



### **3.7 ANTENNA REQUIREMENTS**

#### **3.7.1 STANDARD APPLICABLE**

If transmitting antenna directional gain is greater than 6 dBi, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

#### **3.7.2 ANTENNA CONNECTED CONSTRUCTION**

An embedded-in antenna design is used.

#### **3.7.3 ANTENNA GAIN**

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit and PSD limit.

## **4 PHOTOGRAPHS OF THE TEST CONFIGURATION**

Please refer to the attached file (Test Setup Photo).



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## **5 MODIFICATIONS RECORDERS FOR ENGINEERING CHANGES TO THE EUT BY THE LAB**

No any modifications are made to the EUT by the lab during the test.



## 6 APPENDIX

### WLAN

### DTS BANDWIDTH

### TEST RESULT

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	8.240	2408.320	2416.560	0.5	PASS
		2437	9.120	2432.480	2441.600	0.5	PASS
		2462	8.760	2457.280	2466.040	0.5	PASS
11G	Ant1	2412	15.680	2404.360	2420.040	0.5	PASS
		2437	16.360	2428.880	2445.240	0.5	PASS
		2462	15.680	2453.880	2469.560	0.5	PASS
11N20SISO	Ant1	2412	15.760	2404.840	2420.600	0.5	PASS
		2437	17.680	2428.320	2446.000	0.5	PASS
		2462	17.080	2453.160	2470.240	0.5	PASS

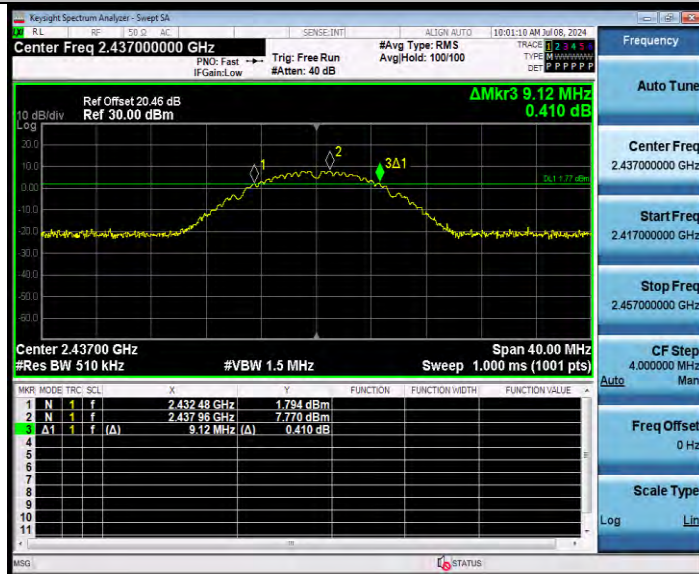


### TEST GRAPHS

11B\_Ant1\_2412



11B\_Ant1\_2437

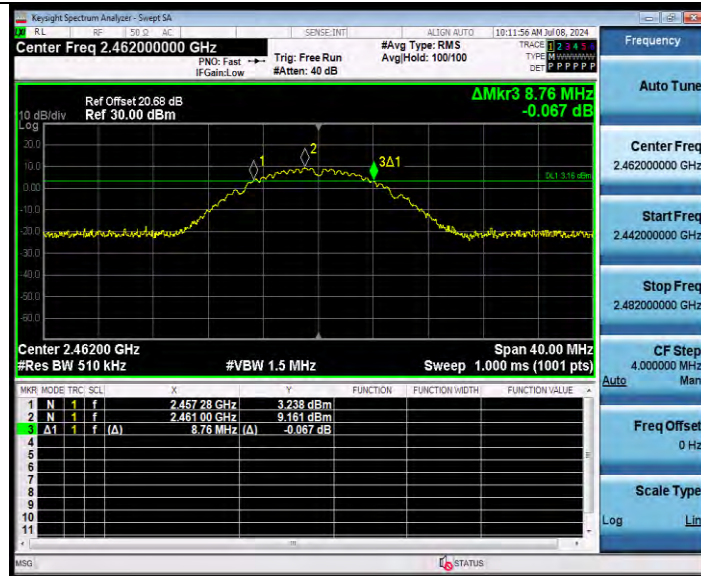


11B\_Ant1\_2462



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11G\_Ant1\_2412



11G\_Ant1\_2437

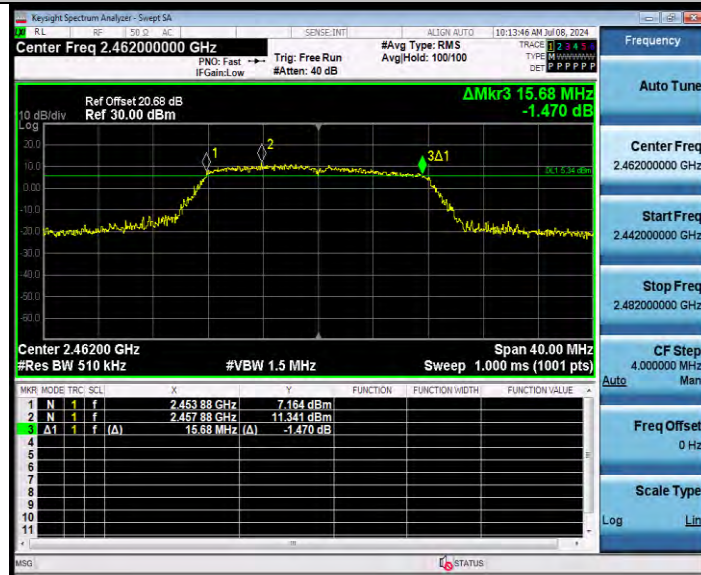


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11G\_Ant1\_2462



11N20SISO\_Ant1\_2412

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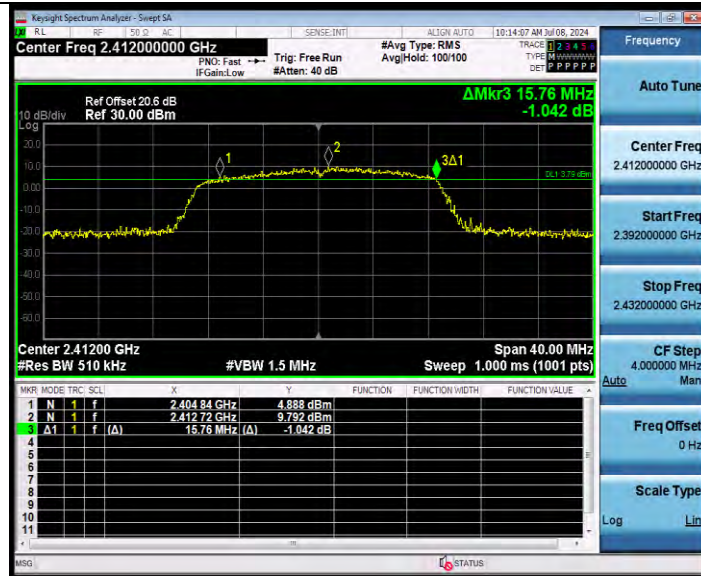
Room B37, Warehouse A5, No.3 Chiwan 4th Road,  
Zhaoshang Street, Nanshan District Shenzhen,  
Guangdong, People's Republic of China

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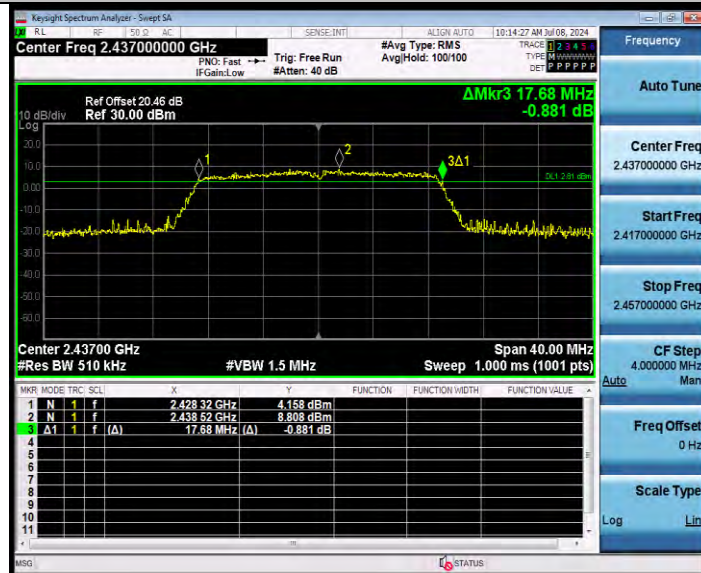


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11N20SISO\_Ant1\_2437



11N20SISO\_Ant1\_2462

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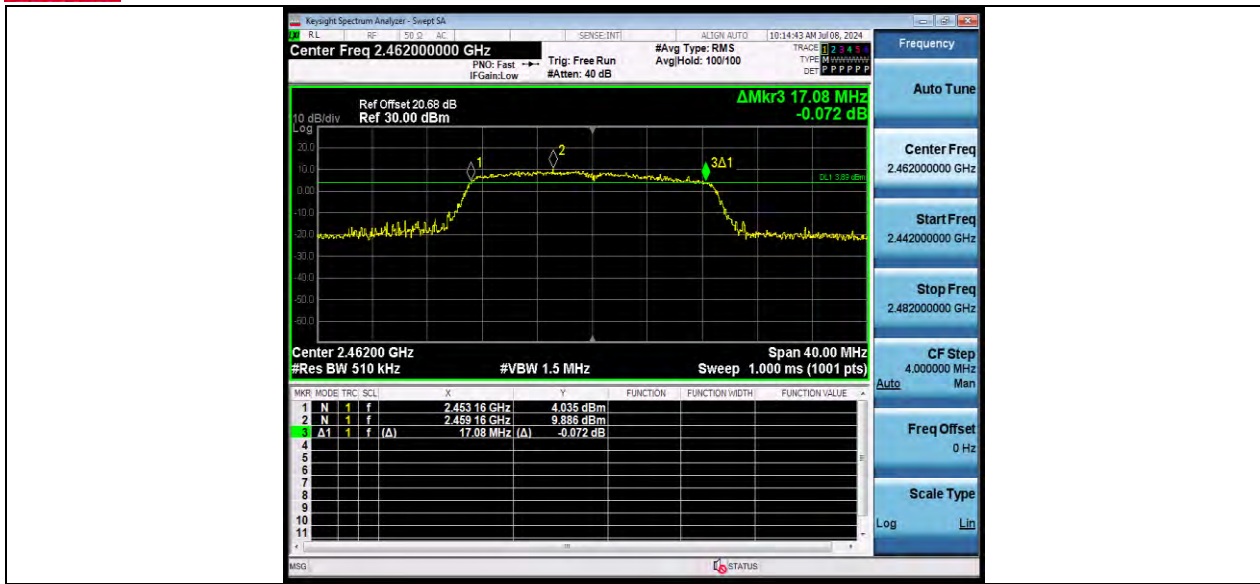
Room B37, Warehouse A5, No.3 Chiwan 4th Road, Zhaoshang Street, Nanshan District Shenzhen, Guangdong, People's Republic of China

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## OCCUPIED CHANNEL BANDWIDTH TEST RESULT

TestMode	Antenna	Channel Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
11B	Ant1	2412	13.662	2405.4094	2419.0714	---	---
		2437	14.311	2429.9069	2444.2179	---	---
		2462	14.002	2454.7945	2468.7965	---	---
11G	Ant1	2412	16.881	2403.7058	2420.5868	---	---
		2437	17.377	2428.3156	2445.6926	---	---
		2462	17.062	2453.3498	2470.4118	---	---
11N20SISO	Ant1	2412	17.934	2403.1227	2421.0567	---	---
		2437	18.259	2427.9142	2446.1732	---	---
		2462	18.065	2452.8838	2470.9488	---	---



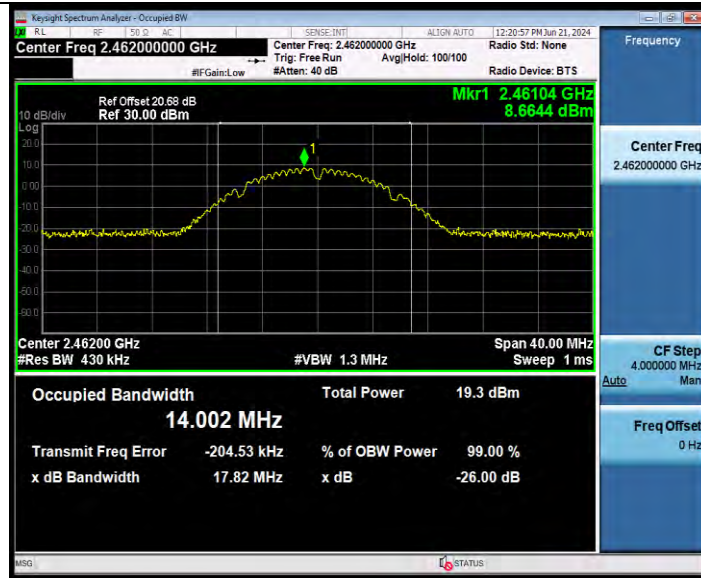
### TEST GRAPHS





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11G\_Ant1\_2412



11G\_Ant1\_2437

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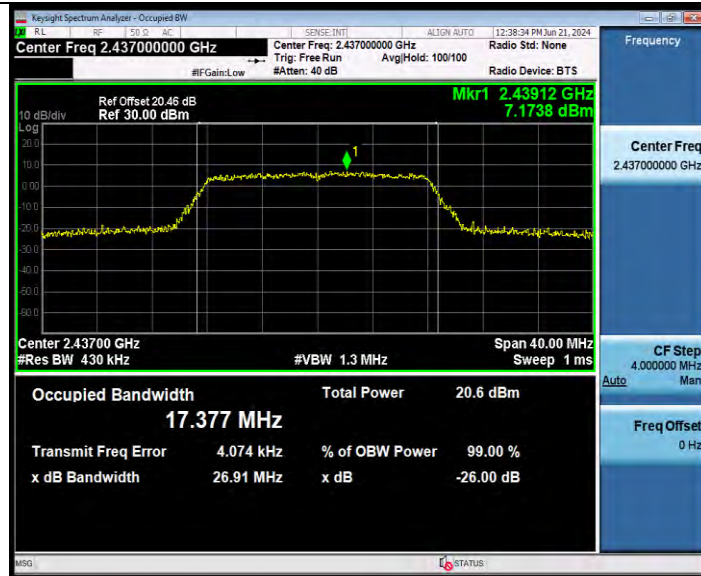
Room B37, Warehouse A5, No.3 Chiwan 4th Road,  
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11G\_Ant1\_2462



11N20SISO\_Ant1\_2412

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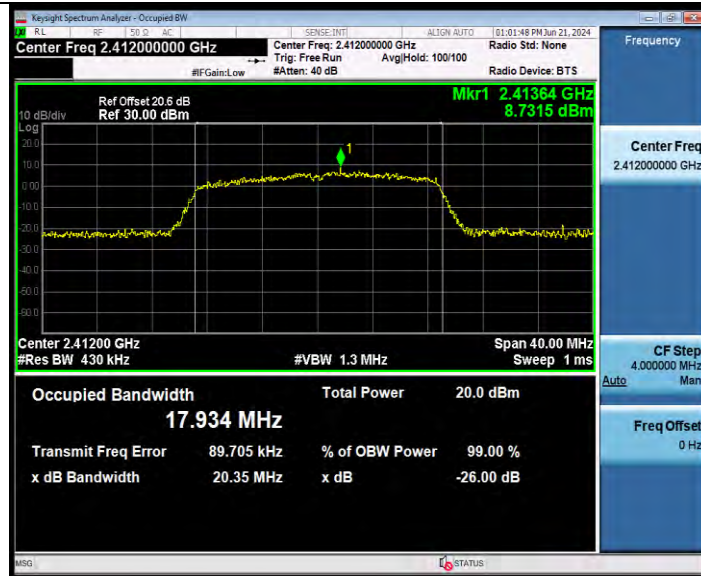
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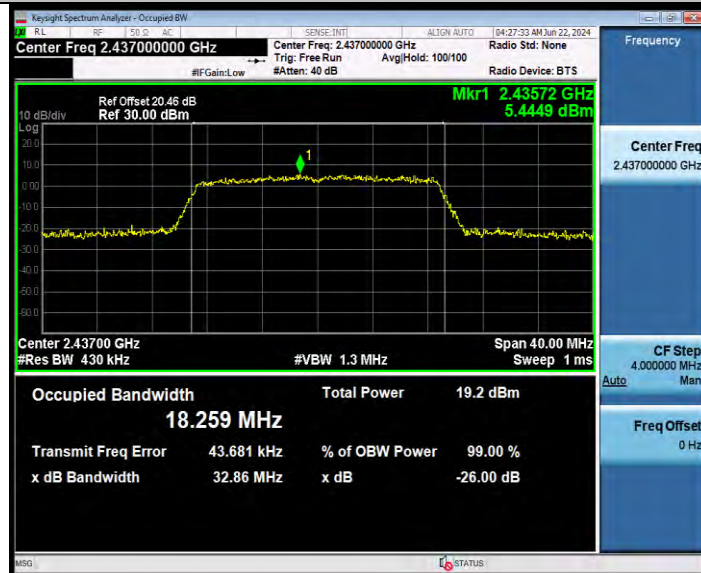


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11N20SISO\_Ant1\_2437

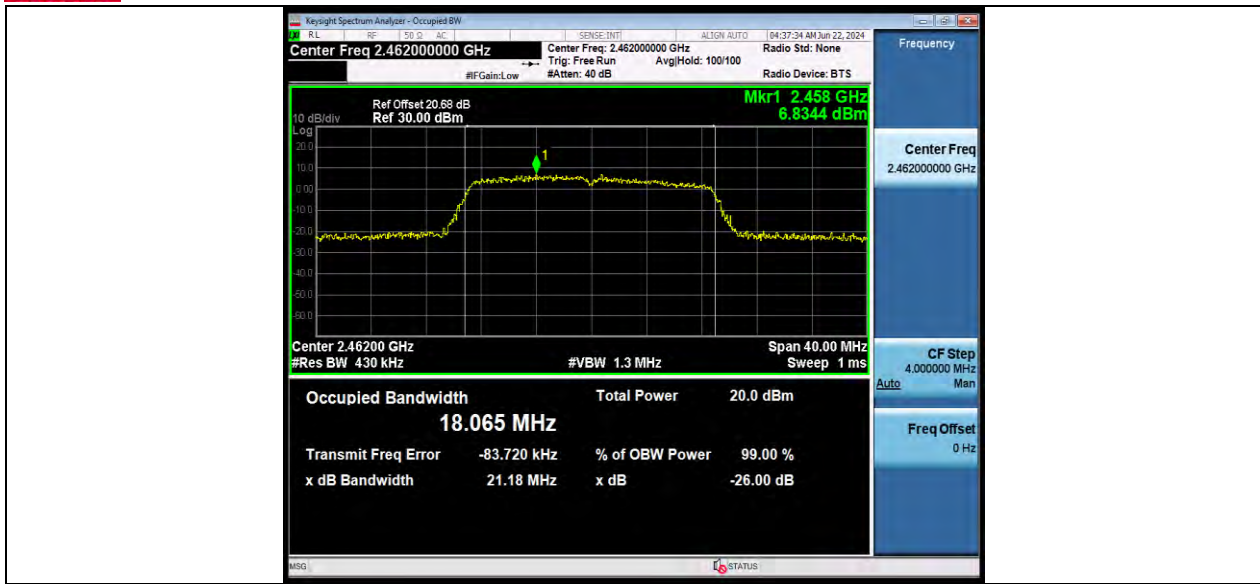


11N20SISO\_Ant1\_2462



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## MAXIMUM CONDUCTED OUTPUT POWER

### TEST RESULT

Test Mode	TX Mod	Freq [MHz]	Ant.	Average power [dBm]	Peak power [dBm]	Peak power [mw]	Conducted Power Limit [dBm]	EIRP power [dBm]	EIRP power [mw]	EIRP Limit [dBm]	Verdict	Power Setting
11B	SISO	2412	ANT 1	15.98	18.24	66.68	≤30.00	20.74	118.58	≤36.00	PASS	17.0
		2437	ANT 1	16.23	18.23	66.53	≤30.00	20.73	118.30	≤36.00	PASS	17.0
		2462	ANT 1	16.24	18.44	69.82	≤30.00	20.94	124.17	≤36.00	PASS	16.5
11G	SISO	2412	ANT 1	14.90	23.81	240.44	≤30.00	26.31	427.56	≤36.00	PASS	16.0
		2437	ANT 1	15.13	23.65	231.74	≤30.00	26.15	412.10	≤36.00	PASS	16.0
		2462	ANT 1	15.20	23.16	207.01	≤30.00	25.66	368.13	≤36.00	PASS	15.5
11N20	SISO	2412	ANT 1	13.96	24.27	267.30	≤30.00	26.77	475.34	≤36.00	PASS	15.0
		2437	ANT 1	14.19	23.79	239.33	≤30.00	26.29	425.60	≤36.00	PASS	15.0
		2462	ANT 1	14.05	24.23	264.85	≤30.00	26.73	470.98	≤36.00	PASS	14.5

Note: The Average power with duty cycle factor.



## MAXIMUM POWER SPECTRAL DENSITY TEST RESULT

TestMode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
11B	Ant1	2412	-4.00	≤8.00	PASS
		2437	-5.96	≤8.00	PASS
		2462	-4.21	≤8.00	PASS
11G	Ant1	2412	-8.26	≤8.00	PASS
		2437	-9.36	≤8.00	PASS
		2462	-7.95	≤8.00	PASS
11N20SISO	Ant1	2412	-9.51	≤8.00	PASS
		2437	-10.42	≤8.00	PASS
		2462	-8.19	≤8.00	PASS





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## TEST GRAPHS

11B\_Ant1\_2412



11B\_Ant1\_2437



11B\_Ant1\_2462



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11G\_Ant1\_2412

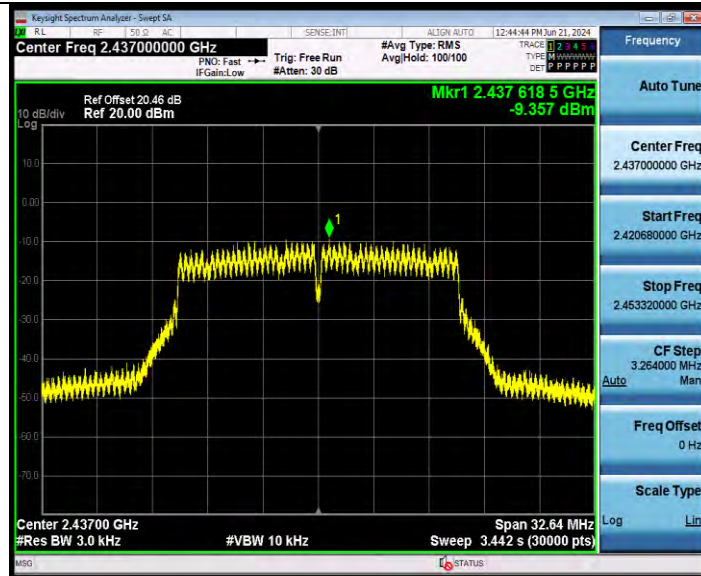


11G\_Ant1\_2437



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11G\_Ant1\_2462

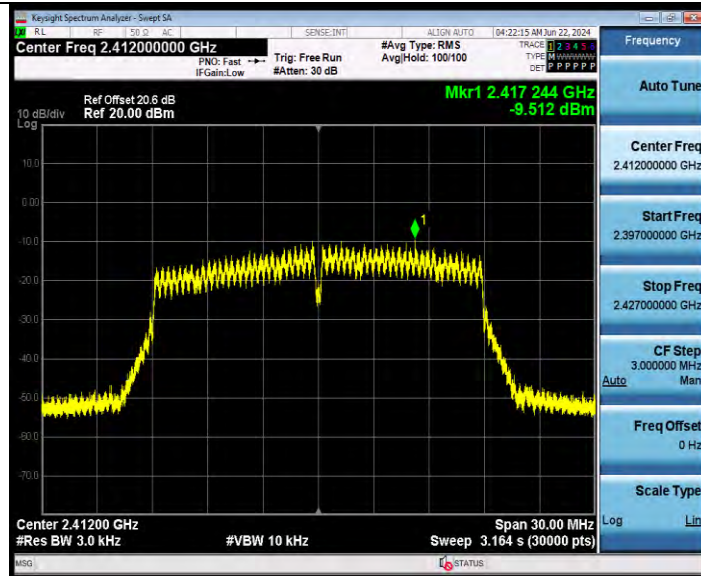


11N20SISO\_Ant1\_2412

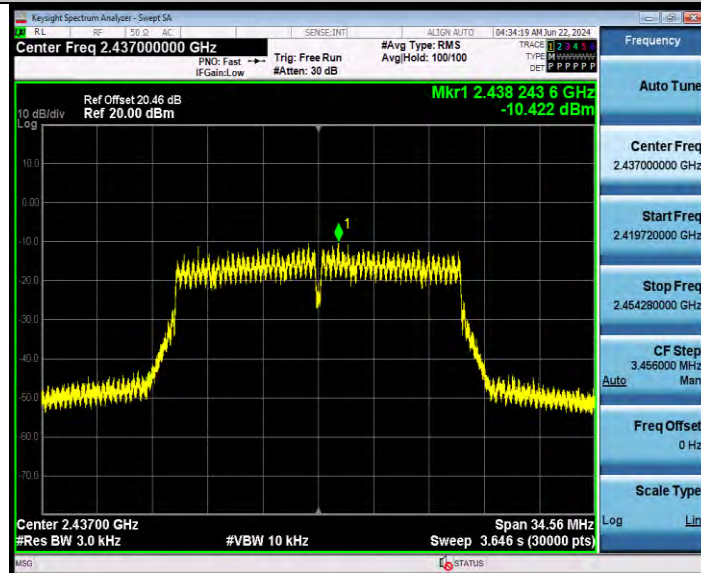


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11N20SISO\_Ant1\_2437

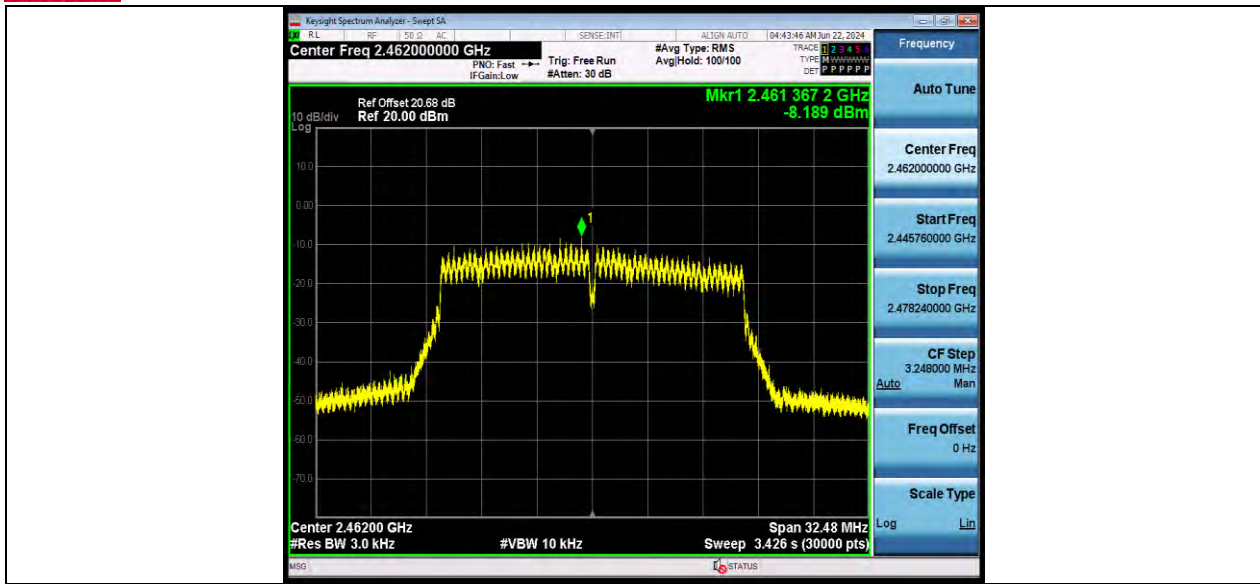


11N20SISO\_Ant1\_2462



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## **BAND EDGE MEASUREMENTS**

### **TEST RESULT**

TestMode	Antenna	ChName	Frequency [MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
11B	Ant1	Low	2412	7.34	-35.36	≤-12.66	PASS
		High	2462	7.69	-34.89	≤-12.31	PASS
11G	Ant1	Low	2412	4.56	-32.59	≤-15.44	PASS
		High	2462	4.66	-34.81	≤-15.34	PASS
11N20SISO	Ant1	Low	2412	3.36	-33.25	≤-16.64	PASS
		High	2462	3.53	-34.65	≤-16.47	PASS

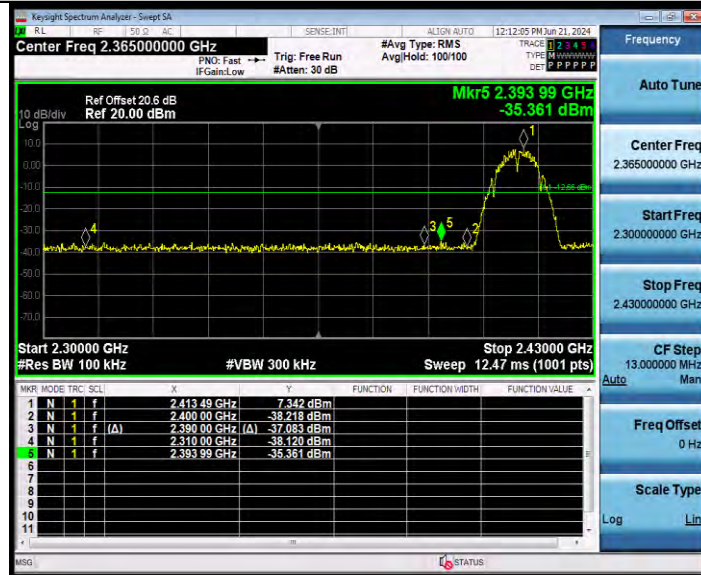


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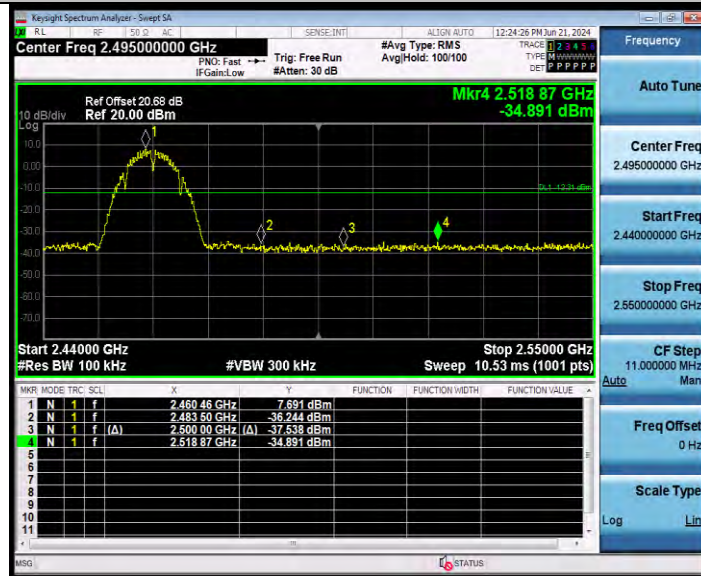
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### TEST GRAPHS

11B\_Ant1\_Low\_2412



11B\_Ant1\_High\_2462



11G\_Ant1\_Low\_2412



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11G\_Ant1\_High\_2462



11N20SISO\_Ant1\_Low\_2412

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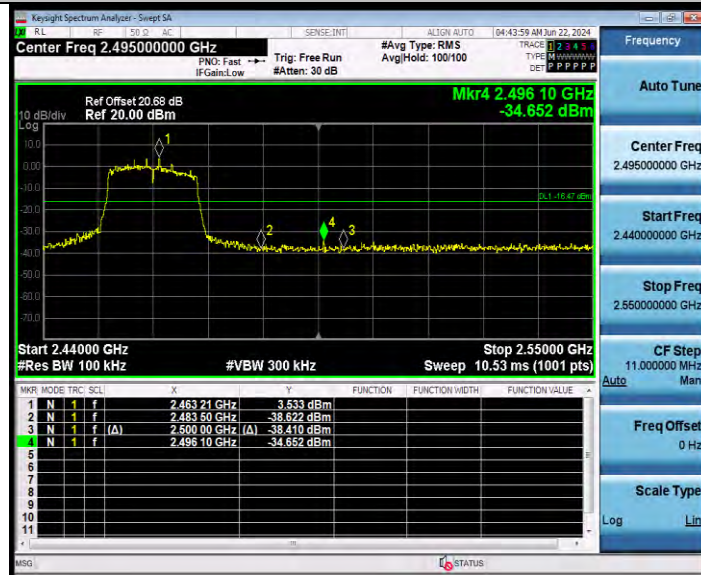


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### CONDUCTED SPURIOUS EMISSION

### TEST RESULT

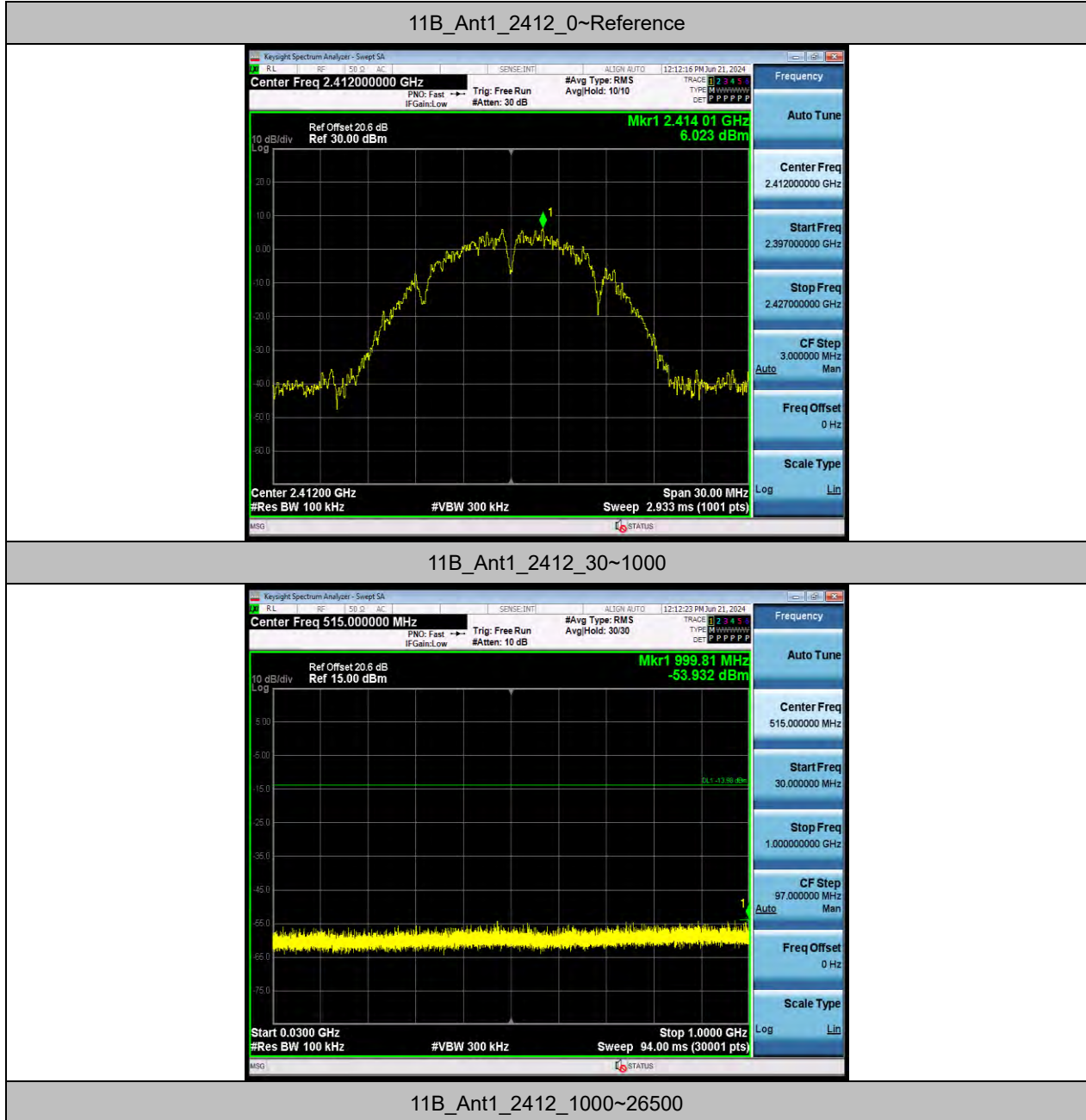
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11B	Ant1	2412	Reference	6.02	6.02	---	PASS
			30~1000	6.02	-53.93	≤-13.98	PASS
			1000~26500	6.02	-34.39	≤-13.98	PASS
		2437	Reference	6.29	6.29	---	PASS
			30~1000	6.29	-53.74	≤-13.71	PASS
			1000~26500	6.29	-27.05	≤-13.71	PASS
		2462	Reference	7.54	7.54	---	PASS
			30~1000	7.54	-53.9	≤-12.46	PASS
			1000~26500	7.54	-34.97	≤-12.46	PASS
11G	Ant1	2412	Reference	3.32	3.32	---	PASS
			30~1000	3.32	-53.92	≤-16.68	PASS
			1000~26500	3.32	-34.38	≤-16.68	PASS
		2437	Reference	2.83	2.83	---	PASS
			30~1000	2.83	-53.39	≤-17.17	PASS
			1000~26500	2.83	-35.59	≤-17.17	PASS
		2462	Reference	3.98	3.98	---	PASS
			30~1000	3.98	-53.72	≤-16.02	PASS
			1000~26500	3.98	-34	≤-16.02	PASS
11N20SISO	Ant1	2412	Reference	2.54	2.54	---	PASS
			30~1000	2.54	-54.73	≤-17.46	PASS
			1000~26500	2.54	-35.69	≤-17.46	PASS
		2437	Reference	2.59	2.59	---	PASS
			30~1000	2.59	-54.16	≤-17.41	PASS
			1000~26500	2.59	-35.19	≤-17.41	PASS
		2462	Reference	0.40	0.40	---	PASS
			30~1000	0.40	-54.07	≤-19.6	PASS
			1000~26500	0.40	-35.38	≤-19.6	PASS



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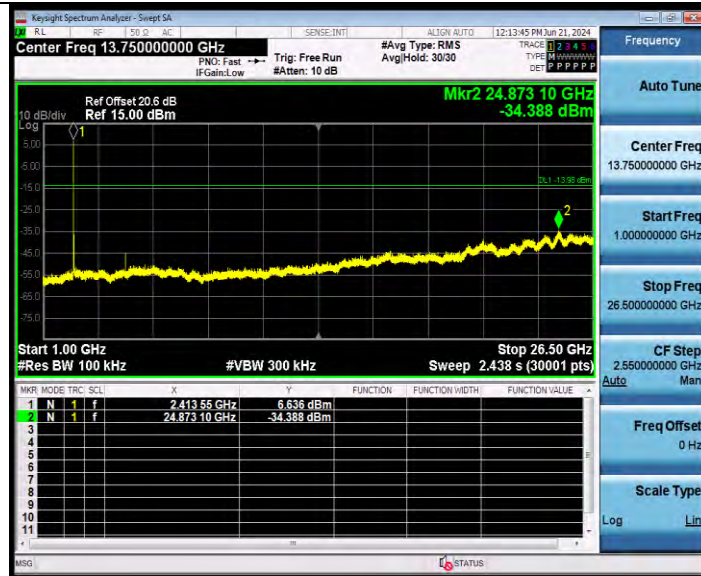
## TEST GRAPHS





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11B\_Ant1\_2437\_0~Reference



11B\_Ant1\_2437\_30~1000

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11B\_Ant1\_2437\_1000~26500



11B\_Ant1\_2462\_0~Reference

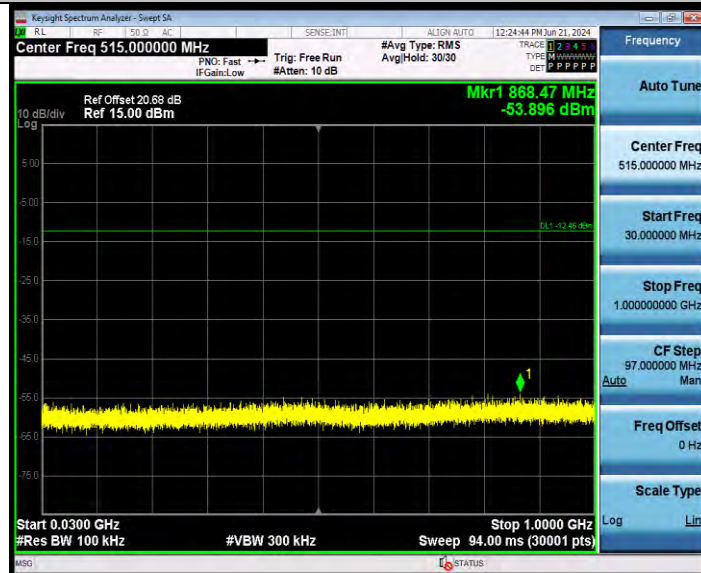


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**Test Report No.: W7L-P24050014RF02**



11B\_Ant1\_2462\_30~1000

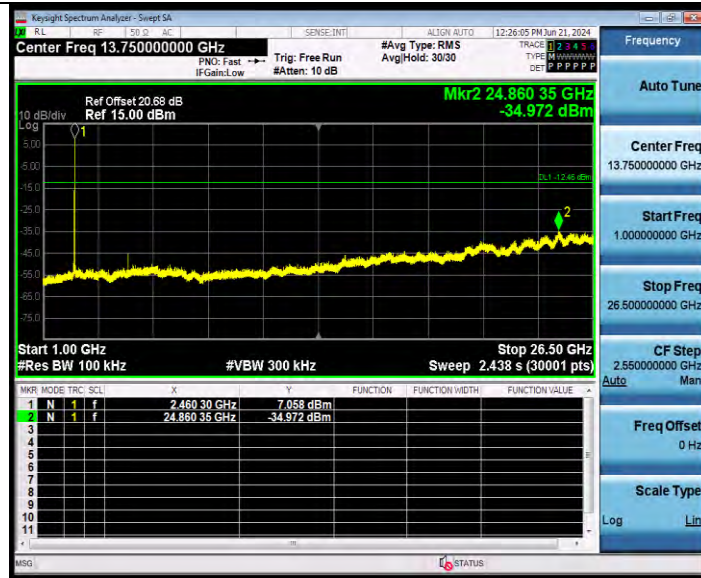


11B\_Ant1\_2462\_1000~26500



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11G\_Ant1\_2412\_0~Reference



11G\_Ant1\_2412\_30~1000

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11G\_Ant1\_2412\_1000~26500



11G\_Ant1\_2437\_0~Reference





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11G\_Ant1\_2437\_30~1000

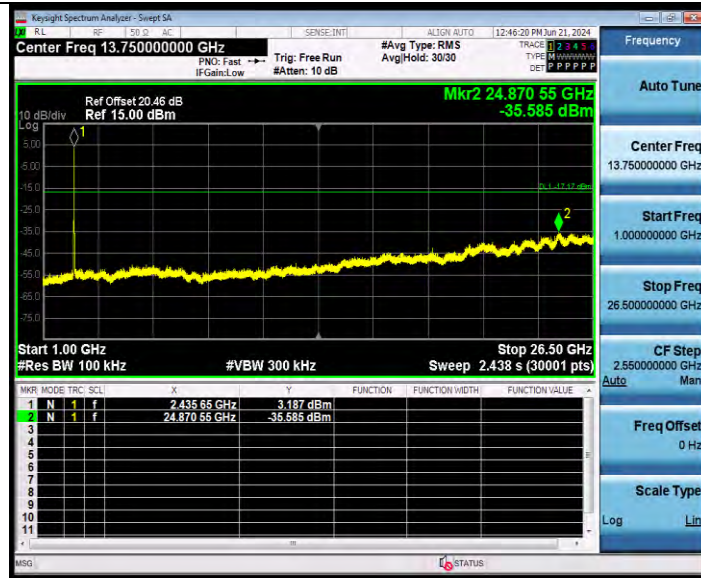


11G\_Ant1\_2437\_1000~26500



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Test Report No.: W7L-P24050014RF02



11G\_Ant1\_2462\_0~Reference



11G\_Ant1\_2462\_30~1000



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11G\_Ant1\_2462\_1000~26500



11N20SISO\_Ant1\_2412\_0~Reference



BUREAU VERITAS

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11N20SISO\_Ant1\_2412\_30~1000



11N20SISO\_Ant1\_2412\_1000~26500



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11N20SISO\_Ant1\_2437\_0~Reference



11N20SISO\_Ant1\_2437\_30~1000

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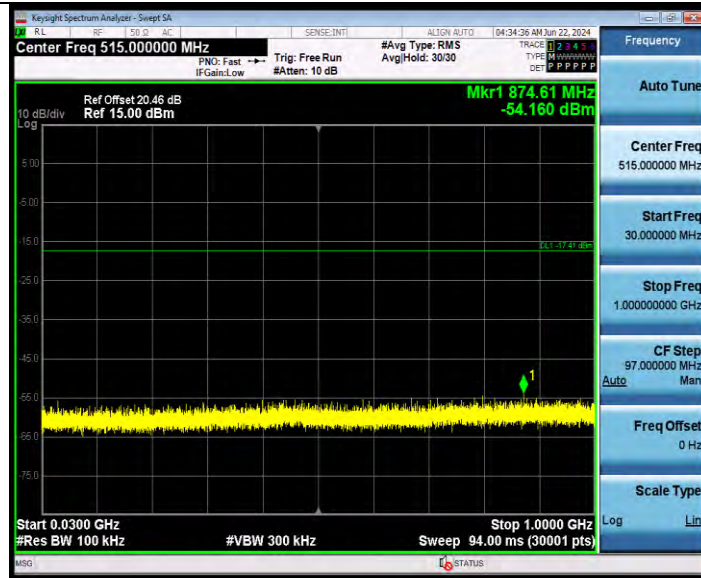
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11N20SISO\_Ant1\_2437\_1000~26500



11N20SISO\_Ant1\_2462\_0~Reference



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11N20SISO\_Ant1\_2462\_30~1000



11N20SISO\_Ant1\_2462\_1000~26500



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## DUTY CYCLE TEST RESULT

TestMode	Antenna	Frequency[MHz]	Transmission Duration [ms]	Transmission Period [ms]	Duty Cycle [%]	Factor
11B	Ant1	2412	8.38	8.42	99.52	0.02
		2437	8.39	8.42	99.64	0.02
		2462	8.38	8.42	99.52	0.02
11G	Ant1	2412	1.39	1.43	97.20	0.12
		2437	1.39	1.44	96.53	0.15
		2462	1.40	1.44	97.22	0.12
11N20SISO	Ant1	2412	1.30	1.35	96.30	0.16
		2437	1.30	1.34	97.01	0.13
		2462	1.30	1.34	97.01	0.13

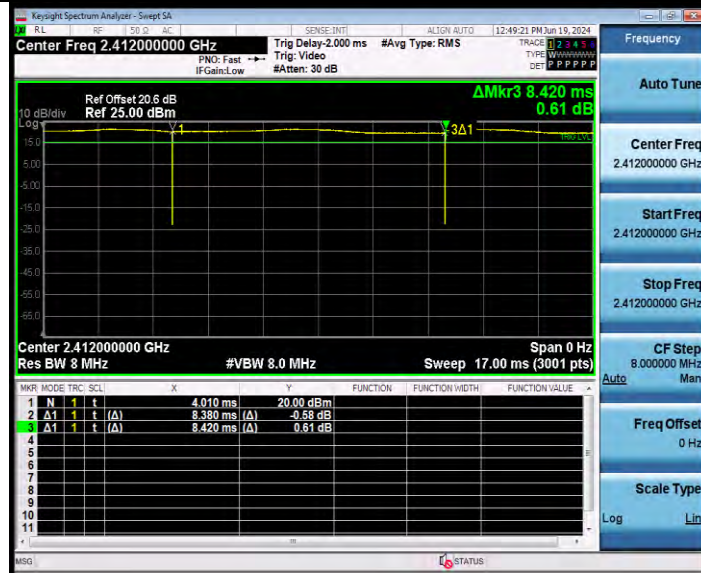


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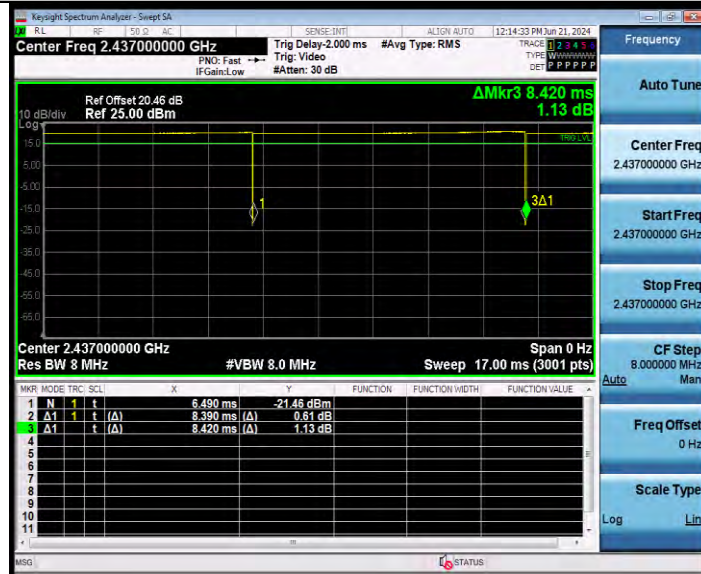
Test Report No.: W7L-P24050014RF02

### TEST GRAPHS

11B\_Ant1\_2412



11B\_Ant1\_2437

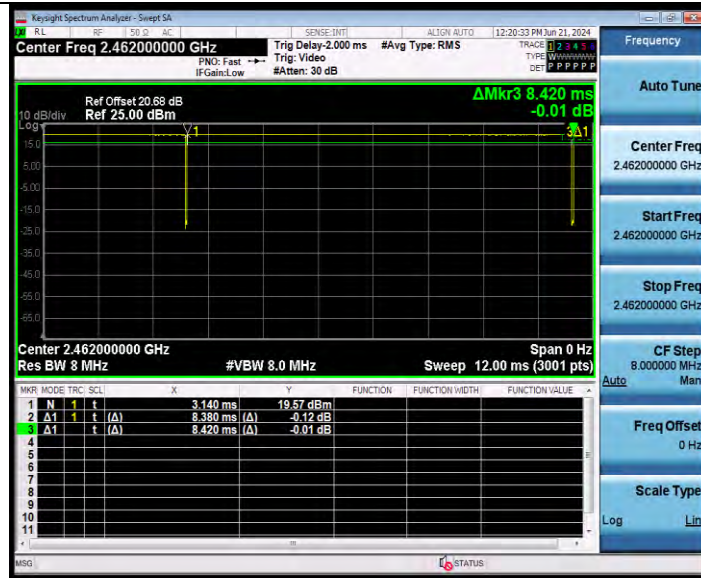


11B\_Ant1\_2462

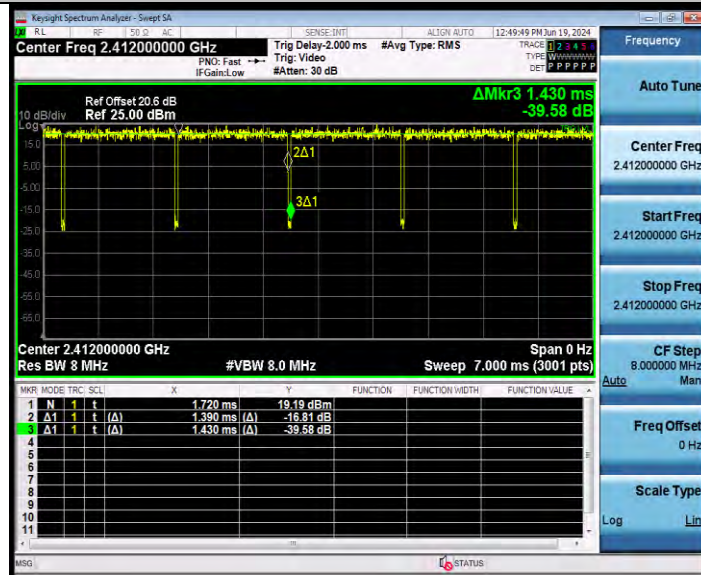


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11G\_Ant1\_2412



11G\_Ant1\_2437

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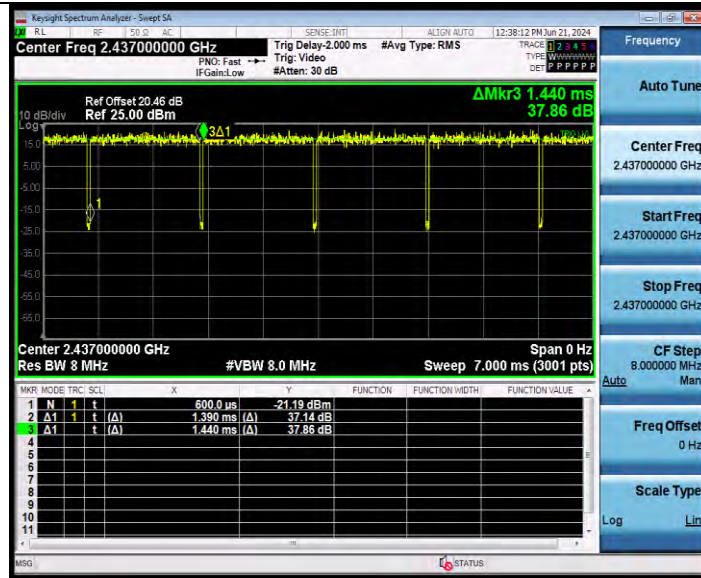
Room B37, Warehouse A5, No.3 Chiwan 4th Road,  
Zhaoshang Street, Nanshan District Shenzhen,  
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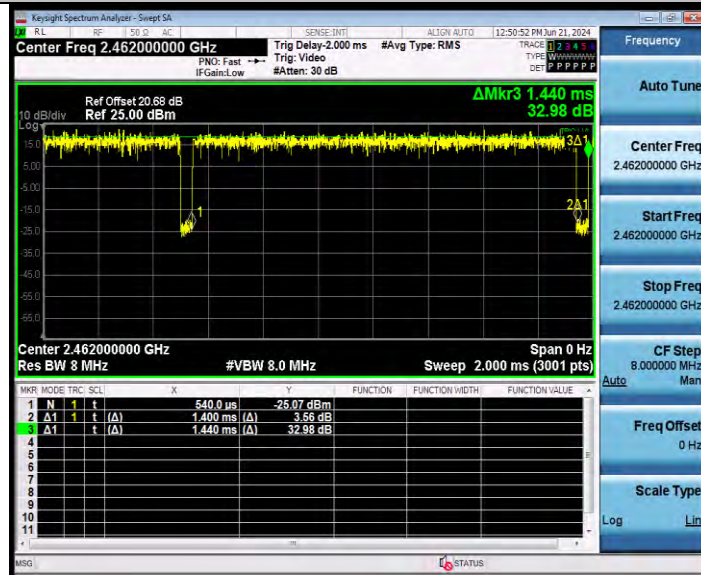


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VERITAS**

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11G\_Ant1\_2462

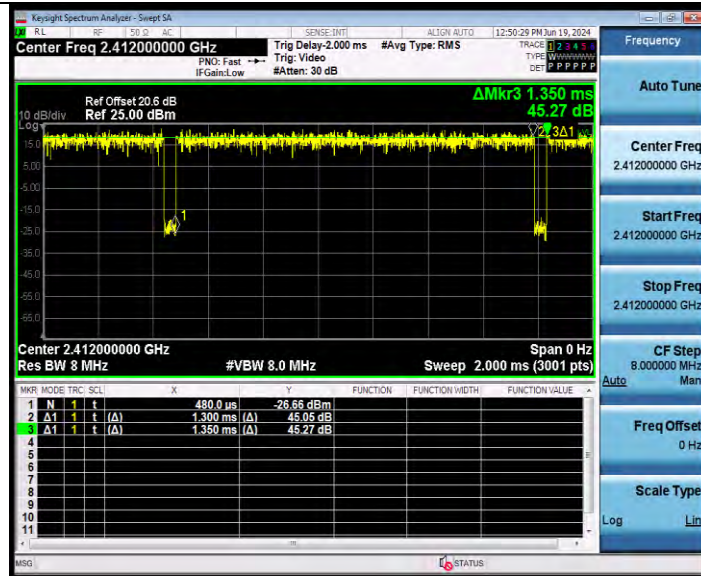


11N20SISO\_Ant1\_2412

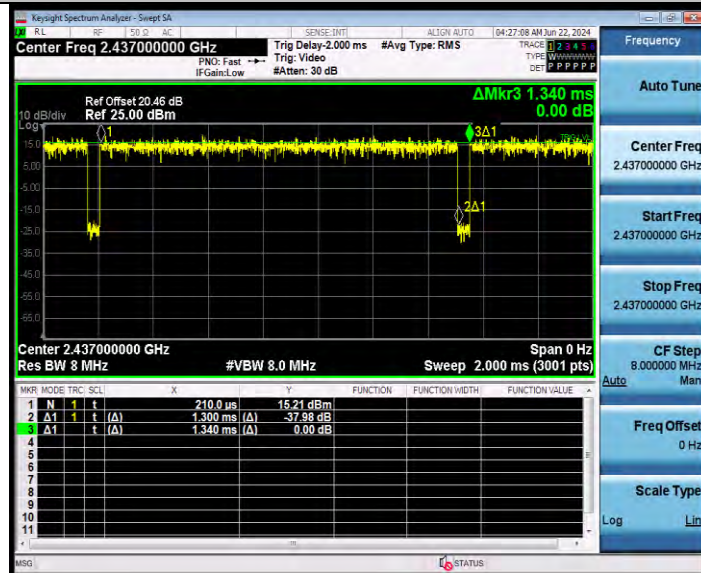


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11N20SISO\_Ant1\_2437

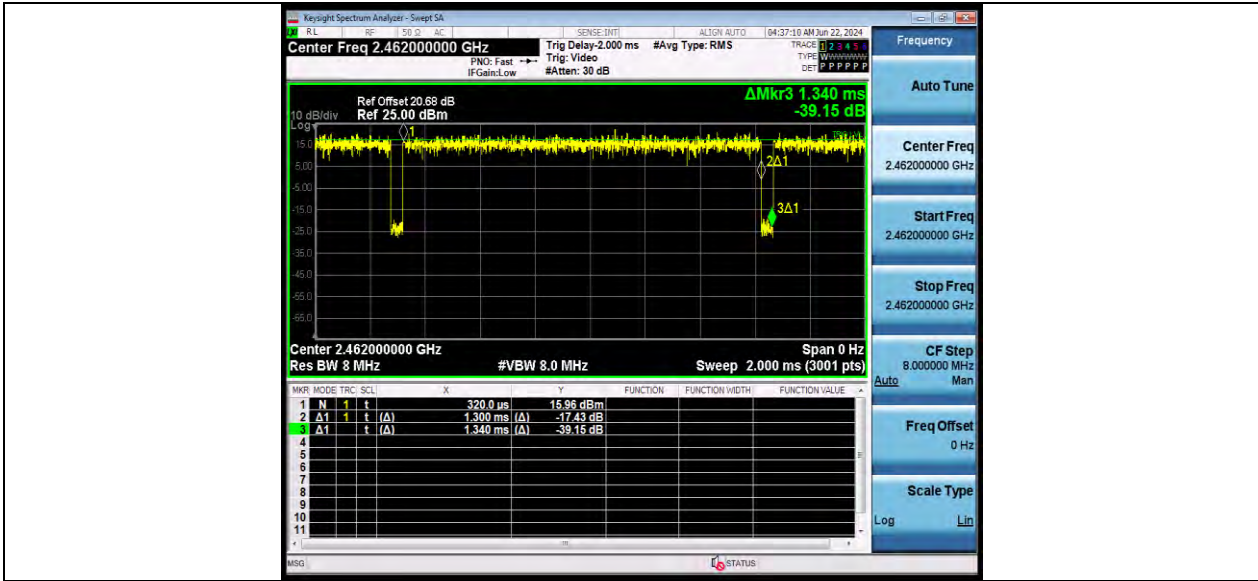


11N20SISO\_Ant1\_2462



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# Test Report No.: W7L-P24050014RF02



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## BLE

### DTS BANDWIDTH

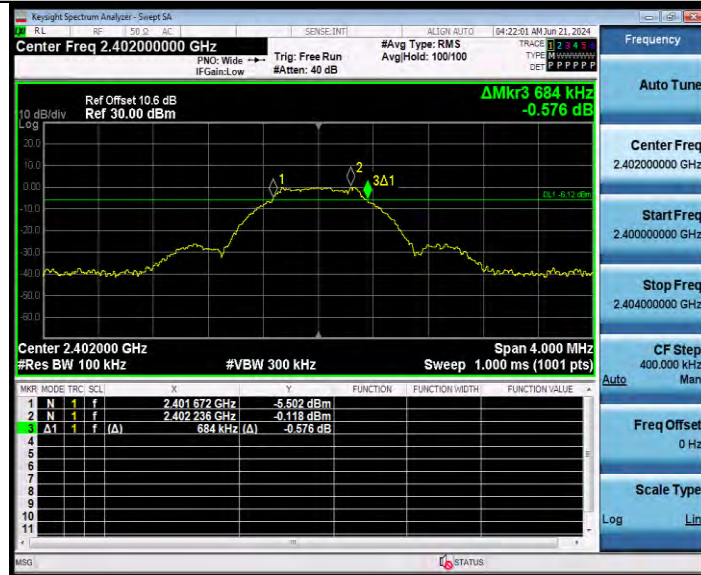
### TEST RESULT

TestMode	Antenna	Frequency[MHz]	DTS BW [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	0.684	2401.672	2402.356	0.5	PASS
		2440	0.656	2439.680	2440.336	0.5	PASS
		2480	0.696	2479.656	2480.352	0.5	PASS
BLE_2M	Ant1	2404	1.144	2403.448	2404.592	0.5	PASS
		2440	1.132	2439.452	2440.584	0.5	PASS
		2478	1.104	2477.448	2478.552	0.5	PASS
BLE_125K	Ant1	2402	0.684	2401.660	2402.344	0.5	PASS
		2440	0.680	2439.664	2440.344	0.5	PASS
		2480	0.684	2479.660	2480.344	0.5	PASS
BLE_500K	Ant1	2402	0.652	2401.680	2402.332	0.5	PASS
		2440	0.660	2439.676	2440.336	0.5	PASS
		2480	0.664	2479.676	2480.340	0.5	PASS

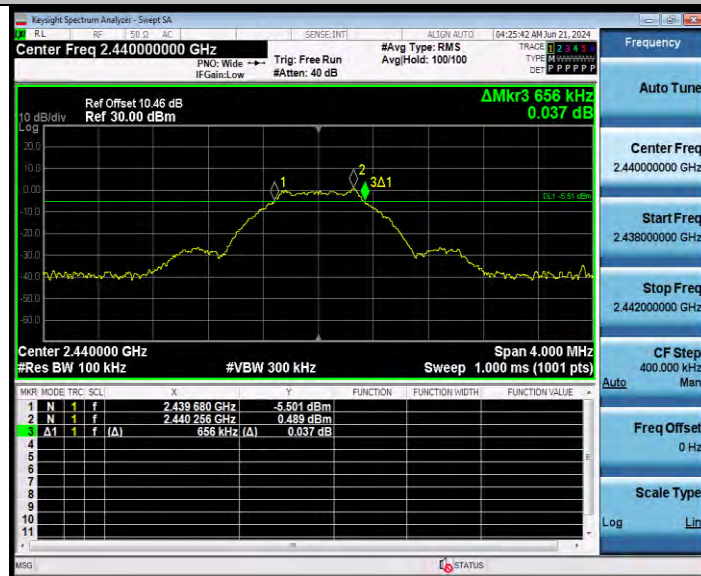


**TEST GRAPHS**

BLE\_1M\_Ant1\_2402



BLE\_1M\_Ant1\_2440



BLE\_1M\_Ant1\_2480





BUREAU VERITAS

Test Report No.: W7L-P24050014RF02



BLE\_2M\_Ant1\_2404



BLE\_2M\_Ant1\_2440



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Test Report No.: W7L-P24050014RF02



BLE\_2M\_Ant1\_2478

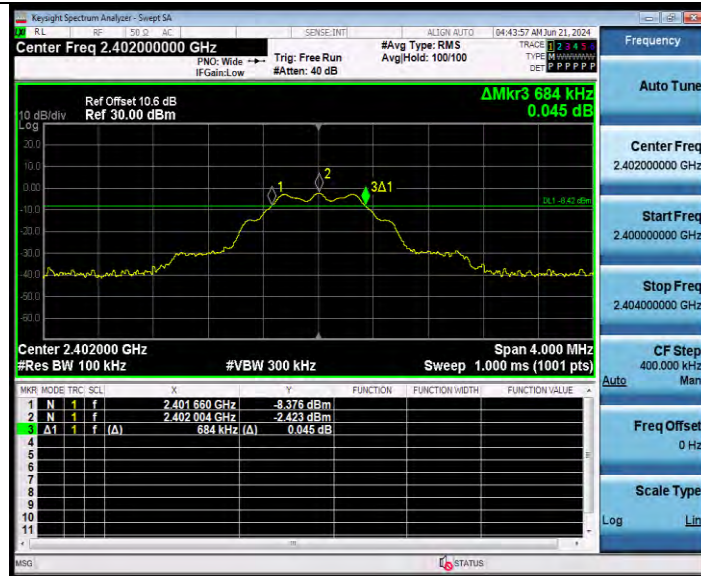


BLE\_125K\_Ant1\_2402

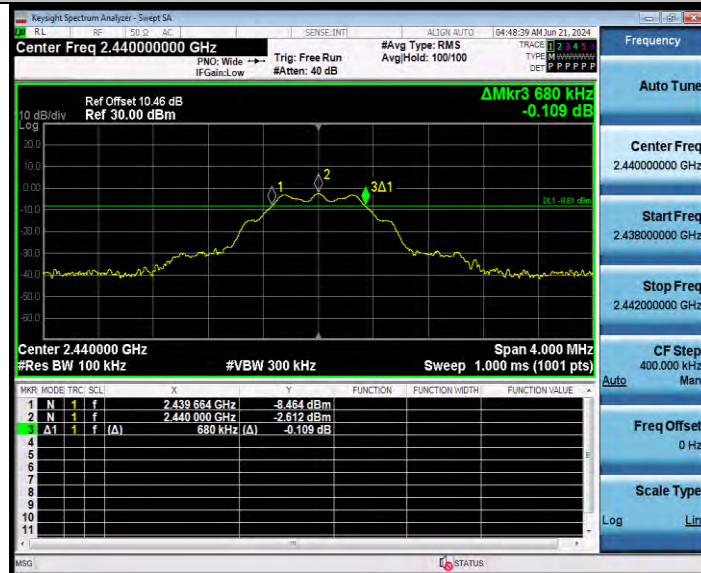


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**Test Report No.: W7L-P24050014RF02**



BLE\_125K\_Ant1\_2440



BLE\_125K\_Ant1\_2480

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BLE\_500K\_Ant1\_2402



BLE\_500K\_Ant1\_2440



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**Test Report No.: W7L-P24050014RF02**



BLE\_500K\_Ant1\_2480





### OCCUPIED CHANNEL BANDWIDTH TEST RESULT

TestMode	Antenna	Frequency[MHz]	OCB [MHz]	FL[MHz]	FH[MHz]	Limit[MHz]	Verdict
BLE_1M	Ant1	2402	1.0401	2401.4846	2402.5247	---	---
		2440	1.0489	2439.4835	2440.5324	---	---
		2480	1.0377	2479.4837	2480.5214	---	---
BLE_2M	Ant1	2404	2.0731	2402.9901	2405.0632	---	---
		2440	2.0836	2438.9771	2441.0607	---	---
		2478	2.0655	2476.9858	2479.0513	---	---
BLE_125K	Ant1	2402	1.0652	2401.4703	2402.5355	---	---
		2440	1.0629	2439.4692	2440.5321	---	---
		2480	1.0619	2479.4693	2480.5312	---	---
BLE_500K	Ant1	2402	1.0270	2401.4885	2402.5155	---	---
		2440	1.0286	2439.4868	2440.5154	---	---
		2480	1.0250	2479.4863	2480.5113	---	---



### TEST GRAPHS





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### Test Report No.: W7L-P24050014RF02



BLE\_2M\_Ant1\_2404



BLE\_2M\_Ant1\_2440

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BLE\_2M\_Ant1\_2478



BLE\_125K\_Ant1\_2402



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### Test Report No.: W7L-P24050014RF02



BLE\_125K\_Ant1\_2440



BLE\_125K\_Ant1\_2480

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### Test Report No.: W7L-P24050014RF02



BLE\_500K\_Ant1\_2402



BLE\_500K\_Ant1\_2440

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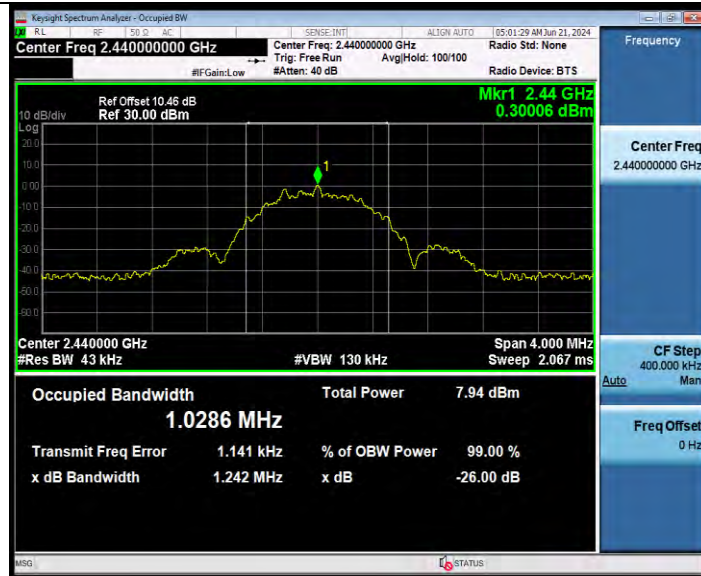
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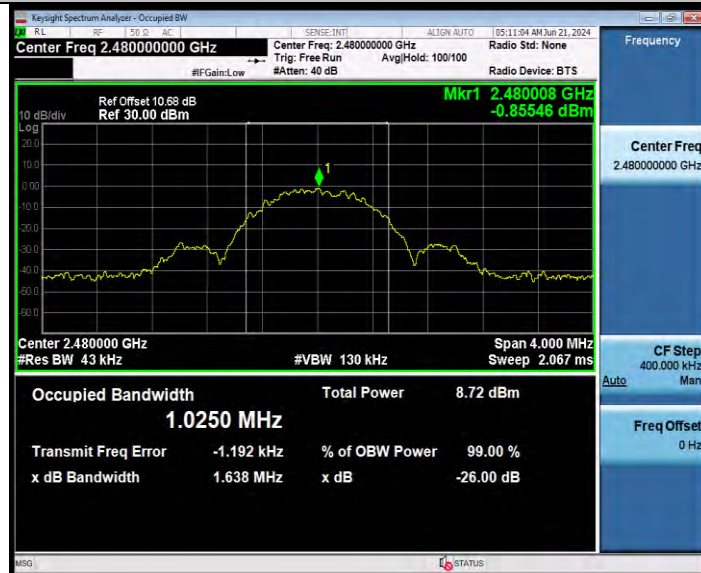


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### Test Report No.: W7L-P24050014RF02



### BLE\_500K\_Ant1\_2480





### MAXIMUM CONDUCTED OUTPUT POWER

#### TEST RESULT

TestMode	Antenna	Channel	Average power [dBm]	Peak power [dBm]	Peak power [mw]	Conducted Limit [dBm]	EIRP [dBm]	EIRP [mw]	EIRP Limit [dBm]	Verdict	Power Setting
BLE_1M	Ant1	2402	0.46	1	1.26	≤30	1.4	1.38	≤36	PASS	Default
		2440	0.97	1.48	1.41	≤30	1.88	1.54	≤36	PASS	Default
		2480	1.69	2.23	1.67	≤30	2.63	1.83	≤36	PASS	Default
BLE_2M	Ant1	2404	0.86	1.18	1.31	≤30	1.58	1.44	≤36	PASS	Default
		2440	1.14	1.51	1.42	≤30	1.91	1.55	≤36	PASS	Default
		2478	1.47	2.38	1.73	≤30	2.78	1.90	≤36	PASS	Default
BLE_125k	Ant1	2402	0.61	1.01	1.26	≤30	1.41	1.38	≤36	PASS	Default
		2440	1.13	1.49	1.41	≤30	1.89	1.55	≤36	PASS	Default
		2480	1.87	2.22	1.67	≤30	2.62	1.83	≤36	PASS	Default
BLE_500K	Ant1	2402	0.49	1.01	1.26	≤30	1.41	1.38	≤36	PASS	Default
		2440	0.98	1.49	1.41	≤30	1.89	1.55	≤36	PASS	Default
		2480	1.7	2.2	1.66	≤30	2.6	1.82	≤36	PASS	Default

Note: EIRP=Peak Power Gain

### MAXIMUM POWER SPECTRAL DENSITY

#### TEST RESULT

TestMode	Antenna	Frequency[MHz]	Result[dBm/3kHz]	Limit[dBm/3kHz]	Verdict
BLE_1M	Ant1	2402	-15.13	≤8.00	PASS
		2440	-15.40	≤8.00	PASS
		2480	-14.04	≤8.00	PASS
BLE_2M	Ant1	2404	-17.45	≤8.00	PASS
		2440	-17.84	≤8.00	PASS
		2478	-16.38	≤8.00	PASS
BLE_125K	Ant1	2402	-5.30	≤8.00	PASS
		2440	-5.58	≤8.00	PASS
		2480	-4.30	≤8.00	PASS



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**Test Report No.: W7L-P24050014RF02**

BLE_500K	Ant1	2402	-5.40	≤8.00	PASS
		2440	-5.69	≤8.00	PASS
		2480	-4.40	≤8.00	PASS



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## TEST GRAPHS

BLE\_1M\_Ant1\_2402



BLE\_1M\_Ant1\_2440



BLE\_1M\_Ant1\_2480



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**Test Report No.: W7L-P24050014RF02**



BLE\_2M\_Ant1\_2404



BLE\_2M\_Ant1\_2440





**BUREAU  
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**Test Report No.: W7L-P24050014RF02**



BLE\_2M\_Ant1\_2478



BLE\_125K\_Ant1\_2402



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Test Report No.: W7L-P24050014RF02



BLE\_125K\_Ant1\_2440



BLE\_125K\_Ant1\_2480

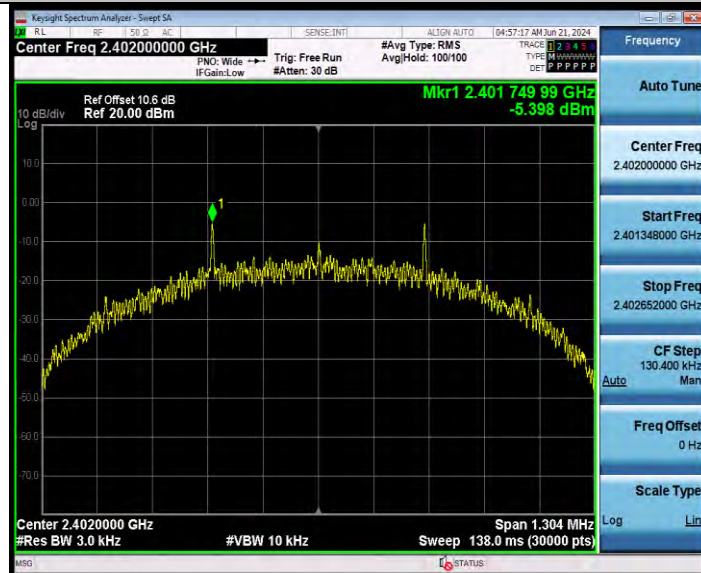


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Test Report No.: W7L-P24050014RF02



BLE\_500K\_Ant1\_2402

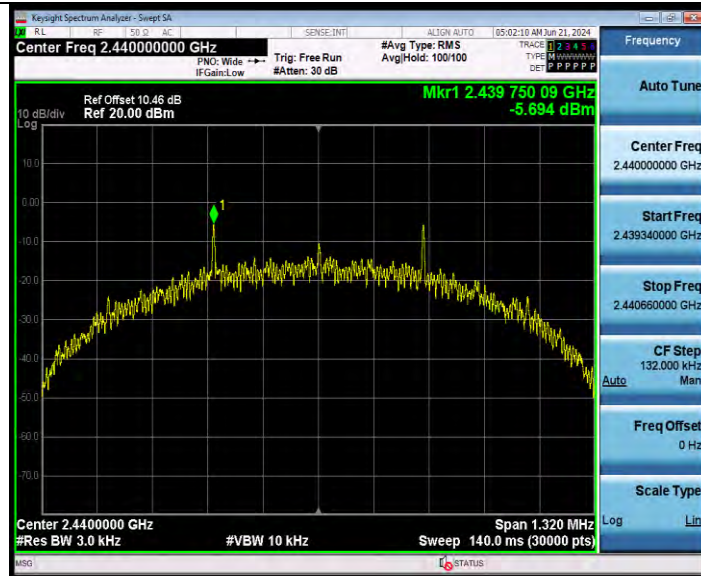


BLE\_500K\_Ant1\_2440



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**Test Report No.: W7L-P24050014RF02**



BLE\_500K\_Ant1\_2480





## BAND EDGE MEASUREMENTS

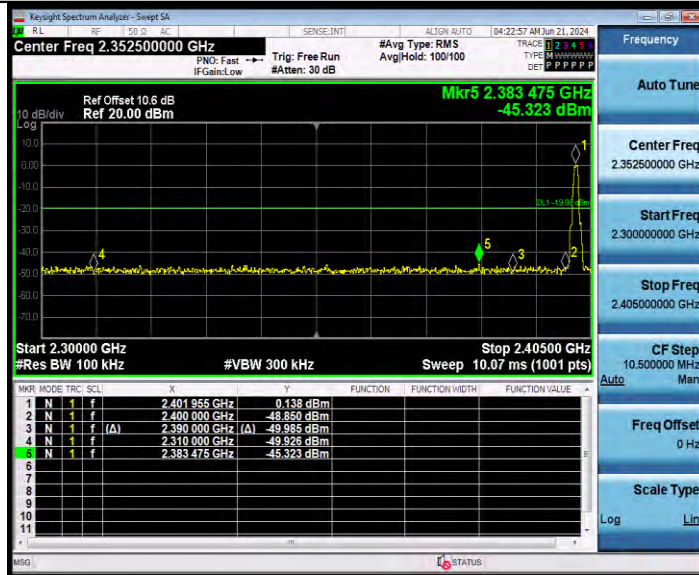
### TEST RESULT

TestMode	Antenna	ChName	Frequency[MHz]	RefLevel[dBm]	Result[dBm]	Limit[dBm]	Verdict
BLE_1M	Ant1	Low	2402	0.14	-45.32	≤-19.86	PASS
		High	2480	1.79	-45.33	≤-18.21	PASS
BLE_2M	Ant1	Low	2404	0.62	-45.36	≤-19.38	PASS
		High	2478	1.03	-44.69	≤-18.97	PASS
BLE_125K	Ant1	Low	2402	-2.42	-45.64	≤-22.42	PASS
		High	2480	-1.44	-44.76	≤-21.44	PASS
BLE_500K	Ant1	Low	2402	0.52	-45.36	≤-19.48	PASS
		High	2480	1.53	-43.95	≤-18.48	PASS

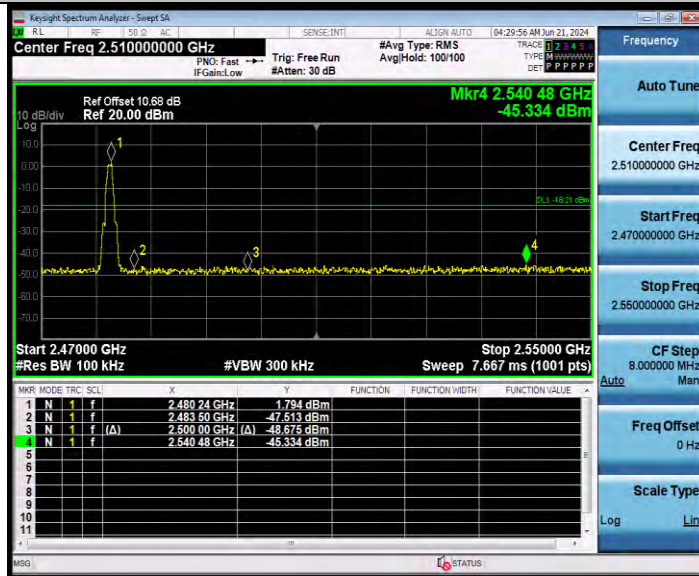


### TEST GRAPHS

BLE\_1M\_Ant1\_Low\_2402



BLE\_1M\_Ant1\_High\_2480



BLE\_2M\_Ant1\_Low\_2404