FCC RADIO TEST REPORT

FCC ID	:	**TVE-241001**
Equipment	:	**Network Security Gateway**
Brand Name	:	**FORTINET**
Model Name	:	**FortiWiFi 70G-POExxxxxxxxxx, FORTIWIFI-70G-POExxxxxxxxxx, FWF-70G-POExxxxxxxxxx, FortiWiFi 71G-POExxxxxxxxxx, FORTIWIFI-71G-POExxxxxxxxxx, FWF-71G-POExxxxxxxxxx (where "x" can be used as "0-9", or "A-Z", or "-", or blank for software changes or marketing purposes only)**
Applicant	:	**Fortinet Inc. 909 Kifer Rd., Sunnyvale, CA 94086, United States**
Manufacturer	:	**Fortinet Inc. 909 Kifer Rd., Sunnyvale, CA 94086, United States**
Standard	:	**FCC Part 15 Subpart C §15.247**

The product was received on Nov. 20, 2024 and testing was performed from Nov. 22, 2024 to Feb. 27, 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

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

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History of this test report

Report No.	Version	Description	Issue Date
FR4N1307B	01	Initial issue of report	Mar. 04, 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	-
3.6	15.207	AC Conducted Emission	Pass	-
3.7	15.203	Antenna Requirement	Pass	-

Conformity Assessment Condition:

1. 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.
2. 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: Yun Huang

Report Producer: Michelle Chen

1 General Description

1.1 Product Feature of Equipment Under Test

Product Feature
General Specs Bluetooth-LE, Wi-Fi 2.4GHz 802.11b/g/n/ax and Wi-Fi 5GHz 802.11a/n/ac/ax. **Antenna Type** WLAN: **<Ant. 1>:** Dipole Antenna **<Ant. 2>:** Dipole Antenna **<Ant. 3>:** Dipole Antenna

Antenna information		
2400 MHz ~ 2483.5 MHz	Peak Gain (dBi)	<Ant. 1>: 3.24 <Ant. 2>: 3.24 <Ant. 3>: 3.24

Remark:

1. The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.
2. Antenna 3 is used for receiving only.

Model differences description		
Model Feature	**FWF-71G-POE**	**FWF-70G-POE**
M.2 SSD	V	X

Remark: All the tests were performed with Model: FWF-71G-POE.

1.1.1 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.

Array Gain = 10 log(NANT/NSS) dB.

The directional gain "DG" is calculated as following table.

	Ant 1 (dBi)	Ant 2 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
2.4GHz	3.24	3.24	3.24	6.25	0.00	0.25

Calculation example:

If a device has two antenna, G_{ANT1}= 3.24dBi; G_{ANT2}=3.24dBi

Directional gain of power measurement = max(3.24, 3.24) + 0 = 3.24 dBi

Directional gain of PSD derived from formula which is

10 x log { { [10^ (3.24 dBi / 20) + 10^ (3.24 dBi / 20)] ^ 2 } / 2 }

= 6.25 dBi

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

PSD limit reduction = Composite gain + PSD Array gain – 6dBi, (min = 0)

<For TXBF Mode>

The EUT supports beamforming modes , then

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

Directional gain = GANT + 10 log(NANT/NSS) dBi,

where NSS = the number of independent spatial streams of data and GANT is the antenna gain in dBi

The directional gain "DG" is calculated as following table.

	Ant 1 (dBi)	Ant 2 (dBi)	DG for Power (dBi)	DG for PSD (dBi)	Power Limit Reduction (dB)	PSD Limit Reduction (dB)
2.4GHz	3.24	3.24	6.25	6.25	0.25	0.25

Calculation example:

Directional gain is derived from formula which is

10 x log { { [10^ (3.24 dBi / 20) + 10^ (3.24 dBi / 20)] ^ 2 } / 2 }

= 6.25 dBi

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

1.2 Modification of EUT

No modifications made to the EUT during the testing.

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 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.

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 two degree (Degree 0 or Degree 90), 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

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

The power for TXBF mode is smaller than CDD mode, so all other conducted and radiated test is covered by CDD mode.

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

CDD Mode

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

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

TXBF Mode

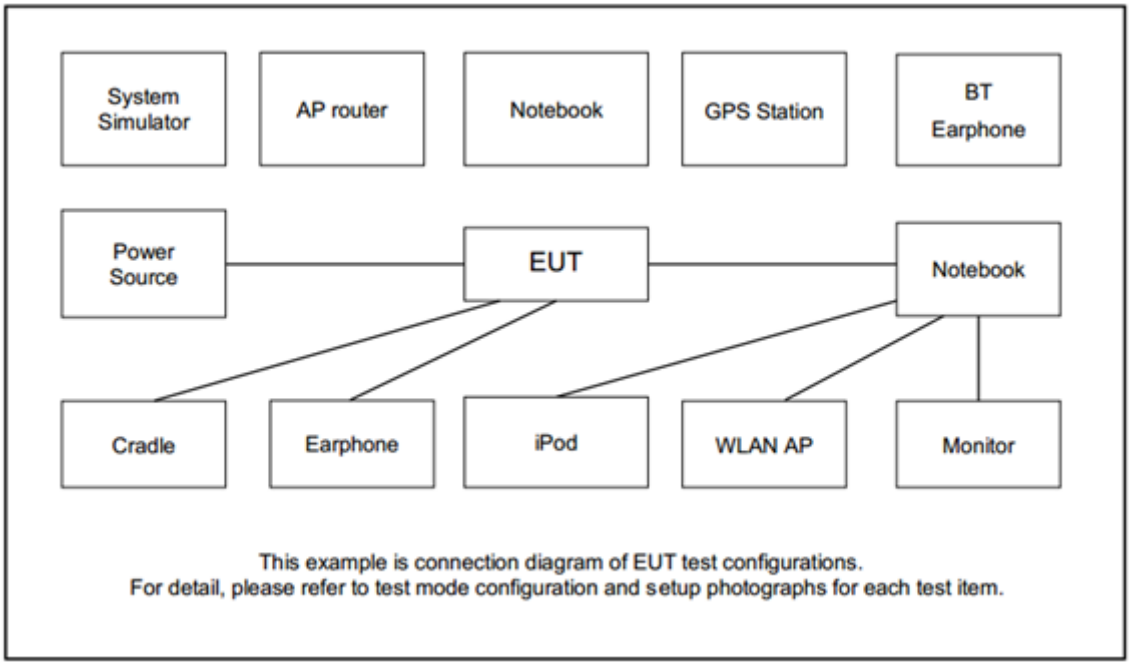
Modulation	Data Rate
802.11n HT20	MCS0
802.11n HT40	MCS0
802.11ax HE20	MCS0
802.11ax HE40	MCS0

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 :WLAN (2.4GHz) Link + Adapter

Remark:
1. The detailed radiated test modes are shown in Appendix C.
2. 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



2.4 Support Unit used in test configuration and system

Item	Equipment	Brand Name	Model Name	FCC ID	Data Cable	Power Cord
1.	WLAN AP	ASUS	RT-AC52	MSQ-RTAC4A00	N/A	Unshielded, 1.8m
2.	Notebook	DELL	Latitude 3400	FCC DoC	N/A	AC I/P：Unshielded, 1.2m DC O/P：Shielded, 1.8m
3.	Notebook	DELL	Latitude 5310	FCC DoC	N/A	AC I/P：Unshielded, 1.2m DC O/P：Shielded, 1.8m

2.5 EUT Operation Test Setup

The RF test items, utility “MT7906 QA 0.0.2.78” 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.

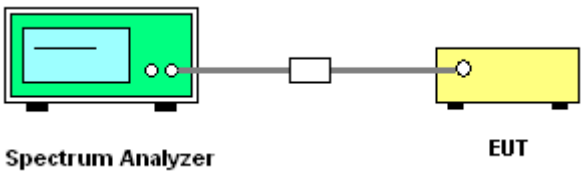
3.1.2 Measuring Instruments

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.

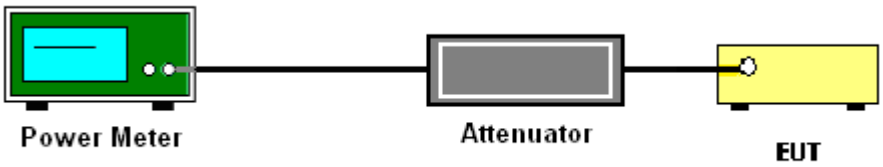
3.2.2 Measuring Instruments

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.

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.

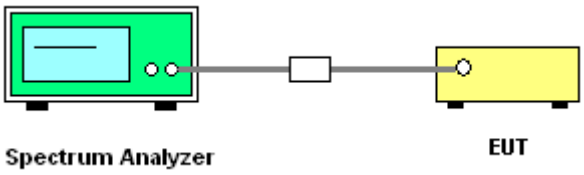
3.3.2 Measuring Instruments

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.

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.

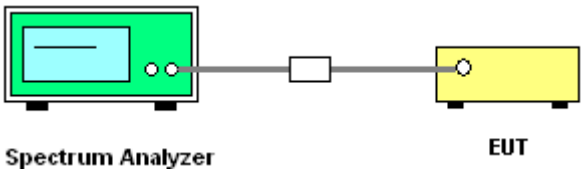
3.4.2 Measuring Instruments

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.

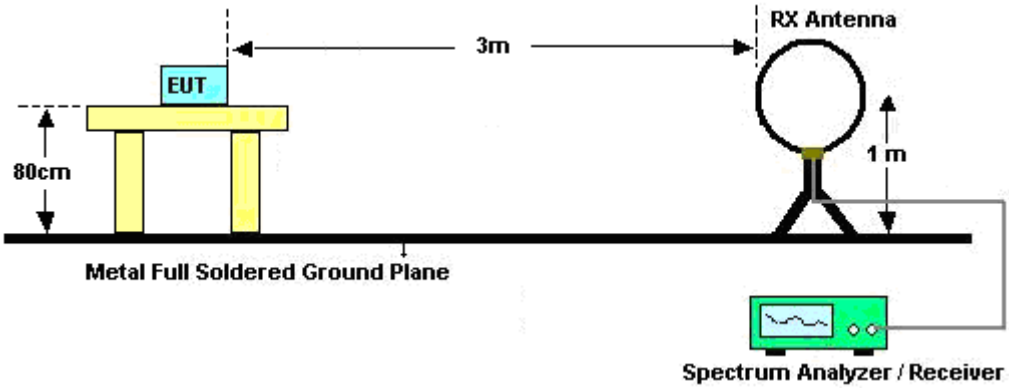
3.5.3 Test Procedures

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 “-“.

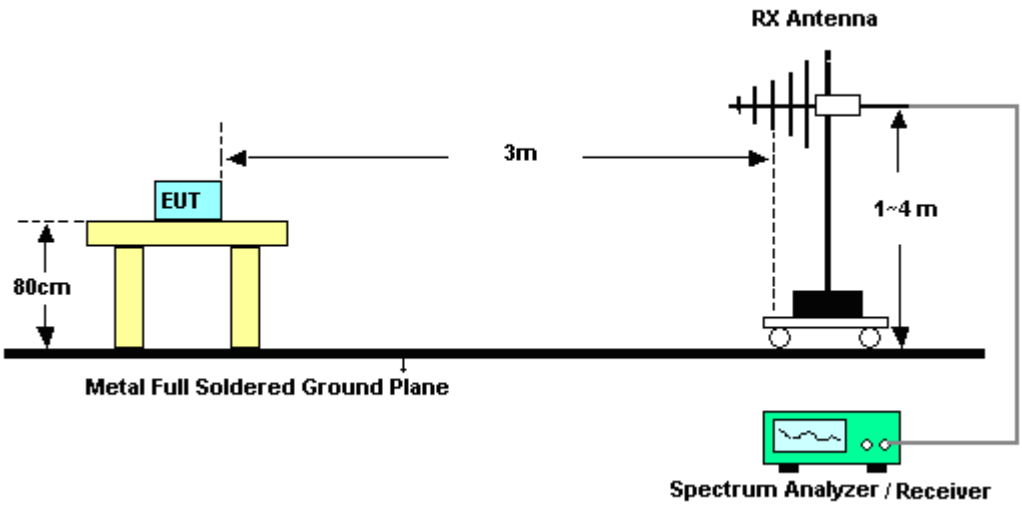
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with 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

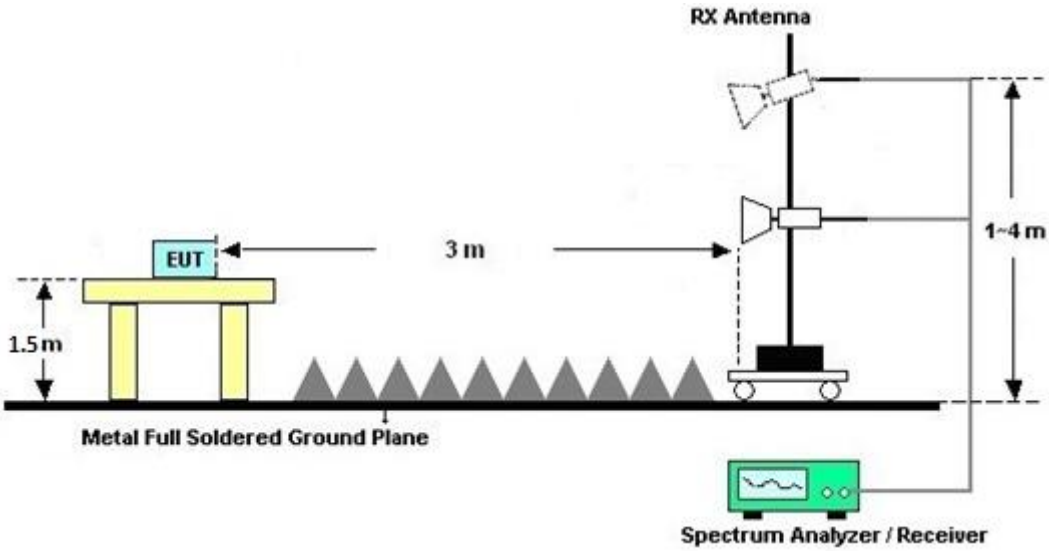
For radiated emissions below 30MHz



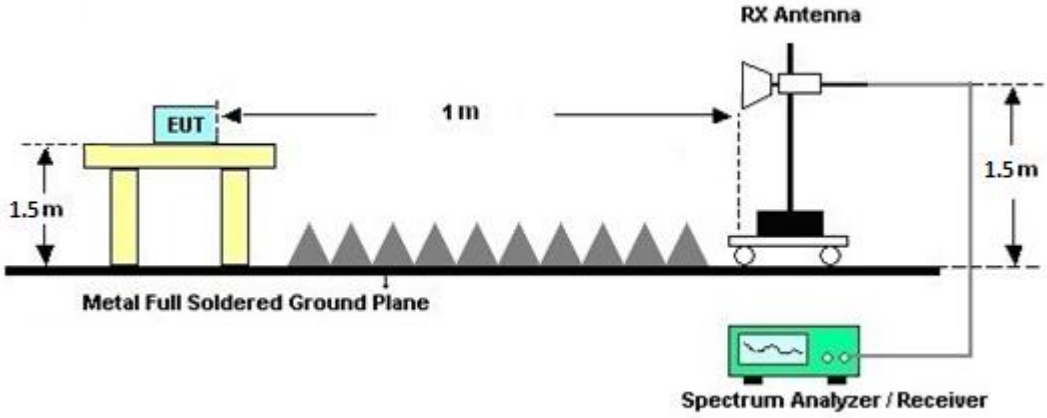
For radiated emissions from 30MHz to 1GHz



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.

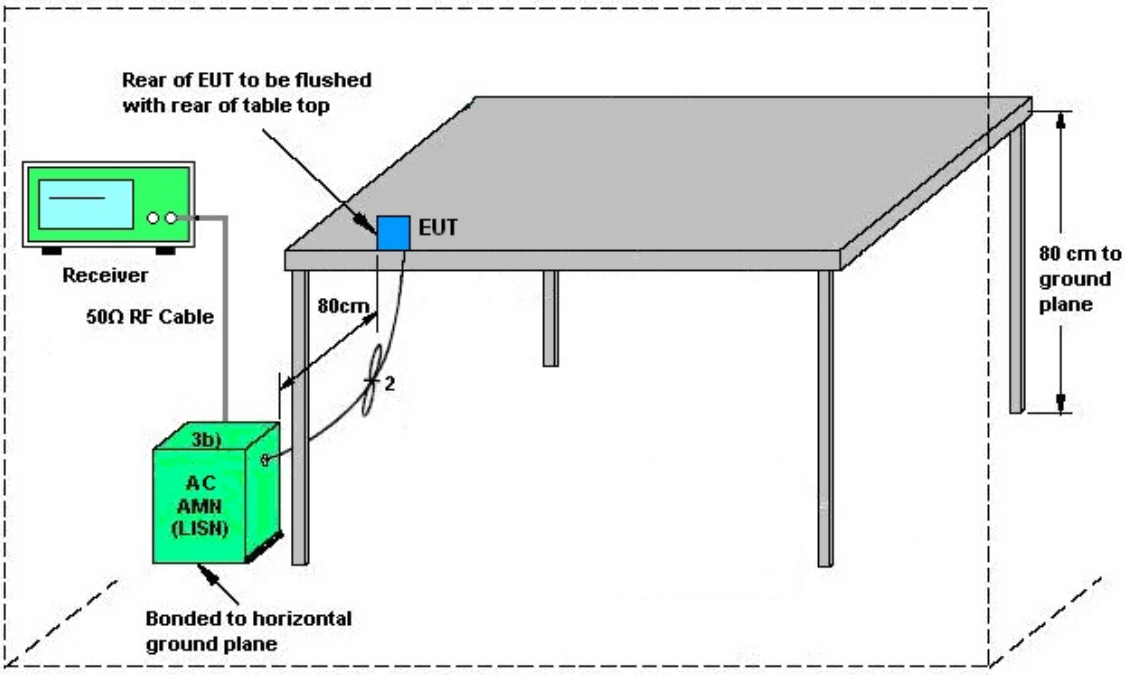
3.6.2 Measuring Instruments

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



AMN = Artificial mains network (LISN)
AE = Associated equipment
EUT = Equipment under test
ISN = Impedance stabilization network

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

Professional installation.

4 List of Measuring Equipment

Instrument	Brand Name	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
AC Power Source	ACPOWER	AFC-11003G	F317040033	N/A	N/A	Dec. 25, 2024	N/A	Conduction (CO07-HY)
Software	Rohde & Schwarz	EMC32 V10.30	N/A	N/A	N/A	Dec. 25, 2024	N/A	Conduction (CO07-HY)
Pulse Limiter	SCHWARZBECK	VTSD 9561-F N	9561-F N00373	9kHz-200MHz	Oct. 23, 2024	Dec. 25, 2024	Oct. 22, 2025	Conduction (CO07-HY)
RF Cable	HUBER + SUHNER	RG 214/U	1358175	9kHz~30MHz	Mar. 14, 2024	Dec. 25, 2024	Mar. 13, 2025	Conduction (CO07-HY)
Two-Line V-Network	TESEQ	NNB 51	45051	N/A	Mar. 10, 2024	Dec. 25, 2024	Mar. 09, 2025	Conduction (CO07-HY)
Four-Line V-Network	TESEQ	NNB 52	36122	N/A	Mar. 07, 2024	Dec. 25, 2024	Mar. 06, 2025	Conduction (CO07-HY)
EMI Test Receiver	Rohde & Schwarz	ESR3	102317	9kHz~3.6GHz	Sep. 23, 2024	Dec. 25, 2024	Sep. 22, 2025	Conduction (CO07-HY)
Hygrometer	TECPEL	DTM-303A	TP201996	N/A	Nov. 01, 2024	Nov. 22, 2024~ Feb. 27, 2025	Oct. 30, 2025	Conducted (TH05-HY)
Power Sensor	DARE	RPR3006W	17I00015SNO36 (NO:35)	10MHz~6GHz	Aug. 20, 2024	Nov. 22, 2024~ Feb. 27, 2025	Aug. 19, 2025	Conducted (TH05-HY)
Signal Analyzer	Rohde & Schwarz	FSV40	101566	10Hz~40GHz	Aug. 23, 2024	Nov. 22, 2024~ Feb. 27, 2025	Aug. 22, 2025	Conducted (TH05-HY)
Switch Control Mainframe	Burgeon	ETF-058	EC1300484 (BOX3)	N/A	May 20, 2024	Nov. 22, 2024~ Feb. 27, 2025	May 19, 2025	Conducted (TH05-HY)
Software	Sporton	BTWIFI_Final_version_240513	N/A	Conducted Other Test Item	N/A	Nov. 22, 2024~ Feb. 27, 2025	N/A	Conducted (TH05-HY)
EMI Test Receiver	Keysight	N9038A(MXE)	MY54130085	N/A	Oct. 16, 2024	Dec 18, 2024~ Feb. 25, 2025	Oct. 15, 2025	Radiation (03CH20-HY)
Loop Antenna	Rohde & Schwarz	HFH2-Z2	100488	9 kHz~30 MHz	Aug. 29, 2024	Dec 18, 2024~ Feb. 25, 2025	Aug. 28, 2025	Radiation (03CH20-HY)
Preamplifier	EMEC	EM18G40G	060801	18GHz~40GHz	May 27, 2024	Dec 18, 2024~ Feb. 25, 2025	May 26, 2025	Radiation (03CH20-HY)
Controller	ChainTek	3000-1	N/A	Control Turn table & Ant Mast	N/A	Dec 18, 2024~ Feb. 25, 2025	N/A	Radiation (03CH20-HY)
Antenna Mast	ChainTek	MBS-520-1	N/A	1m~4m	N/A	Dec 18, 2024~ Feb. 25, 2025	N/A	Radiation (03CH20-HY)
Turn Table	ChainTek	T-200-S-1	N/A	0~360 Degree	N/A	Dec 18, 2024~ Feb. 25, 2025	N/A	Radiation (03CH20-HY)
Signal Analyzer	Keysight	N9010B	MY60240520	N/A	Dec. 09, 2024	Dec 18, 2024~ Feb. 25, 2025	Dec. 08, 2025	Radiation (03CH20-HY)
Bilog Antenna	TESEQ	CBL 6111D&00802N1D01N-06	55606 & 08	30MHz~1GHz	Nov. 27, 2024	Dec 18, 2024~ Feb. 25, 2025	Nov. 26, 2025	Radiation (03CH20-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	02360	1GHz-18GHz	Nov. 01, 2024	Dec 18, 2024~ Feb. 25, 2025	Oct. 31, 2025	Radiation (03CH20-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	1224	18GHz-40GHz	Jun. 24, 2024	Dec 18, 2024~ Feb. 25, 2025	Jun. 23, 2025	Radiation (03CH20-HY)
Preamplifier	COM-POWER	PAM-103	18020201	1MHz-1000MHz	Dec. 31, 2024	Dec 18, 2024~ Feb. 25, 2025	Dec. 30, 2025	Radiation (03CH20-HY)
Amplifier	EMCI	EMC118A45SE	980792	N/A	Nov. 12, 2024	Dec 18, 2024~ Feb. 25, 2025	Nov. 11, 2025	Radiation (03CH20-HY)
RF Cable	HUBER + SUHNER	SUCOFLEX 102	519229/2,804015/2,804027/2	N/A	Jan. 16, 2025	Dec 18, 2024~ Feb. 25, 2025	Jan. 15, 2026	Radiation (03CH20-HY)
Hygrometer	TECPEL	DTM-303A	TP211382	N/A	Mar. 27, 2024	Dec 18, 2024~ Feb. 25, 2025	Mar. 26, 2025	Radiation (03CH20-HY)
Software	Audix	N/A	RK-002156	N/A	N/A	Dec 18, 2024~ Feb. 25, 2025	N/A	Radiation (03CH20-HY)

5 Measurement Uncertainty

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

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))	6.7 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.4 dB

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.6 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:	Benny Ku	Temperature:	21~25	°C
Test Date:	2024/11/22~2025/2/27	Relative Humidity:	51~54	%

<CDD Mode>

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
					Ant1	Ant2	Ant1	Ant2		
11b	1Mbps	2	1	2412	12.52	12.47	8.05	7.52	0.50	Pass
11b	1Mbps	2	6	2437	12.82	13.22	8.03	8.04	0.50	Pass
11b	1Mbps	2	11	2462	12.63	12.59	8.05	8.05	0.50	Pass
11g	6Mbps	2	1	2412	17.34	17.75	15.76	16.29	0.50	Pass
11g	6Mbps	2	6	2437	17.28	17.79	15.65	16.27	0.50	Pass
11g	6Mbps	2	11	2462	17.05	16.86	15.91	16.28	0.50	Pass
HT20	MCS0	2	1	2412	18.18	18.11	16.28	17.55	0.50	Pass
HT20	MCS0	2	6	2437	18.23	18.37	16.53	17.55	0.50	Pass
HT20	MCS0	2	11	2462	18.21	17.90	16.86	17.15	0.50	Pass
HT40	MCS0	2	3	2422	36.78	36.51	35.10	35.08	0.50	Pass
HT40	MCS0	2	6	2437	36.82	36.76	35.11	35.10	0.50	Pass
HT40	MCS0	2	9	2452	37.15	36.98	35.10	35.09	0.50	Pass

Report Number : FR4N1307B

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
					Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
11b	1Mbps	2	1	2412	20.25	20.16	23.22	30.00		3.24		26.46		36.00		Pass
11b	1Mbps	2	6	2437	22.30	21.68	25.01	30.00		3.24		28.25		36.00		Pass
11b	1Mbps	2	11	2462	20.30	19.68	23.01	30.00		3.24		26.25		36.00		Pass
11g	6Mbps	2	1	2412	16.17	16.05	19.12	30.00		3.24		22.36		36.00		Pass
11g	6Mbps	2	2	2417	18.44	18.27	21.37	30.00		3.24		24.61		36.00		Pass
11g	6Mbps	2	6	2437	19.52	19.58	22.56	30.00		3.24		25.80		36.00		Pass
11g	6Mbps	2	10	2457	17.02	17.06	20.05	30.00		3.24		23.29		36.00		Pass
11g	6Mbps	2	11	2462	16.88	16.48	19.69	30.00		3.24		22.93		36.00		Pass
HT20	MCS0	2	1	2412	16.27	16.22	19.26	30.00		3.24		22.50		36.00		Pass
HT20	MCS0	2	6	2437	19.08	19.13	22.12	30.00		3.24		25.36		36.00		Pass
HT20	MCS0	2	11	2462	16.46	15.99	19.24	30.00		3.24		22.48		36.00		Pass
HT40	MCS0	2	3	2422	14.10	13.87	17.00	30.00		3.24		20.24		36.00		Pass
HT40	MCS0	2	6	2437	15.93	15.86	18.91	30.00		3.24		22.15		36.00		Pass
HT40	MCS0	2	9	2452	15.45	15.43	18.45	30.00		3.24		21.69		36.00		Pass

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

Report Number : FR4N1307B

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
					Ant1	Ant2	Worse + 3.01	Ant1	Ant2	Ant1	Ant2	
11b	1Mbps	2	1	2412	-1.38	-1.62	1.63	6.25		7.75		Pass
11b	1Mbps	2	6	2437	-0.54	-0.58	2.47	6.25		7.75		Pass
11b	1Mbps	2	11	2462	-1.42	-2.18	1.59	6.25		7.75		Pass
11g	6Mbps	2	1	2412	-8.23	-9.42	-5.22	6.25		7.75		Pass
11g	6Mbps	2	2	2417	-7.08	-6.43	-3.42	6.25		7.75		Pass
11g	6Mbps	2	6	2437	-5.08	-5.13	-2.07	6.25		7.75		Pass
11g	6Mbps	2	10	2457	-7.91	-7.53	-4.52	6.25		7.75		Pass
11g	6Mbps	2	11	2462	-8.00	-8.74	-4.99	6.25		7.75		Pass
HT20	MCS0	2	1	2412	-9.14	-9.55	-6.13	6.25		7.75		Pass
HT20	MCS0	2	6	2437	-6.97	-6.47	-3.46	6.25		7.75		Pass
HT20	MCS0	2	11	2462	-8.57	-9.75	-5.56	6.25		7.75		Pass
HT40	MCS0	2	3	2422	-14.65	-14.74	-11.64	6.25		7.75		Pass
HT40	MCS0	2	6	2437	-12.78	-12.54	-9.53	6.25		7.75		Pass
HT40	MCS0	2	9	2452	-12.25	-12.10	-9.09	6.25		7.75		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
						Ant1	Ant2	Ant1	Ant2		
HE20	MCS0	2	1	2412	Full	18.94	18.96	18.55	18.09	0.50	Pass
HE20	MCS0	2	6	2437	Full	19.17	19.24	18.57	18.02	0.50	Pass
HE20	MCS0	2	11	2462	Full	19.13	19.08	18.38	18.04	0.50	Pass
HE40	MCS0	2	3	2422	Full	37.95	37.88	36.30	35.08	0.50	Pass
HE40	MCS0	2	6	2437	Full	37.95	37.98	36.28	35.53	0.50	Pass
HE40	MCS0	2	9	2452	Full	38.13	38.25	35.08	35.08	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
						Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	2	1	2412	Full	15.72	15.69	18.72	30.00		3.24		21.96		36.00		Pass
HE20	MCS0	2	6	2437	Full	18.57	18.65	21.62	30.00		3.24		24.86		36.00		Pass
HE20	MCS0	2	10	2457	Full	16.70	16.69	19.71	30.00		3.24		22.95		36.00		Pass
HE20	MCS0	2	11	2462	Full	16.09	15.59	18.86	30.00		3.24		22.10		36.00		Pass
HE40	MCS0	2	3	2422	Full	14.62	14.48	17.56	30.00		3.24		20.80		36.00		Pass
HE40	MCS0	2	6	2437	Full	15.64	15.58	18.62	30.00		3.24		21.86		36.00		Pass
HE40	MCS0	2	9	2452	Full	15.22	15.13	18.19	30.00		3.24		21.43		36.00		Pass

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

Report Number : FR4N1307B

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
						Ant1	Ant2	Worse + 3.01	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	2	1	2412	Full	-10.43	-10.41	-7.40	6.25		7.75		Pass
HE20	MCS0	2	6	2437	Full	-7.90	-7.49	-4.48	6.25		7.75		Pass
HE20	MCS0	2	10	2457	Full	-8.64	-9.80	-5.63	6.25		7.75		Pass
HE20	MCS0	2	11	2462	Full	-7.70	-9.80	-4.69	6.25		7.75		Pass
HE40	MCS0	2	3	2422	Full	-14.56	-13.23	-10.22	6.25		7.75		Pass
HE40	MCS0	2	6	2437	Full	-12.78	-13.15	-9.77	6.25		7.75		Pass
HE40	MCS0	2	9	2452	Full	-13.61	-12.79	-9.78	6.25		7.75		Pass

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

Report Number : FR4N1307B

<TXBF Mode>

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
					Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HT20	MCS0	2	1	2412	15.97	15.92	18.96	29.75		6.25		25.21		36.00		Pass
HT20	MCS0	2	6	2437	18.98	19.03	22.02	29.75		6.25		28.27		36.00		Pass
HT20	MCS0	2	11	2462	16.36	15.89	19.14	29.75		6.25		25.39		36.00		Pass
HT40	MCS0	2	3	2422	14.00	13.77	16.90	29.75		6.25		23.15		36.00		Pass
HT40	MCS0	2	6	2437	15.83	15.76	18.81	29.75		6.25		25.06		36.00		Pass
HT40	MCS0	2	9	2452	15.35	15.33	18.35	29.75		6.25		24.60		36.00		Pass

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

TEST RESULTS DATA
Average Output Power

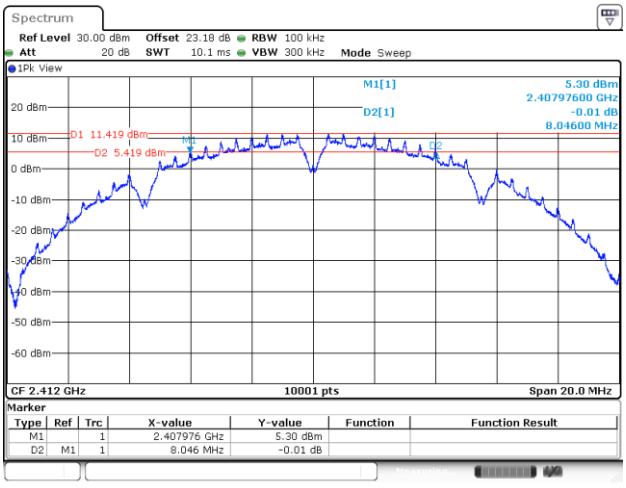
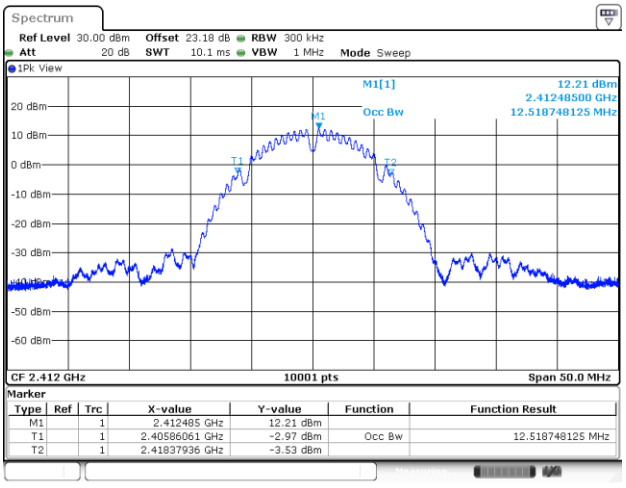
2.4GHz Band MIMO																		
Mod.	Data Rate	NTX	CH.	Freq. (MHz)	RU Config.	Average Conducted Power (dBm)			Conducted Power Limit (dBm)		DG (dBi)		EIRP Power (dBm)		EIRP Power Limit (dBm)		Pass /Fail
						Ant1	Ant2	SUM	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	Ant1	Ant2	
HE20	MCS0	2	1	2412	Full	15.62	15.59	18.62	29.75		6.25		24.87		36.00		Pass
HE20	MCS0	2	6	2437	Full	18.47	18.55	21.52	29.75		6.25		27.77		36.00		Pass
HE20	MCS0	2	10	2457	Full	16.60	16.59	19.61	29.75		6.25		25.86		36.00		Pass
HE20	MCS0	2	11	2462	Full	15.99	15.49	18.76	29.75		6.25		25.01		36.00		Pass
HE40	MCS0	2	3	2422	Full	14.52	14.38	17.46	29.75		6.25		23.71		36.00		Pass
HE40	MCS0	2	6	2437	Full	15.54	15.48	18.52	29.75		6.25		24.77		36.00		Pass
HE40	MCS0	2	9	2452	Full	15.12	15.03	18.09	29.75		6.25		24.34		36.00		Pass

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

<CDD Mode>

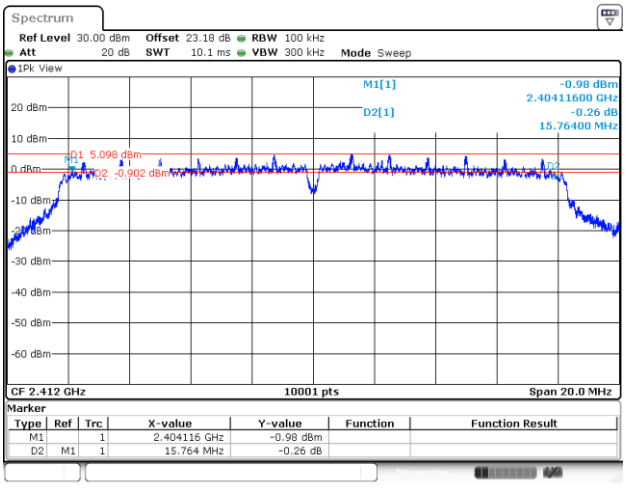
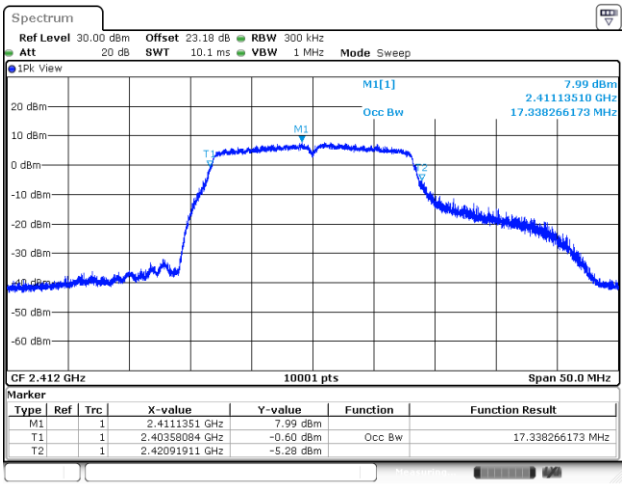
6dB and 99% Occupied Bandwidth

<802.11b>

6dB Bandwidth	99% Occupied Bandwidth
	

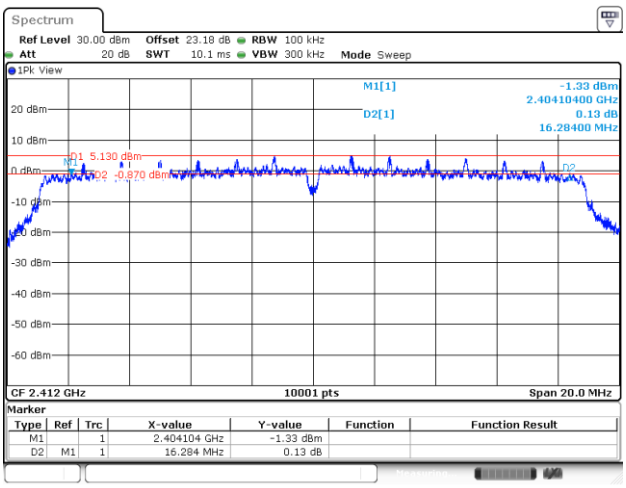
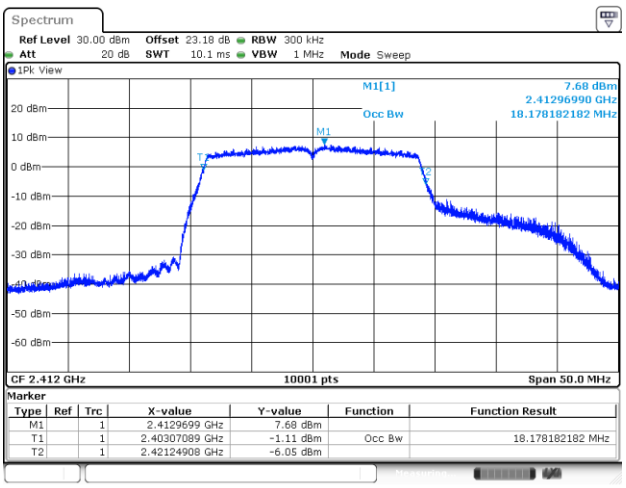
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

<802.11g>

6dB Bandwidth	99% Occupied Bandwidth
	

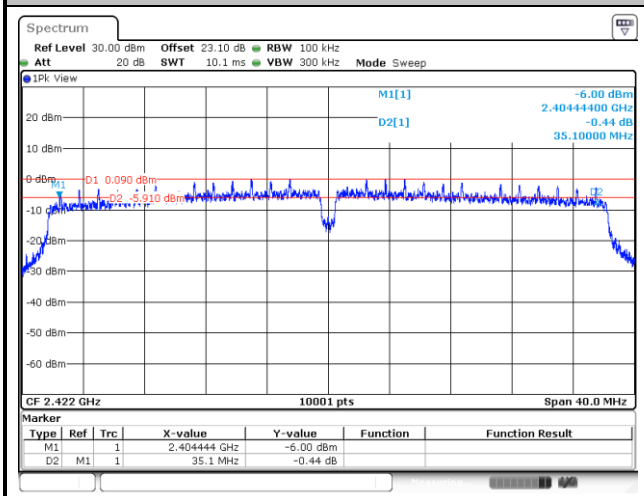
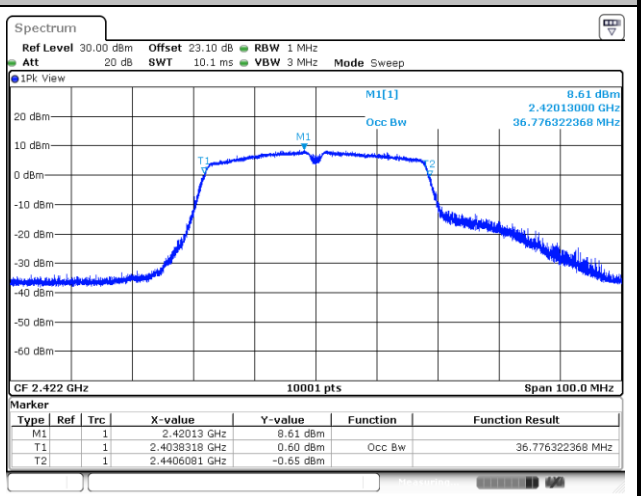
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

<802.11n HT20>

6dB Bandwidth	99% Occupied Bandwidth
	

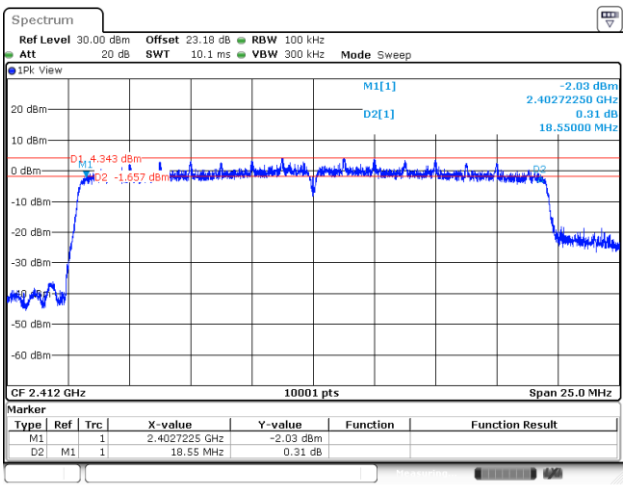
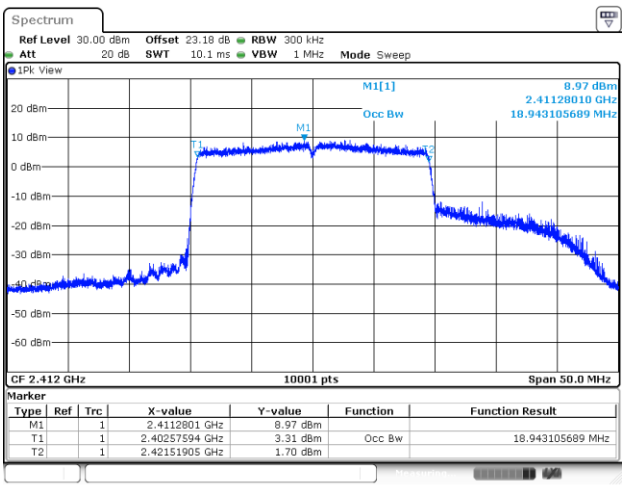
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

<802.11n HT40>

6dB Bandwidth	99% Occupied Bandwidth
	

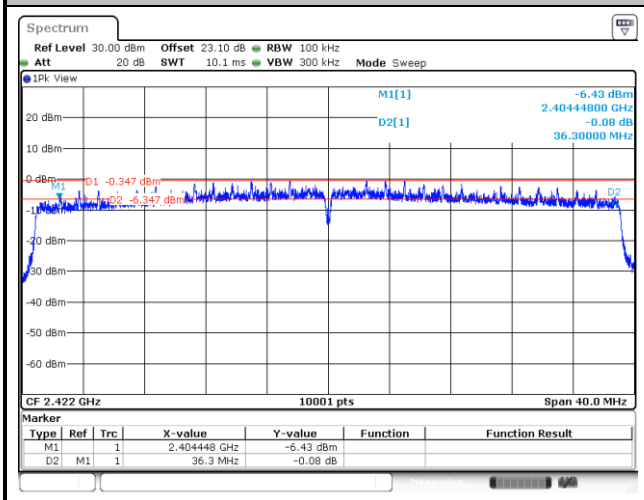
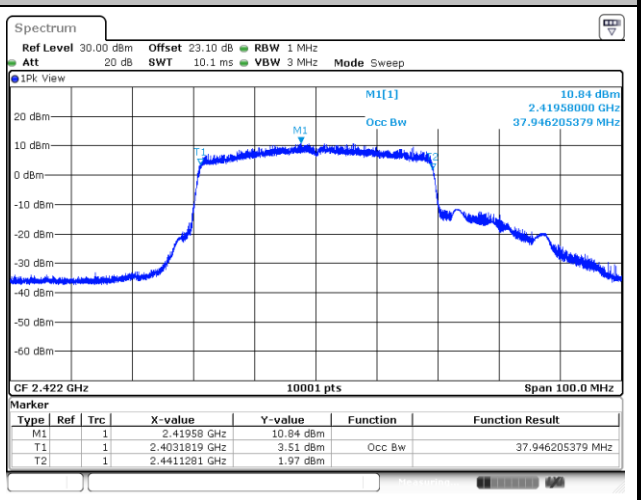
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

<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.

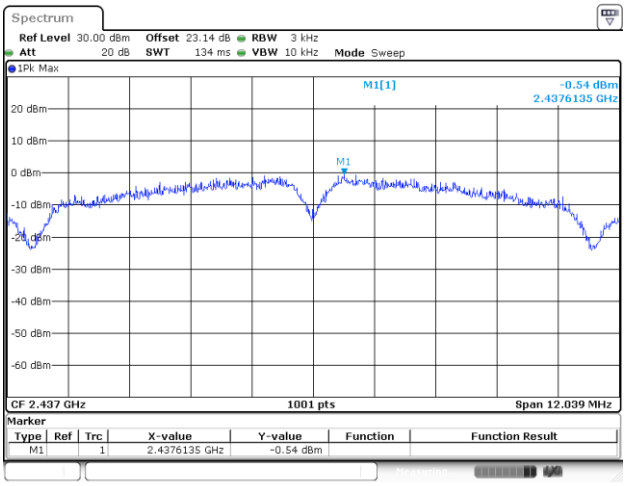
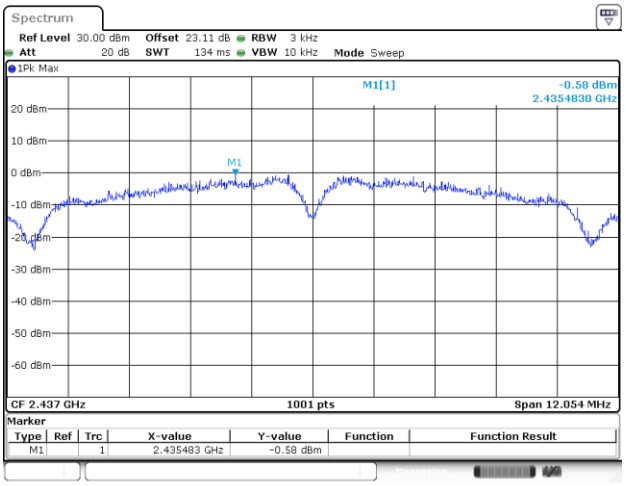
<802.11ax HE40>

6dB Bandwidth	99% Occupied Bandwidth
	

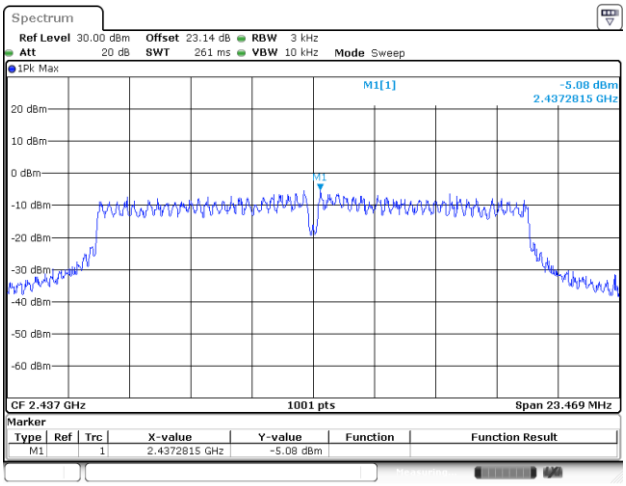
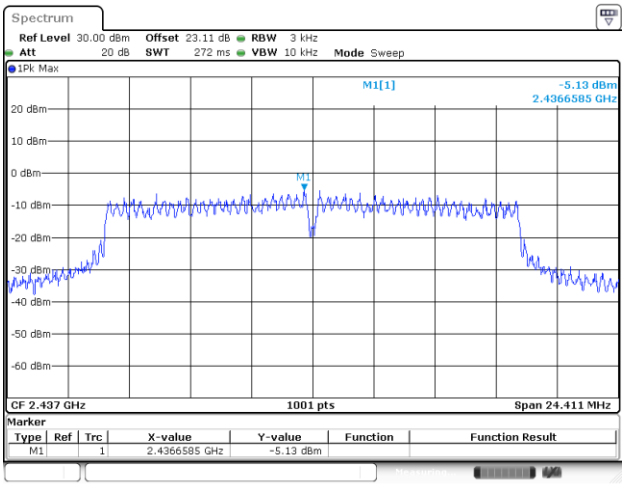
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

Power Spectral Density(dBm/3kHz)

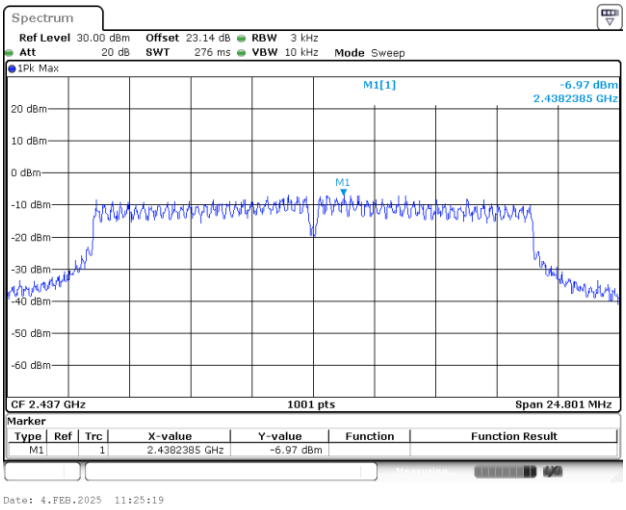
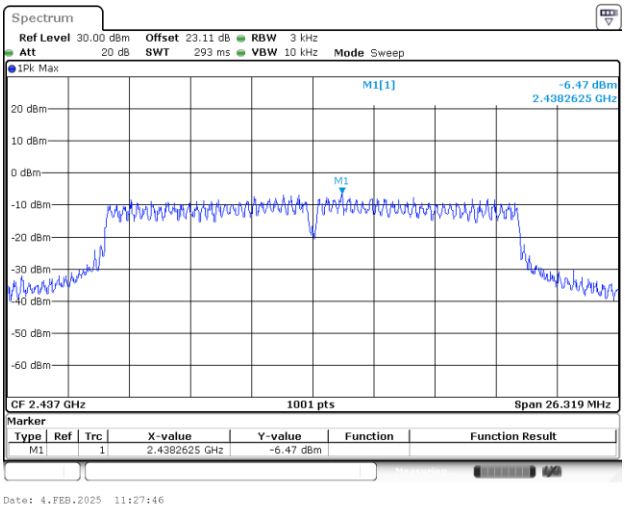
<802.11b>

Maximum Power Density Plot (dBm/3kHz)	
MIMO Ant 1	**MIMO Ant 2**
	

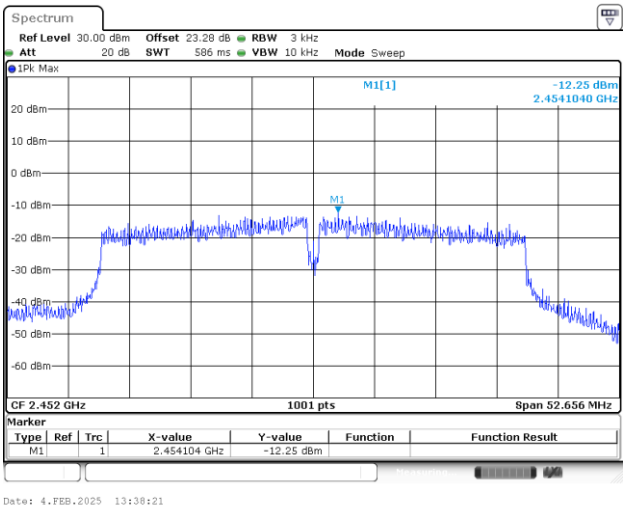
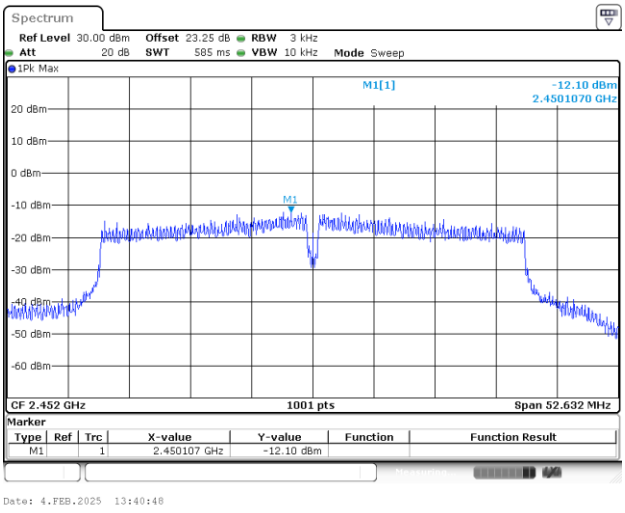
<802.11g>

Maximum Power Density Plot (dBm/3kHz)	
MIMO Ant 1	**MIMO Ant 2**
	

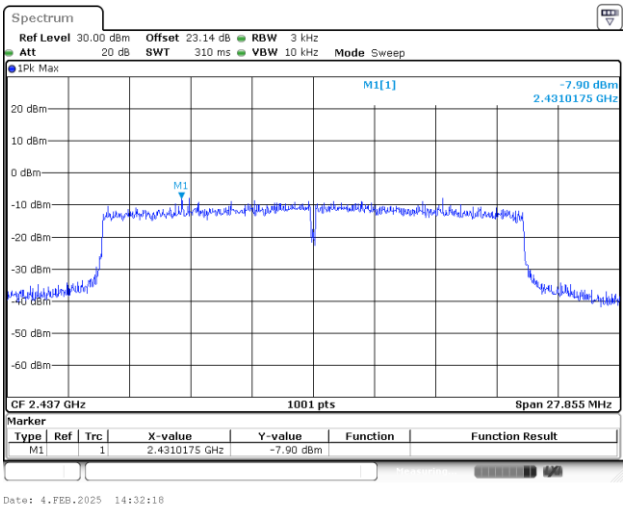
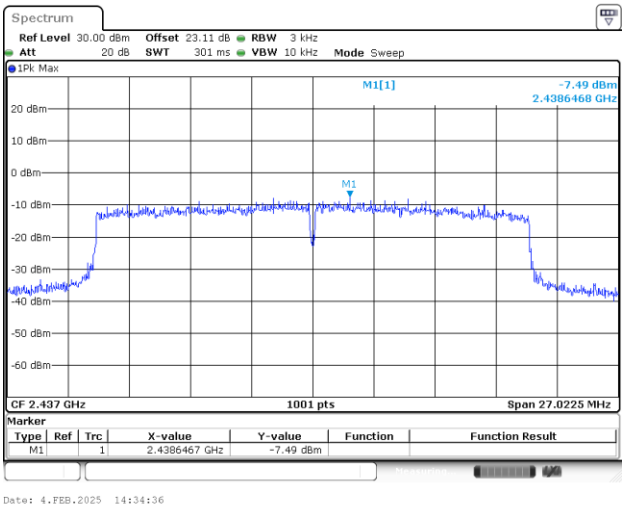
<802.11n HT20>

Maximum Power Density Plot (dBm/3kHz)	
MIMO Ant 1	**MIMO Ant 2**
	

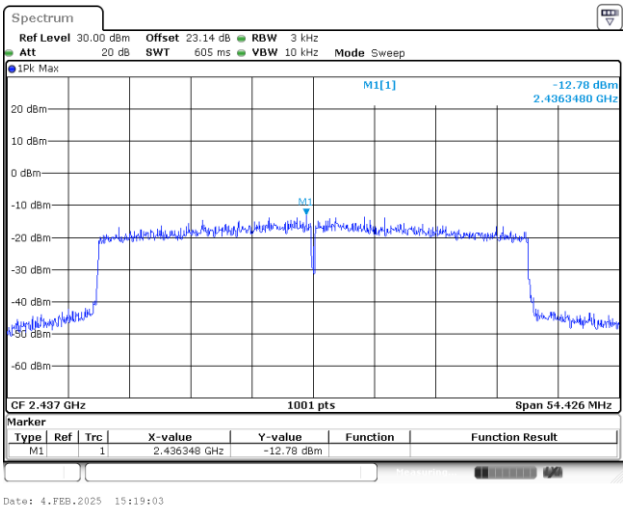
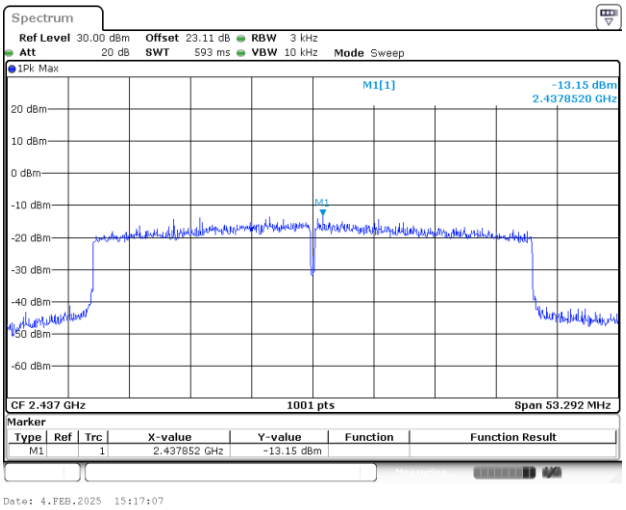
<802.11n HT40>

Maximum Power Density Plot (dBm/3kHz)	
MIMO Ant 1	**MIMO Ant 2**
	

<802.11ax HE20>

Maximum Power Density Plot (dBm/3kHz)	
MIMO Ant 1	**MIMO Ant 2**
	

<802.11ax HE40>

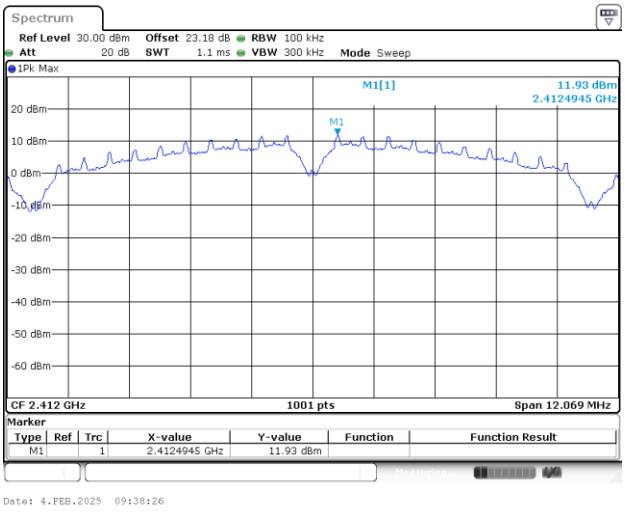
Maximum Power Density Plot (dBm/3kHz)	
MIMO Ant 1	**MIMO Ant 2**
	

Band Edges and Spurious Emission

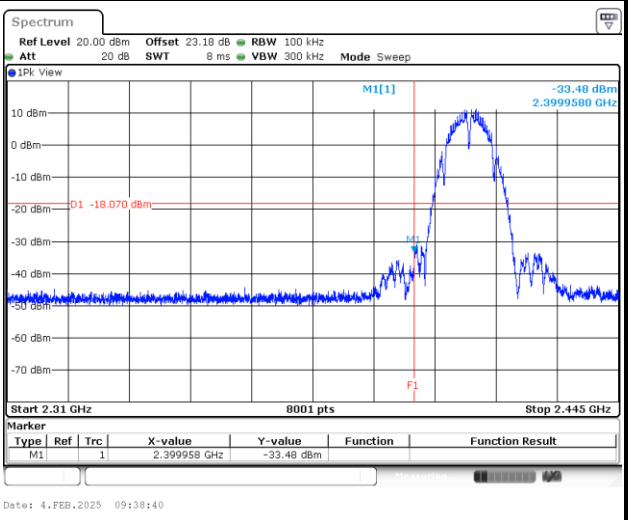
Number of TX = 2, Ant. 1 (Measured)

Test Mode :	802.11b	Test Channel :	01

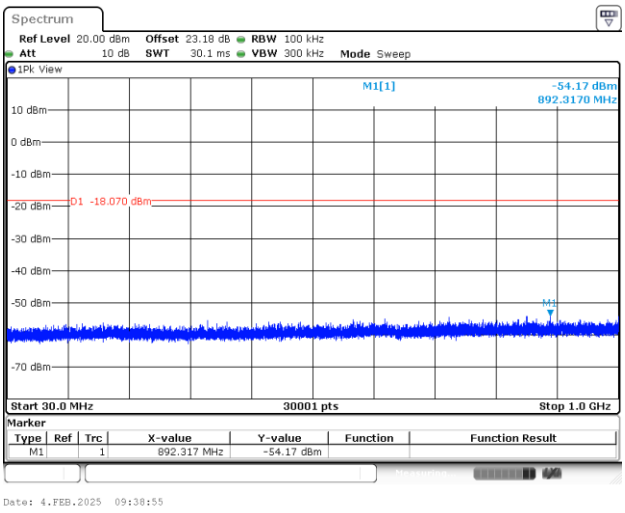
100kHz PSD reference Level



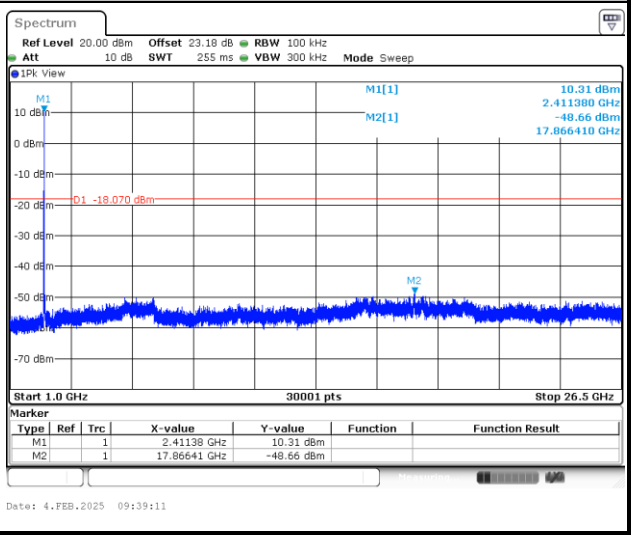
Channel 01 Plot



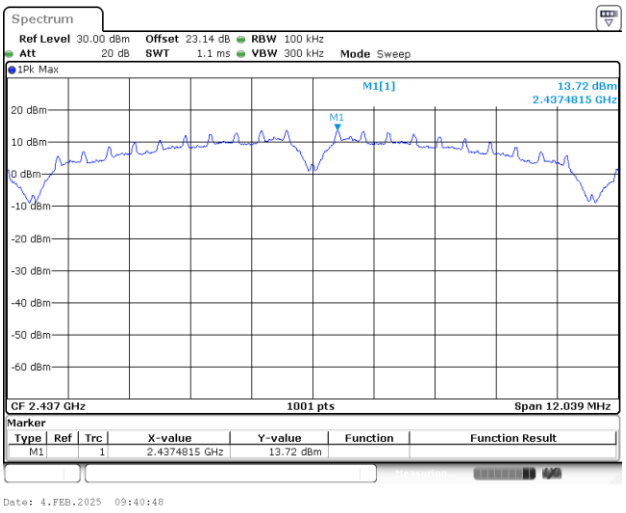
Spurious Emission 30MHz~1GHz

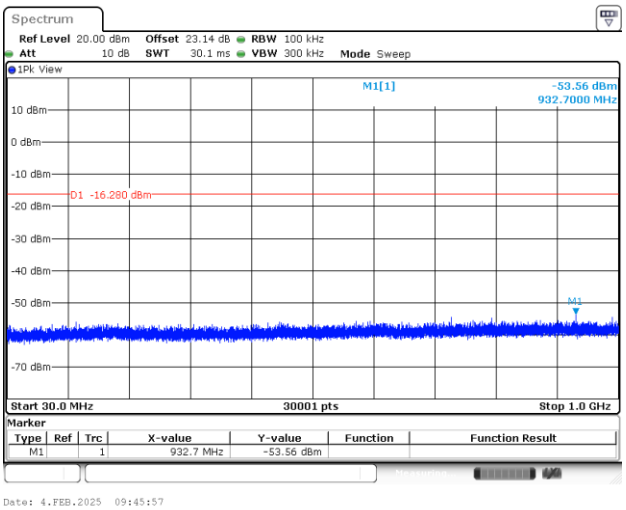
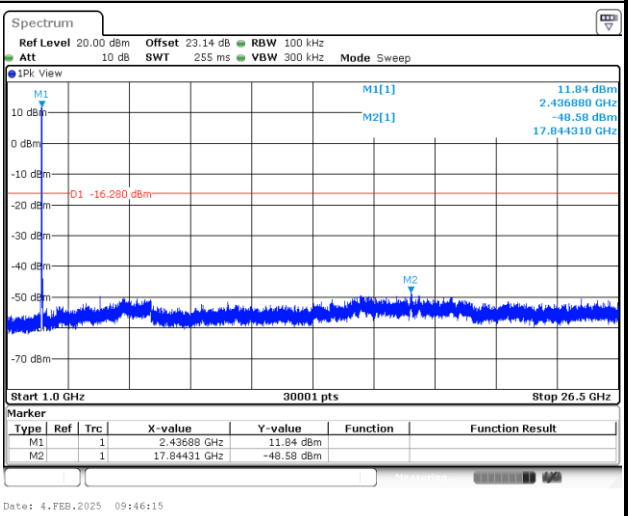


Spurious Emission 1GHz~26.5GHz

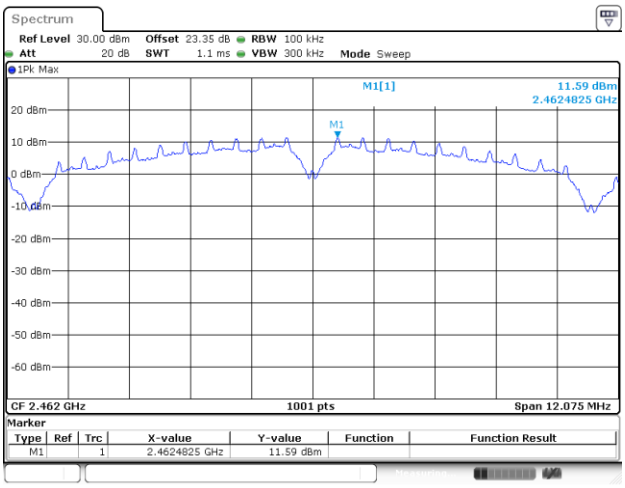
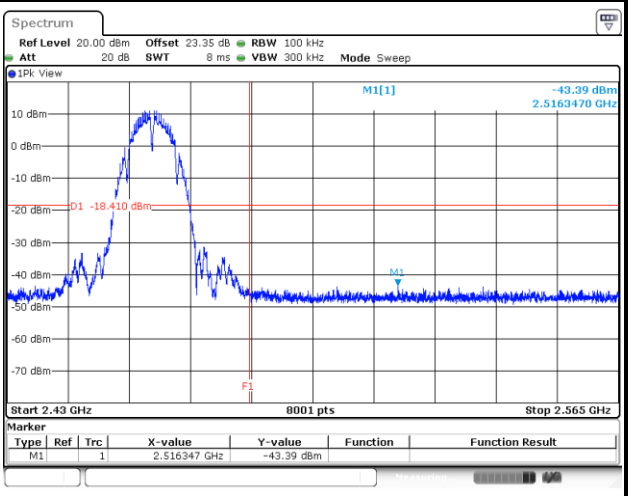
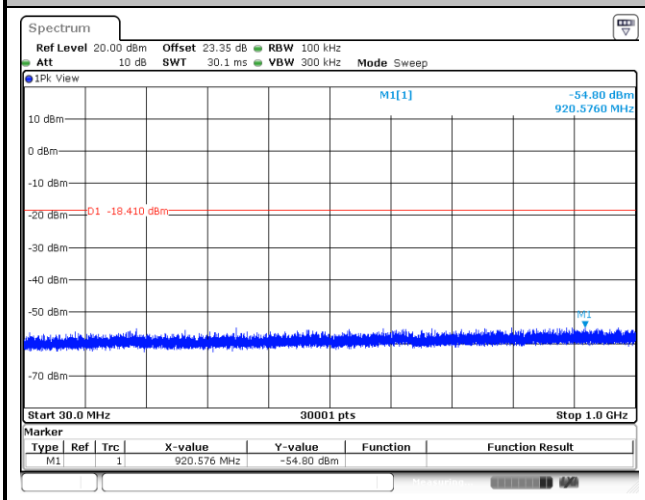
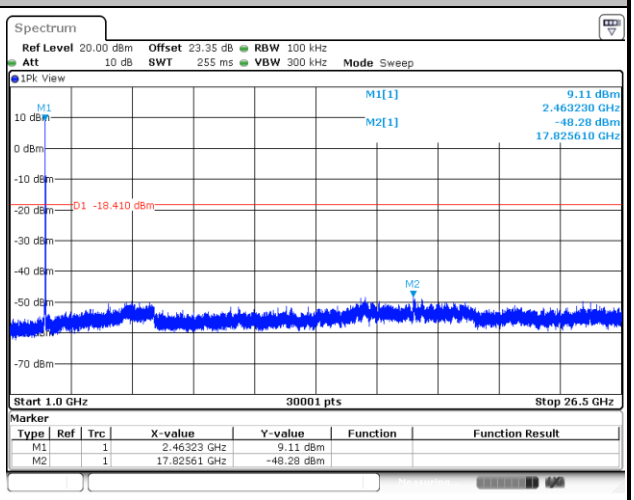


Test Mode :	802.11b	Test Channel :	06

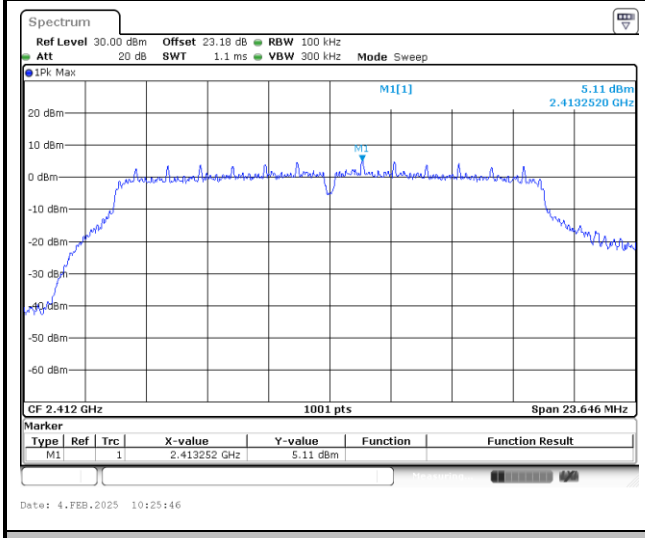
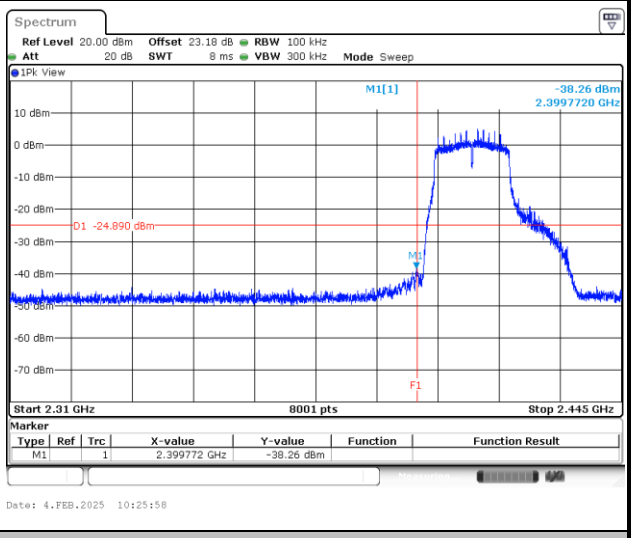
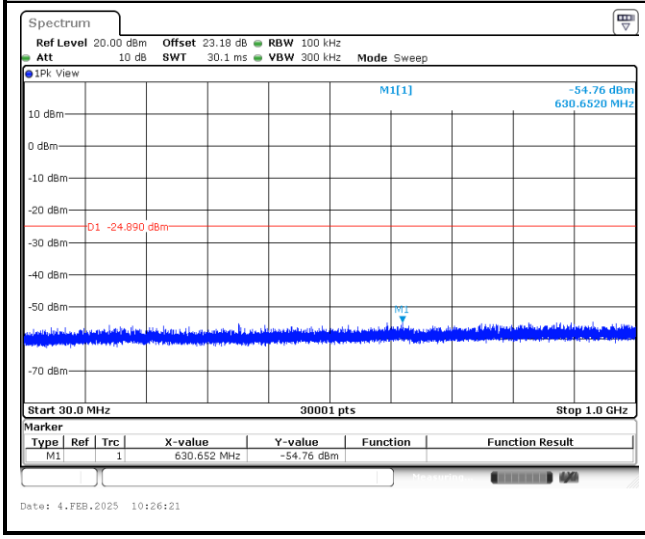
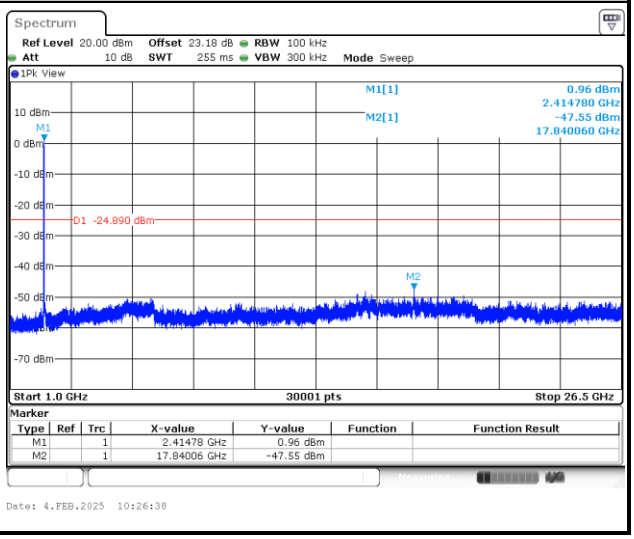
100kHz PSD reference Level	Channel 06 Plot
	

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

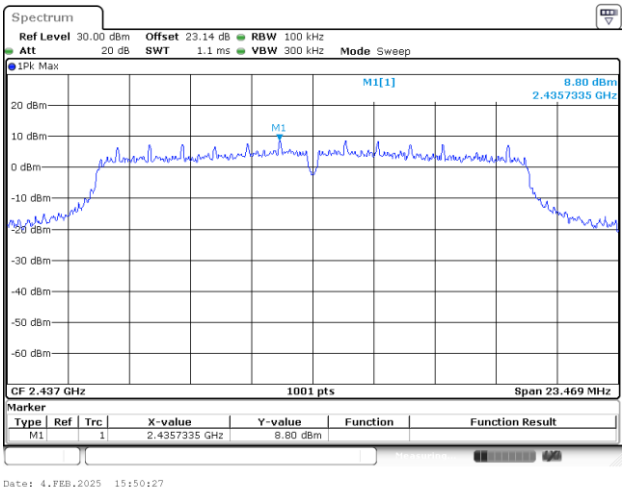
Test Mode :	802.11b	Test Channel :	11

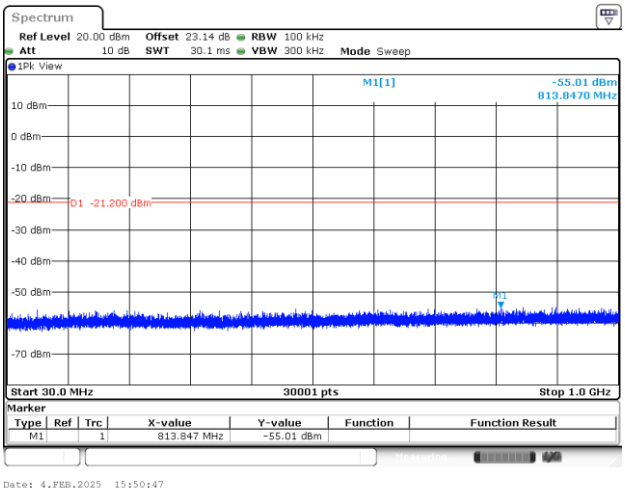
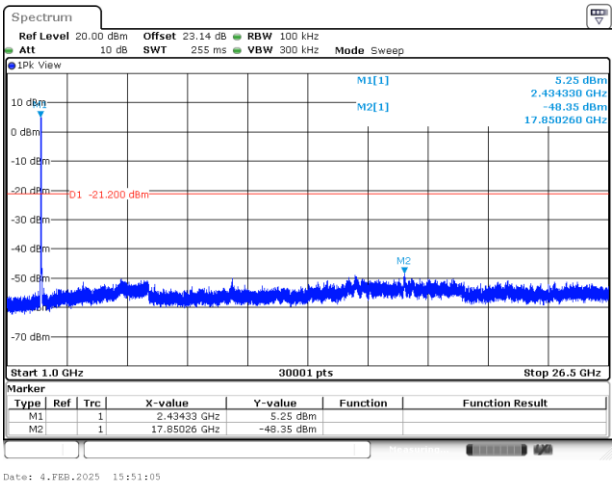
100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11g	Test Channel :	01

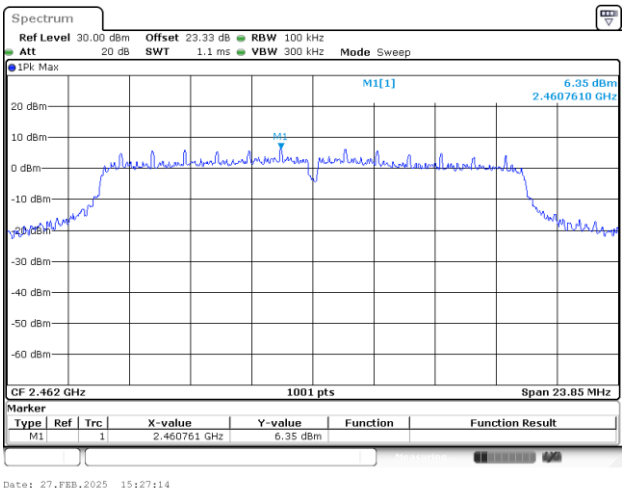
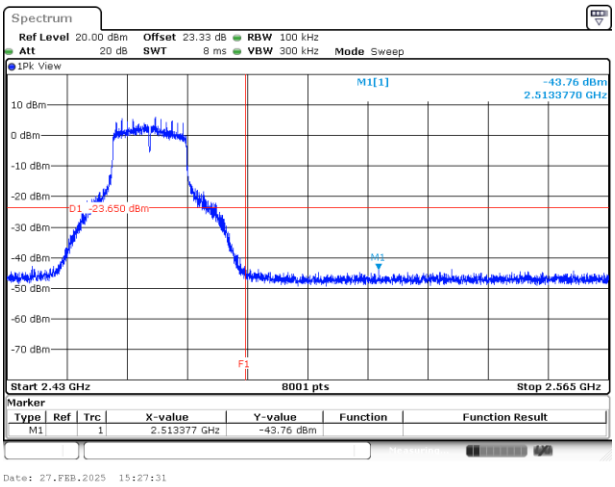
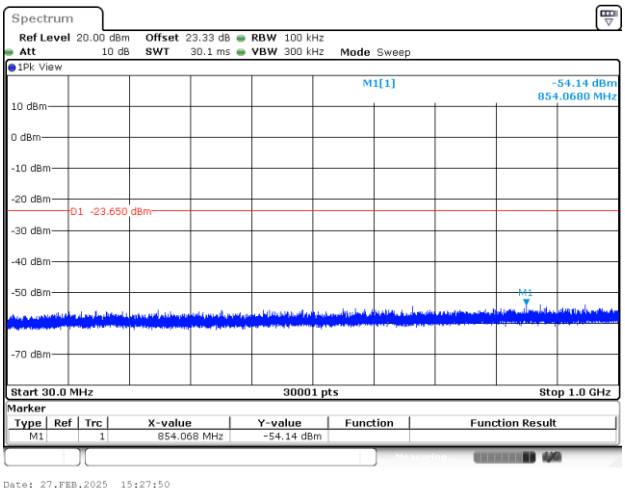
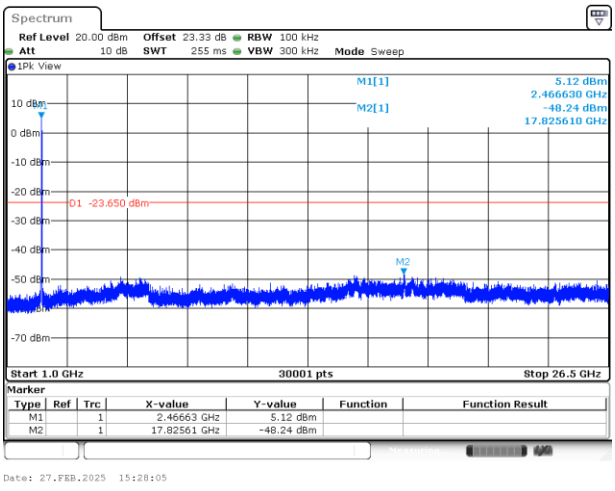
100kHz PSD reference Level	Channel 01 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11g	Test Channel :	06

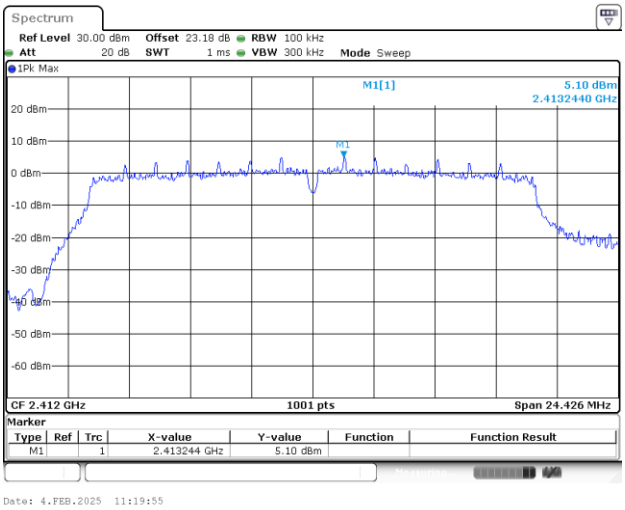
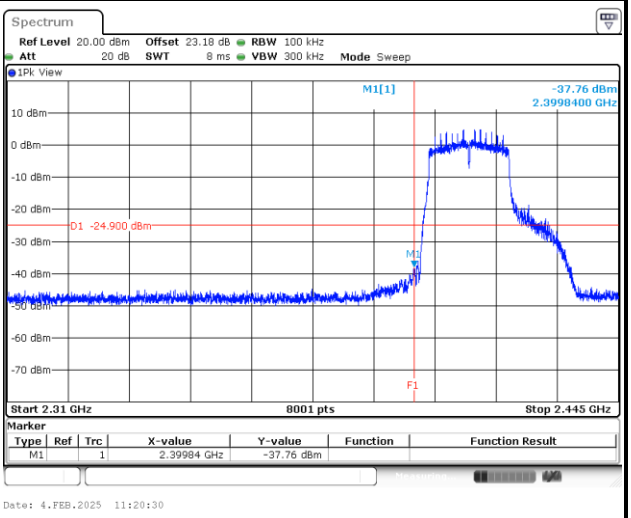
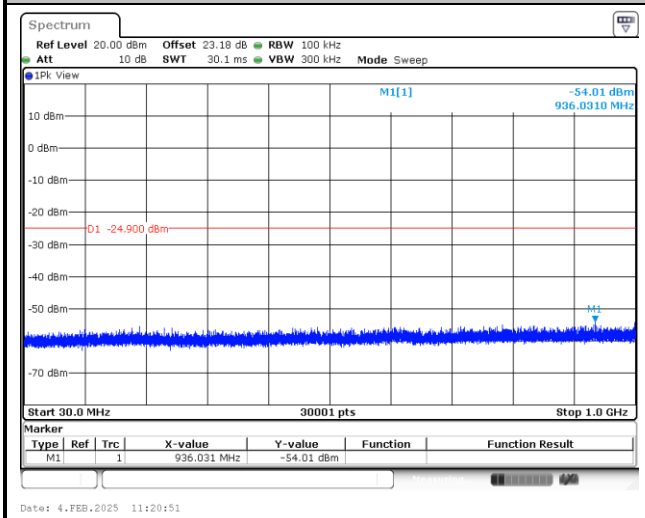
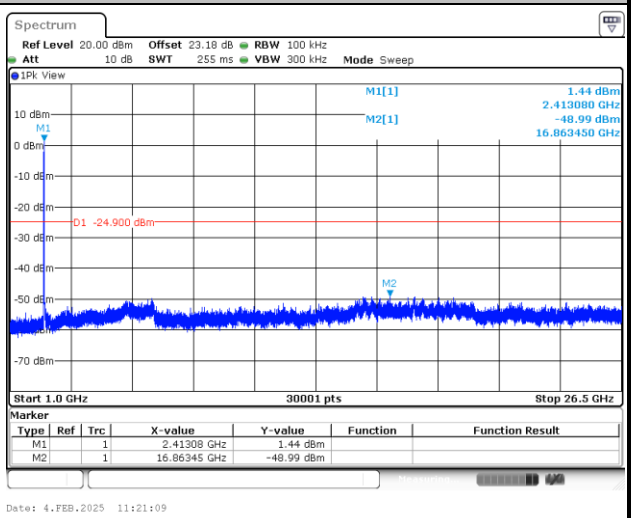
100kHz PSD reference Level	Channel 06 Plot
	

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

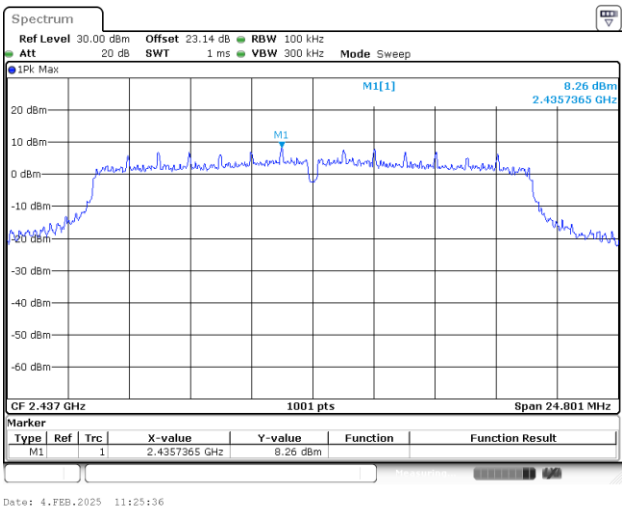
Test Mode :	802.11g	Test Channel :	11

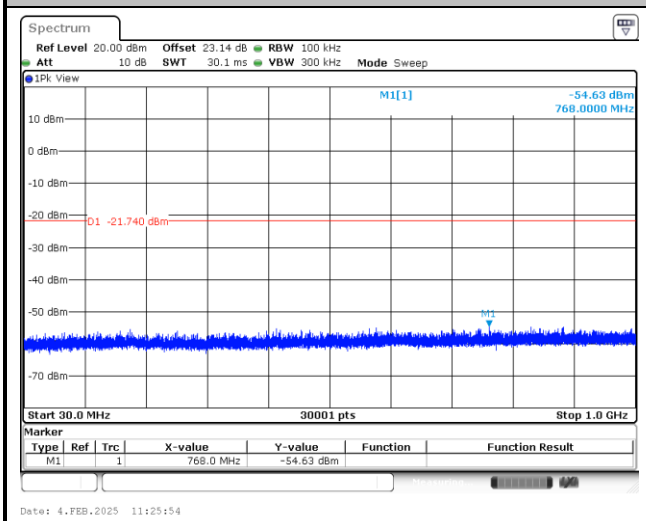
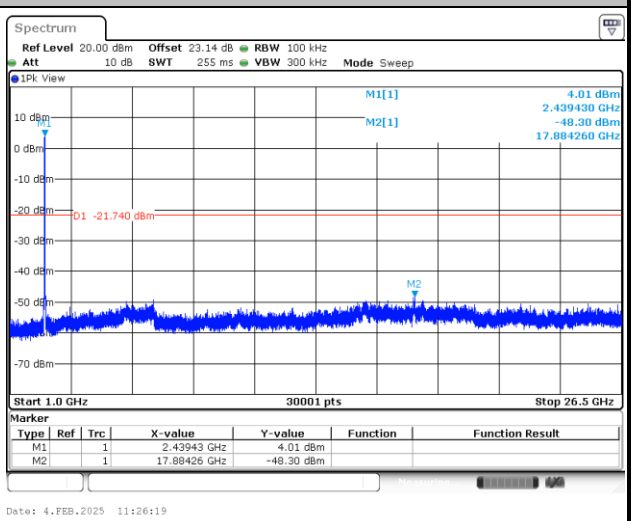
100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11n HT20	Test Channel :	01

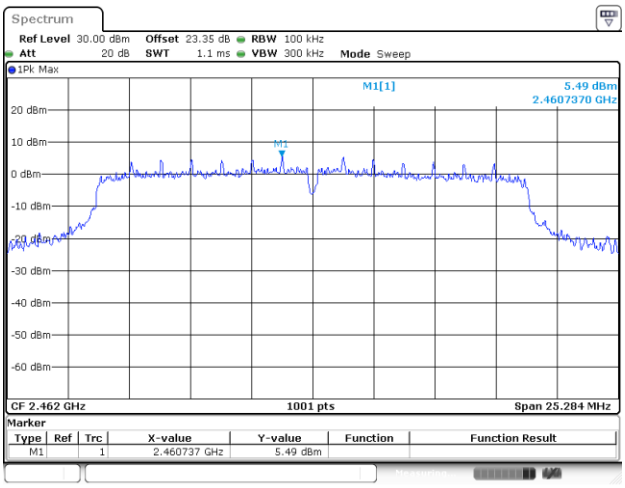
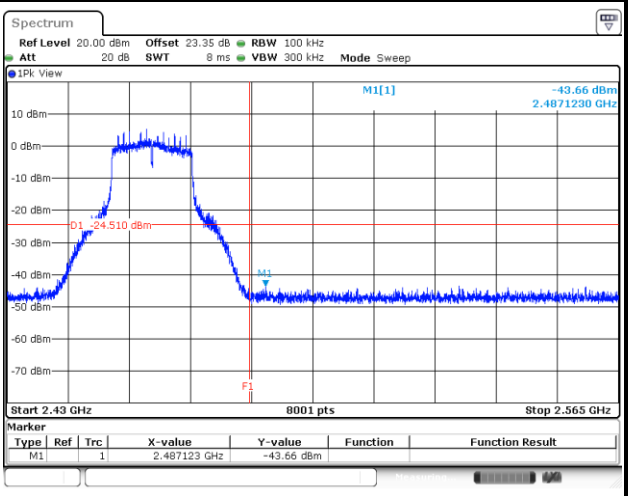
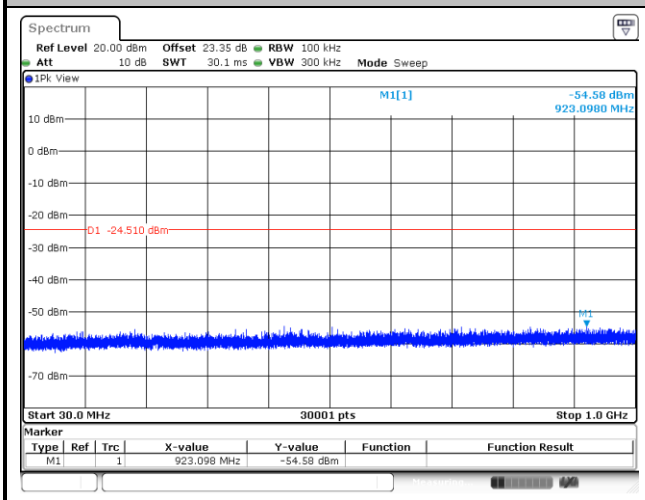
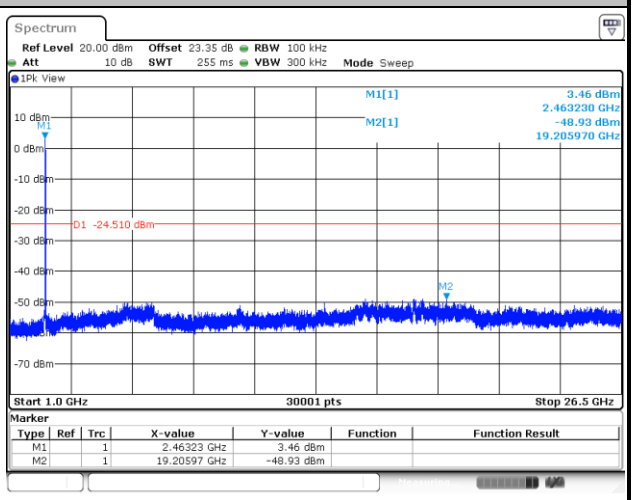
100kHz PSD reference Level	Channel 01 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11n HT20	Test Channel :	06

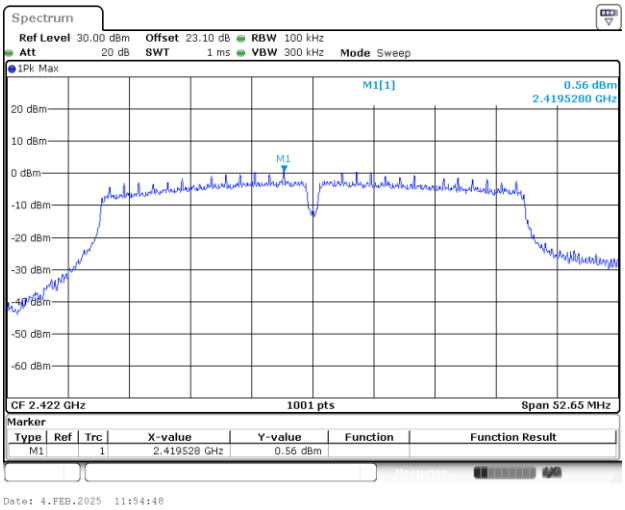
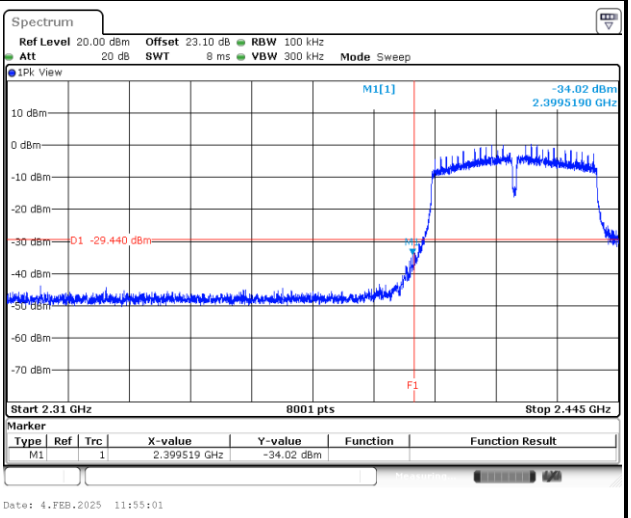
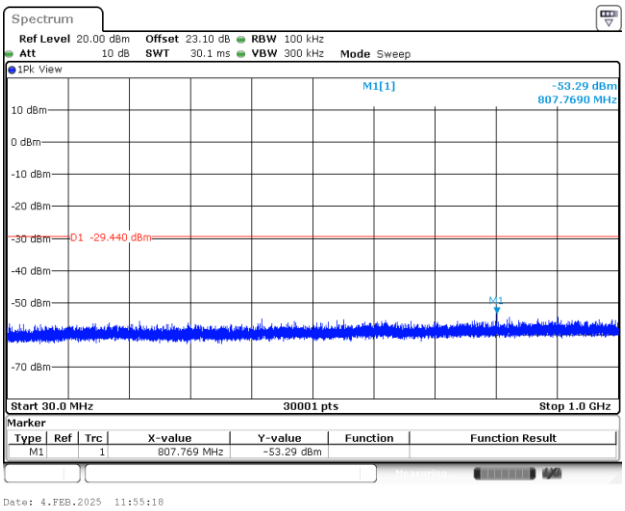
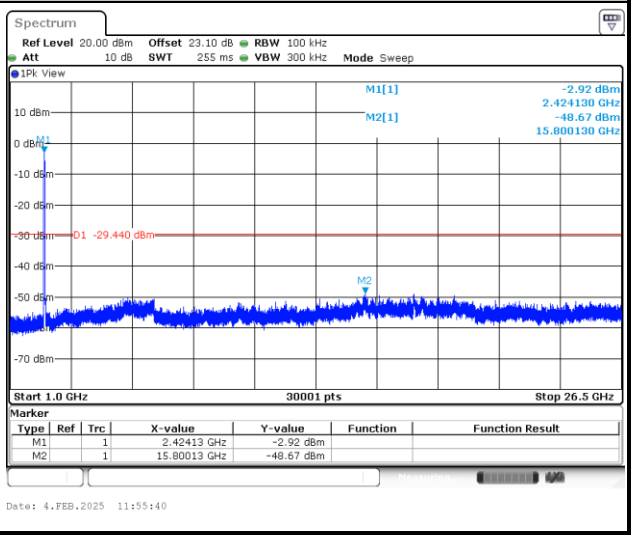
100kHz PSD reference Level	Channel 06 Plot
	

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

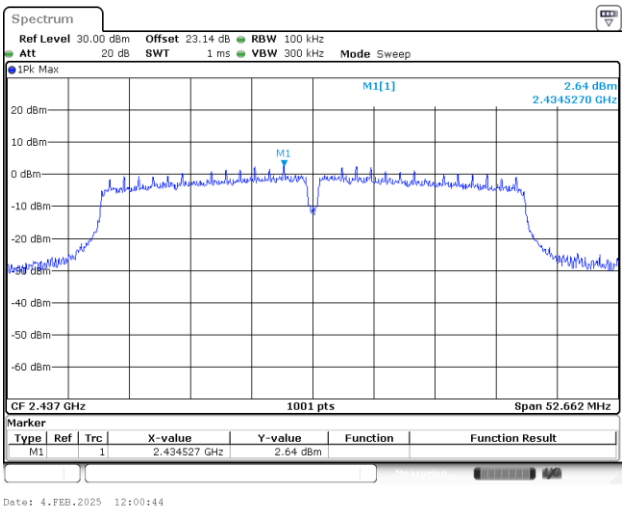
Test Mode :	802.11n HT20	Test Channel :	11

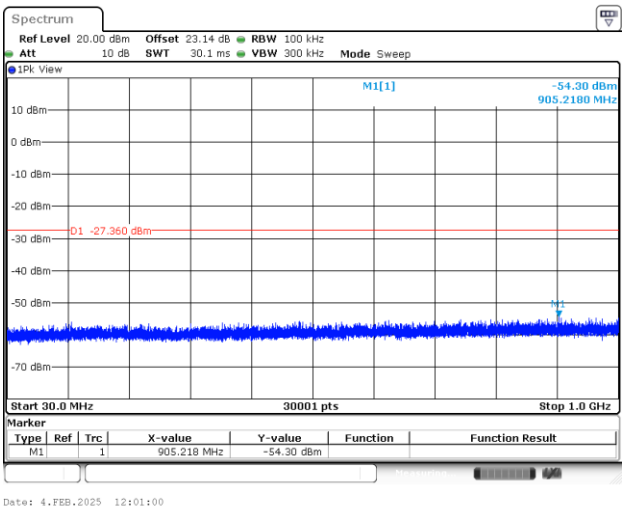
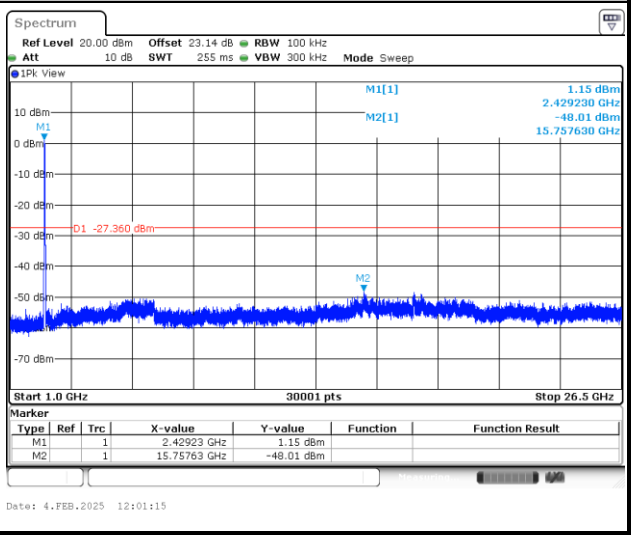
100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11n HT40	Test Channel :	03

100kHz PSD reference Level	Channel 03 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

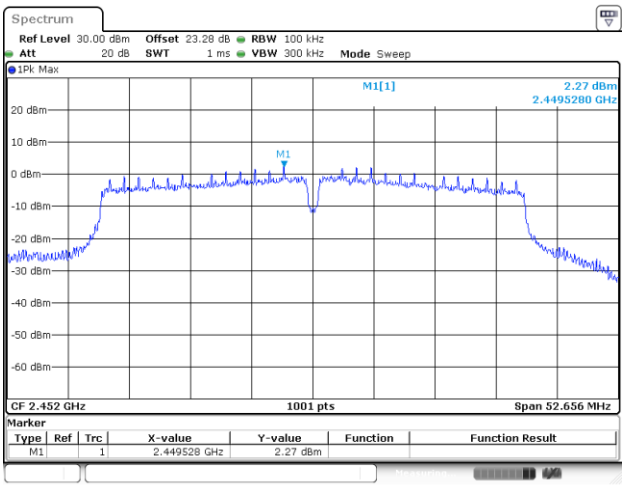
Test Mode :	802.11n HT40	Test Channel :	06

100kHz PSD reference Level	Channel 06 Plot
	

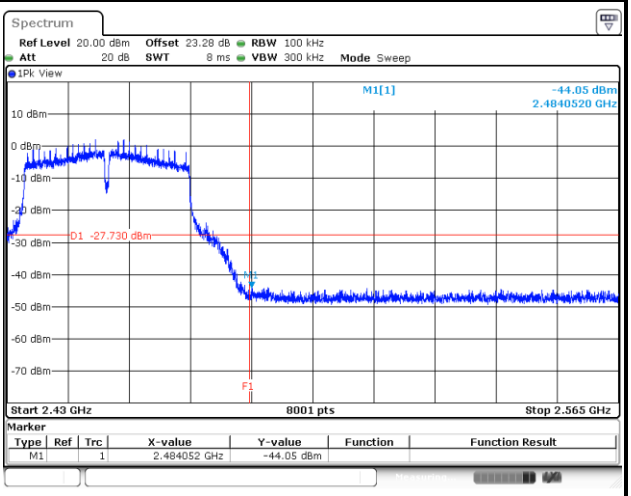
Spurious Emission 30MHz~1GHz	Spurious Emission 1GHz~26.5GHz
	

Test Mode :	802.11n HT40	Test Channel :	09

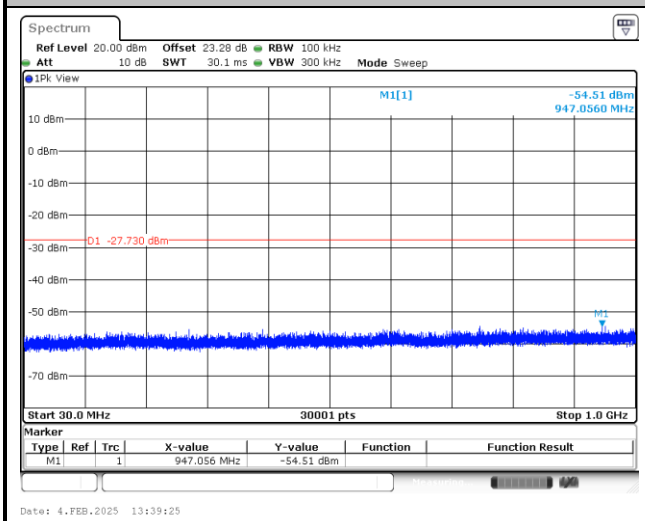
100kHz PSD reference Level



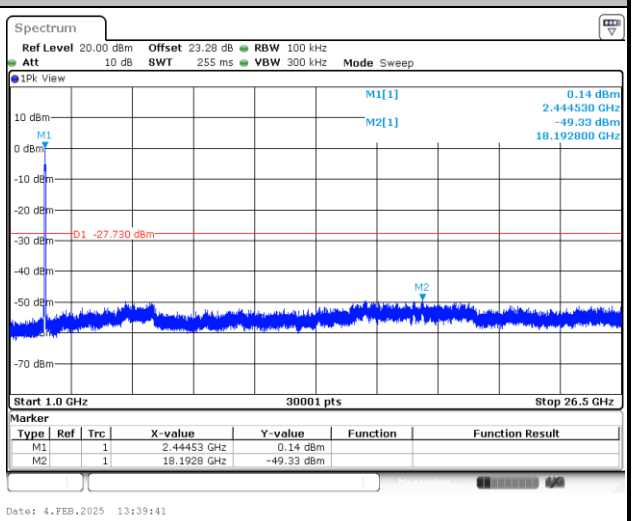
Channel 09 Plot



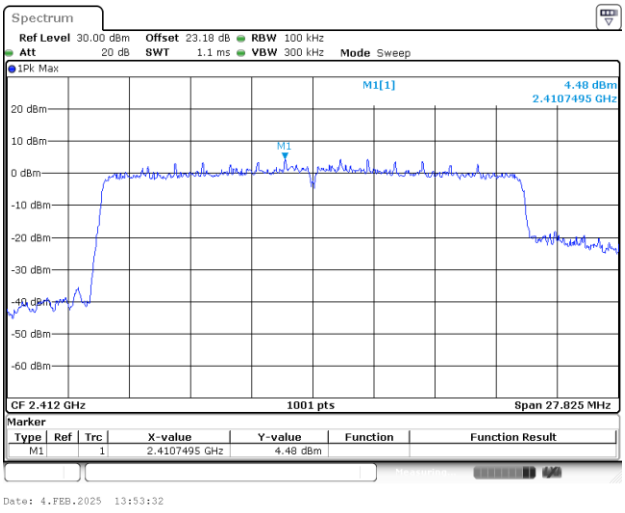
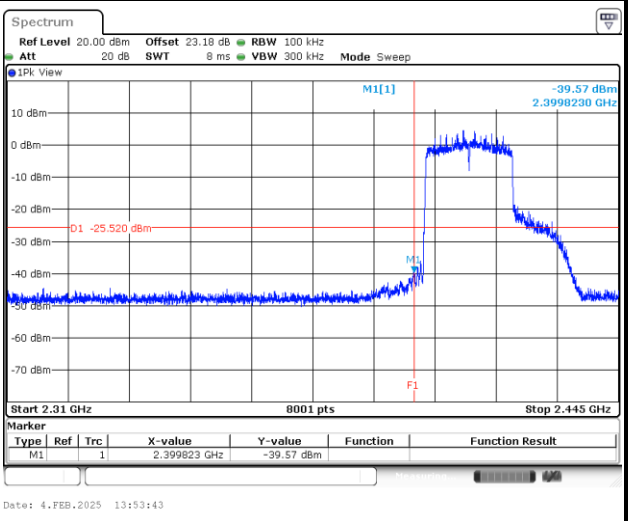
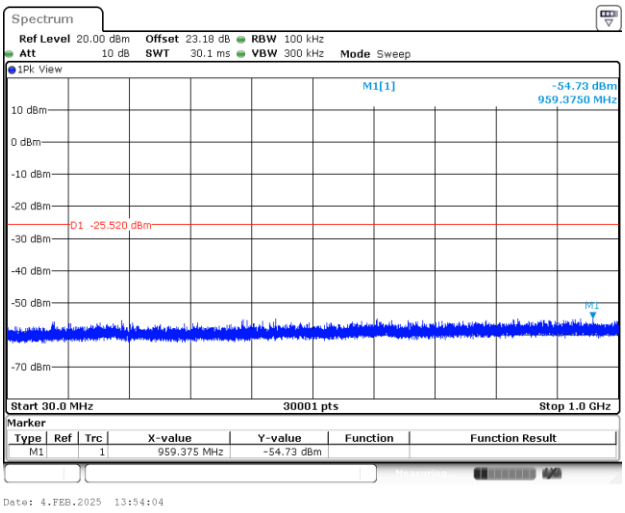
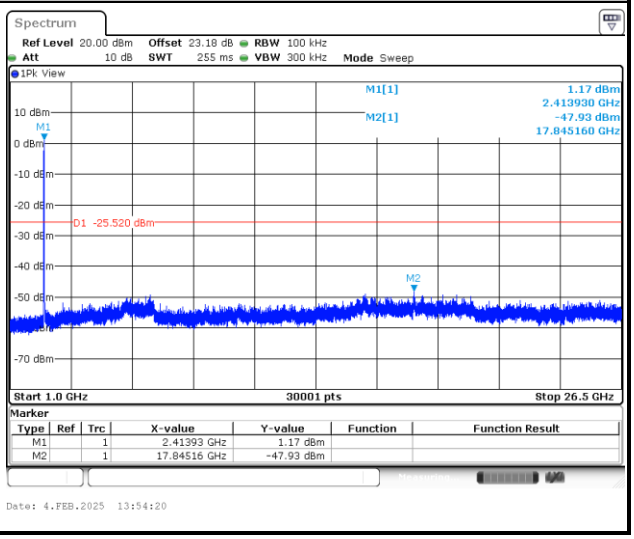
Spurious Emission 30MHz~1GHz



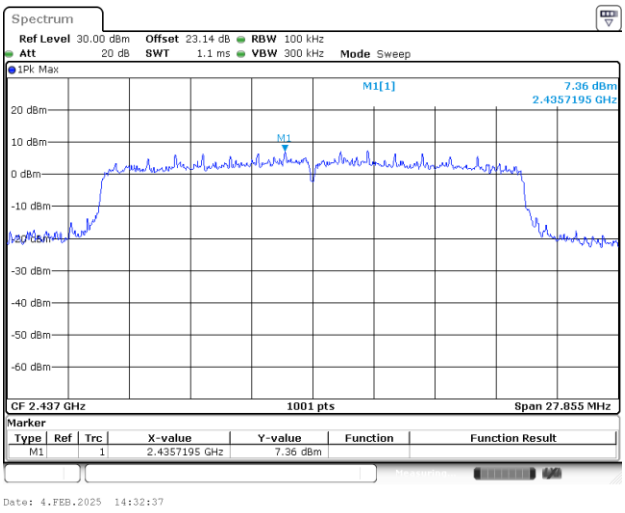
Spurious Emission 1GHz~26.5GHz

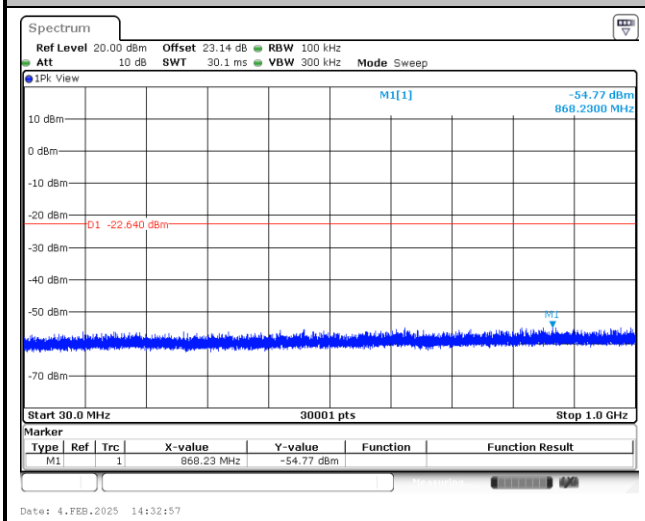
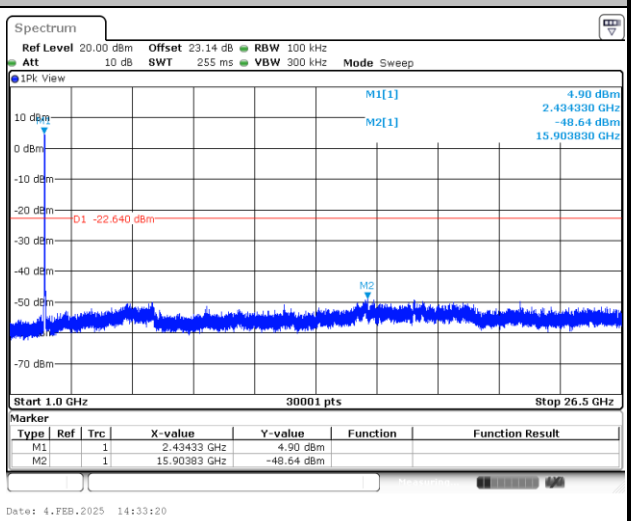


Test Mode :	802.11ax HE20_FullRU	Test Channel :	01

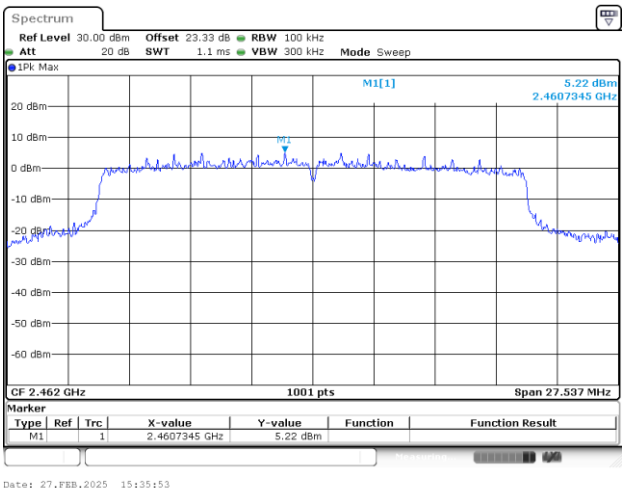
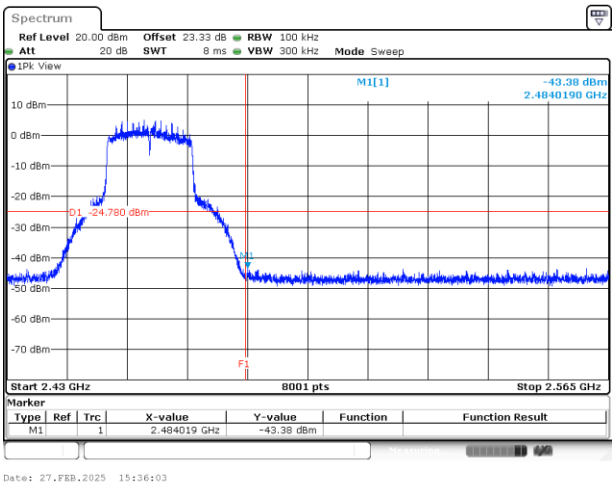
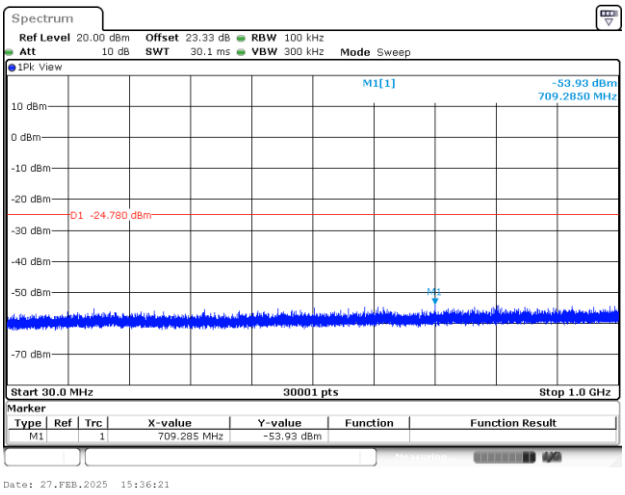
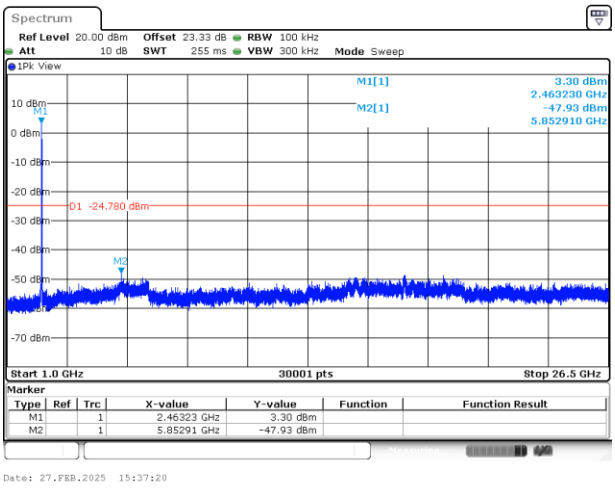
100kHz PSD reference Level	Channel 01 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11ax HE20_FullRU	Test Channel :	06

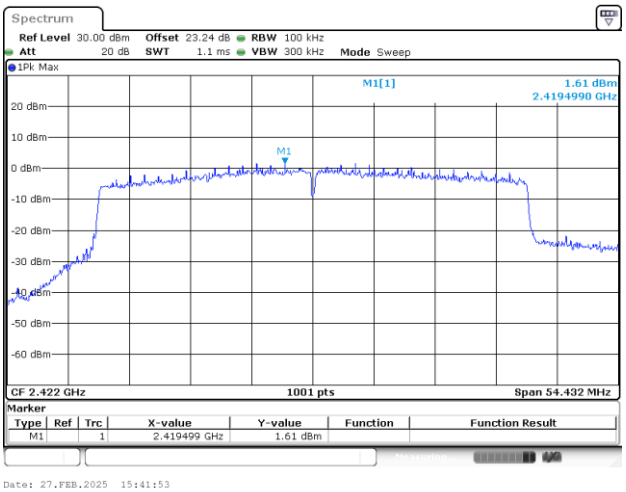
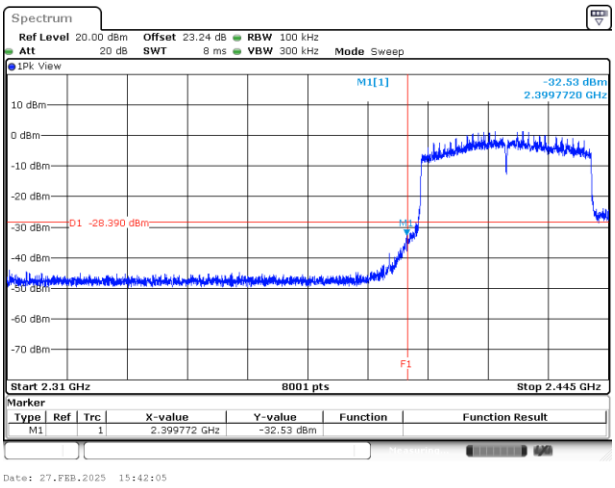
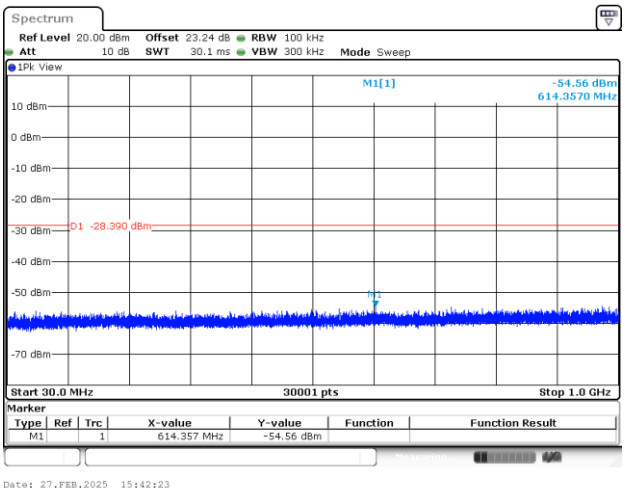
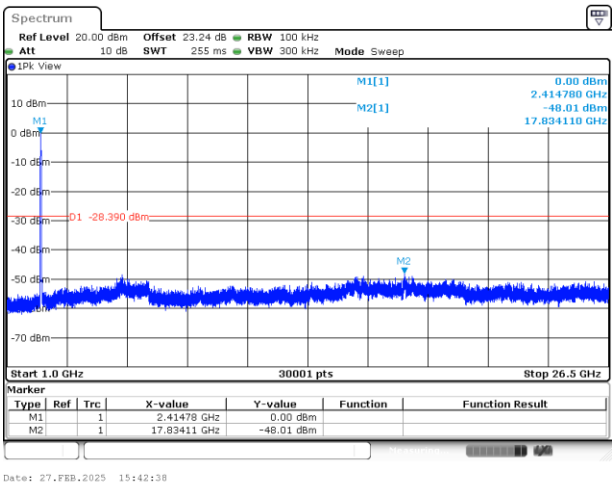
100kHz PSD reference Level	Channel 06 Plot
	

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

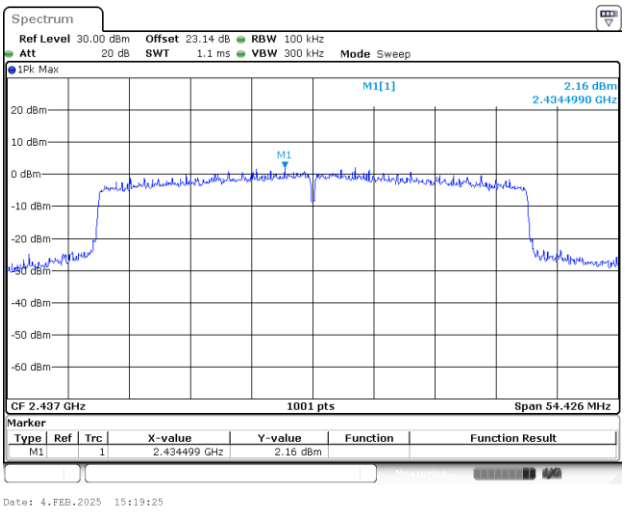
Test Mode :	802.11ax HE20_FullRU	Test Channel :	11

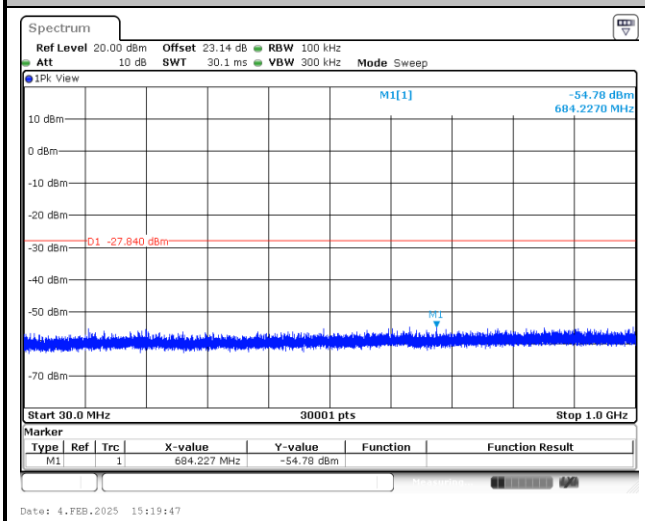
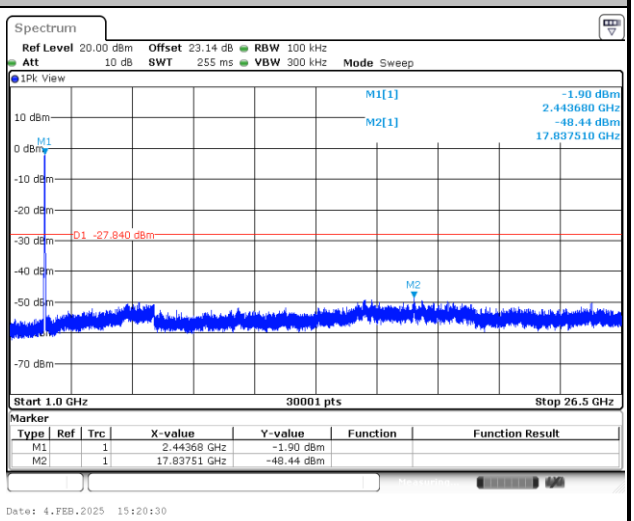
100kHz PSD reference Level	Channel 11 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11ax HE40_FullRU	Test Channel :	03

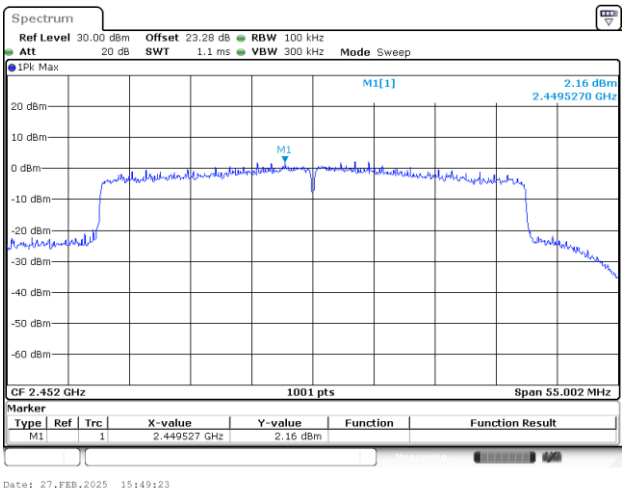
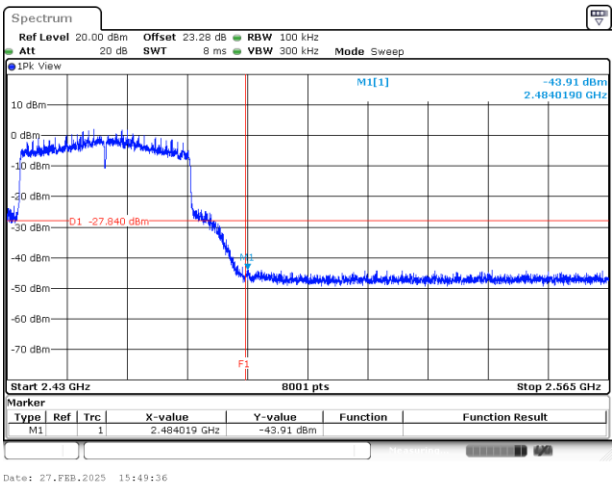
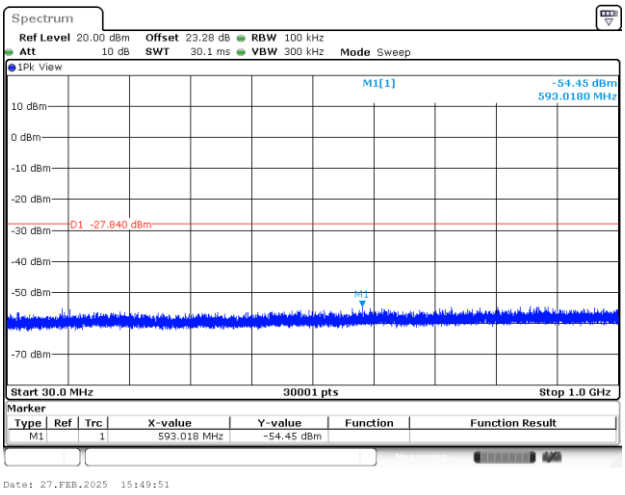
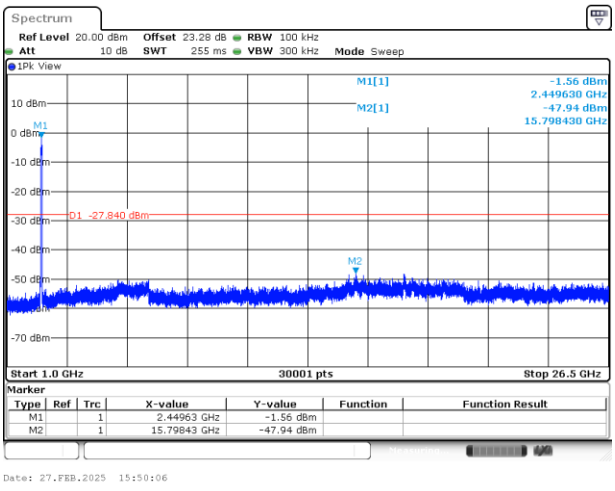
100kHz PSD reference Level	Channel 03 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

Test Mode :	802.11ax HE40_FullRU	Test Channel :	06

100kHz PSD reference Level	Channel 06 Plot
	

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

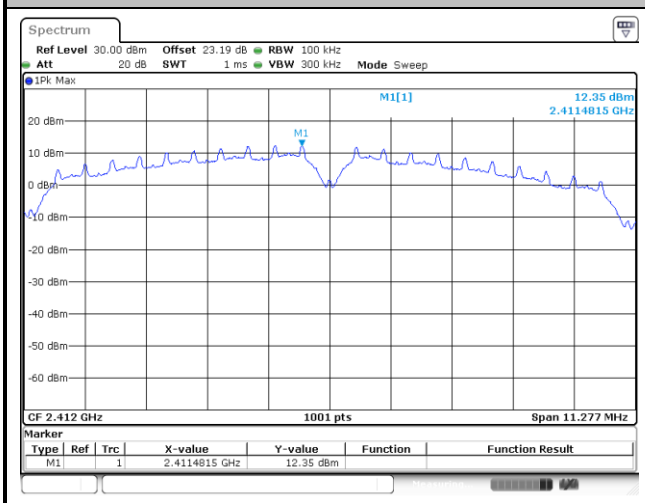
Test Mode :	802.11ax HE40_FullRU	Test Channel :	09

100kHz PSD reference Level	Channel 09 Plot
	
Spurious Emission 30MHz~1GHz	**Spurious Emission 1GHz~26.5GHz**
	

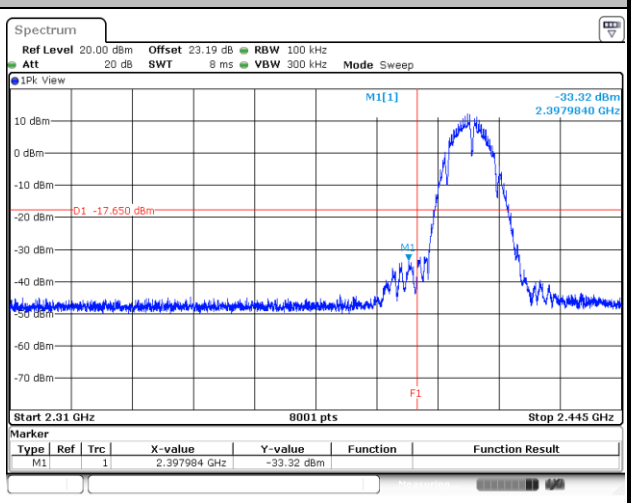
Number of TX = 2, Ant. 2 (Measured)

Test Mode :	802.11b	Test Channel :	01

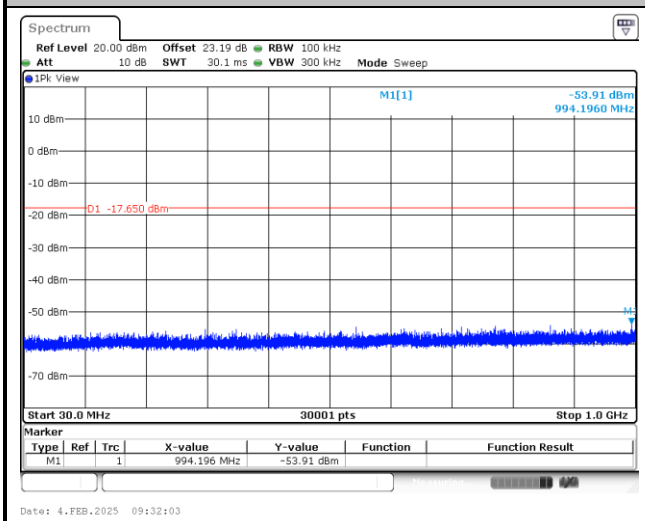
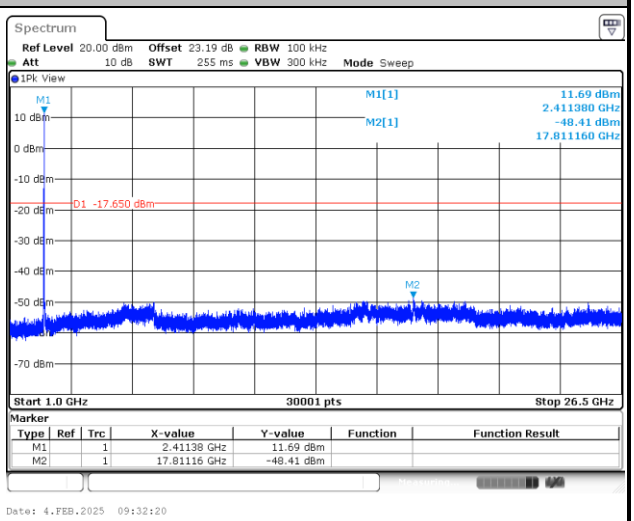
100kHz PSD reference Level



Channel 01 Plot



Spurious Emission 30MHz~1GHz



Spurious Emission 1GHz~26.5GHz