TEST REPORT

eurofins | KCTL Eurofins KCTL Co.Ltd.
65, Sinwon-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16677, Korea
TEL: 82-70-5008-1021
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1. Client

- Name : Samsung Electronics Co., Ltd.
- Address : 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
- Date of Receipt : 2024-10-17

2. Use of Report : Certification

3. Name of Product / Model : Wi-Fi/BT Transceiver / WCF733R

4. Manufacturer / Country of Origin : Samsung Electronics Co., Ltd. / Korea, Vietnam, China

5. FCC ID : A3LWCF733R

6. IC Certificate No. : 649E-WCF733R

7. Date of Test : 2024-10-18 to 2024-11-06

8. Location of Test : ■ Permanent Testing Lab ☐ On Site Testing
(Address:65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea)

9. Test method used : FCC Part 15 Subpart E, 15.407
RSS-247 Issue 3 August 2023
RSS-Gen Issue 5 February 2021

10. Test Result : Refer to the test result in the test report
This laboratory is not accredited for the test results marked. *

Affirmation	Tested by Name : Minki Kim (Signature)	Technical Manager Name : Heesu Ahn (Signature)

The above testing certificate is the accredited test result by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

2024-11-12

Accredited by KOLAS, Republic of KOREA **Eurofins KCTL Co.,Ltd.**

REPORT REVISION HISTORY

Date	Revision	Page No
2024-11-07	Originally issued	-
2024-11-12	Updated	25 ~ 28

Note. The report No. KR24-SRF0155 is superseded by the report No. KR24-SRF0155-A.

General remarks for test reports

Statement concerning the uncertainty of the measurement systems used for the tests

(may be required by the product standard or client)

☐ **Internal procedure used for type testing through which traceability of the measuring uncertainty has been established:**

Procedure number, issue date and title:

Calculations leading to the reported values are on file with the testing laboratory that conducted the testing.

☒ **Statement not required by the standard or client used for type testing**

CONTENTS

1. General information

Client	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Manufacturer	:	Samsung Electronics Co., Ltd.
Address	:	129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Factory 1	:	CHEMTRONICS CO., LTD.
Address 1	:	35, Buk-ri, Namsa-myeon, Cheoin-gu, Yongin-si, Gyeonggi-do, Korea
Factory 2	:	CHEMTROVINA COMPANY LIMITED
Address 2	:	Nhon Trach 2-Loc Khang IZ, Hiep Phuoc Town, Nhon Trach District,, Dong Nai Province, Vietnam
Factory 3	:	SJIT CO., LTD.
Address 3	:	#54-11, Dongtanhana 1gil, Hwaseong-si, Gyeonggi-do, Korea
Factory 4	:	SJIT VINA Co., Ltd
Address 4	:	Lot X2, Ho Nai Industrial Zone, Ho Nai 3 Commune, Trang Bom District, Dong Nai Province, Vietnam
Factory 5	:	Chengdu Xuguang Technology Co., Ltd.
Address 5	:	No.86 2nd Section, Park Road, Longquanyi District, Chengdu City, Sichuan Province, P.R.China
Factory 6	:	XUGUANG TECHNOLOGY (VIETNAM) COMPANY LIMITED
Address 6	:	Factory No.4, Lot CN1, An Duong Industrial Park, Hong Phong Commune, An Duong District, Hai Phong City, Vietnam
Laboratory	:	Eurofins KCTL Co.,Ltd.
Address	:	65, Sinwon-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Korea
Accreditations	:	FCC Site Designation No: KR0040, FCC Site Registration No: 687132 VCCI Registration No. : R-20080, G-20078, C-20059, T-20056 CAB Identifier: KR0040, ISED Number: 8035A KOLAS No.: KT231

2. Device information

Equipment under test	:	Wi-Fi/BT Transceiver			
Model	:	WCF733R			
Modulation technique	:	Bluetooth(BDR/EDR)_GFSK, π/4DQPSK, 8DPSK Bluetooth(BLE)_GFSK WLAN(802.11b/g/n/a/ac)_DSSS, OFDM, OFDMA			
Number of channels	:	BT/LE	:	79 ch(BDR/EDR), 40 ch(BLE)	
		2.400 ㎓ band	:	11 ch (20 ㎒)	
		5 ㎓ band			
		UNII-1	:	4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)	
		UNII-2A	:	4 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)	
		UNII-2C	:	12 ch (20 ㎒), 6 ch (40 ㎒), 3 ch (80 ㎒)	
		UNII-3	:	5 ch (20 ㎒), 2 ch (40 ㎒), 1 ch (80 ㎒)	
Power source	:	DC 5 V			
Antenna type	:	BT/LE : PCB antenna WLAN : Metal antenna			
Antenna gain	:	BT/LE	:	-4.06 dBi	
				Antenna 1	Antenna 2
		2.400 ㎓ band	:	-1.51 dBi	-0.71 dBi
		5 ㎓ band			
		UNII-1	:	1.11 dBi	0.66 dBi
		UNII-2A	:	1.31 dBi	0.77 dBi
		UNII-2C	:	1.23 dBi	0.34 dBi
		UNII-3	:	1.43 dBi	-0.53 dBi
Frequency range	:	2.400 ㎓ band	:	2 402 ㎒ ~ 2 480 ㎒	(Bluetooth/BLE)
				2 412 ㎒ ~ 2 472 ㎒	(802.11b/g/n_HT20)
		5 ㎓ band			
		UNII-1	:	5 180 ㎒ ~ 5 240 ㎒	(802.11a/n/ac_HT20/VHT20)
			:	5 190 ㎒ ~ 5 230 ㎒	(802.11n/ac_HT40/VHT40)
			:	5 210 ㎒	(802.11ac_VHT80)

UNII-2A	:	5 260 ㎒ ~ 5 320 ㎒	(802.11a/n/ac _HT20/VHT20)
	:	5 270 ㎒ ~ 5 310 ㎒	(802.11n/ac_HT40/VHT40)
	:	5 290 ㎒	(802.11ac_VHT80)
UNII-2C	:	5 500 ㎒ ~ 5 720 ㎒	(802.11a/n/ac_HT20/VHT20)
	:	5 510 ㎒ ~ 5 710 ㎒	(802.11n/ac_HT40/VHT40)
	:	5 530 ㎒ ~ 5 690 ㎒	(802.11ac _VHT80)
UNII-3	:	5 745 ㎒ ~ 5 825 ㎒	(802.11a/n/ac_HT20/VHT20)
	:	5 755 ㎒ ~ 5 795 ㎒	(802.11n/ac _HT40/VHT40)
	:	5 775 ㎒	(802.11ac_VHT80)

Software version : v *.**.0.*
(0 is related to RF and the * is not related to RF.)
Hardware version : WCF733R
Test device serial No. : Conducted : 6C70CBEF66F6
Radiated : 6C70CBEF6708
Operation temperature : -10 ℃ ~ 50 ℃

2.1. Frequency/channel operations

This device contains the following capabilities:
Bluetooth(BDR, EDR), Bluetooth Low Energy(1 Mbps, 2 Mbps, 125 kbps, 500 kbps),
WLAN 2.4 GHz_802.11b/g/n(HT20), WLAN 5 GHz_802.11a/n(HT20/40)/ac(VHT20/40/80)

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
36	5 180	52	5 260	100	5 500	149	5 745
40	5 200	56	5 280	120	5 600	157	5 785
48	5 240	64	5 320	140	5 700	165	5 825
				144	5 720		

Table 2.1.1. WLAN 5 GHz(802.11a/n/ac HT20/VHT20)

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
38	5 190	54	5 270	102	5 510	151	5 755
46	5 230	62	5 310	118	5 590	159	5 795
				134	5 670		
				142	5 710		

Table 2.1.2. WLAN 5 GHz(802.11n/ac HT40/VHT40)

UNII-1		UNII-2A		UNII-2C		UNII-3	
Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)	Ch.	Frequency (MHz)
42	5 210	58	5 290	106	5 530	155	5 775
				122	5 610		
				138	5 690		

Table 2.1.3. WLAN 5 GHz(802.11ac_VHT80)

2.2. RF power setting in TEST SW

Test Program	Test mode
MPTool	802.11a/n_HT20/40/ac_VHT20/40/80

Mode	Frequency	RF Power setting value			
		SISO		MIMO	
	[㎒]	ANT 1	ANT 2	ANT 1	ANT 2
802.11a	5 180	84.0	N/A		
	5 200	82.0			
	5 240	80.0			
	5 260	78.0			
	5 280	78.0			
	5 320	74.0			
	5 500	80.0			
	5 600	80.0			
	5 700	86.0			
	5 720	86.0			
	5 745	80.0			
	5 785	82.0			
	5 825	84.0			
802.11n_HT20	5 180	75.0	70.0	75.0	70.0
	5 200	75.0	70.0	75.0	70.0
	5 240	74.0	66.0	70.0	62.0
	5 260	74.0	66.0	68.0	61.0
	5 280	72.0	66.0	68.0	61.0
	5 320	70.0	62.0	64.0	58.0
	5 500	74.0	66.0	73.0	65.0
	5 600	80.0	70.0	72.0	69.0
	5 700	86.0	74.0	79.0	69.0
	5 720	86.0	74.0	79.0	69.0
	5 745	82.0	74.0	77.0	67.0
	5 785	82.0	70.0	77.0	67.0
	5 825	84.0	70.0	78.0	66.0
802.11n_HT40	5 190	75.0	70.0	68.0	58.0
	5 230	74.0	66.0	70.0	62.0
	5 270	74.0	66.0	68.0	61.0
	5 310	68.0	66.0	62.0	52.0
	5 510	74.0	70.0	73.0	65.0
	5 590	74.0	70.0	72.0	69.0
	5 670	78.0	70.0	79.0	70.0
	5 755	82.0	74.0	79.0	69.0
	5 795	80.0	74.0	77.0	67.0

Mode	Frequency	RF Power setting value			
		SISO		MIMO	
	[㎒]	ANT 1	ANT 2	ANT 1	ANT 2
802.11ac_VHT20	5 180	72.0	66.0	71.0	66.0
	5 200	72.0	66.0	71.0	66.0
	5 240	72.0	62.0	66.0	58.0
	5 260	70.0	62.0	64.0	57.0
	5 280	68.0	60.0	64.0	57.0
	5 320	66.0	60.0	60.0	54.0
	5 500	70.0	64.0	69.0	61.0
	5 600	76.0	66.0	68.0	65.0
	5 700	80.0	70.0	75.0	65.0
	5 720	80.0	70.0	75.0	65.0
	5 745	80.0	70.0	73.0	63.0
	5 785	80.0	68.0	73.0	63.0
	5 825	80.0	70.0	74.0	62.0
802.11ac_VHT40	5 190	71.0	66.0	71.0	66.0
	5 230	68.0	62.0	66.0	58.0
	5 270	66.0	62.0	64.0	57.0
	5 310	66.0	62.0	56.0	46.0
	5 510	69.0	62.0	69.0	61.0
	5 590	68.0	65.0	68.0	65.0
	5 670	75.0	66.0	75.0	66.0
	5 755	75.0	70.0	75.0	65.0
	5 795	74.0	70.0	73.0	63.0
802.11ac_VHT80	5 210	68.0	62.0	58.0	48.0
	5 290	58.0	62.0	48.0	44.0
	5 530	70.0	62.0	54.0	44.0
	5 610	72.0	66.0	69.0	65.0
	5 775	74.0	66.0	75.0	65.0

2.3. Simultaneously transmission condition

Item	Technology	Test Mode	Frequency [㎒]
Case 1	WLAN 2.4 ㎓ SISO ANT 2	802.11b	2 412
	Bluetooth Low Energy	1 Mbps	2 402
Case 2	WLAN 5 ㎓ SISO ANT 1	802.11a	5 200
	Bluetooth Low Energy	1 Mbps	2 402

Notes.
Simultaneous condition was performed as a worst case which is configured as a combination of lowest margin for each mode during radiated spurious emission.

2.4. Duty Cycle Factor

SISO

Test mode	Period (ms)	T_{On} time (ms)	Duty cycle		Duty Cycle Factor (dB)
			(Linear)	(%)	
802.11a	1.851 2	1.352 0	0.730 3	73.03	1.364 8
802.11n_HT20	1.764 0	1.264 0	0.716 6	71.66	1.447 5
802.11n_HT40	1.134 0	0.632 0	0.557 3	55.73	2.539 0
802.11ac_VHT20	1.767 2	1.268 0	0.717 5	71.75	1.441 7
802.11ac_VHT40	1.138 5	0.636 0	0.558 6	55.86	2.528 8
802.11ac_VHT80	0.818 0	0.316 0	0.386 3	38.63	4.130 7

Notes:

1. Duty cycle (Linear) = T_{On} time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)
3. DCF is not compensated to average result if the duty cycle is more than 98%

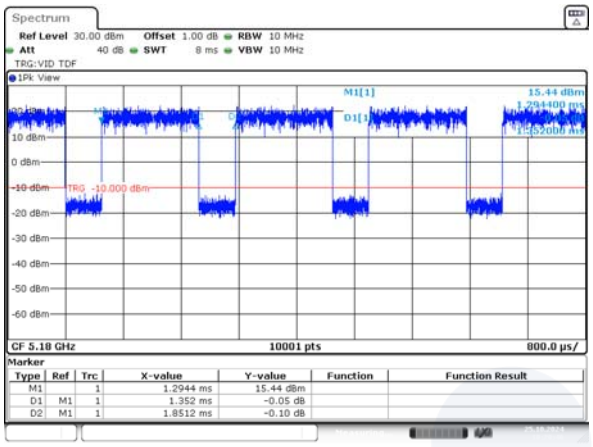
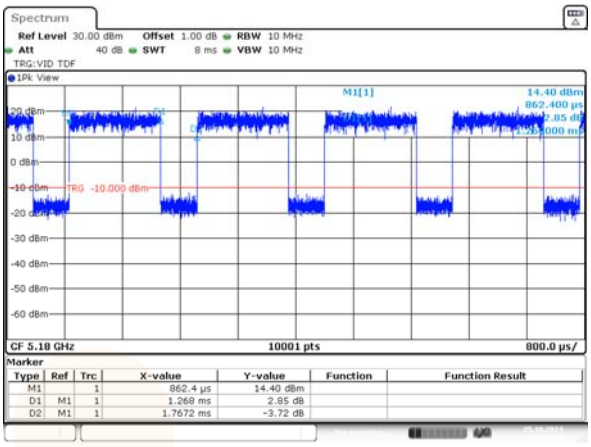
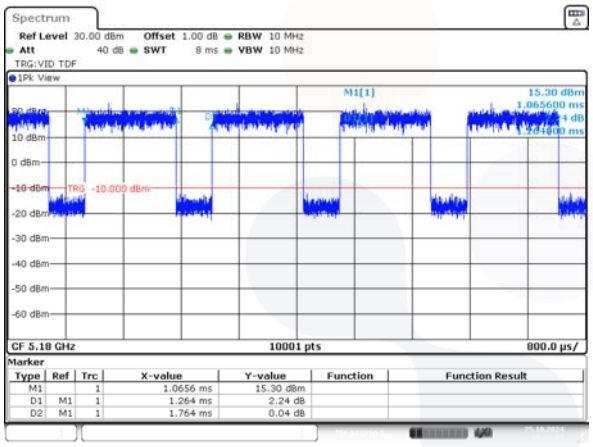
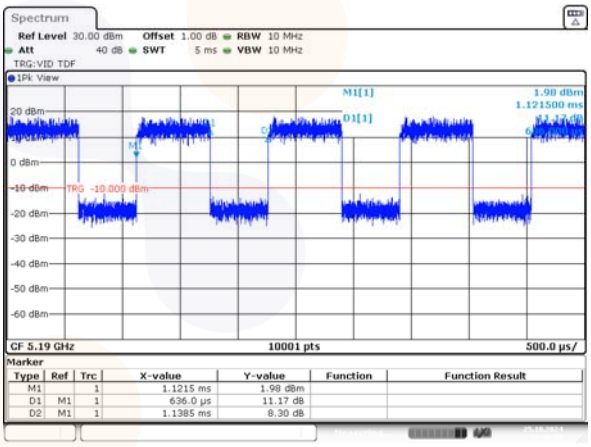
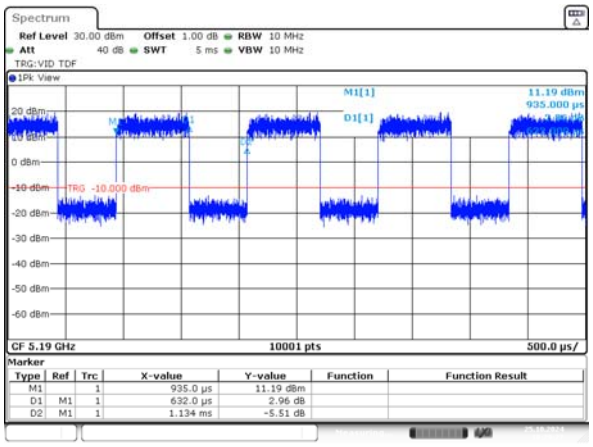
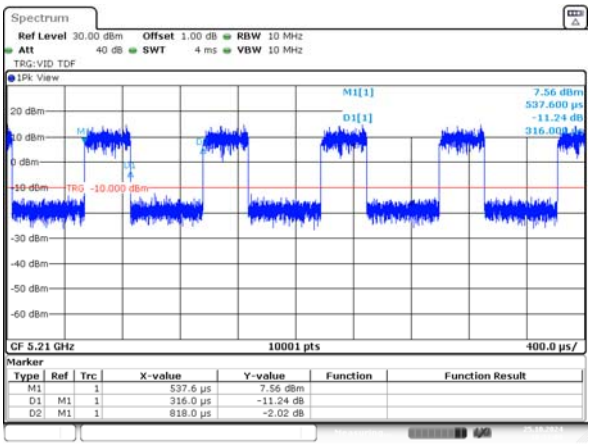
MIMO

Test mode	Period (ms)	T_{On} time (ms)	Duty cycle		Duty Cycle Factor (dB)
			(Linear)	(%)	
802.11n_HT20	1.764 0	1.264 8	0.717 0	71.70	1.444 8
802.11n_HT40	1.134 0	0.632 0	0.557 3	55.73	2.539 0
802.11ac_VHT20	1.166 5	0.664 0	0.569 2	56.92	2.447 2
802.11ac_VHT40	0.846 4	0.344 0	0.406 4	40.64	3.910 2
802.11ac_VHT80	0.686 4	0.183 9	0.267 9	26.79	5.720 0

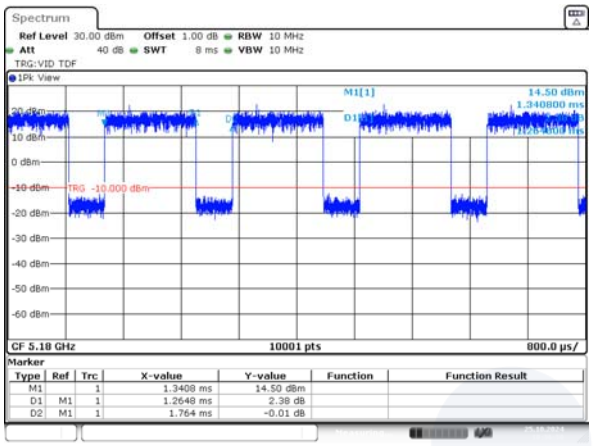
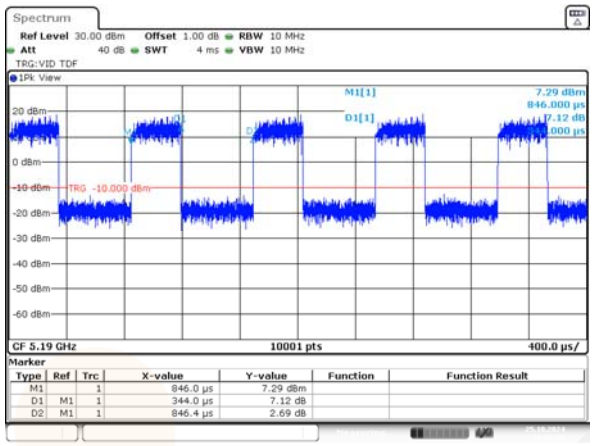
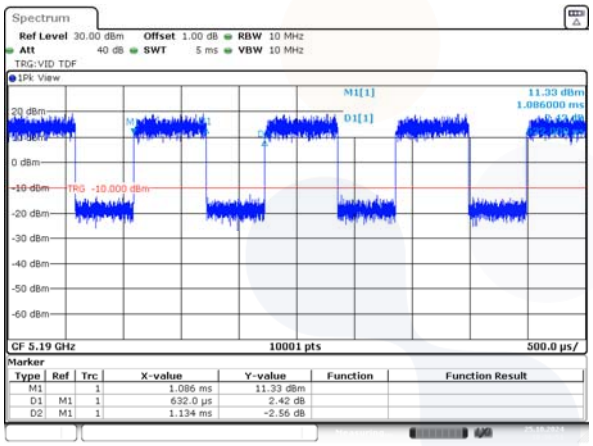
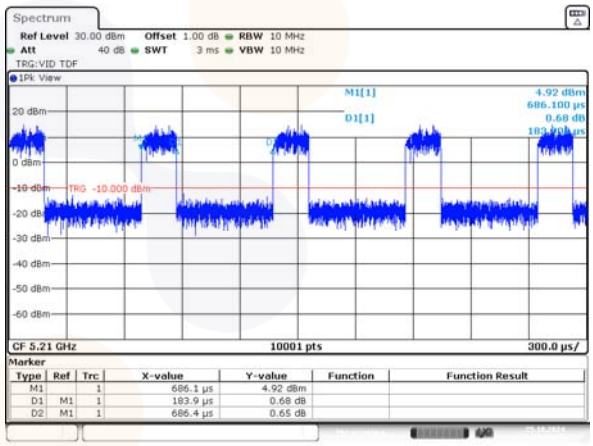
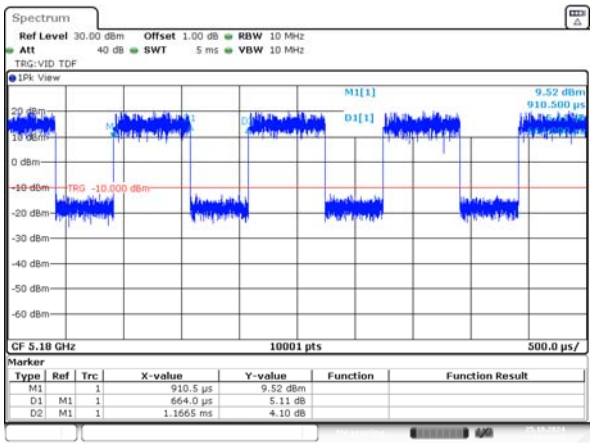
Notes:

1. Duty cycle (Linear) = T_{On} time / Period
2. DCF(Duty cycle factor) = 10log(1/duty cycle)
3. DCF is not compensated to average result if the duty cycle is more than 98%

SISO

802.11a	802.11ac_VHT20
	
802.11n_HT20	**802.11ac_VHT40**
	
802.11n_HT40	**802.11ac_VHT80**
	

MIMO

802.11n_HT20	802.11ac_VHT40
	
802.11n_HT40	**802.11ac_VHT80**
	
802.11ac_VHT20	
	**Blank**

2.5. Antenna information

Band	Mode	SISO			MIMO
		ANT 0	ANT 1	ANT 2	ANT 1 +2
2.4 GHz	Bluetooth	√	X	X	X
	Bluetooth Low Energy	√	X	X	X
	802.11b	X	√	√	X
	802.11g	X	√	√	X
	802.11n_HT20	X	√	√	√
5 GHz	802.11a	X	√	X	X
	802.11n_HT20	X	√	√	√
	802.11n_HT40	X	√	√	√
	802.11ac_VHT20	X	√	√	√
	802.11ac_VHT40	X	√	√	√
	802.11ac_VHT80	X	√	√	√

Note.
1. √ = Support, X = Not support

2.6. Directional Gain Calculations

According to clause F), 2), d), (i) and (ii) of KDB 662911 D01 Multiple Transmitter Output, Directional gain may be calculated by using the formulas as below.

Directional Antenna Gain

Band	ANT 1 Gain (dBi)	ANT 2 Gain (dBi)	Power Directional Gain (dBi)
UNII-1	1.11	0.66	0.89
UNII-2A	1.31	0.77	1.05
UNII-2C	1.23	0.34	0.81
UNII-3	1.43	-0.53	0.56

Uncorrelated_MIMO

Note.

1. Uncorrelated_MIMO

Unequal antenna gains, with equal transmit powers. For antenna gains given by G_1, G_2, …, G_N dBi
Directional gain = 10 log[($10^{G1/10}$ + $10^{G2/10}$ + … + $10^{GN/10}$)/N_{ANT}] dBi

3. Antenna requirement

Requirement of FCC part section 15.203

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

Requirement of RSS-Gen Section 6.8:

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p..) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

- The transmitter has permanently attached Metal Antenna (Internal antenna) on board.
- The E.U.T Complies with the requirement of §15.203, §15.247, §15.407.

4. Summary of tests

FCC Part section(s)	IC Rule Reference	Parameter	Test Condition	Test results
15.407(a)	RSS-247 Issue 2, 6.2	Maximum conducted output power	Conducted	Pass
15.407(a)	RSS-247 Issue 2, 6.2	Maximum power spectral density		Pass
15.407(a)	RSS-Gen Issue 5, 6.7	26 dB Channel Bandwidth		Pass
15.407(e)	RSS-247 Issue 2, 6.2.4	6 dB Channel Bandwidth		Pass
-	RSS-Gen Issue 5, 6.7	Occupied Bandwidth		Pass
15.407(g)	RSS-247 Issue2, 6	Frequency Stability		Pass
15.207(a)	RSS-Gen Issue 5, 8.8	AC Conducted Emissions		Pass
15.407(b), 15.205(a), 15.209(a)	RSS-Gen Issue 5, 8.9, 8.10 RSS-247 Issue 2, 6.2	Spurious emission	Radiated	Pass[8)]
		Band-edge, restricted band		Pass

Notes:

1. All modes of operation and data rates were investigated. The test results shown in the following sections represent the worst case emissions.
2. According to exploratory test no any obvious emission were detected from 9 ㎑ to 30 ㎒. Although these tests were performed other than open field site, adequate comparison measurements were confirmed against 30 m open field site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
3. EUT was investigated in three orthogonal orientations X, Y and Z. it was determined that **X** orientation was worst-case orientation. Therefore, all final radiated testing was performed with the EUT in **X** orientation.
4. All configurations have been performed (Stand-alone, Stand-alone with TA, With accessories). Worst case: Stand-alone with TA
5. The test procedure(s) in this report were performed in accordance as following.
   - ANSI C63.10-2013
   - KDB 662911 D01 v02r01
   - KDB 789033 D02 v02r01
6. The analysis of the overall rate output in the 5 ㎓ WLAN band showed that the lowest rate had the highest output, so the RF test was conducted using this lowest rate
7. Based on the baseline scan, the worst-case data rates were:
   802.11a mode: 6Mbps
   802.11n_HT20/40 mode: MCS0(SISO)
   802.11n_HT20/40 mode: MCS8(MIMO)
   802.11ac_VHT20/40/80 mode: NSS1MCS0(SISO)
   802.11ac_VHT20/40/80 mode: NSS2MCS0(MIMO)
8. These test items Simultaneous condition were performed. Please refer to original report.
   - Report no. KR24-SRC0153 issued on November 07, 2024 by Eurofins KCTL Co.,Ltd.

5. Measurement uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI C63.10-2013.

All measurement uncertainty values are shown with a coverage factor of k=2 to indicated a 95 % level of confidence. The measurement data shown herein meets of exceeds the U_{CISPR} measurement uncertainty values specified in CISPR 16-4-2 and thus, can be compared directly to specified limits to determine compliance.

Parameter	Expanded uncertainty (±)	
Maximum Peak Output Power	0.9 dB	
Peak Power Spectral Density	1.0 dB	
6 dB Channel Bandwidth	0.1 %	
Occupied Bandwidth	0.1 %	
Conducted spurious emission	1.9 dB	
Radiated spurious Emissions (Bandedge, restricted band)	Below 30 ㎒	2.3 dB
	30 ㎒ to 1 000 ㎒	2.5 dB
	1 000 ㎒ to 18 000 ㎒	4.7 dB
	Above 18 000 ㎒	4.8 dB
Conducted Emissions	150 ㎑ to 30 ㎒	2.8 dB

6. Measurement results explanation example

The offset level is set in the spectrum analyzer to compensate the RF cable loss factor between EUT conducted output port and spectrum analyzer.
With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

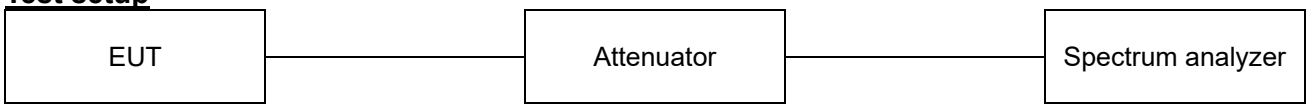
Frequency (㎒)	Factor(dB)	Frequency (㎒)	Factor(dB)
30	10.03	9 000	12.84
50	10.07	10 000	12.92
100	10.17	11 000	13.01
200	10.29	12 000	13.14
300	10.38	13 000	13.33
400	10.47	14 000	13.42
500	10.54	15 000	13.54
600	10.59	16 000	13.88
700	10.65	17 000	13.56
800	10.71	18 000	13.81
900	10.76	19 000	14.12
1 000	10.79	20 000	14.16
2 000	11.19	21 000	14.26
3 000	11.48	22 000	14.75
4 000	11.72	23 000	14.70
5 000	11.98	24 000	14.40
6 000	11.99	25 000	14.59
7 000	12.14	26 000	14.83
8 000	12.58	26 500	14.72

Notes:
Offset(㏈) = RF cable loss(㏈) + Attenuator(㏈)

7. Test results

7.1. Maximum conducted output power

Test setup



Limit

According to §15.407(a), RSS-247(6.2)

FCC

Band	EUT category		Conducted output power limit
UNII-1		Outdoor access point	1 W (30 dBm)
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	250 mW (23.98 dBm)
UNII-2A	√		250 mW or 11 dBm + 10logB[1)]
UNII-2C	√		250 mW or 11 dBm + 10logB[1)]
UNII-3	√		1 W (30 dBm)

IC

Band	Maximum e.i.r.p. limit
UNII-1	200 mW or 10 + 10 logB[2)], dBm
UNII-2A	1 W or 17 dBm + 10logB[2)]
UNII-2C	1 W or 17 dBm + 10logB[2)]
UNII-3	1 W (30 dBm)

Note:

1) Conducted output power limit B is the 26 dB emission bandwidth.
2) Maximum e.i.r.p. limit B is the 99% emission bandwidth.

Test procedure

ANSI C63.10-2013-Section 12.3.2.4 or 12.3.3.1, 14.2
KDB 789033 D02 v02r01 - Section E.2.d) or E.3.a)
KDB 662911 D01 v02r01 – Section E).1) and Section F)

Test settings
Used test method is Section E.2.d)

◆ **KDB 789033 D02 v02r01**

Section E.2.d)
Method SA-2 (trace averaging across on and off times of the EUT transmissions, followed by duty cycle correction):

(i) Measure the duty cycle, x, of the transmitter output signal as described in II.B..
(ii) Set span to encompass the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
(iii) Set RBW = 1 ㎒
(iv) Set RBW ≥ 3 ㎒
(v) Number of points in sweep ≥ 2×span/RBW. (This ensures that bin-to-bin spacing is ≤ RBW/2, so that narrowband signals are not lost between frequency bins.)
(vi) Sweep time = auto.
(vii) Detector = power averaging (rms), if available. Otherwise use sample detector mode.
(viii) Do not use sweep triggering. Allow the sweep to “free run.”
(ix) Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed to ensure that the average accurately represents the true average over the on and off periods of the transmitter.
(x) Compute power by integrating the spectrum across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal using the instrument’s band power measurement function with band limits set equal to the EBW (or occupied bandwidth) band edges. If the instrument does not have a band power function, sum the spectrum levels (in power units) at 1 ㎒ intervals extending across the EBW (or, alternatively, the entire 99% occupied bandwidth) of the signal.
(xi) Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times (because the measurement represents an average over both the on and off times of the transmission). For example, add 10 log(1/0,25) = 6 ㏈ if the duty cycle is 25%.

Test results
SISO

Test mode	Band	Frequency (㎒)	Measured output power									
			Conducted output power (dBm)		FCC Limit (dBm)		ANT gain (dBi)		MAX e.i.r.p. (dBm)		MAX e.i.r.p. Limit (dBm)	
			ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2
802.11a	UNII-1	5 180	16.19	-	23.98	-	1.11	-	16.85	-	22.12	-
		5 200	16.27	-					16.93	-		
		5 240	16.47	-					17.13	-		
	UNII-2A	5 260	16.75	-	23.68	-	1.31	-	17.52	-	29.13	-
		5 280	16.95	-					17.72	-		
		5 320	16.79	-					17.56	-		
	UNII-2C	5 500	15.84	-	23.68	-	1.23	-	16.18	-	29.12	-
		5 600	15.15	-					15.49	-		
		5 700	16.14	-					16.48	-		
	UNII-3	5 745	15.64	-	30.00	-	1.43	-	15.11	-	30.00	-
		5 785	15.18	-					14.65	-		
		5 825	15.42	-					14.89	-		
802.11n HT20	UNII-1	5 180	14.26	14.40	23.98	23.98	1.11	0.66	14.92	15.06	22.43	22.43
		5 200	14.56	14.52					15.22	15.18		
		5 240	15.54	15.21					16.20	15.87		
	UNII-2A	5 260	15.59	15.59	23.92	23.91	1.31	0.77	16.36	16.36	29.43	29.43
		5 280	15.81	15.94					16.58	16.71		
		5 320	15.33	15.65					16.10	16.42		
	UNII-2C	5 500	15.55	15.90	23.88	23.90	1.23	0.34	15.89	16.24	29.41	29.41
		5 600	15.72	15.44					16.06	15.78		
		5 700	15.26	14.74					15.60	15.08		
	UNII-3	5 745	15.30	15.82	30.00	30.00	1.43	-0.53	14.77	15.29	30.00	30.00
		5 785	15.38	15.52					14.85	14.99		
		5 825	15.30	14.06					14.77	13.53		
802.11n HT40	UNII-1	5 190	14.27	14.08	23.98	23.98	1.11	0.66	14.93	14.74	23.01	23.01
		5 230	15.08	15.50					15.74	16.16		
	UNII-2A	5 270	15.86	15.63	23.98	23.98	1.31	0.77	16.63	16.40	30.00	30.00
		5 310	15.97	15.77					16.74	16.54		
	UNII-2C	5 510	14.48	15.96	23.98	23.98	1.23	0.34	14.82	16.30	30.00	30.00
		5 590	14.19	15.46					14.53	15.80		
		5 670	14.19	14.23					14.53	14.57		
	UNII-3	5 755	15.43	15.84	30.00	30.00	1.43	-0.53	14.90	15.31	30.00	30.00
		5 795	14.44	15.31					13.91	14.78		

Test mode	Band	Frequency (㎒)	Measured output power									
			Conducted output power (dBm)		FCC Limit (dBm)		ANT gain (dBi)		MAX e.i.r.p. (dBm)		MAX e.i.r.p. Limit (dBm)	
			ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2	ANT 1	ANT 2
802.11ac VHT20	UNII-1	5 180	13.42	13.34	23.98	23.98	1.11	0.66	14.08	14.00	22.43	22.41
		5 200	13.76	13.53					14.42	14.19		
		5 240	14.96	14.15					15.62	14.81		
	UNII-2A	5 260	14.75	14.69	23.88	23.90	1.31	0.77	15.52	15.46	29.43	29.43
		5 280	14.77	14.74					15.54	15.51		
		5 320	14.66	14.62					15.43	15.39		
	UNII-2C	5 500	14.29	13.66	23.91	23.91	1.23	0.34	14.63	14.00	29.43	29.43
		5 600	13.76	14.21					14.10	14.55		
		5 700	14.52	14.00					14.86	14.34		
	UNII-3	5 745	14.56	14.65	30.00	30.00	1.43	-0.53	14.03	14.12	30.00	30.00
		5 785	14.86	13.99					14.33	13.46		
		5 825	14.50	13.89					13.97	13.36		
802.11ac VHT40	UNII-1	5 190	13.38	13.25	23.98	23.98	1.11	0.66	14.04	13.91	23.01	23.01
		5 230	14.42	14.26					15.08	14.92		
	UNII-2A	5 270	14.14	14.53	23.98	23.98	1.31	0.77	14.91	15.30	30.00	30.00
		5 310	14.75	14.79					15.52	15.56		
	UNII-2C	5 510	13.30	14.10	23.98	23.98	1.23	0.34	13.64	14.44	30.00	30.00
		5 590	13.39	13.37					13.73	13.71		
		5 670	13.44	13.25					13.78	13.59		
	UNII-3	5 755	14.34	14.61	30.00	30.00	1.43	-0.53	13.81	14.08	30.00	30.00
		5 795	14.07	14.78					13.54	14.25		
802.11ac VHT80	UNII-1	5 210	13.04	13.57	23.98	23.98	1.11	0.66	13.70	14.23	23.01	23.01
	UNII-2A	5 290	14.32	14.83	23.98	23.98	1.31	0.77	15.09	15.60	30.00	30.00
	UNII-2C	5 530	14.26	14.10	23.98	23.98	1.23	0.34	14.60	14.44	30.00	30.00
		5 610	13.69	13.37					14.03	13.71		
	UNII-3	5 775	13.76	14.86	30.00	30.00	1.43	-0.53	13.23	14.33	30.00	30.00

Notes:

1. Conducted output power (dBm) = Average power (dBm) + D.C.F (dB)
2. e.i.r.p. Calculation : e.i.r.p. (dBm) = Conducted output power (dBm) + Antenna gain (dBi)

MIMO

Test mode	Band	Frequency (㎒)	Measured output power					
			Conducted output power (dBm)		FCC Limit (dBm)	Directional gain (dBi)	MAX e.i.r.p. (dBm)	MAX e.i.r.p. Limit (dBm)
			ANT 1	ANT 2			ANT 1+ANT 2	
802.11n HT20	UNII-1	5 180	12.51	12.78	23.98	0.89	16.55	22.43
		5 200	12.84	12.94			16.80	
		5 240	13.03	12.64			16.74	
	UNII-2A	5 260	12.84	12.36	23.91	1.05	16.67	29.43
		5 280	13.05	12.34			16.77	
		5 320	13.08	12.24			16.75	
	UNII-2C	5 500	12.43	12.39	23.88	0.81	16.24	29.41
		5 600	11.99	11.52			15.59	
		5 700	12.01	10.96			15.34	
	UNII-3	5 745	12.13	12.18	30.00	0.56	15.73	30.00
		5 785	12.30	11.48			15.48	
		5 825	11.84	11.27			15.14	
802.11n HT40	UNII-1	5 190	12.67	12.24	23.98	0.89	16.36	23.01
		5 230	12.54	11.70			16.04	
	UNII-2A	5 270	13.18	12.34	23.98	1.05	16.84	30.00
		5 310	13.24	12.42			16.91	
	UNII-2C	5 510	12.32	12.87	23.98	0.81	16.42	30.00
		5 590	12.34	11.79			15.89	
		5 670	12.02	10.22			15.03	
	UNII-3	5 755	13.21	12.53	30.00	0.56	16.45	30.00
		5 795	13.18	12.14			16.26	
802.11ac VHT20	UNII-1	5 180	11.43	12.07	23.98	0.89	15.66	22.41
		5 200	11.18	12.33			15.69	
		5 240	11.59	12.15			15.78	
	UNII-2A	5 260	11.60	11.95	23.85	1.05	15.84	29.43
		5 280	11.49	12.29			15.97	
		5 320	11.28	11.88			15.65	
	UNII-2C	5 500	10.91	11.76	23.86	0.81	15.17	29.41
		5 600	10.73	11.23			14.80	
		5 700	10.78	11.11			14.77	
	UNII-3	5 745	11.92	11.44	30.00	0.56	15.25	30.00
		5 785	11.90	11.27			15.16	
		5 825	12.16	11.22			15.28	

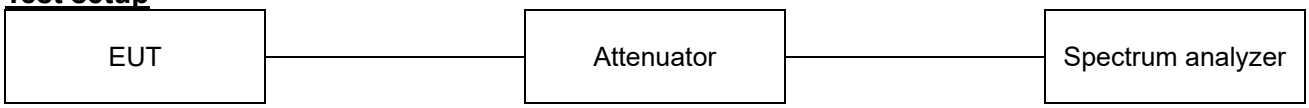
Test mode	Band	Frequency (㎒)	Measured output power					
			Conducted output power (dBm)		FCC Limit (dBm)	Directional gain (dBi)	MAX e.i.r.p. (dBm)	MAX e.i.r.p. Limit (dBm)
			ANT 1	ANT 2			ANT 1+ANT 2	
802.11ac VHT40	UNII-1	5 190	12.44	10.75	23.98	0.89	15.58	23.01
		5 230	11.90	11.22			15.47	
	UNII-2A	5 270	11.66	11.58	23.98	1.05	15.68	30.00
		5 310	11.42	11.62			15.58	
	UNII-2C	5 510	12.17	11.64	23.98	0.81	15.73	30.00
		5 590	10.71	10.96			14.66	
		5 670	10.99	10.76			14.70	
	UNII-3	5 755	12.26	11.44	30.00	0.56	15.44	30.00
		5 795	12.19	11.56			15.46	
802.11ac VHT80	UNII-1	5 210	11.25	10.93	23.98	0.89	14.99	23.01
	UNII-2A	5 290	11.64	11.77	23.98	1.05	15.77	30.00
	UNII-2C	5 530	11.68	10.46	23.98	0.81	14.93	30.00
		5 610	10.14	10.69			14.24	
	UNII-3	5 775	11.09	11.58	30.00	0.56	14.91	30.00

Notes:

1. Conducted output power (dBm) = Average power(10log($10^{(ANT1/10)}$ + $10^{(ANT2/10)}$)) (dBm) + D.C.F (dB)
2. e.i.r.p. Calculation : e.i.r.p. (dBm) = Conducted output power (dBm) + Directional gain (dBi)
3. Directional gain = Uncorrelated (MIMO) and referred to 2.4 tables in the applicable report.

7.2. Maximum Power Spectral Density

Test setup



Limit

According to §15.407(a), RSS-247(6.2)

Band	EUT category		Limit
UNII-1		Outdoor access point	17dBm/㎒
		Indoor access point	
		Fixed point-to-point access point	
	√	Client device	11 dBm /㎒
UNII-2A	√		11 dBm /㎒
UNII-2C	√		11 dBm /㎒
UNII-3	√		30 dBm /500 ㎑

Test procedure

ANSI C63.10-2013 Section 12.3.2.2, 14.3.2.2
KDB 789033 D02 v02r01 – Section E and F
KDB 662911 D01 v02r01 - Section E). 2) and Section F)

Test settings

Section F

The rules requires “maximum power spectral density” measurements where the intent is to measure the maximum value of the time average of the power spectral density measured during a period of continuous transmission. Refer to III.A for additional guidance for devices that use channel aggregation.

1. Create an average power spectrum for the EUT operating mode being tested by following the instructions in II.E.2. for measuring maximum conducted output power using a spectrum analyzer or EMI receiver: select the appropriate test method (SA-1, SA-2, SA-3, or alternatives to each) and apply it up to, but not including, the step labeled,
   “Compute power….” (This procedure is required even if the maximum conducted output power measurement was performed using a power meter, method PM.)
2. Search function on the instrument to find the peak of the spectrum and record its value.
3. Adjustments to the peak value of the spectrum, if applicable:

   a) If Method SA-2 or SA-2 Alternative was used, add 10 log (1/x), where x is the duty cycle, to the peak of the spectrum.
   b) If Method SA-3 Alternative was used and the linear mode was used in II.E.2.g) (viii), add 1 ㏈ to the final result to compensate for the difference between linear averaging and power averaging.
4. The result is the Maximum PSD over 1㎒ reference bandwidth
5. For devices operating in the bands 5.15-5.25 ㎓, 5.25-5.35 ㎓, and 5.47-5.725 ㎓, the preceding procedures make use of 1 ㎒ RBW to satisfy directly the 1 ㎒ reference bandwidth specified in Section 15.407(a)(5). For devices operating in the band 5.725-5.85 ㎓, the rules specify a measurement bandwidth of 500 ㎑. Many spectrum analyzers do not have 500 ㎑ RBW, thus a narrower RBW may need to be used. The rules permit the use of RBWs less than 1㎒, or 500 ㎑, “provided that the measured power is integrated over the full reference bandwidth” to show the total power over the specified measurement bandwidth(i.e.,

1 ㎒, or 500 ㎑). If measurements are performed using a reduced resolution bandwidth (< 1 ㎒, or < 500 ㎑) and integrated over 1 ㎒, or 500 ㎑ bandwidth, the following adjustments to the procedures apply:

a) Set RBW≥1/T, where T is defined in II.B.I.a).
b) Set VBW≥3 RBW.
c) If measurement bandwidth of Maximum PSD is specified in 500 ㎑, add 10 log (500 ㎑ /RBW) to the measured result, whereas RBW (<500 ㎑) is the reduced resolution bandwidth of the spectrum analyzer set during measurement.
d) If measurement bandwidth of Maximum PSD is specified in 1 ㎒, add 10 log (1㎒/RBW) to the measured result, whereas RBW (< 1 ㎒) is the reduced resolution bandwidth of spectrum analyzer set during measurement.
e) Care must be taken to ensure that the measurements are performed during a period of continuous transmission or are corrected upward for duty cycle.

Note:

- As a practical matter, it is recommended to use reduced RBW of 100 ㎑ for the II.F.5.c) and II.F.5.d), since RBW=100 ㎑ is available on nearly all spectrum analyzers.
- Method SA-2 is used.

Test results
SISO

Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)		DCF (dB)	Maximum PSD (dB m/㎒)		Limit (dBm/㎒)
			ANT 1	ANT 2		ANT 1	ANT 2	
802.11a	UNII-1	5 180	4.92	-	1.36	6.28	-	10.00
		5 200	4.48	-		5.84	-	
		5 240	4.91	-		6.27	-	
	UNII-2A	5 260	5.22	-		6.58	-	11.00
		5 280	5.22	-		6.58	-	
		5 320	5.34	-		6.70	-	
	UNII-2C	5 500	4.15	-		5.51	-	11.00
		5 600	3.62	-		4.98	-	
		5 700	4.50	-		5.86	-	
802.11n HT20	UNII-1	5 180	2.31	1.79	1.45	3.76	3.24	10.00
		5 200	2.75	2.85		4.20	4.30	
		5 240	3.82	3.15		5.27	4.60	
	UNII-2A	5 260	3.59	3.67		5.04	5.12	11.00
		5 280	3.99	4.47		5.44	5.92	
		5 320	3.73	4.21		5.18	5.66	
	UNII-2C	5 500	3.51	4.06		4.96	5.51	11.00
		5 600	3.88	3.37		5.33	4.82	
		5 700	3.50	3.00		4.95	4.45	
802.11n HT40	UNII-1	5 190	-1.52	-1.53	2.54	1.02	1.01	10.00
		5 230	-0.59	-0.53		1.95	2.01	
	UNII-2A	5 270	0.23	0.22		2.77	2.76	11.00
		5 310	0.13	0.72		2.67	3.26	
	UNII-2C	5 510	-1.48	0.39		1.06	2.93	11.00
		5 590	-1.76	-0.24		0.78	2.30	
		5 670	-1.55	-1.67		0.99	0.87	
802.11ac VHT20	UNII-1	5 180	1.69	1.53	1.44	3.13	2.97	10.00
		5 200	1.87	1.64		3.31	3.08	
		5 240	3.12	2.55		4.56	3.99	
	UNII-2A	5 260	2.72	2.74		4.16	4.18	11.00
		5 280	2.79	2.72		4.23	4.16	
		5 320	2.46	3.11		3.90	4.55	
	UNII-2C	5 500	2.56	1.87		4.00	3.31	11.00
		5 600	1.92	2.24		3.36	3.68	
		5 700	2.26	2.03		3.70	3.47	

Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)		DCF (dB)	Maximum PSD (dB m/㎒)		Limit (dBm/㎒)
			ANT 1	ANT 2		ANT 1	ANT 2	
802.11ac VHT40	UNII-1	5 190	-2.82	-1.98	2.53	-0.29	0.55	10.00
		5 230	-1.54	-1.50		0.99	1.03	
	UNII-2A	5 270	-1.49	-1.73		1.04	0.80	11.00
		5 310	-1.19	-0.87		1.34	1.66	
	UNII-2C	5 510	-2.68	-1.61		-0.15	0.92	11.00
		5 590	-2.35	-2.55		0.18	-0.02	
		5 670	-2.11	-2.59		0.42	-0.06	
802.11ac VHT80	UNII-1	5 210	-6.70	-7.09	4.13	-2.57	-2.96	10.00
	UNII-2A	5 290	-6.00	-5.73		-1.87	-1.60	11.00
	UNII-2C	5 530	-6.44	-6.59		-2.31	-2.46	11.00
		5 610	-6.05	-7.30		-1.92	-3.17	11.00

Test mode	Band	Frequency (㎒)	Measured PSD (dBm/500 ㎑)		DCF (dB)	Maximum PSD (dBm /500 ㎑)		Limit (dBm /500 ㎑)
			ANT 1	ANT 2		ANT 1	ANT 2	
802.11a	UNII-3	5 745	2.06	-	1.36	3.42	-	30.00
		5 785	1.30	-		2.66	-	
		5 825	1.49	-		2.85	-	
802.11n HT20		5 745	1.11	1.23	1.45	2.56	2.68	
		5 785	0.64	0.95		2.09	2.40	
		5 825	1.11	-0.44		2.56	1.01	
802.11n HT40		5 755	-3.12	-2.48	2.54	-0.58	0.06	
		5 795	-3.90	-3.57		-1.36	-1.03	
802.11ac VHT20		5 745	0.47	0.78	1.44	1.91	2.22	
		5 785	0.44	0.69		1.88	2.13	
		5 825	0.15	-0.49		1.59	0.95	
802.11ac VHT40		5 755	-4.31	-4.05	2.53	-1.78	-1.52	
		5 795	-4.36	-3.47		-1.83	-0.94	
802.11ac VHT80		5 775	-9.03	-7.82	4.13	-4.90	-3.69	

Note:

1. Maximum PSD(dB m/㎒) = Measured PSD (dB m/㎒, 500 ㎑) + DCF(dB)
2. The Unit of UNII-2C is (dB m / ㎒) and Unit of UNII-3 is (dB m / 500 ㎑)
3. FCC UNII-1 Limit = 11 dB m/㎒

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Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)		DCF (dB)	Maximum PSD (dB m/㎒)	Limit (dBm/㎒)
			ANT 1	ANT 2		ANT 1 + ANT 2	
802.11n HT20	UNII-1	5 180	1.05	1.69	1.44	5.84	10.00
		5 200	0.89	1.13		5.47	
		5 240	1.53	0.46		5.48	
	UNII-2A	5 260	0.87	0.38		5.09	11.00
		5 280	1.36	0.52		5.42	
		5 320	1.17	0.57		5.34	
	UNII-2C	5 500	0.43	0.56		4.95	11.00
		5 600	0.22	-0.23		4.46	
		5 700	0.22	-1.21		4.02	
802.11n HT40	UNII-1	5 190	-3.16	-3.52	2.54	2.21	10.00
		5 230	-3.27	-3.71		2.06	
	UNII-2A	5 270	-2.73	-3.48		2.46	11.00
		5 310	-2.58	-2.88		2.82	
	UNII-2C	5 510	-3.06	-3.04		2.50	11.00
		5 590	-3.24	-4.04		1.93	
		5 670	-3.57	-5.58		1.09	
802.11ac VHT20	UNII-1	5 180	-1.47	-0.73	2.45	4.37	10.00
		5 200	-1.77	-0.23		4.53	
		5 240	-1.08	-0.25		4.81	
	UNII-2A	5 260	-1.33	-0.37		4.63	11.00
		5 280	-1.29	-0.76		4.44	
		5 320	-1.12	-0.64		4.58	
	UNII-2C	5 500	-2.03	-1.15		3.89	11.00
		5 600	-1.51	-1.32		4.04	
		5 700	-2.15	-1.37		3.71	

Test mode	Band	Frequency (㎒)	Measured PSD (dBm/㎒)		DCF (dB)	Maximum PSD (dB m/㎒)	Limit (dBm/㎒)
			ANT 1	ANT 2		ANT 1+ANT 2	
802.11ac VHT40	UNII-1	5 190	-4.80	-6.65	3.91	1.29	10.00
		5 230	-5.21	-5.56		1.54	
	UNII-2A	5 270	-5.18	-5.70		1.49	11.00
		5 310	-5.45	-5.30		1.55	
	UNII-2C	5 510	-4.81	-5.43		1.81	11.00
		5 590	-6.65	-5.72		0.76	
		5 670	-5.30	-6.37		1.12	
802.11ac VHT80	UNII-1	5 210	-10.63	-10.03	5.72	-1.59	10.00
	UNII-2A	5 290	-8.69	-8.88		-0.05	11.00
	UNII-2C	5 530	-10.37	-10.48		-1.69	11.00
		5 610	-11.28	-11.00		-2.41	11.00

Test mode	Band	Frequency (㎒)	Measured PSD (dBm/500 ㎑)		DCF (dB)	Maximum PSD (dBm /500 ㎑)	Limit (dBm /500 ㎑)
			ANT 1	ANT 2		ANT1+ANT 2	
802.11n HT20	UNII-3	5 745	-2.29	-2.36	1.44	2.13	30.00
		5 785	-2.32	-2.78		1.91	
		5 825	-2.16	-2.49		2.13	
802.11n HT40		5 755	-5.69	-6.16	2.54	-0.37	
		5 795	-5.06	-6.62		-0.22	
802.11ac VHT20		5 745	-3.75	-3.58	2.45	1.79	
		5 785	-3.32	-4.08		1.77	
		5 825	-3.21	-4.13		1.81	
802.11ac VHT40		5 755	-7.45	-8.30	3.91	-0.93	
		5 795	-7.75	-7.82		-0.86	
802.11ac VHT80		5 775	-13.97	-12.29	5.72	-4.32	

Note:

1. Maximum PSD(dB m/㎒) = Measured PSD(10log($10^{(ANT1/10)}$ + $10^{(ANT2/10)}$)) (dB m/㎒, 500 ㎑) + DCF(dB)
2. The Unit of UNII-2C is (dB m / ㎒) and Unit of UNII-3 is (dB m / 500 ㎑)
3. FCC UNII-1 Limit = 11 dB m/㎒

In order to simplify the report, the attached plot is the worst PSD in Test mode.
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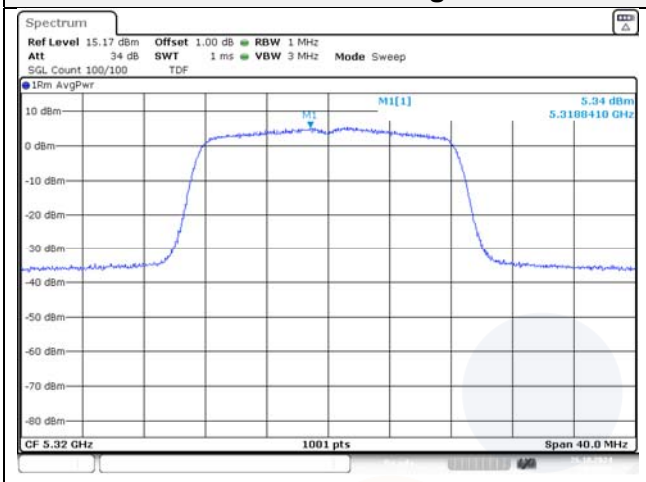
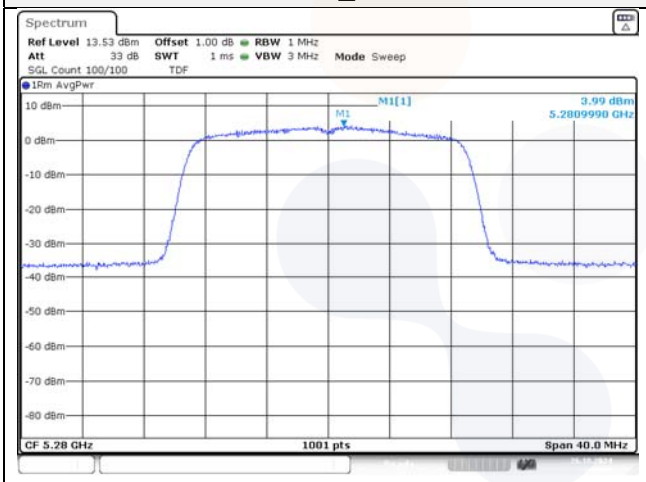
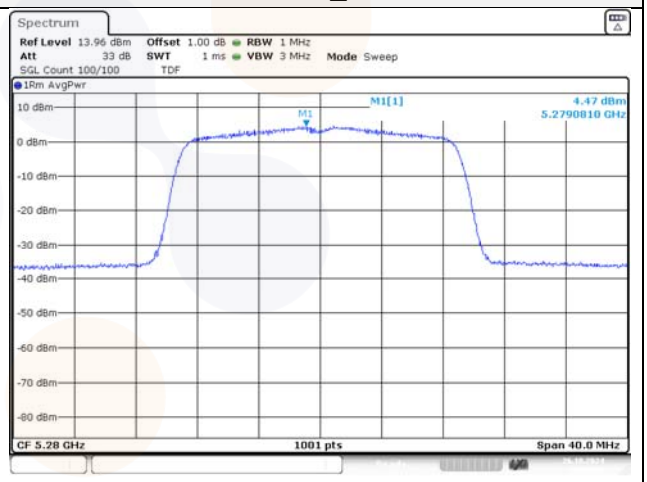
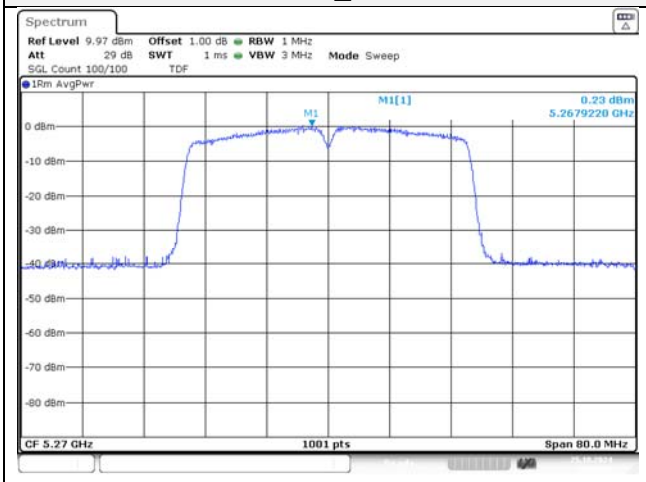
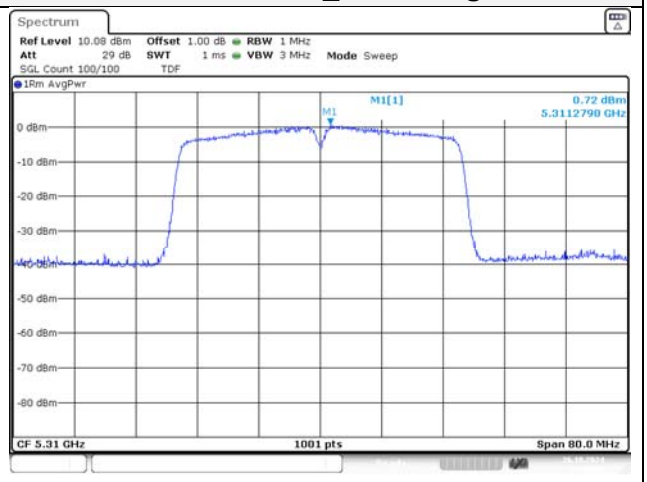
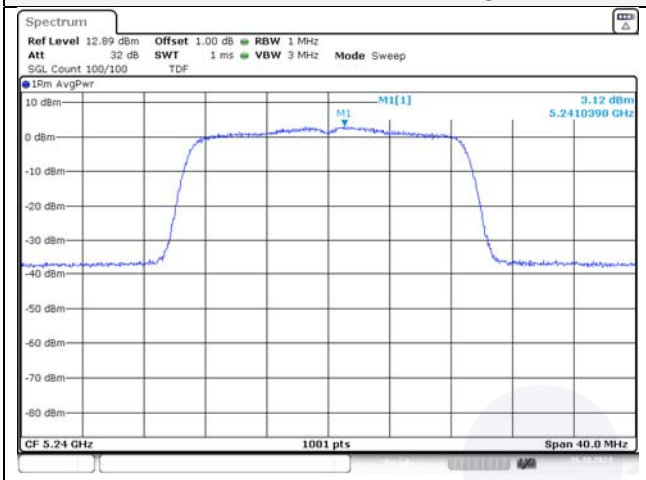
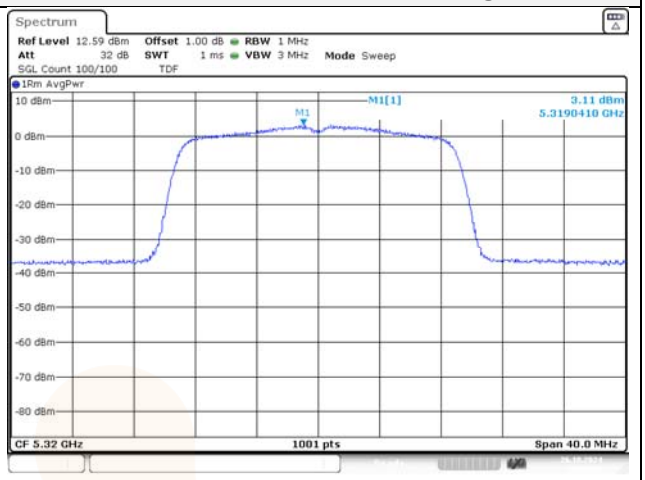
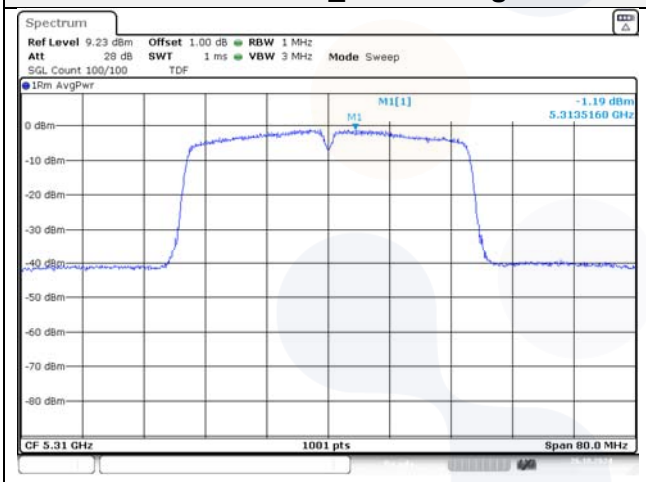
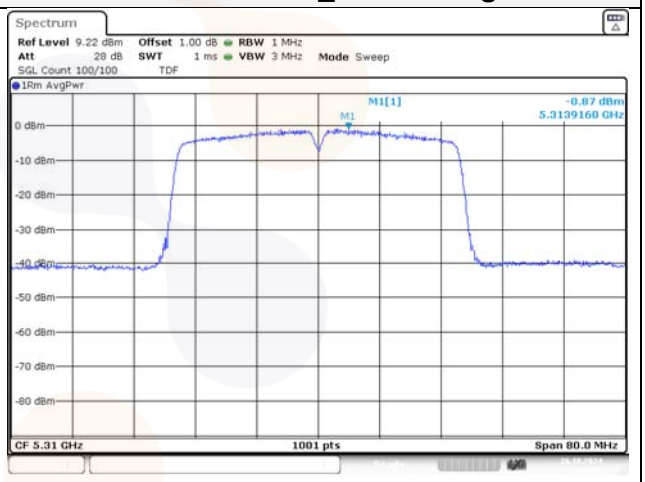
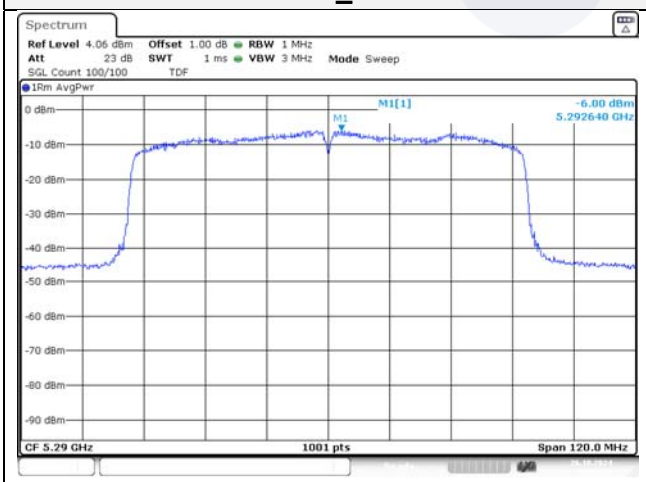
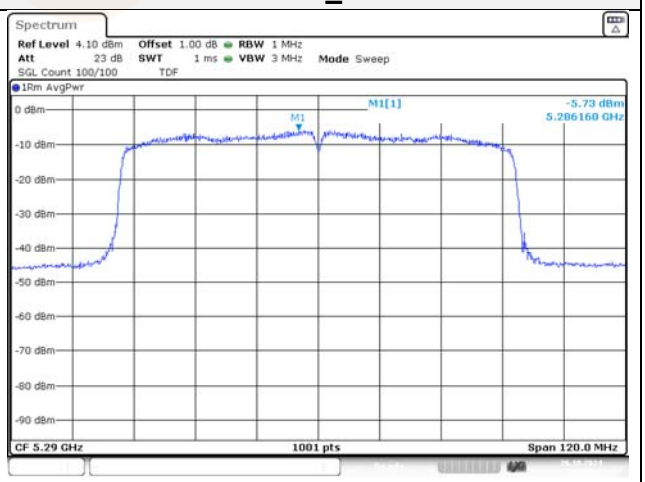
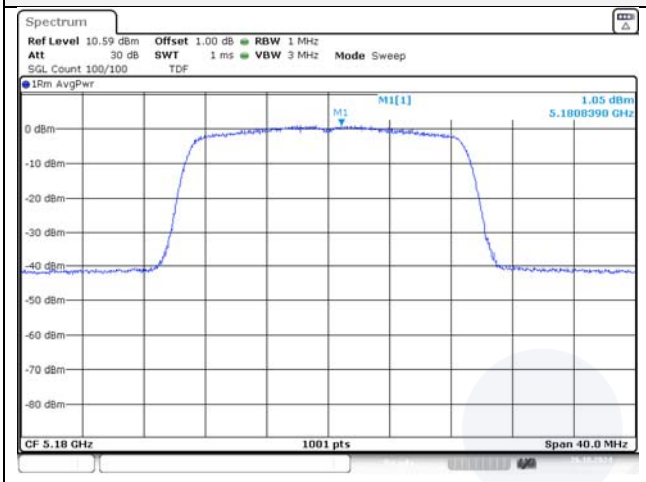
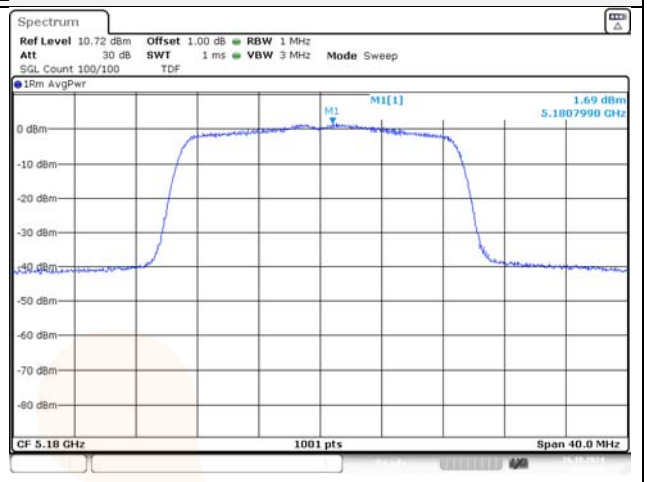
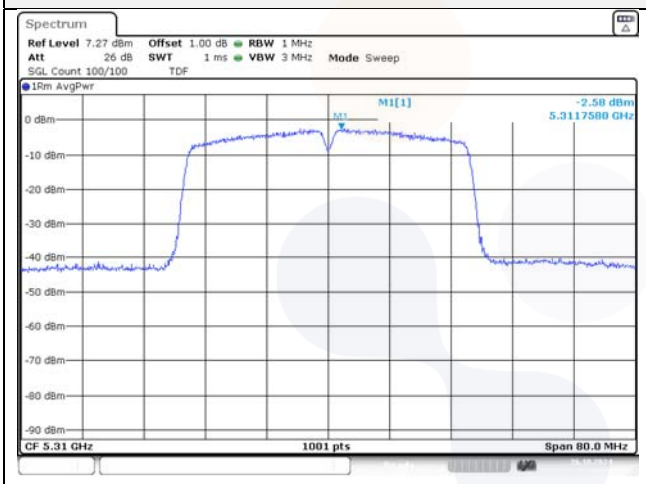
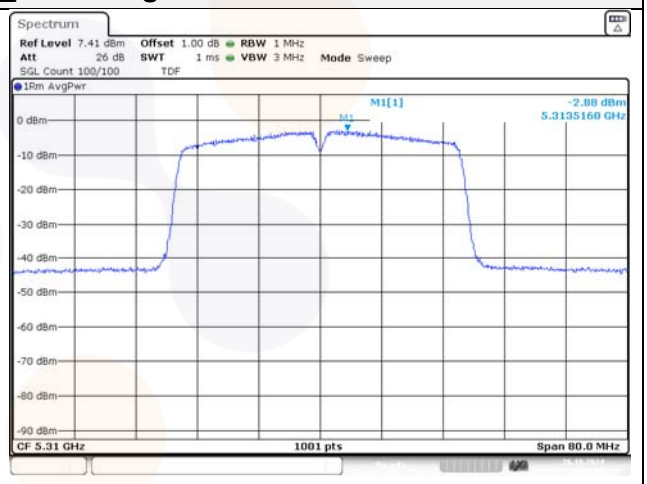
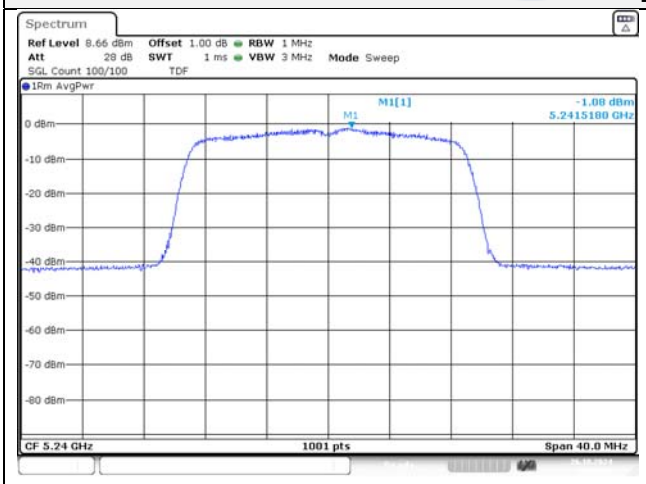
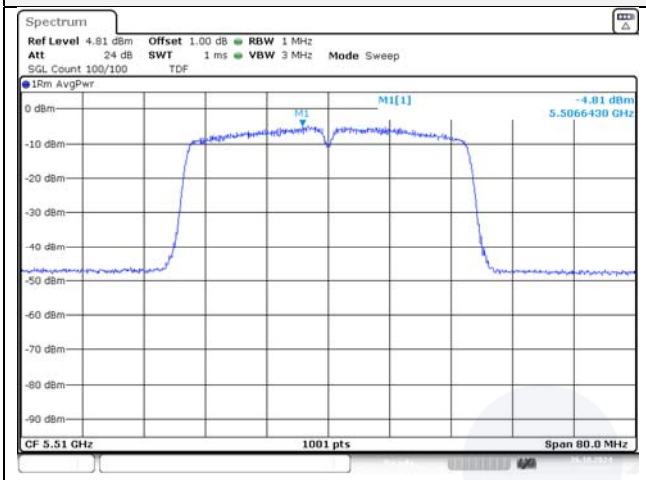
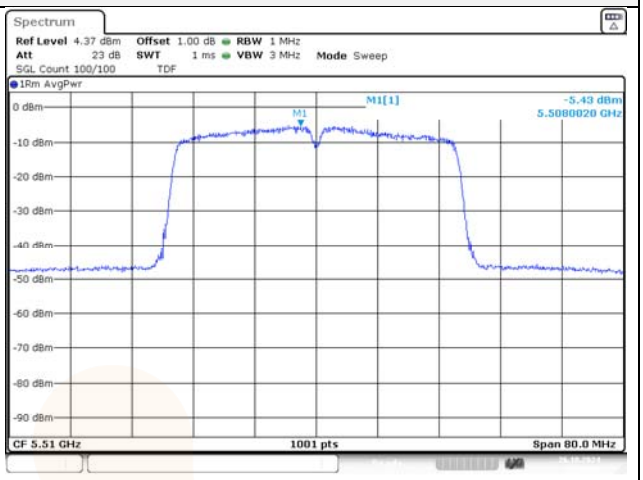
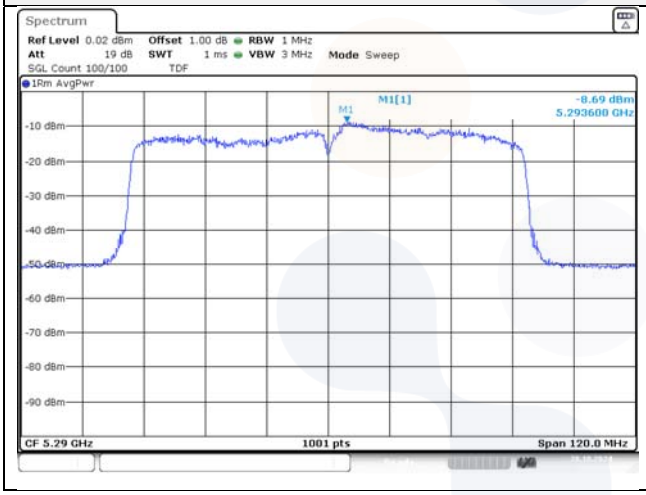
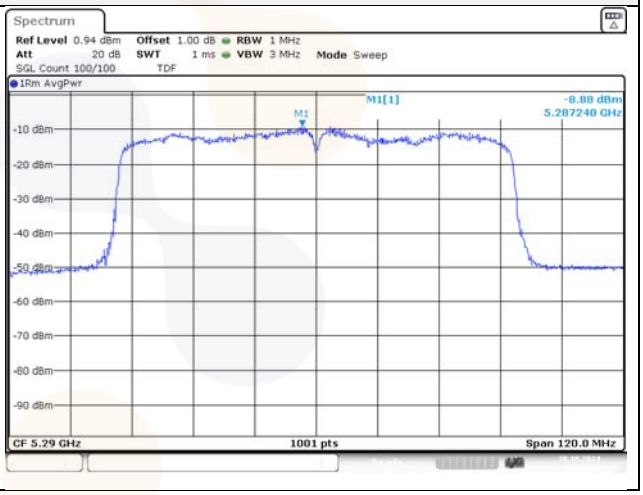
ANT 1	ANT 2
UNII-2A / 802.11a / High ch.	**-**
	Blank
UNII-2A / 802.11n_HT20 / Mid ch.	**UNII-2A / 802.11n_HT20 / Mid ch.**
	
UNII-2A / 802.11n_HT40 / Low ch.	**UNII-2A / 802.11n_HT40 / High ch.**
	

ANT 1	ANT 2
UNII-1 / 802.11ac_VHT20 / High ch.	**UNII-2A / 802.11ac_VHT20 / High ch.**
	
UNII-2A / 802.11ac_VHT40 / High ch.	**UNII-2A / 802.11ac_VHT40 / High ch.**
	
UNII-2A / 802.11ac_VHT80 / Mid ch.	**UNII-2A / 802.11ac_VHT80 / Mid ch.**
	

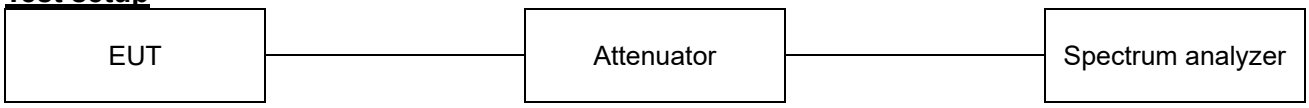
MIMO

ANT 1	ANT 2
UNII-1 / 802.11n_HT20 / Low ch.	
	
UNII-2A / 802.11n_HT40 / High ch.	
	
UNII-1 / 802.11ac_VHT20 / High ch.	
	

ANT 1	ANT 2
UNII-2C / 802.11ac_VHT40 / Low ch.	
	
UNII-2A / 802.11ac_VHT80 / Mid ch.	
	

7.3. 26 dB Bandwidth & 99% Bandwidth

Test setup



Limit

N/A

Test procedure

ANSI C63.10-2013 Section 12.4
KDB 789033 D02 v02r01 - Section C.1 (26dB bandwidth)
KDB 789033 D02 v02r01 - Section D (99% bandwidth)

Test settings

1. 26 dB Bandwidth

a. Set RBW = approximately 1% of the emission bandwidth.
b. Set the VBW > RBW.
c. Detector = Peak.
d. Trace mode = max hold.
e. Measure the maximum width of the emission that is 26 dB down from the maximum of the emission. Compare this with the RBW setting of the analyzer. Readjust RBW and repeat measurement as needed until the RBW/EBW ratio is approximately 1%.

2. 99% Occupied Bandwidth

a. Set center frequency to the nominal EUT channel center frequency.
b. Set span = 1.5 times to 5.0 times the OBW.
c. Set RBW = 1% to 5% of the OBW
d. Set VBW ≥ 3 x RBW
e. Video averaging is not permitted. Where practical, a sample detection and single sweep mode shall be used. Otherwise, peak detection and max hold mode (until the trace stabilizes) shall be used.
f. Use the 99% power bandwidth function of the instrument (if available).
g. If the instrument does not have a 99% power bandwidth function, the trace data points are recovered and directly summed in power units. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached; that frequency is recorded as the lower frequency. The process is repeated until 99.5% of the total is reached; that frequency is recorded as the upper frequency. The 99% occupied bandwidth is the difference between these two frequencies.

Test results

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Test mode	Band	Frequency(㎒)	26 ㏈ bandwidth (㎒)		99% bandwidth (㎒)	
			ANT1	ANT2	ANT1	ANT2
802.11a	UNII-1	5 180	18.73	-	16.33	-
		5 200	18.63	-	16.28	-
		5 240	18.43	-	16.33	-
	UNII-2A	5 260	18.53	-	16.33	-
		5 280	18.73	-	16.33	-
		5 320	18.53	-	16.33	-
	UNII-2C	5 500	18.73	-	16.28	-
		5 600	18.73	-	16.43	-
		5 700	18.53	-	16.38	-
802.11n HT20	UNII-1	5 180	19.63	19.73	17.48	17.48
		5 200	19.63	19.68	17.48	17.48
		5 240	19.63	19.58	17.48	17.48
	UNII-2A	5 260	19.68	19.53	17.48	17.48
		5 280	19.58	19.73	17.48	17.48
		5 320	19.68	19.53	17.53	17.48
	UNII-2C	5 500	19.58	19.48	17.48	17.48
		5 600	19.43	19.53	17.53	17.53
		5 700	19.63	19.63	17.43	17.43
802.11n HT40	UNII-1	5 190	39.46	39.36	35.96	35.96
		5 230	39.26	39.26	36.06	35.96
	UNII-2A	5 270	39.16	39.36	35.96	36.06
		5 310	39.36	39.16	35.96	35.96
	UNII-2C	5 510	39.36	39.36	35.86	35.96
		5 590	39.36	39.16	35.96	35.86
		5 670	39.26	39.46	35.86	35.86
802.11ac VHT20	UNII-1	5 180	19.73	19.73	17.53	17.48
		5 200	19.63	19.73	17.48	17.43
		5 240	19.58	19.73	17.48	17.48
	UNII-2A	5 260	19.58	19.68	17.48	17.48
		5 280	19.43	19.48	17.48	17.48
		5 320	19.48	19.63	17.48	17.78
	UNII-2C	5 500	19.78	19.53	17.48	17.53
		5 600	19.68	19.63	17.48	17.53
		5 700	19.53	19.68	17.48	17.48

Test mode	Band	Frequency(㎒)	26 ㏈ bandwidth (㎒)		99% bandwidth (㎒)	
			ANT1	ANT2	ANT1	ANT2
802.11ac VHT40	UNII-1	5 190	39.46	39.26	35.96	35.86
		5 230	39.36	39.36	35.96	35.86
	UNII-2A	5 270	39.26	39.36	35.86	35.96
		5 310	39.26	39.36	35.86	35.86
	UNII-2C	5 510	39.46	39.36	35.96	35.96
		5 590	39.36	39.26	35.96	35.86
		5 670	39.26	39.46	35.96	35.96
802.11ac VHT80	UNII-1	5 210	81.52	81.16	74.81	74.57
	UNII-2A	5 290	81.28	81.28	74.57	74.57
	UNII-2C	5 530	81.40	81.04	74.57	74.57
		5 610	81.28	81.64	74.45	74.69

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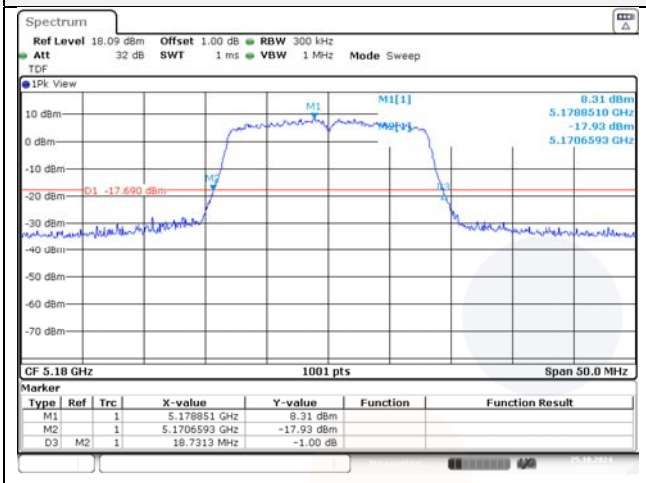
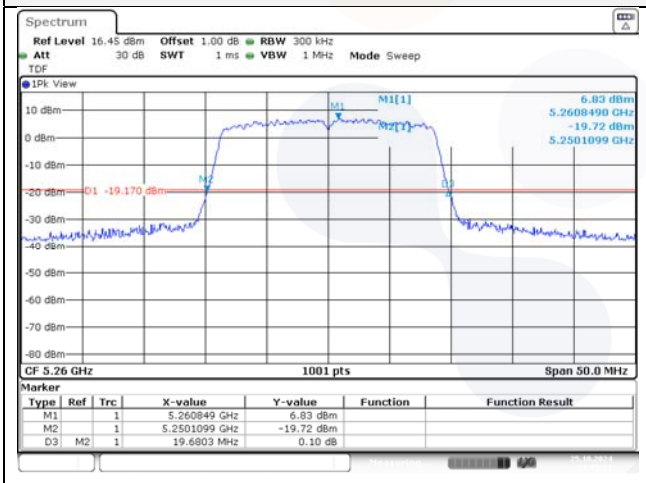
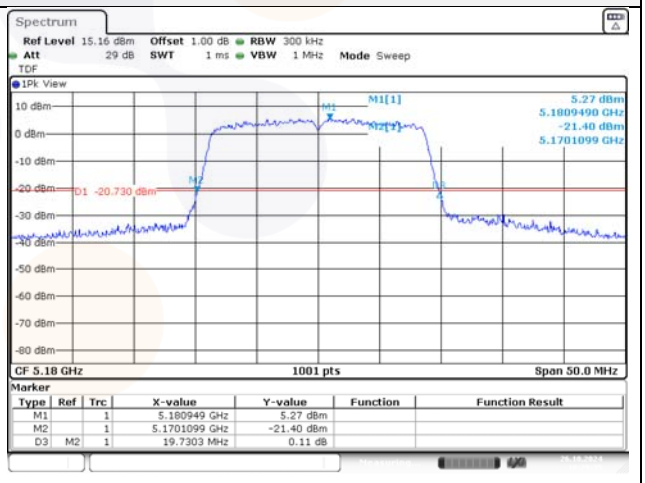
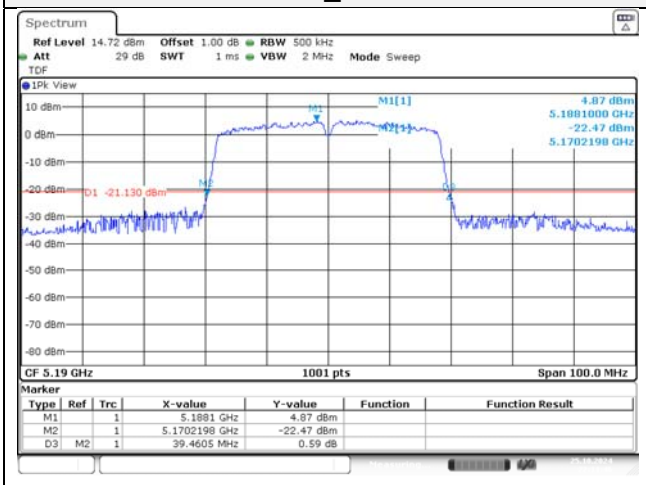
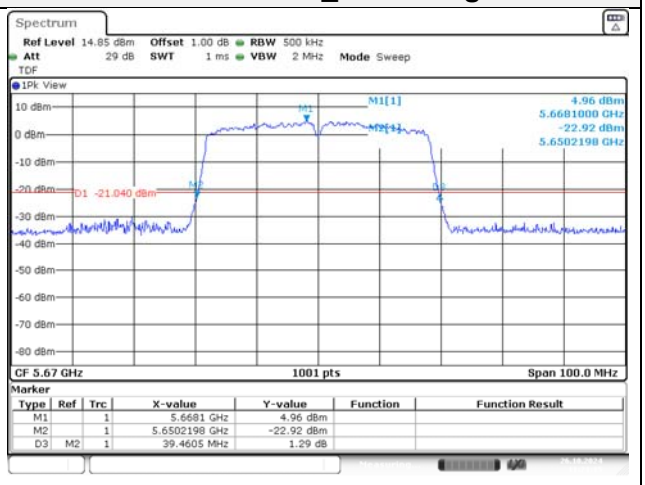
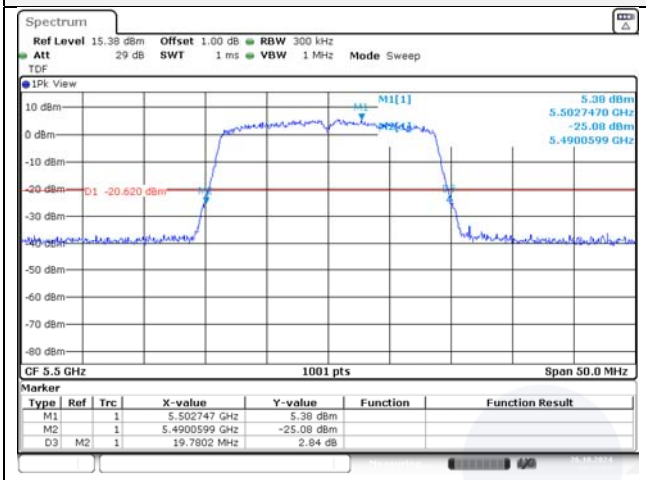
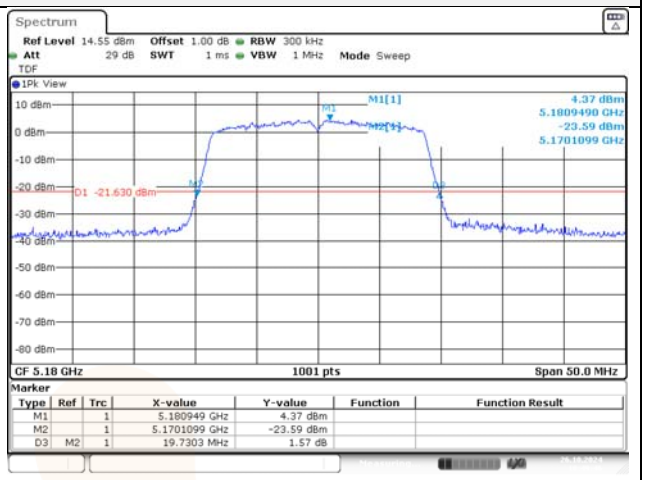
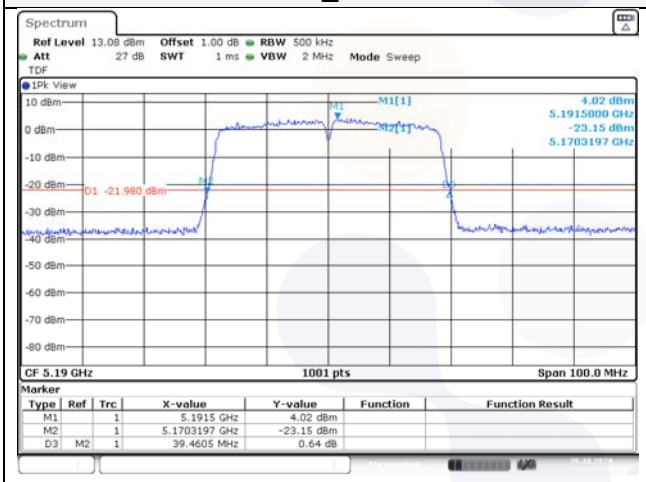
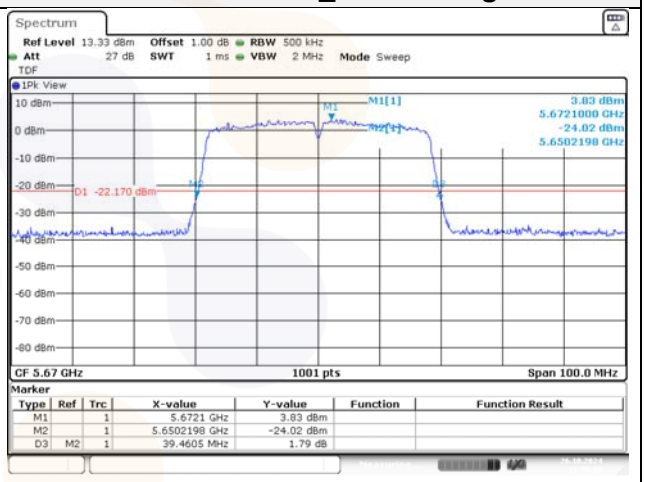
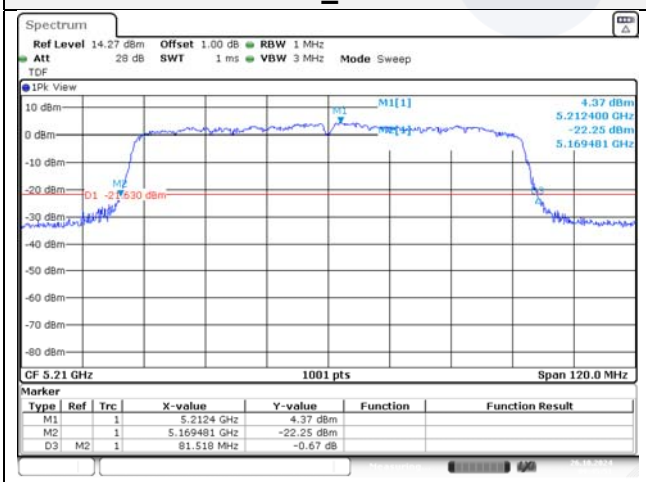
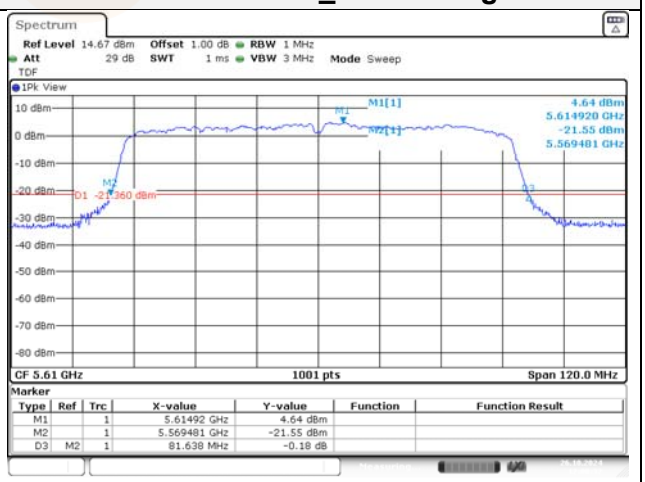
Test mode	Band	Frequency(㎒)	26 ㏈ bandwidth (㎒)		99% bandwidth (㎒)	
			ANT1	ANT2	ANT1	ANT2
802.11n HT20	UNII-1	5 180	19.63	19.53	17.48	17.53
		5 200	19.63	19.48	17.48	17.53
		5 240	19.58	19.68	17.53	17.48
	UNII-2A	5 260	19.58	19.53	17.48	17.48
		5 280	19.68	19.53	17.53	17.48
		5 320	19.58	19.58	17.48	17.48
	UNII-2C	5 500	19.53	19.58	17.48	17.43
		5 600	19.48	19.43	17.48	17.53
		5 700	19.63	19.53	17.48	17.48
802.11n HT40	UNII-1	5 190	39.26	38.96	36.06	35.96
		5 230	39.26	38.96	35.96	35.96
	UNII-2A	5 270	39.06	39.06	35.76	35.86
		5 310	39.06	39.26	35.86	35.76
	UNII-2C	5 510	39.36	39.06	35.96	36.06
		5 590	39.06	39.16	35.86	35.76
		5 670	39.16	39.06	35.86	35.96
802.11ac VHT20	UNII-1	5 180	19.43	19.33	17.43	17.48
		5 200	19.43	19.38	17.53	17.53
		5 240	19.48	19.33	17.48	17.48
	UNII-2A	5 260	19.48	19.28	17.53	17.53
		5 280	19.53	19.33	17.53	17.48
		5 320	19.43	19.33	17.48	17.48
	UNII-2C	5 500	19.43	19.33	17.43	17.53
		5 600	19.48	19.33	17.53	17.48
		5 700	19.53	19.38	17.53	17.53
802.11ac VHT40	UNII-1	5 190	38.66	38.76	35.96	35.86
		5 230	38.76	38.86	35.86	35.86
	UNII-2A	5 270	39.06	38.36	35.96	35.86
		5 310	38.96	38.46	35.96	35.76
	UNII-2C	5 510	39.06	38.86	35.96	35.86
		5 590	39.16	38.66	35.86	35.66
		5 670	39.16	38.86	35.86	35.76
802.11ac VHT80	UNII-1	5 210	81.28	80.68	74.69	74.33
	UNII-2A	5 290	81.88	80.80	74.93	74.57
	UNII-2C	5 530	81.28	80.56	74.81	74.57
		5 610	80.80	81.04	74.45	74.69

In order to simplify the report, the attached plot is the widest bandwidth ins Test mode.

26 dB bandwidth

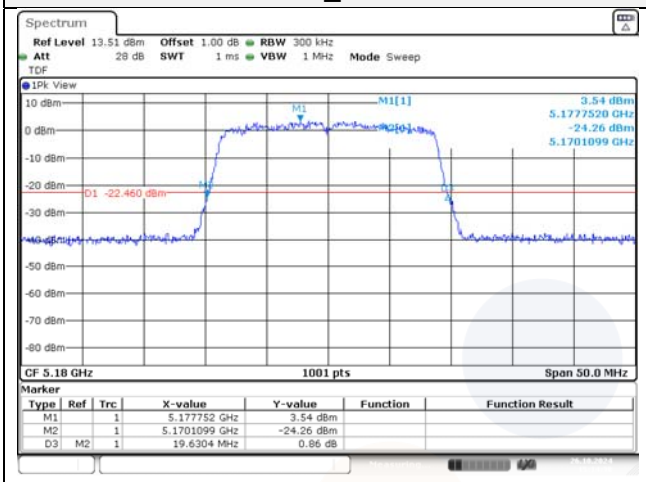
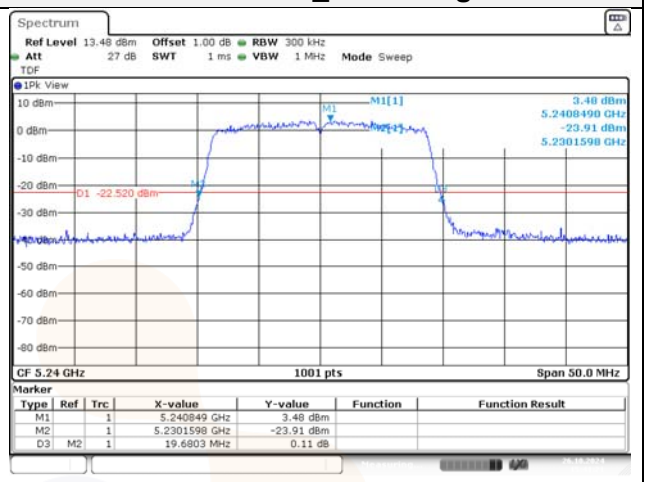
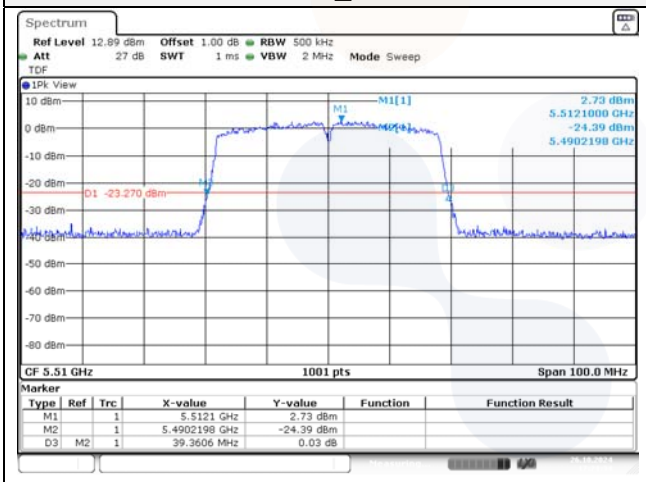
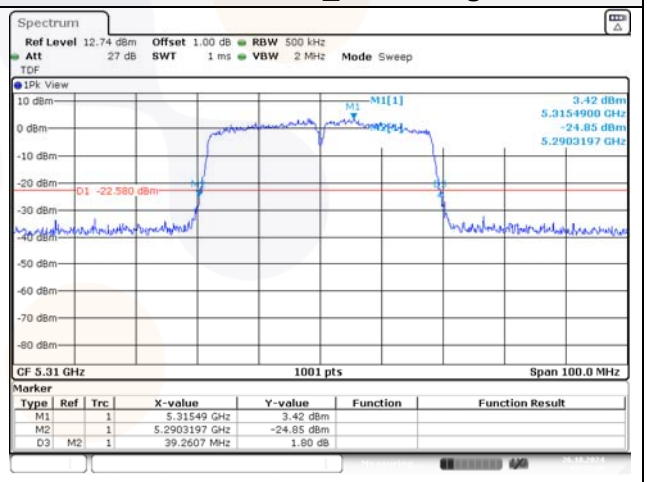
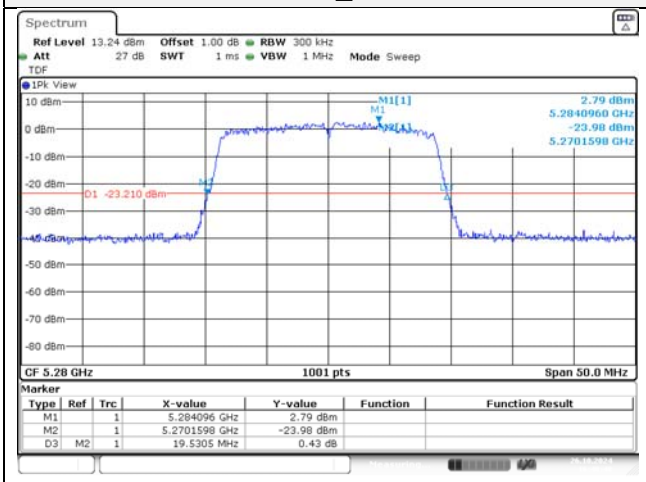
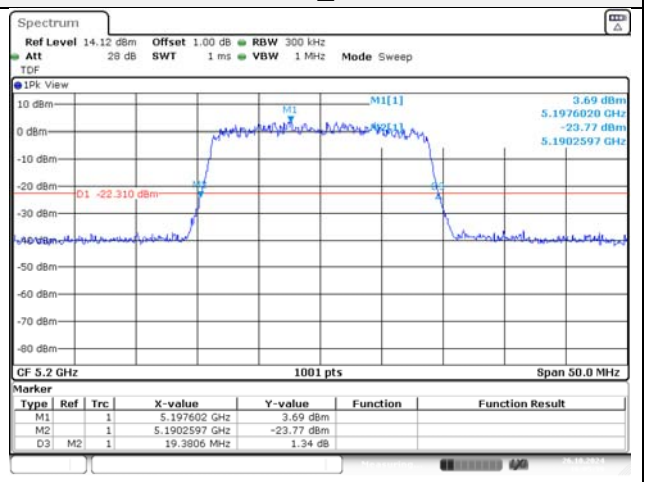
SISO

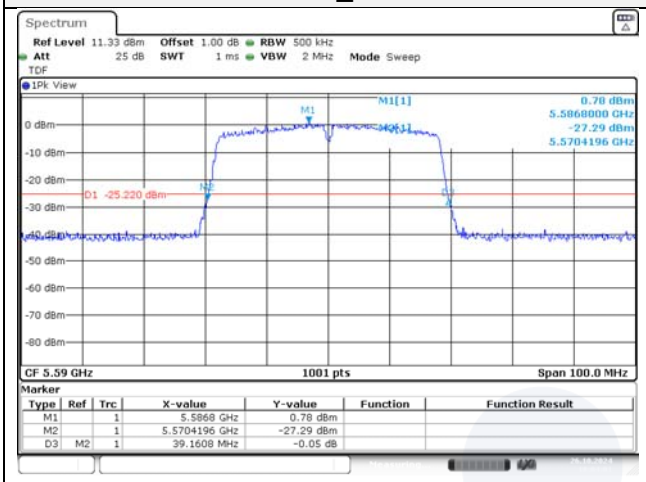
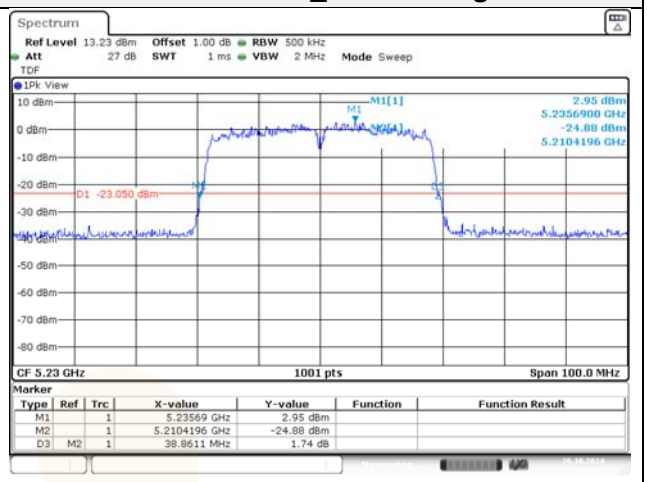
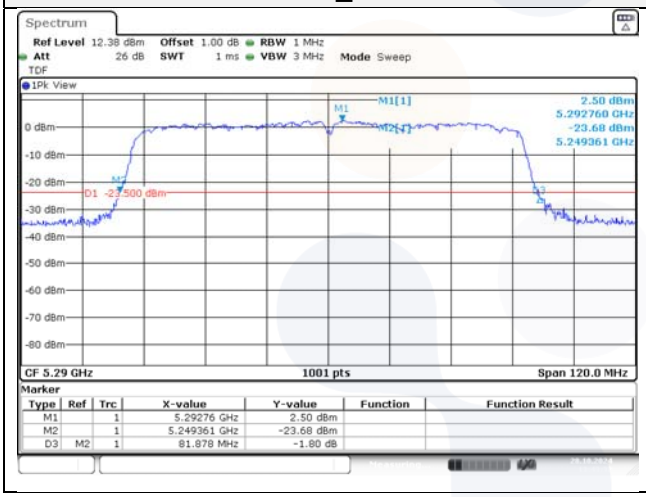
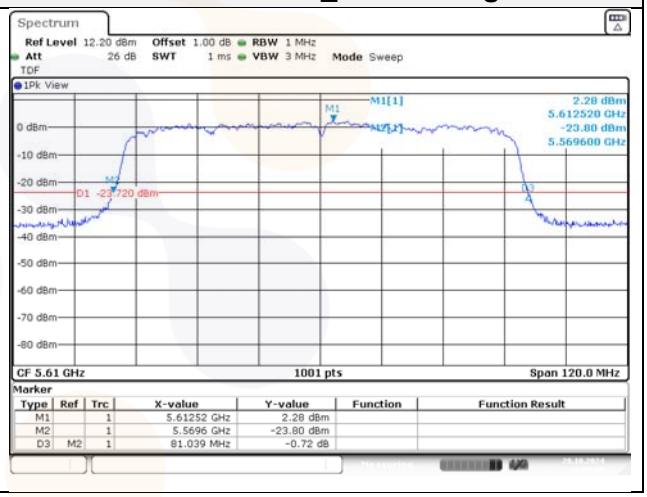
ANT 1	ANT 2
UNII-1 / 802.11a / Low ch.	**-**
	Blank
UNII-2A / 802.11n_HT20 / Low ch.	**UNII-1 / 802.11n_HT20 / Low ch.**
	
UNII-1 / 802.11n_HT40 / Low ch.	**UNII-2C / 802.11n_HT40 / High ch.**
	

ANT 1	ANT 2
UNII-2C / 802.11ac_VHT20 / Low ch.	**UNII-1 / 802.11ac_VHT20 / Low ch.**
	
UNII-1 / 802.11ac_VHT40 / Low ch.	**UNII-2C / 802.11ac_VHT40 / High ch.**
	
UNII-1 / 802.11ac_VHT80 / Low ch.	**UNII-2C / 802.11ac_VHT80 / High ch.**
	

In order to simplify the report, the attached plot is the widest bandwidth ins Test mode.

MIMO

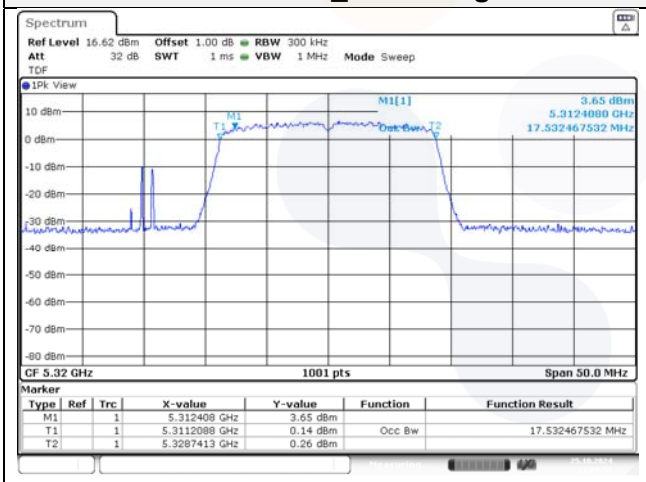
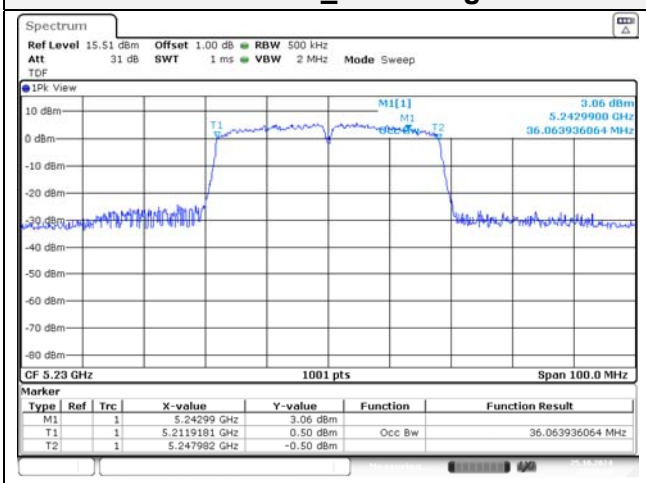
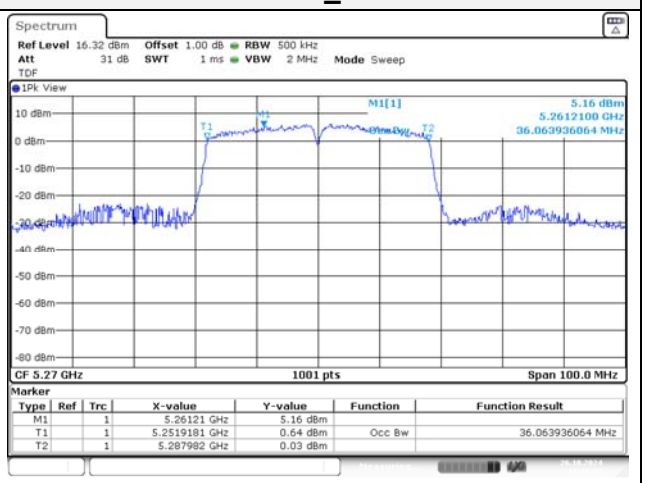
ANT 1	ANT 2
UNII-1 / 802.11n_HT20 / Low ch.	**UNII-1 / 802.11n_HT20 / High ch.**
	
UNII-2C / 802.11n_HT40 / Low ch.	**UNII-2A / 802.11n_HT40 / High ch.**
	
ANT 1	**ANT 2**
UNII-2A / 802.11ac_VHT20 / Mid ch.	**UNII-1 / 802.11ac_VHT20 / Mid ch.**
	

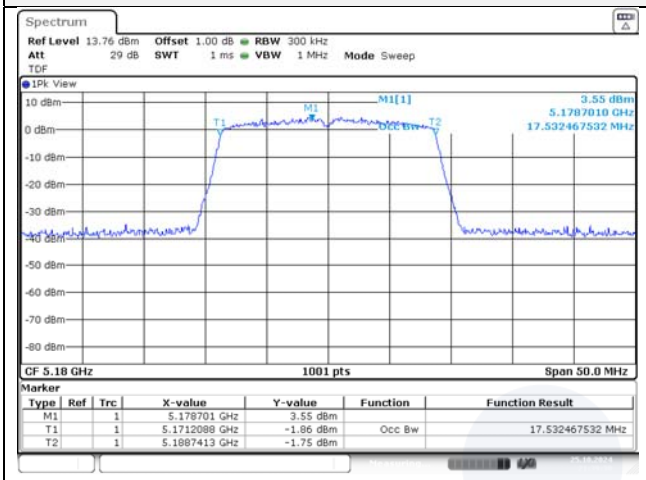
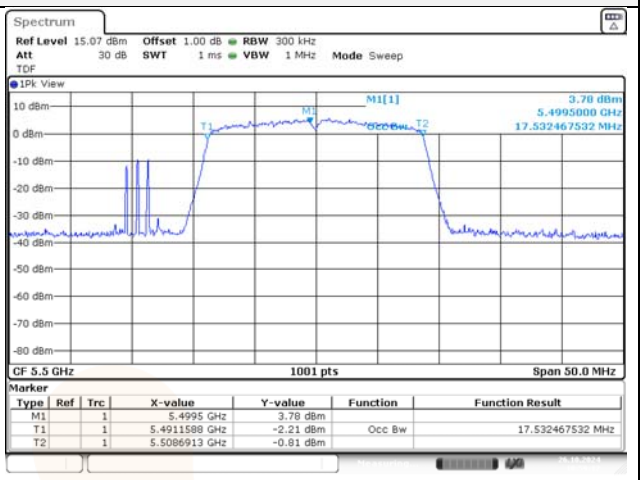
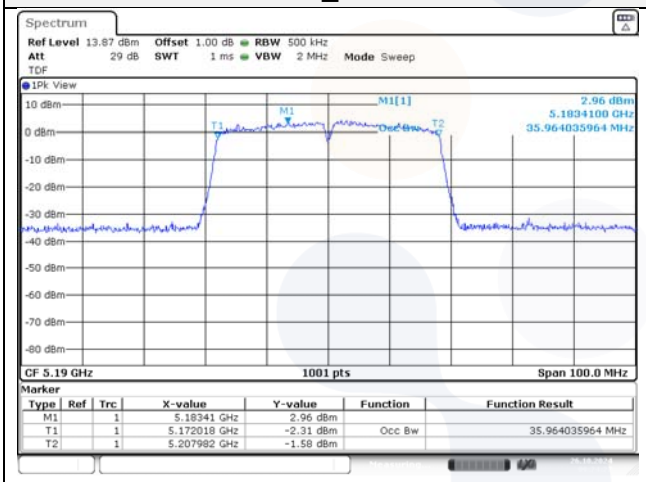
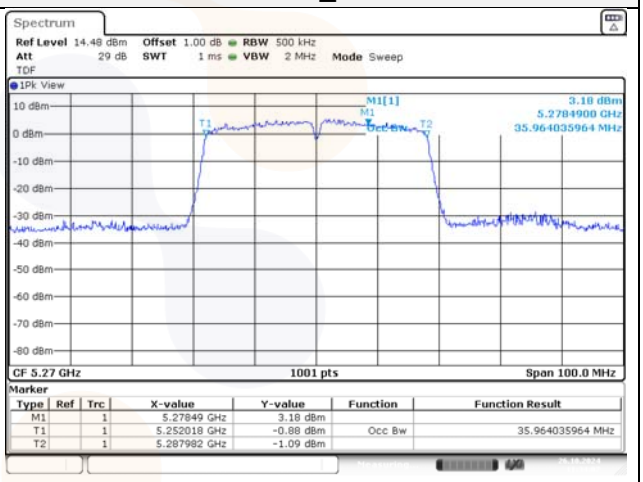
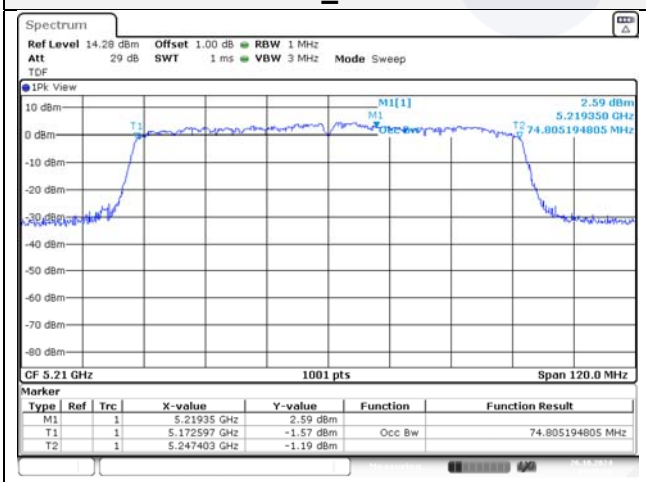
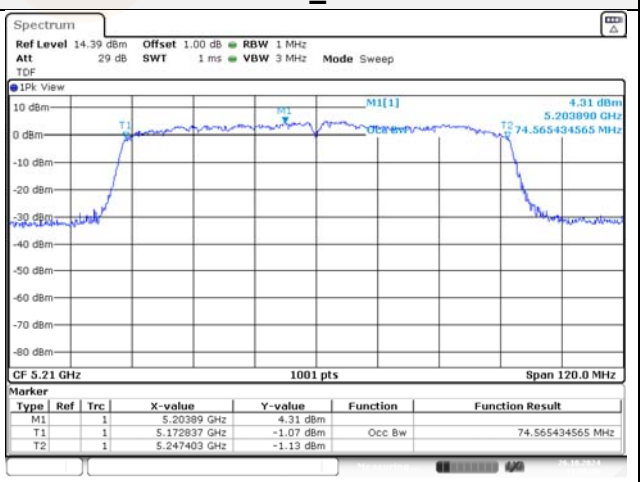
ANT 1	ANT 2
UNII-2C / 802.11ac_VHT40 / Mid ch.	**UNII-1 / 802.11ac_VHT40 / High ch.**
	
UNII-2A / 802.11ac_VHT80 / Mid ch.	**UNII-2C / 802.11ac_VHT80 / High ch.**
	

In order to simplify the report, the attached plot is the widest bandwidth ins Test mode.

99% bandwidth

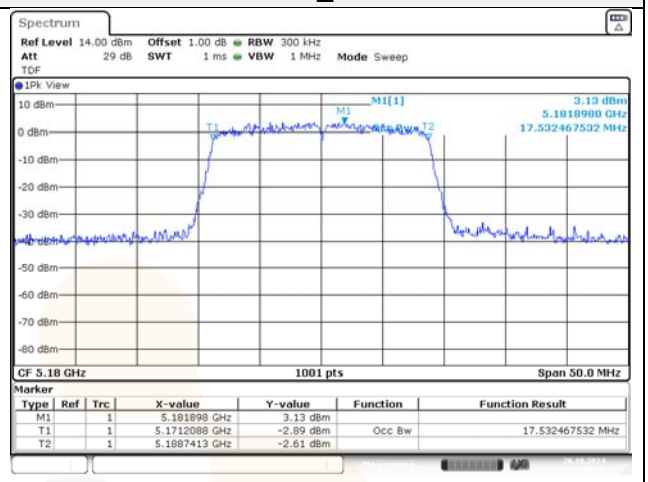
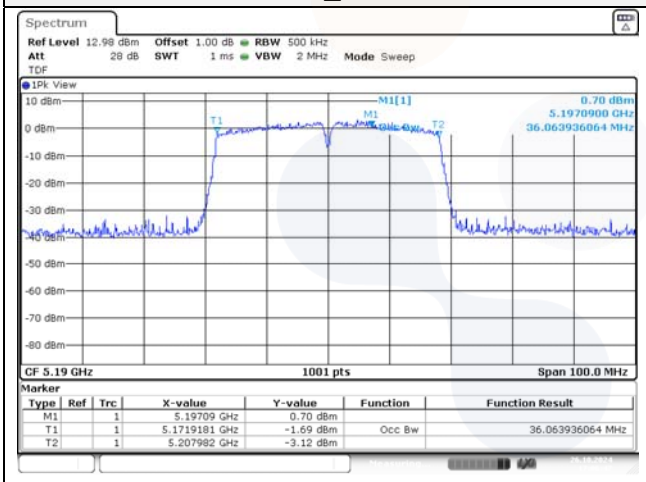
SISO

ANT 1	ANT 2
UNII-2C / 802.11a / Mid ch.	**-**
	Blank
UNII-2A / 802.11n_HT20 / High ch.	**UNII-2C / 802.11n_HT20 / Mid ch.**
	
UNII-1 / 802.11n_HT40 / High ch.	**UNII-2A / 802.11n_HT40 / Low ch.**
	

ANT 1	ANT 2
UNII-1 / 802.11ac_VHT20 / Low ch.	**UNII-2C / 802.11ac_VHT20 / Low ch.**
	
UNII-1 / 802.11ac_VHT40 / Low ch.	**UNII-2A / 802.11ac_VHT40 / Low ch.**
	
UNII-1 / 802.11ac_VHT80 / Low ch.	**UNII-1 / 802.11ac_VHT80 / Low ch.**
	

In order to simplify the report, the attached plot is the widest bandwidth ins Test mode.

MIMO

ANT 1	ANT 2
UNII-1 / 802.11n_HT20 / High ch.	**UNII-1 / 802.11n_HT20 / Low ch.**
	
UNII-1 / 802.11n_HT40 / Low ch.	**UNII-2C / 802.11n_HT40 / Low ch.**
	
ANT 1	**ANT 2**
UNII-1 / 802.11ac_VHT20 / Mid ch.	**UNII-1 / 802.11ac_VHT20 / Mid ch.**