

6. MEASUREMENT UNCERTAINTY

Where relevant, the following test uncertainty levels have been estimated for tests performed on the EUT as specified in CISPR 16-4-2. This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

| |
|-------------------------------------------------------------------------------------------------------------------------|
| AC Conducted Emission Measurement |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 2.68dB |
| Radiated Emission Measurement (Below 1GHz) |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 4.01dB |
| Radiated Emission Measurement (1-18GHz) |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 4.97dB |
| Radiated Emission Measurement (Above 18-40GHz) |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 5.32dB |
| Spurious Emissions, Conducted |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 30MHz-1GHz: 1.00 dB 1GHz-12.75GHz: 1.30 dB |
| Output Power |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.60dB |
| Power Spectrum Density |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.80dB |
| Occupied Bandwidth |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.20MHz |
| Frequency Stability |
| Measuring Uncertainty for a Level of Confidence of 95% ($U=2Uc(y)$): 0.1×10^{-6} MHz |

7. TEST RESULT

7.1. Summary

| FCC Part Section(s) | Test Description | Test Limit | Test Condition | Test Result | Reference |
|---------------------|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|----------------|----------------|-------------|
| 15.247(a)(2) | 6dB Bandwidth | $\geq 500\text{kHz}$ | Conducted | Pass | Section 7.2 |
| 15.247(b)(3) | Output Power | $\leq 30\text{dBm}$ | | Pass | Section 7.3 |
| 15.247(e) | Power Spectral Density | $\leq 8\text{dBm}/3\text{kHz}$ | | Pass | Section 7.4 |
| 15.247(d) | Band Edge | $\geq 30\text{dBc}$ | | Pass | Section 7.5 |
| 15.247(d) | Out-of-Band Emissions | $\geq 30\text{dBc}$ | | Pass | Section 7.6 |
| 15.205 15.209 | General Field Strength Limits (Restricted Bands and Radiated Emission Limits) | Emissions in restricted bands must meet the radiated limits detailed in 15.209 (RSS GEN [8.9]) | Radiated | Pass | Section 7.7 |
| 15.207 | AC Conducted Emissions 150kHz - 30MHz | < FCC 15.207 limits (RSS GEN [8.8]) | Line Conducted | Not Applicable | Section 7.8 |

Notes:

- 1) All modes of operation and data rates were investigated. For radiated emission test, every axis (X, Y, Z) was also verified. The test results shown in the following sections represent the worst case emissions.
- 2) The analyzer plots shown in this section were all taken with a correction table loaded into the analyzer. The correction table was used to account for the losses of the cables and attenuators used as part of the system to connect the EUT to the analyzer at all frequencies of interest.
- 3) All antenna port conducted emissions testing was performed on a test bench with the antenna port of the EUT connected to the spectrum analyzer through calibrated cables and attenuators.

7.2. 6dB Bandwidth Measurement

7.2.1. Test Limit

The minimum permissible 6dB bandwidth is 500 kHz.

7.2.2. Test Procedure used

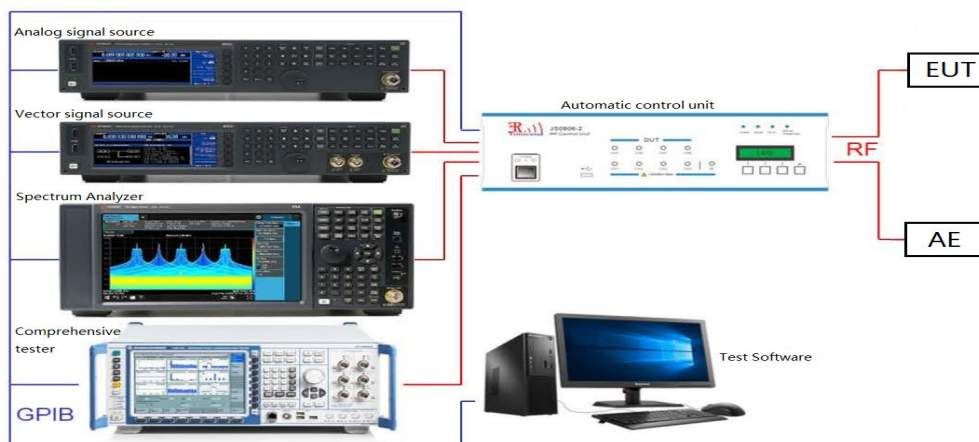
ANSI C63.10-2013 Section 11.8.2 Option 1

KDB 558074 D01 v05r02 – Section 8.2

7.2.3. Test Setting

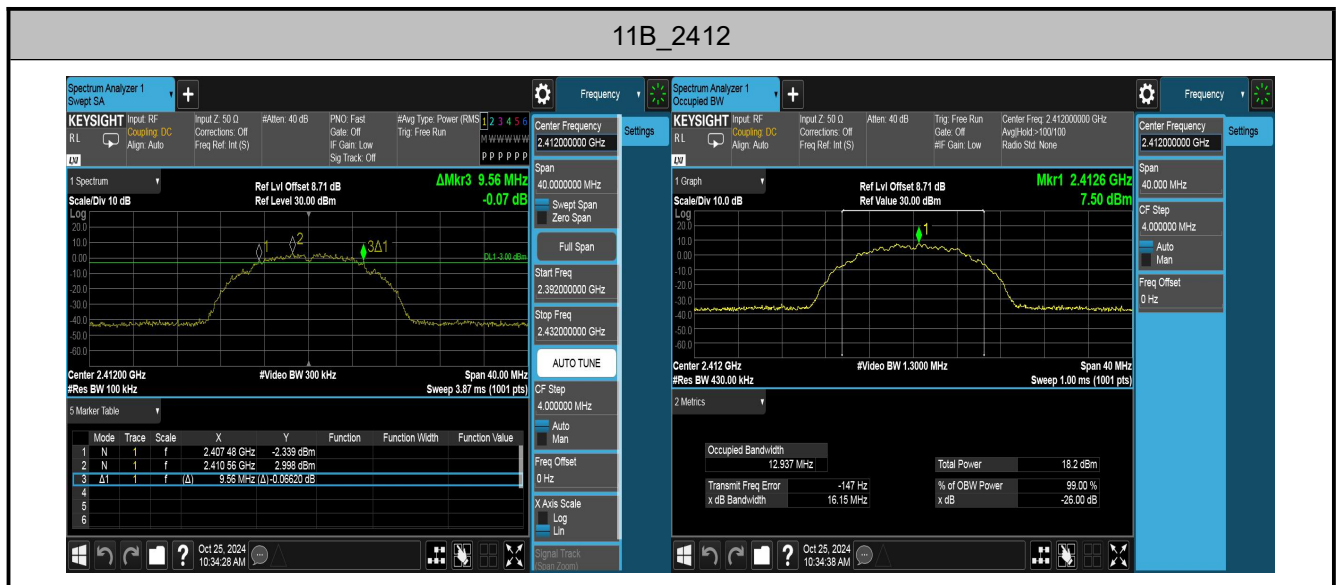
1. Set RBW = 100 kHz
2. VBW $\geq 3 \times$ RBW
3. Detector = peak
4. Trace mode = max hold
5. Sweep = auto couple
6. Allow the trace was allowed to stabilize
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

7.2.4. Test Setup



7.2.5. Test Result

| Test Mode | Channel | DTS BW [MHz] | FL[MHz] | FH[MHz] | Limit [MHz] | 99% BW[MHz] | Verdict |
|--------------|---------|--------------|----------|----------|-------------|-------------|---------|
| 802.11b | 2412 | 9.560 | 2407.480 | 2417.040 | ≥0.5 | 12.937 | PASS |
| | 2437 | 9.200 | 2432.400 | 2441.600 | ≥0.5 | 12.931 | PASS |
| | 2462 | 9.200 | 2457.320 | 2466.520 | ≥0.5 | 12.971 | PASS |
| 802.11g | 2412 | 16.280 | 2403.880 | 2420.160 | ≥0.5 | 16.542 | PASS |
| | 2437 | 16.280 | 2428.880 | 2445.160 | ≥0.5 | 16.546 | PASS |
| | 2462 | 16.320 | 2453.840 | 2470.160 | ≥0.5 | 16.581 | PASS |
| 802.11n-HT20 | 2412 | 16.280 | 2403.880 | 2420.160 | ≥0.5 | 17.371 | PASS |
| | 2437 | 16.040 | 2429.120 | 2445.160 | ≥0.5 | 17.344 | PASS |
| | 2462 | 16.040 | 2453.880 | 2469.920 | ≥0.5 | 17.357 | PASS |
| 802.11n-HT40 | 2422 | 33.840 | 2405.680 | 2439.520 | ≥0.5 | 35.572 | PASS |
| | 2437 | 33.760 | 2419.480 | 2453.240 | ≥0.5 | 35.493 | PASS |
| | 2452 | 32.560 | 2436.960 | 2469.520 | ≥0.5 | 35.500 | PASS |



11B_2437



11B_2462



11G_2412



11G_2437



11G_2462



11N20_2412



11N20_2437



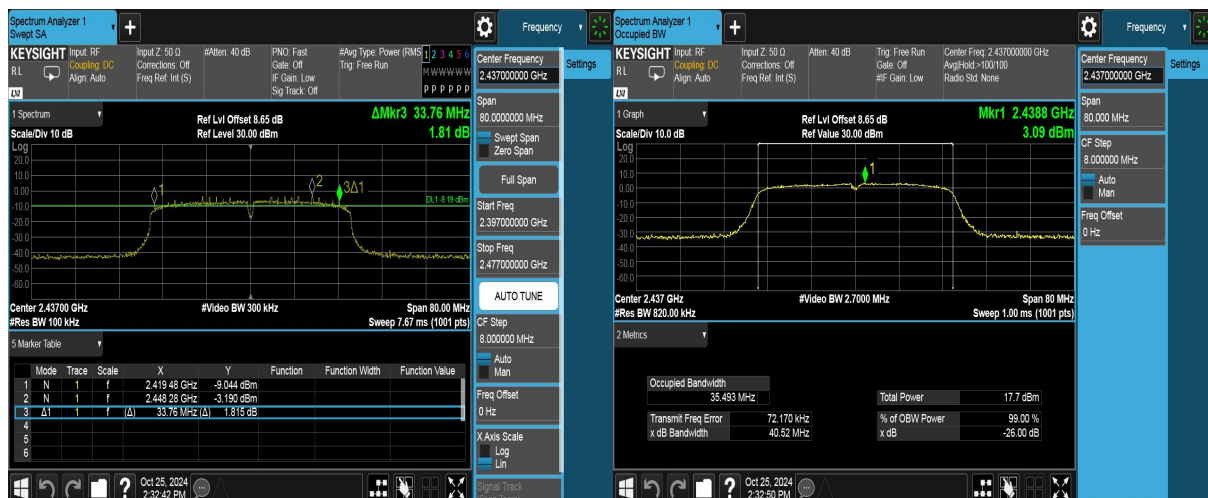
11N20_2462



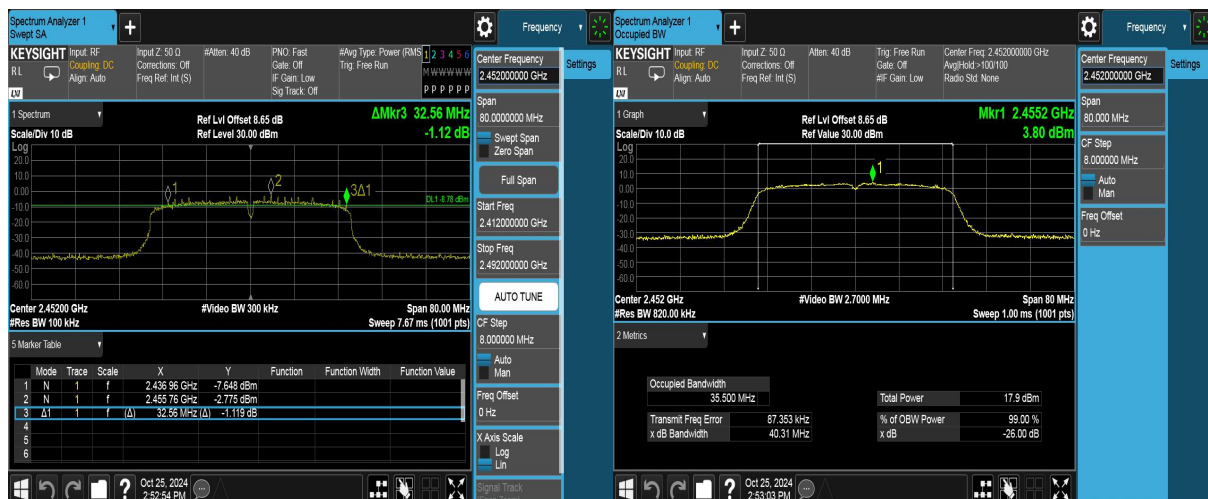
11N40_2422



11N40_2437



11N40_2452



7.3. Output Power Measurement

7.3.1. Test Limit

The maximum permissible conducted output power is 1 Watt (30dBm). And for antenna gain greater than 6dBi the limit shall reduce by the amount in dB that the directional gain of the antenna exceeds 6dBi.

7.3.2. Test Procedure Used

ANSI C63.10-2013 – Section 11.9.2.2.4

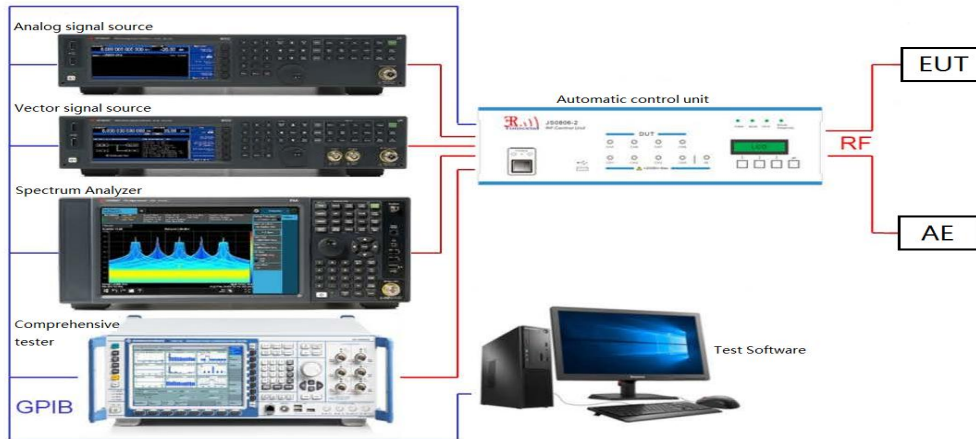
KDB 558074 D01 v05r02 – Section 8.3.2.2

7.3.3. Test Setting

1. Set span to at least 1.5 times the OBW..
2. Set RBW = 1% to 5% of the OBW, not to exceed 1 MHz.
3. Set VBW $\geq [3 \times \text{RBW}]$.
4. Number of points in sweep $\geq [2 \times \text{span} / \text{RBW}]$. (This gives bin-to-bin spacing $\text{RBW} / 2$, so that narrowband signals are not lost between frequency bins.)
5. Sweep time = auto.
6. Detector = RMS (i.e., power averaging), if available. Otherwise, use sample detector mode.
7. Do not use sweep triggering. Allow the sweep to “free run.”
8. Trace average at least 100 traces in power averaging (rms) mode; however, the number of traces to be averaged shall be increased above 100 as needed such that the average accurately represents the true average over the ON and OFF periods of the transmitter.
9. Compute power by integrating the spectrum across the OBW of the signal using the instrument’s band power measurement function with band limits set equal to the OBW band edges. If the instrument does not have a band power function, then sum the spectrum levels (in power units) at intervals equal to the RBW extending across the entire OBW of the spectrum. 10. Add $[10 \log (1 / D)]$, where D is the duty cycle, to the measured power to compute the average power

during the actual transmission times (because the measurement represents an average over both the ON and OFF times of the transmission). For example, add $[10 \log (1/0.25)] = 6 \text{ dB}$ if the duty cycle is 25%.

7.3.4. Test Setup

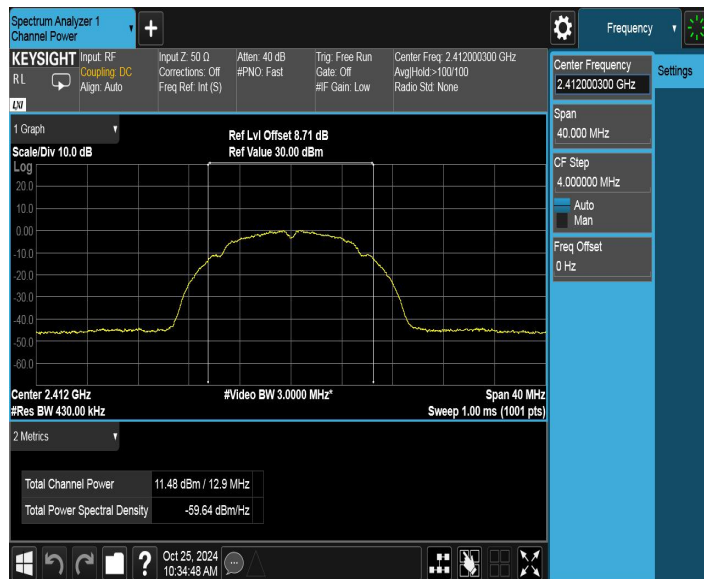


7.3.5. Test Result of Output Power

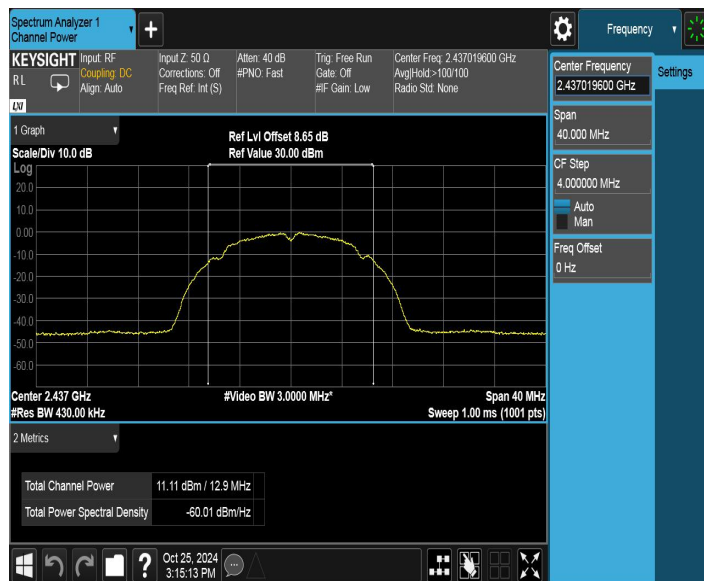
| Test Mode | Channel | Average power [dBm] | Limit[dBm] | Verdict |
|--------------|---------|---------------------|------------|---------|
| 802.11b | 2412 | 11.47 | ≤30 | PASS |
| | 2437 | 11.17 | ≤30 | PASS |
| | 2462 | 10.70 | ≤30 | PASS |
| 802.11g | 2412 | 11.36 | ≤30 | PASS |
| | 2437 | 11.73 | ≤30 | PASS |
| | 2462 | 12.25 | ≤30 | PASS |
| 802.11n-HT20 | 2412 | 11.63 | ≤30 | PASS |
| | 2437 | 11.96 | ≤30 | PASS |
| | 2462 | 12.59 | ≤30 | PASS |
| 802.11n-HT40 | 2422 | 10.10 | ≤30 | PASS |
| | 2437 | 10.19 | ≤30 | PASS |
| | 2452 | 10.33 | ≤30 | PASS |

The Duty Cycle Factor is compensated in the Offset of graph.

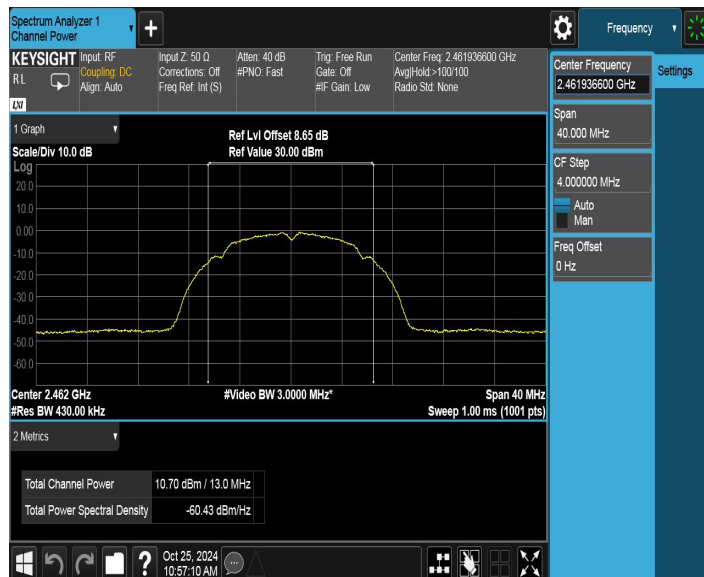
11B_Ant1_2412



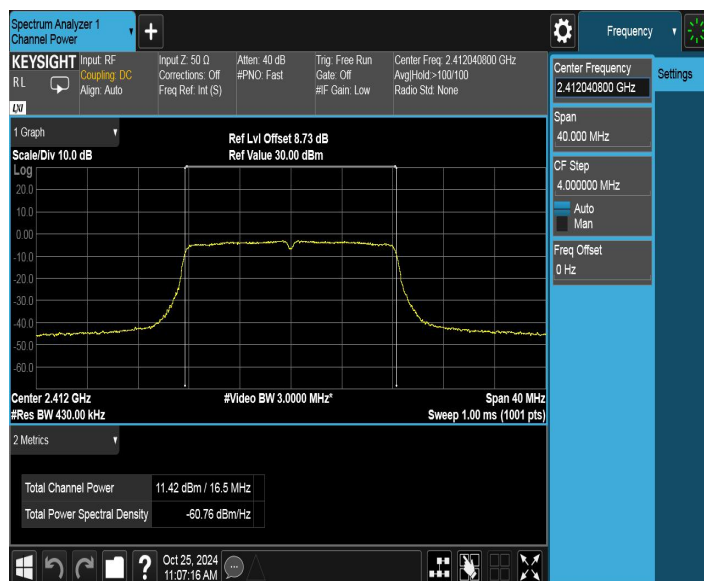
11B_Ant1_2437



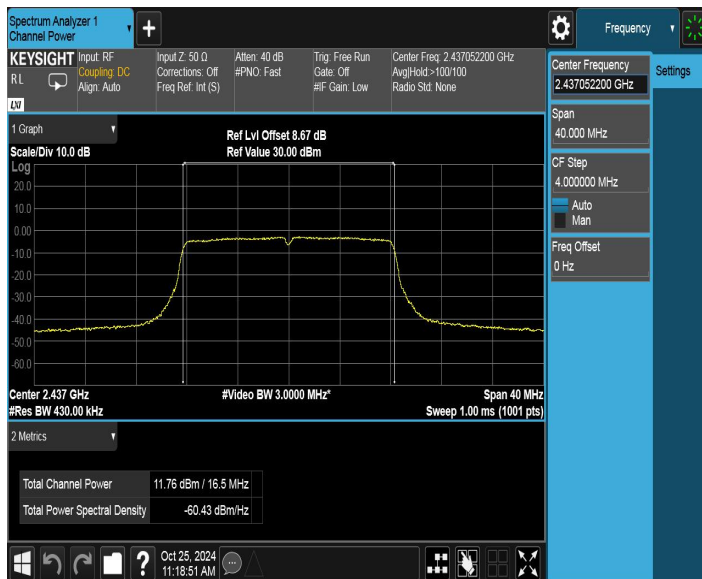
11B_Ant1_2462



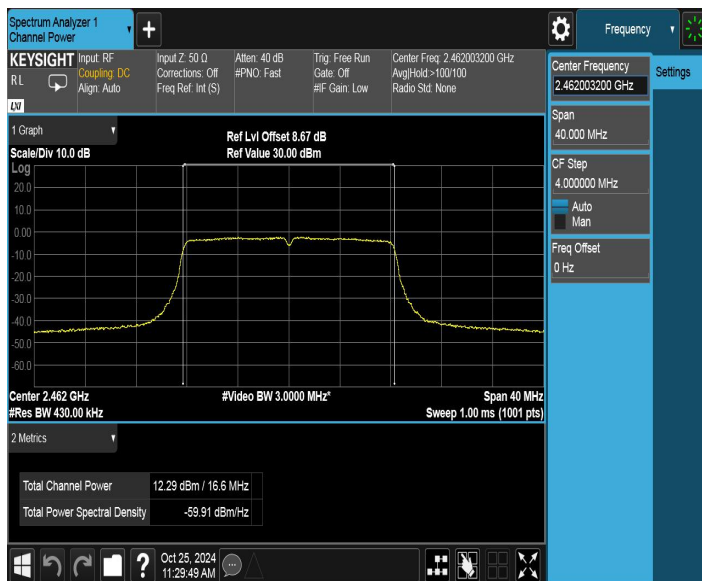
11G_Ant1_2412



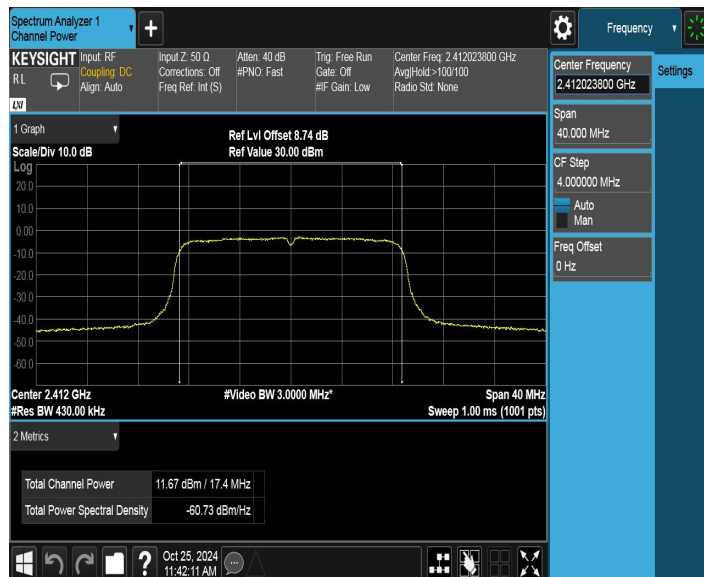
11G_Ant1_2437



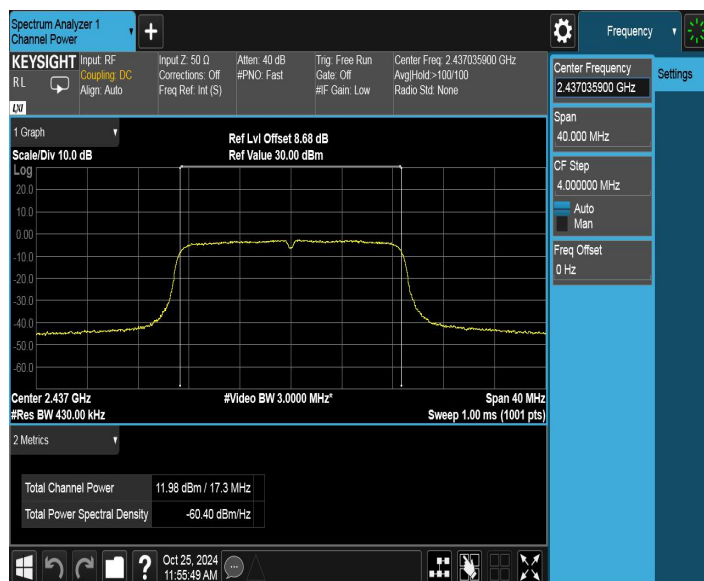
11G_Ant1_2462



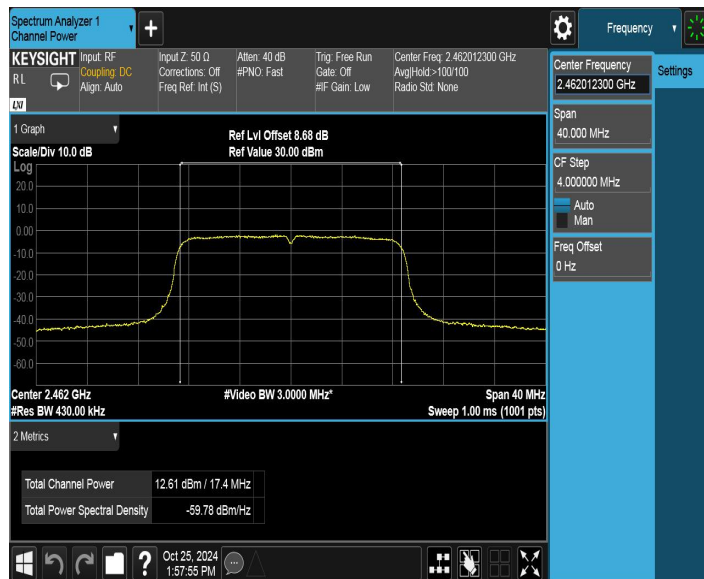
11N20SISO_Ant1_2412



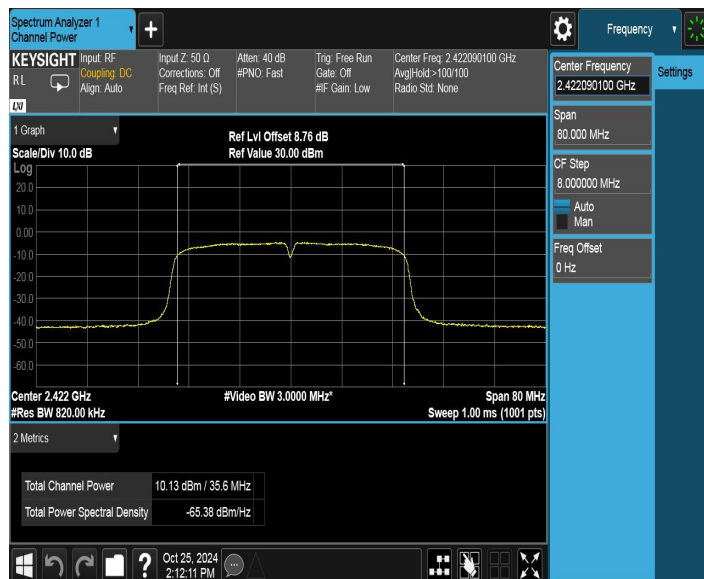
11N20SISO_Ant1_2437



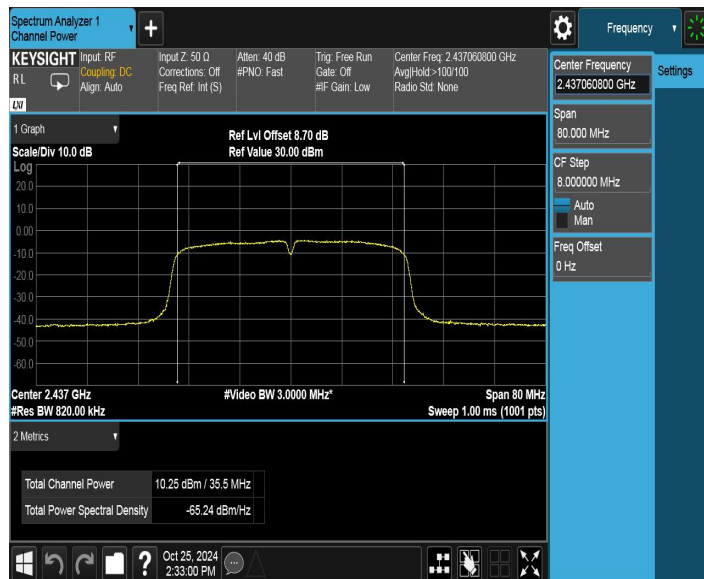
11N20SISO_Ant1_2462



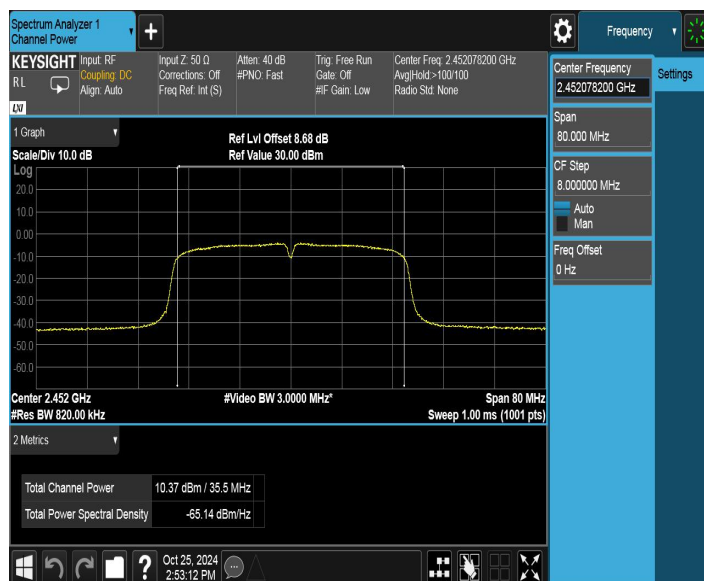
11N40SISO_Ant1_2422



11N40SISO_Ant1_2437



11N40SISO_Ant1_2452



7.4. Power Spectral Density Measurement

7.4.1. Test Limit

The maximum permissible power spectral density is 8dBm in any 3 kHz band. And for antenna gain greater than 6dBi the limit shall reduce by the amount in dB that the directional gain of the antenna exceeds 6dBi.

7.4.2. Test Procedure Used

KDB 558074 D01 v05r02 - Section 8.4

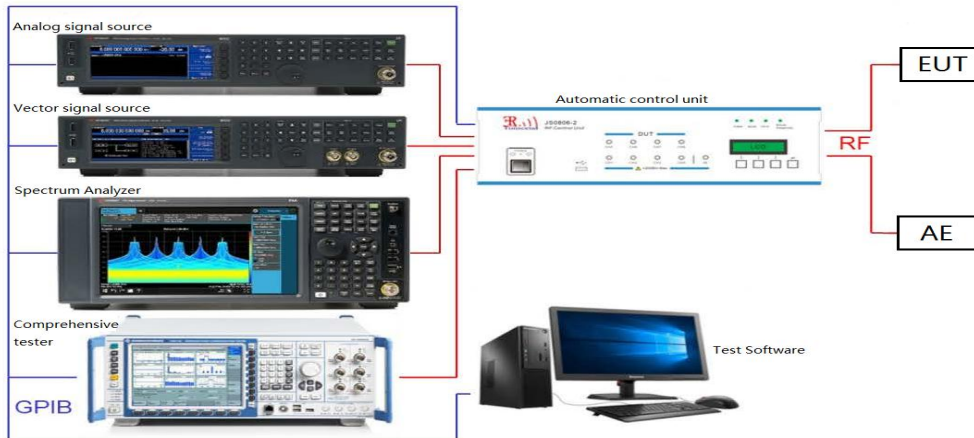
ANSI C63.10 – Section 11.10.5

7.4.3. Test Setting

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the OBW.
3. Set the RBW to $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq [3 \times \text{RBW}]$.
5. Detector = power averaging (rms) or sample detector (when rms not available).
6. Ensure that the number of measurement points in the sweep $\geq [2 \times \text{span} / \text{RBW}]$.
7. Sweep time = auto couple.
8. Do not use sweep triggering; allow sweep to “free run.”
9. Employ trace averaging (rms) mode over a minimum of 100 traces.
10. Use the peak marker function to determine the maximum amplitude level.
11. Add $[10 \log (1 / D)]$, where D is the duty cycle measured in step a), to the measured PSD to

If measured value exceeds requirement specified by regulatory agency, then reduce RBW (but no less than 3 kHz) and repeat (note that this may require zooming in on the emission of interest and reducing the span to meet the minimum measurement point requirement as the RBW is reduced).

7.4.4. Test Setup



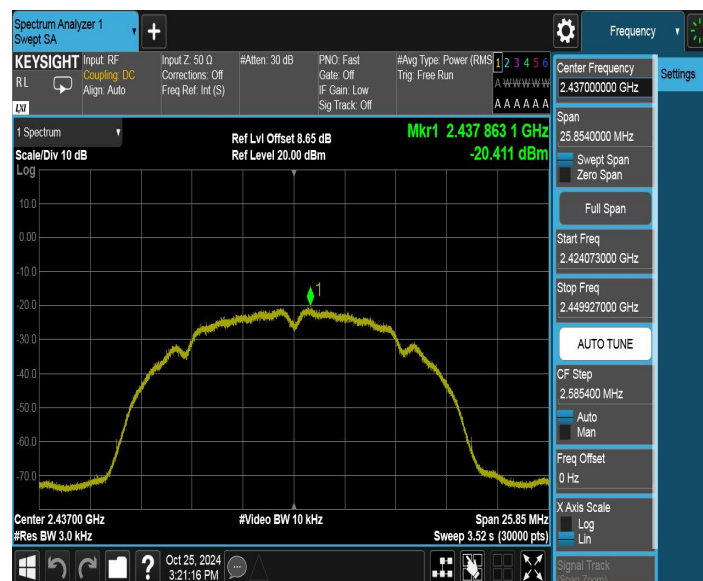
7.4.5. Test Result

| Test Mode | Channel | Result[dBm/3-100kHz] | Limit[dBm/3kHz] | Verdict |
|--------------|---------|----------------------|-----------------|---------|
| 802.11b | 2412 | -20.00 | ≤8.00 | PASS |
| | 2437 | -20.41 | ≤8.00 | PASS |
| | 2462 | -20.61 | ≤8.00 | PASS |
| 802.11g | 2412 | -21.21 | ≤8.00 | PASS |
| | 2437 | -20.70 | ≤8.00 | PASS |
| | 2462 | -20.31 | ≤8.00 | PASS |
| 802.11n-HT20 | 2412 | -20.28 | ≤8.00 | PASS |
| | 2437 | -20.84 | ≤8.00 | PASS |
| | 2462 | -19.73 | ≤8.00 | PASS |
| 802.11n-HT40 | 2422 | -24.26 | ≤8.00 | PASS |
| | 2437 | -24.32 | ≤8.00 | PASS |
| | 2452 | -23.46 | ≤8.00 | PASS |

11B_Ant1_2412



11B_Ant1_2437



11B_Ant1_2462



11G_Ant1_2412

