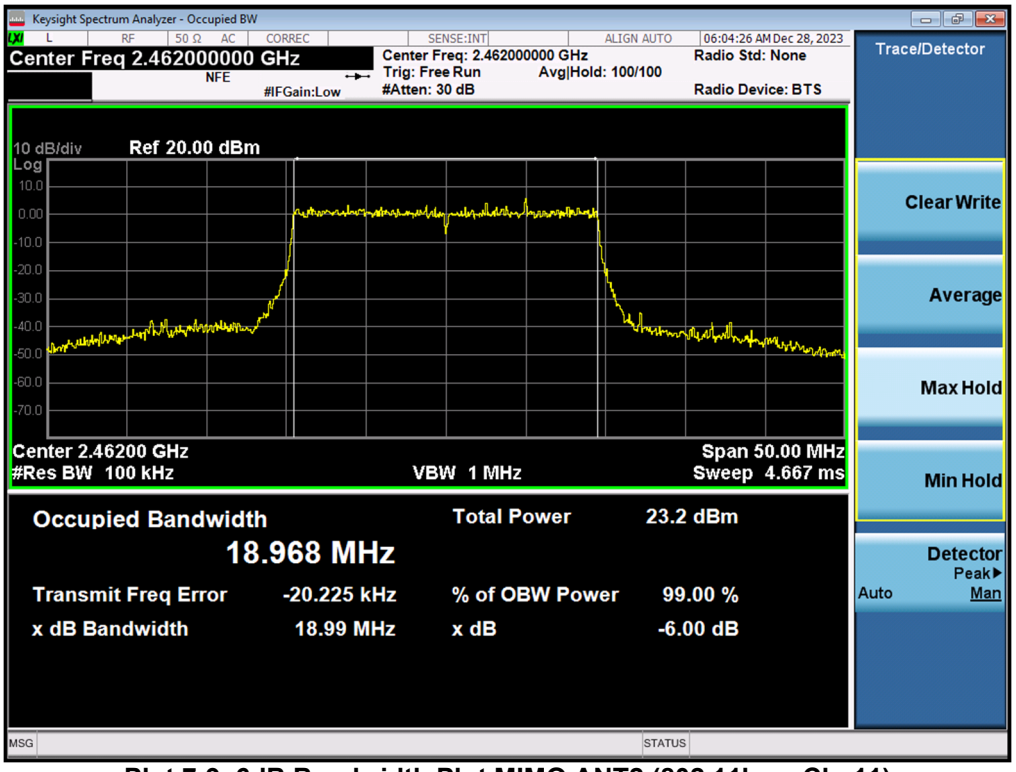



**Plot 7-9. 6dB Bandwidth Plot MIMO ANT2 (802.11be – Ch. 11)**

## 7.3 Output Power Measurement

**Test Overview and Limits**

A transmitter antenna terminal of EUT is connected to the input of an RF power sensor. Measurement is made using a broadband power meter capable of making peak and average measurements while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies.

***The maximum permissible conducted output power is 1 Watt per 15.247 and RSS-247. The e.i.r.p. shall not exceed 4 W per RSS-247.***

**Test Procedure Used**

ANSI C63.10-2013 – Section 11.9.1.3 PKPM1 Peak Power Method
ANSI C63.10-2013 – Section 11.9.2.3.2 Method AVGPM-G
ANSI C63.10-2013 – Section 14.2 Measure-and-Sum Technique

**Test Settings**

**Method PKPM1 (Peak Power Measurement)**

Peak power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The pulse sensor employs a VBW = 50MHz so this method was only used for signals whose DTS bandwidth was less than or equal to 50MHz.

**Method AVGPM-G (Average Power Measurement)**

Average power measurements were performed only when the EUT was transmitting at its maximum power control level using a broadband power meter with a pulse sensor. The power meter implemented triggering and gating capabilities which were set up such that power measurements were recorded only during the ON time of the transmitter. The trace was averaged over 100 traces to obtain the final measured average power.

**Test Setup**

The EUT and measurement equipment were set up as shown in the diagrams below.


**Figure 7-2. Test Instrument & Measurement Setup for Power Meter Measurements**

**Test Notes**

None.

| IEEE 802.11be SU | 2.4GHz WIFI (20MHz 802.11be SISO ANT2) | | | | Conducted Power Limit [dBm] | Conducted Power Margin [dB] | Ant. Gain [dBi] | Max e.i.r.p [dBm] | e.i.r.p Limit [dBm] | e.i.r.p Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|
| | Freq. [MHz] | Channel | Detector | Conducted Power [dBm] | | | | | | |
| | 2412 | 1 | Average | 16.59 | 30.00 | -13.41 | -5.83 | 10.76 | 36.02 | -25.26 |
| | 2417 | 2 | | 17.55 | 30.00 | -12.45 | -5.83 | 11.72 | 36.02 | -24.30 |
| | 2437 | 6 | | 17.45 | 30.00 | -12.55 | -5.83 | 11.62 | 36.02 | -24.40 |
| | 2457 | 10 | | 17.47 | 30.00 | -12.53 | -5.83 | 11.64 | 36.02 | -24.38 |
| | 2462 | 11 | | 16.12 | 30.00 | -13.88 | -5.83 | 10.29 | 36.02 | -25.73 |
| | 2467 | 12 | | 8.02 | 30.00 | -21.98 | -5.83 | 2.19 | 36.02 | -33.83 |
| | 2472 | 13 | | 2.02 | 30.00 | -27.98 | -5.83 | -3.81 | 36.02 | -39.83 |
| | 2412 | 1 | Peak | 23.32 | 30.00 | -6.68 | -5.83 | 17.49 | 36.02 | -18.53 |
| | 2417 | 2 | | 24.53 | 30.00 | -5.47 | -5.83 | 18.70 | 36.02 | -17.32 |
| | 2437 | 6 | | 24.52 | 30.00 | -5.48 | -5.83 | 18.69 | 36.02 | -17.33 |
| | 2457 | 10 | | 24.46 | 30.00 | -5.54 | -5.83 | 18.63 | 36.02 | -17.39 |
| | 2462 | 11 | | 23.21 | 30.00 | -6.79 | -5.83 | 17.38 | 36.02 | -18.64 |
| | 2467 | 12 | | 15.12 | 30.00 | -14.88 | -5.83 | 9.29 | 36.02 | -26.73 |
| | 2472 | 13 | | 8.81 | 30.00 | -21.19 | -5.83 | 2.98 | 36.02 | -33.04 |

**Table 7-4. Conducted Output Power Measurements SISO ANT2**

| IEEE 802.11be SU | 2.4GHz WIFI (20MHz 802.11be MIMO) | | | | | | Conducted Power Limit [dBm] | Conducted Power Margin [dB] | Directional Ant. Gain [dBi] | Max e.i.r.p [dBm] | e.i.r.p Limit [dBm] | e.i.r.p Margin [dB] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Freq [MHz] | Channel | Detector | Conducted Power [dBm] | | | | | | | | |
| | | | | ANT1 | ANT2 | MIMO | | | | | | |
| | 2412 | 1 | Average | 16.61 | 16.59 | 19.61 | 30.00 | -10.39 | -2.57 | 17.04 | 36.02 | -18.98 |
| | 2417 | 2 | | 17.53 | 17.62 | 20.59 | 30.00 | -9.41 | -2.57 | 18.02 | 36.02 | -18.00 |
| | 2437 | 6 | | 17.68 | 17.31 | 20.51 | 30.00 | -9.49 | -2.57 | 17.94 | 36.02 | -18.08 |
| | 2457 | 10 | | 17.85 | 17.28 | 20.58 | 30.00 | -9.42 | -2.57 | 18.01 | 36.02 | -18.01 |
| | 2462 | 11 | | 16.21 | 15.98 | 19.11 | 30.00 | -10.89 | -2.57 | 16.54 | 36.02 | -19.48 |
| | 2467 | 12 | | 5.03 | 5.01 | 8.03 | 30.00 | -21.97 | -2.57 | 5.46 | 36.02 | -30.56 |
| | 2472 | 13 | | -0.36 | -0.24 | 2.71 | 30.00 | -27.29 | -2.57 | 0.14 | 36.02 | -35.88 |
| | 2412 | 1 | Peak | 23.68 | 23.43 | 26.57 | 30.00 | -3.43 | -2.57 | 24.00 | 36.02 | -12.02 |
| | 2417 | 2 | | 24.13 | 24.25 | 27.20 | 30.00 | -2.80 | -2.57 | 24.63 | 36.02 | -11.39 |
| | 2437 | 6 | | 24.31 | 24.16 | 27.25 | 30.00 | -2.75 | -2.57 | 24.68 | 36.02 | -11.34 |
| | 2447 | 8 | | 24.43 | 24.08 | 27.27 | 30.00 | -2.73 | -2.57 | 24.70 | 36.02 | -11.32 |
| | 2457 | 10 | | 24.41 | 24.12 | 27.28 | 30.00 | -2.72 | -2.57 | 24.71 | 36.02 | -11.31 |
| | 2462 | 11 | | 23.13 | 22.99 | 26.07 | 30.00 | -3.93 | -2.57 | 23.50 | 36.02 | -12.52 |
| | 2467 | 12 | | 11.67 | 11.28 | 14.49 | 30.00 | -15.51 | -2.57 | 11.92 | 36.02 | -24.10 |
| | 2472 | 13 | | 6.12 | 6.24 | 9.19 | 30.00 | -20.81 | -2.57 | 6.62 | 36.02 | -29.40 |

**Table 7-5. Conducted Output Power Measurements MIMO**

**Note:**

Per ANSI C63.10-2013 Section 14.2, the conducted powers at Antenna 1 and Antenna 2 were first measured separately during MIMO transmission as shown in the section above. The measured values were then summed in linear power units then converted back to dBm.

**Sample MIMO Calculation:**

At 2412MHz the average conducted output power was measured to be 16.61 dBm for Antenna 1 and 16.59 dBm for Antenna 2.

Antenna 1 + Antenna 2 = MIMO

(16.61 dBm + 16.59 dBm) = (45.81 mW + 45.60 mW) = 91.41 mW = 19.61 dBm

## 7.4 Power Spectral Density

**Test Overview and Limit**

The peak power density is measured with a spectrum analyzer connected to the antenna terminal of the EUT while the EUT is operating at its maximum duty cycle, at maximum power, and at the appropriate frequencies. All data rates are investigated and the worst-case configuration results are reported in this section.

***The maximum permissible power spectral density shall not be greater than 8 dBm in any 3 kHz band.***

**Test Procedure Used**

ANSI C63.10-2013 – Section 11.10.2 Method PKPSD
ANSI C63.10-2013 – Section 14.3.1 Measure-and-Sum Technique

**Test Settings**

1. Analyzer was set to the center frequency of the DTS channel under investigation
2. Span = 1.5 times the DTS channel bandwidth
3. RBW = 10kHz
4. VBW = 1MHz
5. Detector = peak
6. Sweep time = auto couple
7. Trace mode = max hold
8. Trace was allowed to stabilize

**Test Setup**

The EUT and measurement equipment were set up as shown in the diagram below.


**Figure 7-3. Test Instrument & Measurement Setup**

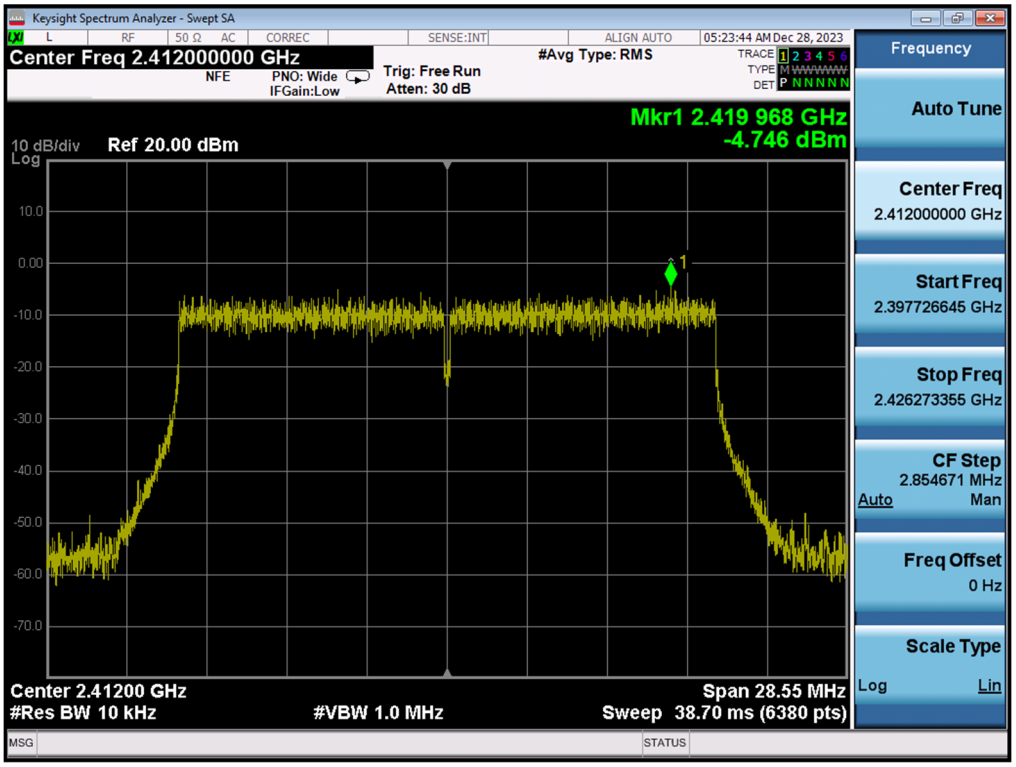
**Test Notes**

None.

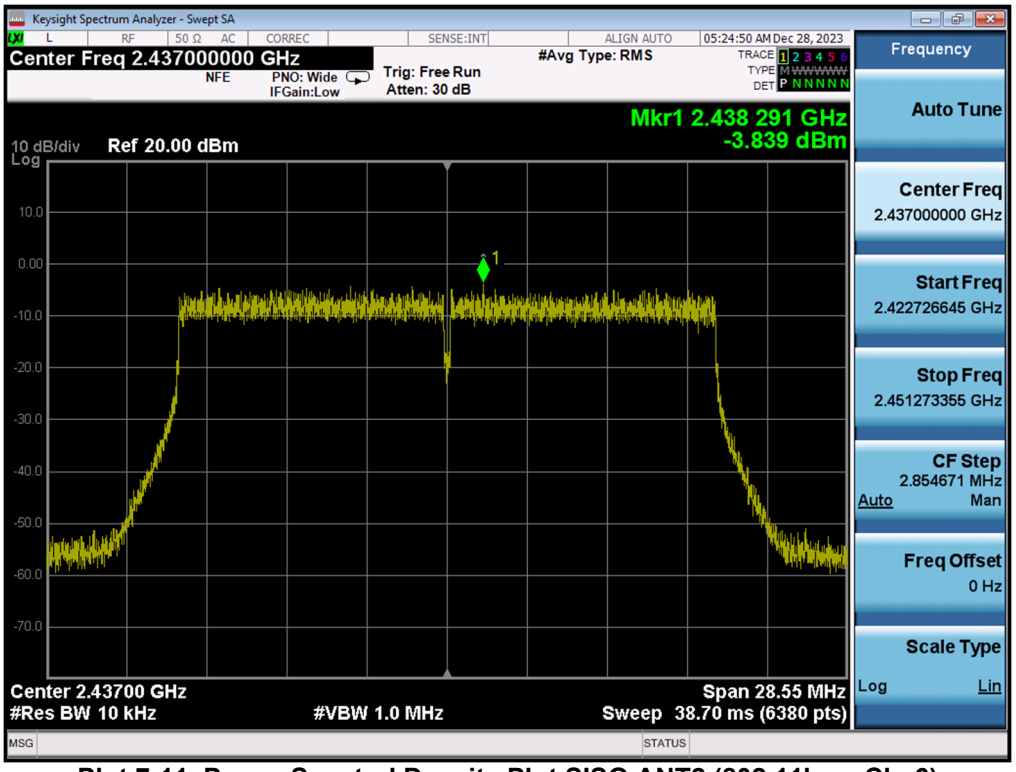
## 7.4.1 SISO Antenna-2 Power Spectral Density Measurements

| Frequency [MHz] | Channel No. | 802.11 Mode | Data Rate [Mbps] | Measured Power Spectral Density [dBm] | Maximum Permissible Power Density [dBm / 3kHz] | Margin [dB] | Pass / Fail |
|---|---|---|---|---|---|---|---|
| 2412 | 1 | be | 6.5/7.2 (MCS0) | -4.75 | 8.00 | -12.75 | Pass |
| 2437 | 6 | be | 6.5/7.2 (MCS0) | -3.84 | 8.00 | -11.84 | Pass |
| 2462 | 11 | be | 6.5/7.2 (MCS0) | -4.33 | 8.00 | -12.33 | Pass |

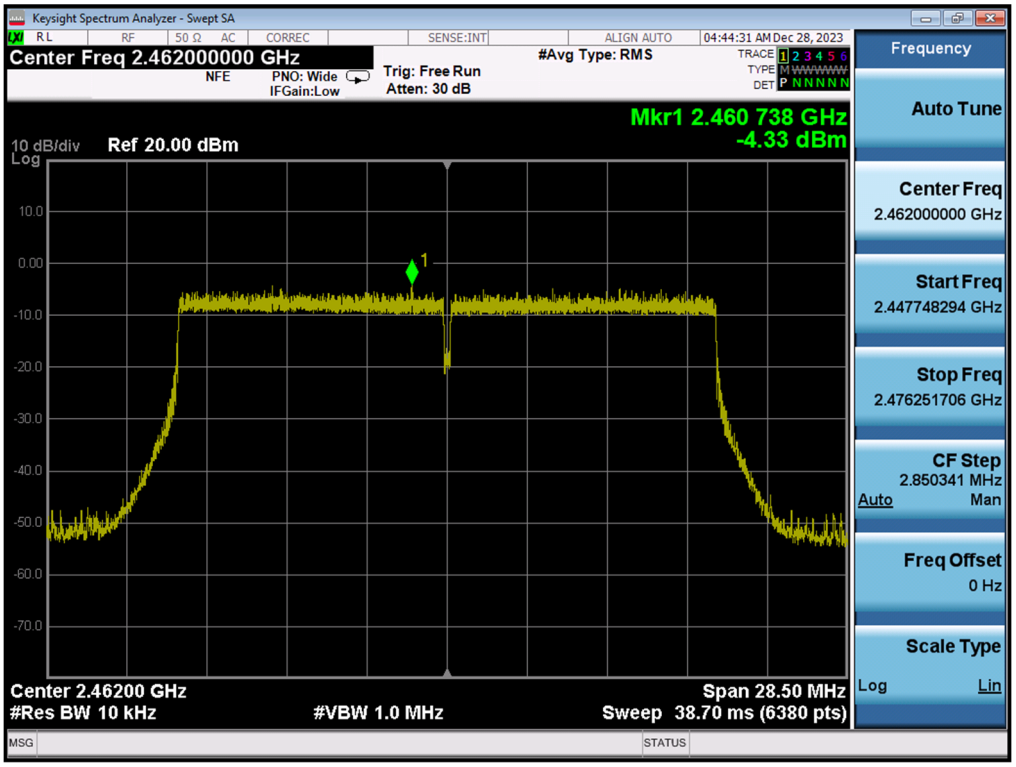
**Table 7-6. Conducted Power Spectral Density Measurements SISO ANT2**




**Plot 7-10. Power Spectral Density Plot SISO ANT2 (802.11be – Ch. 1)**




**Plot 7-11. Power Spectral Density Plot SISO ANT2 (802.11be – Ch. 6)**

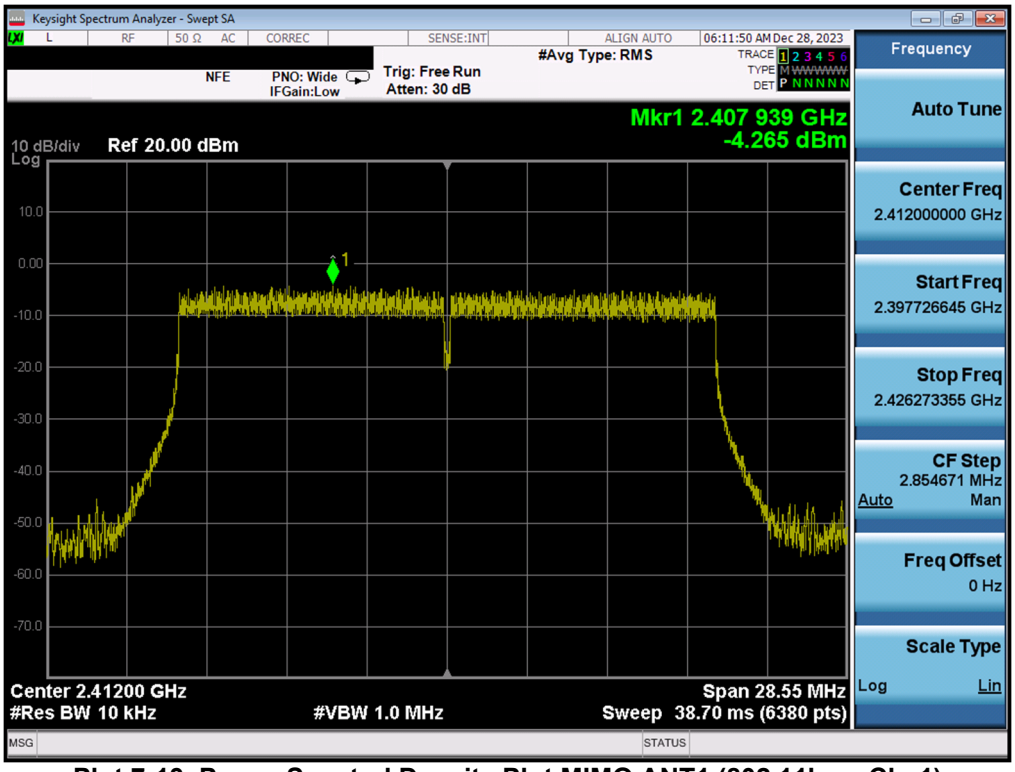



**Plot 7-12. Power Spectral Density Plot SISO ANT2 (802.11be – Ch. 11)**

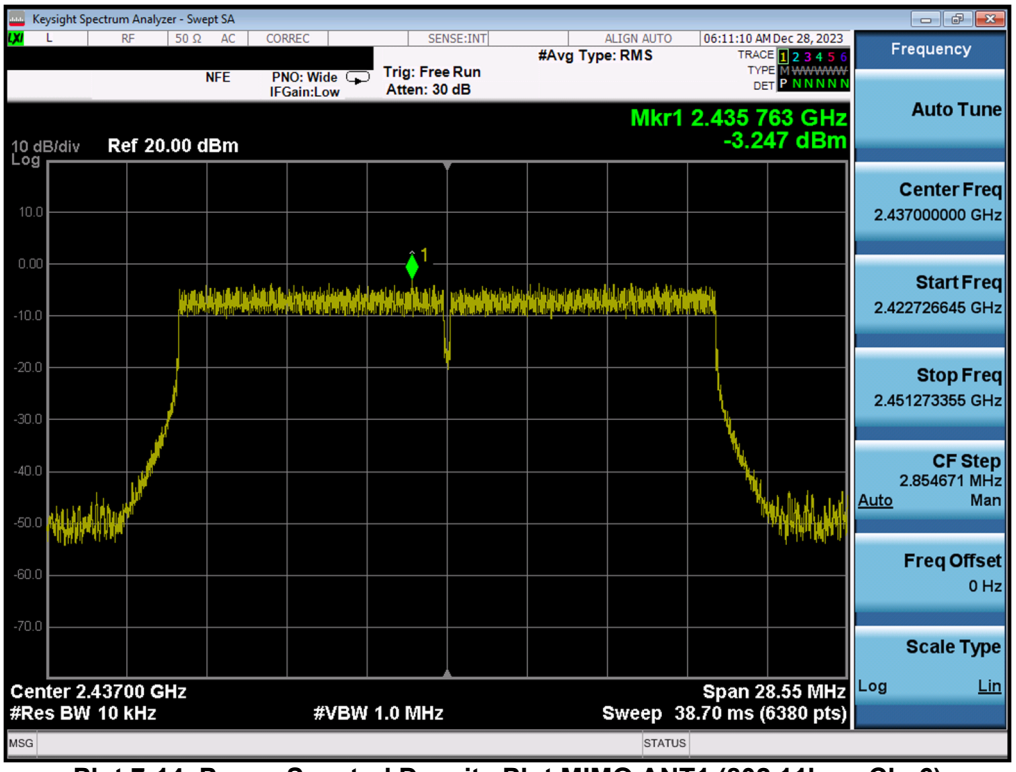
## 7.4.2 MIMO Power Spectral Density Measurements

| Frequency [MHz] | Channel No. | 802.11 Mode | Data Rate [Mbps] | ANT 1 Power Spectral Density [dBm] | ANT 2 Power Spectral Density [dBm] | Summed MIMO Power Spectral Density [dBm] | Maximum Permissible Power Density [dBm / 3kHz] | Margin [dB] | Pass / Fail |
|---|---|---|---|---|---|---|---|---|---|
| 2412 | 1 | be | 6.5/7.2 (MCS0) | -4.27 | -4.12 | -1.18 | 8.00 | -9.18 | Pass |
| 2437 | 6 | be | 6.5/7.2 (MCS0) | -3.25 | -4.06 | -0.62 | 8.00 | -8.62 | Pass |
| 2462 | 11 | be | 6.5/7.2 (MCS0) | -4.90 | -4.99 | -1.93 | 8.00 | -9.93 | Pass |

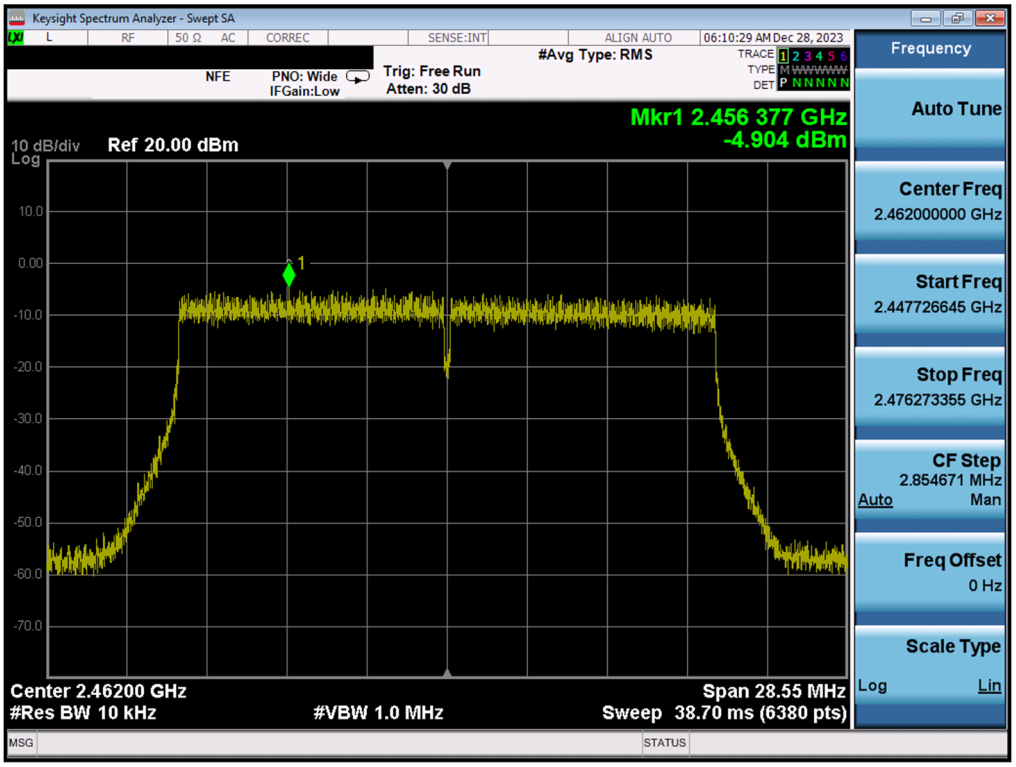
**Table 7-7. Conducted Power Spectral Density Measurements MIMO**




**Plot 7-13. Power Spectral Density Plot MIMO ANT1 (802.11be – Ch. 1)**




**Plot 7-14. Power Spectral Density Plot MIMO ANT1 (802.11be – Ch. 6)**




**Plot 7-15. Power Spectral Density Plot MIMO ANT1 (802.11be – Ch. 11)**