RADIO TEST REPORT

Product	:	35b & G.Fast Security Router
Model Name	:	Vigor 2866FVac
Series Model	:	Refer to Ch.6.1 Note 1
FCC ID	:	VGY2865
Test Regulation	:	FCC 47 CFR Part 15 Subpart C (Section 15.247)
Received Date	:	Mar. 2, 2020
Test Date	:	Jun. 8, 2020 ~ Nov. 12, 2020
Issued Date	:	Nov. 27, 2020
Applicant	:	DrayTek Corp. No.26 Fu Shing Rd., HuKou County, Hsin-Chu Industrial Park, Hsin-Chu, Taiwan 303 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.: 4789400505A-US-R0-V0

Rev.	Test report No.	Date	Page revised	Contents
Original	4789400505A-US-R0-V0	Nov. 4, 2020	-	Initial issue
-	4789400505A-US-R0-V0	Nov. 17, 2020	P.1,P.4,P.12 P.13 P.16 P.57 P.20~P.22, P.24~P.27, P.29~P.31, P.37~P.48, P.58, P.60, P.63, P.65, P.68, P.70, P.90~P.101, P.103~P.108,	Update test date. Modify section 6.5. Update section 7. Update notation and remarks. Add test data and plots of Ch2, Ch4, Ch8, Ch10.
-	4789400505A-US-R0-V0	Nov. 20, 2020	P.24, P.25	Add note.
-	4789400505A-US-R0-V0	Nov. 27, 2020	P.13	Modify section 6.5.

Table Of Contents

1. Attestation of Test Results

APPLICANT:	DrayTek Corp. No.26 Fu Shing Rd., HuKou County, Hsin-Chu Industrial Park, Hsin-Chu, Taiwan 303 R.O.C
MANUFACTURER	DrayTek Corp. No.26 Fu Shing Rd., HuKou County, Hsin-Chu Industrial Park, Hsin-Chu, Taiwan 303 R.O.C
EUT DESCRIPTION:	35b & G.Fast Security Router
BRAND:	DrayTek
MODEL:	Vigor 2866FVac
SERIES MODEL:	Refer to Ch.6.1 Note 1
SAMPLE STAGE:	Engineering sample
DATE of TESTED:	Jun. 8, 2020 ~ Nov. 12, 2020

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:

Cindy Hsin

Cindy Hsin Date : Nov. 27, 2020
Project Handler

Approved and Authorized By:

Mike Cai

Mike Cai Date : Nov. 27, 2020
Engineer Project Associate

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

Note:
1. For the Radiated Band Edge test plots were recorded in Appendix I, the Radiated Emissions test plots were recorded in Appendix II.

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. The full scope of accreditation can be viewed at http://accreditation.taftw.org.tw/taf/public/basic/viewApplyItems.action?unitNo=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.

Test Item	Measurement Frequency Range	K	U(dB)
Conducted disturbance at mains terminals ports	0.15MHz ~ 30MHz	2	1.5
RF Conducted	9 kHz - 40GHz	2	1.0
Radiated disturbance below 30MHz	9 kHz - 30 MHz	2	1.9
Radiated disturbance below 1 GHz	30MHz ~ 1GHz	2	5.4
Radiated disturbance above 1GHz	1GHz ~ 40GHz	2	4.7

6. Equipment under Test

6.1. Description of EUT

Product	35b & G.Fast Security Router
Brand Name	DrayTek
Model Name	Vigor 2866FVac
Series Model	Vigor 2865ac, Vigor 2865Vac, Vigor 2865Fac, Vigor 2865FVac, Vigor 2866ac, Vigor 2866Vac, Vigor 2866Fac, Vigor 2927ac, Vigor 2927Vac, Vigor 2927Fac, Vigor 2927FVac, Vigor 2923ac, Vigor 2923Vac, Vigor 2923Fac, Vigor 2923FVac, Vigor 2925ac, Vigor 2925Vac, Vigor 2925Fac, Vigor 2925FVac, Vigor 2926_v1ac, Vigor 2926_v1Vac, Vigor 2926_v1Fac, Vigor 2926_v1FVac
S/N	209001DAA41E018
Operating Frequency	2412MHz ~ 2462MHz
Modulation	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
Transfer Rate	802.11b: up to 11 Mbps 802.11g: up to 54 Mbps 802.11n: up to MCS15
Number of Channel	11 for 802.11b, 802.11g, 802.11n (HT20) 7 for 802.11n (HT40)
Maximum Output Power	802.11b: 24.22 dBm 802.11g: 25.79 dBm 802.11n (HT20): 26.24 dBm 802.11n (HT40): 21.84 dBm
Normal Voltage	12Vdc from adapter

Note:

1. The models difference table as below:

Main Model Name	DSL	G. fast	SFP	WWAN	LAN	Wi-Fi 2.4G	Wi-Fi 5G	FXS
Vigor 2866FVac	VDSL2/35b	V	V	-	Eth/RJ45x5	V	V	V
Series Model Name	**DSL**	**G. fast**	**SFP**	**WWAN**	**LAN**	**Wi-Fi 2.4G**	**Wi-Fi 5G**	**FXS**
Vigor 2865ac	VDSL2/35b	-	-	-	Eth/RJ45x6	V	V	-
Vigor 2865Vac	VDSL2/35b	-	-	-	Eth/RJ45x6	V	V	V
Vigor 2865Fac	VDSL2/35b	-	V	-	Eth/RJ45x5	V	V	-
Vigor 2865FVac	VDSL2/35b	-	V	-	Eth/RJ45x5	V	V	V
Vigor 2866ac	VDSL2/35b	V	-	-	Eth/RJ45x6	V	V	-
Vigor 2866Vac	VDSL2/35b	V	-	-	Eth/RJ45x6	V	V	V
Vigor 2866Fac	VDSL2/35b	V	V	-	Eth/RJ45x5	V	V	-
Vigor 2927ac	-	-	-	-	Eth/RJ45x6	V	V	-
Vigor 2927Vac	-	-	-	-	Eth/RJ45x6	V	V	V
Vigor 2927Fac	-	-	V	-	Eth/RJ45x6	V	V	-
Vigor 2927FVac	-	-	V	-	Eth/RJ45x6	V	V	V
Vigor 2923ac	-	-	-	-	Eth/RJ45x6	V	V	-
Vigor 2923Vac	-	-	-	-	Eth/RJ45x6	V	V	V
Vigor 2923Fac	-	-	V	-	Eth/RJ45x6	V	V	-
Vigor 2923FVac	-	-	V	-	Eth/RJ45x6	V	V	V
Vigor 2925ac	-	-	-	-	Eth/RJ45x6	V	V	-
Vigor 2925Vac	-	-	-	-	Eth/RJ45x6	V	V	V
Vigor 2925Fac	-	-	V	-	Eth/RJ45x6	V	V	-
Vigor 2925FVac	-	-	V	-	Eth/RJ45x6	V	V	V
Vigor 2926_v1ac	-	-	-	-	Eth/RJ45x6	V	V	-
Vigor 2926_v1Vac	-	-	-	-	Eth/RJ45x6	V	V	V
Vigor 2926_v1Fac	-	-	V	-	Eth/RJ45x6	V	V	-
Vigor 2926_v1FVac	-	-	V	-	Eth/RJ45x6	V	V	V

Note:

- The above model are declared by manufacturer for market segmentation that difference between main model and the series model is the combination of hardware design and appearance, there is nothing changed to RF related part that does not affect the RF characteristics.

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

Modulation Mode	Tx,Rx Function
802.11b	2TX,2RX
802.11g	2TX,2RX
802.11n (HT20)	2TX,2RX
802.11n (HT40)	2TX,2RX

3. The EUT contains following accessory devices

Product	Brand	Model	Description	Remark
AC adapter 1	Channel Well Technology	2ABN036F	Input: 100-240Vac, 1.0A Output:12Vdc, 3A Length: 1.5m	Optional
AC adapter 2	Channel Well Technology	2ABL030F	Input: 100-240Vac, 1.0A Output:12Vdc, 2.5A Length: 1.5m	Optional
AC adapter 3	Channel Well Technology	2ABL024F	Input: 100-240Vac, 1.0A Output:12Vdc, 2A Length: 1.5m	Optional
RJ-45 Cable (Ethernet)	Tung-Li	5U422-20	Length: 3meter, non-shielded cable	-
RJ-11 Cable	N/A	N/A	Length: 1.8meter, non-shielded cable, 6P4C	-

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 and 802.11n (HT20):

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

7 channels are provided for 802.11n (HT40):

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

6.3. Test Condition

Test Item	Test Site No.	Environmental Condition	Input Power	Test Date	Tested by
Antenna Port Conducted Measurement	SR4	24~26°C / 63~67%RH	120Vac / 60 Hz	Jun. 8, 2020 ~ Nov. 12, 2020	Patrick Kuan
Radiated Spurious Emission	966-2	23~27°C / 63~70%RH	120Vac / 60 Hz	Jun. 8, 2020 ~ Nov. 12, 2020	WaterNil Guan / Patrick Kuan
AC power Line Conducted Emission	SR1	23~26°C / 60~64%RH	120Vac / 60 Hz	Sep. 10, 2020~ Sep. 11, 2020	Patrick Kuan

FCC Test Firm Registration Number: 498077

6.4. Description Of Available Antennas

Ant. No.	Brand Name	Model Name	Antenna Type	Antenna Gain(dBi)
Ant 0	Walsin	RFDPA131300SBLB805	Dipole	2.3
Ant 1	Walsin	RFDPA131300SBLB806	Dipole	2.3
Ant 2	Angeei	DPD2430SRW	Dipole	2.3
Ant 3	Angeei	DPD2430SRB	Dipole	2.3

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

- 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).
- 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.
- 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 the antenna position used radiated emission pre-scan and the worst-case emissions are reported.
- The fundamental of the EUT was investigated in three orthogonal axes X/Y/Z, it was determined that X axis was worst-case. Therefore, all final radiated testing was performed with the EUT in X axis.
- 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 AC power line conducted emissions, the pre-scan has been determined by 2ABL030F adapter of AC power 120Vac/60Hz (worst case)
- Pre-scan radiation has been determined by the Model: Vigor 2866FVac (the worst case).
- The 11n20/40 modes do not support the beamforming.

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	1.0
	802.11g	OFDM	BPSK	1 to 11	1,6,11	6.0
	802.11n(HT20)	OFDM	BPSK	1 to 11	1,6,11	MCS0
	802.11n(HT40)	OFDM	BPSK	3 to 9	3,6,9	MCS0
Radiated Emissions (Below 1GHz)	802.11n(HT20)	OFDM	BPSK	1 to 11	6	MCS0
AC Power Line Conducted Emission	802.11n(HT20)	OFDM	BPSK	1 to 11	6	MCS0
Antenna Port Conducted Measurement	802.11b	DSSS	DBPSK	1 to 11	1,6,11	1.0
	802.11g	OFDM	BPSK	1 to 11	1,6,11	6.0
	802.11n(HT20)	OFDM	BPSK	1 to 11	1,6,11	MCS0
	802.11n(HT40)	OFDM	BPSK	3 to 9	3,6,9	MCS0

Co-Location Mode

Test item	Mode	Modulation Technology	Modulation Type	Available Channel	Test Channel	Data Rate
Radiated Emissions	802.11n(HT20)	DSSS	DBPSK	1 to 11	6+157	MCS0
	802.11a	OFDM	BPSK	36 to 48 149 to 165		6.0

6.6. Duty cycle

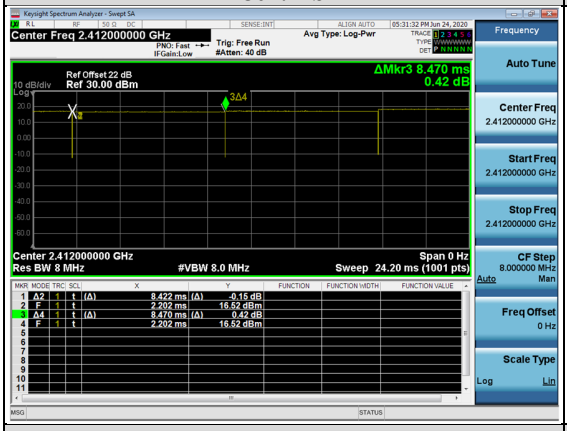
802.11b: Duty cycle = 8.422/8.47 = 0.994, duty cycle of test signal is ≥ 98 %, duty factor is not required.

802.11g: Duty cycle = 1.397/1.447 = 0.965, Duty factor = 10 * log(1/0.965) = 0.15

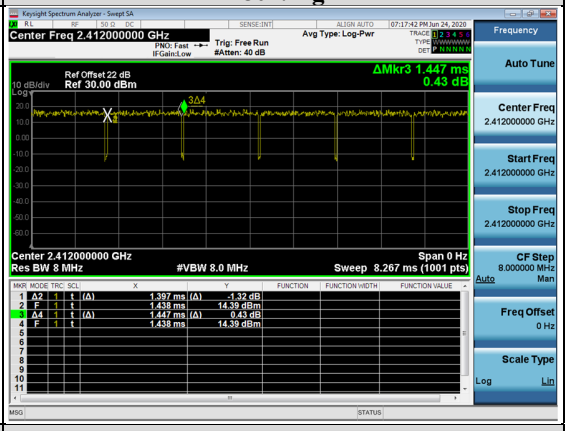
802.11n (HT20): Duty cycle = 0.676/0.728 = 0.929, Duty factor = 10 * log(1/0.929) = 0.32

802.11n (HT40): Duty cycle = 0.3477/0.399 = 0.871, Duty factor = 10 * log(1/0.871) = 0.6

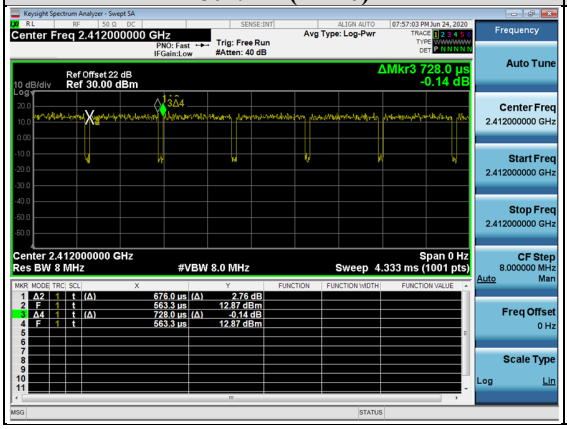
802.11b



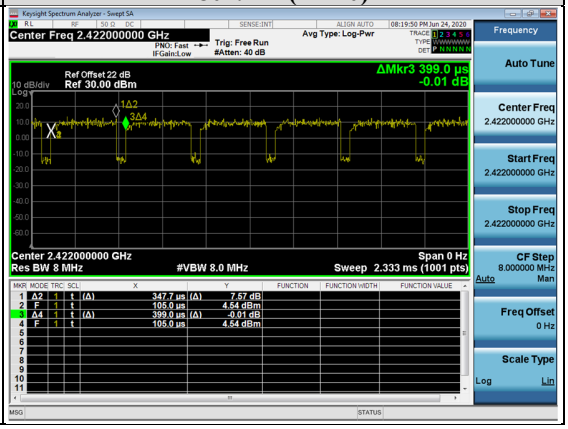
802.11g



802.11n (HT20)



802.11n (HT40)



7. Test Equipment

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Interval**
Radiated Spurious Emission					
Spectrum Analyzer	Keysight	N9010A	MY56070827	Nov. 13, 2019	1 year
EMI Test Receiver	Rohde & Schwarz	ESR7	101754	Dec. 17, 2019	1 year
Loop Antenna	ETS lindgren	6502	00213440	Dec. 19, 2019	1 year
Trilog-Broadband Antenna with 5dB Attenuator	Schwarzbeck & EMCI	VULB 9168 & N-6-05	774 & AT-N0538	Jan. 3, 2020	1 year
Horn Antenna (1-18 GHz)	Schwarzbeck	BBHA 9120 D	01690	Jan. 3, 2020	1 year
Horn Antenna (18-40 GHz)	Schwarzbeck	BBHA 9170	781	Dec. 27, 2019	1 year
Preamplifier (30-1000 MHz)	EMCI	EMC330E	980405	Feb. 4, 2020 Jun. 9, 2020	1 year
Preamplifier (1-18 GHz)	EMCI	EMC051835BE	980406	Feb. 4, 2020	1 year
Preamplifier (18-40GHz)	EMCI	EMC184040SEE	980426	May 19, 2020	1 year
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-4 & 170425-2	Jan. 8, 2020 Jul. 2, 2020	1 year
Cables	Hanyitek	K1K50-UP0264-K1K50-2500	170214-1 & 170214-2	Jan. 8, 2020	1 year

Test Equipment List					
Equipment	**Manufacturer**	**Model No.**	**Serial No.**	**Cal. Date**	**Cal. Interval**
Antenna Port Conducted Measurement					
Spectrum Analyzer	Keysight	N9010A	MY56070821	Dec. 4, 2019	1 year
Pulse Power Sensor	Anritsu	MA2411B	1531202	Dec. 23, 2019	1 year
Power Meter	Anritsu	ML2495A	1645002	Dec. 23, 2019	1 year
AC power Line Conducted Emission					
EMI Test Receiver	Rohde & Schwarz	ESR7	101753	Nov. 19, 2019	1 year
Two-Line V-Network	Rohde & Schwarz	ENV216	102136	Aug. 19, 2020	1 year
Impuls-Begrenzer Pulse Limiter	Rohde & Schwarz	ESH3-Z2	102219-Qt	Aug. 12, 2020	1 year
Cables	HARBOUR INDUSTRIES	LL142	170205-5000-1	Feb. 5, 2020	1 year

UL Software		
Description	**Name**	**Version**
Radiated measurement	EZ_EMC	1.1.4.2
Conducted measurement	Keysight.TestSystem	1.0.0.0
AC power Line Conducted Emission	EZ_EMC	1.1.4.2

8. Description of Test Setup

Support Equipment

Equipment	Brand Name	Model Name	S/N	Remark
Notebook	DELL	Latitude E5470	3JFKWF2	N/A
Notebook	DELL	Latitude E5470	JVSKWF2	N/A
Connector	N/A	N/A	N/A	RJ-45 to RJ-45
USB Device	Transcend	N/A	N/A	8GB
Fiber Module	Fiberpon	SFP+10G-T	N/A	N/A
Rx Device (BF Client)	DrayTek	Vigor 2866LFVac	N/A	FW: r89624_Beta

I/O Cables

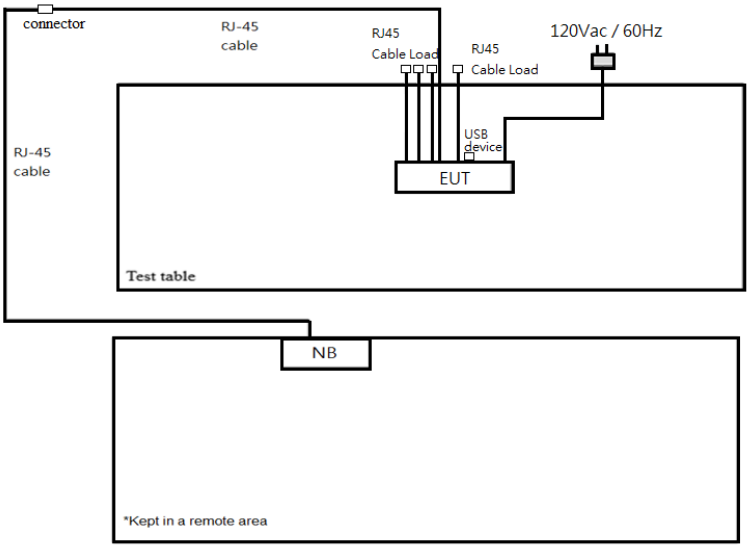
Equipment	Brand Name	Model Name	S/N	Remark
RJ-45 cable	N/A	N/A	N/A	Length : 10m
RJ-45 cable	N/A	N/A	N/A	Length : 1.5m
RJ-45 cable	N/A	N/A	N/A	Length : 1.5m
RJ-45 cable	N/A	N/A	N/A	Length : 1.5m
RJ-45 cable	N/A	N/A	N/A	Length : 1.5m
RJ-45 cable	N/A	N/A	N/A	Length : 1.5m

Test Setup

Controlled using a bespoke application (QA tool) 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

Non-Beamforming Mode



9. Test Results

9.1. 6dB Bandwidth

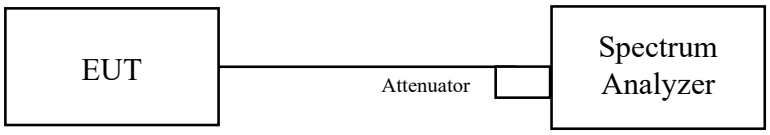
Requirements

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		
1	2412	9.068	9.083	0.5	Pass
6	2437	9.068	9.075	0.5	Pass
11	2462	9.079	9.083	0.5	Pass

802.11g

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.105	15.109	0.5	Pass
2	2417	15.109	15.113	0.5	Pass
6	2437	15.128	15.105	0.5	Pass
10	2457	15.128	15.12	0.5	Pass
11	2462	15.128	15.071	0.5	Pass

802.11n (HT20)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
1	2412	15.128	15.124	0.5	Pass
2	2417	15.128	15.12	0.5	Pass
6	2437	15.135	15.12	0.5	Pass
10	2457	15.128	15.113	0.5	Pass
11	2462	15.701	15.683	0.5	Pass

802.11n (HT40)

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)		Minimum Limit (MHz)	Pass / Fail
		Chain 0	Chain 1		
3	2422	35.093	35.085	0.5	Pass
4	2427	35.085	35.085	0.5	Pass
6	2437	35.093	35.055	0.5	Pass
8	2447	35.085	35.085	0.5	Pass
9	2452	35.1	35.093	0.5	Pass

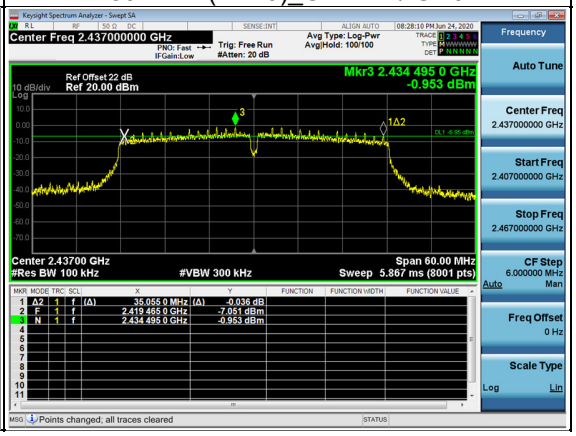
Spectrum Plot of Worst Value

802.11b_Chain 0 / CH6

802.11g_Chain 1 / CH11

802.11n (HT20)_Chain 1/ CH10

802.11n (HT40)_Chain 1 / CH6



9.2. Conducted output power

Requirements

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

Per KDB 662911 D01 Multiple Transmitter Output Method of conducted output power measurement on IEEE 802.11 devices,

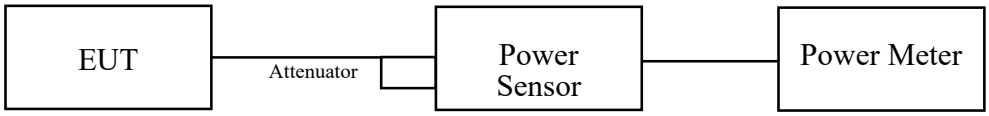
Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$;
Array Gain = 0 dB (i.e., no array gain) for channel widths ≥ 40 MHz for any N_{ANT};
Array Gain = 5 log(N_{ANT}/N_{SS}) dB or 3 dB, whichever is less for 20-MHz channel widths with $N_{ANT} \geq 5$.

For power measurements on all other devices: Array Gain = 10 log(N_{ANT}/N_{SS}) dB.

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

Peak Power

802.11b

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	16.94	16.06	89.796	19.53	30	Pass
6	2437	21.59	20.79	264.162	24.22	30	Pass
11	2462	17.62	16.78	105.453	20.23	30	Pass

802.11g

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	18.56	20.09	173.873	22.4	30	Pass
2	2417	21.92	21.17	286.515	24.57	30	Pass
6	2437	23.12	22.42	379.698	25.79	30	Pass
10	2457	22.12	21.65	309.148	24.90	30	Pass
11	2462	19.26	18.68	158.123	21.99	30	Pass

Note : The power of channel 3/4/5 are the same as tune up power of channel 2.
The power of channel 7/8/9 are the same as tune up power of channel 10.

802.11n (HT20)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
1	2412	19.33	18.46	155.85	21.93	30	Pass
2	2417	21.51	20.73	259.883	24.15	30	Pass
6	2437	23.51	22.93	420.724	26.24	30	Pass
10	2457	21.17	20.72	248.95	23.96	30	Pass
11	2462	17.72	17.28	112.612	20.52	30	Pass

Note : The power of channel 3/4/5 are the same as tune up power of channel 2.
The power of channel 7/8/9 are the same as tune up power of channel 10.

802.11n (HT40)

Channel	Frequency (MHz)	Peak Power (dBm)		Total Power (mW)	Total Power (dBm)	Limit (dBm)	Pass / Fail
		Chain 0	Chain 1				
3	2422	16	16.39	83.362	19.21	30	Pass
4	2427	18.05	16.13	104.846	20.21	30	Pass
6	2437	18.83	18.82	152.592	21.84	30	Pass
8	2447	17.08	17.13	102.692	20.12	30	Pass
9	2452	15.11	16.51	77.205	18.88	30	Pass

Note : The power of channel 5 is the same as tune up power of channel 4.
The power of channel 7 is the same as tune up power of channel 8.

Average Power (Reference Only)

802.11b

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	14.72	13.95	54.479	17.36
6	2437	19.61	18.77	166.747	22.22
11	2462	15.98	13.91	64.232	18.08

802.11g

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	12.76	12.85	38.155	15.82
2	2417	17.05	16.53	95.677	19.81
6	2437	19.56	18.84	166.925	22.23
10	2457	17.79	16.95	109.662	20.4
11	2462	13.68	11.79	38.436	15.85

802.11n (HT20)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
1	2412	12.31	11.41	30.858	14.89
2	2417	17.11	16.35	94.556	19.76
6	2437	19.39	18.77	162.232	22.1
10	2457	16.68	15.95	85.914	19.34
11	2462	11.32	11.25	26.887	14.3

802.11n (HT40)

Channel	Frequency (MHz)	Average Power (dBm)		Total Power (mW)	Total Power (dBm)
		Chain 0	Chain 1		
3	2422	10.12	9.48	19.152	12.82
4	2427	12.04	10.17	26.395	14.22
6	2437	12.56	12.75	36.866	15.67
8	2447	11.59	10.67	26.089	14.16
9	2452	9.02	7.61	13.748	11.38

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)).

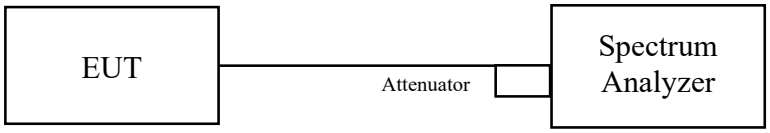
Note:
1. PSD = power spectral density that he same method as used to determine the conducted output power shall be used to determine the power spectral density. And power spectral density in dBm/MHz.
2. G_{TX} = the maximum transmitting antenna directional gain in dBi.
3. Directional Gain = G_{ant} +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

   Nant: Number of Transmit Antennas
   G1, G2,..., Gn: Gain of Individual Antennas (Same for Each Antenna)

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	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-12.90	3.01	-9.89	8	Pass
	6	2437	-10.61	3.01	-7.60	8	Pass
	11	2462	-11.76	3.01	-8.75	8	Pass
1	1	2412	-12.17	3.01	-9.16	8	Pass
	6	2437	-11.93	3.01	-8.92	8	Pass
	11	2462	-12.81	3.01	-9.79	8	Pass

NOTE: Directional gain = 5.31 dBi < 6 dBi, so the limit no need to reduced.

802.11g

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-14.25	3.01	-11.23	8	Pass
	2	2417	-7.90	3.01	-4.89	8	Pass
	6	2437	-7.90	3.01	-4.89	8	Pass
	10	2457	-8.55	3.01	-5.54	8	Pass
	11	2462	-14.74	3.01	-11.73	8	Pass
1	1	2412	-15.53	3.01	-12.51	8	Pass
	2	2417	-9.47	3.01	-6.46	8	Pass
	6	2437	-8.97	3.01	-5.96	8	Pass
	10	2457	-7.43	3.01	-4.42	8	Pass
	11	2462	-16.18	3.01	-13.17	8	Pass

NOTE: Directional gain = 5.31 dBi < 6 dBi, so the limit no need to reduced.

802.11n (HT20)

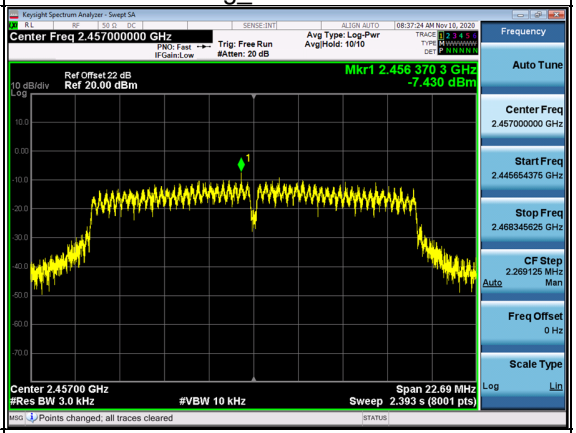
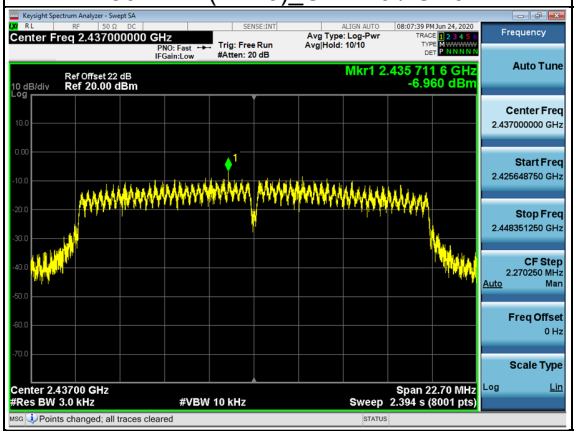
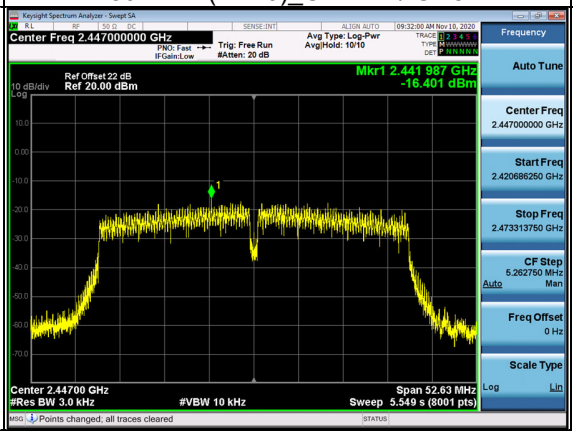
TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	1	2412	-16.18	3.01	-13.17	8	Pass
	2	2417	-7.96	3.01	-4.94	8	Pass
	6	2437	-6.96	3.01	-3.95	8	Pass
	10	2457	-9.37	3.01	-6.36	8	Pass
	11	2462	-16.50	3.01	-13.49	8	Pass
1	1	2412	-16.95	3.01	-13.94	8	Pass
	2	2417	-9.18	3.01	-6.16	8	Pass
	6	2437	-9.00	3.01	-5.99	8	Pass
	10	2457	-9.45	3.01	-6.44	8	Pass
	11	2462	-16.20	3.01	-13.19	8	Pass

NOTE: Directional gain = 5.31 dBi < 6 dBi, so the limit no need to reduced.

802.11n (HT40)

TX Chain	Channel	Freq. (MHz)	PSD (dBm/3 kHz)	10 log (N=2) dB	Total PSD (dBm/3 kHz)	Limit (dBm/3 kHz)	Pass / Fail
0	3	2422	-20.06	3.01	-17.05	8	Pass
	4	2427	-17.20	3.01	-14.18	8	Pass
	6	2437	-17.46	3.01	-14.45	8	Pass
	8	2447	-16.79	3.01	-13.78	8	Pass
	9	2452	-20.57	3.01	-17.56	8	Pass
1	3	2422	-20.57	3.01	-17.55	8	Pass
	4	2427	-16.71	3.01	-13.70	8	Pass
	6	2437	-17.32	3.01	-14.31	8	Pass
	8	2447	-16.40	3.01	-13.39	8	Pass
	9	2452	-20.48	3.01	-17.47	8	Pass

NOTE: Directional gain = 5.31 dBi < 6 dBi, so the limit no need to reduced.

Spectrum Plot of Worst Value	
802.11b_Chain 0 / CH6	802.11g_Chain 1 / CH10
	
802.11n (HT20)_Chain 0 / CH6	802.11n (HT40)_Chain 1 / CH8
	

9.4. Conducted Out of Band Emission

Requirements

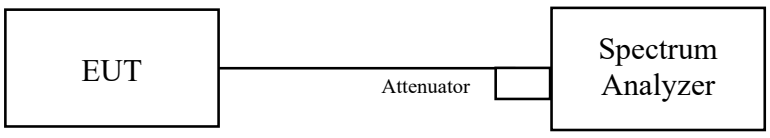
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the 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
a. Set the RBW = 100 kHz.
b. Set the VBW ≥ 300 kHz.
c. Set the span to 1.5 times the DTS bandwidth.
d. Detector = peak.
e. Sweep time = auto couple.
f. Trace mode = max hold.
g. Allow trace to fully stabilize.
h. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.

Measurement Procedure OOBE
a. Set RBW = 100 kHz.
b. Set VBW ≥ 300 kHz.
c. Detector = peak.
d. Sweep = auto couple.
e. Trace Mode = max hold.
f. Allow trace to fully stabilize.
g. Use the peak marker function to determine the maximum amplitude level.

Test Setup



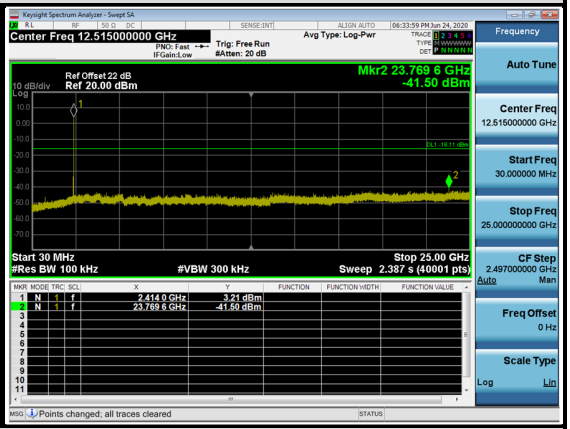
The loss between RF output port of the EUT and the input port of the Spectrum Analyzer has been taken into consideration.

Test Data

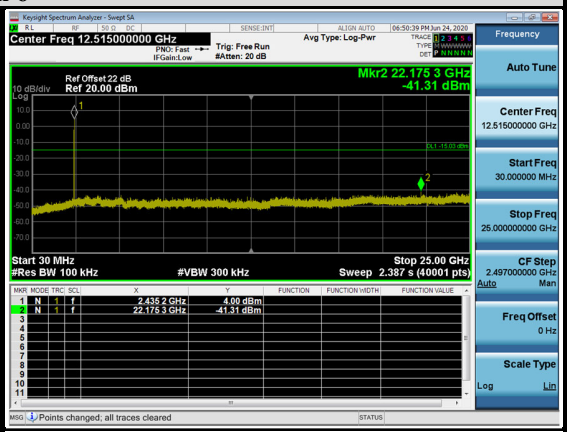
802.11b

CHAIN 0

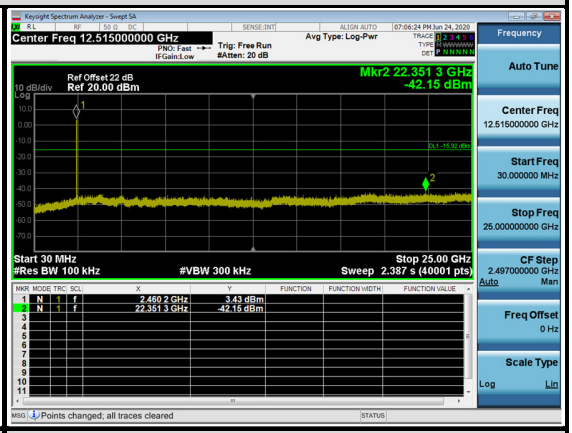
Ch 1



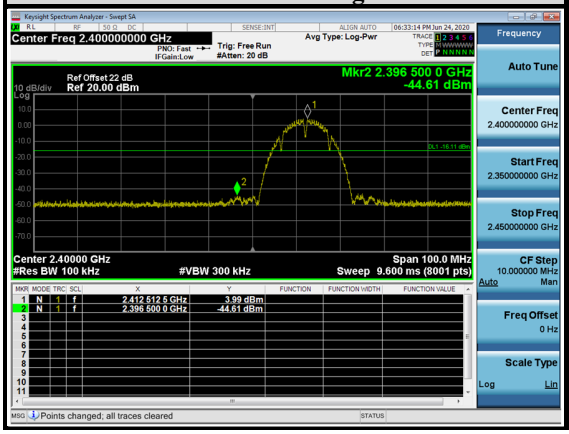
Ch 6



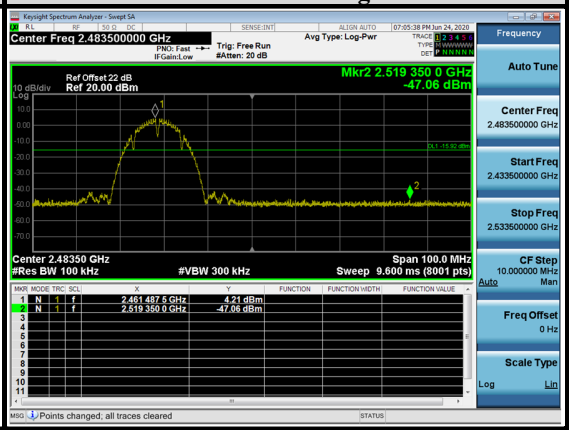
Ch 11



Ch 1 Band Edge

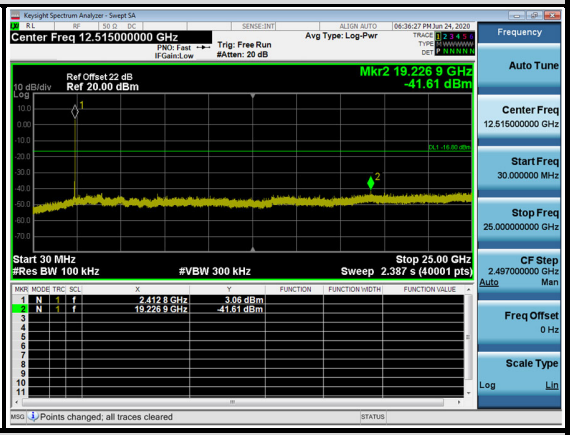


Ch 11 Band Edge

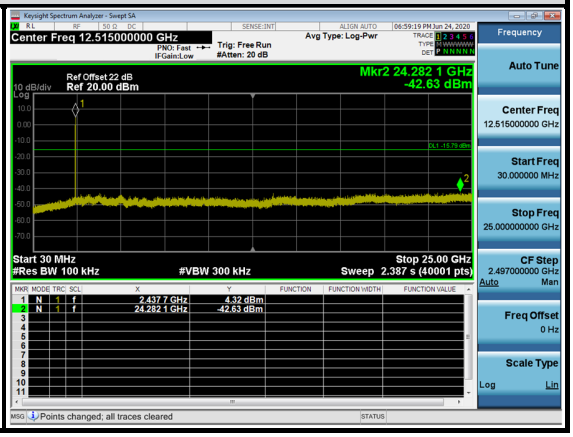


CHAIN 1

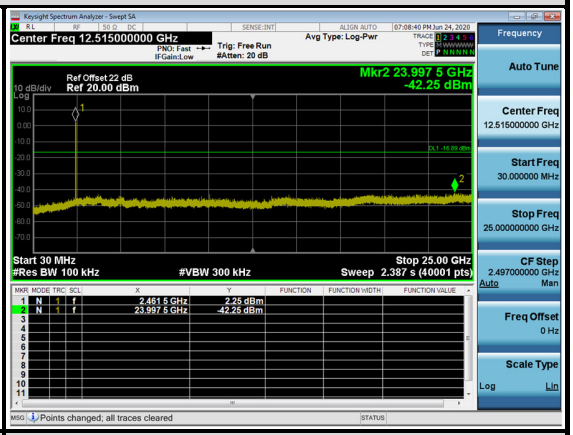
Ch 1



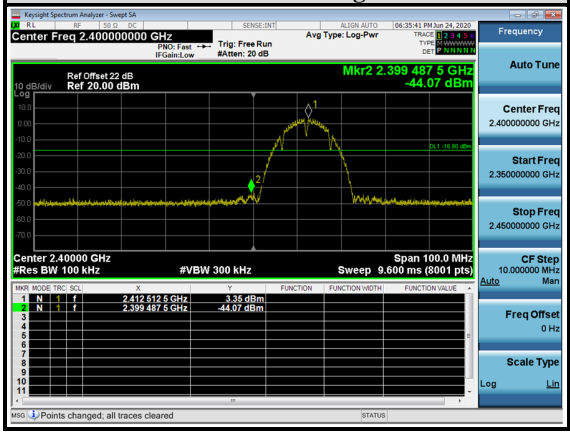
Ch 6



Ch 11



Ch 1 Band Edge



Ch 11 Band Edge