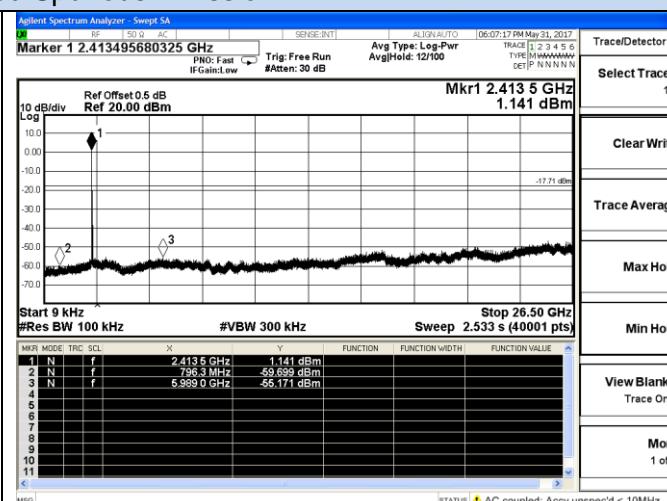
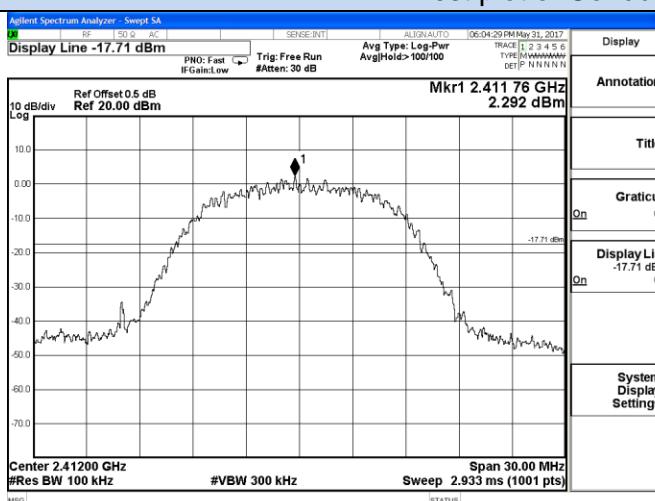
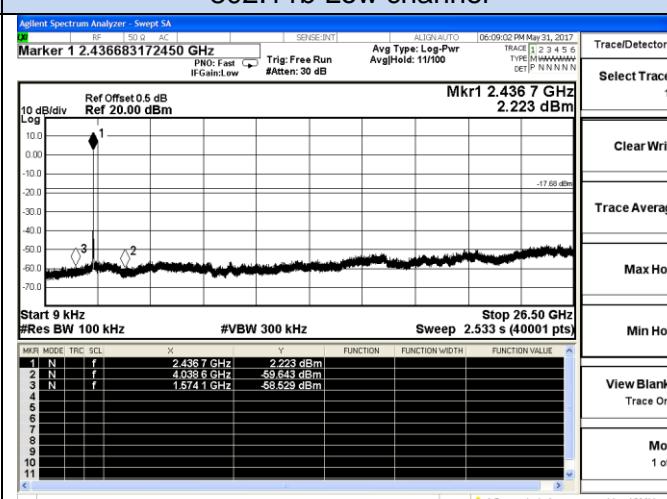
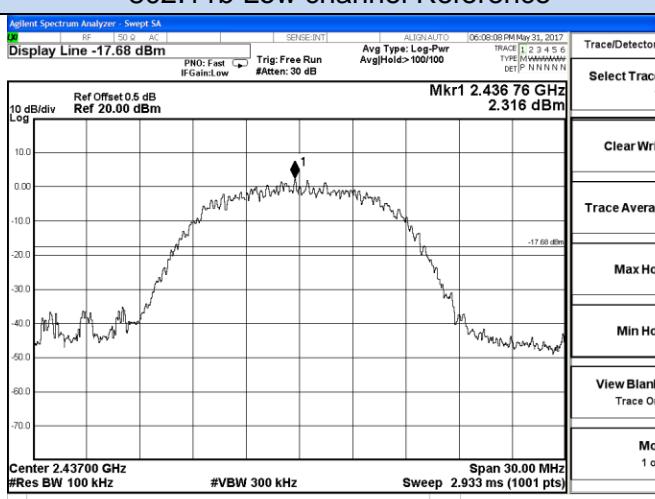


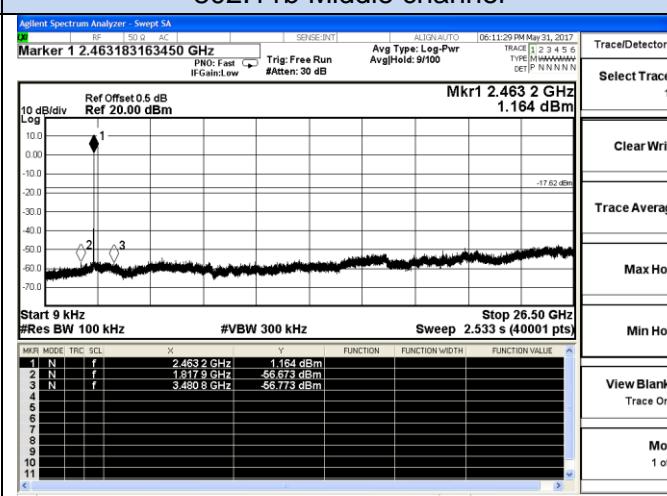
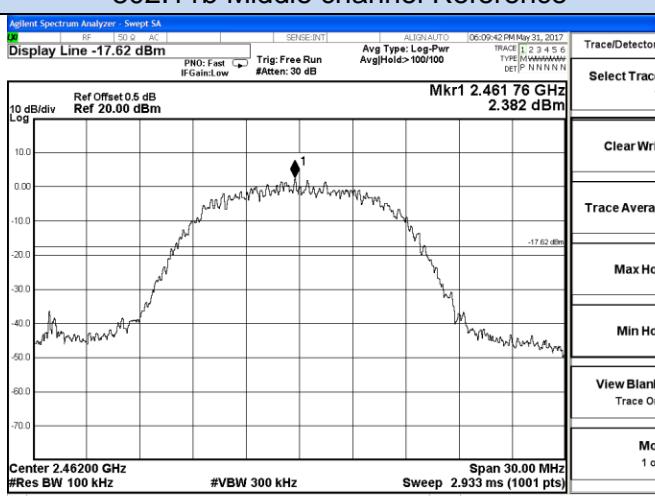
Test plot of Conducted Spurious Emission



802.11b Low channel Reference



802.11b Middle channel Reference



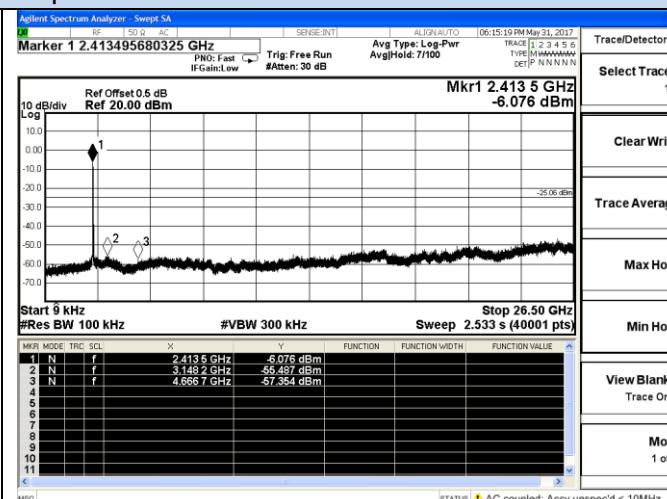
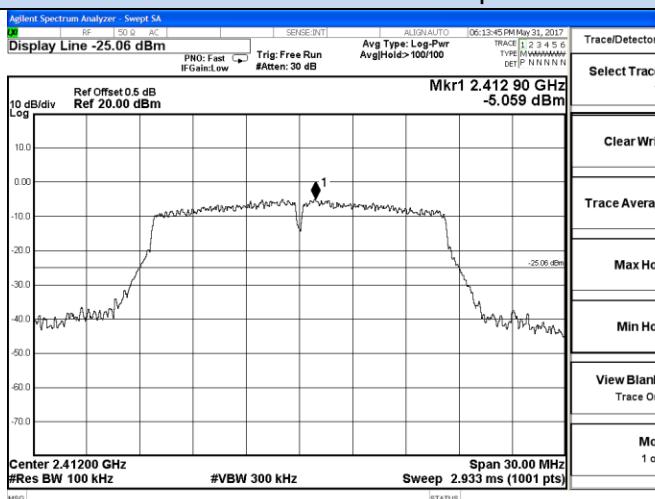
802.11b High channel Reference

802.11b Low channel

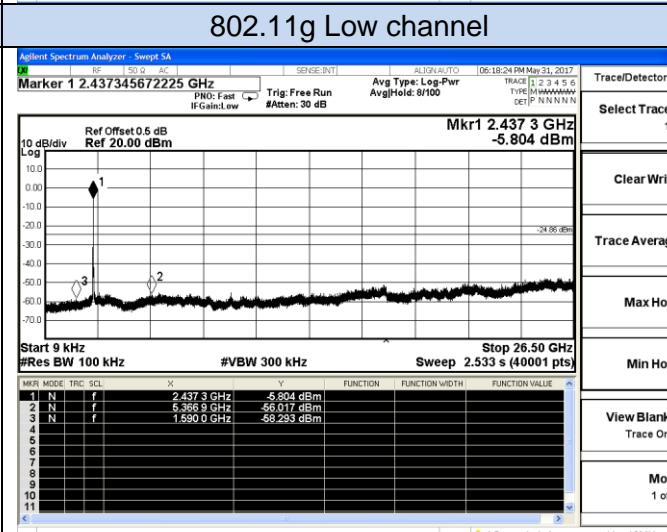
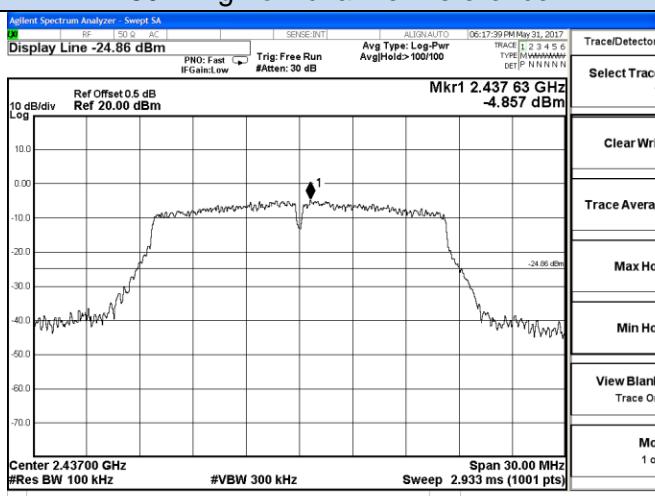
802.11b Middle channel

802.11b High channel

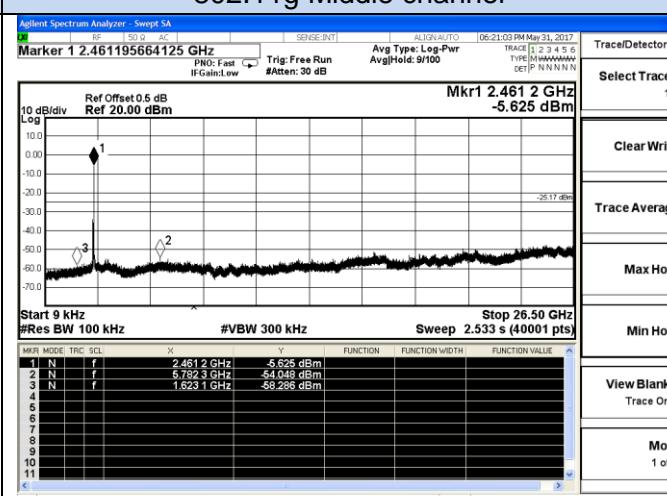
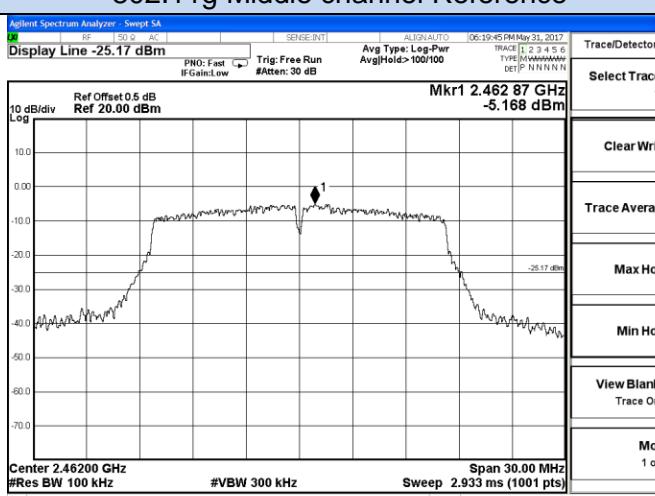
Test plot of Conducted Spurious Emission



802.11g Low channel Reference



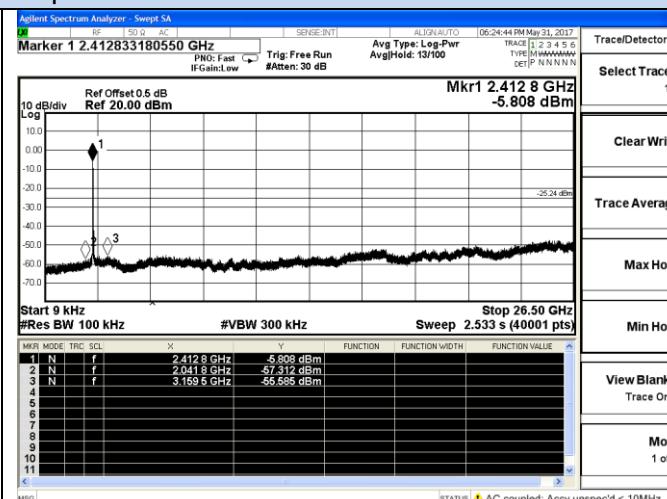
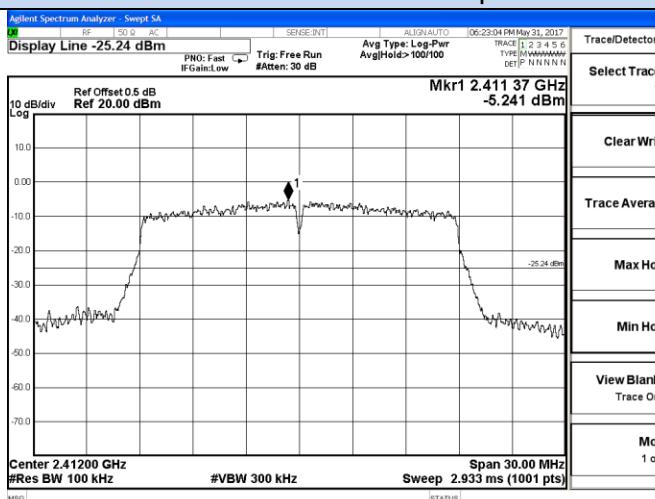
802.11g Middle channel Reference



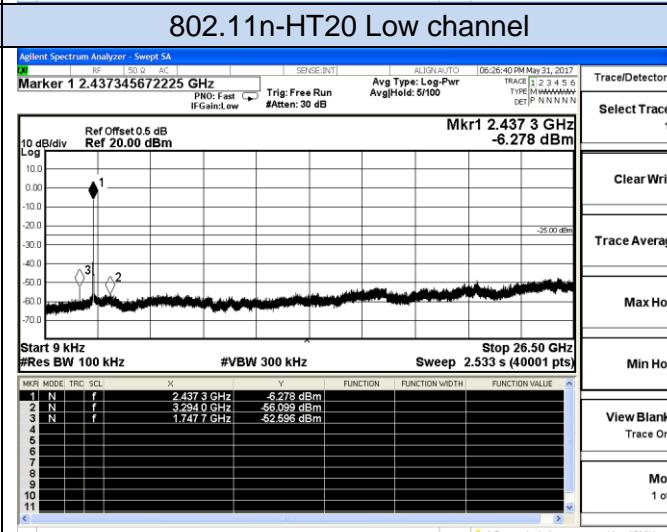
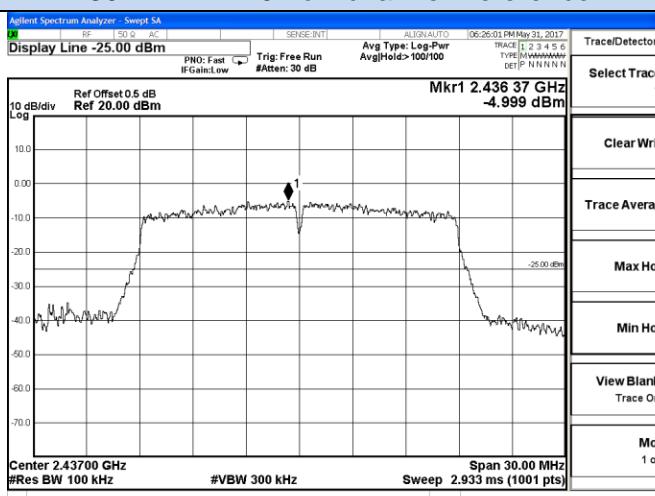
802.11g High channel Reference

802.11g High channel

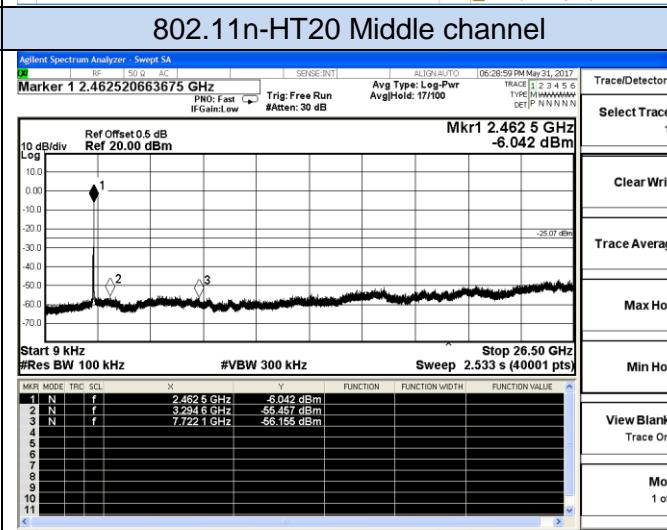
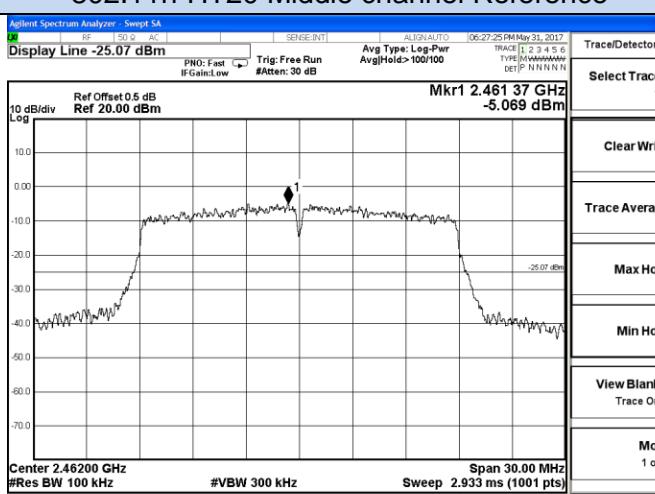
Test plot of Conducted Spurious Emission



802.11n-HT20 Low channel Reference



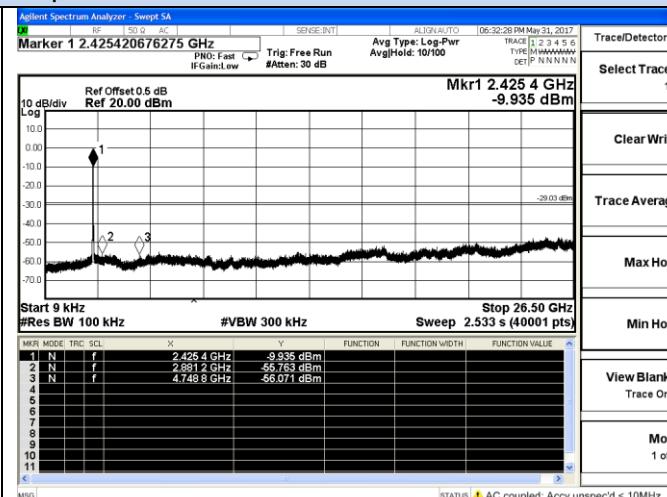
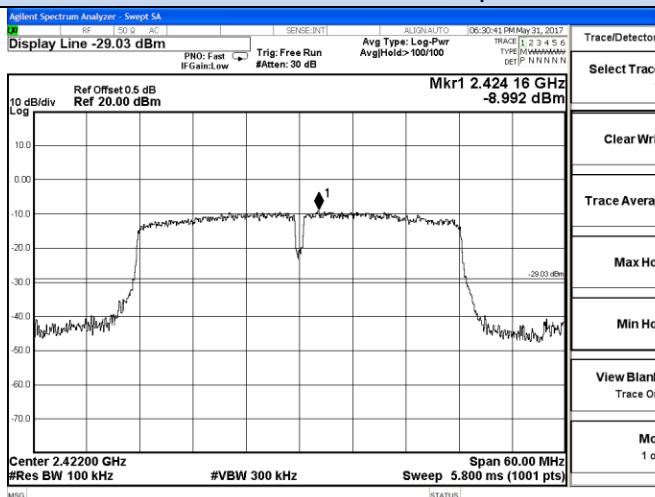
802.11n-HT20 Middle channel Reference



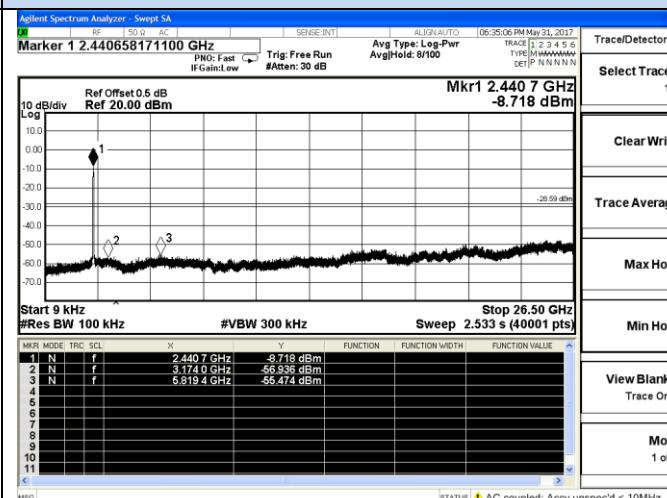
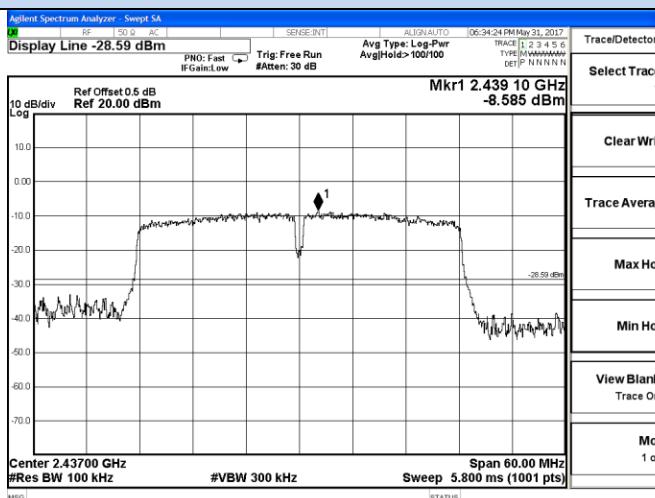
802.11n-HT20 High channel Reference

802.11n-HT20 High channel

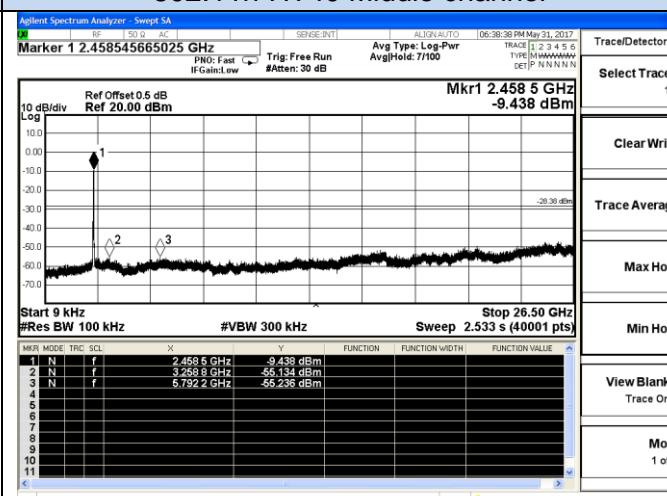
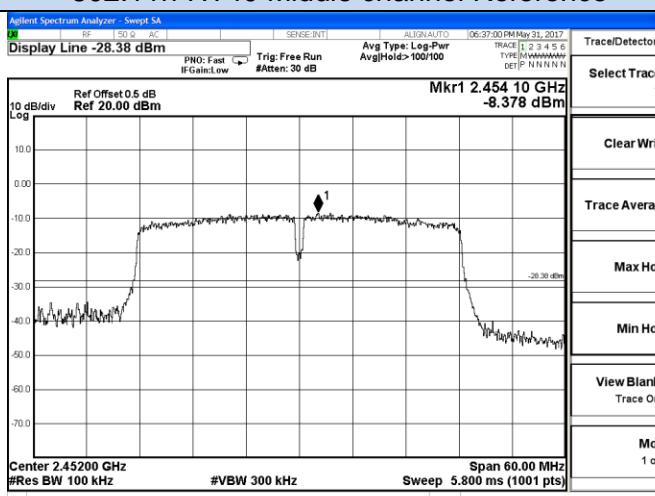
Test plot of Conducted Spurious Emission



802.11n-HT40 Low channel Reference



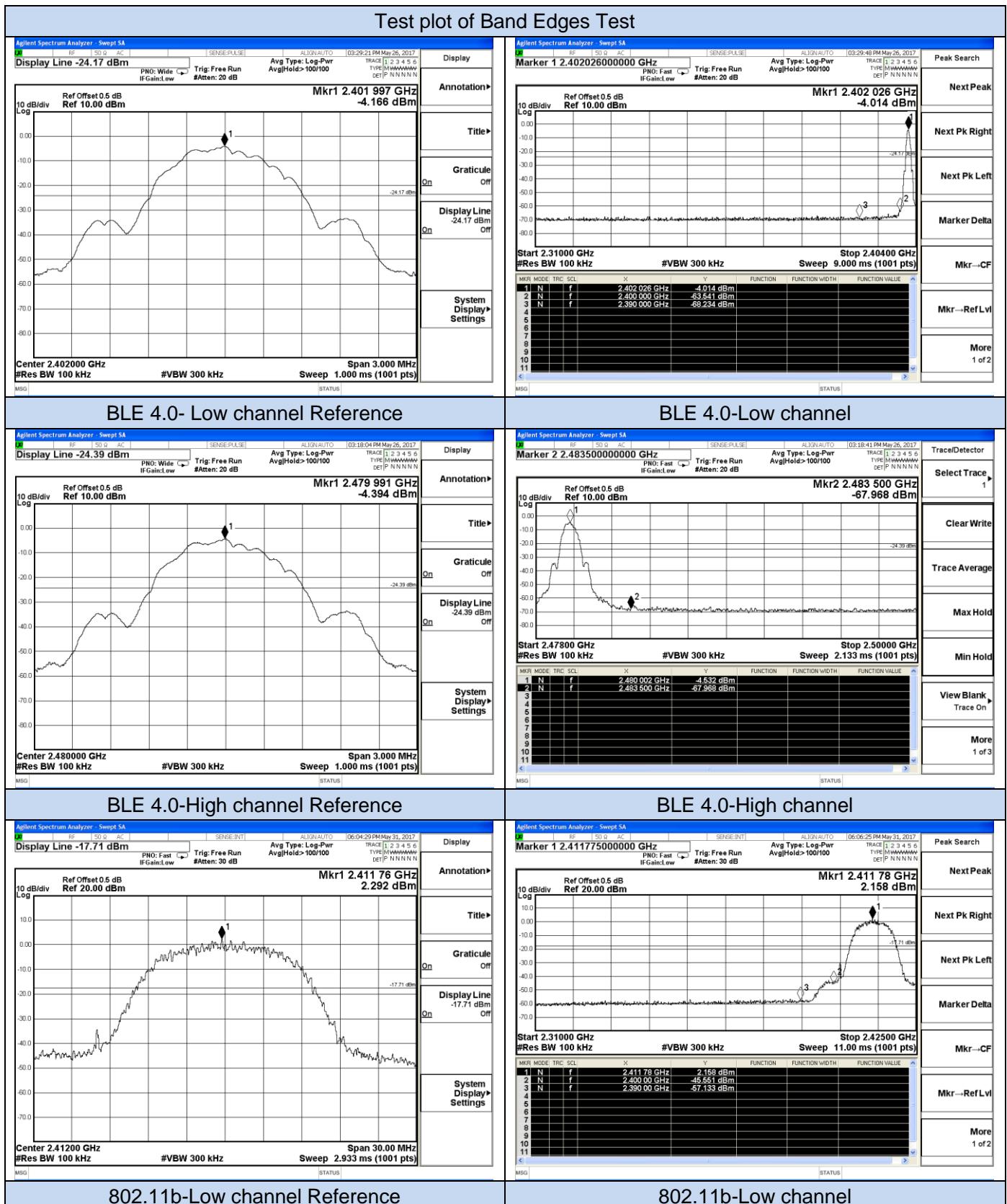
802.11n-HT40 Middle channel Reference

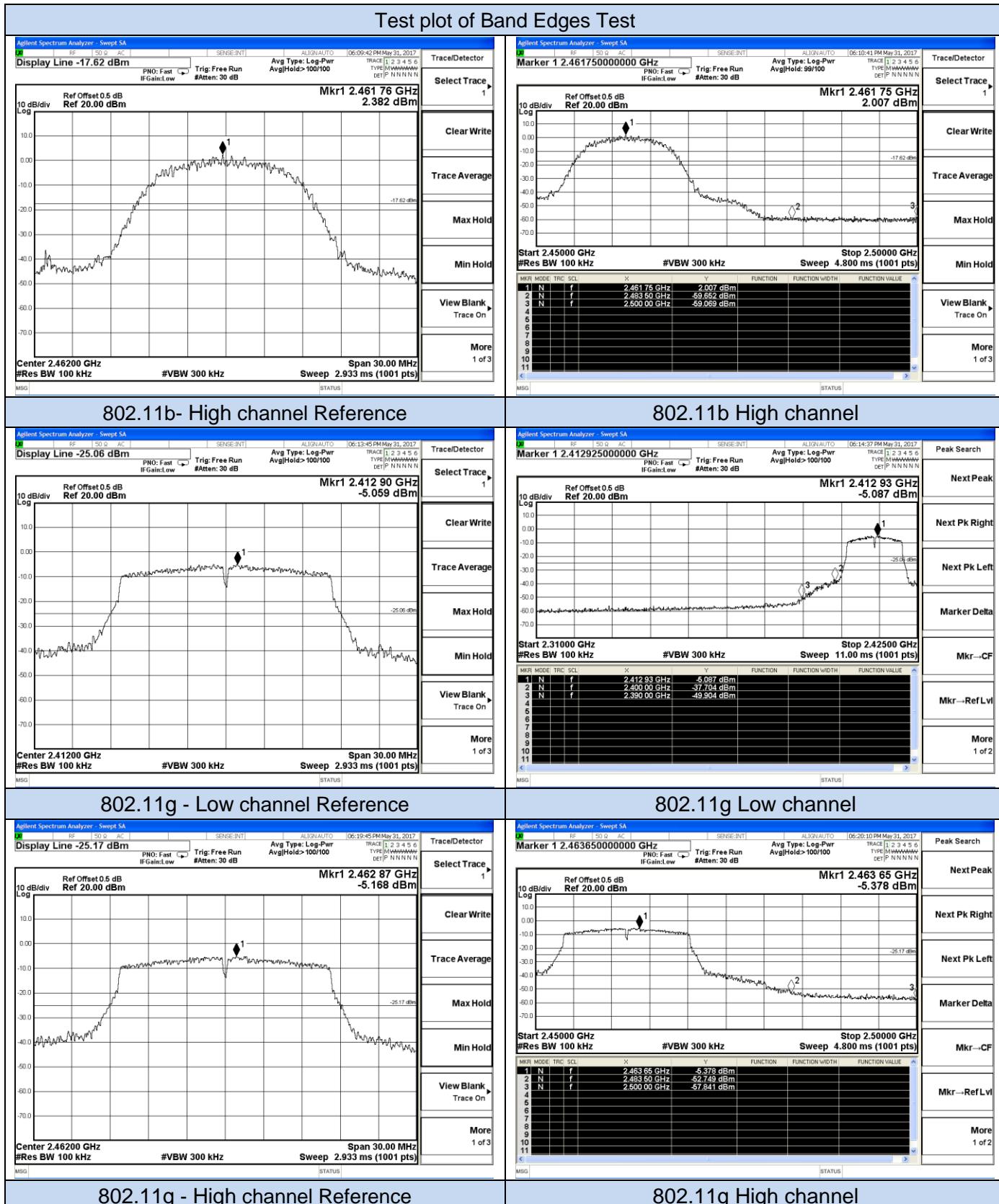


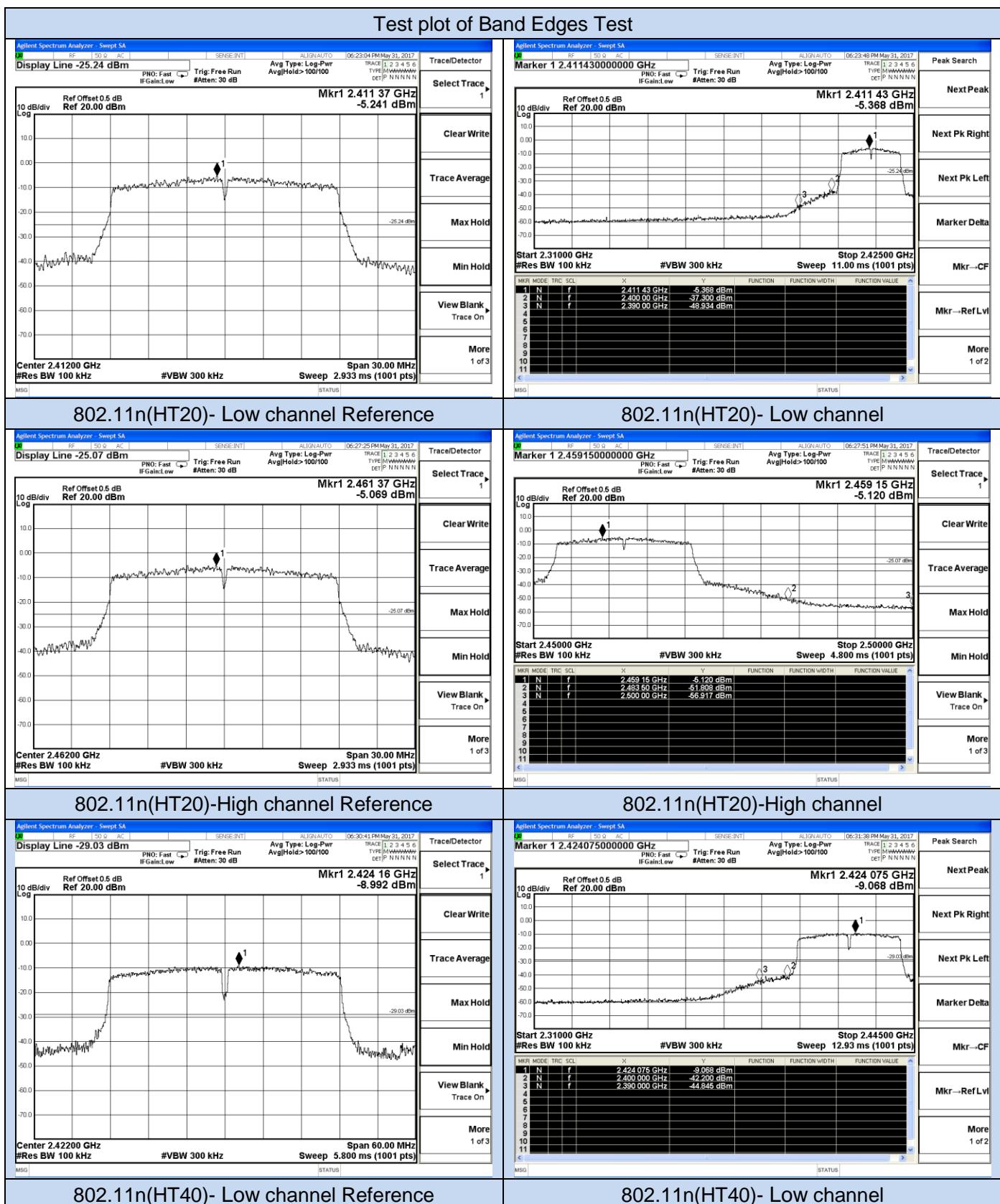
802.11n-HT40 High channel Reference

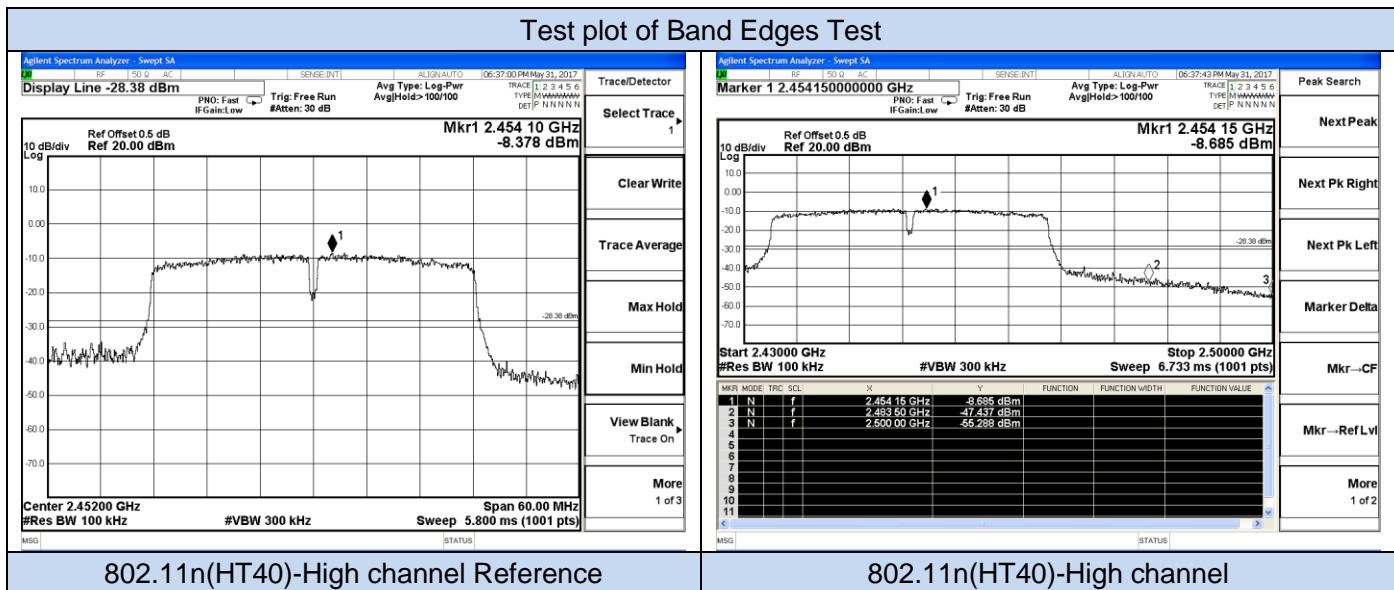
802.11n-HT40 High channel

5.6.7. Test Results of Band Edges Test









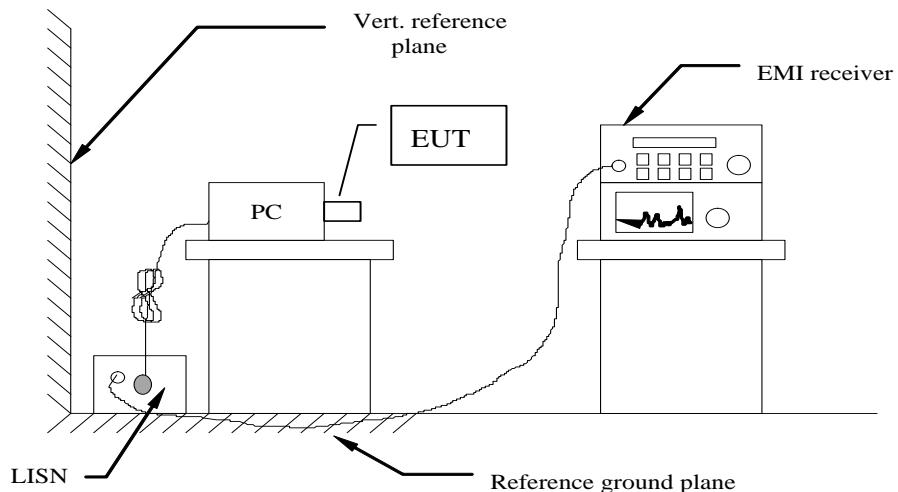
5.7. Power line conducted emissions

5.7.1 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

5.7.2 Block Diagram of Test Setup



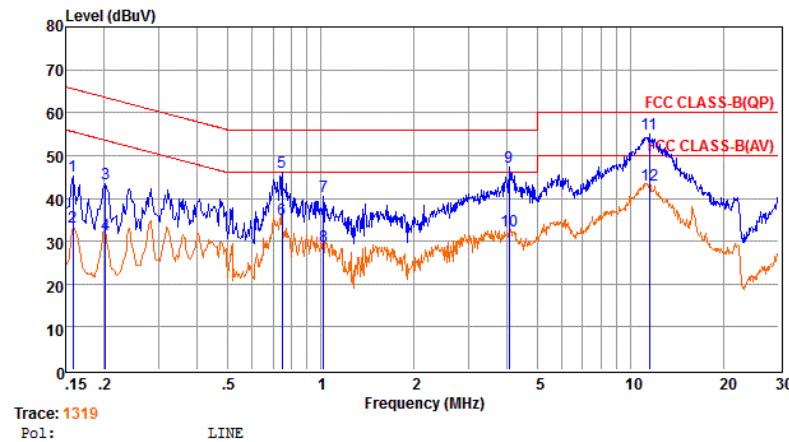
5.7.3 Test Results

PASS.

The test data please refer to following page.

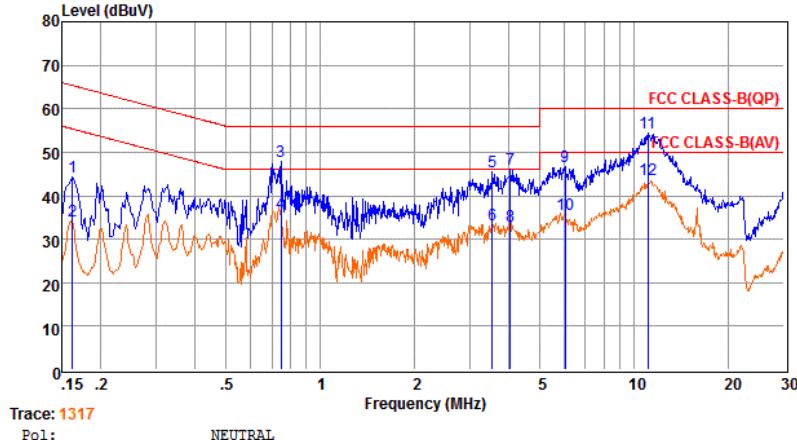
Test result for BLE 4.0 AC 120V/ 60Hz

Temperature	24.9°C	Humidity	50.3%
Test Engineer	Jayden Zhuo	Configurations	BT



Freq	Reading		LISN	Fac	Cab	Los	Aux2	Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB	dBuV	dB	
1	0.16	25.69	9.58	0.02	10.00	45.29	65.56	-20.27	QP			
2	0.16	13.66	9.58	0.02	10.00	33.26	55.55	-22.29	Average			
3	0.20	23.78	9.63	0.02	10.00	43.43	63.54	-20.11	QP			
4	0.20	11.78	9.63	0.02	10.00	31.43	53.53	-22.10	Average			
5	0.75	26.53	9.64	0.04	10.00	46.21	56.00	-9.79	QP			
6	0.75	15.40	9.64	0.04	10.00	35.08	46.00	-10.92	Average			
7	1.02	20.67	9.63	0.05	10.00	40.35	56.00	-15.65	QP			
8	1.02	9.31	9.63	0.05	10.00	28.99	46.00	-17.01	Average			
9	4.05	27.47	9.65	0.06	10.00	47.18	56.00	-8.82	QP			
10	4.05	12.83	9.65	0.06	10.00	32.54	46.00	-13.46	Average			
11	11.50	35.28	9.70	0.09	10.00	55.07	60.00	-4.93	QP			
12	11.50	23.40	9.70	0.09	10.00	43.19	50.00	-6.81	Average			

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

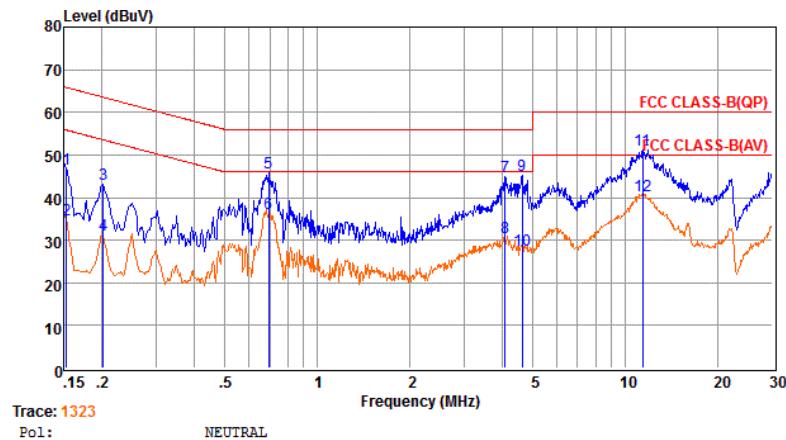


Freq	Reading		LISN	Fac	Cab	Los	Aux2	Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB	dBuV	dB	
1	0.16	24.77	9.67	0.02	10.00	44.46	65.34	-20.88	QP			
2	0.16	14.47	9.67	0.02	10.00	34.16	55.33	-21.17	Average			
3	0.75	28.14	9.63	0.04	10.00	47.81	56.00	-8.19	QP			
4	0.75	16.35	9.63	0.04	10.00	36.02	46.00	-9.98	Average			
5	3.53	25.76	9.65	0.06	10.00	45.47	56.00	-10.53	QP			
6	3.53	13.60	9.65	0.06	10.00	33.31	46.00	-12.69	Average			
7	4.03	26.25	9.65	0.06	10.00	45.96	56.00	-10.04	QP			
8	4.03	13.42	9.65	0.06	10.00	33.13	46.00	-12.87	Average			
9	6.02	27.07	9.68	0.07	10.00	46.82	60.00	-13.18	QP			
10	6.03	16.02	9.68	0.07	10.00	35.77	50.00	-14.23	Average			
11	11.08	34.70	9.73	0.09	10.00	54.52	60.00	-5.48	QP			
12	11.08	23.83	9.73	0.09	10.00	43.65	50.00	-6.35	Average			

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

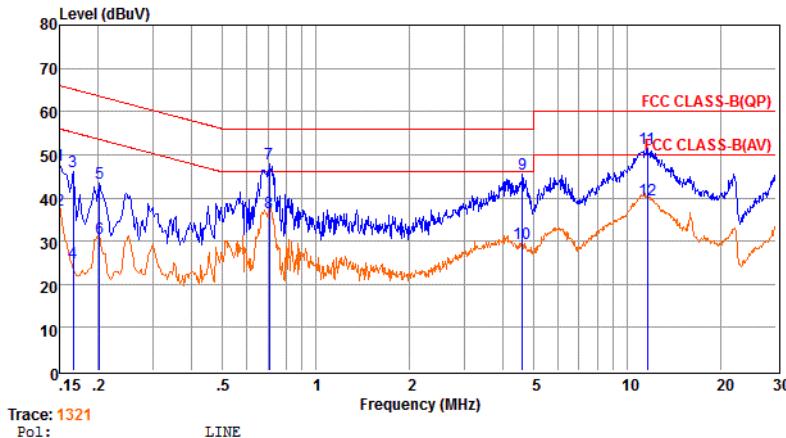
Test result for BLE 4.0 AC 240V/ 60Hz

Temperature	24.9°C	Humidity	50.3%
Test Engineer	Jayden Zhuo	Configurations	BT



Freq	Reading		LISN	Fac	Cab	Los	Aux	2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dB	dB	dB	dB	dB	
1	0.15	27.00	9.69	0.02	10.00	46.71	65.82	-19.11	QP			
2	0.15	15.21	9.69	0.02	10.00	34.92	55.82	-20.90	Average			
3	0.20	23.57	9.59	0.02	10.00	43.18	63.54	-20.36	QP			
4	0.20	11.53	9.59	0.02	10.00	31.14	53.53	-22.39	Average			
5	0.69	26.08	9.63	0.04	10.00	45.75	56.00	-10.25	QP			
6	0.69	16.56	9.63	0.04	10.00	36.23	46.00	-9.77	Average			
7	4.07	25.08	9.65	0.06	10.00	44.79	56.00	-11.21	QP			
8	4.07	10.92	9.65	0.06	10.00	30.63	46.00	-15.37	Average			
9	4.62	25.61	9.66	0.06	10.00	45.33	56.00	-10.67	QP			
10	4.62	8.02	9.66	0.06	10.00	27.74	46.00	-18.26	Average			
11	11.38	31.29	9.73	0.09	10.00	51.11	60.00	-8.89	QP			
12	11.38	20.60	9.73	0.09	10.00	40.42	50.00	-9.58	Average			

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

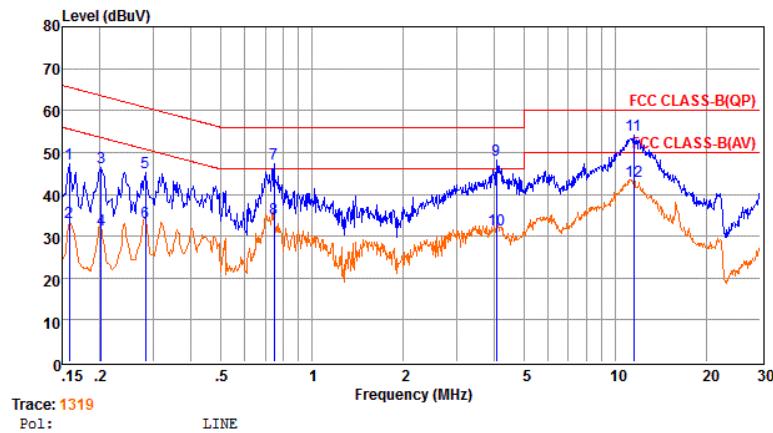


Freq	Reading		LISN	Fac	Cab	Los	Aux	2Fac	Measured	Limit	Over	Remark
	MHz	dBuV	dB	dB	dB	dB	dB	dB	dB	dB	dB	
1	0.15	28.07	9.57	0.02	10.00	47.66	66.00	-18.34	QP			
2	0.15	17.56	9.57	0.02	10.00	37.15	55.99	-18.84	Average			
3	0.17	26.45	9.59	0.02	10.00	46.06	65.16	-19.10	QP			
4	0.17	5.37	9.59	0.02	10.00	24.98	55.16	-30.18	Average			
5	0.20	23.84	9.63	0.02	10.00	43.49	63.54	-20.05	QP			
6	0.20	10.87	9.63	0.02	10.00	30.52	53.53	-23.01	Average			
7	0.71	28.18	9.64	0.04	10.00	47.86	56.00	-8.14	QP			
8	0.71	16.78	9.64	0.04	10.00	36.46	46.00	-9.54	Average			
9	4.60	25.91	9.65	0.06	10.00	45.62	56.00	-10.38	QP			
10	4.60	9.65	9.65	0.06	10.00	29.36	46.00	-16.64	Average			
11	11.62	31.76	9.70	0.09	10.00	51.55	60.00	-8.45	QP			
12	11.62	19.81	9.70	0.09	10.00	39.60	50.00	-10.40	Average			

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

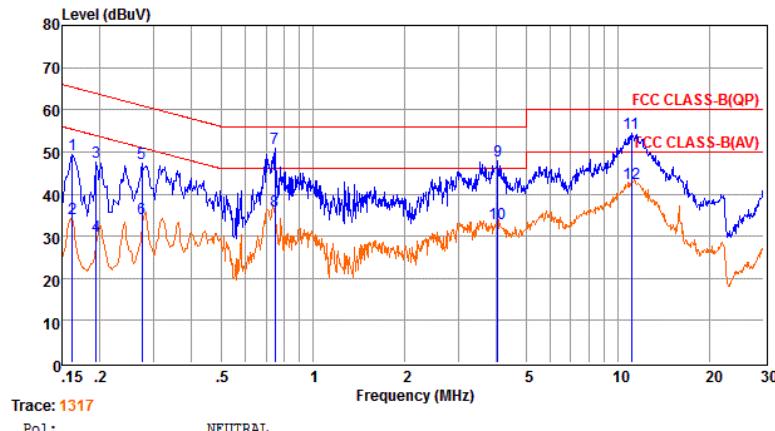
Test result for 802.11b (AC 120V)

Temperature	24.9°C	Humidity	50.3%
Test Engineer	Jayden Zhuo	Configurations	BT



Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.16	27.69	9.58	0.02	10.00	47.29	65.56	-18.27 QP
2	0.16	13.66	9.58	0.02	10.00	33.26	55.55	-22.29 Average
3	0.20	26.78	9.63	0.02	10.00	46.43	63.54	-17.11 QP
4	0.20	11.78	9.63	0.02	10.00	31.43	53.53	-22.10 Average
5	0.28	25.56	9.63	0.03	10.00	45.22	60.76	-15.54 QP
6	0.28	13.60	9.63	0.03	10.00	33.26	50.76	-17.50 Average
7	0.75	27.53	9.64	0.04	10.00	47.21	56.00	-8.79 QP
8	0.75	14.40	9.64	0.04	10.00	34.08	46.00	-11.92 Average
9	4.05	28.47	9.65	0.06	10.00	48.18	56.00	-7.82 QP
10	4.05	11.83	9.65	0.06	10.00	31.54	46.00	-14.46 Average
11	11.50	34.28	9.70	0.09	10.00	54.07	60.00	-5.93 QP
12	11.50	23.40	9.70	0.09	10.00	43.19	50.00	-6.81 Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

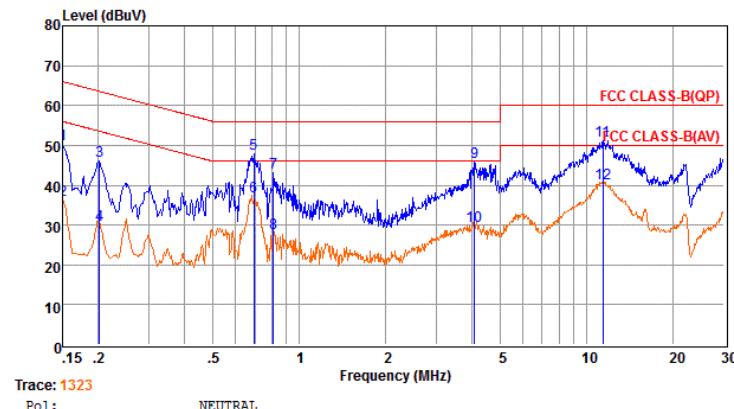


Freq	Reading	LISNFac	CabLos	Aux2Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dBuV	dBuV	dB	
1	0.16	29.77	9.67	0.02	10.00	49.46	65.34	-15.88 QP
2	0.16	14.47	9.67	0.02	10.00	34.16	55.33	-21.17 Average
3	0.19	28.07	9.60	0.02	10.00	47.69	63.84	-16.15 QP
4	0.19	10.33	9.60	0.02	10.00	29.95	53.84	-23.89 Average
5	0.27	27.53	9.60	0.03	10.00	47.16	60.98	-13.82 QP
6	0.27	14.47	9.60	0.03	10.00	34.10	50.98	-16.88 Average
7	0.75	31.14	9.63	0.04	10.00	50.81	56.00	-5.19 QP
8	0.75	16.35	9.63	0.04	10.00	36.02	46.00	-9.98 Average
9	4.03	28.25	9.65	0.06	10.00	47.96	56.00	-8.04 QP
10	4.03	13.42	9.65	0.06	10.00	33.13	46.00	-12.87 Average
11	11.08	34.70	9.73	0.09	10.00	54.52	60.00	-5.48 QP
12	11.08	22.83	9.73	0.09	10.00	42.65	50.00	-7.35 Average

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

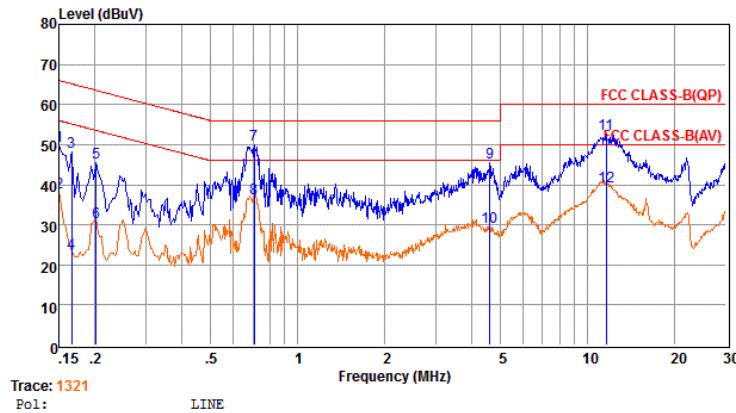
Test result for 802.11b (AC 240V)

Temperature	24.9°C	Humidity	50.3%
Test Engineer	Jayden Zhuo	Configurations	BT



Freq	Reading	LISN	Fac	Cab	Loss	Aux2	Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB	dB		
1	0.15	30.43	9.70	0.02	10.00	50.15	66.00	-15.85	QP		
2	0.15	16.56	9.70	0.02	10.00	36.28	55.99	-19.71	Average		
3	0.20	26.57	9.59	0.02	10.00	46.18	63.54	-17.36	QP		
4	0.20	10.53	9.59	0.02	10.00	30.14	53.53	-23.39	Average		
5	0.69	28.08	9.63	0.04	10.00	47.75	56.00	-8.25	QP		
6	0.69	17.56	9.63	0.04	10.00	37.23	46.00	-8.77	Average		
7	0.81	23.57	9.63	0.04	10.00	43.24	56.00	-12.76	QP		
8	0.81	8.31	9.63	0.04	10.00	27.98	46.00	-18.02	Average		
9	4.07	26.08	9.65	0.06	10.00	45.79	56.00	-10.21	QP		
10	4.07	9.92	9.65	0.06	10.00	29.63	46.00	-16.37	Average		
11	11.38	31.29	9.73	0.09	10.00	51.11	60.00	-8.89	QP		
12	11.38	20.60	9.73	0.09	10.00	40.42	50.00	-9.58	Average		

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.



Freq	Reading	LISN	Fac	Cab	Loss	Aux2	Fac	Measured	Limit	Over	Remark
MHz	dBuV	dB	dB	dB	dB	dBuV	dBuV	dB	dB		
1	0.15	30.07	9.57	0.02	10.00	49.66	66.00	-16.34	QP		
2	0.15	18.56	9.57	0.02	10.00	38.15	55.99	-17.84	Average		
3	0.17	28.45	9.59	0.02	10.00	48.06	65.16	-17.10	QP		
4	0.17	3.37	9.59	0.02	10.00	22.98	55.16	-32.18	Average		
5	0.20	25.84	9.63	0.02	10.00	45.49	63.54	-18.05	QP		
6	0.20	10.87	9.63	0.02	10.00	30.52	53.53	-23.01	Average		
7	0.71	30.18	9.64	0.04	10.00	49.86	56.00	-6.14	QP		
8	0.71	16.78	9.64	0.04	10.00	36.46	46.00	-9.54	Average		
9	4.60	25.91	9.65	0.06	10.00	45.62	56.00	-10.38	QP		
10	4.60	9.65	9.65	0.06	10.00	29.36	46.00	-16.64	Average		
11	11.62	32.76	9.70	0.09	10.00	52.55	60.00	-7.45	QP		
12	11.62	19.81	9.70	0.09	10.00	39.60	50.00	-10.40	Average		

Remarks: 1. Measured = Reading +Cable Loss +Aux2 Fac.
2. The emission levels that are 20dB below the official limit are not reported.

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

5.8. Antenna Requirements

5.8.1. 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.

5.8.2. Antenna Connected Construction

5.8.2.1. Standard Applicable

According to § 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.

5.8.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 5.0dBi, and the antenna is an external antenna with SMA port connecting to PCB board and no consideration of replacement. Please see EUT photo for details.

The WLAN and Bluetooth share same antenna.

5.8.2.3. 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 refers 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

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 normal WLAN devices, the 802.11b mode is used.

Limits

FCC	IC
Antenna Gain	
6 dBi	

T _{nom}	V _{nom}	lowest channel 2412 MHz	middle channel 2437 MHz	highest channel 2462 MHz
Conducted power [dBm] Measured with DSSS modulation		15.20	15.36	15.37
Radiated power [dBm] Measured with DSSS modulation		19.34	19.63	19.90
Gain [dBi] Calculated		4.14	4.27	4.53
Measurement uncertainty		± 1.5 dB (cond.) / ± 3.0 dB (rad.)		

Result: -/-

6. LIST OF MEASURING EQUIPMENTS

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Cal Date	Due Date
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	June 18, 2016	June 17, 2017
Signal analyzer	Agilent	E4448A(External mixers to 40GHz)	US44300469	9kHz~40GHz	July 16, 2016	July 15, 2017
Signal analyzer	Agilent	N9020A	MY50510140	9kHz~26.5GHz	October 27, 2016	October 27, 2017
LISN	MESS Tec	NNB-2/16Z	99079	9KHz-30MHz	June 18, 2016	June 17, 2017
LISN (Support Unit)	EMCO	3819/2NM	9703-1839	9KHz-30MHz	June 18, 2016	June 17, 2017
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9KHz-30MHz	June 18, 2016	June 17, 2017
ISN	SCHAFFNER	ISN ST08	21653	9KHz-30MHz	June 18, 2016	June 17, 2017
3m Semi Anechoic	SIDT FRANKONIA	SAC-3M	03CH03-HY	30M-18GHz 3m	June 18, 2016	June 17, 2017
Amplifier	SCHAFFNER	COA9231A	18667	9kHz-2GHz	June 18, 2016	June 17, 2017
Amplifier	Agilent	8449B	3008A02120	1GHz-26.5GHz	July 16, 2016	July 15, 2017
Amplifier	MITEQ	AMF-6F-260400	9121372	26.5GHz-40GHz	July 16, 2016	July 15, 2017
Loop Antenna	R&S	HFH2-Z2	860004/001	9k-30MHz	June 18, 2016	June 17, 2017
By-log Antenna	SCHWARZBEC K	VULB9163	9163-470	30MHz-1GHz	June 10, 2016	June 09, 2017
Horn Antenna	EMCO	3115	6741	1GHz-18GHz	June 10, 2016	June 09, 2017
Horn Antenna	SCHWARZBEC K	BBHA9170	BBHA9170154	15GHz-40GHz	June 10, 2016	June 09, 2017
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz-1GHz	June 18, 2016	June 17, 2017
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz-40GHz	June 18, 2016	June 17, 2017
Power Meter	R&S	NRVS	100444	DC-40GHz	June 18, 2016	June 17, 2017
Power Sensor	R&S	NRV-Z51	100458	DC-30GHz	June 18, 2016	June 17, 2017
Power Sensor	R&S	NRV-Z32	10057	30MHz-6GHz	June 18, 2016	June 17, 2017
AC Power Source	HPC	HPA-500E	HPA-9100024	AC 0-300V	June 18, 2016	June 17, 2017
DC power Soure	GW	GPC-6030D	C671845	DC 1V-60V	June 18, 2016	June 17, 2017
Temp. and Humidig	Giant Force	GTH-225-20-S	MAB0103-00	N/A	June 18, 2016	June 17, 2017
RF CABLE-1m	JYE Bao	RG142	CB034-1m	20MHz-7GHz	June 18, 2016	June 17, 2017
RF CABLE-2m	JYE Bao	RG142	CB)35-2m	20MHz-1GHz	June 18, 2016	June 17, 2017

Note: All equipment through GRGT EST calibration

7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

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