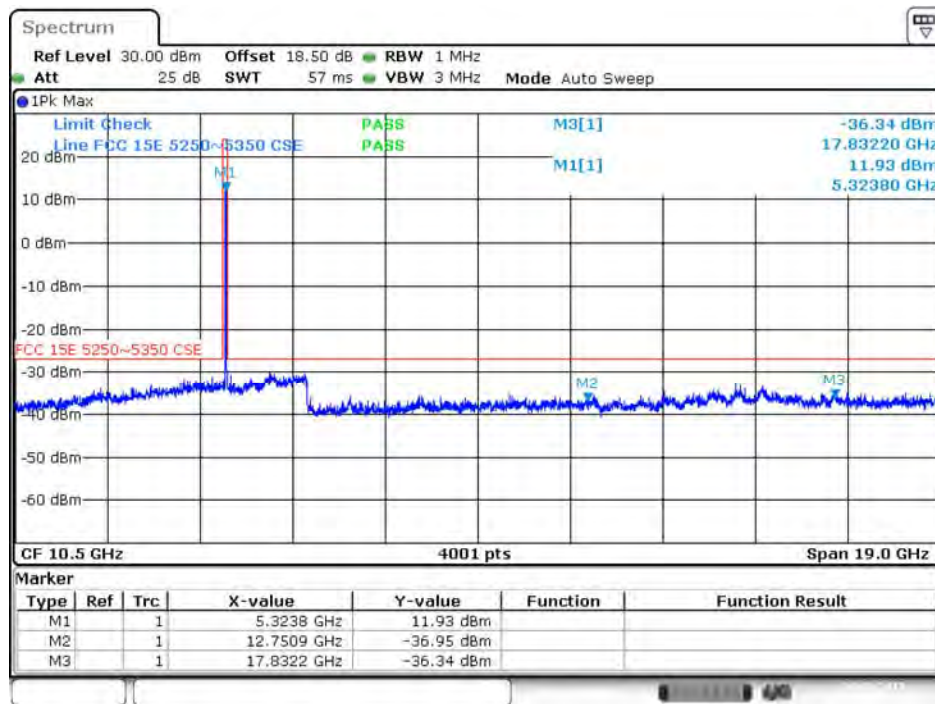
Date: 4.SEP.2015 15:09:05

Band II 11a CH56 (1 ~ 20 GHz)



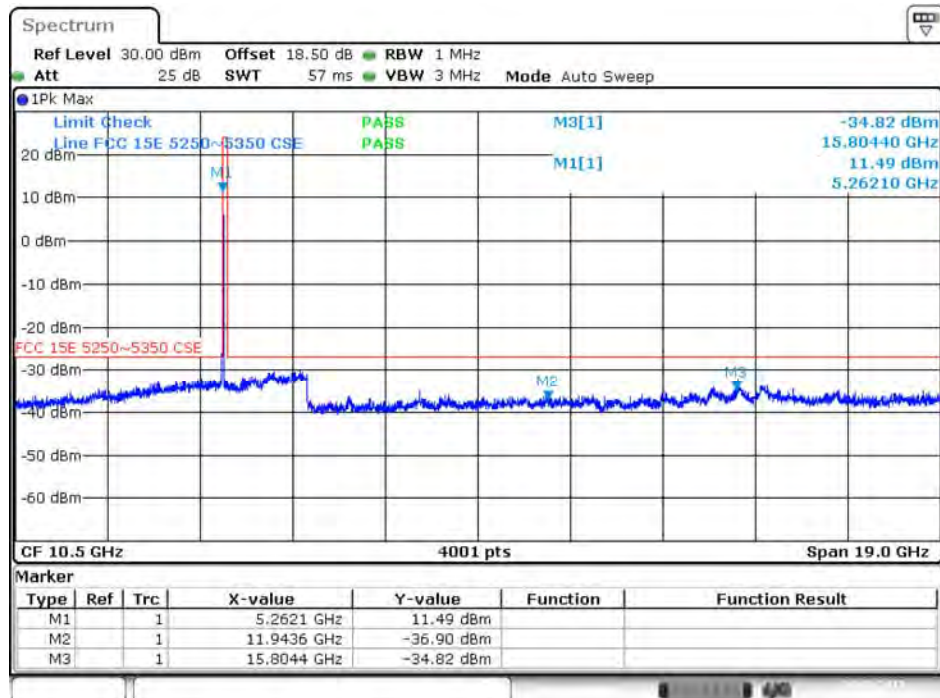
Date: 4.SEP.2015 15:40:57

Band II 11a CH64 (1 ~ 20 GHz)



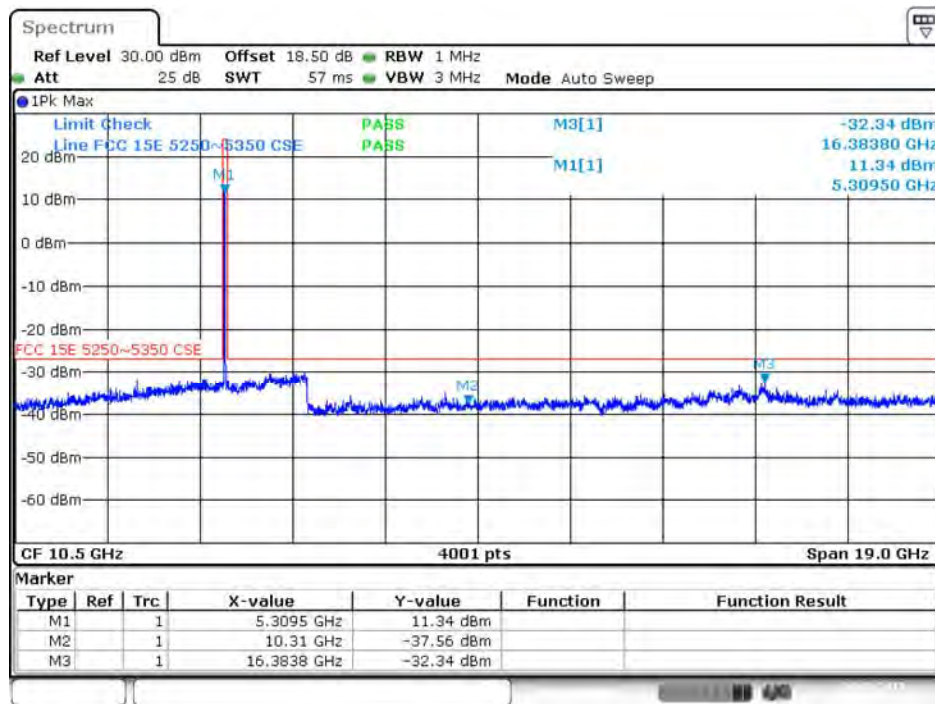
Date: 4.SEP.2015 15:41:46

Band II 11n(HT20) CH52 (1 ~ 20 GHz)



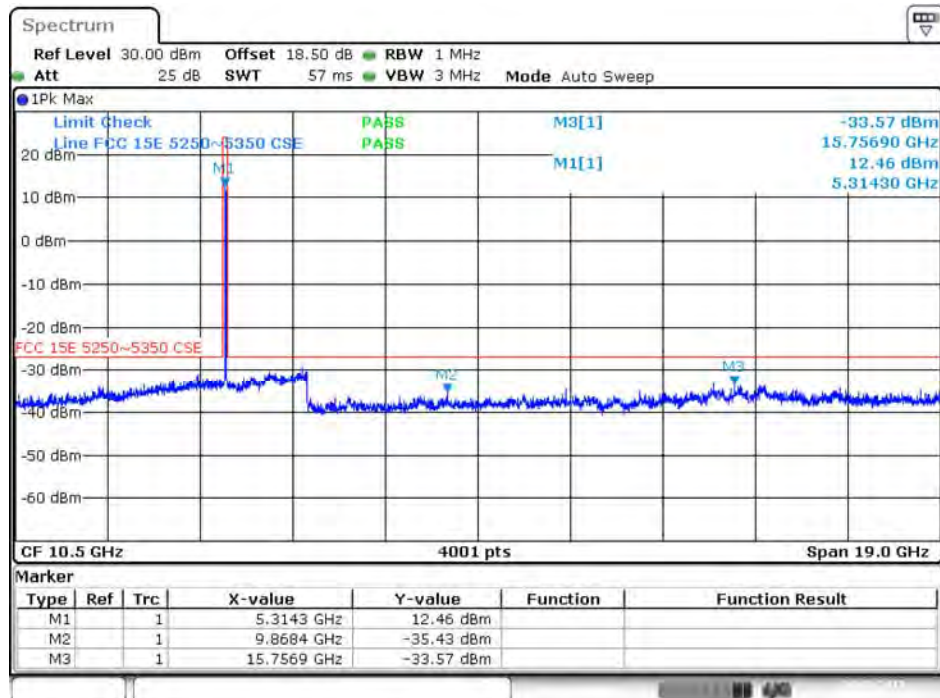
Date: 4.SEP.2015 15:42:39

Band II 11n(HT20) CH56 (1 ~ 20 GHz)



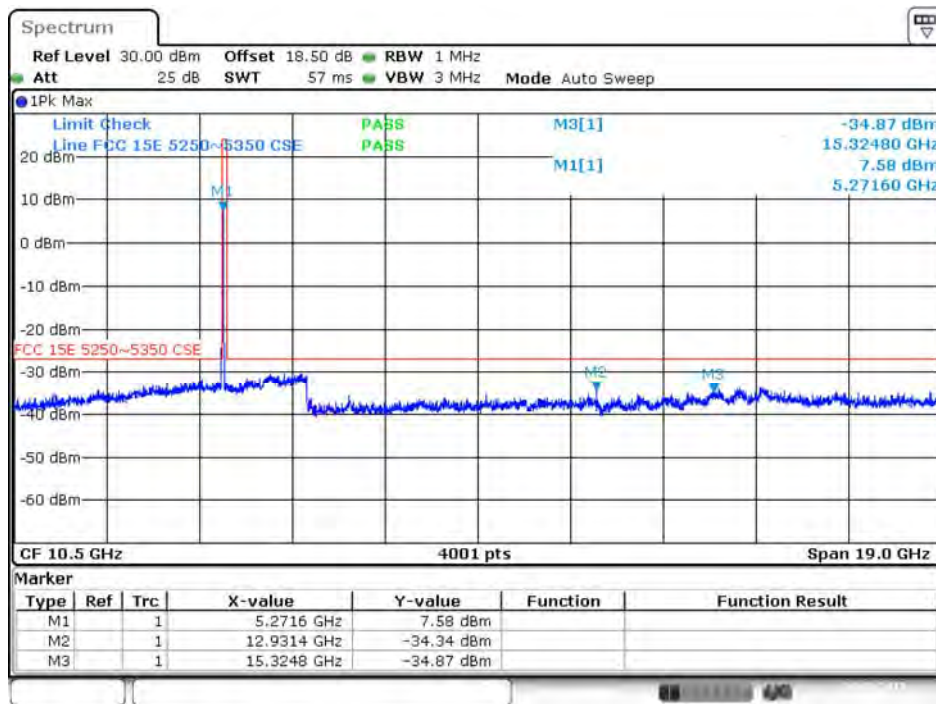
Date: 4.SEP.2015 15:43:24

Band II 11n(HT20) CH64 (1 ~ 20 GHz)



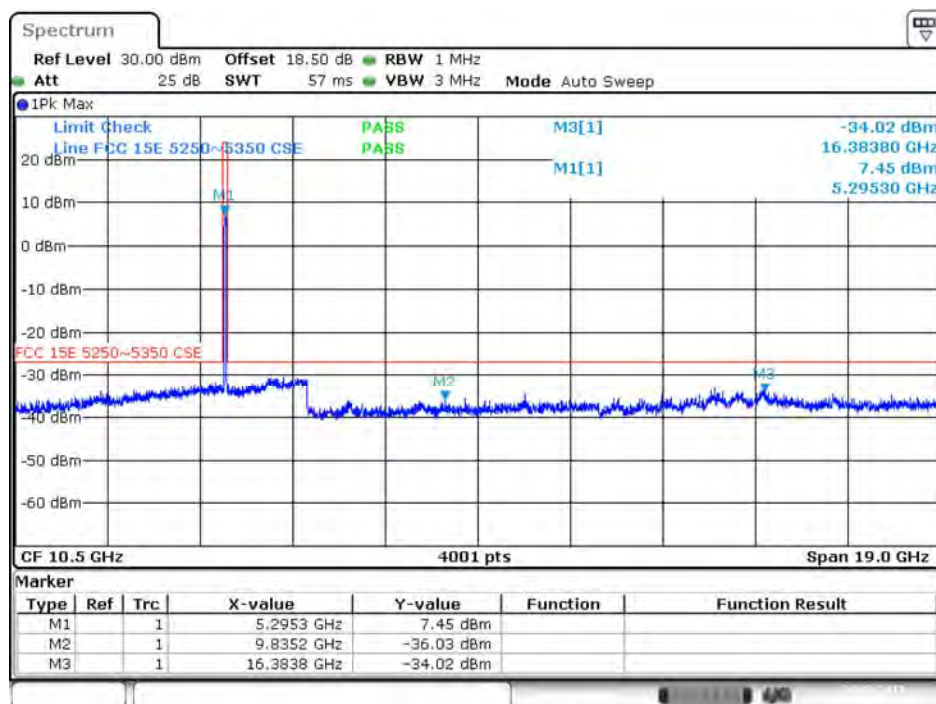
Date: 4.SEP.2015 15:44:04

Band II 11n(HT40) CH54 (1 ~ 20 GHz)



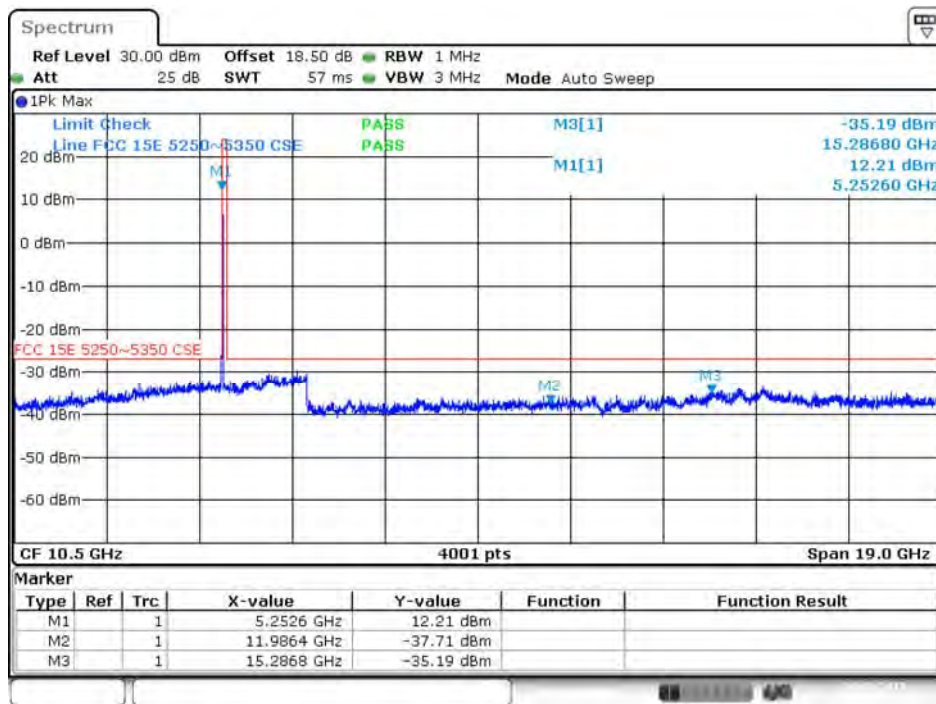
Date: 4.SEP.2015 15:45:22

Band II 11n(HT40) CH62 (1 ~ 20 GHz)



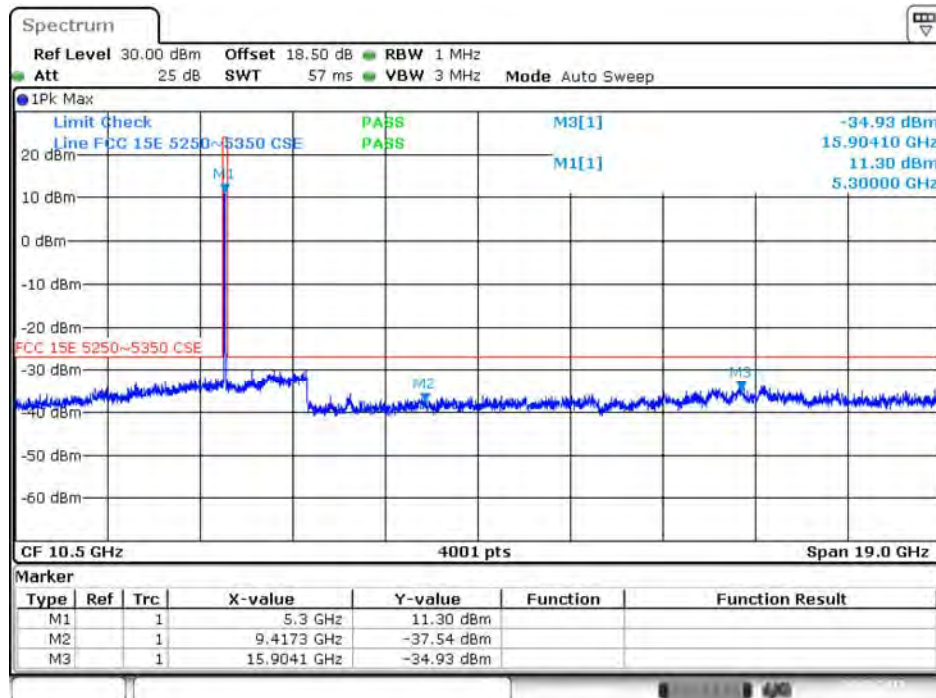
Date: 4.SEP.2015 15:46:06

Band II 11ac(HT20) CH52 (1 ~ 20 GHz)



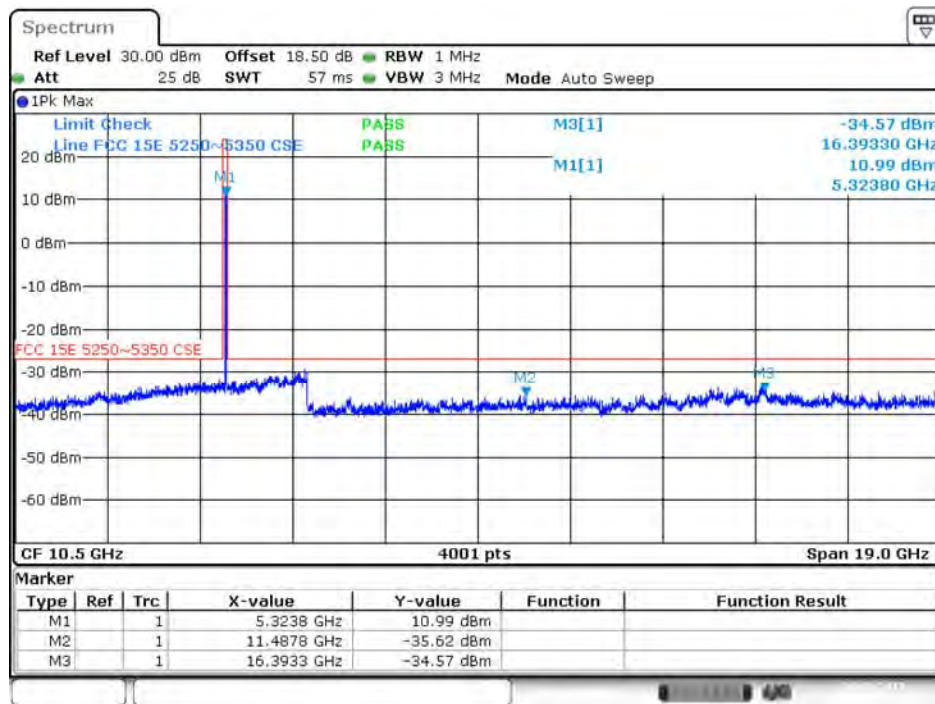
Date: 4.SEP.2015 15:47:21

Band II 11ac(HT20) CH56 (1 ~ 20 GHz)



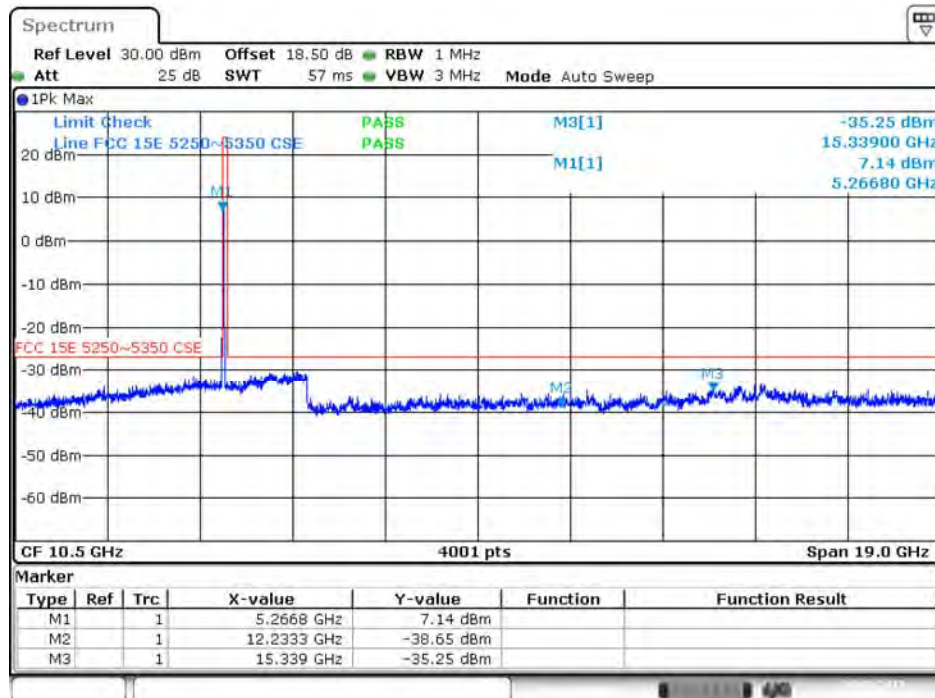
Date: 4.SEP.2015 15:47:59

Band II 11ac(HT20) CH64 (1 ~ 20 GHz)



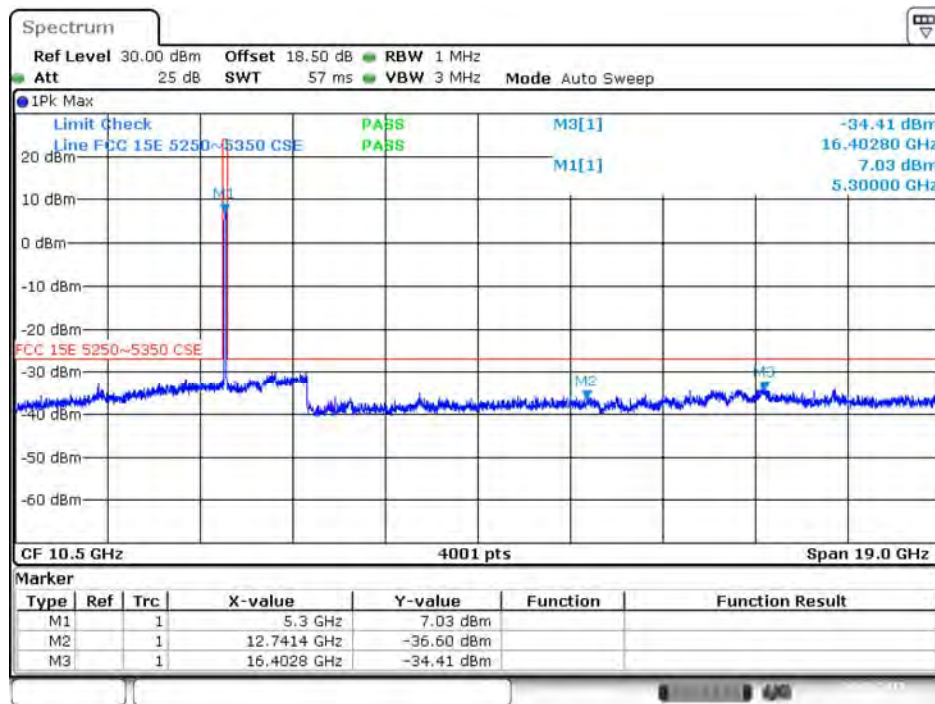
Date: 4.SEP.2015 15:48:32

Band II 11ac(HT40) CH54 (1 ~ 20 GHz)



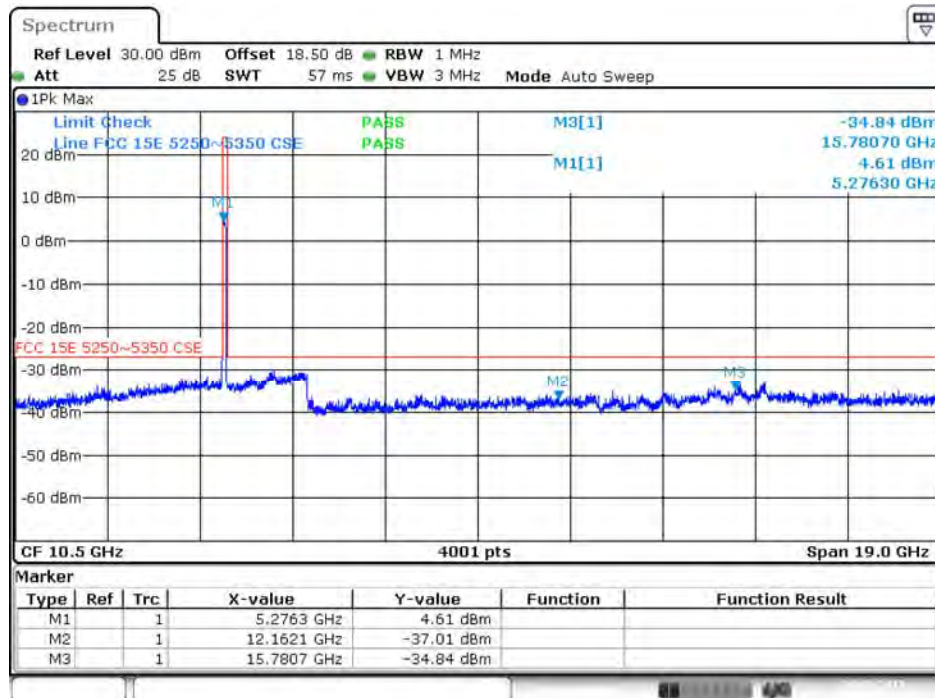
Date: 4.SEP.2015 15:49:24

Band II 11ac(HT40) CH62 (1 ~ 20 GHz)



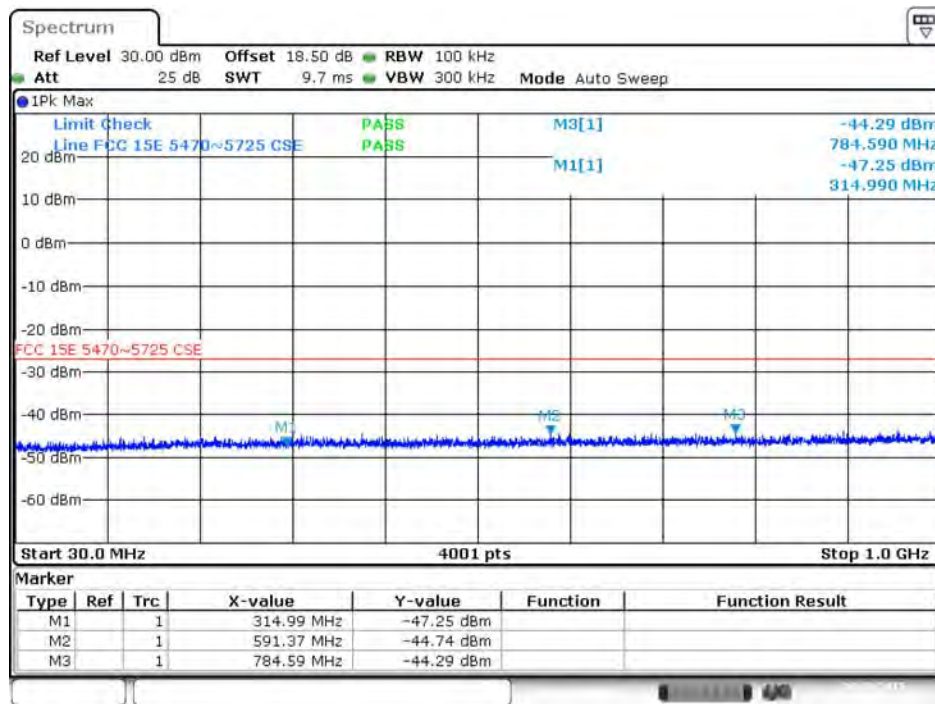
Date: 4.SEP.2015 15:50:09

Band II 11ac(HT80) CH58 (1 ~ 20 GHz)



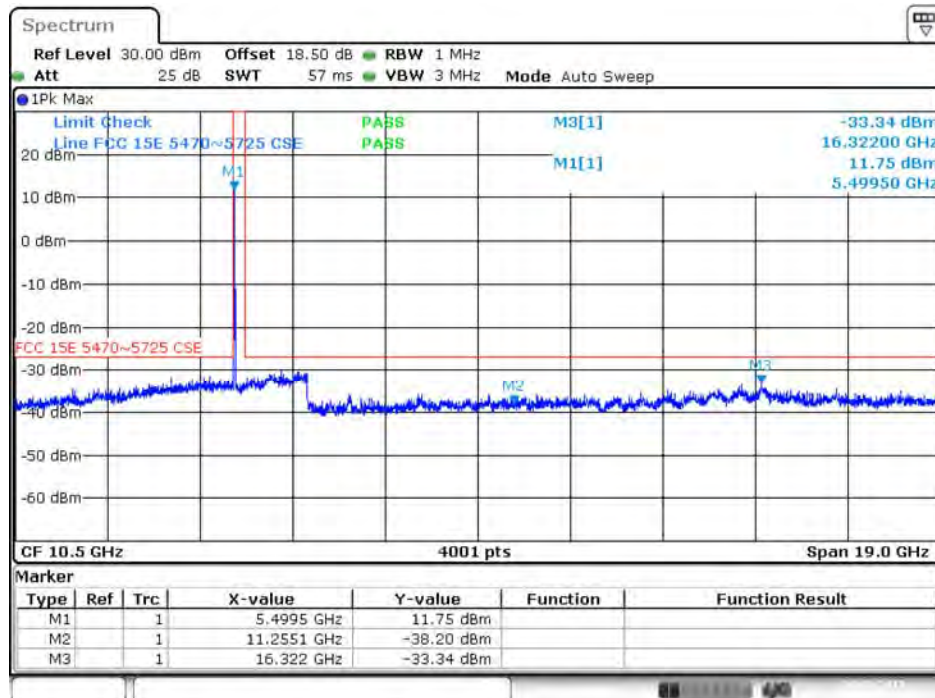
Date: 4.SEP.2015 15:51:17

Band III 11a CH100 (30 ~ 1000 MHz)



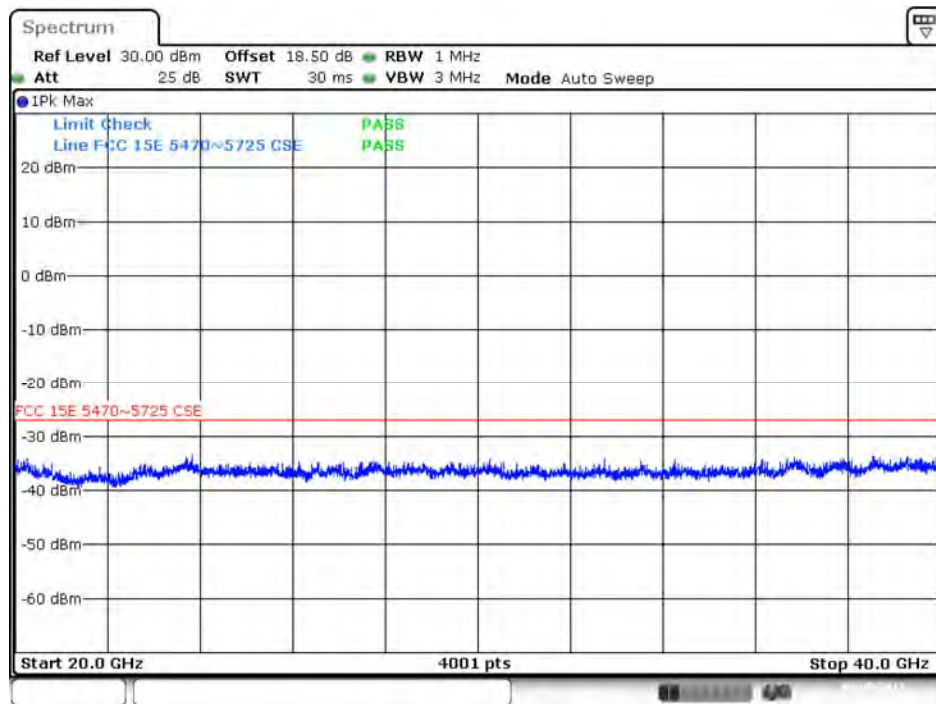
Date: 4.SEP.2015 15:04:22

Band III 11a CH100 (1 ~ 20 GHz)



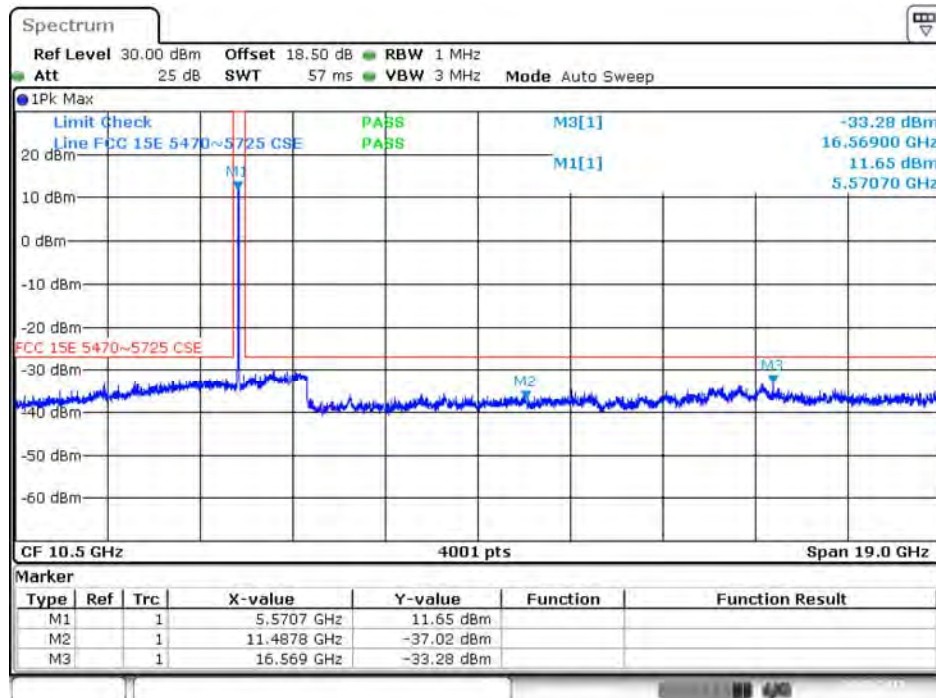
Date: 4.SEP.2015 15:58:59

Band III 11a CH100 (20 ~ 40 GHz)



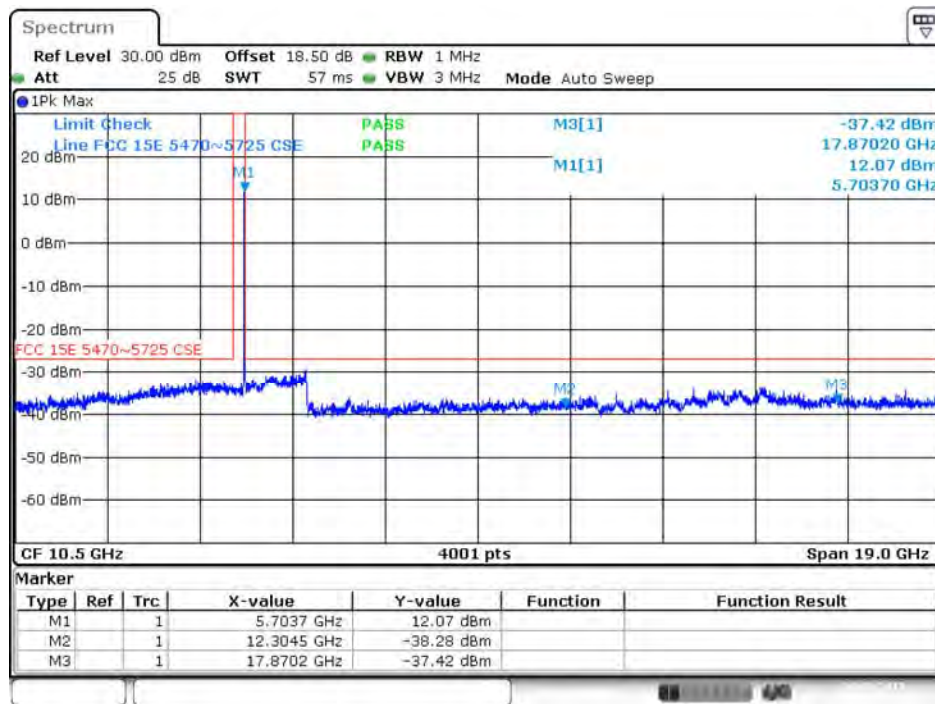
Date: 4.SEP.2015 15:08:16

Band III 11a CH116 (1 ~ 20 GHz)



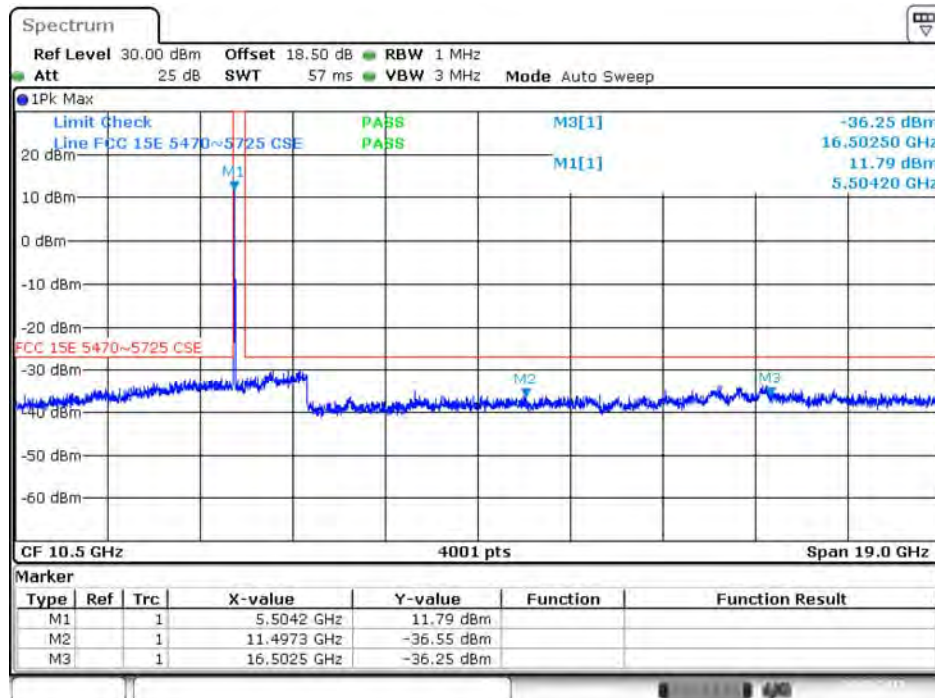
Date: 4.SEP.2015 16:04:05

Band III 11a CH140 (1 ~ 20 GHz)



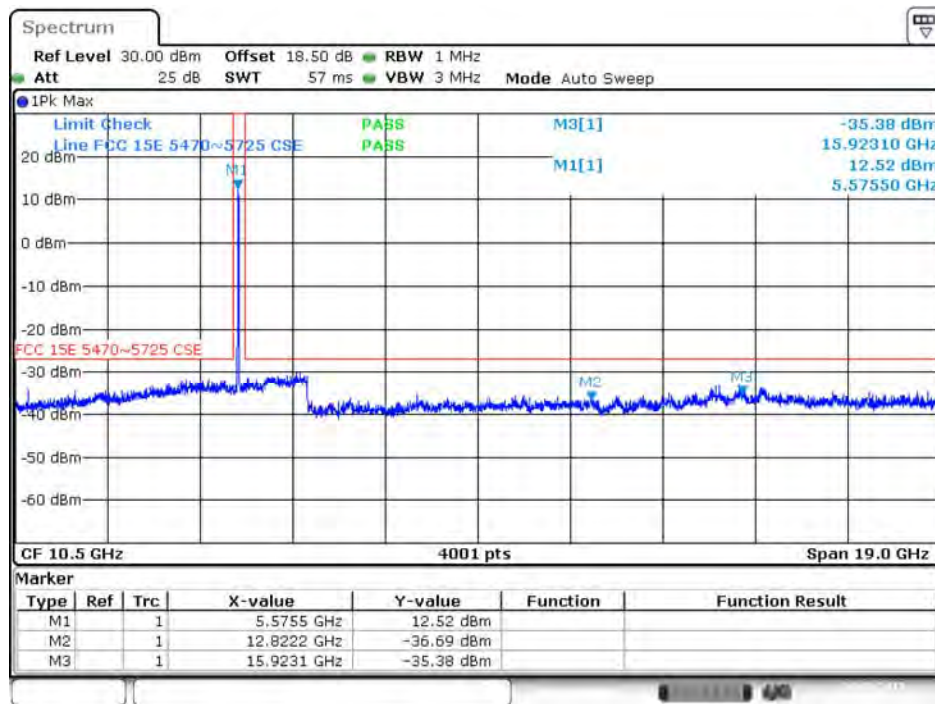
Date: 4.SEP.2015 16:04:40

Band III 11n(HT20) CH100 (1 ~ 20 GHz)



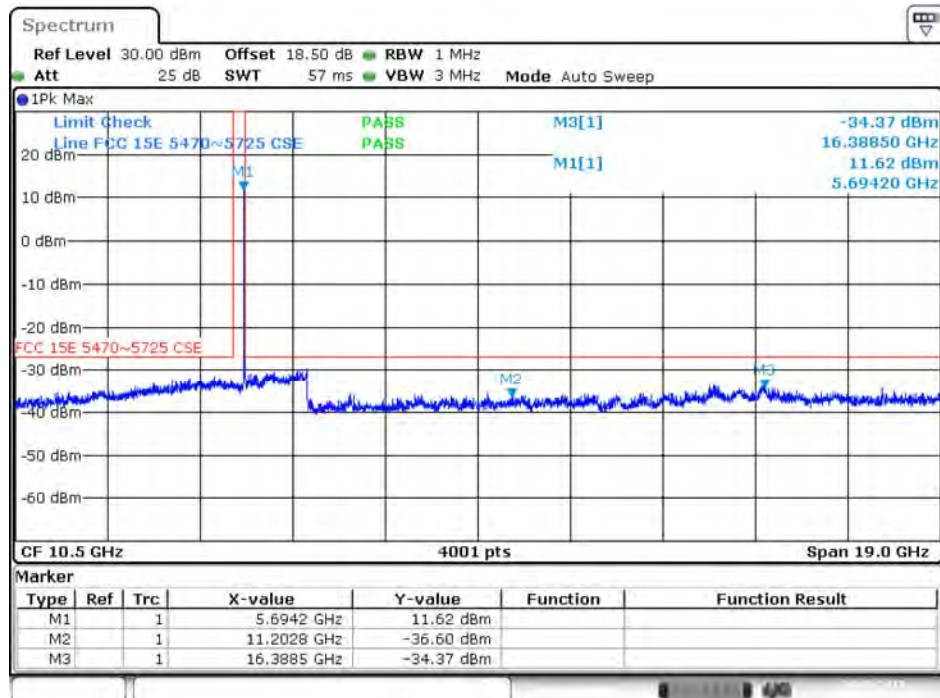
Date: 4.SEP.2015 16:09:53

Band III 11n(HT20) CH116 (1 ~ 20 GHz)



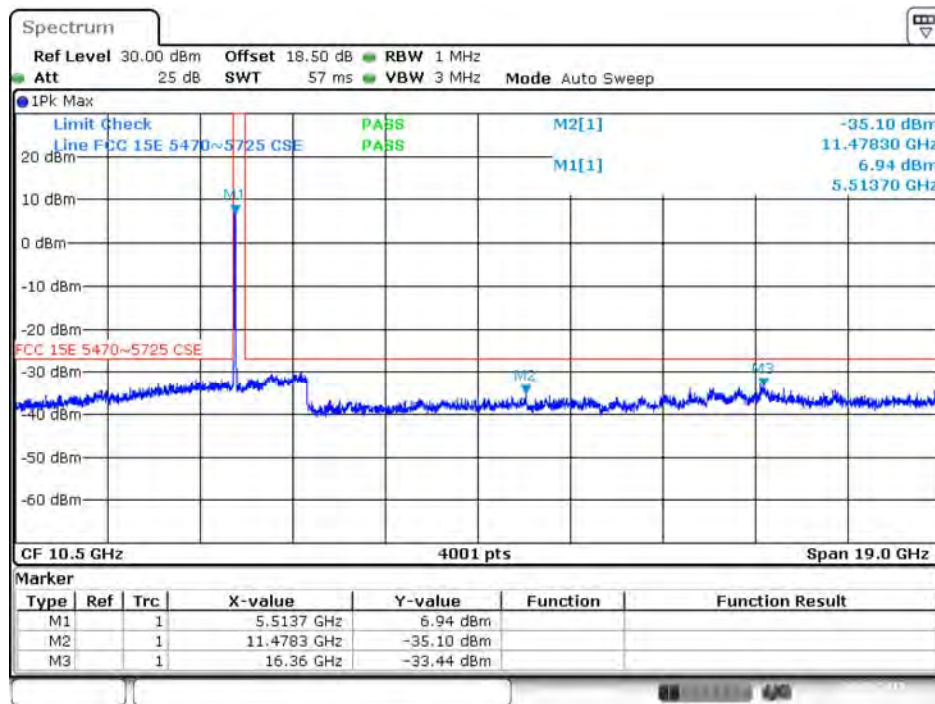
Date: 4.SEP.2015 16:10:29

Band III 11n(HT20) CH140 (1 ~ 20 GHz)



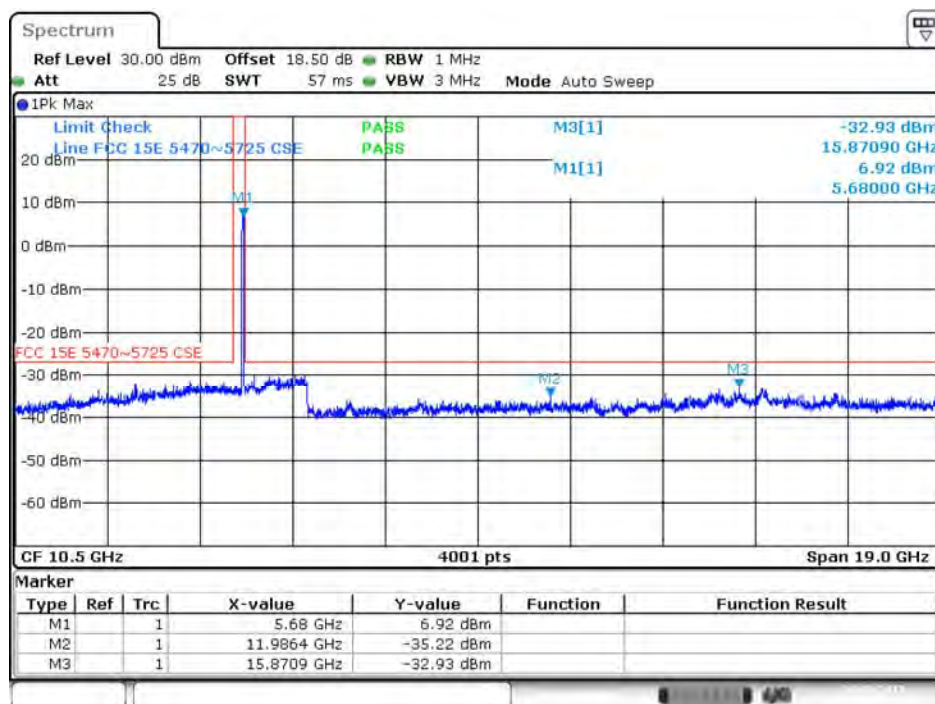
Date: 4.SEP.2015 16:11:32

Band III 11n(HT40) CH102 (1 ~ 20 GHz)



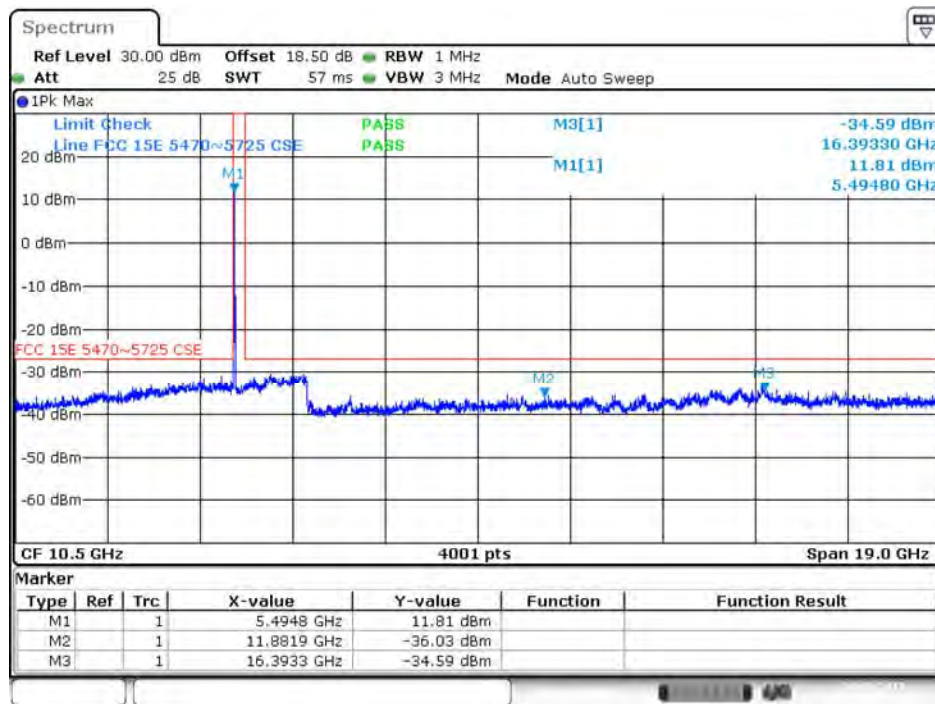
Date: 4.SEP.2015 16:19:22

Band III 11n(HT40) CH134 (1 ~ 20 GHz)



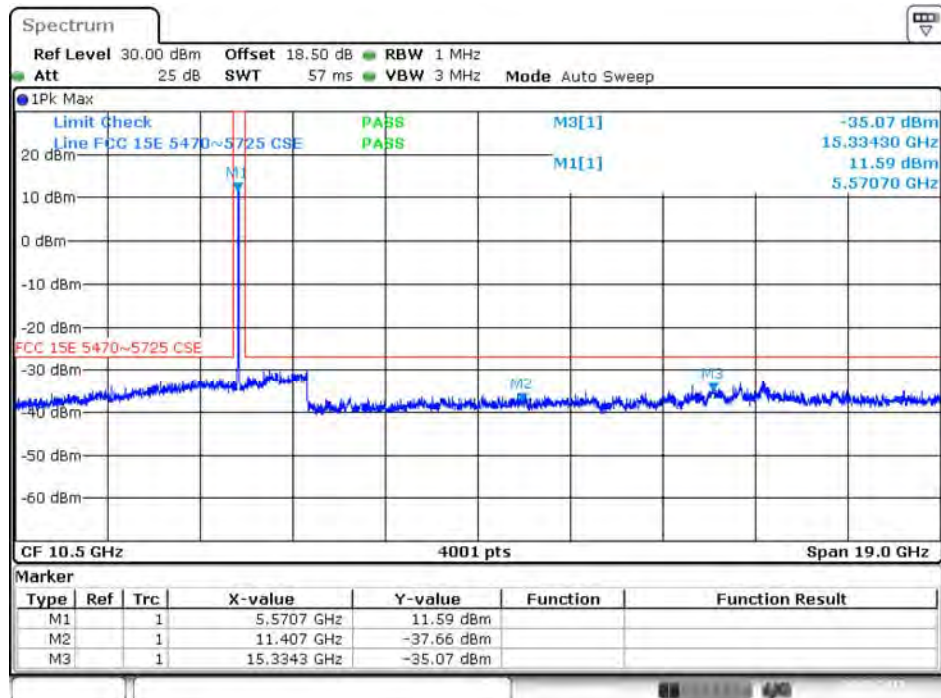
Date: 4.SEP.2015 16:18:38

Band III 11ac(HT20) CH100 (1 ~ 20 GHz)



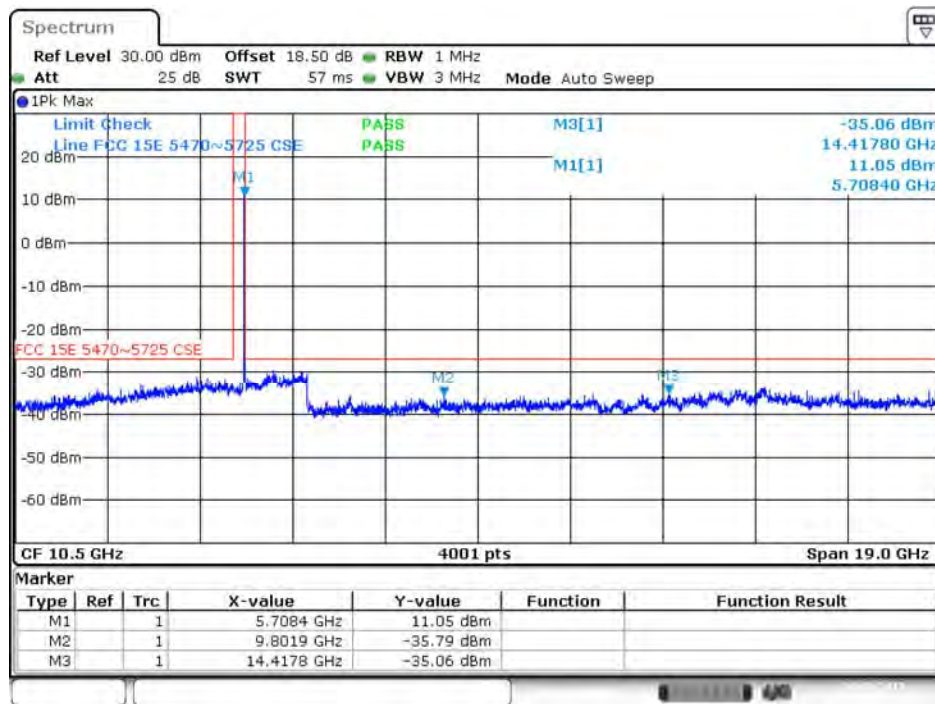
Date: 4.SEP.2015 16:20:39

Band III 11ac(HT20) CH116 (1 ~ 20 GHz)



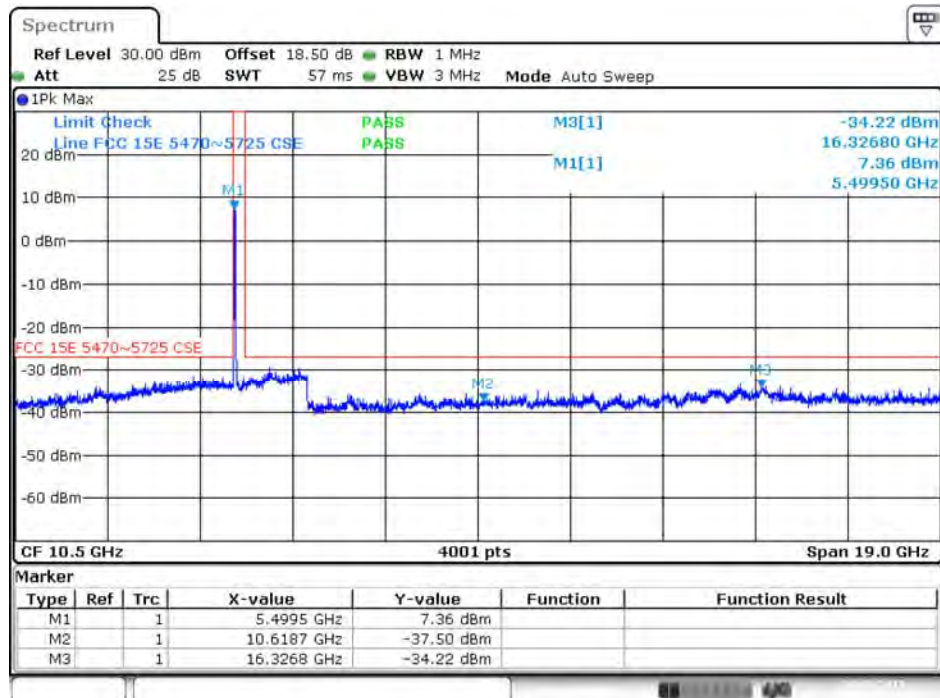
Date: 4.SEP.2015 16:21:34

Band III 11ac(HT20) CH140 (1 ~ 20 GHz)



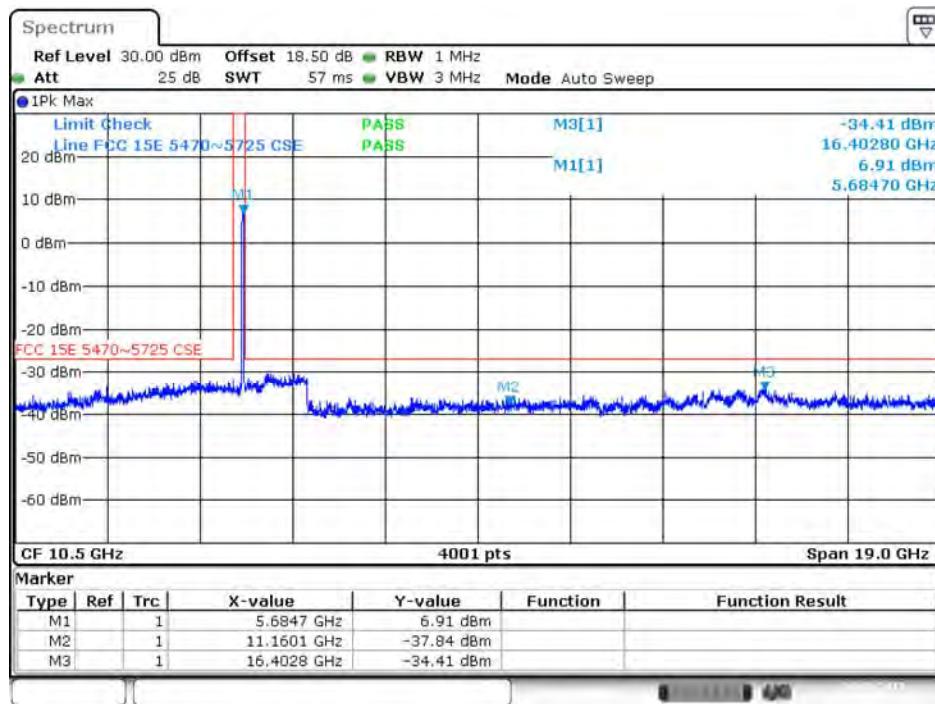
Date: 4.SEP.2015 16:22:06

Band III 11ac(HT40) CH102 (1 ~ 20 GHz)



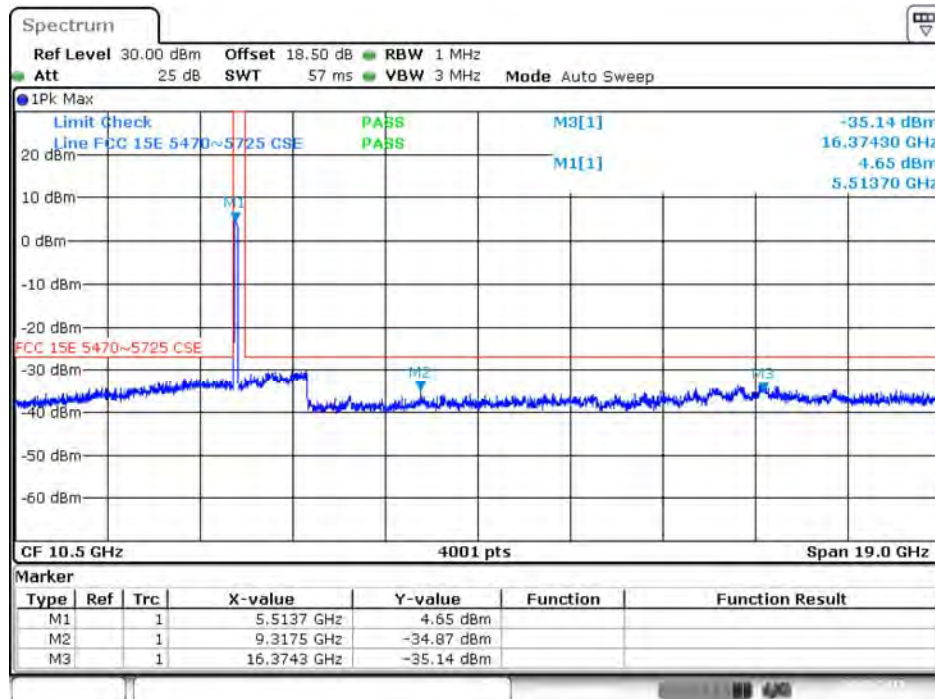
Date: 4.SEP.2015 16:25:06

Band III 11ac(HT40) CH134 (1 ~ 20 GHz)



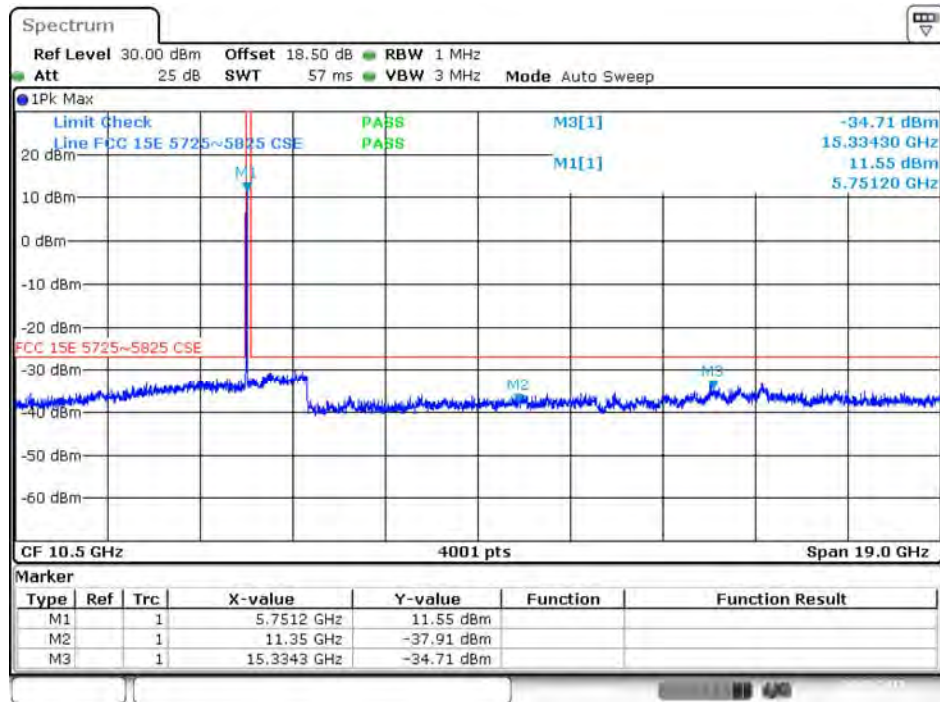
Date: 4.SEP.2015 16:25:47

Band III 11ac(HT80) CH106 (1 ~ 20 GHz)



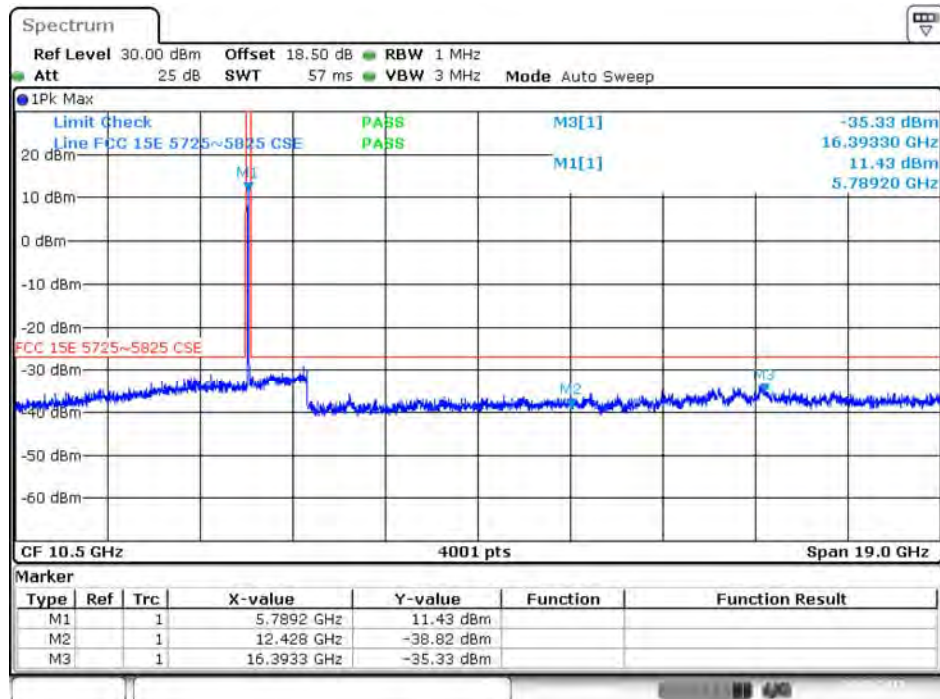
Date: 4.SEP.2015 16:27:25

Band IV 11a CH149 (1 ~ 20 GHz)



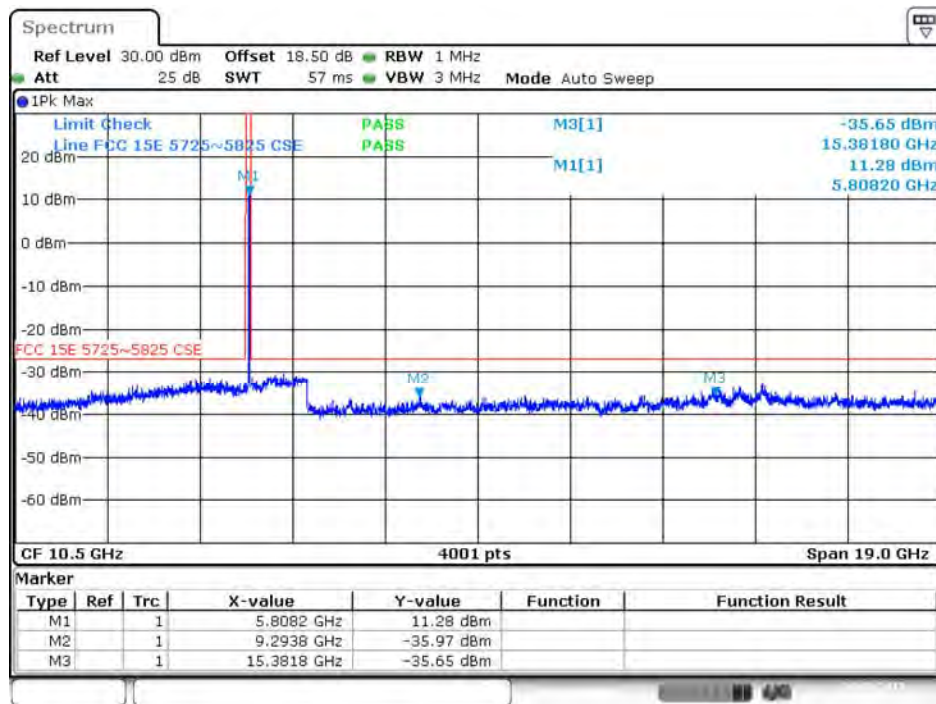
Date: 4.SEP.2015 16:32:10

Band IV 11a CH157 (1 ~ 20 GHz)



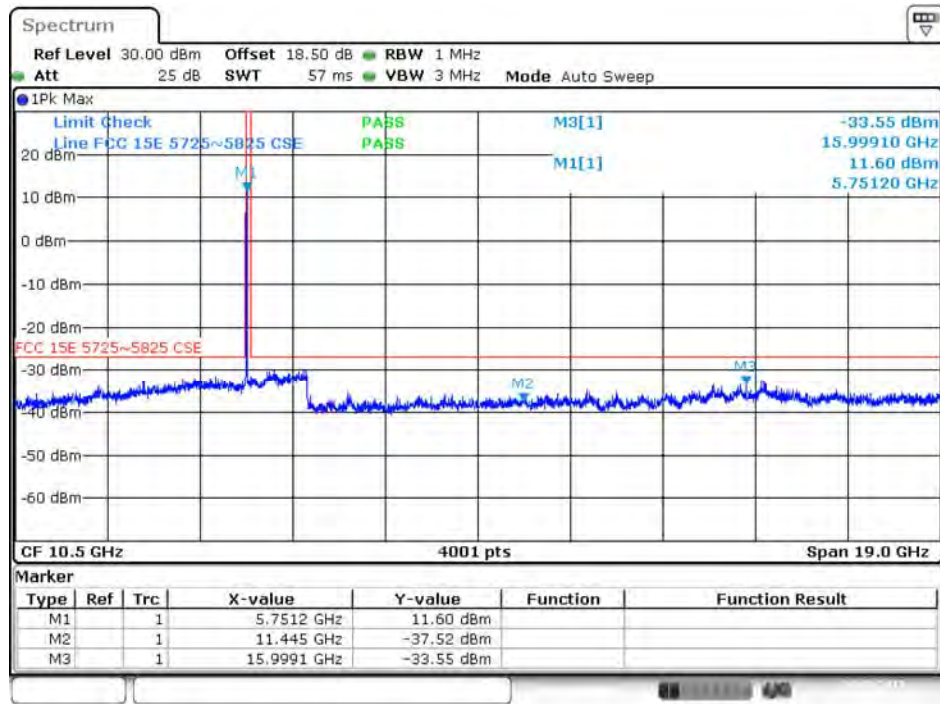
Date: 4.SEP.2015 16:32:44

Band IV 11a CH161 (1 ~ 20 GHz)



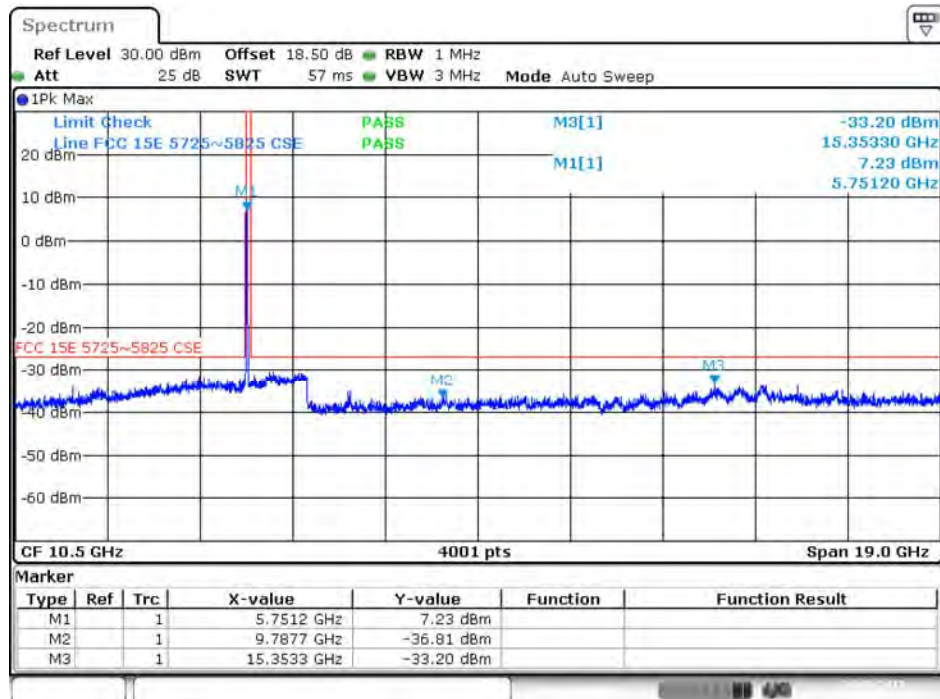
Date: 4.SEP.2015 16:33:14

Band IV 11n(HT20) CH149 (1 ~ 20 GHz)



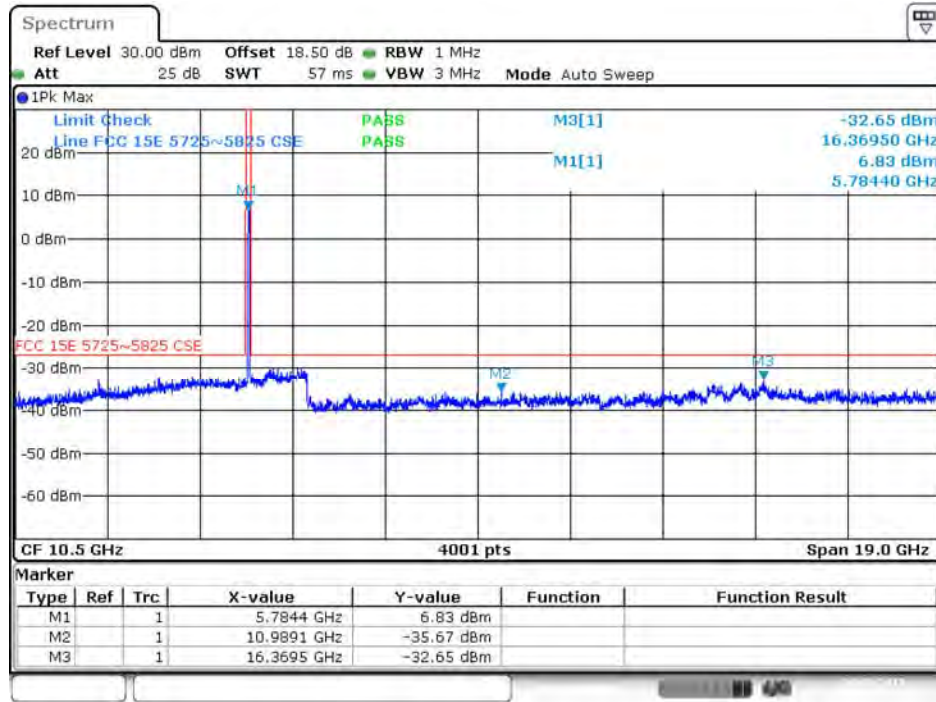
Date: 4.SEP.2015 16:35:13

Band IV 11n(HT40) CH151 (1 ~ 20 GHz)



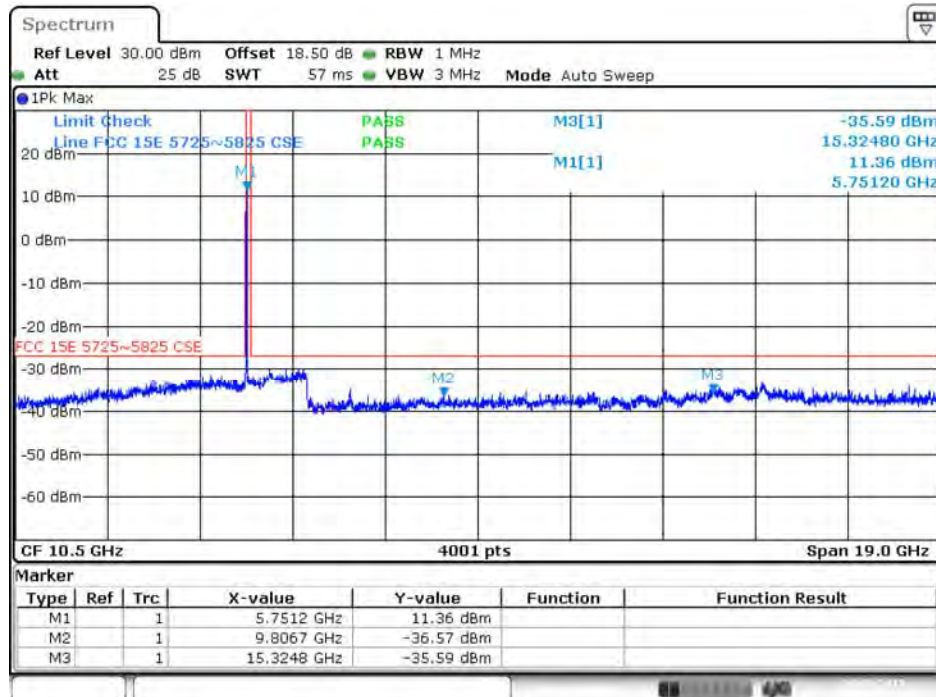
Date: 4.SEP.2015 16:39:12

Band IV 11n(HT40) CH159 (1 ~ 20 GHz)



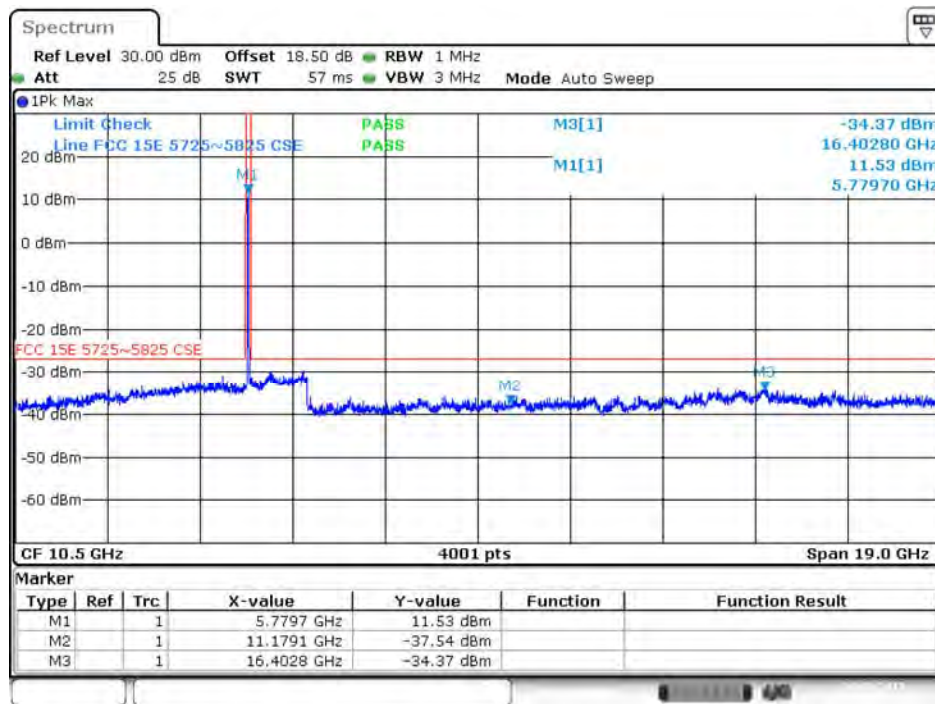
Date: 4.SEP.2015 16:39:52

Band IV 11ac(HT20) CH149 (1 ~ 20 GHz)



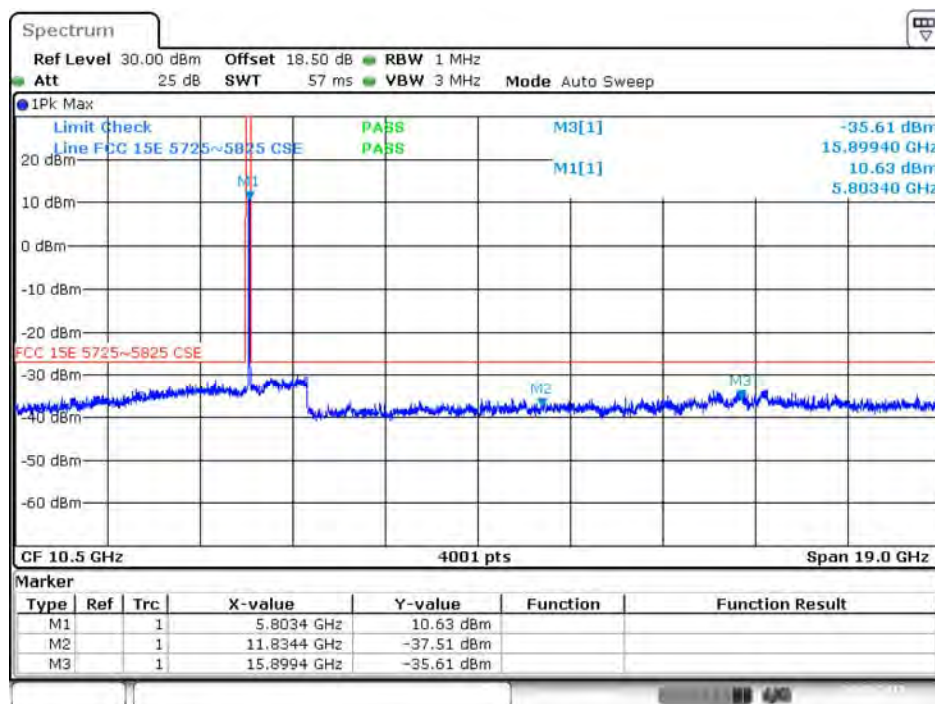
Date: 4.SEP.2015 16:42:35

Band IV 11ac(HT20) CH157 (1 ~ 20 GHz)



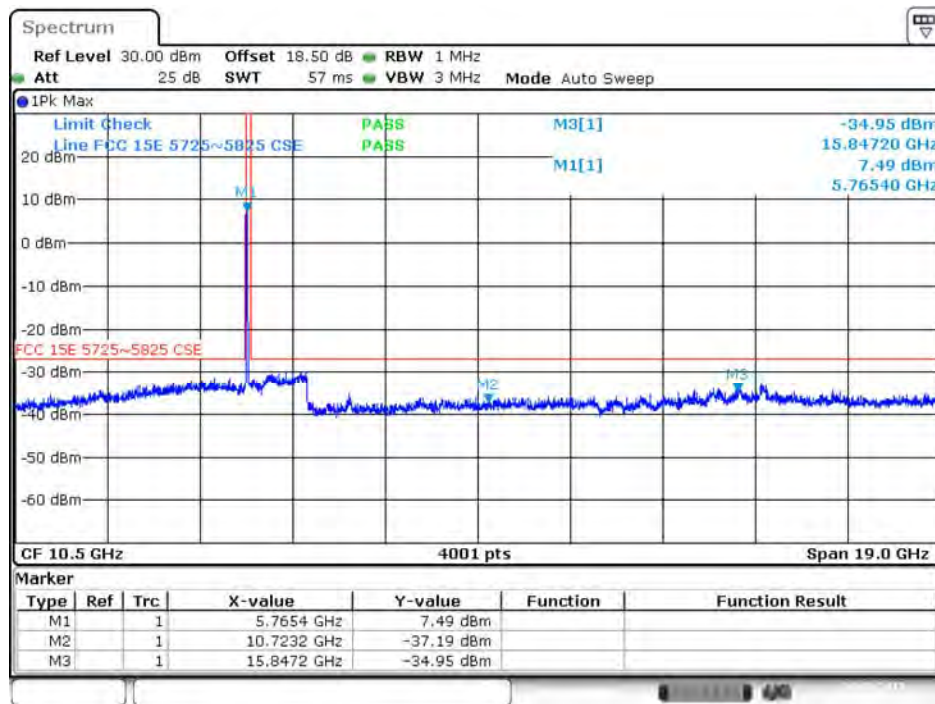
Date: 4.SEP.2015 16:43:18

Band IV 11ac(HT20) CH161 (1 ~ 20 GHz)



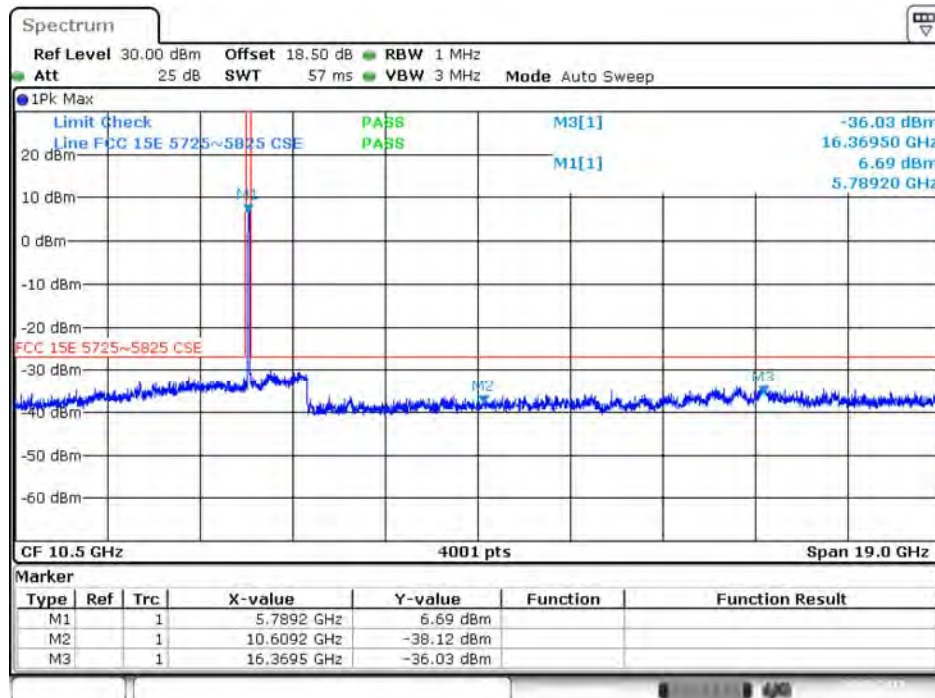
Date: 4.SEP.2015 16:43:57

Band IV 11ac(HT40) CH151 (1 ~ 20 GHz)



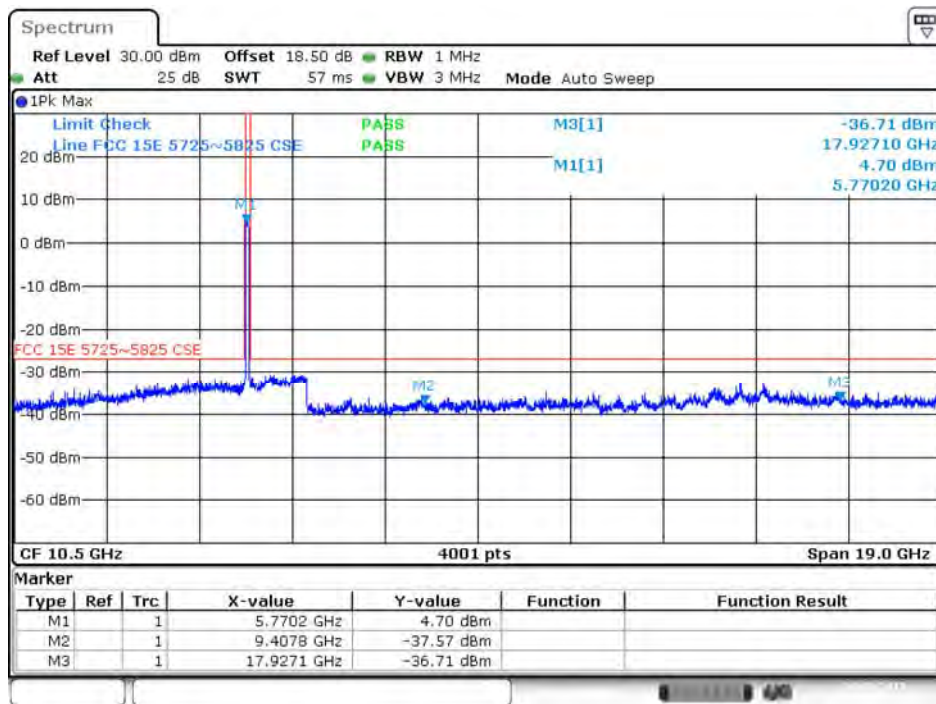
Date: 4.SEP.2015 16:52:26

Band IV 11ac(HT40) CH159 (1 ~ 20 GHz)



Date: 4.SEP.2015 16:52:57

Band IV 11ac(HT80) CH155 (1 ~ 20 GHz)



Date: 4.SEP.2015 16:54:54