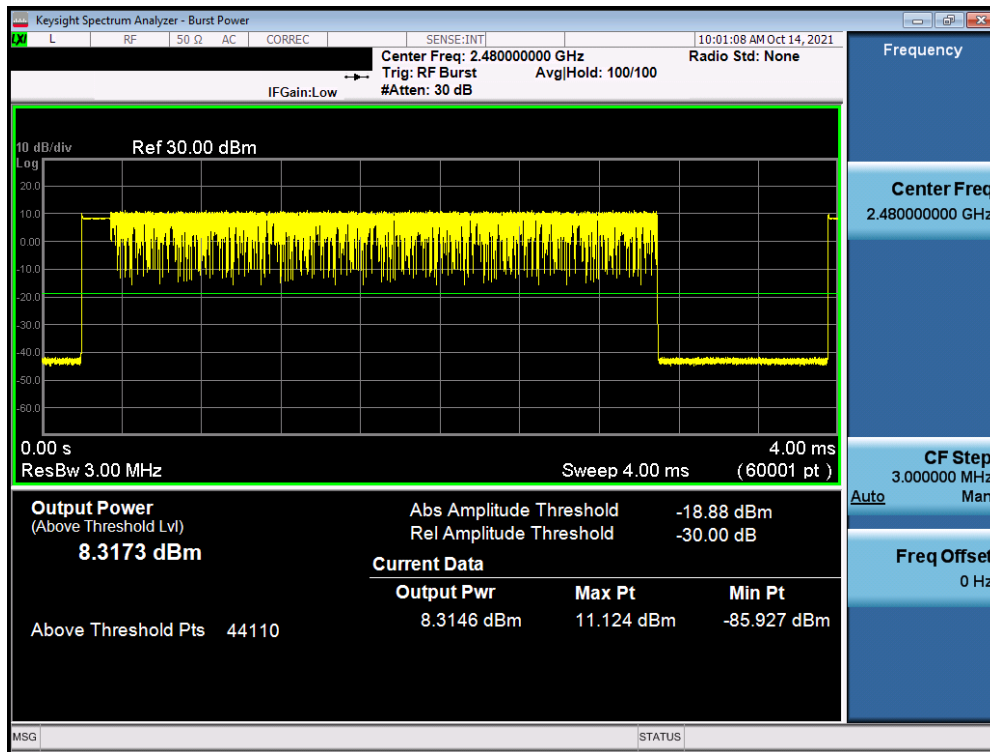


Plot 7-89. Average Conducted Power (3Mbps – Ch. 39) Antenna 2 iPA



Plot 7-90. Average Conducted Power (3Mbps – Ch. 78) Antenna 2 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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Dual Antenna

Frequency [MHz]	Data Rate [Mbps]	Modulation	Power Scheme	Channel No.	Peak Conducted Power ANT 1		Peak Conducted Power ANT 2		Peak Conducted Power Dual	
					[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]
2402	1.0	GFSK	iPA	0	13.07	20.272	10.65	11.614	15.04	31.915
2441	1.0	GFSK	iPA	39	13.28	21.267	11.47	14.028	15.48	35.318
2480	1.0	GFSK	iPA	78	12.32	17.065	10.48	11.179	14.51	28.249
2402	2.0	$\pi/4$ -DQPSK	iPA	0	12.46	17.620	9.80	9.552	14.34	27.164
2441	2.0	$\pi/4$ -DQPSK	iPA	39	12.87	19.382	10.61	11.497	14.90	30.903
2480	2.0	$\pi/4$ -DQPSK	iPA	78	11.75	14.966	9.56	9.026	13.80	23.988
2402	3.0	8DPSK	iPA	0	12.79	19.002	9.98	9.963	14.62	28.973
2441	3.0	8DPSK	iPA	39	13.09	20.347	10.87	12.226	15.13	32.584
2480	3.0	8DPSK	iPA	78	12.13	16.315	9.94	9.870	14.18	26.182

Table 7-6. Dual Bluetooth Conducted Output Power – Peak Measurements

Frequency [MHz]	Data Rate [Mbps]	Modulation	Power Scheme	Channel No.	Avg Conducted Power ANT 1		Avg Conducted Power ANT 2		Avg Conducted Power Dual	
					[dBm]	[mW]	[dBm]	[mW]	[dBm]	[mW]
2402	1.0	GFSK	iPA	0	12.33	17.096	9.96	9.920	14.32	27.040
2441	1.0	GFSK	iPA	39	12.44	17.535	10.08	10.186	14.43	27.733
2480	1.0	GFSK	iPA	78	12.10	16.214	9.65	9.224	14.05	25.410
2402	2.0	$\pi/4$ -DQPSK	iPA	0	10.24	10.575	8.09	6.435	12.31	17.022
2441	2.0	$\pi/4$ -DQPSK	iPA	39	10.63	11.553	9.00	7.935	12.90	19.498
2480	2.0	$\pi/4$ -DQPSK	iPA	78	10.26	10.624	8.05	6.378	12.31	17.022
2402	3.0	8DPSK	iPA	0	10.55	11.340	7.58	5.724	12.32	17.061
2441	3.0	8DPSK	iPA	39	10.75	11.890	8.50	7.084	12.78	18.967
2480	3.0	8DPSK	iPA	78	10.18	10.411	7.52	5.649	12.06	16.069

Table 7-7. Dual Bluetooth Conducted Output Power – Average Measurements

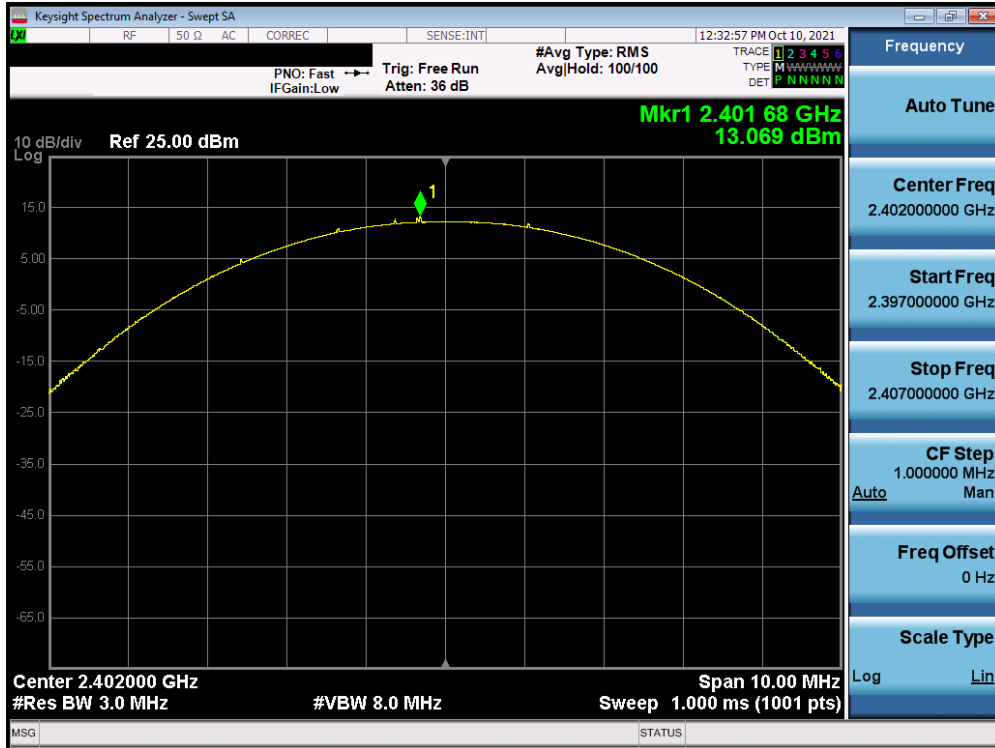
Note:

This device can operate simultaneously on two antennas. The directional gains are shown in Table 2-2 in Section 2.3 of this report. The directional gain from the operation of two antennas is shown to operate at less than 6dBi per the calculation below:

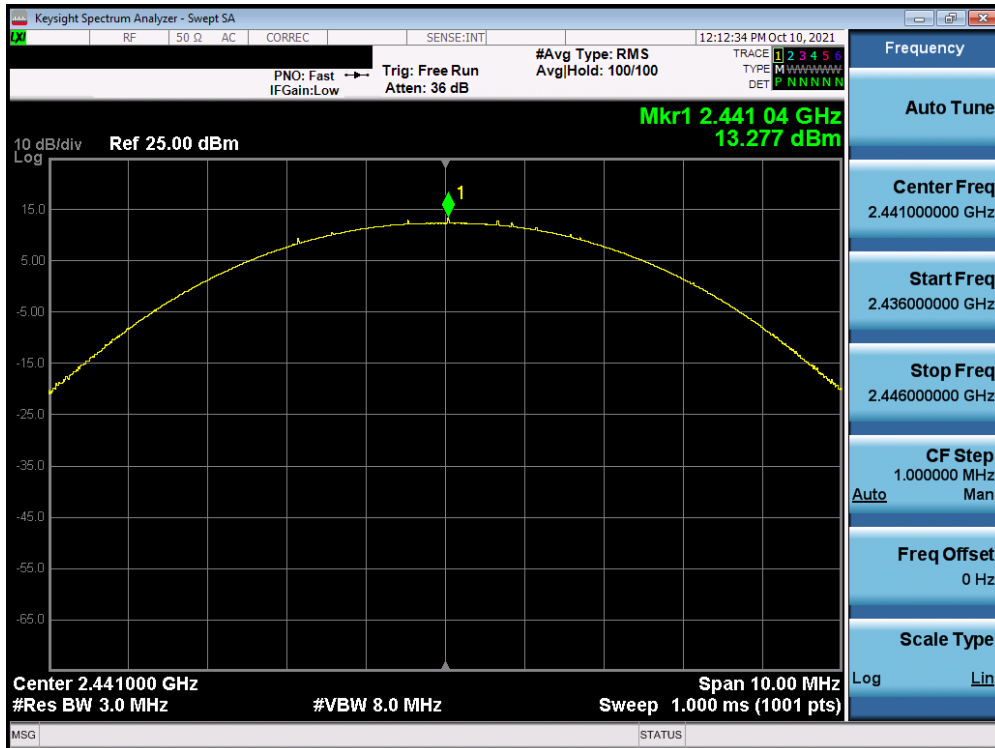
$$\begin{aligned}
 \text{Directional gain} &= 10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}] \text{ dBi} \\
 &= 10 \log[(10^{-6.82/20} + 10^{-6.12/20})^2 / 2] \text{ dBi} \\
 &= -3.45 \text{ dBi}
 \end{aligned}$$

where G_N is the gain of the nth antenna and N_{ANT} is the total number of antennas used.

FCC ID: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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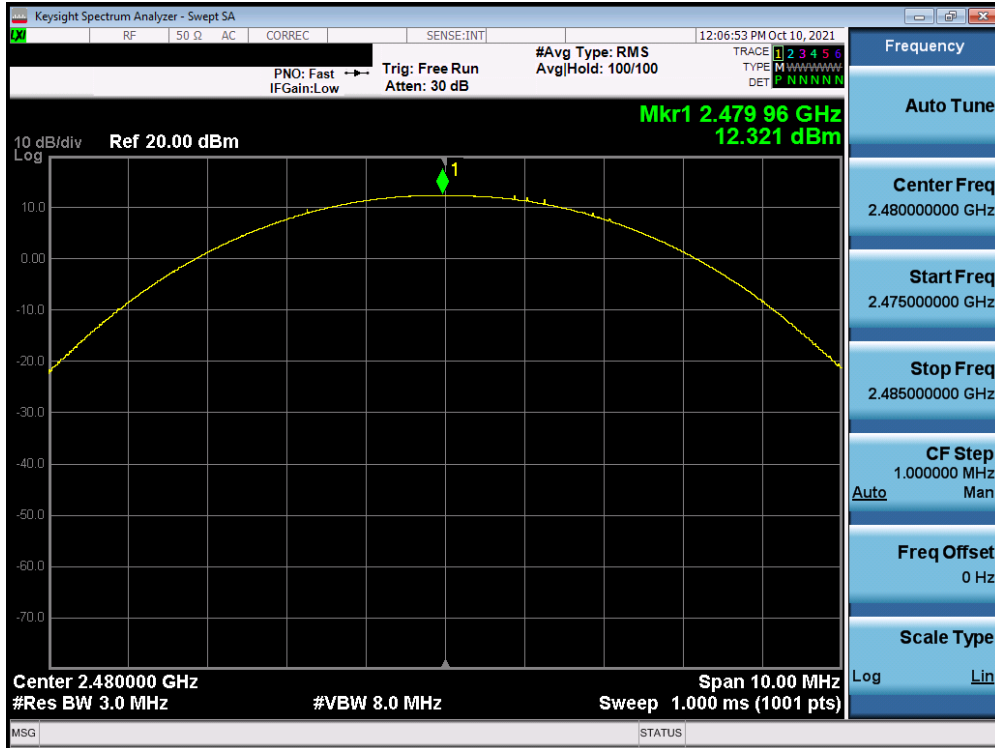


Plot 7-91. Dual Bluetooth Peak Conducted Power (1Mbps – Ch. 0) Antenna 1 iPA

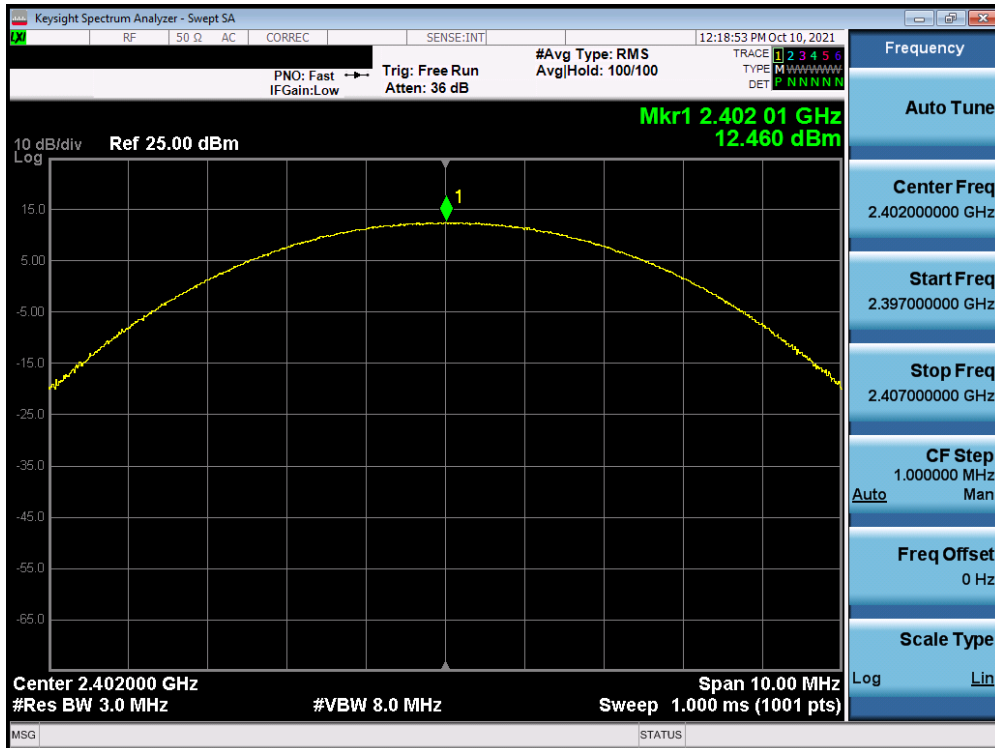


Plot 7-92. Dual Bluetooth Peak Conducted Power (1Mbps – Ch. 39) Antenna 1 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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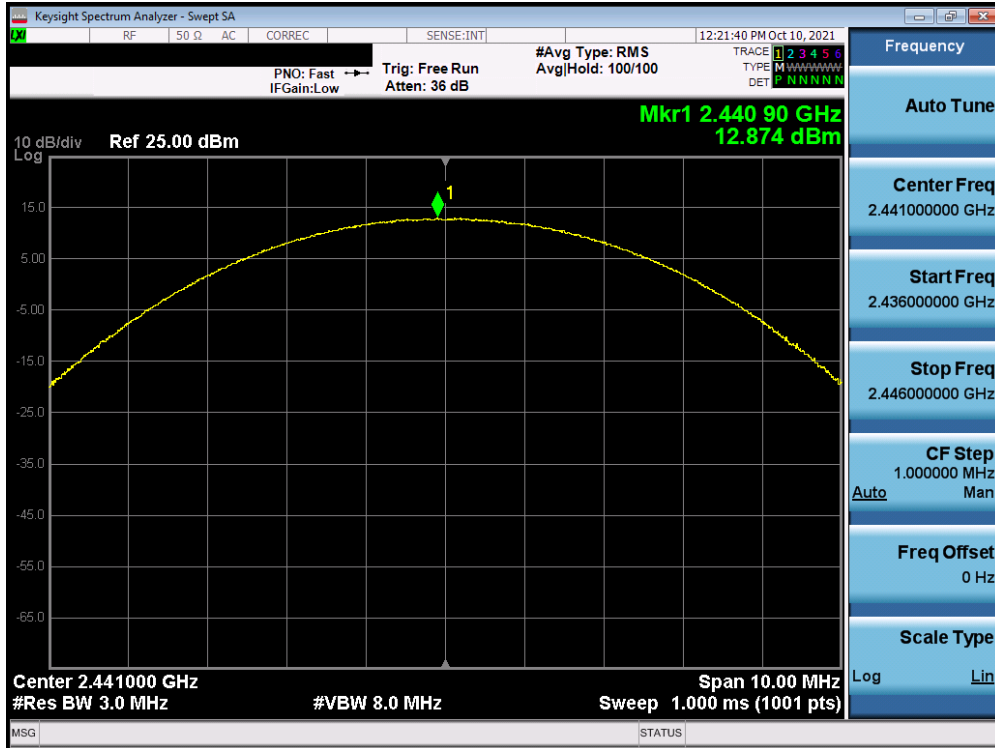


Plot 7-93. Dual Bluetooth Peak Conducted Power (1Mbps – Ch. 78) Antenna 1 iPA

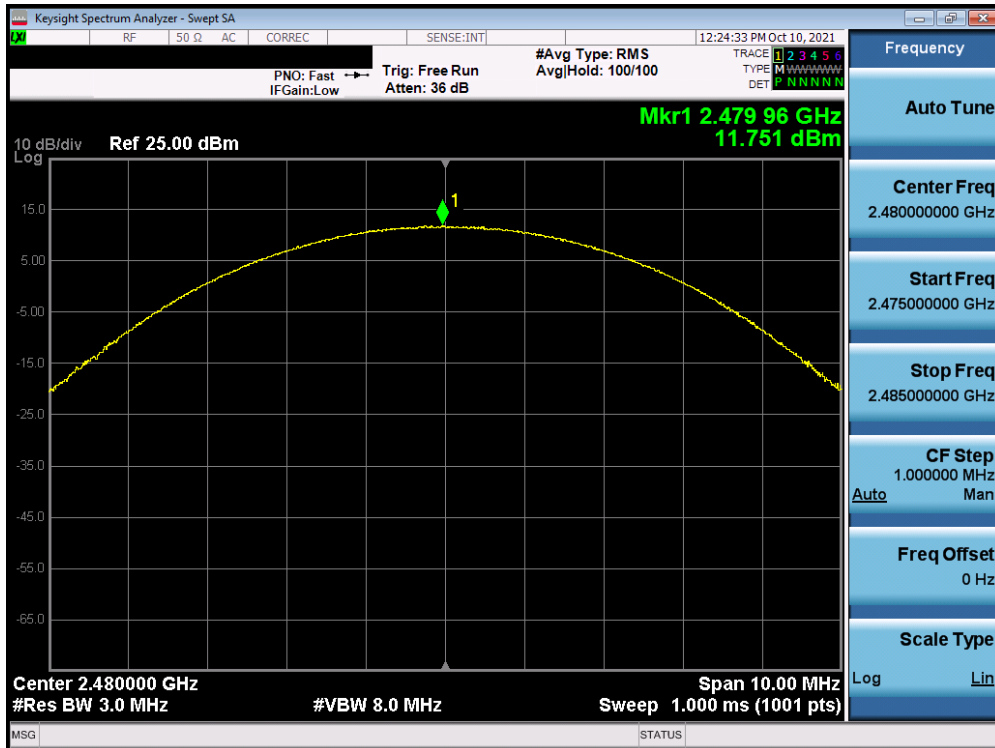


Plot 7-94. Dual Bluetooth Peak Conducted Power (2Mbps – Ch. 0) Antenna 1 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 64 of 131

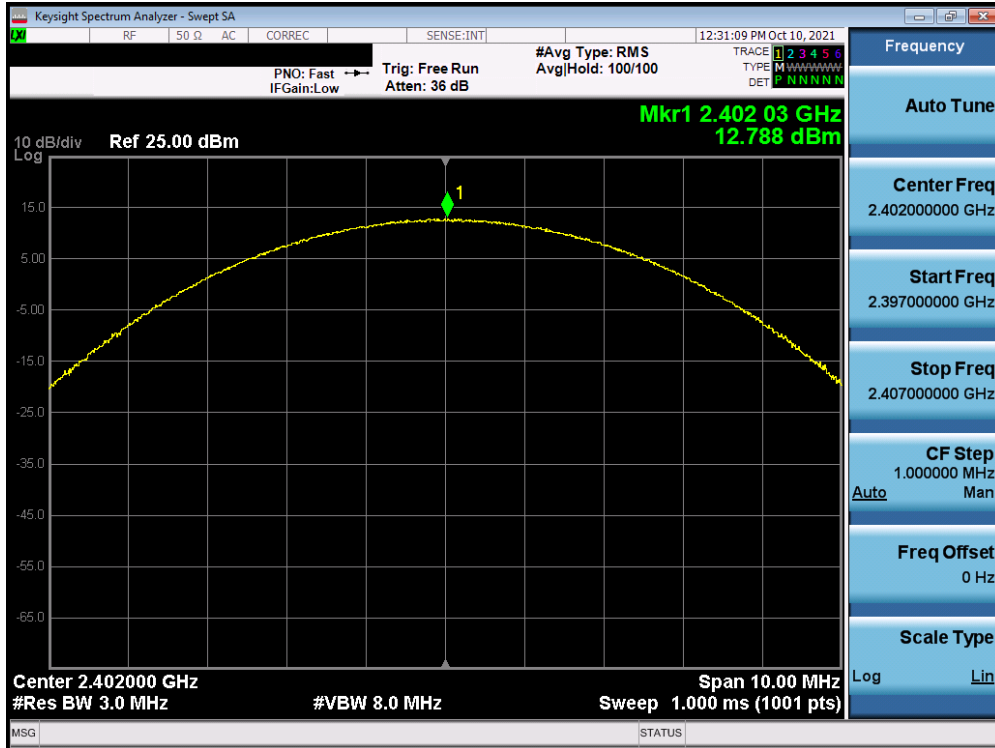


Plot 7-95. Dual Bluetooth Peak Conducted Power (2Mbps – Ch. 39) Antenna 1 iPA

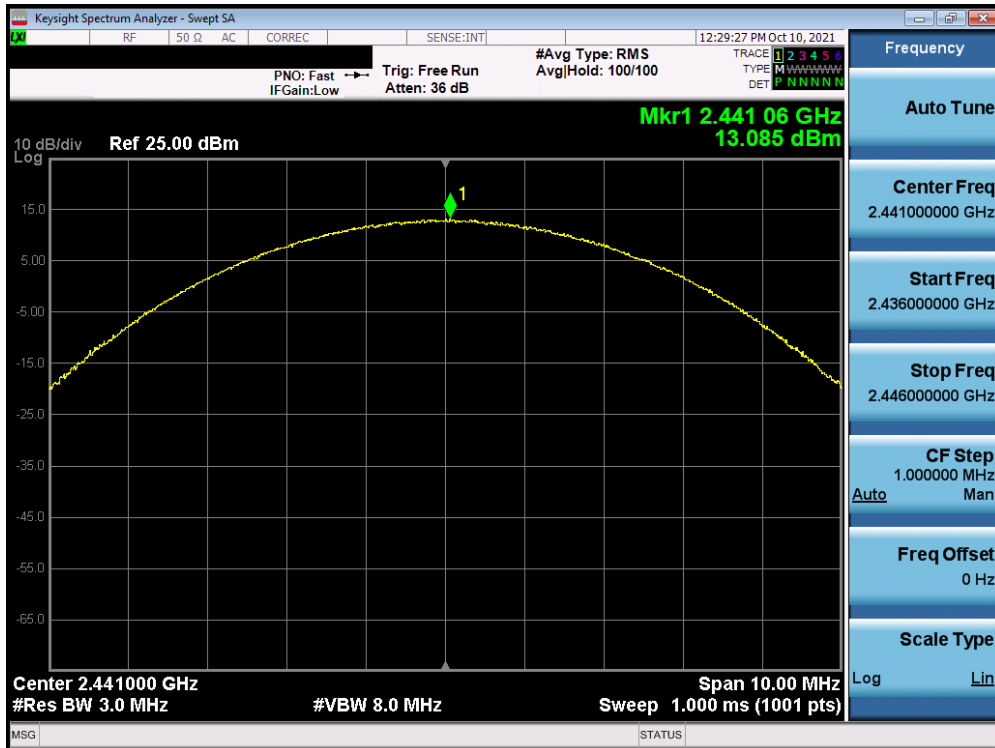


Plot 7-96. Dual Bluetooth Peak Conducted Power (2Mbps – Ch. 78) Antenna 1 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 65 of 131

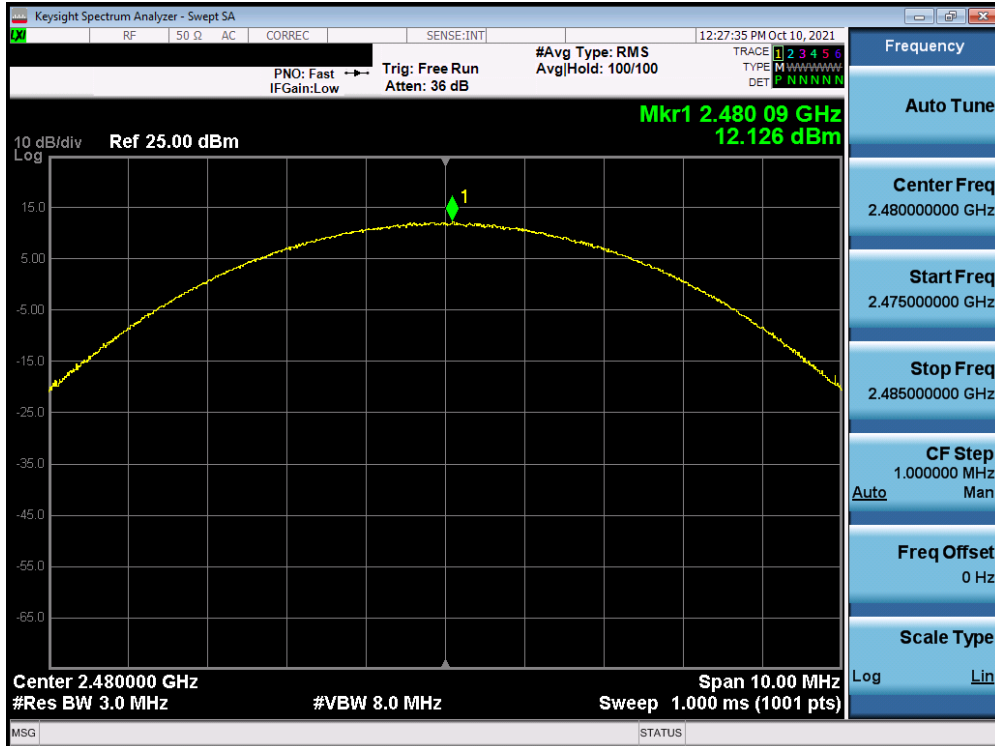


Plot 7-97. Dual Bluetooth Peak Conducted Power (3Mbps – Ch. 0) Antenna 1 iPA

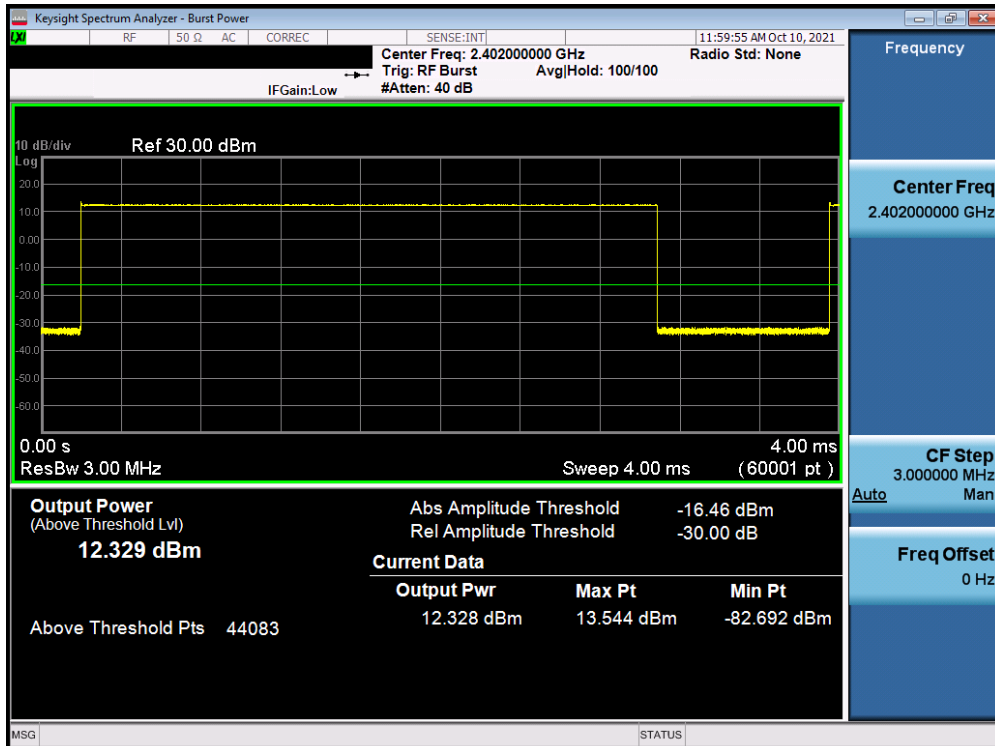


Plot 7-98. Dual Bluetooth Peak Conducted Power (3Mbps – Ch. 39) Antenna 1 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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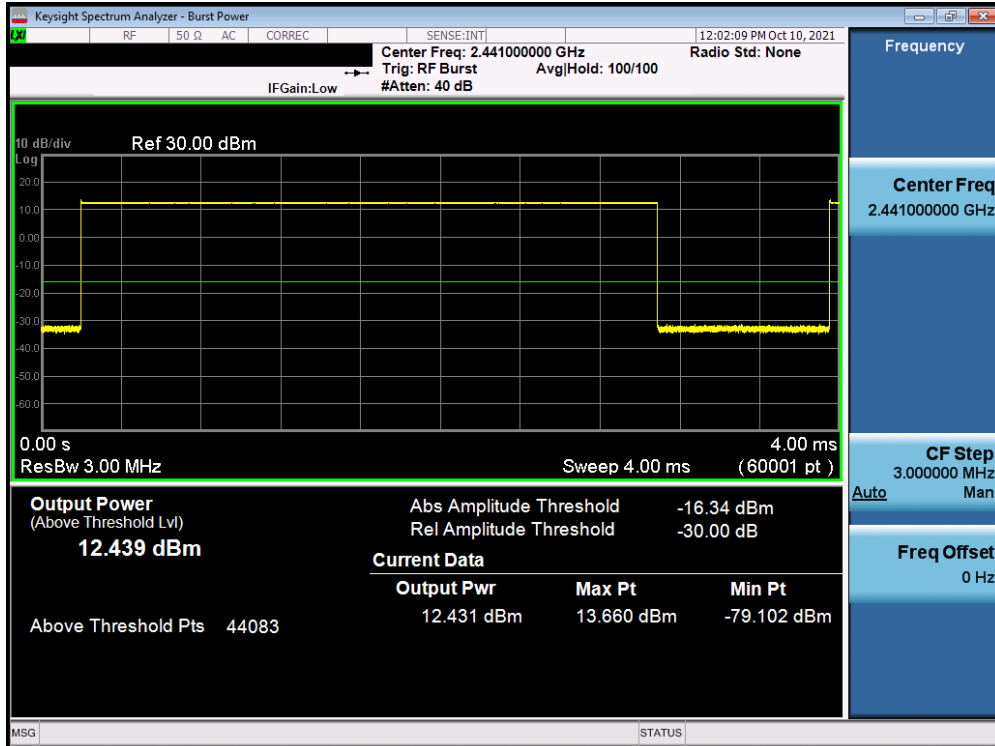


Plot 7-99. Dual Bluetooth Peak Conducted Power (3Mbps – Ch. 78) Antenna 1 iPA

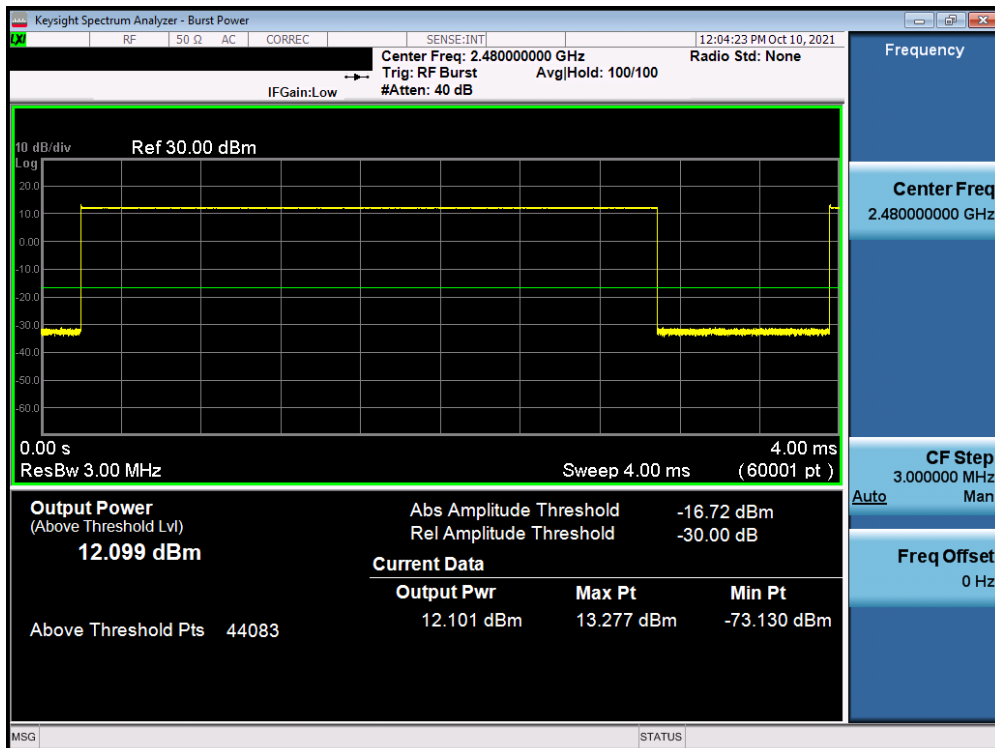


Plot 7-100. Dual Bluetooth Average Conducted Power (1Mbps – Ch. 0) Antenna 1 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 67 of 131

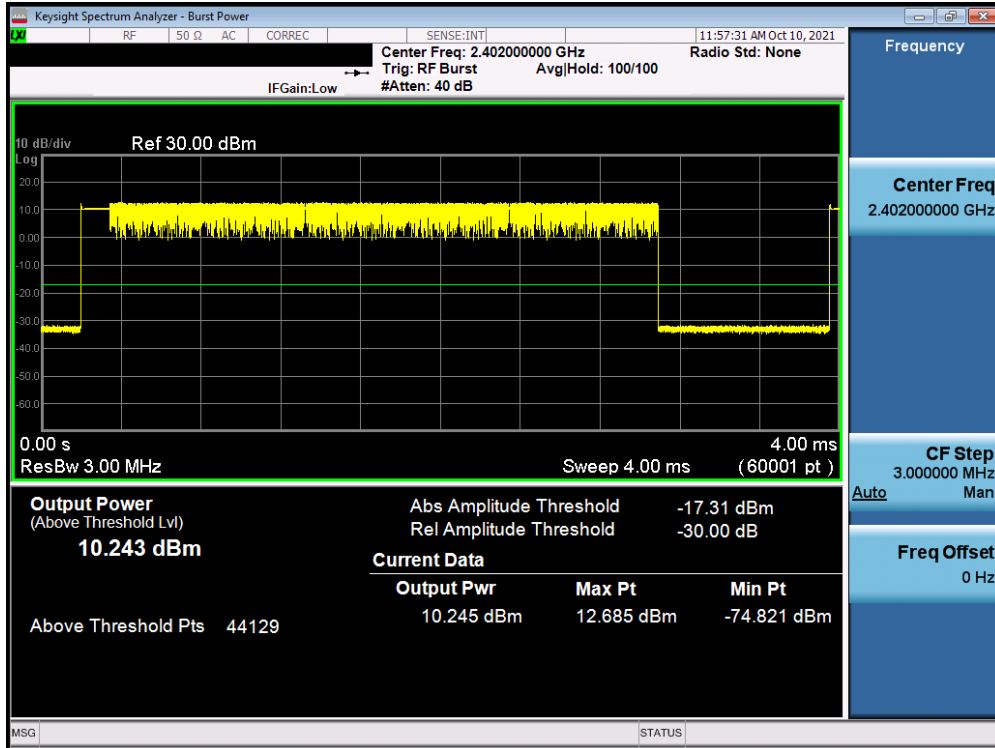


Plot 7-101. Dual Bluetooth Average Conducted Power (1Mbps – Ch. 39) Antenna 1 iPA

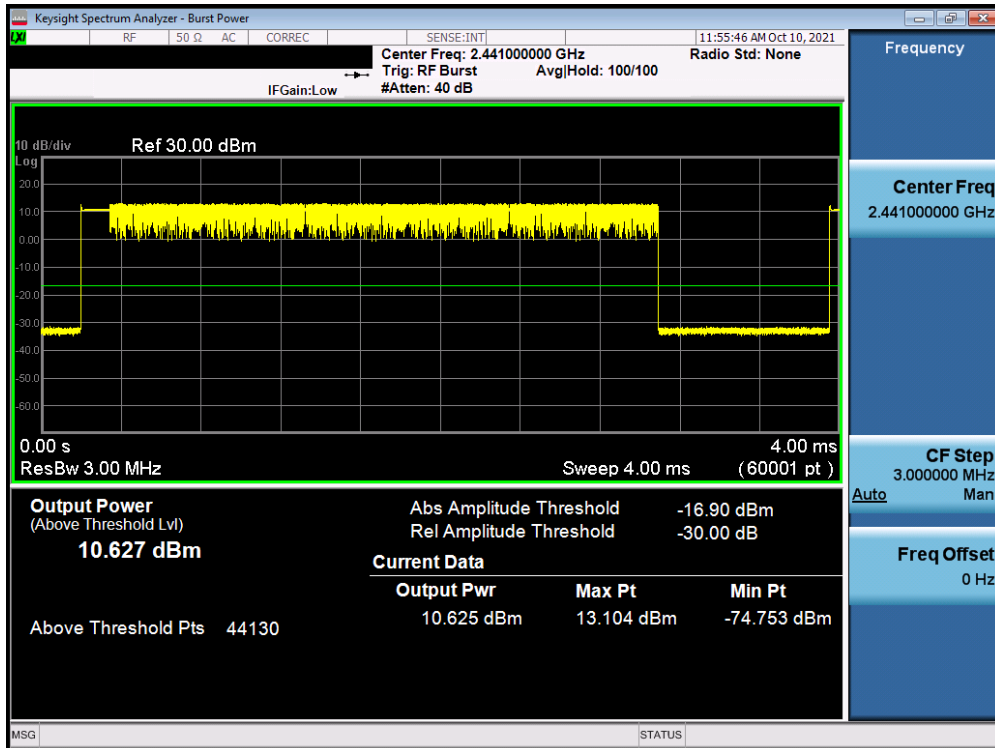


Plot 7-102. Dual Bluetooth Average Conducted Power (1Mbps – Ch. 78) Antenna 1 iPA

FCC ID: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 68 of 131

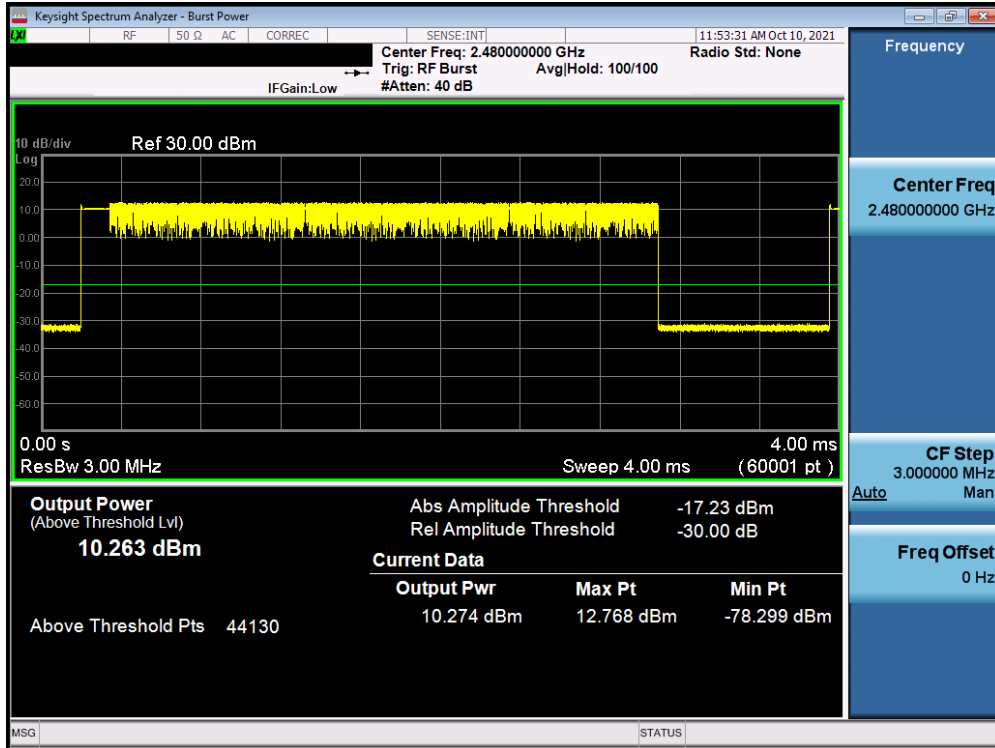


Plot 7-103. Dual Bluetooth Average Conducted Power (2Mbps – Ch. 0) Antenna 1 iPA

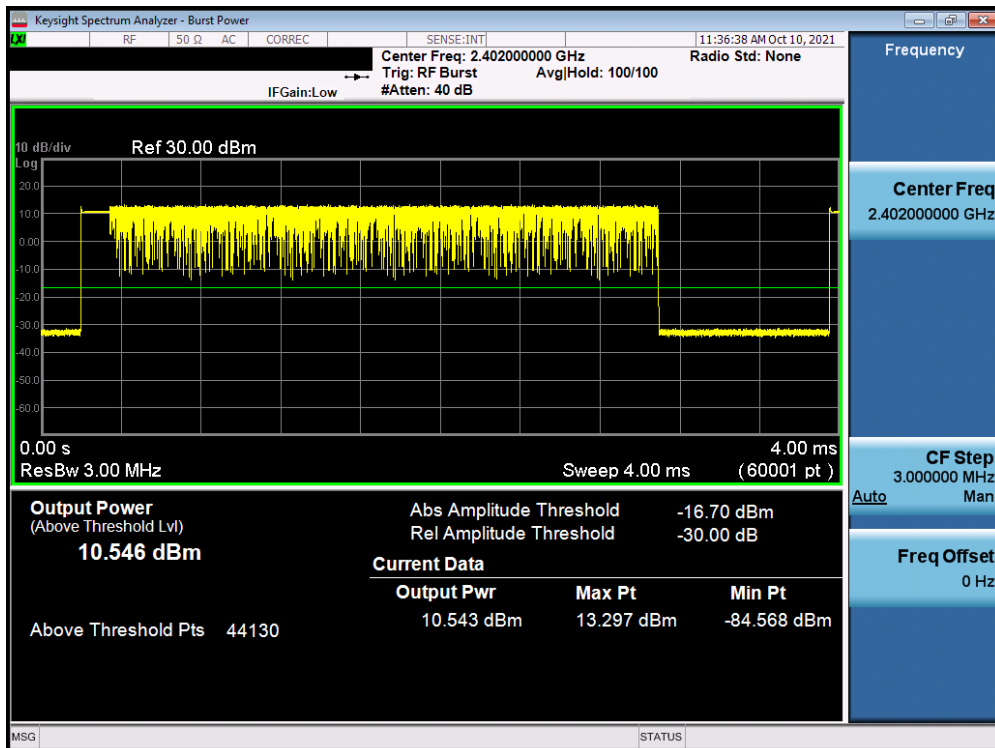


Plot 7-104. Dual Bluetooth Average Conducted Power (2Mbps – Ch. 39) Antenna 1 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 69 of 131

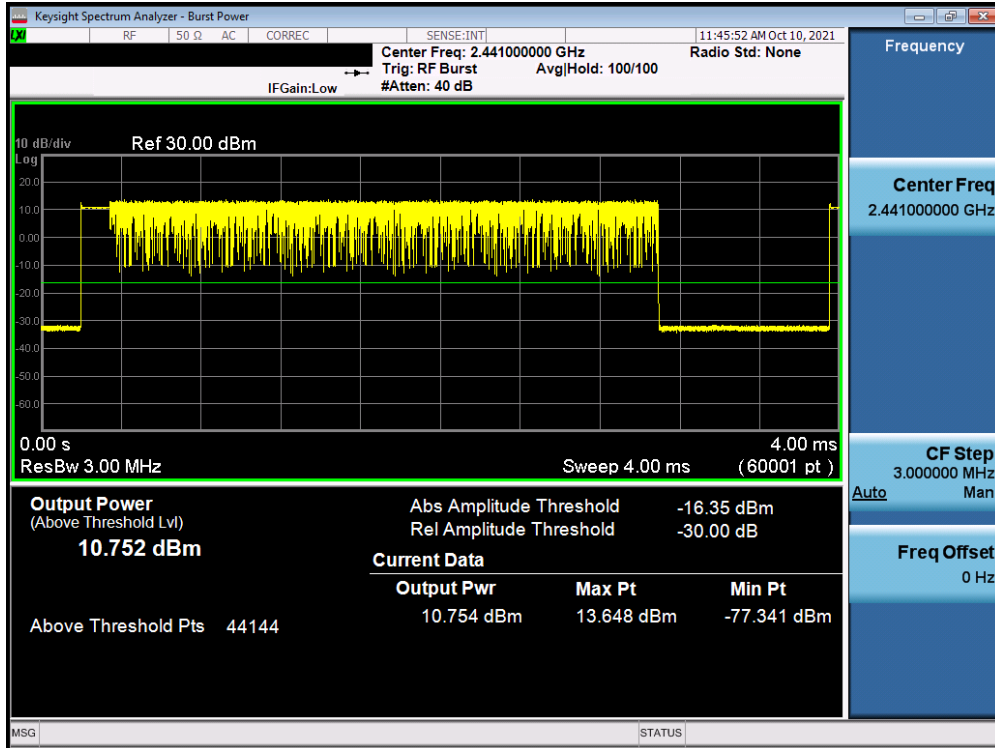


Plot 7-105. Dual Bluetooth Average Conducted Power (2Mbps – Ch. 78) Antenna 1 iPA

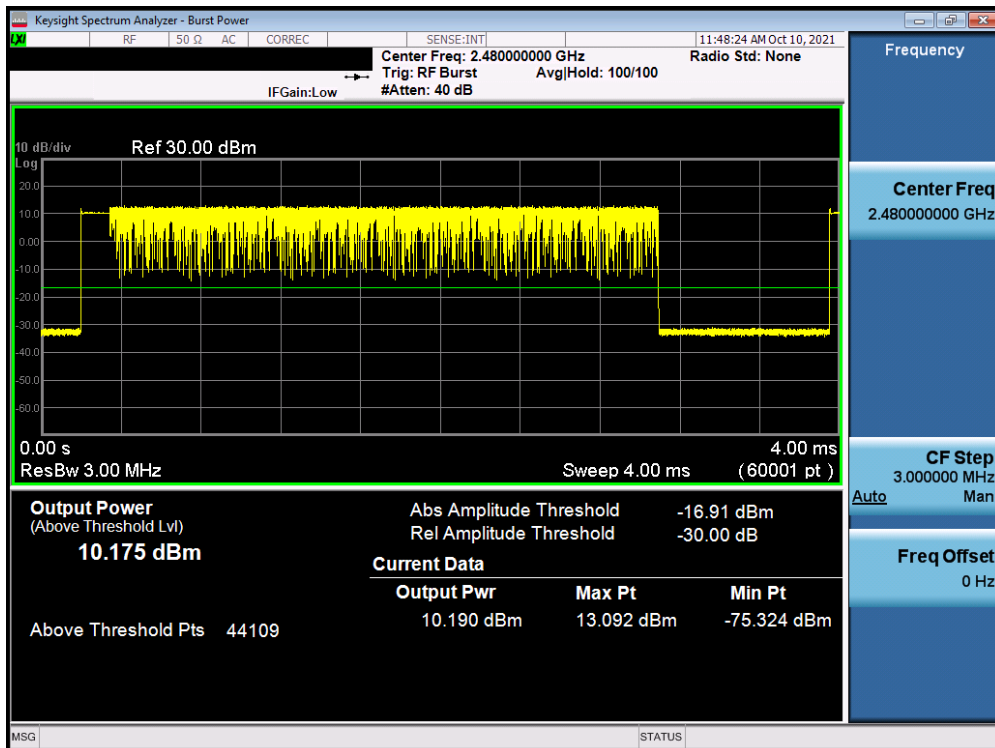


Plot 7-106. Dual Bluetooth Average Conducted Power (3Mbps – Ch. 0) Antenna 1 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 70 of 131

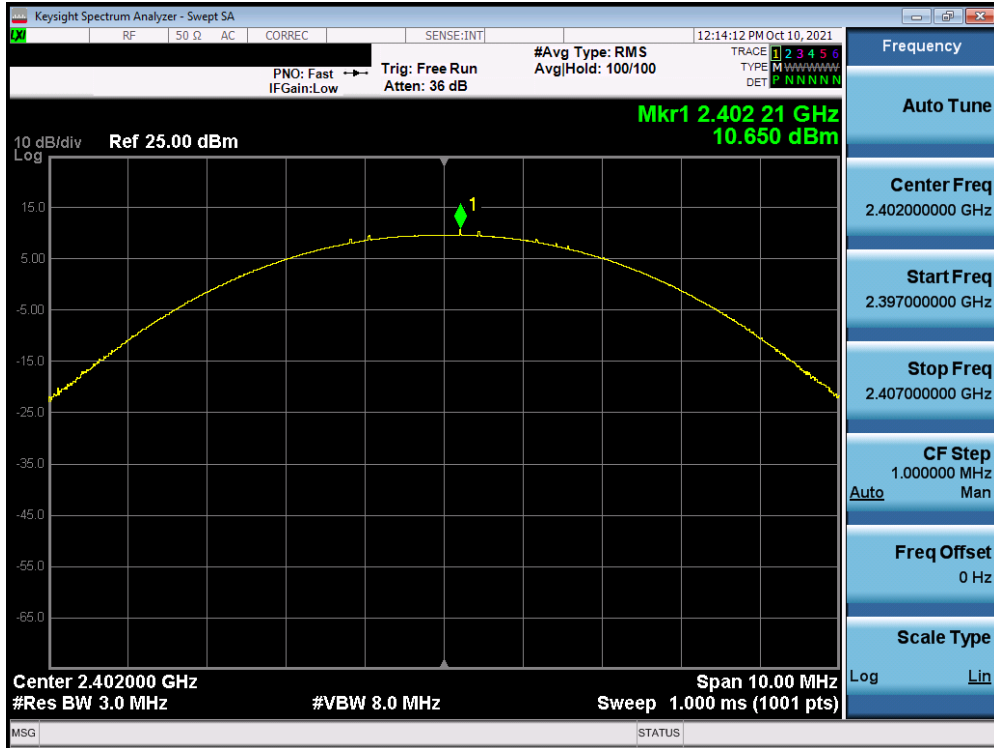


Plot 7-107. Dual Bluetooth Average Conducted Power (3Mbps – Ch. 39) Antenna 1 iPA

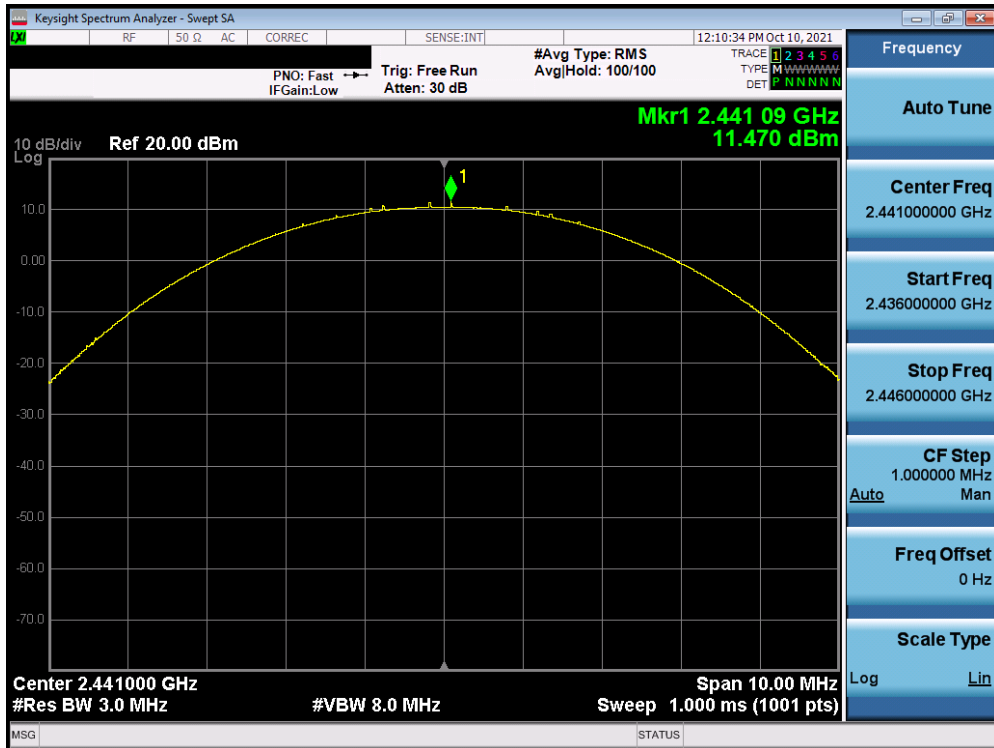


Plot 7-108. Dual Bluetooth Average Conducted Power (3Mbps – Ch. 78) Antenna 1 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 71 of 131

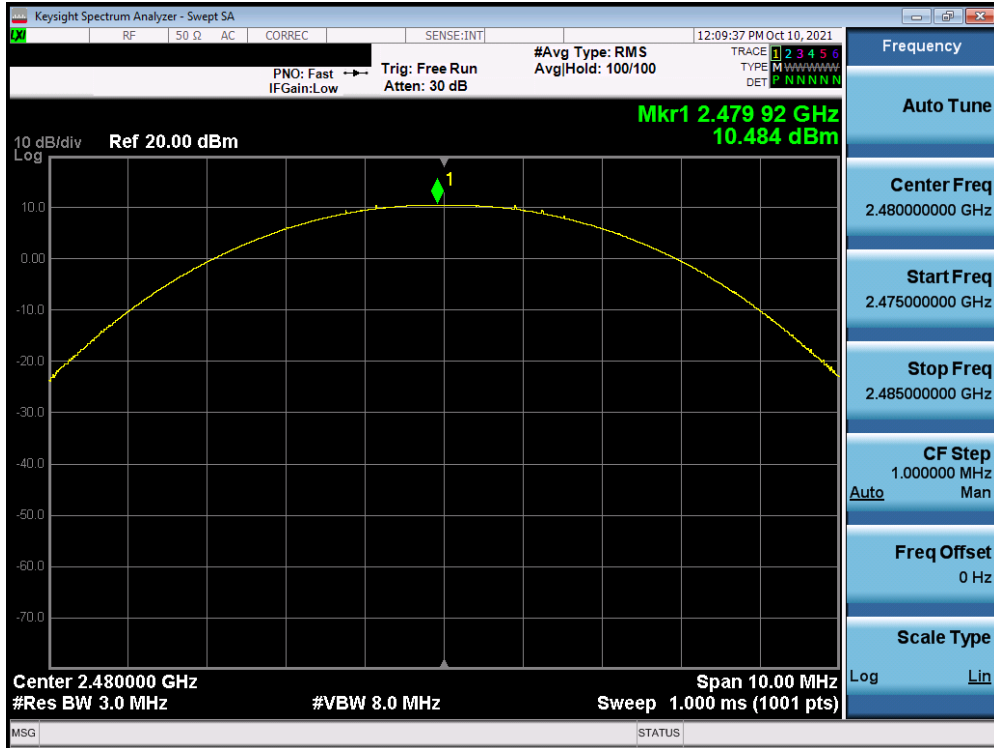


Plot 7-109. Dual Bluetooth Peak Conducted Power (1Mbps – Ch. 0) Antenna 2 iPA

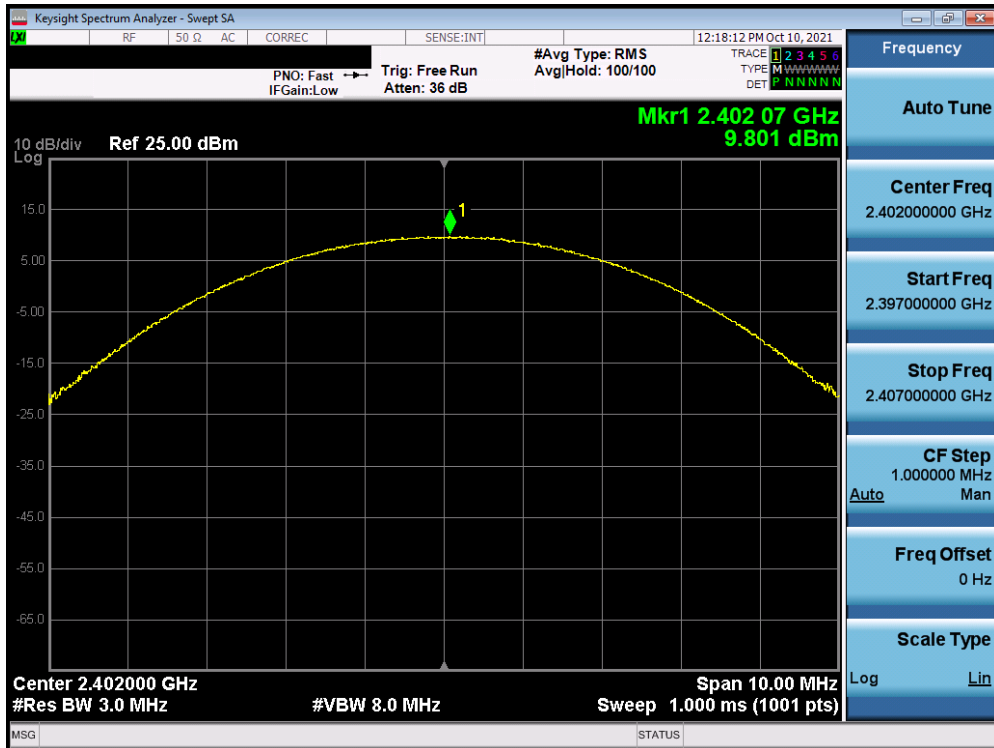


Plot 7-110. Dual Bluetooth Peak Conducted Power (1Mbps – Ch. 39) Antenna 2 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 72 of 131

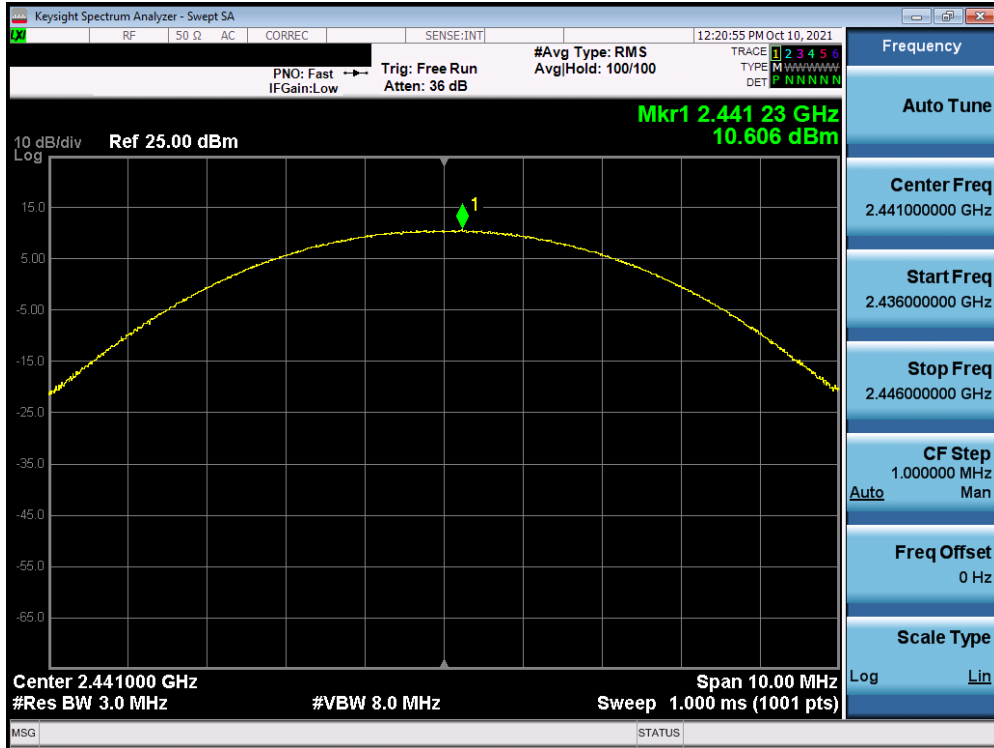


Plot 7-111. Dual Bluetooth Peak Conducted Power (1Mbps – Ch. 78) Antenna 2 iPA

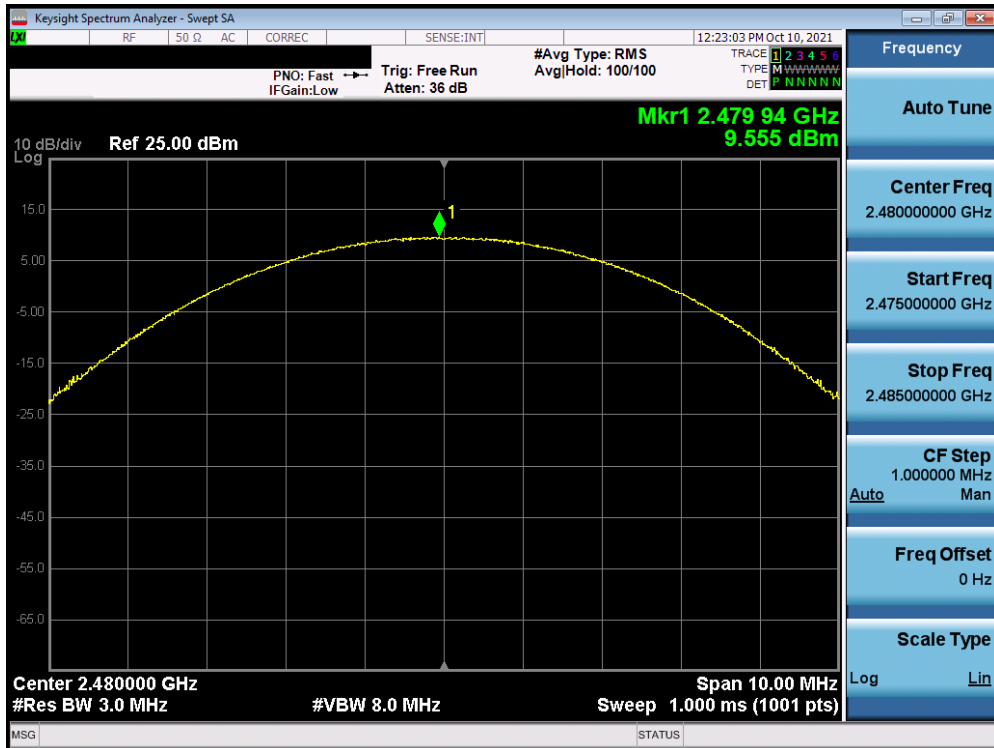


Plot 7-112. Dual Bluetooth Peak Conducted Power (2Mbps – Ch. 0) Antenna 2 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 73 of 131

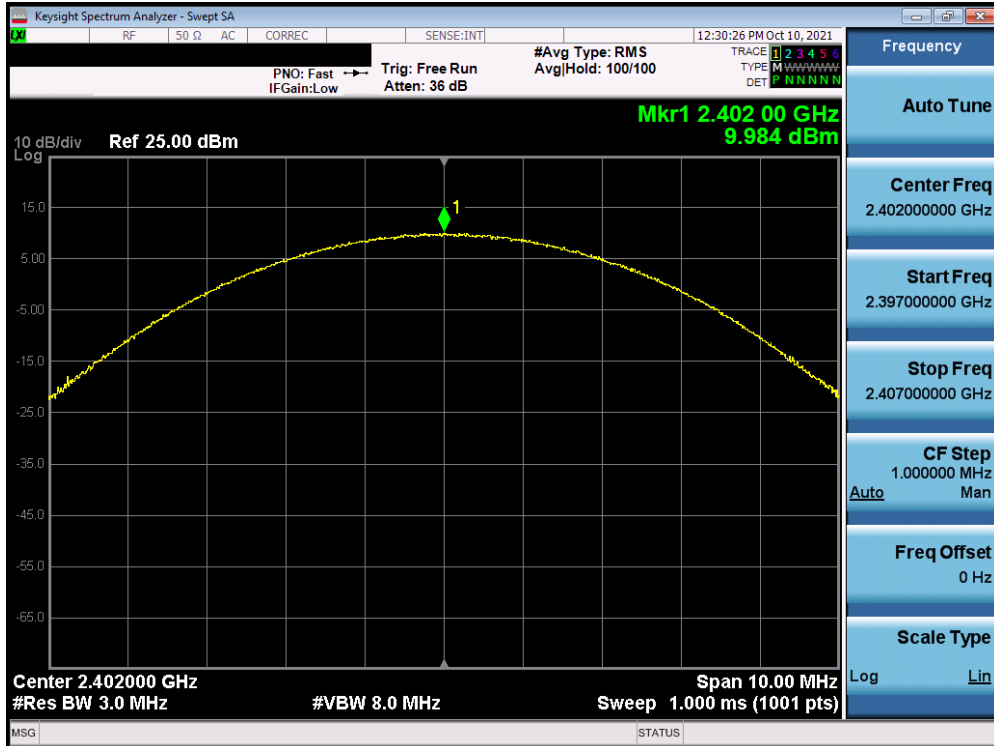


Plot 7-113. Dual Bluetooth Peak Conducted Power (2Mbps – Ch. 39) Antenna 2 iPA

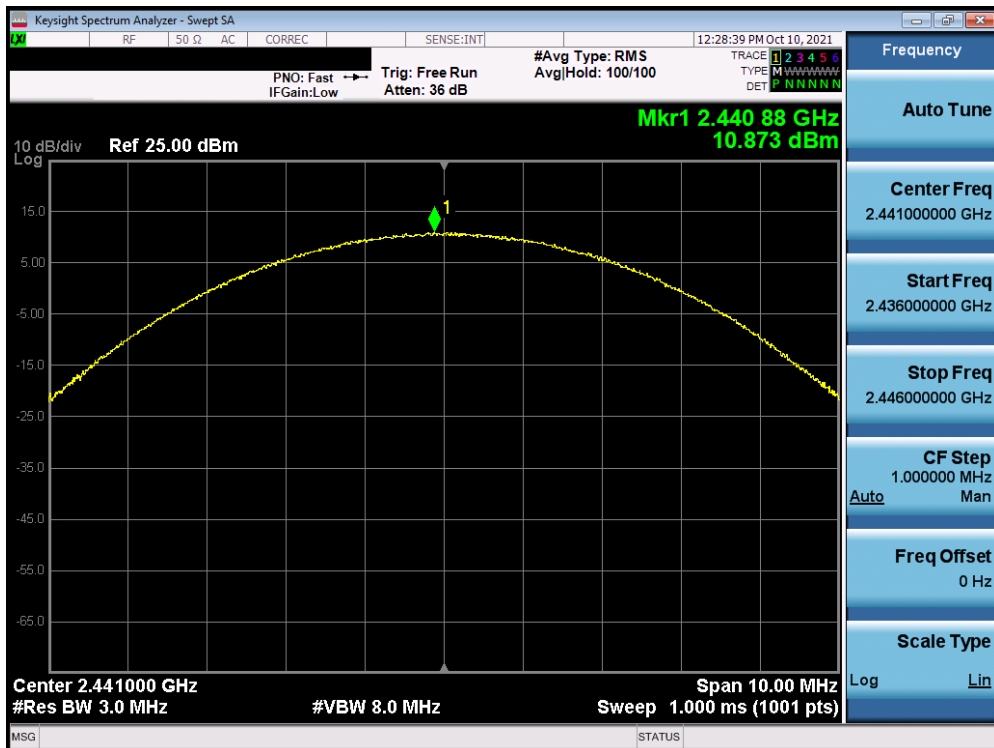


Plot 7-114. Dual Bluetooth Peak Conducted Power (2Mbps – Ch. 78) Antenna 2 iPA

FCC ID: A3LSMS908E	Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 74 of 131

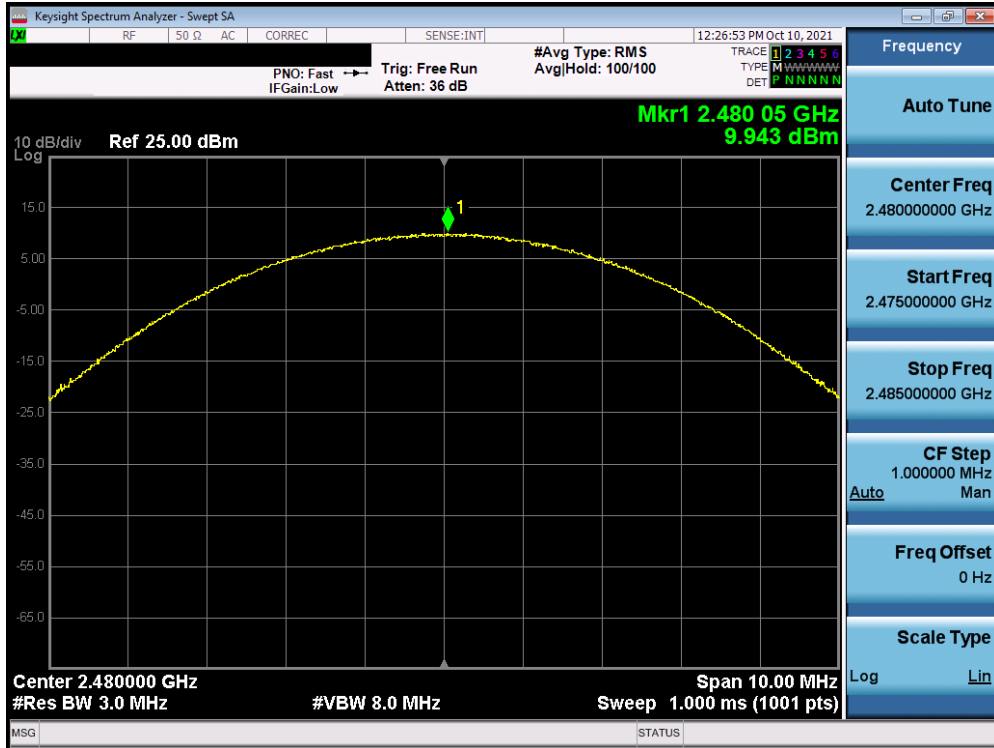


Plot 7-115. Dual Bluetooth Peak Conducted Power (3Mbps – Ch. 0) Antenna 2 iPA

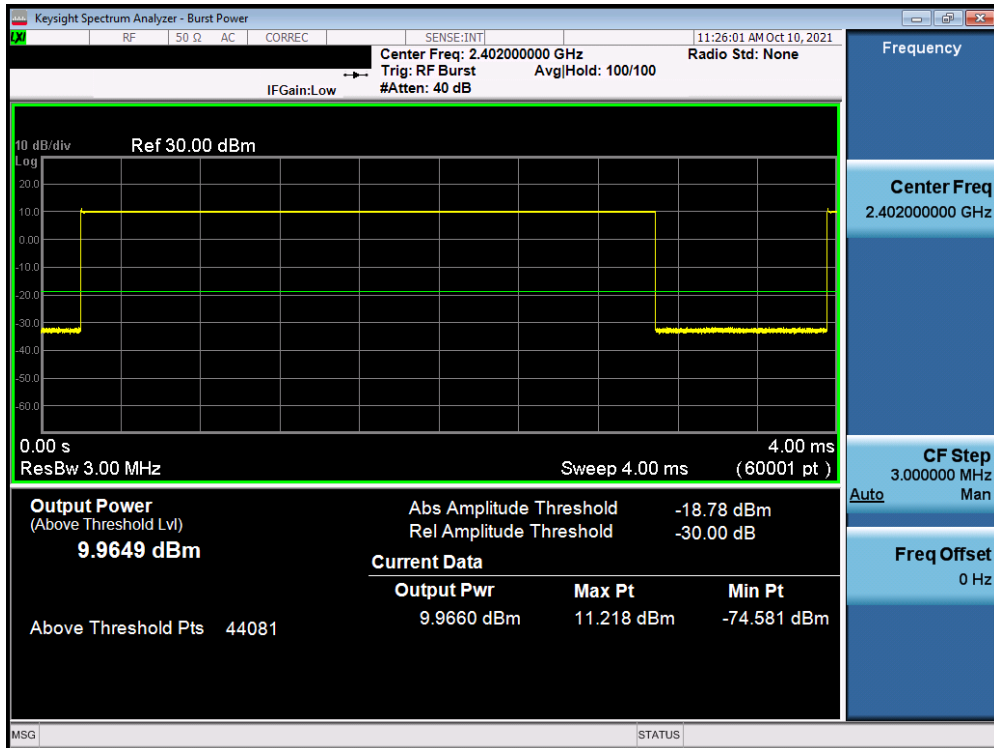


Plot 7-116. Dual Bluetooth Peak Conducted Power (3Mbps – Ch. 39) Antenna 2 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 75 of 131

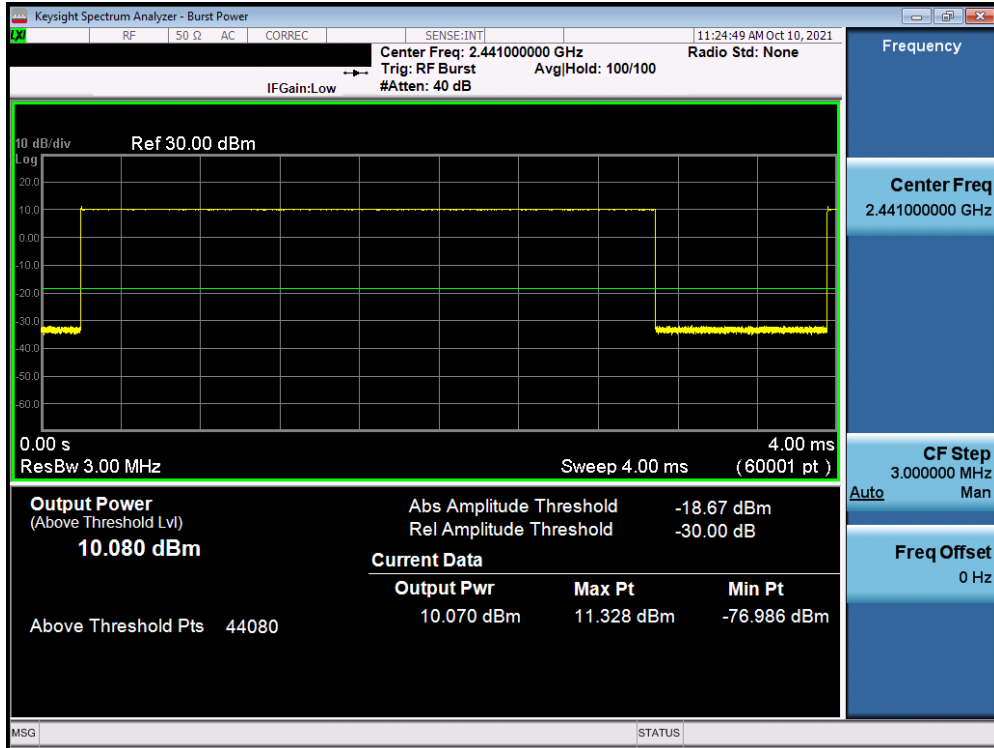


Plot 7-117. Dual Bluetooth Peak Conducted Power (3Mbps – Ch. 78) Antenna 2 iPA

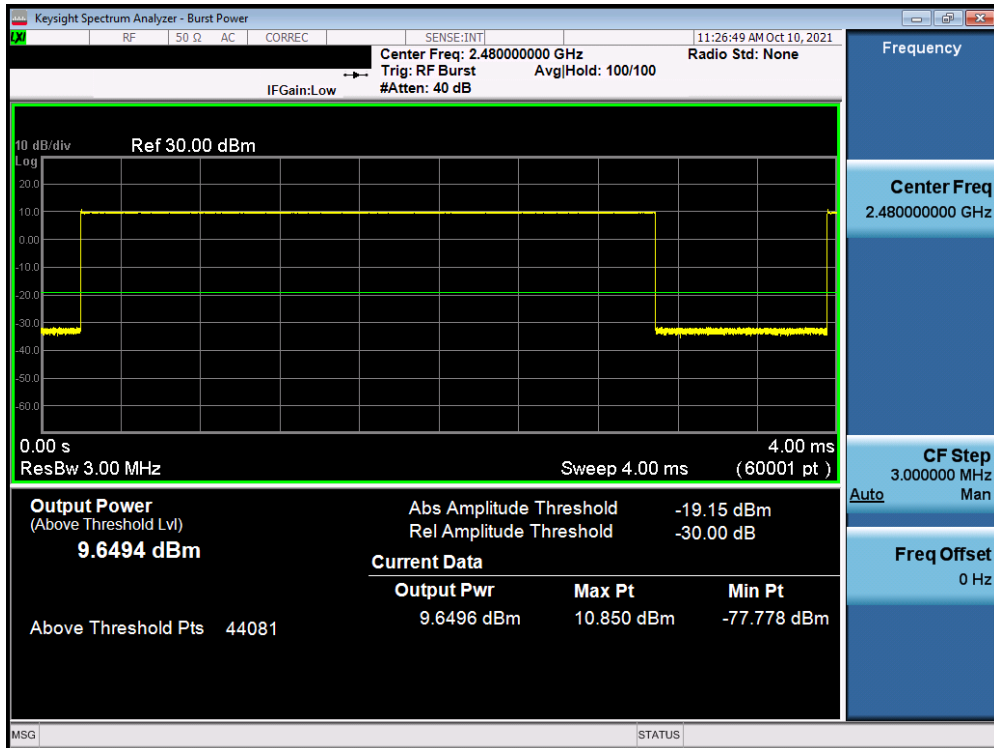


Plot 7-118. Dual Bluetooth Average Conducted Power (1Mbps – Ch. 0) Antenna 2 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 76 of 131

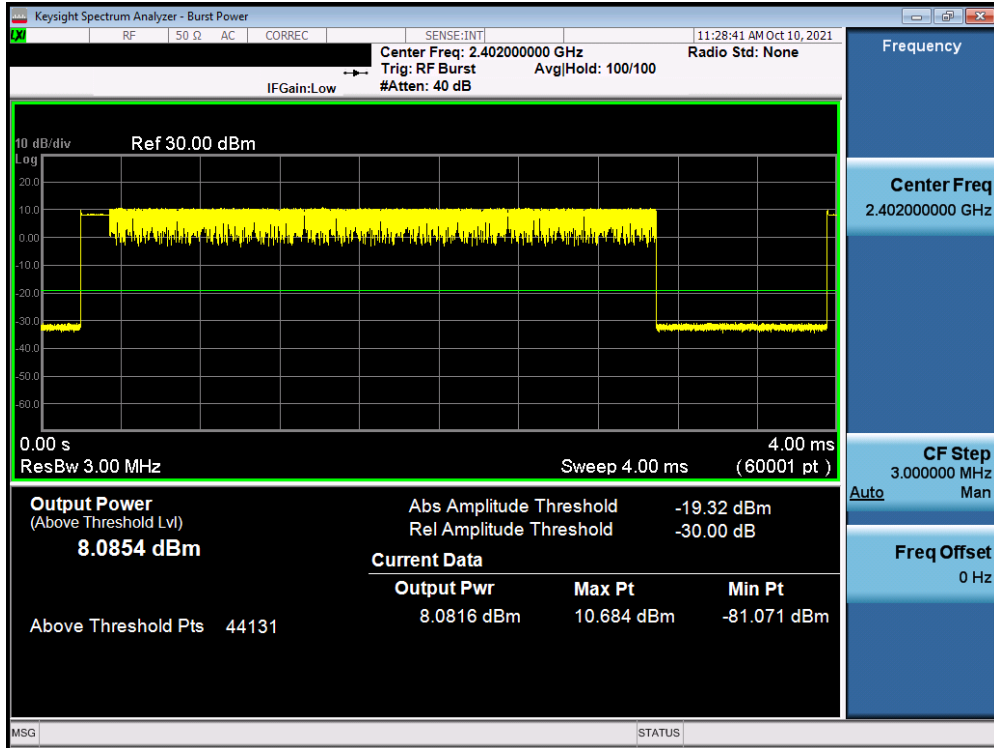


Plot 7-119. Dual Bluetooth Average Conducted Power (1Mbps – Ch. 39) Antenna 2 iPA

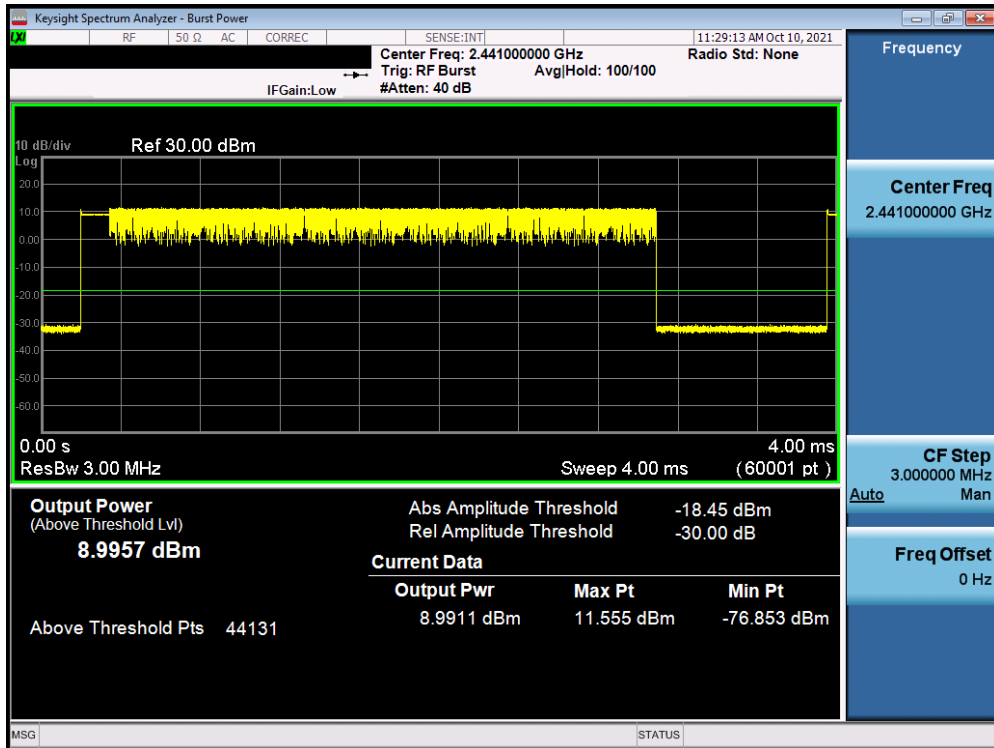


Plot 7-120. Dual Bluetooth Average Conducted Power (1Mbps – Ch. 78) Antenna 2 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 77 of 131

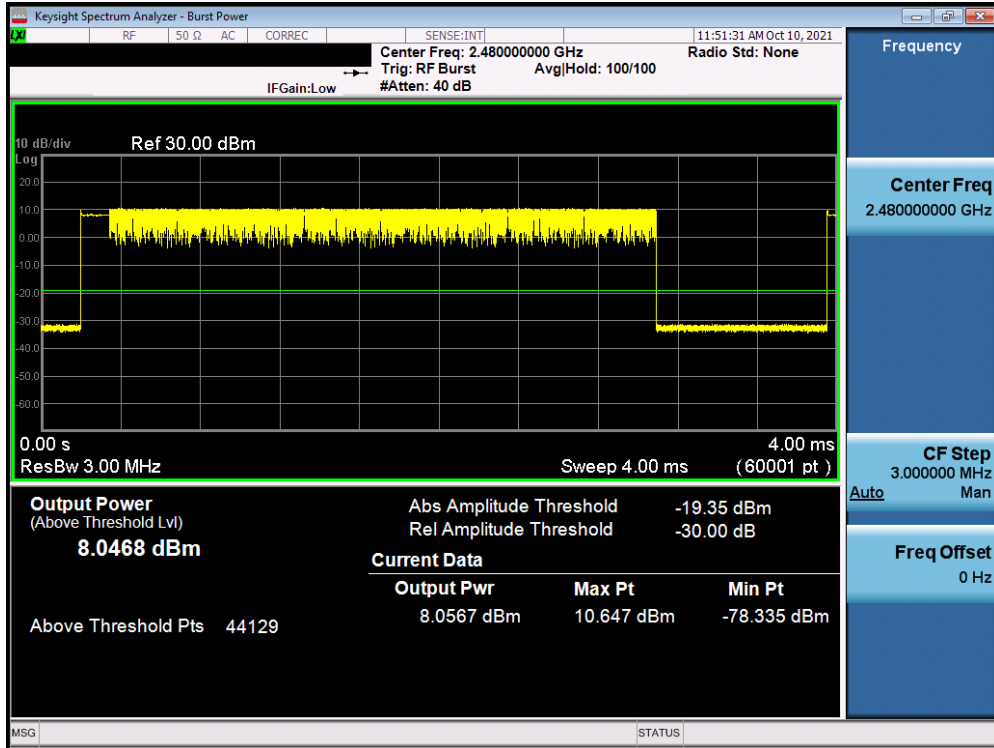


Plot 7-121. Dual Bluetooth Average Conducted Power (2Mbps – Ch. 0) Antenna 2 iPA

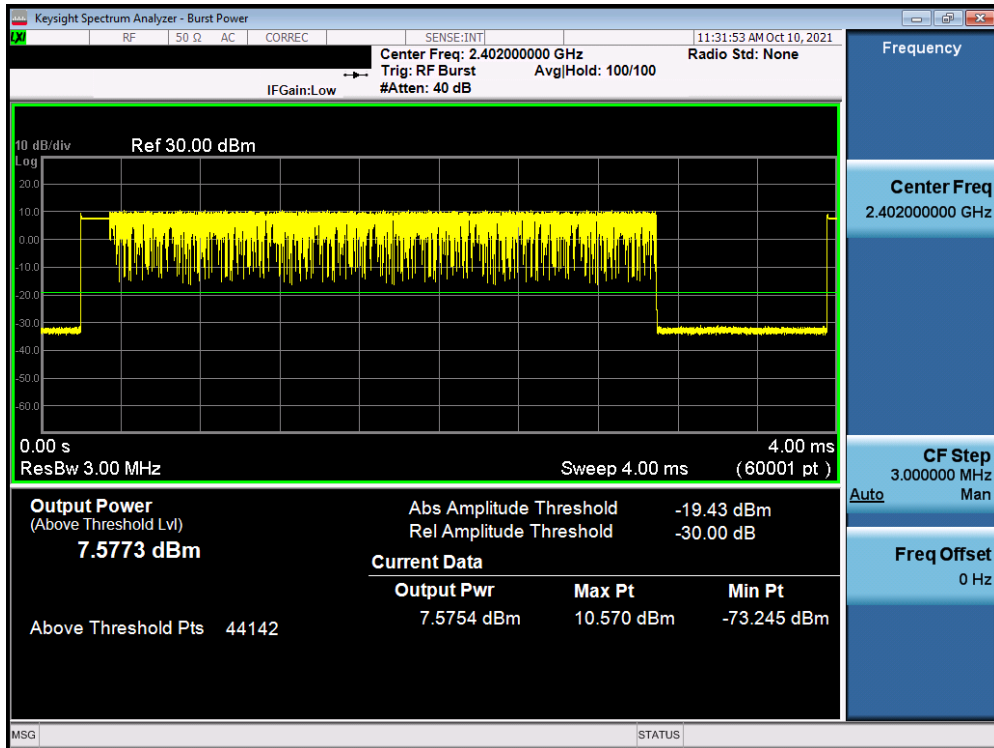


Plot 7-122. Dual Bluetooth Average Conducted Power (2Mbps – Ch. 39) Antenna 2 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 78 of 131

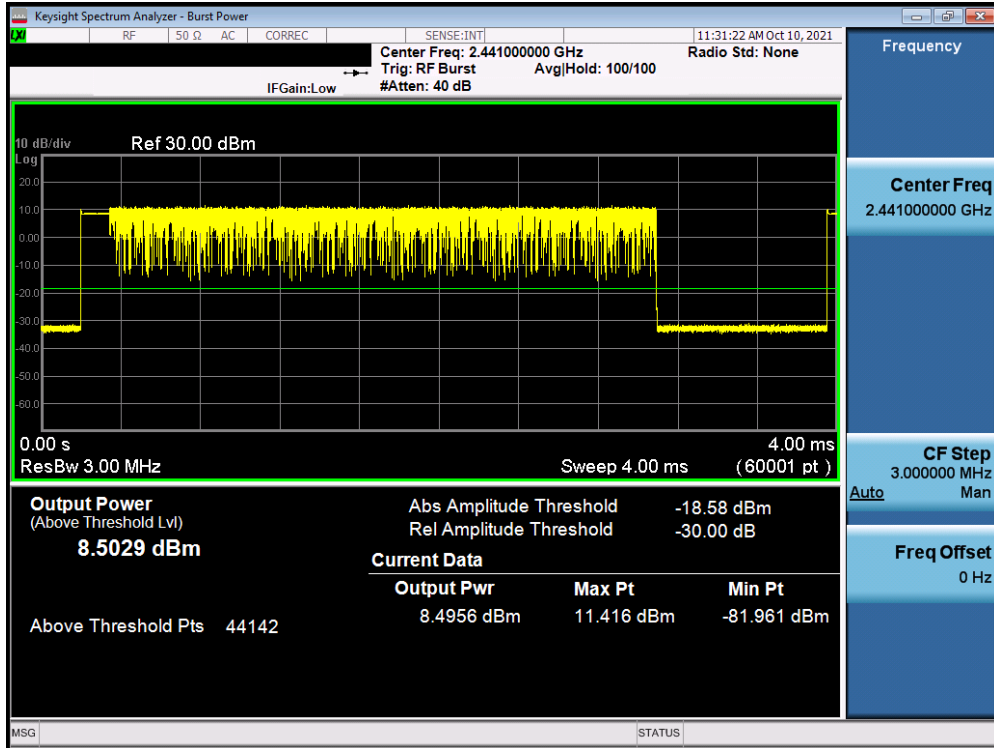


Plot 7-123. Dual Bluetooth Average Conducted Power (2Mbps – Ch. 78) Antenna 2 iPA

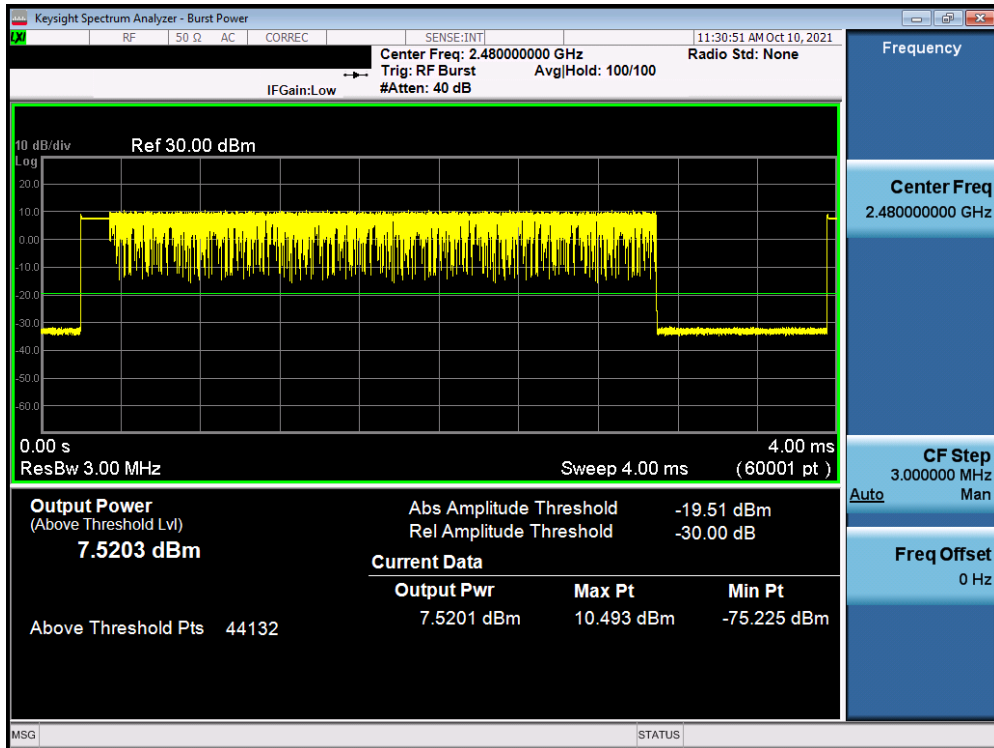


Plot 7-124. Dual Bluetooth Average Conducted Power (3Mbps – Ch. 0) Antenna 2 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 79 of 131



Plot 7-125. Dual Bluetooth Average Conducted Power (3Mbps – Ch. 39) Antenna 2 iPA



Plot 7-126. Dual Bluetooth Average Conducted Power (3Mbps – Ch. 79) Antenna 2 iPA

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 80 of 131

7.4 Conducted Authorized Band Edge §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.

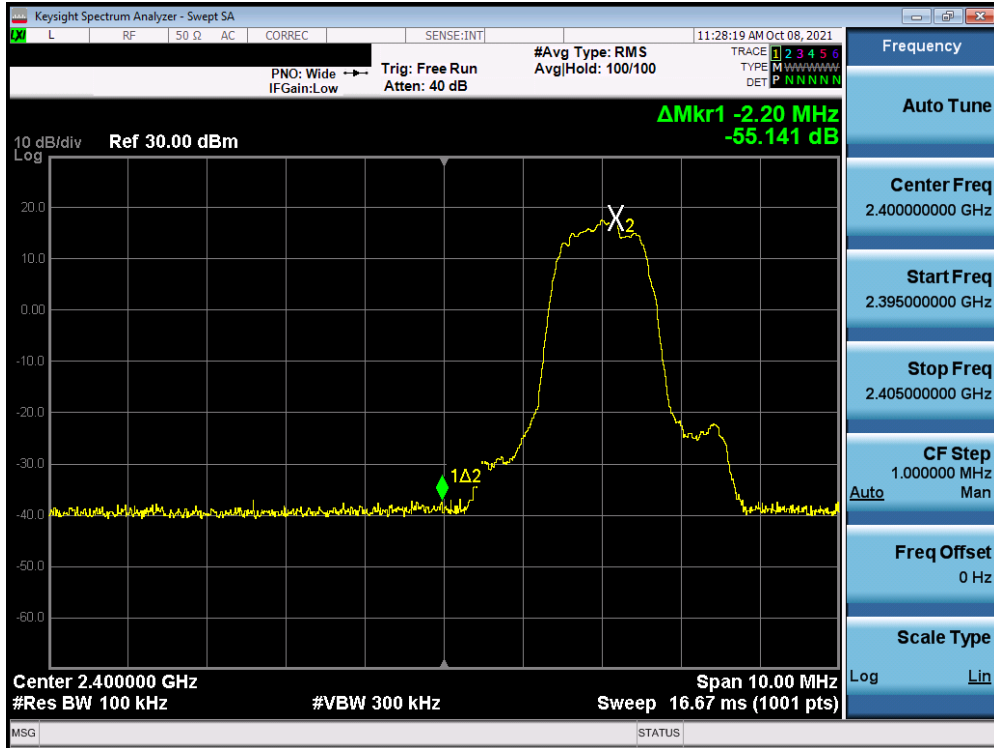


Figure 7-3. Test Instrument & Measurement Setup

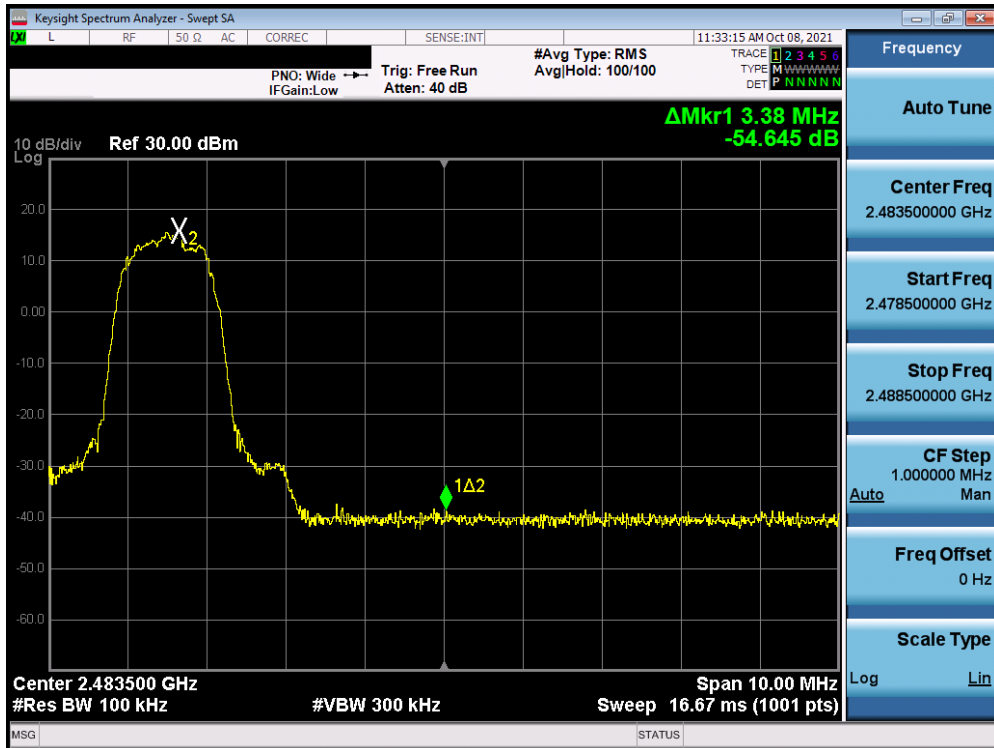
Test Notes

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 3Mbps. 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: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-127. Band Edge Plot (Bluetooth with Hopping Disabled, 3Mbps– Ch. 0) Antenna 1



Plot 7-128. Band Edge Plot (Bluetooth with Hopping Disabled, 3Mbps– Ch. 78) Antenna 1

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 82 of 131

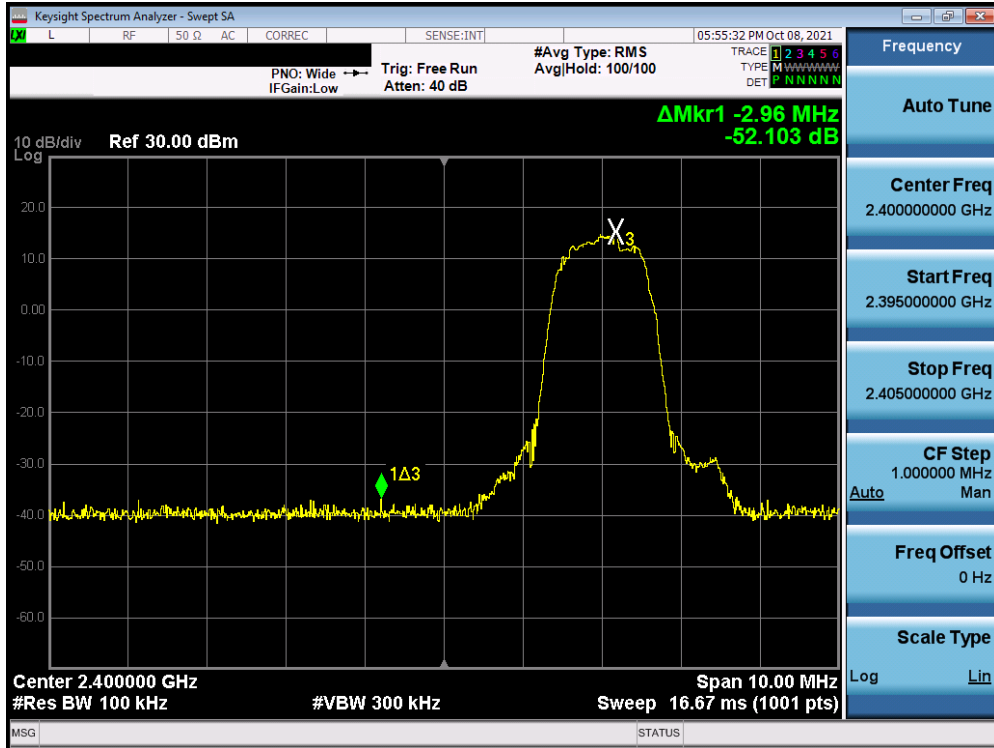


Plot 7-129. Band Edge Plot (Bluetooth with Hopping Enabled, 3Mbps– Ch. 0) Antenna 1

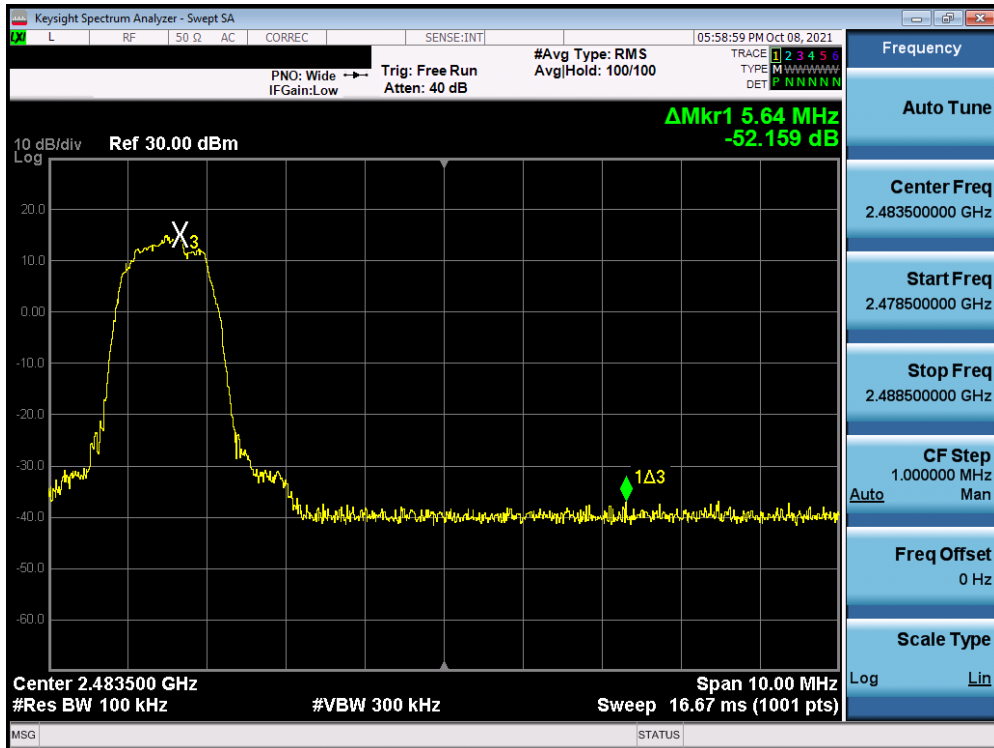


Plot 7-130. Band Edge Plot (Bluetooth with Hopping Enabled, 3Mbps– Ch. 78) Antenna 1

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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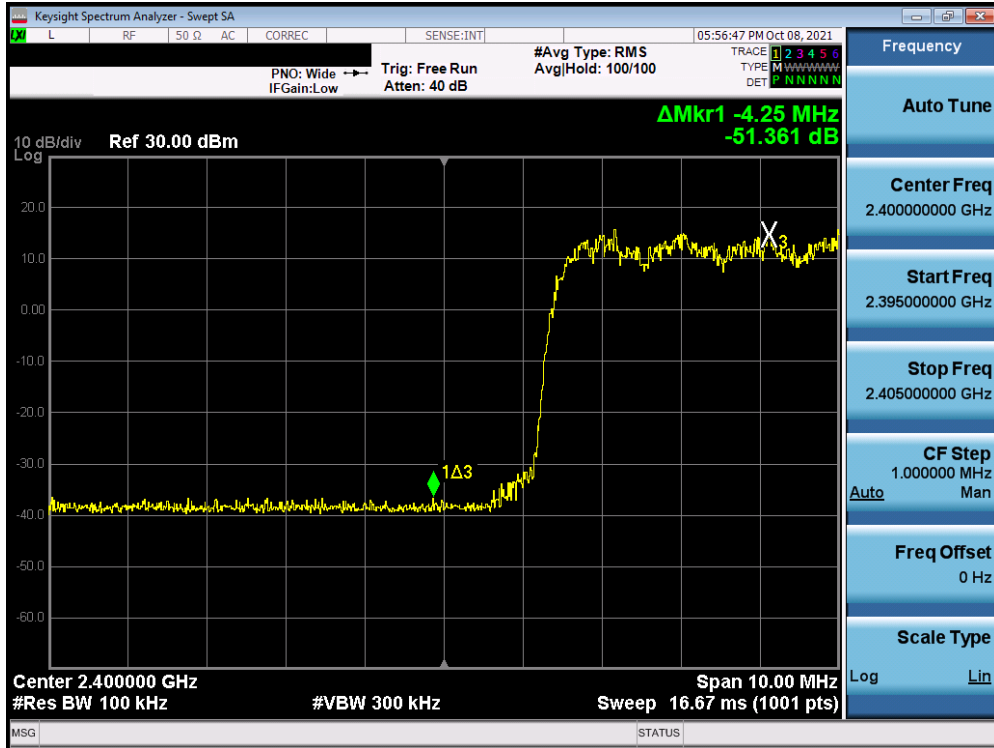


Plot 7-131. Band Edge Plot (Bluetooth with Hopping Disabled, 3Mbps– Ch. 0) Antenna 2

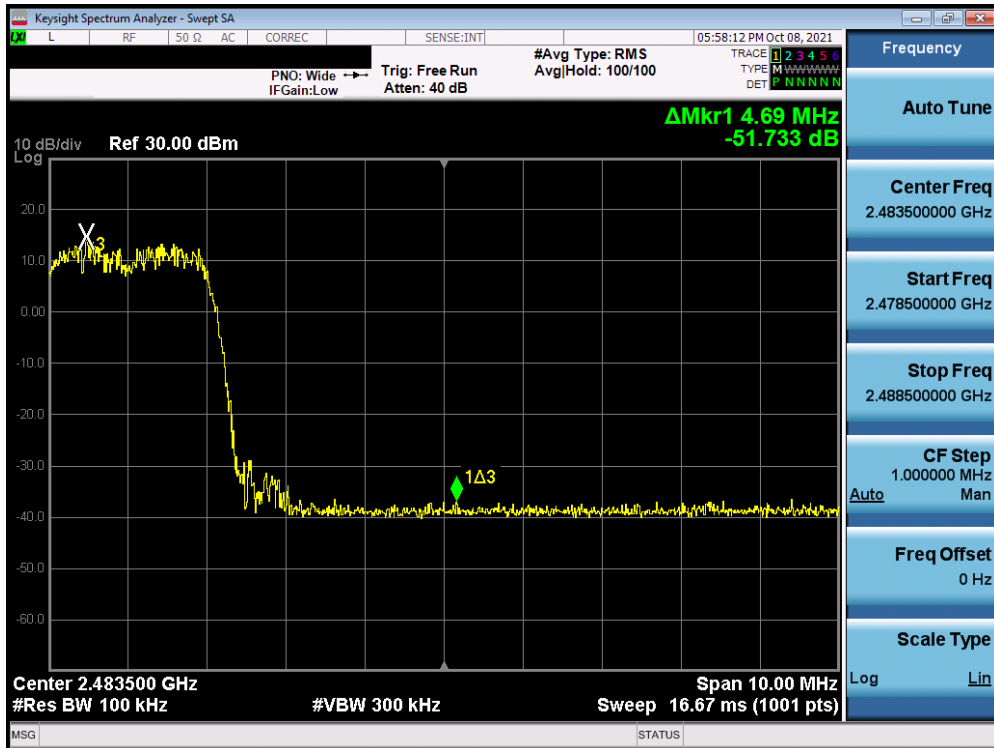


Plot 7-132. Band Edge Plot (Bluetooth with Hopping Disabled, 3Mbps– Ch. 78) Antenna 2

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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Plot 7-133. Band Edge Plot (Bluetooth with Hopping Enabled, 3Mbps– Ch. 0) Antenna 2



Plot 7-134. Band Edge Plot (Bluetooth with Hopping Enabled, 3Mbps– Ch. 78) Antenna 2

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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7.5 Carrier Frequency Separation

§15.247(a)(1); RSS-247 [5.1(b)]

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

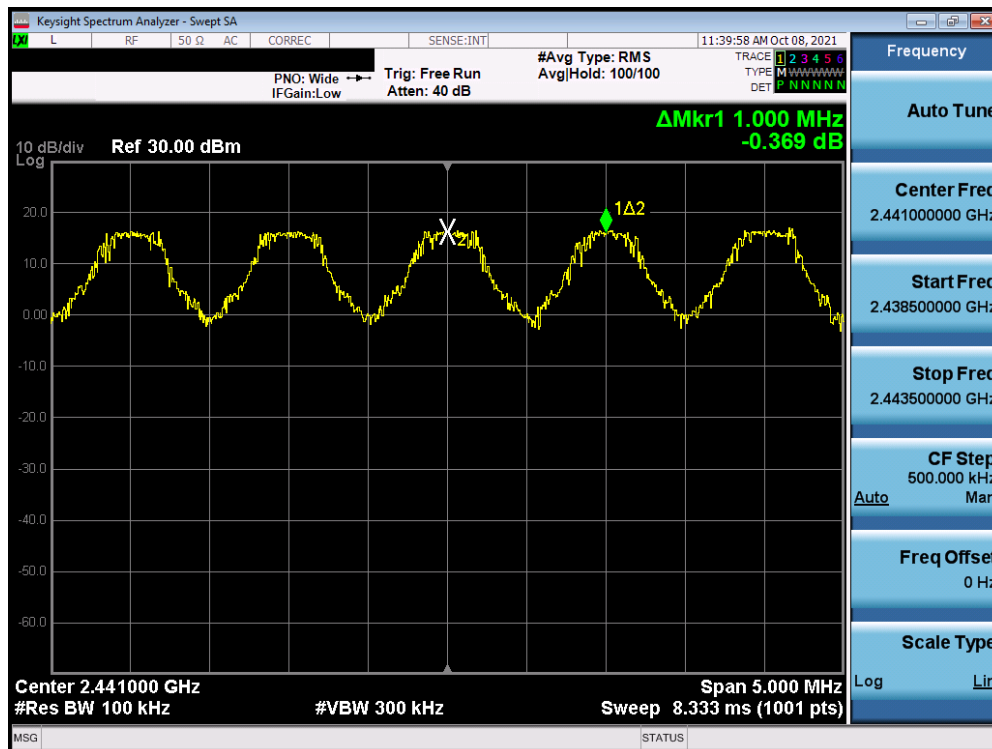
Test Notes

1. 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.
2. All supported modulation and power schemes have been tested on the unit and only worst case configuration is reported.

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Frequency [MHz]	Data Rate [Mbps]	Modulation	Power Scheme	Channel No.	Min. Channel Separation [MHz]
2402	1.0	GFSK	ePA	0	0.663
2441	1.0	GFSK	ePA	39	0.627
2480	1.0	GFSK	ePA	78	0.625
2402	2.0	$\pi/4$ -DQPSK	ePA	0	0.895
2441	2.0	$\pi/4$ -DQPSK	ePA	39	0.881
2480	2.0	$\pi/4$ -DQPSK	ePA	78	0.886
2402	3.0	8DPSK	ePA	0	0.868
2441	3.0	8DPSK	ePA	39	0.873
2480	3.0	8DPSK	ePA	78	0.865

Table 7-8. Minimum Channel Separation – Antenna 1

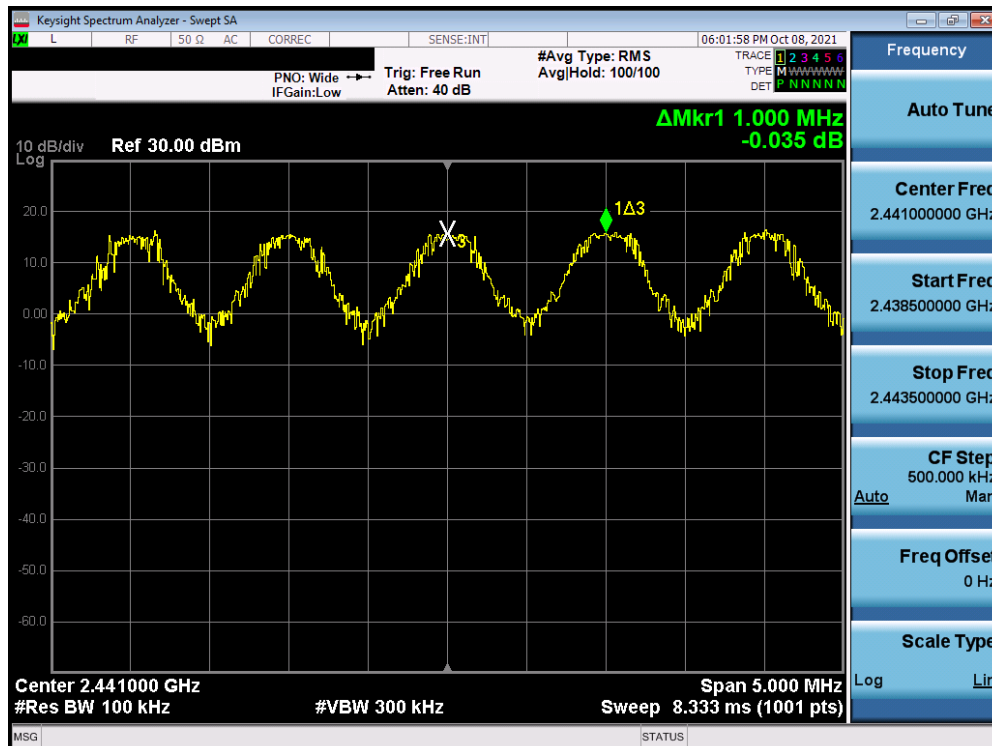


Plot 7-135. Channel Spacing Plot (Bluetooth) – Antenna 1

FCC ID: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Frequency [MHz]	Data Rate [Mbps]	Modulation	Power Scheme	Channel No.	Min. Channel Separation [MHz]
2402	1.0	GFSK	ePA	0	0.681
2441	1.0	GFSK	ePA	39	0.668
2480	1.0	GFSK	ePA	78	0.662
2402	2.0	$\pi/4$ -DQPSK	ePA	0	0.881
2441	2.0	$\pi/4$ -DQPSK	ePA	39	0.882
2480	2.0	$\pi/4$ -DQPSK	ePA	78	0.891
2402	3.0	8DPSK	ePA	0	0.874
2441	3.0	8DPSK	ePA	39	0.881
2480	3.0	8DPSK	ePA	78	0.872

Table 7-9. Minimum Channel Separation – Antenna 2



Plot 7-136. Channel Spacing Plot (Bluetooth) – Antenna 2

FCC ID: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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7.6 Time of Occupancy

§15.247(a)(1)(iii); RSS-247 [5.1(d)]

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.

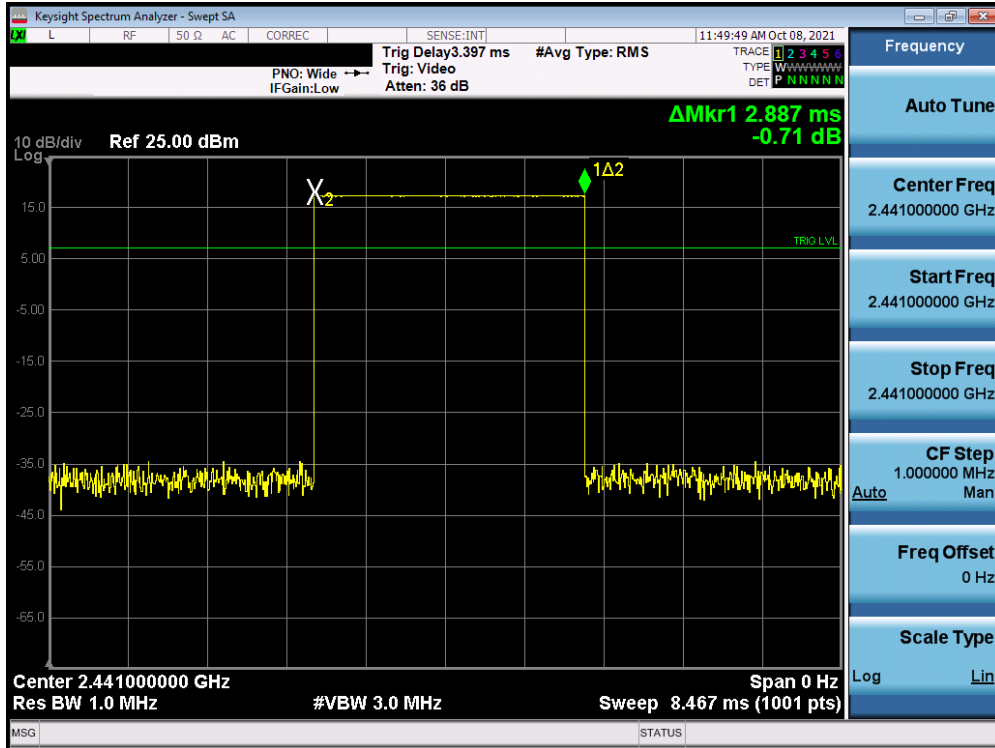


Figure 7-5. Test Instrument & Measurement Setup

Test Notes

All supported modulation and power schemes have been tested on the unit and only worst case configuration is reported

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Plot 7-137. Time of Occupancy Plot (Bluetooth) -Antenna 1

Bluetooth time of Occupancy Calculation

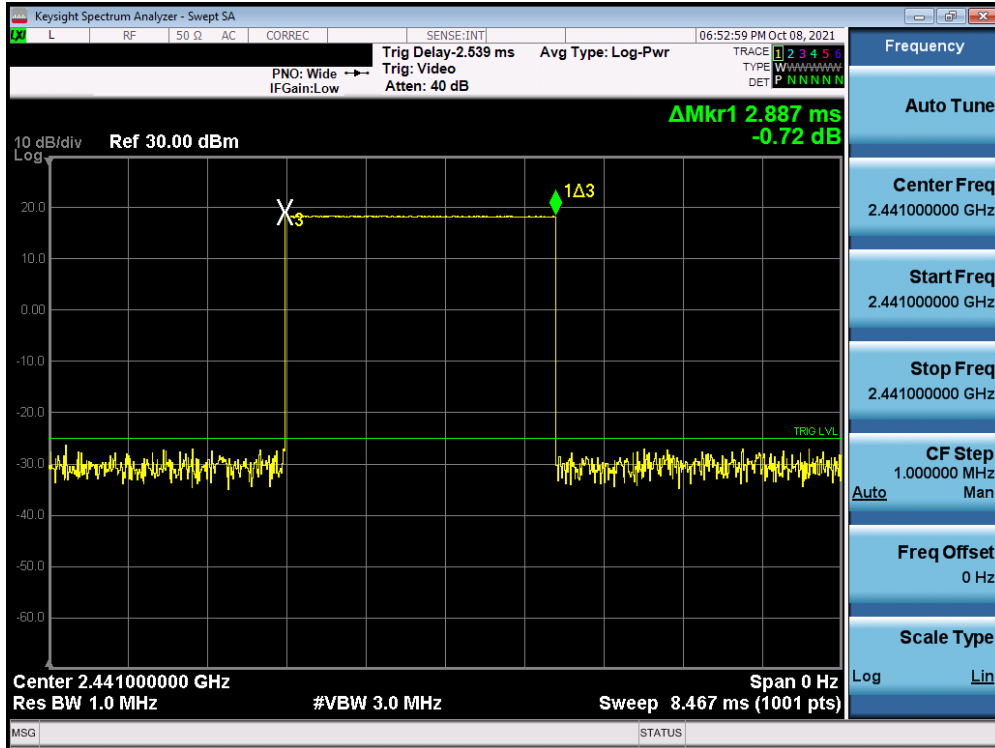
Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s. Since 1x/BDR modes use 5 transmit and 1 receive slot, for a total of 6 slots, the Bluetooth transmitter is actually hopping at a rate of $1600 / 6 = 266.67$ hops/s/slot

- $400\text{ms} \times 79$ hopping channels = 31.6 sec (Time of Occupancy Limit)
- Worst case BT has 266.67 hops/second (for 1x/EDR modes with DH5 operation)
- $266.67 \text{ hops/second} / 79$ channels = 3.38 hops/second (# of hops/second on one channel)
- $3.38 \text{ hops/second/channel} \times 31.6$ seconds = 106.67 hops (# hops over a 31.6 second period)
- $106.67 \text{ hops} \times 2.887 \text{ ms/channel} = 307.96 \text{ ms}$ (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)
- $133.3 \text{ hops/s} / 20$ channels = 6.67 hops/second (# of hops/second on one channel)
- $6.67 \text{ hops/s} / \text{channel} \times 8$ seconds = 53.34 hops (# hops over a 8 second period)
- $53.34 \text{ hops} \times 2.887 \text{ ms/channel} = 153.99 \text{ ms}$ (worst case dwell time for one channel in AFH mode)

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Plot 7-138. Time of Occupancy Plot (Bluetooth) -Antenna 2

Bluetooth time of Occupancy Calculation

Typically, Bluetooth 1x/EDR mode has a channel hopping rate of 1600 hops/s. Since 1x/BDR 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)
- $266.67 \text{ hops/second} / 79$ channels = 3.38 hops/second (# of hops/second on one channel)
- $3.38 \text{ hops/second/channel} \times 31.6$ seconds = 106.67 hops (# hops over a 31.6 second period)
- $106.67 \text{ hops} \times 2.887 \text{ ms/channel} = 307.96 \text{ ms}$ (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)
- $133.3 \text{ hops/s} / 20$ channels = 6.67 hops/second (# of hops/second on one channel)
- $6.67 \text{ hops/s} / \text{channel} \times 8$ seconds = 53.34 hops (# hops over a 8 second period)
- $53.34 \text{ hops} \times 2.887 \text{ ms/channel} = 153.99 \text{ ms}$ (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(d)]

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.

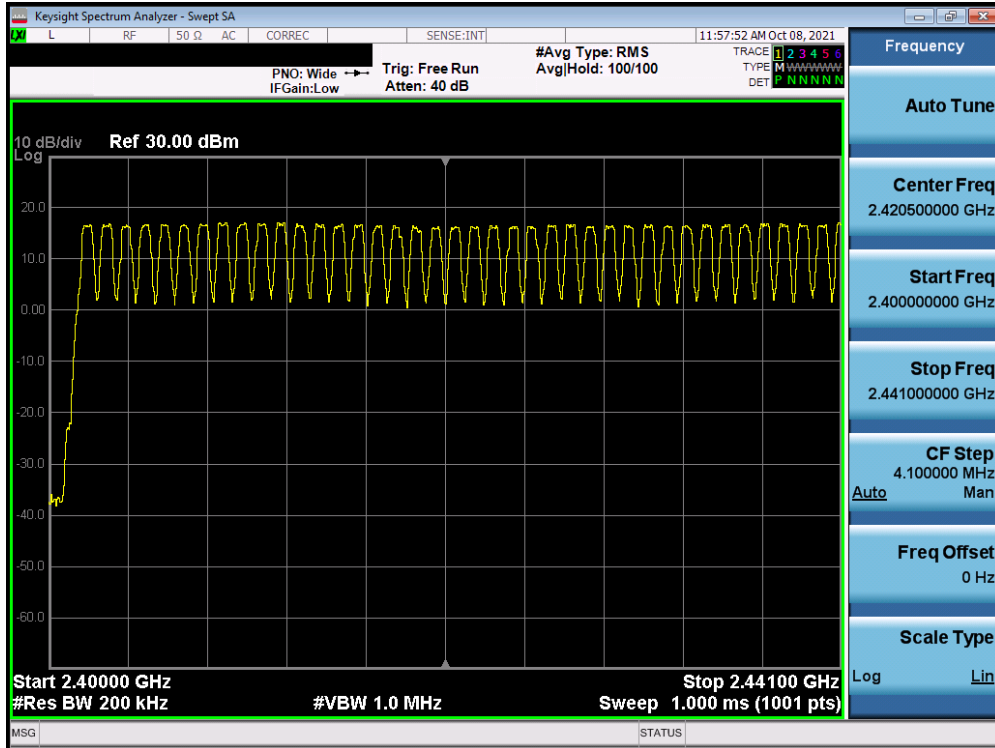


Figure 7-6. Test Instrument & Measurement Setup

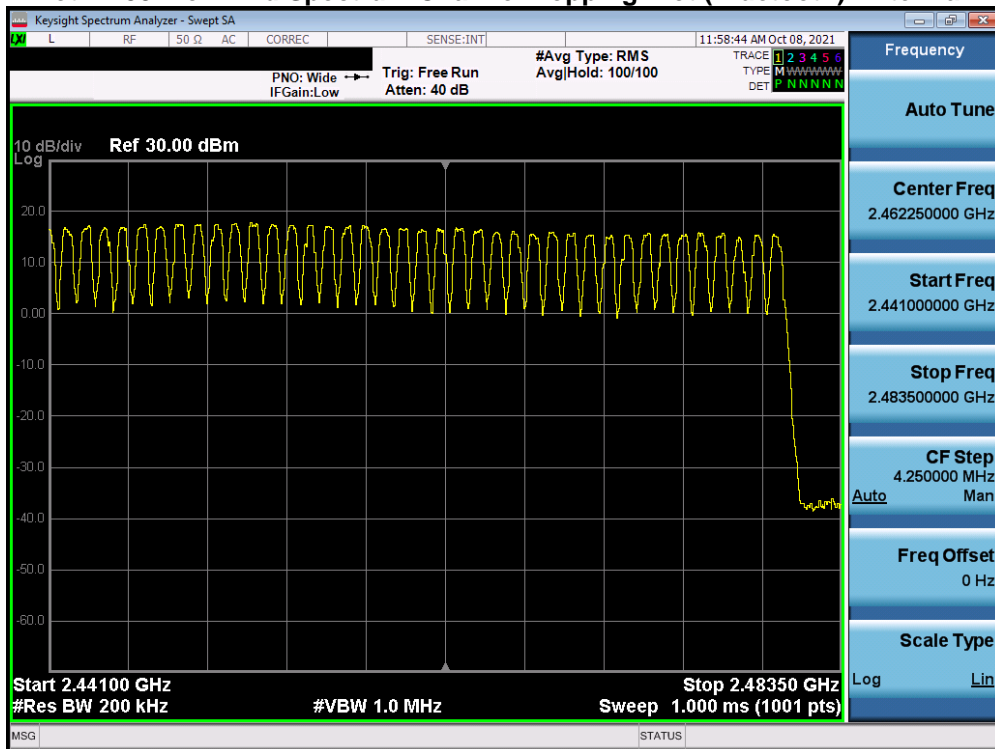
Test Notes

1. The frequency spectrum was broken up into two sub-ranges to clearly show all of the hopping frequencies. In AFH mode, this device operates using 20 channels so the requirement for minimum number of hopping channels is satisfied.
2. All supported modulation and power schemes have been tested on the unit and only worst case configuration is reported.

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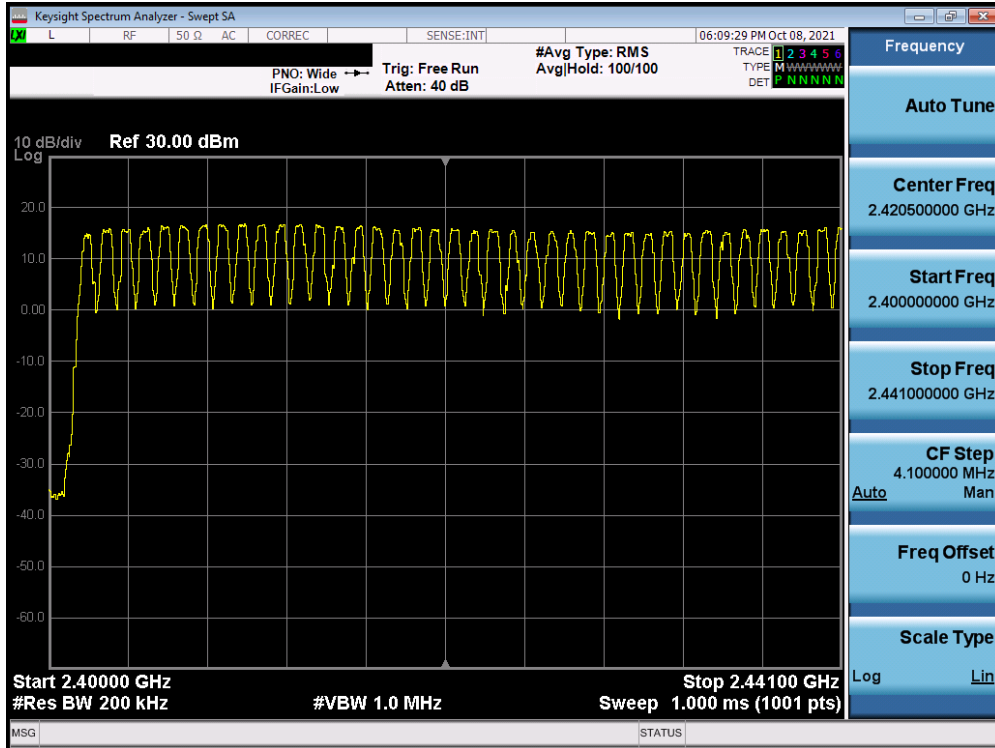


Plot 7-139. Low End Spectrum Channel Hopping Plot (Bluetooth) Antenna 1

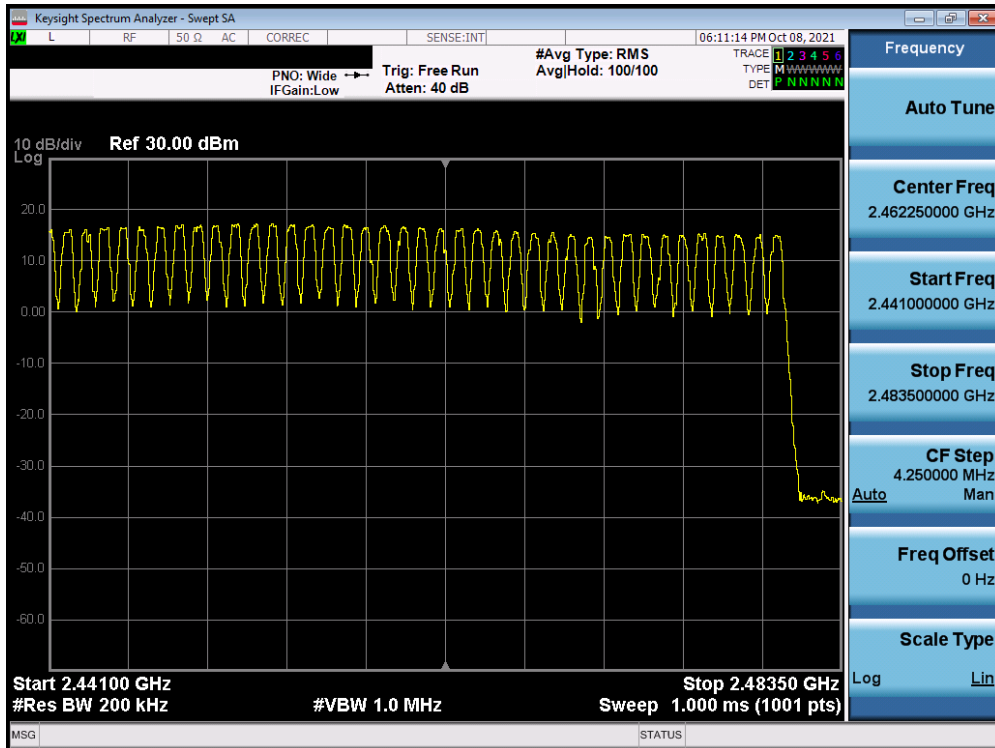


Plot 7-140. High End Spectrum Channel Hopping Plot (Bluetooth) Antenna 1

FCC ID: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Plot 7-141. Low End Spectrum Channel Hopping Plot (Bluetooth) Antenna 2



Plot 7-142. High End Spectrum Channel Hopping Plot (Bluetooth) Antenna 2

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7.8 Conducted Spurious Emissions

§15.247 (d); RSS-247 [5.5]

Test Overview and Limit

Conducted out-of-band spurious emissions were investigated from 30MHz up to 25GHz to include the 10th harmonic of the fundamental transmit frequency. **The maximum permissible out-of-band emission level is 20 dBc.**

Test Procedure Used

ANSI C63.10-2013 – Section 7.8.8

Test Settings

1. Start frequency was set to 30MHz and stop frequency was set to 25GHz (separated into two plots per channel)
2. RBW = 1MHz* (See note below)
3. VBW = 3MHz
4. Detector = Peak
5. Trace mode = max hold
6. Sweep time = auto couple
7. The trace was allowed to stabilize

Test Setup

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

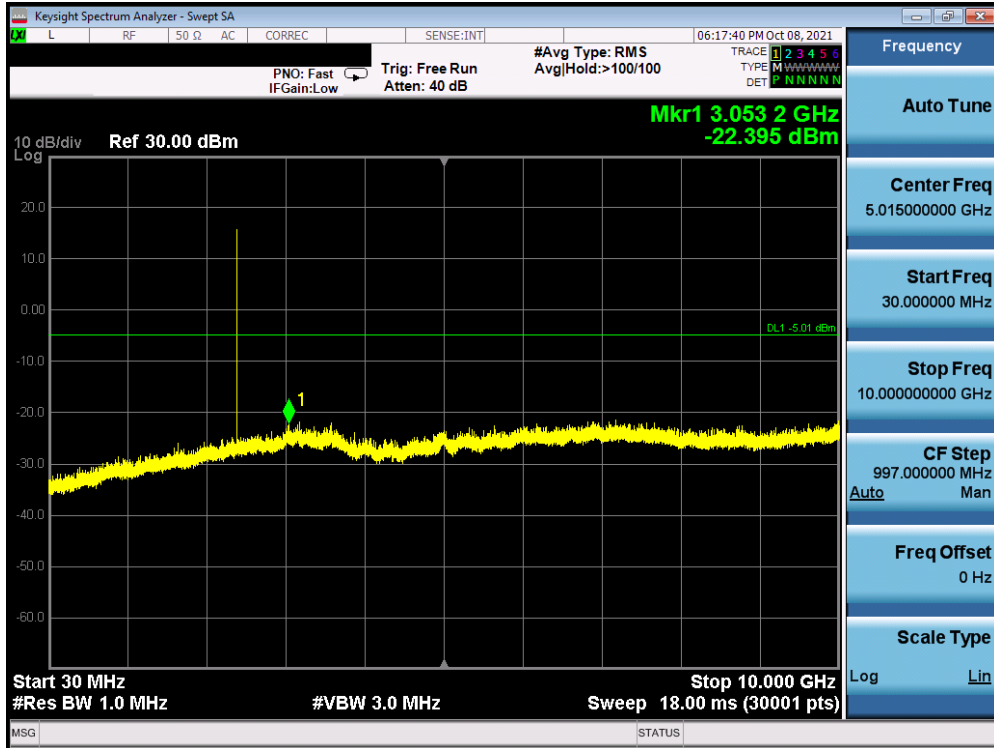


Figure 7-7. Test Instrument & Measurement Setup

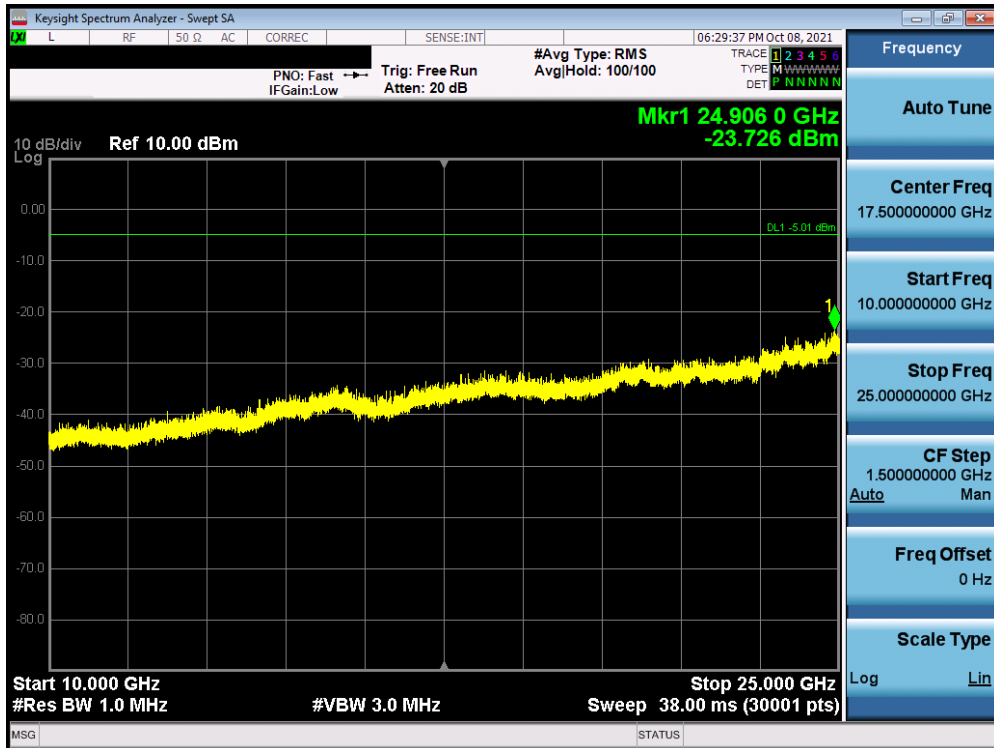
Test Notes

1. Out-of-band conducted spurious emissions were investigated for all data rates and the worst case emissions were found with the EUT transmitting at N/AMbps. The display line shown in the following plots is the limit at 20dB below the fundamental emission level measured in a 100kHz bandwidth. However, the traces in the following plots are measured with a 1MHz RBW to reduce test time, so the display line may not necessarily appear to be 20dB below the level of the fundamental in a 1MHz bandwidth.
2. All supported modulation and power schemes have been tested on the unit and only worst-case configuration is reported

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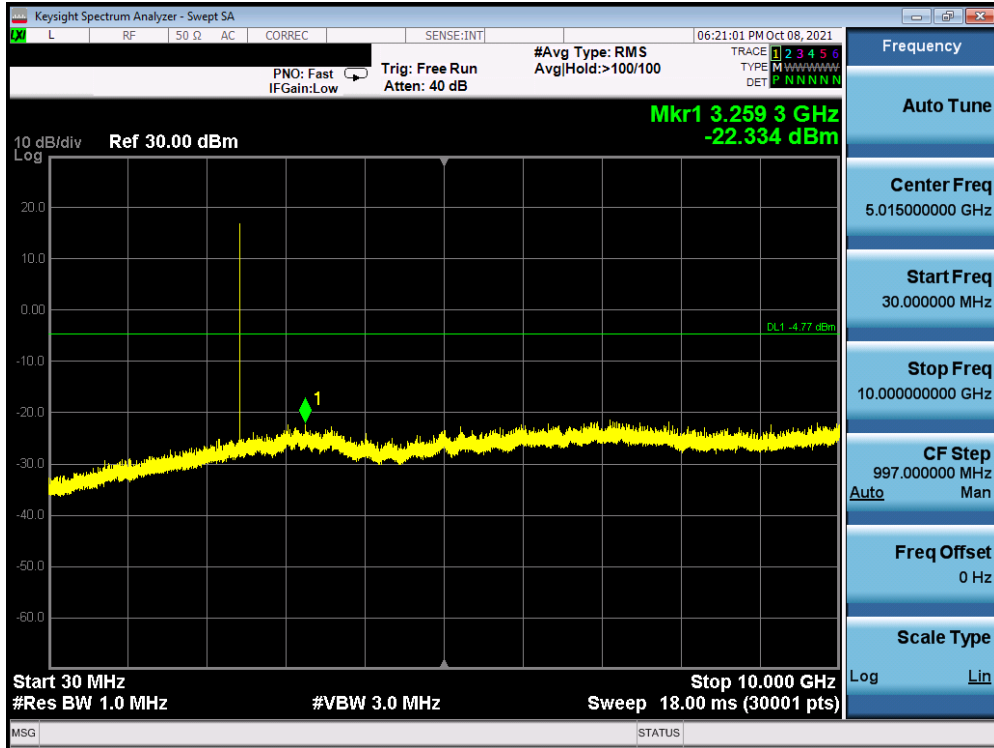


Plot 7-143. Conducted Spurious Plot (Bluetooth, 1Mbps- Ch. 0) Antenna 1

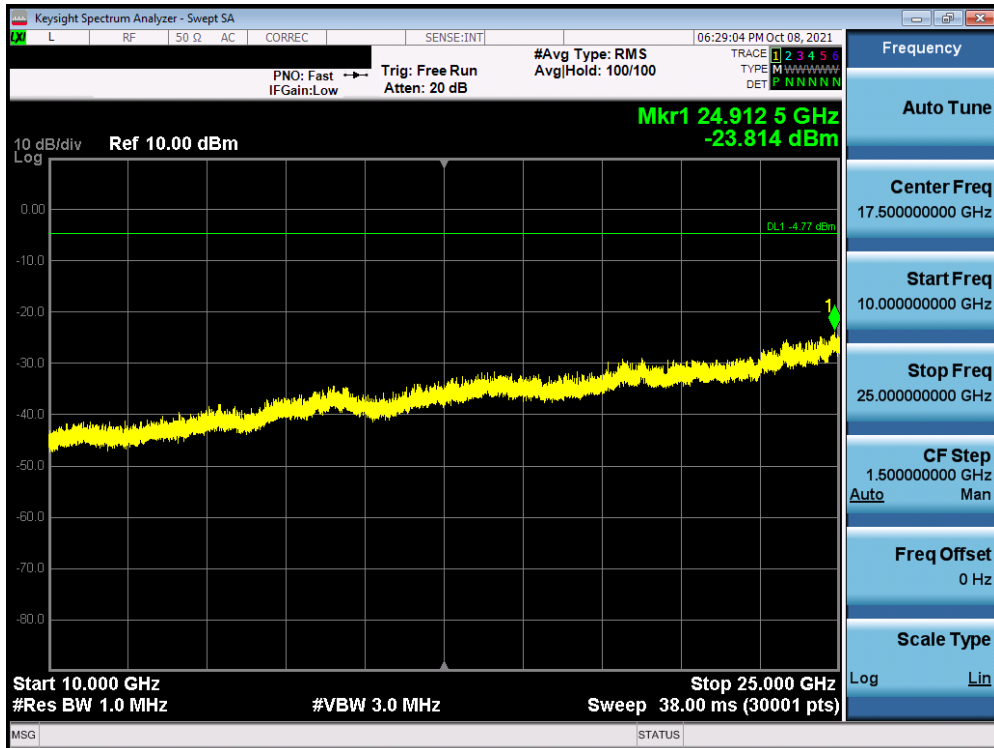


Plot 7-144. Conducted Spurious Plot (Bluetooth, 1Mbps- Ch. 0) Antenna 1

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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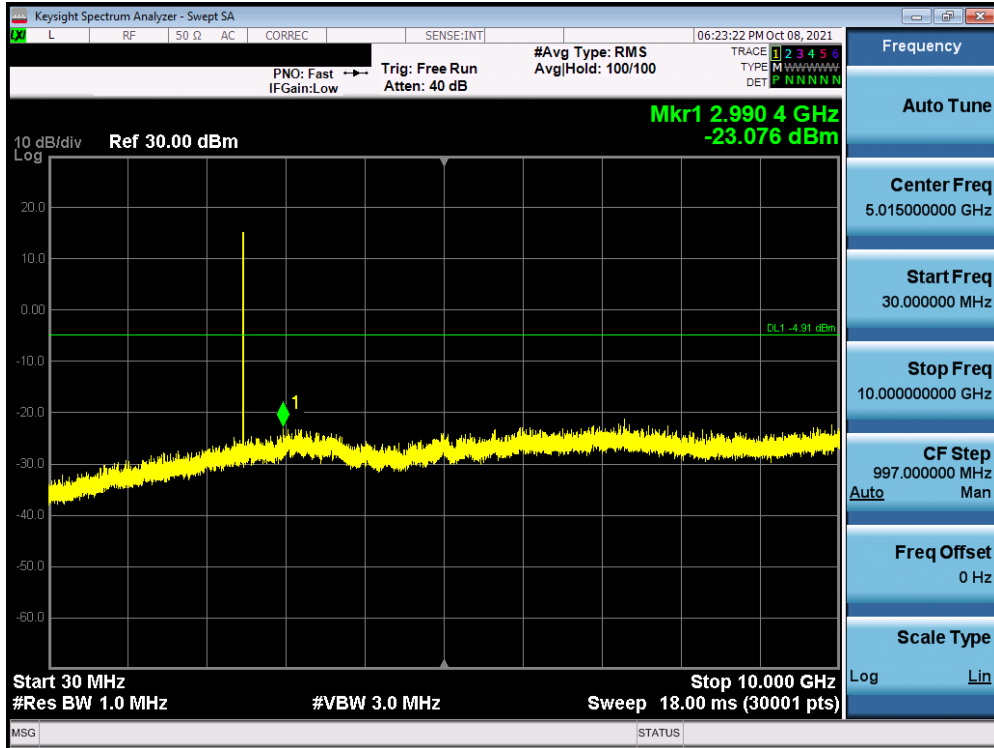


Plot 7-145. Conducted Spurious Plot (Bluetooth, 1Mbps- Ch. 39) Antenna 1

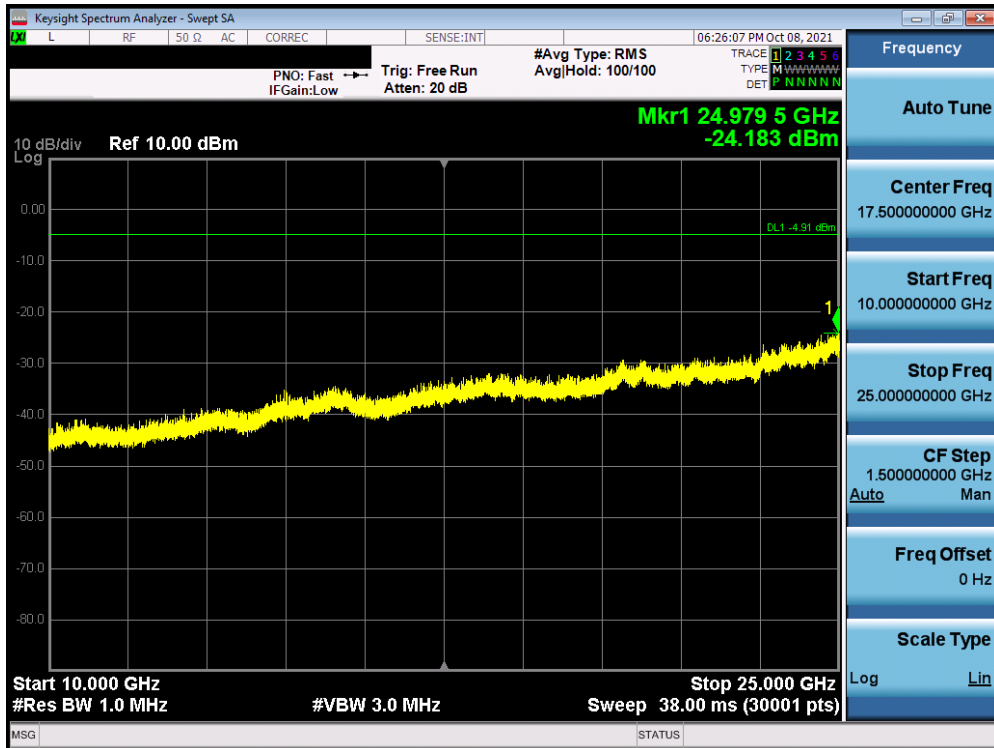


Plot 7-146. Conducted Spurious Plot (Bluetooth, 1Mbps Ch. 39) Antenna 1

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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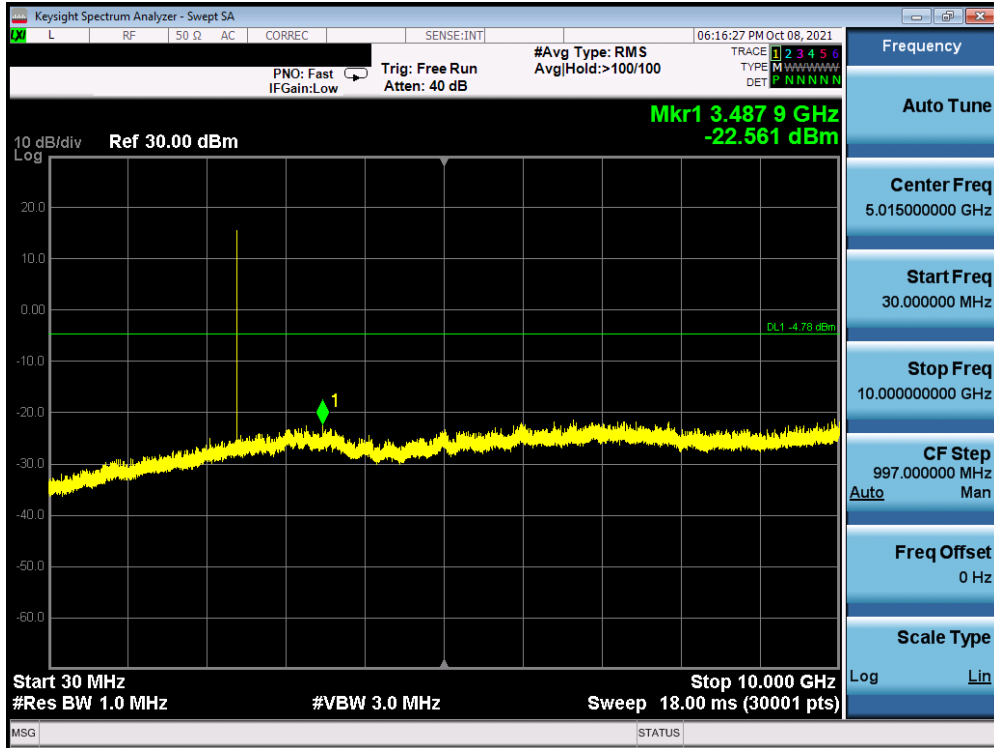


Plot 7-147. Conducted Spurious Plot (Bluetooth, 1Mbps- Ch. 78) Antenna 1

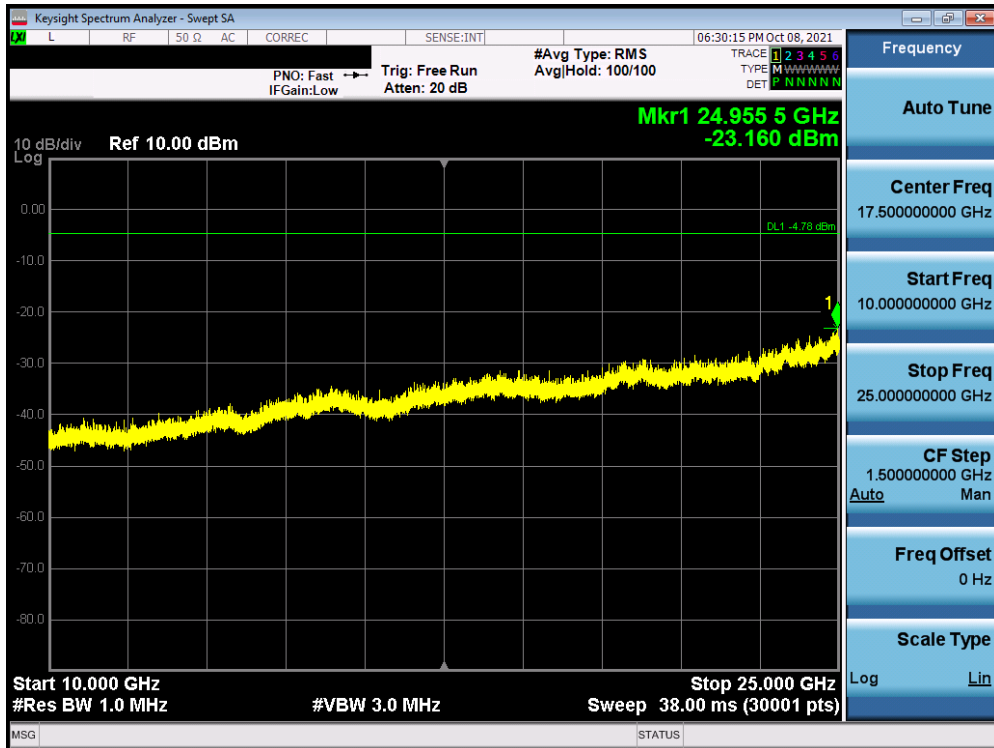


Plot 7-148. Conducted Spurious Plot (Bluetooth, 1Mbps- Ch. 78) Antenna 1

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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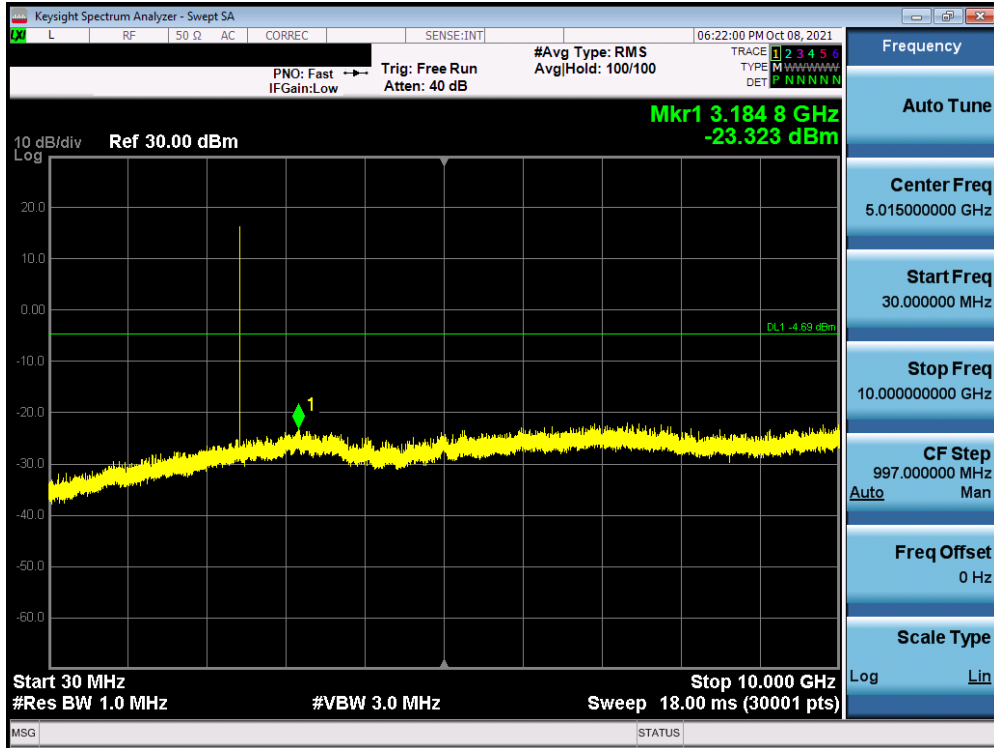


Plot 7-149. Conducted Spurious Plot (Bluetooth, 1Mbps- Ch. 0) Antenna 2

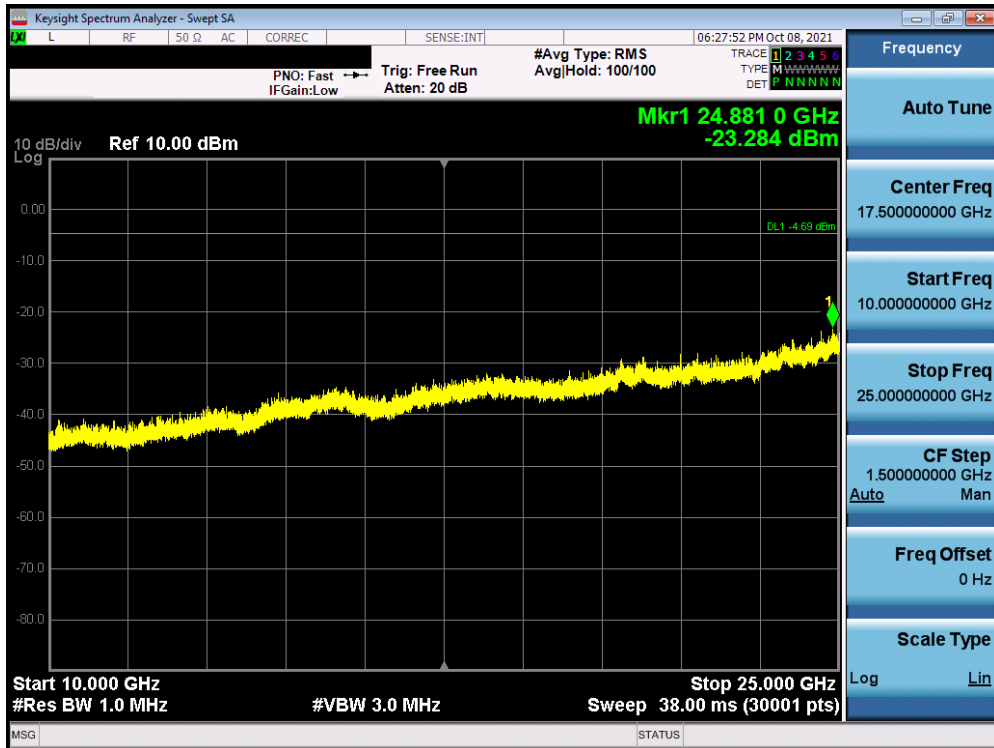


Plot 7-150. Conducted Spurious Plot (Bluetooth, 1Mbps- Ch. 0) Antenna 2

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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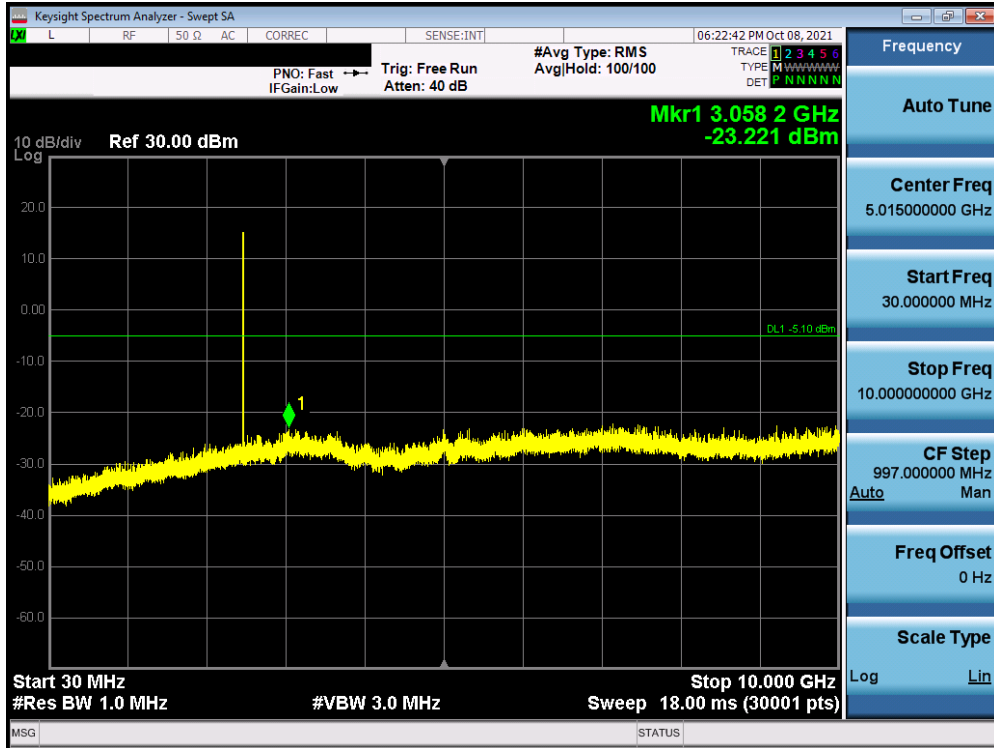


Plot 7-151. Conducted Spurious Plot (Bluetooth, 1Mbps- Ch. 39) Antenna 2

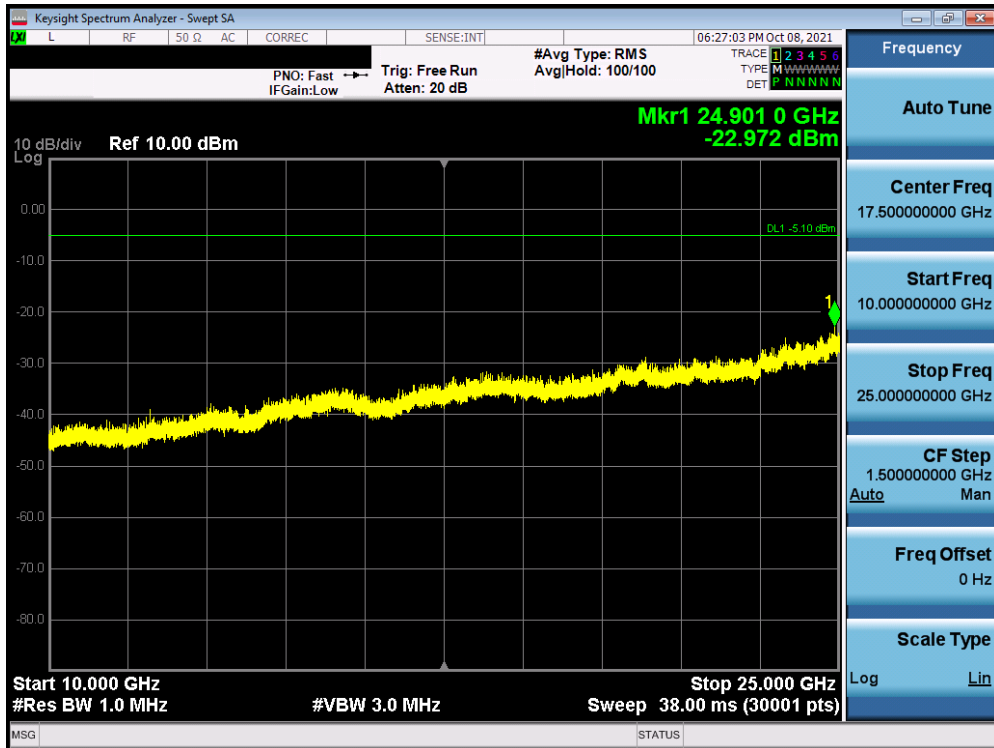


Plot 7-152. Conducted Spurious Plot (Bluetooth, 1MbpsCh. 39) Antenna 2

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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Plot 7-153. Conducted Spurious Plot (Bluetooth, 1Mbps- Ch. 78) Antenna 2



Plot 7-154. Conducted Spurious Plot (Bluetooth, 1Mbps- Ch. 78) Antenna 2

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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7.9 Radiated Spurious Emissions Measurements – Above 1GHz

§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]

Test Overview and Limit

All out of band radiated spurious emissions are measured with a spectrum analyzer connected to a receive antenna while the EUT is operating at maximum power and at the appropriate frequencies. Only the radiated emissions of the configuration that produced the worst case emissions are reported in this section.

All out of band emissions appearing in a restricted band as specified in Section 15.205 of the Title 47 CFR and Table 7 of RSS-Gen (8.10) must not exceed the limits shown in Table 7-10 per Section 15.209 and RSS-Gen (8.9).

Frequency	Field Strength [μ V/m]	Measured Distance [Meters]
Above 960.0 MHz	500	3

Table 7-10. Radiated Limits

Test Procedure Used

ANSI C63.10-2013 – Section 6.6.4.3

Test Settings

Peak Field Strength Measurements

1. Analyzer center frequency was set to the frequency of the radiated spurious emission of interest
2. RBW = 1MHz
3. VBW = 3MHz
4. Detector = peak
5. Sweep time = auto couple
6. Trace mode = max hold
7. Trace was allowed to stabilize

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Test Setup

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

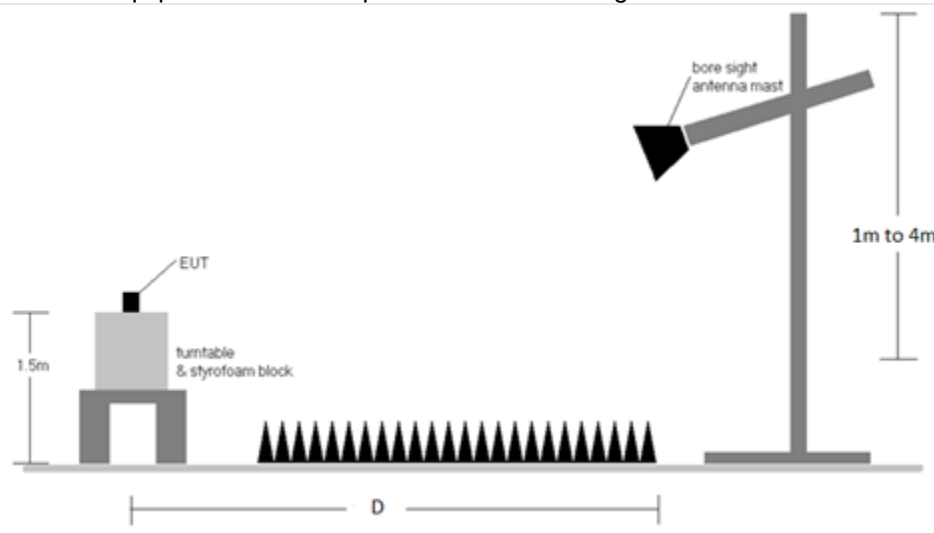


Figure 7-8. Radiated Test Setup >1GHz

Test Notes

1. All emissions lying in restricted bands specified in §15.205 and Section 8.10 of RSS-Gen are below the limit shown in Table 7-10.
2. The antenna is manipulated through typical positions, polarity and length during the tests. The EUT is manipulated through three orthogonal planes.
3. This unit was tested with its standard battery.
4. The spectrum is measured from 9kHz to the 10th harmonic and the worst-case emissions are reported.
5. The wide spectrum spurious emissions plots shown on the following pages are used only for the purpose of emission identification. Any emissions found to be within 20dB of the limit are fully investigated and the results are shown in this section.
6. The "-" shown in the following RSE tables are used to denote a noise floor measurement.
7. Average emissions were not reported since the duty cycle correction factor was greater than 20dB.
8. D is the measurement test distance and emissions 1-18GHz were measured at a 3 meters test distance while emissions above 18GHz were measured at a 1 meter test distance with the application of a distance correction factor.
9. All supported modulation and power schemes have been tested on the unit and only the worst-case configuration is reported

FCC ID: A3LSMS908E	PCTEST Proud to be part of element	MEASUREMENT REPORT (CERTIFICATION)	SAMSUNG	Approved by: Technical Manager
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Sample Calculation

- Field Strength Level $_{[dB\mu V/m]} = \text{Analyzer Level }_{[dBm]} + 107 + \text{AFCL }_{[dB/m]}$
- $\text{AFCL }_{[dB/m]} = \text{Antenna Factor }_{[dB/m]} + \text{Cable Loss }_{[dB]} - \text{Preamplifier Gain }_{[dB]}$
- $\text{Margin }_{[dB]} = \text{Field Strength Level }_{[dB\mu V/m]} - \text{Limit }_{[dB\mu V/m]}$

Duty Cycle Correction Factor Calculation

- Channel hop rate = 800 hops/second (AFH Mode)
- Adjusted channel hop rate for DH5 mode = 133.33 hops/second
- Time per channel hop = $1 / 133.33 \text{ hops/second} = 7.50 \text{ ms}$
- Time to cycle through all channels = $7.50 \times 20 \text{ channels} = 150 \text{ ms}$
- Number of times transmitter hits on one channel = $100 \text{ ms} / 150 \text{ ms} = 1 \text{ time(s)}$
- Worst case dwell time = 7.5 ms
- Duty cycle correction factor = $20\log_{10}(7.5\text{ms}/100\text{ms}) = -22.5 \text{ dB}$

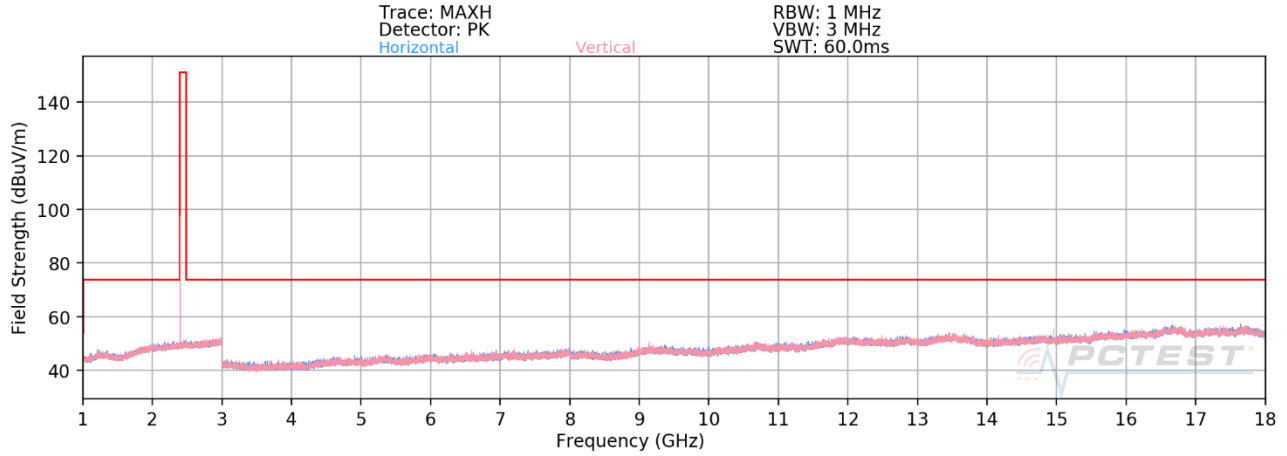
Average Emission Calculation

- Average Emission = Measured Peak Emissions $_{[dB\mu V/m]} - \text{Duty Cycle Correction Factor }_{[dB]}$

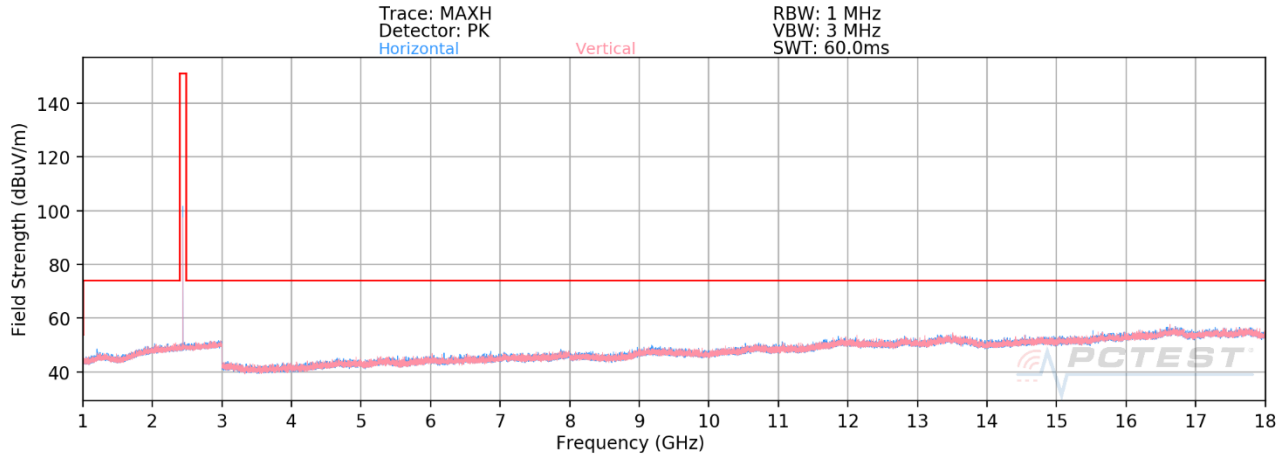
FCC ID: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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Radiated Spurious Emission Measurements (1 – 18GHz)

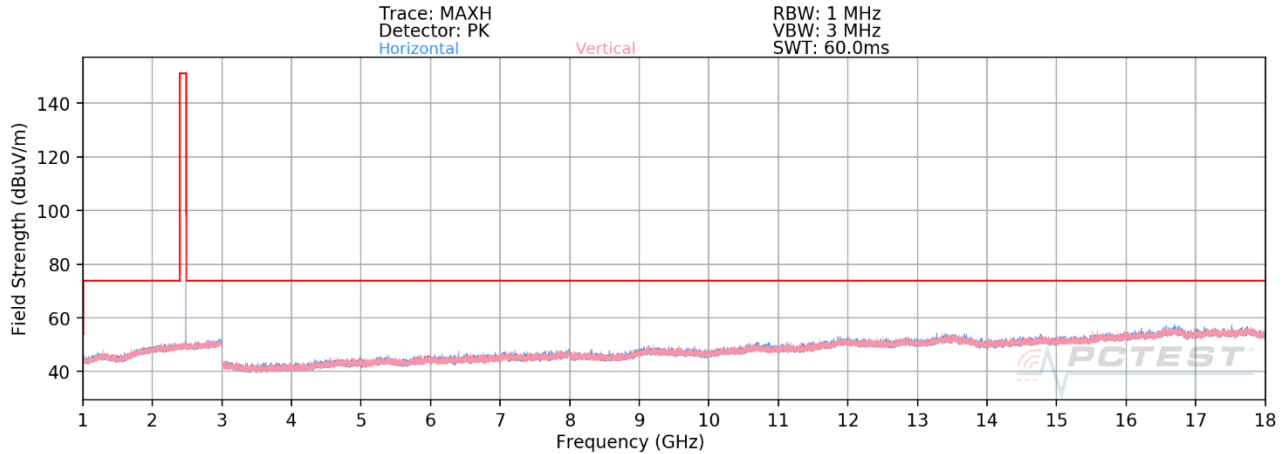
§15.205 §15.209 §15.247 (d); RSS-Gen [8.9]



Plot 7-155. Radiated Spurious Emissions above 1GHz (Bluetooth, 1Mbps– Ch. 0) Antenna 1

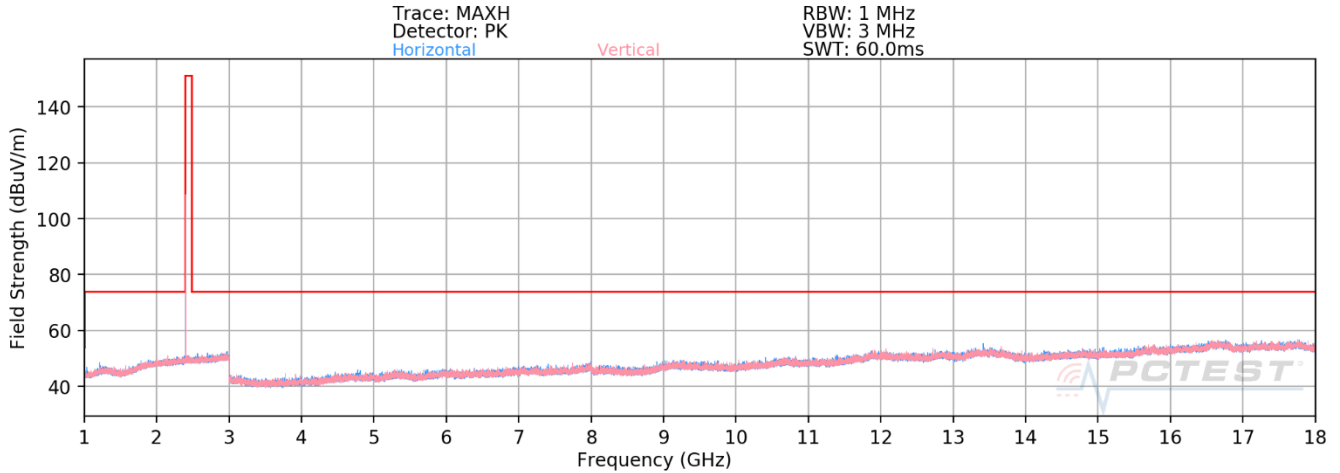


Plot 7-156. Radiated Spurious Emissions above 1GHz (Bluetooth, 1Mbps– Ch. 39) Antenna 1

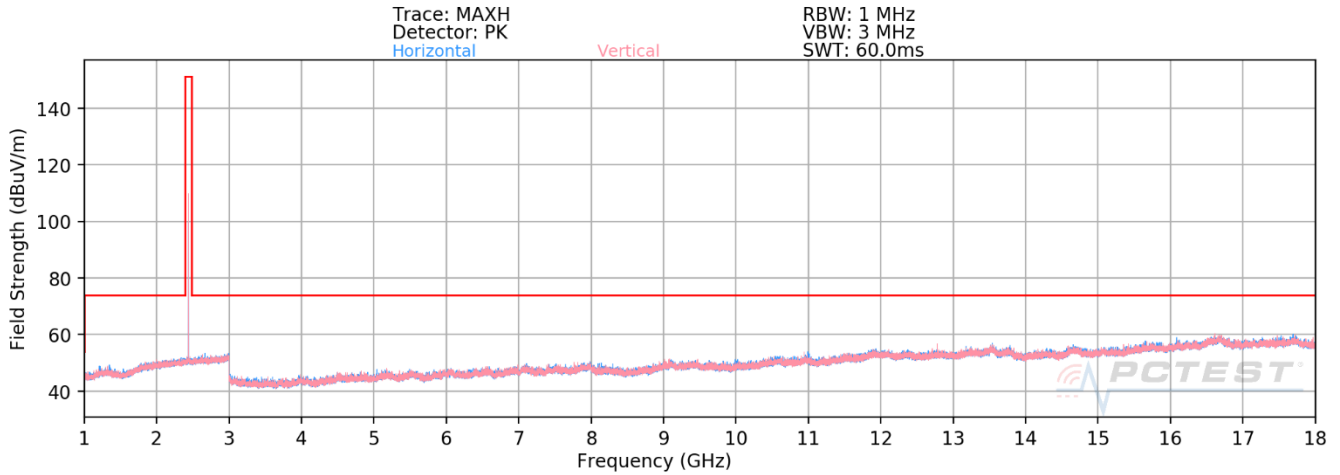


Plot 7-157. Radiated Spurious Emissions above 1GHz (Bluetooth, 1Mbps– Ch. 78) Antenna 1

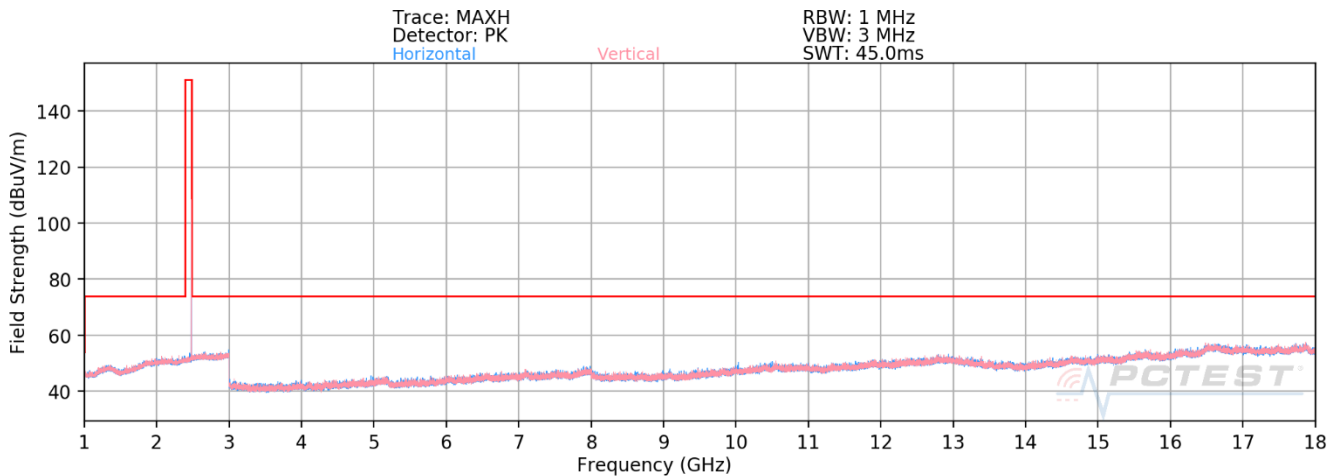
FCC ID: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 105 of 131




Plot 7-158. Radiated Spurious Emissions above 1GHz (Bluetooth, 1Mbps- Ch. 0) Antenna 2

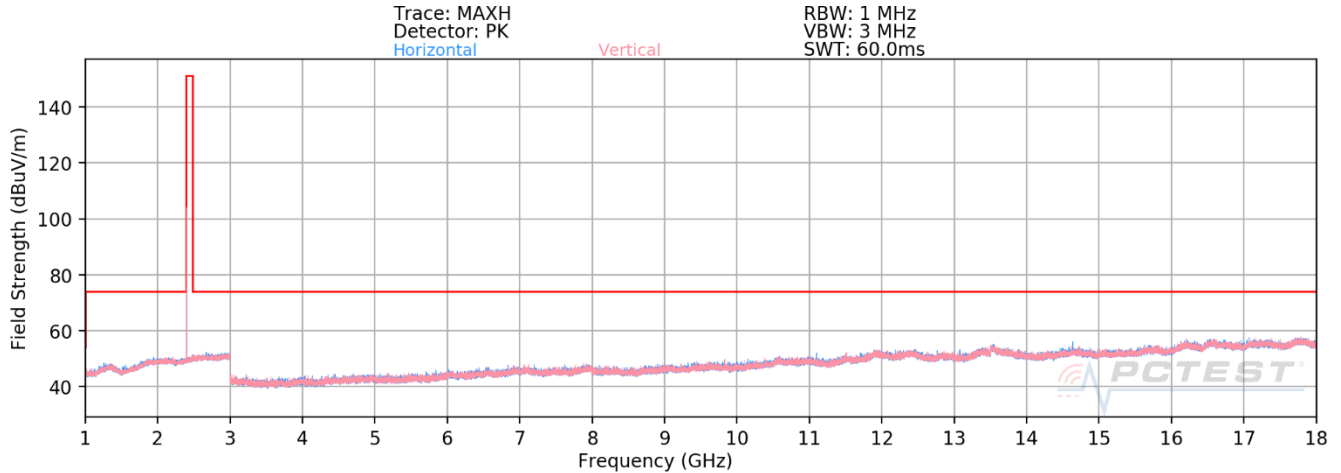


Plot 7-159. Radiated Spurious Emissions above 1GHz (Bluetooth, 1Mbps- Ch. 39) Antenna 2

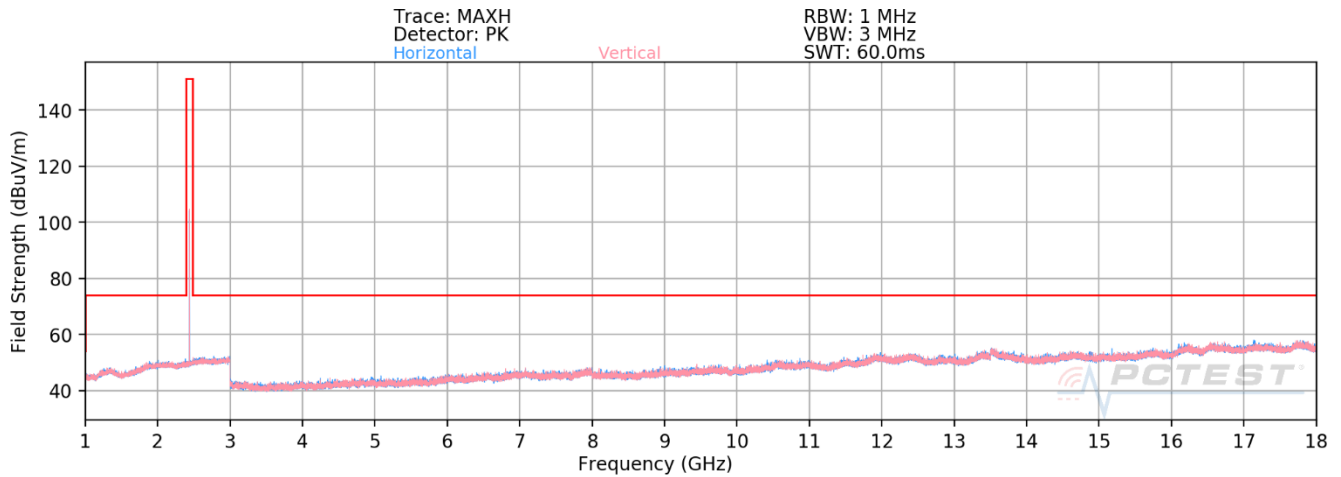


Plot 7-160. Radiated Spurious Emissions above 1GHz (Bluetooth, 1Mbps- Ch. 78) Antenna 2

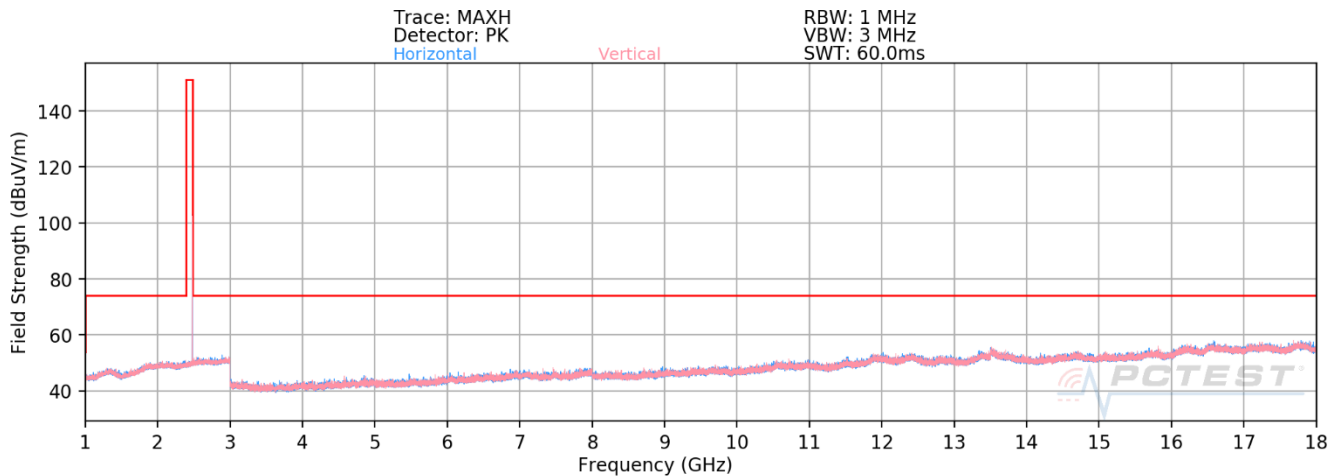
FCC ID: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 106 of 131



Plot 7-161. Radiated Spurious Emissions above 1GHz (Bluetooth, 1Mbps- Ch. 0) Dual



Plot 7-162. Radiated Spurious Emissions above 1GHz (Bluetooth, 1Mbps- Ch. 39) Dual

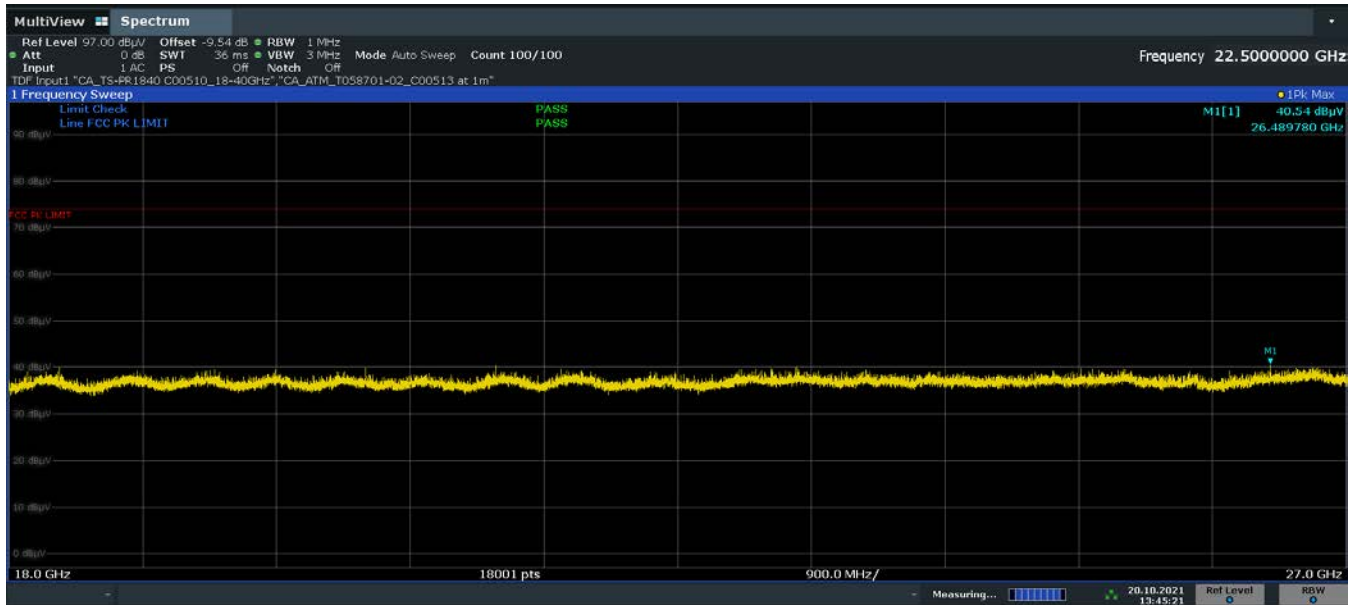


Plot 7-163. Radiated Spurious Emissions above 1GHz (Bluetooth, 1Mbps- Ch. 78) Dual

FCC ID: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
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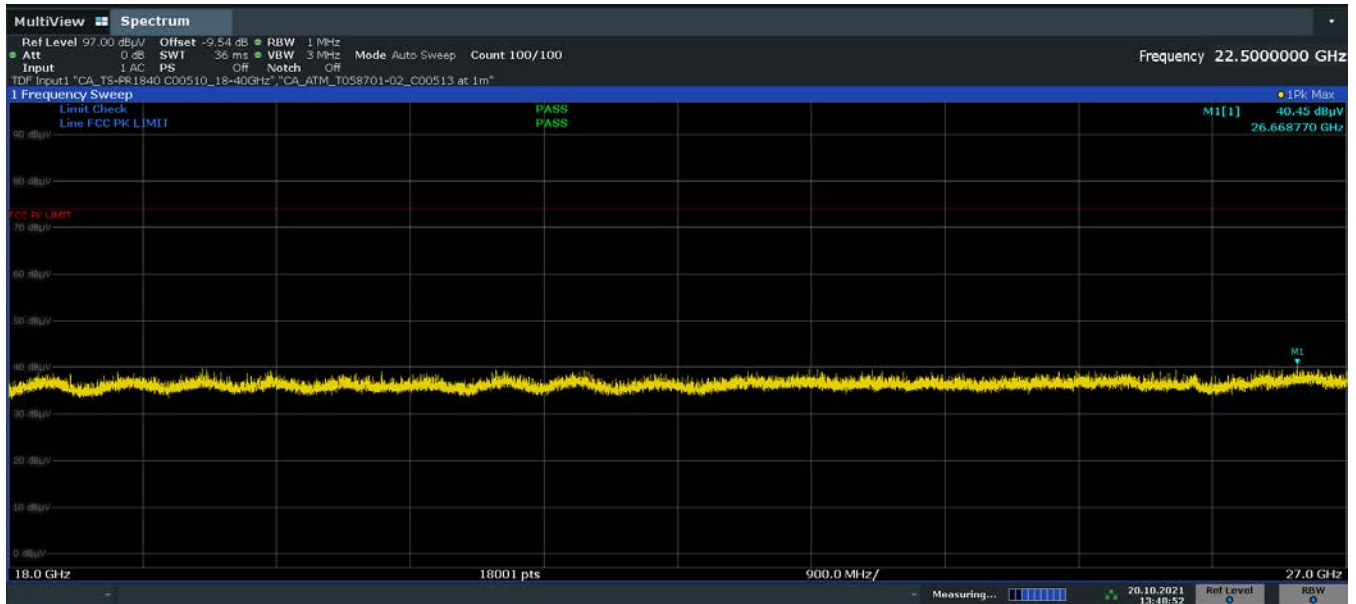
Radiated Spurious Emissions Measurements (Above 18GHz)

\$15.209; RSS-Gen [8.9]



13:45:22 20.10.2021

Plot 7-164. Radiated Spurious Emissions above 18GHz (Bluetooth, 1Mbps- Ch. 0) Antenna 1 – Pol. H



13:48:53 20.10.2021

Plot 7-165. Radiated Spurious Emissions above 18GHz (Bluetooth, 1Mbps- Ch. 0) Antenna 1 – Pol. V

FCC ID: A3LSMS908E		MEASUREMENT REPORT (CERTIFICATION)		Approved by: Technical Manager
Test Report S/N: 1M2109220110-14-R1.A3L	Test Dates: 10/8/2021 - 10/20/2021	EUT Type: Portable Handset		Page 108 of 131