8 100KHz BANDWIDTH OF BAND EDGES MEASUREMENT

8.1 Standard Applicable:

According to §15.247(c), in any 100 KHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100KHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

According to RSS-210 issue 8, §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. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3.

8.2 Measurement Equipment Used:

8.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

8.2.2 Radiated emission:

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
Dipole antenna	SCHWARZBECK	VHAP,30-300	919	11/16/2011	11/15/2013
Dipole antenna	SCHWARZBECK	UHAP,300-1000	1195	10/25/2011	10/24/2013
Loop Antenna9K-30M	A.H.SYSTEM	SAS-564	294	02/27/2013	02/26/2014
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	02/10/2013	02/09/2014
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
Signal Generator	R&S	SMU200A	102330	02/19/2013	02/18/2014
Signal Generator	Anritsu	MG3692A	20311	09/18/2012	09/17/2013
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

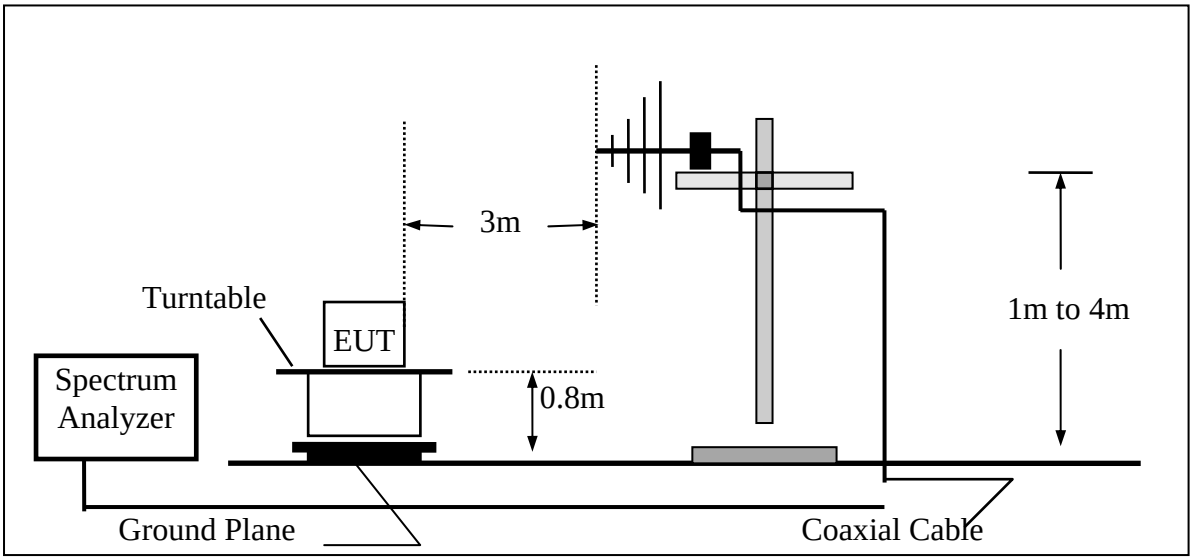
8.3 Test SET-UP:

8.3.1 Conducted Emission at antenna port:

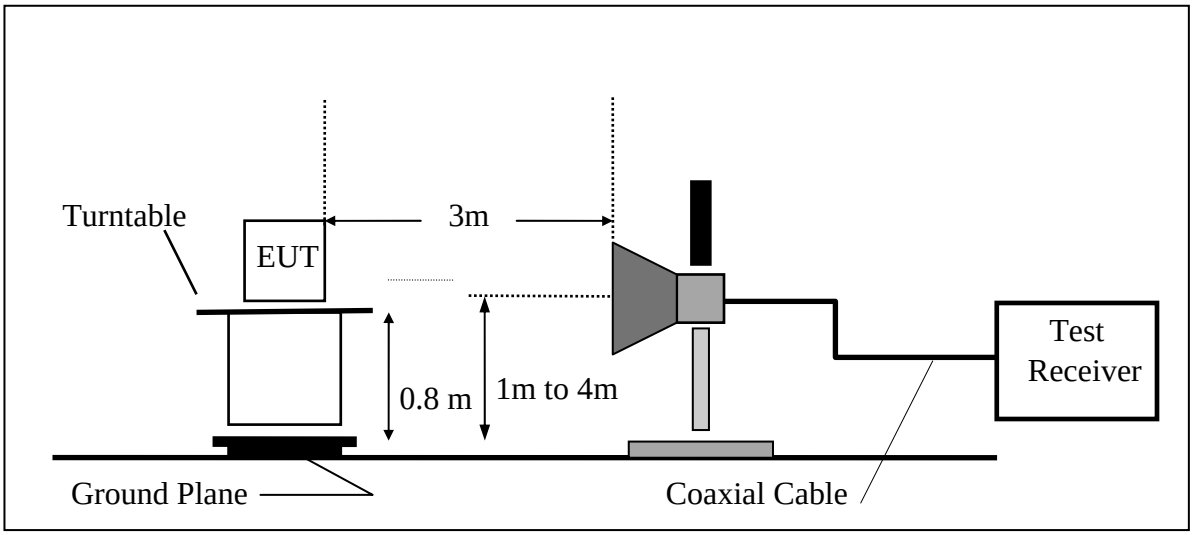
Refer to section 6.3 for details.

8.3.2 Radiated emission:

(A) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(B) Radiated Emission Test Set-UP Frequency Over 1 GHz



8.4 Measurement Procedure:

1. Place the EUT on the table 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 the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span=25MHz, Sweep = auto
5. Mark Peak, 2.390GHz and 2.4835GHz and record the max. level.
6. Repeat above procedures until all frequency measured were complete.

Refer to section 11 and 12 emissions in restricted and non-restricted frequency bands Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r01

The measurement of unwanted emissions at the edge of the authorized frequency bands can be complicated by the leakage of RF energy from the fundamental emission into the RBW pass band. Thus, for measurements at the band edges, a narrower resolution bandwidth (no less than 10 kHz) can be used within the first 1 MHz beyond the fundamental emission, provided that that measured energy is subsequently integrated over the appropriate reference bandwidth (i.e., 100 kHz or 1 MHz). This integration can be performed using the band power function of the spectrum analyzer or by summing the spectral levels (in linear power units) over the appropriate reference bandwidth.

8.5 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	

8.6 Measurement Result:

Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

802.11b

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

Radiated Emission: 802.11b mode

Operation Mode	TX CH Low	Test Date	2013/03/14
Fundamental Frequency	2412 MHz	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	2324.45	54.23	-11.42	42.81	74.00	-31.19	Peak	VERTICAL
2	2390.00	52.10	-11.25	40.85	74.00	-33.15	Peak	VERTICAL
1	2386.16	54.03	-11.26	42.77	74.00	-31.23	Peak	HORIZONTAL
2	2390.00	54.00	-11.25	42.75	74.00	-31.25	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2013/03/14
Fundamental Frequency	2462 MHz	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	2483.50	51.33	-11.01	40.32	74.00	-33.68	Peak	VERTICAL
2	2497.07	54.33	-10.97	43.36	74.00	-30.64	Peak	VERTICAL
1	2483.50	54.90	-11.01	43.89	74.00	-30.11	Peak	HORIZONTAL
2	2483.82	56.38	-11.01	45.37	74.00	-28.63	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.

802.11g

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

Radiated Emission: 802.11g mode

Operation Mode	TX CH Low	Test Date	2013/03/14
Fundamental Frequency	2412 MHz	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	2390.00	55.49	-11.25	44.24	74.00	-29.76	Peak	VERTICAL
1	2389.52	47.72	-11.25	36.47	54.00	-17.53	Average	HORIZONTAL
2	2389.52	68.54	-11.25	57.29	74.00	-16.71	Peak	HORIZONTAL
3	2390.00	49.39	-11.25	38.14	54.00	-15.86	Average	HORIZONTAL
4	2390.00	68.42	-11.25	57.17	74.00	-16.83	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2013/03/14
Fundamental Frequency	2462 MHz	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	2483.50	52.21	-11.01	41.20	74.00	-32.80	Peak	VERTICAL
2	2484.21	53.14	-11.01	42.13	74.00	-31.87	Peak	VERTICAL
1	2483.50	49.74	-11.01	38.73	54.00	-15.27	Average	HORIZONTAL
2	2483.50	63.83	-11.01	52.82	74.00	-21.18	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.

802.11n_20M for 2.4GHz (chain a), Conducted

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

802.11n_20M for 2.4GHz (chain b)

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

Radiated Emission: 802.11 n_20M mode

Operation Mode	TX CH Low	Test Date	2013/03/14
Fundamental Frequency	2412 MHz	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	2390.00	55.20	-11.25	43.95	74.00	-30.05	Peak	VERTICAL
1	2390.00	62.01	-11.25	50.76	74.00	-23.24	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2013/03/14
Fundamental Frequency	2462 MHz	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	2483.50	51.22	-11.01	40.21	74.00	-33.79	Peak	VERTICAL
2	2497.17	53.84	-10.97	42.87	74.00	-31.13	Peak	VERTICAL
1	2483.50	49.79	-11.01	38.78	54.00	-15.22	Average	HORIZONTAL
2	2483.50	65.75	-11.01	54.74	74.00	-19.26	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.

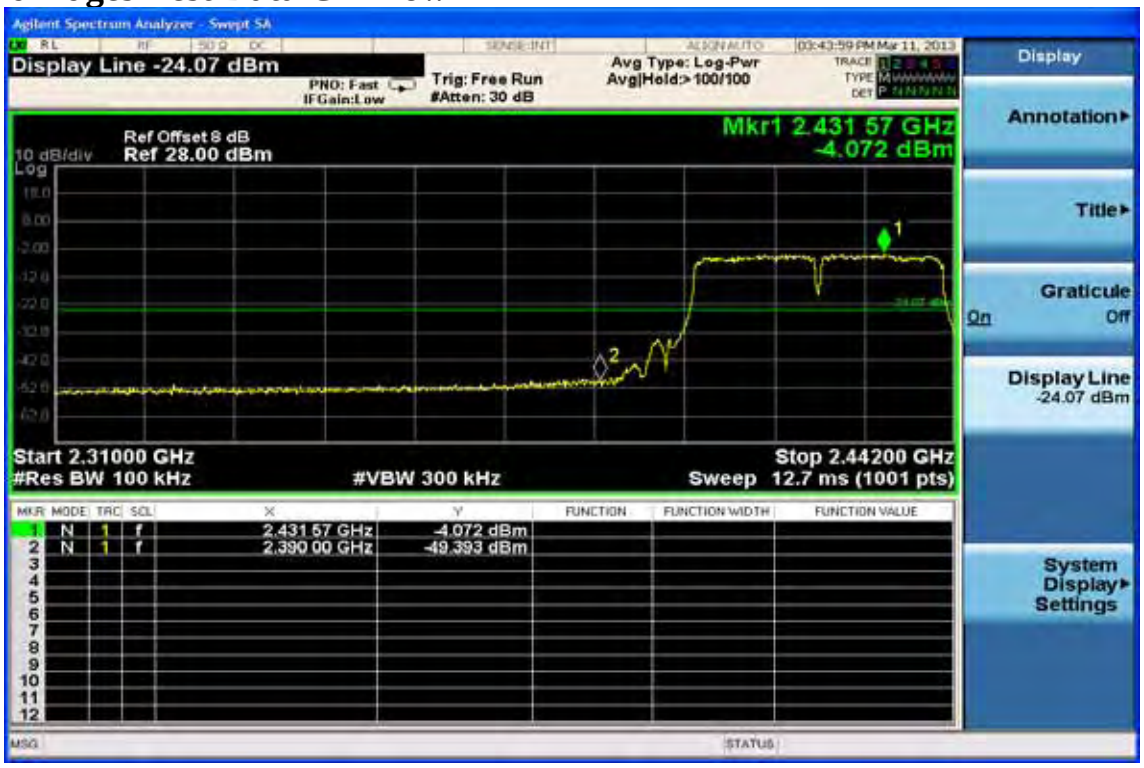
802.11n_40M for 2.4GHz (chain a), Conducted

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

802.11n_40M for 2.4GHz (chain b)

Band Edges Test Data CH-Low



Band Edges Test Data CH-High

Radiated Emission: 802.11 n_40M mode

Operation Mode	TX CH Low	Test Date	2013/03/14
Fundamental Frequency	2422 MHz	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	2390.00	52.28	-11.25	41.03	74.00	-32.97	Peak	VERTICAL
1	2387.22	62.60	-11.26	51.34	74.00	-22.66	Peak	HORIZONTAL
2	2390.00	60.18	-11.25	48.93	74.00	-25.07	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2013/03/14
Fundamental Frequency	2452 MHz	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	2483.50	51.46	-11.01	40.45	74.00	-33.55	Peak	VERTICAL
2	2495.72	53.83	-10.97	42.86	74.00	-31.14	Peak	VERTICAL
1	2483.50	48.93	-11.01	37.92	54.00	-16.08	Average	HORIZONTAL
2	2483.50	65.15	-11.01	54.14	74.00	-19.86	Peak	HORIZONTAL
3	2484.50	48.58	-11.01	37.57	54.00	-16.43	Average	HORIZONTAL
4	2484.50	66.61	-11.01	55.60	74.00	-18.40	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.

802.11a

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

Radiated Emission: 802.11a mode

Operation Mode	TX CH Low	Test Date	2013/03/14
Fundamental Frequency	5745 MHz	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	5724.04	52.00	0.23	52.23	74.00	-21.77	Peak	VERTICAL
2	5725.00	48.49	0.23	48.72	74.00	-25.28	Peak	VERTICAL
1	5724.20	38.11	0.23	38.34	54.00	-15.66	Average	HORIZONTAL
2	5724.20	54.42	0.23	54.65	74.00	-19.35	Peak	HORIZONTAL
3	5725.00	39.09	0.23	39.32	54.00	-14.68	Average	HORIZONTAL
4	5725.00	53.16	0.23	53.39	74.00	-20.61	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2013/03/14
Fundamental Frequency	5825 MHz	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	5850.00	46.78	0.56	47.34	74.00	-26.66	Peak	VERTICAL
2	5850.42	48.35	0.56	48.91	74.00	-25.09	Peak	VERTICAL
1	5850.00	44.52	0.56	45.08	74.00	-28.92	Peak	HORIZONTAL
2	5860.38	47.36	0.58	47.94	74.00	-26.06	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.

802.11n_20M for 5GHz (chain a), Conducted

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

802.11n_20M for 5GHz (chain b)

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

Radiated Emission: 802.11 n_20M mode

Operation Mode	TX CH Low	Test Date	2013/03/14
Fundamental Frequency	5745 MHz	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	5724.37	49.65	0.23	49.88	74.00	-24.12	Peak	VERTICAL
2	5725.00	47.72	0.23	47.95	74.00	-26.05	Peak	VERTICAL
1	5724.15	52.02	0.23	52.25	74.00	-21.75	Peak	HORIZONTAL
2	5725.00	49.22	0.23	49.45	74.00	-24.55	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2013/03/14
Fundamental Frequency	5825 MHz	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	5850.00	46.18	0.56	46.74	74.00	-27.26	Peak	VERTICAL
2	5851.08	47.32	0.56	47.88	74.00	-26.12	Peak	VERTICAL
1	5850.00	45.17	0.56	45.73	74.00	-28.27	Peak	HORIZONTAL
2	5863.13	47.99	0.60	48.59	74.00	-25.41	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.

802.11n_40M for 5GHz (chain a), Conducted

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

802.11n_40M for 5GHz (chain b)

Band Edges Test Data CH-Low

Band Edges Test Data CH-High

Radiated Emission: 802.11 n_40M mode

Operation Mode	TX CH Low	Test Date	2013/03/14
Fundamental Frequency	5755 MHz	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	5722.50	39.04	0.22	39.26	54.00	-14.74	Average	VERTICAL
2	5722.50	54.98	0.22	55.20	74.00	-18.80	Peak	VERTICAL
3	5725.00	40.15	0.23	40.38	54.00	-13.62	Average	VERTICAL
4	5725.00	54.67	0.23	54.90	74.00	-19.10	Peak	VERTICAL
1	5725.00	42.62	0.23	42.85	54.00	-11.15	Average	HORIZONTAL
2	5725.00	56.77	0.23	57.00	74.00	-17.00	Peak	HORIZONTAL

Operation Mode	TX CH High	Test Date	2013/03/14
Fundamental Frequency	5795 MHz	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	5850.00	48.21	0.56	48.77	74.00	-25.23	Peak	VERTICAL
2	5853.05	51.13	0.57	51.70	74.00	-22.30	Peak	VERTICAL
1	5850.00	39.70	0.56	40.26	54.00	-13.74	Average	HORIZONTAL
2	5850.00	50.11	0.56	50.67	74.00	-23.33	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.

9 SPURIOUS RADIATED EMISSION TEST

9.1 Standard Applicable

According to §15.247(c), all other emissions outside these bands shall not exceed the general radiated emission limits specified in §15.209(a). And according to §15.33(a)(1), for an intentional radiator operates below 10GHz, the frequency range of measurements: to the tenth harmonic of the highest fundamental frequency or to 40GHz, whichever is lower.

According to RSS-210 issue 8, §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. In addition, radiated emissions which fall in the restricted bands of Table 1 must also comply with the radiated emission limits specified in Tables 2 and 3

9.2 Measurement Equipment Used:

9.2.1 Conducted Emission at antenna port:

Refer to section 6.2 for details.

9.2.2 Radiated emission:

Refer to section 7.2 for details.

9.3 Test SET-UP:

9.3.1 Conducted Emission at antenna port:

Refer to section 6.3 for details.

9.3.2 Radiated emission:

Refer to section 7.3 for details.

9.4 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. When measurement procedures for electric field radiated emissions above 1 GHz the EUT measurement is to be made "while keeping the antenna in the 'cone of radiation' from that area and pointed at the area both in azimuth and elevation, with polarization oriented for maximum response." is still within the 3dB illumination BW of the measurement antenna.
5. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
6. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
7. Repeat above procedures until all frequency measured were complete.

Refer to section 11 and 12 emissions in restricted and non-restricted frequency bands Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r01

9.5 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

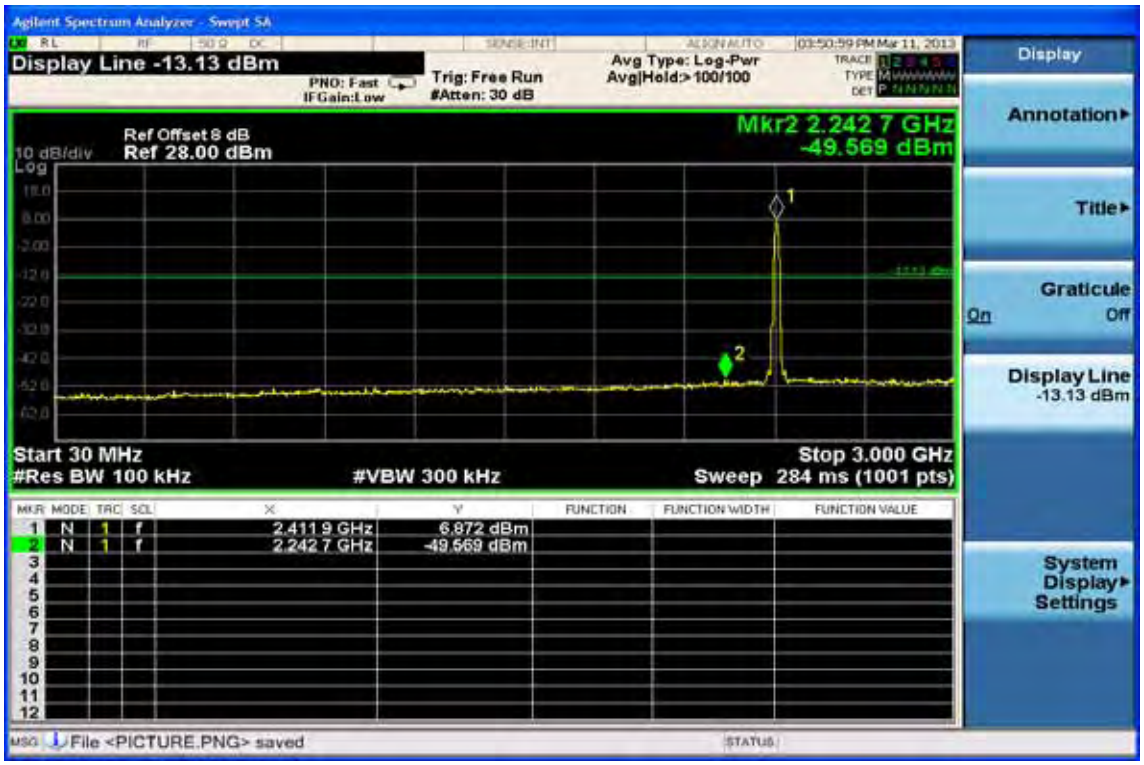
Where	FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
	RA = Reading Amplitude	AG = Amplifier Gain
	AF = Antenna Factor	

9.6 Measurement Result:

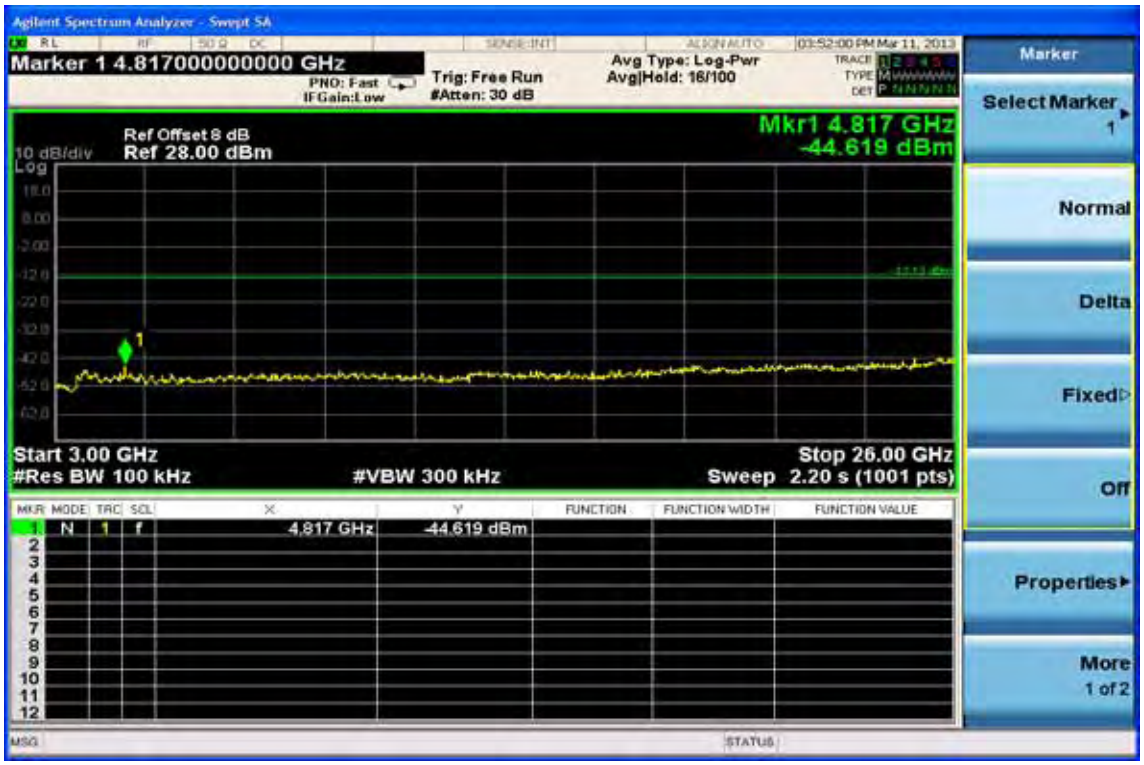
Note: Refer to next page spectrum analyzer data chart and tabular data sheets.

Conducted Spurious Emission Measurement Result
802.11b

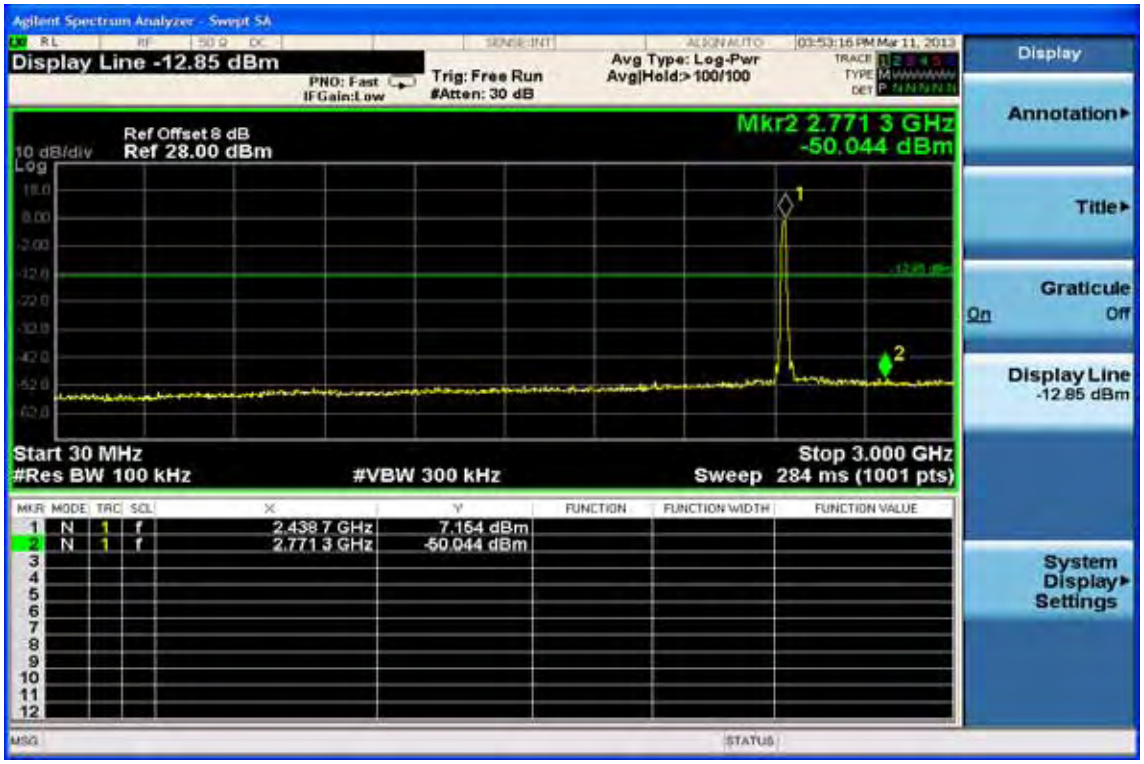
Ch Low 30MHz – 3GHz



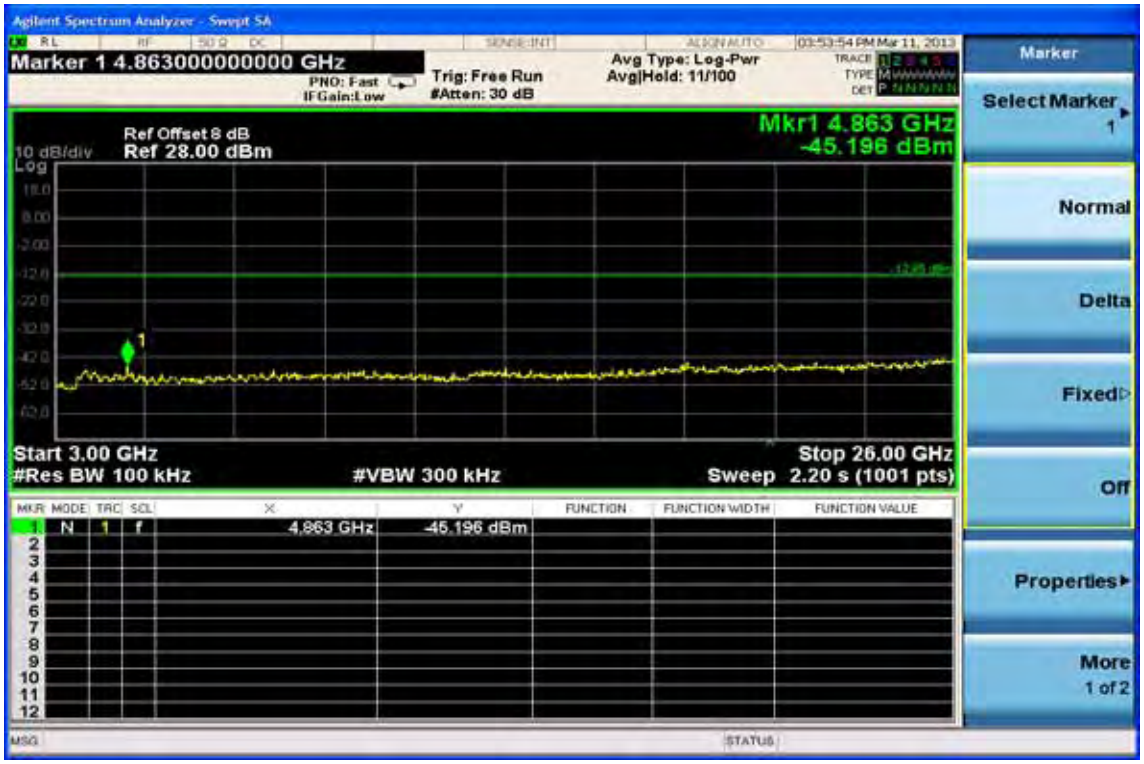
Ch Low 3GHz – 26.5GHz



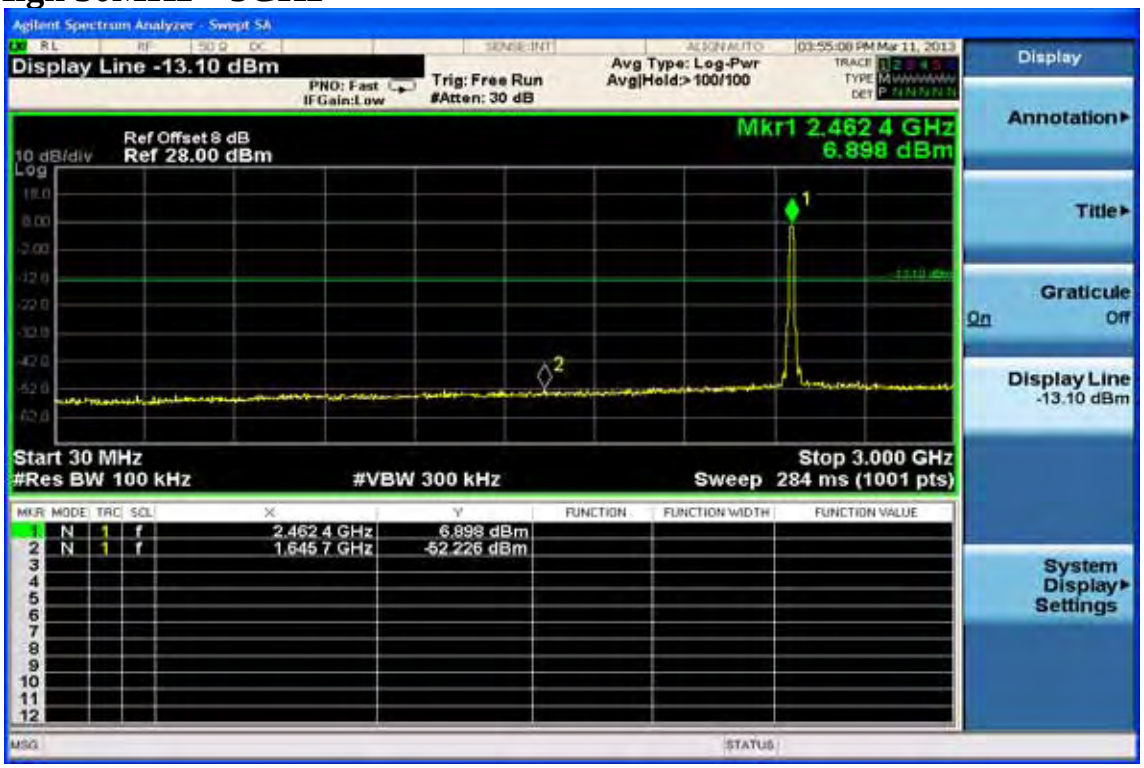
Ch Mid 30MHz – 3GHz



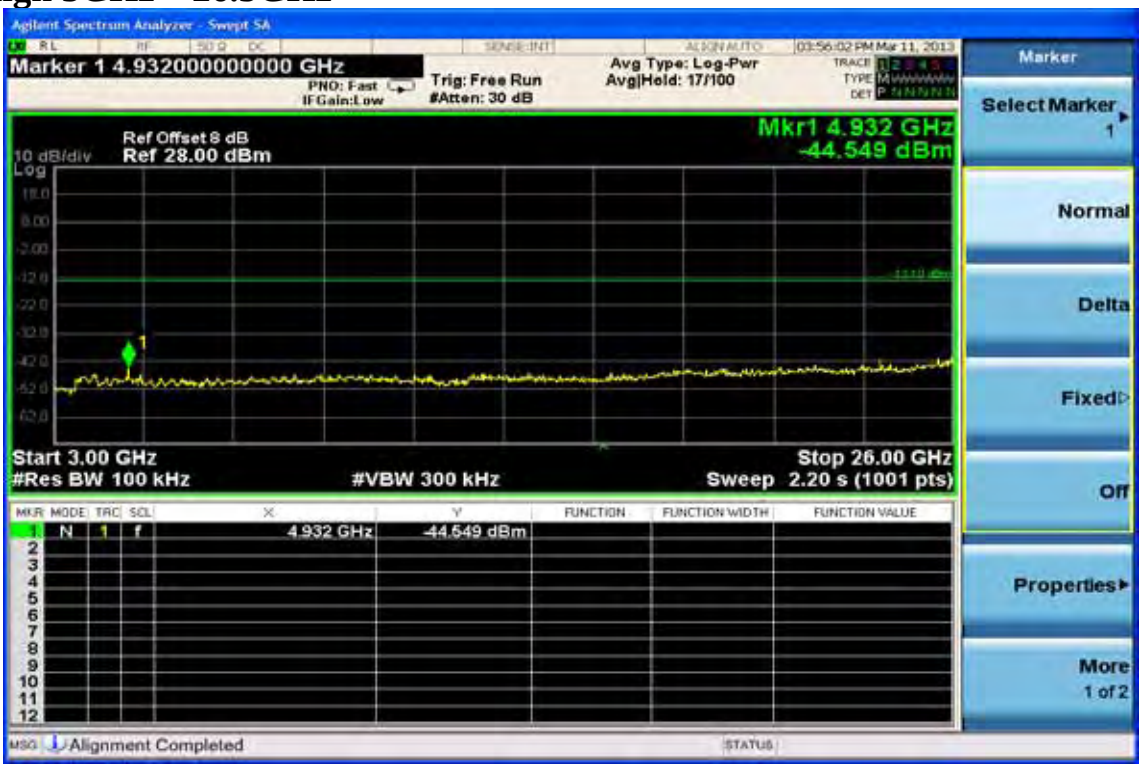
Ch Mid 3GHz – 26.5GHz



Ch High 30MHz – 3GHz

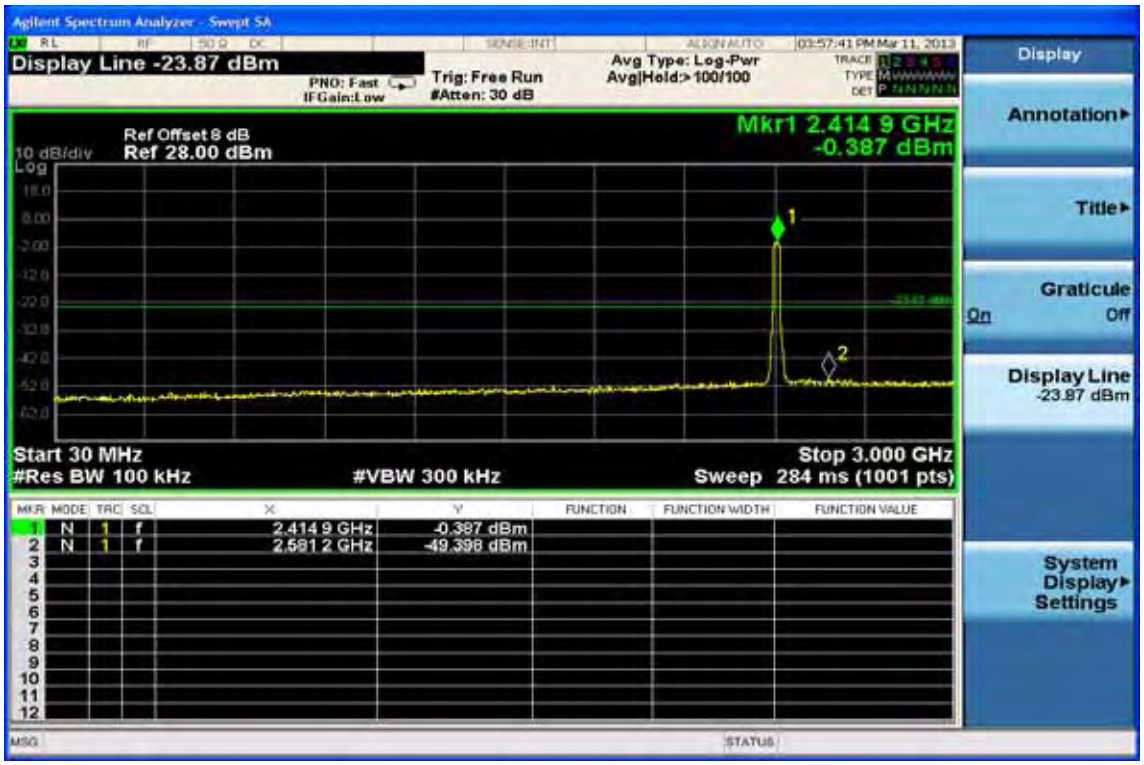


Ch High 3GHz – 26.5GHz

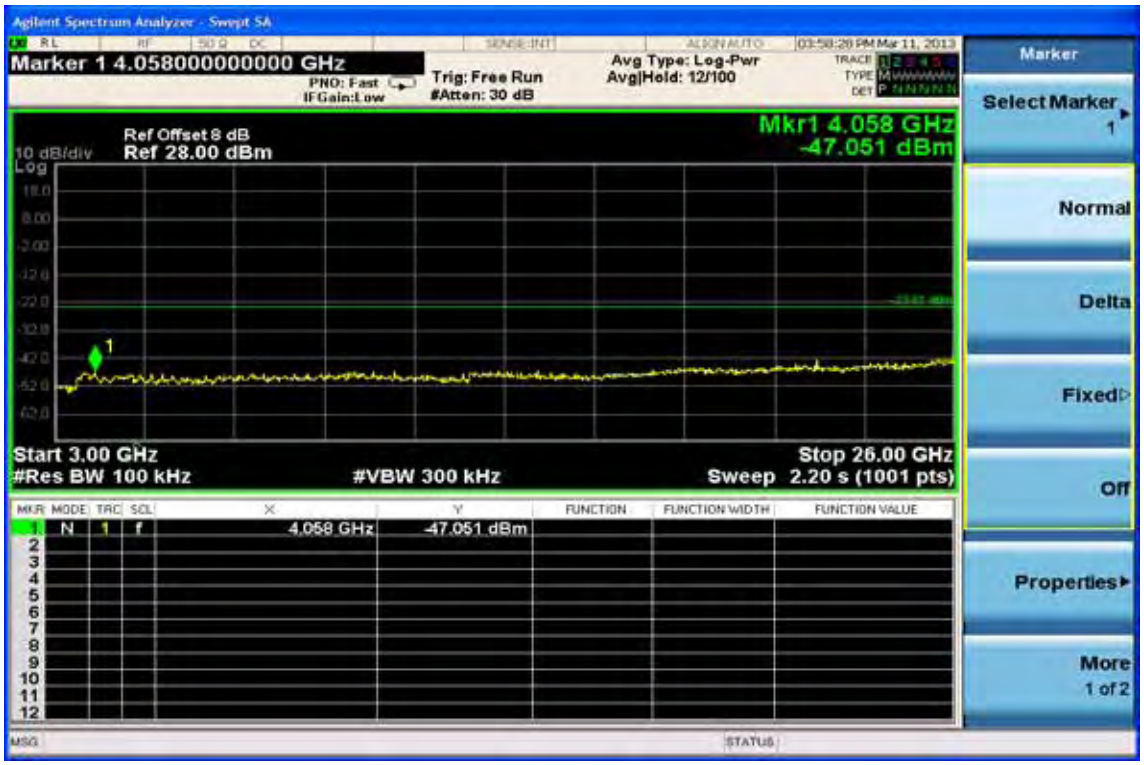


Conducted Spurious Emission Measurement Result
802.11g

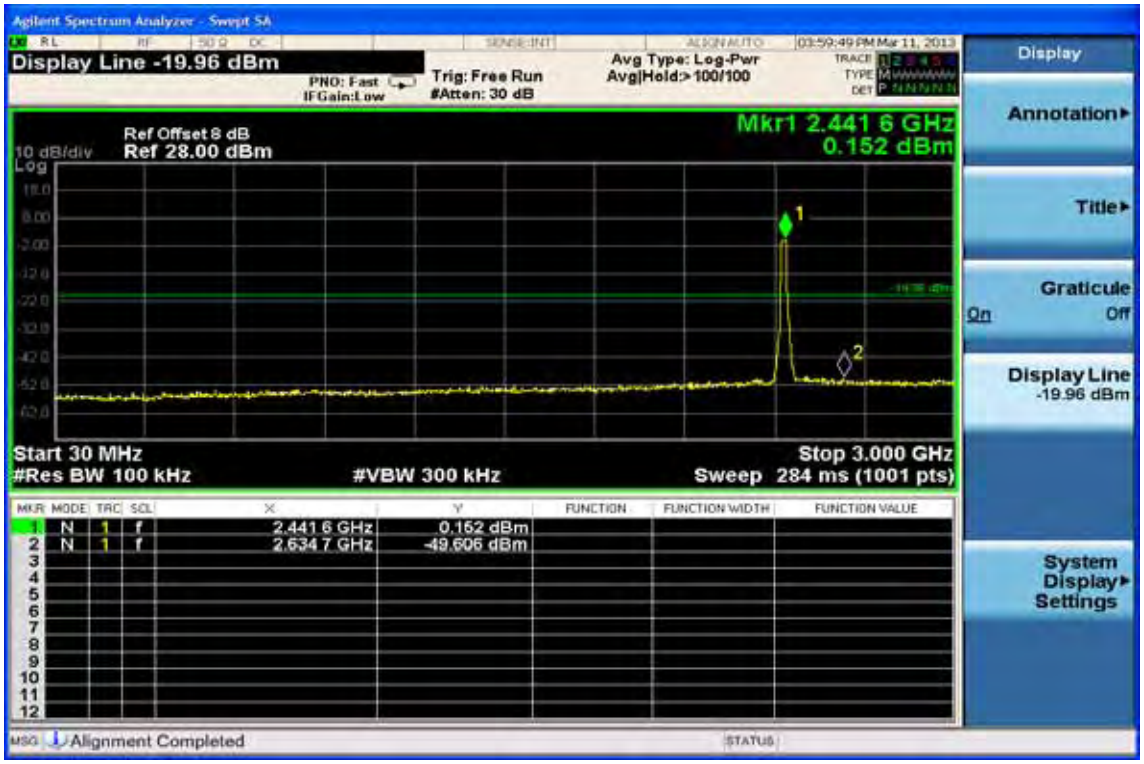
Ch Low 30MHz – 3GHz



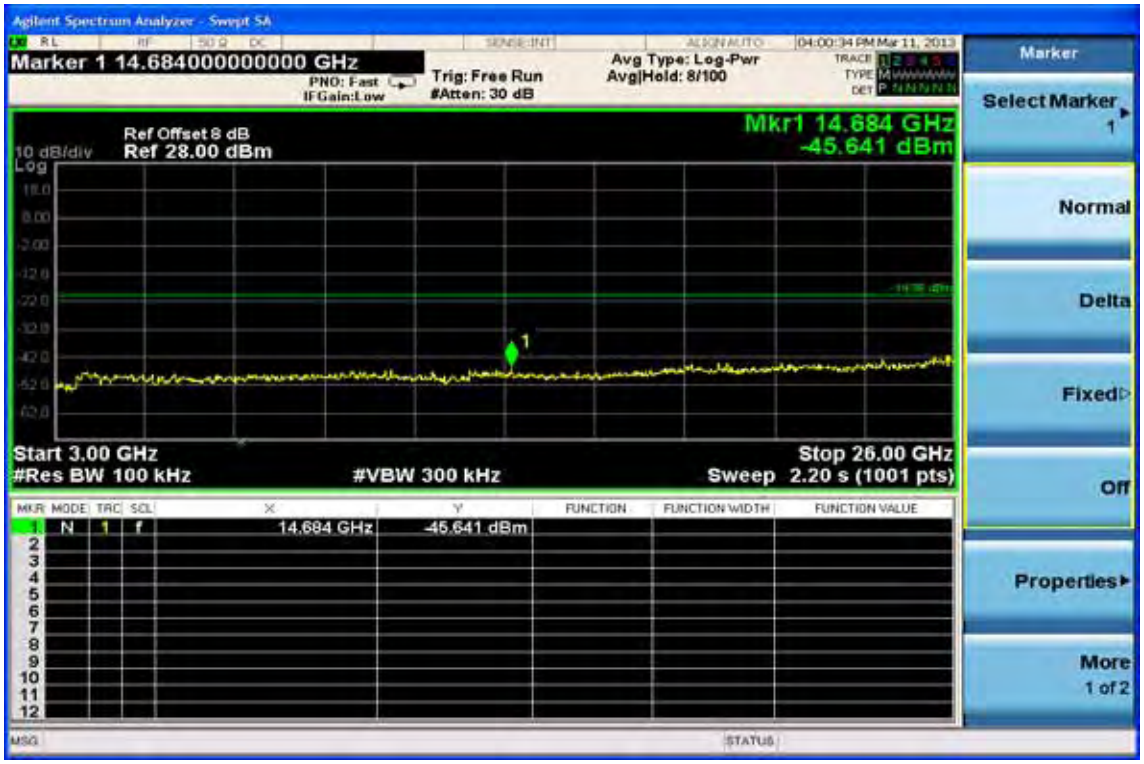
Ch Low 3GHz – 26.5GHz



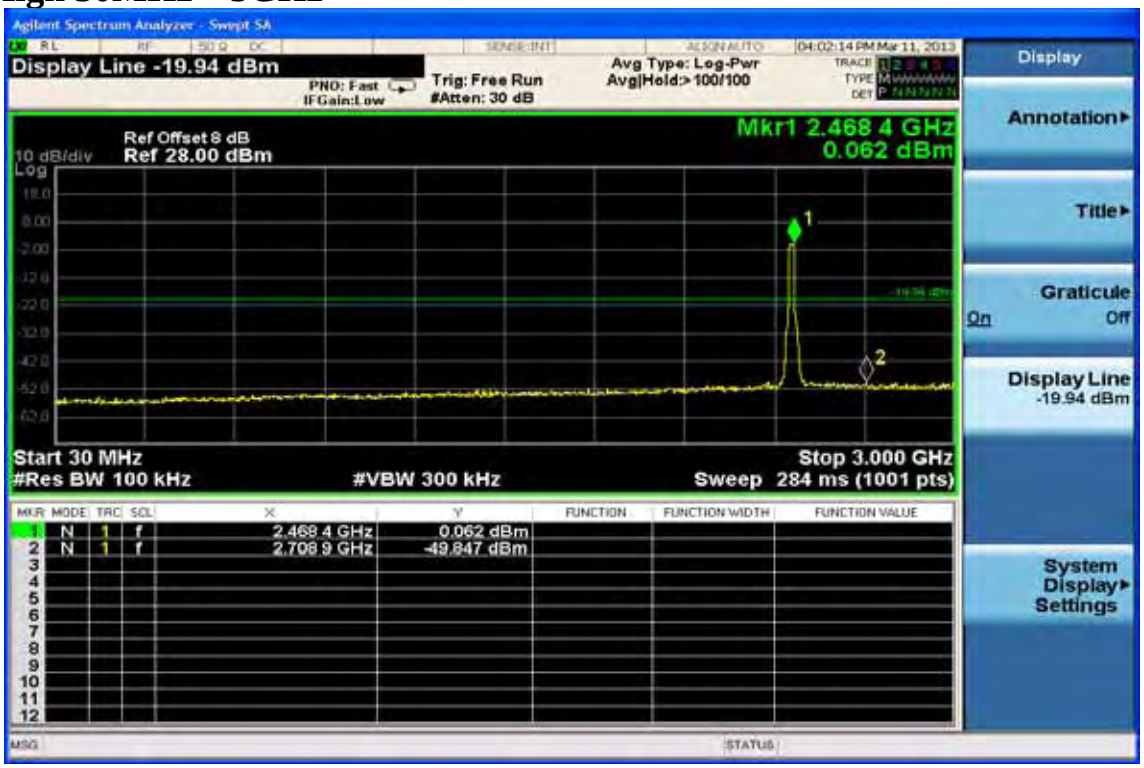
Ch Mid 30MHz – 3GHz



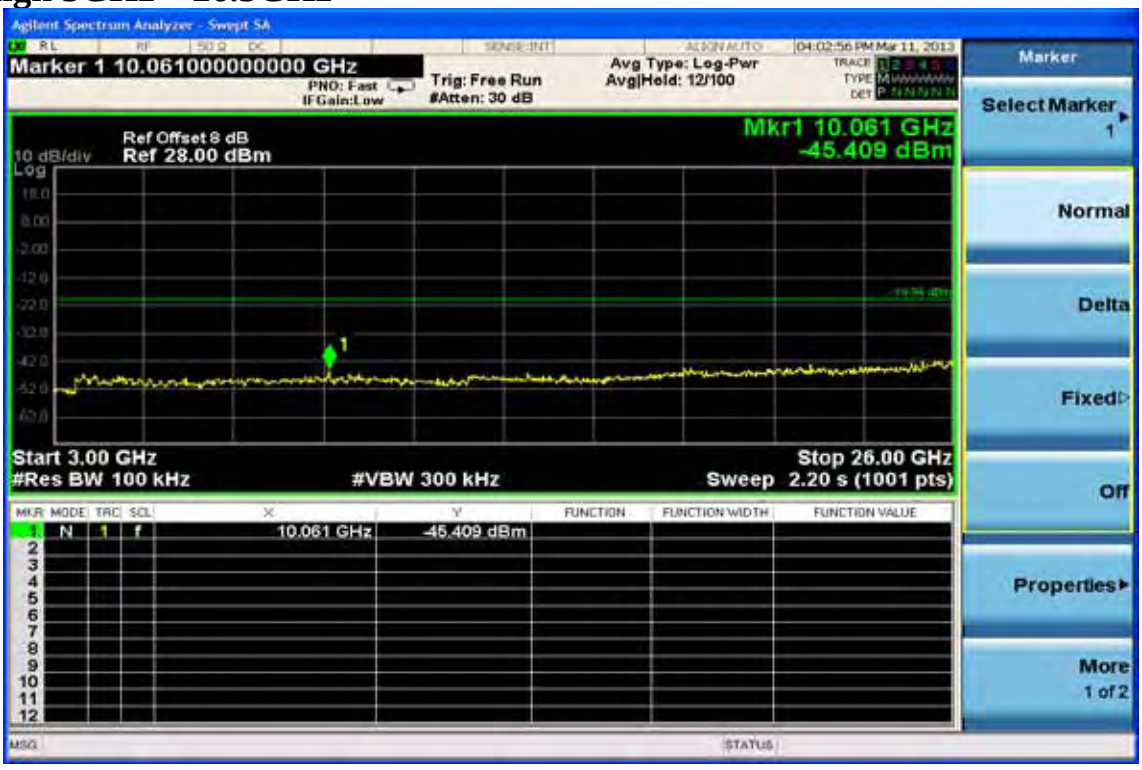
Ch Mid 3GHz – 26.5GHz



Ch High 30MHz – 3GHz

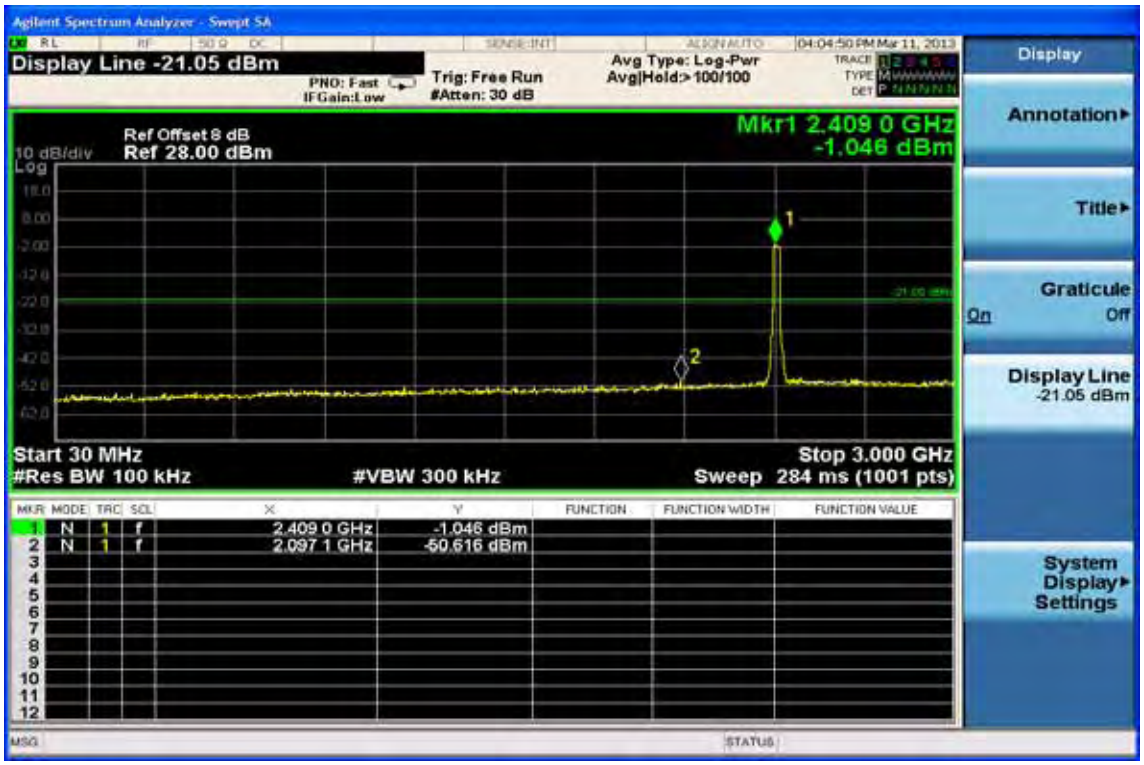


Ch High 3GHz – 26.5GHz

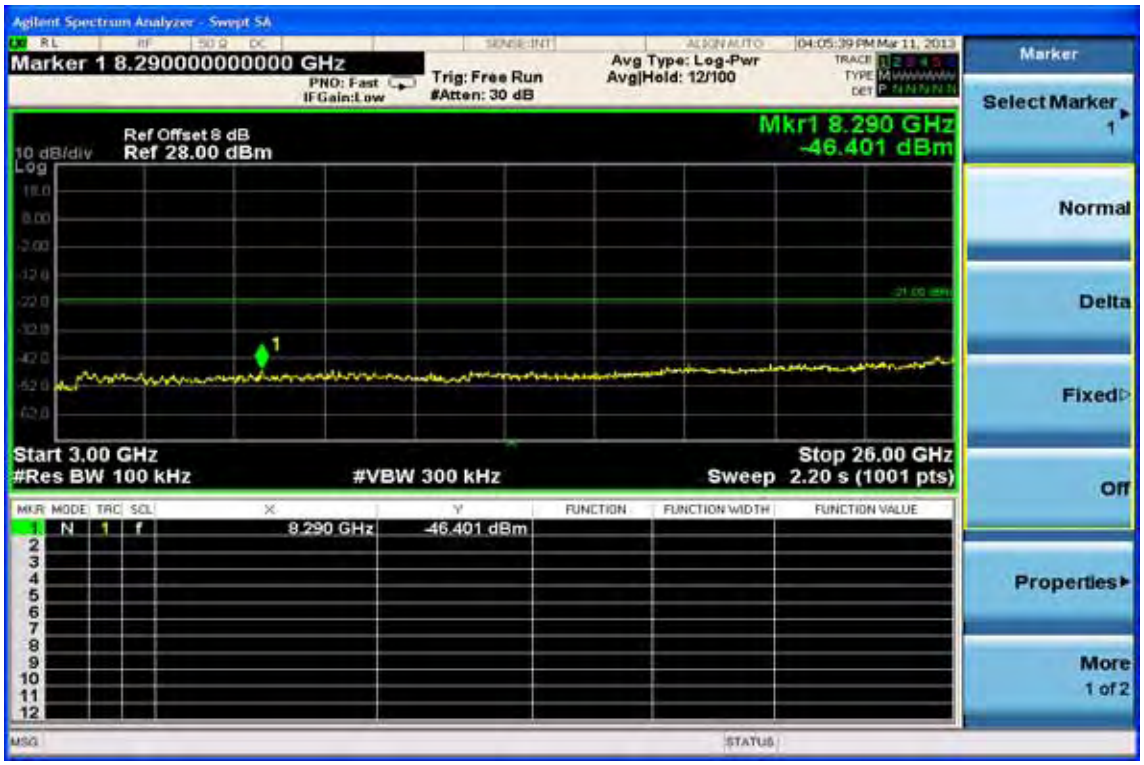


Conducted Spurious Emission Measurement Result
802.11n_20M for 2.4GHz (chain a)

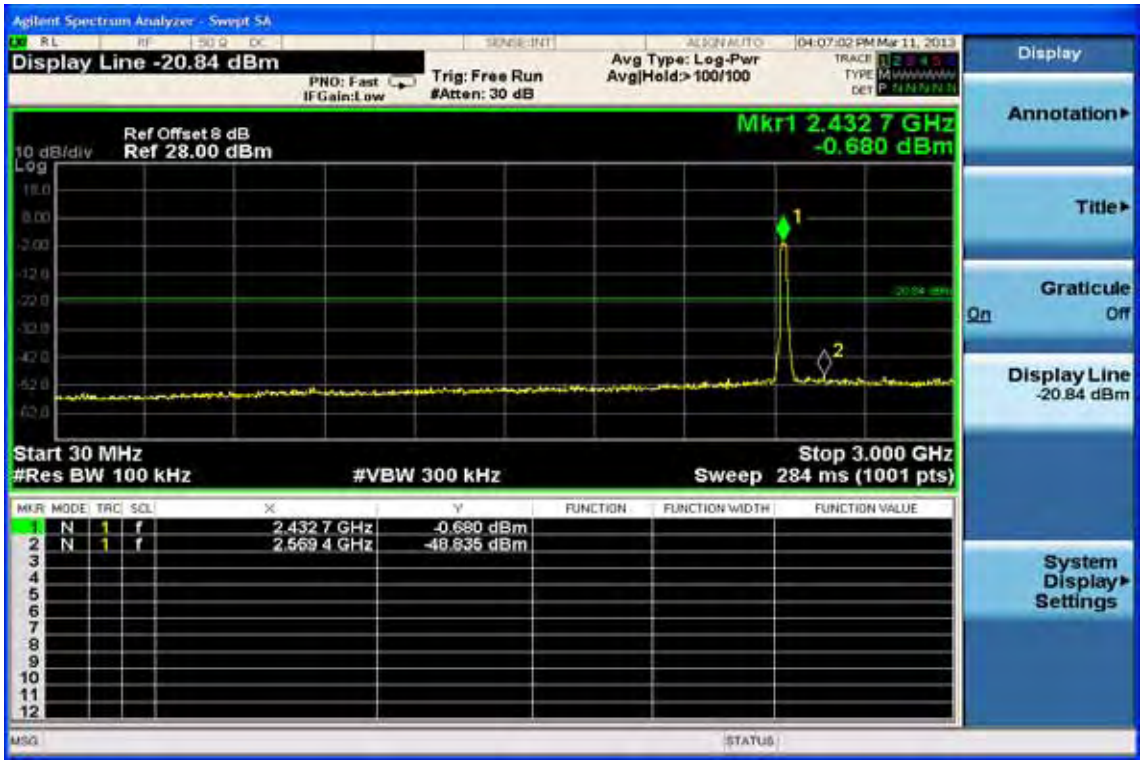
Ch Low 30MHz – 3GHz



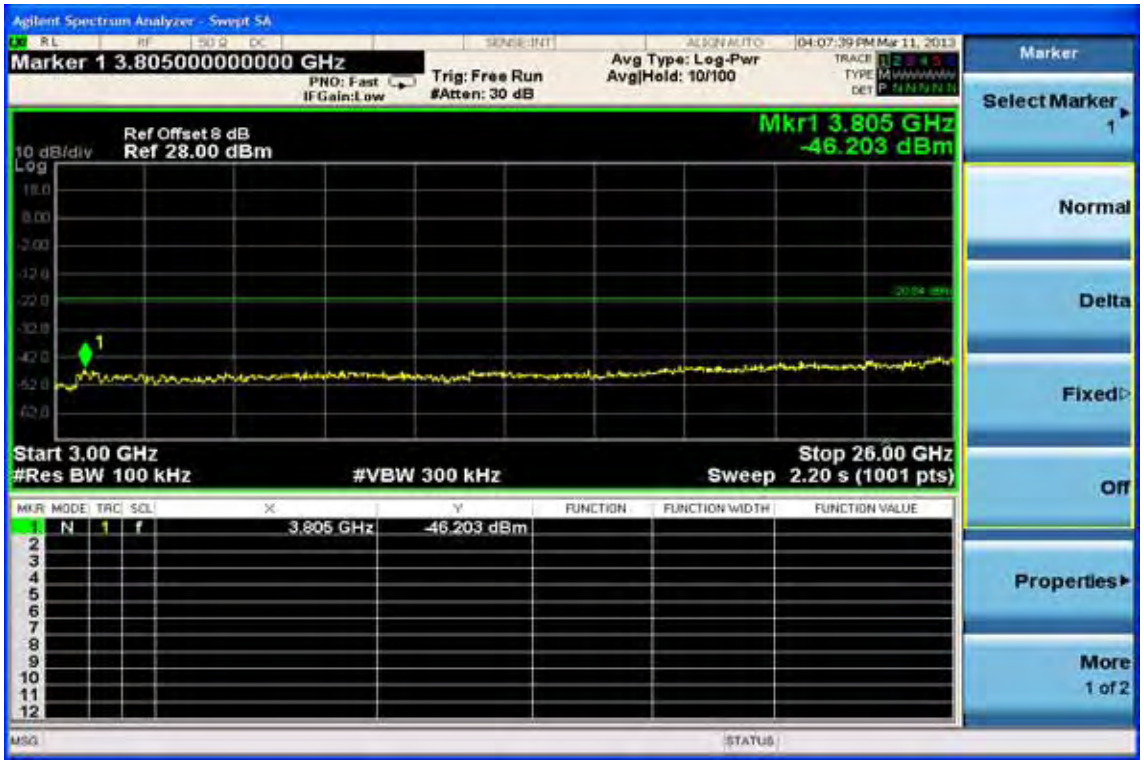
Ch Low 3GHz – 26.5GHz



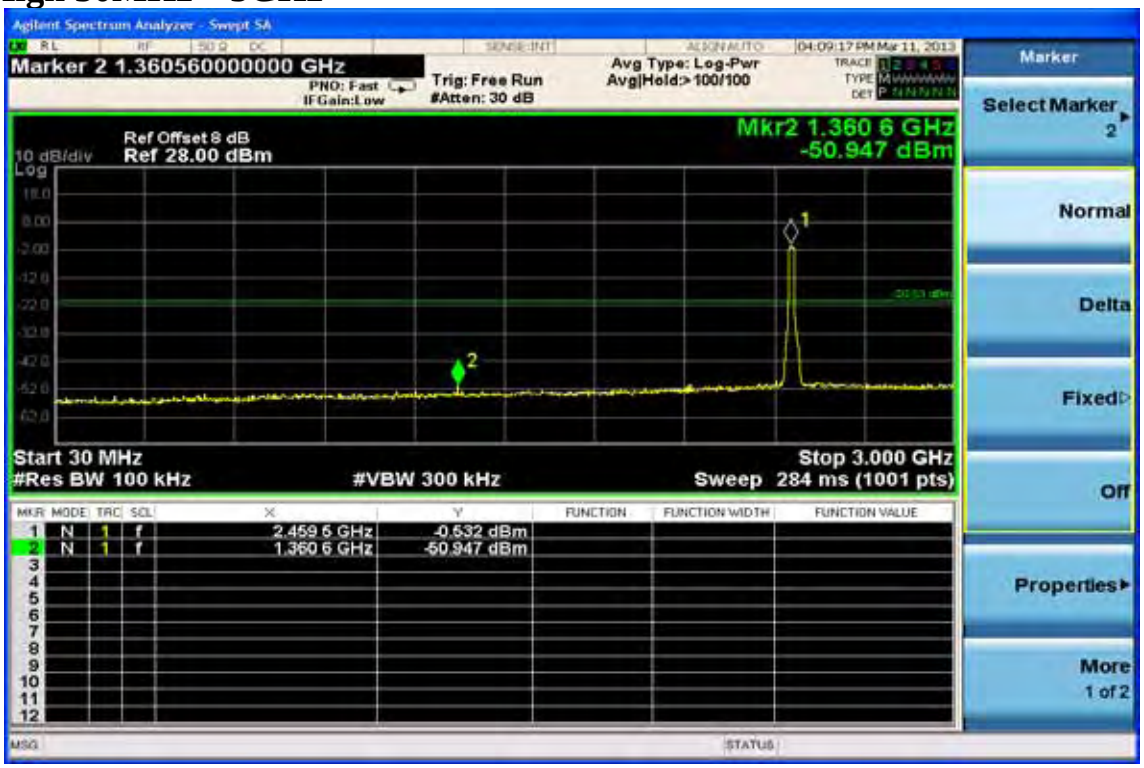
Ch Mid 30MHz – 3GHz



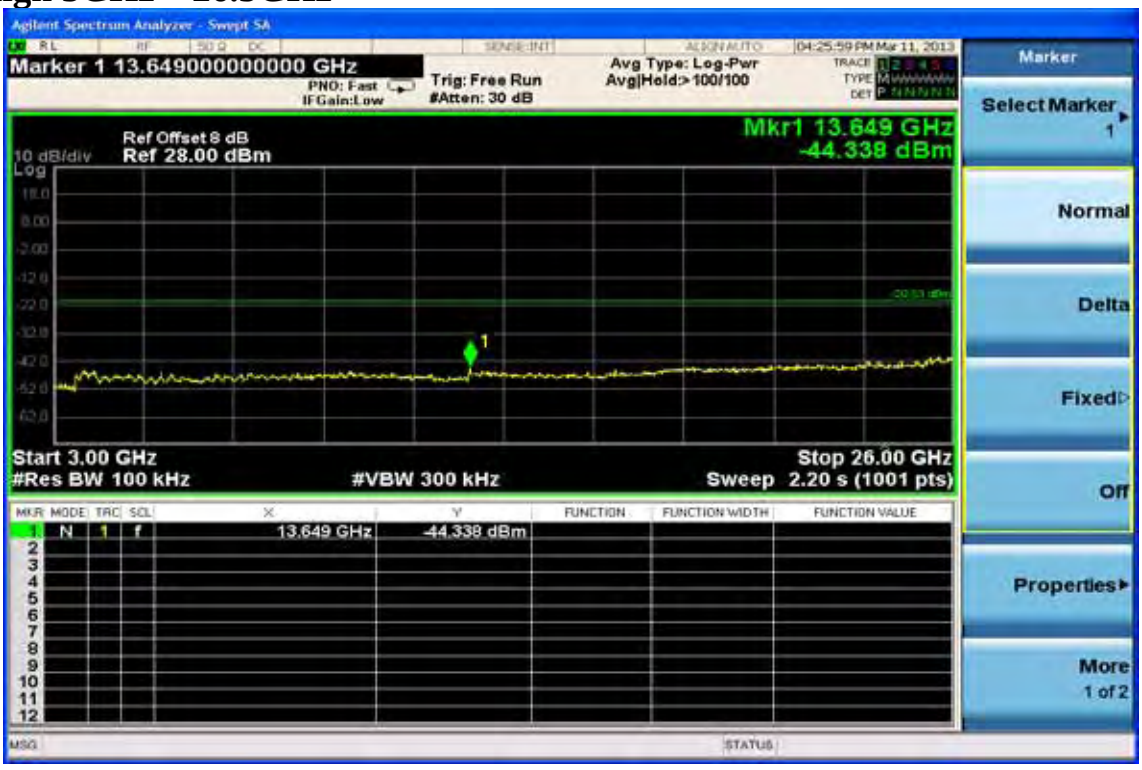
Ch Mid 3GHz – 26.5GHz



Ch High 30MHz – 3GHz

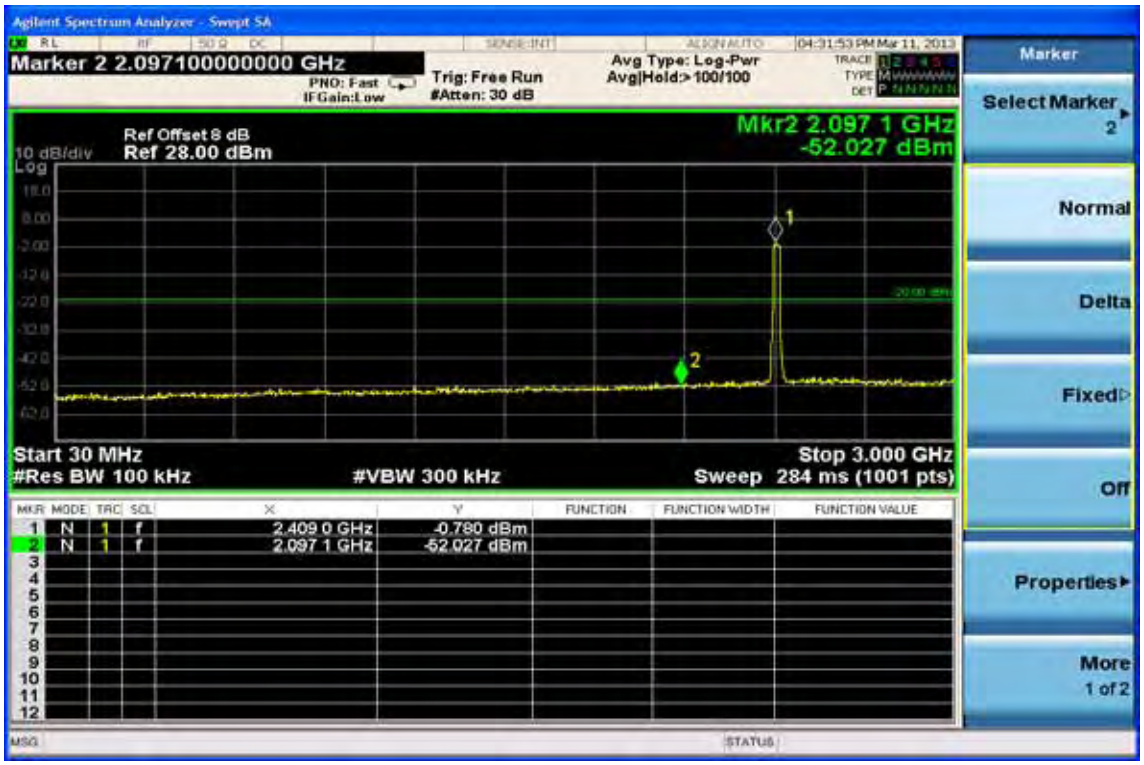


Ch High 3GHz – 26.5GHz

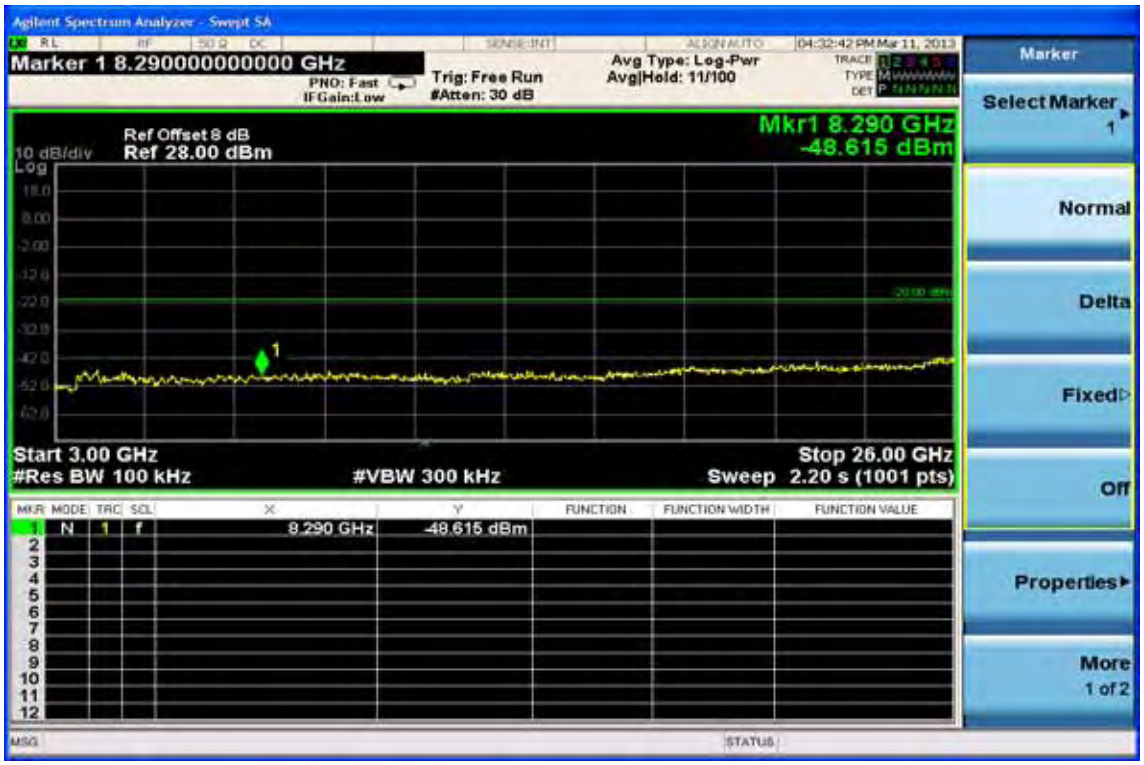


Conducted Spurious Emission Measurement Result
802.11n_20M for 2.4GHz (chain b)

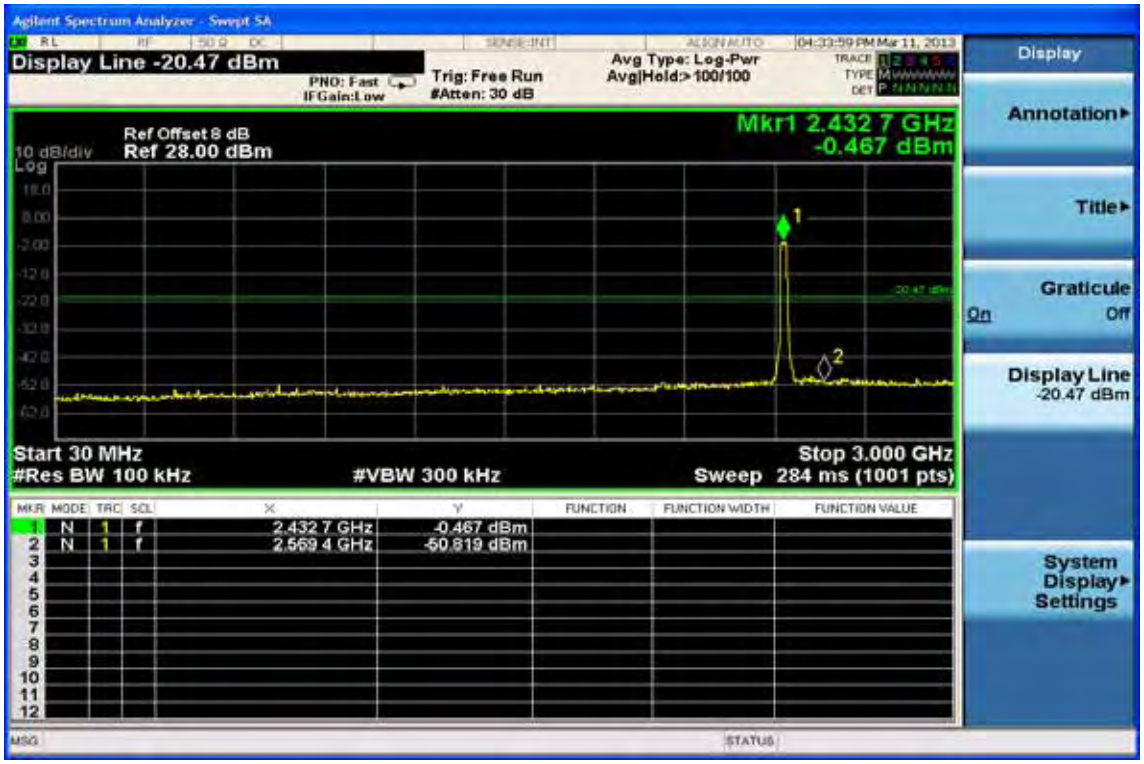
Ch Low 30MHz – 3GHz



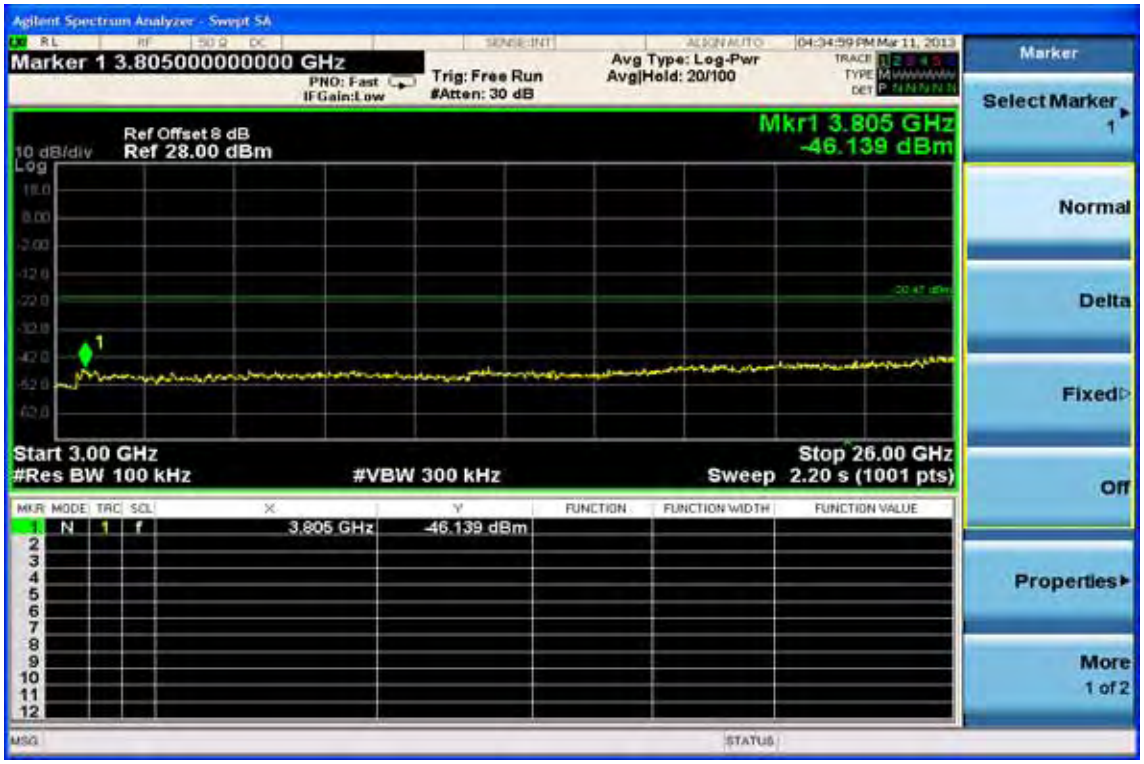
Ch Low 3GHz – 26.5GHz



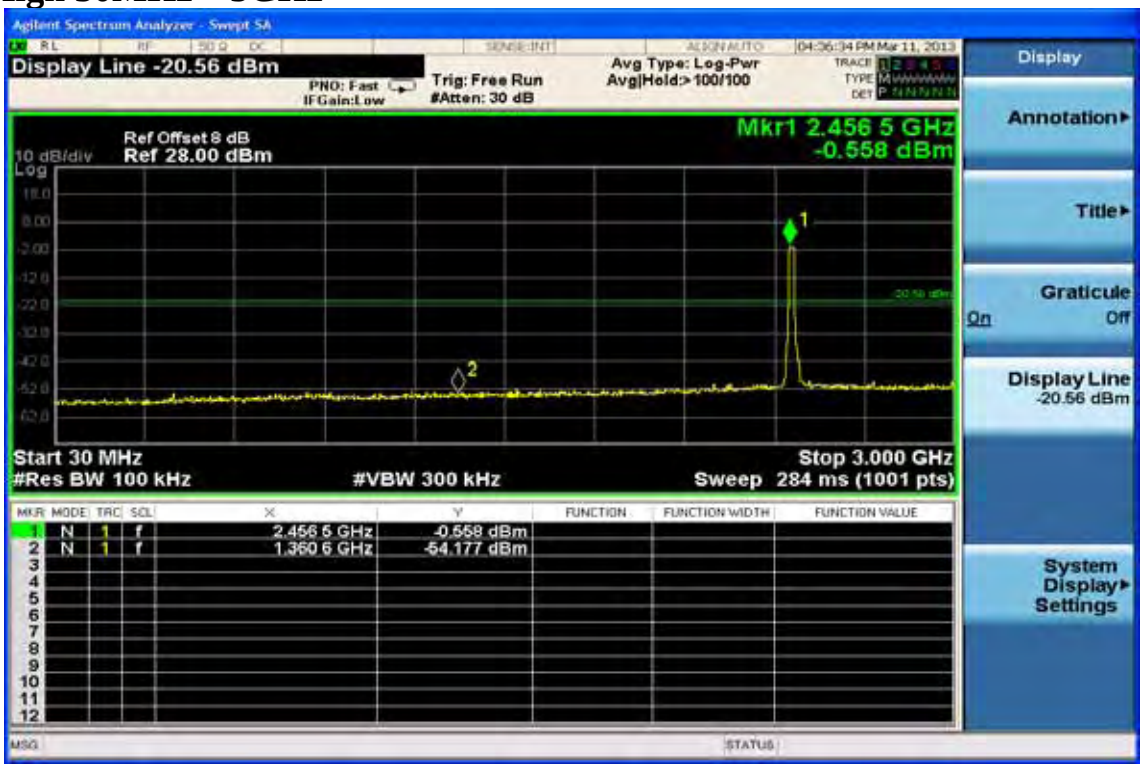
Ch Mid 30MHz – 3GHz



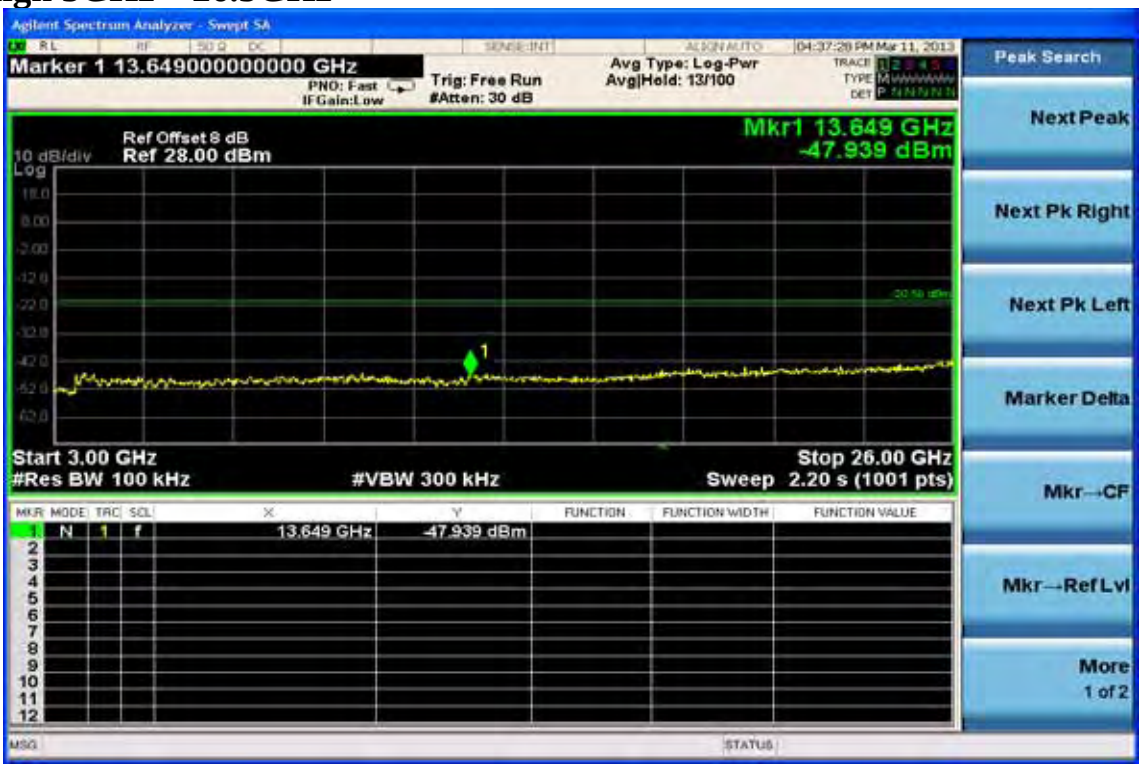
Ch Mid 3GHz – 26.5GHz



Ch High 30MHz – 3GHz

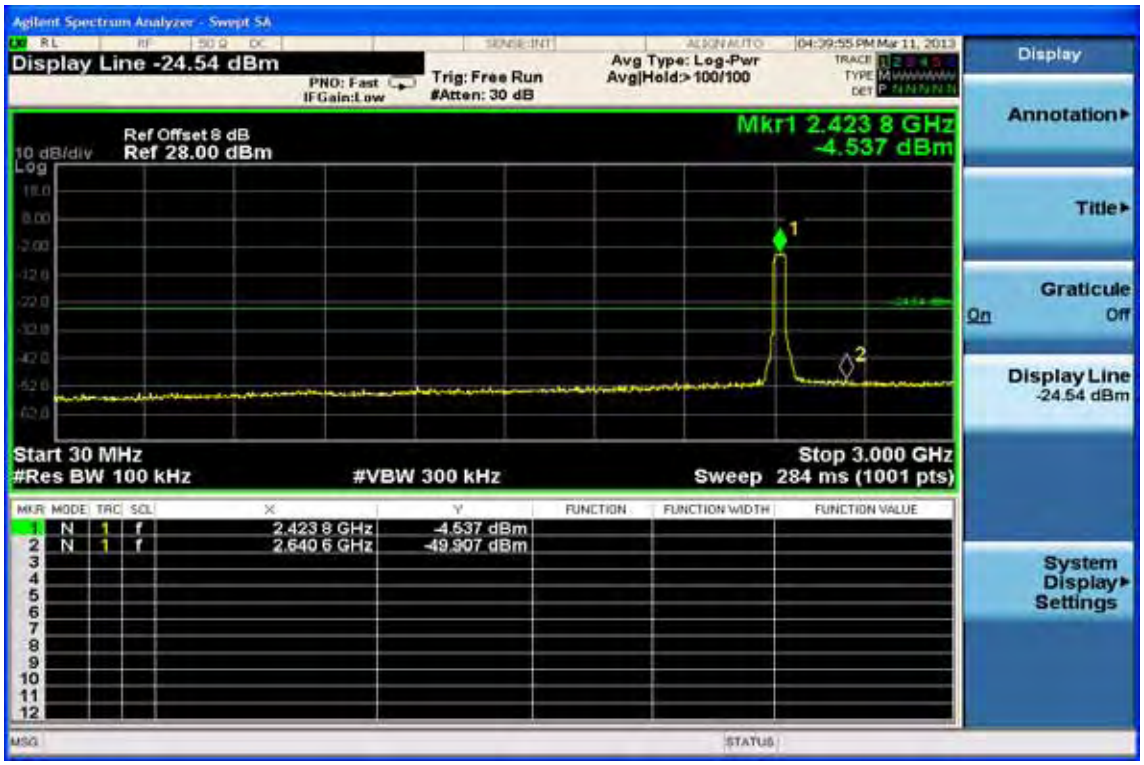


Ch High 3GHz – 26.5GHz

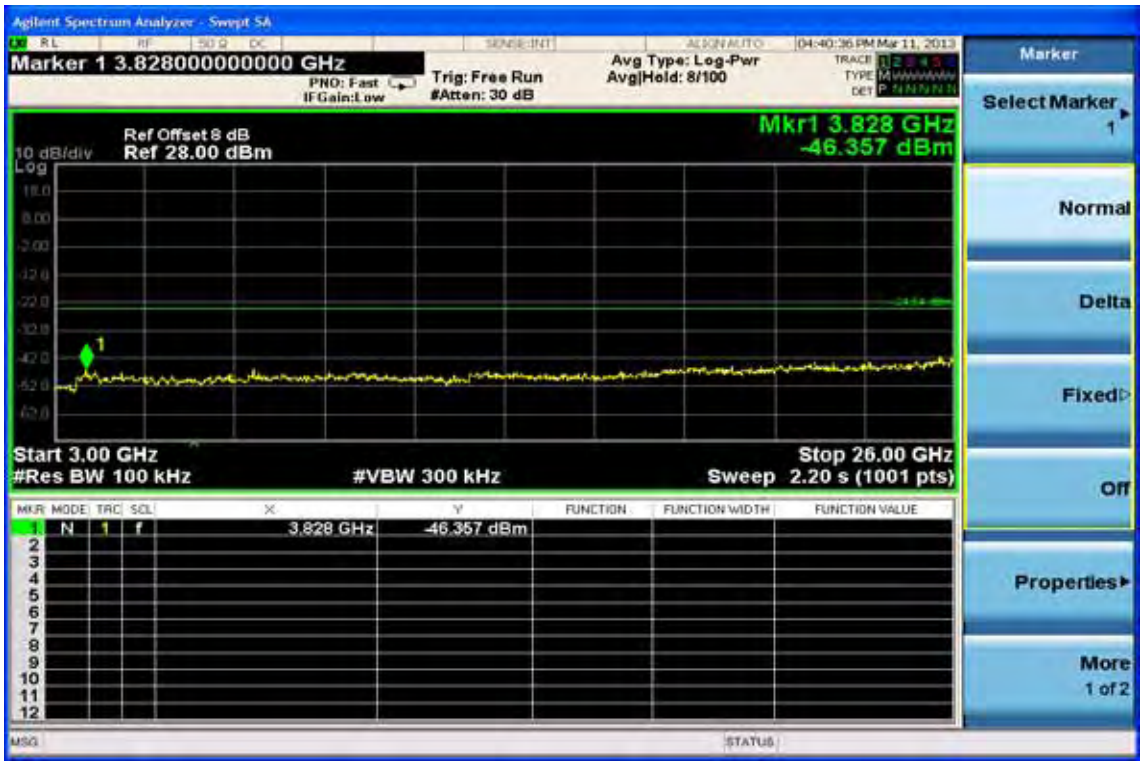


Conducted Spurious Emission Measurement Result
802.11n_40M for 2.4GHz (chain a)

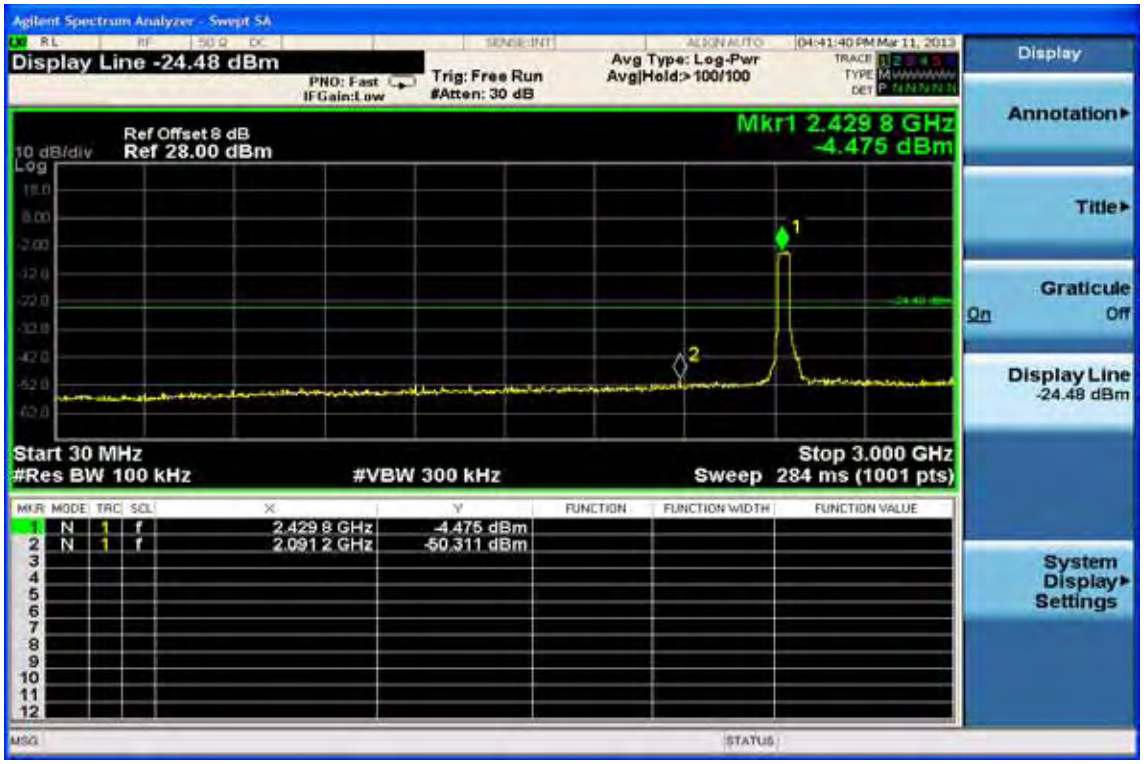
Ch Low 30MHz – 3GHz



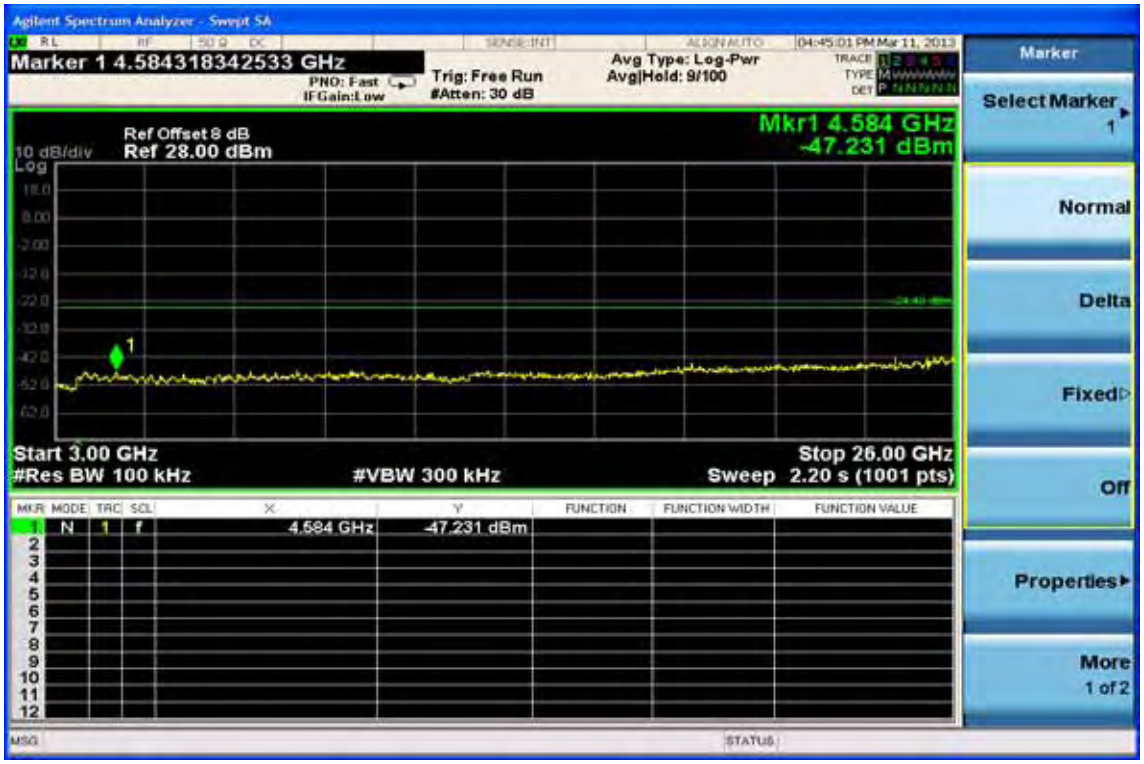
Ch Low 3GHz – 26.5GHz



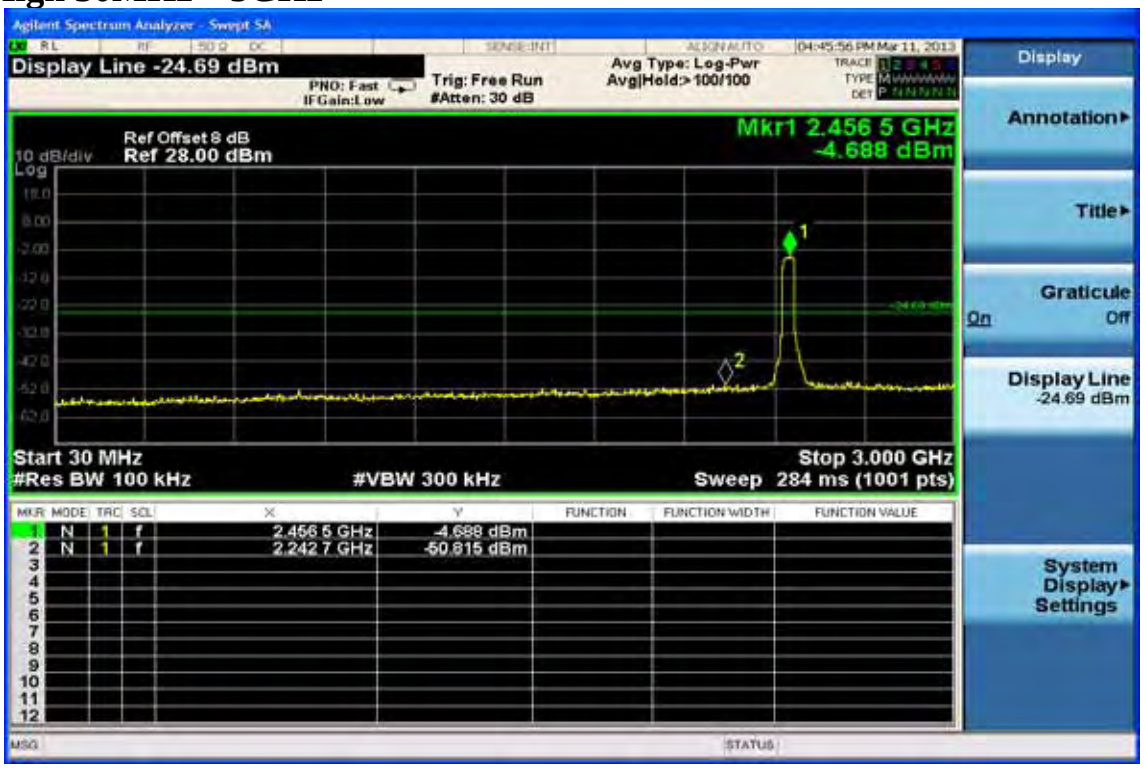
Ch Mid 30MHz – 3GHz



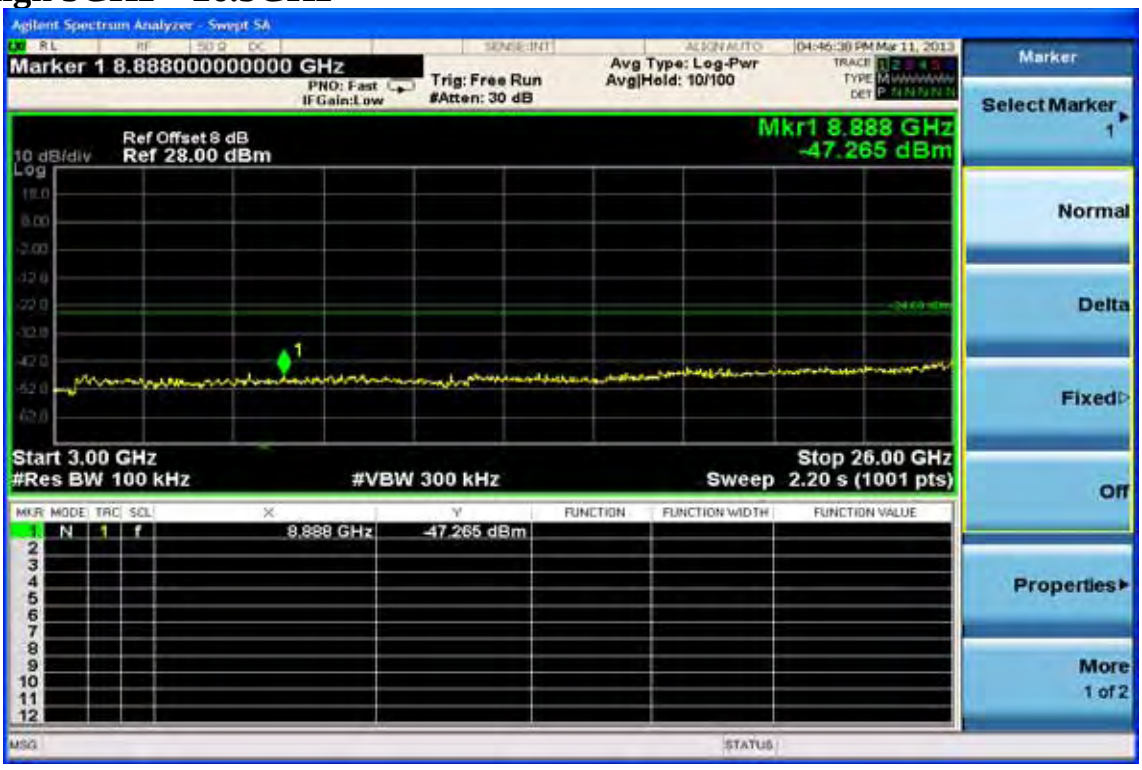
Ch Mid 3GHz – 26.5GHz



Ch High 30MHz – 3GHz

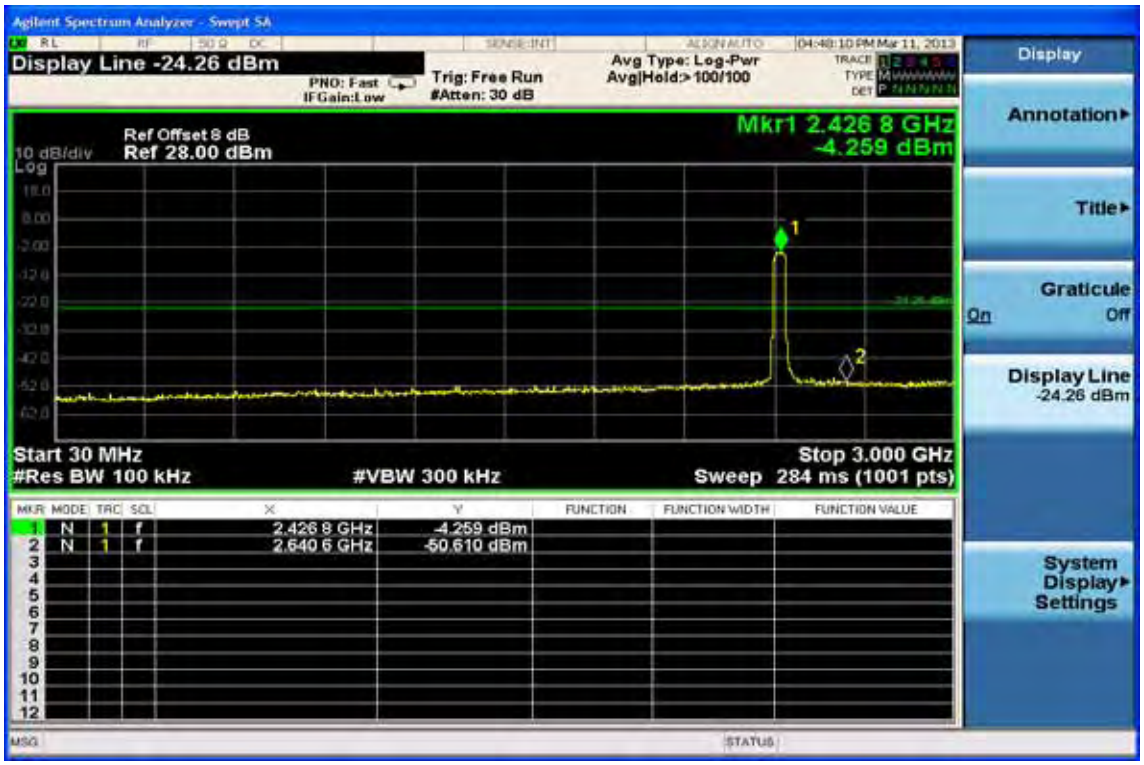


Ch High 3GHz – 26.5GHz

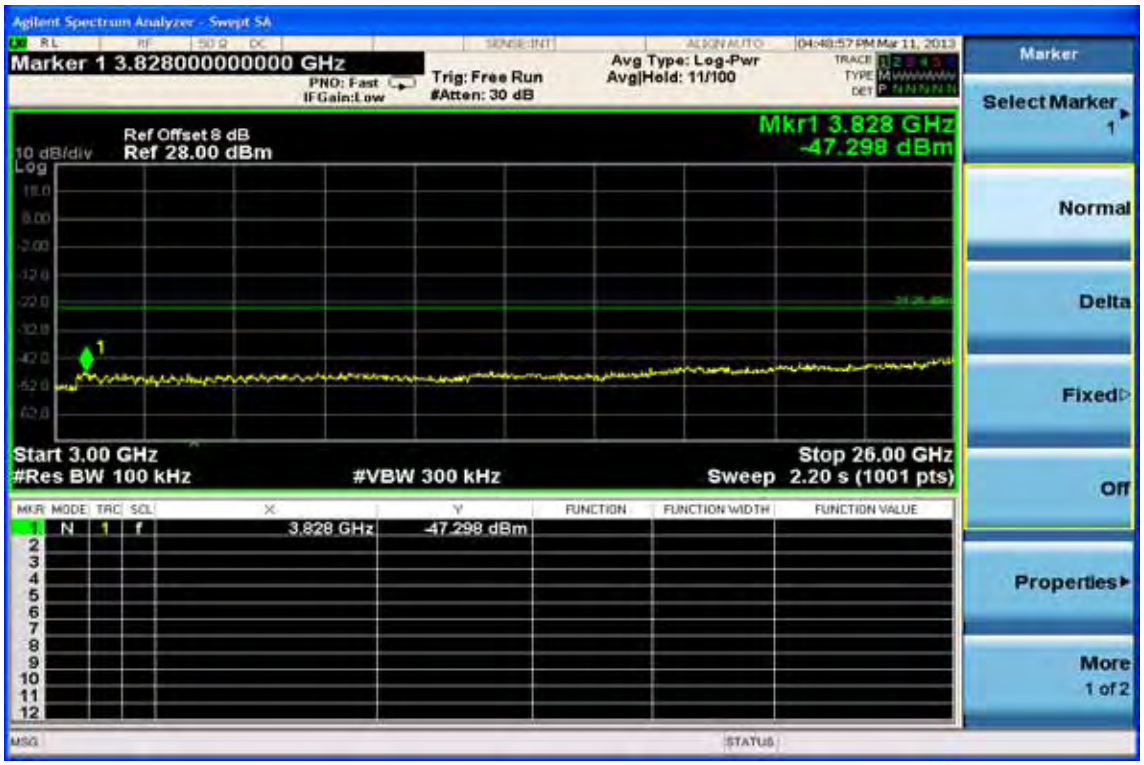


Conducted Spurious Emission Measurement Result
802.11n_40M for 2.4GHz (chain b)

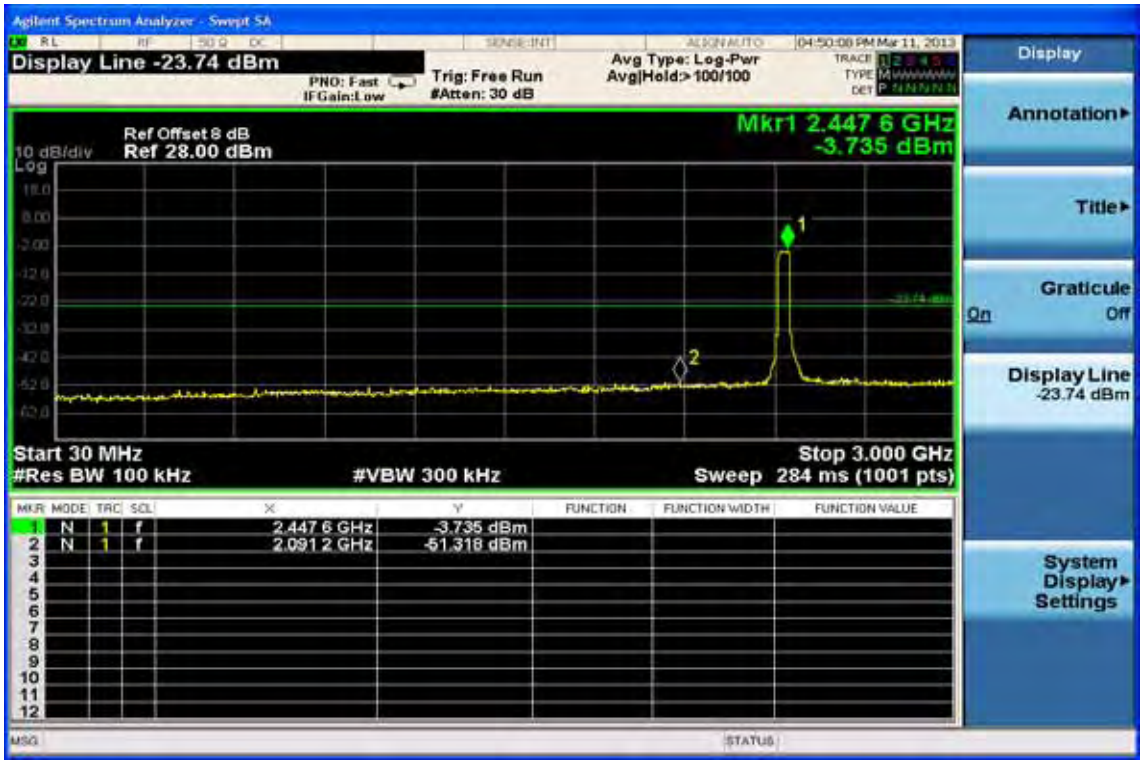
Ch Low 30MHz – 3GHz



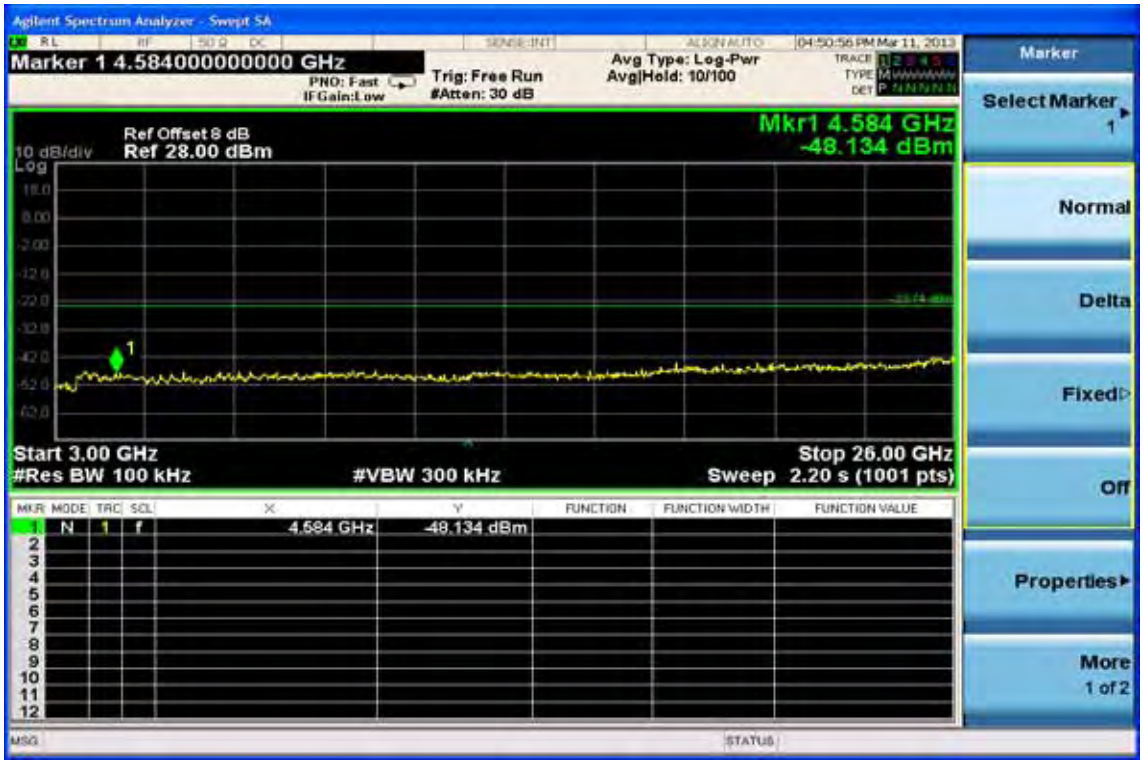
Ch Low 3GHz – 26.5GHz



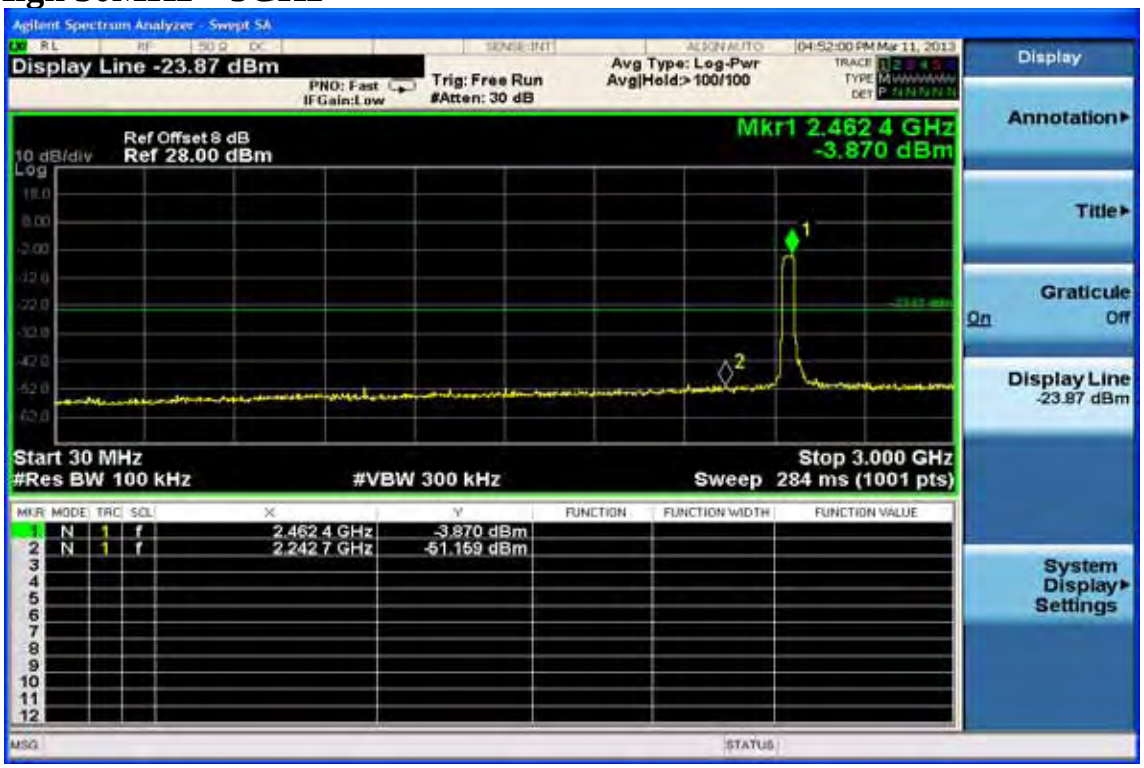
Ch Mid 30MHz – 3GHz



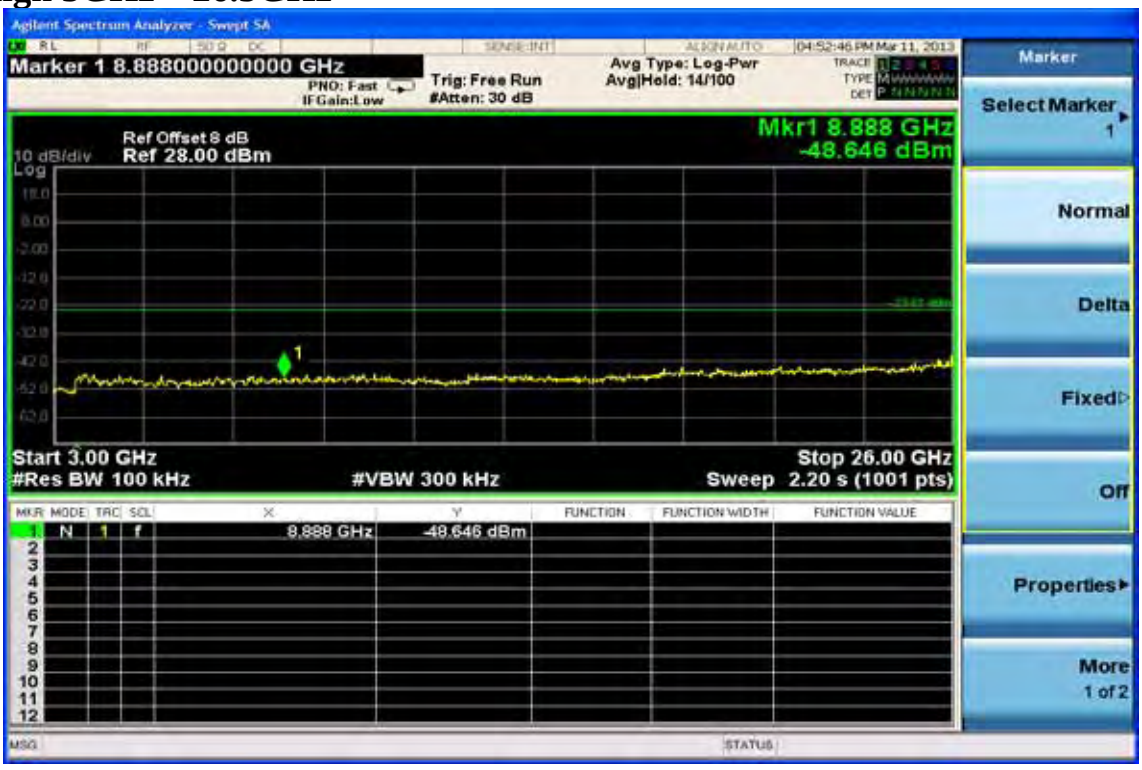
Ch Mid 3GHz – 26.5GHz



Ch High 30MHz – 3GHz

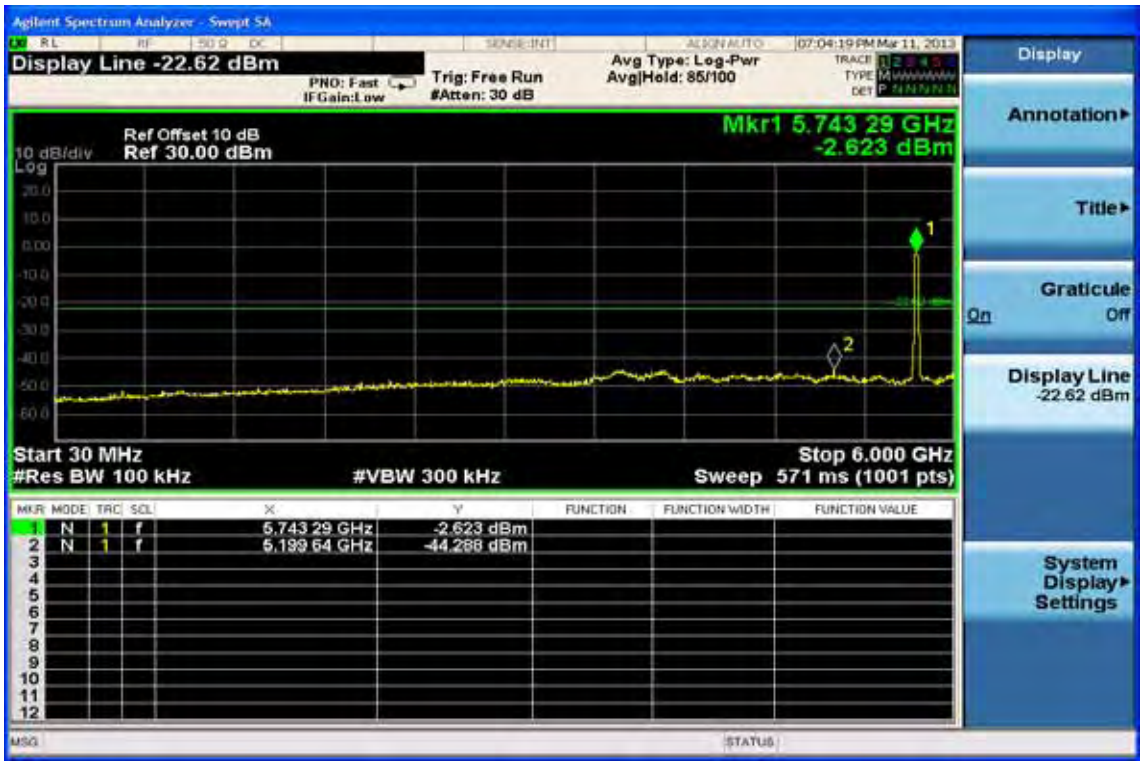


Ch High 3GHz – 26.5GHz

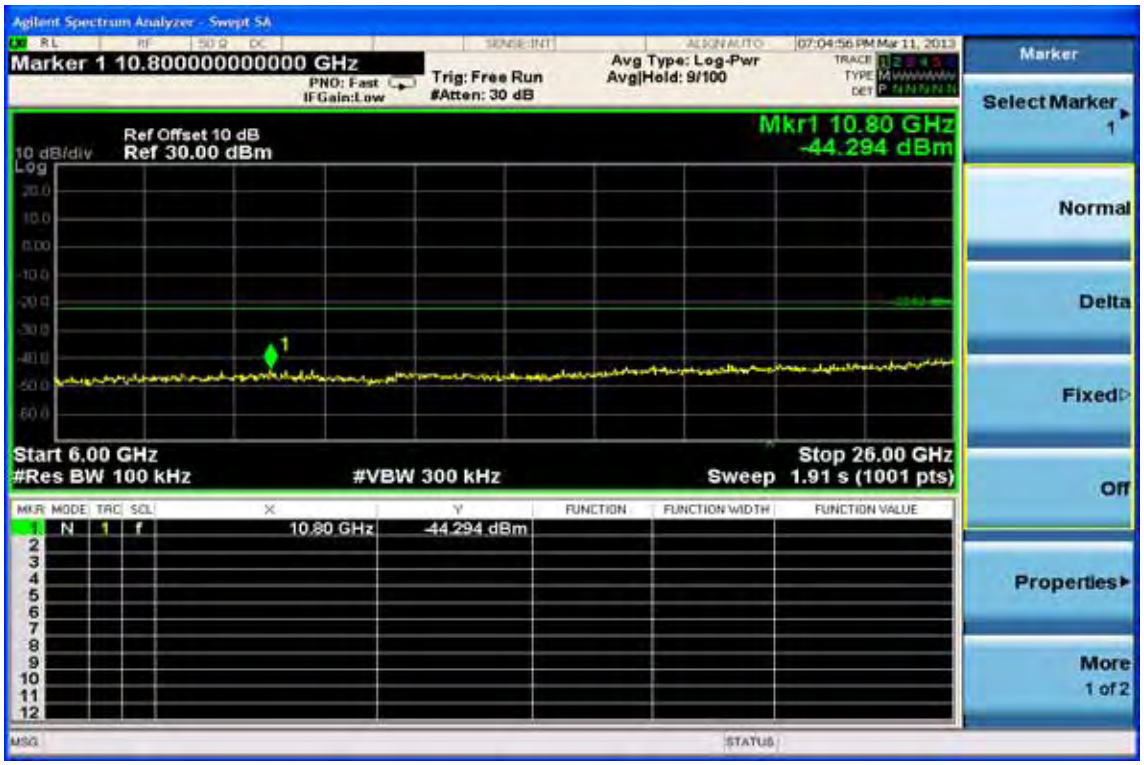


Conducted Spurious Emission Measurement Result
802.11a

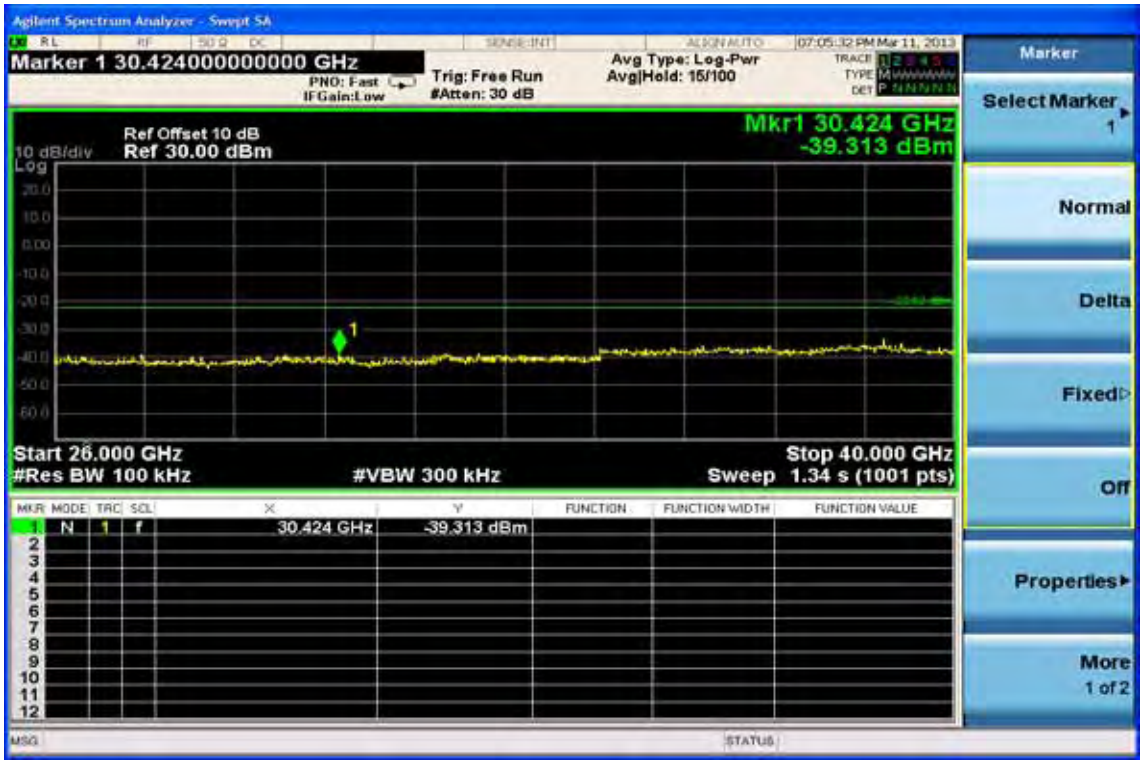
Ch Low 30MHz – 3GHz



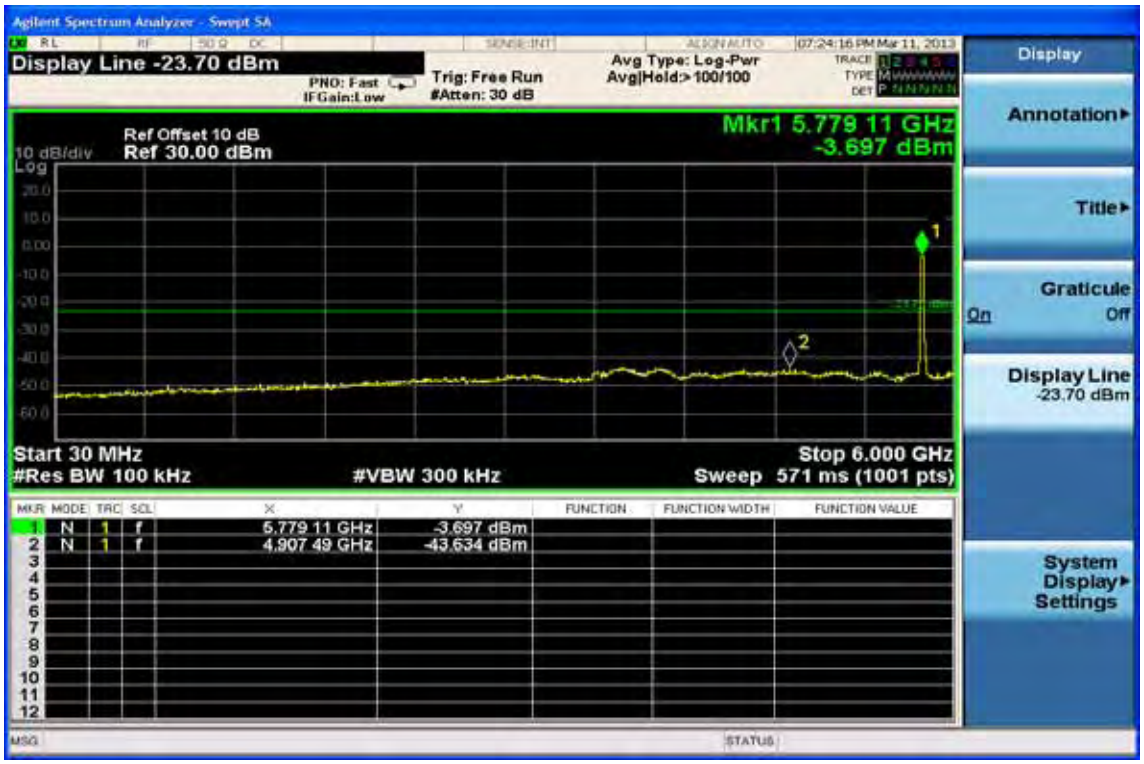
Ch Low 3GHz – 26GHz



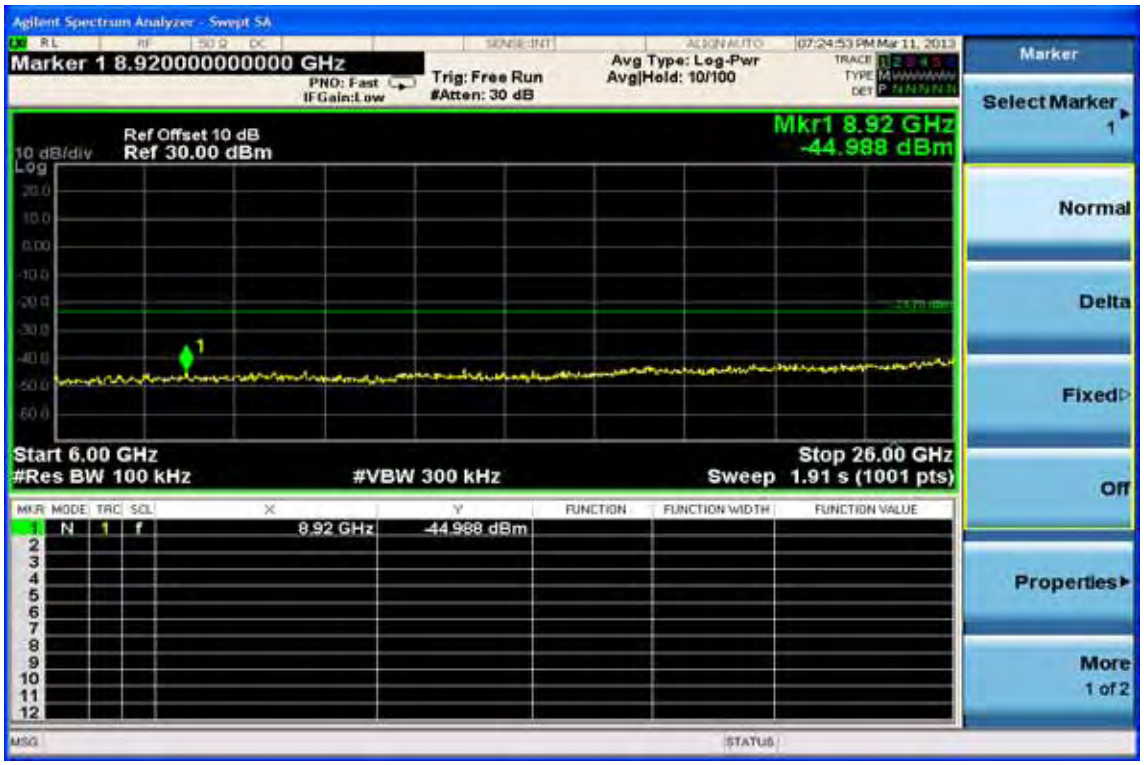
Ch Low 26GHz – 40GHz



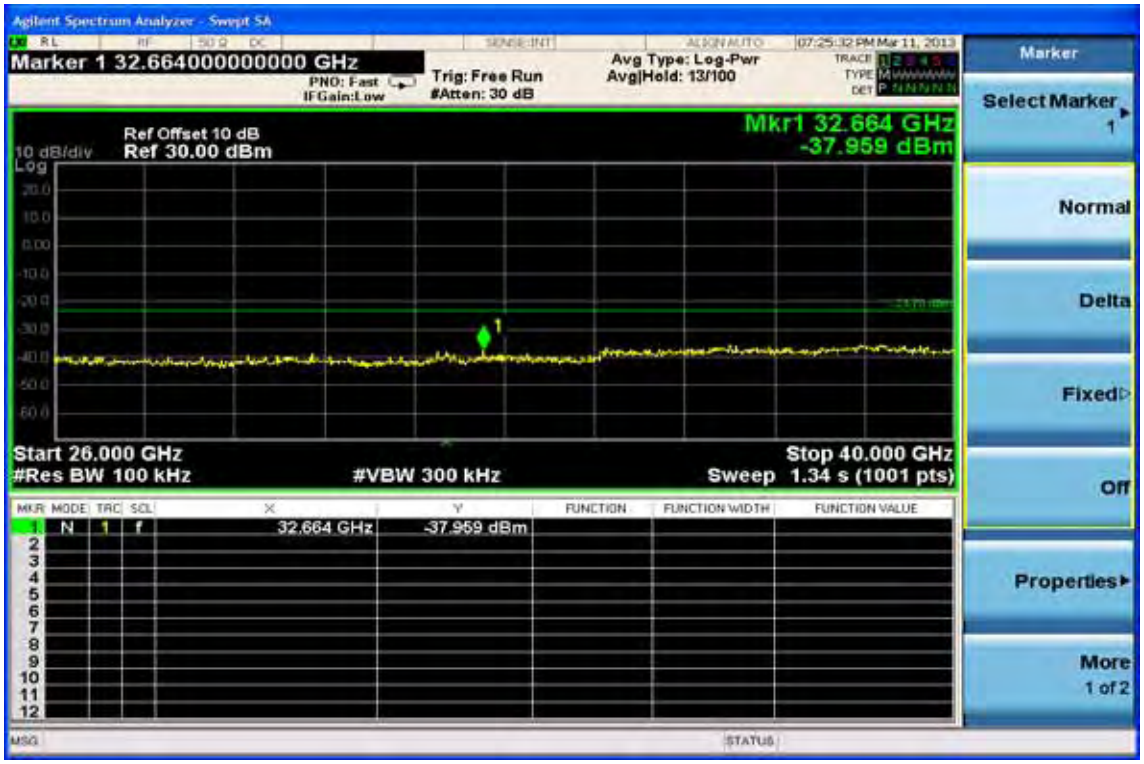
Ch Mid 30MHz – 3GHz



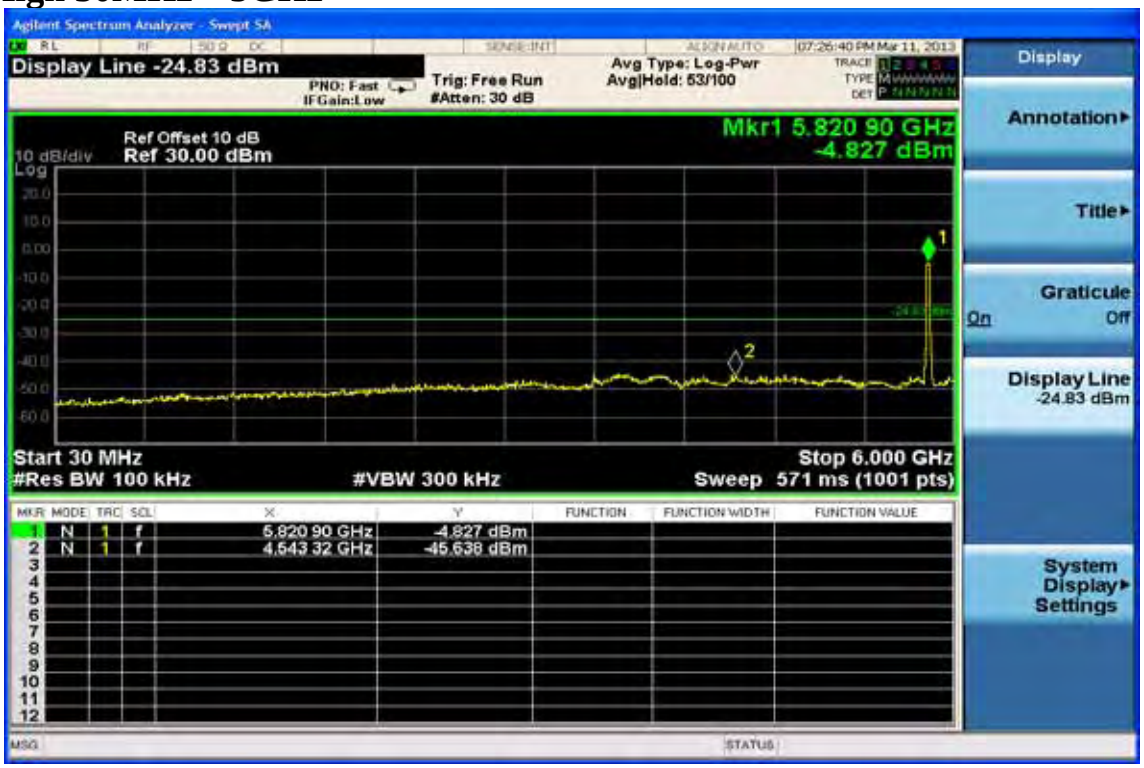
Ch Mid 3GHz – 26GHz



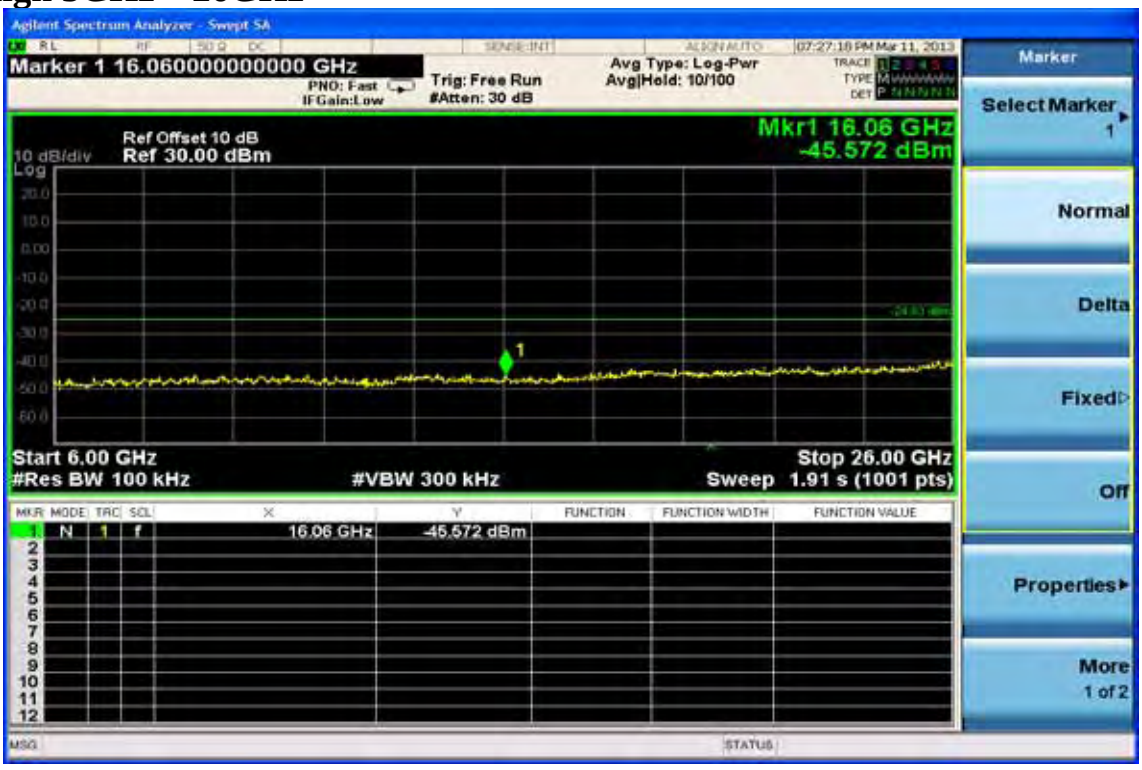
Ch Mid 26GHz – 40GHz



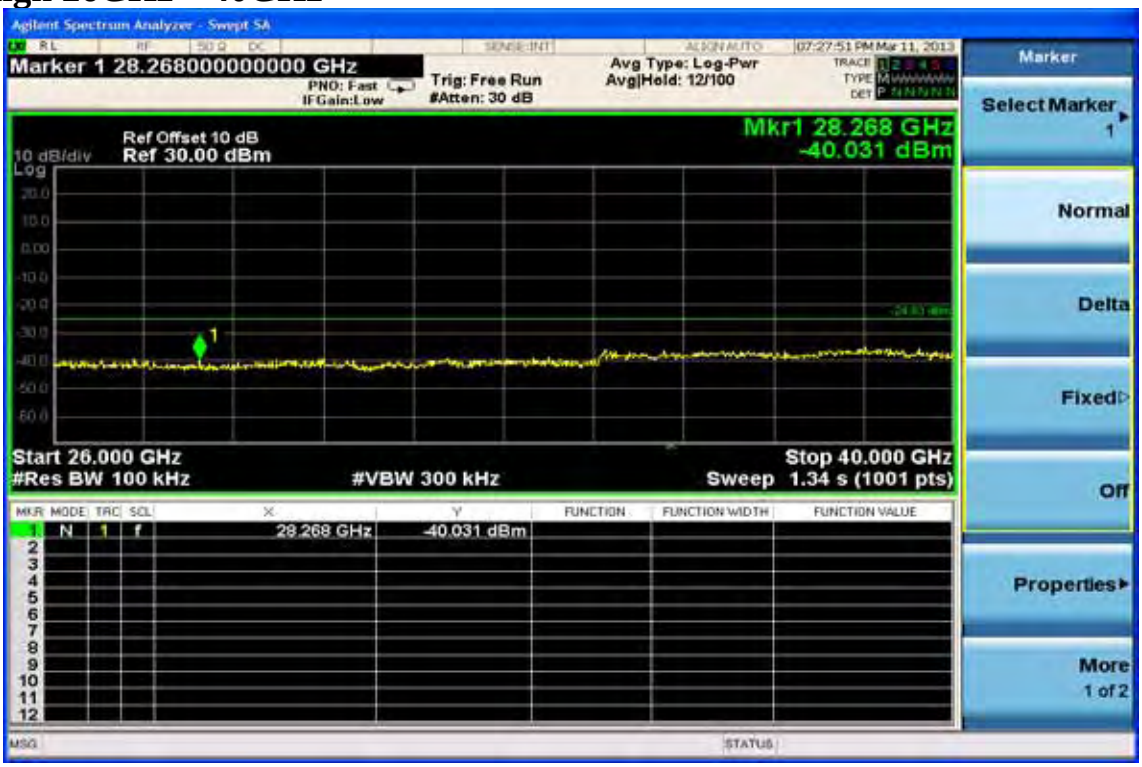
Ch High 30MHz – 3GHz



Ch High 3GHz – 26GHz

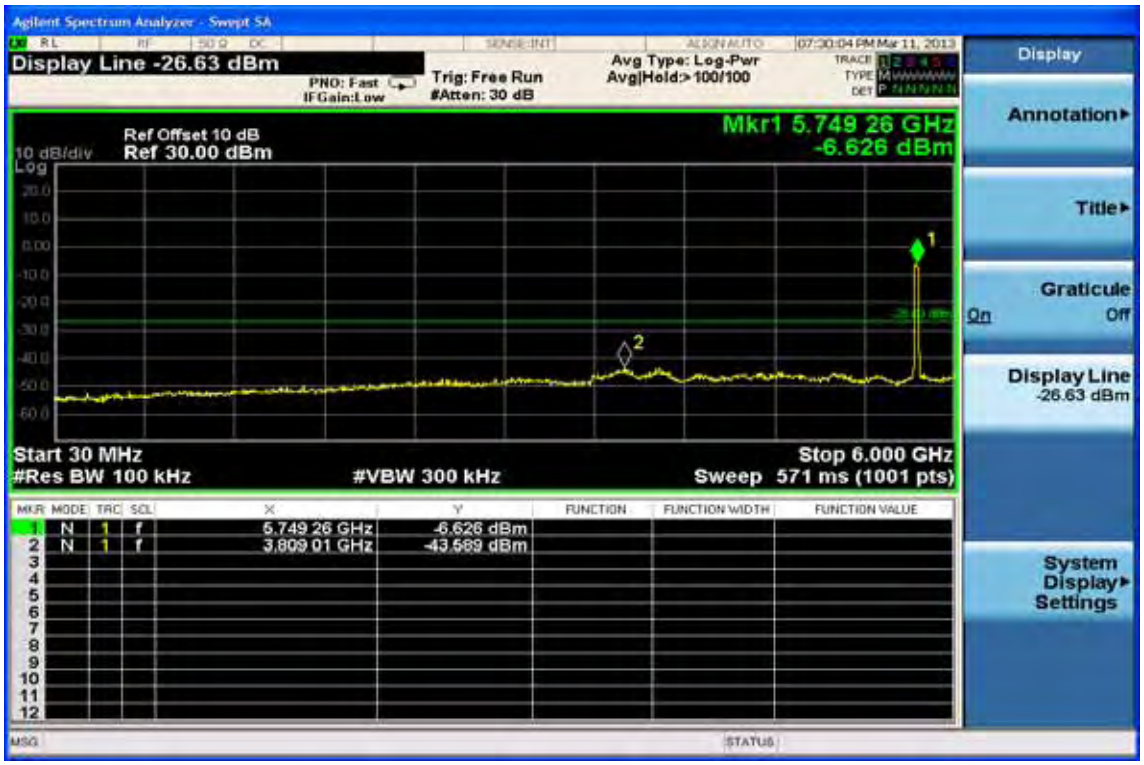


Ch High 26GHz – 40GHz

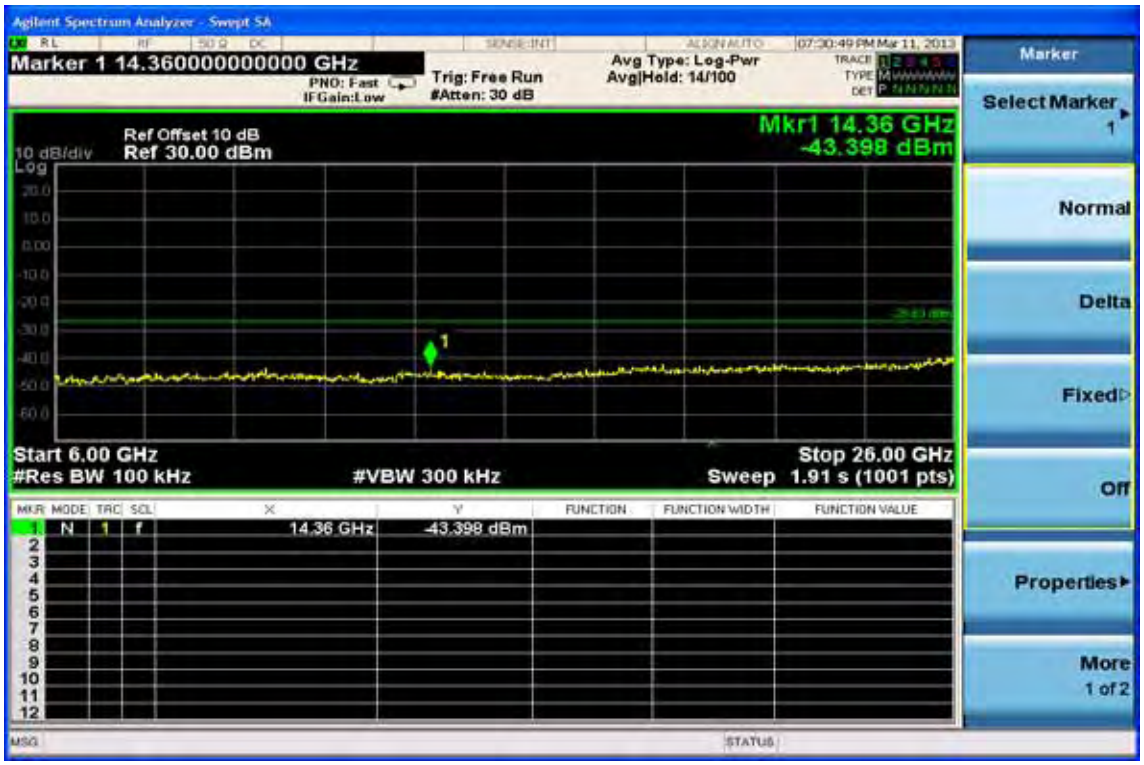


Conducted Spurious Emission Measurement Result
802.11n_20M for 5GHz (chain a)

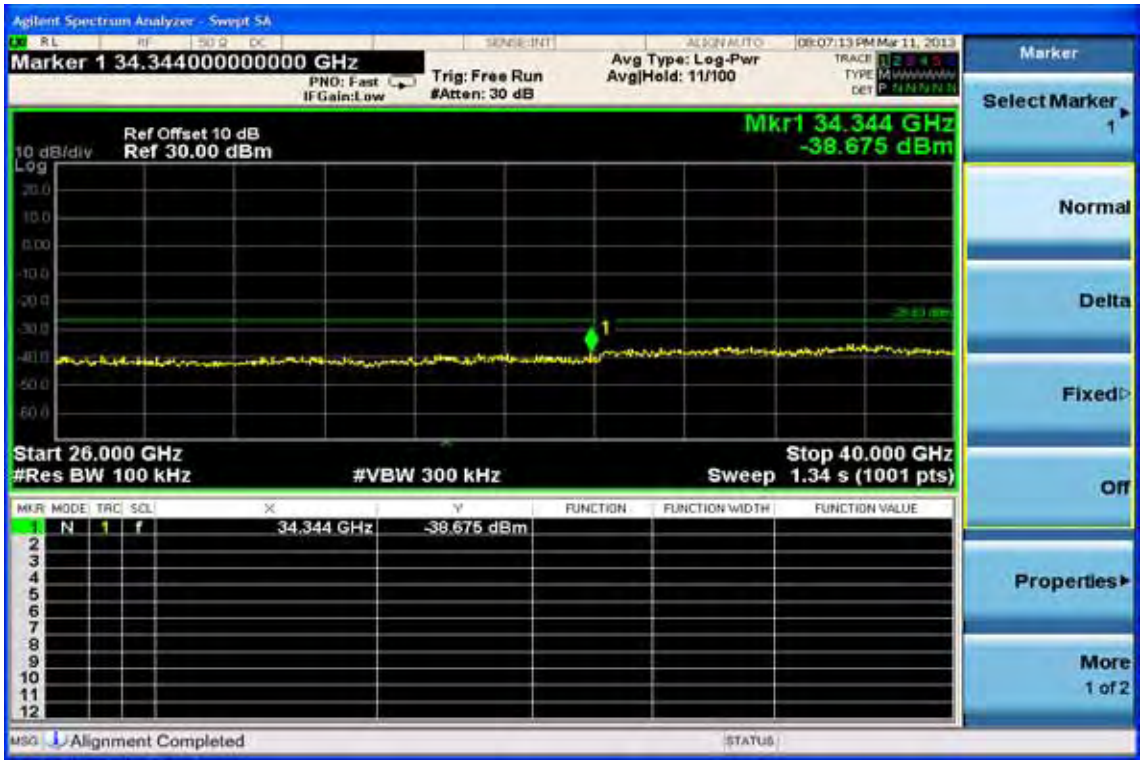
Ch Low 30MHz – 3GHz



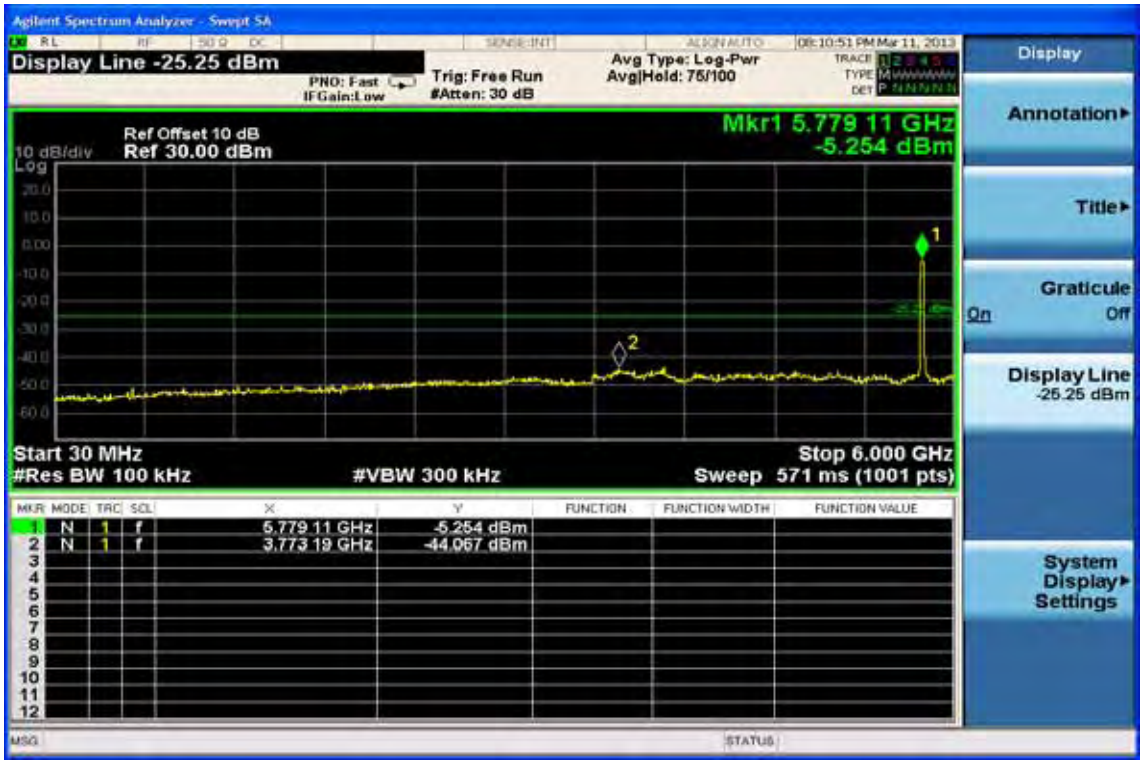
Ch Low 3GHz – 26GHz



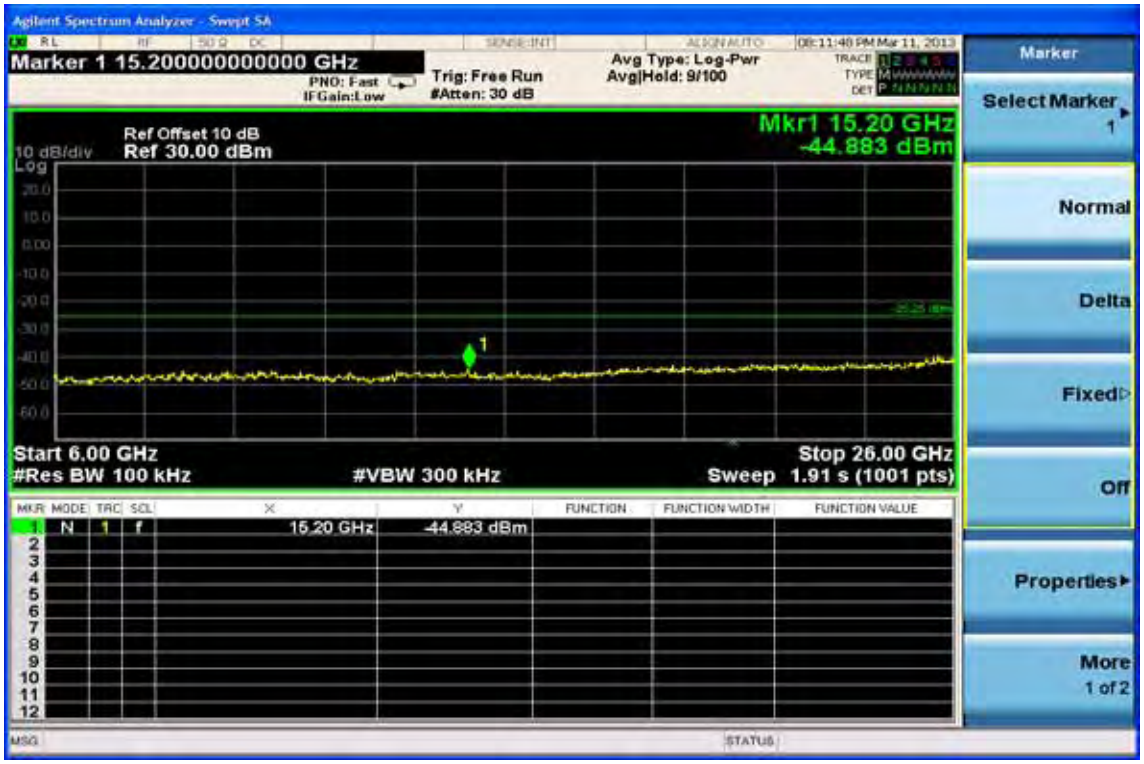
Ch Low 26GHz – 40GHz



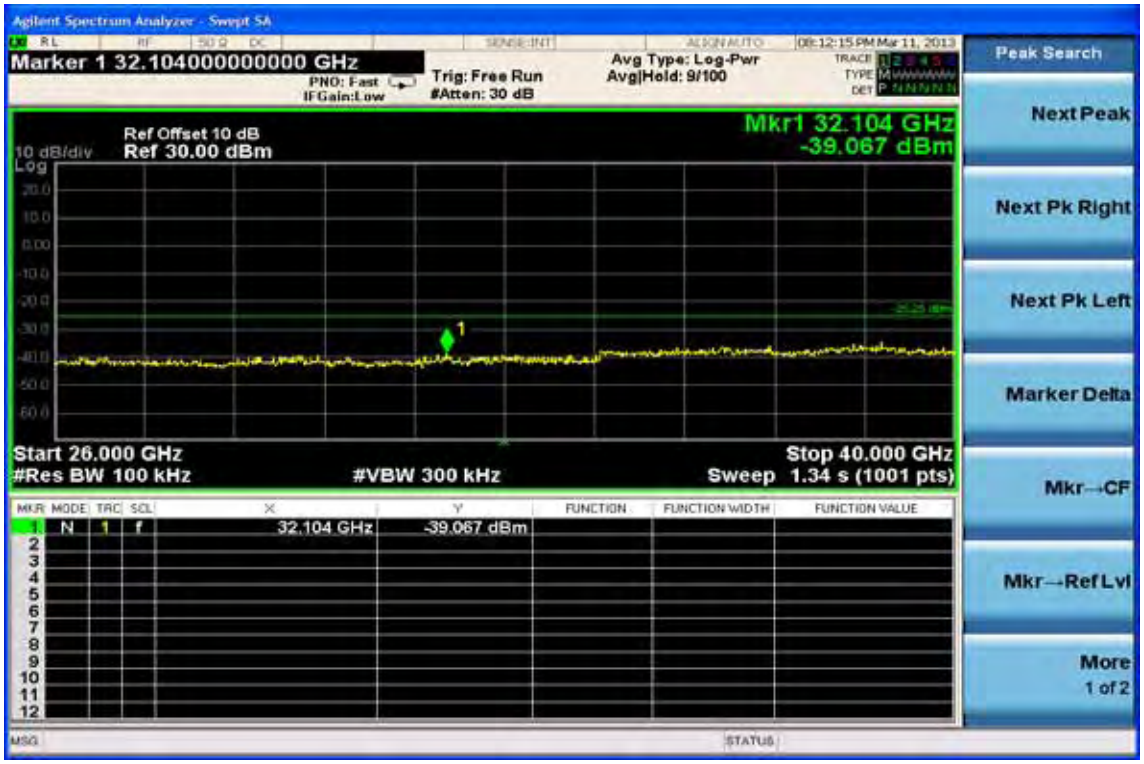
Ch Mid 30MHz – 3GHz



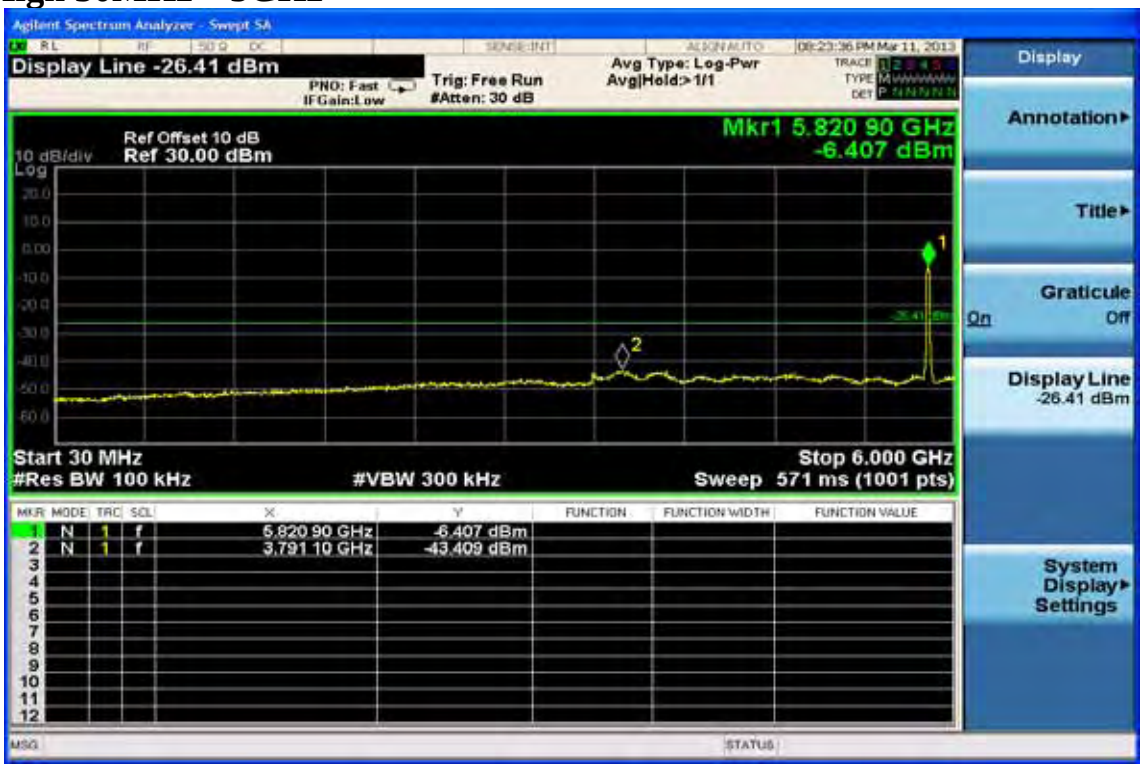
Ch Mid 3GHz – 26GHz



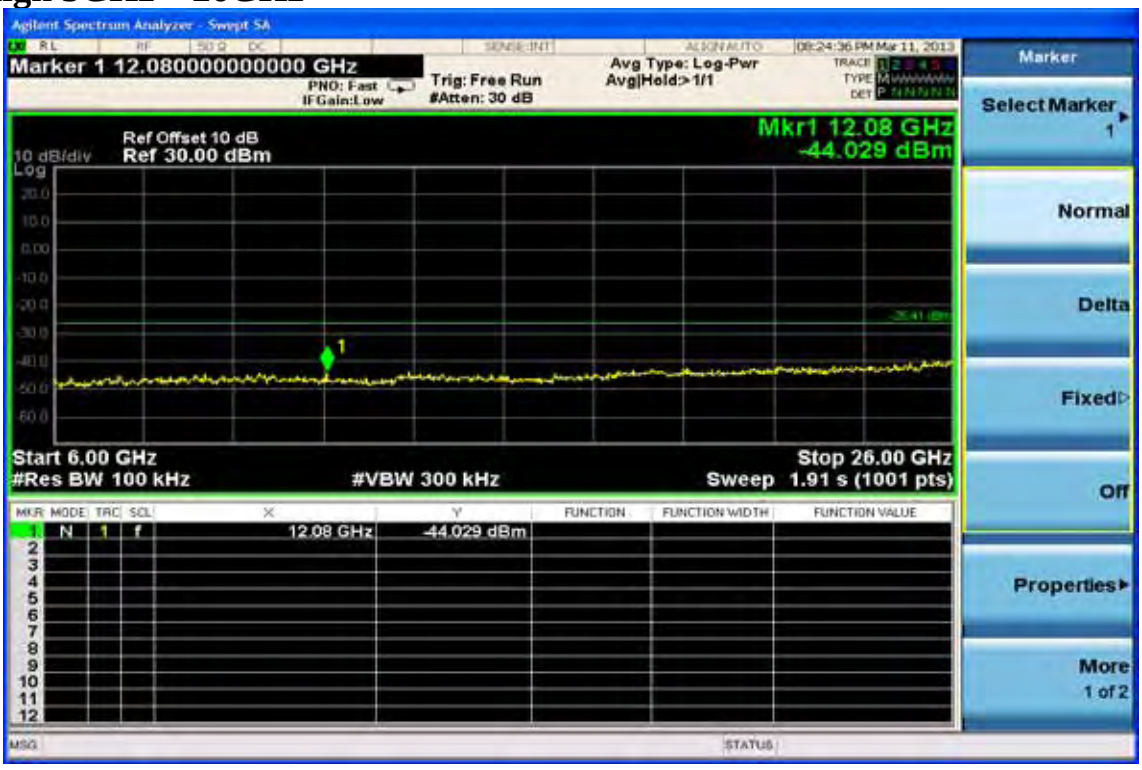
Ch Mid 26GHz – 40GHz



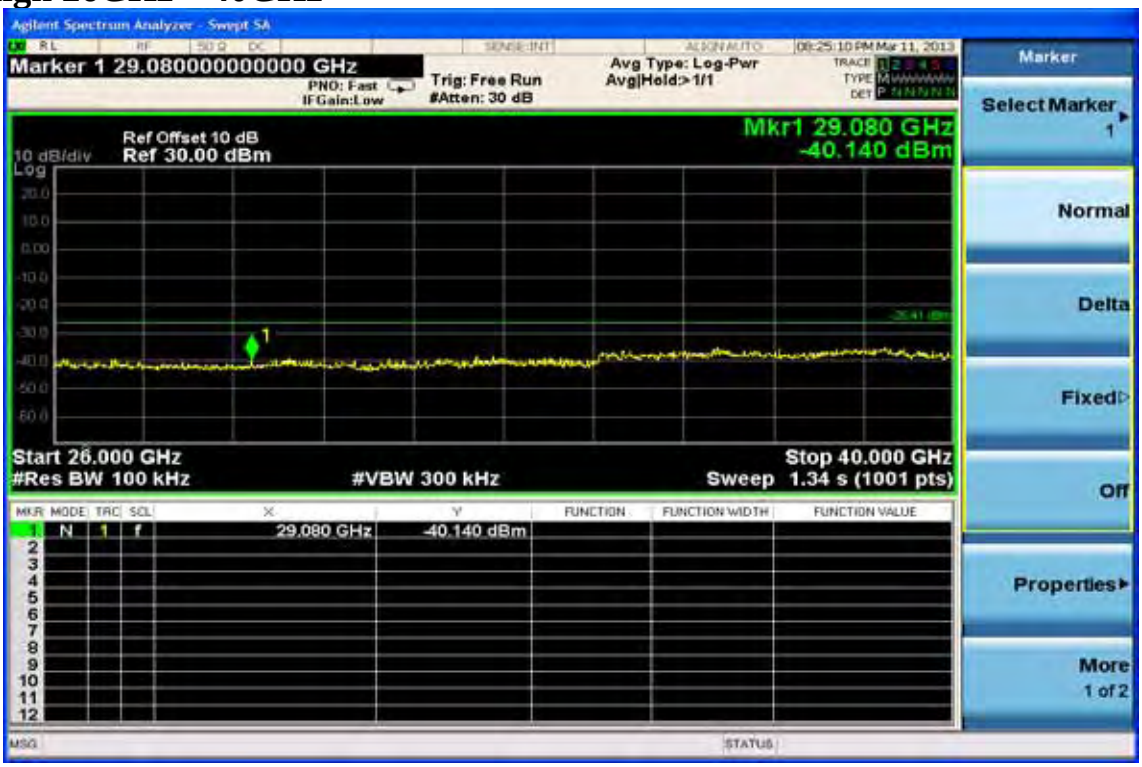
Ch High 30MHz – 3GHz



Ch High 3GHz – 26GHz

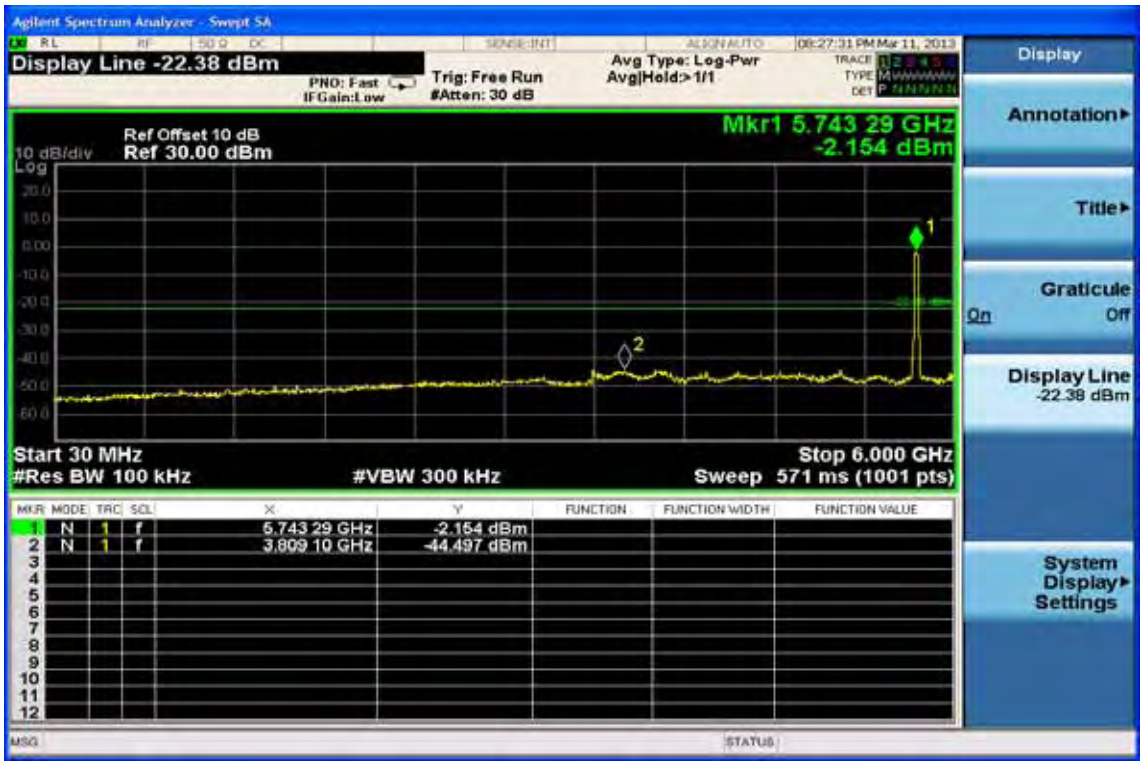


Ch High 26GHz – 40GHz

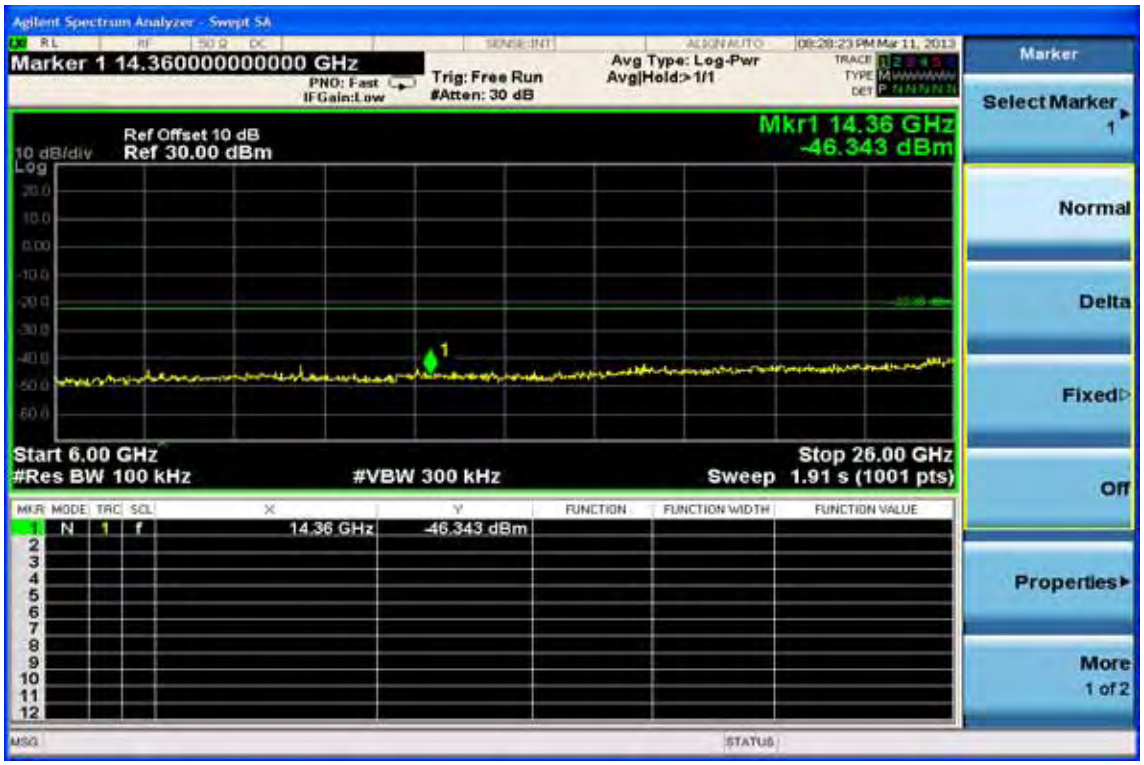


Conducted Spurious Emission Measurement Result
802.11n_20M for 5GHz (chain b)

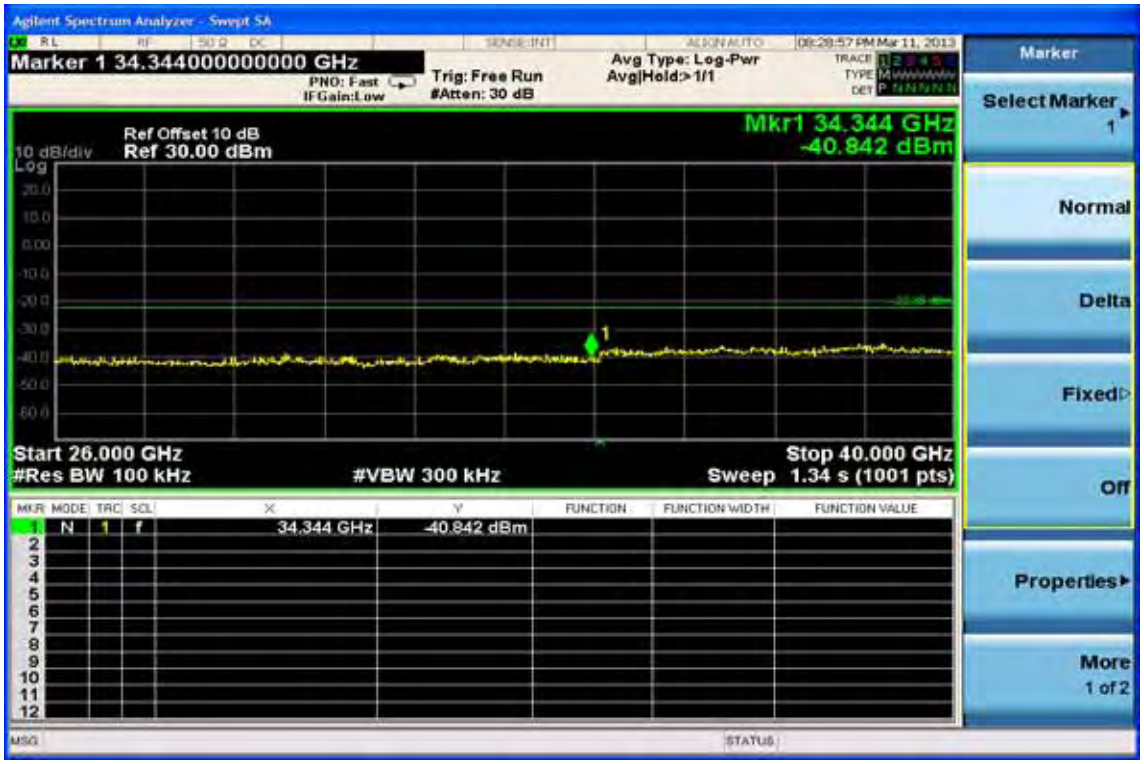
Ch Low 30MHz – 3GHz



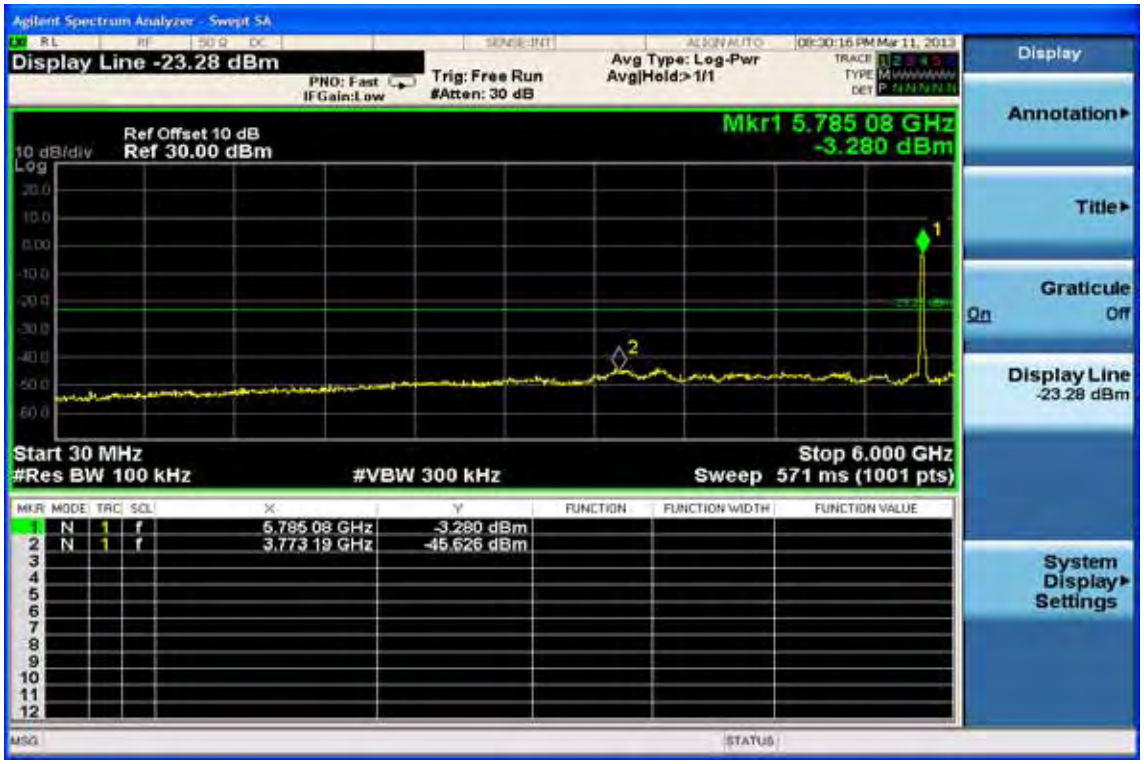
Ch Low 3GHz – 26GHz



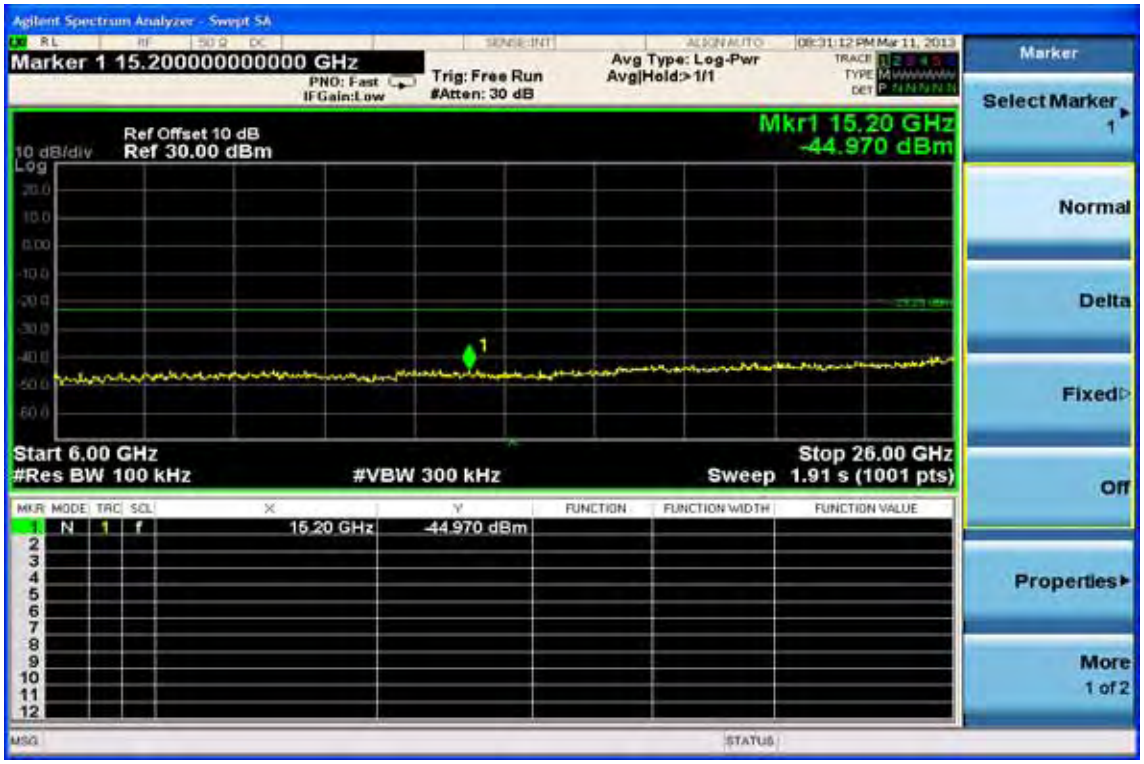
Ch Low 26GHz – 40GHz



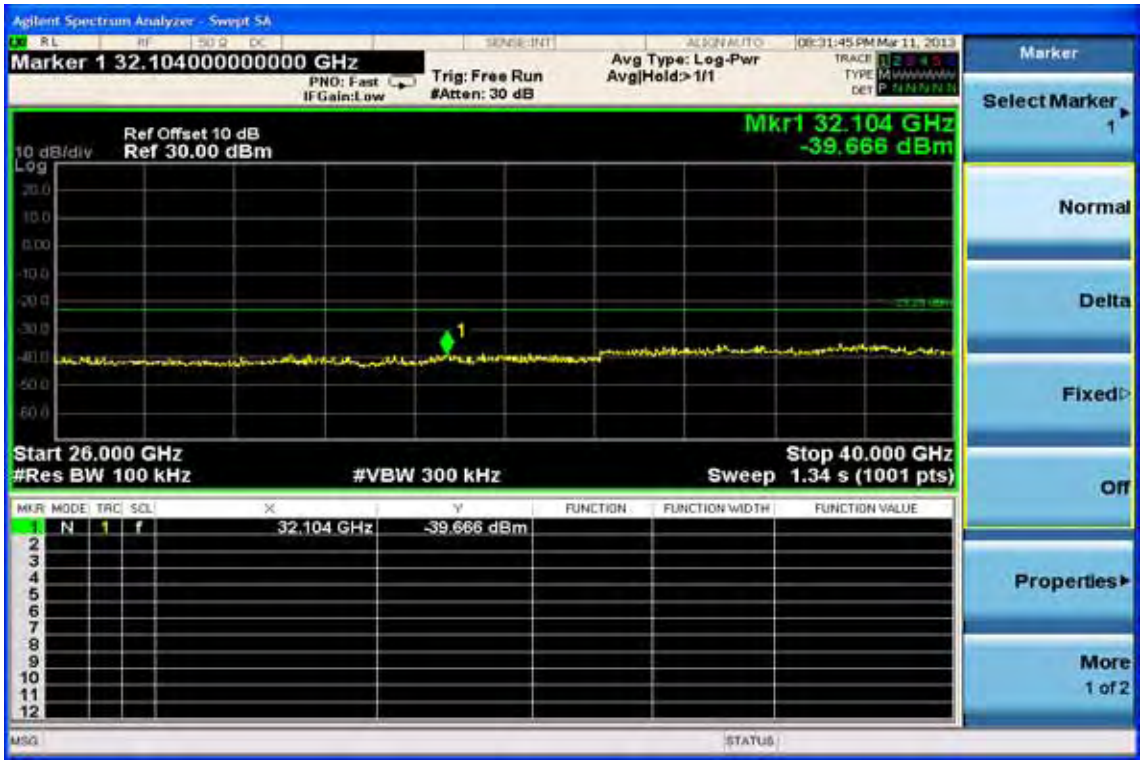
Ch Mid 30MHz – 3GHz



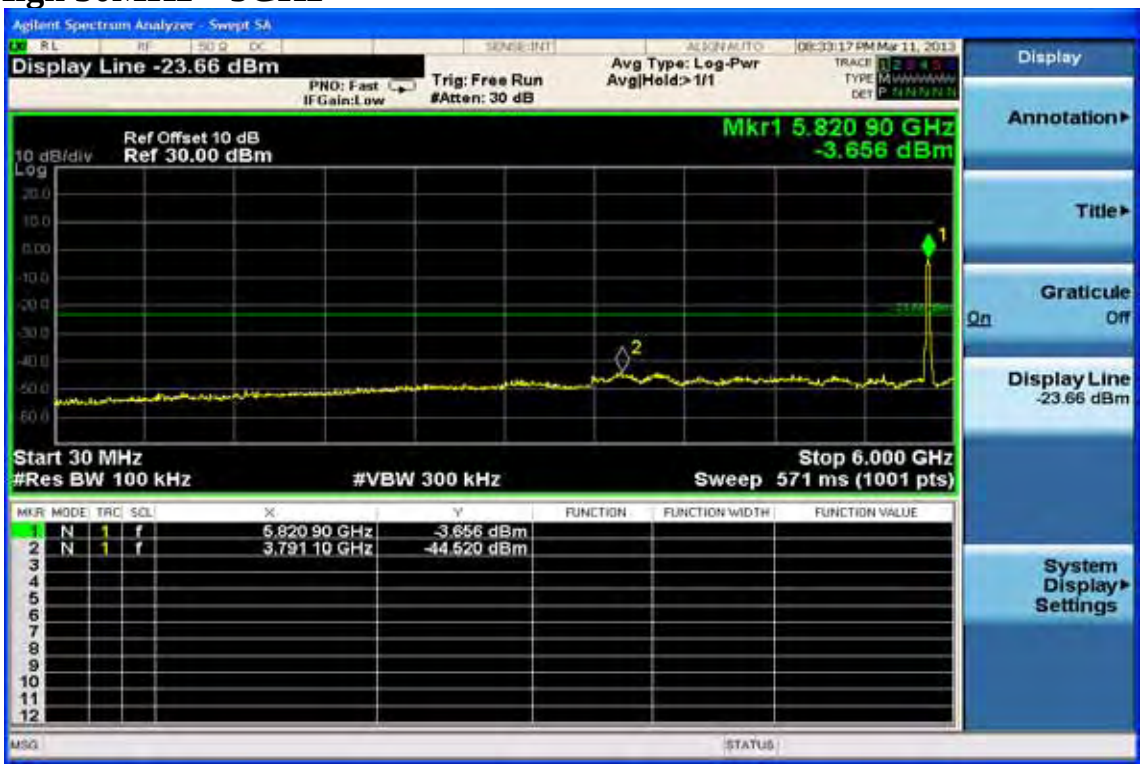
Ch Mid 3GHz – 26GHz



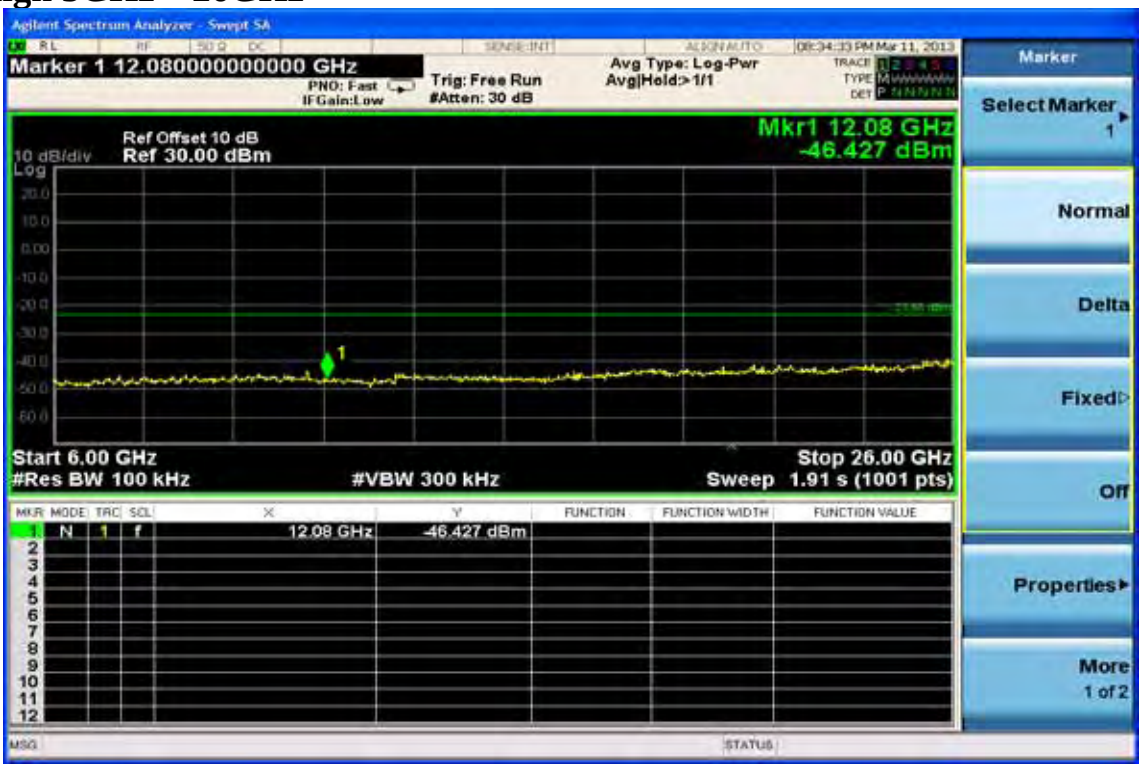
Ch Mid 26GHz – 40GHz



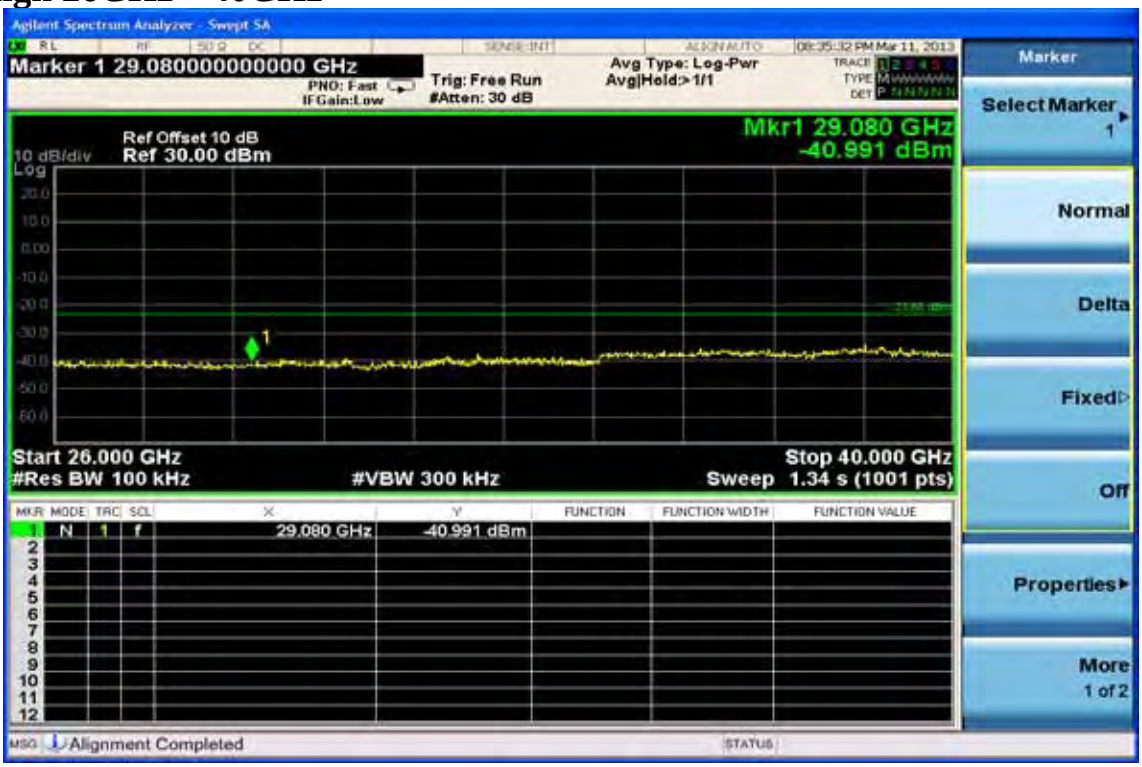
Ch High 30MHz – 3GHz



Ch High 3GHz – 26GHz

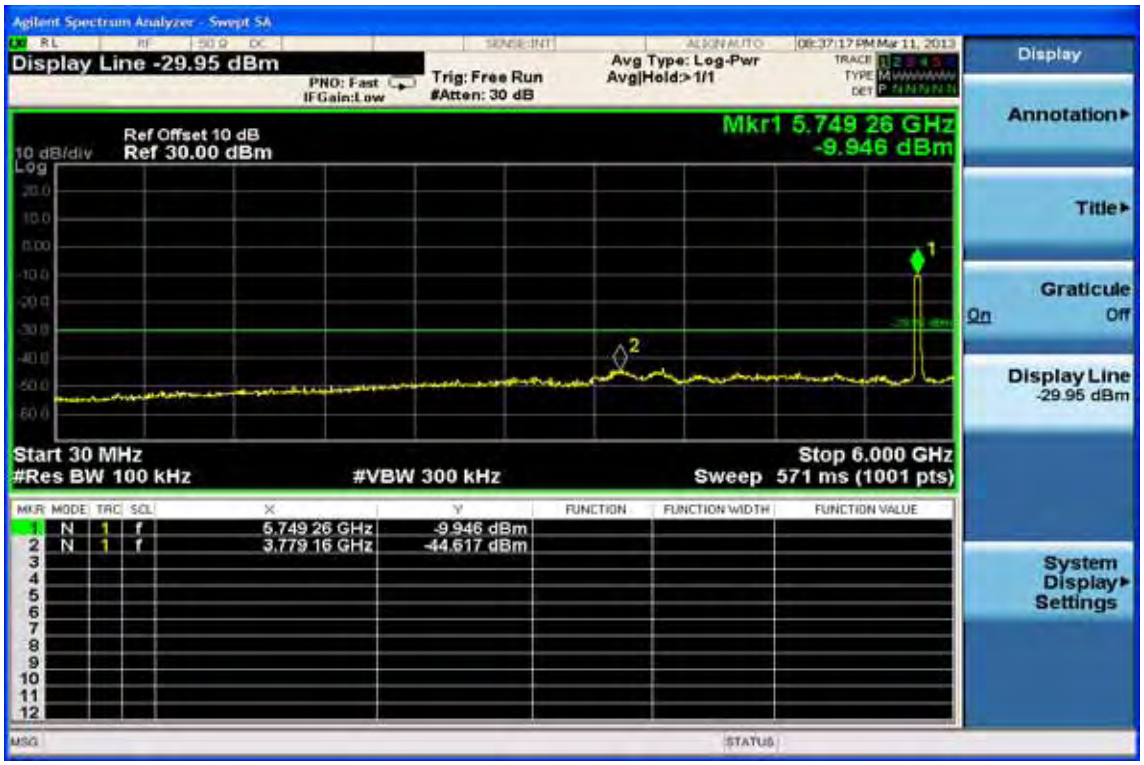


Ch High 26GHz – 40GHz

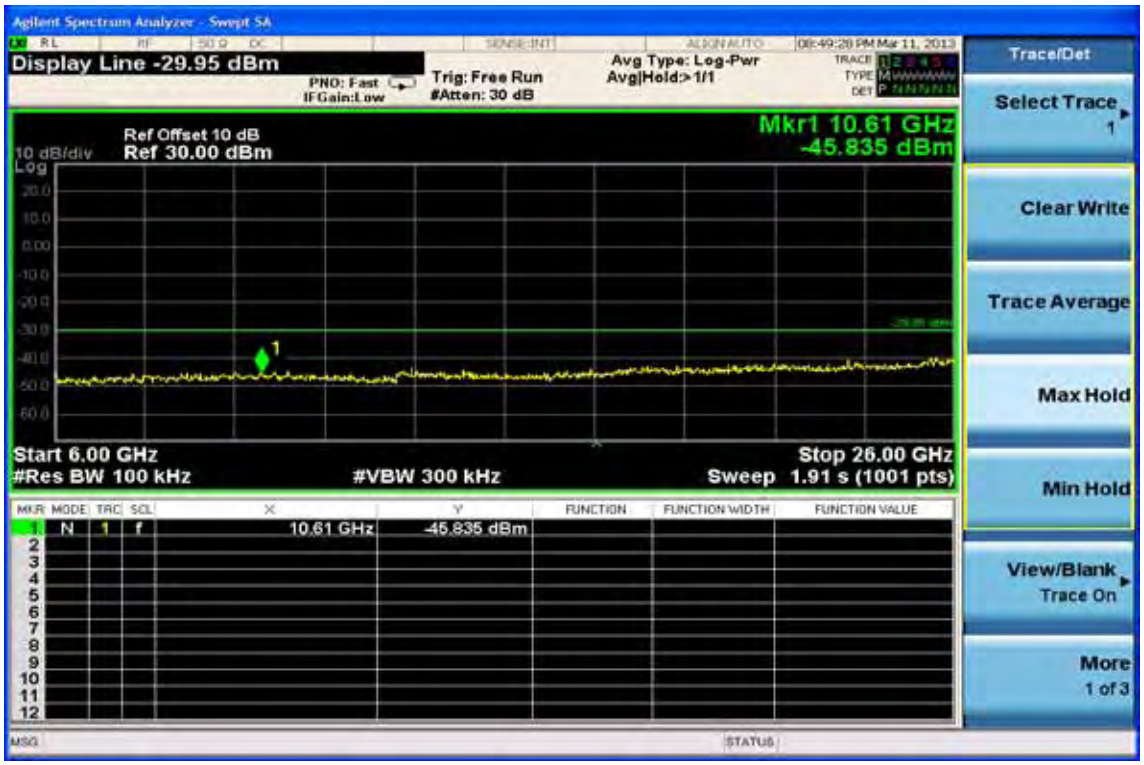


Conducted Spurious Emission Measurement Result
802.11n_40M for 5GHz (chain a)

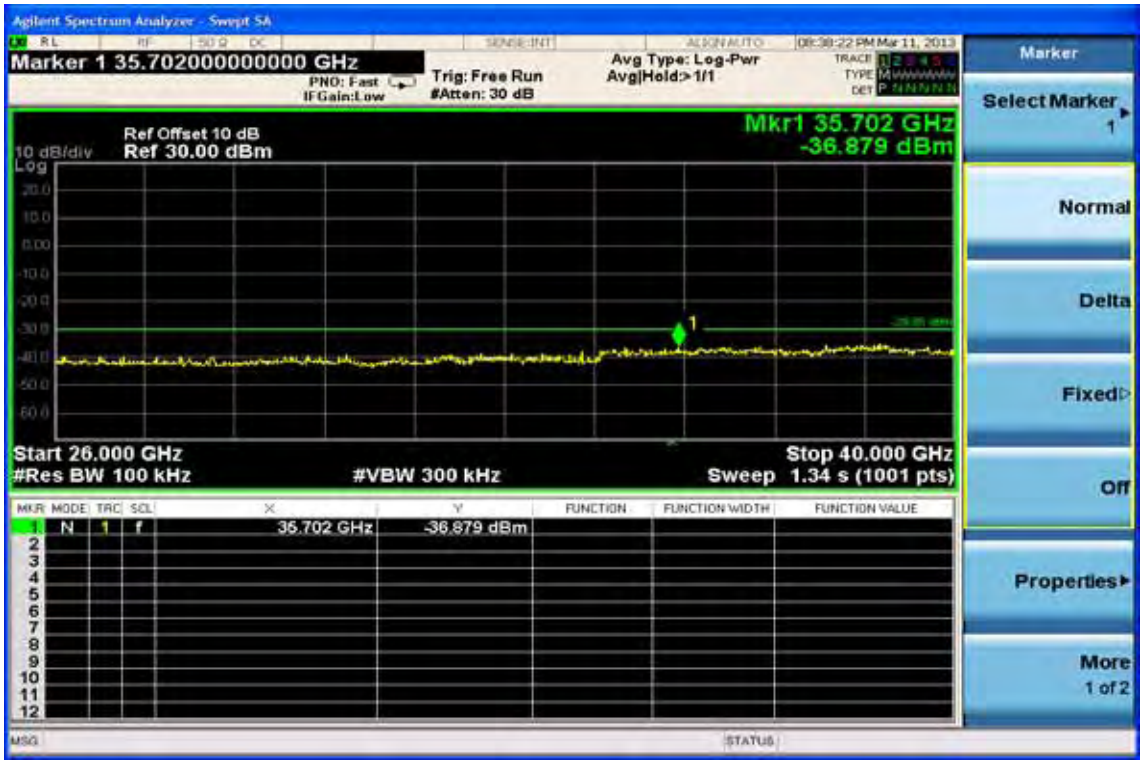
Ch Low 30MHz – 3GHz



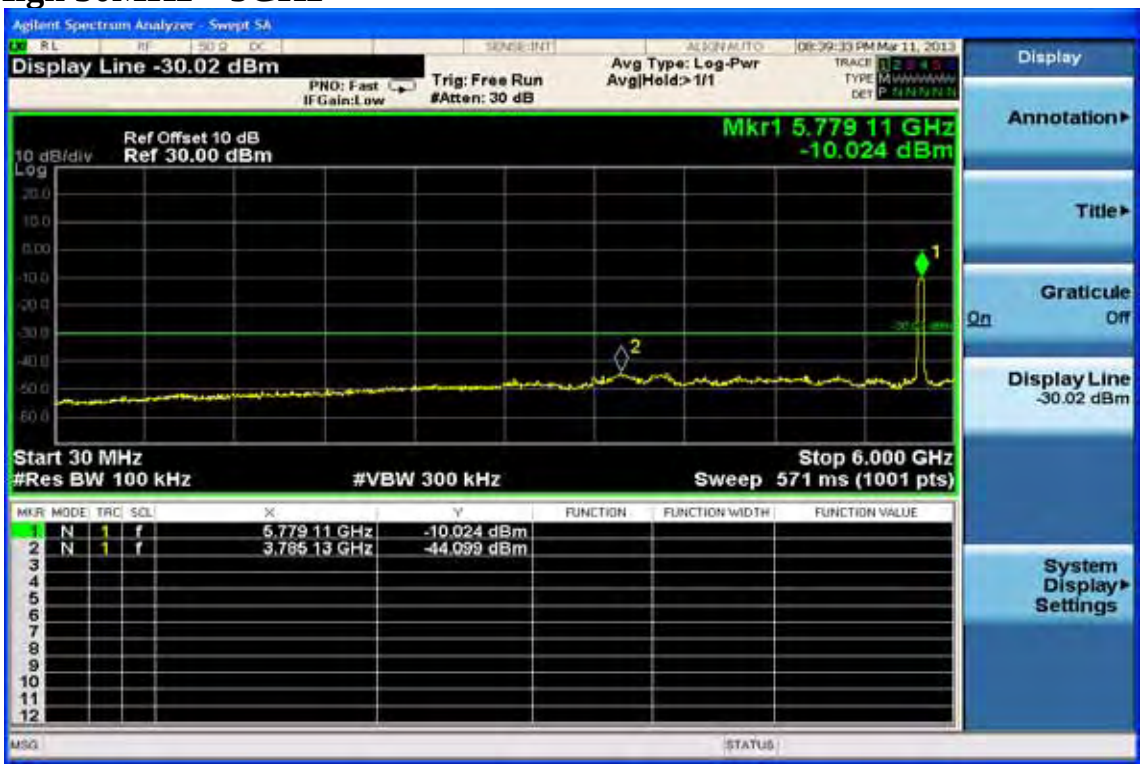
Ch Low 3GHz – 26GHz



Ch Low 26GHz – 40GHz

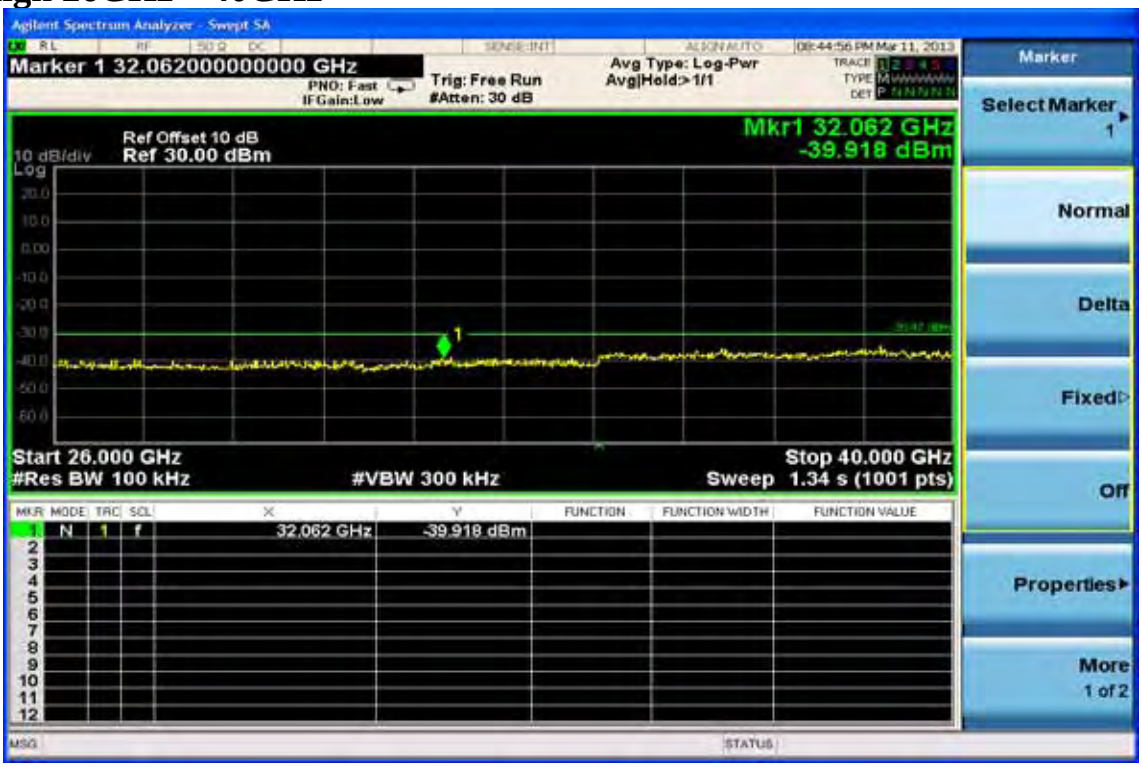


Ch High 30MHz – 3GHz



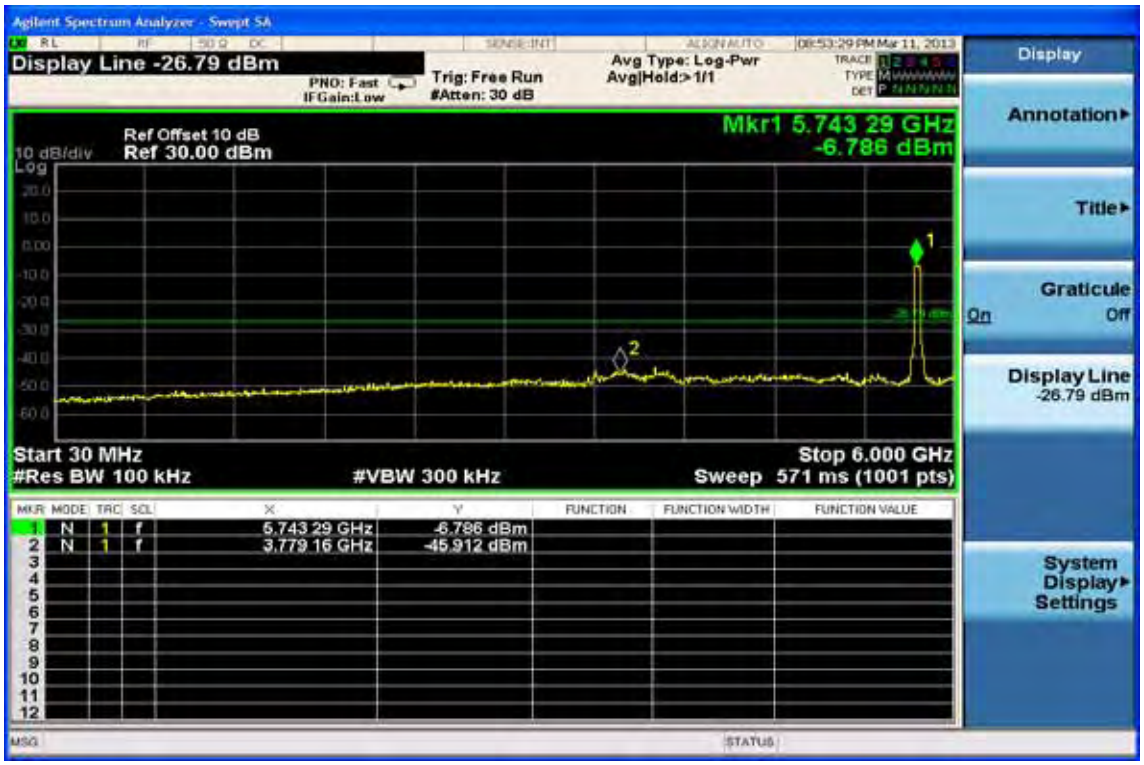
Ch High 3GHz – 26GHz

Ch High 26GHz – 40GHz

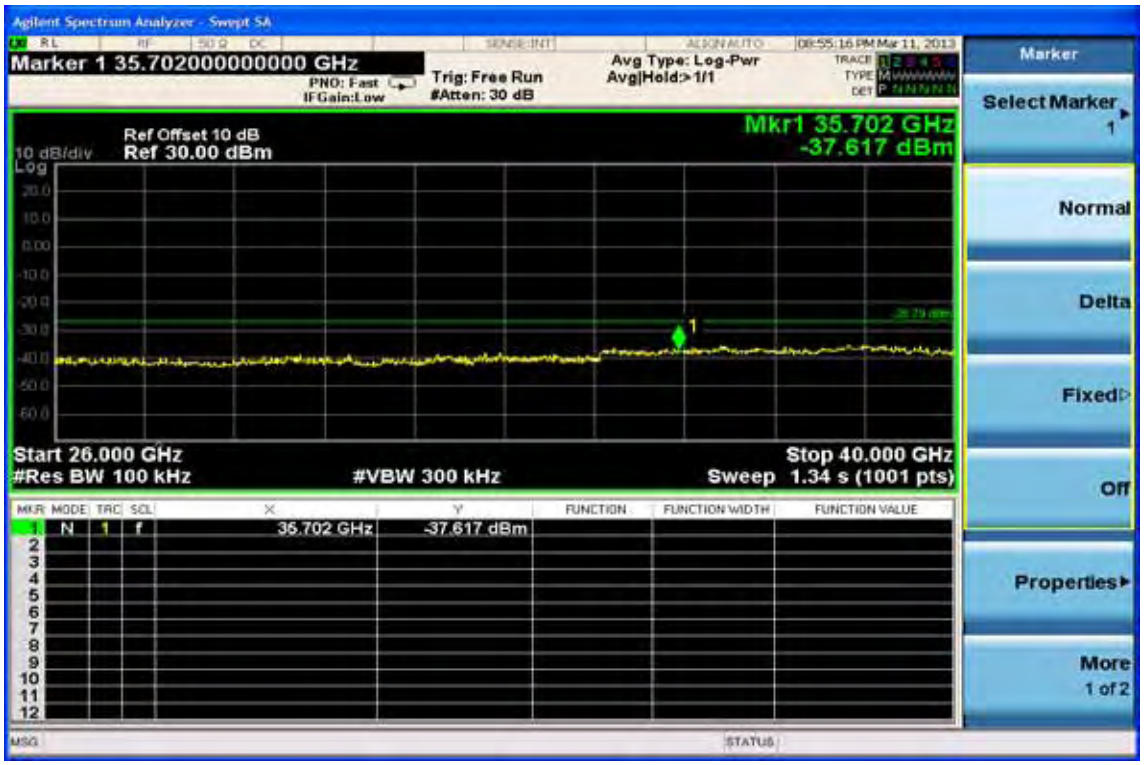


Conducted Spurious Emission Measurement Result
802.11n_40M for 5GHz (chain b)

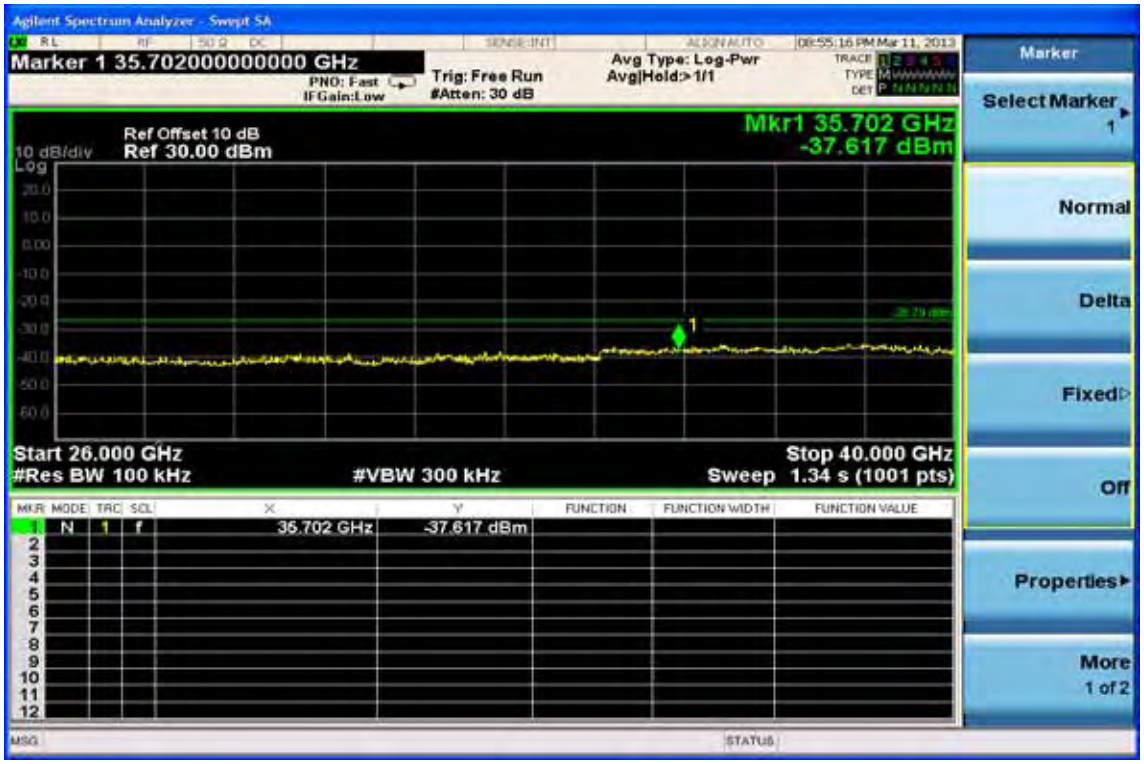
Ch Low 30MHz – 3GHz



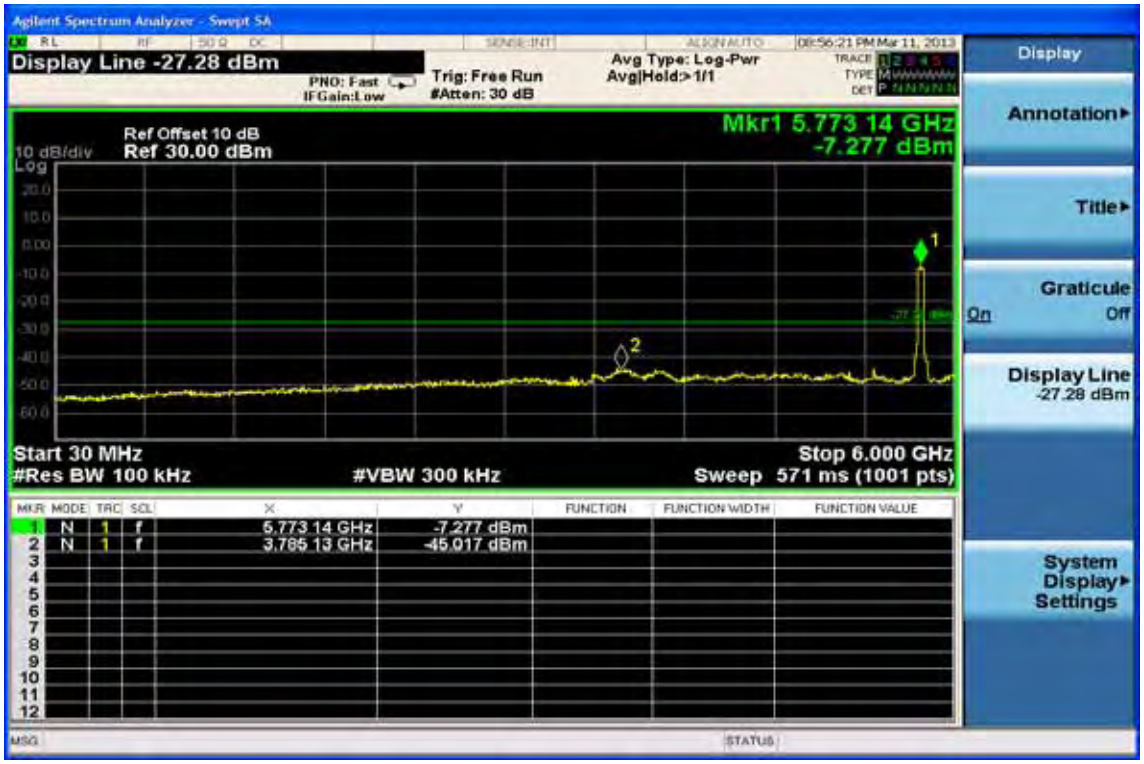
Ch Low 3GHz – 26GHz



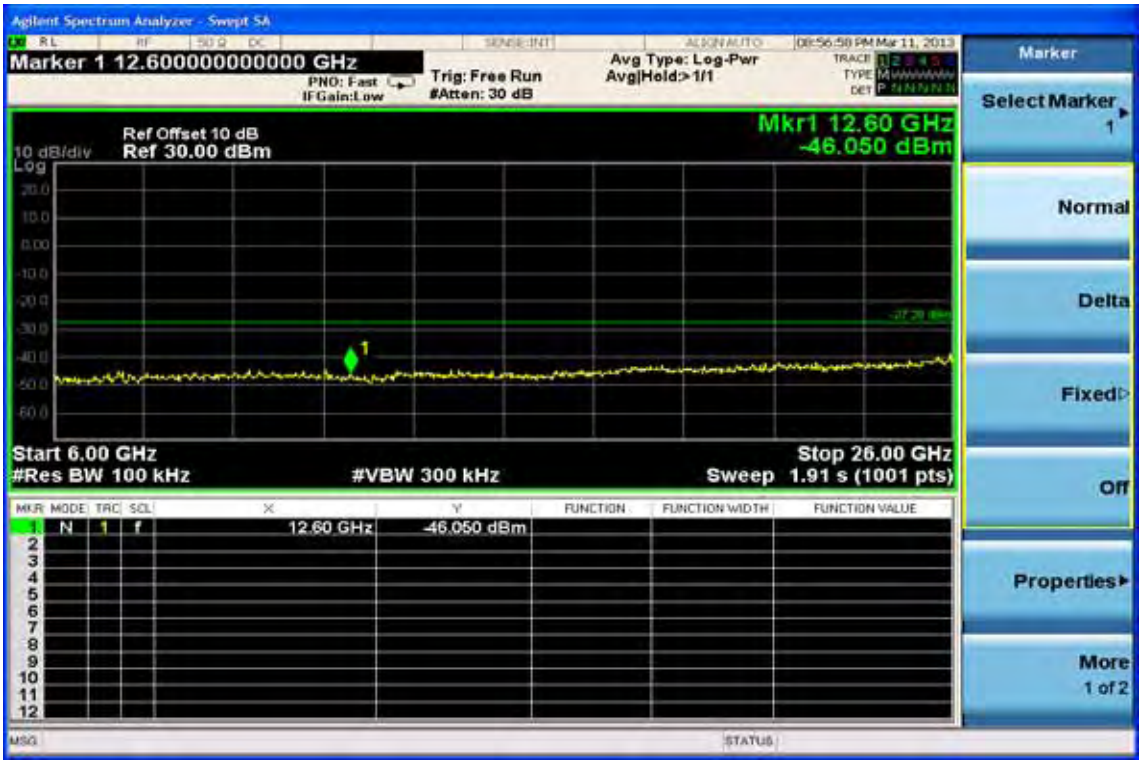
Ch Low 26GHz – 40GHz



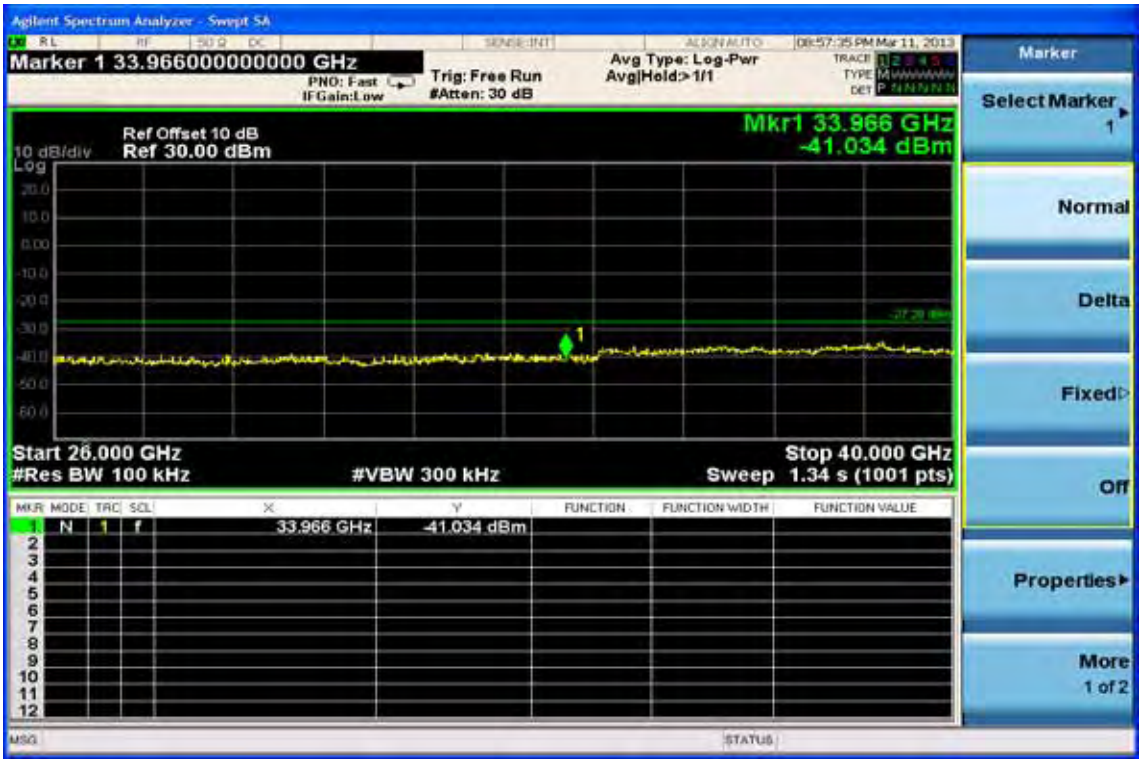
Ch Mid 30MHz – 3GHz



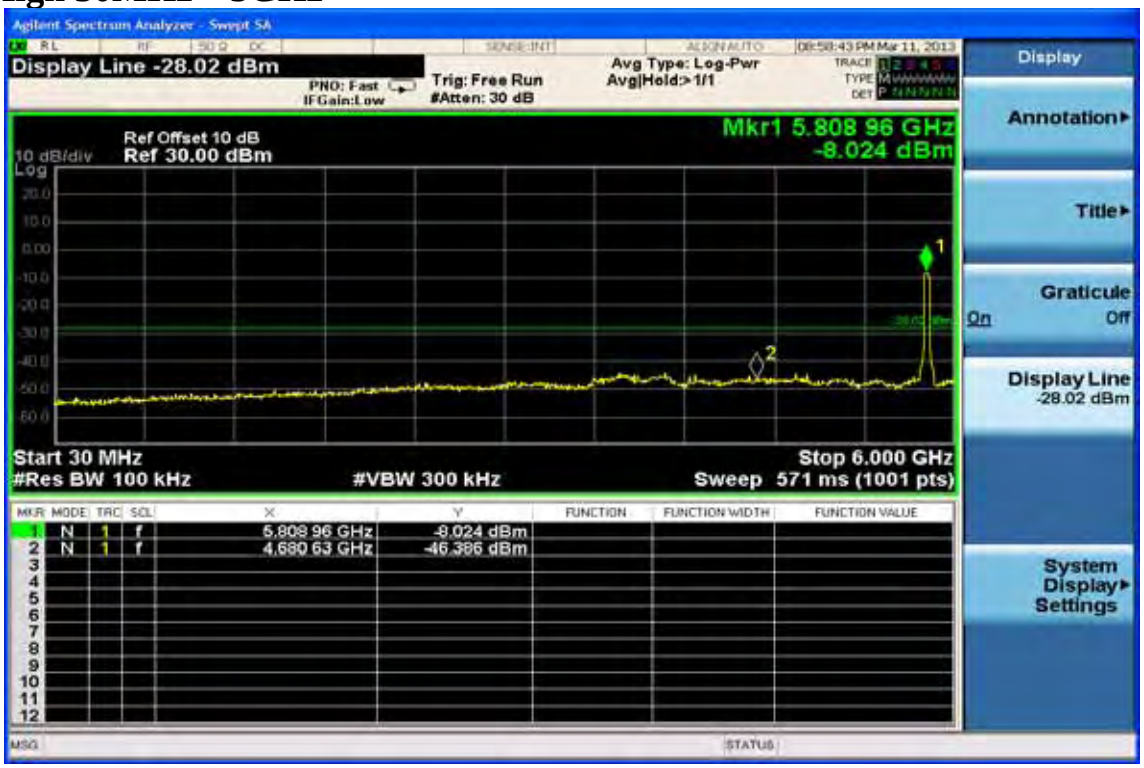
Ch Mid 3GHz – 26GHz



Ch Mid 26GHz – 40GHz

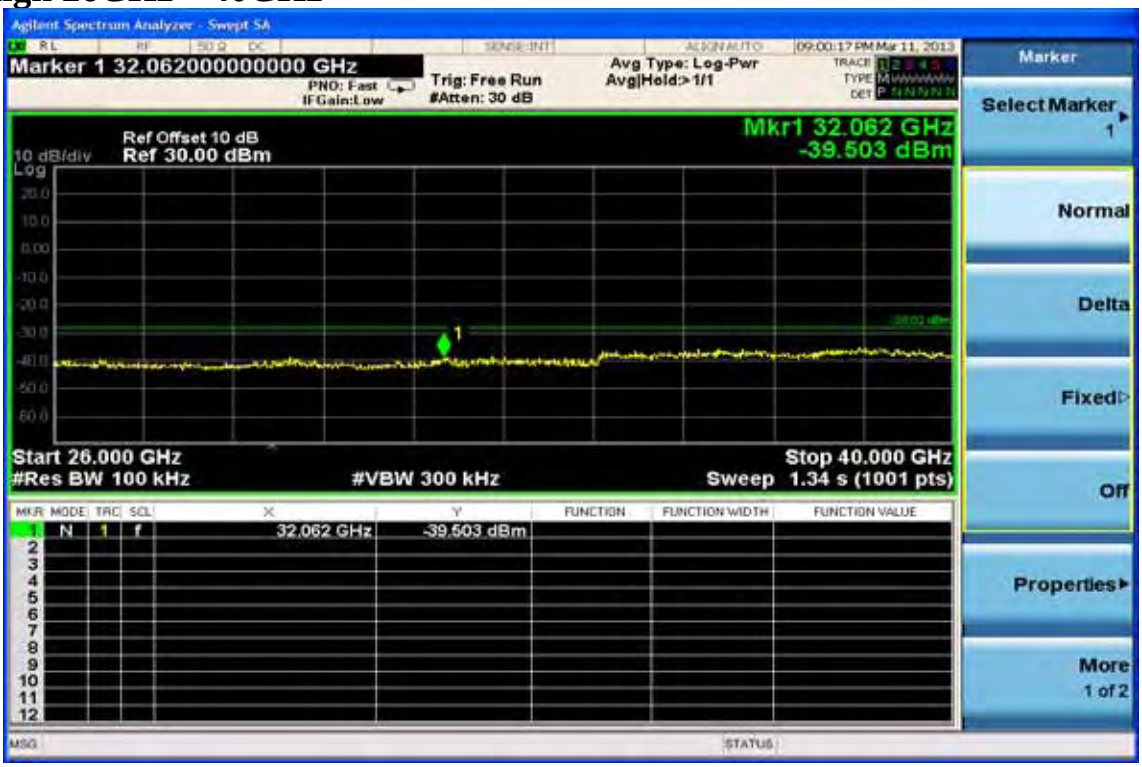


Ch High 30MHz – 3GHz



Ch High 3GHz – 26GHz

Ch High 26GHz – 40GHz



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

Operation Mode	802.11g TX CH Low	Test Date	2013/03/14
Fundamental Frequency	2412MHz	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	107.60	44.40	-16.71	27.69	43.50	-15.81	Peak	VERTICAL
2	269.59	40.00	-13.41	26.59	46.00	-19.41	Peak	VERTICAL
3	379.20	43.81	-10.83	32.98	46.00	-13.02	Peak	VERTICAL
4	499.48	42.50	-9.06	33.44	46.00	-12.56	Peak	VERTICAL
5	646.92	37.42	-6.03	31.39	46.00	-14.61	Peak	VERTICAL
6	759.44	44.78	-3.77	41.01	46.00	-4.99	Peak	VERTICAL
1	108.57	41.91	-16.62	25.29	43.50	-18.21	Peak	HORIZONTAL
2	271.53	30.68	-13.32	17.36	46.00	-28.64	Peak	HORIZONTAL
3	380.17	36.10	-10.83	25.27	46.00	-20.73	Peak	HORIZONTAL
4	499.48	35.55	-9.06	26.49	46.00	-19.51	Peak	HORIZONTAL
5	734.22	29.66	-4.28	25.38	46.00	-20.62	Peak	HORIZONTAL
6	839.95	34.24	-3.06	31.18	46.00	-14.82	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	802.11 g TX CH Mid	Test Date	2013/03/14
Fundamental Frequency	2437MHz	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	108.57	43.84	-16.62	27.22	43.50	-16.28	Peak	VERTICAL
2	269.59	41.17	-13.41	27.76	46.00	-18.24	Peak	VERTICAL
3	378.23	40.49	-10.85	29.64	46.00	-16.36	Peak	VERTICAL
4	432.55	35.75	-9.84	25.91	46.00	-20.09	Peak	VERTICAL
5	497.54	39.59	-9.07	30.52	46.00	-15.48	Peak	VERTICAL
6	759.44	43.61	-3.77	39.84	46.00	-6.16	Peak	VERTICAL
1	108.57	41.68	-16.62	25.06	43.50	-18.44	Peak	HORIZONTAL
2	271.53	31.30	-13.32	17.98	46.00	-28.02	Peak	HORIZONTAL
3	380.17	36.15	-10.83	25.32	46.00	-20.68	Peak	HORIZONTAL
4	499.48	36.29	-9.06	27.23	46.00	-18.77	Peak	HORIZONTAL
5	540.22	33.49	-8.25	25.24	46.00	-20.76	Peak	HORIZONTAL
6	839.95	35.15	-3.06	32.09	46.00	-13.91	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	802.11g TX CH High	Test Date	2013/03/14
Fundamental Frequency	2462MHz	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	107.60	42.70	-16.71	25.99	43.50	-17.51	Peak	VERTICAL
2	270.56	39.92	-13.37	26.55	46.00	-19.45	Peak	VERTICAL
3	379.20	41.86	-10.83	31.03	46.00	-14.97	Peak	VERTICAL
4	499.48	39.98	-9.06	30.92	46.00	-15.08	Peak	VERTICAL
5	646.92	35.10	-6.03	29.07	46.00	-16.93	Peak	VERTICAL
6	757.50	41.85	-3.79	38.06	46.00	-7.94	Peak	VERTICAL
1	108.57	42.54	-16.62	25.92	43.50	-17.58	Peak	HORIZONTAL
2	271.53	31.90	-13.32	18.58	46.00	-27.42	Peak	HORIZONTAL
3	380.17	36.11	-10.83	25.28	46.00	-20.72	Peak	HORIZONTAL
4	499.48	35.69	-9.06	26.63	46.00	-19.37	Peak	HORIZONTAL
5	600.36	31.49	-6.74	24.75	46.00	-21.25	Peak	HORIZONTAL
6	839.95	35.29	-3.06	32.23	46.00	-13.77	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	802.11g TX CH Low	Test Date	2013/03/14
Fundamental Frequency	2412MHz	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	1161.00	60.39	-16.44	43.95	74.00	-30.05	Peak	VERTICAL
2	4824.00	47.80	-2.26	45.54	74.00	-28.46	Peak	VERTICAL
1	1161.00	66.25	-16.44	49.81	74.00	-24.19	Peak	HORIZONTAL
2	4824.00	46.23	-2.26	43.97	74.00	-30.03	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	802.11g TX CH Mid	Test Date	2013/03/14
Fundamental Frequency	2437MHz	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	1161.00	60.31	-16.44	43.87	74.00	-30.13	Peak	VERTICAL
2	4874.00	45.58	-2.09	43.49	74.00	-30.51	Peak	VERTICAL
1	1168.00	66.70	-16.42	50.28	74.00	-23.72	Peak	HORIZONTAL
2	4874.00	45.33	-2.09	43.24	74.00	-30.76	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	802.11g TX CH High	Test Date	2013/03/14
Fundamental Frequency	2462MHz	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	1161.00	61.06	-16.44	44.62	74.00	-29.38	Peak	VERTICAL
2	4924.00	46.38	-1.92	44.46	74.00	-29.54	Peak	VERTICAL
1	1161.00	59.11	-16.44	42.67	74.00	-31.33	Peak	HORIZONTAL
2	4924.00	45.43	-1.92	43.51	74.00	-30.49	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.

10 Peak Power Spectral Density

10.1 Standard Applicable:

According to §15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

According to RSS-210 issue 8, §A8.2(b) and §A8.3(2), The transmitter power spectral density (into the antenna) shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission or over 1.0 second if the transmission exceeds 1.0 second duration.

10.2 Measurement Equipment Used:

Refer to section 6.2 for details.

10.3 Test Set-up:

Refer to section 6.3 for details.

10.4 Measurement Procedure:

Refer to section 10.2 Peak Power Density(PKPPSD) Measurement Procedure of KDB Document: 558074 D01 DTS Meas Guidance v03r01

1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ 300 kHz.
4. Set the span to 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB).
11. The resulting peak PSD level must be ≤ 8 dBm.

10.5 Measurement Result:

802.11b Mode

Frequency MHz	Power Density Reading (dBm)/100KHz	BWCF (dB)	Power Density Level (dBm)/3KHz	Maximum Limit (dBm)
2412	8.57	-15.2	-6.63	8
2437	8.64	-15.2	-6.56	8
2462	8.37	-15.2	-6.83	8

BWCF(bandwidth correction factor)=10log (3 kHz/100KHz)
kHz = -15.2 dB)

802.11g Mode

Frequency MHz	Power Density Reading (dBm)/100KHz	BWCF (dB)	Power Density Level (dBm)/3KHz	Maximum Limit (dBm)
2412	2.01	-15.2	-13.19	8
2437	1.76	-15.2	-13.44	8
2462	2.01	-15.2	-13.19	8

BWCF(bandwidth correction factor)=10log (3 kHz/100KHz)
kHz = -15.2 dB)

802.11n for 2.4GHz
2*2 MIMO

	Frequency (MHz)	Output Chain (dBm/100KHz)		BWCF	Combine Power Density (dBm) /3KHz	Limit (dBm)
		Chain A	chain B			
AN HT20	2412	0.26	1.06	-15.2	-11.51	8
	2437	1.41	1.98	-15.2	-10.49	8
	2462	0.82	1.76	-15.2	-10.87	8
AN HT40	2422	-3.18	-2.2	-15.2	-14.85	8
	2437	-2.53	-2.06	-15.2	-14.48	8
	2452	-2.66	-2.07	-15.2	-14.54	8

802.11a Mode

Frequency MHz	Power Density Reading (dBm)/100KHz	BWCF (dB)	Power Density Level (dBm)/3KHz	Maximum Limit (dBm)
5745	-3.76	-15.2	-18.96	8
5785	-3.91	-15.2	-19.11	8
5825	-4.21	-15.2	-19.41	8

BWCF(bandwidth correction factor)=10log (3 kHz/100KHz)
kHz = -15.2 dB)

802.11n for 5GHz
2*2 MIMO

	Frequency (MHz)	Output Chain (dBm/100KHz)		BWCF	Combine Power Density (dBm) /3KHz	Limit (dBm)
		Chain A	chain B			
AN HT20	5745	-6.01	-1.63	-15.2	-15.48	8
	5785	-5.97	-3.07	-15.2	-16.47	8
	5825	-6.33	-4.05	-15.2	-17.23	8
AN HT40	5755	-9.56	-5.4	-15.2	-19.19	8
	5775	-9.71	-6.01	-15.2	-19.67	8
	5815	-10.5	-7.03	-15.2	-20.62	8

802.11b
Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11g

Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11n_20M for 2.4GHz (chain a)
Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11n_20M for 2.4GHz (chain b)
Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11n_40M for 2.4GHz (chain b)
Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11n_40M for 2.4GHz (chain b)
Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11a

Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11n_20M for 5GHz (chain a)
Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11n_20M for 5GHz (chain b)
Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-Mid)

Power Spectral Density Test Plot (CH-High)

802.11n_40M for 5GHz (chain a)
Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-High)

802.11n_40M for 5GHz (chain b)
Power Spectral Density Test Plot (CH-Low)

Power Spectral Density Test Plot (CH-High)

11 ANTENNA REQUIREMENT

11.1 Standard Applicable:

According to §15.203, Antenna requirement.

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

According to RSS-GEN 7.1.2, a transmitter can only be sold or operated with antennas with which it was certified. A transmitter may be certified with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest-gain antenna of each combination of transmitter and antenna type for which certification is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type and having equal or lesser gain as an antenna that had been successfully tested for certification with the transmitter, will also be considered certified with the transmitter, and may be used and marketed with the transmitter. The manufacturer shall include with the application for certification a list of acceptable antenna types to be used with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. Any antenna gain in excess of 6 dBi (6 dB above isotropic gain) shall be added to the measured RF output power before using the power limits specified in RSS-210 or RSS-310 for devices of RF output powers of 10 milliwatts or less. For devices of output powers greater than 10 milliwatts, except devices subject to RSS-210 Annex 8 (Frequency Hopping and Digital Modulation Systems Operating in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz Bands) or RSS-210 Annex 9 (Local Area Network Devices), the total antenna gain shall be ad
ded to the measured RF output power before using the specified power limits. For devices subject to RSS-210 Annex 8 or Annex 9, the antenna gain shall not be added.

11.2 Antenna Connected Construction:

The directional gins of antenna used for transmitting is -5.2dBi for 2.4G / 5.9dBi for 5G, and the antenna connector is designed with unique type RF connector and no consideration of replacement. Please see EUT photo and antenna spec. for details.

According to KDB662911 D01 SM-MIMO signals could be considered uncorrelated for purposes of directional gain computation.

Directional gain = G_{ANT}

12 Maximum Permissible Exposure (MPE)

12.1 Standard Applicable

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

This is a Mobile device, the MPE is required.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for Maximum Permissive Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
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
1500-15000	/	/	1.0	30

F = frequency in MHz

* = Plane-wave equipment power density

12.2 Maximum Permissible Exposure (MPE) Evaluation

The worst case of Average power: refer to section 6.5 for detail measurement date.

802.11b

Cable loss = 0		Output Power		Limit (dBm)
CH	Frequency (MHz)	Detector		
		PK (dBm)	AV (dBm)	
1	2412	19.24	16.84	30
6	2437	19.83	17.53	
11	2462	19.23	16.92	

MPE Prediction (802.11b)

Prediction of MPE limit at a given distance

Equation from page 18 of 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

Maximum average output power at antenna input	17.53	(dBm)
Maximum Average output power at antenna input	56.6239289	(mW)
Duty cycle:	100	(%)
Maximum Pav :	56.6239289	(mW)
Antenna gain (typical):	-5.2	(dBi)
Maximum antenna gain:	0.301995172	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	2437	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0034037	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.0034037 mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2 at 2437MHz.

The worst case of Average power: refer to section 6.5 for detail measurement date.

802.11a_HT20(5G)

Channel		Frequency (MHz)	Output Chain (dBm)		Combine Output Power (dBm)	Limit(dBm)
			Chain A	chain B		
AN HT20	149	5745	6.91	11.69	12.94	30
	157	5785	7.12	10.52	12.15	30
	165	5825	7.11	9.67	11.59	30

MPE Prediction (802.11a)

Prediction of MPE limit at a given distance

Equation from page 18 of 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

Maximum average output power at antenna input	12.94	(dBm)
Maximum Average output power at antenna input	19.6788629	(mW)
Duty cycle:	100	(%)
Maximum Pav :	19.6788629	(mW)
Antenna gain (typical):	5.9	(dBi)
Maximum antenna gain:	3.89045145	(numeric)
Prediction distance:	20	(cm)
Prediction frequency:	5745	(MHz)
MPE limit for uncontrolled exposure at prediction	1	(mW/cm2)
Power density at predication frequency at 20 (cm)	0.0152388	(mW/cm^2)

Measurement Result

The predicted power density level at 20 cm is 0.0152388 mW/cm^2. This is below the uncontrolled exposure limit of 1 mW/cm^2 at 5745MHz.