



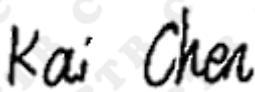
TEST REPORT

Product Name: Shelly Presence Gen4
FCC ID: 2BDC6-PRESENCE
Trademark: 
Model Number: S4SN-0U61X
Prepared For: Shelly Europe Ltd.
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Manufacturer: Shelly Europe Ltd.
Address: 51 Cherni Vrah Blvd., bldg.3, fl.2-3, Sofia 1407, Bulgaria
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Sample Received Date: Sep. 08, 2025
Sample tested Date: Sep. 08, 2025 to Mar 16, 2026
Issue Date: Mar 16, 2026
Report No.: CTB25090819207RF03
Test Standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247
ANSI C63.10:2020
Test Results: PASS
Remark: This is WIFI-2.4GHz band radio test report.

Compiled by:

Reviewed by:

Approved by:

Kai ChenMartin FengBin Mei / Director

Note: If there is any objection to the inspection results in this report, please submit a written report to the company within 15 days from the date of receiving the report. The test report is effective only with both signature and specialized stamp. This result(s) shown in this report refer only to the sample(s) tested. Without written approval of Shenzhen CTB Testing Technology Co., Ltd. this report can't be reproduced except in full. The tested sample(s) and the sample information are provided by the client. "*" indicates the testing items were fulfilled by subcontracted lab. "#" indicates the items are not in CNAS accreditation scope.

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(NOTE: N/A MEANS NOT APPLICABLE)	

1. VERSION

Report No.	Issue Date	Description	Approved
CTB25090819207RF03	Mar 16, 2026	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 C63.10-2020	PASS
Radiated Spurious emissions	47 CFR Part 15 Subpart C Section 15.205/15.209	ANSI C63.10-2020	PASS
Band edge and RF Conducted Spurious Emissions	47 CFR Part 15 Subpart C Section 15.247(d)/15.205(a)	ANSI C63.10-2020	PASS
Conducted Peak Output Power	47 CFR Part 15 Subpart C Section 15.247 (b)(3)	ANSI C63.10-2020	PASS
6dB Occupied Bandwidth	47 CFR Part 15 Subpart C Section 15.247 (a)(2)	ANSI C63.10-2020	PASS
Power Spectral Density	47 CFR Part 15 Subpart C Section 15.247 (e)	ANSI C63.10-2020/ KDB 558074 D05v02	PASS
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203/15.247 (b)	/	PASS
RF Exposure Evaluation	47 CFR Part 15 Subpart C Section 15.247 (i)/1.1310/2.1091	KDB447498D01v06	PASS

Remark:

Test according to ANSI C63.10-2020.

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 chamber Radiated spurious emission(9kHz-30MHz)	$U=\pm 4.8\text{dB}$
3m chamber 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):	S4SN-0U61X
Model Description:	N/A
Wi-Fi Specification:	IEEE 802.11b/g/n/ax
Hardware Version:	0.1.5
Software Version:	1.8.99
Operation Frequency:	WiFi: IEEE 802.11b/g/n/ax20: 2412-2462MHz/ 11 channel IEEE 802.11n40: 2422-2452MHz/ 7 channel
Max. RF output power:	WiFi (2.4G): 13.114dBm
Type of Modulation:	WiFi (2.4G): DSSS, OFDM, OFDMA
Antenna installation:	WiFi (2.4G): PCB antenna
Antenna Gain:	WiFi (2.4G): -4.18dBi
Ratings:	5V=1A

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	Adapter	JIYIN	JY-05100C	N/A	AE

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/n/ax20)	2412MHz	2437MHz	2462MHz
Transmitting(802.11n40)	2422MHz	2437MHz	2452MHz

NOTE: Duty cycle>98%.

Test mode	Rate
802.11b	11M
802.11g	54M
802.11n20	288.9M
802.11n40	600M
802.11/ax20	1147.069M

4.6 Test Environment

Humidity(%):	54
Atmospheric Pressure(kPa):	101
Normal Voltage(AC):	120V
Normal Temperature(°C)	23
Low Temperature(°C)	0
High Temperature(°C)	50

5. TEST FACILITY AND TEST INSTRUMENT USED

5.1 Test Facility

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

FCC Test Firm Registration Number: CN1276

5.2 Test Instrument Used

No.	Equipment	Manufacturer	Type No.	Serial No.	Firmware Version	Calibrated Date	Calibrated until
1	Spectrum Analyzer	Agilent	N9020A	MY52090073	A.14.16	2025/5/23	2026/5/22
2	Power Sensor	Agilent	U2021XA	MY56120032	/	2025/5/23	2026/5/22
3	Power Sensor	Agilent	U2021XA	MY56120034	/	2025/5/23	2026/5/22
4	Communication test set	R&S	CMW500	108058	V3.5.80	2025/5/23	2026/5/22
5	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	A.14.16	2025/5/23	2026/5/22
6	Signal Generator	Agilent	N5181A	MY50140365	A.01.60	2025/5/22	2026/5/21
7	Vector signal generator	Agilent	N5182A	MY47420195	A.01.87	2025/5/22	2026/5/21
8	Communication test set	Agilent	E5515C	MY50102567	B.19.07 (E1962B)	2025/5/22	2026/5/21
9	2.4 GHz Filter	Shenxiang	MSF2400-2483.5MS-1154	20181015001	/	2025/6/18	2026/6/17
10	5 GHz Filter	Shenxiang	MSF5150-5850 MS-1155	20181015001	/	2025/6/18	2026/6/17
11	Filter	Xingbo	XBLBQ-DZA120	190821-1-1	/	2025/5/24	2026/5/23
12	BT&WI-FI Automatic test software	Microwave	MTS8310	Ver. 2.0.0.0	/	/	/
13	Rohde & Schwarz SFU Broadcast Test System	R&S	SFU	101017	/	2024/10/31	2025/10/30
14	Temperature humidity chamber	Hongjing	TH-80CH	DG-15174	/	2025/5/22	2026/5/21
15	234G Automatic test software	Microwave	MTS8200	Ver. 2.0.0.0	/	/	/
16	966 chamber	C.R.T.	966	/	/	2024/6/23	2027/6/22
17	Receiver	R&S	ESPI	100362	RF_ATTEN_7 (104489/003)	2025/5/23	2026/5/22
18	Amplifier	HP	8447E	2945A02747	/	2025/5/23	2026/5/22

19	Amplifier	Agilent	8449B	3008A01838	/	2025/6/2	2026/6/1
20	TRILOG Broadband Antenna	Schwarzbeck	VULB 9168	00869	/	2025/6/29	2026/6/28
21	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA9120D	01911	/	2025/6/1	2026/5/31
22	EMI test software	Fala	EZ-EMC	FA-03A2 RE	/	/	/
23	Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-224	/	2025/6/2	2026/6/1
24	loop antenna	ZHINAN	ZN30900A	GTS534	/	/	/
25	40G Horn antenna	A/H/System	SAS-574	588	/	2025/6/2	2026/6/1
26	Amplifier	AEROFLEX	Aeroflex	097	/	2025/6/2	2026/6/1
27	Power Meter	KEYSIGHT	N1912AP	N/A	A.05.00	2025/6/2	2026/6/1

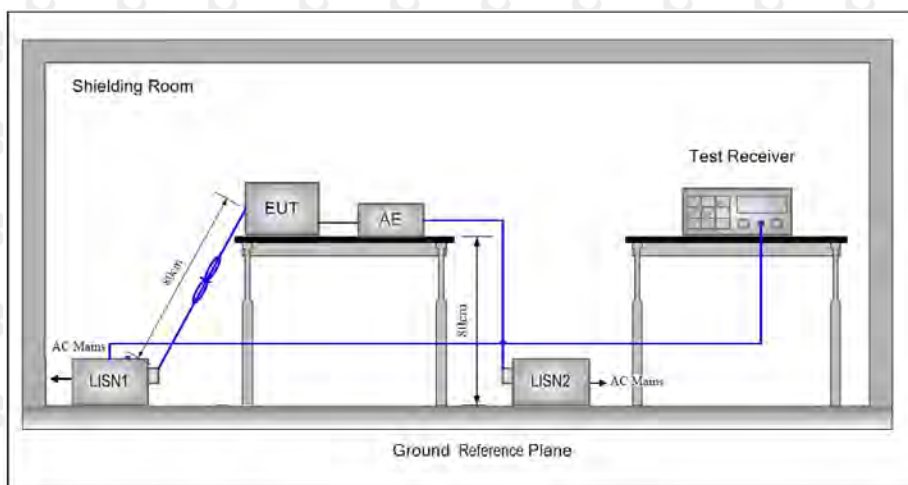
Continuous disturbance							
No.	Equipment	Manufacturer	Model No.	Serial No.	Firmware version	Calibrated Date	Calibrated until
1	843 Shield Room	C/ R/ T	843	/	/	2024/6/22	2027/6/21
2	LISN	ROHDE&SCHWARZ	ESH3-Z5	831551852	/	2025/5/22	2026/5/21
3	EMI TEST RECEIVER	ROHDE&SCHWARZ	ESCI	100428	V4.42.SP3	2025/5/22	2026/5/21
4	Coaxial cable	ZDECL	Z302S	18091904	/	2025/5/22	2026/5/21
5	ISN	Schwarzbeck	NTFM8158	183	/	2025/6/18	2026/6/17
6	Voltage sensor	Schwarzbeck	TK 9420	01189	/	2024/10/26	2025/10/25
7	EZ-EMC	Frad	EMC-con3A1.1	/	/	/	/
8	Current Probe	FCC	F-52B	199453	/	2025/5/24	2026/5/23
9	Communication test set	R&S	CMW500	108058	B.19.07 (E1962B)	2025/5/23	2026/5/22
10	Communication test set	Agilent	E5515C	MY50102567	V3.5.80	2025/5/23	2026/5/22

Radiated emission(No.2 Chamber)							
No.	Equipment	Manufacturer	Model No.	Serial No.	Firmware version	Calibrated Date	Calibrated until
1	966 Chamber	C/ R/ T	966	/	/	2024/6/8	2027/6/7
2	Double Ridged Broadband Horn Antenna	Schwarzbeck	BBHA 9120 D	01911	/	2025/6/1	2026/5/31
3	Broadband Antenna	Schwarzbeck	VULB 9168	1471	/	2024/10/26	2025/10/25
4	Amplifier	Agilent	8449B	3008A01838	/	2025/6/3	2026/6/2
5	Preamplifier	Schwarzbeck	BBV 9743 B	00500	/	2025/5/30	2026/5/29
6	EMI TEST RECEIVER	R&S	ESCI7	100861	/	2024/10/26	2025/10/25
7	Spectrum Analyzer	KEYSIGHT	N9020A	MY51289897	A.14.16	2025/5/23	2026/5/22

8	EMI test software	Farad	EZ-EMC	/	Ver. FARAD-3A1+	/	/
9	Coaxial cable	Rosenberg	8m	/	/	2024/10/26	2025/10/25
10	Coaxial cable	Times	2m	/	/	2024/10/26	2025/10/25
11	Coaxial cable	Times	2m	/	/	2024/10/26	2025/10/25
12	Coaxial cable	Times	1m	/	/	2024/10/26	2025/10/25
13	loop antenna	Schwarzbeck	FMZB 1519B	1519B-224	/	2025/6/2	2026/6/1
14	Communication test set	R&S	CMW500	108058	B.19.07 (E1962B)	2025/5/23	2026/5/22
15	Communication test set	Agilent	E5515C	MY50102567	V3.5.80	2025/5/23	2026/5/22

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 (dB μ V)	
	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.

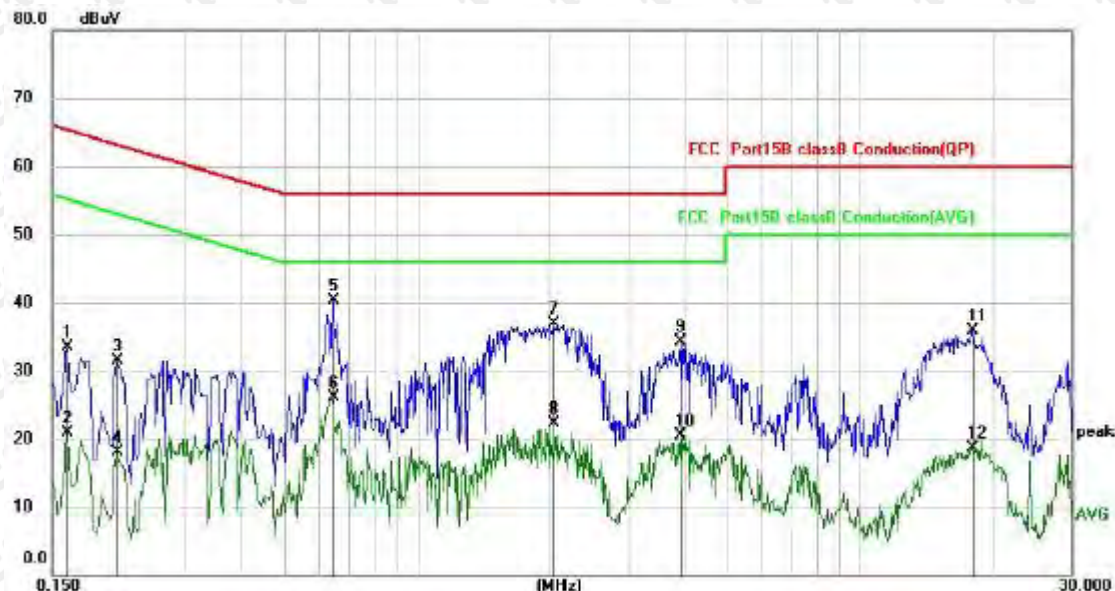
- 5) In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2020 on conducted measurement.

6.4 Test Result

Test Specification: Line

AC 120V 60Hz

the worst: 802.11b (low channel)

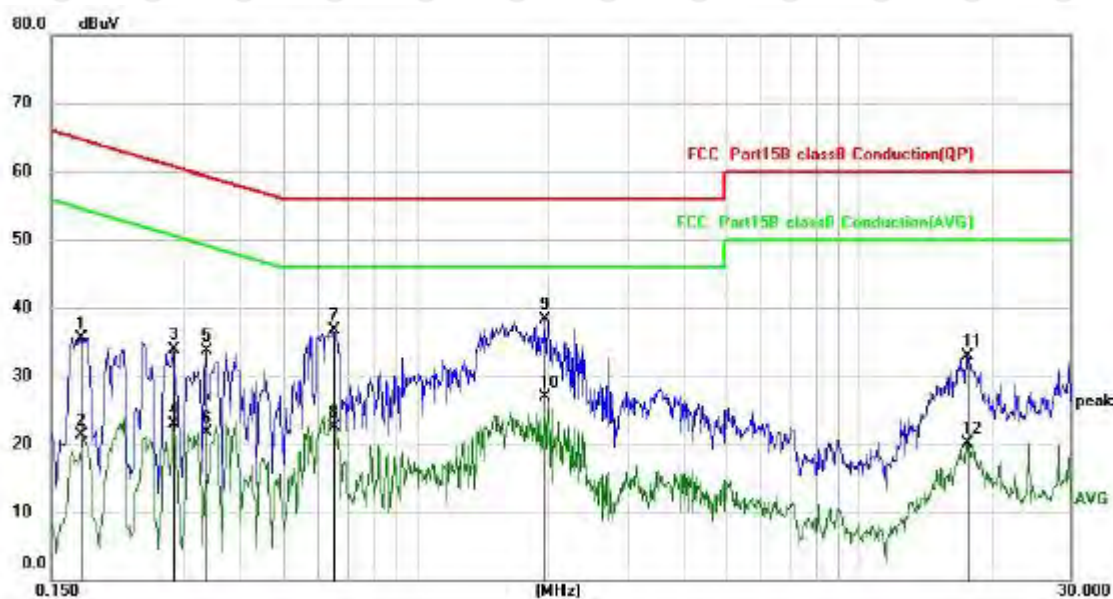


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1620	23.48	10.07	33.55	65.36	-31.81	QP
2		0.1620	10.87	10.07	20.94	55.36	-34.42	AVG
3		0.2100	21.51	10.08	31.59	63.21	-31.62	QP
4		0.2100	8.06	10.08	18.14	53.21	-35.07	AVG
5	*	0.6460	30.14	10.10	40.24	56.00	-15.76	QP
6		0.6460	16.00	10.10	26.10	46.00	-19.90	AVG
7		2.0379	26.64	10.17	36.81	56.00	-19.19	QP
8		2.0379	12.14	10.17	22.31	46.00	-23.69	AVG
9		3.9420	23.97	10.24	34.21	56.00	-21.79	QP
10		3.9420	10.29	10.24	20.53	46.00	-25.47	AVG
11		17.8733	25.14	10.86	36.00	60.00	-24.00	QP
12		17.8733	7.82	10.86	18.68	50.00	-31.32	AVG

Remark:

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

Test Specification: Neutral
AC 120V 60Hz
the worst: 802.11b (low channel)



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector
1		0.1758	25.46	10.08	35.54	64.68	-29.14	QP
2		0.1758	11.25	10.08	21.33	54.68	-33.35	AVG
3		0.2818	23.83	10.08	33.91	60.76	-26.85	QP
4		0.2818	12.88	10.08	22.96	50.76	-27.80	AVG
5		0.3339	23.70	10.08	33.78	59.35	-25.57	QP
6		0.3339	11.63	10.08	21.71	49.35	-27.64	AVG
7		0.6540	26.57	10.11	36.68	56.00	-19.32	QP
8		0.6540	12.32	10.11	22.43	46.00	-23.57	AVG
9 *		1.9500	28.15	10.17	38.32	56.00	-17.68	QP
10		1.9500	16.69	10.17	26.86	46.00	-19.14	AVG
11		17.5217	22.04	10.85	32.89	60.00	-27.11	QP
12		17.5217	9.33	10.85	20.18	50.00	-29.82	AVG

Remark:

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

7. RADIATED SPURIOUS EMISSION

7.1 Block Diagram Of Test Setup

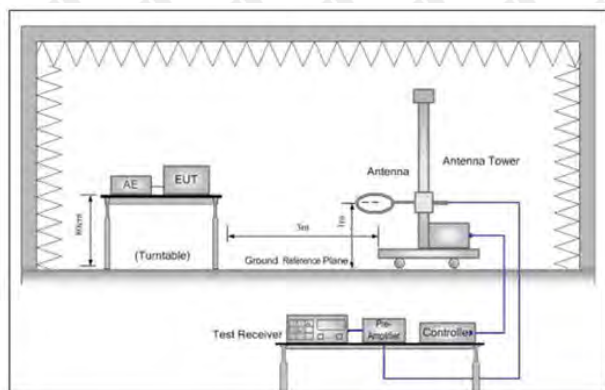


Figure 1. Below 30MHz

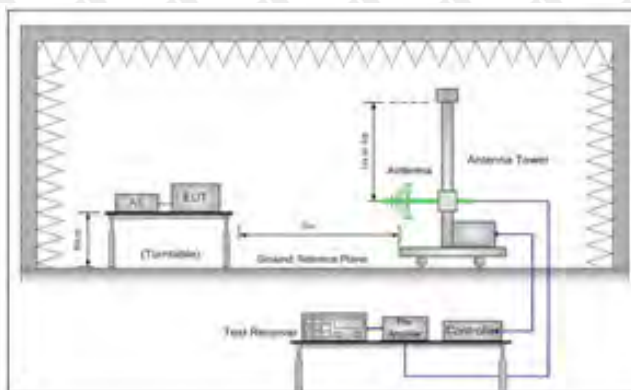


Figure 2. 30MHz to 1GHz

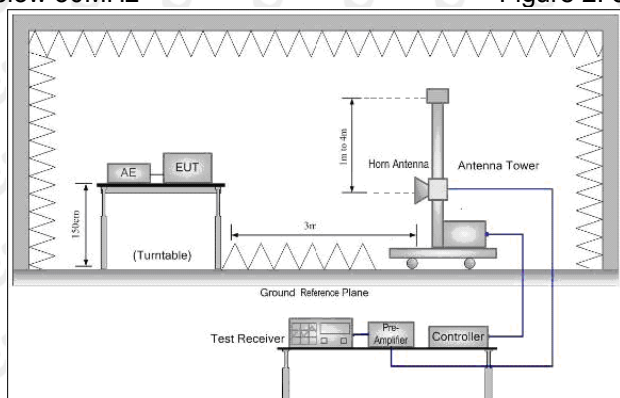


Figure 3. Above 1GHz

7.2 Limit

Spurious Emissions:

Frequency	Field strength (microvolt/meter)	Limit (dB μ V/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:

- a. 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.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. 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.
- d. 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.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. 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:

- g. 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).
- h. Test the EUT in the lowest channel ,the middle channel ,the Highest channel
- i. Repeat above procedures until all frequencies measured was complete.

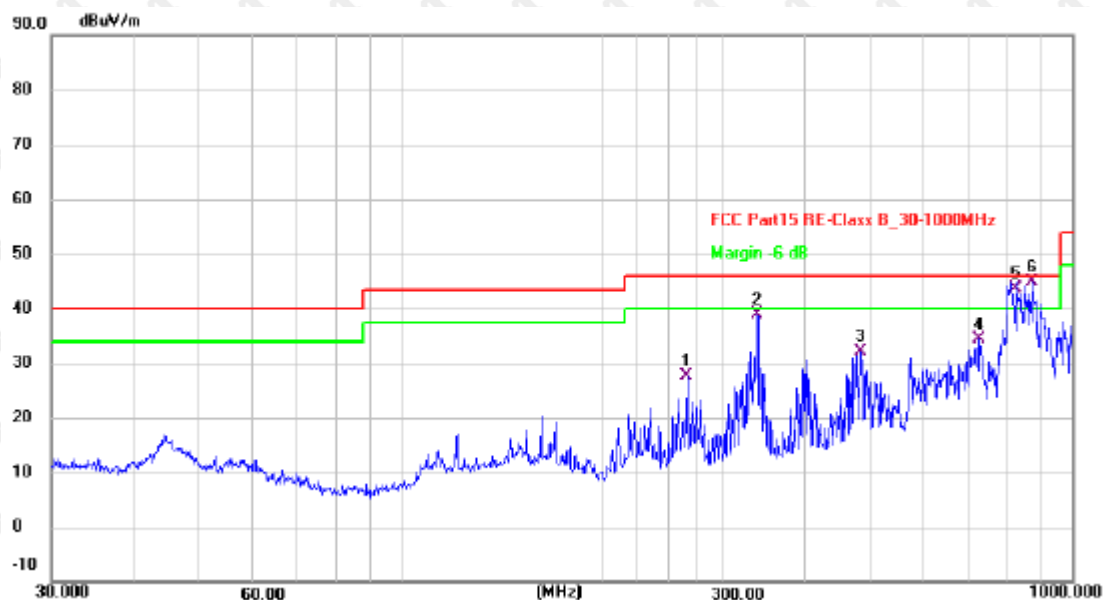
Receiver set:

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	1/T	Average

7.4 Test Result

Below 1GHz Test Results:

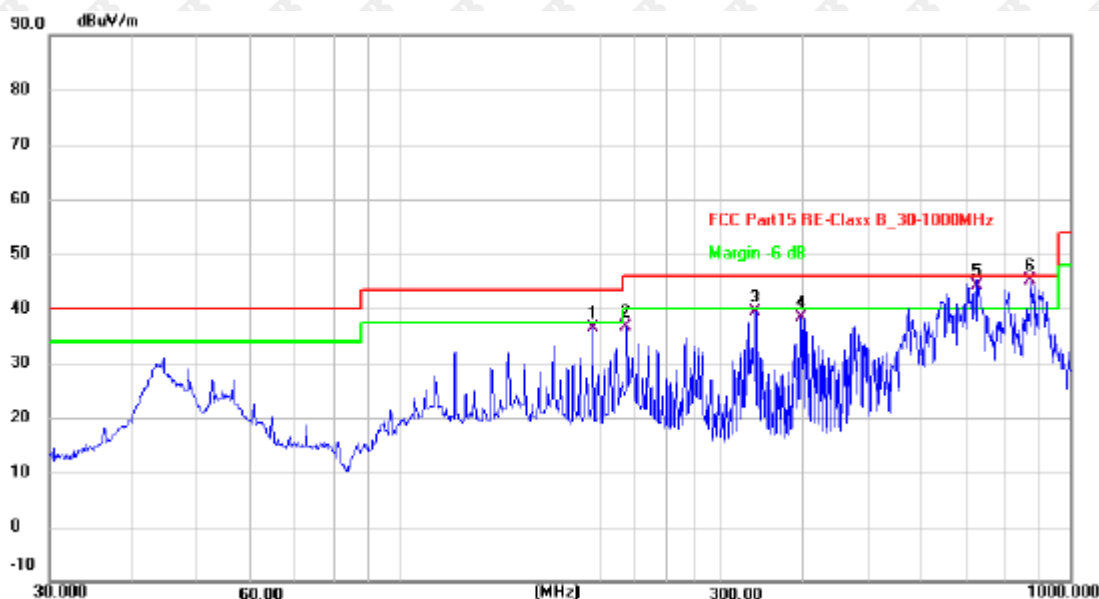
Antenna polarity: H



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	266.6089	41.83	-14.28	27.55	46.00	-18.45	QP
2	338.4001	51.48	-12.59	38.89	46.00	-7.11	QP
3	483.9094	41.43	-9.24	32.19	46.00	-13.81	QP
4	726.8052	38.24	-3.94	34.30	46.00	-11.70	QP
5 !	822.5568	46.14	-2.42	43.72	46.00	-2.28	QP
6 *	870.8882	46.61	-1.65	44.96	46.00	-1.04	QP

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

Antenna polarity: V



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
1	193.7728	52.59	-16.24	36.35	43.50	-7.15	QP
2	217.5443	52.95	-16.29	36.66	46.00	-9.34	QP
3	338.4001	52.08	-12.59	39.49	46.00	-6.51	QP
4	396.2415	49.79	-11.30	38.49	46.00	-7.51	QP
5 !	725.8352	48.11	-3.96	44.15	46.00	-1.85	QP
6 *	870.8532	46.73	-1.65	45.08	46.00	-0.92	QP

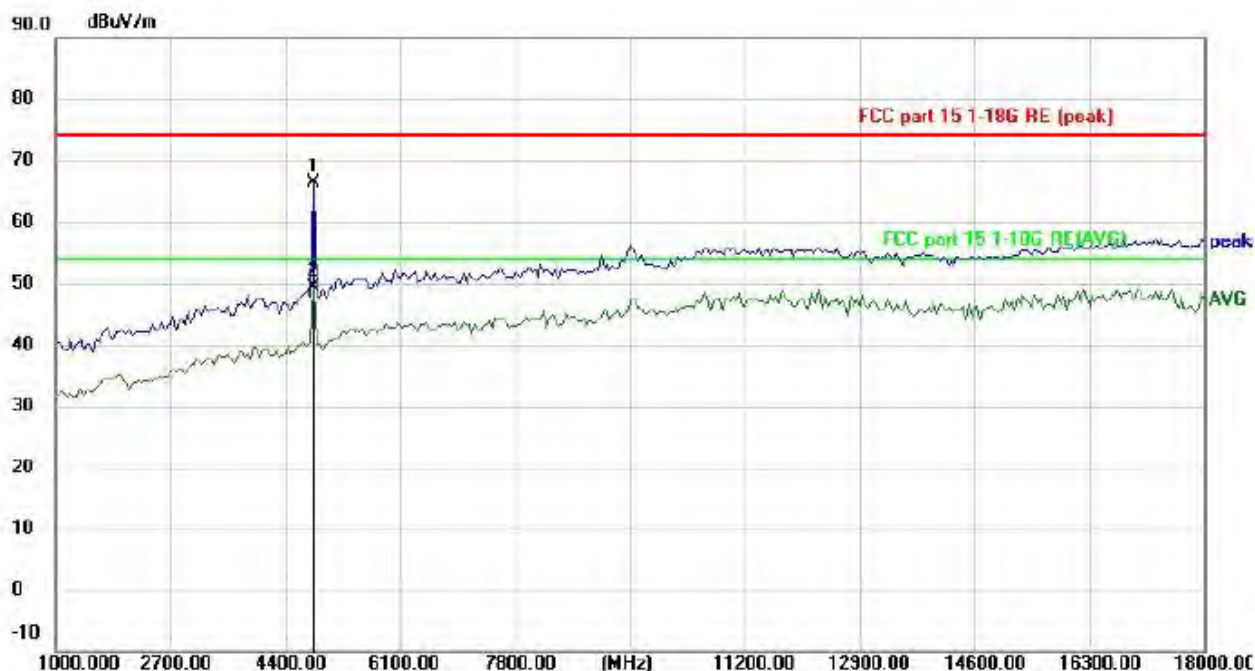
Remark: Factor = Cable lose + Antenna factor - Pre-amplifier; Margin = Limit – Level

1. The margin of 9K-30MHz measurement exceeds 20dB, so the test chart is not included. Test Mode: 802.11b Mid channel (the worst)
2. All modes have been tested, and the test results show that b-mode data is the worst, only b-mode test chart is put. Test Mode: 802.11b Mid channel (the worst)
3. After pre-scanning three directions, the report recorded the worst case Test Mode: 802.11b Mid channel (the worst)

Above 1 GHz Test Results:

Antenna polarity: H

Worst mode: LOW CH1 (802.11b Mode)/2412

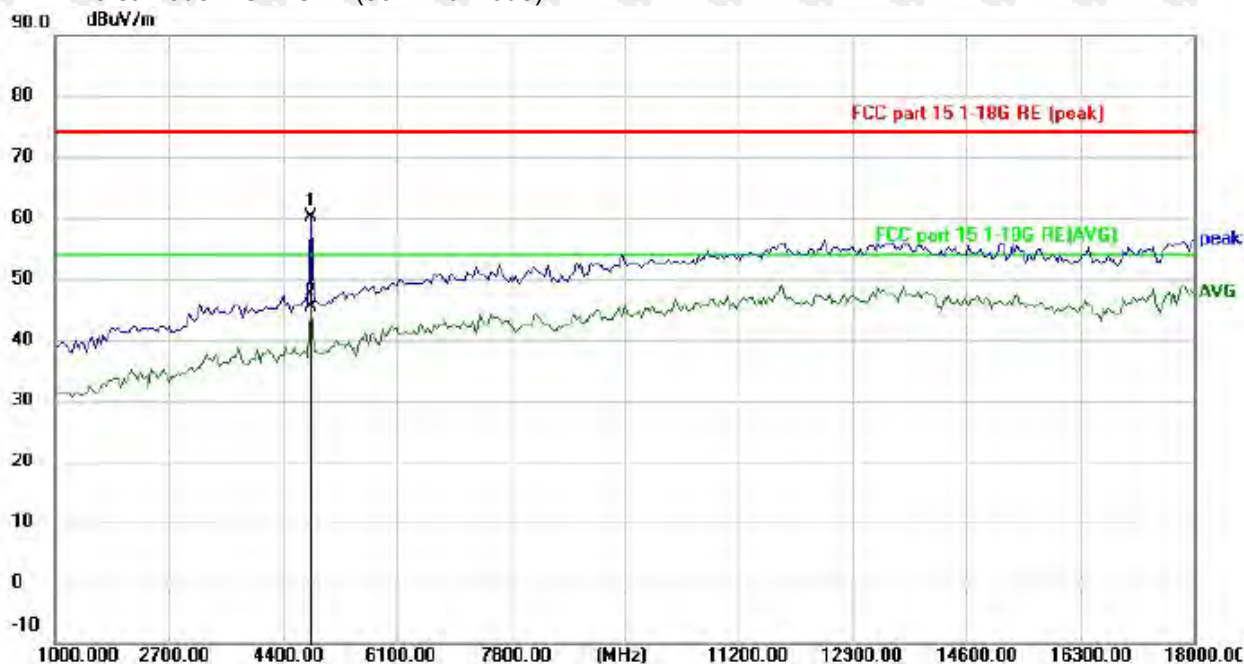


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over
		MHz	dBuV	dB	dBuV/m	dB/m	Detector
1		4825.000	52.52	13.82	66.34	74.00	-7.66 peak
2	*	4825.000	35.55	13.82	49.37	54.00	-4.63 AVG

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

Antenna polarity: V

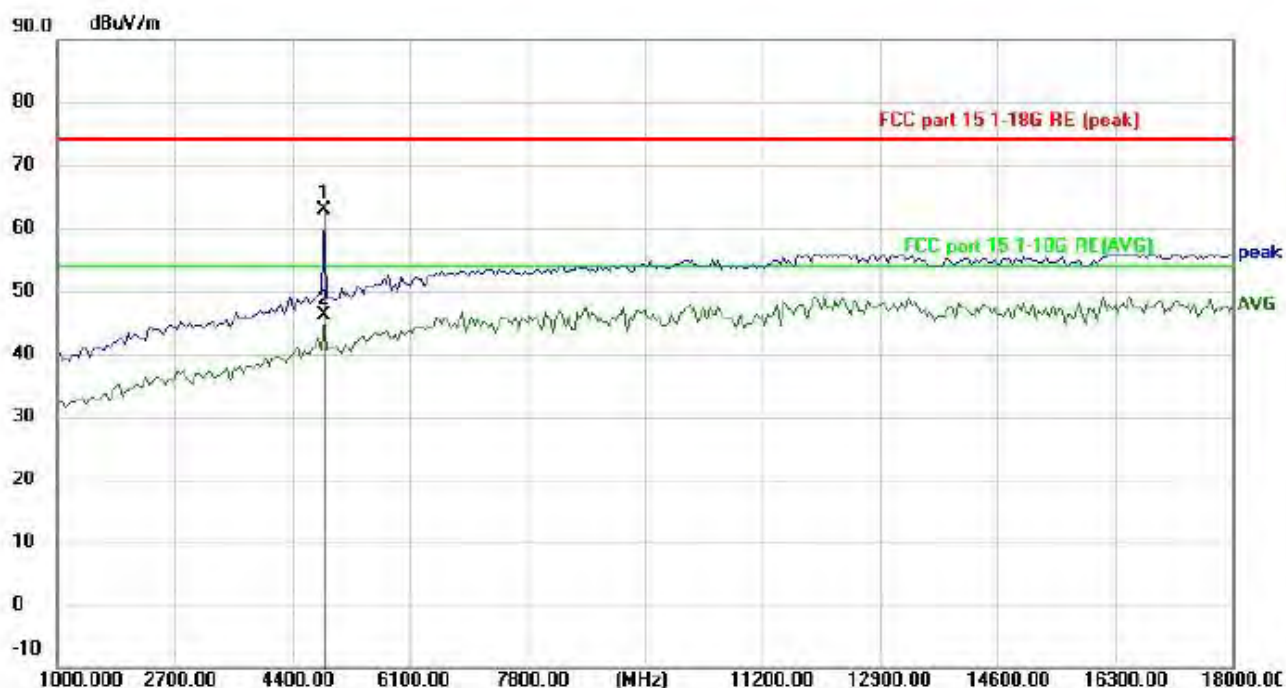
Worst mode: LOW CH1 (802.11b Mode)/2412



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		4825.000	46.42	13.82	60.24	74.00	-13.76	peak
2	*	4825.000	31.62	13.82	45.44	54.00	-8.56	AVG

Antenna polarity: H

Worst mode: Mid CH6 (802.11b Mode)/2437

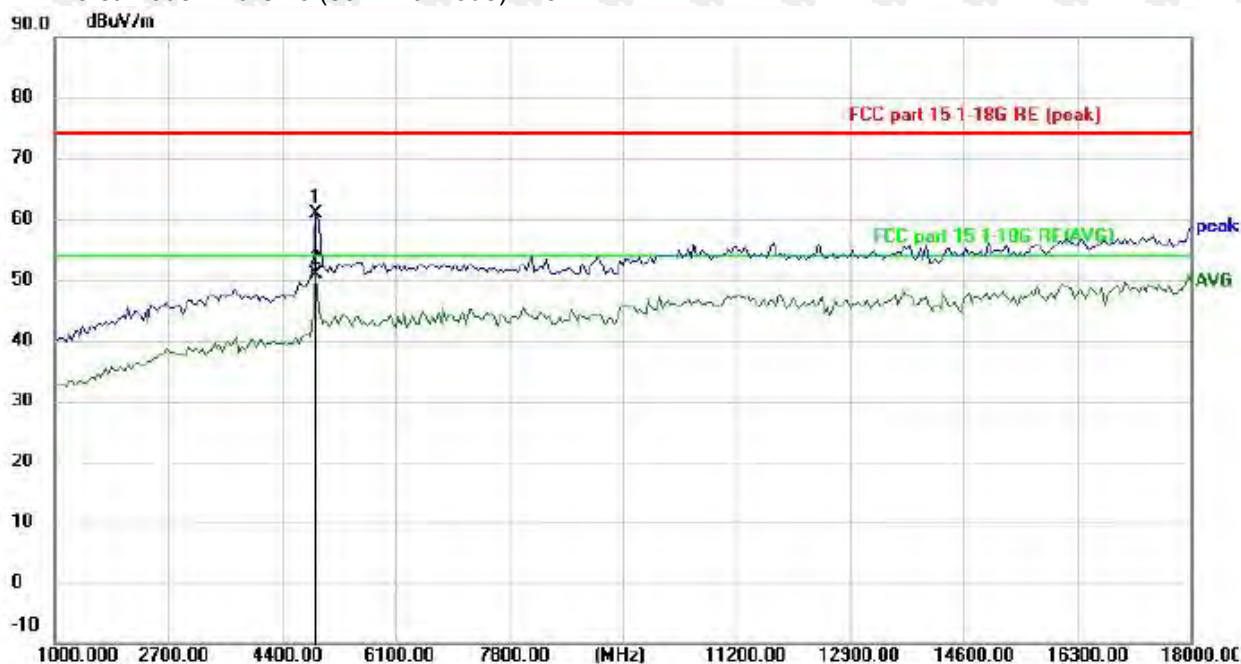


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		4867.500	49.00	14.00	63.00	74.00	-11.00	peak
2	*	4867.500	32.20	14.00	46.20	54.00	-7.80	AVG

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

Antenna polarity: V

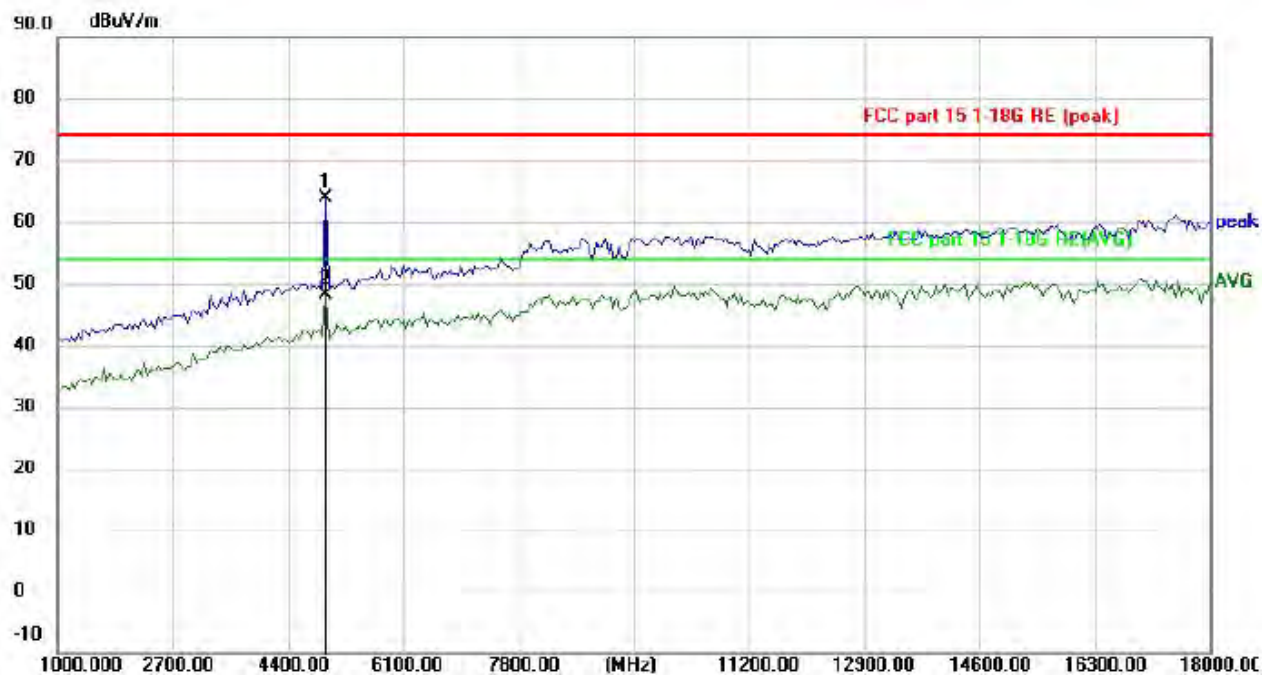
Worst mode: Mid CH6 (802.11b Mode)/2437



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		4910.000	46.81	14.18	60.99	74.00	-13.01	peak
2	*	4910.000	36.82	14.18	51.00	54.00	-3.00	AVG

Antenna polarity: H

Worst mode: High CH11 (802.11b Mode)/2462

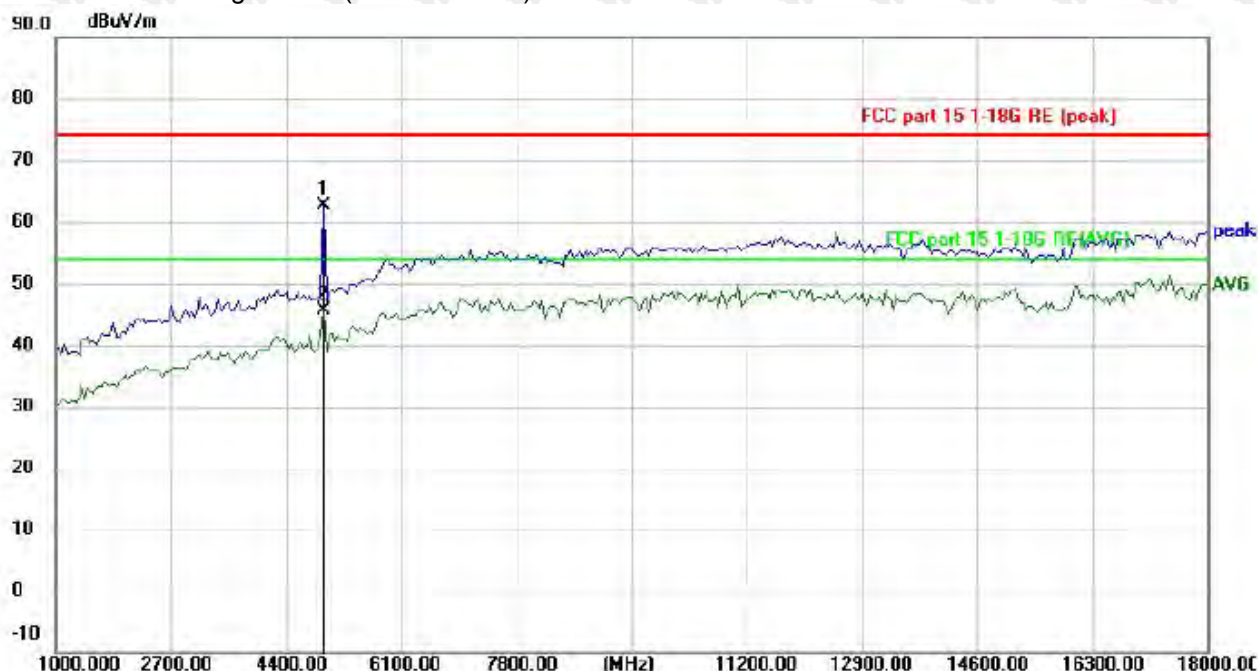


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		4952.500	49.57	14.37	63.94	74.00	-10.06	peak
2	*	4952.500	33.87	14.37	48.24	54.00	-5.76	AVG

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

Antenna polarity: V

Worst mode: High CH11 (802.11b Mode)/2462



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		4952.500	48.26	14.37	62.63	74.00	-11.37	peak
2	*	4952.500	31.34	14.37	45.71	54.00	-8.29	AVG

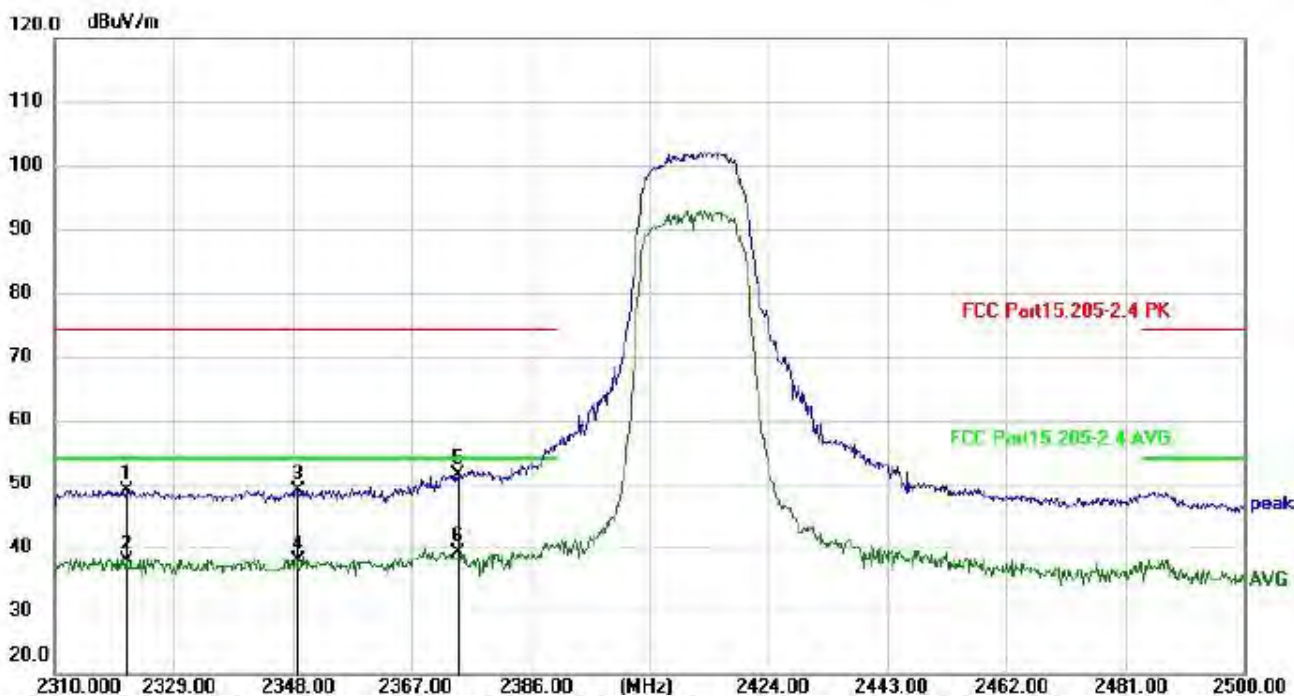
Remark :

- (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)The EUT was tested in the low, mid, high channel and the worst case position data were reported.
- (5) 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)

Antenna polarity: H

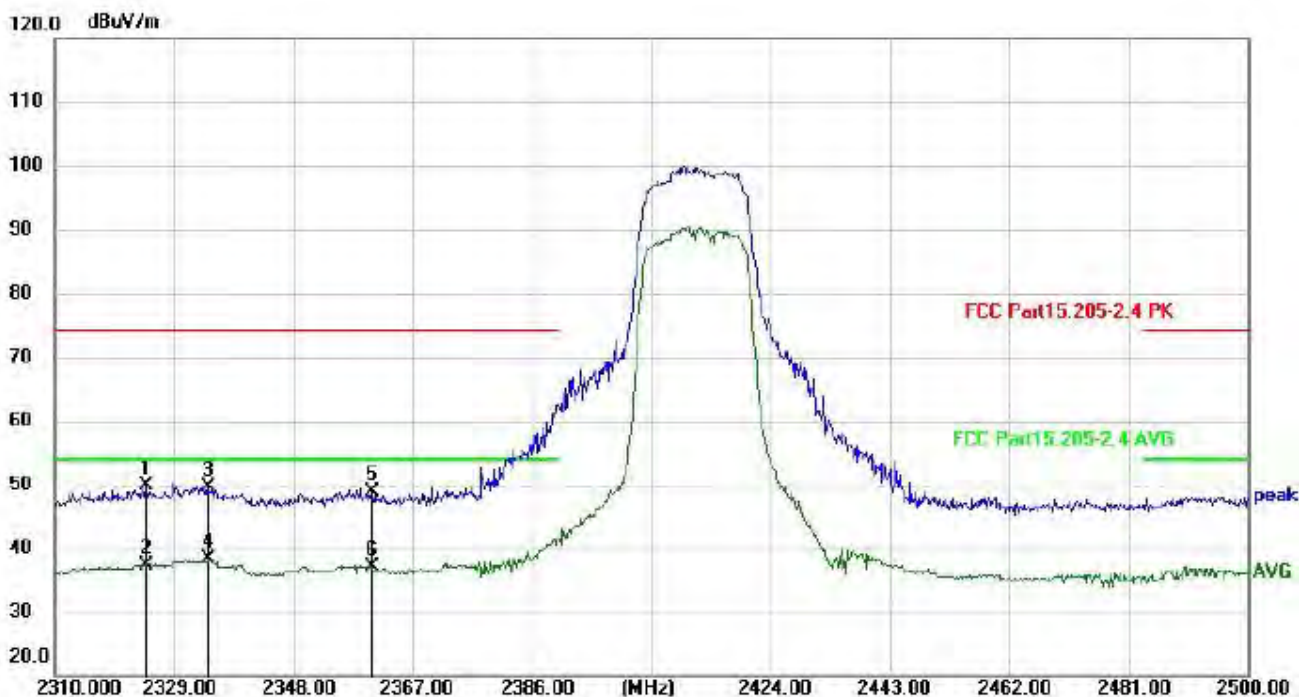
Worst mode :LOW CH1 (802.11N20 Mode)/2412



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

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	
		MHz	dBuV	dB	dBuV/m	dB/m	dB	Detector
1		2321.400	59.55	-10.65	48.90	74.00	-25.10	peak
2		2321.400	48.63	-10.65	37.98	54.00	-16.02	AVG
3		2348.760	59.58	-10.63	48.95	74.00	-25.05	peak
4		2348.760	48.60	-10.63	37.97	54.00	-16.03	AVG
5		2374.410	61.99	-10.62	51.37	74.00	-22.63	peak
6	*	2374.410	49.64	-10.62	39.02	54.00	-14.98	AVG

Antenna polarity: V
Worst mode :LOW CH1 (802.11N20 Mode)/2412



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		2324.440	60.55	-10.65	49.90	74.00	-24.10	peak
2		2324.440	48.13	-10.65	37.48	54.00	-16.52	AVG
3		2334.320	60.33	-10.64	49.69	74.00	-24.31	peak
4	*	2334.320	48.96	-10.64	38.32	54.00	-15.68	AVG
5		2360.540	59.48	-10.62	48.86	74.00	-25.14	peak
6		2360.540	47.82	-10.62	37.20	54.00	-16.80	AVG

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

Antenna polarity: H

Worst mode :High CH11 (802.11N20 Mode)/2462

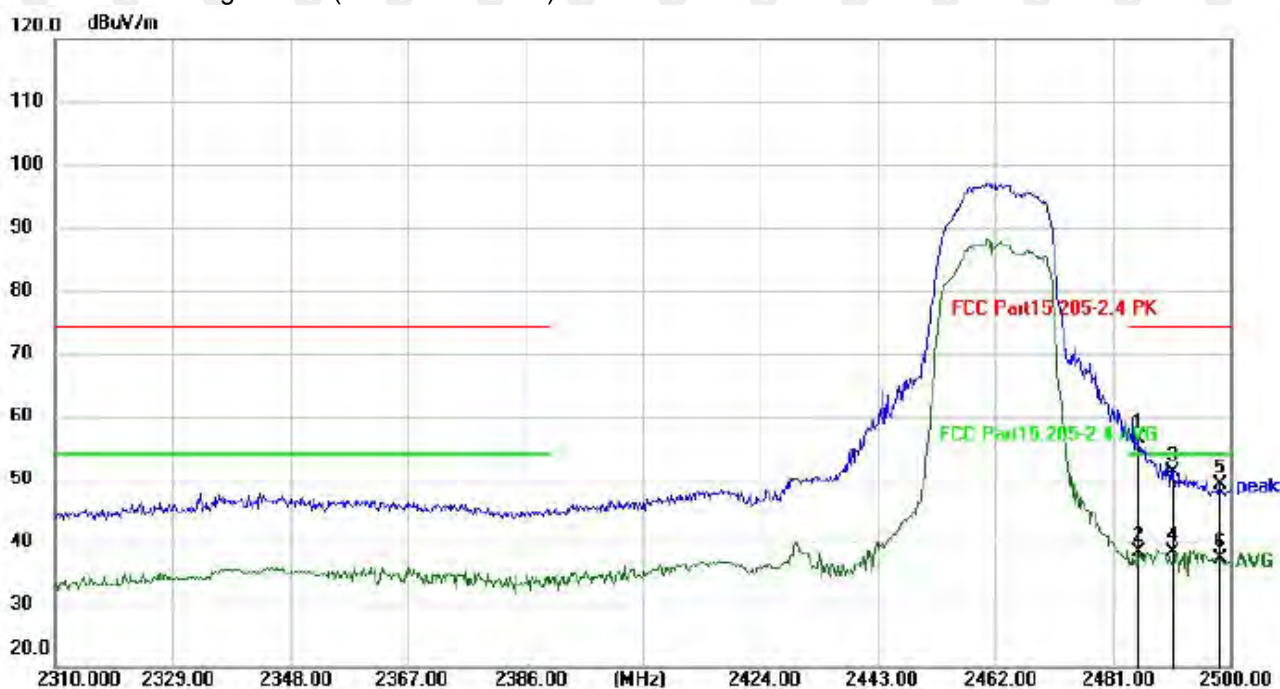


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dB/m	Over dB	Detector
1		2488.410	63.98	-10.53	53.45	74.00	-20.55	peak
2	*	2488.410	51.39	-10.53	40.86	54.00	-13.14	AVG
3		2493.730	62.54	-10.53	52.01	74.00	-21.99	peak
4		2493.730	51.36	-10.53	40.83	54.00	-13.17	AVG
5		2498.290	59.81	-10.53	49.28	74.00	-24.72	peak
6		2498.290	48.79	-10.53	38.26	54.00	-15.74	AVG

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

Antenna polarity: V

Worst mode :High CH11 (802.11N20 Mode)/2462



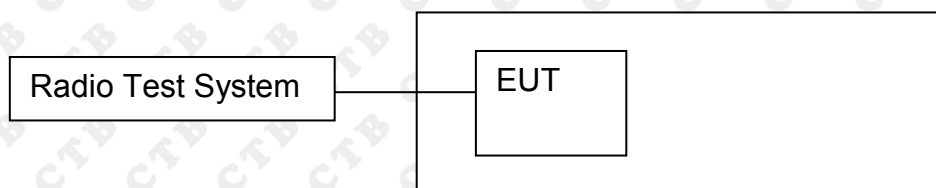
No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Over	
		MHz	Level	Factor	ment			Detector
			dBuV	dB	dBuV/m	dB/m	dB	
1		2485.180	66.82	-10.54	56.28	74.00	-17.72	peak
2	*	2485.180	48.89	-10.54	38.35	54.00	-15.65	AVG
3		2490.690	61.62	-10.53	51.09	74.00	-22.91	peak
4		2490.690	48.80	-10.53	38.27	54.00	-15.73	AVG
5		2498.290	59.57	-10.53	49.04	74.00	-24.96	peak
6		2498.290	47.82	-10.53	37.29	54.00	-16.71	AVG

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

Note: All modes were test at Low, High channel tested and passed, the worst result was reported

8. BAND EDGE AND RF CONDUCTED SPURIOUS EMISSIONS

8.1 Block Diagram Of Test Setup



8.2 Limit

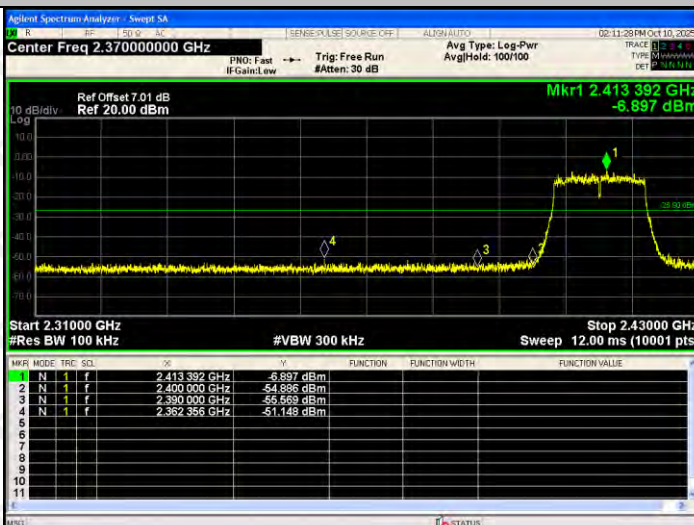
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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

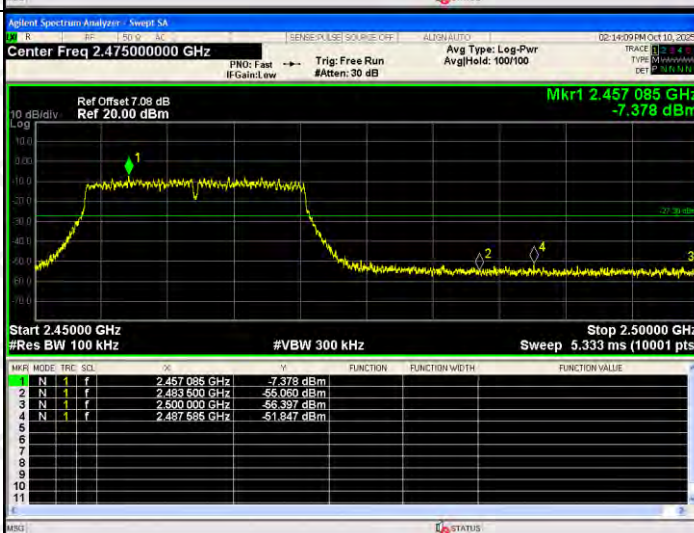
1. Remove the antenna from the EUT and then connect a low RF cable from the antenna port to the spectrum;
2. Set the spectrum analyzer:
 Below 30MHz:
 RBW = 100kHz, VBW = 300kHz, Sweep = auto
 Detector function = peak, Trace = max hold
 Above 30MHz:
 RBW = 100kHz, VBW = 300kHz, Sweep = auto
 Detector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

BAND EDGE Graphs

802.11g/LCH

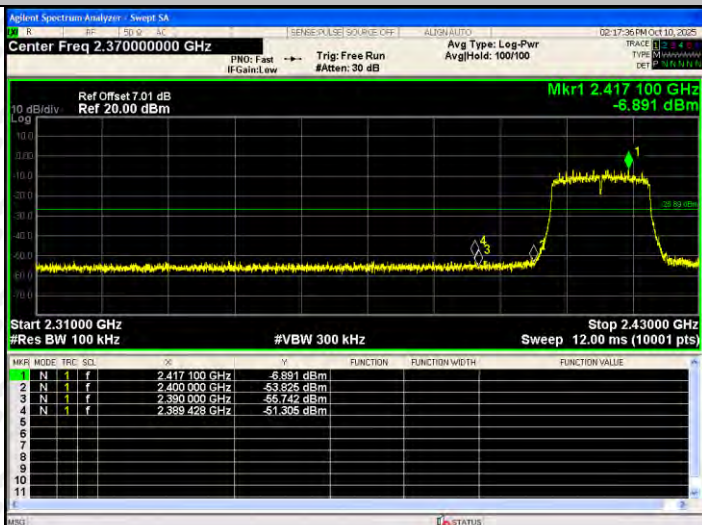


802.11g/HCH

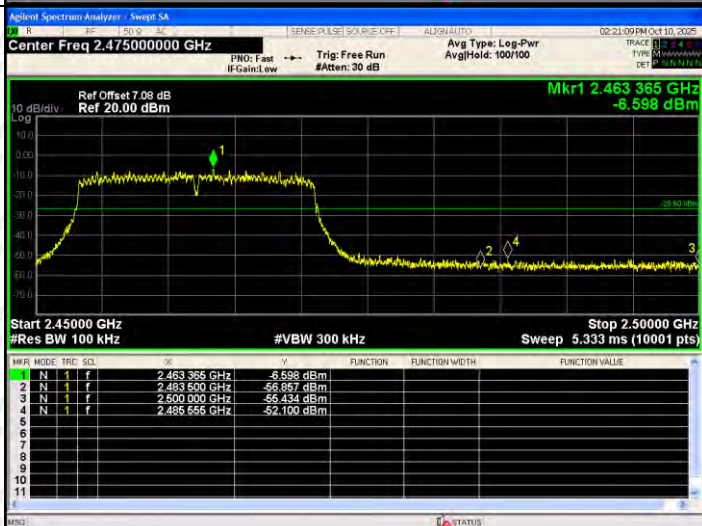


BAND EDGE Graphs

802.11n(HT20)/LCH

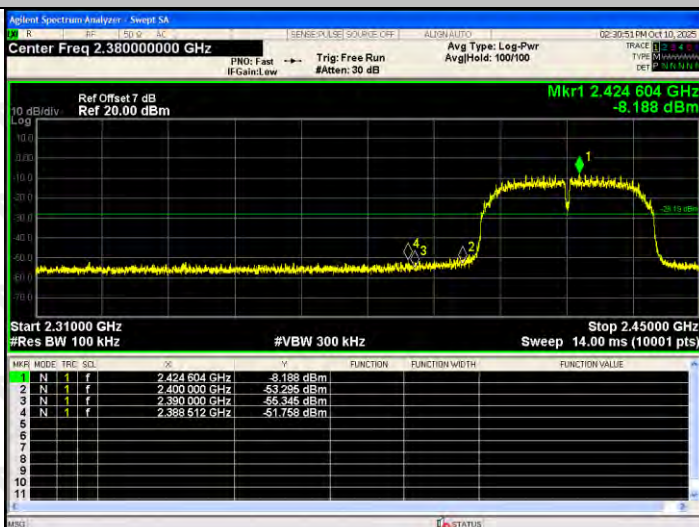


802.11n(HT20)/HCH

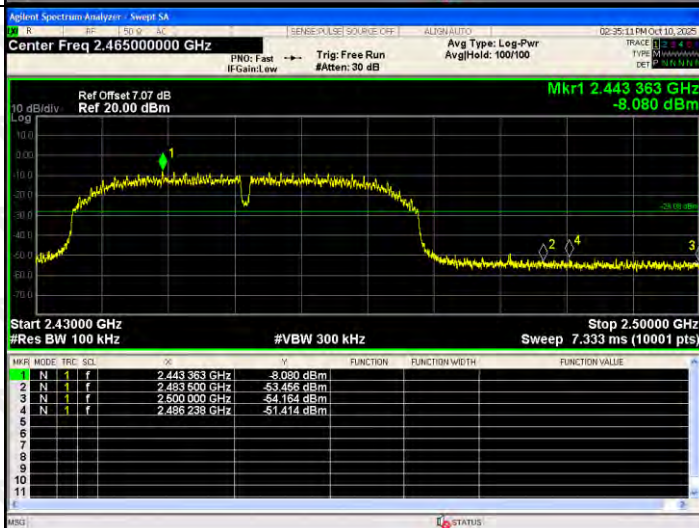


BAND EDGE Graphs

802.11n(HT40)/LCH

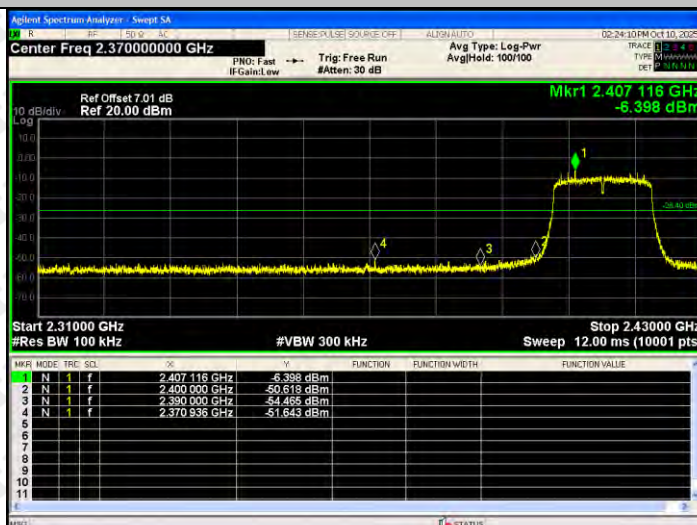


802.11n(HT40)/HCH

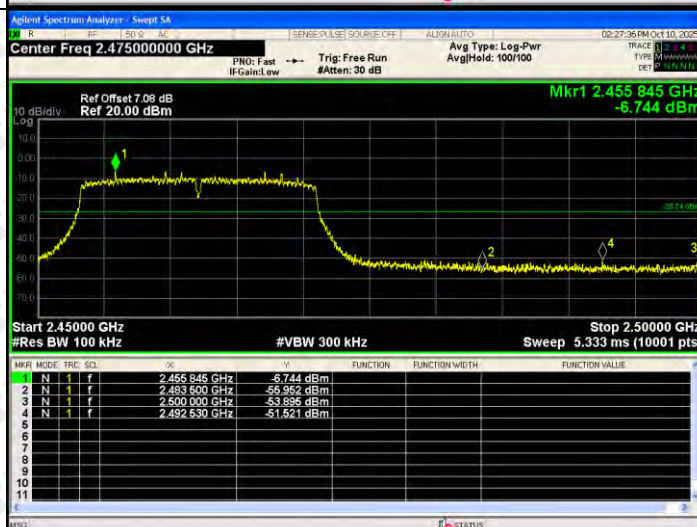


BAND EDGE Graphs

802.11ax(HE20)/LCH

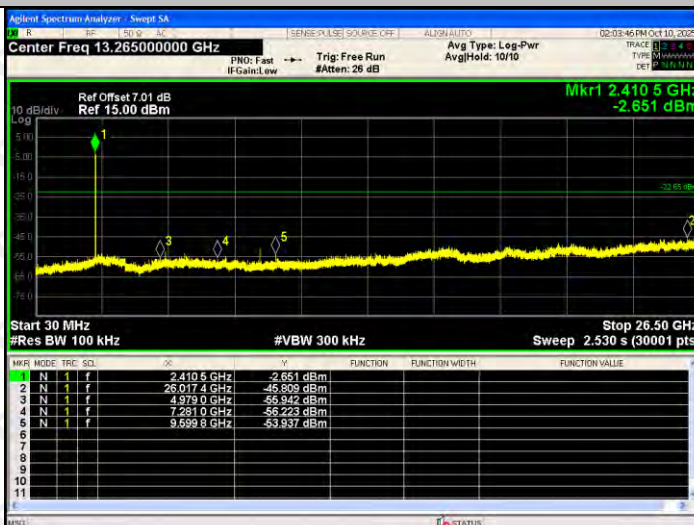


802.11ax(HE20)/HCH

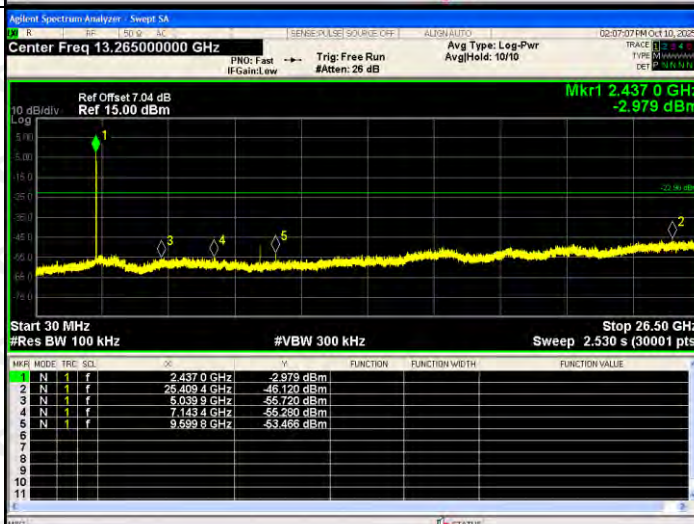


RF Conducted Spurious Emissions Graphs

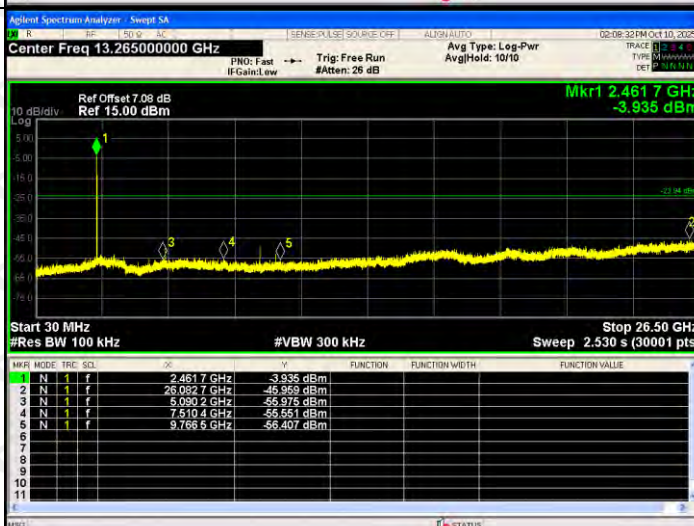
802.11b/LCH



802.11b/MCH

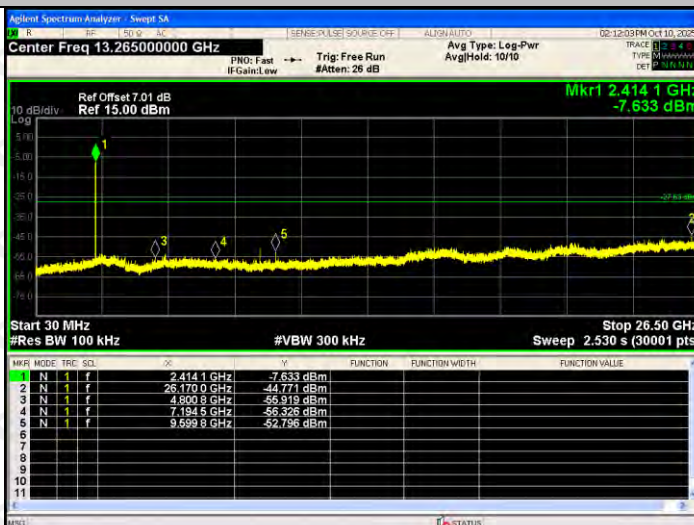


802.11b/HCH

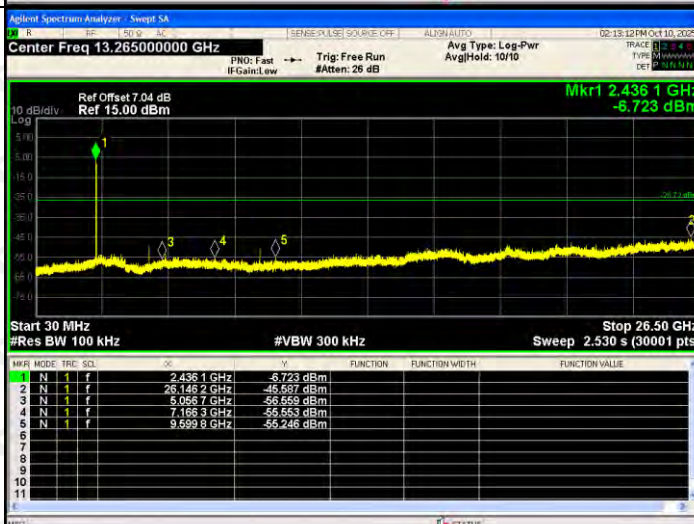


RF Conducted Spurious Emissions Graphs

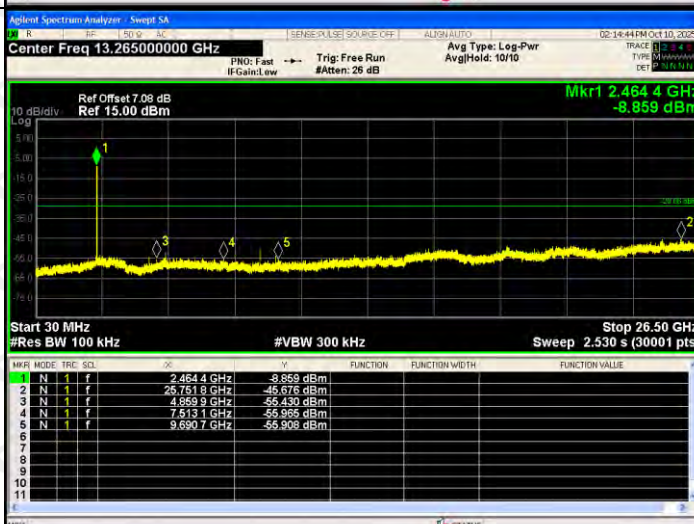
802.11g/LCH



802.11g/MCH

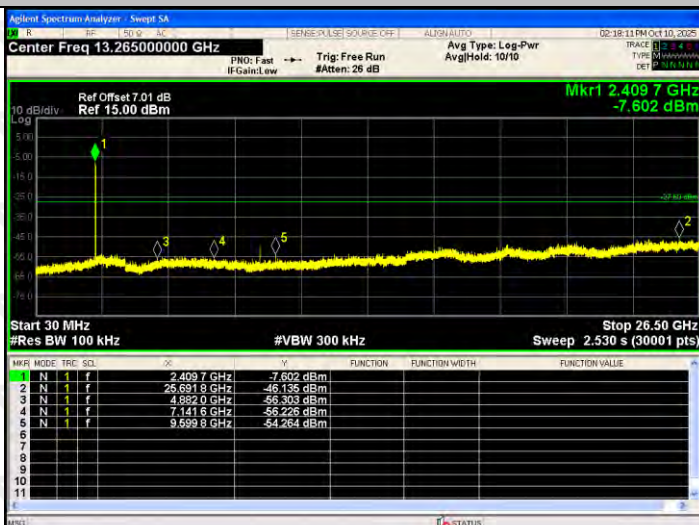


802.11g/HCH

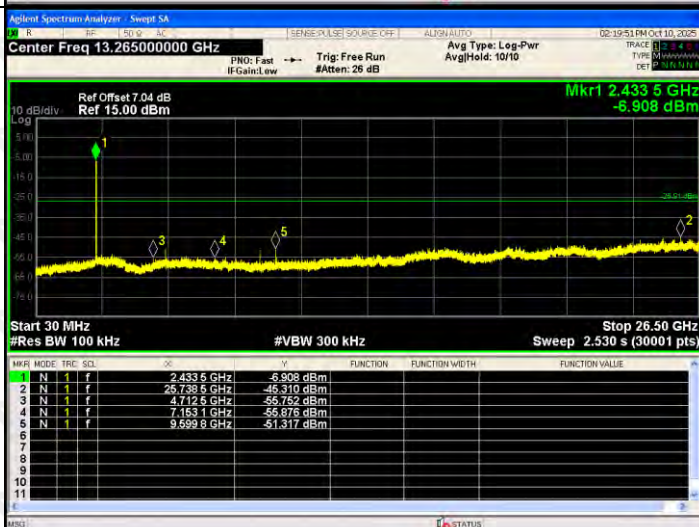


RF Conducted Spurious Emissions Graphs

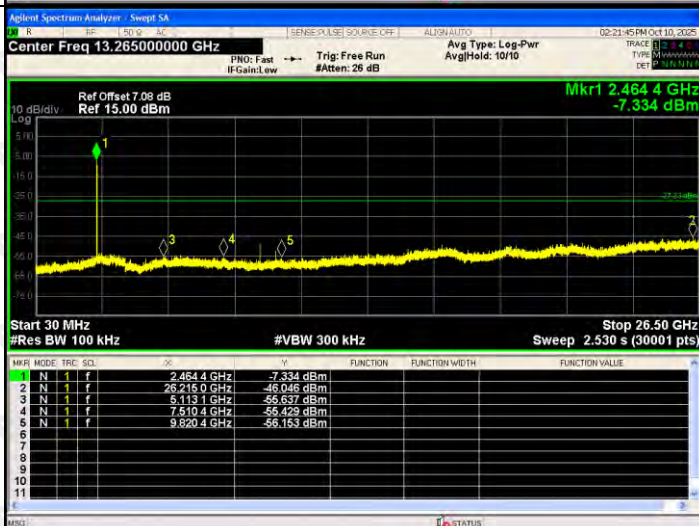
802.11n(HT20)/LCH



802.11n(HT20)/MCH

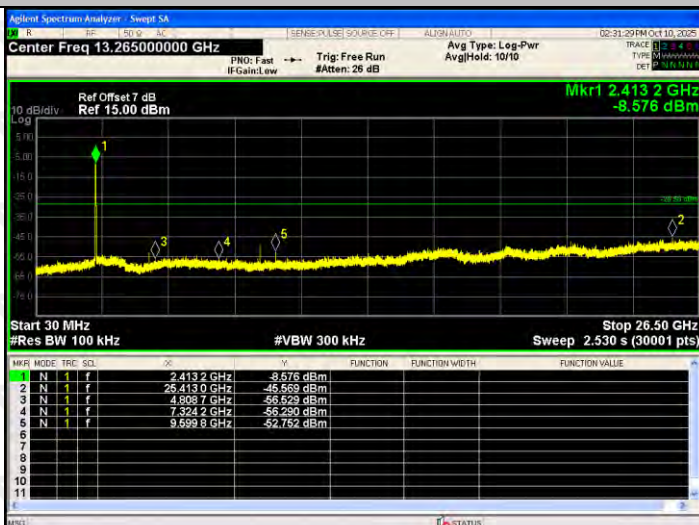


802.11n(HT20)/HCH

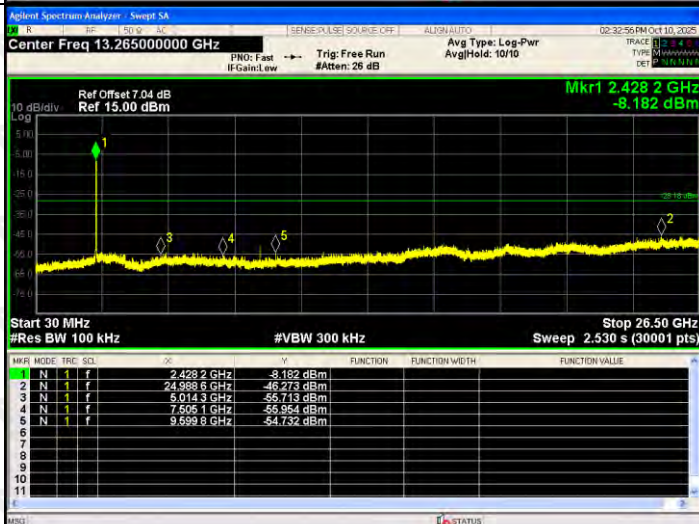


RF Conducted Spurious Emissions Graphs

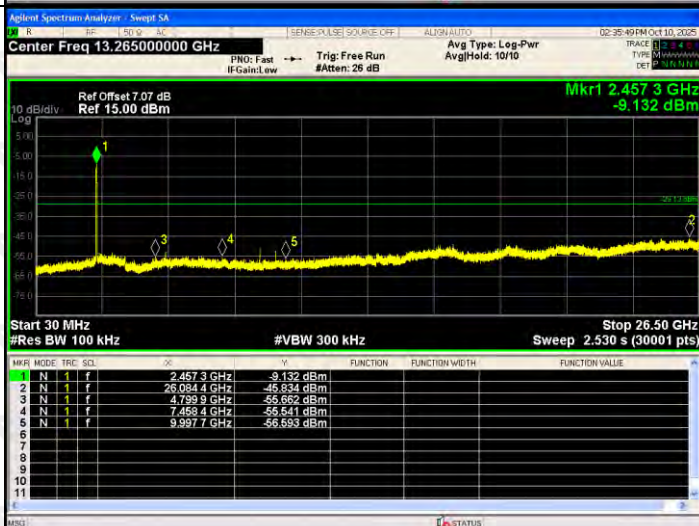
802.11n(HT40)/LCH



802.11n(HT40)/MCH

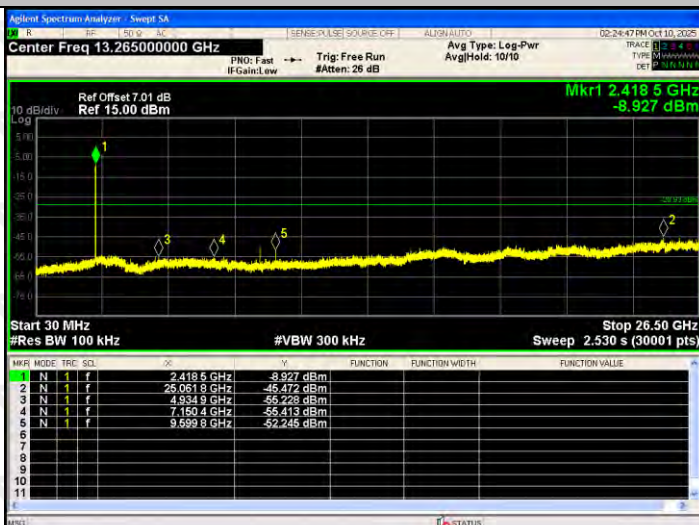


802.11n(HT40)/HCH

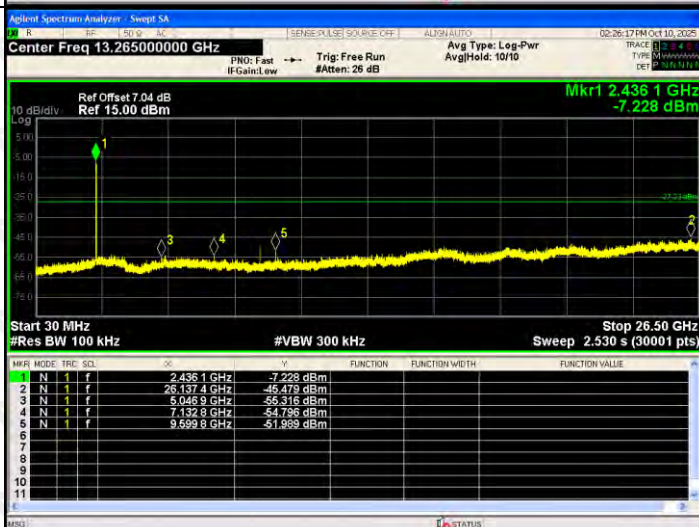


RF Conducted Spurious Emissions Graphs

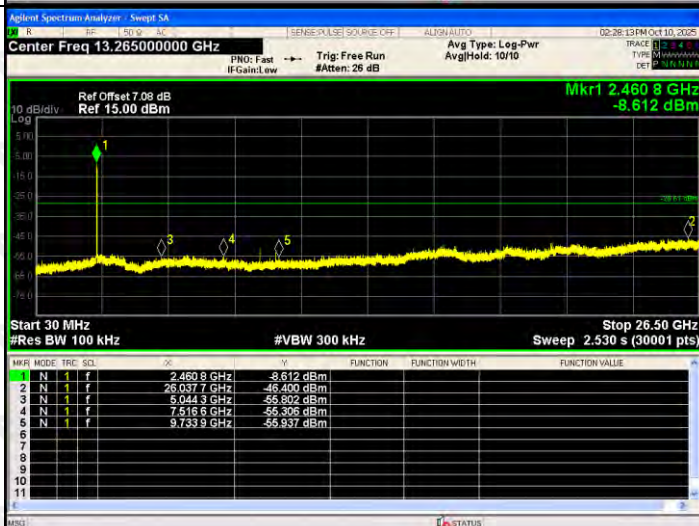
802.11ax(HE20)/LCH



802.11ax(HE20)/MCH



802.11ax(HE20)/HCH



9. CONDUCTED 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)	Maximum Conducted Output Power	1 watt or 30dBm	2400-2483.5	PASS

9.3 Test procedure

1. The EUT was directly connected to the Power meter

9.4 Test Result

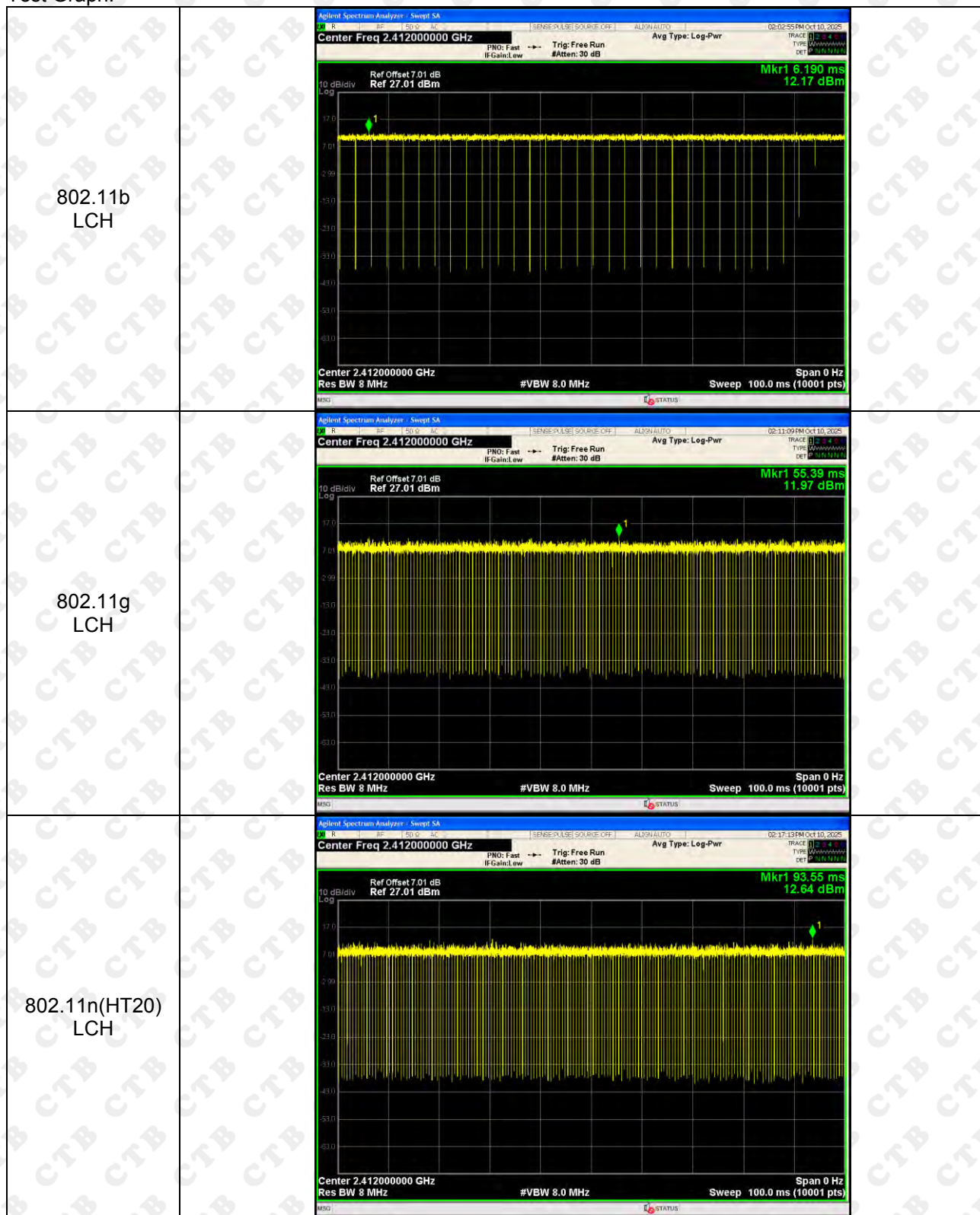
Mode	Channel.	Maximum Peak Output Power [dBm]	Limit [dBm]	Verdict
802.11b	LCH	12.432	30	PASS
	MCH	13.114	30	PASS
	HCH	12.333	30	PASS
802.11g	LCH	11.47	30	PASS
	MCH	12.236	30	PASS
	HCH	11.536	30	PASS
802.11n(HT20)	LCH	11.528	30	PASS
	MCH	12.381	30	PASS
	HCH	11.577	30	PASS
802.11n(HT40)	LCH	12.454	30	PASS
	MCH	12.629	30	PASS
	HCH	12.393	30	PASS
802.11ax(HE20)	LCH	12.036	30	PASS
	MCH	12.533	30	PASS
	HCH	11.881	30	PASS

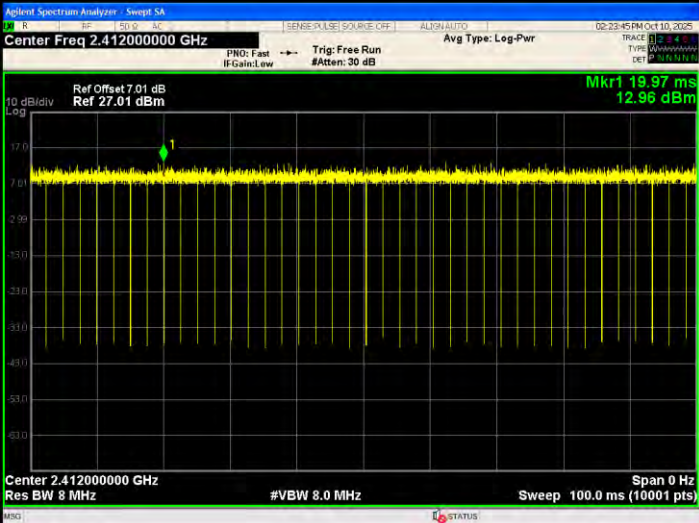
Duty Cycle

Mode	Channel.	Duty Cycle(%)	Correction Factor (dB)
802.11b	LCH	100	0
802.11g	LCH	100	0
802.11n(HT20)	LCH	100	0
802.11n(HT40)	LCH	100	0
802.11ax(HE20)	LCH	100	0

Duty Cycle:

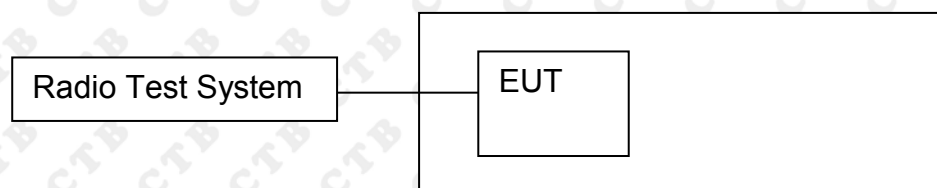
Test Graph:



802.11n(HT40) LCH		
802.11ax(HE20) LCH		

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

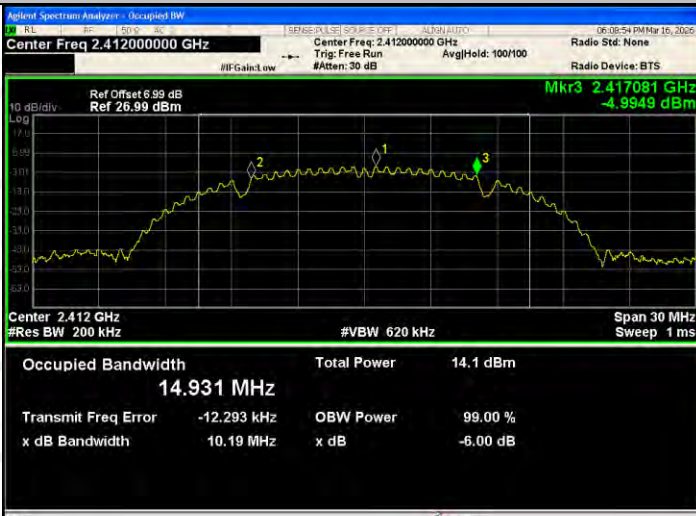
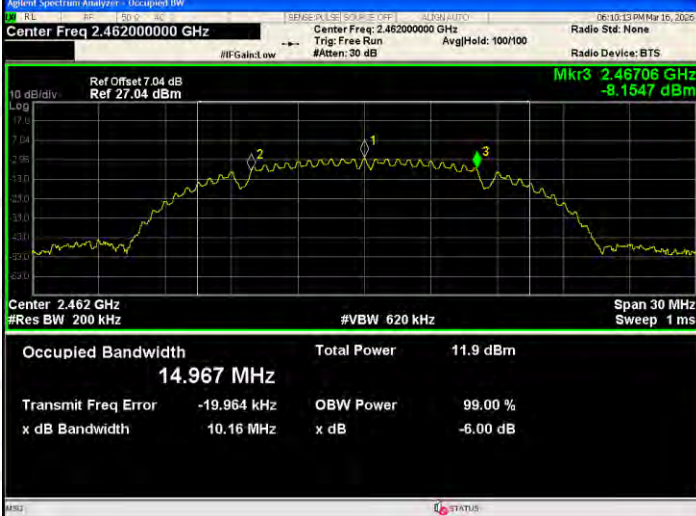
10.3 Test procedure

1. Rem1. Set RBW = 1%~5% OBW.
2. Set the video bandwidth (VBW) $\geq 3 \times$ 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.

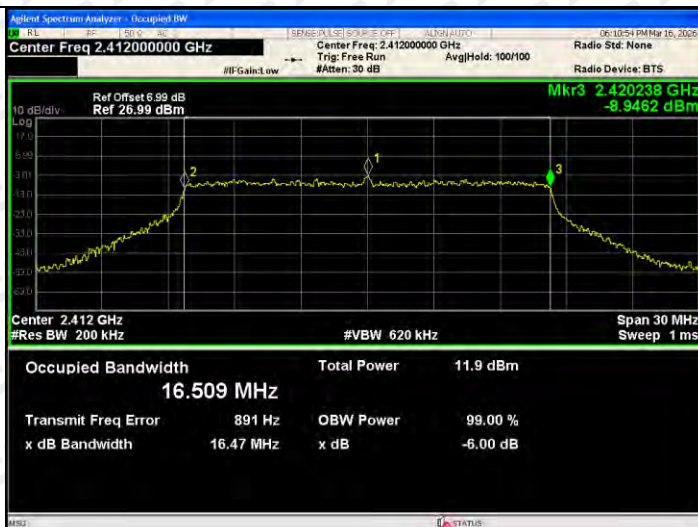
10.4 Test Result

Test Mode	Frequency	6dB Bandwidth (MHz)	Limit(kHz)	Result
802.11b	LCH	10.187	500	PASS
	MCH	10.186	500	PASS
	HCH	10.16	500	PASS
802.11g	LCH	16.474	500	PASS
	MCH	16.418	500	PASS
	HCH	16.514	500	PASS
802.11n(HT20)	LCH	17.668	500	PASS
	MCH	17.569	500	PASS
	HCH	17.451	500	PASS
802.11n(HT40)	LCH	36.185	500	PASS
	MCH	36.186	500	PASS
	HCH	36.195	500	PASS
802.11ax(HE20)	LCH	17.439	500	PASS
	MCH	17.729	500	PASS
	HCH	17.687	500	PASS

Test Graph:
6dB OBW

Graphs	
802.11b /LCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.41200000 GHz Ref Offset: 6.99 dB Ref: 26.99 dBm Mkr3: 2.417081 GHz -4.9949 dBm Center: 2.412 GHz #Res BW: 200 kHz Span: 30 MHz Sweep: 1 ms Occupied Bandwidth: 14.931 MHz Total Power: 14.1 dBm Transmit Freq Error: -12.293 kHz OBW Power: 99.00 % x dB Bandwidth: 10.19 MHz x dB: -6.00 dB
802.11b /MCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.43700000 GHz Ref Offset: 7.01 dB Ref: 27.01 dBm Mkr3: 2.442081 GHz -6.5001 dBm Center: 2.437 GHz #Res BW: 200 kHz Span: 30 MHz Sweep: 1 ms Occupied Bandwidth: 14.937 MHz Total Power: 12.7 dBm Transmit Freq Error: -12.583 kHz OBW Power: 99.00 % x dB Bandwidth: 10.19 MHz x dB: -6.00 dB
802.11b/HCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.46200000 GHz Ref Offset: 7.04 dB Ref: 27.04 dBm Mkr3: 2.46706 GHz -8.1547 dBm Center: 2.462 GHz #Res BW: 200 kHz Span: 30 MHz Sweep: 1 ms Occupied Bandwidth: 14.967 MHz Total Power: 11.9 dBm Transmit Freq Error: -19.964 kHz OBW Power: 99.00 % x dB Bandwidth: 10.16 MHz x dB: -6.00 dB

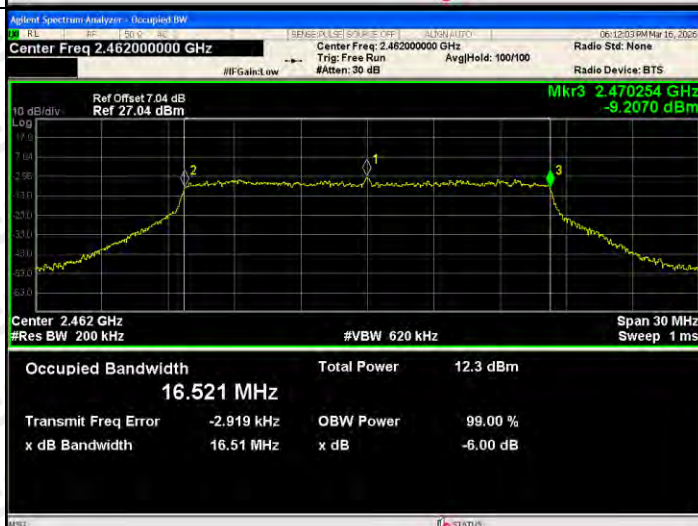
802.11g/LCH

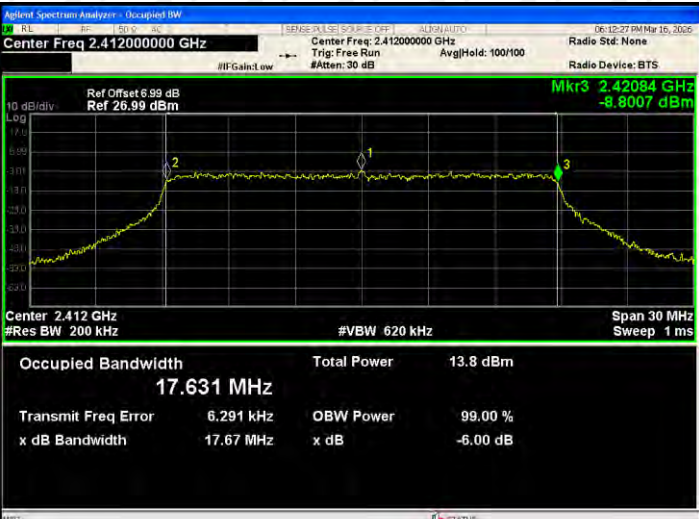
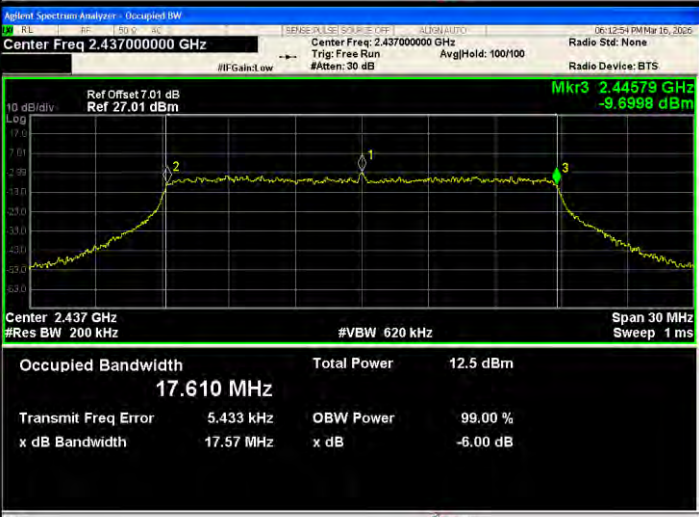
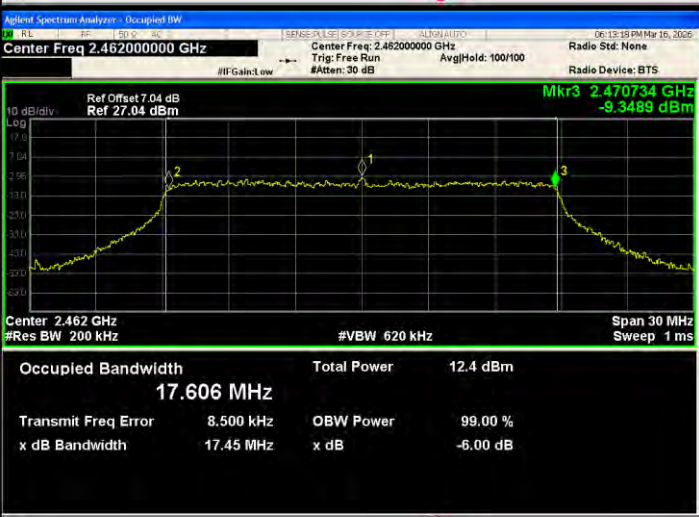


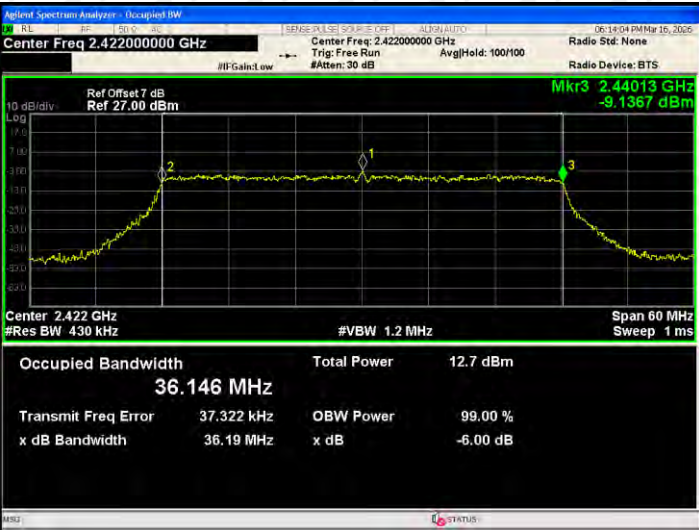
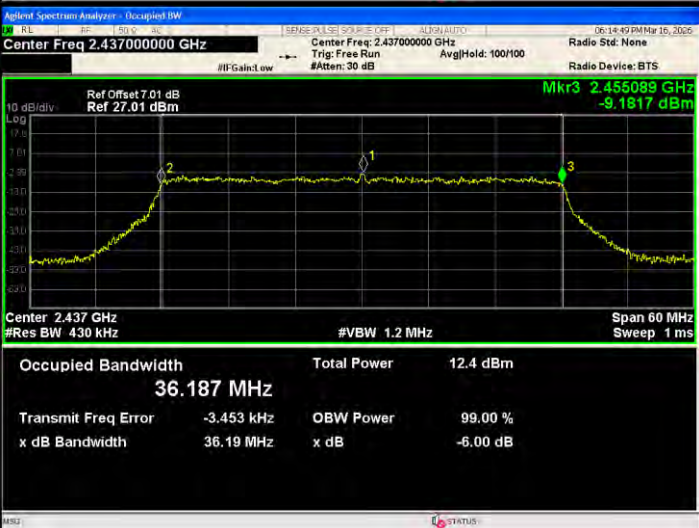
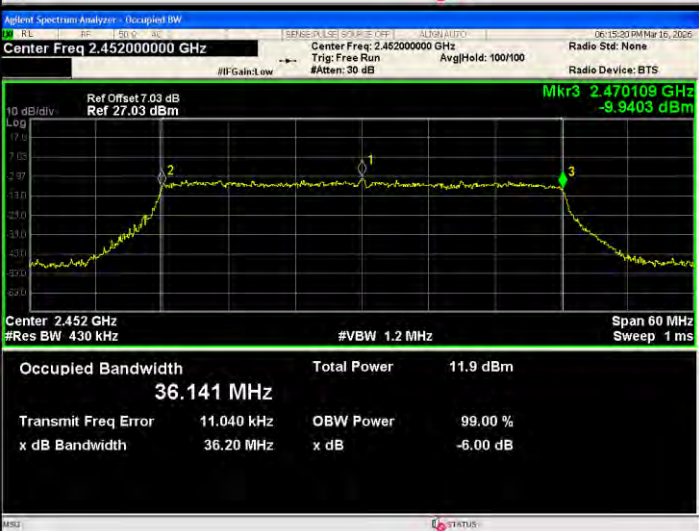
802.11g/MCH

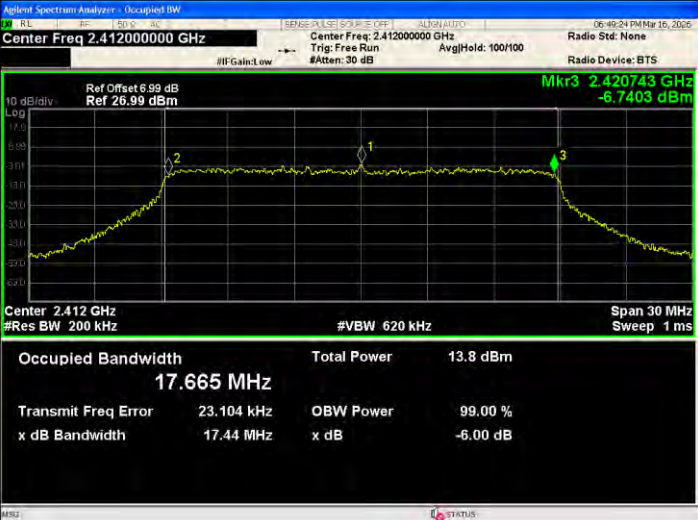
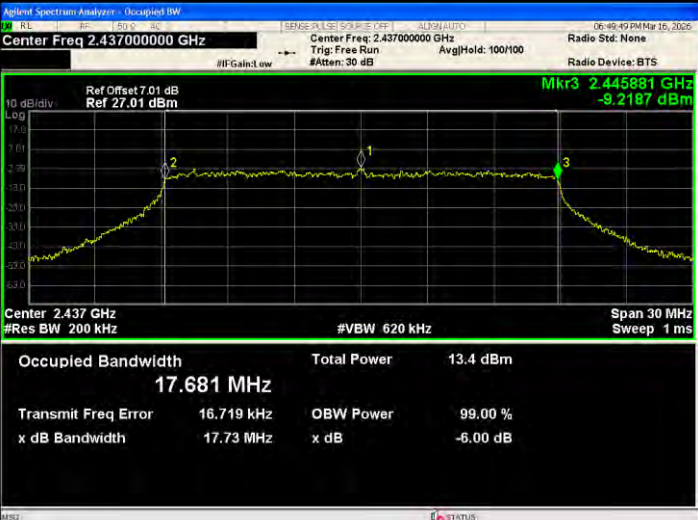


802.11g/HCH



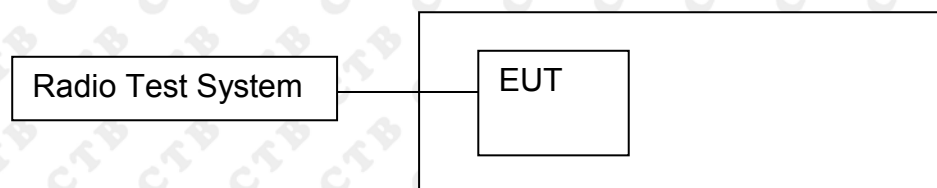
802.11n(HT20)/LCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq 2.412000000 GHz Center Freq: 2.412000000 GHz Trig: Free Run #Att: 30 dB Ref Offset 6.99 dB Ref 26.99 dBm Mkr3 2.42084 GHz -8.8007 dBm Center 2.412 GHz #Res BW 200 kHz #VBW 620 kHz Span 30 MHz Sweep 1 ms Occupied Bandwidth 17.631 MHz Total Power 13.8 dBm Transmit Freq Error 6.291 kHz OBW Power 99.00 % x dB Bandwidth 17.67 MHz x dB -6.00 dB
802.11n(HT20)/MCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq 2.437000000 GHz Center Freq: 2.437000000 GHz Trig: Free Run #Att: 30 dB Ref Offset 7.01 dB Ref 27.01 dBm Mkr3 2.44579 GHz -9.6998 dBm Center 2.437 GHz #Res BW 200 kHz #VBW 620 kHz Span 30 MHz Sweep 1 ms Occupied Bandwidth 17.610 MHz Total Power 12.5 dBm Transmit Freq Error 5.433 kHz OBW Power 99.00 % x dB Bandwidth 17.57 MHz x dB -6.00 dB
802.11n(HT20)/HCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq 2.462000000 GHz Center Freq: 2.462000000 GHz Trig: Free Run #Att: 30 dB Ref Offset 7.04 dB Ref 27.04 dBm Mkr3 2.470734 GHz -9.3489 dBm Center 2.462 GHz #Res BW 200 kHz #VBW 620 kHz Span 30 MHz Sweep 1 ms Occupied Bandwidth 17.606 MHz Total Power 12.4 dBm Transmit Freq Error 8.500 kHz OBW Power 99.00 % x dB Bandwidth 17.45 MHz x dB -6.00 dB

802.11n(HT40)/LCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq 2.422000000 GHz Center Freq: 2.422000000 GHz Trig: Free Run #Att: 30 dB Radio Std: None Radio Device: BTS Ref Offset 7 dB Ref 27.00 dBm Mkr3 2.44013 GHz -9.1367 dBm Center 2.422 GHz #Res BW 430 kHz #VBW 1.2 MHz Span 60 MHz Sweep 1 ms Occupied Bandwidth 36.146 MHz Total Power 12.7 dBm Transmit Freq Error 37.322 kHz OBW Power 99.00 % x dB Bandwidth 36.19 MHz x dB -6.00 dB
802.11n(HT40)/MCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq 2.437000000 GHz Center Freq: 2.437000000 GHz Trig: Free Run #Att: 30 dB Radio Std: None Radio Device: BTS Ref Offset 7.01 dB Ref 27.01 dBm Mkr3 2.455089 GHz -9.1817 dBm Center 2.437 GHz #Res BW 430 kHz #VBW 1.2 MHz Span 60 MHz Sweep 1 ms Occupied Bandwidth 36.187 MHz Total Power 12.4 dBm Transmit Freq Error -3.453 kHz OBW Power 99.00 % x dB Bandwidth 36.19 MHz x dB -6.00 dB
802.11n(HT40)/HCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq 2.452000000 GHz Center Freq: 2.452000000 GHz Trig: Free Run #Att: 30 dB Radio Std: None Radio Device: BTS Ref Offset 7.03 dB Ref 27.03 dBm Mkr3 2.470109 GHz -9.9403 dBm Center 2.452 GHz #Res BW 430 kHz #VBW 1.2 MHz Span 60 MHz Sweep 1 ms Occupied Bandwidth 36.141 MHz Total Power 11.9 dBm Transmit Freq Error 11.040 kHz OBW Power 99.00 % x dB Bandwidth 36.20 MHz x dB -6.00 dB

802.11ax(HE20)/LCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.412000000 GHz Ref Offset: 6.99 dB Ref: 26.99 dBm Mkr3: 2.420743 GHz -6.7403 dBm Center: 2.412 GHz #Res BW: 200 kHz #VBW: 620 kHz Span: 30 MHz Sweep: 1 ms Occupied Bandwidth: 17.665 MHz Total Power: 13.8 dBm Transmit Freq Error: 23.104 kHz OBW Power: 99.00 % x dB Bandwidth: 17.44 MHz x dB: -6.00 dB
802.11ax(HE20)/MCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.437000000 GHz Ref Offset: 7.01 dB Ref: 27.01 dBm Mkr3: 2.445881 GHz -9.2187 dBm Center: 2.437 GHz #Res BW: 200 kHz #VBW: 620 kHz Span: 30 MHz Sweep: 1 ms Occupied Bandwidth: 17.681 MHz Total Power: 13.4 dBm Transmit Freq Error: 16.719 kHz OBW Power: 99.00 % x dB Bandwidth: 17.73 MHz x dB: -6.00 dB
802.11ax(HE20)/HCH	 Agilent Spectrum Analyzer - Occupied BW Center Freq: 2.462000000 GHz Ref Offset: 7.04 dB Ref: 27.04 dBm Mkr3: 2.470857 GHz -9.7131 dBm Center: 2.462 GHz #Res BW: 200 kHz #VBW: 620 kHz Span: 30 MHz Sweep: 1 ms Occupied Bandwidth: 17.650 MHz Total Power: 12.4 dBm Transmit Freq Error: 13.408 kHz OBW Power: 99.00 % x dB Bandwidth: 17.69 MHz x dB: -6.00 dB

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

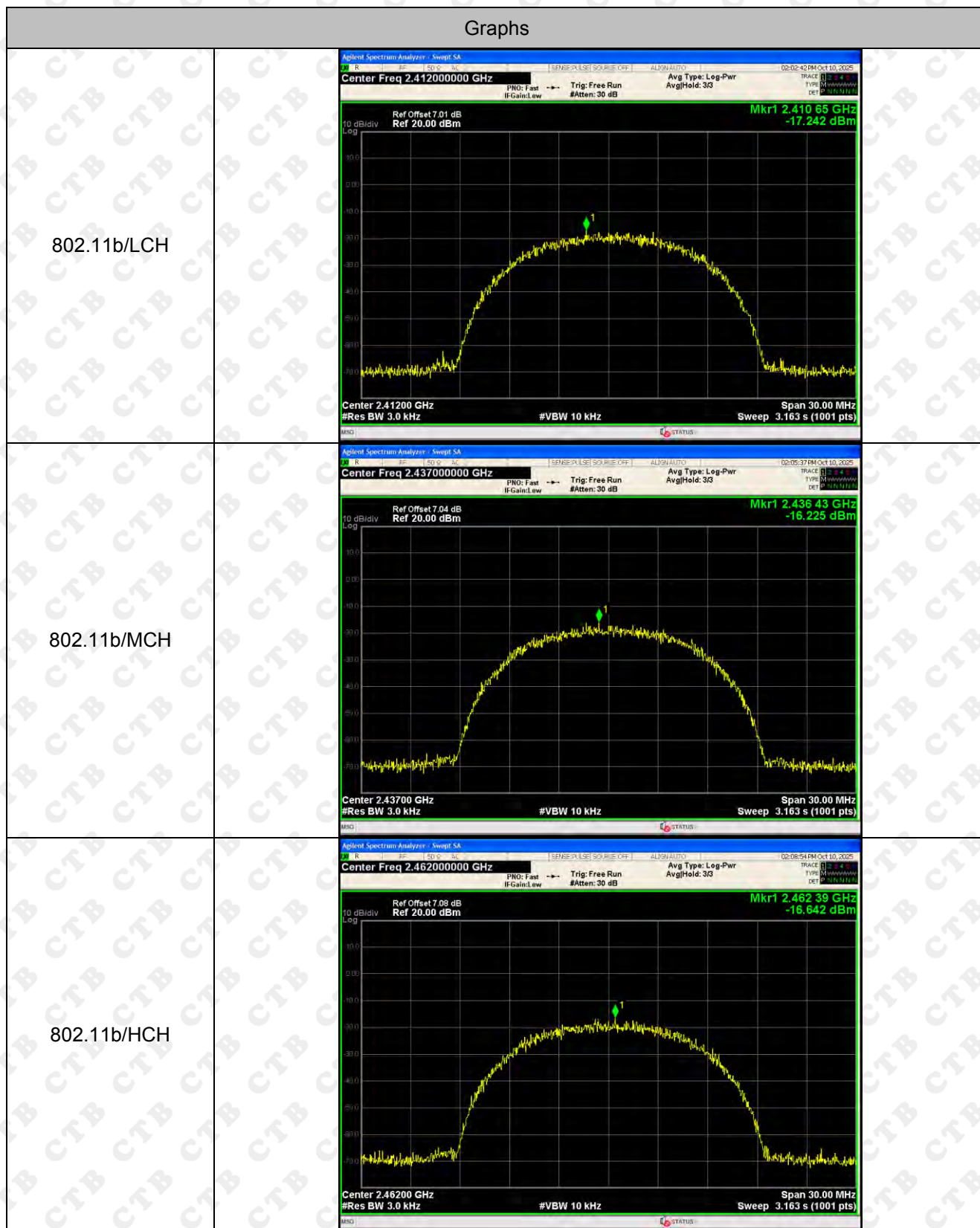
11.3 Test procedure

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	-17.242	8	PASS
	MCH	-16.225	8	PASS
	HCH	-16.642	8	PASS
802.11g	LCH	-20.735	8	PASS
	MCH	-20.54	8	PASS
	HCH	-20.671	8	PASS
802.11n(HT20)	LCH	-20.158	8	PASS
	MCH	-19.852	8	PASS
	HCH	-21.354	8	PASS
802.11n(HT40)	LCH	-21.553	8	PASS
	MCH	-21.33	8	PASS
	HCH	-23.284	8	PASS
802.11ax(HE20)	LCH	-20.98	8	PASS
	MCH	-20.352	8	PASS
	HCH	-19.325	8	PASS

Test Graph



802.11g/LCH

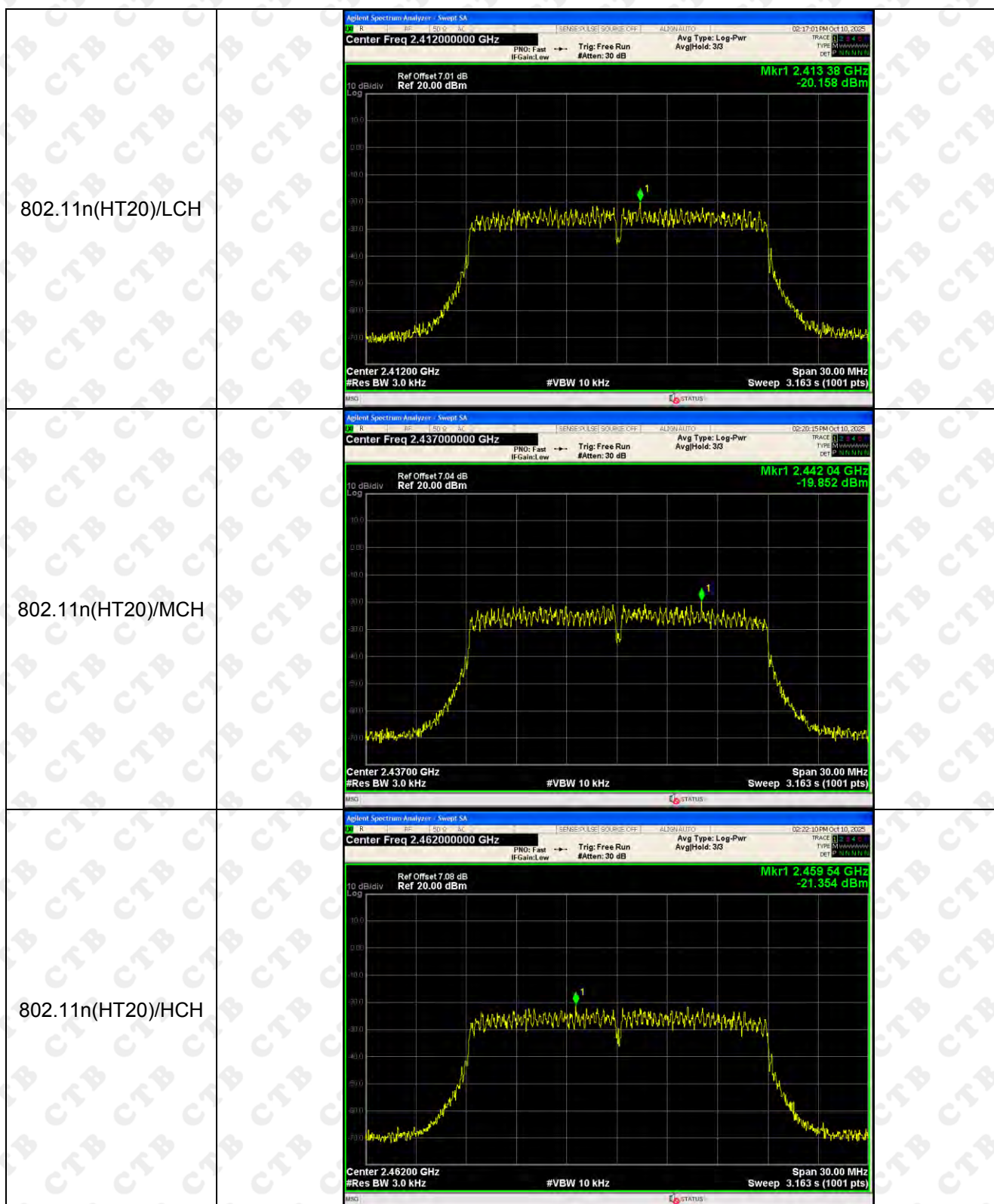


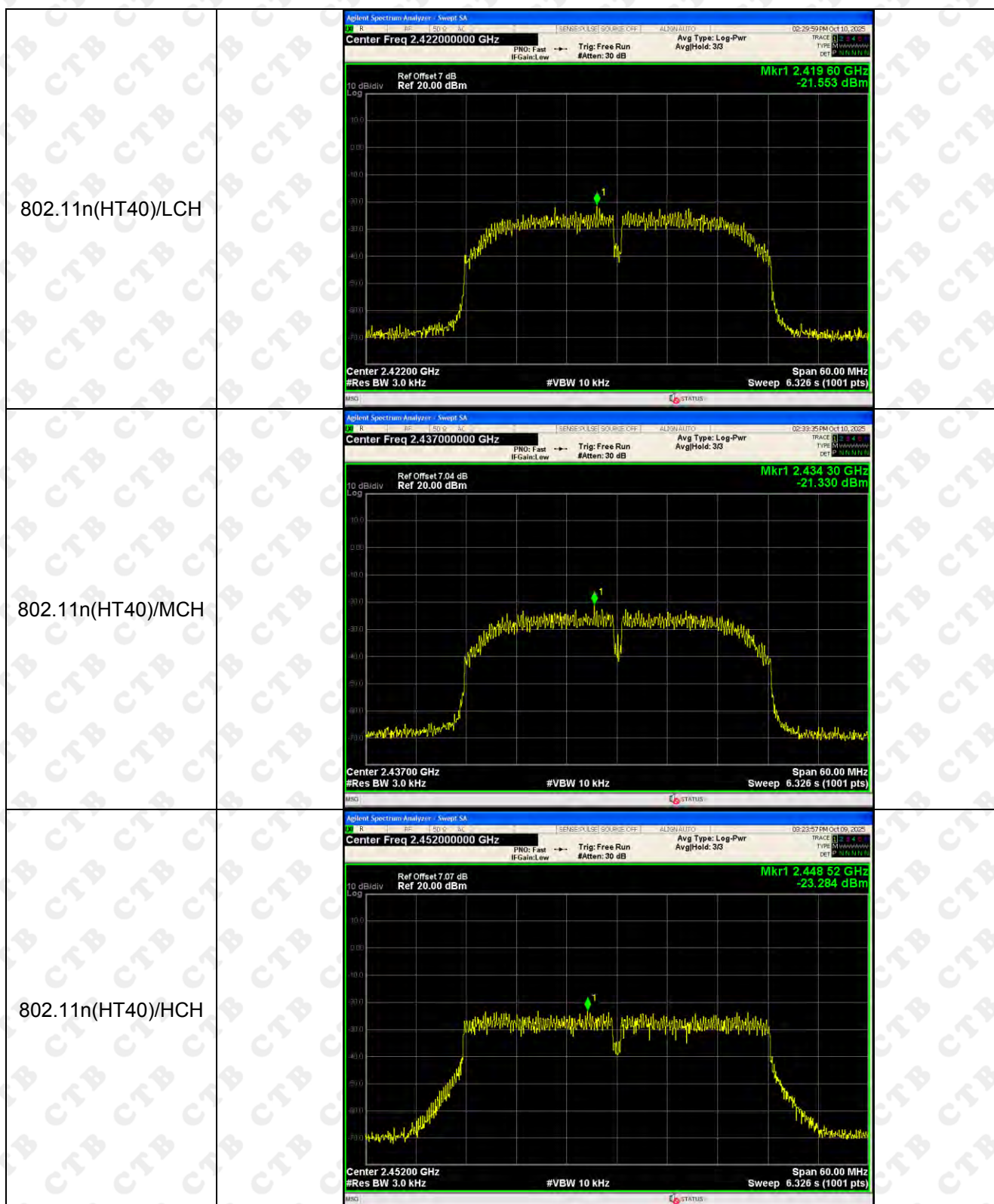
802.11g/MCH

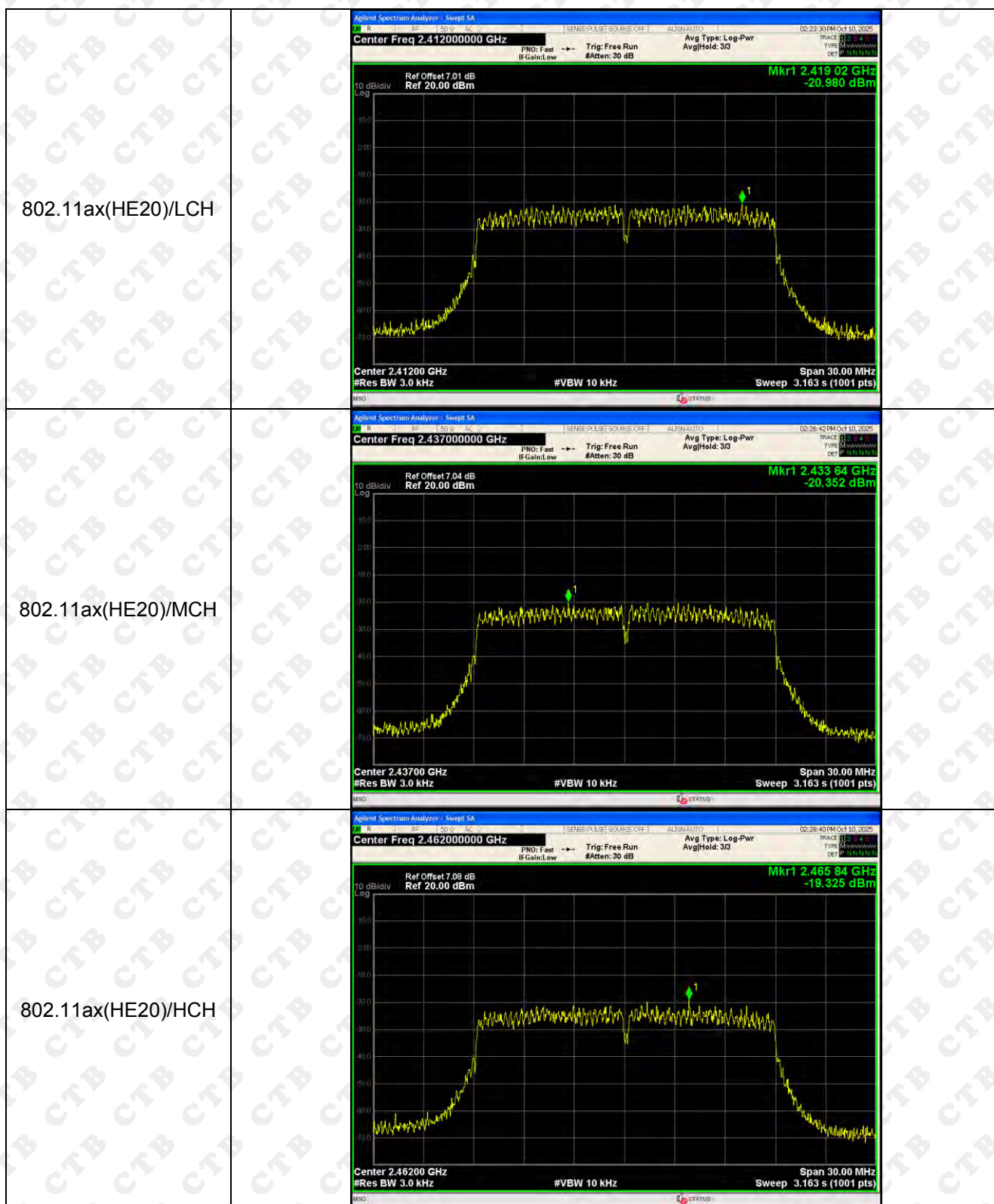


802.11g/HCH









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 PCB antenna and no consideration of replacement. The best case gain of the antenna is -4.18dBi.

13. EUT TEST SETUP PHOTOGRAPHS

Radiated Emissions

Below 1G



Above 1G



Conducted emission



RF Conducted



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