

TEST REPORT

Product Name: Swittons IoT Edge-W2
FCC ID: 2AUJP-SWIT500W-R
Trademark:  Swittons
Model Number: SWIT500W-R, SWIT500W-N, SWIT300W
Prepared For: OPTIKS SOLUTIONS, INC
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Manufacturer: OPTIKS SOLUTIONS, INC
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Sample Received Date: Nov. 26, 2021
Sample tested Date: Nov. 26, 2021 to Dec. 7, 2021
Issue Date: Dec. 7, 2021
Report No.: CTB211207036RF
Test Standards: FCC Part15.247
ANSI C63.10:2013
Test Results: PASS
Remark: This is WIFI-2.4GHz band radio test report.

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(Note: N/A means not applicable)

1. VERSION

Report No.	Issue Date	Description	Approved
CTB211207036RF	Dec. 7, 2021	Original	Valid

2. TEST SUMMARY

The Product has been tested according to the following specifications:

Test Item	Test Requirement	Test method	Result
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	PASS
Radiated Spurious emissions	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2013	PASS
Band edge and RF Conducted Spurious Emissions	47 CFR Part 15 Subpart C Section 15.247(d)/15.205(a)	ANSI C63.10-2013	PASS
Conducted Peak Output Power	47 CFR Part 15 Subpart C Section 15.247 (b)(3)	ANSI C63.10-2013	PASS
6dB Occupied Bandwidth	47 CFR Part 15 Subpart C Section 15.247 (a)(2)	ANSI C63.10-2013	PASS
Power Spectral Density	47 CFR Part 15 Subpart C Section 15.247 (e)	ANSI C63.10-2013/ KDB 558074 D01 v05r02	PASS
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203/15.247 (b)	ANSI C63.10-2013	PASS
RF Exposure Evaluation	47 CFR Part 15 Subpart C Section 15.247 (i)/1.1310/2.1093	KDB447498	PASS

Remark:

Test according to ANSI C63.4-2014 & ANSI C63.10-2013.

3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the Product as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=2$.

Item	Uncertainty
Occupancy bandwidth	$U=\pm 54.3\text{Hz}$
Conducted output power Above 1G	$U=\pm 1.0\text{dB}$
Conducted output power below 1G	$U=\pm 0.9\text{dB}$
Power Spectral Density , Conduction	$U=\pm 1.0\text{dB}$
Conduction spurious emissions	$U=\pm 2.8\text{dB}$
Out of band emission	$U=\pm 54\text{Hz}$
3m camber Radiated spurious emission(9KHz-30MHz)	$U=\pm 4.8\text{dB}$
3m camber Radiated spurious emission(30MHz-1GHz)	$U=\pm 4.3\text{dB}$
3m chamber Radiated spurious emission(1GHz-18GHz)	$U=\pm 4.5\text{dB}$
3m chamber Radiated spurious emission(18GHz-40GHz)	$U=\pm 3.4\text{dB}$
humidity uncertainty	$U=\pm 5.3\%$
Temperature uncertainty	$U=\pm 0.59^{\circ}\text{C}$
Supply voltages	$U=\pm 3\%$
Time	$U=\pm 5\%$

4. PRODUCT INFORMATION AND TEST SETUP

4.1 Product Information

Model(s):	SWIT500W-R, SWIT500W-N, SWIT300W
Model Description:	All the model are the same circuit and RF module, only for model name. Test sample model: SWIT500W-R
Wi-Fi Specification:	IEEE 802.11b/g/n
Hardware Version:	V2.0
Software Version:	V1.0.8
Operation Frequency:	WiFi: IEEE 802.11b/g/n 20: 2412-2462MHz/ 11 channel IEEE 802.11n 40: 2422-2452MHz/ 7 channel
Max. RF output power:	WiFi (2.4G) :7.44dBm
Type of Modulation:	WiFi: DSSS, OFDM, CCK
Antenna installation:	WiFi: Internal Antenna
Antenna Gain:	WiFi (2.4G) : 1.0dBi
Ratings:	DC 5V charging from adapter Input:100-240Vac, 50/60Hz 0.5A Output:5.0V $\overline{\text{---}}$ 1A Battery DC 3.7V, 2000mAh

4.2 Test Setup Configuration

See test photographs attached in EUT TEST SETUP PHOTOGRAPHS for the actual connections between Product and support equipment.

4.3 Support Equipment

Item	Equipment	Mfr/Brand	Model/Type No.	Series No.	Note
1	POWER ADAPTER	OPTIKS SOLUTIONS, INC	M4-050100A1-ETL	N/A	AE
2	battery	AYRST	505060	N/A	N/A

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

4.4 Channel List

CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)	CH	Frequency (MHz)
1	2412	2	2417	3	2422	4	2427
5	2432	6	2437	7	2442	8	2447
9	2452	10	2457	11	2462		

4.5 Test Mode

All test mode(s) and condition(s) mentioned were considered and evaluated respectively by performing full tests, the worst data were recorded and reported.

Test mode	Low channel	Middle channel	High channel
Transmitting(802.11b/g/n20)	2412MHz	2437MHz	2462MHz
Transmitting(802.11n40)	2422MHz	2437MHz	2452MHz

NOTE: DutyCycle>98%.

4.6 Test Environment

Humidity(%):	55
Atmospheric Pressure(kPa):	101.1
Normal Voltage(DC):	3.7
Normal Temperature(°C)	25
Low Temperature(°C)	0
High Temperature(°C)	50

Test mode	rate
802.11b	11M
802.11g	54M
802.11/n20	65M
802.11/n40	65M

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

All measurement facilities used to collect the measurement data are located at Floor 1&2, Building A, No. 26 of Xinhe Road, Xinqiao Street, Baoan District, Shenzhen China. The site and apparatus are constructed in conformance with the requirements of ANSI C63.4 and CISPR 16-1-1 other equivalent standards.

5.2 Test Instrument Used

No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated date	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	2020.09.27	2022.08.05
2	Power Sensor	Agilent	U2021XA	MY56120032	2020.09.27	2022.08.05
3	Power Sensor	Agilent	U2021XA	MY56120034	2020.09.27	2022.08.05
4	Communication test set	R&S	CMW500	108058	2020.09.27	2022.08.05
5	Spectrum Analyzer	R&S	FSP40	100550	2020.09.27	2022.08.05
6	Signal Generator	Agilent	N5181A	MY49060920	2020.09.27	2022.08.16
7	Signal Generator	Agilent	N5182A	MY47420195	2020.09.27	2022.08.05
8	Communication test set	Agilent	E5515C	MY50102567	2020.09.27	2022.08.16
9	band rejection filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	2020.09.27	2022.08.05
10	band rejection filter	Shenxiang	MSF5150-5850 MS-1155	20181015001	2020.09.27	2022.08.05
11	band rejection filter	Xingbo	XBLBQ-DZA120	190821-1-1	2020.09.27	2022.08.05
12	BT&WI-FI Automatic test software	Microwave	MTS8310	Ver. 2.0.0.0	2020.09.27	2022.08.05
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	2020.09.27	2022.08.05
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	2020.09.27	2022.08.05
15	234G Automatic test software	Microwave	MTS8200	Ver. 2.0.0.0	2020.09.27	2022.08.05
16	966 chamber	C.R.T.	966 Room	966	2020.09.27	2024.08.11
17	Receiver	R&S	ESPI	100362	2020.09.27	2022.08.05
18	Amplifier	HP	8447E	2945A02747	2020.09.27	2022.08.05

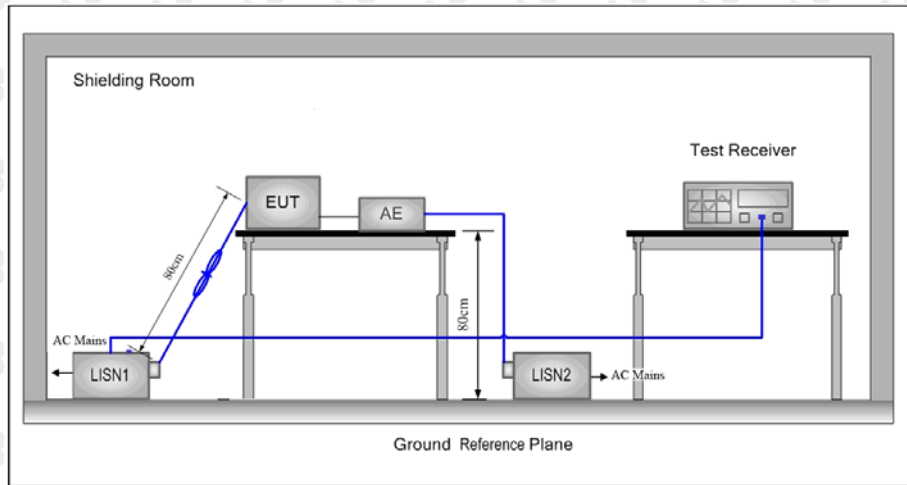
19	Amplifier	Agilent	8449B	3008A01838	2020.09.27	2022.08.05
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	869	2020.09.27	2022.08.07
21	Horn Antenna	Schwarzbeck	BBHA9120D	1911	2020.09.27	2022.08.08
22	Software	Fala	EZ-EMC	FA-03A2 RE	2020.09.27	2022.08.05
23	3-Loop Antenna	Daze	ZN30401	17014	2020.09.27	2022.08.05
24	loop antenna	ZHINAN	ZN30900A	/	2020.09.27	2022.08.05
25	Horn antenna	A/H/System	SAS-574	588	2020.09.27	2022.08.05
26	Amplifier	AEROFLEX	/	S/N/ 097	2020.09.27	2022.08.05

Continuous disturbance						
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated date	Calibrated until
1	AMN	ROHDE&SCHWARZ	ESH3-Z5	831551852	2020.09.27	2022.08.05
2	Pulse limiter	ROHDE&SCHWARZ	ESH3Z2	357881052	2020.09.27	2022.08.05
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428/003	2020.09.27	2022.08.05
4	Coaxial cable	ZDECL	Z302S	18091904	2020.09.27	2022.08.05
5	AAN	Schwarzbeck	NTFM8158	183	2020.09.27	2022.08.05
6	Communication test set	Agilent	E5515C	MY50102567	2020.09.27	2022.08.16
7	Communication test set	R&S	CMW500	108058	2020.09.27	2022.08.05
8	EZ-EMC	Frad	EMC-con3A 1.1	/	/	/

Radiated emission						
No.	Equipment	Manufacturer	Model No.	Serial No.	Calibrated date	Calibrated until
1	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120D	1911	2020.09.27	2022.08.08
2	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	869	2020.09.27	2022.08.05
3	Amplifier	Agilent	8449B	3008A01838	2020.09.27	2022.08.05
4	Amplifier	HP	8447E	2945A02747	2020.09.27	2022.08.05
5	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESPI7	100362	2020.09.27	2022.08.05
6	Coaxial cable	ETS	RFC-SNS-100-NMS-80 NI	/	2020.09.27	2022.08.05
7	Coaxial cable	ETS	RFC-SNS-100-NMS-20 NI	/	2020.09.27	2022.08.05
8	Coaxial cable	ETS	RFC-SNS-100-SMS-20 NI	/	2020.09.27	2022.08.05
9	Coaxial cable	ETS	RFC-NNS-100-NMS-300 NI	/	2020.09.27	2022.08.05
10	Communication test set	Agilent	E5515C	MY50102567	2020.09.27	2022.08.16
11	Communication test set	R&S	CMW500	108058	2020.09.27	2022.08.05
12	EZ-EMC	Frad	EMC-con3A1.1	/	/	/

6. AC POWER LINE CONDUCTED EMISSION

6.1 Block Diagram Of Test Setup



6.2 Limit

Table 4 – AC power-line conducted emissions limits

Frequency (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56 ^{Note 1}	56 to 46 ^{Note 1}
0.5 - 5	56	46
5 - 30	60	50

Note 1: The level decreases linearly with the logarithm of the frequency.

* Decreasing linearly with the logarithm of the frequency

6.3 Test procedure

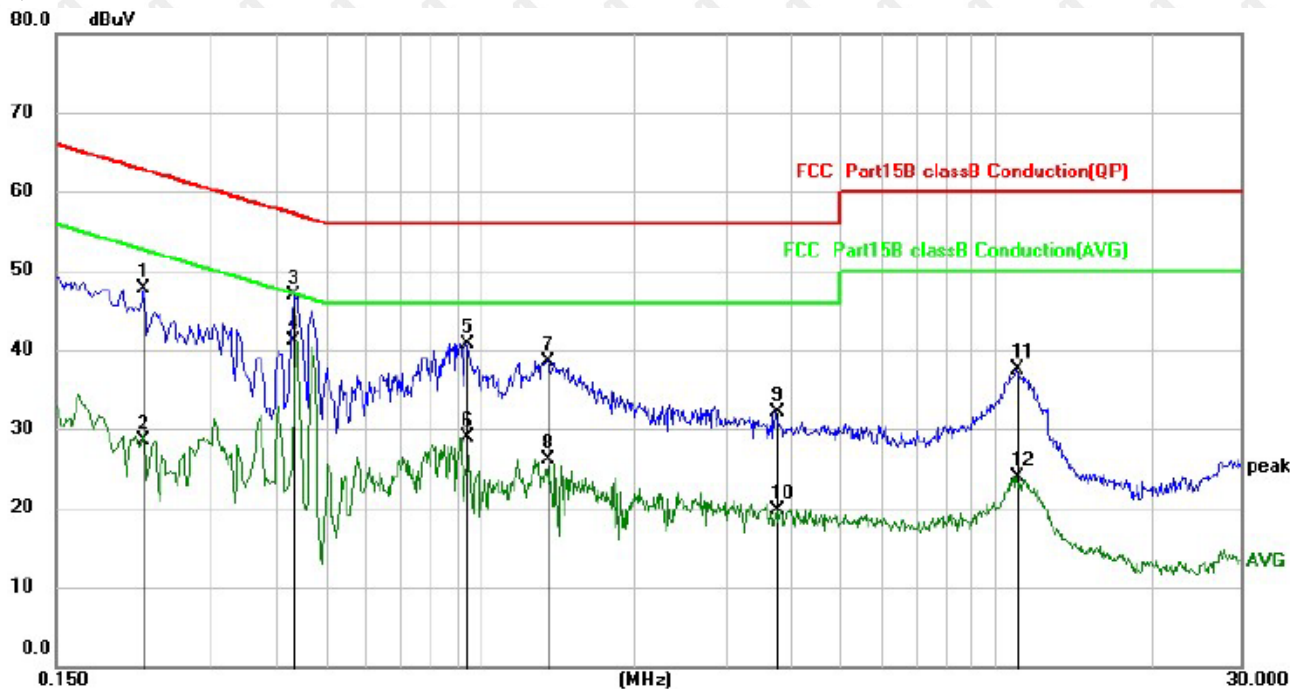
- 1) The mains terminal disturbance voltage test was conducted in a shielded room.
- 2) The EUT was connected to AC power source through a LISN 1 (Line Impedance Stabilization Network) which provides a $50\Omega/50\mu\text{H} + 5\Omega$ linear impedance. The power cables of all other units of the EUT were connected to a second LISN 2, which was bonded to the ground reference plane in the same way as the LISN 1 for the unit being measured. A multiple socket outlet strip was used to connect multiple power cables to a single LISN provided the rating of the LISN was not exceeded.
- 3) The tabletop EUT was placed upon a non-metallic table 0.8m above the ground reference plane. And for floor-standing arrangement, the EUT was placed on the horizontal ground reference plane,
- 4) The test was performed with a vertical ground reference plane. The rear of the EUT shall be 0.4 m from the vertical ground reference plane. The vertical ground reference

plane was bonded to the horizontal ground reference plane. The LISN 1 was placed 0,8 m from the boundary of the unit under test and bonded to a ground reference plane for LISNs mounted on top of the ground reference plane. This distance was between the closest points of the LISN 1 and the EUT. All other units of the EUT and associated equipment was at least 0,8 m from the LISN 2.

- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10 on conducted measurement.

6.4 Test Result

L:

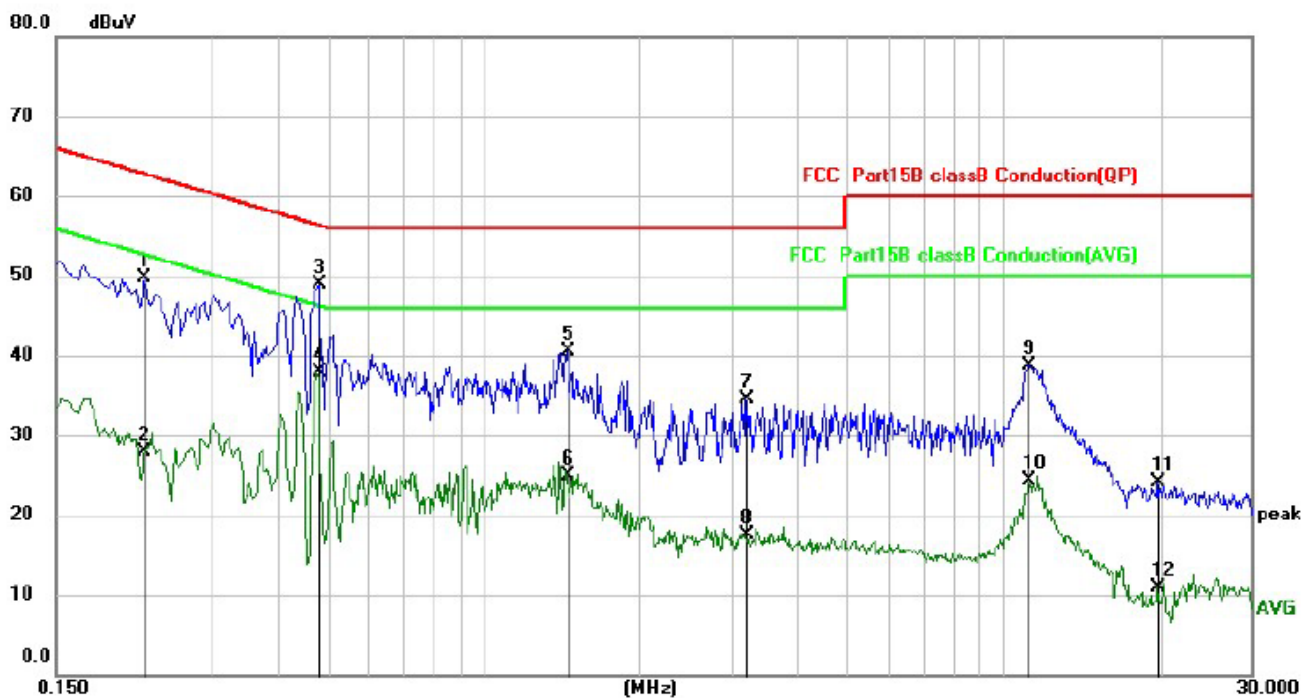


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector
1		0.2220	37.05	10.68	47.73	62.74	-15.01	QP
2		0.2220	17.79	10.68	28.47	52.74	-24.27	AVG
3		0.4339	36.39	10.56	46.95	57.18	-10.23	QP
4	*	0.4339	30.53	10.56	41.09	47.18	-6.09	AVG
5		0.9418	30.10	10.61	40.71	56.00	-15.29	QP
6		0.9418	18.39	10.61	29.00	46.00	-17.00	AVG
7		1.3500	27.89	10.62	38.51	56.00	-17.49	QP
8		1.3500	15.47	10.62	26.09	46.00	-19.91	AVG
9		3.7500	21.42	10.64	32.06	56.00	-23.94	QP
10		3.7500	9.14	10.64	19.78	46.00	-26.22	AVG
11		10.9977	26.67	10.84	37.51	60.00	-22.49	QP
12		10.9977	13.01	10.84	23.85	50.00	-26.15	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

N:



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Detector
		MHz	dBuV	dB	dBuV	dBuV	dB	
1		0.2220	38.96	10.68	49.64	62.74	-13.10	QP
2		0.2220	17.13	10.68	27.81	52.74	-24.93	AVG
3	*	0.4818	38.28	10.53	48.81	56.31	-7.50	QP
4		0.4818	27.30	10.53	37.83	46.31	-8.48	AVG
5		1.4418	29.94	10.62	40.56	56.00	-15.44	QP
6		1.4418	14.29	10.62	24.91	46.00	-21.09	AVG
7		3.1979	23.88	10.64	34.52	56.00	-21.48	QP
8		3.1979	6.94	10.64	17.58	46.00	-28.42	AVG
9		11.1737	27.86	10.84	38.70	60.00	-21.30	QP
10		11.1737	13.38	10.84	24.22	50.00	-25.78	AVG
11		19.7900	13.02	10.99	24.01	60.00	-35.99	QP
12		19.7900	-0.18	10.99	10.81	50.00	-39.19	AVG

Remark:

Factor = Cable loss + LISN factor, Margin = Measurement – Limit

7. RADIATED SPURIOUS EMISSION

7.1 Block Diagram Of Test Setup

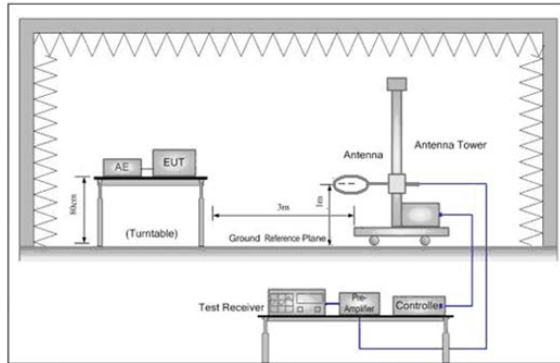


Figure 1. Below 30MHz

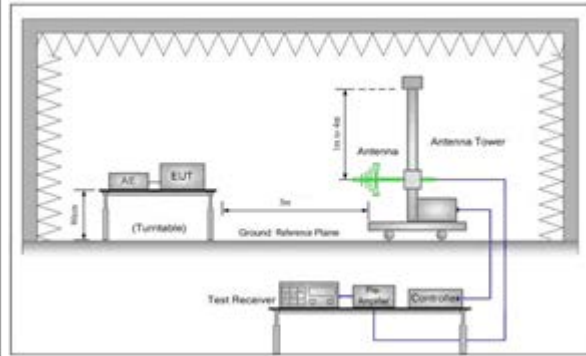


Figure 2. 30MHz to 1GHz

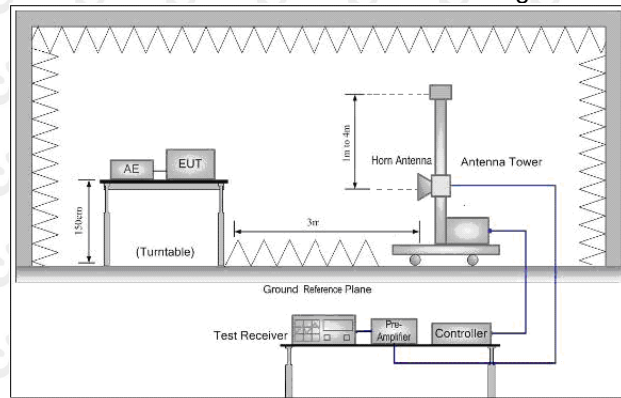


Figure 3. Above 1GHz

7.2 Limit

Spurious Emissions:

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F (kHz)	-	-	300
0.490MHz-1.705MHz	24000/F (kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

7.3 Test procedure

Below 1GHz test procedure as below:

- The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic chamber. The table was rotated 360 degrees to determine the position of the highest radiation.
- The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.
- For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.
- The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

- Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 meter to 1.5 meter(Above 18GHz the distance is 1 meter and table is 1.5 meter).
- Test the EUT in the lowest channel ,the middle channel ,the Highest channel
- Repeat above procedures until all frequencies measured was complete.
- Full battery is used during test

Receiver set:

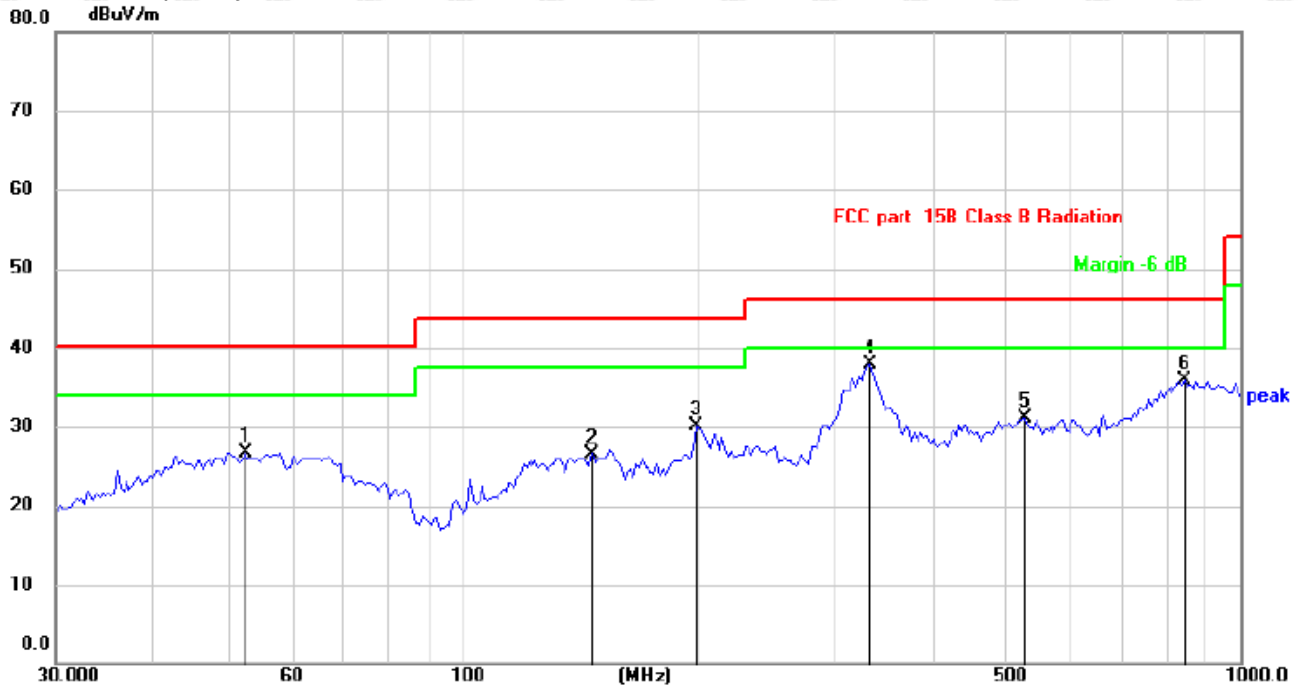
Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30KHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30KHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30KHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30KHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30KHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120 kHz	300KHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10Hz	Average

The margin of 9K-30MH measurement exceeds 20dB, so the test chart is not included. Test Mode: TM1 (the worst)

7.4 Test Result

Below 1GHz Test Results:

Antenna polarity: H

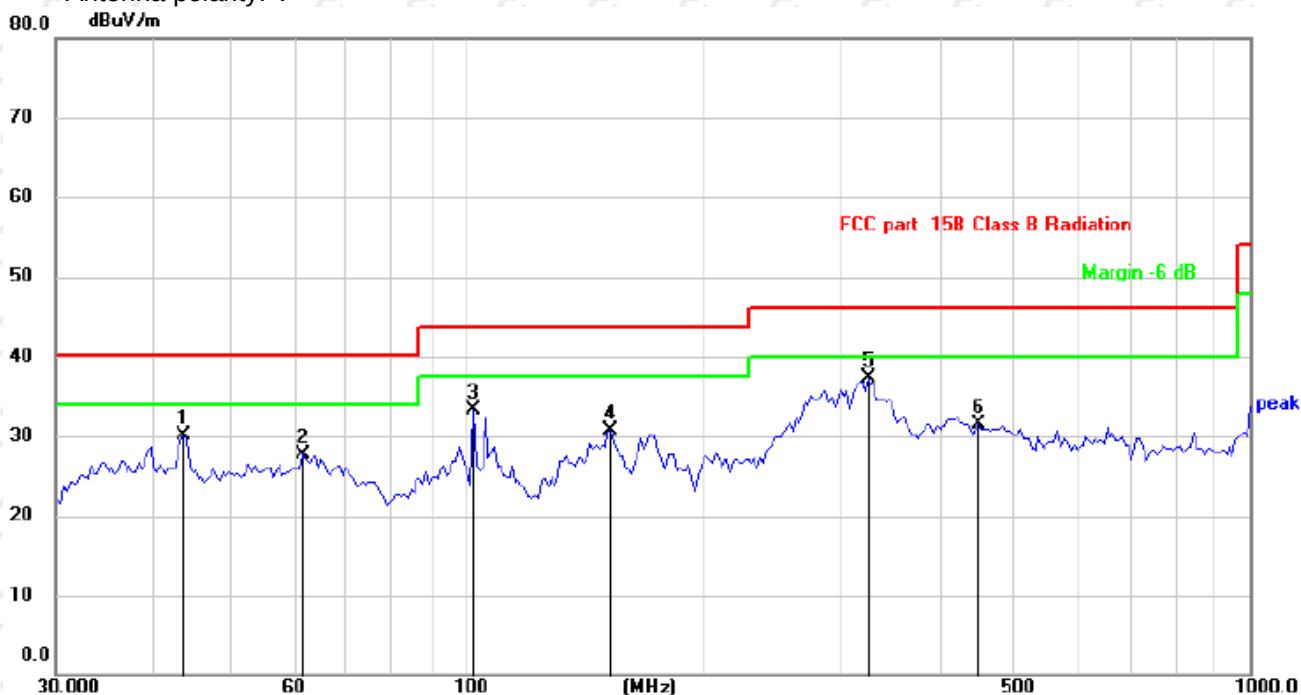


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		52.5752	32.52	-5.78	26.74	40.00	-13.26	QP
2		146.6303	32.08	-5.48	26.60	43.50	-16.90	QP
3		199.2855	38.40	-8.27	30.13	43.50	-13.37	QP
4	*	334.2721	41.87	-4.01	37.86	46.00	-8.14	QP
5		527.3201	29.79	1.22	31.01	46.00	-14.99	QP
6		846.5706	29.84	6.11	35.95	46.00	-10.05	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level

1. All modes have been tested, and the test results show that b-mode data is the worst, only b-mode test chart is put.
2. After pre-scanning three directions, the report recorded the worst case

Antenna polarity: V



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector
		MHz	dBuV	dB	dBuV/m	dB/m	dB	
1		43.7351	35.59	-5.41	30.18	40.00	-9.82	QP
2		62.1037	34.16	-6.54	27.62	40.00	-12.38	QP
3		102.3596	41.79	-8.49	33.30	43.50	-10.20	QP
4		153.2000	36.16	-5.52	30.64	43.50	-12.86	QP
5	*	325.5957	41.63	-4.31	37.32	46.00	-8.68	QP
6		450.3446	32.04	-0.48	31.56	46.00	-14.44	QP

Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level

1. All modes have been tested, and the test results show that b-mode data is the worst, only b-mode test chart is put.
2. After pre-scanning three directions, the report recorded the worst case

Above 1 GHz Test Results:

LOW CH1 (802.11b Mode)/2412

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	66.09	-3.64	62.45	74	-11.55	peak
4824	49.31	-3.64	45.67	54	-8.33	AVG
7236	58.38	-0.95	57.43	74	-16.57	peak
7236	43.96	-0.95	43.01	54	-10.99	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,
Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	64.80	-3.64	61.16	74	-12.84	peak
4824	47.55	-3.64	43.91	54	-10.09	AVG
7236	58.75	-0.95	57.80	74	-16.20	peak
7236	45.11	-0.95	44.16	54	-9.84	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,
Margin = Emission level - Limits

MID CH6 (802.11b Mode)/2437

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	65.14	-3.51	61.63	74	-12.37	peak
4874	48.21	-3.51	44.70	54	-9.30	AVG
7311	58.26	-0.82	57.44	74	-16.56	peak
7311	45.95	-0.82	45.13	54	-8.87	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	64.72	-3.51	61.21	74	-12.79	peak
4874	48.70	-3.51	45.19	54	-8.81	AVG
7311	57.58	-0.82	56.76	74	-17.24	peak
7311	44.27	-0.82	43.45	54	-10.55	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

HIGH CH11 (802.11b Mode)/2462

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	62.44	-3.43	59.01	74	-14.99	peak
4924	45.94	-3.43	42.51	54	-11.49	AVG
7386	57.42	-0.75	56.67	74	-17.33	peak
7386	42.76	-0.75	42.01	54	-11.99	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	64.64	-3.43	61.21	74	-12.79	peak
4924	47.80	-3.43	44.37	54	-9.63	AVG
7386	58.30	-0.75	57.55	74	-16.45	peak
7386	41.22	-0.75	40.47	54	-13.53	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) Data of measurement 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) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

LOW CH1 (802.11g Mode)/2412

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	63.57	-3.64	59.93	74	-14.07	peak
4824	49.63	-3.64	45.99	54	-8.01	AVG
7236	58.07	-0.95	57.12	74	-16.88	peak
7236	46.93	-0.95	45.98	54	-8.02	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	64.45	-3.64	60.81	74	-13.19	peak
4824	46.77	-3.64	43.13	54	-10.87	AVG
7236	59.83	-0.95	58.88	74	-15.12	peak
7236	44.95	-0.95	44.00	54	-10.00	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

MID CH6 (802.11g Mode)/2437

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	62.67	-3.51	59.16	74	-14.84	peak
4874	49.14	-3.51	45.63	54	-8.37	AVG
7311	58.73	-0.82	57.91	74	-16.09	peak
7311	45.76	-0.82	44.94	54	-9.06	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	64.29	-3.51	60.78	74	-13.22	peak
4874	48.40	-3.51	44.89	54	-9.11	AVG
7311	57.24	-0.82	56.42	74	-17.58	peak
7311	41.53	-0.82	40.71	54	-13.29	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

HIGH CH11 (802.11g Mode)/2462

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	63.93	-3.43	60.50	74	-13.50	peak
4924	50.09	-3.43	46.66	54	-7.34	AVG
7386	57.89	-0.75	57.14	74	-16.86	peak
7386	42.80	-0.75	42.05	54	-11.95	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	61.86	-3.43	58.43	74	-15.57	peak
4924	47.03	-3.43	43.60	54	-10.40	AVG
7386	57.82	-0.75	57.07	74	-16.93	peak
7386	41.79	-0.75	41.04	54	-12.96	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits

Remark:

(1) Measuring frequencies from 1 GHz to the 25 GHz.

(2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.

(3) Data of measurement 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) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

LOW CH1 (802.11n/H20 Mode)/2412

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	64.10	-3.64	60.46	74	-13.54	peak
4824	46.91	-3.64	43.27	54	-10.73	AVG
7236	57.88	-0.95	56.93	74	-17.07	peak
7236	44.59	-0.95	43.64	54	-10.36	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,
Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4824	64.96	-3.64	61.32	74	-12.68	peak
4824	48.69	-3.64	45.05	54	-8.95	AVG
7236	58.98	-0.95	58.03	74	-15.97	peak
7236	42.44	-0.95	41.49	54	-12.51	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,
Margin = Emission level - Limits

MID CH6 (802.11n/H20 Mode)/2437

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874.00	62.31	-3.51	58.80	74.00	-15.20	peak
4874.00	47.38	-3.51	43.87	54.00	-10.13	AVG
7311.00	59.50	-0.82	58.68	74.00	-15.32	peak
7311.00	44.77	-0.82	43.95	54.00	-10.05	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,
Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874.00	62.39	-3.51	58.88	74.00	-15.12	peak
4874.00	45.76	-3.51	42.25	54.00	-11.75	AVG
7311.00	57.77	-0.82	56.95	74.00	-17.05	peak
7311.00	41.41	-0.82	40.59	54.00	-13.41	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,
Margin = Emission level - Limits

HIGH CH11 (802.11n/H20 Mode)/2462

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	61.77	-3.43	58.34	74	-15.66	peak
4924	46.16	-3.43	42.73	54	-11.27	AVG
7386	57.28	-0.75	56.53	74	-17.47	peak
7386	42.48	-0.75	41.73	54	-12.27	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,
Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4924	62.72	-3.43	59.29	74	-14.71	peak
4924	45.37	-3.43	41.94	54	-12.06	AVG
7386	57.22	-0.75	56.47	74	-17.53	peak
7386	41.96	-0.75	41.21	54	-12.79	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,
Margin = Emission level - Limits

LOW CH3 (802.11n/H40 Mode)/2422

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4844	64.43	-3.63	60.80	74	-13.20	peak
4844	49.05	-3.63	45.42	54	-8.58	AVG
7266	59.18	-0.94	58.24	74	-15.76	peak
7266	45.59	-0.94	44.65	54	-9.35	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4844	64.39	-3.63	60.76	74	-13.24	peak
4844	47.81	-3.63	44.18	54	-9.82	AVG
7266	59.61	-0.94	58.67	74	-15.33	peak
7266	44.57	-0.94	43.63	54	-10.37	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

MID CH6 (802.11n/H40 Mode)/2437

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	63.61	-3.51	60.10	74	-13.90	peak
4874	47.73	-3.51	44.22	54	-9.78	AVG
7311	59.49	-0.82	58.67	74	-15.33	peak
7311	45.19	-0.82	44.37	54	-9.63	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4874	62.31	-3.51	58.80	74	-15.20	peak
4874	46.46	-3.51	42.95	54	-11.05	AVG
7311	56.66	-0.82	55.84	74	-18.16	peak
7311	43.29	-0.82	42.47	54	-11.53	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

HIGH CH9 (802.11n/H40 Mode)/2452

Horizontal:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4904	64.54	-3.43	61.11	74	-12.89	peak
4904	46.97	-3.43	43.54	54	-10.46	AVG
7356	56.31	-0.75	55.56	74	-18.44	peak
7356	42.41	-0.75	41.66	54	-12.34	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
4904	62.32	-3.43	58.89	74	-15.11	peak
4904	46.36	-3.43	42.93	54	-11.07	AVG
7356	56.26	-0.75	55.51	74	-18.49	peak
7356	44.80	-0.75	44.05	54	-9.95	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Remark:

- (1) Measuring frequencies from 1 GHz to the 25 GHz.
- (2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) Data of measurement 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) When the test results of Peak Detected below the limits of Average Detected, the Average Detected is not need completed. For example: Top Channel at Fundamental 73.16dBuV/m(PK Value) <93.98(AV Limit), at harmonic 53.20 dBuV/m(PK Value) <54 dBuV/m(AV Limit), the Average Detected not need to completed.

Restricted bands around fundamental frequency (Radiated)

Operation Mode:

802.11b Mode TX CH Low (2412MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	58.19	-5.81	52.38	74	-21.62	peak
2390	/	-5.81	/	54	/	AVG
2399	64.58	-5.84	58.74	74	-15.26	peak
2399	48.43	-5.84	42.59	54	-11.41	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,
Margin = Emission level - Limits

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	56.28	-5.81	50.47	74	-23.53	peak
2390	/	-5.81	/	54	/	AVG
2399	62.67	-5.84	56.83	74	-17.17	peak
2399	46.57	-5.84	40.73	54	-13.27	AVG

Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor,
Margin = Emission level - Limits

Operation Mode: TX CH High (2462MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	55.99	-5.65	50.34	74	-23.66	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.58	-5.65	50.93	74	-23.07	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

Operation Mode: 802.11g Mode TX CH Low (2412MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	58.21	-5.81	52.40	74	-21.60	peak
2390	/	-5.81	/	54	/	AVG
2399	61.58	-5.84	55.74	74	-18.26	peak
2399	46.71	-5.84	40.87	54	-13.13	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2390	56.23	-5.81	50.42	74	-23.58	peak
2390	/	-5.81	/	54	/	AVG
2399	62.56	-5.84	56.72	74	-17.28	peak
2399	46.81	-5.84	40.97	54	-13.03	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Operation Mode: TX CH High (2462MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	57.76	-5.65	52.11	74	-21.89	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.96	-5.65	51.31	74	-22.69	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

Operation Mode: 802.11n/H20 Mode TX CH Low (2412MHz)

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2390	57.30	-5.81	51.49	74	-22.51	
2390	/	-5.81	/	54	/	AVG
2399	63.66	-5.84	57.82	74	-16.18	peak
2399	47.92	-5.84	42.08	54	-11.92	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2390	55.83	-5.81	50.02	74	-23.98	
2390	/	-5.81	/	54	/	AVG
2399	60.29	-5.84	54.45	74	-19.55	peak
2399	47.52	-5.84	41.68	54	-12.32	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Operation Mode: TX CH High (2462MHz)

Horizontal

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.65	-5.65	51.00	74	-23.00	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.79	-5.65	51.14	74	-22.86	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

Operation Mode: 802.11n/H40 Mode TX CH Low (2422MHz)

Horizontal

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2390	58.62	-5.81	52.81	74	-21.19	
2390	/	-5.81	/	54	/	AVG
2399	62.29	-5.84	56.45	74	-17.55	peak
2399	46.34	-5.84	40.50	54	-13.50	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency (MHz)	Meter Reading (dBμV)	Factor (dB)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Type
2390	57.34	-5.81	51.53	74	-22.47	
2390	/	-5.81	/	54	/	AVG
2399	62.08	-5.84	56.24	74	-17.76	peak
2399	46.47	-5.84	40.63	54	-13.37	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Operation Mode: TX CH High (2452MHz)

Horizontal

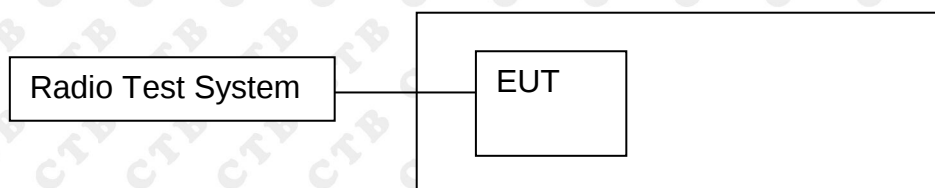
Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	56.50	-5.65	50.85	74	-23.15	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						

Vertical:

Frequency	Meter Reading	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
2483.5	57.75	-5.65	52.10	74	-21.90	peak
2483.5	/	-5.65	/	54	/	AVG
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier. Emission level = Reading Result + Factor, Margin = Emission level - Limits						
Remark: All the other emissions not reported were too low to read and deemed to comply with FCC limit.						

8. BAND EDGE AND RF CONDUCTED SPURIOUS EMISSIONS

8.1 Block Diagram Of Test Setup



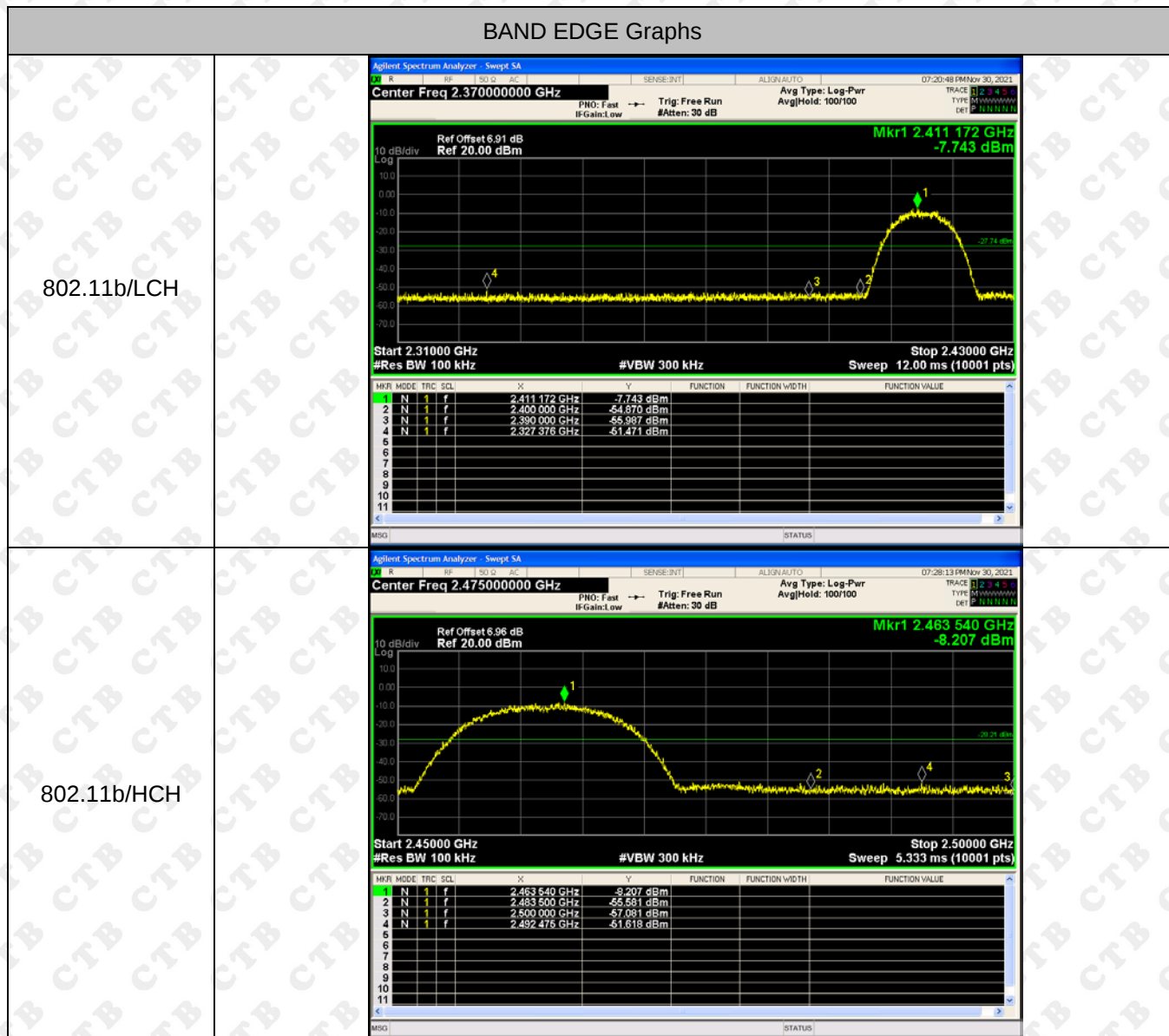
8.2 Limit

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)).

8.3 Test procedure

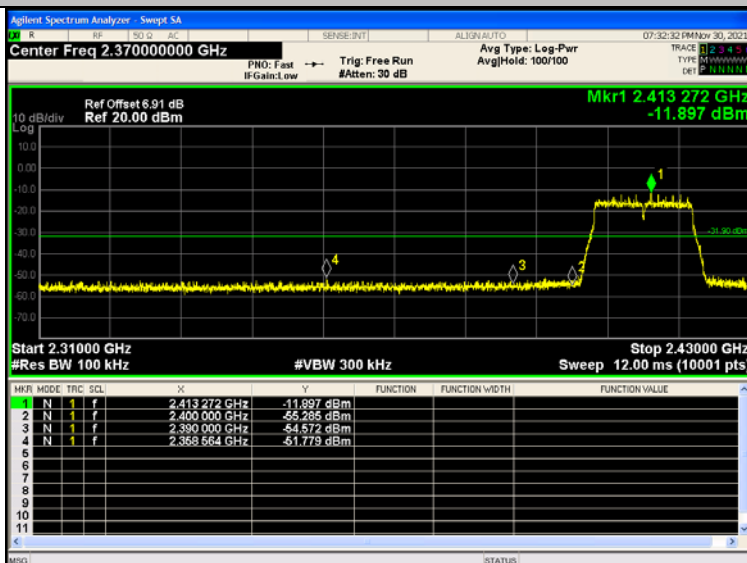
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
Below 30MHz:
RBW = 100kHz, VBW = 300kHz, Sweep = auto
Detector function = peak, Trace = max hold
Above 30MHz:
RBW = 100KHz, VBW = 300KHz, Sweep = auto
Detector function = peak, Trace = max hold

8.4 Test Result

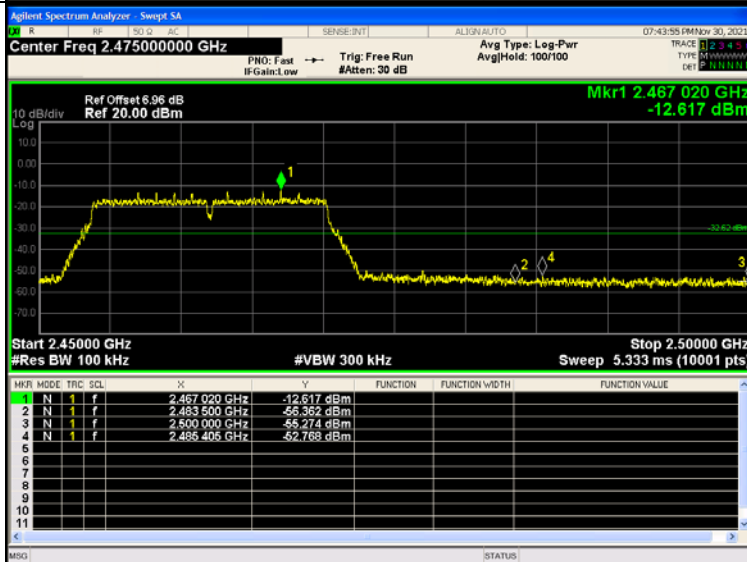


BAND EDGE Graphs

802.11g/LCH

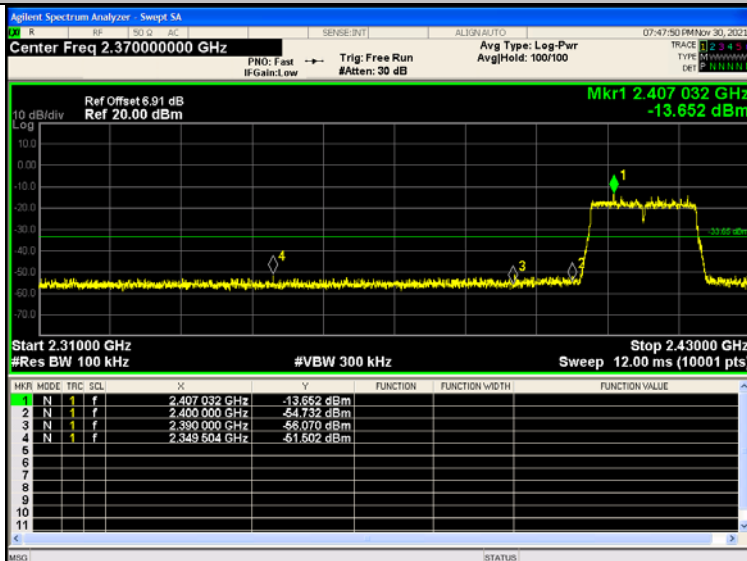


802.11g/HCH

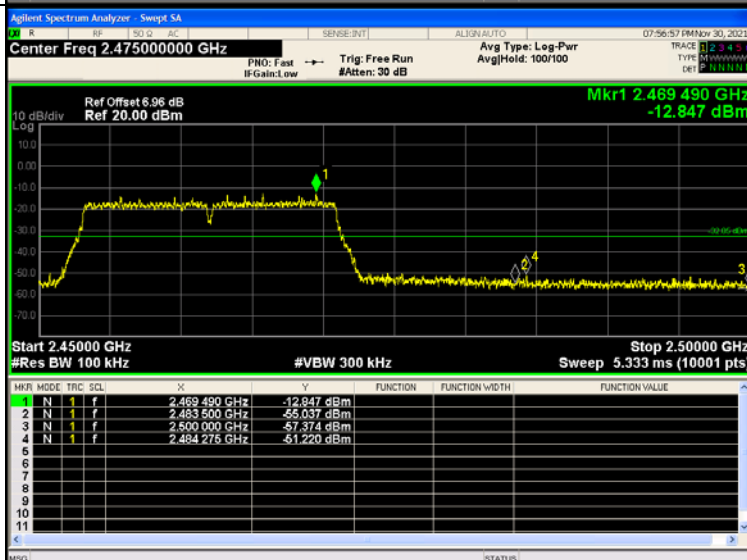


BAND EDGE Graphs

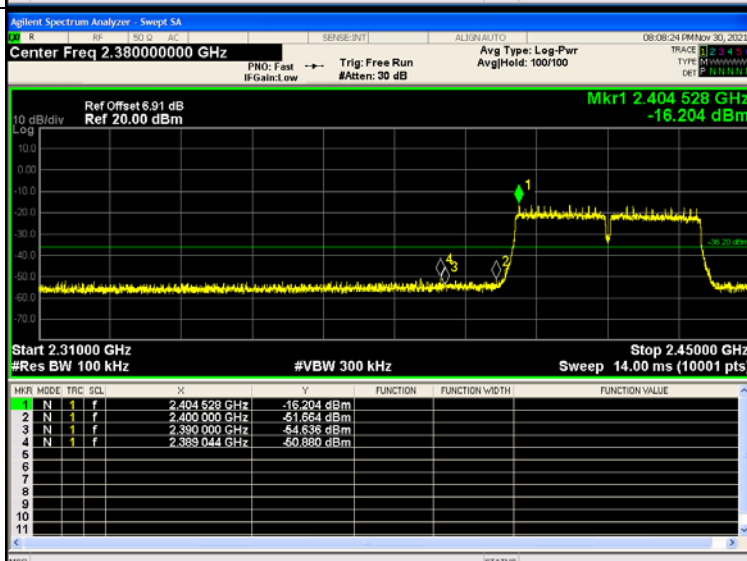
802.11n(HT20)/L
CH



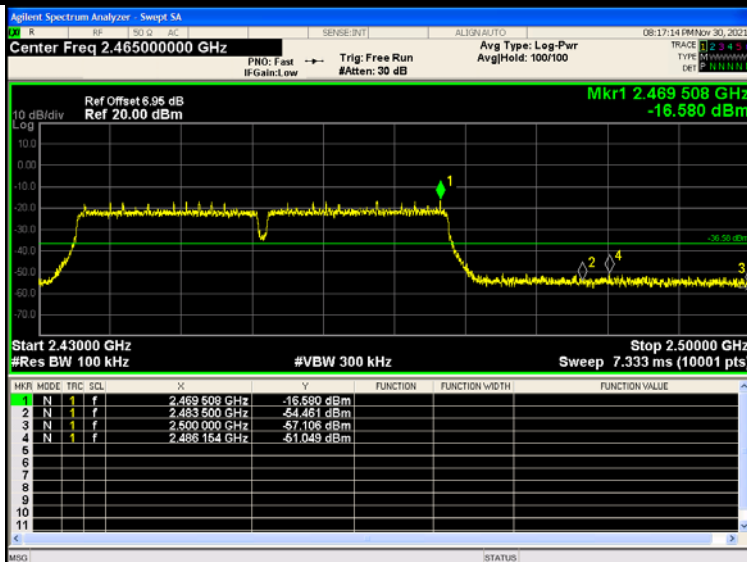
802.11n(HT20)/H
CH



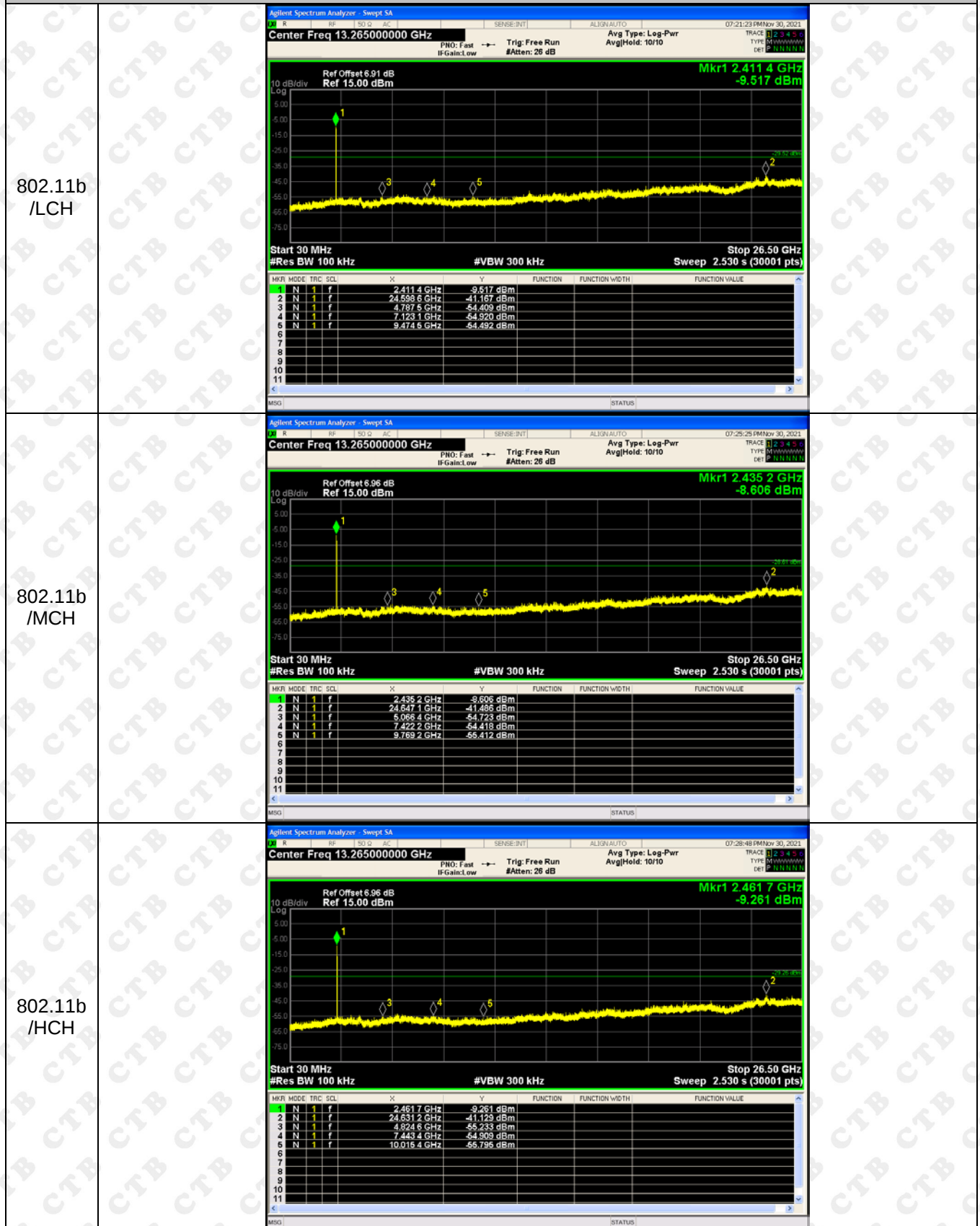
802.11n(HT40)/L
CH



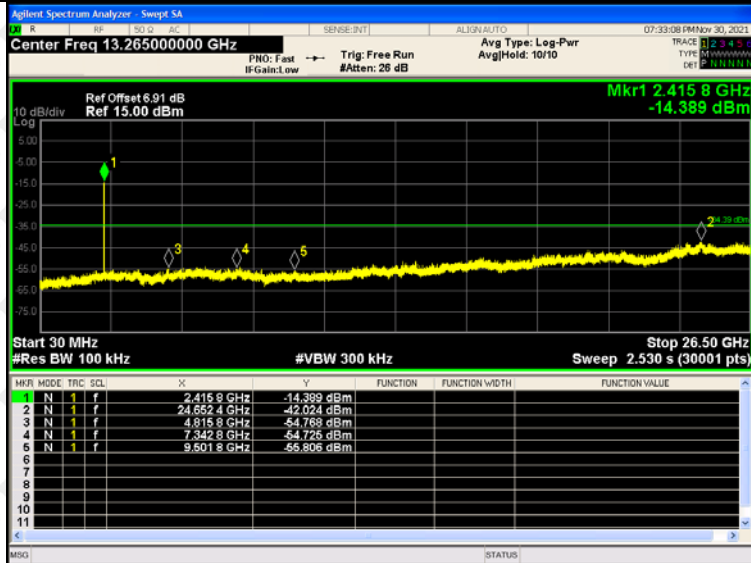
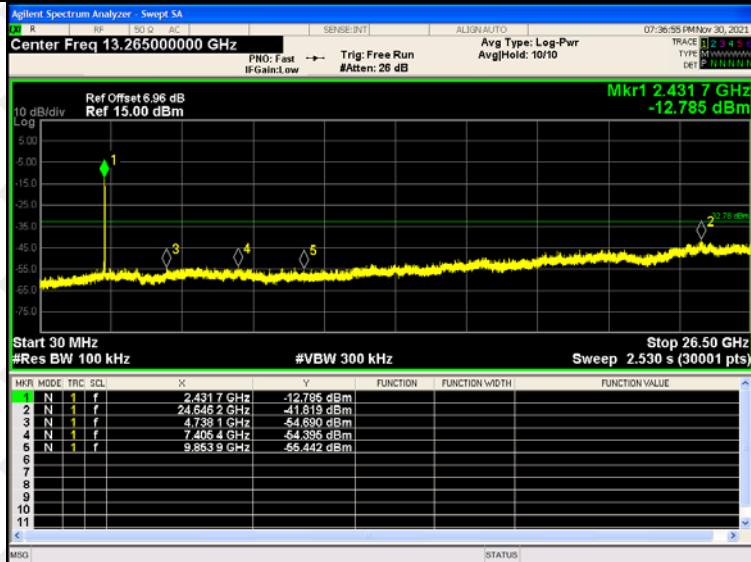
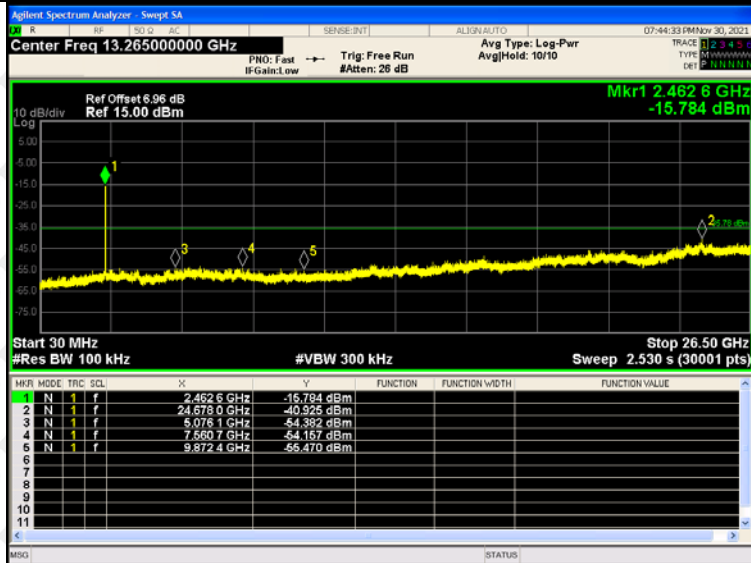
802.11n(HT40)/H
CH



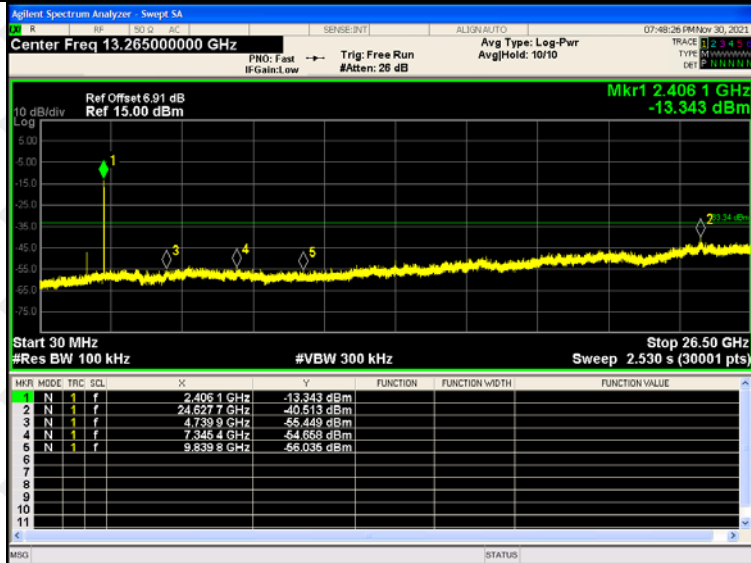
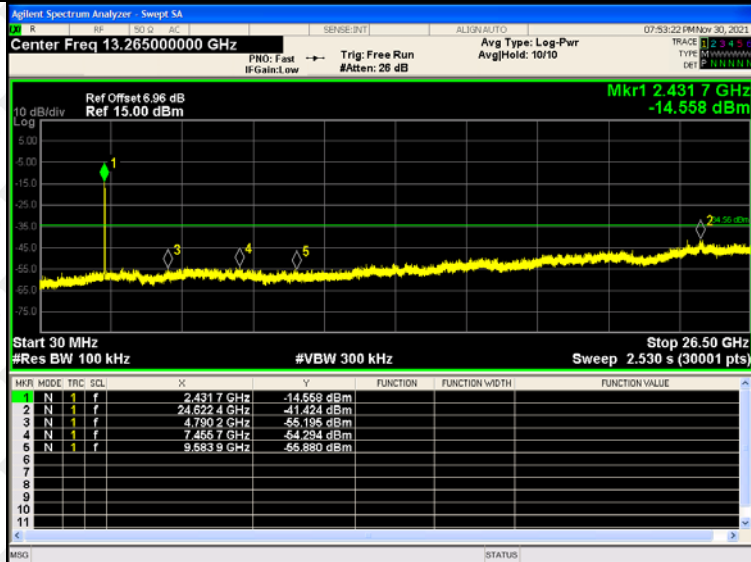
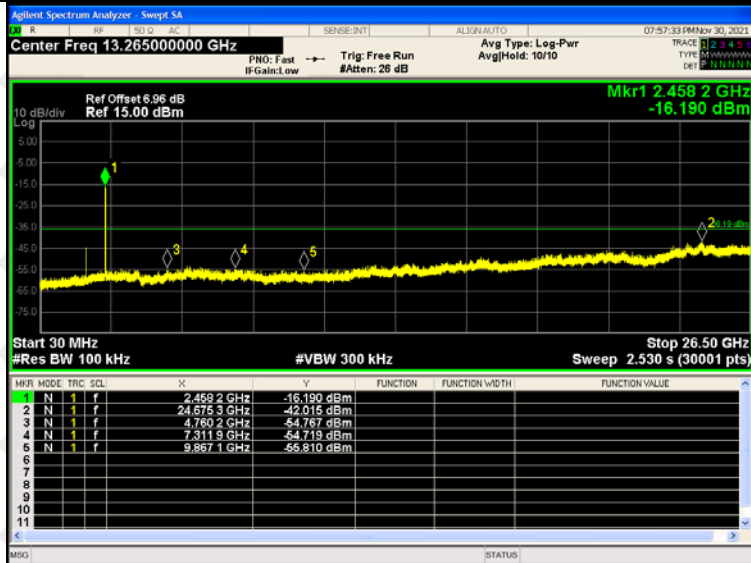
RF Conducted Spurious Emissions Graphs



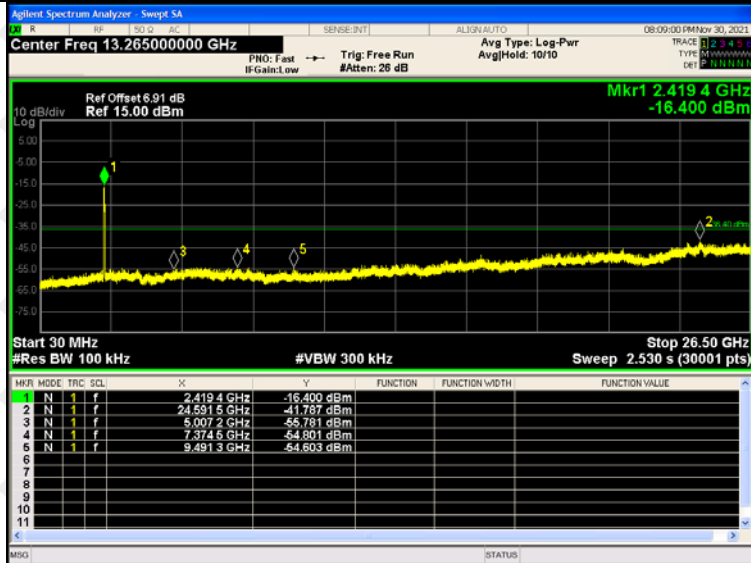
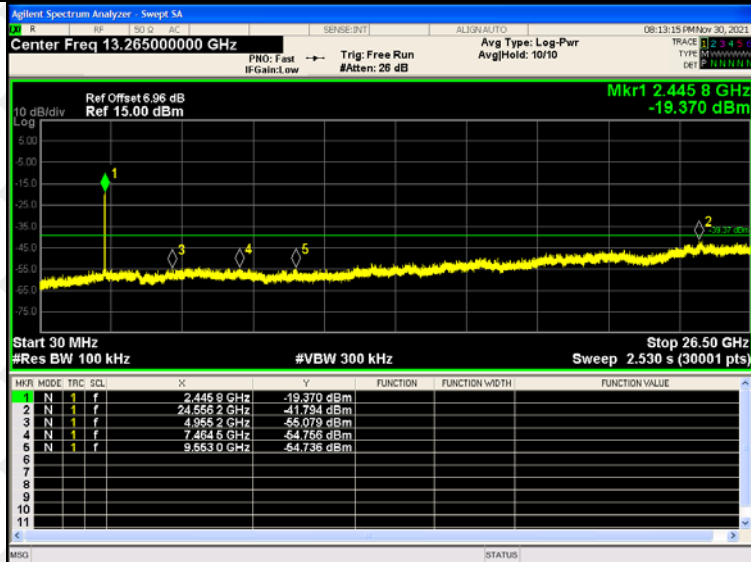
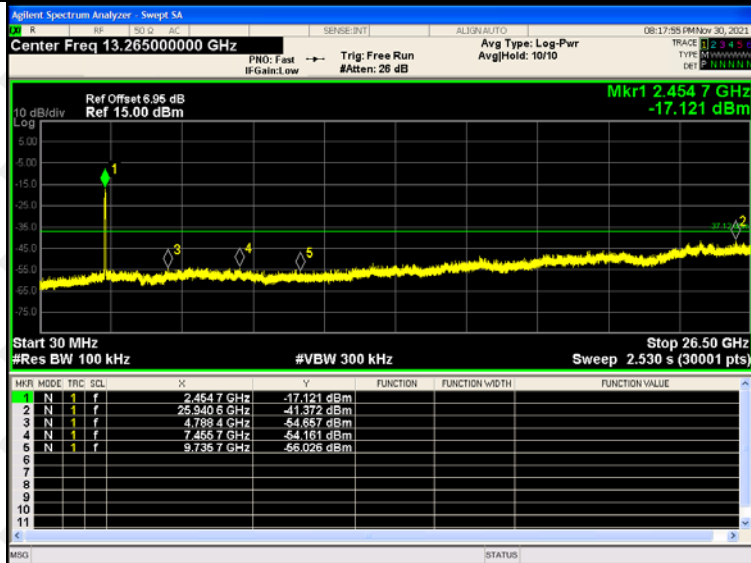
RF Conducted Spurious Emissions Graphs

802.11g
/LCH

802.11g
/MCH

802.11g
/HCH


RF Conducted Spurious Emissions Graphs

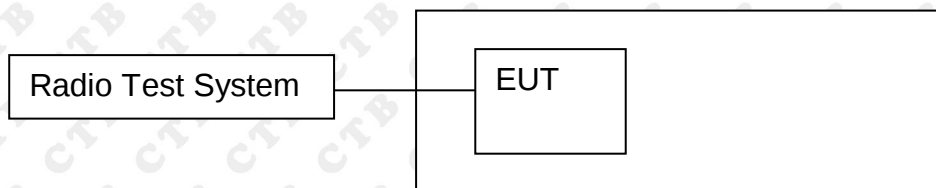
802.11n
(HT20)/
LCH

802.11
n(HT20)
/MCH

802.11
n(HT20)
/HCH


RF Conducted Spurious Emissions Graphs

802.11
n(HT40)
/LCH

802.11
n(HT40)
/MCH

802.11
n(HT40)
/HCH


9. COUDUCTED OUTPUT POWER

9.1 Block Diagram Of Test Setup



9.2 Limit

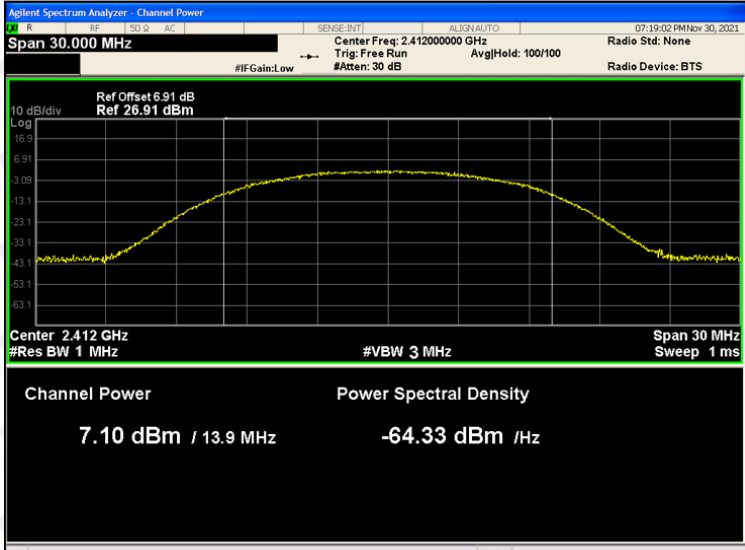
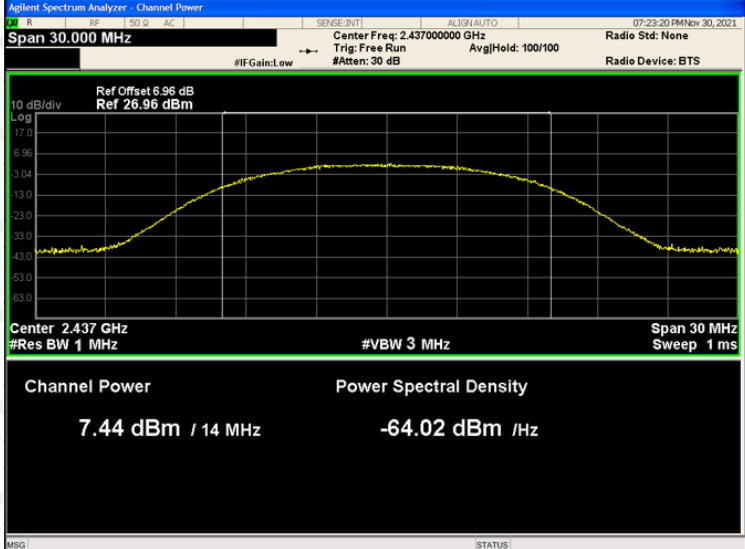
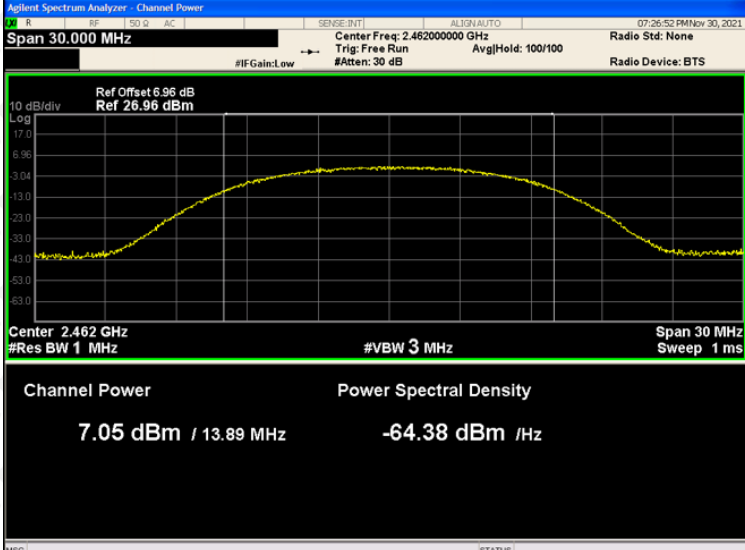
FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(b)(3)	Peak Output Power	1 watt or 30dBm	2400-2483.5	PASS

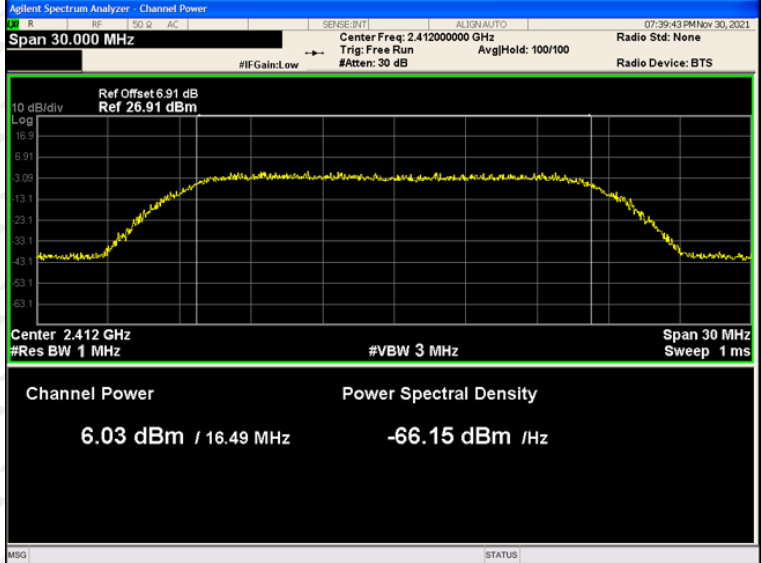
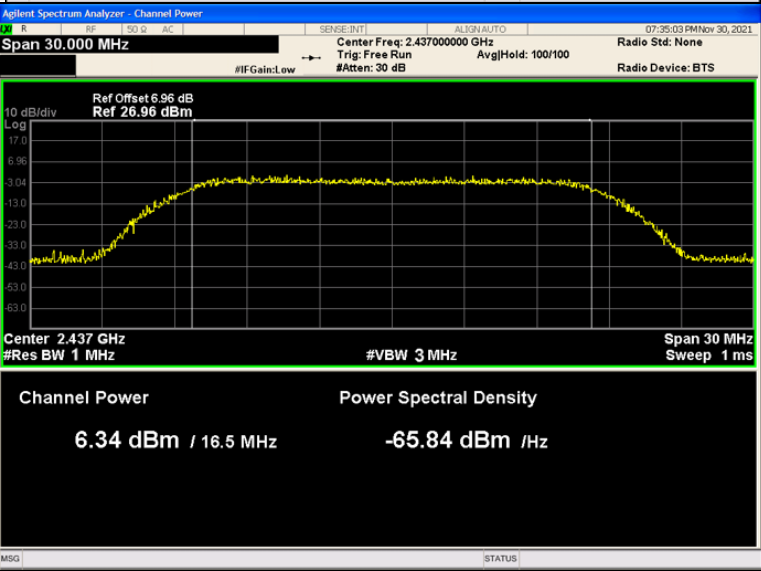
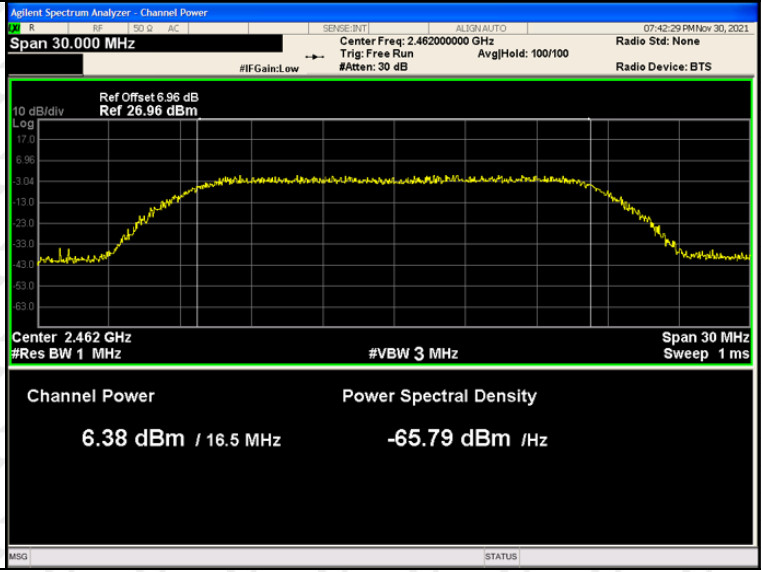
9.3 Test procedure

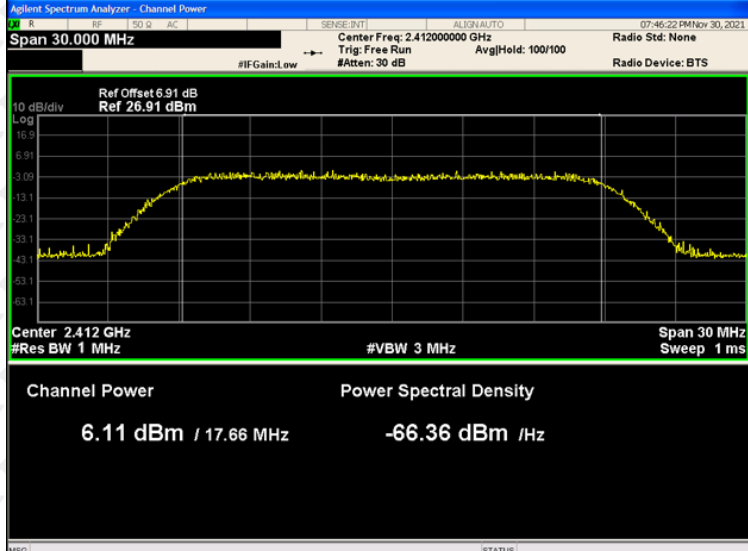
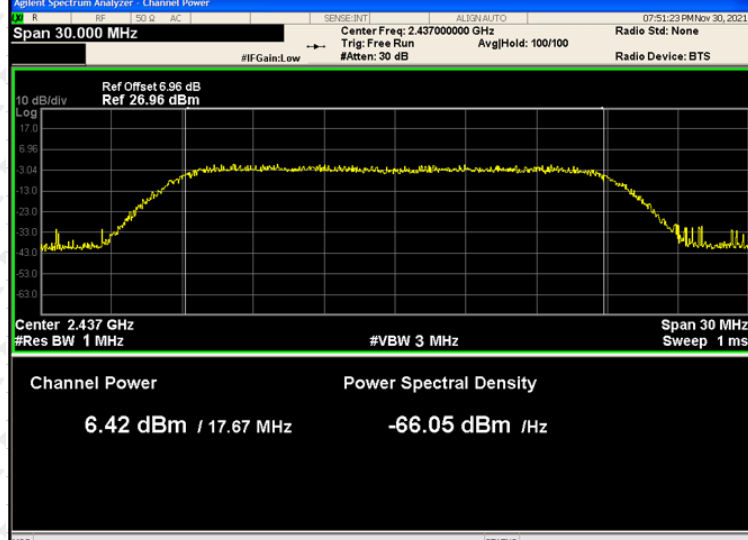
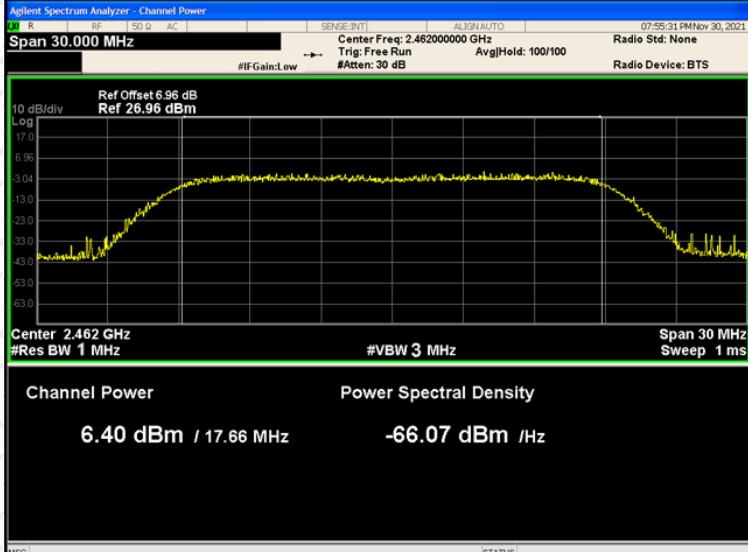
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum.
2. Set the spectrum analyzer: RBW = 1MHz. VBW = 3MHz. Sweep = auto; Detector Function = Peak. Channel power function is used
3. Keep the EUT in transmitting at lowest, middle and highest channel individually. Record the max value.

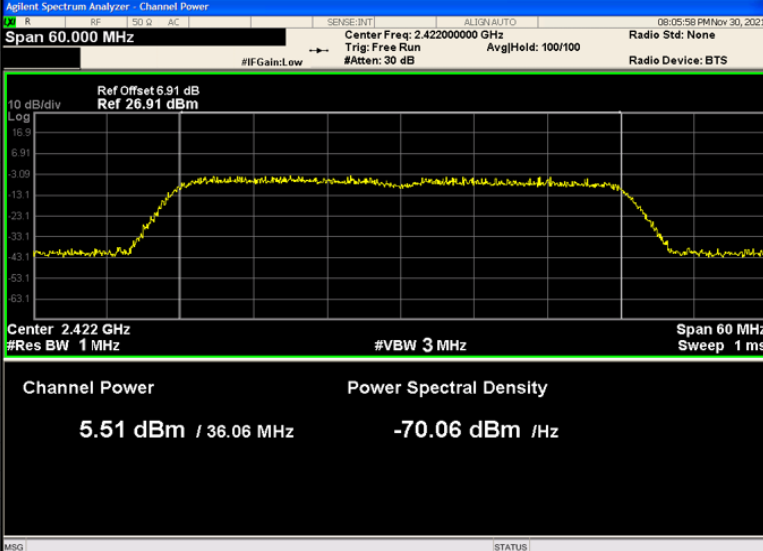
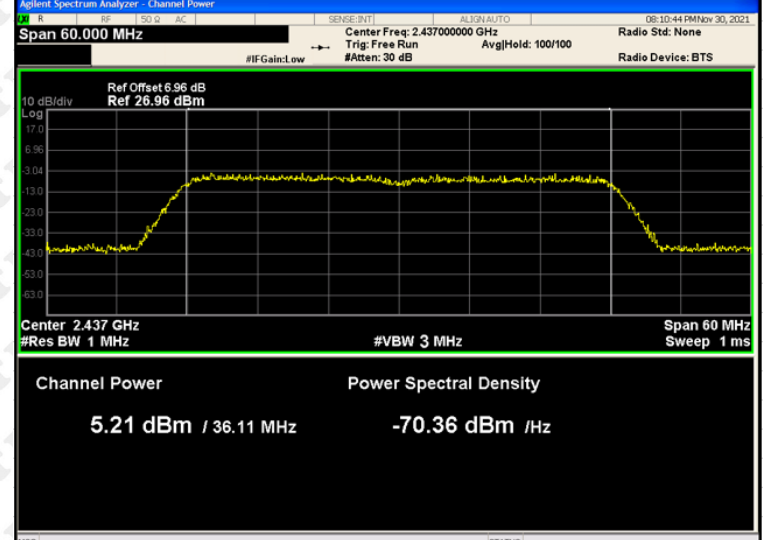
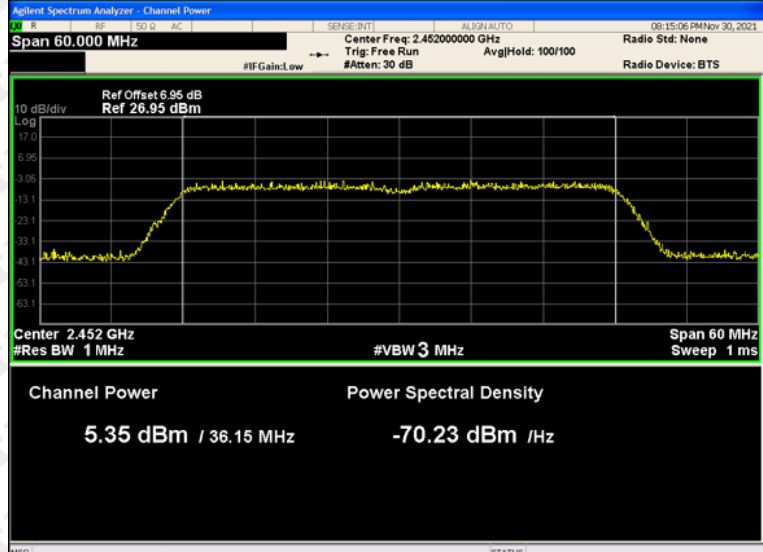
9.4 Test Result

Mode	Channel.	Peak Output Power [dBm]	Limit[dBm]	Verdict
802.11b	LCH	7.10	30	PASS
	MCH	7.44	30	PASS
	HCH	7.05	30	PASS
802.11g	LCH	6.03	30	PASS
	MCH	6.34	30	PASS
	HCH	6.38	30	PASS
802.11n(HT20)	LCH	6.11	30	PASS
	MCH	6.42	30	PASS
	HCH	6.40	30	PASS
802.11n(HT40)	LCH	5.51	30	PASS
	MCH	5.21	30	PASS
	HCH	5.35	30	PASS

Mode	Channel.	Maximum Output Power [dBm]
802.11b	LCH	 Agilent Spectrum Analyzer - Channel Power Span 30.000 MHz Center Freq: 2.412000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.91 dB Ref 26.91 dBm 10 dB/div Log Center 2.412 GHz #Res BW 1 MHz #VBW 3 MHz Span 30 MHz Sweep 1 ms Channel Power Power Spectral Density 7.10 dBm / 13.9 MHz -64.33 dBm /Hz
	MCH	 Agilent Spectrum Analyzer - Channel Power Span 30.000 MHz Center Freq: 2.437000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.96 dB Ref 26.96 dBm 10 dB/div Log Center 2.437 GHz #Res BW 1 MHz #VBW 3 MHz Span 30 MHz Sweep 1 ms Channel Power Power Spectral Density 7.44 dBm / 14 MHz -64.02 dBm /Hz
	HCH	 Agilent Spectrum Analyzer - Channel Power Span 30.000 MHz Center Freq: 2.462000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.96 dB Ref 26.96 dBm 10 dB/div Log Center 2.462 GHz #Res BW 1 MHz #VBW 3 MHz Span 30 MHz Sweep 1 ms Channel Power Power Spectral Density 7.05 dBm / 13.89 MHz -64.38 dBm /Hz

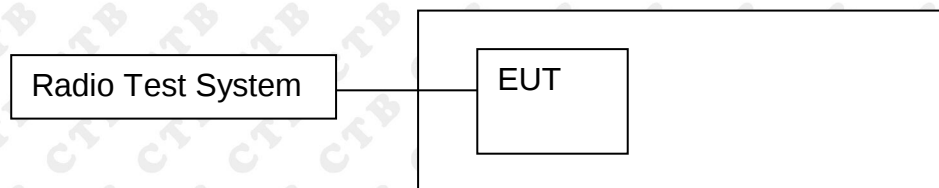
	LCH	 Agilent Spectrum Analyzer - Channel Power Span 30.000 MHz Center Freq: 2.412000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.91 dB Ref 26.91 dBm Center 2.412 GHz #Res BW 1 MHz #VBW 3 MHz Span 30 MHz Sweep 1 ms Channel Power Power Spectral Density 6.03 dBm / 16.49 MHz -66.15 dBm / Hz	
802.11g	MCH	 Agilent Spectrum Analyzer - Channel Power Span 30.000 MHz Center Freq: 2.437000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.96 dB Ref 26.96 dBm Center 2.437 GHz #Res BW 1 MHz #VBW 3 MHz Span 30 MHz Sweep 1 ms Channel Power Power Spectral Density 6.34 dBm / 16.5 MHz -65.84 dBm / Hz	
	HCH	 Agilent Spectrum Analyzer - Channel Power Span 30.000 MHz Center Freq: 2.462000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.96 dB Ref 26.96 dBm Center 2.462 GHz #Res BW 1 MHz #VBW 3 MHz Span 30 MHz Sweep 1 ms Channel Power Power Spectral Density 6.38 dBm / 16.5 MHz -65.79 dBm / Hz	

	LCH	 Agilent Spectrum Analyzer - Channel Power Span 30.000 MHz Center Freq: 2.412000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.91 dB Ref 26.91 dBm 10 dB/div Log Center 2.412 GHz #Res BW 1 MHz #VBW 3 MHz Span 30 MHz Sweep 1 ms Channel Power Power Spectral Density 6.11 dBm / 17.66 MHz -66.36 dBm / Hz	
802.11n(HT20)	MCH	 Agilent Spectrum Analyzer - Channel Power Span 30.000 MHz Center Freq: 2.437000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.96 dB Ref 26.96 dBm 10 dB/div Log Center 2.437 GHz #Res BW 1 MHz #VBW 3 MHz Span 30 MHz Sweep 1 ms Channel Power Power Spectral Density 6.42 dBm / 17.67 MHz -66.05 dBm / Hz	
	HCH	 Agilent Spectrum Analyzer - Channel Power Span 30.000 MHz Center Freq: 2.462000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.96 dB Ref 26.96 dBm 10 dB/div Log Center 2.462 GHz #Res BW 1 MHz #VBW 3 MHz Span 30 MHz Sweep 1 ms Channel Power Power Spectral Density 6.40 dBm / 17.66 MHz -66.07 dBm / Hz	

	LCH	 Agilent Spectrum Analyzer - Channel Power Span 60.000 MHz Center Freq: 2.422000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.91 dB Ref 26.91 dBm Center 2.422 GHz #Res BW 1 MHz #VBW 3 MHz Span 60 MHz Sweep 1 ms Channel Power Power Spectral Density 5.51 dBm / 36.06 MHz -70.06 dBm / Hz
802.11n(HT40)	MCH	 Agilent Spectrum Analyzer - Channel Power Span 60.000 MHz Center Freq: 2.437000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.96 dB Ref 26.96 dBm Center 2.437 GHz #Res BW 1 MHz #VBW 3 MHz Span 60 MHz Sweep 1 ms Channel Power Power Spectral Density 5.21 dBm / 36.11 MHz -70.36 dBm / Hz
	HCH	 Agilent Spectrum Analyzer - Channel Power Span 60.000 MHz Center Freq: 2.452000000 GHz Trig: Free Run Avg/Hold: 100/100 Radio Std: None Radio Device: BTS Ref Offset 6.95 dB Ref 26.95 dBm Center 2.452 GHz #Res BW 1 MHz #VBW 3 MHz Span 60 MHz Sweep 1 ms Channel Power Power Spectral Density 5.35 dBm / 36.15 MHz -70.23 dBm / Hz

10. 6DB OCCUPIED BANDWIDTH

10.1 Block Diagram Of Test Setup



10.2 Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247(a)(2)	Bandwidth	$\geq 500\text{KHz}$ (6dB bandwidth)	2400-2483.5	PASS

10.3 Test procedure

1. Rem1. Set RBW = 100 kHz.
2. Set the video bandwidth (VBW) $\geq 3 \times \text{RBW}$.
3. Detector = Peak.
4. Trace mode = max hold.
5. Sweep = auto couple.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

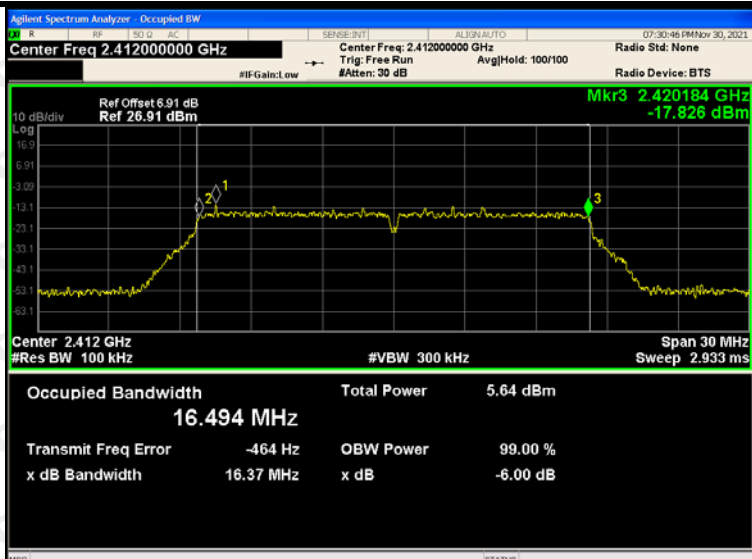
10.4 Test Result

Test Mode	Frequency	6dB Bandwidth (MHz)	Limit(kHz)	Result
802.11b	LCH	10.423	500	PASS
	MCH	11.07	500	PASS
	HCH	9.818	500	PASS
802.11g	LCH	16.37	500	PASS
	MCH	16.369	500	PASS
	HCH	16.388	500	PASS
802.11n(HT20)	LCH	17.624	500	PASS
	MCH	17.604	500	PASS
	HCH	17.62	500	PASS
802.11n(HT40)	LCH	35.802	500	PASS
	MCH	36.099	500	PASS
	HCH	36.328	500	PASS

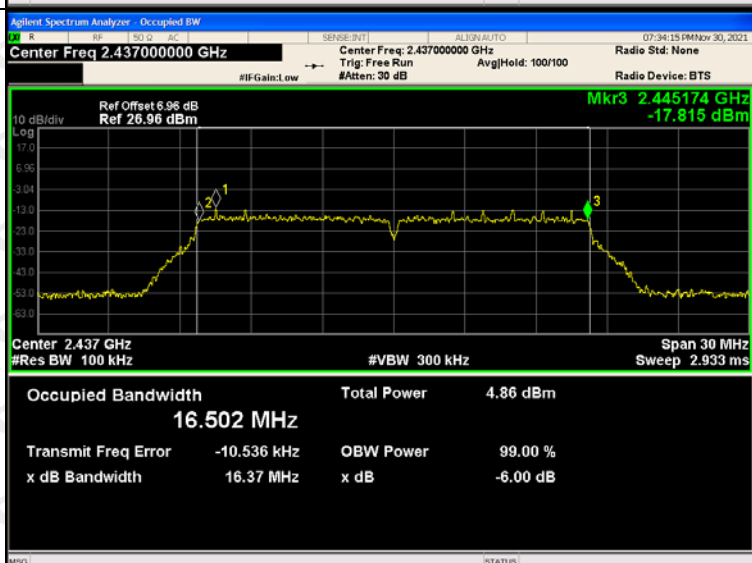
Test Graph:



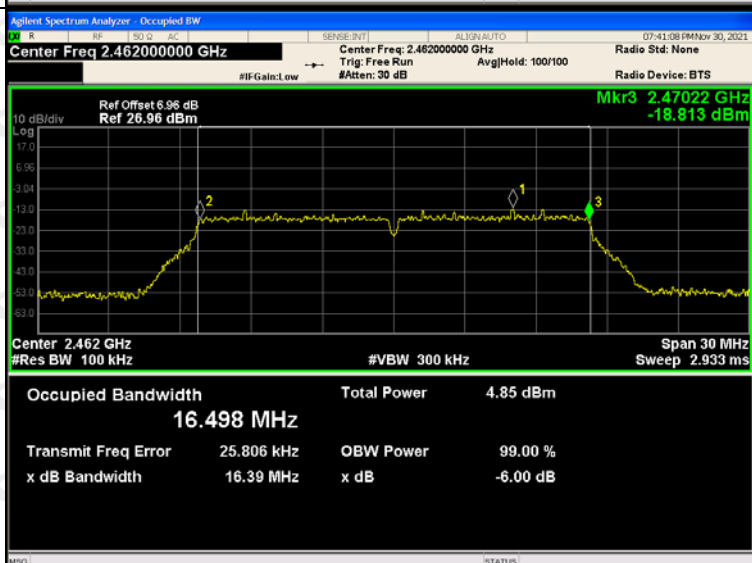
802.11g/LCH

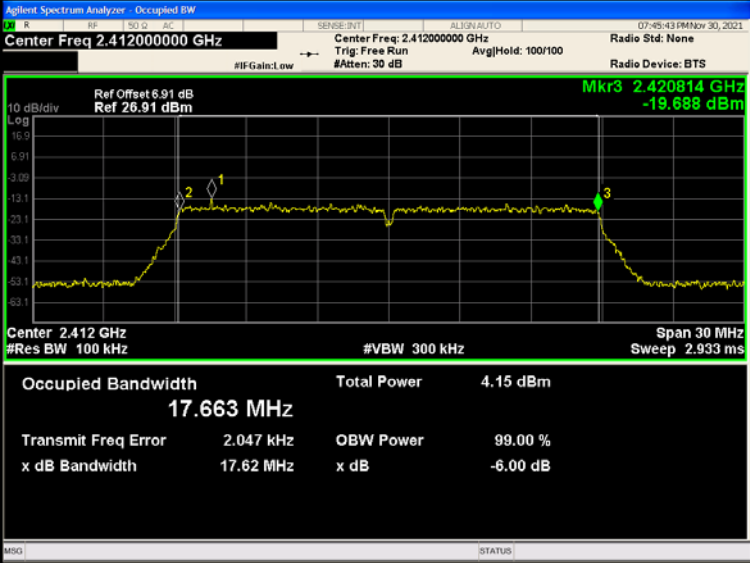
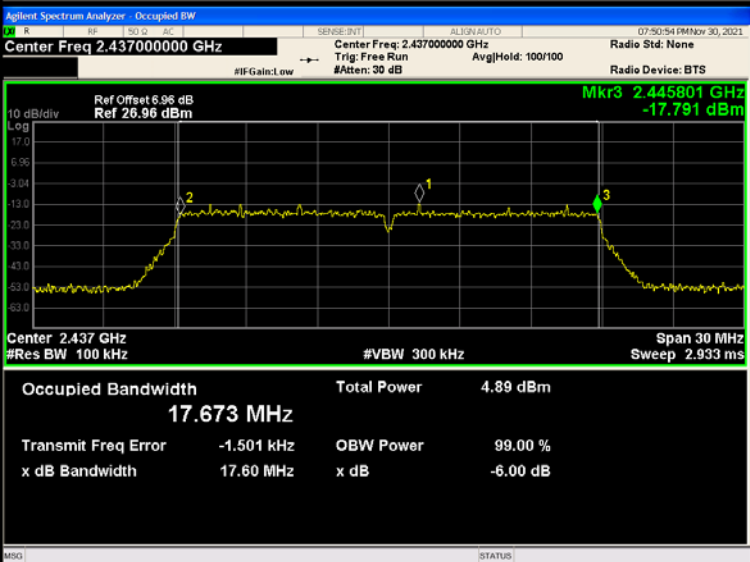
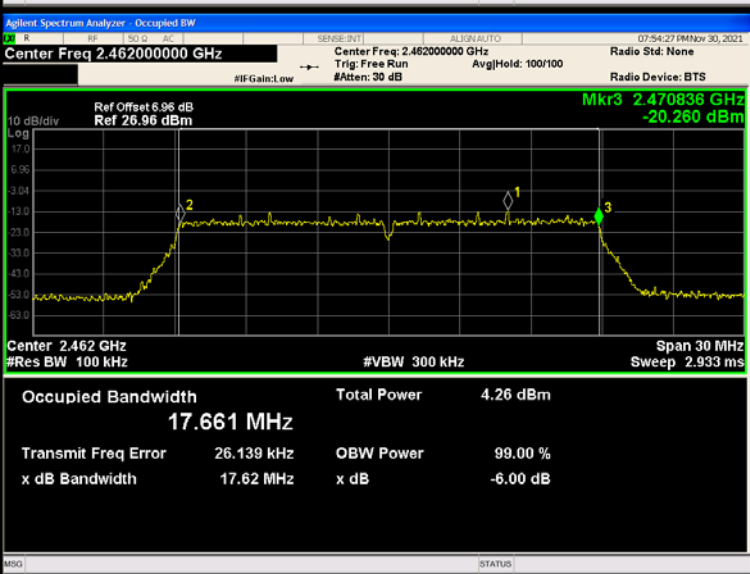


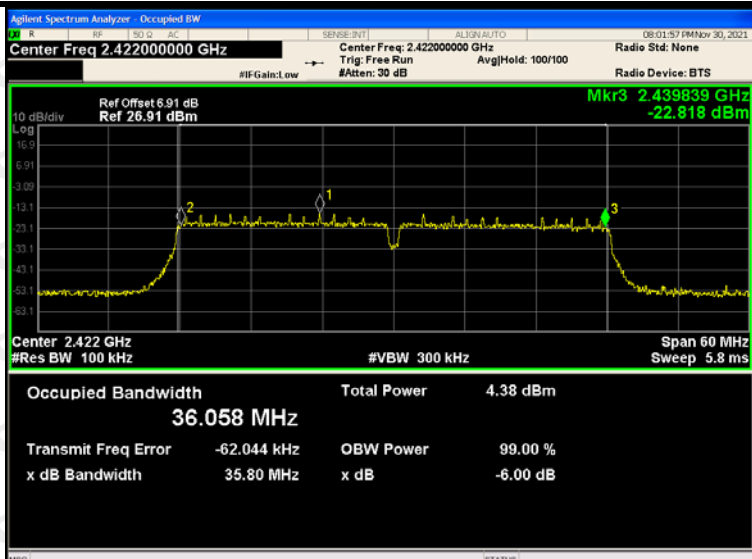
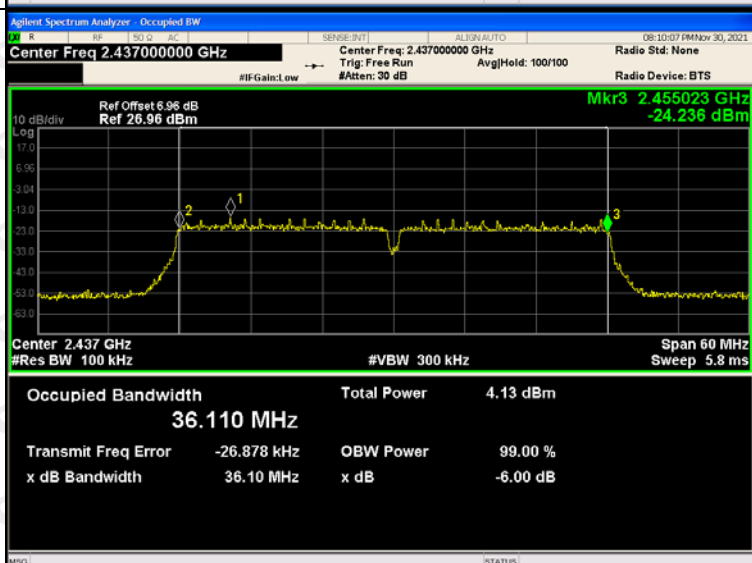
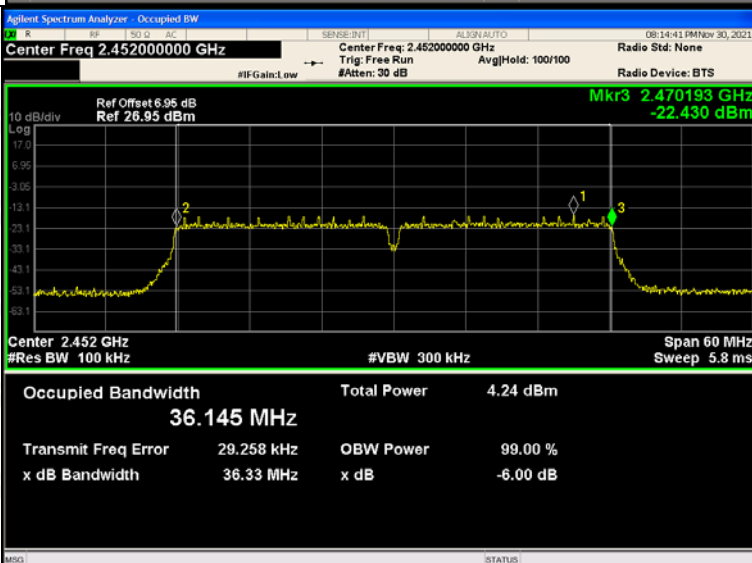
802.11g/MCH



802.11g/HCH

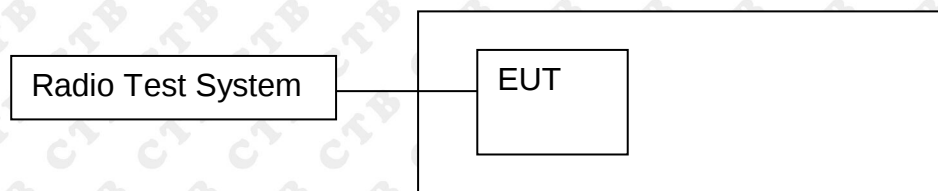


802.11n(HT20)/LC H	 Agilent Spectrum Analyzer - Occupied BW Center Freq 2.412000000 GHz Ref Offset 6.91 dB Ref 26.91 dBm Mkr3 2.420814 GHz -19.688 dBm Center 2.412 GHz #Res BW 100 kHz #VBW 300 kHz Span 30 MHz Sweep 2.933 ms Occupied Bandwidth 17.663 MHz Total Power 4.15 dBm Transmit Freq Error 2.047 kHz OBW Power 99.00 % x dB Bandwidth 17.62 MHz x dB -6.00 dB
802.11n(HT20)/MC H	 Agilent Spectrum Analyzer - Occupied BW Center Freq 2.437000000 GHz Ref Offset 6.96 dB Ref 26.96 dBm Mkr3 2.445801 GHz -17.791 dBm Center 2.437 GHz #Res BW 100 kHz #VBW 300 kHz Span 30 MHz Sweep 2.933 ms Occupied Bandwidth 17.673 MHz Total Power 4.89 dBm Transmit Freq Error -1.501 kHz OBW Power 99.00 % x dB Bandwidth 17.60 MHz x dB -6.00 dB
802.11n(HT20)/HC H	 Agilent Spectrum Analyzer - Occupied BW Center Freq 2.462000000 GHz Ref Offset 6.96 dB Ref 26.96 dBm Mkr3 2.470836 GHz -20.260 dBm Center 2.462 GHz #Res BW 100 kHz #VBW 300 kHz Span 30 MHz Sweep 2.933 ms Occupied Bandwidth 17.661 MHz Total Power 4.26 dBm Transmit Freq Error 26.139 kHz OBW Power 99.00 % x dB Bandwidth 17.62 MHz x dB -6.00 dB

802.11n(HT40)/LC
H

802.11n(HT40)/MC
H

802.11n(HT40)/HC
H


11. POWER SPECTRAL DENSITY

11.1 Block Diagram Of Test Setup



11.2 Limit

FCC Part15 (15.247) , Subpart C				
Section	Test Item	Limit	Frequency Range (MHz)	Result
15.247	Power Spectral Density	8 dBm (in any 3KHz)	2400-2483.5	PASS

11.3 Test procedure

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
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 amplitude level within the RBW.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

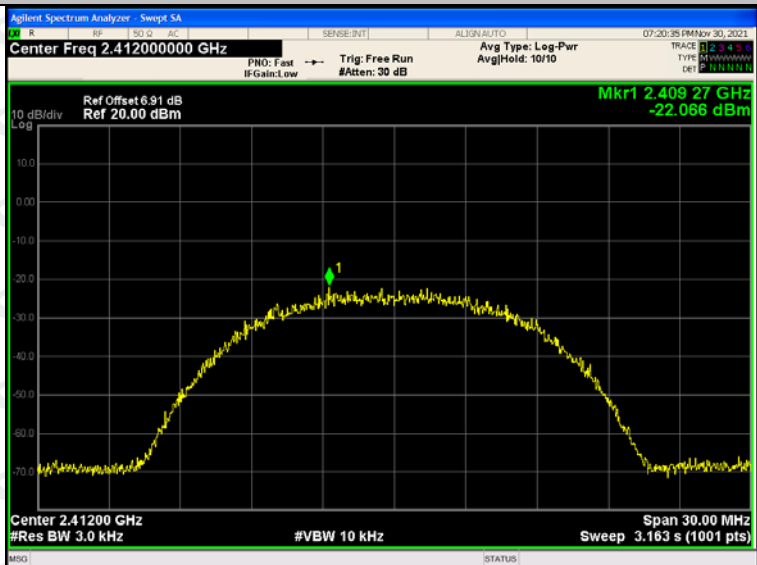
11.4 Test Result

Mode	Channel.	Power Spectral Density [dBm /3KHz]	Limit(8 dBm (in any 3KHz))	Verdict
802.11b	LCH	-22.066	8	PASS
	MCH	-22.302	8	PASS
	HCH	-22.588	8	PASS
802.11g	LCH	-25.833	8	PASS
	MCH	-26.078	8	PASS
	HCH	-26.279	8	PASS
802.11n(H T20)	LCH	-26.844	8	PASS
	MCH	-26.45	8	PASS
	HCH	-26.008	8	PASS
802.11n(H T40)	LCH	-29.455	8	PASS
	MCH	-30.831	8	PASS
	HCH	-28.567	8	PASS

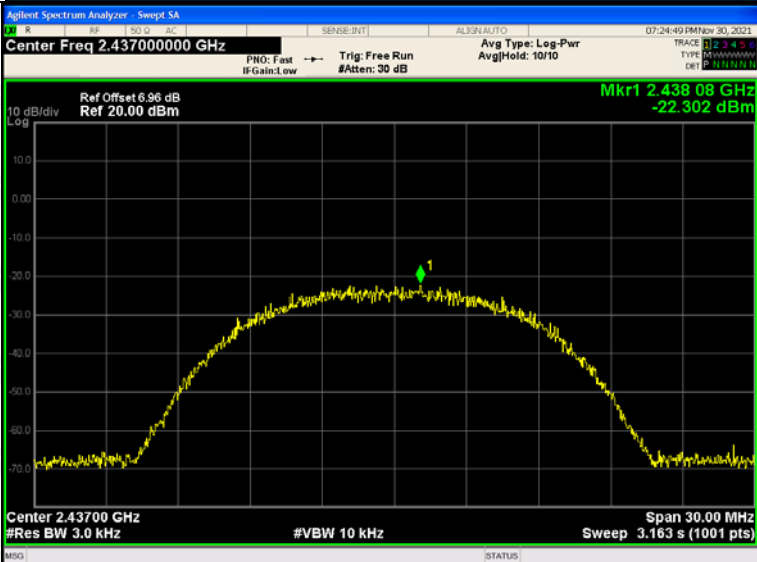
Test Graph

Graphs

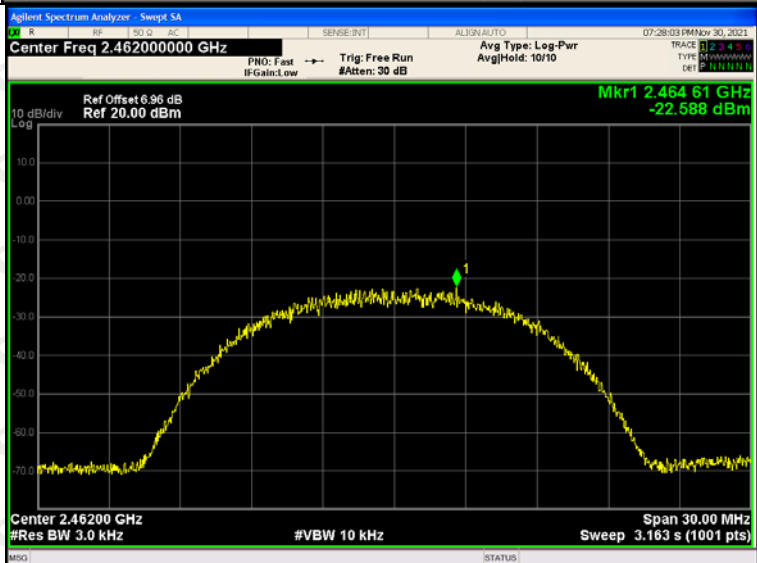
802.11b /LCH



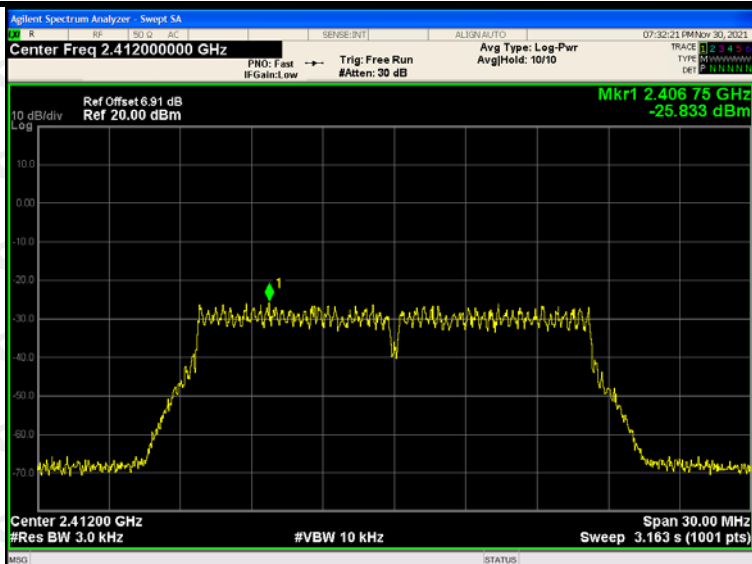
802.11b /MCH



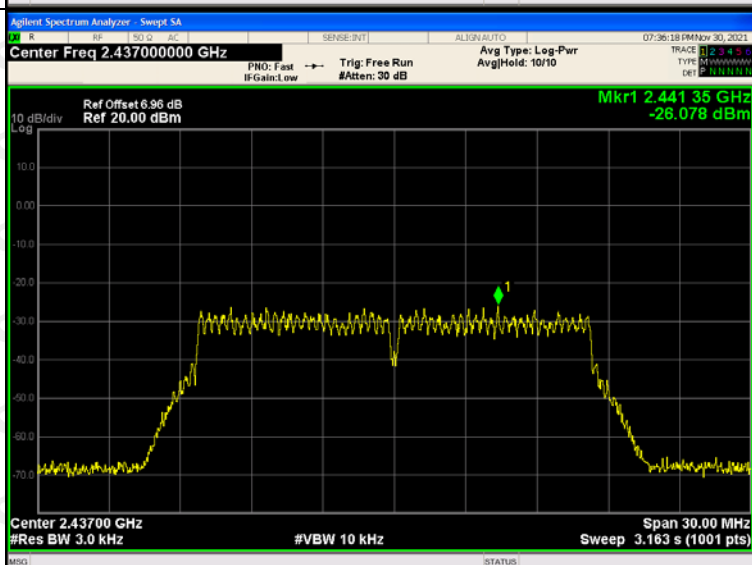
802.11b/HCH



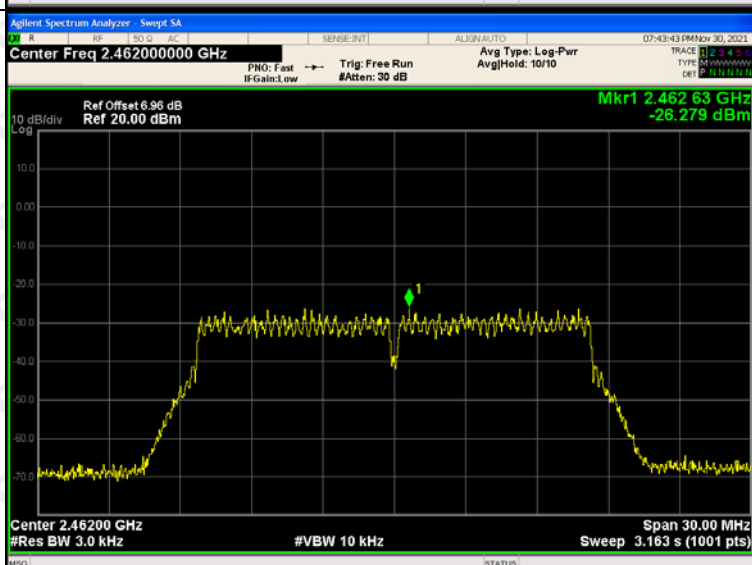
802.11g/LCH

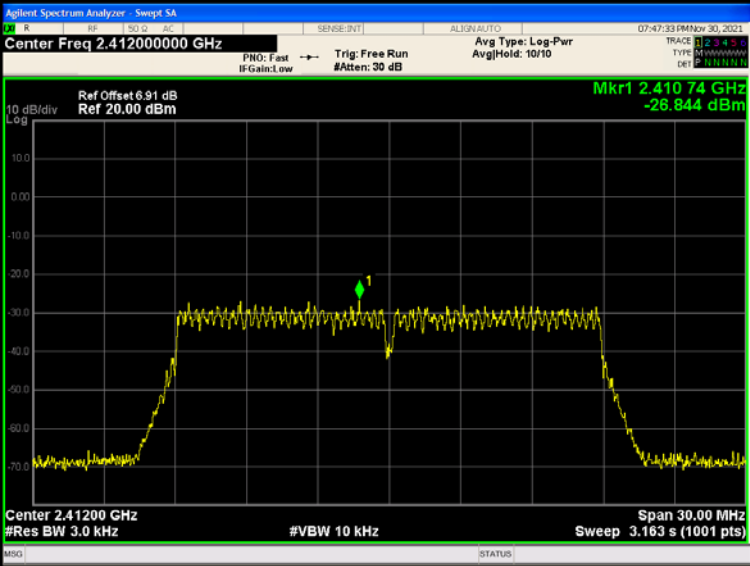
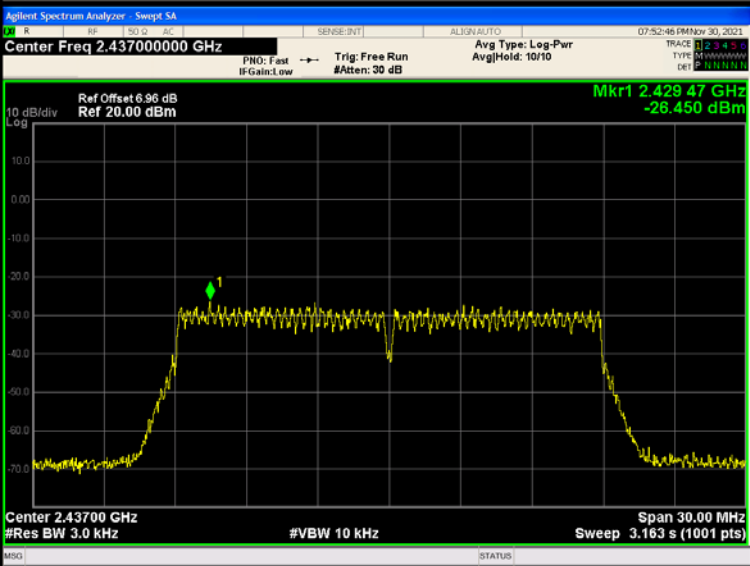
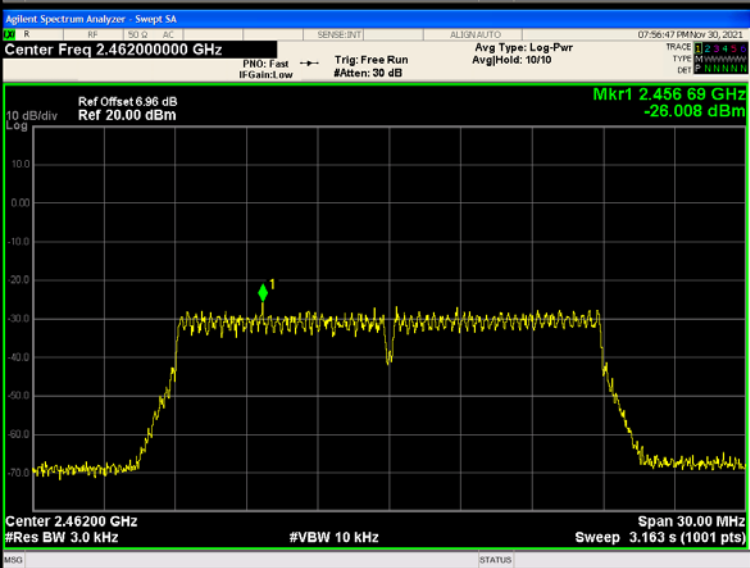


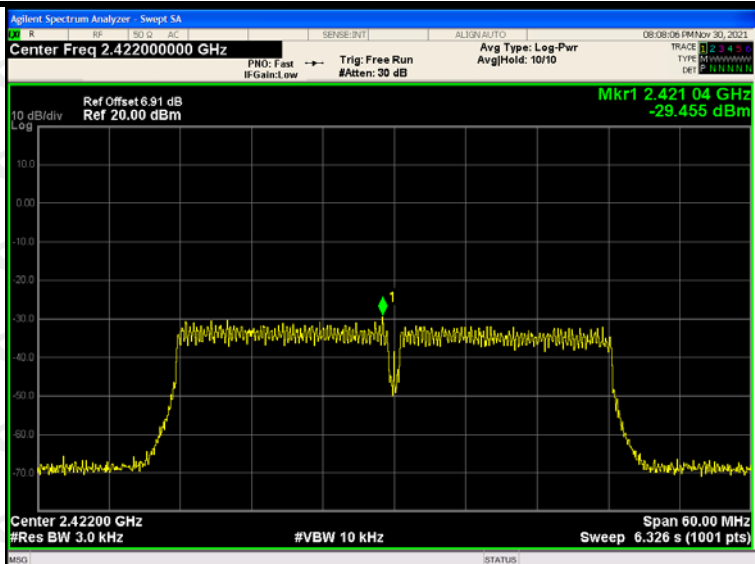
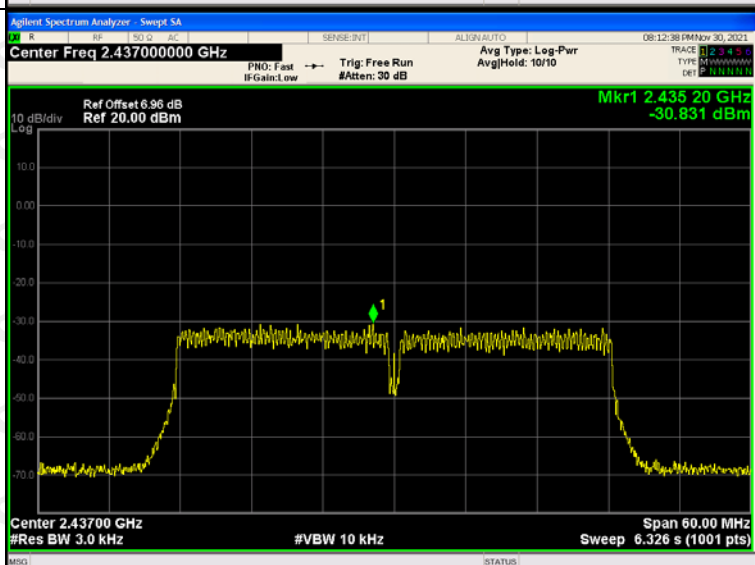
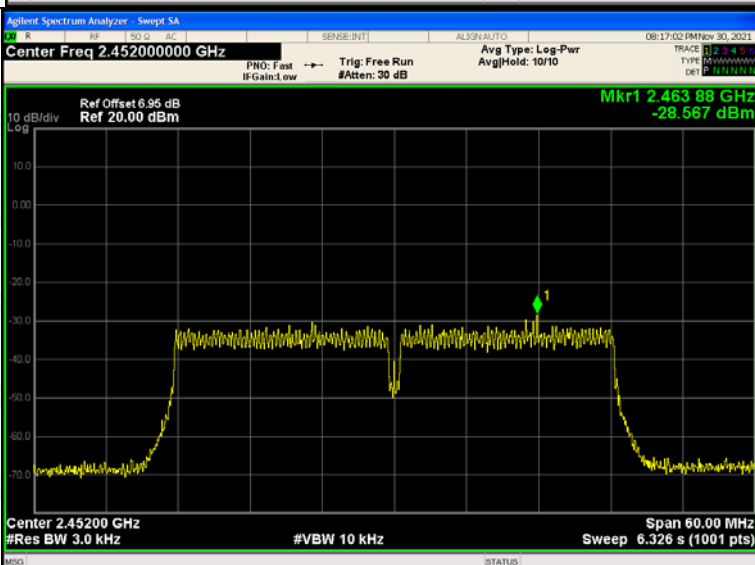
802.11g/MCH



802.11g/HCH



802.11n(HT20)/LC H	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.41200000 GHz Ref Offset 6.91 dB Ref 20.00 dBm Mkr1 2.410 74 GHz -26.844 dBm Center 2.41200 GHz #Res BW 3.0 kHz #VBW 10 kHz Span 30.00 MHz Sweep 3.163 s (1001 pts)
802.11n(HT20)/MC H	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.43700000 GHz Ref Offset 6.96 dB Ref 20.00 dBm Mkr1 2.429 47 GHz -26.450 dBm Center 2.43700 GHz #Res BW 3.0 kHz #VBW 10 kHz Span 30.00 MHz Sweep 3.163 s (1001 pts)
802.11n(HT20)/HC H	 Agilent Spectrum Analyzer - Sweep SA Center Freq 2.46200000 GHz Ref Offset 6.96 dB Ref 20.00 dBm Mkr1 2.456 69 GHz -26.008 dBm Center 2.46200 GHz #Res BW 3.0 kHz #VBW 10 kHz Span 30.00 MHz Sweep 3.163 s (1001 pts)

802.11n(HT40)/LC
H

802.11n(HT40)/MC
H

802.11n(HT40)/HC
H


12. ANTENNA REQUIREMENT

15.203 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, 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.

15.247(b) (4) requirement:

The conducted output power limit specified in paragraph (b) of this section is based on the use of antennas with directional gains that do not exceed 6 dBi. Except as shown in paragraph (c) of this section, if transmitting antennas of directional gain greater than 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1), (b)(2), and (b)(3) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

EUT Antenna:

The antenna is Internal Antenna and no consideration of replacement. The best case gain of the antenna is 1.0dBi.

13. EUT PHOTOGRAPHS

EUT Photo 1



EUT Photo 2



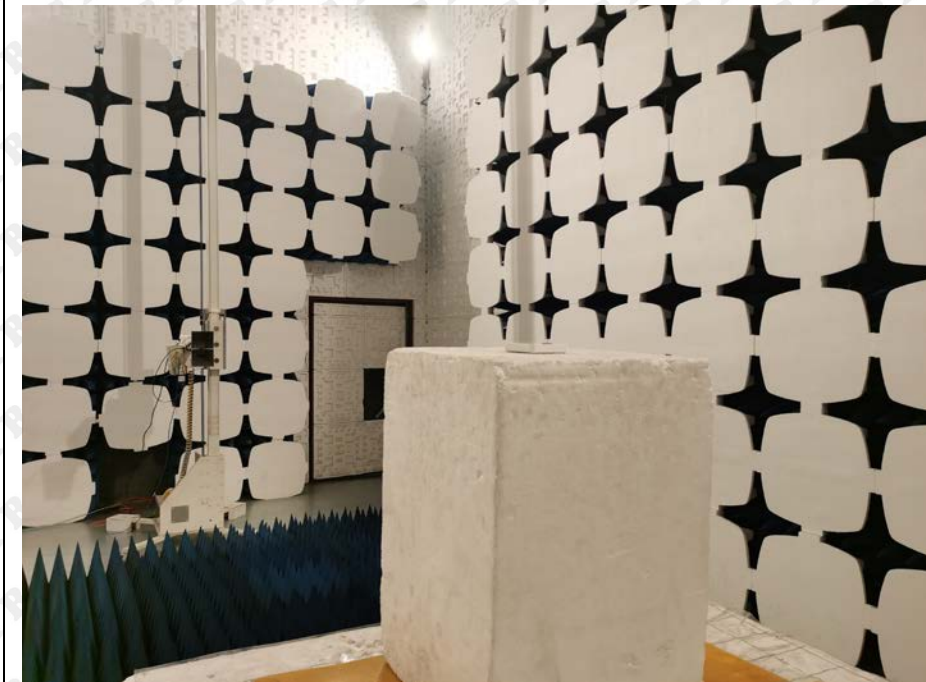
14. EUT TEST SETUP PHOTOGRAPHS

Radiated Emission

Below 1G



Above 1G



Conducted emission

***** END OF REPORT *****