FCC RADIO TEST REPORT

FCC ID	:	**2AFZZ119DG**
Equipment	:	**Mobile Phone**
Brand Name	:	**XIAOMI**
Model Name	:	**2109119DG**
Applicant	:	**Xiaomi Communications Co., Ltd. #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085**
Manufacturer	:	**Xiaomi Communications Co., Ltd. #019, 9th Floor, Building 6, 33 Xi'erqi Middle Road, Haidian District, Beijing, China, 100085**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Jun. 30, 2021 and testing was started from Jul. 03, 2021 and completed on Jul. 28, 2021. We, Sporton International Inc. Wensan Laboratory, would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Reviewed by: Louis Wu

Sporton International Inc. Wensan Laboratory
No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.)

Table of Contents

History of this test report

Report No.	Version	Description	Issued Date
FR162425C	01	Initial issue of report	Aug. 02, 2021

Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
3.1	15.247(a)(2)	6dB Bandwidth	Pass	-
3.1	2.1049	99% Occupied Bandwidth	Reporting only	-
3.2	15.247(b)	Power Output Measurement	Pass	-
3.3	15.247(e)	Power Spectral Density	Pass	-
3.4	15.247(d)	Conducted Band Edges	Pass	-
		Conducted Spurious Emission	Pass	-
3.5	15.247(d)	Radiated Band Edges and Radiated Spurious Emission	Pass	Under limit 3.86 dB at 2390.000 MHz
3.6	15.207	AC Conducted Emission	Pass	Under limit 11.02 dB at 7.346 MHz
3.7	15.203 & 15.247(b)	Antenna Requirement	Pass	-

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

Reviewed by: Danny Lee

Report Producer: Celery Wei

1 General Description

1.1 Product Feature of Equipment Under Test

GSM/WCDMA/LTE/5G NR, Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, Wi-Fi 5GHz 802.11a/n/ac/ax, NFC, and GNSS

Product Specification subjective to this standard	
Sample 1	6G+128GB with Battery 1
Sample 2	8G+128GB with Battery 1
Sample 3	8G+256GB with Battery 1
Sample 4	6G+128GB with Battery 2
Antenna Type	WWAN: PIFA Antenna WLAN <Ant. 7>: PIFA Antenna <Ant. 9>: PIFA Antenna Bluetooth <Ant. 7>: PIFA Antenna <Ant. 9>: PIFA Antenna GPS/Glonass/BDS/Galileo/QZSS/NavIC: PIFA Antenna NFC: Coil Antenna

Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	<Ant. 7>: -1.8 <Ant. 9>: -0.9

Remark: The above EUT's information was declared by manufacturer. Please refer to Comments and Explanations in report summary.

1.2 Modification of EUT

No modifications are made to the EUT during all test items.

1.3 Testing Location

Test Site	Sporton International Inc. Wensan Laboratory
Test Site Location	No.58, Aly. 75, Ln. 564, Wenhua 3rd, Rd., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: +886-3-327-0868 FAX: +886-3-327-0855
Test Site No.	**Sporton Site No.**
	TH05-HY, CO07-HY, 03CH20-HY

Note: The test site complies with ANSI C63.4 2014 requirement.

FCC designation No.: TW3786

1.4 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v05r02
- FCC KDB 414788 D01 Radiated Test Site v01r01.
- FCC KDB 662911 D01 Multiple Transmitter Output v02r01.
- ANSI C63.10-2013

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. The TAF code is not including all the FCC KDB listed without accreditation.

2 Test Configuration of Equipment Under Test

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: conduction emission (150 kHz to 30 MHz), radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, the measured emission level of the EUT was maximized by rotating the EUT on a turntable, adjusting the orientation of the EUT and EUT antenna in three orthogonal axis (X: flat, Y: portrait, Z: landscape), and adjusting the measurement antenna orientation, following C63.10 exploratory test procedures and find Z Plane as worst plane.

b. AC power line Conducted Emission was tested under maximum output power.

2.1 Carrier Frequency and Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
2400-2483.5 MHz	1	2412	7	2442
	2	2417	8	2447
	3	2422	9	2452
	4	2427	10	2457
	5	2432	11	2462
	6	2437		

2.2 Test Mode

Final test modes are considering the modulation and worse data rates as below table.

MIMO Antenna

Modulation	Data Rate
802.11b	1 Mbps
802.11g	6 Mbps
802.11n HT20 (Covered by HE20)	MCS0
802.11n HT40 (Covered by HE40)	MCS0
802.11ax HE20	MCS0
802.11ax HE40	MCS0

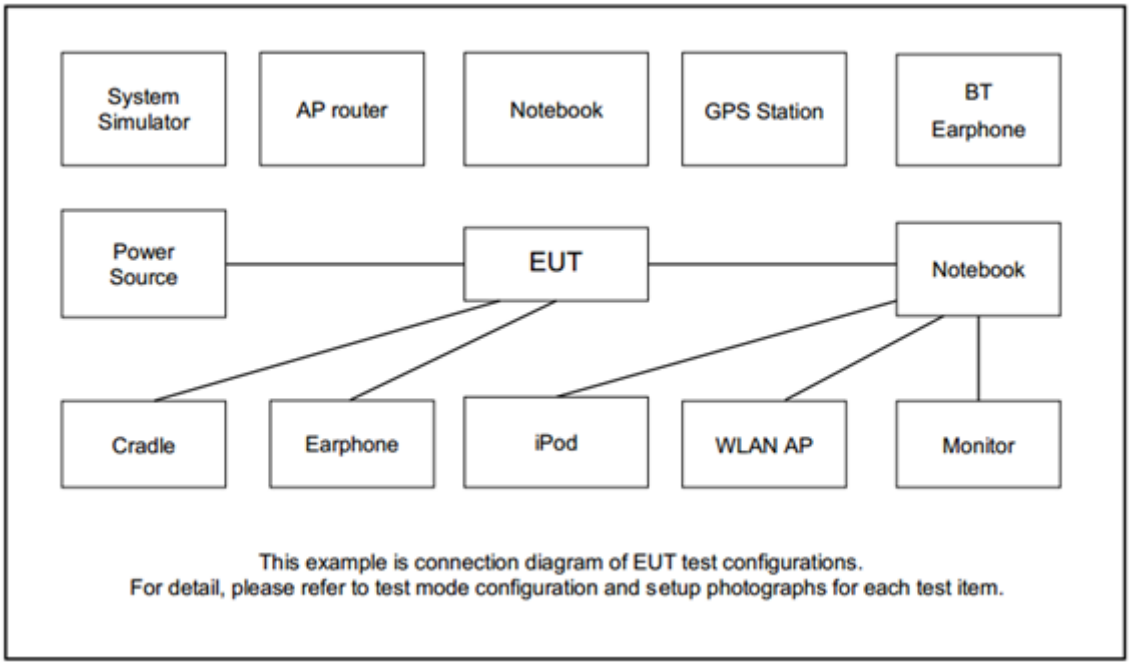
Test Cases	
AC Conducted Emission	Mode 1 : GSM850 Rx (Middle Channel) for Ant 1 + Bluetooth Link + WLAN (2.4GHz) Link + Camera (Rear) + USB Cable 1 (Charging from Adapter) + SIM 1 for Sample 3
Remark: For Radiated Test Cases, the tests were performed with USB Cable 2 and Sample 1.	

Ch. #	2400-2483.5 MHz		
	802.11b	802.11g	802.11ax HE40
Low	01	01	03
Middle	06	06	06
High	11	11	09

Remark:

1. For radiation spurious emission, the final modulation and the worst data rate was reference the max RF conducted power.
2. Since the verify power, the smaller power can be covered by the higher power. Radiation test item 802.11n HT20 and 802.11ax HE20 covered by 802.11g.

2.3 Connection Diagram of Test System



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8 m
4.	Notebook	DELL	Latitude 3400	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Notebook	DELL	Latitude5310	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
6.	SD Card	SanDisk	MicroSD HC	FCC DoC	N/A	N/A

2.5 EUT Operation Test Setup

<For WLAN TX>

The RF test items, make the EUT (SW: MIUI 12.5 Global 21.6.11) get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

<WLAN partial RU TX>

The RF test items, utility “QSPR version 5.0.00188” was installed in Notebook which was programmed in order to make the EUT get into the engineering modes to provide channel selection, power level, data rate and the application type and for continuous transmitting signals.

2.6 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator 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.

Example:

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10 dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)

3 Test Result

3.1 6dB and 99% Bandwidth Measurement

3.1.1 Limit of 6dB and 99% Bandwidth

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

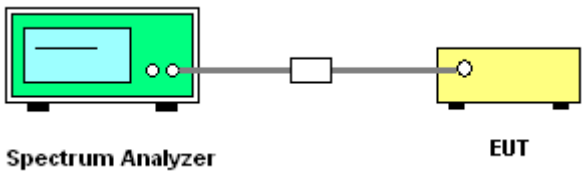
3.1.2 Measuring Instruments

See list of measuring equipment of this test report.

3.1.3 Test Procedures

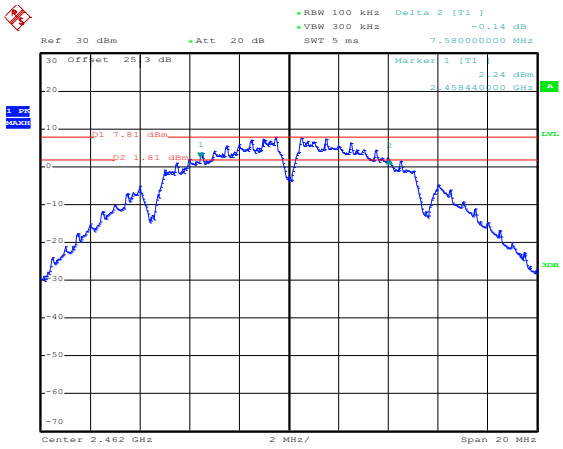
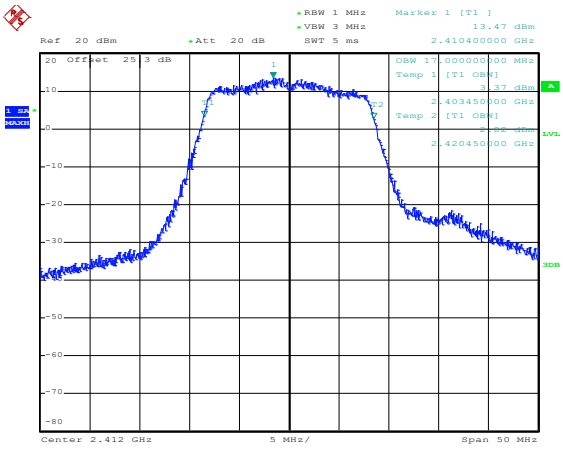
1. The testing follows the ANSI C63.10 Section 6.9.3 (OBW) and 11.8.1 (6dB BW).
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
5. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1-5% of the emission bandwidth and set the Video bandwidth (VBW) ≥ 3 * RBW.
6. Measure and record the results in the test report.

3.1.4 Test Setup

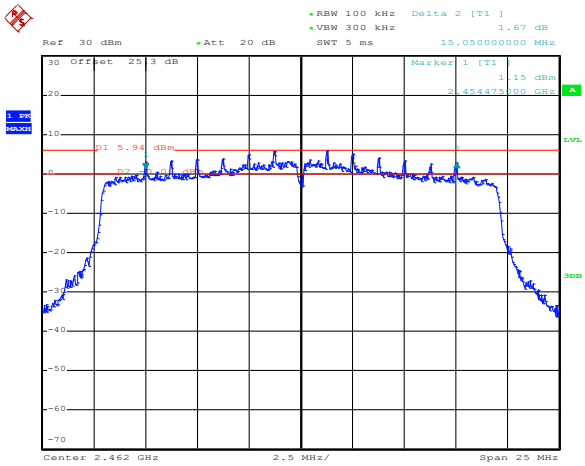
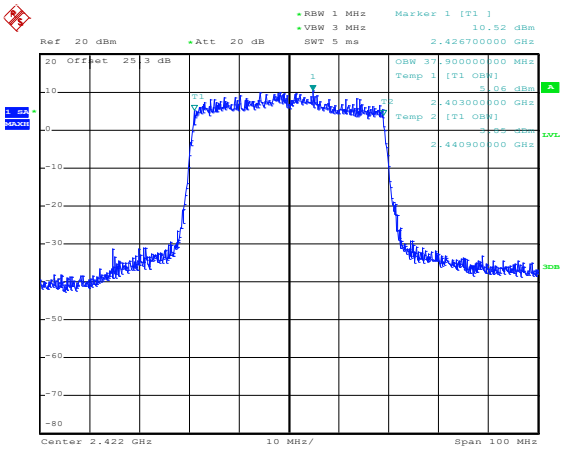


3.1.5 Test Result of 6dB and 99% Occupied Bandwidth

Please refer to Appendix A.

Minimum 6dB Bandwidth	Maximum 99% Occupied Bandwidth
	
Date: 19.JUL.2021 11:23:16	Date: 19.JUL.2021 11:56:33

<For 802.11ax mode>

Minimum 6dB Bandwidth	Maximum 99% Occupied Bandwidth
	
Date: 19.JUL.2021 16:14:26	Date: 19.JUL.2021 17:13:30

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5 MHz, the limit for output power is 30 dBm. If transmitting antenna with directional gain greater than 6 dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

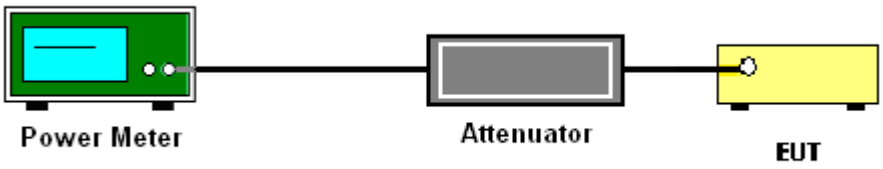
3.2.2 Measuring Instruments

See list of measuring equipment of this test report.

3.2.3 Test Procedures

1. For Average Power, the testing follows ANSI C63.10 Section 11.9.2.3.2 Method AVGPM-G
2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Measure the conducted output power and record the results in the test report.
5. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

3.2.4 Test Setup



3.2.5 Test Result of Average Output Power

Please refer to Appendix A.

3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8 dBm in any 3 kHz band at any time interval of continuous transmission.

3.3.2 Measuring Instruments

See list of measuring equipment of this test report.

3.3.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
6. Measure and record the results in the test report.
7. For MIMO mode, calculation method follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01.

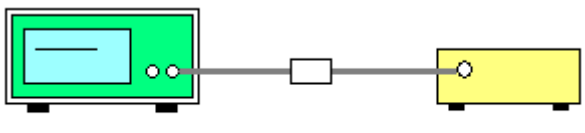
   If measurements performed using method (2) plus 10 log (N) exceeds the emission limit, the test should choose method (1) before declaring that the device fails the emission limit.

   Method (1): Measure and sum the spectra across the outputs.

   The total final Power Spectral Density is from a device with 2 transmitter outputs. The spectrum measurements of the individual outputs are all performed with the same span and number of points, the spectrum value in the first spectral bin of output 1 is summed with that in the first spectral bin of output 2 to obtain the value for the first frequency bin of the summed spectrum.

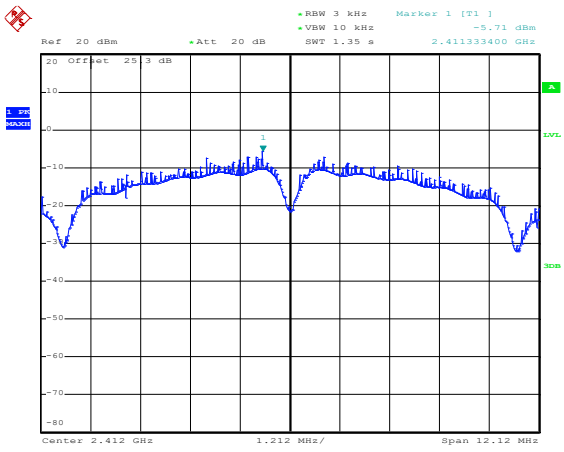
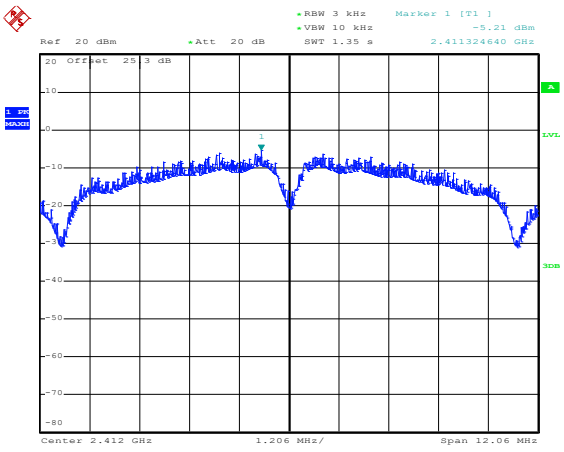
   Method (2): Measure and add 10 log (N) dB, where N is the number of outputs. (N=2)

3.3.4 Test Setup

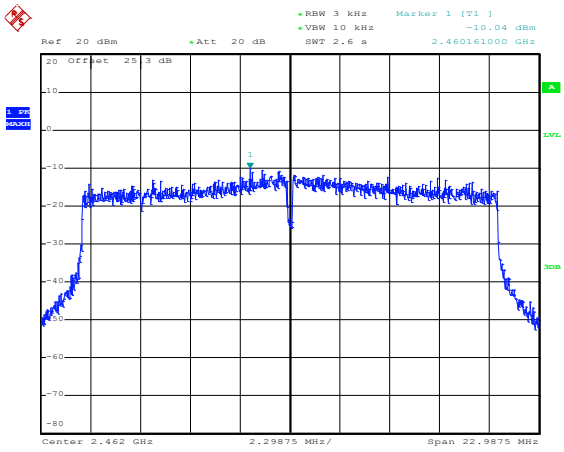
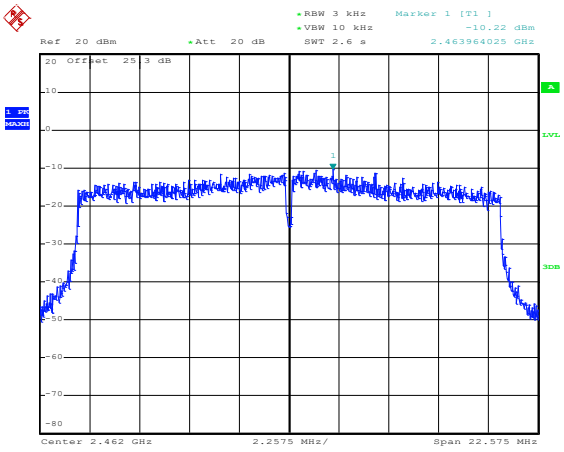


3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

Worst Case Power Density (dBm/3kHz) for MIMO Ant. 7	Worst Case Power Density (dBm/3kHz) for MIMO Ant. 9
	
Date: 19.JUL.2021 10:42:53	Date: 19.JUL.2021 10:53:50

<For 802.11ax mode>

Worst Case Power Density (dBm/3kHz) for MIMO Ant. 7	Worst Case Power Density (dBm/3kHz) for MIMO Ant. 9
	
Date: 19.JUL.2021 16:09:22	Date: 19.JUL.2021 16:26:13

3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission Measurement

In any 100 kHz bandwidth outside of the authorized frequency band, the emissions which fall in the non-restricted bands shall be attenuated at least 20 dB / 30dB relative to the maximum PSD level in 100 kHz by RF conducted measurement.

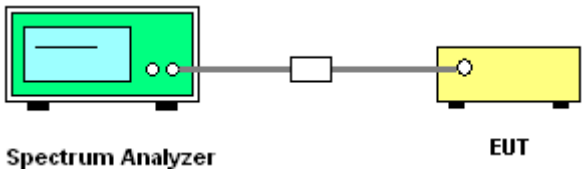
3.4.2 Measuring Instruments

See list of measuring equipment of this test report.

3.4.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.11.3 Emission level measurement.
2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
3. Set the maximum power setting and enable the EUT to transmit continuously.
4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB per 15.247(d).
5. Measure and record the results in the test report.
6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

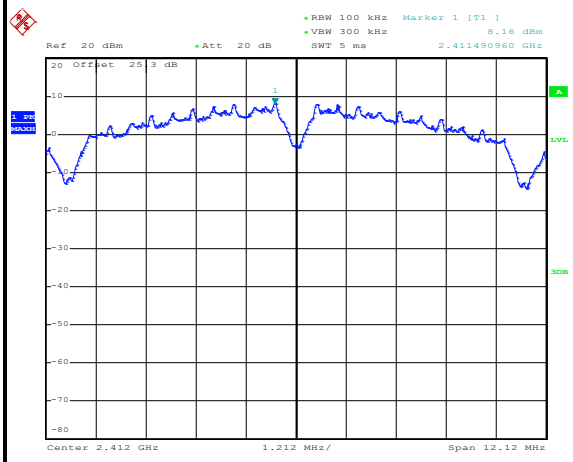
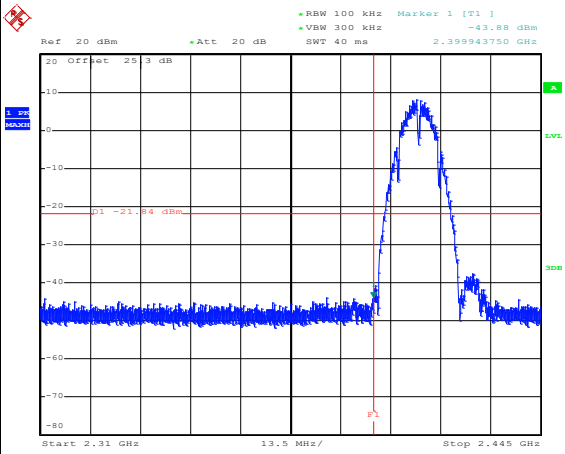
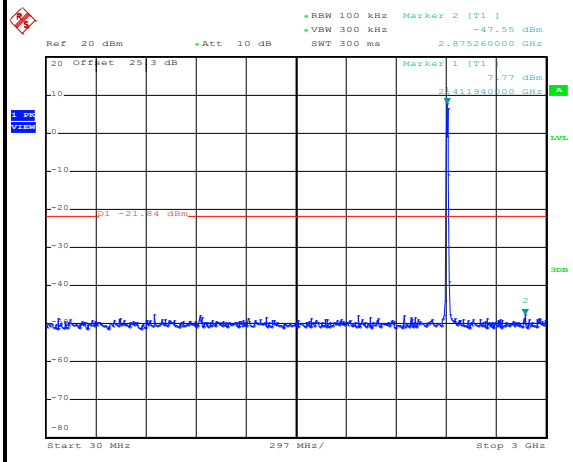
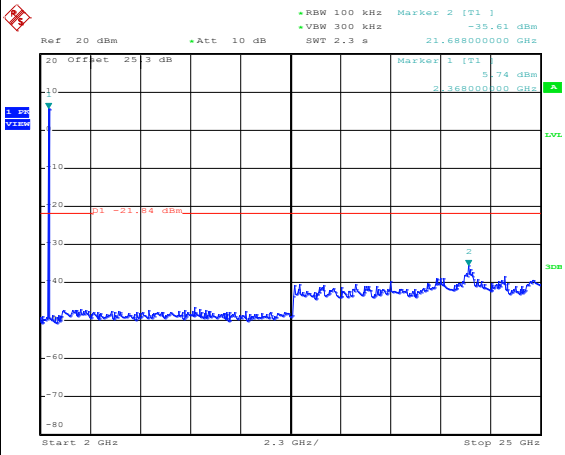
3.4.4 Test Setup



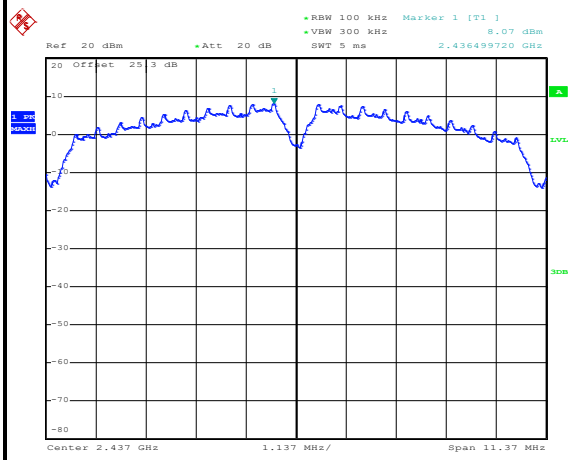
3.4.5 Test Result of Conducted Band Edges and Spurious Emission

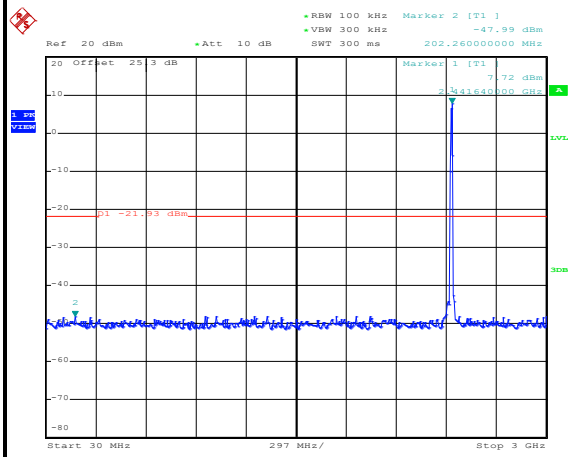
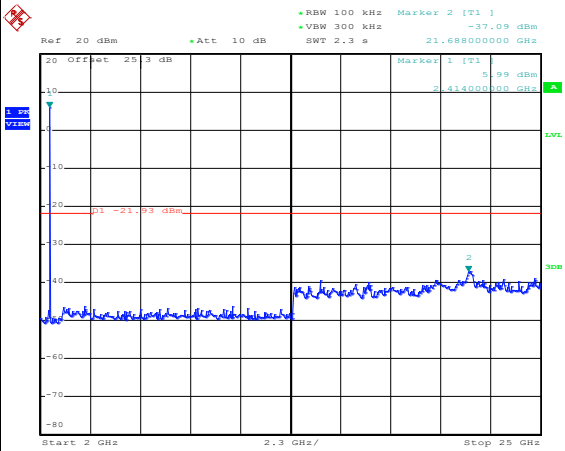
Number of TX = 2, Ant. 7 (Measured)

Test Mode :	802.11b	Test Channel :	01

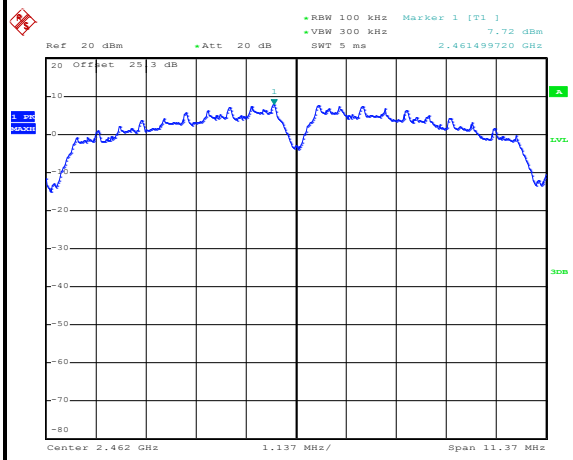
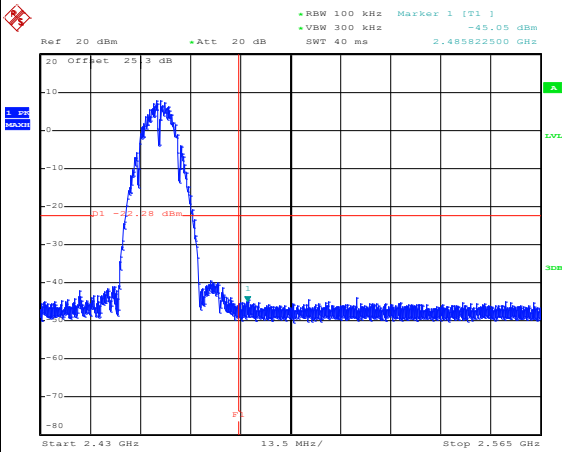
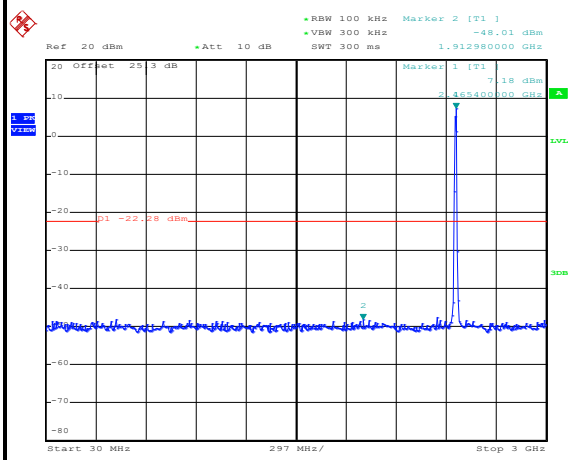
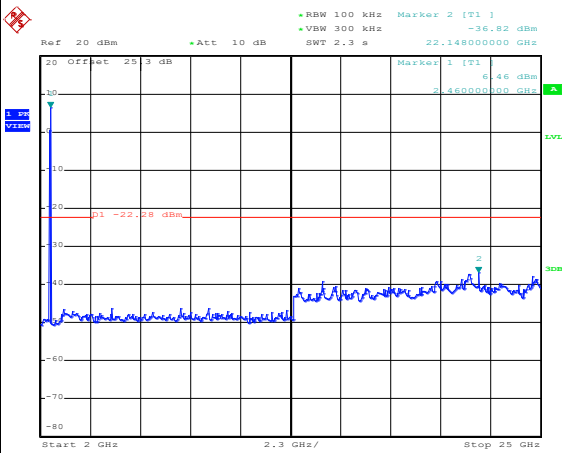
100kHz PSD reference Level	Low Channel Plot
	
Date: 19.JUL.2021 10:43:27	Date: 19.JUL.2021 10:43:47
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 10:44:14	Date: 19.JUL.2021 10:44:31

Test Mode :	802.11b	Test Channel :	06

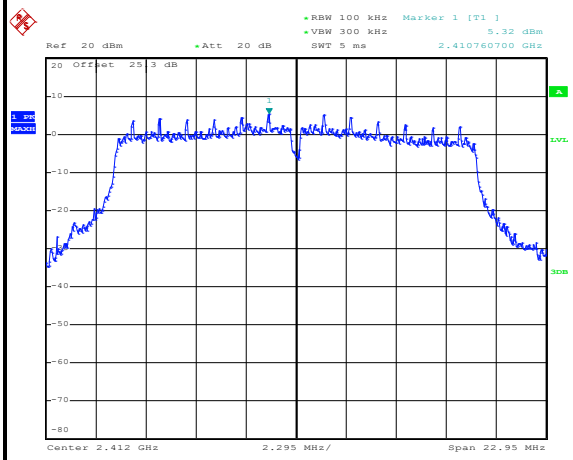
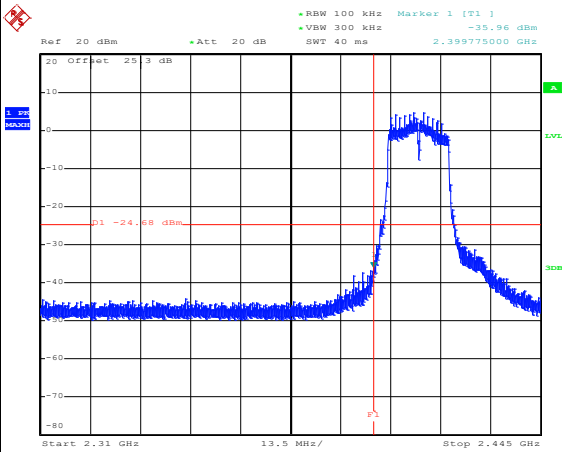
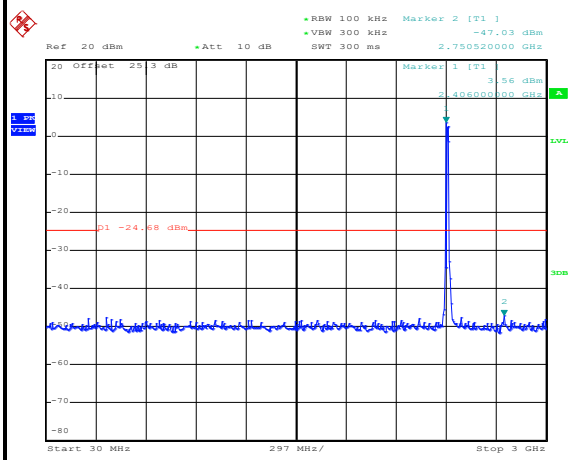
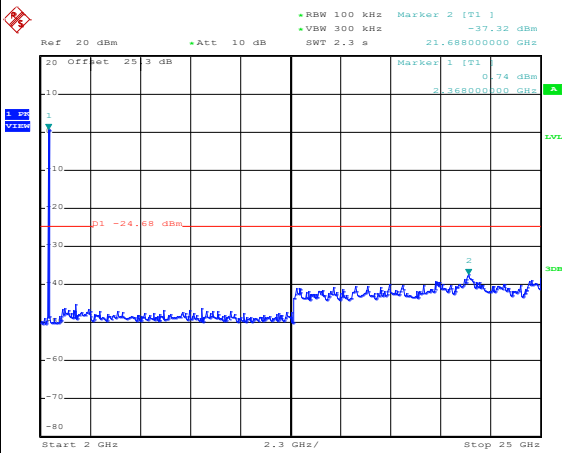
100kHz PSD reference Level	Mid Channel Plot
	
Date: 19.JUL.2021 11:06:17	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	
Date: 19.JUL.2021 11:07:00	Date: 19.JUL.2021 11:07:18

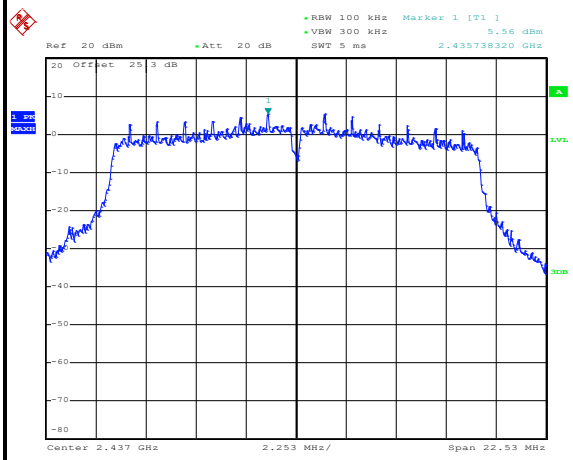
Test Mode :	802.11b	Test Channel :	11

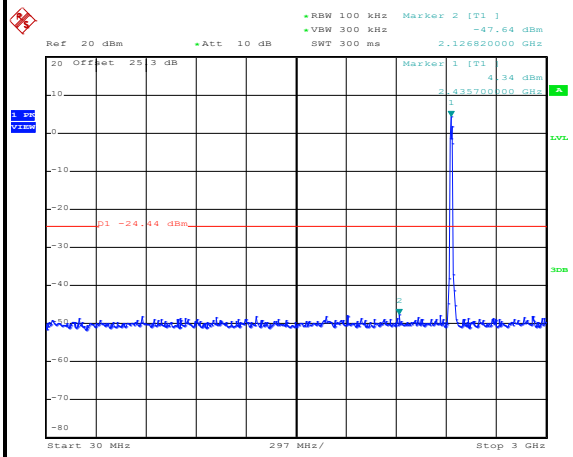
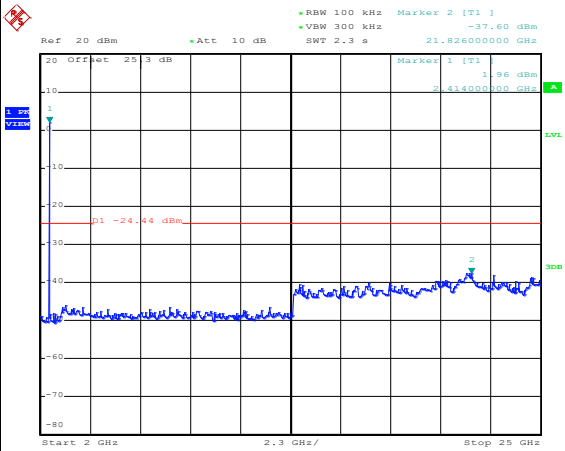
100kHz PSD reference Level	High Channel Plot
	
Date: 19.JUL.2021 11:28:45	Date: 19.JUL.2021 11:29:19
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 11:29:37	Date: 19.JUL.2021 11:29:53

Test Mode :	802.11g	Test Channel :	01

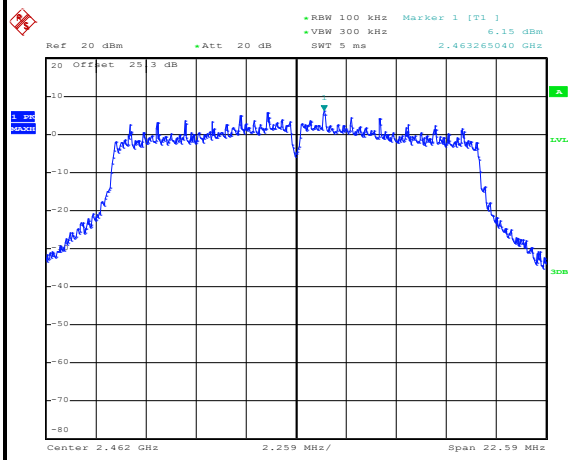
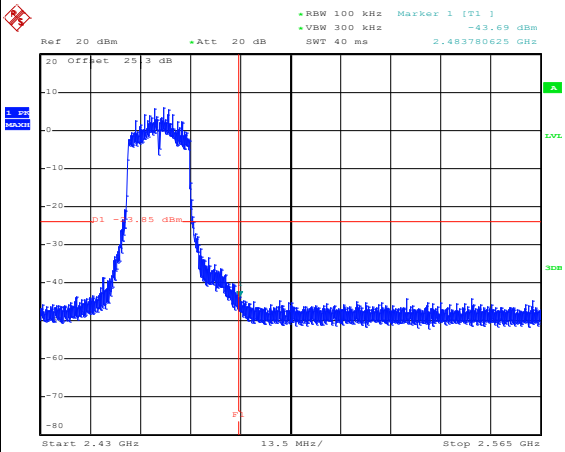
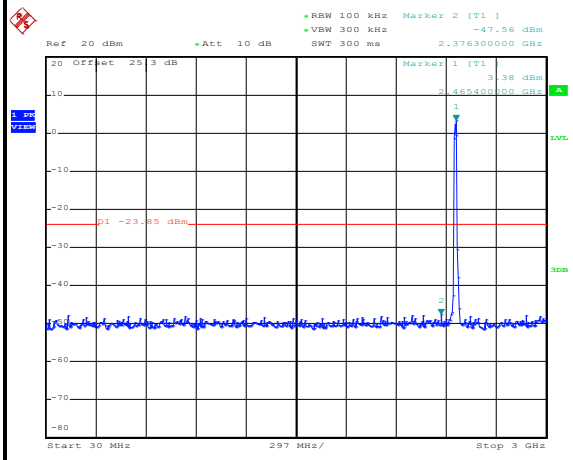
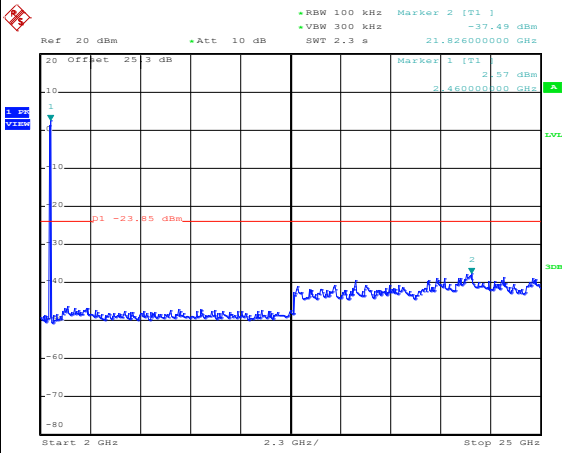
100kHz PSD reference Level	Low Channel Plot
	
Date: 19.JUL.2021 11:53:20	Date: 19.JUL.2021 11:55:14
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 11:55:32	Date: 19.JUL.2021 11:55:52

Test Mode :	802.11g	Test Channel :	06

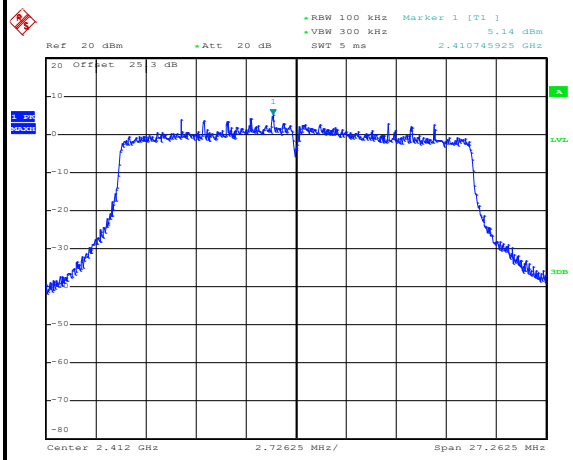
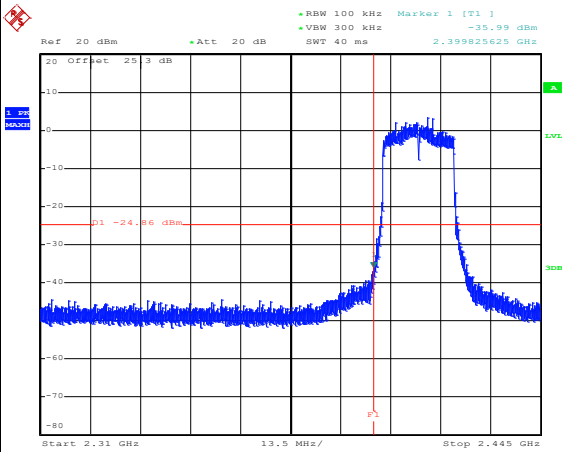
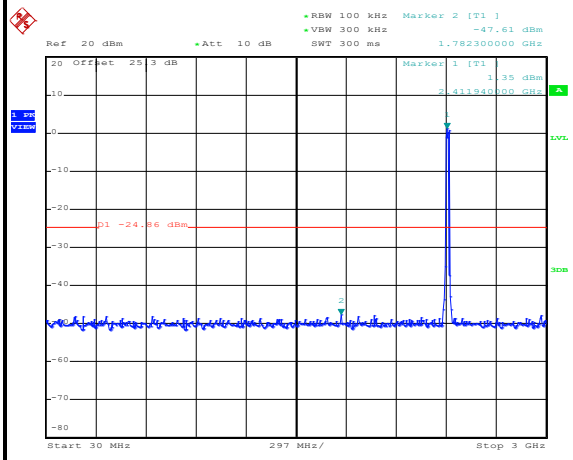
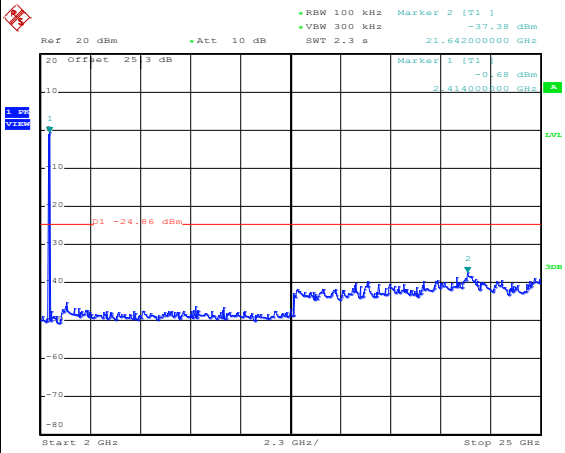
100kHz PSD reference Level	Mid Channel Plot
	
Date: 19.JUL.2021 12:09:04	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	
Date: 19.JUL.2021 12:09:23	Date: 19.JUL.2021 12:09:38

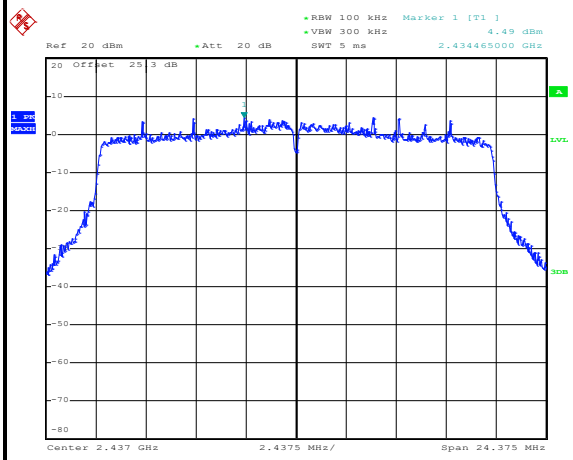
Test Mode :	802.11g	Test Channel :	11

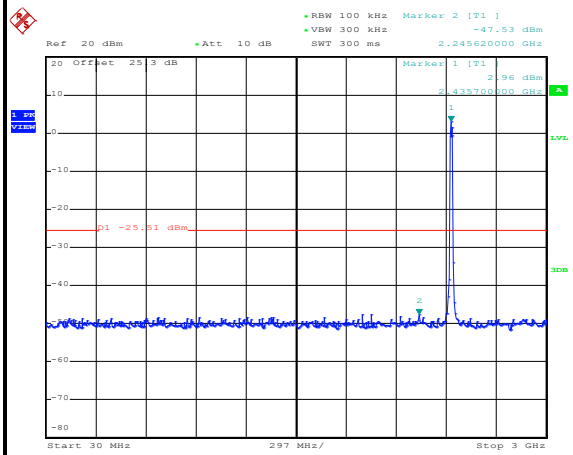
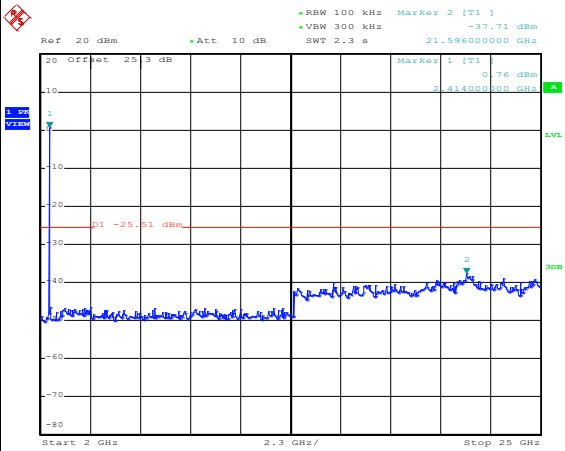
100kHz PSD reference Level	High Channel Plot
	
Date: 19.JUL.2021 13:03:44	Date: 19.JUL.2021 13:04:15
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 13:04:30	Date: 19.JUL.2021 13:04:44

Test Mode :	802.11ax HE20	Test Channel :	01 Full RU

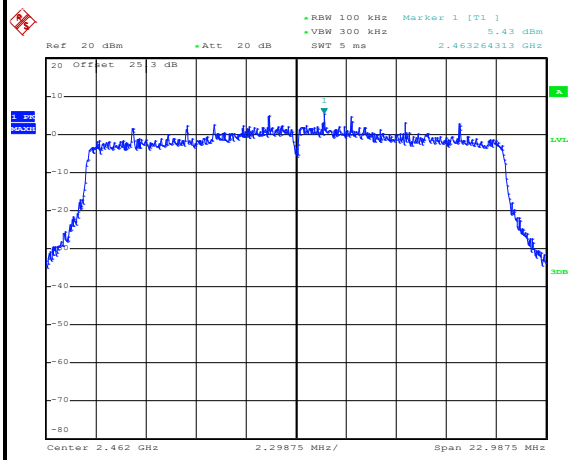
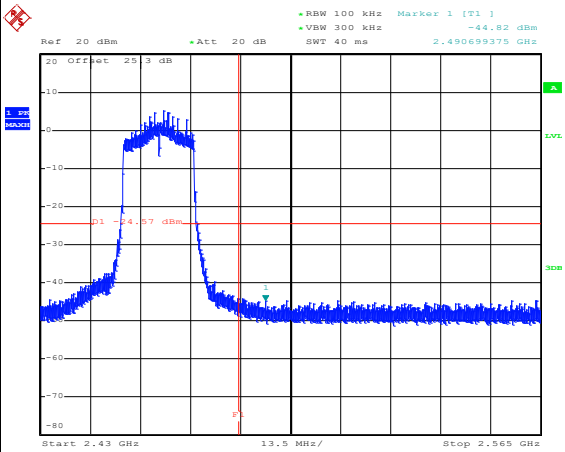
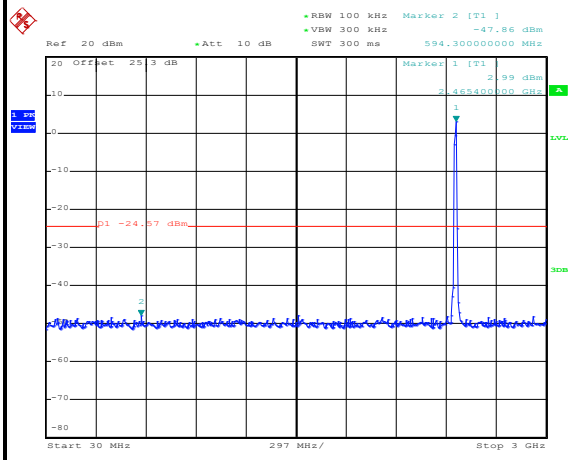
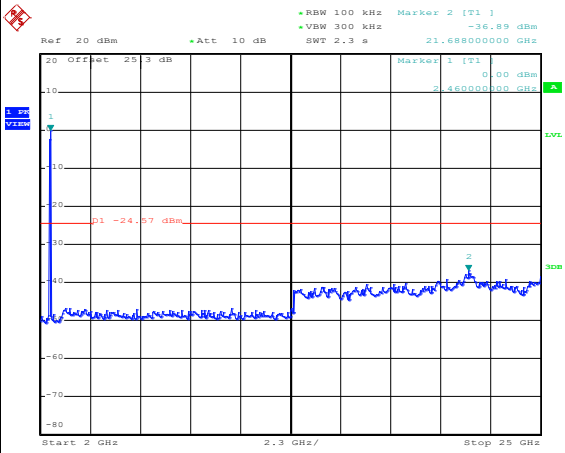
100kHz PSD reference Level	Low Channel Plot
	
Date: 19.JUL.2021 16:51:57	Date: 19.JUL.2021 16:52:13
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 16:53:38	Date: 19.JUL.2021 16:53:56

Test Mode :	802.11ax HE20	Test Channel :	06 Full RU

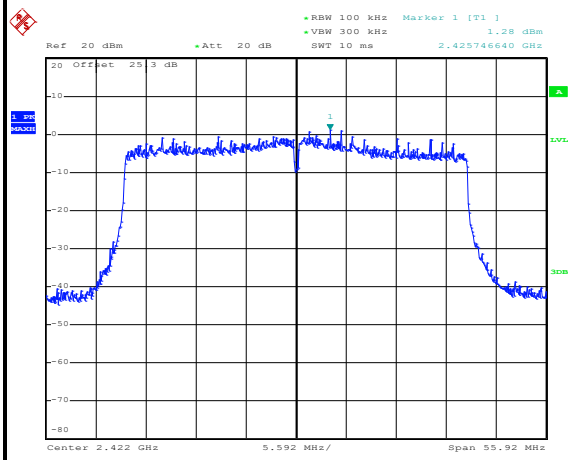
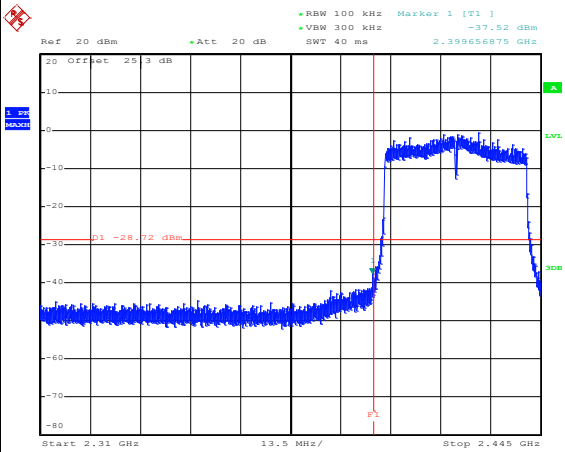
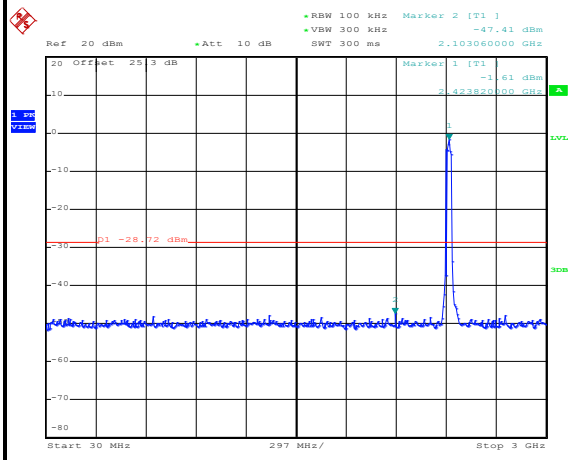
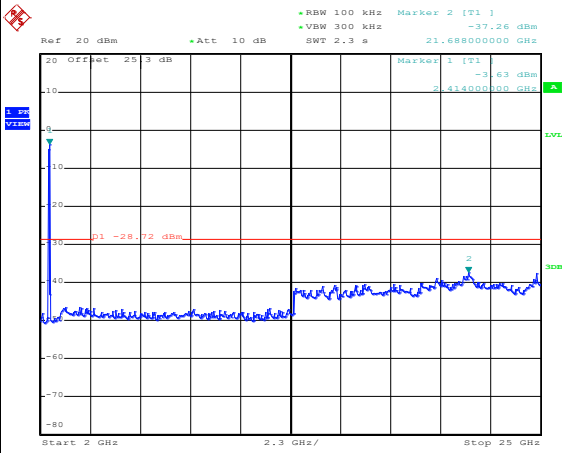
100kHz PSD reference Level	Mid Channel Plot
	
Date: 19.JUL.2021 15:40:43	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	
Date: 19.JUL.2021 15:41:45	Date: 19.JUL.2021 15:42:01

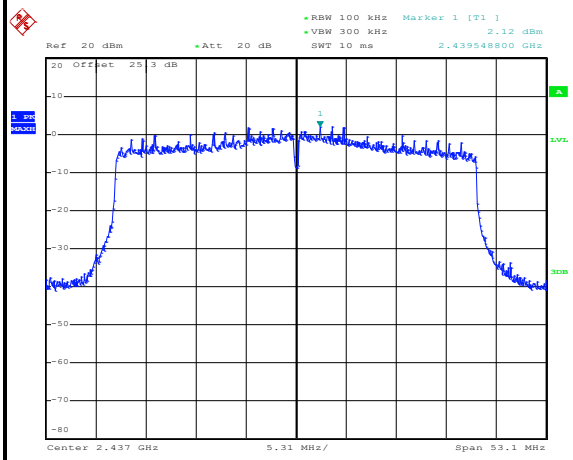
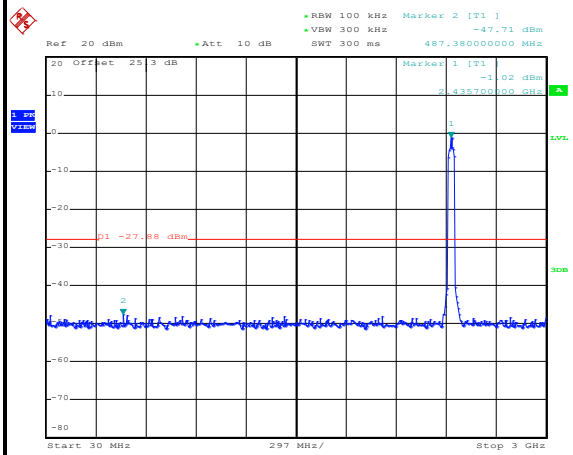
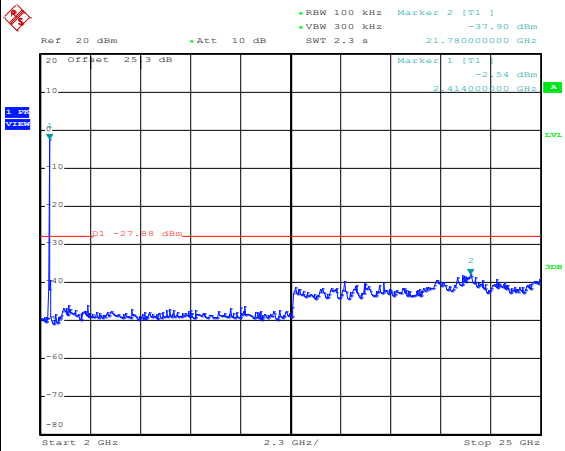
Test Mode :	802.11ax HE20	Test Channel :	11 Full RU

100kHz PSD reference Level	High Channel Plot
	
Date: 19.JUL.2021 16:09:55	Date: 19.JUL.2021 16:10:45
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 16:12:04	Date: 19.JUL.2021 16:12:24

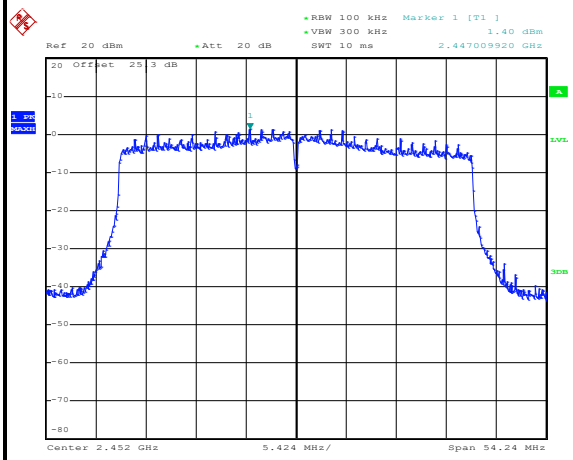
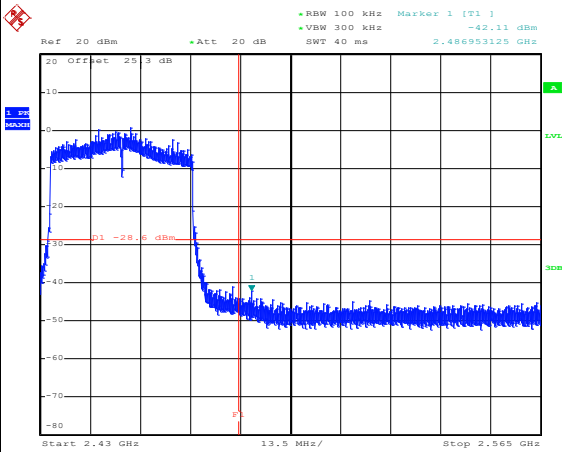
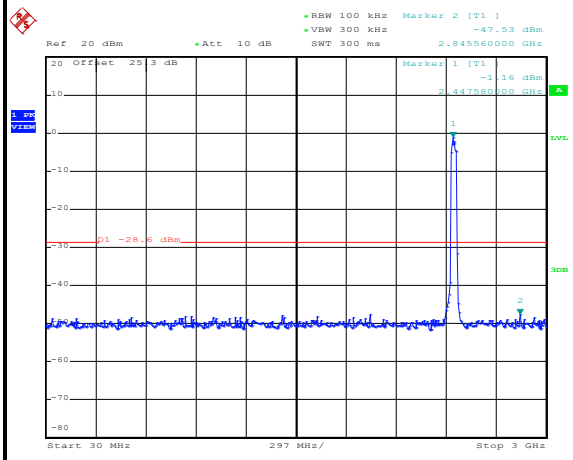
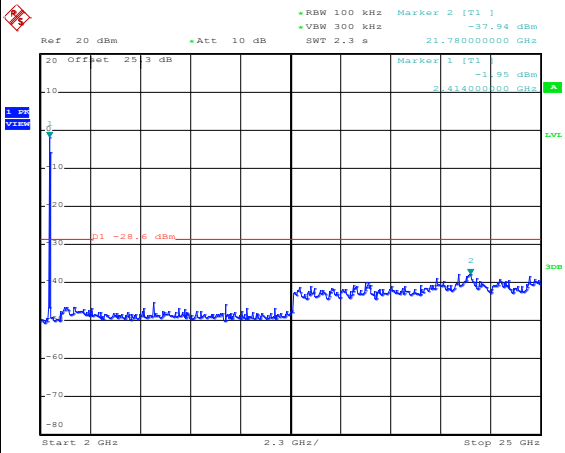
Test Mode :	802.11ax HE40	Test Channel :	03 Full RU

100kHz PSD reference Level	Low Channel Plot
	
Date: 19.JUL.2021 17:11:58	Date: 19.JUL.2021 17:12:15
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 17:12:59	Date: 19.JUL.2021 17:13:14

Test Mode :	802.11ax HE40	Test Channel :	06 Full RU

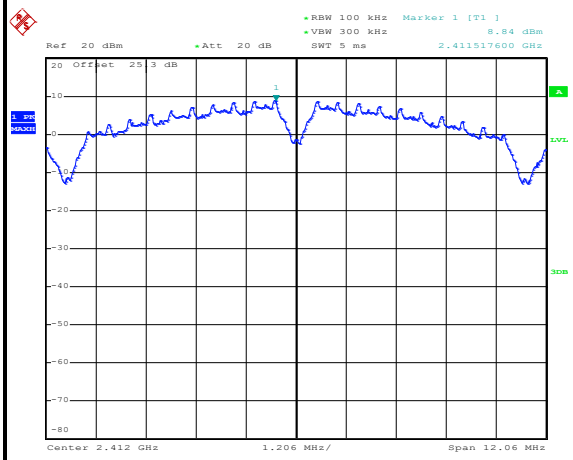
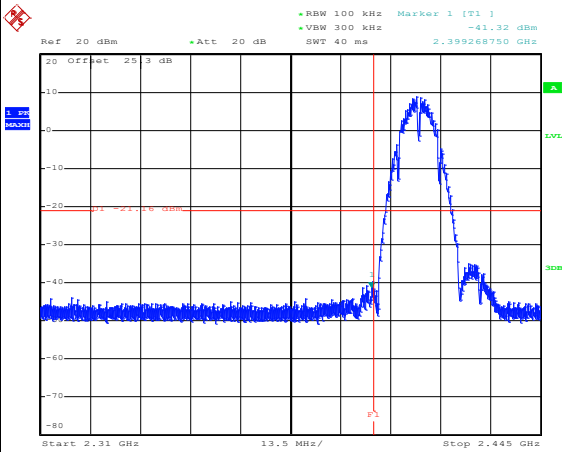
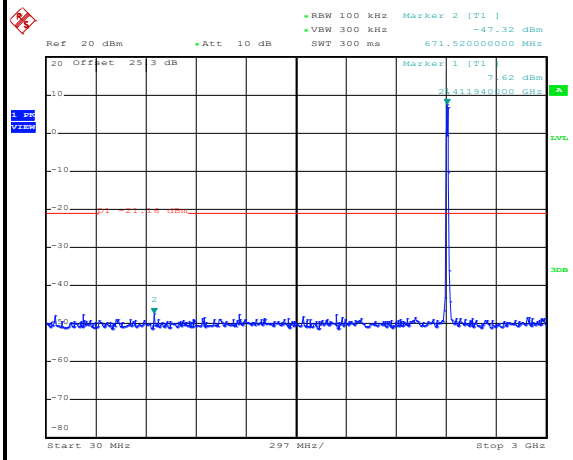
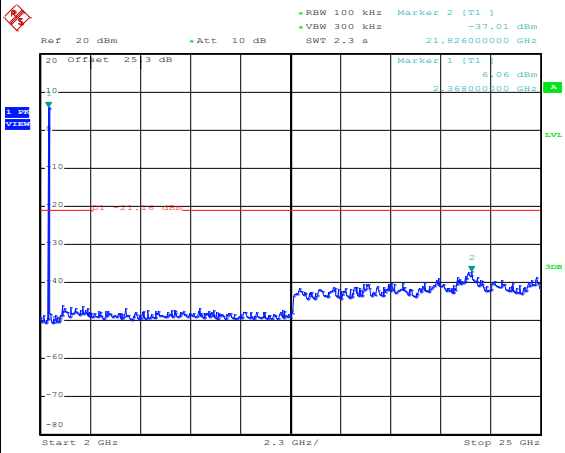
100kHz PSD reference Level	Mid Channel Plot
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

Test Mode :	802.11ax HE40	Test Channel :	09 Full RU

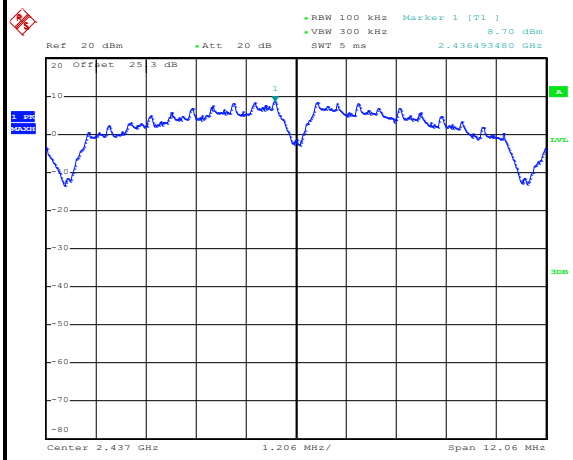
100kHz PSD reference Level	High Channel Plot
	
Date: 19.JUL.2021 18:10:28	Date: 19.JUL.2021 18:11:36
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 18:11:54	Date: 19.JUL.2021 18:12:09

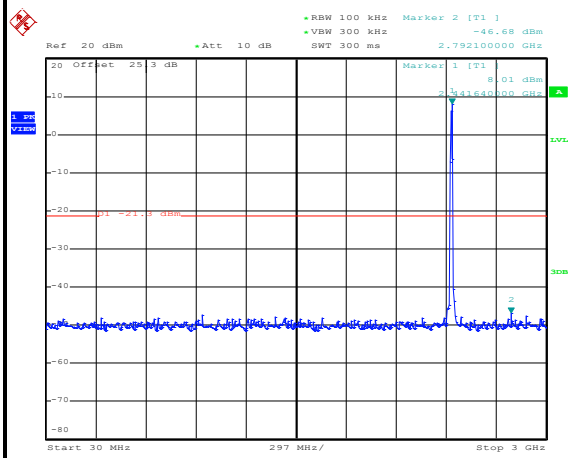
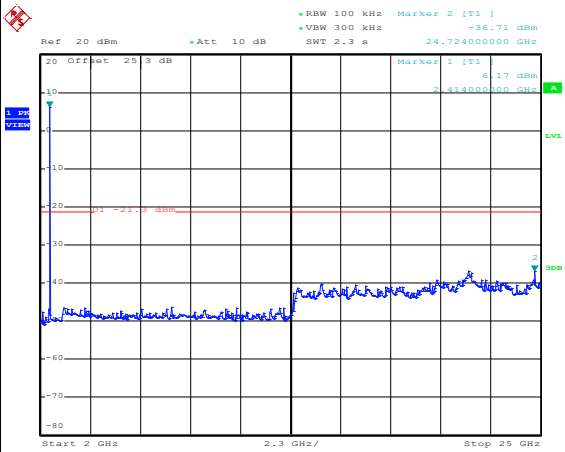
Number of TX = 2, Ant. 9 (Measured)

Test Mode :	802.11b	Test Channel :	01

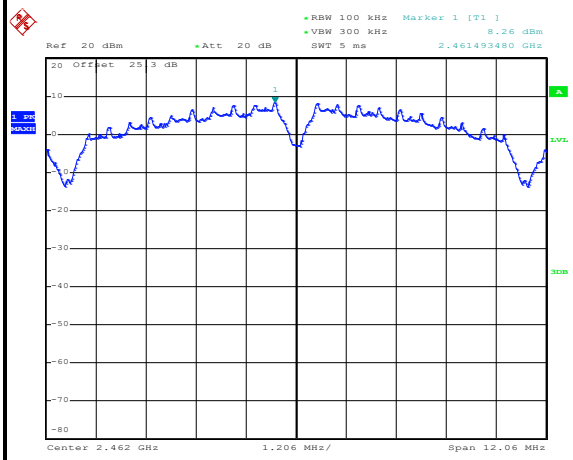
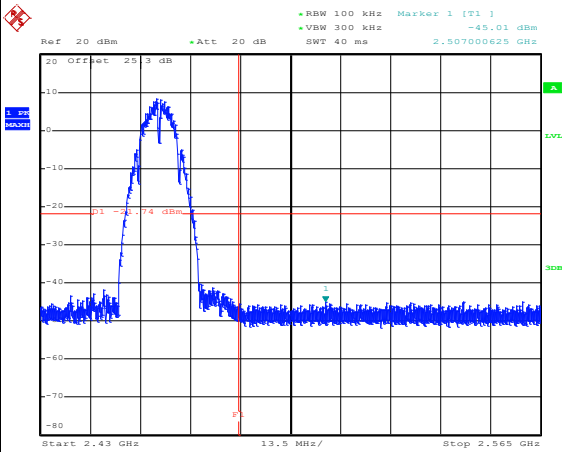
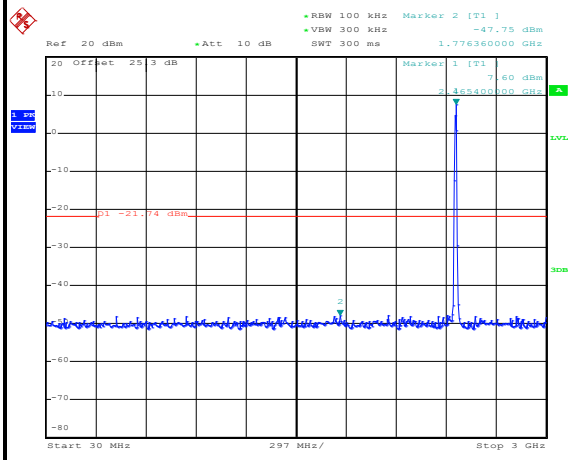
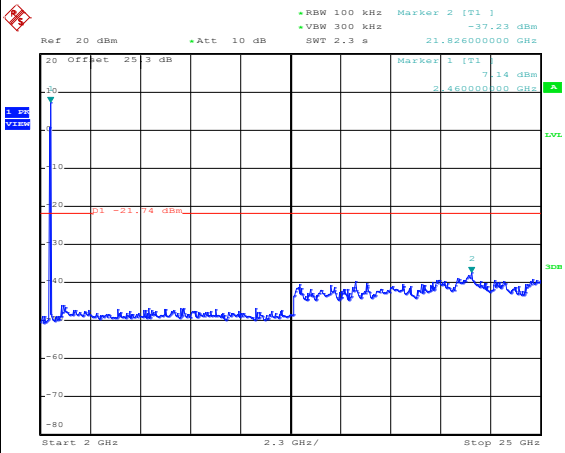
100kHz PSD reference Level	Low Channel Plot
	
Date: 19.JUL.2021 10:56:59	Date: 19.JUL.2021 10:58:44
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 10:59:52	Date: 19.JUL.2021 11:00:07

Test Mode :	802.11b	Test Channel :	06

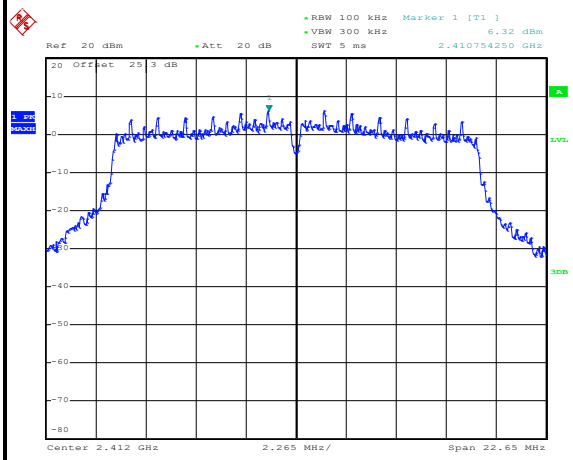
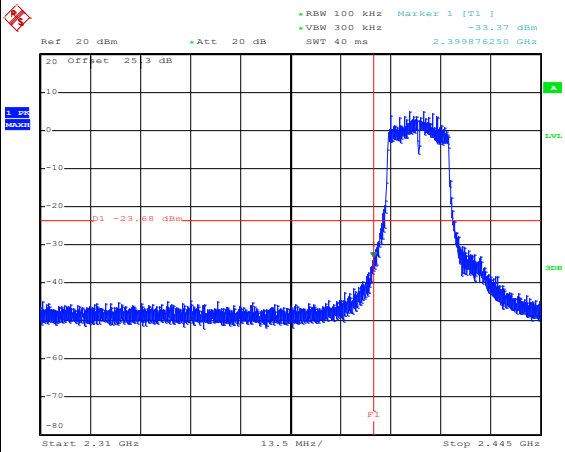
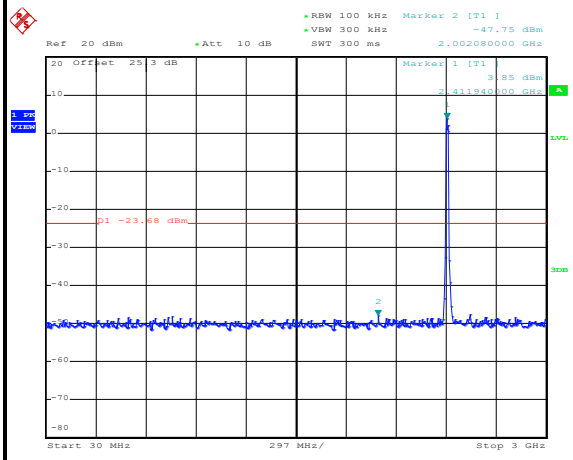
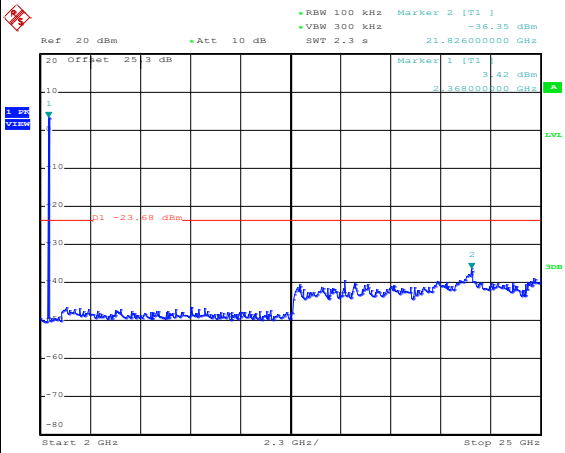
100kHz PSD reference Level	Mid Channel Plot
	
Date: 19.JUL.2021 11:16:53	

Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	
Date: 19.JUL.2021 11:19:17	Date: 19.JUL.2021 11:20:23

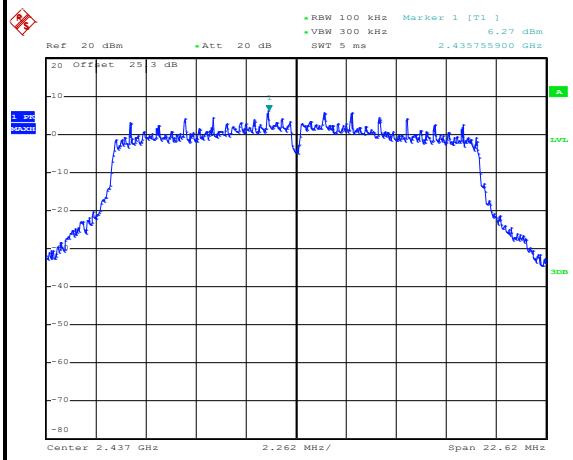
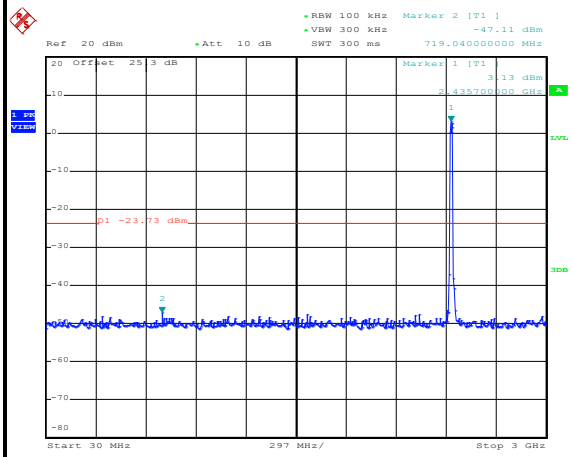
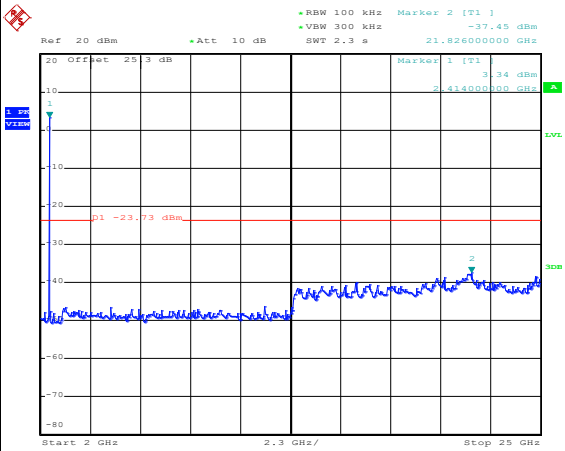
Test Mode :	802.11b	Test Channel :	11

100kHz PSD reference Level	High Channel Plot
	
Date: 19.JUL.2021 11:37:32	Date: 19.JUL.2021 11:38:30
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 11:40:03	Date: 19.JUL.2021 11:40:18

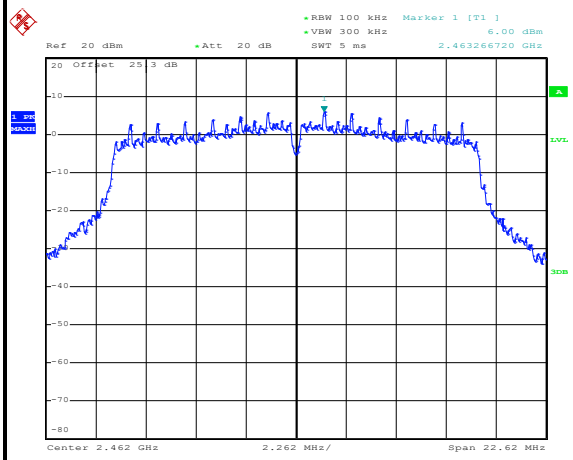
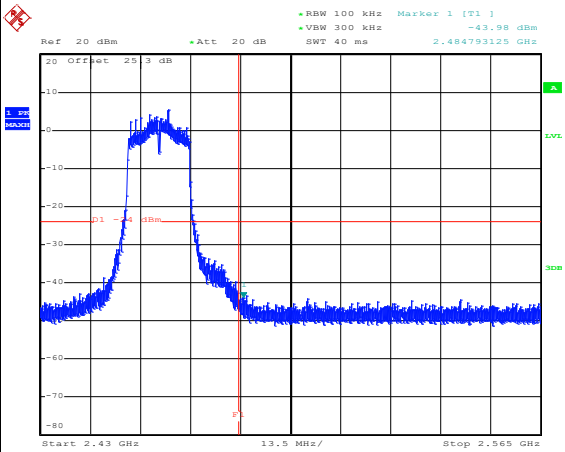
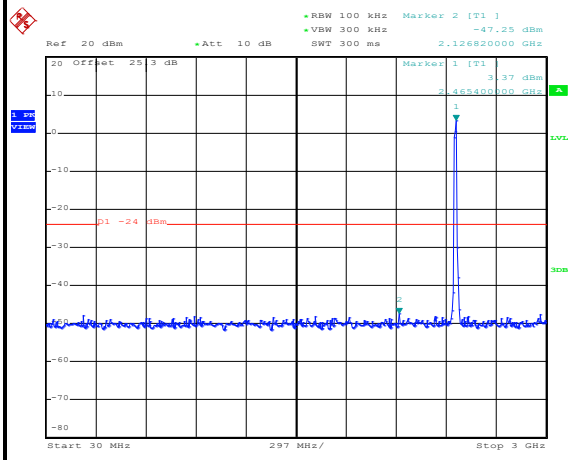
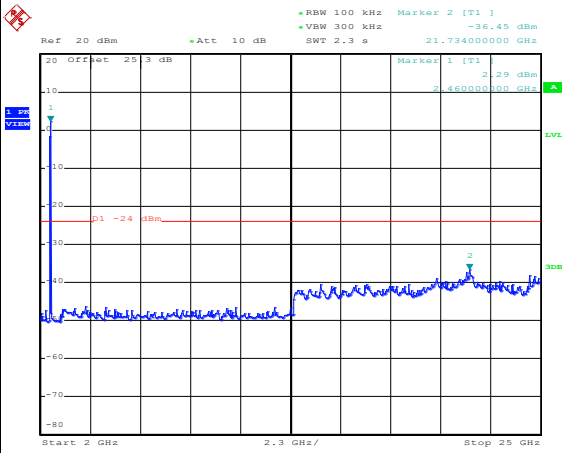
Test Mode :	802.11g	Test Channel :	01

100kHz PSD reference Level	Low Channel Plot
	
Date: 19.JUL.2021 12:02:26	Date: 19.JUL.2021 12:02:51
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 12:03:25	Date: 19.JUL.2021 12:03:40

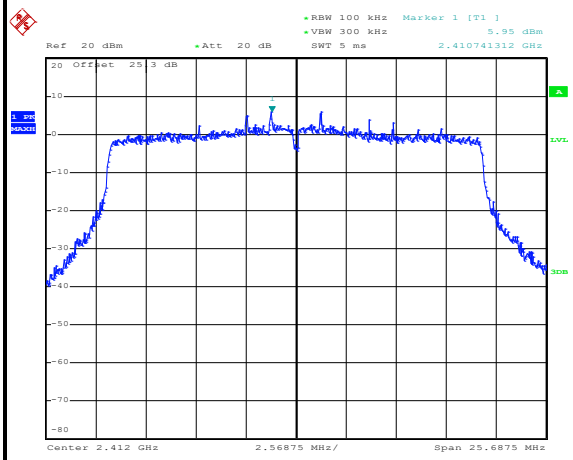
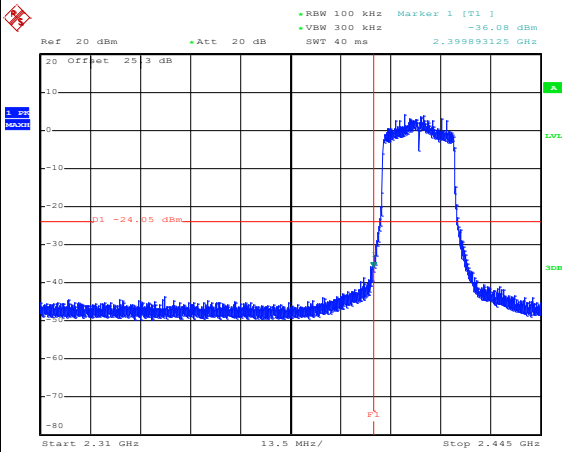
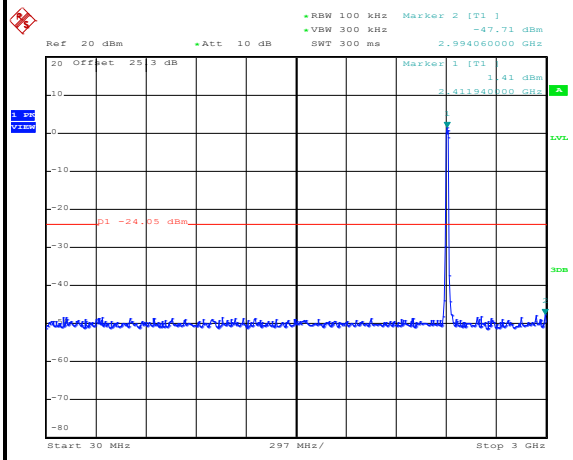
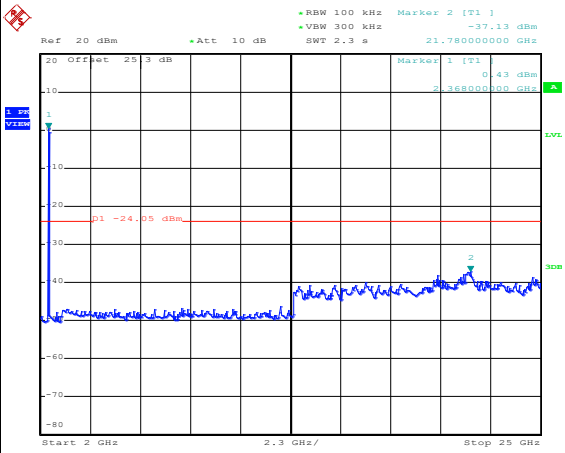
Test Mode :	802.11g	Test Channel :	06

100kHz PSD reference Level	Mid Channel Plot
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

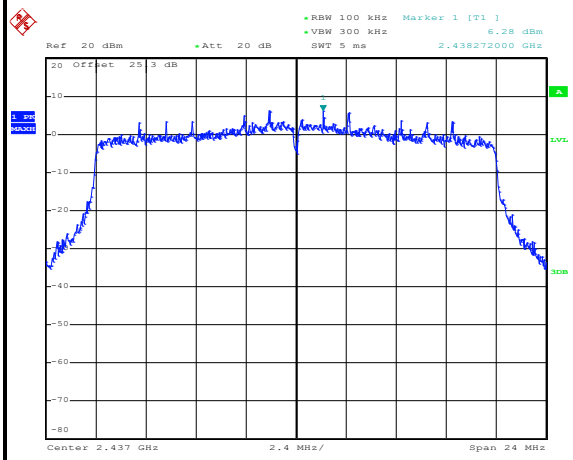
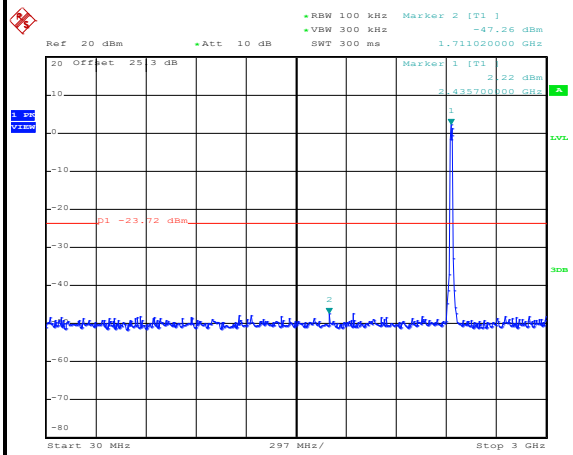
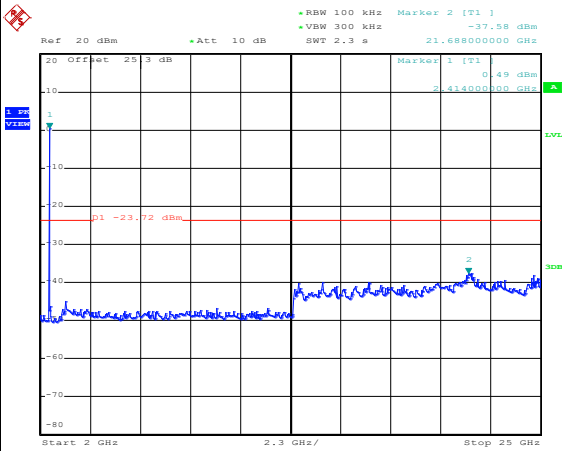
Test Mode :	802.11g	Test Channel :	11

100kHz PSD reference Level	High Channel Plot
	
Date: 19.JUL.2021 14:47:26	Date: 19.JUL.2021 14:47:54
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 14:50:34	Date: 19.JUL.2021 14:51:11

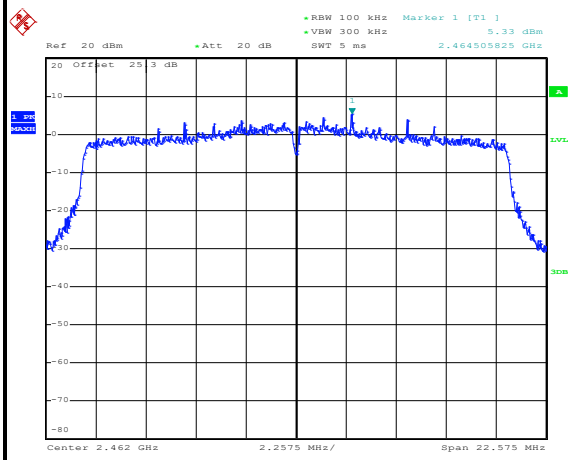
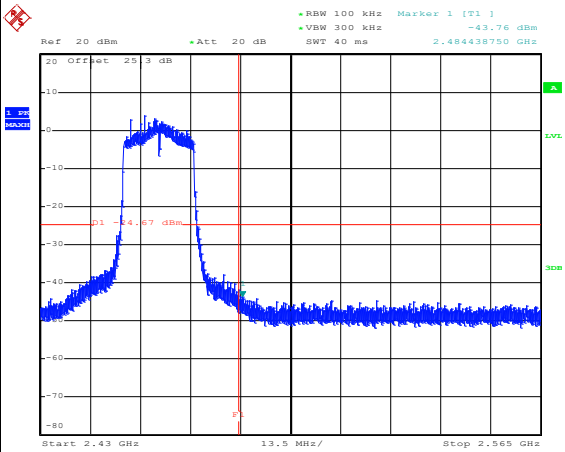
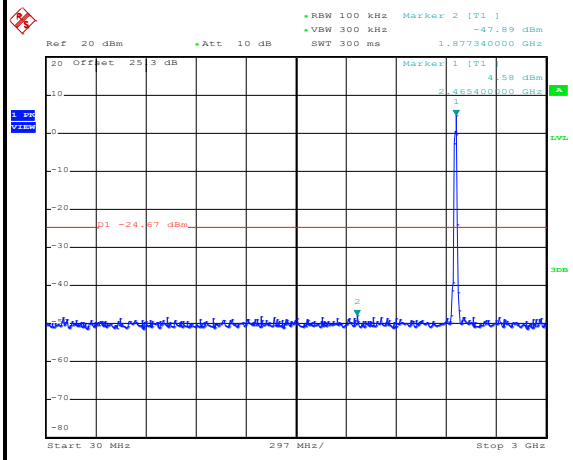
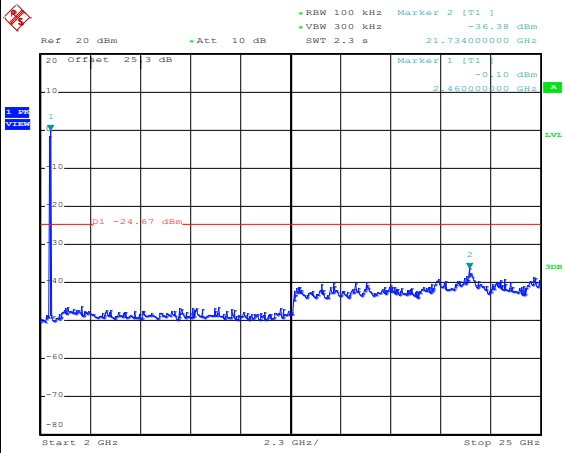
Test Mode :	802.11ax HE20	Test Channel :	01 Full RU

100kHz PSD reference Level	Low Channel Plot
	
Date: 19.JUL.2021 15:27:39	Date: 19.JUL.2021 15:28:54
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 15:29:23	Date: 19.JUL.2021 15:30:02

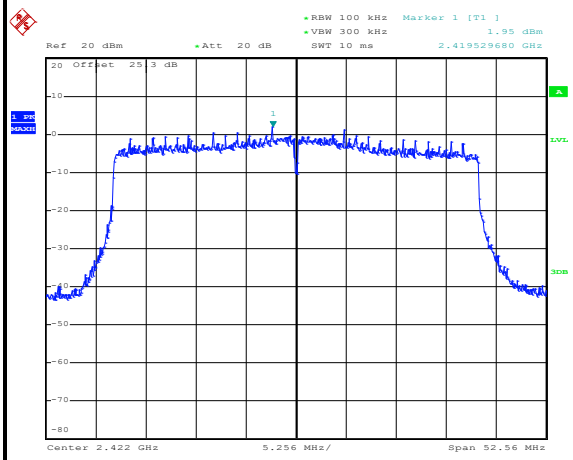
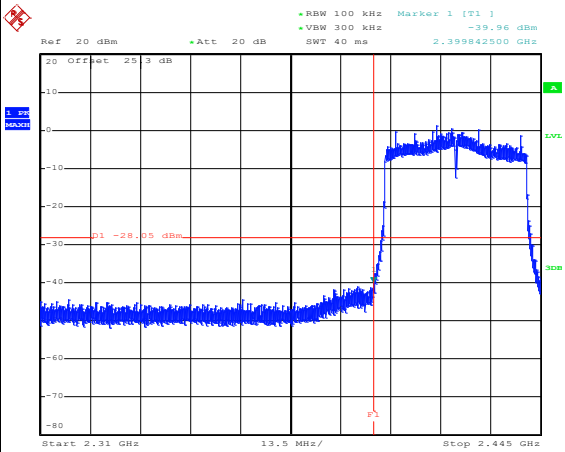
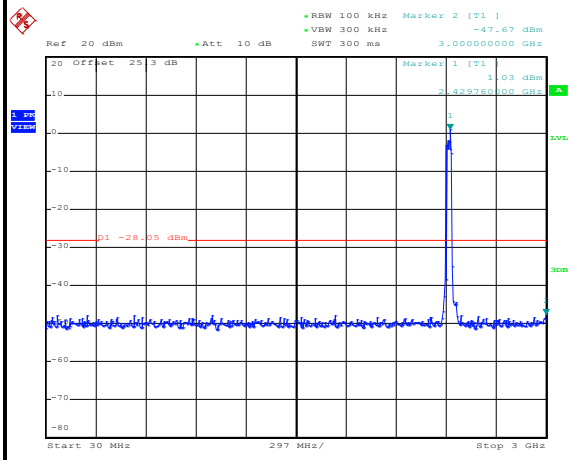
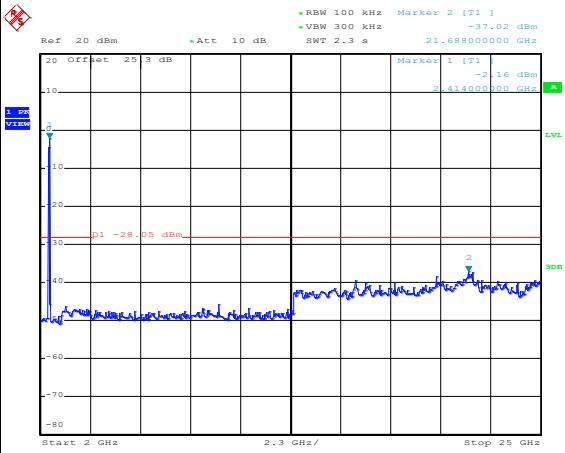
Test Mode :	802.11ax HE20	Test Channel :	06 Full RU

100kHz PSD reference Level	Mid Channel Plot
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

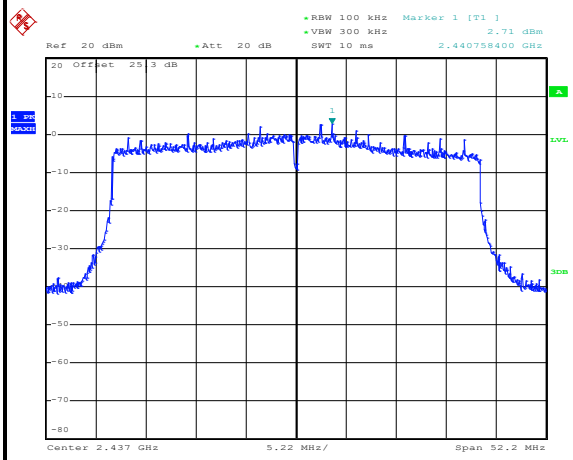
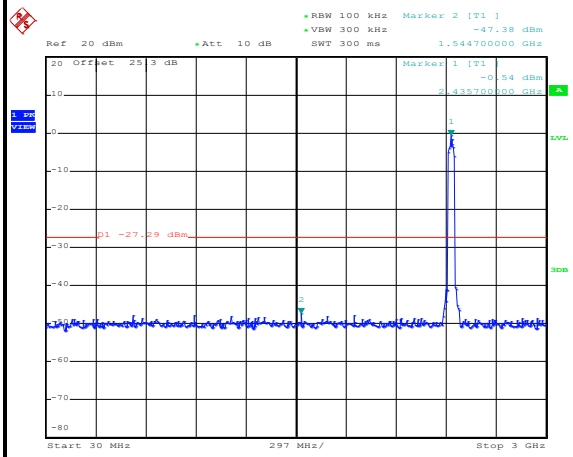
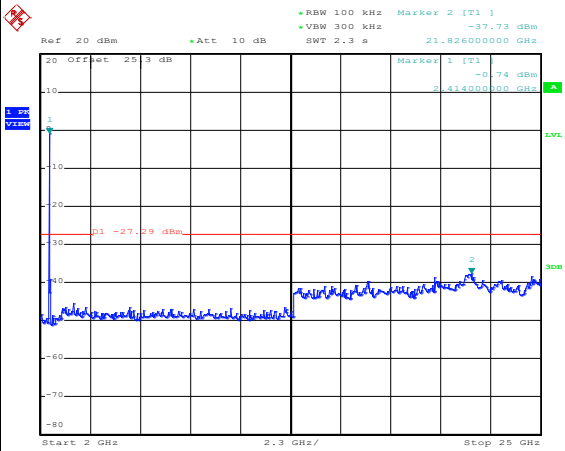
Test Mode :	802.11ax HE20	Test Channel :	11 Full RU

100kHz PSD reference Level	High Channel Plot
	
Date: 19.JUL.2021 16:26:34	Date: 19.JUL.2021 16:26:51
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 16:27:12	Date: 19.JUL.2021 16:27:26

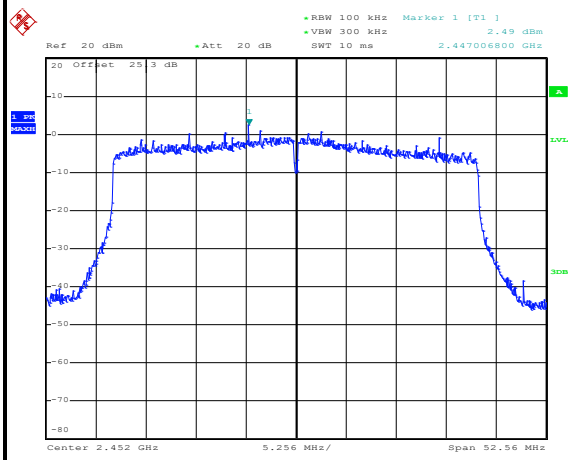
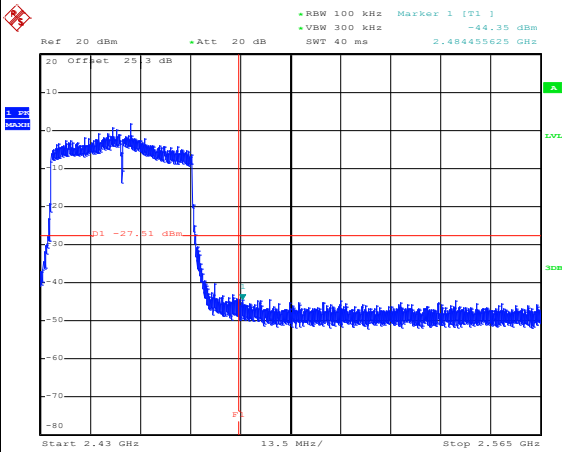
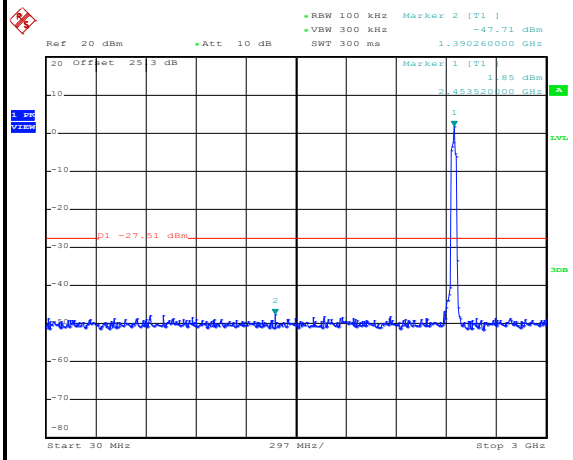
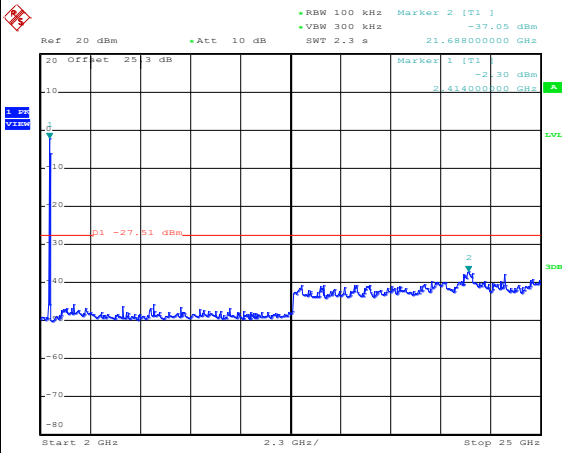
Test Mode :	802.11ax HE40	Test Channel :	03 Full RU

100kHz PSD reference Level	Low Channel Plot
	
Date: 19.JUL.2021 17:18:11	Date: 19.JUL.2021 17:18:30
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 17:19:04	Date: 19.JUL.2021 17:19:18

Test Mode :	802.11ax HE40	Test Channel :	06 Full RU

100kHz PSD reference Level	Mid Channel Plot
	
Spurious Emission 30MHz~3GHz	Spurious Emission 2GHz~25GHz
	

Test Mode :	802.11ax HE40	Test Channel :	09 Full RU

100kHz PSD reference Level	High Channel Plot
	
Date: 19.JUL.2021 18:15:40	Date: 19.JUL.2021 18:18:16
Spurious Emission 30MHz~3GHz	**Spurious Emission 2GHz~25GHz**
	
Date: 19.JUL.2021 18:18:47	Date: 19.JUL.2021 18:19:08

3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated band edge and Spurious Emission Measurement

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

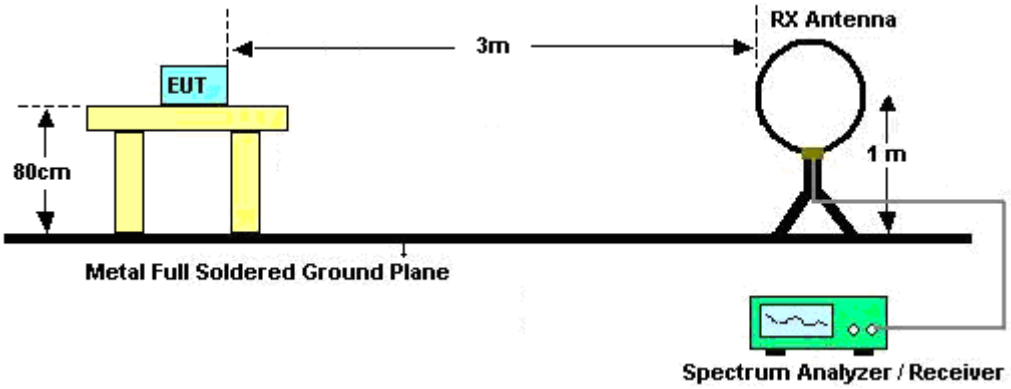
See list of measuring equipment of this test report.

3.5.3 Test Procedures

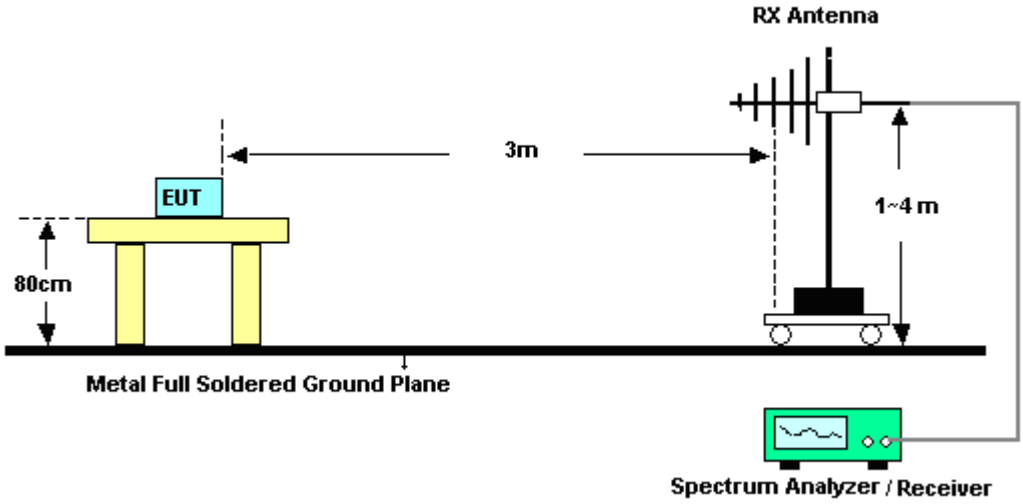
1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
3. The EUT was placed on a turntable with 0.8 meter for frequency below 1 GHz and 1.5 meter for frequency above 1 GHz respectively above ground.
4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. For testing below 1 GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
7. For testing above 1 GHz, the emission level of the EUT in peak mode was 20 dB lower than average limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
8. Use the following spectrum analyzer settings:
   (1) Span shall wide enough to fully capture the emission being measured;
   (2) Set RBW = 100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
   (3) Set RBW = 1 MHz, VBW= 3 MHz for f ≥ 1 GHz for peak measurement.
   For average measurement:
   - VBW = 10 Hz, when duty cycle is no less than 98 percent.
   - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

3.5.4 Test Setup

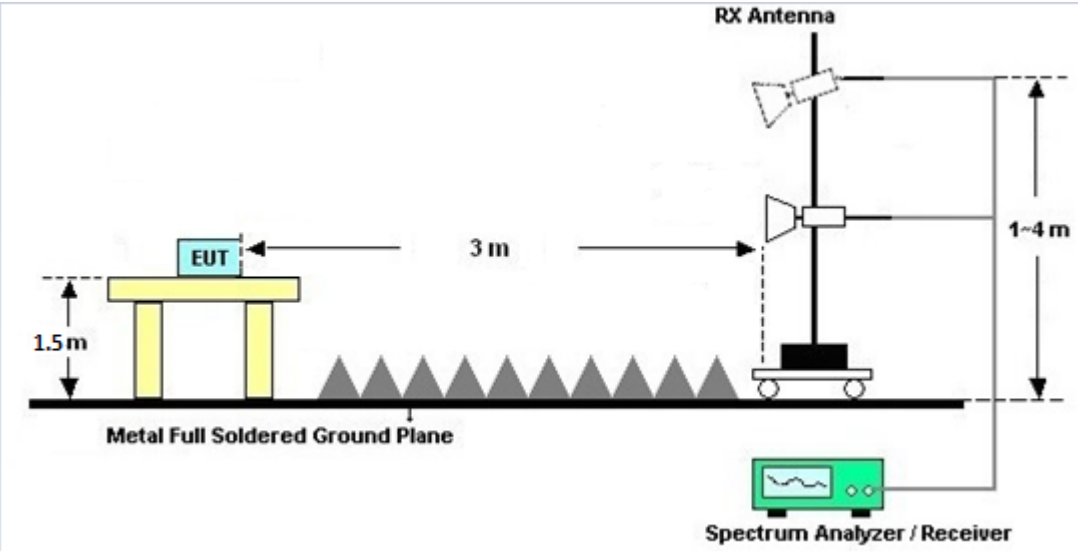
For radiated emissions below 30MHz



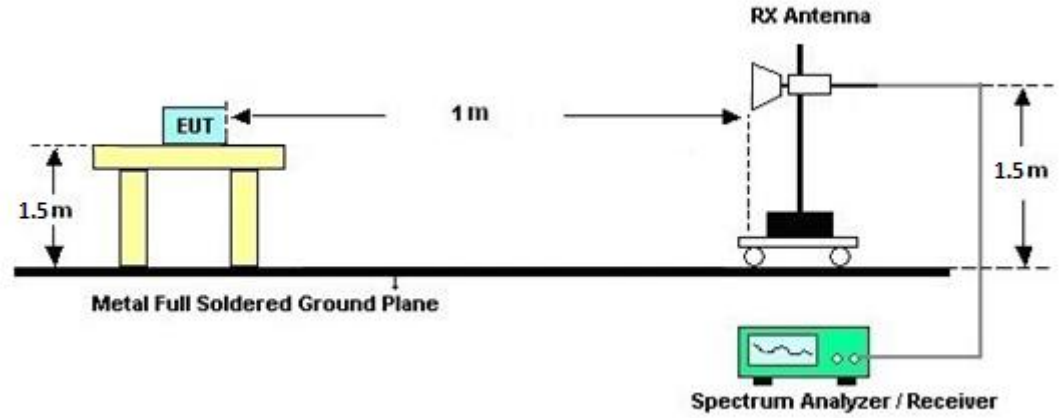
For radiated emissions from 30MHz to 1GHz



For radiated test from 1GHz to 18GHz



For radiated test above 18GHz



3.5.5 Test Results of Radiated Spurious Emissions (9kHz ~ 30MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

There is adequate comparison measurement of both open-field test site and alternative test site - semi-Anechoic chamber according to 414788 D01 Radiated Test Site v01r01, and the result came out very similar.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C and D.

3.5.7 Duty Cycle

Please refer to Appendix E.

3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic)

Please refer to Appendix C and D.

3.6 AC Conducted Emission Measurement

3.6.1 Limit of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of Emission (MHz)	Conducted Limit (dBμV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

*Decreases with the logarithm of the frequency.

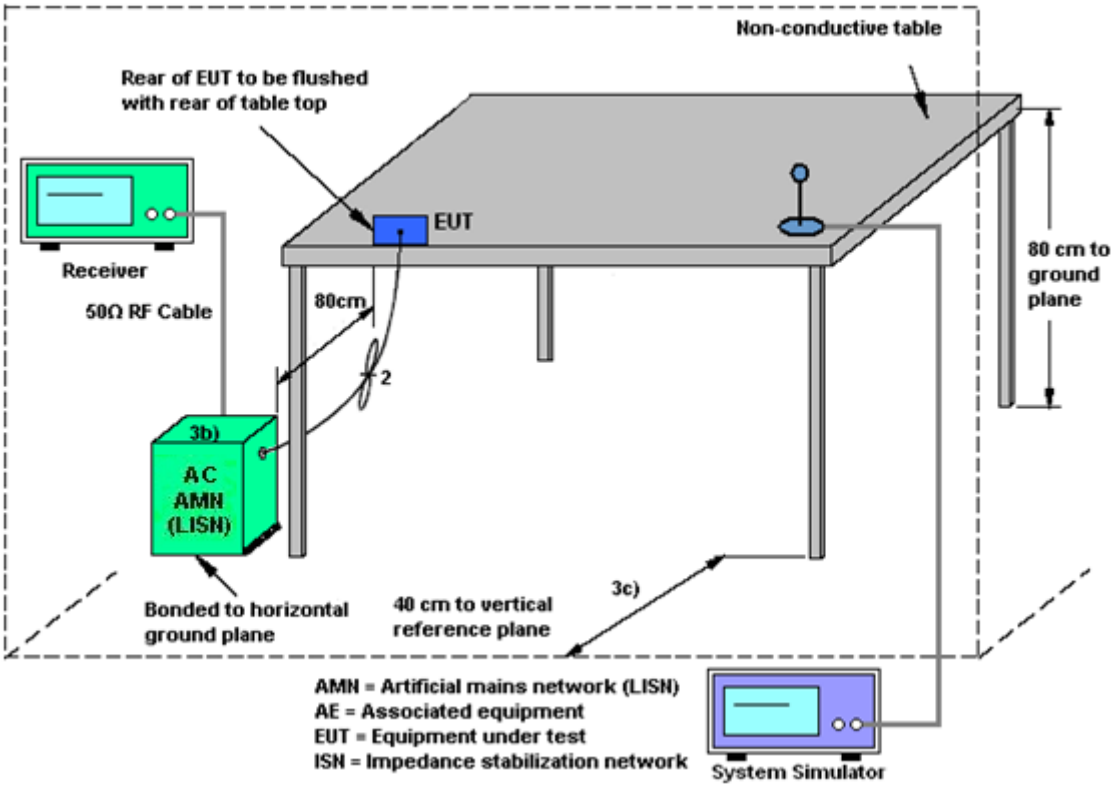
3.6.2 Measuring Instruments

See list of measuring equipment of this test report.

3.6.3 Test Procedures

1. The EUT was placed 0.4 meter from the conducting wall of the shielding room, and it was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN shall be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth (IF bandwidth = 9kHz) with Maximum Hold Mode.

3.6.4 Test Setup



3.6.5 Test Result of AC Conducted Emission

Please refer to Appendix B.

3.7 Antenna Requirements

3.7.1 Standard Applicable

If directional gain of transmitting Antennas is greater than 6 dBi, the power shall be reduced by the same level in dB comparing to gain minus 6 dBi. 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 rule.

3.7.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.7.3 Antenna Gain

<CDD Modes >

FCC KDB 662911 D01 Multiple Transmitter Output v02r01

For CDD transmissions, directional gain is calculated as

Directional gain = G_{ANT} + Array Gain, where Array Gain is as follows.

For power spectral density (PSD) measurements on all devices,

Array Gain = 10 log(N_{ANT}/N_{SS}=1) dB.

For power measurements on IEEE 802.11 devices,

Array Gain = 0 dB (i.e., no array gain) for $N_{ANT} \leq 4$.

Directional gain may be calculated by using the formulas applicable to equal gain antennas with G_{ANT} set equal to the gain of the antenna having the highest gain;

The EUT supports CDD mode.

For power, the directional gain G_{ANT} is set equal to the antenna having the highest gain, i.e., F)2)f)i).

For PSD, the directional gain calculation is following F)2)f)ii) of KDB 662911 D01 v02r01.

The power and PSD limit should be modified if the directional gain of EUT is over 6 dBi,

The directional gain “DG” is calculated as following table.

<CDD Modes>

	Ant. 7 (dBi)	Ant. 9 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
2.4 GHz	-1.80	-0.90	-0.90	1.67	0.00	0.00

Power Limit Reduction = DG(Power) – 6dBi, (min = 0)

PSD Limit Reduction = DG(PSD) – 6dBi, (min = 0)

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	Keysight	N9010B	MY60240520	10Hz~44GHz	Dec. 02, 2020	Jul. 13, 2021~ Jul. 23, 2021	Dec. 01, 2021	Radiation (03CH20-HY)
Preamplifier	COM-POWER	PAM-103	18020201	1MHz-1000MHz	Jan. 04, 2021	Jul. 13, 2021~ Jul. 23, 2021	Jan. 03, 2022	Radiation (03CH20-HY)
Amplifier	EMCI	EMC118A45SE	980792	N/A	Nov. 16, 2020	Jul. 13, 2021~ Jul. 23, 2021	Nov. 15, 2021	Radiation (03CH20-HY)
Preamplifier	EMEC	EM18G40G	060715	18GHz~40GHz	Dec. 11, 2020	Jul. 13, 2021~ Jul. 23, 2021	Dec. 10, 2021	Radiation (03CH20-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100315	9 kHz~30 MHz	Jan. 04, 2021	Jul. 13, 2021~ Jul. 23, 2021	Jan. 03, 2022	Radiation (03CH20-HY)
Bilog Antenna	TESEQ	CBL 6111D&00802N1D01N-06	55606 & 08	30MHz~1GHz	Oct. 22, 2020	Jul. 13, 2021~ Jul. 23, 2021	Oct. 21, 2021	Radiation (03CH20-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	002360	1GHz-18GHz	Nov. 03, 2020	Jul. 13, 2021~ Jul. 23, 2021	Nov. 02, 2021	Radiation (03CH20-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA9170	009910	18GHz-40GHz	May 12, 2021	Jul. 13, 2021~ Jul. 23, 2021	May 11, 2022	Radiation (03CH20-HY)
Filter	Wainwright	WLK4-1000-1530-8000-40SS	SN27	1.53GHz Low Pass Filter	May 25, 2021	Jul. 13, 2021~ Jul. 23, 2021	May 24, 2022	Radiation (03CH20-HY)
Filter	Wainwright	WHKX12-2700-3000-18000-60ST	SN8	N/A	Mar. 26, 2021	Jul. 13, 2021~ Jul. 23, 2021	Mar. 25, 2022	Radiation (03CH20-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	519229/2,804015/2,804027/2	N/A	Jan. 20, 2021	Jul. 13, 2021~ Jul. 23, 2021	Jan. 19, 2022	Radiation (03CH20-HY)
Software	Audix	E3 6.2009-8-24	RK-002156	N/A	N/A	Jul. 13, 2021~ Jul. 23, 2021	N/A	Radiation (03CH20-HY)
Antenna Mast	EMEC	AM-BS-4500-B	N/A	1m~4m	N/A	Jul. 13, 2021~ Jul. 23, 2021	N/A	Radiation (03CH20-HY)
Turn Table	EMEC	TT2000	N/A	0~360 Degree	N/A	Jul. 13, 2021~ Jul. 23, 2021	N/A	Radiation (03CH20-HY)
AC Power Source	ACPOWER	AFC-11003G	F317040033	N/A	N/A	Jul. 15, 2021	N/A	Conduction (CO07-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Jul. 15, 2021	N/A	Conduction (CO07-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	9561-F N00373	9kHz-200MHz	Nov. 02, 2020	Jul. 15, 2021	Nov. 01, 2021	Conduction (CO07-HY)
RF Cable	HUBER + SUHNER	RG 214/U	1358175	9kHz~30MHz	N/A	Jul. 15, 2021	N/A	Conduction (CO07-HY)
Two-Line V-Network	TESEQ	NNB 51	45051	N/A	Feb. 01, 2021	Jul. 15, 2021	Jan. 31, 2022	Conduction (CO07-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102317	9kHz~3.6GHz	Sep. 11, 2020	Jul. 15, 2021	Sep. 10, 2021	Conduction (CO07-HY)
Power Sensor	DARE	RPR3006W	16I00054SNO12	10MHz~6GHz	Dec. 16, 2020	Jul. 03, 2021~ Jul. 28, 2021	Dec. 15, 2021	Conducted (TH05-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz-40GHz	Jan. 21, 2021	Jul. 03, 2021~ Jul. 28, 2021	Jan. 20, 2022	Conducted (TH05-HY)
Switch Box & RF Cable	Burgeon	ETF058	EC1300484	N/A	Nov. 19, 2020	Jul. 03, 2021~ Jul. 28, 2021	Nov. 18, 2021	Conducted (TH05-HY)

5 Uncertainty of Evaluation

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.2 dB**

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.9 dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.8 dB**

Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.5 dB**

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Mina Liu	Temperature:	21~25	°C
Test Date:	2021/07/03~2021/07/28	Relative Humidity:	51~54	%

Report Number : FR162425C

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band MIMO										
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
					Ant7	Ant9	Ant7	Ant9		
11b	1Mbps	2	1	2412	13.15	13.10	8.08	8.04	0.50	Pass
11b	1Mbps	2	6	2437	13.05	13.20	7.58	8.04	0.50	Pass
11b	1Mbps	2	11	2462	13.15	13.15	7.58	8.04	0.50	Pass
11g	6Mbps	2	1	2412	17.00	16.95	15.30	15.10	0.50	Pass
11g	6Mbps	2	6	2437	16.80	16.85	15.02	15.08	0.50	Pass
11g	6Mbps	2	11	2462	16.80	16.90	15.06	15.08	0.50	Pass

TEST RESULTS DATA
Average Output Power

2.4GHz Band MIMO																
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
					Ant7	Ant9	SUM	Ant7	Ant9	Ant7	Ant9	Ant7	Ant9	Ant7	Ant9	
11b	1Mbps	2	1	2412	17.90	18.50	21.22	30.00		-0.90		20.32		36.00		Pass
11b	1Mbps	2	6	2437	18.00	18.40	21.21	30.00		-0.90		20.31		36.00		Pass
11b	1Mbps	2	11	2462	17.50	18.10	20.82	30.00		-0.90		19.92		36.00		Pass
11g	6Mbps	2	1	2412	15.70	16.60	19.18	30.00		-0.90		18.28		36.00		Pass
11g	6Mbps	2	6	2437	15.80	16.60	19.23	30.00		-0.90		18.33		36.00		Pass
11g	6Mbps	2	11	2462	15.50	16.20	18.87	30.00		-0.90		17.97		36.00		Pass
HT20	MCS0	2	1	2412	15.60	16.40	19.03	30.00		-0.90		18.13		36.00		Pass
HT20	MCS0	2	6	2437	15.70	16.30	19.02	30.00		-0.90		18.12		36.00		Pass
HT20	MCS0	2	11	2462	15.30	15.90	18.62	30.00		-0.90		17.72		36.00		Pass
HT40	MCS0	2	3	2422	15.00	15.40	18.21	30.00		-0.90		17.31		36.00		Pass
HT40	MCS0	2	6	2437	15.70	16.20	18.97	30.00		-0.90		18.07		36.00		Pass
HT40	MCS0	2	9	2452	15.00	15.50	18.27	30.00		-0.90		17.37		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Peak Power Spectral Density

2.4GHz Band MIMO												
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
					Ant7	Ant9	Worse + 3.01	Ant7	Ant9	Ant7	Ant9	
11b	1Mbps	2	1	2412	-5.71	-5.21	-2.20	1.67		8.00		Pass
11b	1Mbps	2	6	2437	-5.72	-6.02	-2.71	1.67		8.00		Pass
11b	1Mbps	2	11	2462	-6.11	-6.22	-3.10	1.67		8.00		Pass
11g	6Mbps	2	1	2412	-9.71	-9.83	-6.70	1.67		8.00		Pass
11g	6Mbps	2	6	2437	-9.73	-9.86	-6.72	1.67		8.00		Pass
11g	6Mbps	2	11	2462	-9.95	-9.52	-6.51	1.67		8.00		Pass

Measured power density (dBm) has offset with cable loss.

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

2.4GHz Band MIMO											
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	99% Occupied BW (MHz)		6dB BW (MHz)		6dB BW Limit (MHz)	Pass/Fail
						Ant7	Ant9	Ant7	Ant9		
HE20	MCS0	2	1	2412	Full	19.45	19.40	18.18	17.13	0.50	Pass
HE20	MCS0	2	6	2437	Full	19.25	19.35	16.25	16.00	0.50	Pass
HE20	MCS0	2	11	2462	Full	19.40	19.35	15.33	15.05	0.50	Pass
HE40	MCS0	2	3	2422	Full	37.90	37.90	37.28	35.04	0.50	Pass
HE40	MCS0	2	6	2437	Full	37.80	37.90	35.40	34.80	0.50	Pass
HE40	MCS0	2	9	2452	Full	37.90	37.80	36.16	35.04	0.50	Pass

TEST RESULTS DATA
Average Output Power

2.4GHz Band MIMO																	
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
						Ant7	Ant9	SUM	Ant7	Ant9	Ant7	Ant9	Ant7	Ant9	Ant7	Ant9	
HE20	MCS0	2	1	2412	Full	15.70	16.50	19.13	30.00		-0.90		18.23		36.00		Pass
HE20	MCS0	2	1	2412	26/0	7.00	7.60	10.32	30.00		-0.90		9.42		36.00		Pass
HE20	MCS0	2	1	2412	52/37	9.30	9.80	12.57	30.00		-0.90		11.67		36.00		Pass
HE20	MCS0	2	1	2412	106/53	11.40	12.10	14.77	30.00		-0.90		13.87		36.00		Pass
HE20	MCS0	2	6	2437	Full	15.90	16.50	19.22	30.00		-0.90		18.32		36.00		Pass
HE20	MCS0	2	11	2462	Full	15.40	16.00	18.72	30.00		-0.90		17.82		36.00		Pass
HE20	MCS0	2	11	2462	26/8	5.90	6.60	9.27	30.00		-0.90		8.37		36.00		Pass
HE20	MCS0	2	11	2462	52/40	9.70	10.20	12.97	30.00		-0.90		12.07		36.00		Pass
HE20	MCS0	2	11	2462	106/54	12.30	12.90	15.62	30.00		-0.90		14.72		36.00		Pass
HE40	MCS0	2	3	2422	Full	15.10	15.50	18.31	30.00		-0.90		17.41		36.00		Pass
HE40	MCS0	2	3	2422	242/61	12.30	12.80	15.57	30.00		-0.90		14.67		36.00		Pass
HE40	MCS0	2	6	2437	Full	15.80	16.30	19.07	30.00		-0.90		18.17		36.00		Pass
HE40	MCS0	2	9	2452	Full	15.10	15.60	18.37	30.00		-0.90		17.47		36.00		Pass
HE40	MCS0	2	9	2452	242/62	12.70	13.30	16.02	30.00		-0.90		15.12		36.00		Pass

Note: Measured power (dBm) has offset with cable loss.

TEST RESULTS DATA
Peak Power Spectral Density

2.4GHz Band MIMO													
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Peak PSD (dBm/3kHz)			DG (dBi)		Peak PSD Limit (dBm/3kHz)		Pass/Fail
						Ant7	Ant9	Worse + 3.01	Ant7	Ant9	Ant7	Ant9	
HE20	MCS0	2	1	2412	Full	-10.22	-10.21	-7.20	1.67		8.00		Pass
HE20	MCS0	2	1	2412	26/0	-10.72	-10.33	-7.32	1.67		8.00		Pass
HE20	MCS0	2	1	2412	52/37	-10.39	-10.22	-7.21	1.67		8.00		Pass
HE20	MCS0	2	1	2412	106/53	-10.65	-10.31	-7.30	1.67		8.00		Pass
HE20	MCS0	2	6	2437	Full	-10.07	-10.29	-7.06	1.67		8.00		Pass
HE20	MCS0	2	11	2462	Full	-10.04	-10.22	-7.03	1.67		8.00		Pass
HE20	MCS0	2	11	2462	26/8	-10.39	-10.69	-7.38	1.67		8.00		Pass
HE20	MCS0	2	11	2462	52/40	-10.17	-10.39	-7.16	1.67		8.00		Pass
HE20	MCS0	2	11	2462	106/54	-10.33	-10.38	-7.32	1.67		8.00		Pass
HE40	MCS0	2	3	2422	Full	-13.58	-13.51	-10.50	1.67		8.00		Pass
HE40	MCS0	2	3	2422	242/61	-13.95	-13.95	-10.94	1.67		8.00		Pass
HE40	MCS0	2	6	2437	Full	-12.82	-13.05	-9.81	1.67		8.00		Pass
HE40	MCS0	2	9	2452	Full	-13.04	-13.09	-10.03	1.67		8.00		Pass
HE40	MCS0	2	9	2452	242/62	-13.38	-13.28	-10.27	1.67		8.00		Pass

Measured power density (dBm) has offset with cable loss.

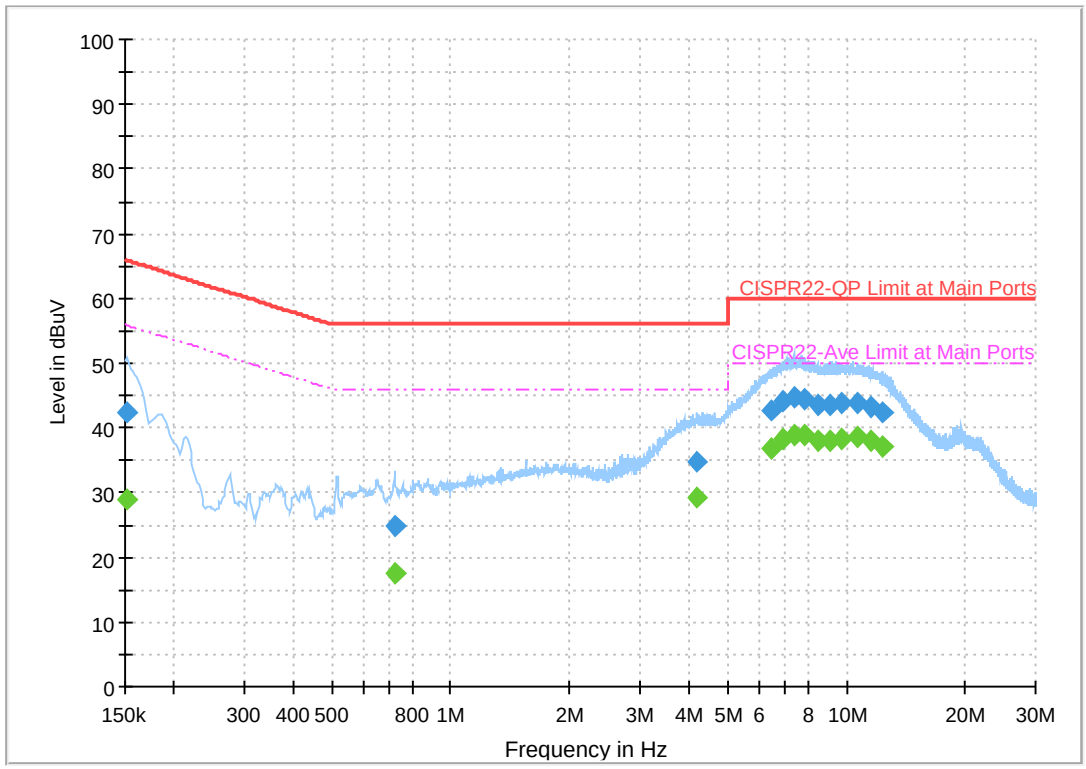
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Tom Lee	**Temperature :**	23~26℃
		Relative Humidity :	40~50%

EUT Information

Report NO :	162425
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

Full Spectrum



Final_Result

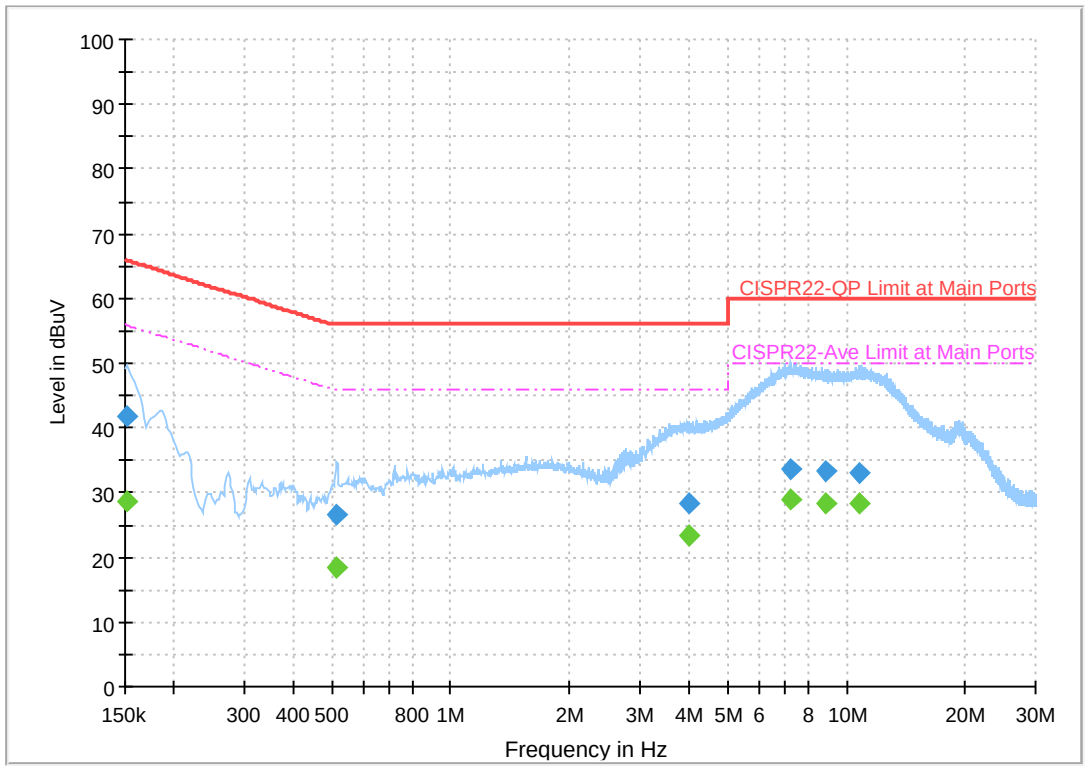
Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	---	28.80	55.88	27.07	L1	OFF	20.0
0.152250	42.48	---	65.88	23.39	L1	OFF	20.0
0.721500	---	17.46	46.00	28.54	L1	OFF	20.0
0.721500	24.97	---	56.00	31.03	L1	OFF	20.0
4.170750	---	29.38	46.00	16.62	L1	OFF	20.1
4.170750	34.73	---	56.00	21.27	L1	OFF	20.1
6.427500	---	36.98	50.00	13.02	L1	OFF	20.1
6.427500	42.71	---	60.00	17.29	L1	OFF	20.1
6.911250	---	38.34	50.00	11.66	L1	OFF	20.1
6.911250	44.09	---	60.00	15.91	L1	OFF	20.1
7.345500	---	38.98	50.00	11.02	L1	OFF	20.1
7.345500	44.69	---	60.00	15.31	L1	OFF	20.1
7.833750	---	38.81	50.00	11.19	L1	OFF	20.1
7.833750	44.42	---	60.00	15.58	L1	OFF	20.1
8.477250	---	38.14	50.00	11.86	L1	OFF	20.1
8.477250	43.66	---	60.00	16.34	L1	OFF	20.1
9.035250	---	38.11	50.00	11.89	L1	OFF	20.1
9.035250	43.57	---	60.00	16.43	L1	OFF	20.1
9.759750	---	38.31	50.00	11.69	L1	OFF	20.1
9.759750	43.88	---	60.00	16.12	L1	OFF	20.1
10.637250	---	38.64	50.00	11.36	L1	OFF	20.2
10.637250	43.96	---	60.00	16.04	L1	OFF	20.2
11.526000	---	38.15	50.00	11.85	L1	OFF	20.2
11.526000	43.39	---	60.00	16.61	L1	OFF	20.2

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
12.387750	---	37.07	50.00	12.93	L1	OFF	20.2
12.387750	42.32	---	60.00	17.68	L1	OFF	20.2

EUT Information

Report NO :	162425
Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Neutral

Full Spectrum



Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.152250	41.93	---	65.88	23.94	N	OFF	20.0
0.152250	---	28.62	55.88	27.25	N	OFF	20.0
0.514500	26.60	---	56.00	29.40	N	OFF	20.0
0.514500	---	18.36	46.00	27.64	N	OFF	20.0
3.999750	28.27	---	56.00	27.73	N	OFF	20.1
3.999750	---	23.51	46.00	22.49	N	OFF	20.1
7.208250	33.51	---	60.00	26.49	N	OFF	20.1
7.208250	---	28.81	50.00	21.19	N	OFF	20.1
8.853000	33.45	---	60.00	26.55	N	OFF	20.1
8.853000	---	28.37	50.00	21.63	N	OFF	20.1
10.788000	33.09	---	60.00	26.91	N	OFF	20.2
10.788000	---	28.28	50.00	21.72	N	OFF	20.2

Appendix C. Radiated Spurious Emission

Test Engineer :	JC Liang and Steven Wu	Temperature :	20~23°C
		Relative Humidity :	66~69%

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
7+9		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2387.28	50.51	-23.49	74	41.03	27.25	18.42	36.19	123	29	P	H
		2390	40.79	-13.21	54	31.3	27.26	18.42	36.19	123	29	A	H
	*	2412	111.26	-	-	101.65	27.35	18.46	36.2	123	29	P	H
	*	2412	108.06	-	-	98.45	27.35	18.46	36.2	123	29	A	H
													H
													H
		2386.125	51.16	-22.84	74	41.7	27.24	18.41	36.19	100	111	P	V
		2386.755	41.83	-12.17	54	32.35	27.25	18.42	36.19	100	111	A	V
	*	2412	113.65	-	-	104.04	27.35	18.46	36.2	100	111	P	V
	*	2412	110.61	-	-	101	27.35	18.46	36.2	100	111	A	V
													V
													V
802.11b CH 06 2437MHz		2389.8	49.16	-24.84	74	39.67	27.26	18.42	36.19	119	29	P	H
		2386.44	40.01	-13.99	54	30.54	27.25	18.41	36.19	119	29	A	H
	*	2437	112.19	-	-	102.45	27.45	18.5	36.21	119	29	P	H
	*	2437	108.66	-	-	98.92	27.45	18.5	36.21	119	29	A	H
		2485.68	49.82	-24.18	74	39.82	27.64	18.59	36.23	119	29	P	H
		2485.2	41.33	-12.67	54	31.33	27.64	18.59	36.23	119	29	A	H
		2389.66	49.82	-24.18	74	40.33	27.26	18.42	36.19	113	111	P	V
		2389.94	41.95	-12.05	54	32.46	27.26	18.42	36.19	113	111	A	V
	*	2437	113.76	-	-	104.02	27.45	18.5	36.21	113	111	P	V
	*	2437	110.13	-	-	100.39	27.45	18.5	36.21	113	111	A	V
		2485.52	50.34	-23.66	74	40.34	27.64	18.59	36.23	113	111	P	V
		2485.44	41.8	-12.2	54	31.8	27.64	18.59	36.23	113	111	A	V

802.11b CH 11 2462MHz	*	2462	111.6	-	-	101.72	27.55	18.55	36.22	112	33	P	H
	*	2462	108.47	-	-	98.59	27.55	18.55	36.22	112	33	A	H
		2483.68	51.47	-22.53	74	41.47	27.63	18.59	36.22	112	33	P	H
		2485.92	43.31	-10.69	54	33.31	27.64	18.59	36.23	112	33	A	H
													H
													H
	*	2462	112.67	-	-	102.79	27.55	18.55	36.22	100	111	P	V
	*	2462	109.52	-	-	99.64	27.55	18.55	36.22	100	111	A	V
		2486.12	51.02	-22.98	74	41.02	27.64	18.59	36.23	100	111	P	V
		2485.84	43.4	-10.6	54	33.4	27.64	18.59	36.23	100	111	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
7+9		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		4824	42.73	-31.27	74	35.3	32.14	12.73	37.44	100	0	P	H
		17970	56.3	-17.7	74	34.98	42.06	24.56	45.3	100	23	P	H
		17970	46.7	-7.3	54	25.38	42.06	24.56	45.3	100	23	A	H
													H
													H
													H
		4824	42.95	-31.05	74	35.52	32.14	12.73	37.44	100	0	P	V
		17955	56.59	-17.41	74	35.37	41.94	24.56	45.28	100	12	P	V
		17955	46.76	-7.24	54	25.54	41.94	24.56	45.28	100	12	A	V
													V
													V
													V
802.11b CH 06 2437MHz		4874	43.45	-30.55	74	35.86	32.3	12.77	37.48	100	0	P	H
		7311	47.08	-26.92	74	33.29	36.76	15.38	38.35	100	0	P	H
		17970	56.14	-17.86	74	34.82	42.06	24.56	45.3	100	28	P	H
		17970	46.55	-7.45	54	25.23	42.06	24.56	45.3	100	28	A	H
													H
													H
		4874	42.51	-31.49	74	34.92	32.3	12.77	37.48	100	0	P	V
		7311	47.08	-26.92	74	33.29	36.76	15.38	38.35	100	0	P	V
		17940	56.32	-17.68	74	35.21	41.82	24.55	45.26	100	33	P	V
		17940	46.82	-7.18	54	25.71	41.82	24.55	45.26	100	33	A	V
													V
													V

WIFI Ant. 7+9	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11b CH 11 2462MHz		4924	43.11	-30.89	74	35.35	32.49	12.79	37.52	100	0	P	H
		7386	47.25	-26.75	74	33.74	36.46	15.46	38.41	100	0	P	H
		17805	55.41	-18.59	74	35.36	40.64	24.51	45.1	100	18	P	H
		17805	45.72	-8.28	54	25.67	40.64	24.51	45.1	100	18	A	H
													H
													H
		4924	42.69	-31.31	74	34.93	32.49	12.79	37.52	100	0	P	V
		7386	47.2	-26.8	74	33.69	36.46	15.46	38.41	100	0	P	V
		17985	56.03	-17.97	74	34.59	42.18	24.57	45.31	100	33	P	V
		17985	46.7	-7.3	54	25.26	42.18	24.57	45.31	100	33	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
7+9		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		2387.49	53.17	-20.83	74	43.69	27.25	18.42	36.19	124	31	P	H
		2388.225	42.56	-11.44	54	33.08	27.25	18.42	36.19	124	31	A	H
	*	2412	110.75	-	-	101.14	27.35	18.46	36.2	124	31	P	H
	*	2412	103.8	-	-	94.19	27.35	18.46	36.2	124	31	A	H
													H
													H
		2386.86	54.7	-19.3	74	45.22	27.25	18.42	36.19	100	113	P	V
		2390	44.74	-9.26	54	35.25	27.26	18.42	36.19	100	113	A	V
	*	2412	112.57	-	-	102.96	27.35	18.46	36.2	100	113	P	V
	*	2412	105.91	-	-	96.3	27.35	18.46	36.2	100	113	A	V
													V
													V
802.11g CH 06 2437MHz		2389.2	48.74	-25.26	74	39.25	27.26	18.42	36.19	117	30	P	H
		2390	39.8	-14.2	54	30.31	27.26	18.42	36.19	117	30	A	H
	*	2437	111.09	-	-	101.35	27.45	18.5	36.21	117	30	P	H
	*	2437	104.36	-	-	94.62	27.45	18.5	36.21	117	30	A	H
		2498.96	49.29	-24.71	74	39.21	27.7	18.61	36.23	117	30	P	H
		2483.52	39.88	-14.12	54	29.88	27.63	18.59	36.22	117	30	A	H
		2388.08	49.93	-24.07	74	40.45	27.25	18.42	36.19	100	112	P	V
		2389.36	40.76	-13.24	54	31.27	27.26	18.42	36.19	100	112	A	V
	*	2437	113.29	-	-	103.55	27.45	18.5	36.21	100	112	P	V
	*	2437	105.66	-	-	95.92	27.45	18.5	36.21	100	112	A	V
		2486.08	49.64	-24.36	74	39.64	27.64	18.59	36.23	100	112	P	V
		2483.84	40.24	-13.76	54	30.23	27.64	18.59	36.22	100	112	A	V

802.11g CH 11 2462MHz	*	2462	110.76	-	-	100.88	27.55	18.55	36.22	118	32	P	H
	*	2462	103.08	-	-	93.2	27.55	18.55	36.22	118	32	A	H
		2483.56	59.41	-14.59	74	49.41	27.63	18.59	36.22	118	32	P	H
		2483.56	48.74	-5.26	54	38.74	27.63	18.59	36.22	118	32	A	H
													H
													H
	*	2462	112.35	-	-	102.47	27.55	18.55	36.22	100	59	P	V
	*	2462	105.08	-	-	95.2	27.55	18.55	36.22	100	59	A	V
		2483.56	57.84	-16.16	74	47.84	27.63	18.59	36.22	100	59	P	V
		2483.52	48.2	-5.8	54	38.2	27.63	18.59	36.22	100	59	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
7+9		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11g CH 01 2412MHz		4824	42.48	-31.52	74	35.05	32.14	12.73	37.44	100	0	P	H
		17850	55.81	-18.19	74	35.39	41.05	24.53	45.16	100	18	P	H
		17850	45.8	-8.2	54	25.38	41.05	24.53	45.16	100	18	A	H
													H
													H
													H
		4824	42.71	-31.29	74	35.28	32.14	12.73	37.44	100	0	P	V
		17955	56.2	-17.8	74	34.98	41.94	24.56	45.28	100	35	P	V
		17955	46.59	-7.41	54	25.37	41.94	24.56	45.28	100	35	A	V
													V
													V
													V
802.11g CH 06 2437MHz		4874	43.02	-30.98	74	35.43	32.3	12.77	37.48	100	0	P	H
		7311	47.62	-26.38	74	33.83	36.76	15.38	38.35	100	0	P	H
		17955	56.54	-17.46	74	35.32	41.94	24.56	45.28	100	23	P	H
		17955	46.88	-7.12	54	25.66	41.94	24.56	45.28	100	23	A	H
													H
													H
		4874	44.81	-29.19	74	37.22	32.3	12.77	37.48	100	0	P	V
		7311	48.2	-25.8	74	34.41	36.76	15.38	38.35	100	0	P	V
		17970	56.08	-17.92	74	34.76	42.06	24.56	45.3	100	54	P	V
		17970	46.71	-7.29	54	25.39	42.06	24.56	45.3	100	54	A	V
													V
													V

WIFI Ant. 7+9	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11g CH 11 2462MHz		4924	42.51	-31.49	74	34.75	32.49	12.79	37.52	100	0	P	H
		7386	47.27	-26.73	74	33.76	36.46	15.46	38.41	100	0	P	H
		17970	56.34	-17.66	74	35.02	42.06	24.56	45.3	100	12	P	H
		17970	46.77	-7.23	54	25.45	42.06	24.56	45.3	100	12	A	H
													H
													H
		4924	41.59	-32.41	74	33.83	32.49	12.79	37.52	100	0	P	V
		7386	46	-28	74	32.49	36.46	15.46	38.41	100	0	P	V
		17970	56.14	-17.86	74	34.82	42.06	24.56	45.3	100	31	P	V
		17970	46.51	-7.49	54	25.19	42.06	24.56	45.3	100	31	A	V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11ax HE40 Full (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
7+9		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		2389.8	58.57	-15.43	74	49.08	27.26	18.42	36.19	117	30	P	H
		2389.94	48.48	-5.52	54	38.99	27.26	18.42	36.19	117	30	A	H
	*	2422	108.36	-	-	98.7	27.39	18.48	36.21	117	30	P	H
	*	2422	98.75	-	-	89.09	27.39	18.48	36.21	117	30	A	H
802.11ax		2485.6	49.18	-24.82	74	39.18	27.64	18.59	36.23	117	30	P	H
HE40 Full		2483.52	40.25	-13.75	54	30.25	27.63	18.59	36.22	117	30	A	H
CH 03		2389.8	59.27	-14.73	74	49.78	27.26	18.42	36.19	100	110	P	V
2422MHz		2389.8	48.76	-5.24	54	39.27	27.26	18.42	36.19	100	110	A	V
	*	2422	109.14	-	-	99.48	27.39	18.48	36.21	100	110	P	V
	*	2422	100.49	-	-	90.83	27.39	18.48	36.21	100	110	A	V
		2485.92	50.76	-23.24	74	40.76	27.64	18.59	36.23	100	110	P	V
		2483.52	40.88	-13.12	54	30.88	27.63	18.59	36.22	100	110	A	V
		2389.66	55.95	-18.05	74	46.46	27.26	18.42	36.19	120	32	P	H
		2389.94	45.8	-8.2	54	36.31	27.26	18.42	36.19	120	32	A	H
	*	2437	108	-	-	98.26	27.45	18.5	36.21	120	32	P	H
	*	2437	99.23	-	-	89.49	27.45	18.5	36.21	120	32	A	H
802.11ax		2483.6	57.25	-16.75	74	47.25	27.63	18.59	36.22	120	32	P	H
HE40 Full		2483.52	46.36	-7.64	54	36.36	27.63	18.59	36.22	120	32	A	H
CH 06		2389.8	57.71	-16.29	74	48.22	27.26	18.42	36.19	111	111	P	V
2437MHz		2389.94	47.49	-6.51	54	38	27.26	18.42	36.19	111	111	A	V
	*	2437	110.1	-	-	100.36	27.45	18.5	36.21	111	111	P	V
	*	2437	100.36	-	-	90.62	27.45	18.5	36.21	111	111	A	V
		2484.16	57.73	-16.27	74	47.72	27.64	18.59	36.22	111	111	P	V
		2483.68	47.01	-6.99	54	37.01	27.63	18.59	36.22	111	111	A	V

WIFI Ant. 7+9	Note	Frequency (MHz)	Level (dBµV/m)	Over Limit (dB)	Limit Line (dBµV/m)	Read Level (dBµV)	Antenna Factor (dB/m)	Path Loss (dB)	Preamp Factor (dB)	Ant Pos (cm)	Table Pos (deg)	Peak Avg. (P/A)	Pol. (H/V)
802.11ax HE40 Full CH 09 2452MHz		2388.4	49.76	-24.24	74	40.28	27.25	18.42	36.19	100	32	P	H
		2389.94	39.89	-14.11	54	30.4	27.26	18.42	36.19	100	32	A	H
	*	2452	107.37	-	-	97.54	27.51	18.53	36.21	100	32	P	H
	*	2452	98.11	-	-	88.28	27.51	18.53	36.21	100	32	A	H
		2483.68	57.71	-16.29	74	47.71	27.63	18.59	36.22	100	32	P	H
		2483.52	47.57	-6.43	54	37.57	27.63	18.59	36.22	100	32	A	H
		2389.52	50.51	-23.49	74	41.02	27.26	18.42	36.19	100	110	P	V
		2389.94	40.68	-13.32	54	31.19	27.26	18.42	36.19	100	110	A	V
	*	2452	108.64	-	-	98.81	27.51	18.53	36.21	100	110	P	V
	*	2452	100.2	-	-	90.37	27.51	18.53	36.21	100	110	A	V
		2484.56	59.34	-14.66	74	49.34	27.64	18.59	36.23	100	110	P	V
		2483.52	48.64	-5.36	54	38.64	27.63	18.59	36.22	100	110	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

2.4GHz 2400~2483.5MHz

WIFI 802.11ax HE40 Partial 242 (Band Edge @ 3m)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
7+9		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		2390	65.99	-8.01	74	56.5	27.26	18.42	36.19	207	48	P	H
		2390	49.29	-4.71	54	39.8	27.26	18.42	36.19	207	48	A	H
	*	2422	109.01	-	-	99.35	27.39	18.48	36.21	207	48	P	H
802.11ax	*	2422	100.36	-	-	90.7	27.39	18.48	36.21	207	48	A	H
HE40		2483.68	49.9	-24.1	74	39.9	27.63	18.59	36.22	207	48	P	H
Partial		2483.76	38.87	-15.13	54	28.86	27.64	18.59	36.22	207	48	A	H
242/61		2390	66.67	-7.33	74	57.18	27.26	18.42	36.19	101	67	P	V
CH 03		2390	50.14	-3.86	54	40.65	27.26	18.42	36.19	101	67	A	V
2422MHz	*	2422	109.59	-	-	99.93	27.39	18.48	36.21	101	67	P	V
	*	2422	100.15	-	-	90.49	27.39	18.48	36.21	101	67	A	V
		2486.72	49.79	-24.21	74	39.78	27.65	18.59	36.23	101	67	P	V
		2483.6	38.85	-15.15	54	28.85	27.63	18.59	36.22	101	67	A	V
Remark	1. No other spurious found. 2. All results are PASS against Peak and Average limit line.												

Emission above 18GHz

WIFI 802.11ax HE40 (SHF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
7+9		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		38504	51.38	-16.82	68.2	36.92	43.7	26.46	55.7	150	0	P	H
													H
													H
													H
													H
													H
													H
													H
													H
													H
WIFI													H
802.11ax													H
HE40		38570	52.91	-15.29	68.2	38.35	43.76	26.47	55.67	150	0	P	V
SHF													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V
													V

Remark

1. No other spurious found.
2. All results are PASS against limit line.

Emission below 1GHz

WIFI 802.11ax HE40 (LF)

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
7+9		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
		30.97	23.2	-16.8	40	33.82	24.13	0.97	35.72	-	-	P	H
		110.51	26.81	-16.69	43.5	43.33	17.29	1.82	35.63	-	-	P	H
		169.68	24.88	-18.62	43.5	42.5	15.65	2.26	35.53	-	-	P	H
		289.96	24.57	-21.43	46	37.69	19.17	2.98	35.27	-	-	P	H
		563.5	28.85	-17.15	46	32.91	26.29	4.18	34.53	-	-	P	H
		956.35	34.96	-11.04	46	31.42	31.03	5.63	33.12	100	0	P	H
													H
													H
													H
													H
WIFI													H
802.11ax													H
HE40		55.22	23.63	-16.37	40	45.39	12.7	1.25	35.71	-	-	P	V
LF		186.17	22.7	-20.8	43.5	40.85	14.99	2.36	35.5	-	-	P	V
		492.69	27.77	-18.23	46	34.54	24.05	3.94	34.76	-	-	P	V
		607.15	28.69	-17.31	46	33.01	25.73	4.34	34.39	-	-	P	V
		853.53	33.29	-12.71	46	32.41	29.12	5.28	33.52	-	-	P	V
		956.35	34.39	-11.61	46	30.85	31.03	5.63	33.12	100	0	P	V
													V
													V
													V
													V
													V
													V
Remark	1. No other spurious found. 2. All results are PASS against limit line.												

Note symbol

*	**Fundamental Frequency** which can be ignored. However, the level of any unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is **over limit** line.
P/A	**P**eak or **A**verage
H/V	**H**orizontal or **V**ertical

A calculation example for radiated spurious emission is shown as below:

WIFI	Note	Frequency	Level	Over	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
Ant.				Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
7+9		(MHz)	(dBμV/m)	(dB)	(dBμV/m)	(dBμV)	(dB/m)	(dB)	(dB)	(cm)	(deg)	(P/A)	(H/V)
802.11b CH 01 2412MHz		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	P	H
		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	A	H

1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
2. Level(dBμV/m) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

3. Over Limit(dB) = Level(dBμV/m) – Limit Line(dBμV/m)

For Peak Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 54.51(dBμV) – 35.86 (dB)

= 55.45 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 55.45(dBμV/m) – 74(dBμV/m)

= -18.55(dB)

For Average Limit @ 2390MHz:

1. Level(dBμV/m)

= Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBμV) - Preamp Factor(dB)

= 32.22(dB/m) + 4.58(dB) + 42.6(dBμV) – 35.86 (dB)

= 43.54 (dBμV/m)

2. Over Limit(dB)

= Level(dBμV/m) – Limit Line(dBμV/m)

= 43.54(dBμV/m) – 54(dBμV/m)

= -10.46(dB)

Both peak and average measured complies with the limit line, so test result is “PASS”.

Appendix D. Radiated Spurious Emission Plots

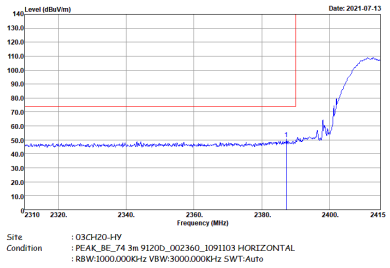
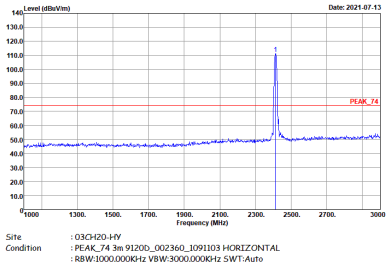
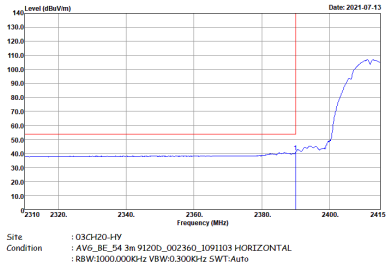
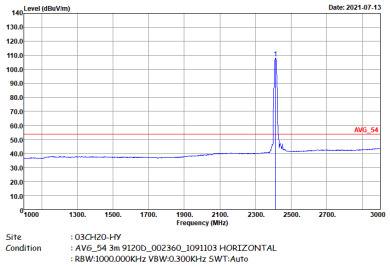
Test Engineer :	JC Liang and Steven Wu	**Temperature :**	20~23°C
		Relative Humidity :	66~69%

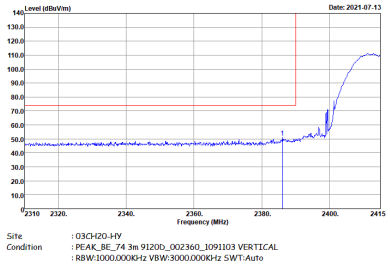
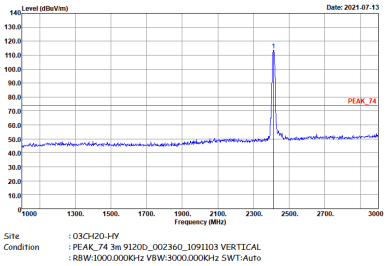
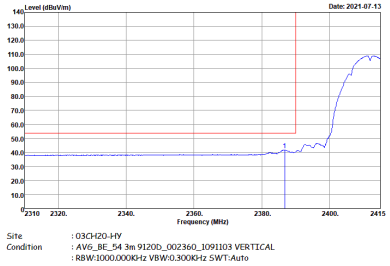
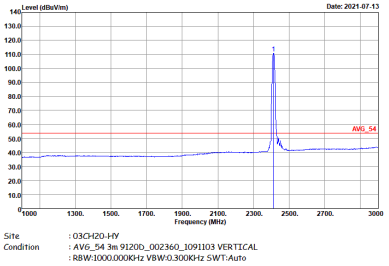
Note symbol

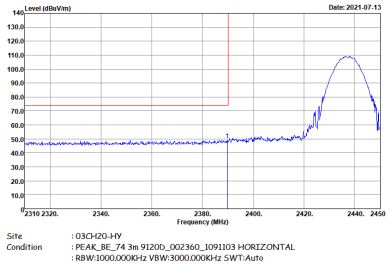
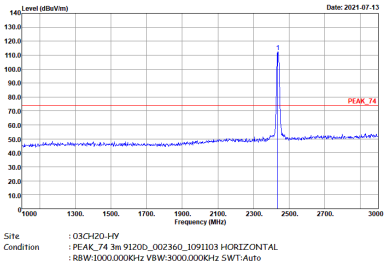
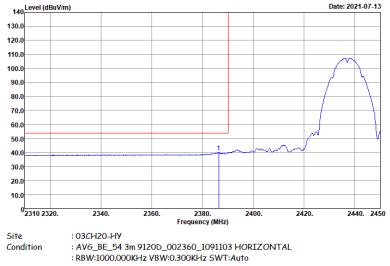
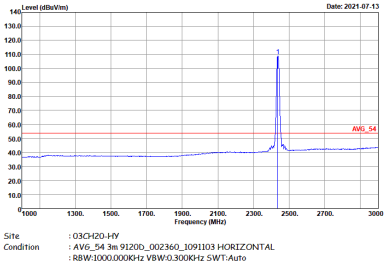
-L	**Low channel location**
-R	**High channel location**

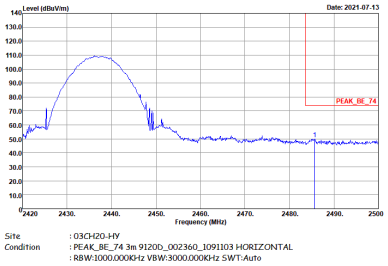
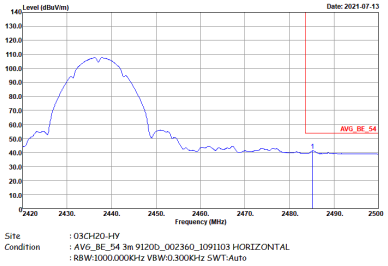
2.4GHz 2400~2483.5MHz

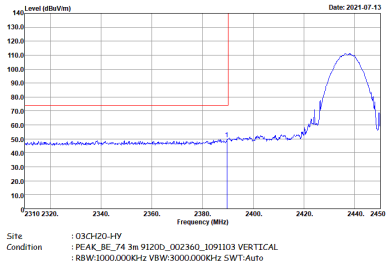
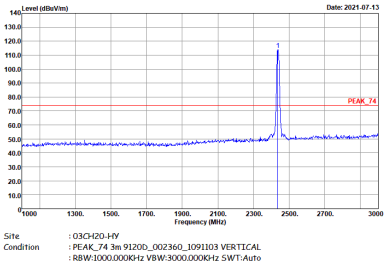
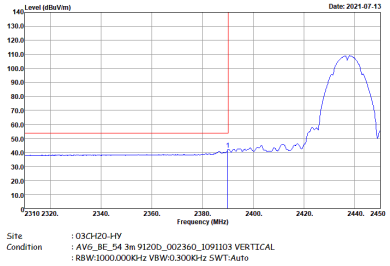
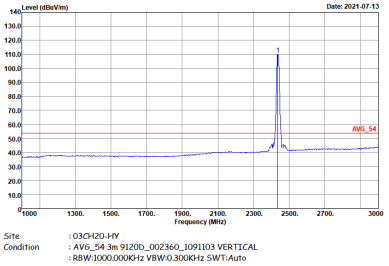
WIFI 802.11b (Band Edge @ 3m)

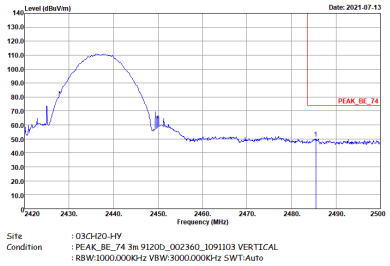
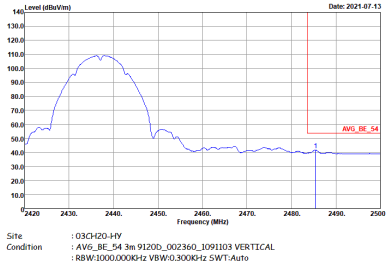
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH01 2412MHz	
7+9	Horizontal	Fundamental
Peak		
Avg.		

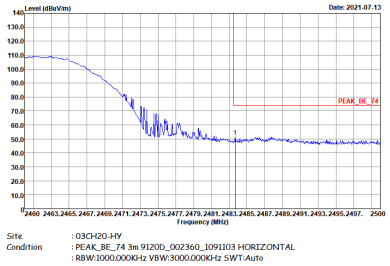
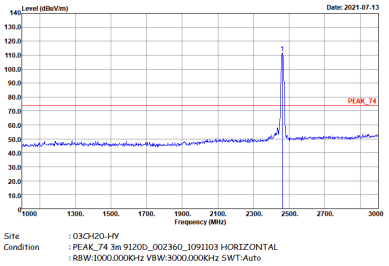
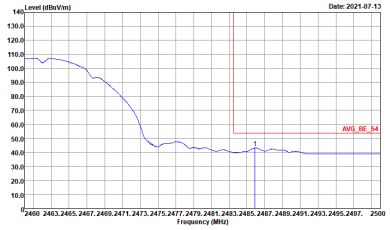
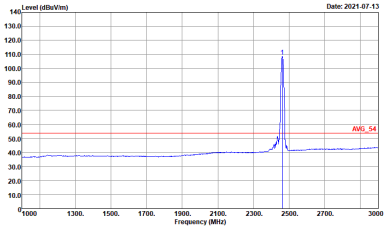
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH01 2412MHz	
7+9	Vertical	Fundamental
Peak		
Avg.		

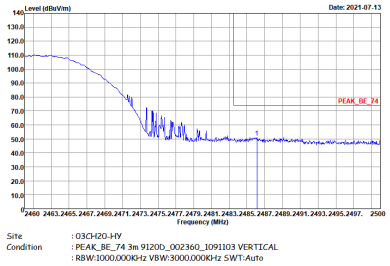
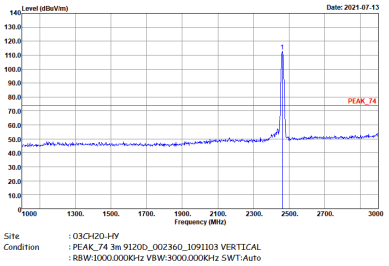
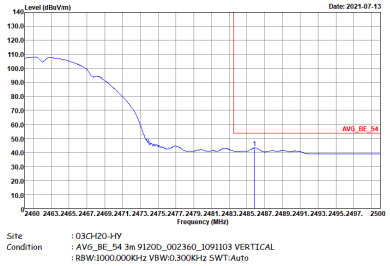
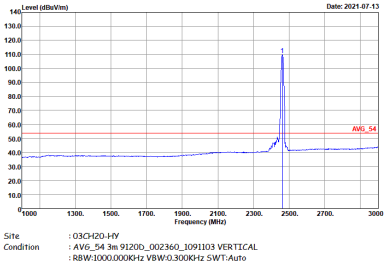
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - L	
7+9	Horizontal	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - R	
7+9	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - L	
7+9	Vertical	Fundamental
Peak		
Avg.		

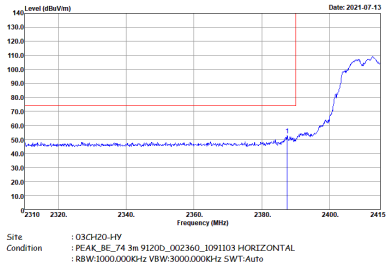
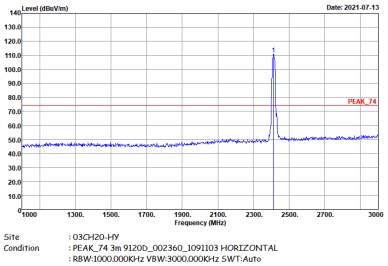
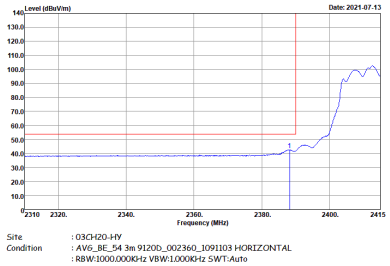
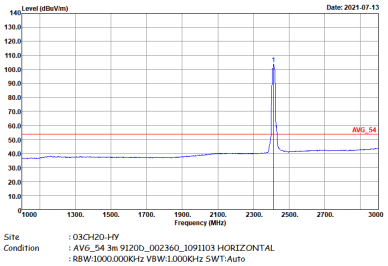
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH06 2437MHz - R	
7+9	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

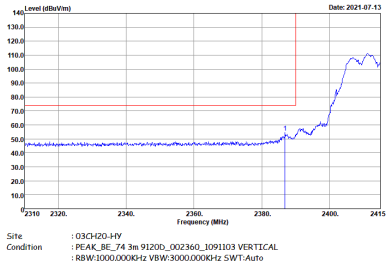
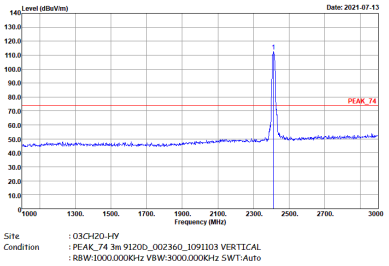
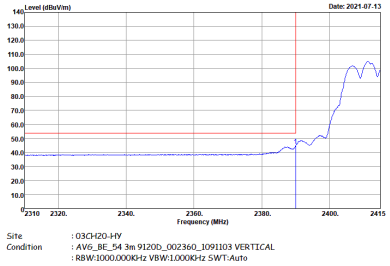
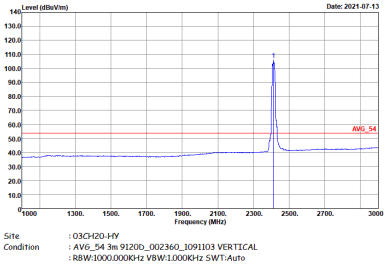
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
7+9	Horizontal	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_74 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto

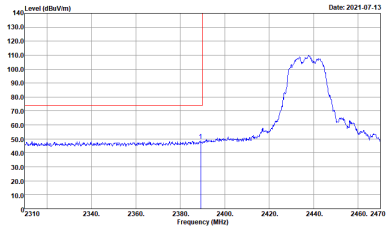
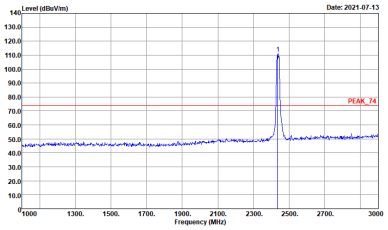
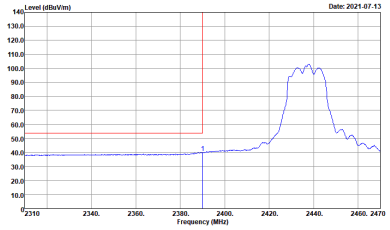
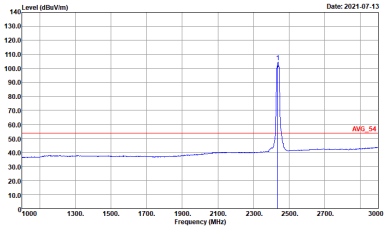
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11b CH11 2462MHz	
7+9	Vertical	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 9120D_002360_1091103 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_74 3m 9120D_002360_1091103 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 9120D_002360_1091103 VERTICAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_002360_1091103 VERTICAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto

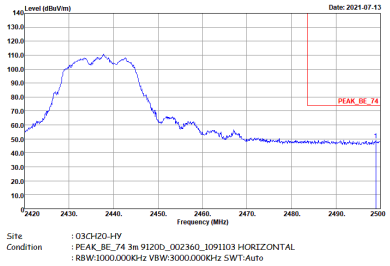
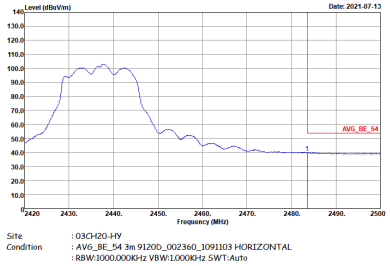
2.4GHz 2400~2483.5MHz

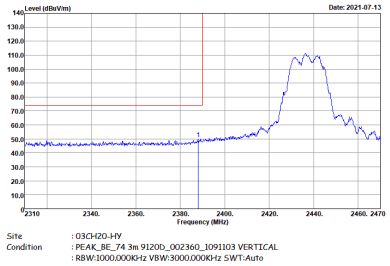
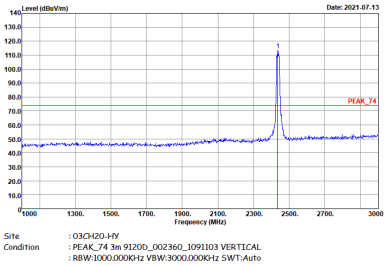
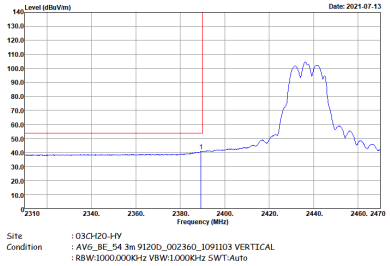
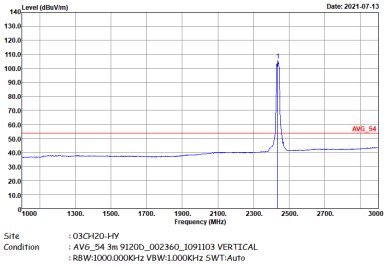
WIFI 802.11g (Band Edge @ 3m)

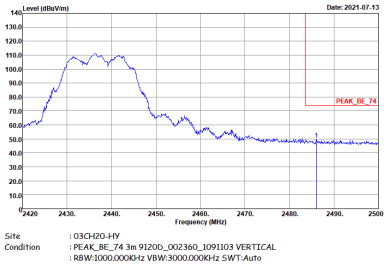
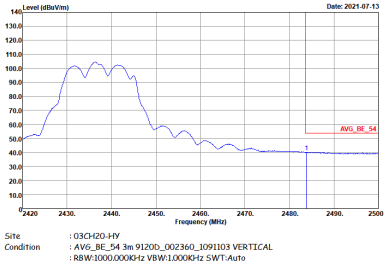
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH01 2412MHz	
7+9	Horizontal	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_74 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

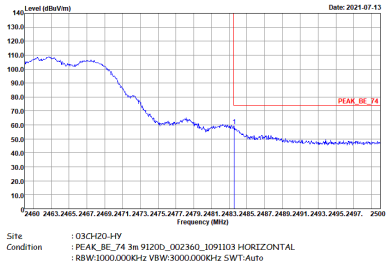
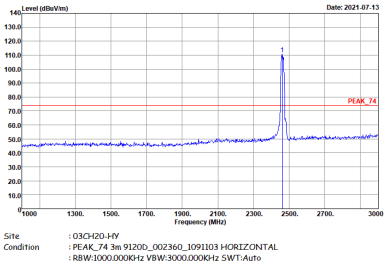
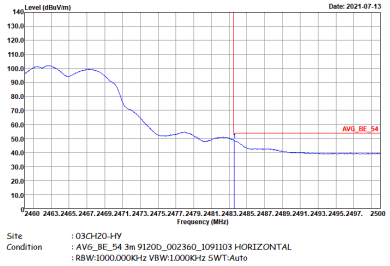
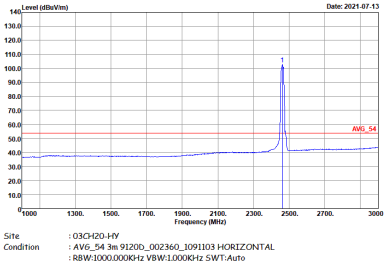
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH01 2412MHz	
7+9	Vertical	Fundamental
Peak		
Avg.		

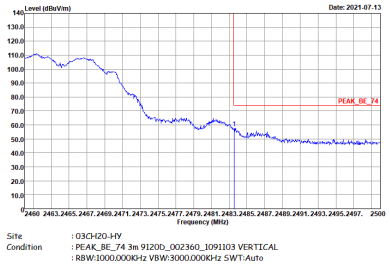
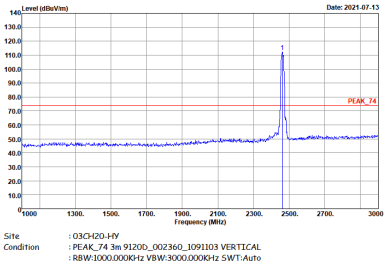
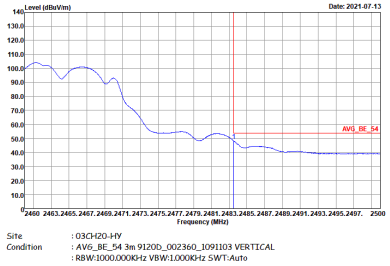
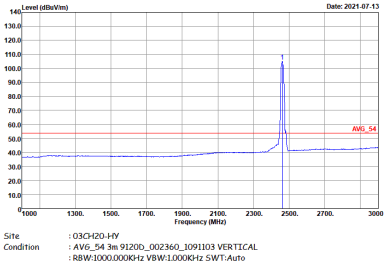
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - L	
7+9	Horizontal	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_8E_74 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_74 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_8E_54 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - R	
7+9	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - L	
7+9	Vertical	Fundamental
Peak		
Avg.		

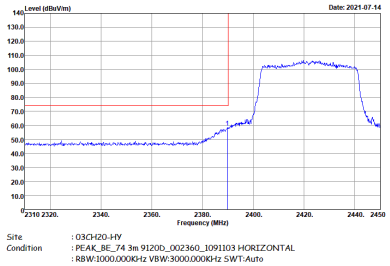
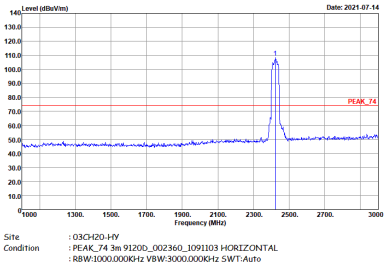
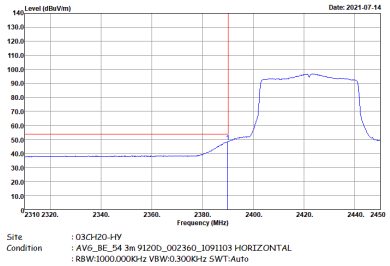
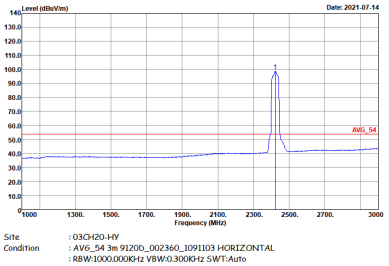
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH06 2437MHz - R	
7+9	Vertical	Fundamental
Peak		Left Blank
Avg.		Left Blank

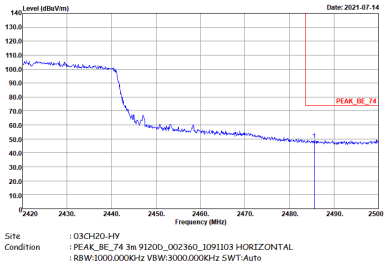
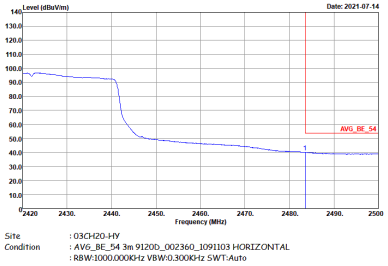
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH11 2462MHz	
7+9	Horizontal	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_74 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

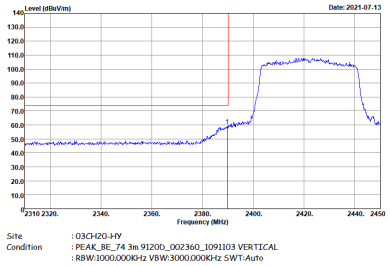
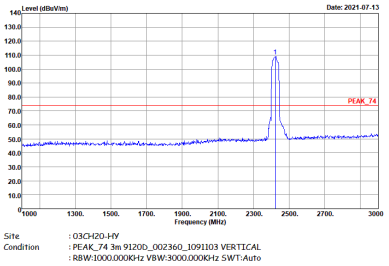
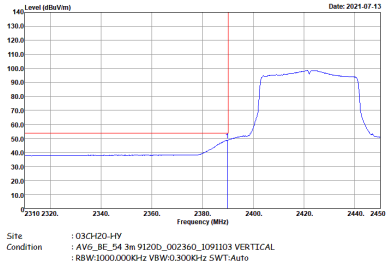
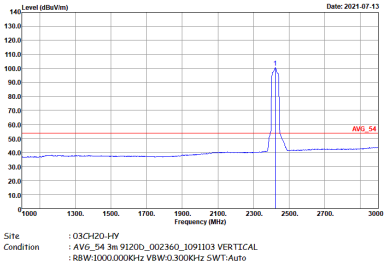
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11g CH11 2462MHz	
7+9	Vertical	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 9120D_002360_1091103 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_74 3m 9120D_002360_1091103 VERTICAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 9120D_002360_1091103 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_002360_1091103 VERTICAL : RBW:1000.000KHz VBW:1.000KHz SWT:Auto

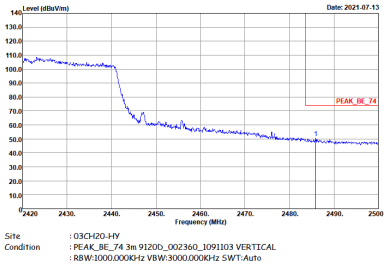
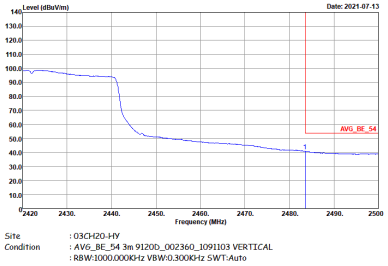
2.4GHz 2400~2483.5MHz

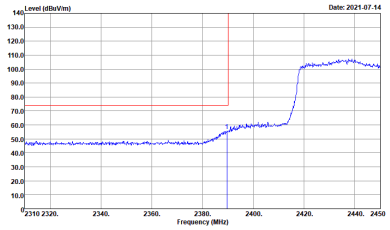
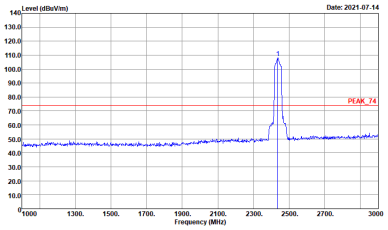
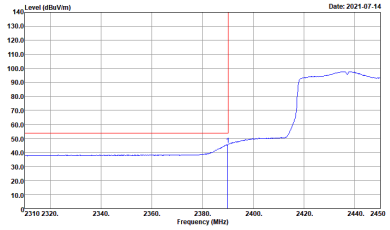
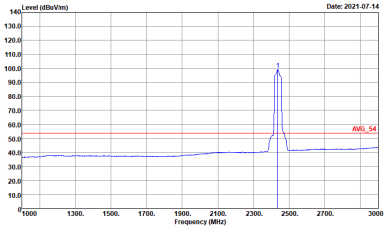
WIFI 802.11ax HE40 Full (Band Edge @ 3m)

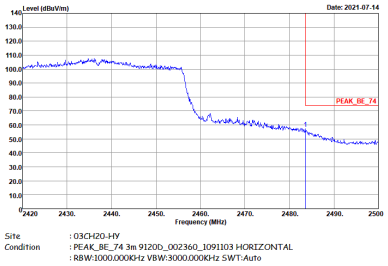
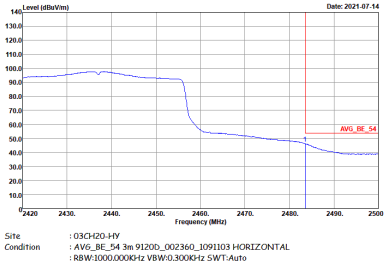
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - L	
7+9	Horizontal	Fundamental
Peak		
Avg.		

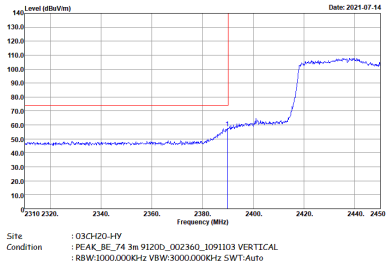
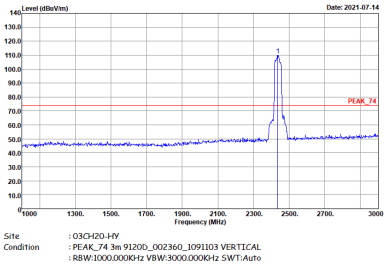
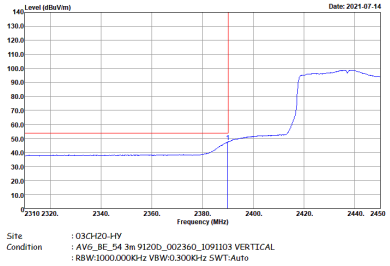
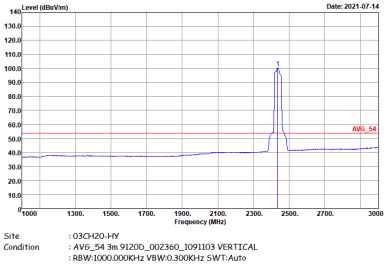
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - R	
7+9	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

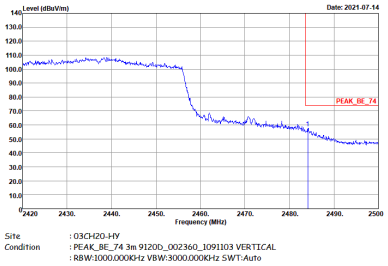
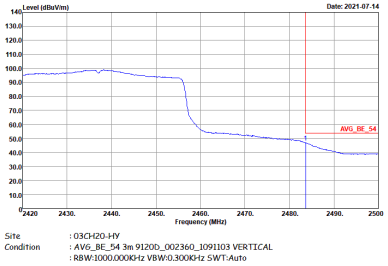
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - L	
7+9	Vertical	Fundamental
Peak		
Avg.		

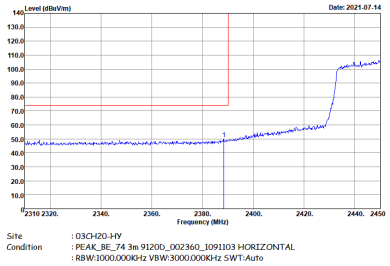
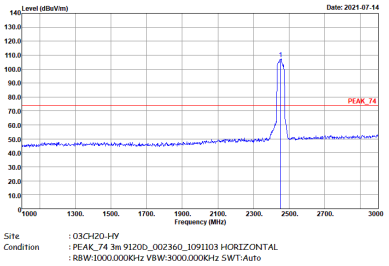
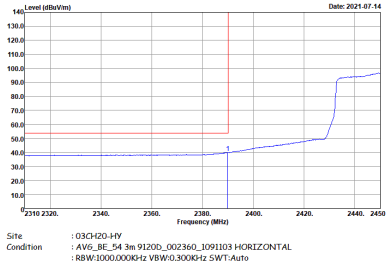
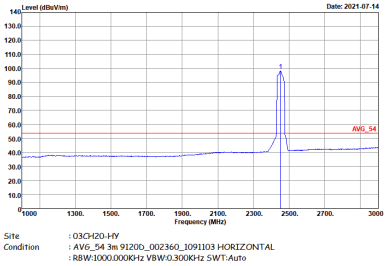
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH03 2422MHz - R	
7+9	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

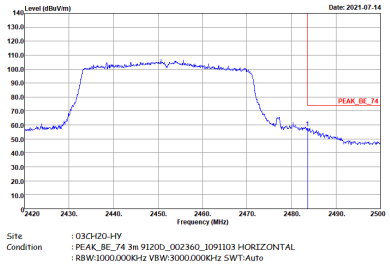
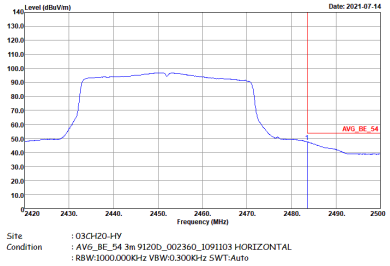
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH06 2437MHz - L	
7+9	Horizontal	Fundamental
Peak	 Site : 03CH20-HY Condition : PEAK_BE_74 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto	 Site : 03CH20-HY Condition : PEAK_74 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:3000.000KHz SWT:Auto
Avg.	 Site : 03CH20-HY Condition : AVG_BE_54 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto	 Site : 03CH20-HY Condition : AVG_54 3m 9120D_002360_1091103 HORIZONTAL : RBW:1000.000KHz VBW:0.300KHz SWT:Auto

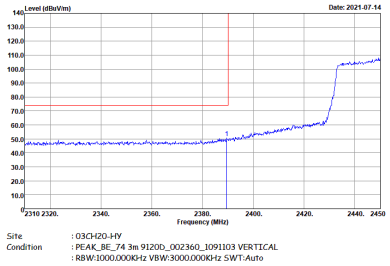
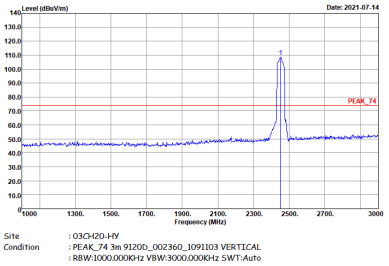
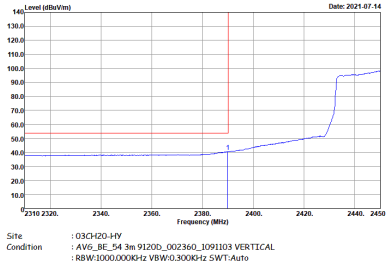
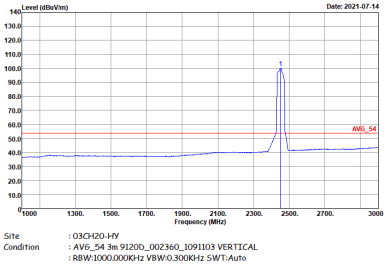
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH06 2437MHz - R	
7+9	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

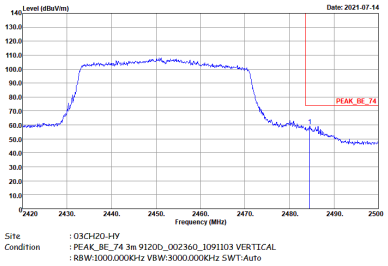
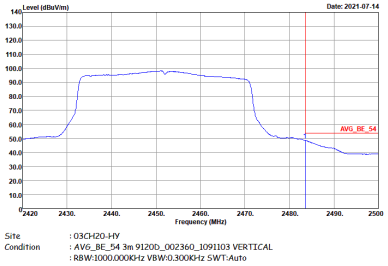
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH06 2437MHz - L	
7+9	Vertical	Fundamental
Peak		
Avg.		

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH06 2437MHz - R	
7+9	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
7+9	Horizontal	Fundamental
Peak		
Avg.		

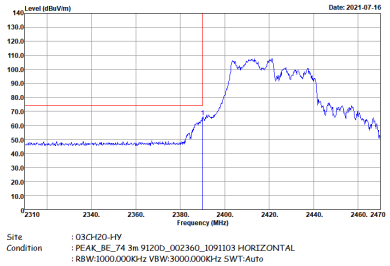
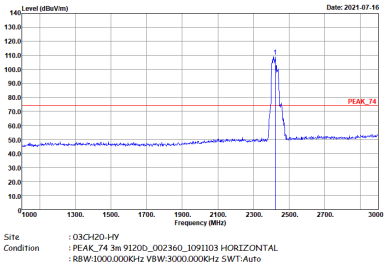
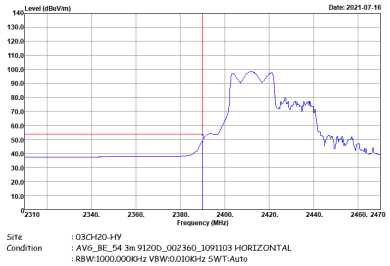
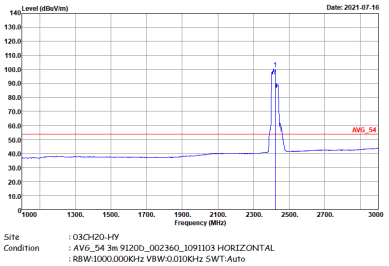
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
7+9	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

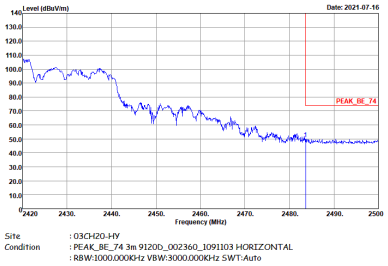
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - L	
7+9	Vertical	Fundamental
Peak		
Avg.		

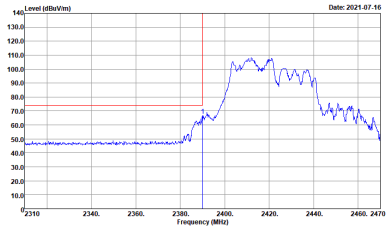
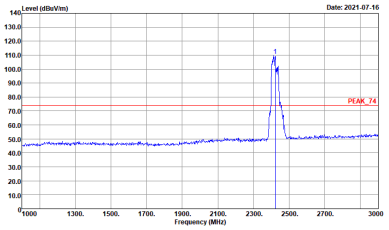
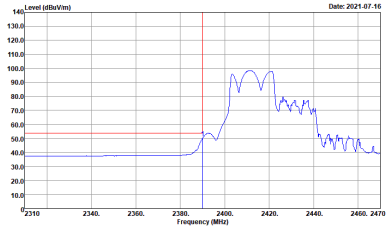
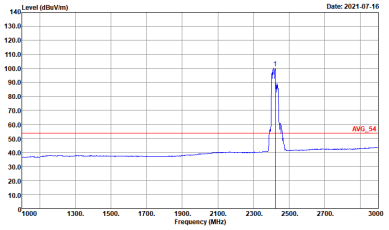
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Full CH09 2452MHz - R	
7+9	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

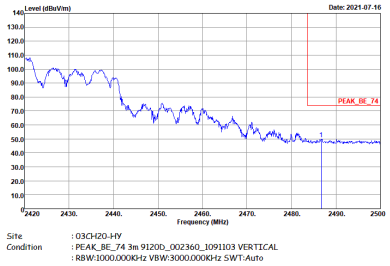
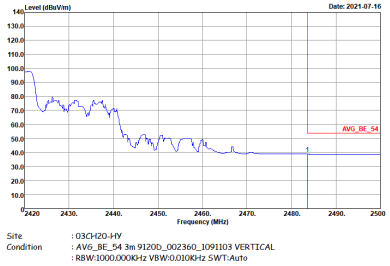
2.4GHz 2400~2483.5MHz

WIFI 802.11ax HE40 Partial 242 (Band Edge @ 3m)

WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Partial 242/61 CH03 2422MHz - L	
7+9	Horizontal	Fundamental
Peak		
Avg.		

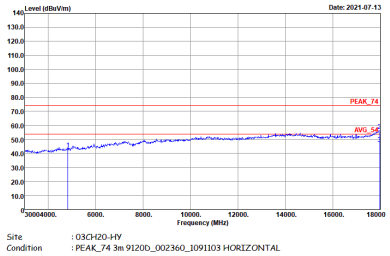
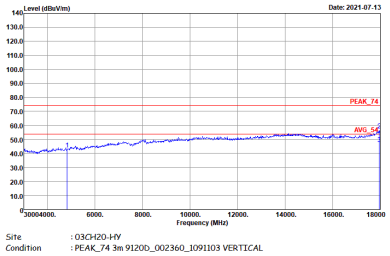
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Partial 242/61 CH03 2422MHz - R	
7+9	Horizontal	Fundamental
Peak		Left blank
Avg.		Left blank

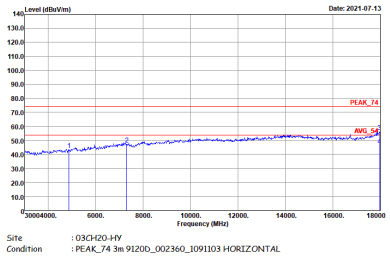
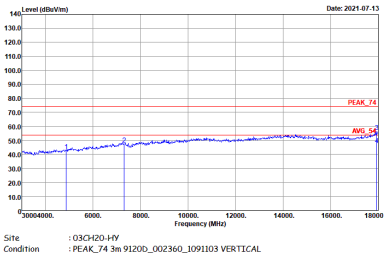
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Partial 242/61 CH03 2422MHz - L	
7+9	Vertical	Fundamental
Peak		
Avg.		

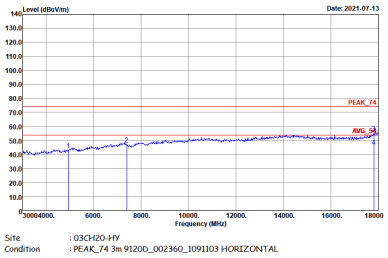
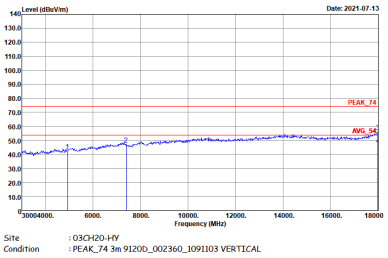
WIFI	2.4GHz 2400~2483.5MHz Band Edge @ 3m	
ANT	802.11ax HE40 Partial 242/61 CH03 2422MHz - R	
7+9	Vertical	Fundamental
Peak		Left blank
Avg.		Left blank

2.4GHz 2400~2483.5MHz

WIFI 802.11b (Harmonic @ 3m)

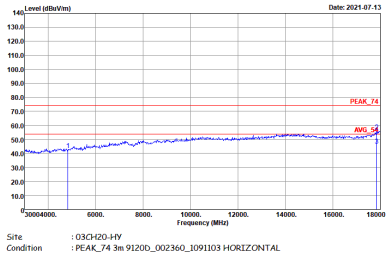
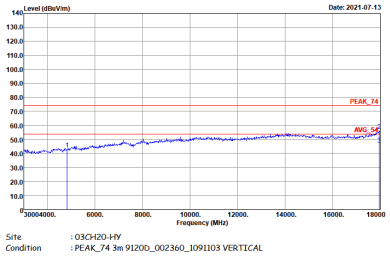
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH01 2412MHz	
7+9	Horizontal	Vertical
Peak Avg.		

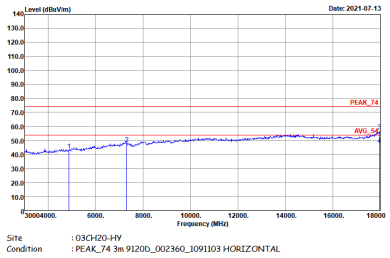
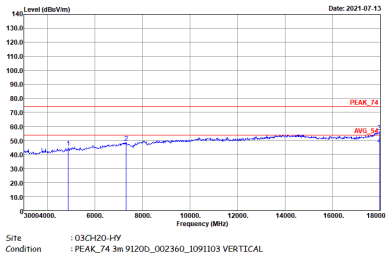
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH06 2437MHz	
7+9	Horizontal	Vertical
Peak Avg.		

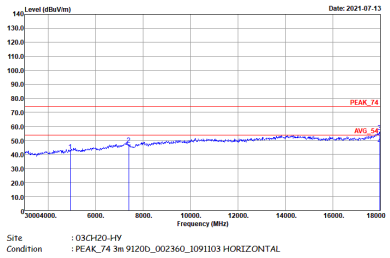
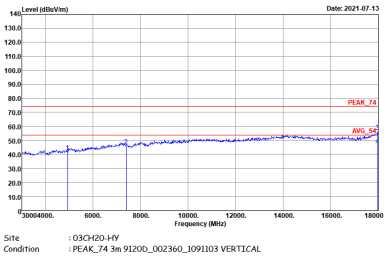
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11b CH11 2462MHz	
7+9	Horizontal	Vertical
Peak Avg.		

2.4GHz 2400~2483.5MHz

WIFI 802.11g (Harmonic @ 3m)

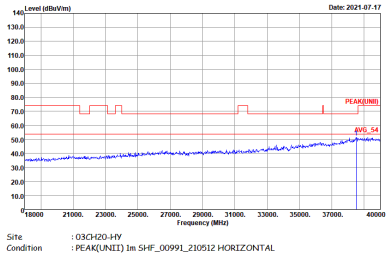
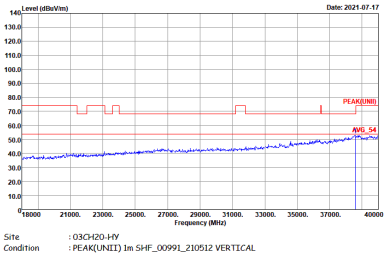
WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH01 2412MHz	
7+9	Horizontal	Vertical
Peak Avg.		

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH06 2437MHz	
7+9	Horizontal	Vertical
Peak Avg.		

WIFI	2.4GHz 2400~2483.5MHz Harmonic @ 3m	
ANT	802.11g CH11 2462MHz	
7+9	Horizontal	Vertical
Peak Avg.		

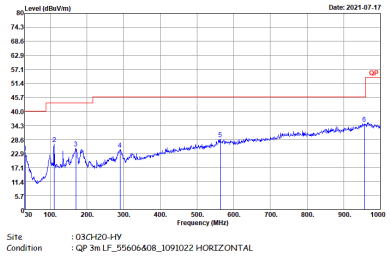
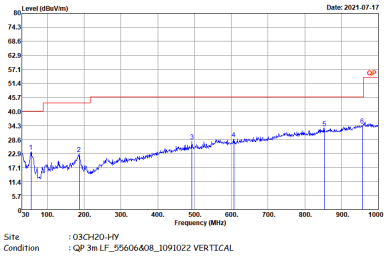
Emission above 18GHz

WIFI 802.11ax HE40 (SHF)

WIFI	2.4GHz 2400~2483.5MHz	
ANT	WIFI 802.11ax HE40 SHF	
7+9	Horizontal	Vertical
Peak Avg.		

Emission below 1GHz

WIFI 802.11ax HE40 (LF)

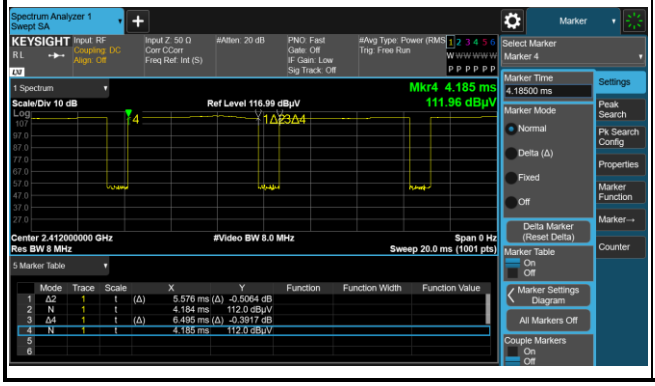
WIFI	2.4GHz 2400~2483.5MHz	
ANT	WIFI 802.11ax HE40 LF	
7+9	Horizontal	Vertical
QP / Peak		

Appendix E. Duty Cycle Plots

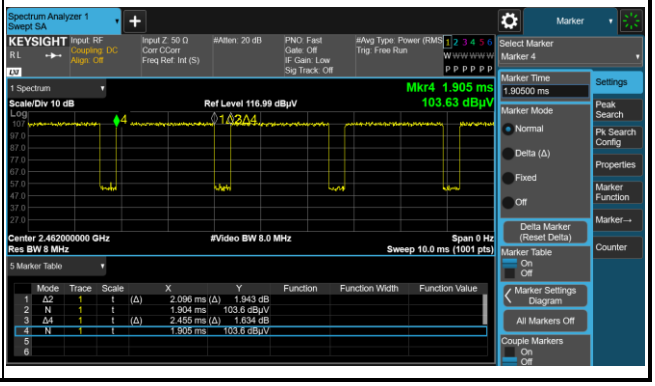
Antenna	Band	Duty Cycle(%)	T(us)	1/T(kHz)	VBW Setting
7+9	802.11b	85.85	5576	0.18	300Hz
7+9	802.11g	85.38	2096	0.48	1kHz
7+9	2.4GHz 802.11ax HE40 Full RU	97.17	3746	0.27	300Hz
7+9	2.4GHz 802.11ax HE40 242 RU	99.31	-	-	10Hz

MIMO <Ant. 7+9>

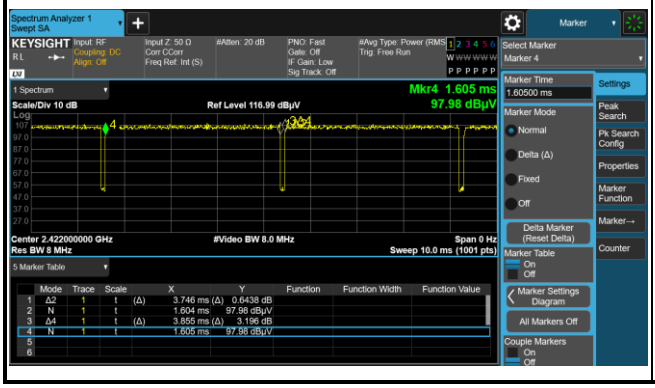
802.11b



802.11g



802.11ax HE40 Full RU



802.11ax HE40 242 RU