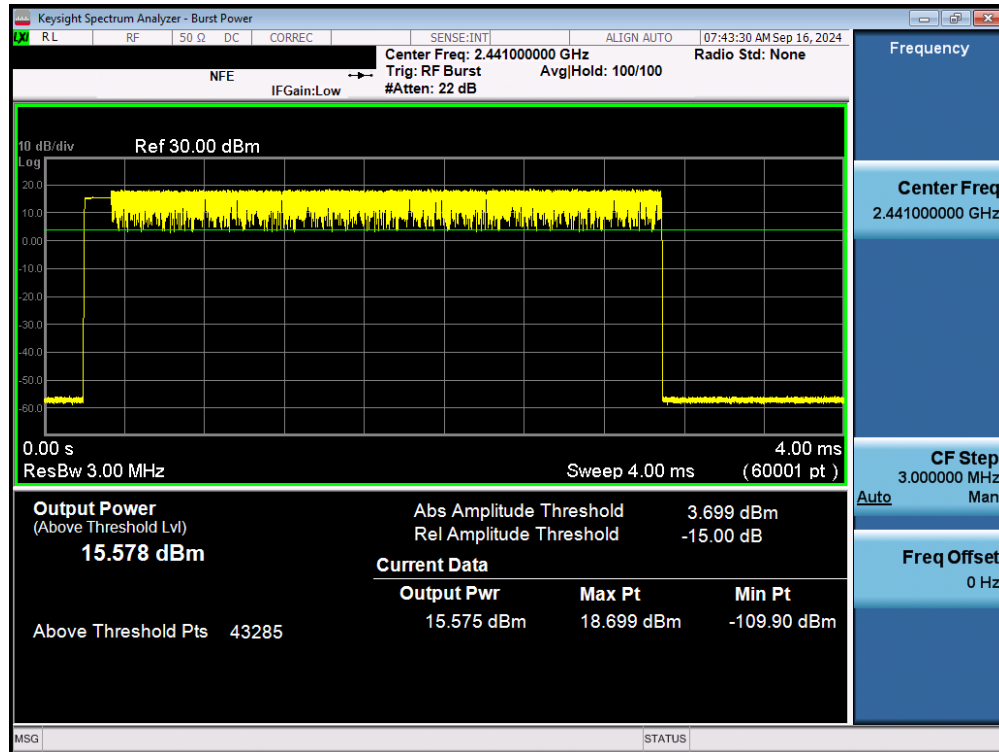
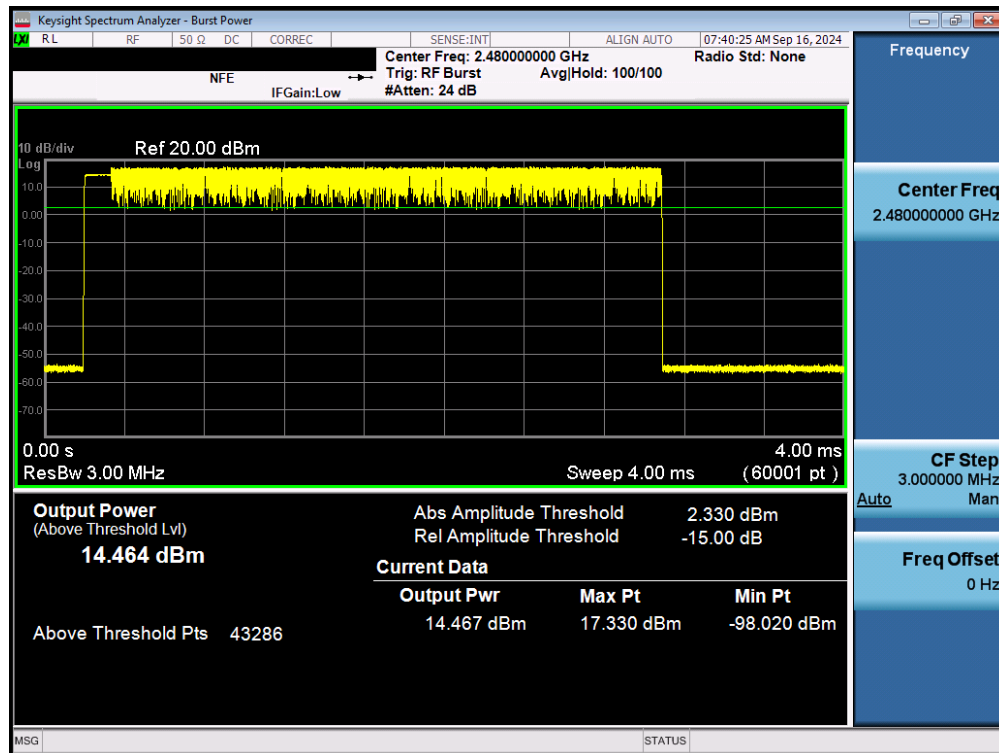


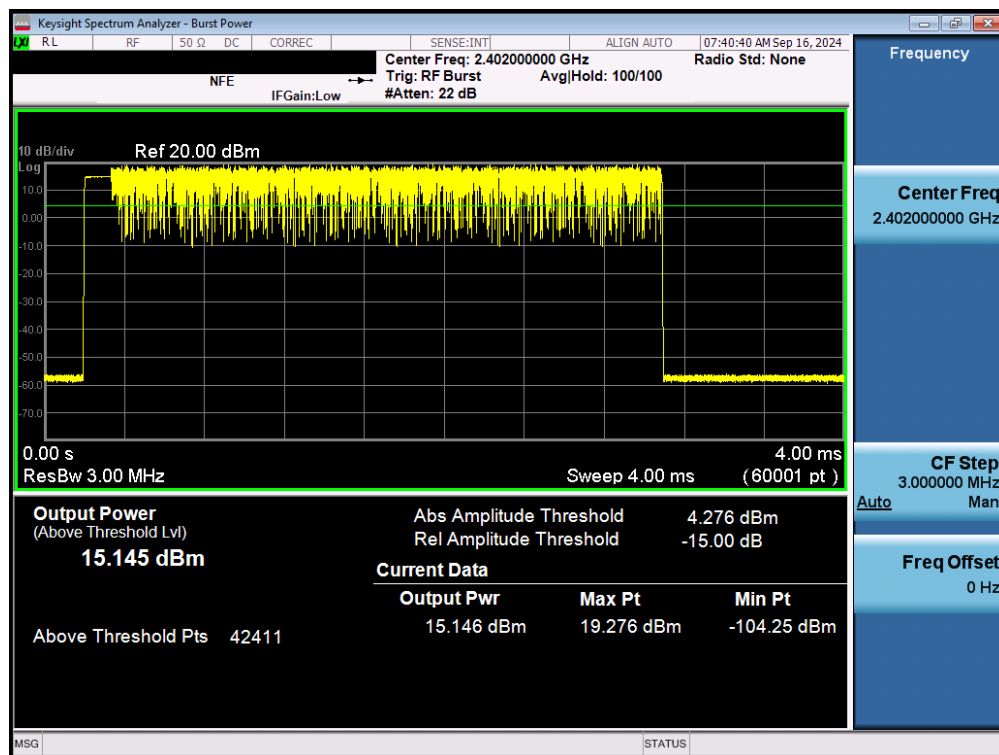


Plot 7-70. Average Conducted Power (2Mbps – Ch. 39) – Ant 2

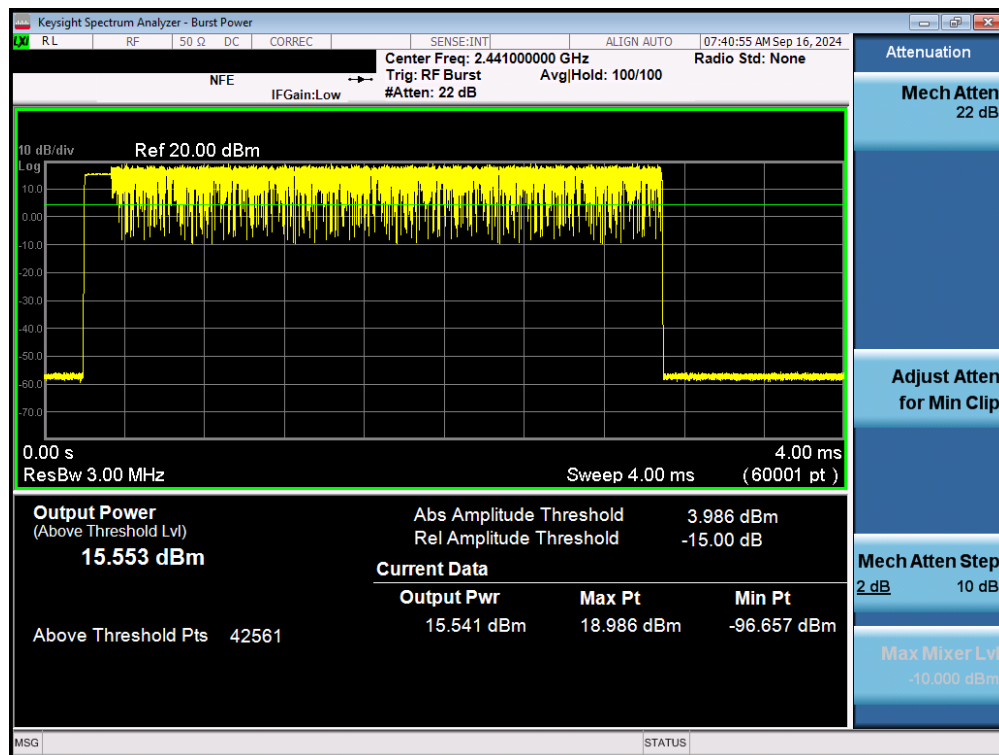


Plot 7-71. Average Conducted Power (2Mbps – Ch. 78) – Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 53 of 142

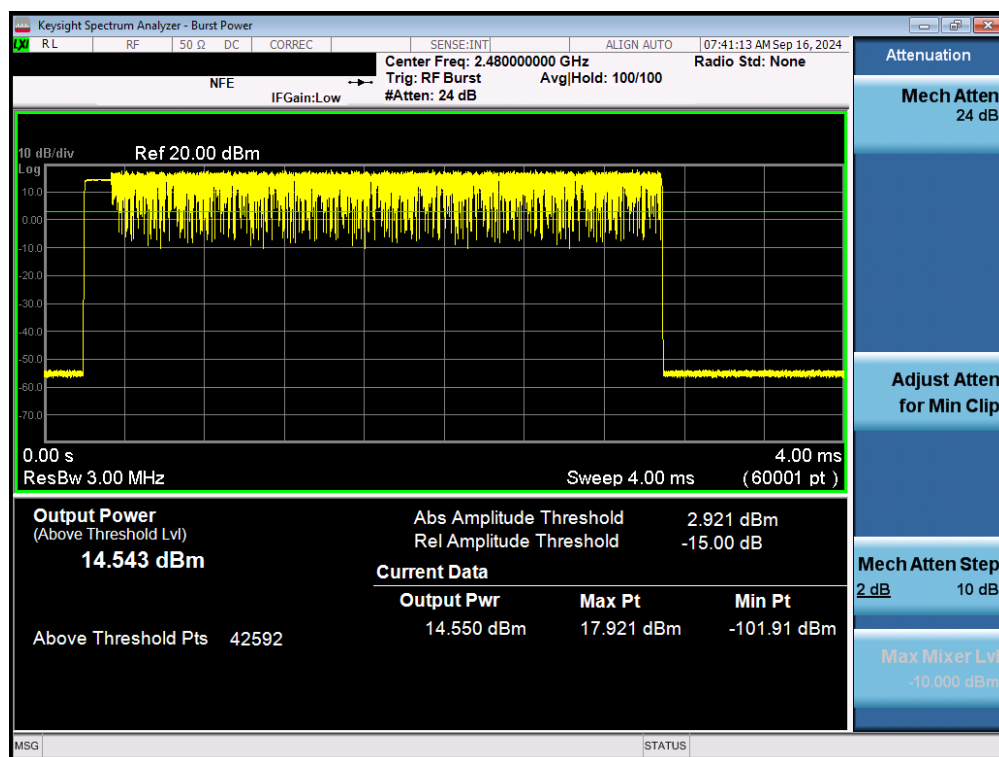


Plot 7-72. Average Conducted Power (3Mbps – Ch. 0) – Ant 2



Plot 7-73. Average Conducted Power (3Mbps – Ch. 39) – Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 54 of 142

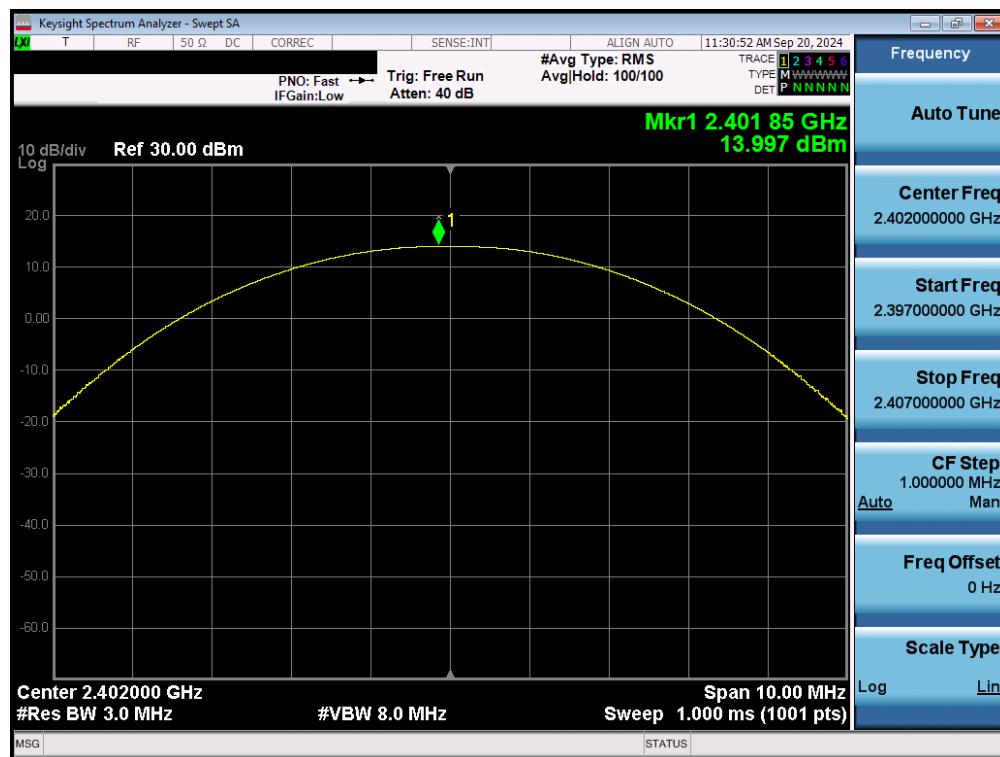


Plot 7-74. Average Conducted Power (3Mbps – Ch. 78) – Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 55 of 142

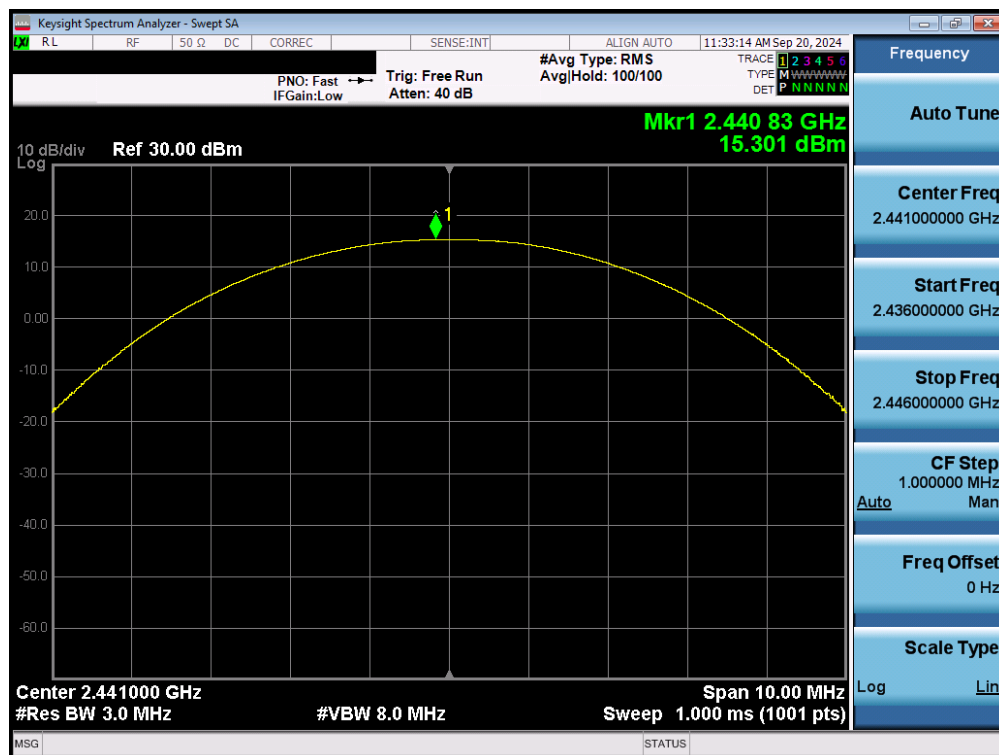
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	ANT1 Peak Conducted Power		ANT1 Avg Conducted Power		ANT2 Peak Conducted Power		ANT2 Avg Conducted Power		Dual Peak Conducted Power		Dual Avg Conducted Power	
				[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]
2402	1.0	GFSK	0	14.00	25.102	13.80	23.991	14.28	26.792	14.14	25.956	17.15	51.893	16.99	49.947
2441	1.0	GFSK	39	15.30	33.892	15.15	32.756	14.44	27.765	14.33	27.087	17.90	61.657	17.77	59.843
2480	1.0	GFSK	78	15.16	32.787	14.50	28.186	13.92	24.643	13.89	24.497	17.59	57.430	17.22	52.683
2402	2.0	$\pi/4$ -QPSK	0	13.55	22.626	10.94	12.415	13.21	20.960	11.25	13.348	16.39	43.586	14.11	25.762
2441	2.0	$\pi/4$ -QPSK	39	14.58	28.714	12.27	16.865	13.65	23.185	11.66	14.652	17.15	51.899	14.99	31.517
2480	2.0	$\pi/4$ -QPSK	78	13.68	23.356	11.69	14.750	12.89	19.454	10.91	12.342	16.32	42.810	14.33	27.091
2402	3.0	8DPSK	0	13.76	23.763	10.90	12.296	13.44	22.075	11.05	12.728	16.61	45.838	13.98	25.024
2441	3.0	8DPSK	39	14.86	30.627	12.32	17.059	13.84	24.205	11.70	14.783	17.39	54.831	15.03	31.841
2480	3.0	8DPSK	78	14.35	27.252	11.75	14.966	13.13	20.554	10.80	12.031	16.79	47.806	14.31	26.997

Table 7-11. Conducted Output Power Measurements – Dual

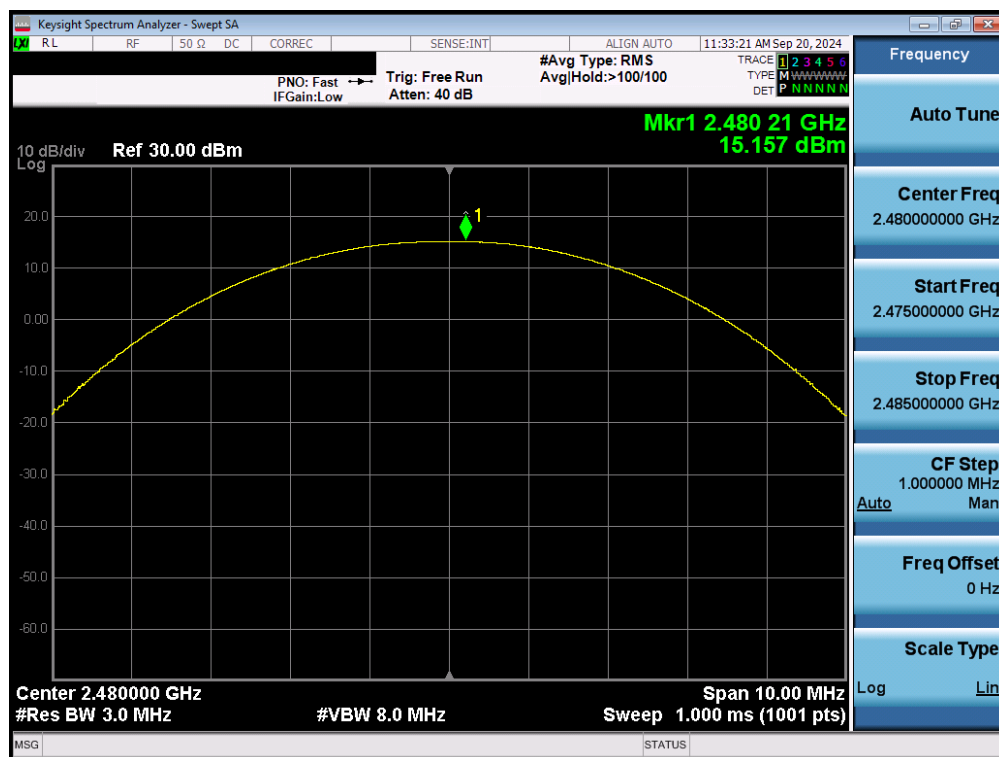


Plot 7-75. Peak Conducted Power (1Mbps – Ch. 0) – Dual Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 56 of 142

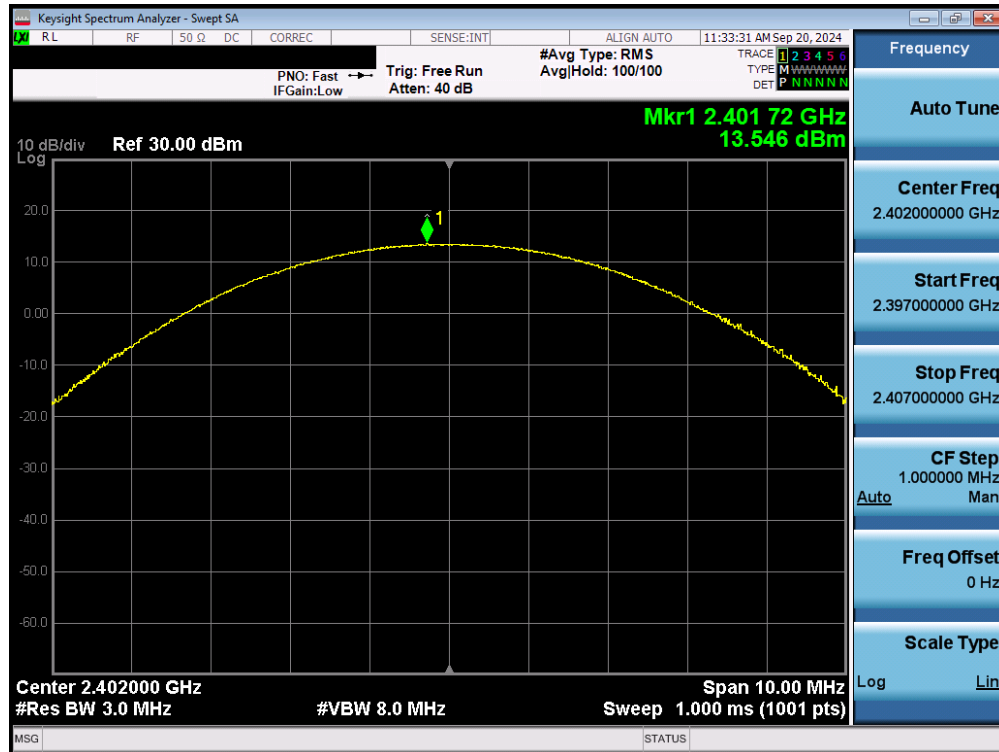


Plot 7-76. Peak Conducted Power (1Mbps – Ch. 39) – Dual Ant 1

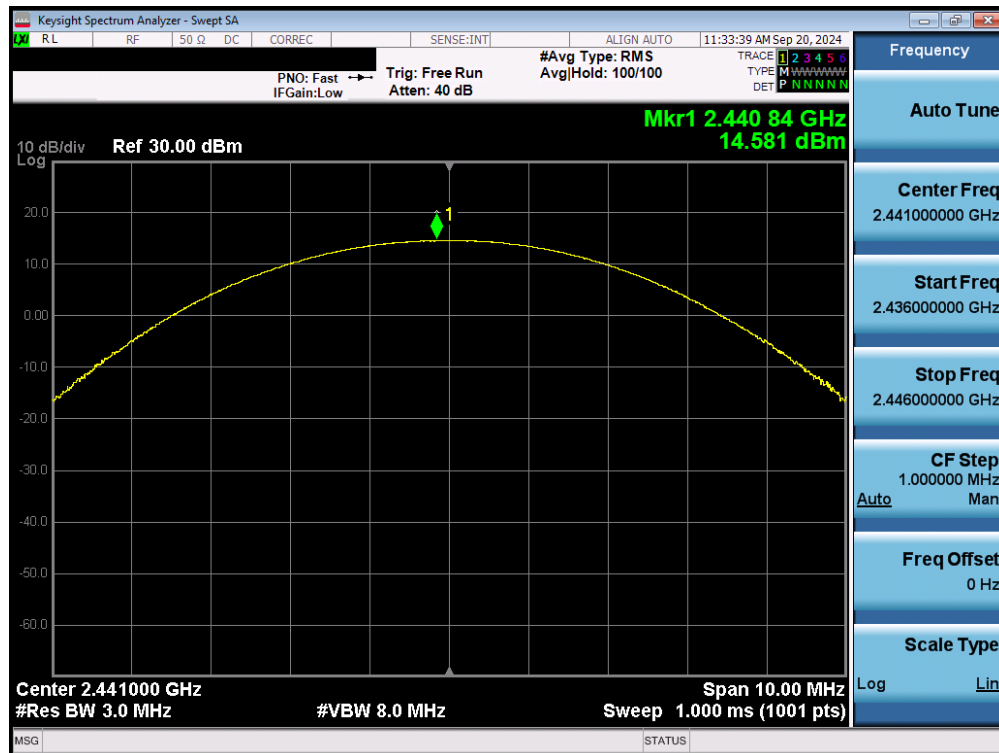


Plot 7-77. Peak Conducted Power (1Mbps – Ch. 78) – Dual Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 57 of 142

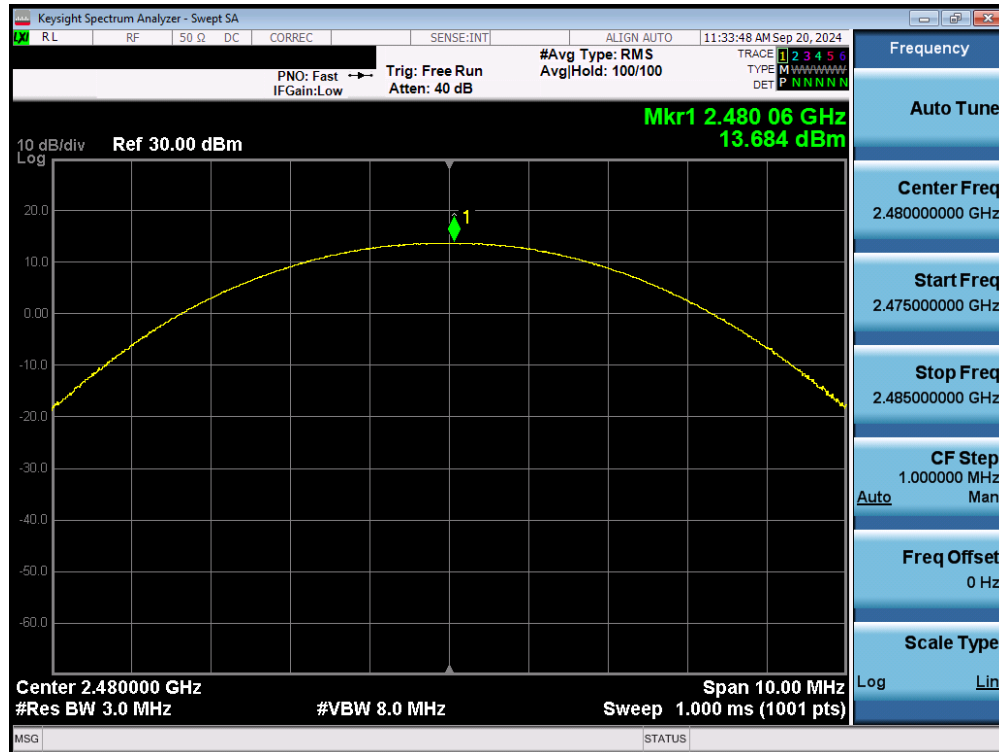


Plot 7-78. Peak Conducted Power (2Mbps – Ch. 0) – Dual Ant 1

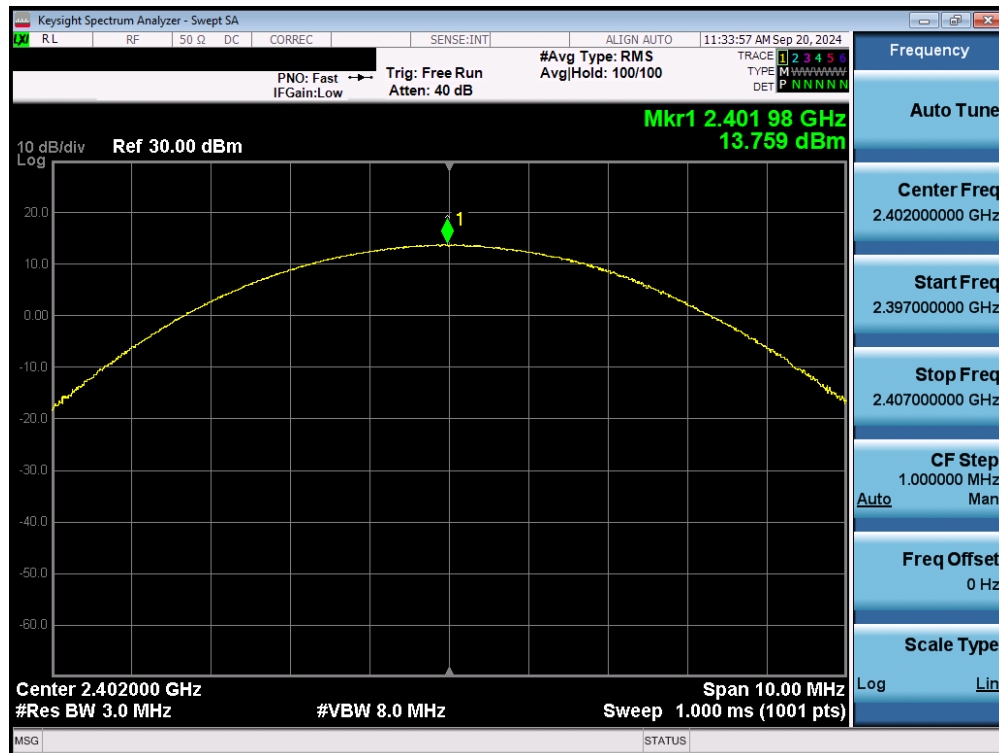


Plot 7-79. Peak Conducted Power (2Mbps – Ch. 39) – Dual Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 58 of 142

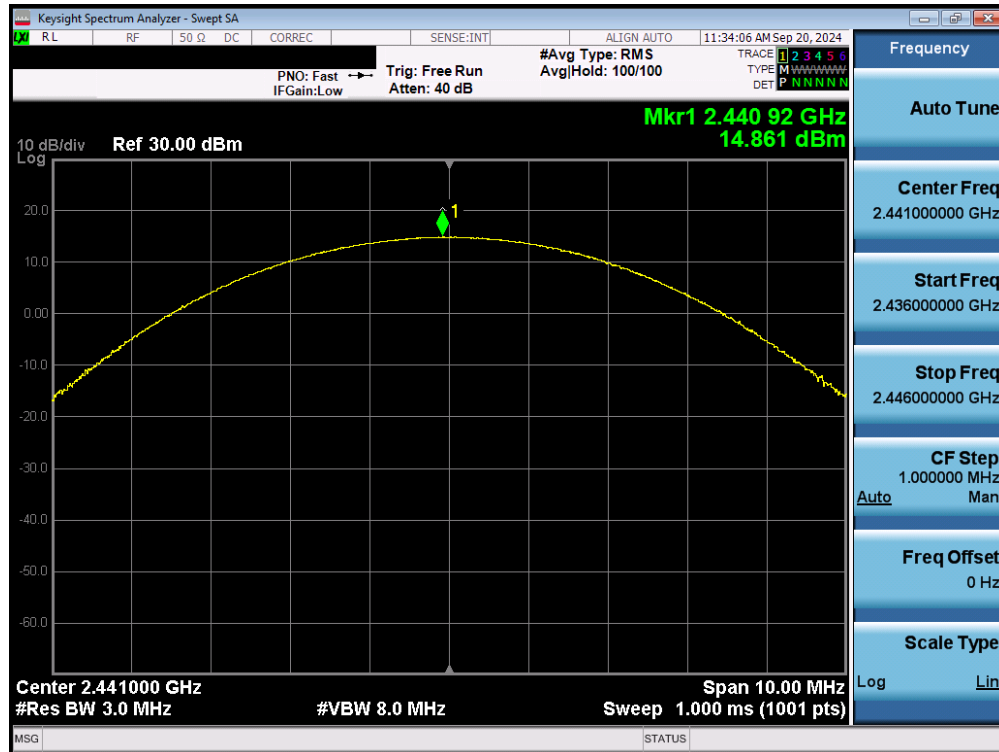


Plot 7-80. Peak Conducted Power (2Mbps – Ch. 78) – Dual Ant 1

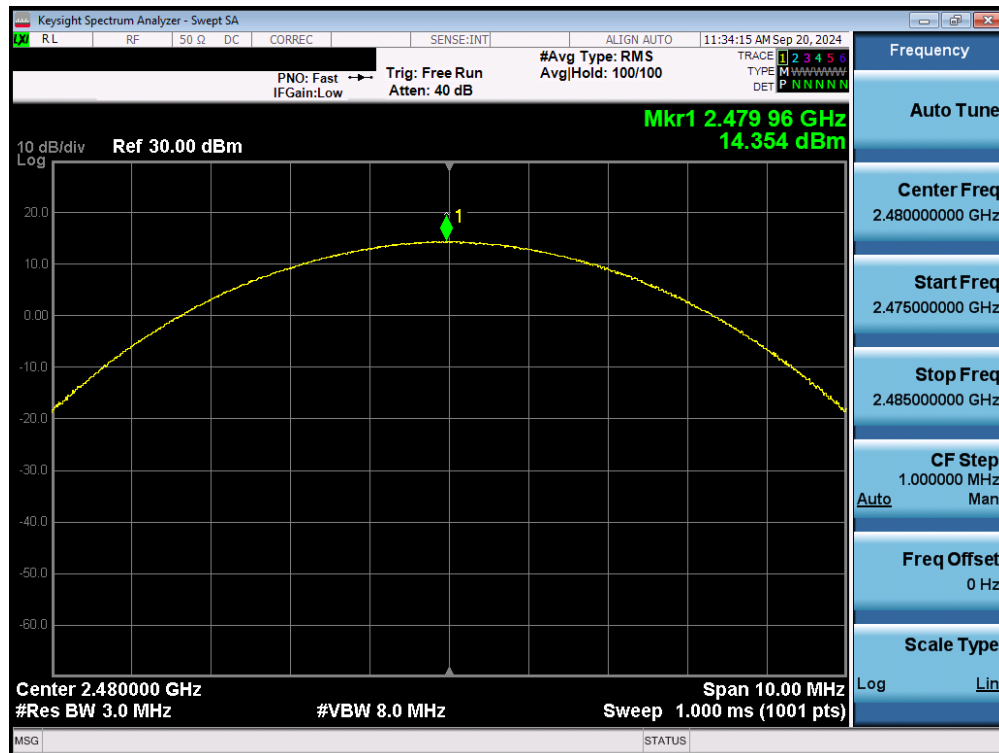


Plot 7-81. Peak Conducted Power (3Mbps – Ch. 0) – Dual Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 59 of 142

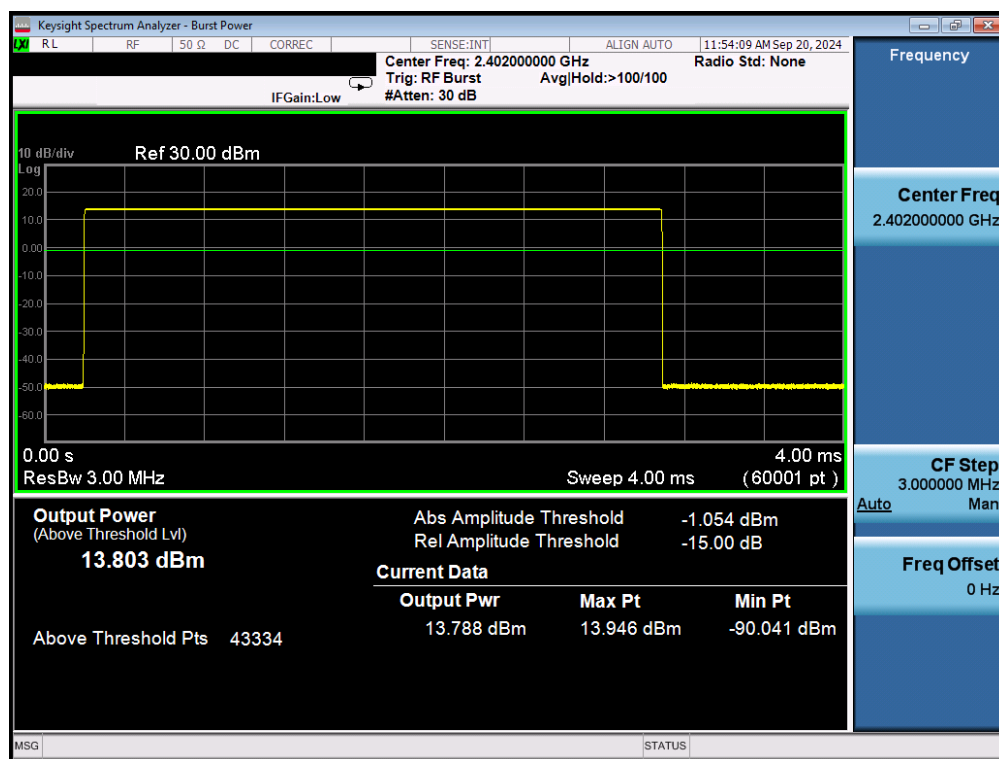


Plot 7-82. Peak Conducted Power (3Mbps – Ch. 39) – Dual Ant 1

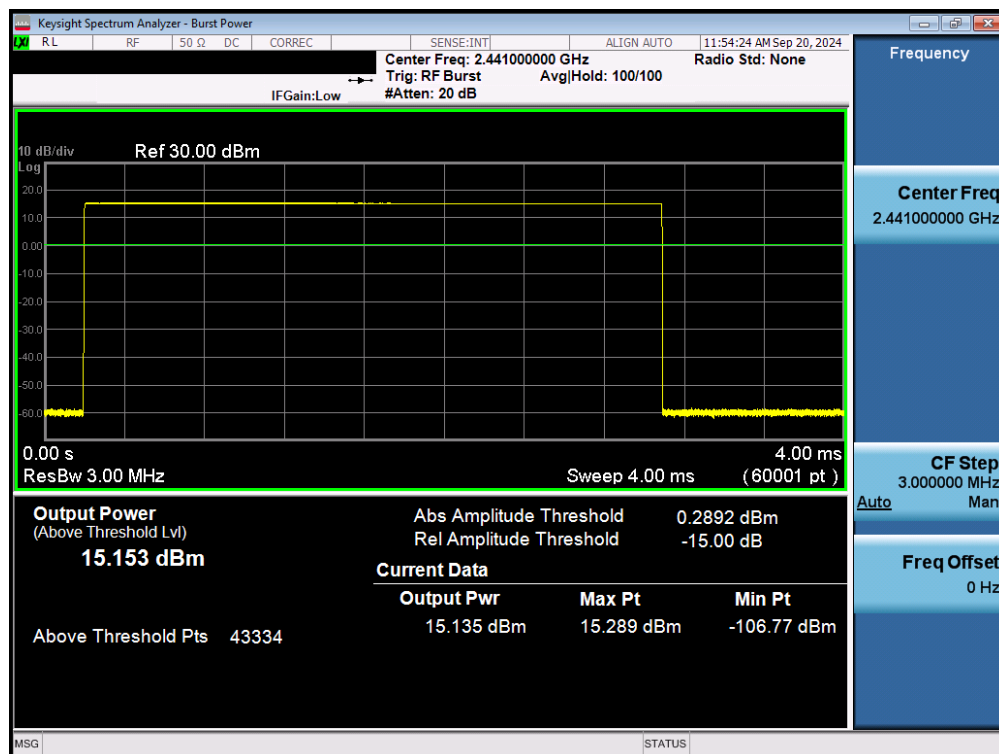


Plot 7-83. Peak Conducted Power (3Mbps – Ch. 78) – Dual Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 60 of 142

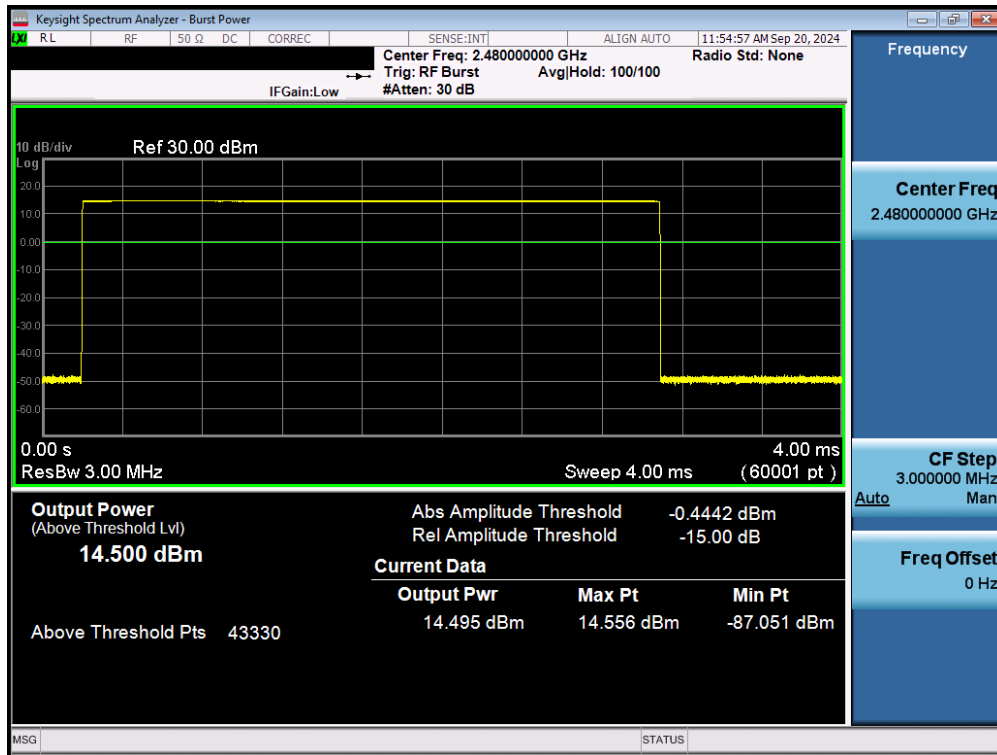


Plot 7-84. Average Conducted Power (1Mbps – Ch. 0) – Dual Ant 1

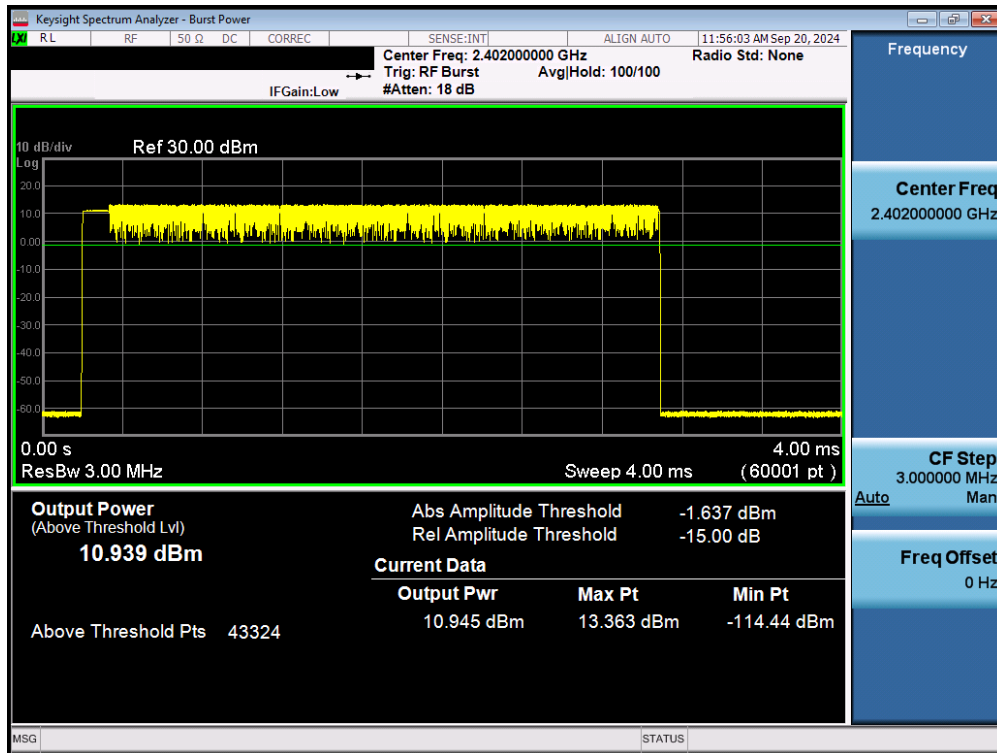


Plot 7-85. Average Conducted Power (1Mbps – Ch. 39) – Dual Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 61 of 142

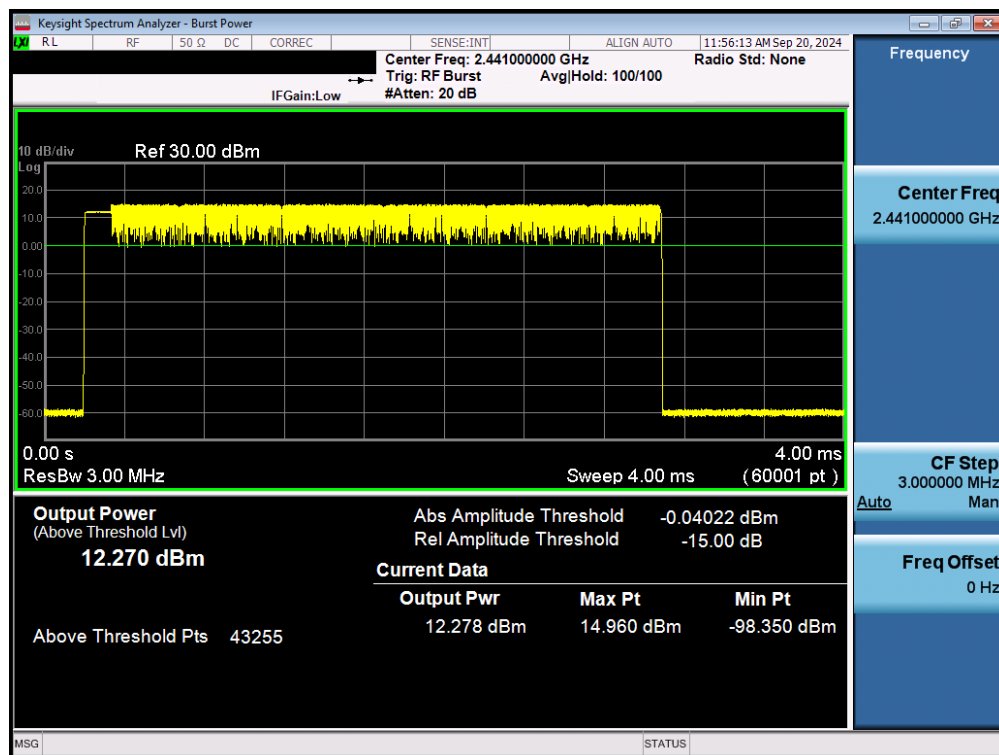


Plot 7-86. Average Conducted Power (1Mbps – Ch. 78) – Dual Ant 1

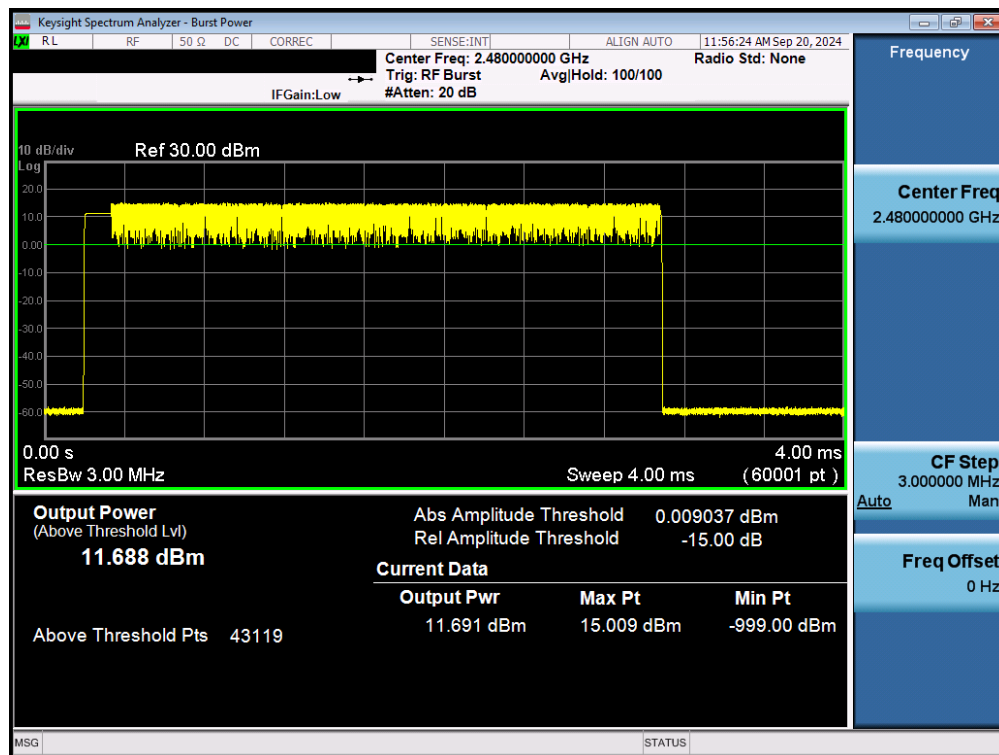


Plot 7-87. Average Conducted Power (2Mbps – Ch. 0) – Dual Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 62 of 142

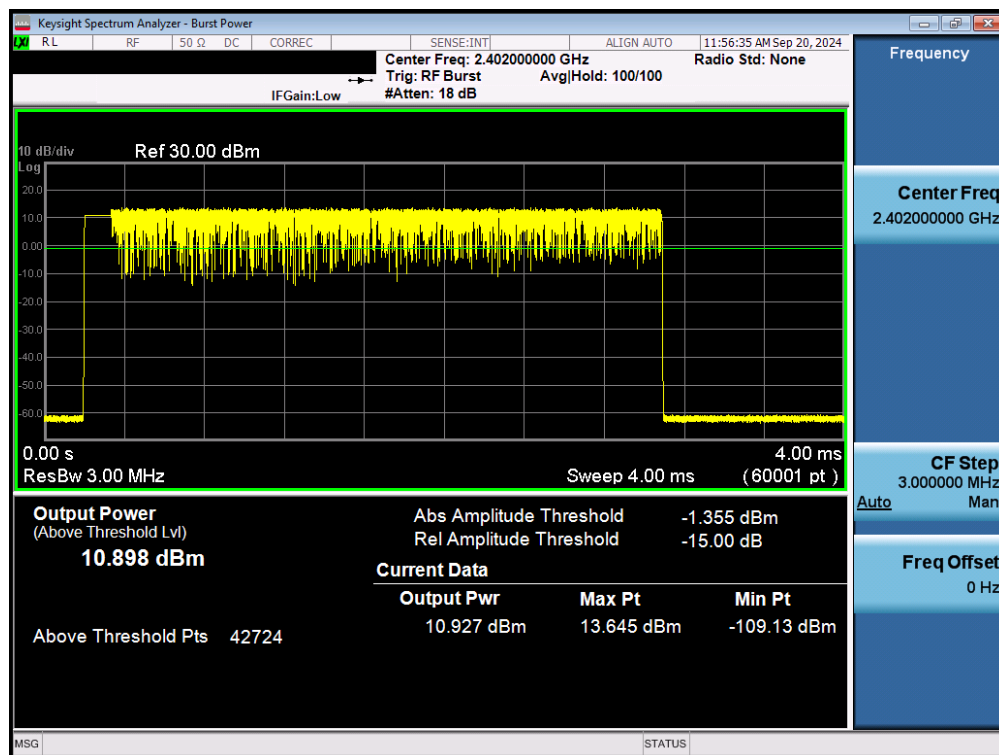


Plot 7-88. Average Conducted Power (2Mbps – Ch. 39) – Dual Ant 1

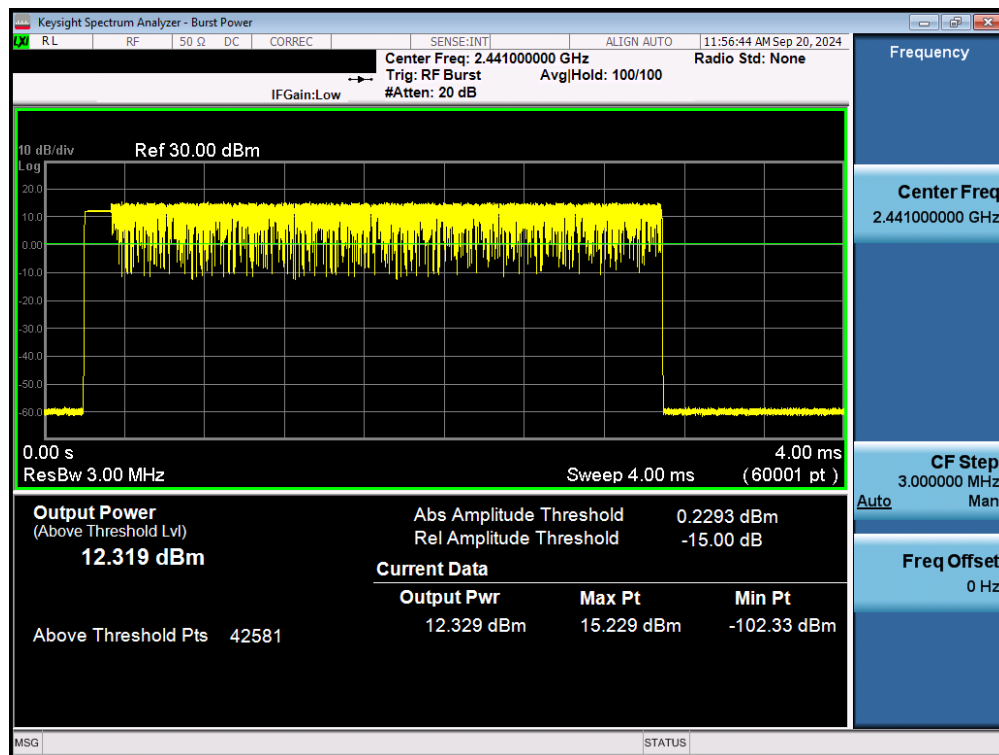


Plot 7-89. Average Conducted Power (2Mbps – Ch. 78) – Dual Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 63 of 142

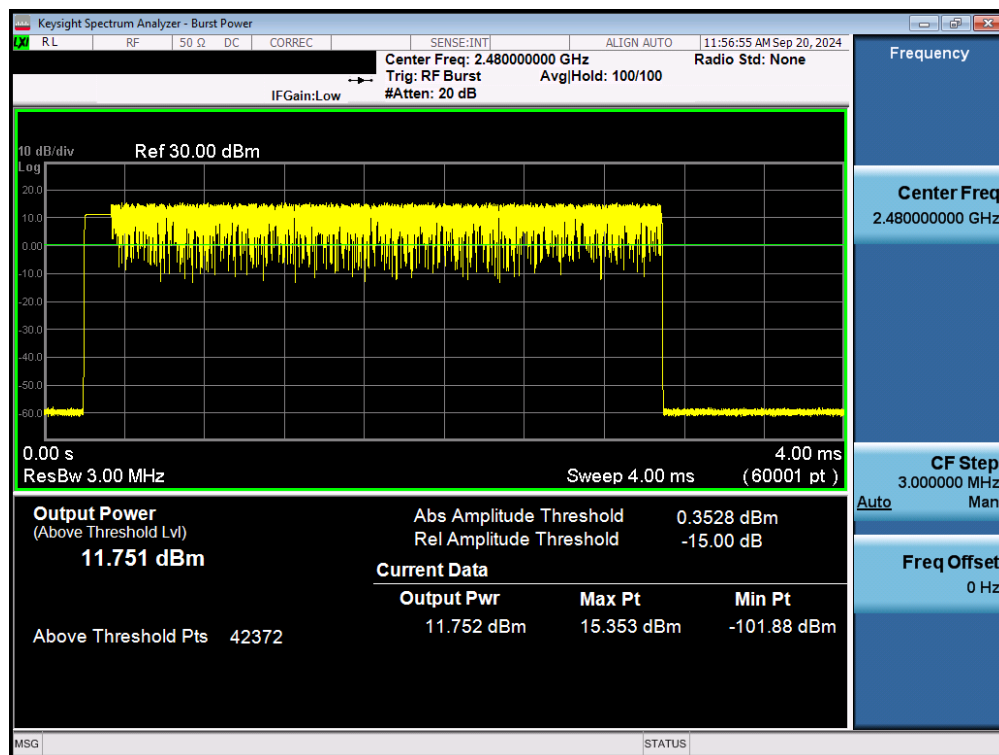


Plot 7-90. Average Conducted Power (3Mbps – Ch. 0) – Dual Ant 1

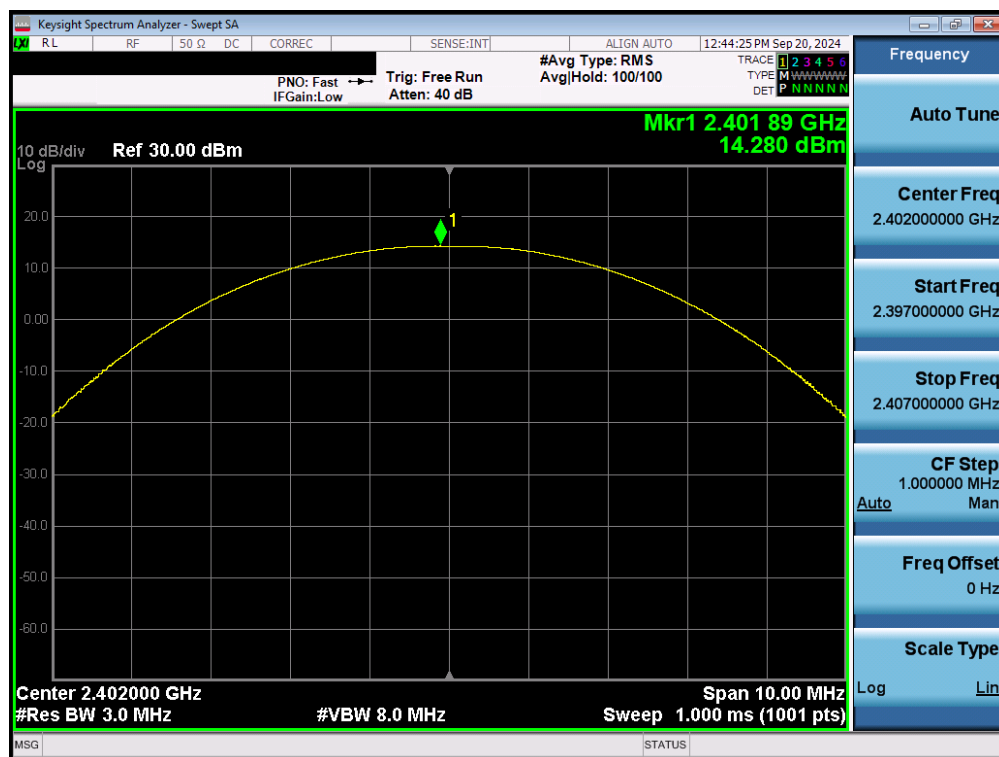


Plot 7-91. Average Conducted Power (3Mbps – Ch. 39) – Dual Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 64 of 142

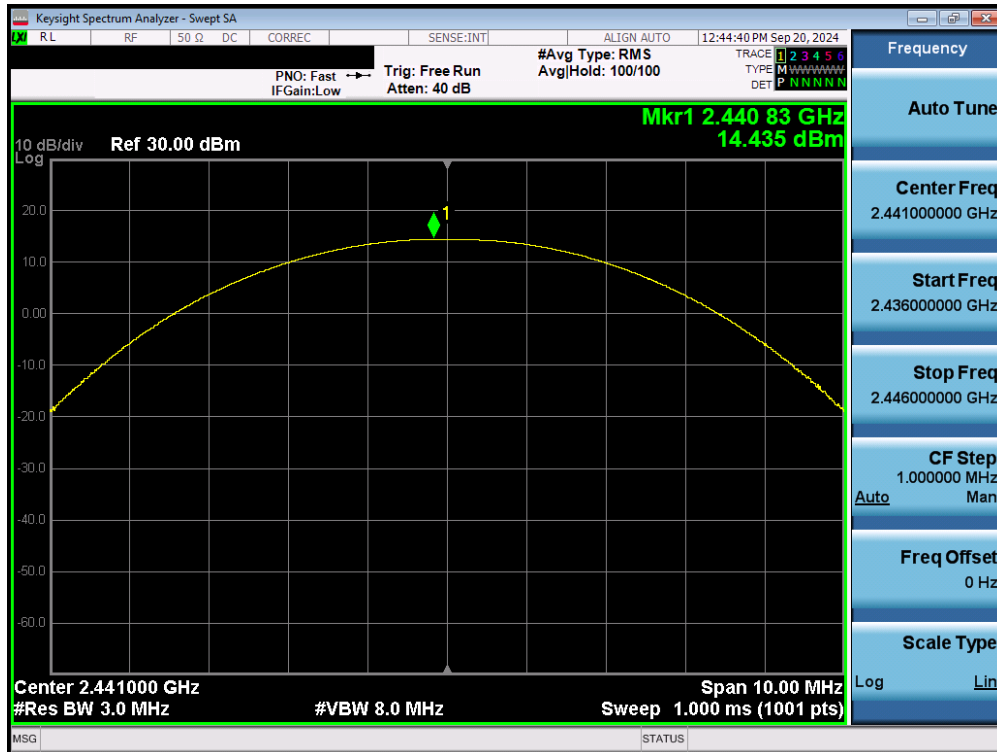


Plot 7-92. Average Conducted Power (3Mbps – Ch. 78) – Dual Ant 1

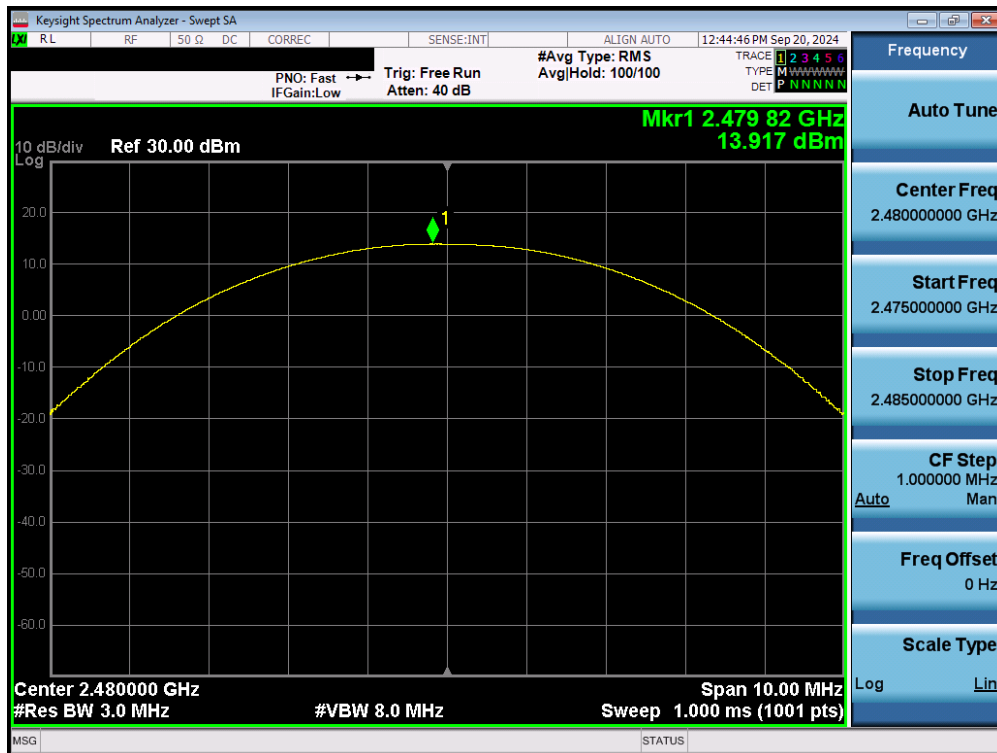


Plot 7-93. Peak Conducted Power (1Mbps – Ch. 0) – Dual Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 65 of 142

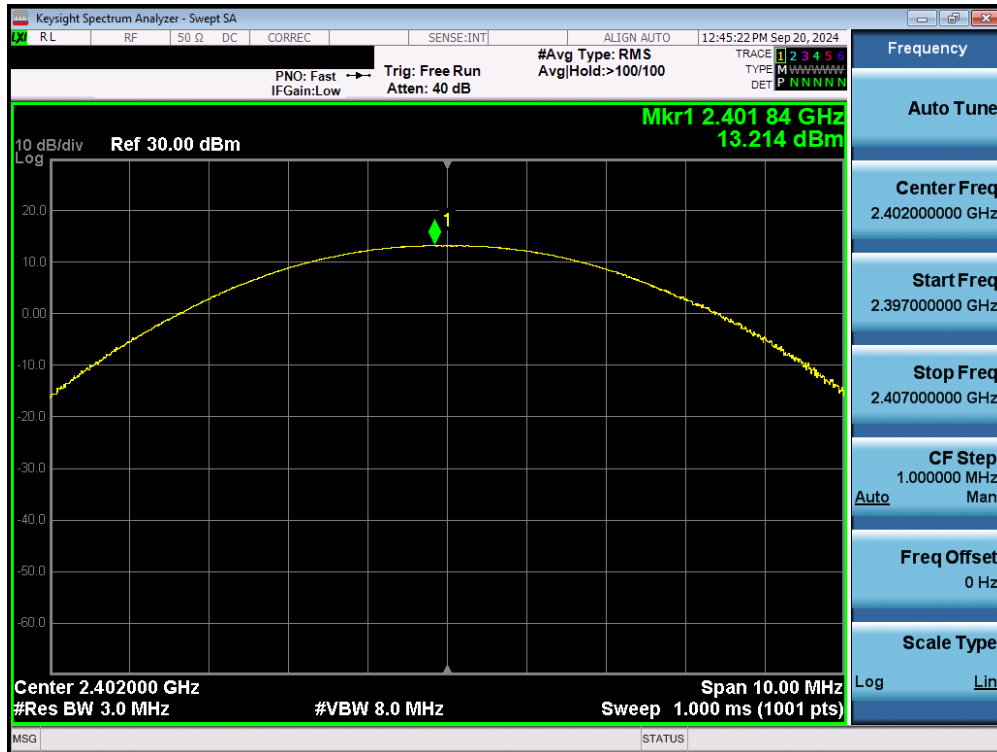


Plot 7-94. Peak Conducted Power (1Mbps – Ch. 39) – Dual Ant 2

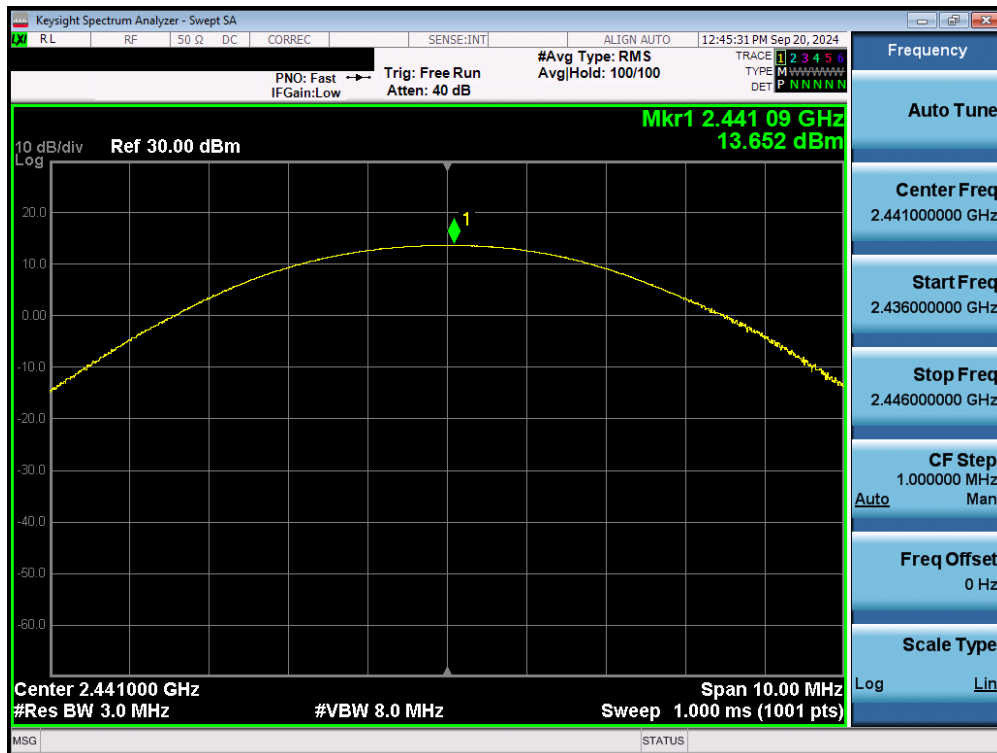


Plot 7-95. Peak Conducted Power (1Mbps – Ch. 78) – Dual Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 66 of 142

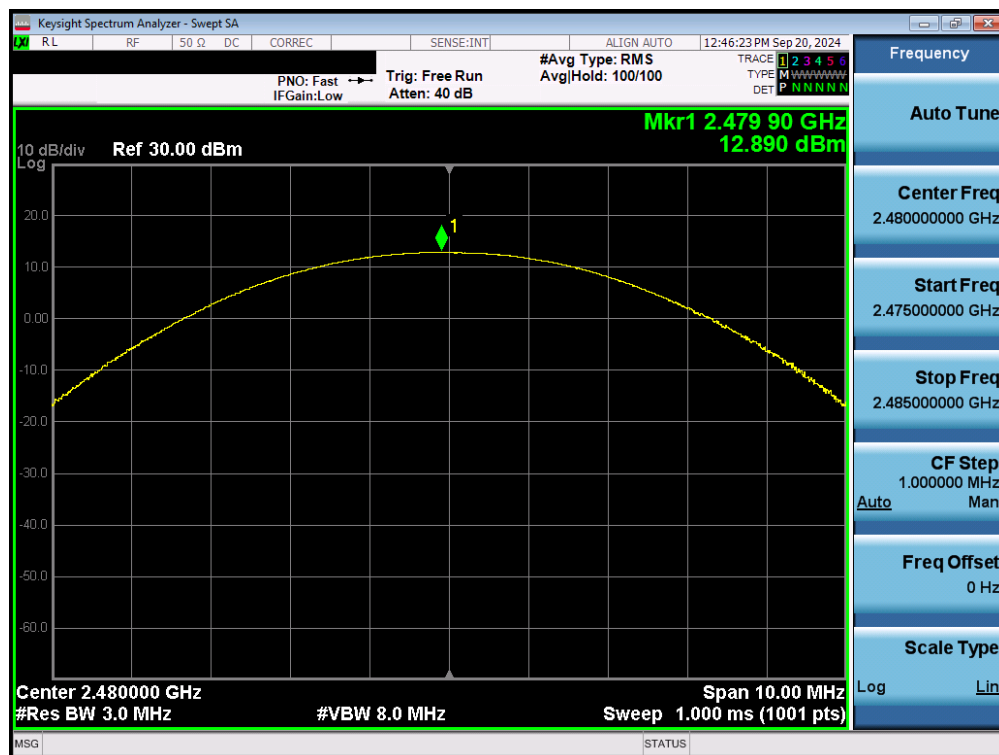


Plot 7-96. Peak Conducted Power (2Mbps – Ch. 0) – Dual Ant 2

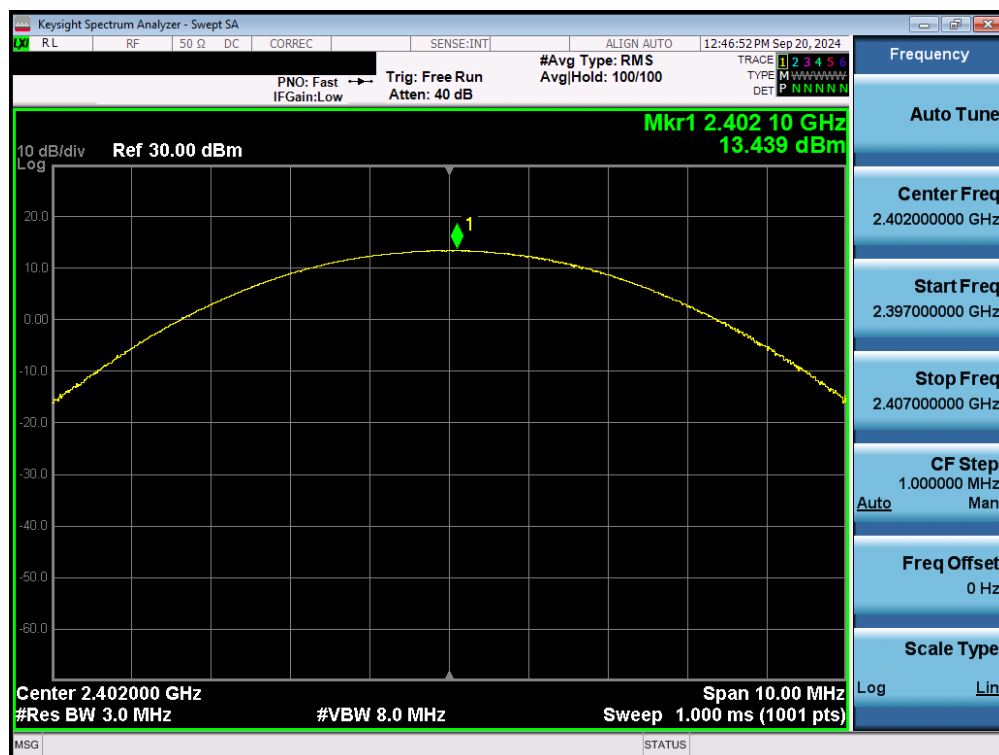


Plot 7-97. Peak Conducted Power (2Mbps – Ch. 39) – Dual Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 67 of 142

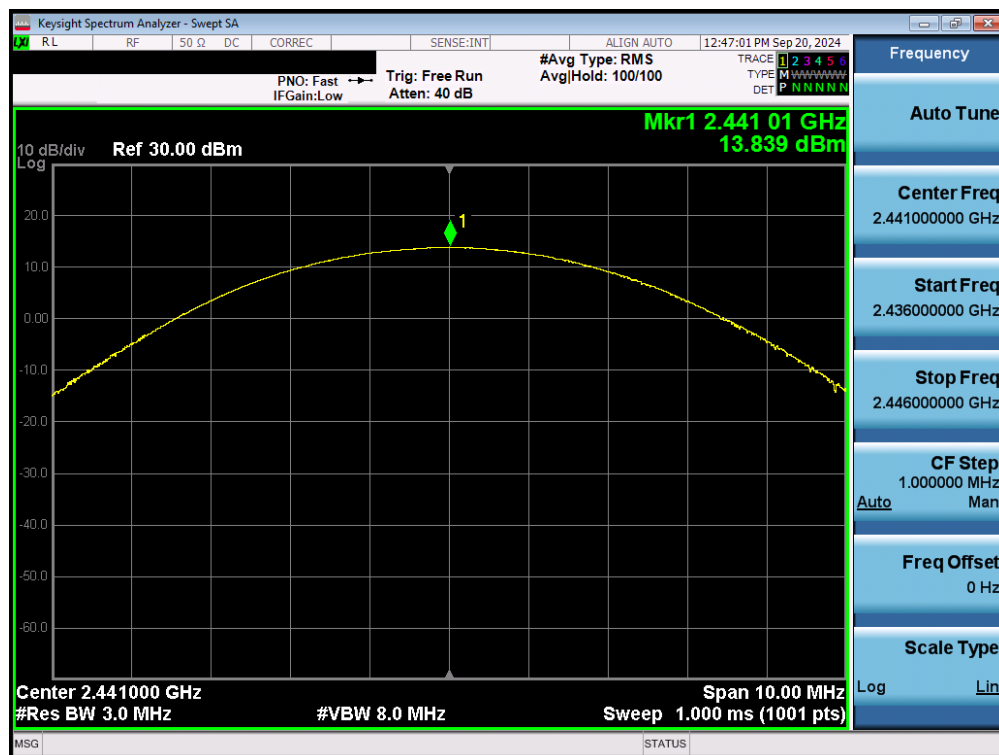


Plot 7-98. Peak Conducted Power (2Mbps – Ch. 78) – Dual Ant 2

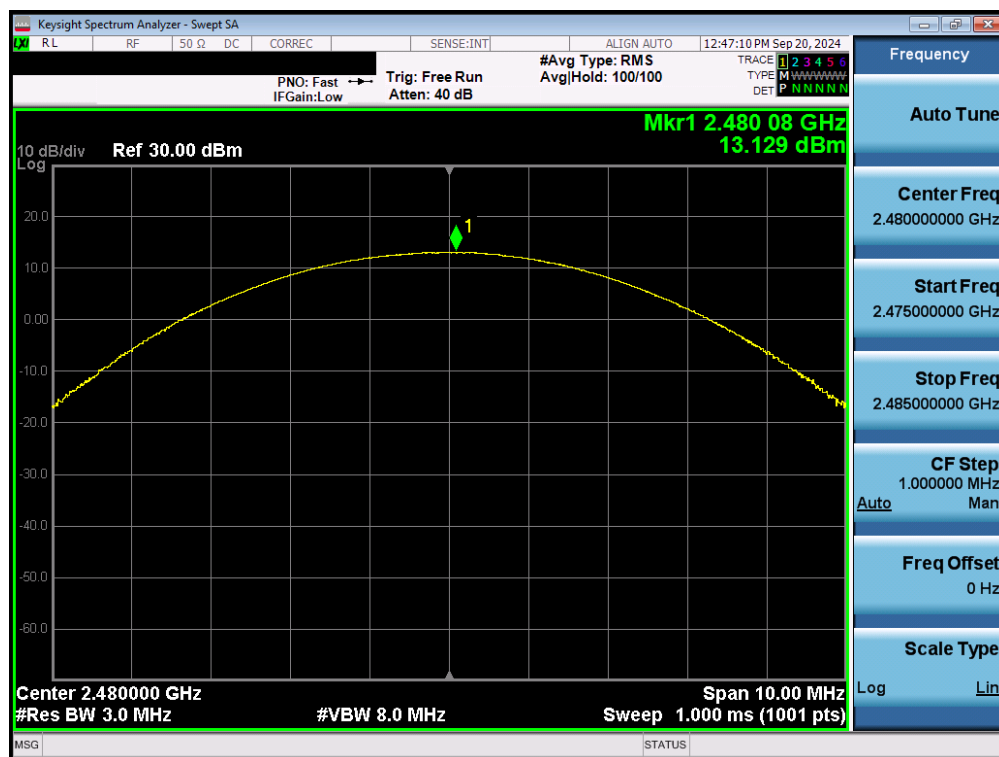


Plot 7-99. Peak Conducted Power (3Mbps – Ch. 0) – Dual Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 68 of 142

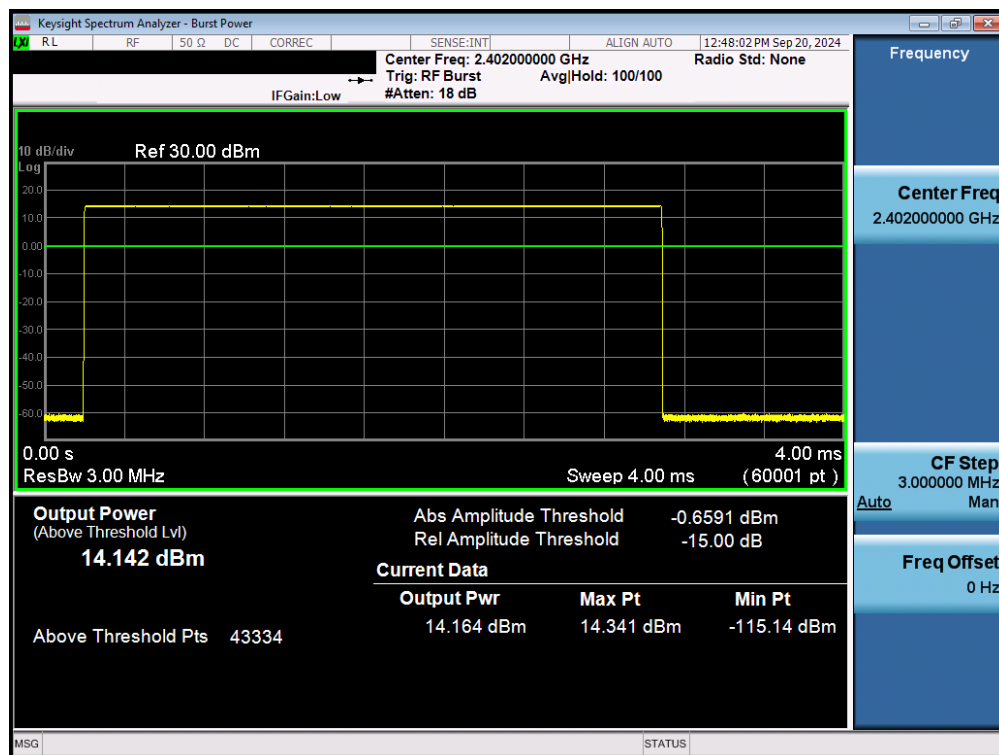


Plot 7-100. Peak Conducted Power (3Mbps - Ch. 39) - Dual Ant 2

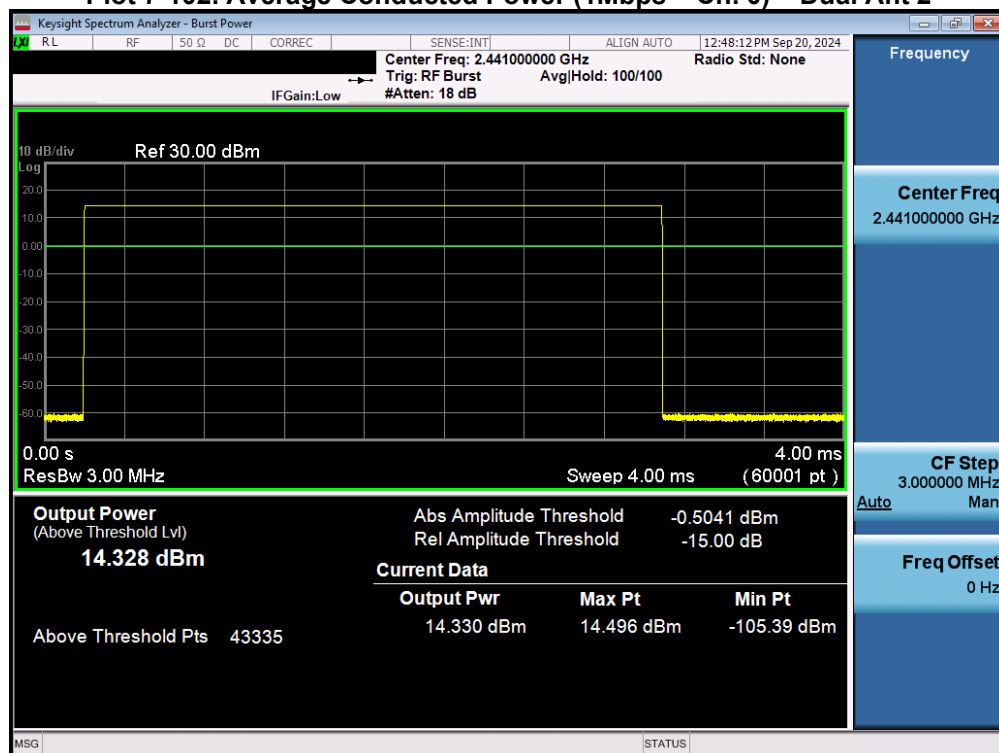


Plot 7-101. Peak Conducted Power (3Mbps - Ch. 78) - Dual Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 69 of 142

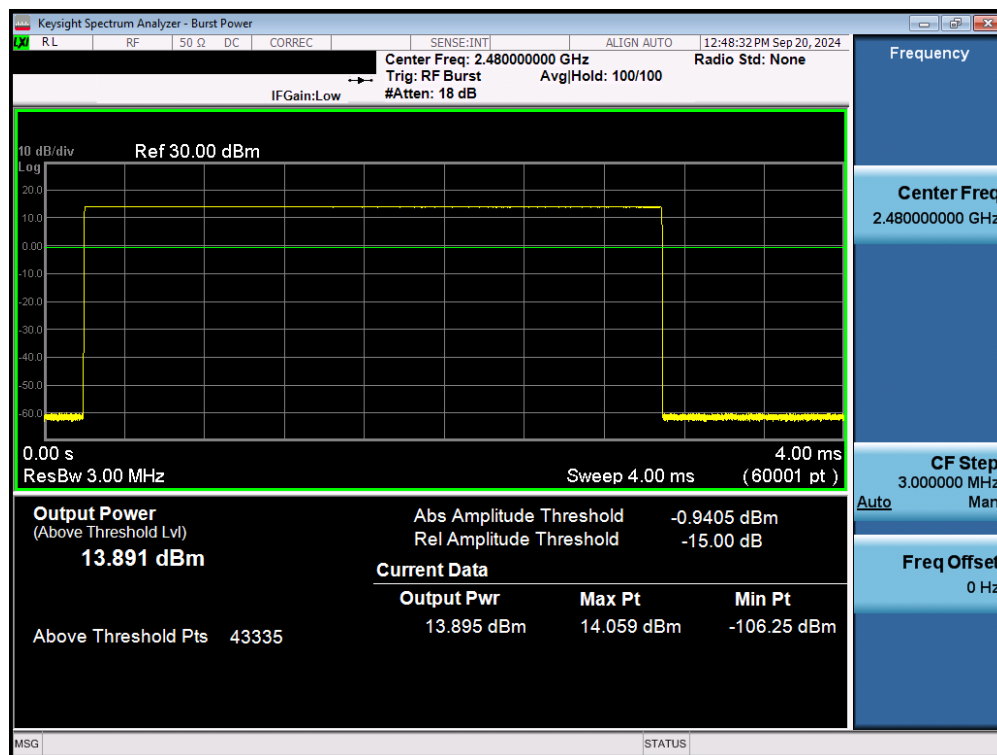


Plot 7-102. Average Conducted Power (1Mbps – Ch. 0) – Dual Ant 2

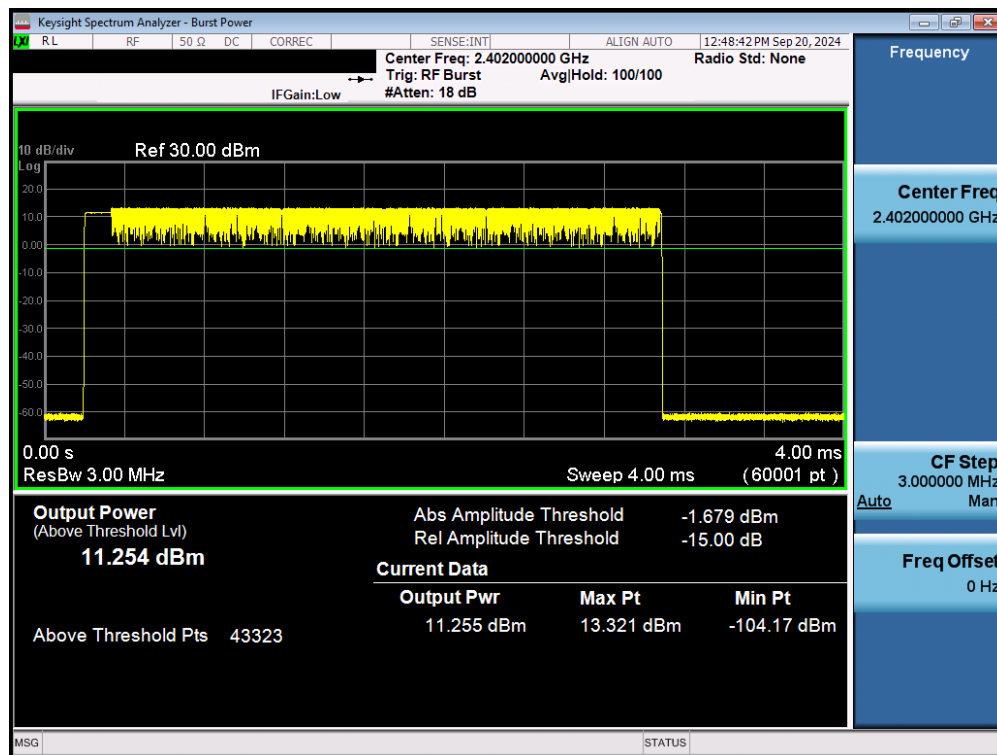


Plot 7-103. Average Conducted Power (1Mbps – Ch. 39) – Dual Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 70 of 142

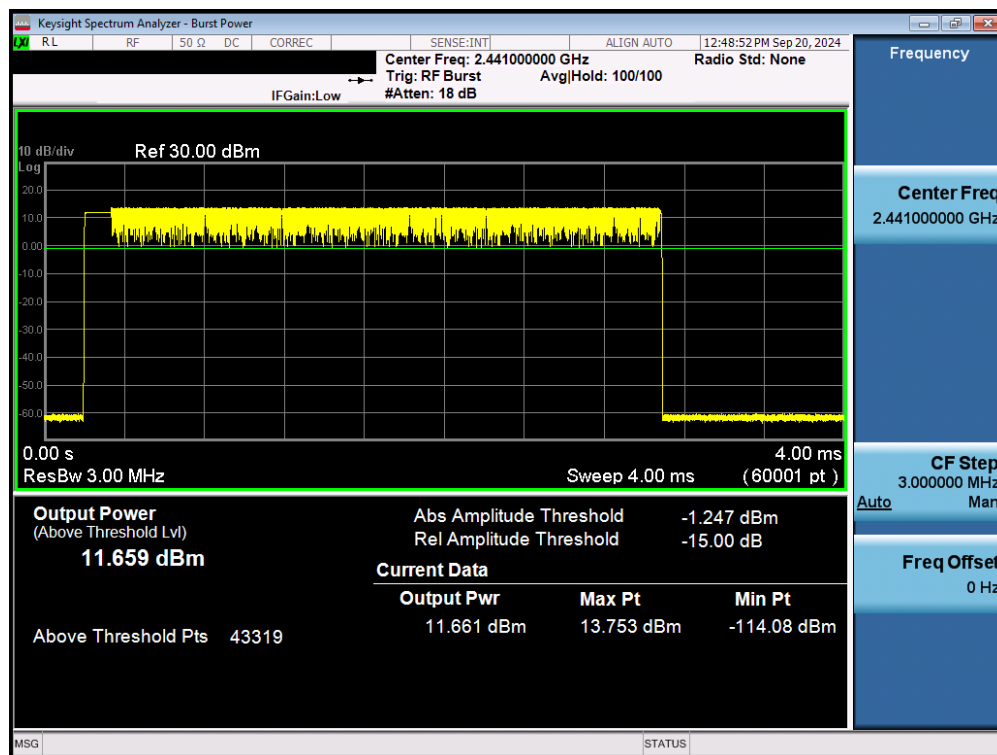


Plot 7-104. Average Conducted Power (1Mbps – Ch. 78) – Dual Ant 2

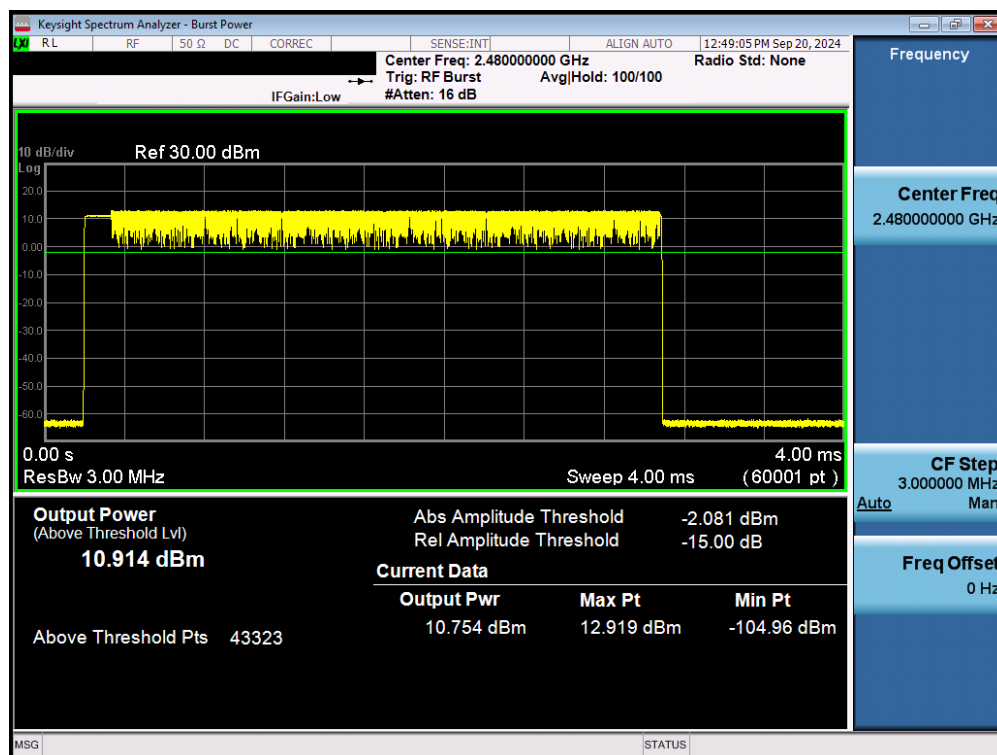


Plot 7-105. Average Conducted Power (2Mbps – Ch. 0) – Dual Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 71 of 142

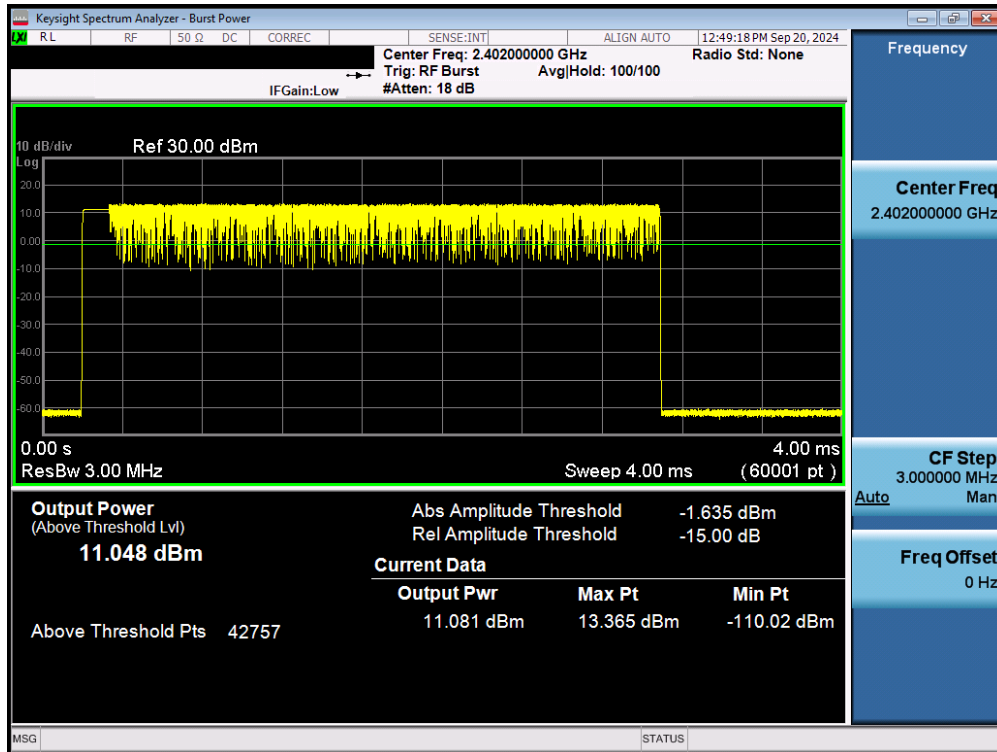


Plot 7-106. Average Conducted Power (2Mbps – Ch. 39) – Dual Ant 2

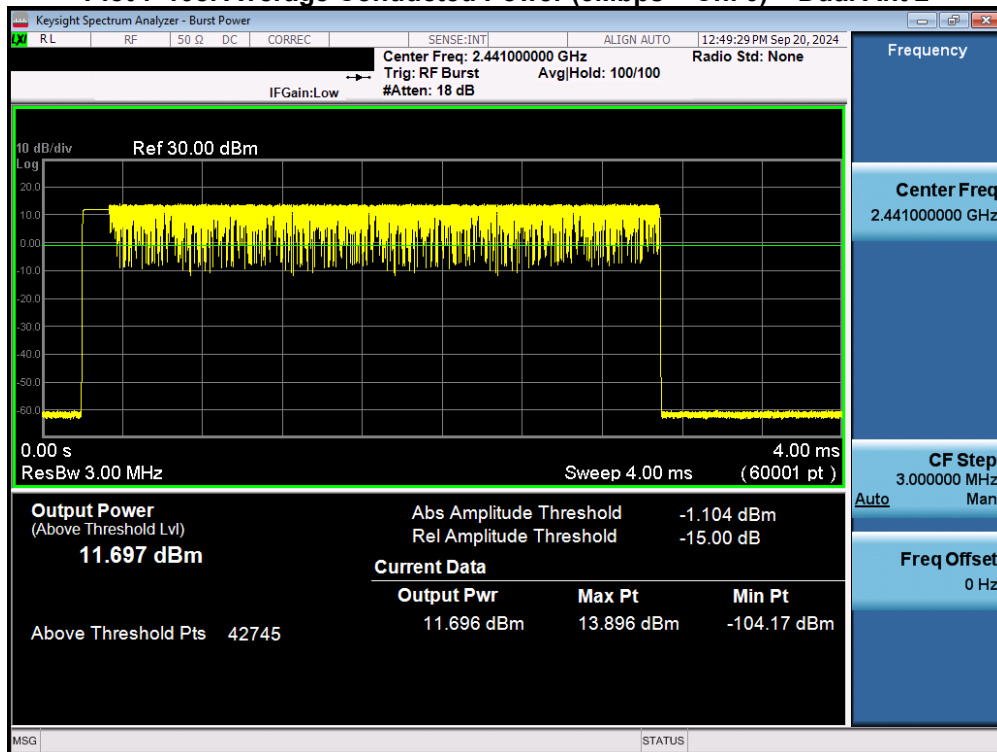


Plot 7-107. Average Conducted Power (2Mbps – Ch. 78) – Dual Ant 2

FCC ID: A3LSMS938JPN		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset		Page 72 of 142

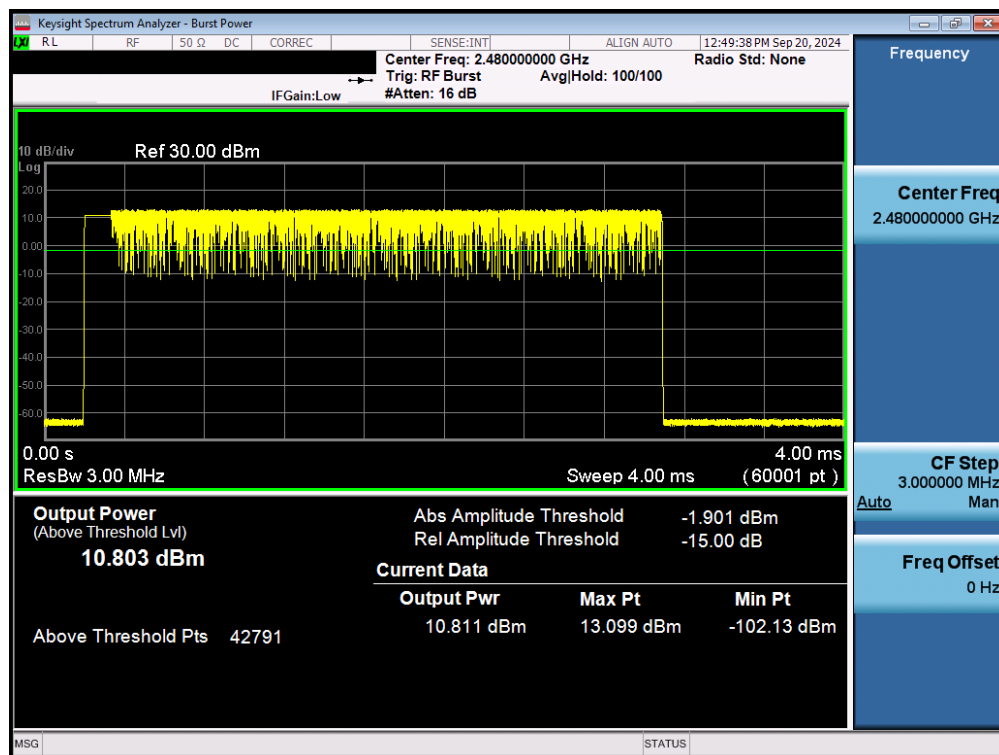


Plot 7-108. Average Conducted Power (3Mbps – Ch. 0) – Dual Ant 2



Plot 7-109. Average Conducted Power (3Mbps – Ch. 39) – Dual Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 73 of 142



Plot 7-110. Average Conducted Power (3Mbps - Ch. 78) - Dual Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 74 of 142

7.4 Band Edge Compliance

§15.247 (d); RSS-247 [5.5]

Test Overview and Limits

EUT operates in hopping and non-hopping transmission mode. Measurement is taken at the highest point located outside of the emission bandwidth. **The maximum permissible out-of-band emission level is 20 dBc.**

Test Procedure Used

ANSI C63.10-2013 – Section 6.10.4

Test Settings

1. Start and stop frequency were set such that the band edge would be placed in the center of the plot
2. Span was set large enough so as to capture all out of band emissions near the band edge
3. RBW = 100kHz
4. VBW = 300kHz
5. Detector = Peak
6. Number of sweep points $\geq 2 \times \text{Span/RBW}$
7. Trace mode = max hold
8. Sweep time = auto couple
9. The trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

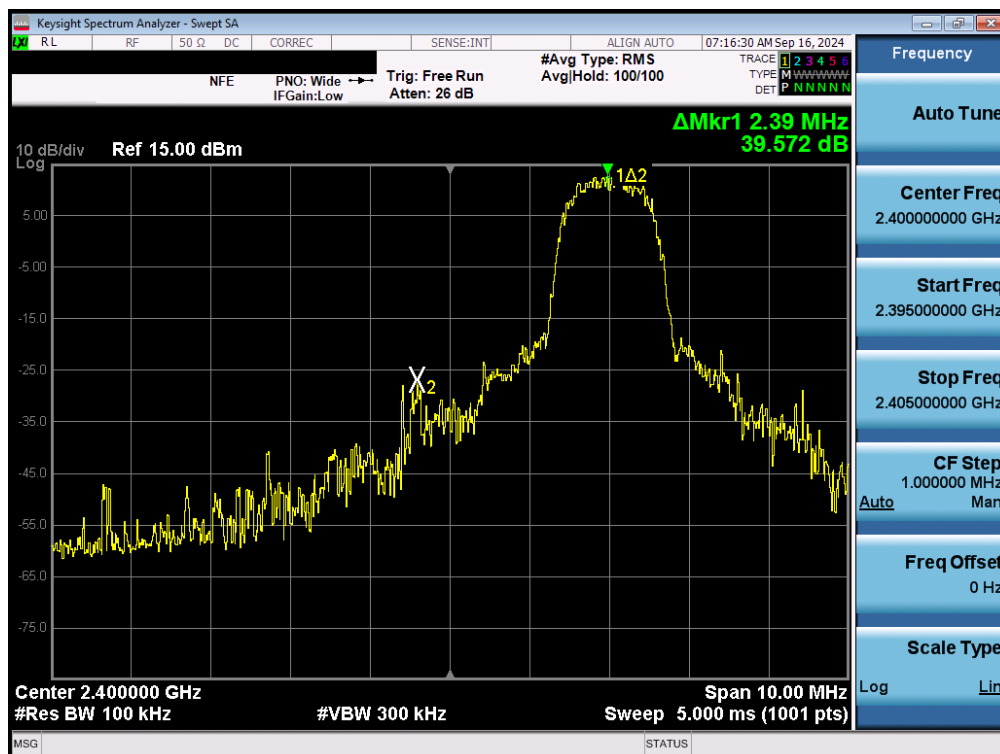


Figure 7-3. Test Instrument & Measurement Setup

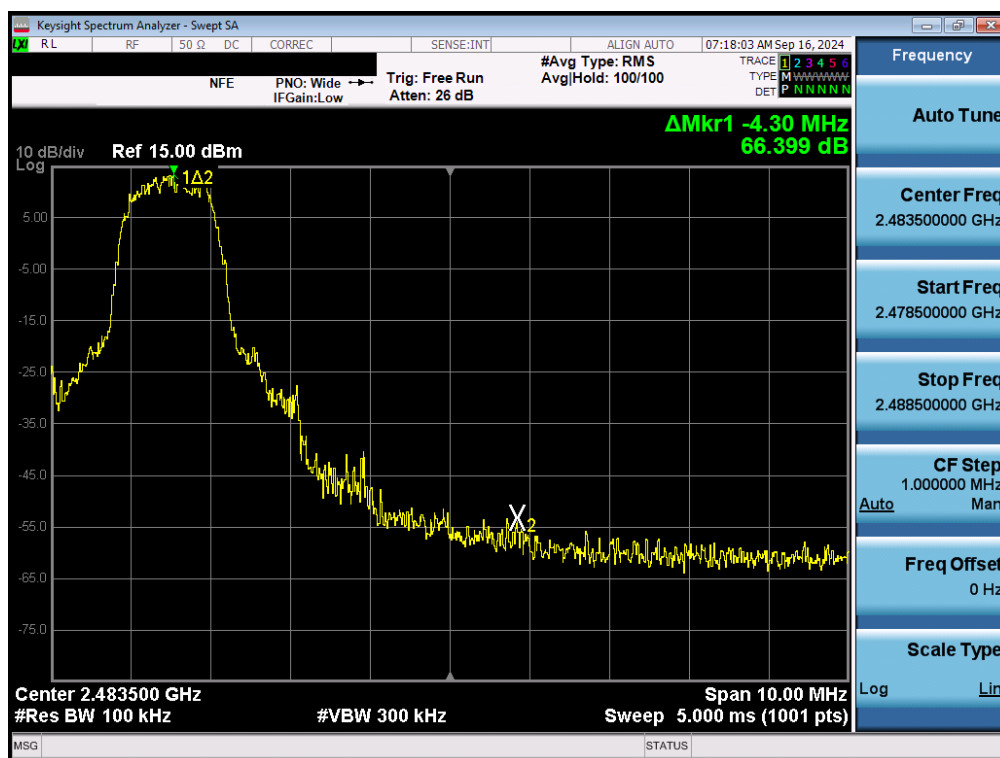
Test Notes

Out of band conducted spurious emissions at the band edge were investigated for all data rates in hopping and non-hopping modes. The worst case emissions were found with the EUT transmitting at 3 Mbps. Band edge emissions were also investigated with the EUT transmitting in all data rates. Plots of the worst case emissions are shown below.

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 75 of 142

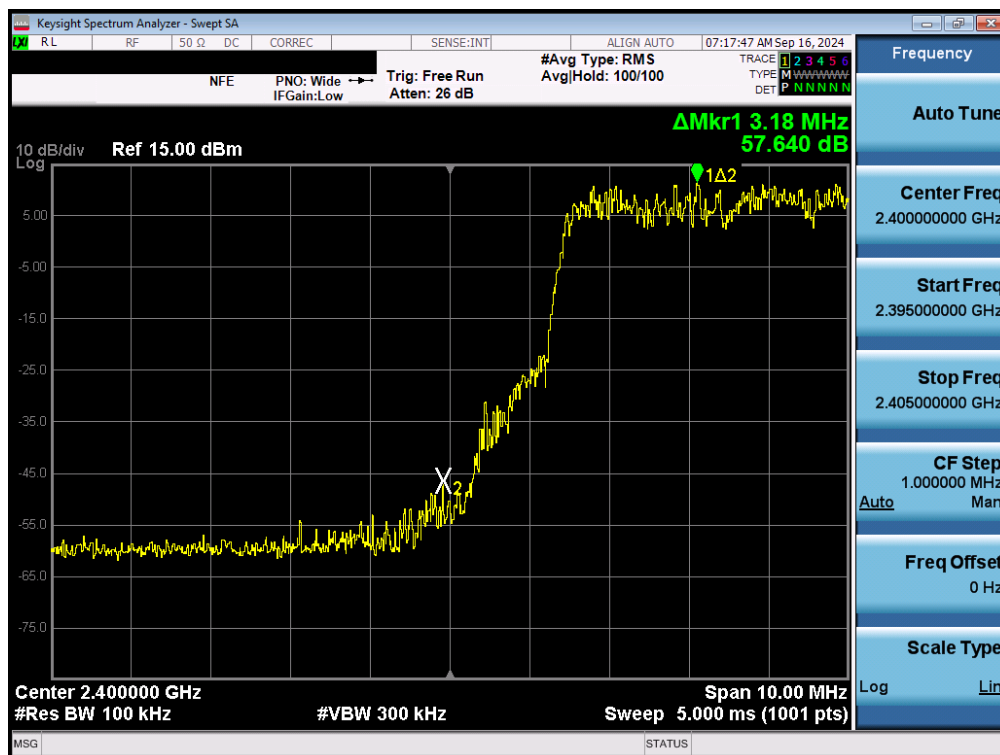


Plot 7-111. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 0) – Ant 1

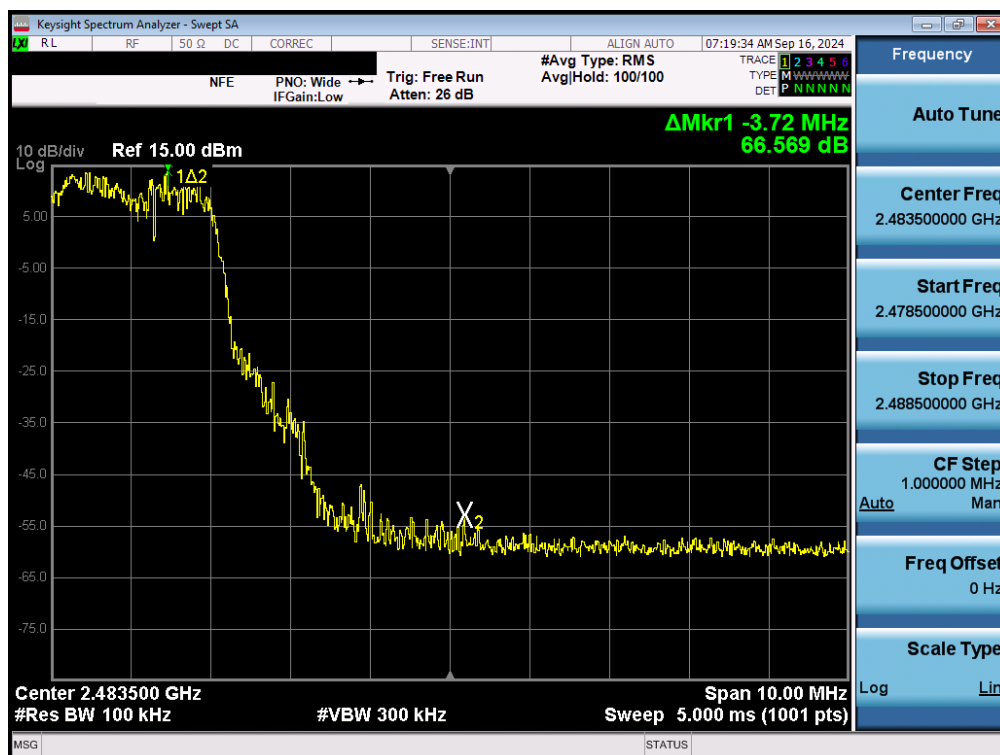


Plot 7-112. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 78) – Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2408260070-19.A3L	Test Dates: 09/03/2024 - 10/25/2024	EUT Type: Portable Handset	Page 76 of 142

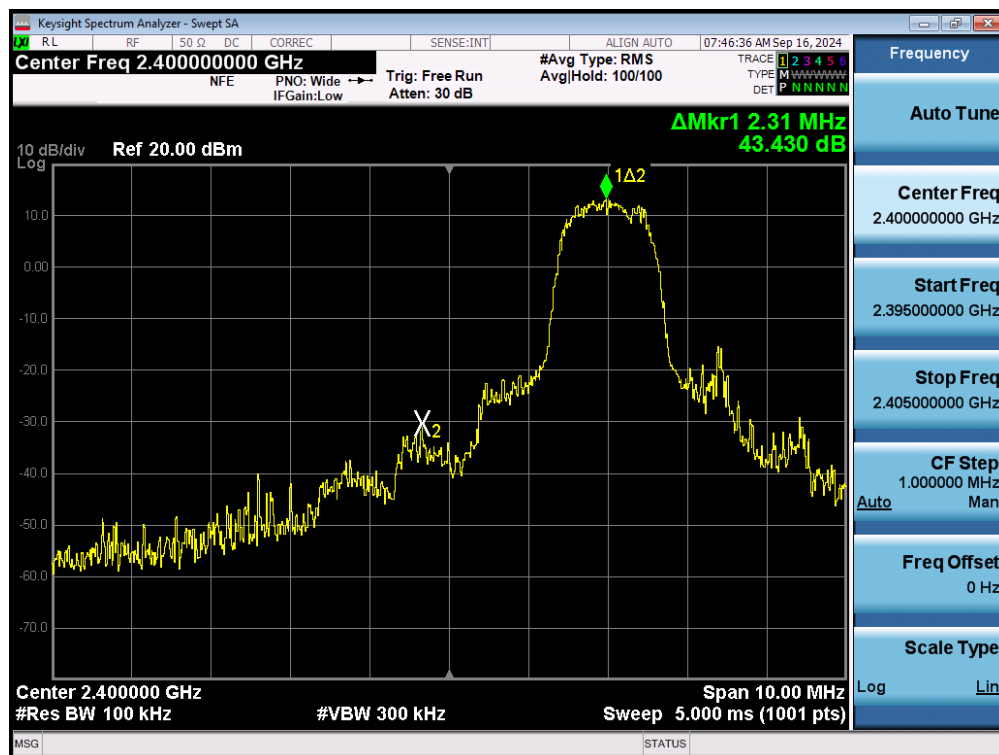


Plot 7-113. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps) – Ant 1

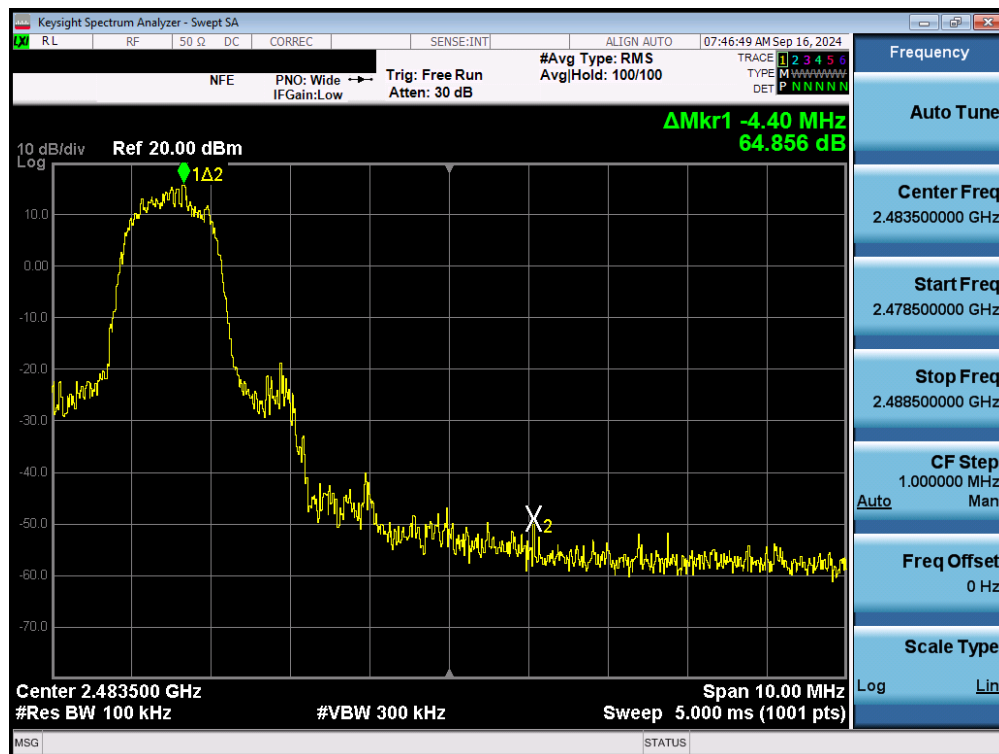


Plot 7-114. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps) – Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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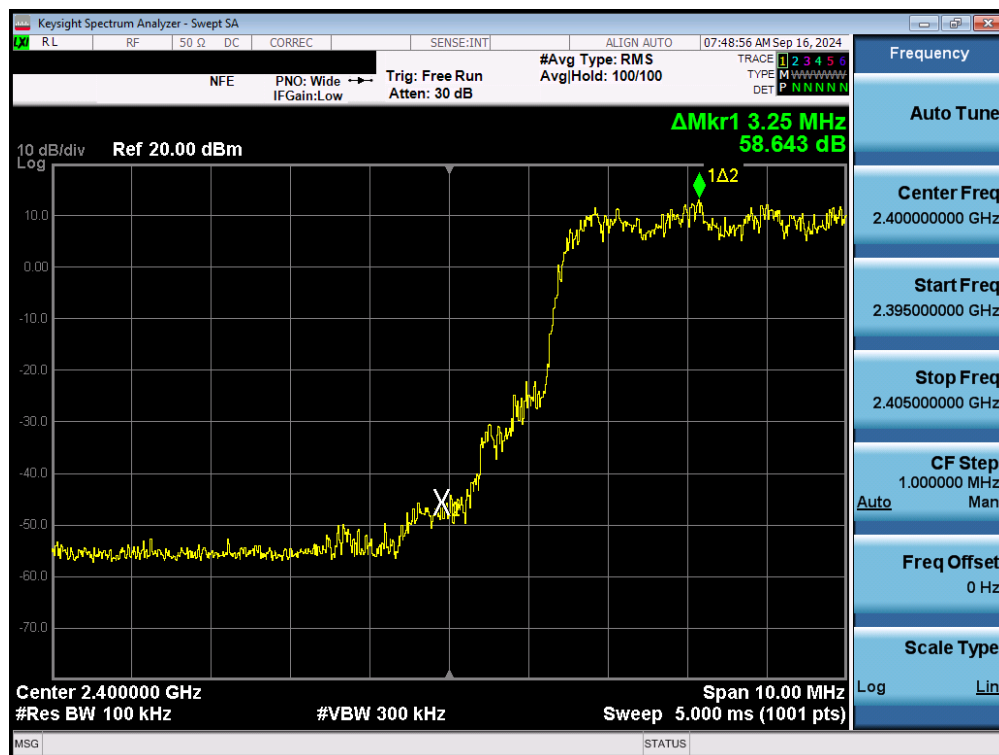


Plot 7-115. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 0) – Ant 2



Plot 7-116. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 78) – Ant 2

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-117. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps) – Ant 2



Plot 7-118. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps) – Ant 2

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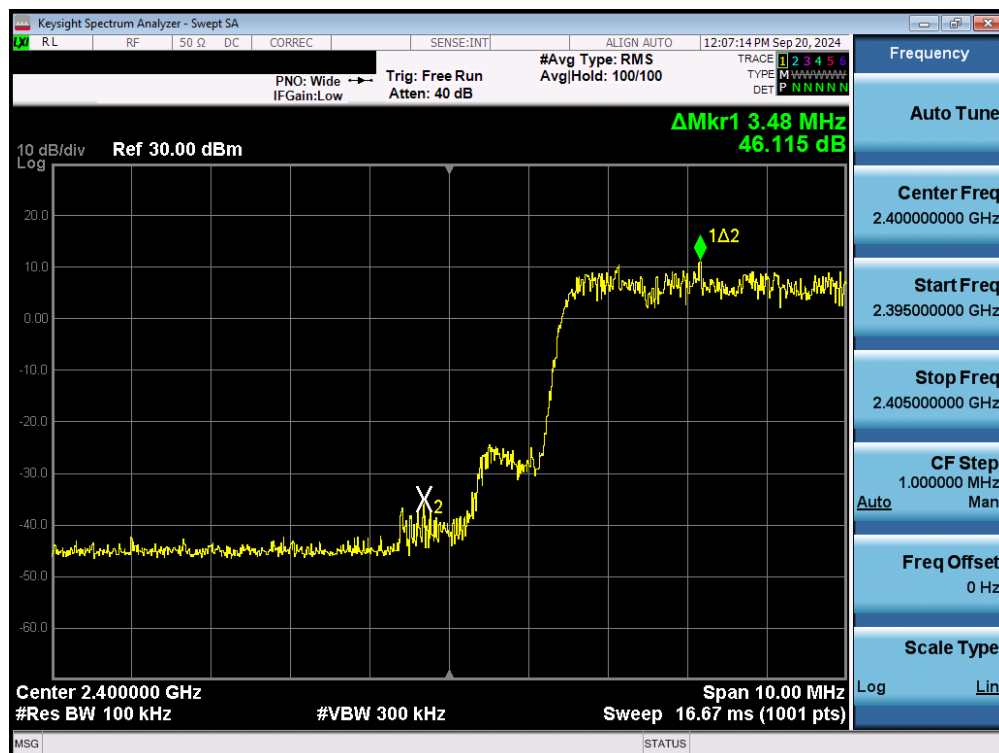


Plot 7-119. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 0) – Dual Ant 1



Plot 7-120. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 78) – Dual Ant 1

FCC ID: A3LSMS938JPN	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-121. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps) – Dual Ant 1



Plot 7-122. Band Edge Plot (Bluetooth with Hopping Enabled, 3 Mbps) – Dual Ant 1

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Plot 7-123. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 0) – Dual Ant 2



Plot 7-124. Band Edge Plot (Bluetooth with Hopping Disabled, 3 Mbps – Ch. 78) – Dual Ant 2

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7.5 Carrier Frequency Separation

§15.247 (a.1); RSS-247 [5.1(2)]

Test Overview and Limit

Measurement is made with EUT operating in hopping mode. ***The minimum permissible channel separation for this system is 2/3 the value of the 20dB BW.***

Test Procedure Used

ANSI C63.10-2013 – Section 7.8.2

Test Settings

1. Span = Wide enough to capture peaks of two adjacent channels
2. RBW = 30% of channel spacing. Adjust as necessary to best identify center of each individual channel
3. VBW $\geq$ RBW
4. Sweep = Auto
5. Detector = Peak
6. Trace mode = max hold
7. The trace was allowed to stabilize.
8. Marker-delta function used to determine separation between peaks of the adjacent channels

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.



Figure 7-4. Test Instrument & Measurement Setup

Test Notes

The EUT complies with the minimum channel separation requirement when it is operating in 1x/EDR mode using 79 channels and when operating in AFH mode using 20 channels.

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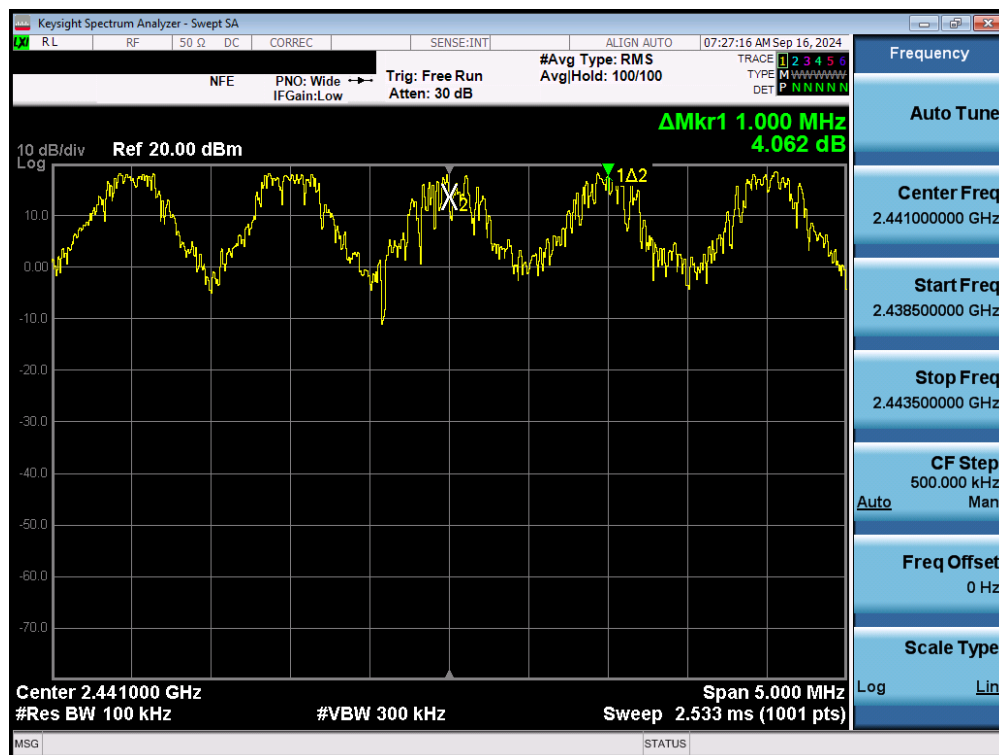
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Min. Channel Separation [MHz]
2402	1.0	GFSK	0	0.631
2441	1.0	GFSK	39	0.626
2480	1.0	GFSK	78	0.630
2402	2.0	$\pi/4$ -DQPSK	0	0.862
2441	2.0	$\pi/4$ -DQPSK	39	0.876
2480	2.0	$\pi/4$ -DQPSK	78	0.864
2402	3.0	8DPSK	0	0.885
2441	3.0	8DPSK	39	0.858
2480	3.0	8DPSK	78	0.880

Table 7-12. Minimum Channel Separation – Ant 1

Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Min. Channel Separation [MHz]
2402	1.0	GFSK	0	0.626
2441	1.0	GFSK	39	0.631
2480	1.0	GFSK	78	0.599
2402	2.0	$\pi/4$ -DQPSK	0	0.881
2441	2.0	$\pi/4$ -DQPSK	39	0.877
2480	2.0	$\pi/4$ -DQPSK	78	0.875
2402	3.0	8DPSK	0	0.897
2441	3.0	8DPSK	39	0.893
2480	3.0	8DPSK	78	0.859

Table 7-13. Minimum Channel Separation – Ant 2

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Plot 7-127. Channel Spacing Plot (Bluetooth) – Ant 1



Plot 7-128. Channel Spacing Plot (Bluetooth) – Ant 2

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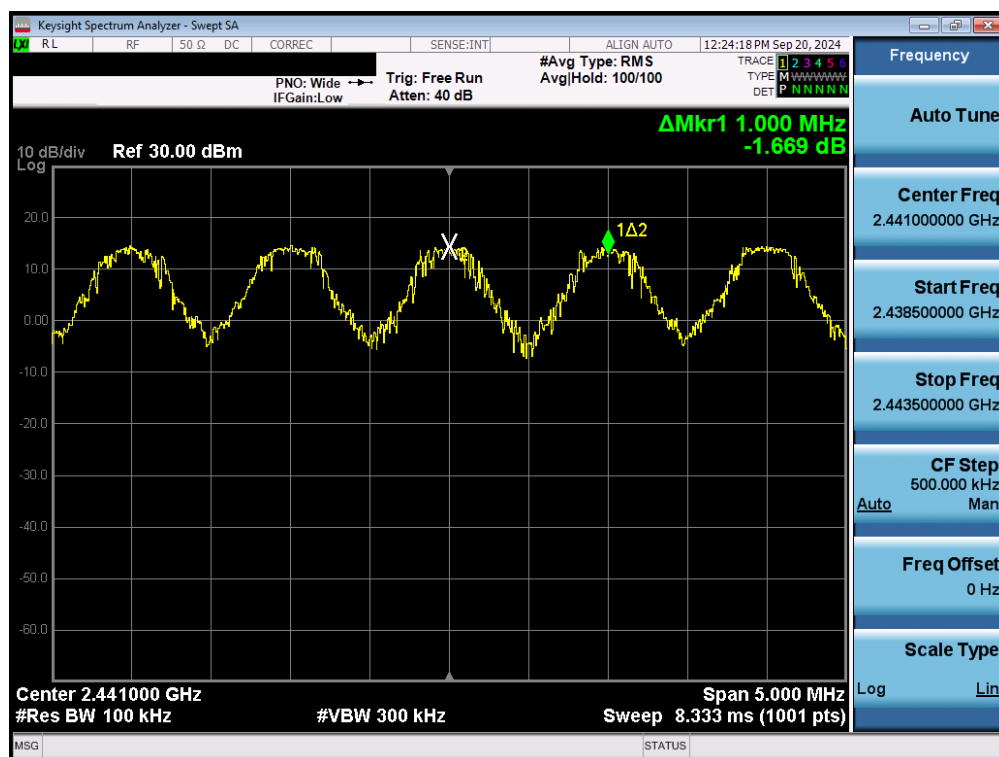
Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Min. Channel Separation [MHz]
2402	1.0	GFSK	0	0.631
2441	1.0	GFSK	39	0.632
2480	1.0	GFSK	78	0.626
2402	2.0	$\pi/4$ -DQPSK	0	0.888
2441	2.0	$\pi/4$ -DQPSK	39	0.887
2480	2.0	$\pi/4$ -DQPSK	78	0.886
2402	3.0	8DPSK	0	0.885
2441	3.0	8DPSK	39	0.890
2480	3.0	8DPSK	78	0.871

Table 7-14. Minimum Channel Separation – Dual Ant 1

Frequency [MHz]	Data Rate [Mbps]	Mod.	Channel No.	Min. Channel Separation [MHz]
2402	1.0	GFSK	0	0.628
2441	1.0	GFSK	39	0.630
2480	1.0	GFSK	78	0.656
2402	2.0	$\pi/4$ -DQPSK	0	0.895
2441	2.0	$\pi/4$ -DQPSK	39	0.903
2480	2.0	$\pi/4$ -DQPSK	78	0.896
2402	3.0	8DPSK	0	0.890
2441	3.0	8DPSK	39	0.885
2480	3.0	8DPSK	78	0.882

Table 7-15. Minimum Channel Separation – Dual Ant 2

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Plot 7-129. Channel Spacing Plot (Bluetooth) – Dual Ant 1



Plot 7-130. Channel Spacing Plot (Bluetooth) – Dual Ant 2

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7.6 Time of Occupancy

§15.247 (a.1.iii); RSS-247 [5.1(4)]

Test Overview and Limit

Measurement is made while EUT is operating in hopping mode with the spectrum analyzer set to zero span. ***The maximum permissible time of occupancy is 400 ms within a period of 400ms multiplied by the number of hopping channels employed.***

Test Procedure Used

ANSI C63.10-2013 – Section 7.8.4

Test Settings

1. Span = zero span, centered on a hopping channel
2. RBW $\leq$ channel spacing and $\gg 1/T$, where T is expected dwell time per channel
3. Sweep = as necessary to capture entire dwell time. Second plot may be required to demonstrate two successive hops on a channel
4. Trigger is set with appropriate trigger delay to place pulse near the center of the plot
5. Detector = peak
6. Trace mode = max hold
7. Marker-delta function used to determine transmit time per hop

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

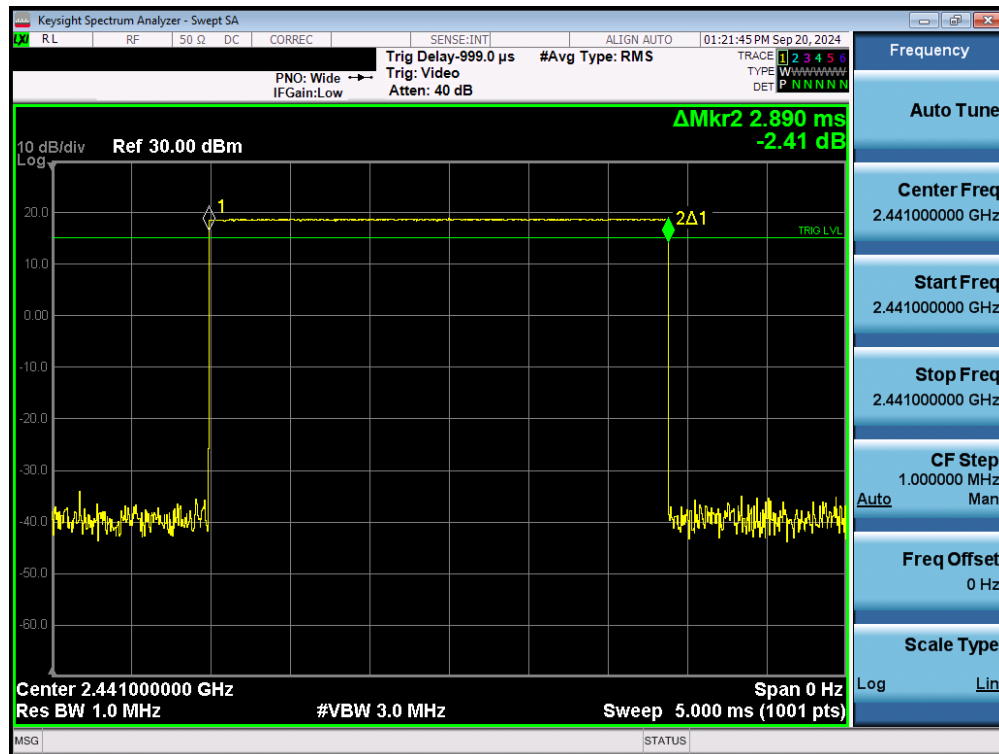


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

None

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Plot 7-131. Time of Occupancy Plot (Bluetooth) – Ant 1

Bluetooth Time of Occupancy Calculation

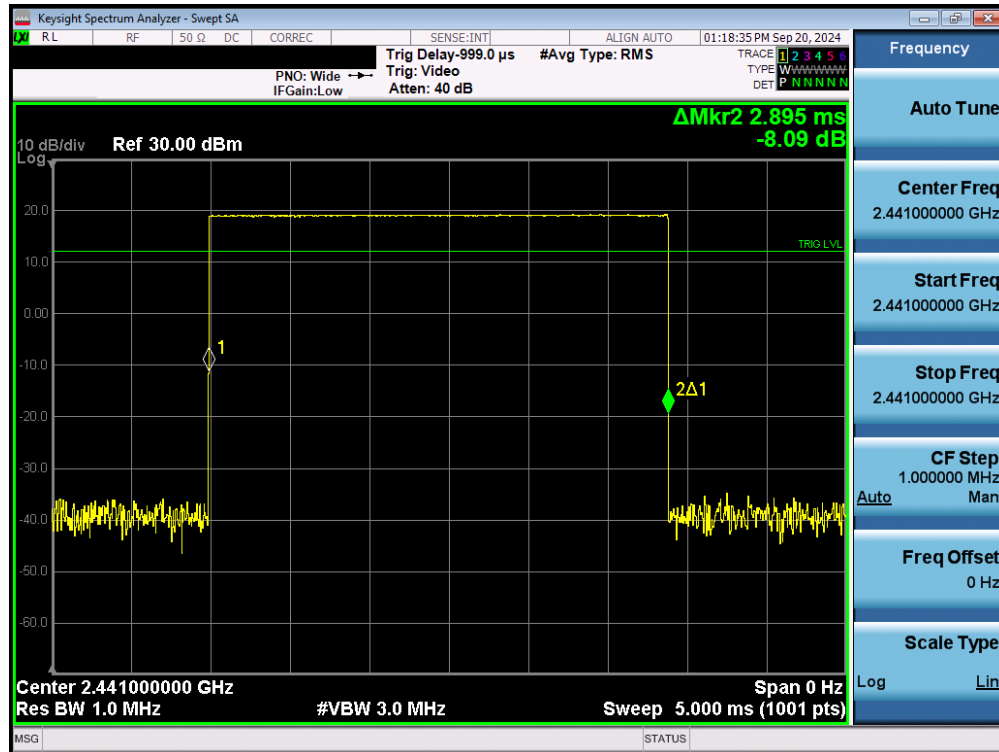
Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s. Since 1x/EDR modes use 5 transmit and 1 receive slot, for a total of 6 slots, the Bluetooth transmitter is actually hopping at a rate of $1600 / 6 = 266.67$ hops/s/slot

- 400ms x 79 hopping channels = 31.6 sec (Time of Occupancy Limit)
- Worst case BT has 266.67 hops/second (for 1x/EDR modes with DH5 operation)
- 266.67 hops/second / 79 channels = 3.38 hops/second (# of hops/second on one channel)
- 3.38 hops/second/channel x 31.6 seconds = 106.67 hops (# hops over a 31.6 second period)
- 106.67 hops x 2.89 ms/channel = 308.28 ms (worst case dwell time for one channel in 1x/EDR modes)

With AFH, the number of channels is reduced to a minimum of 20 channels and the channel hopping rate is reduced by 50% to 800 hops/s. AFH mode also uses 6 total slots so the Bluetooth transmitter hops at a rate of $800 / 6 = 133.3$ hops/s/slot

- $400\text{ms} \times 20 \text{ hopping channels} = 8 \text{ sec}$ (Time of Occupancy Limit)
- Worst case BT has 133.3 hops/second/slot (for AFH mode with DH5 operation)
- $133.3 \text{ hops/s} / 20 \text{ channels} = 6.67 \text{ hops/second}$ (# of hops/second on one channel)
- $6.67 \text{ hops/s} / \text{channel} \times 8 \text{ seconds} = 53.34 \text{ hops}$ (# hops over a 8 second period)
- $53.34 \text{ hops} \times 2.89 \text{ ms/channel} = 154.15 \text{ ms}$ (worst case dwell time for one channel in AFH mode)

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Plot 7-132. Time of Occupancy Plot (Bluetooth) – Ant 2

Bluetooth Time of Occupancy Calculation

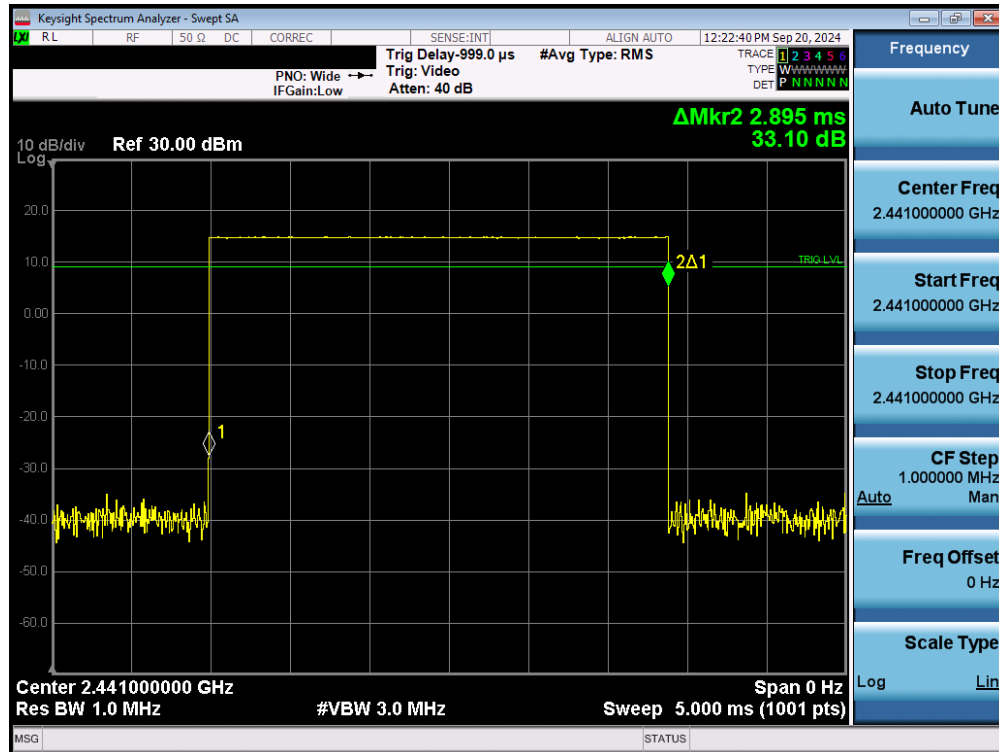
Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s. Since 1x/EDR modes use 5 transmit and 1 receive slot, for a total of 6 slots, the Bluetooth transmitter is actually hopping at a rate of $1600 / 6 = 266.67$ hops/s/slot

- $400\text{ms} \times 79$ hopping channels = 31.6 sec (Time of Occupancy Limit)
- Worst case BT has 266.67 hops/second (for 1x/EDR modes with DH5 operation)
- $266.67 \text{ hops/second} / 79 \text{ channels} = 3.38 \text{ hops/second}$ (# of hops/second on one channel)
- $3.38 \text{ hops/second/channel} \times 31.6 \text{ seconds} = 106.67 \text{ hops}$ (# hops over a 31.6 second period)
- $106.67 \text{ hops} \times 2.895 \text{ ms/channel} = 308.81 \text{ ms}$ (worst case dwell time for one channel in 1x/EDR modes)

With AFH, the number of channels is reduced to a minimum of 20 channels and the channel hopping rate is reduced by 50% to 800 hops/s. AFH mode also uses 6 total slots so the Bluetooth transmitter hops at a rate of $800 / 6 = 133.3$ hops/s/slot

- $400\text{ms} \times 20$ hopping channels = 8 sec (Time of Occupancy Limit)
- Worst case BT has 133.3 hops/second/slot (for AFH mode with DH5 operation)
- $133.3 \text{ hops/s} / 20 \text{ channels} = 6.67 \text{ hops/second}$ (# of hops/second on one channel)
- $6.67 \text{ hops/s} / \text{channel} \times 8 \text{ seconds} = 53.34 \text{ hops}$ (# hops over a 8 second period)
- $53.34 \text{ hops} \times 2.895 \text{ ms/channel} = 154.42 \text{ ms}$ (worst case dwell time for one channel in AFH mode)

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Plot 7-133. Time of Occupancy Plot (Bluetooth) – Dual Ant 1

Bluetooth Time of Occupancy Calculation

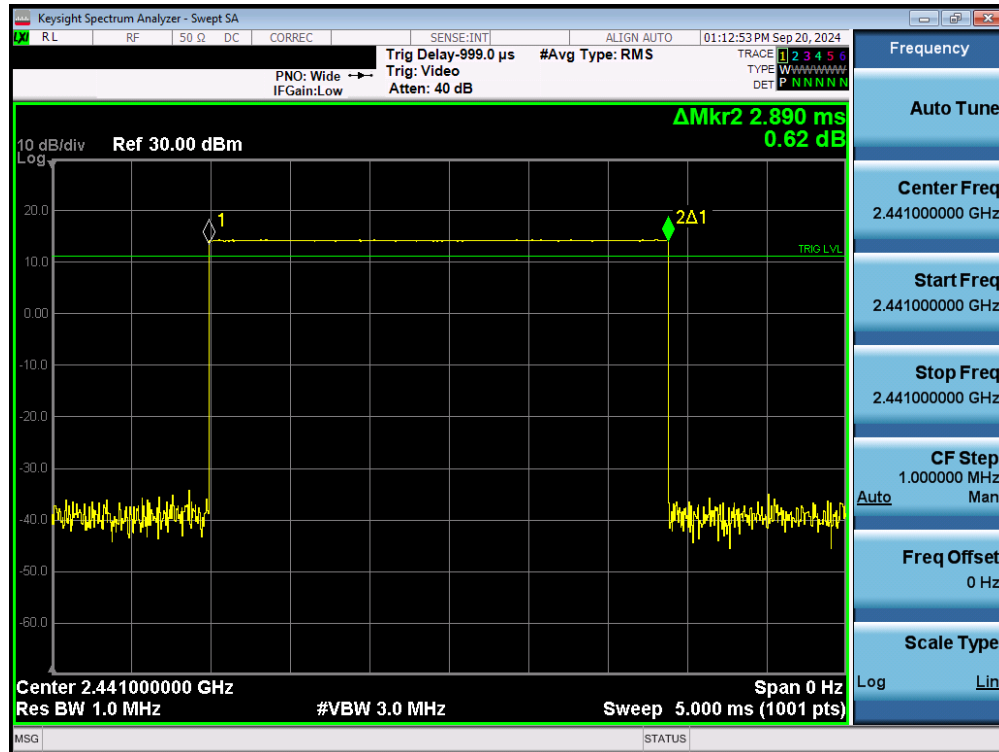
Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s. Since 1x/EDR modes use 5 transmit and 1 receive slot, for a total of 6 slots, the Bluetooth transmitter is actually hopping at a rate of $1600 / 6 = 266.67$ hops/s/slot

- $400\text{ms} \times 79$ hopping channels = 31.6 sec (Time of Occupancy Limit)
- Worst case BT has 266.67 hops/second (for 1x/EDR modes with DH5 operation)
- $266.67 \text{ hops/second} / 79 \text{ channels} = 3.38 \text{ hops/second}$ (# of hops/second on one channel)
- $3.38 \text{ hops/second/channel} \times 31.6 \text{ seconds} = 106.67 \text{ hops}$ (# hops over a 31.6 second period)
- $106.67 \text{ hops} \times 2.895 \text{ ms/channel} = 308.81 \text{ ms}$ (worst case dwell time for one channel in 1x/EDR modes)

With AFH, the number of channels is reduced to a minimum of 20 channels and the channel hopping rate is reduced by 50% to 800 hops/s. AFH mode also uses 6 total slots so the Bluetooth transmitter hops at a rate of $800 / 6 = 133.3$ hops/s/slot

- $400\text{ms} \times 20$ hopping channels = 8 sec (Time of Occupancy Limit)
- Worst case BT has 133.3 hops/second/slot (for AFH mode with DH5 operation)
- $133.3 \text{ hops/s} / 20 \text{ channels} = 6.67 \text{ hops/second}$ (# of hops/second on one channel)
- $6.67 \text{ hops/s} / \text{channel} \times 8 \text{ seconds} = 53.34 \text{ hops}$ (# hops over a 8 second period)
- $53.34 \text{ hops} \times 2.895 \text{ ms/channel} = 154.42 \text{ ms}$ (worst case dwell time for one channel in AFH mode)

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Plot 7-134. Time of Occupancy Plot (Bluetooth) – Dual Ant 2

Bluetooth Time of Occupancy Calculation

Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s. Since 1x/EDR modes use 5 transmit and 1 receive slot, for a total of 6 slots, the Bluetooth transmitter is actually hopping at a rate of $1600 / 6 = 266.67$ hops/s/slot

- $400\text{ms} \times 79$ hopping channels = 31.6 sec (Time of Occupancy Limit)
- Worst case BT has 266.67 hops/second (for 1x/EDR modes with DH5 operation)
- $266.67 \text{ hops/second} / 79 \text{ channels} = 3.38 \text{ hops/second}$ (# of hops/second on one channel)
- $3.38 \text{ hops/second/channel} \times 31.6 \text{ seconds} = 106.67 \text{ hops}$ (# hops over a 31.6 second period)
- $106.67 \text{ hops} \times 2.89 \text{ ms/channel} = 308.28 \text{ ms}$ (worst case dwell time for one channel in 1x/EDR modes)

With AFH, the number of channels is reduced to a minimum of 20 channels and the channel hopping rate is reduced by 50% to 800 hops/s. AFH mode also uses 6 total slots so the Bluetooth transmitter hops at a rate of $800 / 6 = 133.3$ hops/s/slot

- $400\text{ms} \times 20$ hopping channels = 8 sec (Time of Occupancy Limit)
- Worst case BT has 133.3 hops/second/slot (for AFH mode with DH5 operation)
- $133.3 \text{ hops/s} / 20 \text{ channels} = 6.67 \text{ hops/second}$ (# of hops/second on one channel)
- $6.67 \text{ hops/s} / \text{channel} \times 8 \text{ seconds} = 53.34 \text{ hops}$ (# hops over a 8 second period)
- $53.34 \text{ hops} \times 2.89 \text{ ms/channel} = 154.15 \text{ ms}$ (worst case dwell time for one channel in AFH mode)

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7.7 Number of Hopping Channels

§15.247 (a.1.iii); RSS-247 [5.1(4)]

Test Overview and Limit

Measurement is made while EUT is operating in hopping mode. ***This frequency hopping system must employ a minimum of 15 hopping channels.***

Test Procedure Used

ANSI C63.10-2013 – Section 7.8.3

Test Settings

1. Span = frequency of band of operation (divided into two plots)
2. RBW < 30% of channel spacing or 20dB bandwidth, whichever is smaller
3. VBW ≥ RBW
4. Sweep = auto
5. Detector = peak
6. Trace mode = max hold
7. Trace was allowed to stabilize

Test Setup

The EUT and measurement equipment were set up as shown in the diagram below.

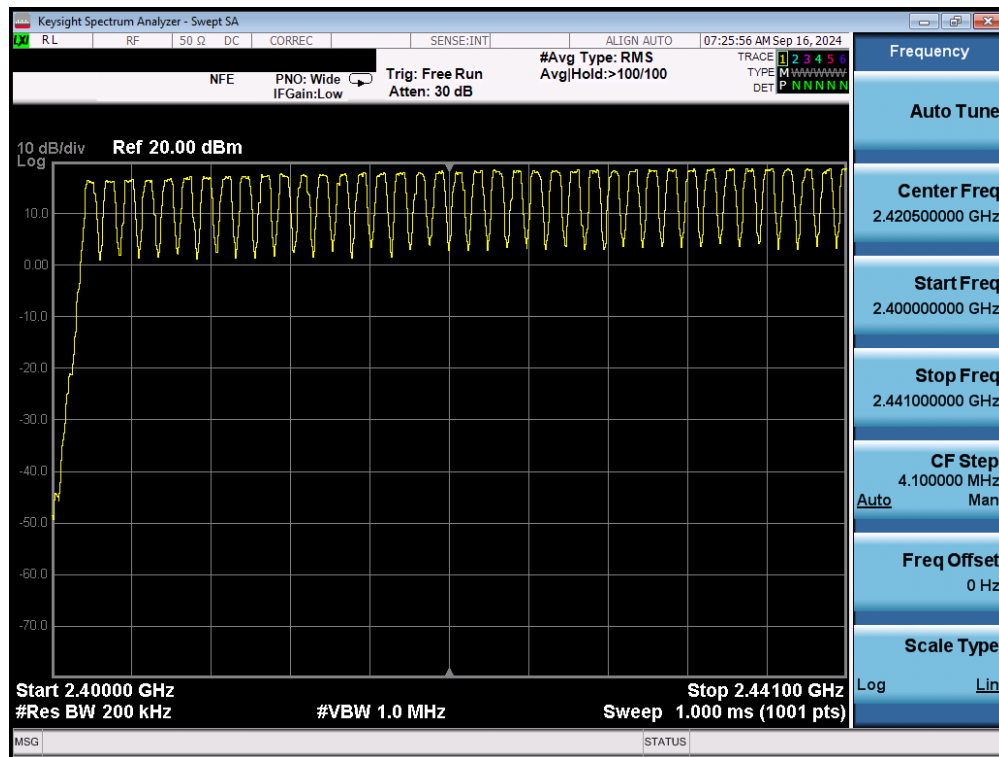


Figure 7-6. Test Instrument & Measurement Setup

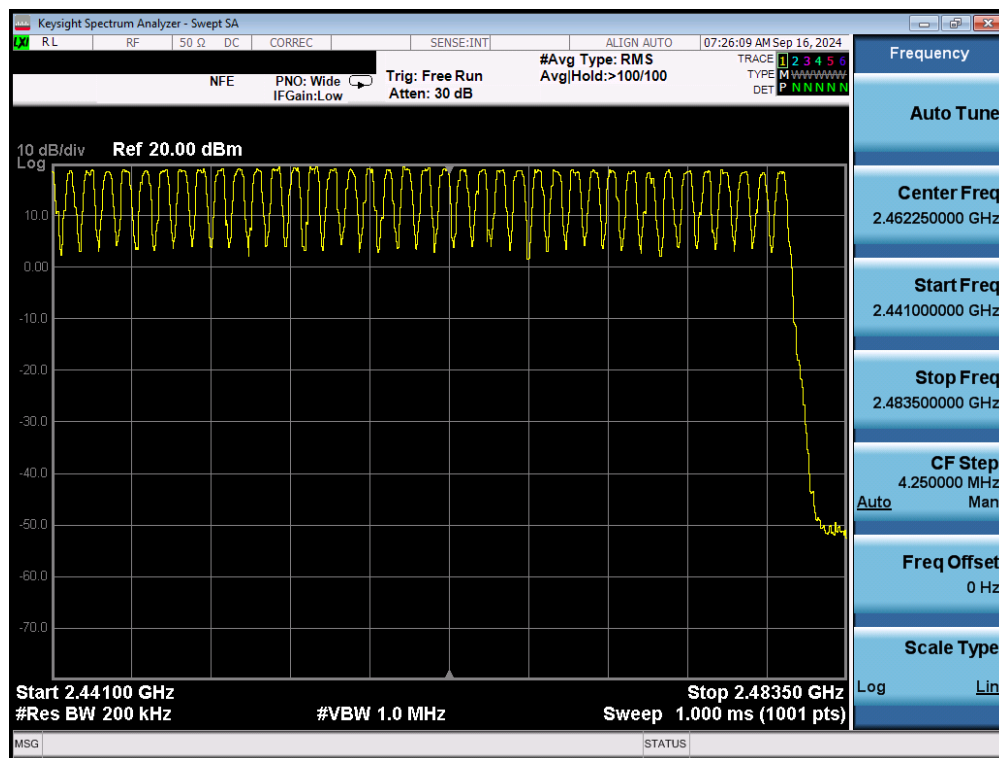
Test Notes

The frequency spectrum was broken up into two sub-ranges to clearly show all the hopping frequencies. In AFH mode, this device operates using 20 channels so the requirement for minimum number of hopping channels is satisfied.

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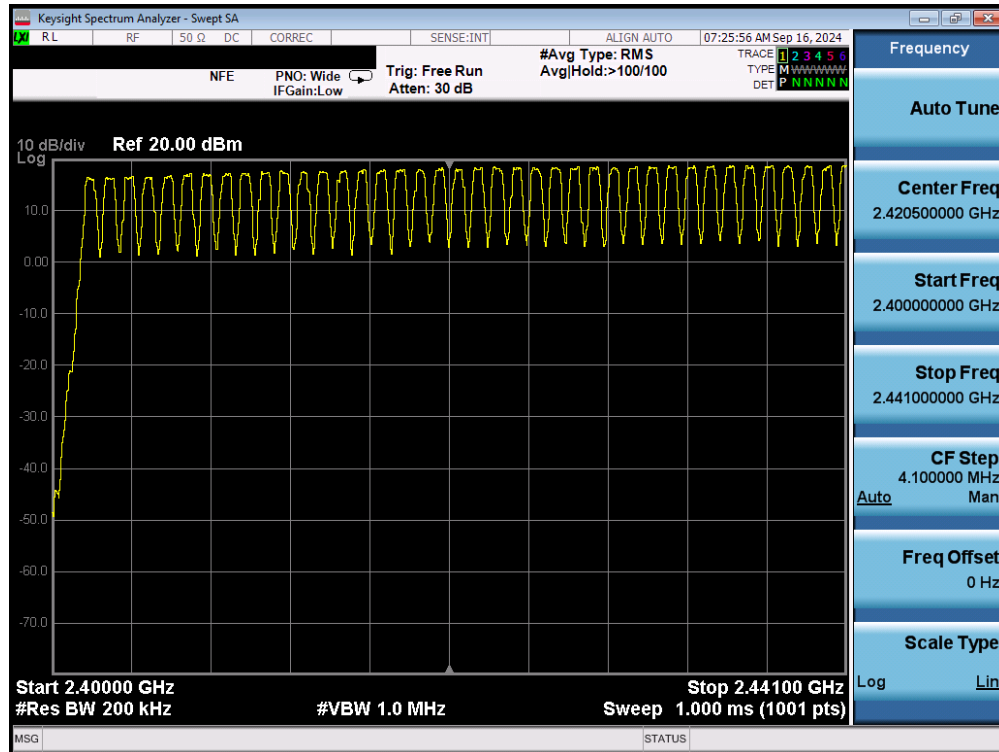


Plot 7-135. Low End Spectrum Channel Hopping Plot (Bluetooth) – Ant 1

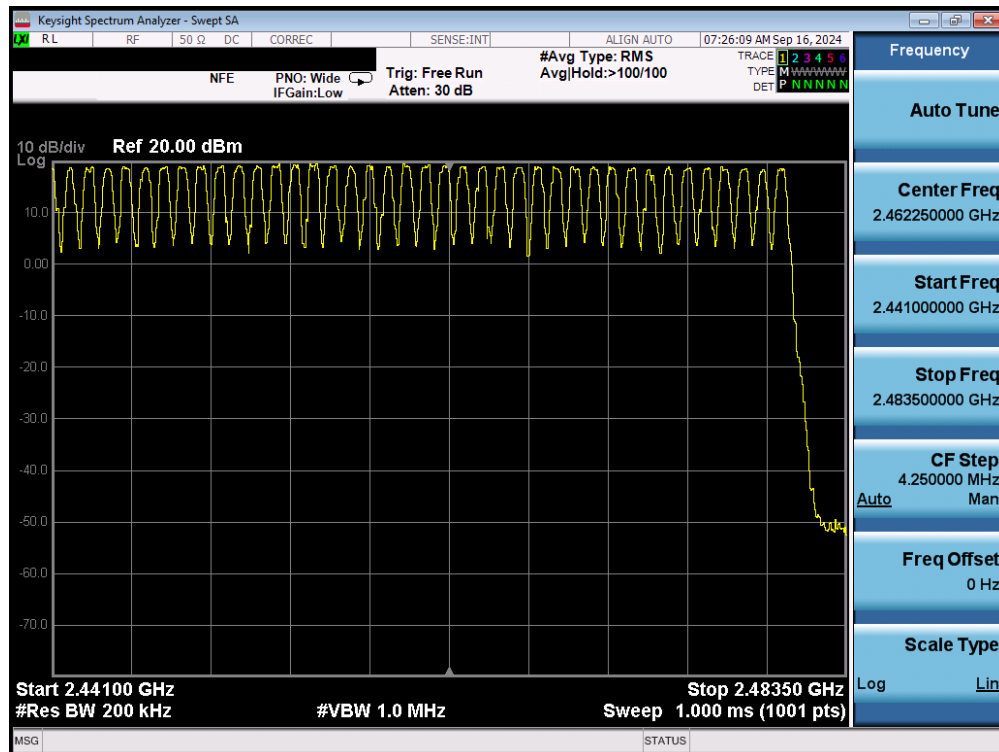


Plot 7-136. High End Spectrum Channel Hopping Plot (Bluetooth) – Ant 1

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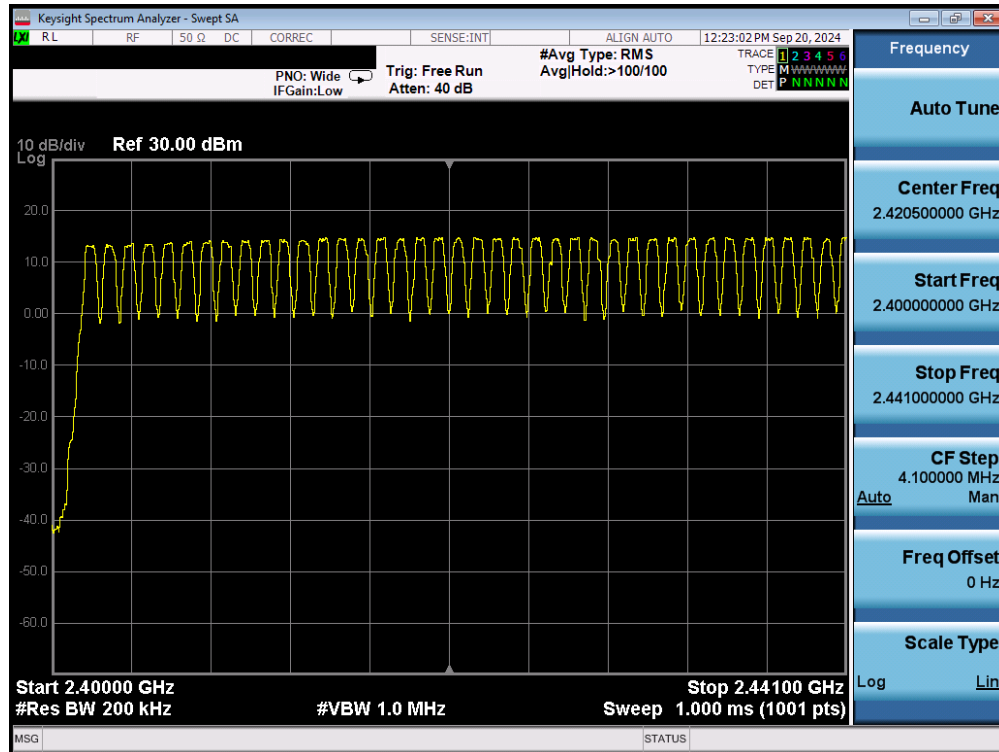


Plot 7-137. Low End Spectrum Channel Hopping Plot (Bluetooth) – Ant 2

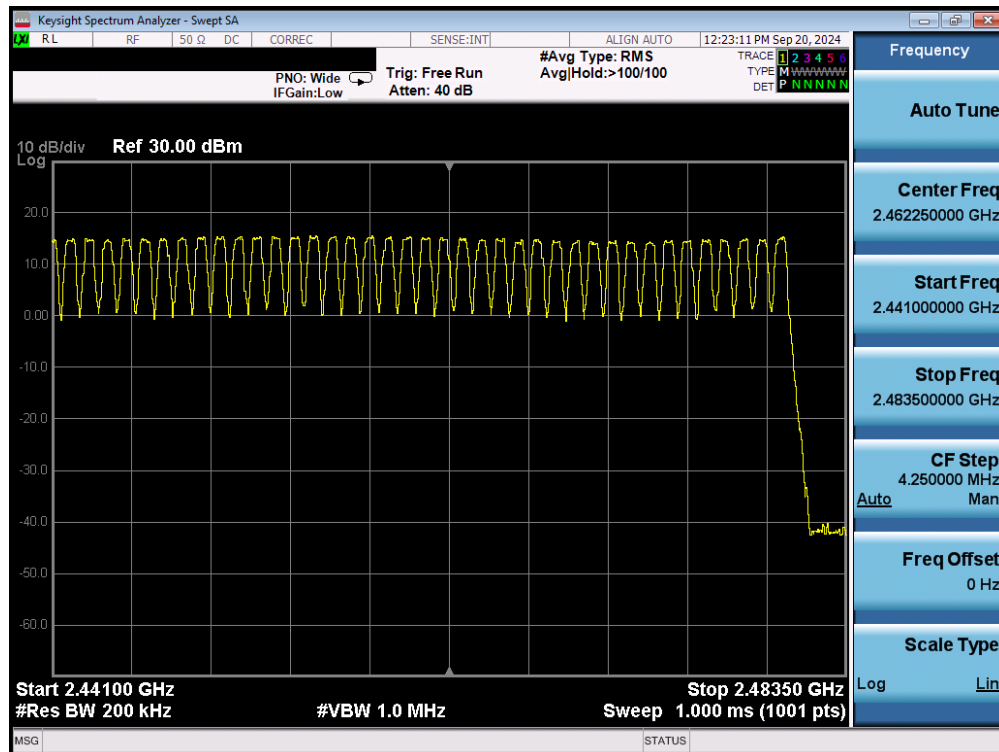


Plot 7-138. High End Spectrum Channel Hopping Plot (Bluetooth) – Ant 2

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Plot 7-139. Low End Spectrum Channel Hopping Plot (Bluetooth) – Dual Ant 1



Plot 7-140. High End Spectrum Channel Hopping Plot (Bluetooth) – Dual Ant 1

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