FCC RADIO TEST REPORT

FCC ID	:	**UZ7MC345B**
Equipment	:	**Mobile Computer**
Brand Name	:	**ZEBRA**
Model Name	:	**MC345B**
Applicant	:	**Zebra Technologies Corporation** **3 Overlook Point, Lincolnshire, IL 60069 USA**
Manufacturer	:	**Zebra Technologies Corporation** **3 Overlook Point, Lincolnshire, IL 60069 USA**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Oct. 25, 2024 and testing was performed from Nov. 03, 2024 to Jan. 07, 2025. 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 from Sporton International Inc. Wensan Laboratory, the test report shall not be reproduced except in full.

Louis Wu

Approved by: Louis Wu

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History of this test report

Report No.	Version	Description	Issue Date
FR4O2225C	01	Initial issue of report	Feb. 19, 2025

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	Pass	-
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	1.53 dB under the limit at 2388.39 MHz
3.6	15.207	AC Conducted Emission	Pass	14.10 dB under the limit at 0.16 MHz
3.7	15.203	Antenna Requirement	Pass	-

Conformity Assessment Condition:

1. ECR inquiry for data referencing from UZ7MC345A has been approved by FCC. The ECR inquiry and the associated document are submitted in the confidential exhibit.
2. UZ7MC345B is different from FCC ID: UZ7MC345A (Reference model), in the following:
   - The only difference between UZ7MC345A and UZ7MC345B are the WWAN support bands, which is controlled by software.
3. All the test results are referenced from UZ7MC345A (Sporton Test Report FR4O2228C), and spot check results to justify data referencing is presented in the Appendix F.
4. The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of non-compliance that may potentially occur if measurement uncertainty is taken into account.
5. The measurement uncertainty please refer to each test result in the section “Measurement Uncertainty”.

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

Reviewed by: Keven Cheng

Report Producer: Mila Chen

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature	
Equipment	Mobile Computer
Brand Name	ZEBRA
Model Name	MC345B
FCC ID	UZ7MC345B
Supported Radio application	WCDMA/HSPA/LTE/5G NR/NFC WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80/VHT160 WLAN 11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE

1.2 EUT Information (Referenced Model)

Product Feature	
FCC ID	UZ7MC345A
Sample 1	SKU 9 (Brick+SE5800+38 Keypad)
Sample 2	SKU 10 (Gun+SE4770+29 Keypad)
Sample 3	SKU 11 (Gun+SE5500+47 Keypad)
EUT supports Radios application	WCDMA/HSPA/LTE/5G NR/NFC WLAN 11a/b/g/n HT20/HT40 WLAN 11ac VHT20/VHT40/VHT80/VHT160 WLAN 11ax HE20/HE40/HE80/HE160 Bluetooth BR/EDR/LE
HW Version	EV
SW Version	14-10-10.00-UG-U00-PRD-NEM-04
FW Version	FUSION_QA_6_1.0.0.001_U
MFD	14SEP24
EUT Stage	Identical Prototype

Remark: The EUT's information above is declared by manufacturer.

Stage	MC34 WWAN SKU list				
Configuration	**SKU3**	**SKU6**	**SKU9**	**SKU10**	**SKU11**
WW/WL	WWAN	WWAN	WWAN	WWAN	WWAN
Form Factor	FA	FA	FA	FA	FA
SKU	Prem	Prem+	Prem+	Prem	Prem+
Brick / Gun	Gun	Gun	Brick	Gun	Gun
DDR size	6GB	6GB	6GB	6GB	6GB
UFS size	64GB	128GB	128GB	64GB	128GB
Scan engine	SE5500	SE5800	SE5800	SE4770	SE5500
FF Camera	None	5MP (PN)	5MP (PN)	None	5MP (PN)
RF Camera		13MP (PN)	13MP (PN)		13MP (PN)
Keypad	47	47	38	29	47
Battery	7000mAh	7000mAh	7000mAh	7000mAh	7000mAh
Region (ROW or NA)	NA	NA	NA	NA	NA

Specification of Accessories				
Adapter USB Wall Charger	**Brand Name**	Zebra	**Model Number**	PWR-WUA5V12W0US
Battery 1 Standard Battery (7000mAh)	**Brand Name**	Zebra	**Model Number**	BT-000375
			Manufacturer	TWS
Battery 2 Standard Battery (7000mAh)	**Brand Name**	Zebra	**Model Number**	BT-000375
			Manufacturer	Inventus
Battery 3 BLE Battery (7000mAh)	**Brand Name**	Zebra	**Model Number**	BT-000444
Battery 4 BLE Battery (7000mAh)	**Brand Name**	Zebra	**Model Number**	BT-000375
			Manufacturer	TWS
Type C USB Cable	**Brand Name**	Zebra	**Model Number**	CBL-TC5X-USBC2A-01
USB Cable Cup	**Brand Name**	Zebra	**Model Number**	CBL-MC33-USBCHG-01
Soft Holster for Gun Type	**Brand Name**	Zebra	**Model Number**	SG-MC3021212-01R
Soft Holster for Brick Type	**Brand Name**	Zebra	**Model Number**	SG-MC3X-SHLSTB-01
USB-C PTT Headset	**Brand Name**	Zebra	**Model Number**	HDST-USBC-PTT1-01
USB-C to 3.5mm adapter	**Brand Name**	Zebra	**Model Number**	ADP-USBC-35MM1-01
3.5mm To Quick Disconnect (QD) Adapter Cable	**Brand Name**	Zebra	**Model Number**	ADP-35M-QDCBL1-01
3.5mm PTT Headset	**Brand Name**	Zebra	**Model Number**	HDST-35MM-PTT1-01
3.5mm PTT HS2100 Headset	**Brand Name**	Zebra	**Model Number**	HS2100
Quick Disconnect (QD) Cable	**Brand Name**	Zebra	**Model Number**	CBL-HS2100-QDC1-01

1.3 Product Specification of Equipment Under Test

Product Specification is subject to this standard	
Tx/Rx Frequency Range	2400 MHz ~ 2483.5 MHz
Maximum Output Power to Antenna	**MIMO <Ant. 6+7>** 802.11b : 23.24 dBm / 0.2109 W 802.11g : 22.93 dBm / 0.1963 W 802.11n HT20 : 23.20 dBm / 0.2089 W 802.11ac VHT20 : 23.10 dBm / 0.2042 W 802.11ax HE20 : 23.30 dBm / 0.2138 W
99% Occupied Bandwidth	**MIMO <Ant. 6>** 802.11b: 13.15 MHz 802.11g: 16.53 MHz 802.11n HT20: 17.65 MHz 802.11ax HE20: 19.02 MHz **MIMO <Ant. 7>** 802.11b: 13.53 MHz 802.11g: 16.61 MHz 802.11n HT20: 17.69 MHz 802.11ax HE20: 19.10 MHz
Antenna Type / Gain	**<Ant. 6>:** PIFA Antenna with gain 1.81 dBi **<Ant. 7>:** Monopole Antenna with gain 0.50 dBi
Type of Modulation	802.11b : DSSS (DBPSK / DQPSK / CCK) 802.11g/n : OFDM (BPSK / QPSK / 16QAM / 64QAM) 802.11ac : OFDM (BPSK / QPSK / 16QAM / 64QAM / 256QAM) 802.11ax : OFDMA (BPSK / QPSK / 16QAM / 64QAM / 256QAM / 1024QAM)
Antenna Function Description	<table><tr><td></td><td>Ant. 6</td><td>Ant. 7</td></tr><tr><td>802.11 b/g/n/ac/ax MIMO</td><td>V</td><td>V</td></tr></table>

Remark:

1. MIMO Ant. 6+7 Directional Gain is a calculated result from MIMO Ant. 6 and MIMO Ant. 7. The formula used in calculation is documented in section 1.2.1.
2. Power of MIMO Ant. 6 + Ant. 7 is a calculated result from sum of the power MIMO Ant. 6 and MIMO Ant. 7.
3. 802.11ax Support Tx Beamforming mode, and the manufacturer declares that Tx Beamforming power/EIRP is less than CDD mode 3dbm, so CDD mode cover Tx Beamforming mode.
4. The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

1.3.1 Antenna Directional Gain

<For CDD Mode>

Follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)f)ii)

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

For power measurements on IEEE 802.11 devices,

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

G_{ANT} is set equal to the gain of the antenna having the highest gain.

For PSD measurements, the directional gain calculation.

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;
N_{SS} = the number of independent spatial streams of data;
N_{ANT} = the total number of antennas
$g_{j,k} = 10^{G_k / 20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;
G_k is the gain in dBi of the kth antenna.

As minimum N_{SS}=1 is supported by EUT, the formula can be simplified as:

Directional gain = $10*\log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi

Where G1, G2….GN denote single antenna gain.

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

			DG for Power	DG for PSD	Power Limit Reduction	PSD Limit Reduction
	Ant 6 (dBi)	Ant 7 (dBi)	(dBi)	(dBi)	(dB)	(dB)
2.4GHz	1.81	0.50	1.81	4.19	0.00	0.00

Calculation example:

If a device has two antenna, G_{ANT6}= 1.81dBi; G_{ANT7}=0.50dBi

Directional gain of power measurement = max(1.81, 0.50) + 0 = 1.81 dBi

Directional gain of PSD derived from formula which is

10 x log { { [10^ (1.81 dBi / 20) + 10^ (0.50 dBi / 20)] ^ 2 } / 2 }

= 4.19 dBi

Power and PSD limit reduction = Composite gain – 6dBi, (min = 0)

<TXBF Modes>

The EUT supports beamforming modes , then

Follows FCC KDB 662911 D01 Multiple Transmitter Output v02r01 F)2)e)ii)

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k / 20}$ if the kth antenna is being fed by spatial stream j, or zero if it is not;

G_k is the gain in dBi of the kth antenna.

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

			DG	DG	Power	PSD
			for	for	Limit	Limit
	Ant 6	Ant 7	Power	PSD	Reduction	Reduction
	(dBi)	(dBi)	(dBi)	(dBi)	(dB)	(dB)
2.4GHz	1.81	0.50	4.19	4.19	0.00	0.00

Calculation example:

Directional gain is derived from formula which is

10 x log { { [10^ (1.81 dBi / 20) + 10^ (0.50 dBi / 20)] ^ 2 } / 2 }

= 4.19 dBi

Power and PSD limit reduction = Composite gain – 6dBi, (min = 0)

1.4 Modification of EUT

No modifications made to the EUT during the testing.

1.5 Testing Location

Test Site	Sporton International Inc. EMC & Wireless Communications Laboratory
Test Site Location	No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978
Test Site No.	**Sporton Site No.**
	CO05-HY (TAF Code: 1190)
Remark	The Conducted Emission test item subcontracted to Sporton International Inc. EMC & Wireless Communications Laboratory

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

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, 03CH22-HY

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

FCC designation No.: TW1190 and TW3786

1.6 Applicable Standards

According to the specifications declared by 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 15.247 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 the test items were validated and recorded in accordance with the standards without any modification during the testing.
2. The TAF code is not including all the FCC KDB listed without accreditation.
3. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

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 only the worst case emissions were reported in this report.

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

This device support 26/52/106/242-tone RU channel.

The PSD of partial RU is reduced to be smaller than full RU according to TCB workshop interim guidance Oct. 2022.

The 802.11ax mode is investigated among different tones, full resource units (RU), partial resource units. The partial RU has no higher power than full RU's, thus the full RU is chosen as main test configuration.

The 242-tone RU is covered by 20MHz channel.

The SISO mode conducted power is covered by MIMO mode per chain, so only the MIMO mode is tested.

The power for 802.11ac mode is smaller than 802.11n mode, so all other conducted and radiated test is covered by 802.11n mode.

The final test modes include the worst data rates for each modulation shown in the table below.

MIMO Antenna

Modulation	Data Rate
802.11b	**1 Mbps**
802.11g	**6 Mbps**
802.11n HT20	**MCS0**
802.11ac VHT20 (Covered by HT20)	**MCS0**
802.11ax HE20	**MCS0**

Remark: The conducted power level of each chain in MIMO mode is equal or higher than SISO mode.

Test Cases	
AC Conducted Emission	Mode 1 :LTE Band 7 Link + WLAN (2.4GHz) Link + Bluetooth Link + MPEG4 + Battery 1 Standard Battery (7000mAh) + USB Cable Cup (Charge from Adapter USB Wall Charger) for Sample 1
Remark: For Radiated Test Cases, the tests were performed with Battery 1 Standard Battery (7000mAh).	

<Sample 1>

Ch. #	2400-2483.5 MHz			
	802.11b	802.11g	802.11ac VHT20	802.11ax HE20
Low	01	01	-	01
Middle	06	06	-	06
High	11	11	11	11

<Sample 2>

Ch. #	2400-2483.5 MHz
	802.11b
Low	01
Middle	-
High	-

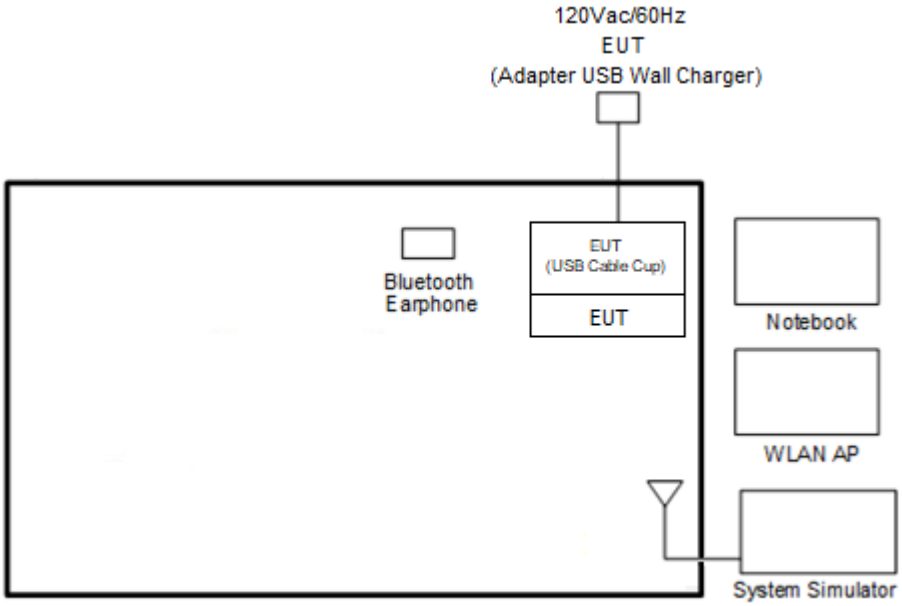
<Sample 3>

Ch. #	2400-2483.5 MHz
	802.11b
Low	01
Middle	-
High	-

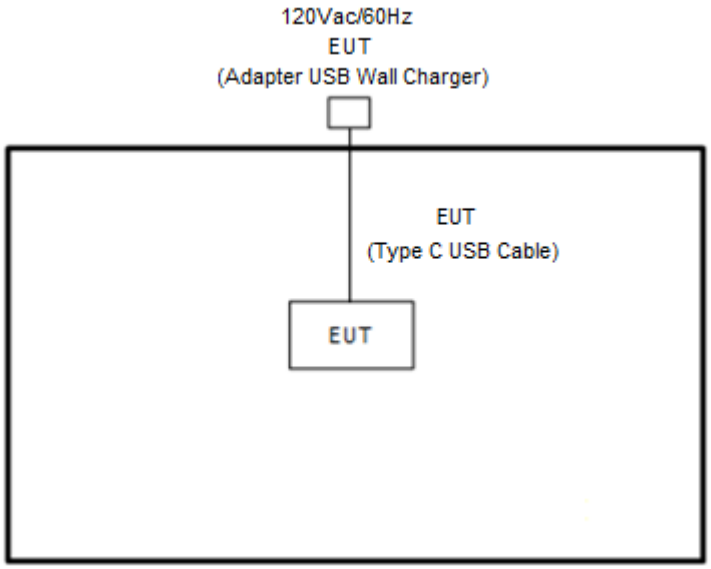
Remark: For radiation spurious emission, the modulation and the data rate picked for testing are determined by the Max. RF conducted power.

2.3 Connection Diagram of Test System

<AC Conducted Emission Mode>



<WLAN Tx Mode>



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, 1.8m
2.	Bluetooth Earphone	Sony Ericsson	MW600	PY7DDA-2029	N/A	N/A
3.	WLAN AP	ASUS	RT-AC66U	MSQ-RTAC66U	N/A	Unshielded, 1.8m
4.	Notebook	Lenovo	TP00116A	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.5 EUT Operation Test Setup

The RF test items, utility “QRCT V4.1 Version 4.0.118.1” 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.

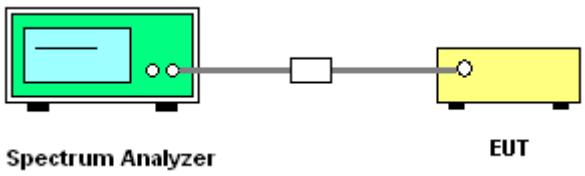
3.1.2 Measuring Instruments

Please refer to the measuring equipment list in 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 is connected to the spectrum analyzer by RF cable and attenuator. The path loss is 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.

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.

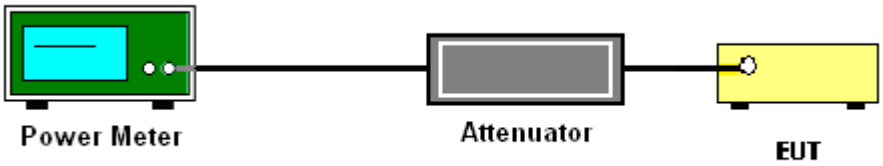
3.2.2 Measuring Instruments

Please refer to the measuring equipment list in 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 is connected to the power meter by RF cable and attenuator. The path loss is 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

Please refer to the measuring equipment list in this test report.

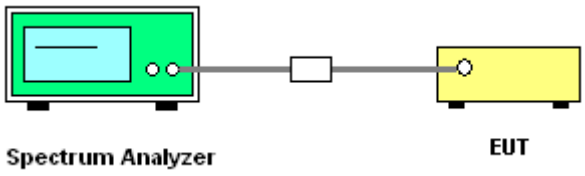
3.3.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.10.2 Method PKPSD.
2. The RF output of EUT is connected to the spectrum analyzer by RF cable and attenuator. The path loss is 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.

   Method (c): Measure and add 10 log(N_{ANT}) dB.

   With this technique, spectrum measurements are performed at each output of the device, but rather than summing the spectra or the spectral peaks across the outputs, the quantity 10 log(N_{ANT}) dB is added to each spectrum value before comparing to the emission limit. The addition of 10 log(N_{ANT}) dB serves to apportion the emission limit among the N_{ANT} outputs so that each output is permitted to contribute no more than $1/N_{ANT}$ th of the PSD limit .

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

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.

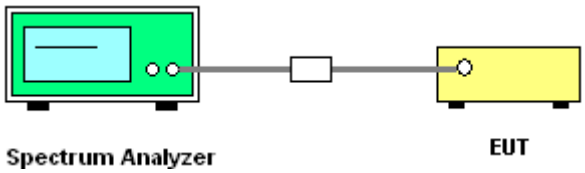
3.4.2 Measuring Instruments

Please refer to the measuring equipment list in 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 is connected to the spectrum analyzer by RF cable and attenuator. The path loss is 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

Please refer to Appendix A.

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 is 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

Please refer to the measuring equipment list in this test report.

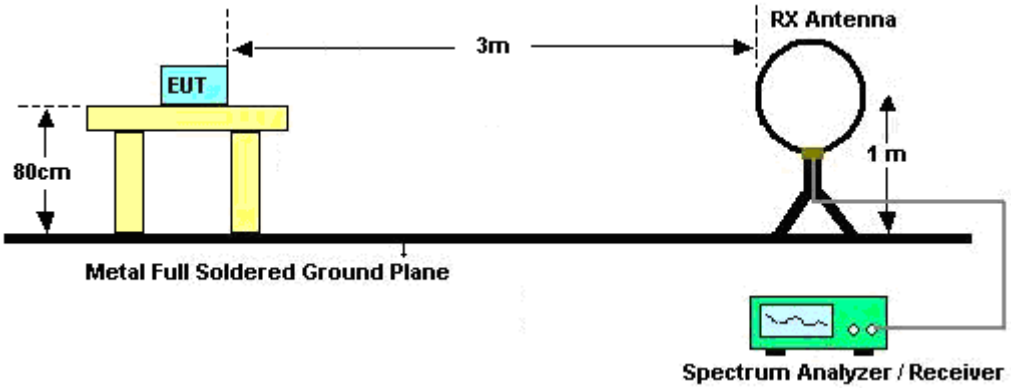
3.5.3 Test Procedures

1. The testing follows the ANSI C63.10 Section 11.12.1 Radiated emission measurements.
2. The EUT is 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 is 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 is set 3 meters away from the receiving antenna, which is mounted on the top of a variable height antenna tower.
5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
6. Radiated testing below 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading. When there is no suspected emission found and the emission level is with at least 6 dB margin against QP limit line, the position is marked as “-“.

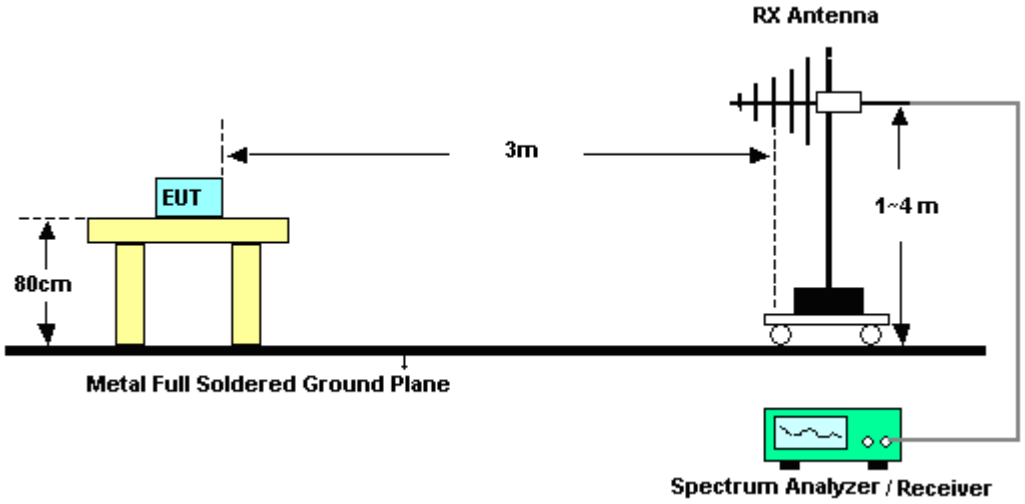
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with at least 6 dB margin against average limit line, the position is marked as "-".
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

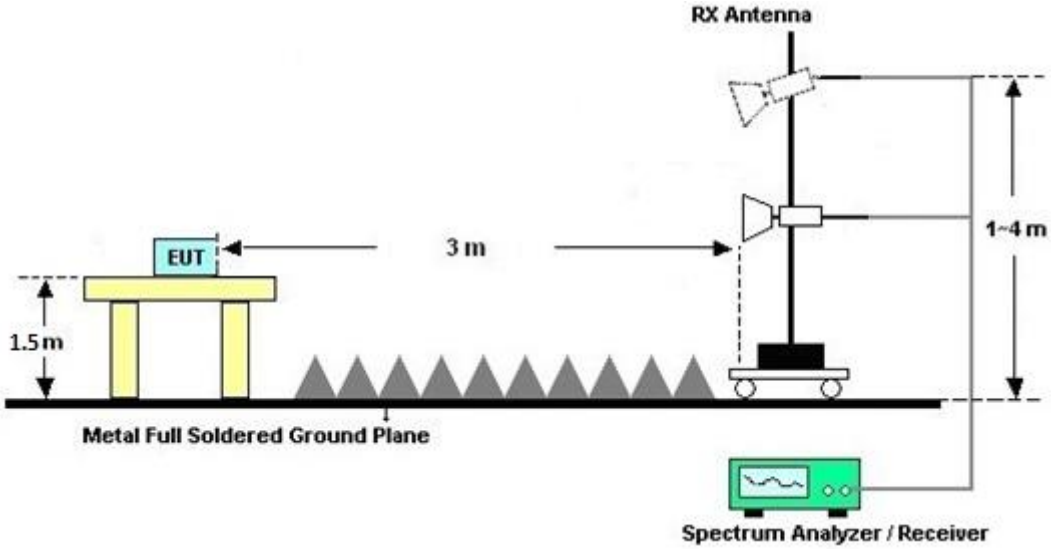
For radiated emissions below 30MHz



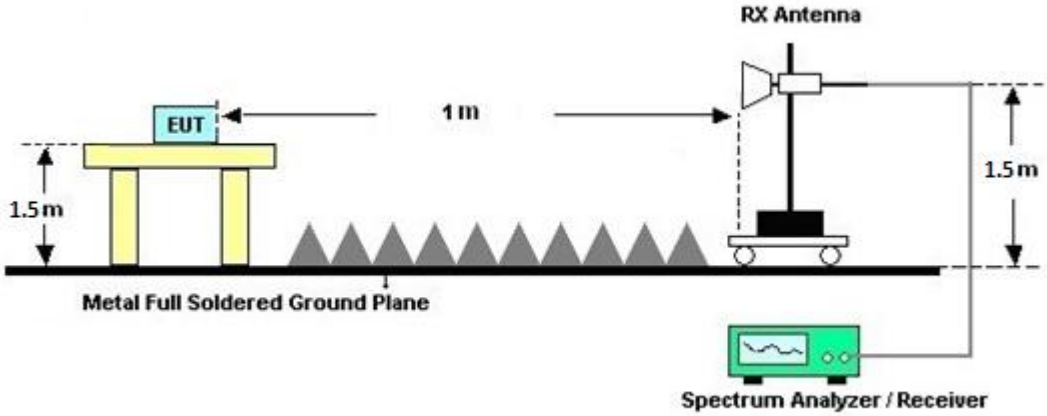
For radiated emissions from 30MHz to 1GHz



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 starts from 9 kHz to 30 MHz, is pre-scanned and the result which is 20 dB lower than the limit line is 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 comes out very similar.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix C.

3.5.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix C.

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.

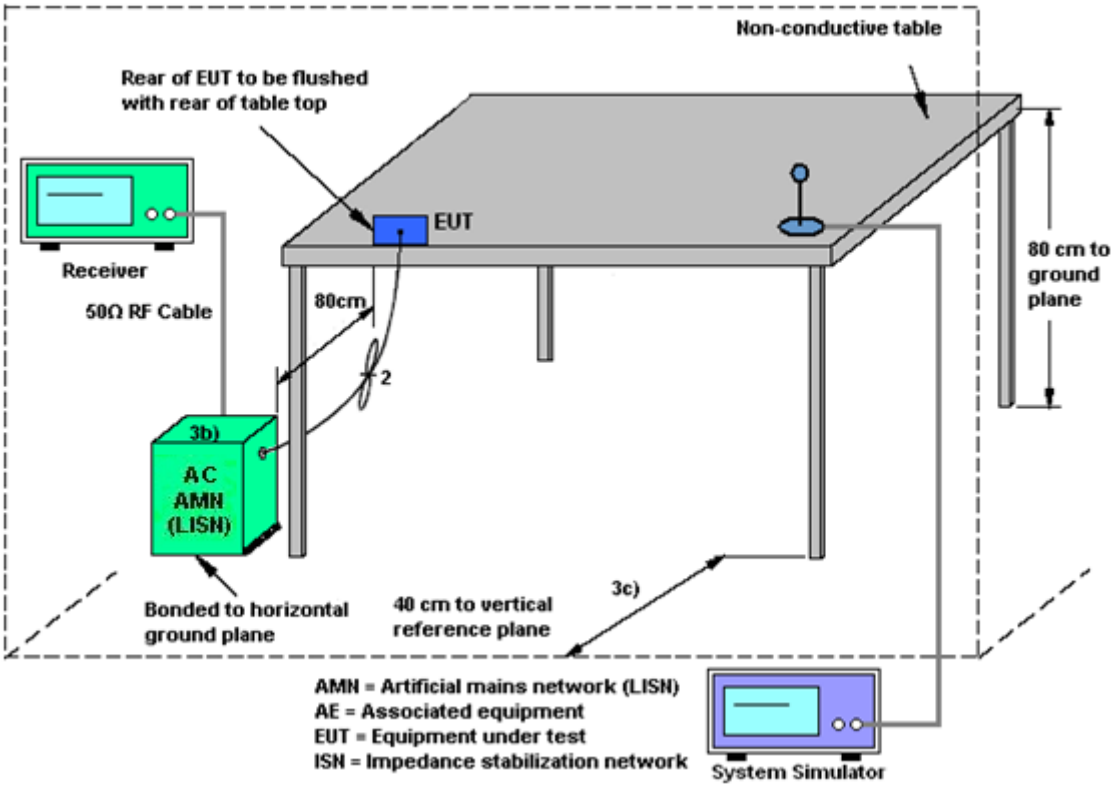
3.6.2 Measuring Instruments

Please refer to the measuring equipment list in this test report.

3.6.3 Test Procedures

1. The EUT is placed 0.4 meter away from the conducting wall of the shielding room, and is 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 Line and Neutral shall be tested in order to find out the maximum conducted emission.
7. The frequency range from 150 kHz to 30 MHz is scanned.
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

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of § 15.211, 15.213, 15.217, 15.219, 15.221, or § 15.236. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with § 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this part are not exceeded.

3.7.2 Antenna Anti-Replacement Construction

Antenna permanently attached.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 01, 2024	Nov. 05, 2024~ Dec. 18, 2024	Oct. 31, 2025	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	15I00041SNO 10 (NO:248)	10MHz~6GHz	Jan. 10, 2024	Nov. 05, 2024~ Dec. 18, 2024	Jan. 09, 2025	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 23, 2024	Nov. 05, 2024~ Dec. 18, 2024	Aug. 22, 2025	Conducted (TH05-HY)
Switch Control Mainframe	Burgeon	ETF-058	EC1300484 (BOX3)	N/A	May 20, 2024	Nov. 05, 2024~ Dec. 18, 2024	May 19, 2025	Conducted (TH05-HY)
Software	Sporton	BTWIFI_Final_ version_240513	N/A	Conducted Other Test Item	N/A	Nov. 05, 2024~ Dec. 18, 2024	N/A	Conducted (TH05-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9kHz~30MHz	Aug. 29, 2024	Nov. 03, 2024~ Dec. 14, 2024	Aug. 28, 2025	Radiation (03CH22-HY)
Bilog Antenna	TESEQ	CBL 6111D & 00802N1D01N-06	47020 & 06	30MHz~1GHz	Oct. 05, 2024	Nov. 03, 2024~ Dec. 14, 2024	Oct. 04, 2025	Radiation (03CH22-HY)
Amplifier	SONOMA	310N	421581	N/A	Jul. 11, 2024	Nov. 03, 2024~ Dec. 14, 2024	Jul. 10, 2025	Radiation (03CH22-HY)
Double Ridged Guide Horn Antenna	RFSPIN	DRH18-E	LE2C04A18EN	1GHz~18GHz	Jul. 11, 2024	Nov. 03, 2024~ Dec. 14, 2024	Jul. 10, 2025	Radiation (03CH22-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	1224	18GHz-40GHz	Jun. 24, 2024	Nov. 03, 2024~ Dec. 14, 2024	Jun. 23, 2025	Radiation (03CH22-HY)
Amplifier	EMEC	EM01G18GA	060877	N/A	Sep. 27, 2024	Nov. 03, 2024~ Dec. 14, 2024	Sep. 26, 2025	Radiation (03CH22-HY)
Preamplifier	EMEC	EM18G40G	060873	18-40GHz	Sep. 02, 2024	Nov. 03, 2024~ Dec. 14, 2024	Sep. 01, 2025	Radiation (03CH22-HY)
Signal Analyzer	Keysight	N9010B	MY62170278	10Hz~44GHz	Sep. 24, 2024	Nov. 03, 2024~ Dec. 14, 2024	Sep. 23, 2025	Radiation (03CH22-HY)
EMI Test Receiver	Keysight	N9038B	MY62210111	20Hz~8.4GHz	Sep. 03, 2024	Nov. 03, 2024~ Dec. 14, 2024	Sep. 02, 2025	Radiation (03CH22-HY)
Hygrometer	TECPEL	DTM-303A	TP211469	N/A	Jan. 03, 2024	Nov. 03, 2024~ Dec. 14, 2024	Jan. 02, 2025	Radiation (03CH22-HY)
Controller	EMEC	EM1000	N/A	Control Turn table & Ant Mast	N/A	Nov. 03, 2024~ Dec. 14, 2024	N/A	Radiation (03CH22-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Nov. 03, 2024~ Dec. 14, 2024	N/A	Radiation (03CH22-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Nov. 03, 2024~ Dec. 14, 2024	N/A	Radiation (03CH22-HY)
Software	Audix	E3 6.09824_20191 22	RK-002347	N/A	N/A	Nov. 03, 2024~ Dec. 14, 2024	N/A	Radiation (03CH22-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	803951/2	9kHz~30MHz	Mar. 06, 2024	Nov. 03, 2024~ Dec. 14, 2024	Mar. 05, 2025	Radiation (03CH22-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	804390/2,8046 11/2,804615/2	N/A	Oct. 23, 2024	Nov. 03, 2024~ Dec. 14, 2024	Oct. 22, 2025	Radiation (03CH22-HY)

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Nov. 11, 2024	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102388	9kHz~3.6GHz	Dec. 06, 2023	Nov. 11, 2024	Dec. 05, 2024	Conduction (CO05-HY)
Hygrometer	Testo	608-H1	34913912	N/A	Oct. 14, 2024	Nov. 11, 2024	Oct. 13, 2025	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz~30MHz	Dec. 08, 2023	Nov. 11, 2024	Dec. 07, 2024	Conduction (CO05-HY)
Software	Rohde & Schwarz	EMC32	N/A	N/A	N/A	Nov. 11, 2024	N/A	Conduction (CO05-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	00691	N/A	Jul. 30, 2024	Nov. 11, 2024	Jul. 29, 2025	Conduction (CO05-HY)
LISN Cable	MVE	RG-400	MQT24082501	N/A	Oct. 15, 2024	Nov. 11, 2024	Oct. 14, 2025	Conduction (CO05-HY)

5 Measurement Uncertainty

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**3.7 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**6.6 dB**

Uncertainty of Radiated Emission Measurement (1000 MHz ~ 6000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.2 dB**

Uncertainty of Radiated Emission Measurement (6000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.0 dB**

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**5.7 dB**

Appendix A. Test Result of Conducted Test Items

Test Engineer:	Junyu Jhou	Temperature:	21~25	°C
Test Date:	2024/11/5~2024/12/18	Relative Humidity:	51~54	%

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
					Ant6	Ant7	Ant6	Ant7		
11b	1Mbps	2	1	2412	13.04	13.09	8.08	8.06	0.50	Pass
11b	1Mbps	2	6	2437	13.07	13.53	8.54	9.03	0.50	Pass
11b	1Mbps	2	11	2462	13.15	13.47	8.07	8.05	0.50	Pass
11g	6Mbps	2	1	2412	16.45	16.38	16.06	15.72	0.50	Pass
11g	6Mbps	2	6	2437	16.53	16.61	16.28	16.32	0.50	Pass
11g	6Mbps	2	11	2462	16.47	16.41	16.29	16.30	0.50	Pass
HT20	MCS0	2	1	2412	17.59	17.56	16.65	16.34	0.50	Pass
HT20	MCS0	2	6	2437	17.65	17.69	16.53	17.55	0.50	Pass
HT20	MCS0	2	11	2462	17.62	17.59	17.17	17.27	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
					Ant6	Ant7	SUM	Ant6	Ant7	Ant6	Ant7	Ant6	Ant7	Ant6	Ant7	
11b	1Mbps	2	1	2412	19.32	20.00	22.68	30.00		1.81		24.49		36.00		Pass
11b	1Mbps	2	6	2437	19.65	20.00	22.84	30.00		1.81		24.65		36.00		Pass
11b	1Mbps	2	11	2462	20.12	20.34	23.24	30.00		1.81		25.05		36.00		Pass
11g	6Mbps	2	1	2412	17.41	17.68	20.56	30.00		1.81		22.37		36.00		Pass
11g	6Mbps	2	6	2437	19.77	20.07	22.93	30.00		1.81		24.74		36.00		Pass
11g	6Mbps	2	11	2462	17.31	17.71	20.52	30.00		1.81		22.33		36.00		Pass
HT20	MCS0	2	1	2412	16.91	17.16	20.05	30.00		1.81		21.86		36.00		Pass
HT20	MCS0	2	6	2437	20.10	20.28	23.20	30.00		1.81		25.01		36.00		Pass
HT20	MCS0	2	11	2462	17.02	17.40	20.22	30.00		1.81		22.03		36.00		Pass
VHT20	MCS0	2	1	2412	16.81	17.06	19.95	30.00		1.81		21.76		36.00		Pass
VHT20	MCS0	2	6	2437	20.00	20.18	23.10	30.00		1.81		24.91		36.00		Pass
VHT20	MCS0	2	11	2462	16.92	17.30	20.12	30.00		1.81		21.93		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
					Ant6	Ant7	Worse + 3.01	Ant6	Ant7	Ant6	Ant7	
11b	1Mbps	2	1	2412	-3.43	-2.69	0.32	4.19		8.00		Pass
11b	1Mbps	2	6	2437	-2.30	-2.06	0.95	4.19		8.00		Pass
11b	1Mbps	2	11	2462	-2.60	-2.09	0.92	4.19		8.00		Pass
11g	6Mbps	2	1	2412	-7.30	-7.41	-4.29	4.19		8.00		Pass
11g	6Mbps	2	6	2437	-5.73	-5.71	-2.70	4.19		8.00		Pass
11g	6Mbps	2	11	2462	-7.39	-7.32	-4.31	4.19		8.00		Pass
HT20	MCS0	2	1	2412	-8.17	-7.89	-4.88	4.19		8.00		Pass
HT20	MCS0	2	6	2437	-5.27	-5.40	-2.26	4.19		8.00		Pass
HT20	MCS0	2	11	2462	-8.89	-7.70	-4.69	4.19		8.00		Pass

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
						Ant6	Ant7	Ant6	Ant7		
HE20	MCS0	2	1	2412	Full	18.90	18.90	18.38	17.69	0.50	Pass
HE20	MCS0	2	6	2437	Full	19.02	19.10	18.75	18.81	0.50	Pass
HE20	MCS0	2	11	2462	Full	18.95	18.93	18.86	18.53	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
						Ant6	Ant7	SUM	Ant6	Ant7	Ant6	Ant7	Ant6	Ant7	Ant6	Ant7	
HE20	MCS0	2	1	2412	Full	17.01	17.26	20.15	30.00		1.81		21.96		36.00		Pass
HE20	MCS0	2	1	2412	26/0	8.80	8.90	11.86	30.00		1.81		13.67		36.00		Pass
HE20	MCS0	2	1	2412	52/37	10.54	10.70	13.63	30.00		1.81		15.44		36.00		Pass
HE20	MCS0	2	1	2412	106/53	14.30	14.34	17.33	30.00		1.81		19.14		36.00		Pass
HE20	MCS0	2	6	2437	Full	20.20	20.38	23.30	30.00		1.81		25.11		36.00		Pass
HE20	MCS0	2	6	2437	26/4	10.50	10.81	13.67	30.00		1.81		15.48		36.00		Pass
HE20	MCS0	2	6	2437	52/38	13.53	14.16	16.87	30.00		1.81		18.68		36.00		Pass
HE20	MCS0	2	6	2437	106/53	16.05	16.78	19.44	30.00		1.81		21.25		36.00		Pass
HE20	MCS0	2	11	2462	Full	17.12	17.50	20.32	30.00		1.81		22.13		36.00		Pass
HE20	MCS0	2	11	2462	26/8	7.37	6.95	10.18	30.00		1.81		11.99		36.00		Pass
HE20	MCS0	2	11	2462	52/40	10.45	10.05	13.26	30.00		1.81		15.07		36.00		Pass
HE20	MCS0	2	11	2462	106/54	13.88	13.92	16.91	30.00		1.81		18.72		36.00		Pass

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

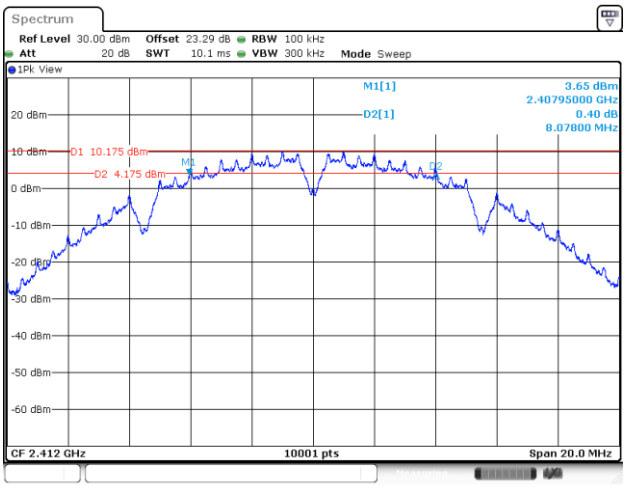
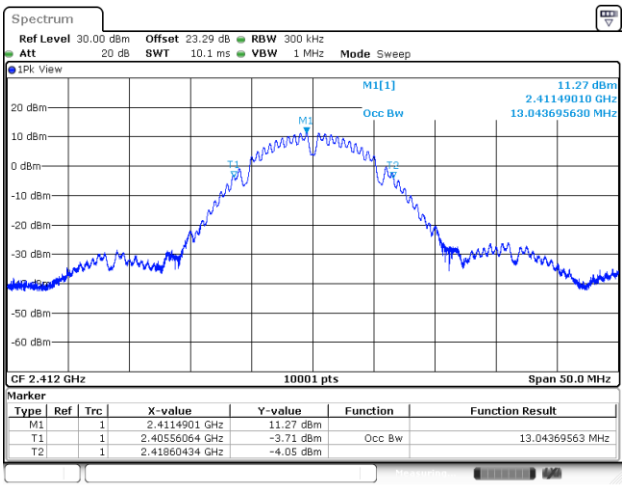
TEST RESULTS DATA
Peak Power Spectral Density

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
						Ant6	Ant7	Worse + 3.01	Ant6	Ant7	Ant6	Ant7	
HE20	MCS0	2	1	2412	Full	-8.09	-8.00	-4.99	4.19		8.00		Pass
HE20	MCS0	2	1	2412	26/0	-8.19	-8.08	-5.07	4.19		8.00		Pass
HE20	MCS0	2	1	2412	52/37	-8.40	-8.10	-5.09	4.19		8.00		Pass
HE20	MCS0	2	1	2412	106/53	-8.13	-8.27	-5.12	4.19		8.00		Pass
HE20	MCS0	2	6	2437	Full	-5.87	-5.21	-2.20	4.19		8.00		Pass
HE20	MCS0	2	6	2437	26/4	-6.08	-5.31	-2.30	4.19		8.00		Pass
HE20	MCS0	2	6	2437	52/38	-6.16	-5.81	-2.80	4.19		8.00		Pass
HE20	MCS0	2	6	2437	106/53	-6.07	-5.62	-2.61	4.19		8.00		Pass
HE20	MCS0	2	11	2462	Full	-8.37	-8.32	-5.31	4.19		8.00		Pass
HE20	MCS0	2	11	2462	26/8	-8.89	-8.58	-5.57	4.19		8.00		Pass
HE20	MCS0	2	11	2462	52/40	-8.68	-8.89	-5.67	4.19		8.00		Pass
HE20	MCS0	2	11	2462	106/54	-8.73	-8.86	-5.72	4.19		8.00		Pass

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

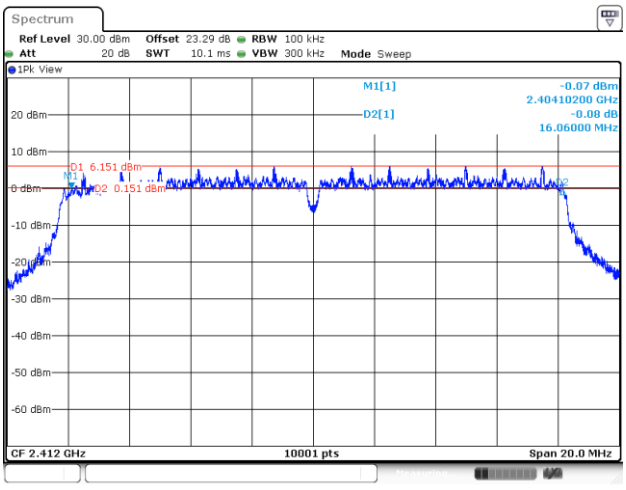
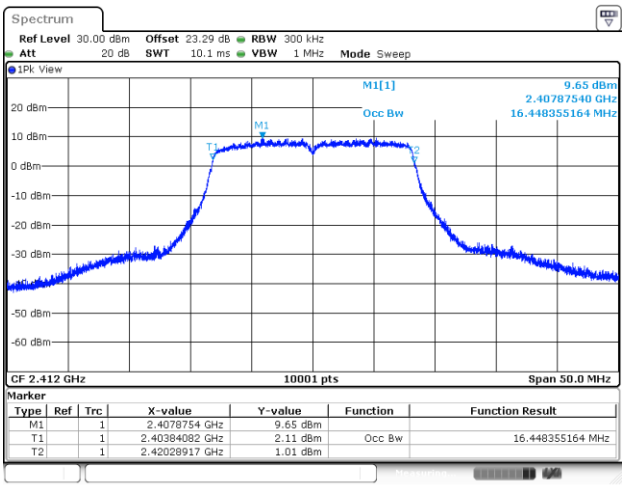
6dB and 99% Occupied Bandwidth

<802.11b>

6dB Bandwidth	99% Occupied Bandwidth
	

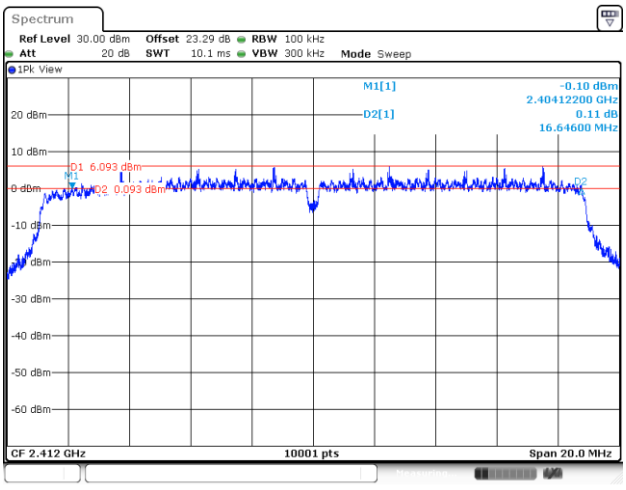
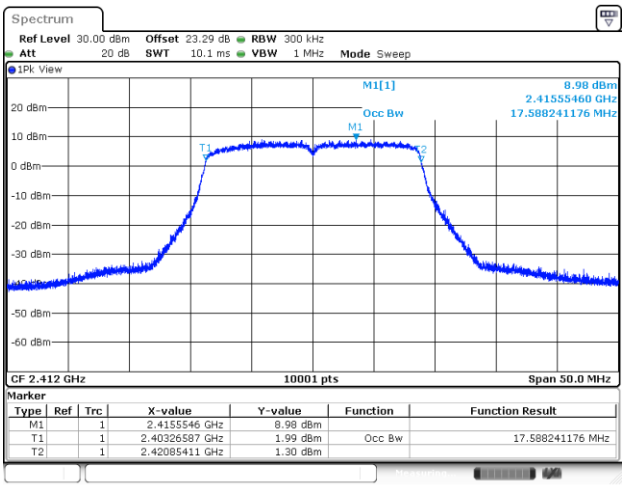
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

<802.11g>

6dB Bandwidth	99% Occupied Bandwidth
	

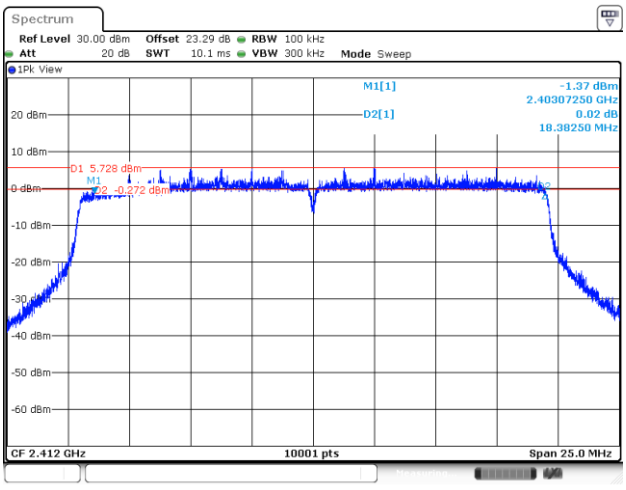
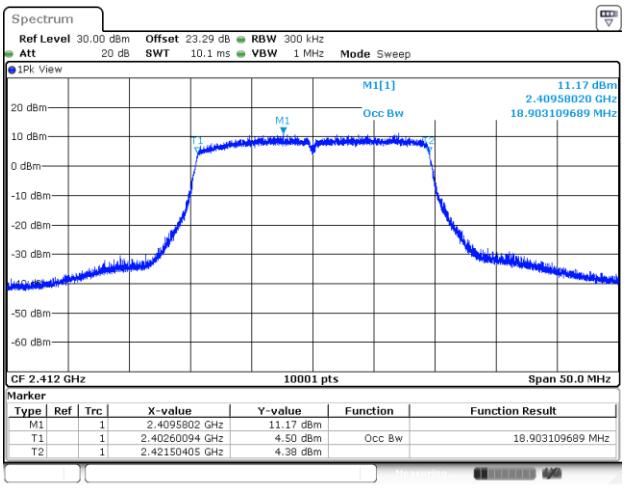
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

<802.11n HT20>

6dB Bandwidth	99% Occupied Bandwidth
	

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

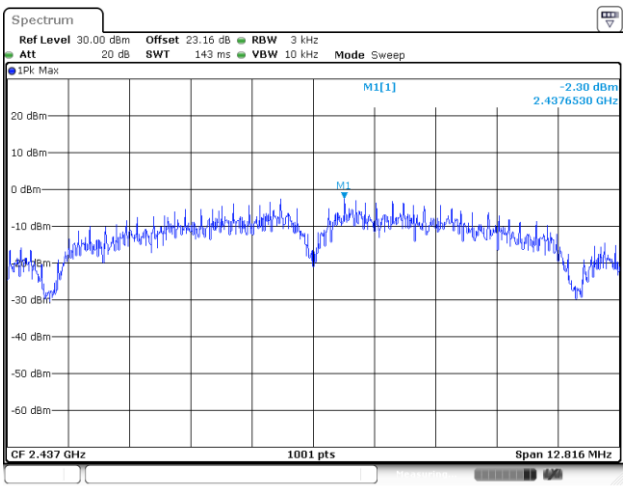
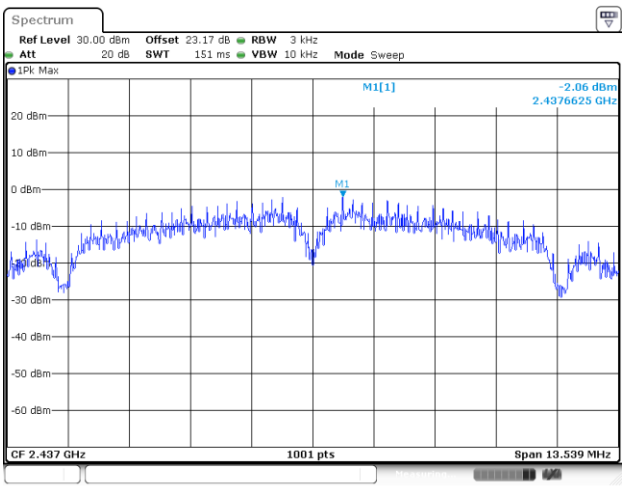
<802.11ax HE20>

6dB Bandwidth	99% Occupied Bandwidth
	

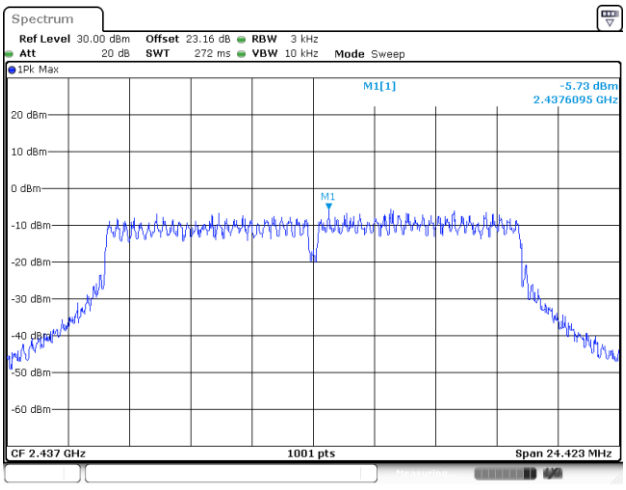
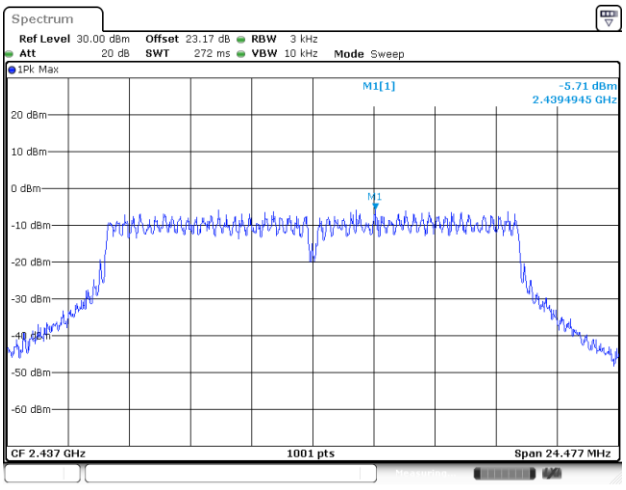
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

Power Spectral Density(dBm/3kHz)

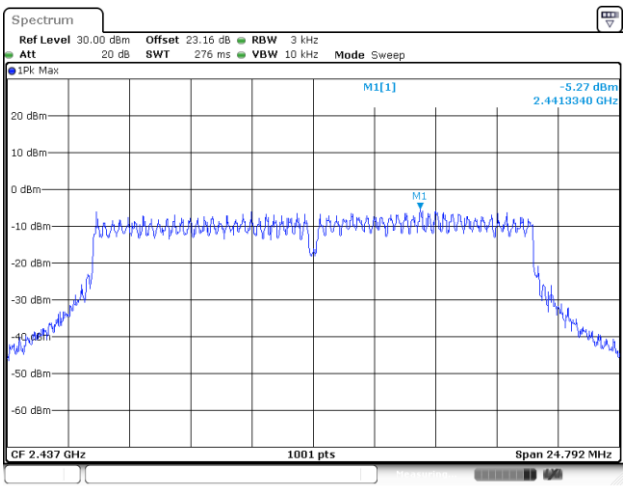
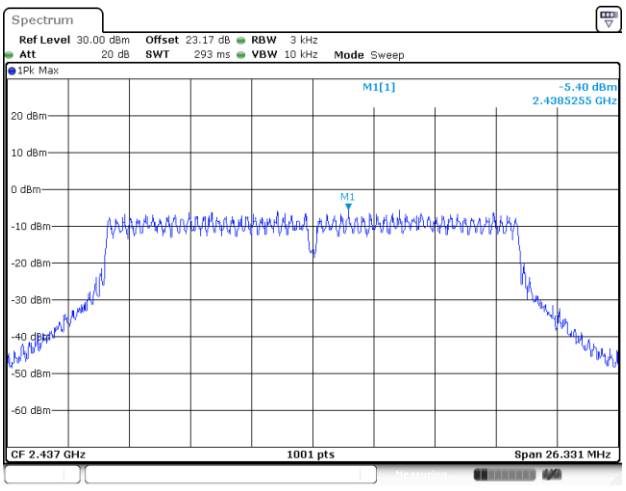
<802.11b>

Maximum Power Density Plot (dBm/3kHz)	
MIMO Ant 6	**MIMO Ant 7**
	

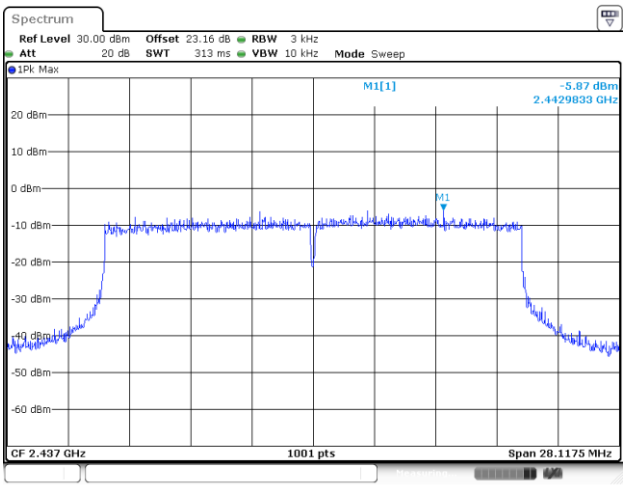
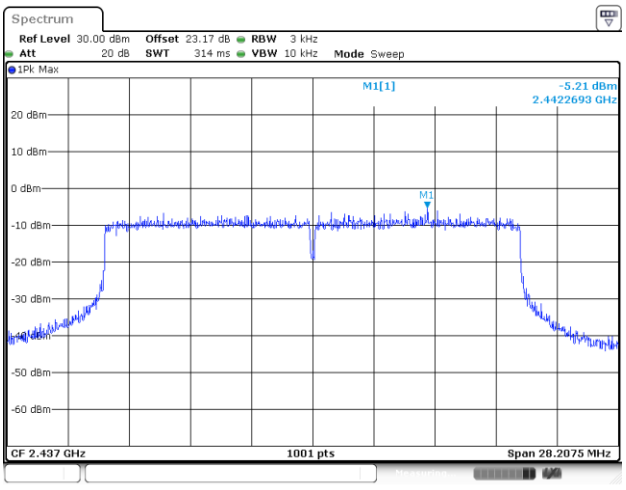
<802.11g>

Maximum Power Density Plot (dBm/3kHz)	
MIMO Ant 6	**MIMO Ant 7**
	

<802.11n HT20>

Maximum Power Density Plot (dBm/3kHz)	
MIMO Ant 6	**MIMO Ant 7**
	

<802.11ax HE20>

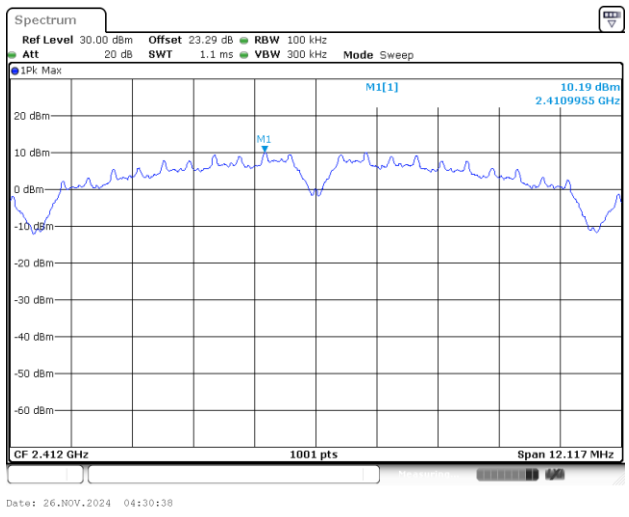
Maximum Power Density Plot (dBm/3kHz)	
MIMO Ant 6	**MIMO Ant 7**
	

Band Edges and Spurious Emission

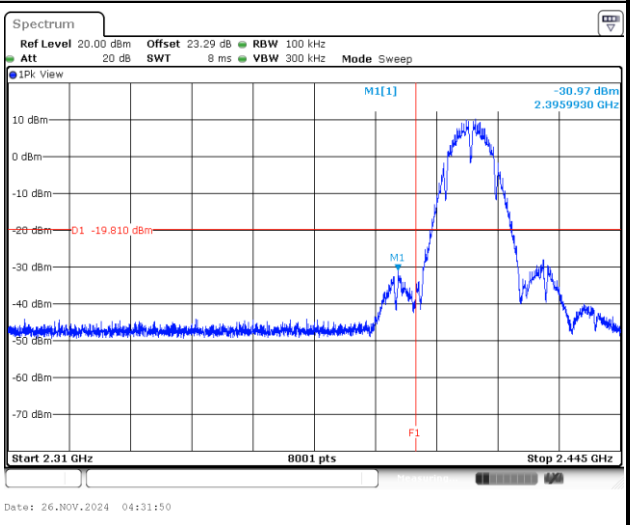
Number of TX = 2, Ant. 6 (Measured)

Test Mode :	802.11b	Test Channel :	01

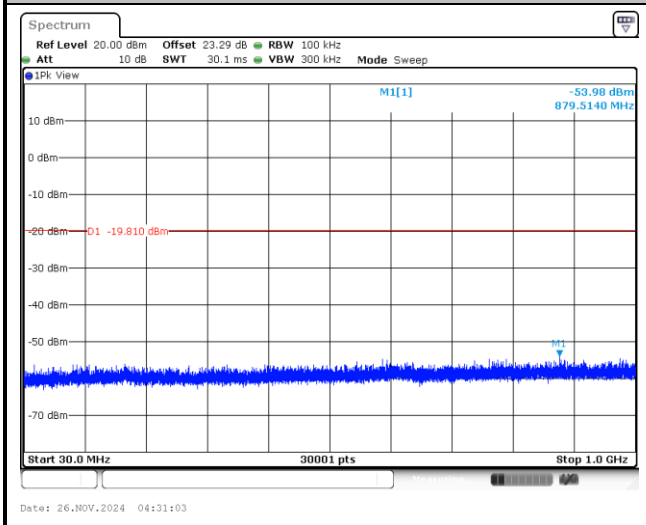
100kHz PSD reference Level



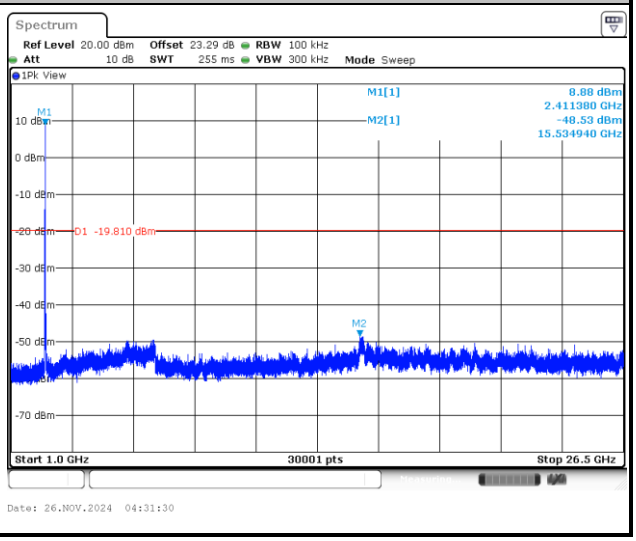
Channel 01 Plot



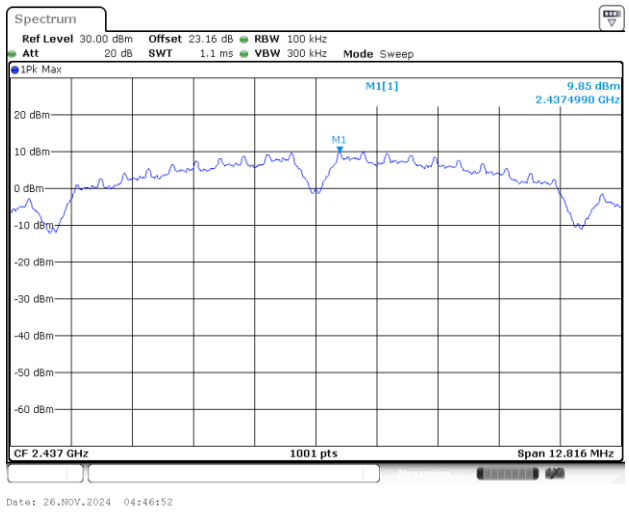
Spurious Emission 30MHz~1GHz

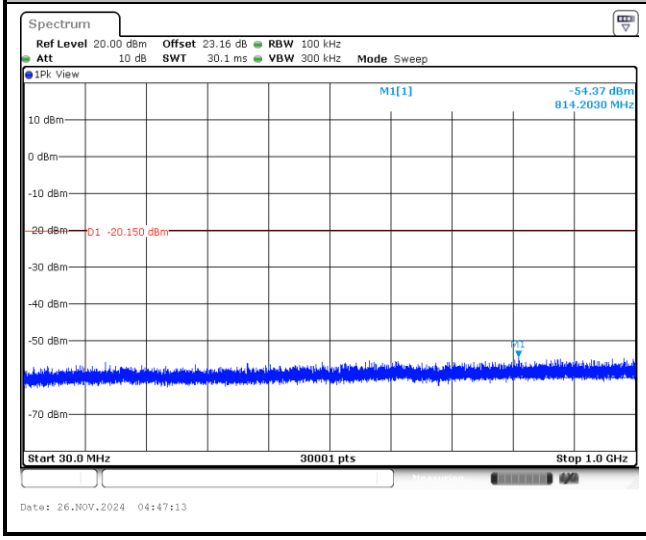
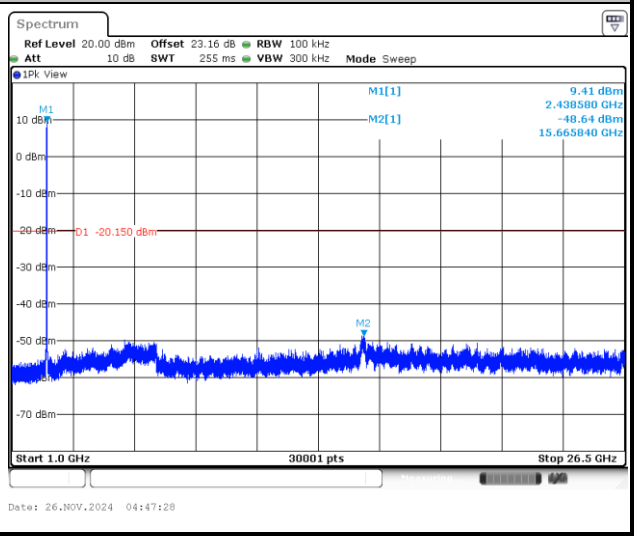


Spurious Emission 1GHz~26.5GHz

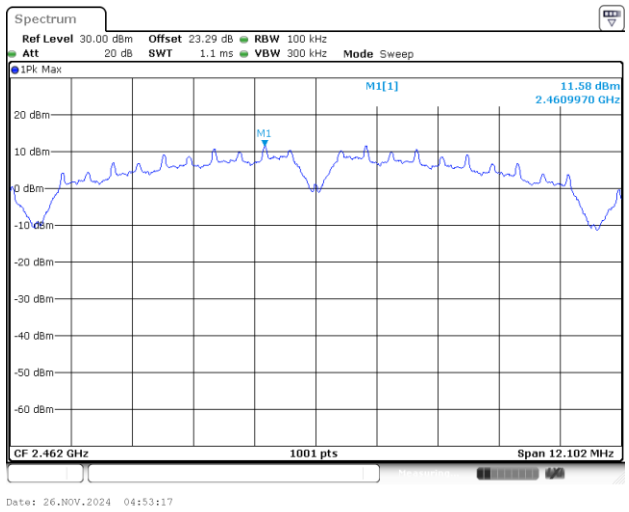
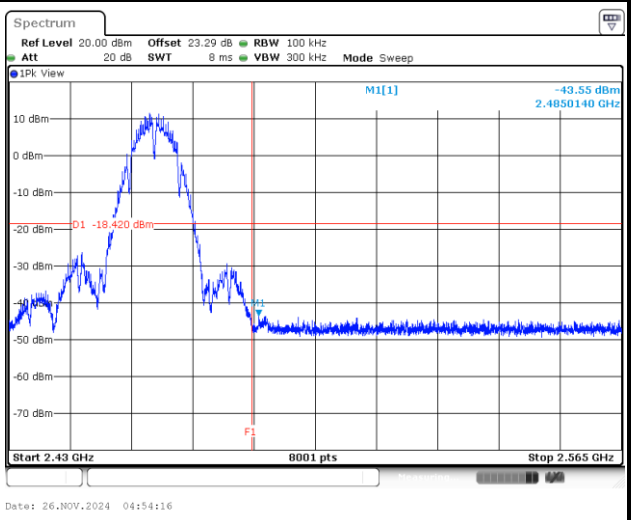
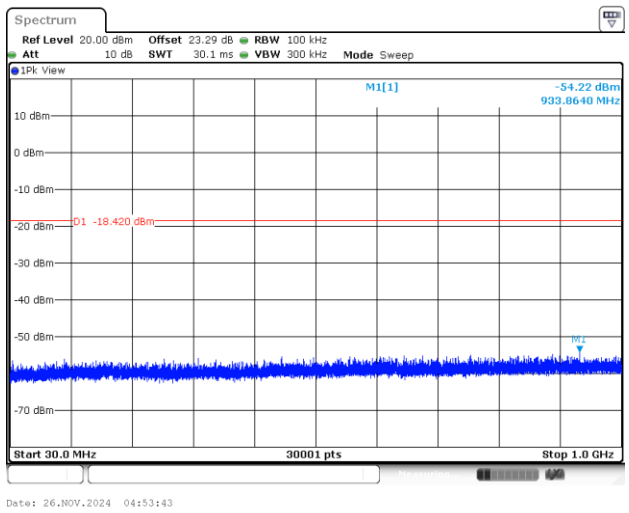
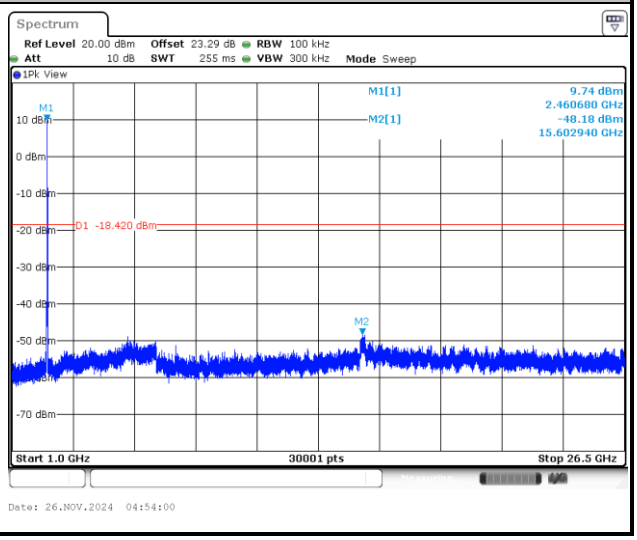


Test Mode :	802.11b	Test Channel :	06

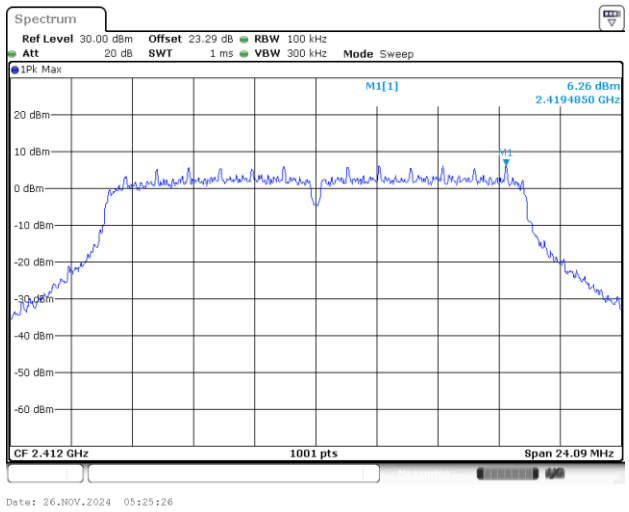
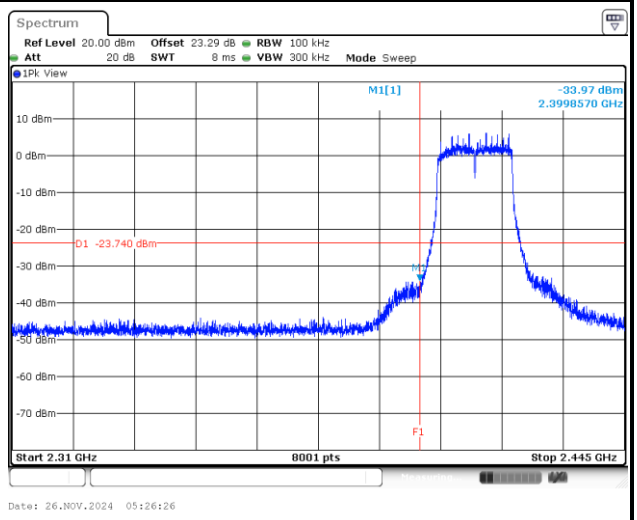
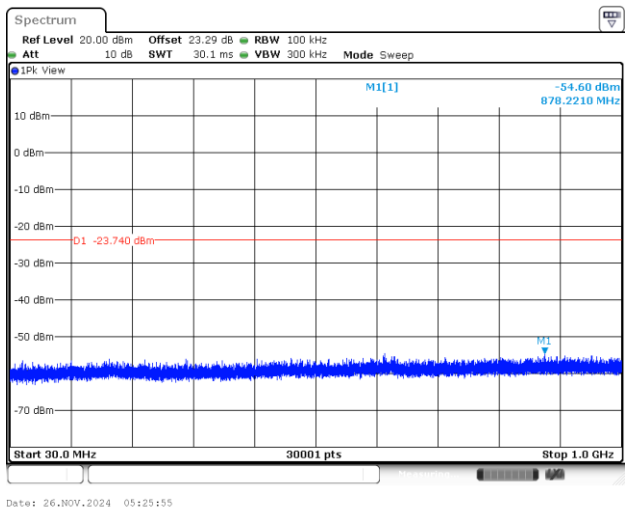
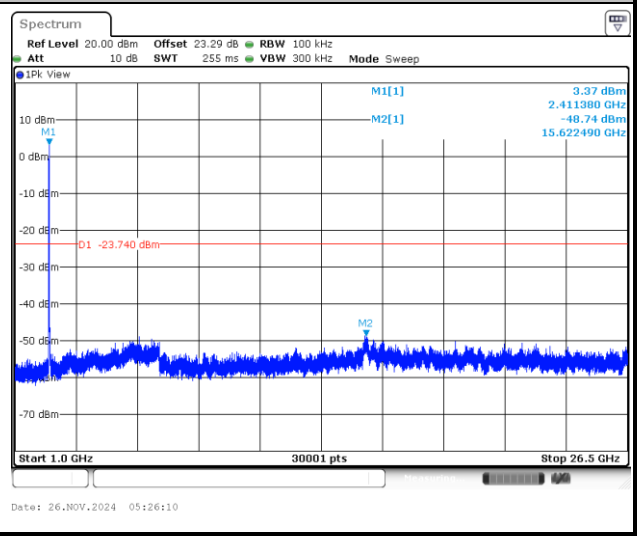
100kHz PSD reference Level	Channel 06 Plot
	

Spurious Emission 30MHz~1GHz	Spurious Emission 1GHz~26.5GHz
	

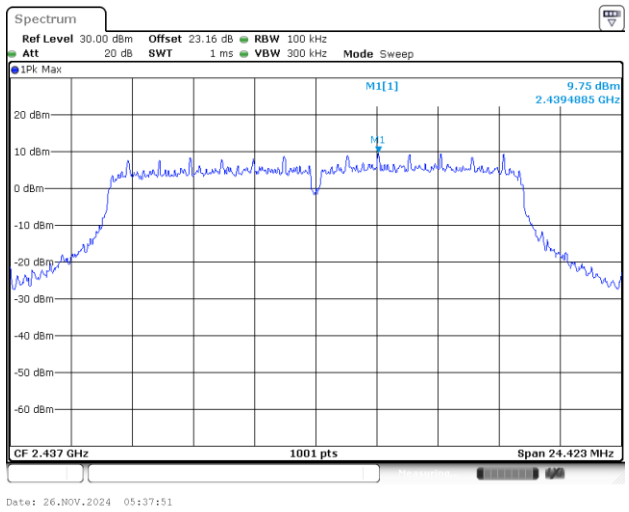
Test Mode :	802.11b	Test Channel :	11

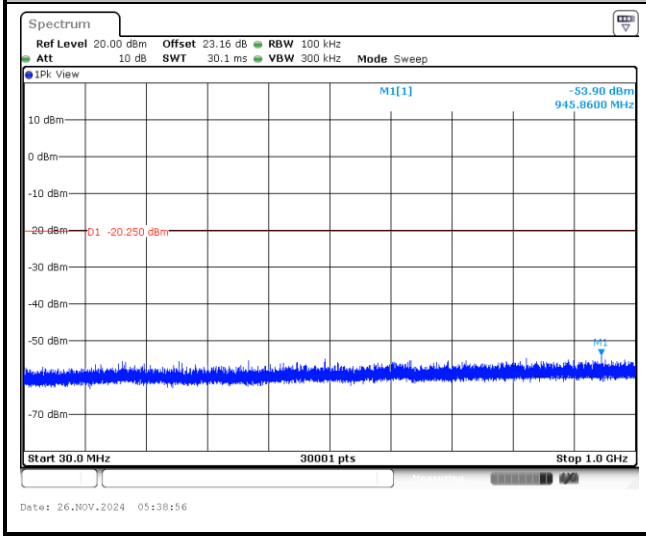
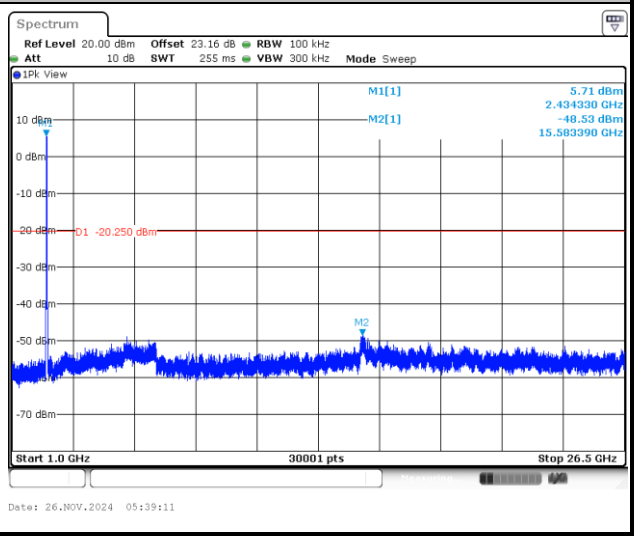
100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11g	Test Channel :	01

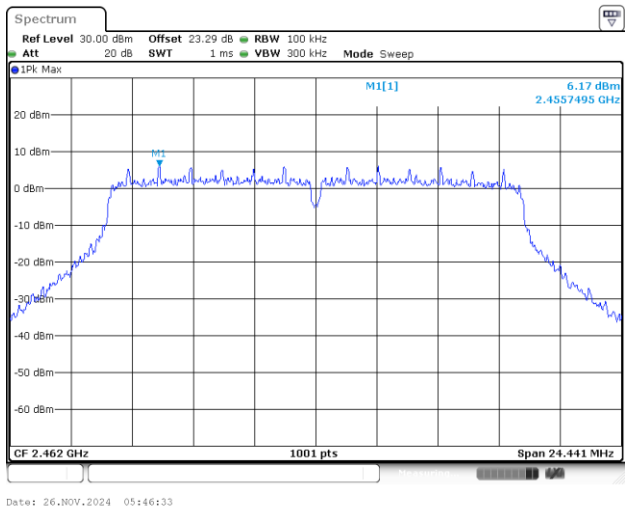
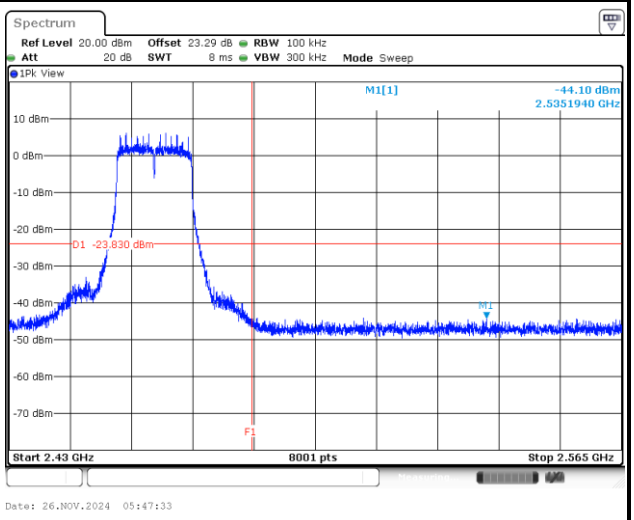
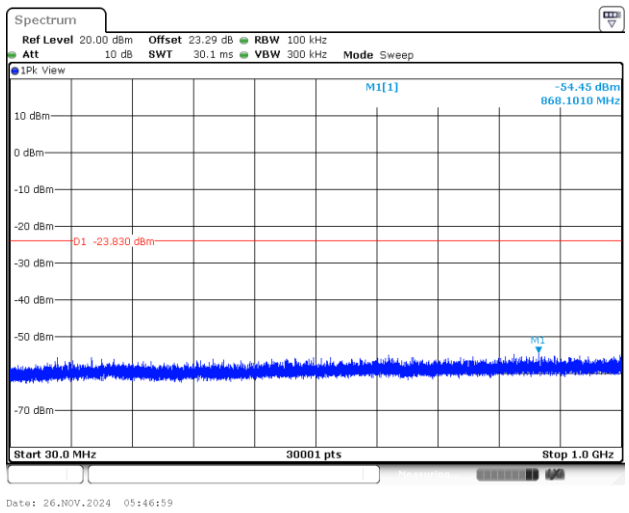
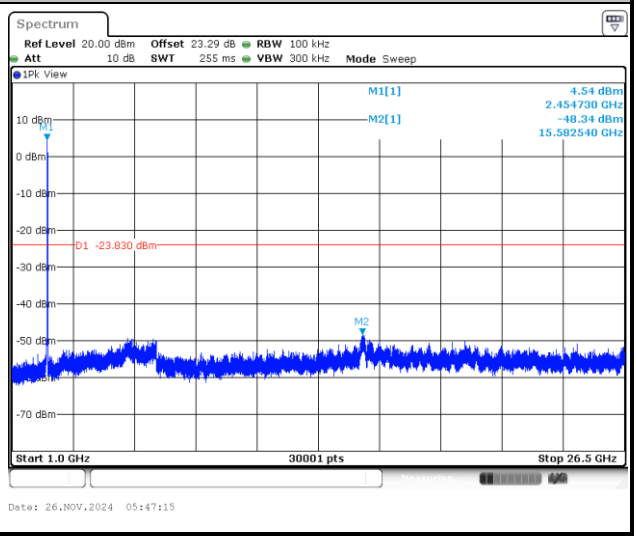
100kHz PSD reference Level	Channel 01 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11g	Test Channel :	06

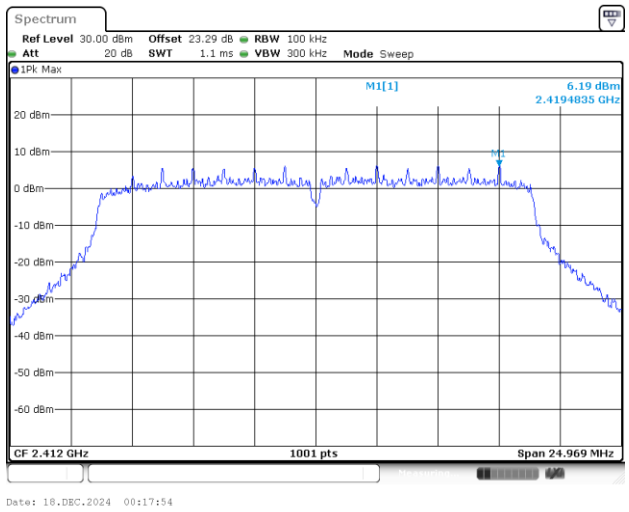
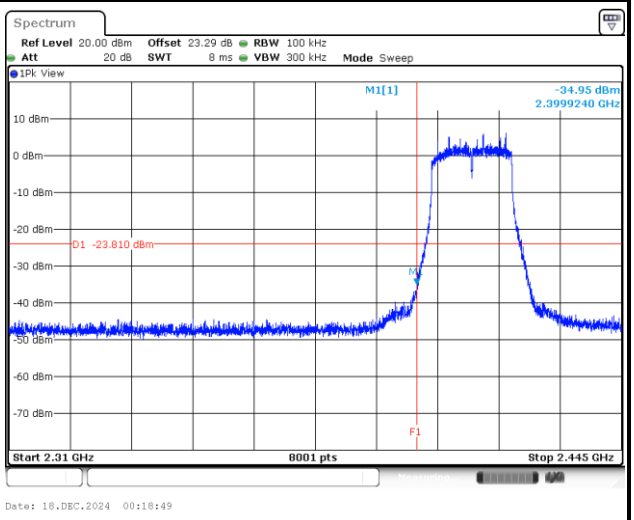
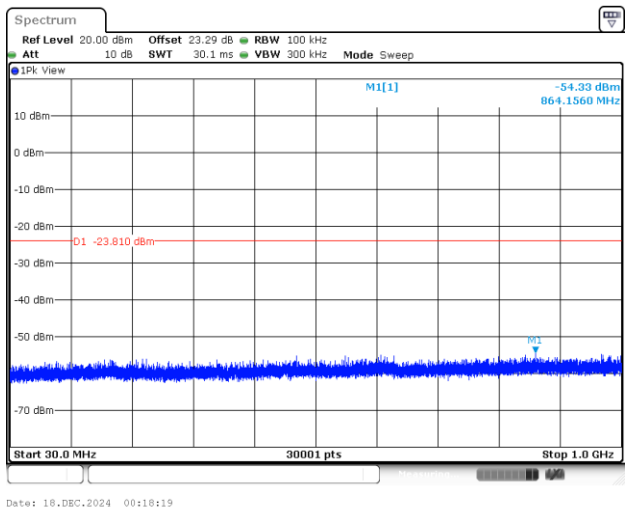
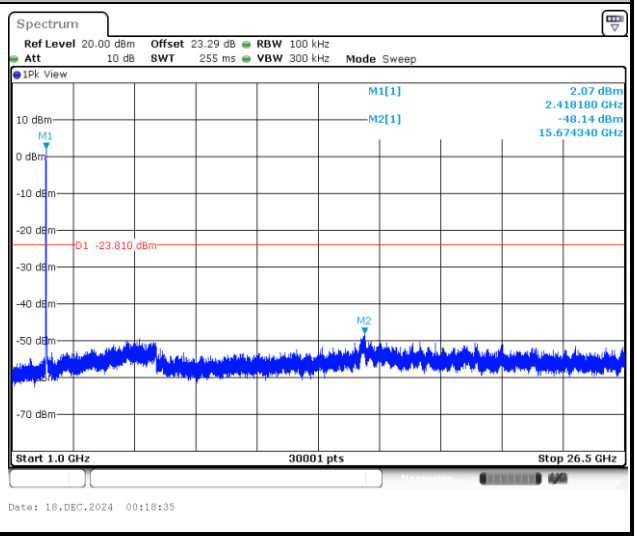
100kHz PSD reference Level	Channel 06 Plot
	

Spurious Emission 30MHz~1GHz	Spurious Emission 1GHz~26.5GHz
	

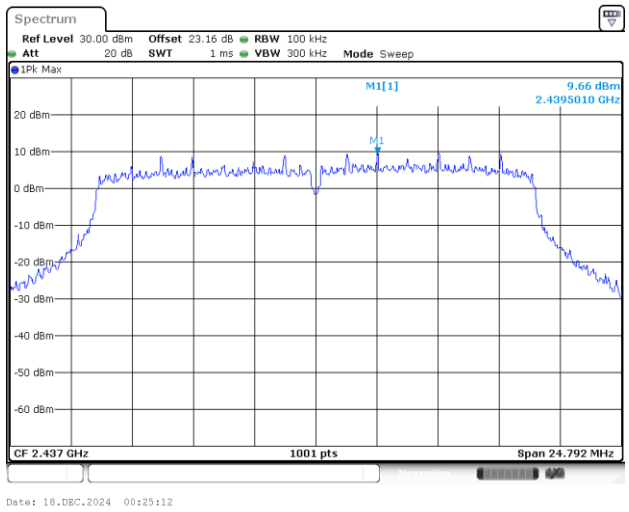
Test Mode :	802.11g	Test Channel :	11

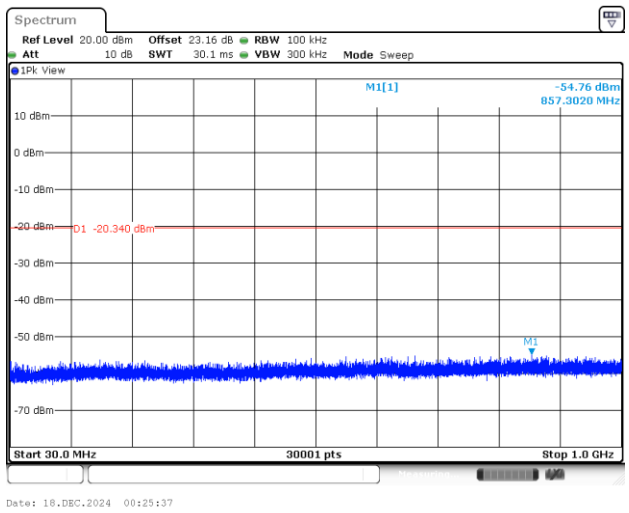
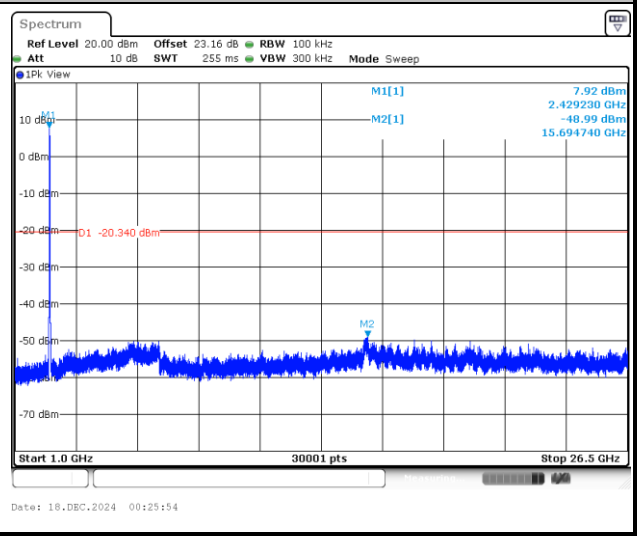
100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11n HT20	Test Channel :	01

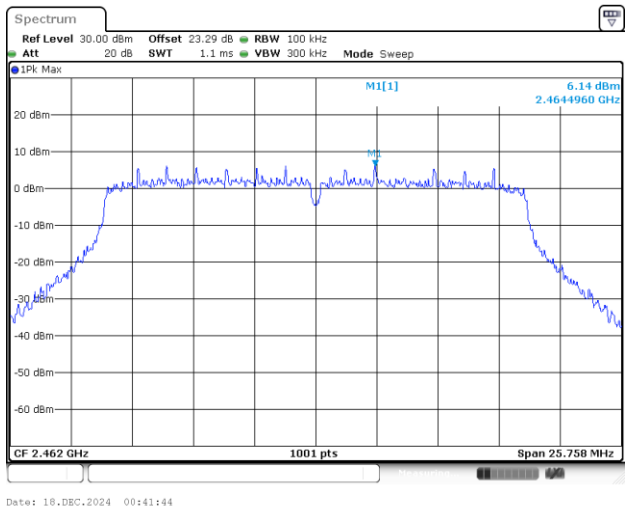
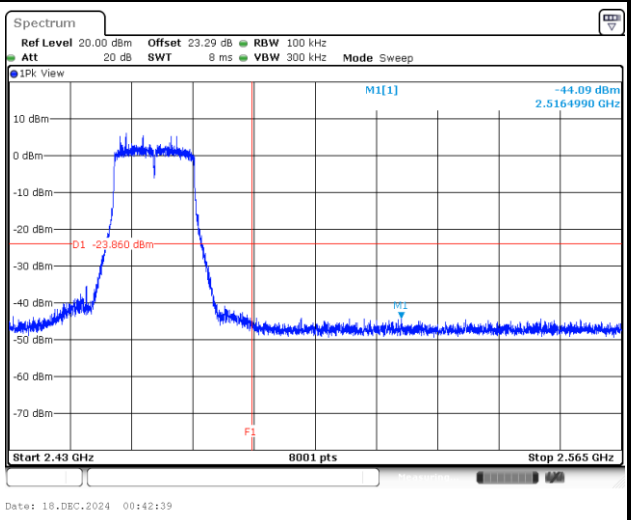
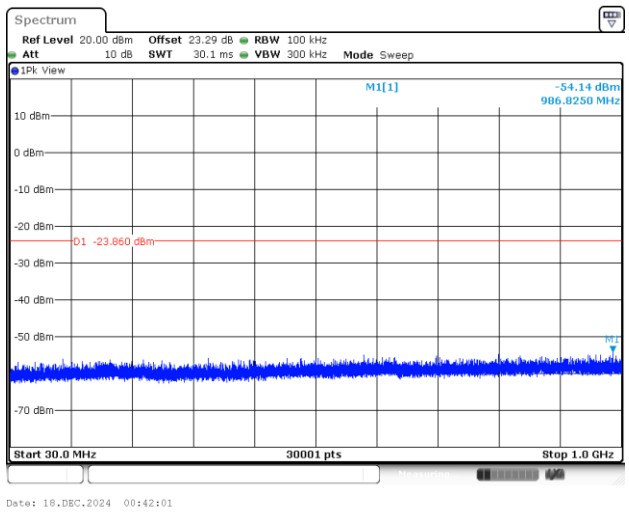
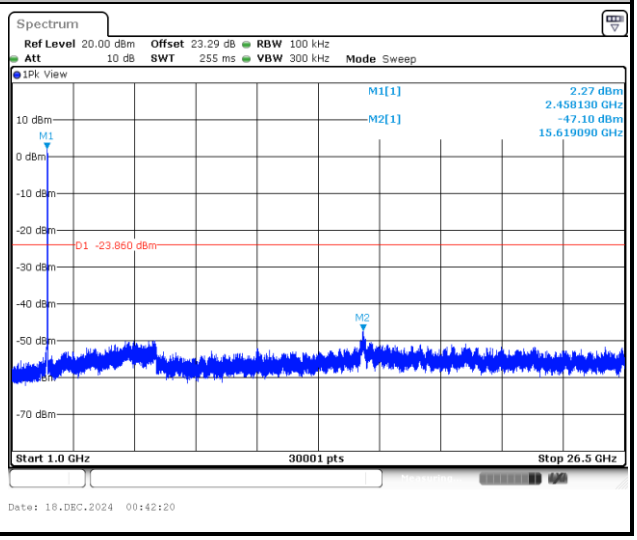
100kHz PSD reference Level	Channel 01 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11n HT20	Test Channel :	06

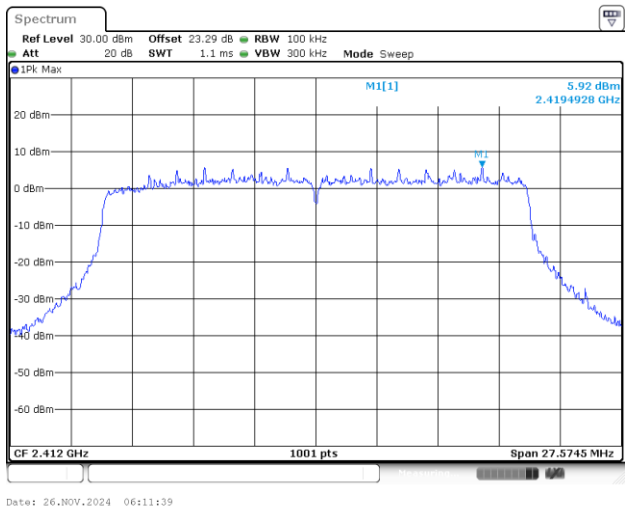
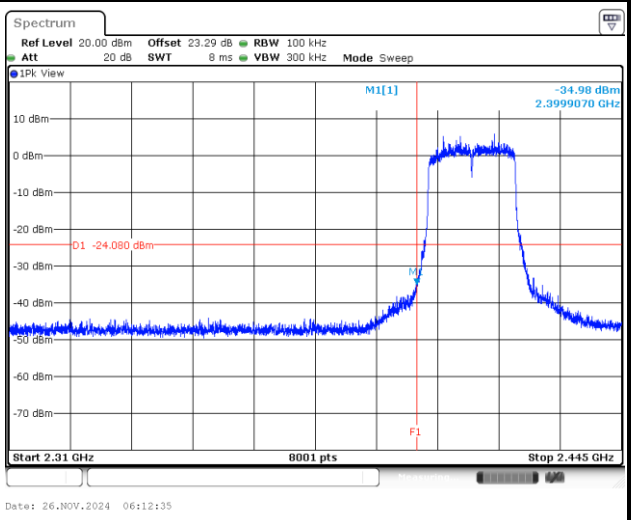
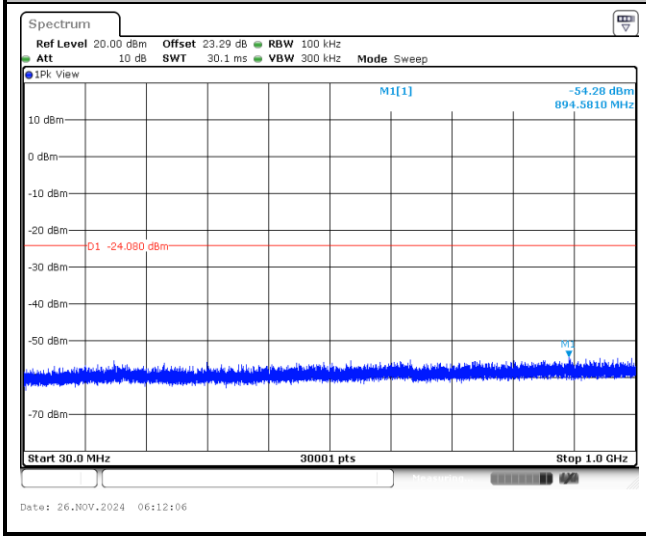
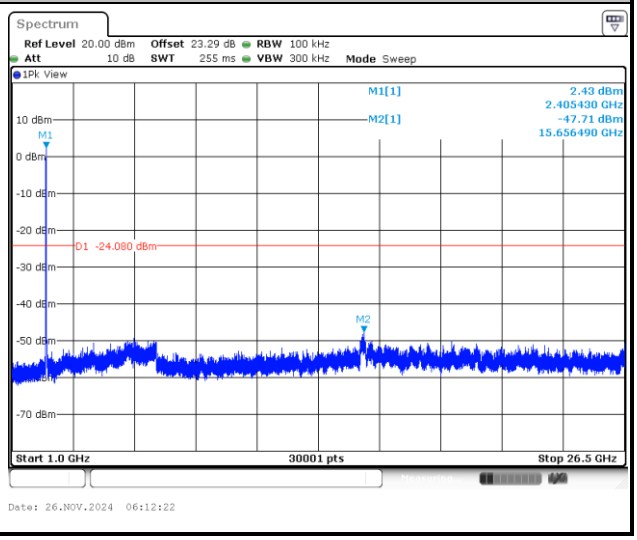
100kHz PSD reference Level	Channel 06 Plot
	

Spurious Emission 30MHz~1GHz	Spurious Emission 1GHz~26.5GHz
	

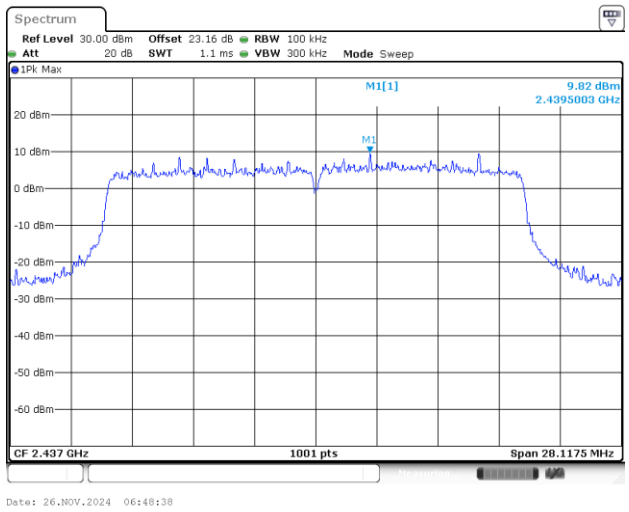
Test Mode :	802.11n HT20	Test Channel :	11

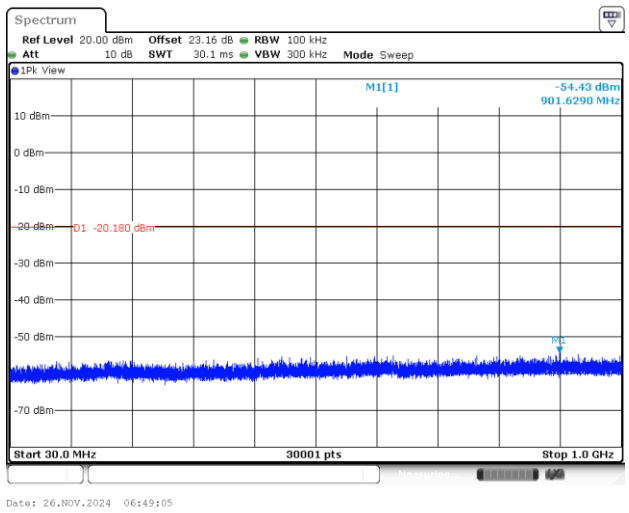
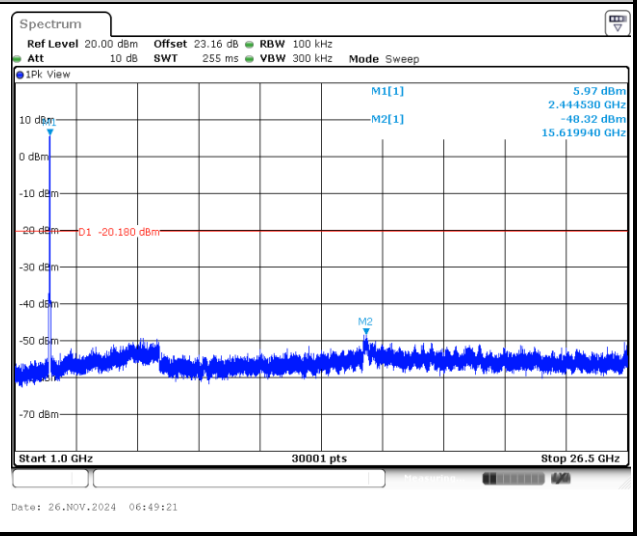
100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11ax HE20_Full RU	Test Channel :	01

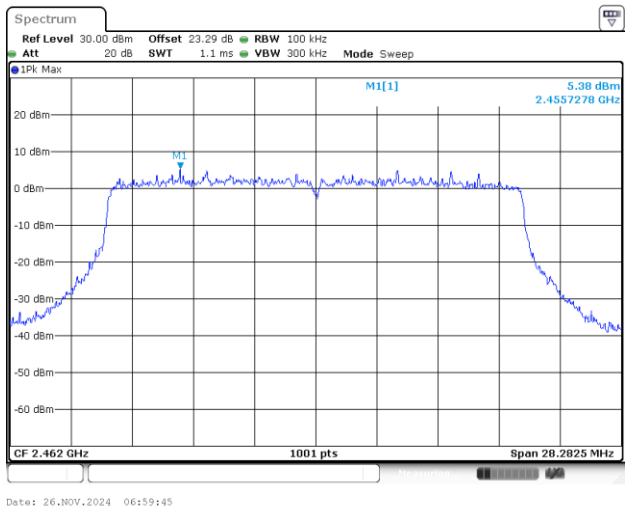
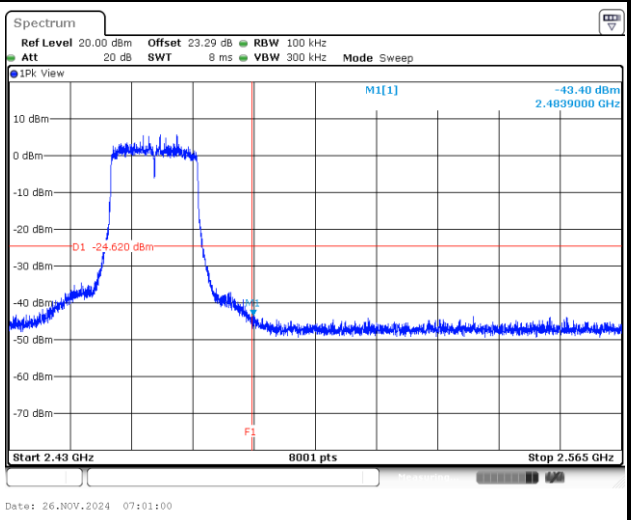
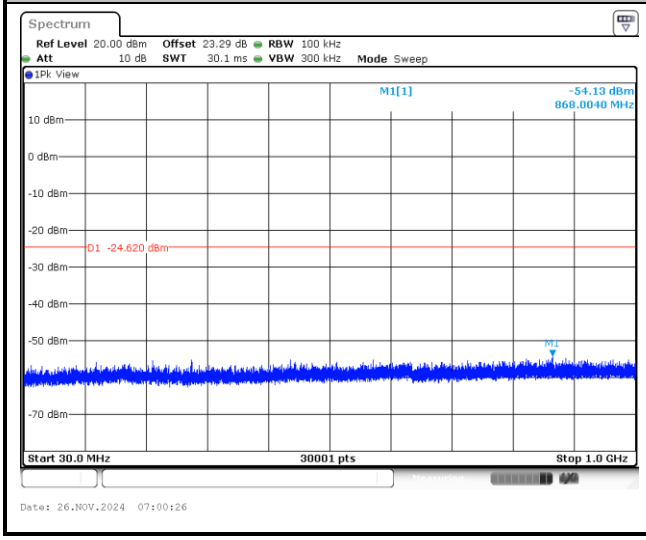
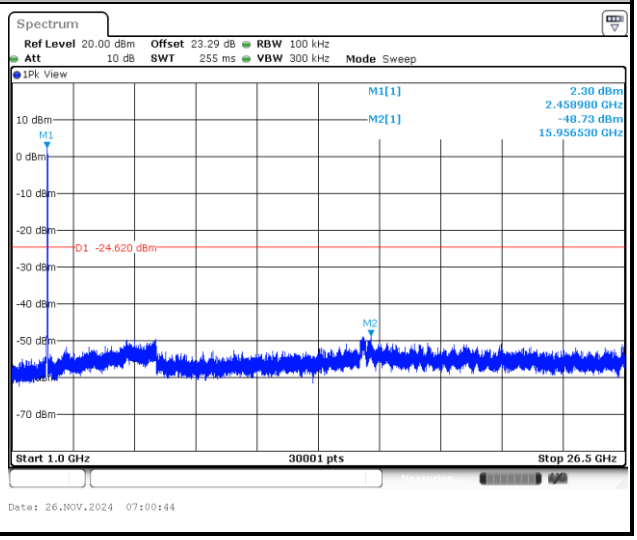
100kHz PSD reference Level	Channel 01 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11ax HE20_Full RU	Test Channel :	06

100kHz PSD reference Level	Channel 06 Plot
	

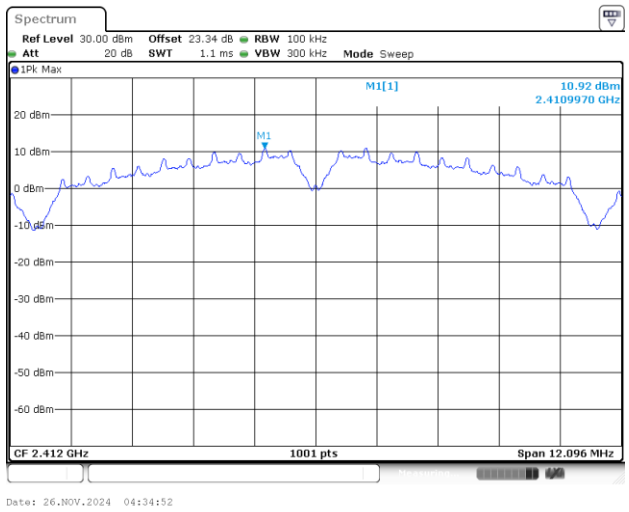
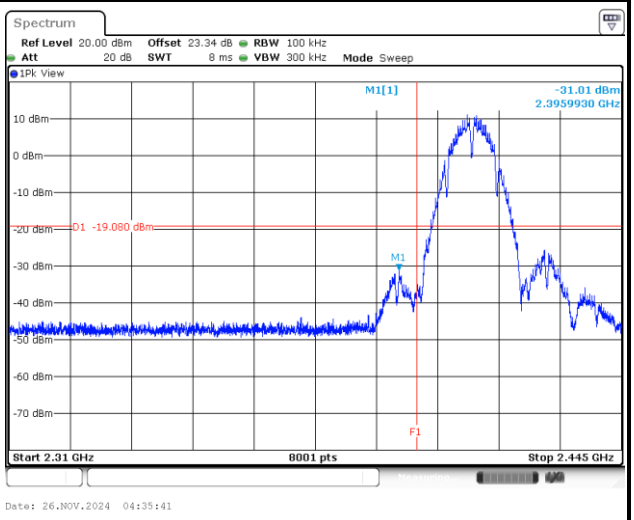
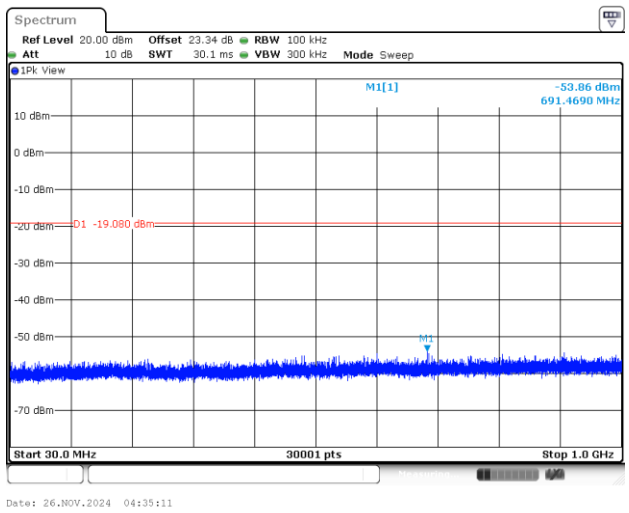
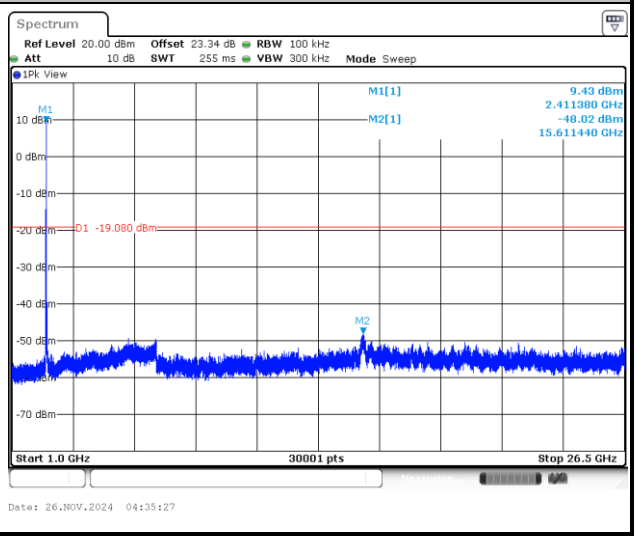
Spurious Emission 30MHz~1GHz	Spurious Emission 1GHz~26.5GHz
	

Test Mode :	802.11ax HE20_Full RU	Test Channel :	11

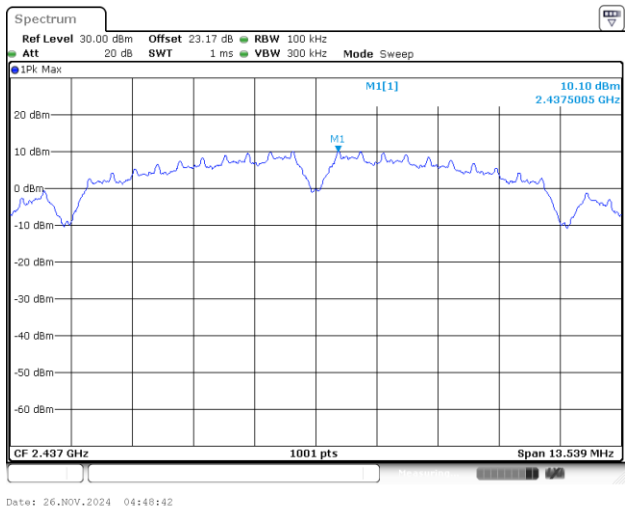
100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

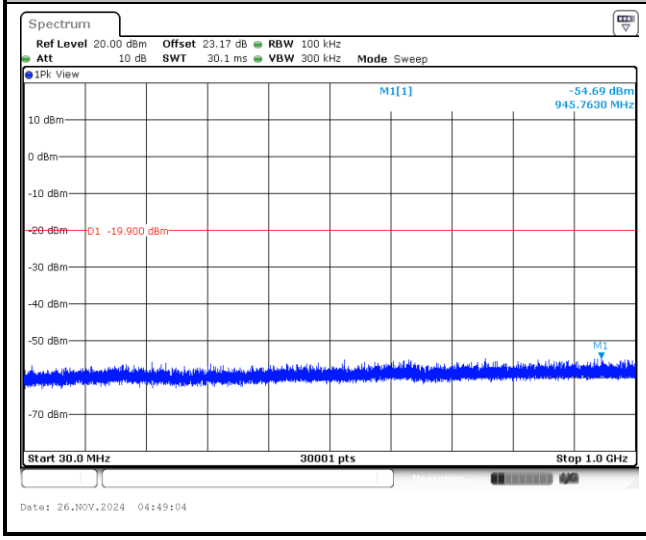
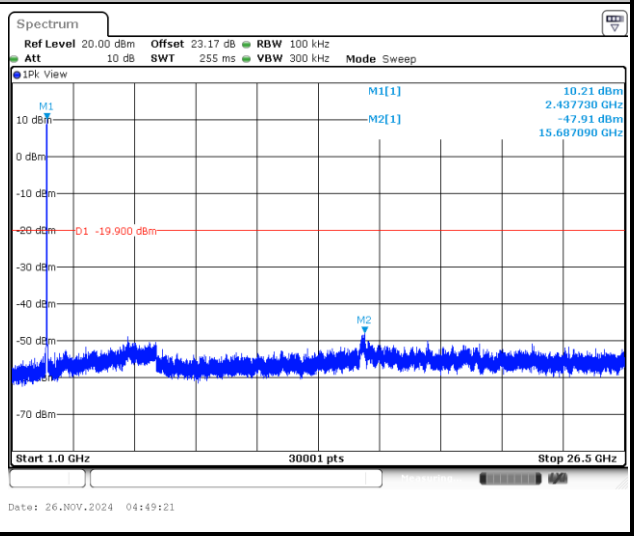
Number of TX = 2, Ant. 7 (Measured)

Test Mode :	802.11b	Test Channel :	01

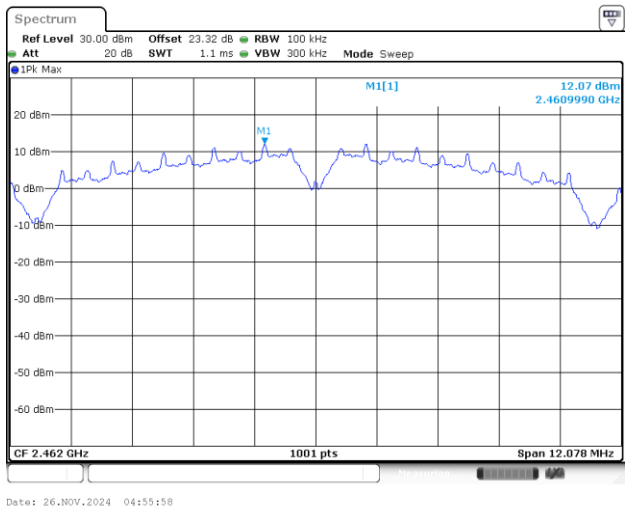
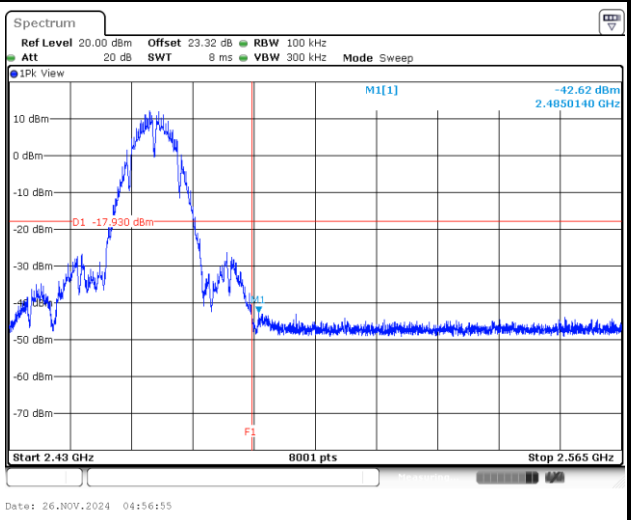
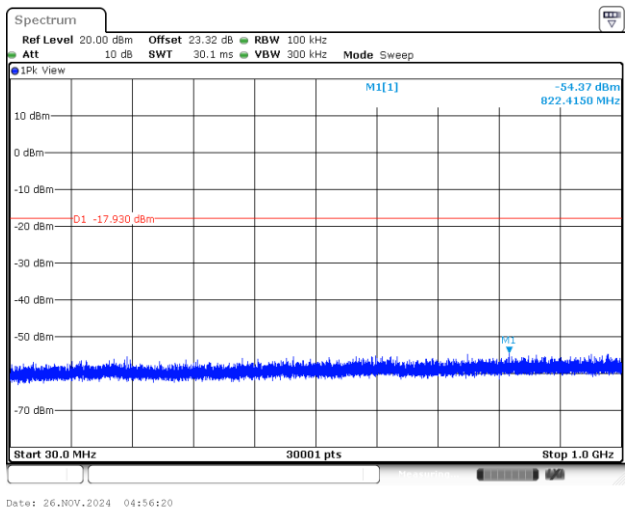
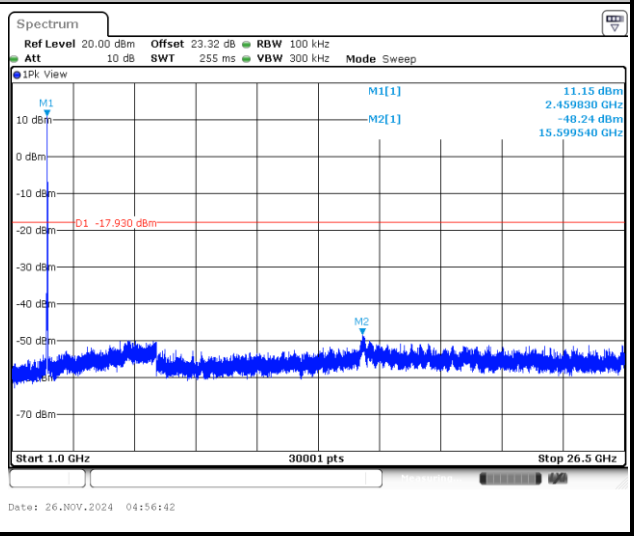
100kHz PSD reference Level	Channel 01 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11b	Test Channel :	06

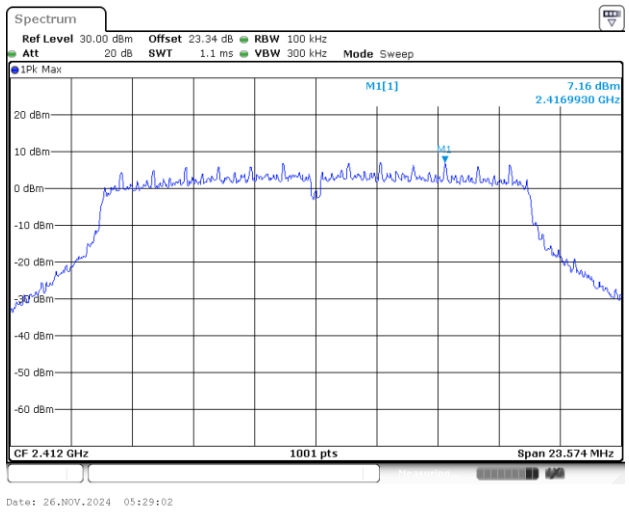
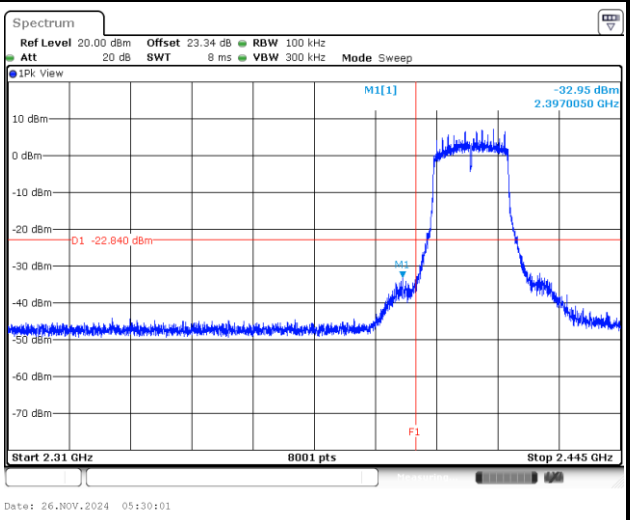
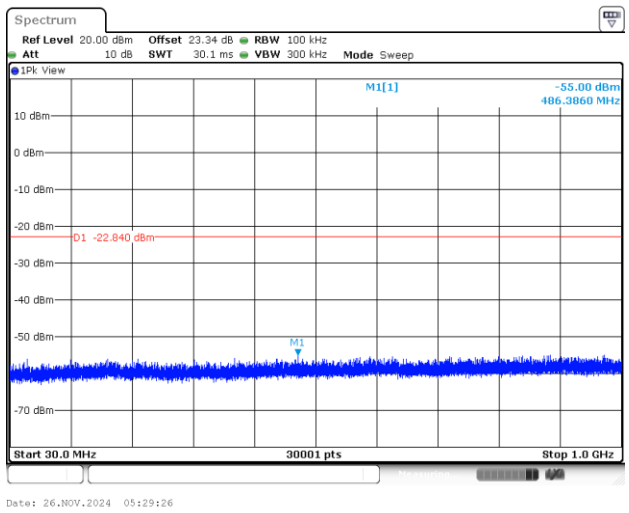
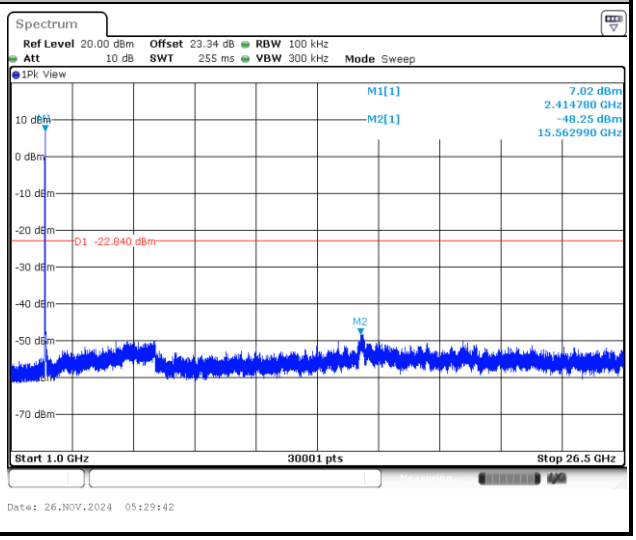
100kHz PSD reference Level	Channel 06 Plot
	

Spurious Emission 30MHz~1GHz	Spurious Emission 1GHz~26.5GHz
	

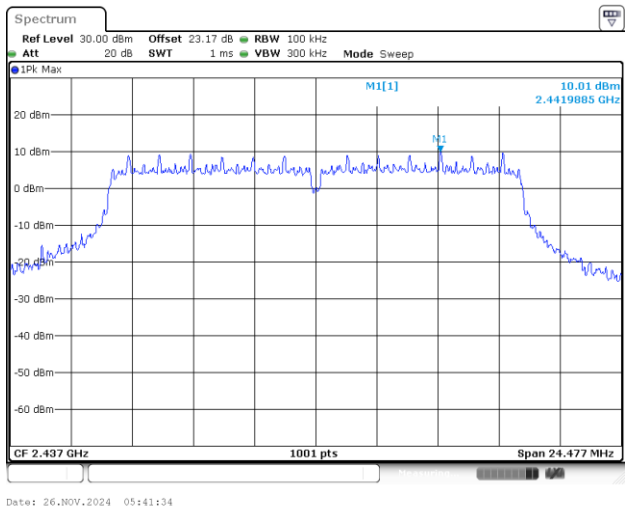
Test Mode :	802.11b	Test Channel :	11

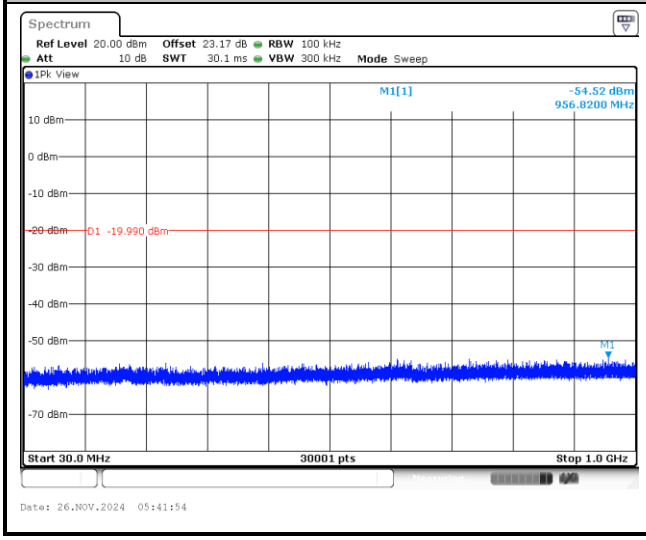
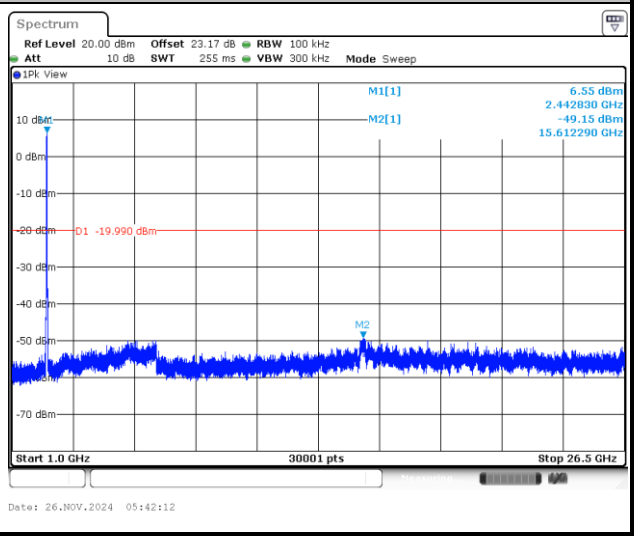
100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11g	Test Channel :	01

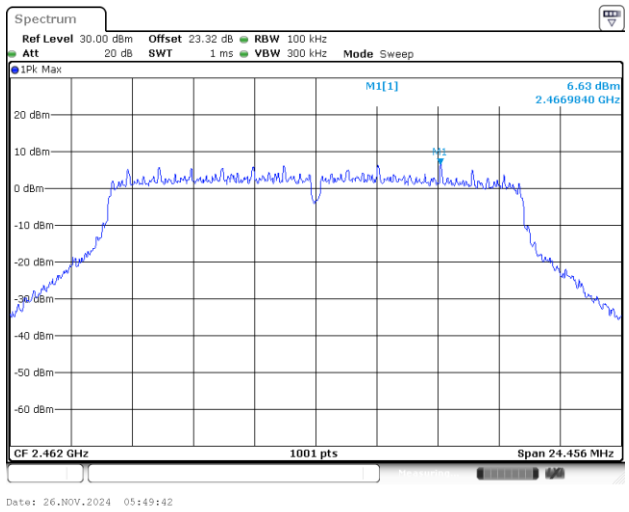
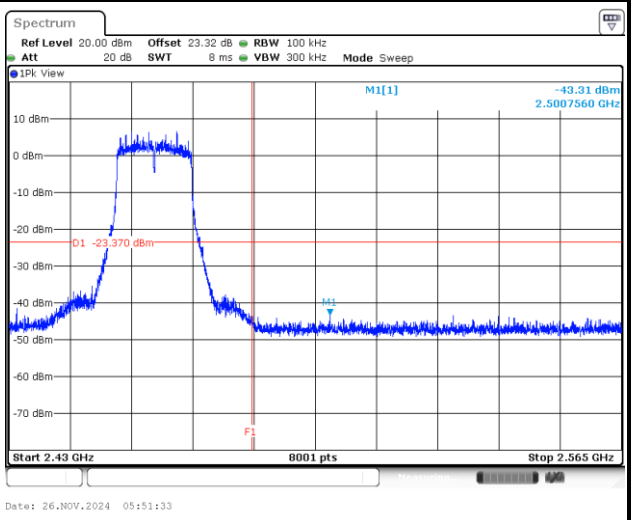
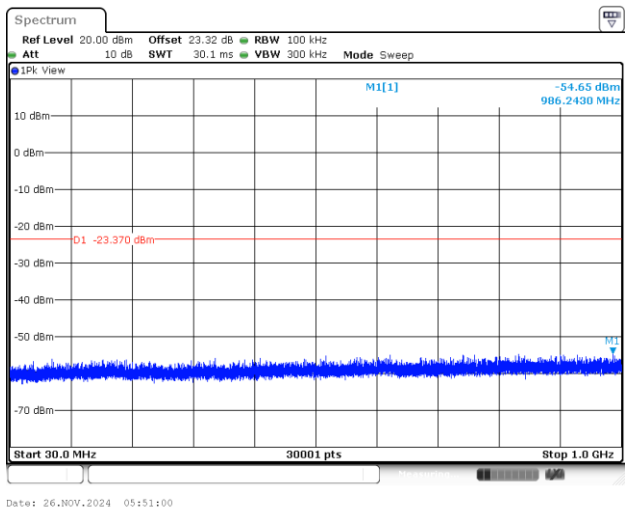
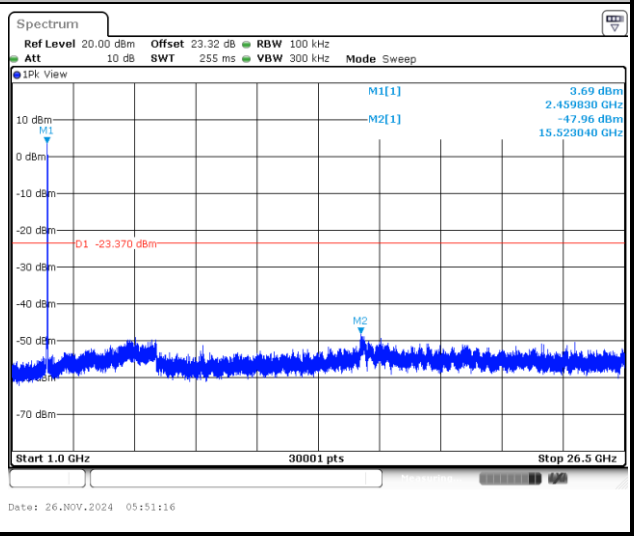
100kHz PSD reference Level	Channel 01 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11g	Test Channel :	06

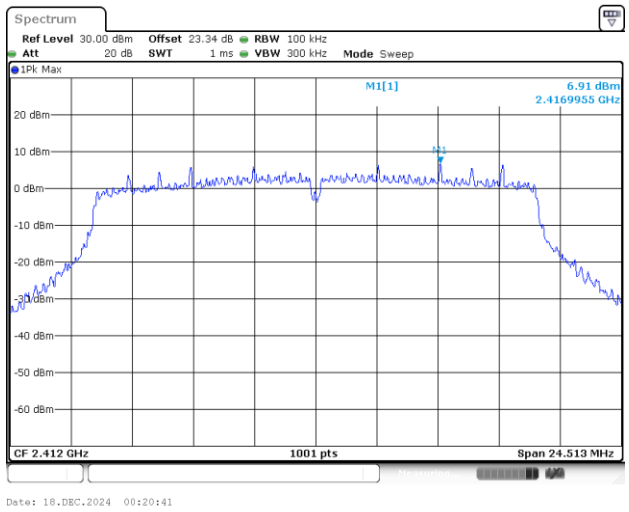
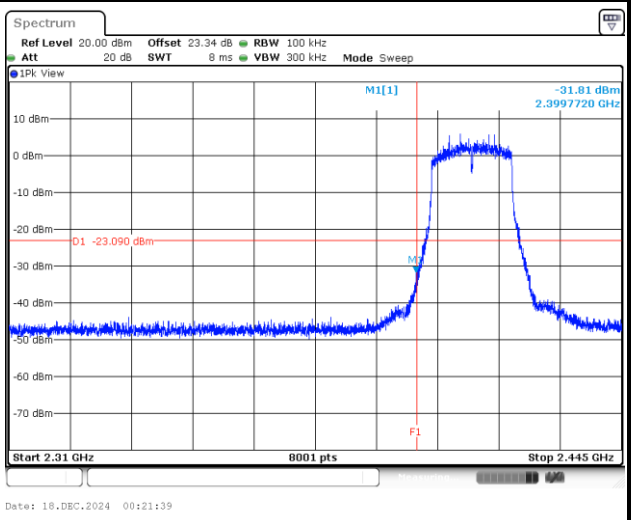
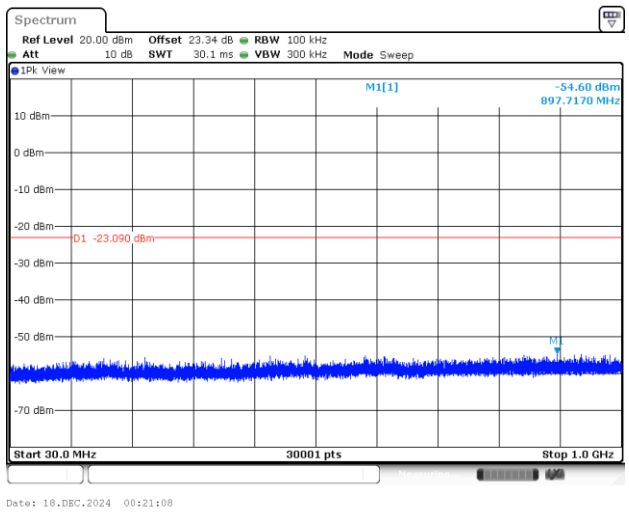
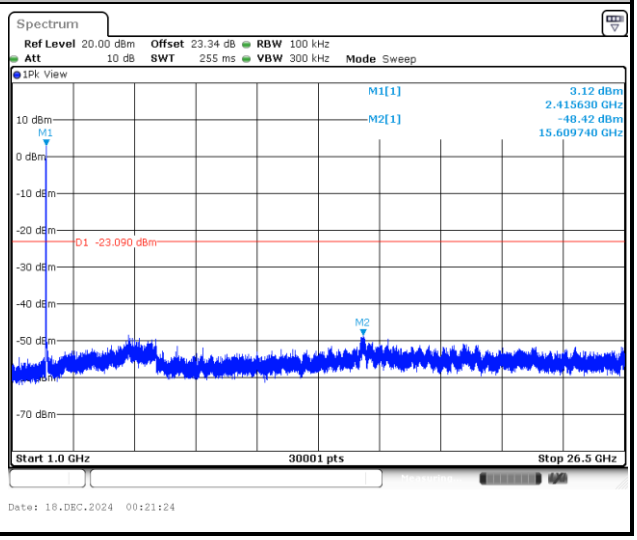
100kHz PSD reference Level	Channel 06 Plot
	

Spurious Emission 30MHz~1GHz	Spurious Emission 1GHz~26.5GHz
	

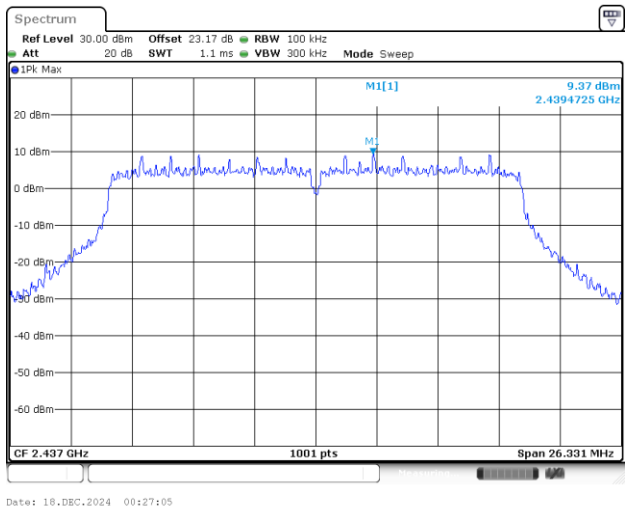
Test Mode :	802.11g	Test Channel :	11

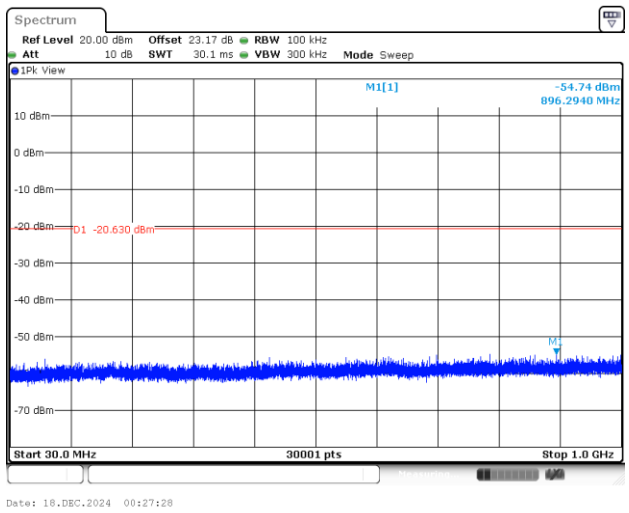
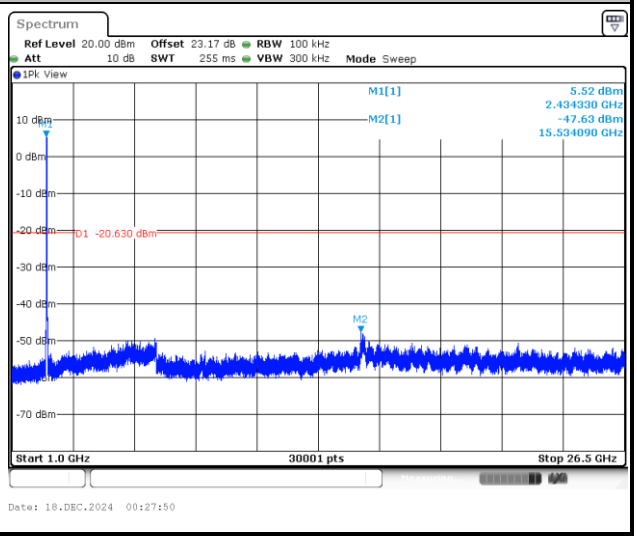
100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11n HT20	Test Channel :	01

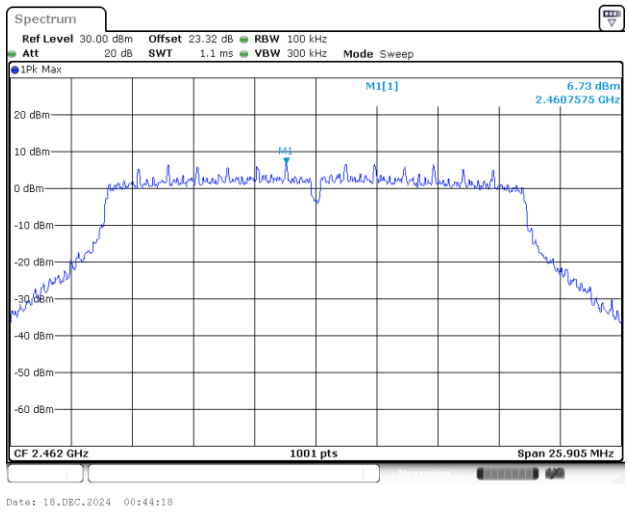
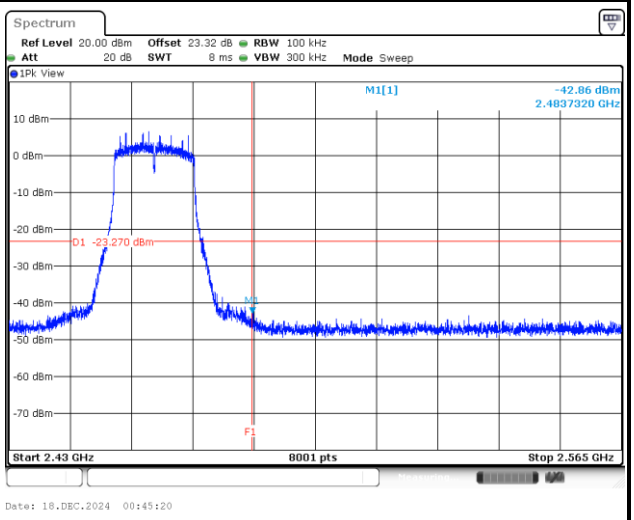
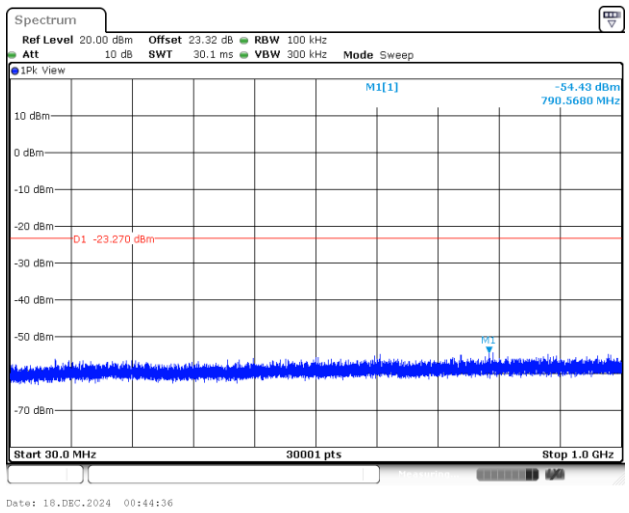
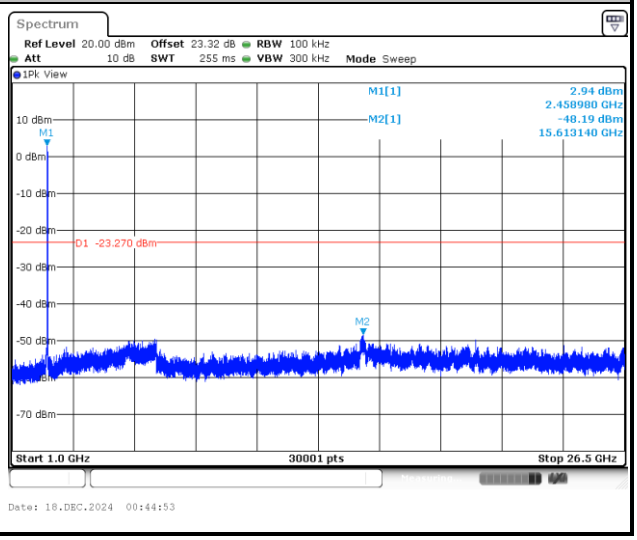
100kHz PSD reference Level	Channel 01 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11n HT20	Test Channel :	06

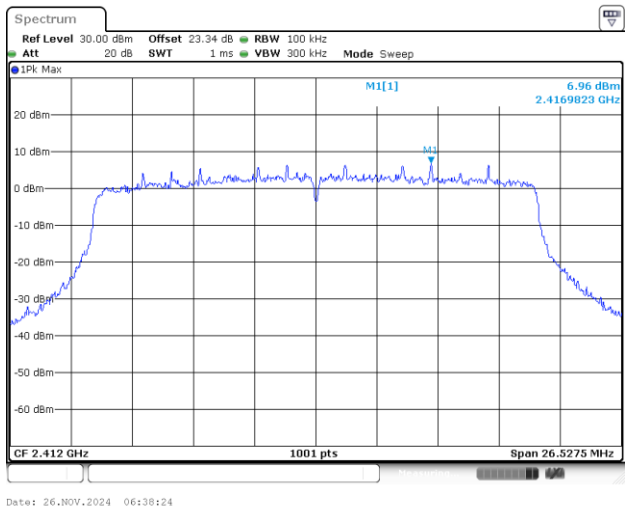
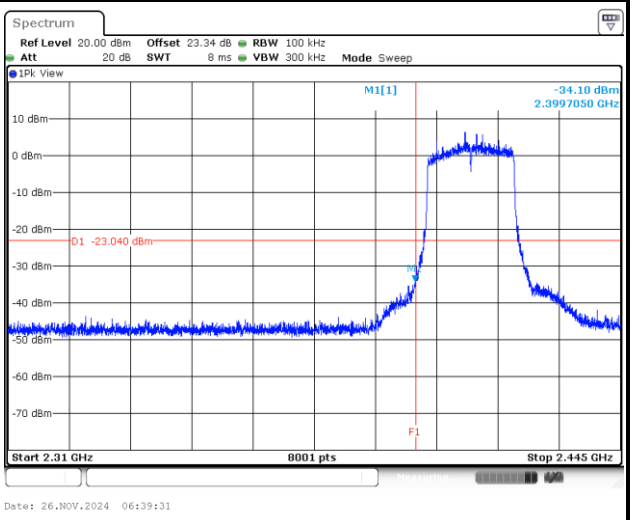
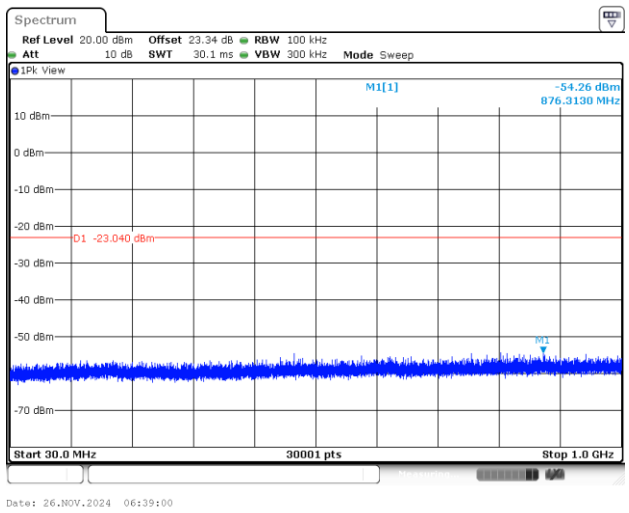
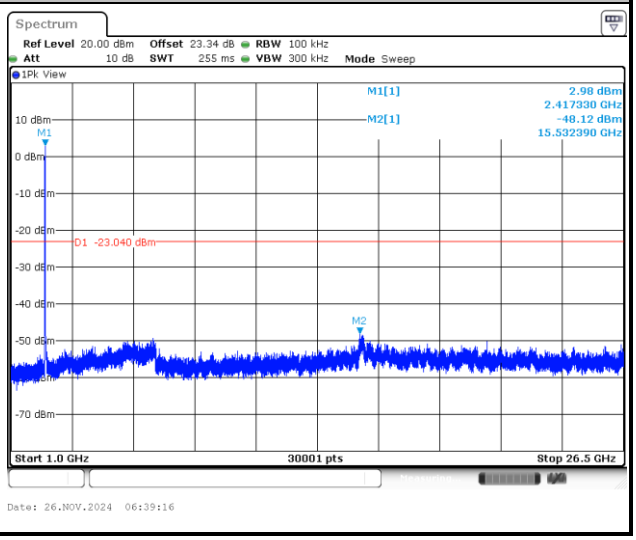
100kHz PSD reference Level	Channel 06 Plot
	

Spurious Emission 30MHz~1GHz	Spurious Emission 1GHz~26.5GHz
	

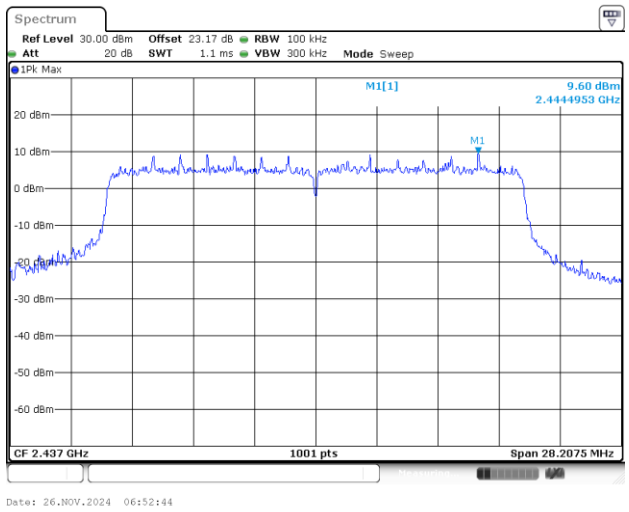
Test Mode :	802.11n HT20	Test Channel :	11

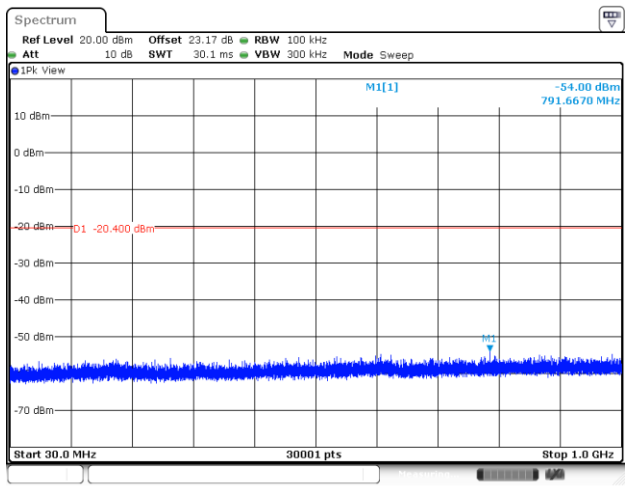
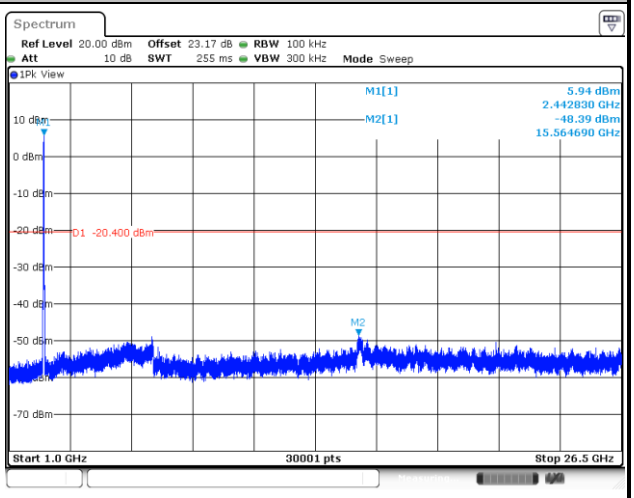
100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11ax HE20_Full RU	Test Channel :	01

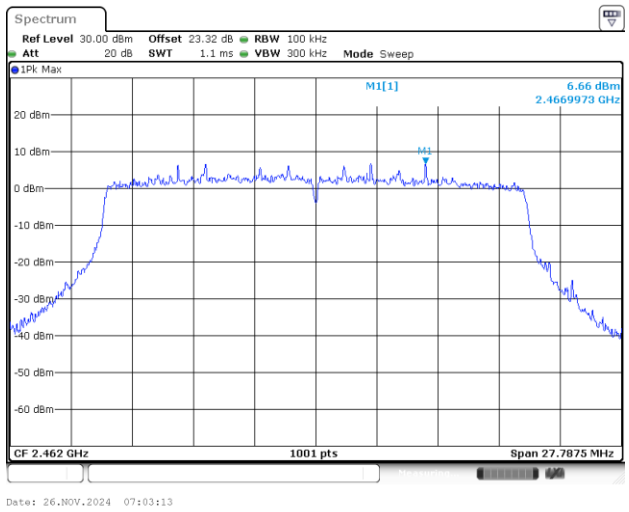
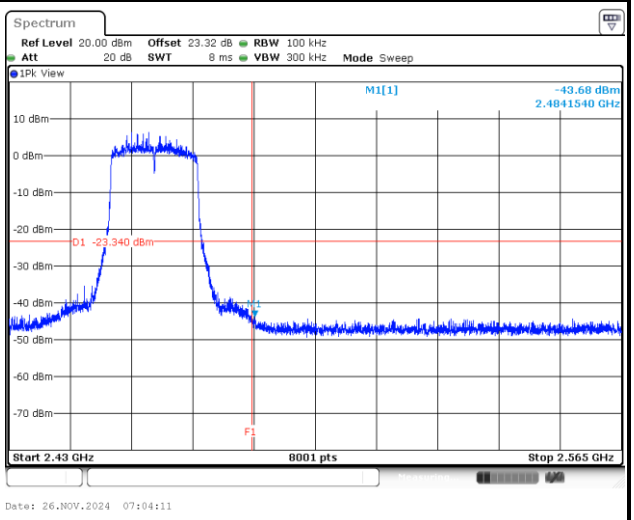
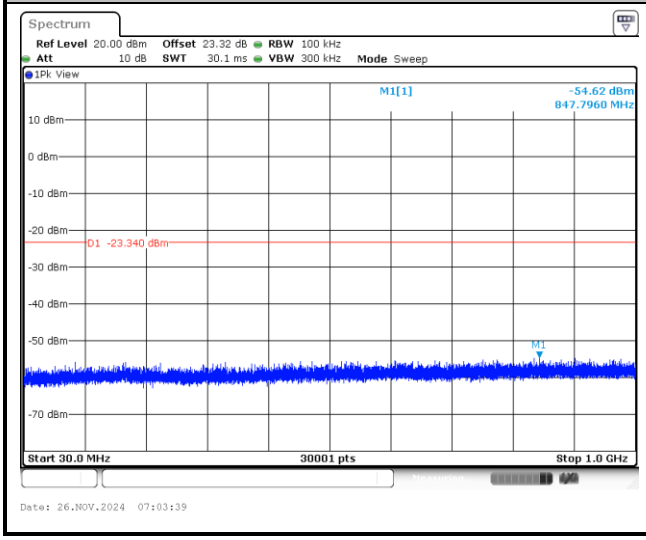
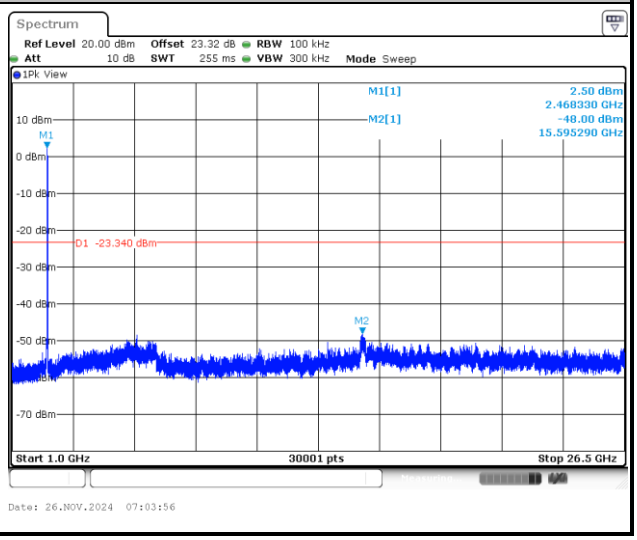
100kHz PSD reference Level	Channel 01 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11ax HE20_Full RU	Test Channel :	06

100kHz PSD reference Level	Channel 06 Plot
	

Spurious Emission 30MHz~1GHz	Spurious Emission 1GHz~26.5GHz
	

Test Mode :	802.11ax HE20_Full RU	Test Channel :	11

100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

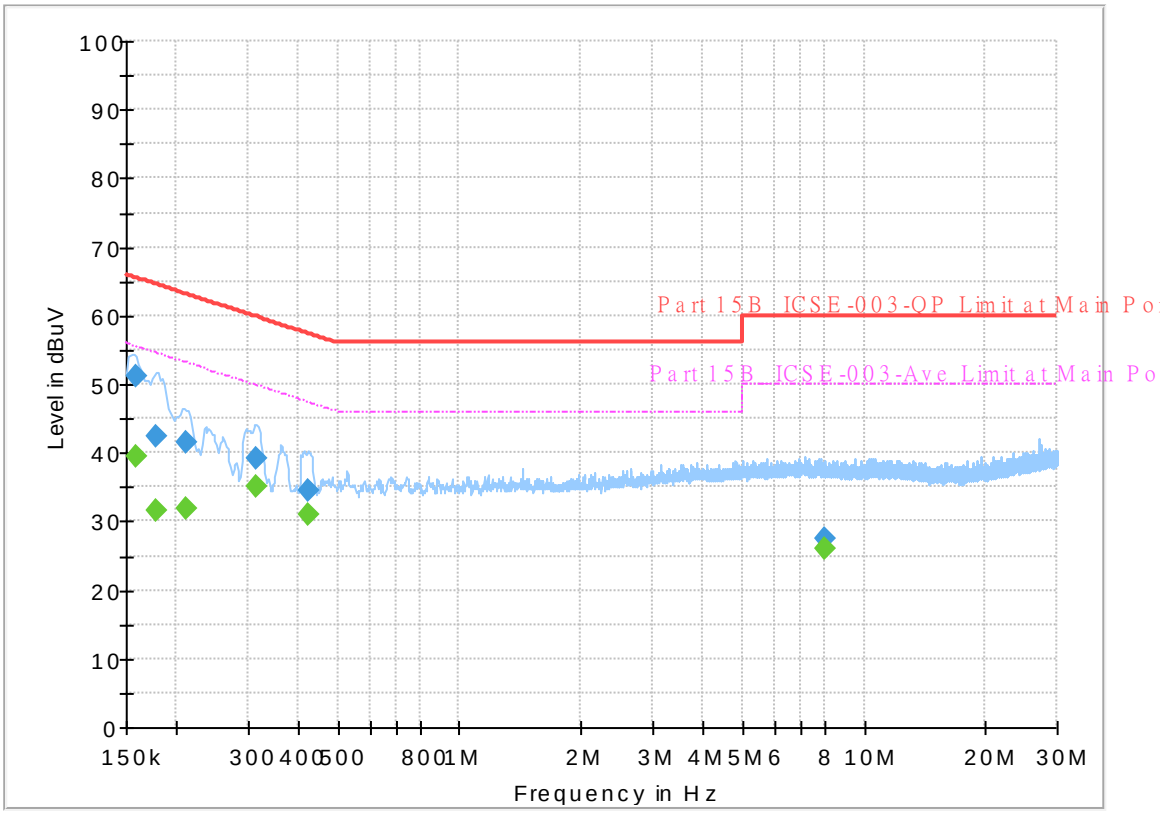
Appendix B. AC Conducted Emission Test Results

Test Engineer :	Calvin Wang	**Temperature :**	23~26℃
		Relative Humidity :	45~55%

EUT Information

Test Mode :	Mode 1
Test Voltage :	120Vac/60Hz
Phase :	Line

Full Spectrum



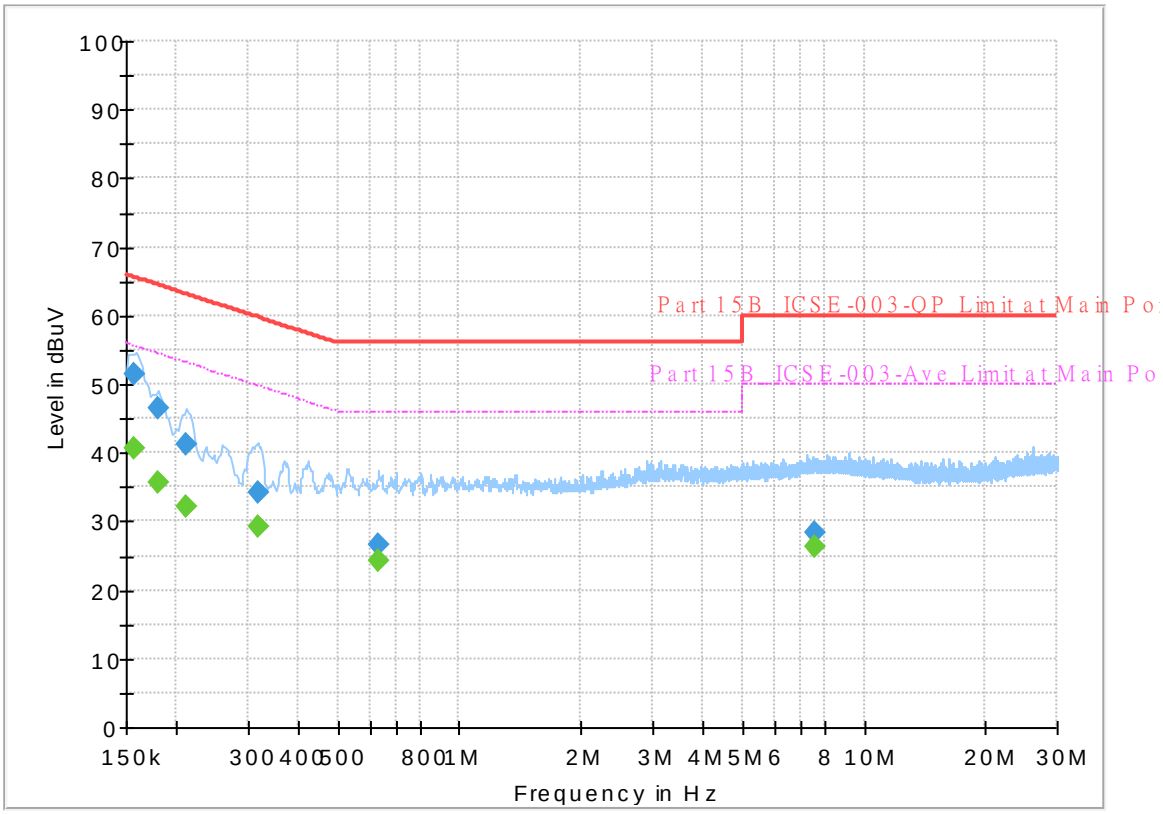
Final_Result

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Line	Filter	Corr. (dB)
0.159000	---	39.55	55.52	15.97	L1	OFF	19.8
0.159000	51.19	---	65.52	14.33	L1	OFF	19.8
0.177000	---	31.45	54.63	23.18	L1	OFF	19.8
0.177000	42.37	---	64.63	22.26	L1	OFF	19.8
0.210750	---	31.92	53.18	21.26	L1	OFF	19.8
0.210750	41.57	---	63.18	21.61	L1	OFF	19.8
0.314250	---	34.96	49.86	14.90	L1	OFF	19.8
0.314250	39.26	---	59.86	20.60	L1	OFF	19.8
0.422250	---	31.13	47.40	16.27	L1	OFF	19.8
0.422250	34.37	---	57.40	23.03	L1	OFF	19.8
8.004750	---	25.90	50.00	24.10	L1	OFF	20.2
8.004750	27.57	---	60.00	32.43	L1	OFF	20.2

EUT Information

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)
0.156750	---	40.51	55.63	15.12	N	OFF	19.8
0.156750	51.53	---	65.63	14.10	N	OFF	19.8
0.179250	---	35.79	54.52	18.73	N	OFF	19.8
0.179250	46.58	---	64.52	17.94	N	OFF	19.8
0.210750	---	32.19	53.18	20.99	N	OFF	19.8
0.210750	41.37	---	63.18	21.81	N	OFF	19.8
0.316500	---	29.26	49.80	20.54	N	OFF	19.8
0.316500	34.24	---	59.80	25.56	N	OFF	19.8
0.629250	---	24.24	46.00	21.76	N	OFF	19.8
0.629250	26.49	---	56.00	29.51	N	OFF	19.8
7.581750	---	26.36	50.00	23.64	N	OFF	20.2
7.581750	28.42	---	60.00	31.58	N	OFF	20.2

Appendix C. Radiated Spurious Emission Test Data

Test Engineer :	Ken Kuo, Karl Hou, and York Hung	**Temperature :**	21.5~24.9°C
		Relative Humidity :	50.1~60.9%

Note symbol

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

C1. Radiated Spurious Emission Test Modes

Mode	Band (MHz)	Antenna	Sample	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 19	2400-2483.5	6+7	1	802.11b	01	2412	1Mbps	-	-
Mode 20	2400-2483.5	6+7	1	802.11b	06	2437	1Mbps	-	-
Mode 21	2400-2483.5	6+7	1	802.11b	11	2462	1Mbps	-	-
Mode 22	2400-2483.5	6+7	1	802.11g	01	2412	6Mbps	-	-
Mode 23	2400-2483.5	6+7	1	802.11g	06	2437	6Mbps	-	-
Mode 24	2400-2483.5	6+7	1	802.11g	11	2462	6Mbps	-	-
Mode 25	2400-2483.5	6+7	1	802.11ax HE20	01	2412	MCS0	Full RU	-
Mode 26	2400-2483.5	6+7	1	802.11ax HE20	01	2412	MCS0	Partial RU 106/53	-
Mode 27	2400-2483.5	6+7	1	802.11ax HE20	06	2437	MCS0	Full RU	-
Mode 28	2400-2483.5	6+7	1	802.11ax HE20	11	2462	MCS0	Full RU	-
Mode 29	2400-2483.5	6+7	1	802.11ax HE20	11	2462	MCS0	Partial RU 106/54	-
Mode 35	2400-2483.5	6+7	2	802.11b	01	2412	1Mbps	-	-
Mode 36	2400-2483.5	6+7	3	802.11b	01	2412	1Mbps	-	-
Mode 42	2400-2483.5	6+7	1	802.11b	01	2412	1Mbps	-	LF
Mode 43	2400-2483.5	6+7	1	802.11ac VHT20	11	2462	MCS0		-

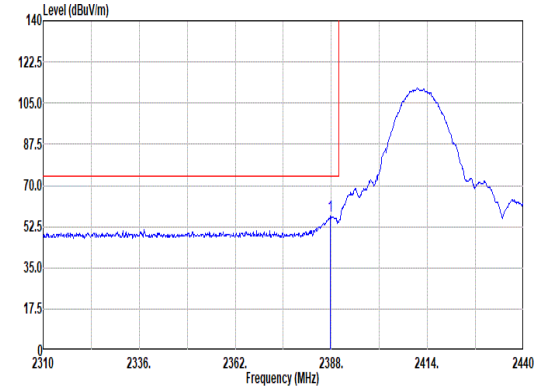
C2. Summary of each worse mode

Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	RU	Remark
19	802.11b	01	2388.39	52.47	54.00	-1.53	V	Avg.	Pass	-	Band Edge
	802.11b	01	4824.00	45.23	74.00	-28.77	H	Peak	Pass	-	Harmonic
20	802.11b	06	2389.50	42.99	54.00	-11.01	V	Avg.	Pass	-	Band Edge
	802.11b	06	7311.00	42.82	54.00	-11.18	H	Avg.	Pass	-	Harmonic
21	802.11b	11	2483.51	52.20	54.00	-1.80	H	Avg.	Pass	-	Band Edge
	802.11b	11	4924.00	45.03	54.00	-8.97	V	Avg.	Pass	-	Harmonic
22	802.11g	01	2389.95	51.38	54.00	-2.62	V	Avg.	Pass	-	Band Edge
	802.11g	01	4824.00	46.32	74.00	-27.68	V	Peak	Pass	-	Harmonic
23	802.11g	06	2389.88	50.45	54.00	-3.55	H	Avg.	Pass	-	Band Edge
	802.11g	06	7311.00	40.77	54.00	-13.23	H	Avg.	Pass	-	Harmonic
24	802.11g	11	2483.51	51.07	54.00	-2.93	V	Avg.	Pass	-	Band Edge
	802.11g	11	7386.00	37.69	54.00	-16.31	H	Avg.	Pass	-	Harmonic
25	802.11ax HE20	01	2389.95	49.66	54.00	-4.34	V	Avg.	Pass	Full RU	Band Edge
	802.11ax HE20	01	4824.00	44.96	74.00	-29.04	V	Peak	Pass	Full RU	Harmonic
26	802.11ax HE20	01	2389.69	72.25	74.00	-1.75	V	Peak	Pass	Partial RU 106/53	Band Edge
	802.11ax HE20	01	-	-	-	-	-	-	-	Partial RU 106/53	Harmonic
27	802.11ax HE20	06	2483.56	48.37	54.00	-5.63	V	Avg.	Pass	Full RU	Band Edge
	802.11ax HE20	06	7311.00	40.63	54.00	-13.37	H	Avg.	Pass	Full RU	Harmonic

Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	RU	Remark
28	802.11ax HE20	11	2483.51	51.90	54.00	-2.10	V	Avg.	Pass	Full RU	Band Edge
	802.11ax HE20	11	7386.00	37.85	54.00	-16.15	H	Avg.	Pass	Full RU	Harmonic
29	802.11ax HE20	11	2483.77	71.75	74.00	-2.25	H	Peak	Pass	Partial RU 106/54	Band Edge
	802.11ax HE20	11	-	-	-	-	-	-	-	Partial RU 106/54	Harmonic
35	802.11b	01	2388.39	49.81	54.00	-4.19	V	Avg.	Pass	-	Band Edge
	802.11b	01	4824.00	44.91	74.00	-29.09	H	Peak	Pass	-	Harmonic
36	802.11b	01	2388.13	51.41	54.00	-2.59	H	Avg.	Pass	-	Band Edge
	802.11b	01	4824.00	44.92	74.00	-29.08	H	Peak	Pass	-	Harmonic
42	LF	01	34.85	30.41	40.00	-9.59	V	QP	Pass	-	LF
43	802.11ac VHT20	11	2483.51	51.52	54.00	-2.48	V	Avg.	Pass		Band Edge
	802.11ac VHT20	11	7386.00	39.45	54.00	-14.55	V	Avg.	Pass		Harmonic

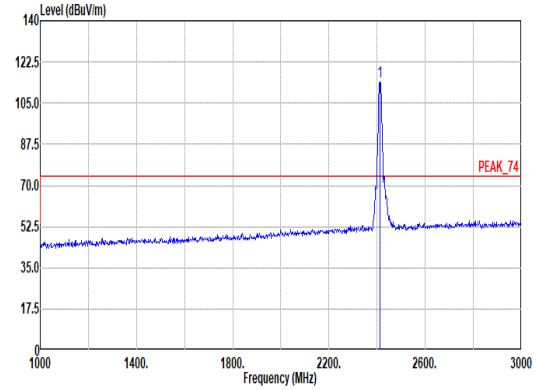
Mode	19	
	Band Edge	
	2400-2483.5_802.11b_CH01_2412MHz	
ANT	6+7	
Pol.	Horizontal	Fundamental

Peak



Site : 03CH22-HY
Condition: PEAK_BE_74 3m DRH18-E_LE2C04A18EN_240711 HORIZONTAL
: RBW:1000.000kHz VBW:3000.000kHz SWT:Auto

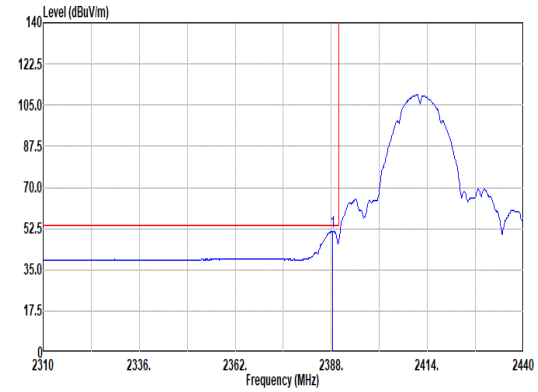
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2387.74	57.00	74.00	-17.00	44.21	26.72	8.63	32.59	10.03	102	307	PEAK



Site : 03CH22-HY
Condition: PEAK_74 3m DRH18-E_LE2C04A18EN_240711 HORIZONTAL
: RBW:1000.000kHz VBW:3000.000kHz SWT:Auto

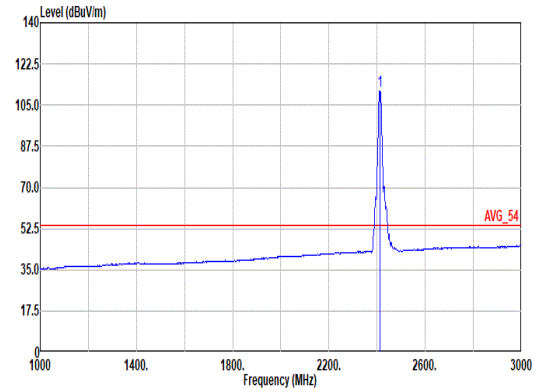
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2412.00	113.90	------	------	100.92	26.88	8.67	32.60	10.03	102	307	PEAK

Avg.



Site : 03CH22-HY
Condition: AVG_BE_54 3m DRH18-E_LE2C04A18EN_240711 HORIZONTAL
: RBW:1000.000kHz VBW:0.010kHz SWT:Auto

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2388.39	51.39	54.00	-2.61	38.60	26.72	8.63	32.59	10.03	102	307	AVERAGE

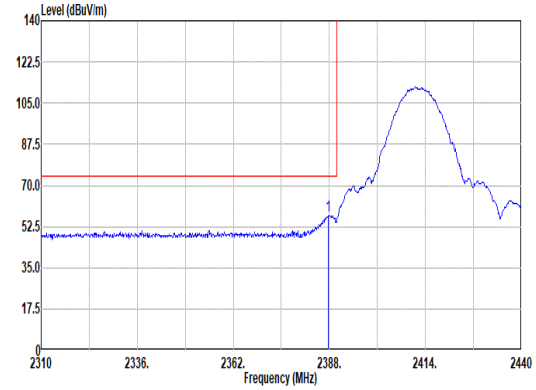


Site : 03CH22-HY
Condition: AVG_54 3m DRH18-E_LE2C04A18EN_240711 HORIZONTAL
: RBW:1000.000kHz VBW:0.010kHz SWT:Auto

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2412.00	110.86	------	------	97.86	26.90	8.67	32.60	10.03	102	307	AVERAGE

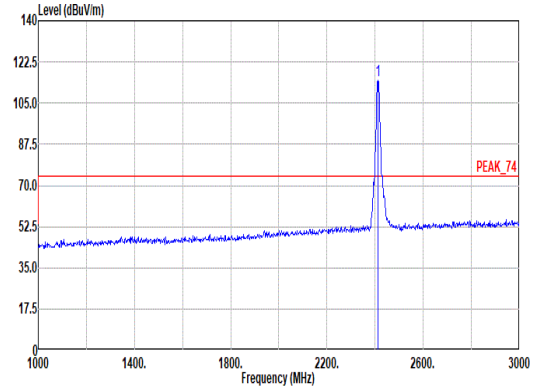
Mode	19	
	Band Edge	
	2400-2483.5_802.11b_CH01_2412MHz	
ANT	6+7	
Pol.	Vertical	Fundamental

Peak



Site : 03CH22-HY
Condition: PEAK_BE_74 3m DRH18-E_LE2C04A18EN_240711 VERTICAL
: RBW:1000.000kHz VBW:3000.000kHz SWT:Auto

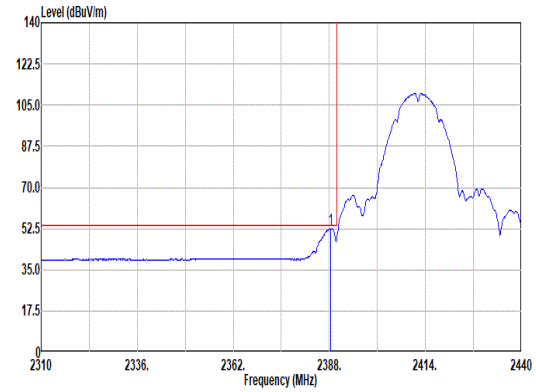
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2387.74	57.30	74.00	-16.70	44.51	26.72	8.63	32.59	10.03	100	355	PEAK



Site : 03CH22-HY
Condition: PEAK_74 3m DRH18-E_LE2C04A18EN_240711 VERTICAL
: RBW:1000.000kHz VBW:3000.000kHz SWT:Auto

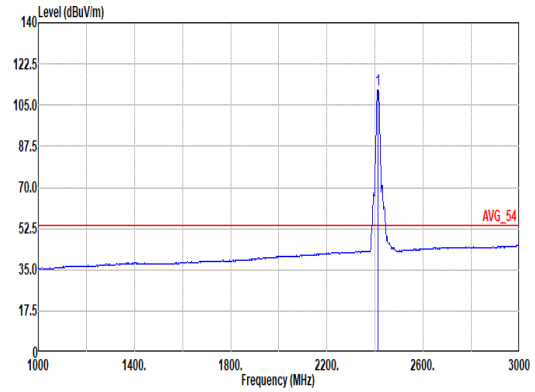
	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2412.00	114.53	------	------	101.55	26.88	8.67	32.60	10.03	100	355	PEAK

Avg.



Site : 03CH22-HY
Condition: AVG_BE_54 3m DRH18-E_LE2C04A18EN_240711 VERTICAL
: RBW:1000.000kHz VBW:0.010kHz SWT:Auto

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2388.39	52.47	54.00	-1.53	39.68	26.72	8.63	32.59	10.03	100	355	AVERAGE



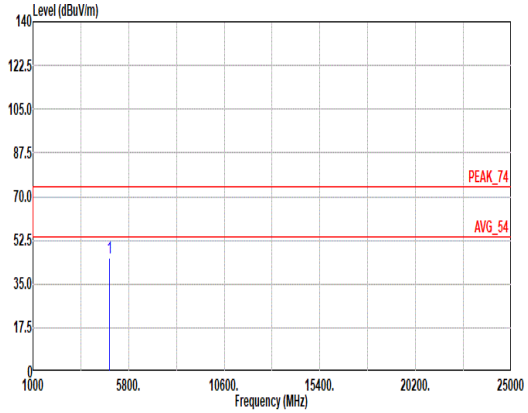
Site : 03CH22-HY
Condition: AVG_54 3m DRH18-E_LE2C04A18EN_240711 VERTICAL
: RBW:1000.000kHz VBW:0.010kHz SWT:Auto

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	2412.00	111.38	------	------	98.38	26.90	8.67	32.60	10.03	100	355	AVERAGE

Mode	19	
	Harmonic	
	2400-2483.5_802.11b_CH01_2412MHz	
ANT	6+7	
Pol.	Horizontal	Vertical

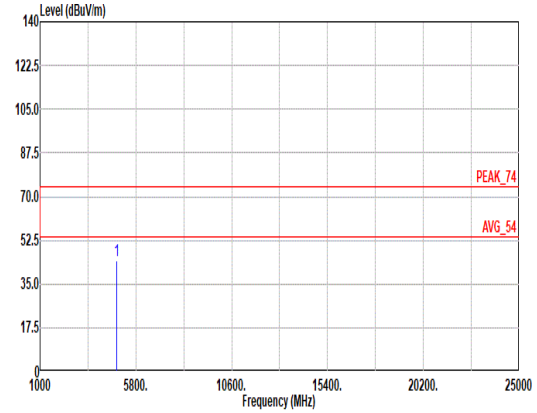
Peak

Avg.



Site : 03CH22-HY
Condition: PEAK_74 3m DRH18-E_LE2C04A18EN_240711 HORIZONTAL

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4824.00	45.23	74.00	-28.77	33.34	32.40	12.44	33.67	0.72	--	--	PEAK



Site : 03CH22-HY
Condition: PEAK_74 3m DRH18-E_LE2C04A18EN_240711 VERTICAL

	Freq	Level	Limit Line	Margin	Read Level	Ant Factor	Cable Loss	Preamp Factor	Aux Factor	APos	TPos	Remark
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB/m	dB	dB	dB	cm	deg	
1	4824.00	44.59	74.00	-29.41	32.70	32.40	12.44	33.67	0.72	--	--	PEAK