Appendix B: Test Results of Bluetooth Low Energy

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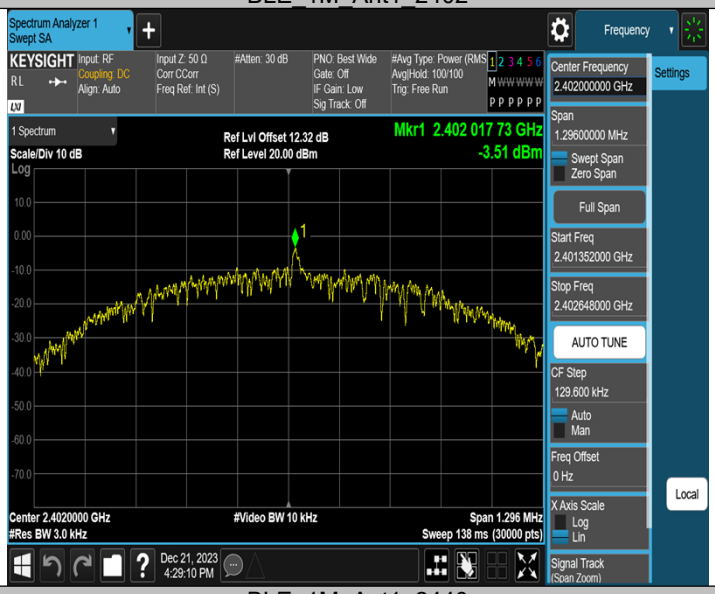
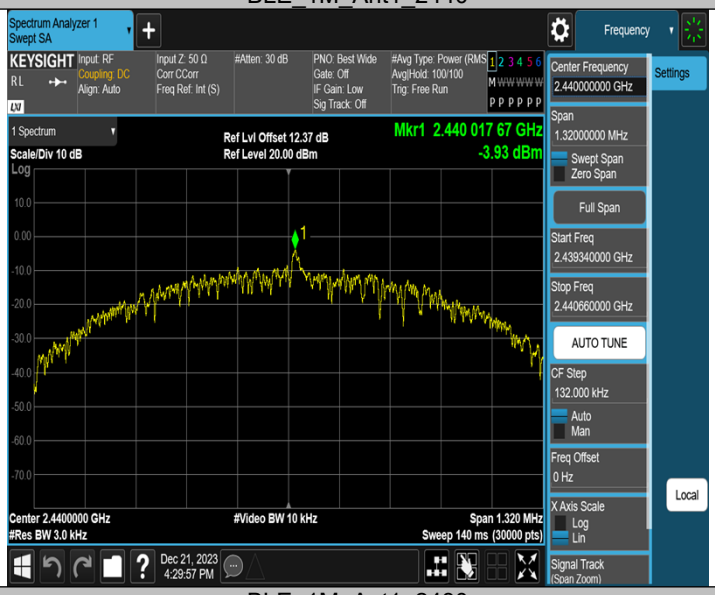
Appendix B.1: Test Results of Conducted Power Spectral Density

TestMode	Antenna	Channel	Result[dBm/3-100kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-3.52	≤8.00	PASS
		2440	-3.93	≤8.00	PASS
		2480	-3.11	≤8.00	PASS
BLE_2M	Ant1	2402	-3.86	≤8.00	PASS
		2440	-4.07	≤8.00	PASS
		2480	-3.42	≤8.00	PASS

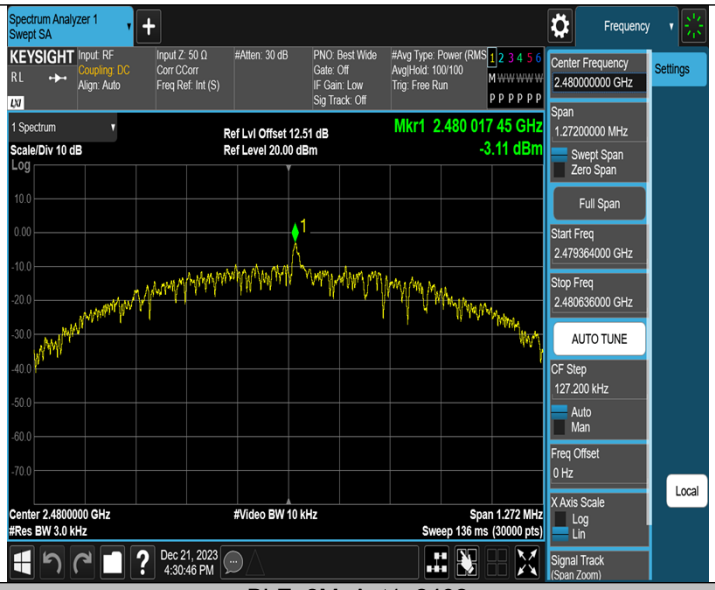
BLE_1M_Ant1_2402



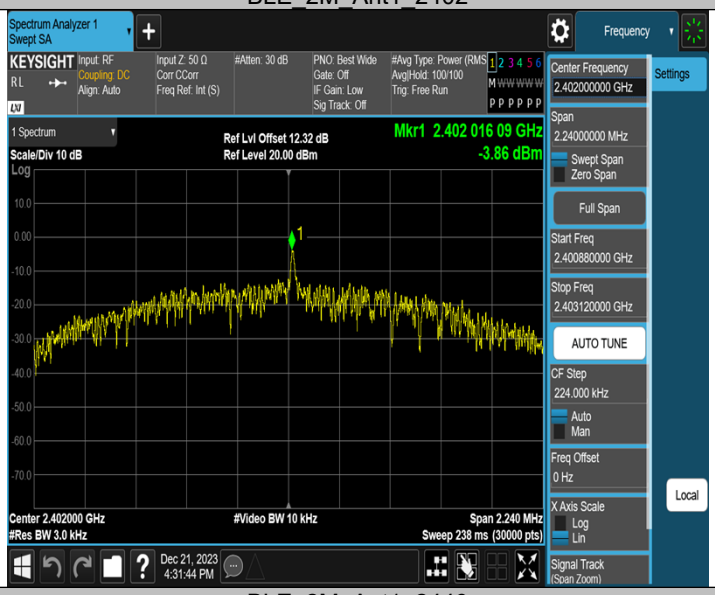
BLE_1M_Ant1_2440



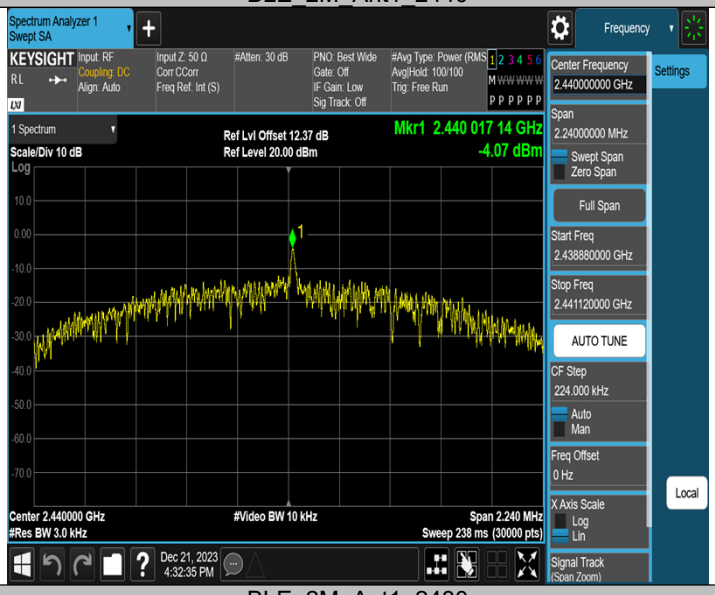
BLE_1M_Ant1_2480



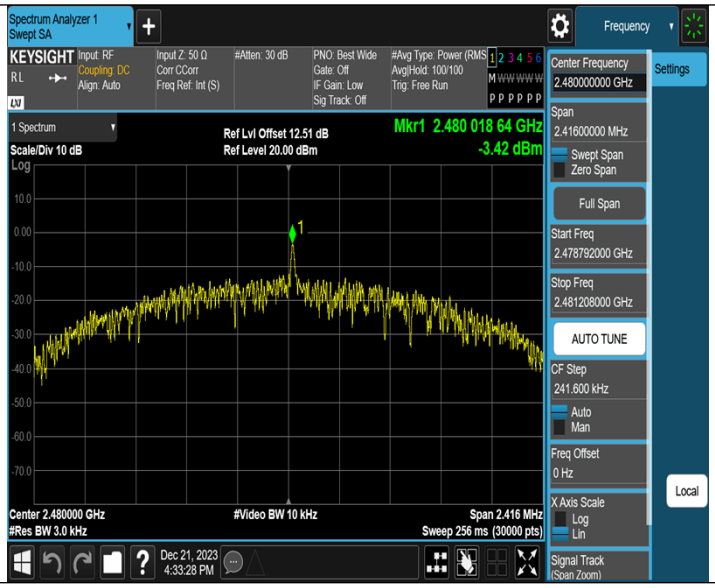
BLE_2M_Ant1_2402



BLE_2M_Ant1_2440



BLE_2M_Ant1_2480


Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corr CCorr
Freq Ref: Int (S)
#Atten: 30 dB
PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off
#Avg Type: Power (RMS)
Avg|Hold: 100/100
Trig: Free Run
1 Spectrum
Scale/Div 10 dB
Ref Lvl Offset 12.51 dB
Ref Level 20.00 dBm
Mkr1 2.480 018 64 GHz
-3.42 dBm
Center 2.480000 GHz
#Res BW 3.0 kHz
#Video BW 10 kHz
Span 2.416 MHz
Sweep 256 ms (30000 pts)
Dec 21, 2023
4:33:28 PM
Frequency
Center Frequency
2.480000000 GHz
Settings
Span
2.41600000 MHz
Swept Span
Zero Span
Full Span
Start Freq
2.478792000 GHz
Stop Freq
2.481208000 GHz
AUTO TUNE
CF Step
241.600 kHz
Auto
Man
Freq Offset
0 Hz
X Axis Scale
Log
Lin
Signal Track
(Span Zoom)
Local

Appendix B.2: Test Results of 6dB Bandwidth

TestMode	Antenna	Channel	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.648	2401.696	2402.344	0.5	PASS
		2440	0.660	2439.688	2440.348	0.5	PASS
		2480	0.636	2479.700	2480.336	0.5	PASS
BLE_2M	Ant1	2402	1.120	2401.468	2402.588	0.5	PASS
		2440	1.120	2439.472	2440.592	0.5	PASS
		2480	1.208	2479.400	2480.608	0.5	PASS

BLE_1M_Ant1_2402

BLE_1M_Ant1_2440

BLE_1M_Ant1_2480

BLE_2M_Ant1_2402

BLE_2M_Ant1_2440

BLE_2M_Ant1_2480

Spectrum Analyzer 1
Swept SA
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corr CCorr
Freq Ref: Int (S)
#Atten: 40 dB
PNO: Best Wide
Gate: Off
IF Gain: Low
Sig Track: Off
#Avg Type: Power (RMS)
Avg|Hold: 100/100
Trig: Free Run
1 Spectrum
Scale/Div 10 dB
Ref Lvl Offset 12.67 dB
Ref Level 30.00 dBm
ΔMkr3 1.208 MHz
0.28 dB
Center 2.480000 GHz
#Res BW 100 kHz
#Video BW 300 kHz
Span 4.000 MHz
Sweep 1.00 ms (1001 pts)
5 Marker Table
Mode Trace Scale X Y Function Function Width Function Value
1 N 1 f 2.479 400 GHz -1.380 dBm
2 N 1 f 2.480 024 GHz 4.531 dBm
3 Δ1 1 f (Δ) 1.208 MHz (Δ) 0.2782 dB
Nov 16, 2023
3:26:22 PM
Frequency
Settings
Center Frequency
2.480000000 GHz
Span
4.00000000 MHz
Swept Span
Zero Span
Full Span
Start Freq
2.478000000 GHz
Stop Freq
2.482000000 GHz
AUTO TUNE
CF Step
400.000 kHz
Auto
Man
Freq Offset
0 Hz
X Axis Scale
Log
Lin
Signal Track
(Span Zoom)
Local

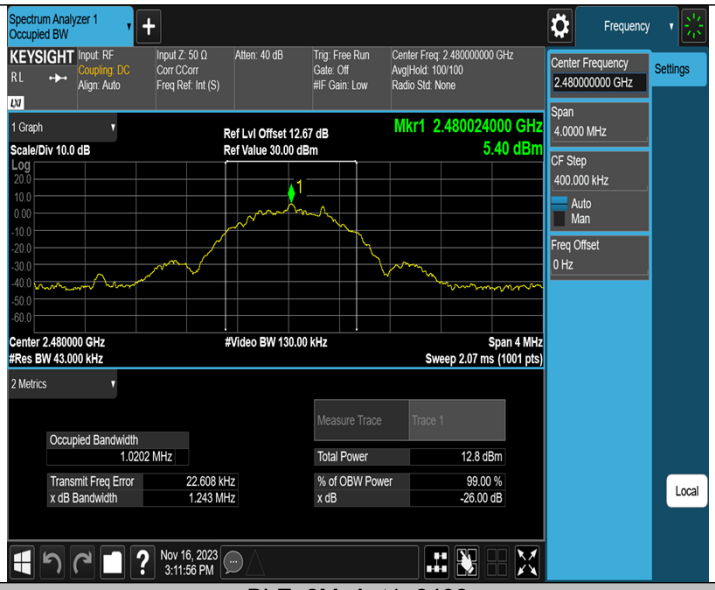
Appendix B.3: Test Results of 99% Bandwidth

TestMode	Antenna	Channel	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.0214	2401.5111	2402.5325	---	---
		2440	1.0146	2439.5157	2440.5303	---	---
		2480	1.0202	2479.5125	2480.5327	---	---
BLE_2M	Ant1	2402	2.0373	2401.0128	2403.0501	---	---
		2440	2.0507	2439.0060	2441.0567	---	---
		2480	2.0241	2479.0184	2481.0425	---	---

BLE_1M_Ant1_2402

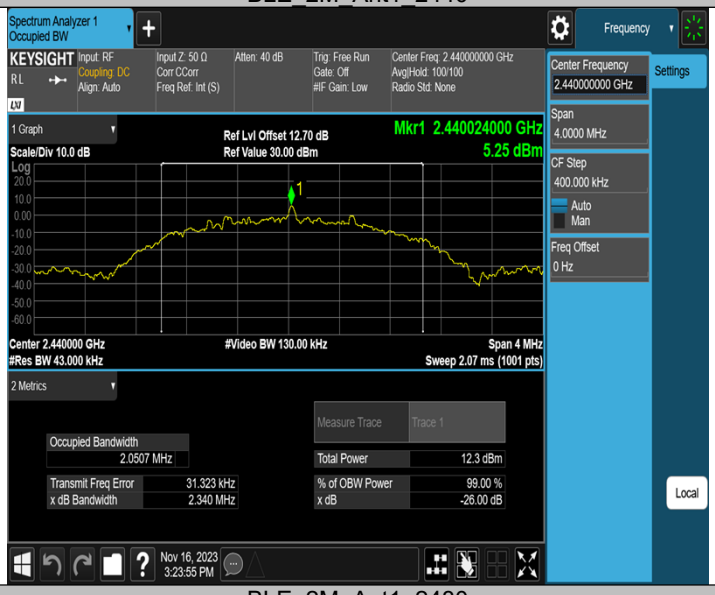
BLE_1M_Ant1_2440

BLE_1M_Ant1_2480



BLE_2M_Ant1_2402

BLE_2M_Ant1_2440



BLE_2M_Ant1_2480

Spectrum Analyzer 1
Occupied BW
KEYSIGHT
Input: RF
Coupling: DC
Align: Auto
Input Z: 50 Ω
Corr CCorr
Freq Ref: Int (S)
Atten: 40 dB
Trig: Free Run
Gate: Off
#IF Gain: Low
Center Freq: 2.480000000 GHz
Avg|Hold: 100/100
Radio Std: None
1 Graph
Scale/Div 10.0 dB
Ref Lvl Offset 12.67 dB
Ref Value 30.00 dBm
Mkr1 2.480028000 GHz
5.61 dBm
Center 2.480000 GHz
#Res BW 43.000 kHz
#Video BW 130.00 kHz
Span 4 MHz
Sweep 2.07 ms (1001 pts)
2 Metrics
Occupied Bandwidth
2.0241 MHz
Transmit Freq Error 30.492 kHz
x dB Bandwidth 2.303 MHz
Measure Trace
Trace 1
Total Power 12.7 dBm
% of OBW Power 99.00 %
x dB -26.00 dB
Nov 16, 2023
3:26:29 PM
Frequency
Center Frequency
2.480000000 GHz
Settings
Span
4.0000 MHz
CF Step
400.000 kHz
Auto
Man
Freq Offset
0 Hz
Local

Appendix B.4: Test Results of Conducted Spurious Emissions Measured in 100 kHz Bandwidth

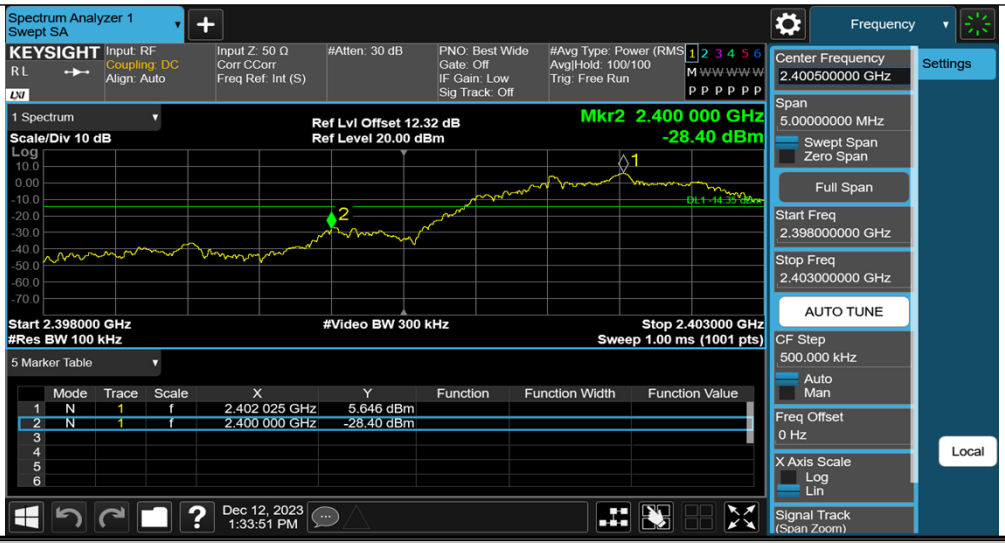
Band Edge

TestMode	Antenna	ChName	Channel	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	5.595	-47.52	≤-14.41	PASS
		High	2480	5.514	-43.37	≤-14.49	PASS
BLE_2M	Ant1	Low	2402	5.646	-28.4	≤-14.35	PASS
		High	2480	5.594	-49.17	≤-14.41	PASS

BLE_1M_Ant1_Low_2402

BLE_1M_Ant1_High_2480

BLE_2M_Ant1_Low_2402



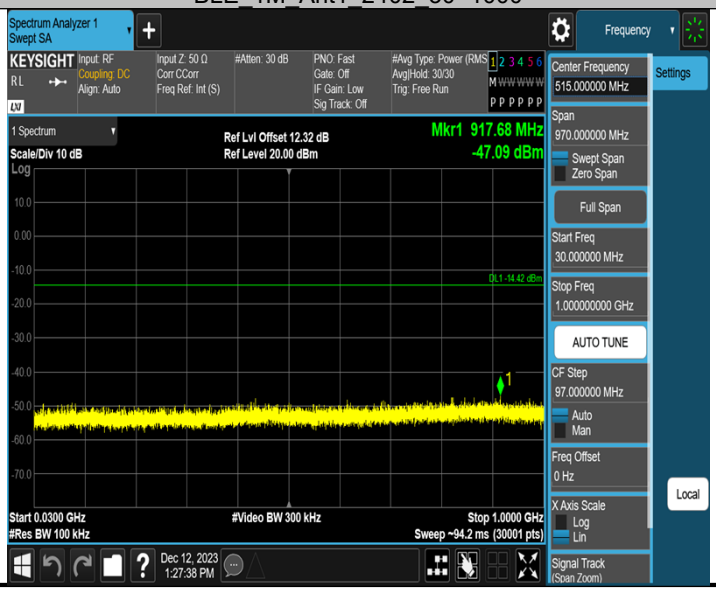
BLE_2M_Ant1_High_2480

Conducted Spurious Emission

TestMode	Antenna	Channel	FreqRange [MHz]	RefLevel [dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	2402	Reference	5.58	5.58	---	PASS
			30~1000	5.58	-47.09	≤-14.42	PASS
			1000~26500	5.58	-38.67	≤-14.42	PASS
		2440	Reference	5.62	5.62	---	PASS
			30~1000	5.62	-47.4	≤-14.38	PASS
			1000~26500	5.62	-37.59	≤-14.38	PASS
		2480	Reference	5.44	5.44	---	PASS
			30~1000	5.44	-45.5	≤-14.56	PASS
			1000~26500	5.44	-37.39	≤-14.56	PASS
BLE_2M	Ant1	2402	Reference	5.65	5.65	---	PASS
			30~1000	5.65	-47.59	≤-14.35	PASS
			1000~26500	5.65	-38.76	≤-14.35	PASS
		2440	Reference	5.68	5.68	---	PASS
			30~1000	5.68	-47.12	≤-14.32	PASS
			1000~26500	5.68	-38.21	≤-14.32	PASS
		2480	Reference	5.53	5.53	---	PASS
			30~1000	5.53	-46.68	≤-14.47	PASS
			1000~26500	5.53	-38.1	≤-14.47	PASS

BLE_1M_Ant1_2402_0~Reference

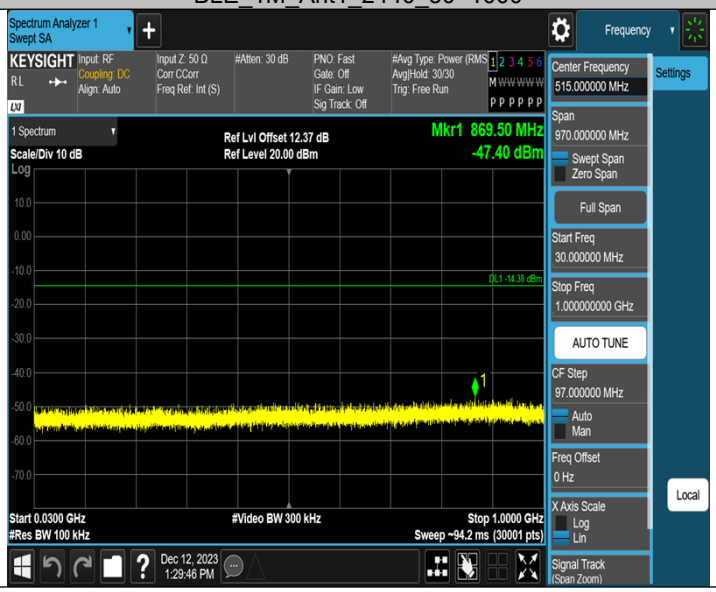
BLE_1M_Ant1_2402_30~1000



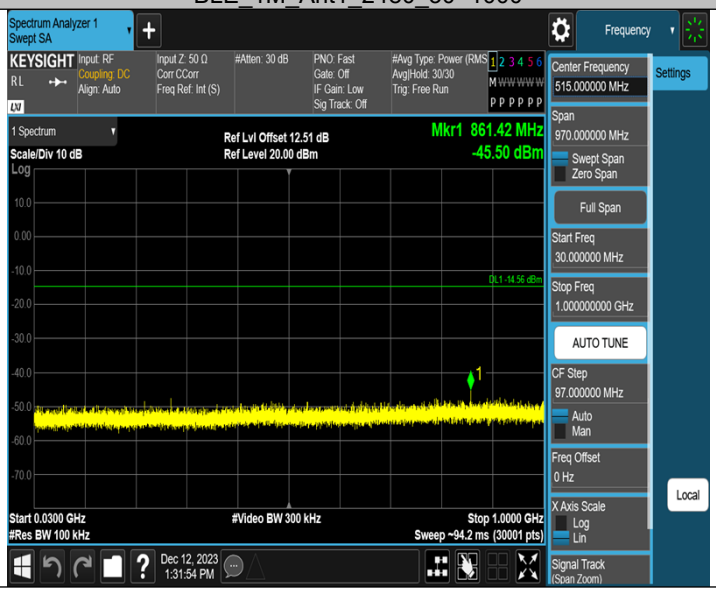
BLE_1M_Ant1_2402_1000~26500

BLE_1M_Ant1_2440_0~Reference

BLE_1M_Ant1_2440_30~1000



BLE_1M_Ant1_2440_1000~26500

BLE_1M_Ant1_2480_0~Reference

BLE_1M_Ant1_2480_30~1000