

## FCC/ISED - TEST REPORT

Report Number : **709502409836-00A** Date of Issue: December 26,2024

Model : TYAUX-F2

Product Type : Wi-Fi and Bluetooth Module

Applicant : Hangzhou Tuya Information Technology Co.,Ltd

Address : Room 301,Building 1,Huace Center,Xihu District,  
Hangzhou,Zhejiang, China

Manufacturer : Hangzhou Tuya Information Technology Co.,Ltd

Address : Room 301,Building 1,Huace Center,Xihu District,  
Hangzhou,Zhejiang, China

Test Result : **n Positive      o Negative**

Total pages including  
Appendices : 71



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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 |
|------------------|-----------------------|---------------|
| 709502409836-00A | First Issue           | 12/26/2024    |

## 3 Details about the Test Laboratory

### Test Site 1

Company name: TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch  
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Shanghai 201108,  
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Telephone: +86 21 6141 0123

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FCC Registration No.: 820234

FCC Designation Number: CN1183

ISED CAB identifier: CN0101

IC Registration No.: 31668

## 4 Description of the Equipment under Test

Product: Wi-Fi and Bluetooth Module

PMN / HVIN / Model no.: TYAUX-F2

FCC ID: 2ANDL-TYAUX-F2

IC: 23243-TYAUXF2

Rating: 3.0-3.6V DC

RF Transmission Frequency: Wi-Fi:2412-2462MHz  
Bluetooth LE:2402~2480MHz

No. of Operated Channel: 2.4GHz WIFI: 11 for 802.11b/g/n(HT20)  
2.4GHz BLE: 40

Modulation: Direct Sequence Spread Spectrum (DSSS) for 802.11b  
Orthogonal Frequency Division Multiplexing (OFDM) for 802.11g/n; 2.4GHz BLE: GFSK

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     |    |          |

| Bluetooth Low Energy |          |    |          |    |          |    |          |
|----------------------|----------|----|----------|----|----------|----|----------|
| Ch                   | Fre(MHz) | Ch | Fre(MHz) | Ch | Fre(MHz) | Ch | Fre(MHz) |
| 0                    | 2402     | 10 | 2422     | 20 | 2442     | 30 | 2462     |
| 1                    | 2404     | 11 | 2424     | 21 | 2444     | 31 | 2464     |
| 2                    | 2406     | 12 | 2426     | 22 | 2446     | 32 | 2466     |
| 3                    | 2408     | 13 | 2428     | 23 | 2448     | 33 | 2468     |
| 4                    | 2410     | 14 | 2430     | 24 | 2450     | 34 | 2470     |
| 5                    | 2412     | 15 | 2432     | 25 | 2452     | 35 | 2472     |
| 6                    | 2414     | 16 | 2434     | 26 | 2454     | 36 | 2474     |
| 7                    | 2416     | 17 | 2436     | 27 | 2456     | 37 | 2476     |
| 8                    | 2418     | 18 | 2438     | 28 | 2458     | 38 | 2478     |
| 9                    | 2420     | 19 | 2440     | 29 | 2460     | 39 | 2480     |



Hardware Version: V1.0.0

Software Version: V3.5.0

Antenna type: Onboard PCB antenna

Antenna Gain: 1.68dBi

Description of the EUT: The Equipment Under Test (EUT) is a Wi-Fi and Bluetooth module which support 2.4GHz Wi-Fi and BLE 4.2(support 1Mbps data rate). We tested it and listed the worst data in this report.

Test sample no.: SHA-866932-1 (RF radiated); SHA-866932-2 (RF conducted)

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<br>10-1-2023 Edition                                               | PART 15 - RADIO FREQUENCY DEVICES<br>Subpart C - Intentional Radiators                                                              |
| RSS-Gen Issue 5<br>April 2018 + Amendment 1 March<br>2019 + Amendment 2 February<br>2021 | General Requirements for Compliance of Radio Apparatus                                                                              |
| RSS-247<br>Issue 3 August 2023                                                           | Digital Transmission Systems (DTSS), Frequency Hopping<br>Systems (FHSS) and License-Exempt Local Area Network (LE-<br>LAN) Devices |

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



## 6 Summary of Test Results

| Technical Requirements                                  |                              |                                             |            |           |                                     |                          |                                     |
|---------------------------------------------------------|------------------------------|---------------------------------------------|------------|-----------|-------------------------------------|--------------------------|-------------------------------------|
| FCC Part 15 Subpart C & RSS-247 Issue 3/RSS-Gen Issue 5 |                              |                                             |            |           |                                     |                          |                                     |
| Test Condition                                          |                              |                                             | Pages      | Test Site | Test Result                         |                          |                                     |
|                                                         |                              |                                             |            |           | Pass                                | Fail                     | N/A                                 |
| §15.207                                                 | RSS-GEN 8.8                  | Conducted emission AC power port            | 13-17      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247 (b) (3)                                         | RSS-247 5.4(d)               | Conducted peak output power & e.i.r.p       | 18         | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(a)(1)                                           | RSS-247 5.1(a) & RSS-Gen 6.7 | 20dB bandwidth and 99% Occupied Bandwidth   | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)                                           | RSS-247 5.1(b)               | Carrier frequency separation                | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)(iii)                                      | RSS-247 5.1(d)               | Number of hopping frequencies               | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(1)(iii)                                      | RSS-247 5.1(d)               | Dwell Time - Average Time of Occupancy      | ---        | ---       | <input type="checkbox"/>            | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| §15.247(a)(2)                                           | RSS-247 5.2(a) & RSS-GEN 6.7 | 6dB bandwidth and 99% Occupied Bandwidth    | 19-25      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(e)                                              | RSS-247 5.2(b)               | Power spectral density                      | 26-29      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(e)                                              | RSS-247 5.5                  | Spurious RF conducted emissions             | 30-39      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(d)                                              | RSS-247 5.5                  | Band edge                                   | 40-46      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.247(d) & §15.209 & §15.205                          | RSS-247 5.5 & RSS-Gen 6.13   | Spurious radiated emissions for transmitter | 47-67      | Site 1    | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/>            |
| §15.203                                                 | RSS-Gen 6.8                  | 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 PCB antenna, which gain is 1.68dBi. In accordance to §15.203 and RSS-Gen 6.8, 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: 2ANDL-TYAUX-F2, IC: 23243-TYAUXF2 complies with Section 15.207,15.209,15.231,15.247 of the FCC Part 15, Subpart C Rules and RSS-247, RSS-GEN.

This report is only for the 2.4GHz Wi-Fi test report, for the 2.4GHz BLE test report please refer to 709502409836-00B.

### SUMMARY:

All tests according to the regulations cited on page 5 were

n - Performed

o - **Not** Performed

The Equipment under Test

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

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

Sample Received Date: November 22, 2024

Testing Start Date: November 25, 2024

Testing End Date: December 24, 2024

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

Reviewed by:

Prepared by:

Tested by:



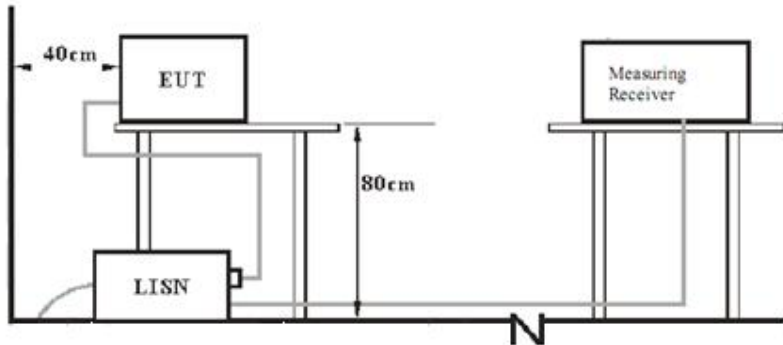
Hui TONG  
Review Engineer

Jiaxi XU  
Project Engineer

Chengjie GUO  
Test Engineer

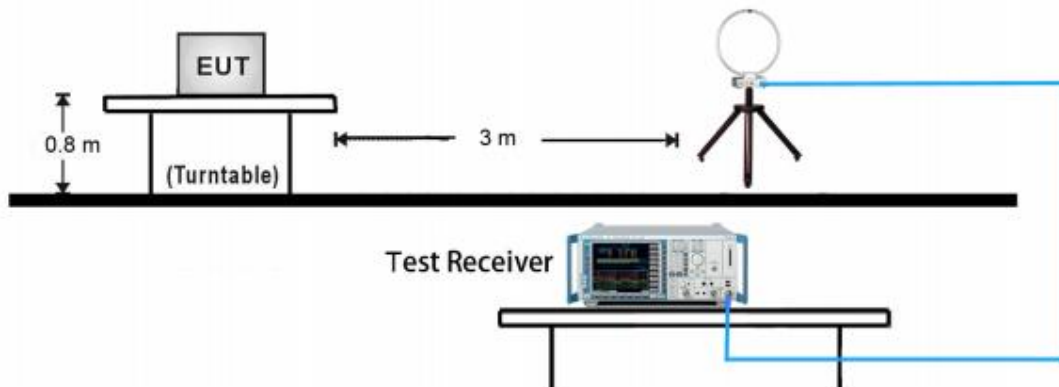
## 8 Test Setups

### 8.1 AC Power Line Conducted Emission test setups

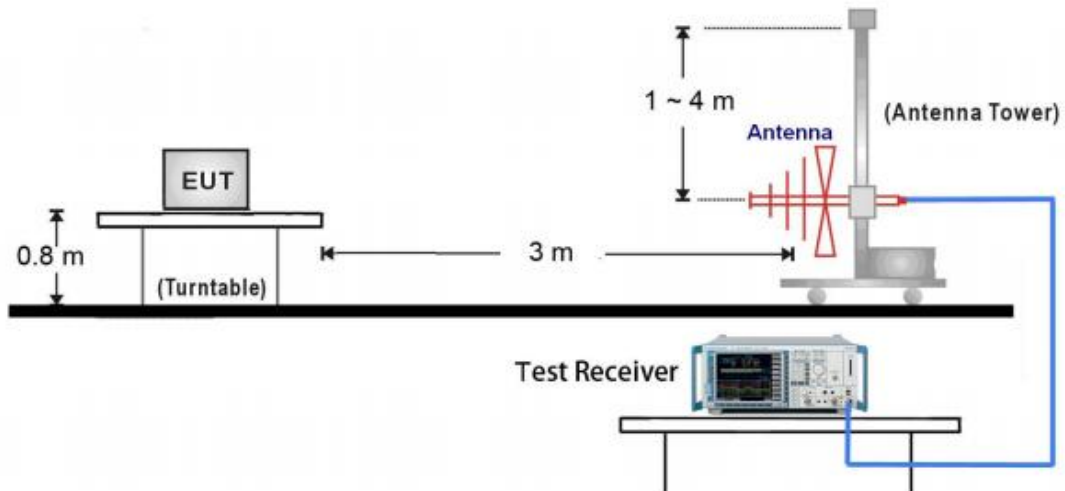


### 8.2 Radiated test setups

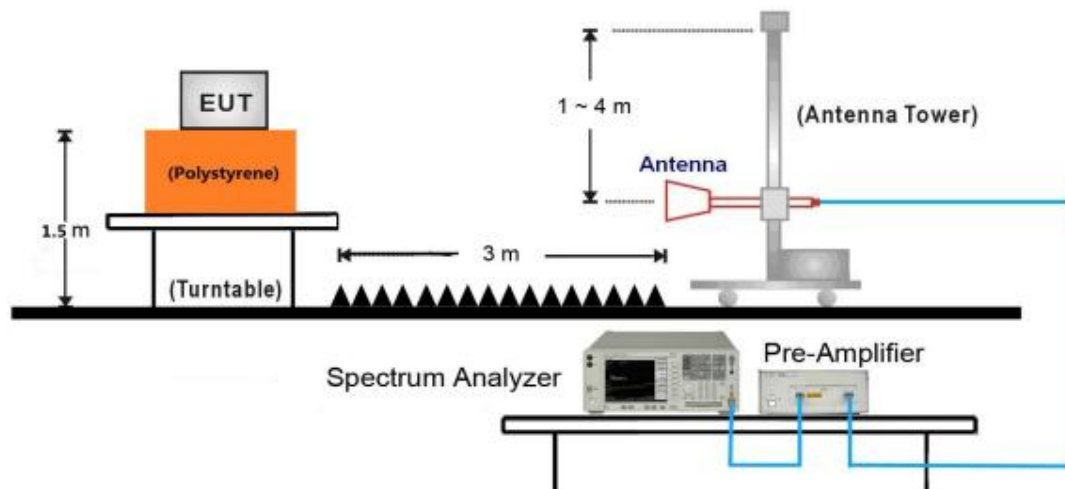
#### 9kHz ~ 30MHz Test Setup:



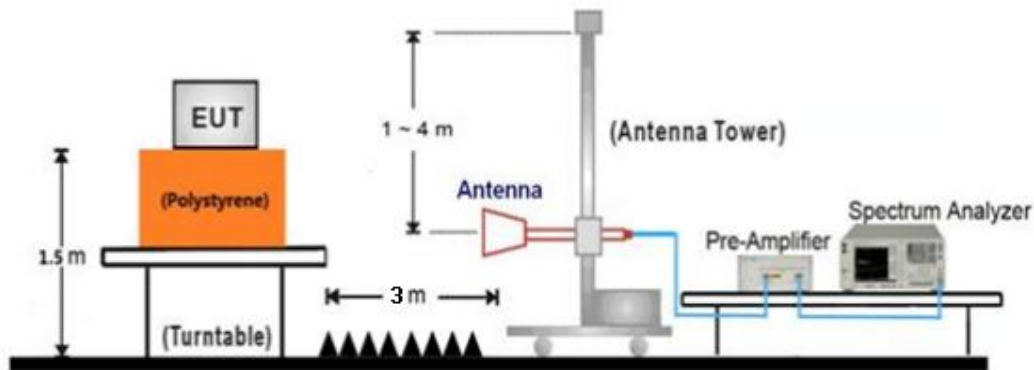
### 30MHz ~ 1GHz Test Setup:



### 1GHz ~ 18GHz Test Setup:

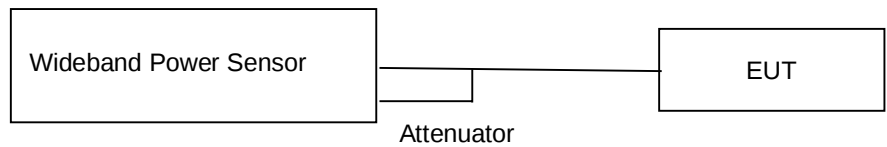


18GHz ~ 25GHz Test Setup:

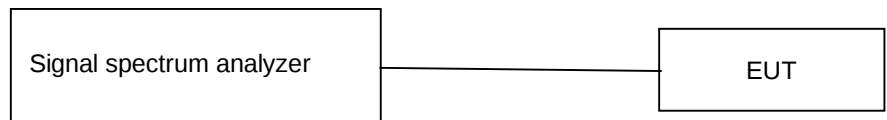


8.3 Conducted RF test setups

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    | Lenovo       | E470              | PF-OU5TS7 17/09 |

Test software: AmebaZ2\_mptool\_1V3

Test Mode Applicability and Tested Channel Detail:

| Mode         | Tested Channel | Data Rate (Mbps) | Modulation | Index Value (Power level setting) |
|--------------|----------------|------------------|------------|-----------------------------------|
| 802.11b      | 1              | 1                | CCK        | 86                                |
|              | 6              | 1                | CCK        | 84                                |
|              | 11             | 1                | CCK        | 83                                |
| 802.11g      | 1              | 6                | OFDM       | 88                                |
|              | 6              | 6                | OFDM       | 92                                |
|              | 11             | 6                | OFDM       | 82                                |
| 802.11n HT20 | 1              | MCS0             | OFDM       | 88                                |
|              | 6              | MCS0             | OFDM       | 94                                |
|              | 11             | MCS0             | OFDM       | 82                                |

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 & RSS-GEN 8.8, 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

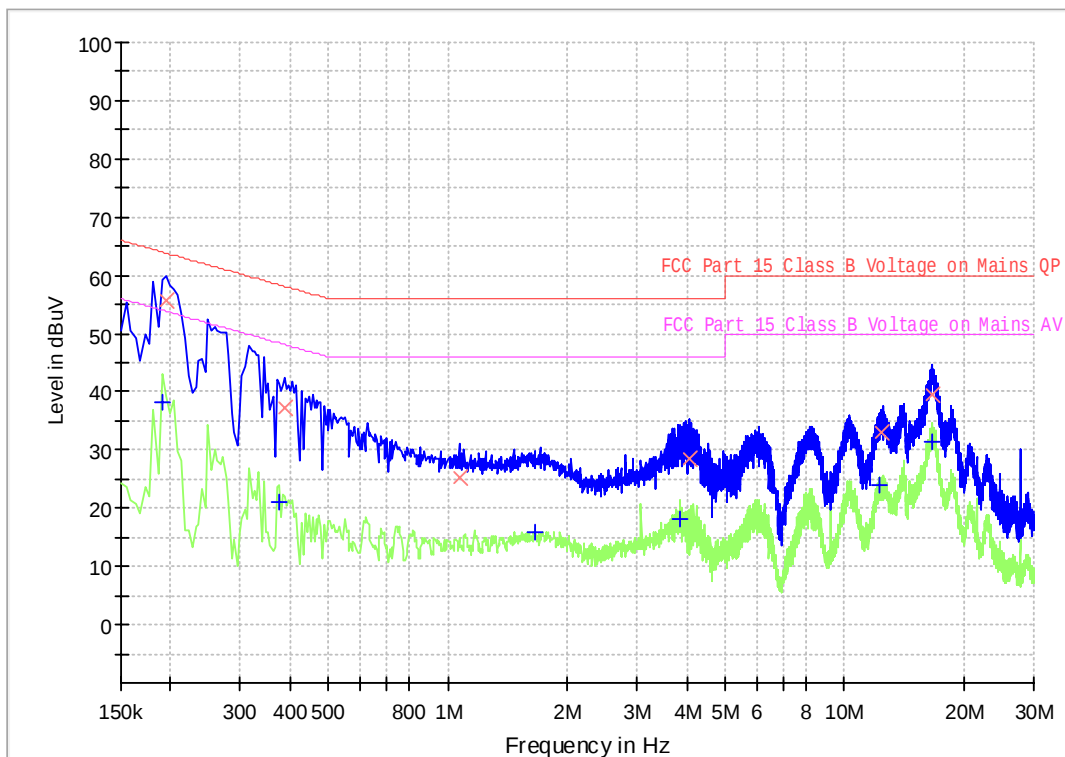
## EUT Information

EUT Name: Wi-Fi and Bluetooth Module  
 Model: TYAUX-F2  
 Client: Hangzhou Tuya Information Co., Ltd  
 Op Cond: Power on, TX\_2437MHz at N20 mode, AC 120V/60Hz  
 Operator: Chengjie Guo  
 Standard: FCC Part 15.207(a)  
 Comment: Phase L  
 Sample No.: SHA-866932-2

## Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup: Voltage with 2-Line-LISN  
 Receiver: [ESR 3]  
 Level Unit: dBuV

| Subrange         | Step Size | Detectors | IF BW  | Meas. Time | Preamp |
|------------------|-----------|-----------|--------|------------|--------|
| 9 kHz - 150 kHz  | 100 Hz    | PK+       | 200 Hz | 0.02 s     | 0 dB   |
| 150 kHz - 30 MHz | 4.5 kHz   | PK+; AVG  | 9 kHz  | 0.01 s     | 0 dB   |





## Final Result

| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.186000        | ---              | 40.82           | 54.21        | 13.39       | 1000.0          | 9.000           | L1   | 19.5       |
| 0.186000        | 50.81            | ---             | 64.21        | 13.40       | 1000.0          | 9.000           | L1   | 19.5       |
| 0.424500        | ---              | 28.96           | 47.36        | 18.40       | 1000.0          | 9.000           | L1   | 19.5       |
| 0.501000        | 42.84            | ---             | 56.00        | 13.16       | 1000.0          | 9.000           | L1   | 19.5       |
| 1.923000        | 37.41            | ---             | 56.00        | 18.59       | 1000.0          | 9.000           | L1   | 19.5       |
| 1.932000        | ---              | 25.58           | 46.00        | 20.42       | 1000.0          | 9.000           | L1   | 19.5       |
| 2.629500        | 35.80            | ---             | 56.00        | 20.20       | 1000.0          | 9.000           | L1   | 19.5       |
| 3.619500        | ---              | 24.91           | 46.00        | 21.09       | 1000.0          | 9.000           | L1   | 19.5       |
| 6.301500        | ---              | 26.78           | 50.00        | 23.22       | 1000.0          | 9.000           | L1   | 19.7       |
| 6.459000        | 33.30            | ---             | 60.00        | 26.70       | 1000.0          | 9.000           | L1   | 19.7       |
| 21.525000       | ---              | 24.49           | 50.00        | 25.51       | 1000.0          | 9.000           | L1   | 20.7       |
| 21.619500       | 31.84            | ---             | 60.00        | 28.16       | 1000.0          | 9.000           | L1   | 20.7       |

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

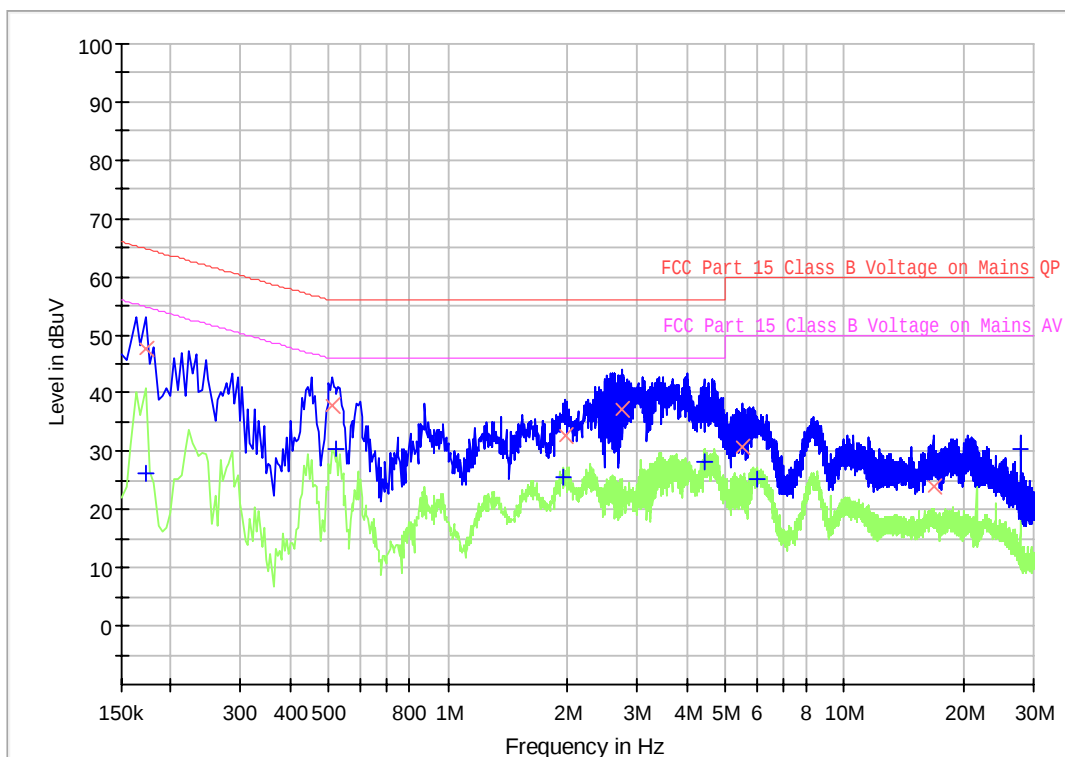
## EUT Information

EUT Name: Wi-Fi and Bluetooth Module  
 Model: TYAUX-F2  
 Client: Hangzhou Tuya Information Co., Ltd  
 Op Cond: Power on, TX\_2437MHz at N20 mode, AC 120V/60Hz  
 Operator: Chengjie Guo  
 Standard: FCC Part 15.207(a)  
 Comment: Phase N  
 Sample No.: SHA-866932-2

## Scan Setup: Voltage with 2-Line-LISN pre [EMI conducted]

Hardware Setup: Voltage with 2-Line-LISN  
 Receiver: [ESR 3]  
 Level Unit: dBuV

| Subrange         | Step Size | Detectors | IF BW  | Meas. Time | Preamp |
|------------------|-----------|-----------|--------|------------|--------|
| 9 kHz - 150 kHz  | 100 Hz    | PK+       | 200 Hz | 0.02 s     | 0 dB   |
| 150 kHz - 30 MHz | 4.5 kHz   | PK+; AVG  | 9 kHz  | 0.01 s     | 0 dB   |





## Final Result

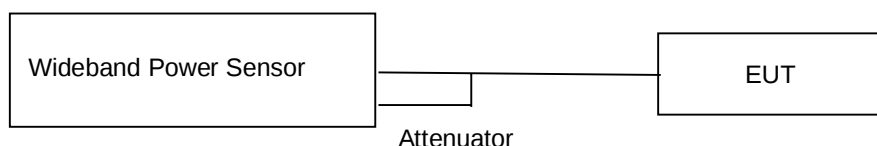
| Frequency (MHz) | QuasiPeak (dBuV) | CAverage (dBuV) | Limit (dBuV) | Margin (dB) | Meas. Time (ms) | Bandwidth (kHz) | Line | Corr. (dB) |
|-----------------|------------------|-----------------|--------------|-------------|-----------------|-----------------|------|------------|
| 0.172500        | ---              | 26.17           | 54.84        | 28.67       | 1000.0          | 9.000           | N    | 19.5       |
| 0.172500        | 47.44            | ---             | 64.84        | 17.40       | 1000.0          | 9.000           | N    | 19.5       |
| 0.510000        | 37.77            | ---             | 56.00        | 18.23       | 1000.0          | 9.000           | N    | 19.5       |
| 0.523500        | ---              | 30.43           | 46.00        | 15.57       | 1000.0          | 9.000           | N    | 19.5       |
| 1.963500        | ---              | 25.54           | 46.00        | 20.46       | 1000.0          | 9.000           | N    | 19.5       |
| 1.981500        | 32.84            | ---             | 56.00        | 23.16       | 1000.0          | 9.000           | N    | 19.5       |
| 2.751000        | 37.33            | ---             | 56.00        | 18.67       | 1000.0          | 9.000           | N    | 19.5       |
| 4.443000        | ---              | 28.32           | 46.00        | 17.68       | 1000.0          | 9.000           | N    | 19.6       |
| 5.500500        | 30.81            | ---             | 60.00        | 29.19       | 1000.0          | 9.000           | N    | 19.6       |
| 5.995500        | ---              | 25.39           | 50.00        | 24.61       | 1000.0          | 9.000           | N    | 19.6       |
| 16.849500       | 23.91            | ---             | 60.00        | 36.09       | 1000.0          | 9.000           | N    | 20.0       |
| 27.649500       | ---              | 30.47           | 50.00        | 19.53       | 1000.0          | 9.000           | N    | 20.8       |

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 and e.i.r.p.

### 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.



**Wideband Power Sensor conducted test setup**

### Limits

According to §15.247 (b) (3) & RSS-247 5.4(d) conducted peak output power limit as below:

|                                    | Frequency Range | Limit | Limit |
|------------------------------------|-----------------|-------|-------|
|                                    | MHz             | W     | dBm   |
| <b>Conducted peak output power</b> | 2400-2483.5     | ≤1    | ≤30   |
| <b>e.i.r.p.</b>                    | 2400-2483.5     | ≤4    | ≤36   |

Test result as below

| 802.11B: Antenna gain=1.68dBi |                                                     |        |                                 |        |
|-------------------------------|-----------------------------------------------------|--------|---------------------------------|--------|
| Frequency MHz                 | Conducted Peak Output Power(dBm)<br>§15.247 (b) (3) | Result | e.i.r.p.(dBm)<br>RSS-247 5.4(d) | Result |
| 2412MHz                       | 20.15                                               | Pass   | 21.83                           | Pass   |
| 2437MHz                       | 19.74                                               | Pass   | 21.42                           | Pass   |
| 2462MHz                       | 19.57                                               | Pass   | 21.25                           | Pass   |

| 802.11G: Antenna gain=1.68dBi |                                                     |        |                                 |        |
|-------------------------------|-----------------------------------------------------|--------|---------------------------------|--------|
| Frequency MHz                 | Conducted Peak Output Power(dBm)<br>§15.247 (b) (3) | Result | e.i.r.p.(dBm)<br>RSS-247 5.4(d) | Result |
| 2412MHz                       | 22.69                                               | Pass   | 24.37                           | Pass   |
| 2437MHz                       | 22.77                                               | Pass   | 24.45                           | Pass   |
| 2462MHz                       | 21.21                                               | Pass   | 22.89                           | Pass   |

| 802.11N20: Antenna gain=1.68dBi |                                                     |        |                                 |        |
|---------------------------------|-----------------------------------------------------|--------|---------------------------------|--------|
| Frequency MHz                   | Conducted Peak Output Power(dBm)<br>§15.247 (b) (3) | Result | e.i.r.p.(dBm)<br>RSS-247 5.4(d) | Result |
| 2412MHz                         | 21.31                                               | Pass   | 22.99                           | Pass   |
| 2437MHz                         | 22.64                                               | Pass   | 24.32                           | Pass   |
| 2462MHz                         | 20.47                                               | Pass   | 22.15                           | Pass   |

### 10.36dB 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. Connect EUT test port to spectrum analyzer.  
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

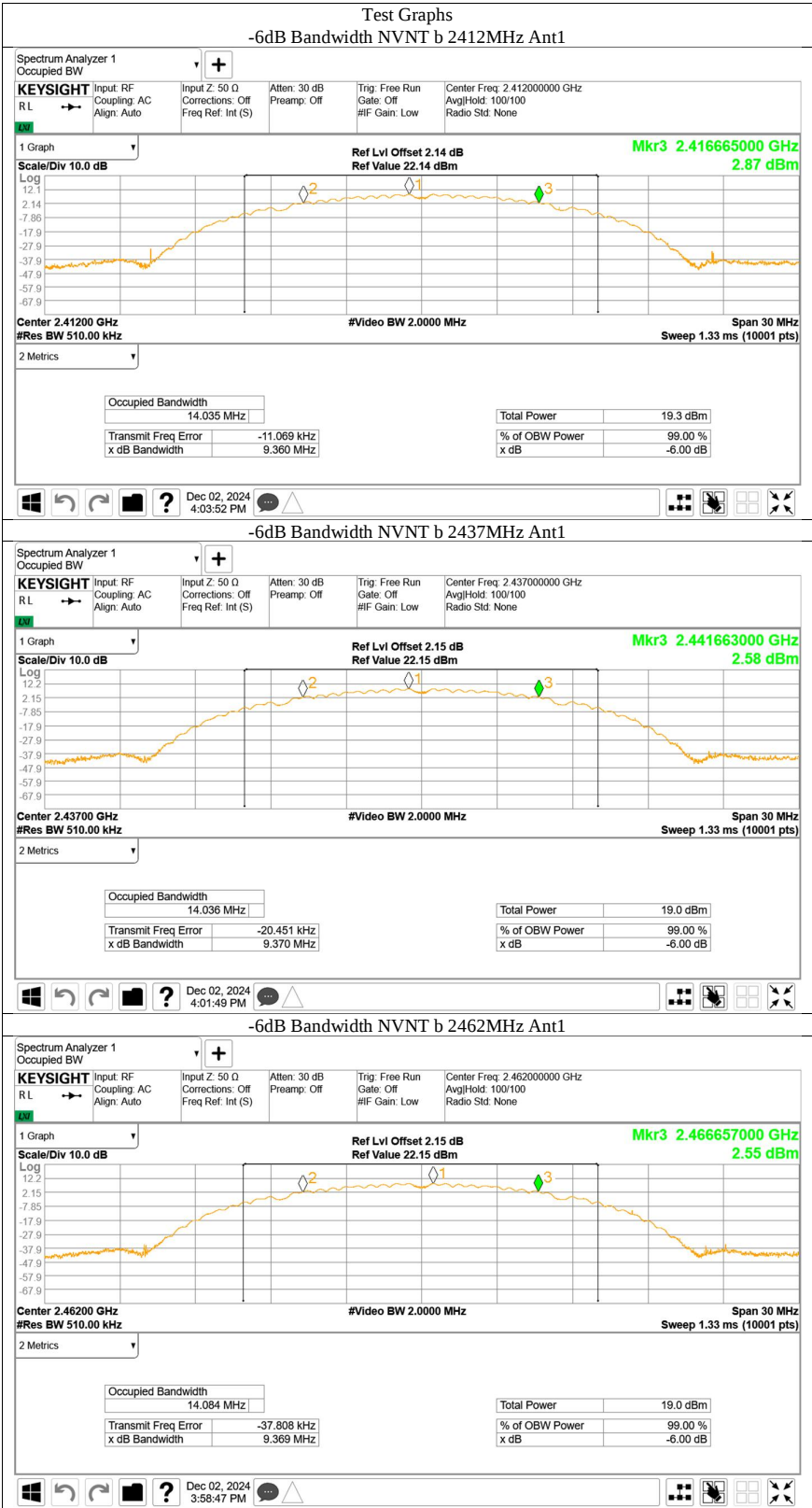
| 6dB bandwidth Limit [kHz] | 99% bandwidth Limit [kHz] |
|---------------------------|---------------------------|
| $\geq 500$                | --                        |

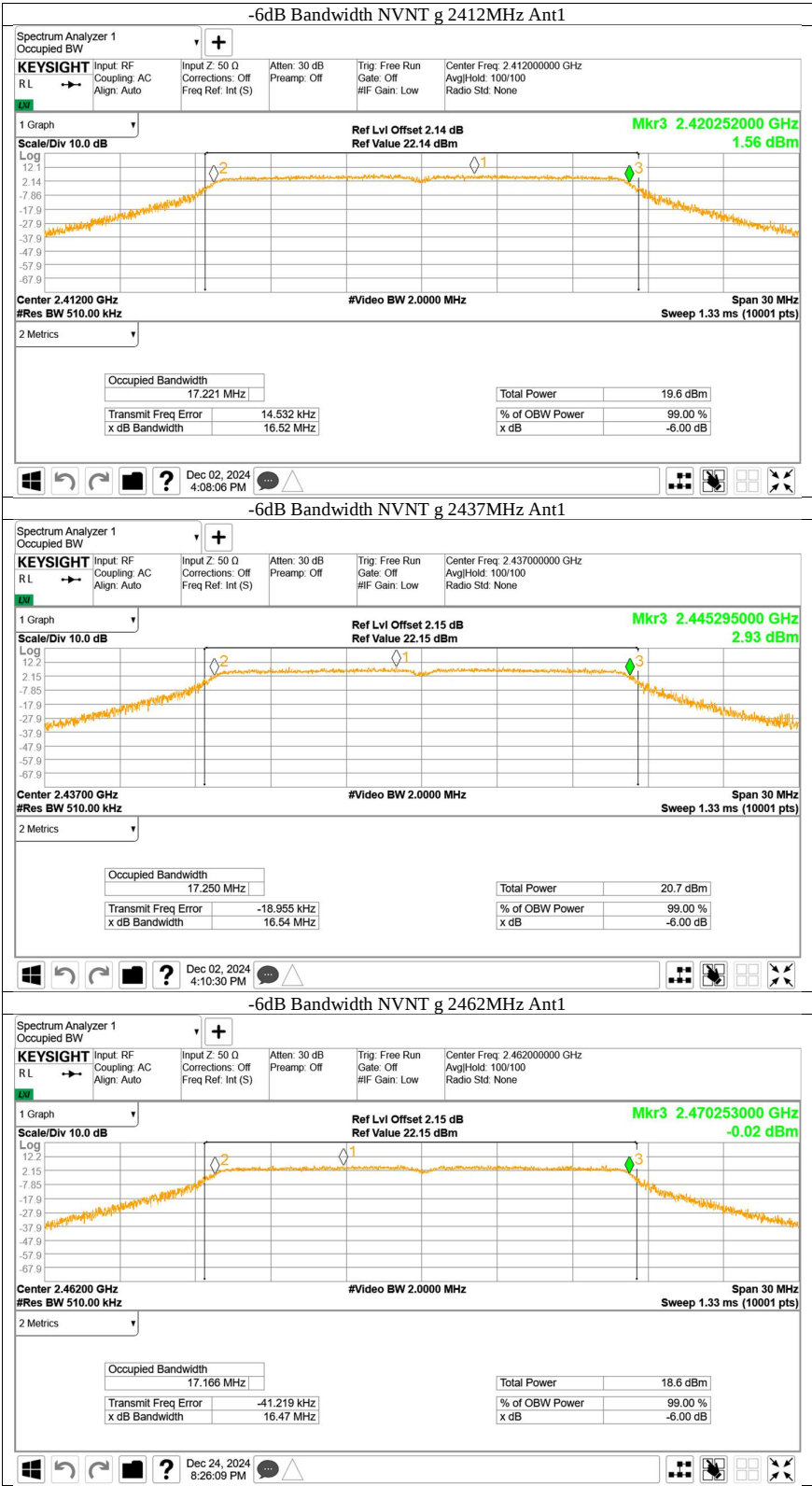
#### Test result

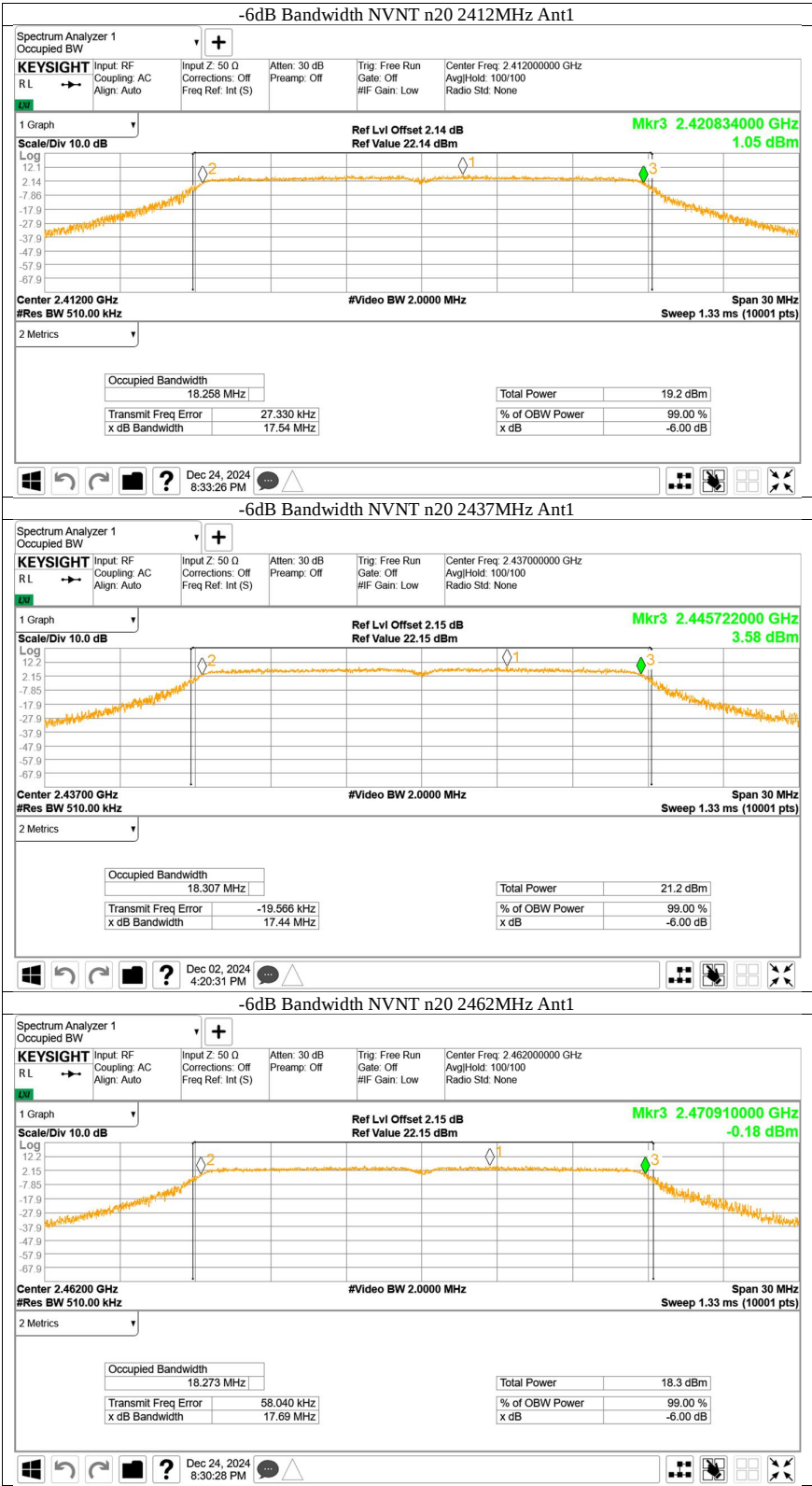
| Test Mode     | Frequency MHz | 6dB bandwidth (MHz) |            | Result  | 99% occupied bandwidth MHz |
|---------------|---------------|---------------------|------------|---------|----------------------------|
|               |               | result              | limit      | verdict |                            |
| 802.11b       | 2412          | 9.36                | $\geq 0.5$ | Pass    | 14.054                     |
|               | 2437          | 9.37                | $\geq 0.5$ | Pass    | 14.043                     |
|               | 2462          | 9.369               | $\geq 0.5$ | Pass    | 14.086                     |
| 802.11g       | 2412          | 16.522              | $\geq 0.5$ | Pass    | 16.600                     |
|               | 2437          | 16.542              | $\geq 0.5$ | Pass    | 16.599                     |
|               | 2462          | 16.469              | $\geq 0.5$ | Pass    | 16.603                     |
| 802.11n(HT20) | 2412          | 17.543              | $\geq 0.5$ | Pass    | 17.753                     |
|               | 2437          | 17.44               | $\geq 0.5$ | Pass    | 17.775                     |
|               | 2462          | 17.687              | $\geq 0.5$ | Pass    | 17.755                     |



6 dB Bandwidth







Spectrum Analyzer 1  
Occupied BW

KEYSIGHT  
Input: RF  
Coupling: AC  
Align: Auto  
R.L. →

Input Z: 50 Ω  
Corrections: Off  
Freq Ref: Int (S)

Atten: 30 dB  
Preamp: Off

Trig: Free Run  
Gate: Off  
#IF Gain: Low

Center Freq: 2.43700000 GHz  
Avg/Hold: 100/100  
Radio Std: None

Spectrum Analyzer 1  
Occupied BW

KEYSIGHT  
Input: RF  
Coupling: AC  
Align: Auto  
R.L. →

Input Z: 50 Ω  
Corrections: Off  
Freq Ref: Int (S)

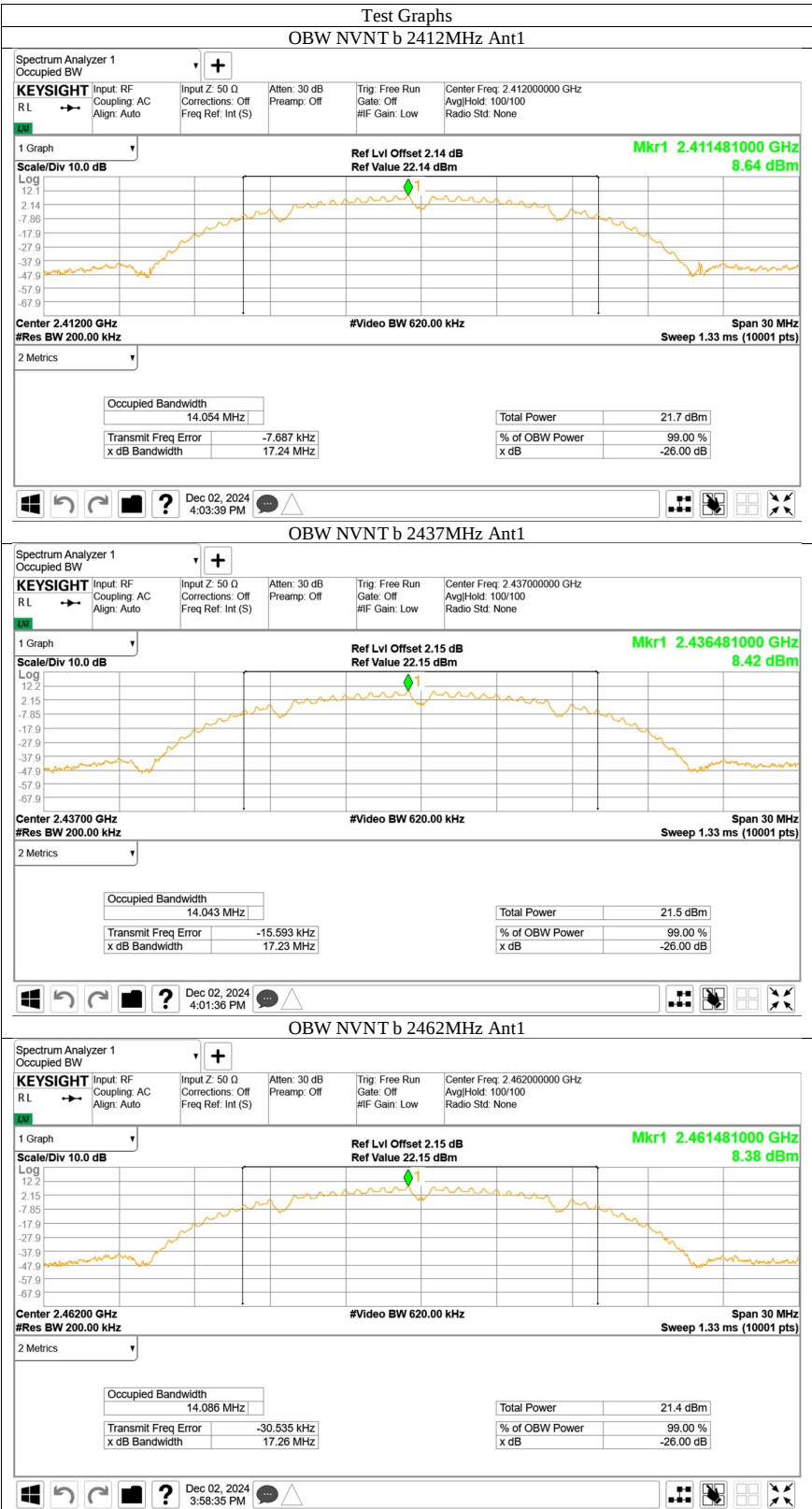
Atten: 30 dB  
Preamp: Off

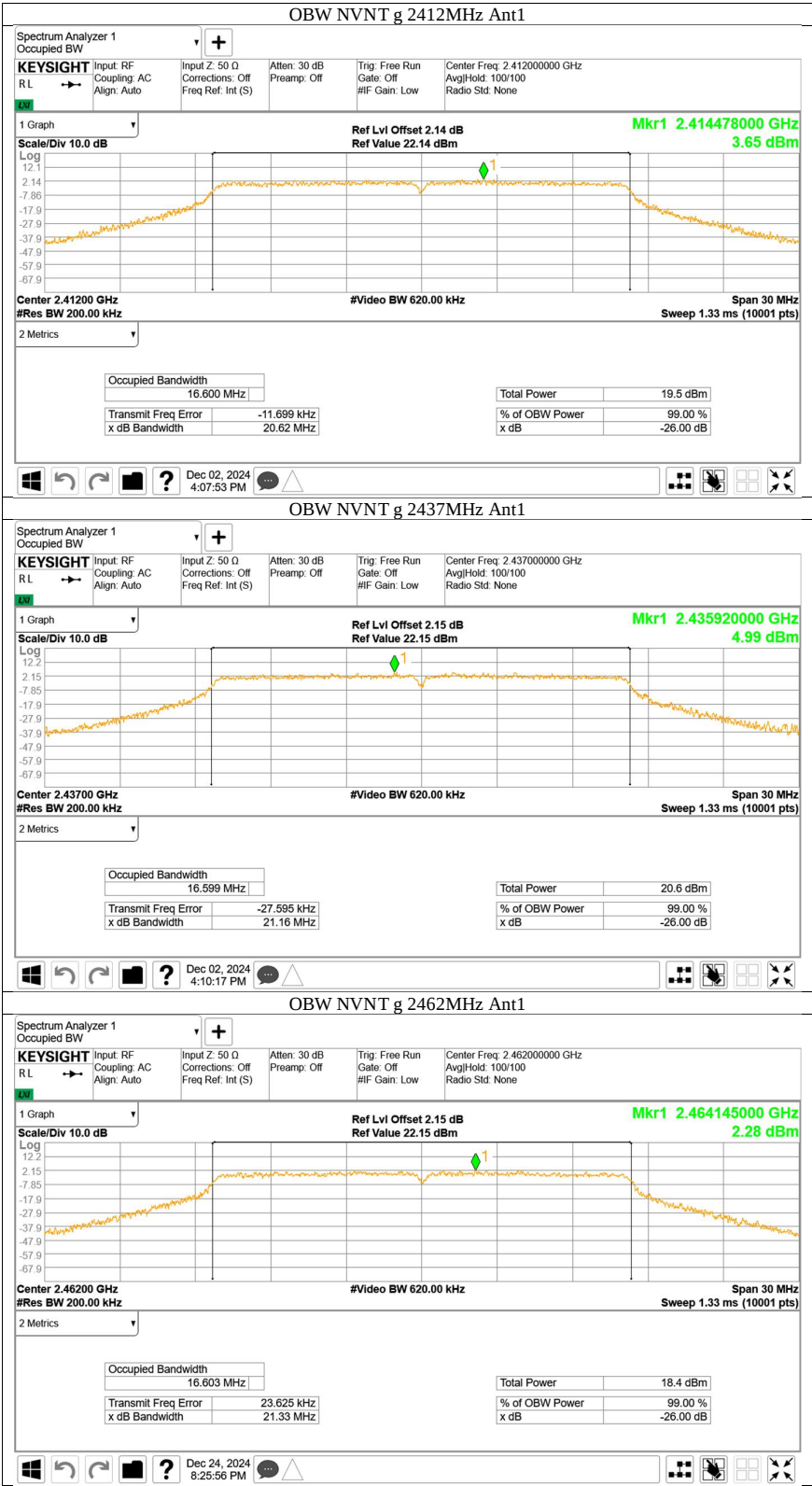
Trig: Free Run  
Gate: Off  
#IF Gain: Low

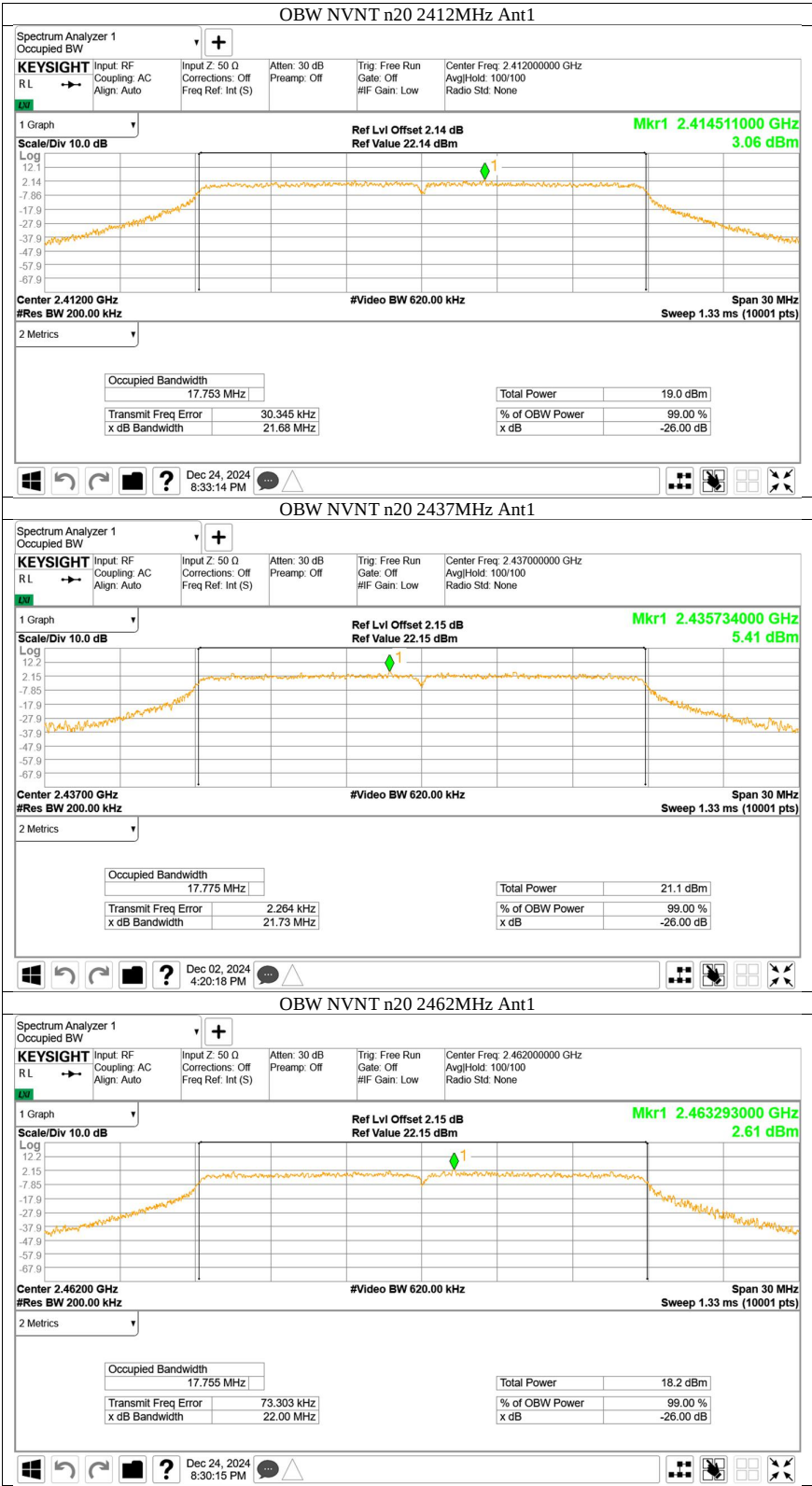
Center Freq: 2.46200000 GHz  
Avg/Hold: 100/100  
Radio Std: None



99% Occupied 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

#### 802.11 b

| Frequency<br>MHz       | Power spectral<br>density<br>dBm/3kHz | Result |
|------------------------|---------------------------------------|--------|
| Low channel 2412MHz    | -5.34                                 | Pass   |
| Middle channel 2437MHz | -5.82                                 | Pass   |
| High channel 2462MHz   | -6.37                                 | Pass   |

#### 802.11 g

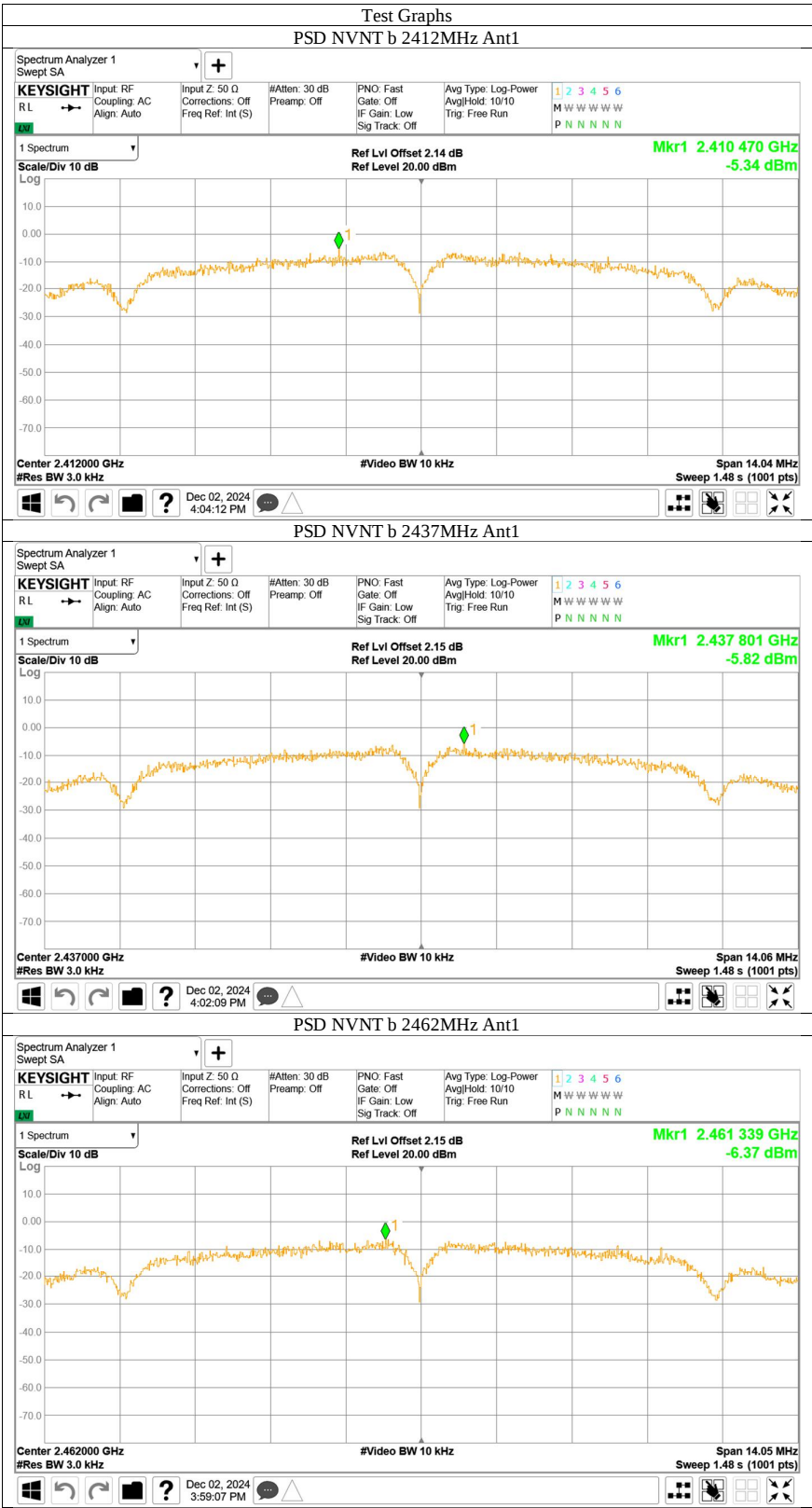
| Frequency<br>MHz       | Power spectral<br>density<br>dBm/3kHz | Result |
|------------------------|---------------------------------------|--------|
| Low channel 2412MHz    | -11.59                                | Pass   |
| Middle channel 2437MHz | -10.12                                | Pass   |
| High channel 2462MHz   | -12.24                                | Pass   |

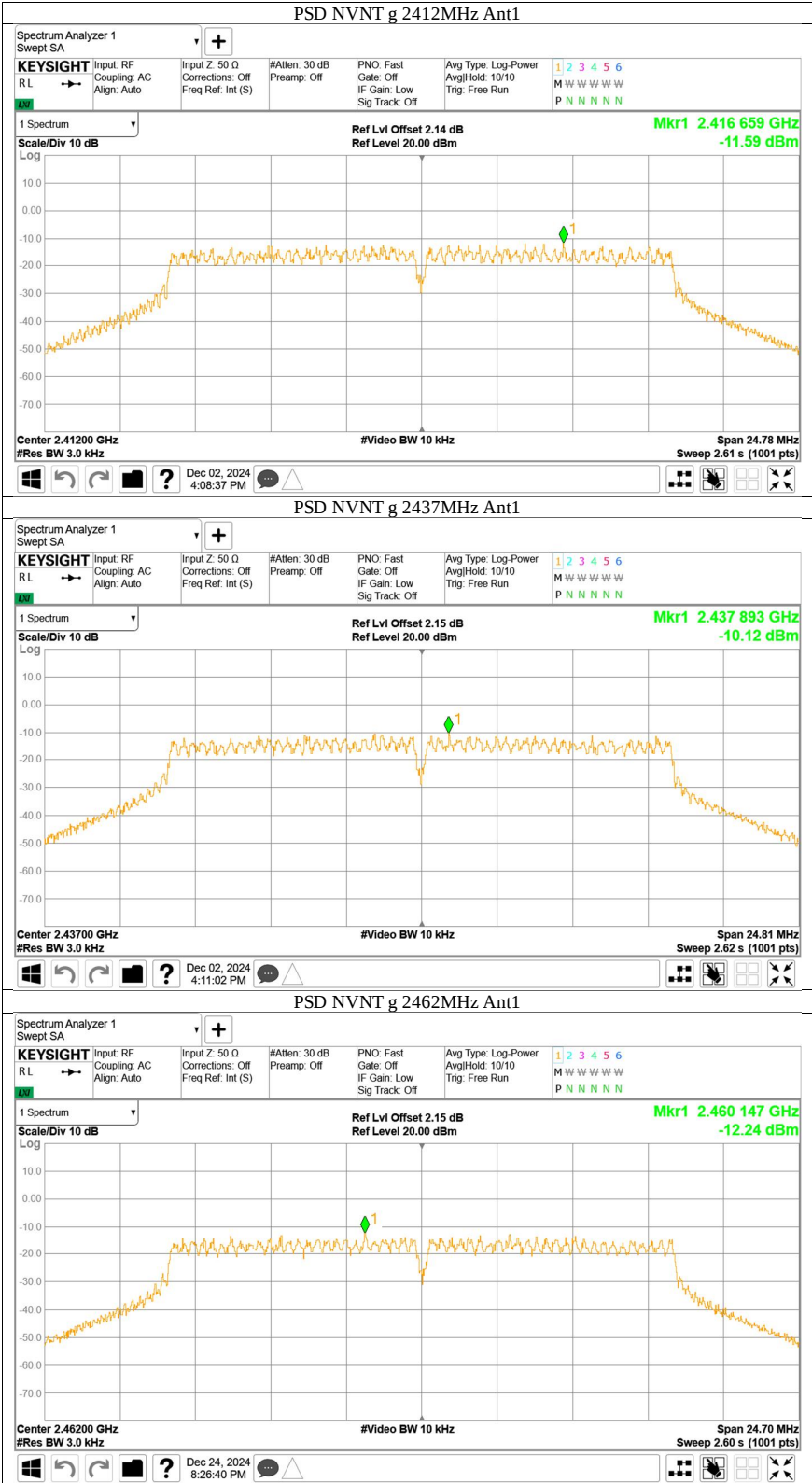
#### 802.11 n (HT20)

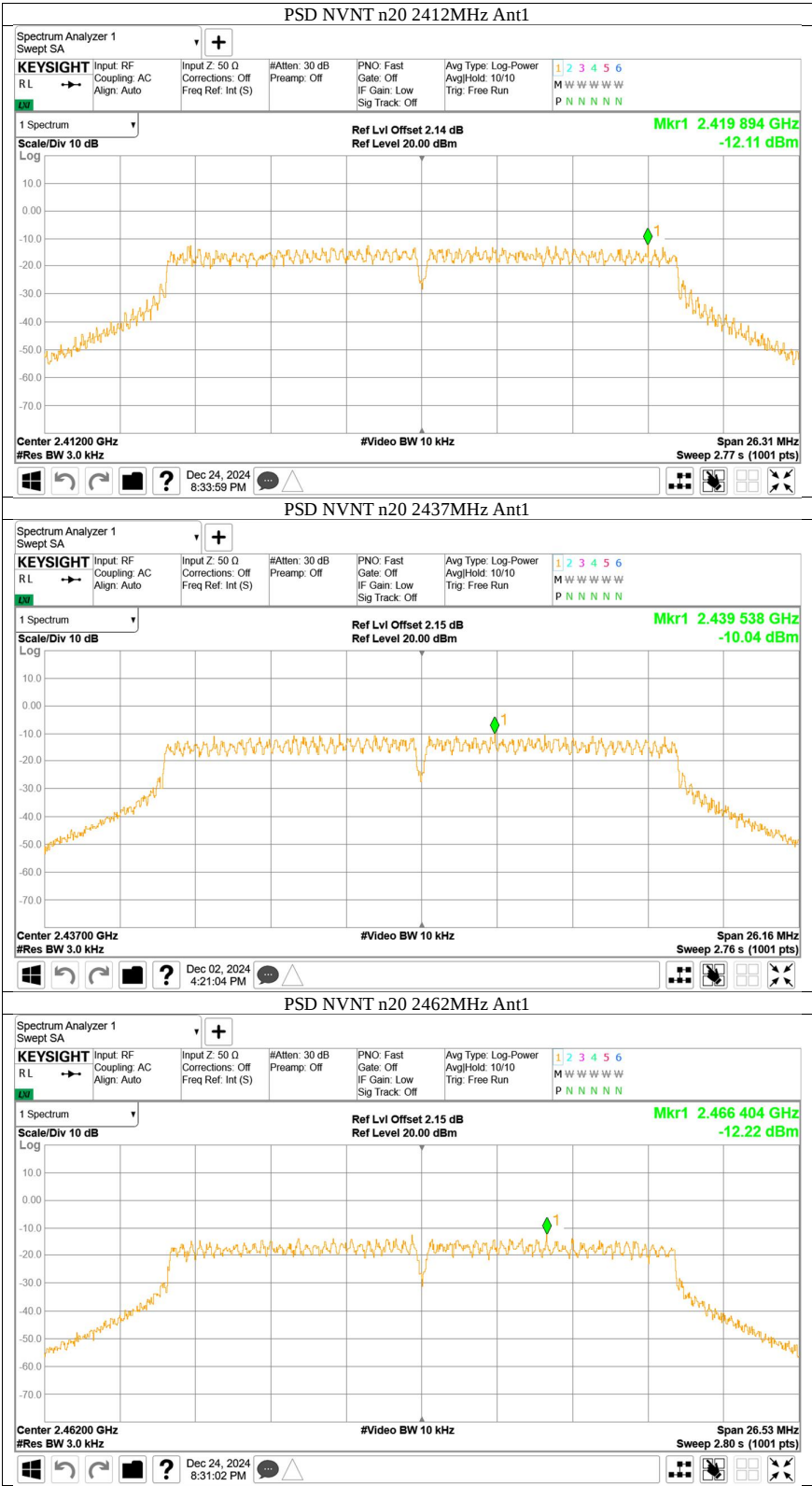
| Frequency<br>MHz       | Power spectral<br>density<br>dBm/3kHz | Result |
|------------------------|---------------------------------------|--------|
| Low channel 2412MHz    | -12.11                                | Pass   |
| Middle channel 2437MHz | -10.04                                | Pass   |
| High channel 2462MHz   | -12.22                                | Pass   |



Power spectral density







## 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 $\geq$ 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

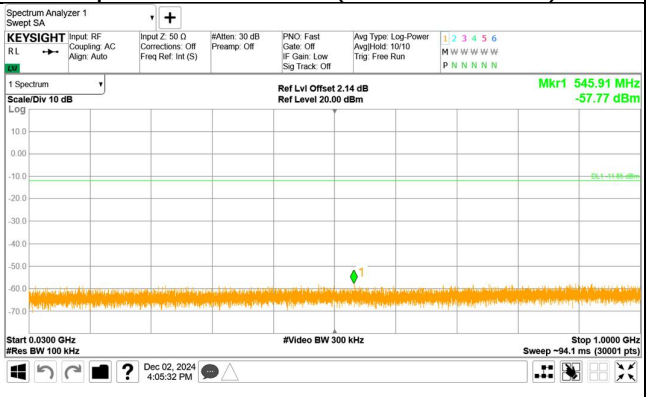
802.11 B

Out-of-Band Emissions

Channel 1 (2412MHz)

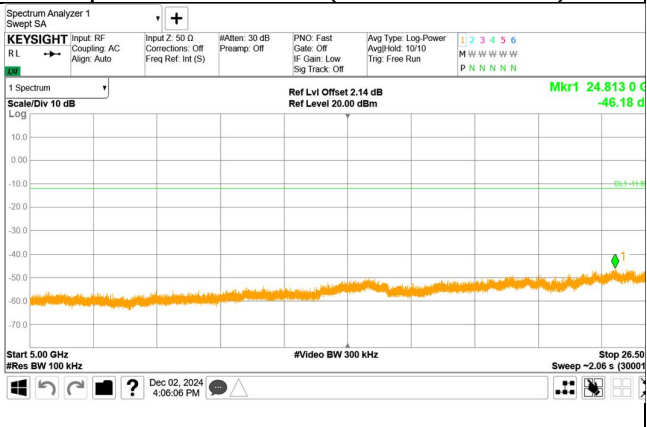
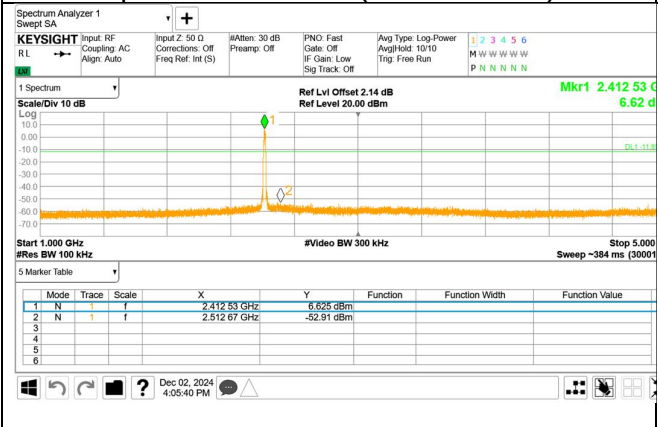
Reference point

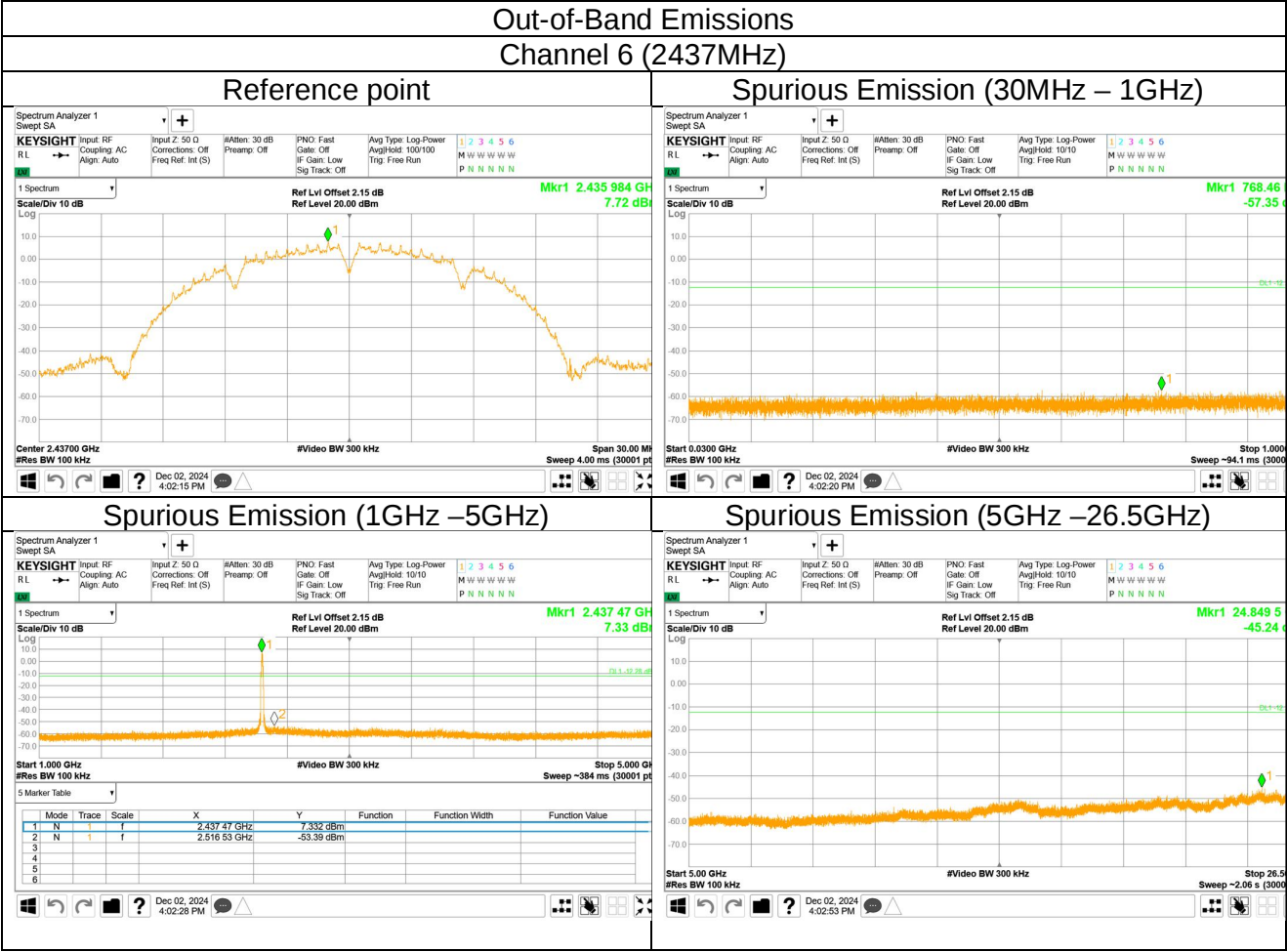
Spurious Emission (30MHz – 1GHz)

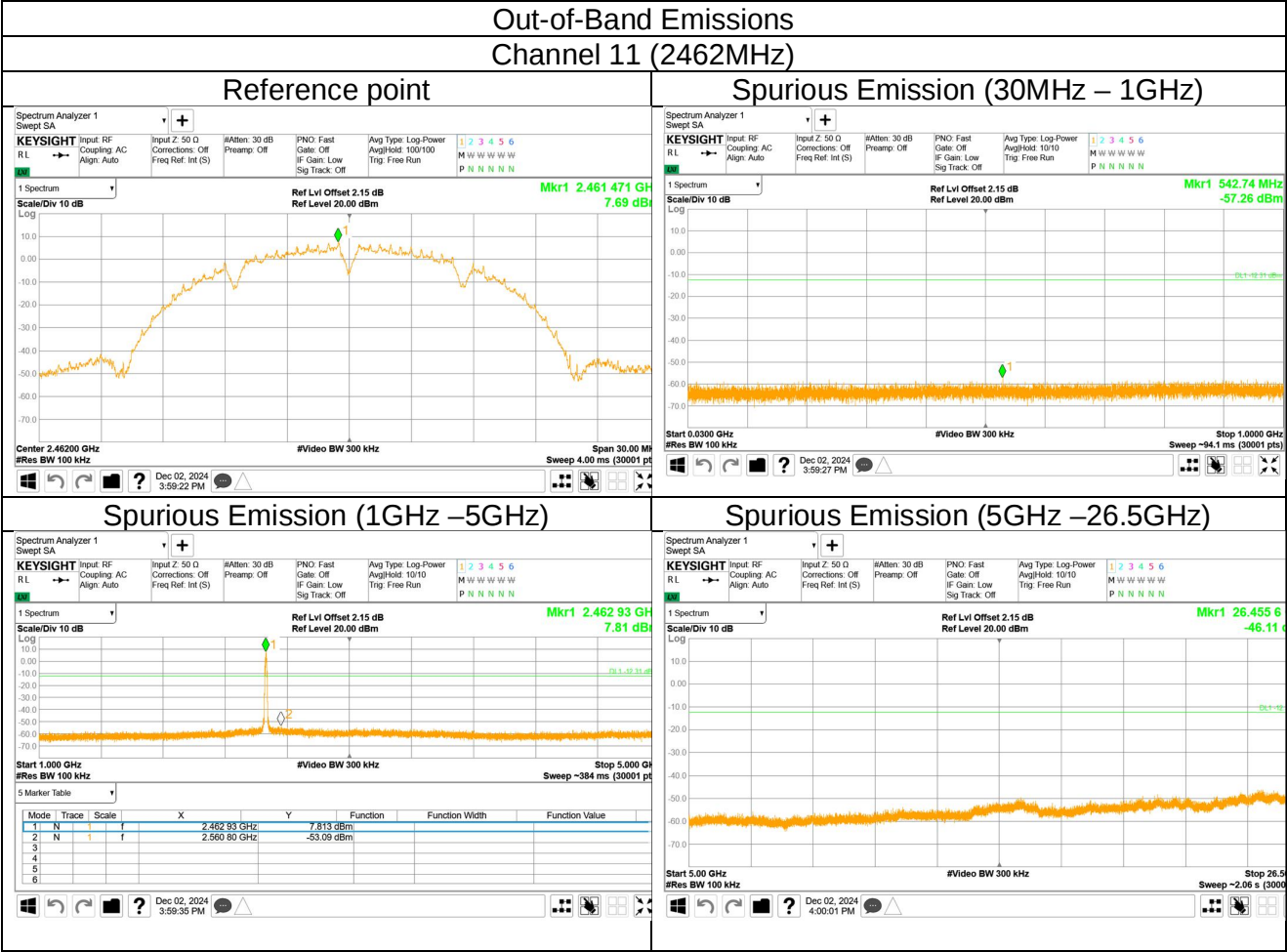


Spurious Emission (1GHz – 5GHz)

Spurious Emission (5GHz – 26.5GHz)



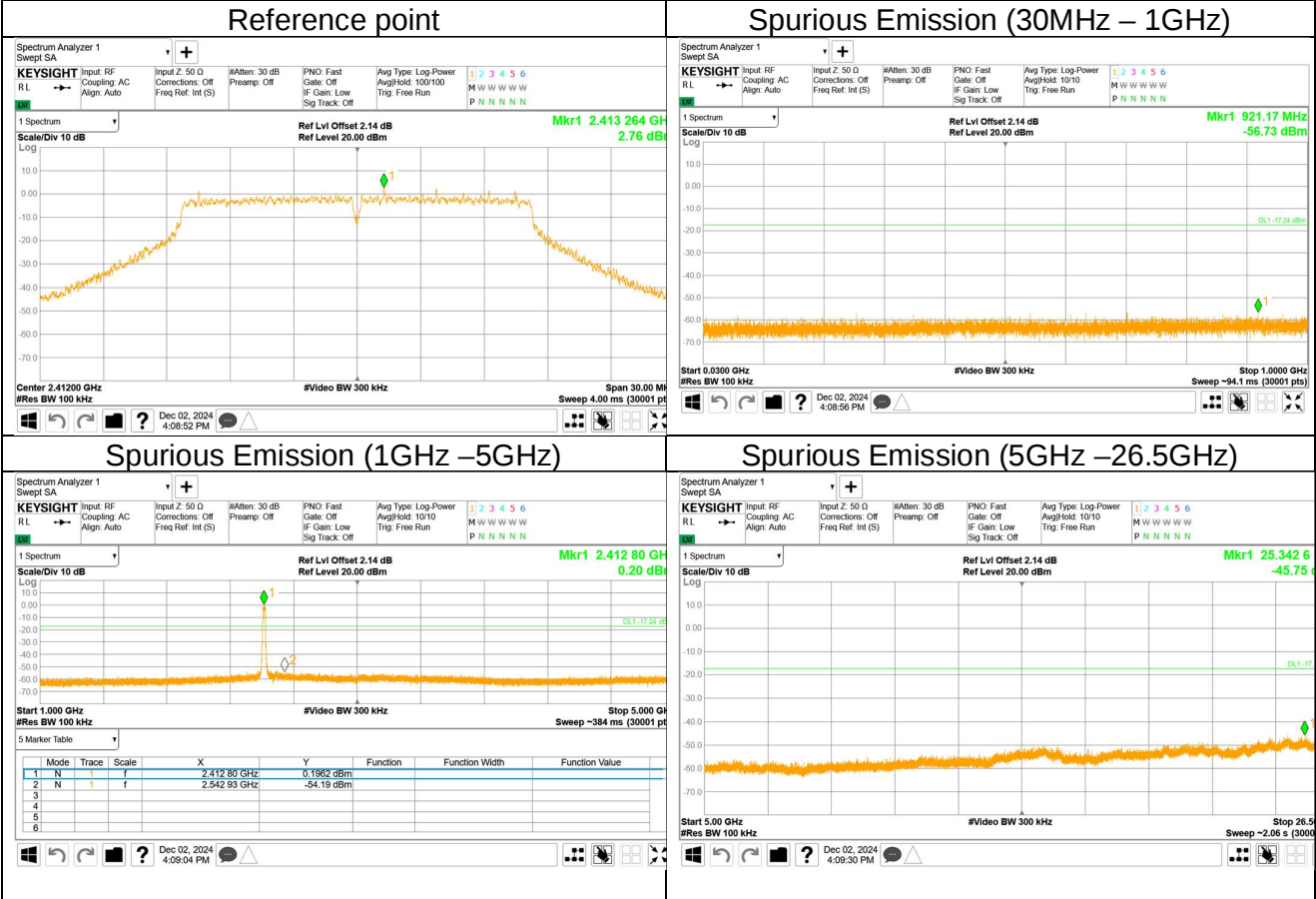


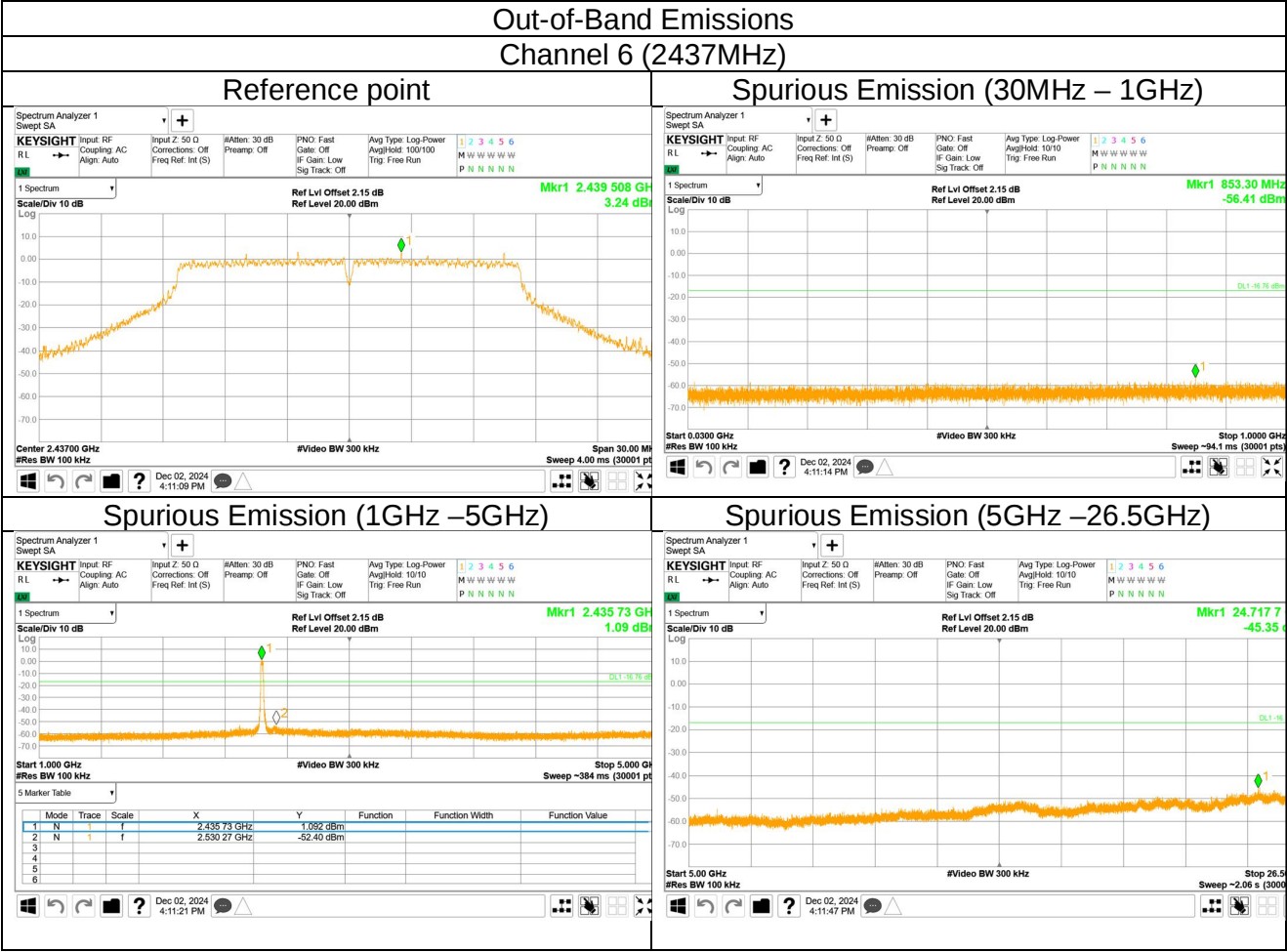


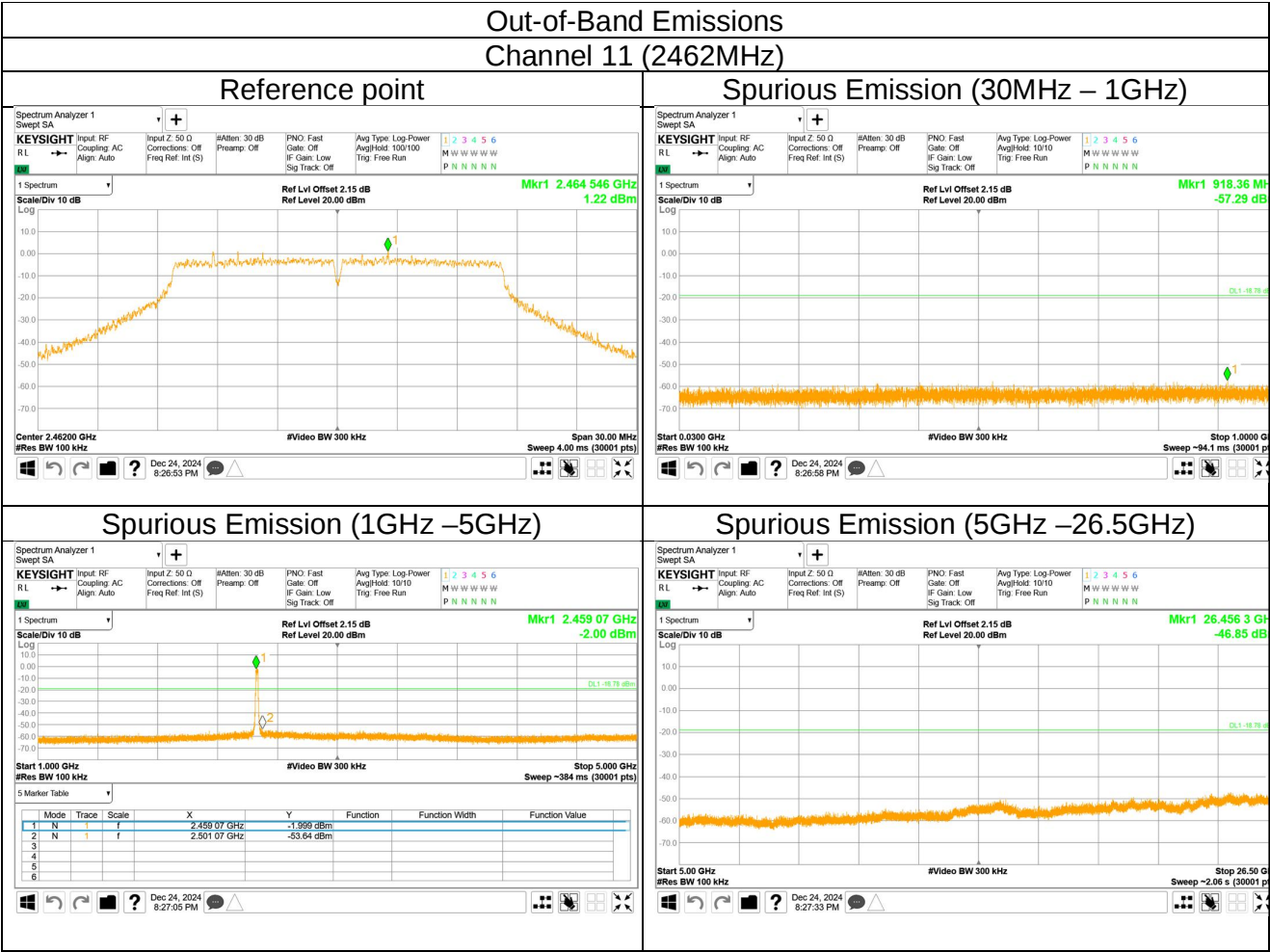


802.11 G

Out-of-Band Emissions  
Channel 1 (2412MHz)

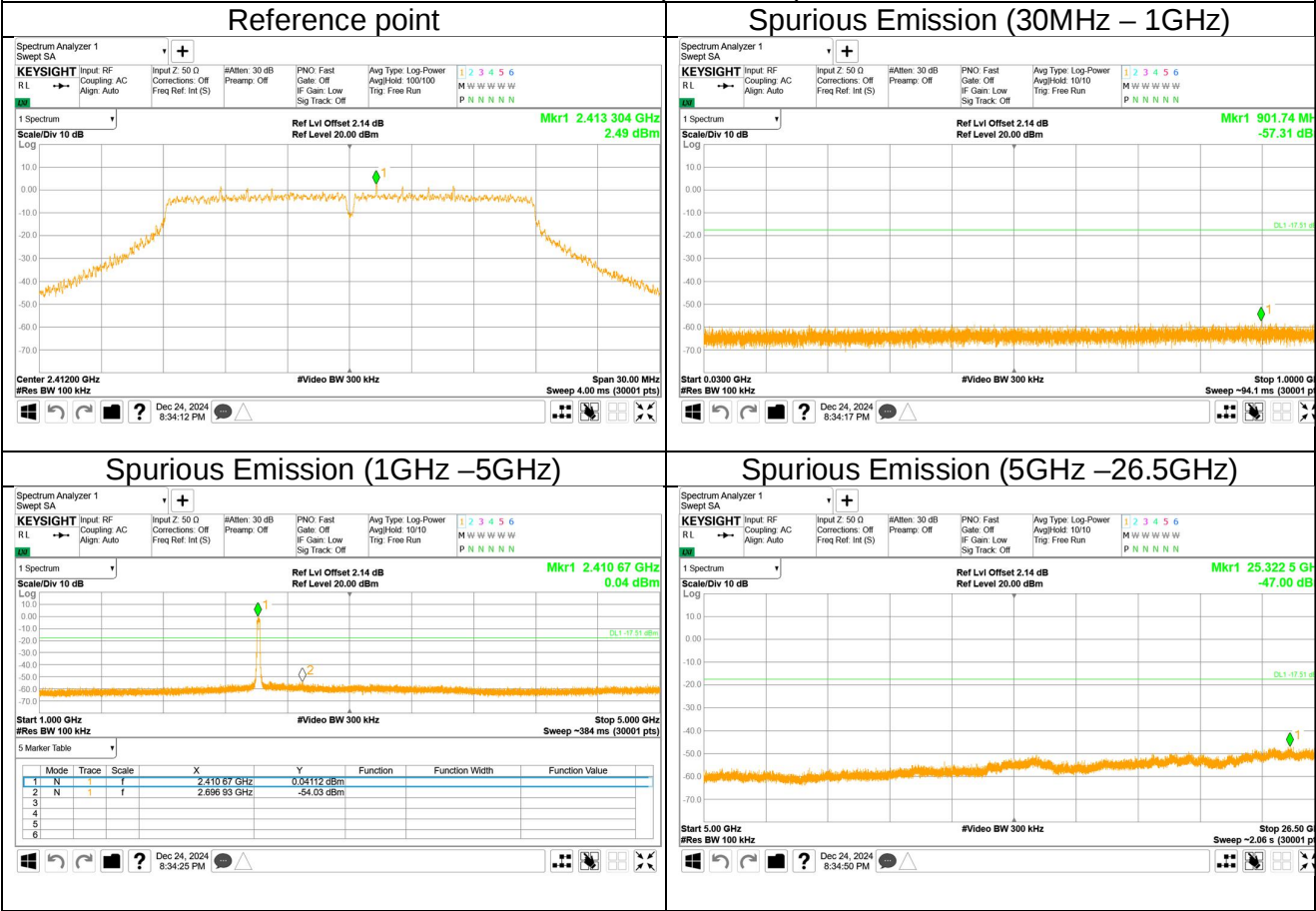


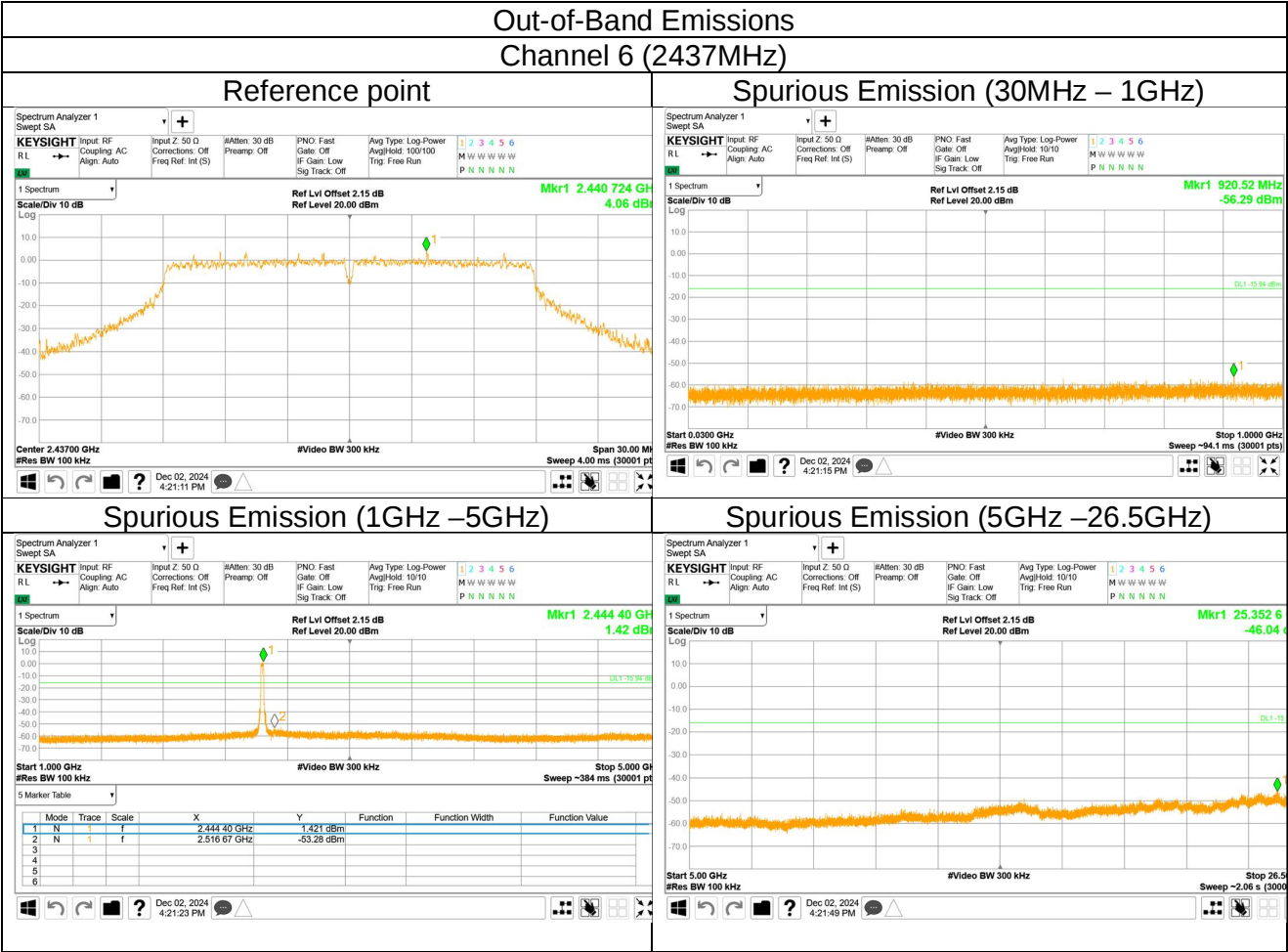


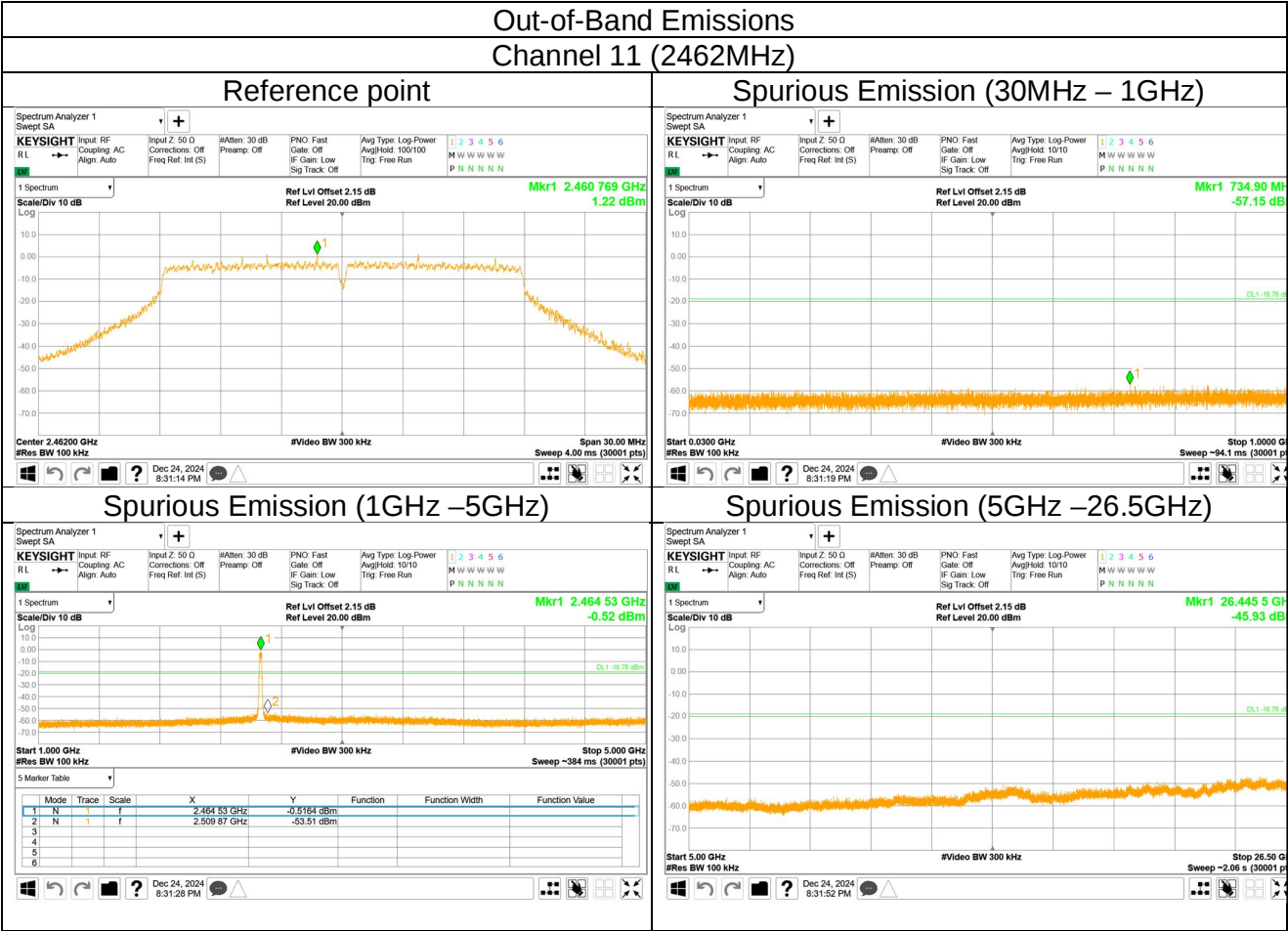




802.11 N HT20  
Out-of-Band Emissions  
Channel 1 (2412MHz)







## 10.6 Band edge

### 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  
RBW = 100 kHz, VBW $\geq$ 3RBW, Sweep = auto, Detector function = peak, Trace = max hold
4. Allow the trace to stabilize, use the peak and delta measurement to record the result.
5. The level displayed must comply with the limit specified in this Section.
6. Repeat above procedures until all frequencies measured were complete and submit all the plots.

### Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under § 15.247(b)(3) and RSS-247 section 5.4(d), the attenuation required shall be 30 dB instead of 20 dB.