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PART 15C & RSS-247 RF TEST REPORT

FCC ID:	A3LSMS741B
Model (s):	SM-S741B/DS, SM-S741B
Device Type:	Portable Handset
Report Issue Date:	July 24, 2026

Samsung Electronics Co., Ltd.
129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16677, Rep. of Korea
Certification

The measurement evaluations presented in this report are based on the maximum performance of the tested device(s), which has been shown to be capable of compliance with the applicable technical requirements specified herein and has been tested in accordance with the measurement procedures outlined in 47CFR §2.947, ANSI C63.10-2020 + Cor.1-2023 + C63.10a-2024 + Errata to C63.10a-2024.

This document has been revised and replaces all previously issued versions of this document with the same Test Report S/N.

Youngbin Song
Technical Manager

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1. DUT Specifics

1.1. Device under Test

The manufacturer has confirmed that the device is within operational tolerances expected for production units and has the same physical, mechanical, and thermal characteristics expected for production units. The serial number of the device used for each test is indicated alongside the results.

1.2. Maximum Power per Mode

Table 1-1 Maximum Conducted Peak Power Summary

MODE	Operating Mode	Frequency Range			Max Peak Power	
		[MHz]			[dBm]	[W]
LE	1M	2402	-	2480	16.85	0.048
	2M	2404	-	2478	16.98	0.050
	125k	2402	-	2480	10.93	0.012
	500k	2402	-	2480	10.71	0.012

1.3. Description of Antennas

The antenna gain values are provided by the manufacturer in the antenna specification document. The document is included in the certification filing as a public exhibit. The highest antenna gain for each operating frequency band is applied during the compliance evaluation.

Table 1-2 Antenna Operating Configurations

Band	Mode	SISO		MIMO	
		Ant 1	Ant 2	Ant 1	Ant 2
LE	1M	✔	✔	✔	✔
	2M	✔	✔	✔	✔
	125 k	✔	✔		
	500 k	✔	✔		

✓ indicates Supported

Table 1-3 Maximum Antenna Peak Gain by Operating Band

Antenna Gain	Bluetooth (2.4 GHz) [dBi]
Antenna 1	-5.03
Antenna 2	-6.47
Directional Gain	-2.71

Note 1 : The DUT incorporates an internal, permanently attached antenna which cannot be replaced by the end-user. Therefore, DUT complies with the requirements of §15.203

Note 2 : Per KDB 662911 D01 v02r01, the directional gain for MIMO operations with unequal antenna gains and equal transmit powers was calculated as follows

Correlated Directional Gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi

2. Executive Summary

2.1. Device Description

The DUT is a portable wireless handset designed to operate across multiple communication standards and frequency bands. This report covers the complete compliance testing of BLE (DTS) in accordance with the applicable standards and regulatory requirements.

2.2. Summary of Test Results

The DUT has been tested according to the following specifications. The test period was from June 17, 2026 through July 06, 2026.

Test Condition	Test Item	FCC	ISED	Limit	Test Result	Reference
Conducted	maximum peak conducted output power	§15.247(b)	RSS-247(6.3)	< 1 Watt	PASS	Section 5.4
	Maximum Power Spectral Density	§15.247(e)	RSS-247(6.3)	< 8 dBm / 3 kHz	PASS	Section 5.5
	6dB Bandwidth	§15.247(a)	RSS-247(6.3)	> 500 kHz	PASS	Section 5.6
	Conducted Spurious Emissions	§15.247(d)	RSS-247(6.6)	> 20 dBc	PASS	Section 5.7
	AC Conducted Emissions	§15.207	RSS-Gen(8.8)	The DUT shall comply with the limits specified in §15.207	PASS	Section 7.0
Radiated	Unwanted Emissions Outside of the Band	§15.247(d) §15.205 §15.209	RSS-247(6.6) RSS-Gen(8.9) RSS-Gen(8.10)	Undesirable emission must meet the limits detailed in 15.247(d) & RSS-247(6.6)	PASS	Section 6

2.3. Test Guidance Applied

Testing was performed in accordance with the following rules, standards, and guidance:

- ANSI C63.10 - 2020 + Cor.1-2023 + C63.10a-2024 + Errata to C63.10a-2024
- ANSI C63.4 - 2014 + C63.4a - 2017
- RSS-Gen Issue 5
- RSS-247 Issue 4
- FCC 47 CFR Part 2
- FCC 47 CFR Part 15
- KDB 662911 D01 v02r01
- KDB 558074 D01 v05r02

2.4. NGTL Test Site Location

All measurement operations were conducted at the NGTL testing facility.

- Location: 52-7, Choha-ro, Mohyeon-eup, Cheoin-gu, Yongin-si, Gyeonggi-do, Republic of Korea.
- Site Compliance: The measurement environments strictly adhere to the site validation requirements specified in ANSI C63.4-2014+C63.a-2017 and FCC KDB 414788 D01.
- Accreditations: Fully accredited to ISO/IEC 17025 and designated by the National Radio Research Agency (RRA) as a Conformity Assessment Body (CAB) under the MRAs, maintaining official testing recognition from the FCC and ISED.

FCC Designation Number	FCC Test Firm Registration Number
KR0179	985720

ISED CAB identifier	ISED Company Number
KR0179	35746

3. Description of Tests

Testing of the DUT was conducted in accordance with the methodologies outlined in ANSI C63.10-2020 and KDB 558074 D01 15.247 Meas Guidance v05r02. For details regarding the test configuration, refer to the following sections:

- Antenna Port Conducted Test : Sections 5.1
- Radiated Emissions Test : Sections 6.1
- AC Line Conducted Test : Sections 7.1

- All tests were conducted under the environmental conditions specified below

Ambient Temperature : 22 - 26°C

Relative Humidity : 41 – 49 % RH

- Data Referencing is applied for the following tests:

Test Condition	Test Item	Data Referencing [Applied / Full]	Referred Data and Spot-Checks
Conducted	Maximum Peak Conducted Output Power	Applied	Section 12
	Maximum Power Spectral Density	Applied	Section 12
	6dB Bandwidth	Applied	Section 12
Radiated	Radiated Spurious Emissions	Applied	Section 12
	Radiated Band Edge	Applied	Section 12

4. Reference Test Results

4.1. Duty Cycle

4.1.1. Test Method

The measurement was performed using the zero-span mode of the spectrum analyzer in accordance with ANSI C63.10-2020.

4.1.2. Test Results

Table 4-1 Operation Duty Cycle

Mode		On Time [ms]	Period [ms]	Duty Cycle [%]	DCCF [dB]
LE 1M	37	0.389	0.756	51.51	2.88
LE 2M	37	0.204	0.537	37.95	4.21
LE 125k	37	3.100	4.108	75.46	1.22
LE 500k	37	1.067	1.816	58.76	2.31

Note: Duty cycle evaluation was performed in zero-span mode using a spectrum analyzer. The center frequency was set to the operating frequency of the transmission, with RBW ≥ 20 MHz, VBW ≥ 50 MHz, and the detector set to Peak. The selected measurement parameters satisfied the requirement that both RBW and VBW exceed 50/T, and the sweep configuration provided more than 100 points across the transmission duration.

5. Conducted Test Results

5.1. Test Configuration

All operating modes, channels, and data rates across the DTS (LE) bands were investigated; the results documented herein represent the worst-case emissions. Since the output power differs between SISO and MIMO configurations, all required tests were performed for both configurations, and only the worst-case results are included in this report.

All spectrum analyzer plots incorporate pre-loaded correction factors to compensate for external path losses (cables, couplers, splitters and attenuators) across the measured frequency range.

Conducted emissions were captured using automated test software 'NGTL ATE' Ver. 0.00.

5.2. Conducted Measurement Setup

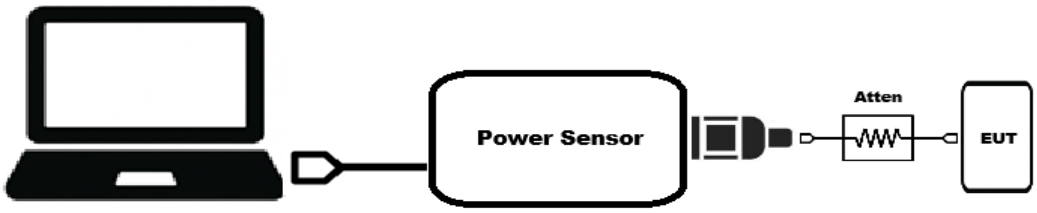


Figure 5-1 Conducted Power Measurement Setup

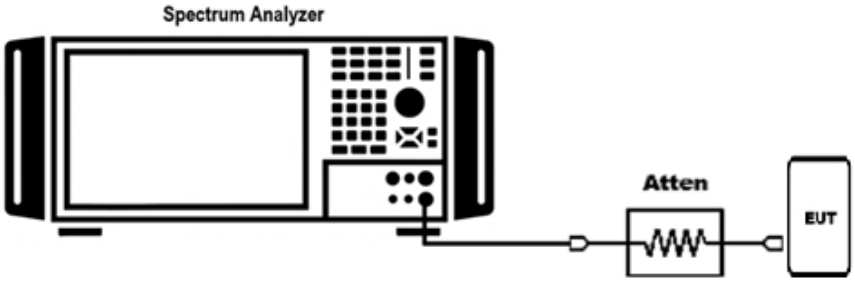


Figure 5-2 Conducted Measurement Setup

5.3. Conducted Measurement Sample

Serial Number(s) : ZDH0498M, ZDH0475M, ZEJ0881M

5.4. The Maximum Output Power

5.4.1. Regulatory Limit

Part. 15.247(b)

(3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power.

RSS-247 - Section 6.3

For DTS operating in the band 2400-2483.5 MHz, the maximum peak conducted output power shall not exceed 1W, and the e.i.r.p. shall not exceed 4 W, except as provided in section 6.5 a) and b).
As an alternative to a peak power measurement, compliance can be based on a measurement of the maximum conducted output power.

5.4.2. Test Method

ANSI C63.10-2020, clause 11.9.1.2 Peak power meter method

ANSI C63.10-2020, clause 11.9.2.3.2 method AVGPM-G

5.4.3. Test Procedure

a) Connect the DUT to a wideband gated RF power meter.
b) Apply an offset to the power meter to compensate for the insertion losses of the cables and attenuators connected between the DUT and the power sensor.
c) Configure the DUT to transmit at its maximum power control level.
d) Adjust the gate parameters on the power meter to ensure that the power is measured strictly during the active transmission of the DUT.

5.4.4. Sample Calculation

MIMO P_T = P_T (Ant1) + P_T (Ant2)

= 14.18 dBm + 13.48 dBm = 26.18 mW + 22.28 mW = 48.47 mW

= 10 log (48.47 mW) = 16.85 dBm

Correlated Directional Gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \ldots + 10^{GN/20})^2 / N_{ANT}]$ dBi

= $10 \log[(10^{-5.03/20} + 10^{-6.47/20})^2 / 2]$ dBi = - 2.71 dBi

Test Note

- ✓ The output power was measured during the transmitter ON time at the maximum power control level using a gated RF power meter. No duty cycle correction factor was applied.

5.4.5. Test Results

Table 5-1 SISO Maximum Output Power

Mode	freq. [MHz]	Channel	SISO				LIMIT [dBm]	Margin [dB]
			Average [dBm]		Peak Power [dBm]			
			Ant1	Ant2	Ant1	Ant2		
1M	2402	0	15.12	16.26	15.38	16.49	30	-13.51
	2440	19	16.02	15.72	16.24	15.98	30	-13.76
	2480	39	15.72	16.15	15.84	16.43	30	-13.57
2M	2404	1	15.37	16.34	15.69	16.61	30	-13.39
	2440	19	16.22	15.61	16.64	15.94	30	-13.36
	2478	38	15.73	16.26	16.04	16.66	30	-13.34
125k	2402	0	10.14	10.76	10.23	10.93	30	-19.07
	2440	19	9.46	9.04	9.74	9.22	30	-20.26
	2480	39	9.53	9.43	9.77	9.62	30	-20.23
500k	2402	0	10.33	10.58	10.44	10.71	30	-19.29
	2440	19	9.61	9.07	9.86	9.26	30	-20.14
	2480	39	9.64	9.51	9.89	9.69	30	-20.11

Table 5-2 SISO Maximum Output Power – e.i.r.p

Mode	freq. [MHz]	CH. [MHz]	SISO [e.i.r.p]				LIMIT [dBm]	Margin [dB]
			Average [dBm]		Peak Power [dBm]			
			Ant1	Ant2	Ant1	Ant2		
1M	2402	0	10.09	9.79	10.35	10.02	36	-25.65
	2440	19	10.99	9.25	11.21	9.51	36	-24.79
	2480	38	10.69	9.68	10.81	9.96	36	-25.19
2M	2404	0	10.34	9.87	10.66	10.14	36	-25.34
	2440	19	11.19	9.14	11.61	9.47	36	-24.39
	2478	38	10.70	9.79	11.01	10.19	36	-24.99
125k	2402	0	5.11	4.29	5.20	4.46	36	-30.80
	2440	19	4.43	2.57	4.71	2.75	36	-31.29
	2480	38	4.50	2.96	4.74	3.15	36	-31.26
500k	2402	0	5.30	4.11	5.41	4.24	36	-30.59
	2440	19	4.58	2.6	4.83	2.79	36	-31.17
	2480	38	4.61	3.04	4.86	3.22	36	-31.14

Table 5-3 MIMO Maximum Output Power

Mode	freq. [MHz]	Channel	MIMO						LIMIT [dBm]	Margin [dB]
			Average Power [dBm]			Peak Power [dBm]				
			Ant1	Ant2	MIMO	Ant1	Ant2	MIMO		
1M	2402	0	13.98	13.08	16.56	14.18	13.48	16.85	30	-13.15
	2440	19	13.16	11.86	15.57	13.32	11.93	15.69	30	-14.31
	2480	39	12.98	12.02	15.54	13.14	12.11	15.67	30	-14.33
2M	2404	1	13.99	13.33	16.68	14.34	13.56	16.98	30	-13.02
	2440	19	13.18	11.91	15.60	13.37	11.98	15.74	30	-14.26
	2478	38	12.93	12.18	15.58	13.11	12.36	15.76	30	-14.24

Table 5-4 MIMO Maximum Output Power – e.i.r.p

Mode	freq. [MHz]	CH. [MHz]	MIMO [e.i.r.p]		LIMIT [dBm]	Margin [dB]
			Average Power [dBm]	Peak Power [dBm]		
			MIMO	MIMO		
1M	2402	0	13.85	14.14	36	-21.86
	2440	19	12.86	12.98	36	-23.02
	2480	38	12.83	12.96	36	-23.04
2M	2404	0	13.97	14.27	36	-21.73
	2440	19	12.89	13.03	36	-22.97
	2478	38	12.87	13.05	36	-22.95

5.5. The Maximum Power Spectral Density

5.5.1. Regulatory Limits

Part. 15.247(e)

For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

RSS-247 - Section 6.3

The transmitter power spectral density conducted from the transmitter to the antenna(s) shall not be greater than 8 dBm/3 kHz band during any time interval of continuous transmission.

5.5.2. Test Method

ANSI C63.10-2020, clause 11.10.2 Method PKPSD (peak PSD)

5.5.3. Test Procedure

a) Set analyzer center frequency to DTS channel center frequency.
b) Span > 1.5 times the DTS bandwidth
c) RBW to 3 kHz ≤ RBW ≤ 100 kHz / RBW = 10 kHz
d) VBW ≥ [3 × RBW]
e) Detector = Peak
f) Sweep time = Auto (Coupled) or sufficient to investigate.
g) Trace mode = Max-Hold
h) Allow trace to fully stabilize
i) Use the peak marker function to determine the maximum amplitude level within the RBW.
j) If measured value exceeds requirement, then reduce RBW (but no less than 3 kHz) and repeat.

5.5.4. Sample Calculation

MIMO P_T = P_T (Ant1) + P_T (Ant2)

= 2.68 dBm + 4.69 dBm = 1.85 mW + 2.94 mW = 4.79 mW

= 10 log (4.79 mW) = 6.81 dBm

Test Note

- ✓ The insertion losses between the DUT and the spectrum analyzer, including cables and attenuators, were compensated.
- ✓ Plots representing the worst-case scenarios for each table are included.

5.5.5. Test Results

Table 5-5 BLE Peak PSD

Mode	freq. [MHz]	Channel	PSD [dBm/ 10 kHz]					Limit [dBm / 3kHz]	Margin [dB]
			SISO		MIMO				
			Ant1	Ant2	Ant1	Ant2	MIMO		
1M	2402	0	3.26	4.01	2.68	4.69	6.81	8.00	-1.19
	2440	19	3.95	4.08	1.58	2.31	4.97	8.00	-3.03
	2480	39	3.53	5.00	1.19	1.24	4.22	8.00	-3.00
2M	2404	1	0.55	1.24	-0.22	0.78	3.32	8.00	-4.68
	2440	19	1.11	1.16	-1.25	-1.46	1.66	8.00	-6.34
	2478	38	0.47	2.30	-1.76	-1.33	1.48	8.00	-5.70
125k	2402	0	4.35	3.64	NA			8.00	-3.66
	2440	19	2.64	4.24				8.00	-3.76
	2480	39	3.61	4.44				8.00	-3.56
500k	2402	0	2.51	4.00				8.00	-4.00
	2440	19	1.63	2.67				8.00	-5.33
	2480	39	2.03	2.94				8.00	-5.06

Plot 5-1 LE 1M CH.0 SISO Peak PSD – (ANT1)

Plot 5-2 LE 1M CH.0 SISO Peak PSD – (ANT2)

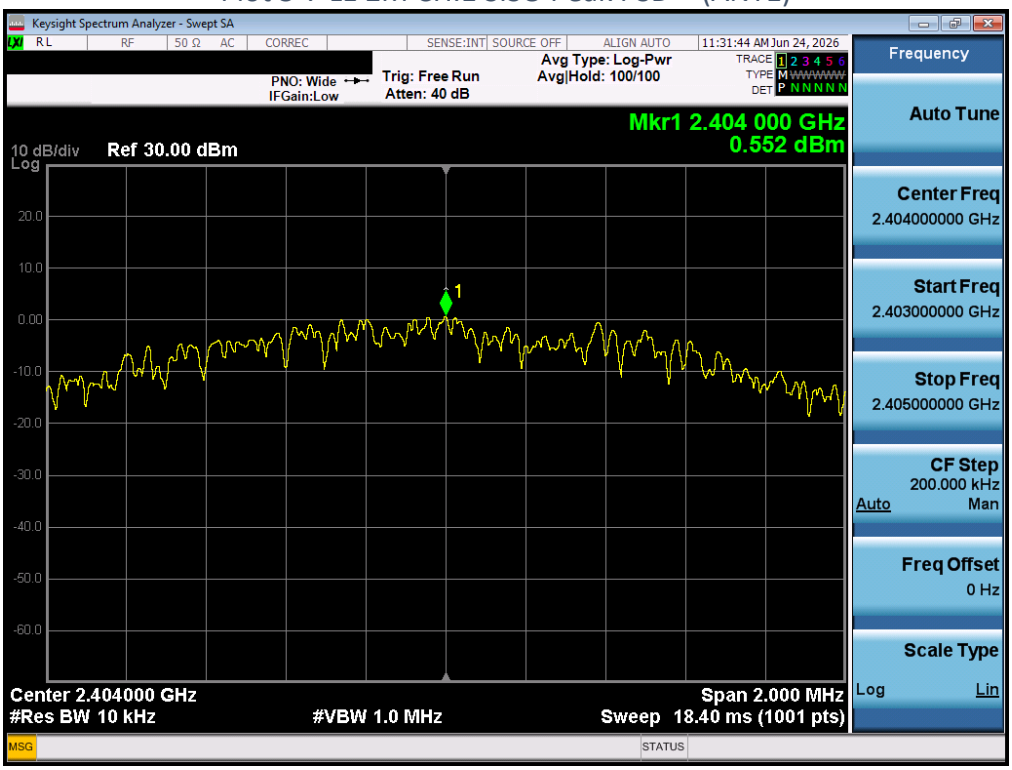
Plot 5-3 LE 1M CH.19 SISO Peak PSD – (ANT1)

Plot 5-4 LE 1M CH.19 SISO Peak PSD – (ANT2)

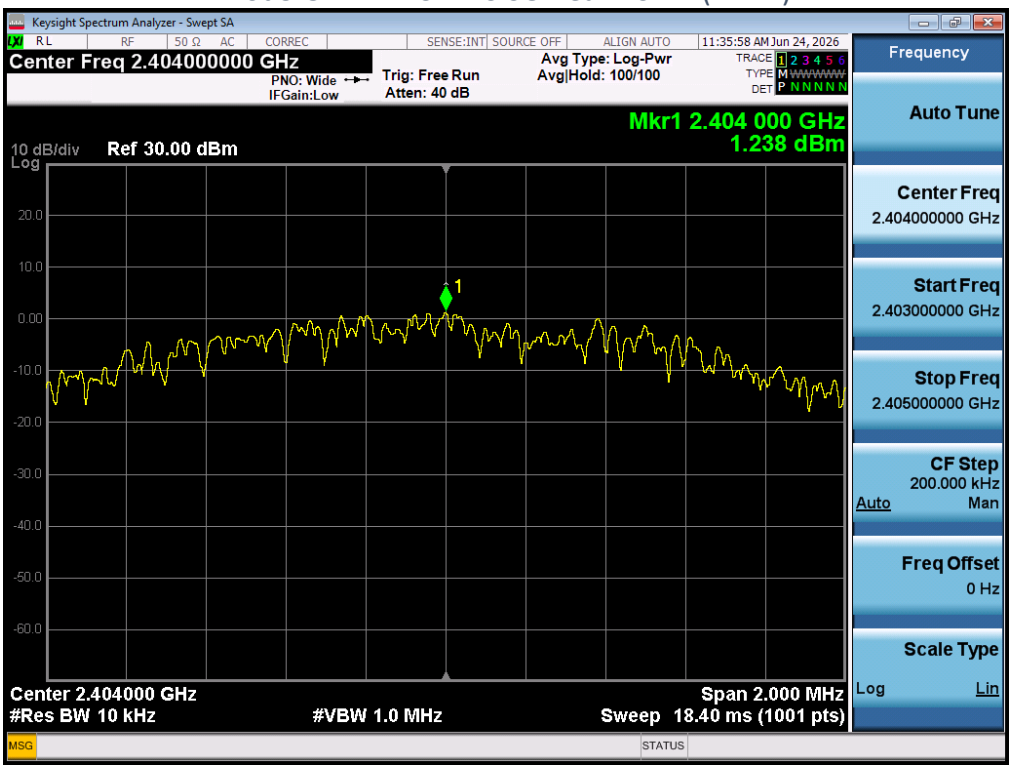
Plot 5-5 LE 1M CH.39 SISO Peak PSD – (ANT1)

Plot 5-6 LE 1M CH.39 SISO Peak PSD – (ANT2)

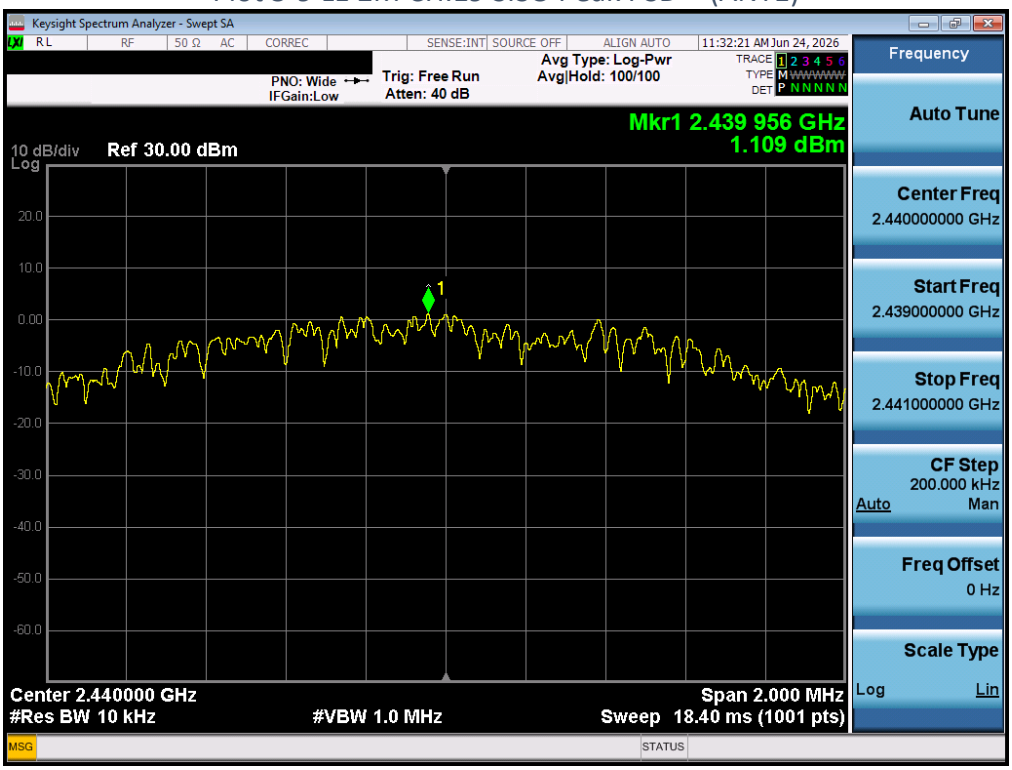
Plot 5-7 LE 2M CH.1 SISO Peak PSD – (ANT1)



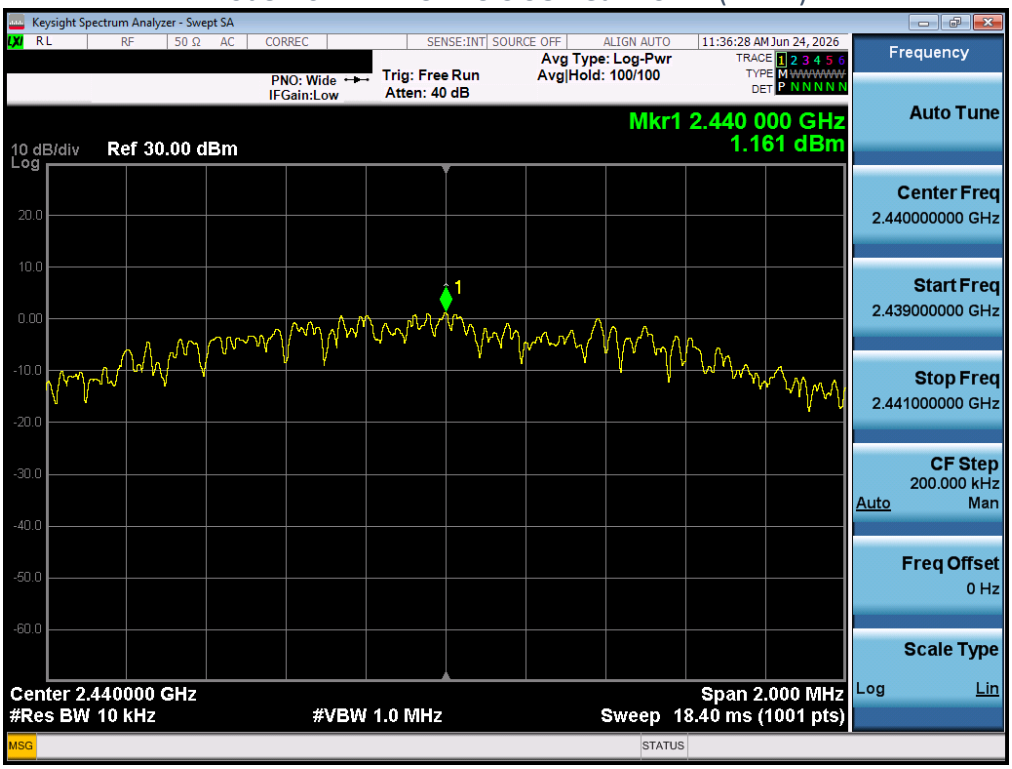
Plot 5-8 LE 2M CH.1 SISO Peak PSD – (ANT2)



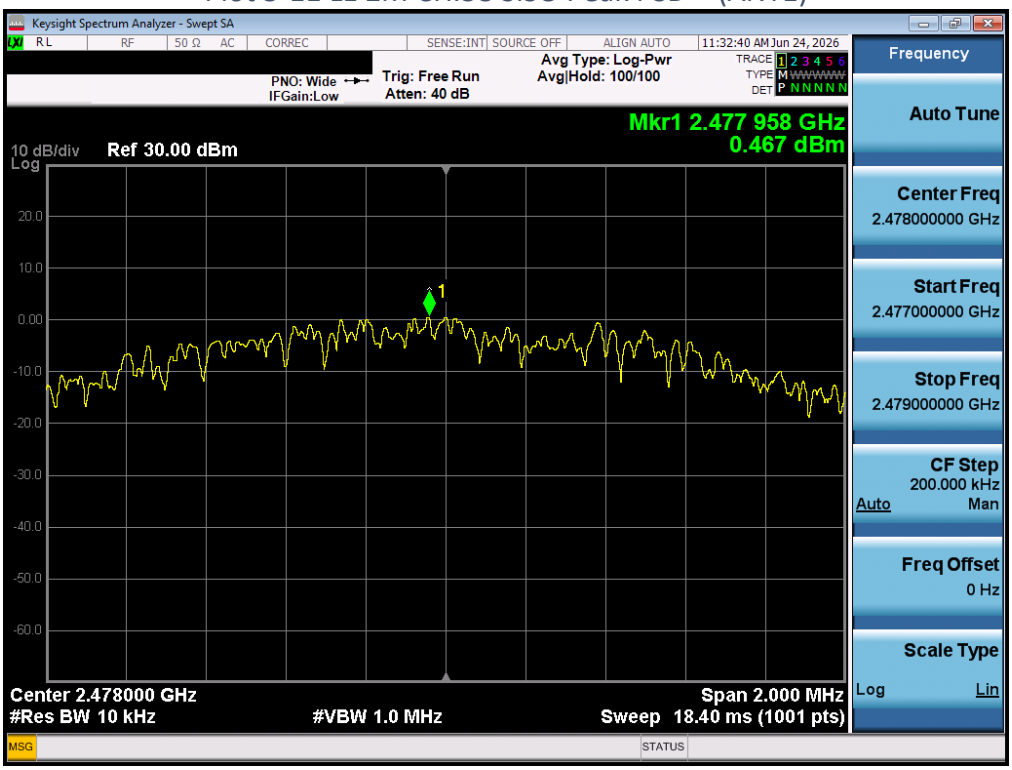
Plot 5-9 LE 2M CH.19 SISO Peak PSD – (ANT1)



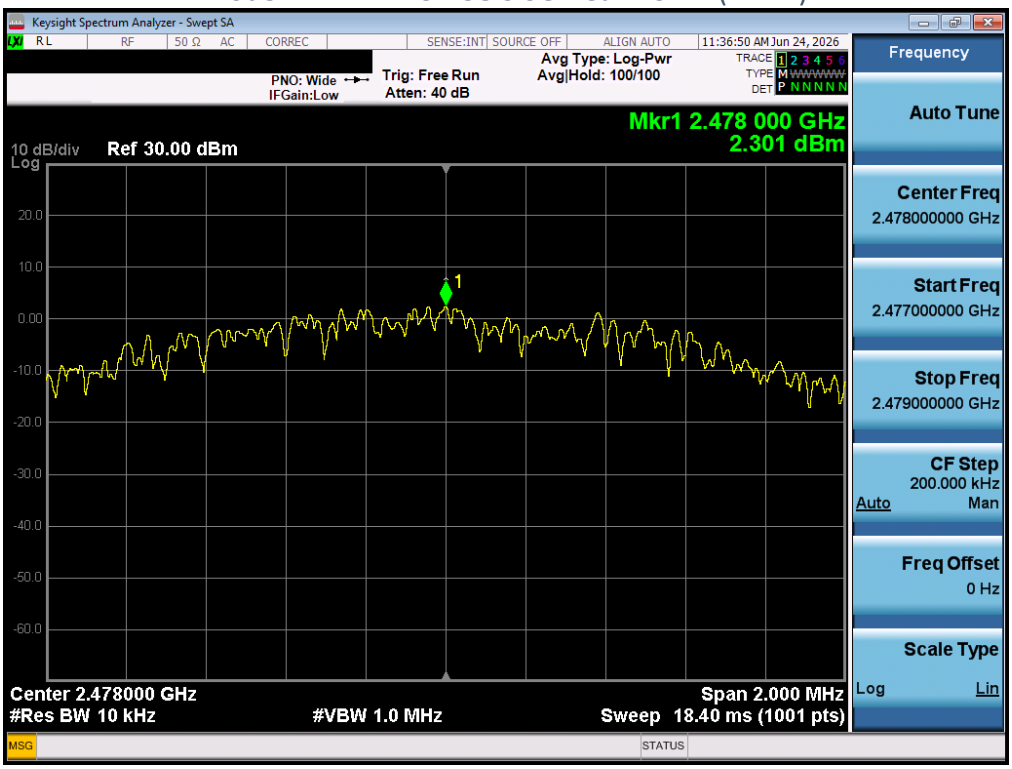
Plot 5-10 LE 2M CH.19 SISO Peak PSD – (ANT2)



Plot 5-11 LE 2M CH.38 SISO Peak PSD – (ANT1)



Plot 5-12 LE 2M CH.38 SISO Peak PSD – (ANT2)



Plot 5-13 LE 1M CH.0 MIMO Peak PSD – (ANT1)

Plot 5-14 LE 1M CH.0 MIMO Peak PSD – (ANT2)

Plot 5-15 LE 1M CH.19 MIMO Peak PSD – (ANT1)

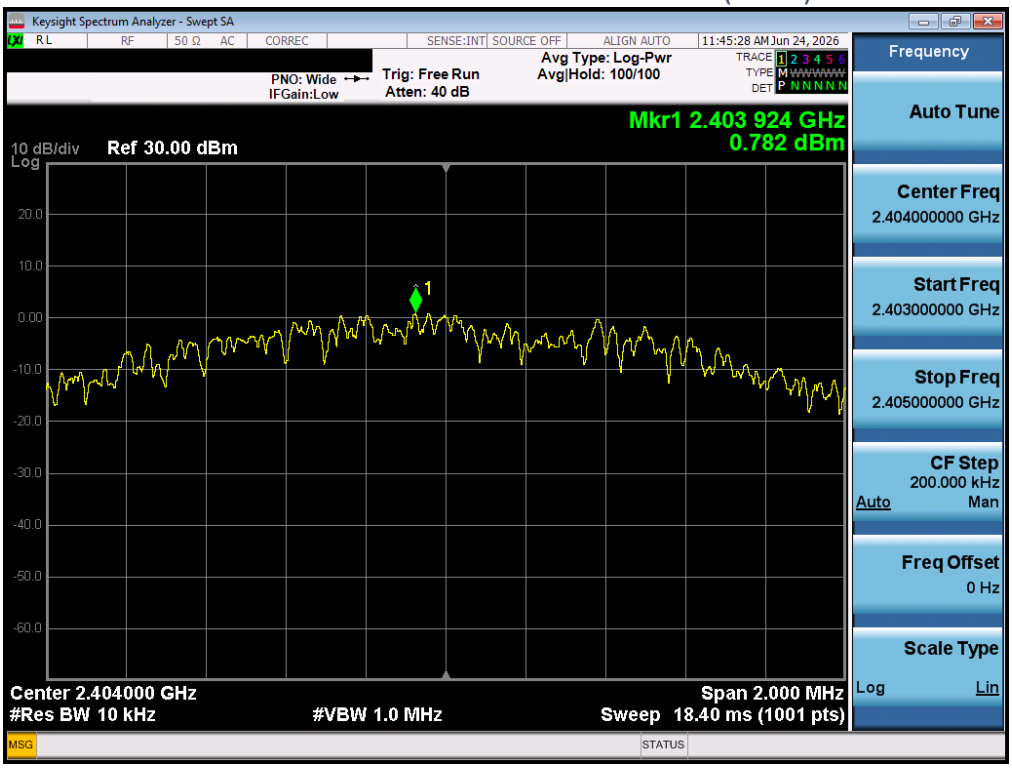
Plot 5-16 LE 1M CH.19 MIMO Peak PSD – (ANT2)

Plot 5-17 LE 1M CH.39 MIMO Peak PSD – (ANT1)

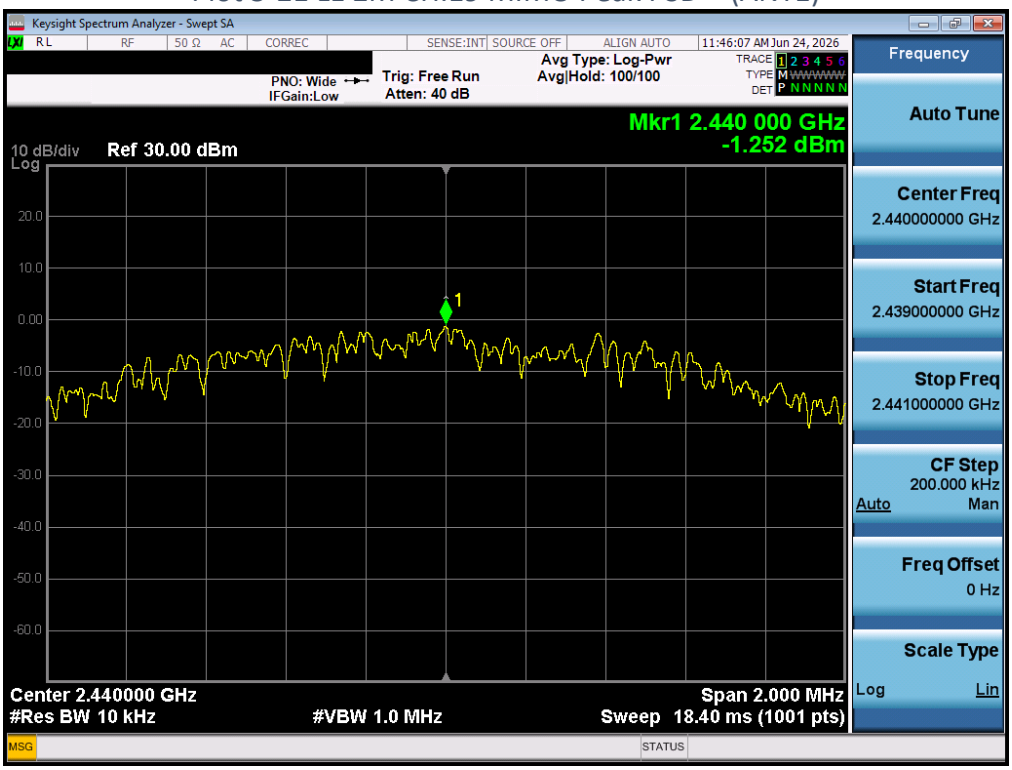
Plot 5-18 LE 1M CH.39 MIMO Peak PSD – (ANT2)

Plot 5-19 LE 2M CH.1 MIMO Peak PSD – (ANT1)

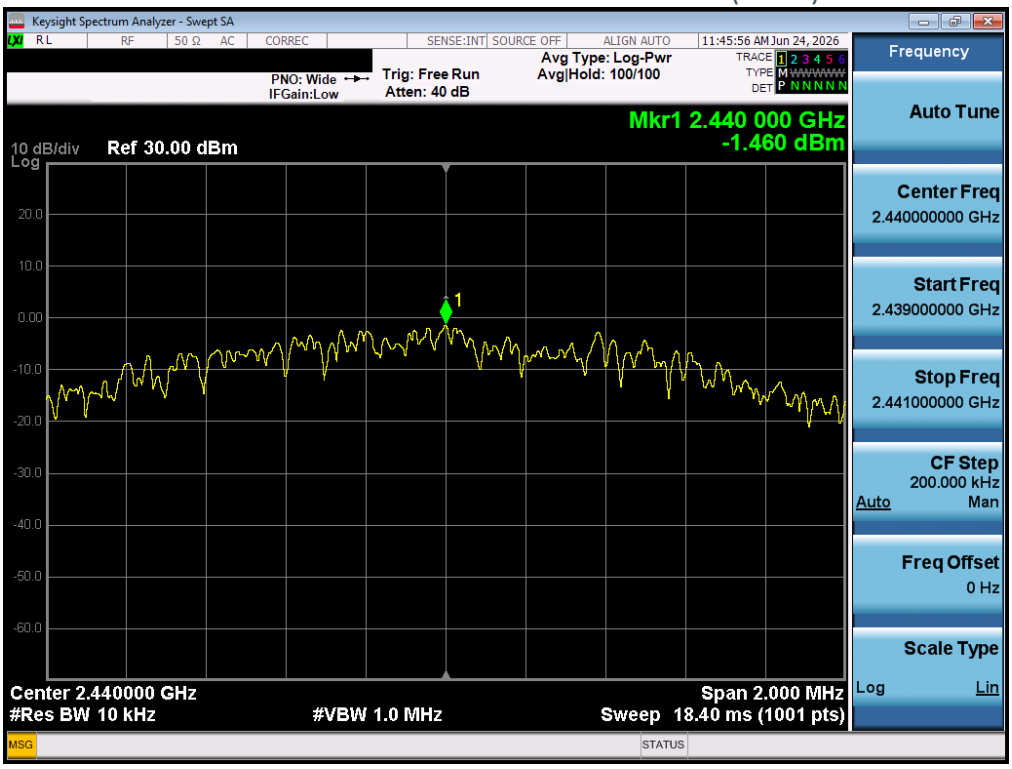
Plot 5-20 LE 2M CH.1 MIMO Peak PSD – (ANT2)



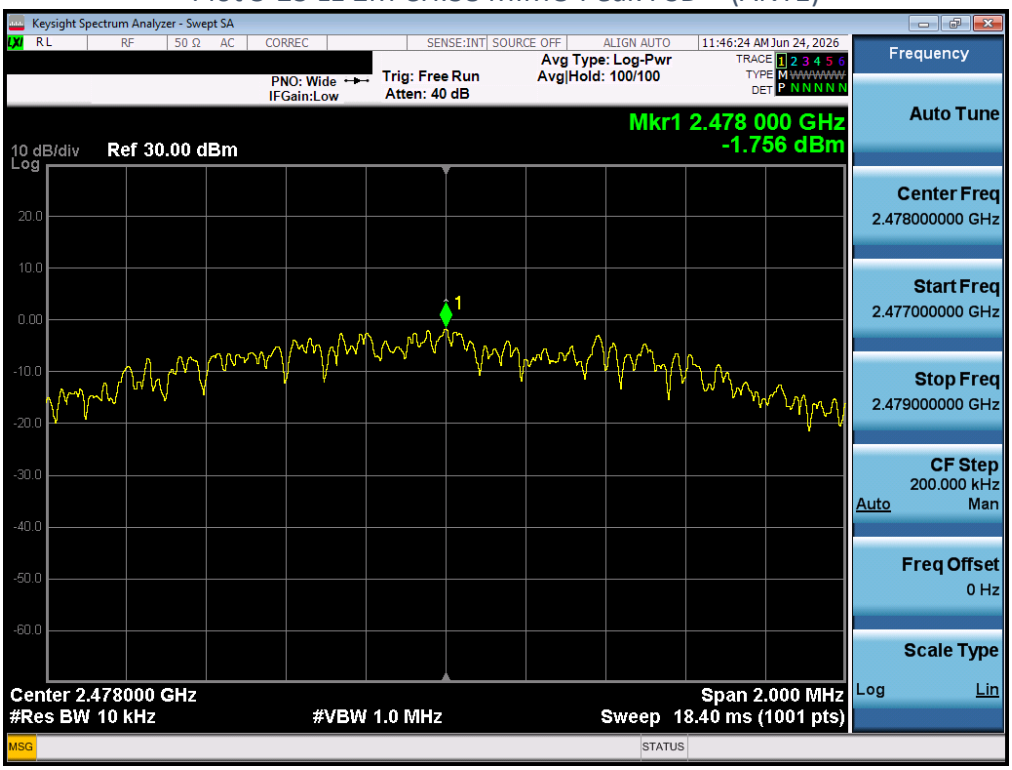
Plot 5-21 LE 2M CH.19 MIMO Peak PSD – (ANT1)



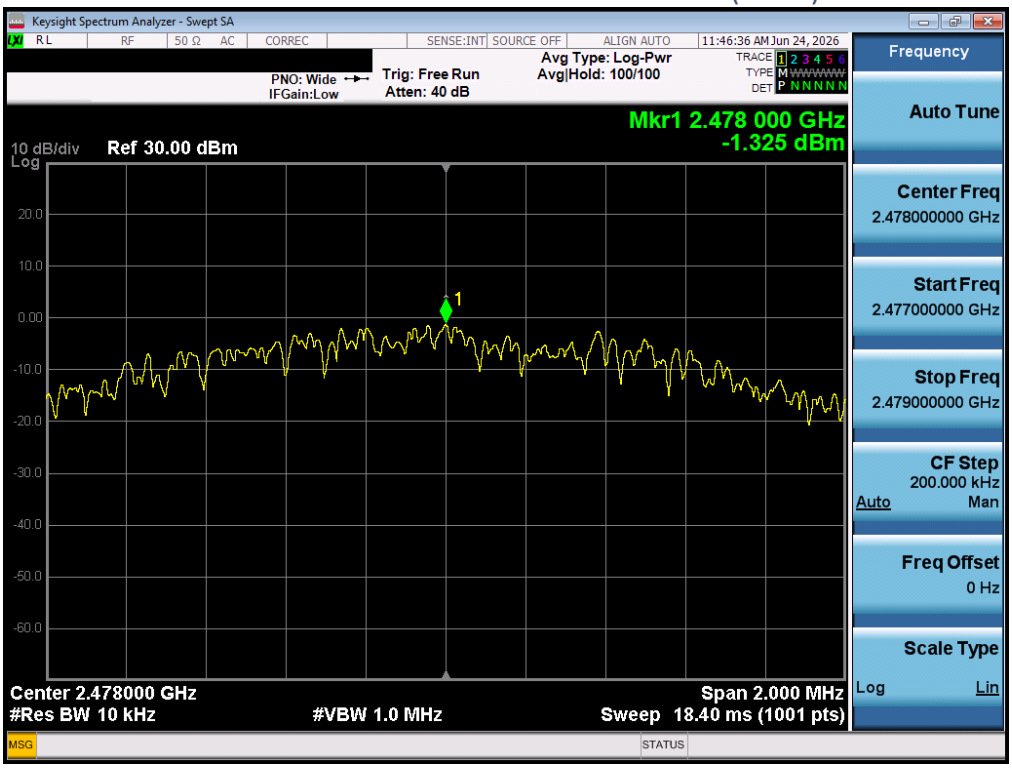
Plot 5-22 LE 2M CH.19 MIMO Peak PSD – (ANT2)



Plot 5-23 LE 2M CH.38 MIMO Peak PSD – (ANT1)



Plot 5-24 LE 2M CH.38 MIMO Peak PSD – (ANT2)



5.6. 6dB Bandwidth

5.6.1. Regulatory Limit

Part. 15.247(a)

(2) Systems using digital modulation techniques may operate in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

RSS-247 - Section 6.3

For operation in the 902–928 MHz and 2400–2483.5 MHz bands, the minimum 6 dB bandwidth shall not be less than 500 kHz.

RSS-Gen – Section 6.7
The occupied bandwidth or the “99% emission bandwidth” is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs

5.6.2. Test Method

ANSI C63.10-2020, clause 11.8 Option 2

5.6.3. Test Procedure

The procedure for this method is as follows:

a) RBW = 100 kHz
b) VBW ≥ [3 × RBW]
c) Detector = Peak
d) Trace mode = max-hold.
e) Sweep time = Auto (Coupled) or sufficient to investigate.
f) Allow the trace to stabilize.
g) Measure the maximum width of the emission by placing two markers, one at the lowest frequency and the other at the highest frequency of the envelope of the spectral display, such that each marker is at or slightly below the “−6 dB down amplitude”. If a marker is below this “−6 dB down amplitude” value, then it shall be as close as possible to this value.

Test Note

✓ The automatic bandwidth measurement function of the spectrum analyzer was used.

5.6.4. Test Results

Table 5-6 BLE 6dB Bandwidth & OBW - SISO

Mode	freq. [MHz]	CH. [MHz]	6dB Bandwidth [MHz] / SISO		OBW [MHz] / SISO	
			Ant1	Ant2	Ant1	Ant2
1M	2402	0	0.67	0.68	1.04	1.04
	2440	19	0.67	0.67	1.04	1.04
	2480	39	0.67	0.67	1.04	1.04
2M	2404	1	1.15	1.16	2.06	2.04
	2440	19	1.18	1.11	2.06	2.07
	2478	38	1.16	1.11	2.03	2.06
125k	2402	0	0.67	0.61	1.06	1.04
	2440	19	0.61	0.65	1.06	1.05
	2480	39	0.67	0.61	1.05	1.05
500k	2402	0	0.66	0.65	1.03	1.04
	2440	19	0.67	0.64	1.04	1.02
	2480	39	0.66	0.63	1.04	1.05

Table 5-7 BLE 6dB Bandwidth & OBW - MIMO

Mode	freq. [MHz]	CH. [MHz]	6dB Bandwidth [MHz] / MIMO		OBW [MHz] / MIMO	
			Ant1	Ant2	Ant1	Ant2
1M	2402	0	0.66	0.69	1.04	1.04
	2440	19	0.68	0.67	1.04	1.03
	2480	39	0.66	0.67	1.05	1.03
2M	2404	1	1.17	1.12	2.06	2.05
	2440	19	1.18	1.12	2.07	2.06
	2478	38	1.12	1.12	2.06	2.06

Plot 5-25 LE 1M CH.0 SISO 6dB Bandwidth & OBW – (ANT1)

Plot 5-26 LE 1M CH.0 SISO 6dB Bandwidth & OBW – (ANT2)

Plot 5-27 LE 1M CH.19 SISO 6dB Bandwidth & OBW – (ANT1)

Plot 5-28 LE 1M CH.19 SISO 6dB Bandwidth & OBW – (ANT2)

Plot 5-29 LE 1M CH.39 SISO 6dB Bandwidth & OBW – (ANT1)

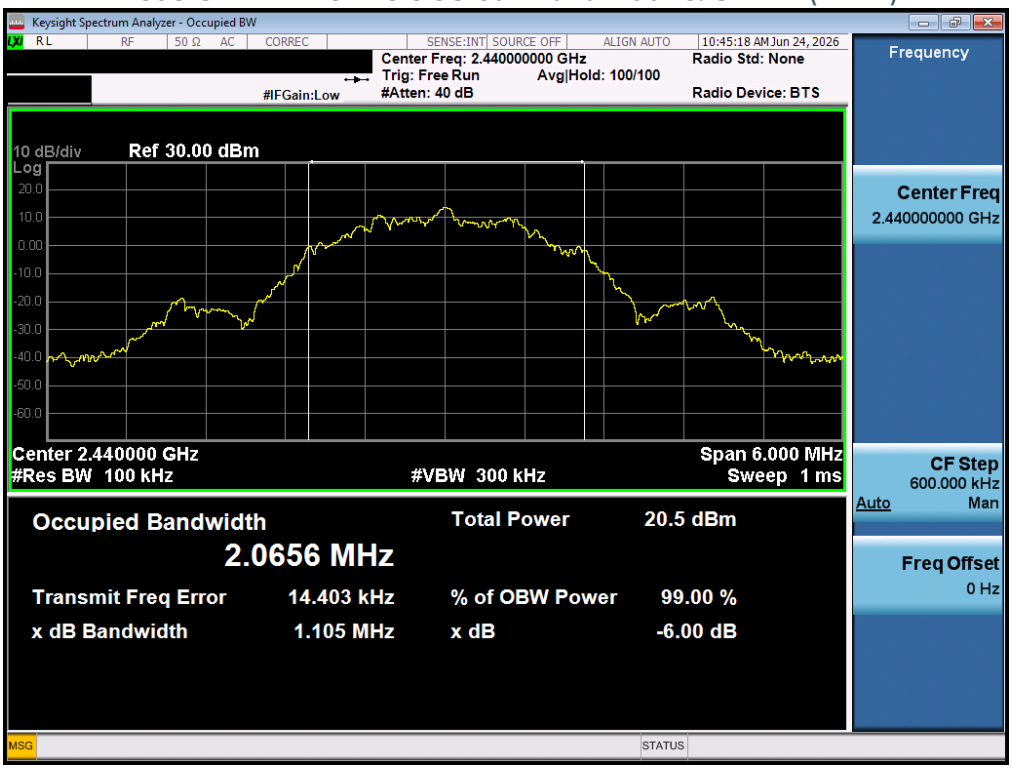
Plot 5-30 LE 1M CH.39 SISO 6dB Bandwidth & OBW – (ANT2)

Plot 5-31 LE 2M CH.1 SISO 6dB Bandwidth & OBW – (ANT1)

Plot 5-32 LE 2M CH.1 SISO 6dB Bandwidth & OBW – (ANT2)

Plot 5-33 LE 2M CH.19 SISO 6dB Bandwidth & OBW – (ANT1)

Plot 5-34 LE 2M CH.19 SISO 6dB Bandwidth & OBW – (ANT2)



Plot 5-35 LE 2M CH.38 SISO 6dB Bandwidth & OBW – (ANT1)

Plot 5-36 LE 2M CH.38 SISO 6dB Bandwidth & OBW – (ANT2)

Plot 5-37 LE 125k CH.0 SISO 6dB Bandwidth & OBW – (ANT1)

Plot 5-38 LE 125k CH.0 SISO 6dB Bandwidth & OBW – (ANT2)

Plot 5-39 LE 125k CH.19 SISO 6dB Bandwidth & OBW – (ANT1)

Plot 5-40 LE 125k CH.19 SISO 6dB Bandwidth & OBW – (ANT2)

Plot 5-41 LE 125k CH.39 SISO 6dB Bandwidth & OBW – (ANT1)

Plot 5-42 LE 125k CH.39 SISO 6dB Bandwidth & OBW – (ANT2)

Plot 5-43 LE 500k CH.0 SISO 6dB Bandwidth & OBW – (ANT1)

Plot 5-44 LE 500k CH.0 SISO 6dB Bandwidth & OBW – (ANT2)

Plot 5-45 LE 500k CH.19 SISO 6dB Bandwidth & OBW – (ANT1)

Plot 5-46 LE 500k CH.19 SISO 6dB Bandwidth & OBW – (ANT2)

Plot 5-47 LE 500k CH.39 SISO 6dB Bandwidth & OBW – (ANT1)

Plot 5-48 LE 500k CH.39 SISO 6dB Bandwidth & OBW – (ANT2)

Plot 5-49 LE 1M CH.0 MIMO 6dB Bandwidth & OBW – (ANT1)

Plot 5-50 LE 1M CH.0 MIMO 6dB Bandwidth & OBW – (ANT2)

Plot 5-51 LE 1M CH.19 MIMO 6dB Bandwidth & OBW – (ANT1)

Plot 5-52 LE 1M CH.19 MIMO 6dB Bandwidth & OBW – (ANT2)

Plot 5-53 LE 1M CH.39 MIMO 6dB Bandwidth & OBW – (ANT1)

Plot 5-54 LE 1M CH.39 MIMO 6dB Bandwidth & OBW – (ANT2)

Plot 5-55 LE 2M CH.1 MIMO 6dB Bandwidth & OBW – (ANT1)

Plot 5-56 LE 2M CH.1 MIMO 6dB Bandwidth & OBW – (ANT2)

Plot 5-57 LE 2M CH.19 MIMO 6dB Bandwidth & OBW – (ANT1)

Plot 5-58 LE 2M CH.19 MIMO 6dB Bandwidth & OBW – (ANT2)

Plot 5-59 LE 2M CH.38 MIMO 6dB Bandwidth & OBW – (ANT1)

Plot 5-60 LE 2M CH.38 MIMO 6dB Bandwidth & OBW – (ANT2)

5.7. Conducted Spurious Emissions

5.7.1. Regulatory Limit

Part. 15.247(d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.

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In any 100 kHz bandwidth outside the frequency band in which the spread spectrum device, digitally modulated device, or hybrid system is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power – based on either an RF conducted or a radiated measurement – provided that the transmitter demonstrates compliance with the peak conducted power limits.

5.7.2. Test Method

ANSI C63.10 – 2020, clause 11.11

ANSI C63.10 – 2020, clause 11.12

5.7.3. Test Procedure

Band Edge Measurement.

a) Set the start and stop frequencies such that the band edge is placed in the center of the plot.
b) Set the span large enough to capture all out-of-band emissions near the band edge.
c) RBW = 100 kHz
d) VBW ≥ [3 X RBW]
e) Detector = Peak
f) Sweep Point = Number of sweep points ≥ [2 X SPAN/RBW]
g) Trace Mode = Max-Hold
h) Use the peak marker to locate the highest out-of-band emission, then use the delta marker Function to measure the emission level relative to the fundamental.

Spurious Emissions Measurement.

Establish a reference level by using the following procedure:

a) Set instrument center frequency to DTS channel center frequency.
b) Set the span to ≥ 1.5 times the DTS bandwidth.
c) RBW = 100 kHz
d) VBW ≥ [3 × RBW]
e) Detector = Peak
f) Sweep time = Auto (Coupled) or sufficient to investigate
g) Trace mode = Max-Hold
h) Allow trace to fully stabilize.
i) Use the peak marker function to determine the maximum PSD level.

Establish an emission level by using the following procedure:

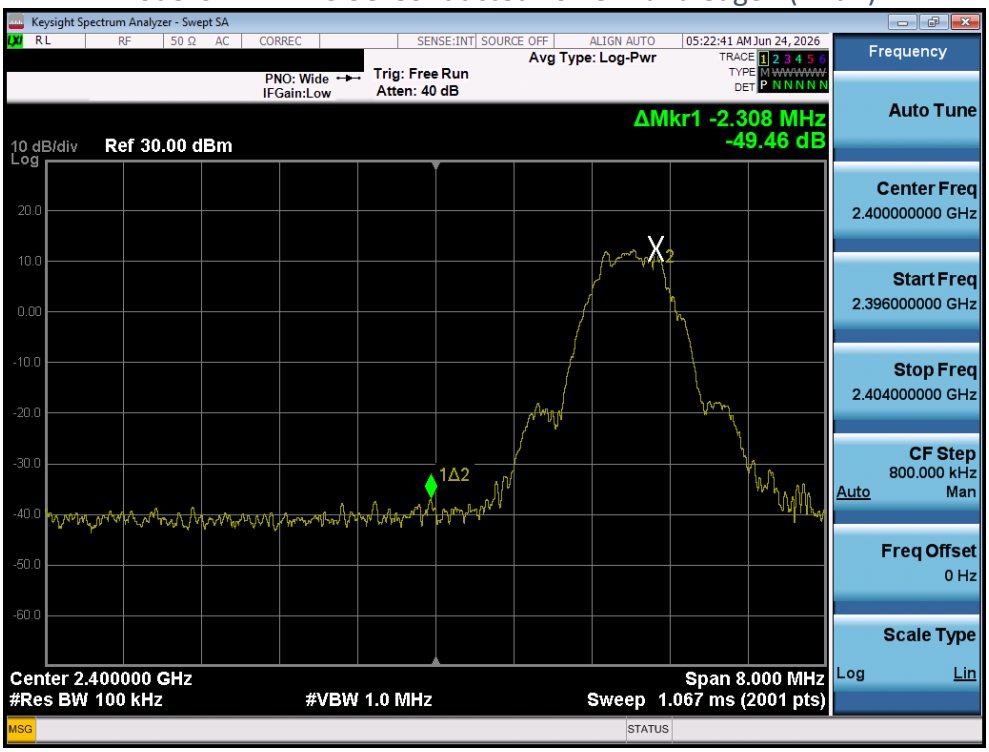
a) Set the center frequency and span to encompass frequency range to be measured. Note that the frequency range might need to be divided into multiple frequency ranges to retain frequency resolution.
b) RBW = 1 MHz
c) VBW ≥ [3 × RBW]
d) Detector = Peak
e) Sweep time = Auto (Coupled) or sufficient to investigate
f) Trace mode = Max-Hold
g) Allow trace to fully stabilize.
h) Use the peak marker function to determine the maximum amplitude level.

Test Note

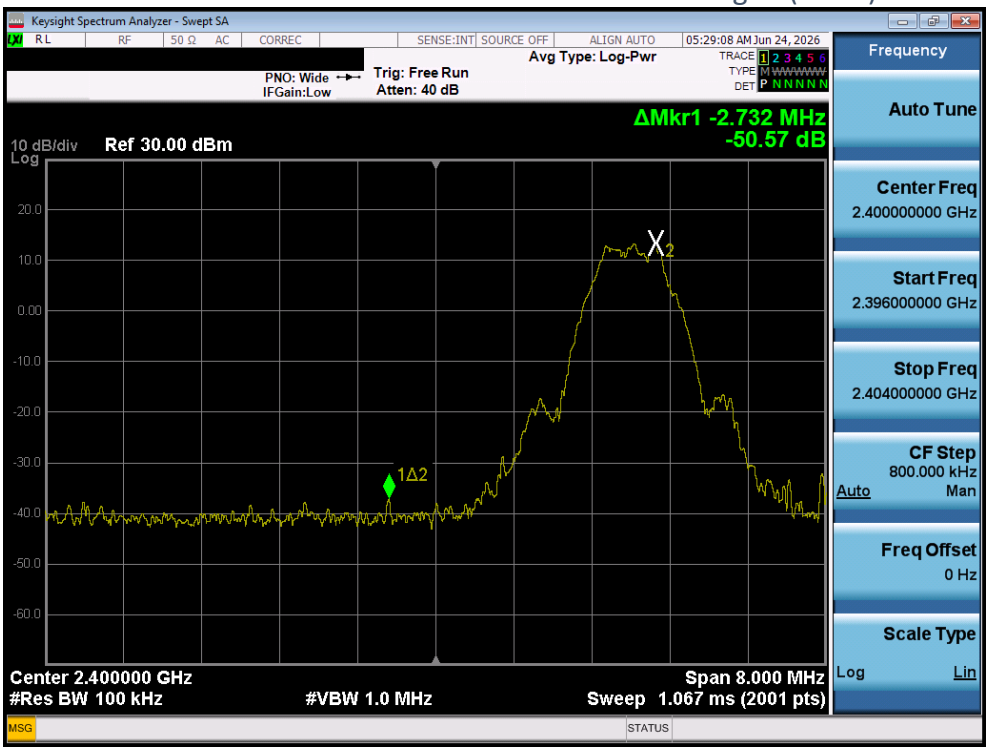
- ✓ The number of points can also be increased for large spans to retain frequency resolution.
- ✓ The channel containing the maximum PSD level can be used as the reference level.
- ✓ Out-of-band conducted spurious emissions were investigated for all data rates. However, the traces in the following plots are measured with a 1 MHz RBW to reduce test time, so the display line may not necessarily appear to be 20 dB below the level of the fundamental in a 1 MHz bandwidth.
  If there is no compliance margin or a non-conformity occurs, reduce the RBW to 100 kHz and repeat the measurement.

5.7.4. Test Results

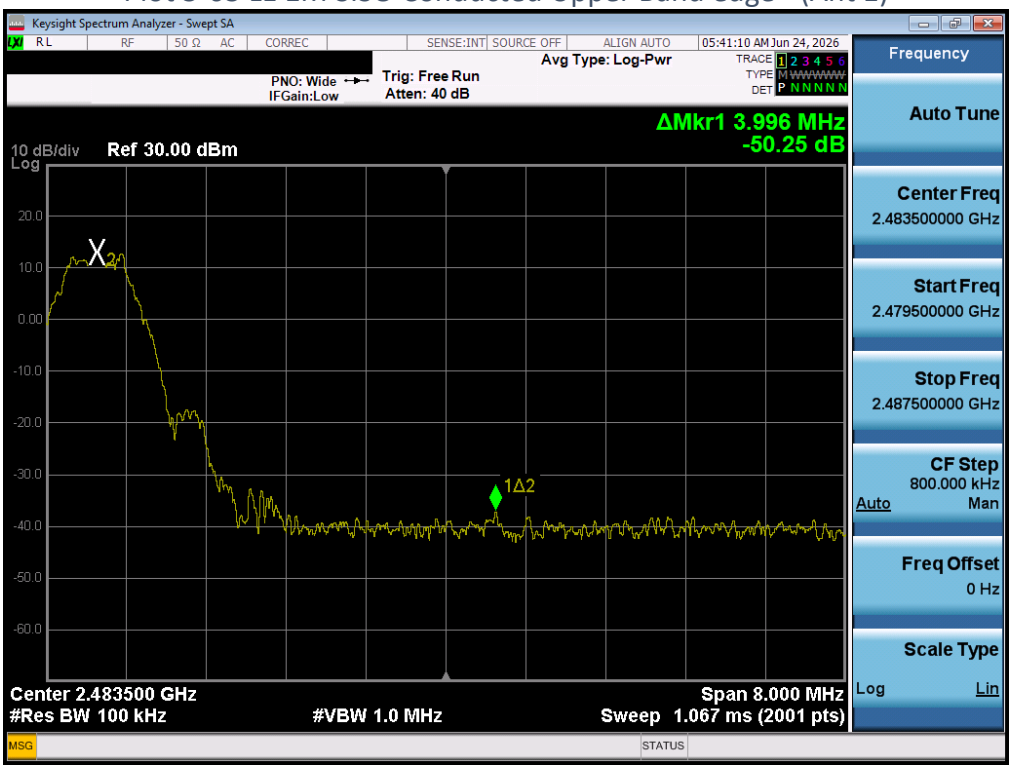
Plot 5-61 LE 1M SISO Conducted Lower Band edge - (Ant 1)



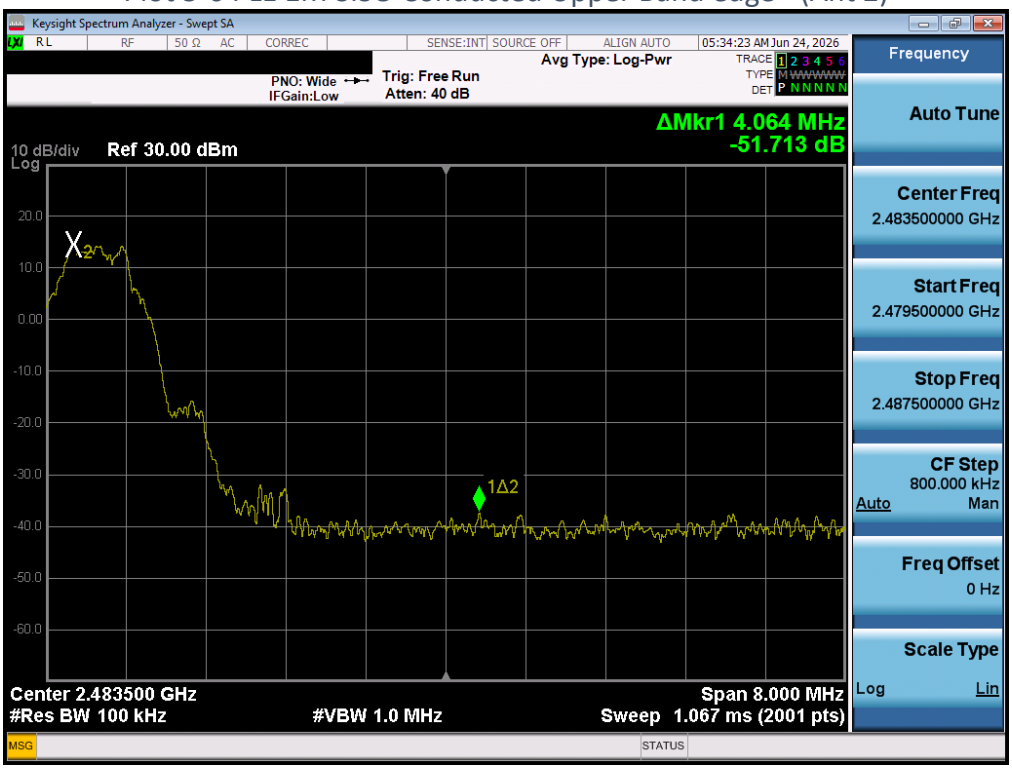
Plot 5-62 LE 1M SISO Conducted Lower Band edge - (Ant 2)



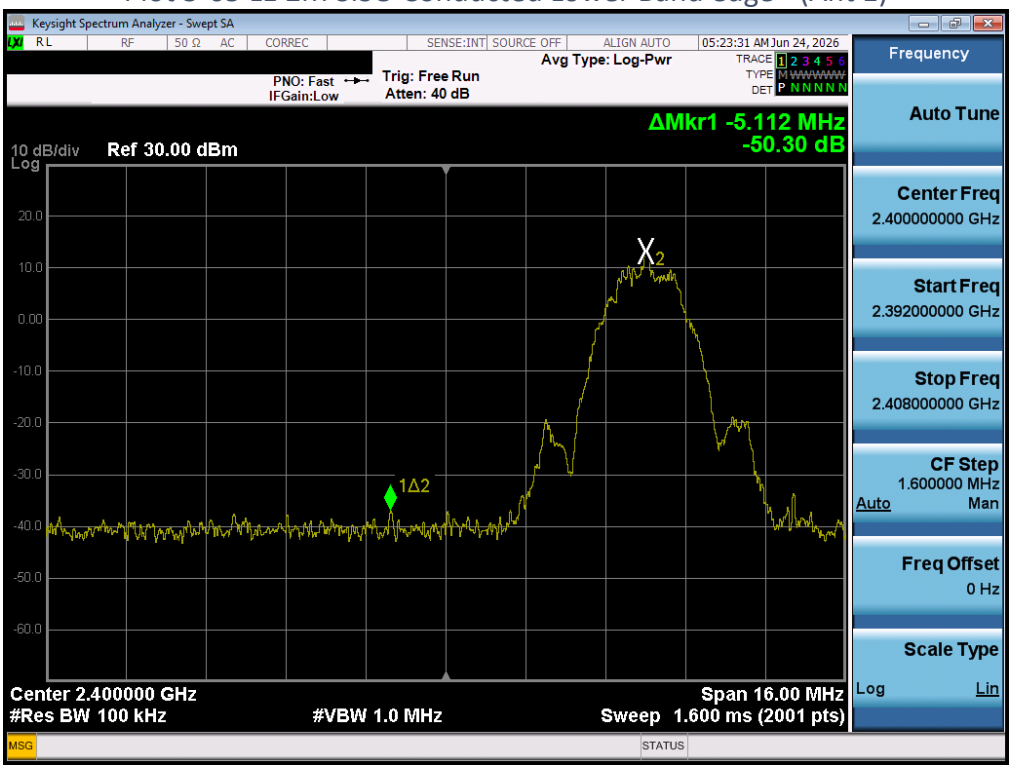
Plot 5-63 LE 1M SISO Conducted Upper Band edge - (Ant 1)



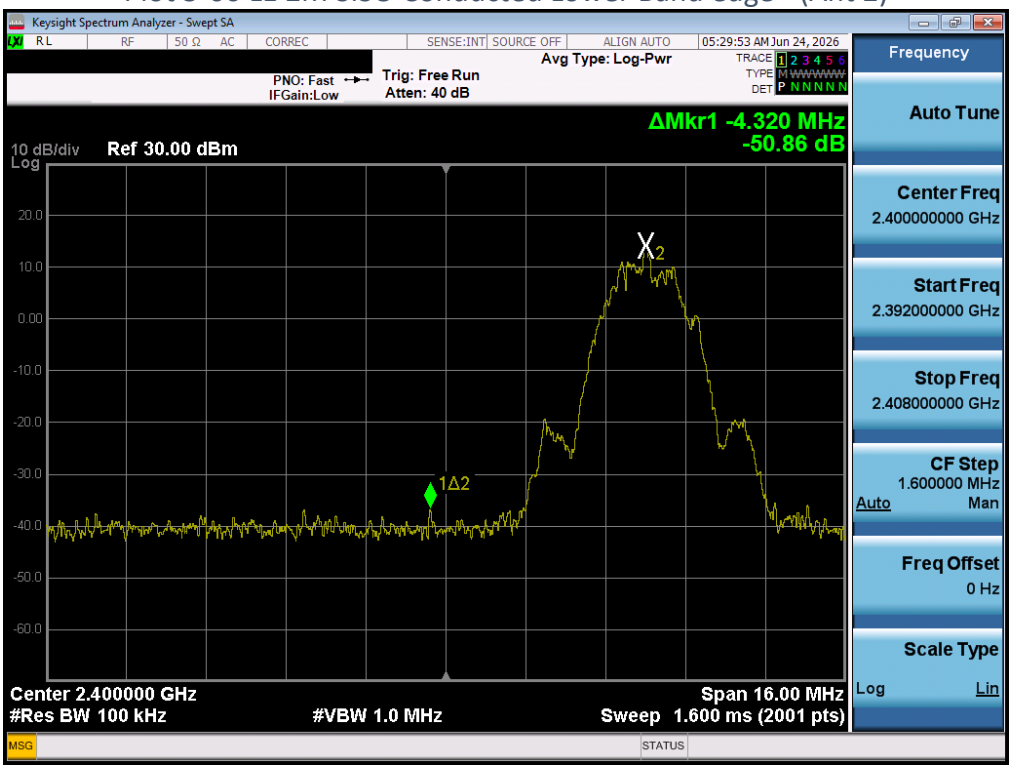
Plot 5-64 LE 1M SISO Conducted Upper Band edge - (Ant 2)



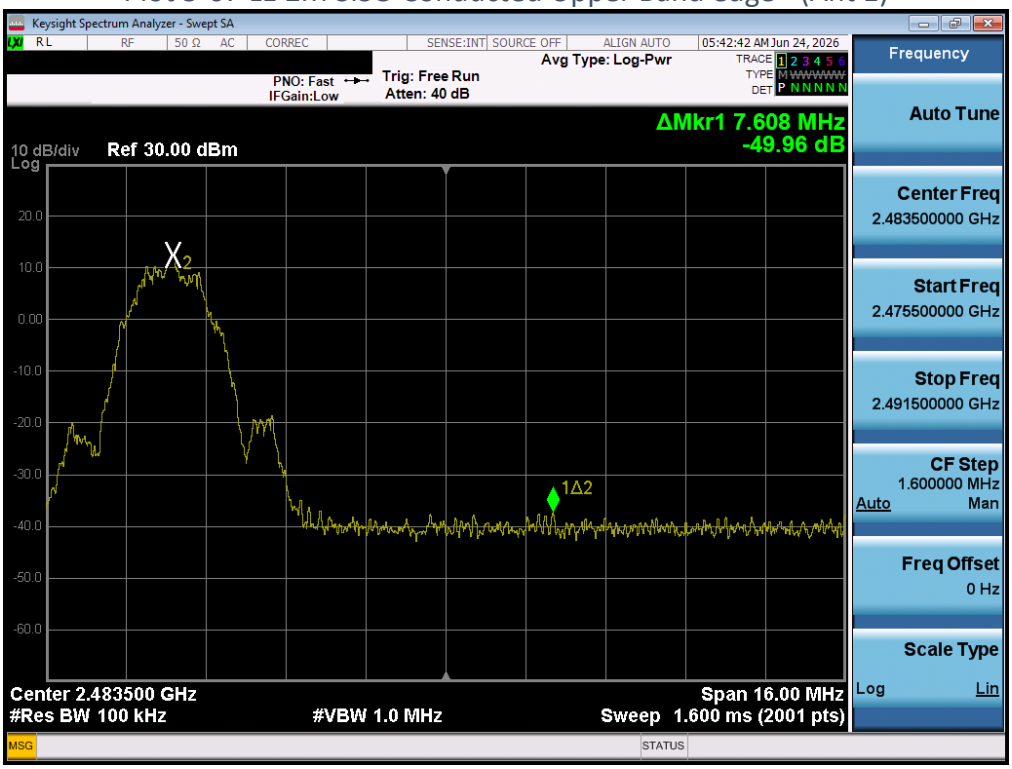
Plot 5-65 LE 2M SISO Conducted Lower Band edge - (Ant 1)



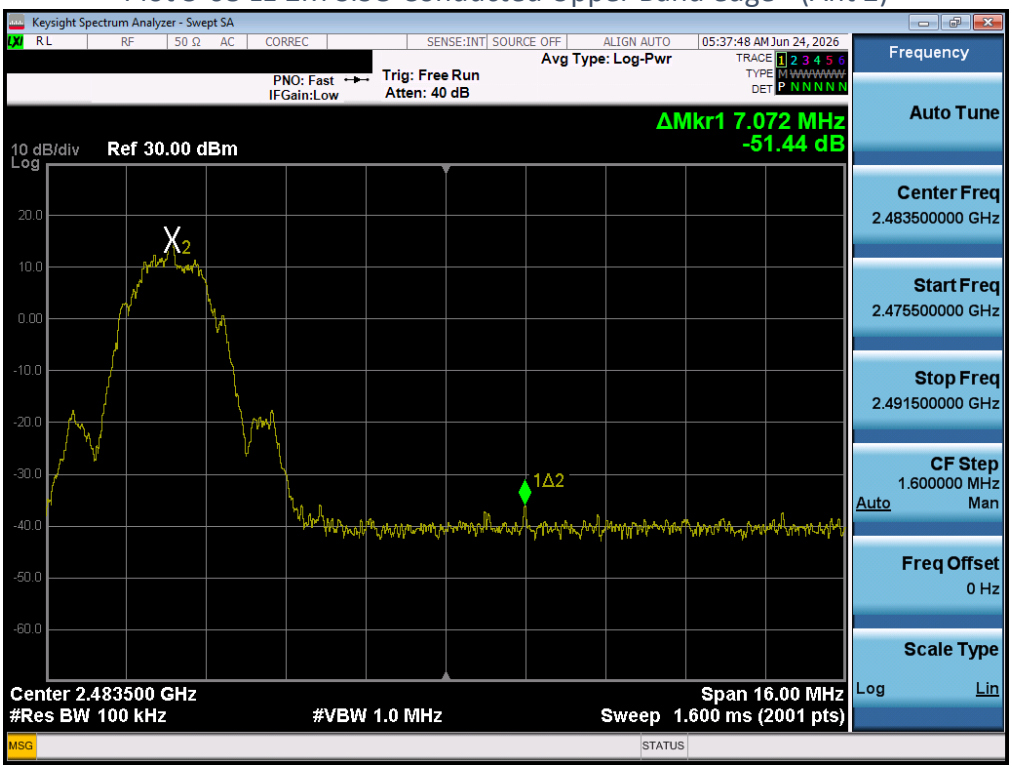
Plot 5-66 LE 2M SISO Conducted Lower Band edge - (Ant 2)



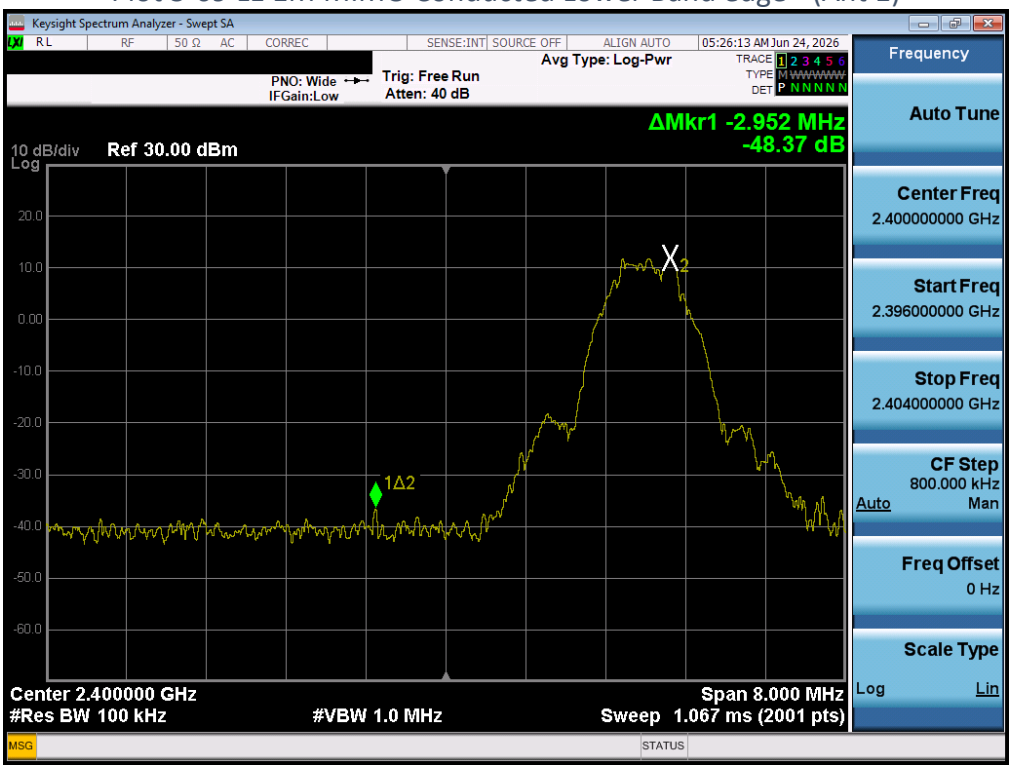
Plot 5-67 LE 2M SISO Conducted Upper Band edge - (Ant 1)



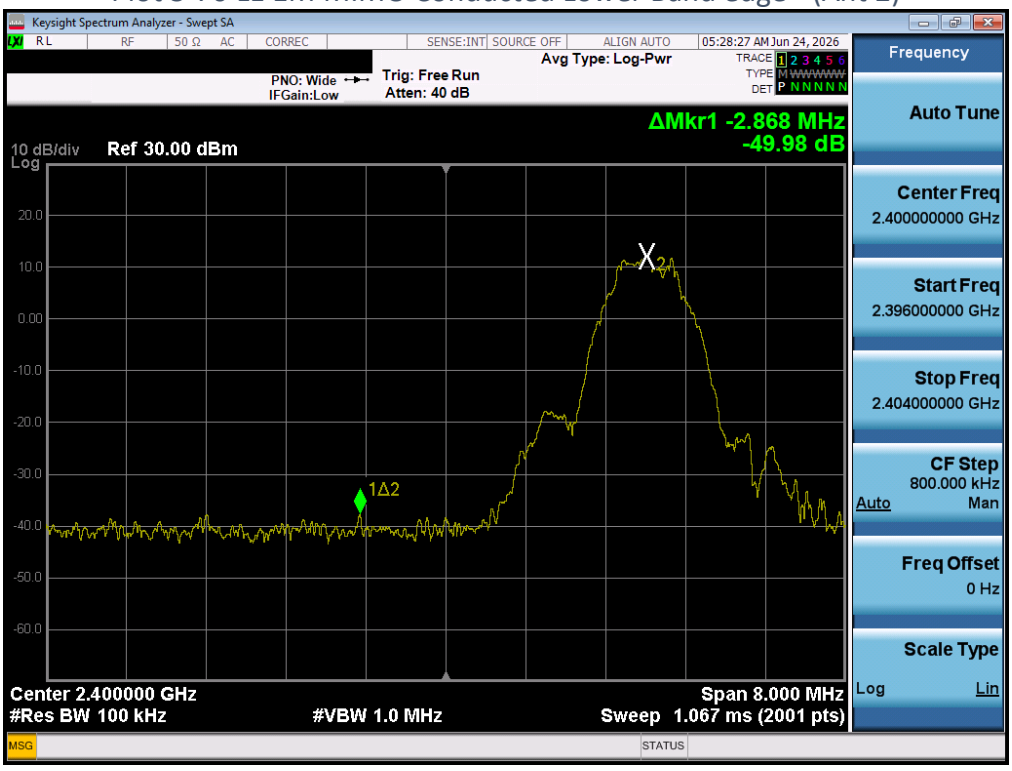
Plot 5-68 LE 2M SISO Conducted Upper Band edge - (Ant 2)



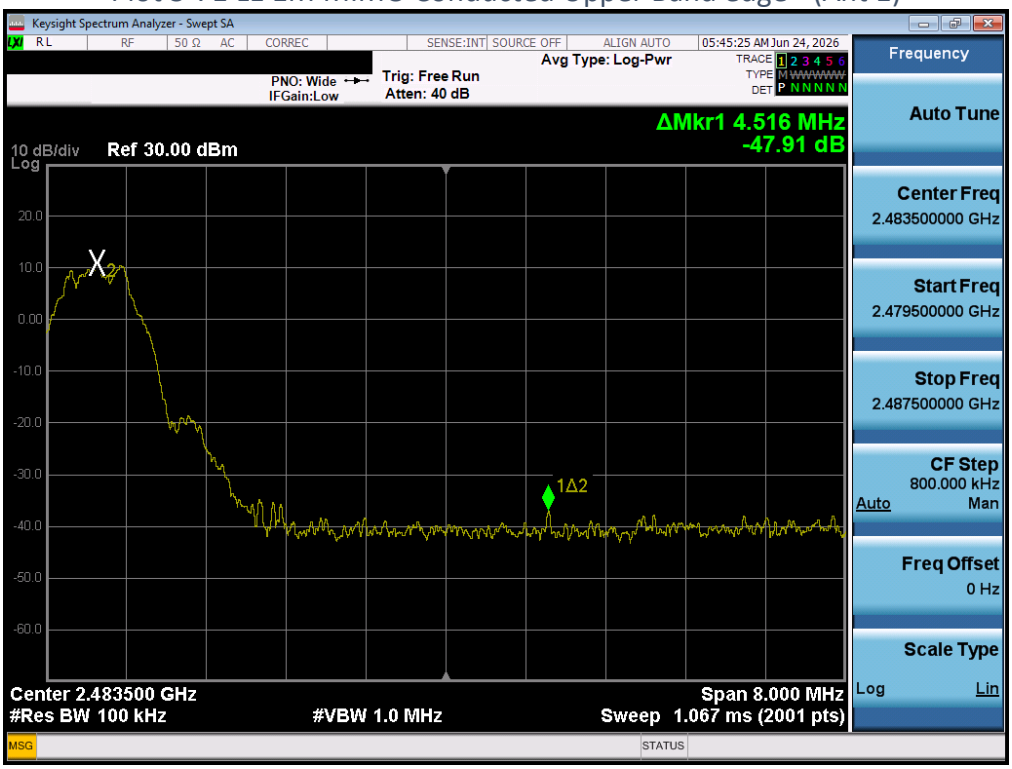
Plot 5-69 LE 1M MIMO Conducted Lower Band edge - (Ant 1)



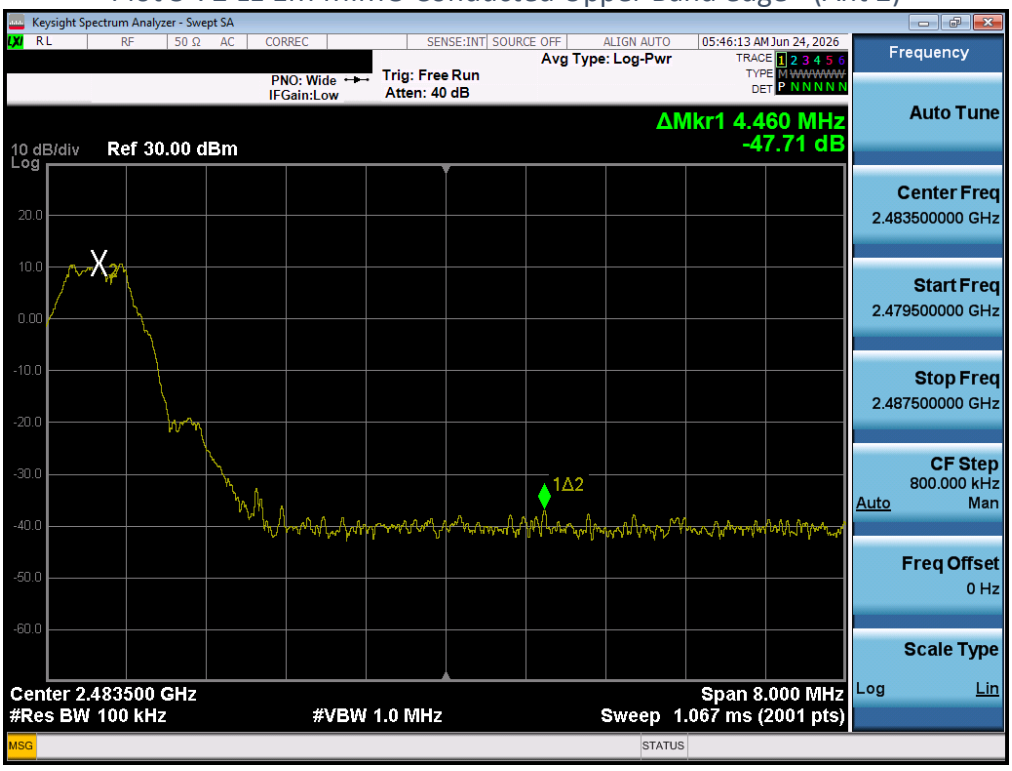
Plot 5-70 LE 1M MIMO Conducted Lower Band edge - (Ant 2)



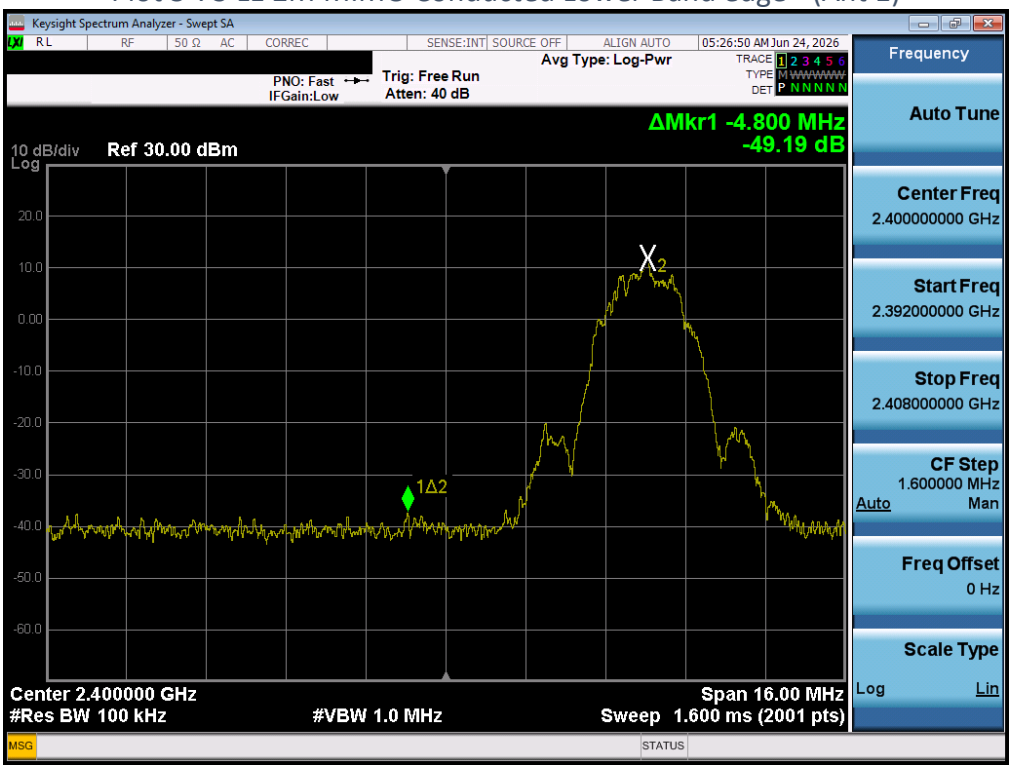
Plot 5-71 LE 1M MIMO Conducted Upper Band edge - (Ant 1)



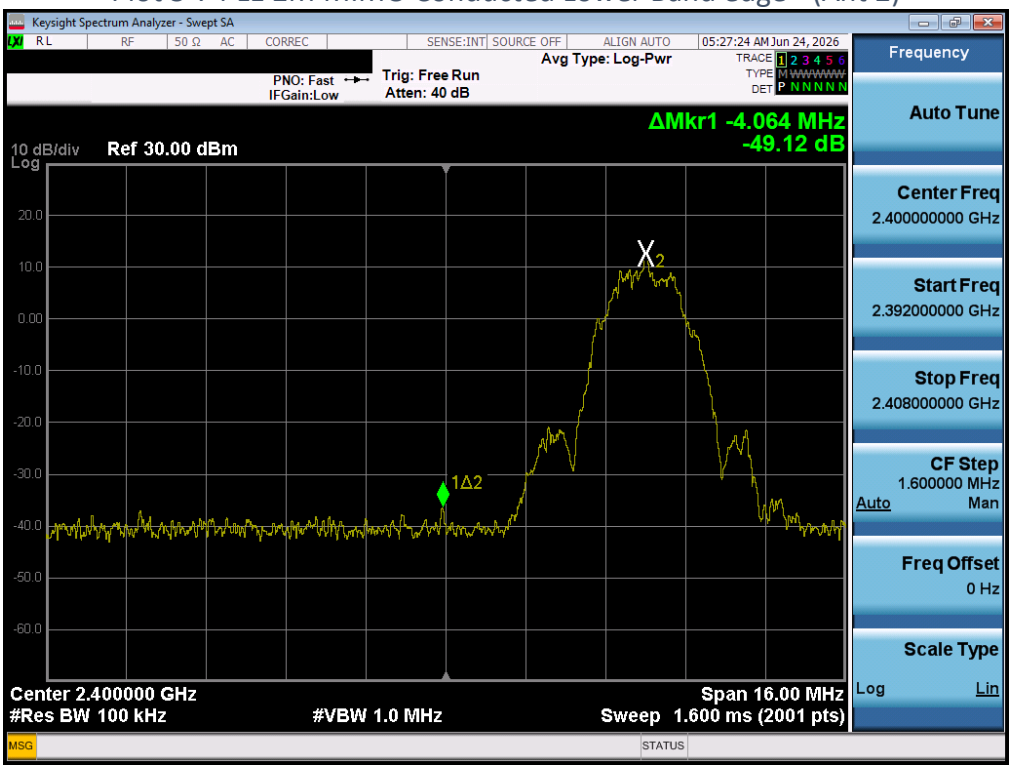
Plot 5-72 LE 1M MIMO Conducted Upper Band edge - (Ant 2)



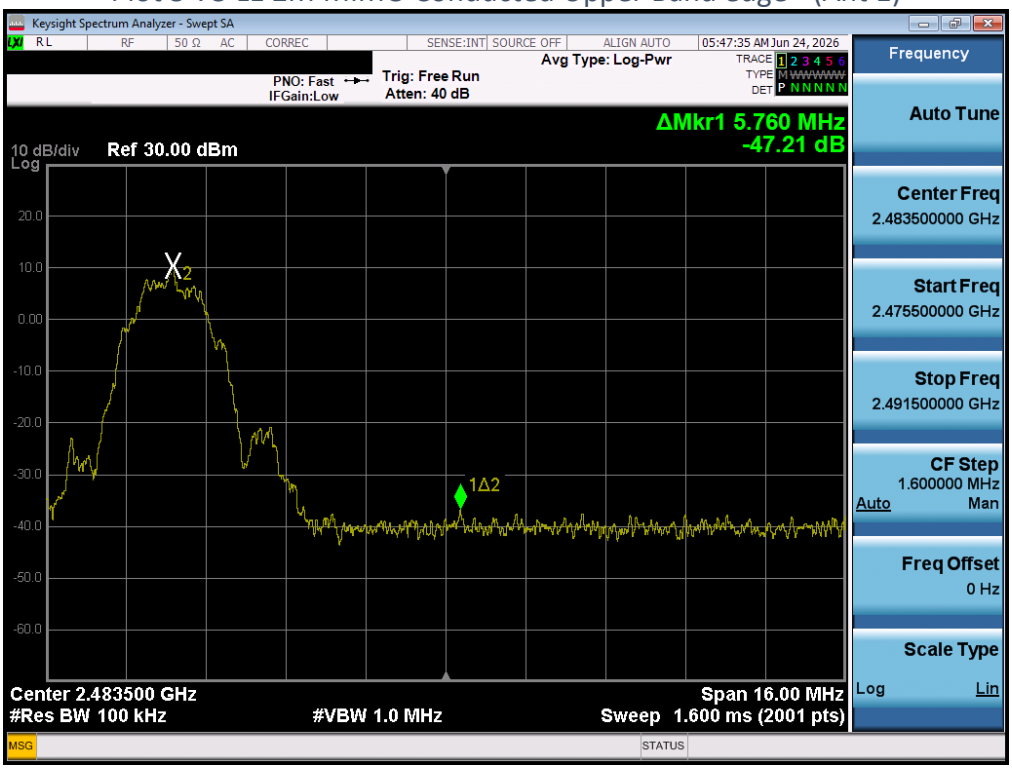
Plot 5-73 LE 2M MIMO Conducted Lower Band edge - (Ant 1)



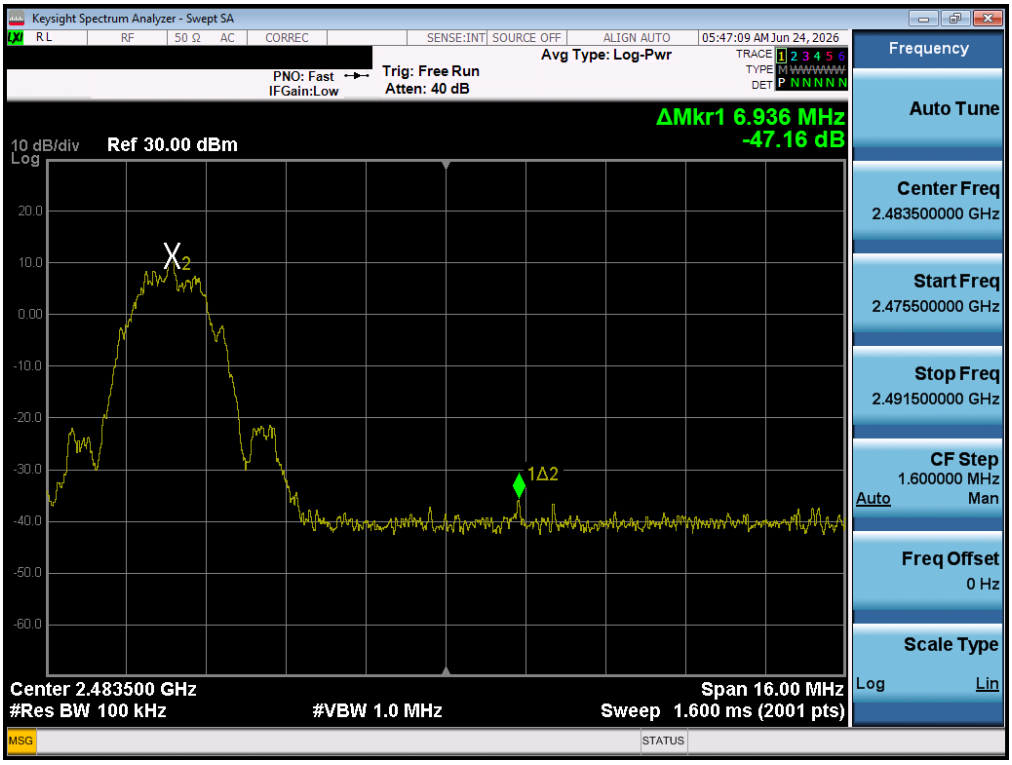
Plot 5-74 LE 2M MIMO Conducted Lower Band edge - (Ant 2)



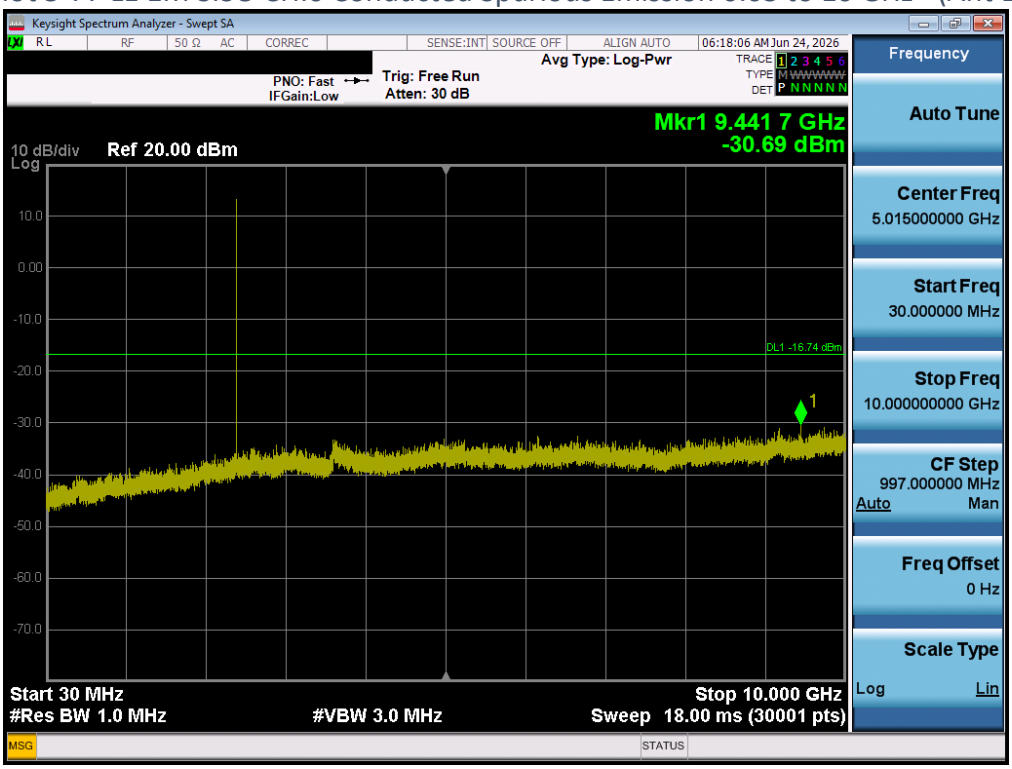
Plot 5-75 LE 2M MIMO Conducted Upper Band edge - (Ant 1)



Plot 5-76 LE 2M MIMO Conducted Upper Band edge - (Ant 2)

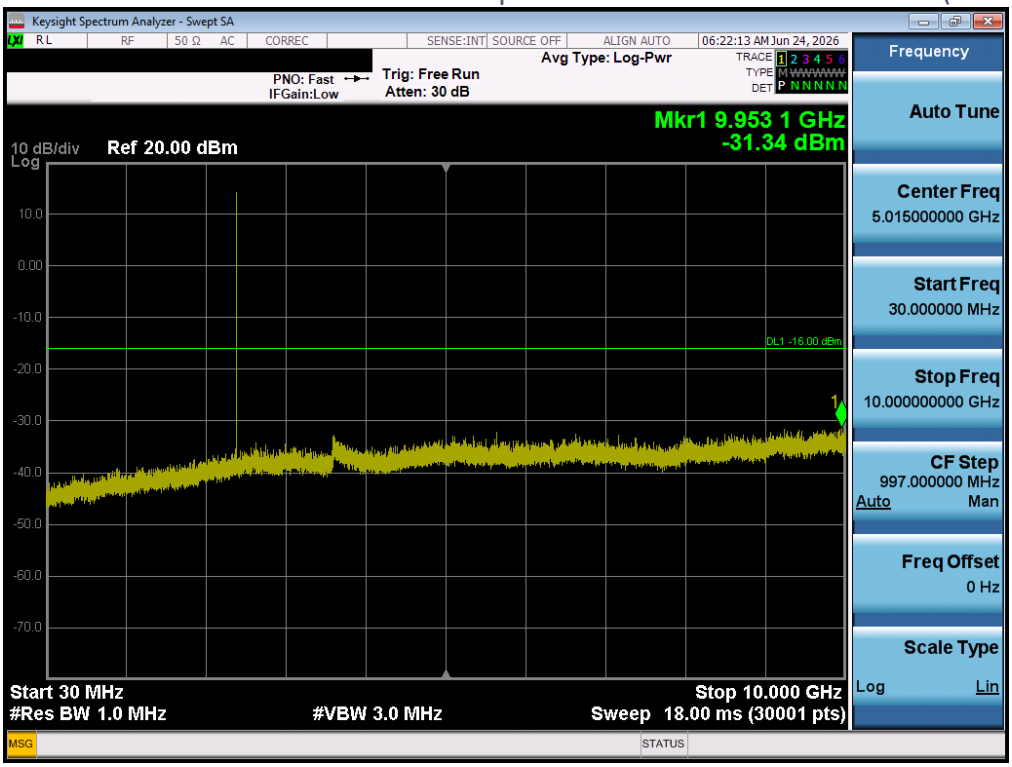


Plot 5-77 LE 1M SISO CH.0 Conducted Spurious Emission 0.03 to 10 GHz - (Ant 1)

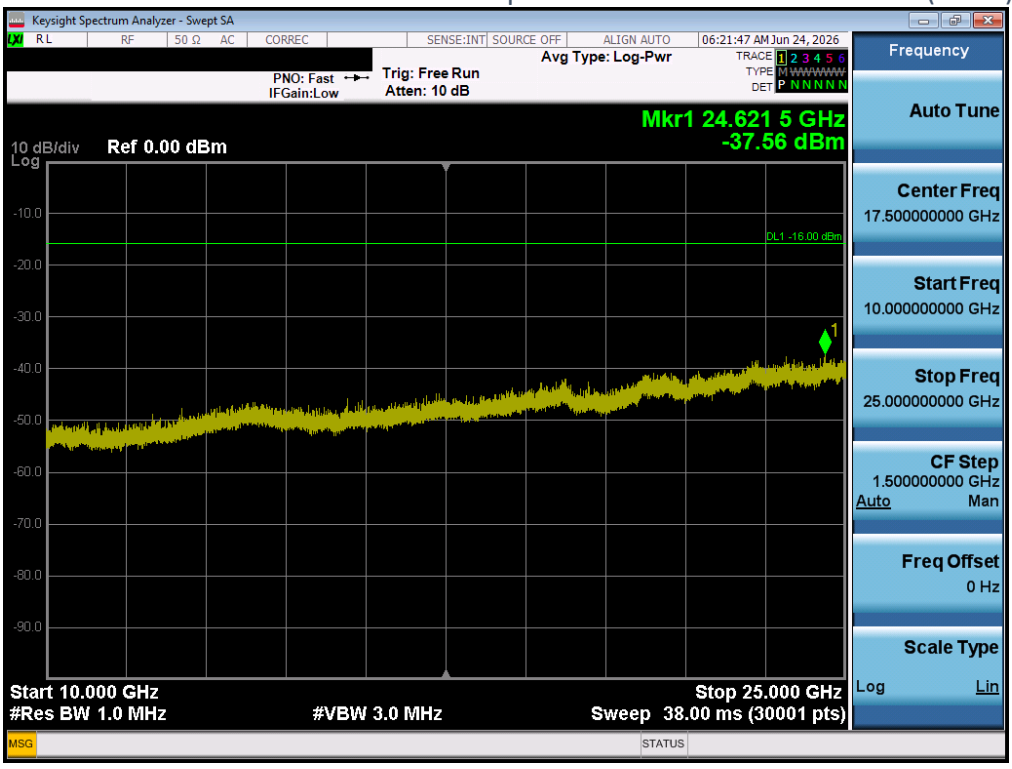


Plot 5-78 LE 1M SISO CH.0 Conducted Spurious Emission 10 to 25 GHz - (Ant 1)

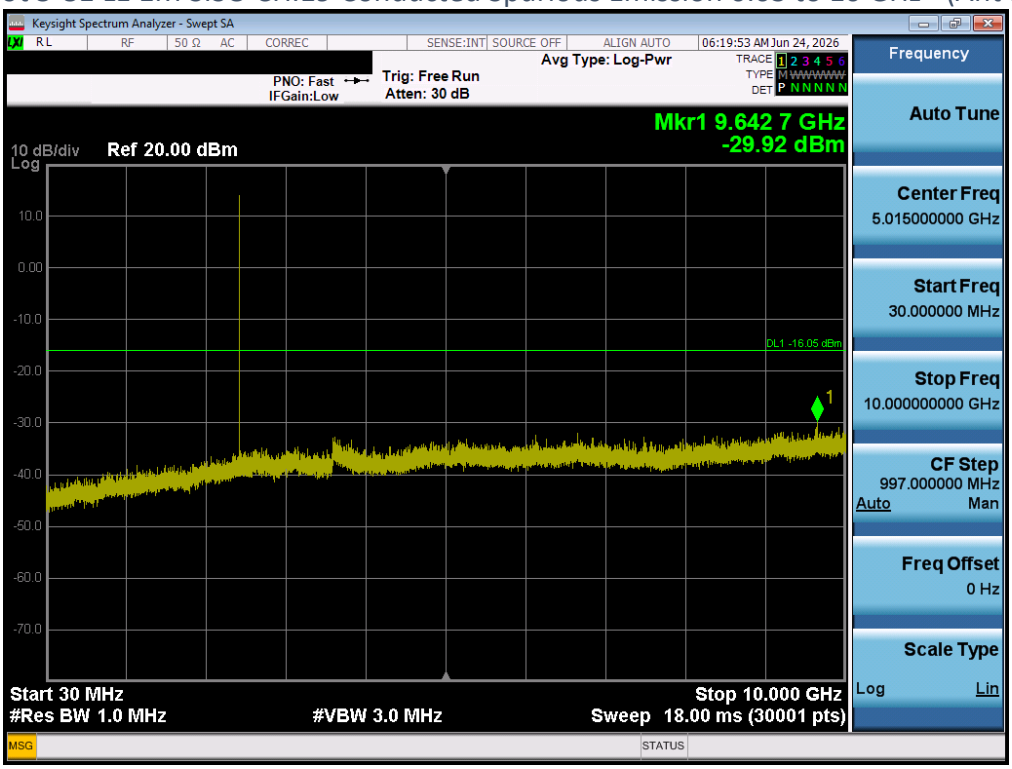
Plot 5-79 LE 1M SISO CH.0 Conducted Spurious Emission 0.03 to 10 GHz - (Ant2)



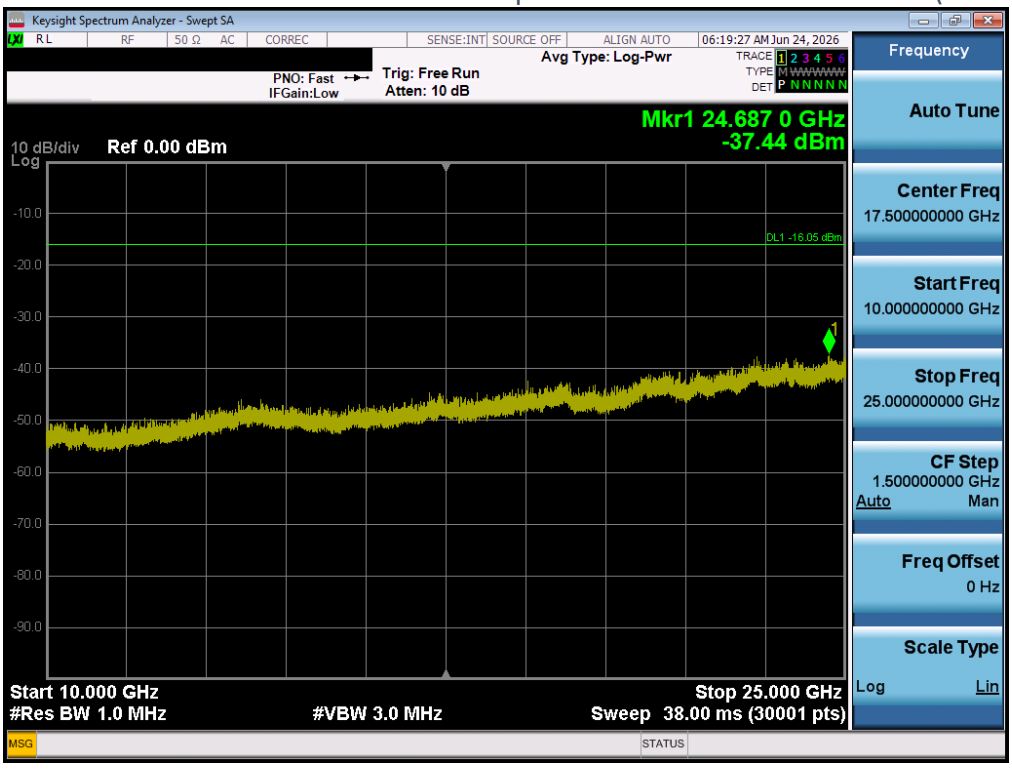
Plot 5-80 LE 1M SISO CH.0 Conducted Spurious Emission 10 to 25 GHz - (Ant 2)



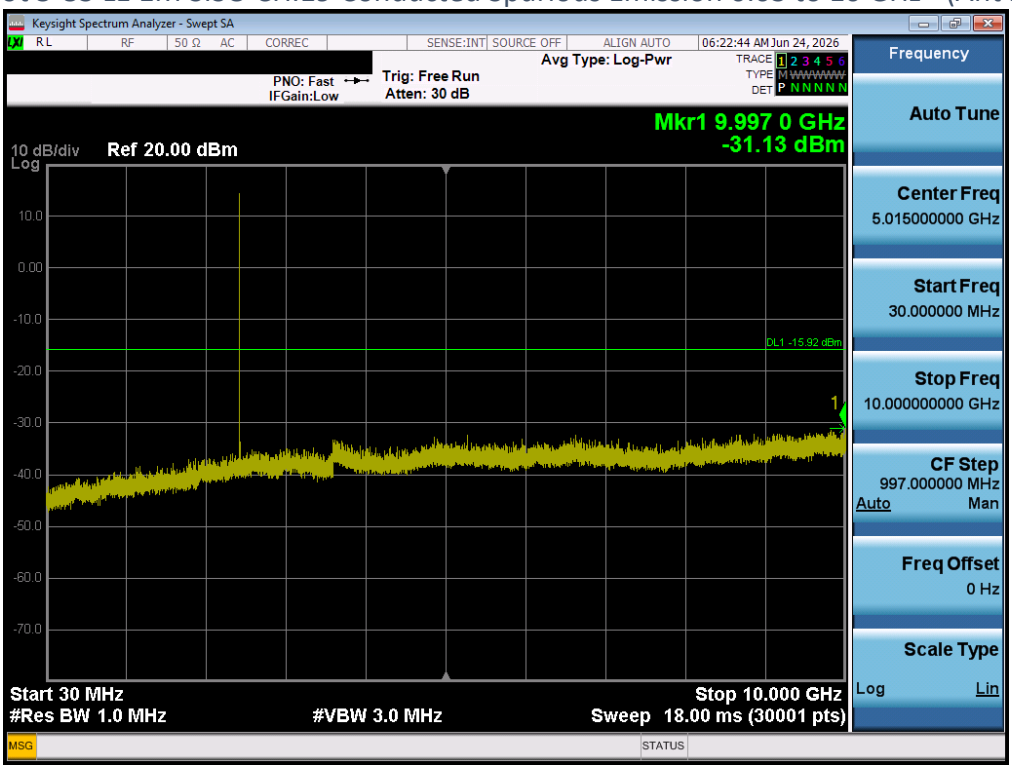
Plot 5-81 LE 1M SISO CH.19 Conducted Spurious Emission 0.03 to 10 GHz - (Ant 1)



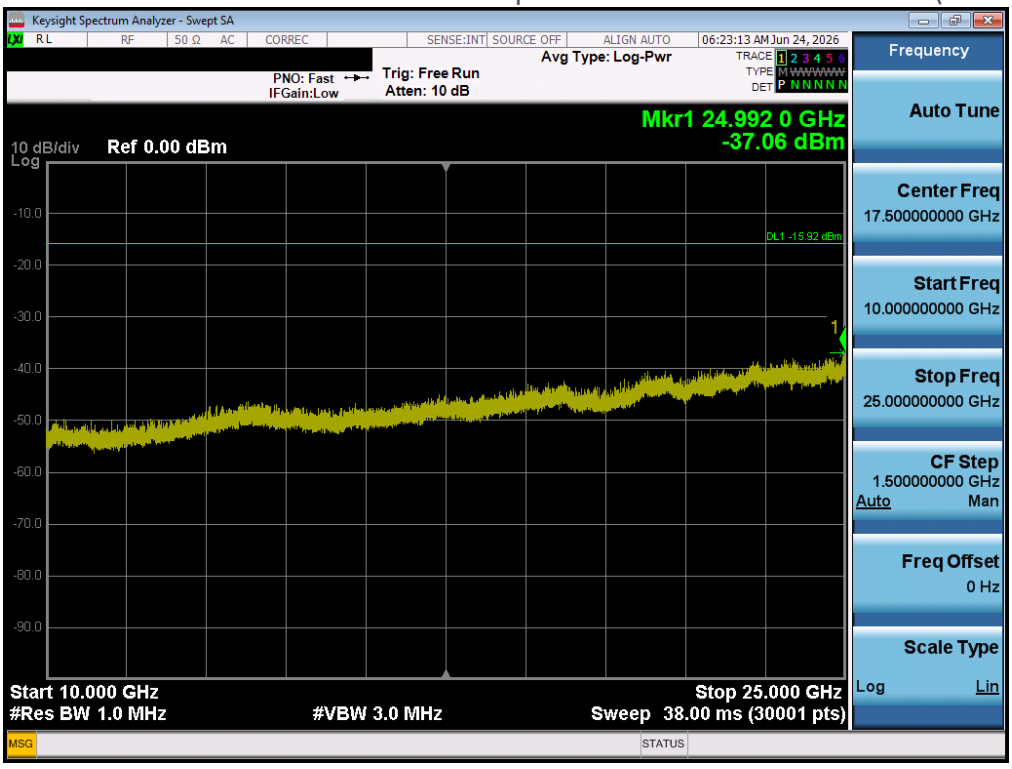
Plot 5-82 LE 1M SISO CH.19 Conducted Spurious Emission 10 to 25 GHz - (Ant 1)



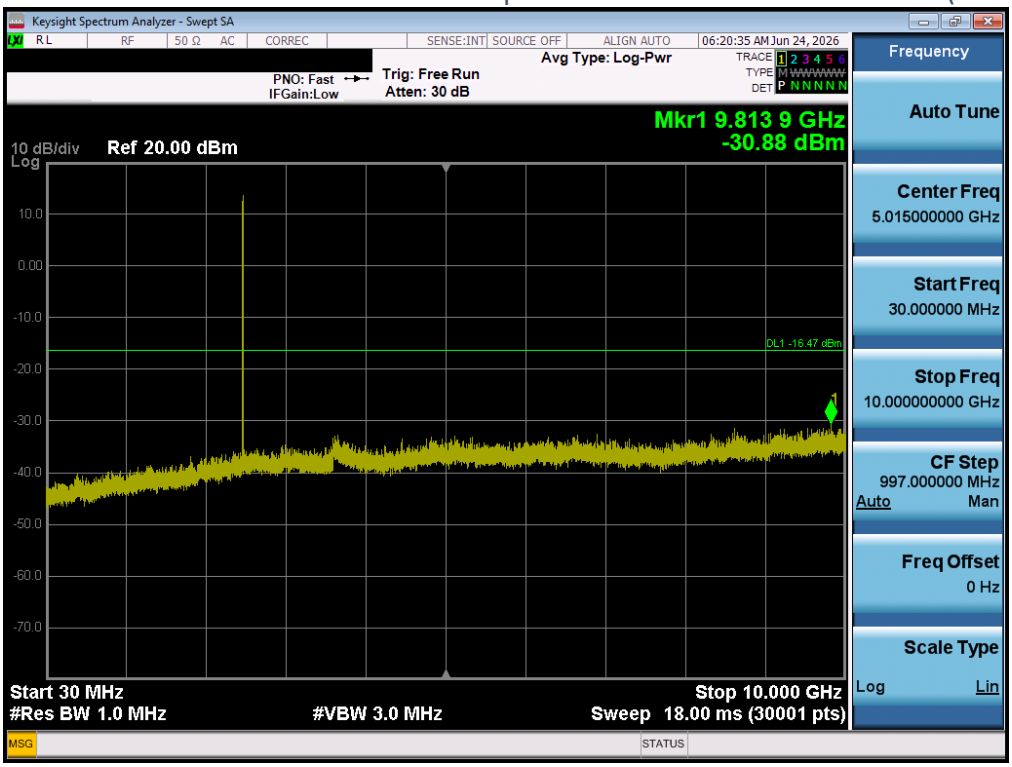
Plot 5-83 LE 1M SISO CH.19 Conducted Spurious Emission 0.03 to 10 GHz - (Ant 2)



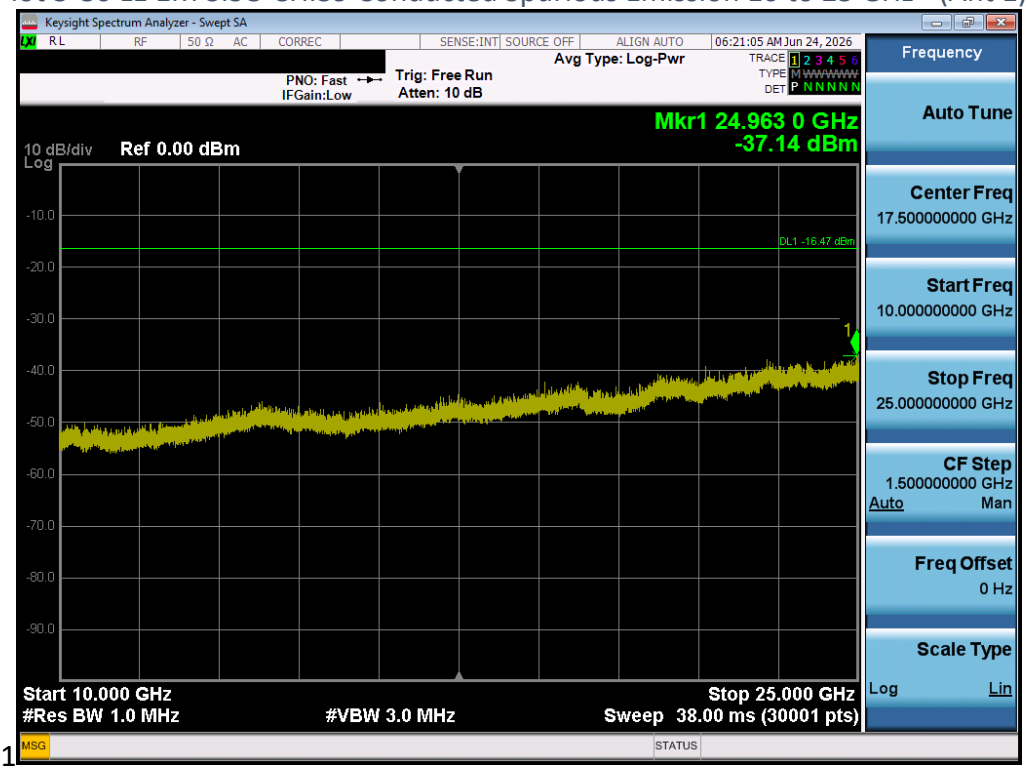
Plot 5-84 LE 1M SISO CH.19 Conducted Spurious Emission 10 to 25 GHz - (Ant 2)



Plot 5-85 LE 1M SISO CH.39 Conducted Spurious Emission 0.03 to 10 GHz - (Ant 1)

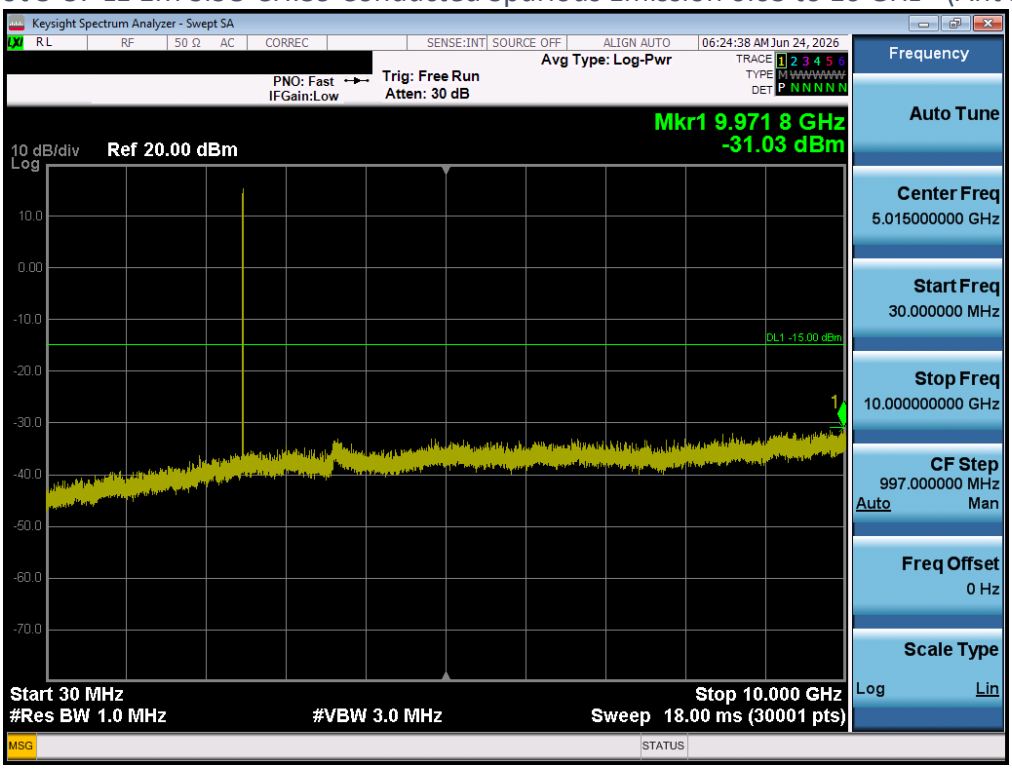


Plot 5-86 LE 1M SISO CH.39 Conducted Spurious Emission 10 to 25 GHz - (Ant 1)

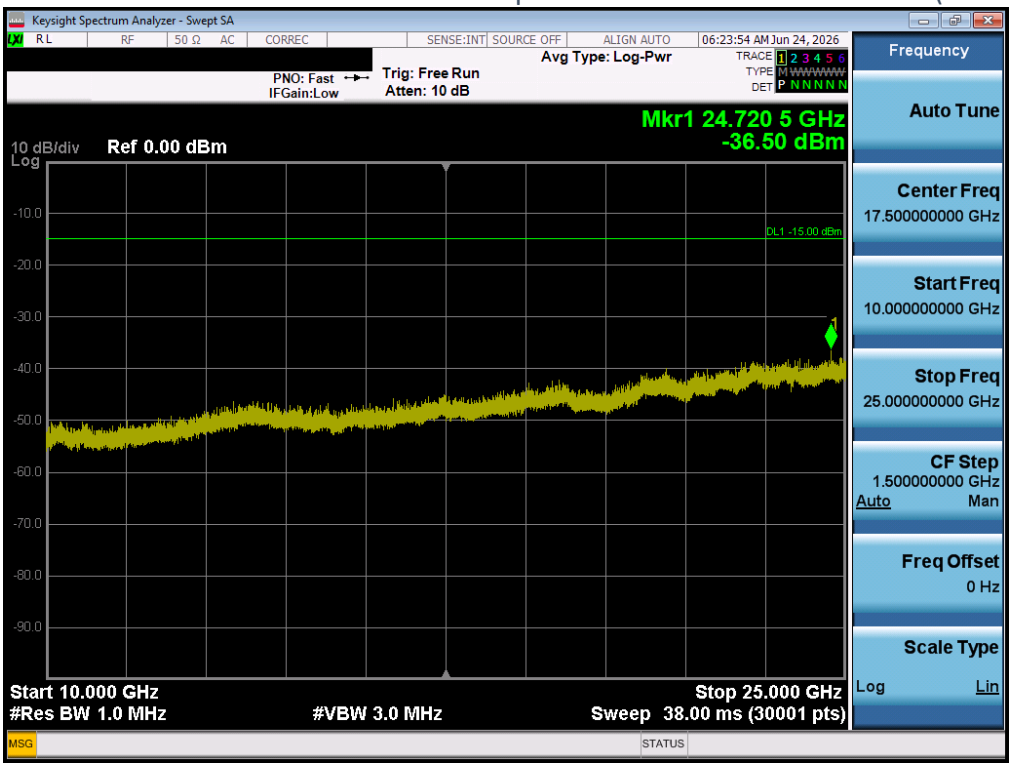


1

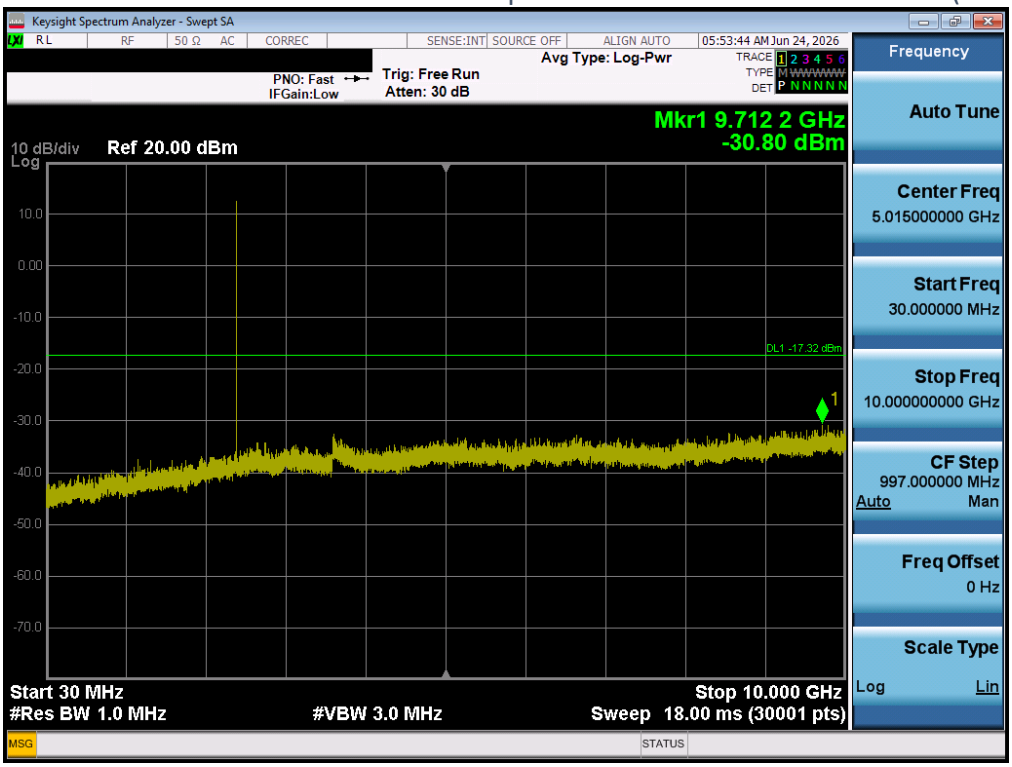
Plot 5-87 LE 1M SISO CH.39 Conducted Spurious Emission 0.03 to 10 GHz - (Ant 2)



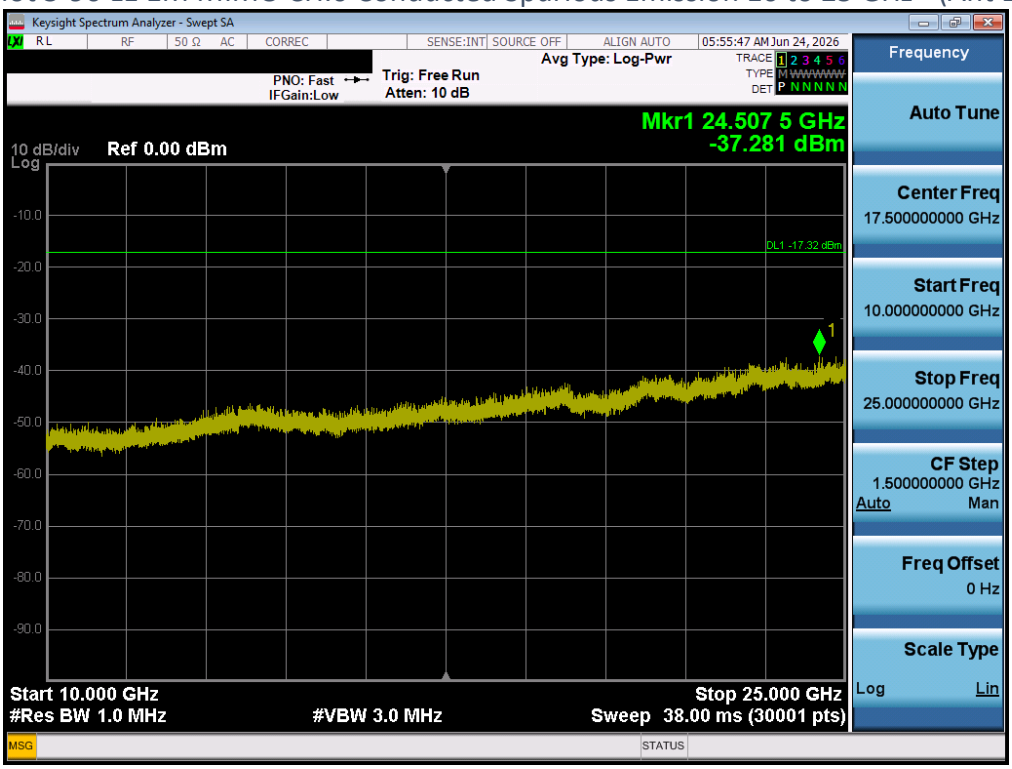
Plot 5-88 LE 1M SISO CH.39 Conducted Spurious Emission 10 to 25 GHz - (Ant 2)



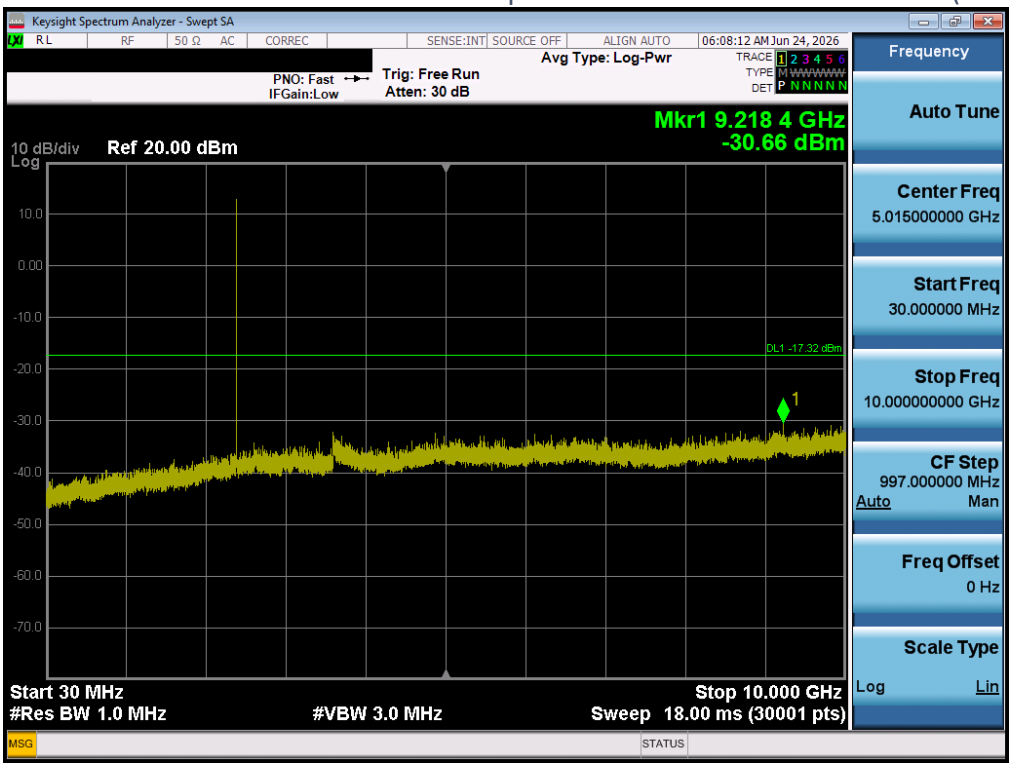
Plot 5-89 LE 1M MIMO CH.0 Conducted Spurious Emission 0.03 to 10 GHz - (Ant 1)



Plot 5-90 LE 1M MIMO CH.0 Conducted Spurious Emission 10 to 25 GHz - (Ant 1)

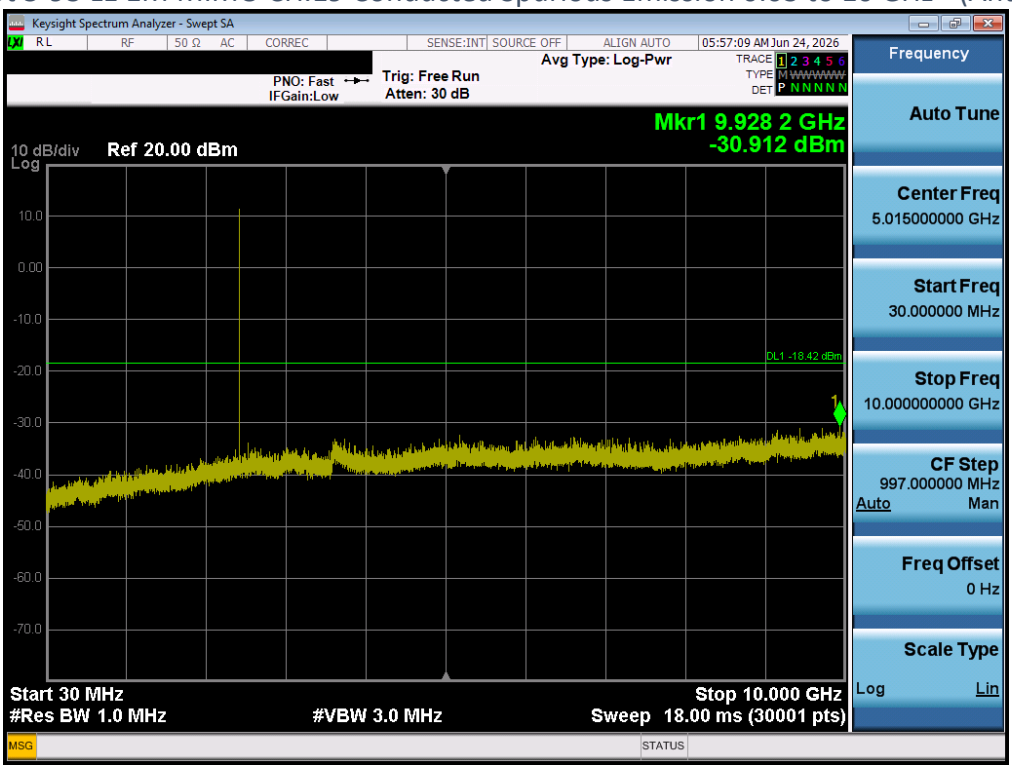


Plot 5-91 LE 1M MIMO CH.0 Conducted Spurious Emission 0.03 to 10 GHz - (Ant 2)

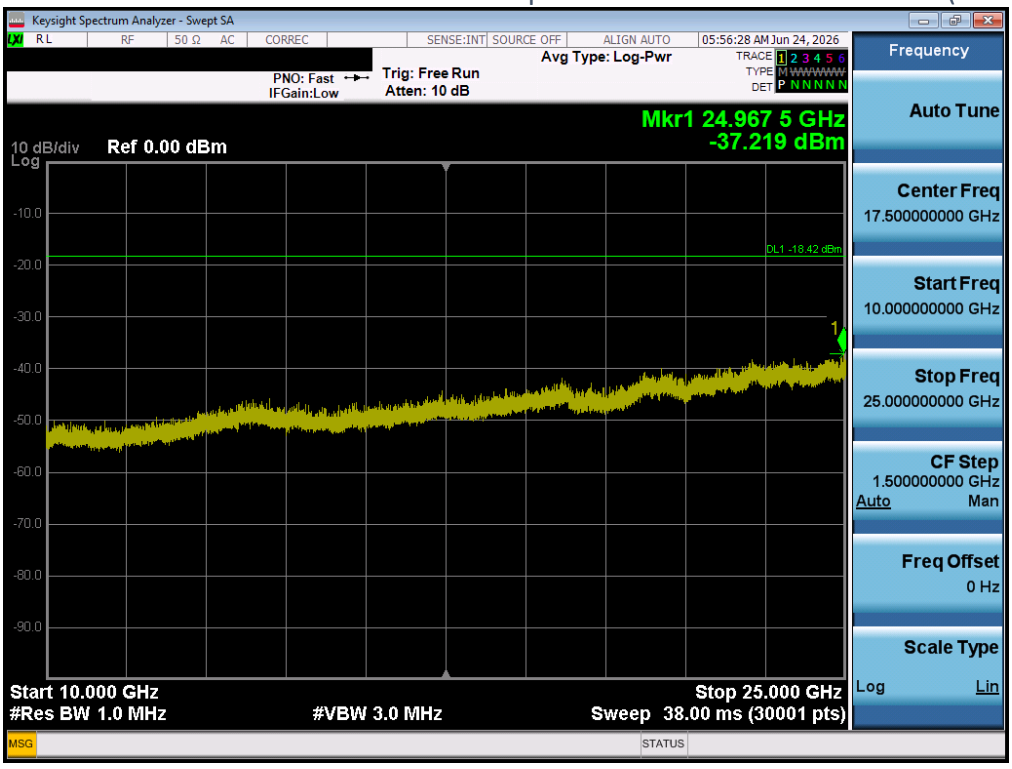


Plot 5-92 LE 1M MIMO CH.0 Conducted Spurious Emission 10 to 25 GHz - (Ant 2)

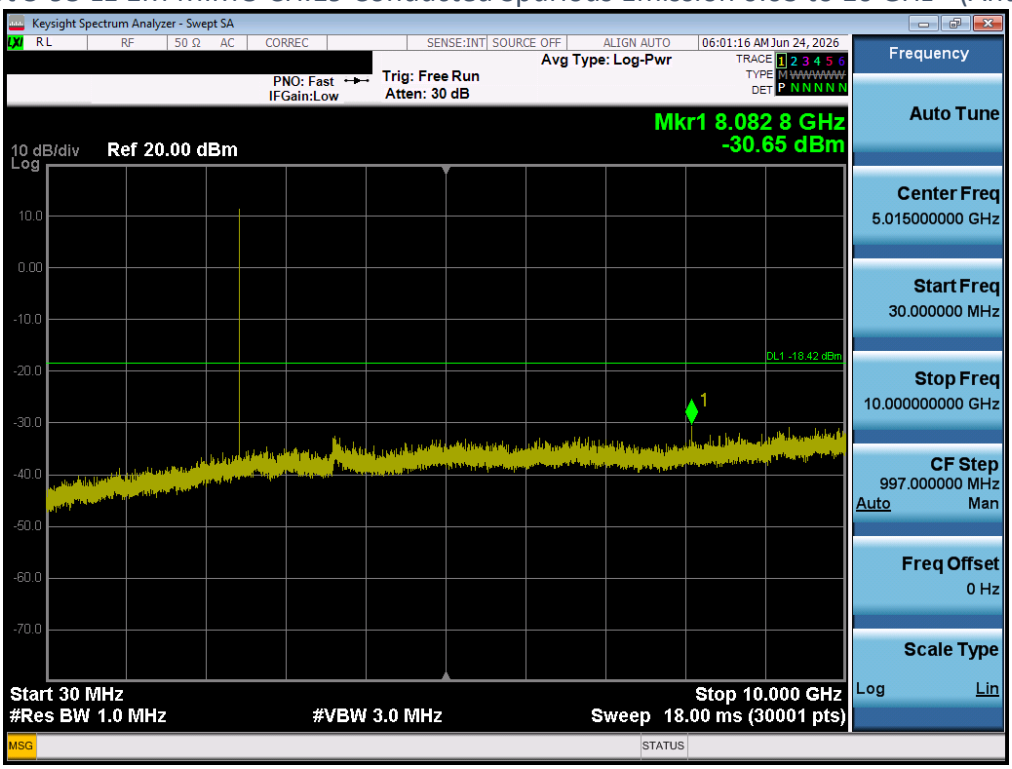
Plot 5-93 LE 1M MIMO CH.19 Conducted Spurious Emission 0.03 to 10 GHz - (Ant 1)



Plot 5-94 LE 1M MIMO CH.19 Conducted Spurious Emission 10 to 25 GHz - (Ant 1)

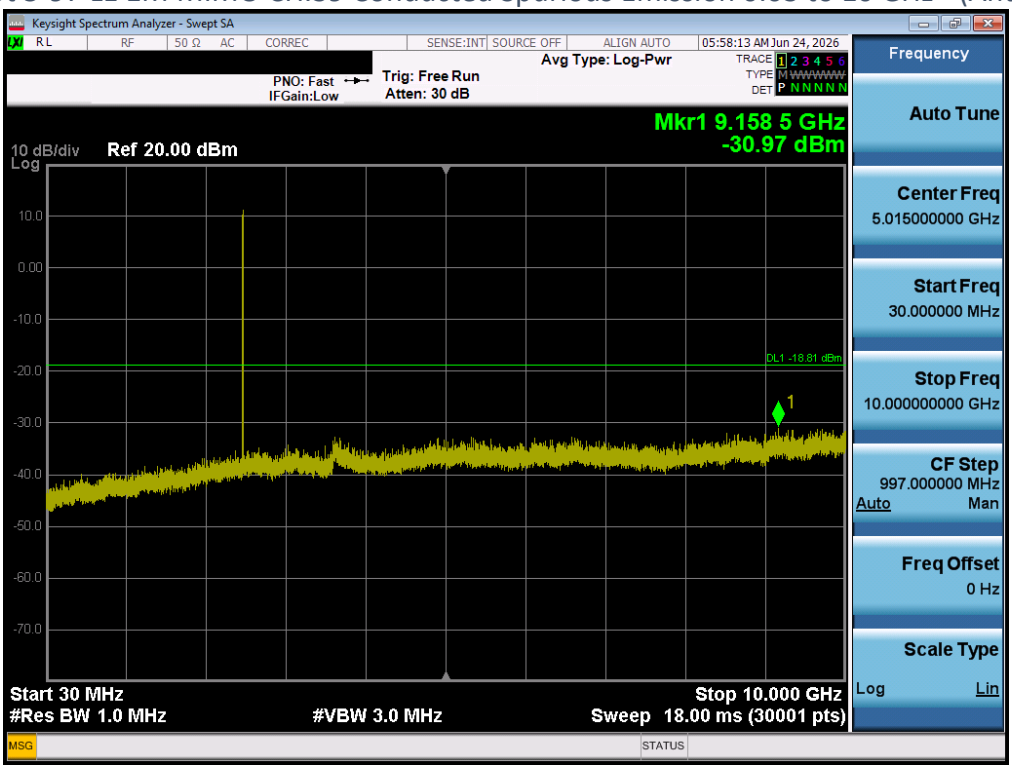


Plot 5-95 LE 1M MIMO CH.19 Conducted Spurious Emission 0.03 to 10 GHz - (Ant 2)

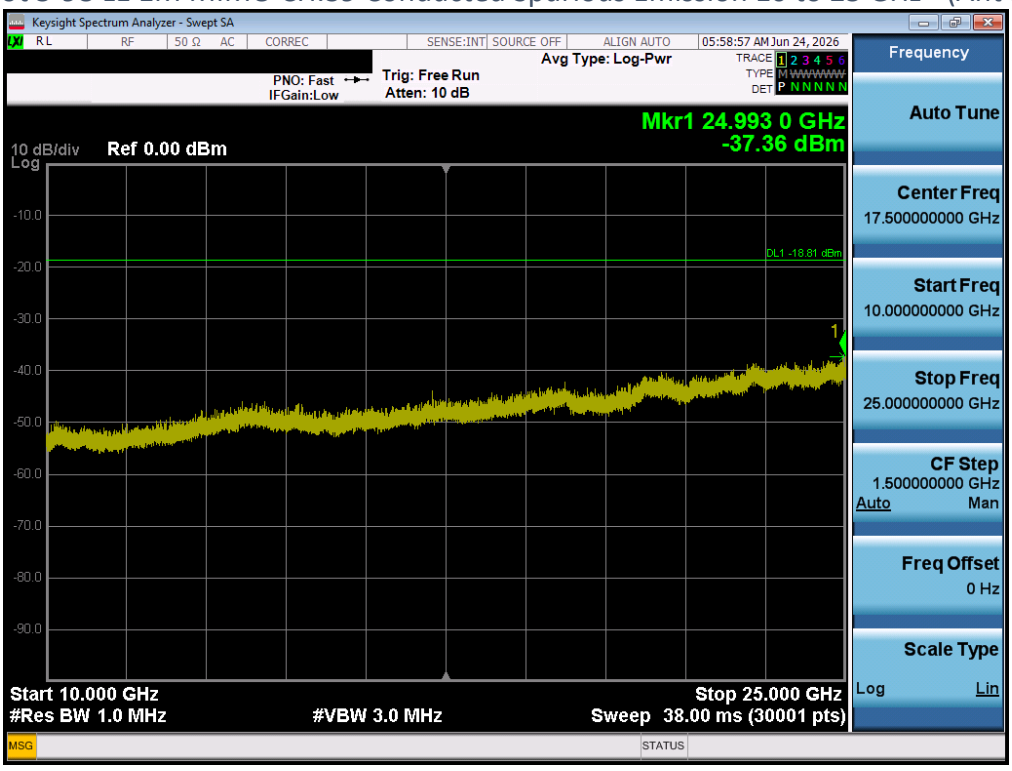


Plot 5-96 LE 1M MIMO CH.19 Conducted Spurious Emission 10 to 25 GHz - (Ant 2)

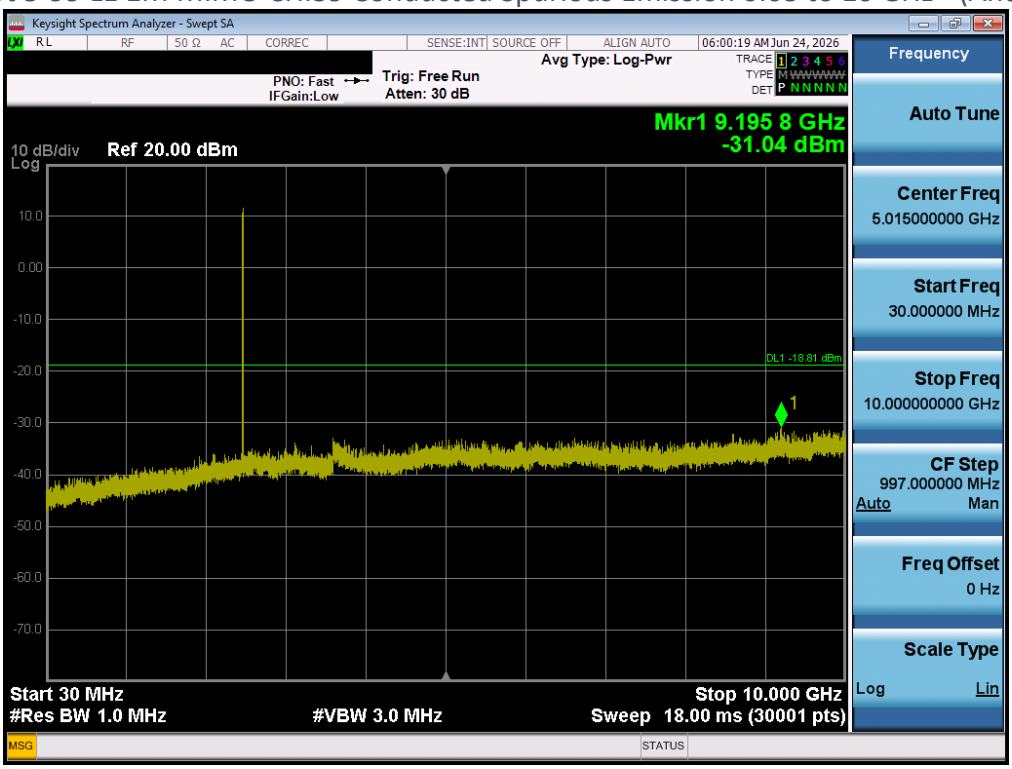
Plot 5-97 LE 1M MIMO CH.39 Conducted Spurious Emission 0.03 to 10 GHz - (Ant 1)



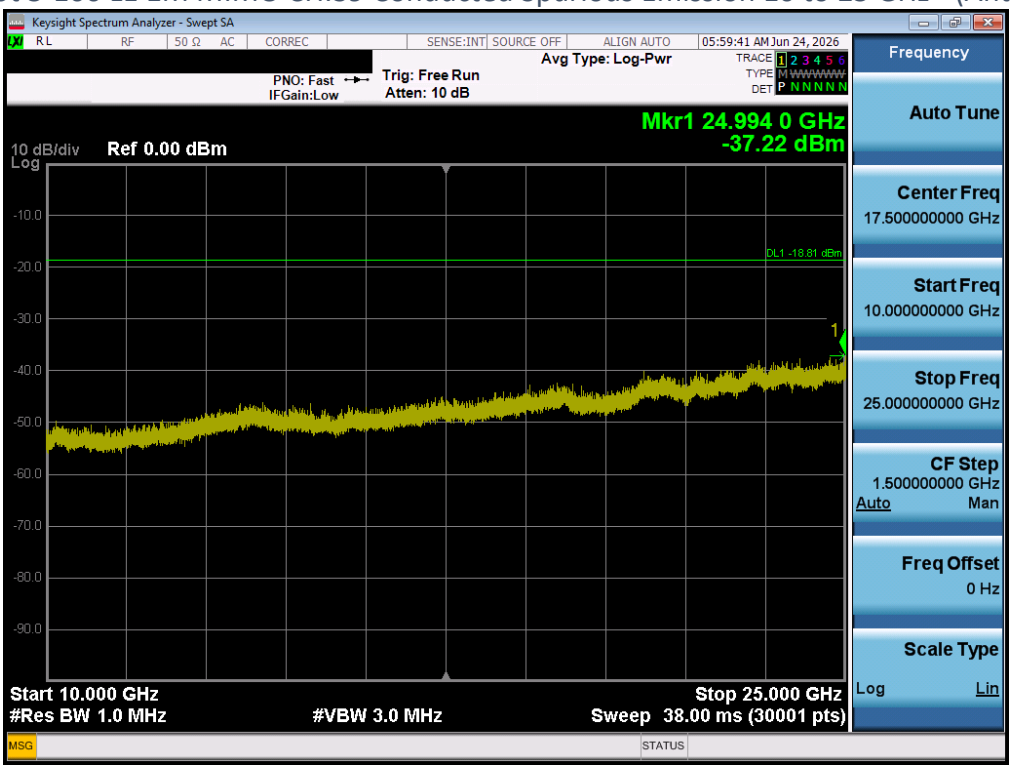
Plot 5-98 LE 1M MIMO CH.39 Conducted Spurious Emission 10 to 25 GHz - (Ant 1)



Plot 5-99 LE 1M MIMO CH.39 Conducted Spurious Emission 0.03 to 10 GHz - (Ant 2)



Plot 5-100 LE 1M MIMO CH.39 Conducted Spurious Emission 10 to 25 GHz - (Ant 2)



6. Radiated Test Results

6.1. Test Configuration

Description of EUT

The DUT is a portable wireless handset designed to operate across multiple wireless communication standards and frequency bands. This report covers the compliance testing of the Bluetooth Low Energy (BLE) transmitter in accordance with the applicable FCC requirements.

All operating modes, channels, and data rates across the DTS (LE) bands were investigated; the results documented herein represent the worst-case emissions. Since the output power varies between SISO and MIMO configurations, all required tests were performed for both configurations, and only the worst-case results are included in this report.

Radiated Test Facilities & Setup

Radiated emissions testing was conducted in an indoor 3-meter semi-anechoic chamber (SAC). For all frequency ranges, the turntable was rotated 360° and the receive antenna height was varied from 1 m to 4 m to maximize emissions. The specific test setups and calibrated, linearly polarized antennas utilized are as follows:

- 9 kHz to 30 MHz : DUT height at 0.8 m / Active Loop Antenna
- 30 MHz to 1 GHz : DUT height at 0.8 m / No floor absorbers / Broadband Bi-log Antenna
- 1 GHz to 18 GHz : DUT height at 1.5 m / Floor absorbers deployed / Broadband Double-Ridge Horn Antenna
- Above 18 GHz : DUT height at 1.5 m / Floor absorbers deployed / Standard Gain Horn Antenna

Test Orientations

The DUT was investigated in three orthogonal orientations (X, Y, and Z) for each band. Since the equipment transmits below 10 GHz, Radiated Spurious Emissions testing was performed from 9 kHz up to the lower of the tenth harmonic of the highest fundamental frequency or 40 GHz. Testing from 1 GHz to 18 GHz was performed on the low, mid, and high channels. Testing below 1 GHz and above 18 GHz was conducted only under the worst-case configuration. In accordance with ANSI C63.10, measurement results for frequencies below 1 GHz and above 18 GHz are included in the report only when emissions are detected within 20 dB of the applicable limit.

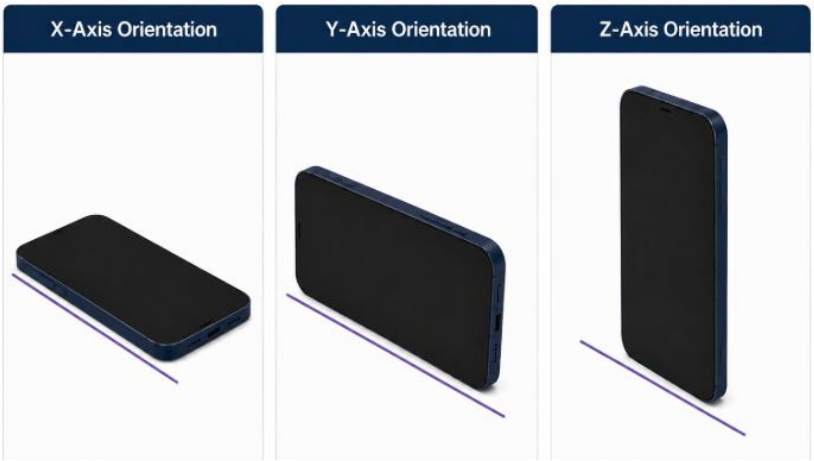


Figure 6-1 Three orthogonal orientations.

Radiated emissions were captured using automated test software 'NGTL ATE' Ver. 0.00.

6.2. Radiated Measurement Setup

Figure 6-2 Radiated Measurement Setup Below 30 MHz

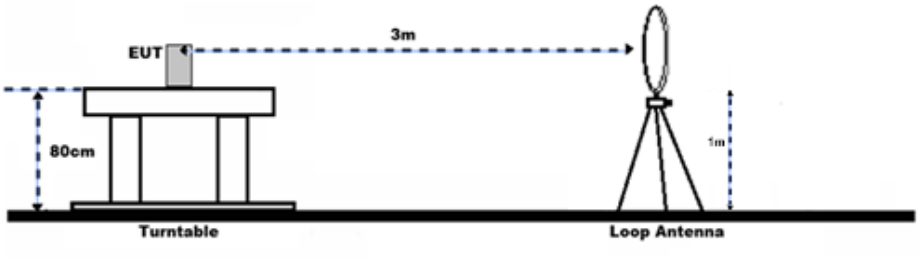


Figure 6-3 Radiated Measurement Setup Below 1 GHz

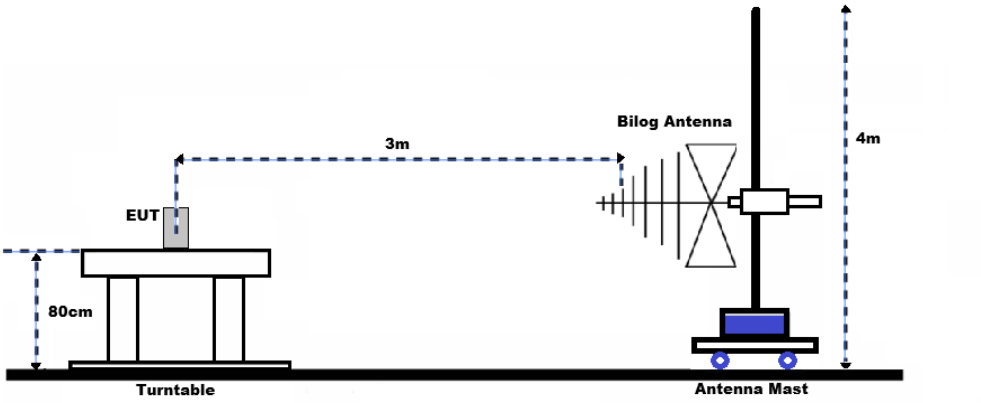
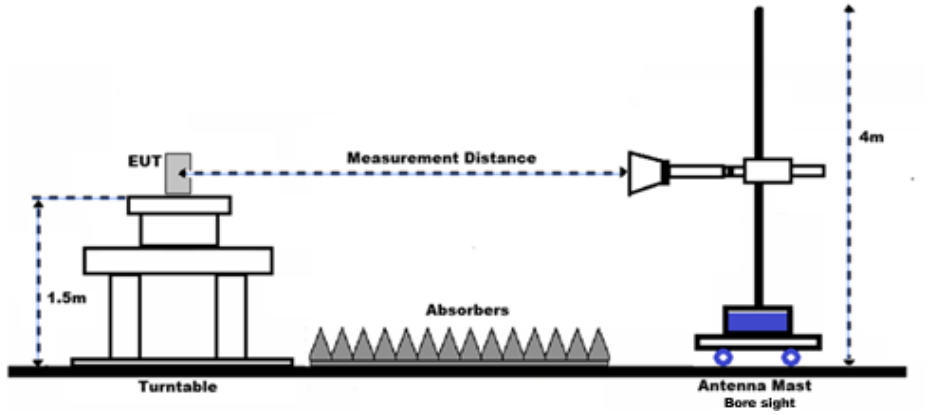


Figure 6-4 Radiated Measurement Setup Above 1 GHz



6.3. Radiated Measurement Sample

Serial Number(s) : ZDH0461M, ZDH0460M

6.4. Radiated Spurious Emissions

6.4.1. Regulatory Limit

Part 15.205 Restriction band of operation

Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(Above 38.6)
13.36-13.41			

Part 15.209 Radiated emission limit; general requirements

Except as shown in paragraph (b)(6) of this section, the maximum emissions outside of the frequency bands of operation shall be attenuated in accordance with the following limits:

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F(kHz)	300
0.490 – 1.705	24000 / F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 – 216	150**	3
216 – 960	200**	3
Above 960	500	3

**Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g., §§15.231 and 15.241.

Part 15.247 (d)

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

RSS-GEN - Section 8.9

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Frequency (MHz)	Magnetic field strength (H-Field) (μA/m)	Measurement Distance (m)
0.009 – 0.490[Note]	6.37/F (F in kHz)	300
0.490 – 1.705	63.7/F (F in kHz)	30
1.705 – 30.0	0.08	30

The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

Frequency (MHz)	Field Strength (μV/m)	Measurement Distance (m)
30 – 88	100**	3
88 – 216	150**	3
216 – 960	200**	3
Above 960	500	3

RSS-GEN - Section 8.10

Restricted frequency bands

Restricted frequency bands, identified in table 7, are designated primarily for safety-of-life services (distress calling and certain aeronautical activities), certain satellite downlinks, radio astronomy and some government uses. Except where otherwise indicated, the following conditions related to the restricted frequency bands apply:

a) The transmit frequency, including fundamental components of modulation, of licensed-exempt radio apparatus shall not fall within the restricted frequency bands listed in table 7 except for apparatus compliant with RSS-287, Emergency Position Indicating Radio Beacons (EPIRB), Emergency Locator Transmitters (ELT), Personal Locator Beacons (PLB), and Maritime Survivor Locator Devices (MSLD).

b) Unwanted emissions that fall into restricted frequency bands listed in table 7 shall comply with the limits specified in table 5 and table 6.

c) Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

Frequency (MHz)	Frequency (MHz)	Frequency (MHz)	Frequency (GHz)
0.090 - 0.110	13.36 - 13.41	960 - 1427	9.0 - 9.2
0.495 - 0.505	16.42 - 16.423	1435 - 1626.5	9.3 - 9.5
2.1735 - 2.1905	16.69475 - 16.69525	1645.5 - 1646.5	10.6 - 12.7
3.020 - 3.026	16.80425 - 16.80475	1660 - 1710	13.25 - 13.4
4.125 - 4.128	25.5 - 25.67	1718.8 - 1722.2	14.47 - 14.5
4.17725 - 4.17775	37.5 - 38.25	2200 - 2300	15.35 - 16.2
4.20725 - 4.20775	73 - 74.6	2310 - 2390	17.7 - 21.4
5.677 - 5.683	74.8 - 75.2	2483.5 - 2500	22.01 - 23.12
6.215 - 6.218	108 - 138	2655 - 2900	23.6 - 24.0
6.26775 - 6.26825	149.9 - 150.05	3260 – 3267	31.2 - 31.8
6.31175 - 6.31225	156.52475 - 56.52525	3332 - 3339	36.43 - 36.5
8.291 - 8.294	156.7 - 156.9	3345.8 - 3358	Above 38.6
8.362 - 8.366	162.0125 - 167.17	3500 - 4400	
8.37625 - 8.38675	167.72 - 173.2	4500 - 5150	
8.41425 - 8.41475	240 - 285	5350 - 5460	
12.29 - 12.293	322 - 335.4	5350 - 5460	
12.51975 - 12.52025	399.9 - 410	7250 - 7750	
12.57675 - 12.57725	608 - 614	8025 – 8500	

RSS-247 - Section 6.6

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum device, digitally modulated device, or hybrid system is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power – based on either an RF conducted or a radiated measurement – provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under section 6.3.2, the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

6.4.2. Test Method

ANSI C63.10 – 2020, clause 11.11

ANSI C63.10 – 2020, clause 11.12

6.4.3. Test Procedure

Quasi-Peak - Below 1GHz

d) RBW = 120 kHz
e) Detector = Quasi-Peak
f) Sweep time = Auto (Coupled) or sufficient to investigate
g) Trace mode = Max-Hold

Peak measurement - above 1GHz

a) RBW = 1 MHz
b) VBW ≥ [3 × RBW]
c) Detector = Peak
d) Trace mode = Max-Hold
e) Allow sweeps to continue until the trace stabilizes. Note that if the transmission is not continuous, then the time required for the trace to stabilize will increase by a factor of approximately 1 / D, where D is the duty cycle. For example, at 50% duty cycle, the measurement time will increase by a factor of two, relative to measurement time for continuous transmission.

Average measurement - above 1GHz [Method AD]

a) RBW = 1 MHz
b) VBW ≥ [3 × RBW]
c) Detector = Power average (rms)
d) Sweep time = Auto (Coupled) or sufficient to investigate
e) Trace mode = Max-Hold
f) Sweep count = Same or greater than 100
g) If tests are performed with the EUT transmitting at a duty cycle less than 98%, then a correction factor shall be added to the measurement results prior to comparing with the emission limit, to compute the emission level that would have been measured had the test been performed at 100% duty cycle. The correction factor is computed as follows:

   1) If power averaging (rms) mode was used in the preceding step e), then the correction factor is [10 log (1 / D)], where D is the duty cycle. For example, if the transmit duty cycle was 50%, then 3 dB shall be added to the measured emission levels.

6.4.4. Sample Calculation

Where relevant, the following sample calculation is provided:

E(dBµV/m) = Measured Voltage (dBµV) + DCCF (dB) + Antenna Factor (dB/m) + Total Loss [Cable Loss (dB) – Preamplifier Gain (dB)]

E(dBµV/m) = 47.64 dBµV + (- 6.80) dB/m = 40.84 dBµV/m

* DCCF: Duty Cycle Correction Factor

6.4.5. Radiated Spurious Test Results

Plot 6-1 30 MHz to 1 000 MHz Worst case LE 1M SISO ANT1 2440 MHz

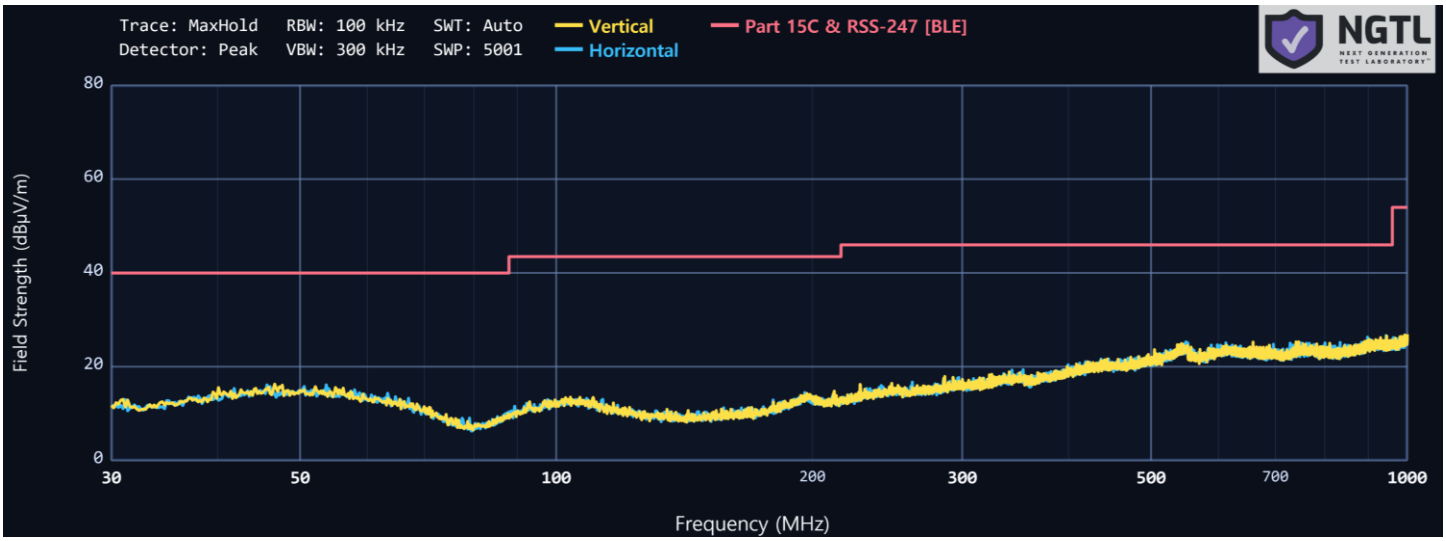


Table 6-1 Radiated Spurious Emissions 30 MHz to 1000 MHz

Test Mode	Tested Frequency [MHz]	Frequency [MHz]	Reading Value [dBµV]	Pol [H/V]	Detector Mode	DCCF [dB]	Ant Factor [dB/m]	Result [dBµV/m]	Limit [dBµV/m]	Margin [dB]
1M	2440	48.85	46.07	H	PK	0.00	-31.30	14.77	40.00	-25.23
		200.53	45.66	V	PK	0.00	-28.40	17.26	43.50	-26.24
		532.68	49.86	V	PK	0.00	-26.45	23.41	43.50	-20.09