

Appendix B. Test Plots

QCN5024

Duty cycle

802.11b

On+off time



802.11g

On+off time



802.11ax HE20

On+off time



802.11ax HE40

On+off time



Out of Band Conducted Spurious Emission

802.11b_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-0

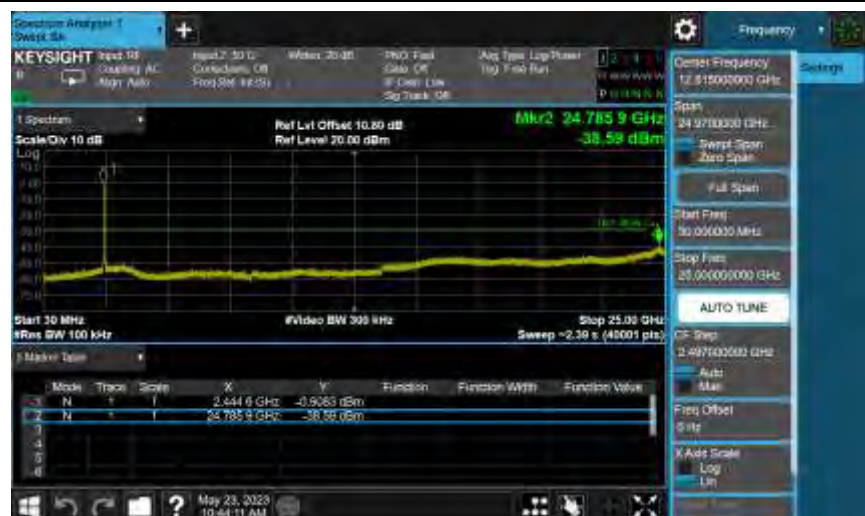
2422 MHz



2437 MHz



2452 MHz



802.11b_ANT-1

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-1

2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-1

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-1

2422 MHz



2437 MHz



2452 MHz



802.11b_ANT-2

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-2

2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-2

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-2

2422 MHz



2437 MHz



2452 MHz



802.11b_ANT-3

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-3

2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-3

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-3

2422 MHz



2437 MHz



2452 MHz



Reference level

802.11b_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-0

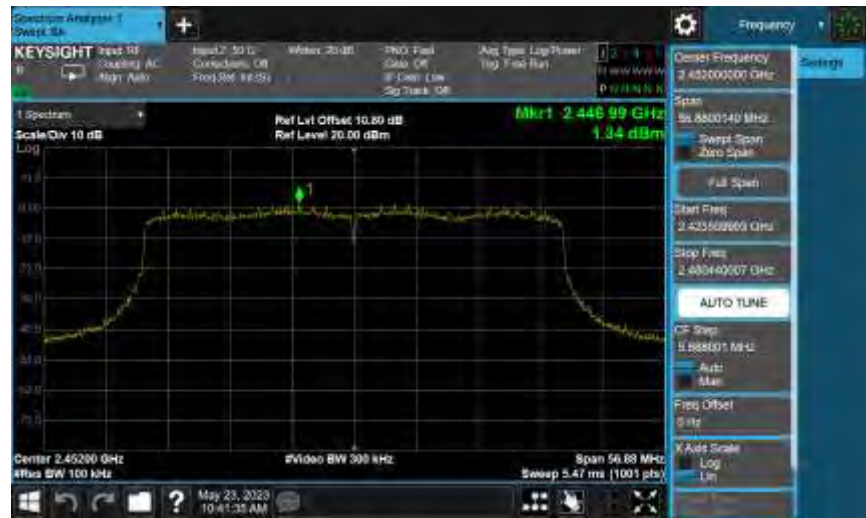
2422 MHz



2437 MHz



2452 MHz



802.11b_ANT-1

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-1

2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-1

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-1

2422 MHz



2437 MHz



2452 MHz



802.11b_ANT-2

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-2

2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-2

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-2

2422 MHz



2437 MHz



2452 MHz



802.11b_ANT-3

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-3

2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-3

2412 MHz



2437 MHz



2462 MHz





Conducted Band Edge

802.11b_ANT-0

2412 MHz



2462 MHz



802.11g_ANT-0

2412 MHz



2462 MHz



802.11ax HE20_ANT-0

2412 MHz



2462 MHz



802.11ax HE40_ANT-0

2422 MHz



2452 MHz



802.11b_ANT-1

2412 MHz



2462 MHz



802.11g_ANT-1

2412 MHz



2462 MHz



802.11ax HE20_ANT-1

2412 MHz



2462 MHz



802.11ax HE40_ANT-1

2422 MHz



2452 MHz



802.11b_ANT-2

2412 MHz



2462 MHz



802.11g_ANT-2

2412 MHz



2462 MHz



802.11ax HE20_ANT-2

2412 MHz



2462 MHz



802.11ax HE40_ANT-2

2422 MHz



2452 MHz



802.11b_ANT-3

2412 MHz



2462 MHz



802.11g_ANT-3

2412 MHz



2462 MHz



802.11ax HE20_ANT-3

2412 MHz



2462 MHz



802.11ax HE40_ANT-3

2422 MHz



2452 MHz



6 dB Bandwidth

802.11b_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-0

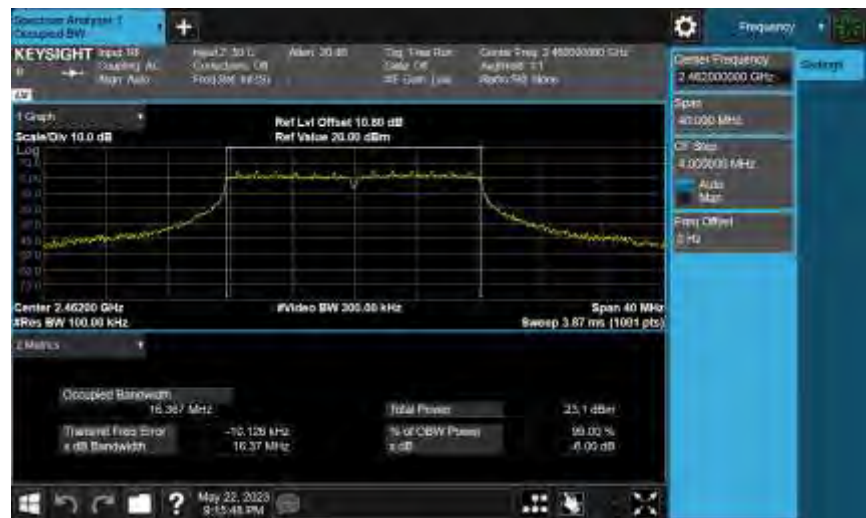
2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-0

2422 MHz



2437 MHz



2452 MHz



802.11b_ANT-1

2412 MHz



2437 MHz

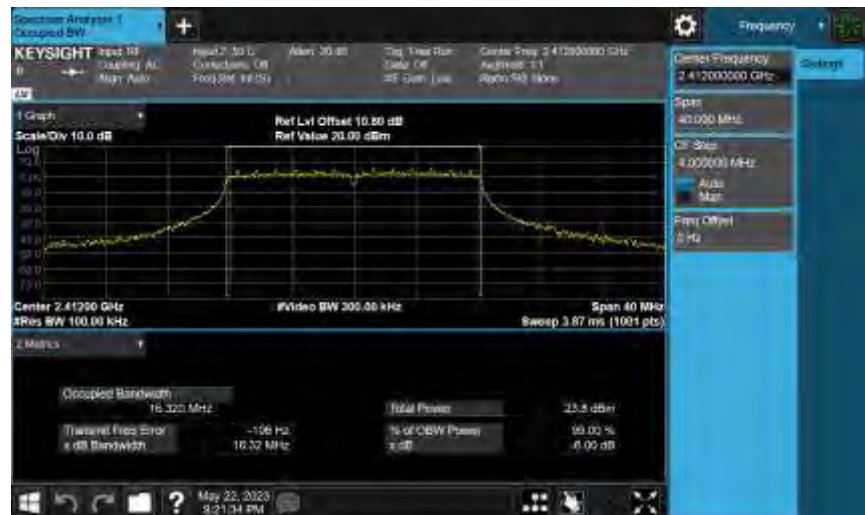


2462 MHz



802.11g_ANT-1

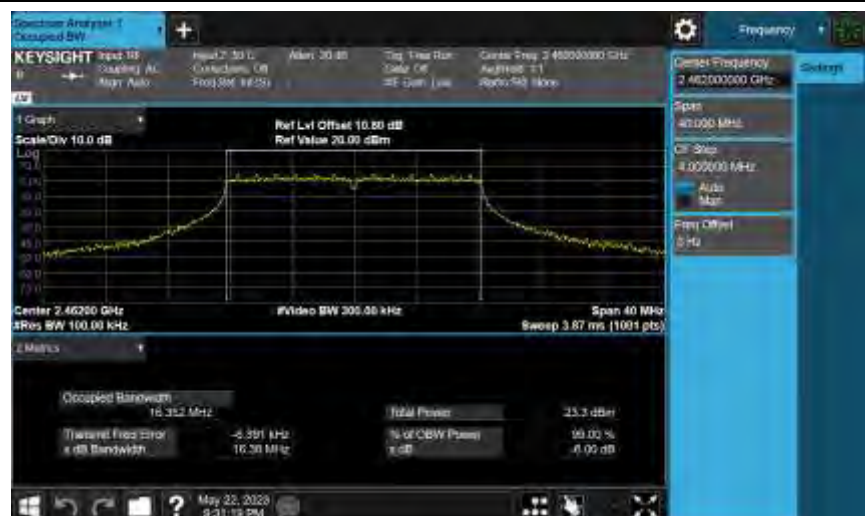
2412 MHz



2437 MHz

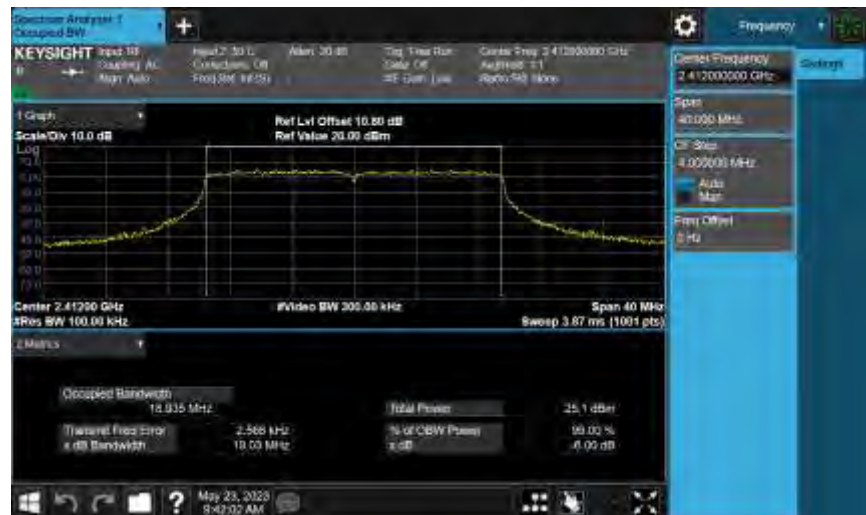


2462 MHz



802.11ax HE20_ANT-1

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-1

2422 MHz

Keysight Spectrum Analyzer screenshot showing a signal at 2422 MHz. The display includes a frequency plot with a yellow trace, a scale of 10.0 dB, and a reference level offset of 10.00 dB. The center frequency is 2.42200 GHz, and the video bandwidth is 300.00 kHz. The span is 80 MHz, and the sweep is 7.67 ms (1001 pts). The E-Metrics section shows an occupied bandwidth of 37.035 MHz, a total power of 23.8 dBm, and a transient peak error of 15.140 kHz. The interface also displays various settings like Resolution BW (100.00 kHz) and Span (80 MHz).

2437 MHz

Keysight Spectrum Analyzer screenshot showing a signal at 2437 MHz. The display includes a frequency plot with a yellow trace, a scale of 10.0 dB, and a reference level offset of 10.00 dB. The center frequency is 2.43700 GHz, and the video bandwidth is 300.00 kHz. The span is 80 MHz, and the sweep is 7.67 ms (1001 pts). The E-Metrics section shows an occupied bandwidth of 37.054 MHz, a total power of 23.3 dBm, and a transient peak error of 8.074 kHz. The interface also displays various settings like Resolution BW (100.00 kHz) and Span (80 MHz).

2452 MHz

Keysight Spectrum Analyzer screenshot showing a signal at 2452 MHz. The display includes a frequency plot with a yellow trace, a scale of 10.0 dB, and a reference level offset of 10.00 dB. The center frequency is 2.45200 GHz, and the video bandwidth is 300.00 kHz. The span is 80 MHz, and the sweep is 7.67 ms (1001 pts). The E-Metrics section shows an occupied bandwidth of 37.054 MHz, a total power of 23.8 dBm, and a transient peak error of 13.088 kHz. The interface also displays various settings like Resolution BW (100.00 kHz) and Span (80 MHz).

802.11b_ANT-2

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-2

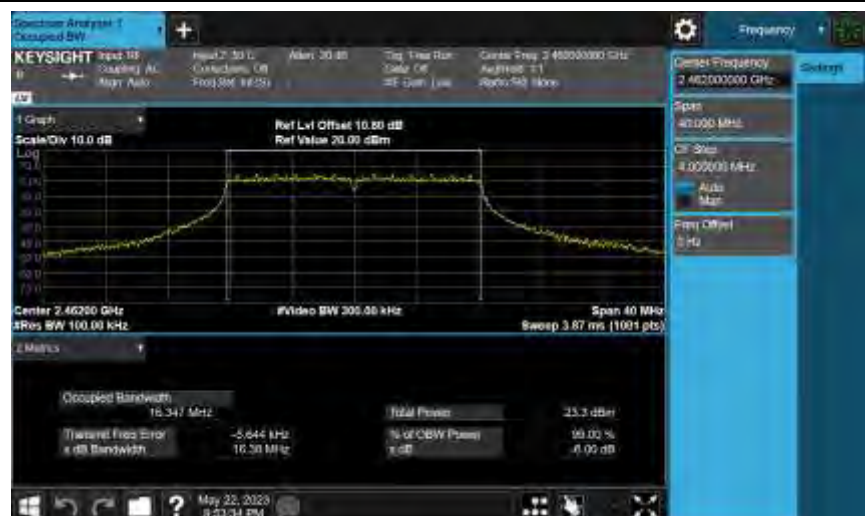
2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-2

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-2

2422 MHz



2437 MHz



2452 MHz



802.11b_ANT-3

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-3

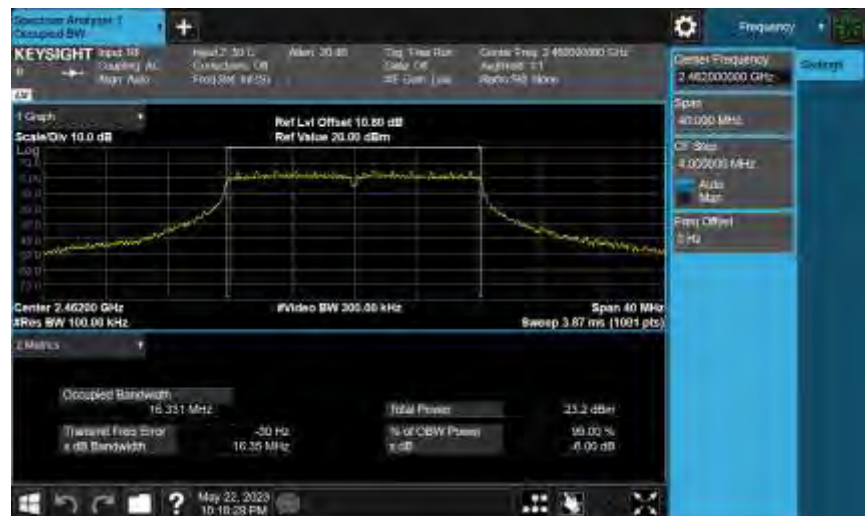
2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-3

2412 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Result: 30.0 Center Freq: 2412.000000 GHz Span: 40.000 MHz

Ref Lvl Offset: 10.00 dB Ref Value: 20.00 dBm

Center 2.41200 GHz #Video BW 300.00 kHz Span 40 MHz

Res BW 100.00 kHz Sweep 3.87 ms (1001 pts)

Occupied Bandwidth: 13.794 MHz Total Power: 24.3 dBm

Transmit Freq Error: 13.794 MHz % of CBW Power: 99.00 %

3 dB Bandwidth: 13.794 MHz 3 dB: 6.00 dB

May 23, 2023 10:12:40 AM

2437 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Result: 30.0 Center Freq: 2437.000000 GHz Span: 40.000 MHz

Ref Lvl Offset: 10.00 dB Ref Value: 20.00 dBm

Center 2.43700 GHz #Video BW 300.00 kHz Span 40 MHz

Res BW 100.00 kHz Sweep 3.87 ms (1001 pts)

Occupied Bandwidth: 11.560 MHz Total Power: 25.7 dBm

Transmit Freq Error: 11.560 MHz % of CBW Power: 99.00 %

3 dB Bandwidth: 11.560 MHz 3 dB: 6.00 dB

May 23, 2023 10:17:38 AM

2462 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Result: 30.0 Center Freq: 2462.000000 GHz Span: 40.000 MHz

Ref Lvl Offset: 10.00 dB Ref Value: 20.00 dBm

Center 2.46200 GHz #Video BW 300.00 kHz Span 40 MHz

Res BW 100.00 kHz Sweep 3.87 ms (1001 pts)

Occupied Bandwidth: 3.752 MHz Total Power: 25.7 dBm

Transmit Freq Error: 3.752 MHz % of CBW Power: 99.00 %

3 dB Bandwidth: 3.752 MHz 3 dB: 6.00 dB

May 23, 2023 10:21:31 AM

802.11ax HE40_ANT-3

2422 MHz



2437 MHz



2452 MHz



99% Occupied Bandwidth

802.11b_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-0

2422 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center 2.4220 GHz
#Res BW 1.0000 MHz
#Video BW 3.0000 MHz
Span 80 MHz
Sweep 1.00 ms (1001 pts)

Occupied Bandwidth: 37.037 MHz
Total Power: 25.6 dBm
Transient Freq Error: 2.788 kHz
% of CBW Power: 99.00 %
x dB Bandwidth: 41.86 MHz
x dB

May 23, 2020 10:28:07 AM

2437 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center 2.4370 GHz
#Res BW 1.0000 MHz
#Video BW 3.0000 MHz
Span 80 MHz
Sweep 1.00 ms (1001 pts)

Occupied Bandwidth: 37.036 MHz
Total Power: 27.5 dBm
Transient Freq Error: 5.830 kHz
% of CBW Power: 99.00 %
x dB Bandwidth: 42.44 MHz
x dB

May 23, 2020 10:35:07 AM

2452 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center 2.4520 GHz
#Res BW 1.0000 MHz
#Video BW 3.0000 MHz
Span 80 MHz
Sweep 1.00 ms (1001 pts)

Occupied Bandwidth: 37.930 MHz
Total Power: 25.6 dBm
Transient Freq Error: 11.573 kHz
% of CBW Power: 99.00 %
x dB Bandwidth: 41.86 MHz
x dB

May 23, 2020 10:40:03 AM

802.11b_ANT-1

2412 MHz



2437 MHz

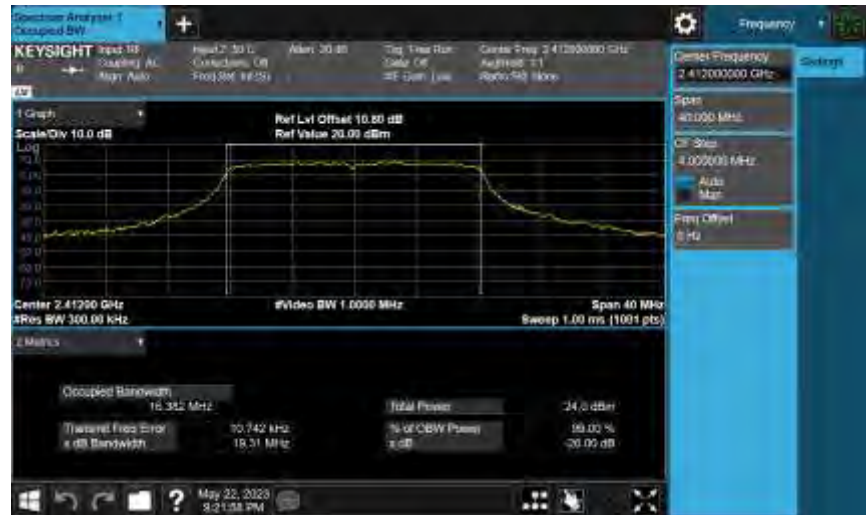


2462 MHz



802.11g_ANT-1

2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-1

2412 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Head: 2.30 Hz, Center: 2412.000 GHz, Span: 40.000 MHz, Res: 300.000 kHz, Video BW: 1.0000 MHz, Sweep: 1.00 ms (1001 pts)

Center: 2412.000 GHz, Span: 40.000 MHz, Res: 300.000 kHz, Video BW: 1.0000 MHz, Sweep: 1.00 ms (1001 pts)

Occupied Bandwidth: 12.713 MHz, Total Power: 28.3 dBm, % of CBW Power: 99.00 %, 10 dB Bandwidth: 21.43 MHz, 1 dB Bandwidth: 20.00 dB

2437 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Head: 2.30 Hz, Center: 2437.000 GHz, Span: 40.000 MHz, Res: 300.000 kHz, Video BW: 1.0000 MHz, Sweep: 1.00 ms (1001 pts)

Center: 2437.000 GHz, Span: 40.000 MHz, Res: 300.000 kHz, Video BW: 1.0000 MHz, Sweep: 1.00 ms (1001 pts)

Occupied Bandwidth: 24.805 MHz, Total Power: 28.3 dBm, % of CBW Power: 99.00 %, 10 dB Bandwidth: 32.32 MHz, 1 dB Bandwidth: 20.00 dB

2462 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Head: 2.30 Hz, Center: 2462.000 GHz, Span: 40.000 MHz, Res: 300.000 kHz, Video BW: 1.0000 MHz, Sweep: 1.00 ms (1001 pts)

Center: 2462.000 GHz, Span: 40.000 MHz, Res: 300.000 kHz, Video BW: 1.0000 MHz, Sweep: 1.00 ms (1001 pts)

Occupied Bandwidth: 0.055 MHz, Total Power: 25.1 dBm, % of CBW Power: 99.00 %, 10 dB Bandwidth: 21.72 MHz, 1 dB Bandwidth: 20.00 dB

802.11ax HE40_ANT-1

2422 MHz



2437 MHz



2452 MHz



802.11b_ANT-2

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-2

2412 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center 2.41290 GHz
#Res BW 300.00 kHz
#Video BW 1.0000 MHz
Span 40 MHz
Sweep 1.00 ms (1001 pts)

Occupied Bandwidth: 18.335 MHz
Total Power: 24.2 dBm
Transmit Freq Error: 10.375 kHz
% of CBW Power: 99.00 %
x dB Bandwidth: 18.53 MHz
x dB

May 22, 2023 8:43:58 PM

2437 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center 2.43700 GHz
#Res BW 300.00 kHz
#Video BW 1.0000 MHz
Span 40 MHz
Sweep 1.00 ms (1001 pts)

Occupied Bandwidth: 18.976 MHz
Total Power: 27.7 dBm
Transmit Freq Error: 95.279 kHz
% of CBW Power: 99.00 %
x dB Bandwidth: 23.36 MHz
x dB

May 22, 2023 8:48:03 PM

2462 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center 2.46200 GHz
#Res BW 300.00 kHz
#Video BW 1.0000 MHz
Span 40 MHz
Sweep 1.00 ms (1001 pts)

Occupied Bandwidth: 18.484 MHz
Total Power: 25.4 dBm
Transmit Freq Error: -2.062 kHz
% of CBW Power: 99.00 %
x dB Bandwidth: 19.70 MHz
x dB

May 22, 2023 8:51:58 PM

802.11ax HE20_ANT-2

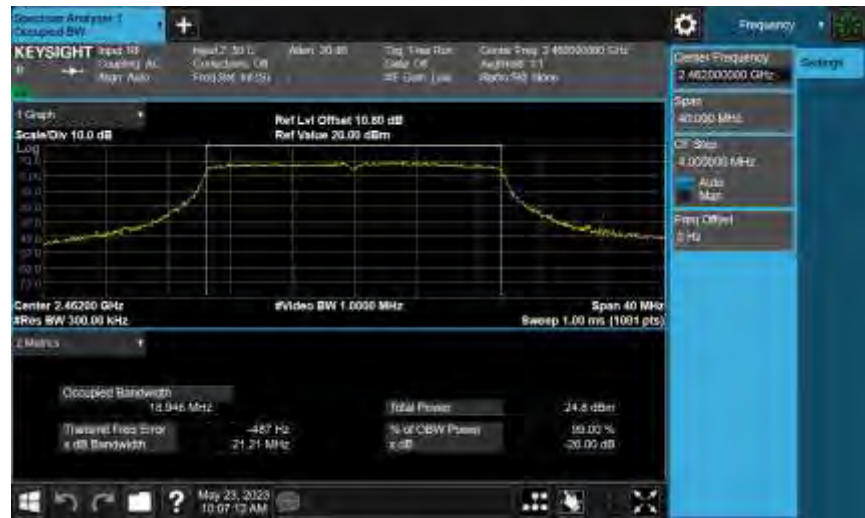
2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-2

2422 MHz



2437 MHz



2452 MHz



802.11b_ANT-3

2412 MHz



2437 MHz

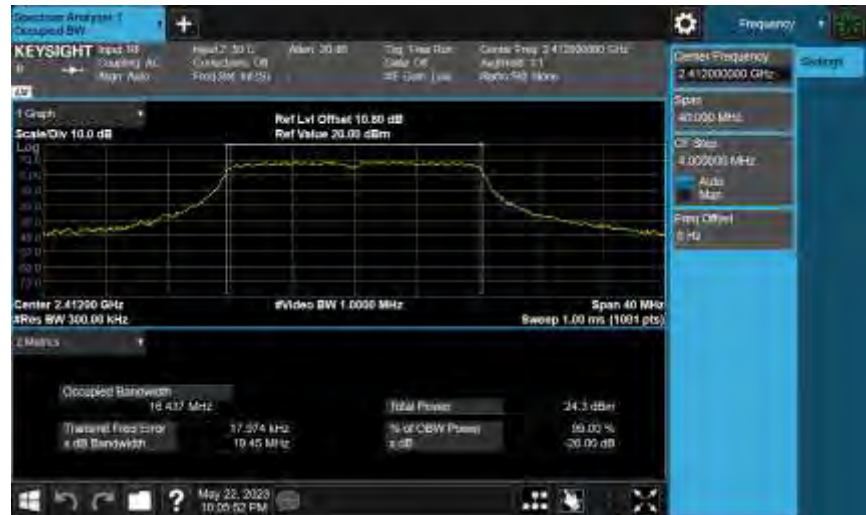


2462 MHz



802.11g_ANT-3

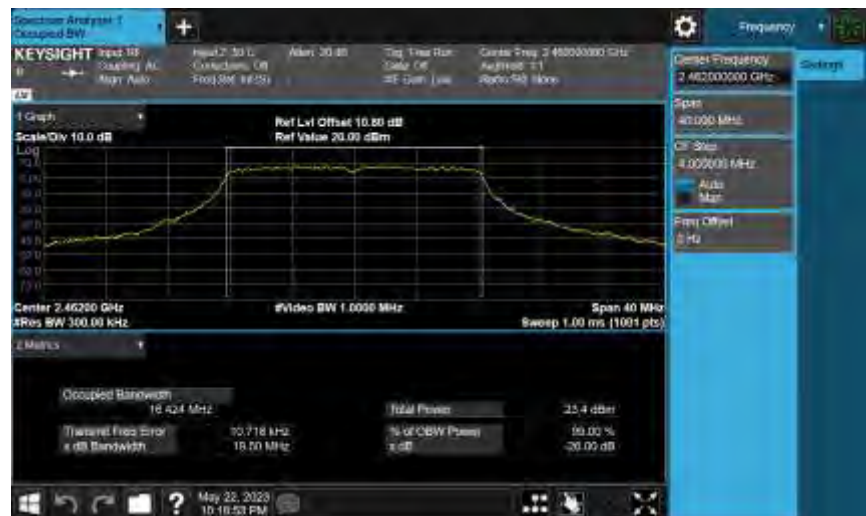
2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-3

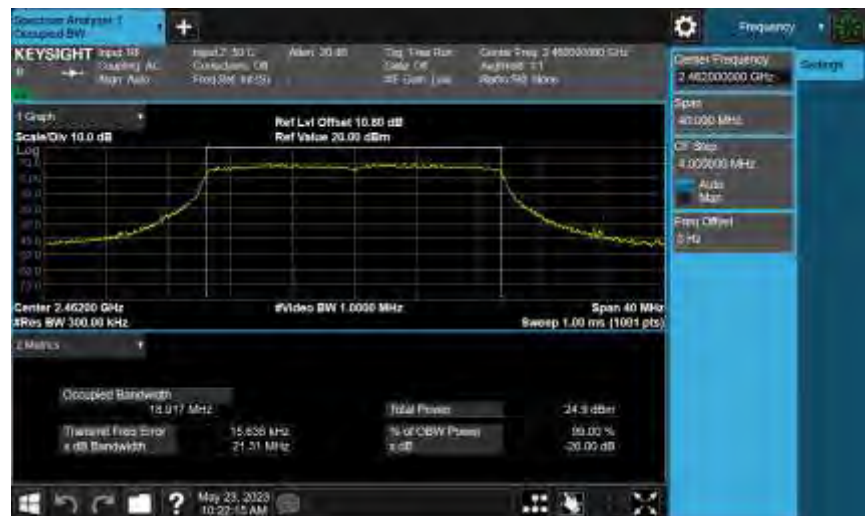
2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-3

2422 MHz



2437 MHz



2452 MHz



Maximum Power Spectral Density

802.11b_ANT-0

2412 MHz



2437 MHz

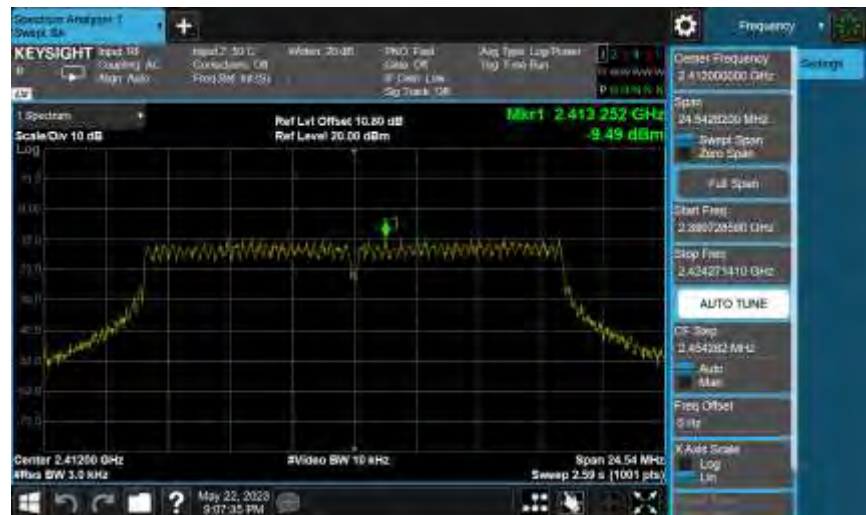


2462 MHz



802.11g_ANT-0

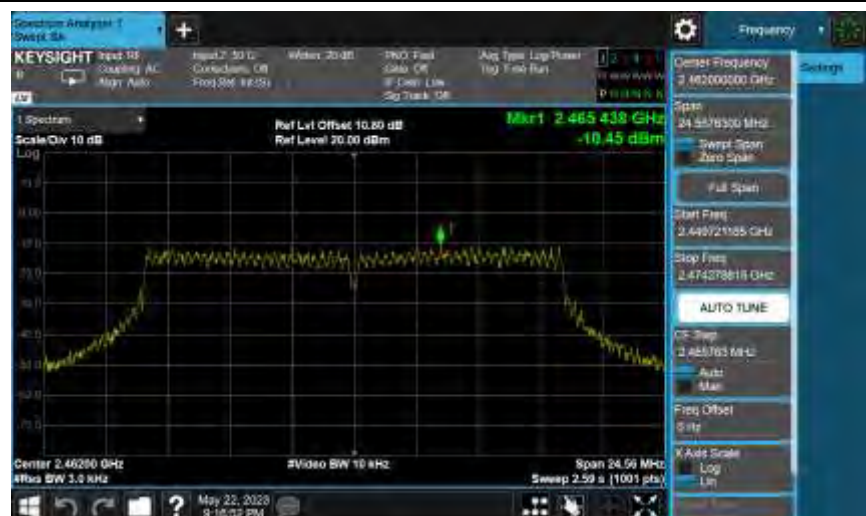
2412 MHz



2437 MHz

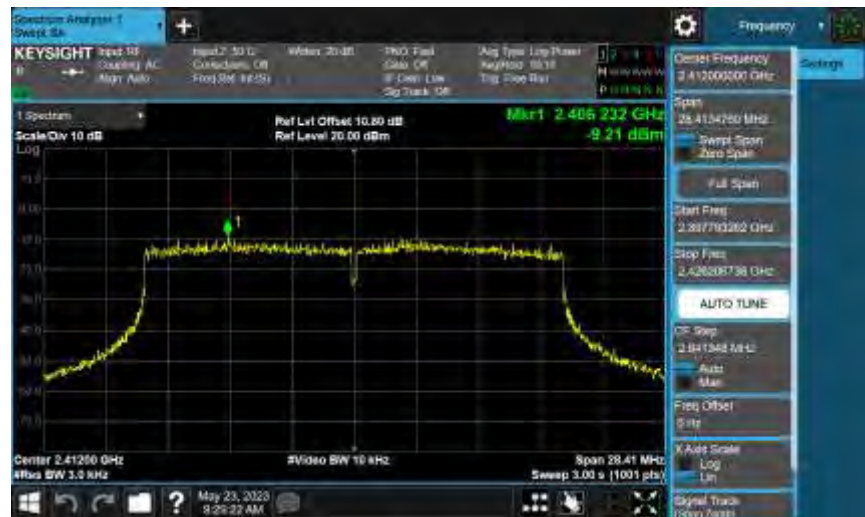


2462 MHz



802.11ax HE20_ANT-0

2412 MHz



2437 MHz



2462 MHz

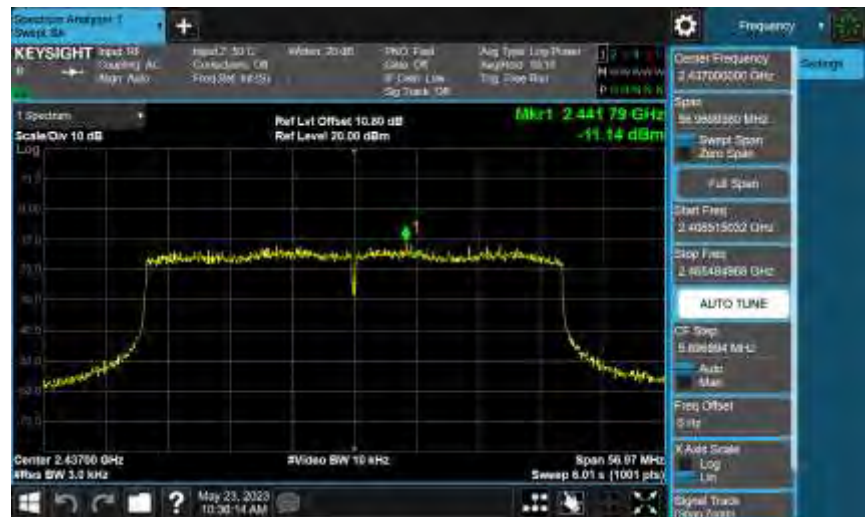


802.11ax HE40_ANT-0

2422 MHz



2437 MHz



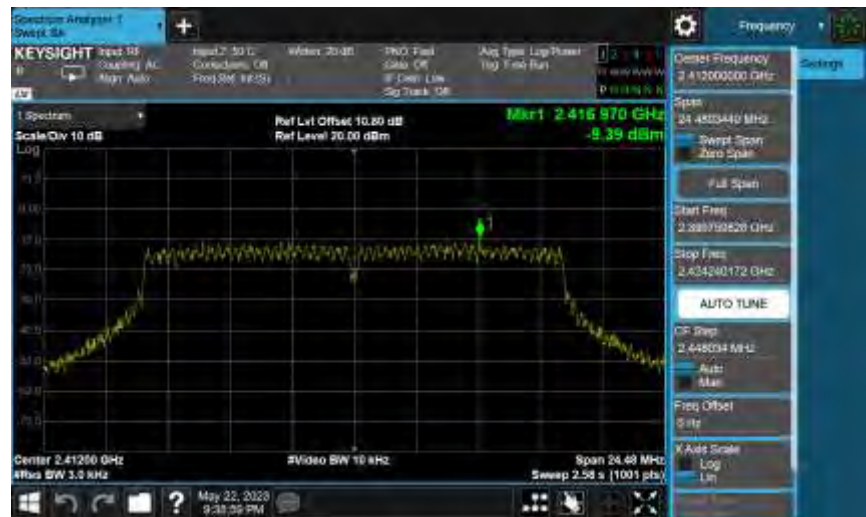
2452 MHz





802.11g_ANT-1

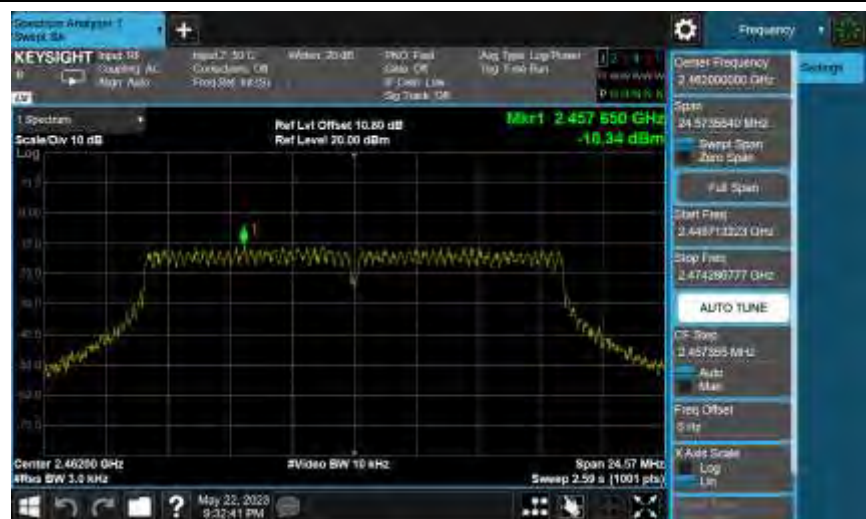
2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-1

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-1

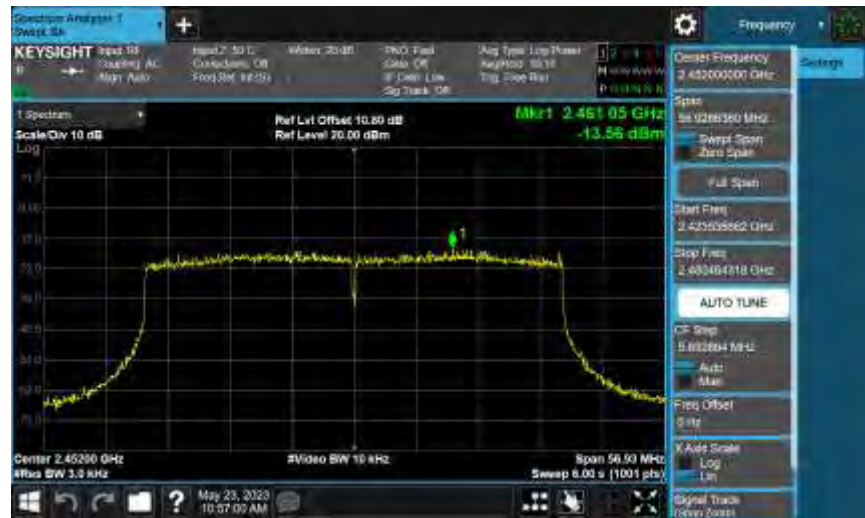
2422 MHz

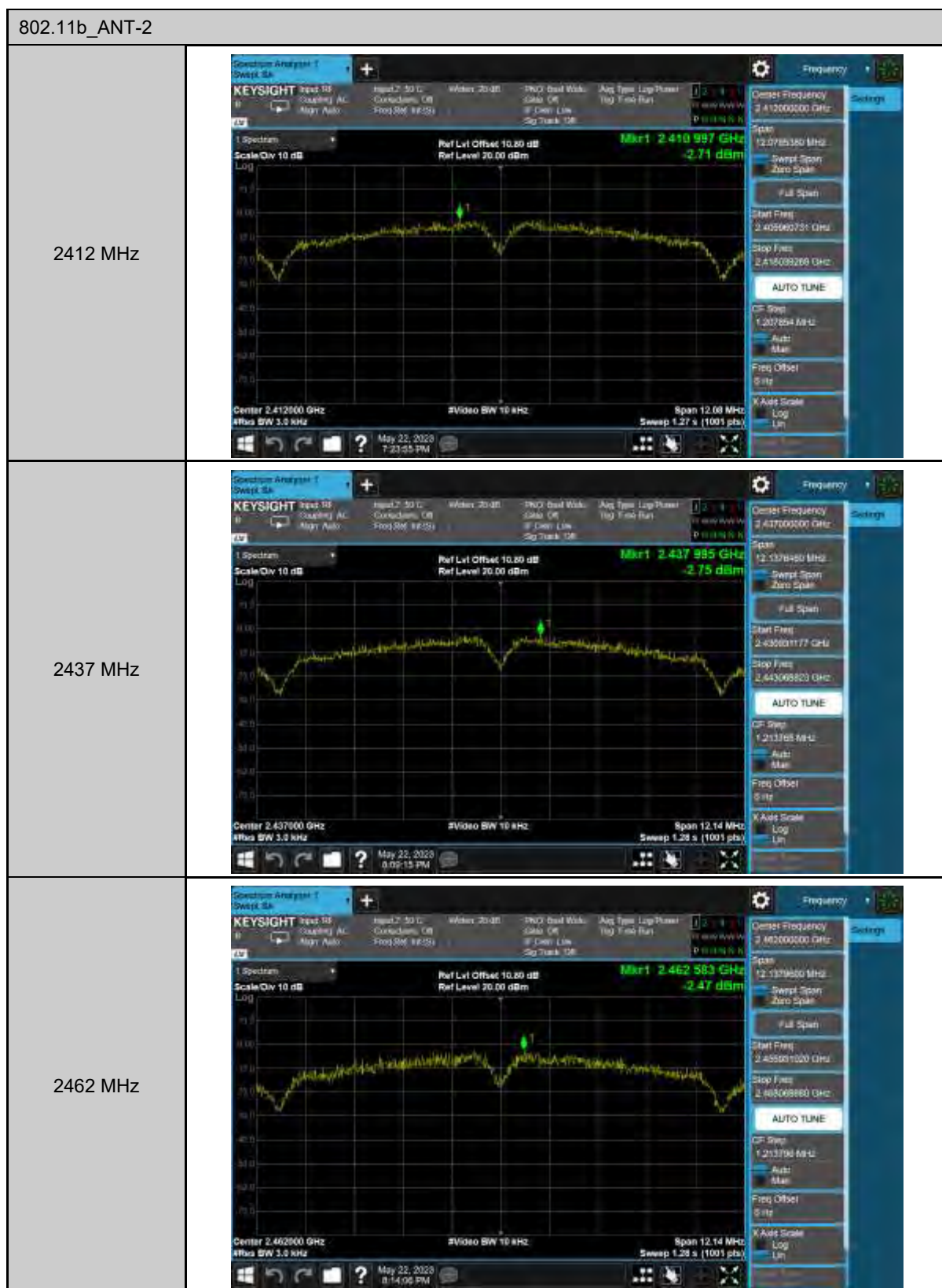


2437 MHz



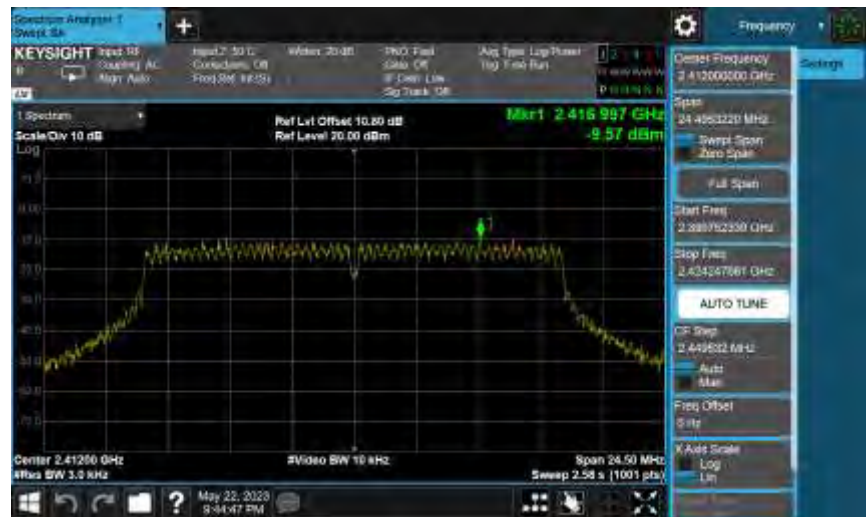
2452 MHz





802.11g_ANT-2

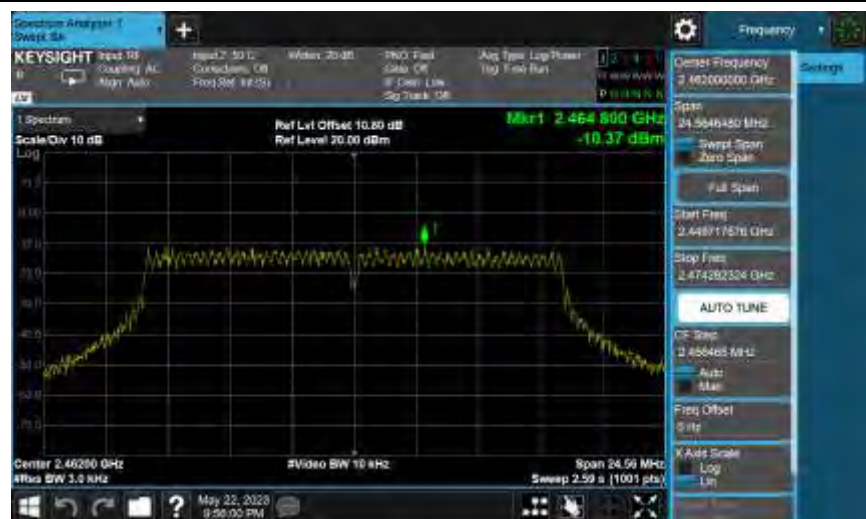
2412 MHz



2437 MHz



2462 MHz



802.11ax HE20_ANT-2

2412 MHz



2437 MHz



2462 MHz



802.11ax HE40_ANT-2

2422 MHz



2437 MHz



2452 MHz



802.11b_ANT-3

2412 MHz



2437 MHz

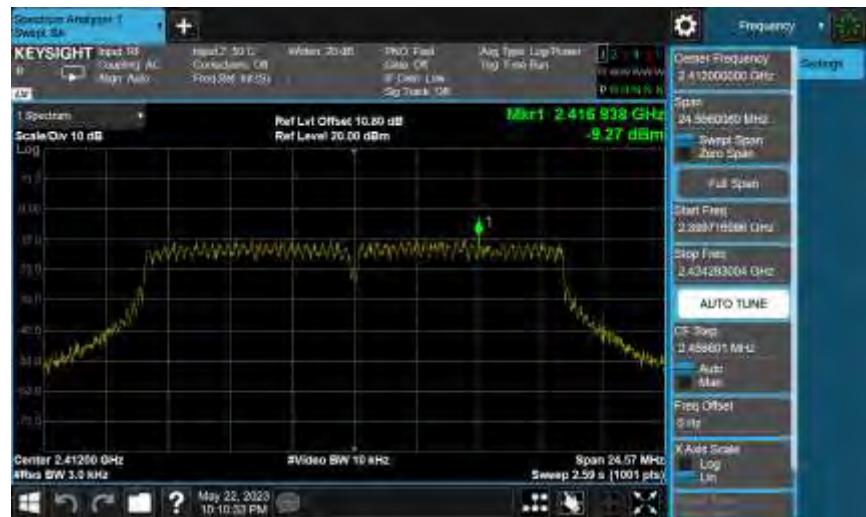


2462 MHz



802.11g_ANT-3

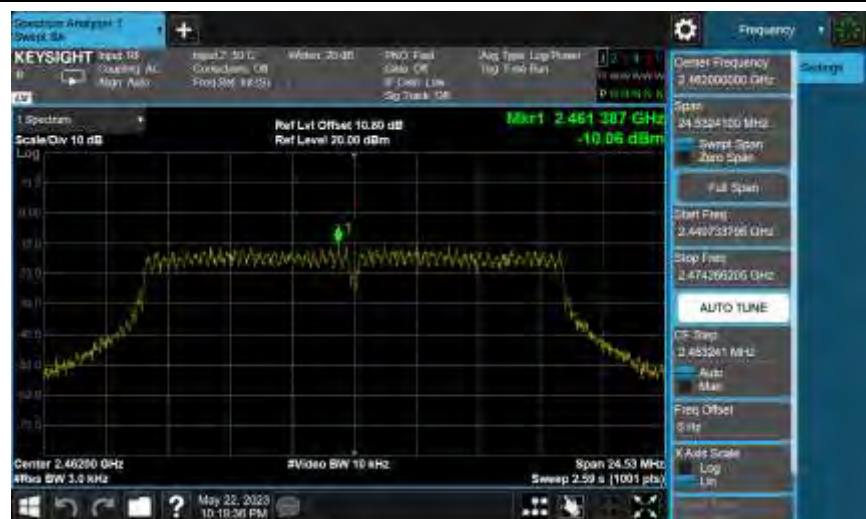
2412 MHz



2437 MHz

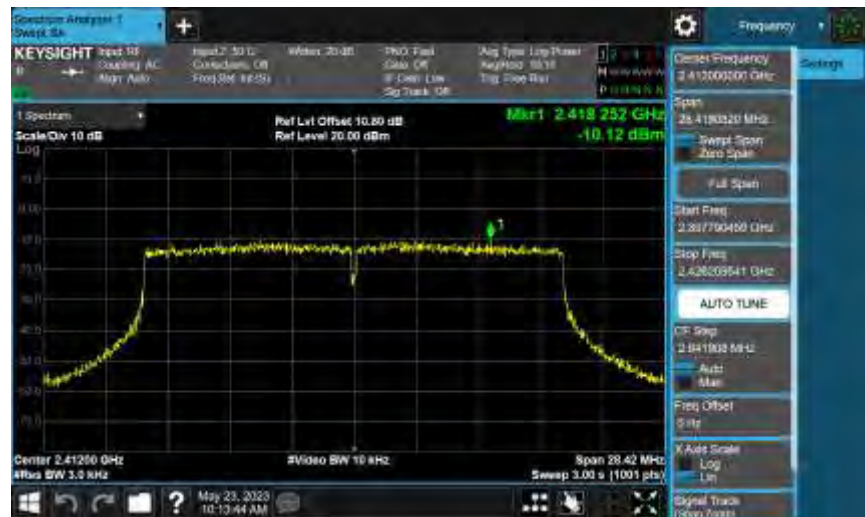


2462 MHz



802.11ax HE20_ANT-3

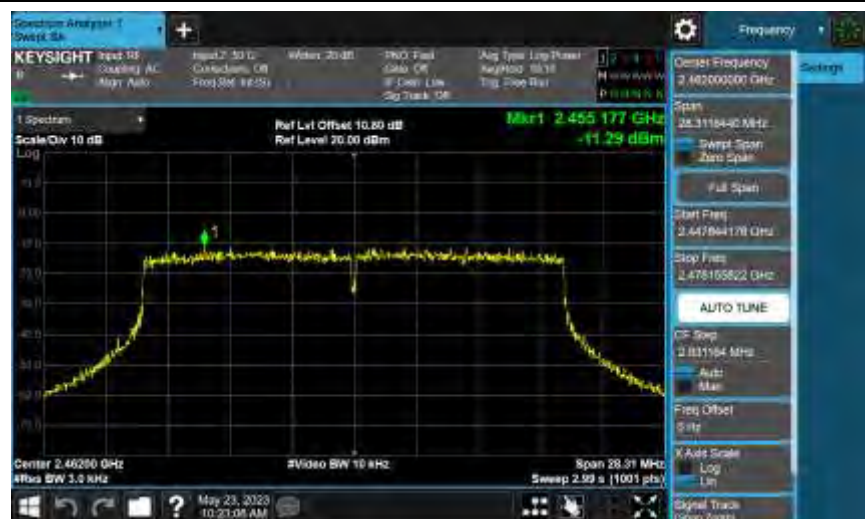
2412 MHz



2437 MHz



2462 MHz

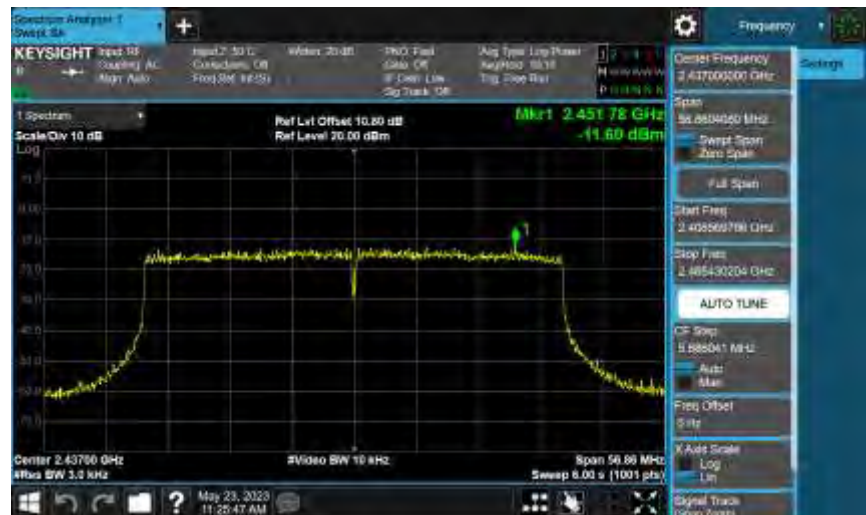


802.11ax HE40_ANT-3

2422 MHz



2437 MHz



2452 MHz



QCA9889

Duty cycle

802.11b

On+off time



802.11g

On+off time



802.11n VHT20

On+off time



802.11n VHT40

On+off time



Out of Band Conducted Spurious Emission

802.11b_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11n VHT20_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11n VHT40_ANT-0

2422 MHz



2437 MHz



2452 MHz



Reference level

802.11b_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11n VHT20_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11n VHT40_ANT-0

2422 MHz



2437 MHz



2452 MHz



Conducted Band Edge

802.11b_ANT-0

2412 MHz



2462 MHz



802.11g_ANT-0

2412 MHz



2462 MHz



802.11n VHT20_ANT-0

2412 MHz



2462 MHz



802.11n VHT40_ANT-0

2422 MHz



2452 MHz



6 dB Bandwidth

802.11b_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11n VHT20_ANT-0

2412 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center Frequency: 2.412000000 GHz

Span: 40.000 MHz

Ref Lvl Offset: 10.00 dB

Ref Value: 20.00 dBm

Occupied Bandwidth: 17.756 MHz

Total Power: 20.3 dBm

Transient Freq Error: 6.616 kHz

% of CBW Power: 99.00 %

dB Bandwidth: 17.54 MHz

dB: -6.00 dB

May 22, 2023 10:00:00 AM

2437 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center Frequency: 2.437000000 GHz

Span: 40.000 MHz

Ref Lvl Offset: 10.00 dB

Ref Value: 20.00 dBm

Occupied Bandwidth: 23.256 MHz

Total Power: 27.7 dBm

Transient Freq Error: 656.47 kHz

% of CBW Power: 99.00 %

dB Bandwidth: 17.57 MHz

dB: -6.00 dB

May 22, 2023 10:00:00 AM

2462 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center Frequency: 2.462000000 GHz

Span: 40.000 MHz

Ref Lvl Offset: 10.00 dB

Ref Value: 20.00 dBm

Occupied Bandwidth: 18.722 MHz

Total Power: 24.7 dBm

Transient Freq Error: 702.29 kHz

% of CBW Power: 99.00 %

dB Bandwidth: 17.57 MHz

dB: -6.00 dB

May 22, 2023 10:03:00 AM

802.11n VHT40_ANT-0

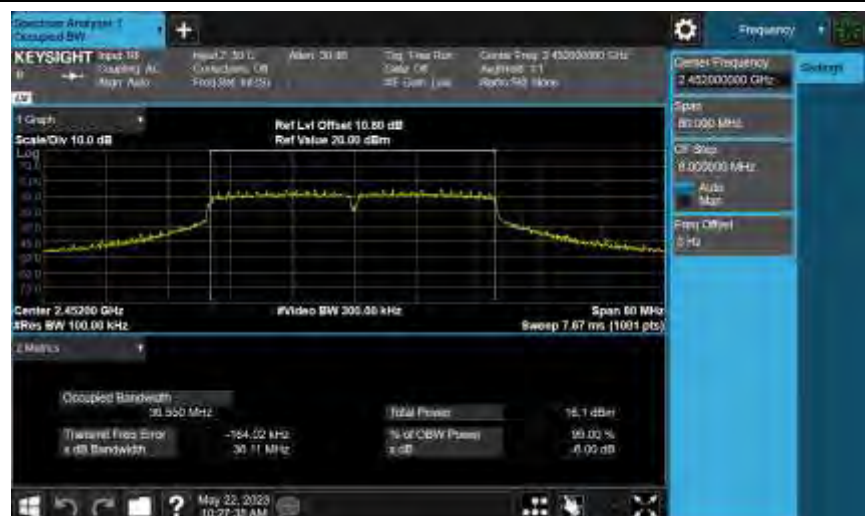
2422 MHz



2437 MHz



2452 MHz



99% Occupied Bandwidth

802.11b_ANT-0	 Keysight Spectrum Analyzer 1 Occupied BW Center Frequency: 2 412 000 000 GHz Span: 40.000 MHz Occupied Bandwidth: 12.463 MHz Total Power: 18.6 dBm % of CBW Power: 99.00 % 99% BW: 16.20 MHz
2437 MHz	 Keysight Spectrum Analyzer 1 Occupied BW Center Frequency: 2 437 000 000 GHz Span: 40.000 MHz Occupied Bandwidth: 12.765 MHz Total Power: 20.5 dBm % of CBW Power: 99.00 % 99% BW: 16.70 MHz
2462 MHz	 Keysight Spectrum Analyzer 1 Occupied BW Center Frequency: 2 462 000 000 GHz Span: 40.000 MHz Occupied Bandwidth: 12.857 MHz Total Power: 20.5 dBm % of CBW Power: 99.00 % 99% BW: 16.32 MHz

802.11g_ANT-0

2412 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center Frequency: 2.41200000 GHz
Span: 40.000 MHz
Ref Lvl Offset: 10.00 dB
Ref Value: 20.00 dBm

Occupied Bandwidth: 17.142 MHz
Total Power: 21.5 dBm
Transient Freq Error: 33.235 kHz
% of CBW Power: 99.00 %

2437 MHz

KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center Frequency: 2.43700000 GHz
Span: 40.000 MHz
Ref Lvl Offset: 10.00 dB
Ref Value: 20.00 dBm

Occupied Bandwidth: 24.502 MHz
Total Power: 27.2 dBm
Transient Freq Error: 702.70 kHz
% of CBW Power: 99.00 %

2462 MHz

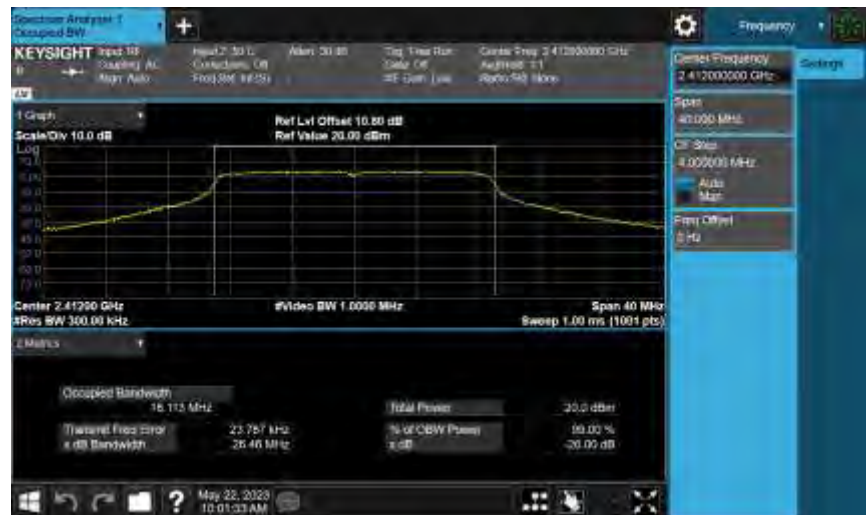
KEYSIGHT Spectrum Analyzer 1 Occupied BW

Center Frequency: 2.46200000 GHz
Span: 40.000 MHz
Ref Lvl Offset: 10.00 dB
Ref Value: 20.00 dBm

Occupied Bandwidth: 18.684 MHz
Total Power: 24.5 dBm
Transient Freq Error: 240.55 kHz
% of CBW Power: 99.00 %

802.11n VHT20_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11n VHT40_ANT-0

2422 MHz



2437 MHz



2452 MHz



Maximum Power Spectral Density

802.11b_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11g_ANT-0

2412 MHz



2437 MHz



2462 MHz



802.11n VHT20_ANT-0

2412 MHz



2437 MHz



2462 MHz

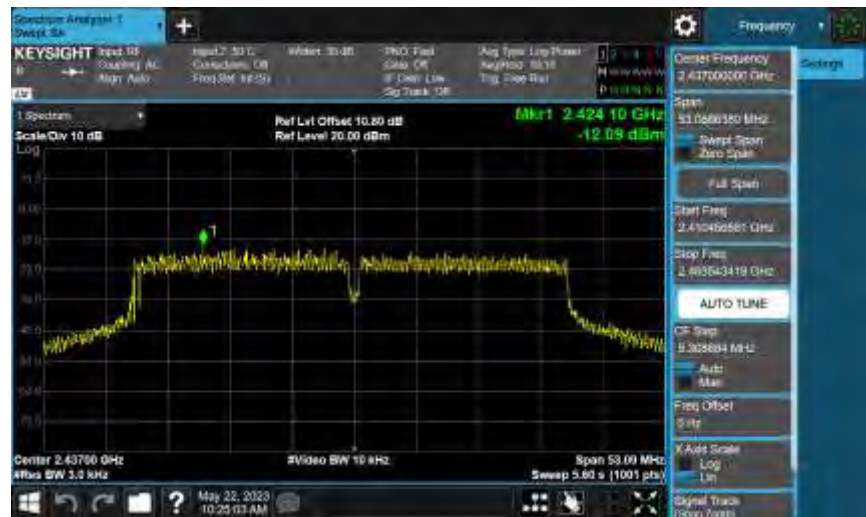


802.11n VHT40_ANT-0

2422 MHz



2437 MHz



2452 MHz

