



# FCC - TEST REPORT

Report Number : 4842024420600A Date of Issue: 2025.04.07

Model : THP23-ZB-X, THP23-ZB-P, THP23-ZB-X-Vx, THP23-ZB-Vx,  
THP23-M-X, THP23-M-Vx ("x" represents 1, 2, 3.....)

Product Type : Smart M Gateway

Applicant : Zhejiang Lingzhu Technology Co., Ltd.

Address : Room 302, No 1 Building Huace Center, Xihu District 310000,  
Hangzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF  
CHINA

Manufacturer : Zhejiang Lingzhu Technology Co., Ltd.

Address : Room 302, No 1 Building Huace Center, Xihu District 310000,  
Hangzhou City, Zhejiang Province, PEOPLE'S REPUBLIC OF  
CHINA

Test Result : ☒ Positive ☐ Negative

Total pages including  
Appendices : 111



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## 2 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

| Issue | Description of Change | Date of Issue |
|-------|-----------------------|---------------|
| 1     | First Issue           | 2025.04.07    |



### 3 Details about the Test Laboratory

#### Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd.

Floor 1-4, Building B, No.37, Tuanjie Road(Middle), Xishan Economic and Technological Development Zone, Wuxi, Jiangsu. China

Test Firm FCC  
Registration  
Number: 571980

Designation  
number: CN1405

Telephone: +86 510 8820 3737  
Fax: +86 510 8820 3636

## 4 Description of the Equipment under Test

Product: Smart M Gateway

PMN / HVIN / Model no.: THP23-ZB-X, THP23-ZB-P, THP23-ZB-X-Vx, THP23-ZB-Vx, THP23-M-X, THP23-M-Vx ("x" represents 1, 2, 3.....)

FCC ID: 2BEWXTHP23

Rating: Gateway Input: DC 5V, 2A (Type C Port); DC 48V, 0.35A (PoE Port)  
Adapter Input: 100-240V~, 50/60Hz, 0.4A (for model KA12H-0502000US);  
100-240V~, 50/60Hz, 0.3A (for model TPA-10D050200UU01)  
Adppter Output: DC 5.0V, 2.0A, 10W

RF Transmission Frequency: 2.4G Wi-Fi: 802.11b/g/n-HT20: 2412~2462 MHz

No. of Operated Channel: 2.4GHz WIFI: 11 for 802.11b/g/n(HT20)

Modulation: Direct Sequence Spread Spectrum (DSSS) for 802.11b  
Orthogonal Frequency Division Multiplexing (OFDM) for 802.11g/n(HT20)

Channel list:

| 802.11b/g/n(HT20) |          |    |          |
|-------------------|----------|----|----------|
| Ch                | Fre(MHz) | Ch | Fre(MHz) |
| 1                 | 2412     | 7  | 2442     |
| 2                 | 2417     | 8  | 2447     |
| 3                 | 2422     | 9  | 2452     |
| 4                 | 2427     | 10 | 2457     |
| 5                 | 2432     | 11 | 2462     |
| 6                 | 2437     |    |          |

Hardware Version: V1.3.0

Software Version: V1.0.4

Antenna Type: Built-in antenna

Antenna Gain: 2.78dBi

Description of the EUT: The Equipment Under Test (EUT) is a Smart M Gateway which support 2.4GHz & 5GHz Wi-Fi, Low Energy Bluetooth (1Mbps data rate) and Zigbee function. We tested it and listed the worst data in this report. The gateway can normally be powered by two different models of adapters: KA12H-0502000US and TPA-10D050200UU01. Additionally, the gateway can also be powered via its PoE (Power over Ethernet) port. According to the client's declaration, all models of the gateway have the same wireless parameters and electrical structures. In this report, only model THP23-ZB-X was chosen to perform test.

Test sample no.: WUX-0877560-006

### Remark

This report is only for 2.4G Wi-Fi

Title: DTS Test Report  
Revision: 02  
Effective date: 2024-08-01

ID-Number: EMC\_WUX\_F\_25.34E  
Author: Ming GU

Phone: +86 510 8820 3737  
Fax: +86 510 8820 3636

TÜV SÜD Certification and Testing (China)  
Co., Ltd.  
Floor 1-4, Building B, No.37, Tuanjie  
Road(Middle), Xishan Economic and  
Technological Development Zone, Wuxi,  
Jiangsu, China



The sample's mentioned in this report is/are submitted/ supplied/ manufactured by client. The laboratory therefore assumes no responsibility for accuracy of information on the brand name, model number, origin of manufacture, consignment or any information supplied.



5 Summary of Test Standards

| Test Standards        |                                                                        |
|-----------------------|------------------------------------------------------------------------|
| FCC Part 15 Subpart C | PART 15 - RADIO FREQUENCY DEVICES<br>Subpart C - Intentional Radiators |

All the test methods were according to KDB 558074 D01 15.247 Meas Guidance v05r02 and ANSI C63.10 (2020).

## 6 Summary of Test Results

| Technical Requirements         |                                             |            |           |                                     |                          |                                     |
|--------------------------------|---------------------------------------------|------------|-----------|-------------------------------------|--------------------------|-------------------------------------|
| Test Condition                 |                                             | Pages      | Test Site | Test Result                         |                          |                                     |
|                                |                                             |            |           | Pass                                | Fail                     | N/A                                 |
| §15.207                        | Conducted emission AC power port            | 13-19      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247 (b) (3)                | Conducted peak output power                 | 20-21      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(a)(1)                  | 20dB bandwidth                              | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)                  | Carrier frequency separation                | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)(iii)             | Number of hopping frequencies               | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)(iii)             | Dwell Time                                  | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(2)                  | 6dB bandwidth and 99% Occupied Bandwidth    | 22-30      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(e)                     | Power spectral density                      | 31-35      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(d)                     | Spurious RF conducted emissions             | 36-49      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(d)                     | Band edge                                   | 50-55      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(d) & §15.209 & §15.205 | Spurious radiated emissions for transmitter | 56-106     | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.203                        | Antenna requirement                         | See note 1 |           | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |

Remark 1: N/A – Not Applicable.

Note 1: The EUT uses a Built-in antenna, which gain is 2.78dBi. In accordance to §15.203, It is considered sufficiently to comply with the provisions of this section.



## 7 General Remarks

### Remarks

This submittal(s) (test report) is intended for FCC ID: 2BEWXTHP23, complies with Section 15.207,15.209,15.231,15.247 of the FCC Part 15, Subpart C Rules.

### SUMMARY:

All tests according to the regulations cited on page 7 were

■ - Performed

□ - **Not** Performed

The Equipment under Test

■ - **Fulfills** the general approval requirements.

□ - **Does not** fulfill the general approval requirements.

Sample Received Date: 2025.01.02

Testing Start Date: 2025.01.06

Testing End Date: 2025.02.27

-TÜV SÜD Certification and Testing (China) Co., Ltd.

Reviewed by:

Zhilan Xue  
Project Manager

Prepared by:

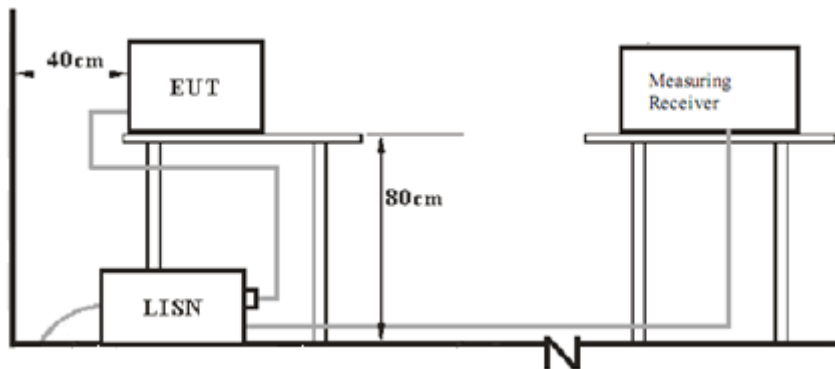
Xin Feng  
Project Engineer

Tested by:

Xu Zheng  
Test Engineer

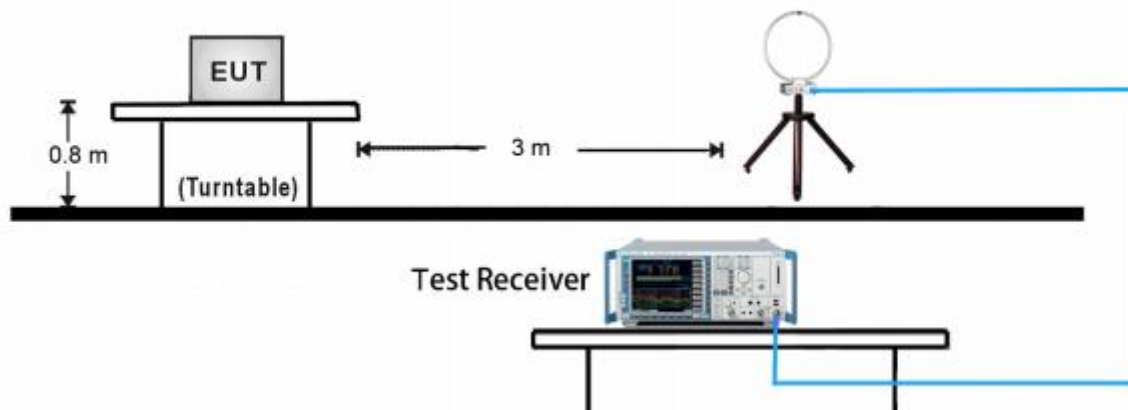
## 8 Test Setups

### 7.1 AC Power Line Conducted Emission test setups

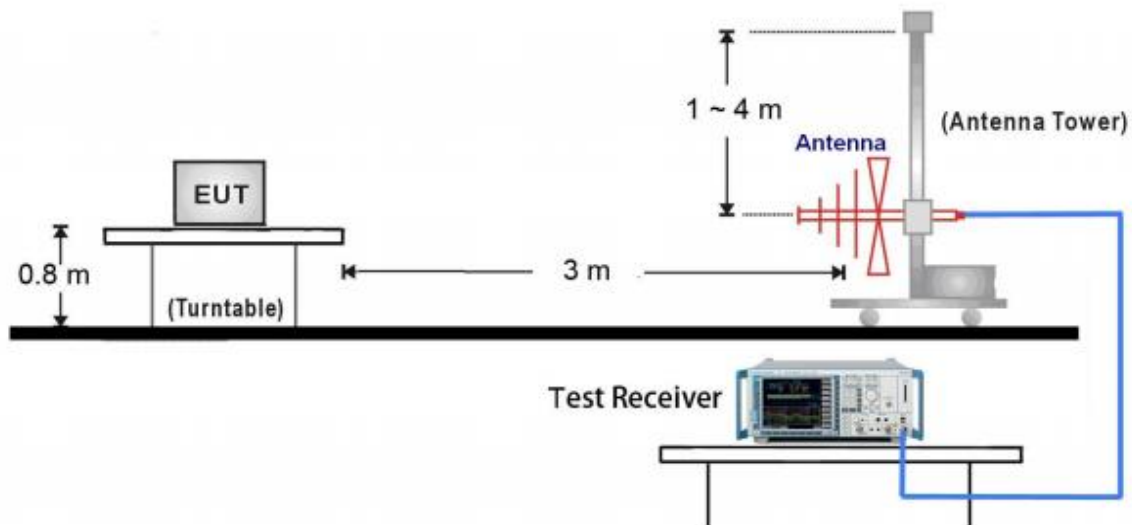


### 7.2 Radiated test setups

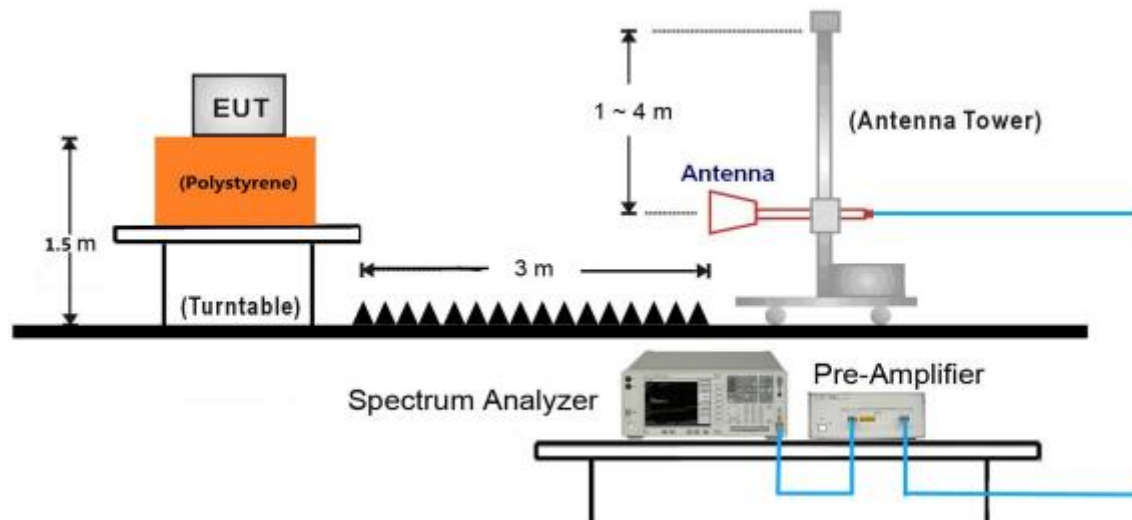
9kHz ~ 30MHz Test Setup:



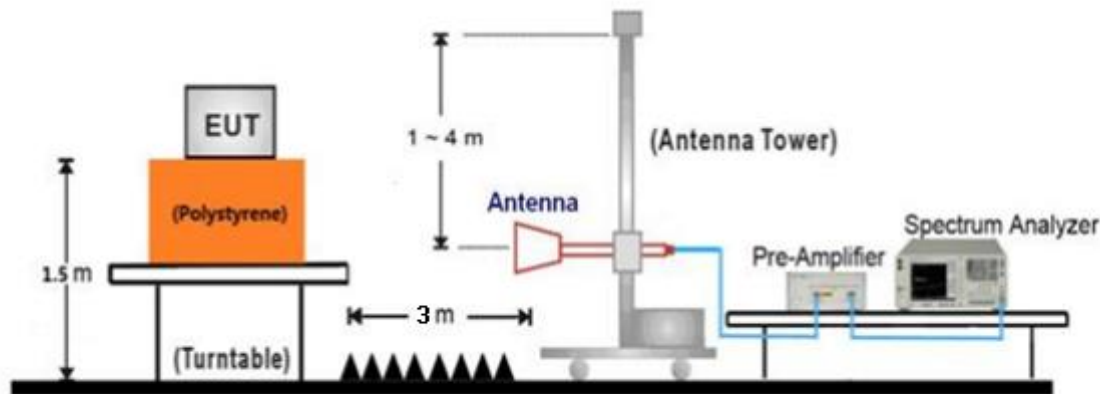
## 30MHz ~ 1GHz Test Setup:



## 1GHz ~ 18GHz Test Setup:

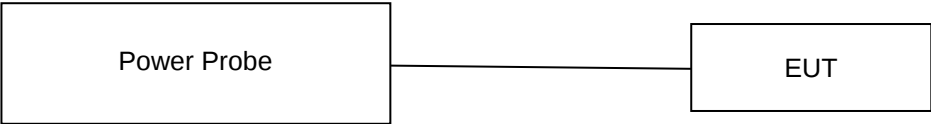


18GHz ~ 25GHz Test Setup:



7.3 Conducted RF test setups

For Conducted peak output power



For other test items



## 9 Systems test configuration

Auxiliary Equipment Used during Test:

| DESCRIPTION | MANUFACTURER | MODEL NO.(SHIELD) | S/N(LENGTH) |
|-------------|--------------|-------------------|-------------|
| Notebook    | Huawei       | VLT-W50           | 2018AP1231  |

Test software: sscom5.13.1

Test Mode Applicability and Tested Channel Detail:

| Mode         | Tested Channel | Data Rate      | Modulation | Power level setting (Index Value) |
|--------------|----------------|----------------|------------|-----------------------------------|
| 802.11b      | 1              | 1 Mbps         | DSSS       | 16                                |
|              | 6              |                |            | 16                                |
|              | 11             |                |            | 16                                |
| 802.11g      | 1              | 6 Mbps         | OFDM       | 12                                |
|              | 6              |                |            | 12                                |
|              | 11             |                |            | 12                                |
| 802.11n HT20 | 1              | MCS0 (6.5Mbps) | OFDM       | 12                                |
|              | 6              |                |            | 12                                |
|              | 11             |                |            | 12                                |

Non-hopping mode: The system was configured to operate at a signal channel transmitting. The test software allows the configuration and operation at the worst-case duty and the highest transmit power.

## 10 Technical Requirement

### 10.1 Conducted Emission

#### Test Method

1. The EUT was placed on a table, which is 0.8m above ground plane
2. The power line of the EUT is connected to the AC mains through a Artificial Mains Network (A.M.N.).
3. Maximum procedure was performed to ensure EUT compliance
4. A EMI test receiver is used to test the emissions from both sides of AC line

#### Limit

According to §15.207, conducted emissions limit as below:

| Frequency<br>MHz | QP Limit<br>dB $\mu$ V | AV Limit<br>dB $\mu$ V |
|------------------|------------------------|------------------------|
| 0.150-0.500      | 66-56*                 | 56-46*                 |
| 0.500-5          | 56                     | 46                     |
| 5-30             | 60                     | 50                     |

Decreasing linearly with logarithm of the frequency

**Conducted Emission**

# 150k-30MHz Conducted Emission Test

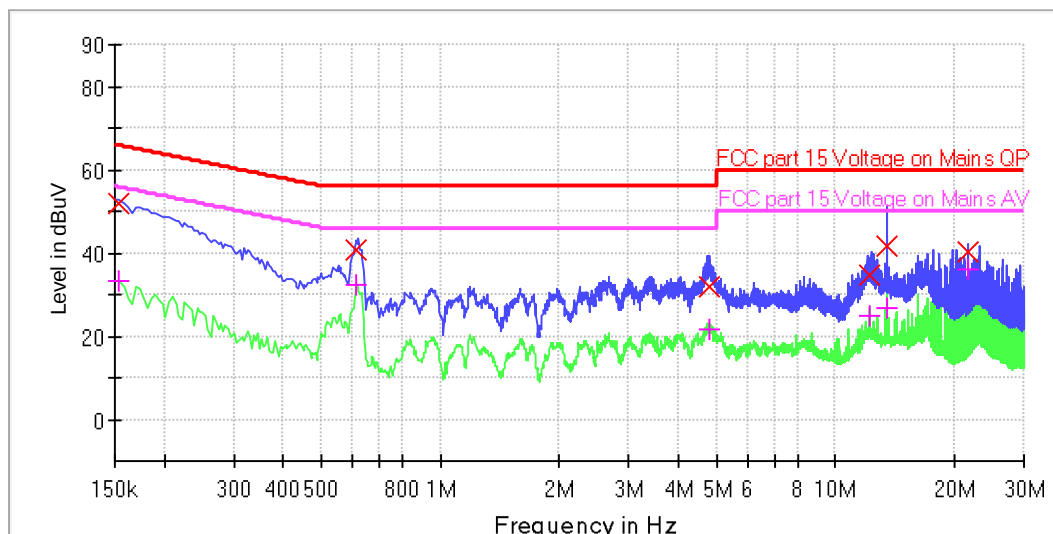
**EUT Information**

EUT: Smart M Gateway  
Model: THP23-ZB-X  
Client: Zhejiang Lingzhu Technology Co., Ltd  
Operating Conditions: Power on, 2.4G Wi-Fi transmitting, 802.11G 2462MHz  
Operator Name: Xu Zheng  
Input: AC 120V 60Hz  
Test Standard: FCC Part 15.207(a)  
Comment: Phase L, Adapter Model: TPA-10D050200UU01  
Sample No.: WUX-0877560-006

**Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]**

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz\_Fcc  
Receiver: [ESW 8]  
Level Unit: dBuV

| Subrange         | Step Size | Detectors | IF BW | Meas. Time | Preamp |
|------------------|-----------|-----------|-------|------------|--------|
| 150 kHz - 30 MHz | 4 kHz     | PK+ ; AVG | 9 kHz | 0.01 s     | 0 dB   |

**Limit and Margin**

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Meas. Time (ms) | Bandwidth (kHz) | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBuV) | Margin - CAV (dB) | Limit - CAV (dBuV) |
|-----------------|------------------|-----------------|-----------------|-----------------|------------|-------------------|--------------------|-------------------|--------------------|
| 0.154000        | 51.7             | 33.3            | 1000.0          | 9.000           | 10.6       | 14.1              | 65.8               | 22.5              | 55.8               |
| 0.614000        | 40.8             | 32.3            | 1000.0          | 9.000           | 10.5       | 15.2              | 56.0               | 13.7              | 46.0               |
| 4.798000        | 32.1             | 21.6            | 1000.0          | 9.000           | 10.6       | 23.9              | 56.0               | 24.4              | 46.0               |
| 12.198000       | 34.6             | 24.8            | 1000.0          | 9.000           | 10.9       | 25.4              | 60.0               | 25.2              | 50.0               |
| 13.562000       | 41.9             | 26.8            | 1000.0          | 9.000           | 10.9       | 18.1              | 60.0               | 23.2              | 50.0               |
| 21.662000       | 40.1             | 36.1            | 1000.0          | 9.000           | 11.1       | 19.9              | 60.0               | 14.0              | 50.0               |

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

# 150k-30MHz Conducted Emission Test

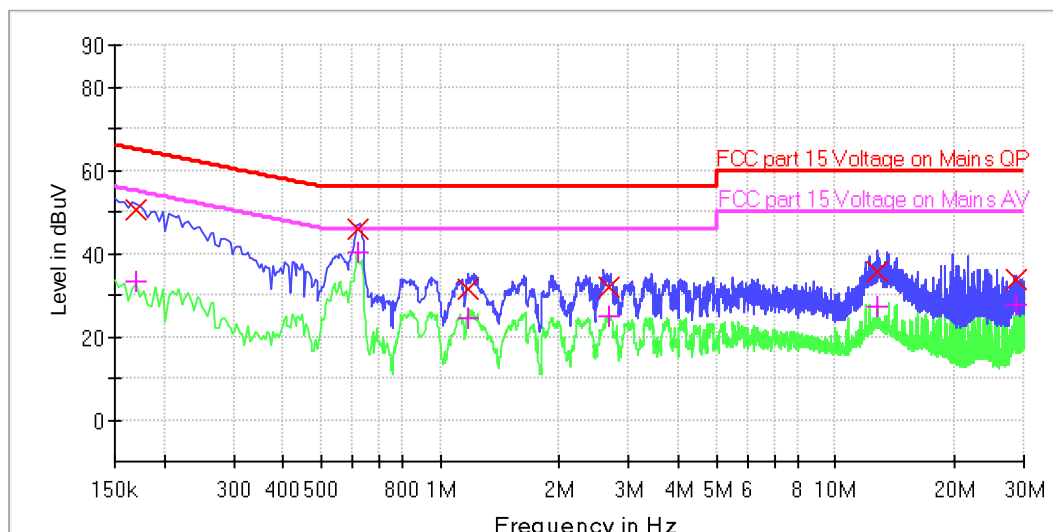
## EUT Information

EUT: Smart M Gateway  
Model: THP23-ZB-X  
Client: Zhejiang Lingzhu Technology Co., Ltd  
Operating Conditions: Power on, 2.4G Wi-Fi transmitting, 802.11G 2462MHz  
Operator Name: Xu Zheng  
Input: AC 120V 60Hz  
Test Standard: FCC Part 15.207(a)  
Comment: Phase N, Adapter Model: TPA-10D050200UU01  
Sample No.: WUX-0877560-006

## Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz\_Fcc  
Receiver: [ESW 8]  
Level Unit: dBuV

| Subrange         | Step Size | Detectors | IF BW | Meas. Time | Preamp |
|------------------|-----------|-----------|-------|------------|--------|
| 150 kHz - 30 MHz | 4 kHz     | PK+ ; AVG | 9 kHz | 0.01 s     | 0 dB   |



## Limit and Margin

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Meas. Time (ms) | Bandwidth (kHz) | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBuV) | Margin - CAV (dB) | Limit - CAV (dBuV) |
|-----------------|------------------|-----------------|-----------------|-----------------|------------|-------------------|--------------------|-------------------|--------------------|
| 0.170000        | 50.5             | 33.1            | 1000.0          | 9.000           | 10.6       | 14.4              | 65.0               | 21.8              | 55.0               |
| 0.618000        | 46.0             | 40.1            | 1000.0          | 9.000           | 10.5       | 10.0              | 56.0               | 6.0               | 46.0               |
| 1.178000        | 31.3             | 24.3            | 1000.0          | 9.000           | 10.5       | 24.7              | 56.0               | 21.7              | 46.0               |
| 2.670000        | 31.7             | 24.7            | 1000.0          | 9.000           | 10.6       | 24.3              | 56.0               | 21.3              | 46.0               |
| 12.746000       | 35.5             | 27.1            | 1000.0          | 9.000           | 10.9       | 24.6              | 60.0               | 22.9              | 50.0               |
| 28.562000       | 33.5             | 27.8            | 1000.0          | 9.000           | 11.4       | 26.5              | 60.0               | 22.2              | 50.0               |

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)  
Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

# 150k-30MHz Conducted Emission Test

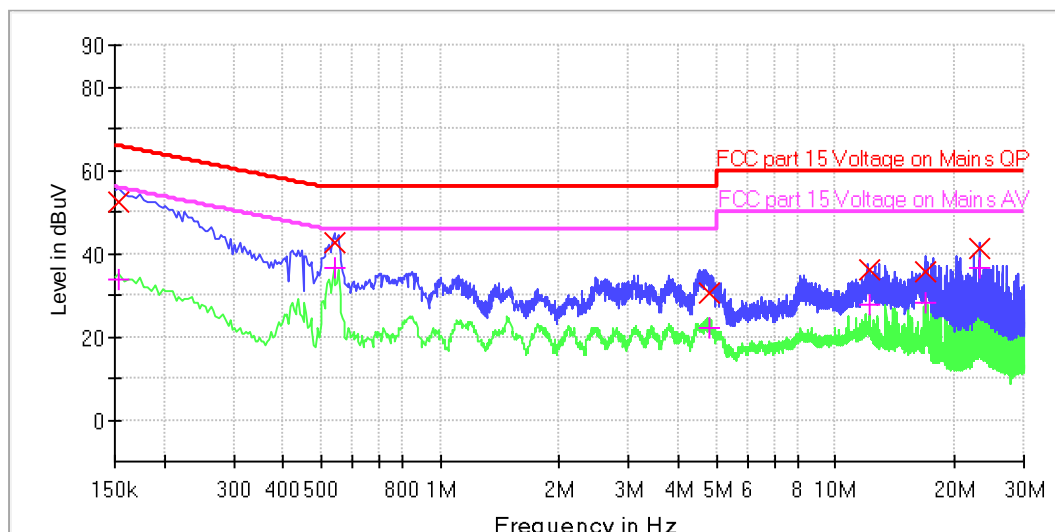
## EUT Information

EUT: Smart M Gateway  
Model: THP23-ZB-X  
Client: Zhejiang Lingzhu Technology Co., Ltd  
Operating Conditions: Power on, 2.4G Wi-Fi transmitting, 802.11G 2462MHz  
Operator Name: Xu Zheng  
Input: AC 120V 60Hz  
Test Standard: FCC Part 15.207(a)  
Comment: Phase L, Adapter Model: KA12H-0502000US  
Sample No.: WUX-0877560-006

## Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz\_Fcc  
Receiver: [ESW 8]  
Level Unit: dBuV

| Subrange         | Step Size | Detectors | IF BW | Meas. Time | Preamp |
|------------------|-----------|-----------|-------|------------|--------|
| 150 kHz - 30 MHz | 4 kHz     | PK+ ; AVG | 9 kHz | 0.01 s     | 0 dB   |



## Limit and Margin

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Meas. Time (ms) | Bandwidth (kHz) | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBuV) | Margin - CAV (dB) | Limit - CAV (dBuV) |
|-----------------|------------------|-----------------|-----------------|-----------------|------------|-------------------|--------------------|-------------------|--------------------|
| 0.154000        | 52.5             | 33.7            | 1000.0          | 9.000           | 10.6       | 13.3              | 65.8               | 22.1              | 55.8               |
| 0.538000        | 42.7             | 36.7            | 1000.0          | 9.000           | 10.5       | 13.3              | 56.0               | 9.3               | 46.0               |
| 4.810000        | 30.7             | 22.3            | 1000.0          | 9.000           | 10.6       | 25.3              | 56.0               | 23.7              | 46.0               |
| 12.138000       | 35.9             | 27.8            | 1000.0          | 9.000           | 10.9       | 24.1              | 60.0               | 22.2              | 50.0               |
| 16.898000       | 35.4             | 28.1            | 1000.0          | 9.000           | 11.0       | 24.6              | 60.0               | 21.9              | 50.0               |
| 23.130000       | 41.1             | 36.5            | 1000.0          | 9.000           | 11.2       | 19.0              | 60.0               | 13.5              | 50.0               |

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

# 150k-30MHz Conducted Emission Test

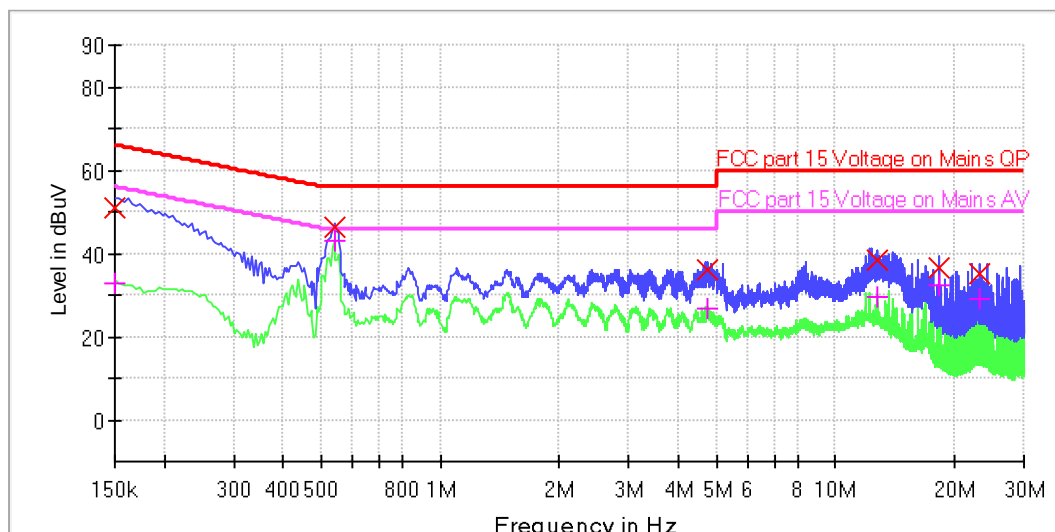
## EUT Information

EUT: Smart M Gateway  
Model: THP23-ZB-X  
Client: Zhejiang Lingzhu Technology Co., Ltd  
Operating Conditions: Power on, 2.4G Wi-Fi transmitting, 802.11G 2462MHz  
Operator Name: Xu Zheng  
Input: AC 120V 60Hz  
Test Standard: FCC Part 15.207(a)  
Comment: Phase N, Adapter Model: KA12H-0502000US  
Sample No.: WUX-0877560-006

## Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz\_Fcc  
Receiver: [ESW 8]  
Level Unit: dBuV

| Subrange         | Step Size | Detectors | IF BW | Meas. Time | Preamp |
|------------------|-----------|-----------|-------|------------|--------|
| 150 kHz - 30 MHz | 4 kHz     | PK+ ; AVG | 9 kHz | 0.01 s     | 0 dB   |



## Limit and Margin

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Meas. Time (ms) | Bandwidth (kHz) | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBuV) | Margin - CAV (dB) | Limit - CAV (dBuV) |
|-----------------|------------------|-----------------|-----------------|-----------------|------------|-------------------|--------------------|-------------------|--------------------|
| 0.150000        | 51.1             | 32.8            | 1000.0          | 9.000           | 10.6       | 15.0              | 66.0               | 23.2              | 56.0               |
| 0.538000        | 46.1             | 43.0            | 1000.0          | 9.000           | 10.5       | 9.9               | 56.0               | 3.0               | 46.0               |
| 4.730000        | 35.9             | 26.9            | 1000.0          | 9.000           | 10.6       | 20.1              | 56.0               | 19.1              | 46.0               |
| 12.746000       | 38.5             | 29.6            | 1000.0          | 9.000           | 10.9       | 21.5              | 60.0               | 20.4              | 50.0               |
| 18.242000       | 36.5             | 32.1            | 1000.0          | 9.000           | 11.0       | 23.5              | 60.0               | 17.9              | 50.0               |
| 23.066000       | 35.1             | 28.9            | 1000.0          | 9.000           | 11.2       | 24.9              | 60.0               | 21.1              | 50.0               |

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)  
Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

# 150k-30MHz Conducted Emission Test

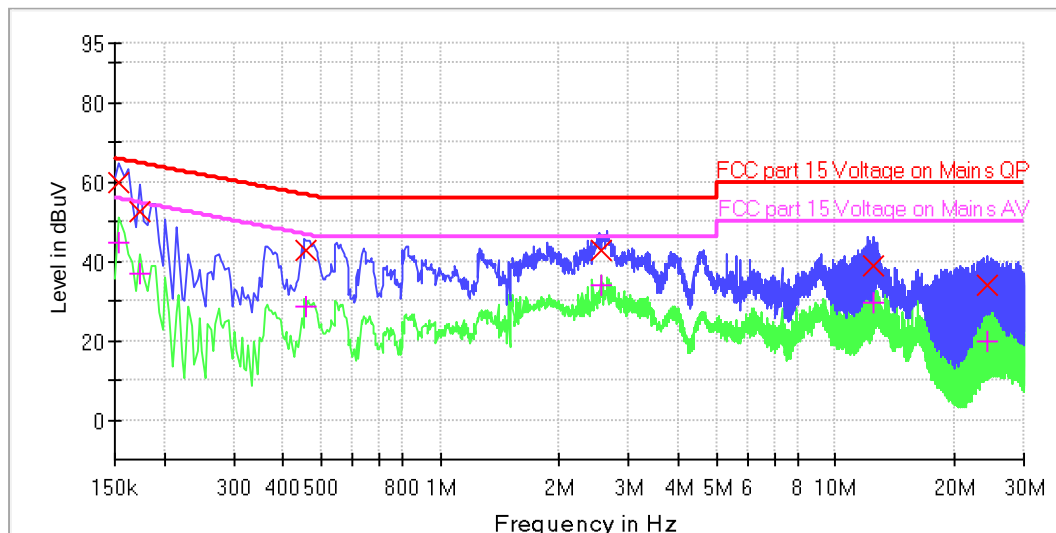
## EUT Information

EUT: Smart M Gateway  
Model: THP23-ZB-X  
Client: Zhejiang Lingzhu Technology Co., Ltd  
Operating Conditions: Power on, 2.4G Wi-Fi transmitting, 802.11G 2462MHz  
Operator Name: Xu Zheng  
Input: AC 120V 60Hz (for a network switch that provides PoE power supply)  
Test Standard: FCC Part 15.207(a)  
Comment: Phase L  
Sample No.: WUX-0877560-006

## Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz\_Fcc  
Receiver: [ESW 8]  
Level Unit: dBuV

| Subrange         | Step Size | Detectors | IF BW | Meas. Time | Preamp |
|------------------|-----------|-----------|-------|------------|--------|
| 150 kHz - 30 MHz | 4 kHz     | PK+ ; AVG | 9 kHz | 0.01 s     | 0 dB   |



## Limit and Margin

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Meas. Time (ms) | Bandwidth (kHz) | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBuV) | Margin - CAV (dB) | Limit - CAV (dBuV) |
|-----------------|------------------|-----------------|-----------------|-----------------|------------|-------------------|--------------------|-------------------|--------------------|
| 0.154000        | 59.7             | 44.5            | 1000.0          | 9.000           | 10.1       | 6.1               | 65.8               | 11.3              | 55.8               |
| 0.174000        | 52.5             | 37.1            | 1000.0          | 9.000           | 10.1       | 12.2              | 64.8               | 17.7              | 54.8               |
| 0.458000        | 43.0             | 28.7            | 1000.0          | 9.000           | 10.1       | 13.8              | 56.7               | 18.0              | 46.7               |
| 2.546000        | 42.8             | 34.0            | 1000.0          | 9.000           | 10.2       | 13.2              | 56.0               | 12.0              | 46.0               |
| 12.466000       | 38.6             | 29.8            | 1000.0          | 9.000           | 10.5       | 21.4              | 60.0               | 20.2              | 50.0               |
| 24.242000       | 34.1             | 19.8            | 1000.0          | 9.000           | 10.7       | 25.9              | 60.0               | 30.2              | 50.0               |

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)

Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

# 150k-30MHz Conducted Emission Test

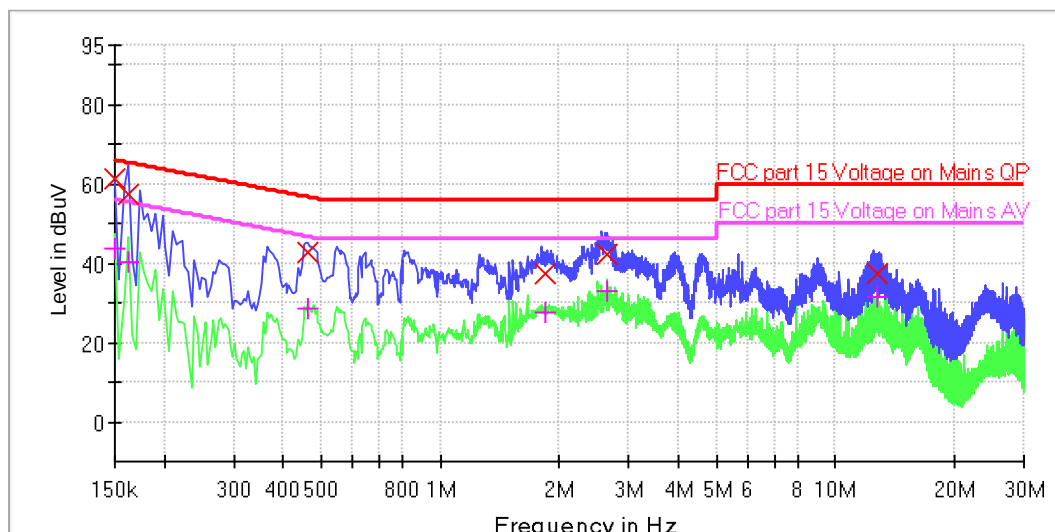
## EUT Information

EUT: Smart M Gateway  
Model: THP23-ZB-X  
Client: Zhejiang Lingzhu Technology Co., Ltd  
Operating Conditions: Power on, 2.4G Wi-Fi transmitting, 802.11G 2462MHz  
Operator Name: Xu Zheng  
Input: AC 120V 60Hz (for a network switch that provides PoE power supply)  
Test Standard: FCC Part 15.207(a)  
Comment: Phase N  
Sample No.: WUX-0877560-006

## Scan Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz Pre Fcc [EMI conducted]

Hardware Setup: Mains Voltage LISN 2 Lines 150kHz-30MHz\_Fcc  
Receiver: [ESW 8]  
Level Unit: dBuV

| Subrange         | Step Size | Detectors | IF BW | Meas. Time | Preamp |
|------------------|-----------|-----------|-------|------------|--------|
| 150 kHz - 30 MHz | 4 kHz     | PK+ ; AVG | 9 kHz | 0.01 s     | 0 dB   |



## Limit and Margin

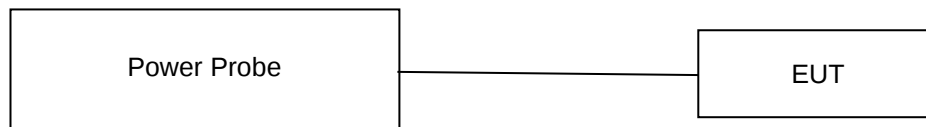
| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Meas. Time (ms) | Bandwidth (kHz) | Corr. (dB) | Margin - QPK (dB) | Limit - QPK (dBuV) | Margin - CAV (dB) | Limit - CAV (dBuV) |
|-----------------|------------------|-----------------|-----------------|-----------------|------------|-------------------|--------------------|-------------------|--------------------|
| 0.150000        | 61.1             | 43.8            | 1000.0          | 9.000           | 10.1       | 4.9               | 66.0               | 12.2              | 56.0               |
| 0.162000        | 57.2             | 40.2            | 1000.0          | 9.000           | 10.1       | 8.1               | 65.4               | 15.2              | 55.4               |
| 0.462000        | 42.7             | 28.3            | 1000.0          | 9.000           | 10.1       | 13.9              | 56.7               | 18.3              | 46.7               |
| 1.838000        | 37.3             | 27.7            | 1000.0          | 9.000           | 10.2       | 18.7              | 56.0               | 18.3              | 46.0               |
| 2.646000        | 42.3             | 33.0            | 1000.0          | 9.000           | 10.2       | 13.7              | 56.0               | 13.1              | 46.0               |
| 12.750000       | 37.5             | 31.6            | 1000.0          | 9.000           | 10.5       | 22.6              | 60.0               | 18.4              | 50.0               |

Note 1: Measure Level (dBuV/m) = Reading Level (dBuV) + Factor (dB)  
Factor (dB) = Cable Loss (dB) + LISN Factor (dB) + 10dB Attenuator

## 10.2 Conducted peak output power

### Test Method

- 1) The EUT is configured to transmit continuously, or to transmit with a constant duty cycle.
- 2) At all times when the EUT is transmitting, it shall be transmitting at its maximum power control level.
- 3) The integration period of the power meter exceeds the repetition period of the transmitted signal by at least a factor of five.
- 4) Measure the peak power of the transmitter. This measurement is a peak over both the ON and OFF periods of the transmitter.



### Power Probe conducted test setup

#### Limits

According to §15.247 (b) (3), conducted peak output power limit as below:

| Frequency Range<br>MHz | Limit<br>W | Limit<br>dBm |
|------------------------|------------|--------------|
| 2400-2483.5            | ≤1         | ≤30          |

Test result as below table

#### 802.11b Test Result

| Data transmission Rate | Frequency (MHz) | Conducted Peak Output Power (dBm)<br>§15.247 (b) (3) |       |         |
|------------------------|-----------------|------------------------------------------------------|-------|---------|
|                        |                 | Result                                               | limit | Verdict |
| 1Mbps                  | 2412MHz         | 19.12                                                | ≤30   | Pass    |
|                        | 2437MHz         | 18.62                                                | ≤30   | Pass    |
|                        | 2462MHz         | 19.40                                                | ≤30   | Pass    |

#### 802.11g Test Result

| Data transmission Rate | Frequency (MHz) | Conducted Peak Output Power (dBm)<br>§15.247 (b) (3) |       |         |
|------------------------|-----------------|------------------------------------------------------|-------|---------|
|                        |                 | Result                                               | limit | Verdict |
| 6Mbps                  | 2412MHz         | 22.33                                                | ≤30   | Pass    |
|                        | 2437MHz         | 22.67                                                | ≤30   | Pass    |
|                        | 2462MHz         | <b>23.02</b>                                         | ≤30   | Pass    |



802.11n20 Test Result

| Data transmission Rate | Frequency (MHz) | Conducted Peak Output Power (dBm)<br>§15.247 (b) (3) |       |         |
|------------------------|-----------------|------------------------------------------------------|-------|---------|
|                        |                 | Result                                               | limit | Verdict |
| MCS0<br>(6.5Mbps)      | 2412MHz         | 22.15                                                | ≤30   | Pass    |
|                        | 2437MHz         | 22.69                                                | ≤30   | Pass    |
|                        | 2462MHz         | 22.84                                                | ≤30   | Pass    |

## 10.3 6dB bandwidth and 99% Occupied Bandwidth

### Test Method

1. Set RBW = shall be in the range of 1% to 5% of the OBW but not less than 100 kHz.
2. Set the VBW  $\geq [3 \times \text{RBW}]$ .
3. Detector = peak.  
RBW=100KHz, VBW $\geq$ 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Trace mode = max-hold.
5. Sweep = No faster than coupled (auto) time.
6. Allow the trace to stabilize.
7. Measure the maximum width of the emission by placing two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “-6 dB down amplitude”. If a marker is below this “-6 dB down amplitude” value, then it shall be as close as possible to this value.

### Test Method for 99 % Bandwidth

1. Use the following spectrum analyzer settings:  
RBW=1% to 5% of the actual occupied, VBW $\geq$ 3RBW, Sweep = auto,  
Detector function = peak, Trace = max hold
2. Use the occupied bandwidth measurement capability of test receiver.
3. Allow the trace to stabilize, record the occupied bandwidth value.

### Limit

6dB bandwidth Limit [kHz]

99% bandwidth Limit [kHz]

 $\geq 500$ 

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### Test result

802.11b Test Result

| Data transmission rate | Frequency MHz | 6dB bandwidth (MHz) |            | Result  | 99% occupied bandwidth MHz |
|------------------------|---------------|---------------------|------------|---------|----------------------------|
|                        |               | result              | limit      | verdict |                            |
| 1Mbps                  | 2412          | 10.119              | $\geq 0.5$ | Pass    | 14.018                     |
|                        | 2437          | 10.170              | $\geq 0.5$ | Pass    | 14.099                     |
|                        | 2462          | 10.116              | $\geq 0.5$ | Pass    | 13.988                     |

802.11g Test Result

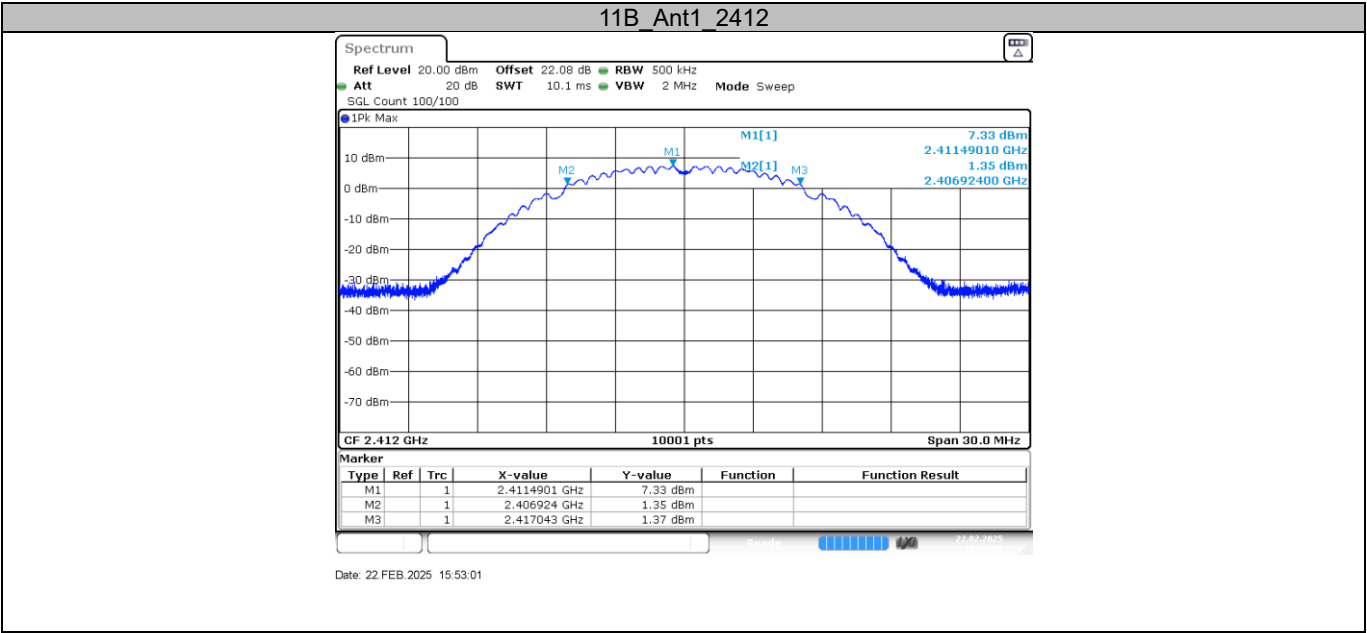
| Data transmission rate | Frequency MHz | 6dB bandwidth (MHz) |            | Result  | 99% occupied bandwidth MHz |
|------------------------|---------------|---------------------|------------|---------|----------------------------|
|                        |               | result              | limit      | verdict |                            |
| 6Mbps                  | 2412          | 16.326              | $\geq 0.5$ | Pass    | 16.510                     |
|                        | 2437          | 16.257              | $\geq 0.5$ | Pass    | 16.519                     |
|                        | 2462          | 16.311              | $\geq 0.5$ | Pass    | 16.507                     |



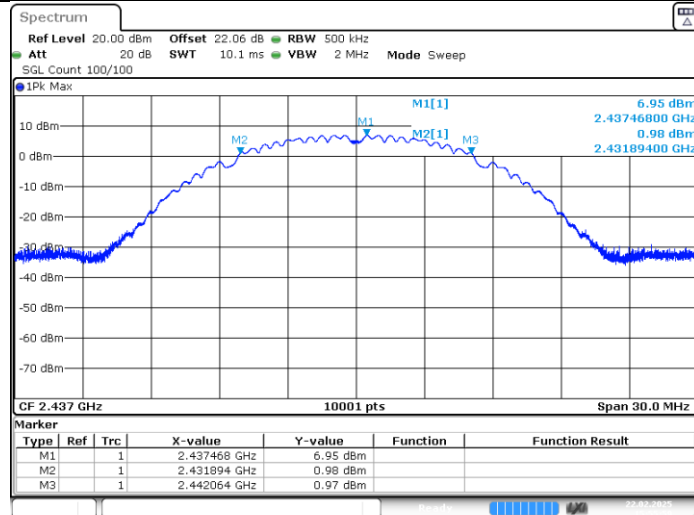
802.11n20 Test Result

| Data transmission rate | Frequency MHz | 6dB bandwidth (MHz) |       | Result  | 99% occupied bandwidth MHz |
|------------------------|---------------|---------------------|-------|---------|----------------------------|
|                        |               | result              | limit | verdict |                            |
| MCS0 (6.5Mbps)         | 2412          | 17.502              | ≥0.5  | Pass    | 17.653                     |
|                        | 2437          | 17.502              | ≥0.5  | Pass    | 17.653                     |
|                        | 2462          | 17.529              | ≥0.5  | Pass    | 17.656                     |

6dB Bandwidth

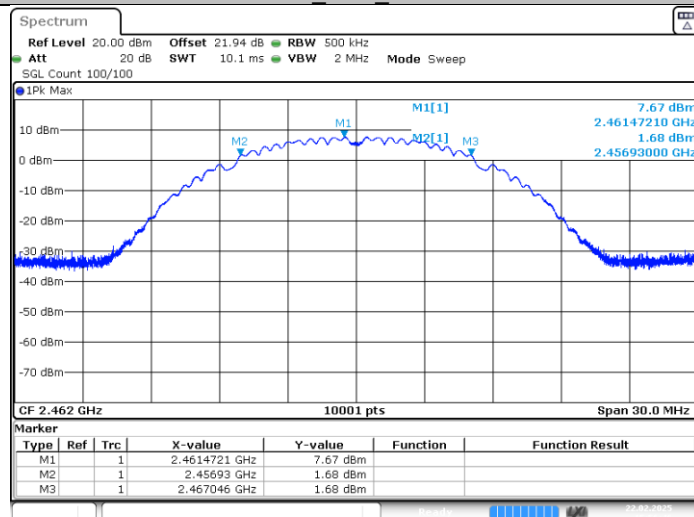


### 11B\_Ant1\_2437



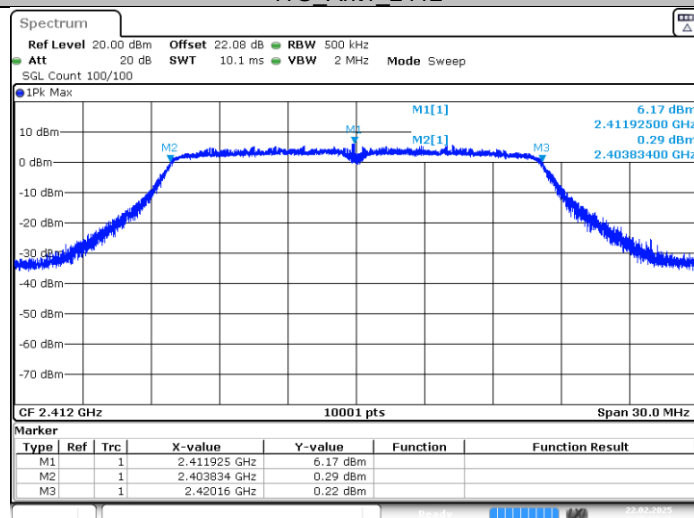
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### 11B\_Ant1\_2462



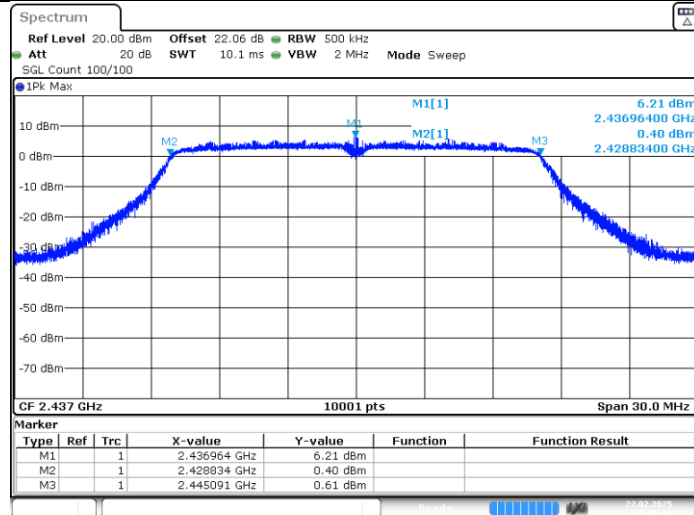
Date: 22 FEB 2025 15:56:47

### 11G\_Ant1\_2412



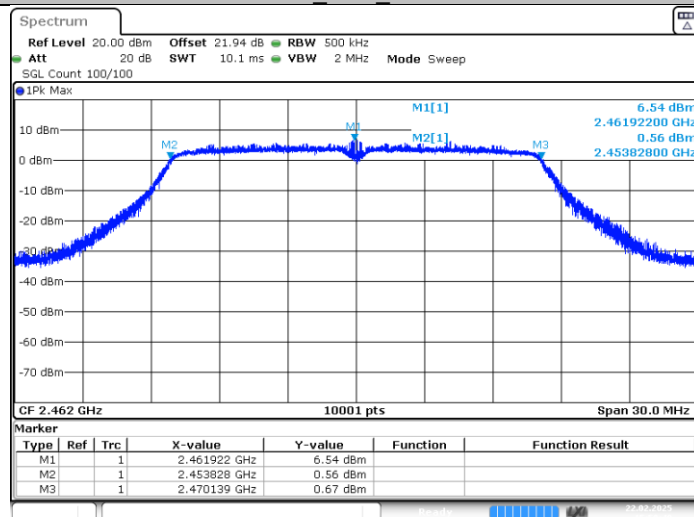
Date: 22 FEB 2025 15:57:44

### 11G\_Ant1\_2437



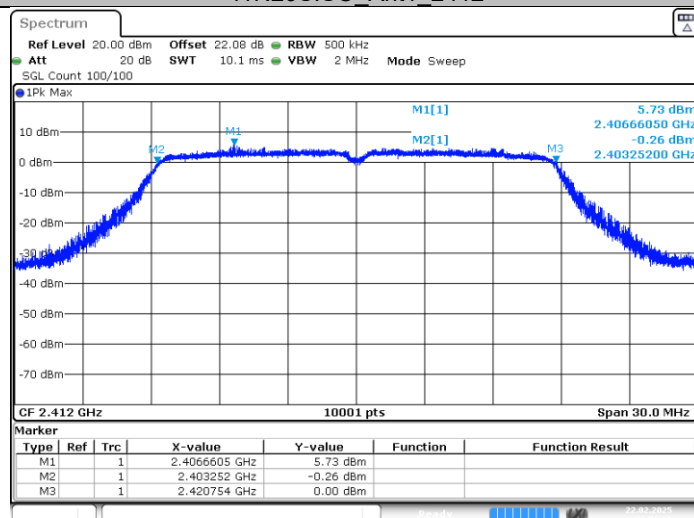
Date: 22 FEB 2025 15:58:14

### 11G\_Ant1\_2462



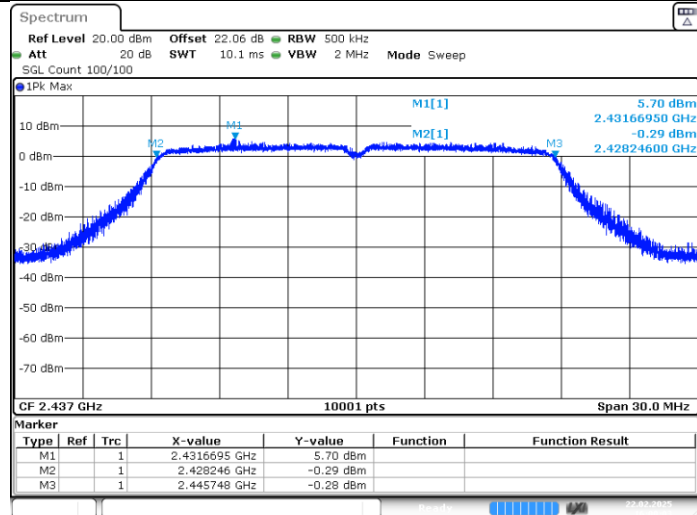
Date: 22 FEB 2025 15:58:39

### 11N20SISO\_Ant1\_2412



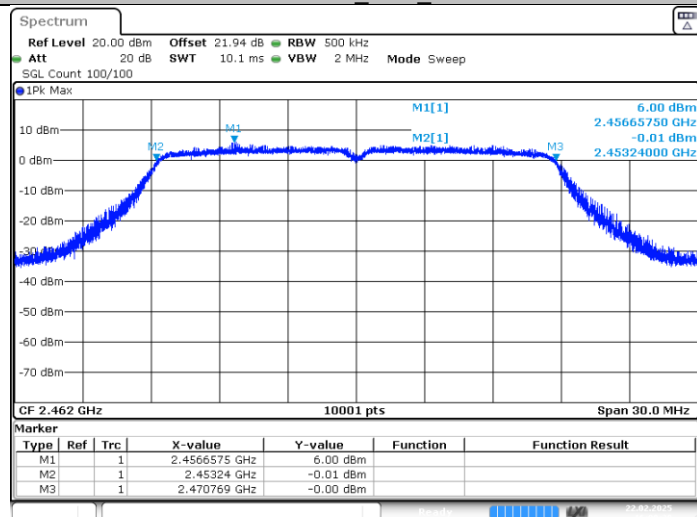
Date: 22 FEB 2025 15:59:28

### 11N20SISO\_Ant1\_2437



Date: 22 FEB 2025 16:00:03

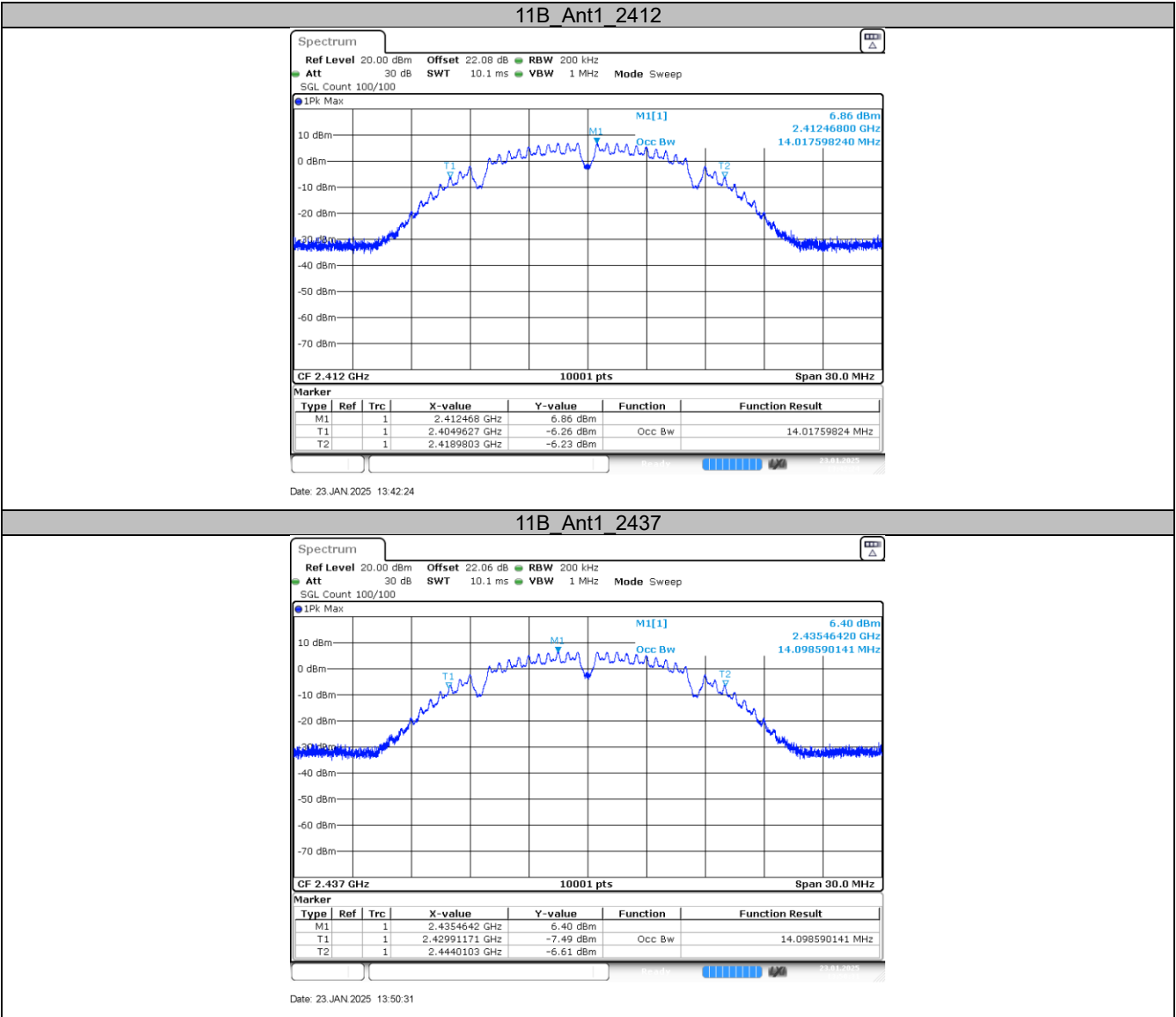
### 11N20SISO\_Ant1\_2462

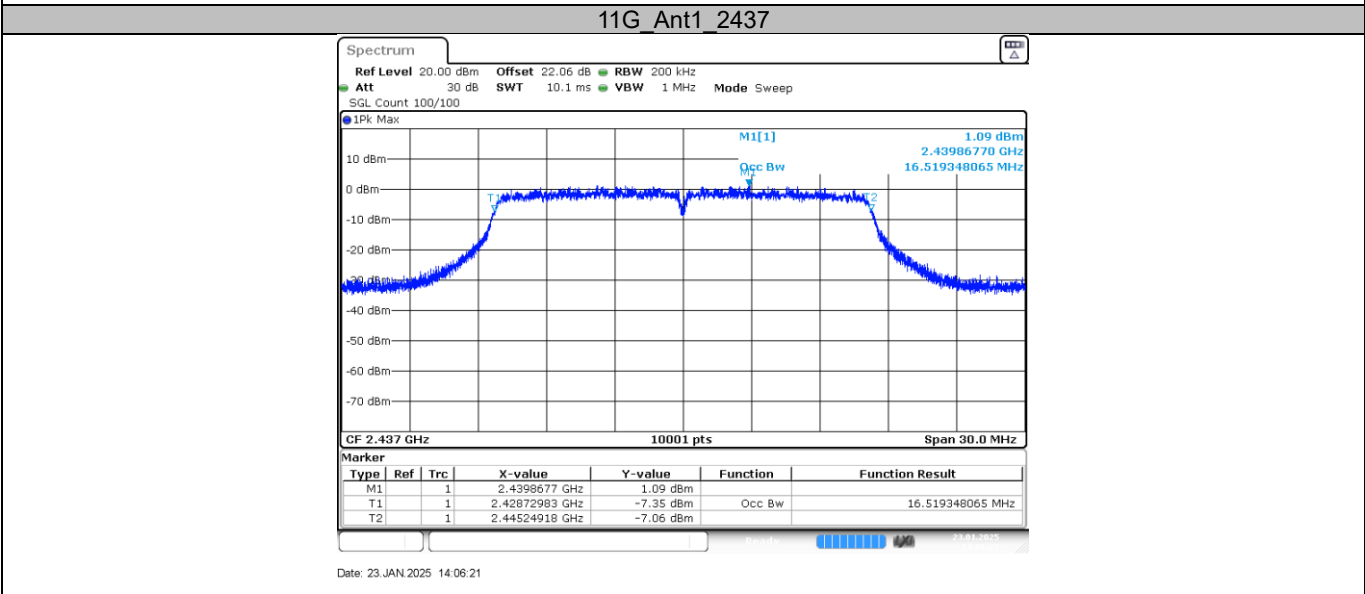
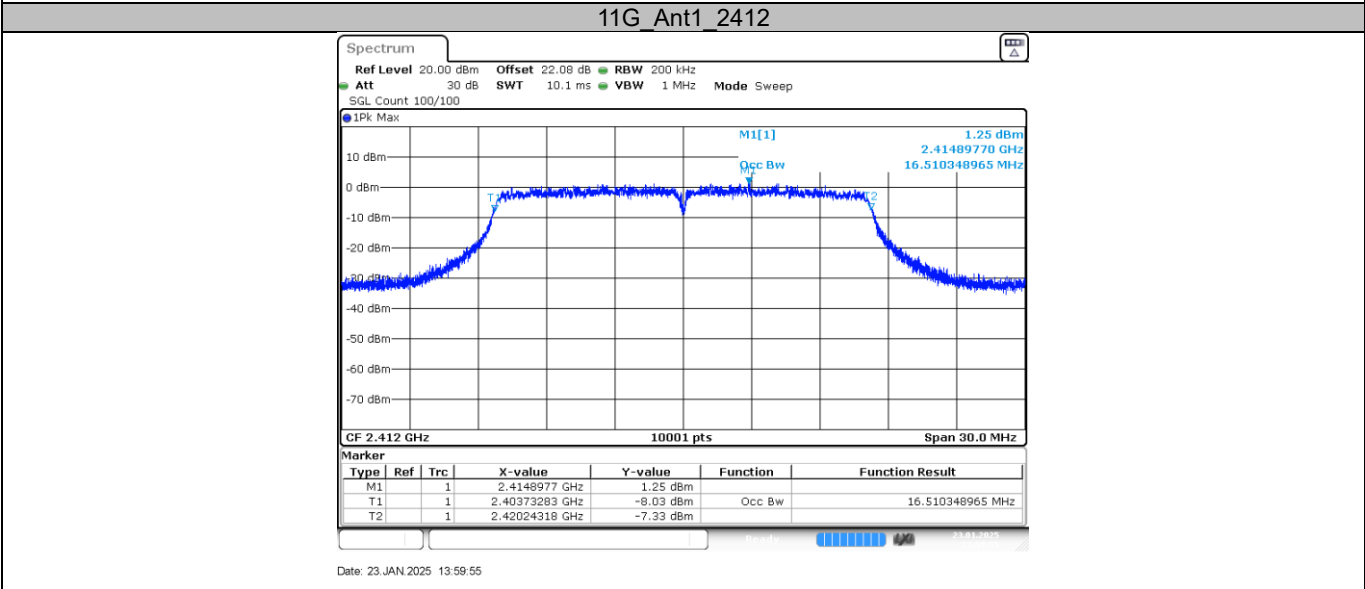
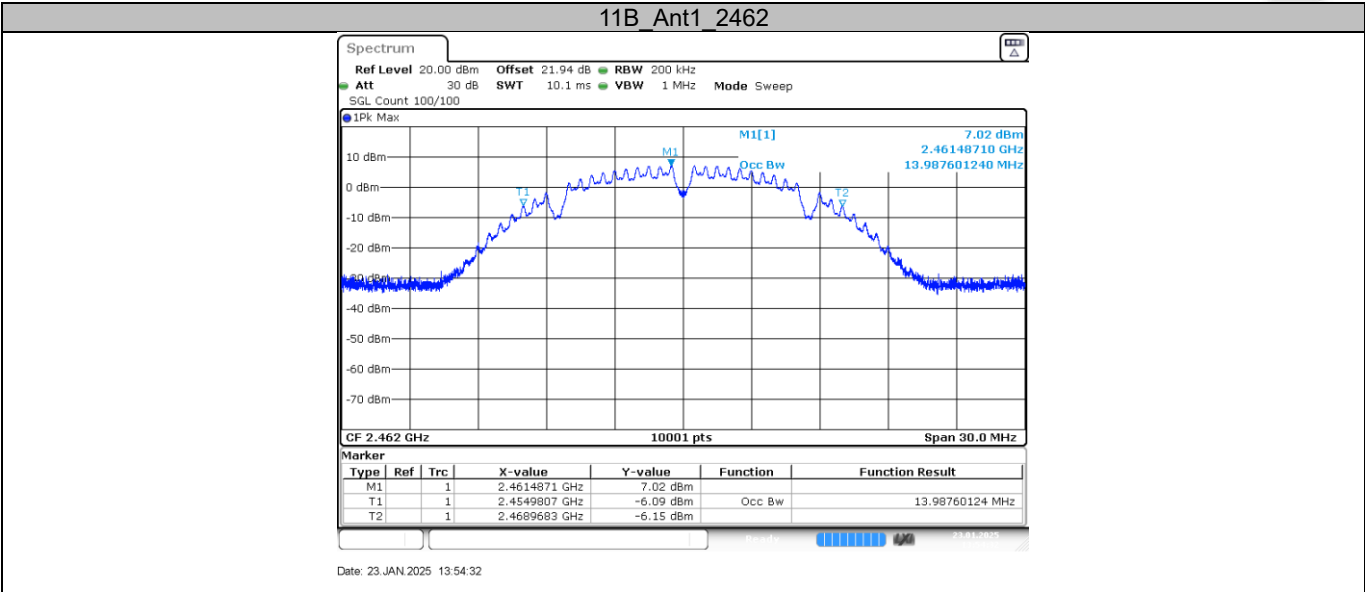


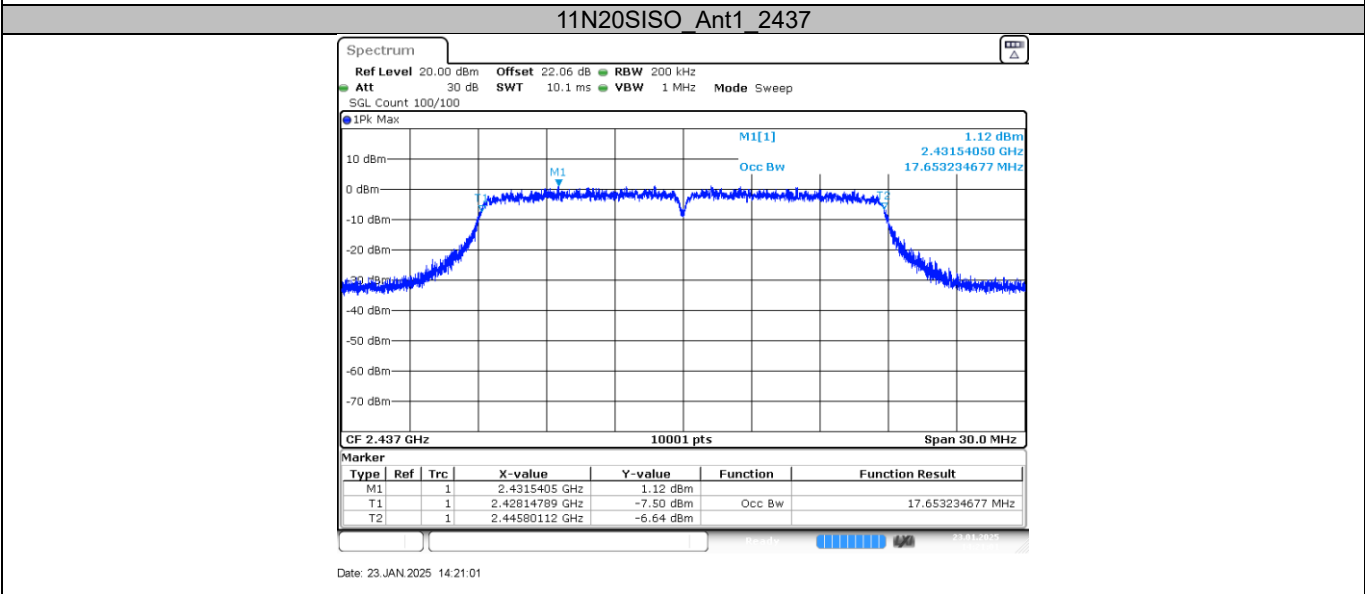
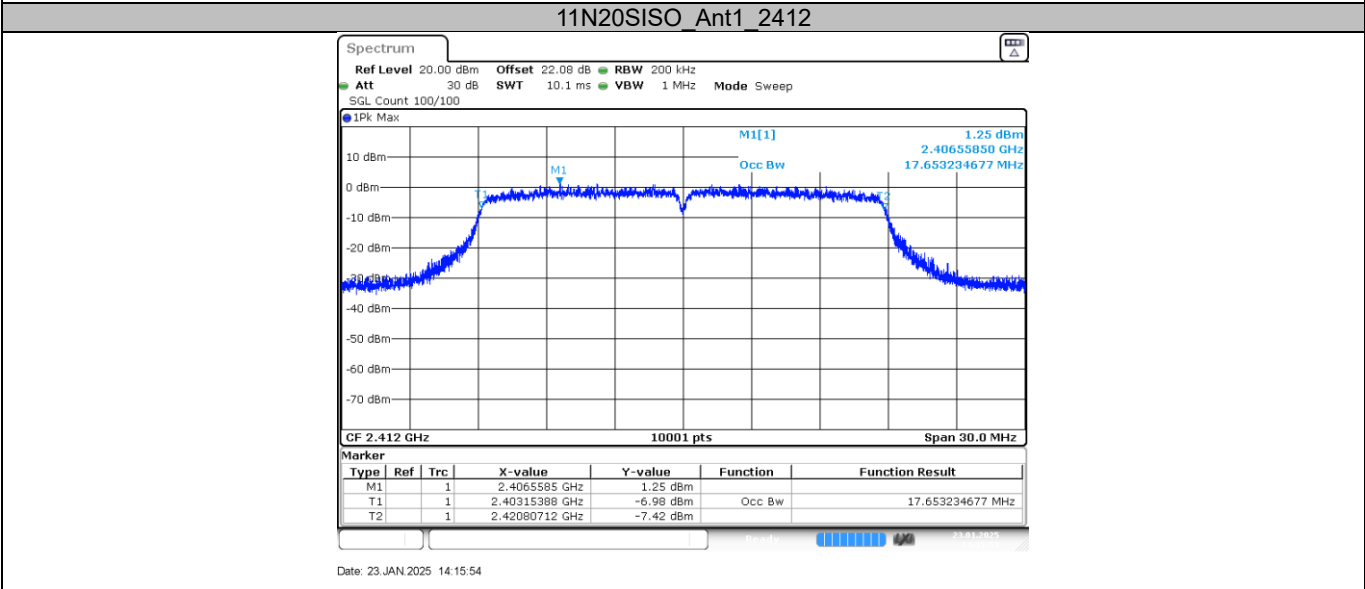
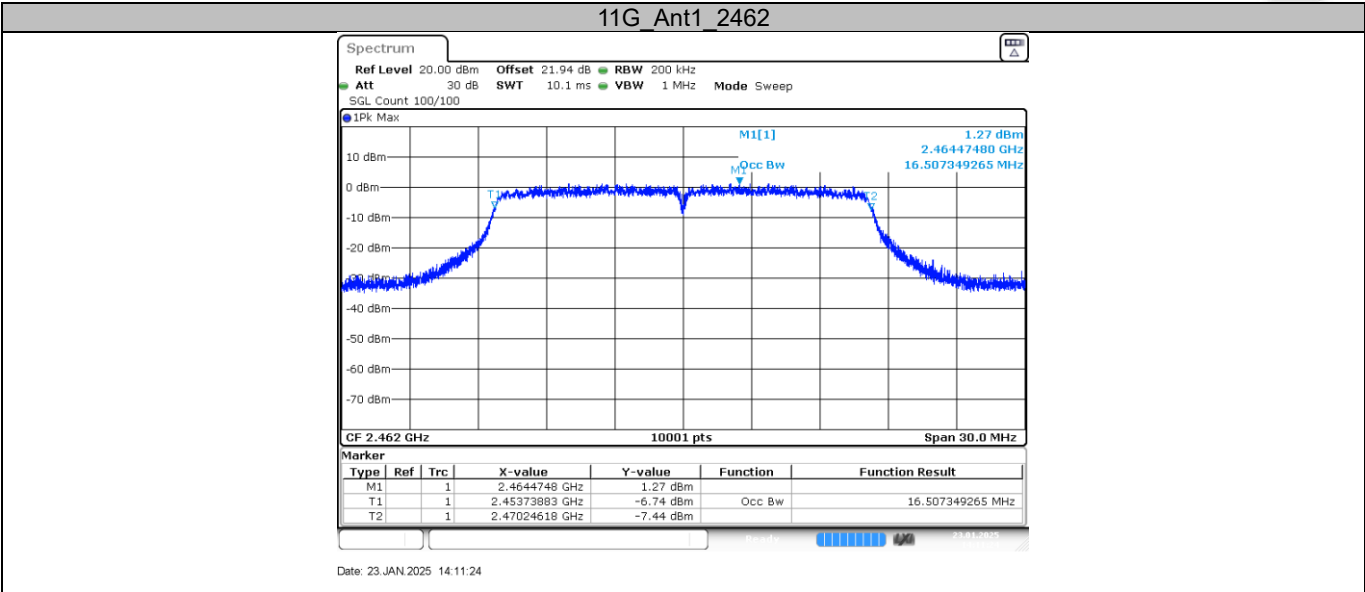
Date: 22 FEB 2025 16:00:28

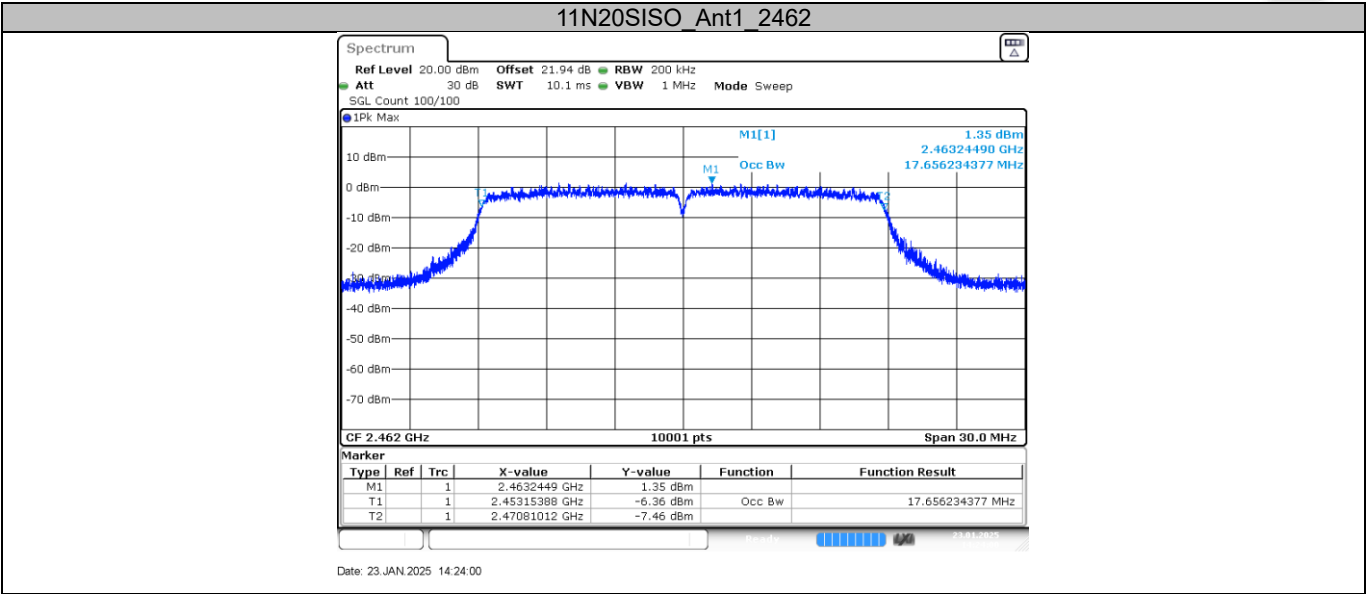


99% Bandwidth









## 10.4 Power spectral density

### Test Method

This procedure shall be used if maximum peak conducted output power was used to demonstrate compliance:

1. The RF output of EUT was connected to the spectrum analyzer. The path loss was compensated to the results for each measurement.
2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
3. Use the following spectrum analyzer settings:
4. Set analyzer center frequency to DTS channel center frequency. RBW=3kHz, VBW $\geq$ 3RBW, Span=1.5 times DTS bandwidth, Detector=Peak, Sweep=auto, Trace= max hold.
5. Allow trace to fully stabilize, use the peak marker function to determine the maximum amplitude level within the RBW.
6. Repeat above procedures until other frequencies measured were completed.

### Limit

Limit [dBm/3kHz]

$\leq 8$

### Test result

802.11b Test Result

| Data transmission rate | Frequency (MHz)        | Power spectral density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|------------------------|------------------------|-----------------------------------|------------------|--------|
| 1Mbps                  | Low channel 2412MHz    | -6.89                             | 8                | Pass   |
|                        | Middle channel 2437MHz | -7.39                             | 8                | Pass   |
|                        | High channel 2462MHz   | -7.12                             | 8                | Pass   |

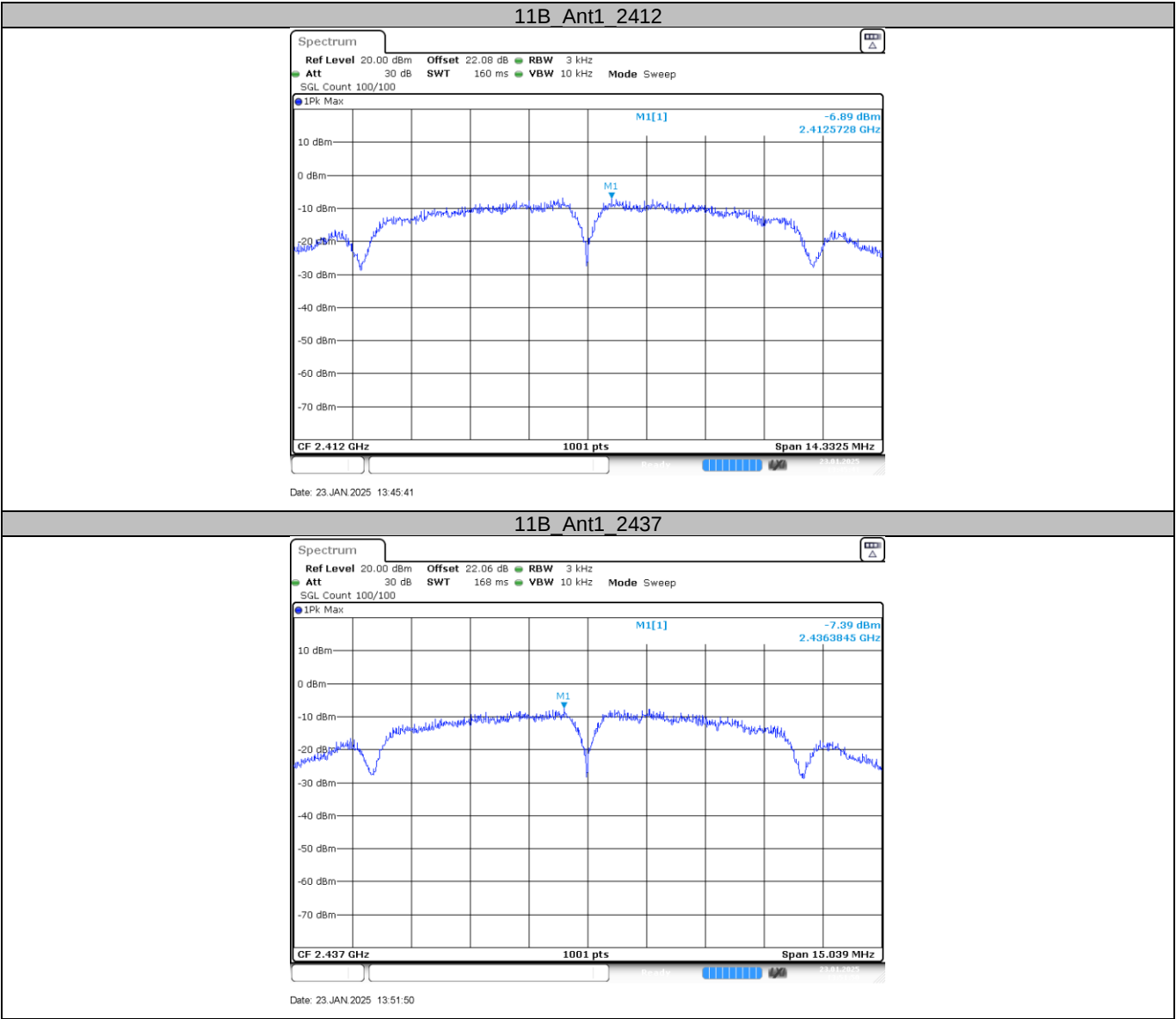
802.11g Test Result

| Data transmission rate | Frequency (MHz)        | Power spectral density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|------------------------|------------------------|-----------------------------------|------------------|--------|
| 6Mbps                  | Low channel 2412MHz    | -14.25                            | 8                | Pass   |
|                        | Middle channel 2437MHz | -14.22                            | 8                | Pass   |
|                        | High channel 2462MHz   | -13.91                            | 8                | Pass   |

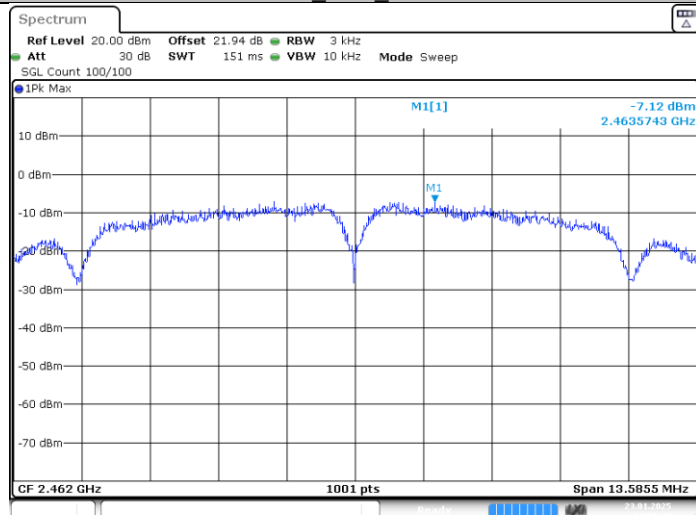


802.11n20 Test Result

| Data transmission rate | Frequency (MHz)        | Power spectral density (dBm/3kHz) | Limit (dBm/3kHz) | Result |
|------------------------|------------------------|-----------------------------------|------------------|--------|
| MCS0 (6.5Mbps)         | Low channel 2412MHz    | -13.55                            | 8                | Pass   |
|                        | Middle channel 2437MHz | -13.65                            | 8                | Pass   |
|                        | High channel 2462MHz   | -13.28                            | 8                | Pass   |

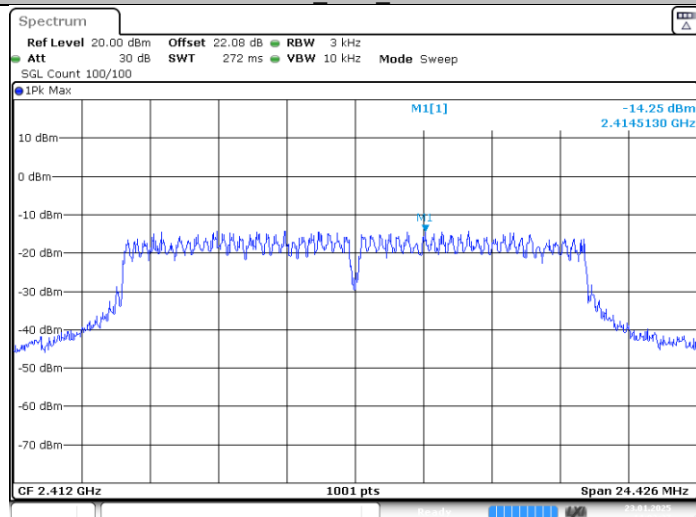


## 11B\_Ant1\_2462



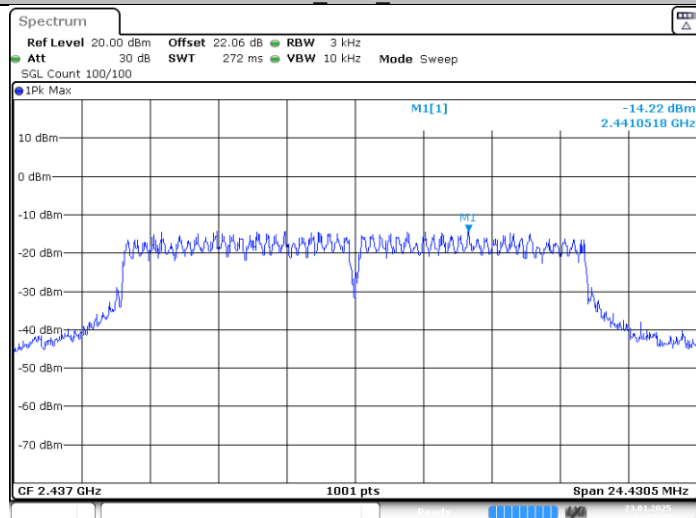
Date: 23. JAN. 2025 13:55:42

## 11G\_Ant1\_2412



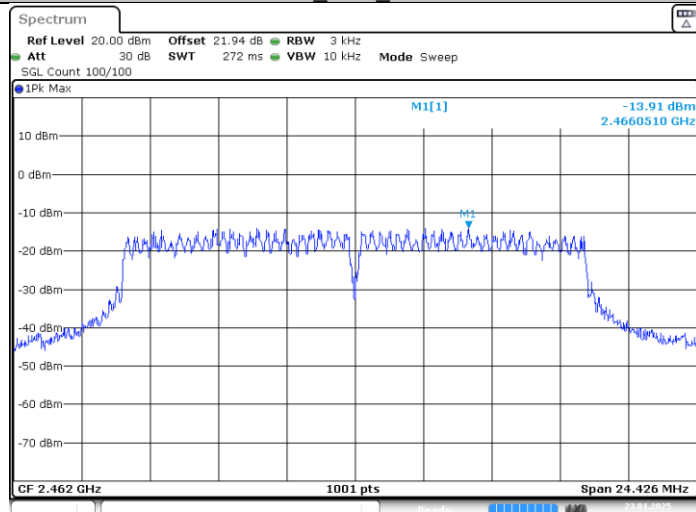
Date: 23. JAN. 2025 14:02:37

## 11G\_Ant1\_2437



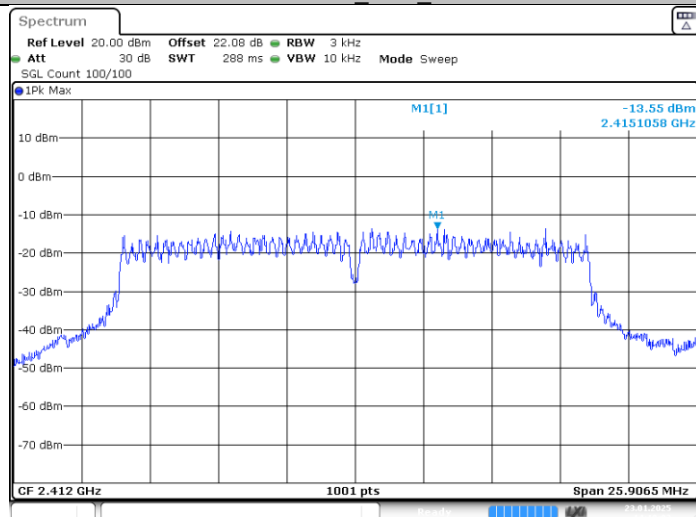
Date: 23. JAN. 2025 14:07:45

## 11G\_Ant1\_2462



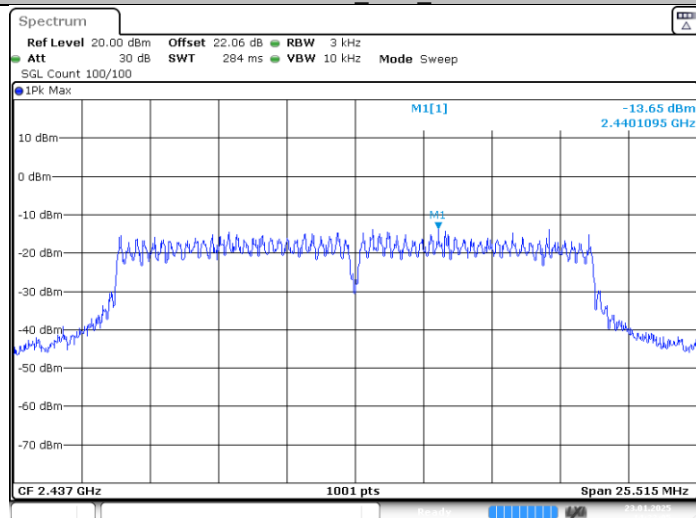
Date: 23. JAN. 2025 14:12:30

## 11N20SISO\_Ant1\_2412

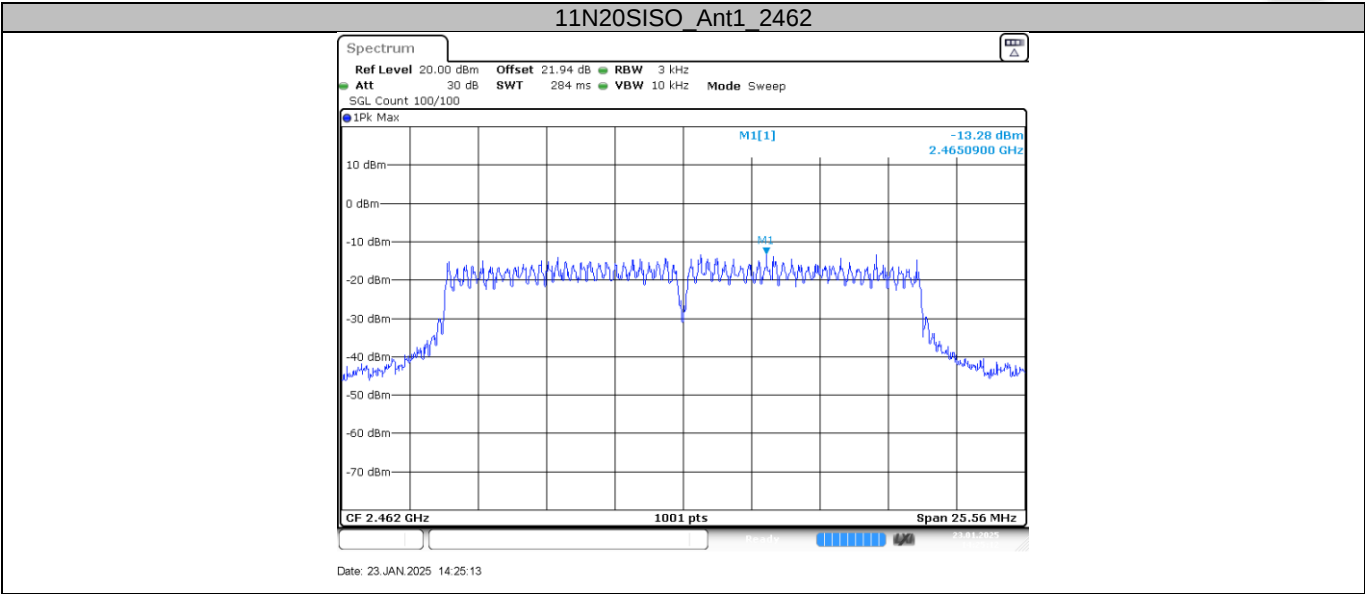


Date: 23. JAN. 2025 14:18:03

## 11N20SISO\_Ant1\_2437



Date: 23. JAN. 2025 14:22:05





10.5 Spurious RF conducted emissions

Test Method

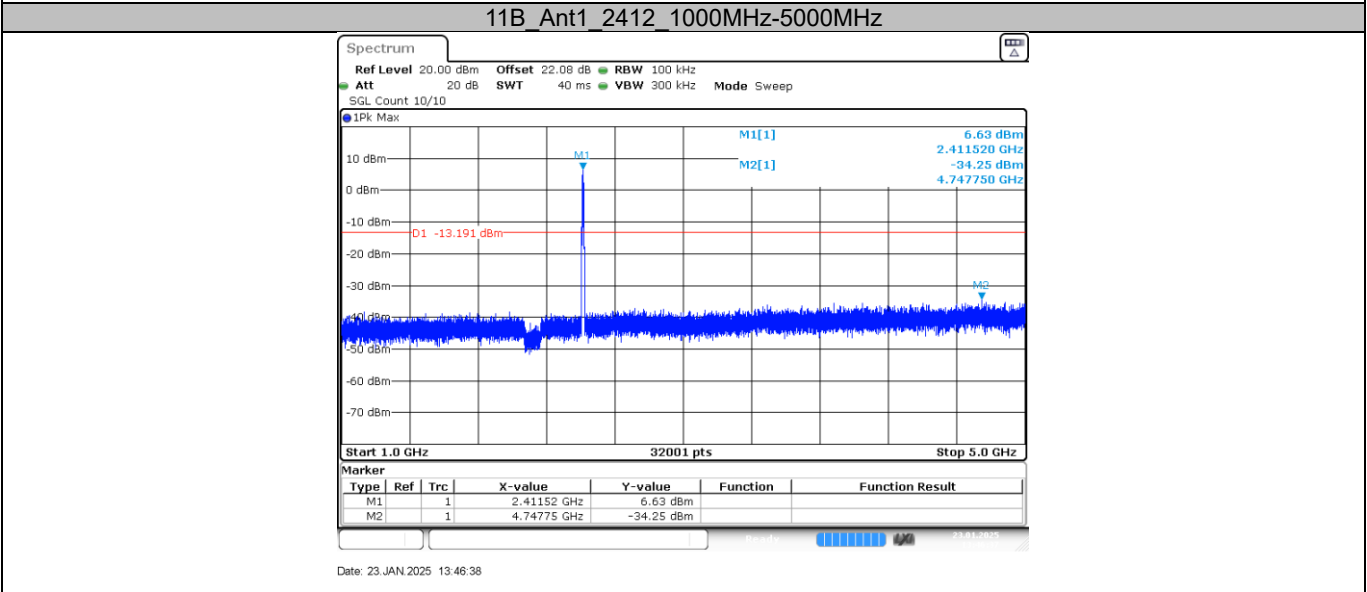
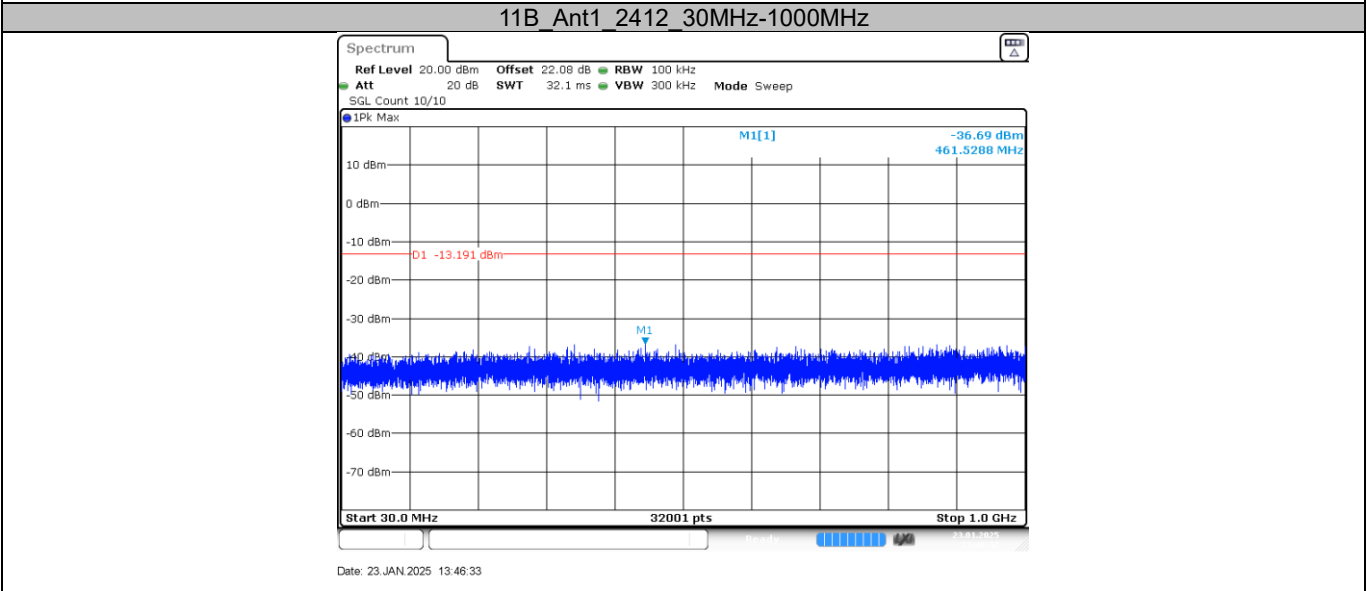
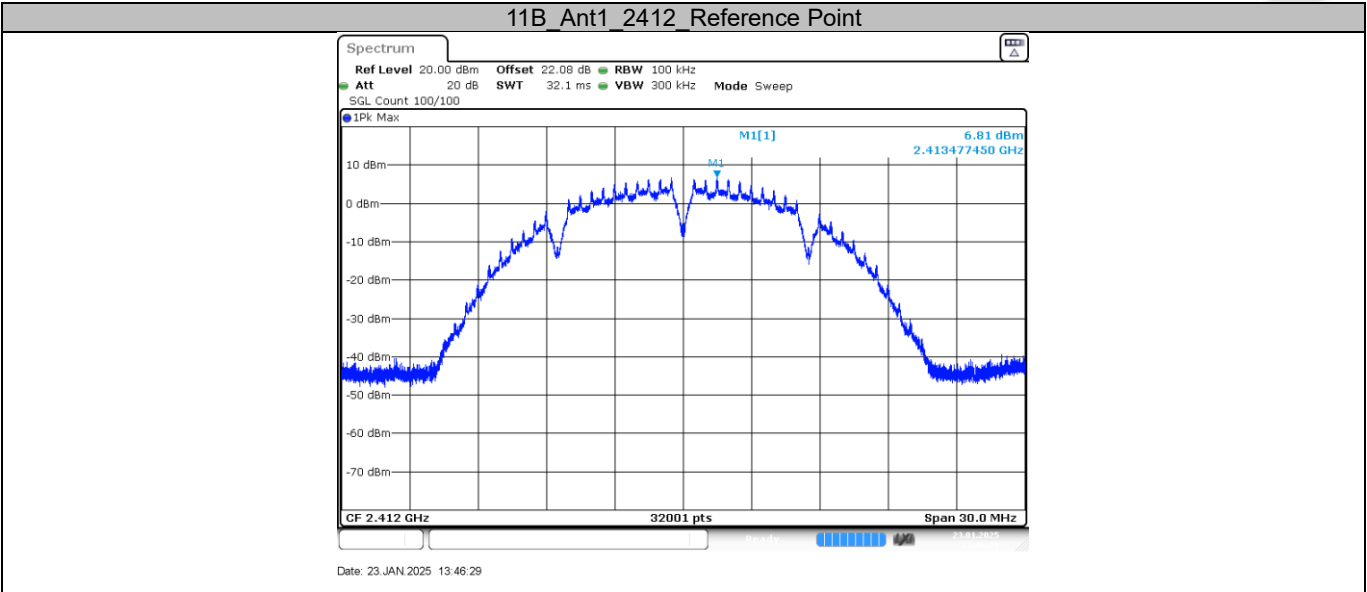
- 1. The RF output of EUT was connected to the spectrum analyzer by RF cable. The path loss was compensated to the results for each measurement.
- 2. Set to the maximum power setting, the instrument center frequency is set to the nominal EUT channel center frequency enable the EUT transmit continuously.
- 3. Use the following spectrum analyzer settings:  
Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10<sup>th</sup> harmonic. Typically, several plots are required to cover this entire span.  
RBW = 100 kHz, VBW≥3RBW, Sweep = auto, Detector function = peak, Trace = max hold
- 4. Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.
- 5. The level displayed must comply with the limit specified in this Section. Submit these plots.
- 6. Repeat above procedures until all frequencies measured were complete.

Limit

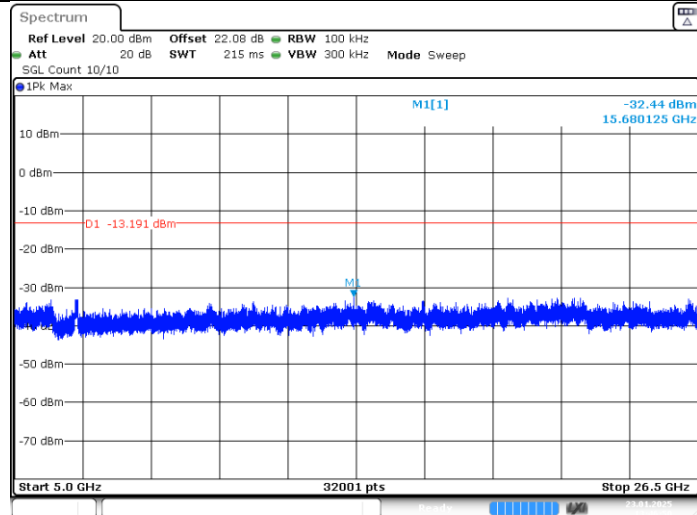
| Frequency Range<br>MHz | Limit (dBc) |
|------------------------|-------------|
| 30-25000               | -20         |

### Spurious RF conducted emissions

| Test Mode | Test Frequency (MHz) | Freq. Range (MHZ) | Result (dBm) | Limit (dBm) | Verdict |
|-----------|----------------------|-------------------|--------------|-------------|---------|
| 11B       | 2412                 | Reference         | 6.81         | ---         | PASS    |
|           |                      | 30~1000           | -36.69       | <=-13.19    | PASS    |
|           |                      | 1000~26500        | -32.44       | <=-13.19    | PASS    |
|           | 2437                 | Reference         | 6.17         | ---         | PASS    |
|           |                      | 30~1000           | -36.82       | <=-13.83    | PASS    |
|           |                      | 1000~26500        | -31.80       | <=-13.83    | PASS    |
|           | 2462                 | Reference         | 6.71         | ---         | PASS    |
|           |                      | 30~1000           | -36.47       | <=-13.29    | PASS    |
|           |                      | 1000~26500        | -32.45       | <=-13.29    | PASS    |
| 11G       | 2412                 | Reference         | 0.08         | ---         | PASS    |
|           |                      | 30~1000           | -36.41       | <=-19.92    | PASS    |
|           |                      | 1000~26500        | -32.45       | <=-19.92    | PASS    |
|           | 2437                 | Reference         | 0.08         | ---         | PASS    |
|           |                      | 30~1000           | -36.18       | <=-19.92    | PASS    |
|           |                      | 1000~26500        | -32.59       | <=-19.92    | PASS    |
|           | 2462                 | Reference         | 0.38         | ---         | PASS    |
|           |                      | 30~1000           | -36.62       | <=-19.62    | PASS    |
|           |                      | 1000~26500        | -32.92       | <=-19.62    | PASS    |
| 11N20     | 2412                 | Reference         | 0.17         | ---         | PASS    |
|           |                      | 30~1000           | -36.61       | <=-19.83    | PASS    |
|           |                      | 1000~26500        | -32.70       | <=-19.83    | PASS    |
|           | 2437                 | Reference         | 0.02         | ---         | PASS    |
|           |                      | 30~1000           | -37.00       | <=-19.98    | PASS    |
|           |                      | 1000~26500        | -32.21       | <=-19.98    | PASS    |
|           | 2462                 | Reference         | 0.40         | ---         | PASS    |
|           |                      | 30~1000           | -36.82       | <=-19.60    | PASS    |
|           |                      | 1000~26500        | -32.16       | <=-19.60    | PASS    |

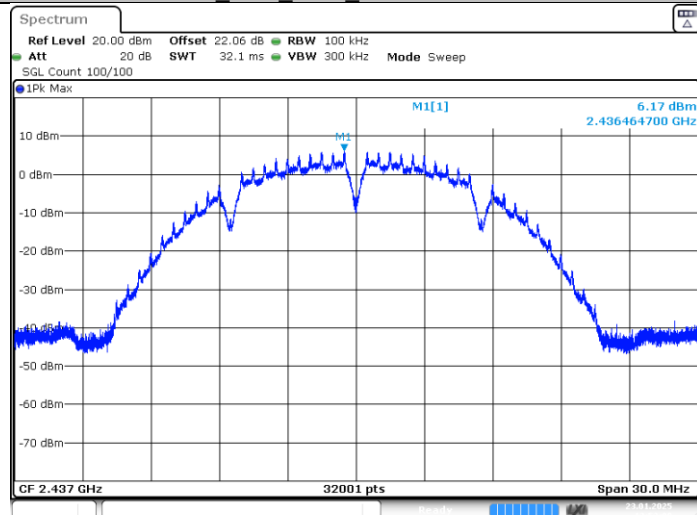


11B\_Ant1\_2412\_5000MHz-26500MHz



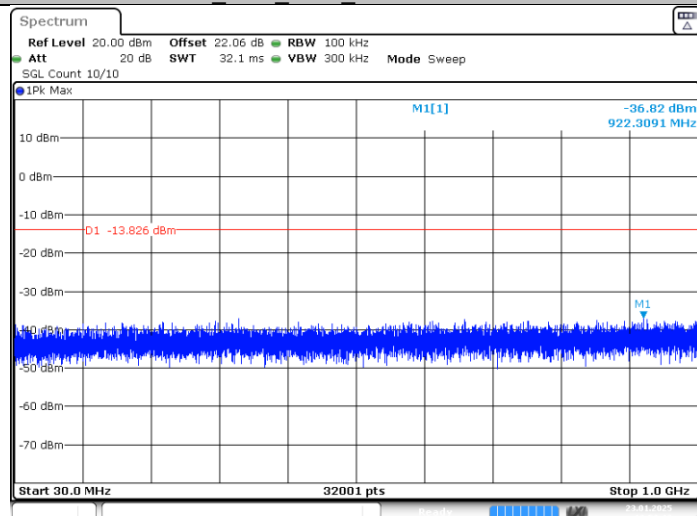
Date: 23.JAN.2025 13:46:51

## 11B\_Ant1\_2437\_Reference Point

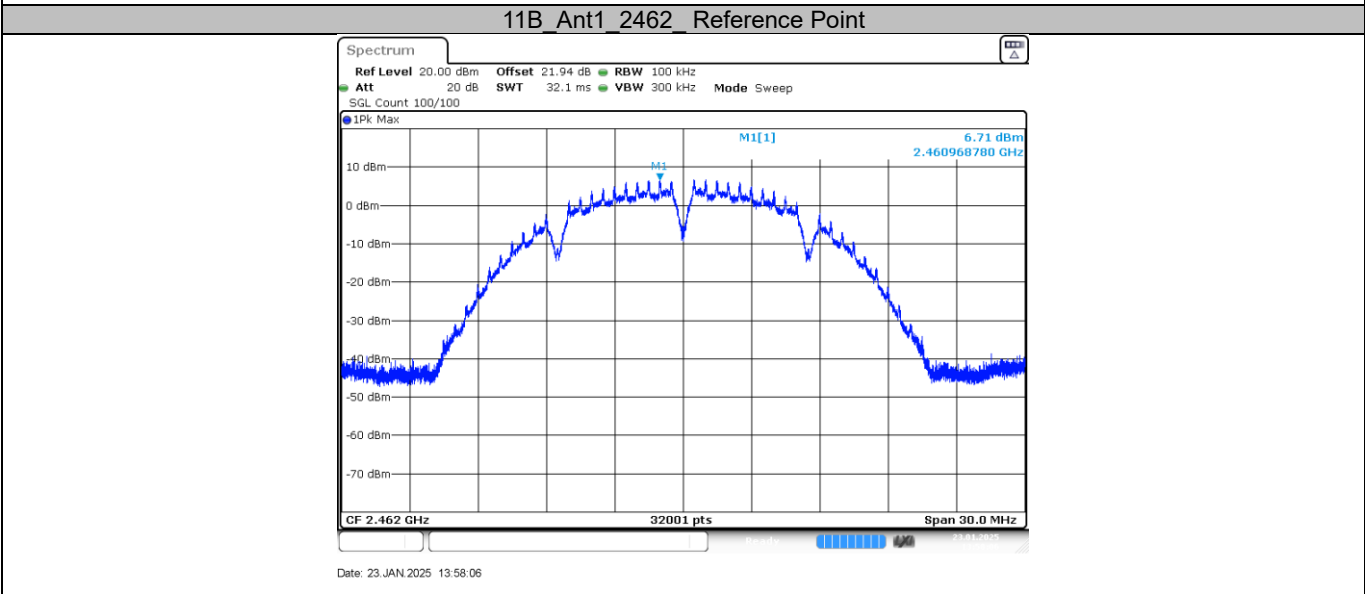
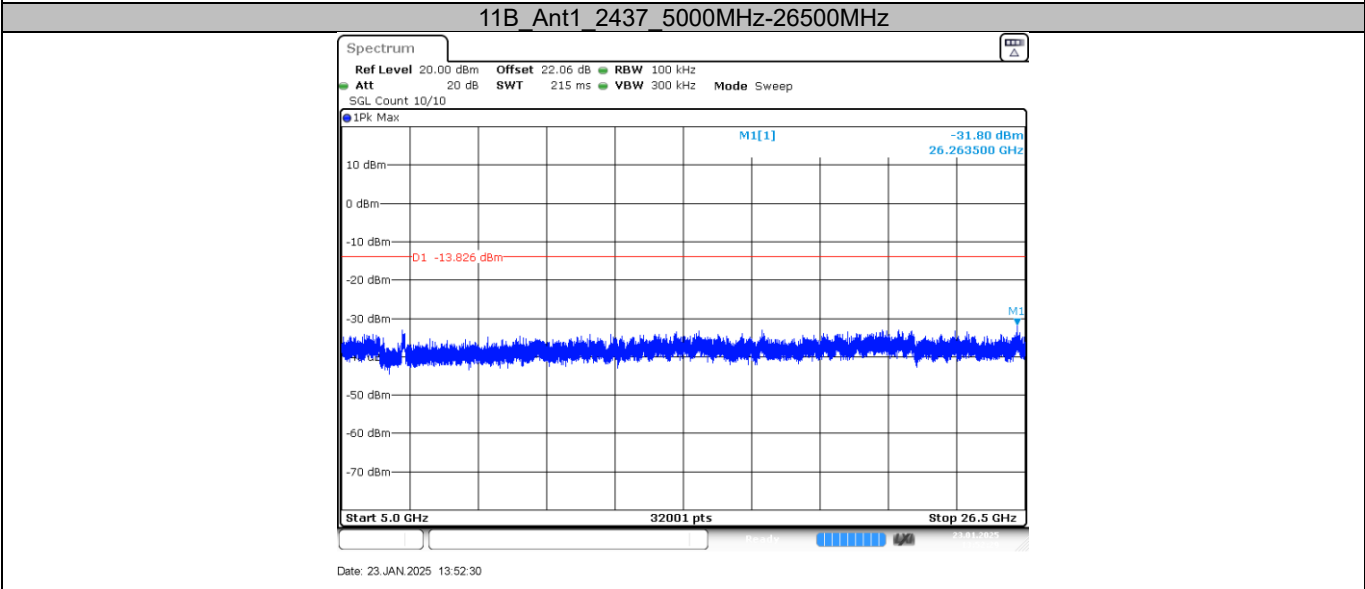
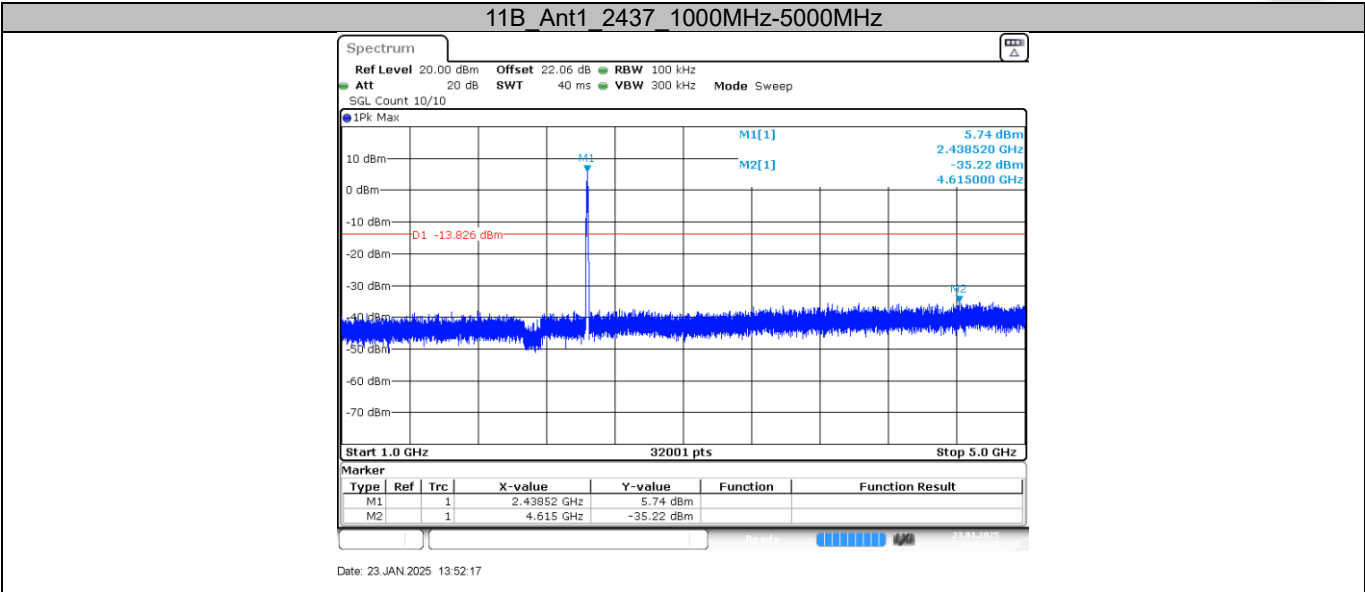


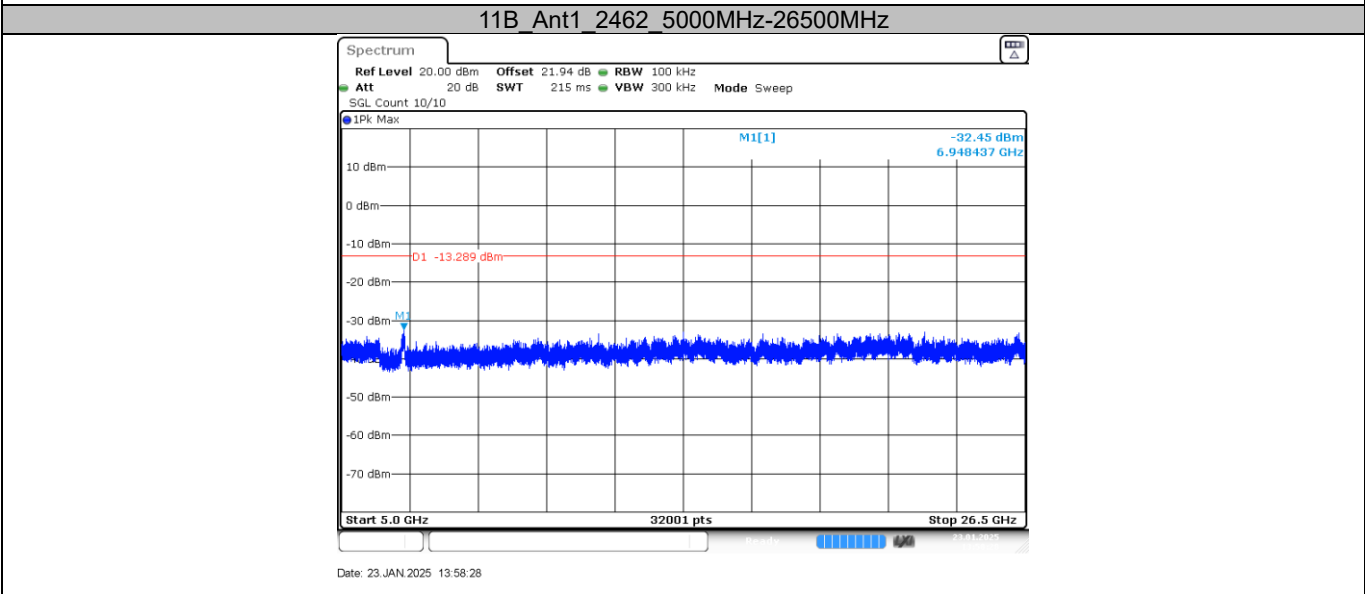
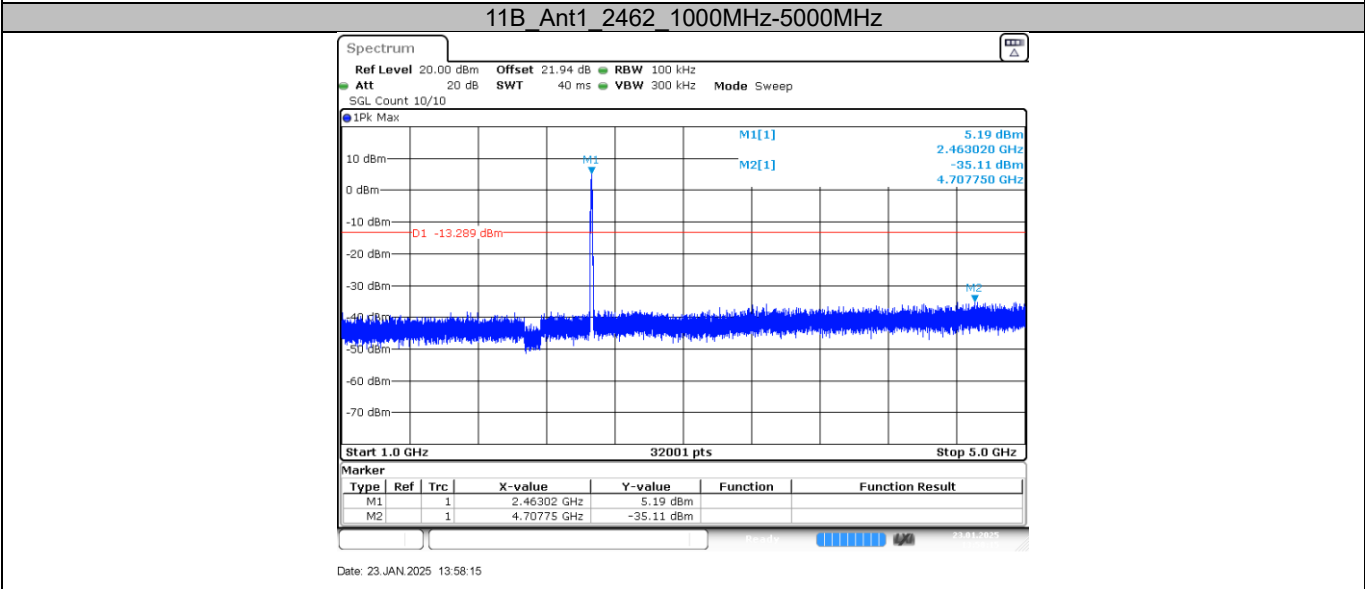
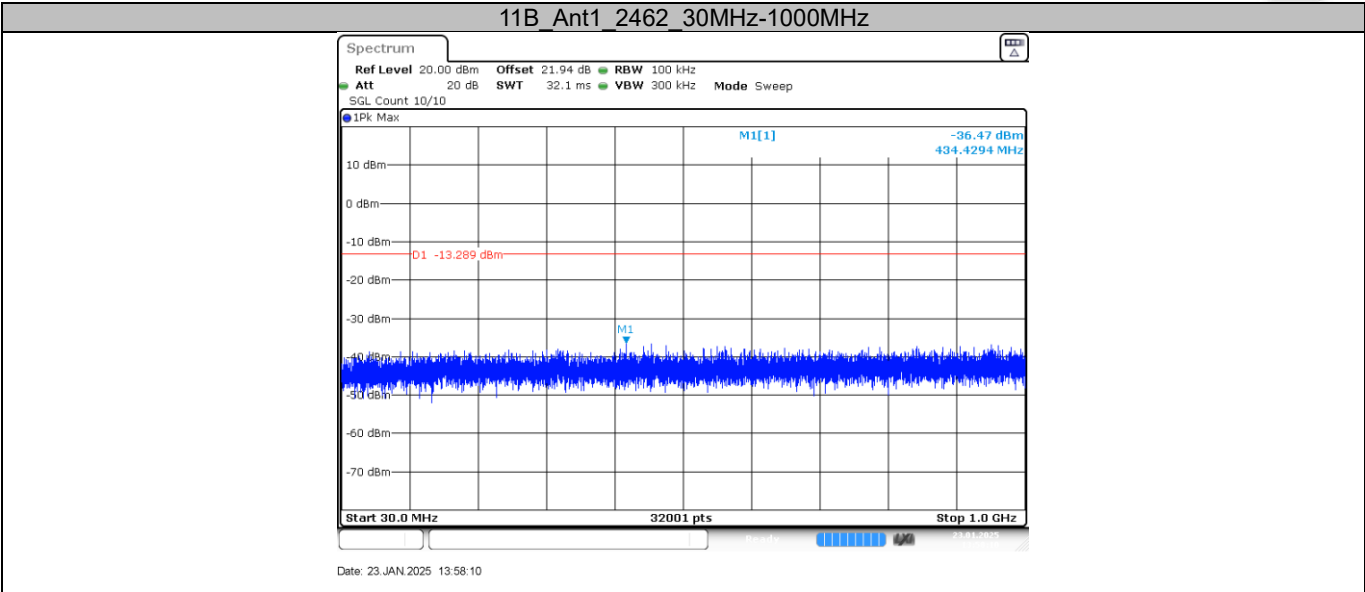
Date: 23.JAN.2025 13:52:08

## 11B\_Ant1\_2437\_30MHz-1000MHz

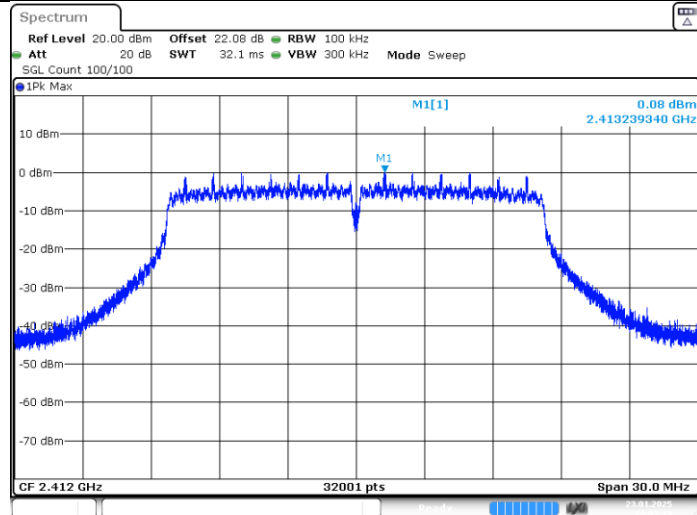


Date: 23 JAN 2025 13:52:12



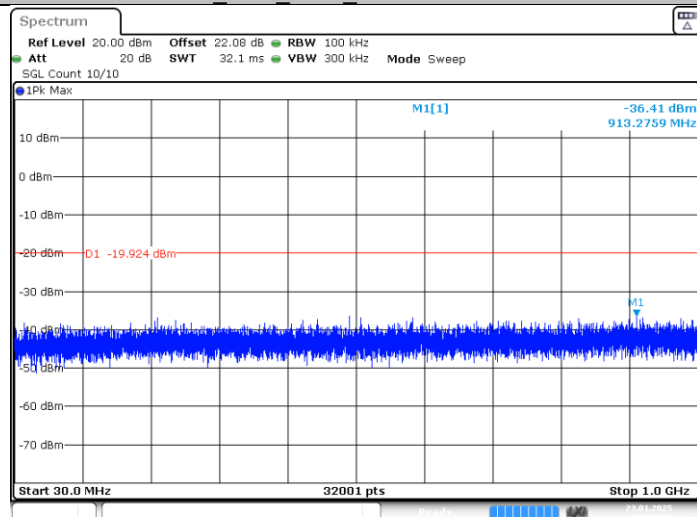


### 11G\_Ant1\_2412\_Reference Point



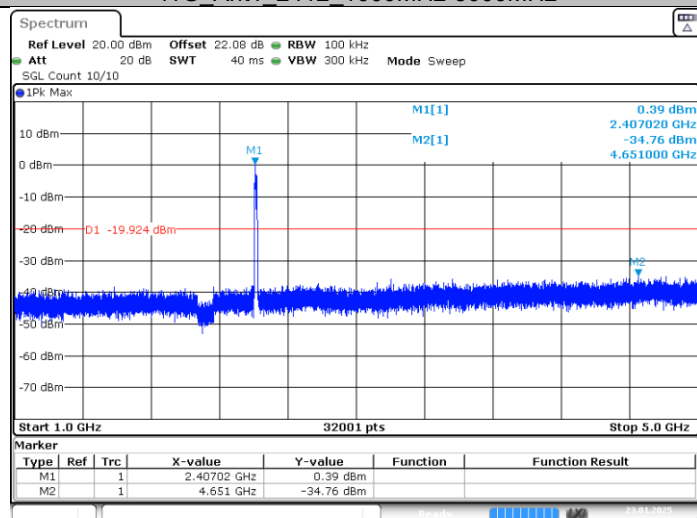
Date: 23. JAN. 2025 14:03:19

### 11G\_Ant1\_2412\_30MHz-1000MHz



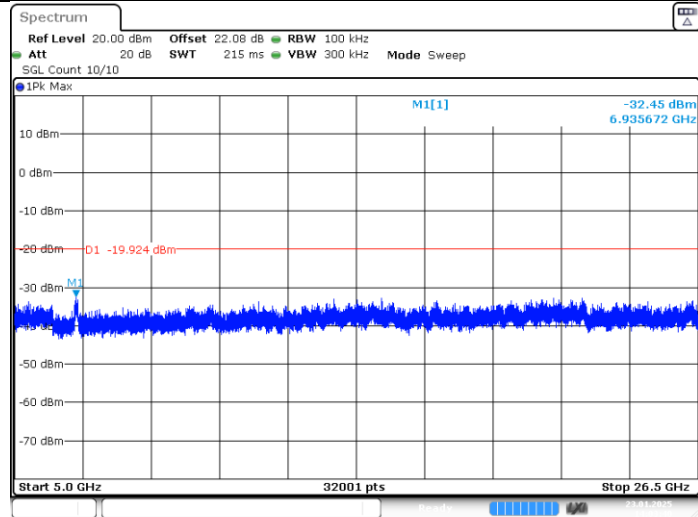
Date: 23. JAN. 2025 14:03:23

### 11G\_Ant1\_2412\_1000MHz-5000MHz



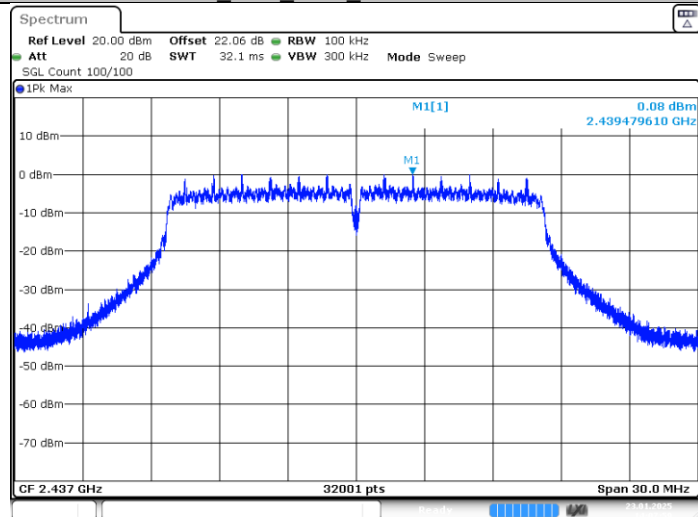
Date: 23. JAN. 2025 14:03:28

## 11G\_Ant1\_2412\_5000MHz-26500MHz



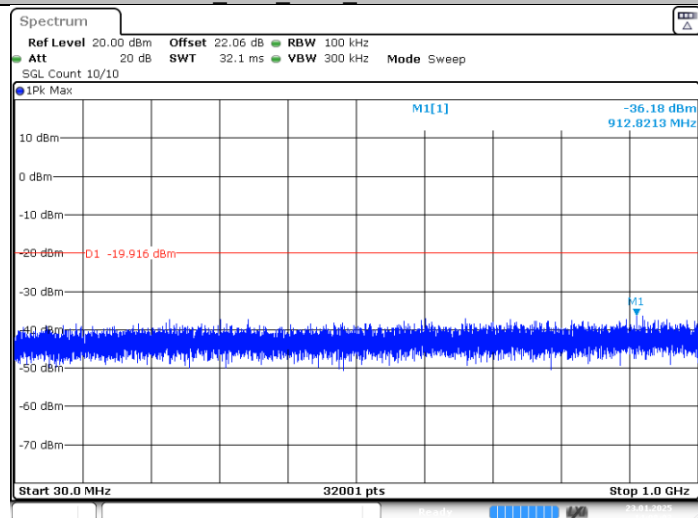
Date: 23. JAN. 2025 14:03:41

## 11G\_Ant1\_2437\_Reference Point

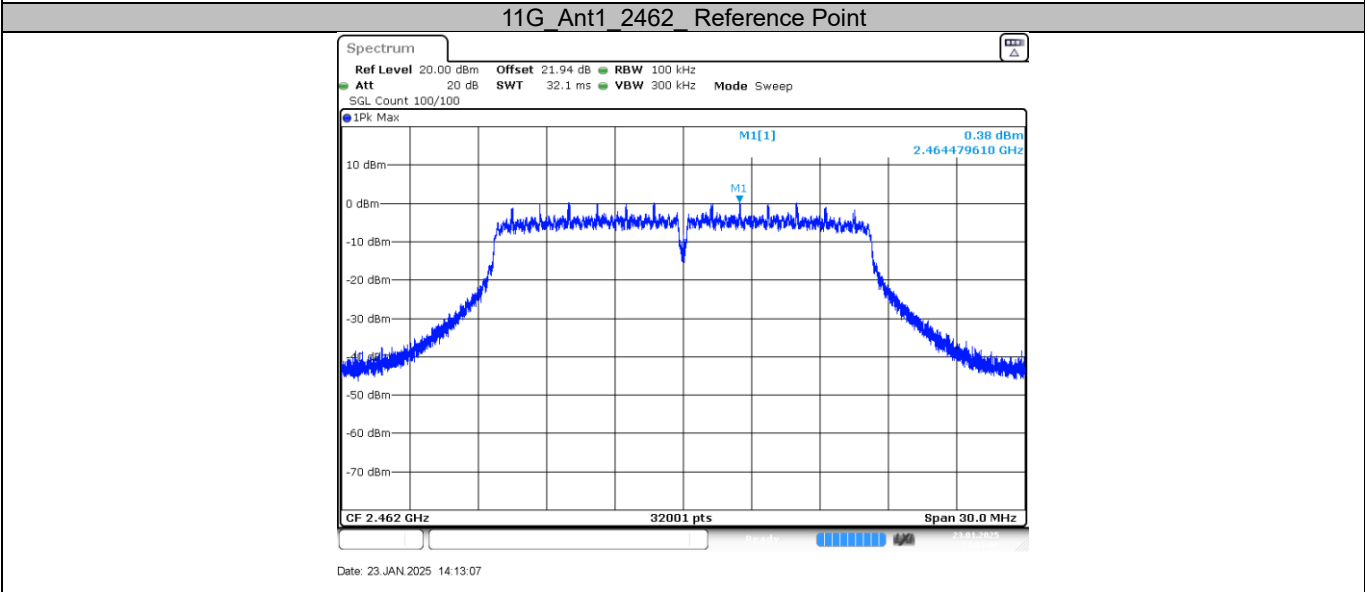
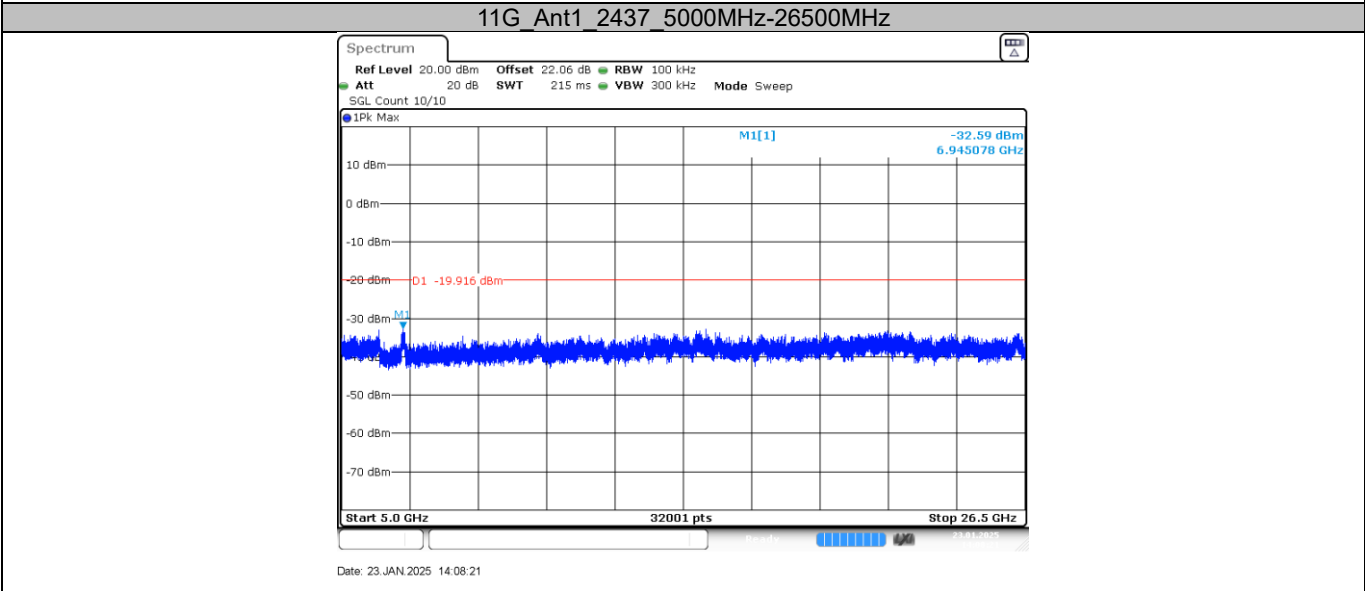
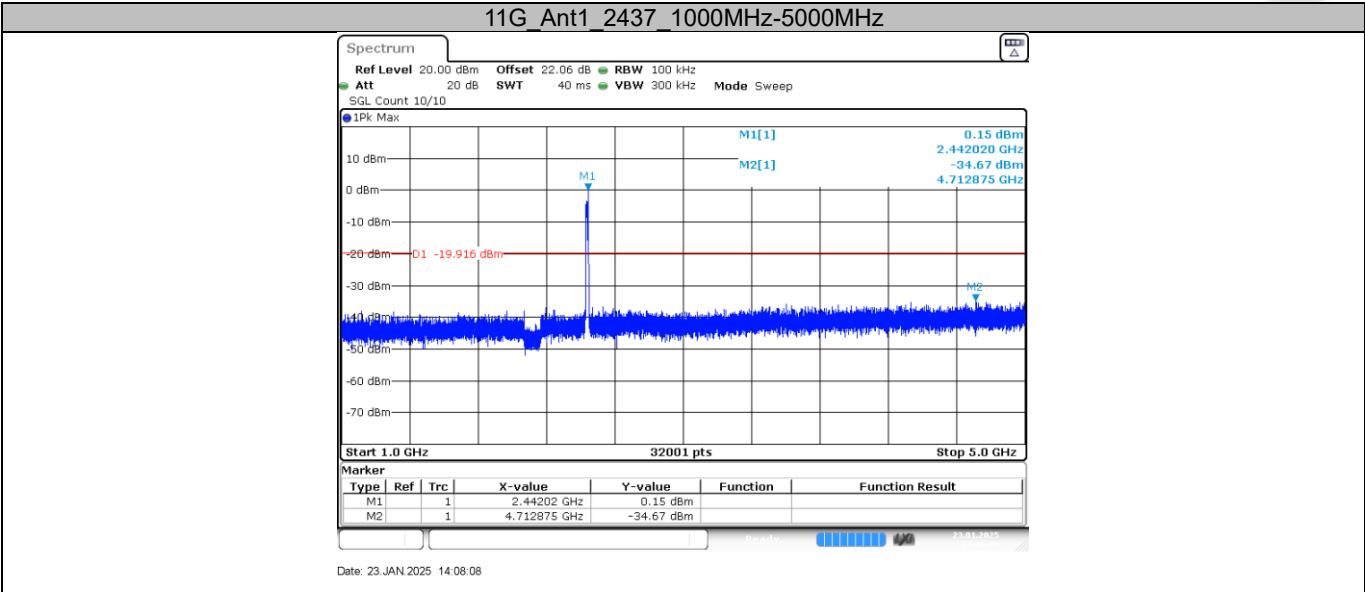


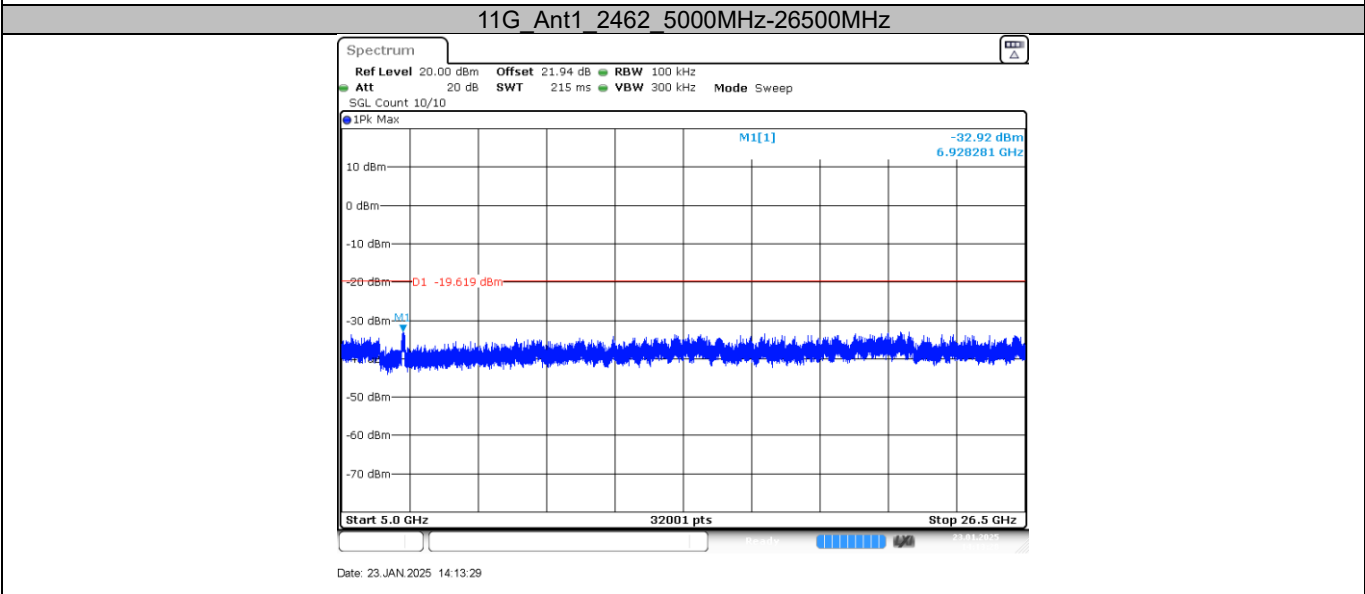
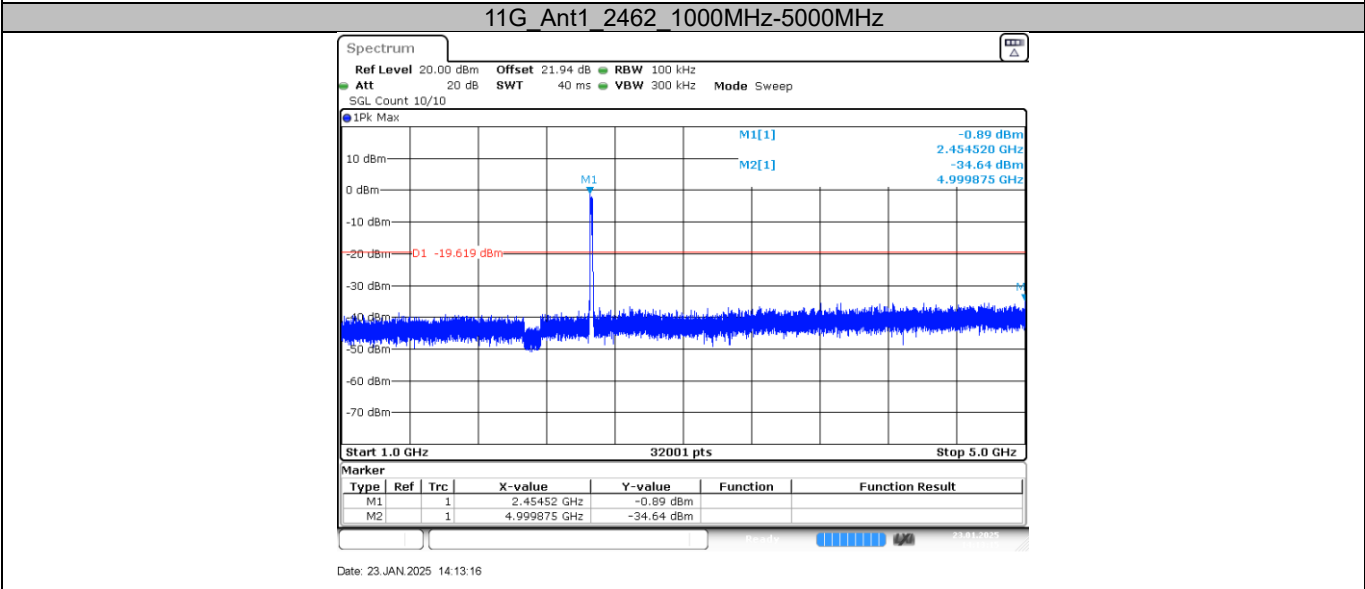
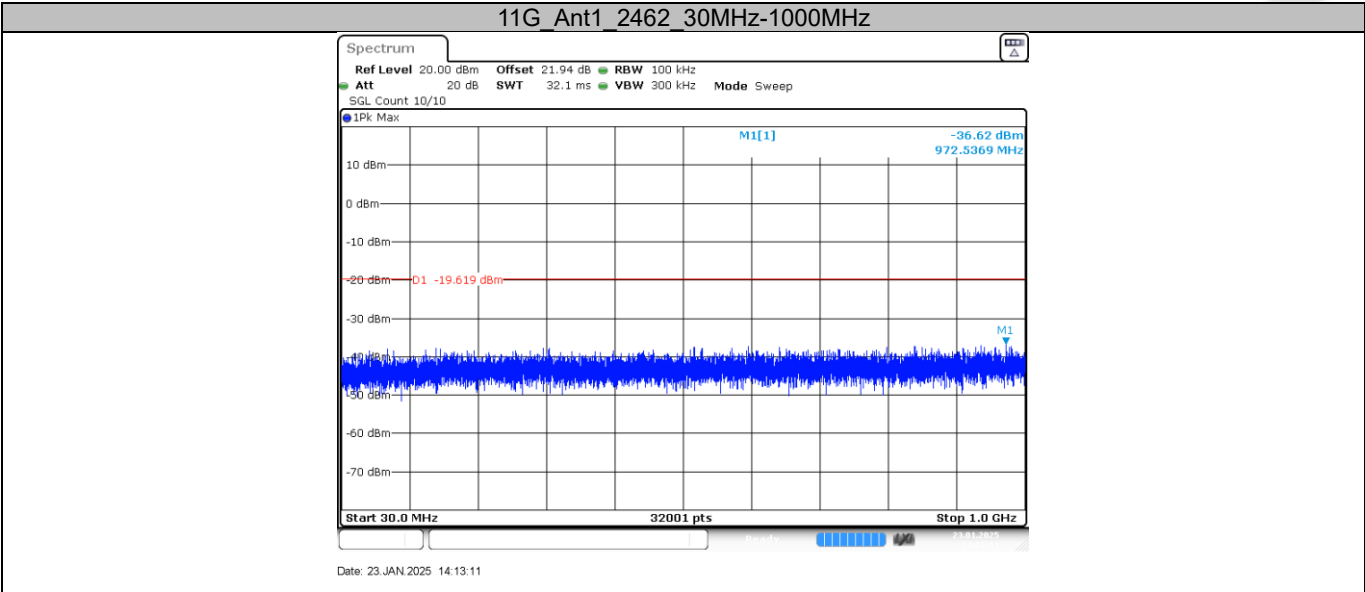
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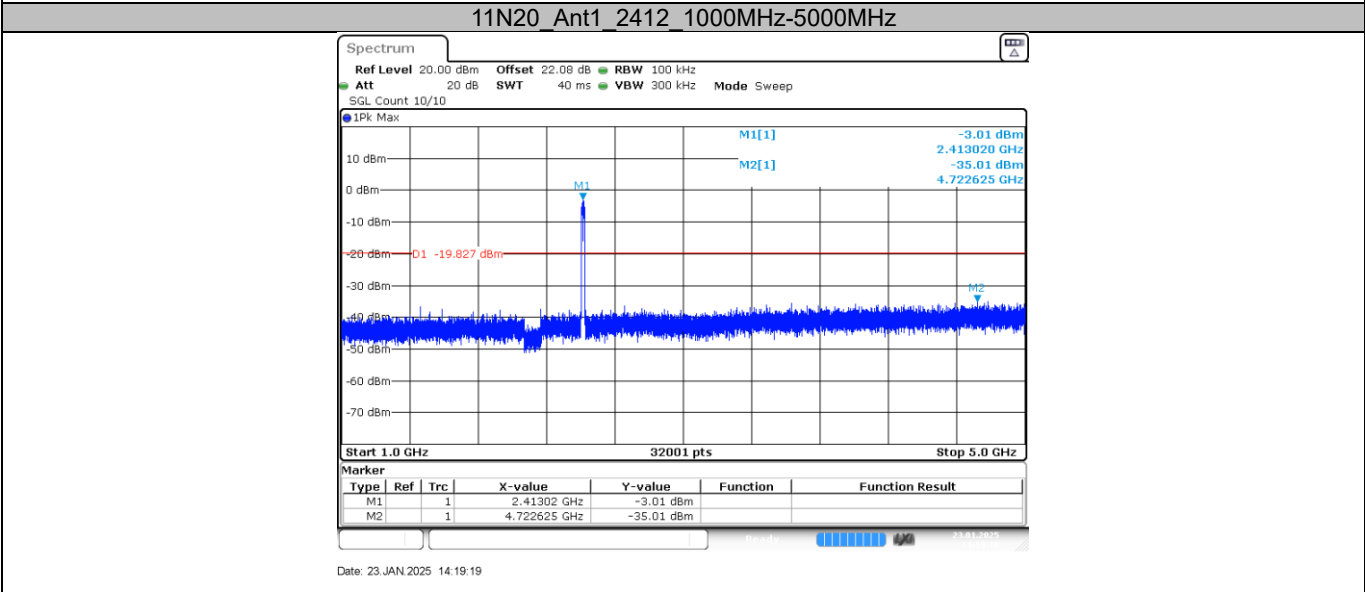
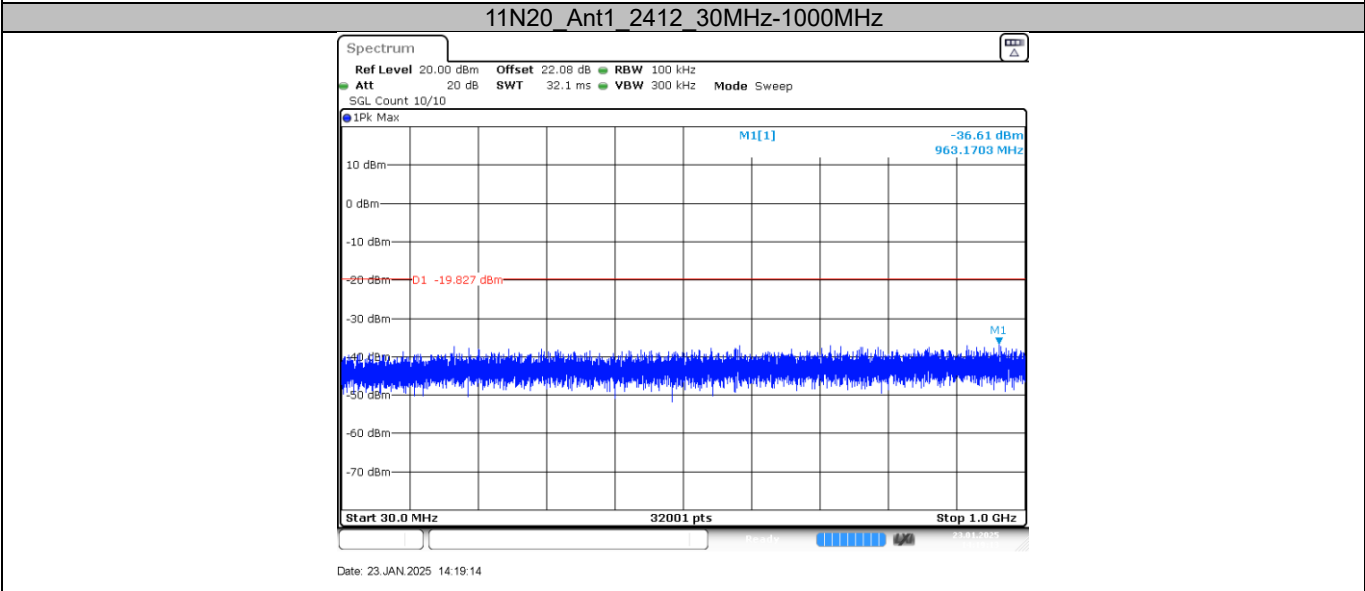
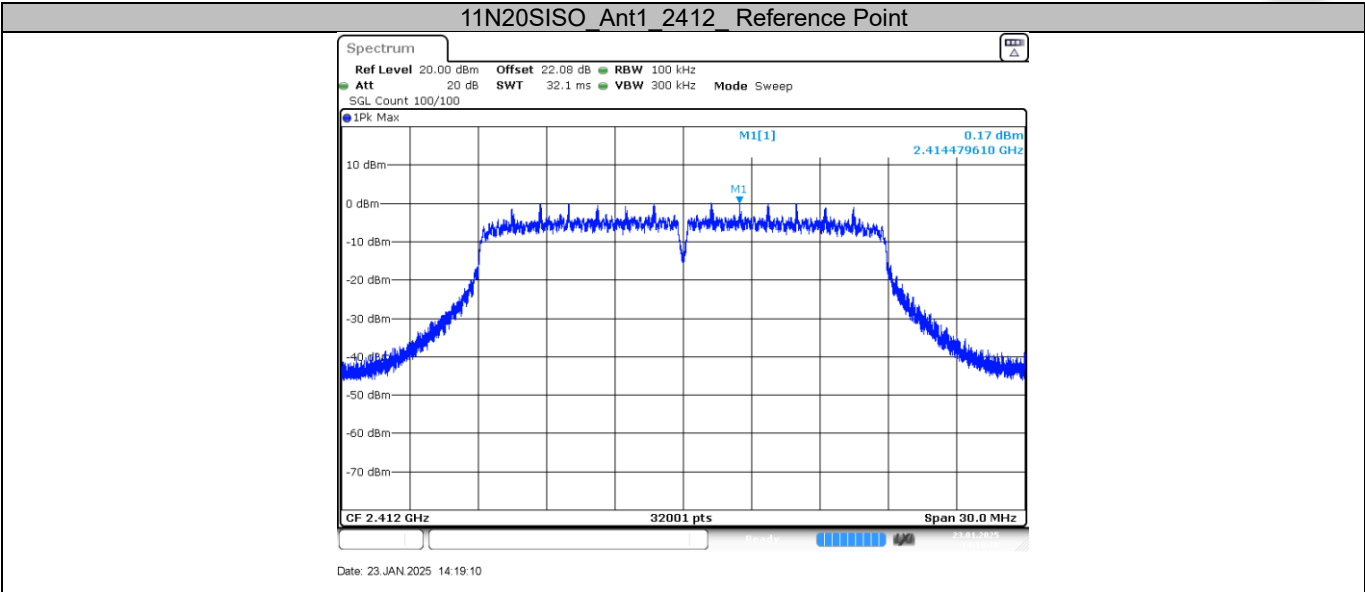
## 11G\_Ant1\_2437\_30MHz-1000MHz



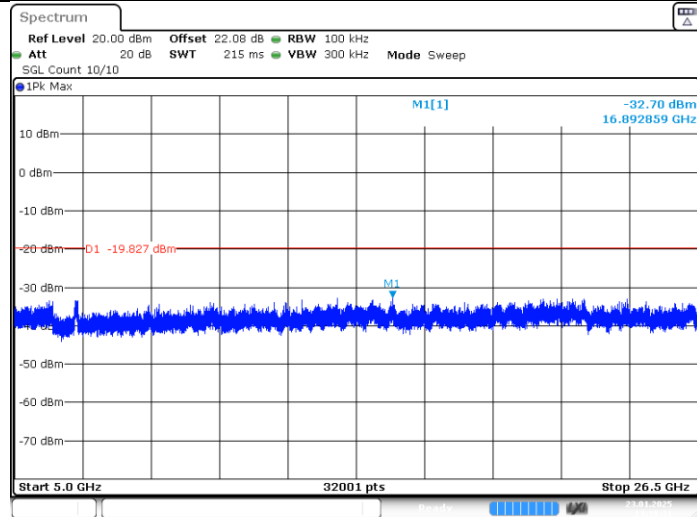
Date: 23. JAN. 2025 14:08:03





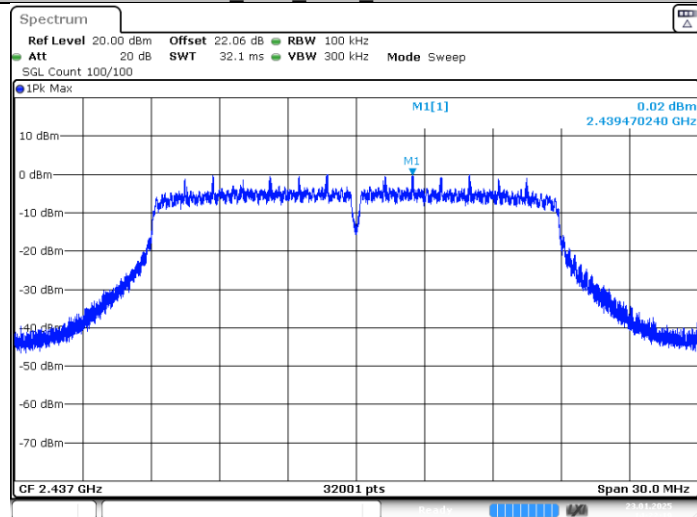


## 11N20\_Ant1\_2412\_5000MHz-26500MHz



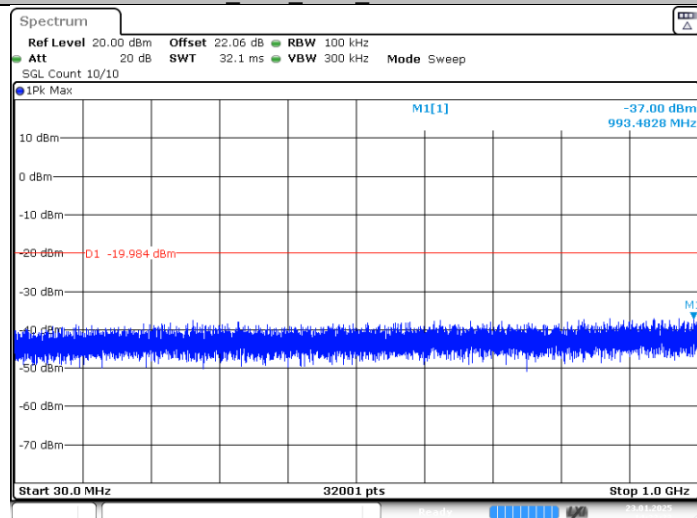
Date: 23. JAN. 2025 14:19:32

## 11N20\_Ant1\_2437\_Reference Point



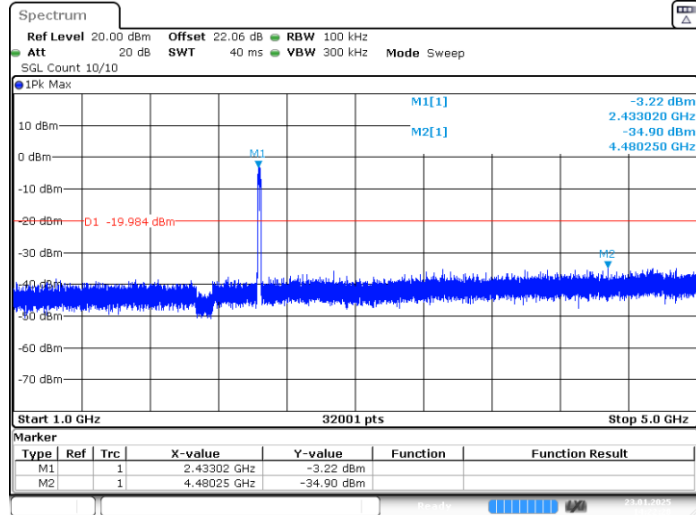
Date: 23. JAN. 2025 14:22:19

## 11N20\_Ant1\_2437\_30MHz-1000MHz



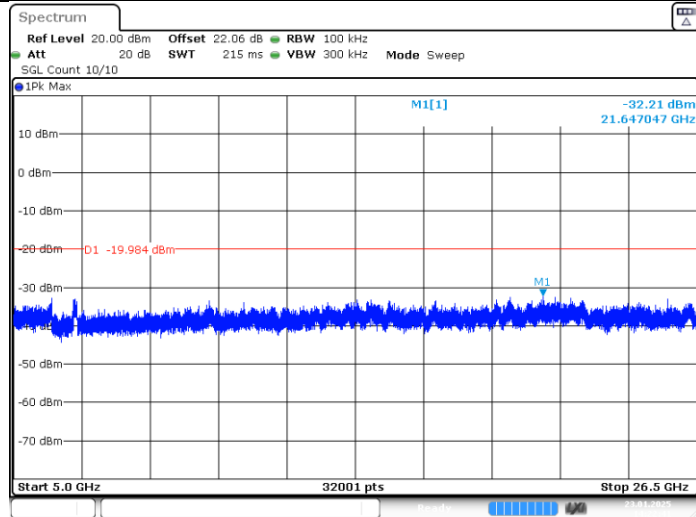
Date: 23. JAN. 2025 14:22:23

### 11N20\_Ant1\_2437\_1000MHz-5000MHz



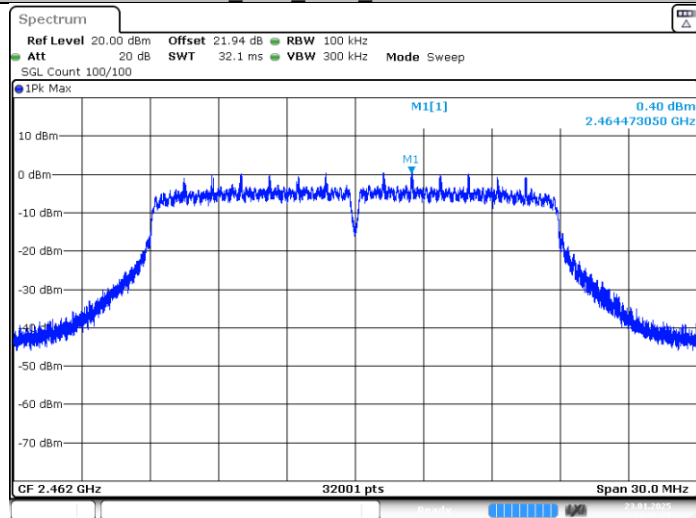
Date: 23 JAN 2025 14:22:28

### 11N20\_Ant1\_2437\_5000MHz-26500MHz



Date: 23 JAN 2025 14:22:41

### 11N20\_Ant1\_2462\_Reference Point



Date: 23 JAN 2025 14:26:29

