

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

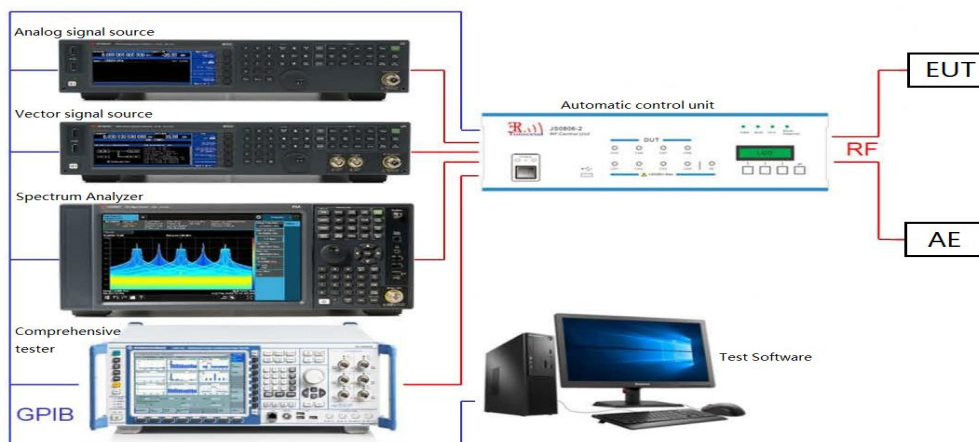
ANSI C63.10-2013 Section 11.8.2 Option 1

KDB 558074 D01 v05r02 – Section 8.2

7.2.3. Test Setting

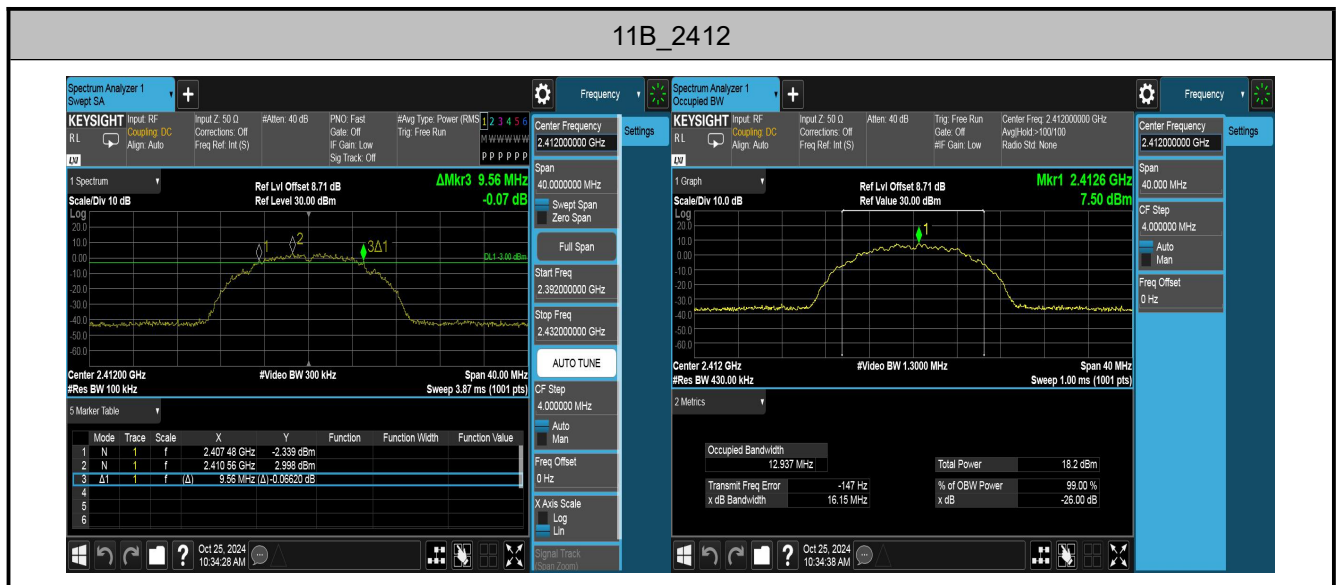
1. Set RBW = 100 kHz
2. VBW $\geq 3 \times$ RBW
3. Detector = peak
4. Trace mode = max hold
5. Sweep = auto couple
6. Allow the trace was allowed to stabilize
7. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper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

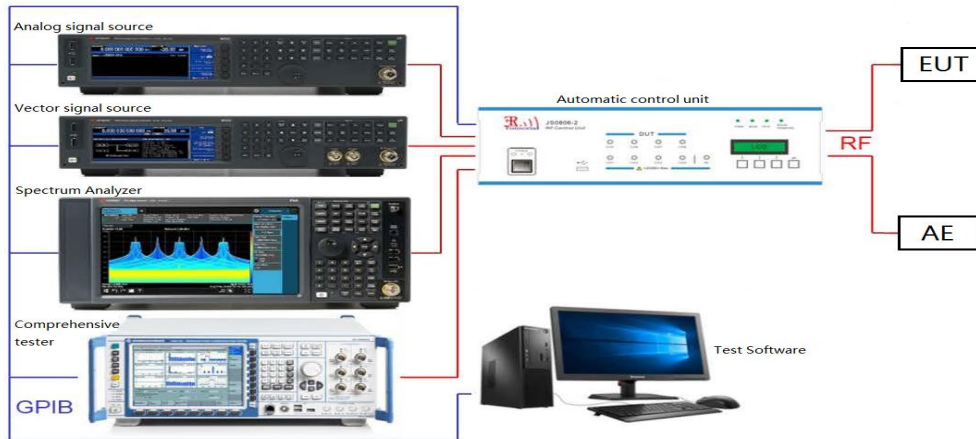
KDB 558074 D01 v05r02 – Section 8.3.2.2

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

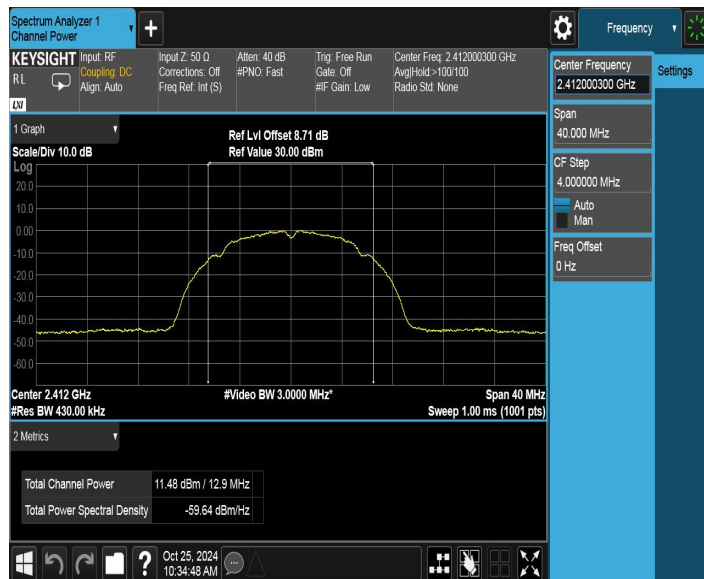


7.3.5. Test Result of Output Power

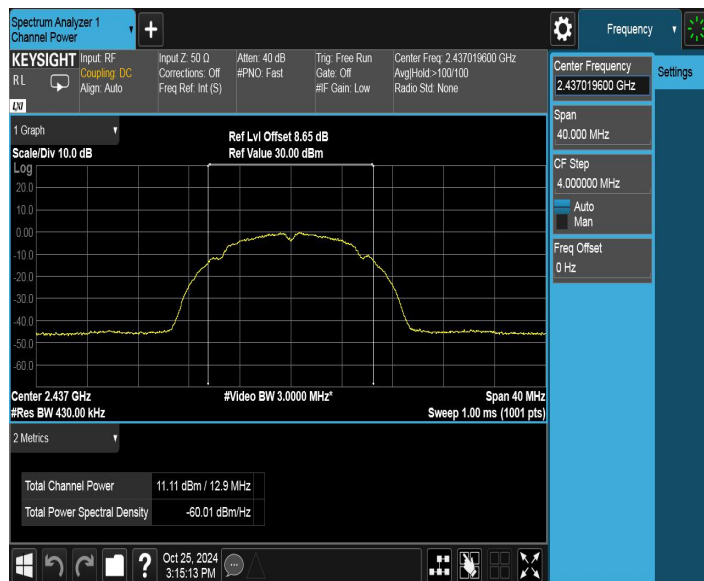
Test Mode	Channel	Average power [dBm]	Limit[dBm]	Verdict
802.11b	2412	11.47	≤30	PASS
	2437	11.17	≤30	PASS
	2462	10.70	≤30	PASS
802.11g	2412	11.36	≤30	PASS
	2437	11.73	≤30	PASS
	2462	12.25	≤30	PASS
802.11n-HT20	2412	11.63	≤30	PASS
	2437	11.96	≤30	PASS
	2462	12.59	≤30	PASS
802.11n-HT40	2422	10.10	≤30	PASS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

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

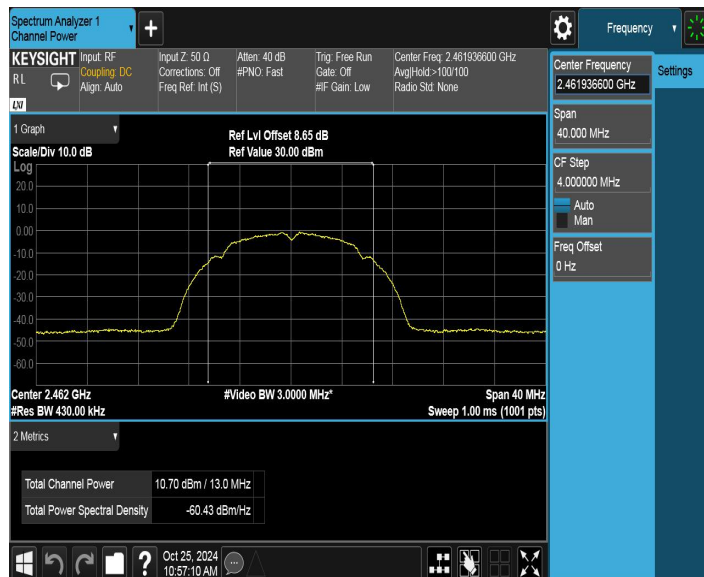
11B_Ant1_2412



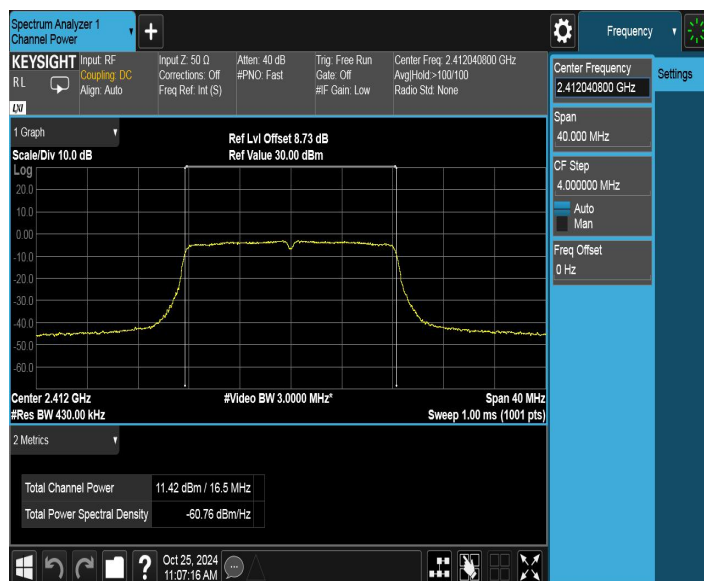
11B_Ant1_2437



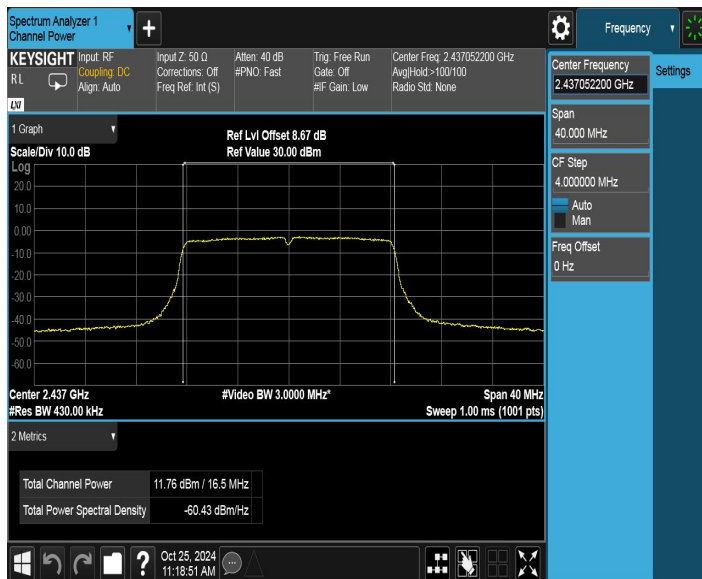
11B_Ant1_2462



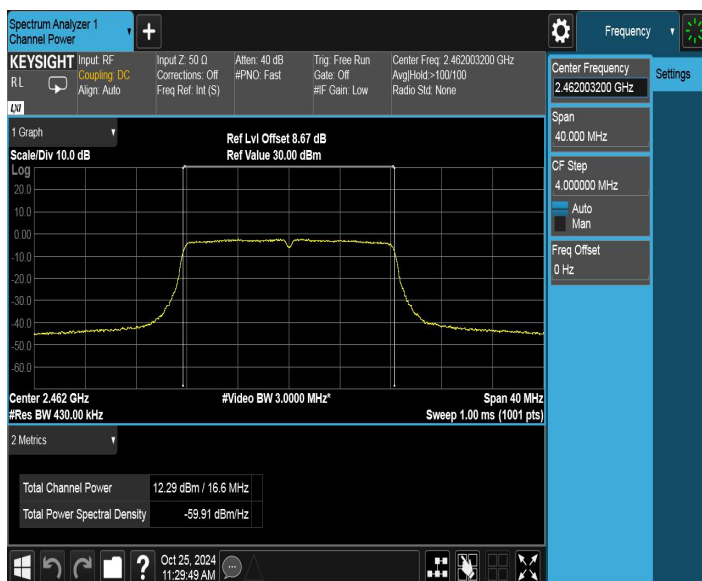
11G_Ant1_2412



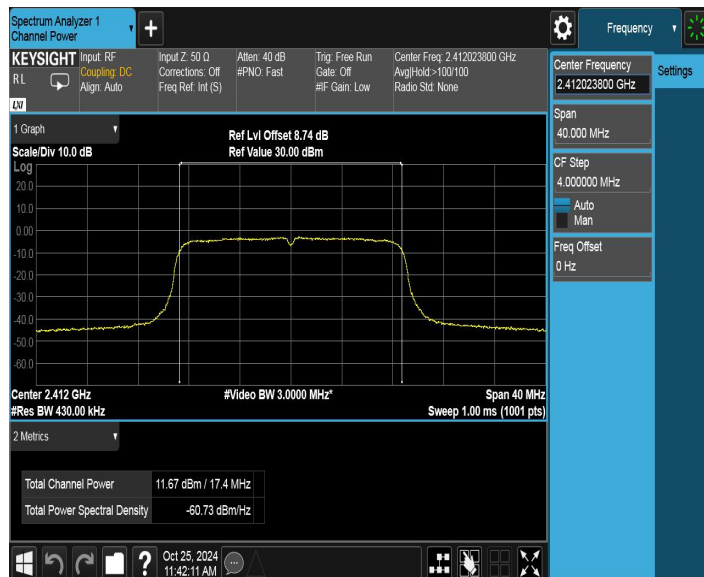
11G_Ant1_2437



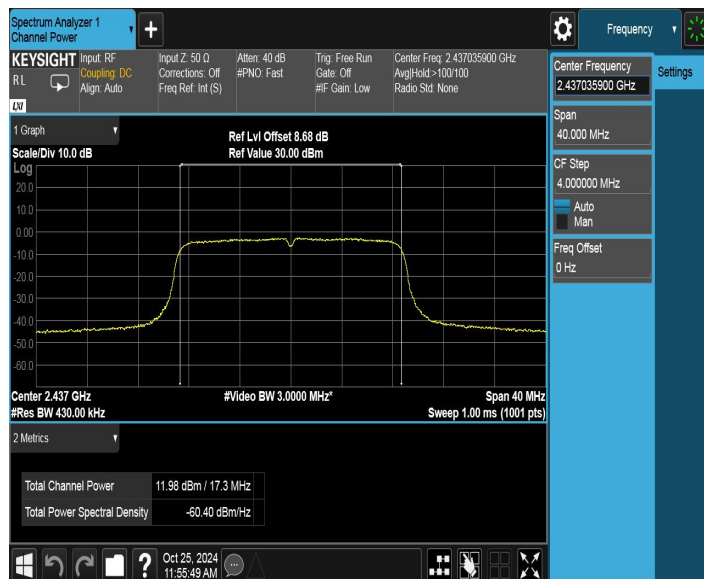
11G_Ant1_2462



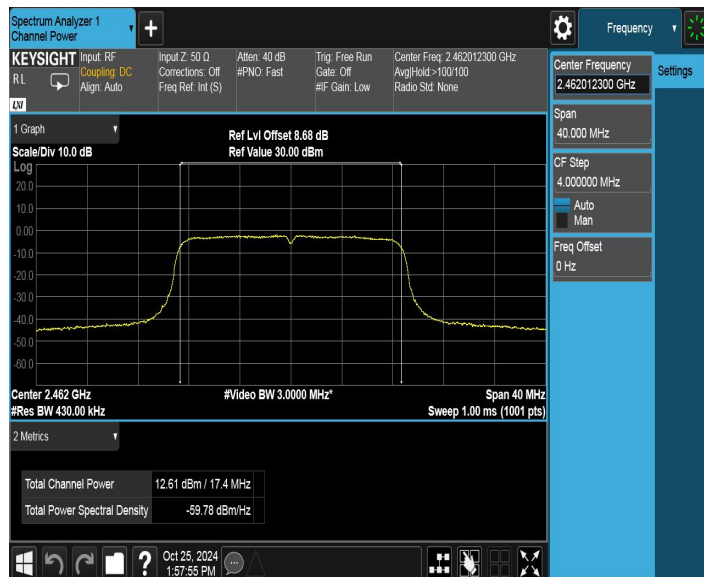
11N20SISO_Ant1_2412



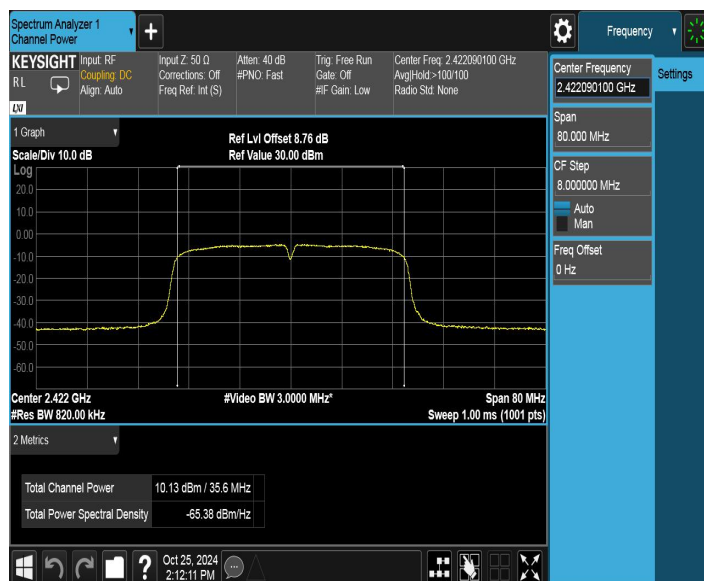
11N20SISO_Ant1_2437



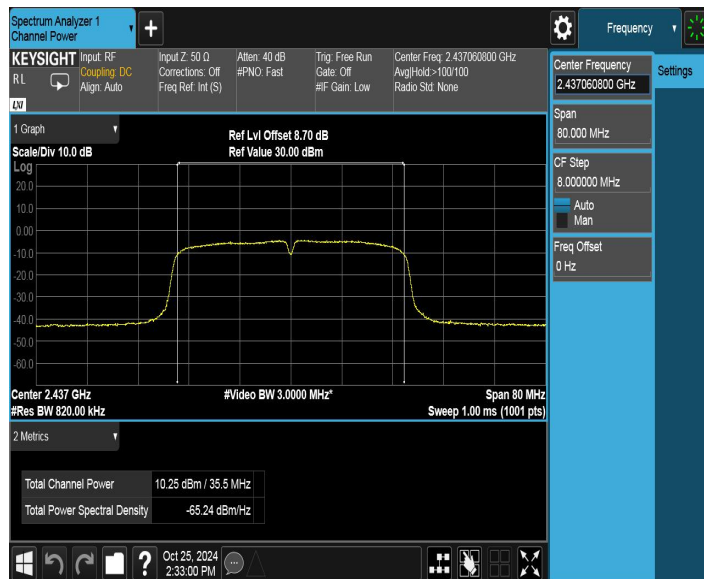
11N20SISO_Ant1_2462



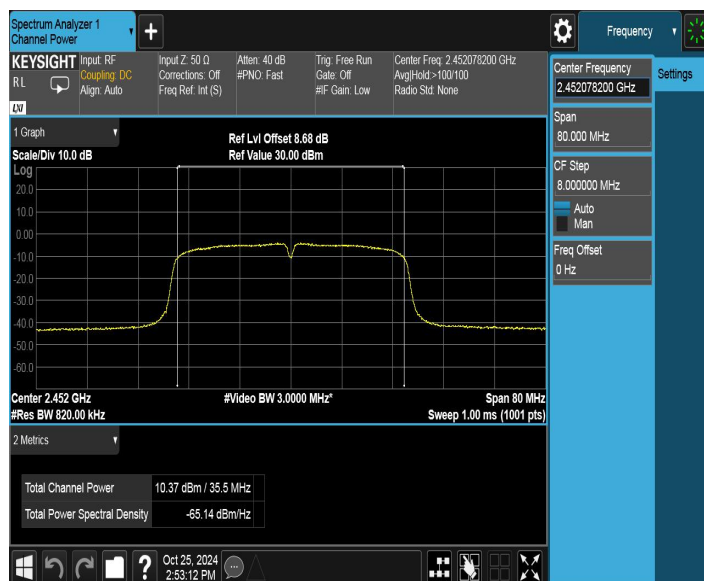
11N40SISO_Ant1_2422



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

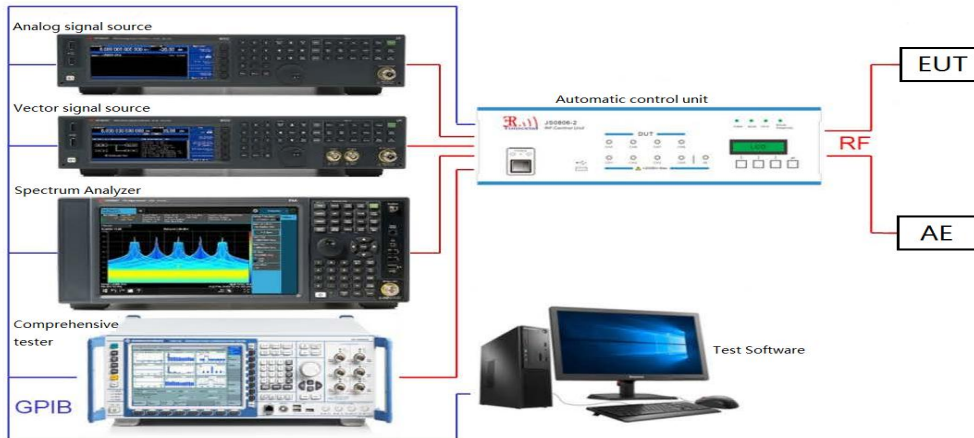
ANSI C63.10 – Section 11.10.5

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

