

802.11g

TX-Low Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2377.34	45.14	32.89	35.16	3.51	46.38	74	-27.62	Peak	Horizontal
2377.37	34.56	32.90	35.16	3.51	35.81	54	-18.19	Average	Horizontal
2390.00	48.69	32.92	35.16	3.54	49.99	74	-24.01	Peak	Horizontal
2389.97	38.21	32.92	35.16	3.54	39.51	54	-14.49	Average	Horizontal
2400.00	52.52	32.92	35.16	3.54	53.82	74	-20.18	Peak	Horizontal
2399.97	41.87	32.92	35.16	3.54	43.17	54	-10.83	Average	Horizontal
2377.34	46.54	32.89	35.16	3.51	47.78	74	-26.22	Peak	Vertical
2377.37	36.19	32.90	35.16	3.51	37.44	54	-16.56	Average	Vertical
2390.00	50.06	32.92	35.16	3.54	51.36	74	-22.64	Peak	Vertical
2389.97	38.24	32.92	35.16	3.54	39.54	54	-14.46	Average	Vertical
2400.00	54.18	32.92	35.16	3.54	55.48	74	-18.52	Peak	Vertical
2399.97	43.79	32.92	35.16	3.54	45.09	54	-8.91	Average	Vertical

TX-High Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2483.50	45.94	33.06	35.18	3.60	47.42	74	-26.58	Peak	Horizontal
2483.53	34.84	33.08	35.18	3.60	36.34	54	-17.66	Average	Horizontal
2487.44	47.95	33.08	35.18	3.62	49.47	74	-24.53	Peak	Horizontal
2487.47	35.46	33.08	35.18	3.62	36.98	54	-17.02	Average	Horizontal
2483.50	46.24	33.06	35.18	3.60	47.72	74	-26.28	Peak	Vertical
2483.53	36.01	33.08	35.18	3.60	37.51	54	-16.49	Average	Vertical
2487.44	48.30	33.08	35.18	3.62	49.82	74	-24.18	Peak	Vertical
2487.47	37.35	33.08	35.18	3.62	38.87	54	-15.13	Average	Vertical

802.11n(HT20)

TX-Low Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2377.61	47.14	32.89	35.16	3.51	48.38	74	-25.62	Peak	Horizontal
2377.63	35.55	32.9	35.16	3.51	36.80	54	-17.20	Average	Horizontal
2390.00	49.12	32.92	35.16	3.54	50.42	74	-23.58	Peak	Horizontal
2389.97	37.89	32.92	35.16	3.54	39.19	54	-14.81	Average	Horizontal
2400.00	55.27	32.92	35.16	3.54	56.57	74	-17.43	Peak	Horizontal
2399.97	45.16	32.92	35.16	3.54	46.46	54	-7.54	Average	Horizontal
2377.61	47.67	32.89	35.16	3.51	48.91	74	-25.09	Peak	Vertical
2377.63	36.71	32.9	35.16	3.51	37.96	54	-16.04	Average	Vertical
2390.00	49.50	32.92	35.16	3.54	50.80	74	-23.20	Peak	Vertical
2389.97	39.21	32.92	35.16	3.54	40.51	54	-13.49	Average	Vertical
2400.00	56.83	32.92	35.16	3.54	58.13	74	-15.87	Peak	Vertical
2399.97	45.76	32.92	35.16	3.54	47.06	54	-6.94	Average	Vertical

TX-High Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2483.50	44.91	33.06	35.18	3.60	46.39	74	-27.61	Peak	Horizontal
2483.53	35.65	33.08	35.18	3.60	37.15	54	-16.85	Average	Horizontal
2488.17	47.37	33.08	35.18	3.62	48.89	74	-25.11	Peak	Horizontal
2488.20	36.06	33.08	35.18	3.62	37.58	54	-16.42	Average	Horizontal
2483.50	42.62	33.06	35.18	3.60	44.10	74	-29.90	Peak	Vertical
2483.53	36.09	33.08	35.18	3.60	37.59	54	-16.41	Average	Vertical
2488.17	47.29	33.08	35.18	3.62	48.81	74	-25.19	Peak	Vertical
2488.20	36.85	33.08	35.18	3.62	38.37	54	-15.63	Average	Vertical

802.11n(HT40)

TX-Low Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2378.37	48.67	32.89	35.16	3.51	49.91	74	-24.09	Peak	Horizontal
2378.40	37.78	32.90	35.16	3.51	39.03	54	-14.97	Average	Horizontal
2390.00	50.61	32.92	35.16	3.54	51.91	74	-22.09	Peak	Horizontal
2389.97	39.58	32.92	35.16	3.54	40.88	54	-13.12	Average	Horizontal
2400.00	51.60	32.92	35.16	3.54	52.90	74	-21.10	Peak	Horizontal
2399.97	41.70	32.92	35.16	3.54	43.00	54	-11.00	Average	Horizontal
2378.37	49.44	32.89	35.16	3.51	50.68	74	-23.32	Peak	Vertical
2378.40	39.85	32.90	35.16	3.51	41.10	54	-12.90	Average	Vertical
2390.00	51.38	32.92	35.16	3.54	52.68	74	-21.32	Peak	Vertical
2389.97	40.85	32.92	35.16	3.54	42.15	54	-11.85	Average	Vertical
2400.00	53.54	32.92	35.16	3.54	54.84	74	-19.16	Peak	Vertical
2399.97	44.58	32.92	35.16	3.54	45.88	54	-8.12	Average	Vertical

TX-High Channel

Freq. MHz	Reading dBuv	Ant. Fac. dB/m	Pre. Fac. dB	Cab. Loss dB	Measured dBuv/m	Limit dBuv/m	Margin dB	Remark	Pol.
2483.50	48.30	33.06	35.18	3.60	49.78	74	-24.22	Peak	Horizontal
2483.53	38.26	33.08	35.18	3.60	39.76	54	-14.24	Average	Horizontal
2487.71	49.51	33.08	35.18	3.62	51.03	74	-22.97	Peak	Horizontal
2487.74	39.02	33.08	35.18	3.62	40.54	54	-13.46	Average	Horizontal
2483.50	48.88	33.06	35.18	3.60	50.36	74	-23.64	Peak	Vertical
2483.53	38.87	33.08	35.18	3.60	40.37	54	-13.63	Average	Vertical
2487.71	49.63	33.08	35.18	3.62	51.15	74	-22.85	Peak	Vertical
2487.74	39.90	33.08	35.18	3.62	41.42	54	-12.58	Average	Vertical

5.5. Conducted Spurious Emissions and Band Edges Test

5.5.1. Standard Applicable

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. 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 in §15.209(a) (see §15.205(c)).

5.5.2. Instruments Setting

The following table is the setting of the spectrum analyzer.

Spectrum Parameter	Setting
Detector	Peak
Attenuation	Auto
RB / VB (Emission in restricted band)	100KHz/300KHz
RB / VB (Emission in non-restricted band)	100KHz/300KHz

5.5.3. Test Procedures

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz

The spectrum from 9 kHz to 26.5GHz is investigated with the transmitter set to the lowest, Middle, and highest channels.

5.5.4. Test Setup Layout

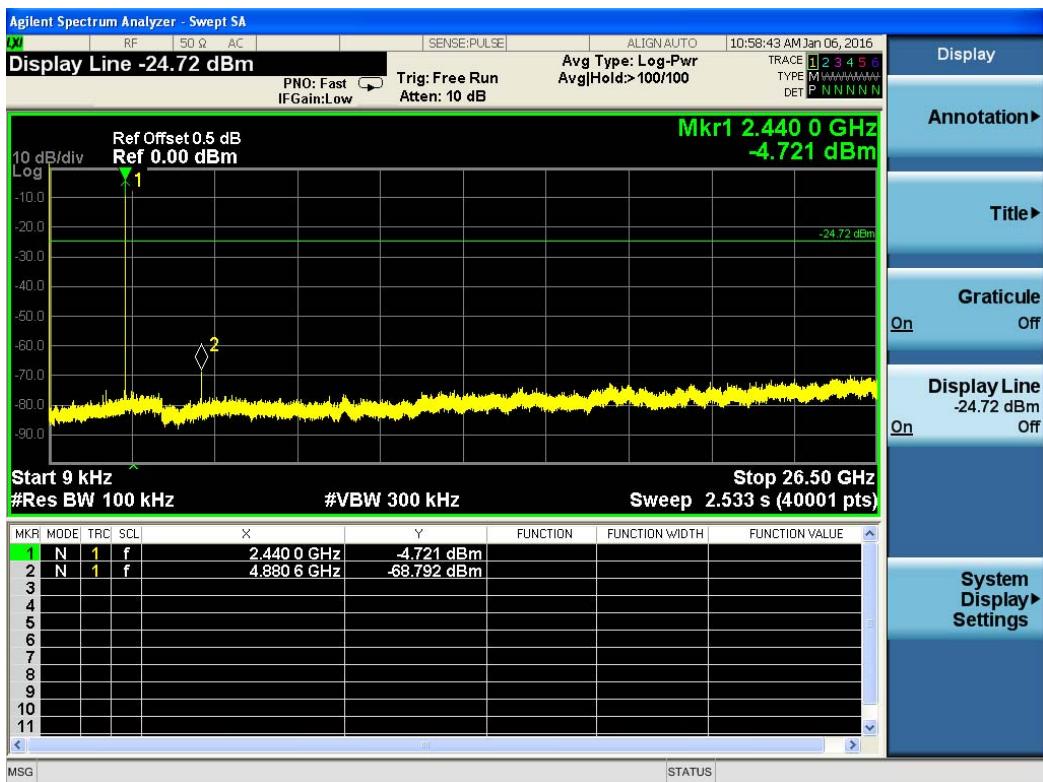
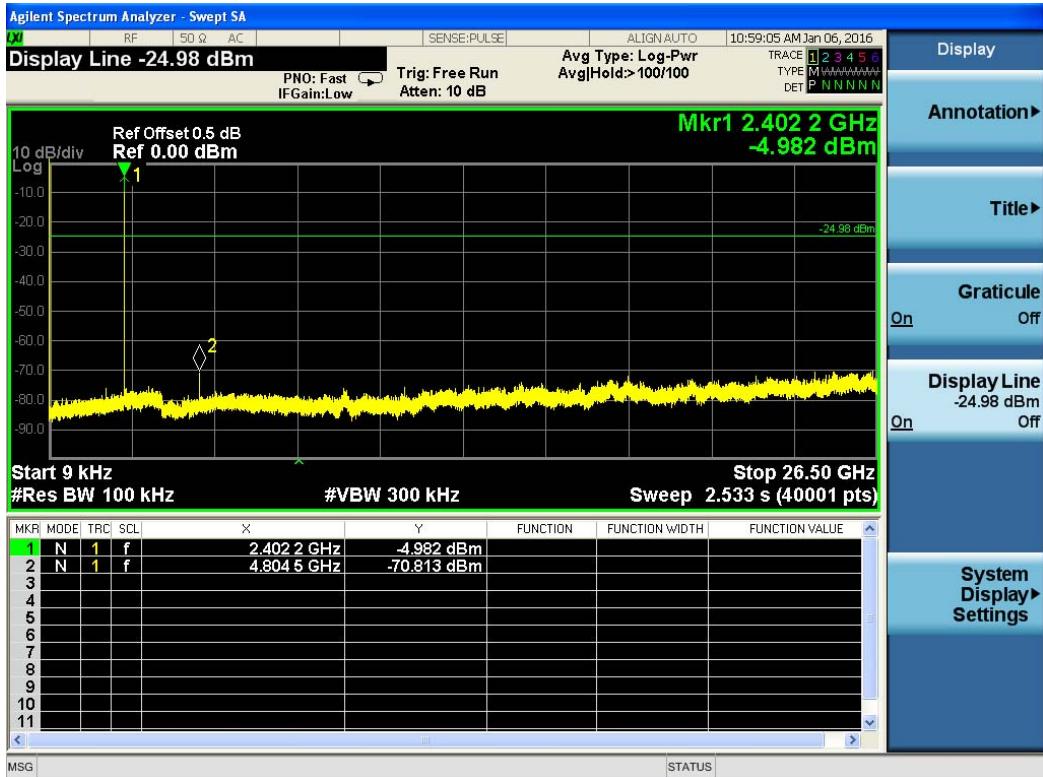
This test setup layout is the same as that shown in section 5.3.4.

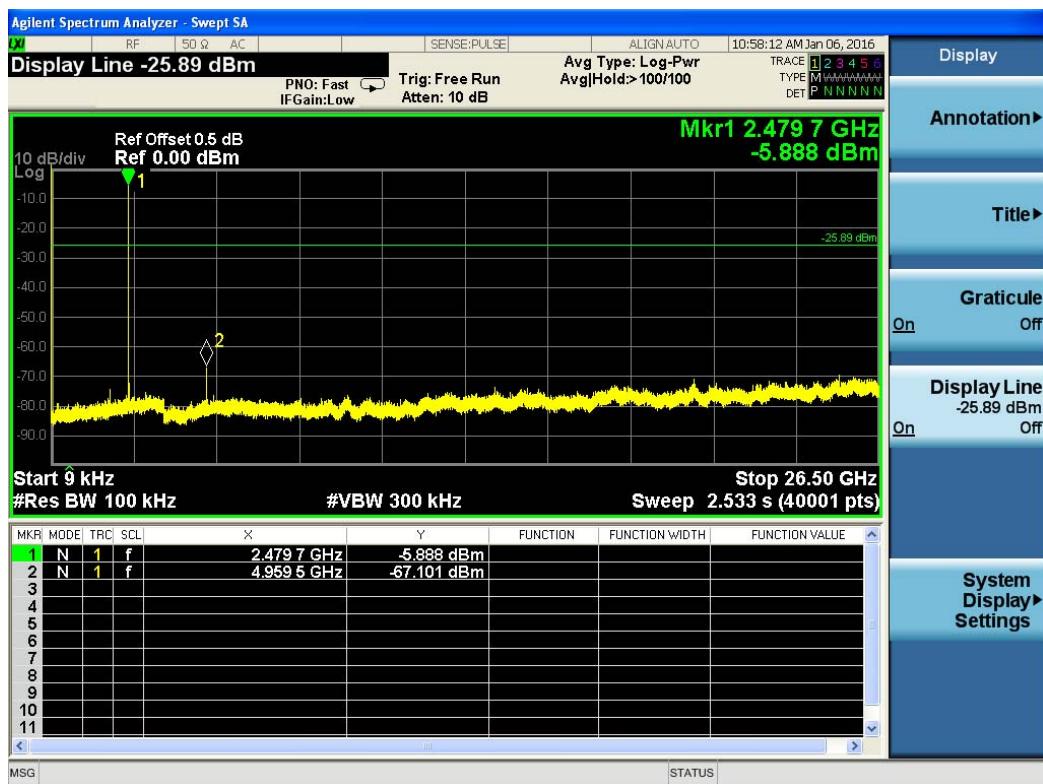
5.5.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

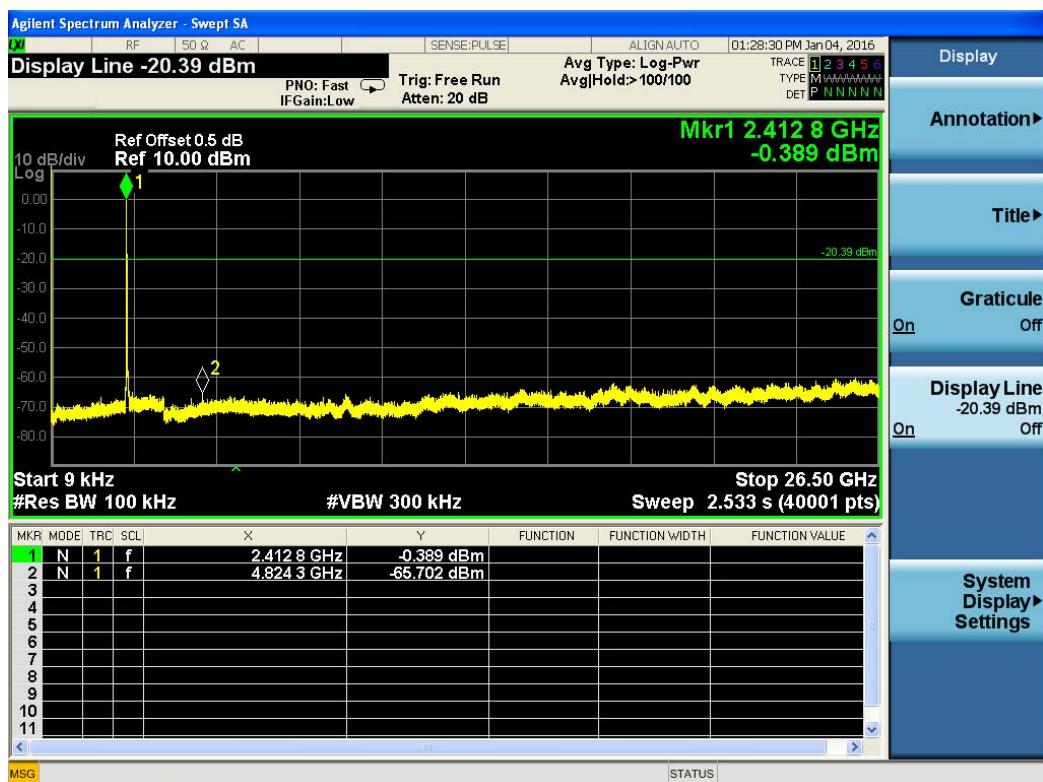
5.5.6. Test Results of Conducted Spurious Emissions

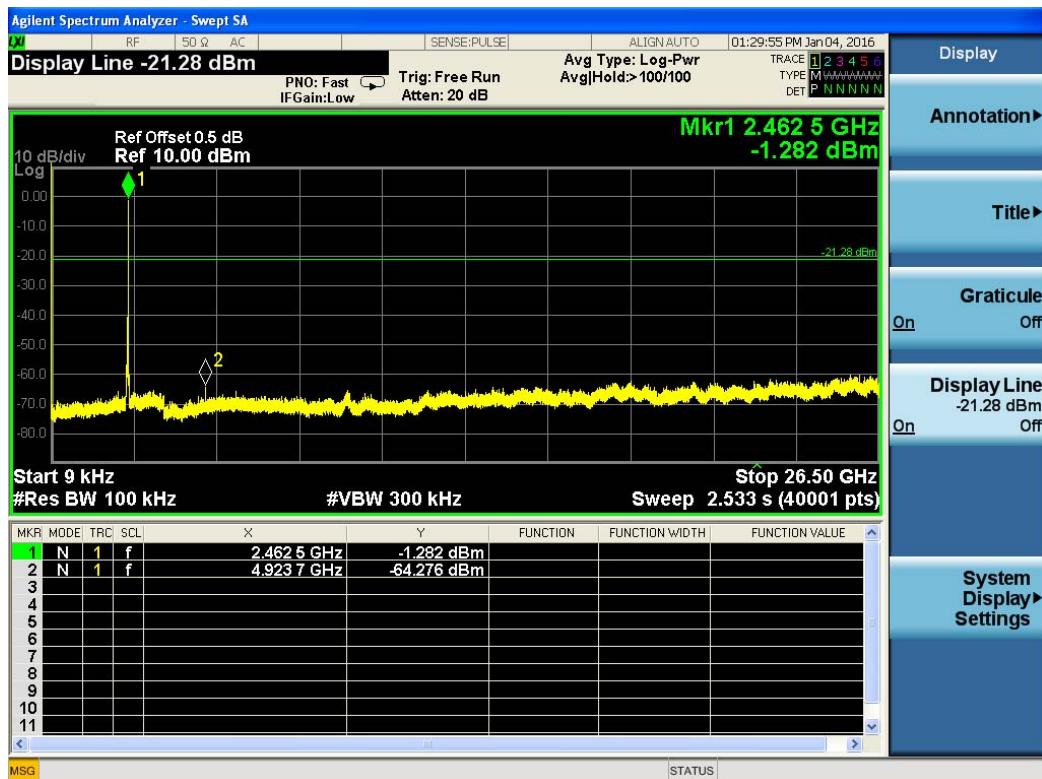
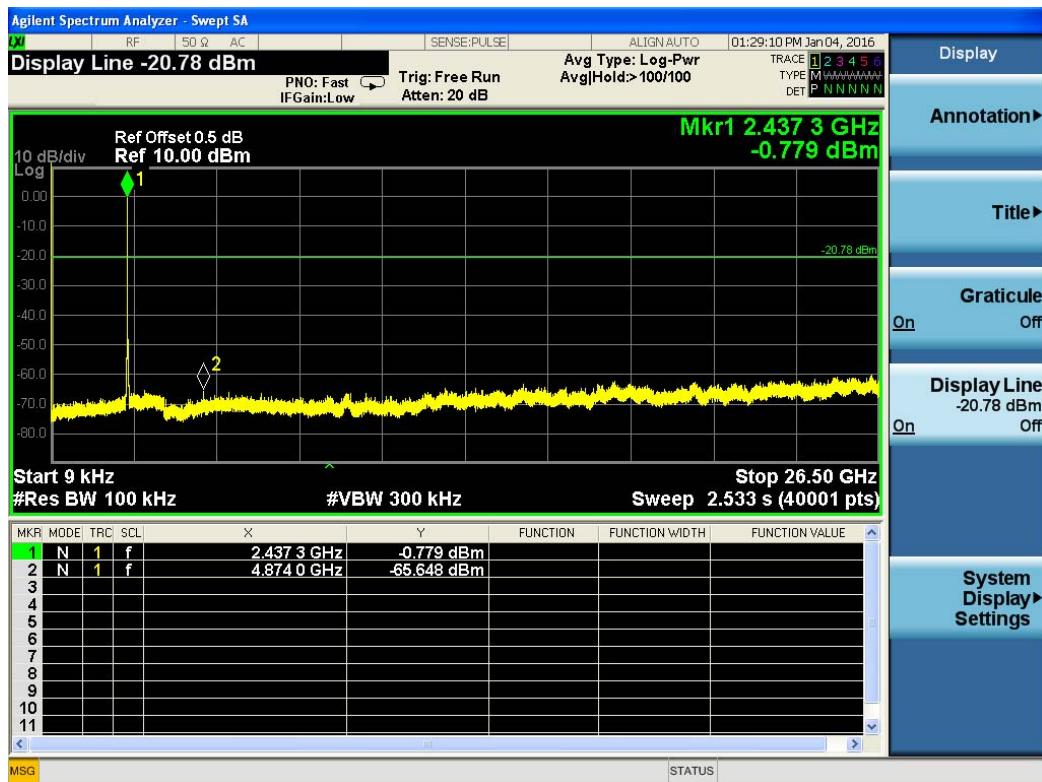
BLE 4.0



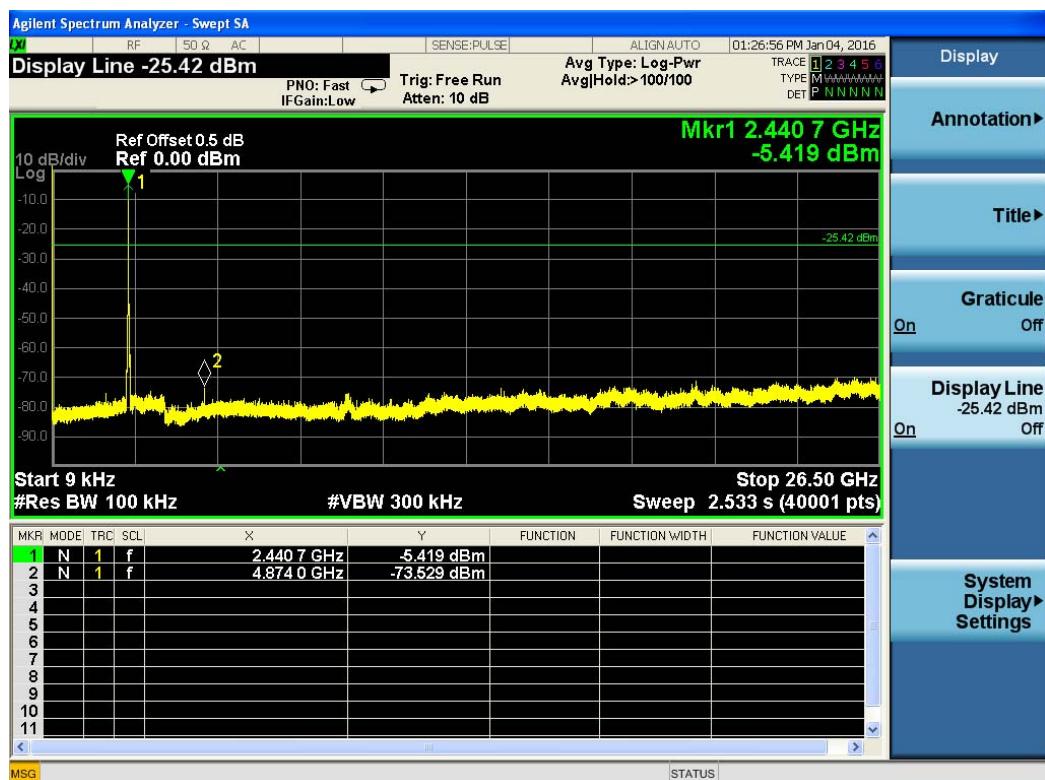
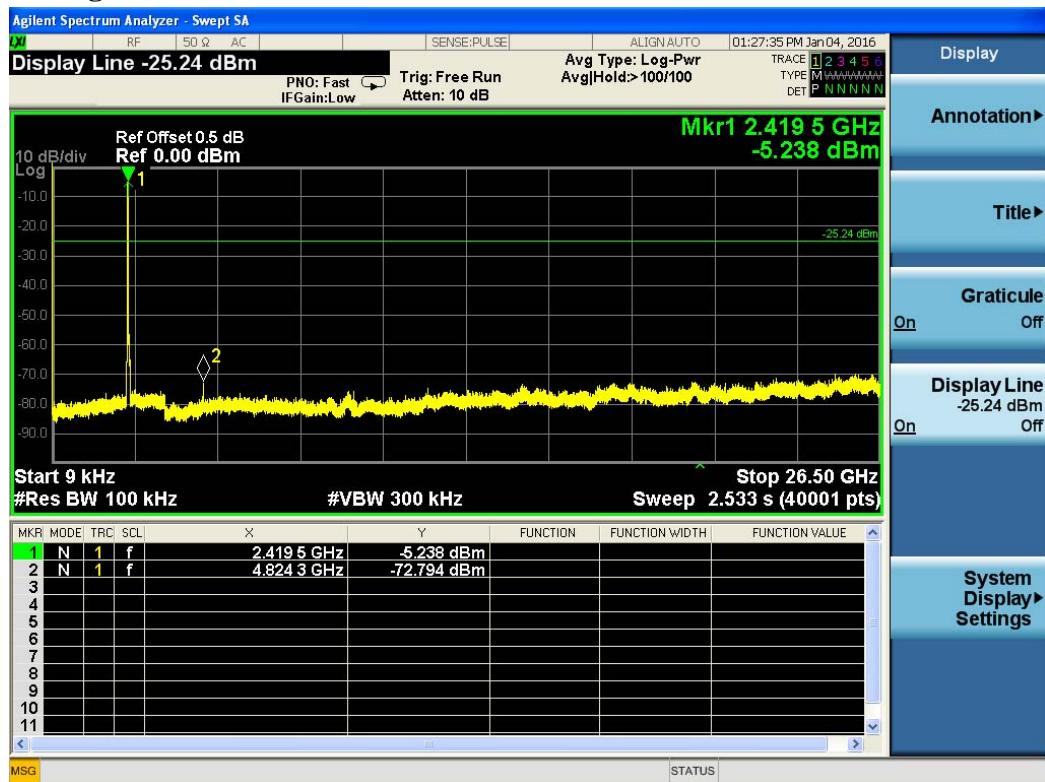


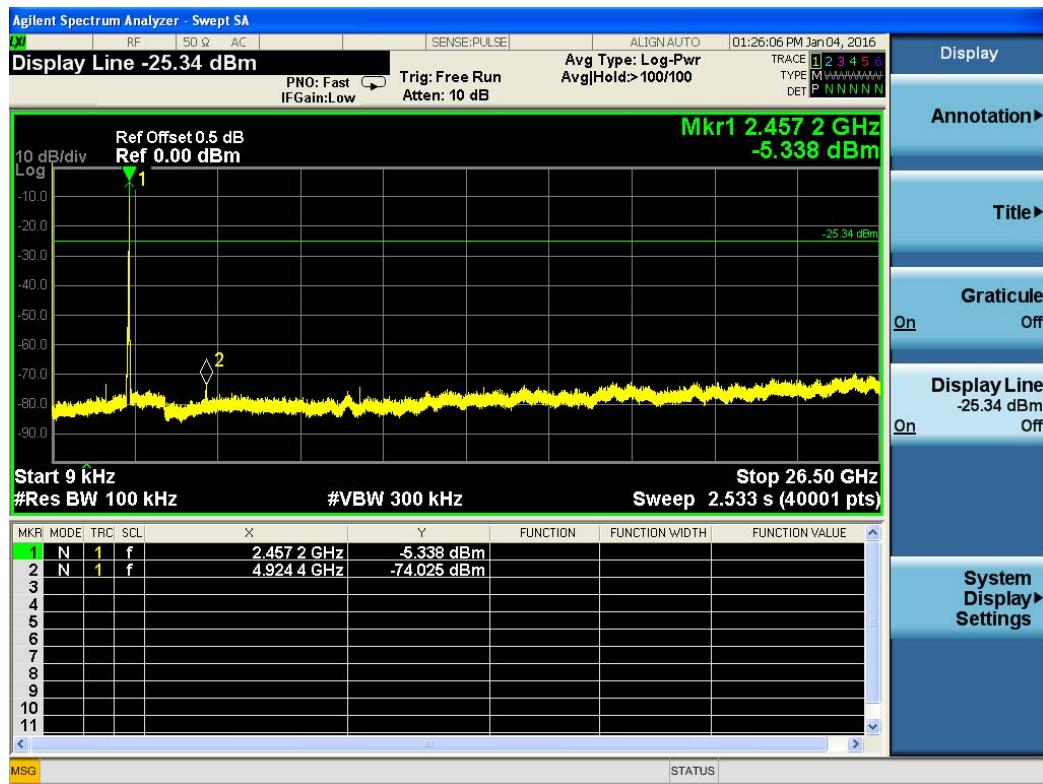
802.11b



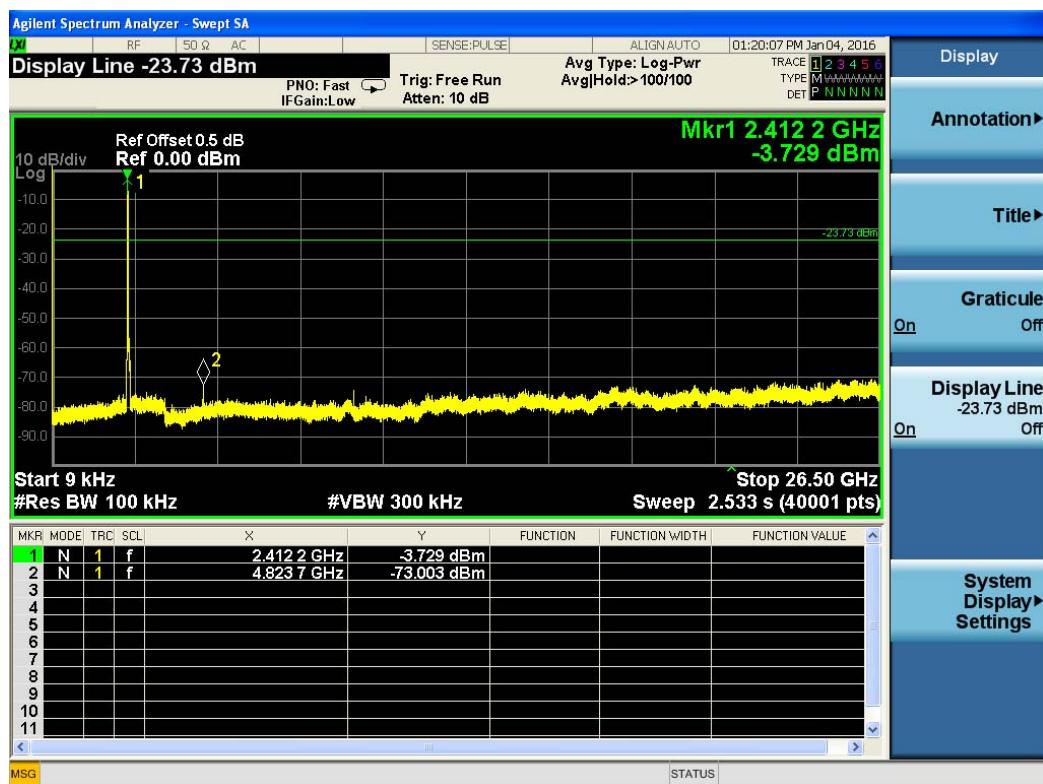


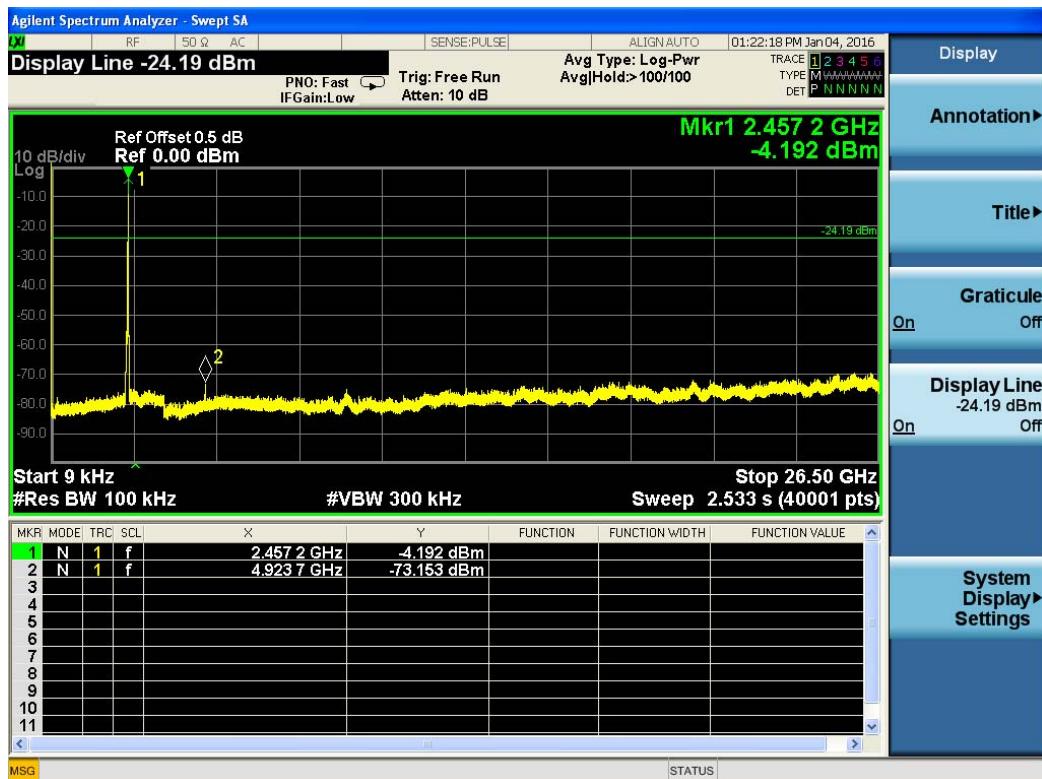
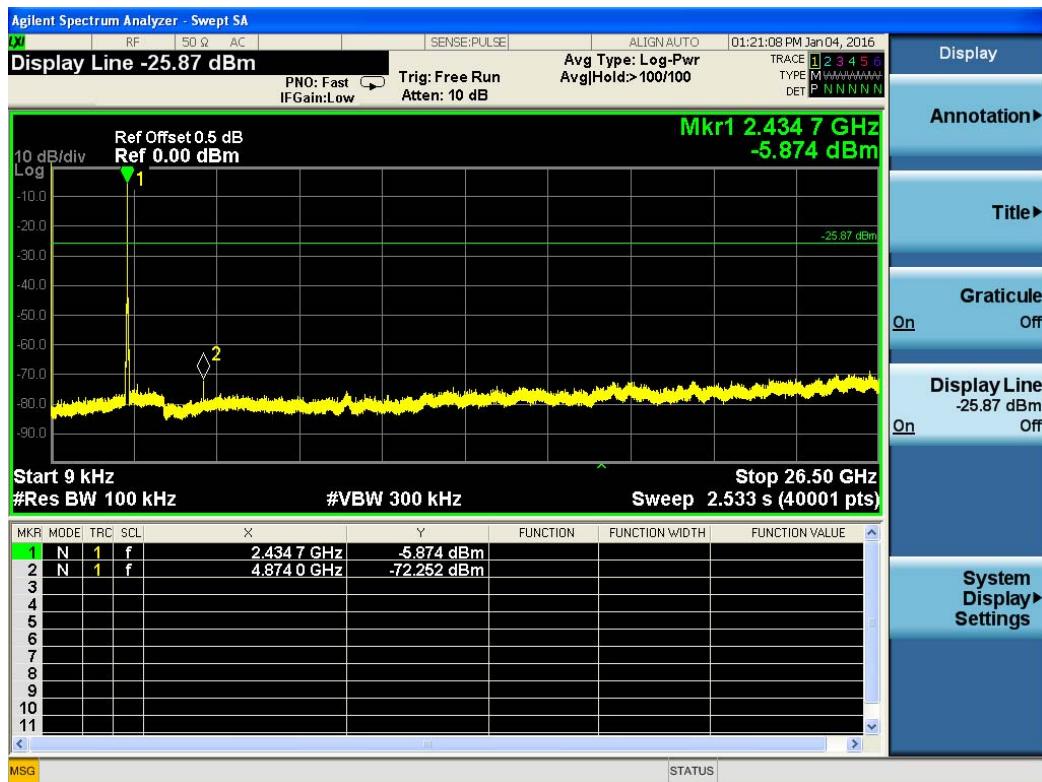
802.11g



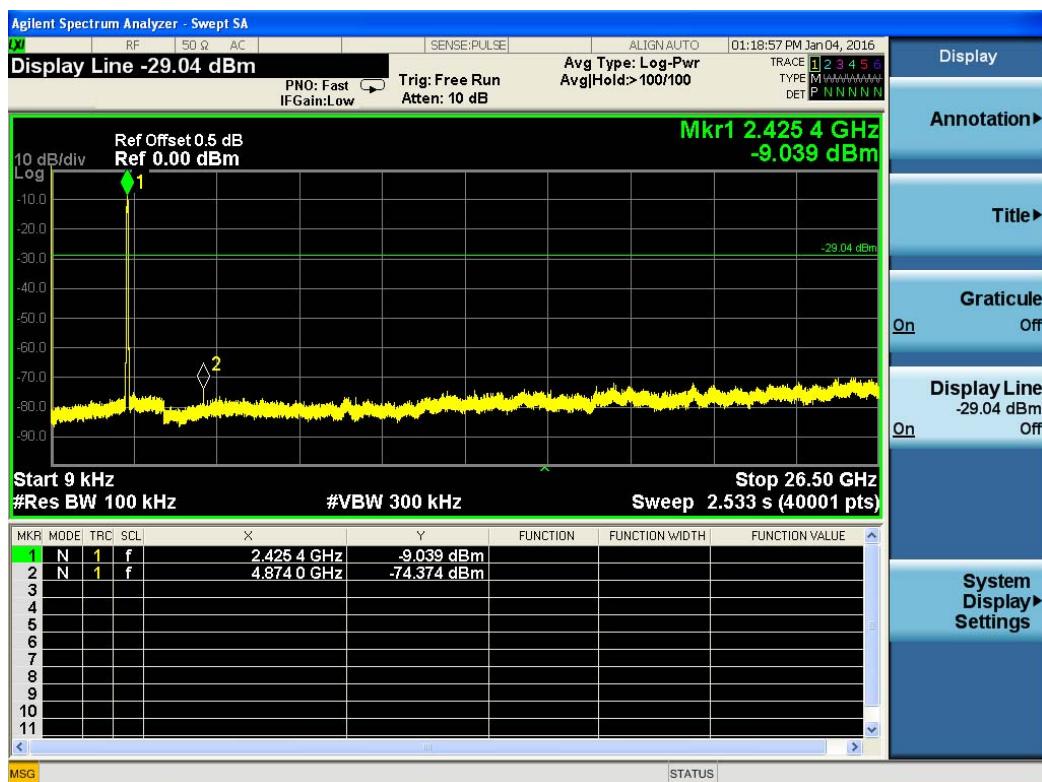
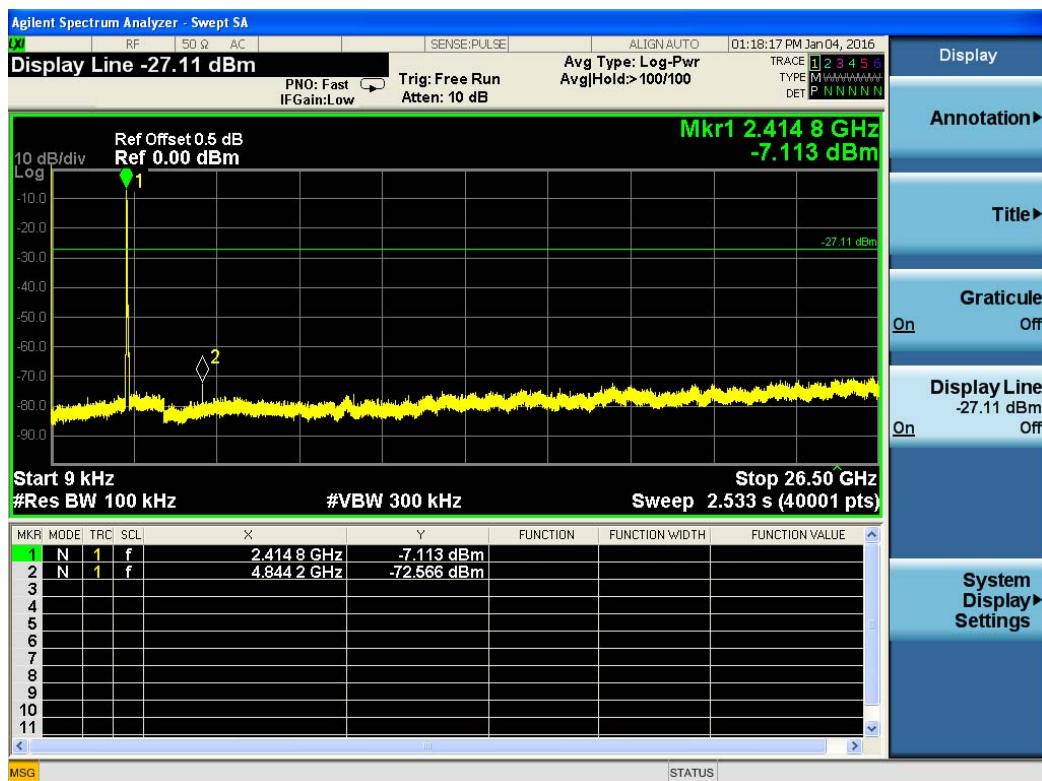


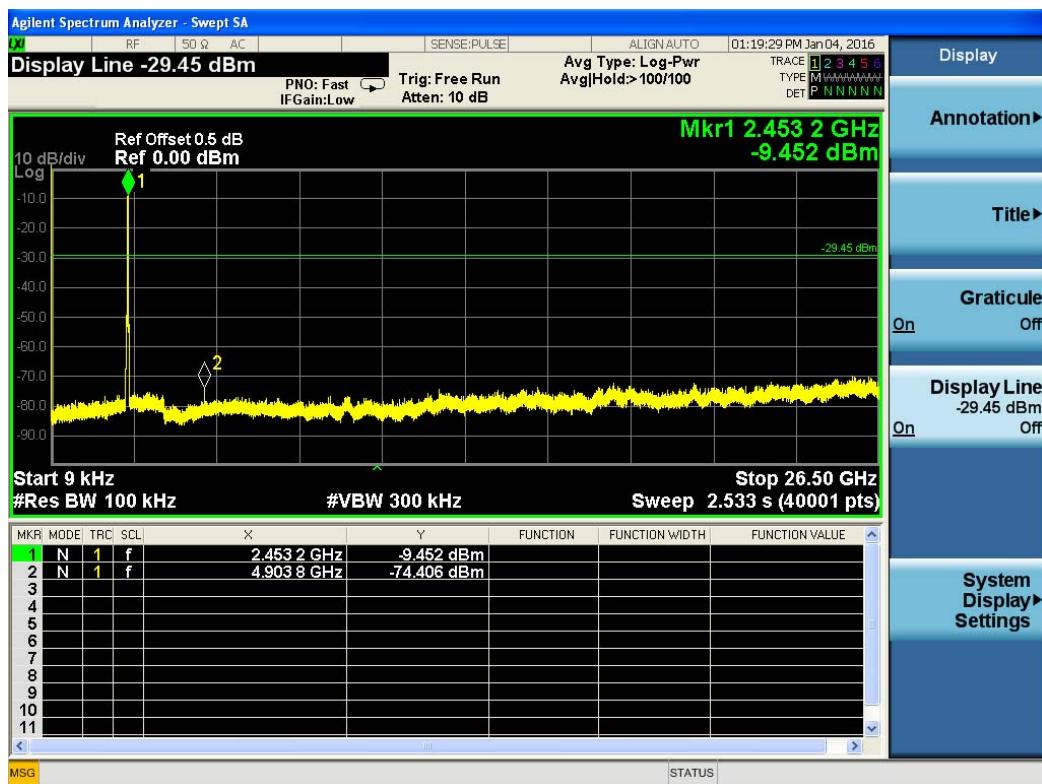
802.11n HT20





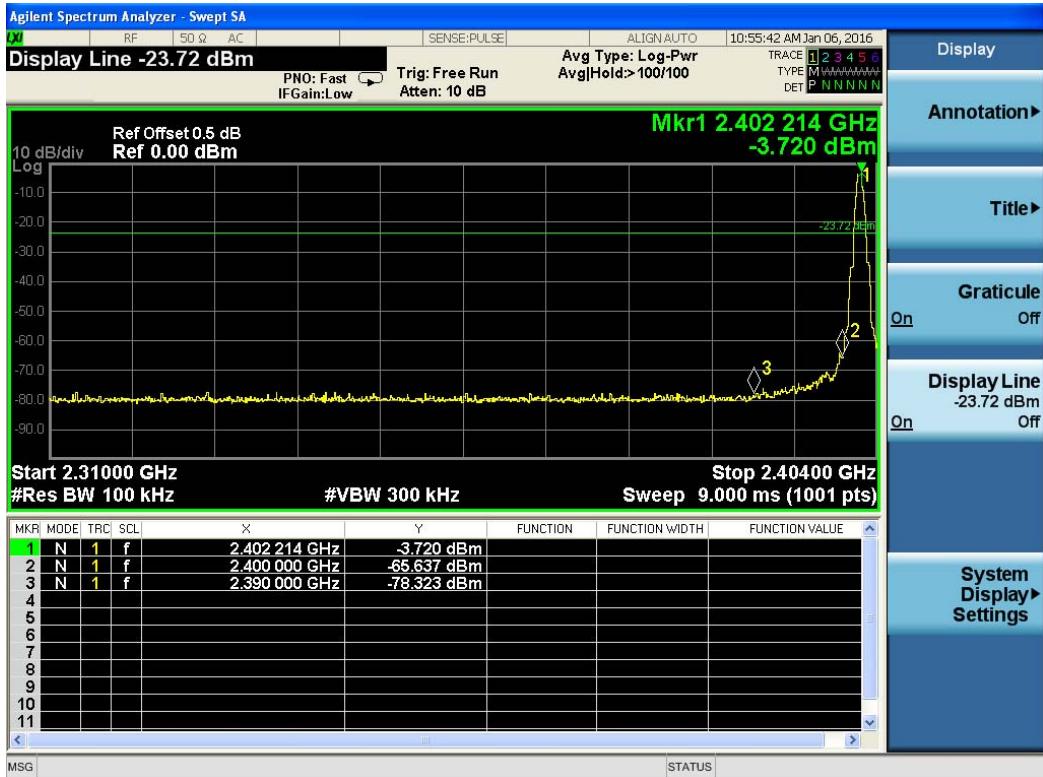
802.11n HT40



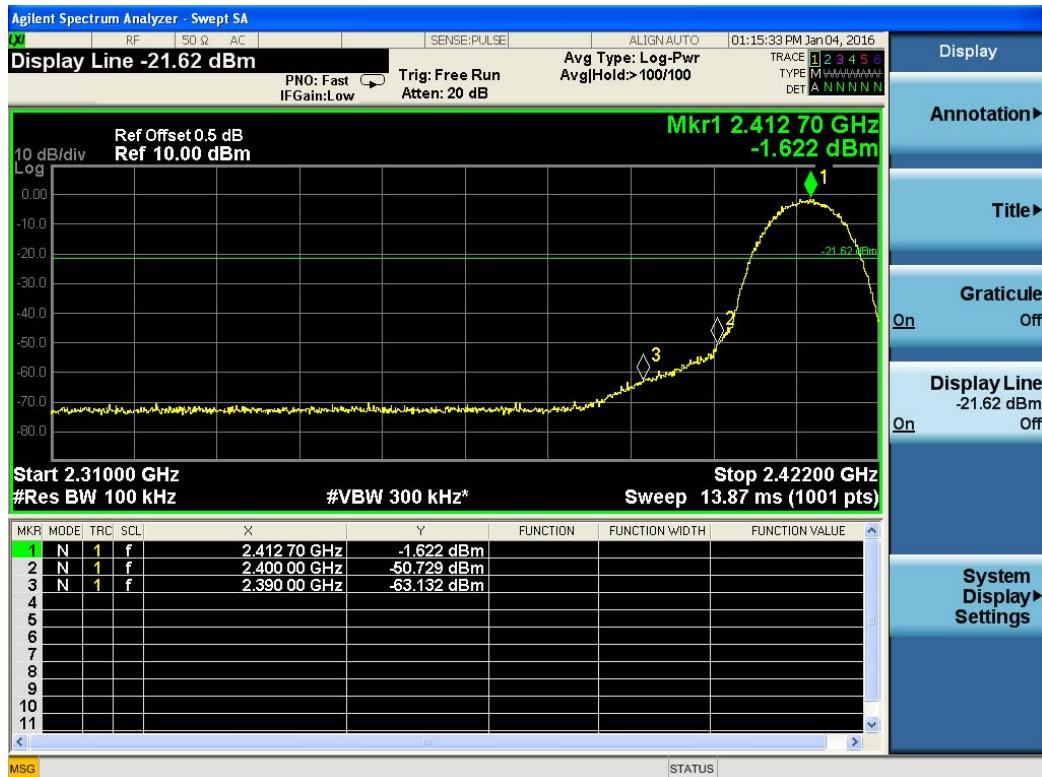


5.5.7. Test Results of Band Edges Test

BLE 4.0



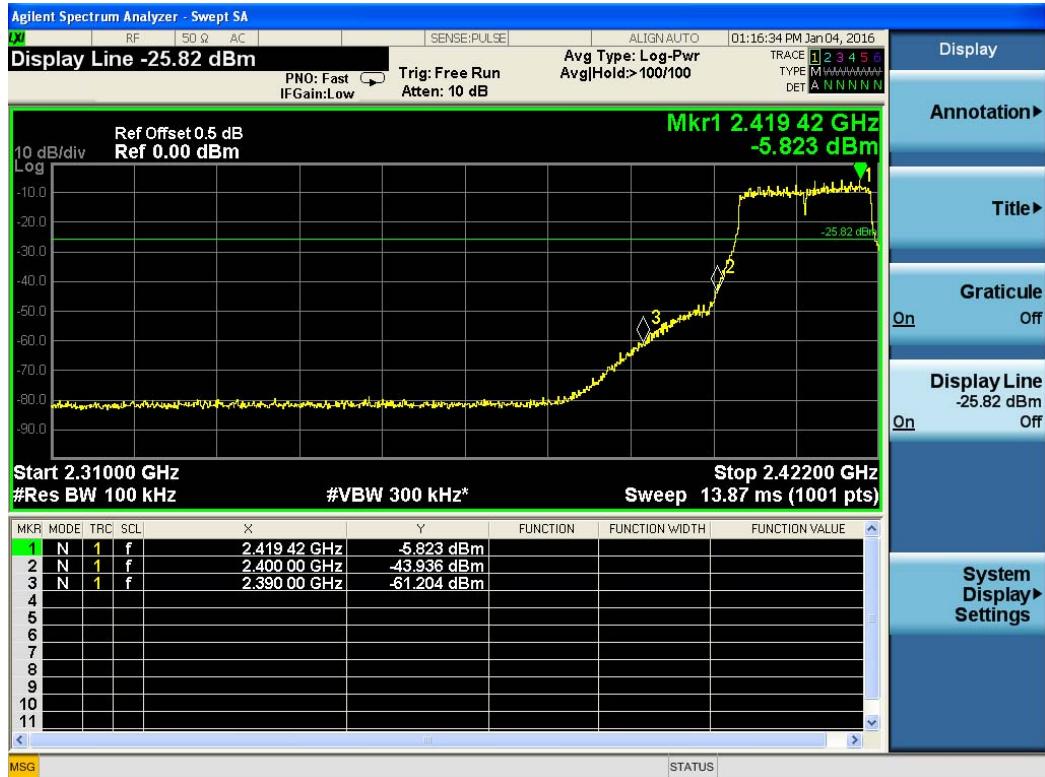
802.11b



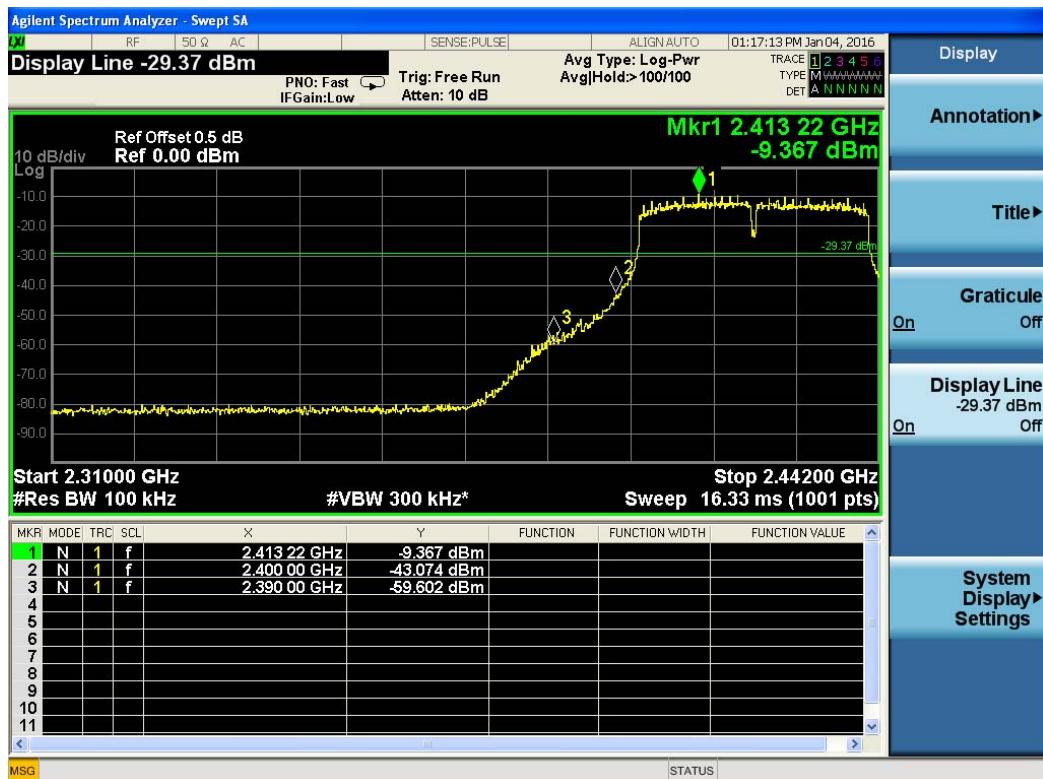
802.11g



802.11n HT20



802.11n HT40



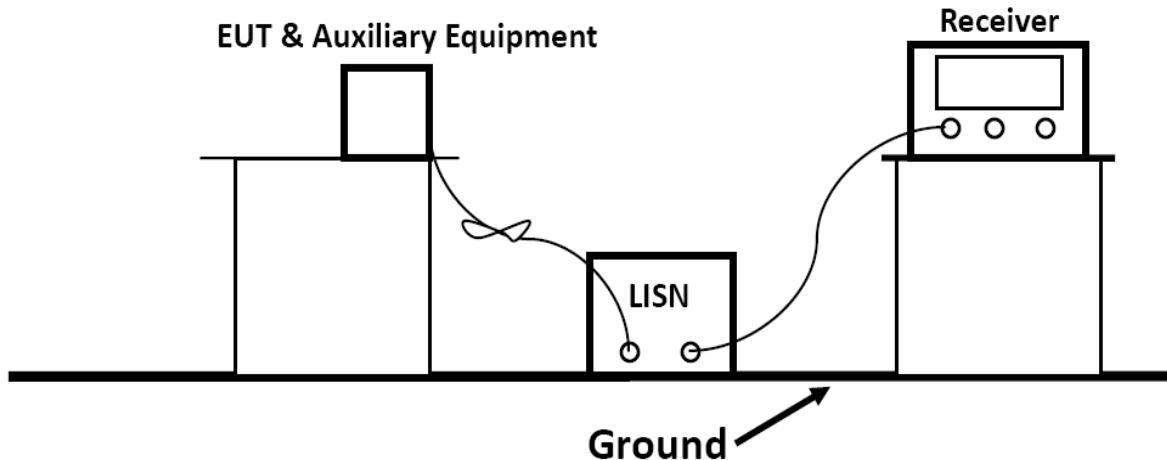
5.6. Power line conducted emissions

5.6.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dB μ V)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

5.6.2 Block Diagram of Test Setup

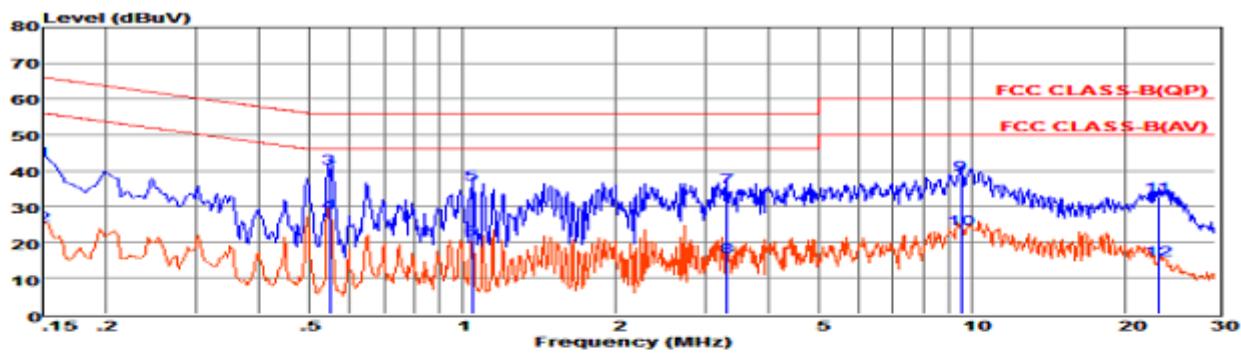


5.6.3 Test Results

PASS.

The test data please refer to following page.

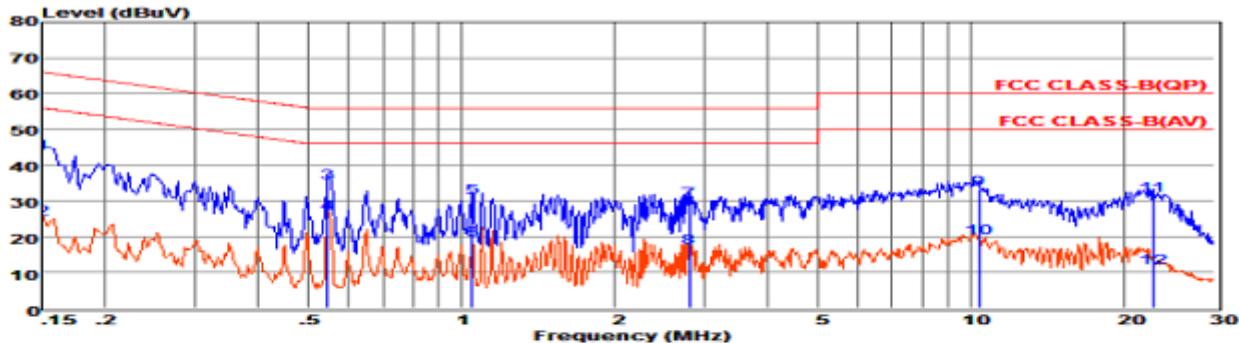
Test Result For Line Power Input AC 120V/60Hz (Worst Case)



Env. Ins: 24*/56%
 EUT:
 M/N: SF550
 Power Rating: AC 120V/60Hz
 Test Mode: TX-Low Channel (802.11b)
 Operator: Leo
 Memo:
 Pol: LINE

Freq	Reading	LianFac	CabLoss	Atten_Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1 0.15000	23.10	9.57	0.02	10.00	42.69	66.00	-23.31	QP
2 0.15010	5.05	9.57	0.02	10.00	24.64	55.99	-31.35	Average
3 0.54934	21.02	9.63	0.04	10.00	40.69	56.00	-15.31	QP
4 0.54944	8.54	9.63	0.04	10.00	28.21	46.00	-17.79	Average
5 1.04296	16.52	9.63	0.05	10.00	36.20	56.00	-19.80	QP
6 1.04396	1.23	9.63	0.05	10.00	20.91	46.00	-25.09	Average
7 3.31049	15.79	9.65	0.06	10.00	35.50	56.00	-20.50	QP
8 3.31149	-3.67	9.65	0.06	10.00	16.04	46.00	-29.96	Average
9 9.50162	19.20	9.69	0.08	10.00	38.97	60.00	-21.03	QP
10 9.50262	4.05	9.69	0.08	10.00	23.82	50.00	-26.18	Average
1123.14040	13.24	9.71	0.13	10.00	33.08	60.00	-26.92	QP
1223.14140	-4.79	9.71	0.13	10.00	15.05	50.00	-34.95	Average

Remarks: 1. Measured = Reading + Lian Factor +Cable Loss+Atten_Fac.
 2. The emission levels that are 20dB below the official limit are not reported.



Env. Ins: 24*/56%
 EUT:
 M/N: SF550
 Power Rating: AC 120V/60Hz
 Test Mode: TX-Low Channel (802.11b)
 Operator: Leo
 Memo:
 Pol: NEUTRAL

Freq	Reading	LianFac	CabLoss	Atten_Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1 0.15000	23.69	9.70	0.02	10.00	43.41	66.00	-22.59	QP
2 0.15010	5.13	9.70	0.02	10.00	24.85	55.99	-31.14	Average
3 0.54644	15.52	9.62	0.04	10.00	35.18	56.00	-20.82	QP
4 0.54654	6.85	9.62	0.04	10.00	26.51	46.00	-19.49	Average
5 1.04850	11.11	9.63	0.05	10.00	30.79	56.00	-25.21	QP
6 1.04950	-0.55	9.63	0.05	10.00	19.13	46.00	-26.87	Average
7 2.79422	10.30	9.64	0.05	10.00	29.99	56.00	-26.01	QP
8 2.79522	-2.88	9.64	0.05	10.00	16.81	46.00	-29.19	Average
910.34223	13.62	9.72	0.08	10.00	33.42	60.00	-26.58	QP
1010.34323	-0.17	9.72	0.08	10.00	19.63	50.00	-30.37	Average
1122.77549	11.46	9.82	0.12	10.00	31.40	60.00	-28.60	QP
1222.77649	-8.56	9.82	0.12	10.00	11.38	50.00	-38.62	Average

Remarks: 1. Measured = Reading + Lian Factor +Cable Loss+Atten_Fac.
 2. The emission levels that are 20dB below the official limit are not reported.

***Note: Pre-scan all mode and recorded the worst case results in this report (802.11b (TX-Low Channel)).

5.7. Antenna Requirements

5.7.1. Standard Applicable

According to antenna requirement of §15.203.

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 re-placed 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.

And according to §15.247(4)(1), system operating in the 2400-2483.5MHz bands that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

8.2 Antenna Connected Construction

8.2.1. Antenna Connector Construction

The antenna used for transmitting is permanently attached and no consideration of replacement. Please see EUT photo for details.

The BT and WLAN share same PIFA antenna, the maximum gain is 0.5dBi for BT; more information as follows

8.2.2. Results: Compliance.

Measurement

The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module.

Conducted power refer ANSI C63.10:2013 Output power test procedure for DTS devices
Radiated power refers to ANSI C63.10:2013 Radiated emissions tests.

Measurement parameters

Measurement parameter	
Detector:	Peak
Sweep time:	Auto
Resolution bandwidth:	1MHz
Video bandwidth:	3MHz
Trace-Mode:	Max hold

Limits

FCC	IC
Antenna Gain	
6 dBi	

Note: The antenna gain of the complete system is calculated by the difference of radiated power in EIRP and the conducted power of the module. For WLAN devices, the DSSS mode is used; as lower power Bluetooth use frequency range same as normal Bluetooth, please refer to normal Bluetooth test report for antenna results information.

T _{nom}	V _{nom}	lowest channel 2412 MHz	middle channel 2437 MHz	highest channel 24620 MHz
Conducted power [dBm] Measured with DSSS modulation		10.04	9.27	9.66
Radiated power [dBm] Measured with DSSS modulation		9.25	9.04	8.88
Gain [dBi] Calculated		-0.79	-0.23	-0.78
Measurement uncertainty		± 1.6 dB (cond.) / ± 3.8 dB (rad.)		

Result: -/-

-----THE END OF REPORT-----