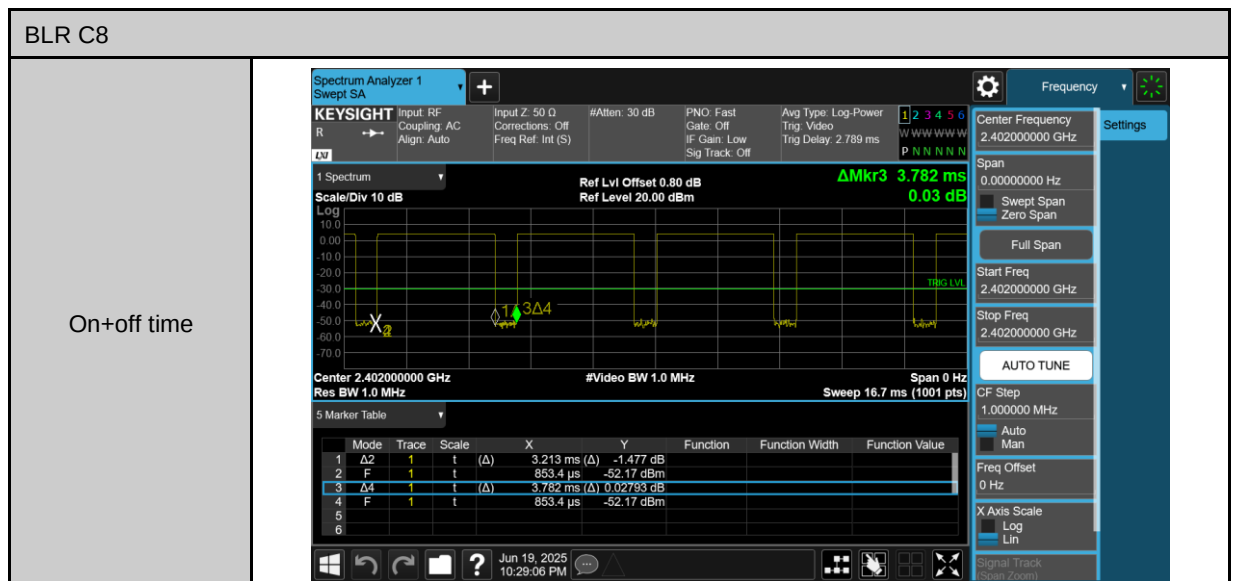
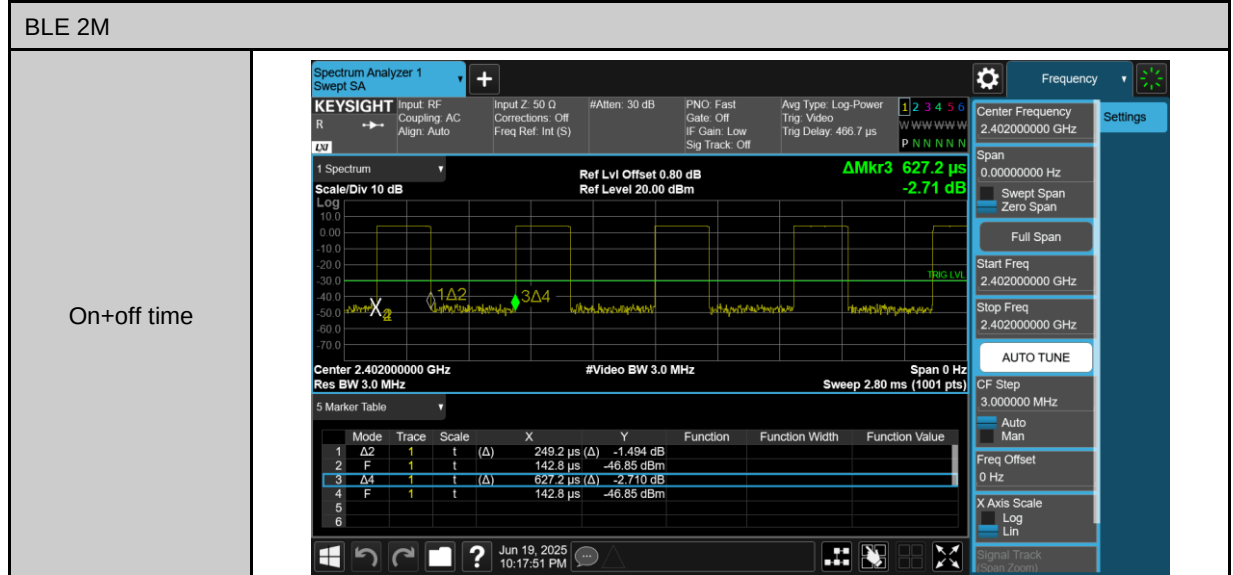


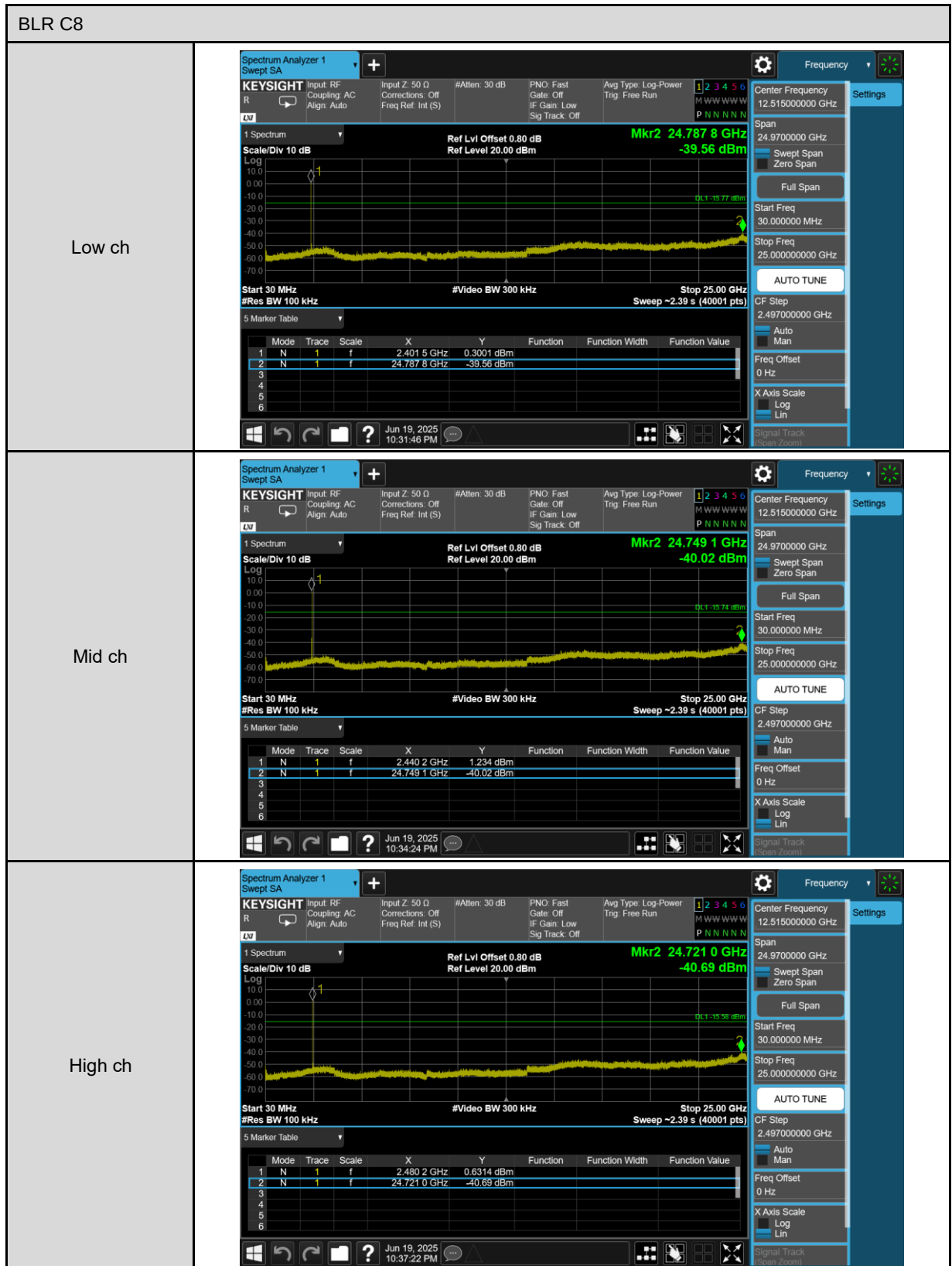
Appendix B. Test Plots

Duty cycle

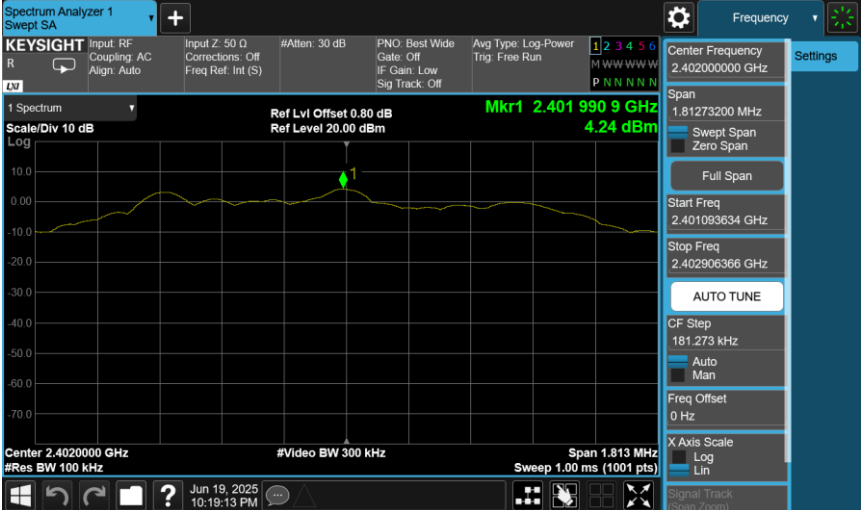


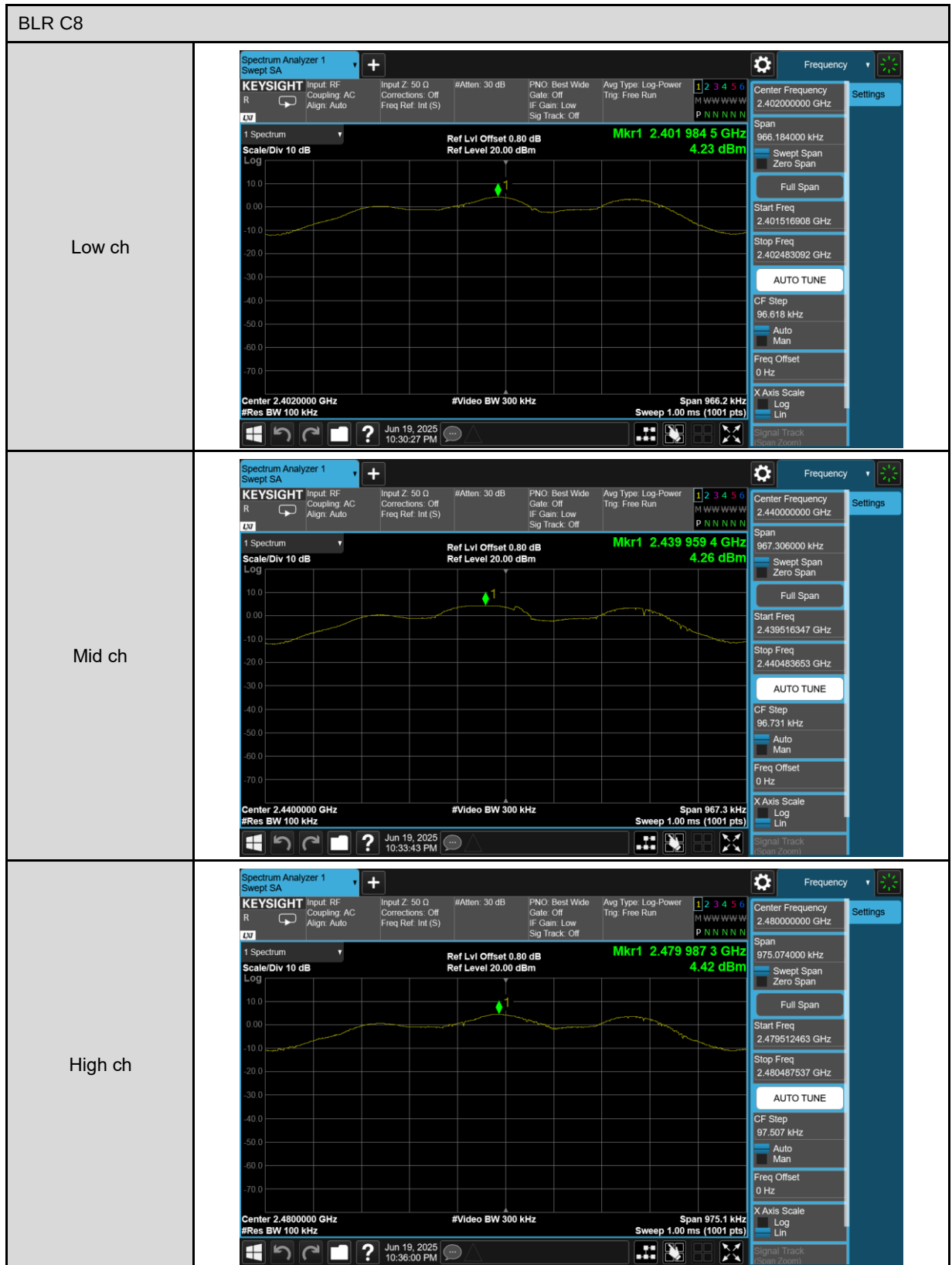
Out of Band Conducted Spurious Emission

BLE 2M																																																									
Low ch	Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF Coupling AC Align Auto Input Z 50 Ω Corrections Off Freq Ref: Int (S) #Atten: 30 dB PNO: Fast Gate Off IF Gain: Low Sig Track Off Avg Type: Log-Power Trig: Free Run 1 2 3 4 5 6 M W W W W W P N N N N N 1 Spectrum Scale/Div 10 dB Log Ref Lvl Offset 0.80 dB Ref Level 20.00 dBm Mkr2 24.762 8 GHz -40.99 dBm Start 30 MHz #Res BW 100 kHz #Video BW 300 kHz Stop 25.00 GHz Sweep ~2.39 s (40001 pts) 5 Marker Table <table><tr><th>Mode</th><th>Trace</th><th>Scale</th><th>X</th><th>Y</th><th>Function</th><th>Function Width</th><th>Function Value</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.401 5 GHz</td><td>0.2248 dBm</td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>24.762 8 GHz</td><td>-40.99 dBm</td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Settings Center Frequency 12.515000000 GHz Span 24.97000000 GHz Swept Span Zero Span Full Span Start Freq 30.000000 MHz Stop Freq 25.000000000 GHz AUTO TUNE CF Step 2.497000000 GHz Auto Man Freq Offset 0 Hz X Axis Scale Log Lin Signal Track (Span Zoom)	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value	1	N	1	f	2.401 5 GHz	0.2248 dBm			2	N	1	f	24.762 8 GHz	-40.99 dBm			3								4								5								6							
Mode	Trace	Scale	X	Y	Function	Function Width	Function Value																																																		
1	N	1	f	2.401 5 GHz	0.2248 dBm																																																				
2	N	1	f	24.762 8 GHz	-40.99 dBm																																																				
3																																																									
4																																																									
5																																																									
6																																																									
Mid ch	Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF Coupling AC Align Auto Input Z 50 Ω Corrections Off Freq Ref: Int (S) #Atten: 30 dB PNO: Fast Gate Off IF Gain: Low Sig Track Off Avg Type: Log-Power Trig: Free Run 1 2 3 4 5 6 M W W W W W P N N N N N 1 Spectrum Scale/Div 10 dB Log Ref Lvl Offset 0.80 dB Ref Level 20.00 dBm Mkr2 24.773 4 GHz -39.87 dBm Start 30 MHz #Res BW 100 kHz #Video BW 300 kHz Stop 25.00 GHz Sweep ~2.39 s (40001 pts) 5 Marker Table <table><tr><th>Mode</th><th>Trace</th><th>Scale</th><th>X</th><th>Y</th><th>Function</th><th>Function Width</th><th>Function Value</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.440 2 GHz</td><td>4.132 dBm</td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>24.773 4 GHz</td><td>-39.87 dBm</td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Settings Center Frequency 12.515000000 GHz Span 24.97000000 GHz Swept Span Zero Span Full Span Start Freq 30.000000 MHz Stop Freq 25.000000000 GHz AUTO TUNE CF Step 2.497000000 GHz Auto Man Freq Offset 0 Hz X Axis Scale Log Lin Signal Track (Span Zoom)	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value	1	N	1	f	2.440 2 GHz	4.132 dBm			2	N	1	f	24.773 4 GHz	-39.87 dBm			3								4								5								6							
Mode	Trace	Scale	X	Y	Function	Function Width	Function Value																																																		
1	N	1	f	2.440 2 GHz	4.132 dBm																																																				
2	N	1	f	24.773 4 GHz	-39.87 dBm																																																				
3																																																									
4																																																									
5																																																									
6																																																									
High ch	Spectrum Analyzer 1 Swept SA KEYSIGHT Input RF Coupling AC Align Auto Input Z 50 Ω Corrections Off Freq Ref: Int (S) #Atten: 30 dB PNO: Fast Gate Off IF Gain: Low Sig Track Off Avg Type: Log-Power Trig: Free Run 1 2 3 4 5 6 M W W W W W P N N N N N 1 Spectrum Scale/Div 10 dB Log Ref Lvl Offset 0.80 dB Ref Level 20.00 dBm Mkr2 24.862 7 GHz -40.54 dBm Start 30 MHz #Res BW 100 kHz #Video BW 300 kHz Stop 25.00 GHz Sweep ~2.39 s (40001 pts) 5 Marker Table <table><tr><th>Mode</th><th>Trace</th><th>Scale</th><th>X</th><th>Y</th><th>Function</th><th>Function Width</th><th>Function Value</th></tr><tr><td>1</td><td>N</td><td>1</td><td>f</td><td>2.480 2 GHz</td><td>4.322 dBm</td><td></td><td></td></tr><tr><td>2</td><td>N</td><td>1</td><td>f</td><td>24.862 7 GHz</td><td>-40.54 dBm</td><td></td><td></td></tr><tr><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>6</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table> Settings Center Frequency 12.515000000 GHz Span 24.97000000 GHz Swept Span Zero Span Full Span Start Freq 30.000000 MHz Stop Freq 25.000000000 GHz AUTO TUNE CF Step 2.497000000 GHz Auto Man Freq Offset 0 Hz X Axis Scale Log Lin Signal Track (Span Zoom)	Mode	Trace	Scale	X	Y	Function	Function Width	Function Value	1	N	1	f	2.480 2 GHz	4.322 dBm			2	N	1	f	24.862 7 GHz	-40.54 dBm			3								4								5								6							
Mode	Trace	Scale	X	Y	Function	Function Width	Function Value																																																		
1	N	1	f	2.480 2 GHz	4.322 dBm																																																				
2	N	1	f	24.862 7 GHz	-40.54 dBm																																																				
3																																																									
4																																																									
5																																																									
6																																																									

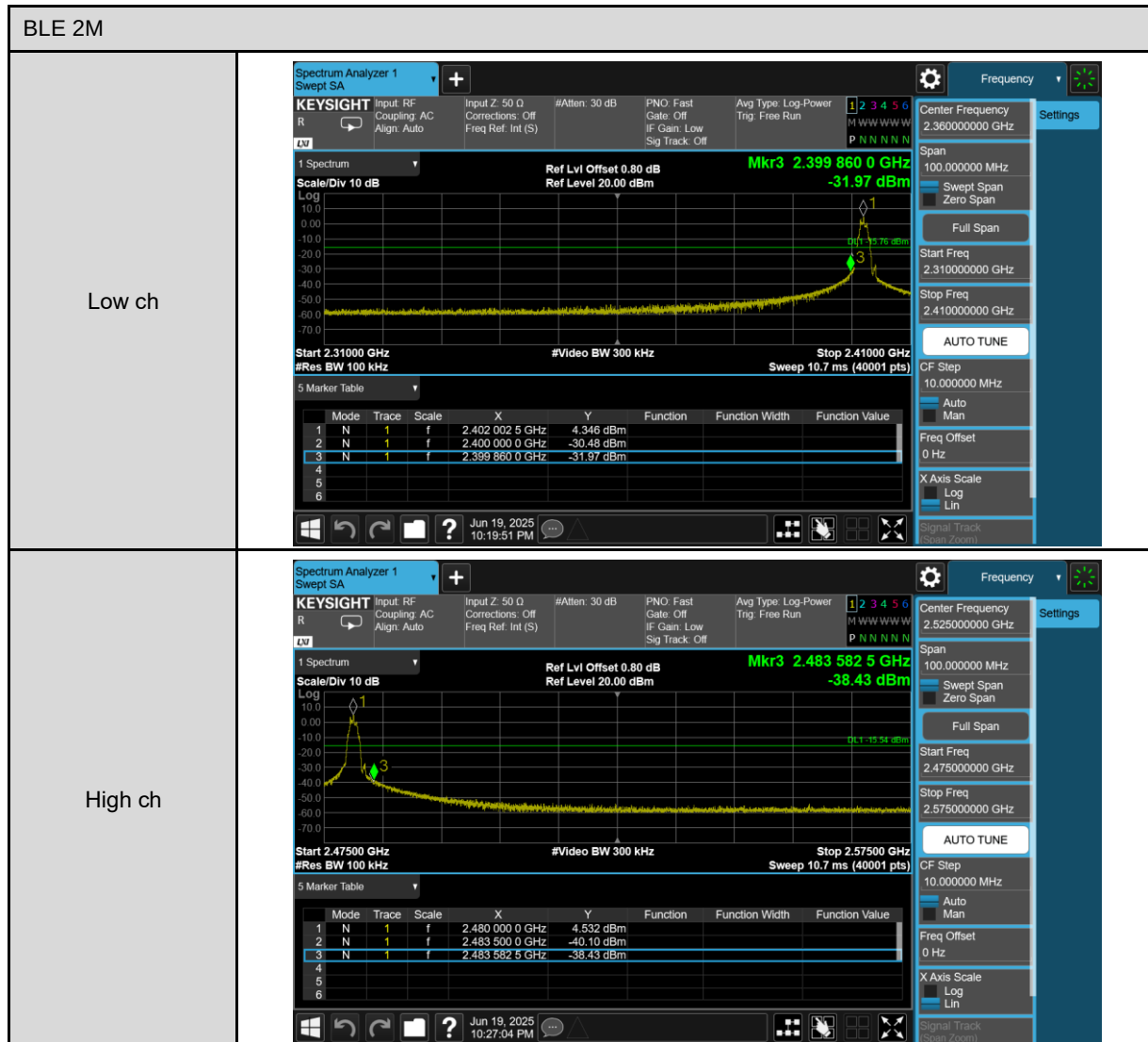


Reference level

BLE 2M Low ch	
Mid ch	
High ch	



Conducted Band Edge



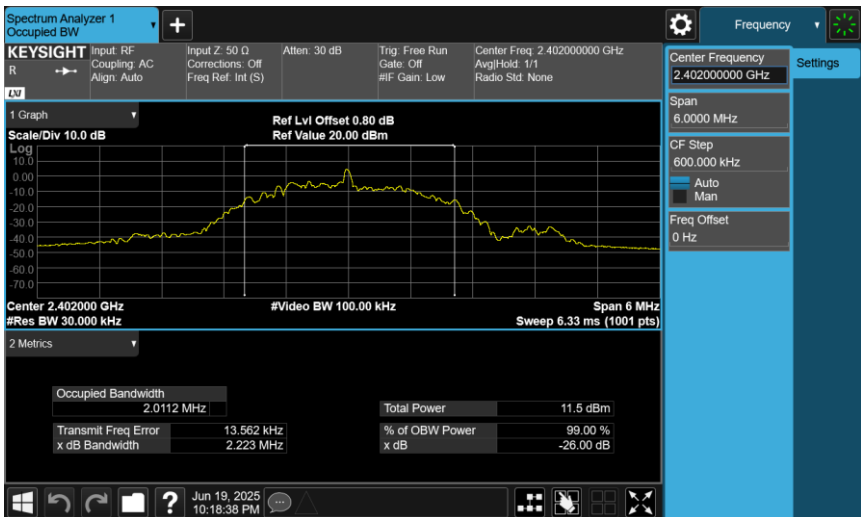
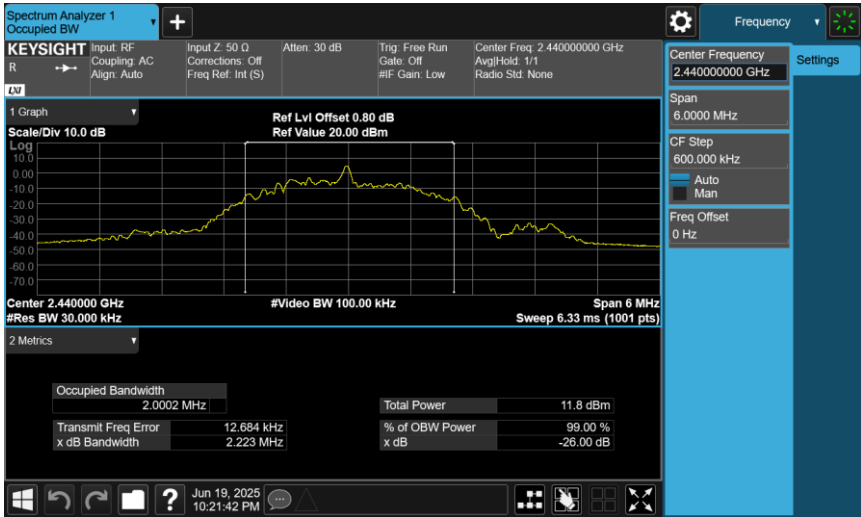
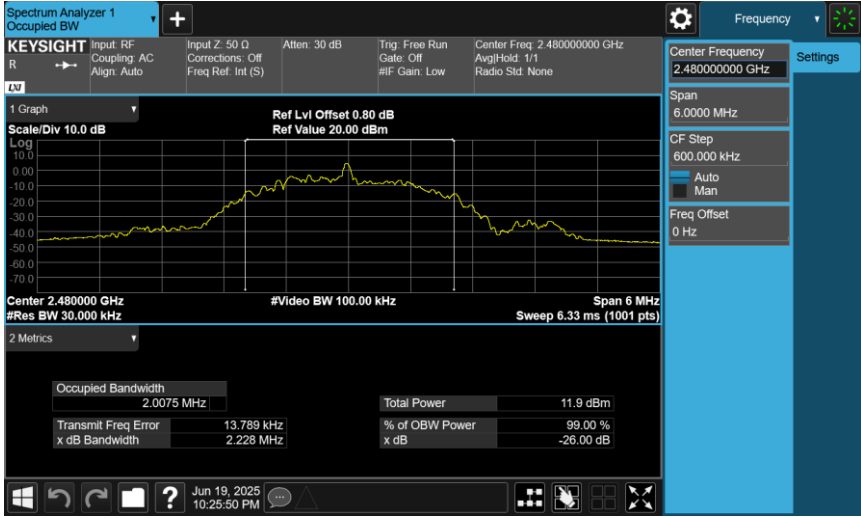


6 dB Bandwidth

BLE 2M	
Low ch	Spectrum Analyzer 1 Occupied BW KEYSIGHT Input: RF Coupling: AC Align: Auto Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) Atten: 30 dB Trig: Free Run Gate: Off #F Gain: Low Center Freq: 2.402000000 GHz Avg/Hold: 1/1 Radio Std: None 1 Graph Scale/Div 10.0 dB Log Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.402000 GHz #Res BW 100.00 kHz #Video BW 300.00 kHz Span 6 MHz Sweep 1.00 ms (1001 pts) 2 Metrics Occupied Bandwidth 2.0574 MHz Total Power 11.9 dBm Transmit Freq Error 1.341 kHz % of OBW Power 99.00 % x dB Bandwidth 1.208 MHz x dB -6.00 dB Jun 19, 2025 10:18:14 PM Frequency Center Frequency 2.402000000 GHz Span 6.0000 MHz CF Step 600.000 kHz Auto Man Freq Offset 0 Hz
Mid ch	Spectrum Analyzer 1 Occupied BW KEYSIGHT Input: RF Coupling: AC Align: Auto Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) Atten: 30 dB Trig: Free Run Gate: Off #F Gain: Low Center Freq: 2.440000000 GHz Avg/Hold: 1/1 Radio Std: None 1 Graph Scale/Div 10.0 dB Log Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.440000 GHz #Res BW 100.00 kHz #Video BW 300.00 kHz Span 6 MHz Sweep 1.00 ms (1001 pts) 2 Metrics Occupied Bandwidth 2.0480 MHz Total Power 12.1 dBm Transmit Freq Error 664 Hz % of OBW Power 99.00 % x dB Bandwidth 1.206 MHz x dB -6.00 dB Jun 19, 2025 10:21:19 PM Frequency Center Frequency 2.440000000 GHz Span 6.0000 MHz CF Step 600.000 kHz Auto Man Freq Offset 0 Hz
High ch	Spectrum Analyzer 1 Occupied BW KEYSIGHT Input: RF Coupling: AC Align: Auto Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) Atten: 30 dB Trig: Free Run Gate: Off #F Gain: Low Center Freq: 2.480000000 GHz Avg/Hold: 1/1 Radio Std: None 1 Graph Scale/Div 10.0 dB Log Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.480000 GHz #Res BW 100.00 kHz #Video BW 300.00 kHz Span 6 MHz Sweep 1.00 ms (1001 pts) 2 Metrics Occupied Bandwidth 2.0581 MHz Total Power 12.1 dBm Transmit Freq Error 1.362 kHz % of OBW Power 99.00 % x dB Bandwidth 1.214 MHz x dB -6.00 dB Jun 19, 2025 10:25:27 PM Frequency Center Frequency 2.480000000 GHz Span 6.0000 MHz CF Step 600.000 kHz Auto Man Freq Offset 0 Hz

BLR C8	
Low ch	Spectrum Analyzer 1 Occupied BW KEYSIGHT Input: RF Coupling: AC Align: Auto Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) Atten: 30 dB Trig: Free Run Gate: Off #IF Gain: Low Center Freq: 2.402000000 GHz Avg/Hold: 1/1 Radio Slt: None 1 Graph Scale/Div 10.0 dB Log Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.402000 GHz #Res BW 100.00 kHz #Video BW 300.00 kHz Sweep 1.00 ms (1001 pts) 2 Metrics Occupied Bandwidth 1.0682 MHz Total Power 9.38 dBm Transmit Freq Error 2.424 kHz % of OBW Power 99.00 % x dB Bandwidth 644.1 kHz x dB -6.00 dB Jun 19, 2025 10:29:29 PM Frequency Settings Center Frequency 2.402000000 GHz Span 3.0000 MHz CF Step 300.000 kHz Auto Man Freq Offset 0 Hz
Mid ch	Spectrum Analyzer 1 Occupied BW KEYSIGHT Input: RF Coupling: AC Align: Auto Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) Atten: 30 dB Trig: Free Run Gate: Off #IF Gain: Low Center Freq: 2.440000000 GHz Avg/Hold: 1/1 Radio Slt: None 1 Graph Scale/Div 10.0 dB Log Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.440000 GHz #Res BW 100.00 kHz #Video BW 300.00 kHz Sweep 1.00 ms (1001 pts) 2 Metrics Occupied Bandwidth 1.0767 MHz Total Power 9.75 dBm Transmit Freq Error -6.513 kHz % of OBW Power 99.00 % x dB Bandwidth 644.9 kHz x dB -6.00 dB Jun 19, 2025 10:32:46 PM Frequency Settings Center Frequency 2.440000000 GHz Span 3.0000 MHz CF Step 300.000 kHz Auto Man Freq Offset 0 Hz
High ch	Spectrum Analyzer 1 Occupied BW KEYSIGHT Input: RF Coupling: AC Align: Auto Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) Atten: 30 dB Trig: Free Run Gate: Off #IF Gain: Low Center Freq: 2.480000000 GHz Avg/Hold: 1/1 Radio Slt: None 1 Graph Scale/Div 10.0 dB Log Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.480000 GHz #Res BW 100.00 kHz #Video BW 300.00 kHz Sweep 1.00 ms (1001 pts) 2 Metrics Occupied Bandwidth 1.0702 MHz Total Power 9.70 dBm Transmit Freq Error 4.464 kHz % of OBW Power 99.00 % x dB Bandwidth 650.0 kHz x dB -6.00 dB Jun 19, 2025 10:35:03 PM Frequency Settings Center Frequency 2.480000000 GHz Span 3.0000 MHz CF Step 300.000 kHz Auto Man Freq Offset 0 Hz

99 % Occupied Bandwidth

BLE 2M															
Low ch	 Keysight Spectrum Analyzer 1 - Occupied BW Center Frequency: 2.402000000 GHz Span: 6.0000 MHz CF Step: 600.000 kHz Freq Offset: 0 Hz Scale/Div 10.0 dB Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.402000 GHz #Res BW 30.000 kHz #Video BW 100.00 kHz Sweep 6.33 ms (1001 pts) <table border="1"> <thead> <tr> <th colspan="2">2 Metrics</th> </tr> </thead> <tbody> <tr> <td>Occupied Bandwidth</td><td>2.0112 MHz</td> </tr> <tr> <td>Total Power</td><td>11.5 dBm</td> </tr> <tr> <td>Transmit Freq Error</td><td>13.562 kHz</td> </tr> <tr> <td>% of OBW Power</td><td>99.00 %</td> </tr> <tr> <td>x dB Bandwidth</td><td>2.223 MHz</td> </tr> <tr> <td>x dB</td><td>-26.00 dB</td> </tr> </tbody> </table>	2 Metrics		Occupied Bandwidth	2.0112 MHz	Total Power	11.5 dBm	Transmit Freq Error	13.562 kHz	% of OBW Power	99.00 %	x dB Bandwidth	2.223 MHz	x dB	-26.00 dB
2 Metrics															
Occupied Bandwidth	2.0112 MHz														
Total Power	11.5 dBm														
Transmit Freq Error	13.562 kHz														
% of OBW Power	99.00 %														
x dB Bandwidth	2.223 MHz														
x dB	-26.00 dB														
Mid ch	 Keysight Spectrum Analyzer 1 - Occupied BW Center Frequency: 2.440000000 GHz Span: 6.0000 MHz CF Step: 600.000 kHz Freq Offset: 0 Hz Scale/Div 10.0 dB Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.440000 GHz #Res BW 30.000 kHz #Video BW 100.00 kHz Sweep 6.33 ms (1001 pts) <table border="1"> <thead> <tr> <th colspan="2">2 Metrics</th> </tr> </thead> <tbody> <tr> <td>Occupied Bandwidth</td><td>2.0002 MHz</td> </tr> <tr> <td>Total Power</td><td>11.8 dBm</td> </tr> <tr> <td>Transmit Freq Error</td><td>12.684 kHz</td> </tr> <tr> <td>% of OBW Power</td><td>99.00 %</td> </tr> <tr> <td>x dB Bandwidth</td><td>2.223 MHz</td> </tr> <tr> <td>x dB</td><td>-26.00 dB</td> </tr> </tbody> </table>	2 Metrics		Occupied Bandwidth	2.0002 MHz	Total Power	11.8 dBm	Transmit Freq Error	12.684 kHz	% of OBW Power	99.00 %	x dB Bandwidth	2.223 MHz	x dB	-26.00 dB
2 Metrics															
Occupied Bandwidth	2.0002 MHz														
Total Power	11.8 dBm														
Transmit Freq Error	12.684 kHz														
% of OBW Power	99.00 %														
x dB Bandwidth	2.223 MHz														
x dB	-26.00 dB														
High ch	 Keysight Spectrum Analyzer 1 - Occupied BW Center Frequency: 2.480000000 GHz Span: 6.0000 MHz CF Step: 600.000 kHz Freq Offset: 0 Hz Scale/Div 10.0 dB Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.480000 GHz #Res BW 30.000 kHz #Video BW 100.00 kHz Sweep 6.33 ms (1001 pts) <table border="1"> <thead> <tr> <th colspan="2">2 Metrics</th> </tr> </thead> <tbody> <tr> <td>Occupied Bandwidth</td><td>2.0075 MHz</td> </tr> <tr> <td>Total Power</td><td>11.9 dBm</td> </tr> <tr> <td>Transmit Freq Error</td><td>13.789 kHz</td> </tr> <tr> <td>% of OBW Power</td><td>99.00 %</td> </tr> <tr> <td>x dB Bandwidth</td><td>2.228 MHz</td> </tr> <tr> <td>x dB</td><td>-26.00 dB</td> </tr> </tbody> </table>	2 Metrics		Occupied Bandwidth	2.0075 MHz	Total Power	11.9 dBm	Transmit Freq Error	13.789 kHz	% of OBW Power	99.00 %	x dB Bandwidth	2.228 MHz	x dB	-26.00 dB
2 Metrics															
Occupied Bandwidth	2.0075 MHz														
Total Power	11.9 dBm														
Transmit Freq Error	13.789 kHz														
% of OBW Power	99.00 %														
x dB Bandwidth	2.228 MHz														
x dB	-26.00 dB														

BLR C8	
Low ch	Spectrum Analyzer 1 Occupied BW KEYSIGHT Input: RF Coupling: AC Align: Auto Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) Atten: 30 dB Trig: Free Run Gate: Off #F Gain: Low Center Freq: 2.402000000 GHz Avg/Hold: 1/1 Radio Sld: None 1 Graph Scale/Div 10.0 dB Log Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.402000 GHz #Res BW 30.000 kHz #Video BW 100.00 kHz Sweep 3.20 ms (1001 pts) 2 Metrics Occupied Bandwidth 1.0376 MHz Total Power 10.4 dBm Transmit Freq Error -3.601 kHz % of OBW Power 99.00 % x dB Bandwidth 1.183 MHz x dB -26.00 dB Jun 19, 2025 10:29:53 PM Frequency Settings Center Frequency 2.402000000 GHz Span 3.0000 MHz CF Step 300.000 kHz Auto Man Freq Offset 0 Hz
Mid ch	Spectrum Analyzer 1 Occupied BW KEYSIGHT Input: RF Coupling: AC Align: Auto Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) Atten: 30 dB Trig: Free Run Gate: Off #F Gain: Low Center Freq: 2.440000000 GHz Avg/Hold: 1/1 Radio Sld: None 1 Graph Scale/Div 10.0 dB Log Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.440000 GHz #Res BW 30.000 kHz #Video BW 100.00 kHz Sweep 3.20 ms (1001 pts) 2 Metrics Occupied Bandwidth 1.0249 MHz Total Power 11.1 dBm Transmit Freq Error -4.698 kHz % of OBW Power 99.00 % x dB Bandwidth 1.184 MHz x dB -26.00 dB Jun 19, 2025 10:33:09 PM Frequency Settings Center Frequency 2.440000000 GHz Span 3.0000 MHz CF Step 300.000 kHz Auto Man Freq Offset 0 Hz
High ch	Spectrum Analyzer 1 Occupied BW KEYSIGHT Input: RF Coupling: AC Align: Auto Input Z: 50 Ω Corrections: Off Freq Ref: Int (S) Atten: 30 dB Trig: Free Run Gate: Off #F Gain: Low Center Freq: 2.480000000 GHz Avg/Hold: 1/1 Radio Sld: None 1 Graph Scale/Div 10.0 dB Log Ref Lvl Offset 0.80 dB Ref Value 20.00 dBm Center 2.480000 GHz #Res BW 30.000 kHz #Video BW 100.00 kHz Sweep 3.20 ms (1001 pts) 2 Metrics Occupied Bandwidth 1.0433 MHz Total Power 10.6 dBm Transmit Freq Error -5.462 kHz % of OBW Power 99.00 % x dB Bandwidth 1.188 MHz x dB -26.00 dB Jun 19, 2025 10:35:26 PM Frequency Settings Center Frequency 2.480000000 GHz Span 3.0000 MHz CF Step 300.000 kHz Auto Man Freq Offset 0 Hz

Power Density

