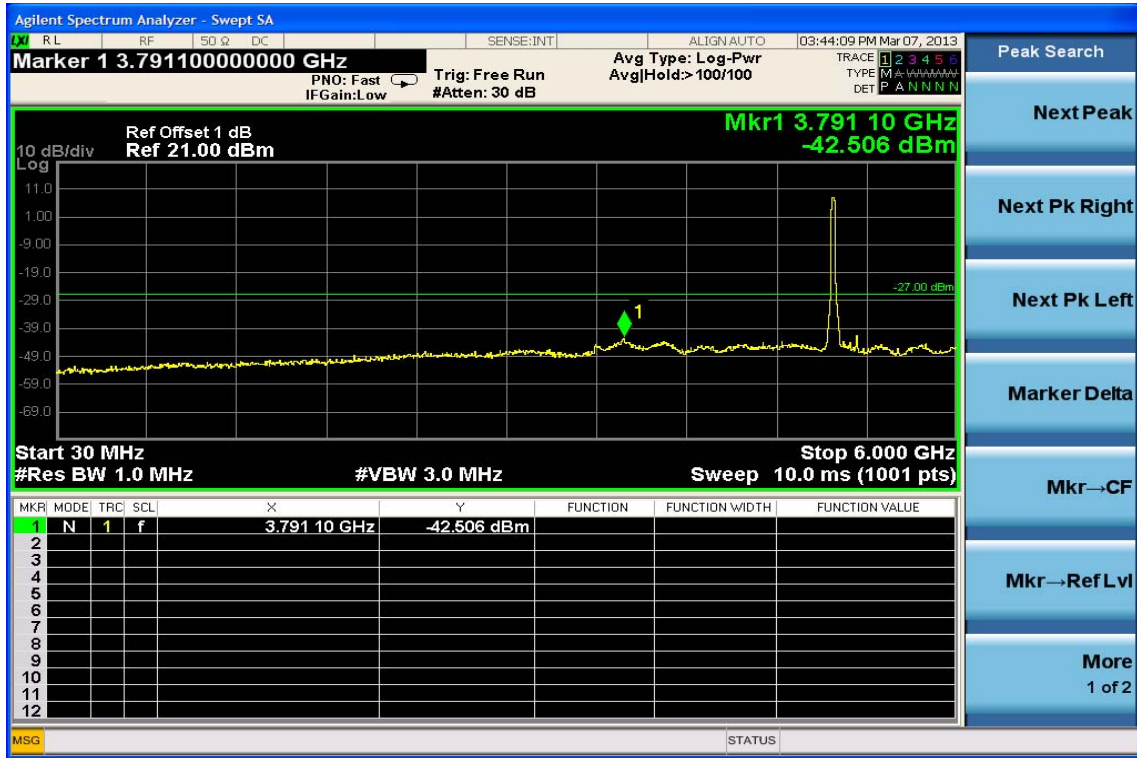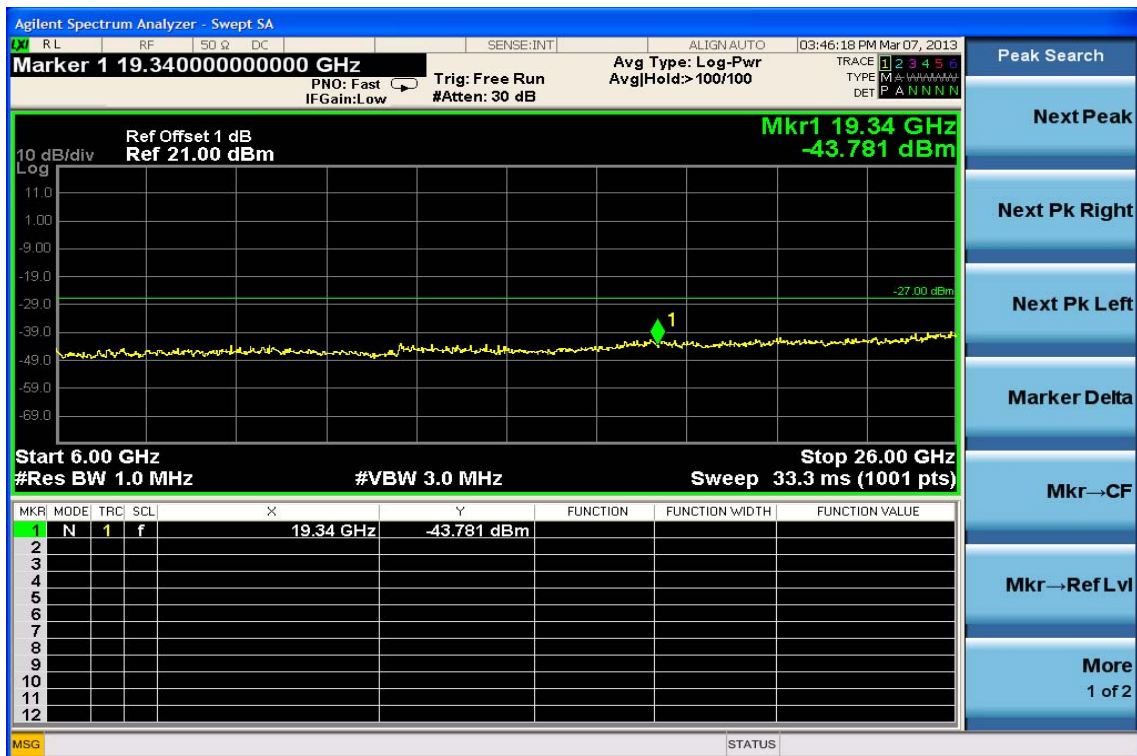## 802.11a mode
5180MHz, 30MHz – 6GHz

5180MHz, 6GHz – 18GHz

5180MHz, 18GHz – 40GHz

5260MHz, 30MHz – 6GHz

5260MHz, 6GHz – 18GHz

5260MHz, 18GHz – 40GHz

Report Number: ISL-13LR036FE

5320MHz, 30MHz – 6GHz

5320MHz, 6GHz – 18GHz

5320MHz, 18GHz – 40GHz

5500MHz, 30MHz – 6GHz

5500MHz, 6GHz – 18GHz

5500MHz, 18GHz – 40GHz

5580MHz, 30MHz – 6GHz

5580MHz, 6GHz – 18GHz

5580MHz, 18GHz – 40GHz

5700MHz, 30MHz – 6GHz

5700MHz, 6GHz – 18GHz
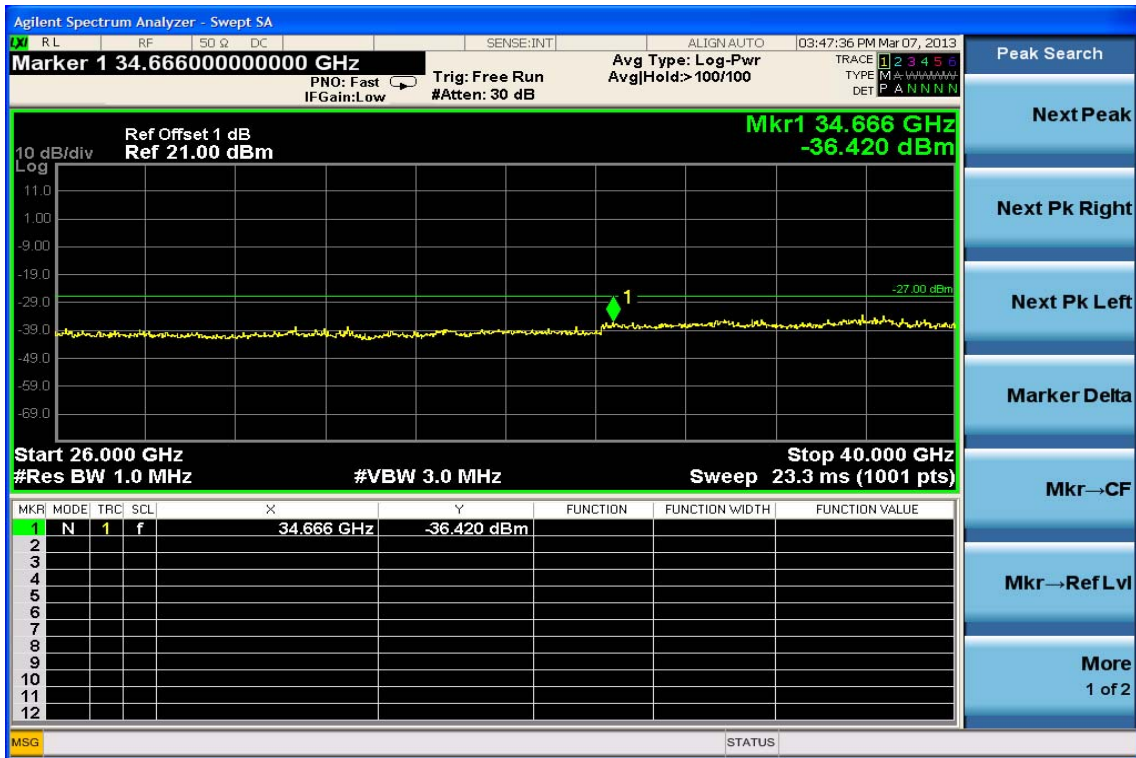

5700MHz, 18GHz – 40GHz
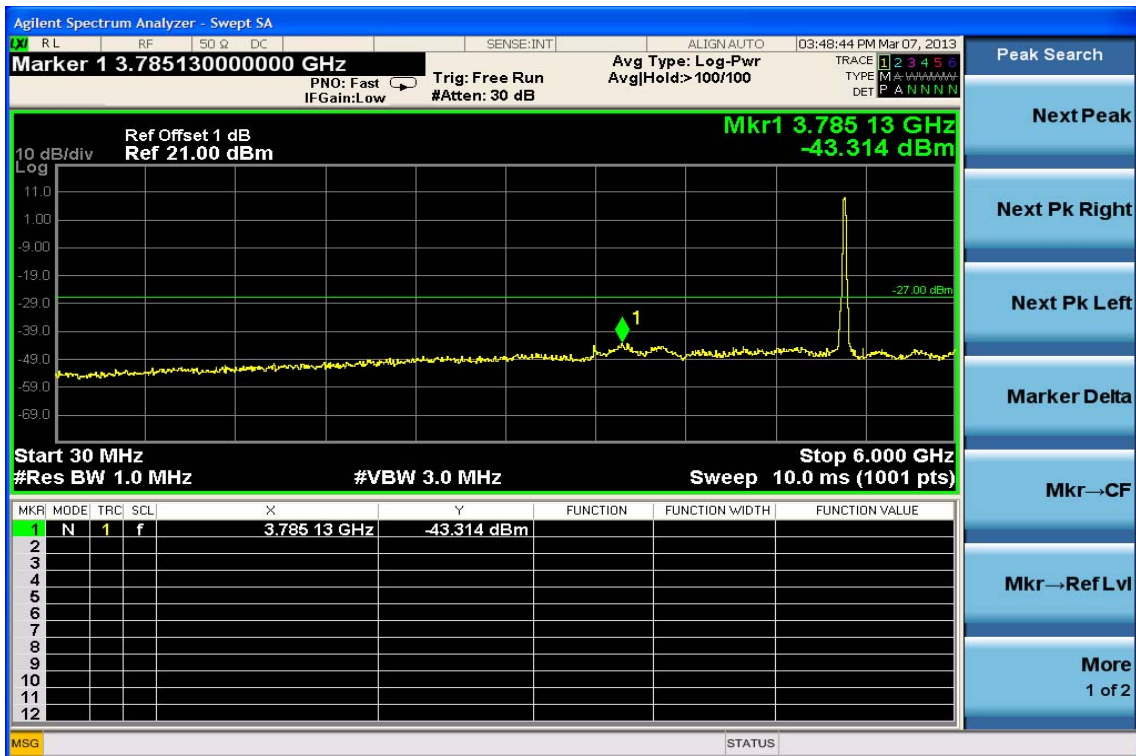
802.11n HT20 mode
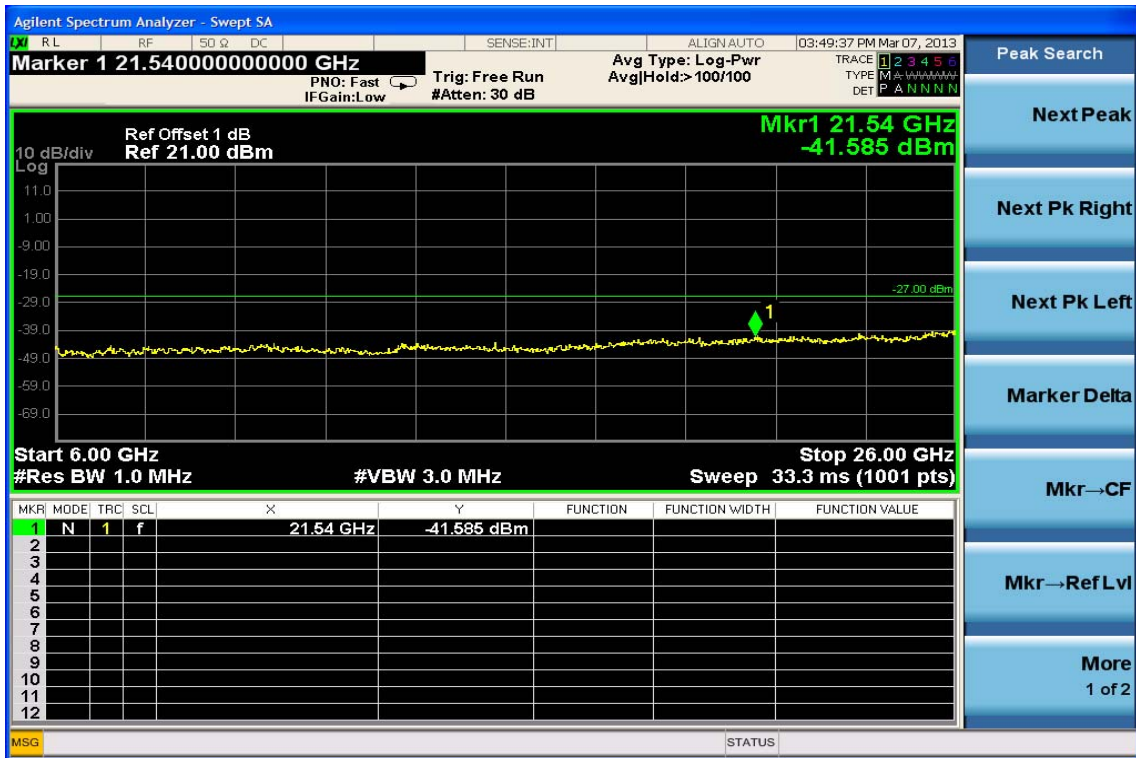## 5180MHz, 30MHz – 6GHz

5180MHz, 6GHz – 18GHz

5180MHz, 18GHz – 40GHz
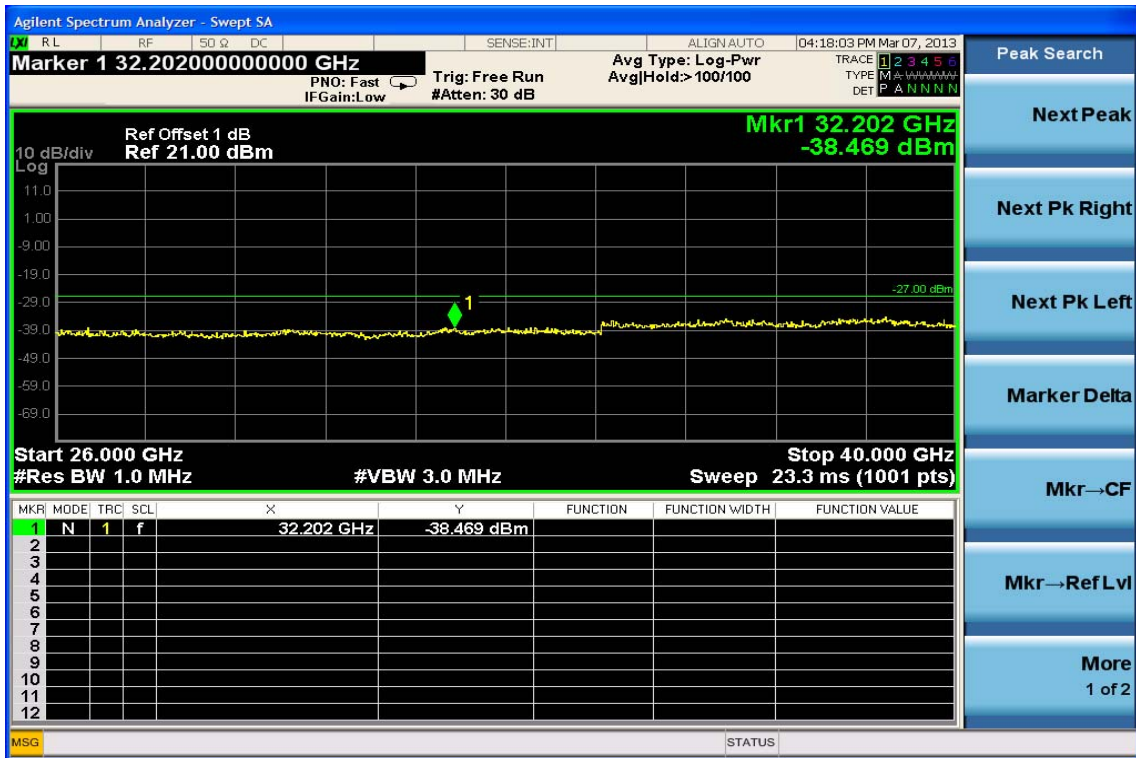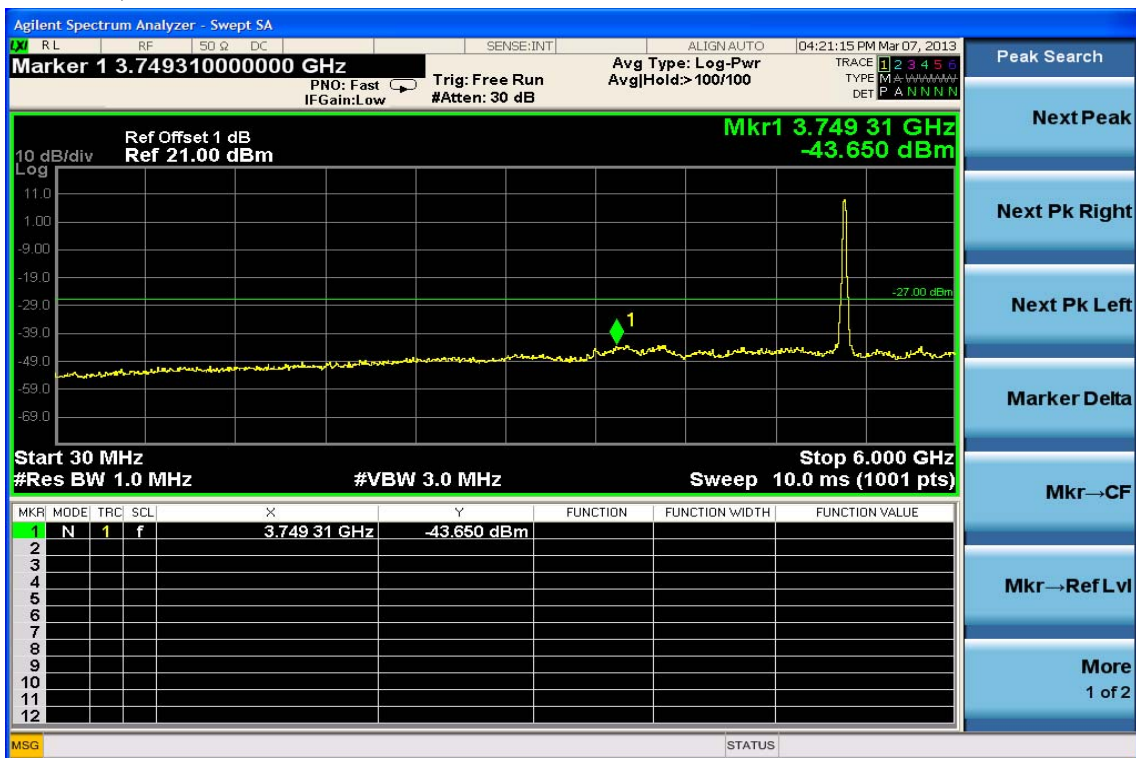
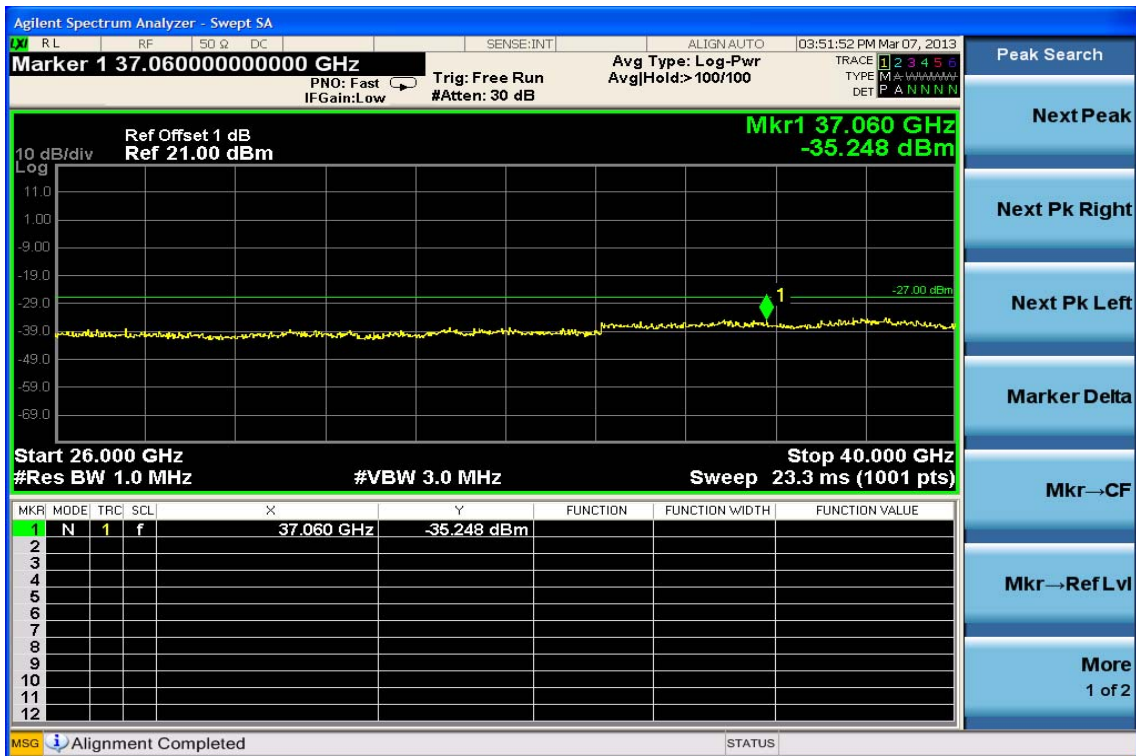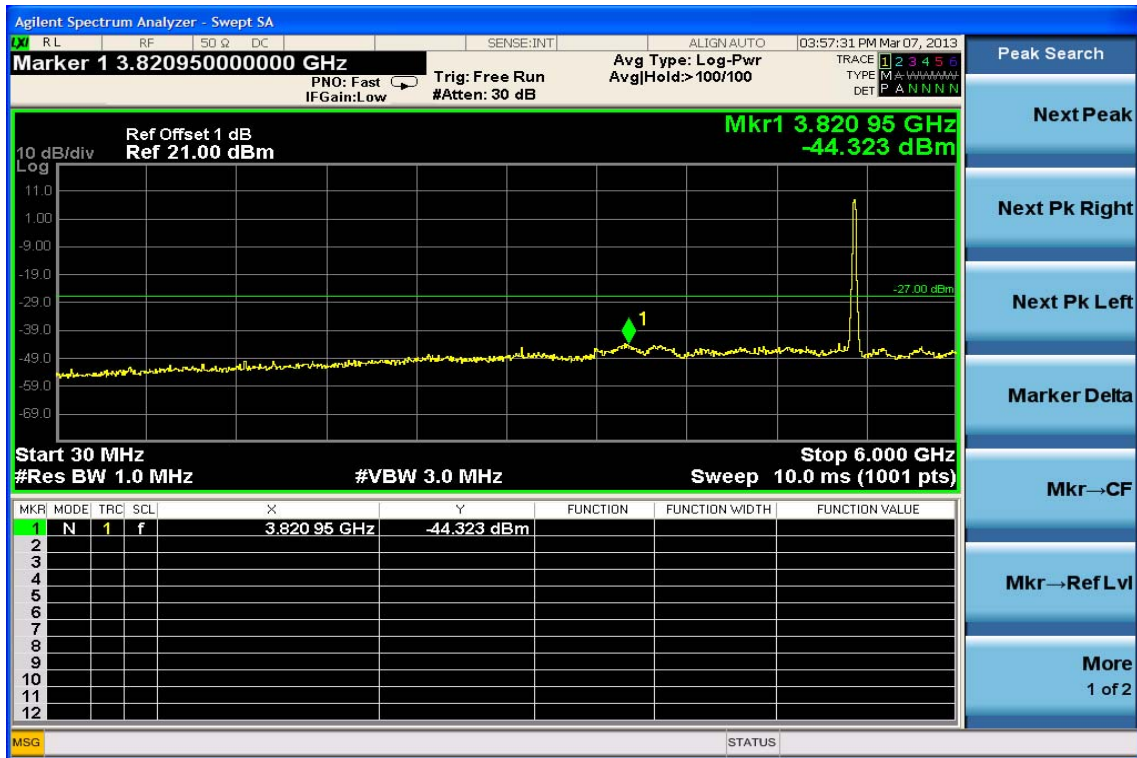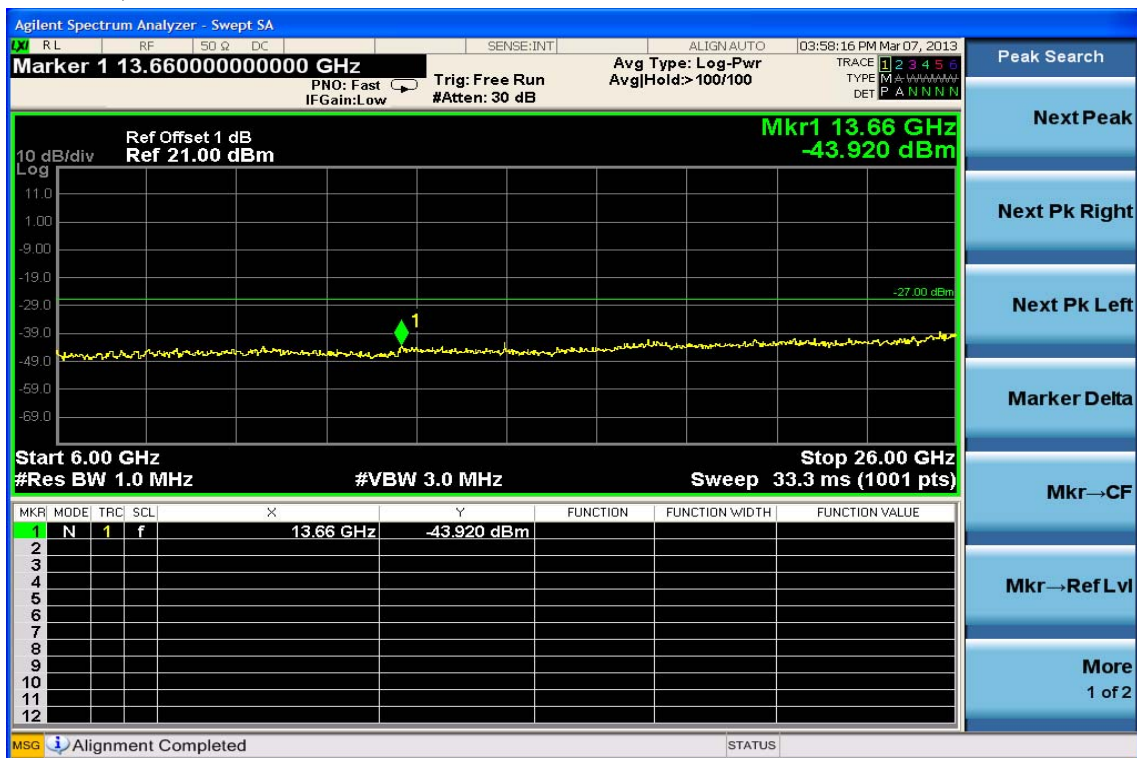## 5260MHz, 30MHz – 6GHz
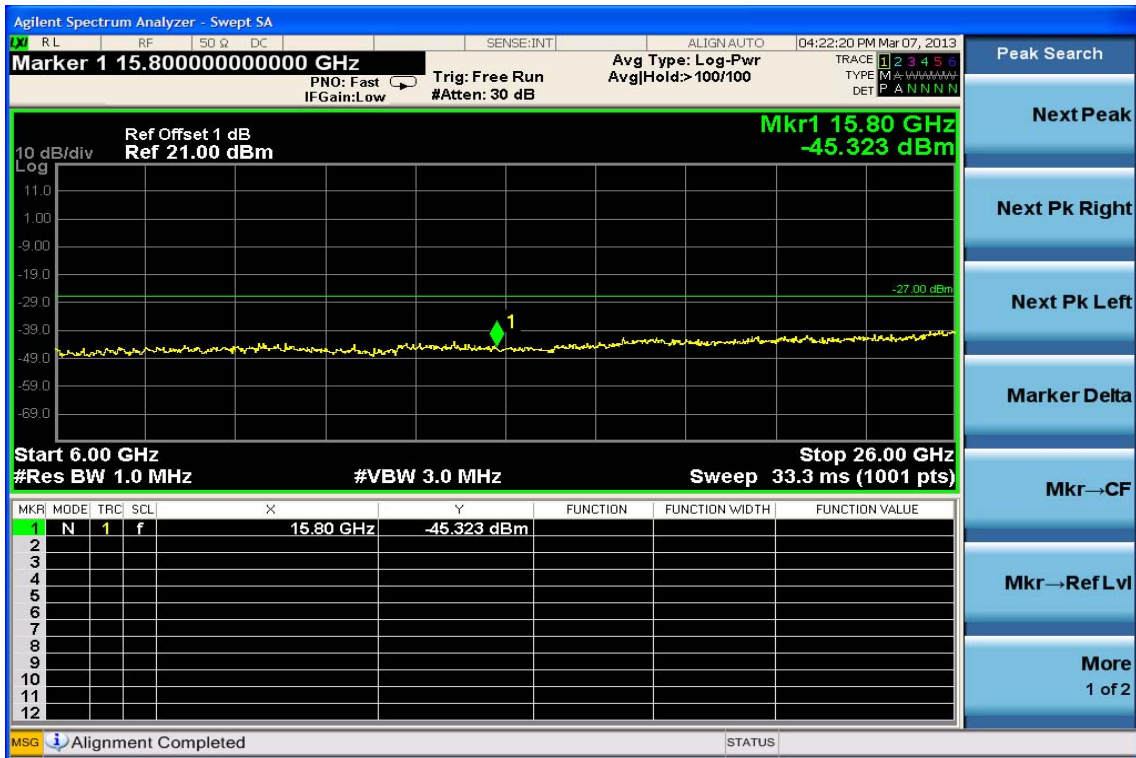
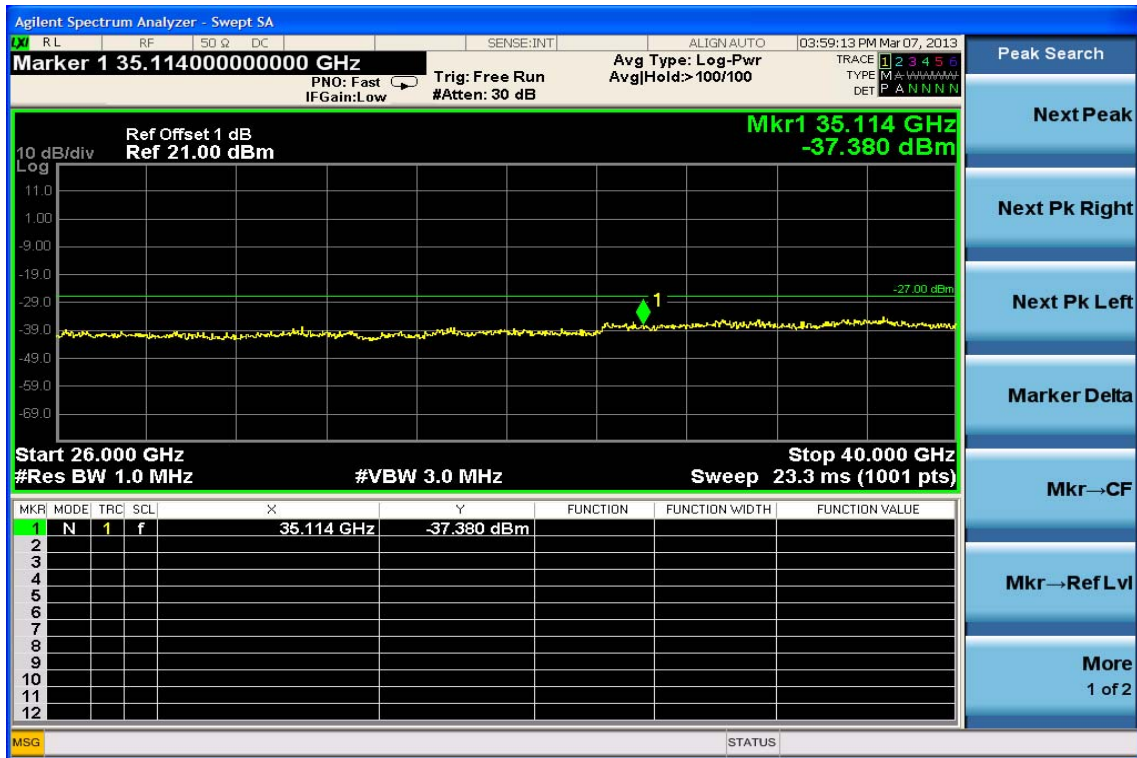## 5260MHz, 6GHz – 18GHz

5260MHz, 18GHz – 40GHz
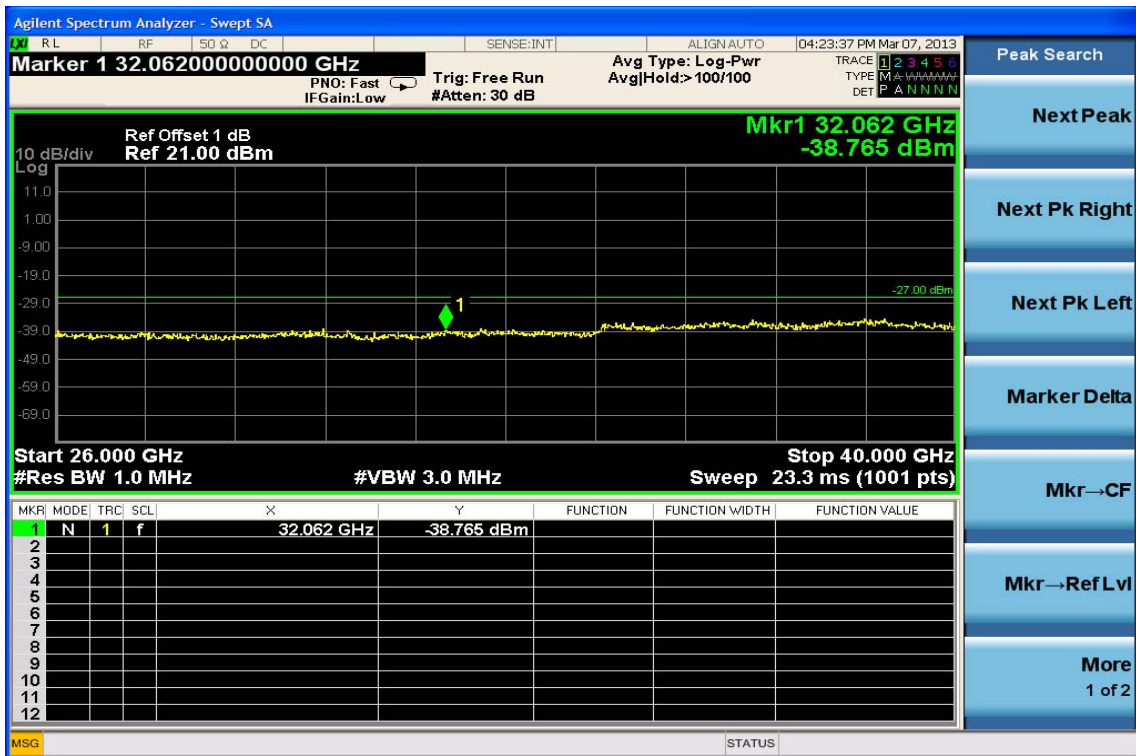
5320MHz, 30MHz – 6GHz
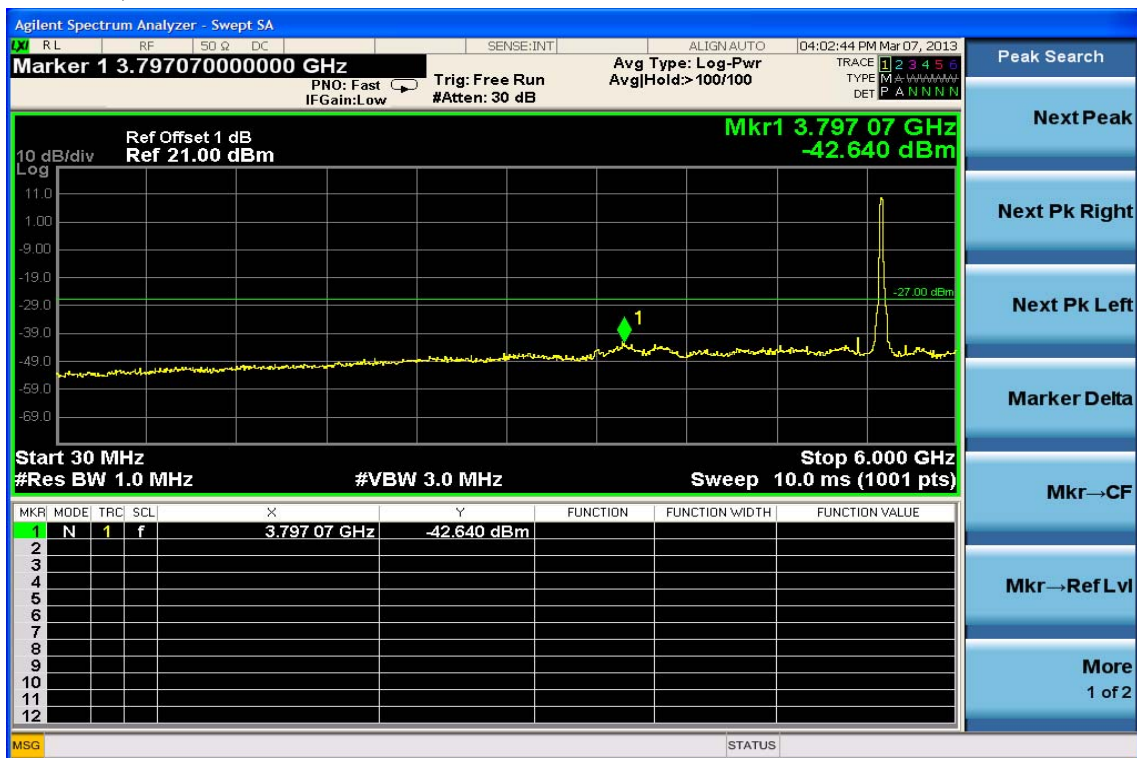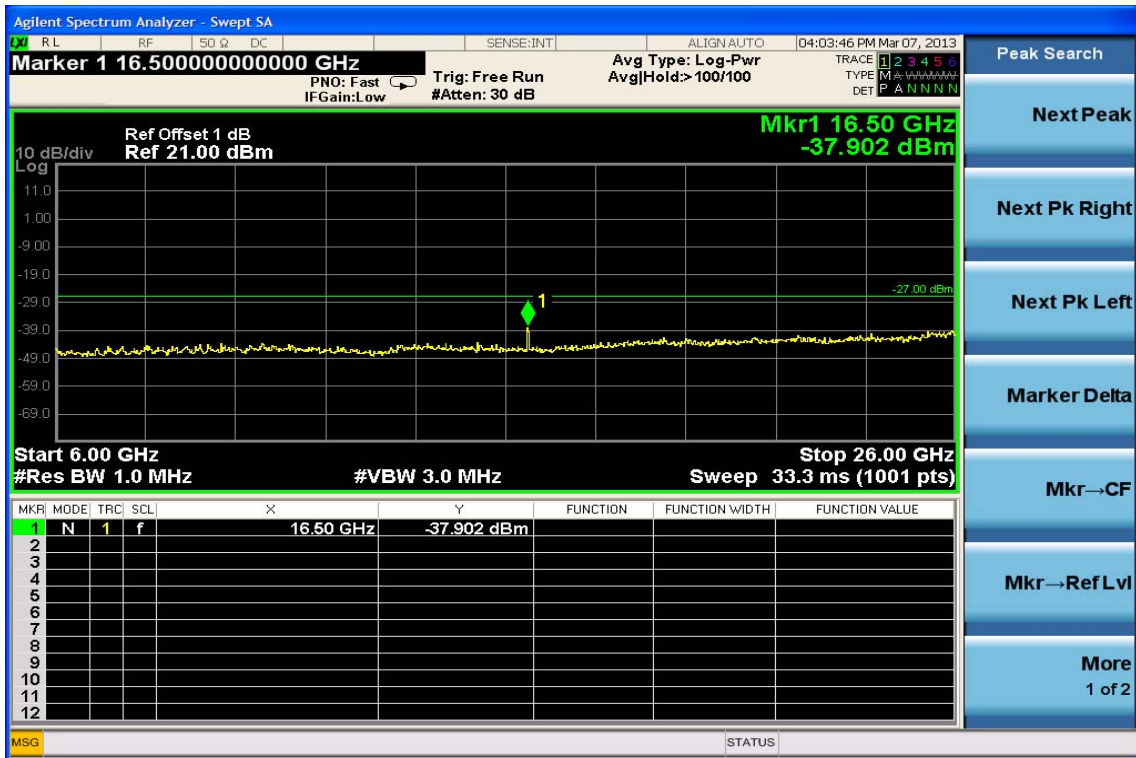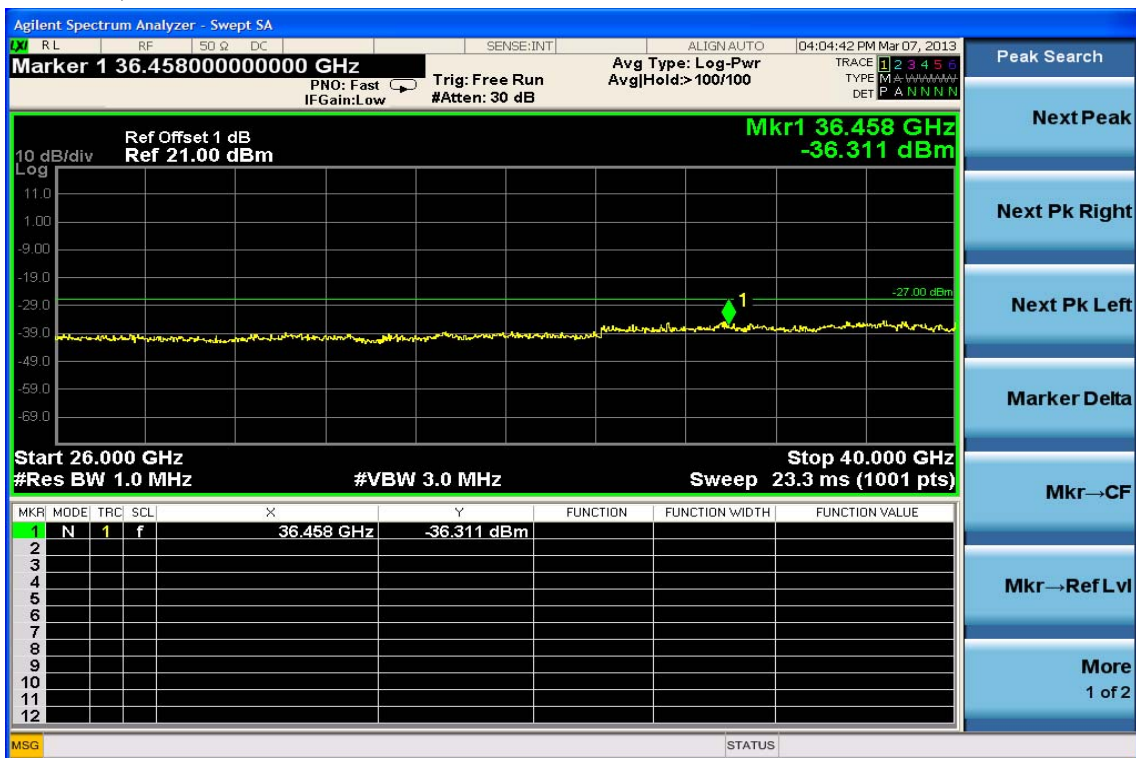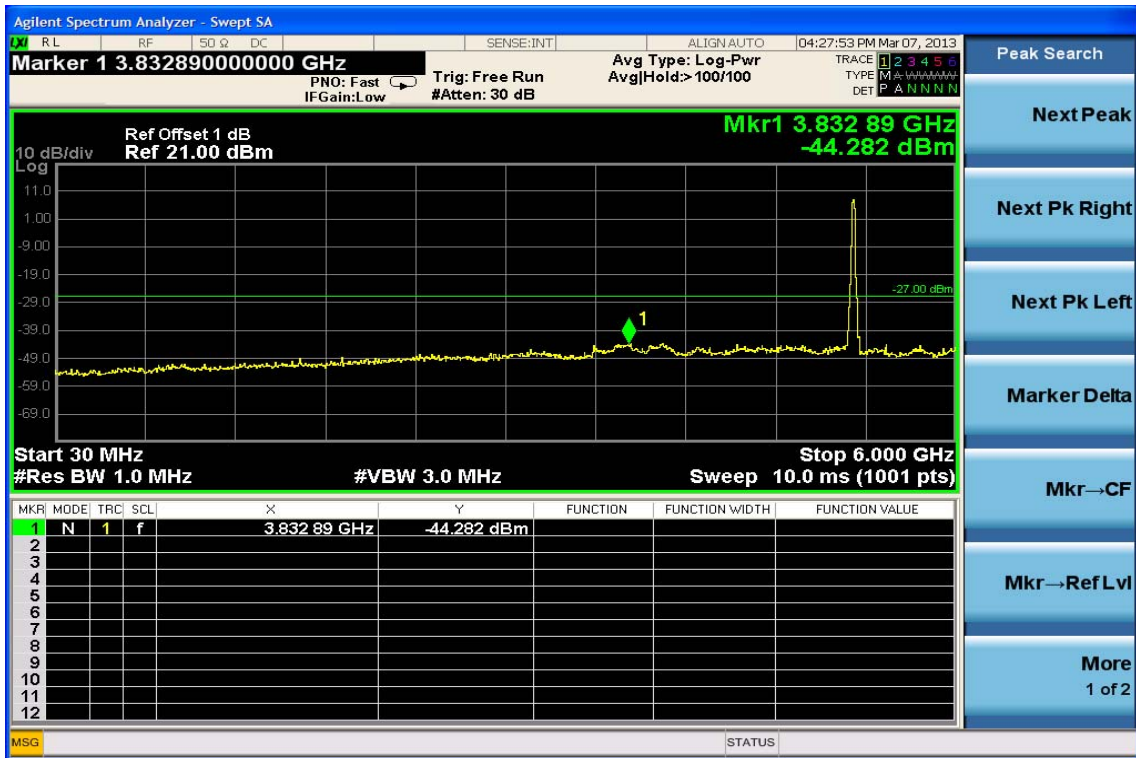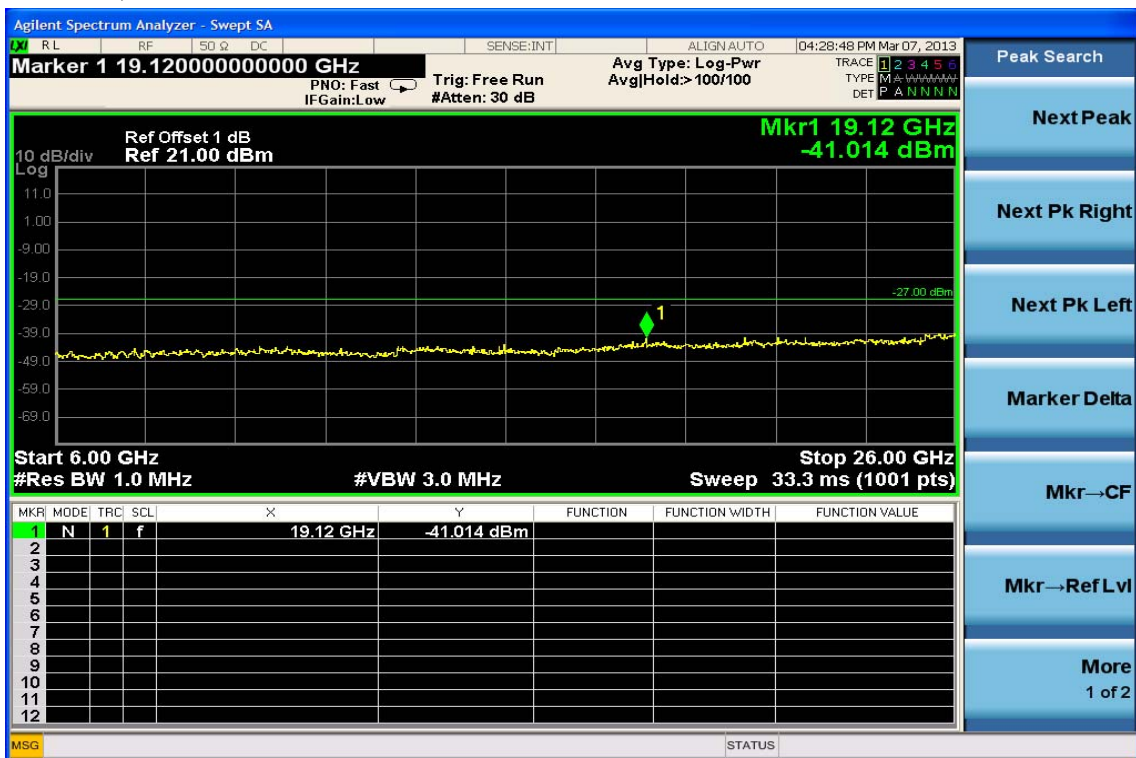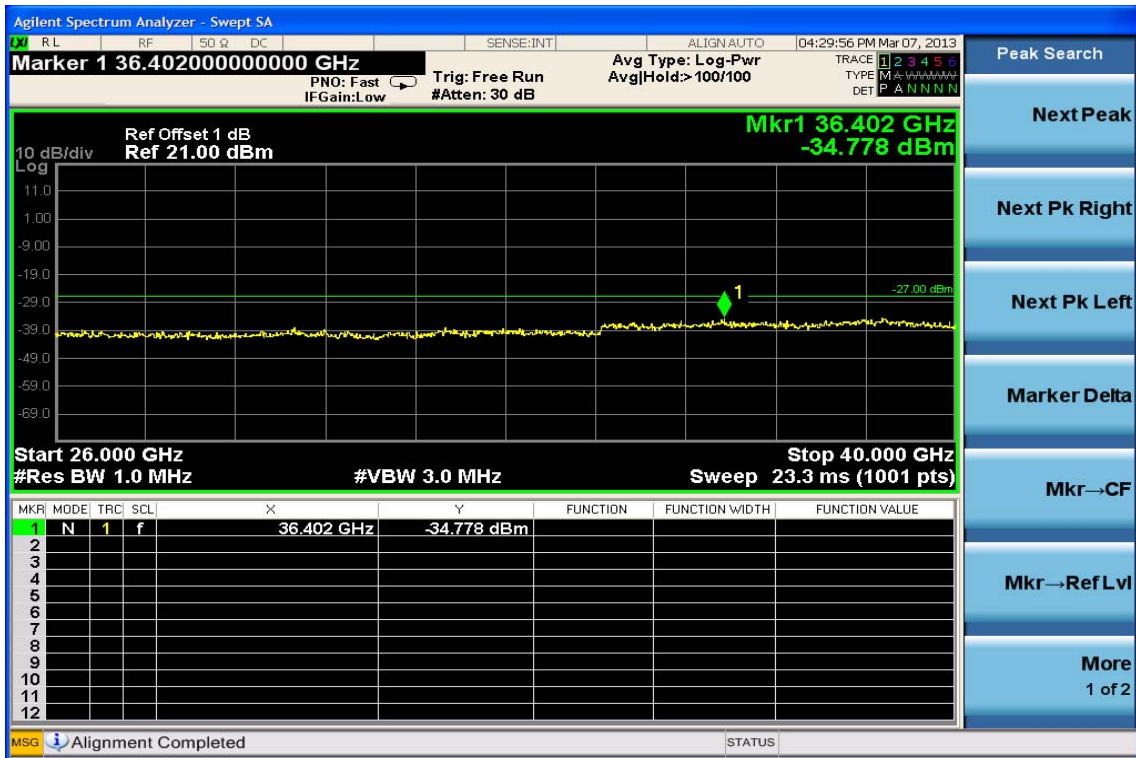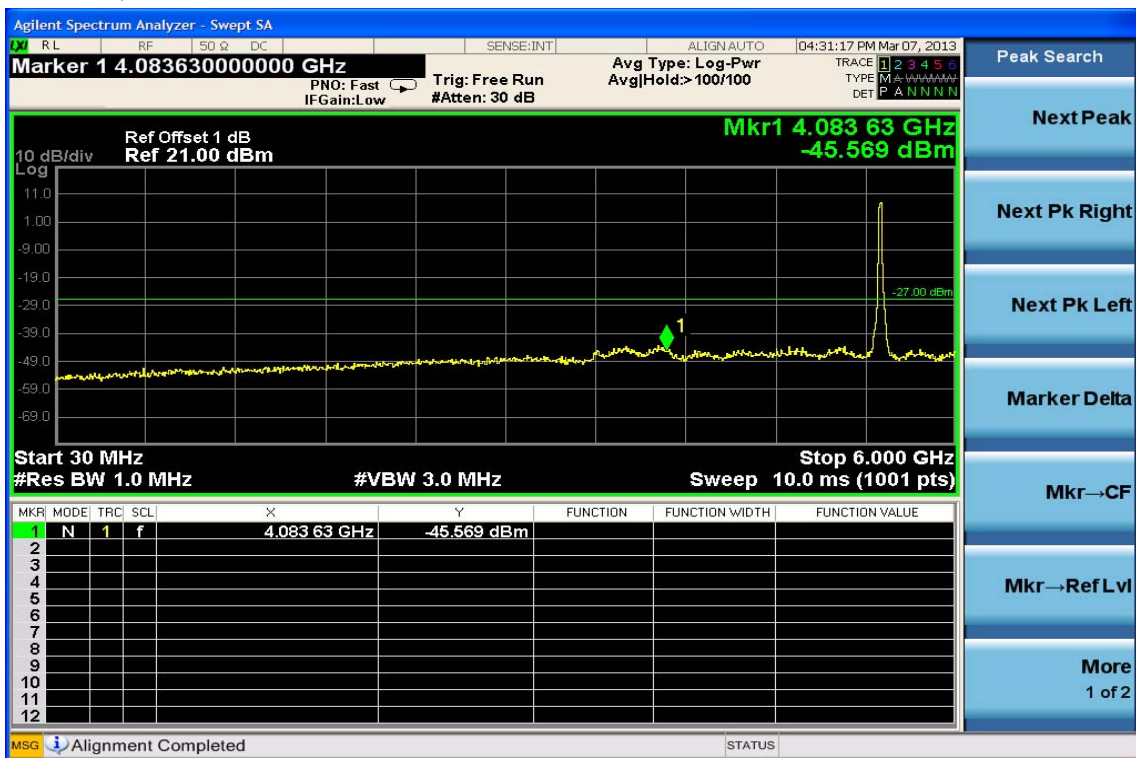

5320MHz, 6GHz – 18GHz
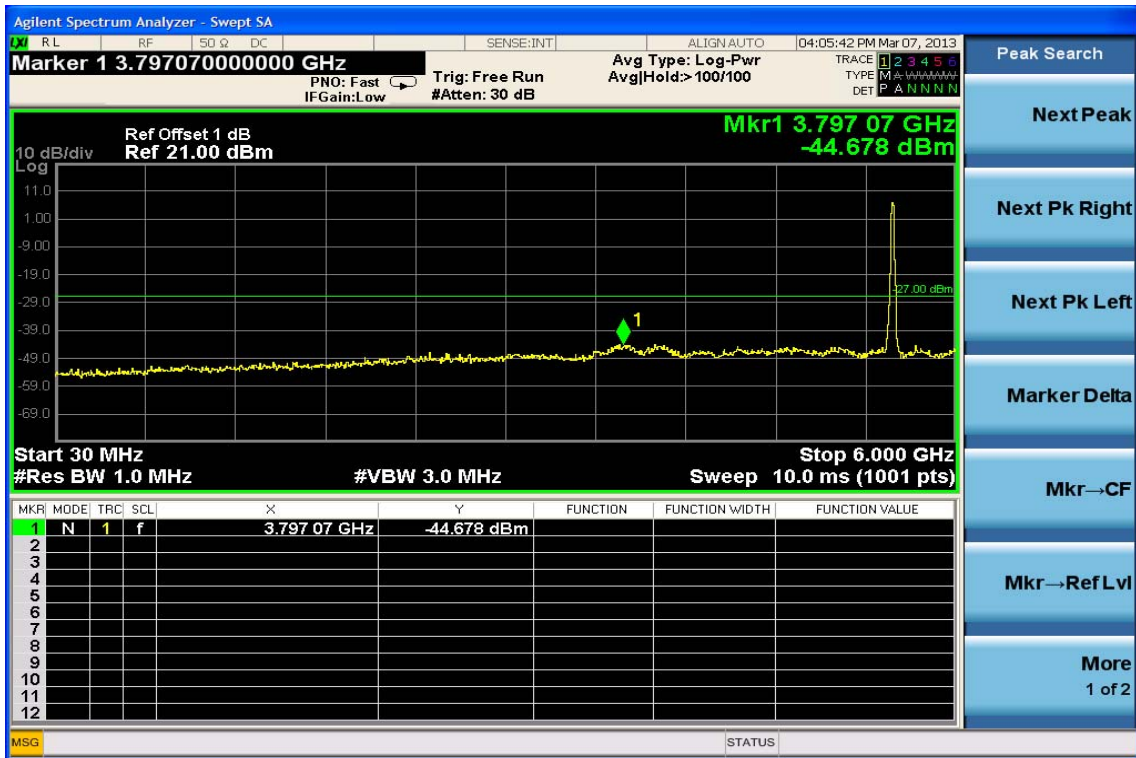
5320MHz, 18GHz – 40GHz
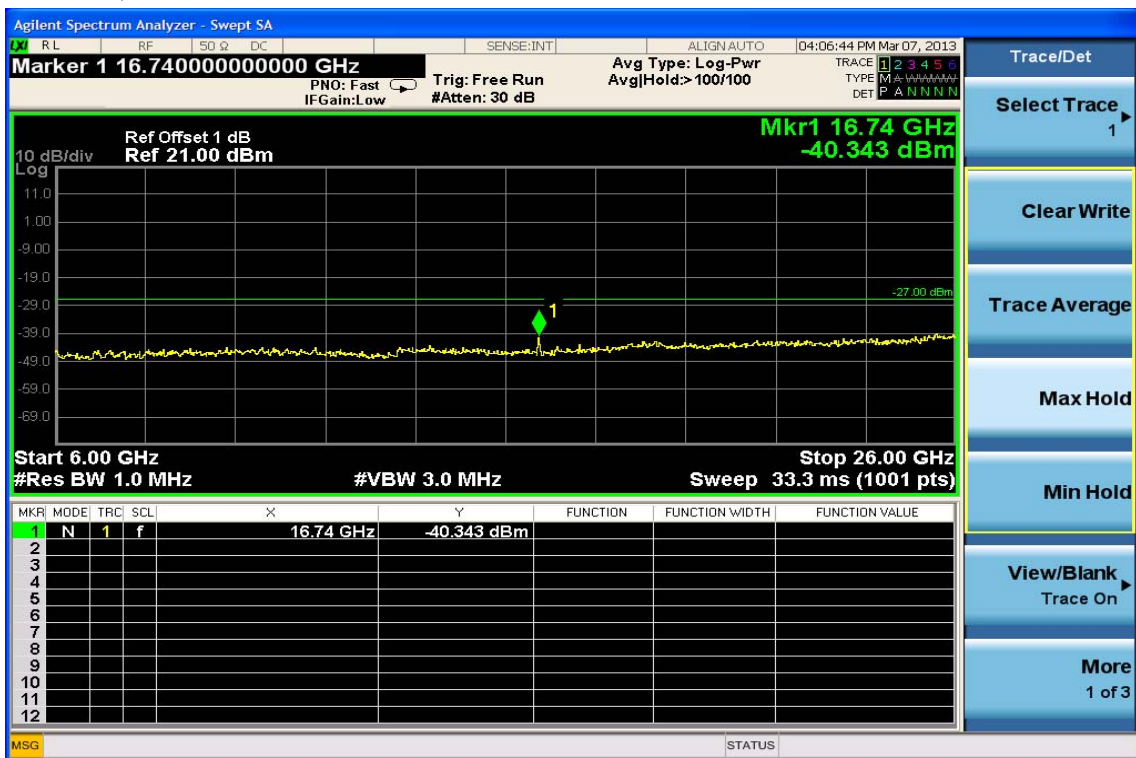

5500MHz, 30MHz – 6GHz
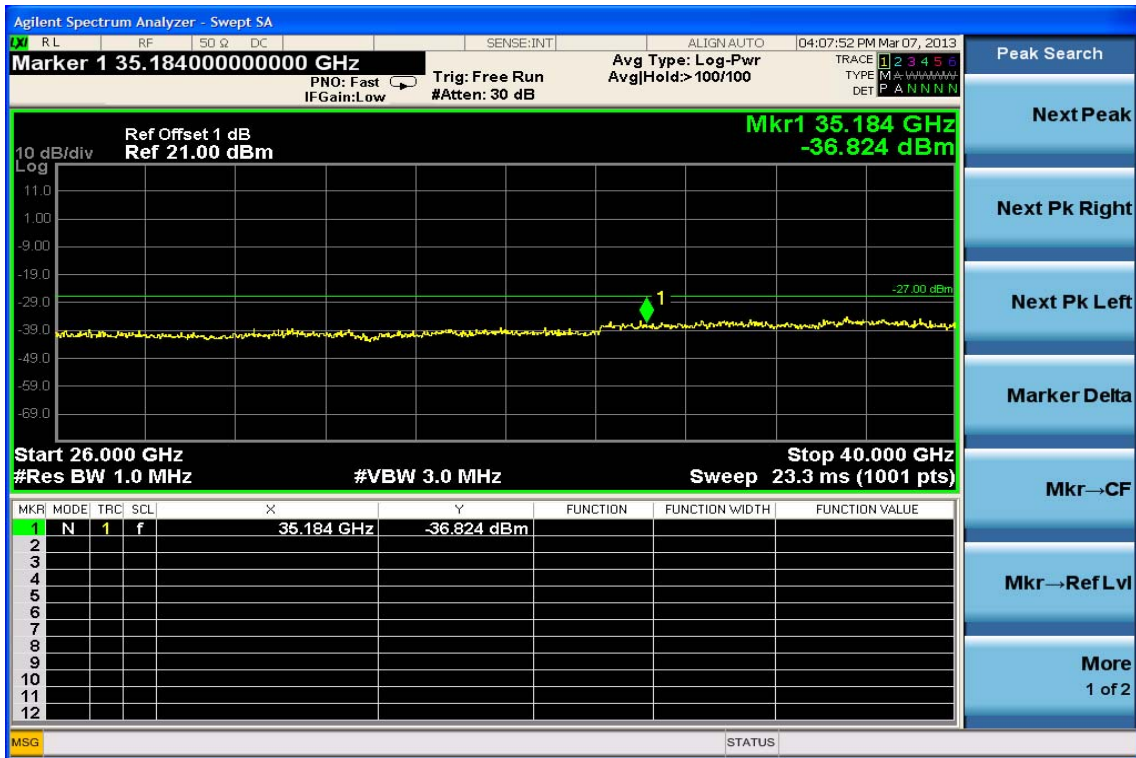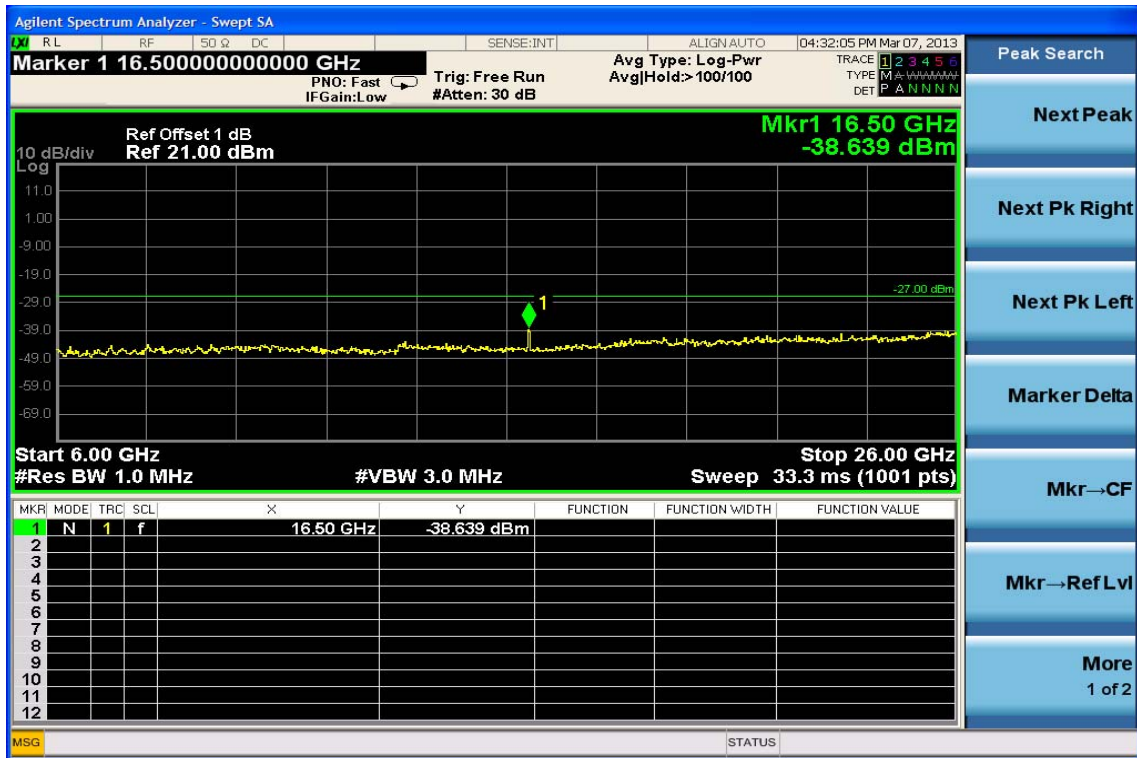
5500MHz, 6GHz – 18GHz
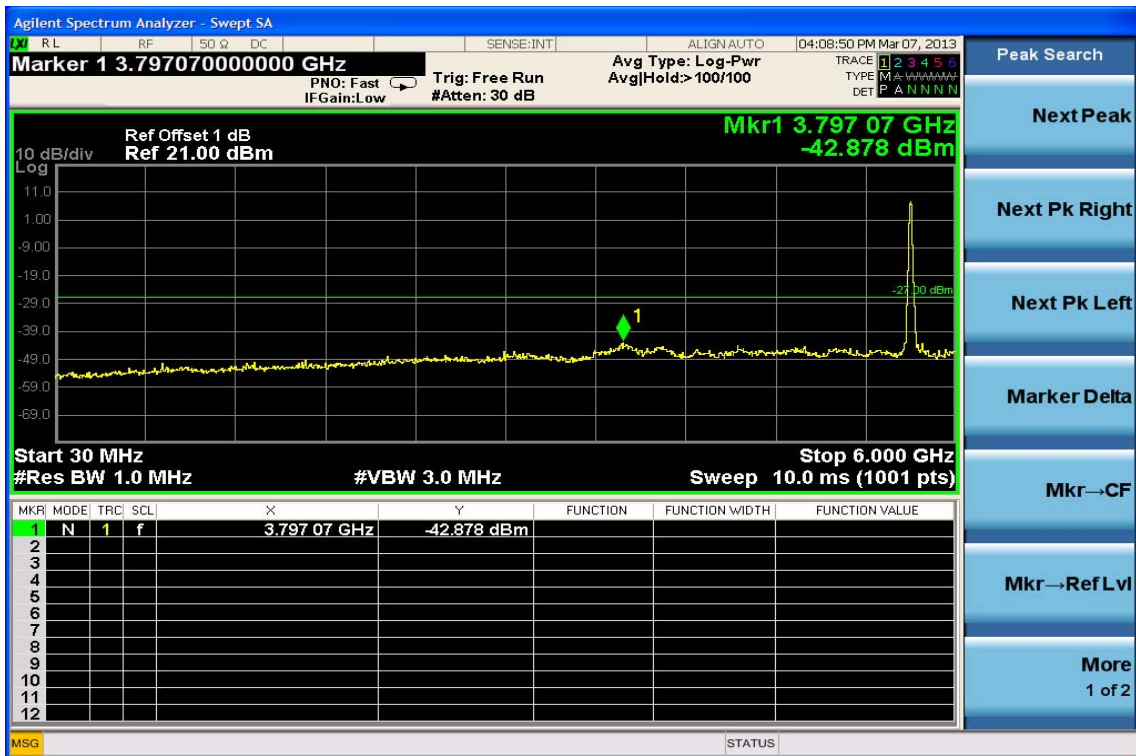

5500MHz, 18GHz – 40GHz
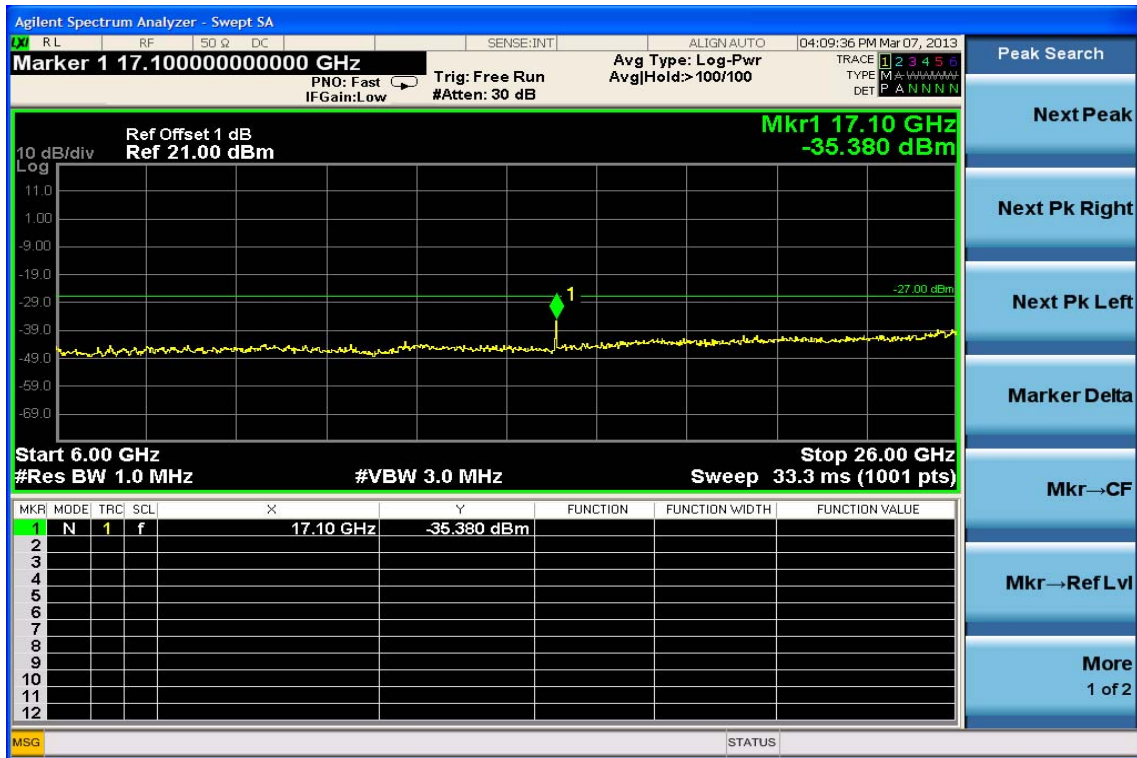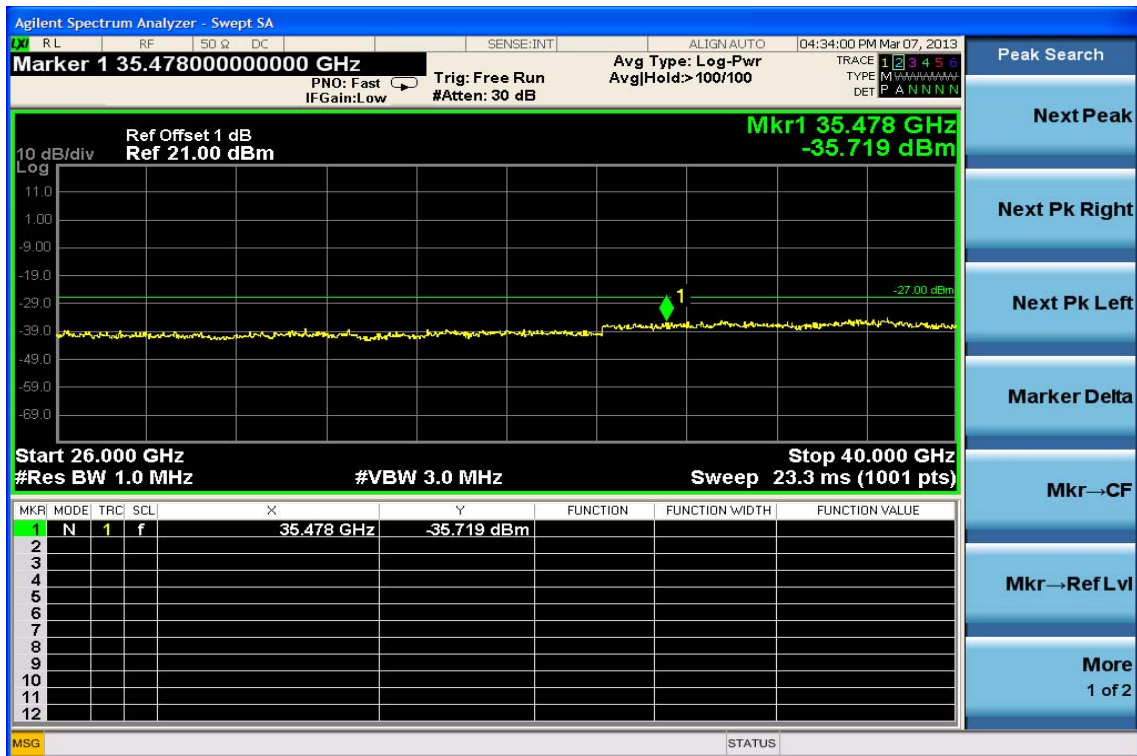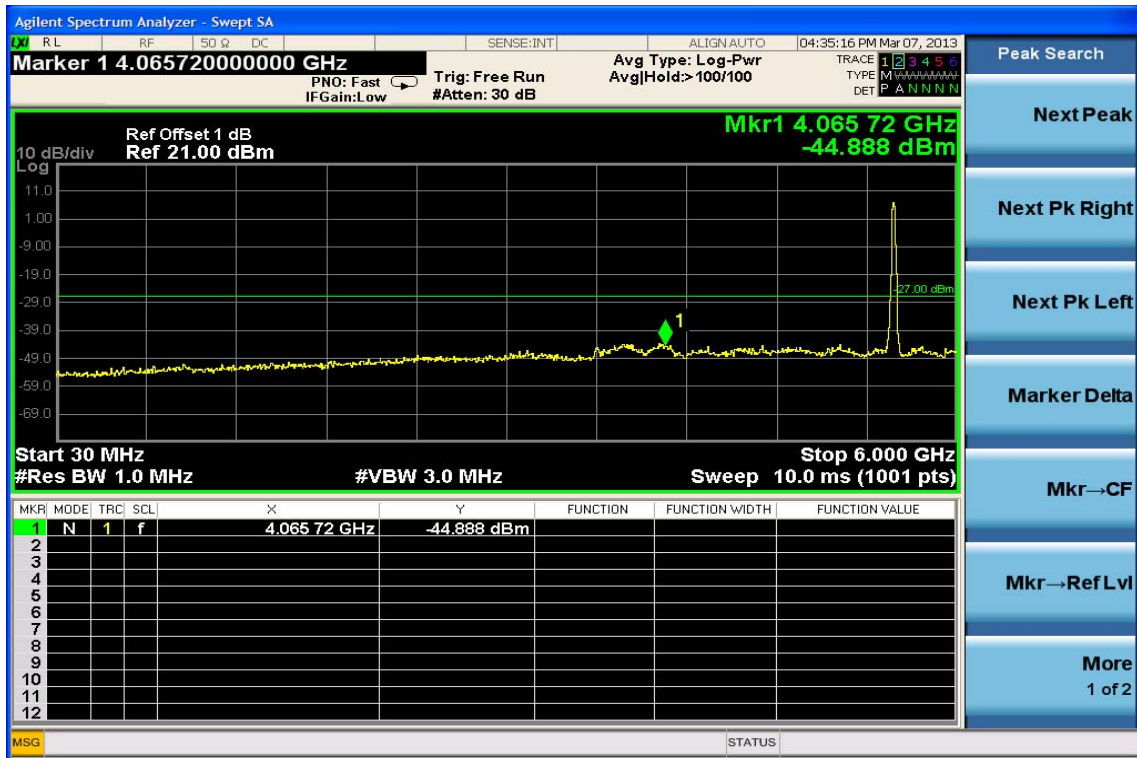
5580MHz, 30MHz – 6GHz
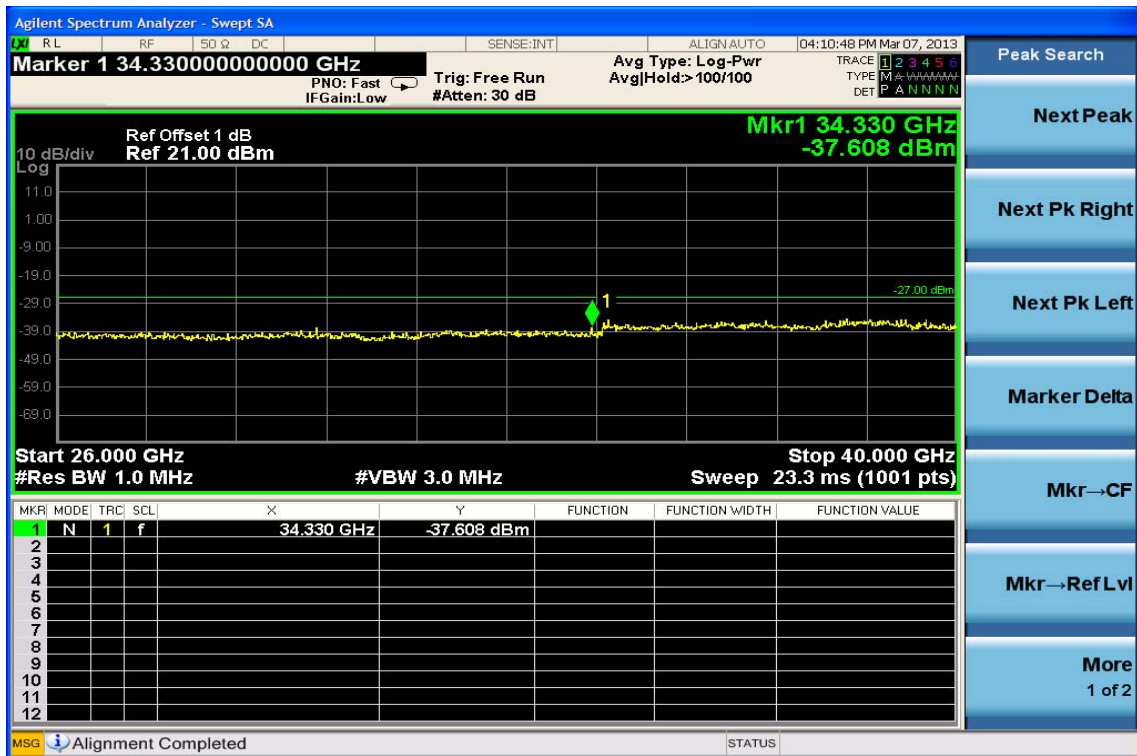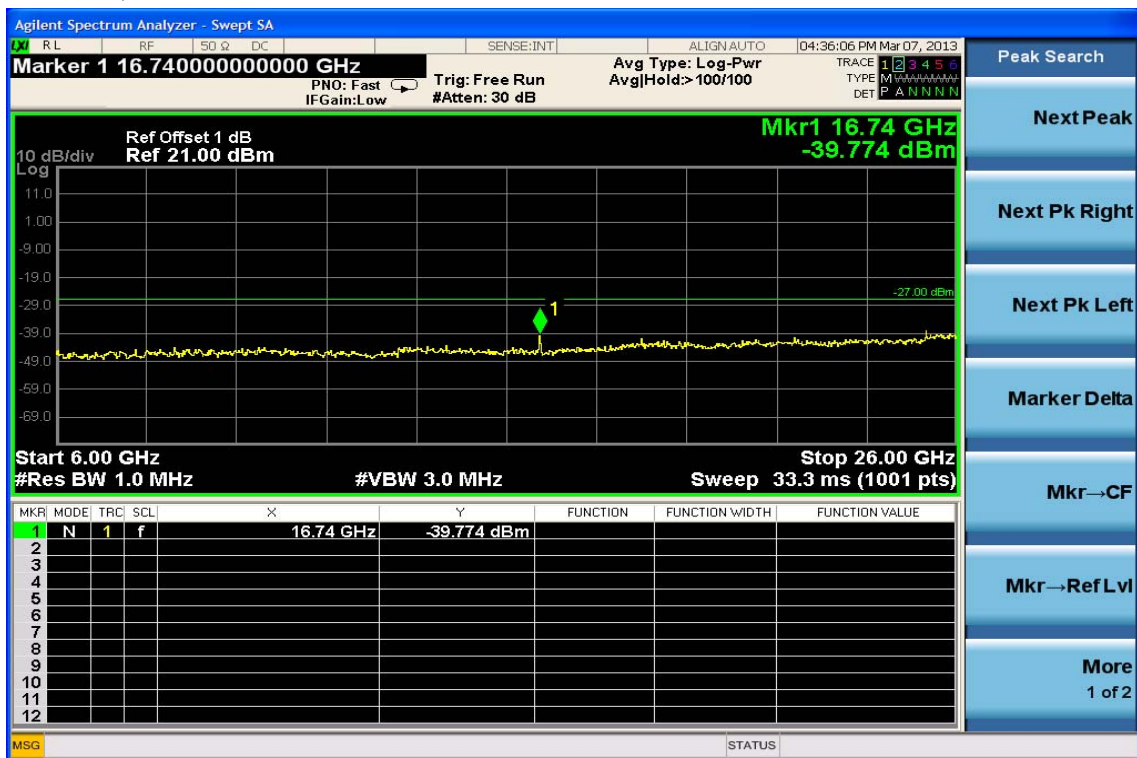

5580MHz, 6GHz – 18GHz
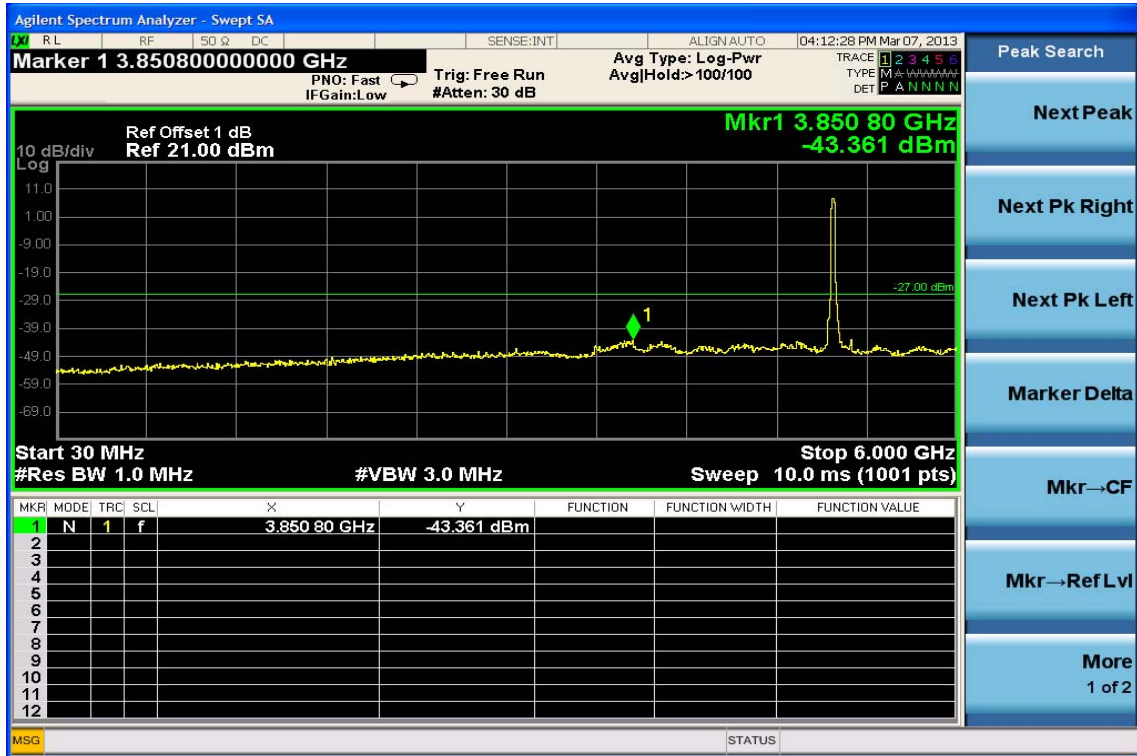
5580MHz, 18GHz – 40GHz
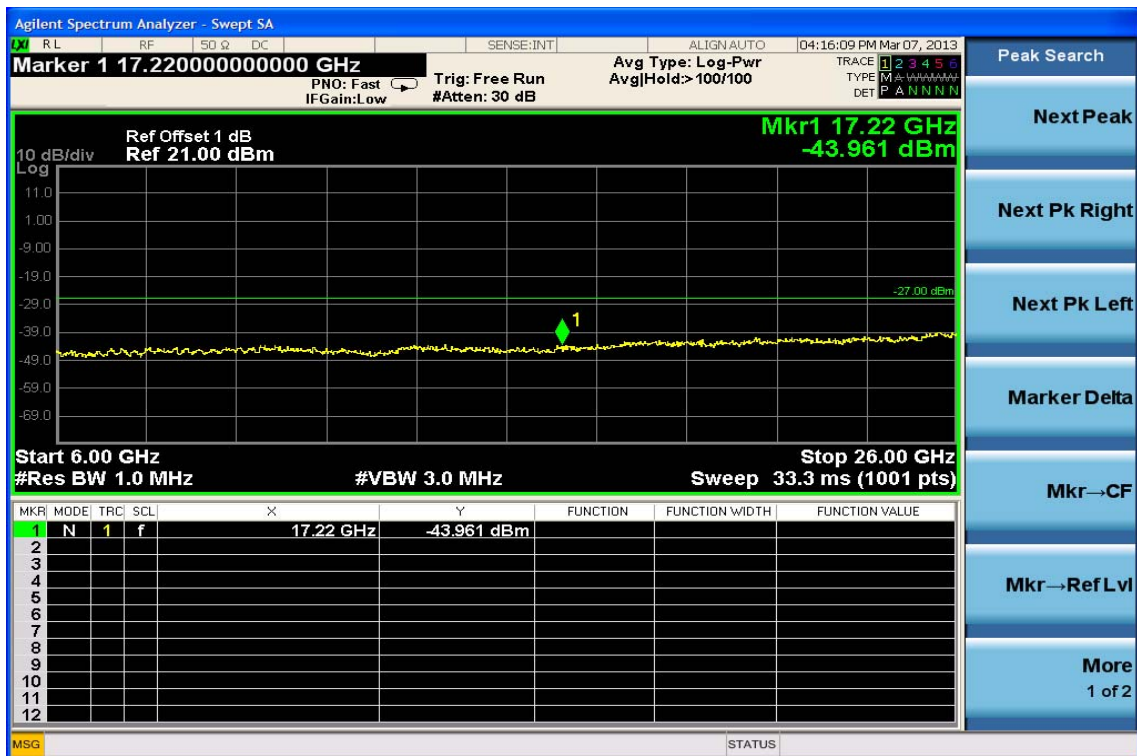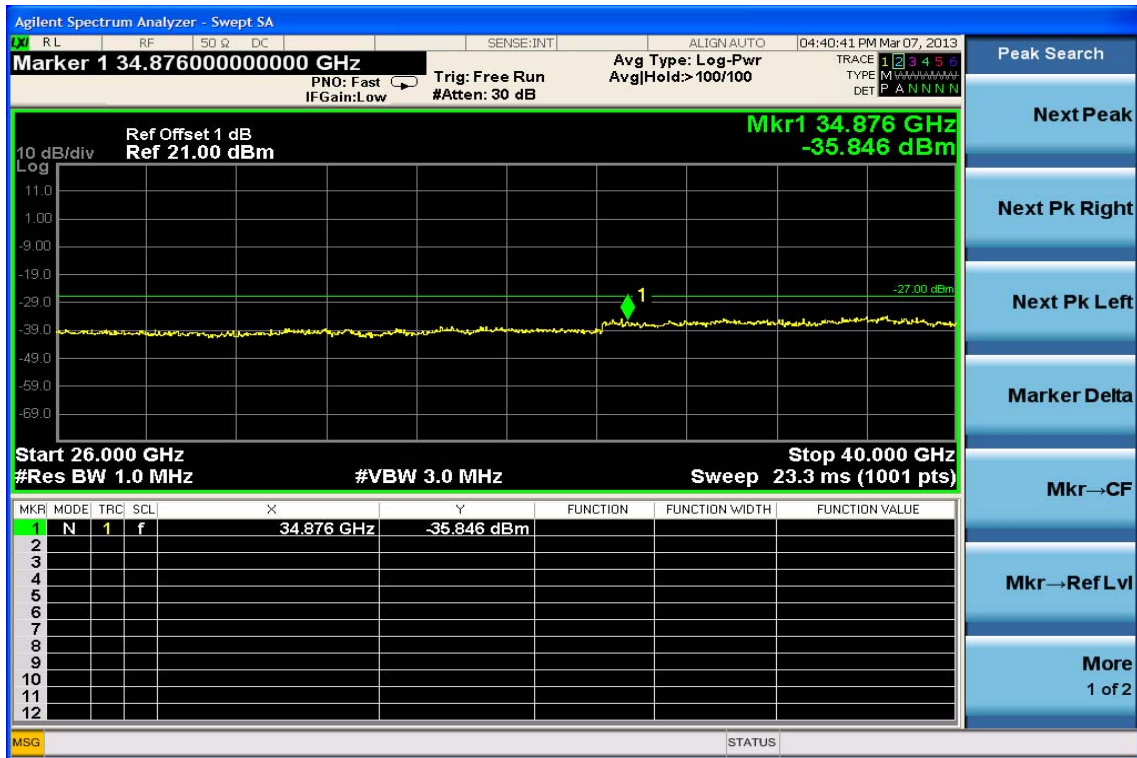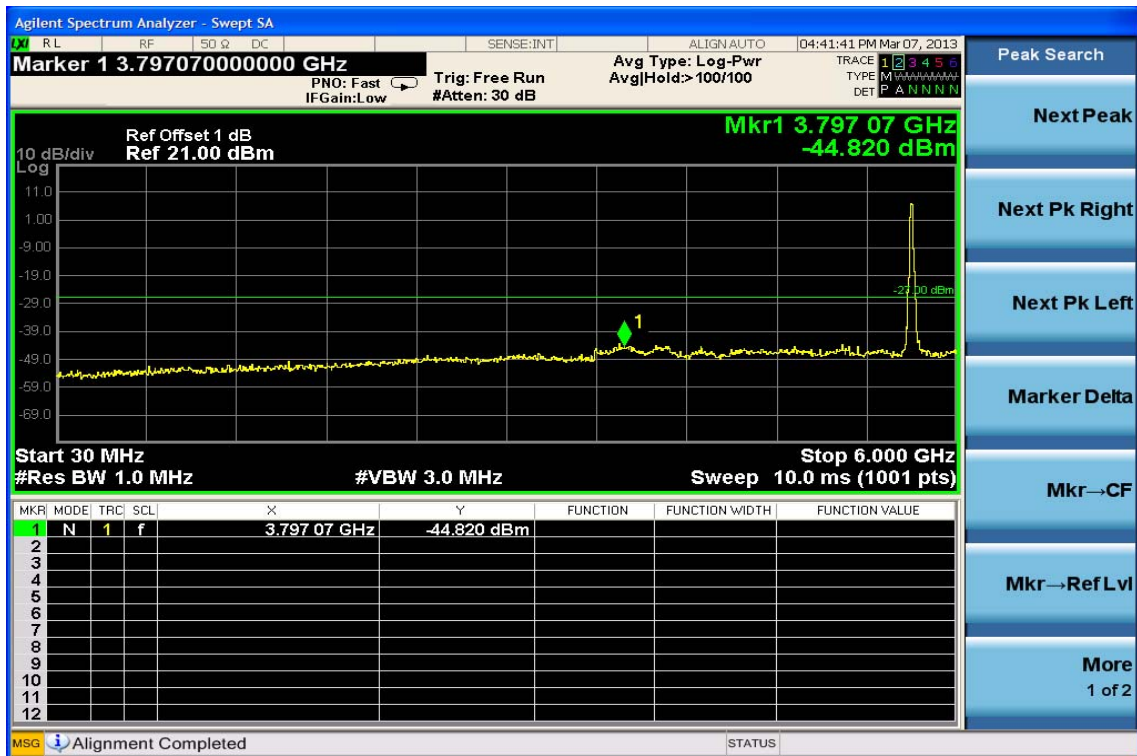

5700MHz, 30MHz – 6GHz
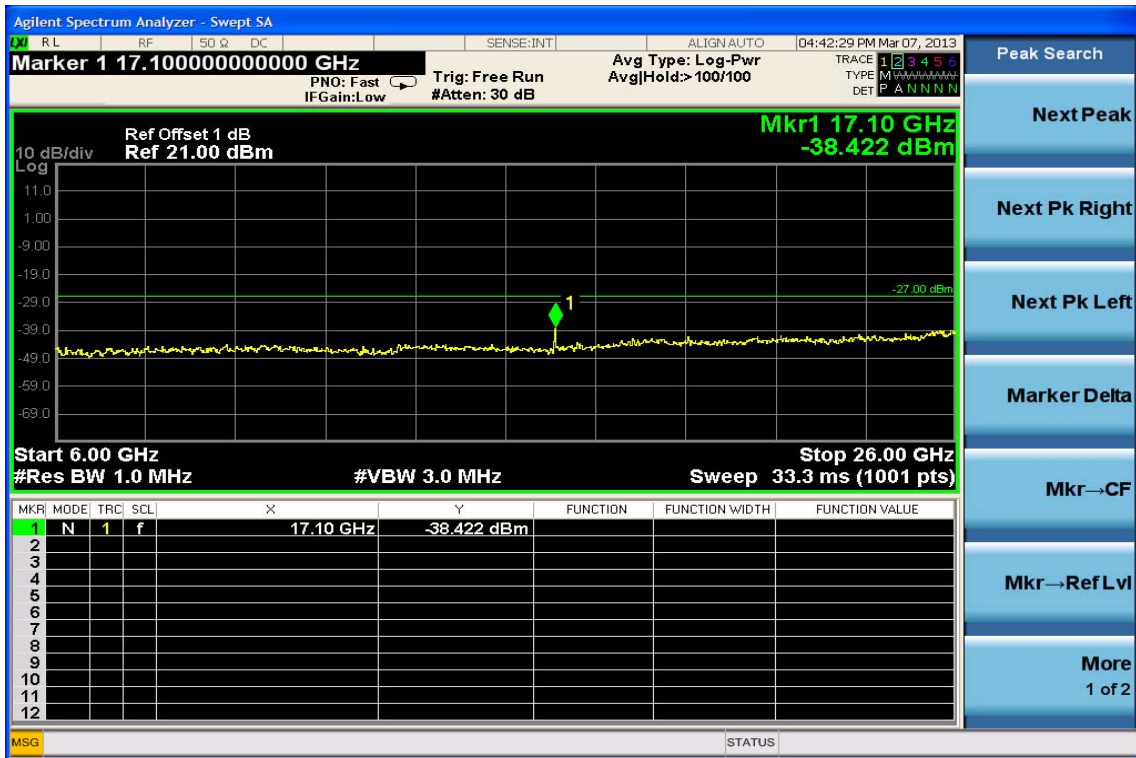
5700MHz, 6GHz – 18GHz

5700MHz, 18GHz – 40GHz
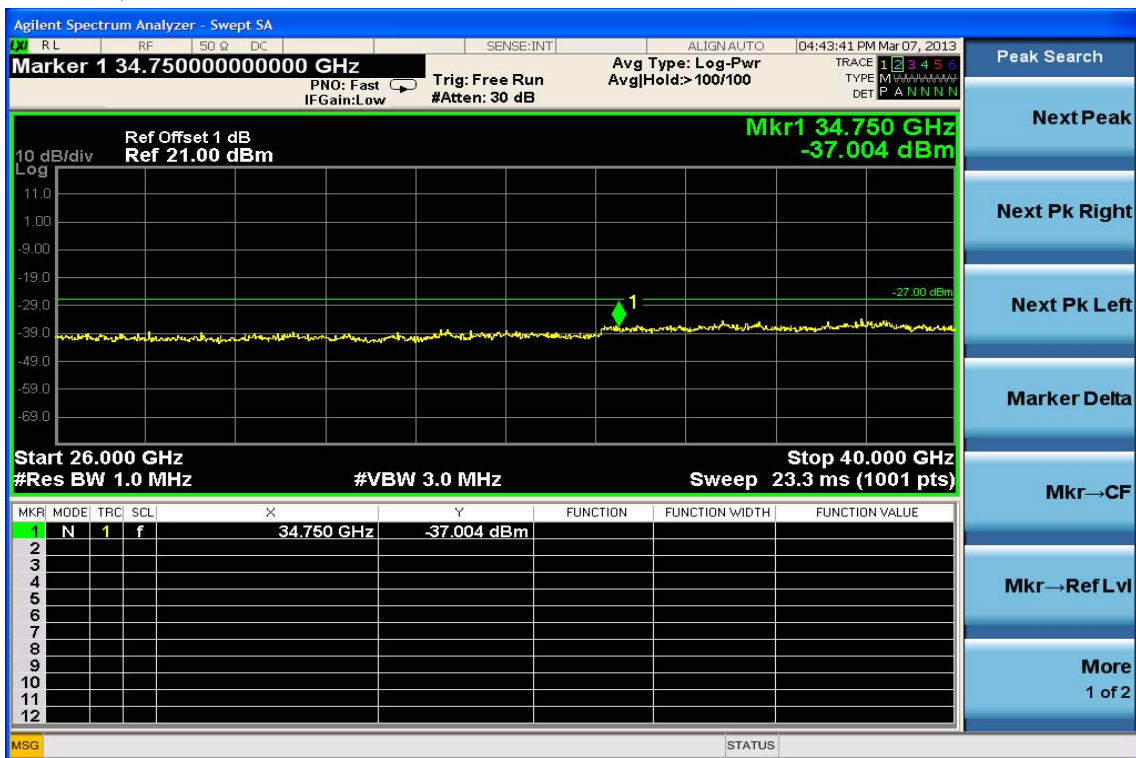
11. UNDESIRABLE EMISSION - RADICTED MEASUREMENT

11.1 Standard Applicable

According to §15.407(b),

(b) Undesirable Emission Limits: Except as shown in Paragraph (b)(6) of this section, the peak emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

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

(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.

(3) 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.

(4) For transmitters operating in the 5.725-5.825 GHz band: all emissions within the frequency range from the band edge to 10 MHz above or below the band edge shall not exceed an EIRP of -17 dBm/MHz; for frequencies 10 MHz or greater above or below the band edge, emissions shall not exceed an EIRP of -27 dBm/MHz.

(5) The above emission measurements shall be performed using a minimum resolution bandwidth of 1 MHz. A lower resolution bandwidth may be employed near the band edge, when necessary, provided the measured energy is integrated to show the total power over 1 MHz.

(6) Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in Section 15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in Section 15.207.

(7) The provisions of Section 15.205 of this part apply to intentional radiators operating under this section.

(8) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the upper and lower frequency block edges as the design of the equipment permits.

§15.205- RESTRICTED BANDS OF OPERATIONS

(a) Except as shown 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	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	([2])
13.36 - 13.41	322 - 335.4		

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209.   At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector.   Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions.   The provisions in Section 15.35 apply to these measurements.

§15.209- RADIATED EMISSION LIMITS: GENERAL REQUIREMENTS

FCC PART 15.209

MEASURING DISTANCE OF 3 METER		
FREQUENCY RANGE (MHz)	FIELD STRENGTH (Microvolts/m)	FIELD STRENGTH (dBuV/m)
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

According to RSS-210 A9.2

1. For transmitters operating in the band 5150-5250 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27dBm/MHz e.i.r.p.

2. For transmitters operating in the band 5250-5350 MHz, all emissions outside the band 5150-5350 MHz shall not exceed -27dBm/MHz e.i.r.p. Devices operating in the band 5250-5350 MHz that generate emissions in the band 5150-5250 MHz shall not exceed an out-of-band emission limit of -27dBm/MHz e.i.r.p. in the band 5150-5250 MHz in order to operate indoor/outdoor, or alternatively shall comply with the spectral power density for operation within the band 5150-5250 MHz and shall be labeled "for indoor use only".

3. For transmitters operating in the band 5470-5725 MHz, all emissions outside that band shall not exceed -27dBm/MHz e.i.r.p.

4. For transmitters operating in the band 5725-5825 MHz, all emissions within the frequency range from the band edges to 10 MHz above or below the band edges shall not exceed -17dBm/MHz e.i.r.p. For frequencies more than 10 MHz above or below the band edges, emissions shall not exceed -27dBm/MHz.

11.2 EUT Setup

1. The radiated emission tests were performed in the 3 meter open-test site, using the setup in accordance with the ANSI C63.4-1992.

2. The EUT was put in the front of the test table. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse   were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.

3. The keyboard was placed directly in the front of the monitor, flushed with the front table-top. The mouse was placed next to the Keyboard, flushed with the back of keyboard.

4. The spacing between the peripherals was 10 centimeters.

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

6. The host PC system was connected with 120Vac/60Hz power source.

11.3 Measurement Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.

2. The turn table shall rotate 360 degrees to determine the position of maximum emission level.

3. EUT is set 3m away from the receiving antenna which varied from 1m to 4m to find out the highest emissions.

4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.

5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.

6. Repeat above procedures until all frequency measured were complete.
    Refer to section E of KDB Document: KDB789033 D01 General UNII Test Procedures v01r02

11.4 Test SET-UP (Block Diagram of Configuration)

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz
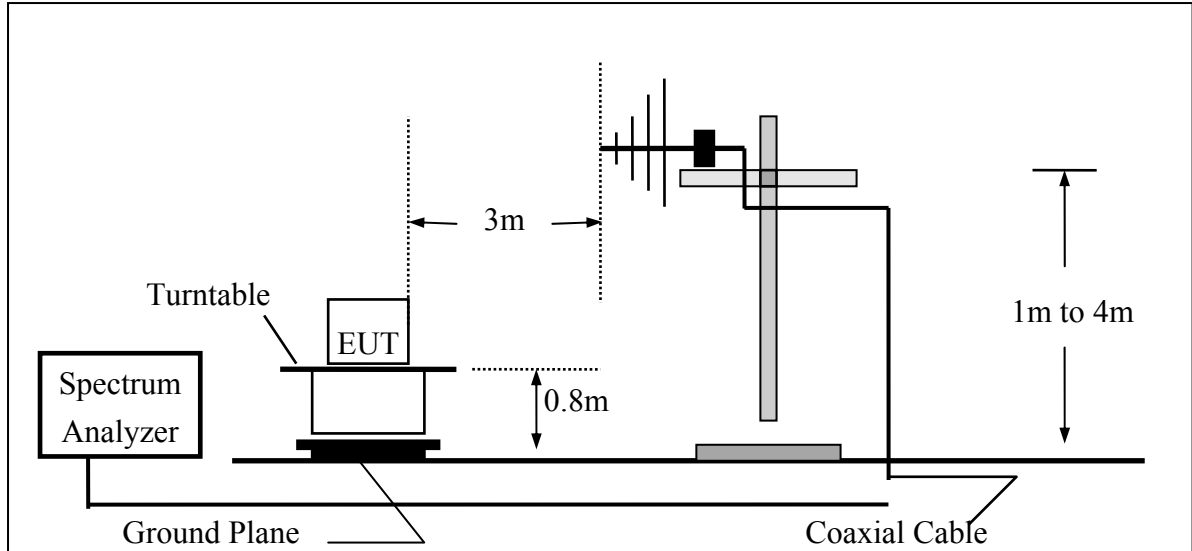
(B) Radiated Emission Test Set-UP Frequency Over 1 GHz
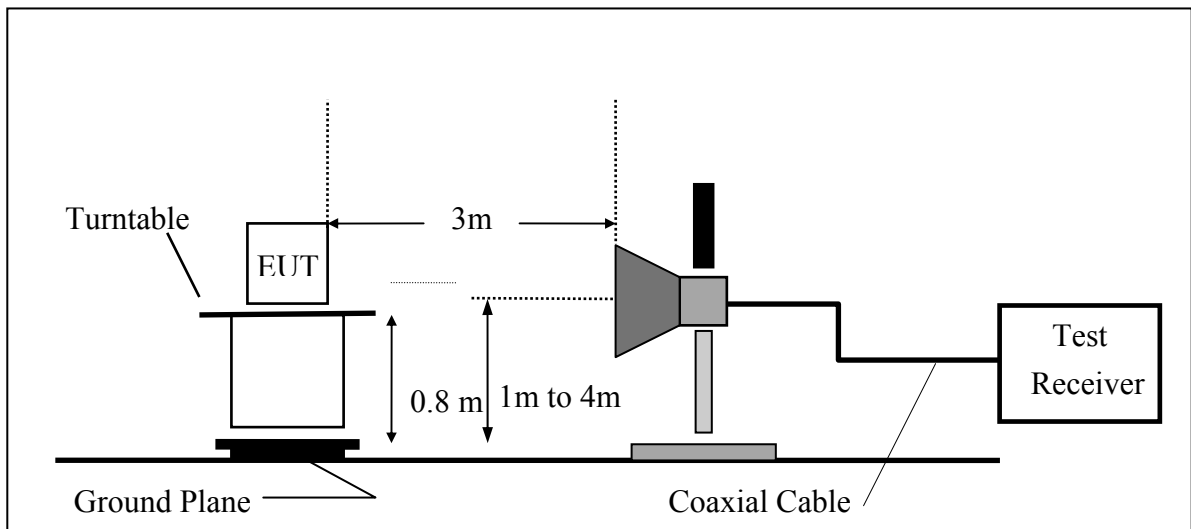
11.5　Measurement Equipment Used:

Chamber 14(966)					
EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	CAL DUE.
Spectrum Analyzer 21(26.5GHz)	Agilent	N9010A	MY49060537	07/17/2012	07/16/2013
Spectrum Analyzer 20(6.5GHz)	Agilent	E4443A	MY48250315	05/24/2012	05/23/2013
Spectrum Analyzer 22(43GHz)	R&S	FSU43	100143	04/25/2012	04/24/2013
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	02/28/2012	02/27/2014
Bilog Antenna30-1G	Schaffner	CBL 6111B	2756	01/13/2013	01/12/2014
Horn antenna1-18G	COM-POWER	AH118	2011071401	03/01/2013	02/29/2014
Horn antenna1-18G(06)	EMCO	3117	0006665	10/15/2012	10/14/2013
Horn antenna26-40G(05)	Com-power	AH-640	100A	01/09/2013	01/08/2015
Horn antenna18-26G(04)	Com-power	AH-826	081001	05/04/2011	05/03/2013
Preamplifier9-1000M	HP	8447D	NA	02/19/2013	02/18/2014
Preamplifier1-18G	MITEQ	AFS44-00101800-25-10P-44	1329256	07/23/2012	07/22/2013
Preamplifier1-26G	EM	EM01M26G	NA	02/26/2013	02/25/2014
Preamplifier26-40G	MITEQ	JS-26004000-27-5A	818471	05/21/2011	05/20/2013
Cable1-18G	HUBER SUHNER	Sucoflex 106	NA	09/07/2012	09/06/2013
Cable UP to 1G	HUBER SUHNER	RG 214/U	NA	10/08/2012	10/07/2013
SUCOFLEX 1GHz~40GHz cable	HUBER SUHNER	Sucoflex 102	27963/2&37421/2	09/21/2011	09/20/2013
2.4G Filter	Micro-Tronics	Brm50702	76	12/27/2012	12/26/2013
5G Filter	Micro-Tronics	Brm50716	005	12/27/2012	12/26/2013

11.6   Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor(if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CL - AG

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

11.7   Measurement Result

Refer to attach tabular data sheets.

NOTE:

The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 100kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.

FCC ID: HLZFX1

IC: 1754F-FX1

Radiated Spurious Emission Measurement Result (below 1GHz) (worst case)

Operation Mode	802.11a TX CH Low	Test Date	2013/03/12
Fundamental Frequency	5180MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	72.68	44.97	-16.65	28.32	40.00	-11.68	Peak	VERTICAL
2	161.92	35.42	-13.53	21.89	43.50	-21.61	Peak	VERTICAL
3	269.59	36.67	-13.41	23.26	46.00	-22.74	Peak	VERTICAL
4	555.74	35.49	-7.90	27.59	46.00	-18.41	Peak	VERTICAL
5	600.36	38.34	-6.74	31.60	46.00	-14.40	Peak	VERTICAL
6	655.65	35.32	-5.90	29.42	46.00	-16.58	Peak	VERTICAL
1	71.71	46.29	-16.39	29.90	40.00	-10.10	Peak	HORIZONTAL
2	140.58	38.50	-13.87	24.63	43.50	-18.87	Peak	HORIZONTAL
3	241.46	46.90	-14.34	32.56	46.00	-13.44	Peak	HORIZONTAL
4	340.40	36.89	-11.67	25.22	46.00	-20.78	Peak	HORIZONTAL
5	555.74	39.17	-7.90	31.27	46.00	-14.73	Peak	HORIZONTAL
6	599.39	39.26	-6.76	32.50	46.00	-13.50	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz) (worst case)

Operation Mode	802.11a TX CH Mid	Test Date	2013/03/12
Fundamental Frequency	5260MHz	Test By	Dino
Temperature	25 ℃	Pol	Ver./Hor
Humidity	60 %		

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	71.71	45.08	-16.39	28.69	40.00	-11.31	Peak	VERTICAL
2	162.89	35.29	-13.62	21.67	43.50	-21.83	Peak	VERTICAL
3	256.01	35.61	-14.00	21.61	46.00	-24.39	Peak	VERTICAL
4	338.46	39.23	-11.69	27.54	46.00	-18.46	Peak	VERTICAL
5	480.08	32.61	-9.22	23.39	46.00	-22.61	Peak	VERTICAL
6	641.10	36.95	-6.11	30.84	46.00	-15.16	Peak	VERTICAL
1	71.71	47.62	-16.39	31.23	40.00	-8.77	Peak	HORIZONTAL
2	165.80	38.51	-13.86	24.65	43.50	-18.85	Peak	HORIZONTAL
3	232.73	47.02	-14.83	32.19	46.00	-13.81	Peak	HORIZONTAL
4	342.34	37.41	-11.65	25.76	46.00	-20.24	Peak	HORIZONTAL
5	555.74	41.47	-7.90	33.57	46.00	-12.43	Peak	HORIZONTAL
6	641.10	43.66	-6.11	37.55	46.00	-8.45	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (below 1GHz) (worst case)

Operation Mode	802.11a TX CH High		Test Date	2013/03/12
Fundamental Frequency	5320MHz		Test By	Dino
Temperature	25 ℃		Pol	Ver./Hor
Humidity	60 %			

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	71.71	44.88	-16.39	28.49	40.00	-11.51	Peak	VERTICAL
2	160.95	36.10	-13.46	22.64	43.50	-20.86	Peak	VERTICAL
3	256.01	35.31	-14.00	21.31	46.00	-24.69	Peak	VERTICAL
4	367.56	38.64	-11.08	27.56	46.00	-18.44	Peak	VERTICAL
5	600.36	37.14	-6.74	30.40	46.00	-15.60	Peak	VERTICAL
6	641.10	36.27	-6.11	30.16	46.00	-15.84	Peak	VERTICAL
1	55.22	43.33	-14.36	28.97	40.00	-11.03	Peak	HORIZONTAL
2	230.79	39.97	-14.96	25.01	46.00	-20.99	Peak	HORIZONTAL
3	365.62	40.06	-11.13	28.93	46.00	-17.07	Peak	HORIZONTAL
4	600.36	42.50	-6.74	35.76	46.00	-10.24	Peak	HORIZONTAL
5	641.10	39.68	-6.11	33.57	46.00	-12.43	Peak	HORIZONTAL
6	940.83	32.59	-1.38	31.21	46.00	-14.79	Peak	HORIZONTAL

Remark:

1 No further spurious emissions detected from the lowest internal frequency and 30MHz.

2 Measuring frequencies from the lowest internal frequency to the 1GHz.

3 Radiated emissions measured in frequency range from 9MHz to 1000MHz were made with an instrument detector setting 9-90KHz/110-490KHz using PK/AV and other Frequency Band using PK/QP

4 Measurement result within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5 The IF bandwidth of SPA between 9kHz to 30MHz was 10kHz, VBW= 30kHz; between 30MHz to 1GHz was 100KHz, VBW=300KHz.

Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11a TX CH Low	Test Date	2013/03/12
Fundamental Frequency	5180MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	2288.00	51.88	-11.51	40.37	74.00	-33.63	Peak	VERTICAL
2	4206.00	48.65	-4.54	44.11	74.00	-29.89	Peak	VERTICAL
3	10360.00	30.71	6.98	37.69	74.00	-36.31	Peak	VERTICAL
1	1112.00	53.74	-16.58	37.16	74.00	-36.84	Peak	HORIZONTAL
2	3198.00	50.46	-8.68	41.78	74.00	-32.22	Peak	HORIZONTAL
3	10360.00	31.81	6.98	38.79	74.00	-35.21	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11a TX CH Mid	Test Date	2013/03/12
Fundamental Frequency	5260MHz	Test By	Dino
Temperature	25 ℃	Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	1371.00	53.91	-15.84	38.07	74.00	-35.93	Peak	VERTICAL
2	4787.00	49.91	-2.38	47.53	74.00	-26.47	Peak	VERTICAL
3	10520.00	37.49	7.22	44.71	74.00	-29.29	Peak	VERTICAL
1	2456.00	51.67	-11.07	40.60	74.00	-33.40	Peak	HORIZONTAL
2	2799.00	51.09	-9.95	41.14	74.00	-32.86	Peak	HORIZONTAL
3	10520.00	35.81	7.22	43.03	74.00	-30.97	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Radiated Spurious Emission Measurement Result (above 1GHz) (worst case)

Operation Mode	802.11a TX CH High		Test Date	2013/03/12
Fundamental Frequency	5230MHz		Test By	Dino
Temperature	25 ℃		Humidity	60 %

No	Freq MHz	Reading dBuV	Factor dB	Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark	Pol V/H
1	3289.00	50.26	-8.40	41.86	74.00	-32.14	Peak	VERTICAL
2	4325.00	48.15	-4.06	44.09	74.00	-29.91	Peak	VERTICAL
3	10640.00	36.38	7.27	43.65	74.00	-30.35	Peak	VERTICAL
1	1455.00	53.39	-15.61	37.78	74.00	-36.22	Peak	HORIZONTAL
2	3002.00	50.64	-9.29	41.35	74.00	-32.65	Peak	HORIZONTAL
3	10640.00	35.21	7.27	42.48	74.00	-31.52	Peak	HORIZONTAL

Remark:

1 Measuring frequencies from the lowest internal frequency to the 10th of fundamental frequency

2 Field strength limits for frequency above 1000MHz are based on average limits. However, Peak mode field strength shall not exceed the average limits specified plus 20dB.

3 Measurement of data within this frequency range shown " - " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4 Spectrum Peak mode IF bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, Sweep time= 200 ms., the VBW setting was 3 MHz.

5 Spectrum AV mode if bandwidth Setting : 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

Band Edges Test Data
802.11a mode, 5180MHz

802.11a mode, 5320MHz