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## Annex for 2.4G Wi-Fi

Test Report No.: CTL2408147031-WF02

### TABLE OF CONTENTS

|                                                               |    |
|---------------------------------------------------------------|----|
| Annex for 2.4G Wi-Fi .....                                    | 1  |
| 1. Duty Cycle .....                                           | 2  |
| 2. Bandwidth .....                                            | 9  |
| 3. Maximum Conducted Output Power .....                       | 22 |
| 4. Maximum Power Spectral Density .....                       | 29 |
| 5. Unwanted Emissions In Non-restricted Frequency Bands ..... | 36 |

FCC ID: 2BD5N-SURFERS2

## 1. Duty Cycle

### 1.1 Test Result

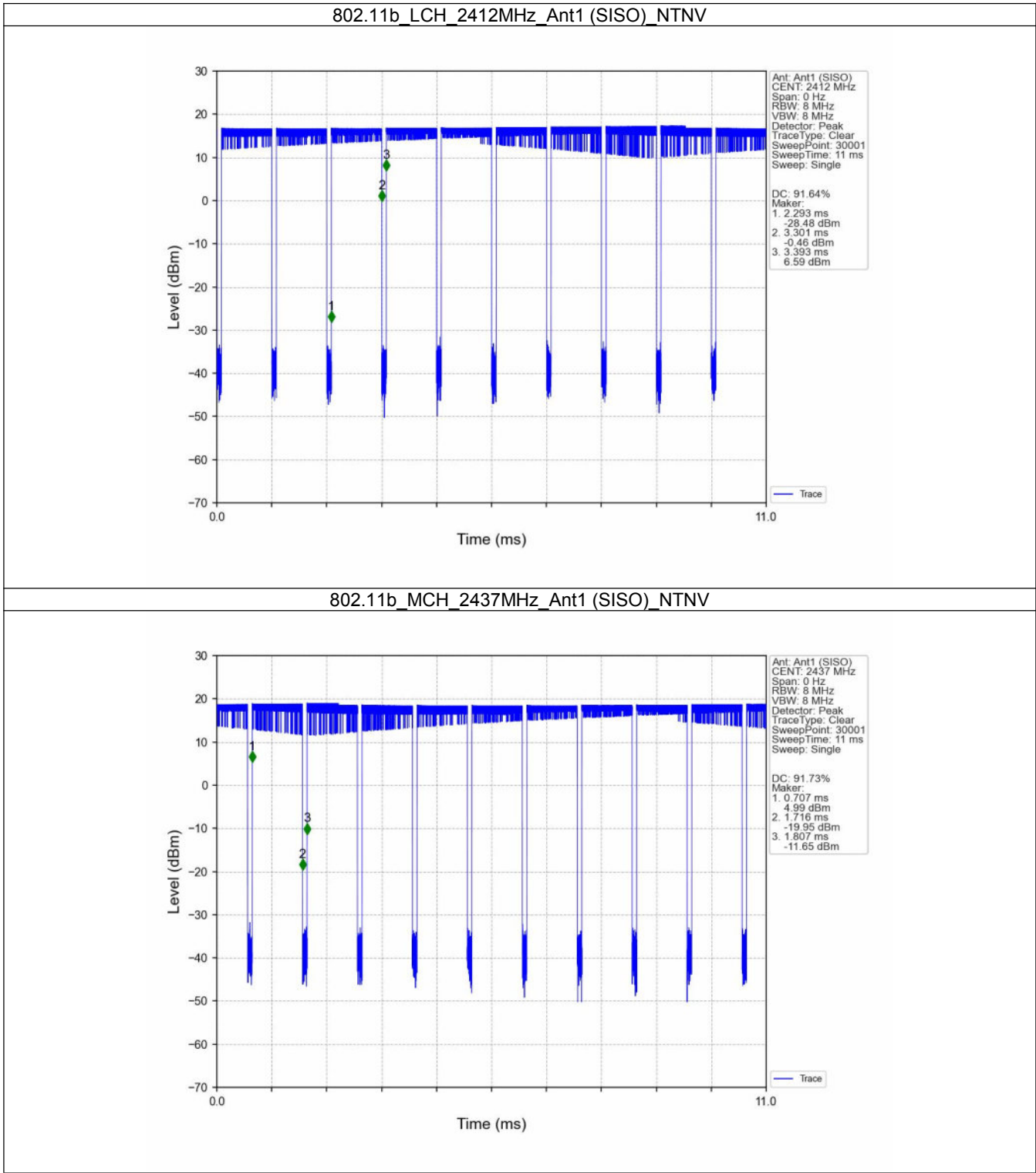
#### 1.1.1 Ant1

| Ant1           |         |                 |           |             |                |                                   |                       |
|----------------|---------|-----------------|-----------|-------------|----------------|-----------------------------------|-----------------------|
| Mode           | TX Type | Frequency (MHz) | T_on (ms) | Period (ms) | Duty Cycle (%) | Duty Cycle Correction Factor (dB) | Max. DC Variation (%) |
| 802.11b        | SISO    | 2412            | 1.008     | 1.100       | 91.64          | 0.38                              | 0.03                  |
|                |         | 2437            | 1.009     | 1.100       | 91.73          | 0.38                              | 0.03                  |
|                |         | 2462            | 1.009     | 1.100       | 91.73          | 0.38                              | 0.03                  |
| 802.11g        | SISO    | 2412            | 0.617     | 0.669       | 92.23          | 0.35                              | 0.00                  |
|                |         | 2437            | 0.616     | 0.669       | 92.08          | 0.36                              | 0.03                  |
|                |         | 2462            | 0.616     | 0.669       | 92.08          | 0.36                              | 0.03                  |
| 802.11n (HT20) | SISO    | 2412            | 0.613     | 0.665       | 92.18          | 0.35                              | 0.00                  |
|                |         | 2437            | 0.612     | 0.665       | 92.03          | 0.36                              | 0.04                  |
|                |         | 2462            | 0.612     | 0.665       | 92.03          | 0.36                              | 0.00                  |
| 802.11n (HT40) | SISO    | 2422            | 0.612     | 0.665       | 92.03          | 0.36                              | 0.04                  |
|                |         | 2437            | 0.613     | 0.665       | 92.18          | 0.35                              | 0.04                  |
|                |         | 2452            | 0.613     | 0.665       | 92.18          | 0.35                              | 0.04                  |

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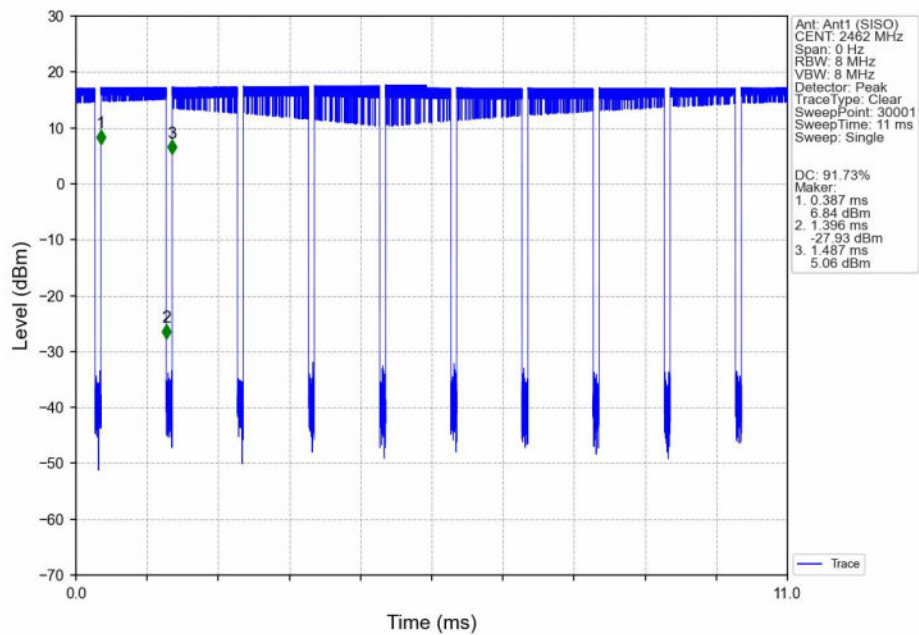
1.2 Test Graph

1.2.1 Ant1

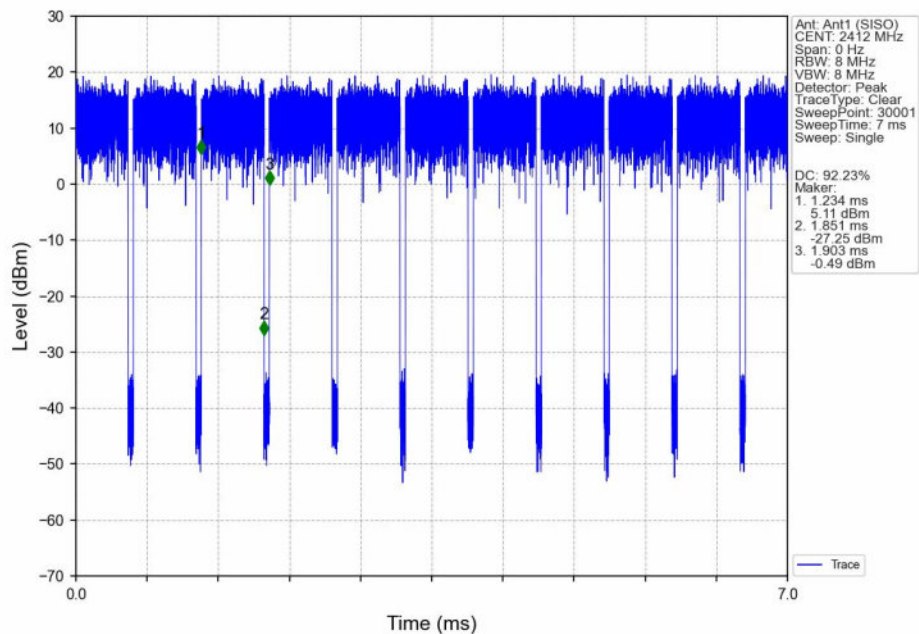


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802.11b\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

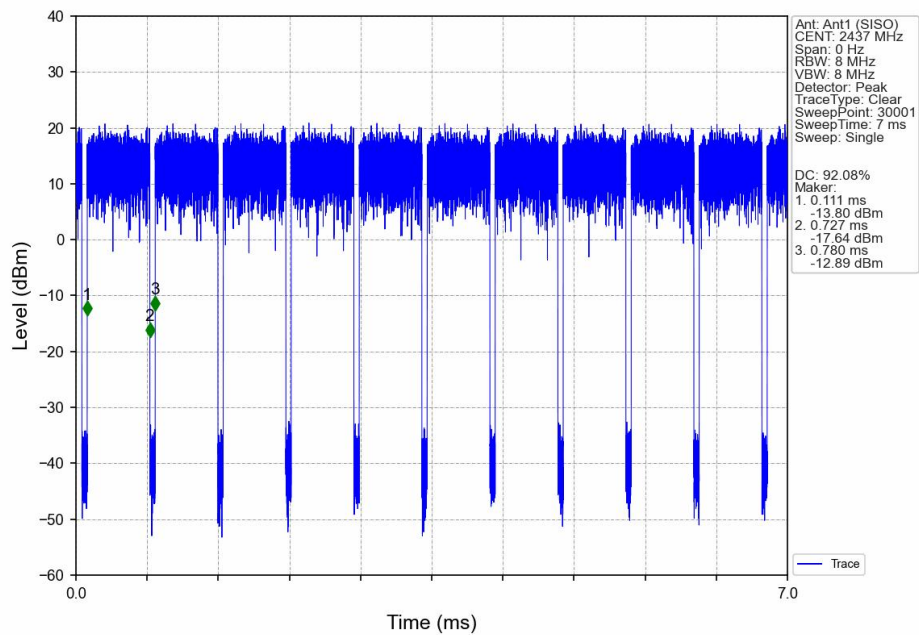


802.11g\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

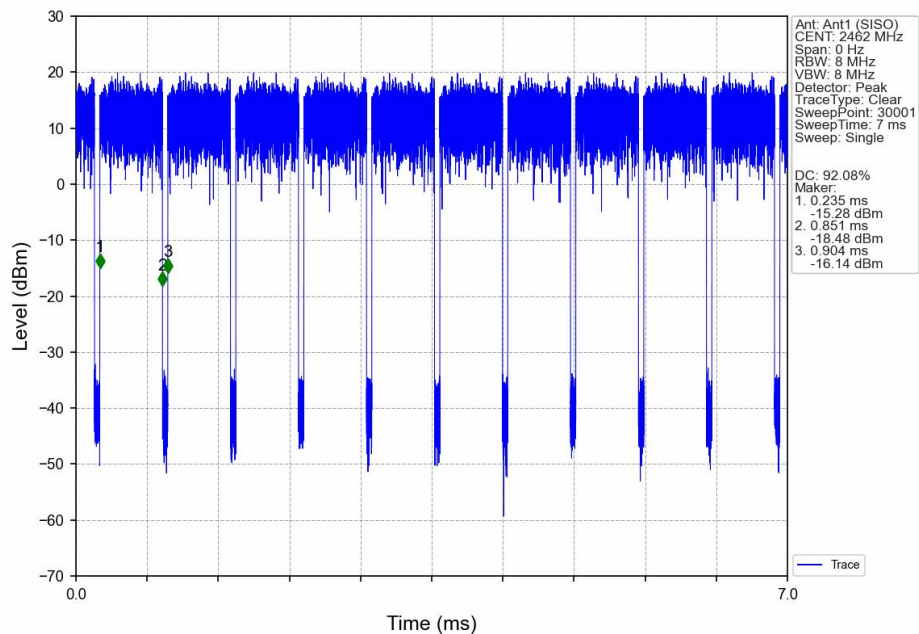


FCC ID: 2BD5N-SURFERS2

802.11g\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

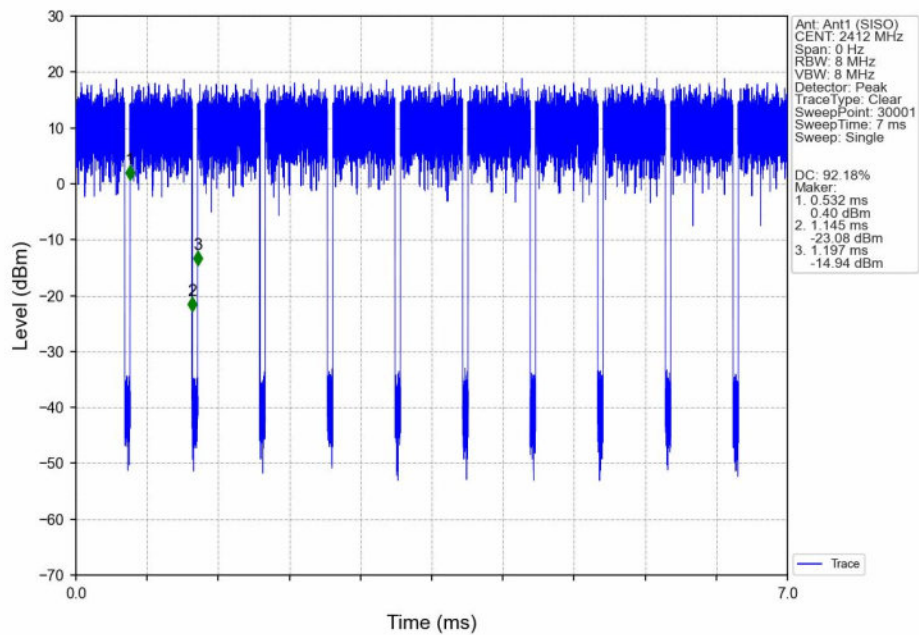


802.11g\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

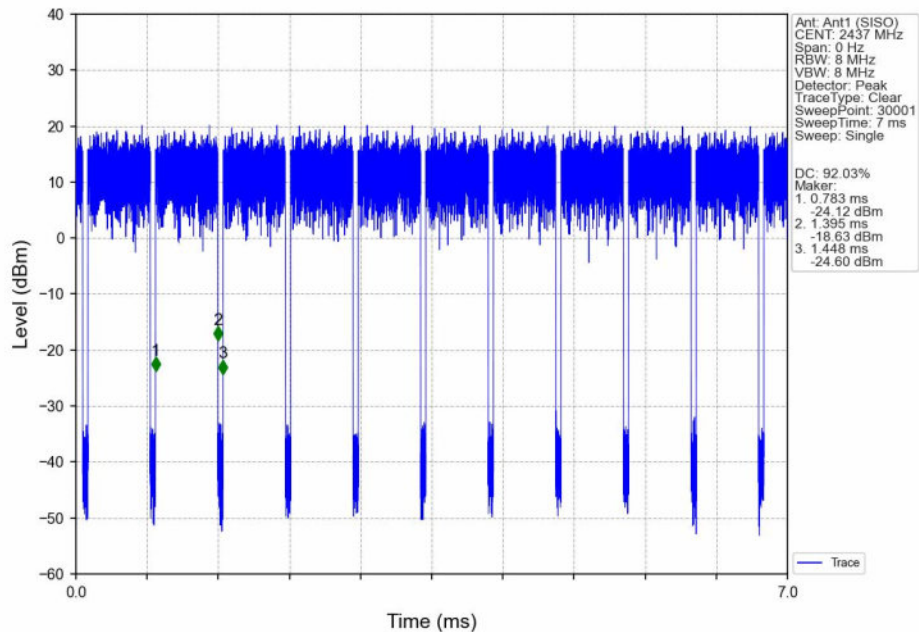


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

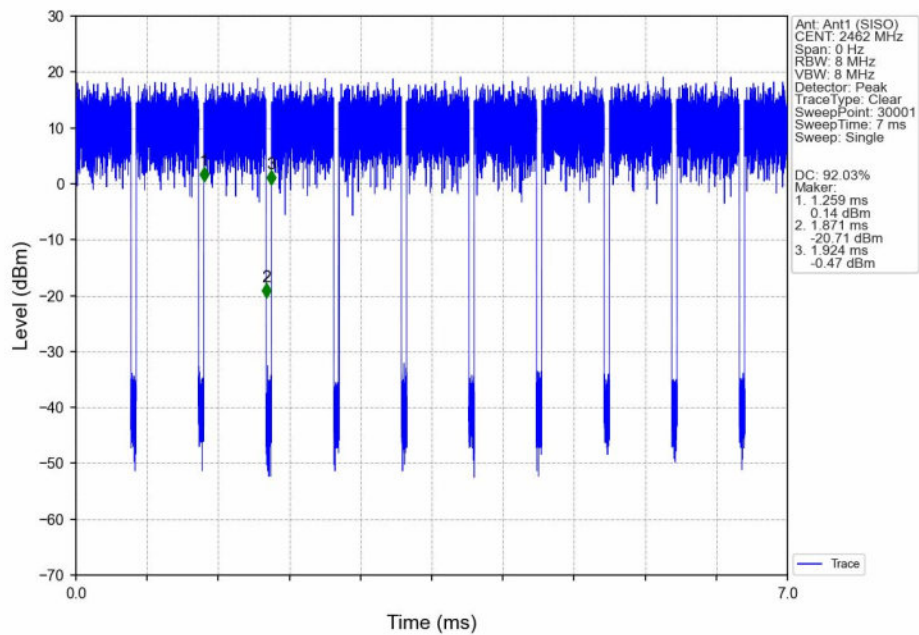


802.11n(HT20)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

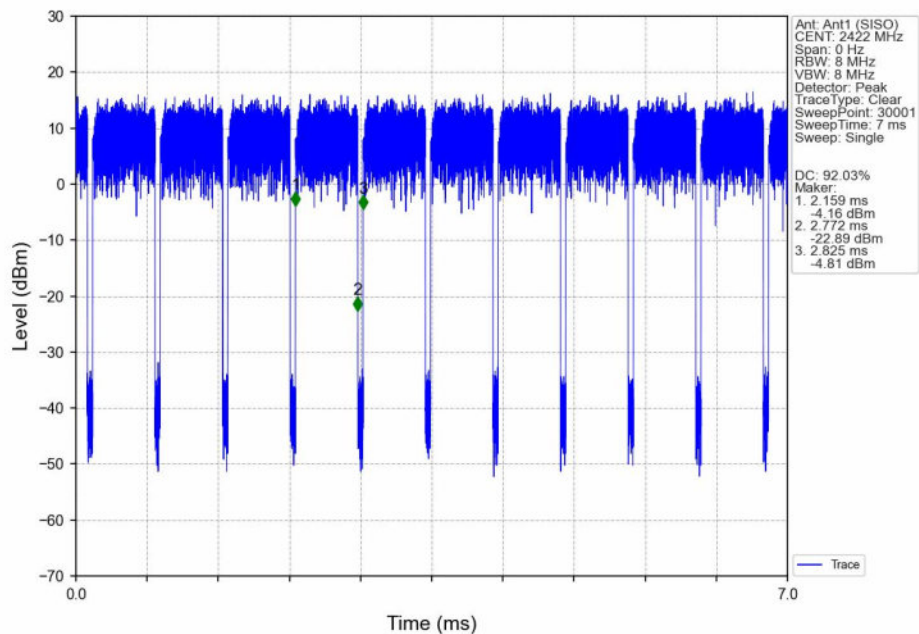


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

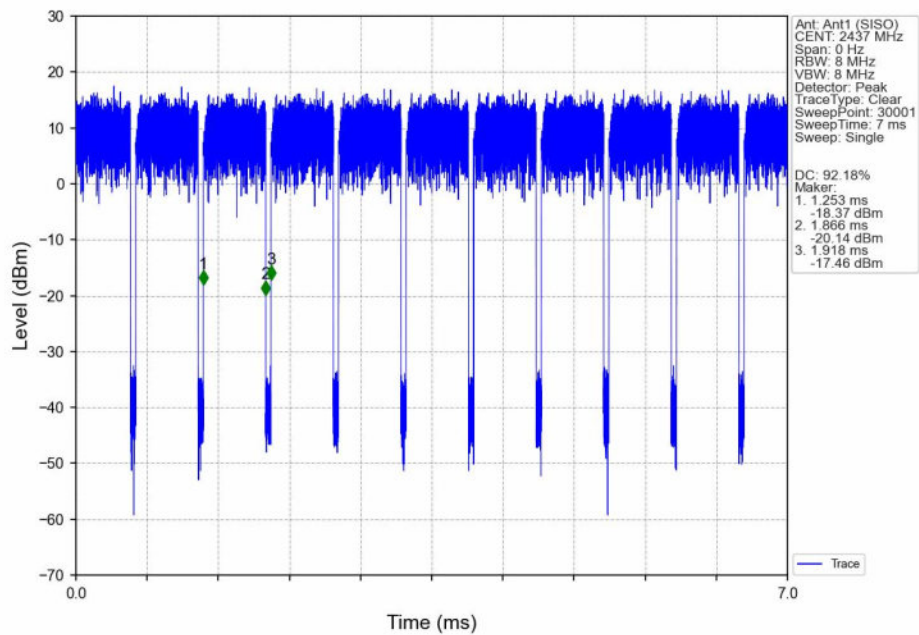


802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV

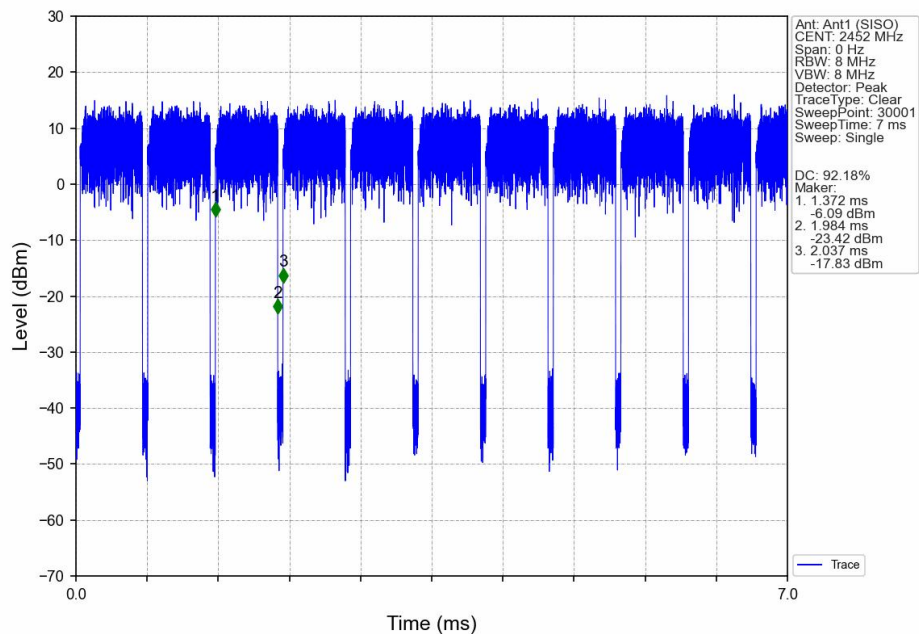


FCC ID: 2BD5N-SURFERS2

802.11n(HT40)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_HCH\_2452MHz\_Ant1 (SISO)\_NTNV



FCC ID: 2BD5N-SURFERS2

## 2. Bandwidth

### 2.1 Test Result

#### 2.1.1 OBW

| Mode           | TX Type | Frequency (MHz) | ANT | 99% Occupied Bandwidth (MHz) |       | Verdict |
|----------------|---------|-----------------|-----|------------------------------|-------|---------|
|                |         |                 |     | Result                       | Limit |         |
| 802.11b        | SISO    | 2412            | 1   | 13.109                       | /     | Pass    |
|                |         | 2437            | 1   | 12.948                       | /     | Pass    |
|                |         | 2462            | 1   | 12.971                       | /     | Pass    |
| 802.11g        | SISO    | 2412            | 1   | 18.109                       | /     | Pass    |
|                |         | 2437            | 1   | 17.859                       | /     | Pass    |
|                |         | 2462            | 1   | 17.835                       | /     | Pass    |
| 802.11n (HT20) | SISO    | 2412            | 1   | 18.847                       | /     | Pass    |
|                |         | 2437            | 1   | 18.670                       | /     | Pass    |
|                |         | 2462            | 1   | 18.675                       | /     | Pass    |
| 802.11n (HT40) | SISO    | 2422            | 1   | 36.727                       | /     | Pass    |
|                |         | 2437            | 1   | 36.663                       | /     | Pass    |
|                |         | 2452            | 1   | 37.216                       | /     | Pass    |

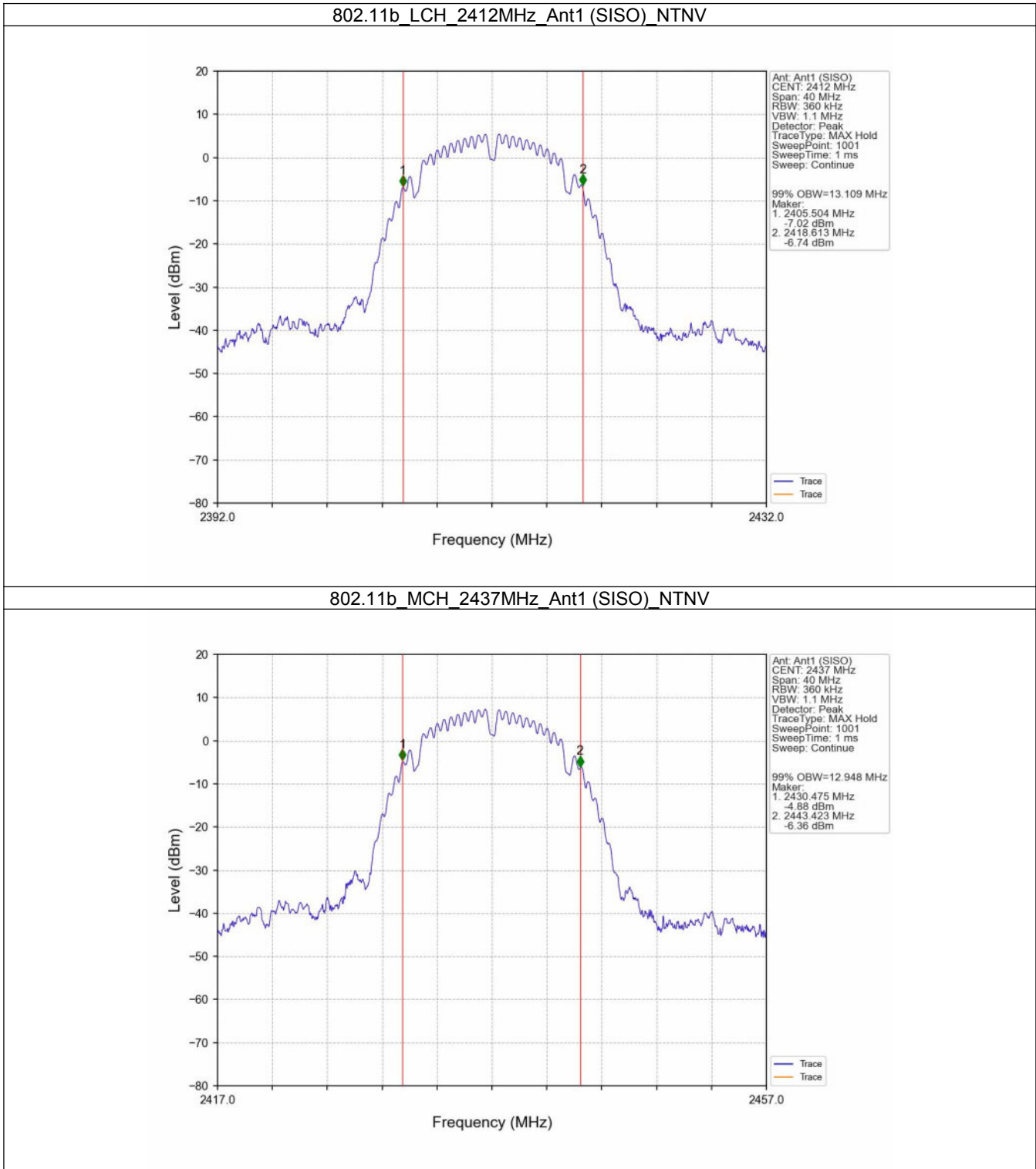
#### 2.1.2 6dB BW

| Mode           | TX Type | Frequency (MHz) | ANT | 6dB Bandwidth (MHz) |            | Verdict |
|----------------|---------|-----------------|-----|---------------------|------------|---------|
|                |         |                 |     | Result              | Limit      |         |
| 802.11b        | SISO    | 2412            | 1   | 9.581               | $\geq 0.5$ | Pass    |
|                |         | 2437            | 1   | 9.116               | $\geq 0.5$ | Pass    |
|                |         | 2462            | 1   | 9.532               | $\geq 0.5$ | Pass    |
| 802.11g        | SISO    | 2412            | 1   | 16.374              | $\geq 0.5$ | Pass    |
|                |         | 2437            | 1   | 15.959              | $\geq 0.5$ | Pass    |
|                |         | 2462            | 1   | 15.907              | $\geq 0.5$ | Pass    |
| 802.11n (HT20) | SISO    | 2412            | 1   | 17.608              | $\geq 0.5$ | Pass    |
|                |         | 2437            | 1   | 16.392              | $\geq 0.5$ | Pass    |
|                |         | 2462            | 1   | 16.382              | $\geq 0.5$ | Pass    |
| 802.11n (HT40) | SISO    | 2422            | 1   | 35.143              | $\geq 0.5$ | Pass    |
|                |         | 2437            | 1   | 35.155              | $\geq 0.5$ | Pass    |
|                |         | 2452            | 1   | 35.689              | $\geq 0.5$ | Pass    |

FCC ID: 2BD5N-SURFERS2

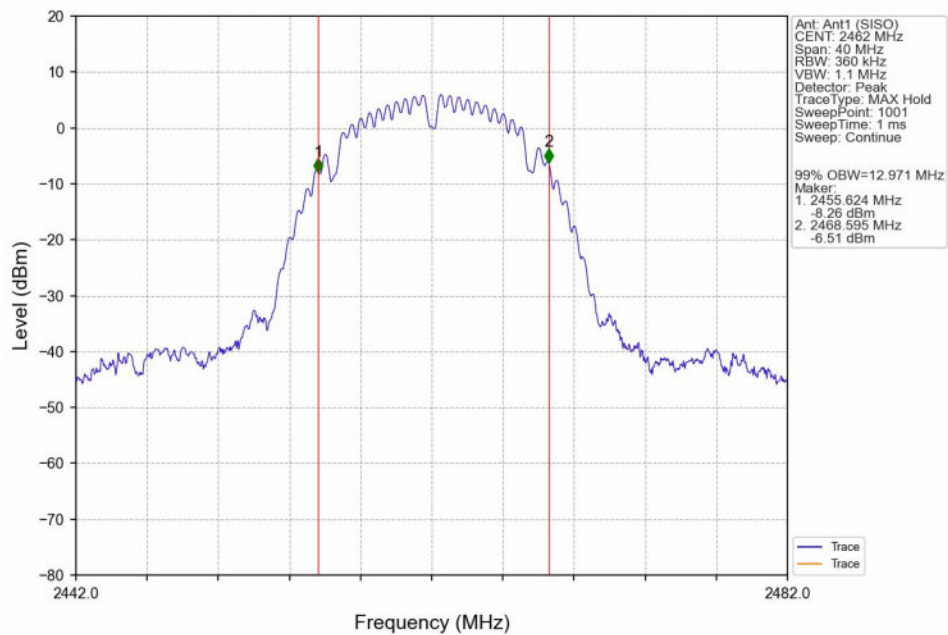
2.2 Test Graph

2.2.1 OBW

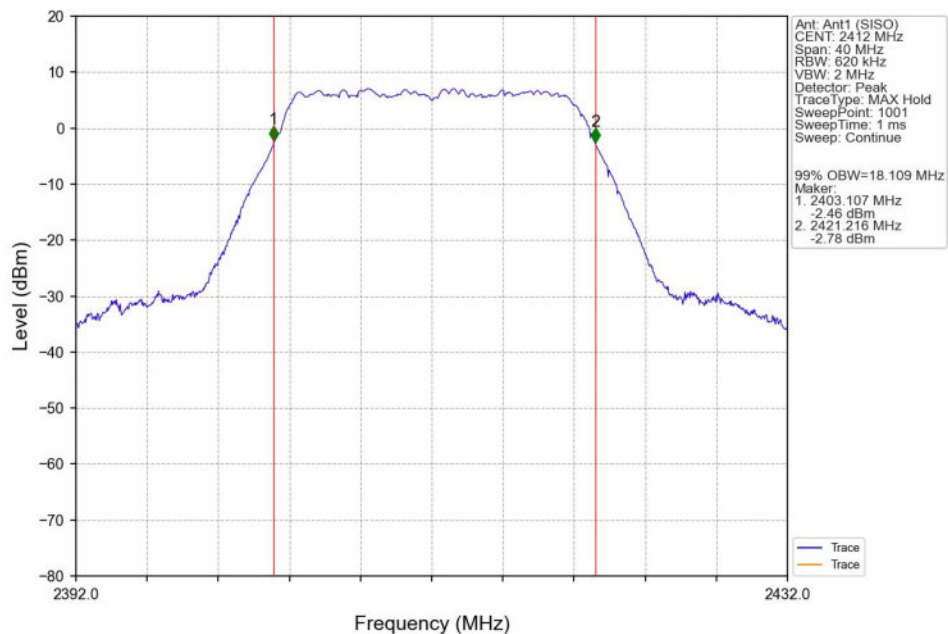


FCC ID: 2BD5N-SURFERS2

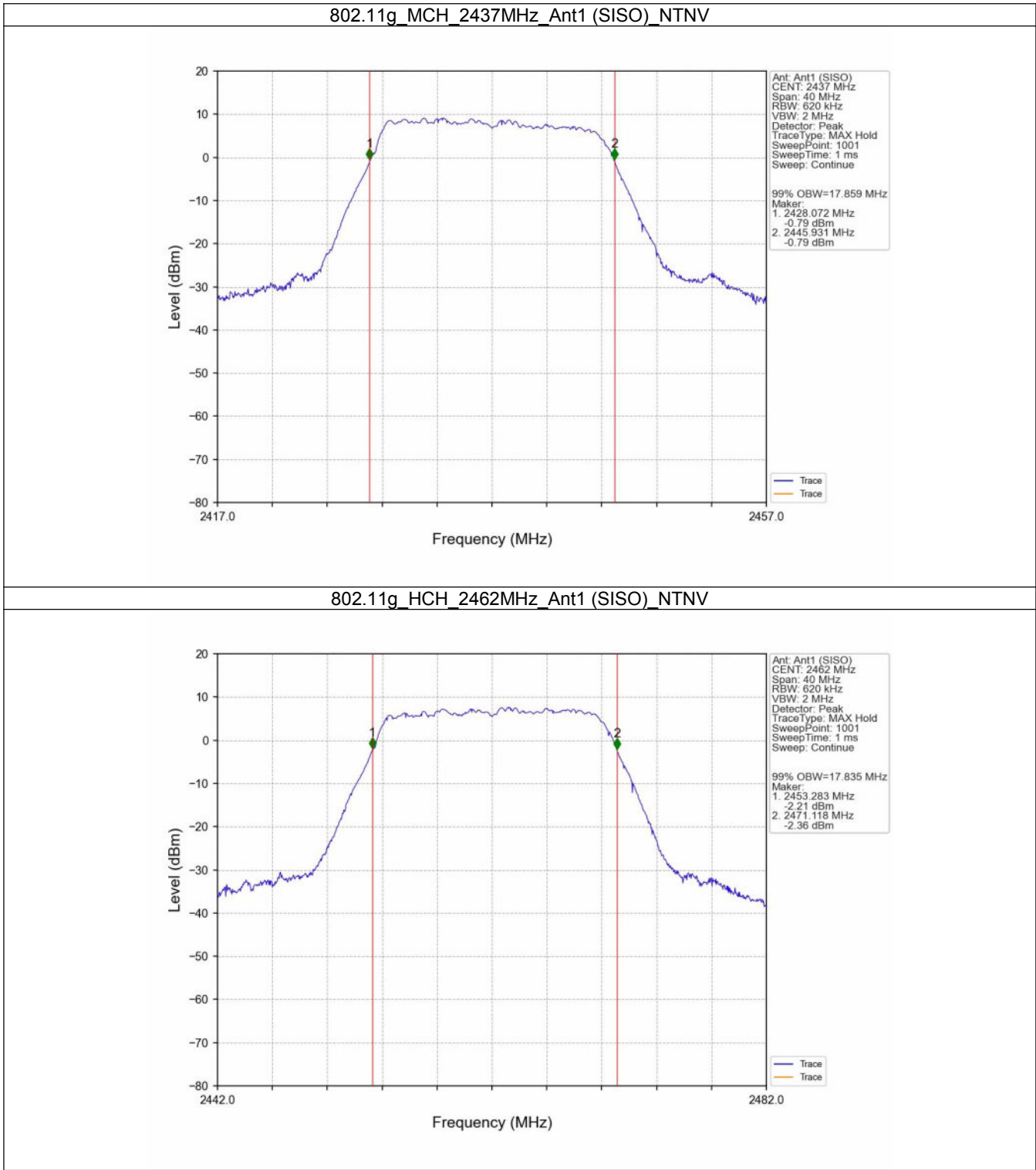
802.11b\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV



802.11g\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

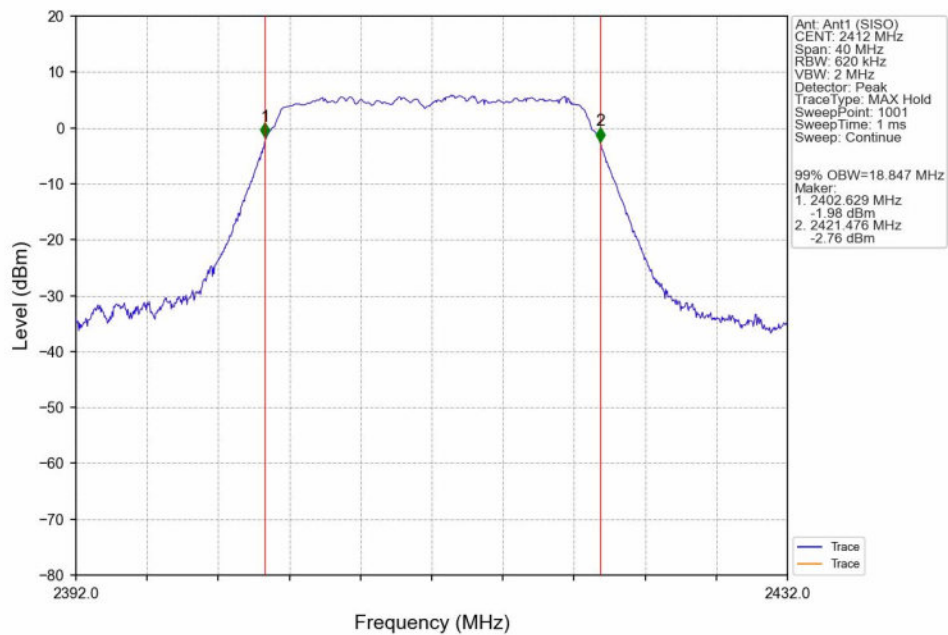


FCC ID: 2BD5N-SURFERS2

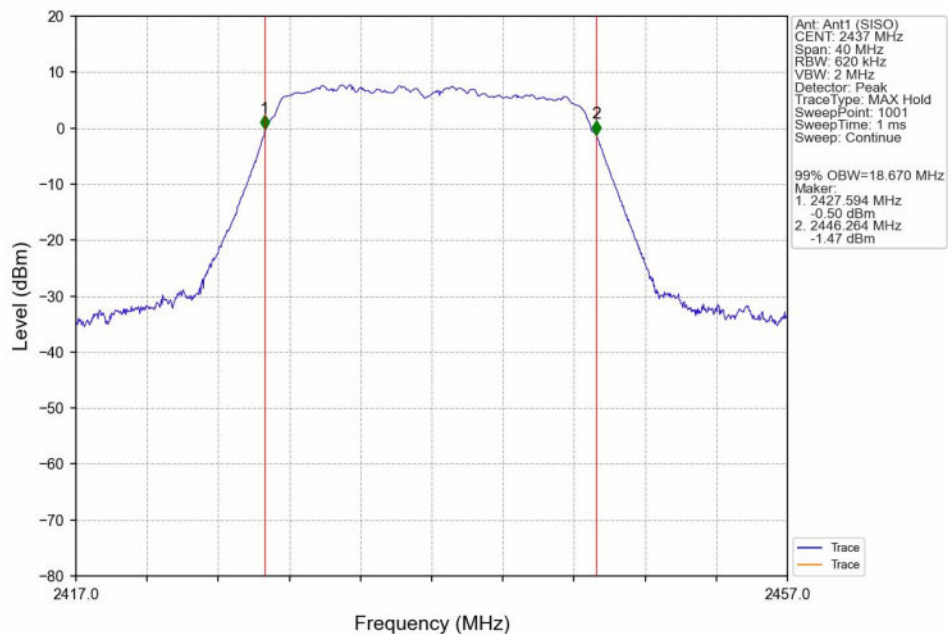


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

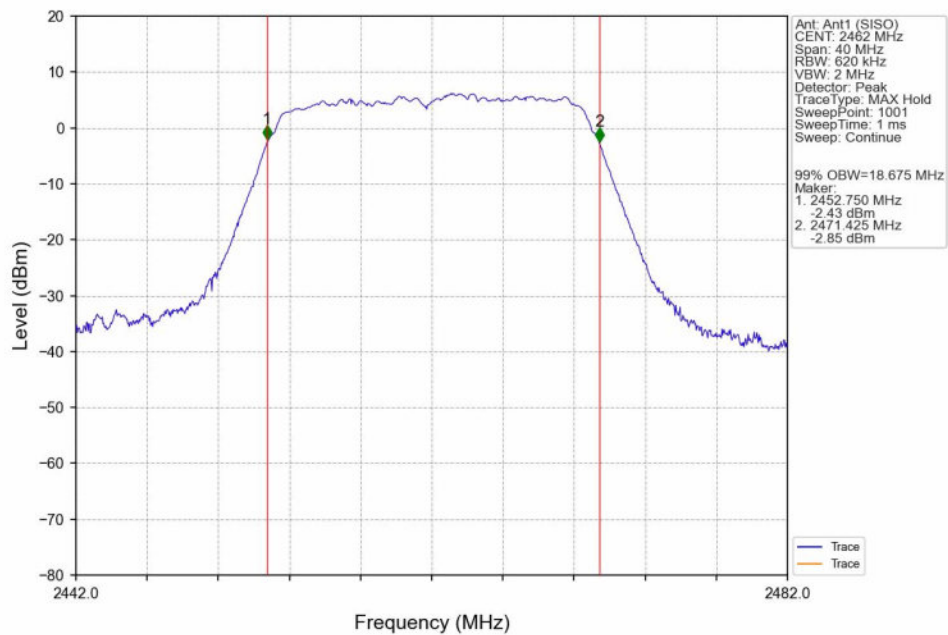


802.11n(HT20)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

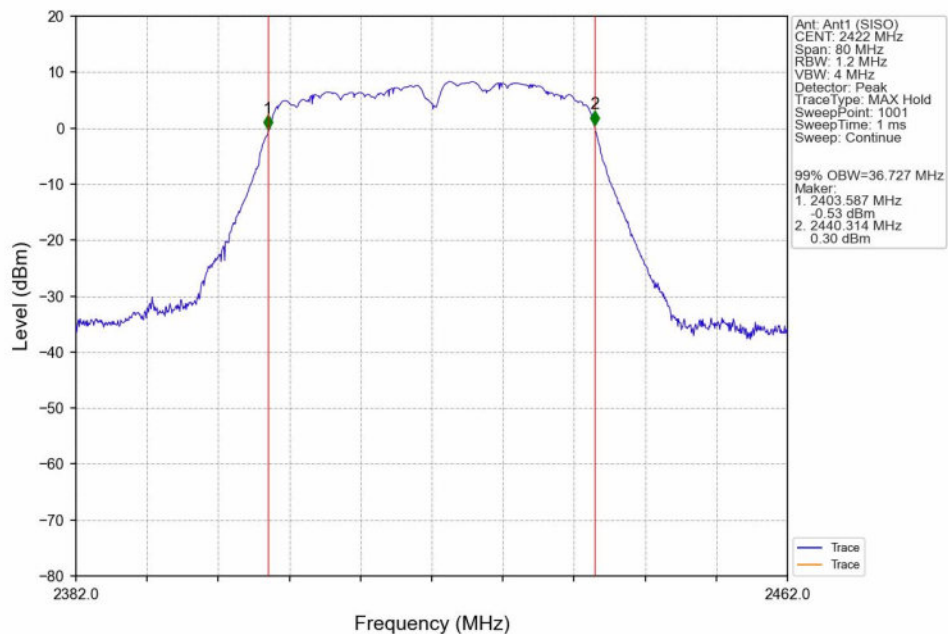


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802.11n(HT20)\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

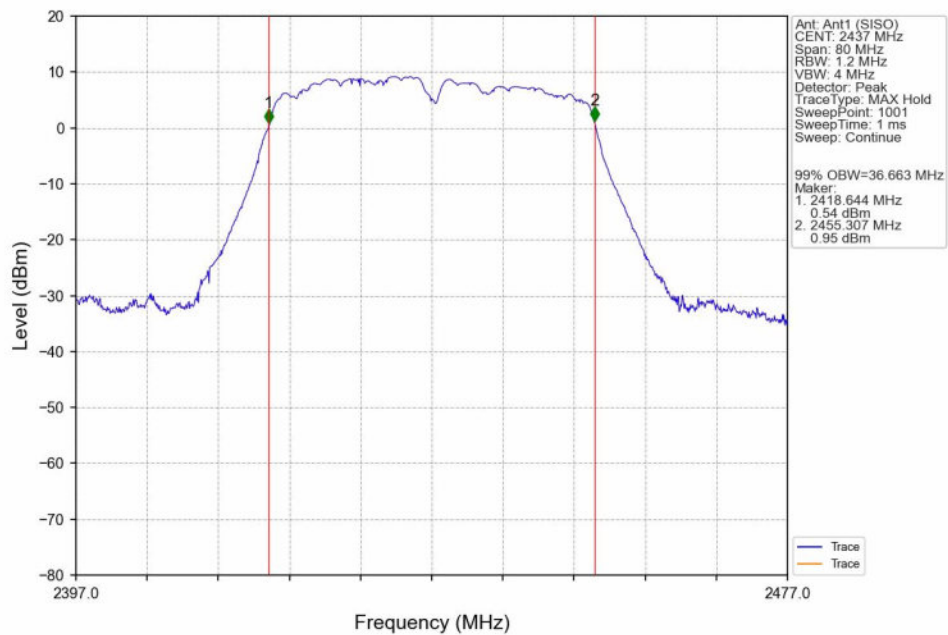


802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV

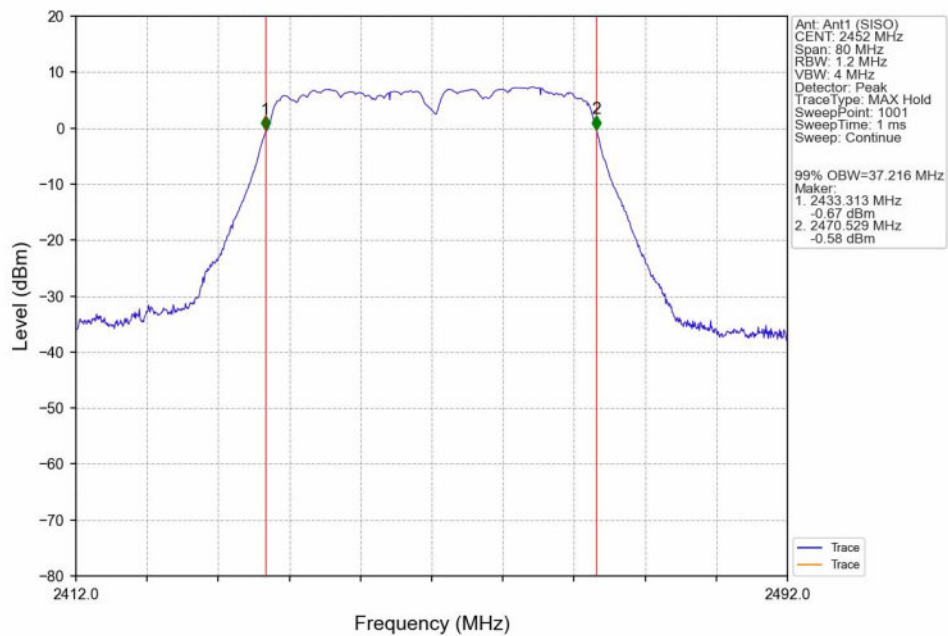


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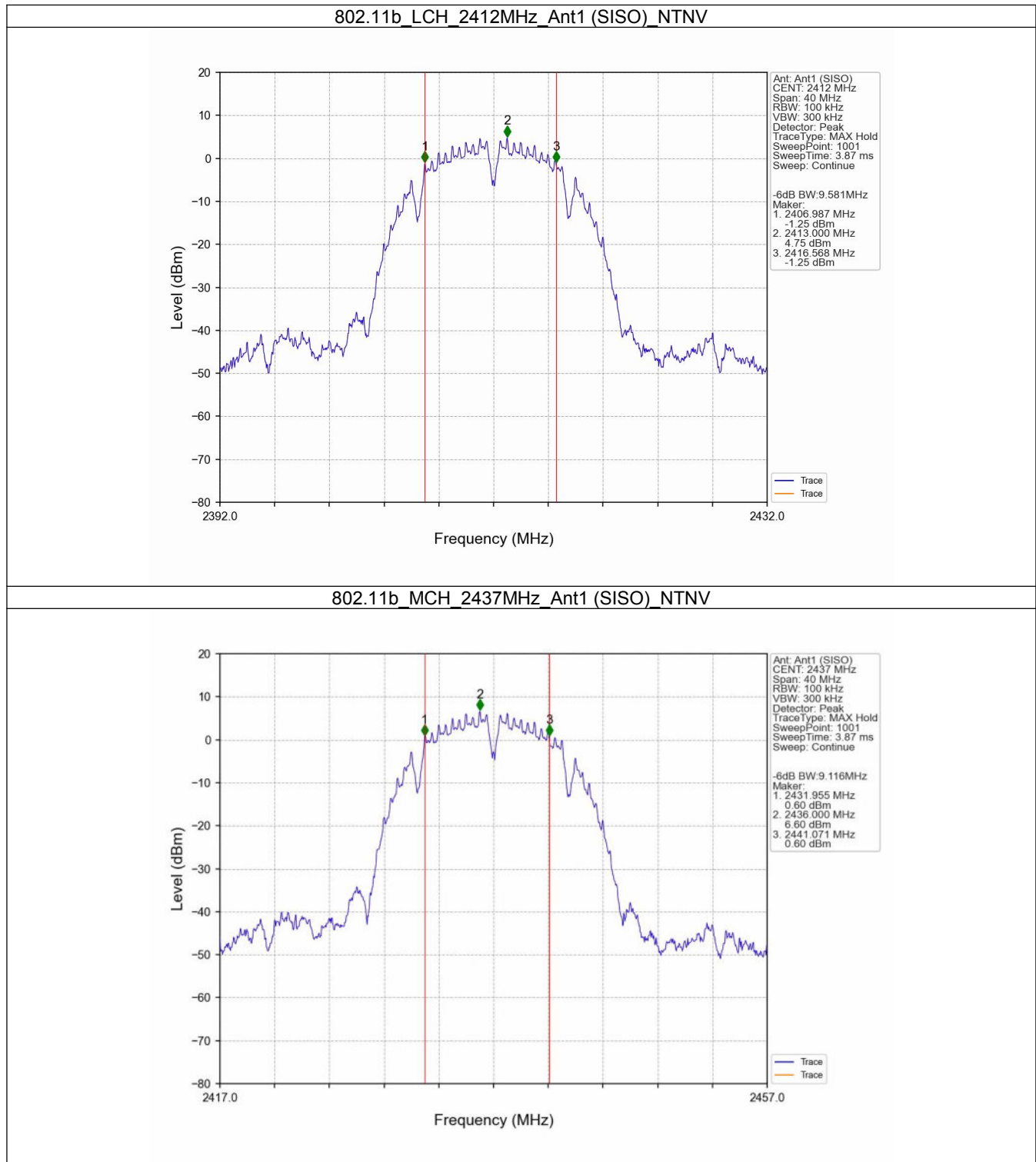
802.11n(HT40)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_HCH\_2452MHz\_Ant1 (SISO)\_NTNV

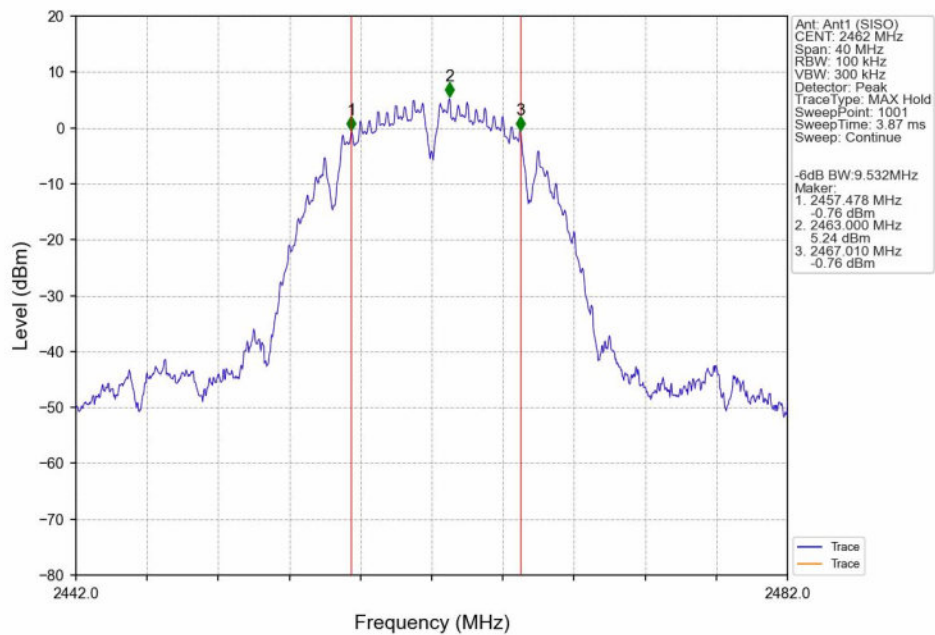


FCC ID: 2BD5N-SURFERS2

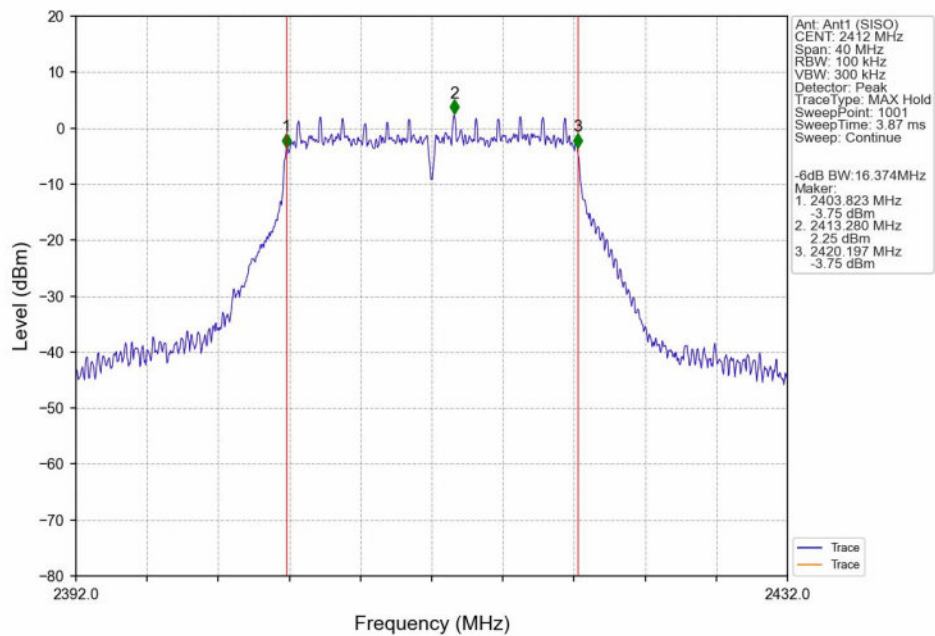
**2.2.2 6dB BW**

FCC ID: 2BD5N-SURFERS2

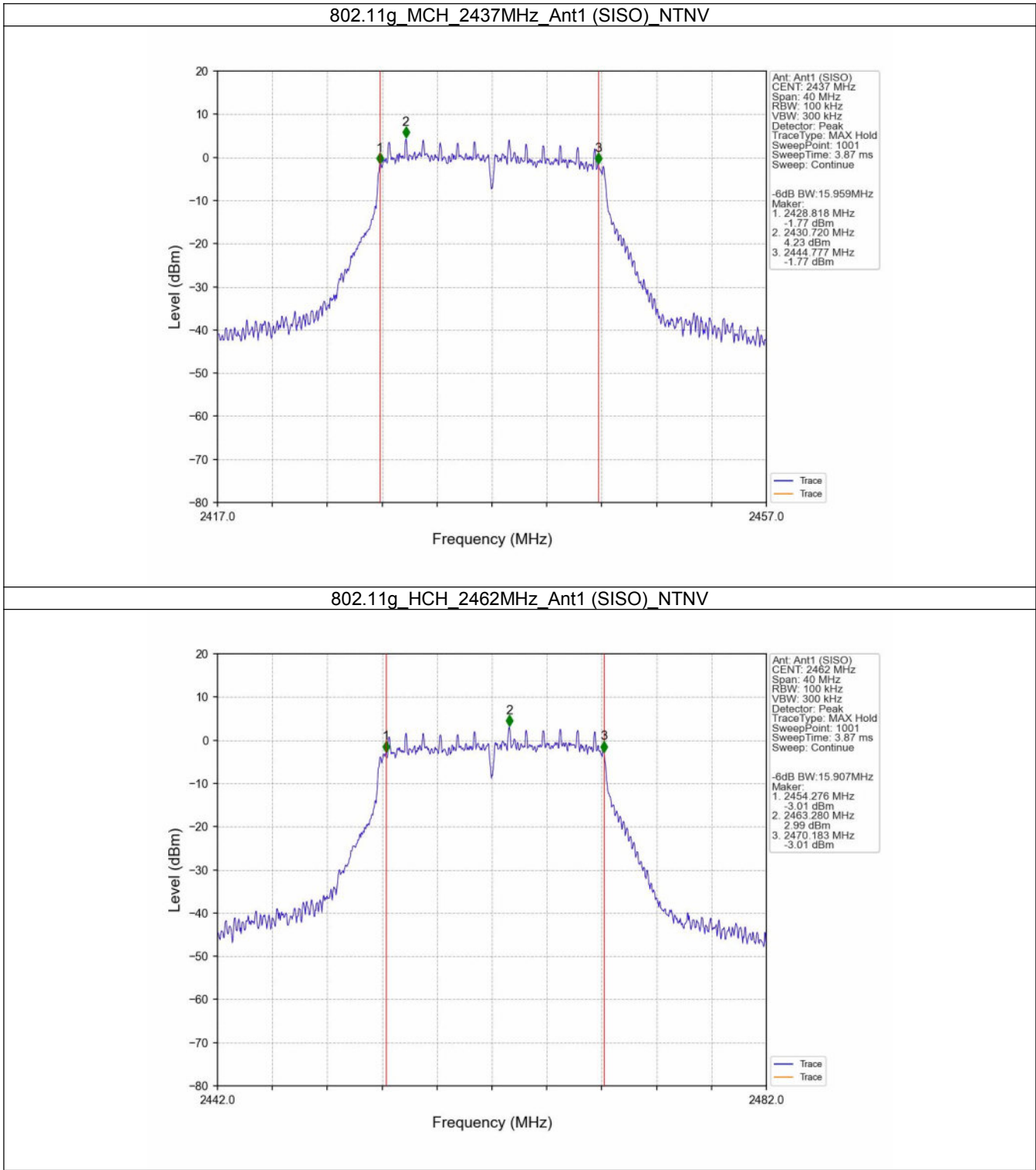
802.11b\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV



802.11g\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

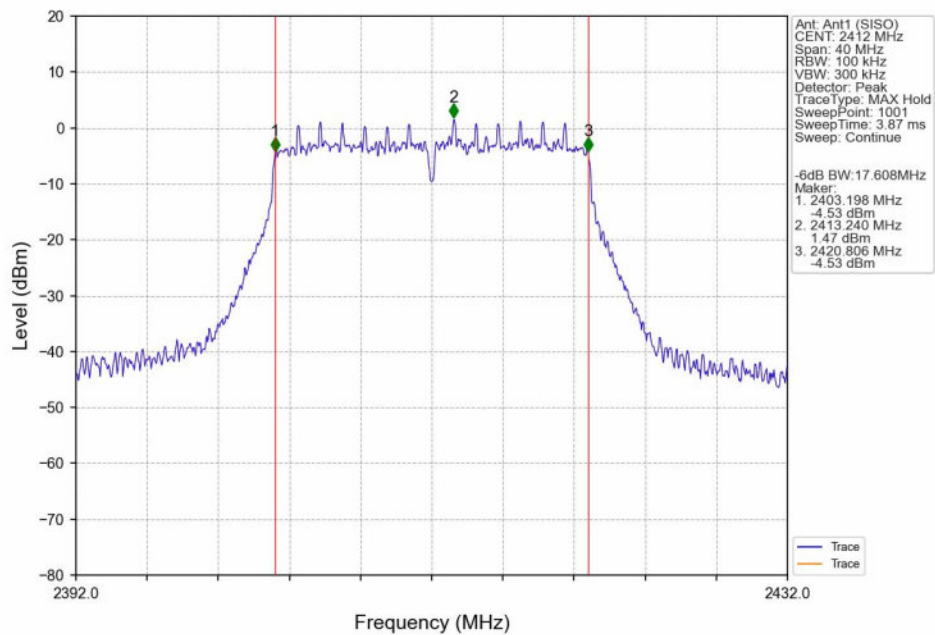


FCC ID: 2BD5N-SURFERS2

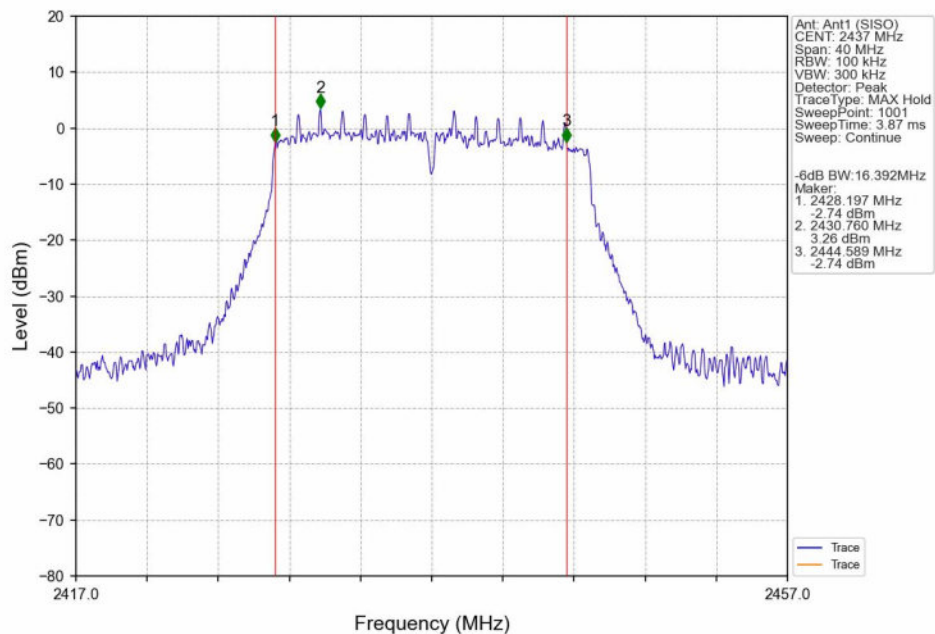


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

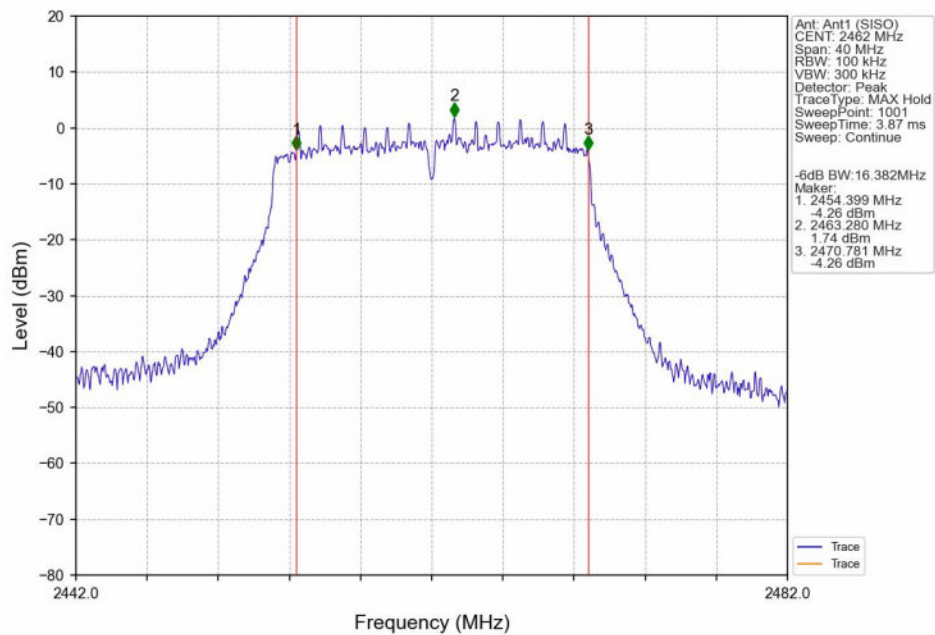


802.11n(HT20)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

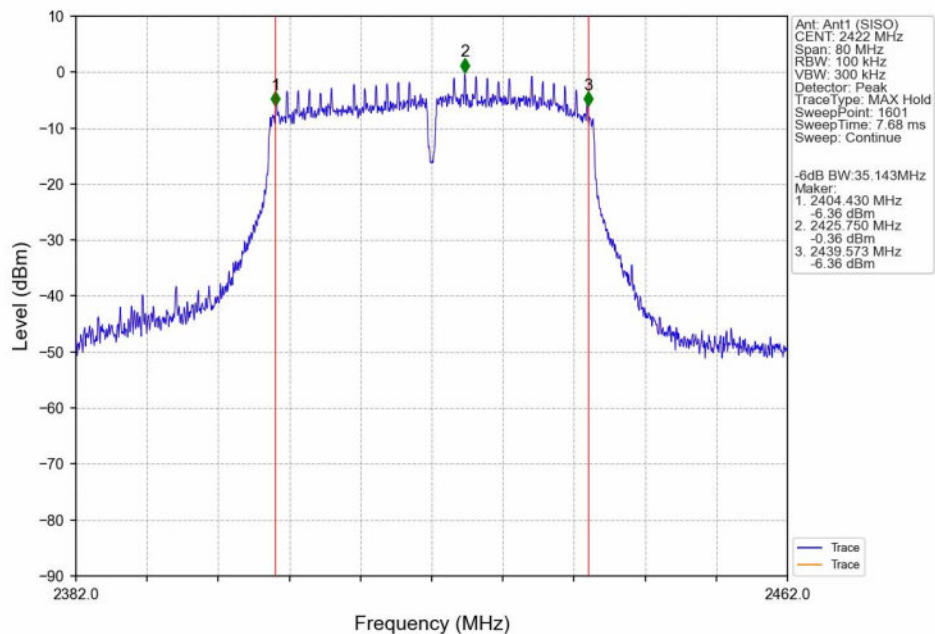


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

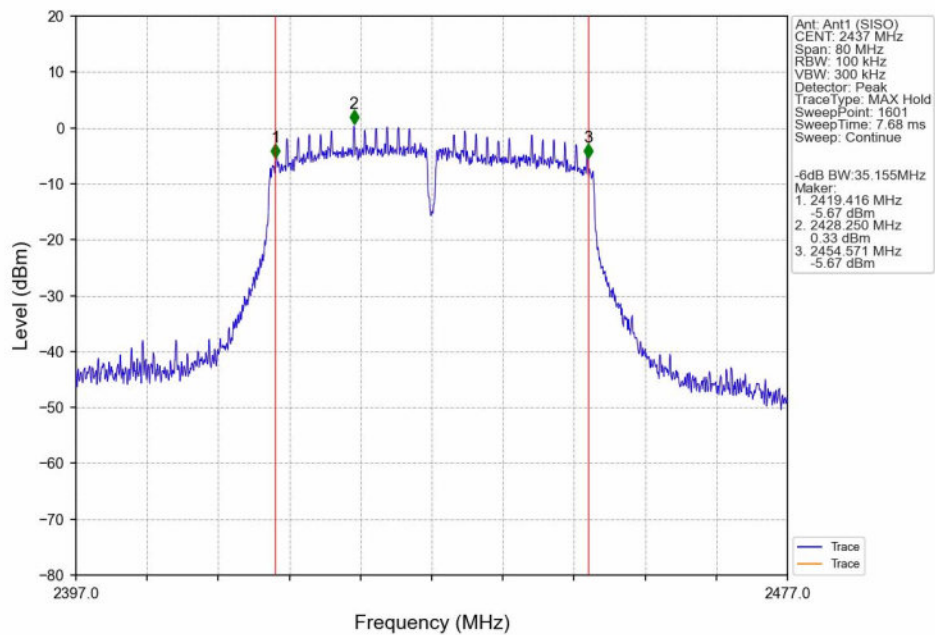


802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV

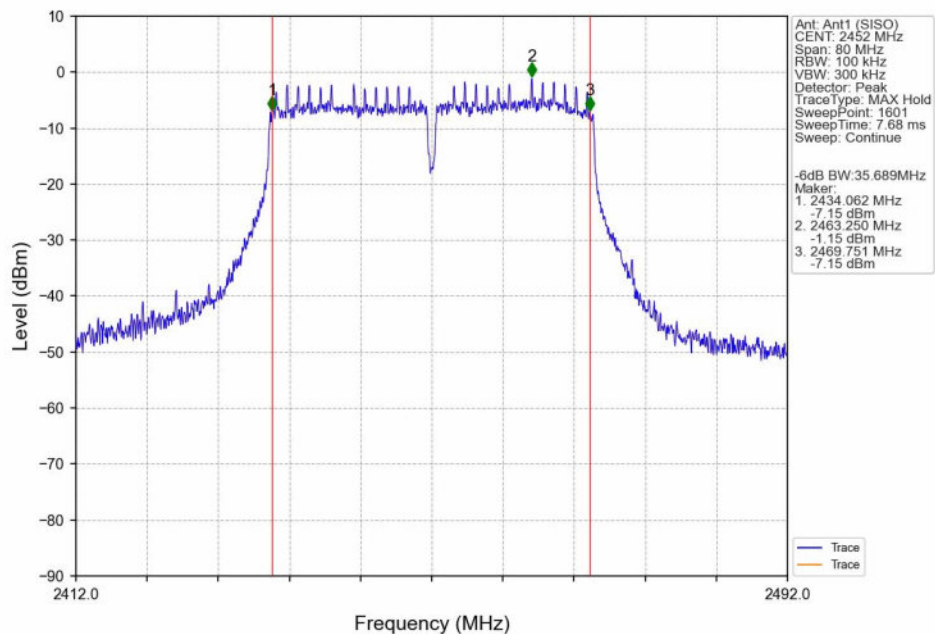


FCC ID: 2BD5N-SURFERS2

802.11n(HT40)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_HCH\_2452MHz\_Ant1 (SISO)\_NTNV



FCC ID: 2BD5N-SURFERS2

### 3. Maximum Conducted Output Power

#### 3.1 Test Result

##### 3.1.1 Power

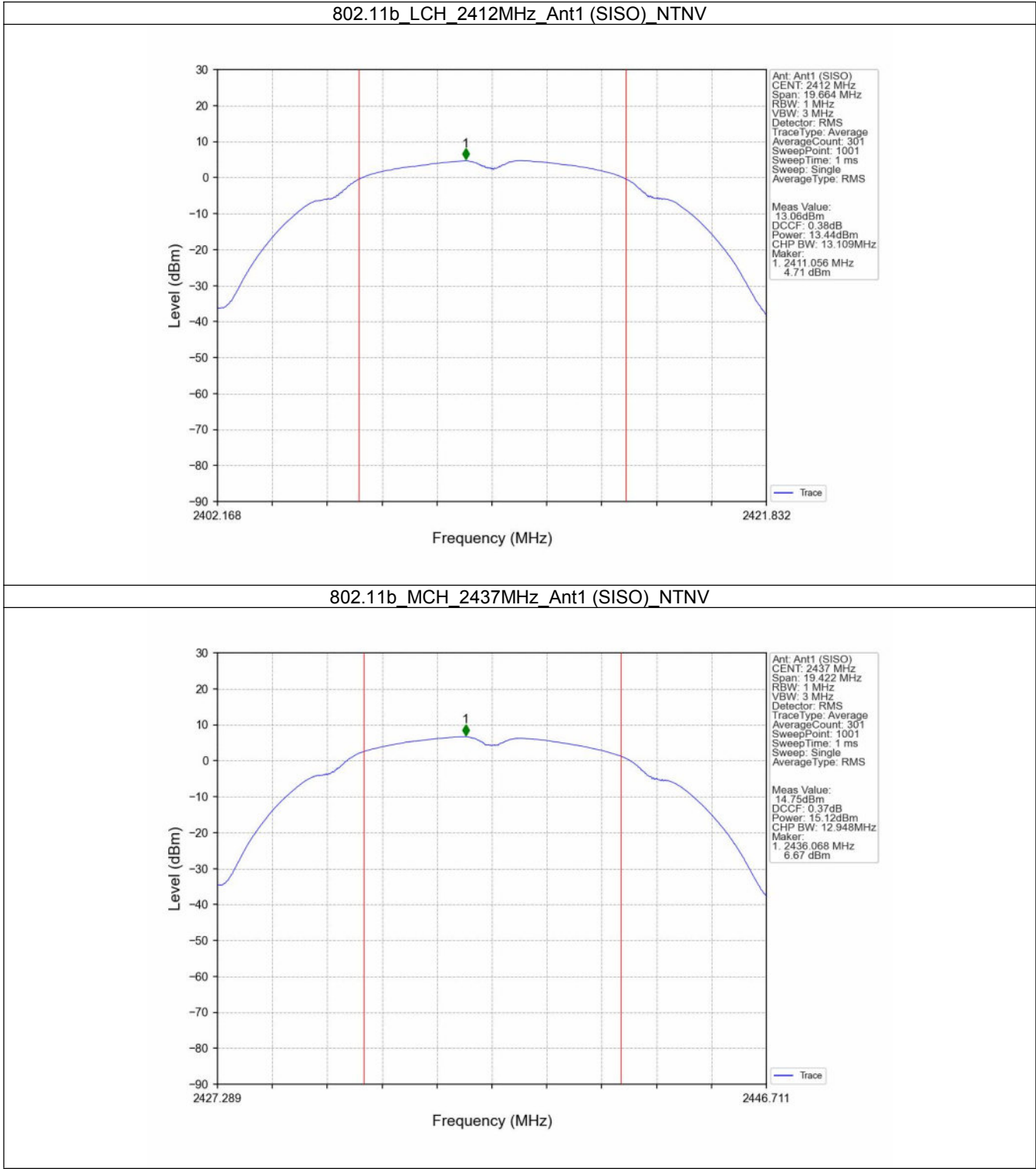
| Mode           | TX Type | Frequency (MHz) | Maximum Average Conducted Output Power (dBm) |       | Verdict |
|----------------|---------|-----------------|----------------------------------------------|-------|---------|
|                |         |                 | ANT1                                         | Limit |         |
| 802.11b        | SISO    | 2412            | 13.44                                        | <=30  | Pass    |
|                |         | 2437            | 15.12                                        | <=30  | Pass    |
|                |         | 2462            | 13.81                                        | <=30  | Pass    |
| 802.11g        | SISO    | 2412            | 13.34                                        | <=30  | Pass    |
|                |         | 2437            | 14.91                                        | <=30  | Pass    |
|                |         | 2462            | 13.59                                        | <=30  | Pass    |
| 802.11n (HT20) | SISO    | 2412            | 12.41                                        | <=30  | Pass    |
|                |         | 2437            | 13.86                                        | <=30  | Pass    |
|                |         | 2462            | 12.36                                        | <=30  | Pass    |
| 802.11n (HT40) | SISO    | 2422            | 12.83                                        | <=30  | Pass    |
|                |         | 2437            | 13.56                                        | <=30  | Pass    |
|                |         | 2452            | 12.53                                        | <=30  | Pass    |

Note1: Antenna Gain: Ant1: 1.06dBi;

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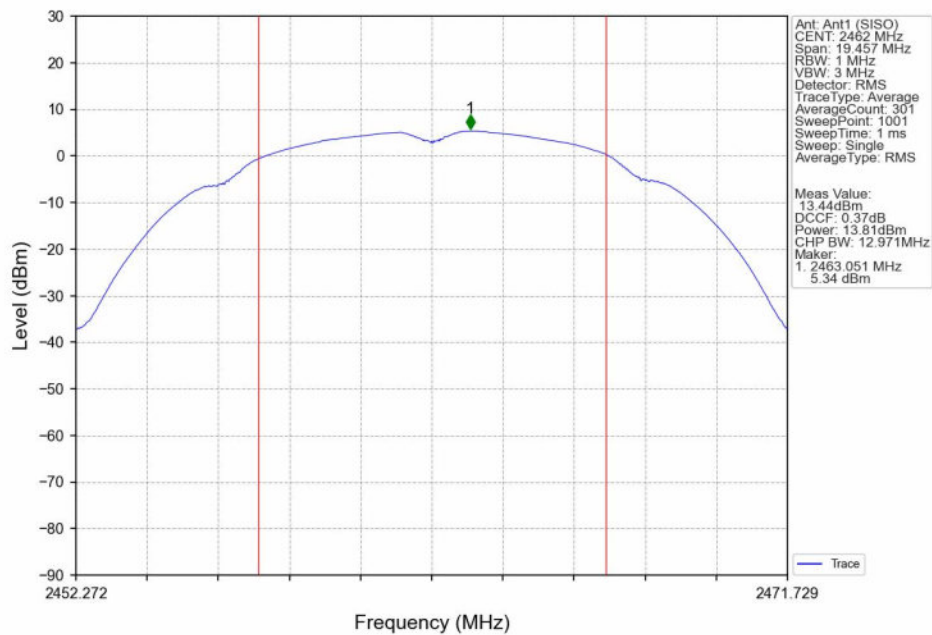
3.2 Test Graph

3.2.1 Power

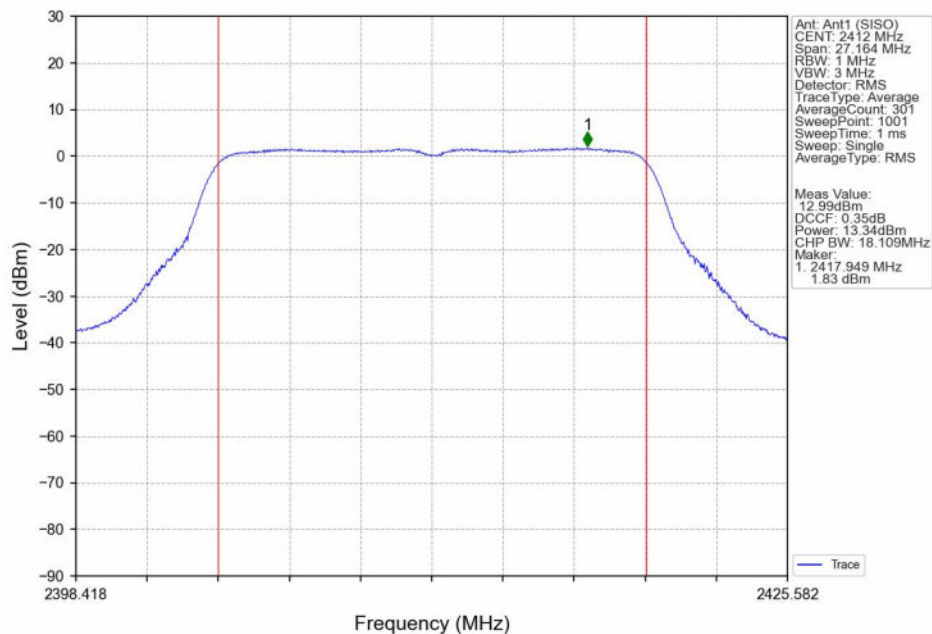


FCC ID: 2BD5N-SURFERS2

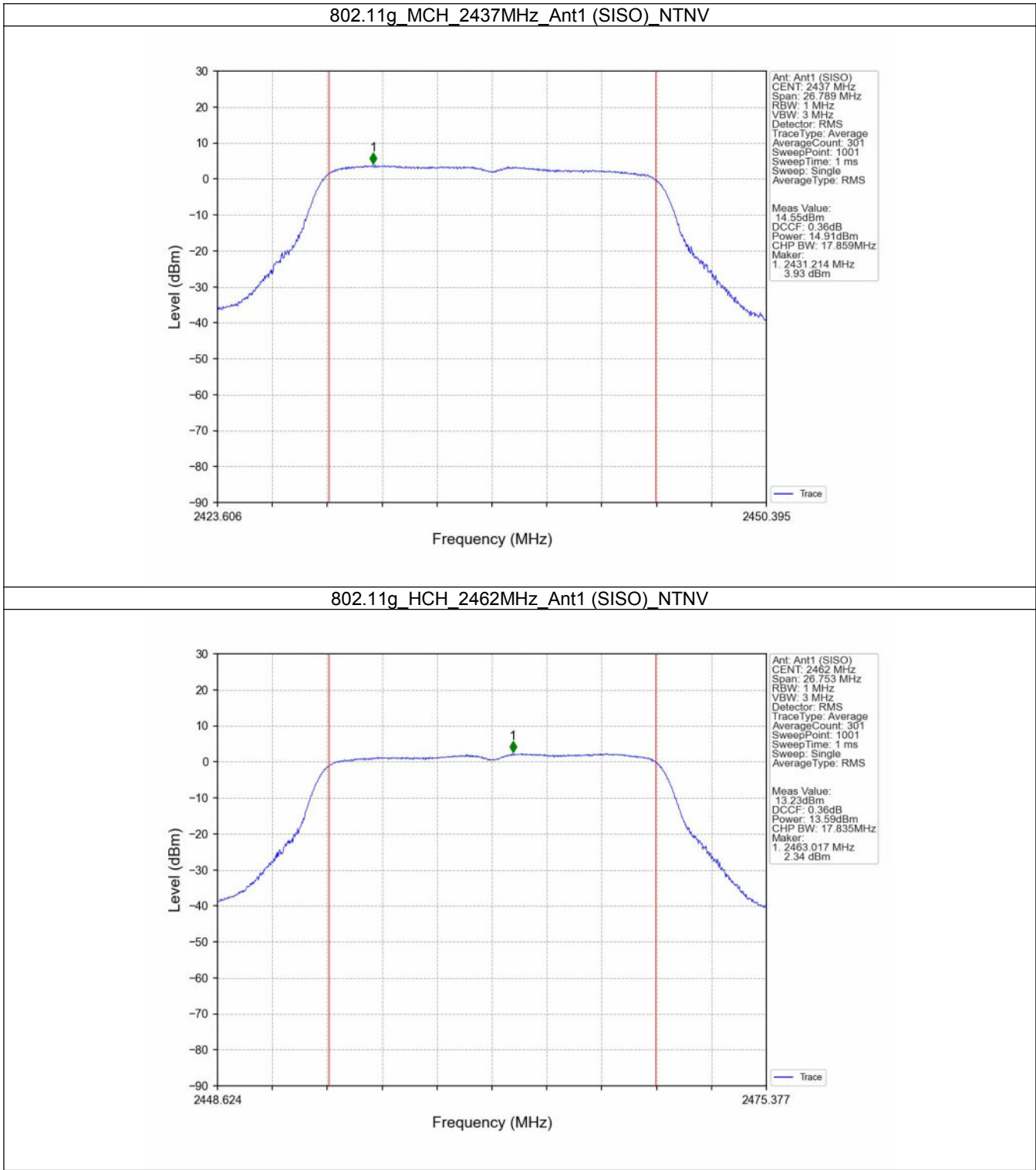
802.11b\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV



802.11g\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

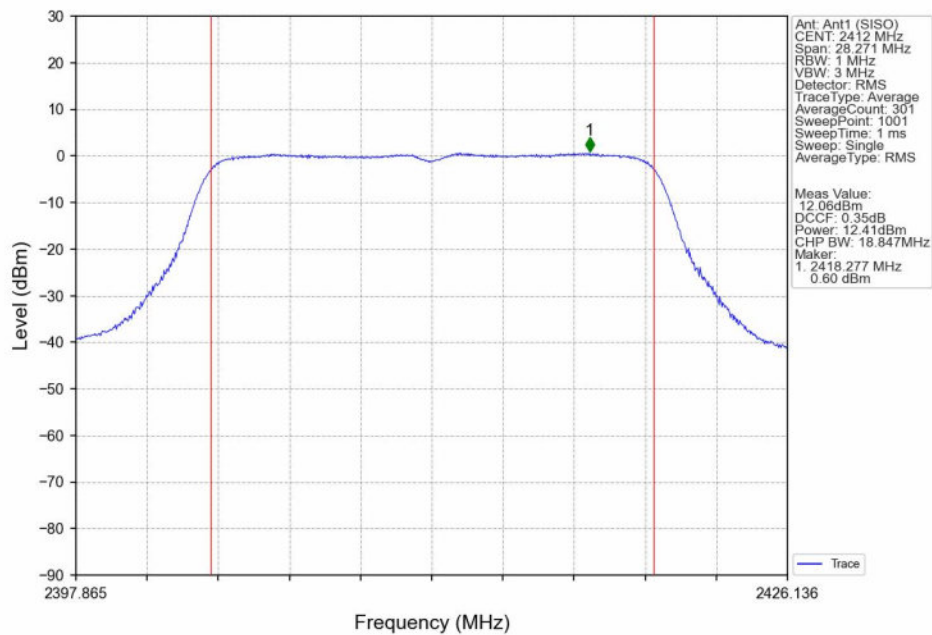


FCC ID: 2BD5N-SURFERS2

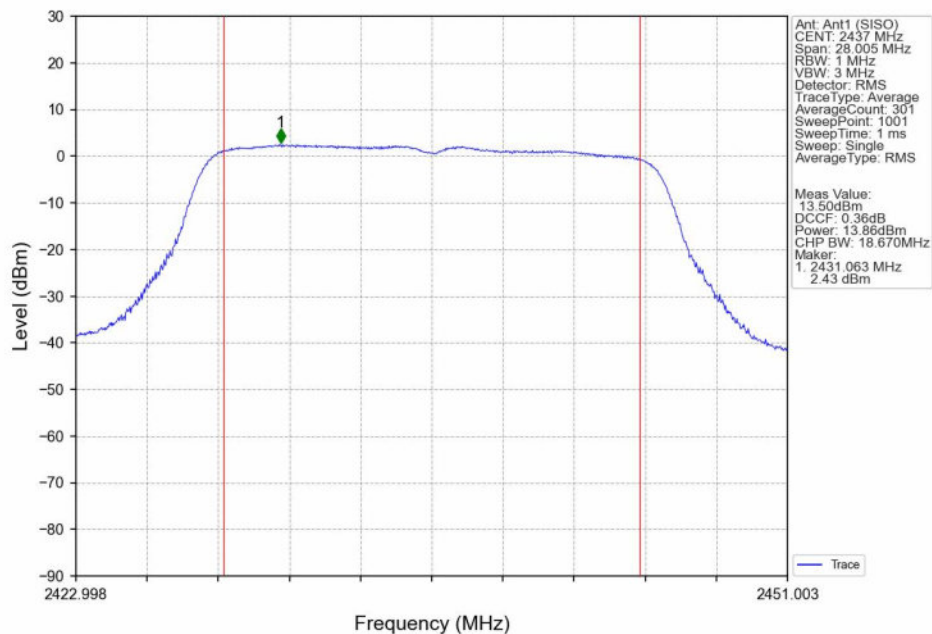


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

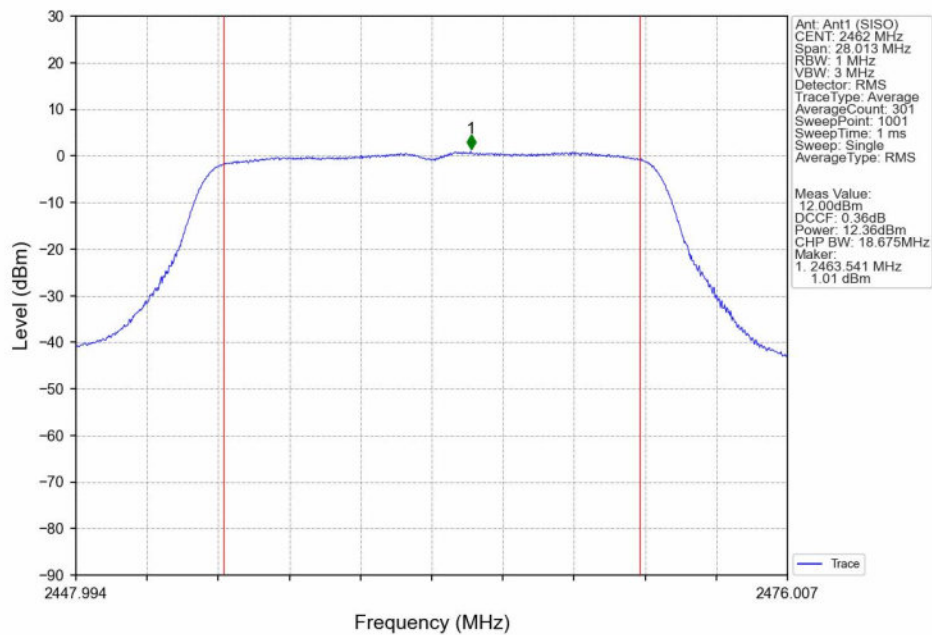


802.11n(HT20)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

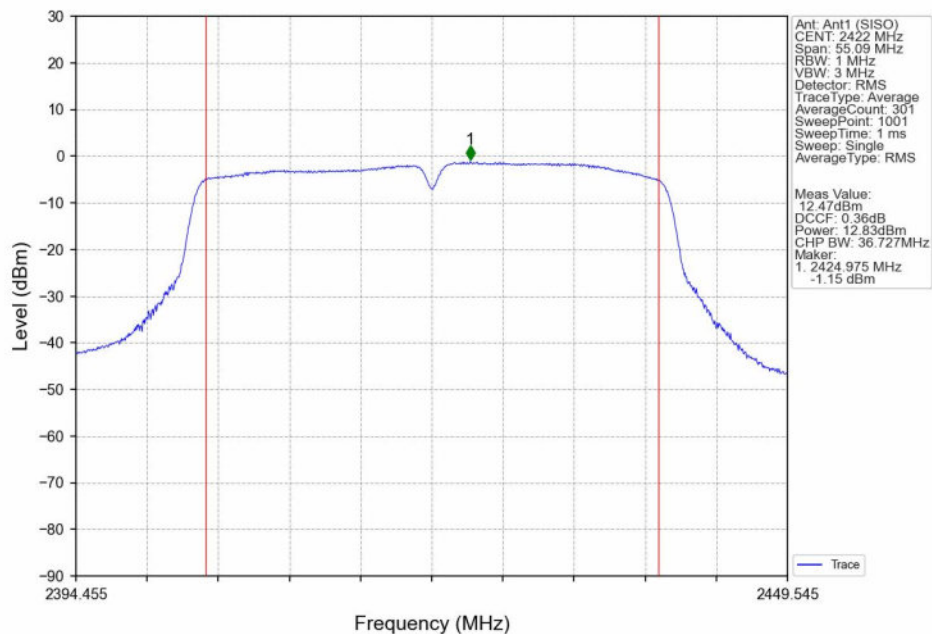


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

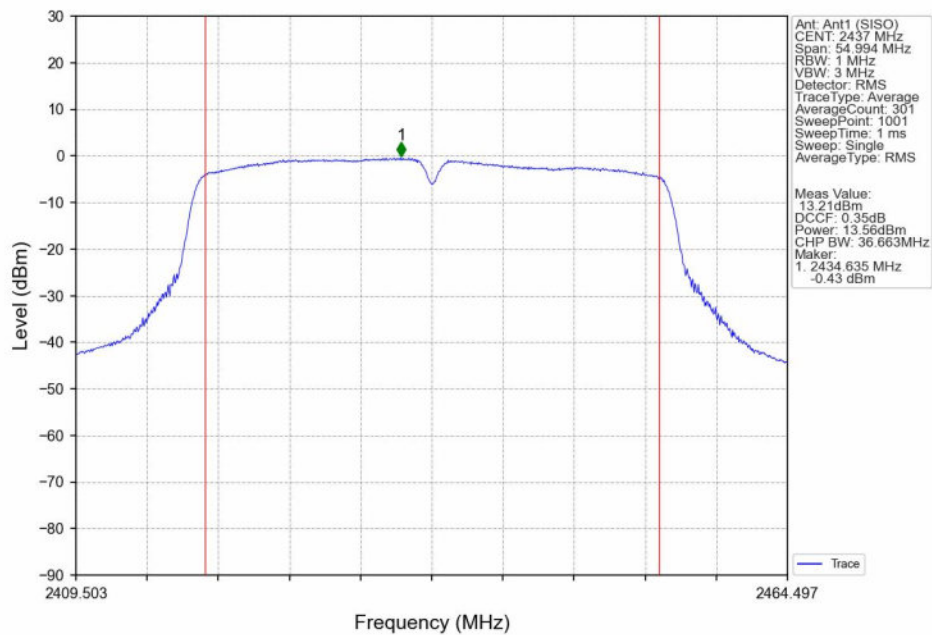


802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV

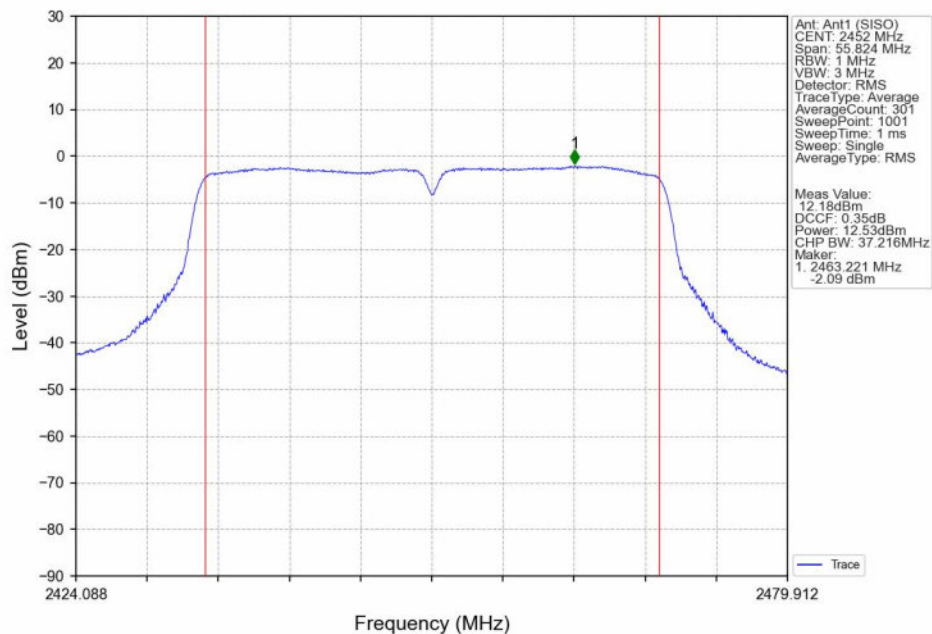


FCC ID: 2BD5N-SURFERS2

802.11n(HT40)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_HCH\_2452MHz\_Ant1 (SISO)\_NTNV



FCC ID: 2BD5N-SURFERS2

## 4. Maximum Power Spectral Density

### 4.1 Test Result

#### 4.1.1 PSD

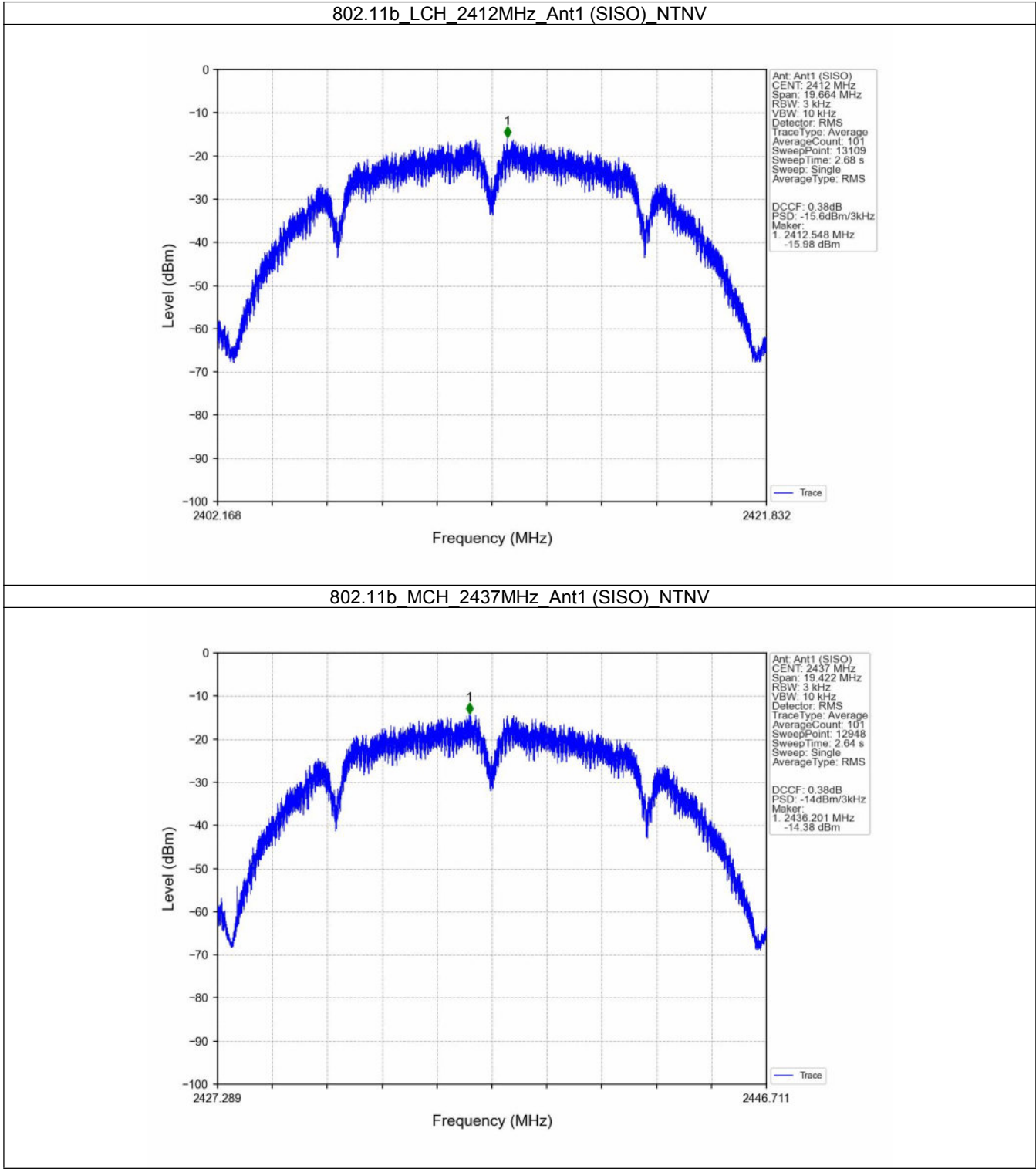
| Mode           | TX Type | Frequency (MHz) | Maximum PSD (dBm/3kHz) |       | Verdict |
|----------------|---------|-----------------|------------------------|-------|---------|
|                |         |                 | ANT1                   | Limit |         |
| 802.11b        | SISO    | 2412            | -15.60                 | <=8   | Pass    |
|                |         | 2437            | -14.00                 | <=8   | Pass    |
|                |         | 2462            | -15.13                 | <=8   | Pass    |
| 802.11g        | SISO    | 2412            | -16.47                 | <=8   | Pass    |
|                |         | 2437            | -14.75                 | <=8   | Pass    |
|                |         | 2462            | -15.94                 | <=8   | Pass    |
| 802.11n (HT20) | SISO    | 2412            | -16.77                 | <=8   | Pass    |
|                |         | 2437            | -15.22                 | <=8   | Pass    |
|                |         | 2462            | -17.02                 | <=8   | Pass    |
| 802.11n (HT40) | SISO    | 2422            | -18.28                 | <=8   | Pass    |
|                |         | 2437            | -18.74                 | <=8   | Pass    |
|                |         | 2452            | -19.48                 | <=8   | Pass    |

Note1: Antenna Gain: Ant1: 1.06dBi;

FCC ID: 2BD5N-SURFERS2

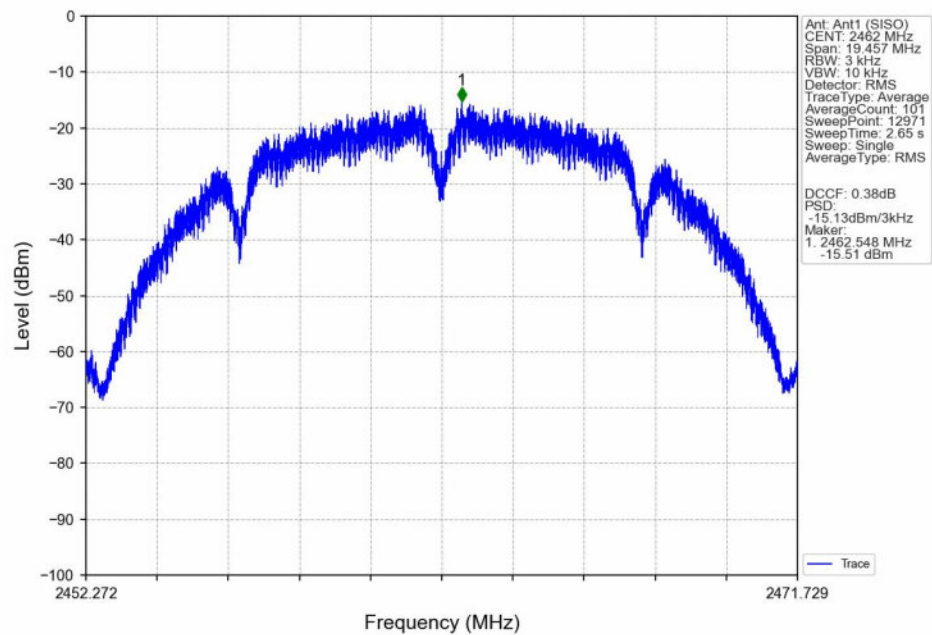
4.2 Test Graph

4.2.1 PSD

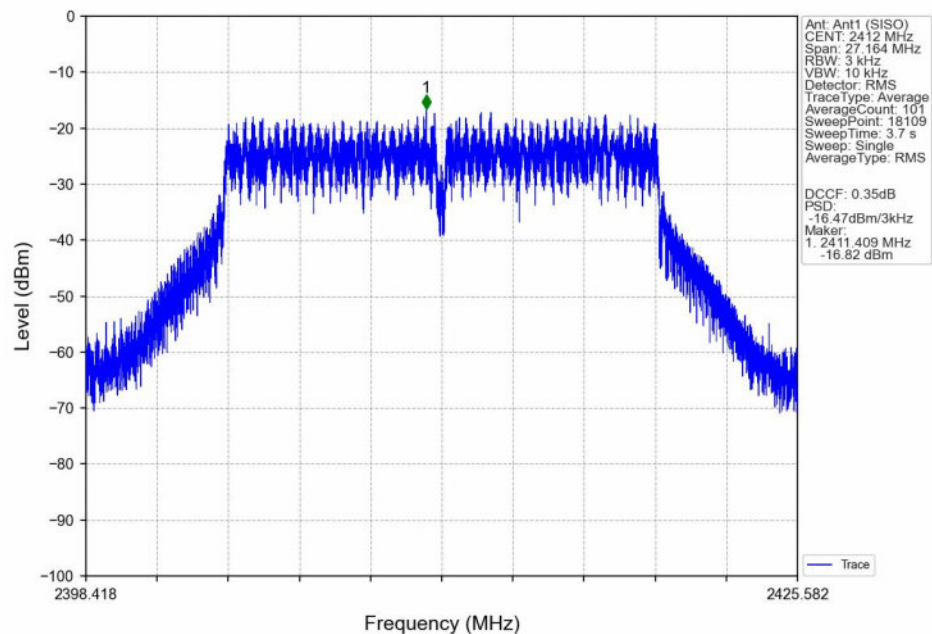


FCC ID: 2BD5N-SURFERS2

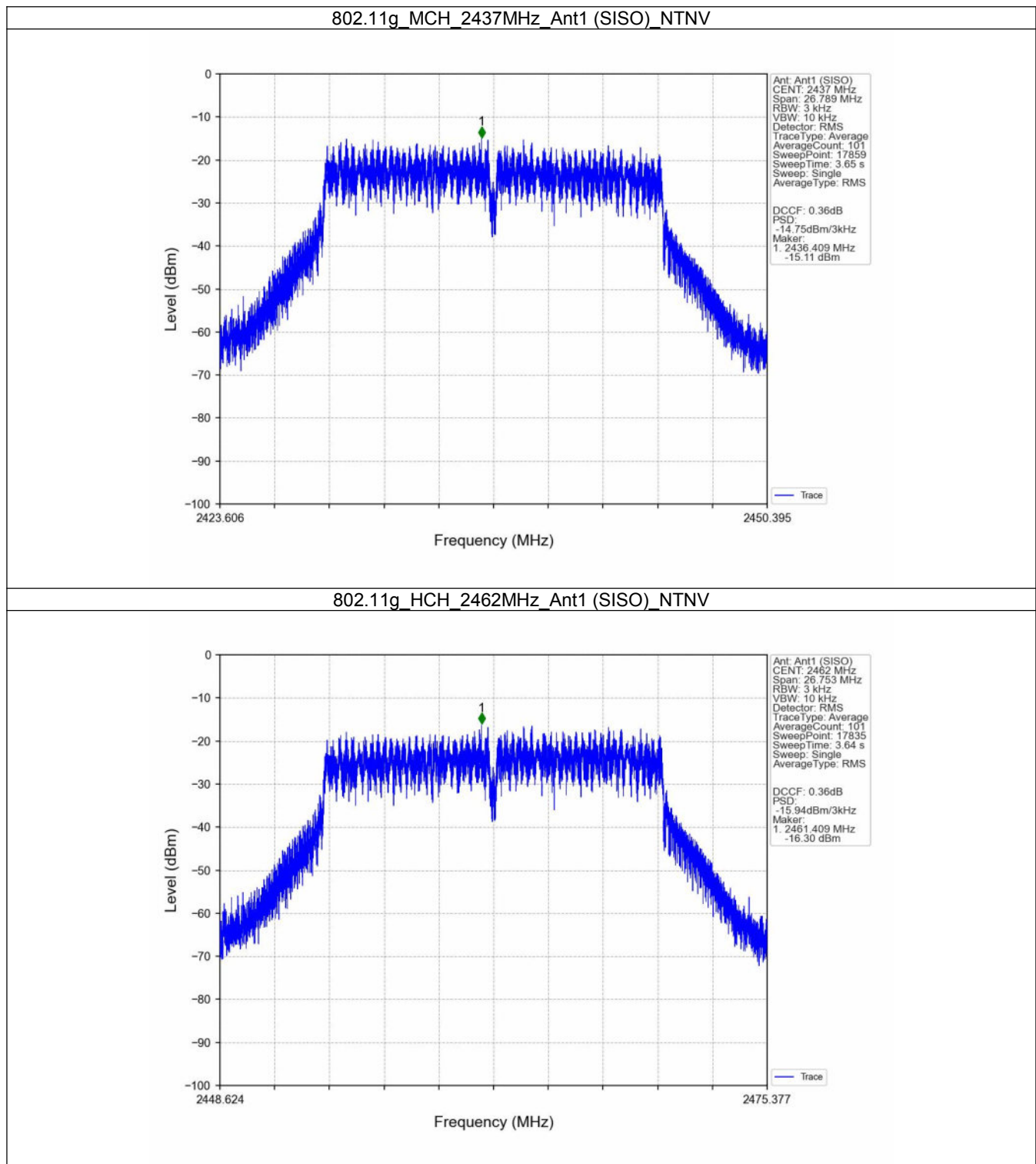
802.11b\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV



802.11g\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

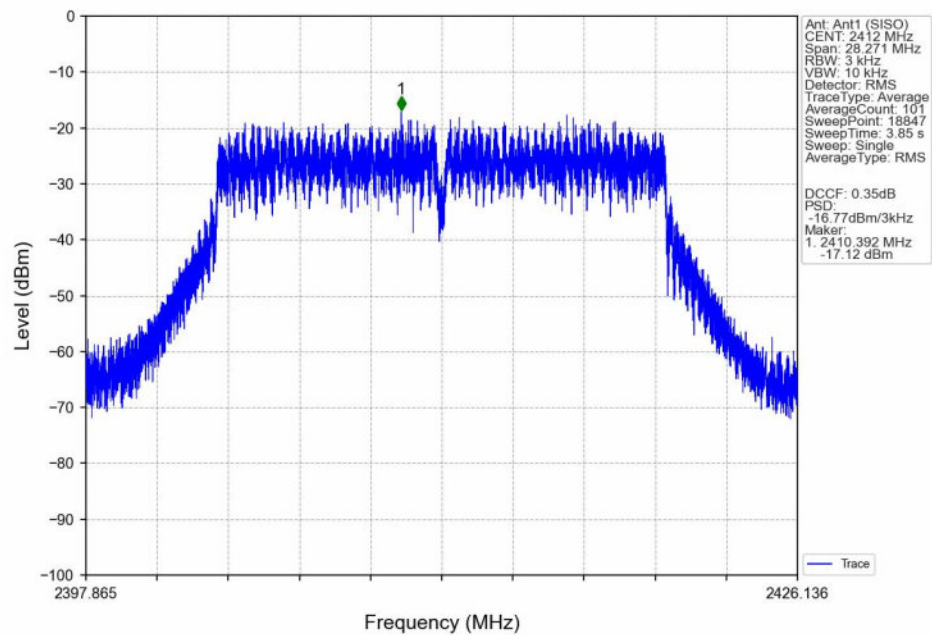


FCC ID: 2BD5N-SURFERS2

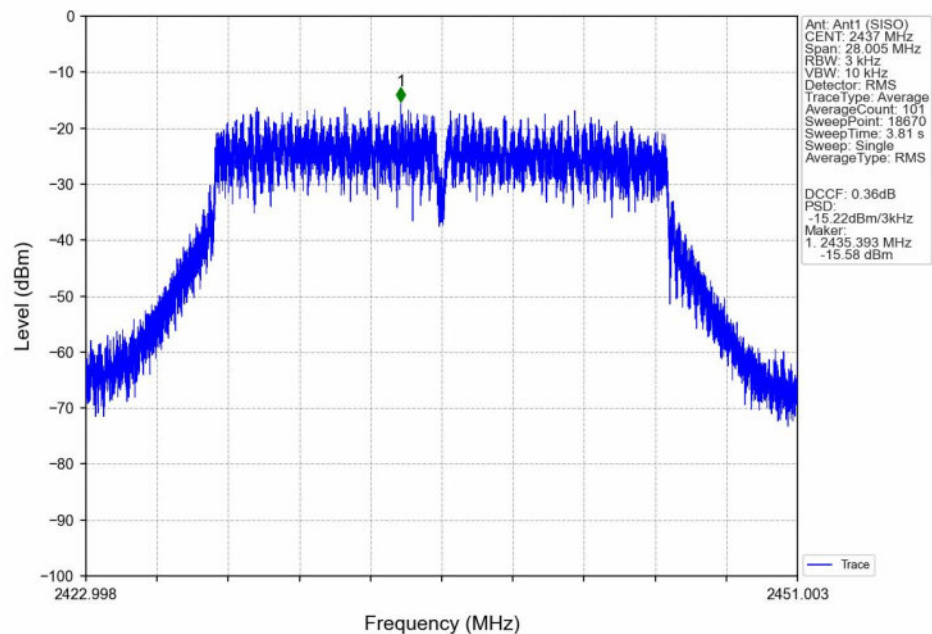


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

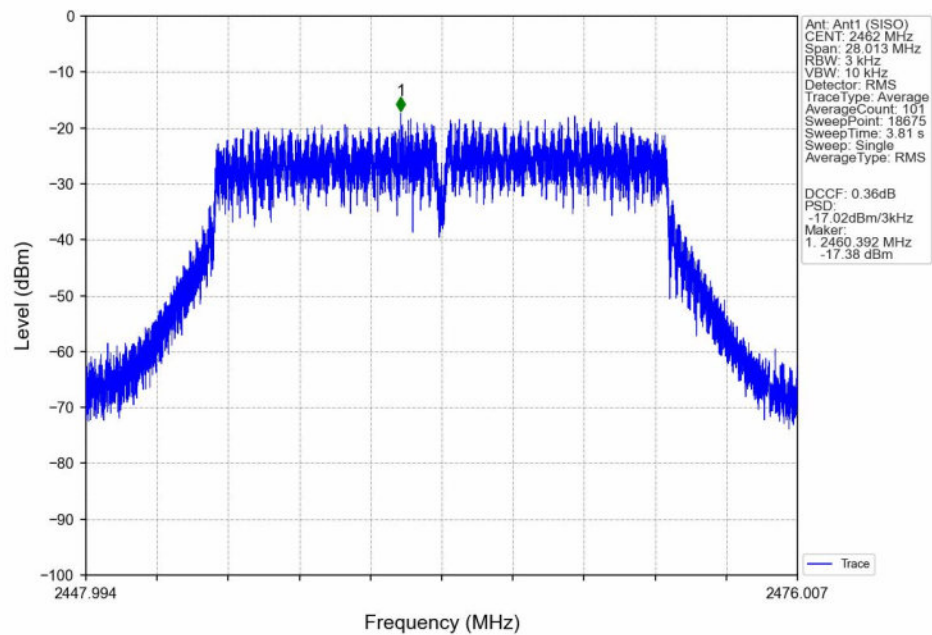


802.11n(HT20)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

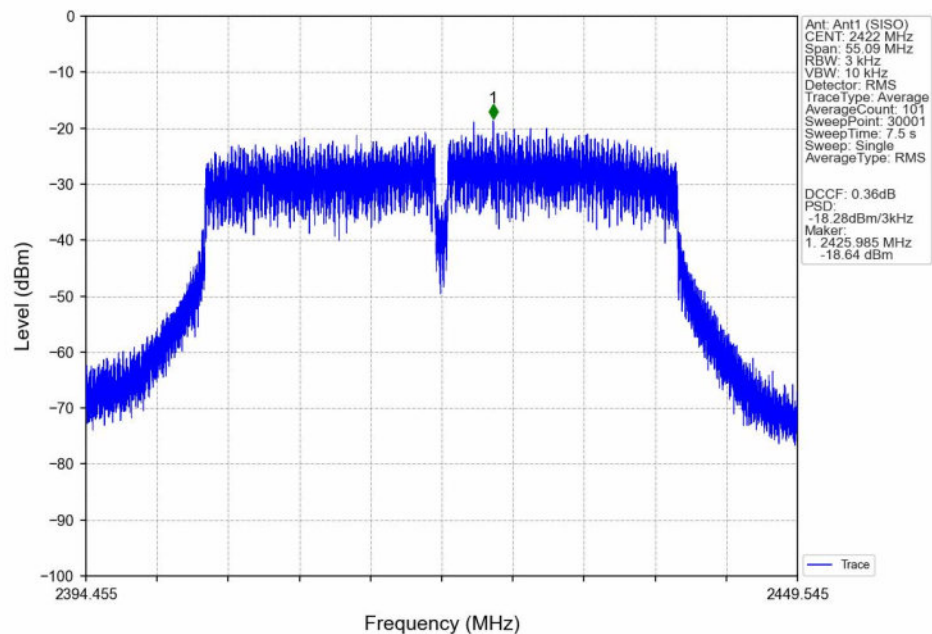


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

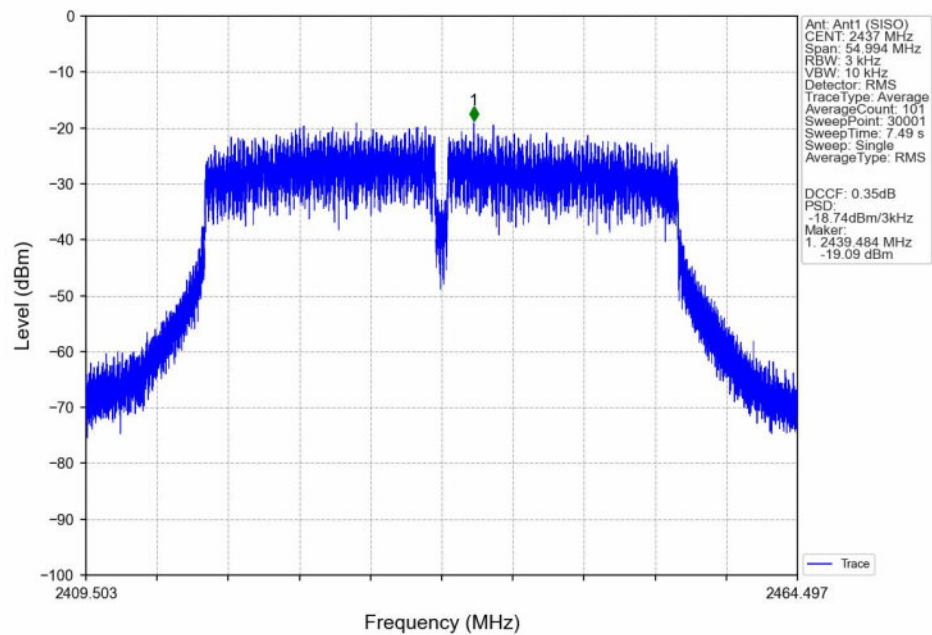


802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV

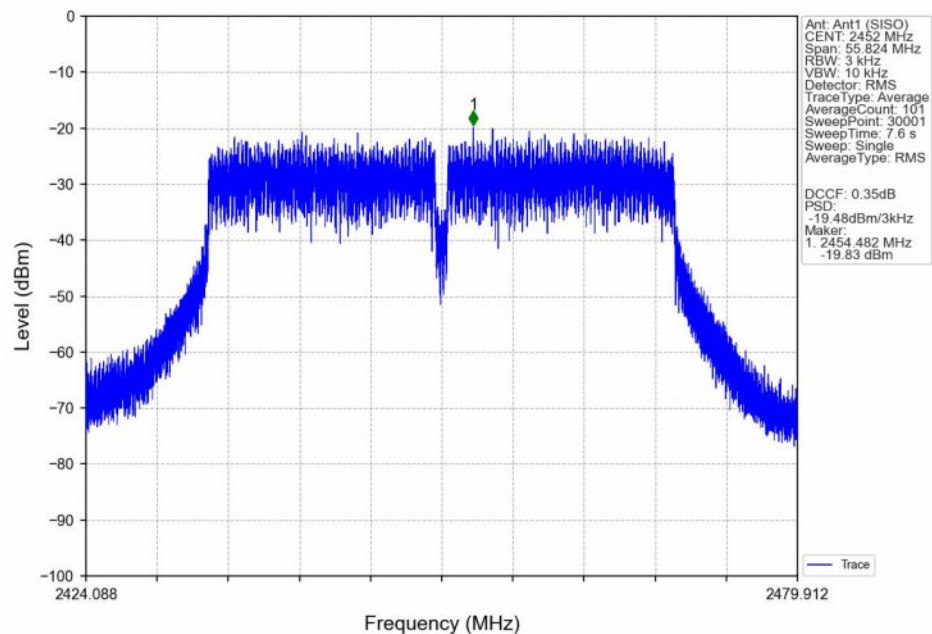


FCC ID: 2BD5N-SURFERS2

802.11n(HT40)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_HCH\_2452MHz\_Ant1 (SISO)\_NTNV



## 5. Unwanted Emissions In Non-restricted Frequency Bands

### 5.1 Test Result

#### 5.1.1 Ref

| Mode           | TX Type | Frequency (MHz) | ANT | Level of Reference (dBm) |
|----------------|---------|-----------------|-----|--------------------------|
| 802.11b        | SISO    | 2412            | 1   | 4.66                     |
|                |         | 2437            | 1   | 6.37                     |
|                |         | 2462            | 1   | 5.17                     |
| 802.11g        | SISO    | 2412            | 1   | 2.34                     |
|                |         | 2437            | 1   | 4.18                     |
|                |         | 2462            | 1   | 2.78                     |
| 802.11n (HT20) | SISO    | 2412            | 1   | 1.51                     |
|                |         | 2437            | 1   | 3.20                     |
|                |         | 2462            | 1   | 1.82                     |
| 802.11n (HT40) | SISO    | 2422            | 1   | -0.18                    |
|                |         | 2437            | 1   | 0.32                     |
|                |         | 2452            | 1   | -1.05                    |

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

#### 5.1.2 CSE

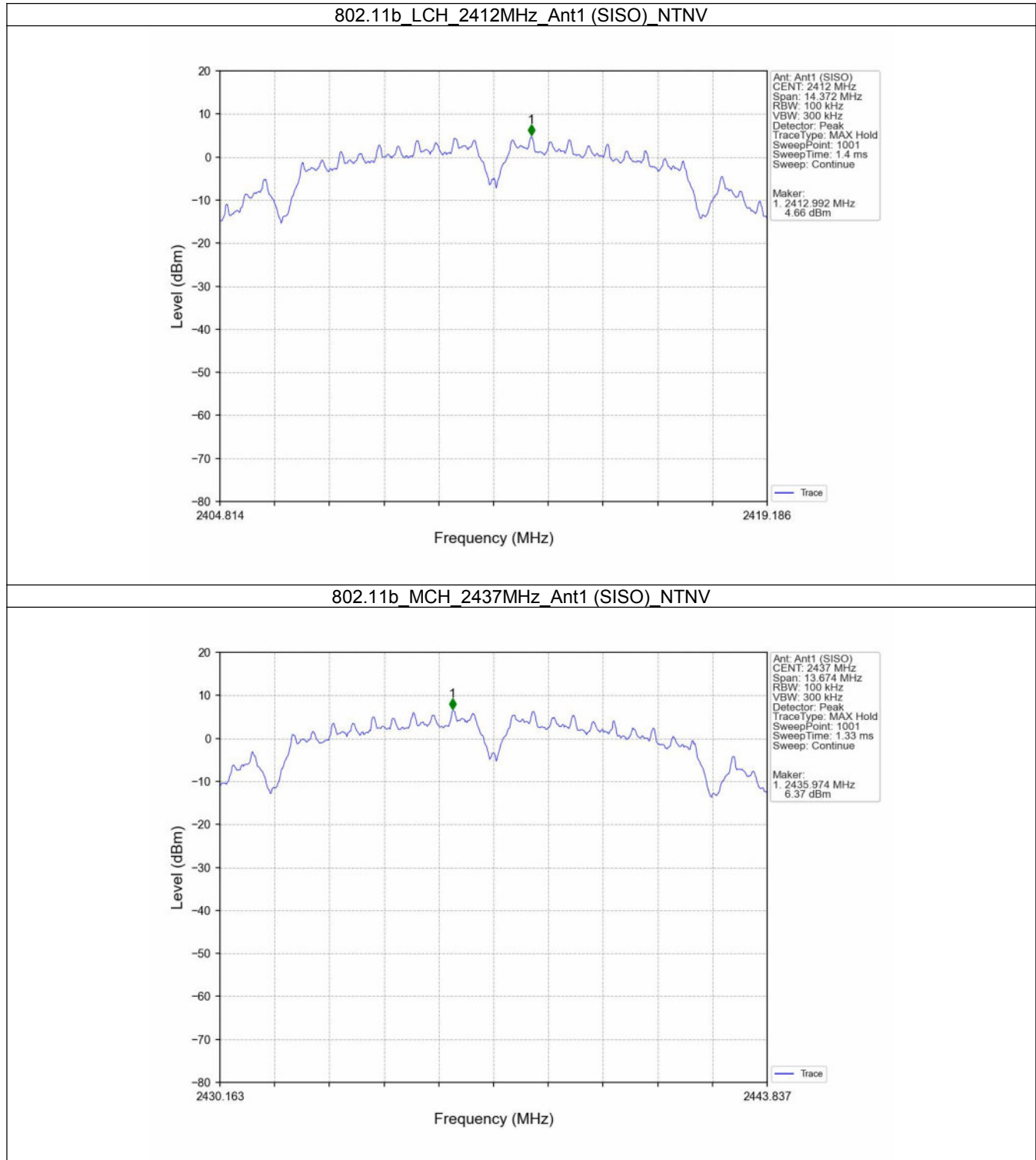
| Mode           | TX Type | Frequency (MHz) | ANT | Level of Reference (dBm) | Limit (dBm) | Verdict |
|----------------|---------|-----------------|-----|--------------------------|-------------|---------|
| 802.11b        | SISO    | 2412            | 1   | 6.37                     | -23.63      | Pass    |
|                |         | 2437            | 1   | 6.37                     | -23.63      | Pass    |
|                |         | 2462            | 1   | 6.37                     | -23.63      | Pass    |
| 802.11g        | SISO    | 2412            | 1   | 4.18                     | -25.82      | Pass    |
|                |         | 2437            | 1   | 4.18                     | -25.82      | Pass    |
|                |         | 2462            | 1   | 4.18                     | -25.82      | Pass    |
| 802.11n (HT20) | SISO    | 2412            | 1   | 3.20                     | -26.80      | Pass    |
|                |         | 2437            | 1   | 3.20                     | -26.80      | Pass    |
|                |         | 2462            | 1   | 3.20                     | -26.80      | Pass    |
| 802.11n (HT40) | SISO    | 2422            | 1   | 0.32                     | -29.68      | Pass    |
|                |         | 2437            | 1   | 0.32                     | -29.68      | Pass    |
|                |         | 2452            | 1   | 0.32                     | -29.68      | Pass    |

Note1: Refer to FCC Part 15.247 (d) and ANSI C63.10-2013, the channel contains the maximum PSD level was used to establish the reference level.

FCC ID: 2BD5N-SURFERS2

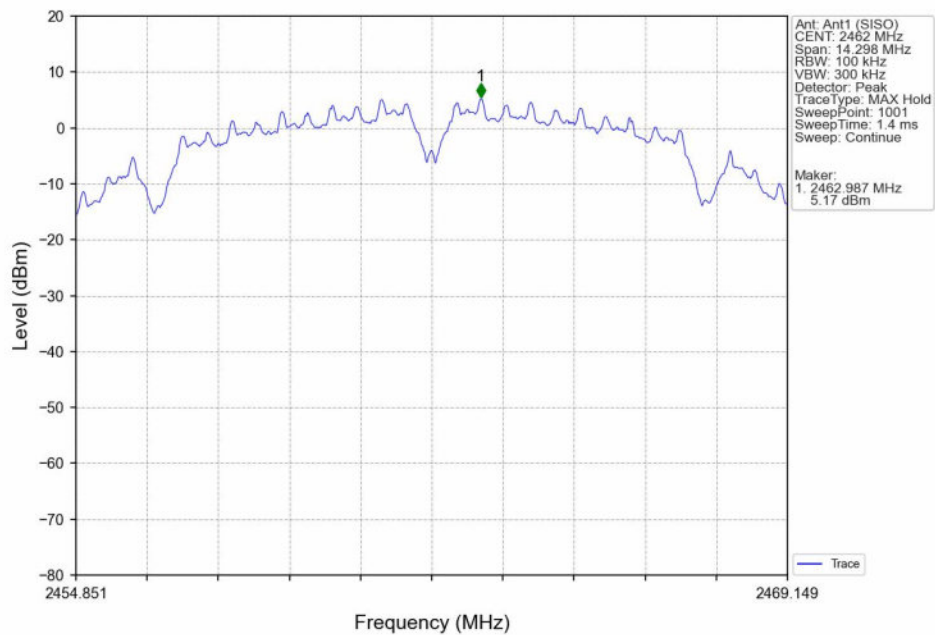
## 5.2 Test Graph

### 5.2.1 Ref

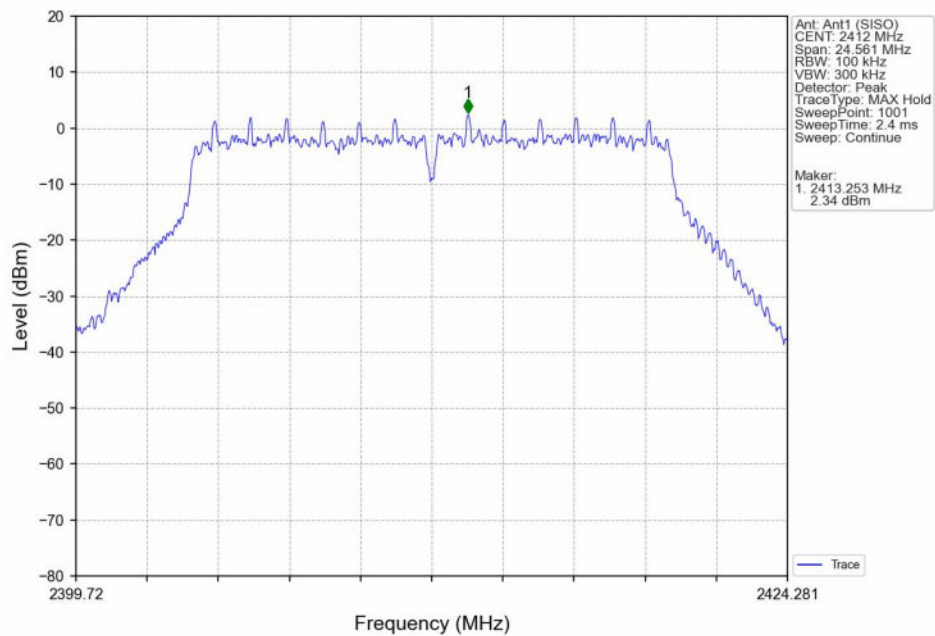


FCC ID: 2BD5N-SURFERS2

802.11b\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

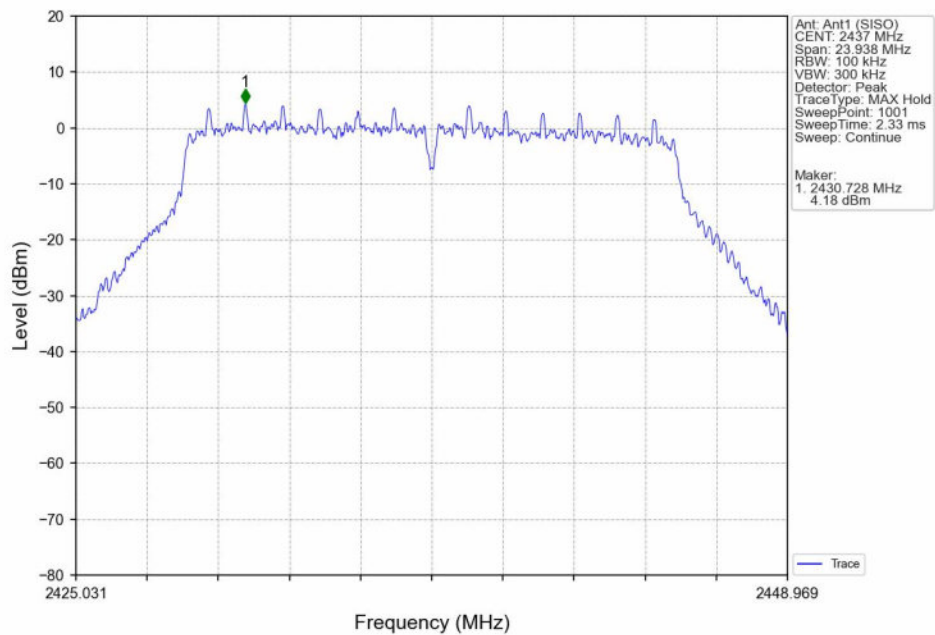


802.11g\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

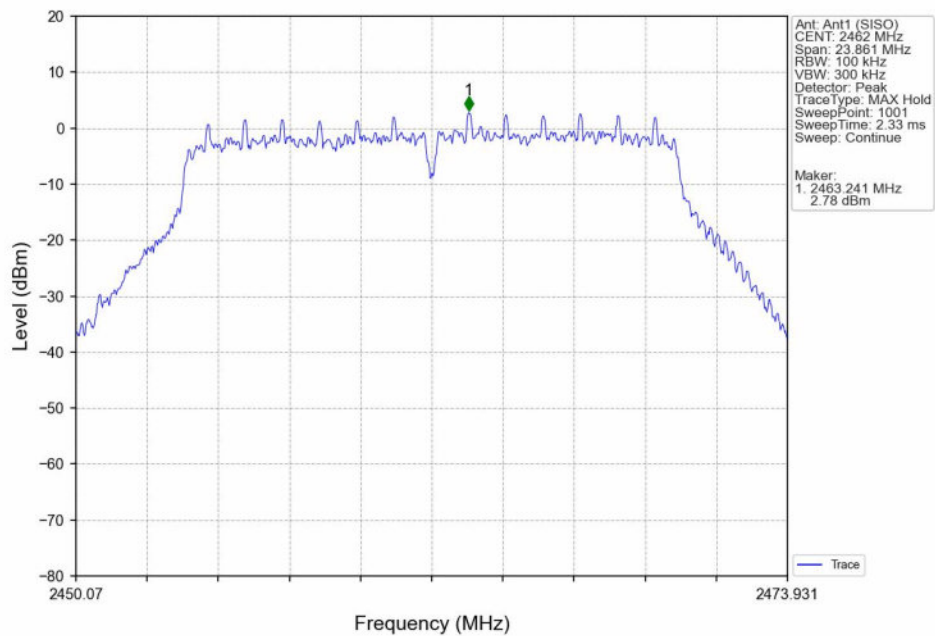


FCC ID: 2BD5N-SURFERS2

802.11g\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

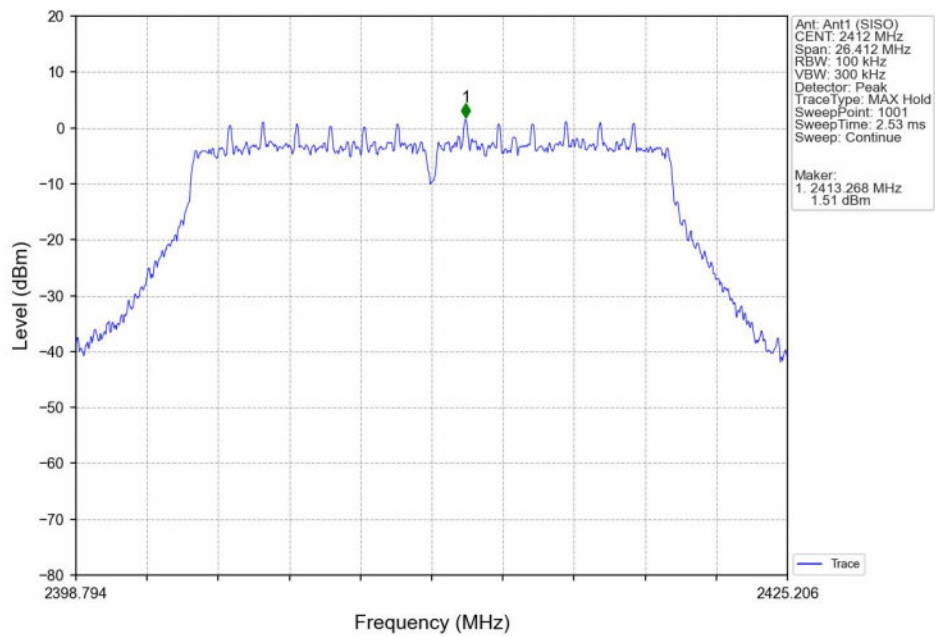


802.11g\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

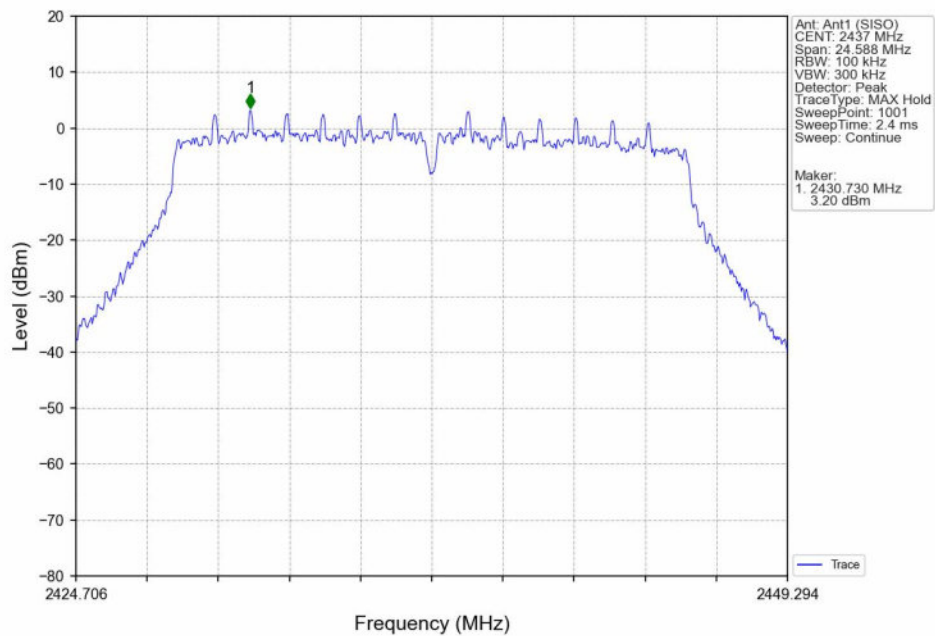


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

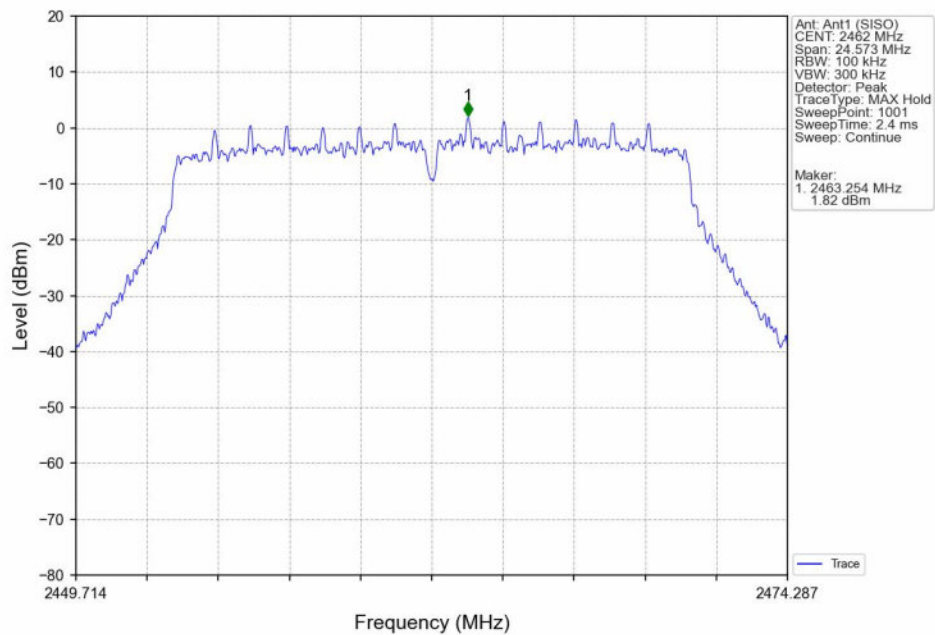


802.11n(HT20)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

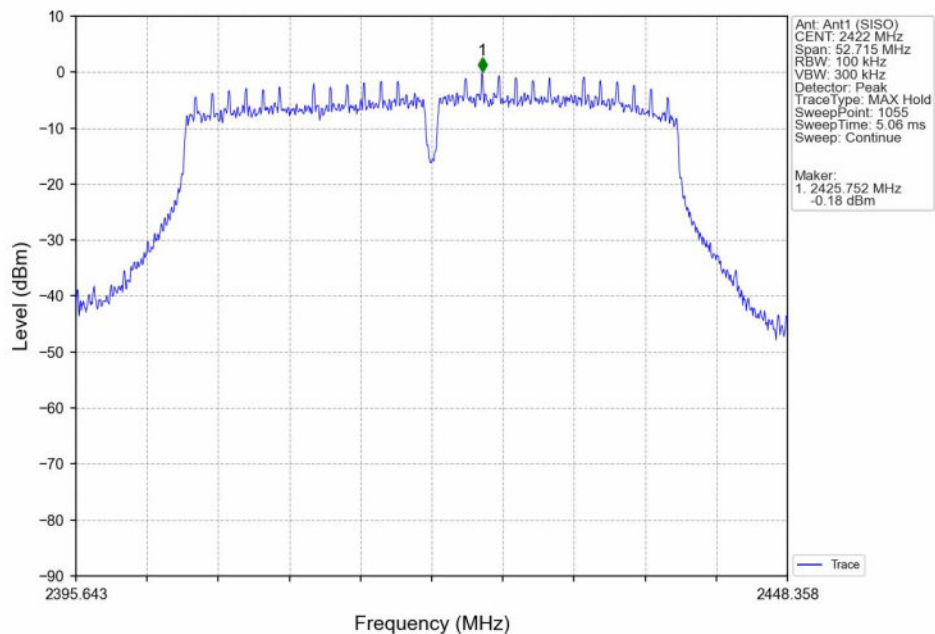


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

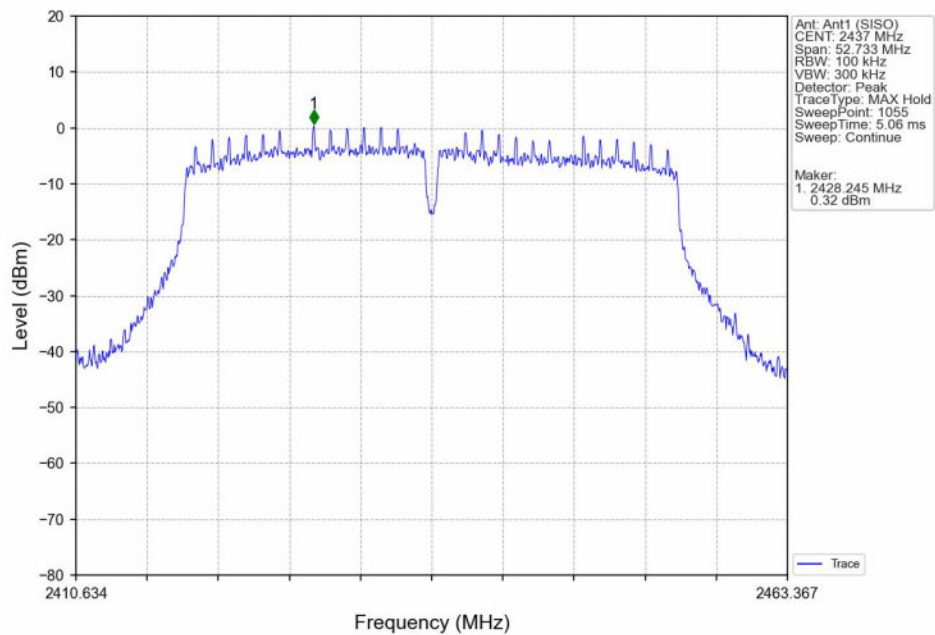


802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV

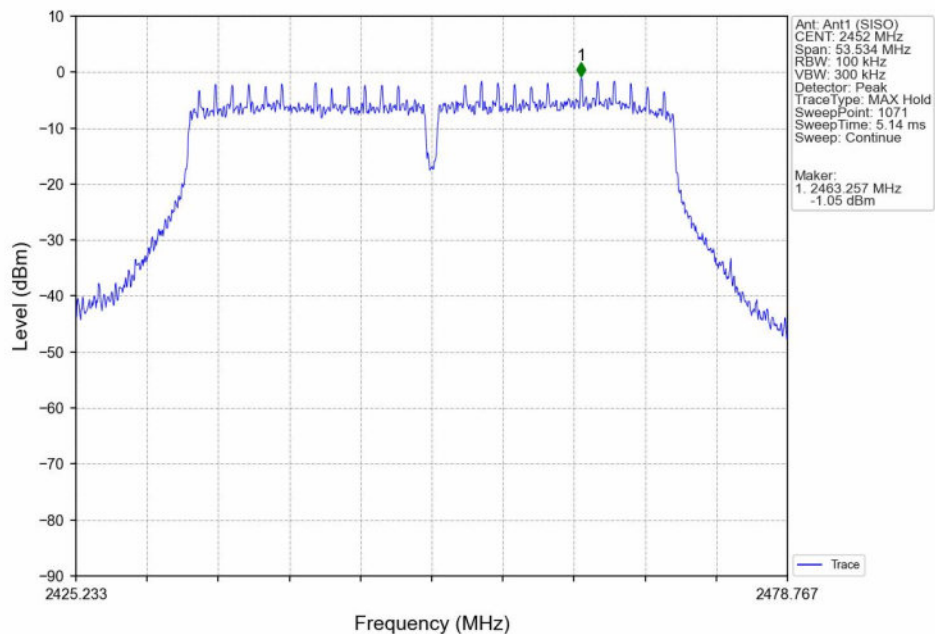


FCC ID: 2BD5N-SURFERS2

802.11n(HT40)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

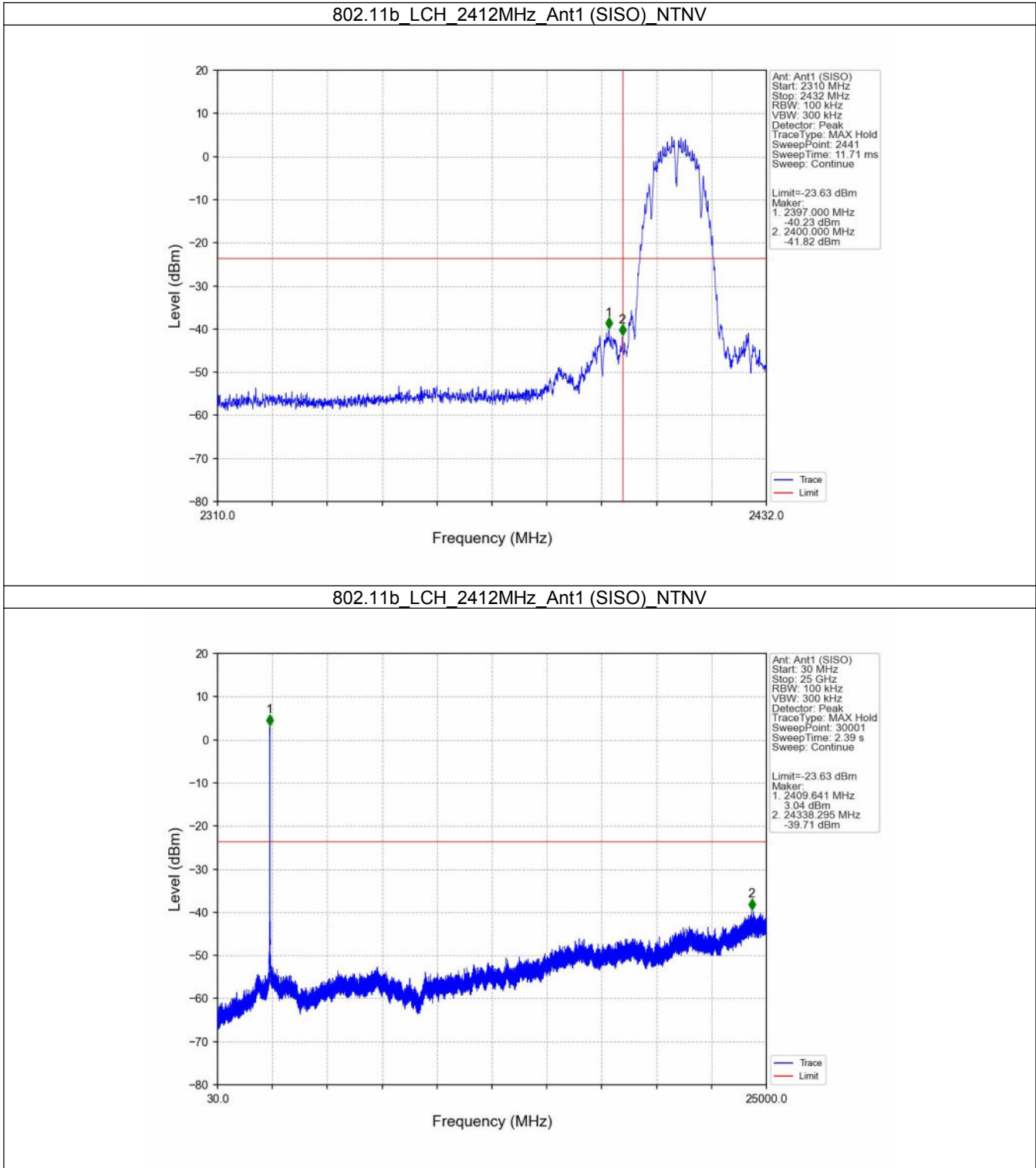


802.11n(HT40)\_HCH\_2452MHz\_Ant1 (SISO)\_NTNV



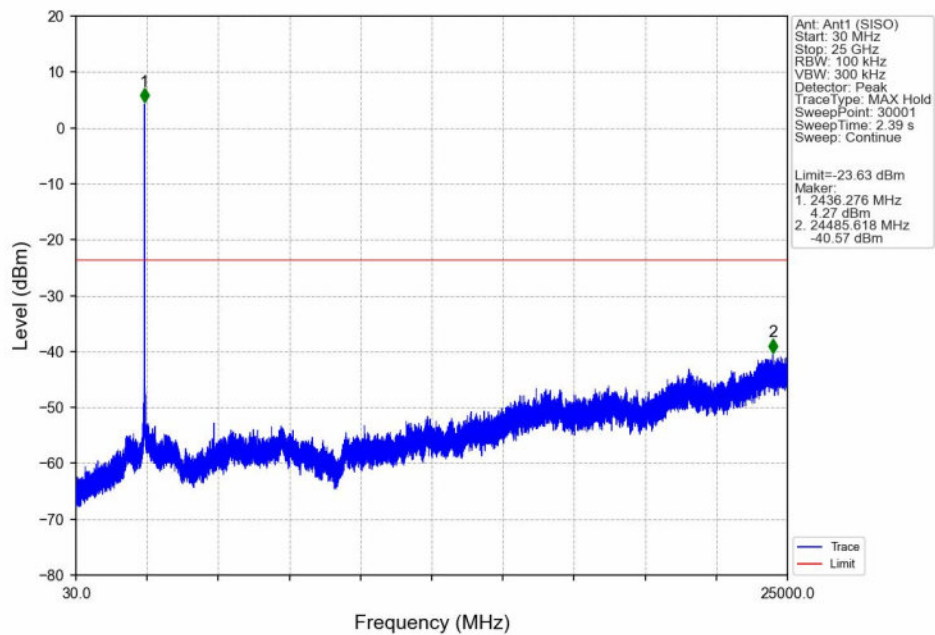
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5.2.2 CSE

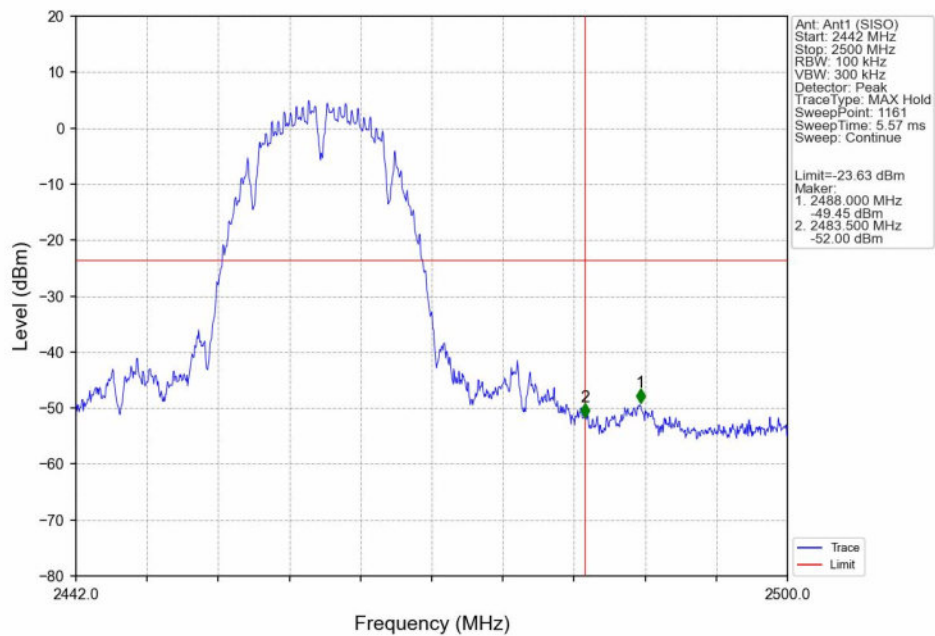


FCC ID: 2BD5N-SURFERS2

802.11b\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

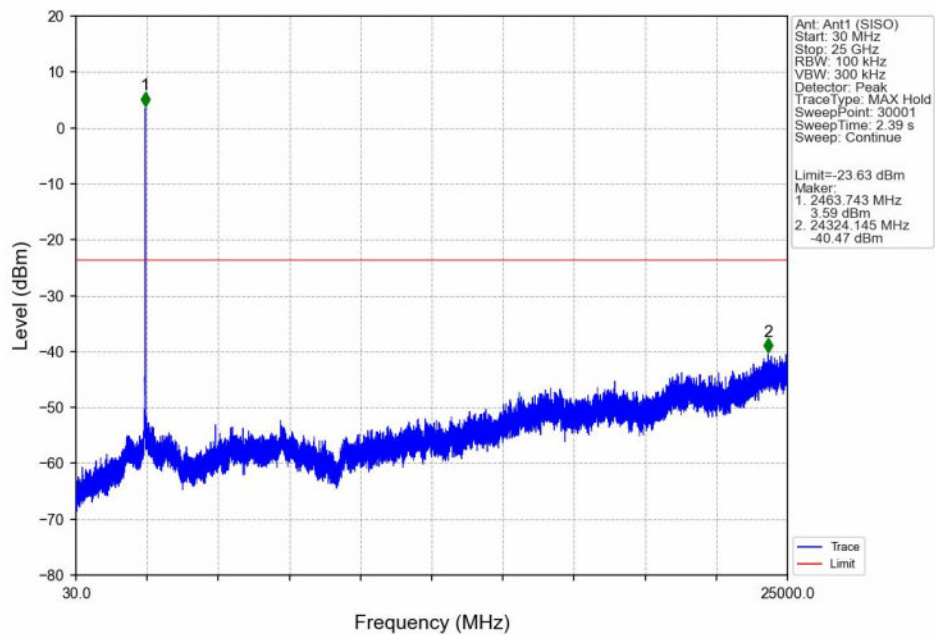


802.11b\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

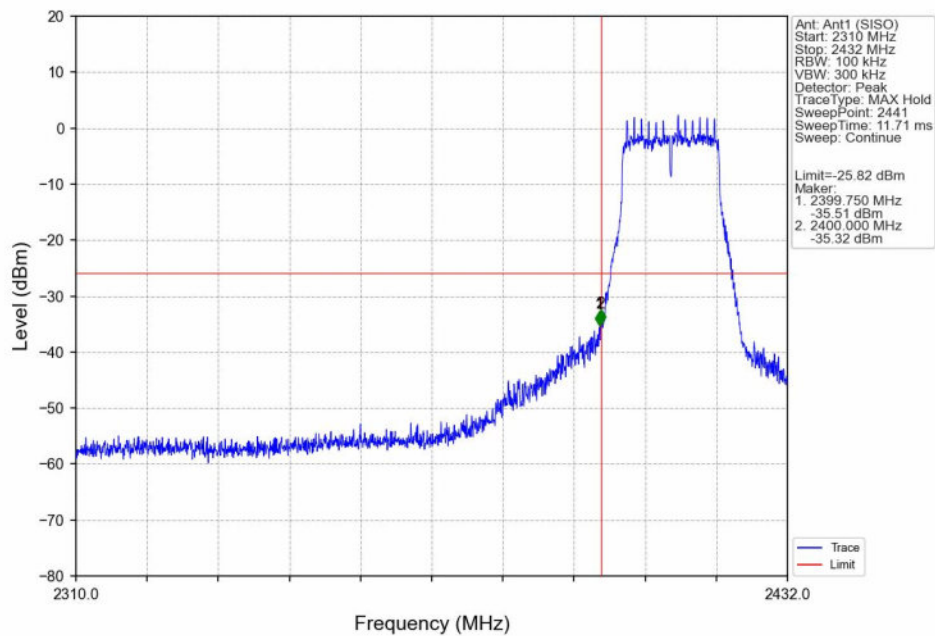


FCC ID: 2BD5N-SURFERS2

802.11b\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

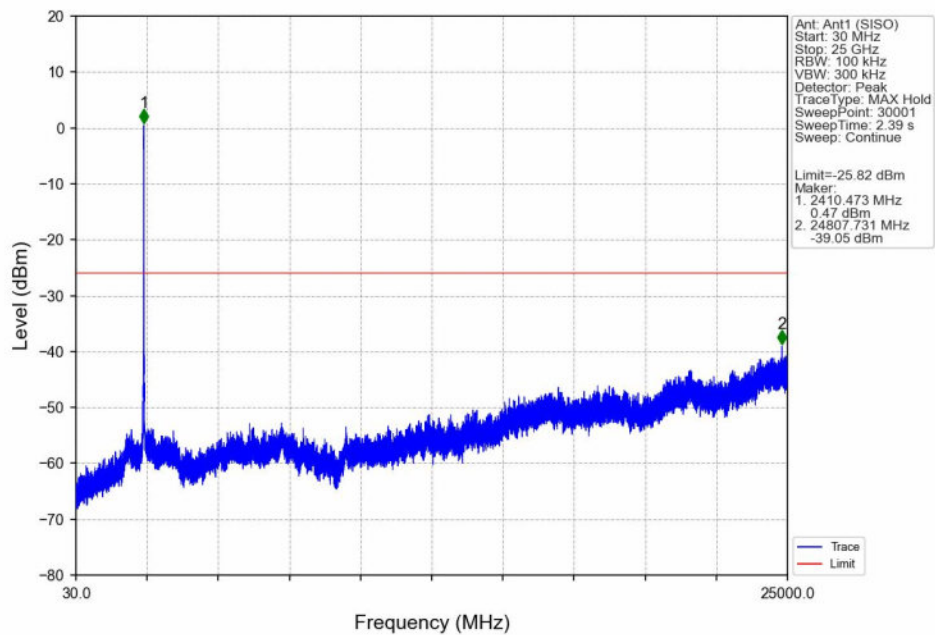


802.11g\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

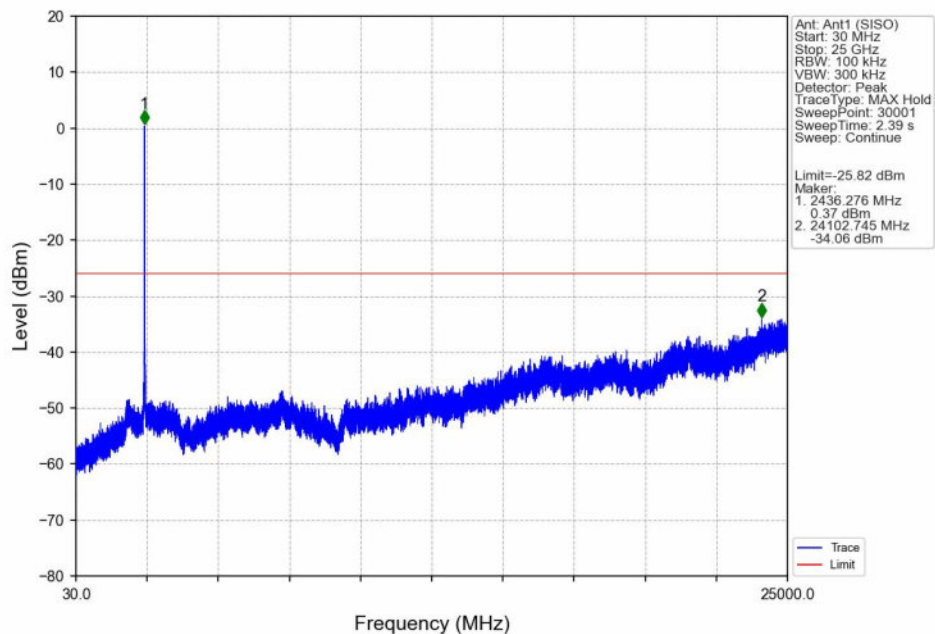


FCC ID: 2BD5N-SURFERS2

802.11g\_LCH\_2412MHz\_Ant1 (SISO)\_NTNV

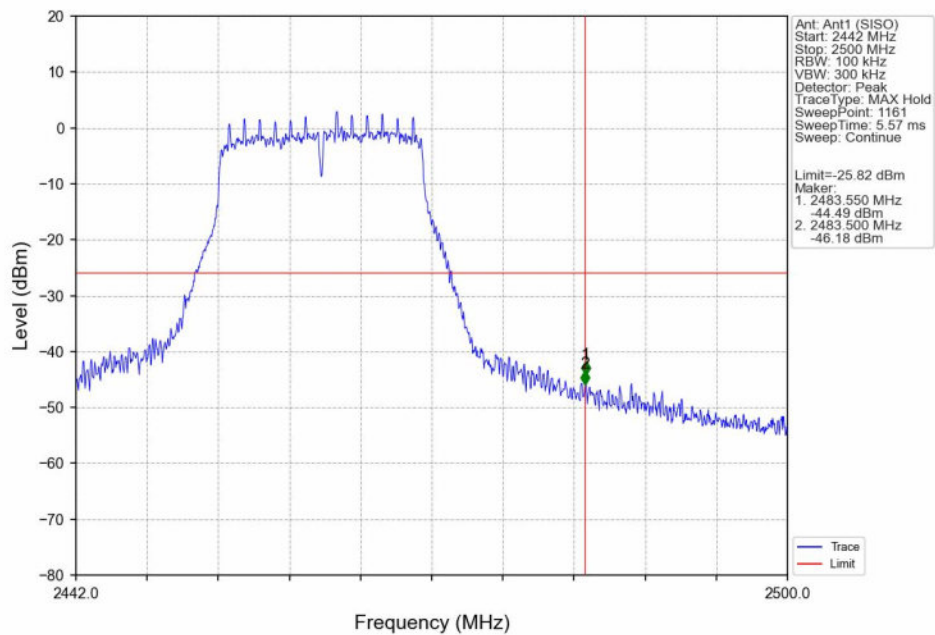


802.11g\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV

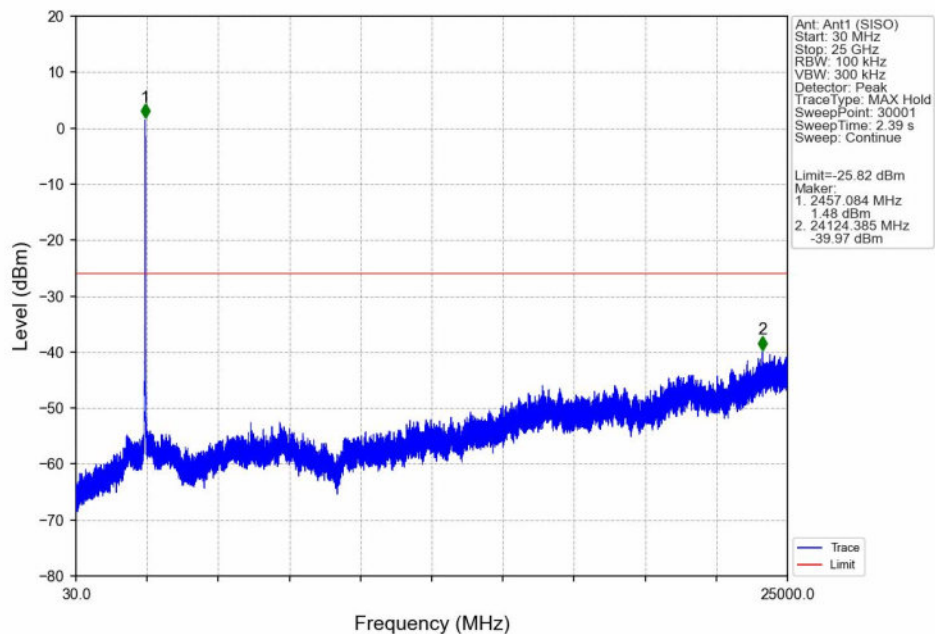


FCC ID: 2BD5N-SURFERS2

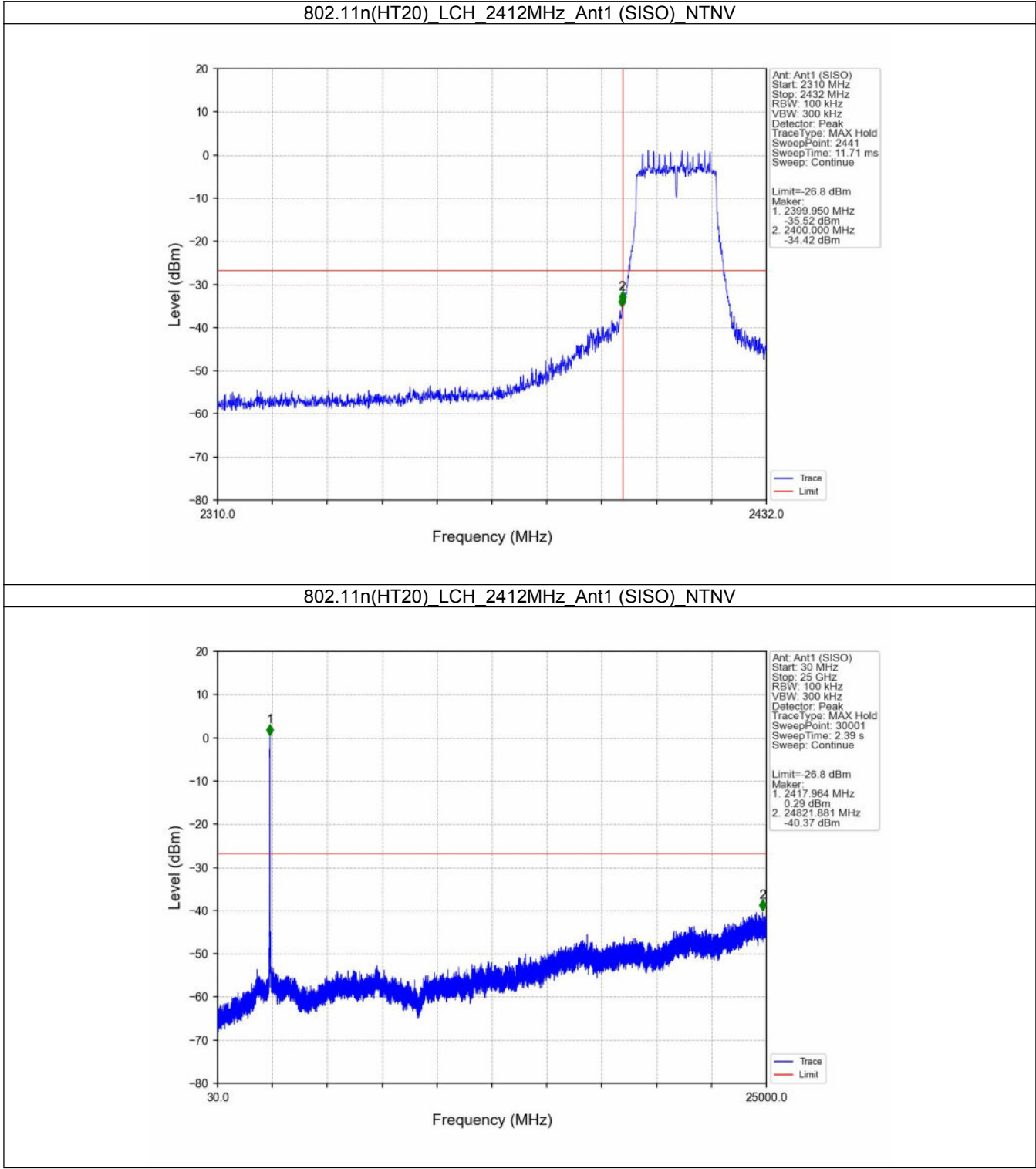
802.11g\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV



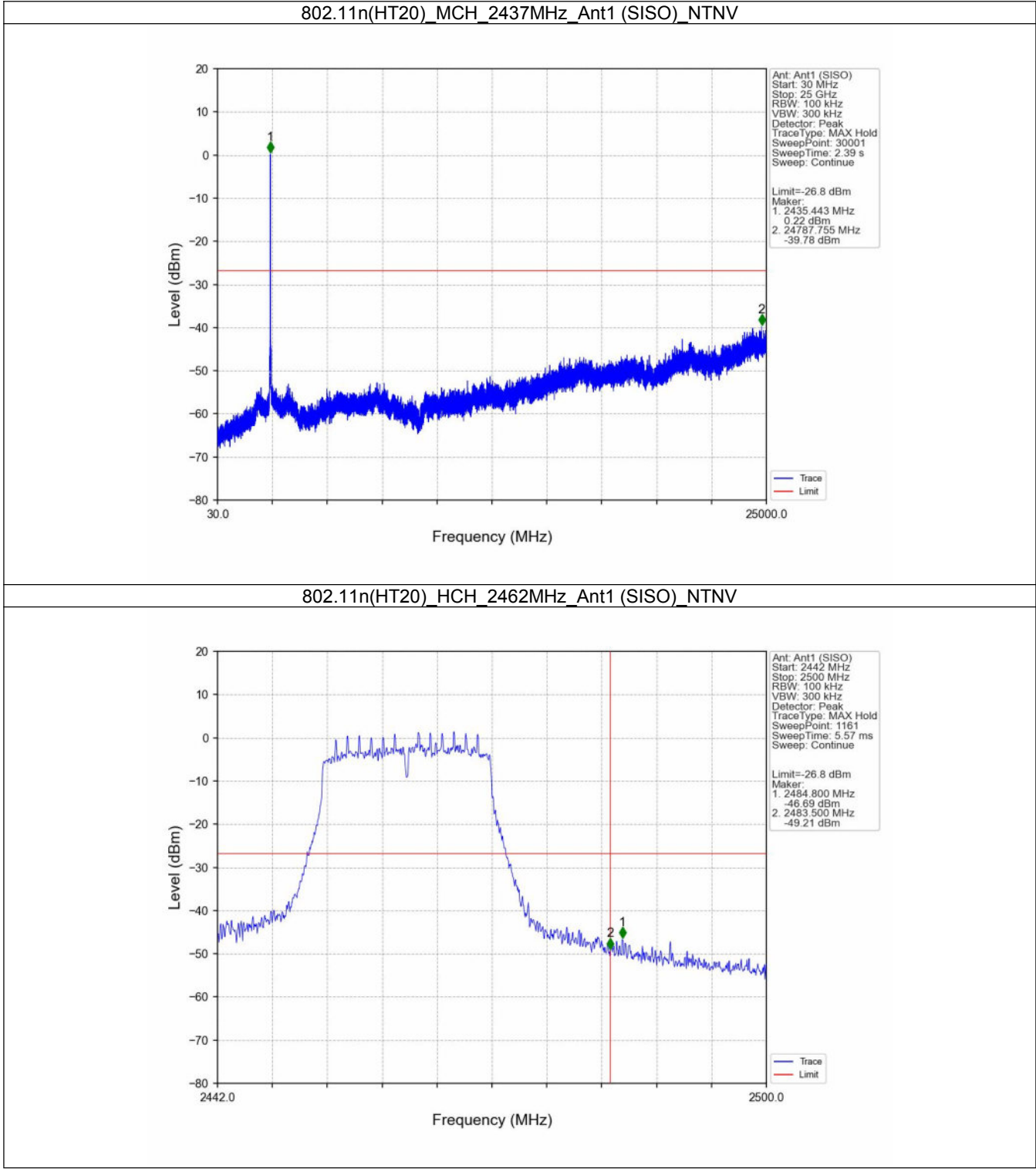
802.11g\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV



FCC ID: 2BD5N-SURFERS2

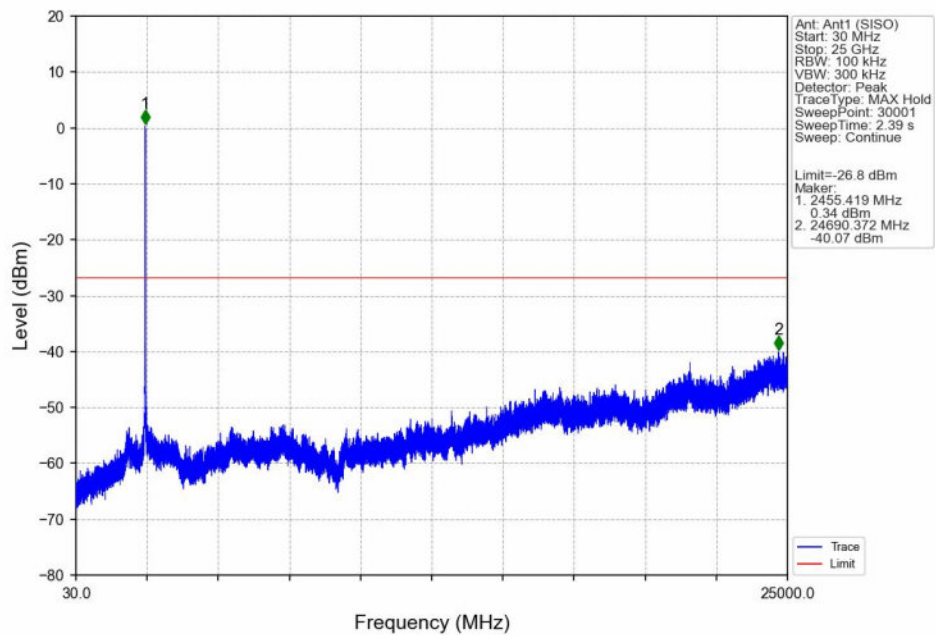


FCC ID: 2BD5N-SURFERS2

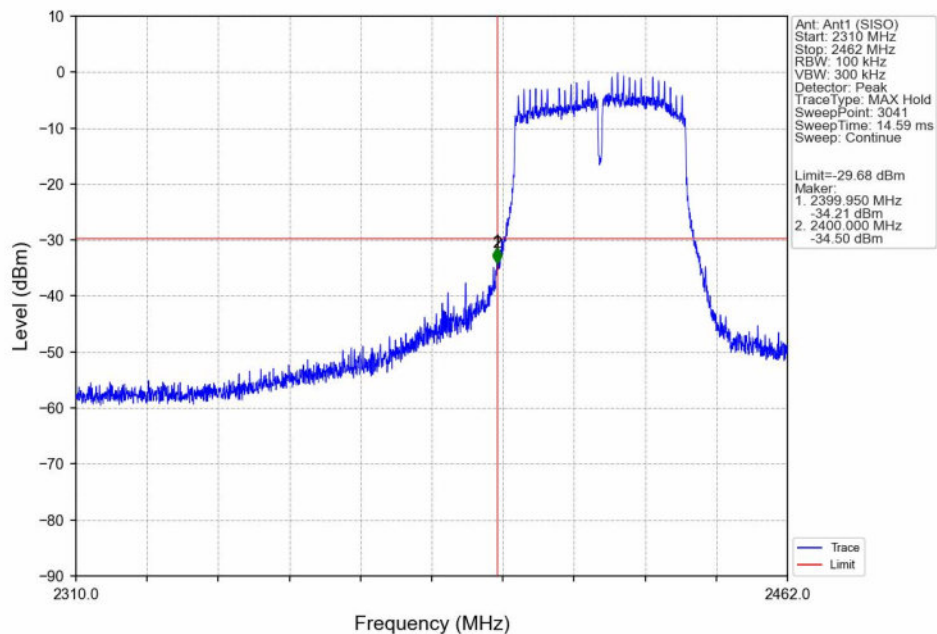


FCC ID: 2BD5N-SURFERS2

802.11n(HT20)\_HCH\_2462MHz\_Ant1 (SISO)\_NTNV

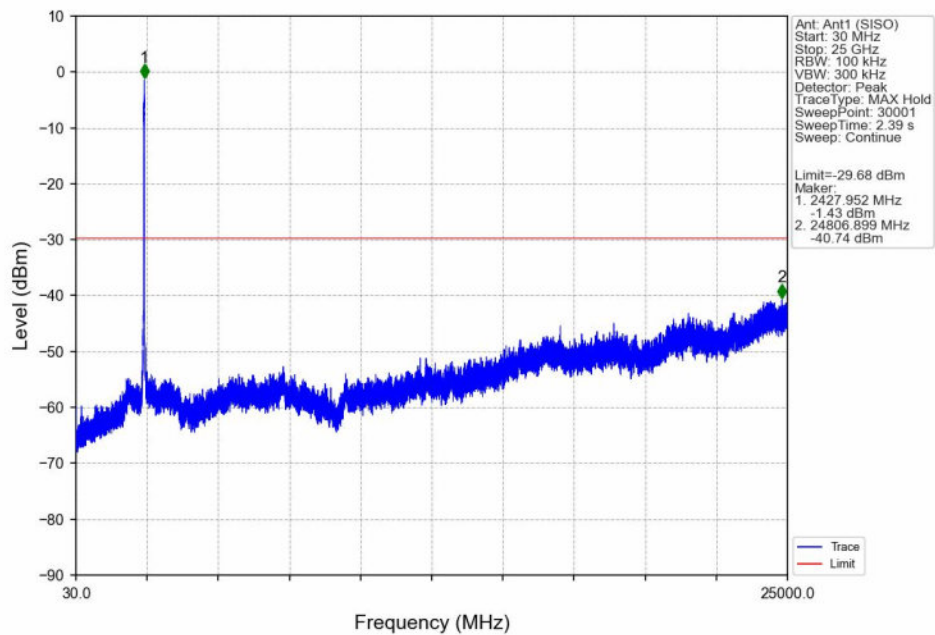


802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV

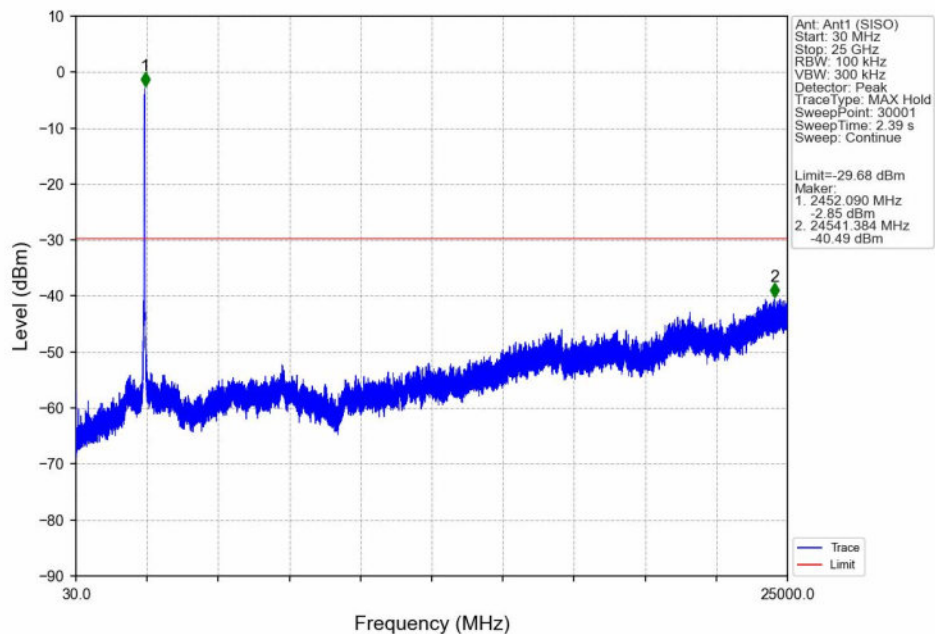


FCC ID: 2BD5N-SURFERS2

802.11n(HT40)\_LCH\_2422MHz\_Ant1 (SISO)\_NTNV



802.11n(HT40)\_MCH\_2437MHz\_Ant1 (SISO)\_NTNV



FCC ID: 2BD5N-SURFERS2

