RADIO TEST REPORT

Product	:	Wireless Cable Gateway (Wi-Fi 6)
Model Name	:	CBV390S5-AX5700
Series Model	:	CBW390S5-AX5700
FCC ID	:	RK9-CBV390S5
Test Regulation	:	FCC 47 CFR Part 15 Subpart C (Section 15.247)
Received Date	:	2021/9/23
Test Date	:	2021/9/28 ~ 2021/11/3
Issued Date	:	2022/3/22
Applicant	:	CastleNet Technology Inc. No. 14, Ln. 141, Sec. 3, Beishen Rd., Shenkeng Dist., New Taipei City 22244, Taiwan (R.O.C.)
Issued By	:	Underwriters Laboratories Taiwan Co., Ltd. Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan

Testing Laboratory
3398

The results reported herein have been performed in accordance with the laboratory's terms of accreditation. This report shall not be reproduced except in full without the written approval of the Laboratory. The results in this report are responsible of the test sample(s) provided by the client only and are not to be used to indicate applicability to other similar products.

REVISION HISTORY

Original Test Report No.: 4790091528-US-R0-V0

Rev.	Test report No.	Date	Page revised	Contents
Original	4790091528-US-R0-V0	2022/3/22	-	Initial issue

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1. Attestation of Test Results

APPLICANT:	CastleNet Technology Inc. No. 14, Ln. 141, Sec. 3, Beishen Rd., Shenkeng Dist., New Taipei City 22244, Taiwan (R.O.C.)
MANUFACTURER:	CastleNet Technology Inc. No. 14, Ln. 141, Sec. 3, Beishen Rd., Shenkeng Dist., New Taipei City 22244, Taiwan (R.O.C.)
EUT DESCRIPTION:	Wireless Cable Gateway (Wi-Fi 6)
BRAND:	CastleNet Technology Inc.
MODEL:	CBV390S5-AX5700
SERIES MODEL:	CBW390S5-AX5700
SAMPLE STAGE:	Production Unit
DATE of TESTED:	2021/9/28 ~ 2021/11/3

APPLICABLE STANDARDS	
STANDARD	**Test Results**
FCC 47 CFR PART 15 Subpart C (Section 15.247)	PASS

Underwriters Laboratories Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Taiwan Co., Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Taiwan Co., Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Prepared By:

Sally Lu Date : 2022/3/22
Project Handler

Approved and Authorized By:

Waternil Guan Date : 2022/3/22
Engineer

2. Summary of Test Results

Summary of Test Results		
FCC Clause	**Test Items**	**Result**
15.247(a)(2)	6dB Bandwidth	PASS
15.247(b)	Conducted Output Power	PASS
15.247(e)	Power Spectral Density	PASS
15.247(d)	Antenna Port Emission	PASS
15.205 / 15.209 / 15.247(d)	Radiated Emissions and Band Edge Measurement	PASS
15.207	AC Power Conducted Emission	PASS
15.203	Antenna Requirement	PASS

3. Test Methodology and Reference Procedures

The tests documented in this report were performed in accordance with 47 CFR FCC Part 2, KDB558074 D01 Meas Guidance v05r02, KDB414788 D01 Radiated Test Site v01r01, ANSI C63.10-2013 and KDB 662911 D01 Multiple Transmitter Output v02r01.

4. Facilities and Accreditation

Test Location	Underwriters Laboratories Taiwan Co., Ltd.
Address	Building B and Building E, No. 372-7, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County, Taiwan
Accreditation Certificate	Underwriters Laboratories Taiwan Co., Ltd. is accredited by TAF, Laboratory Code 3398.

5. Measurement Uncertainty

For statement of conformity, accuracy method (Section 8.2.4 and 8.2.5 of ISO Guide 98-4) was applied as decision rule for measurement in this test report.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor k=2.

Measurement	Frequency	Uncertainty
Conducted disturbance at mains terminals ports	150kHz ~ 30MHz	±3.1 dB
RF Conducted	9 kHz - 40GHz	±1.9 dB
Radiated disturbance below 30MHz	9 kHz - 30 MHz	±1.9 dB
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	±5.4 dB
Radiated disturbance above 1 GHz	1GHz ~ 40GHz	±4.7 dB

6. Equipment under Test

6.1. Description of EUT

Product	Wireless Cable Gateway (Wi-Fi 6)
Brand Name	CastleNet Technology Inc.
Model Name	CBV390S5-AX5700
Series Model	CBW390S5-AX5700
Operating Frequency	2412MHz ~ 2462MHz
Modulation	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM 1024QAM, 256QAM, 64QAM, 16QAM, QPSK, BPSK for OFDMA
Transfer Rate	802.11b: up to 11 Mbps 802.11g: up to 54 Mbps 802.11n: up to MCS23 802.11ac: up to MCS9 802.11ax: up to MCS11
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20) 7 for 802.11n (HT40), 802.11ac (VHT40) ,802.11ax (HE40)
Maximum Output Power	**Non-Beamforming mode:** 802.11b: 28.17 dBm 802.11g: 29.28 dBm 802.11ax (HE20): 29.62 dBm 802.11ax (HE40): 29.54 dBm **Beamforming mode:** 802.11ax (HE20): 27.63 dBm 802.11ax (HE40): 27.58 dBm
Normal Voltage	12Vdc from adapter
S/N	3PD5X57000056
Sample ID	4249937
Software Version	0001_21131.M.001

Note:

1. The models difference table as below:

Model	Function				
	2.5G port	1G port	USB port	TEL port	ON/OFF switch
CBV390S5-AX5700	v	v	v	v	v
CBW390S5-AX5700	v	v	-	-	-

2. The EUT incorporates a MIMO function. Physically, the EUT provides three completed transmitters and three receivers.

Modulation Mode	Tx,Rx Function
802.11b	3TX,3RX
802.11g	3TX,3RX
802.11n (HT20)	3TX,3RX
802.11n (HT40)	3TX,3RX
802.11ac (VHT20)	3TX,3RX
802.11ac (VHT40)	3TX,3RX
802.11ax (HE20)	3TX,3RX
802.11ax (HE40)	3TX,3RX

* The modulation and bandwidth are similar for 802.11n mode for HT20 / HT40 and 802.11ac mode for VHT20 / VHT40 and 802.11ax mode for HE20 / HE40, therefore investigated worst case to representative mode in test report.

3. The EUT contains following accessory devices:

Product	Brand	Model	Description
AC adapter	MOSO	MSS-V3500WR120-042A0-US	Input: 100-240V 50-60Hz Output: 12.0V 3.5A Length: 1.5m
Lan Cable (Generic)	EKSON	JY01-C066	Length: 1.0m non-shielded cable Color: Gray
Lan Cable (Home+)	EKSON	PF01-C110	Length: 1.0m non-shielded cable Color: Yellow

4. The above EUT information is declared by manufacturer and for more detailed features description, please refer the manufacturer's or user's manual.

6.2. Channel List

11 channels are provided for 802.11b, 802.11g, 802.11n (HT20), 802.11ac (VHT20), 802.11ax (HE20):

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

7 channels are provided for 802.11n (HT40), 802.11ac (VHT40), 802.11ax (HE40):

Channel	Frequency (MHz)	Channel	Frequency (MHz)
3	2422	7	2442
4	2427	8	2447
5	2432	9	2452
6	2437	-	-

6.3. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	20~26℃/ 62~68%RH	120Vac/ 60Hz	2021/09/28~ 2021/10/21	Wayne Chen
Radiated Spurious Emission	966-2	20~26℃/ 62~68%RH	120Vac/ 60Hz	2021/09/28~ 2021/11/3	Wayne Chen
AC power Line Conducted Emission	SR1	20~26℃/ 62~68%RH	120Vac/ 60Hz	2021/09/28~ 2021/10/21	Wayne Chen

FCC Test Firm Registration Number: 498077

6.4. Description of Available Antennas

Ant. No.	Transmitter Circuit	Brand Name	Model Name	Ant. Type	Maximum Gain (dBi)
1	Chain (0)	Taiwan Anjie	AJDP1J-C0050	Dipole	2.4GHz: 3.22 5GHz: 4.68
2	Chain (1)	Taiwan Anjie	AJDP1J-R0003	Dipole	2.4GHz: 3.30 5GHz: 4.23
3	Chain (2)	Taiwan Anjie	AJDP1J-W0059	Dipole	2.4GHz: 3.64 5GHz: 5.01
4	Chain (3)	Taiwan Anjie	AJWP1J-B0017	Dipole	5GHz: 5.32

Note: The above antenna information was provided from customer and for more detailed features description, please refer the manufacturer's specification or user's manual.

6.5. Test Mode Applicability and Tested Channel Detail

- For AC power line conducted emissions, the pre-scan has been determined by AC power 120Vac/60Hz (worst case).
- The fundamental of the EUT was investigated in three orthogonal axes X-Y/Y-Z/X-Z, it was determined that Y-Z plane was worst-case. Therefore, all final radiated testing was performed with the EUT in Y-Z plane.
- For Antenna Port Conducted Measurement, this item includes all test value of each mode, but only includes spectrum plot of worst value of each mode.
- For below 30MHz testing, investigation was done on three antenna orientations (parallel, perpendicular, and ground-parallel), parallel and perpendicular are the worst orientations, therefore testing was performed on these two orientations only.
- For below 1 GHz radiated emission and AC power line conducted emission have performed all modes of operation were investigated and the worst-case emissions are reported.
- Pre-Scan has been conducted to determine the worst-case mode from all possible combinations between available modulations, data rates and antenna ports (if EUT with antenna diversity architecture).

Non-Beamforming mode:

Test Item	Mode	Modulation Technology	Modulation Type	Available Channel	Test Channel	Data Rate
Radiated Emissions (Above 1GHz)	802.11b	DSSS	DBPSK	1 to 11	1,6,11	1 Mbps
	802.11g	OFDM	BPSK	1 to 11	1,6,11	6 Mbps
	802.11ax20	OFDMA	BPSK	1 to 11	1,6,11	HE0
	802.11ax40	OFDMA	BPSK	3 to 9	3,6,9	HE0
Radiated Emissions (Below 1GHz)	802.11g	OFDM	BPSK	1 to 11	6	6 Mbps
AC Power Line Conducted Emission	802.11g	OFDM	BPSK	1 to 11	6	6 Mbps
Antenna Port Conducted Measurement	802.11b	DSSS	DBPSK	1 to 11	1,6,11	1 Mbps
	802.11g	OFDM	BPSK	1 to 11	1,6,11	6 Mbps
	802.11ax20	OFDMA	BPSK	1 to 11	1,6,11	HE0
	802.11ax40	OFDMA	BPSK	3 to 9	3,6,9	HE0

Beamforming mode:

Test Item	Mode	Modulation Technology	Modulation Type	Available Channel	Test Channel	Data Rate
*Antenna Port Conducted Measurement	802.11ax20	OFDMA	BPSK	1 to 11	1,6,11	HE0
	802.11ax40	OFDMA	BPSK	3 to 9	3,6,9	HE0

*Note: The worse spurious emissions test and maximum output power was found in Non-Beamforming mode. Therefore Beamforming mode only the test data of the RF output power were recorded in this report.

Simultaneously transmission condition:

Condition	Technology	
1	WLAN (2.4GHz)	WLAN (5GHz)

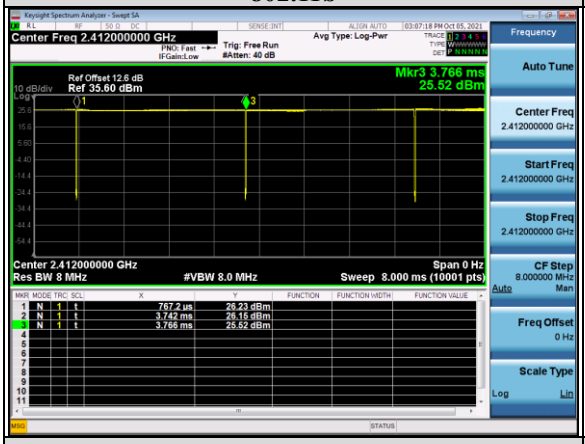
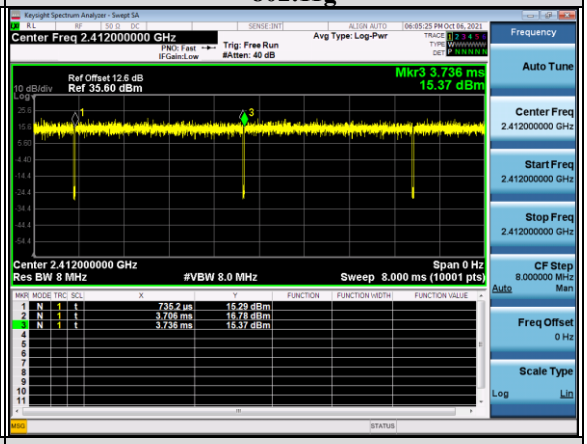
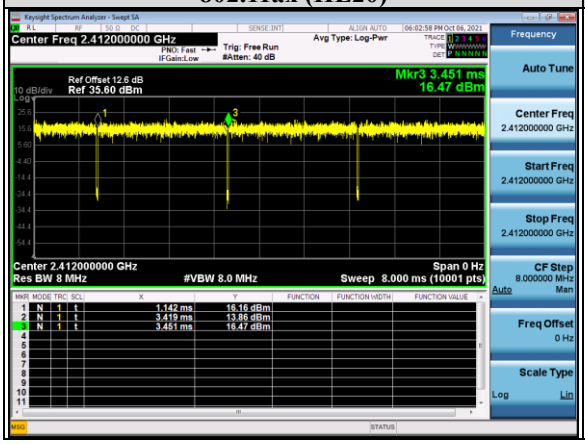
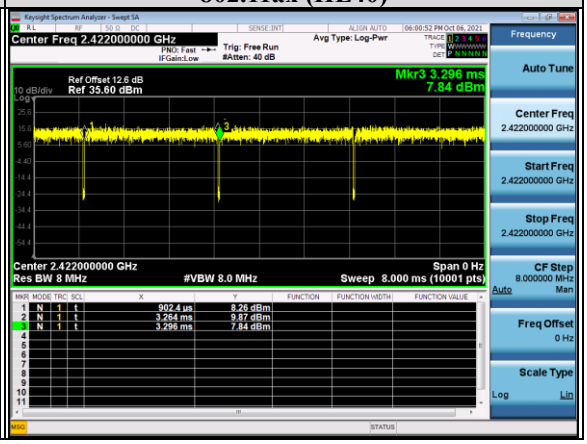
6.6. Duty cycle

802.11b: Duty cycle = 2.9748/2.9988 = 0.992, duty cycle of test signal is ≥ 98 %, duty factor is not required.

802.11g: Duty cycle = 2.9708/3.0008 = 0.99, duty cycle of test signal is ≥ 98 %, duty factor is not required.

802.11ax(HE20): Duty cycle = 2.277/2.309 = 0.986, duty cycle of test signal is ≥ 98 %, duty factor is not required.

802.11ax(HE40): Duty cycle = 2.3616/2.3936 = 0.987, duty cycle of test signal is ≥ 98 %, duty factor is not required.

802.11b	802.11g
	
802.11ax (HE20)	**802.11ax (HE40)**
	

7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	2020/11/11	2021/11/10
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	2020/12/11	2021/12/10
Loop Antenna	ETS lindgren	6502	00213440	2020/12/25	2021/12/24
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	2021/1/13	2022/1/12
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	2020/12/30	2021/12/29
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	2020/12/30	2021/12/29
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	2021/6/8	2022/6/7
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	2021/2/3	2022/2/2
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	2021/5/19	2022/5/18
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	2021/1/22	2022/1/21
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	2021/1/22	2022/1/21

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Expired date**
Antenna Port Conducted Measurement					
Spectrum Analyzer	Keysight	N9010A	MY56070834	2020/11/6	2021/11/5
Pulse Power Sensor	Anritsu	MA2411B	1531202	2020/12/21	2021/12/20
Power Meter	Anritsu	ML2495A	1645002	2020/12/21	2021/12/20
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	2020/11/17	2021/11/16
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	2021/8/30	2022/8/29
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	2021/8/26	2022/8/25
Cables	TITAN	CFD200	T0732ACFD20 020A300-1	2021/3/2	2022/3/1

UL Software		
Description	**Name**	**Version**
Radiated measurement	e3	6.191211 (V6)
Conducted measurement	RF Conducted Test Tools	ver 2.4.0.620b
AC power Line Conducted Emission	EZ_EMC	UL-3A1.2

8. Description of Test Setup

Support Equipment

ID	Equipment	Brand Name	Model Name	S/N	Remark
A	Laptop	DELL	Latitude E5470	CXSKWF2	Provide by lab
B	Adapter	Moso	MSS-V3500WR120-042A0-US	N/A	Provide by Client
C	USB	Transcend	JetFlash 700	N/A	Provide by lab
D	Laptop	DELL	Latitude E5470	5M2MWF2	Provide by lab
E	Hub	D-Link	DES-1005A	TES1005AL	Provide by lab
F	Phone	SAMPO	HT-B1003L	993706277	Provide by lab
G	Phone	SAMPO	HT-B1003L	993706278	Provide by lab

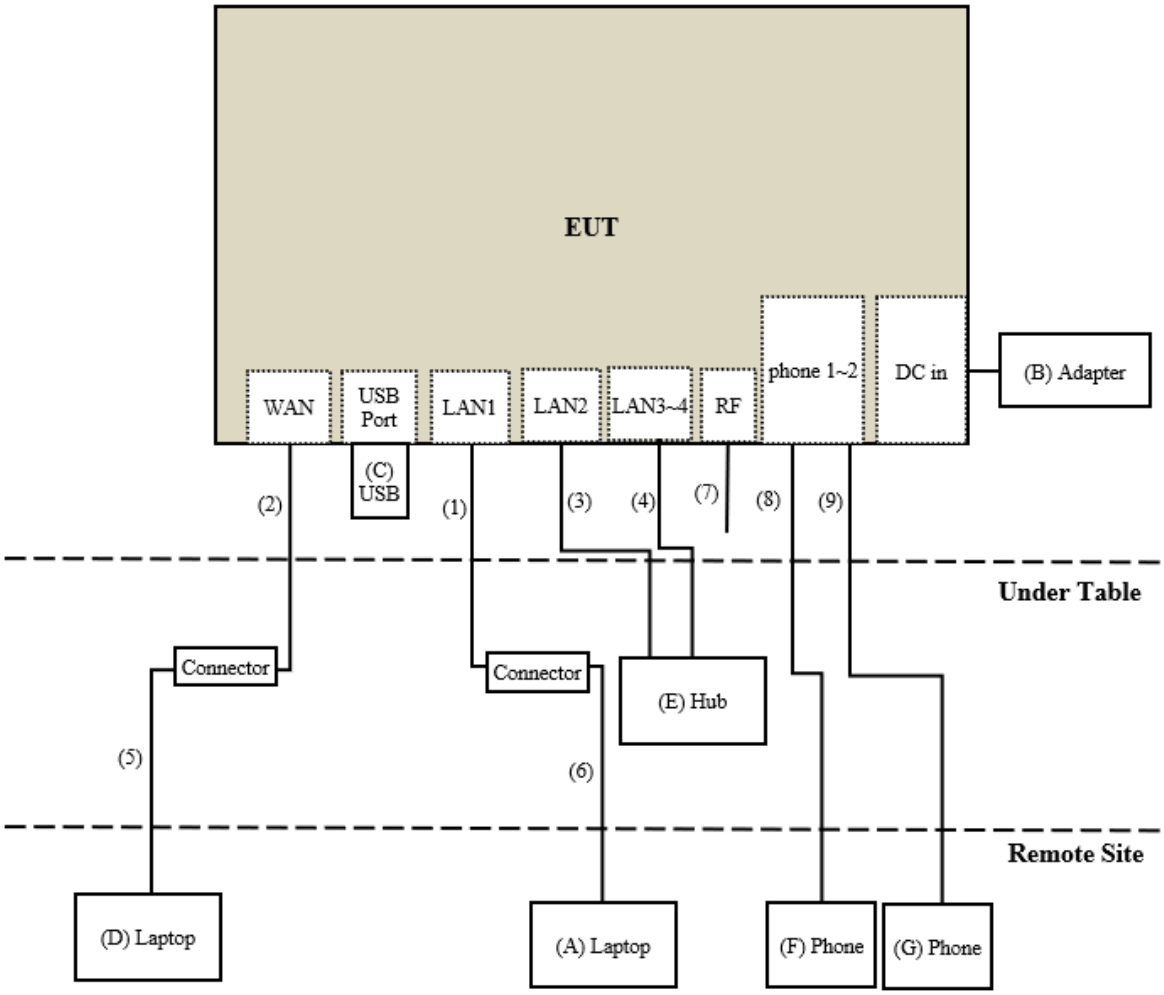
I/O Cables

ID	Equipment	Brand Name	Model Name	Length (m)	Remark
1	Lan Cable (Home+)	EKSON	PF01-C110	1	Provide by Client
2	RJ-45 Cable	OEM/AngNet	UTP	2	Provide by lab
3	Lan Cable (Generic)	EKSON	JY01-C066	1	Provide by Client
4	RJ-45 Cable	OEM/AngNet	UTP	2	Number x 2 Provide by lab
5	RJ-45 Cable	Fastlink	FL-61STU-04	10	Provide by lab
6	RJ-45 Cable	Fastlink	FL-61STU-04	10	Provide by lab
7	Coaxial Cable	COMMSCOP	5781	2.5	Provide by Client
8	RJ-11 Cable	Tupavco	PW01	10	Provide by lab
9	RJ-11 Cable	Tupavco	PW01	10	Provide by lab

Test Setup

Controlled using a bespoke application (accessMtool v3.1.0.1) on a test Notebook. The application was used to enable a continuous transmission mode and to select the test channels, data rates, modulation schemes and power setting as required.

Setup Diagram for Test



9. Test Results

9.1. 6dB Bandwidth

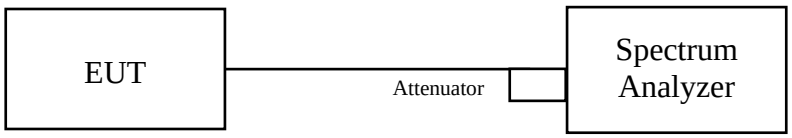
Requirements

The minimum 6 dB bandwidth shall be at least 500 kHz.

Test procedure

a. Set resolution bandwidth (RBW) = 100kHz.
b. Set the video bandwidth (VBW) ≥ 3 x RBW, Detector = Peak.
c. Trace mode = max hold.
d. Sweep = auto couple.
e. Measure the maximum width of the emission that is constrained by the frequencies associated with the two amplitude points (upper and lower) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

802.11b

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	7.53	7.07	7.08	0.5	PASS
6	2437	7.07	7.08	7.06	0.5	PASS
11	2462	7.55	7.08	7.08	0.5	PASS

802.11g

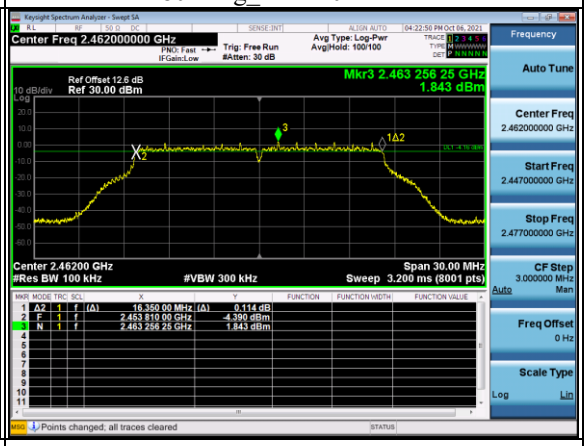
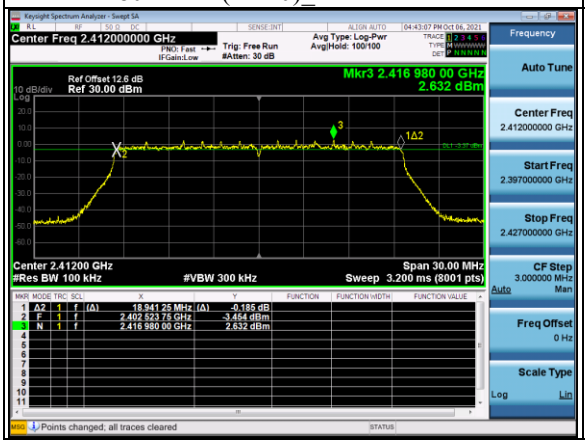
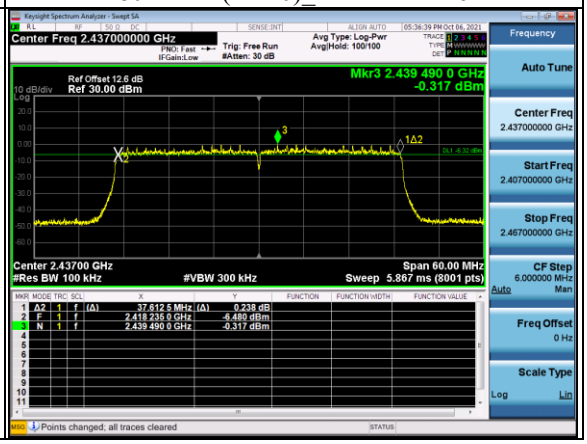
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	16.37	16.39	16.44	0.5	PASS
6	2437	16.38	16.39	16.40	0.5	PASS
11	2462	16.35	16.41	16.40	0.5	PASS

802.11ax (HE20)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
1	2412	19.00	18.96	18.94	0.5	PASS
6	2437	19.01	18.98	18.95	0.5	PASS
11	2462	19.02	19.00	18.97	0.5	PASS

802.11ax (HE40)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)			Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1	Chain 2		
3	2422	37.72	37.66	37.66	0.5	PASS
6	2437	37.71	37.66	37.61	0.5	PASS
9	2452	37.73	37.62	37.70	0.5	PASS

Spectrum Plot of Worst Value	
802.11b_Chain 2 / CH6	802.11g_Chain 0 / CH11
	
802.11ax (HE20)_Chain 2 / CH1	802.11ax (HE40)_Chain 2 / CH6
	

9.2. Conducted Output Power

Requirements

For systems using digital modulation in the 2400-2483.5 MHz bands: 1 Watt.

Note:
1. Directional Gain = 10 log[($10^{G1/20}$ + $10^{G2/20}$ +...+$10^{Gn/20}$)^2 / Nant] dBi.

   N*a*nt: Number of Transmit Antennas
   G1, G2,..., Gn: Gain of Individual Antennas

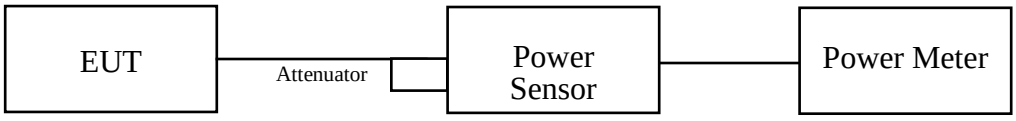
2. Per KDB 662911 Method of conducted output power measurement on IEEE 802.11 devices,

   Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
   Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
   Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

Test Procedure

A peak power sensor was used on the output port of the EUT. A power meter was used to read the response of the peak power sensor. Record the power level.

Test Setup



The loss between RF output port of the EUT and the input port of the Power Meter has been taken into consideration.

Test Data

Non-Beamforming mode

Peak Power

802.11b

Channel	Frequency (MHz)	Peak Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	23.44	23.84	22.86	656.145	28.17	30	PASS
6	2437	23.53	23.51	22.78	639.735	28.06	30	PASS
11	2462	23.38	23.62	22.50	625.173	27.96	30	PASS

802.11g

Channel	Frequency (MHz)	Peak Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	24.83	24.37	24.31	847.227	29.28	30	PASS
6	2437	24.53	24.39	24.25	824.138	29.16	30	PASS
11	2462	24.30	24.34	24.22	805.378	29.06	30	PASS

802.11ax (HE20)

Channel	Frequency (MHz)	Peak Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	24.86	25.04	24.65	916.22	29.62	30	PASS
6	2437	24.89	24.85	24.50	895.365	29.52	30	PASS
11	2462	24.60	24.82	24.46	870.964	29.40	30	PASS

802.11ax (HE40)

Channel	Frequency (MHz)	Peak Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	24.94	24.81	24.55	899.498	29.54	30	PASS
6	2437	24.82	24.93	24.53	897.429	29.53	30	PASS
9	2452	24.87	24.85	24.53	895.365	29.52	30	PASS

Average Power (Reference Only)

802.11b

Channel	Frequency (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1	Chain 2		
1	2412	20.21	20.64	19.67	313.329	24.96
6	2437	20.37	20.36	19.59	308.319	24.89
11	2462	20.18	20.41	19.31	299.226	24.76

802.11g

Channel	Frequency (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1	Chain 2		
1	2412	13.82	13.52	13.42	68.549	18.36
6	2437	13.72	13.52	13.38	67.764	18.31
11	2462	13.56	13.44	13.23	65.766	18.18

802.11ax (HE20)

Channel	Frequency (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1	Chain 2		
1	2412	14.93	15.04	14.63	92.045	19.64
6	2437	14.95	14.91	14.50	90.365	19.56
11	2462	14.73	14.87	14.39	87.902	19.44

802.11ax (HE40)

Channel	Frequency (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1	Chain 2		
3	2422	14.99	14.81	14.47	89.743	19.53
6	2437	14.85	14.92	14.46	89.536	19.52
9	2452	14.91	14.90	14.46	89.743	19.53

Beamforming mode

Peak Power

802.11ax (HE20)

Channel	Frequency (MHz)	Peak Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
1	2412	22.75	22.91	22.60	566.239	27.53	27.84	PASS
6	2437	23.04	22.91	22.60	579.429	27.63	27.84	PASS
11	2462	22.72	22.95	22.36	555.904	27.45	27.84	PASS

802.11ax (HE40)

Channel	Frequency (MHz)	Peak Power (dBm)			Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1	Chain 2				
3	2422	23.02	22.82	22.56	572.796	27.58	27.84	PASS
6	2437	22.75	22.94	22.45	561.048	27.49	27.84	PASS
9	2452	22.98	22.77	22.52	566.239	27.53	27.84	PASS

Average Power (Reference Only)

802.11ax (HE20)

Channel	Frequency (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1	Chain 2		
1	2412	14.05	14.03	13.70	74.131	18.70
6	2437	14.08	13.96	13.59	73.282	18.65
11	2462	13.83	13.98	13.27	70.469	18.48

802.11ax (HE40)

Channel	Frequency (MHz)	Average Power (dBm)			Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1	Chain 2		
3	2422	13.99	13.70	13.60	71.45	18.54
6	2437	13.97	13.86	13.33	70.795	18.50
9	2452	14.05	13.95	13.38	71.945	18.57

9.3. Power Spectral Density

Requirements

The Maximum of Power Spectral Density Measurement is 8dBm in any 3 kHz (If G_{TX} > 6 dBi, then PSD = 8 – (G_{TX} – 6)).

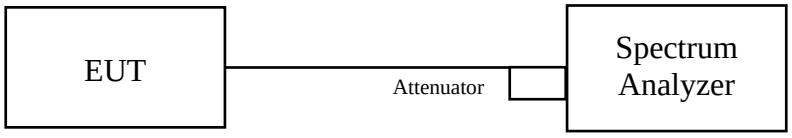
Note:
1. PSD = power spectral density that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And power spectral density in dBm/MHz.
2. G_{TX} = the maximum transmitting antenna directional gain in dBi.
3. Directional Gain = 10 log[($10^{G1/20}$ + $10^{G2/20}$ +...+$10^{Gn/20}$)^2 / Nant] dBi.

   Nant: Number of Transmit Antennas
   G1, G2,..., Gn: Gain of Individual Antennas

Test procedure

a. Set analyzer center frequency to DTS channel center frequency.
b. Set the span to 1.5 times the DTS bandwidth.
c. Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz.
d. Set the VBW ≥ 3 × RBW.
e. Detector = peak.
f. Sweep time = auto couple.
g. Trace mode = max hold.
h. Allow trace to fully stabilize.
i. Use the peak marker function to determine the maximum amplitude level within the RBW.

Test Setup



The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

802.11b

TX Chain	Channel	Frequency (MHz)	PSD (dBm/3 kHz)	10 log (N=3) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	0.52	4.77	5.29	5.84	PASS
	6	2437	0.56	4.77	5.34	5.84	PASS
	11	2462	0.48	4.77	5.25	5.84	PASS
1	1	2412	0.55	4.77	5.32	5.84	PASS
	6	2437	0.50	4.77	5.27	5.84	PASS
	11	2462	0.56	4.77	5.33	5.84	PASS
2	1	2412	0.52	4.77	5.29	5.84	PASS
	6	2437	0.54	4.77	5.31	5.84	PASS
	11	2462	0.49	4.77	5.26	5.84	PASS

NOTE: Directional gain = 8.16 dBi > 6 dBi , so the limit shall be reduced.

802.11g

TX Chain	Channel	Frequency (MHz)	PSD (dBm/3 kHz)	10 log (N=3) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-11.84	4.77	-7.07	5.84	PASS
	6	2437	-12.44	4.77	-7.67	5.84	PASS
	11	2462	-12.76	4.77	-7.98	5.84	PASS
1	1	2412	-12.27	4.77	-7.49	5.84	PASS
	6	2437	-12.23	4.77	-7.45	5.84	PASS
	11	2462	-12.23	4.77	-7.46	5.84	PASS
2	1	2412	-11.49	4.77	-6.72	5.84	PASS
	6	2437	-12.48	4.77	-7.71	5.84	PASS
	11	2462	-11.51	4.77	-6.74	5.84	PASS

NOTE: Directional gain = 8.16 dBi > 6 dBi , so the limit shall be reduced.

802.11ax (HE20)

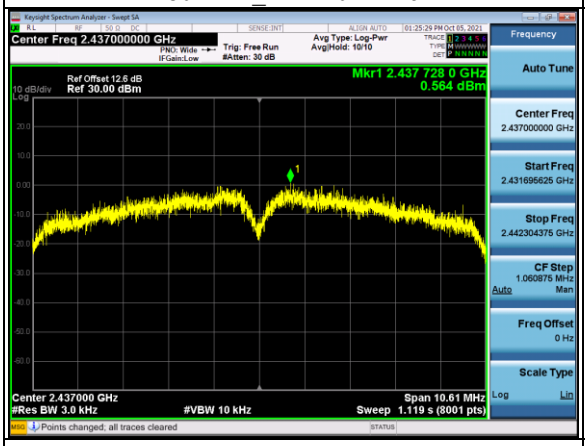
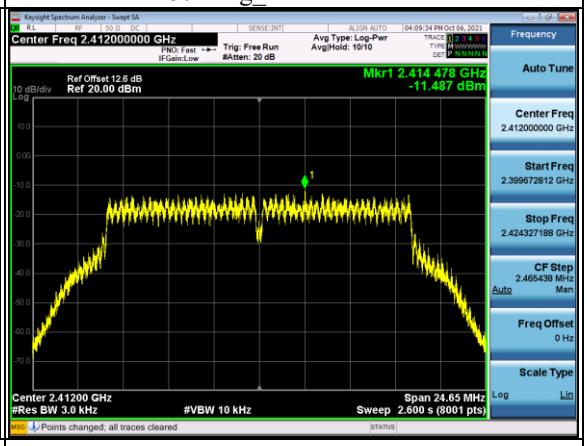
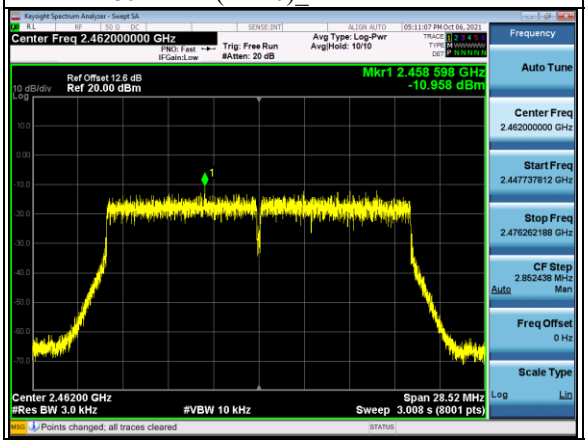
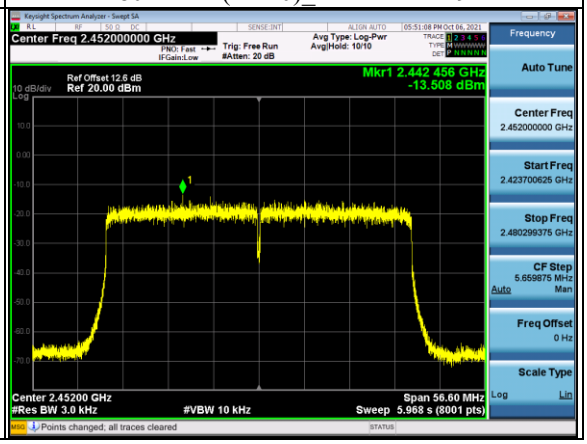
TX Chain	Channel	Frequency (MHz)	PSD (dBm/3 kHz)	10 log (N=3) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-11.61	4.77	-6.84	5.84	PASS
	6	2437	-11.26	4.77	-6.49	5.84	PASS
	11	2462	-11.74	4.77	-6.97	5.84	PASS
1	1	2412	-11.55	4.77	-6.78	5.84	PASS
	6	2437	-11.80	4.77	-7.03	5.84	PASS
	11	2462	-10.96	4.77	-6.19	5.84	PASS
2	1	2412	-11.84	4.77	-7.07	5.84	PASS
	6	2437	-11.59	4.77	-6.81	5.84	PASS
	11	2462	-11.65	4.77	-6.87	5.84	PASS

NOTE: Directional gain = 8.16 dBi > 6 dBi , so the limit shall be reduced.

802.11ax (HE40)

TX Chain	Channel	Frequency (MHz)	PSD (dBm/3 kHz)	10 log (N=3) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	3	2422	-13.69	4.77	-8.92	5.84	PASS
	6	2437	-14.10	4.77	-9.32	5.84	PASS
	9	2452	-13.71	4.77	-8.94	5.84	PASS
1	3	2422	-13.52	4.77	-8.75	5.84	PASS
	6	2437	-13.76	4.77	-8.98	5.84	PASS
	9	2452	-13.51	4.77	-8.74	5.84	PASS
2	3	2422	-15.08	4.77	-10.31	5.84	PASS
	6	2437	-14.52	4.77	-9.75	5.84	PASS
	9	2452	-14.97	4.77	-10.20	5.84	PASS

NOTE: Directional gain = 8.16 dBi > 6 dBi , so the limit shall be reduced.

Spectrum Plot of Worst Value	
802.11b_Chain 0 / CH6	802.11g_Chain 2 / CH1
	
802.11ax (HE20)_Chain 1 / CH11	802.11ax (HE40)_Chain 1 / CH9
	

9.4. Conducted Out of Band Emission

Requirements

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.

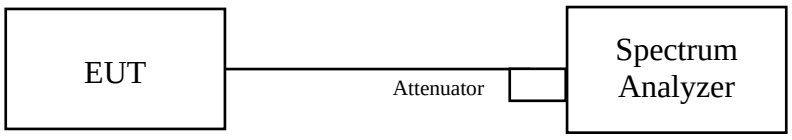
Test procedure

Measurement Procedure REF

1. Set the RBW = 100 kHz.
2. Set the VBW ≥ 300 kHz.
3. Set the span to 1.5 times the DTS bandwidth.
4. Detector = peak.
5. Sweep time = auto couple.
6. Trace mode = max hold.
7. Allow trace to fully stabilize.
8. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Measurement Procedure OOBE
1. Set RBW = 100 kHz.
2. Set VBW ≥ 300 kHz.
3. Detector = peak.
4. Sweep = auto couple.
5. Trace Mode = max hold.
6. Allow trace to fully stabilize.
7. Use the peak marker function to determine the maximum amplitude level.

Test Setup



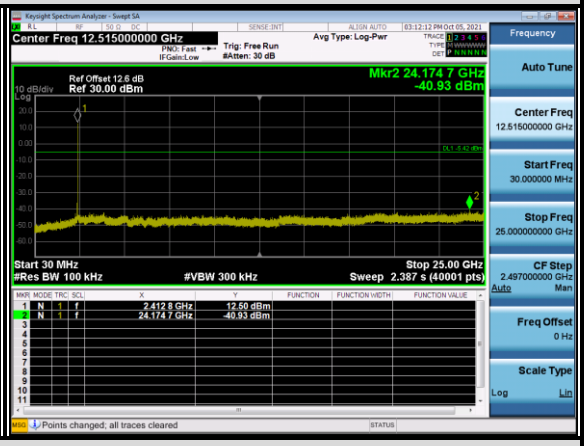
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

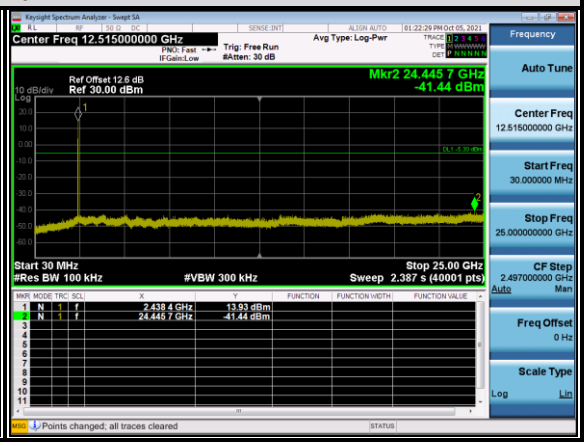
802.11b

Chain 0

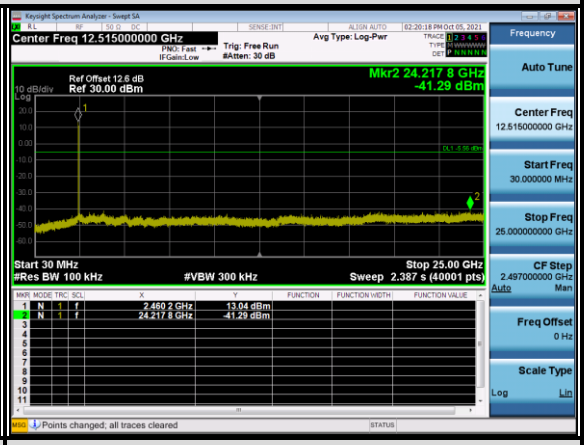
Ch 1



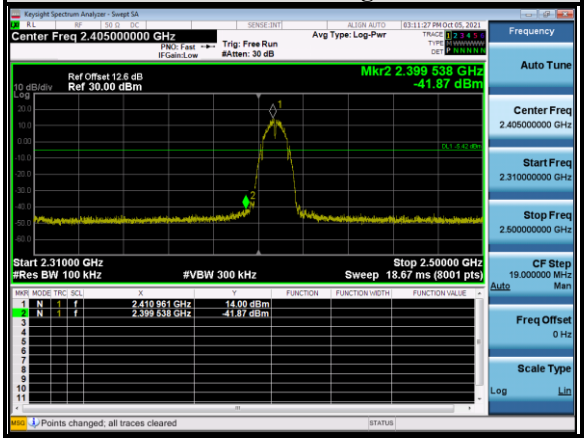
Ch 6



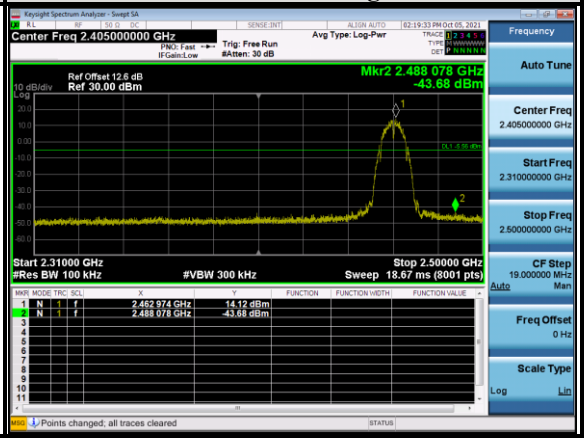
Ch 11



Ch 1 Band Edge

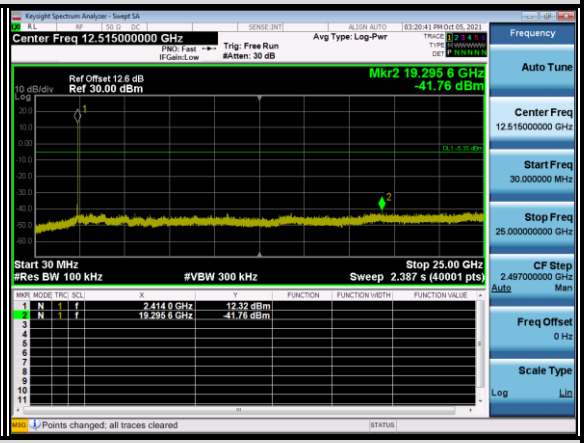


Ch 11 Band Edge

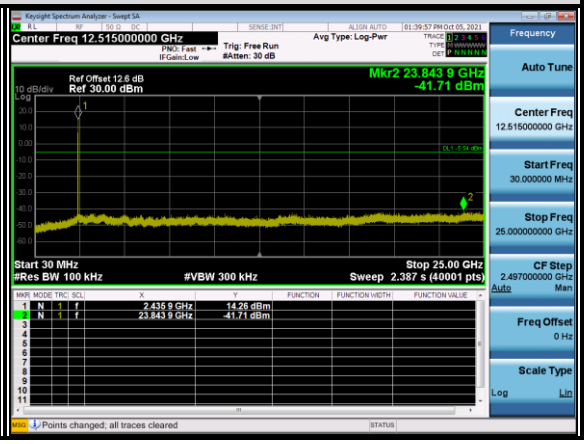


Chain 1

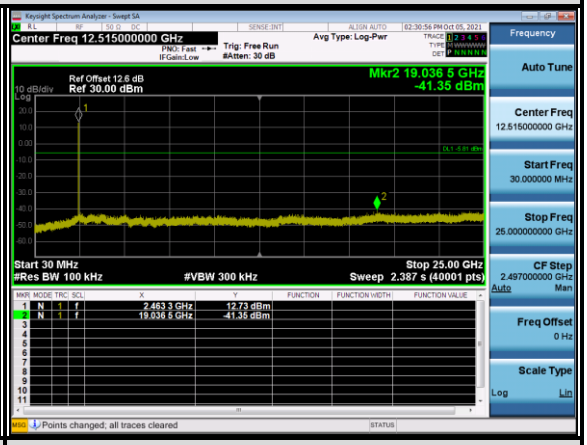
Ch 1



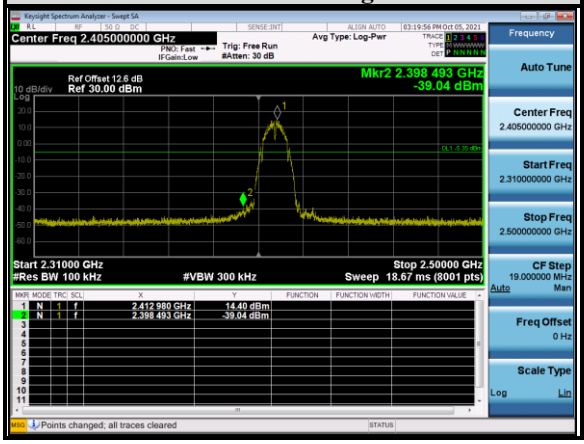
Ch 6



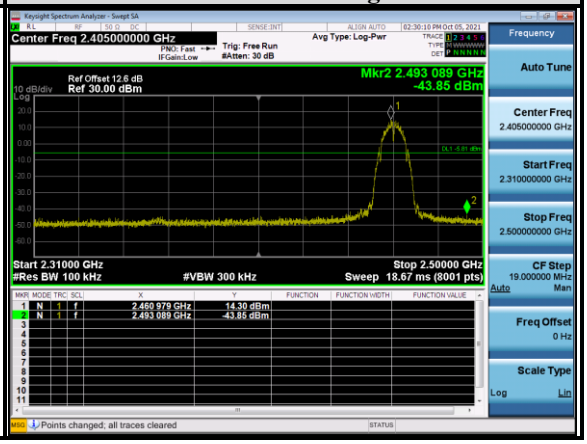
Ch 11



Ch 1 Band Edge

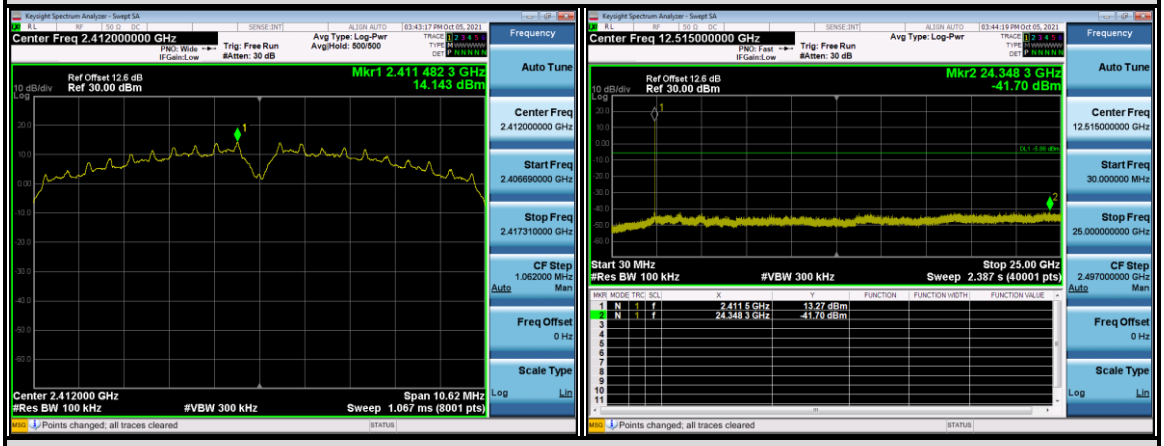


Ch 11 Band Edge

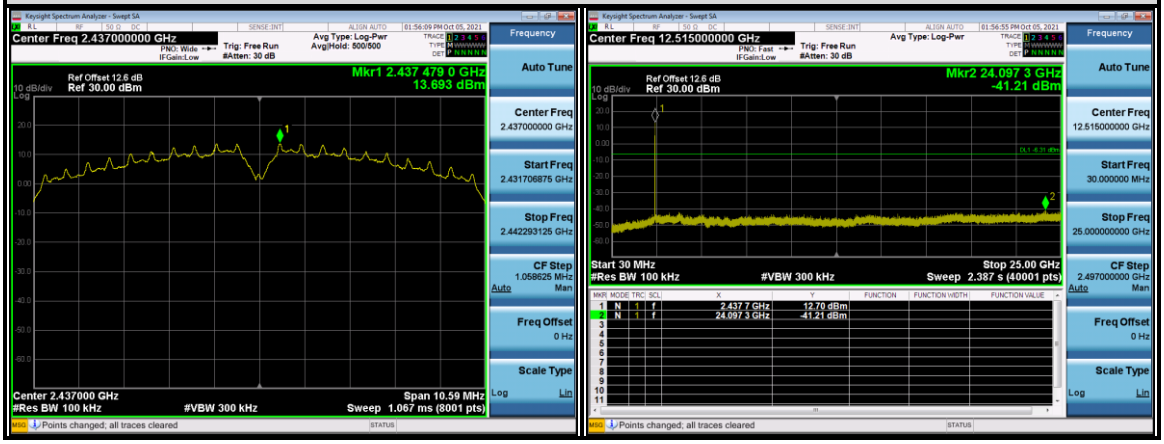


Chain 2

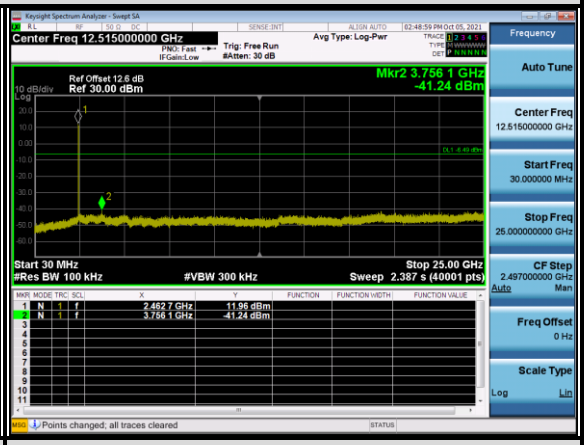
Ch 1



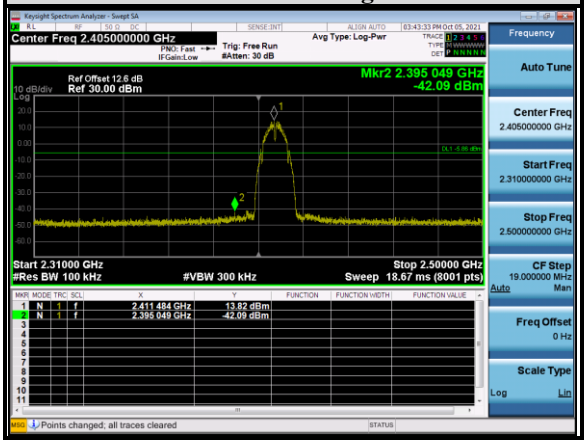
Ch 6



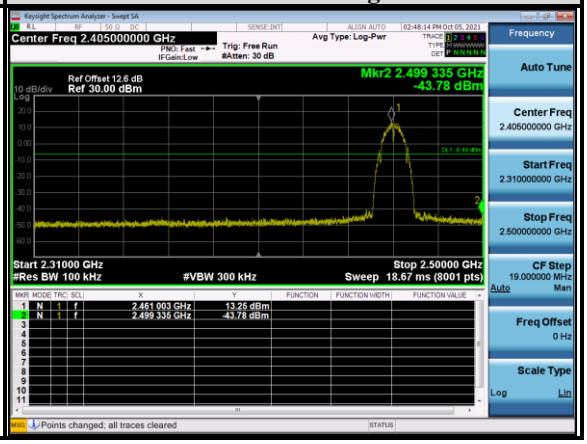
Ch 11



Ch 1 Band Edge



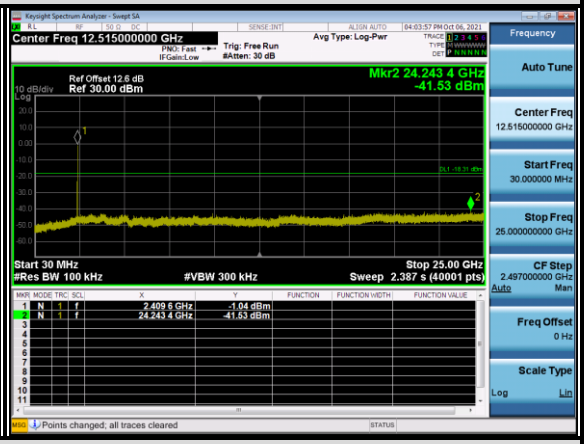
Ch 11 Band Edge



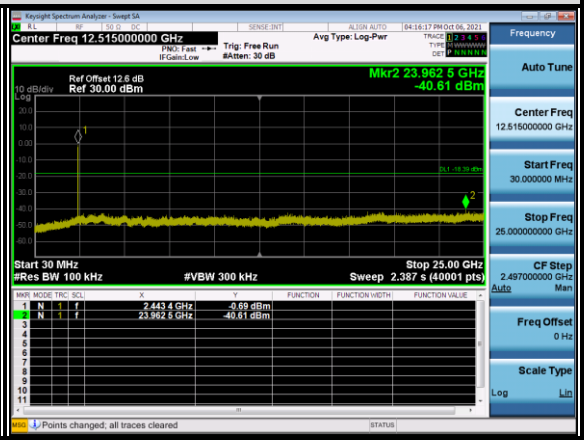
802.11g

Chain 0

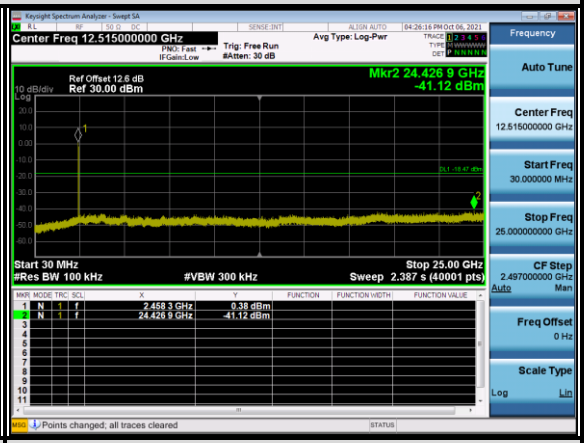
Ch 1



Ch 6



Ch 11



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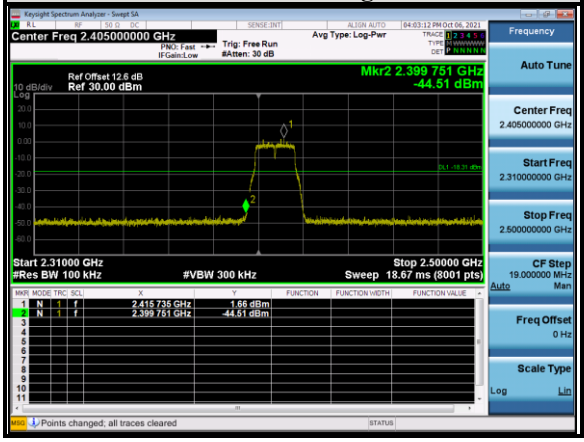
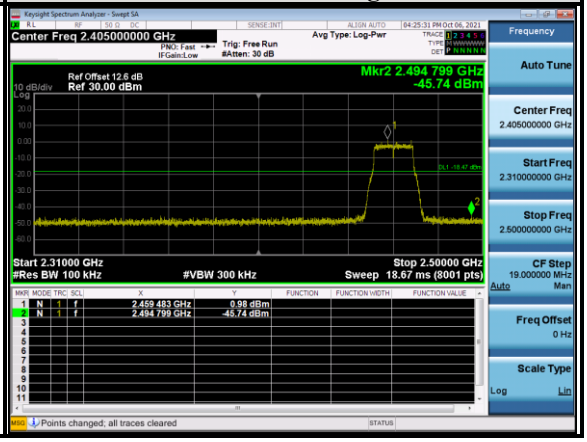


Ch 11 Band Edge

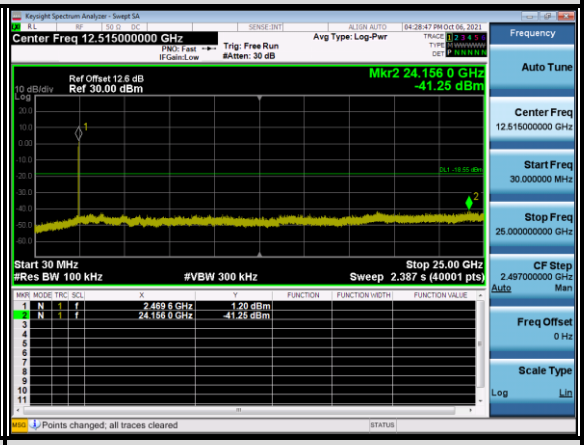


Chain 1

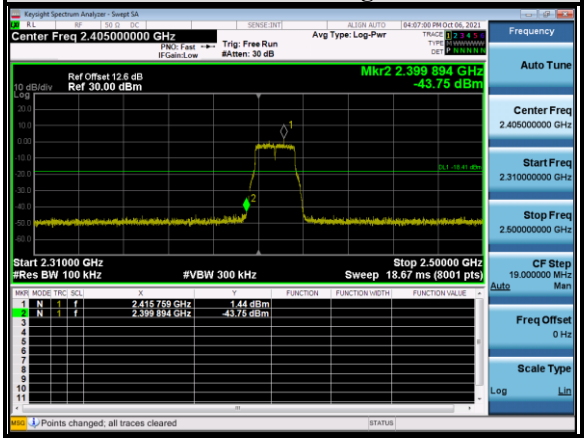
Ch 1

Ch 6

Ch 11



Ch 1 Band Edge



Ch 11 Band Edge