Lab Code: 200167-0

FCC PART 15.407
RSS-210, ISSUE 8, DEC 2010
TEST AND MEASUREMENT REPORT

For

Meru Networks Inc.

894 Ross Drive,

Sunnyvale, CA 94089, USA

FCC ID: RE7-AP1020
IC: 6749A-AP1020
Model: AP1020i/AP1020e

Report Type:	**Product Type:**
CIIPC	802.11a/b/g/n Access Point

Test Engineers:	Ning Ma
Report Number:	R1108081-407-1
Report Date:	2012-01-18
Reviewed By:	Victor Zhang EMC/RF Lead
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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1108081-407-1	Original Report	2012-01-18

1 General Description

1.1 Product Description for Equipment under Test (EUT)

This test and measurement report was prepared on behalf of *Meru Networks Inc*, and their product FCC ID: RE7-AP1020, IC: 6749A-AP1020, model: *AP1020i and AP1020e* or the "EUT" as referred on this report is a dual band Wireless 802.11a/b/g/n outdoor access point. The EUT's DFS operating Frequency is 5250-5350 MHz and 5470-5725 MHz (802.11 a/n mode)

1.2 Mechanical Description of EUT

AP1020e
The EUT measures approximately 154 mm L x 116 mm W x 36 mm H

The test data gathered are from typical production sample, serial number: 3911A102e0A11B65 provided by the Manufacturer.

AP1020i
The EUT measures approximately 172 mm L x 172 mm W x 41 mm H

The test data gathered are from typical production sample, serial number: 4310A102i000CE60997F3 provided by the manufacturer.

1.3 Objective

This report is prepared on behalf of *Meru Networks, Inc.* in accordance with FCC §15.407 and RSS-210, Issue 8, Dec 2010.

The objective is to determine compliance with FCC and IC rules.

1.4 Related Submittal(s)/Grant(s)

FCC ID: RE7-AP1020, FCC Part 15.247 and FCC 15.407 submission of Non-DFS bands.

1.5 Test Methodology

ANSI C63.4-2009, ANSI C63.10-2009, FCC Part 15.407 and RSS-210 Issue 8, Dec 2010.

1.6 Test Facility

The test site used by BACL Corp. to collect radiated and conducted emissions measurement data is located at its facility in Sunnyvale, California, USA.

The test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997, and Article 8 of the VCCI regulations on December 25, 1997. The test site also complies with the test methods and procedures set forth in CISPR 22:2005 + A1:2005 + A2:2006 §10.4 for measurements below 1 GHz and §10.6 for measurements above 1 GHz. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2003 & TIA/EIA-603.

The Federal Communications Commission and Voluntary Control Council for Interference have the reports on file and they are listed under FCC registration number: 90464 and VCCI Registration No.: R-3729, C-4176, G-469, and T-1206. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL Corp. is a National Institute of Standards and Technology (NIST) accredited laboratory under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The current scope of accreditations can be found at http://ts.nist.gov/Standards/scopes/2001670.htm

2 EUT Test Configuration

2.1 Justification

The EUT was configured for testing according to FCC Part 15.407 and RSS-210 Standard.

2.2 EUT Exercise Software

The software used, SCRT5.5.1, was provided by customer and verified by Ning Ma to comply with the standard requirements being tested against.

2.3 Equipment Modifications

N/A

2.4 Special Equipment

N/A

2.5 Local Support Equipment

Manufacturers	Description	Models	Serial Number
DELL	Laptop	1XDRM A00	4SD2LQ1
NETGEAR	Router	GS605 v2	1FE1715K02A42

2.6 Power Supply List and Details

Manufacturer	Description	Model Number	Serial Number
Power Dsine	Power Adapter	PD-7001G/AC	D0844644000023FA01
Delta Electronics	Power Adapter	ADP-15KB	DNW0517000319

2.7 EUT Internal Configuration

Objects/Parts	Manufacturers	Models	Series Number
WiFi Module	Broadcom	LOG-M11	E150630
Main Board	Meru Network, Inc	MVT1.0	40AB103V 8501-6000386-01

2.8 External I/O Cabling List and AC Cord

Cable Description	Length (M)	From	To
RJ 45	< 1.0	Power Adapter	Router
RJ 45	< 1.0	Power Adapter	EUT
RJ 45	< 1.0	Router	Laptop

3 Summary of Test Results

FCC/IC Rules	Description of Test	Result
FCC §15.203 IC RSS-Gen §7.1.4	Antenna Requirements	Compliance
FCC §15.207 IC RSS-Gen §7.2.2	Conducted Emissions	Compliance
FCC §15.209(a), 15.407(b) IC RSS-210 §A9.2	Spurious Radiated Emissions	Compliance
FCC §15.407(a) IC RSS-210 §A9.2	26 dB and 99% Emission Bandwidth	Compliance
FCC §407(a) IC RSS-210 §A9.2	Peak Output Power Measurement	Compliance
FCC §15.407 (b) IC RSS-210 §A9.2	Out of Band Emissions	Compliance
FCC §15.407(a) IC RSS-5210 §A9.2	Power Spectral Density	Compliance
IC RSS-210 §2.6 & RSS-Gen §6	Receiver Spurious Radiated Emissions	Compliance
FCC §15.407(b) IC RSS-210 §A9.2	Spurious Emissions at Antenna Terminals	Compliance
FCC §15.407(a)(6)	Peak Excursion Ratio	Compliance
FCC §15.407(f), §2.1091 IC RSS-102	RF Exposure	Compliance

4 FCC §15.207 & IC RSS-Gen §7.2.2 - Conducted Emissions

4.1 Applicable Standards

As per FCC §15.207 and IC RSS-Gen §7.2.2 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 Note 1	56 to 46 Note 1
0.5-5	56	46
5-30	60	50

Note 1 Decreases with the logarithm of the frequency.

4.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.4-2003 measurement procedure. The specification used was FCC §15.207 and IC RSS-Gen §7.2.2 limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

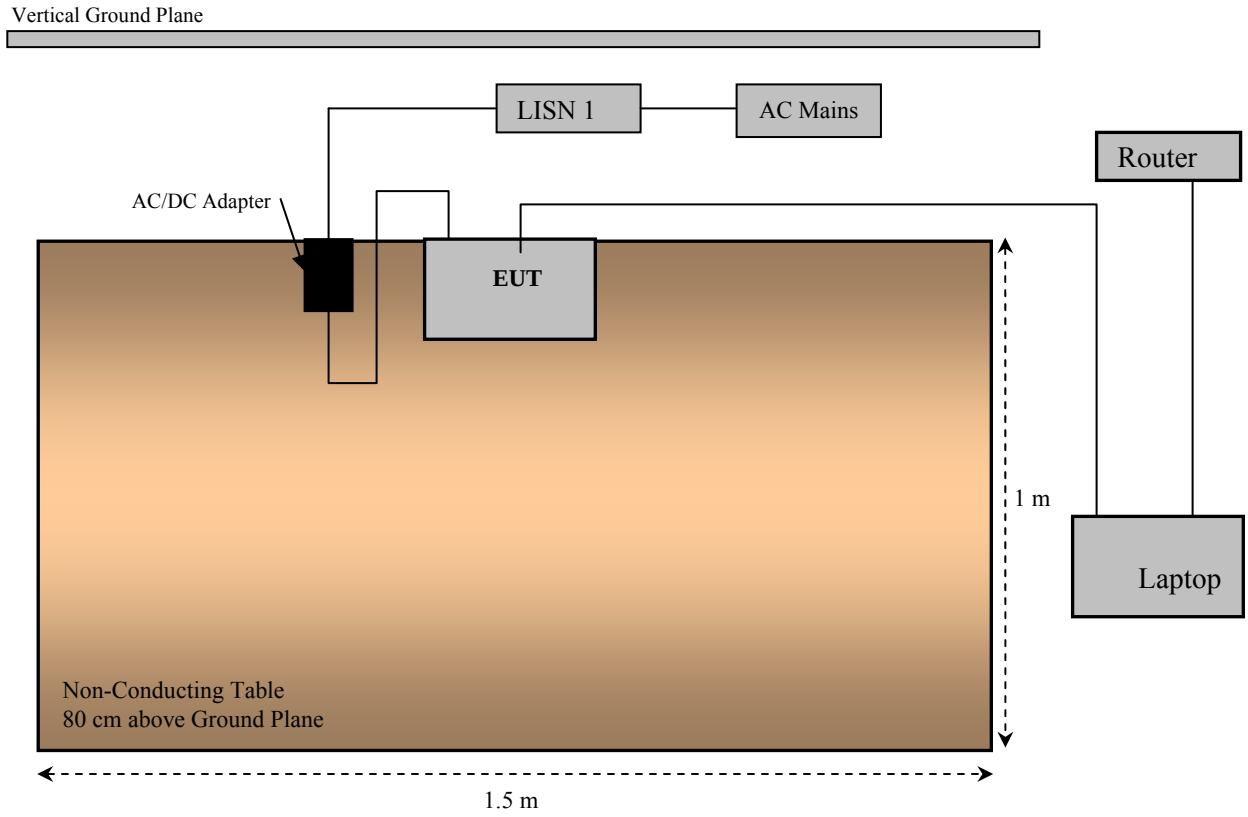
4.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-2.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Quasi-Peak readings are distinguished with a “QP.” Average readings are distinguished with an “Ave”.

4.4 Test Setup Block Diagram



4.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

4.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2011-04-14
Solar Electronics	LISN	9252-R-24-BNC	511205	2011-06-25
TTE	Filter, High Pass	H9962-150K-50-21378	K7133	2011-06-10

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

4.7 Test Environmental Conditions

Temperature:	22 °C
Relative Humidity:	49%
ATM Pressure:	101.3kPa

The testing was performed Ning Ma from 2011-10-21 at 5meter chamber3.

4.8 Summary of Test Results

According to the recorded data in following table, the EUT was found to comply with the FCC/IC standard's conducted emissions limits, with the margin reading of:

AP1020e:

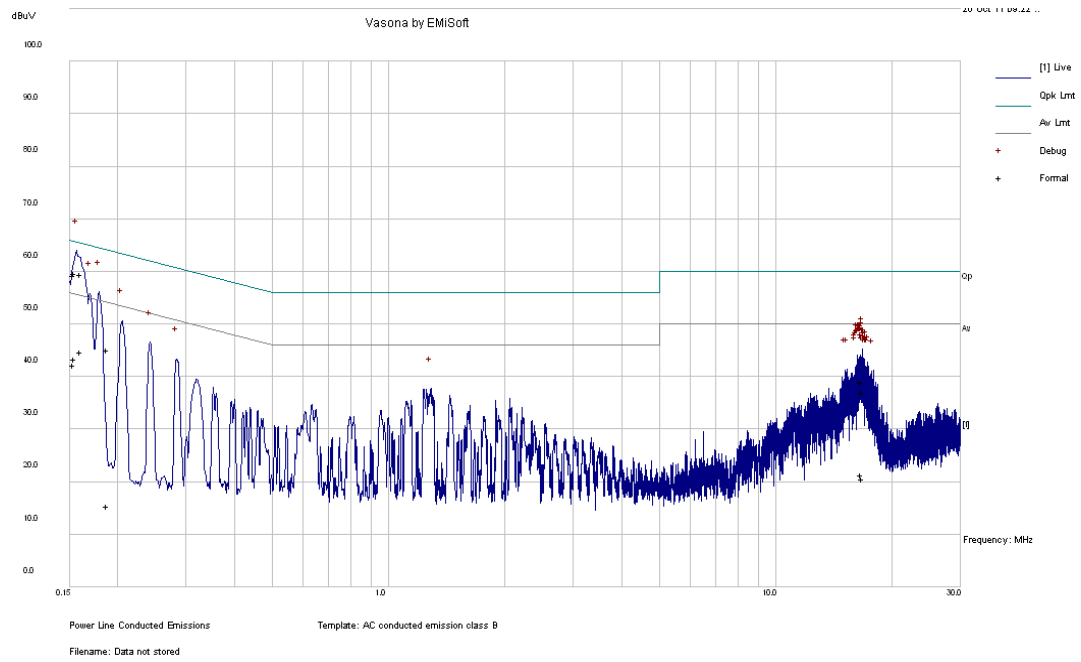
Connection: AC/DC adapter connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Line/Neutral)**	**Range (MHz)**
-4.01	0.154017	Neutral	0.15 to 30

AP1020i

Please refer to original FCC ID: RE7-AP1020/IC: 6479A-AP1020.

4.9 Conducted Emissions Test Plots and Data

120 V, 60 Hz – Line



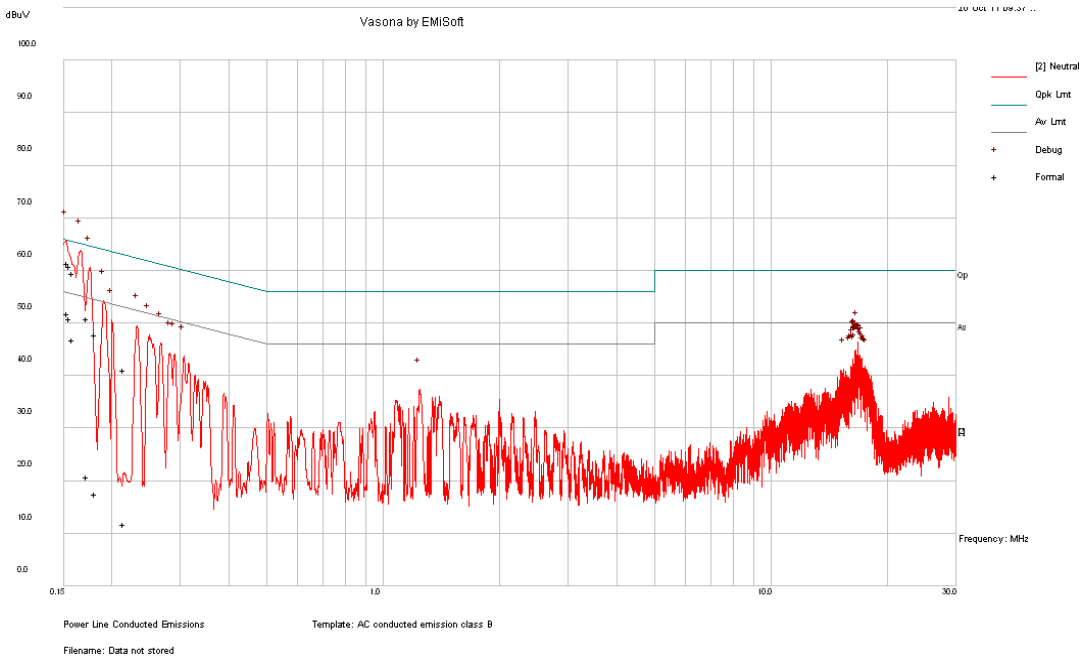
Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.160923	59.43	Line	65.42	-5.99
0.154893	59.71	Line	65.73	-6.02
0.153987	59.34	Line	65.78	-6.44
0.187965	45.08	Line	64.13	-19.05
16.70766	39.05	Line	60	-20.95
16.76939	37.03	Line	60	-22.97

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.160923	44.72	Line	55.42	-10.70
0.154893	43.48	Line	57.73	-12.25
0.153987	42.21	Line	55.78	-13.57
16.70766	21.44	Line	50	-28.56
16.76939	20.58	Line	50	-29.42
0.187965	15.38	Line	54.13	-38.74

120 V, 60 Hz – Neutral



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.154017	61.46	Neutral	65.78	-4.32
0.1557	60.9	Neutral	65.69	-4.79
0.158343	59.43	Neutral	65.55	-6.12
0.172353	50.81	Neutral	64.85	-14.04
0.181503	47.83	Neutral	64.42	-16.59
0.214752	41.15	Neutral	63.02	-21.87

Average Measurements

Frequency (MHz)	Corrected Amplitude (dBµV)	Conductor (Line/Neutral)	Limit (dBµV)	Margin (dB)
0.154017	51.77	Neutral	55.78	-4.01
0.1557	50.84	Neutral	55.69	-4.85
0.158343	46.8	Neutral	55.55	-8.76
0.172353	20.84	Neutral	54.85	-34.01
0.181503	17.46	Neutral	54.42	-36.96
0.214752	11.86	Neutral	53.02	-41.16

5 FCC §15.209(a), §15.407(b) & IC RSS-210 §A9.2 – Spurious Radiated Emissions

5.1 Applicable Standard

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As per FCC §15.209(a) and RSS-Gen §7.2.2: Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

Frequency (MHz)	Field Strength (micro volts/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 Note 2	3
88 - 216	150 Note 2	3
216 - 960	200 Note 2	3
Above 960	500	3

Note 2: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As Per FCC §15.205(a) and IC RSS-Gen §7.2.2, except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

5.2 EUT Setup

The radiated emissions tests were performed using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC §15.209, §15.407 and IC RSS-210, RSS-Gen limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

5.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 meter, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
(2) Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

5.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to the indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, the Corrected Amplitude (CA) of 40.3 dBuV/m = indicated Amplitude reading (Ai) 32.5 dBuV + Antenna Factor (AF) 23.5 dB + Cable Loss (CL) 3.7 dB + Attenuator (Atten) 10 dB - Amplifier Gain (Ga) 29.4 dB

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Limit

5.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2011-03-21
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A0020106-3	2011-06-29
A.R.A Inc	Horn antenna	DRG-1181A	1132	2010-11-29
Hewlett Packard	Pre amplifier	8447D	2944A06639	2011-06-09
Mini-Circuits	Pre Amplifier	ZVA-183-S	570400946	2011-05-09

Statement of Traceability: BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

5.6 Test Environmental Conditions

Temperature:	18~21 °C
Relative Humidity:	30~35 %
ATM Pressure:	101.2-102.2kPa

The testing was performed by Ning Ma from 2011-09-28 to 2011-09-29.

5.7 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.407, 15.209, 15.205 and IC RSS-210/RSS-Gen standard's radiated emissions limits, and had the worst margin of:

AP1020e

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
Mode: 802.11a mode 20 MHz 5250-5350 MHz			
-27.06	40.173	Vertical	30 MHz - 1 GHz
Mode: 802.11a mode 20 MHz 5470-5725 MHz			
-11.45	105.6645	Vertical	30 MHz - 1 GHz
Mode: 802.11n mode 40 MHz 5250-5350 MHz			
-10.74	105.6428	Vertical	30 MHz - 1 GHz
Mode: 802.11n mode 40 MHz 5470-5725 MHz			
-13.21	105.6248	Vertical	30 MHz - 1 GHz

Note: A mode 20 MHz and N mode 40 MHz is worst case.

Please refer to the following table and plots for specific test result details

AP1020i

Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Channel, Range
Mode: 802.11a mode 20 MHz 5250-5350 MHz			
-11.39	105.6418	Vertical	30 MHz - 1 GHz
Mode: 802.11a mode 20 MHz 5470-5725 MHz			
-10.93	105.6998	Vertical	30 MHz - 1 GHz
Mode: 802.11n mode 40 MHz 5250-5350 MHz			
-8.48	105.6193	Vertical	30 MHz - 1 GHz
Mode: 802.11n mode 40 MHz 5470-5725 MHz			
-7.84	105.6263	Vertical	30 MHz - 1 GHz

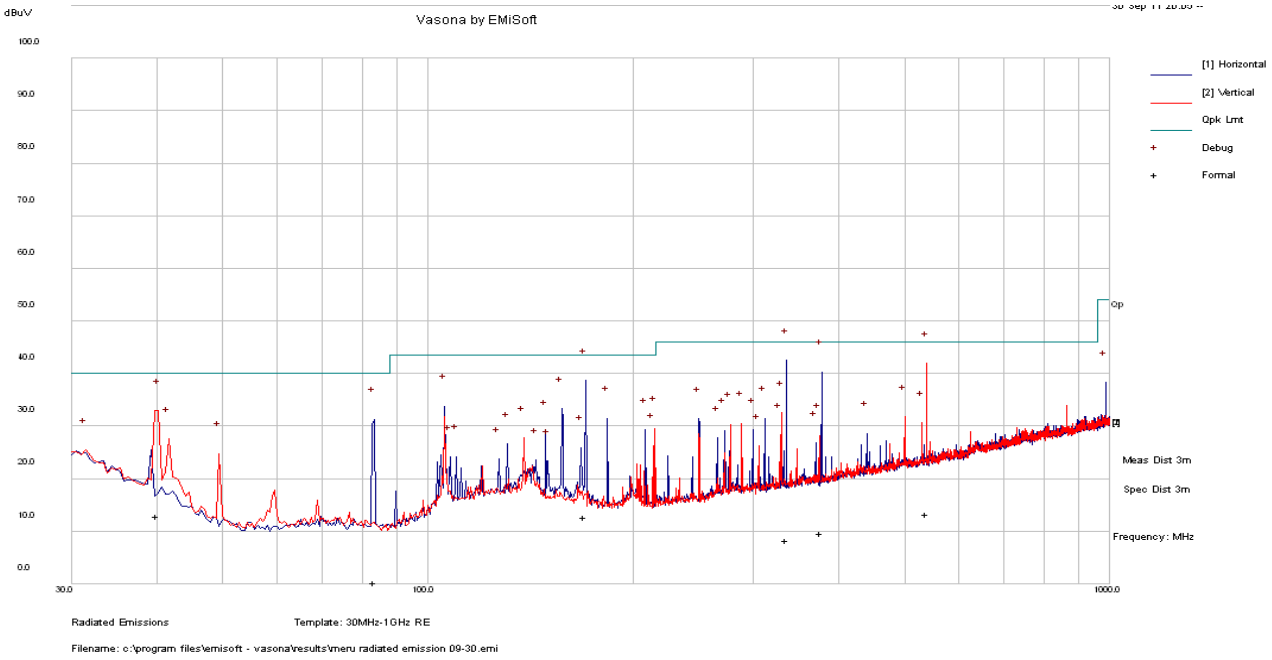
Note: A mode 20MHz and N mode 40MHz is worst case.

Please refer to the following table and plots for specific test result details

5.8 Radiated Emissions Test Result Data

1) Radiated Emission at 3 meters, 30 MHz – 1 GHz

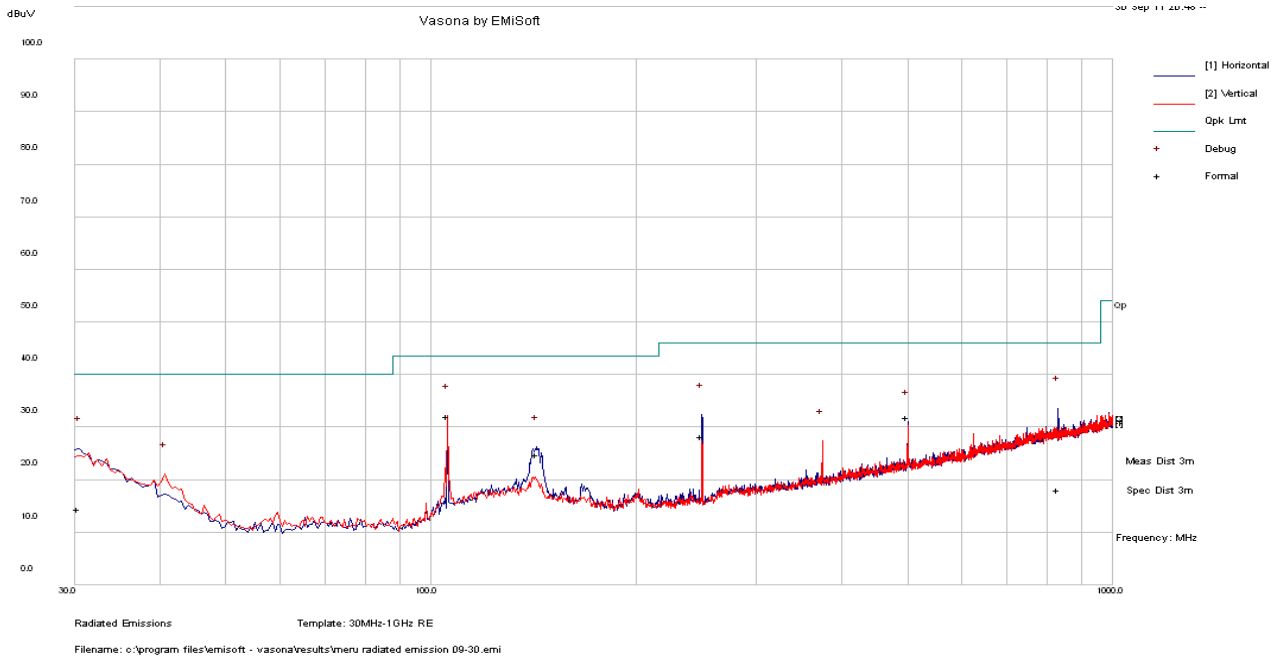
AP1020e, 802.11a Mode POE



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
10.173	12.94	136	V	112	40	-27.06
170.1633	12.8	181	H	250	43.5	-30.70
538.133	13.33	296	V	172	46	-32.67
377.7908	9.73	256	H	51	46	-36.27
335.5645	8.41	165	H	122	46	-37.59
83.41575	0.22	110	H	176	40	-39.78

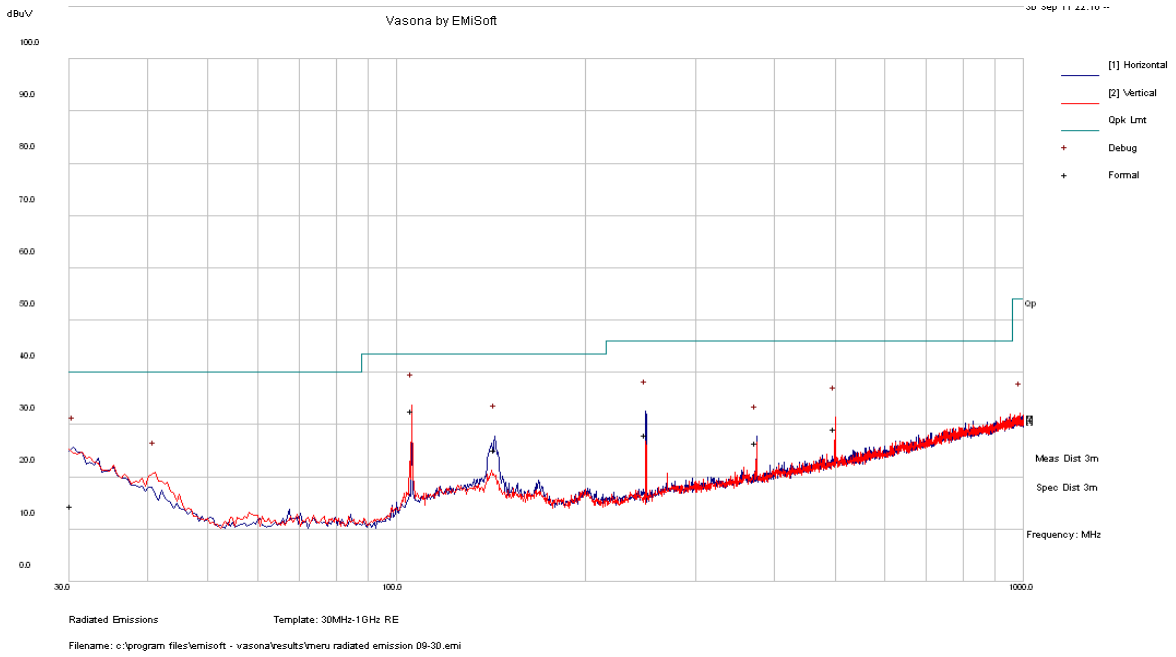
AP1020e, 802.11a Mode POE



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.6645	32.05	99	V	291	43.5	-11.45
499.9818	31.82	156	H	228	46	-14.18
249.955	28.3	102	H	243	46	-17.70
143.0133	24.79	200	H	288	43.5	-18.71
30.429	14.47	235	H	56	40	-25.53
830.466	18.01	195	H	10	46	-27.99

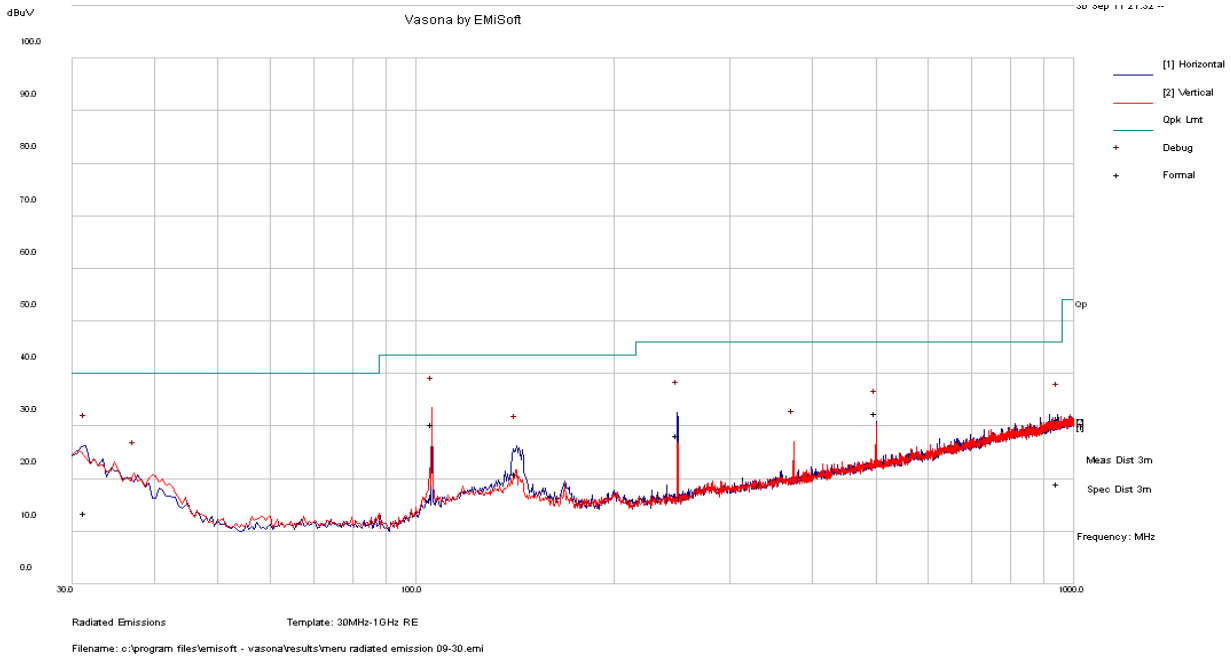
AP1020e, 802.11n 40 MHz Mode POE



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.6428	32.76	121	V	317	43.5	-10.74
500.006	29.26	209	V	194	46	-16.74
249.9523	28.16	100	H	249	46	-17.84
143.5503	25.21	202	H	284	43.5	-18.29
374.993	26.46	99	H	135	46	-19.54
30.24725	14.54	214	H	183	40	-25.46

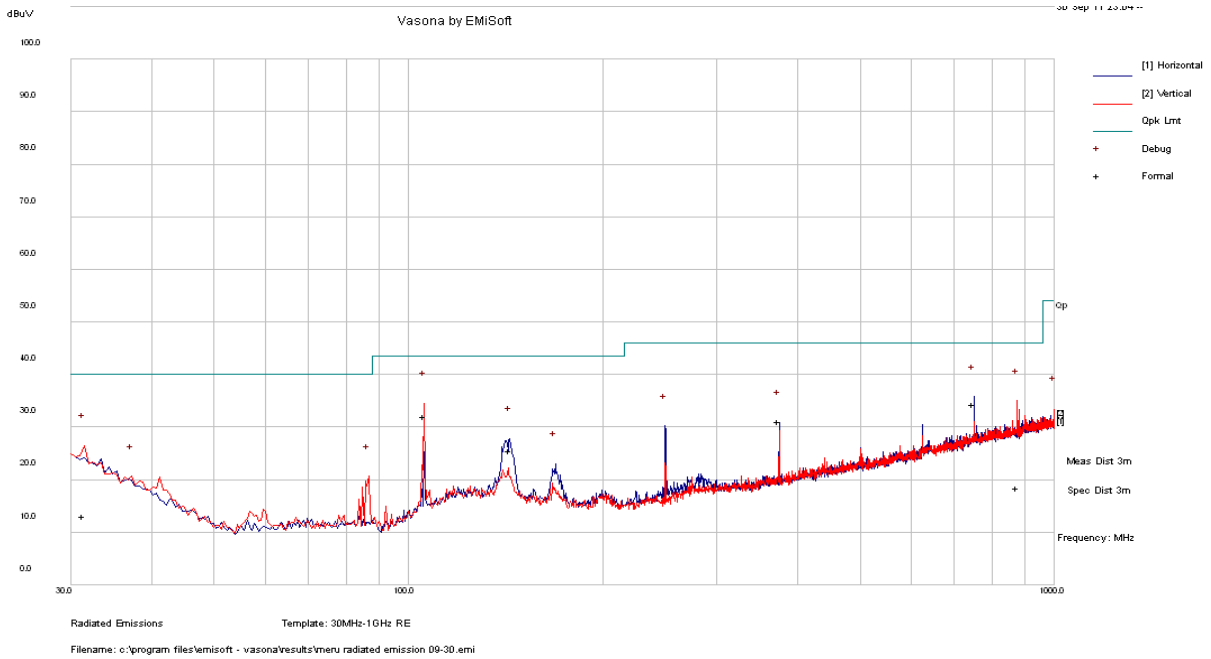
AP1020e, 802.11n 40 MHz Mode POE



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.6428	30.29	99	V	298	43.5	-13.21
499.9968	32.43	170	H	221	46	-13.57
249.955	28.25	107	H	243	46	-17.75
141.8608	20.95	227	H	264	43.5	-22.55
31.4395	13.47	248	H	244	40	-26.53
945.8638	19.13	258	H	329	46	-26.87

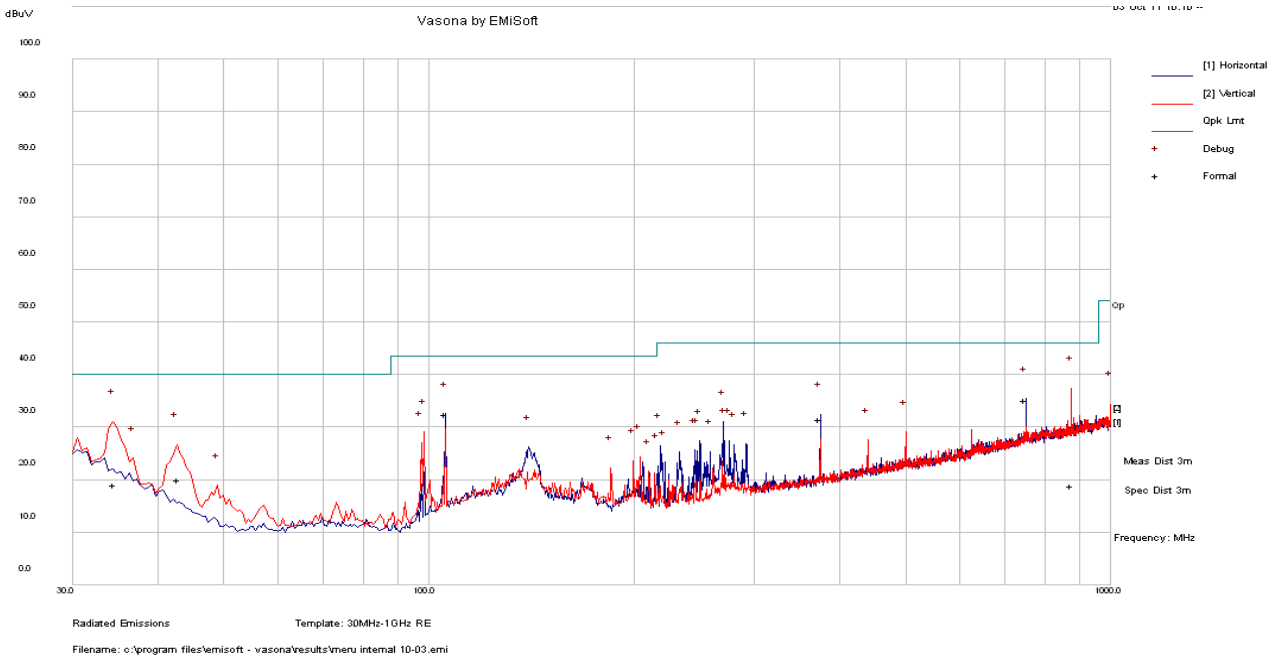
AP1020i, 5250-5350MHz, 802.11a Mode POE



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.6418	32.11	165	V	281	43.5	-11.39
750.0245	34.36	296	H	176	46	-11.64
375.001	31.13	136	H	145	46	-14.87
143.603	25.59	110	H	259	43.5	-17.91
31.363	13.22	256	V	234	40	-26.78
875.1685	18.59	181	V	69	46	-27.41

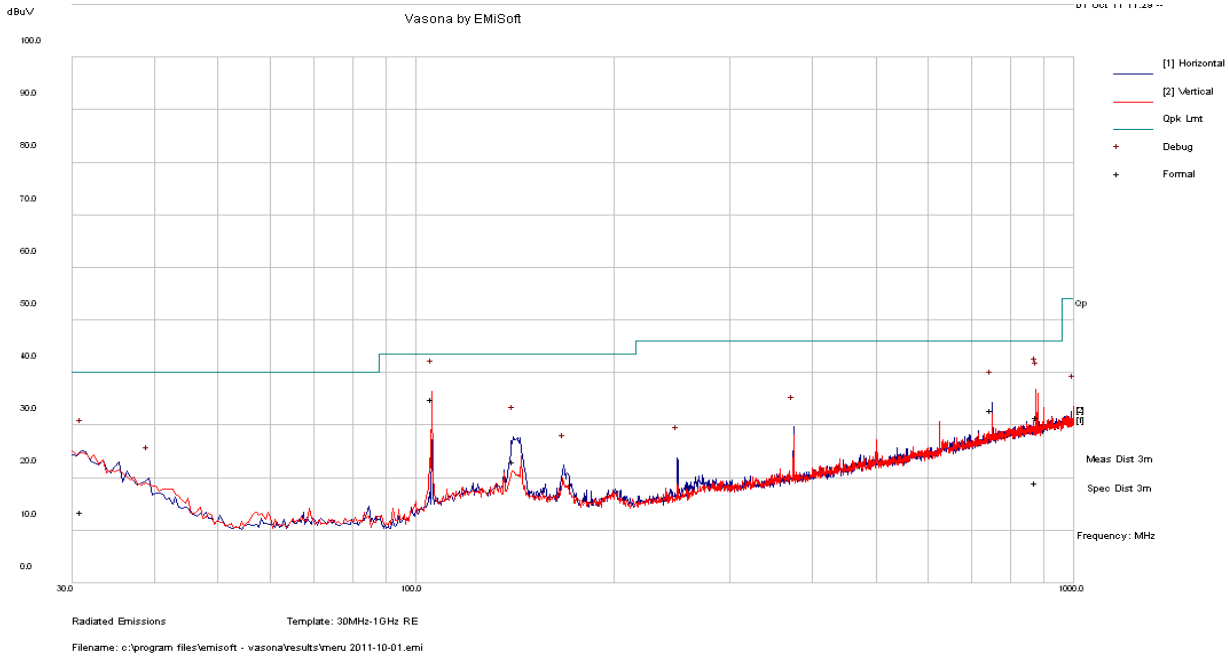
AP1020i, 5470-5725 MHz, 802.11a Mode POE



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
750.0113	35.16	110	H	217	46	-10.84
375.0183	31.61	99	H	146	46	-14.39
105.6998	32.57	166	H	94	43.5	-19.93
42.85825	19.98	100	V	143	40	-20.02
34.56775	19.14	203	V	180	40	-20.86
875.3173	18.81	160	V	281	46	-27.19

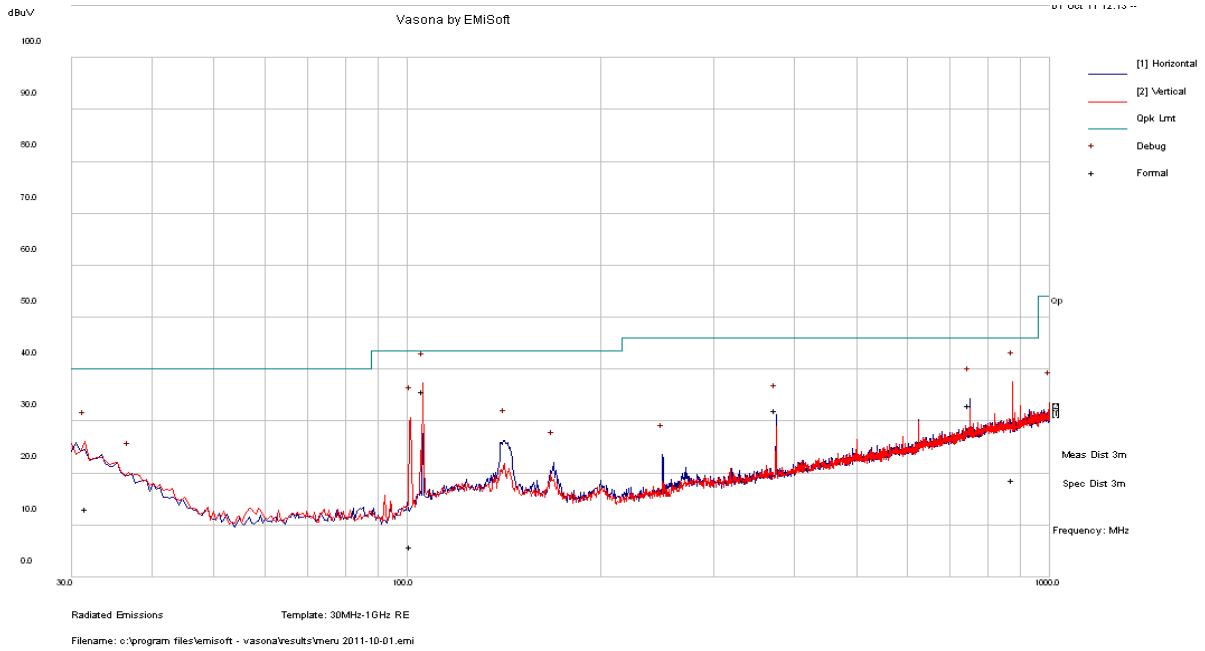
AP1020i, 5250-5350 MHz, 802.11n 40 MHz Mode POE



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.6193	35.02	100	V	138	43.5	-8.48
750.023	32.85	109	H	215	46	-13.15
879.988	31.61	120	V	5	46	-14.39
140.49	23.18	201	H	250	43.5	-20.32
31.00175	13.45	187	H	296	40	-26.55
875.2303	19.15	130	V	174	46	-26.85

AP1020i, 5470-5725 MHz, 802.11n 40 MHz Mode POE



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dB)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.6263	35.66	99	V	151	43.5	-7.84
750.0193	33.06	100	H	211	46	-12.94
375.0213	32.01	99	H	146	46	-13.99
31.594	13.1	179	V	228	40	-26.90
875.4928	18.65	270	V	107	46	-27.35
101.245	5.85	102	V	242	43.5	-37.65

2) Radiated Emission at 3 meters, above 1 GHz

AP1020e, 802.11a Mode 5250-5350 MHz

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low channel 5260 MHz, measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
Middle channel 5280 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
High channel 5320 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-

AP1020e, 802.11a Mode 5470-5725 MHz

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low channel 5500 MHz, measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
Middle channel 5580 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
High channel 5700 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-

AP1020e, 802.11 n40 Mode 5250-5350 MHz

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low channel 5270 MHz, measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
Middle channel 5310 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-

AP1020e, 802.11 n40 Mode 5470-5725 MHz

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low channel 5510 MHz, measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
Middle channel 5590 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
High channel 5670 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-

* All the Restricted Band Frequencies are more than 20 dB below the margin

AP1020i, 802.11a Mode 5250-5350 MHz

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low channel 5260 MHz, measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
Middle channel 5280 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
High channel 5320 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-

AP1020i, 802.11a Mode 5470-5725 MHz

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low channel 5500 MHz, measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
Middle channel 5580 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
High channel 5700 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-

AP1020i, 802.11 n40 Mode 5250-5350 MHz

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low channel 5270 MHz, measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
Middle channel 5310 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-

AP1020i, 802.11 n40 Mode 5470-5725 MHz

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low channel 5510 MHz, measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
Middle channel 5590 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-
High channel 5670 MHz measured at 3 meters											
-	-	-	-	-	-	-	-	-	-	-	-

* All the Restricted Band Frequencies are more than 20 dB below the margin

6 FCC §15.407(a) & IC RSS-210 §A9.2 – 26 dB and 99% Emission Bandwidth

6.1 Applicable Standard

FCC §15.407(a) and RSS-210 A9.2.

6.2 Measurement Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 26 dB from the reference level. Record the frequency difference as the emissions bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

6.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

6.4 Test Environmental Conditions

Temperature:	23-25 °C
Relative Humidity:	35-50 %
ATM Pressure:	101-103kPa

The testing was performed by Ning Ma on 2011-09-07~ 2011-09-11 at RF Site.

6.5 Summary of Test Results

TX Chain 1

802.11 a 20 MHz Mode:

5250MHz-5350MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5260	16.5927	28.253	> 500	Compliant
Middle	5280	16.4539	25.330	> 500	Compliant
High	5700	16.5449	27.307	> 500	Compliant

5470MHz-5725MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5500	16.5122	26.963	> 500	Compliant
Middle	5580	16.5048	27.261	> 500	Compliant
High	5700	16.5130	27.251	> 500	Compliant

802.11 n 20 MHz Mode:

5250MHz-5350MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5260	17.6764	30.099	> 500	Compliant
Middle	5280	17.6582	28.527	> 500	Compliant
High	5700	17.6288	28.553	> 500	Compliant

5250MHz-5350MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5500	17.6446	26.294	> 500	Compliant
Middle	5580	17.6281	25.471	> 500	Compliant
High	5700	17.6444	25.123	> 500	Compliant

802.11 n 40 MHz Mode:

5250MHz-5350MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5270	36.2042	57.610	> 500	Compliant
High	5310	36.5646	42.251	> 500	Compliant

5250MHz-5350MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5510	36.1614	42.077	> 500	Compliant
Middle	5590	36.0971	45.723	> 500	Compliant
High	5670	36.0754	41.982	> 500	Compliant

TX Chain 2

802.11 a 20 MHz Mode:

5250MHz-5350MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5260	16.4427	25.357	> 500	Compliant
Middle	5280	16.4349	25.060	> 500	Compliant
High	5700	16.4394	25.364	> 500	Compliant

5470MHz-5725MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5500	16.6109	25.452	> 500	Compliant
Middle	5580	16.6018	25.504	> 500	Compliant
High	5700	16.6147	25.461	> 500	Compliant

802.11 n 20 MHz Mode:

5250MHz-5350MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5260	17.5897	25.072	> 500	Compliant
Middle	5280	17.5890	22.305	> 500	Compliant
High	5700	17.5528	22.455	> 500	Compliant

5470MHz-57250MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5500	17.5626	22.321	> 500	Compliant
Middle	5580	17.5973	25.095	> 500	Compliant
High	5700	17.5917	25.053	> 500	Compliant

802.11 n 40 MHz Mode:

5250MHz-5350MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	26 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5270	36.0229	37.992	> 500	Compliant
High	5310	36.3160	41.368	> 500	Compliant

5250MHz-5350MHz

Channel	Frequency (MHz)	99% Emission Bandwidth (MHz)	6 dB Emission Bandwidth (MHz)	Limit (kHz)	Results
Low	5510	36.1662	41.430	> 500	Compliant
Middle	5590	36.0953	37.808	> 500	Compliant
High	5670	36.1828	47.019	> 500	Compliant

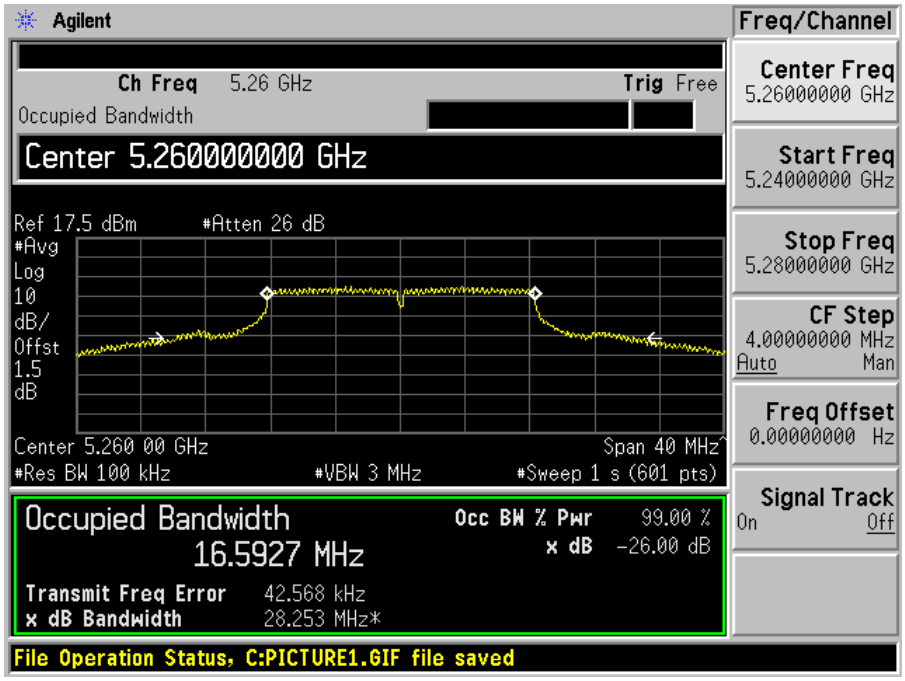
Please refer to the following plots for detailed test results.

TX Chain 1

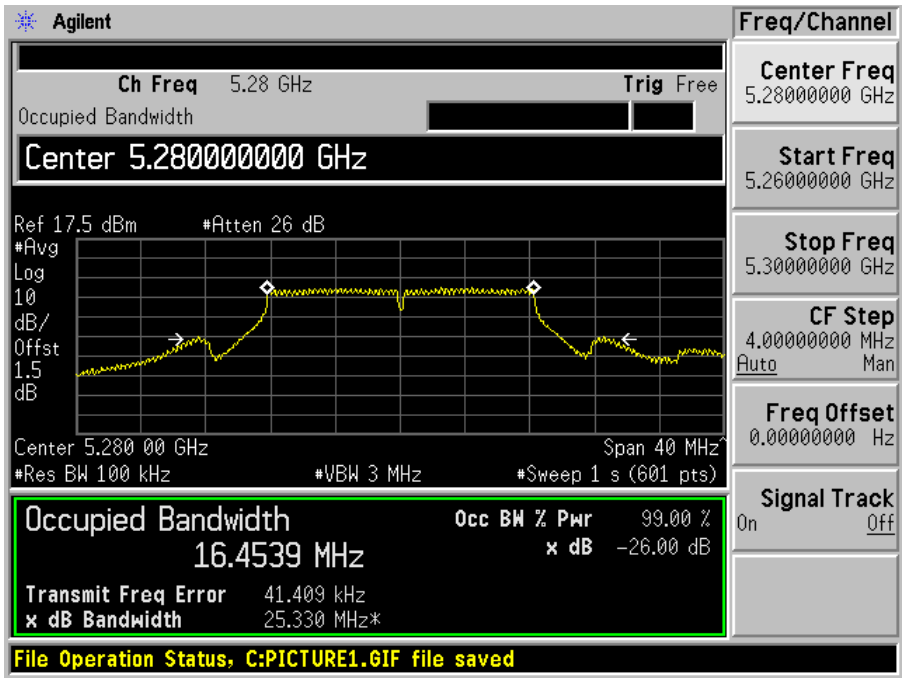
802.11 a 20MHz

5250MHz-5350MHz

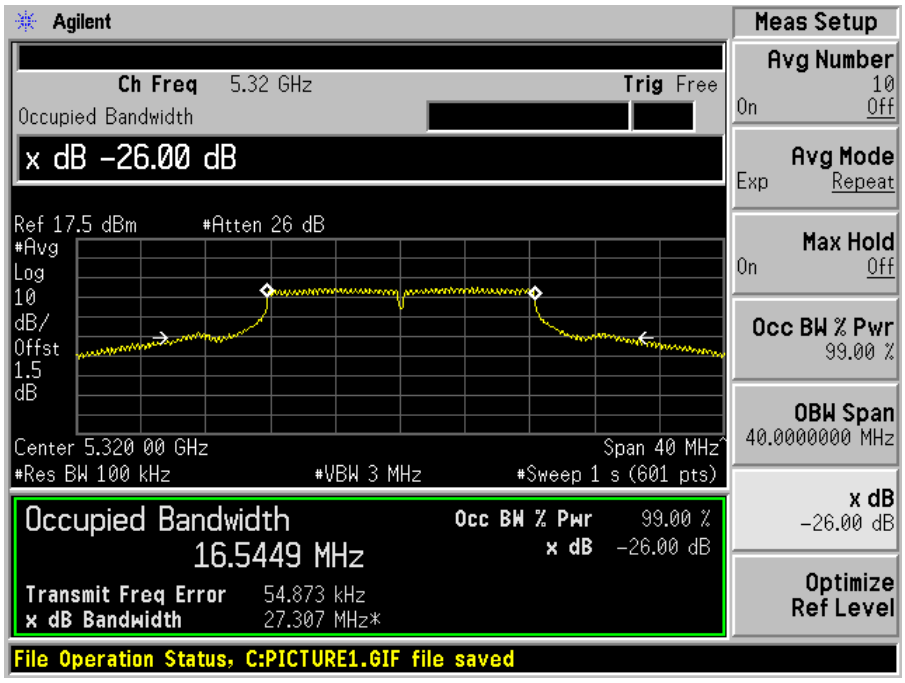
Low channel



Middle channel

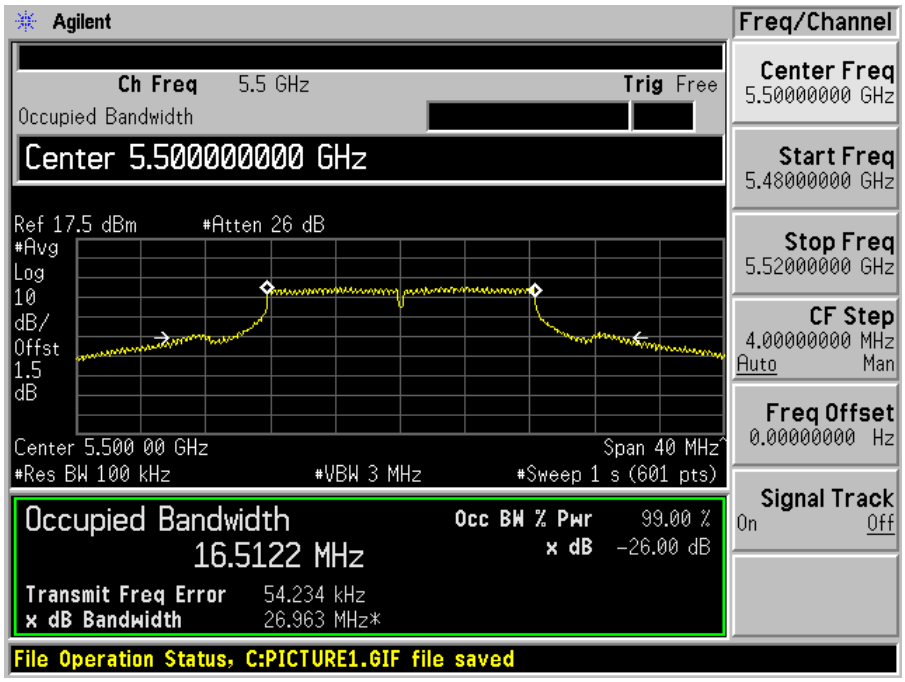


High channel

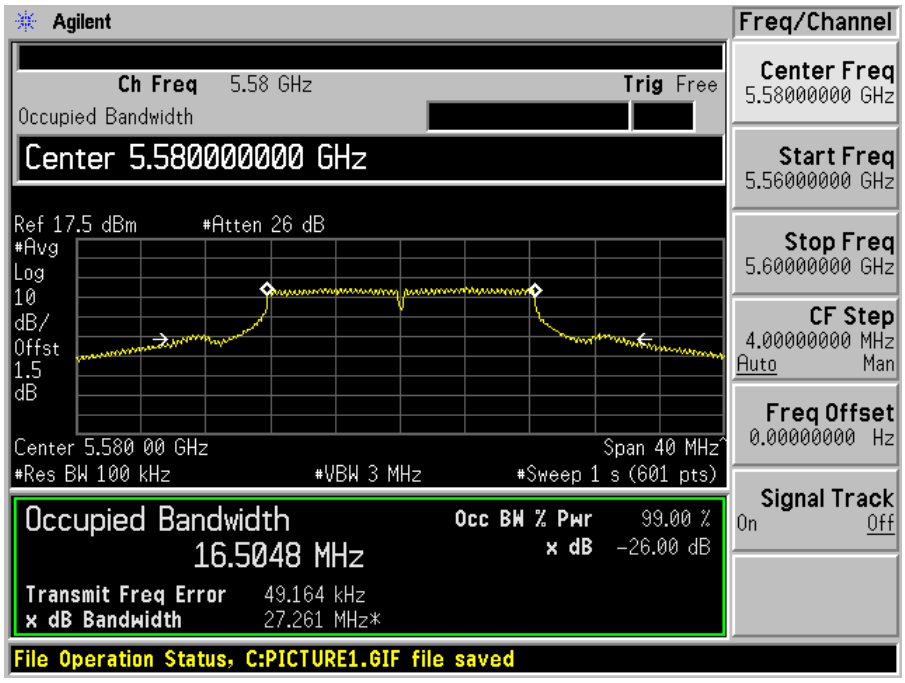


54710MHz-5725MHz

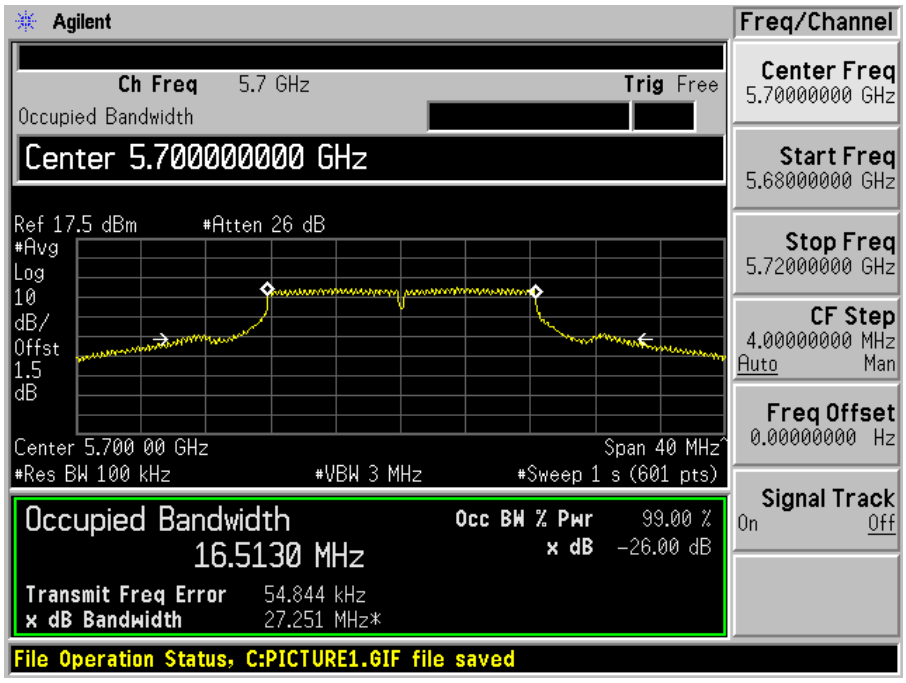
Low channel



Middle channel



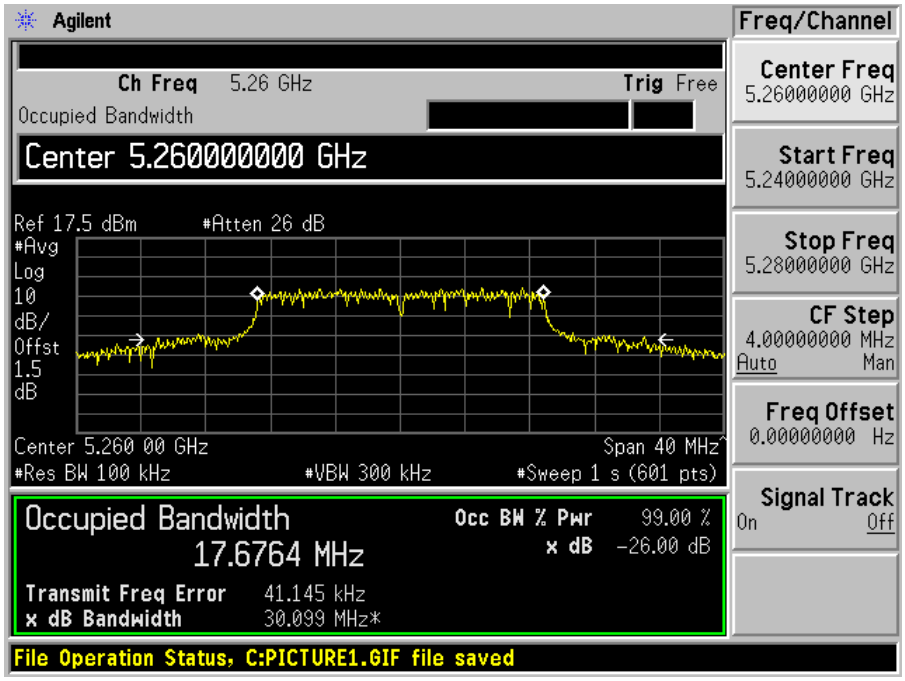
High channel



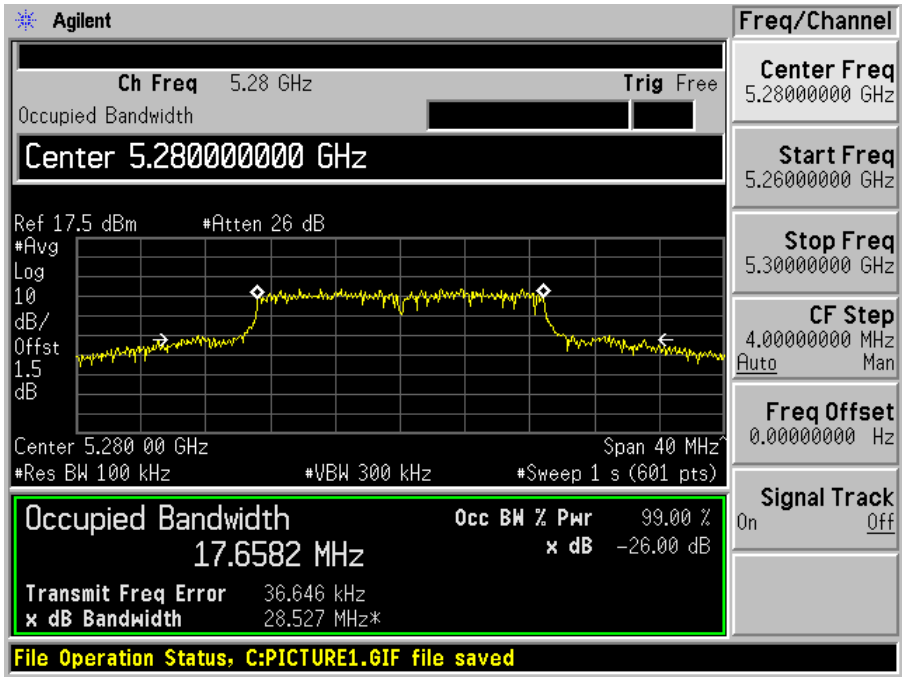
802.11 n 20 MHz

5250MHz-5350MHz

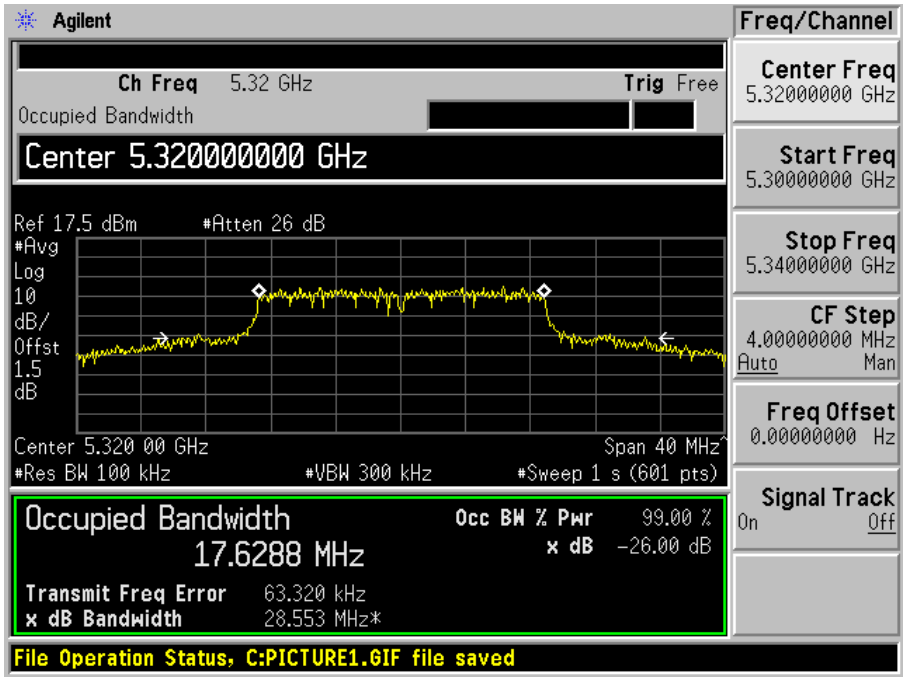
Low channel



Middle channel

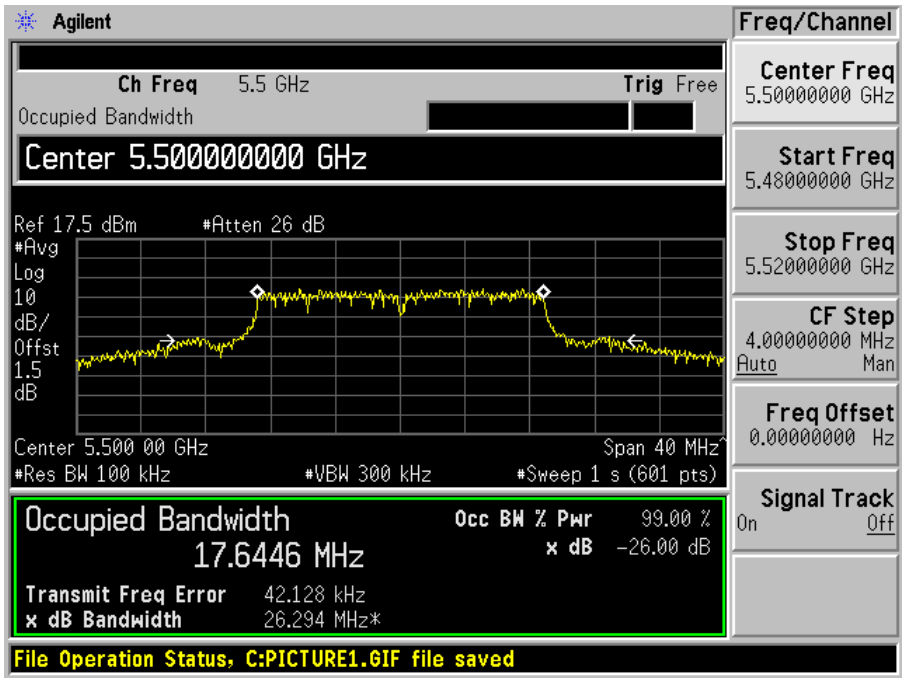


High channel

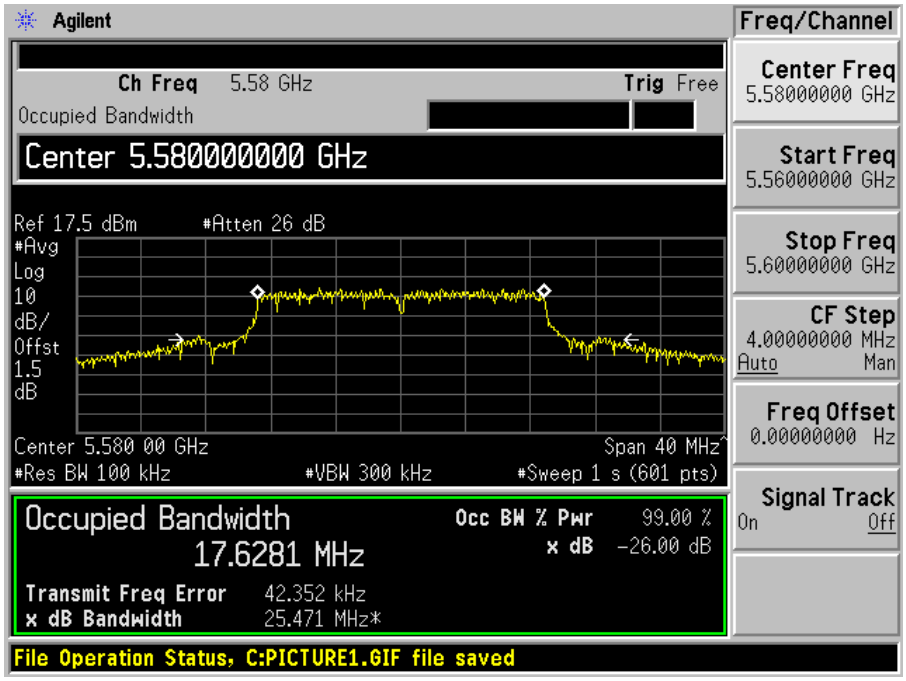


5470MHz-5725MHz

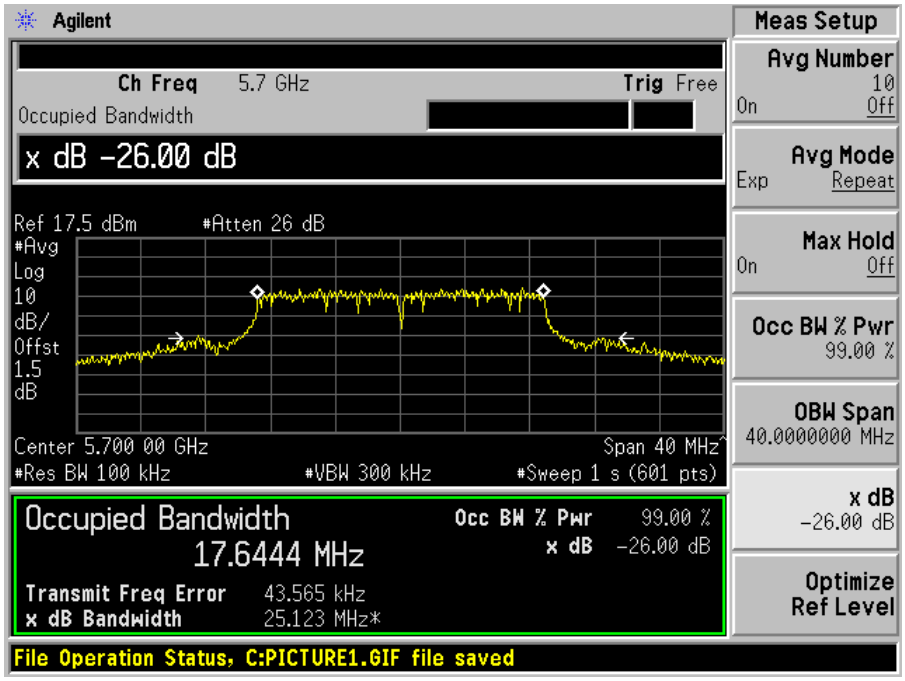
Low channel



Middle channel



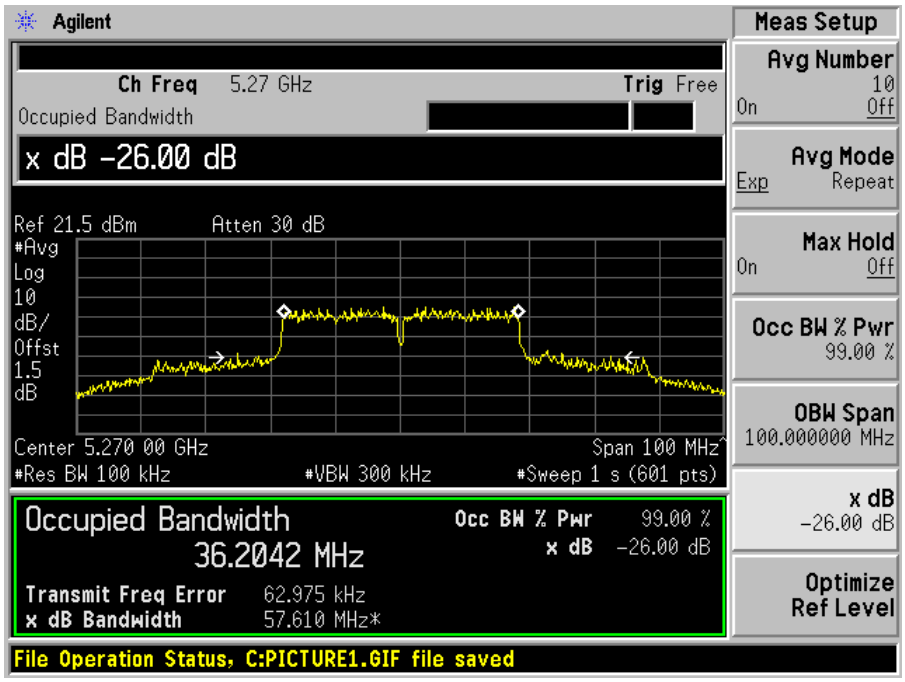
High channel



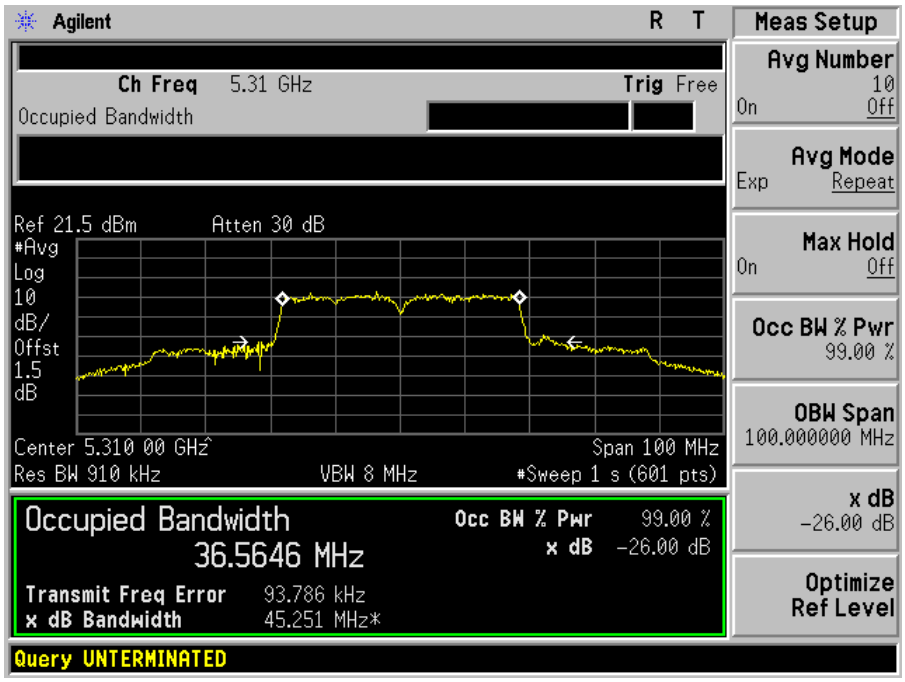
802.11 n 40MHz

5250MHz-5350MHz

Low channel

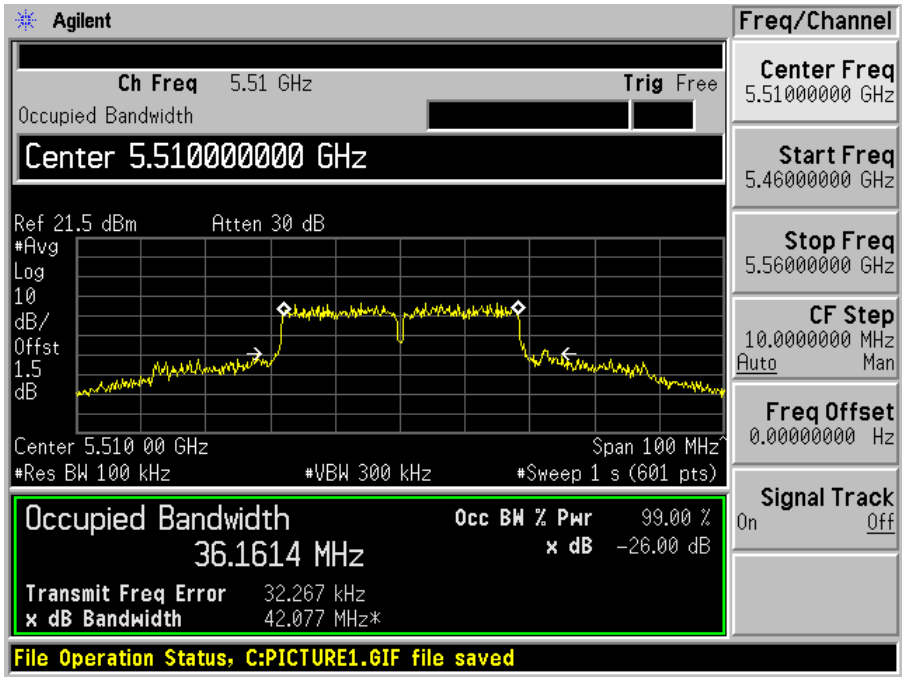


High channel

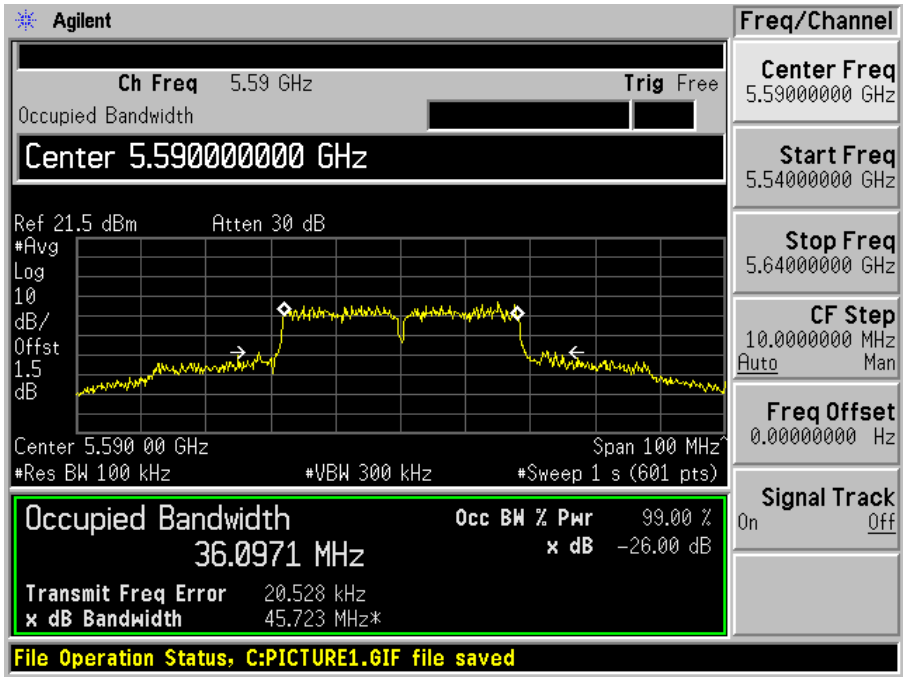


5470MHz-5725MHz

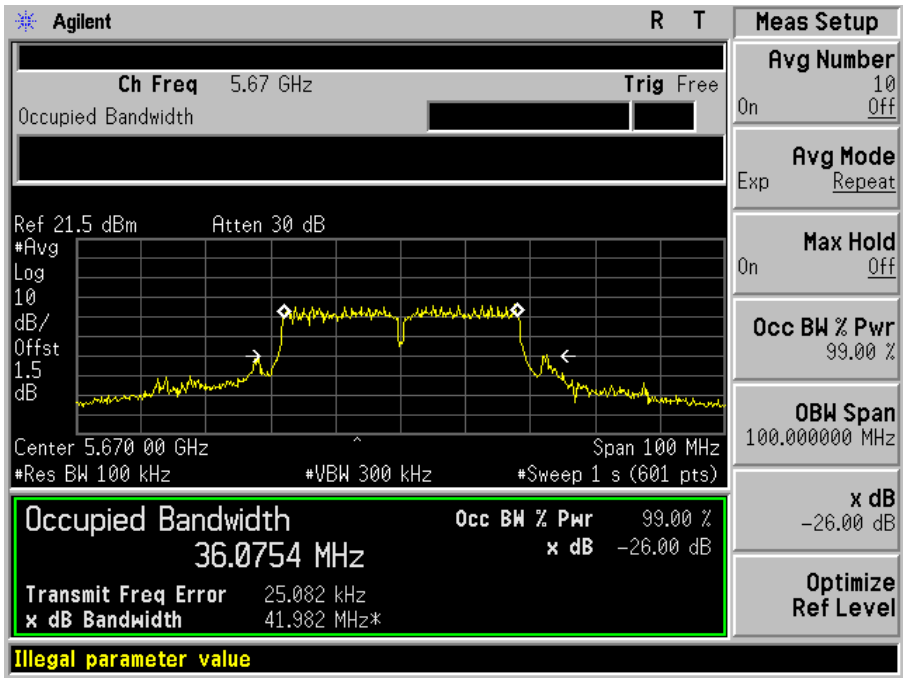
Low channel



Middle channel



High channel

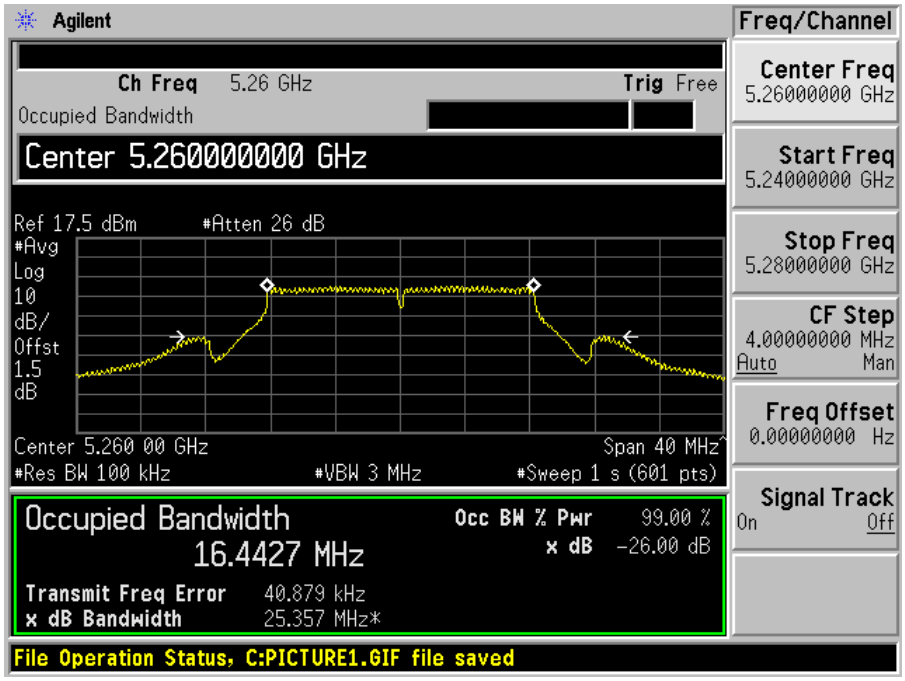


TX Chain 2

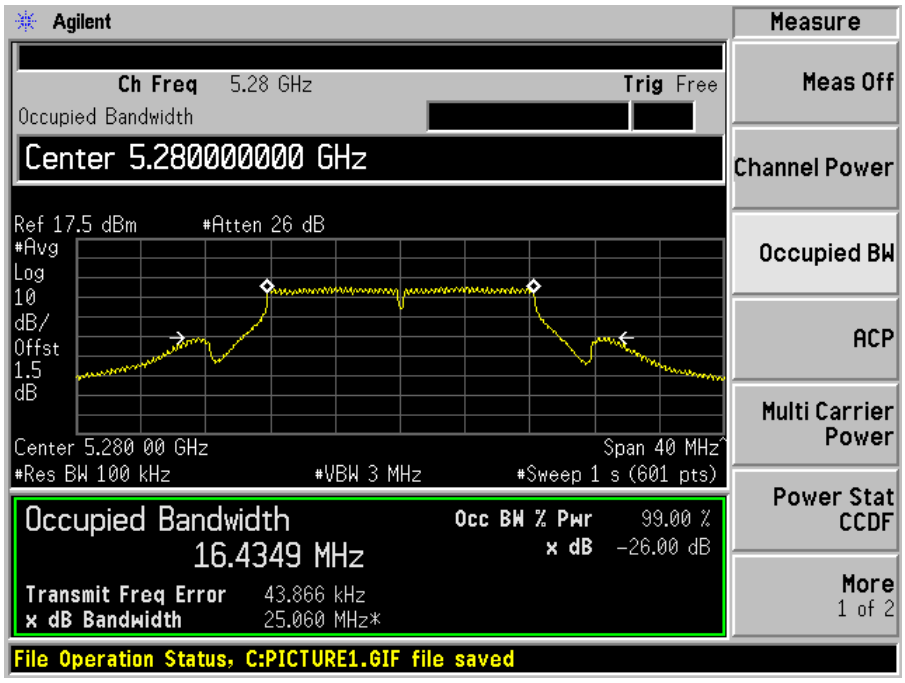
802.11 a 20MHz

5250MHz-5350MHz

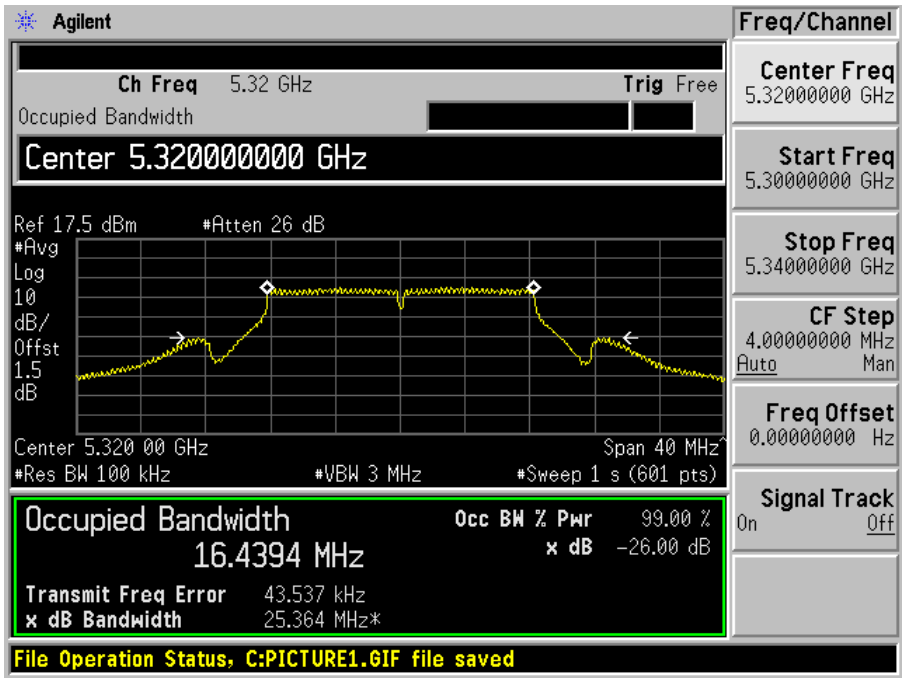
Low channel



Middle channel

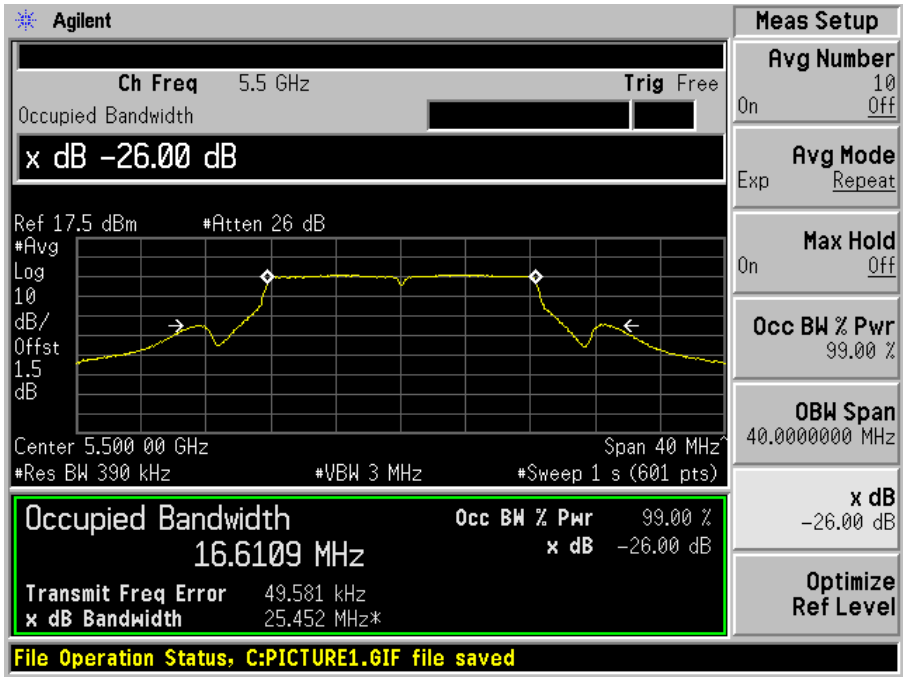


High channel

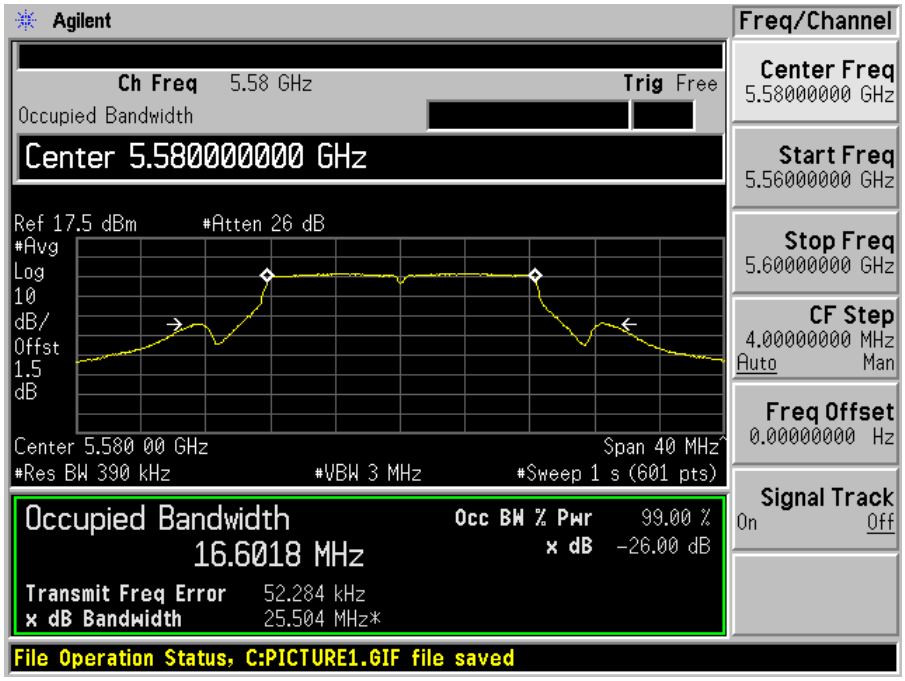


5470MHz-5725MHz

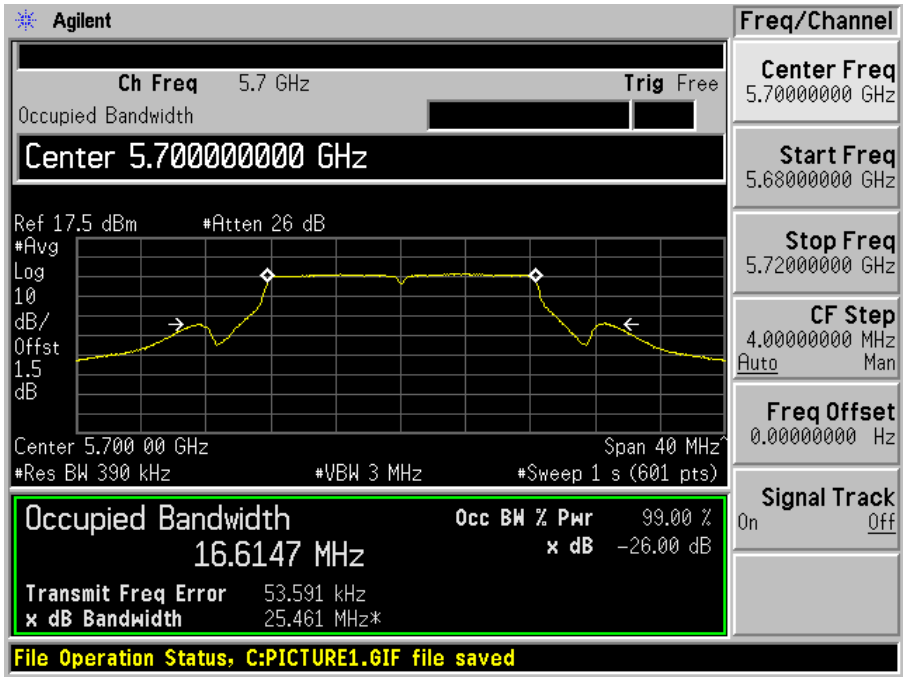
Low channel



Middle channel



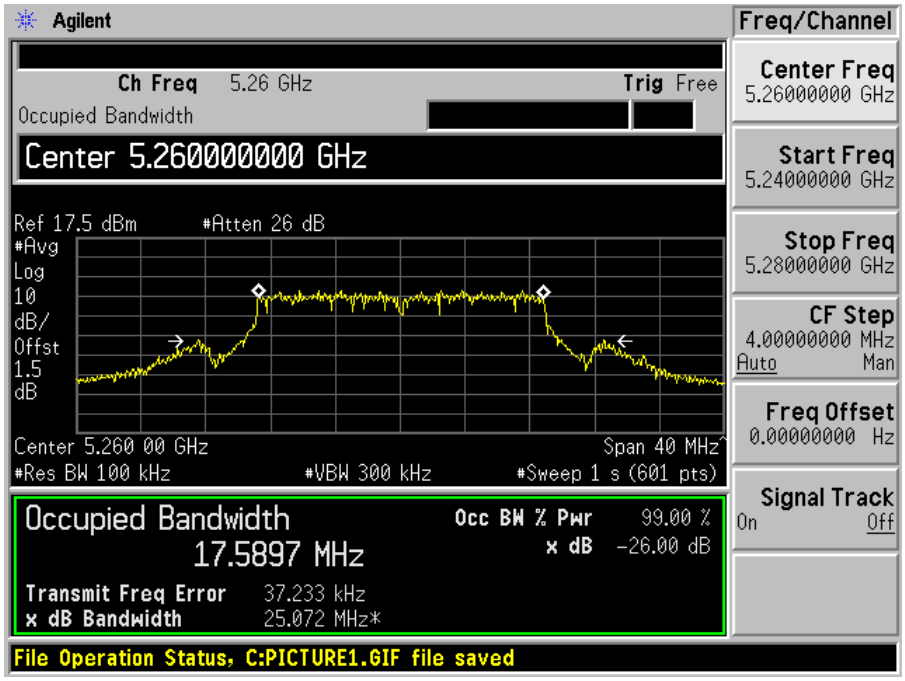
High channel



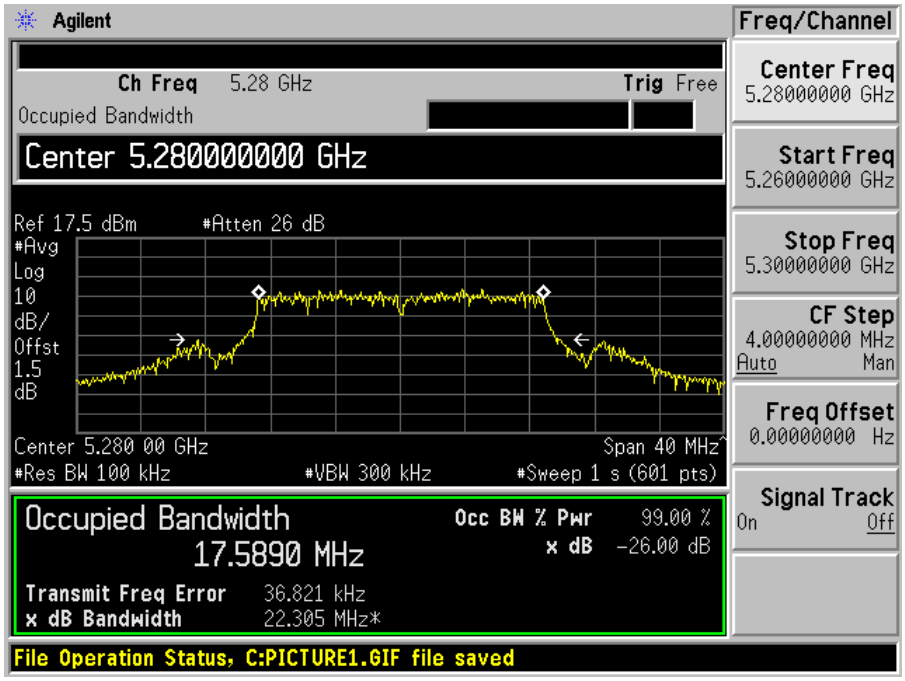
802.11 n 20MHz

5250MHz-5350MHz

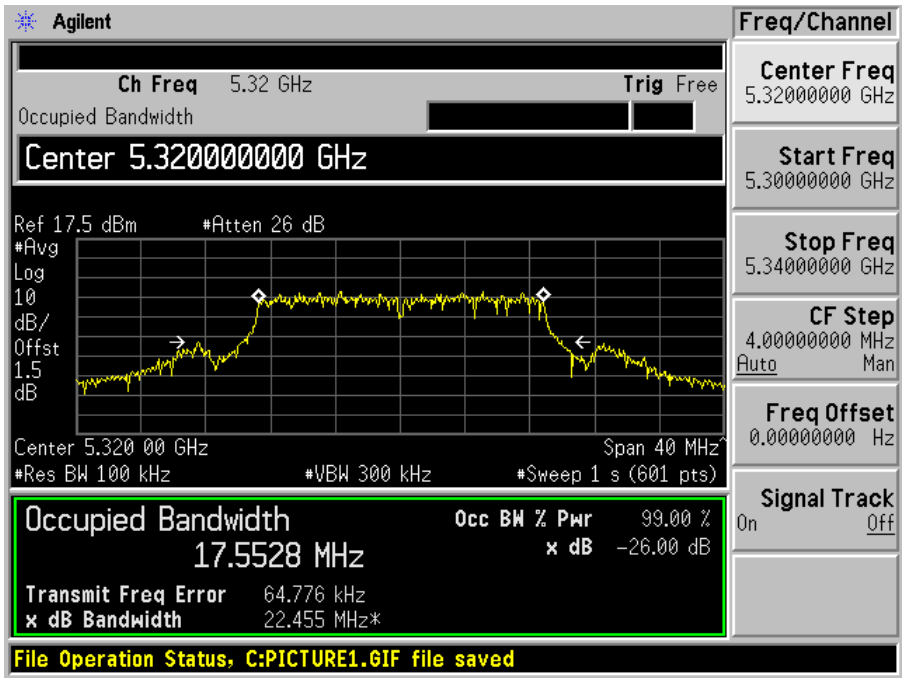
Low channel



Middle channel

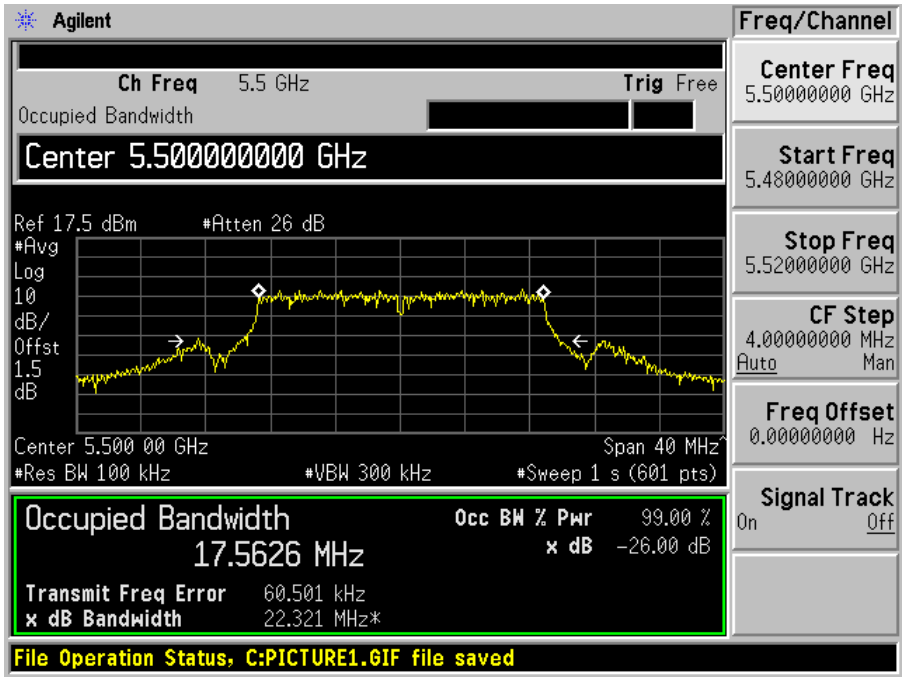


High channel

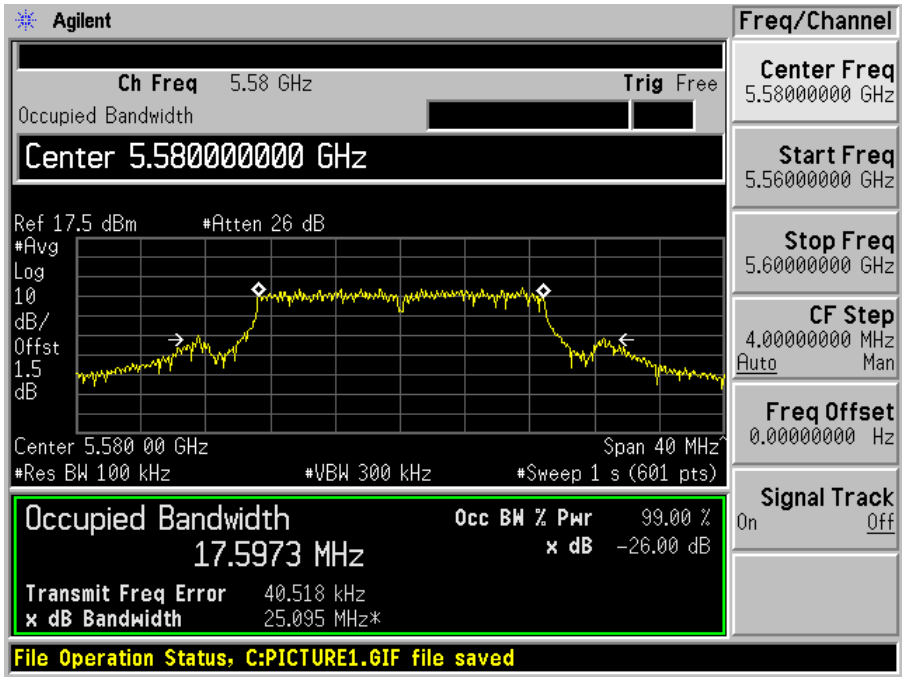


5470MHz-5725MHz

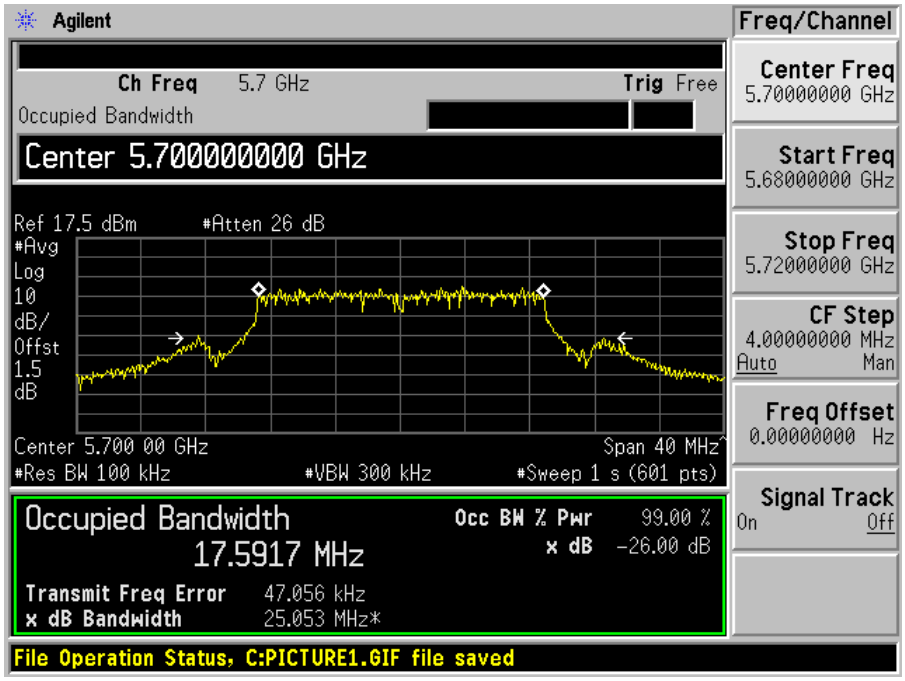
Low channel



Middle channel



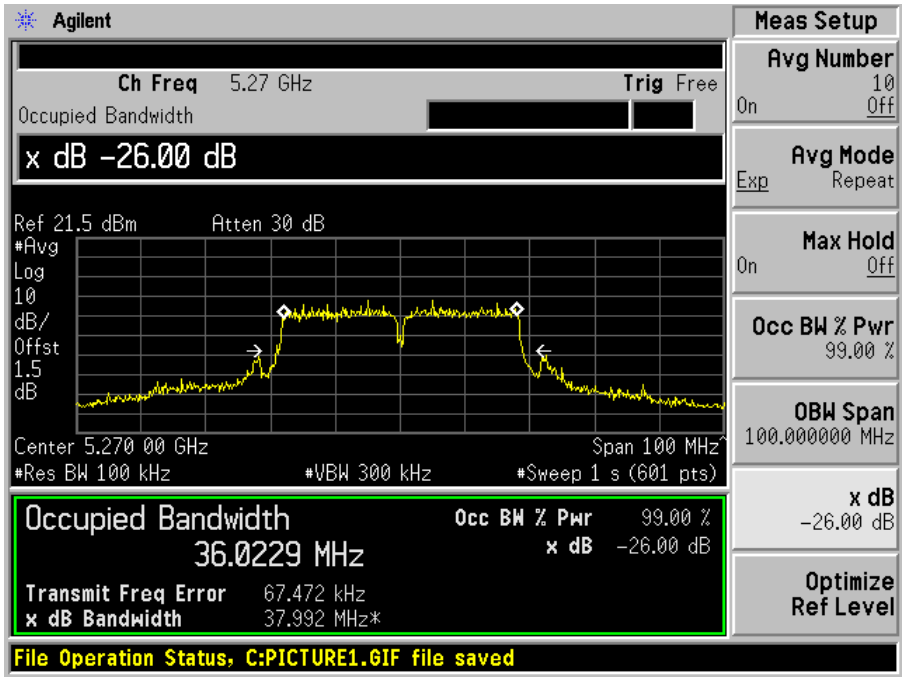
High channel



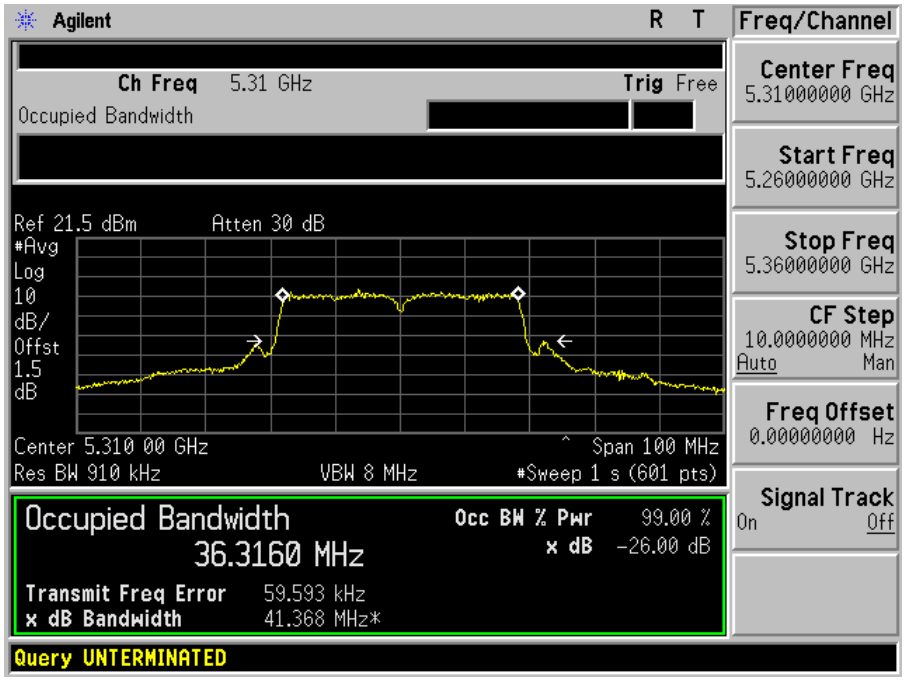
802.11 n 40 MHz

5250MHz-5350MHz

Low channel

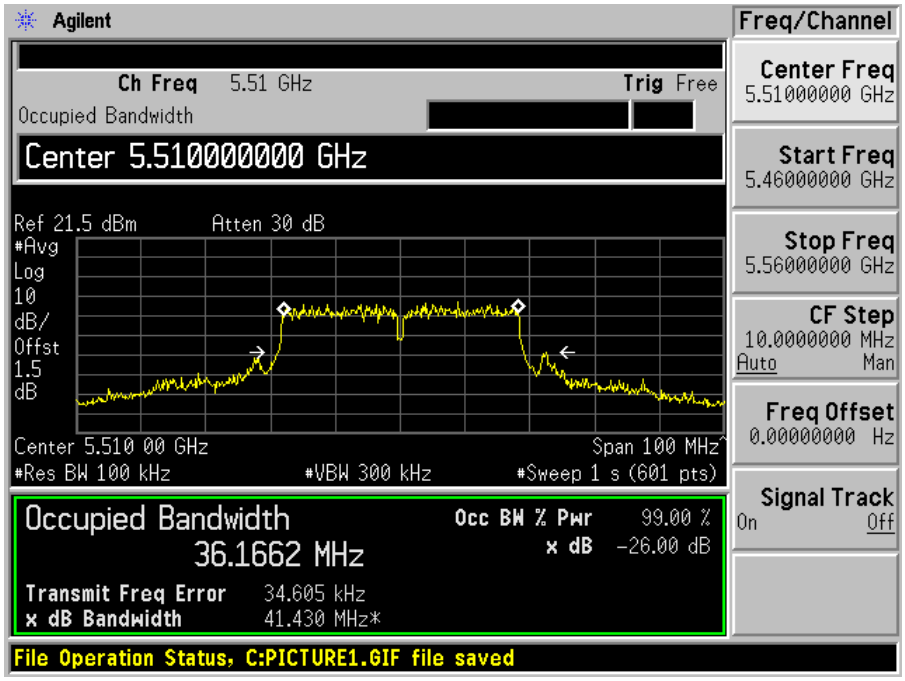


High channel

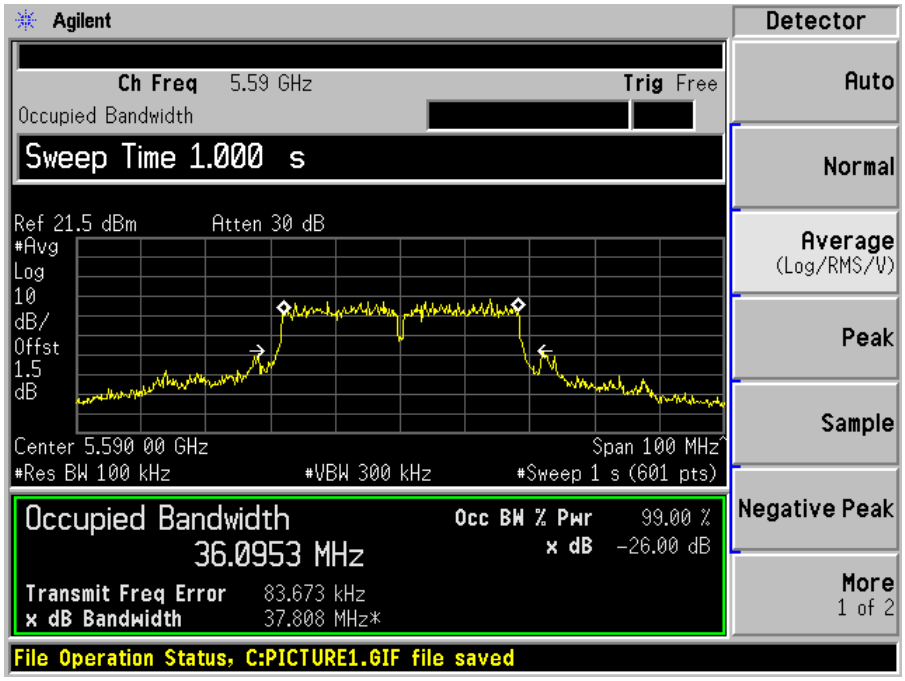


5470MHz-5725MHz

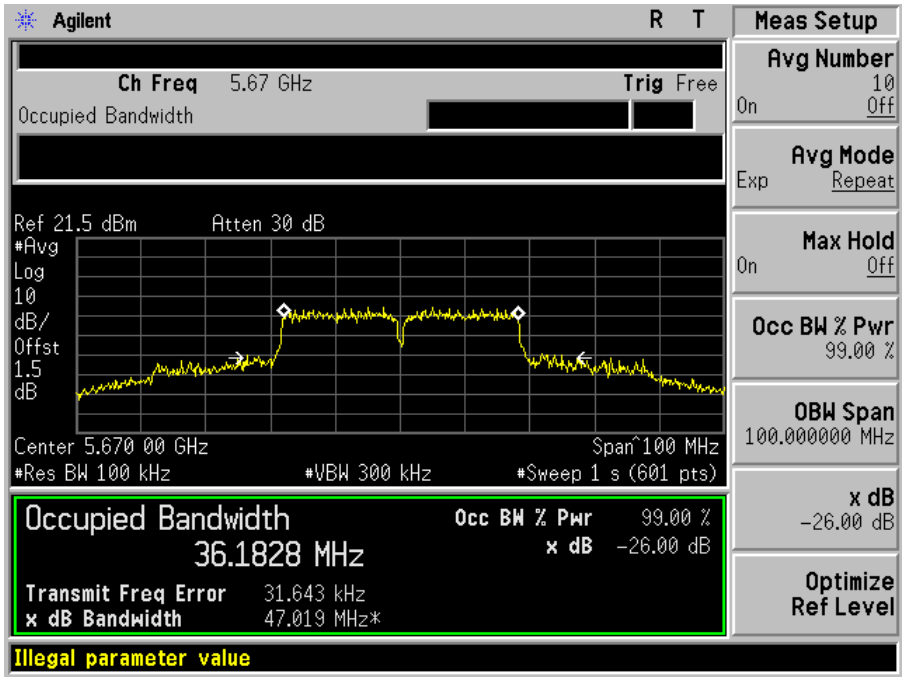
Low channel



Middle channel



High channel



7 FCC §407(a) & IC RSS-210 §A9.2 - Peak Output Power Measurement

7.1 Applicable Standard

According to FCC §15.407(a)(1)

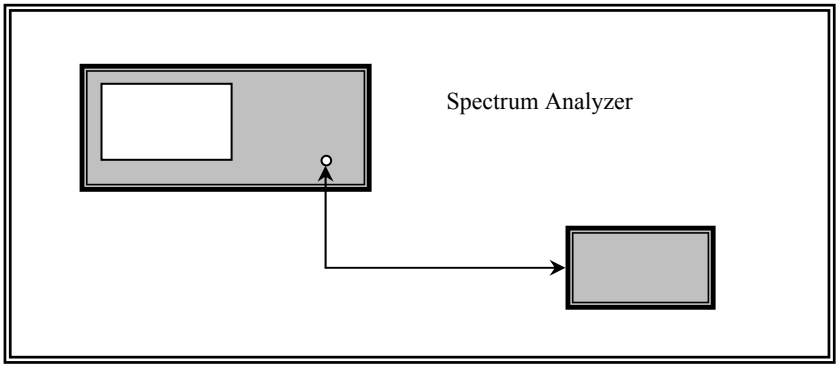
(1) For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

2) For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to IC RSS-210 § 9.2, For the band 5150-5250 MHz, the maximum equivalent isotropically radiated power (e.i.r.p.) shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band

7.2 Measurement Procedure

1. Place the EUT on a bench and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to a spectrum analyzer.
3. Add a correction factor to the display.



7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

7.4 Test Environmental Conditions

Temperature:	23-25 °C
Relative Humidity:	35-50 %
ATM Pressure:	101-103kPa

The testing was performed by Ning Ma on 2011-09-07~ 2011-09-11 at RF Site.

7.5 Test Results

802.11a 20 MHz

5250MHz-5350MHz

Channel	Frequency (MHz)	TX Chain 1 Output Power (dBm)	TX Chain 2 Output Power (dBm)	Worst Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5260	10.27	10.62	10.62	23	-12.38
Middle	5280	10.49	10.59	10.59	23	-12.41
High	5320	10.61	10.87	10.87	23	-12.13

5470MHz-5725MHz

Channel	Frequency (MHz)	TX Chain 1 Output Power (dBm)	TX Chain 2 Output Power (dBm)	Worst Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	10.72	11.39	11.39	23	-11.61
Middle	5580	10.71	11.82	11.82	23	-11.18
High	5700	10.89	11.89	11.89	23	-11.11

802.11 n 20 MHz

5250MHz-5350MHz

Channel	Frequency (MHz)	TX Chain 1 Output Power (dBm)	TX Chain 2 Output Power (dBm)	Total Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5260	7.73	8.09	10.92	23	-12.08
Middle	5280	7.68	8.01	10.86	23	-12.14
High	5320	7.71	8.34	11.05	23	-11.95

5470MHz-5725MHz

Channel	Frequency (MHz)	TX Chain 1 Output Power (dBm)	TX Chain 2 Output Power (dBm)	Total Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	7.97	8.97	11.51	23	-11.49
Middle	5580	8.41	9.51	12.01	23	-10.99
High	5700	8.10	8.13	11.13	23	-11.87

802.11 n 40 MHz

5250MHz-5350MHz

Channel	Frequency (MHz)	TX Chain 1 Output Power (dBm)	TX Chain 2 Output Power (dBm)	Total Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5270	5.39	6.21	8.83	23	-14.17
High	5310	5.88	6.30	9.11	23	-13.89

5470MHz-5725MHz

Channel	Frequency (MHz)	TX Chain 1 Output Power (dBm)	TX Chain 2 Output Power (dBm)	Total Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	5510	5.91	6.34	9.14	23	-13.86
Middle	5590	5.96	6.72	9.37	23	-13.63
High	5670	5.85	6.53	9.21	23	-13.79

8 FCC §15.407(b) & IC RSS-210 §A9.3 – Out of Band Emissions

8.1 Applicable Standard

According to FCC §15.407(b) For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25–5.35 GHz band that generate emissions in the 5.15–5.25 GHz band must meet all applicable technical requirements for operation in the 5.15–5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15–5.25 GHz band. For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz.

According to Rss-210 §A8.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the radio frequency power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under section A8.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Tables 2 and 3 is not required.

8.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Set both RBW and VBW of spectrum analyzer to 100 kHz with a convenient frequency span including 100 kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

8.4 Test Environmental Conditions

Temperature:	23-25 °C
Relative Humidity:	35-50 %
ATM Pressure:	101-103kPa

The testing was performed by Ning Ma on 2011-09-07~ 2011-09-11 at RF Site.

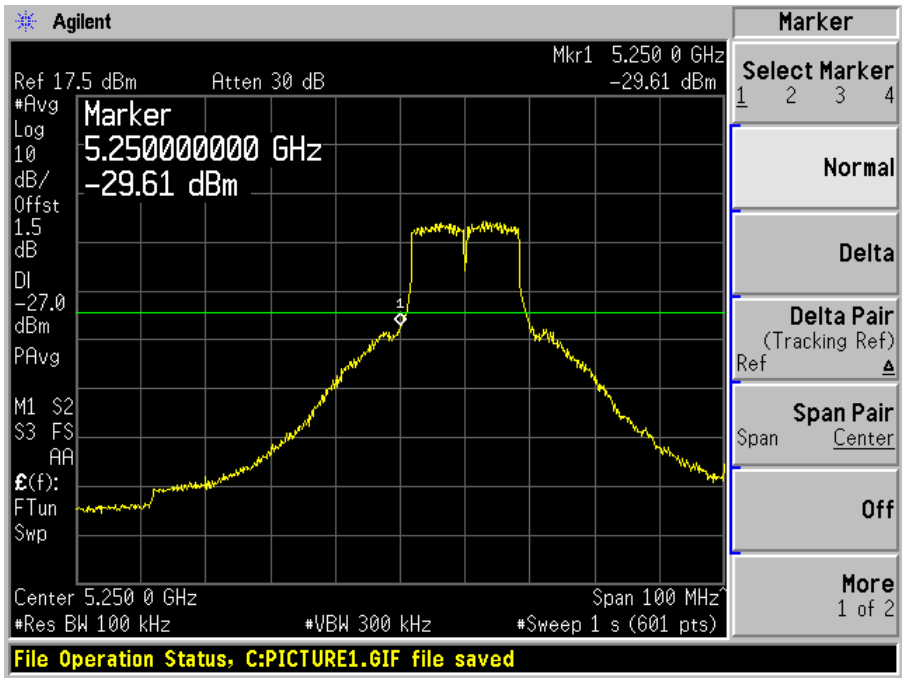
8.5 Test Results

Please refer to following pages for plots of band edge.

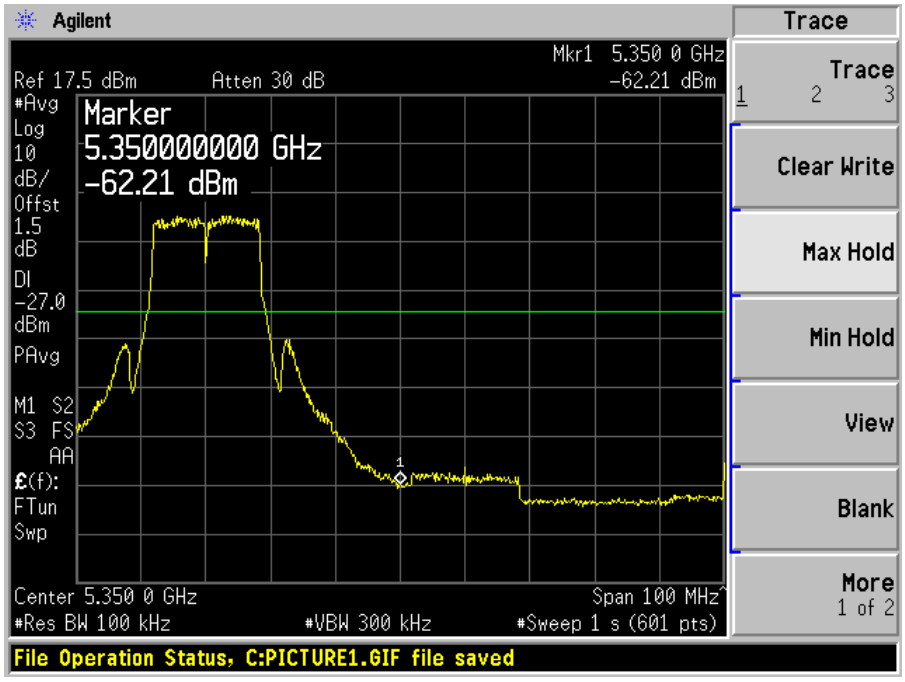
TX Chain 1

802.11 a 20 MHz
5250MHz-5350MHz

Low Band Edge

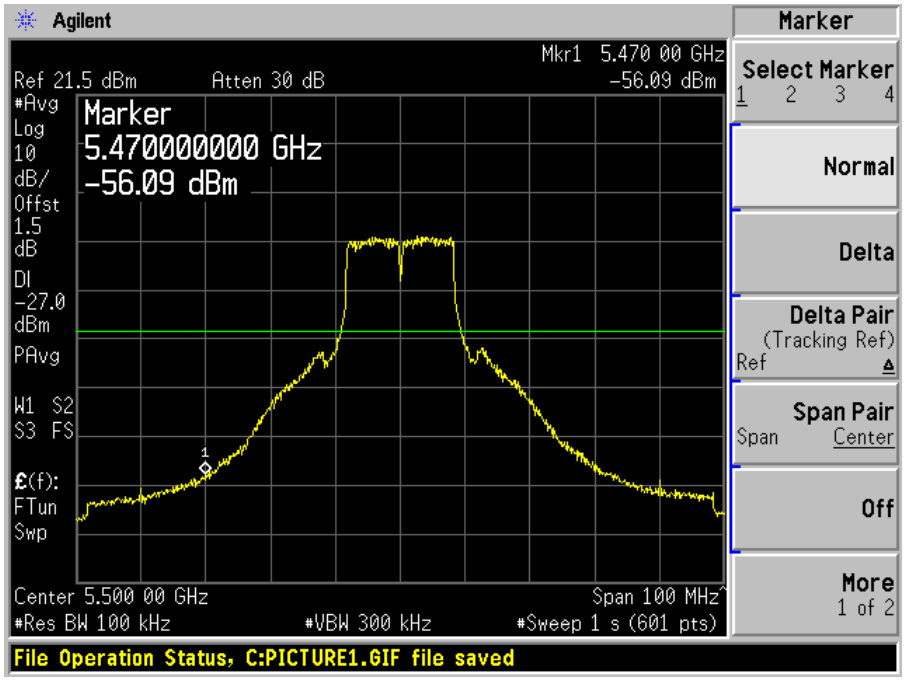


High Band Edge

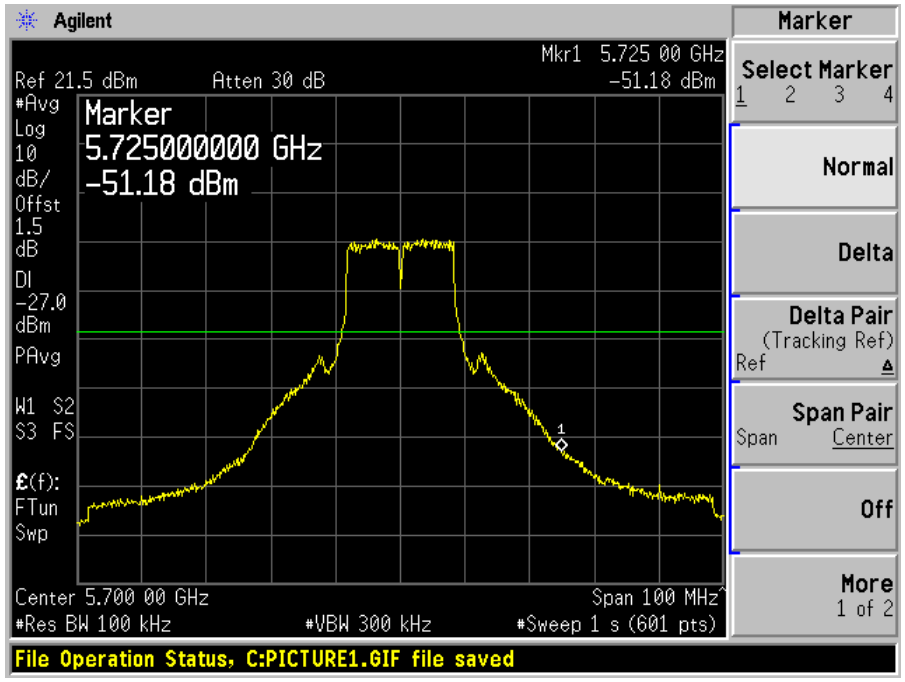


5470MHz-5725MHz

Low Band Edge



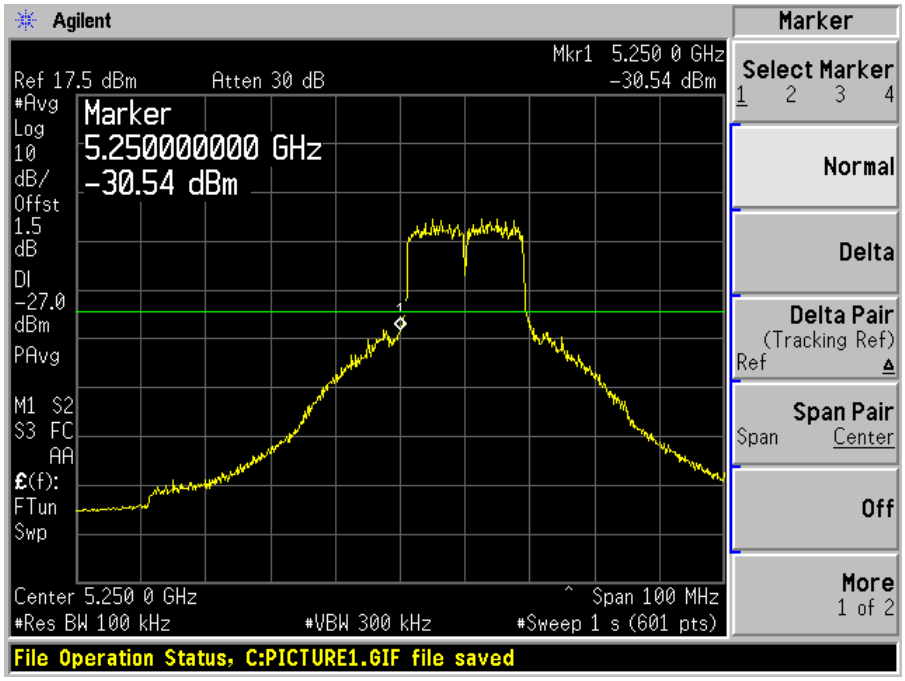
High Band Edge



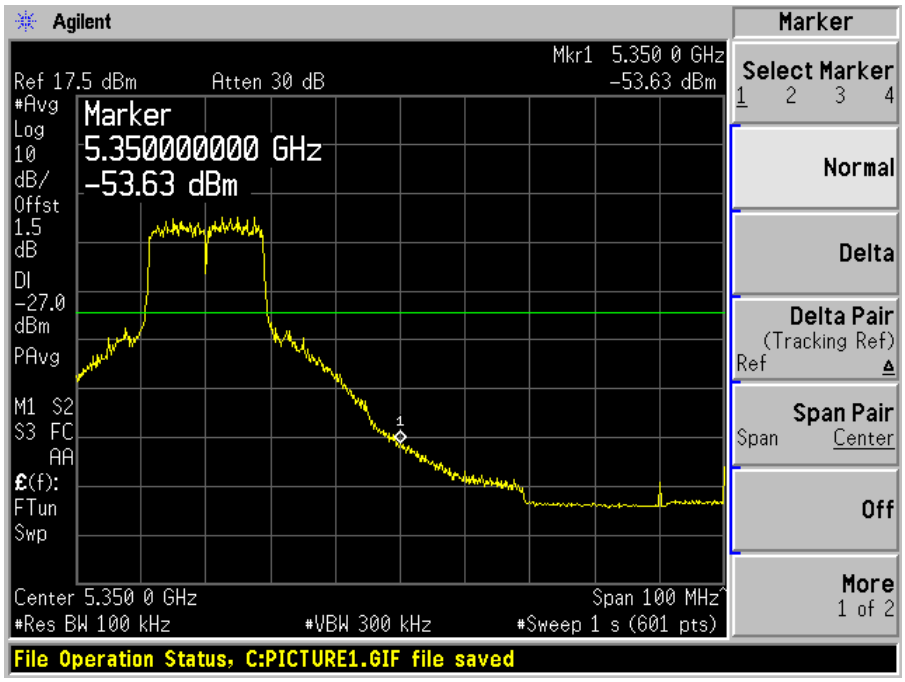
802.11 n 20 MHz

5250MHz-5350MHz

Low Band Edge

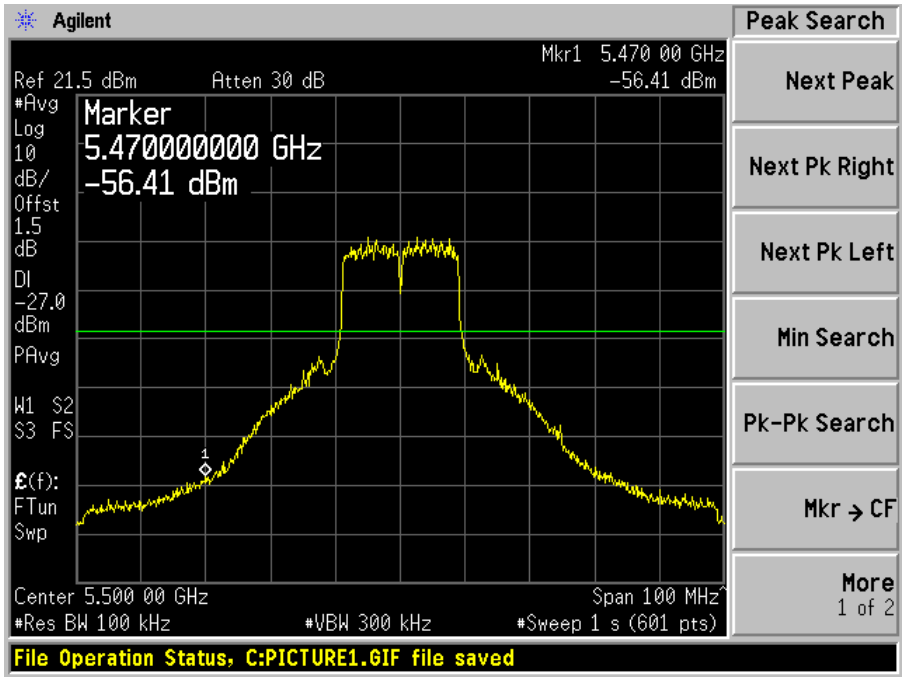


High Band Edge

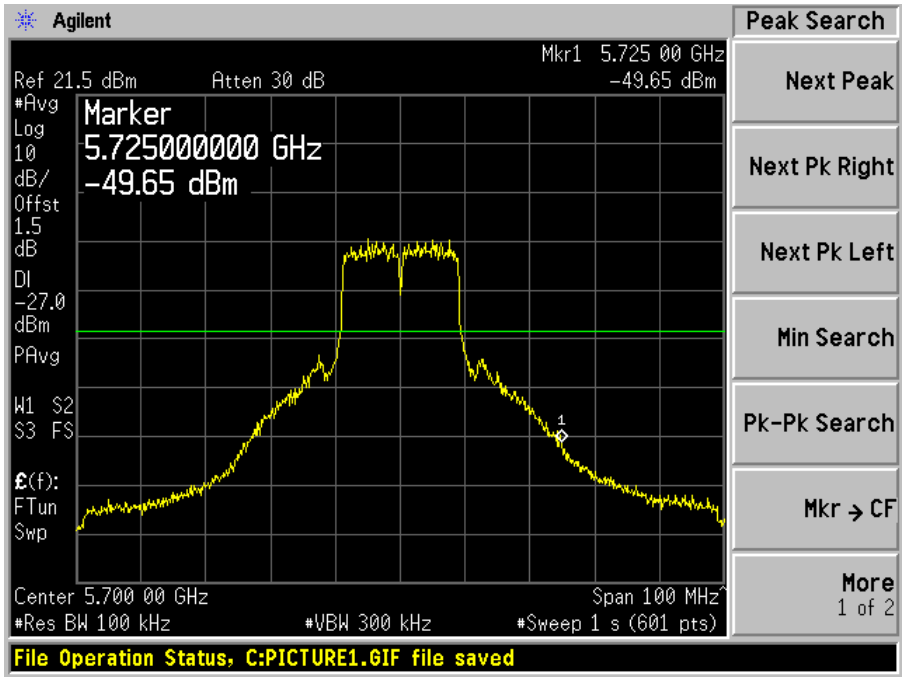


5470MHz-5725MHz

Low Band Edge

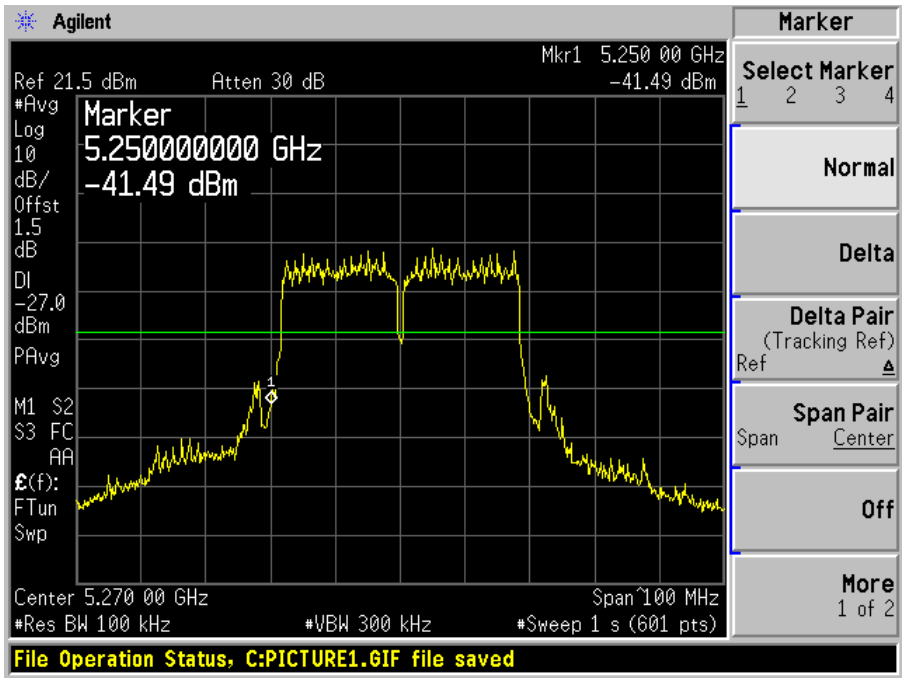


High Band Edge



802.11 n 40 MHz
5250MHz-5350MHz

Low Band Edge



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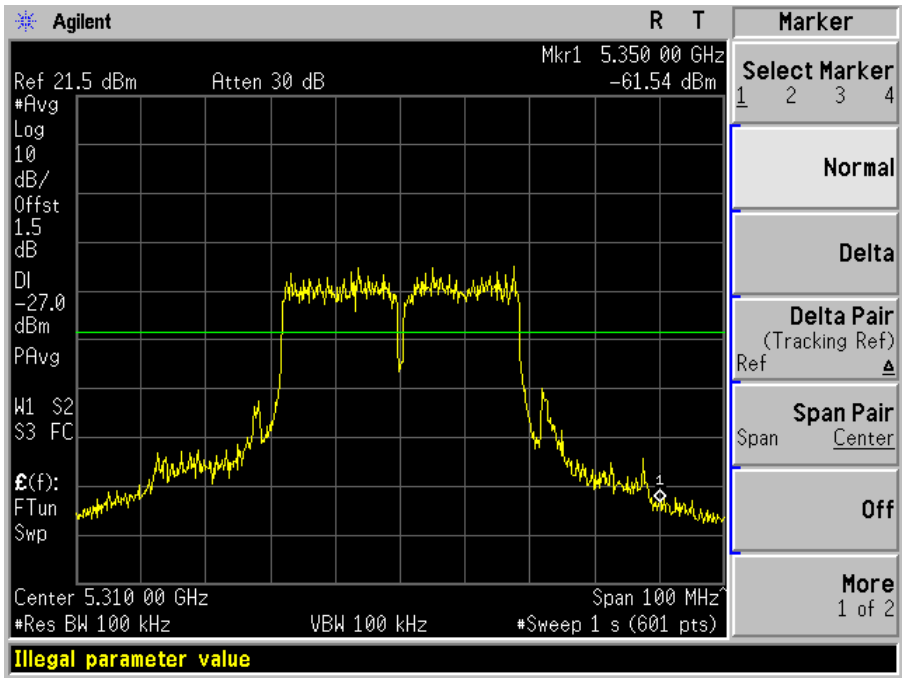
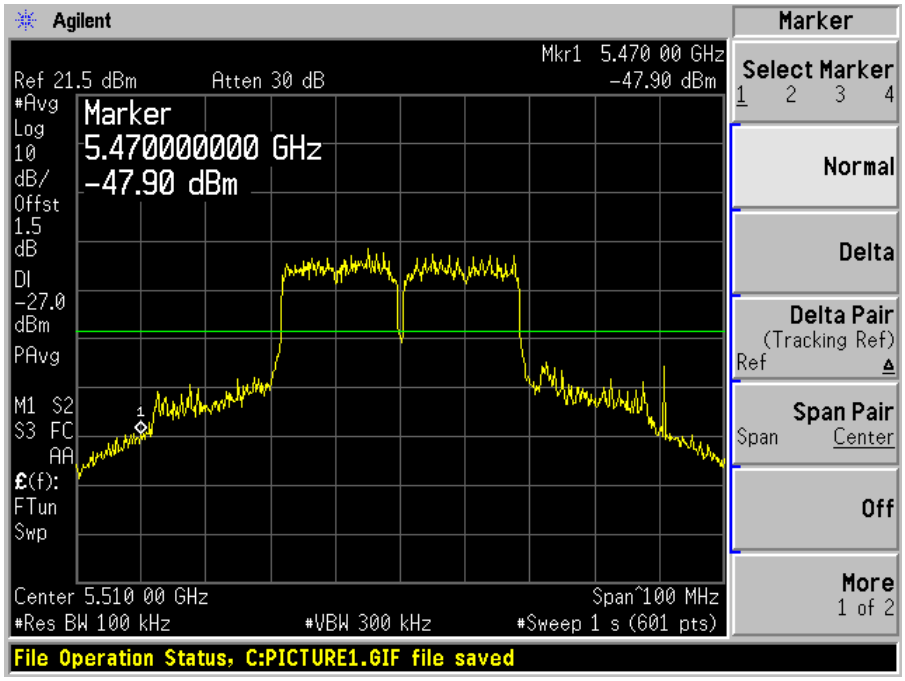


5470MHz-5725MHz

Low Band Edge



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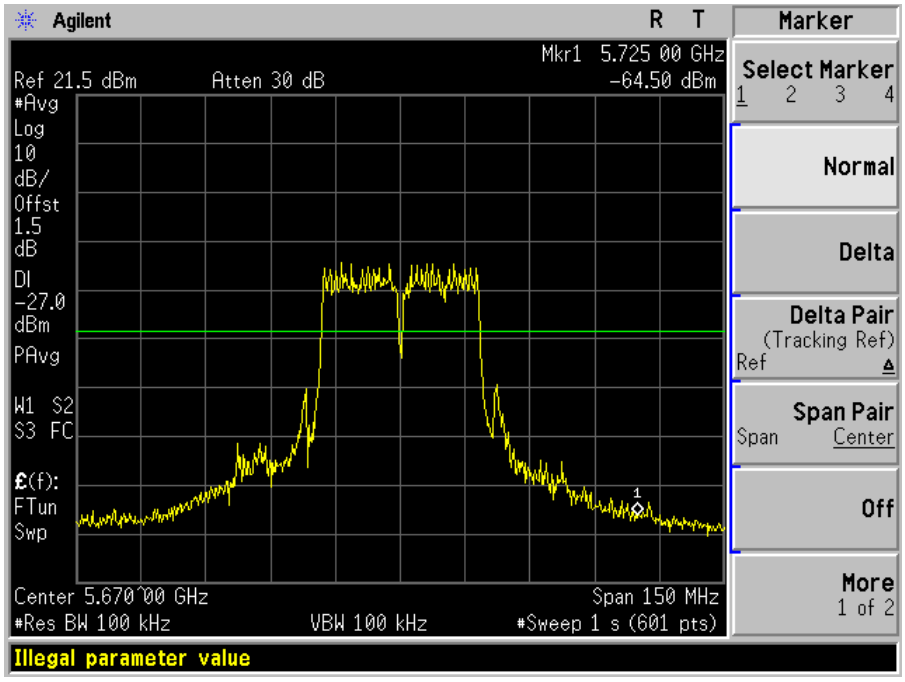
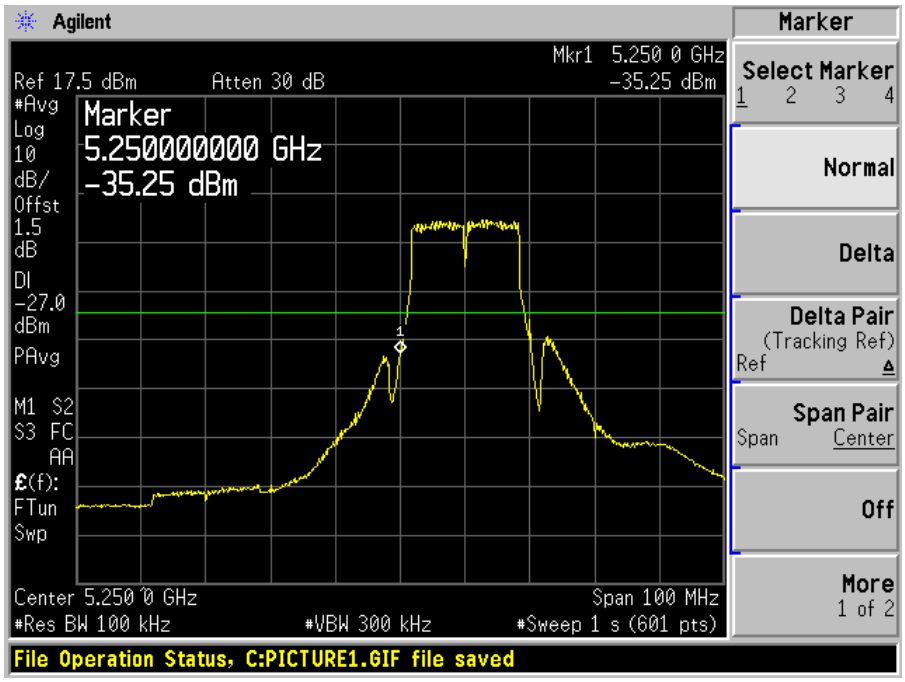


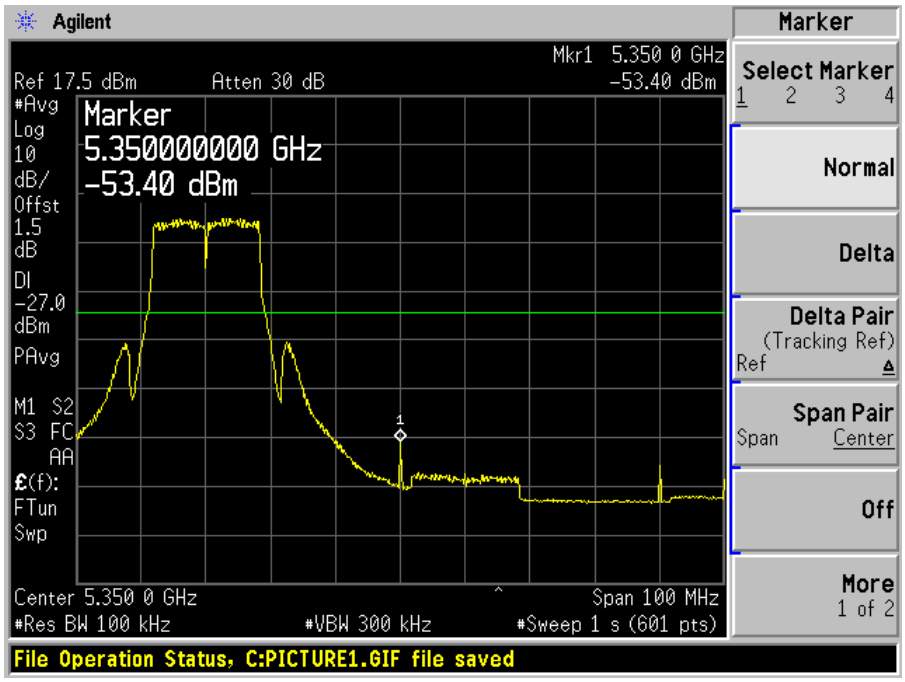
TX Chain 2

802.11 a 20 MHz
5250MHz-5350MHz

Low Band Edge

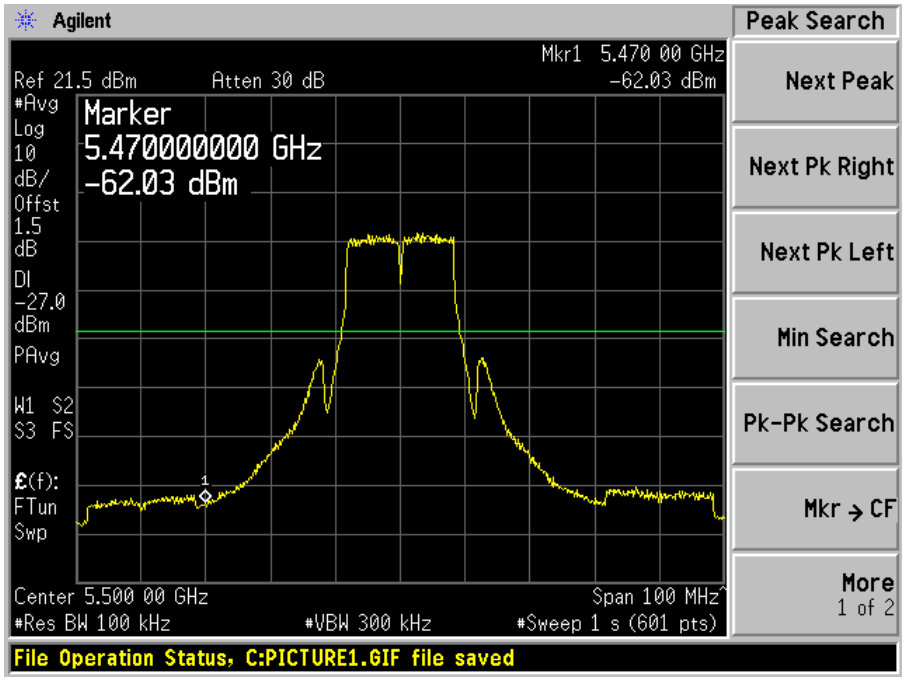


High Band Edge

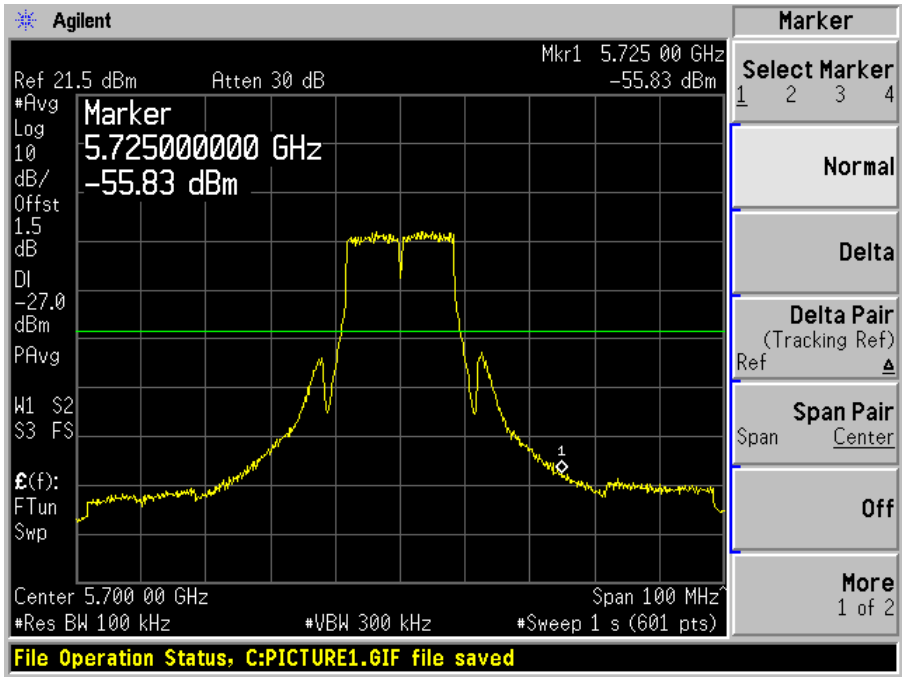


5470MHz-5725MHz

Low Band Edge

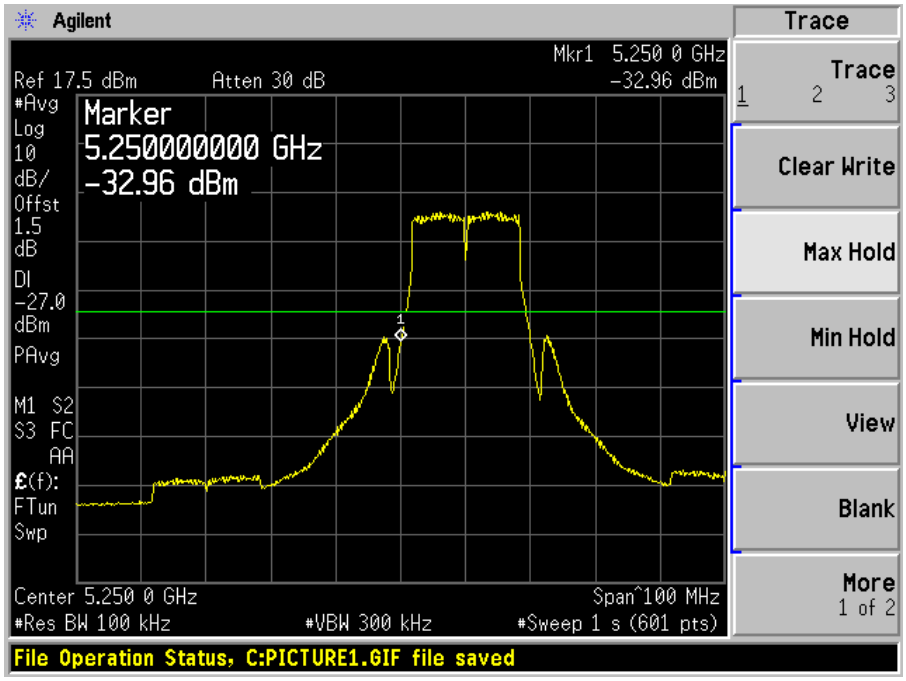


High Band Edge

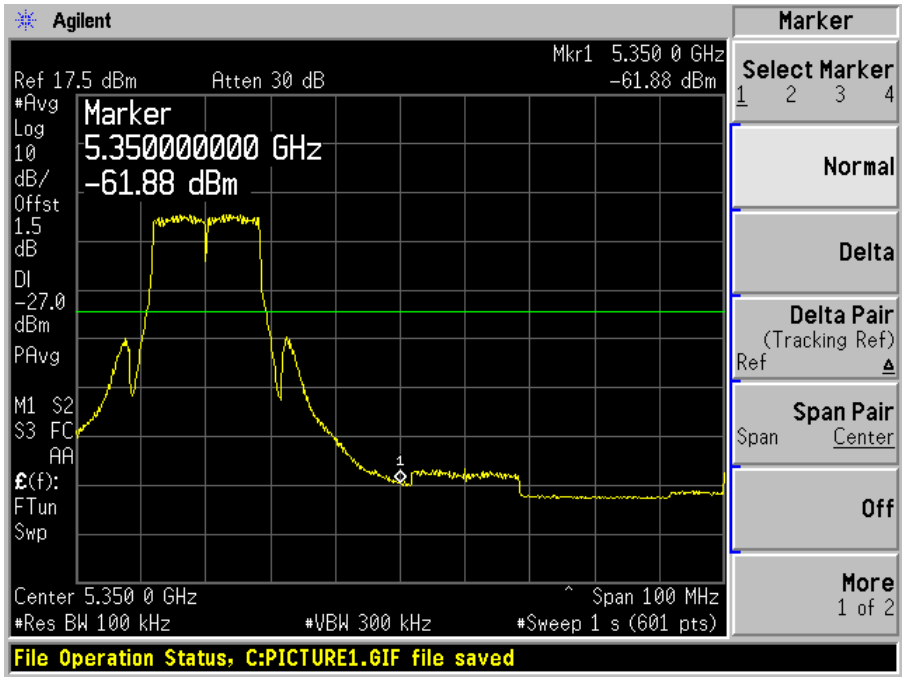


802.11 n 20 MHz
5250MHz-5350MHz

Low Band Edge

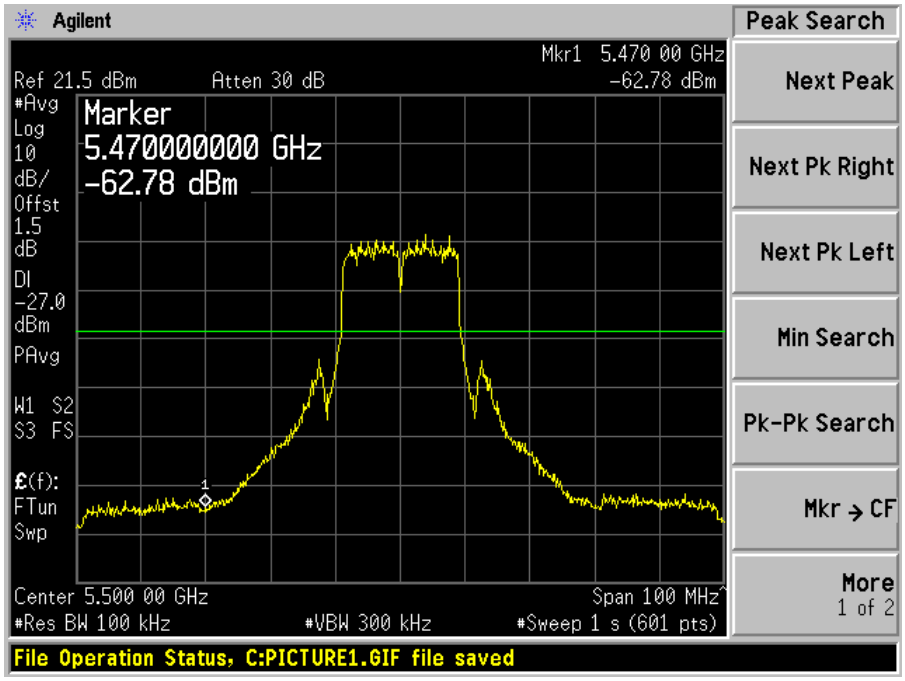


High Band Edge

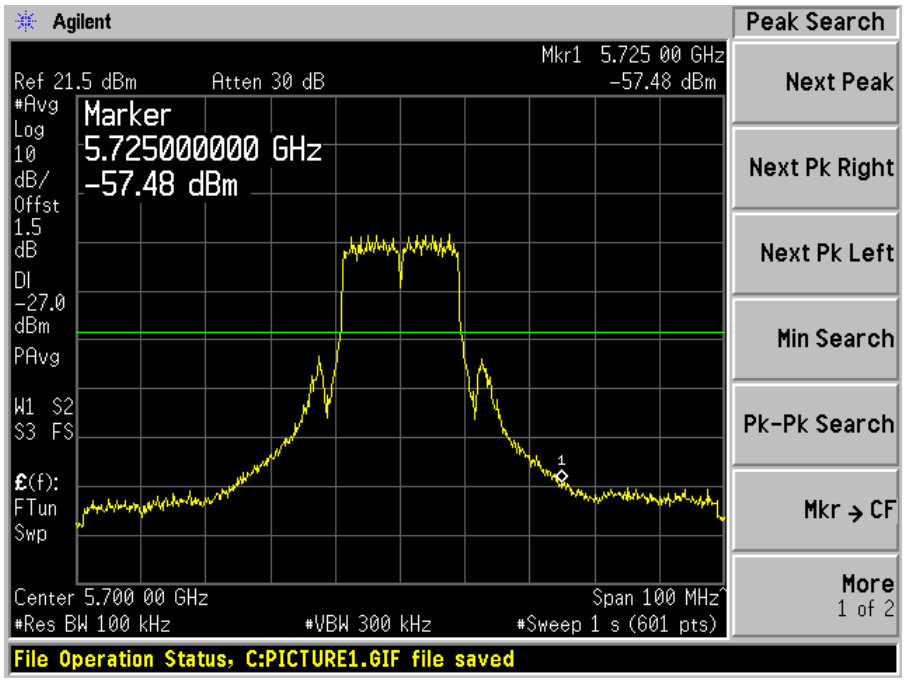


5470MHz-5725MHz

Low Band Edge

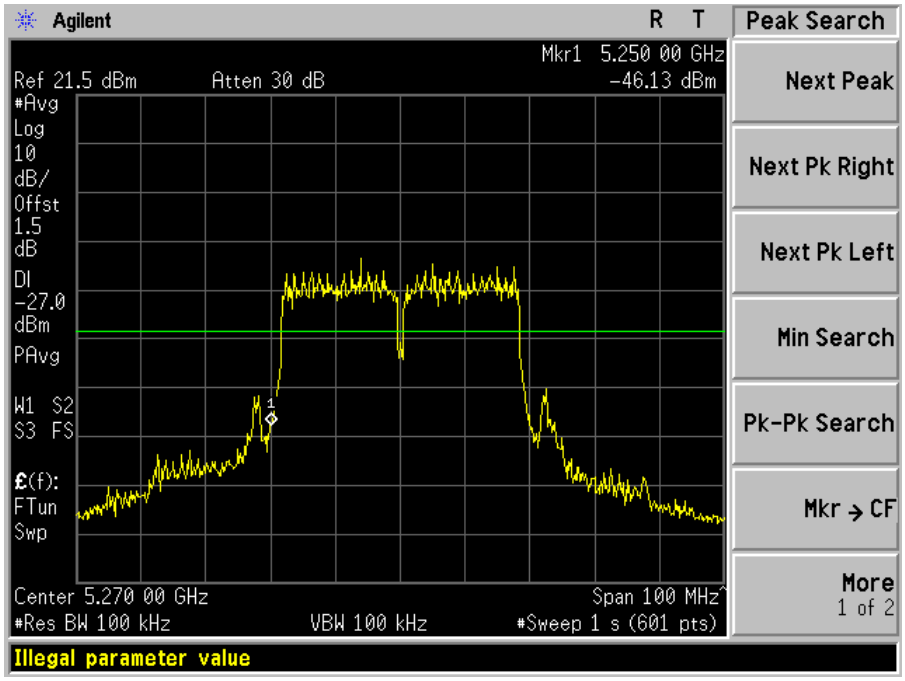


High Band Edge

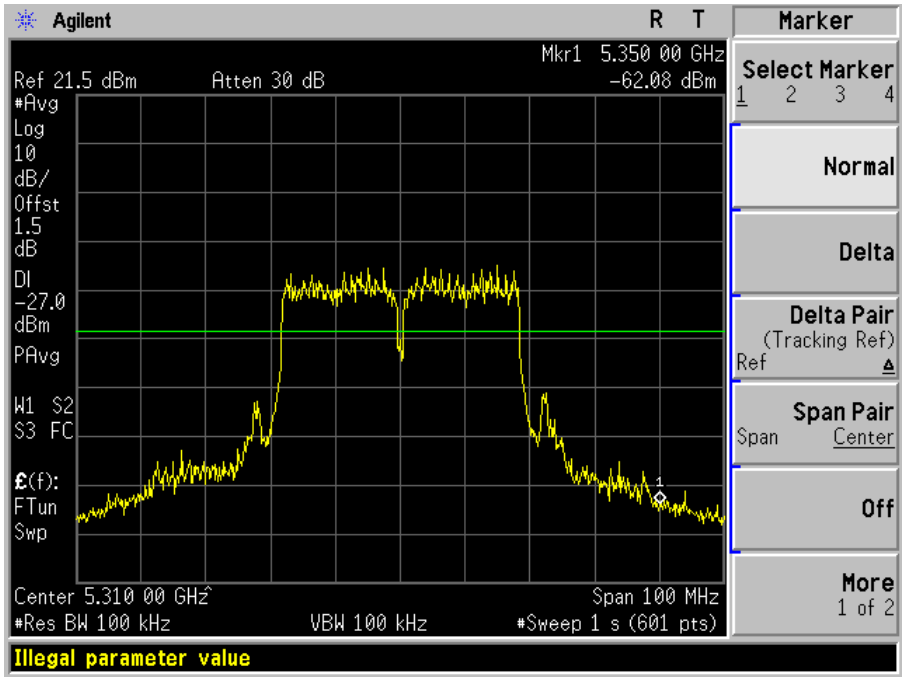


802.11 n 40 MHz
5250MHz-5350MHz

Low Band Edge

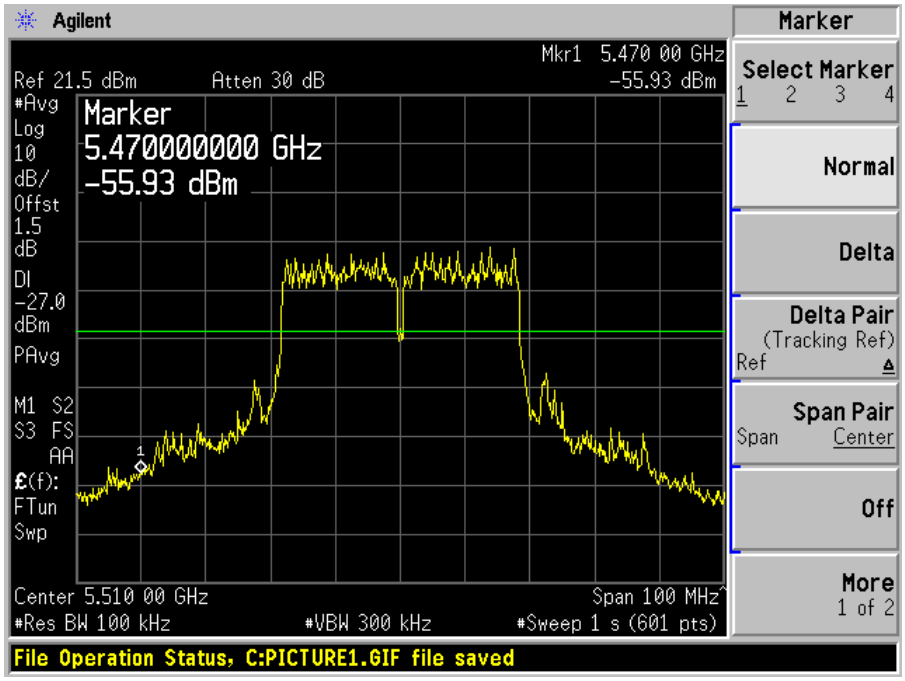


High Band Edge

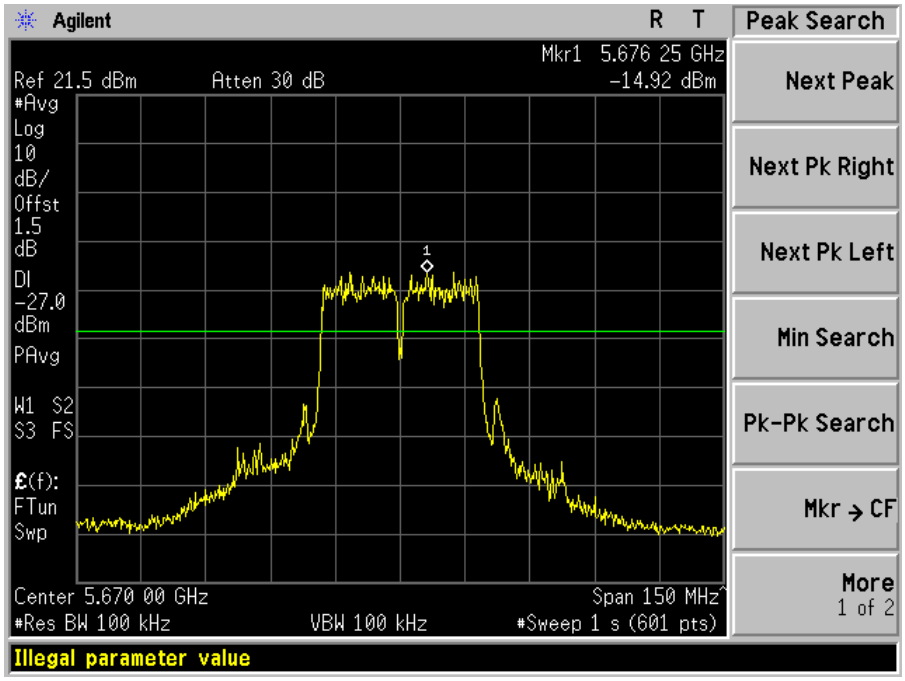


5470MHz-5725MHz

Low Band Edge



High Band Edge



9 FCC §15.407(a) & IC RSS-210 §A9.2 - Power Spectral Density

9.1 Applicable Standard

According to FCC §15.407(a) and IC RSS-210 §9.2

(1) For the band 5.15–5.25 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26–dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4 dBm in any 1–MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

2) For the 5.25–5.35 GHz and 5.47–5.725 GHz bands, the maximum conducted output power over the frequency bands of operation shall not exceed the lesser of 250 mW or 11 dBm + 10 log B, where B is the 26 dB emission bandwidth in megahertz. In addition, the peak power spectral density shall not exceed 11 dBm in any 1 megahertz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the maximum conducted output power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to IC RSS-210 § 9.2: (1) For the band 5150-5250 MHz, the maximum equivalent isotropically radiated power (e.i.r.p.) shall not exceed 200 mW or 10 + 10 log10 B, dBm, whichever power is less. B is the 99% emission bandwidth in MHz. The e.i.r.p. spectral density shall not exceed 10 dBm in any 1.0 MHz band

9.2 Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT was set without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range, and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of SA on any frequency be measured and set SA to 1.5MHz span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Repeat above procedures until all frequencies measured were complete.

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

9.4 Test Environmental Conditions

Temperature:	23-25 °C
Relative Humidity:	35-50 %
ATM Pressure:	101-103kPa

The testing was performed by Ning Ma on 2011-09-07~ 2011-09-11 at RF Site.

9.5 Test Results

802.11 a 20 MHz mode

5250MHz-5350MHz

Channel	Frequency (MHz)	TX Chain 1 Power Spectral Density (dBm)	TX Chain 2 Power Spectral Density (dBm))	Worst Power Spectral Density (dBm))	Limit (dBm/MHz)	Margin (dB)
Low	5260	1.4	1.185	1.4	11	-9.6
Middle	5280	1.103	1.148	1.148	11	-9.852
High	5320	1.882	1.33	1.882	11	-9.118

5470MHz-5275MHz

Channel	Frequency (MHz)	TX Chain 1 Power Spectral Density (dBm)	TX Chain 2 Power Spectral Density (dBm))	Worst Power Spectral Density (dBm	Limit (dBm/MHz)	Margin (dB)
Low	5500	1.939	2.106	2.106	11	-8.894
Middle	5580	2.396	1.466	2.396	11	-8.604
High	5700	1.86	2.861	2.861	11	-8.139

802.11 n 20 MHz mode

5250MHz-5350MHz

Channel	Frequency (MHz)	TX Chain 1 Power Spectral Density (dBm)	TX Chain 2 Power Spectral Density (dBm))	Total Power Spectral Density (dBm)	Limit (dBm/MHz)	Margin (dB)
Low	5260	-0.303	-0.874	2.431	11	-8.569
Middle	5280	-1.155	-0.846	2.013	11	-8.987
High	5320	-0.830	-0.816	2.187	11	-8.813

5470MHz-5275MHz

Channel	Frequency (MHz)	TX Chain 1 Power Spectral Density (dBm)	TX Chain 2 Power Spectral Density (dBm))	Total Power Spectral Density (dBm)	Limit (dBm/MHz)	Margin (dB)
Low	5500	-0.392	0.127	2.886	11	-8.114
Middle	5580	0.068	-0.504	2.802	11	-8.198
High	5700	-0.261	0.835	3.332	11	-7.668

802.11 n 40 MHz mode

5250MHz-5350MHz

Channel	Frequency (MHz)	TX Chain 1 Power Spectral Density (dBm)	TX Chain 2 Power Spectral Density (dBm))	Total Power Spectral Density (dBm)	Limit (dBm/MHz)	Margin (dB)
Low	5270	-6.028	-5.162	-2.563	11	-13.563
High	5310	-6.376	-5.252	-2.767	11	-13.767

5470MHz-5275MHz

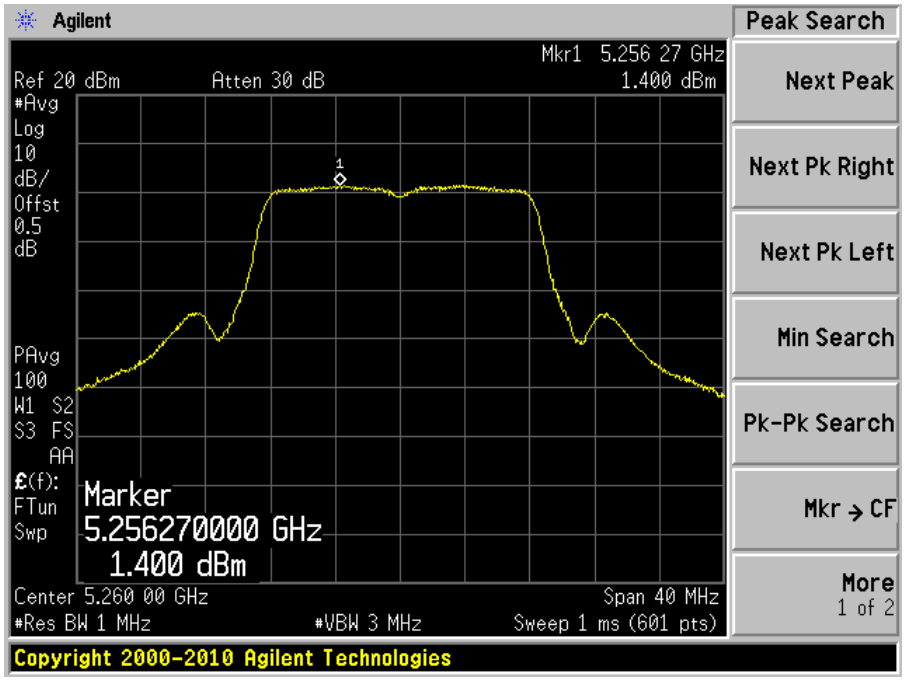
Channel	Frequency (MHz)	TX Chain 1 Power Spectral Density (dBm)	TX Chain 2 Power Spectral Density (dBm))	Total Power Spectral Density (dBm)	Limit (dBm/MHz)	Margin (dB)
Low	5510	-5.199	-4.285	-1.708	11	-12.708
Middle	5590	-5.601	-5.24	-2.406	11	-13.406
High	5670	-5.008	-4.772	-1.878	11	-12.878

TX Chain 1

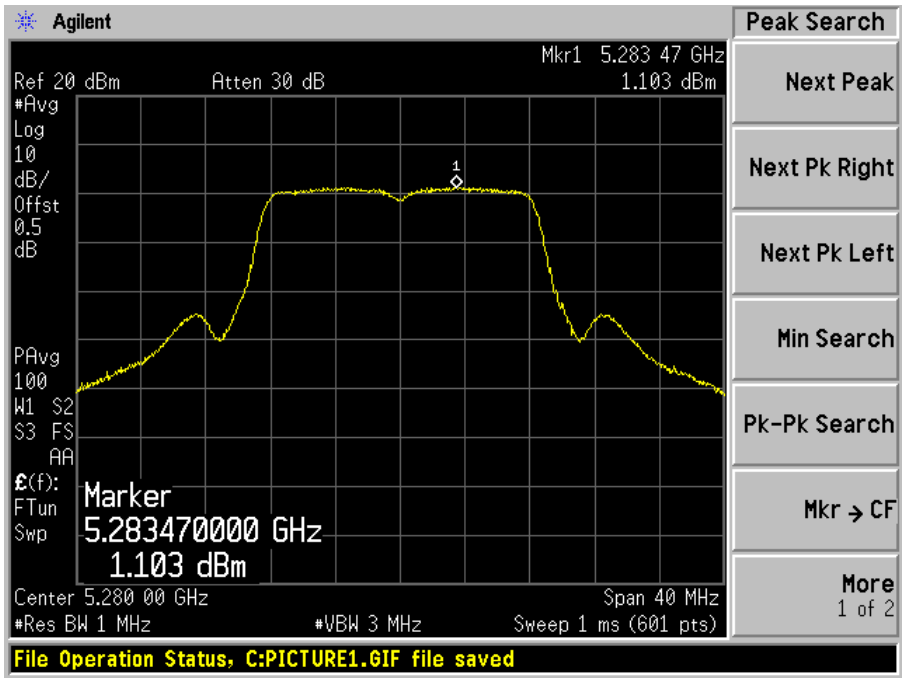
802.11 a 20MHz

5250MHz-5350MHz

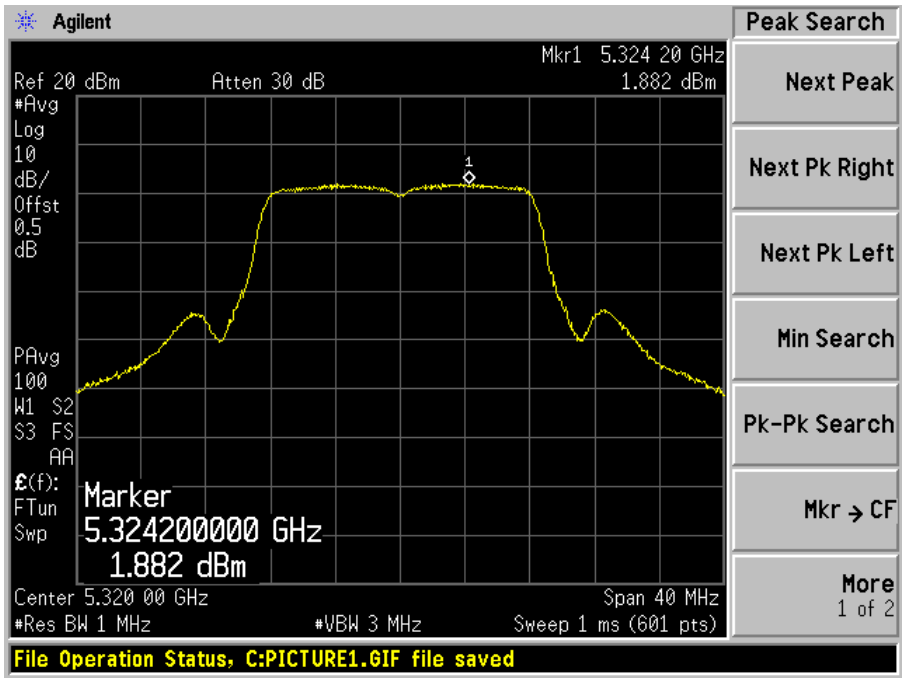
Low channel



Middle Channel

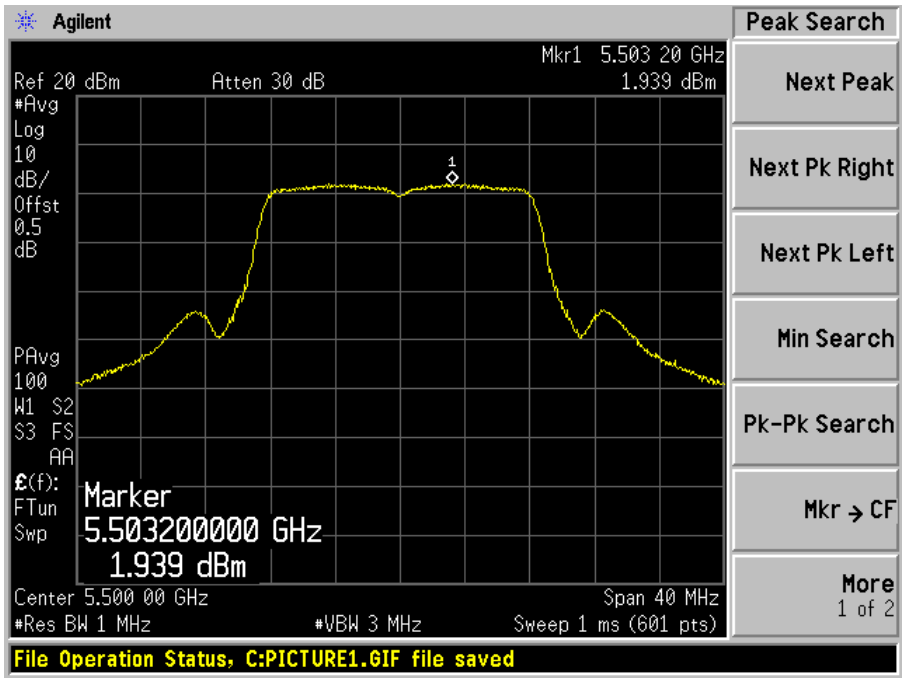


High Channel

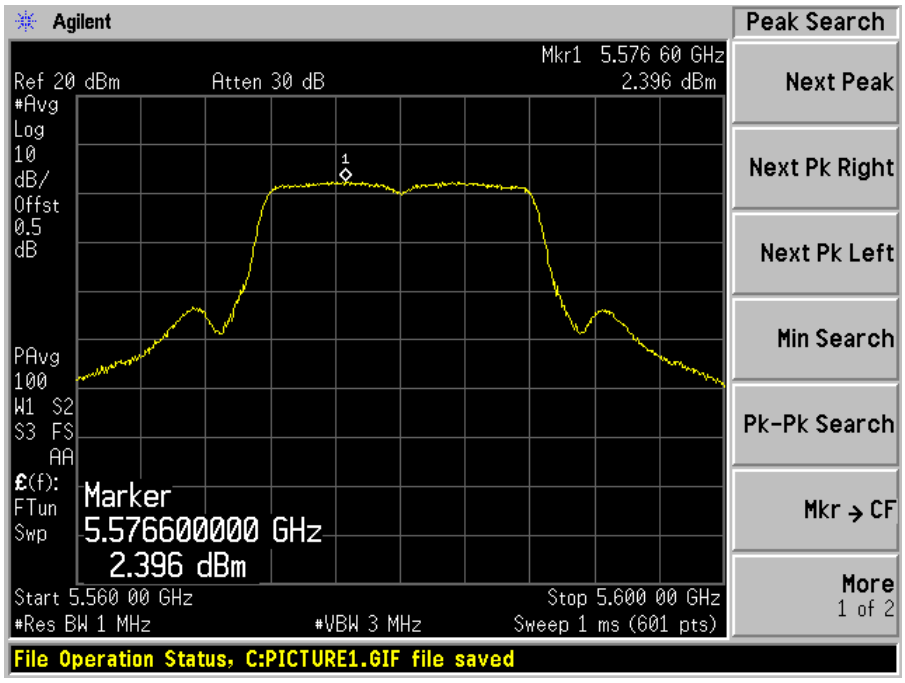


5470MHz-5725MHz

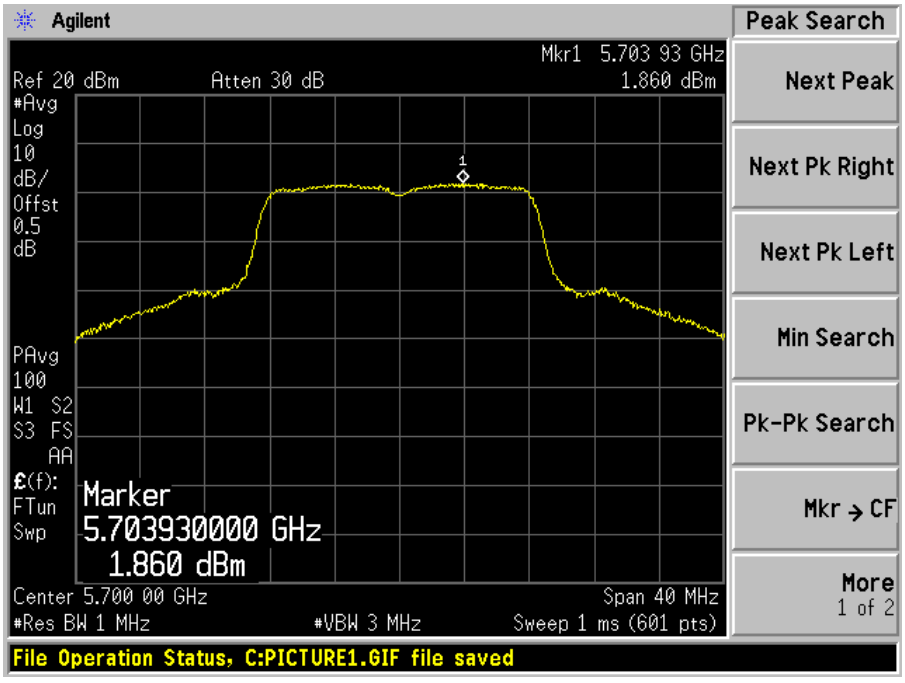
Low Channel



Middle Channel



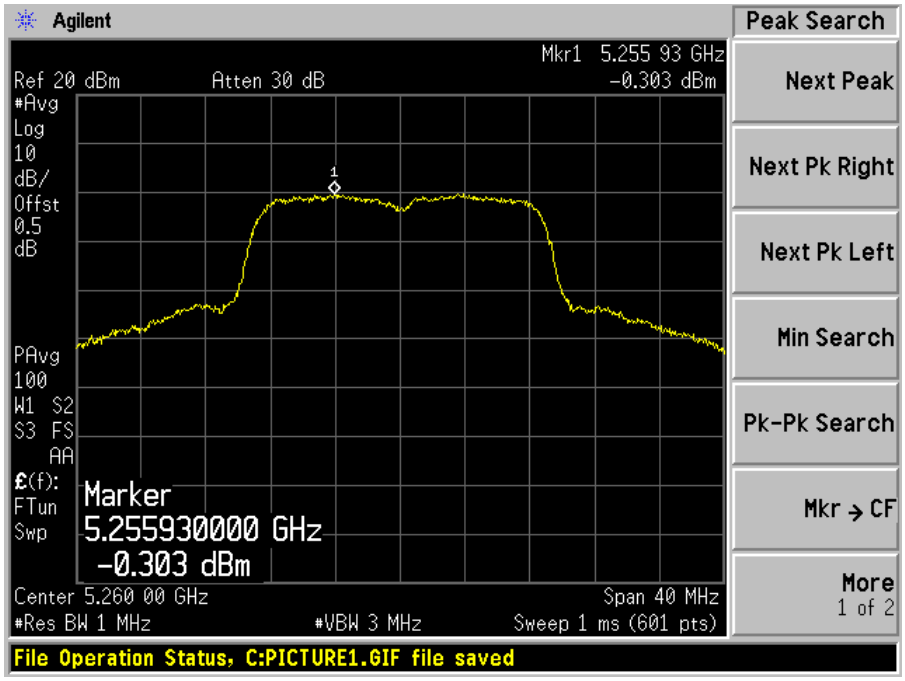
High Channel



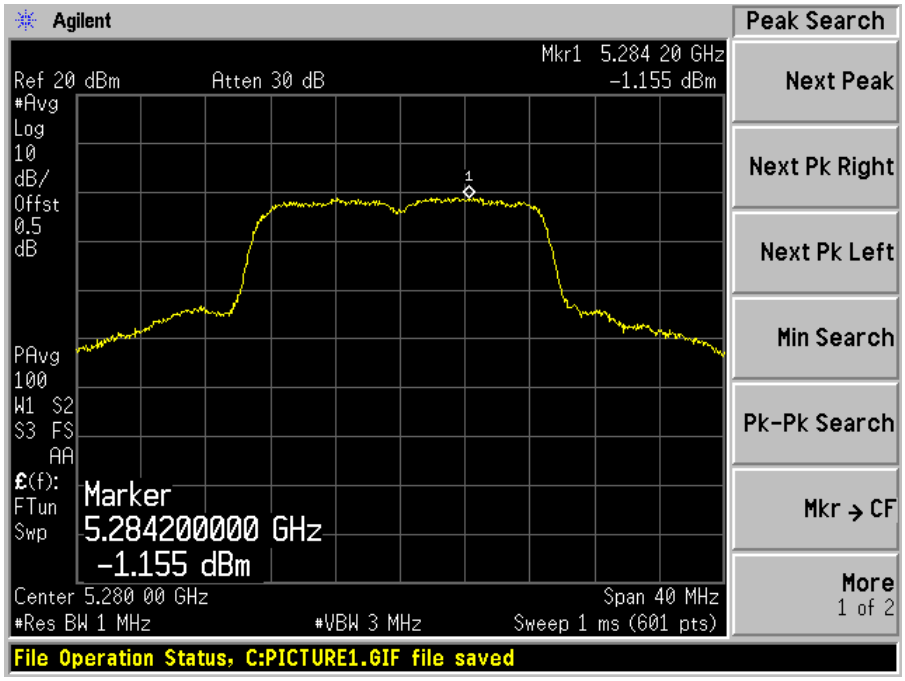
802.11 n 20MHz

5250MHz-5350MHz

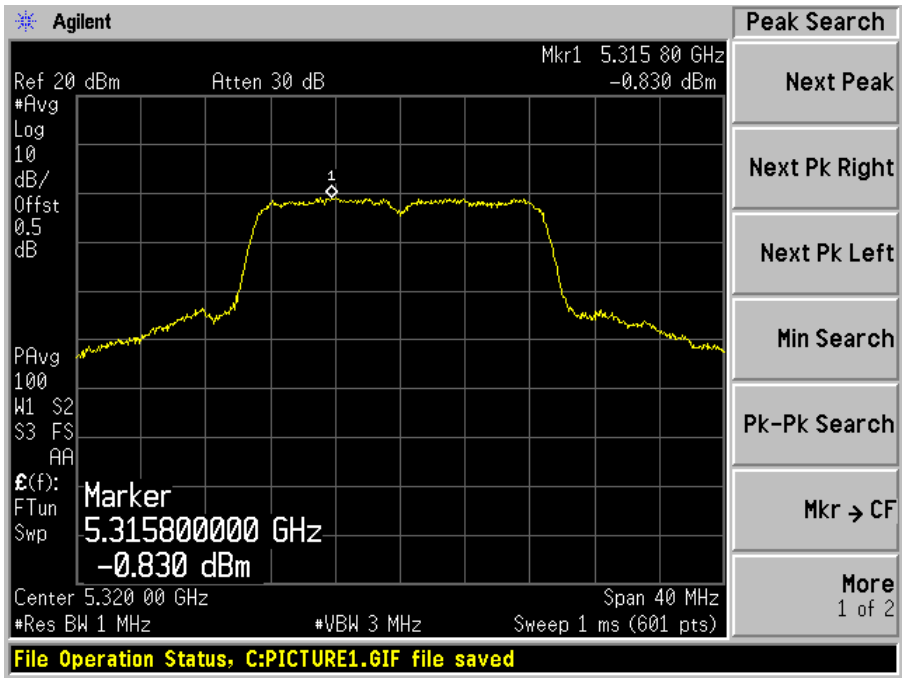
Low channel



Middle Channel

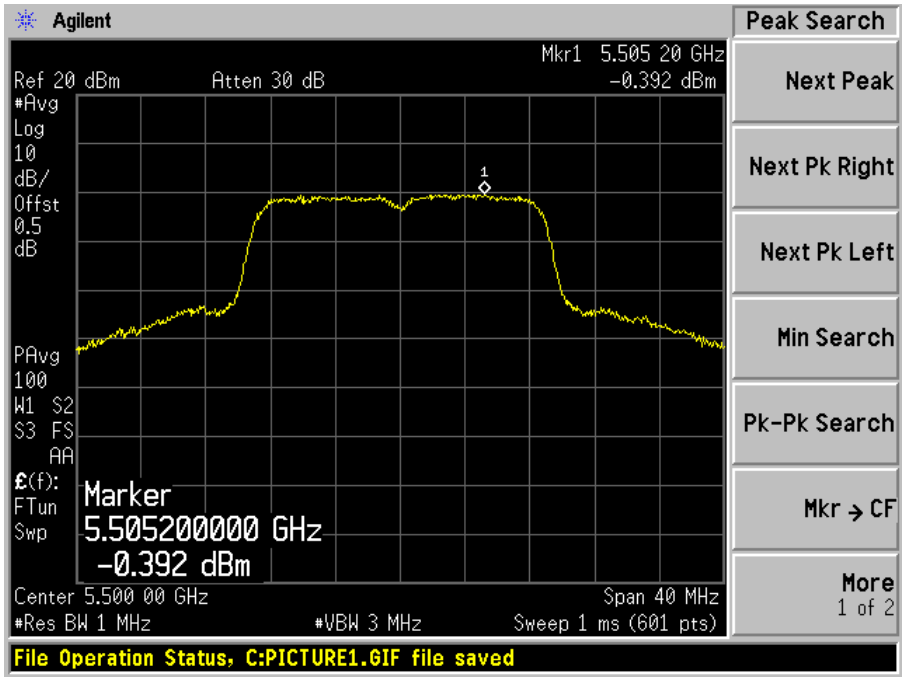


High Channel

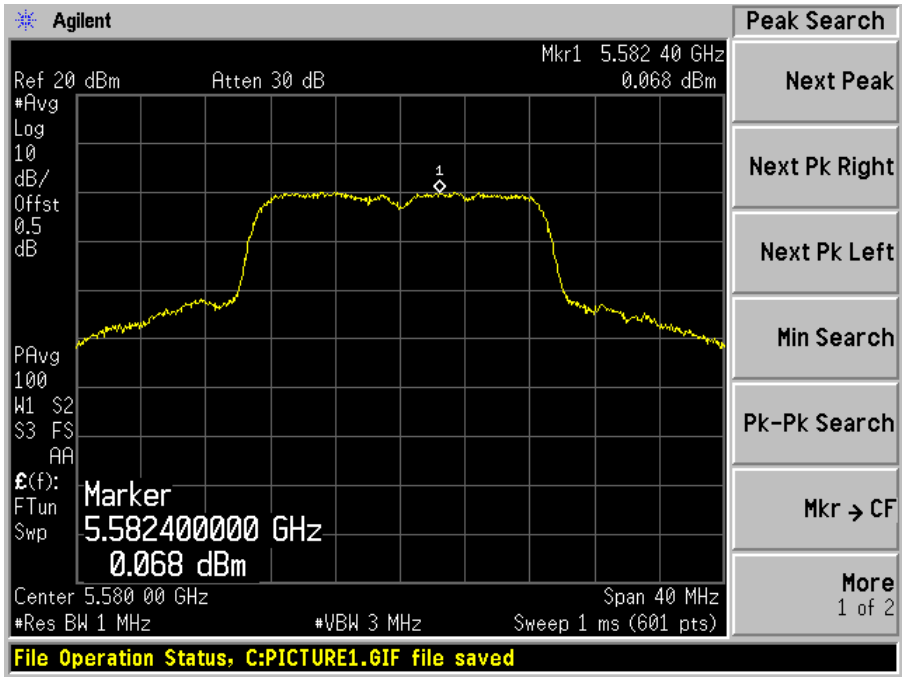


5470MHz-5725MHz

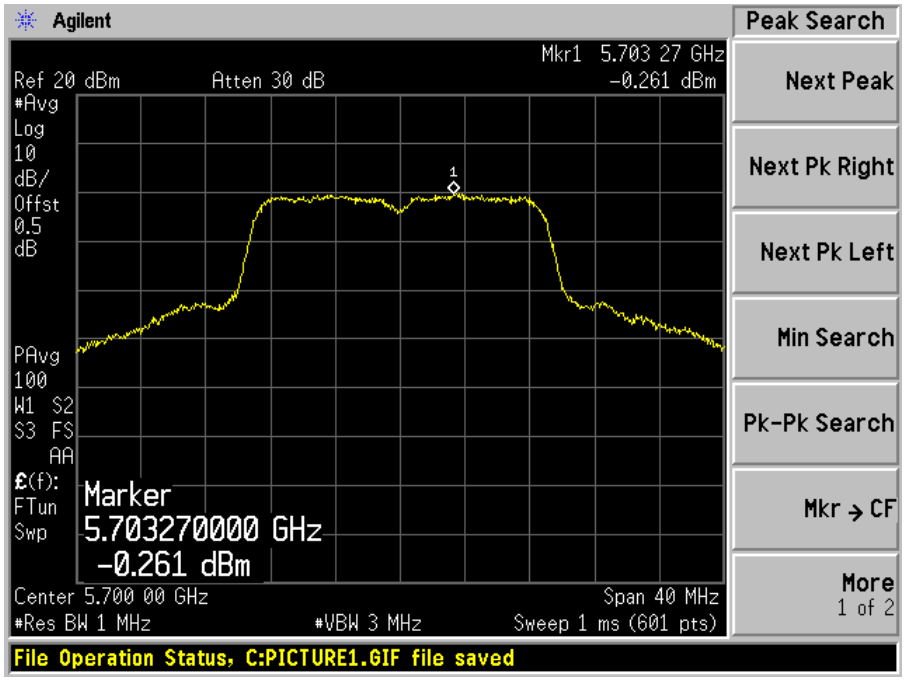
Low Channel



Middle Channel



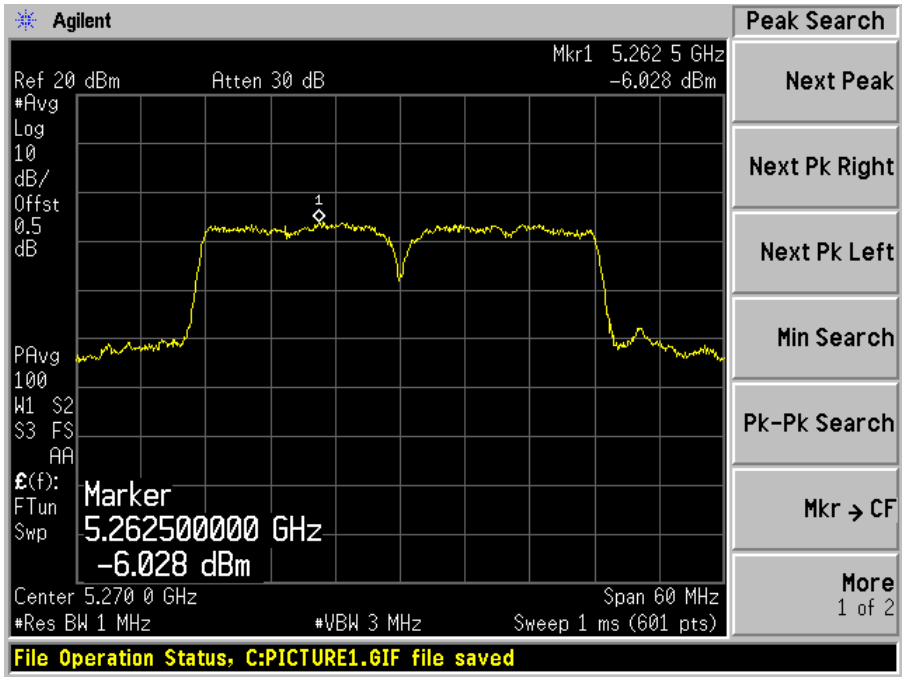
High Channel



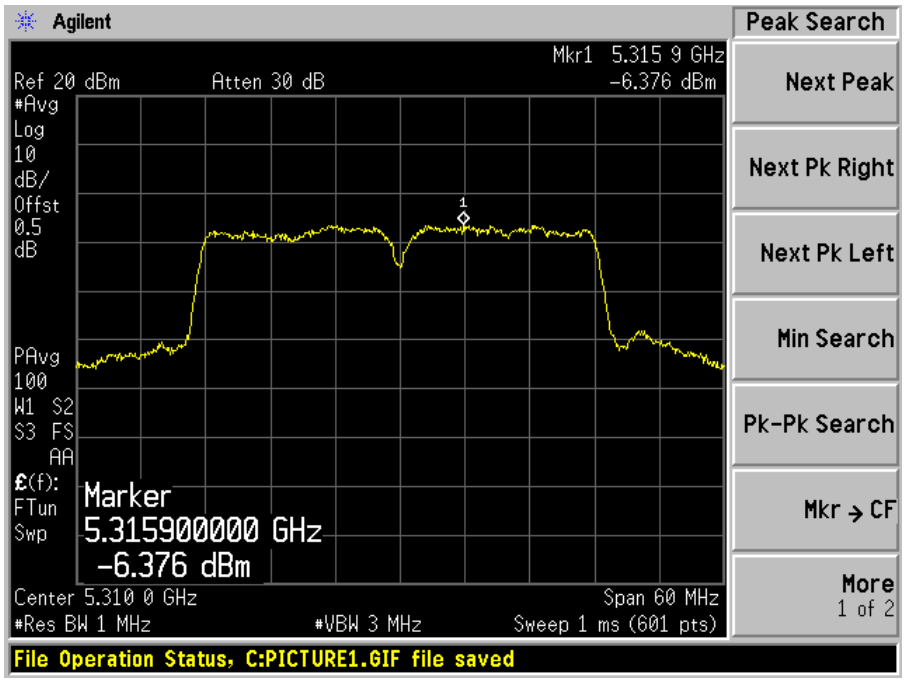
802.11 n 40MHz

5250MHz-5350MHz

Low channel

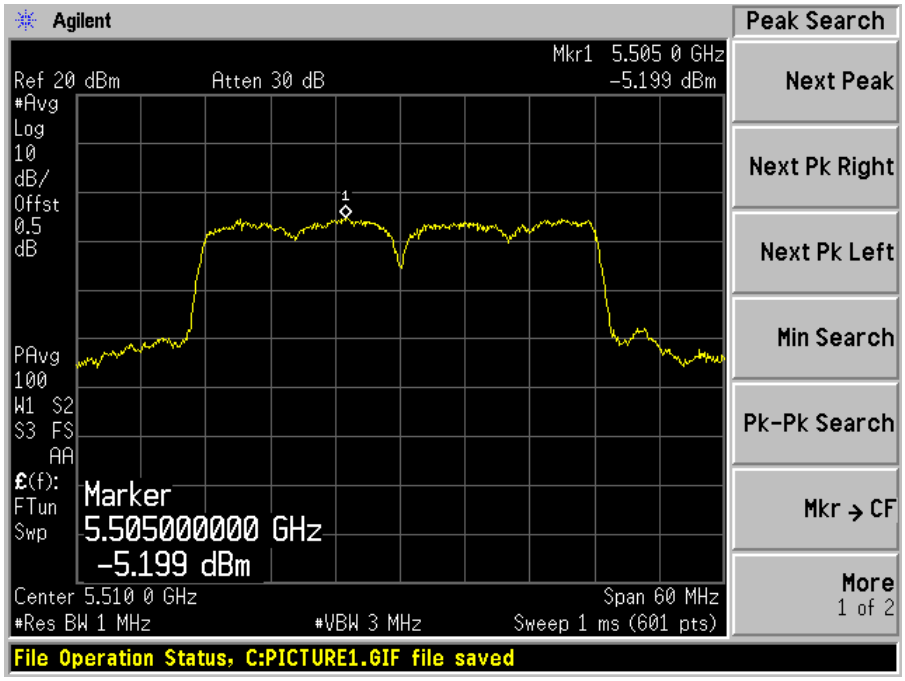


High Channel

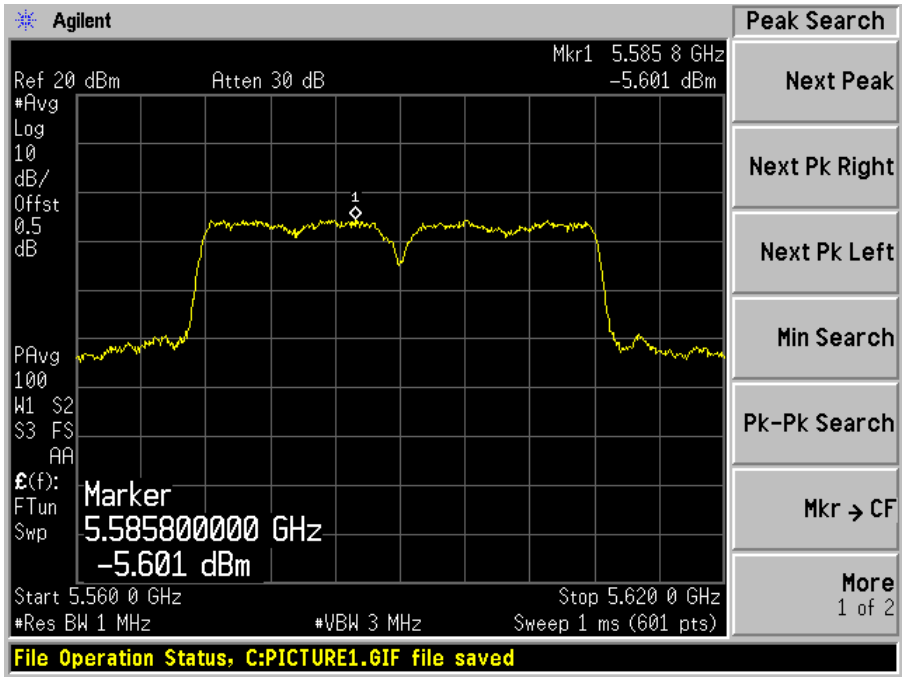


5470MHz-5725MHz

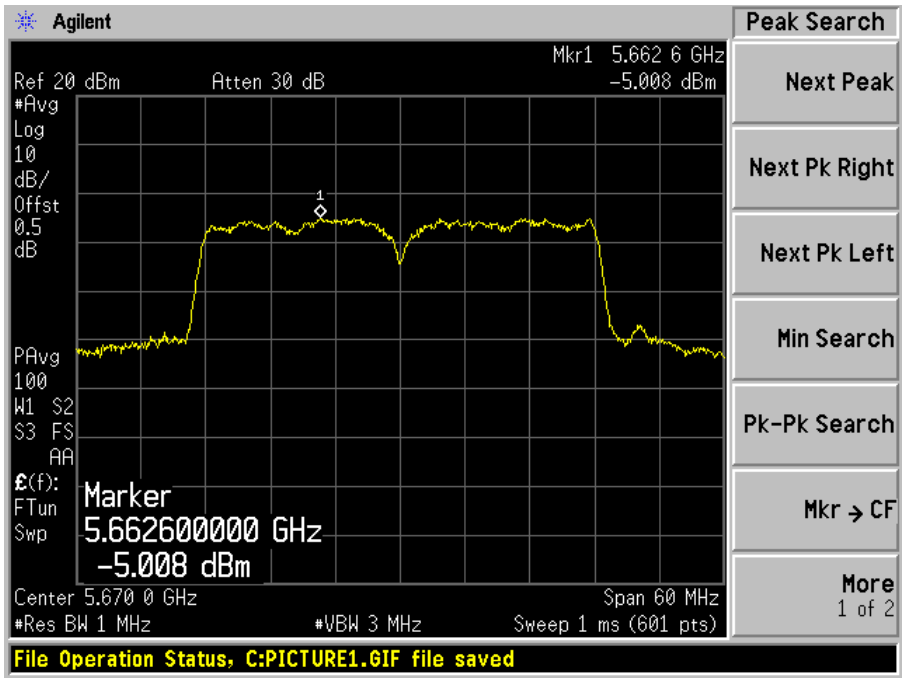
Low Channel



Middle Channel



High Channel

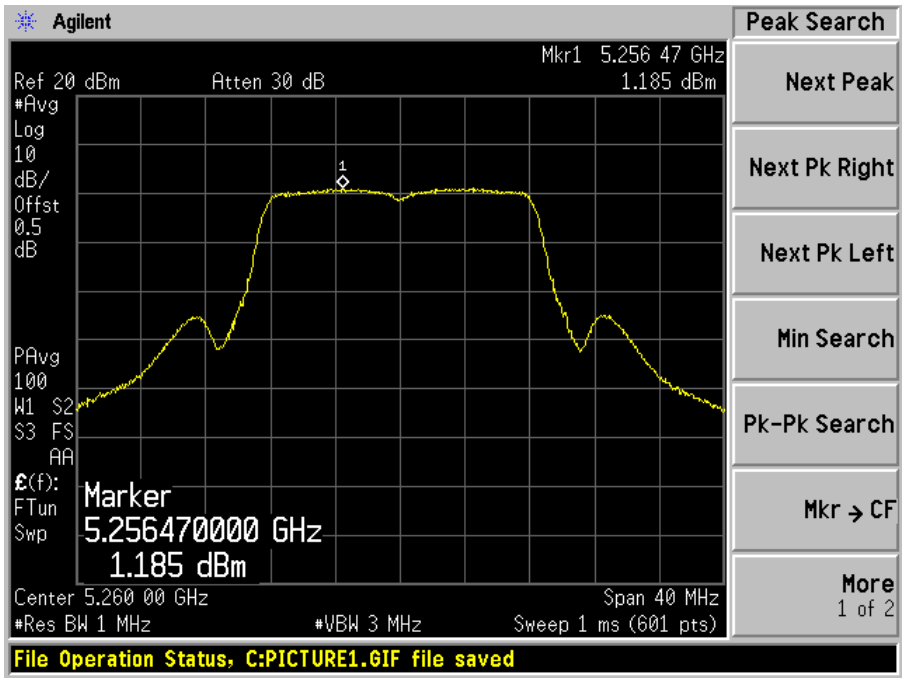


TX Chain 2

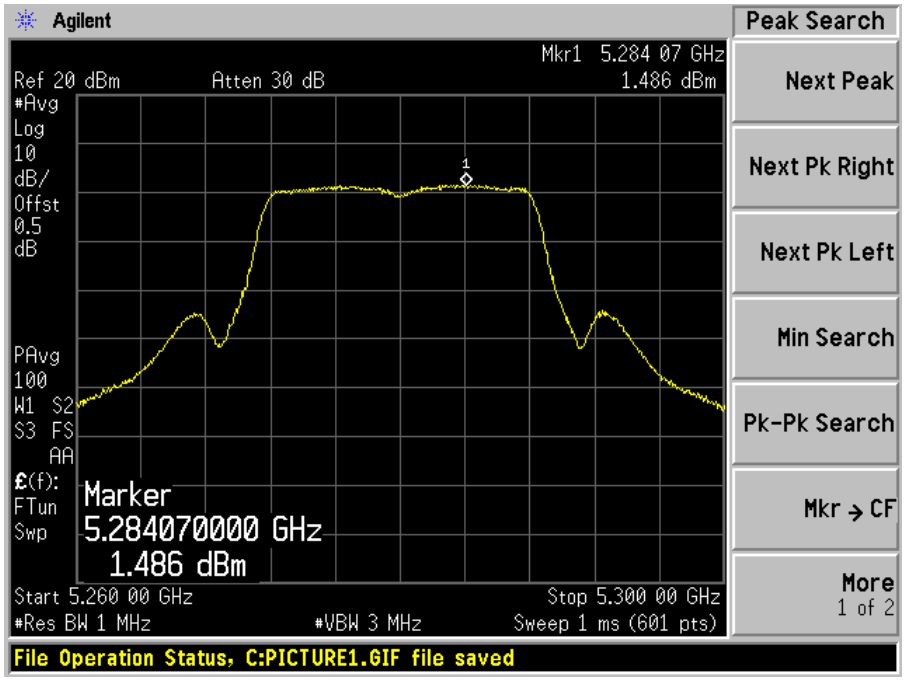
802.11 a 20MHz

5250MHz-5350MHz

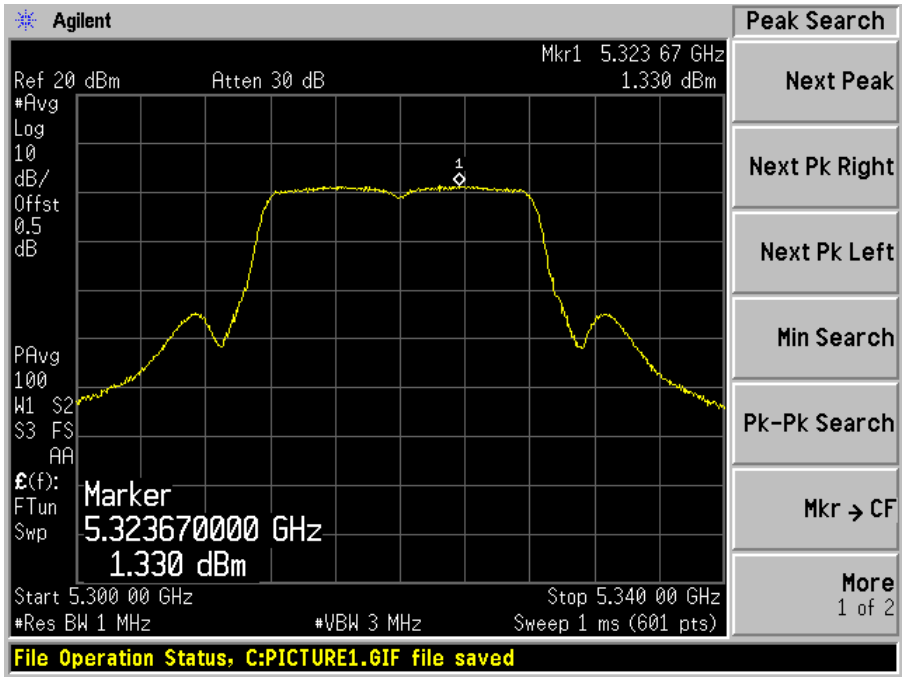
Low channel



Middle Channel

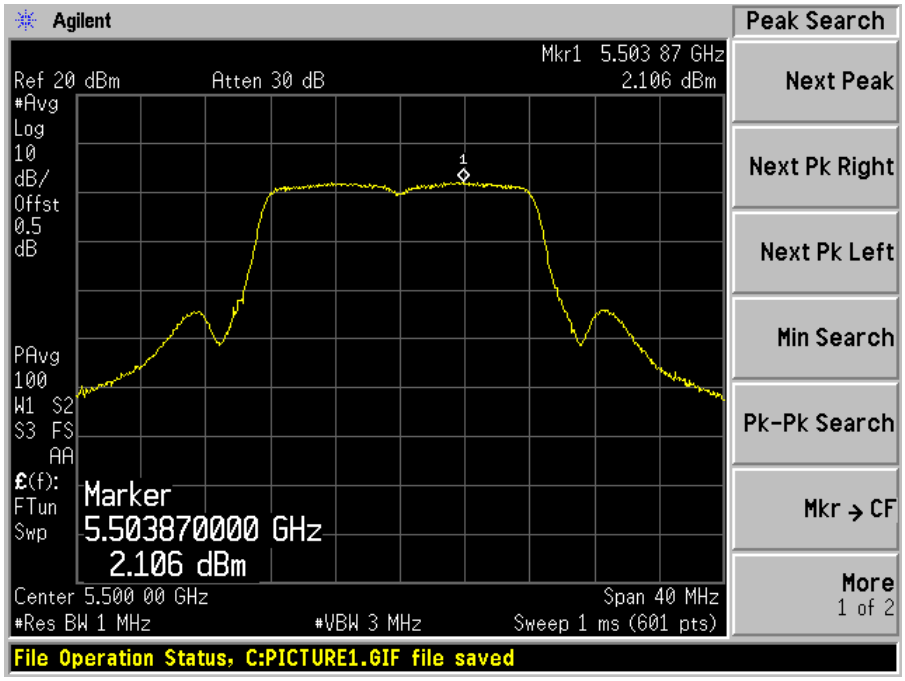


High Channel

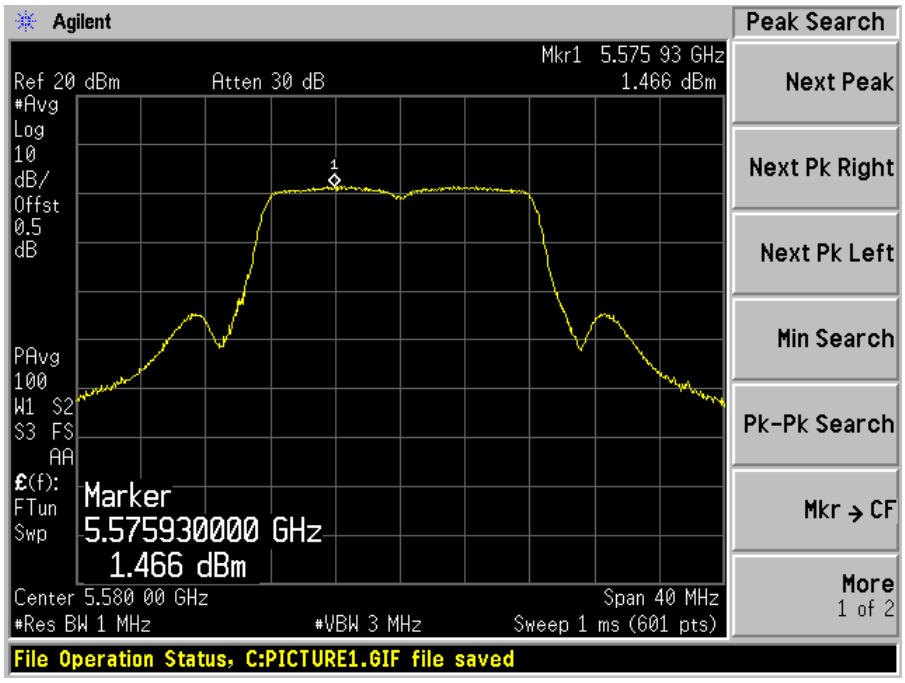


5470MHz-5725MHz

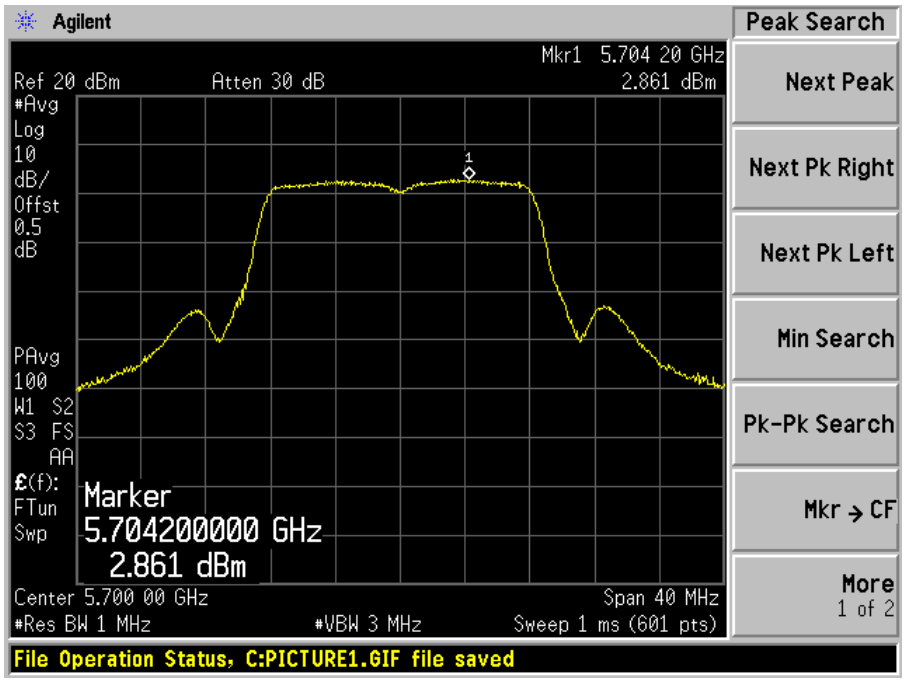
Low Channel



Middle Channel



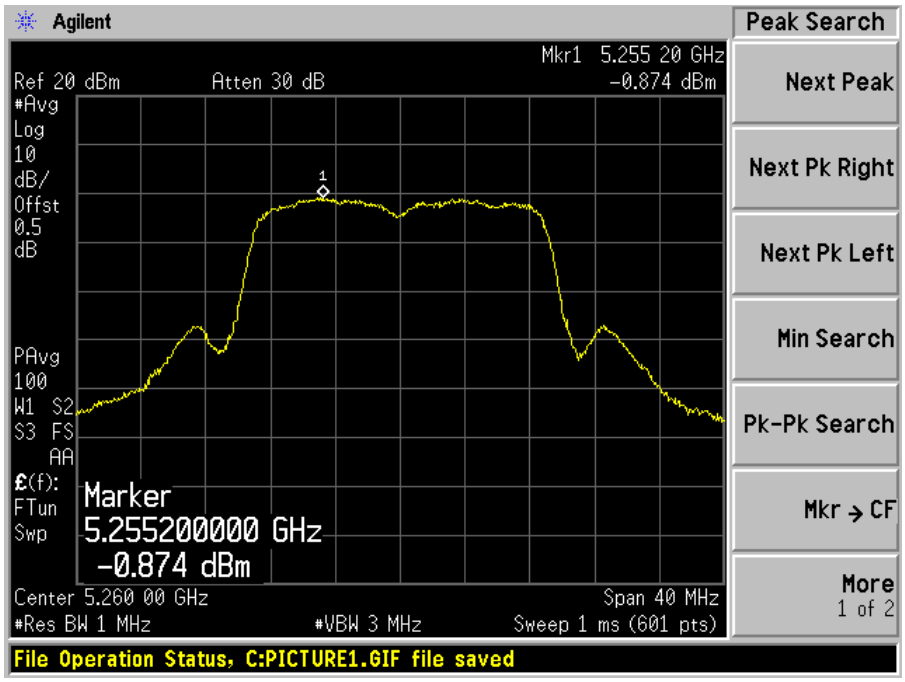
High Channel



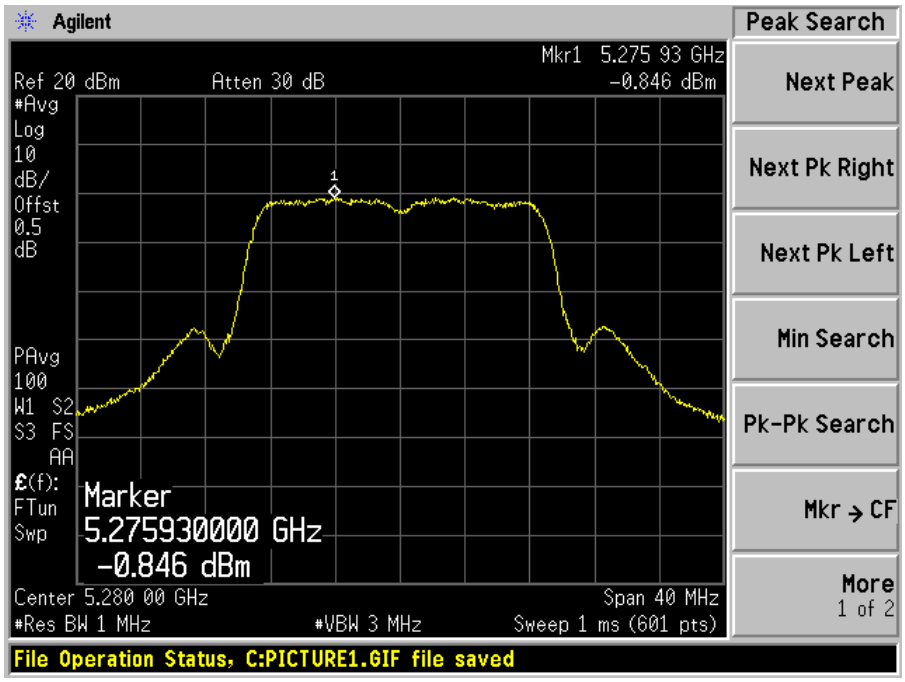
802.11 n 20MHz

5250MHz-5350MHz

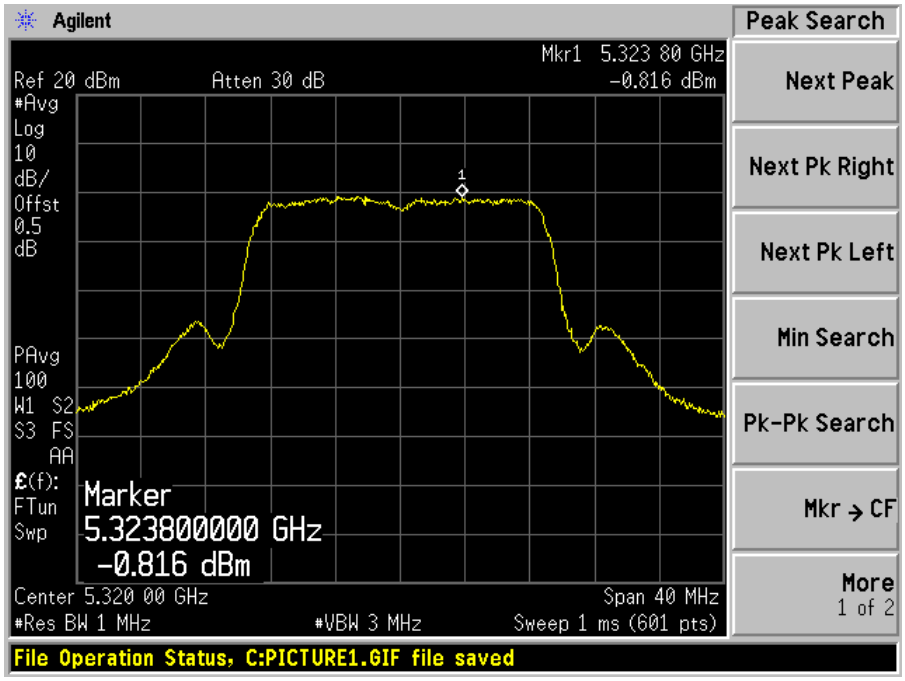
Low channel



Middle Channel

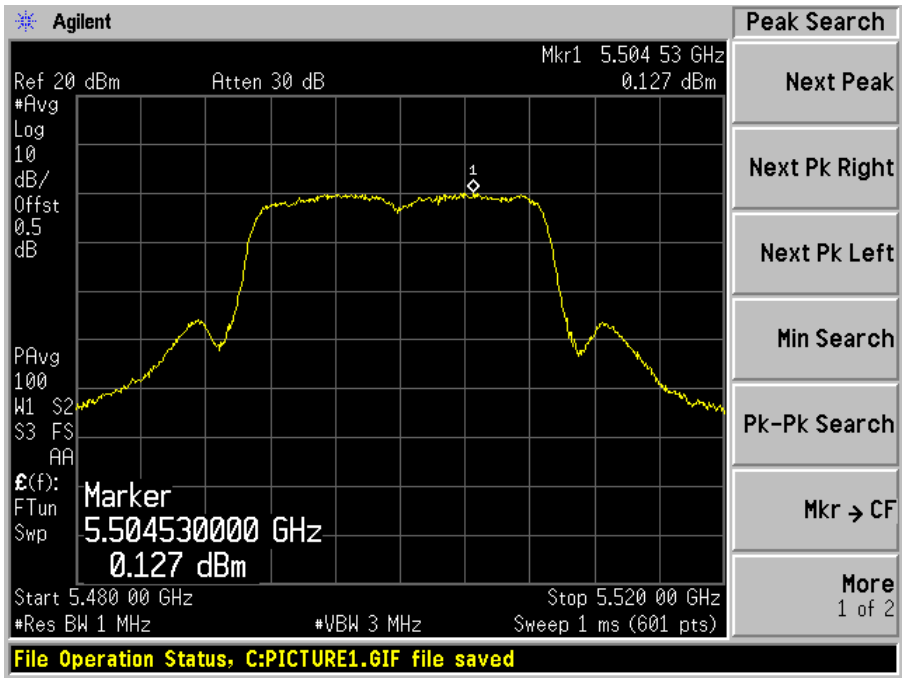


High Channel

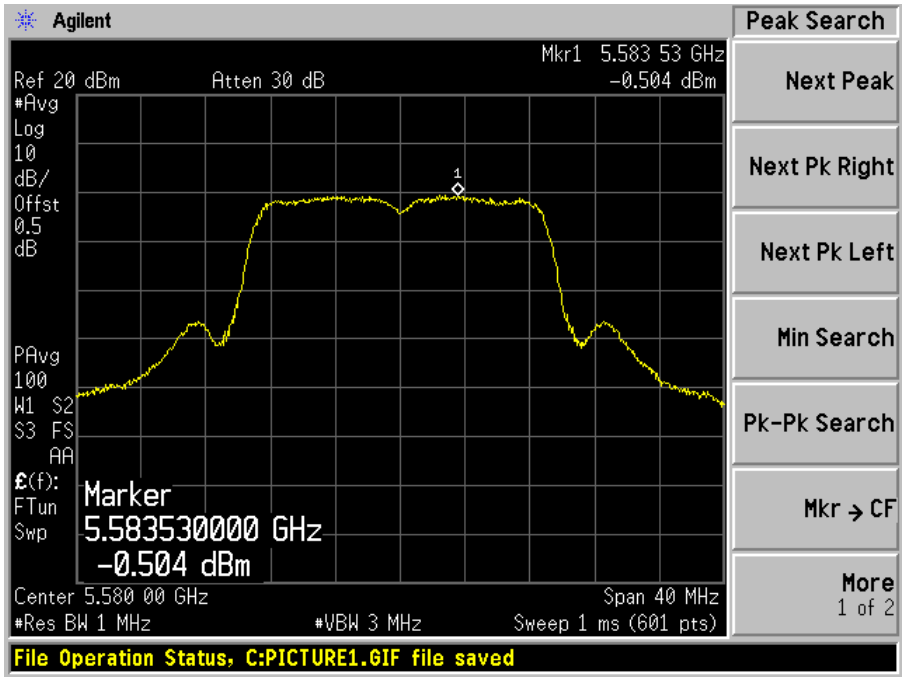


5470MHz-5725MHz

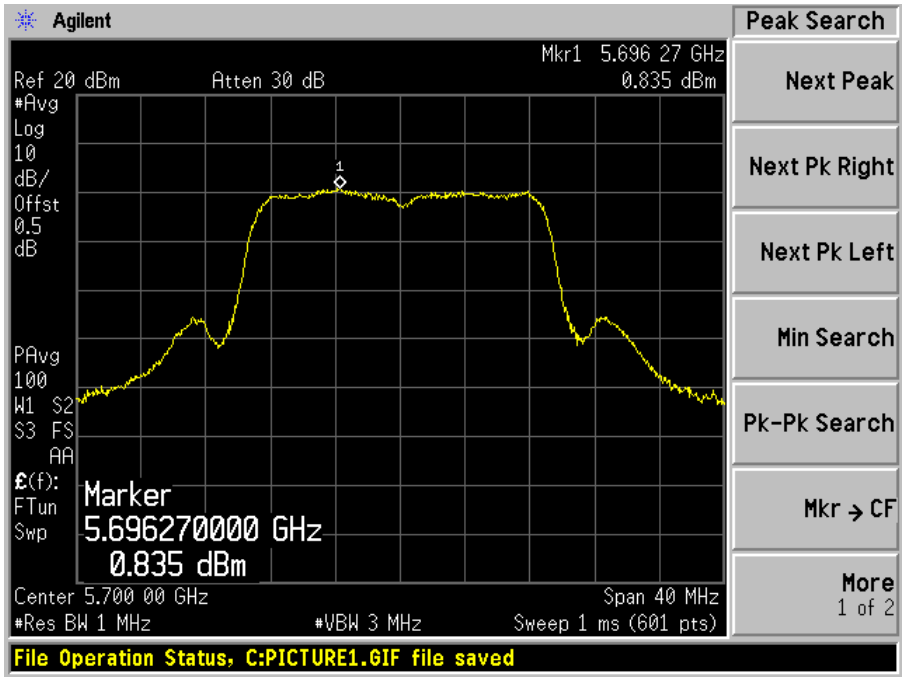
Low Channel



Middle Channel



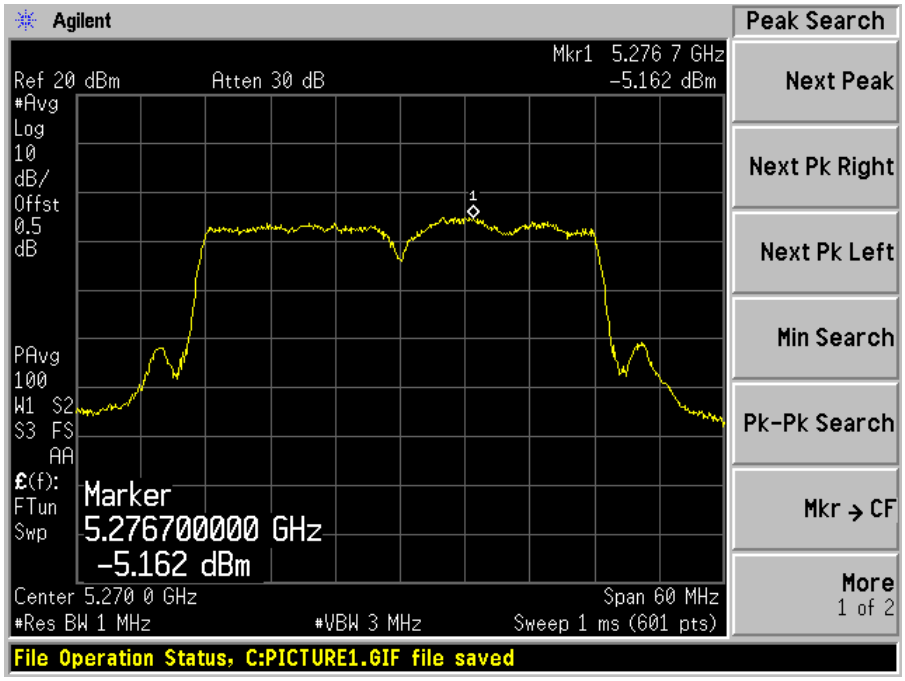
High Channel



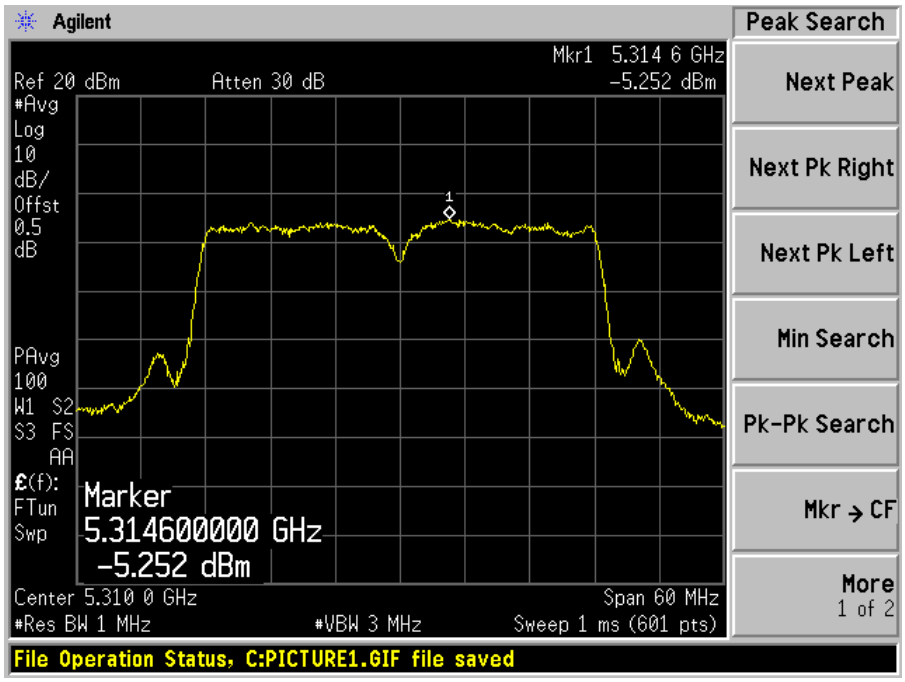
802.11 n 40MHz

5250MHz-5350MHz

Low channel

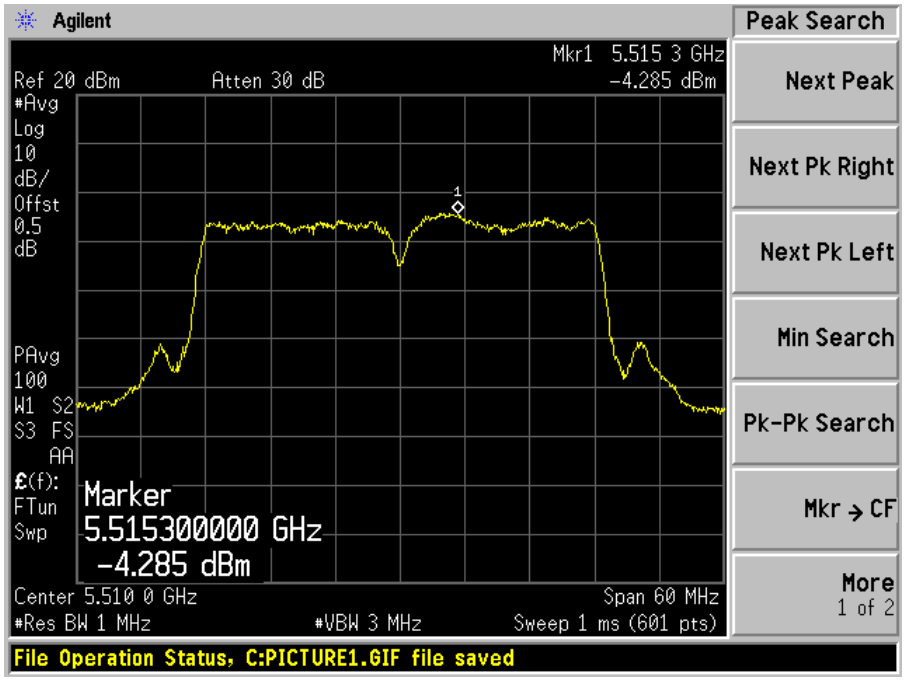


High Channel

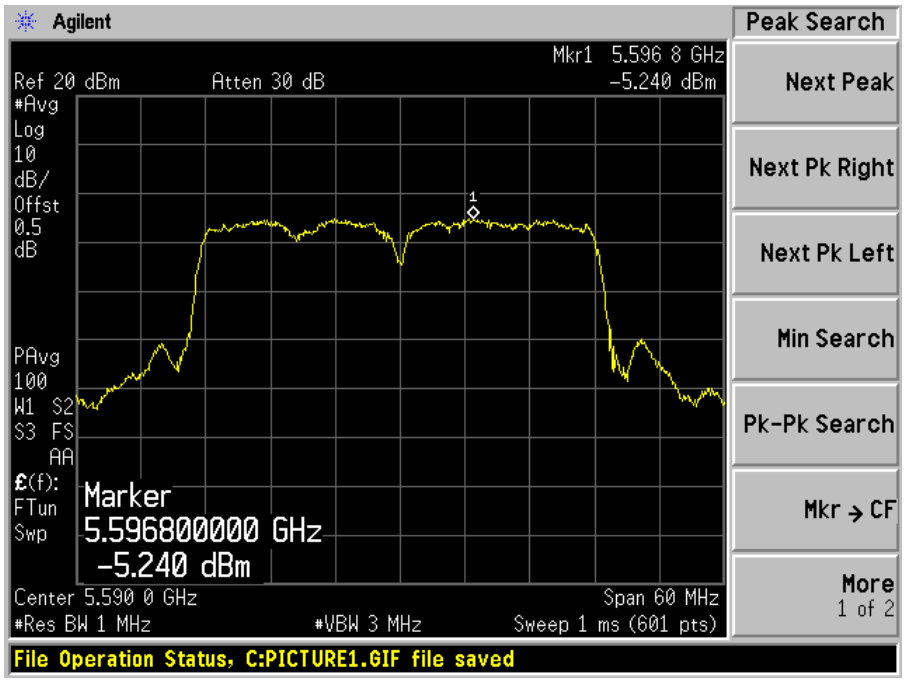


5470MHz-5725MHz

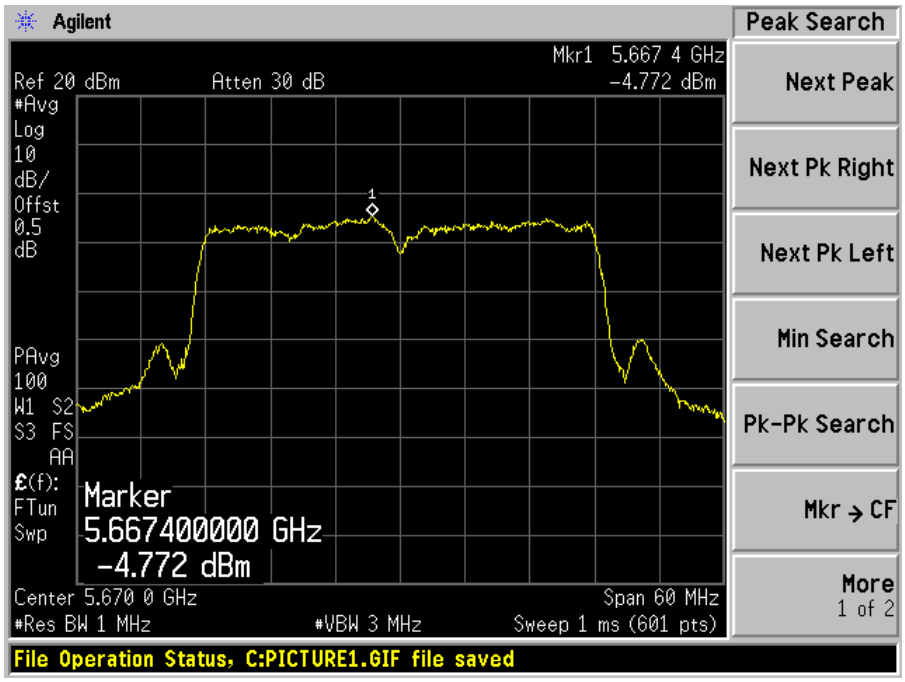
Low Channel



Middle Channel



High Channel



10 IC RSS-210 §2.6 & RSS-Gen §6 - Receiver Spurious Radiated Emissions

10.1 Applicable Standard

According to RSS-Gen §4.10, the receiver shall be operated in the normal receive mode near the mid-point of the band over which the receiver is designed to operate.

Unless otherwise specified in the applicable RSS, the radiated emission measurement is the standard measurement method (with the device's antenna in place) to measure receiver spurious emissions.

Radiated emission measurements are to be performed using a calibrated open-area test site.

For either method, the search for spurious emissions shall be from the lowest frequency internally generated or used in the receiver (e.g. local oscillator, intermediate or carrier frequency), or 30 MHz, whichever is the higher, to at least 3 times the highest tuneable or local oscillator frequency, whichever is the higher, without exceeding 40 GHz.

For emissions below 1 GHz, measurements shall be performed using a CISPR quasi-peak detector and the related measurement bandwidth. As an alternative to CISPR quasi-peak measurement, compliance with the emission limit can be demonstrated using measuring equipment employing a peak detector with the same measurement bandwidth as that for CISPR quasi-peak measurements. Above 1 GHz, measurements shall be performed using an average detector and a resolution bandwidth of 300 kHz to 1 MHz.

According to RSS-210 §2.6, Tables 2 and 3 show the general field strength limits of unwanted emissions, where applicable, for transmitters and receivers operating in accordance with the provisions specified in this RSS. Transmitters whose wanted emissions are also within the limits shown in Tables 2 and 3 may operate in any of the frequency bands of Tables 2 and 3, other than the restricted bands of Table 1 and the TV bands, and shall be certified under RSS-210.

Table 2: General Field Strength Limits for Transmitters and Receivers at Frequencies above 30 MHz **(Note)**

Frequency (MHz)	Field Strength Microvolts/m at 3 meters (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Note: Transmitting devices are not permitted in Table 1 bands or in TV bands (54-72 MHz, 76-88 MHz, 174-216 MHz, 470-608 MHz, and 614-806 MHz). Prohibition of operation in TV bands does not apply to momentary devices, or to medical telemetry devices in the band 174-216 MHz, and to perimeter protection systems in the bands 54-72 and 76-88 MHz. The perimeter protection devices are to meet Table 3 field strengths limits.

Table 3: General Field Strength Limits for Transmitters at Frequencies below 30 MHz (Transmit)

Frequency (fundamental or spurious)	Field Strength (microvolts/m)	Magnetic H-Field (microamperes/m)	Measurement Distance (metres)
9-490 kHz	2,400/F (F in kHz)	2,400/377F (F in kHz)	300
490-1,705 kHz	24,000/F (F in kHz)	24,000/377F (F in kHz)	30
1.705-30 MHz	30	N/A	30

Note: The emission limits for the bands 9-90 kHz and 110-490 kHz are based on measurements employing an average detector.

10.2 EUT Setup

The radiated emissions tests were performed in the 3 meter chamber, using the setup in accordance with ANSI C63.4-2003.

10.3 Test Procedure

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data were recorded in the peak detection mode. Quasi-peak readings was performed only when an emissions was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**QP**" in the data table.

10.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to the indicated Amplitude (Ai) reading. The basic equation is as follows:

CA = Ai + AF + CL + Atten – Ga

For example, the Corrected Amplitude (CA) of 40.3 dBuV/m = indicated Amplitude reading (Ai) 32.5 dBuV + Antenna Factor (AF) 23.5 dB + Cable Loss (CL) 3.7 dB + Attenuator (Atten) 10 dB - Amplifier Gain (Ga) 29.4 dB

The "**Margin**" column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corrected Amplitude - Class B Limit

10.5 Test Equipment Lists and Details

Manufacturer	Description	Model Number	Serial Number	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2011-03-21
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A0020106-3	2011-06-29
A.R.A Inc	Horn antenna	DRG-1181A	1132	2010-11-29
Hewlett Packard	Pre amplifier	8447D	2944A06639	2011-06-09
Mini-Circuits	Pre Amplifier	ZVA-183-S	570400946	2011-05-09

Statement of Traceability: BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

10.6 Test Environmental Conditions

Temperature:	18~21 °C
Relative Humidity:	30~35 %
ATM Pressure:	101.2-102.2kPa

The testing was performed by Ning Ma from 2010-05-10 to 2010-05-22.

10.7 Summary of Test Results

According to the test data,, the EUT complied with the with the RSS-210, with the closest margins from the limit listed below:

Unwanted Emissions and Receiving Spurious Emission, (30-1000 MHz):

AP1020e, 5250-5350 MHz

Mode: Receiving			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range (MHz)**
-5.91	105.6735	V	30 MHz to 1000 MHz

AP1020e, 5470-5725 MHz

Mode: Receiving			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range (MHz)**
-16.13	42.65775	V	30 MHz to 1000 MHz

AP1020i, 5250-5350 MHz

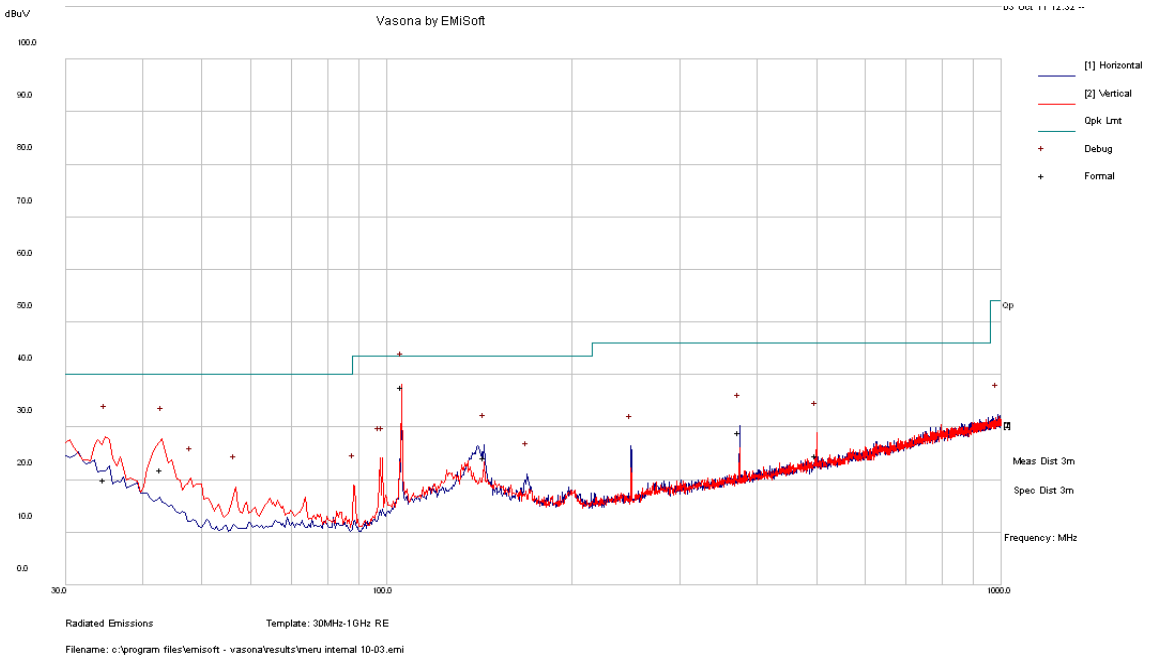
Mode: Receiving			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range (MHz)**
-11.18	750.0265	V	30 MHz to 1000 MHz

AP1020i, 5470-5725 MHz

Mode: Receiving			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Range (MHz)**
-5.92	105.634	V	30 MHz to 1000 MHz

1) AP1020e, Radiated Emission at 3 meters, 30 MHz -1 GHz

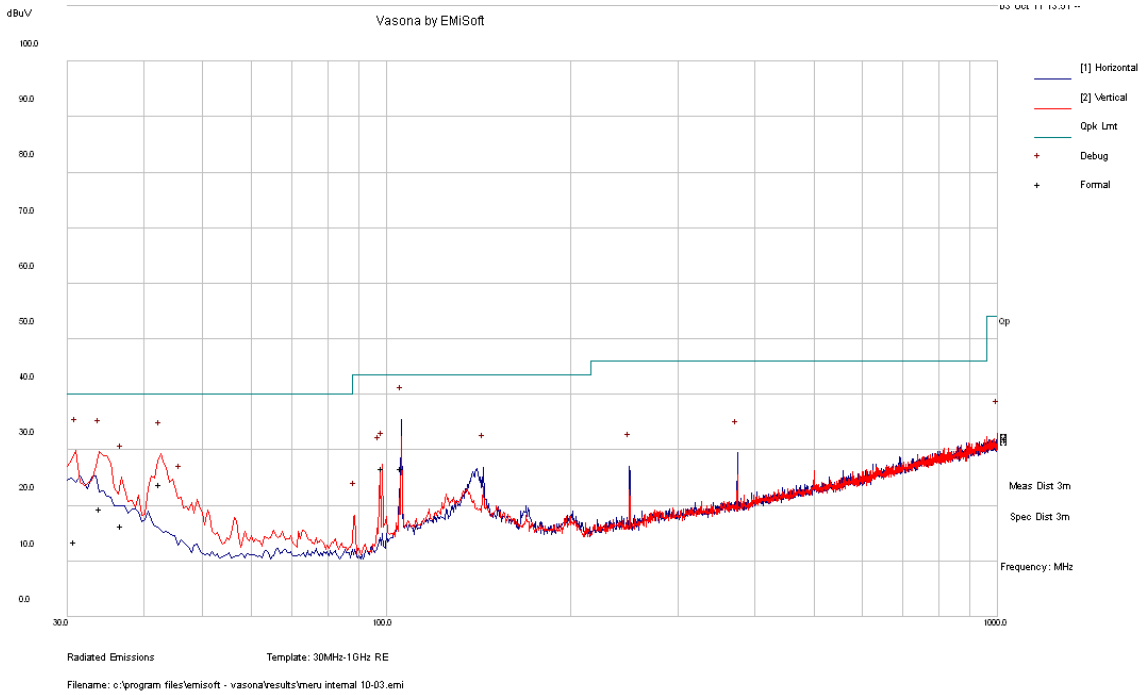
AP1020e, 5250-5350 MHz, Middle channel



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.6735	37.59	119	V	287	43.5	-5.91
375.007	28.96	99	H	137	46	-17.04
42.96825	21.92	130	V	295	40	-18.08
144.034	24.23	199	H	272	43.5	-19.27
34.68875	20.02	100	V	199	40	-19.98
500.0043	24.63	101	V	6	46	-21.37

AP1020e, 5470-5725 MHz, Middle channel (5190 MHz)



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
42.65775	23.87	114	V	103	40	-16.13
105.6678	26.78	199	H	238	43.5	-16.72
98.5175	26.69	123	V	299	43.5	-16.81
33.99875	19.36	116	V	86	40	-20.64
36.92225	16.33	209	V	351	40	-23.67
30.87225	13.56	267	V	67	40	-26.44

2) AP1020e, Radiated Emission at 3 meters, above 1GHz

AP1020e, 5250-5350 MHz

Middle channel measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	Part 15C		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
-	-	-	-	-	-	-	-	-	-	-	-

* All the Restricted Band Frequencies are more than 20 dB below the margin

AP1020e, 5470-5725 MHz

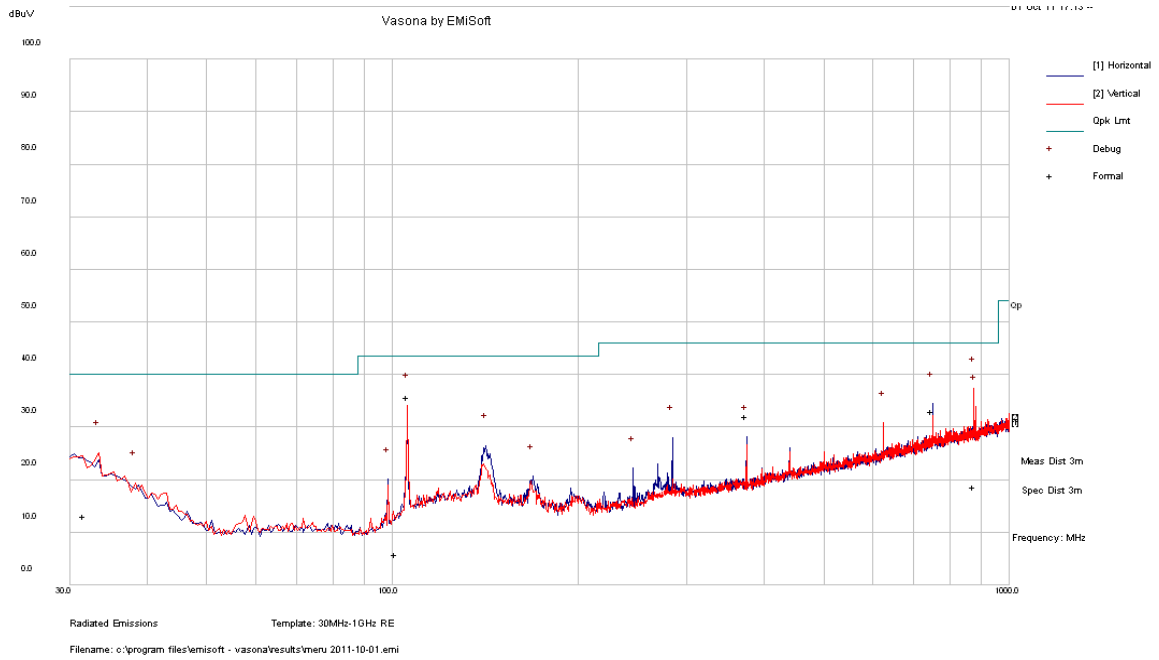
Middle channel measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	Part 15C		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
-	-	-	-	-	-	-	-	-	-	-	-

* All the Restricted Band Frequencies are more than 20 dB below the margin

3) AP1020i, Radiated Emission at 3 meters, 30 MHz – 1 GHz

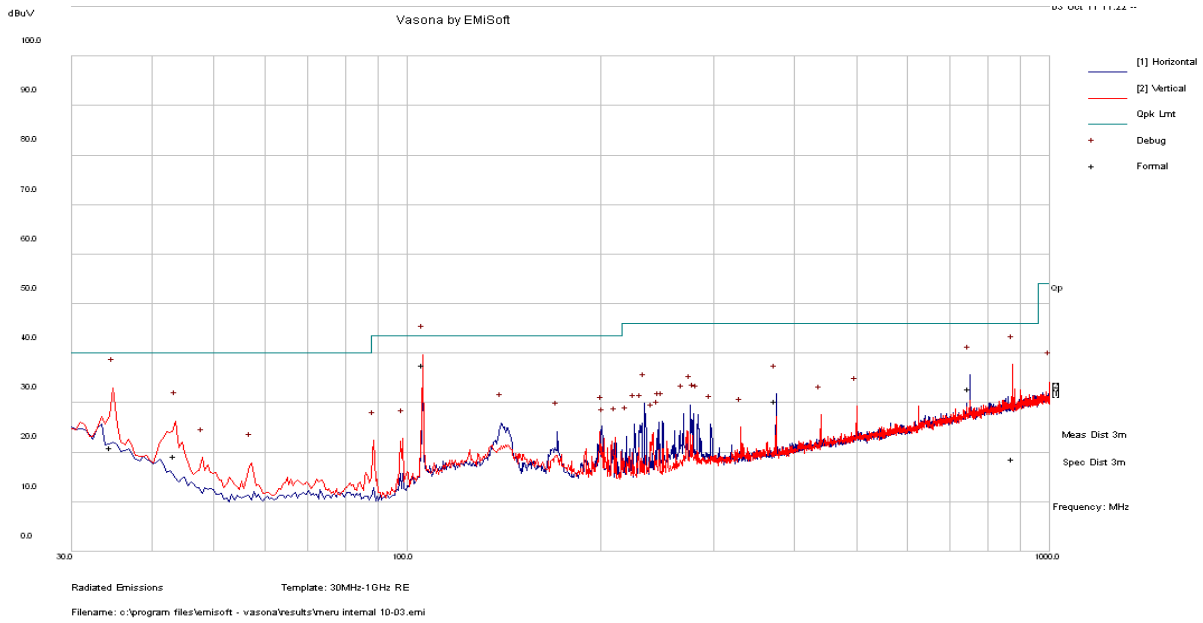
AP1020i, 5250-5350 MHz, Middle channel



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
750.0265	34.82	113	H	219	46	-11.18
880.0313	29.98	104	V	0	46	-16.02
625.007	29.57	99	V	227	46	-16.43
105.645	17.63	99	V	208	43.5	-25.87
875.1208	18.65	248	V	0	46	-27.35
33.42975	11.79	184	V	286	40	-28.21

AP1020i, 5470-5725 MHz, Middle channel (5190 MHz)



Quasi-Peak Measurements

Frequency (MHz)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)
105.634	37.58	112	V	279	43.5	-5.92
750.028	32.87	119	H	190	46	-13.13
374.9843	30.41	101	H	142	46	-15.59
34.61025	20.97	99	V	177	40	-19.03
43.4985	19.27	118	V	21	40	-20.73
875.155	18.7	119	V	106	46	-27.30

4) AP1020i, Radiated Emission at 3 meters, above 1GHz

AP1020i, 5250-5350 MHz

Middle channel measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	Part 15C		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
-	-	-	-	-	-	-	-	-	-	-	-

* All the Restricted Band Frequencies are more than 20 dB below the margin

AP1020i, 5470-5725 MHz

Middle channel measured at 3 meters

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	Part 15C		Comments
			Height (m)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
-	-	-	-	-	-	-	-	-	-	-	-

* All the Restricted Band Frequencies are more than 20 dB below the margin

11 FCC §15.407(b) & IC RSS-210 §A9.2 - Spurious Emissions at Antenna Terminals

11.1 Applicable Standard

For FCC §15.407(b) and IC RSS-210 §A9.2, For transmitters operating in the 5.25–5.35 GHz band: all emissions outside of the 5.15–5.35 GHz band shall not exceed an EIRP of –27 dBm/MHz. Devices operating in the 5.25–5.35 GHz band that generate emissions in the 5.15–5.25 GHz band must meet all applicable technical requirements for operation in the 5.15–5.25 GHz band (including indoor use) or alternatively meet an out-of-band emission EIRP limit of –27 dBm/MHz in the 5.15–5.25 GHz band. For transmitters operating in the 5.47–5.725 GHz band: all emissions outside of the 5.47–5.725 GHz band shall not exceed an EIRP of −27 dBm/MHz.

11.2 Measurement Procedure

The RF output of the EUT was connected to a spectrum analyzer through appropriate attenuation. The resolution bandwidth of the spectrum analyzer was set at 100 kHz. Sufficient scans were taken to show any out of band emissions up to 10th harmonic.

11.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

11.4 Test Environmental Conditions

Temperature:	23-25 °C
Relative Humidity:	35-50 %
ATM Pressure:	101-103kPa

The testing was performed by Ning Ma on 2011-10-11~ 2011-10-12 at RF Site.

11.5 Test Results

Please refer to following plots of spurious emissions.

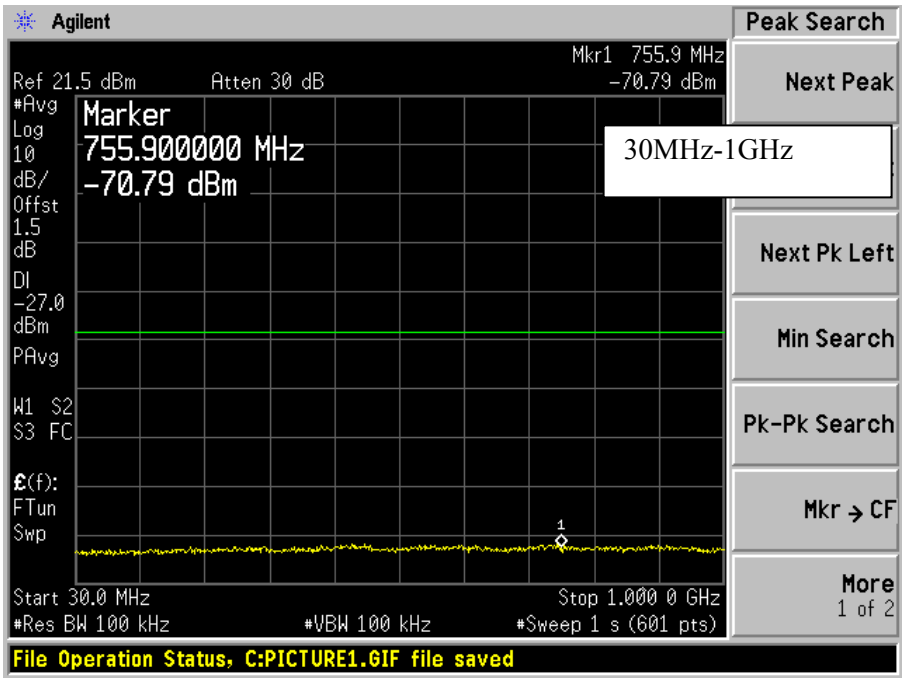
TX Chain 1

802.11 a mode 20MHz

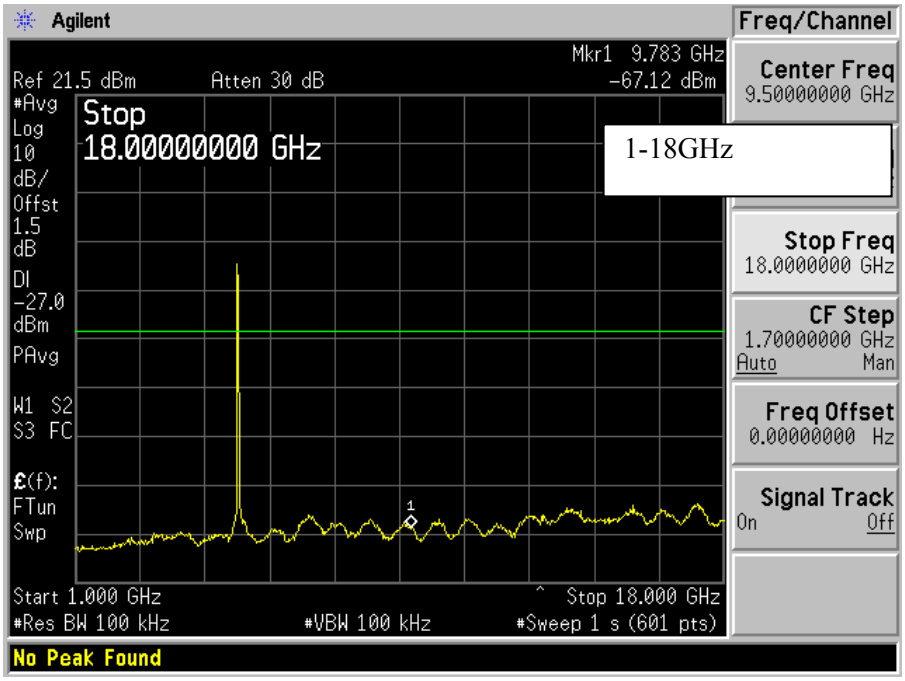
5250MHz-5350MHz

Low Channel

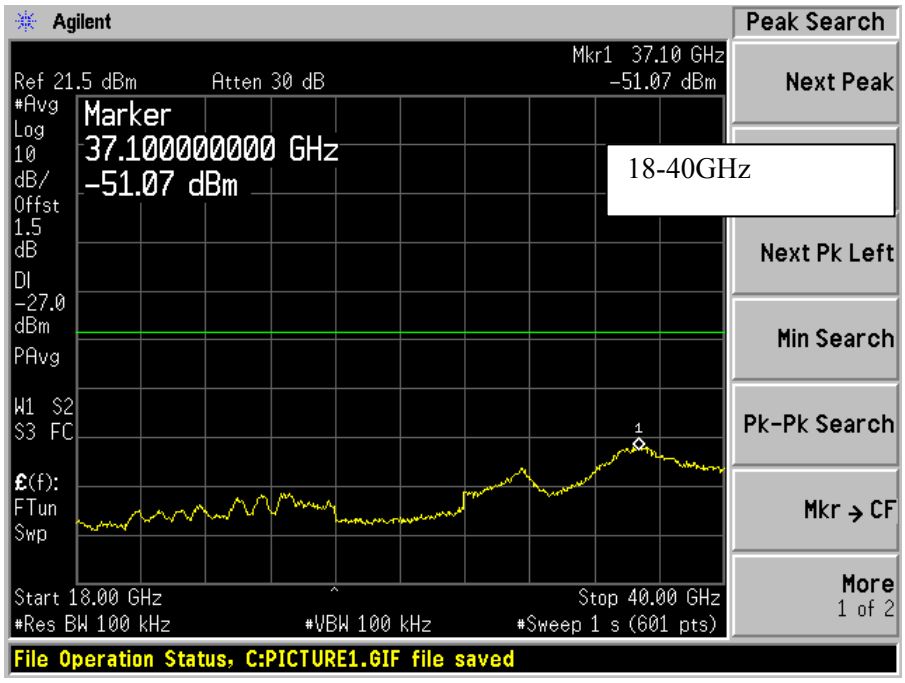
30MHz----1GHz



1GHz----18GHz

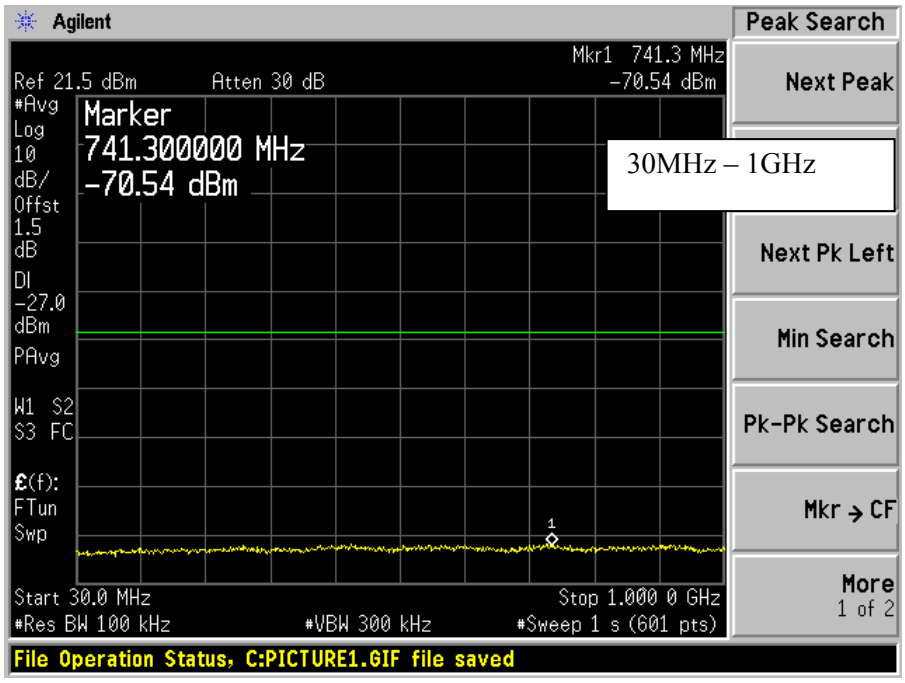


18GHz----40GHz

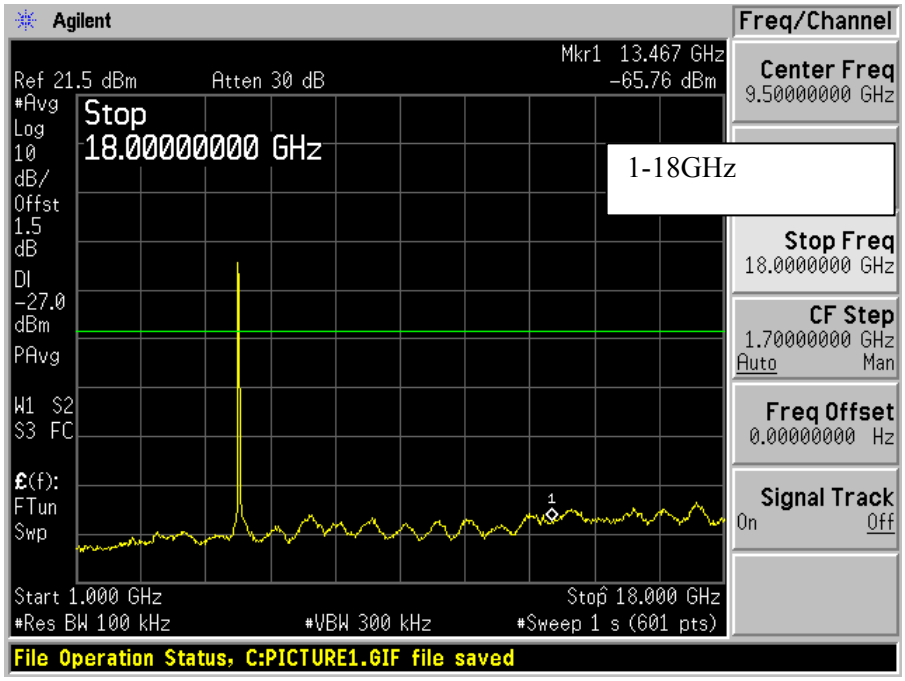


Middle Channel

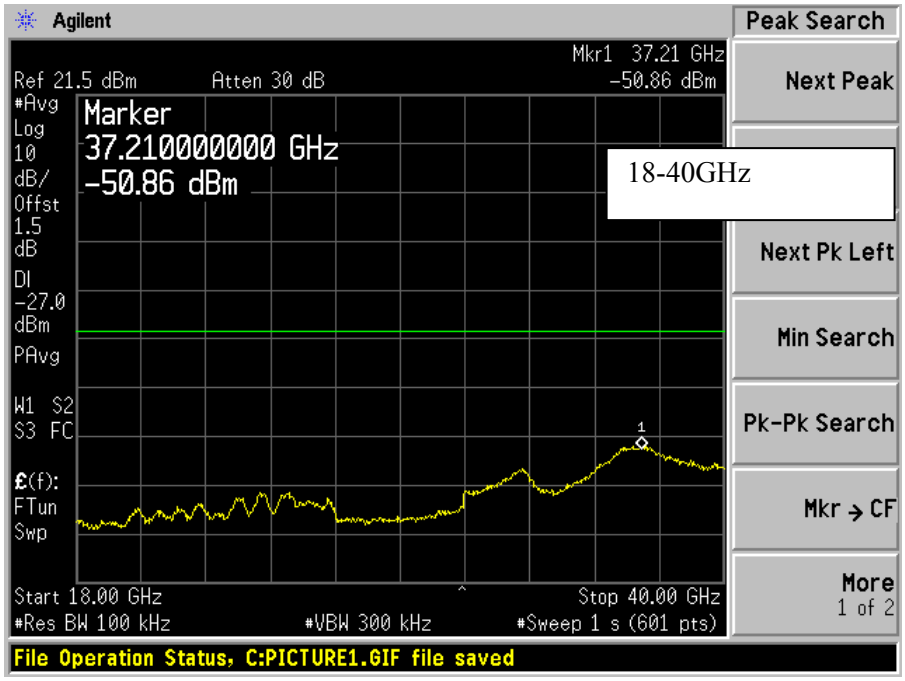
30MHz----1GHz



1GHz----18GHz

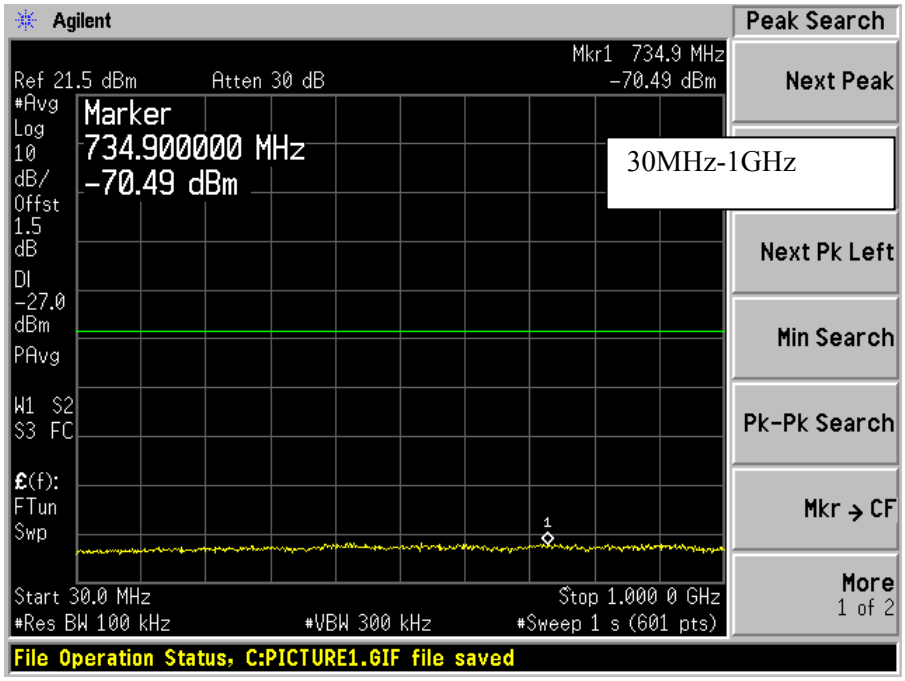


18GHz----40GHz

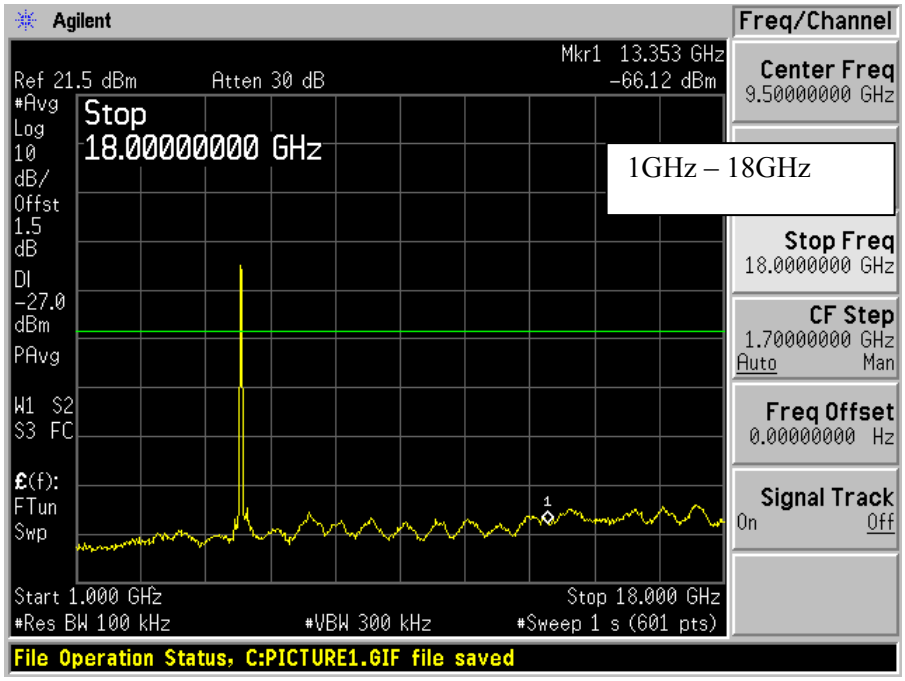


High Channel

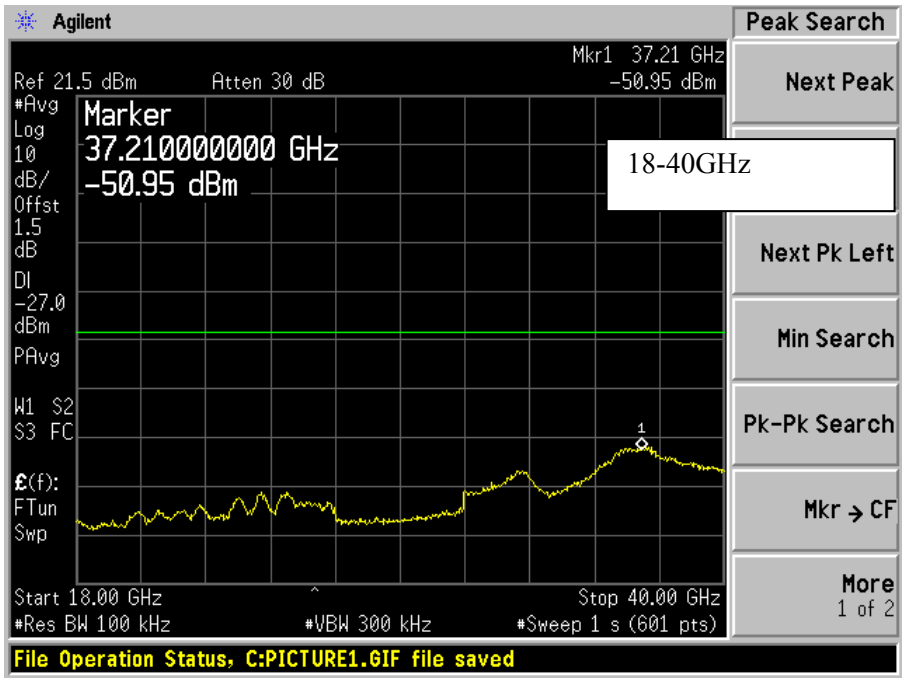
30MHz----1GHz



1GHz----18GHz



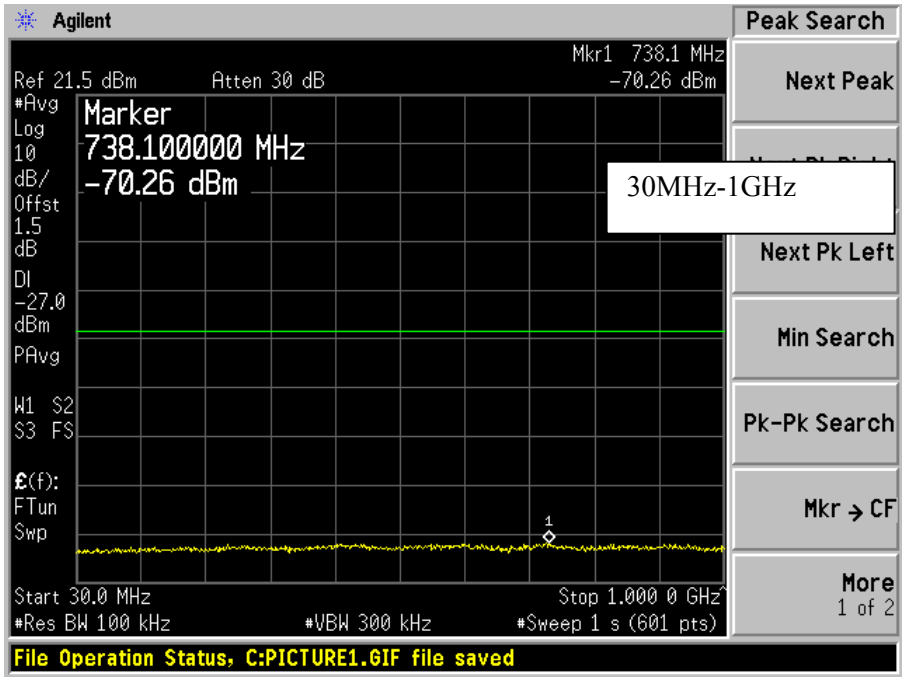
18GHz----40GHz



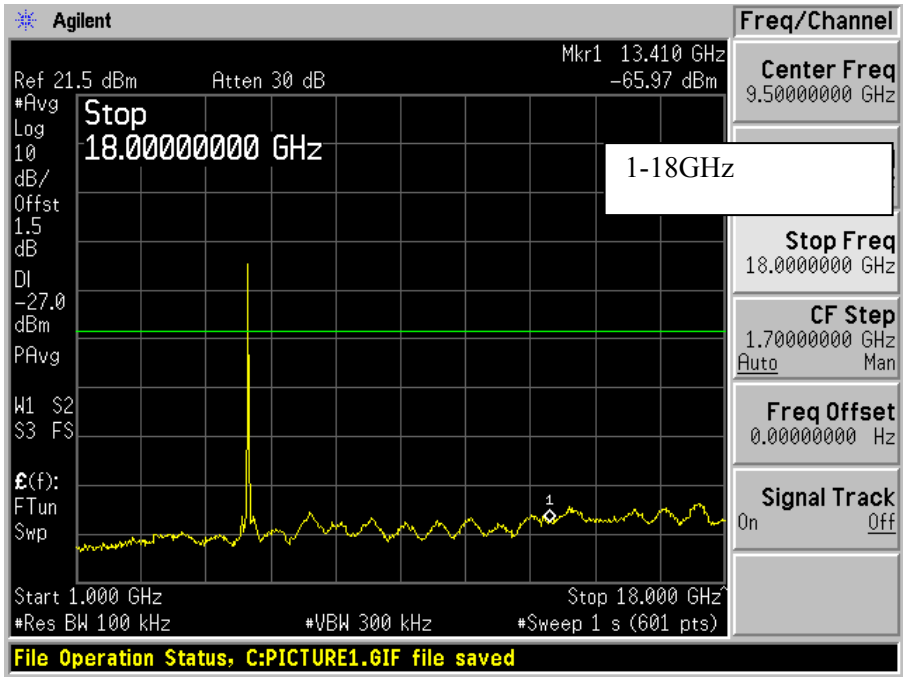
5470MHz-5725MHz

Low Channel

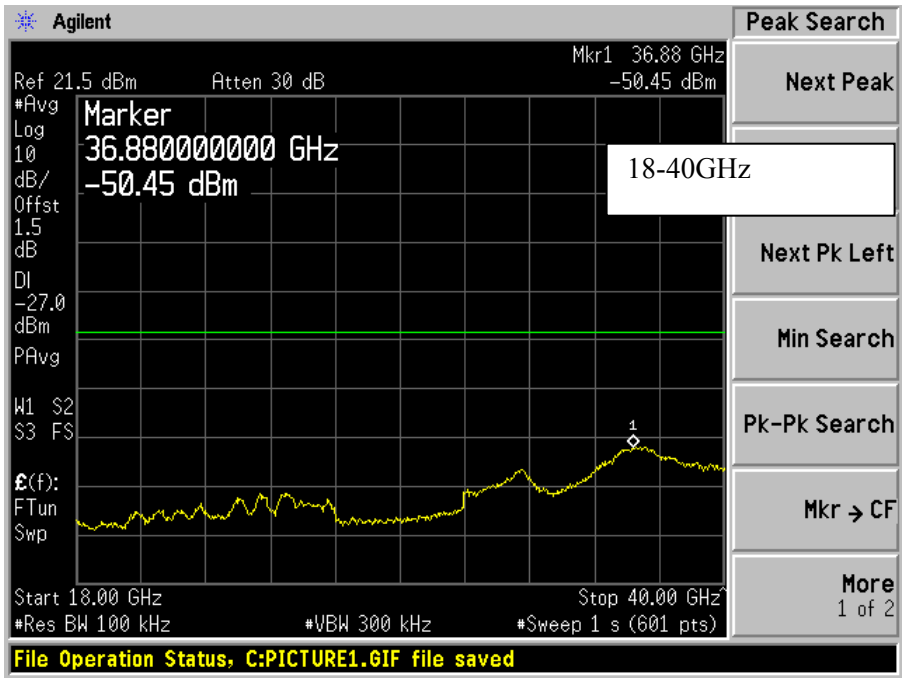
30MHz----1GHz



1GHz----18GHz

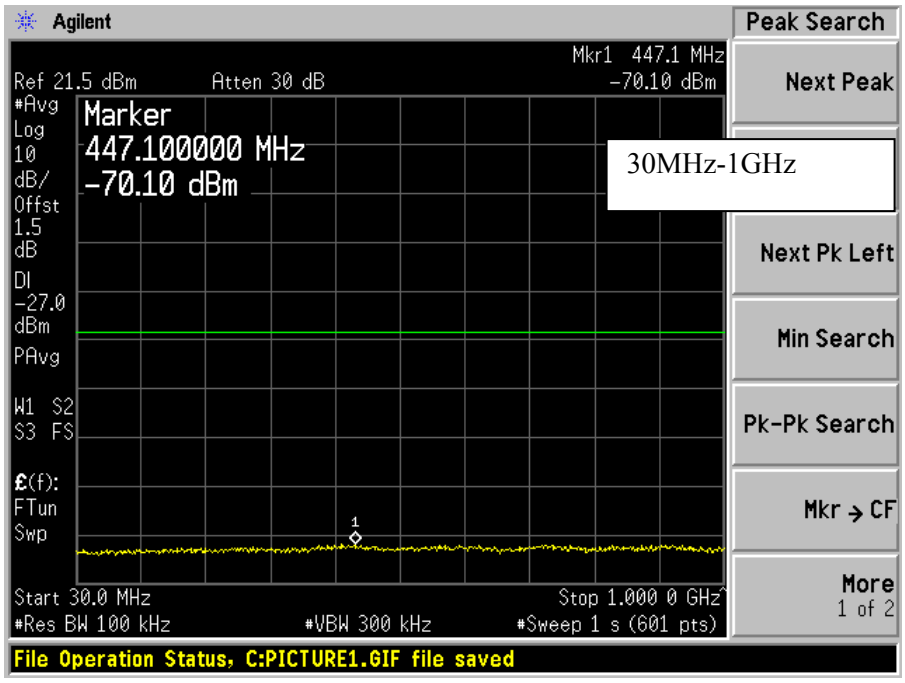


18GHz----40GHz

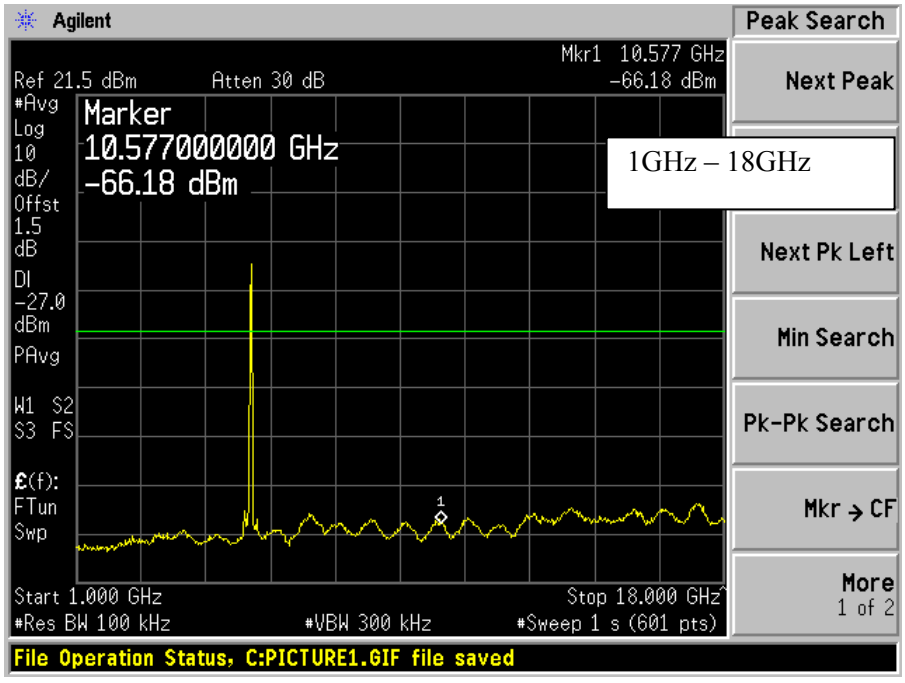


Middle Channel

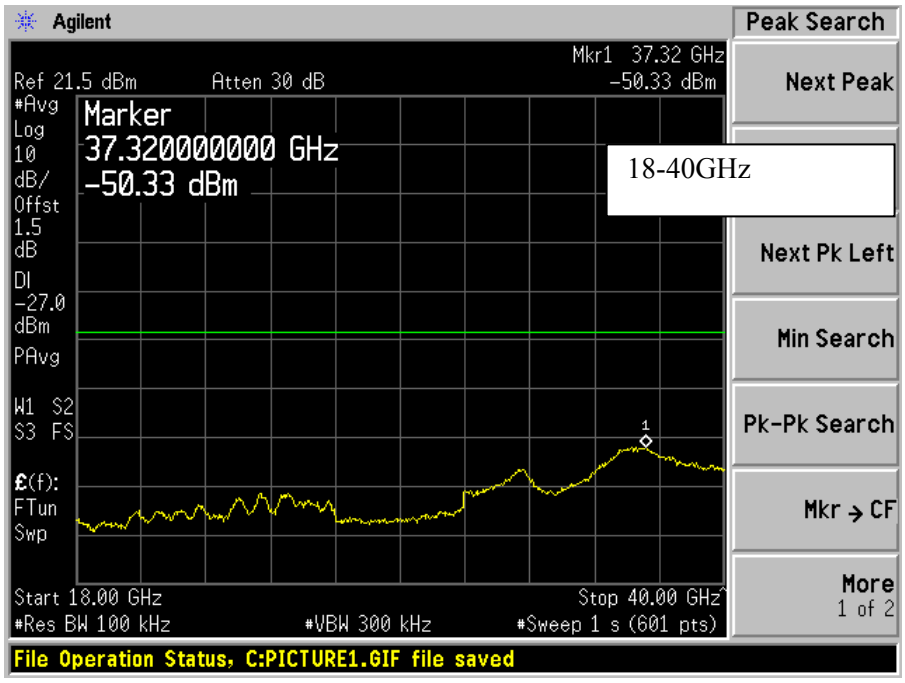
30MHz----1GHz



1GHz----18GHz

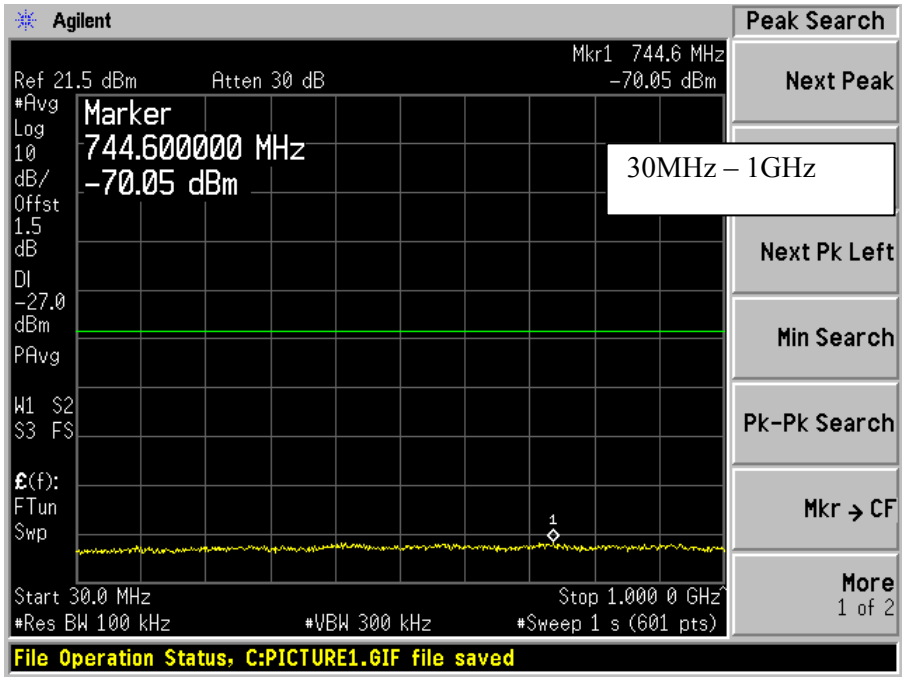


18GHz----40GHz

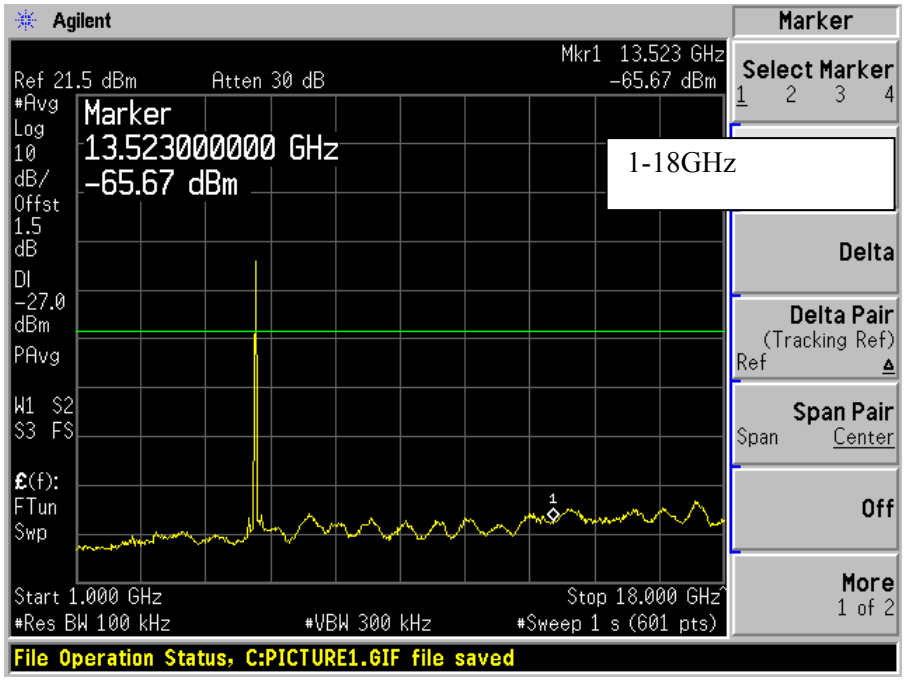


High Channel

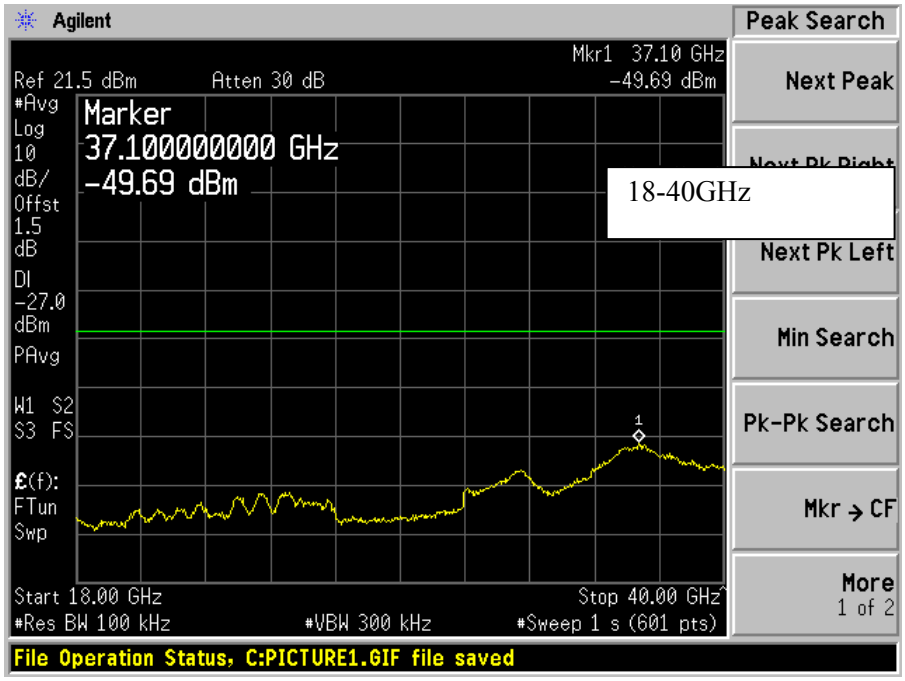
30MHz----1GHz



1GHz----18GHz



18GHz----40GHz

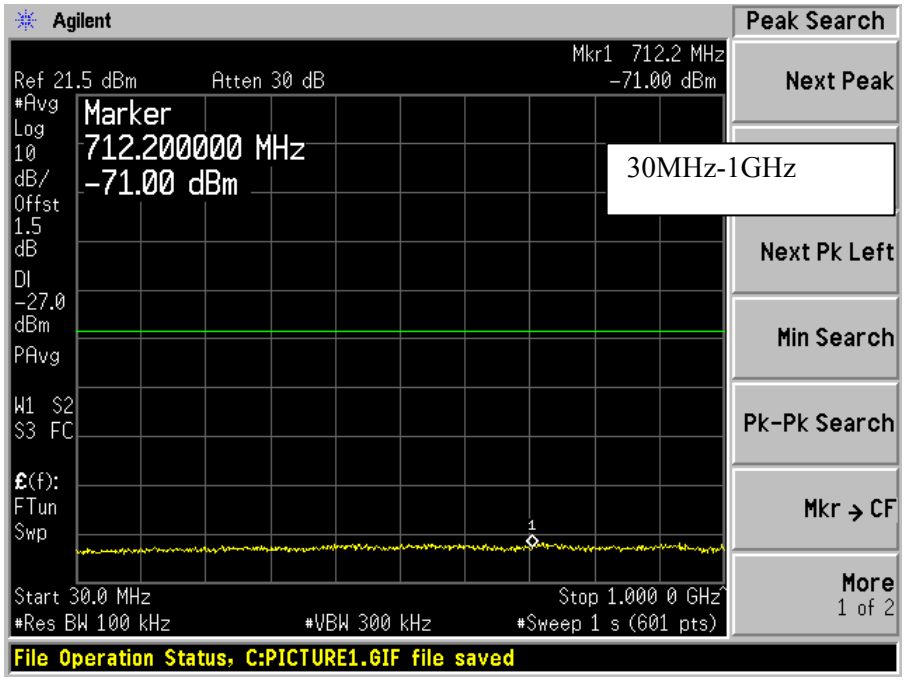


802.11 n mode 20MHz

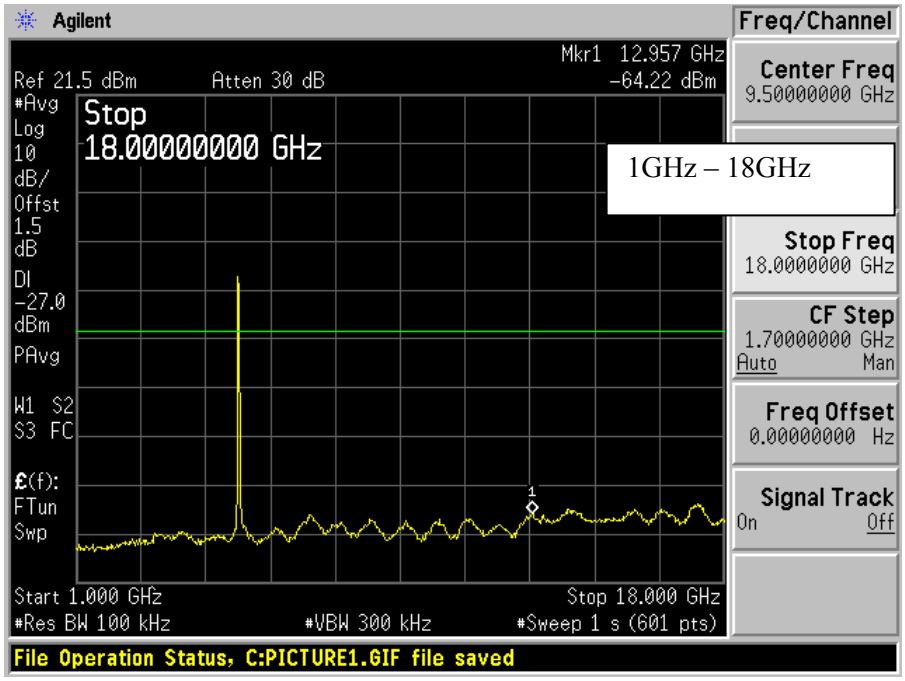
5250MHz-5350MHz

Low Channel

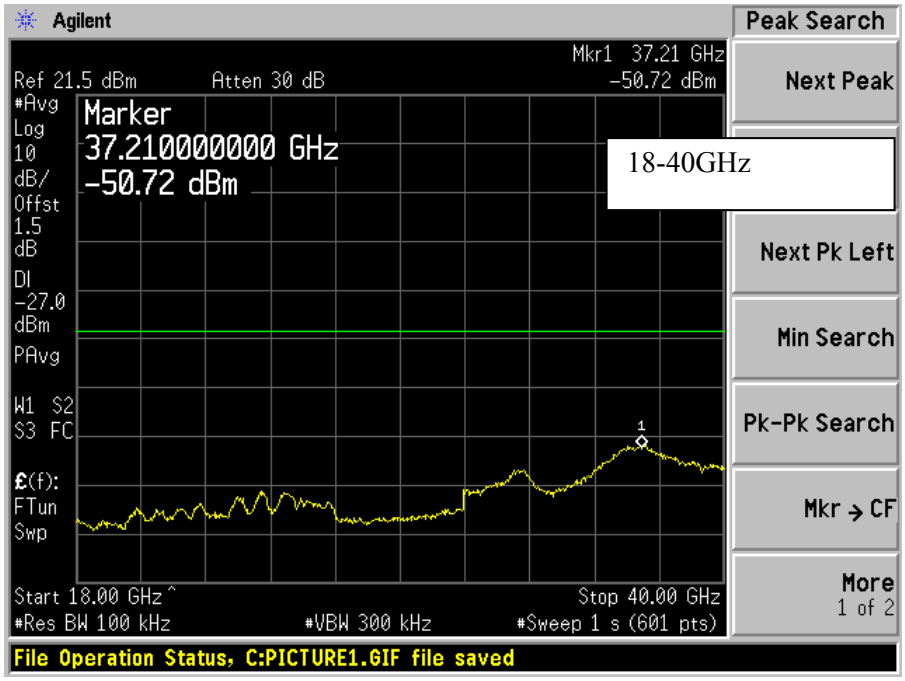
30MHz----1GHz



1GHz----18GHz

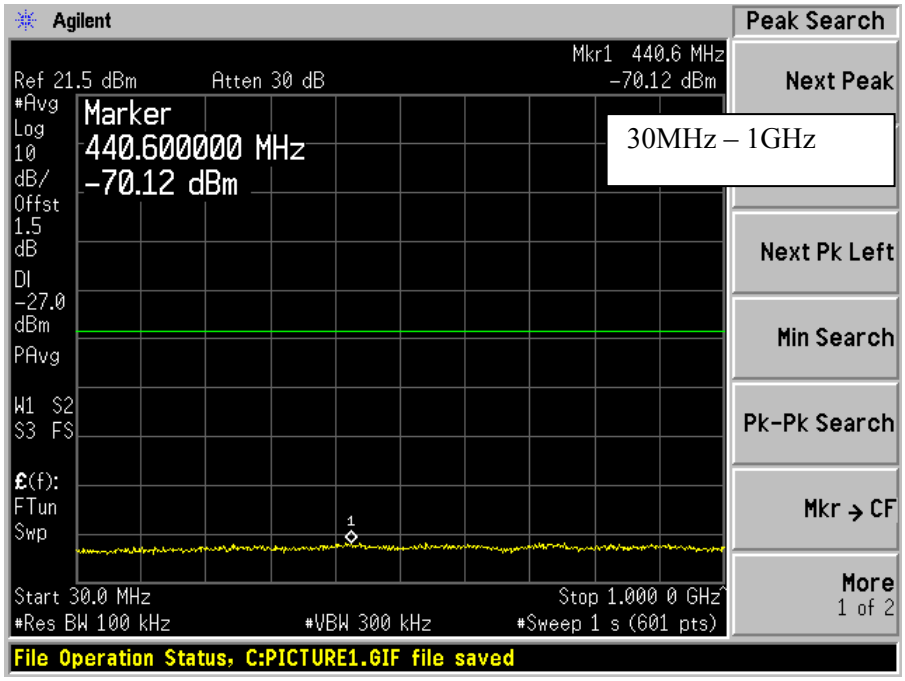


18GHz----40GHz

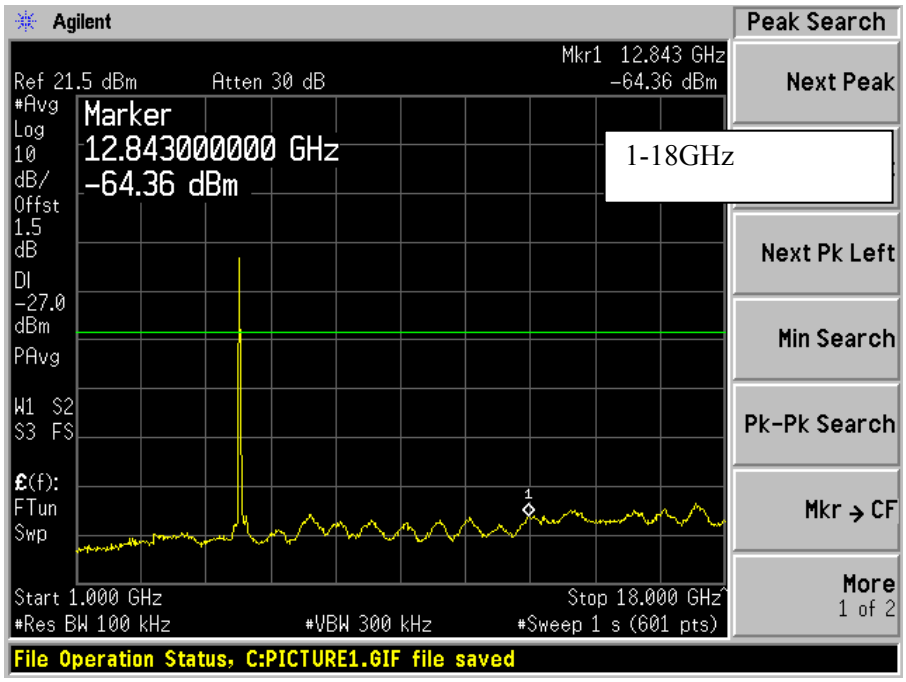


Middle Channel

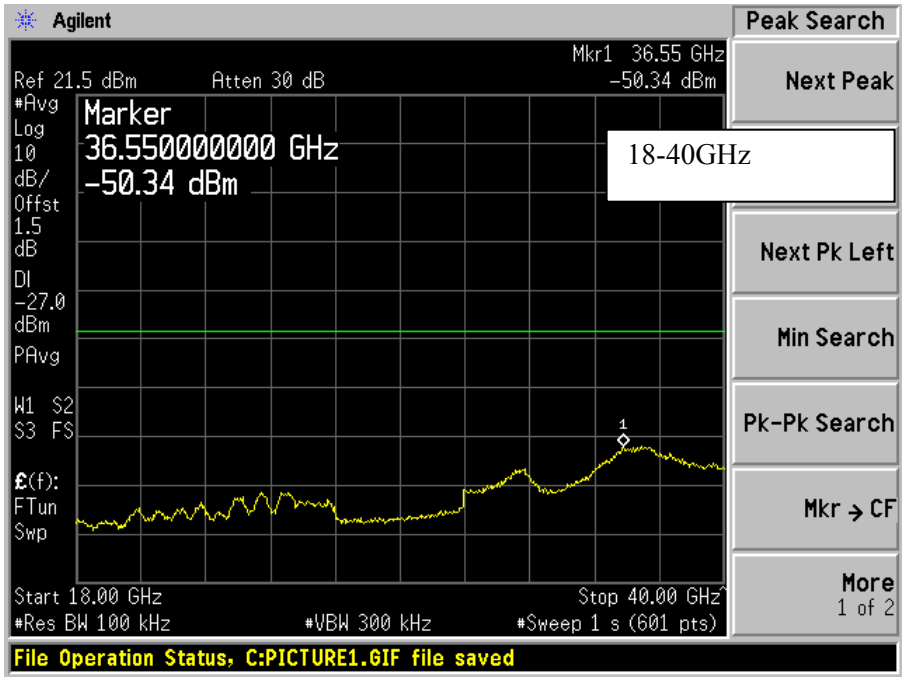
30MHz----1GHz



1GHz----18GHz

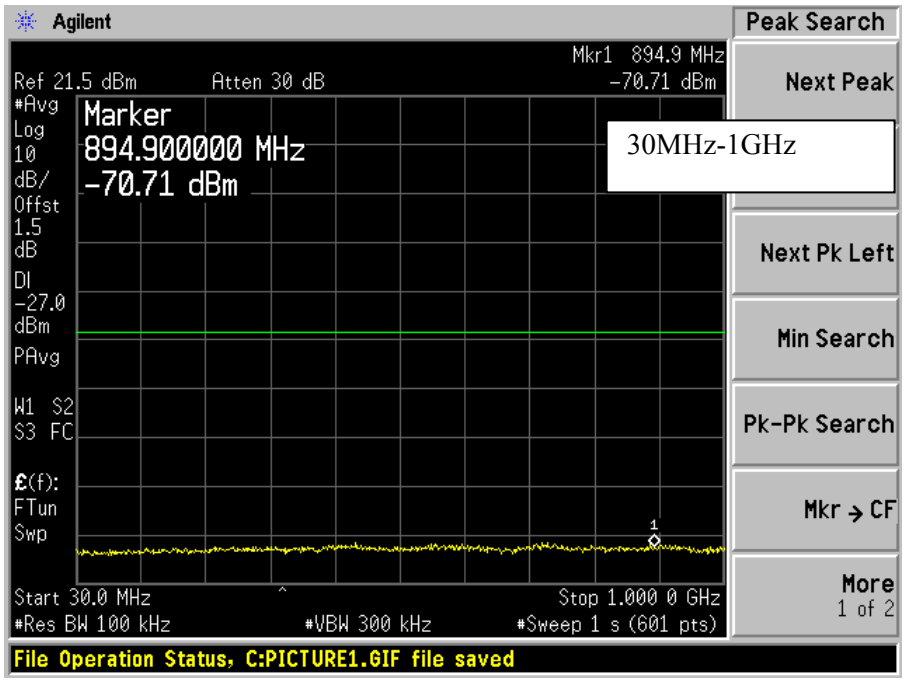


18GHz----40GHz

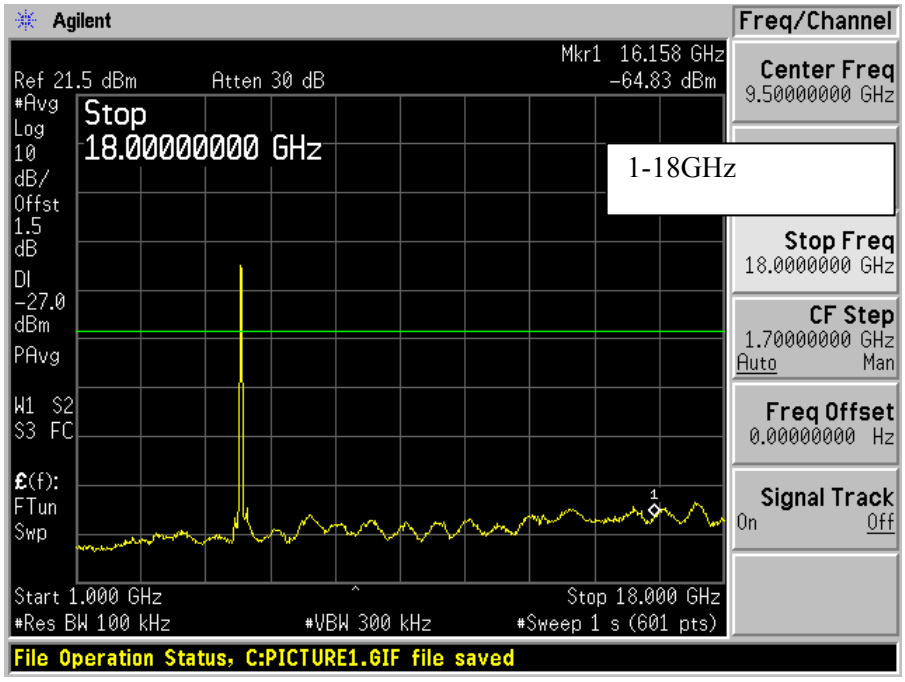


High Channel

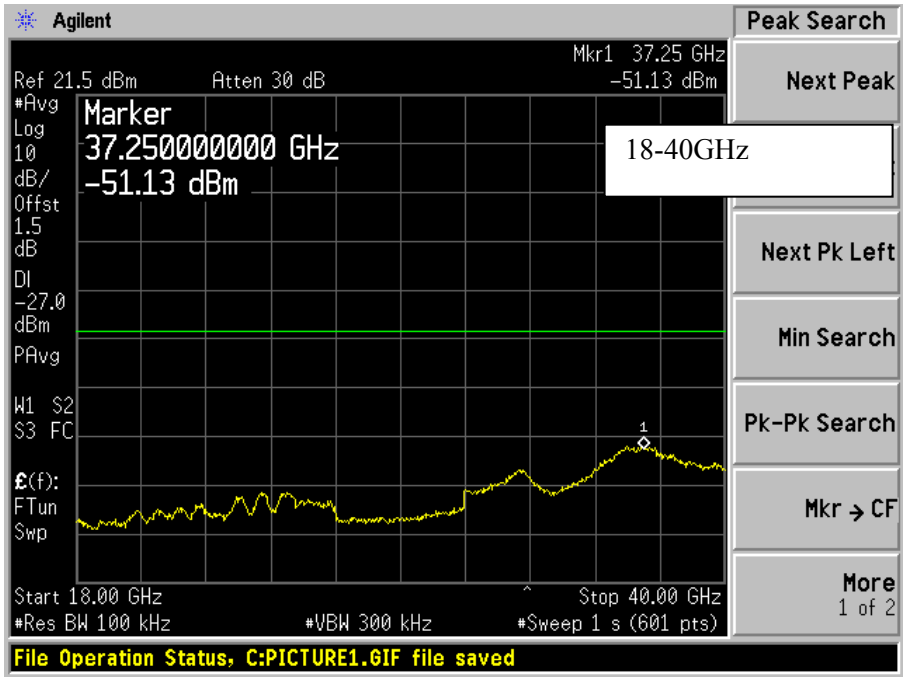
30MHz----1GHz



1GHz----18GHz



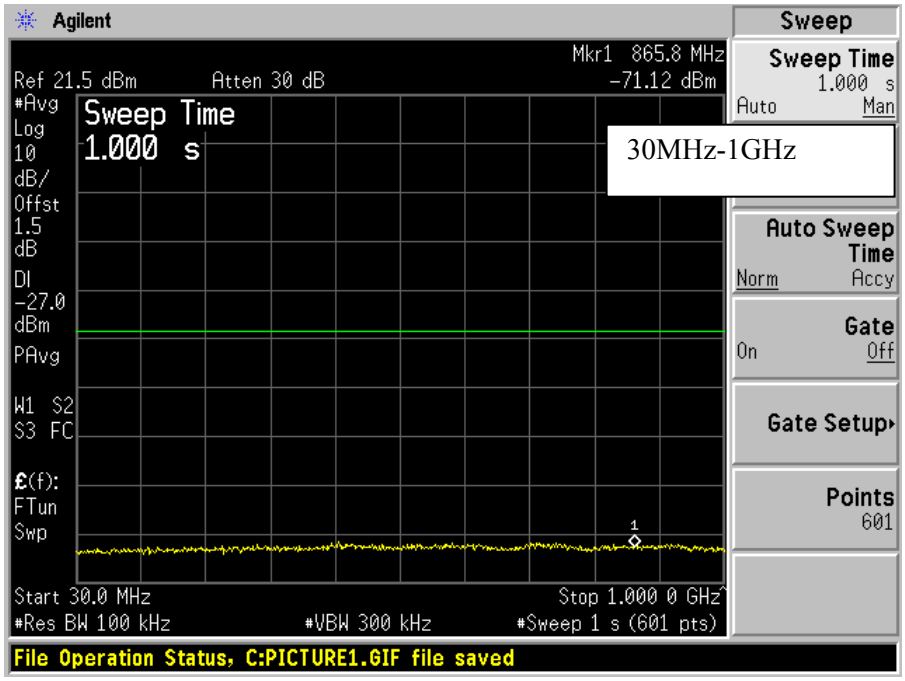
18GHz----40GHz



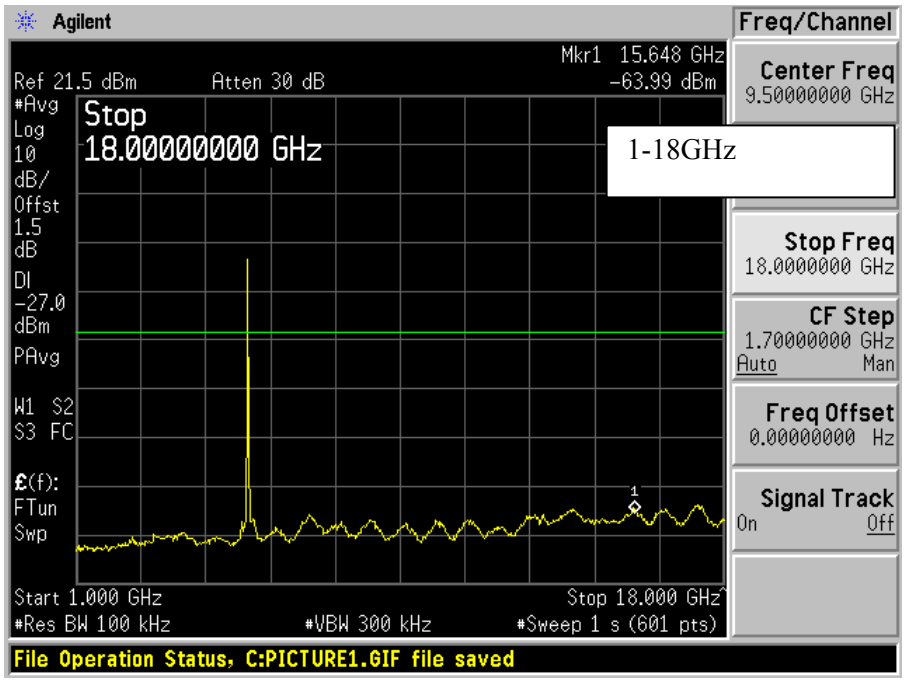
5470MHz-5725MHz

Low Channel

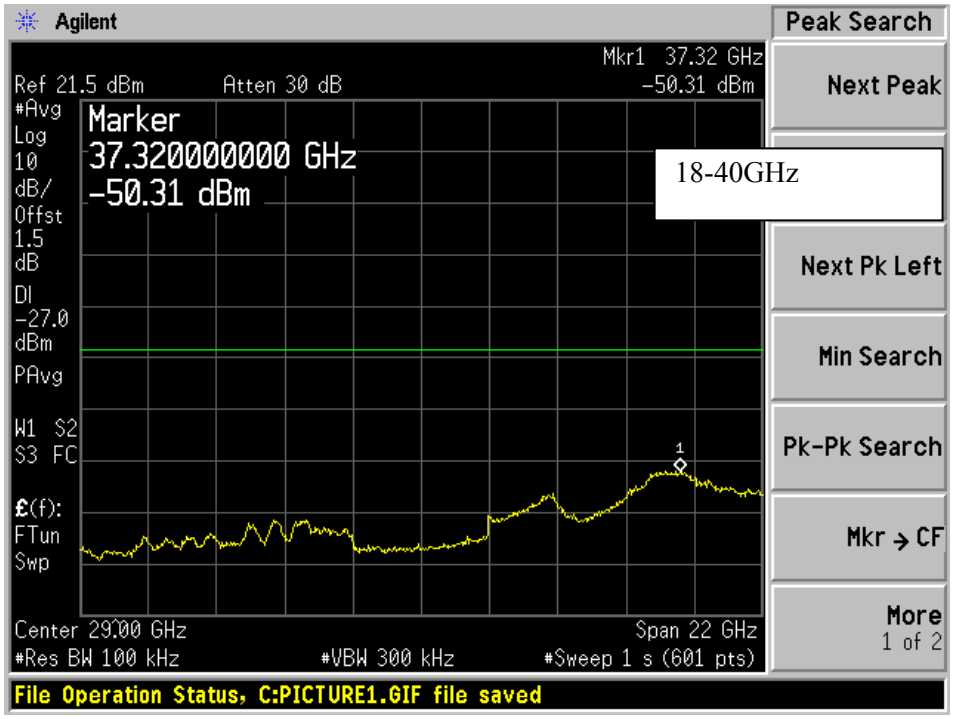
30MHz----1GHz



1GHz----18GHz

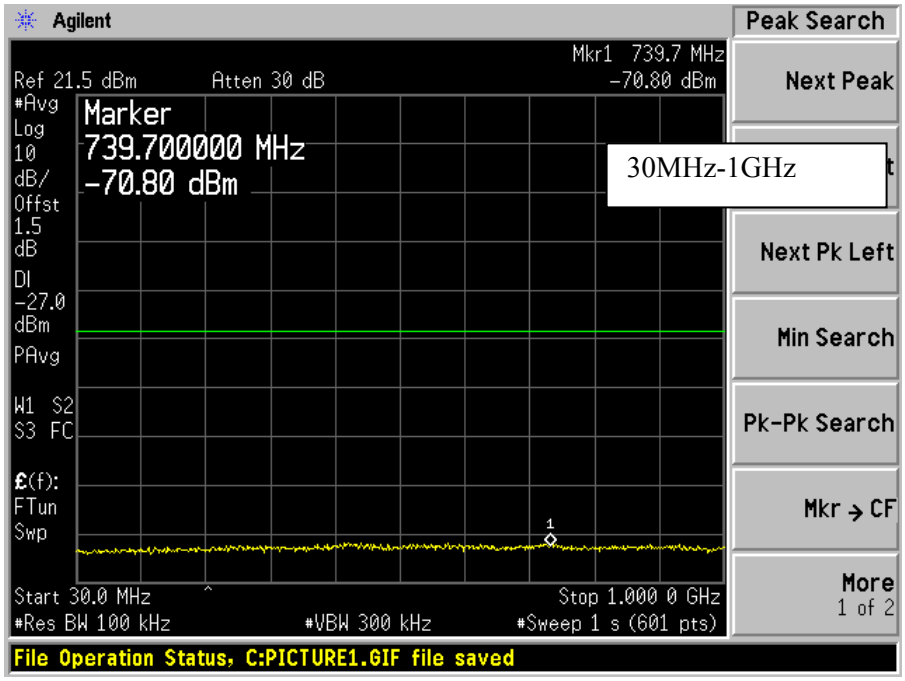


18GHz----40GHz

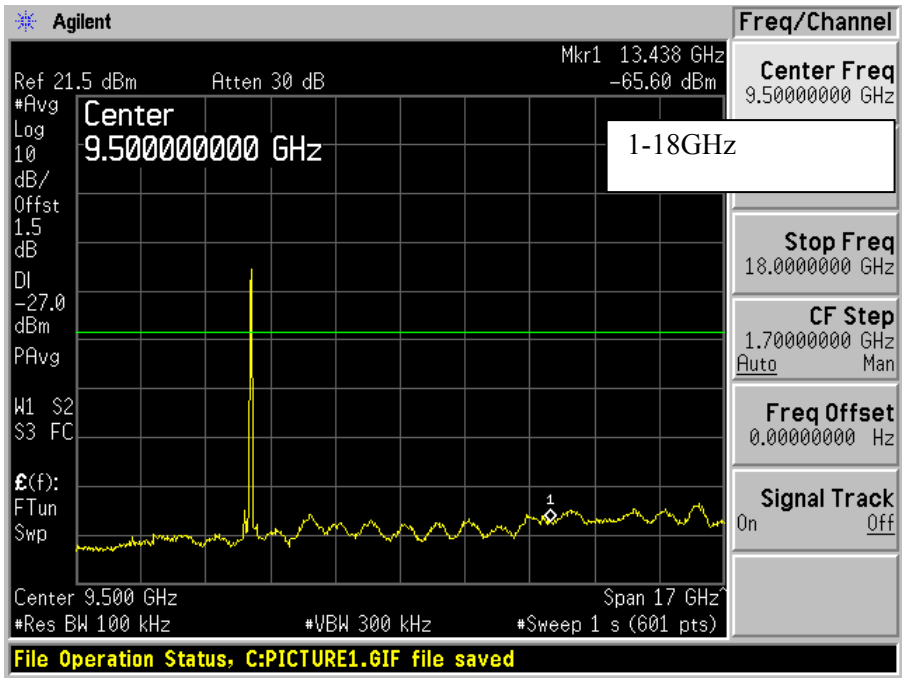


Middle Channel

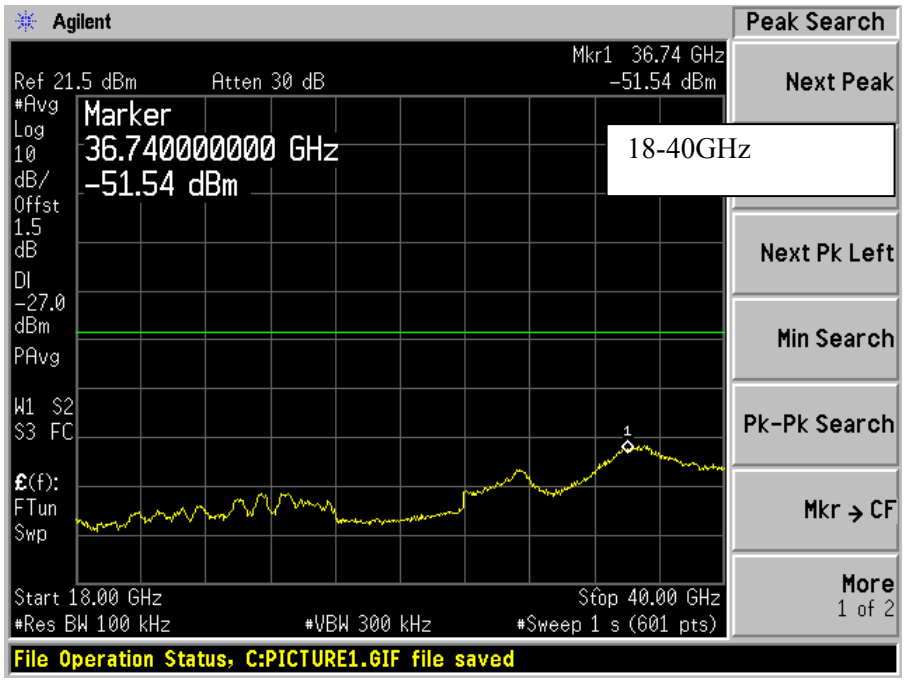
30MHz----1GHz



1GHz----18GHz

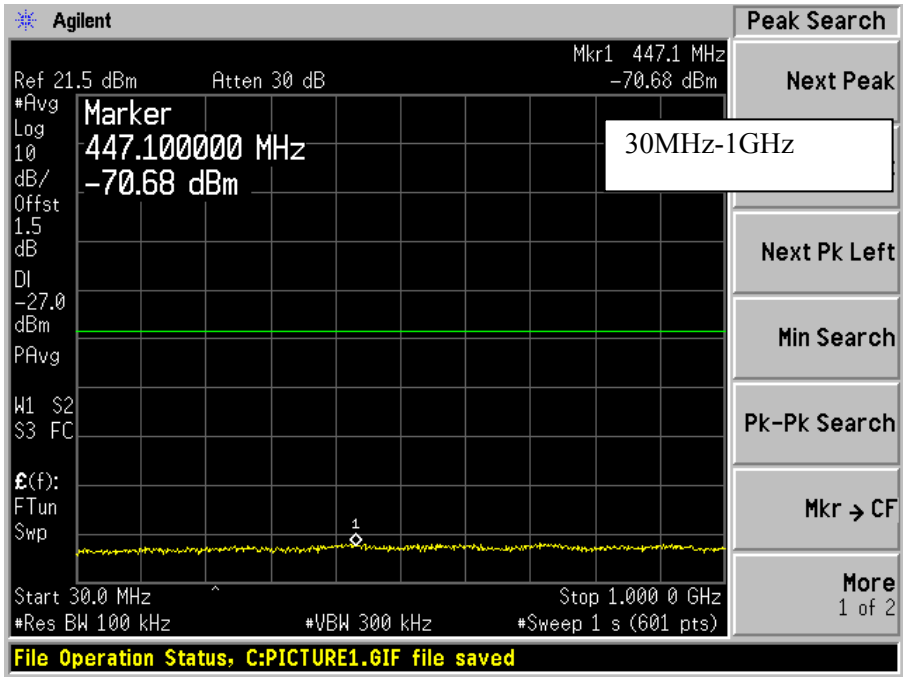


18GHz----40GHz

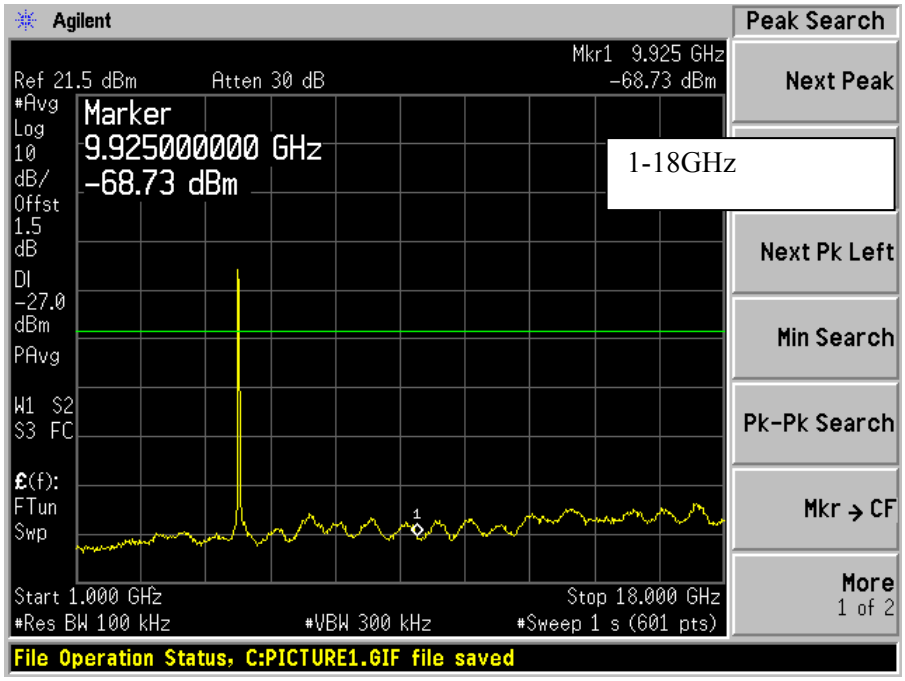


High Channel

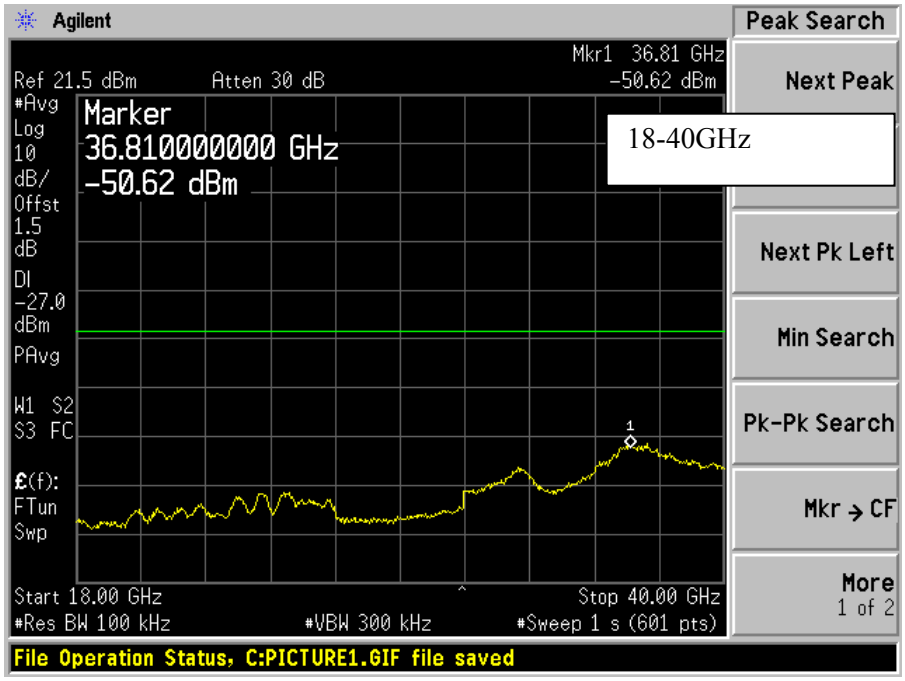
30MHz----1GHz



1GHz----18GHz



18GHz----40GHz

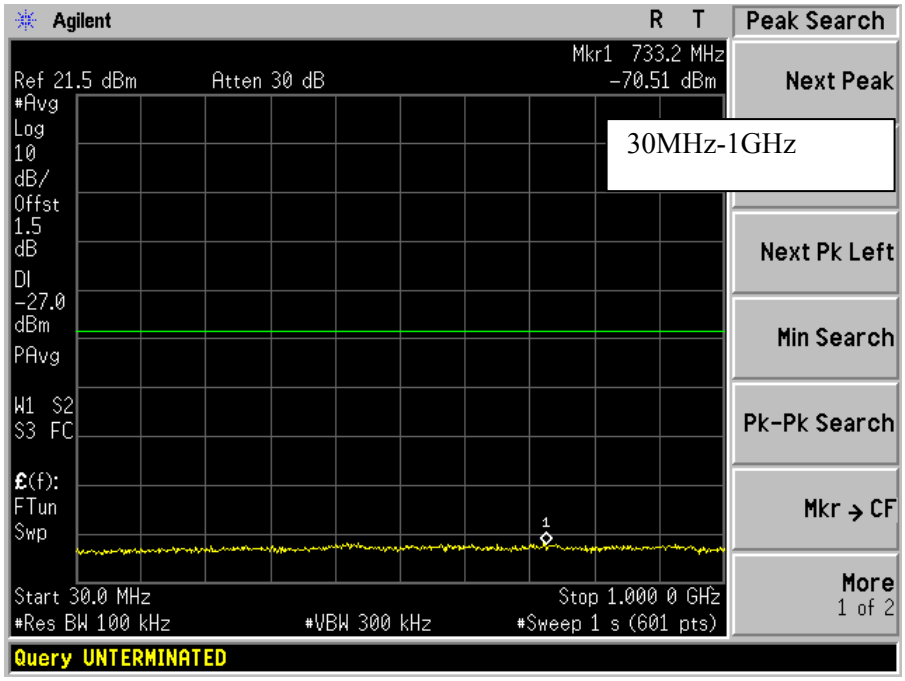


802.11 n mode 40MHz

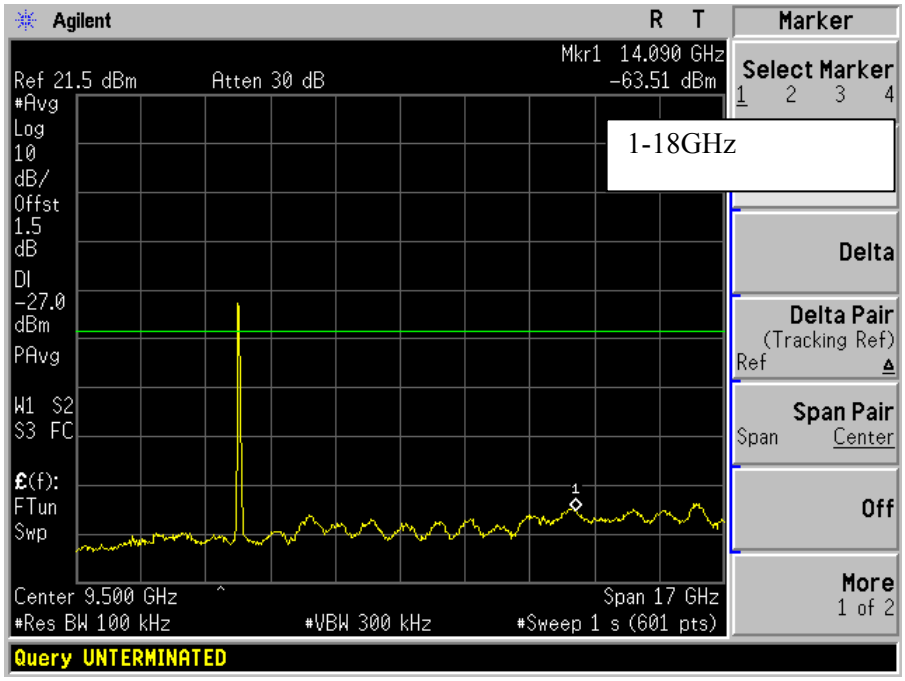
5250MHz-5350MHz

Low Channel

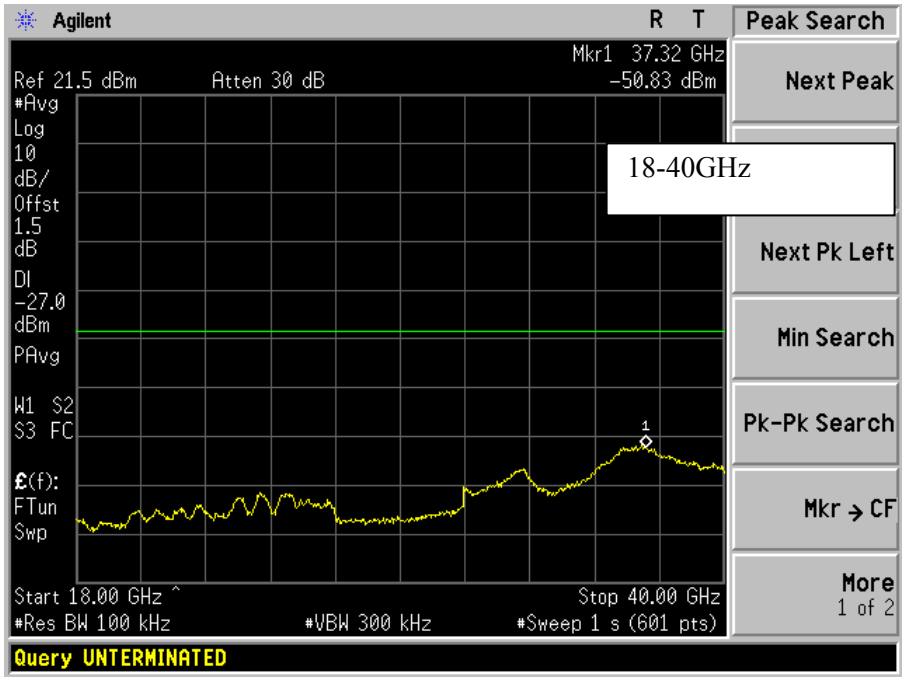
30MHz----1GHz



1GHz----18GHz

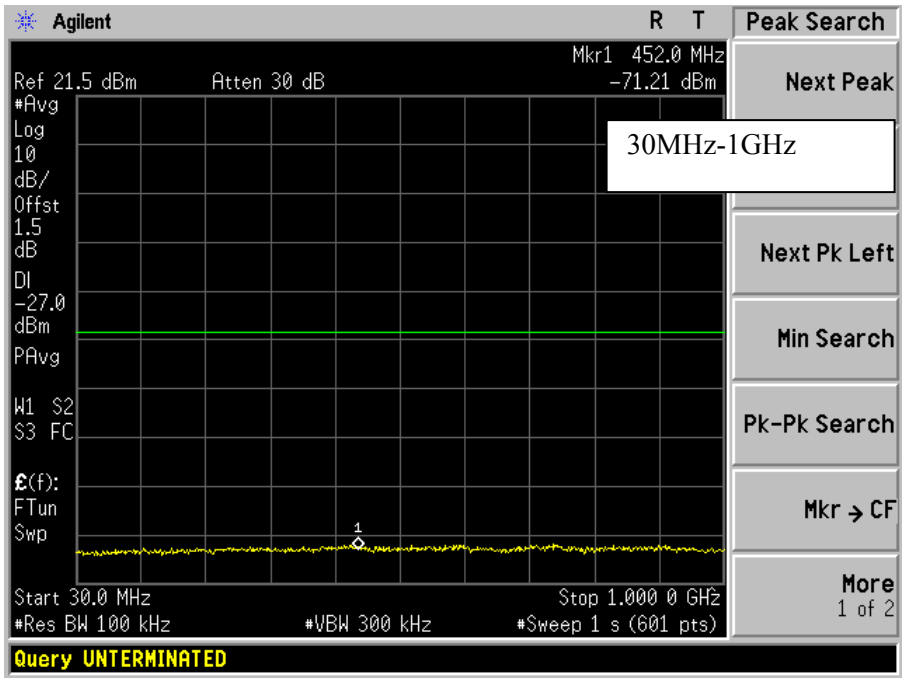


18GHz----40GHz

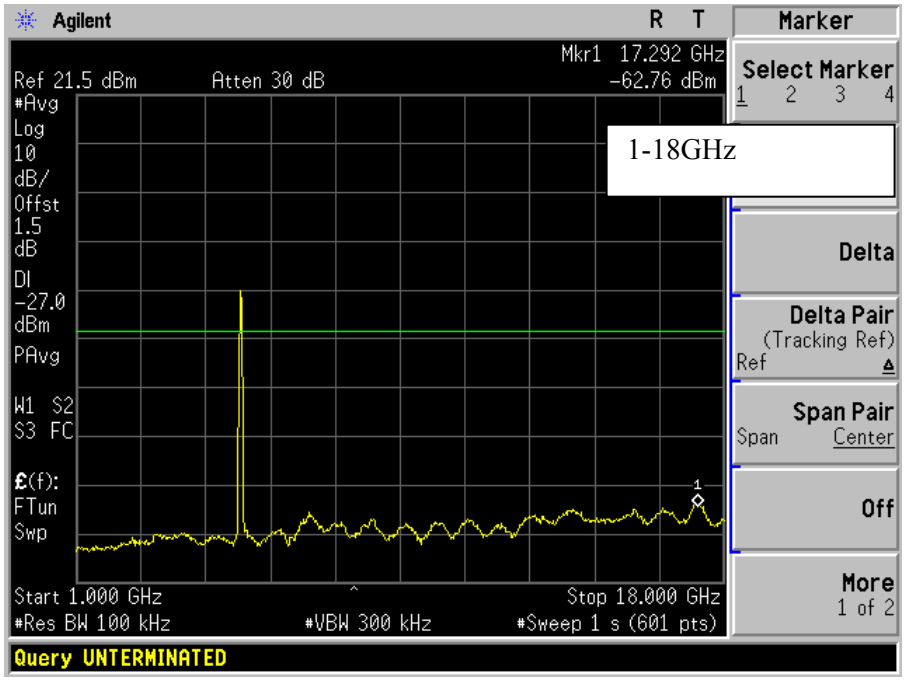


High Channel

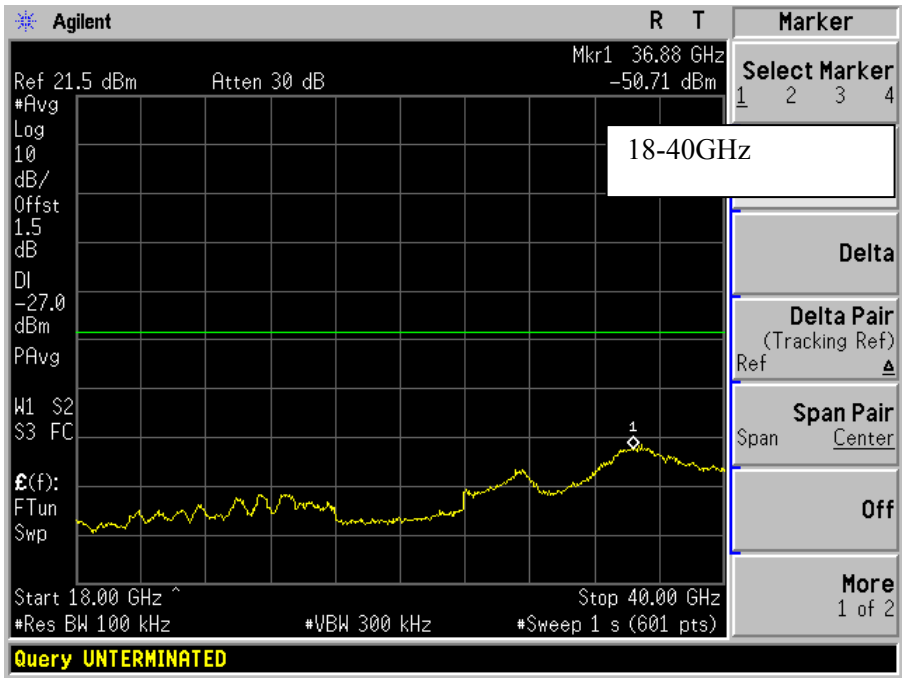
30MHz----1GHz



1GHz----18GHz



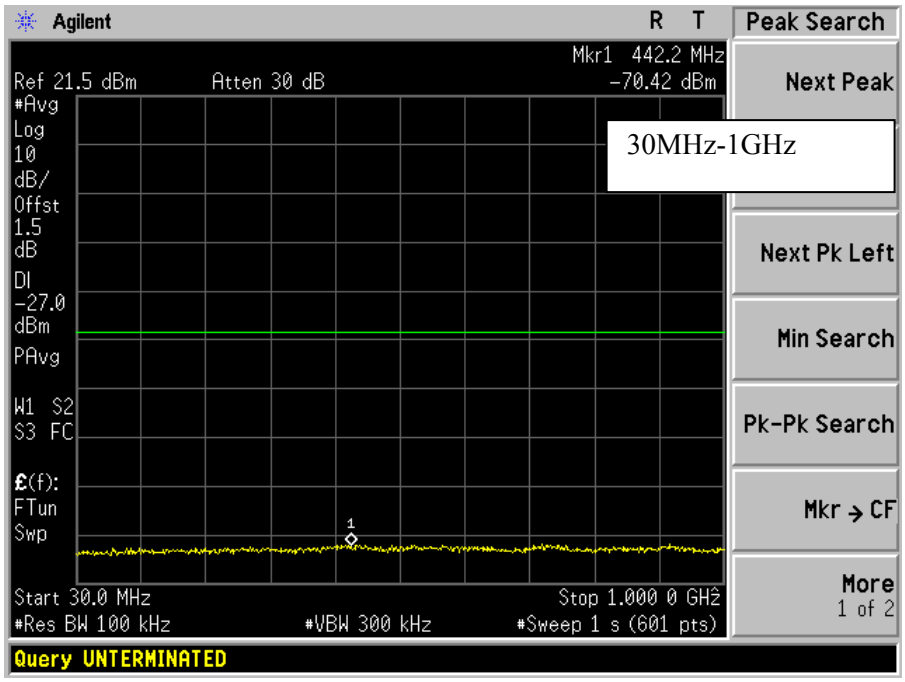
18GHz----40GHz



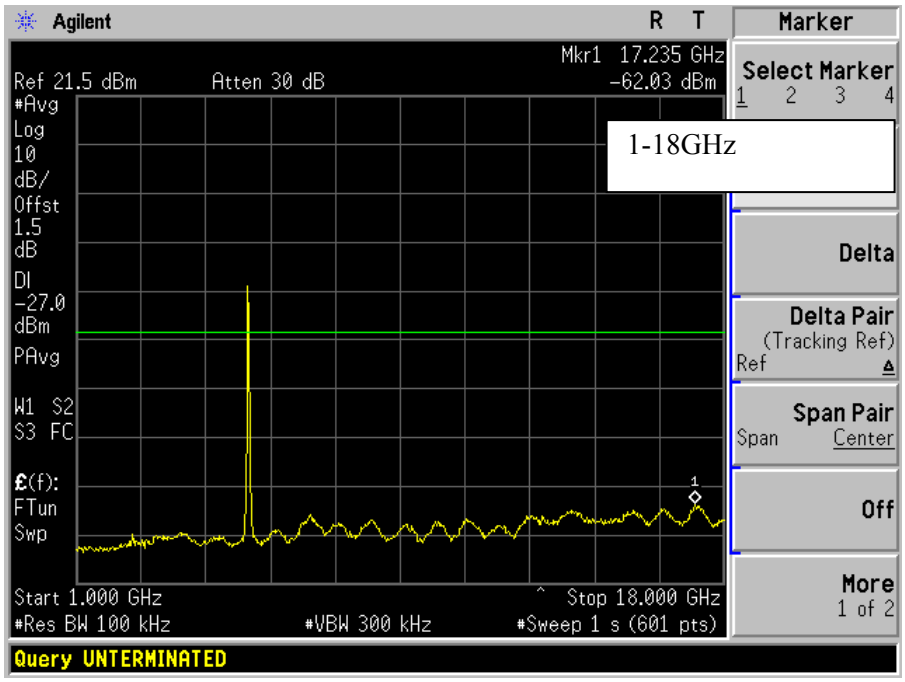
5470MHz-5725MHz

Low Channel

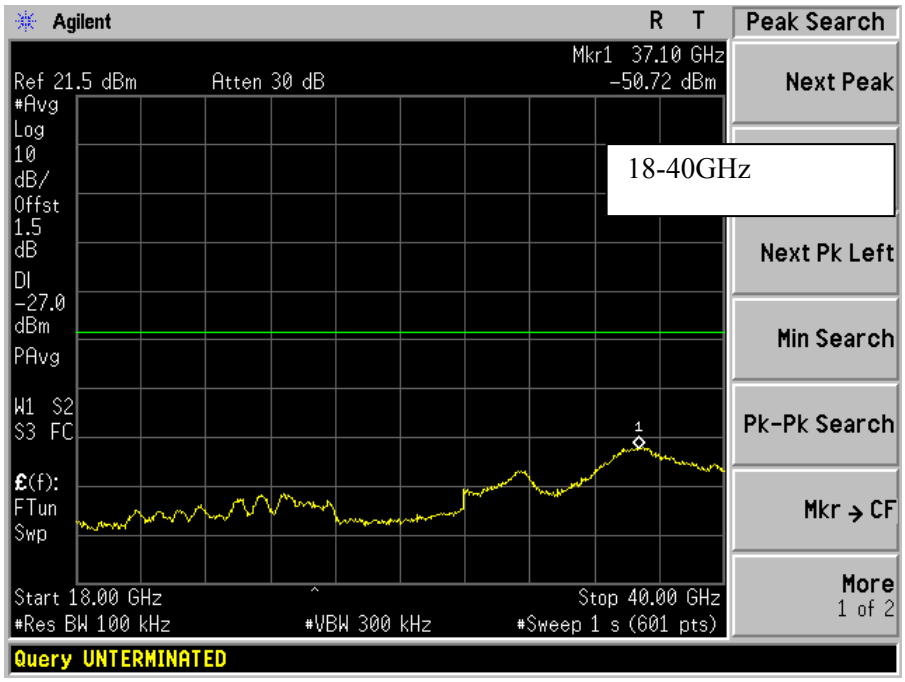
30MHz----1GHz



1GHz----18GHz

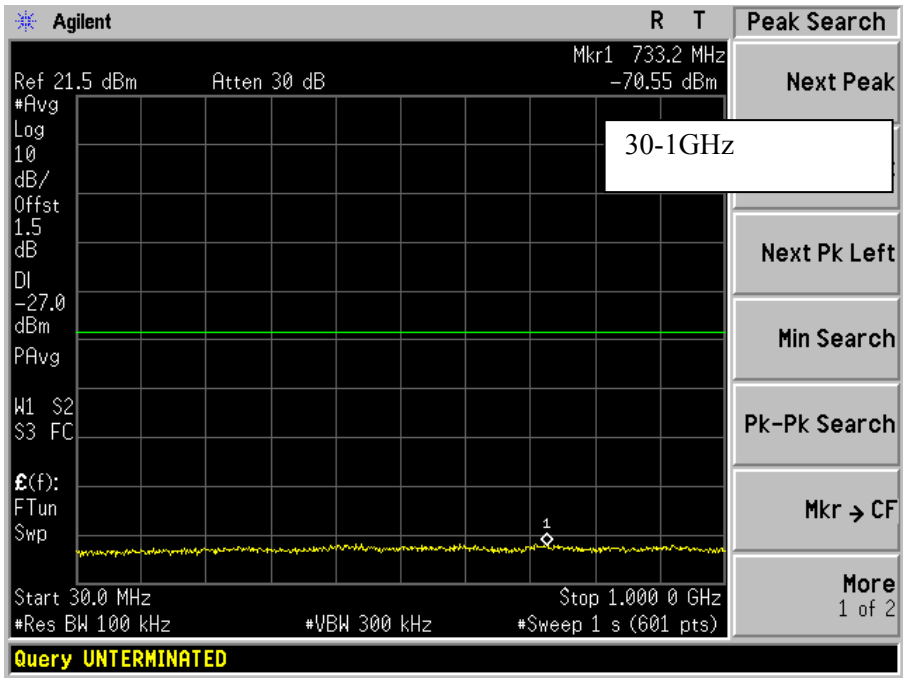


18GHz----40GHz

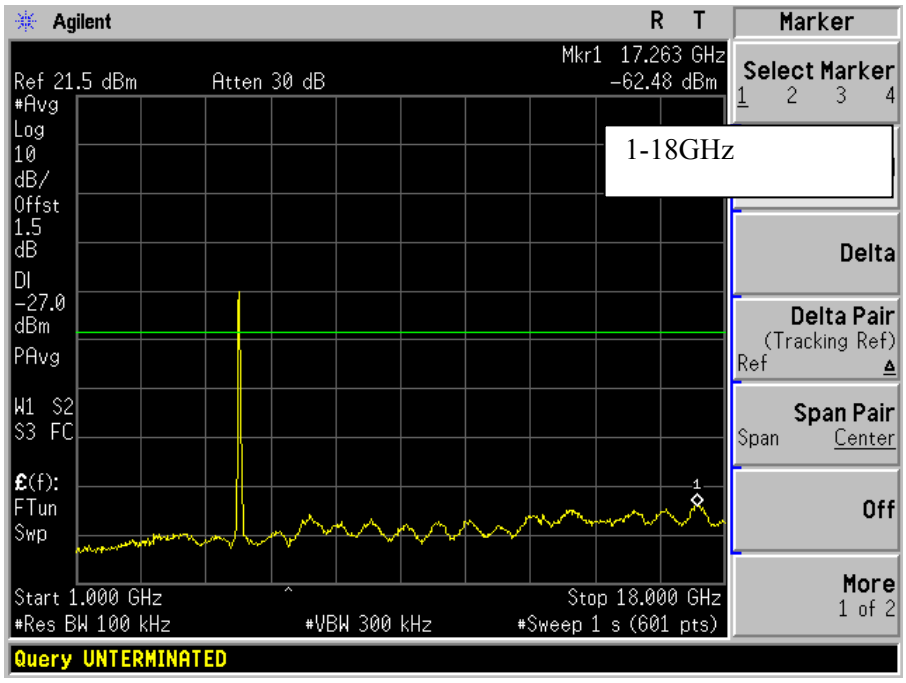


Middle Channel

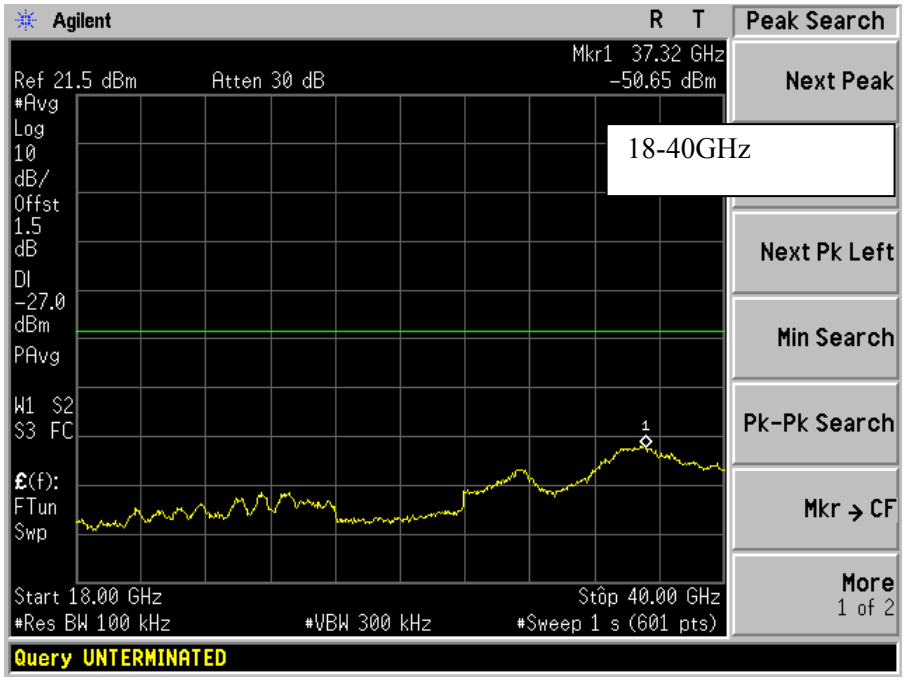
30MHz----1GHz



1GHz----18GHz

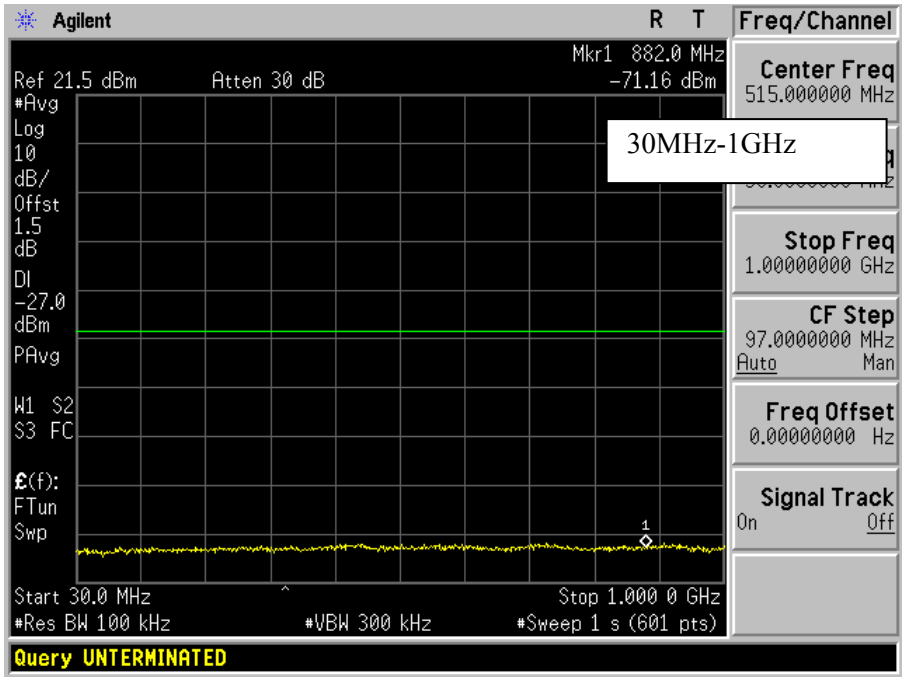


18GHz----40GHz

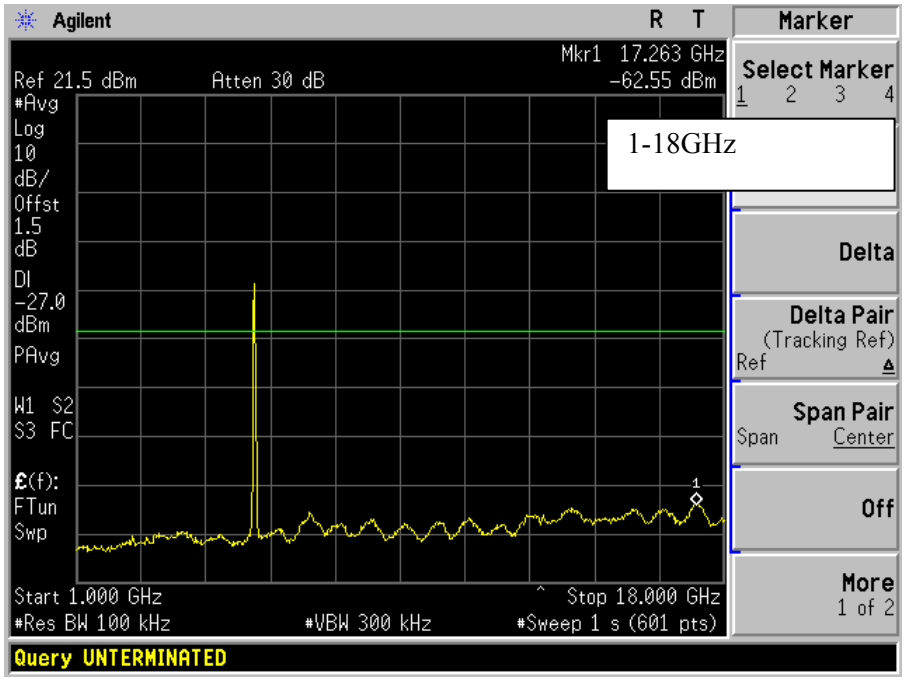


High Channel

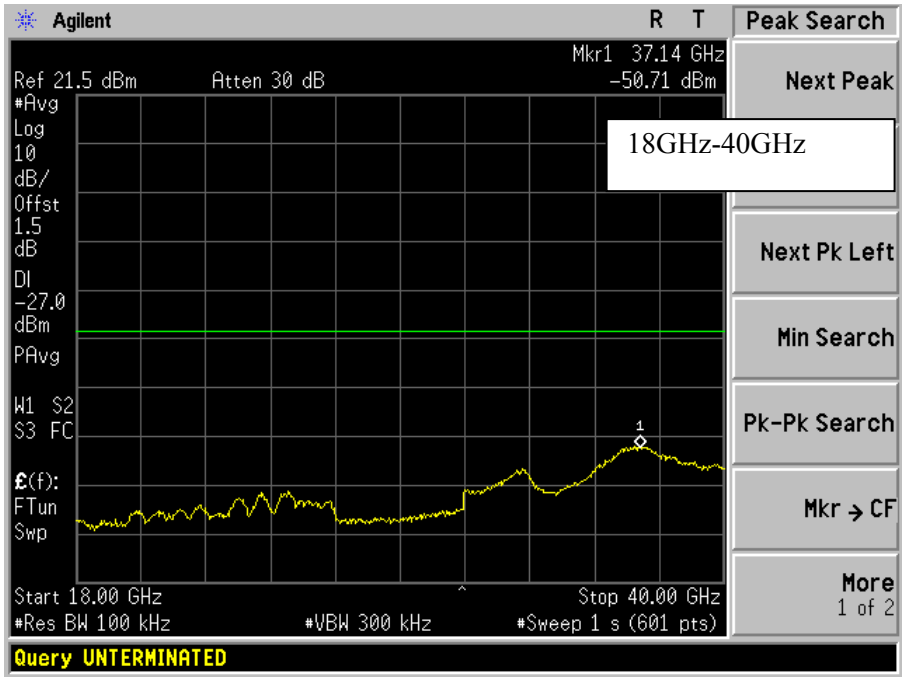
30MHz----1GHz



1GHz----18GHz



18GHz----40GHz


Agilent
R T
Peak Search
Mkr1 37.14 GHz
Ref 21.5 dBm
Atten 30 dB
-50.71 dBm
Next Peak
#Avg
Log
10
dB/
Offst
1.5
dB
18GHz-40GHz
Next Pk Left
Dl
-27.0
dBm
Min Search
PAvg
W1 S2
S3 FC
Pk-Pk Search
£(f):
FTun
Swp
Mkr → CF
More
1 of 2
Start 18.00 GHz
Stop 40.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 1 s (601 pts)
Query UNTERMINATED

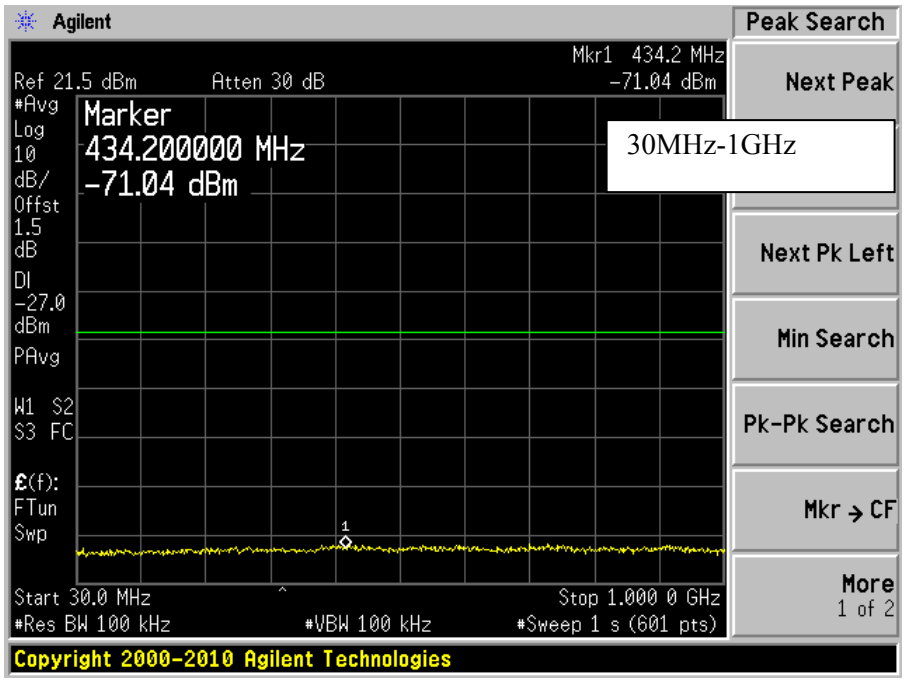
TX Chain 2

802.11 a mode 20MHz

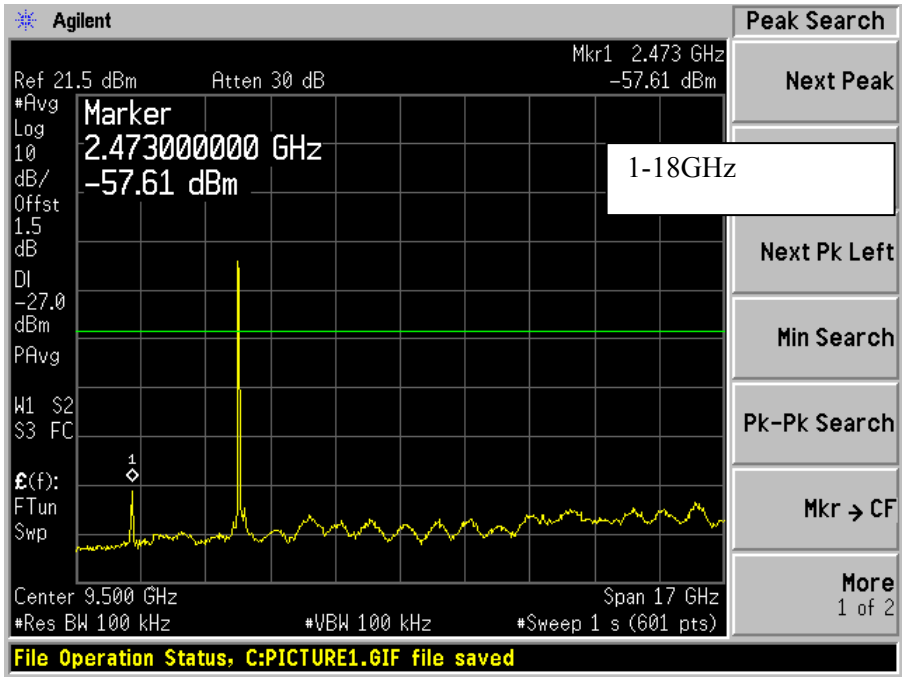
5250MHz-5350MHz

Low Channel

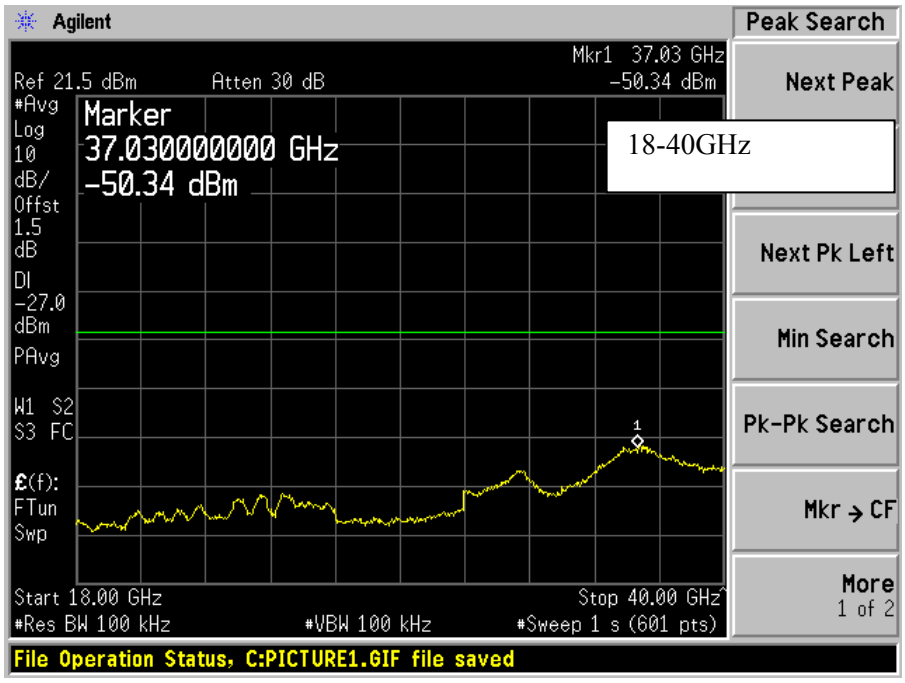
30MHz----1GHz



1GHz----18GHz

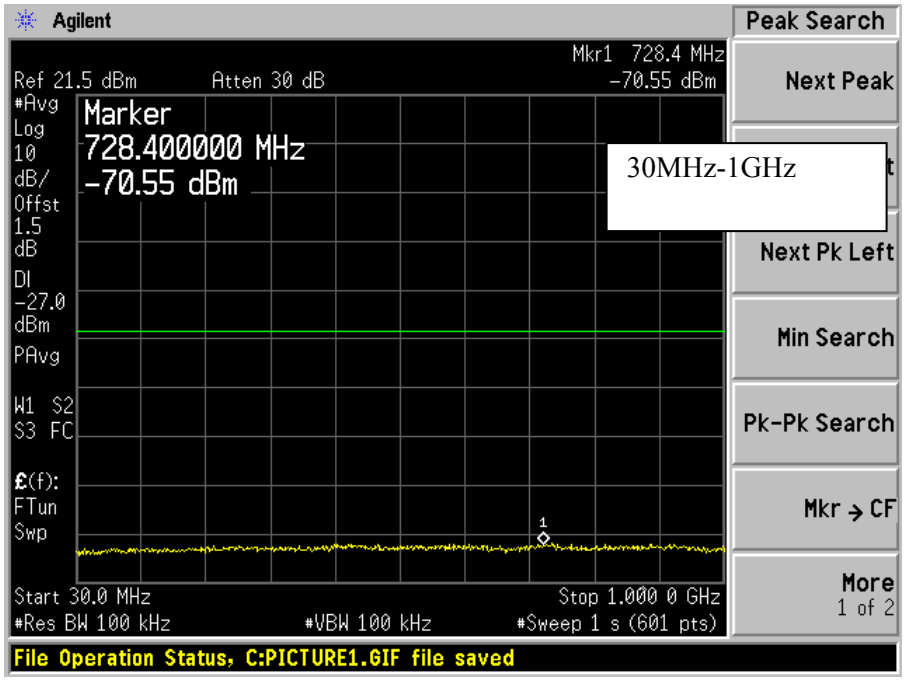


18GHz----40GHz

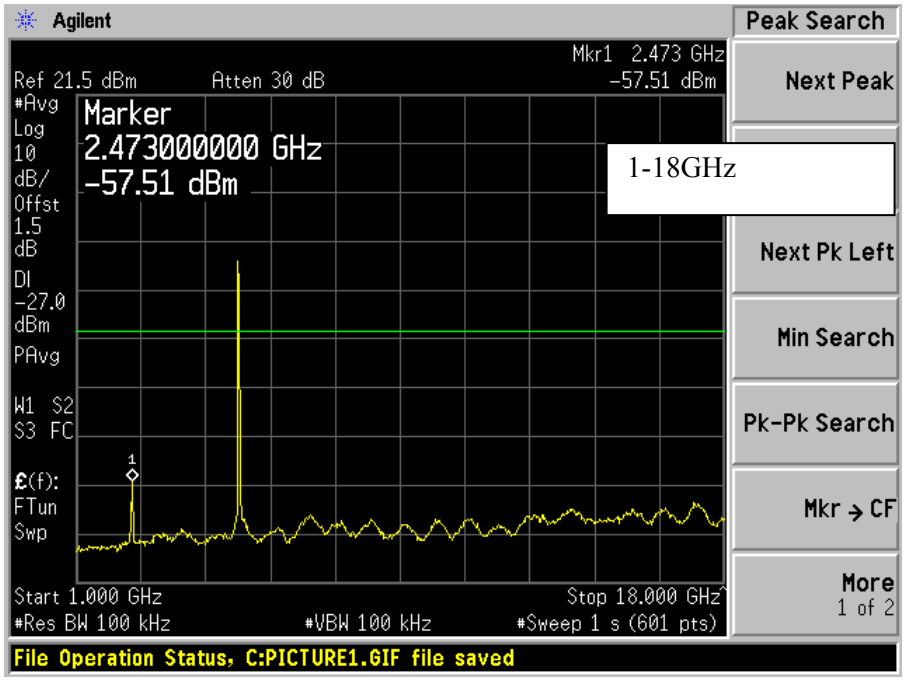


Middle Channel

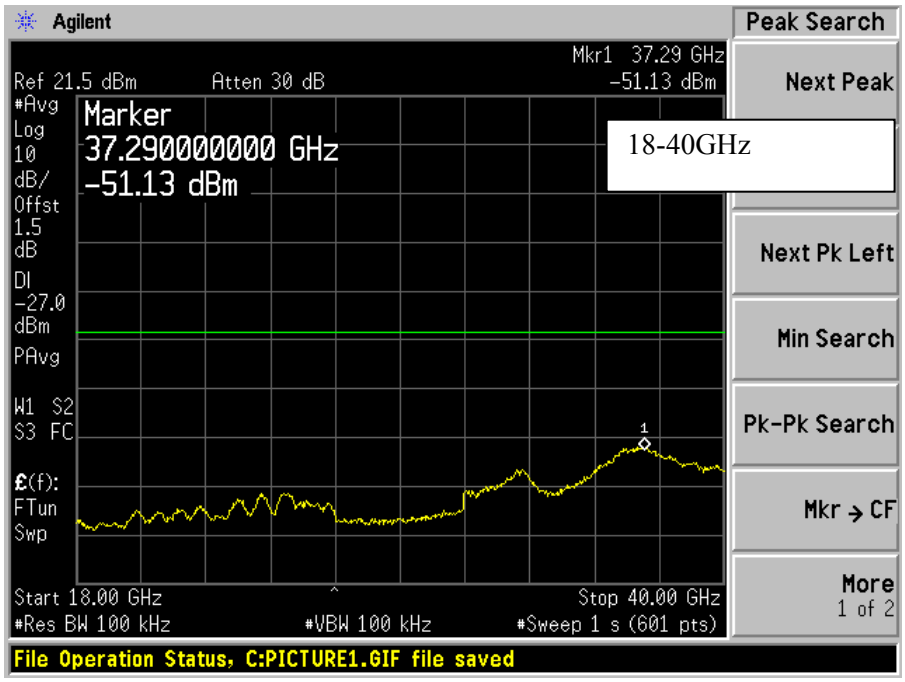
30MHz----1GHz



1GHz----18GHz

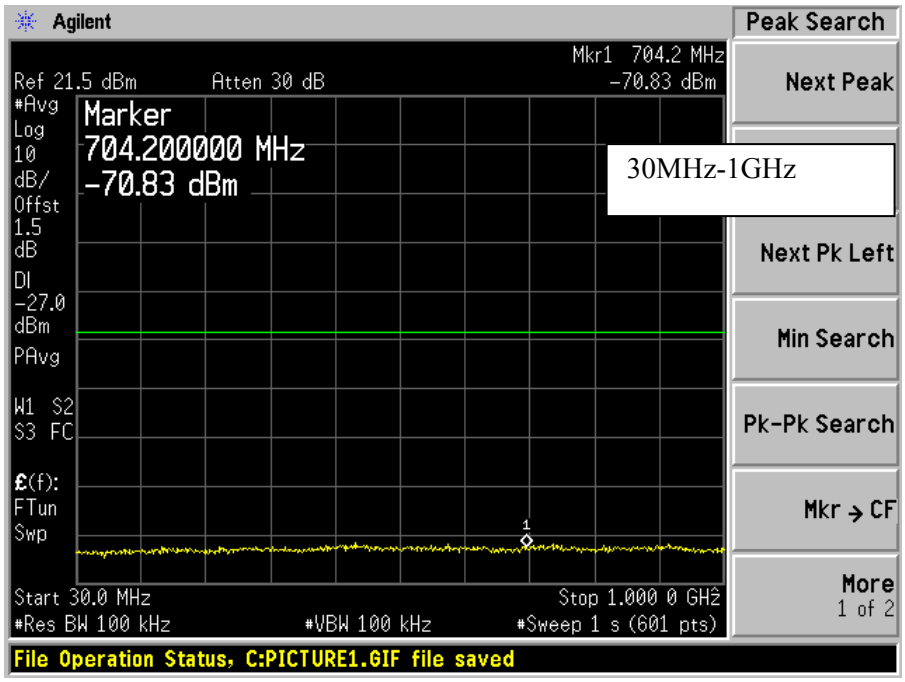


18GHz----40GHz

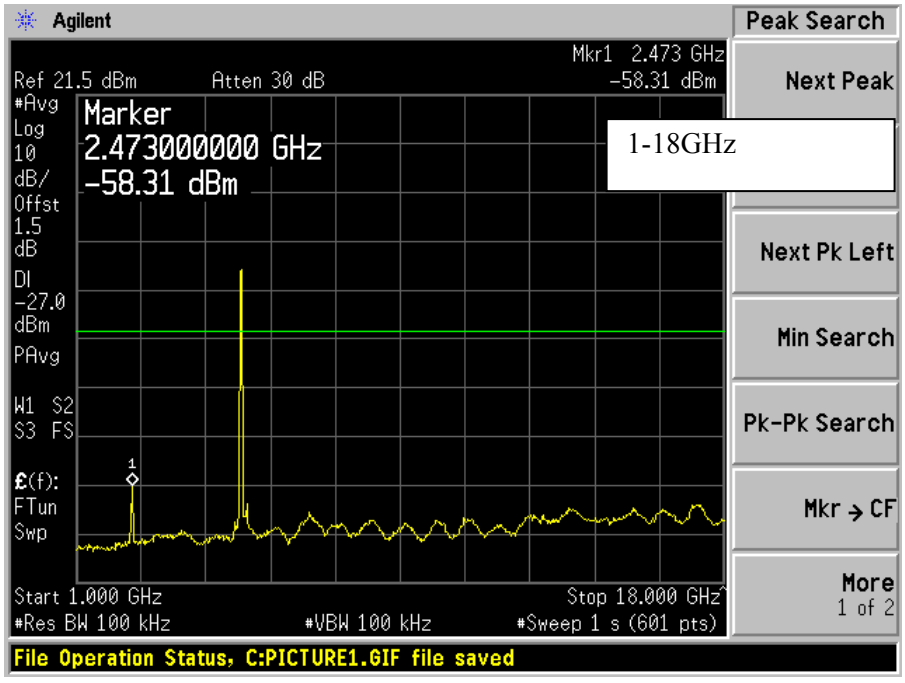


High Channel

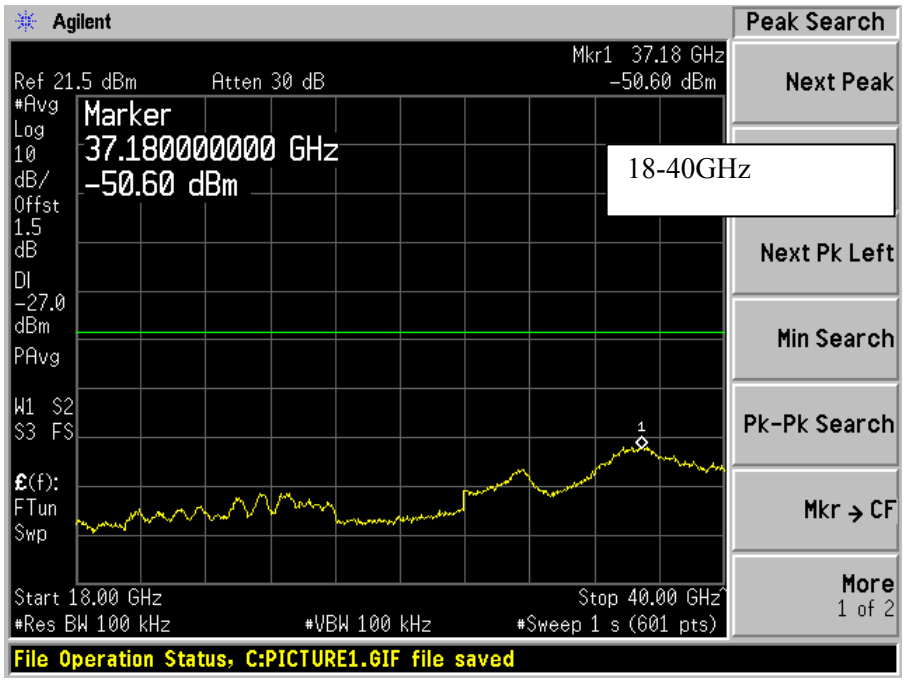
30MHz----1GHz



1GHz----18GHz



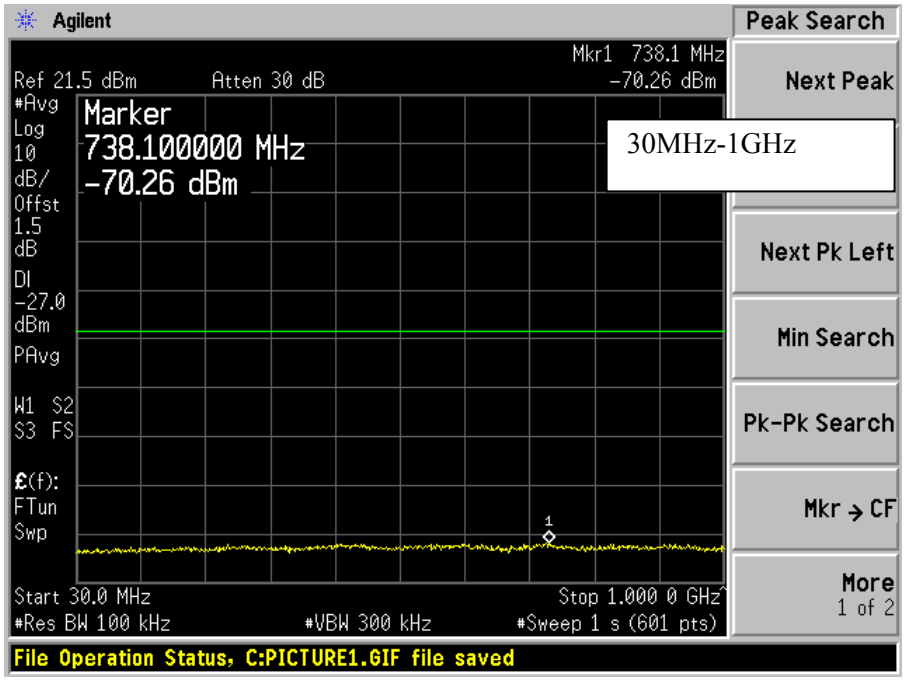
18GHz----40GHz



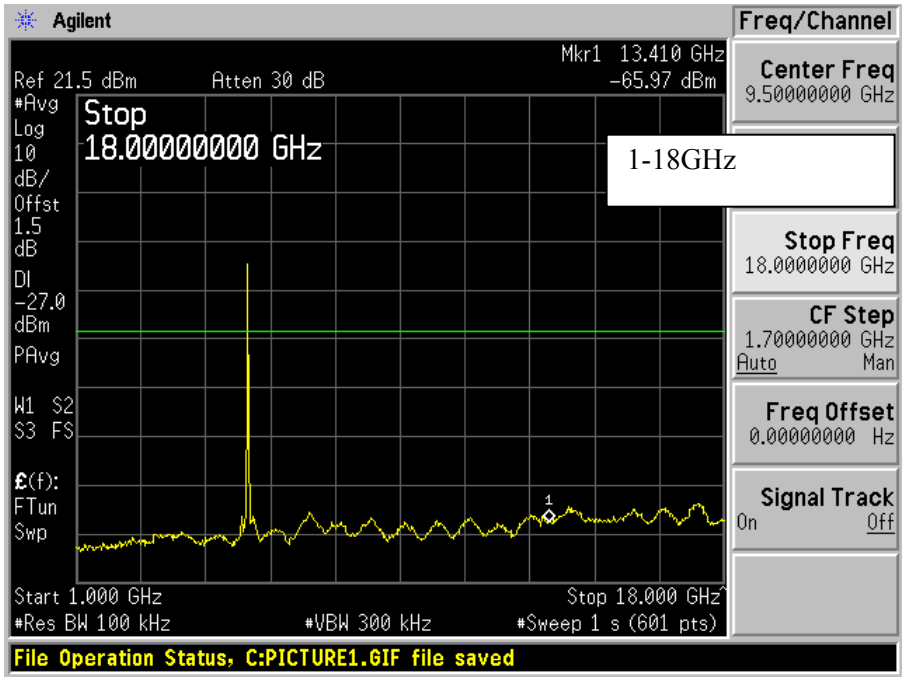
5470MHz-5725MHz

Low Channel

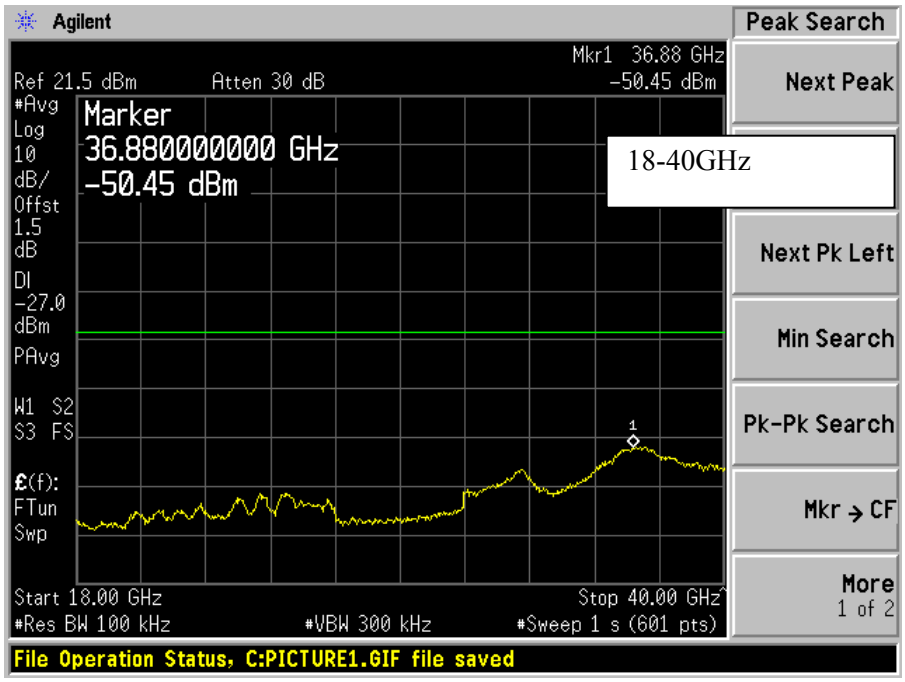
30MHz----1GHz



1GHz----18GHz

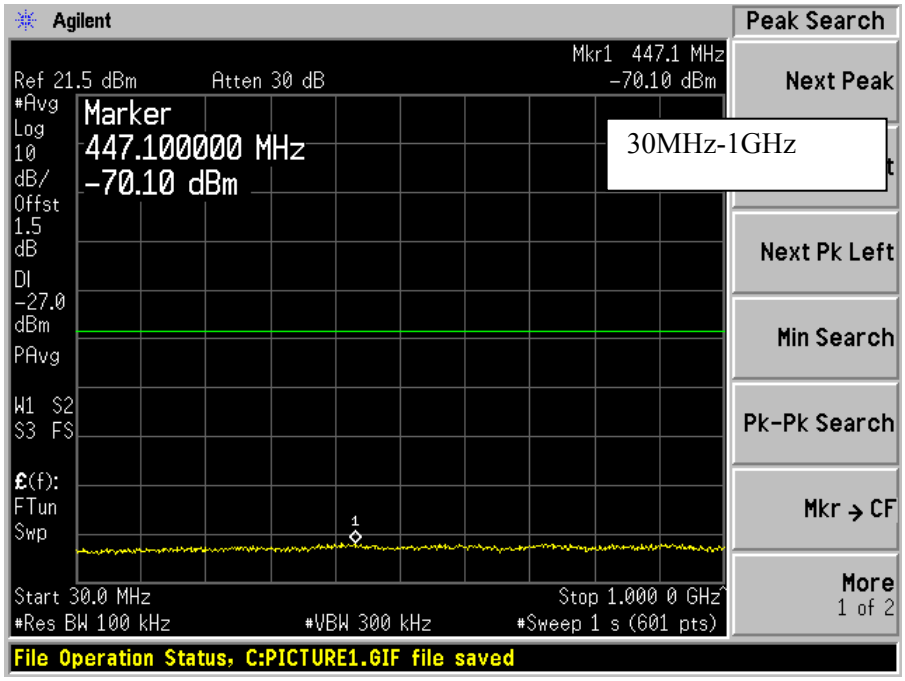


18GHz----40GHz

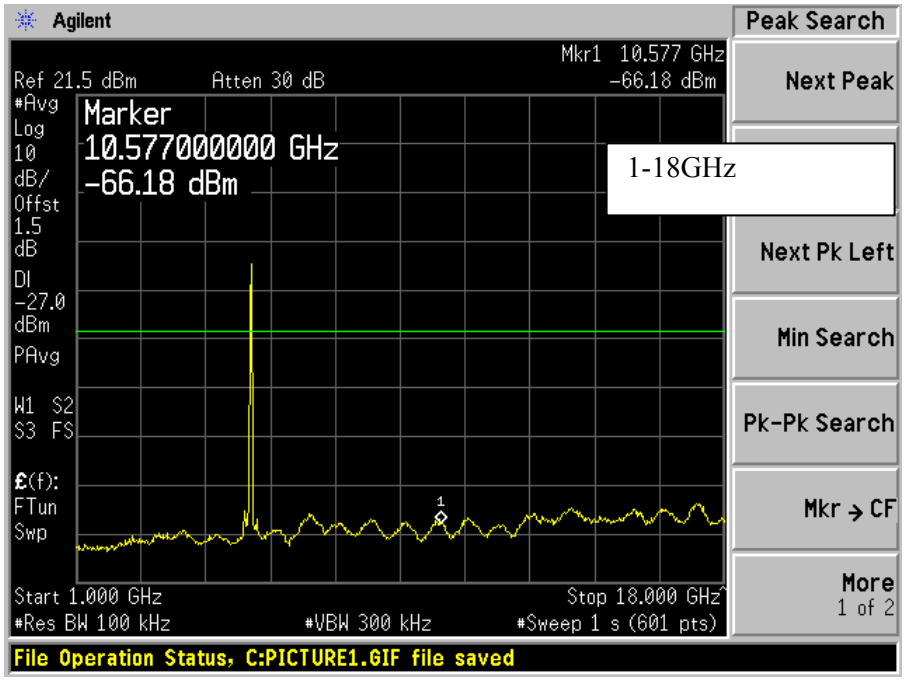


Middle Channel

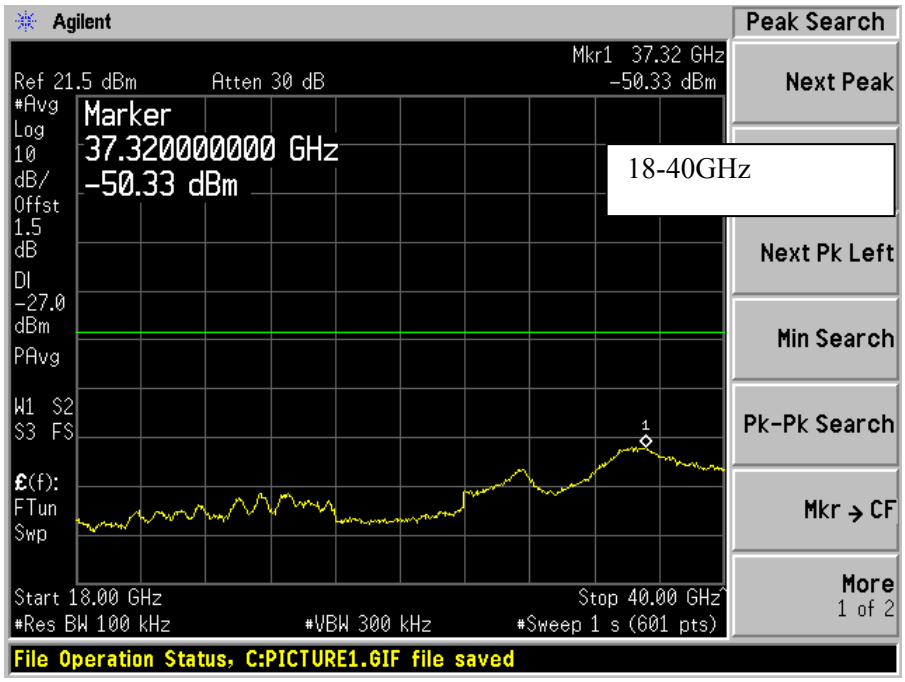
30MHz----1GHz



1GHz----18GHz

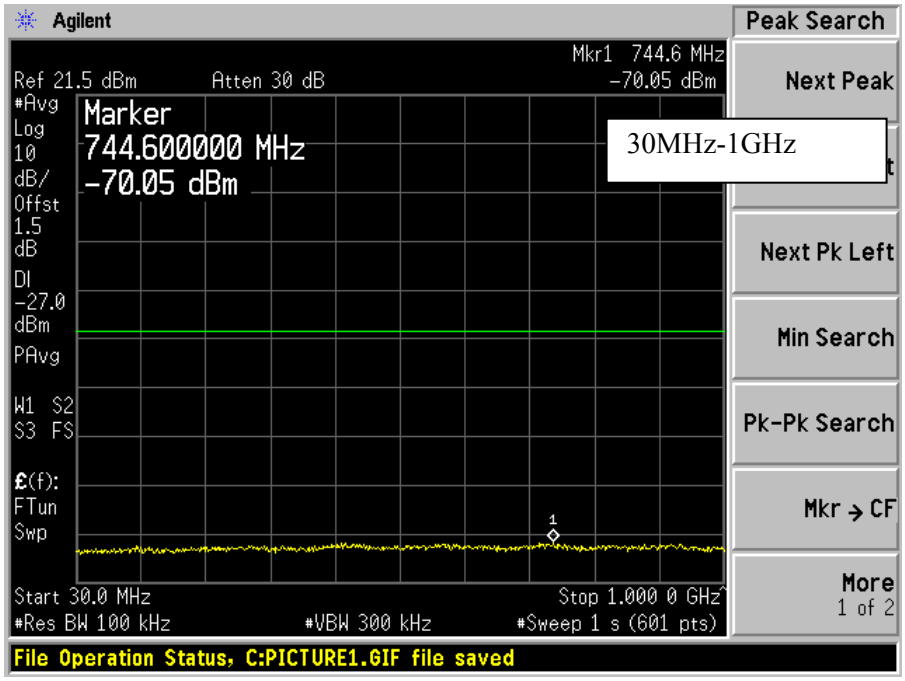


18GHz----40GHz

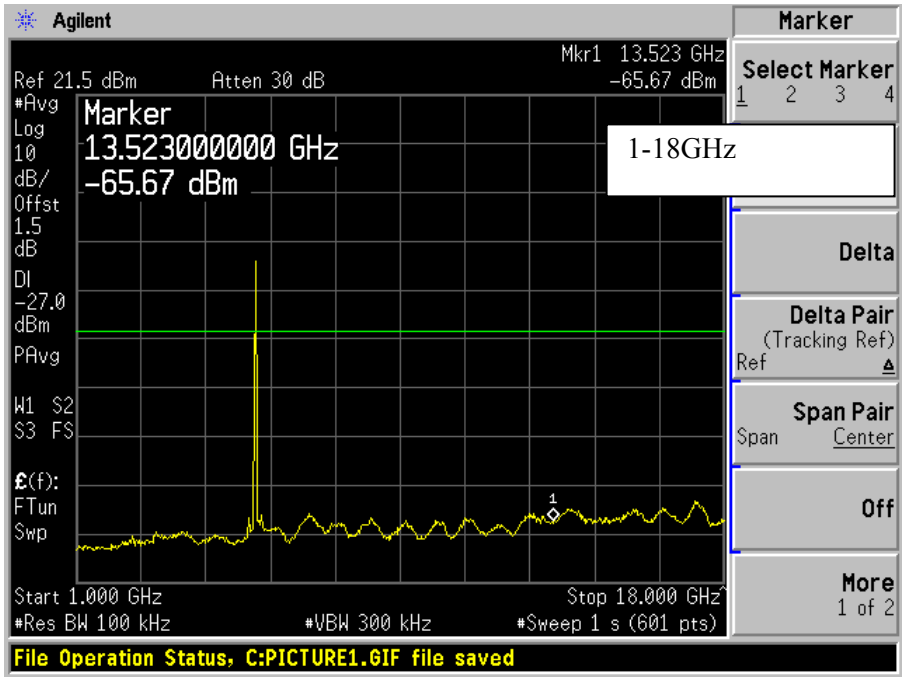


High Channel

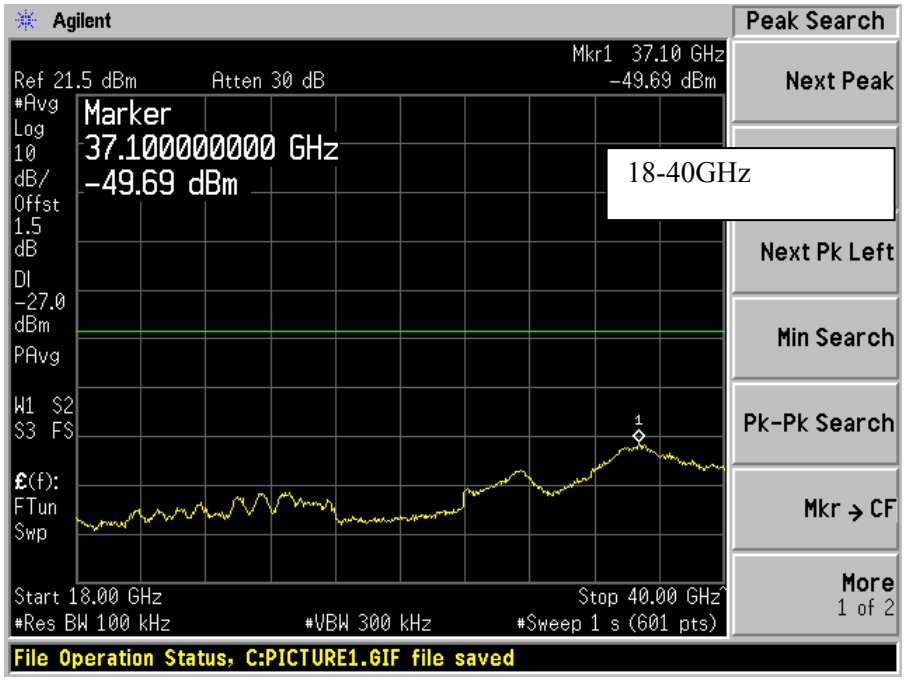
30MHz----1GHz



1GHz----18GHz



18GHz----40GHz

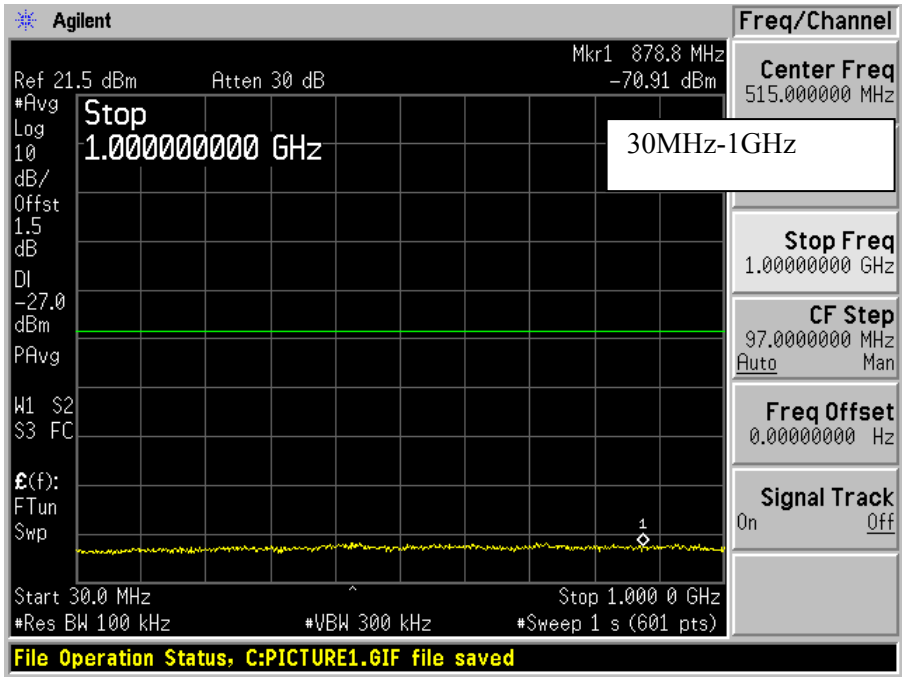


802.11 n mode 20MHz

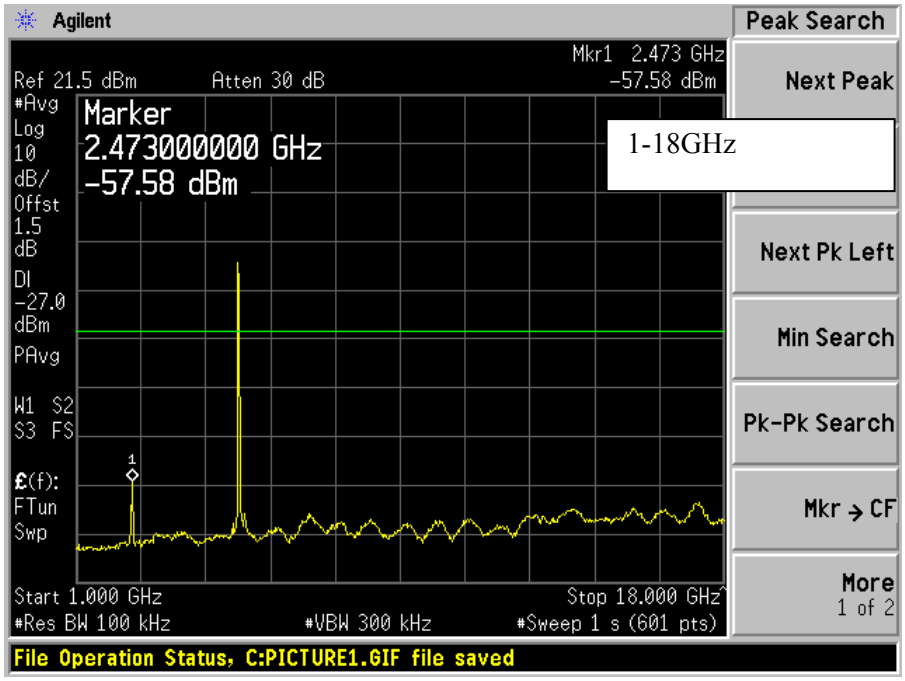
5250MHz-5350MHz

Low Channel

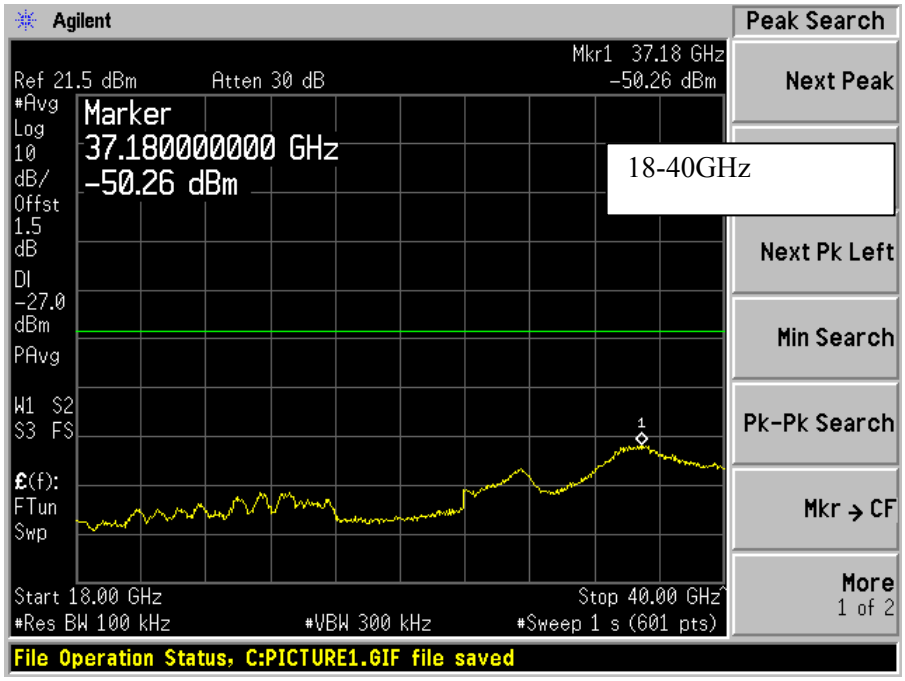
30MHz----1GHz



1GHz----18GHz

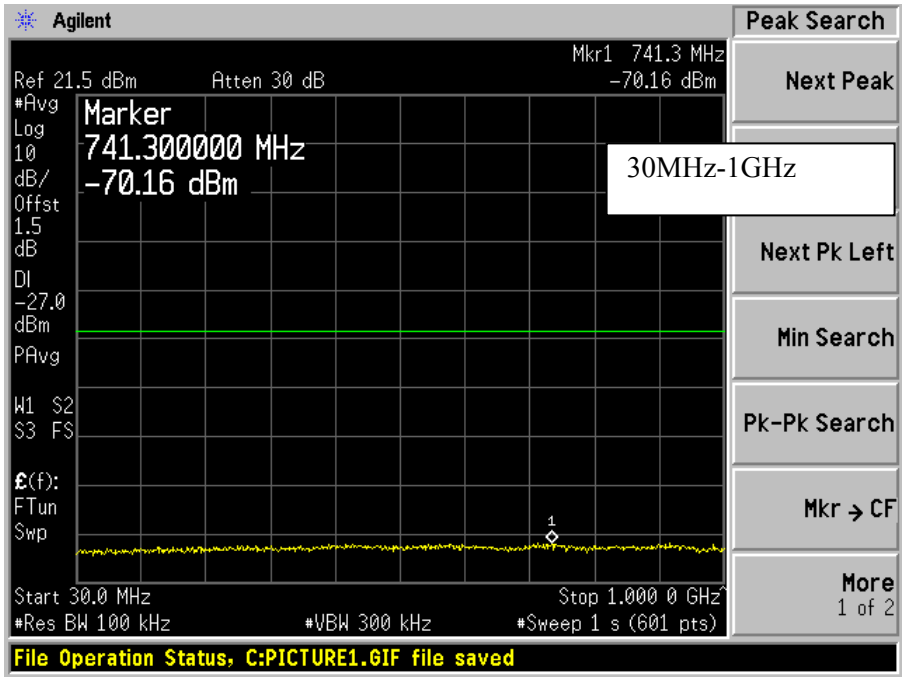


18GHz----40GHz

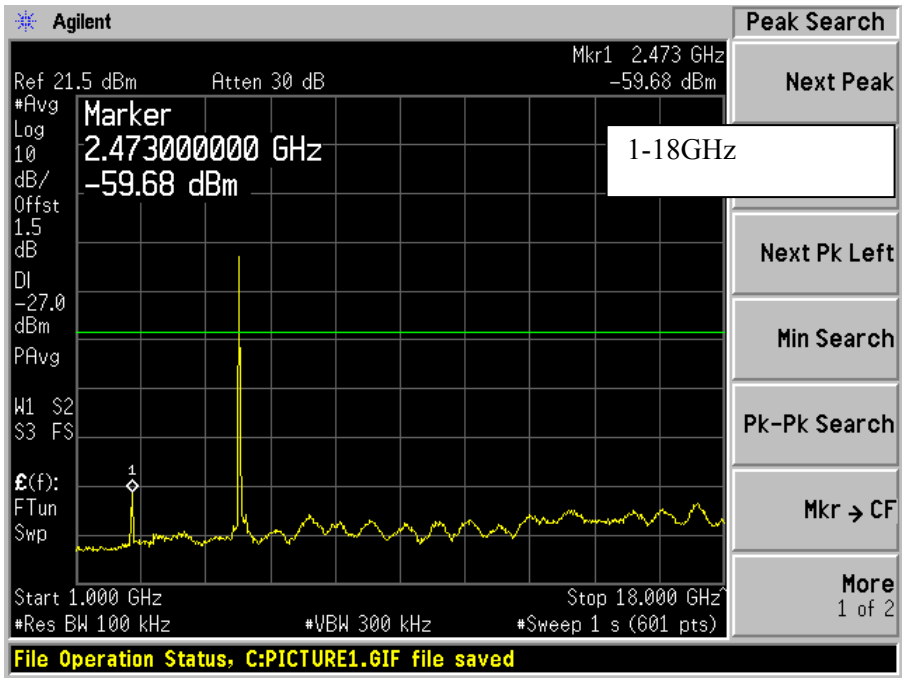


Middle Channel

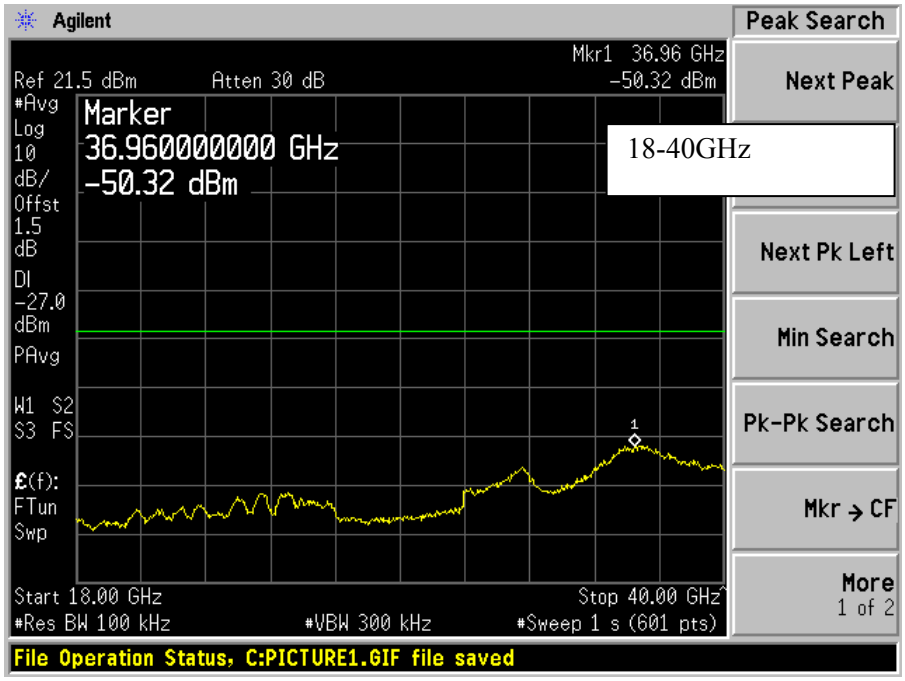
30MHz----1GHz



1GHz----18GHz

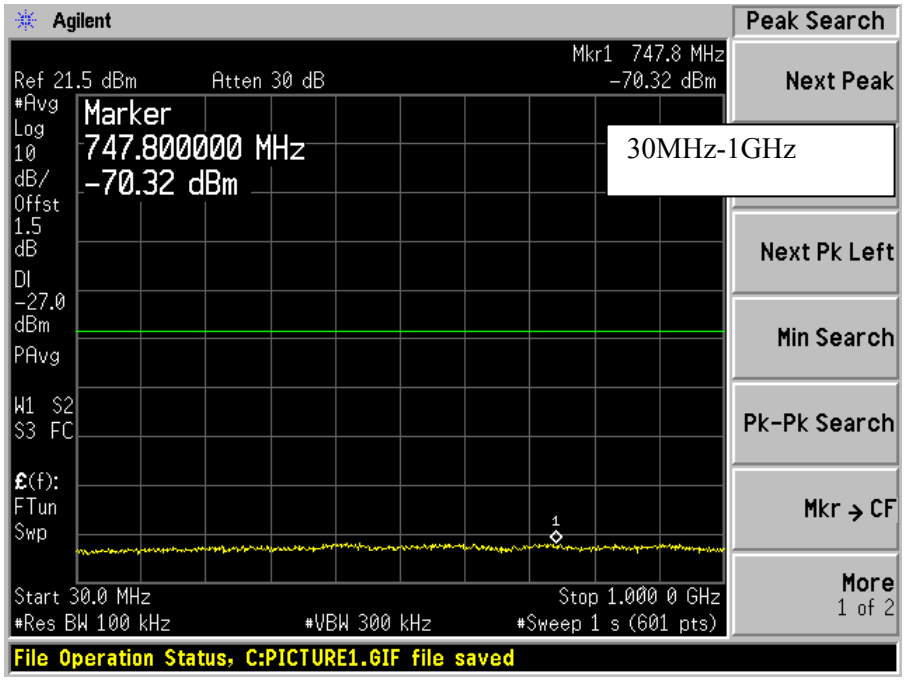


18GHz----40GHz

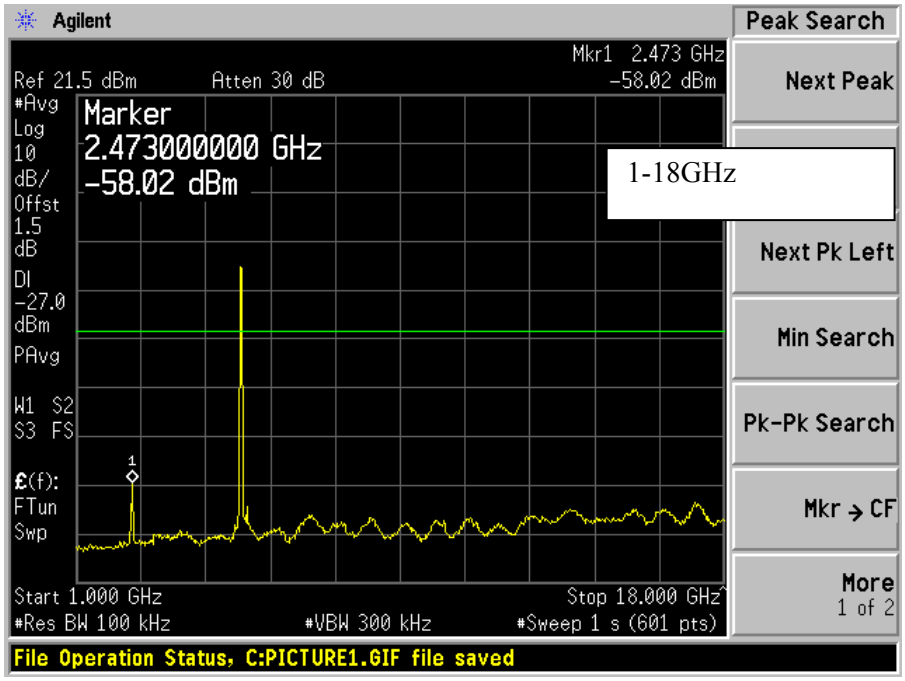


High Channel

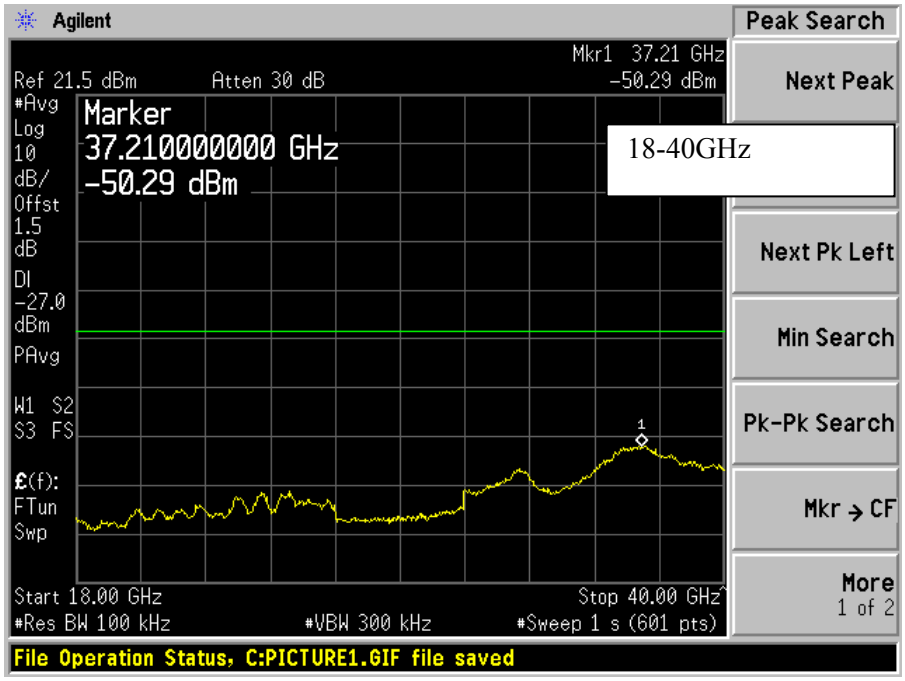
30MHz----1GHz



1GHz----18GHz



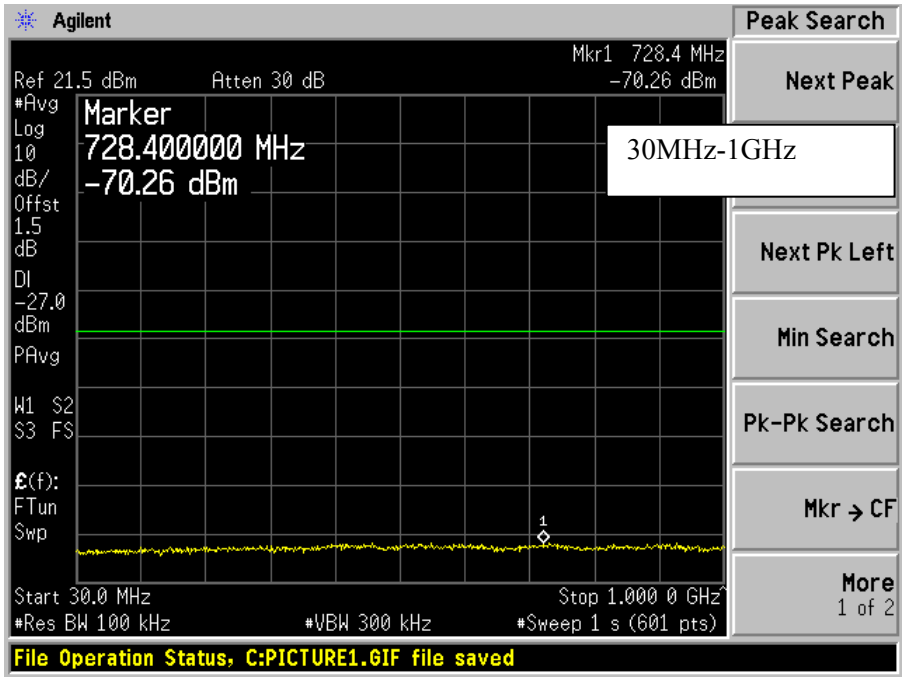
18GHz----40GHz



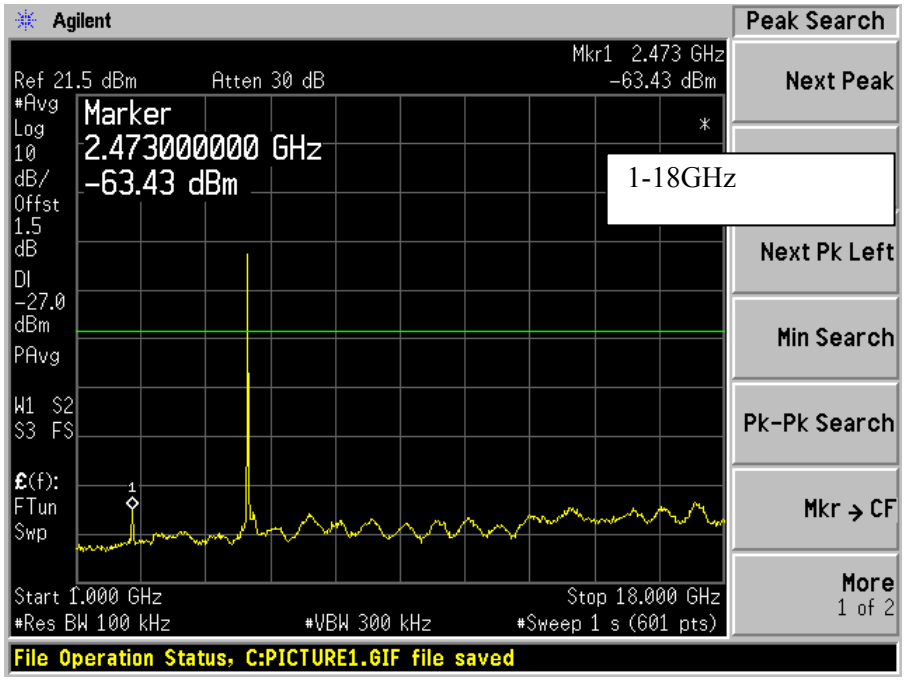
5470MHz-5725MHz

Low Channel

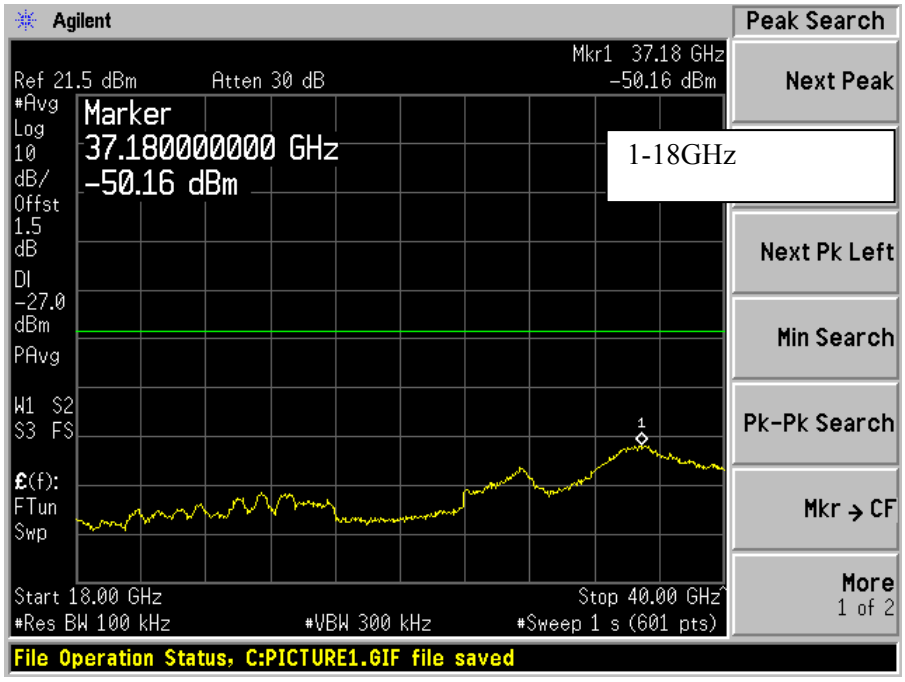
30MHz----1GHz



1GHz----18GHz

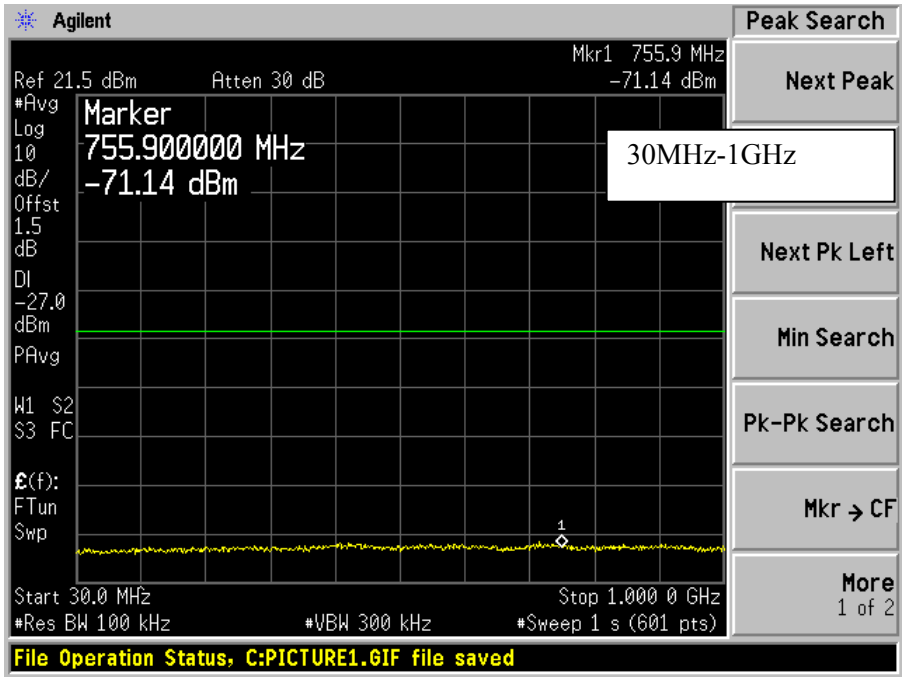


18GHz----40GHz

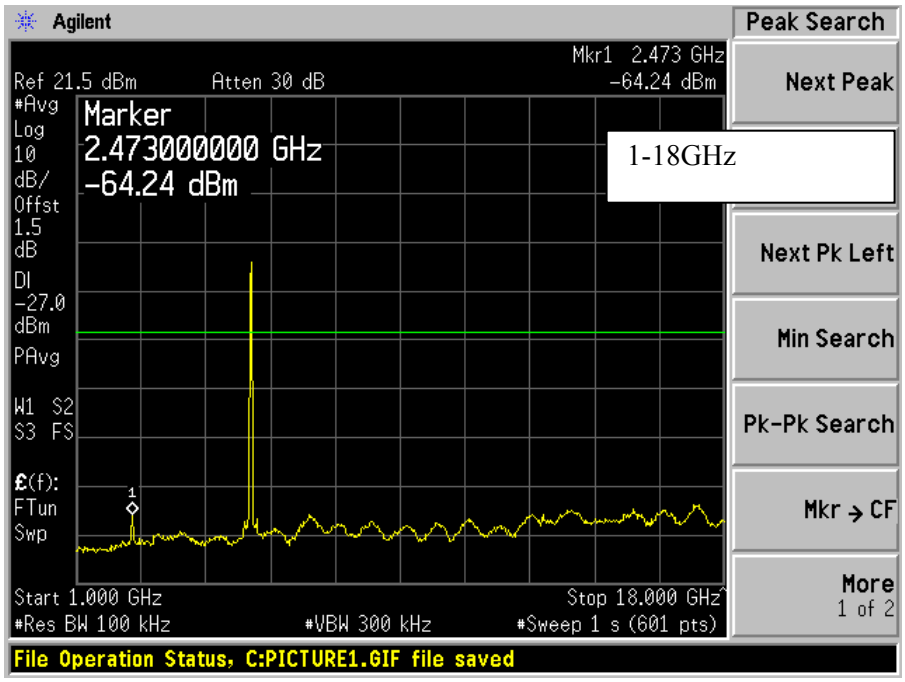


Middle Channel

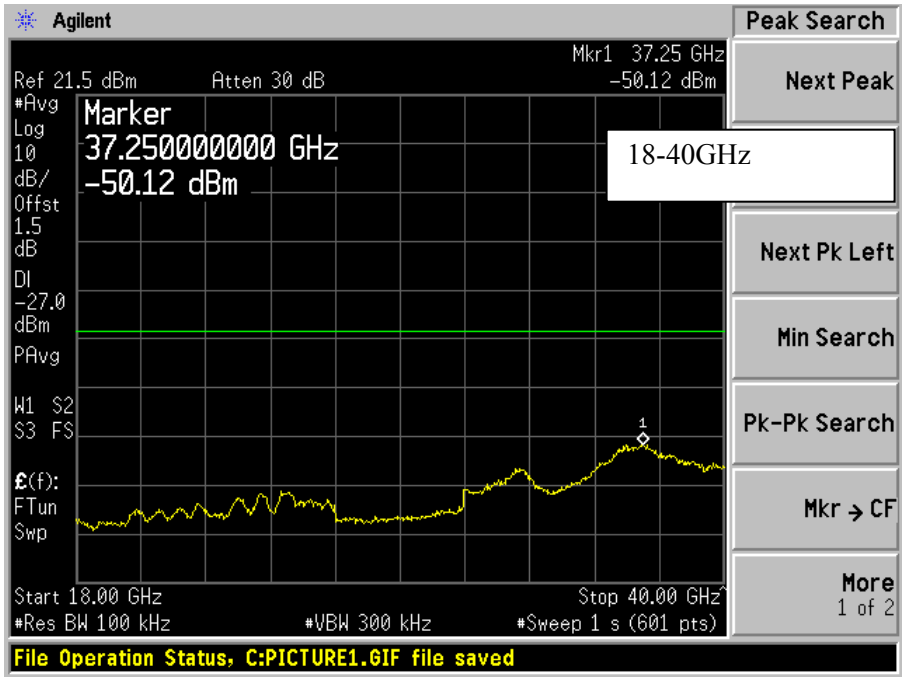
30MHz----1GHz



1GHz----18GHz

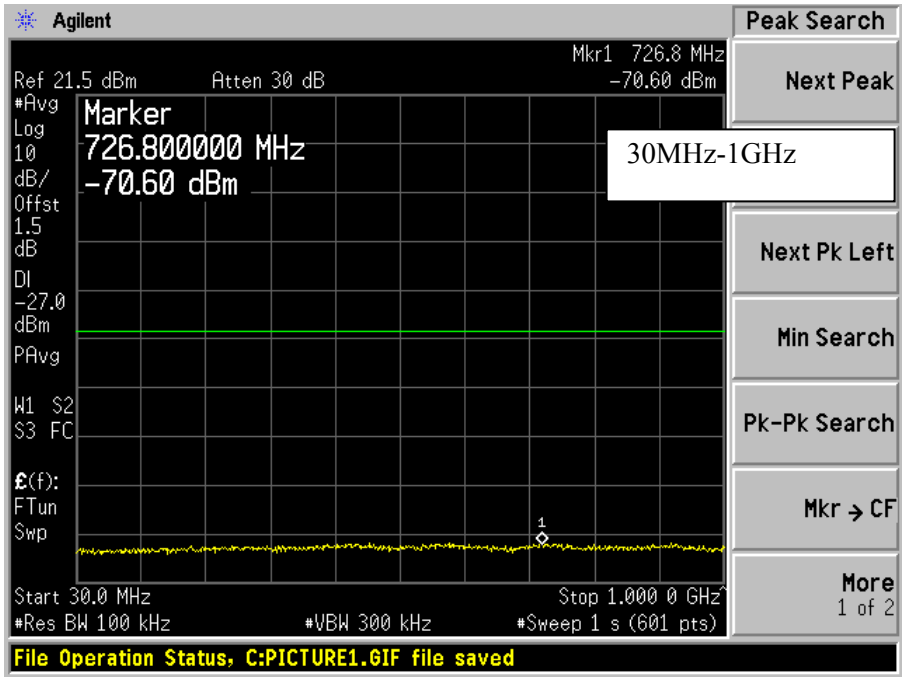


18GHz----40GHz

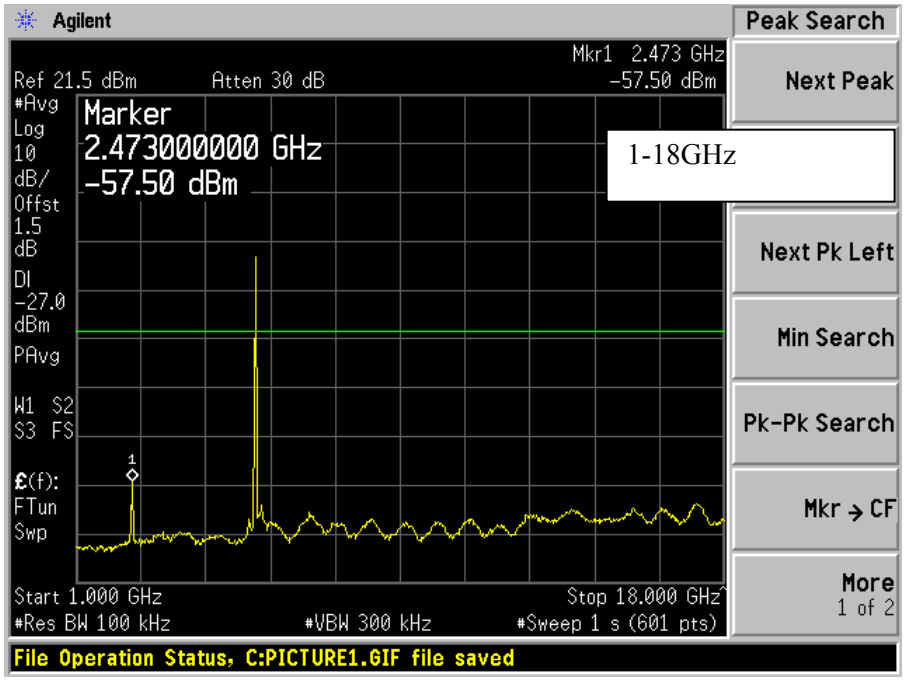


High Channel

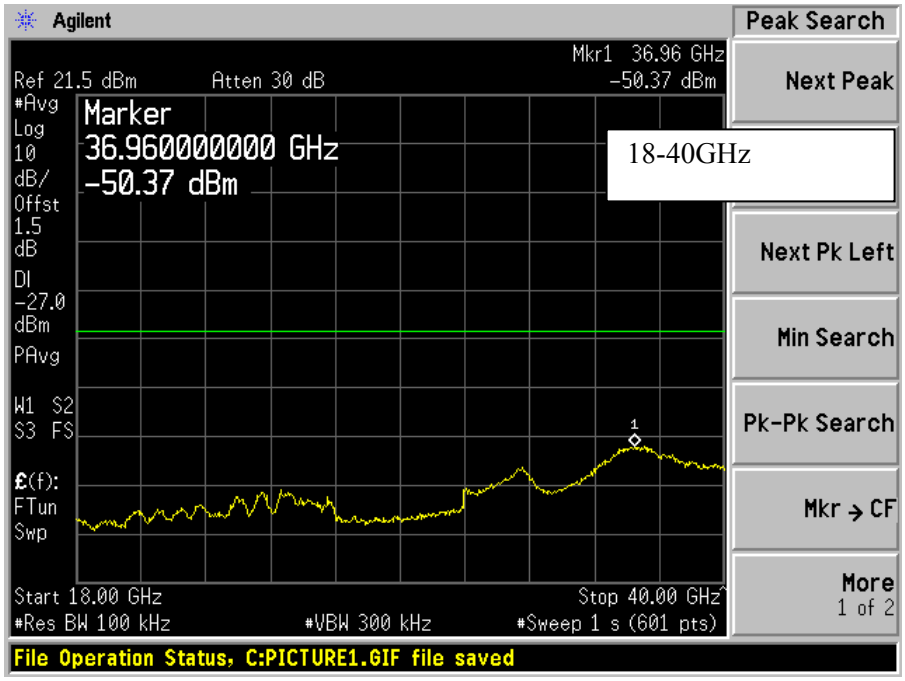
30MHz----1GHz



1GHz----18GHz



18GHz----40GHz

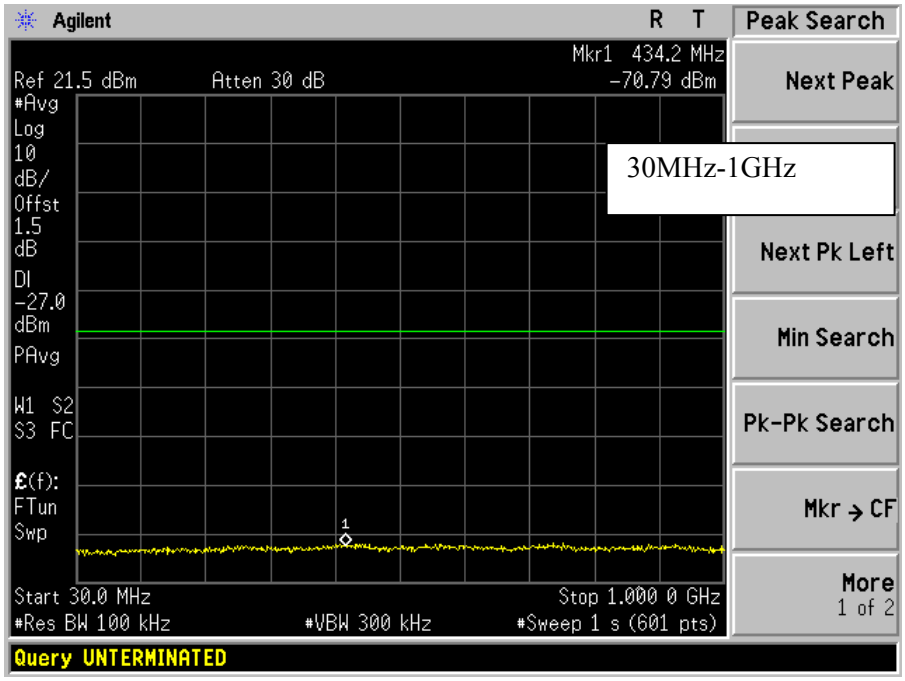


802.11 n mode 40MHz

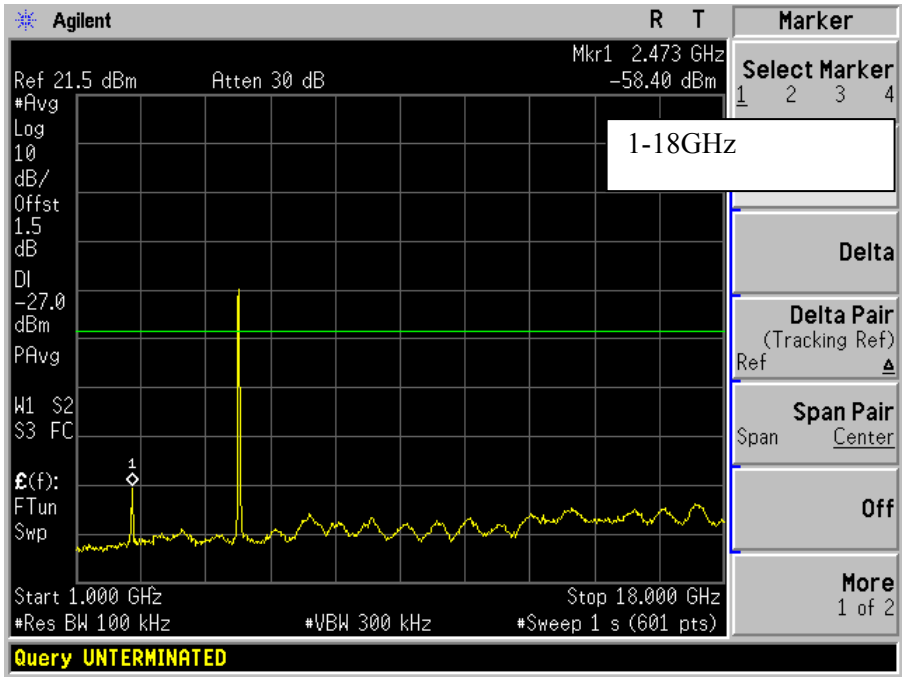
5250MHz-5350MHz

Low Channel

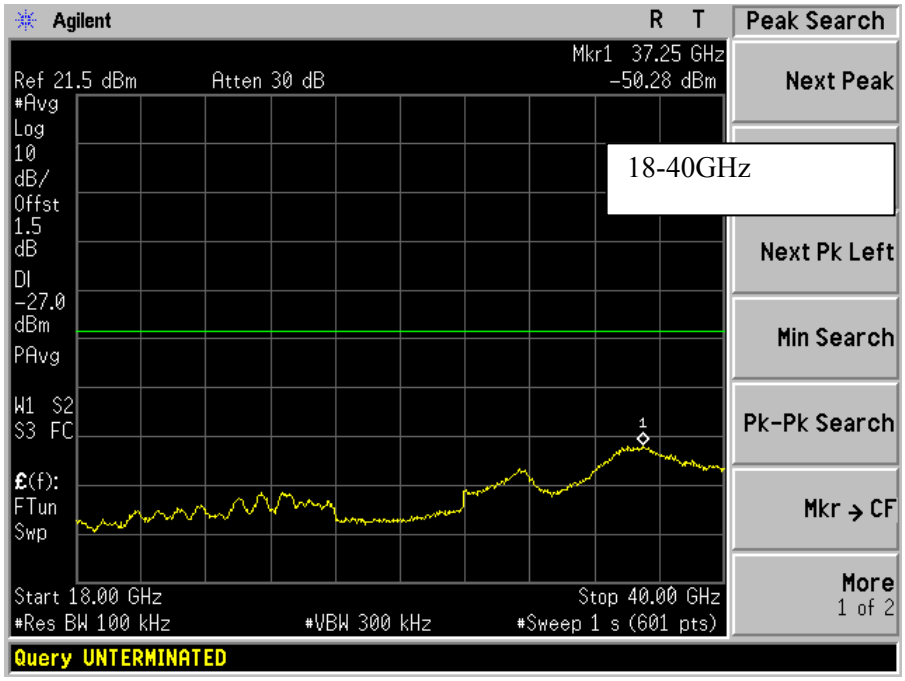
30MHz----1GHz



1GHz----18GHz

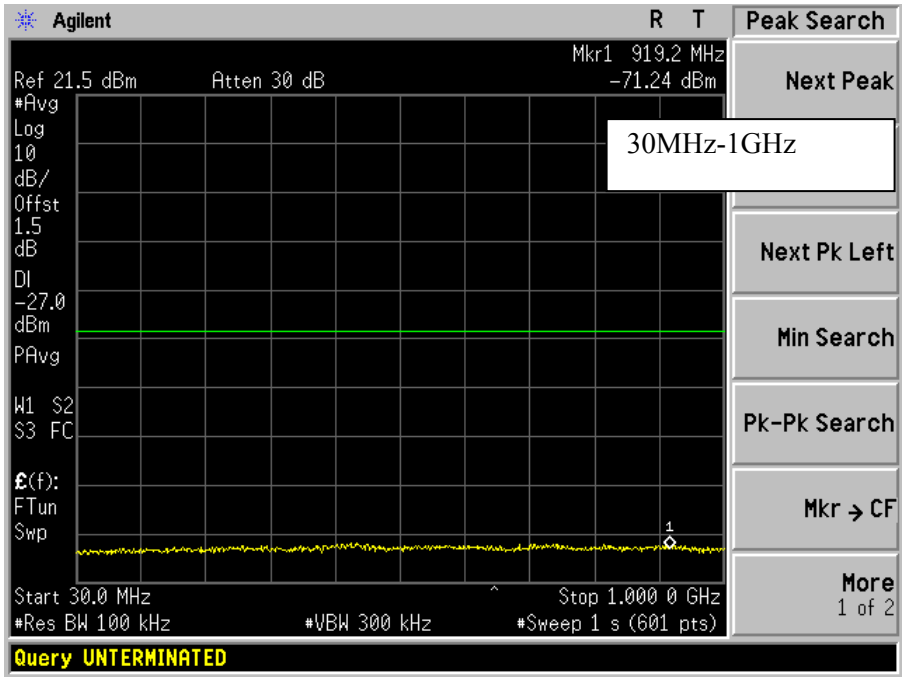


18GHz----40GHz

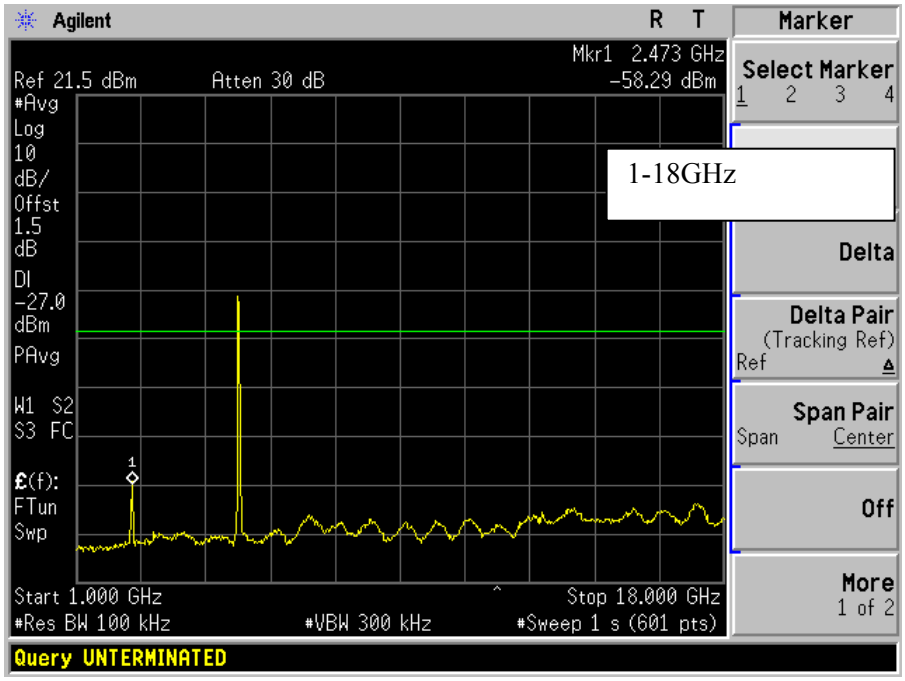


High Channel

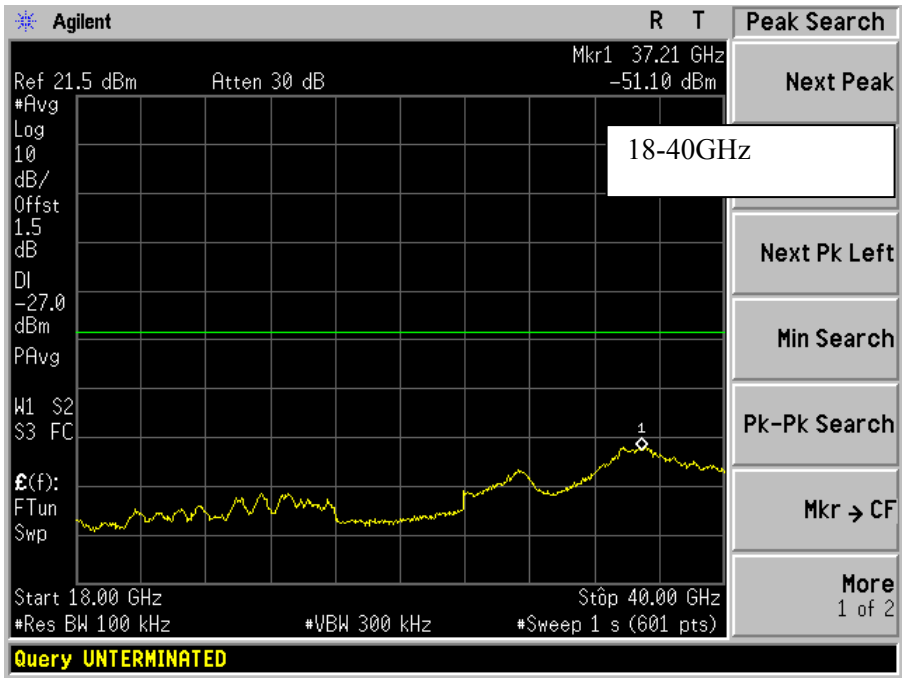
30MHz----1GHz



1GHz----18GHz



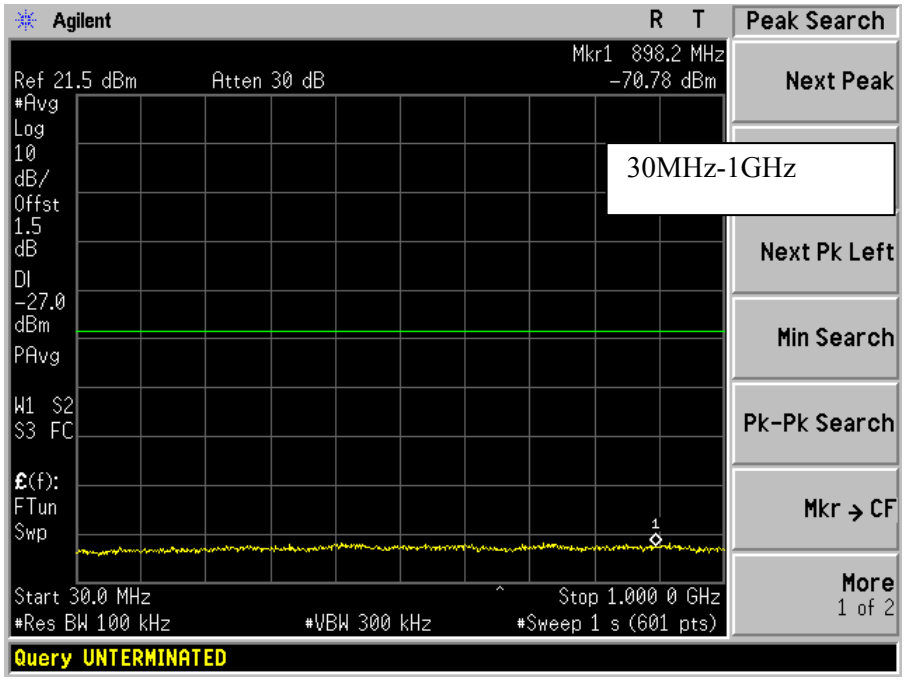
18GHz----40GHz



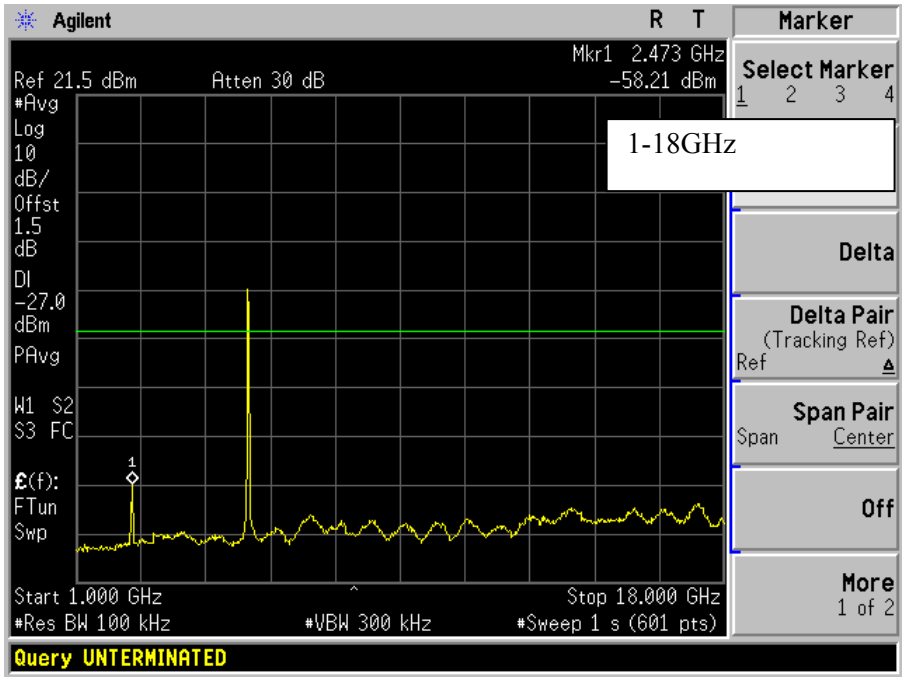
5470MHz-5725MHz

Low Channel

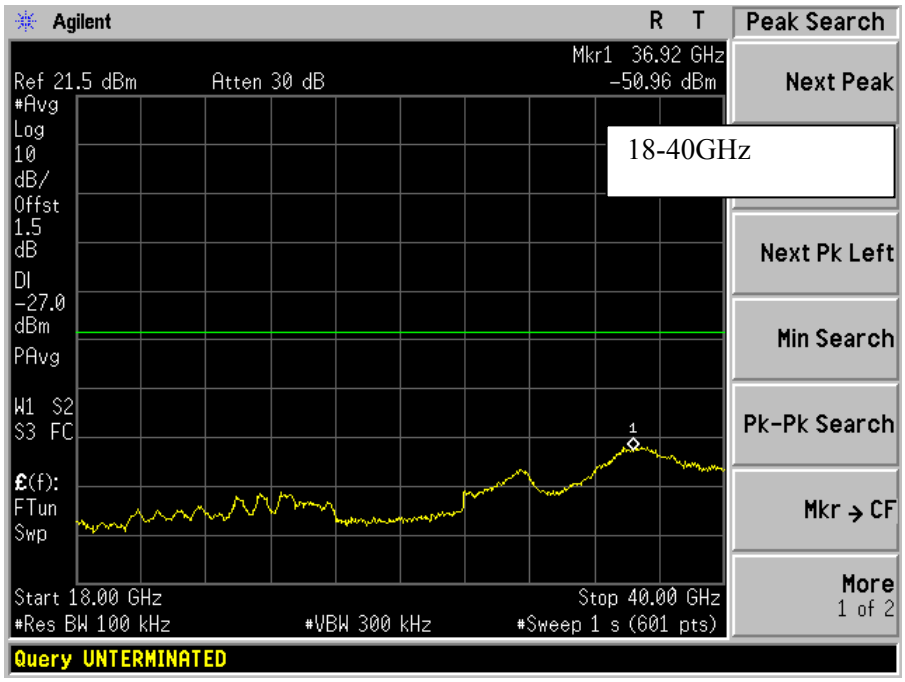
30MHz----1GHz



1GHz----18GHz

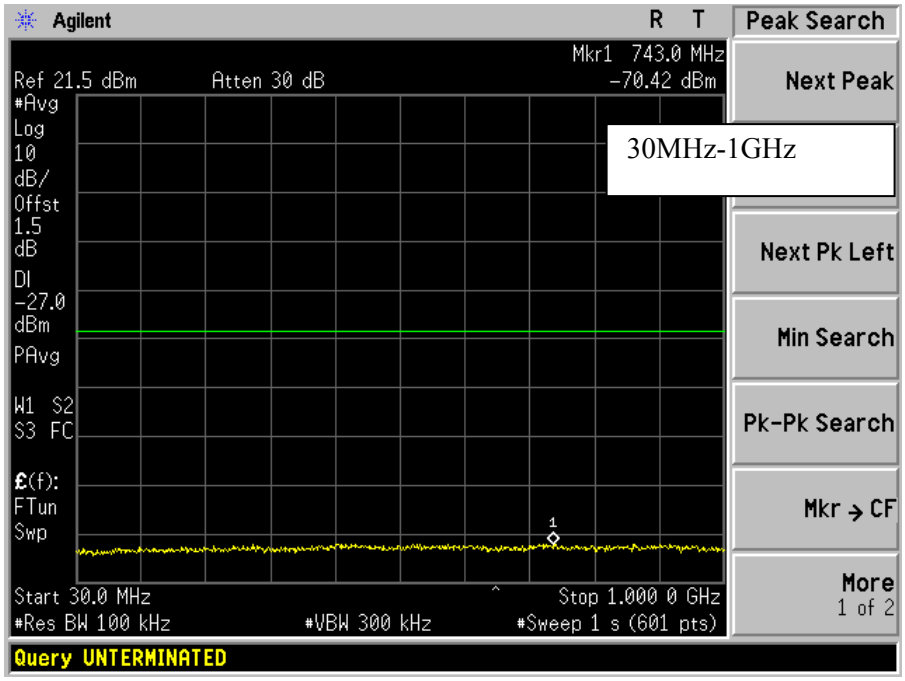


18GHz----40GHz

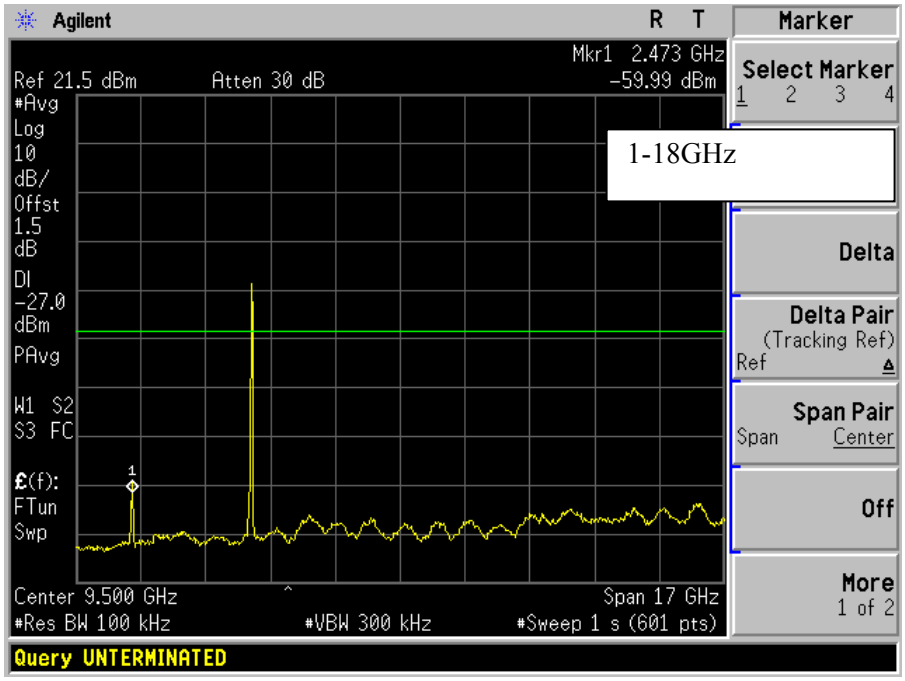


Middle Channel

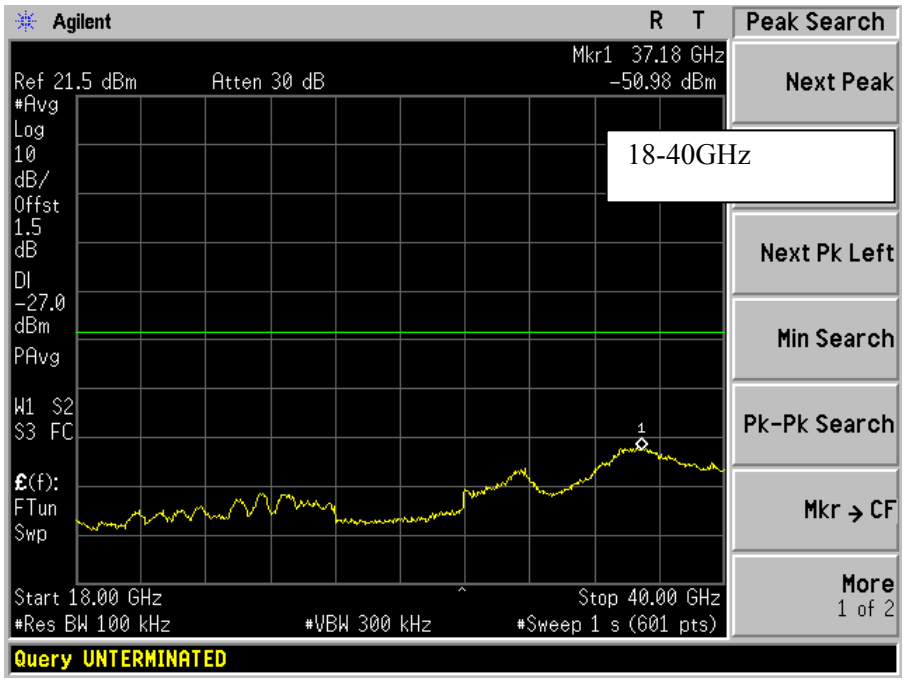
30MHz----1GHz



1GHz----18GHz

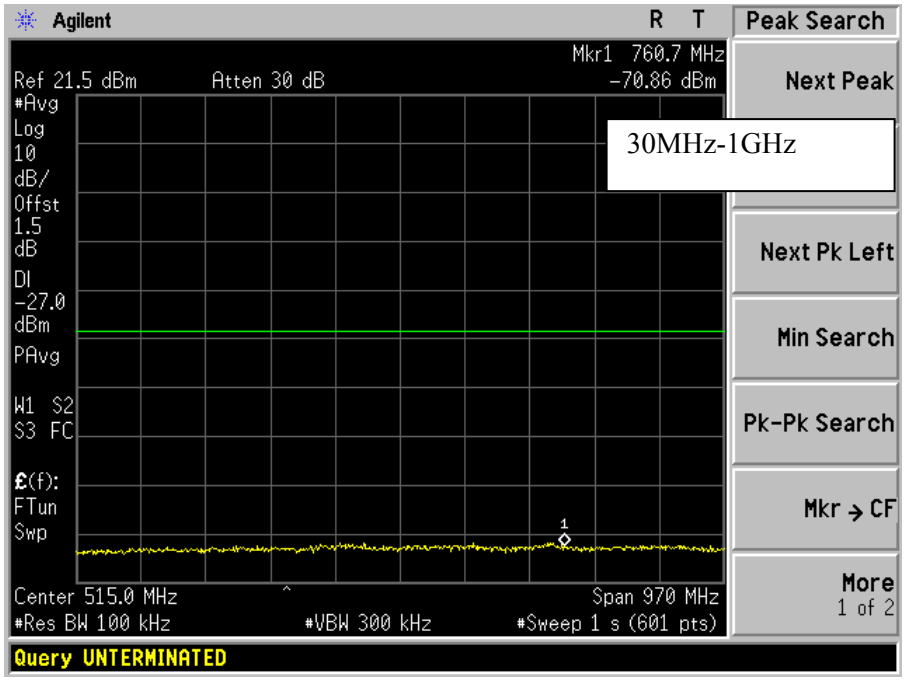


18GHz----40GHz

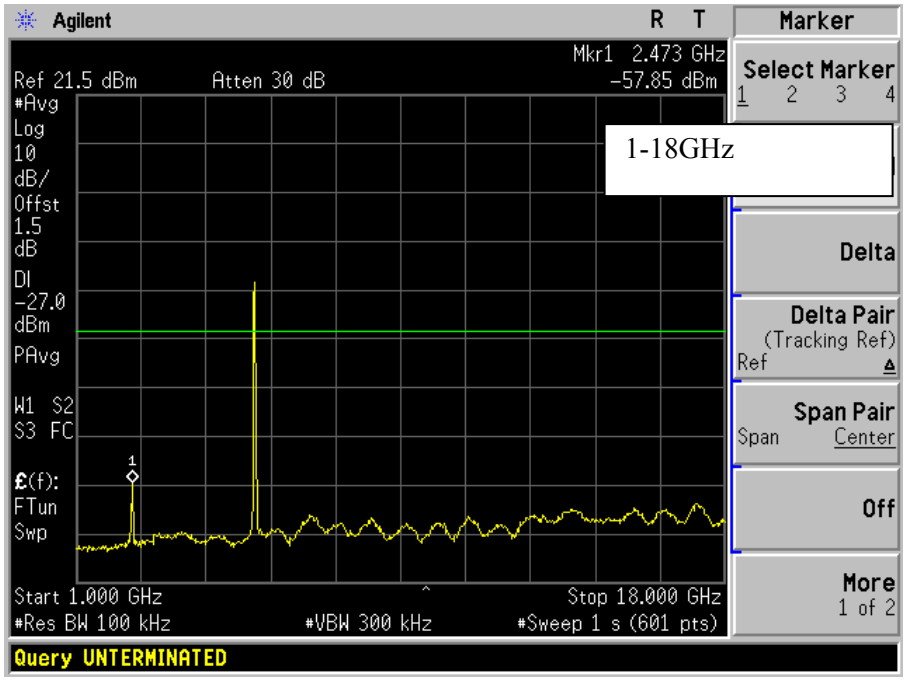


High Channel

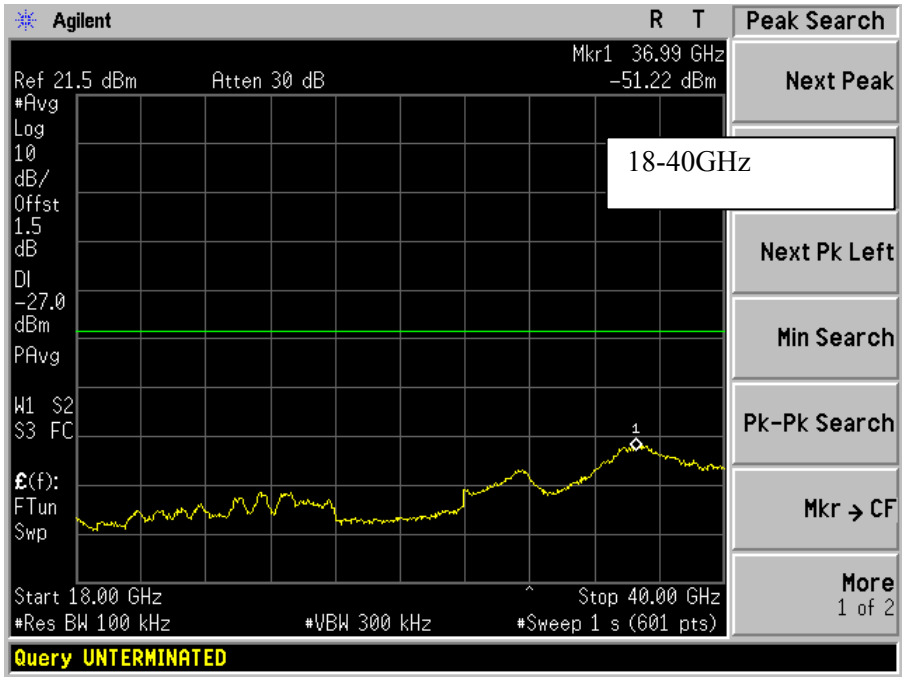
30MHz----1GHz



1GHz----18GHz



18GHz----40GHz


Agilent
R T
Peak Search
Mkr1 36.99 GHz
Ref 21.5 dBm
Atten 30 dB
-51.22 dBm
Next Peak
#Avg
Log
10
dB/
Offst
1.5
dB
Dl
-27.0
dBm
PAvg
18-40GHz
Next Pk Left
Min Search
W1 S2
S3 FC
Pk-Pk Search
£(f):
FTun
Swp
Mkr → CF
More
1 of 2
Start 18.00 GHz
Stop 40.00 GHz
#Res BW 100 kHz
#VBW 300 kHz
#Sweep 1 s (601 pts)
Query UNTERMINATED

12 FCC §407(a)(6) - Peak Excursion Ratio

12.1 Applicable Standard

FCC §15.407(a)(6)

According to FCC §15.407(a) (6), the ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the maximum conducted output power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

12.2 Test Procedure

Set the spectrum analyzer span to view the entire emission bandwidth.
The largest difference between the following two traces must be ≤ 13 dB for all frequencies across the emission bandwidth. Submit a plot.

1st Trace:
• Set RBW = 1 MHz, VBW ≥ 3 MHz with peak detector and max hold settings.

2nd Trace:
• create the 2nd trace using the settings described in the section "FCC §15.407(a)(1)(2) – CONDUCTED TRANSMITTER OUTPUT POWER".

12.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4440A	MY44303352	2011-05-10

Statement of Traceability: BACL Corp. attests that all calibrations have been performed per the NVLAP requirements, traceable to the NIST.

12.4 Test Environmental Conditions

Temperature:	23-25 °C
Relative Humidity:	35-50 %
ATM Pressure:	101-103kPa

The testing was performed by Ning Ma on 2011-09-07~ 2011-09-11 at RF Site.

12.5 Test Results

Channel	Frequency (MHz)	TX Chain 1 PER (dBm)	TX Chain 2 PER (dBm)	Worst Antenna PER (dBm)	Limit (dBm)	Margin (dB)
802.11a, 5250-5350 MHz						
Low	5260	7.89	7.95	7.95	13	-5.05
Middle	5280	7.43	8.07	8.07	13	-4.93
High	5320	8.01	8.09	8.09	13	-4.91
802.11a, 5470-5725 MHz						
Low	5500	8.55	8.57	8.57	13	-4.43
Middle	5580	8.51	8.91	8.91	13	-4.09
High	5700	8.82	9.07	9.07	13	-3.93

Channel	Frequency (MHz)	TX Chain 1 PER (dBm)	TX Chain 2 PER (dBm)	Worst Antenna PER (dBm)	Limit (dBm)	Margin (dB)
802.11n HT20, 5250-5350 MHz						
Low	5260	7.91	8.16	8.16	13	-4.84
Middle	5280	7.82	8.06	8.06	13	-4.94
High	5320	7.89	8.27	8.27	13	-4.73
802.11n HT20, 5470-5725 MHz						
Low	5500	8.01	9.01	9.01	13	-3.99
Middle	5580	8.12	9.24	9.24	13	-3.76
High	5700	8.19	9.27	9.27	13	-3.73
802.11n HT40, 5250-5350 MHz						
Low	5270	8.69	9.52	9.52	13	-3.48
High	5310	8.94	9.38	9.38	13	-3.62
802.11n HT40, 5470-5725 MHz						
Low	5510	8.03	8.91	8.91	13	-4.09
Middle	5590	8.02	8.88	8.88	13	-4.12
High	5670	7.99	8.63	8.63	13	-4.37

13 FCC §15.407(f), §2.1091 & IC RSS-102 - RF Exposure

13.1 Applicable Standard

According to FCC §15.407(f) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	* (100)	30
1.34-30	824/f	2.19/f	* ($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF fields.

According to IC RSS-102 Issue 2 section 4.1, RF limits used for general public will be applied to the EUT.

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m^2)	Time Averaging (minutes)
0.003 - 1	280	2.19	-	6
1 - 10	280 / f	2.19 / f	-	6
10 - 30	28	2.19 / f	-	6
30 – 300	28	0.073	2*	6
300 – 1 500	$1.585\ f^{0.5}$	$0.0042\ f^{0.5}$	f / 150	6
1 500 – 15 000	61.4	0.163	10	6
15 000 – 150 000	61.4	0.163	10	$616000 / f^{1.2}$
150 000- 300 000	$0.158\ f^{0.5}$	$4.21 \times 10\ -4\ f^{0.5}$	$6.67 \times 10^{-5}\ f$	$616000 / f^{1.2}$

Note: *f* is frequency in MHz
* = Power density limit is applicable at frequencies greater than 100 MHz

13.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

13.3 MPE Results

Radio Band	Max. Conducted Output Power (dBm)	Antenna Gain (dBi)	MPE Evaluation Distance (cm)	MPE (mw/cm^2)	MPE Limit (mw/cm^2)	Result
2.4 GHz	26.47	3.5	20	0.20	1.0	Compliance
W52	15.48	6.0	20	0.03	1.0	Compliance
W53	11.12	6.0	20	0.001	1.0	Compliance
W56	15.60	6.0	20	0.03	1.0	Compliance
W58	25.04	6.0	20	0.25	1.0	Compliance

The device is compliant with the requirement MPE limit for uncontrolled exposure at 20 cm distance.