



FCC RADIO TEST REPORT

FCC ID : BEJNT-15U50T
Equipment : Notebook Computer
Brand Name : LG
Model Name : 15U50T,15UD50T,15UG50T,15UB50T,15UT50T>(* can be 0 to 9 or A to Z or blank denoting buyer request)
Applicant : LG Electronics USA, Inc.
 111 Sylvan Avenue North Building Englewood Cliffs,
 NJ 07632 United States
Manufacturer : LG ELECTRONICS INC.
Standard : FCC Part 15 Subpart C §15.247

The product was received on Aug. 05, 2024 and testing was performed from Aug. 08, 2024 to Sep. 09, 2024. 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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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 | 1.03 dB under the limit at 2483.54 MHz |
| 3.6 | 15.207 | AC Conducted Emission | Pass | 15.43 dB under the limit at 0.21 MHz |
| 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:

1. 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.
2. The purpose of different model name is for marketing segmentation.

Reviewed by: Sheng Kuo

Report Producer: Rebecca Wu



1 General Description

1.1 Product Feature of Equipment Under Test

| Product Feature | |
|---|--|
| General Specs Bluetooth, Wi-Fi 2.4GHz 802.11b/g/n/ax, and Wi-Fi 5GHz 802.11a/n/ac/ax. | |
| Antenna Type WLAN: <Ant. 1>: PIFA Antenna <Ant. 2>: PIFA Antenna Bluetooth: PIFA Antenna | |
| Sample 1 | EUT with High-Tek Electronics Co., Ltd Antenna |
| Sample 2 | EUT with Pulse Antenna |
| Integrated WLAN module | Brand Name: Intel® Wi-Fi 6 AX203 Model Name: AX203NGW |

| Antenna Information (High-Tek Electronics Co., Ltd Antenna) | | |
|---|-----------------|------------------------------|
| 2400 MHz ~ 2483.5 MHz | Peak Gain (dBi) | Ant. 1: 2.83 Ant. 2: 2.19 |

| Antenna Information (Pulse Antenna) | | |
|-------------------------------------|-----------------|------------------------------|
| 2400 MHz ~ 2483.5 MHz | Peak Gain (dBi) | Ant. 1: 2.92 Ant. 2: 2.57 |

Remark: The EUT's information above is declared by manufacturer. Please refer to Disclaimer in report summary.

1.1.1 Antenna Directional Gain

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 k th antenna is being fed by spatial stream j , or zero if it is not;
 G_k is the gain in dBi of the k th antenna.

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

Directional gain = $10 \cdot \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}]$ dBi

Where G_1, G_2, \dots, G_N denote single antenna gain.

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

| | | | DG | DG | Power | PSD |
|---------------|-------|-------|-------|-------|-----------|-----------|
| | | | for | for | Limit | Limit |
| | Ant 1 | Ant 2 | Power | PSD | Reduction | Reduction |
| | (dBi) | (dBi) | (dBi) | (dBi) | (dB) | (dB) |
| 2.4GHz | 2.92 | 2.57 | 2.92 | 5.76 | 0.00 | 0.00 |

Calculation example:

If a device has two antenna, $G_{ANT1}= 2.92$ dBi; $G_{ANT2}=2.57$ dBi

Directional gain of power measurement = $\max(2.92, 2.57) + 0 = 2.92$ dBi

Directional gain of PSD derived from formula which is

$$10 \times \log \left\{ \left[10^{(2.92 \text{ dBi} / 20)} + 10^{(2.57 \text{ dBi} / 20)} \right]^2 / 2 \right\}$$

$$= 5.76 \text{ dBi}$$

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

Remark: Ant. 1 means Chain B (Aux.) and Ant. 2 means Chain A (Main).



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, 03CH23-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).

- 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 | 8 | 2447 |
| | 2 | 2417 | 9 | 2452 |
| | 3 | 2422 | 10 | 2457 |
| | 4 | 2427 | 11 | 2462 |
| | 5 | 2432 | 12 | 2467 |
| | 6 | 2437 | 13 | 2472 |
| | 7 | 2442 | | |



2.2 Test Mode

This device support 26/52/106/242/484-tone RU.

This report references the test results from module ID: PD9AX203NG module report.

Spot-check tests are based on the worst-case modulation and channel conditions for each frequency range, as detailed in the original module report., verify the results and record them in the report.

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

Single Antenna

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

MIMO Antenna

| Modulation | Data Rate |
|--------------------------------|-----------|
| 802.11n HT20 (Covered by HE20) | MCS0 |
| 802.11n HT40 (Covered by HE40) | MCS0 |
| 802.11ax HE20 | MCS0 |
| 802.11ax HE40 | MCS0 |

| Test Cases | |
|---|---|
| AC Conducted Emission | Mode 1 :WLAN (2.4GHz) Link + Bluetooth Link + Monitor+ USB HD (USB Type A) + USB HD (USB Type C) + iPod + Earphone for Sample 1 |
| Remark: For Radiated Test Cases, the tests were performed with Sample 2. | |



<Chain B>

| Ch. # | 2400-2483.5 MHz | | | |
|--------|-----------------|---------|---------------|---------------|
| | 802.11b | 802.11g | 802.11ax HE20 | 802.11ax HE40 |
| Low | - | - | - | - |
| Middle | - | - | - | - |
| High | 13 | 13 | 12 | 11 |
| | | | 13 | |

<Chain A>

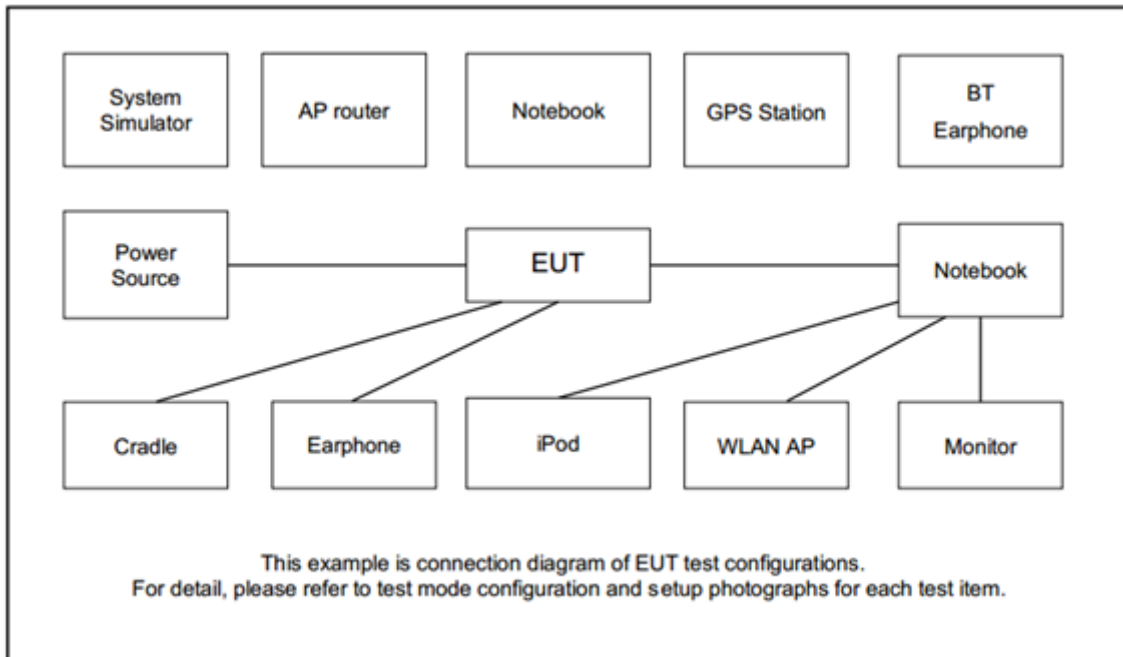
| Ch. # | 2400-2483.5 MHz | | | |
|--------|-----------------|---------|---------------|---------------|
| | 802.11b | 802.11g | 802.11ax HE20 | 802.11ax HE40 |
| Low | 01 | 01 | 01 | 03 |
| Middle | 07 | 07 | 07 | 07 |
| High | 11 | 11 | 11 | 09 |
| | 12 | 12 | 13 | 10 |
| | | | | 11 |

MIMO <Chain B+A>

| Ch. # | 2400-2483.5 MHz | |
|--------|-----------------|---------------|
| | 802.11ax HE20 | 802.11ax HE40 |
| Low | 01 | 03 |
| Middle | 07 | 07 |
| High | 11 | 09 |
| | 12 | 10 |
| | 13 | 11 |

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



2.4 Support Unit used in test configuration and system

| Item | Equipment | Brand Name | Model Name | FCC ID | Data Cable | Power Cord |
|------|--------------------|------------|-------------|--------------|-------------------|-------------------|
| 1. | Bluetooth Earphone | Sony | SBH20 | PY7-RD0010 | N/A | N/A |
| 2. | WLAN AP | ASUS | RT-AC52 | MSQ-RTAC4A00 | N/A | Unshielded, 1.8 m |
| 3. | iPod | Apple | A1199 | FCC DoC | Shielded, 1.0 m | N/A |
| 4. | Earphone + Mic | Samsung | Ecouteur | N/A | Unshielded, 1.8 m | N/A |
| 5. | LCD Monitor | AOC | U2879VF | FCC DoC | N/A | Shielded, 1.0 m |
| 6. | USB HD | ADATA | HV620S-1T | FCC DoC | Shielded, 1.0 m | N/A |
| 7. | USB HD | Transcend | TS1TSJ25A3W | FCC DoC | Shielded, 0.5 m | N/A |
| 8. | iPod Earphone | Apple | N/A | Verification | Unshielded, 1.0 m | N/A |



2.5 EUT Operation Test Setup

The RF test items, utility “DRTU Version : DRTU.06643.23.60.0” was installed in EUT 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.

$$\begin{aligned} \text{Offset}(dB) &= \text{RF cable loss}(dB) + \text{attenuator factor}(dB). \\ &= 4.2 + 10 = 14.2 \text{ (dB)} \end{aligned}$$

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) $\geq 3 * RBW$.
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.

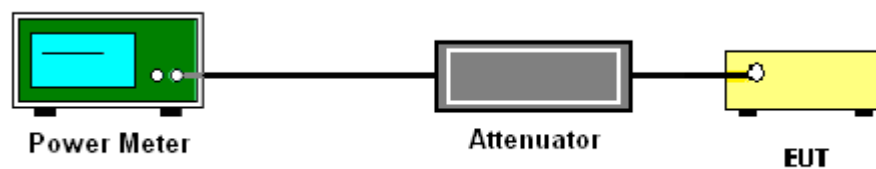
3.2.2 Measuring Instruments

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.

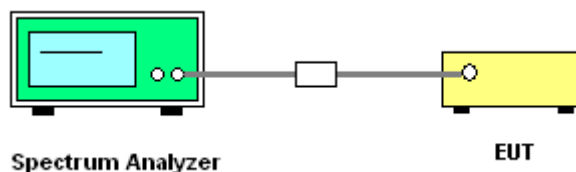
3.3.3 Test Procedures

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.

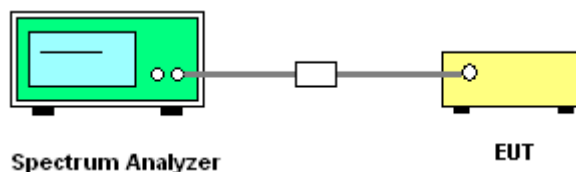
3.4.2 Measuring Instruments

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.

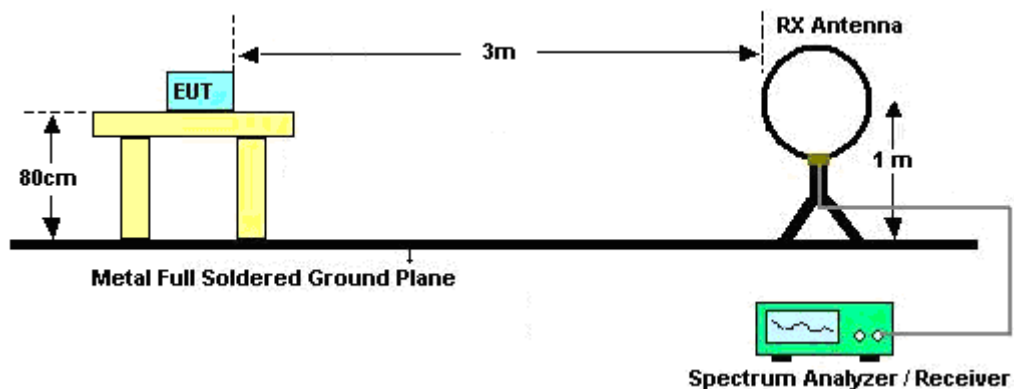
3.5.3 Test Procedures

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 “-“.

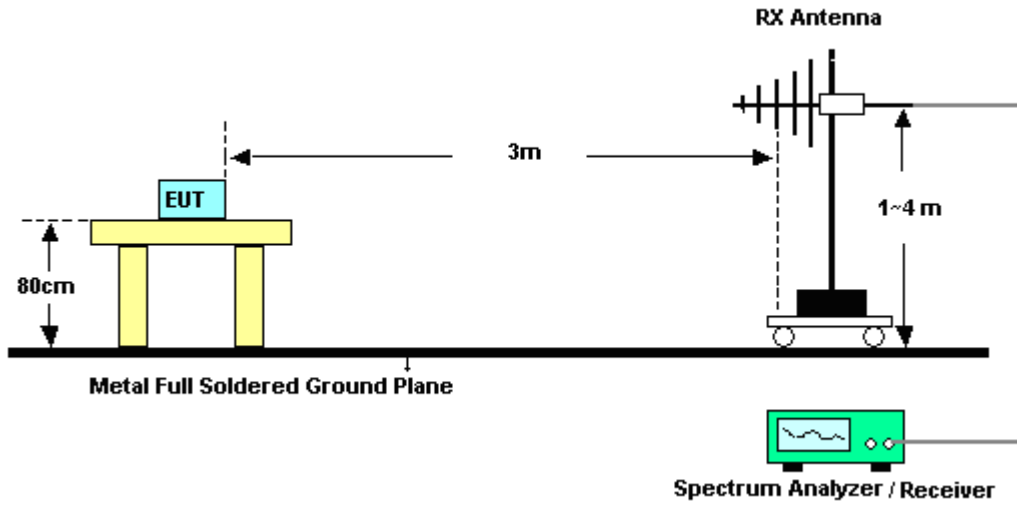
7. Radiated testing above 1 GHz is performed by adjusting the antenna tower from 1 m to 4 m and by rotating the turn table from 0 degree to 360 degrees to find the peak maximum hold reading for scanning all frequencies. When there is no suspected emission found and the harmonic emission level is with 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 \geq RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3 MHz for $f \geq 1$ GHz for peak measurement.For average measurement:
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW $\geq 1/T$, 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

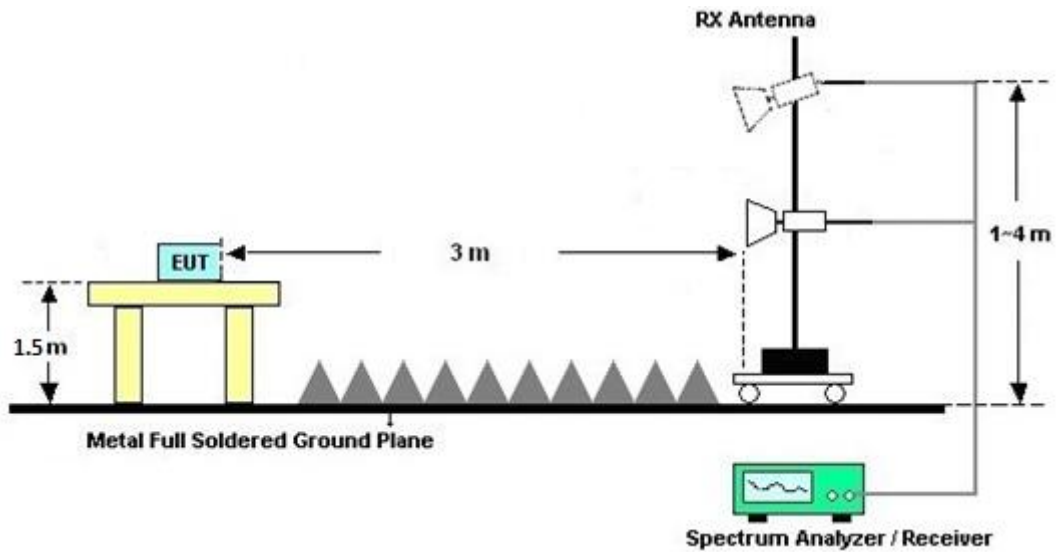
For radiated emissions below 30MHz



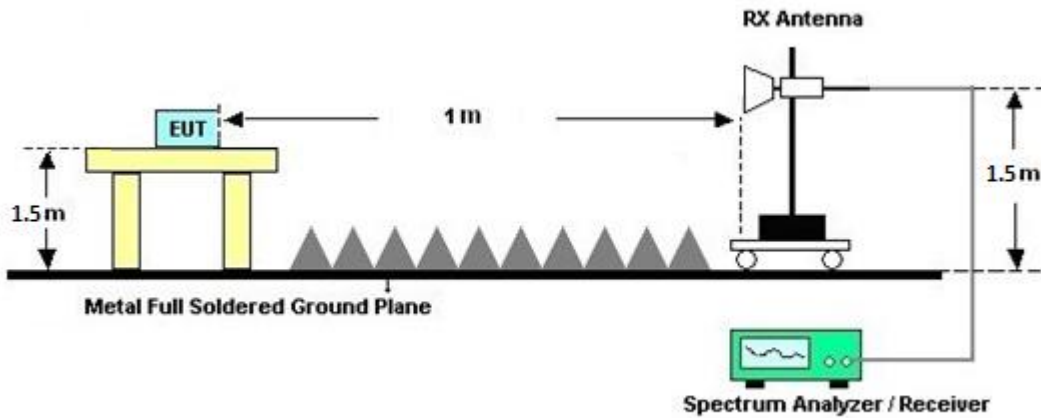
For radiated emissions from 30MHz to 1GHz



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 |
|--|--------------------|---------------------------------|----------------------------|----------------------------------|------------------|---------------------------------|---------------|--------------------------|
| Loop Antenna | Rohde & Schwarz | HFH2-Z2 | 100488 | 9 kHz~30 MHz | Sep. 12, 2023 | Aug. 27, 2024~ Sep. 05, 2024 | Sep. 11, 2024 | Radiation (03CH23-HY) |
| Bilog Antenna with 6dB pad | TESEQ & WOKEN | CBL 6111D & 00802N1D-06 | 63303 & 001 | N/A | Oct. 15, 2023 | Aug. 27, 2024~ Sep. 05, 2024 | Oct. 14, 2024 | Radiation (03CH23-HY) |
| Amplifier | SONOMA | 310N | 421580 | N/A | Jul. 14, 2024 | Aug. 27, 2024~ Sep. 05, 2024 | Jul. 13, 2025 | Radiation (03CH23-HY) |
| Double Ridged Guide Horn Antenna | RFSPIN | DRH18-E | LE2C05A18EN | 1GHz~18GHz | Jun. 20, 2024 | Aug. 27, 2024~ Sep. 05, 2024 | Jun. 19, 2025 | Radiation (03CH23-HY) |
| SHF-EHF Horn Antenna | SCHWARZBE CK | BBHA9170 | 1223 | 18GHz-40GHz | Jun. 24, 2024 | Aug. 27, 2024~ Sep. 05, 2024 | Jun. 23, 2025 | Radiation (03CH23-HY) |
| Amplifier | EMEC | EM01G18GA | 060878 | N/A | Sep. 28, 2023 | Aug. 27, 2024~ Sep. 05, 2024 | Sep. 27, 2024 | Radiation (03CH23-HY) |
| Preamplifier | EMEC | EM18G40G | 060871 | 18-40GHz | Aug. 23, 2024 | Aug. 27, 2024~ Sep. 05, 2024 | Aug. 22, 2025 | Radiation (03CH23-HY) |
| Signal Analyzer | Agilent | N9010A | MY53470118 | N/A | Aug. 09, 2024 | Aug. 27, 2024~ Sep. 05, 2024 | Aug. 08, 2025 | Radiation (03CH23-HY) |
| Hygrometer | TECPEL | DTM-303B | TP211542 | N/A | Oct. 30, 2023 | Aug. 27, 2024~ Sep. 05, 2024 | Oct. 29, 2024 | Radiation (03CH23-HY) |
| Controller | EMEC | EM1000 | N/A | Control Turn table & Ant Mast | N/A | Aug. 27, 2024~ Sep. 05, 2024 | N/A | Radiation (03CH23-HY) |
| Antenna Mast | ChainTek | MBS-520-1 | N/A | 1m~4m | N/A | Aug. 27, 2024~ Sep. 05, 2024 | N/A | Radiation (03CH23-HY) |
| Turn Table | ChainTek | T-200-S-1 | N/A | 0~360 Degree | N/A | Aug. 27, 2024~ Sep. 05, 2024 | N/A | Radiation (03CH23-HY) |
| Software | Audix | E3 6.09824_20191 22 | RK-002348 | N/A | N/A | Aug. 27, 2024~ Sep. 05, 2024 | N/A | Radiation (03CH23-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | 803951/2 | 9kHz~30MHz | Mar. 06, 2024 | Aug. 27, 2024~ Sep. 05, 2024 | Mar. 05, 2025 | Radiation (03CH23-HY) |
| RF Cable | HUBER + SUHNER | SUCOFLEX 102 | 804395/2 | N/A | Nov. 27, 2023 | Aug. 27, 2024~ Sep. 05, 2024 | Nov. 26, 2024 | Radiation (03CH23-HY) |
| RF Cable | EMC | EMC101Y | 231115/231119 /231122 | N/A | Nov. 27, 2023 | Aug. 27, 2024~ Sep. 05, 2024 | Nov. 26, 2024 | Radiation (03CH23-HY) |
| Hygrometer | TECPEL | DTM-303A | TP201996 | N/A | Nov. 07, 2023 | Aug. 08, 2024~ Sep. 09, 2024 | Nov. 06, 2024 | Conducted (TH05-HY) |
| Power Sensor | DARE | RPR3006W | 15100041SNO 10 (NO:248) | 10MHz~6GHz | Jan. 10, 2024 | Aug. 08, 2024~ Sep. 09, 2024 | Jan. 09, 2025 | Conducted (TH05-HY) |
| Signal Analyzer | Rohde & Schwarz | FSV40 | 101564 | 10Hz ~ 40GHz | Sep. 12, 2023 | Aug. 08, 2024~ Sep. 09, 2024 | Sep. 11, 2024 | Conducted (TH05-HY) |
| Switch Control Mainframe | Burgeon | ETF-058 | EC1300484 (BOX3) | N/A | May 20, 2024 | Aug. 08, 2024~ Sep. 09, 2024 | May 19, 2025 | Conducted (TH05-HY) |
| Software | Sporton | BTWIFI_Final_ version_240513 | N/A | Conducted Other Test Item | N/A | Aug. 08, 2024~ Sep. 09, 2024 | N/A | Conducted (TH05-HY) |



| 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 | Aug. 13, 2024 | N/A | Conduction (CO07-HY) |
| Software | Rohde & Schwarz | EMC32 V10.30 | N/A | N/A | N/A | Aug. 13, 2024 | N/A | Conduction (CO07-HY) |
| Pulse Limiter | SCHWARZBECK | VTSD 9561-F N | 9561-F N00373 | 9kHz-200MHz | Oct. 20, 2023 | Aug. 13, 2024 | Oct. 19, 2024 | Conduction (CO07-HY) |
| RF Cable | HUBER + SUHNER | RG 214/U | 1358175 | 9kHz~30MHz | Mar. 14, 2024 | Aug. 13, 2024 | Mar. 13, 2025 | Conduction (CO07-HY) |
| Two-Line V-Network | TESEQ | NNB 51 | 45051 | N/A | Mar. 10, 2024 | Aug. 13, 2024 | Mar. 09, 2025 | Conduction (CO07-HY) |
| Four-Line V-Network | TESEQ | NNB 52 | 36122 | N/A | Mar. 07, 2024 | Aug. 13, 2024 | Mar. 06, 2025 | Conduction (CO07-HY) |
| EMI Test Receiver | Rohde & Schwarz | ESR3 | 102317 | 9kHz~3.6GHz | Sep. 20, 2023 | Aug. 13, 2024 | Sep. 19, 2024 | Conduction (CO07-HY) |



5 Measurement Uncertainty

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

| | |
|---|---------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 3.44 dB |
|---|---------|

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

| | |
|---|--------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 6.5 dB |
|---|--------|

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

| | |
|---|--------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 4.6 dB |
|---|--------|

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

| | |
|---|--------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 4.6 dB |
|---|--------|

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

| | |
|---|--------|
| Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$) | 5.3 dB |
|---|--------|

Appendix A. Test Result of Conducted Test Items

| | | | | |
|----------------|-----------------------|--------------------|-------|----|
| Test Engineer: | Kevin Xiao | Temperature: | 21~25 | °C |
| Test Date: | 2024/08/08~2024/09/09 | Relative Humidity: | 51~54 | % |

Remark: For Conducted Test Items, Ant. 1 means Chain B (Aux.) and Ant. 2 means Chain A (Main).

TEST RESULTS DATA
6dB and 99% Occupied Bandwidth

| 2.4GHz Band Single Antenna | | | | | | | | | | |
|----------------------------|-----------|-----|-----|-------------|-----------------------|-------|--------------|-------|--------------------|-----------|
| 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 | 1 | 1 | 2412 | 13.56 | 13.50 | 9.02 | 9.03 | 0.50 | Pass |
| 11b | 1Mbps | 1 | 7 | 2442 | 13.65 | 13.68 | 9.04 | 9.05 | 0.50 | Pass |
| 11b | 1Mbps | 1 | 11 | 2462 | 13.41 | 13.44 | 8.55 | 9.02 | 0.50 | Pass |
| 11b | 1Mbps | 1 | 12 | 2467 | 13.45 | 13.45 | 9.01 | 9.01 | 0.50 | Pass |
| 11b | 1Mbps | 1 | 13 | 2472 | 13.39 | 13.34 | 8.55 | 9.03 | 0.50 | Pass |
| 11g | 6Mbps | 1 | 1 | 2412 | 16.80 | 16.79 | 15.32 | 15.12 | 0.50 | Pass |
| 11g | 6Mbps | 1 | 7 | 2442 | 17.39 | 17.21 | 15.13 | 15.12 | 0.50 | Pass |
| 11g | 6Mbps | 1 | 11 | 2462 | 16.82 | 16.80 | 15.11 | 15.12 | 0.50 | Pass |
| 11g | 6Mbps | 1 | 12 | 2467 | 16.80 | 16.80 | 15.10 | 15.12 | 0.50 | Pass |
| 11g | 6Mbps | 1 | 13 | 2472 | 16.50 | 16.50 | 16.34 | 16.33 | 0.50 | Pass |

TEST RESULTS DATA
Average Output Power

| 2.4GHz Band Single Antenna | | | | | | | | | | | | | | | | |
|----------------------------|-----------|-----|-----|-------------|-------------------------------|-------|-----|-----------------------------|-------|----------|------|------------------|-------|------------------------|-------|------------|
| 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 | 1 | 1 | 2412 | 19.20 | 19.30 | | 30.00 | 30.00 | 2.92 | 2.57 | 22.12 | 21.87 | 36.00 | 36.00 | Pass |
| 11b | 1Mbps | 1 | 7 | 2442 | 20.70 | 20.80 | | 30.00 | 30.00 | 2.92 | 2.57 | 23.62 | 23.37 | 36.00 | 36.00 | Pass |
| 11b | 1Mbps | 1 | 11 | 2462 | 19.10 | 19.40 | | 30.00 | 30.00 | 2.92 | 2.57 | 22.02 | 21.97 | 36.00 | 36.00 | Pass |
| 11b | 1Mbps | 1 | 12 | 2467 | 18.10 | 18.40 | | 30.00 | 30.00 | 2.92 | 2.57 | 21.02 | 20.97 | 36.00 | 36.00 | Pass |
| 11b | 1Mbps | 1 | 13 | 2472 | 15.90 | 14.70 | | 30.00 | 30.00 | 2.92 | 2.57 | 18.82 | 17.27 | 36.00 | 36.00 | Pass |
| 11g | 6Mbps | 1 | 1 | 2412 | 16.70 | 16.80 | | 30.00 | 30.00 | 2.92 | 2.57 | 19.62 | 19.37 | 36.00 | 36.00 | Pass |
| 11g | 6Mbps | 1 | 7 | 2442 | 20.40 | 20.60 | | 30.00 | 30.00 | 2.92 | 2.57 | 23.32 | 23.17 | 36.00 | 36.00 | Pass |
| 11g | 6Mbps | 1 | 11 | 2462 | 17.10 | 17.40 | | 30.00 | 30.00 | 2.92 | 2.57 | 20.02 | 19.97 | 36.00 | 36.00 | Pass |
| 11g | 6Mbps | 1 | 12 | 2467 | 14.60 | 15.40 | | 30.00 | 30.00 | 2.92 | 2.57 | 17.52 | 17.97 | 36.00 | 36.00 | Pass |
| 11g | 6Mbps | 1 | 13 | 2472 | 11.60 | 10.50 | | 30.00 | 30.00 | 2.92 | 2.57 | 14.52 | 13.07 | 36.00 | 36.00 | Pass |

TEST RESULTS DATA
Peak Power Spectral Density

| 2.4GHz Band Single Antenna | | | | | | | | | | | | |
|----------------------------|-----------|-----|-----|-------------|---------------------|--------|--------------|----------|------|---------------------------|------|-----------|
| 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 | 1 | 1 | 2412 | -3.63 | -3.64 | | 2.92 | 2.57 | 8.00 | 8.00 | Pass |
| 11b | 1Mbps | 1 | 7 | 2442 | -2.31 | -2.37 | | 2.92 | 2.57 | 8.00 | 8.00 | Pass |
| 11b | 1Mbps | 1 | 11 | 2462 | -3.92 | -3.33 | | 2.92 | 2.57 | 8.00 | 8.00 | Pass |
| 11b | 1Mbps | 1 | 12 | 2467 | -4.30 | -4.53 | | 2.92 | 2.57 | 8.00 | 8.00 | Pass |
| 11b | 1Mbps | 1 | 13 | 2472 | -6.70 | -8.12 | | 2.92 | 2.57 | 8.00 | 8.00 | Pass |
| 11g | 6Mbps | 1 | 1 | 2412 | -7.60 | -7.35 | | 2.92 | 2.57 | 8.00 | 8.00 | Pass |
| 11g | 6Mbps | 1 | 7 | 2442 | -4.03 | -4.63 | | 2.92 | 2.57 | 8.00 | 8.00 | Pass |
| 11g | 6Mbps | 1 | 11 | 2462 | -8.16 | -6.83 | | 2.92 | 2.57 | 8.00 | 8.00 | Pass |
| 11g | 6Mbps | 1 | 12 | 2467 | -10.41 | -9.92 | | 2.92 | 2.57 | 8.00 | 8.00 | Pass |
| 11g | 6Mbps | 1 | 13 | 2472 | -14.73 | -15.50 | | 2.92 | 2.57 | 8.00 | 8.00 | Pass |

Note: 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 | 18.90 | 18.91 | 16.59 | 17.73 | 0.50 | Pass |
| HE20 | MCS0 | 2 | 7 | 2442 | Full | 18.92 | 18.92 | 16.64 | 17.68 | 0.50 | Pass |
| HE20 | MCS0 | 2 | 11 | 2462 | Full | 18.92 | 18.90 | 17.65 | 16.33 | 0.50 | Pass |
| HE20 | MCS0 | 2 | 12 | 2467 | Full | 18.92 | 18.89 | 17.93 | 17.46 | 0.50 | Pass |
| HE20 | MCS0 | 2 | 13 | 2472 | Full | 18.74 | 18.76 | 18.69 | 18.65 | 0.50 | Pass |
| HE40 | MCS0 | 2 | 3 | 2422 | Full | 37.68 | 37.63 | 35.70 | 35.36 | 0.50 | Pass |
| HE40 | MCS0 | 2 | 7 | 2442 | Full | 37.67 | 37.64 | 35.03 | 35.01 | 0.50 | Pass |
| HE40 | MCS0 | 2 | 9 | 2452 | Full | 37.67 | 37.64 | 35.08 | 35.05 | 0.50 | Pass |
| HE40 | MCS0 | 2 | 10 | 2457 | Full | 37.60 | 37.58 | 35.51 | 34.53 | 0.50 | Pass |
| HE40 | MCS0 | 2 | 11 | 2462 | Full | 38.00 | 37.99 | 37.78 | 37.71 | 0.50 | Pass |

TEST RESULTS DATA
Average Output Power

| 2.4GHz Band Single Antenna | | | | | | | | | | | | | | | | | |
|----------------------------|-----------|-----|-----|-------------|------------|-------------------------------|-------|-----|-----------------------------|-------|----------|------|------------------|-------|------------------------|-------|------------|
| 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 | 1 | 1 | 2412 | Full | 16.50 | 16.50 | | 30.00 | 30.00 | 2.92 | 2.57 | 19.42 | 19.07 | 36.00 | 36.00 | Pass |
| HE20 | MCS0 | 1 | 1 | 2412 | 26/0 | 18.20 | 18.50 | | 30.00 | 30.00 | 2.92 | 2.57 | 21.12 | 21.07 | 36.00 | 36.00 | Pass |
| HE20 | MCS0 | 1 | 1 | 2412 | 52/37 | 18.70 | 18.80 | | 30.00 | 30.00 | 2.92 | 2.57 | 21.62 | 21.37 | 36.00 | 36.00 | Pass |
| HE20 | MCS0 | 1 | 1 | 2412 | 106/53 | 18.60 | 18.50 | | 30.00 | 30.00 | 2.92 | 2.57 | 21.52 | 21.07 | 36.00 | 36.00 | Pass |
| HE20 | MCS0 | 1 | 7 | 2442 | Full | 19.40 | 19.80 | | 30.00 | 30.00 | 2.92 | 2.57 | 22.32 | 22.37 | 36.00 | 36.00 | Pass |
| HE20 | MCS0 | 1 | 11 | 2462 | Full | 15.80 | 15.60 | | 30.00 | 30.00 | 2.92 | 2.57 | 18.72 | 18.17 | 36.00 | 36.00 | Pass |
| HE20 | MCS0 | 1 | 12 | 2467 | Full | 15.30 | 13.80 | | 30.00 | 30.00 | 2.92 | 2.57 | 18.22 | 16.37 | 36.00 | 36.00 | Pass |
| HE20 | MCS0 | 1 | 13 | 2472 | Full | 11.10 | 10.30 | | 30.00 | 30.00 | 2.92 | 2.57 | 14.02 | 12.87 | 36.00 | 36.00 | Pass |
| HE20 | MCS0 | 1 | 13 | 2472 | 26/8 | 3.20 | 3.40 | | 30.00 | 30.00 | 2.92 | 2.57 | 6.12 | 5.97 | 36.00 | 36.00 | Pass |
| HE20 | MCS0 | 1 | 13 | 2472 | 52/40 | 5.70 | 5.80 | | 30.00 | 30.00 | 2.92 | 2.57 | 8.62 | 8.37 | 36.00 | 36.00 | Pass |
| HE20 | MCS0 | 1 | 13 | 2472 | 106/54 | 7.30 | 8.90 | | 30.00 | 30.00 | 2.92 | 2.57 | 10.22 | 11.47 | 36.00 | 36.00 | Pass |
| HE40 | MCS0 | 1 | 3 | 2422 | Full | 16.30 | 16.40 | | 30.00 | 30.00 | 2.92 | 2.57 | 19.22 | 18.97 | 36.00 | 36.00 | Pass |
| HE40 | MCS0 | 1 | 3 | 2422 | 242/61 | 16.40 | 16.50 | | 30.00 | 30.00 | 2.92 | 2.57 | 19.32 | 19.07 | 36.00 | 36.00 | Pass |
| HE40 | MCS0 | 1 | 7 | 2442 | Full | 15.70 | 15.90 | | 30.00 | 30.00 | 2.92 | 2.57 | 18.62 | 18.47 | 36.00 | 36.00 | Pass |
| HE40 | MCS0 | 1 | 9 | 2452 | Full | 15.60 | 15.90 | | 30.00 | 30.00 | 2.92 | 2.57 | 18.52 | 18.47 | 36.00 | 36.00 | Pass |
| HE40 | MCS0 | 1 | 10 | 2457 | Full | 10.30 | 11.90 | | 30.00 | 30.00 | 2.92 | 2.57 | 13.22 | 14.47 | 36.00 | 36.00 | Pass |
| HE40 | MCS0 | 1 | 11 | 2462 | Full | 11.00 | 10.30 | | 30.00 | 30.00 | 2.92 | 2.57 | 13.92 | 12.87 | 36.00 | 36.00 | Pass |
| HE40 | MCS0 | 1 | 11 | 2462 | 242/62 | 1.50 | 3.00 | | 30.00 | 30.00 | 2.92 | 2.57 | 4.42 | 5.57 | 36.00 | 36.00 | Pass |

| 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 | 15.40 | 15.50 | 18.46 | 30.00 | | 2.92 | | 21.38 | | 36.00 | | Pass |
| HE20 | MCS0 | 2 | 1 | 2412 | 26/0 | 15.20 | 15.40 | 18.31 | 30.00 | | 2.92 | | 21.23 | | 36.00 | | Pass |
| HE20 | MCS0 | 2 | 1 | 2412 | 52/37 | 15.60 | 15.70 | 18.66 | 30.00 | | 2.92 | | 21.58 | | 36.00 | | Pass |
| HE20 | MCS0 | 2 | 1 | 2412 | 106/53 | 15.60 | 15.80 | 18.71 | 30.00 | | 2.92 | | 21.63 | | 36.00 | | Pass |
| HE20 | MCS0 | 2 | 7 | 2442 | Full | 16.60 | 16.70 | 19.66 | 30.00 | | 2.92 | | 22.58 | | 36.00 | | Pass |
| HE20 | MCS0 | 2 | 11 | 2462 | Full | 13.70 | 13.80 | 16.76 | 30.00 | | 2.92 | | 19.68 | | 36.00 | | Pass |
| HE20 | MCS0 | 2 | 12 | 2467 | Full | 12.20 | 12.30 | 15.26 | 30.00 | | 2.92 | | 18.18 | | 36.00 | | Pass |
| HE20 | MCS0 | 2 | 13 | 2472 | Full | 8.50 | 9.00 | 11.77 | 30.00 | | 2.92 | | 14.69 | | 36.00 | | Pass |
| HE20 | MCS0 | 2 | 13 | 2472 | 26/8 | -0.70 | 0.50 | 2.95 | 30.00 | | 2.92 | | 5.87 | | 36.00 | | Pass |
| HE20 | MCS0 | 2 | 13 | 2472 | 52/40 | 3.40 | 4.00 | 6.72 | 30.00 | | 2.92 | | 9.64 | | 36.00 | | Pass |
| HE20 | MCS0 | 2 | 13 | 2472 | 106/54 | 5.40 | 6.40 | 8.94 | 30.00 | | 2.92 | | 11.86 | | 36.00 | | Pass |
| HE40 | MCS0 | 2 | 3 | 2422 | Full | 13.60 | 13.70 | 16.66 | 30.00 | | 2.92 | | 19.58 | | 36.00 | | Pass |
| HE40 | MCS0 | 2 | 3 | 2422 | 242/61 | 14.50 | 14.60 | 17.56 | 30.00 | | 2.92 | | 20.48 | | 36.00 | | Pass |
| HE40 | MCS0 | 2 | 7 | 2442 | Full | 13.40 | 13.70 | 16.56 | 30.00 | | 2.92 | | 19.48 | | 36.00 | | Pass |
| HE40 | MCS0 | 2 | 9 | 2452 | Full | 12.40 | 12.80 | 15.61 | 30.00 | | 2.92 | | 18.53 | | 36.00 | | Pass |
| HE40 | MCS0 | 2 | 10 | 2457 | Full | 9.40 | 9.80 | 12.61 | 30.00 | | 2.92 | | 15.53 | | 36.00 | | Pass |
| HE40 | MCS0 | 2 | 11 | 2462 | Full | 9.60 | 8.50 | 12.10 | 30.00 | | 2.92 | | 15.02 | | 36.00 | | Pass |
| HE40 | MCS0 | 2 | 11 | 2462 | 242/62 | -0.90 | -1.10 | 2.01 | 30.00 | | 2.92 | | 4.93 | | 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) | 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 | -9.26 | -8.33 | -5.32 | 5.76 | | 8.00 | | Pass |
| HE20 | MCS0 | 2 | 1 | 2412 | 26/0 | -1.98 | -0.81 | 2.20 | 5.76 | | 8.00 | | Pass |
| HE20 | MCS0 | 2 | 1 | 2412 | 52/37 | -4.52 | -3.03 | -0.02 | 5.76 | | 8.00 | | Pass |
| HE20 | MCS0 | 2 | 1 | 2412 | 106/53 | -6.90 | -7.33 | -3.89 | 5.76 | | 8.00 | | Pass |
| HE20 | MCS0 | 2 | 7 | 2442 | Full | -9.11 | -8.37 | -5.36 | 5.76 | | 8.00 | | Pass |
| HE20 | MCS0 | 2 | 11 | 2462 | Full | -11.16 | -10.81 | -7.80 | 5.76 | | 8.00 | | Pass |
| HE20 | MCS0 | 2 | 12 | 2467 | Full | -12.57 | -12.12 | -9.11 | 5.76 | | 8.00 | | Pass |
| HE20 | MCS0 | 2 | 13 | 2472 | Full | -18.05 | -15.66 | -12.65 | 5.76 | | 8.00 | | Pass |
| HE20 | MCS0 | 2 | 13 | 2472 | 26/8 | -17.53 | -16.03 | -13.02 | 5.76 | | 8.00 | | Pass |
| HE20 | MCS0 | 2 | 13 | 2472 | 52/40 | -15.96 | -15.37 | -12.36 | 5.76 | | 8.00 | | Pass |
| HE20 | MCS0 | 2 | 13 | 2472 | 106/54 | -17.93 | -14.12 | -11.11 | 5.76 | | 8.00 | | Pass |
| HE40 | MCS0 | 2 | 3 | 2422 | Full | -13.97 | -14.23 | -10.96 | 5.76 | | 8.00 | | Pass |
| HE40 | MCS0 | 2 | 3 | 2422 | 242/61 | -11.21 | -11.22 | -8.20 | 5.76 | | 8.00 | | Pass |
| HE40 | MCS0 | 2 | 7 | 2442 | Full | -15.74 | -15.47 | -12.46 | 5.76 | | 8.00 | | Pass |
| HE40 | MCS0 | 2 | 9 | 2452 | Full | -15.41 | -15.14 | -12.13 | 5.76 | | 8.00 | | Pass |
| HE40 | MCS0 | 2 | 10 | 2457 | Full | -18.65 | -17.78 | -14.77 | 5.76 | | 8.00 | | Pass |
| HE40 | MCS0 | 2 | 11 | 2462 | Full | -20.10 | -19.42 | -16.41 | 5.76 | | 8.00 | | Pass |
| HE40 | MCS0 | 2 | 11 | 2462 | 242/62 | -27.97 | -28.00 | -24.96 | 5.76 | | 8.00 | | Pass |

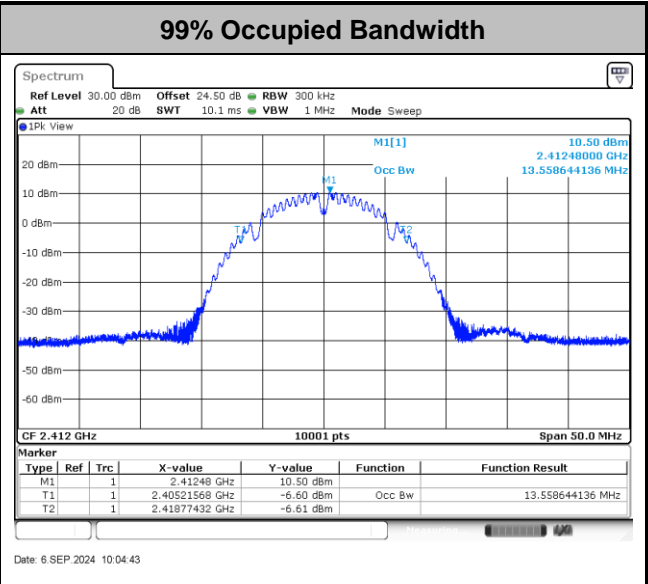
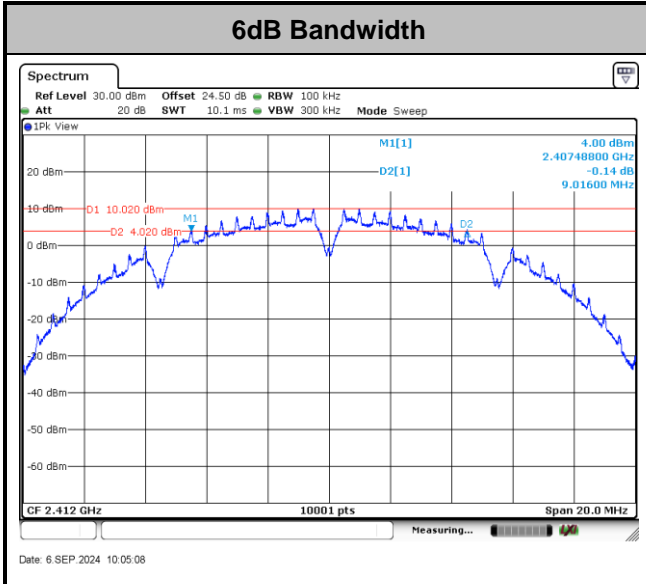
Note: Measured power density (dBm) has offset with cable loss.



6dB and 99% Occupied Bandwidth

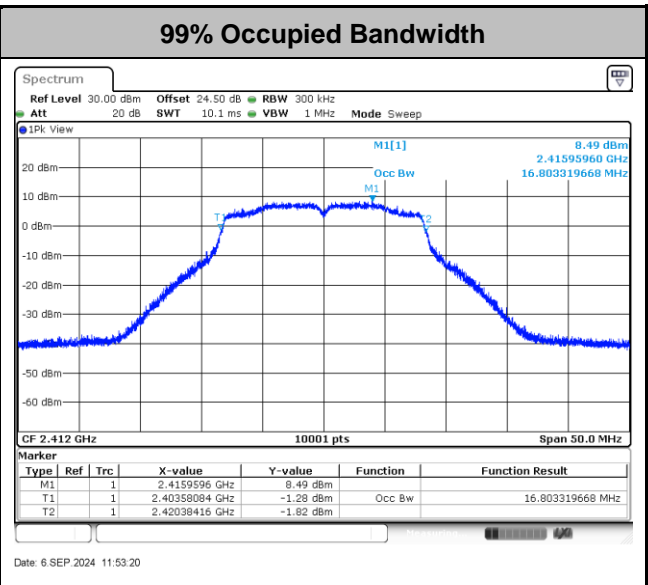
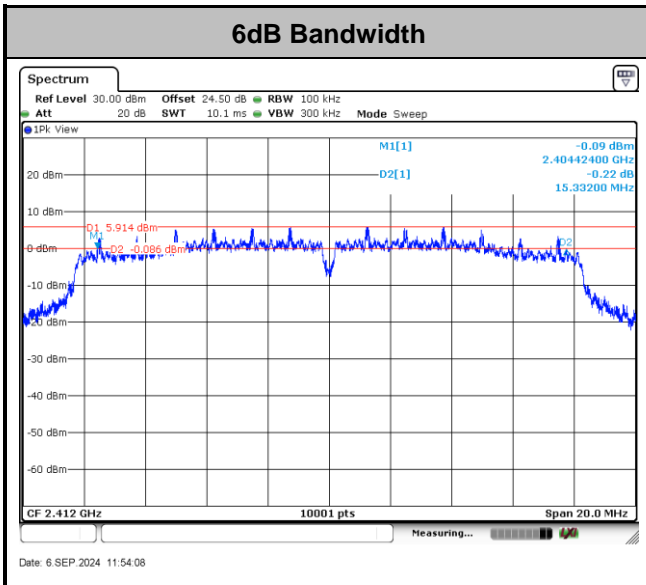
<Ant. 1>

<802.11b>



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

<802.11g>

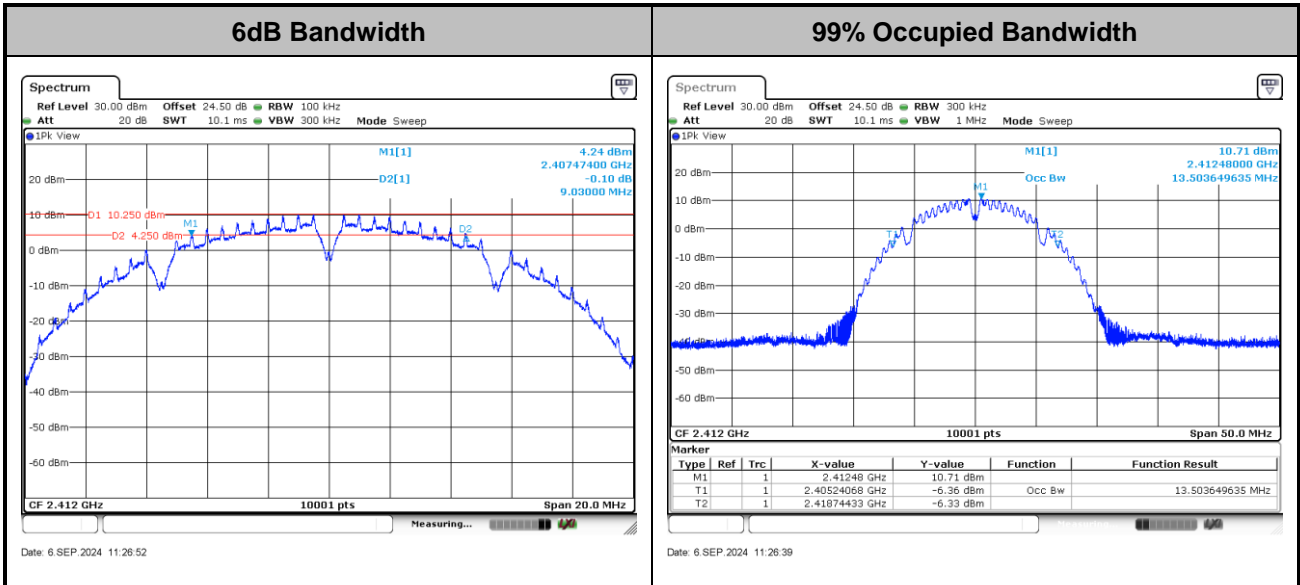


Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



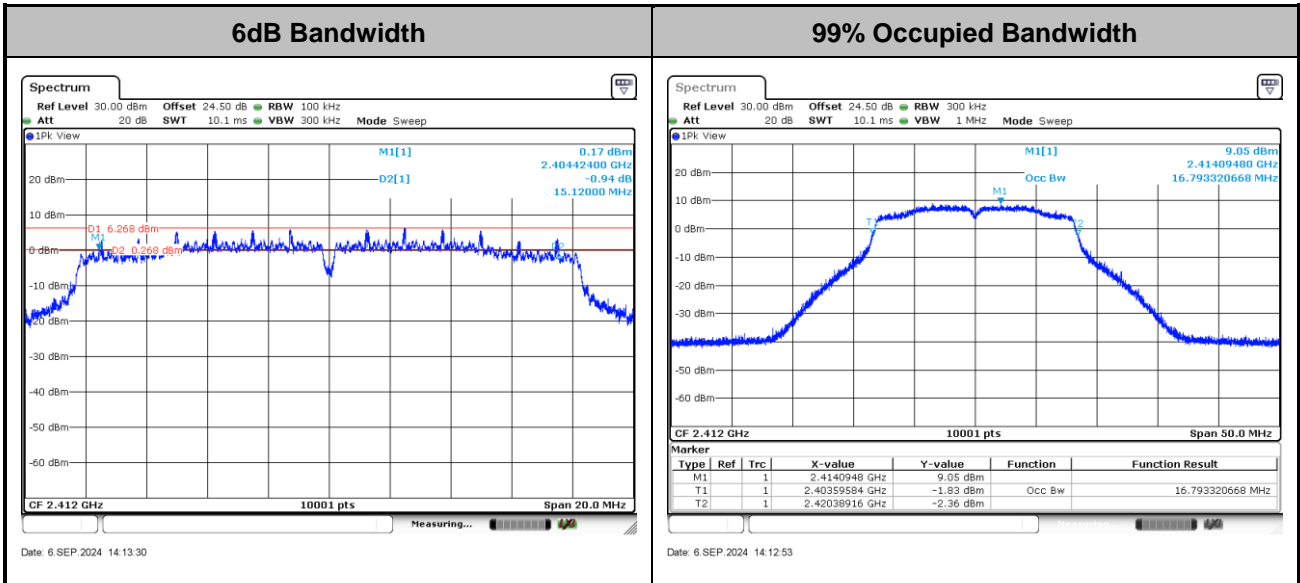
<Ant. 2>

<802.11b>



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

<802.11g>

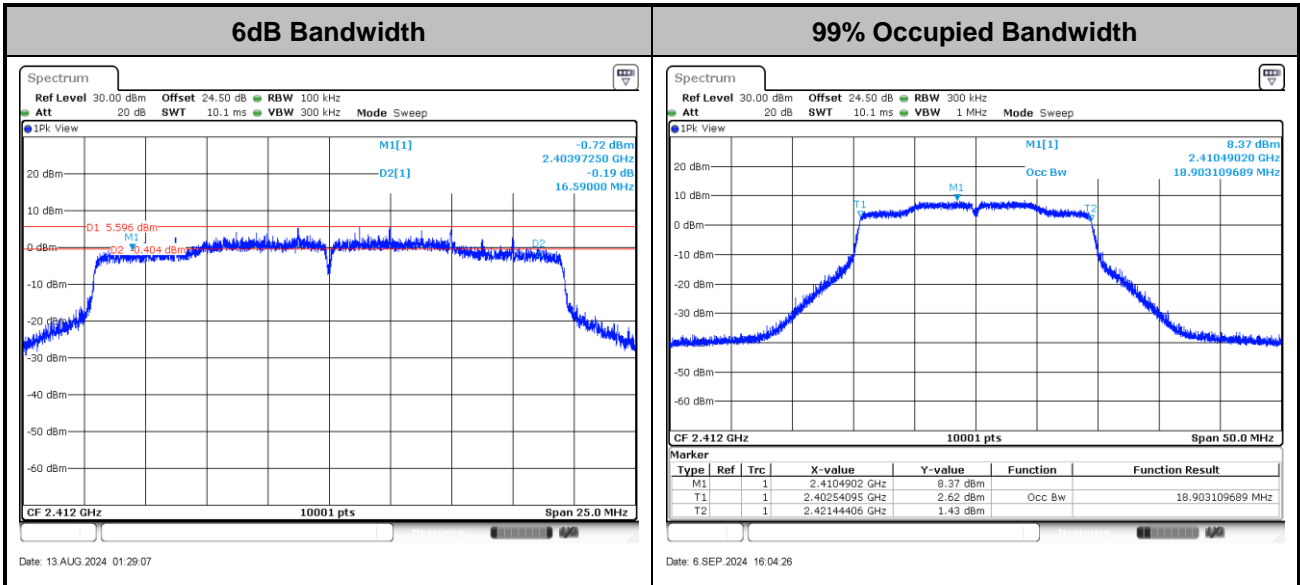


Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



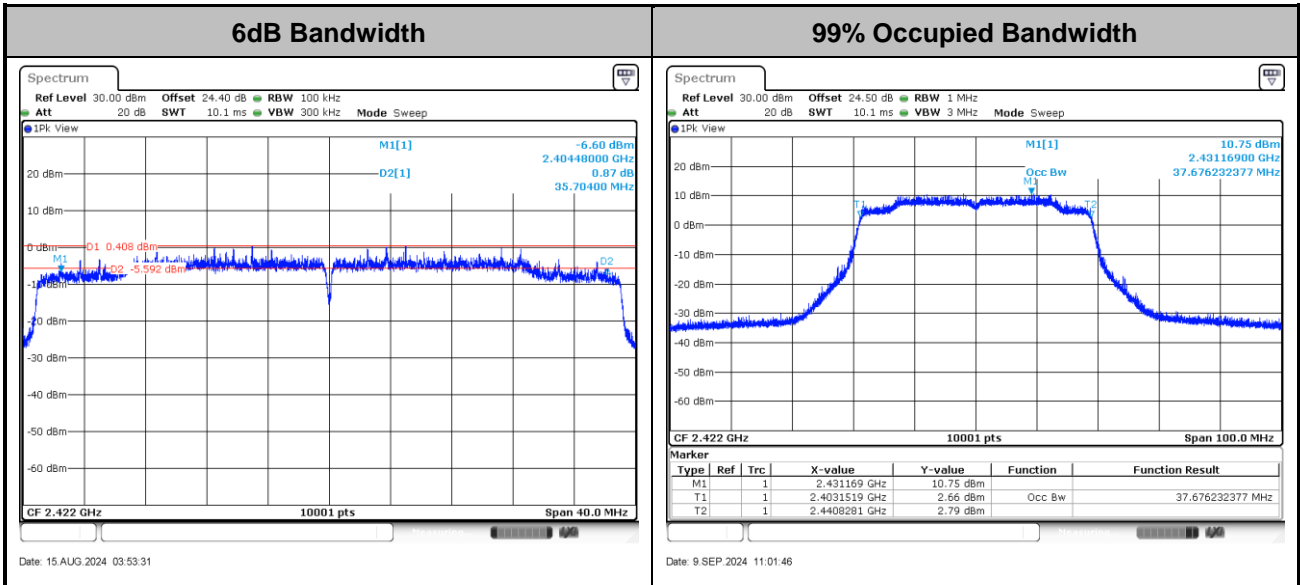
MIMO <Ant 1+2>

<802.11ax HE20>



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

<802.11ax HE40>



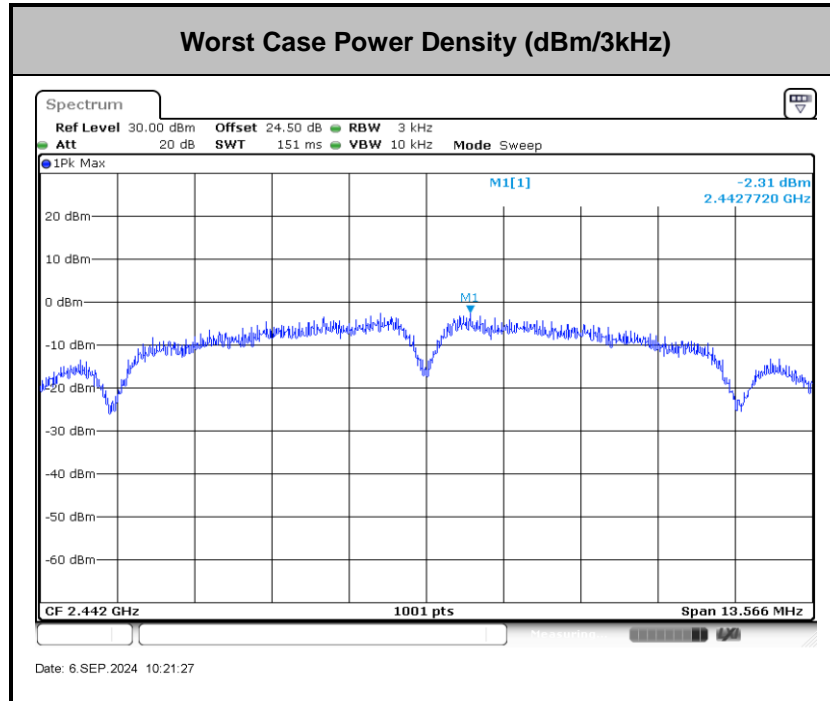
Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.



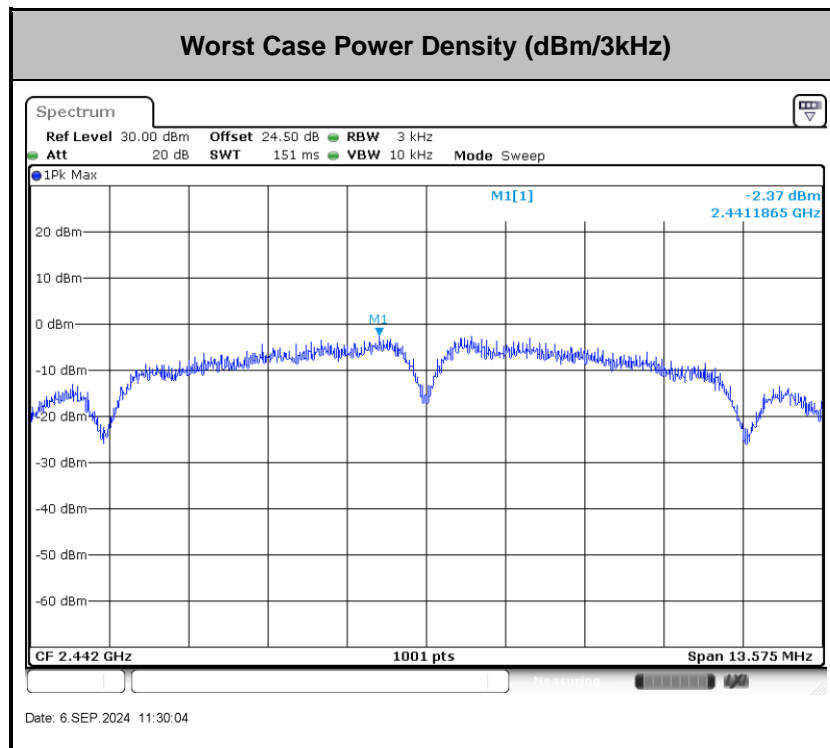
Power Spectral Density(dBm/3kHz)

<802.11b>

<Ant. 1>



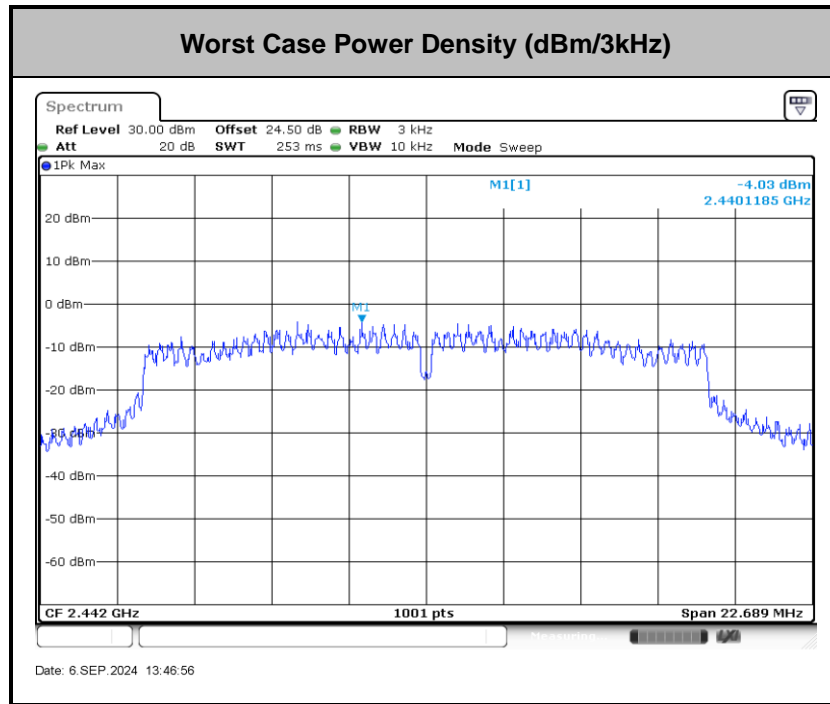
<Ant. 2>



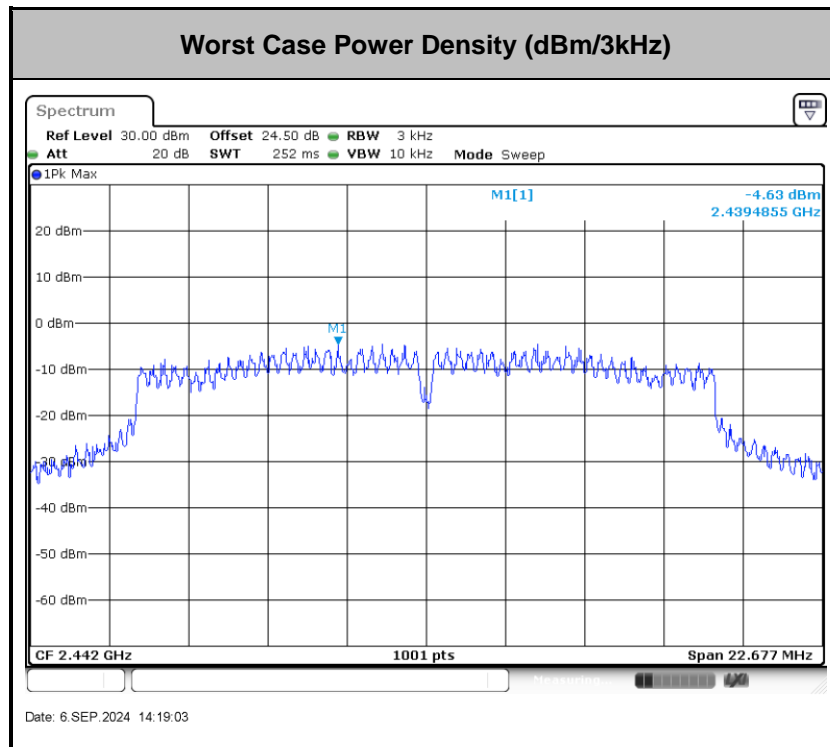


<802.11g>

<Ant. 1>

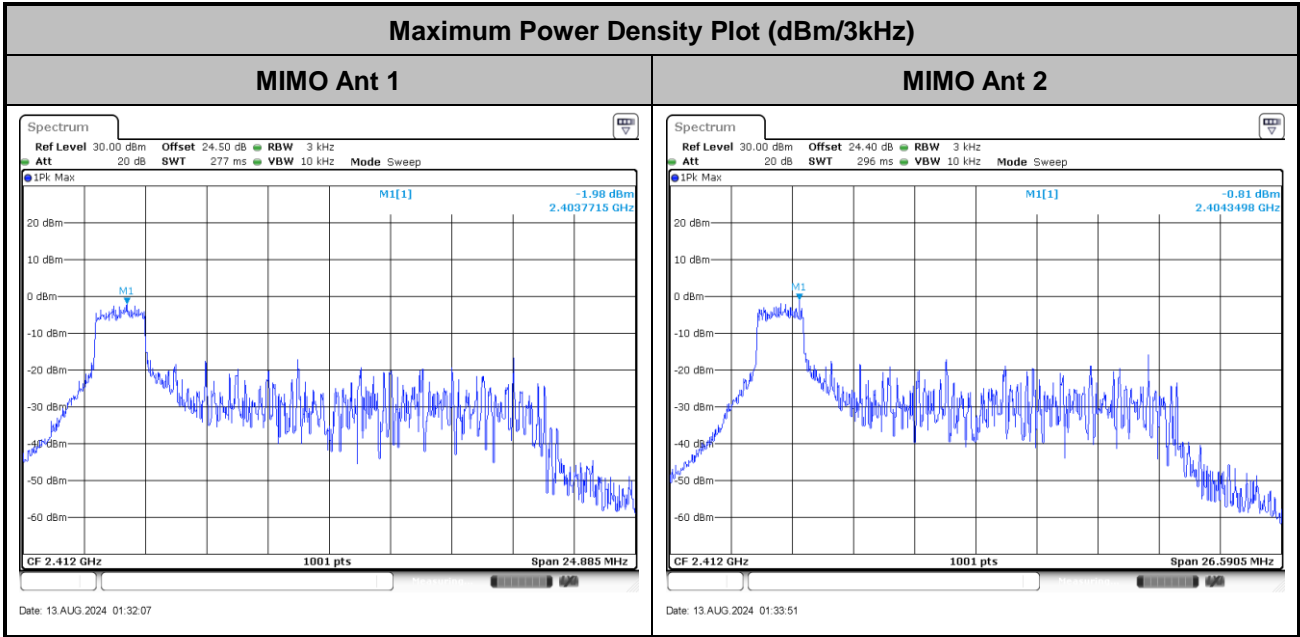


<Ant. 2>

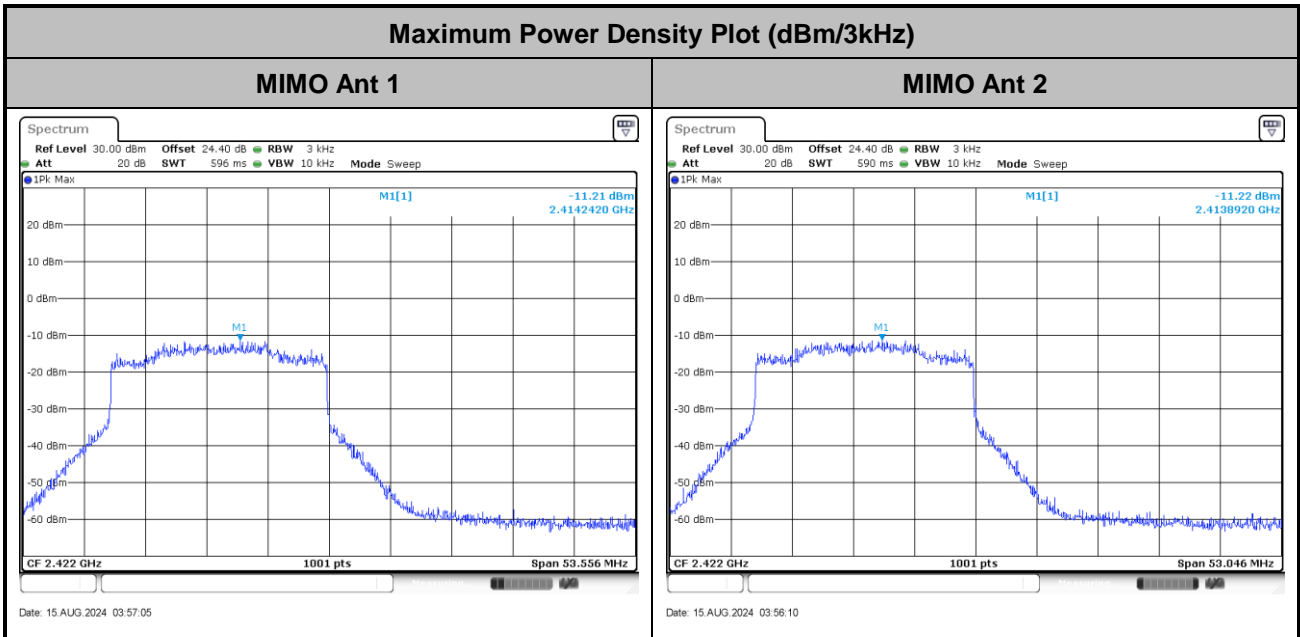




<802.11ax HE20>



<802.11ax HE40>

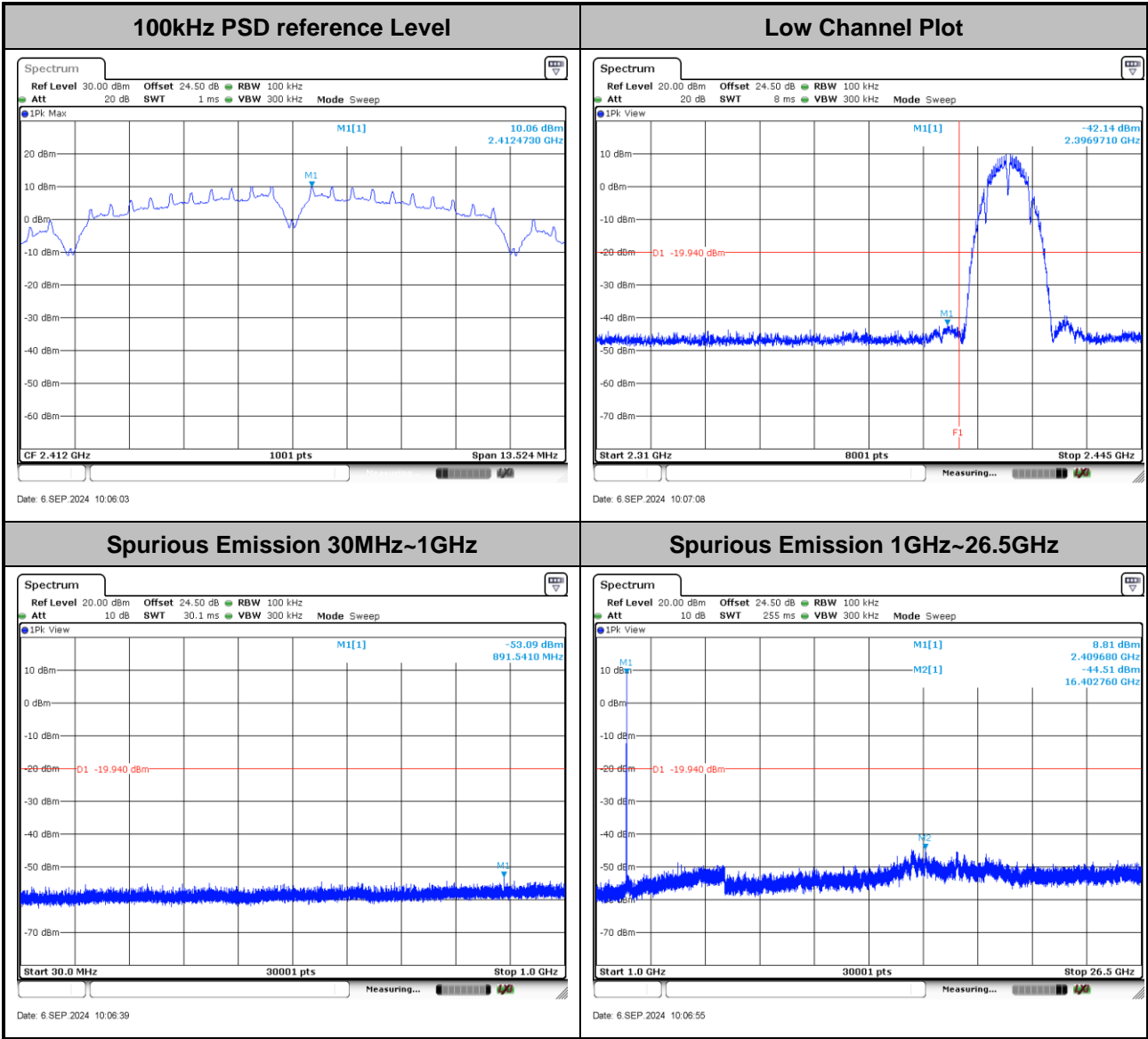




Band Edges and Spurious Emission

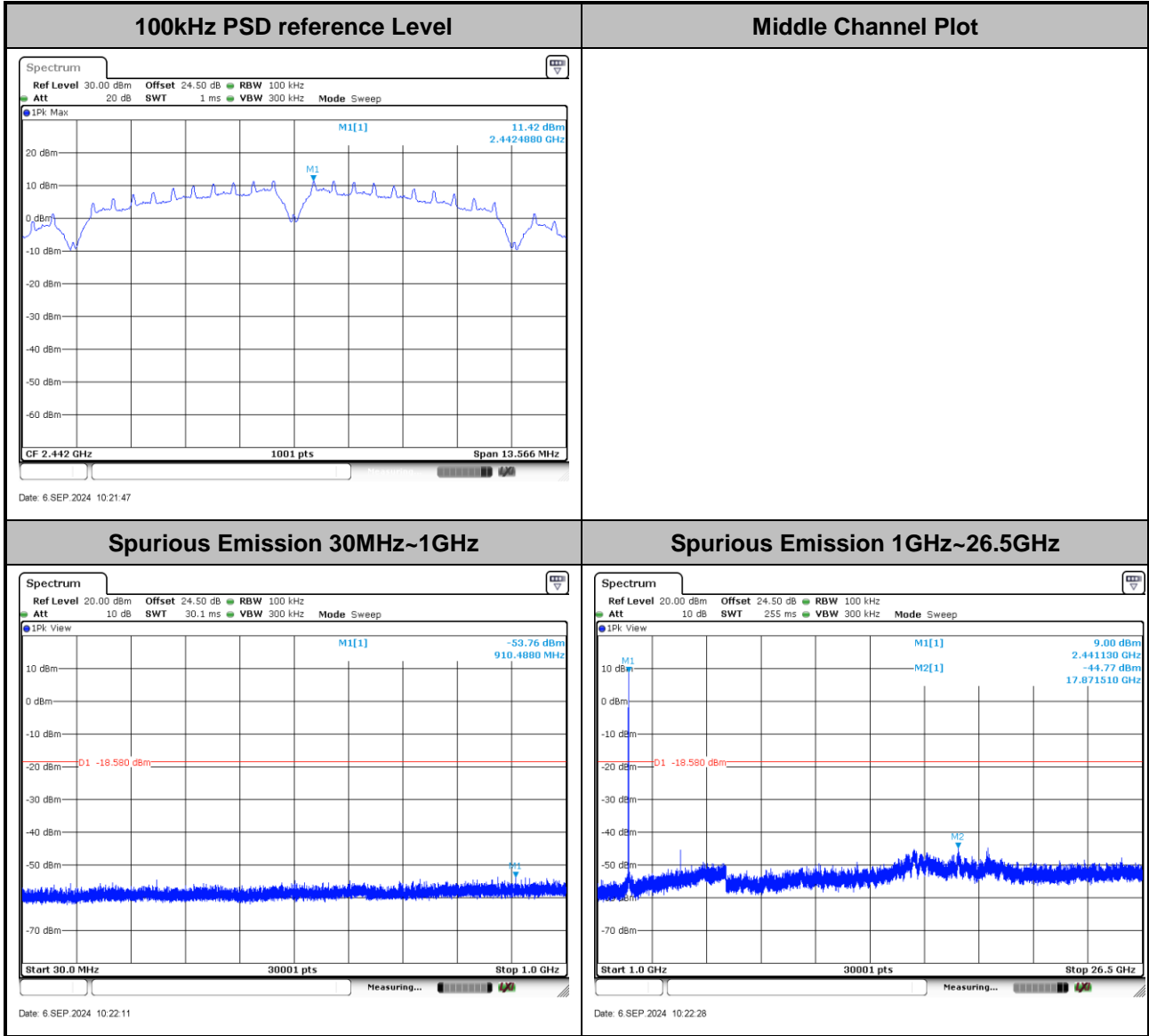
Number of TX = 2, Ant. 1 (Measured)

| | | | |
|-------------|---------|----------------|----|
| Test Mode : | 802.11b | Test Channel : | 01 |
|-------------|---------|----------------|----|



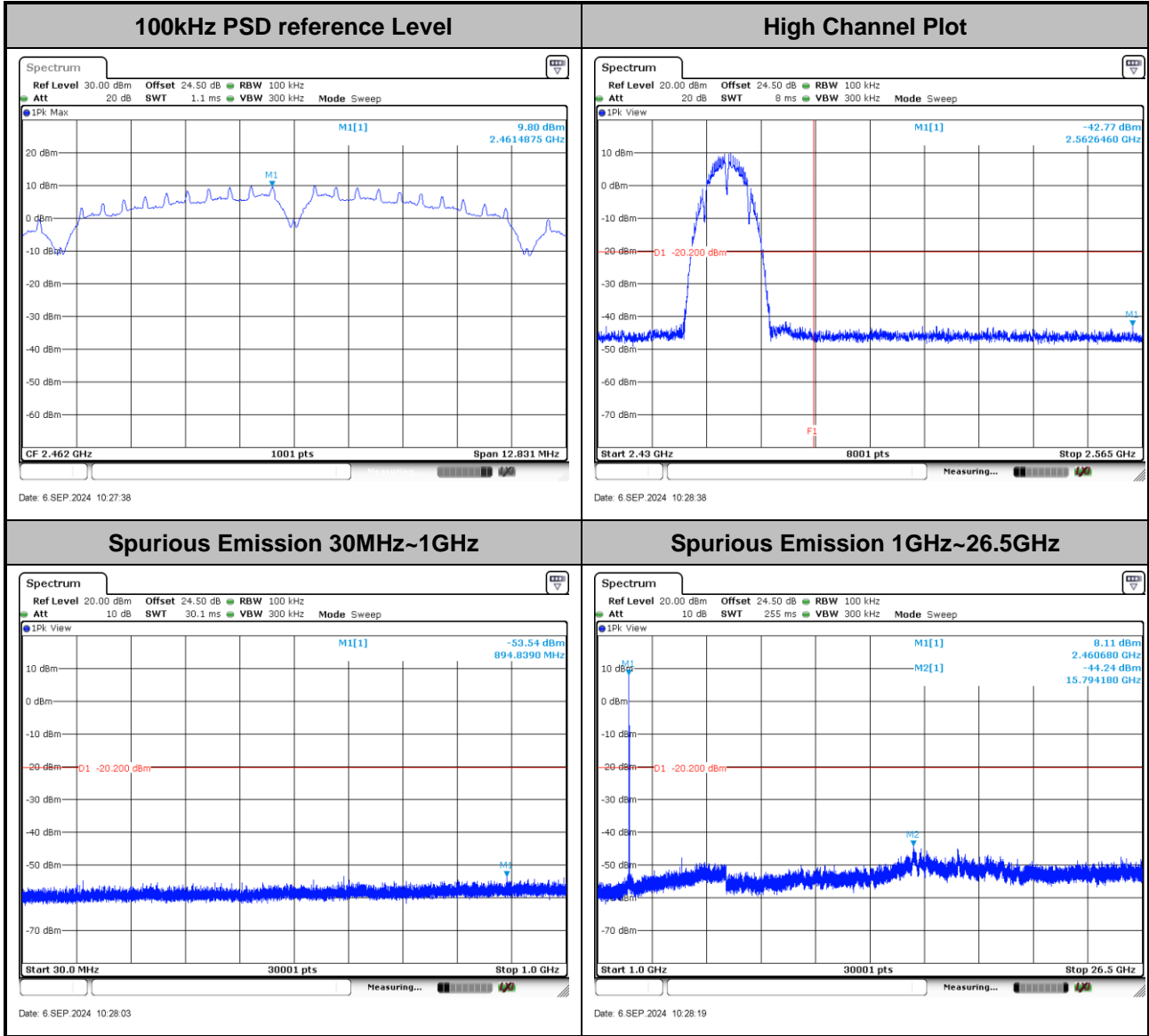


| | | | |
|-------------|---------|----------------|----|
| Test Mode : | 802.11b | Test Channel : | 07 |
|-------------|---------|----------------|----|



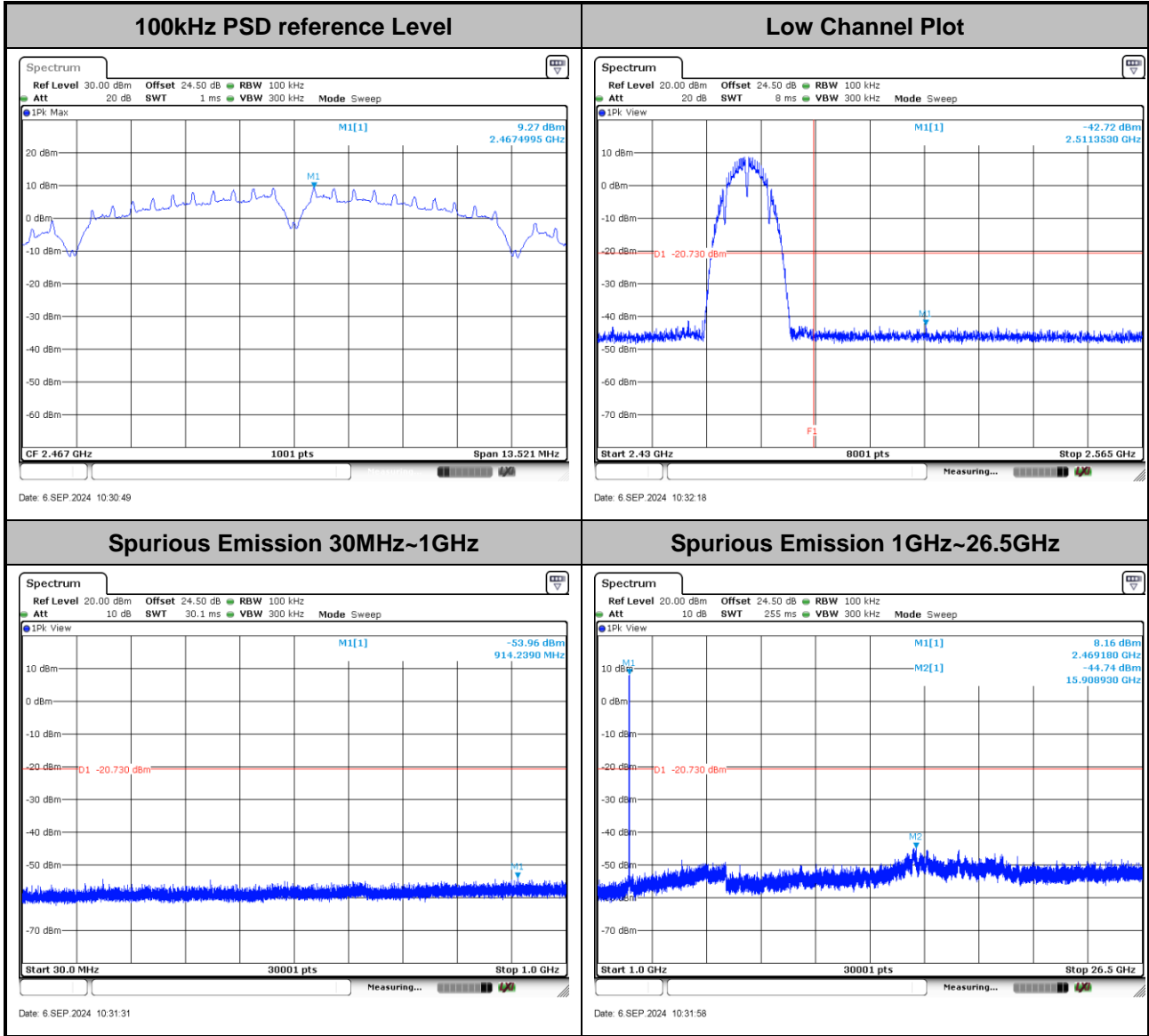


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|-------------|---------|----------------|----|
| Test Mode : | 802.11b | Test Channel : | 11 |
|-------------|---------|----------------|----|



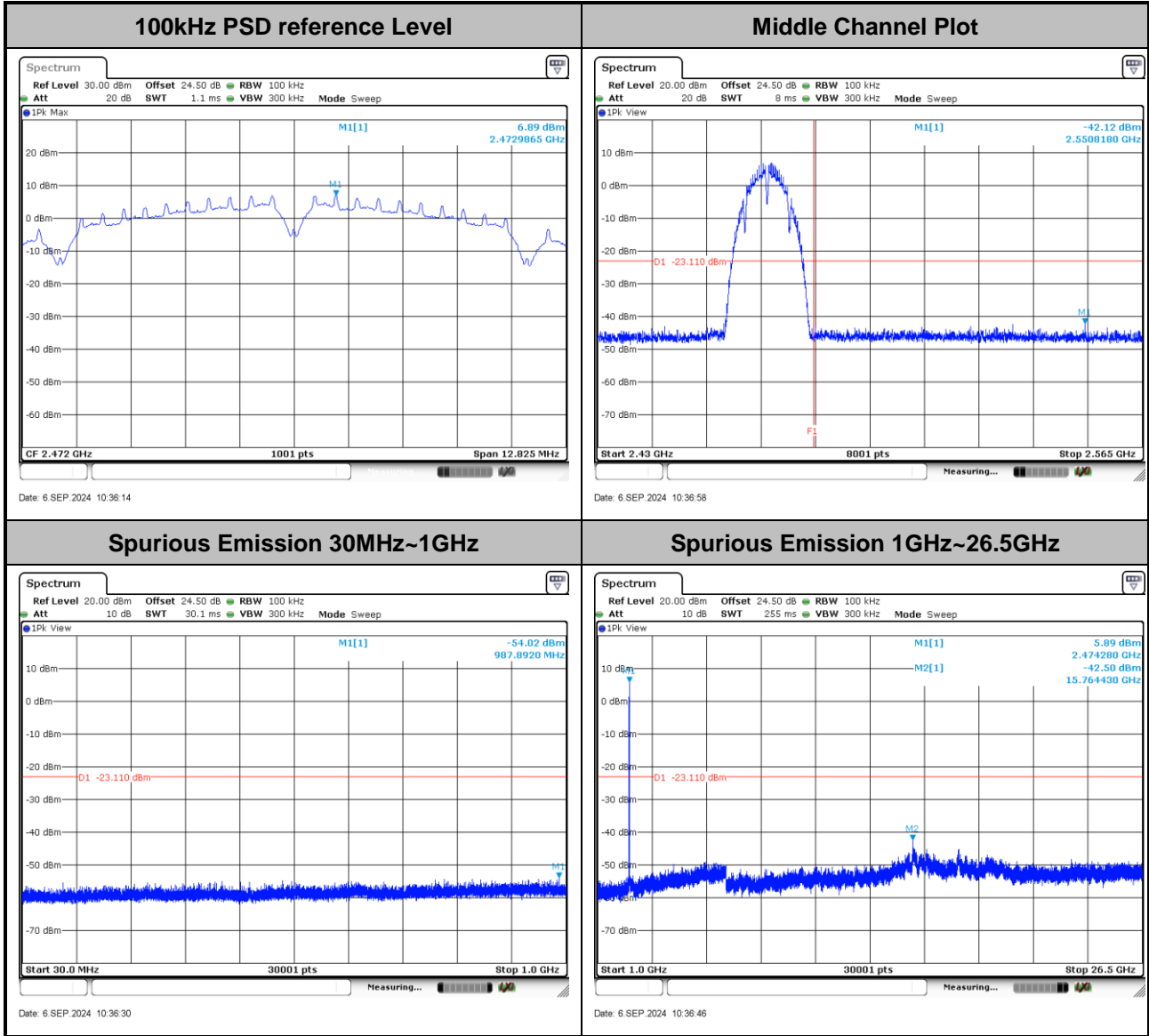


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|-------------|---------|----------------|----|
| Test Mode : | 802.11b | Test Channel : | 12 |
|-------------|---------|----------------|----|



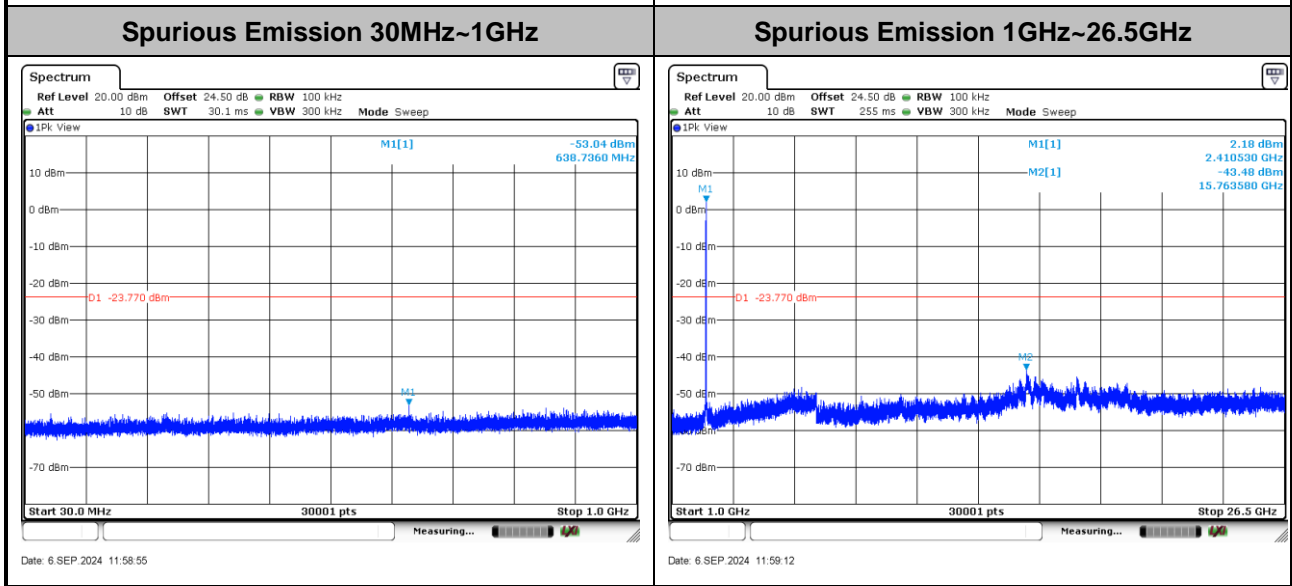
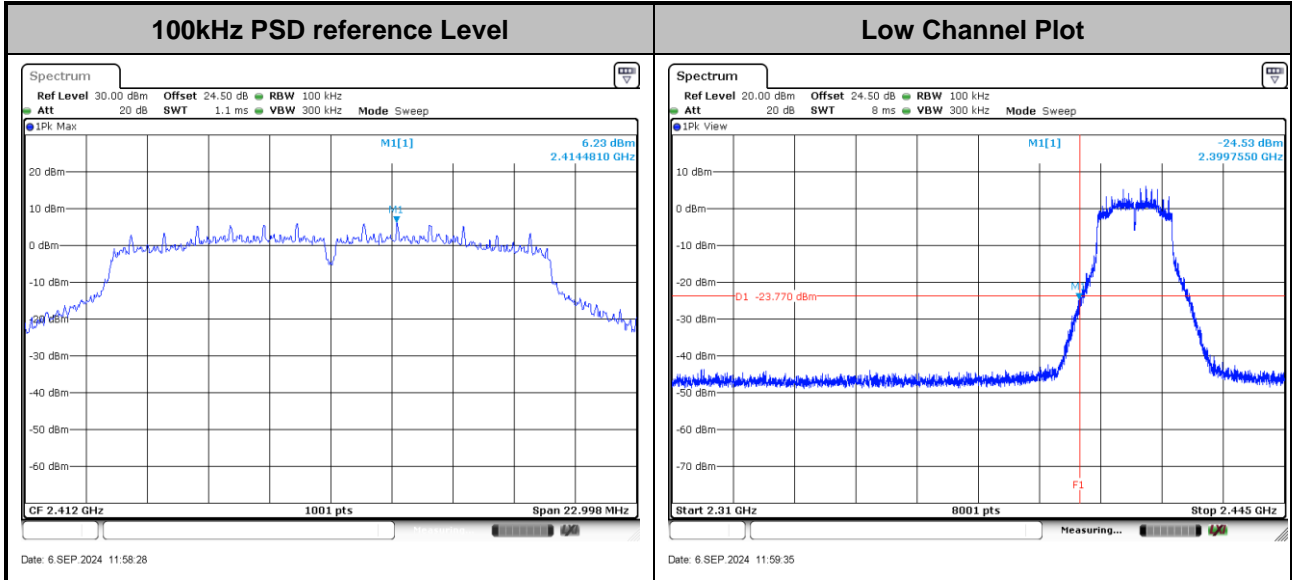


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|-------------|---------|----------------|----|
| Test Mode : | 802.11b | Test Channel : | 13 |
|-------------|---------|----------------|----|



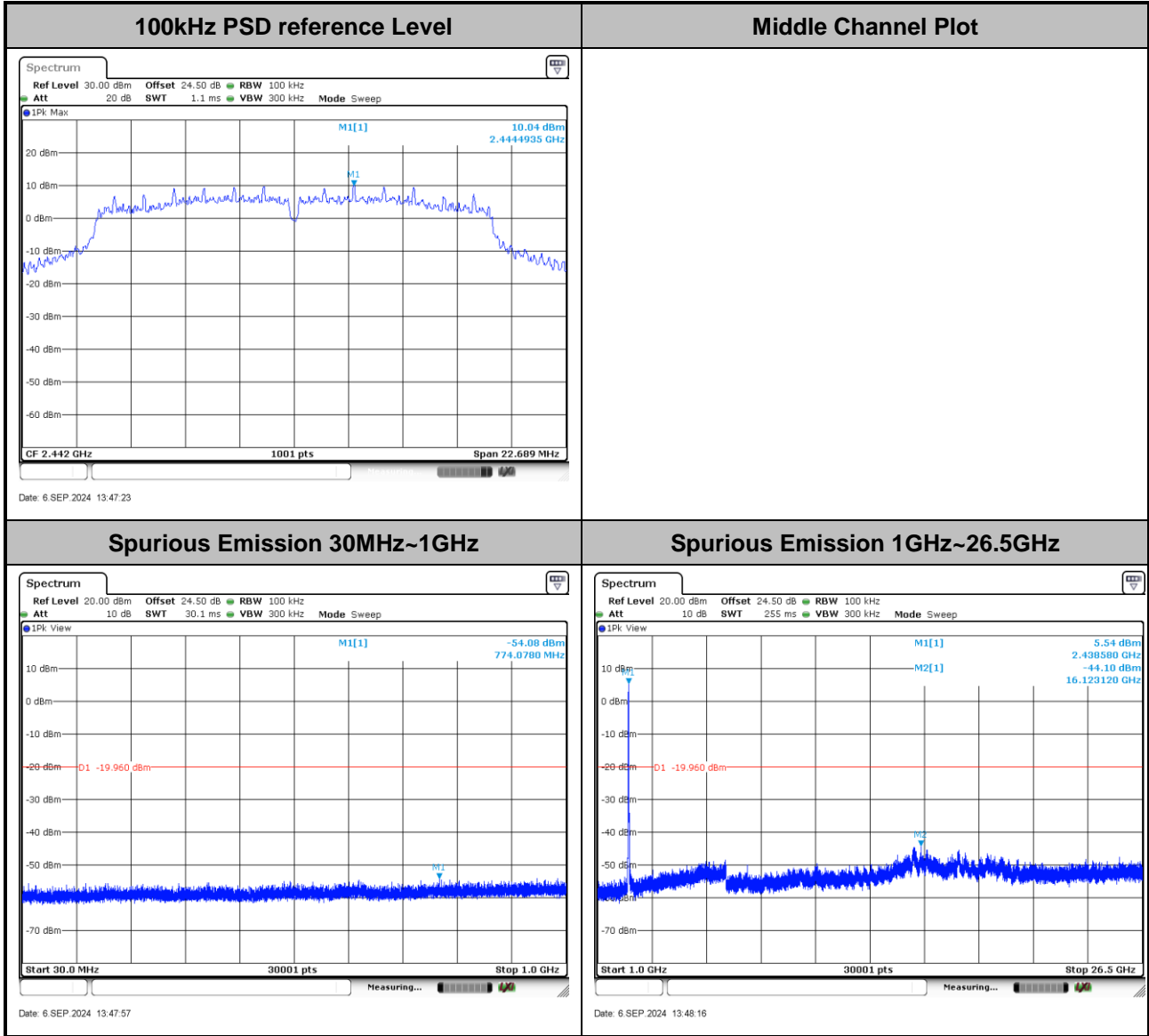


| | | | |
|-------------|---------|----------------|----|
| Test Mode : | 802.11g | Test Channel : | 01 |
|-------------|---------|----------------|----|



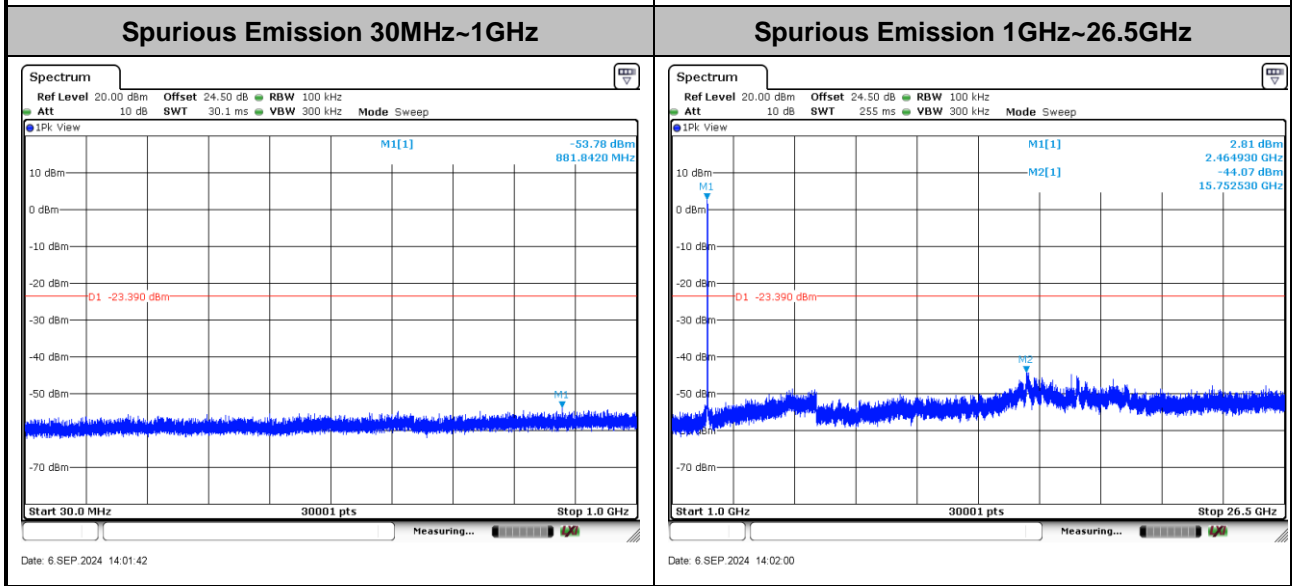
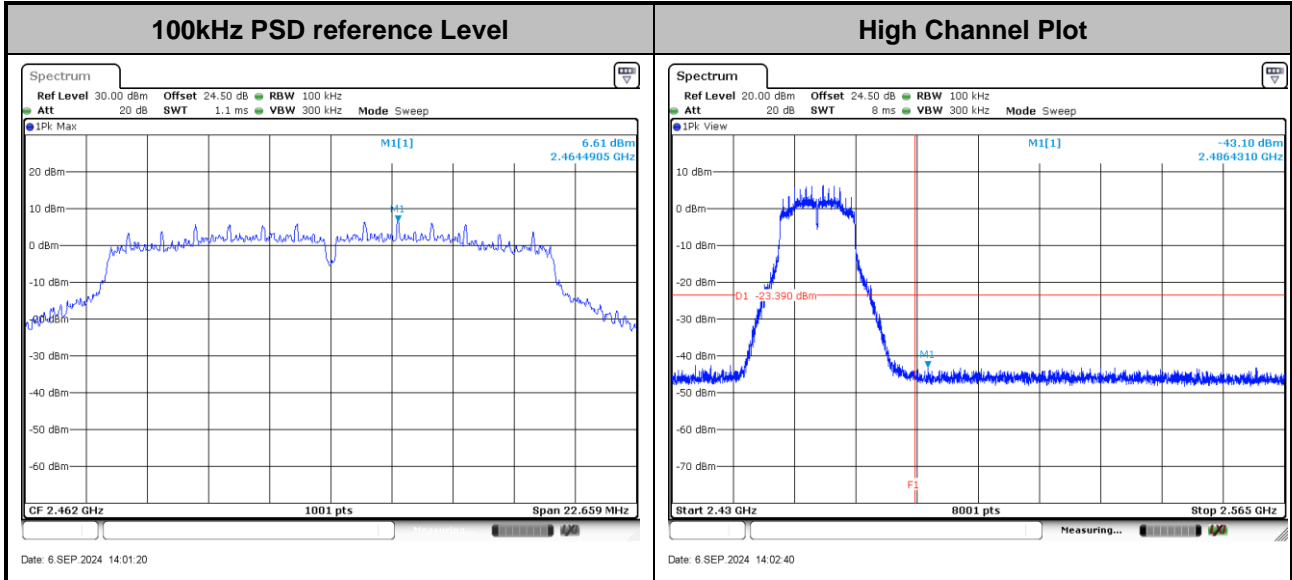


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|-------------|---------|----------------|----|
| Test Mode : | 802.11g | Test Channel : | 07 |
|-------------|---------|----------------|----|



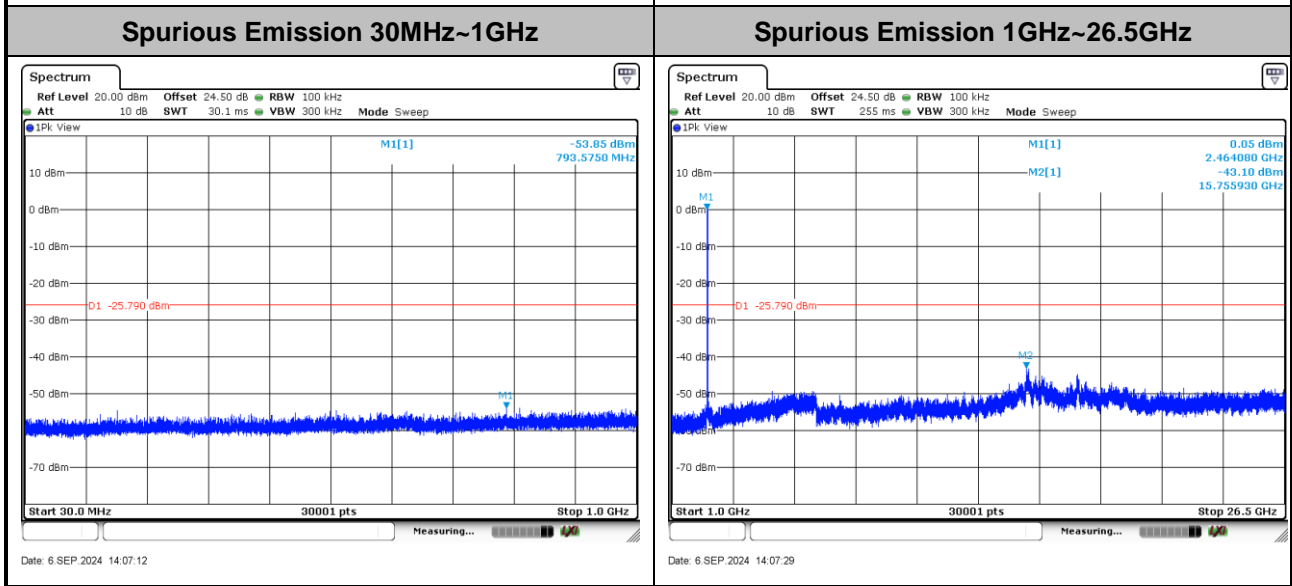
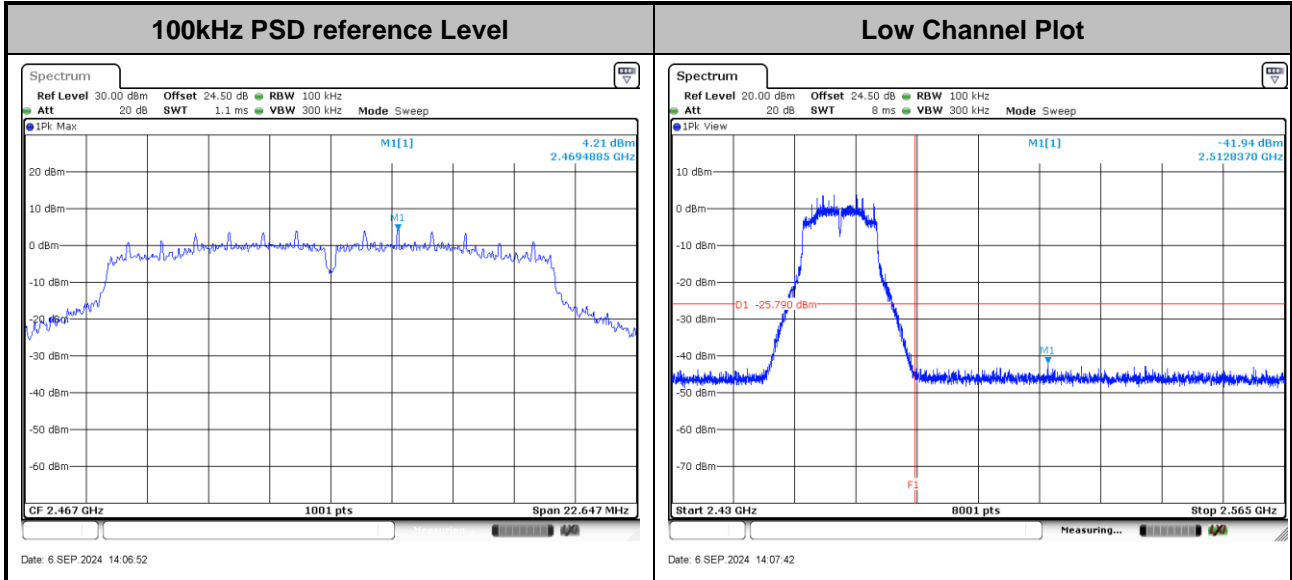


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|-------------|---------|----------------|----|
| Test Mode : | 802.11g | Test Channel : | 11 |
|-------------|---------|----------------|----|



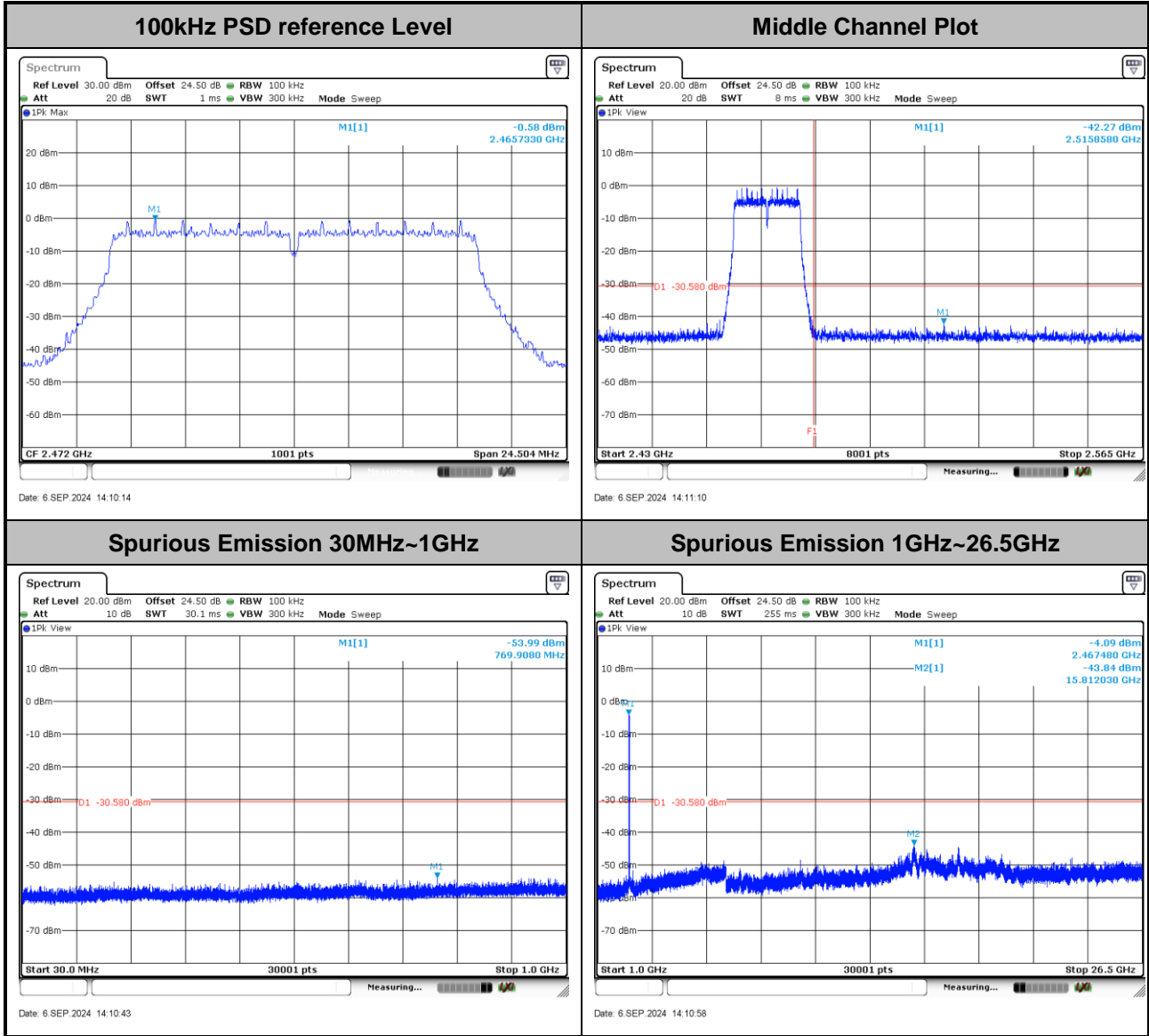


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|-------------|---------|----------------|----|
| Test Mode : | 802.11g | Test Channel : | 12 |
|-------------|---------|----------------|----|



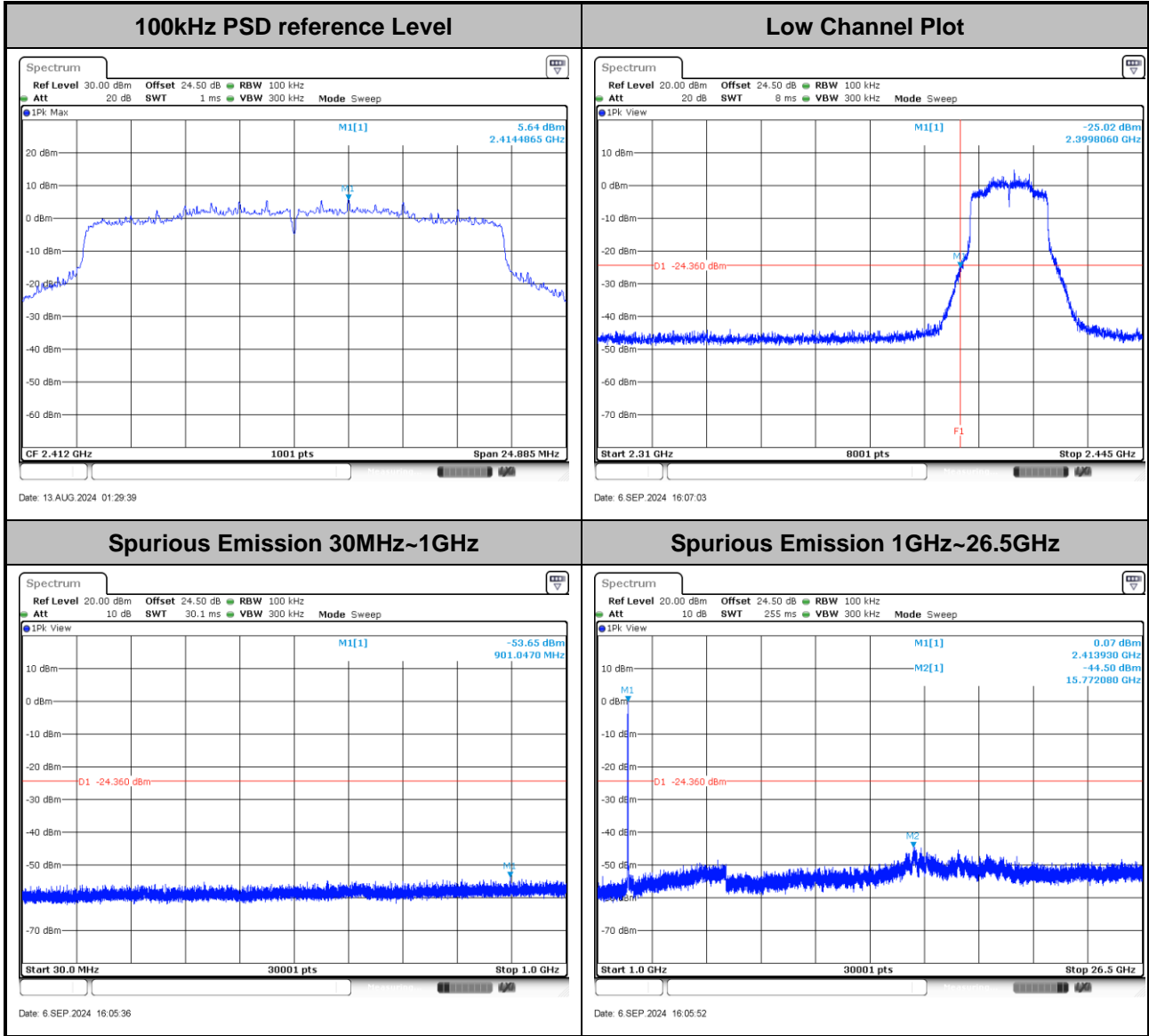


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|-------------|---------|----------------|----|
| Test Mode : | 802.11g | Test Channel : | 13 |
|-------------|---------|----------------|----|



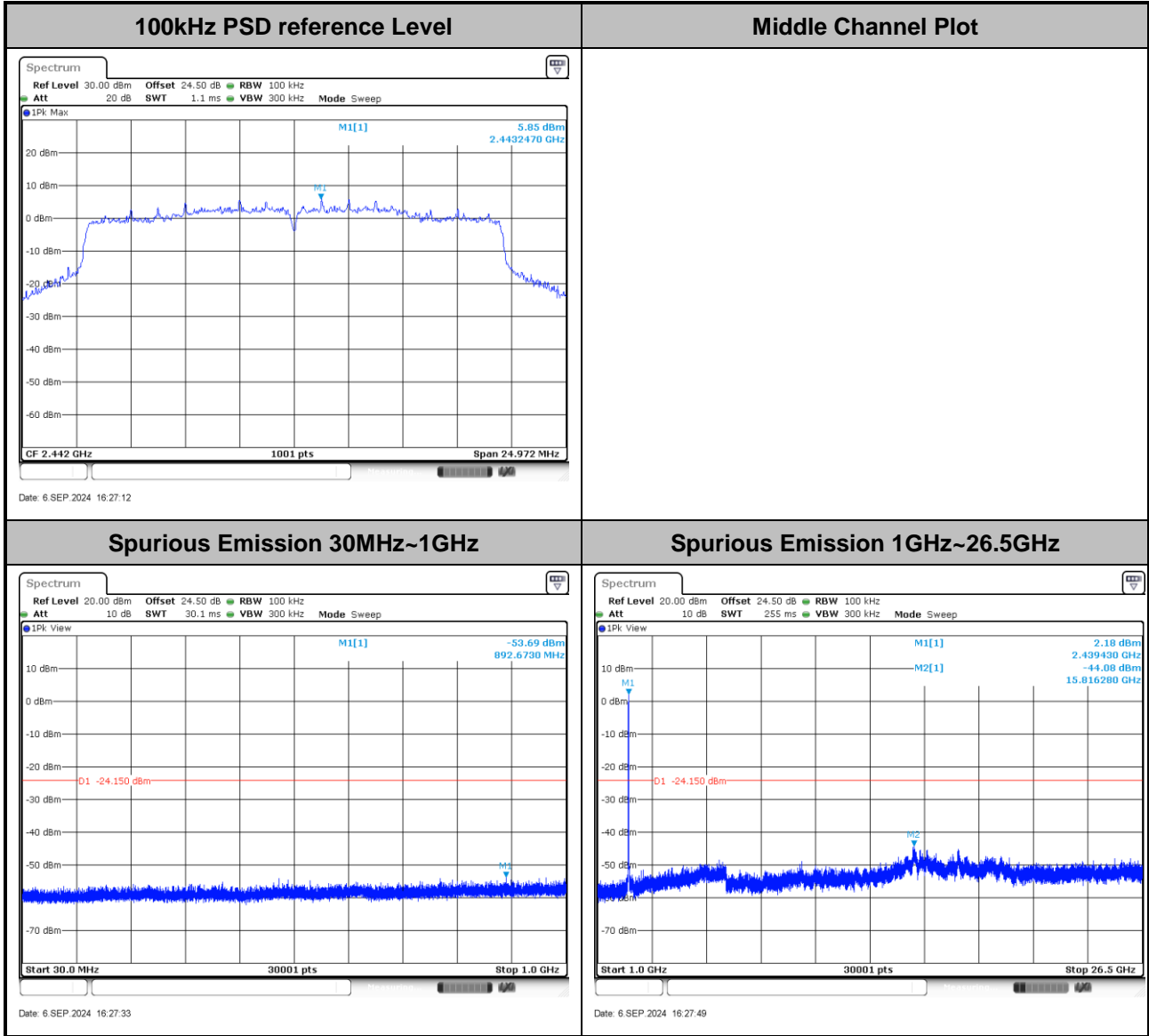


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|-------------|-----------------------|----------------|----|
| Test Mode : | 802.11ax HE20_FullIRU | Test Channel : | 01 |
|-------------|-----------------------|----------------|----|



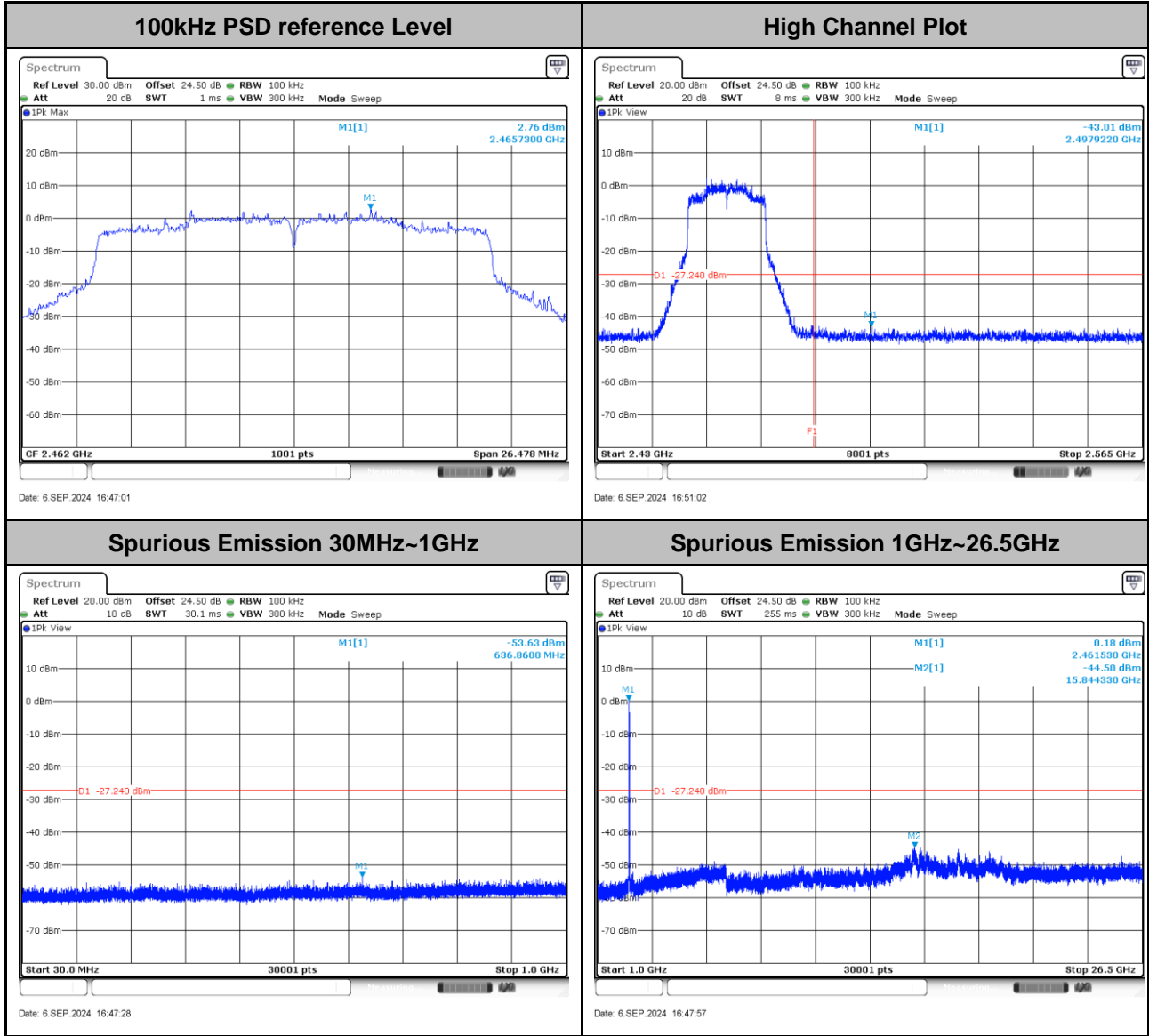


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|-------------|----------------------|----------------|----|
| Test Mode : | 802.11ax HE20_FullRU | Test Channel : | 07 |
|-------------|----------------------|----------------|----|



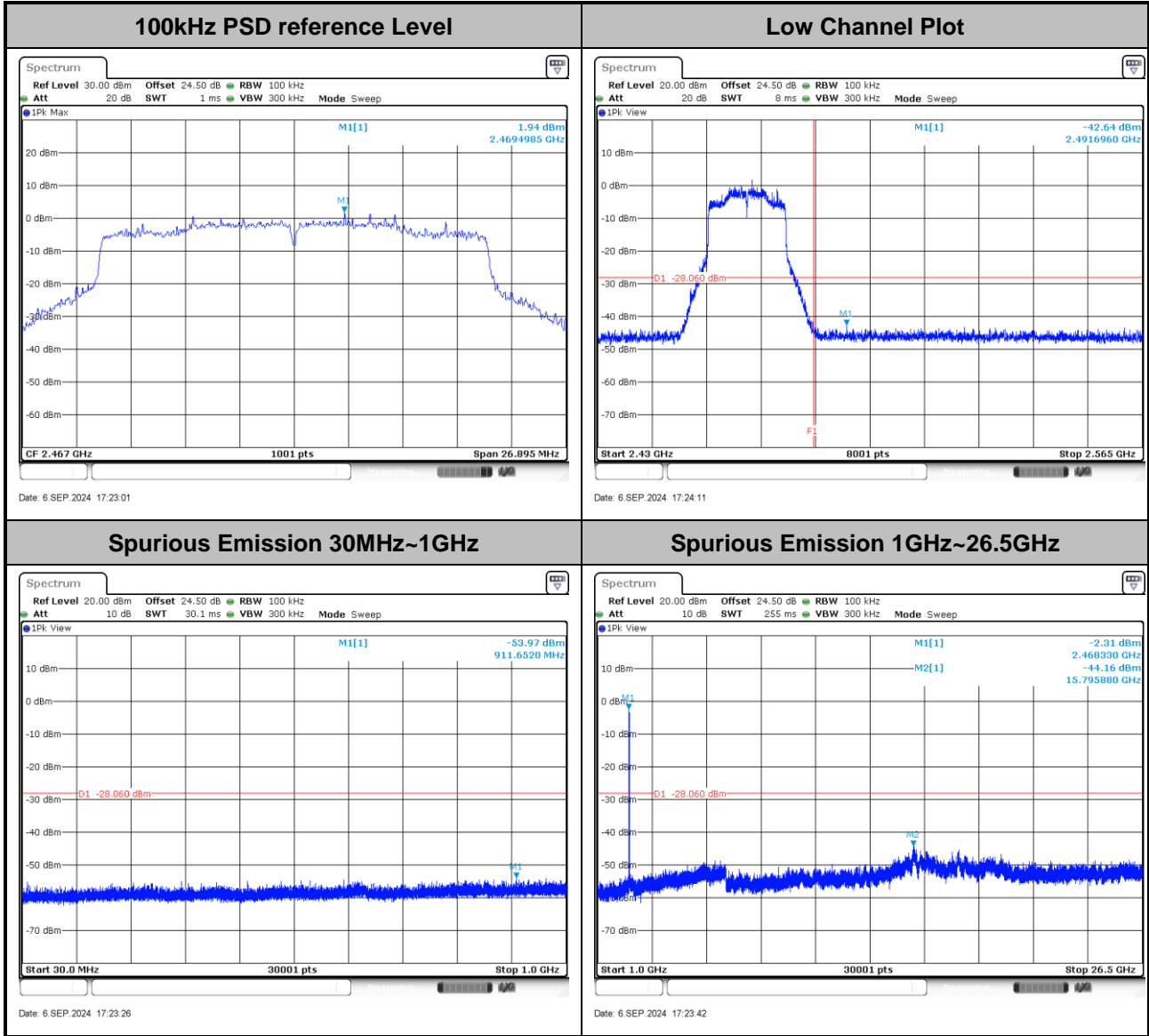


| | | | |
|-------------|----------------------|----------------|----|
| Test Mode : | 802.11ax HE20_FullRU | Test Channel : | 11 |
|-------------|----------------------|----------------|----|



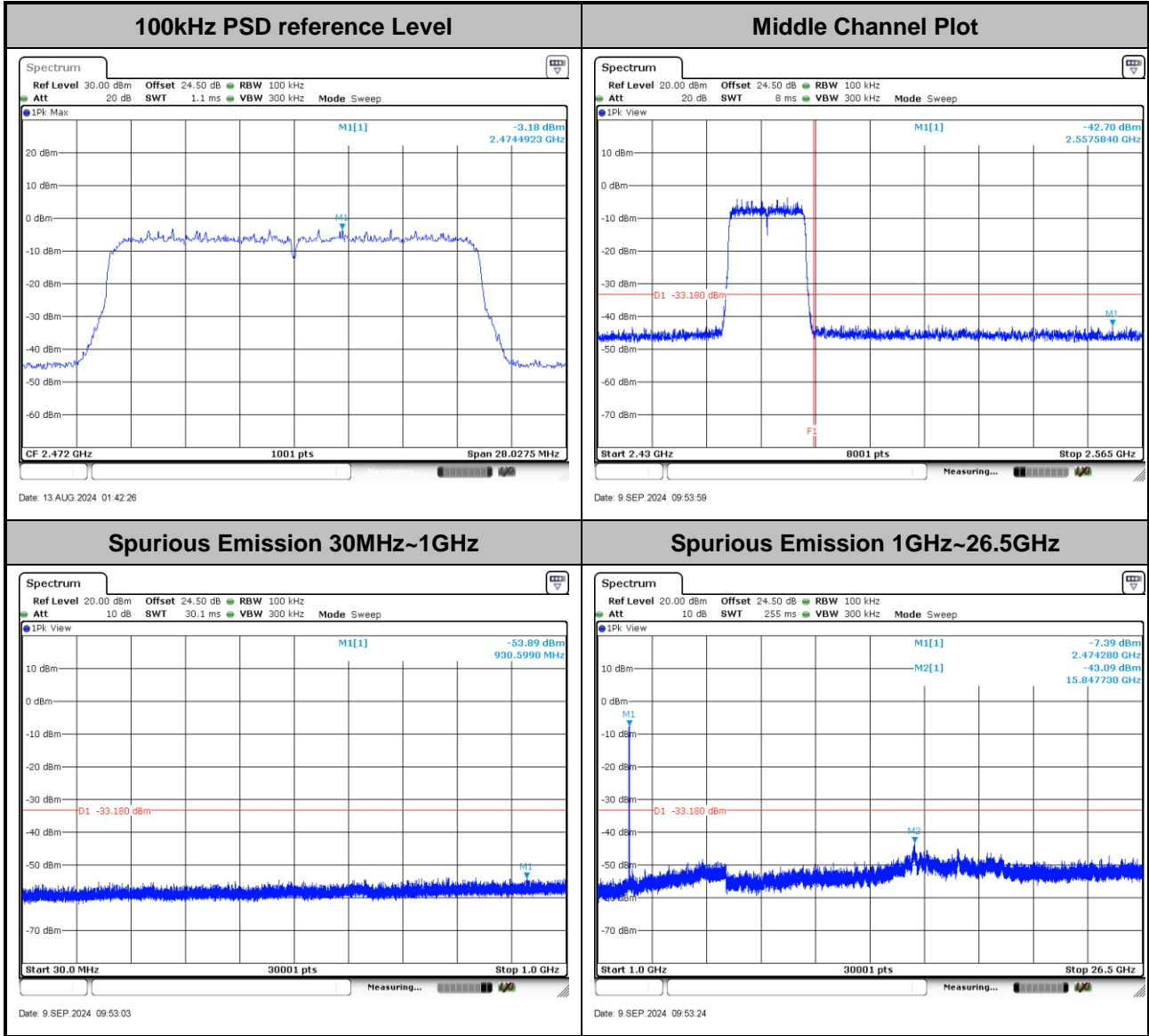


| | | | |
|-------------|----------------------|----------------|----|
| Test Mode : | 802.11ax HE20_FullRU | Test Channel : | 12 |
|-------------|----------------------|----------------|----|



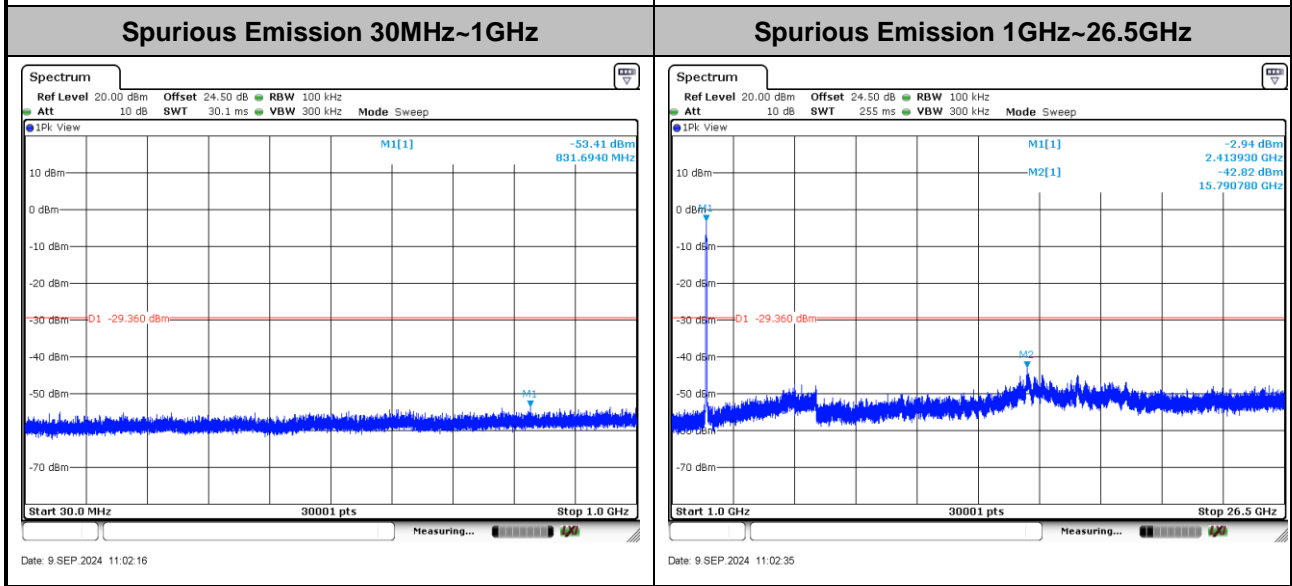
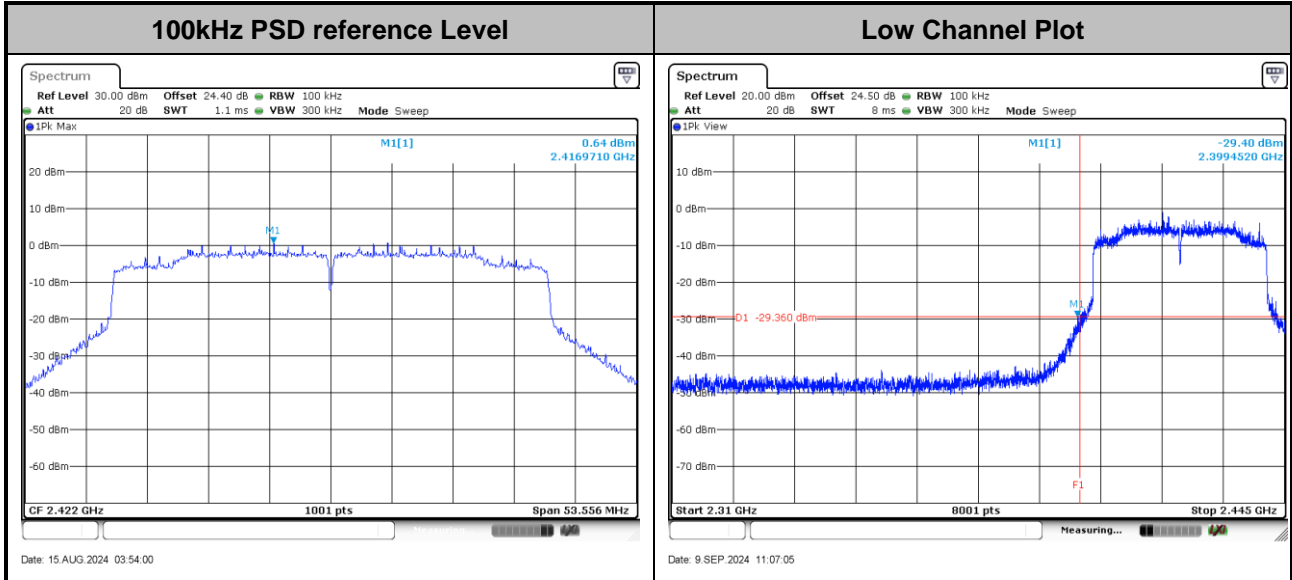


| | | | |
|-------------|----------------------|----------------|----|
| Test Mode : | 802.11ax HE20_FullRU | Test Channel : | 13 |
|-------------|----------------------|----------------|----|



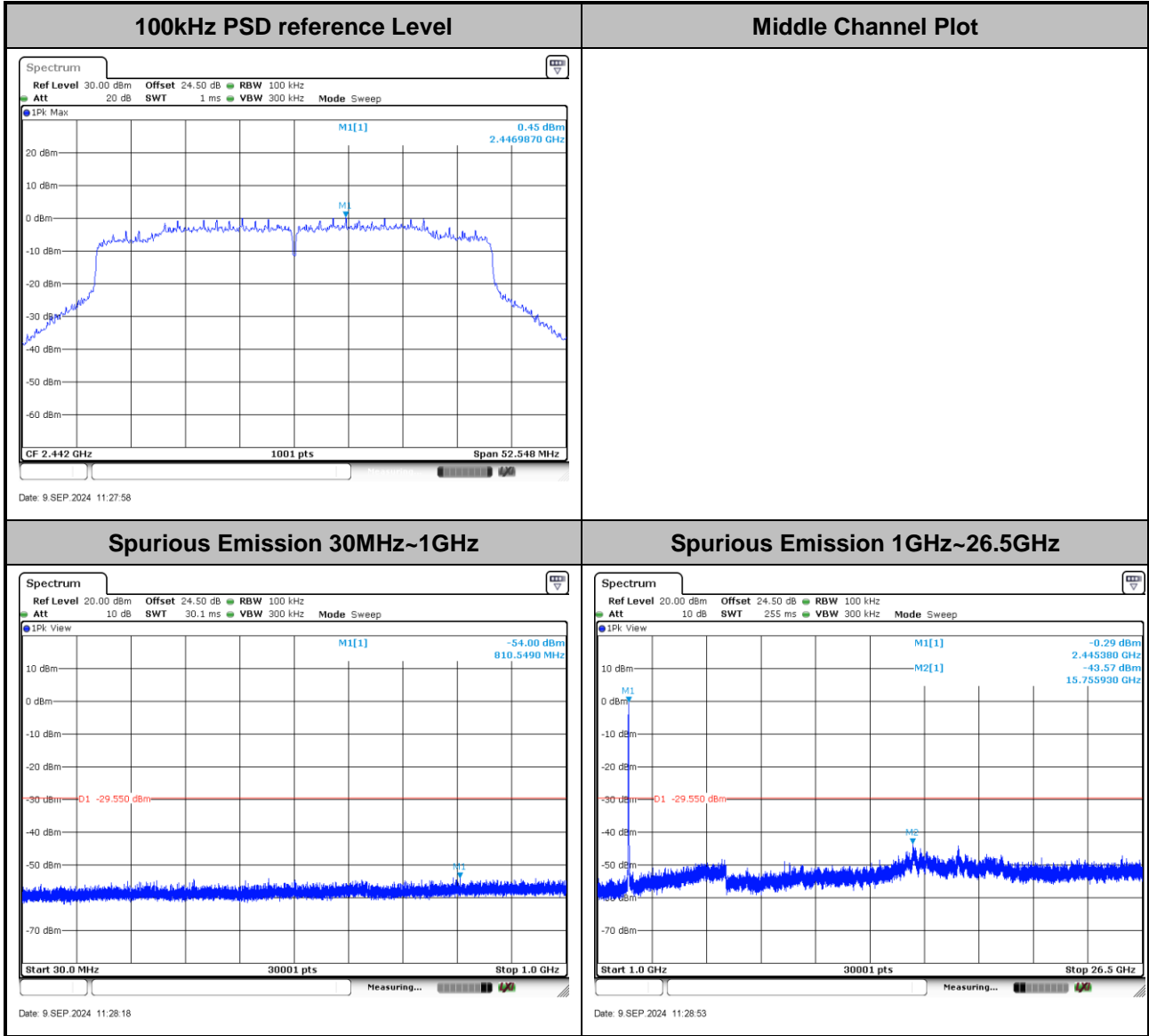


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|-------------|----------------------|----------------|----|
| Test Mode : | 802.11ax HE40_FullRU | Test Channel : | 03 |
|-------------|----------------------|----------------|----|



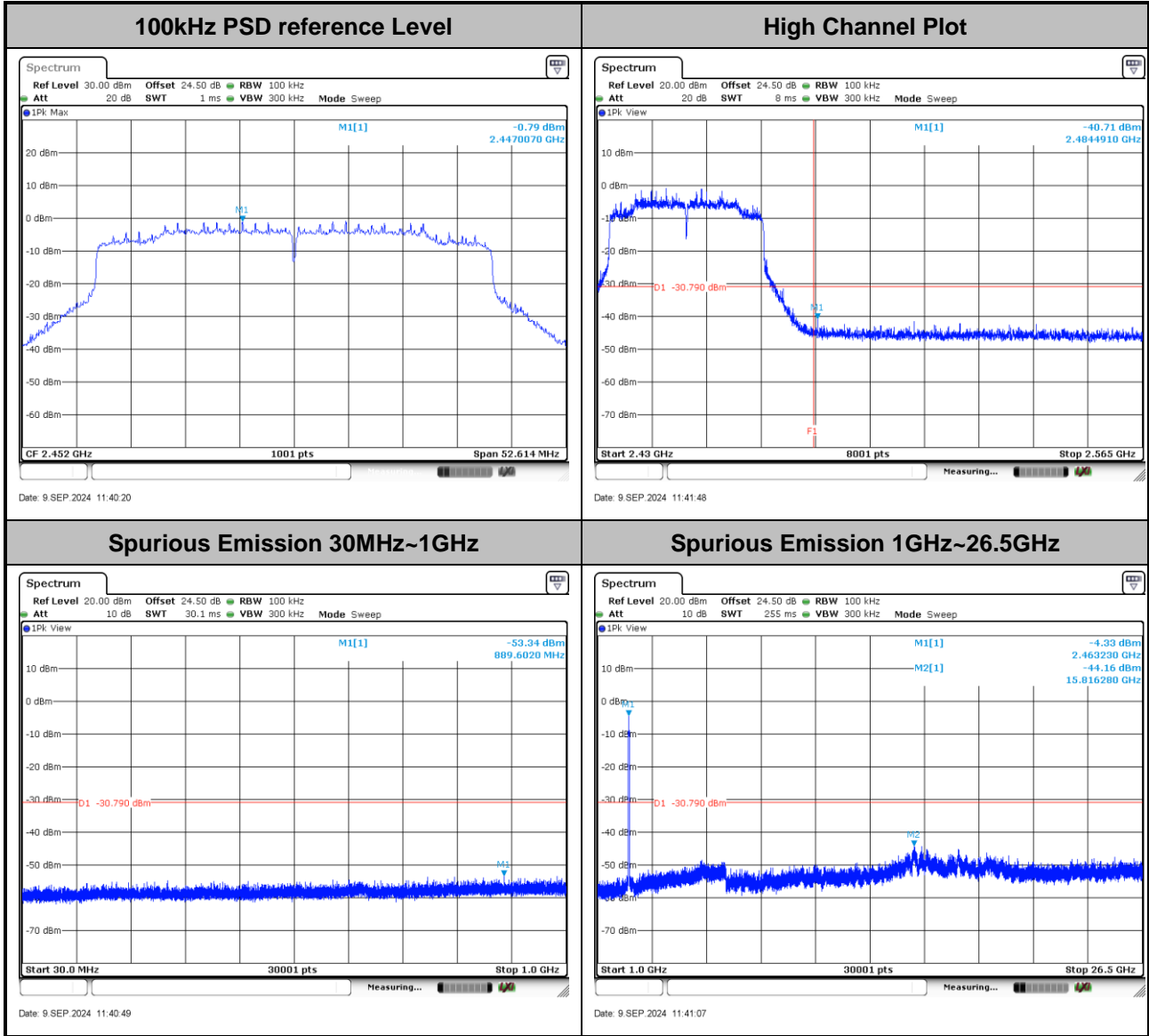


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|-------------|----------------------|----------------|----|
| Test Mode : | 802.11ax HE40_FullRU | Test Channel : | 07 |
|-------------|----------------------|----------------|----|



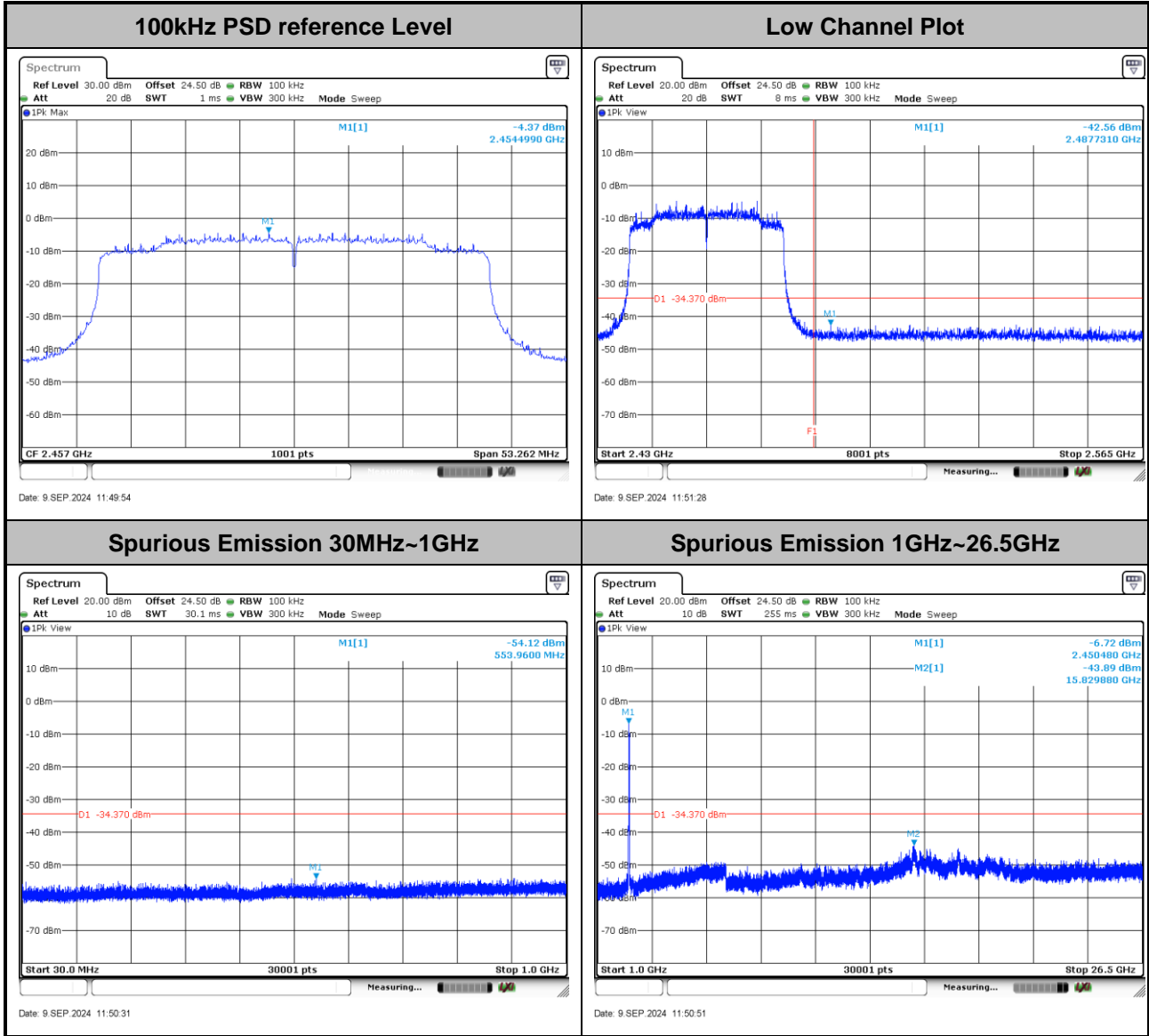


| | | | |
|-------------|----------------------|----------------|----|
| Test Mode : | 802.11ax HE40_FullRU | Test Channel : | 09 |
|-------------|----------------------|----------------|----|



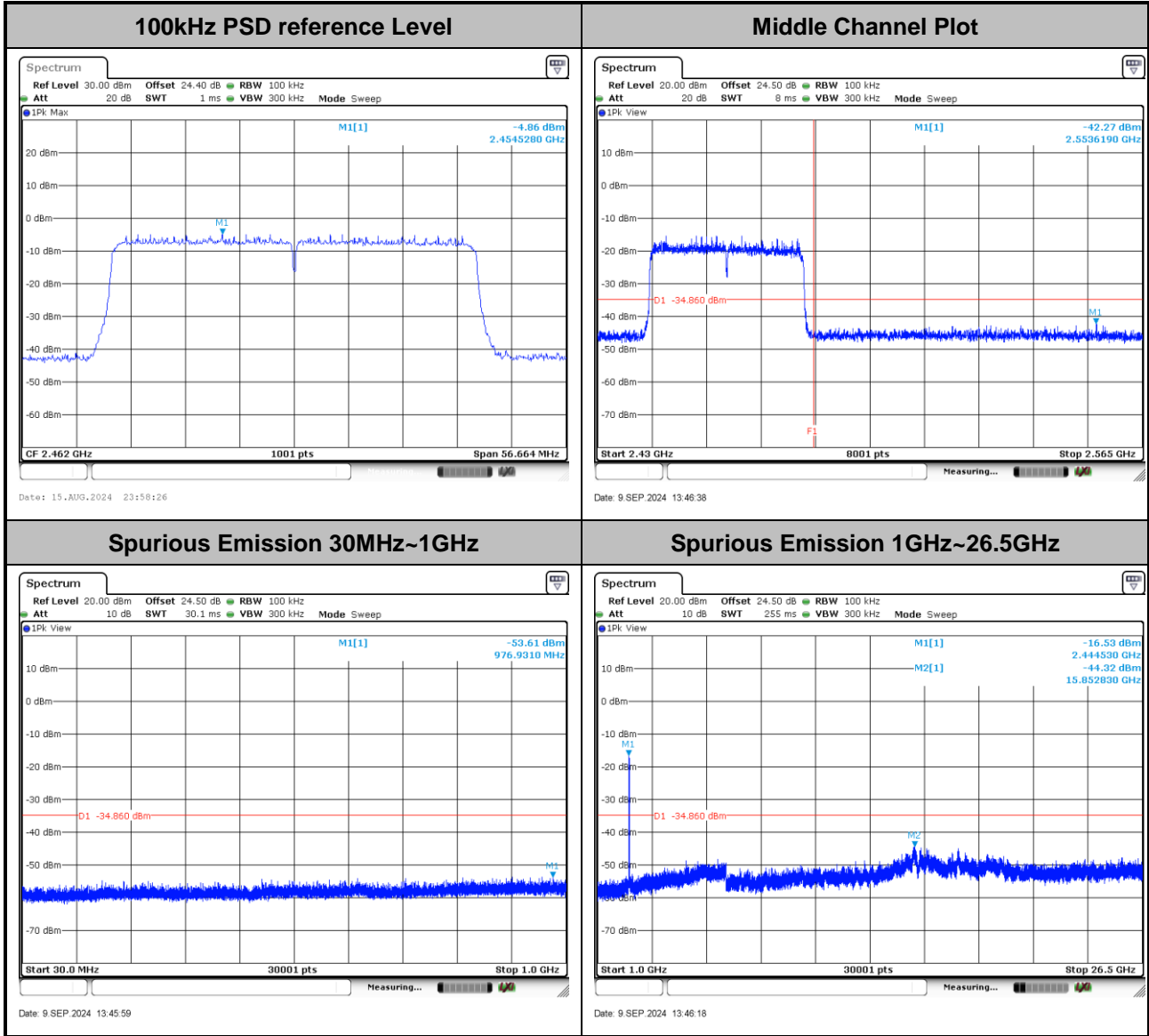


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|-------------|----------------------|----------------|----|
| Test Mode : | 802.11ax HE40_FullRU | Test Channel : | 10 |
|-------------|----------------------|----------------|----|





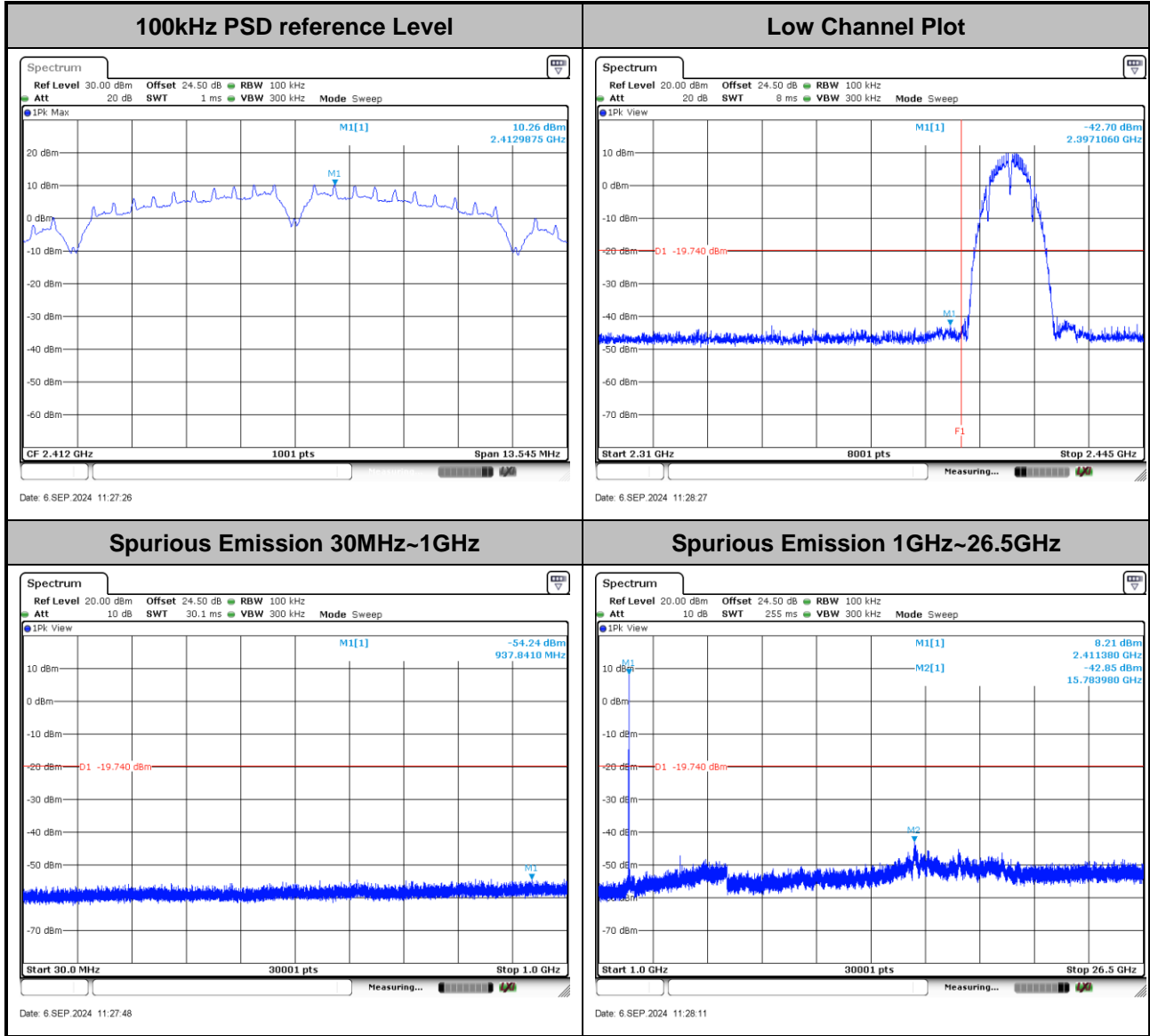
| | | | |
|-------------|-----------------------|----------------|----|
| Test Mode : | 802.11ax HE40_FullIRU | Test Channel : | 11 |
|-------------|-----------------------|----------------|----|





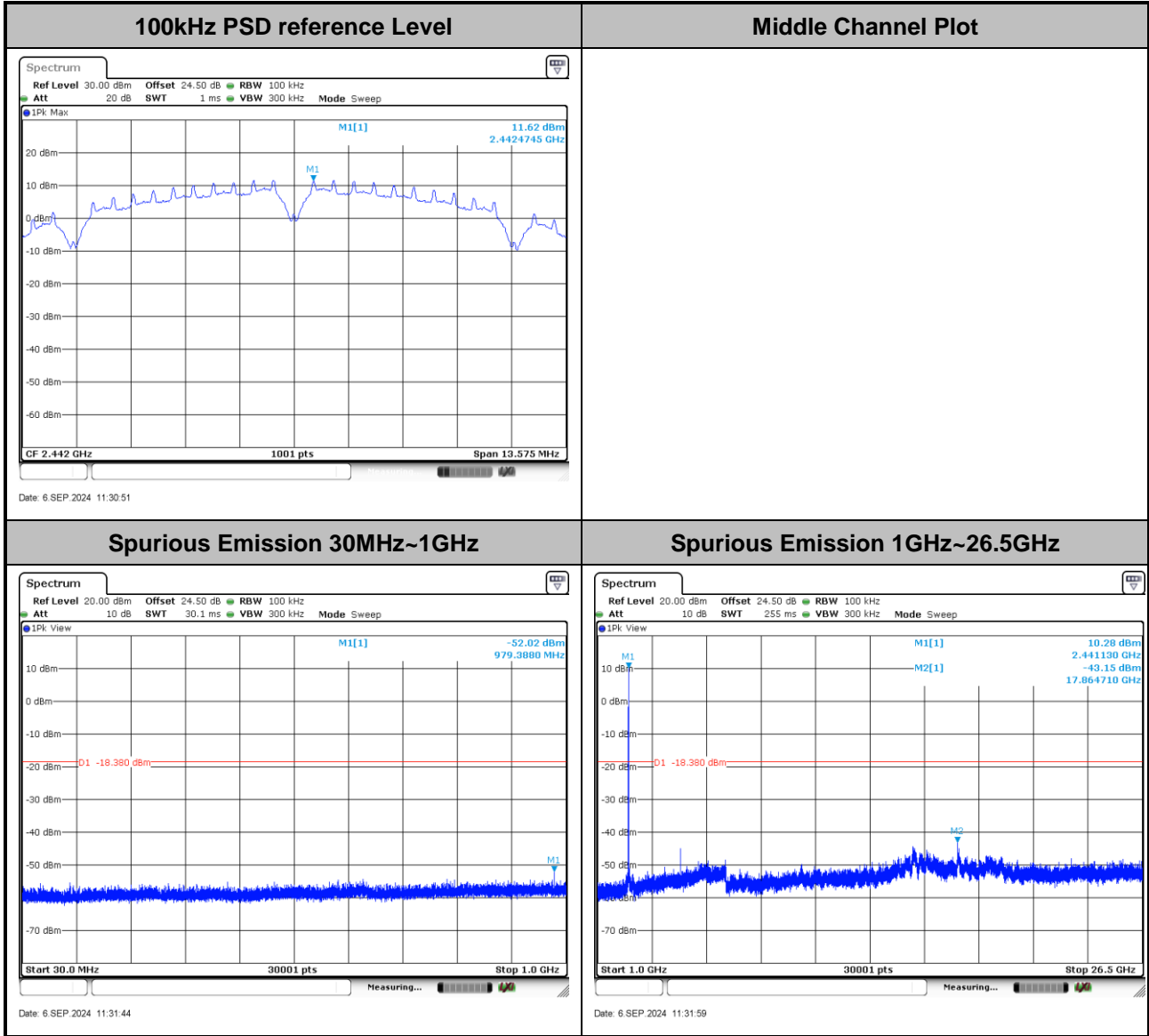
Number of TX = 2, Ant. 2 (Measured)

| | | | |
|-------------|---------|----------------|----|
| Test Mode : | 802.11b | Test Channel : | 01 |
|-------------|---------|----------------|----|





| | | | |
|-------------|---------|----------------|----|
| Test Mode : | 802.11b | Test Channel : | 07 |
|-------------|---------|----------------|----|





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|-------------|---------|----------------|----|
| Test Mode : | 802.11b | Test Channel : | 11 |
|-------------|---------|----------------|----|

