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Date: 8 October 2023

International Testing Labs Ltd.
FCC/ISED Radio Test Report

for

AeroScout Inc.

Equipment under test:

Asset Tag

T12SB

FCC ID: Q3HTAG1200SB

IC: 5115A-TAG1200SB

Tested by: _____

N. Yakobov

Approved by: _____

M. Zohar

This report concerns:	Original Grant
Equipment type: ISED:	FCC: (DTS) Digital Transmission System Spread Spectrum Digital Device (2400-2483.5)
Limits used:	47CFR15 Section 15.247 RSS-247, Issue 2, February 2017, Section 5 RSS-Gen, Issue 5, April 2018
Measurement procedure:	KDB 558074 D01 v05r01,ANSI C63.10:2013 RSS-Gen, Issue 5, April 2018

Applicant:

Reuven Amsalem

AeroScout Inc.

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Email: reuven.amsalem@sbdinc.com

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1 General Information

1.1 Administrative Information

Manufacturer:	AeroScout Inc.
Equipment Under Test (E.U.T):	Asset Tag
Equipment PMN:	T12SB
Equipment HVIN:	T15e
Equipment Serial No.:	N/A
Date of Receipt of E.U.T:	26 February 2023
Start of Test:	26 February 2023
End of Test:	28 March 2023
Test Laboratory Location:	3 Ha'oreg Street, Modi'in Maccabim Reut 7177909, Israel
	FCC Designation number: IL1005
Test Specifications:	FCC Part 15, Subpart C
	RSS-247, Issue 2, February 2017, Section 5
	RSS-Gen, Issue 5, April 2018

1.2 Product Description

Model: T12SB

Product is a battery-operated tag used for asset/human tracking or for human tracking. Lithium battery is non-rechargeable. Unit contains internal sensors (accelerometer, temperature, ultrasound) and the following non-approved radio types:

1. 125 kHz LF receiver
2. 2.4 GHz WIFI transceiver per 802.11 b/g/n (SISO) based on TI 3135 chip
3. 2.4 GHz BLE transceiver based on Nordic nRF52840 chip

The WIFI and BLE transceivers share same antenna by using an antenna switch.

Product can appear in two configurations that differ in the type of the ultrasound sensor card.

Type of Equipment		
☒	Stand Alone (Equipment with/without its own control provisions)	
☐	Combined (Equipment where radio part is fully integrated with another type of equipment)	
☐	Plug in card (Equipment intended for a variety of host systems)	
Intended Use		Condition of use
☐	Fixed	Always of distance >2m from the people
☐	Mobile	Always of distance >20cm from the people
☒	Portable	Always of distance <20cm to human body
Assigned frequency band		2402-2483.5MHz

Operational frequencies				Wi-Fi: 2412-2462 MHz BLE: 2402-2480MHz			
Maximum rated output power				At transmitter 50Ω RF output connector [dBm]		+19	
				Effective Radiated Power (for equipment without RF connector)			
Antenna Connection							
☐	Unique Coupling	☐	Standard Connection	☒	Integral	☒	With temporary RF connector
						☐	Without temporary RF connector
Antenna Gain(peak)				+0.7dBi			
Operating channel bandwidth				WIFI: 20MHz BLE:1/2MHz			
Type of modulation				OFDM (Wi-Fi), GFSK (BLE)			
Bit rate				72MBPs (MCS7)			
Maximum transmitter duty cycle				0.3%			
Transmitter power source							
☐	AC			Nominal rated voltage			
☒	DC			Nominal rated voltage		3V	
☐	Battery			Nominal rated voltage			
Receiver Class				1			
Temperature and Voltage extreme condition				-30 to +70C			

1.3 Test Methodology

Conducted and radiated testing was performed according to the procedures in KDB 558074 D01 v05r01, ANSI C63.10: 2013, RSS-Gen, Issue 5, April 2018. Radiated testing was performed at an antenna to EUT distance of three meters.

1.4 Measurement Uncertainty

Conducted Emission

Conducted Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4)

0.15 – 30 MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 3.44 dB

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site:

30-1000MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 4.96 dB

1 GHz to 6 GHz
Expanded Uncertainty (95% Confidence, K=2):
±5.19 dB

>6 GHz

Expanded Uncertainty (95% Confidence, K=2):
±5.51 dB

2 System Test Configuration

2.1 Justification

1. The E.U.T. contains two optional transceivers: IEEE 802.15.1 standard (BLE), and IEEE 802.11g/n standard (Wi-Fib/g/n) with 20MHz CBW.
    a. For BLE: the unit was evaluated while transmitting at the low channel (2402 MHz), the mid channel (2426 MHz) and the high channel (2480 MHz).
    b. For Wi-Fi b/g/n: the unit was evaluated while transmitting at the low channel (2412 MHz), the mid channel (2437 MHz) and the high channel (2462 MHz).
2. Conducted emission tests were performed with the E.U.T. antenna terminal connected by an RF cable to the Spectrum Analyzer, through a 30dB external attenuator.
3. Final radiated emission for Wi-Fi b/g/n modes tests were performed using the lowest and highest bit rates for each different protocol type. The bit rates for each protocol are shown in the table below:

Protocol Type	"Worst Case" Bit Rate
Wi-Fi/b	1,11 Mbit/s
Wi-Fi/g	6,54 Mbit/s
Wi-Fi/n	6.5,65 Mbit/s (MCS0,MCS7)

4. Final radiated emission tests was performed after exploratory emission testing that was performed in 3 orthogonal polarities to determine the "worst case" radiation and found at Y axis

2.2 EUT Exercise Software

No special exercise software was used.

2.3 Special Accessories

N/A

2.4 Equipment Modifications

No modifications were necessary in order to achieve compliance.

2.5 Configuration of Tested System

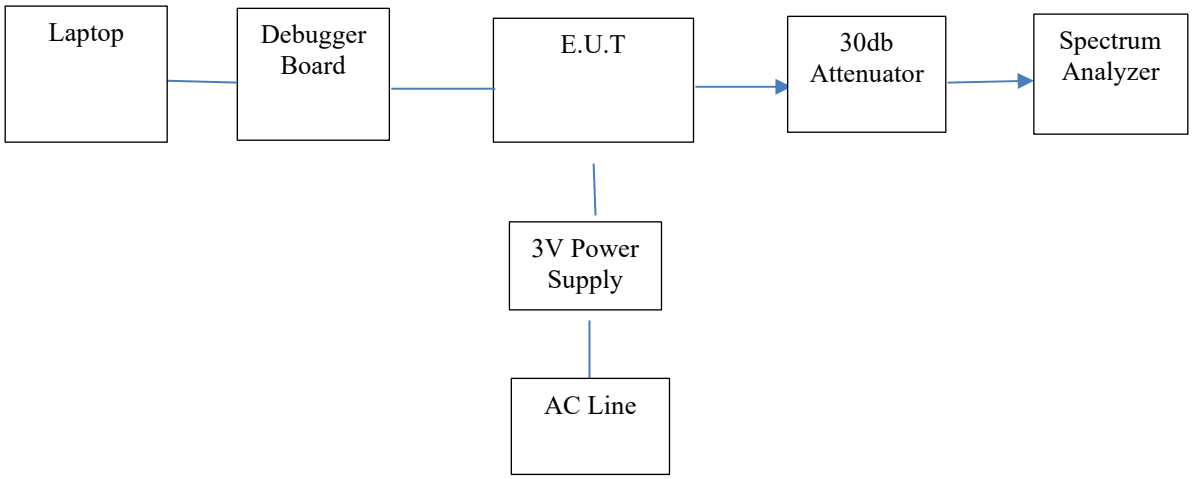


Figure 1. Configuration of Tested System, Conducted

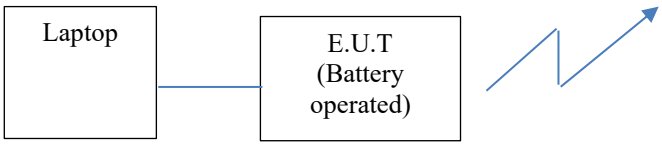


Figure 2. Configuration of Tested System, Radiated

3 Test Setup Photos

See a separate file.

4 6 dB Minimum Bandwidth

4.1 Test Specification

FCC Part 15, Subpart C, Section 247(a)(2)

RSS-247, Issue 2, Section 5.2(a)

4.2 Test Procedure

(Temperature (23.8°C)/ Humidity (40%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report. The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss=31.0 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.
The spectrum bandwidth of the E.U.T. at the point of 6 dB below maximum peak power was measured and recorded. The RBW was set to 100 kHz.

4.3 Test Limit

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.

4.4 Test Results

4.4.1 BLE

Operation Frequency	Reading	Limit
(MHz)	(kHz)	(kHz)
2402.0	719.0	>500.0
2426.0	709.0	>500.0
2480.0	719.0	>500.0

Figure 3 6 dB Minimum Bandwidth

JUDGEMENT: Passed

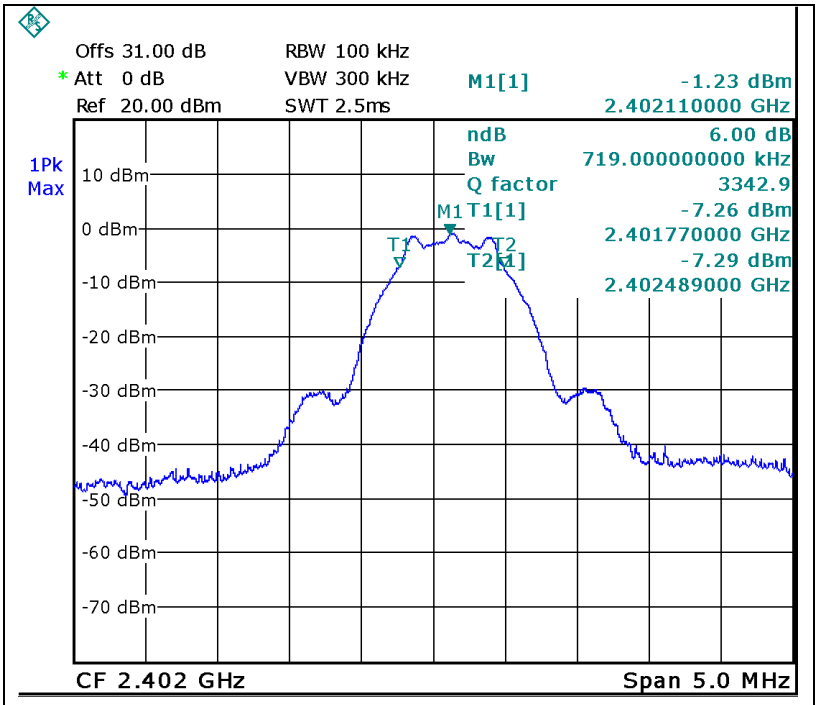


Figure 4. 2402.0 MHz, BLE

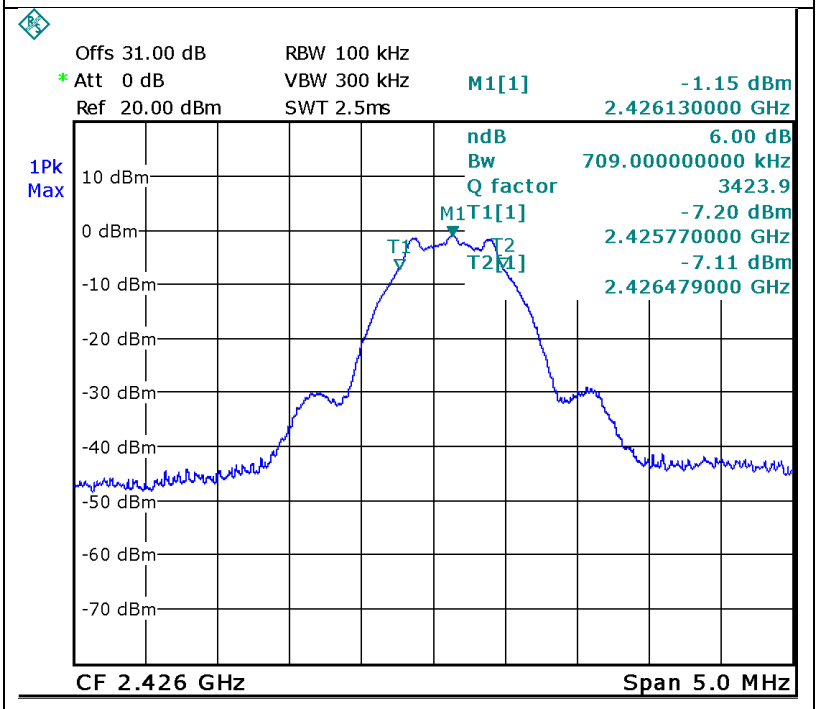


Figure 5. 2426.0 MHz, BLE

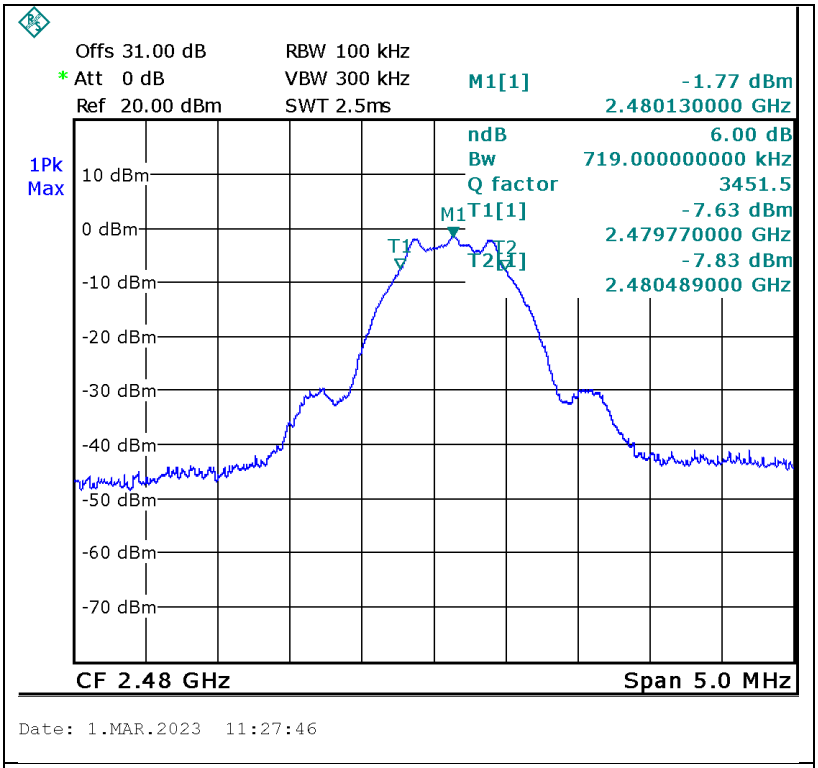


Figure 6. 2480.0 MHz, BLE

4.4.2 Wi-Fi

Protocol Type	Operation Frequency (MHz)	Reading (kHz)	Limit (kHz)
Wi-fi/b (1Mbit/s)	2412.0	9421.0	>500.0
	2437.0	9018.0	>500.0
	2462.0	9980.0	>500.0
Wi-fi/b (11Mbit/s)	2412.0	9661.0	>500.0
	2437.0	9178.0	>500.0
	2462.0	9741.0	>500.0
Wi-fi/g (6Mbit/s)	2412.0	13812.0	>500.0
	2437.0	15010.0	>500.0
	2462.0	13892.0	>500.0
Wi-fi/g (54Mbit/s)	2412.0	15808.0	>500.0
	2437.0	15888.0	>500.0
	2462.0	16128.0	>500.0
Wi-fi/n (6.5Mbit/s)	2412.0	15010.0	>500.0
	2437.0	15170.0	>500.0
	2462.0	14770.0	>500.0

Protocol Type	Operation Frequency	Reading	Limit
	(MHz)	(kHz)	(kHz)
Wi-fi/n (65Mbit/s)	2412.0	16926.0	>500.0
	2437.0	16287.0	>500.0
	2462.0	17325.0	>500.0

Figure 7 6 dB Minimum Bandwidth

JUDGEMENT: Passed

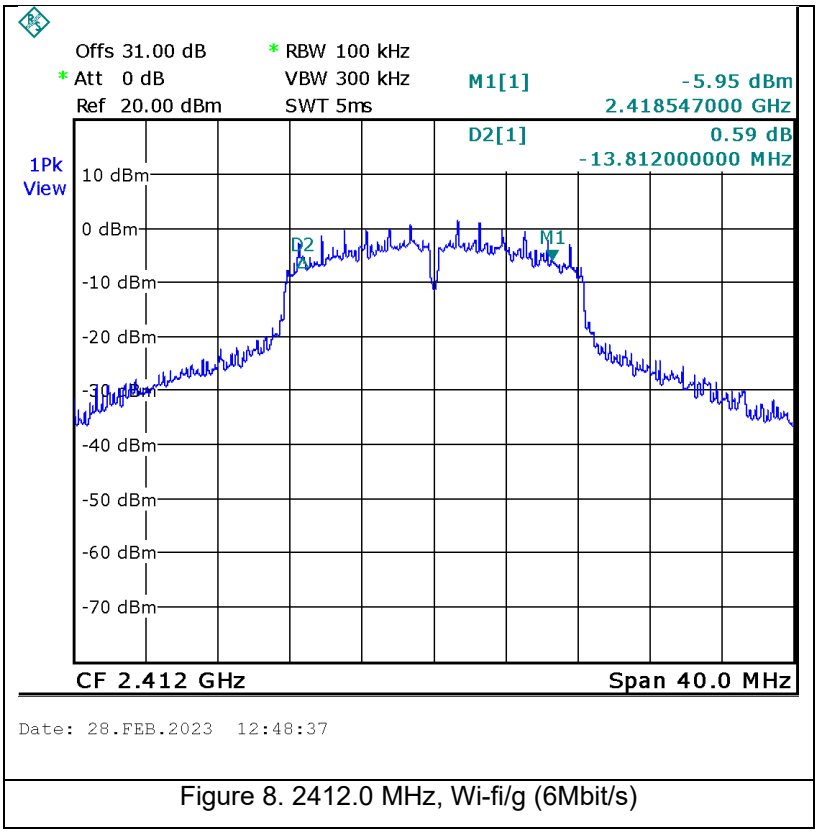


Figure 8. 2412.0 MHz, Wi-fi/g (6Mbit/s)

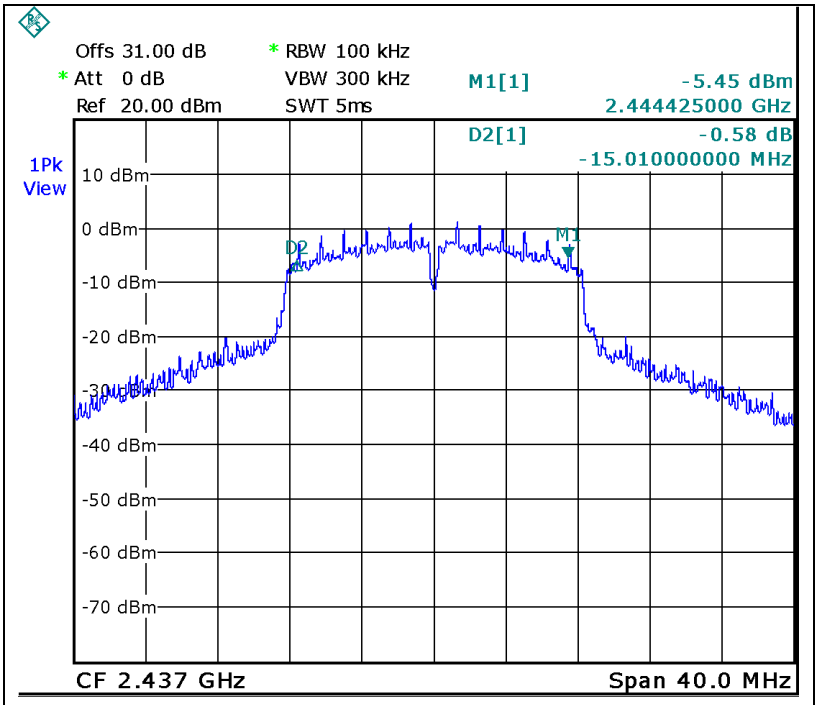


Figure 9. 2437.0 MHz, Wi-fi/g (6Mbit/s)

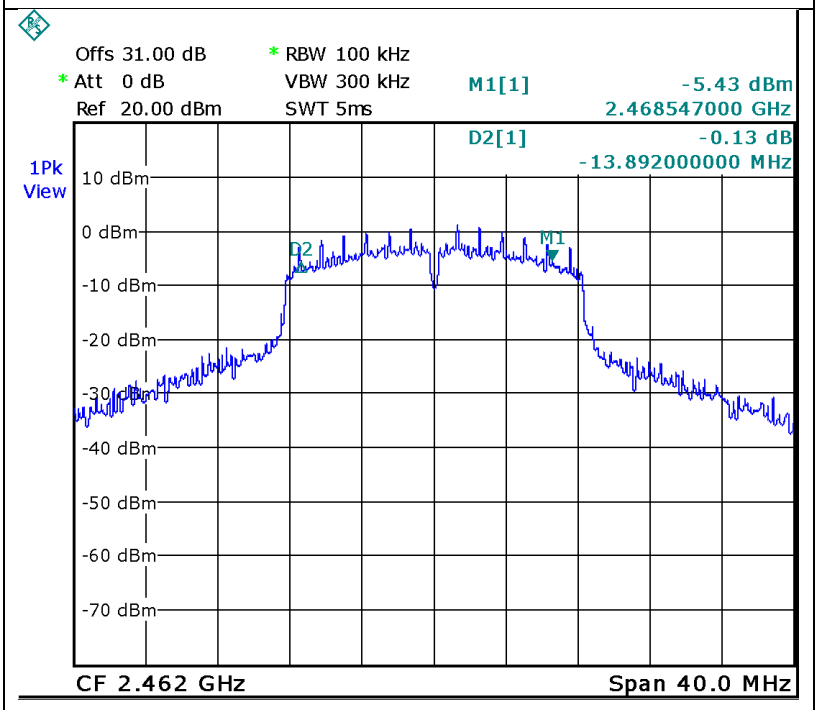


Figure 10. 2462.0 MHz, Wi-fi/g (6Mbit/s)

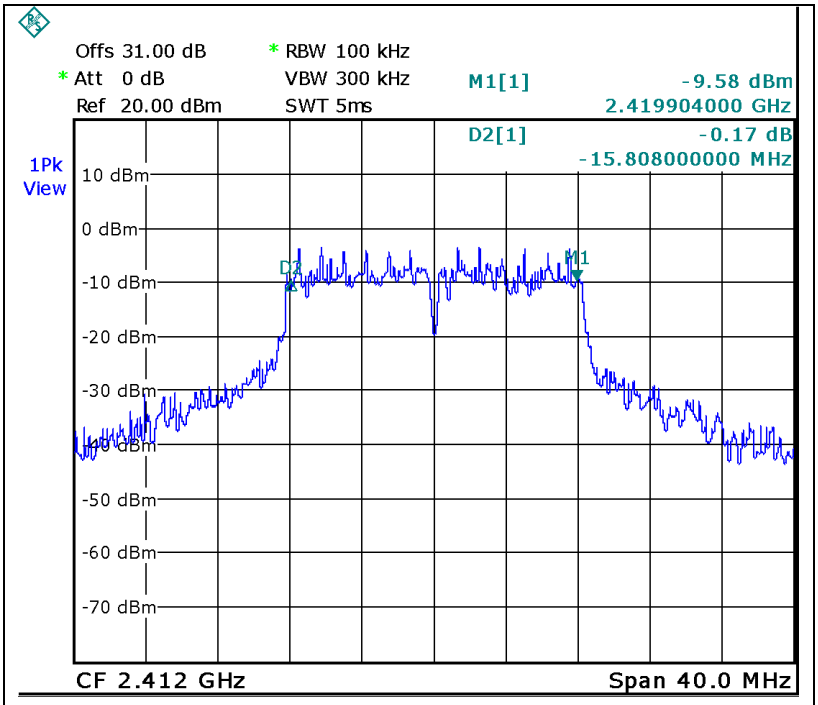


Figure 11. 2412.0 MHz, Wi-fi/g (54Mbit/s)

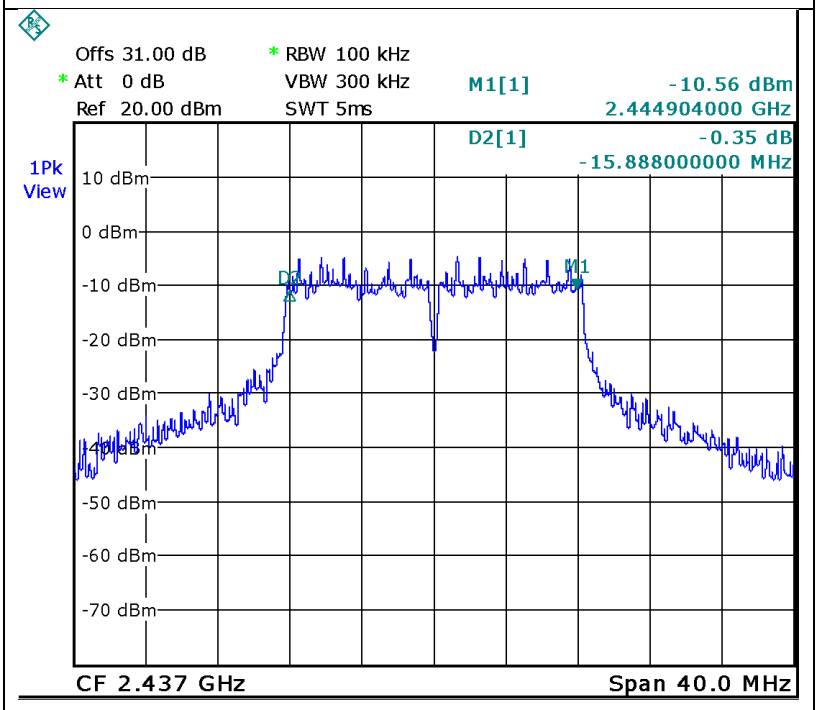


Figure 12. 2437.0 MHz, Wi-fi/g (54Mbit/s)

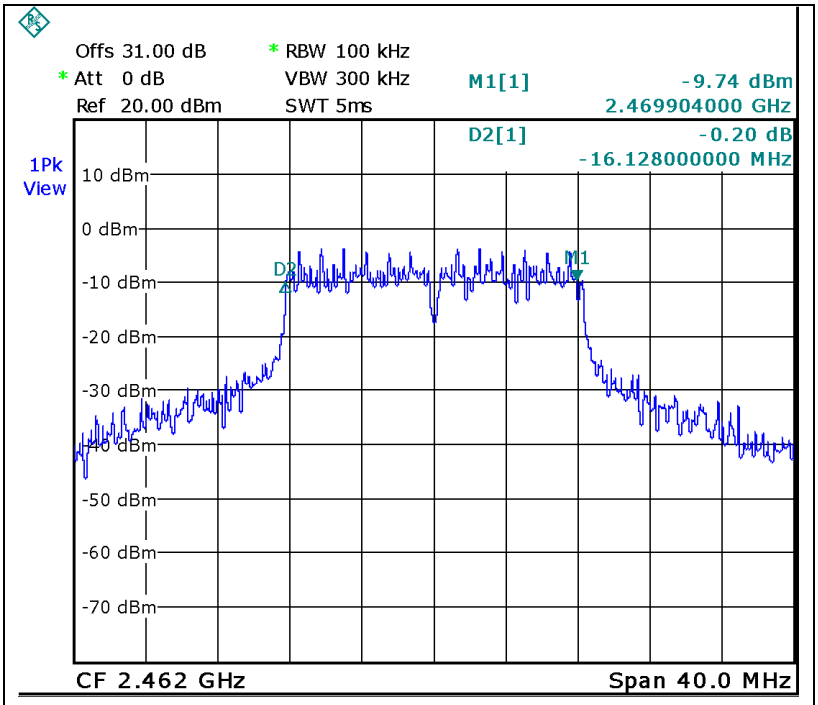


Figure 13. 2462.0 MHz, Wi-fi/g (54Mbit/s)

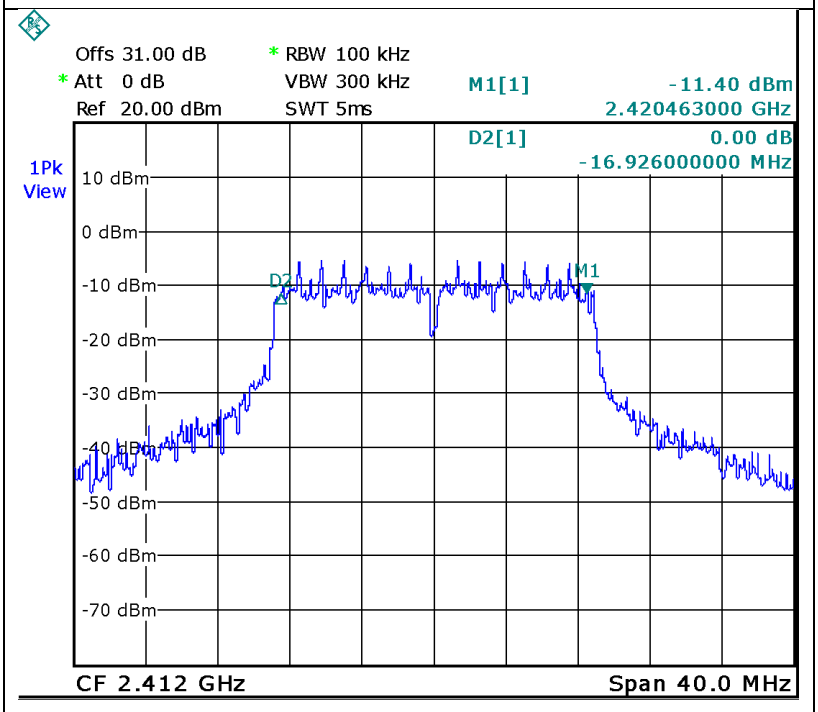


Figure 14. 2412.0 MHz, Wi-fi/n (65Mbit/s)

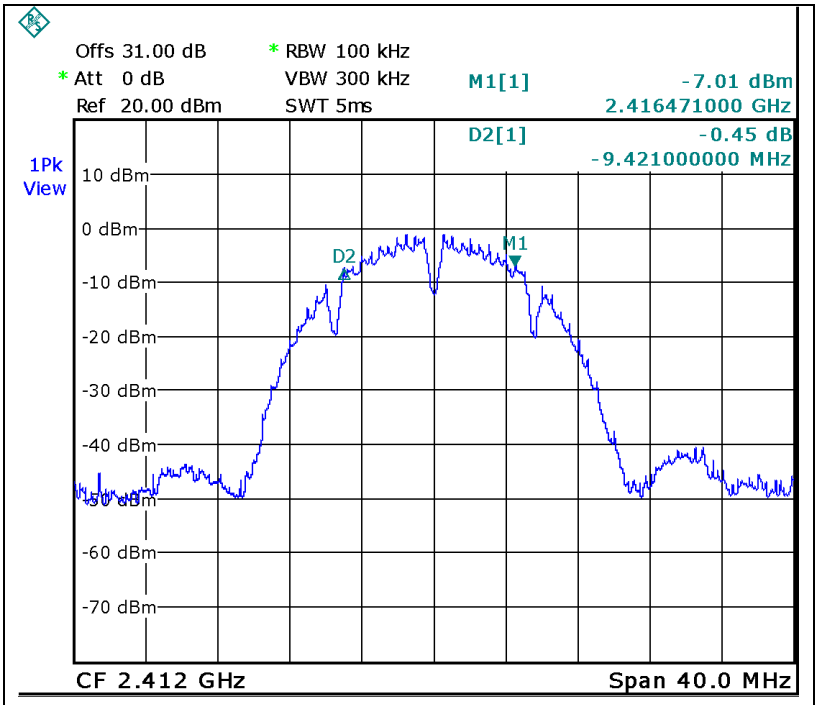


Figure 15. 2412.0 MHz, Wi-fi/b (1Mbit/s)

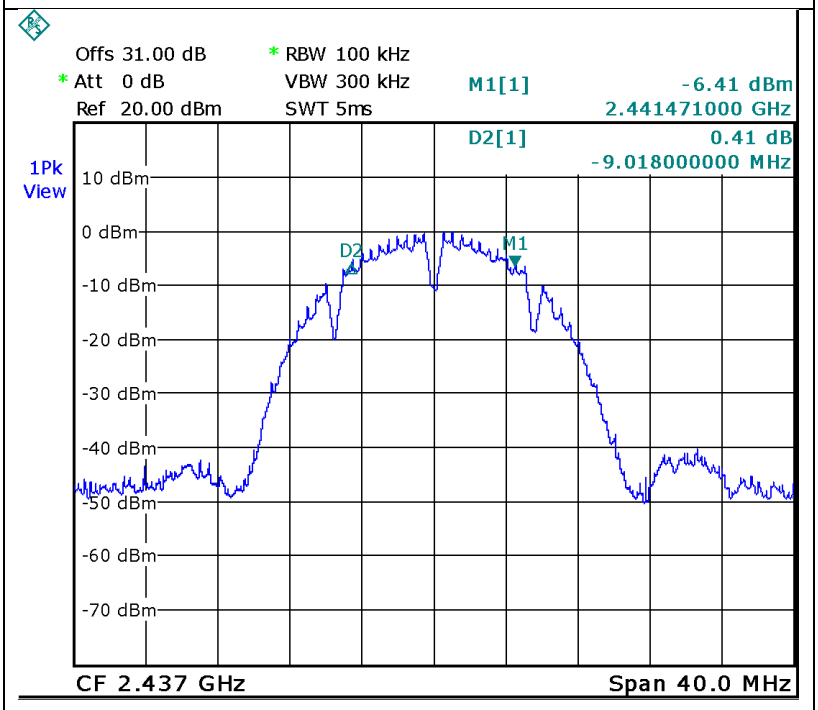


Figure 16. 2437.0 MHz, Wi-fi/b (1Mbit/s)

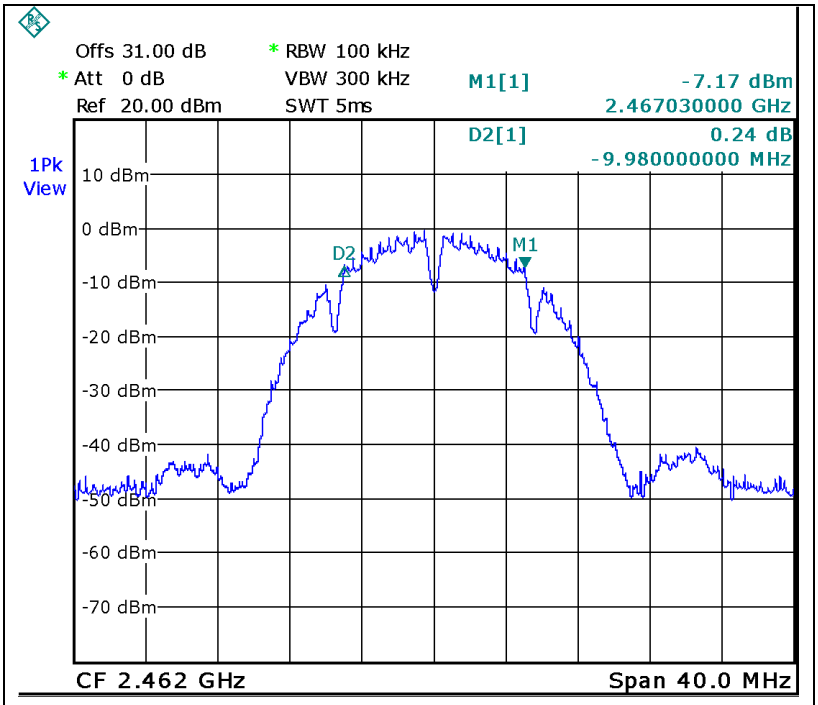


Figure 17. 2462.0 MHz, Wi-fi/b (1Mbit/s)

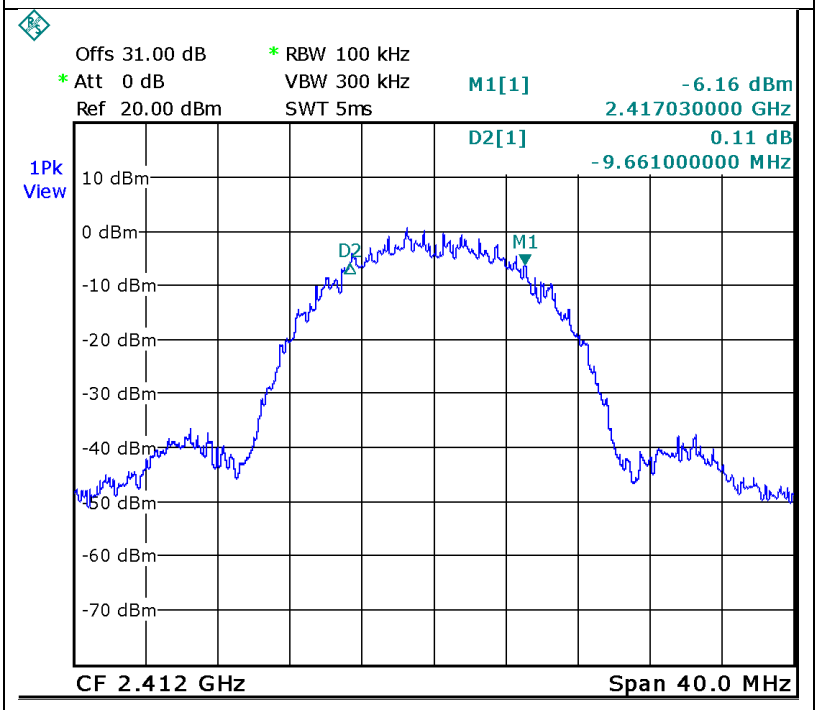


Figure 18. 2412.0 MHz, Wi-fi/b (11Mbit/s)

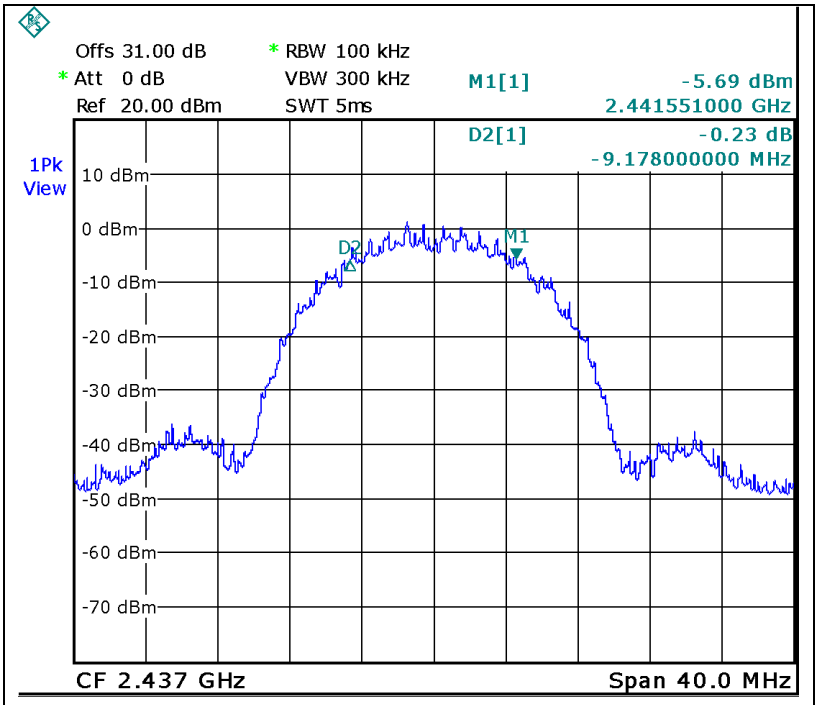


Figure 19. 2437.0 MHz, Wi-fi/b (11Mbit/s)

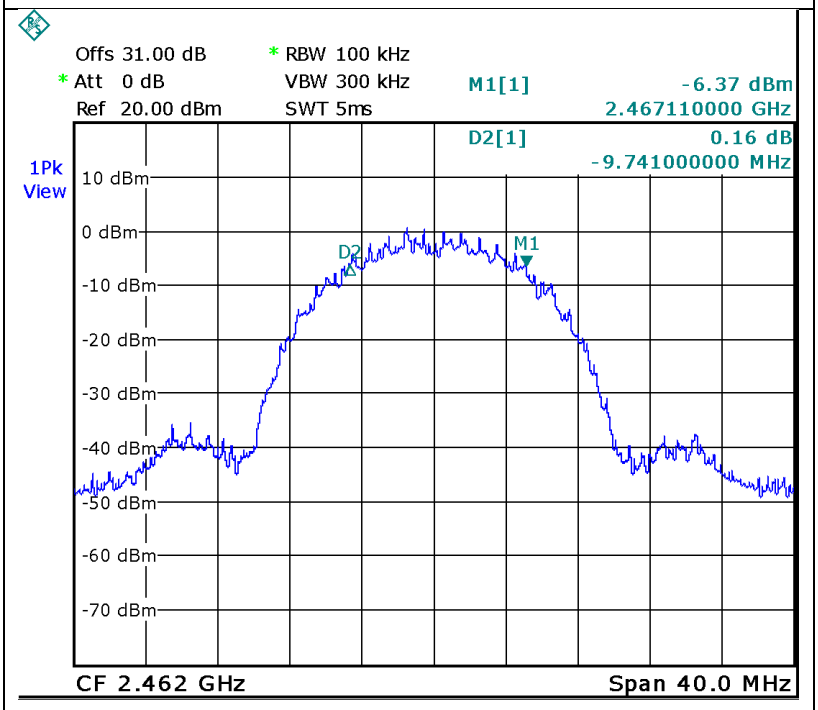


Figure 20. 2462.0 MHz, Wi-fi/b (11Mbit/s)

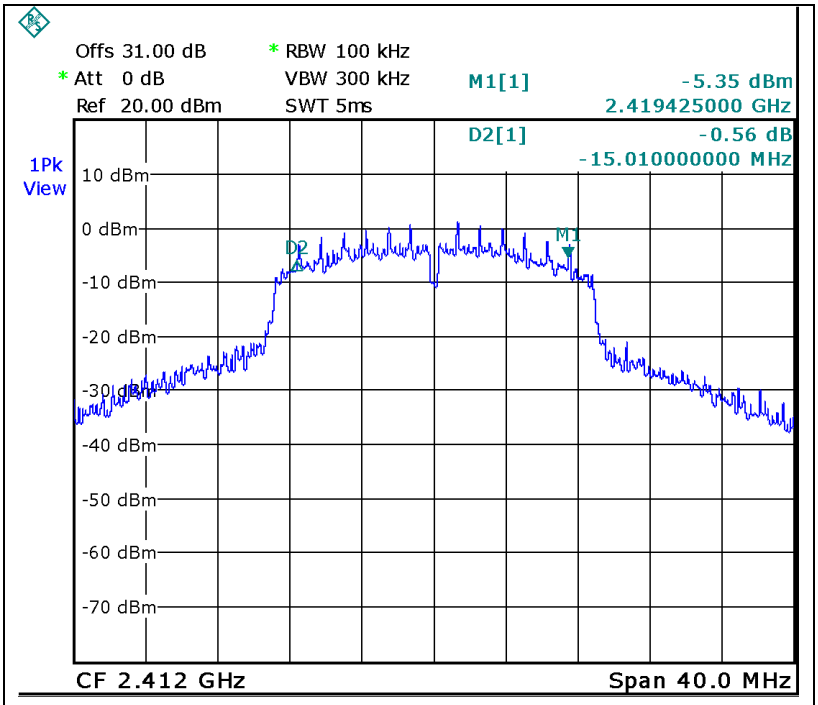


Figure 21. 2412.0 MHz, Wi-fi/n (6.5Mbit/s)

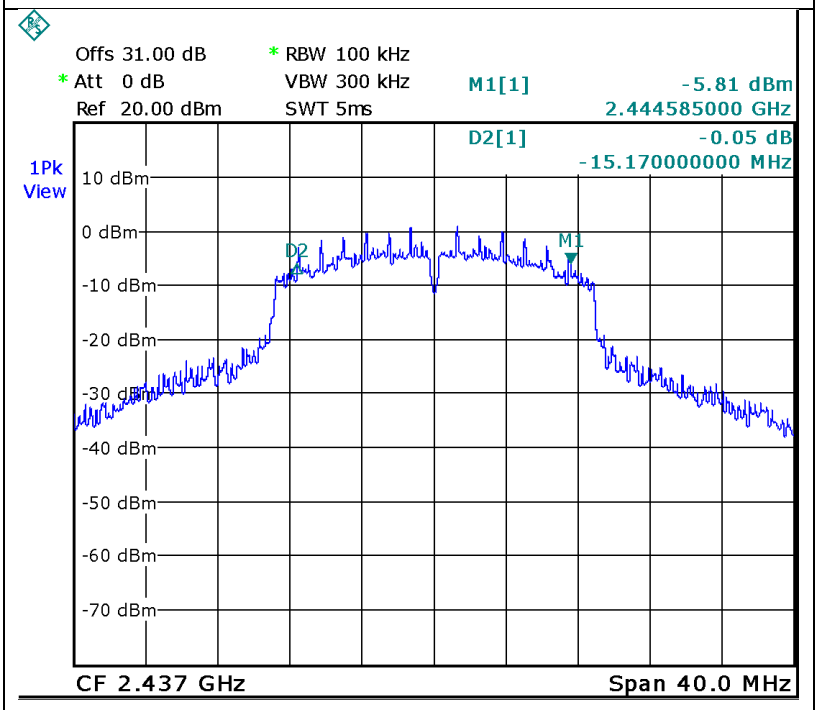


Figure 22. 2437.0 MHz, Wi-fi/n (6.5Mbit/s)

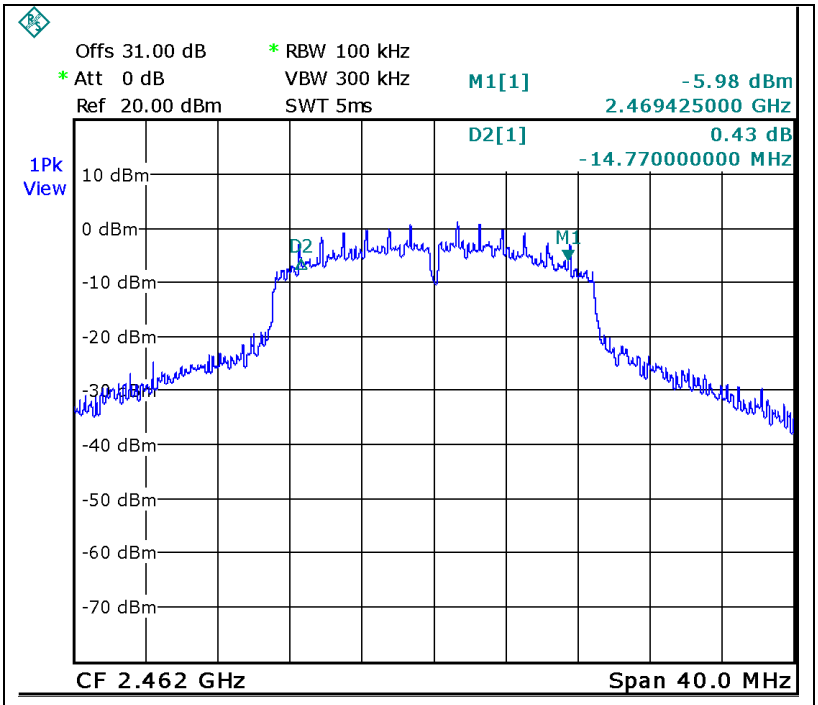


Figure 23. 2462.0 MHz, Wi-fi/n (6.5Mbit/s)

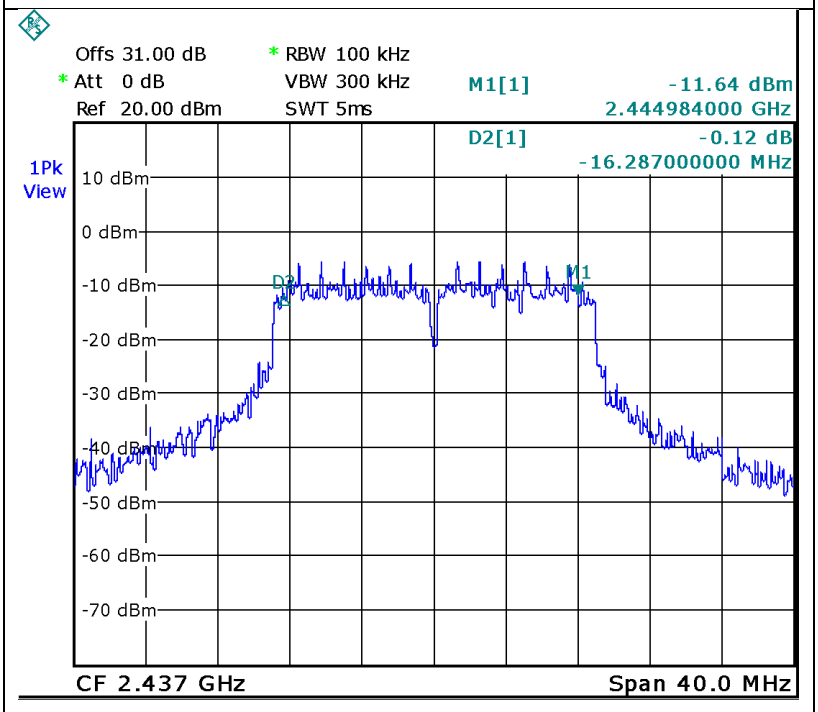


Figure 24. 2437.0 MHz, Wi-fi/n (65Mbit/s)

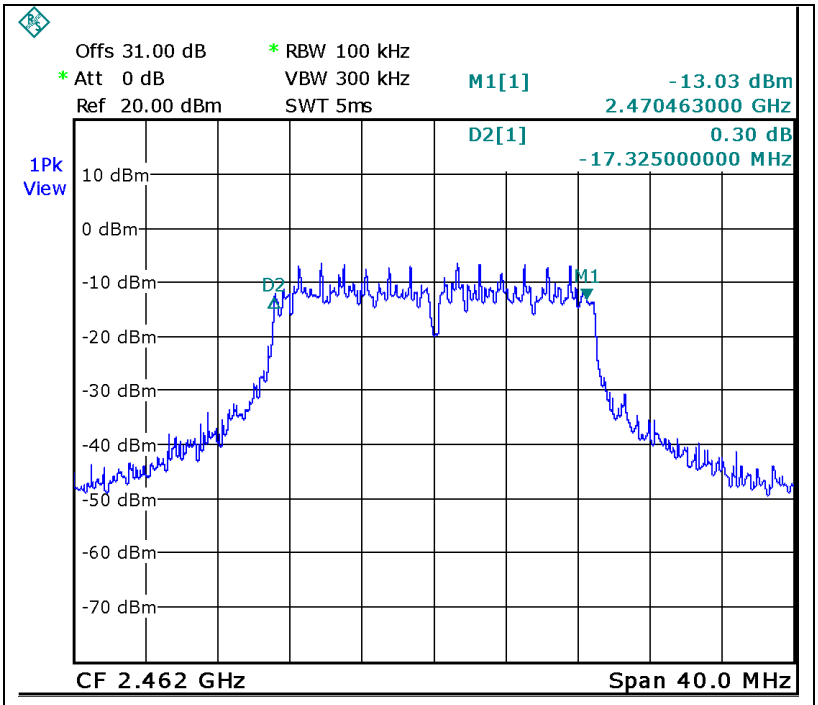


Figure 25. 2462.0 MHz, Wi-fi/n (65Mbit/s)

4.5 Test Equipment Used; 6dB Bandwidth

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	February 20, 2023	February 20, 2024
30 dB attenuator	MCL	BW-S30W5	533	May 16, 2022	May 16, 2023
RF Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS\KPS (KPS-1503-590-KPS	1503-590 (05032006)	May 16, 2022	May 16, 2023

Figure 26 Test Equipment Used

5 Maximum Conducted Output Power

5.1 Test Specification

FCC, Part 15, Subpart C, Section 247(b)(3)

RSS-247, Issue 2, Section 5.4(d)

5.2 Test Procedure

(Temperature (23.8°C)/ Humidity (40%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report. The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss= 31.0 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

5.3 Test Limit

The maximum peak conducted output power of the intentional radiator for systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands: 1 Watt.

5.4 Test Results

5.4.1 BLE

Operation Frequency	Power	Power	Limit	Margin
(MHz)	(dBm)	(mW)	(mW)	(mW)
2402	-1.09	0.78	1000	-999.2
2426	-1.57	0.70	1000	-999.3
2480	-1.89	0.65	1000	-999.4

Figure 27 Maximum Peak Power Output

JUDGEMENT: Passed by_-999.2_mW

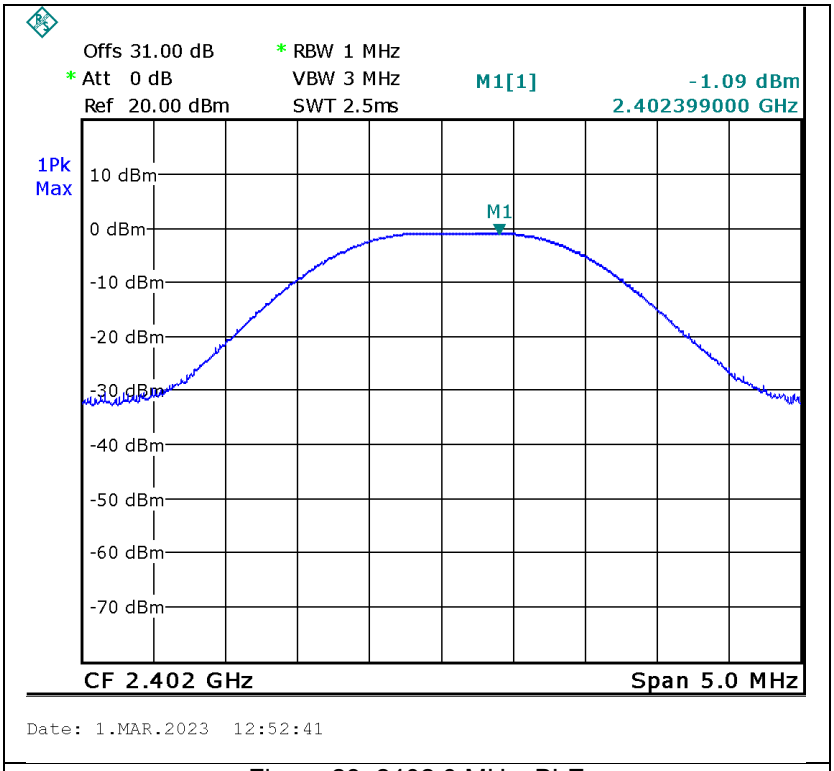


Figure 28. 2402.0 MHz, BLE

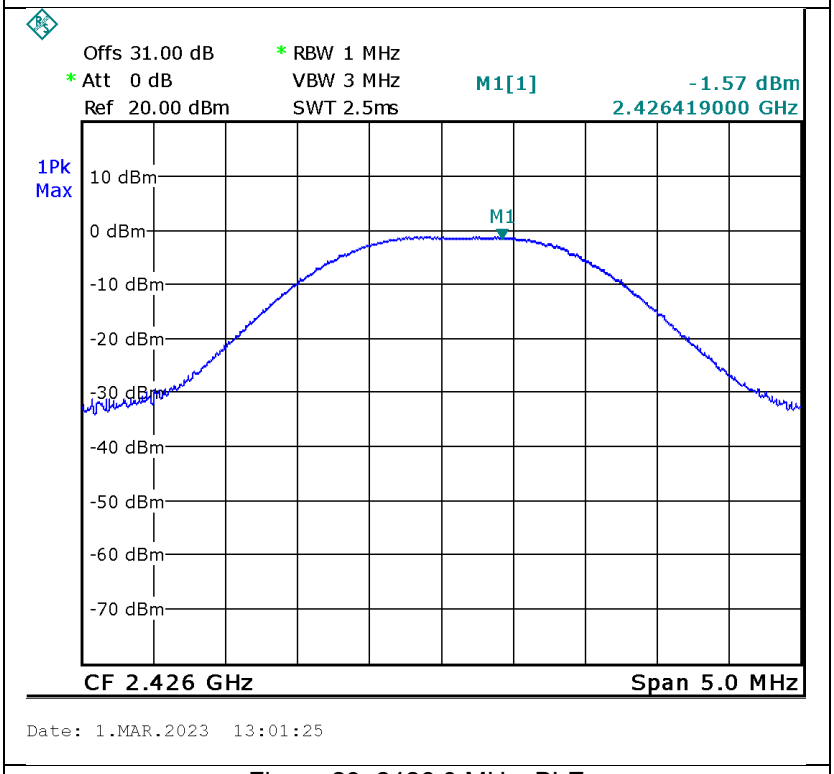


Figure 29. 2426.0 MHz, BLE

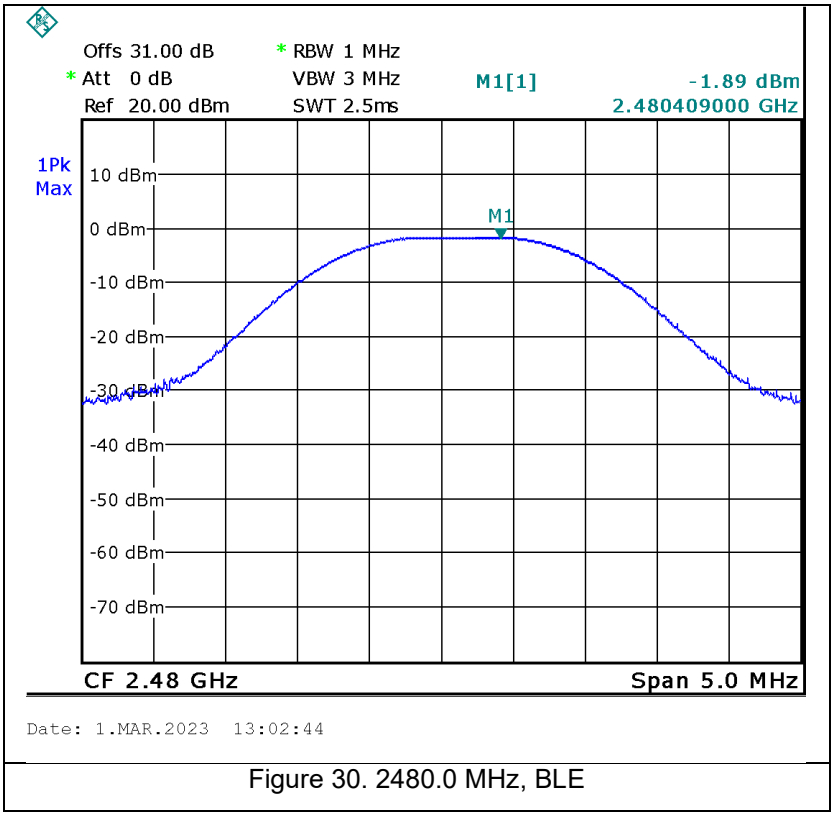


Figure 30. 2480.0 MHz, BLE

5.4.2 Wi-Fi

Protocol Type	Operation Frequency (MHz)	Power (dBm)	Power (mW)	Limit (mW)	Margin (mW)
Wi-fi/b (1Mbit/s)	2412	11.97	15.74	1000	-984.3
	2437	12.61	18.24	1000	-981.8
	2462	12.71	18.66	1000	-981.3
Wi-fi/b (11Mbit/s)	2412	16.06	40.36	1000	-959.6
	2437	16.73	47.10	1000	-952.9
	2462	16.65	46.24	1000	-953.8
Wi-fi/g (6Mbit/s)	2412	19.79	95.28	1000	-904.7
	2437	19.35	86.10	1000	-913.9
	2462	19.39	86.90	1000	-913.1
Wi-fi/g (54Mbit/s)	2412	16.01	39.90	1000	-960.1
	2437	19.32	85.51	1000	-914.5
	2462	16.11	40.83	1000	-959.2
Wi-fi/n (6.5Mbit/s)	2412	19.3	85.11	1000	-914.9
	2437	19.33	85.70	1000	-914.3
	2462	19.33	85.70	1000	-914.3
	2412	13.96	24.89	1000	-975.1

Protocol Type	Operation Frequency	Power	Power	Limit	Margin
	(MHz)	(dBm)	(mW)	(mW)	(mW)
Wi-fi/n (65Mbit/s)	2437	13.87	24.38	1000	-975.6
	2462	13.71	23.50	1000	-976.5

Figure 31 Maximum Peak Power Output

JUDGEMENT: Passed by __-904.7 mW

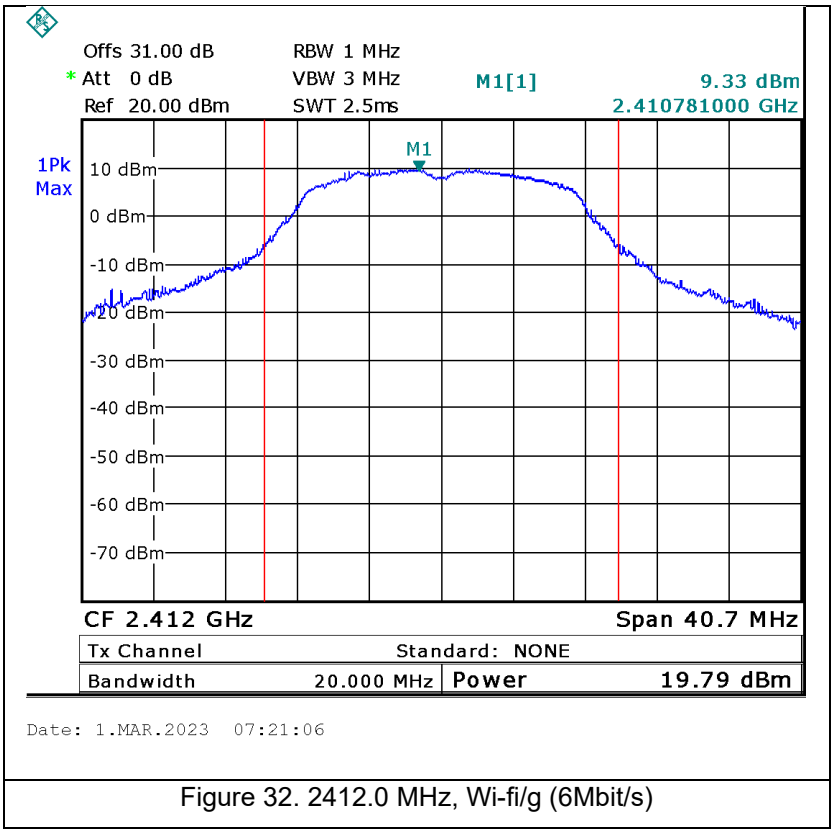


Figure 32. 2412.0 MHz, Wi-fi/g (6Mbit/s)

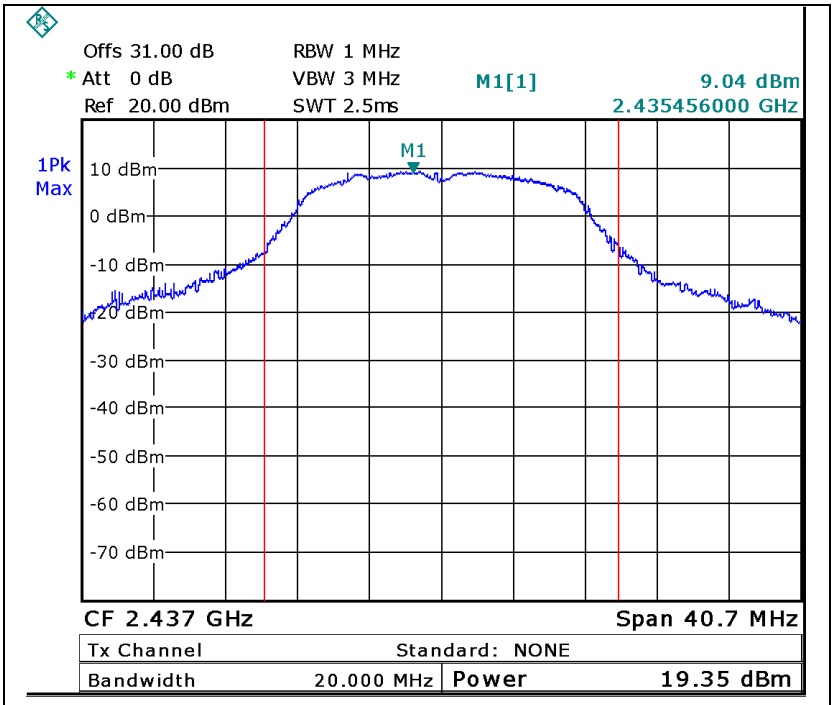


Figure 33. 2437.0 MHz, Wi-fi/g (6Mbit/s)

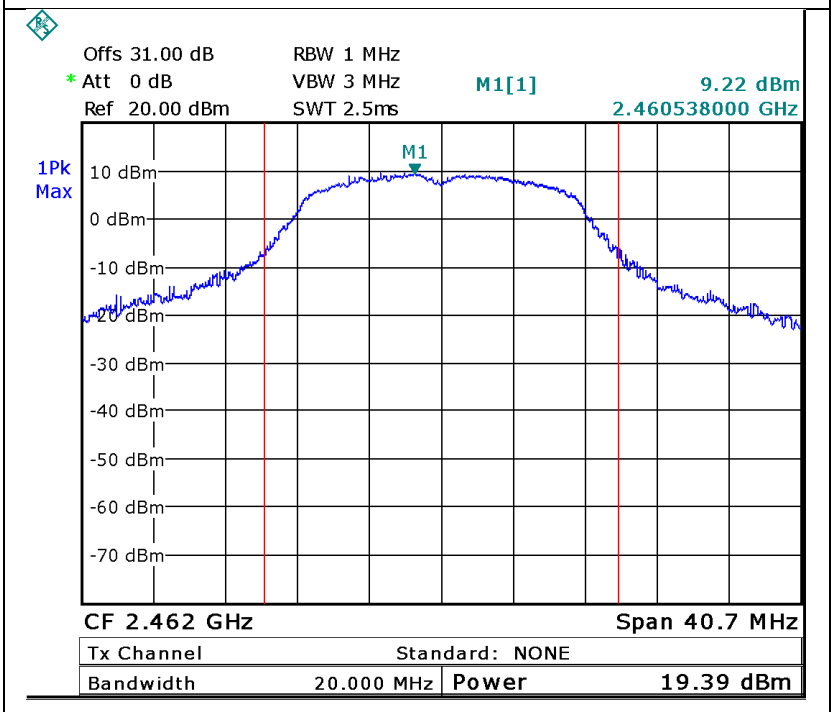


Figure 34. 2462.0 MHz, Wi-fi/g (6Mbit/s)

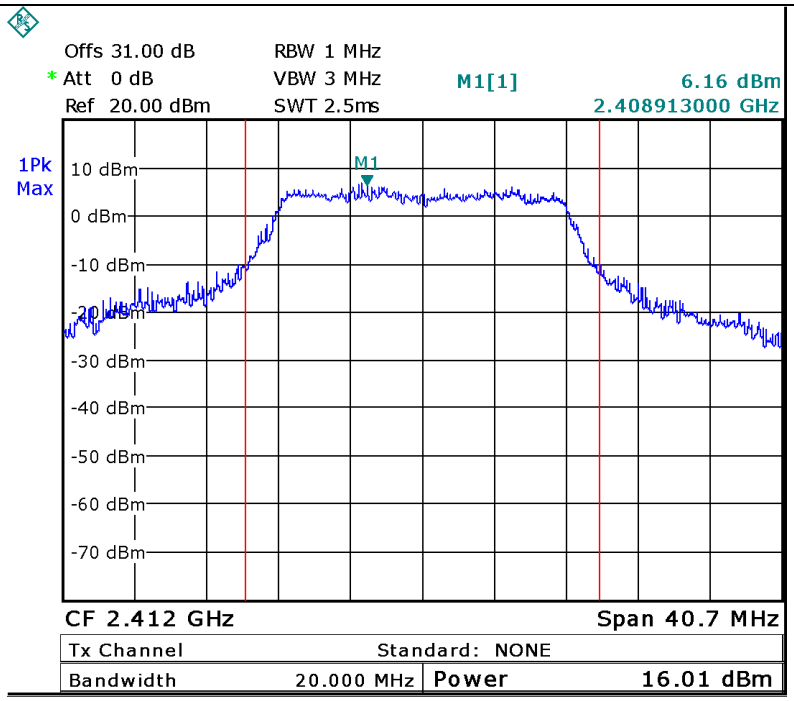


Figure 35. 2412.0 MHz, Wi-fi/g (54Mbit/s)

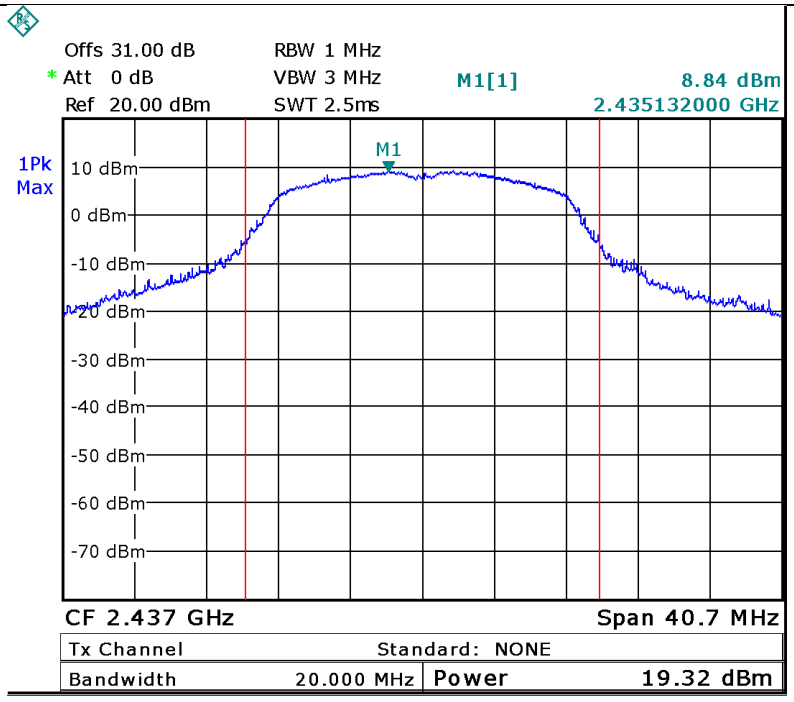


Figure 36. 2437.0 MHz, Wi-fi/g (54Mbit/s)

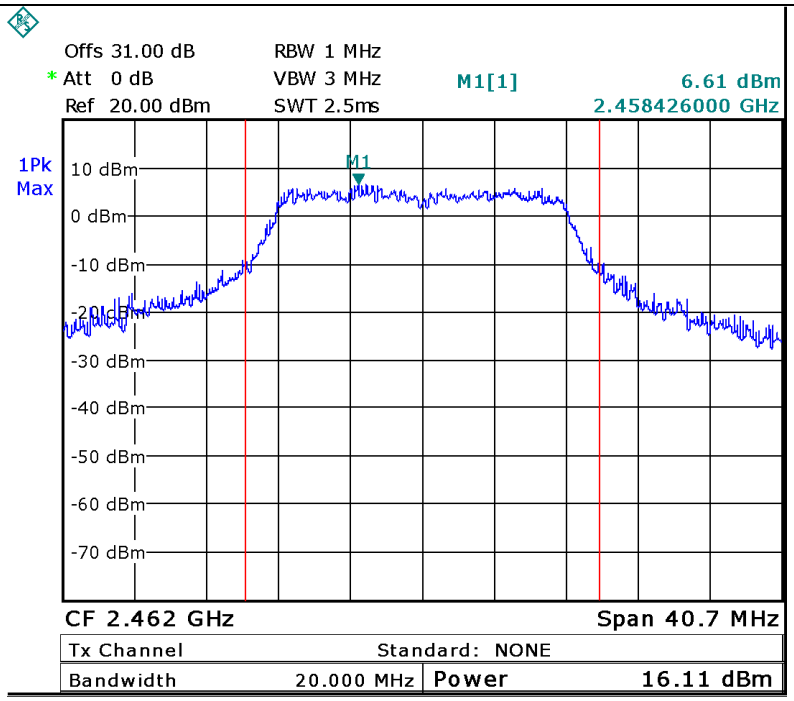


Figure 37. 2462.0 MHz, Wi-fi/g (54Mbit/s)

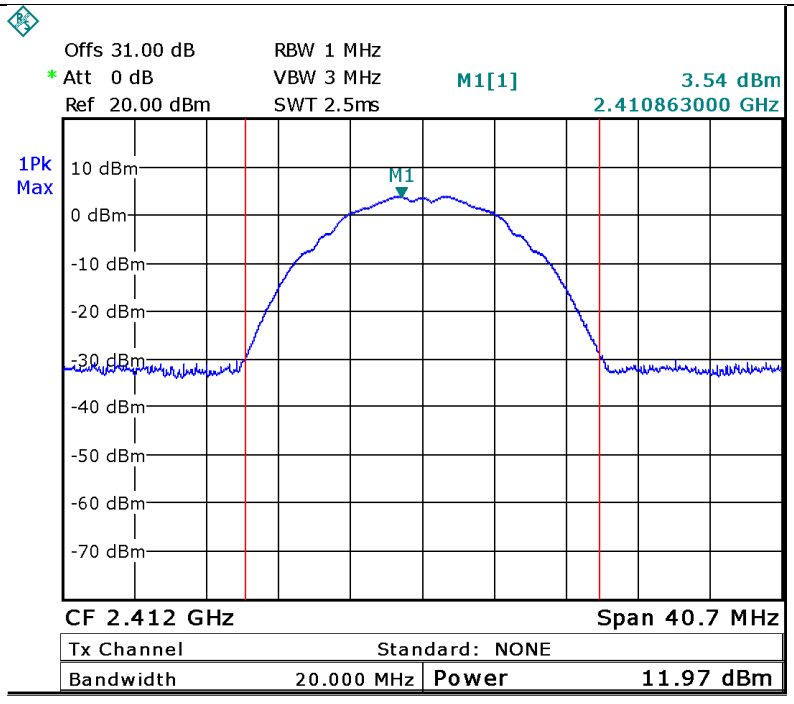


Figure 38. 2412.0 MHz, Wi-fi/b (1Mbit/s)

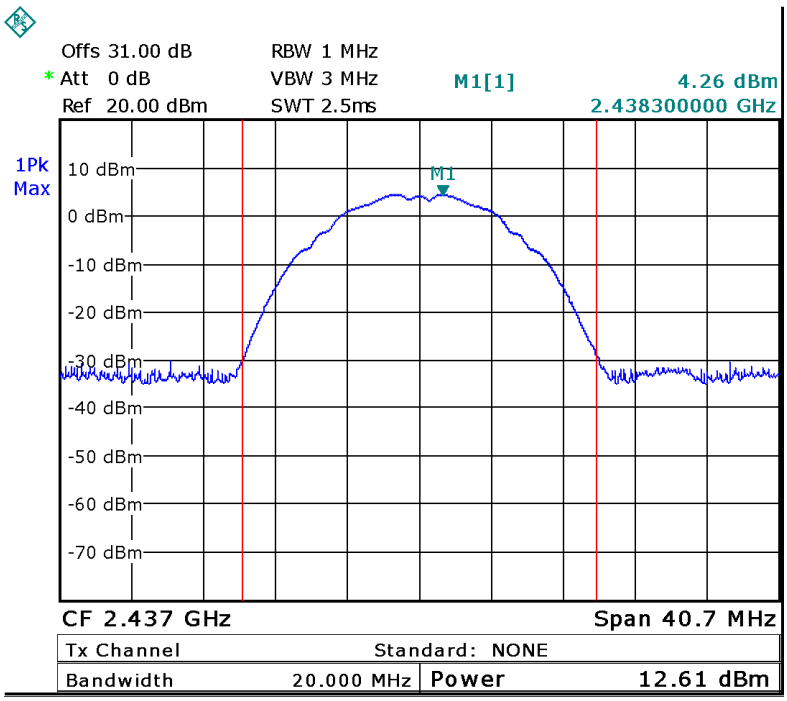


Figure 39. 2437.0 MHz, Wi-fi/b (1Mbit/s)

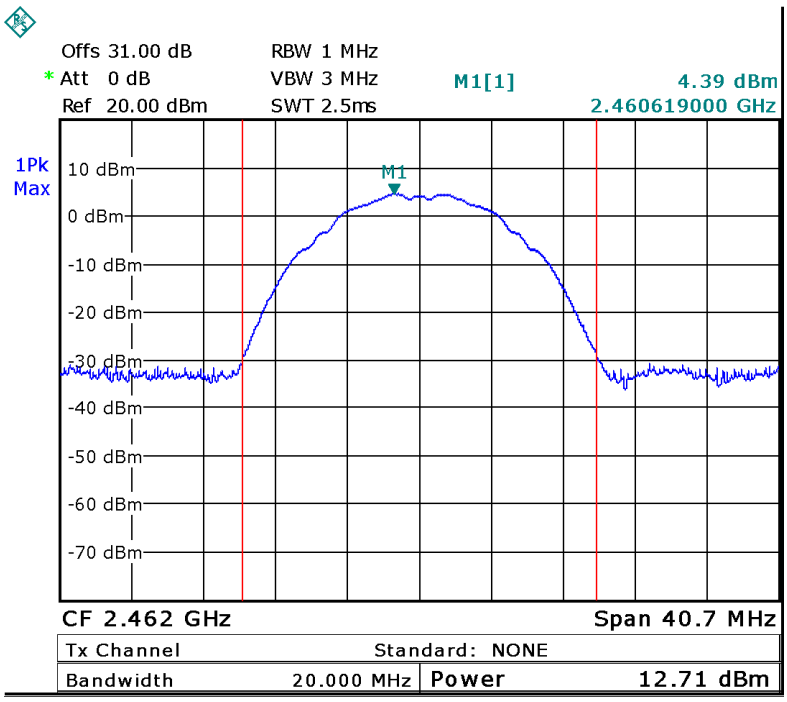


Figure 40. 2462.0 MHz, Wi-fi/b (1Mbit/s)

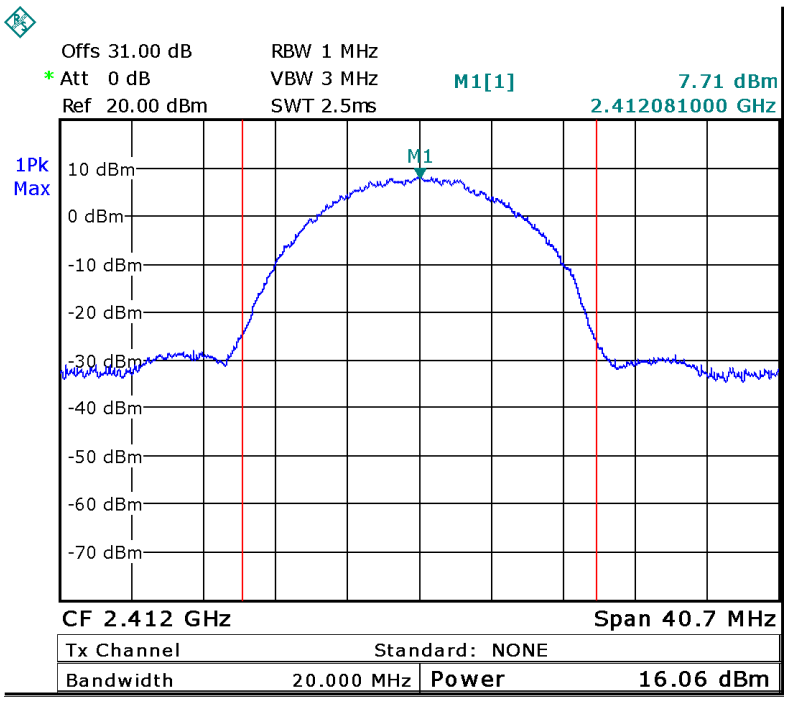


Figure 41. 2412.0 MHz, Wi-fi/b (11Mbit/s)

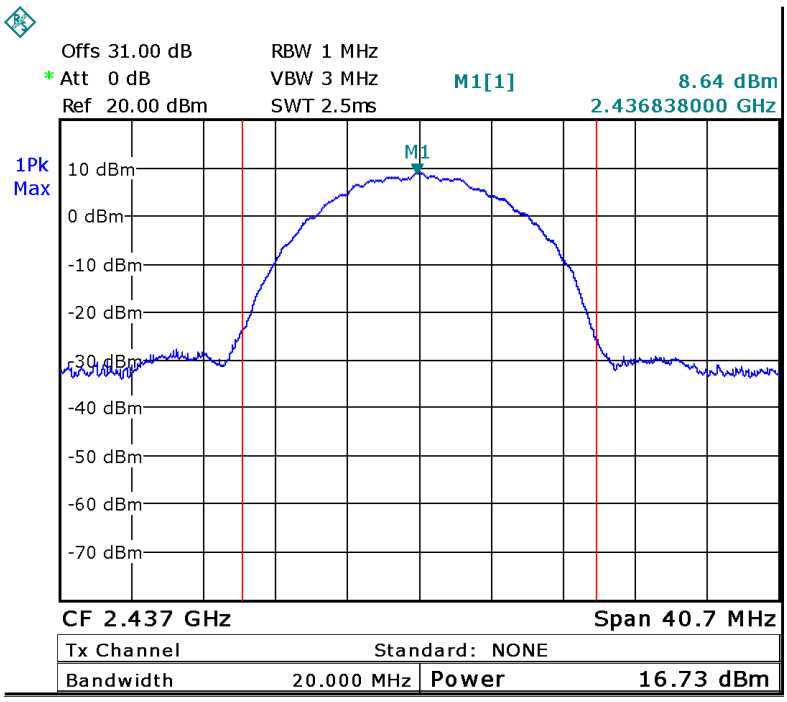


Figure 42. 2437.0 MHz, Wi-fi/b (11Mbit/s)

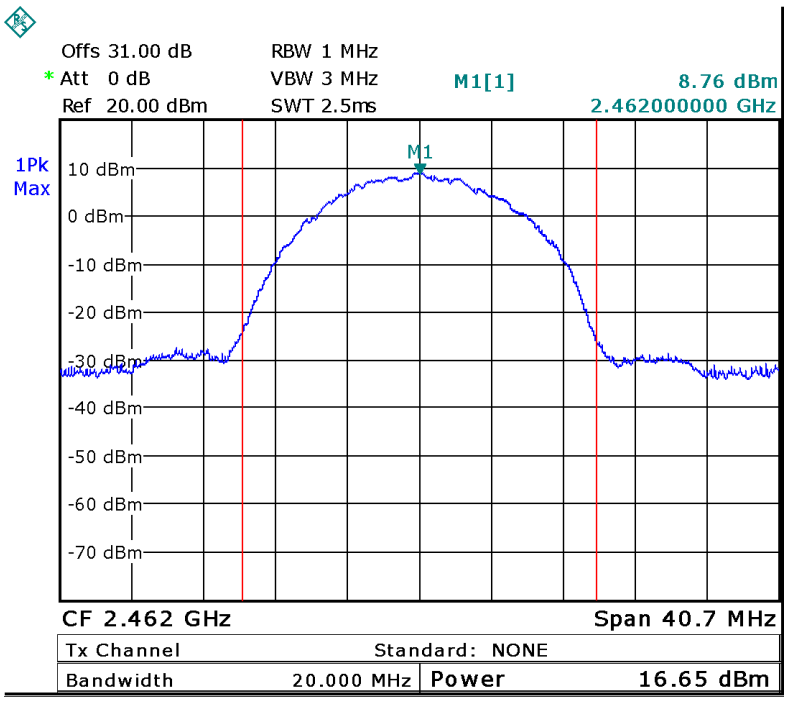


Figure 43. 2462.0 MHz, Wi-fi/b (11Mbit/s)

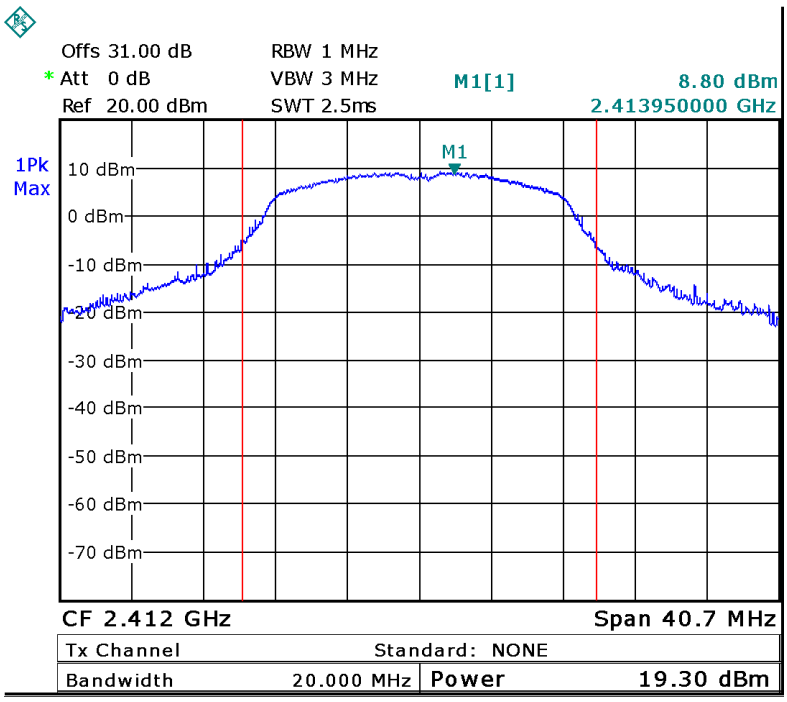


Figure 44. 2412.0 MHz, Wi-fi/n (6.5Mbit/s)

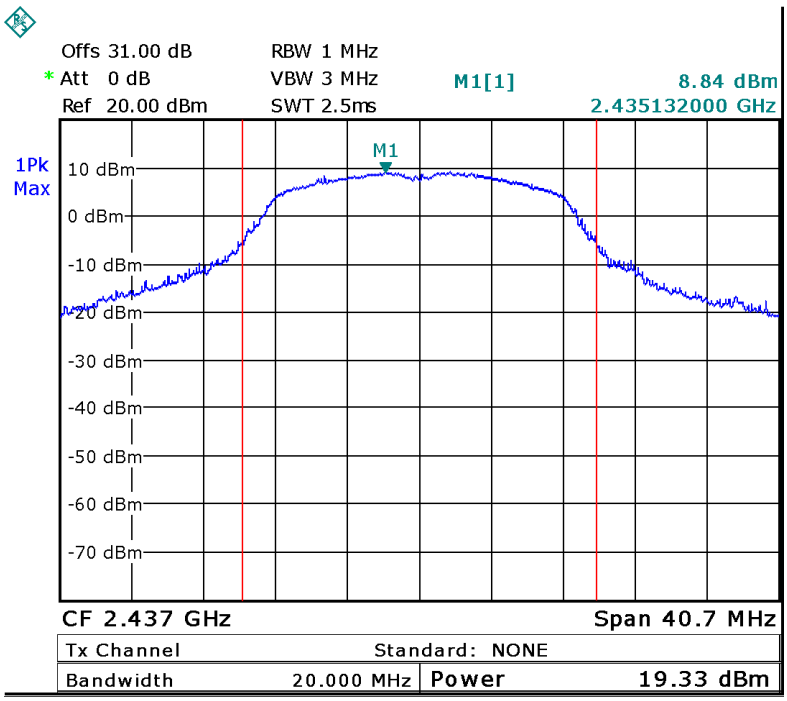


Figure 45. 2437.0 MHz, Wi-fi/n (6.5Mbit/s)

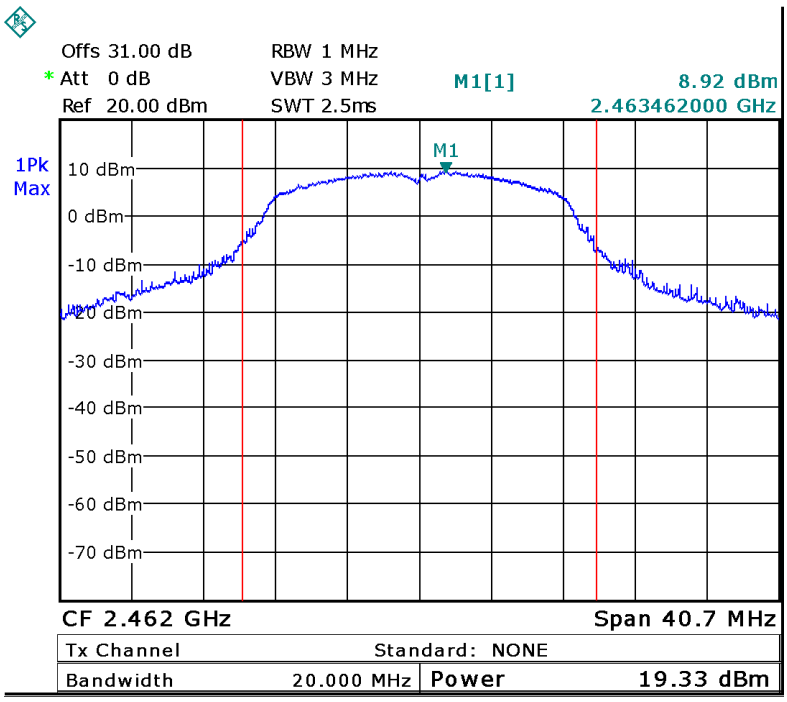


Figure 46. 2462.0 MHz, Wi-fi/n (6.5Mbit/s)

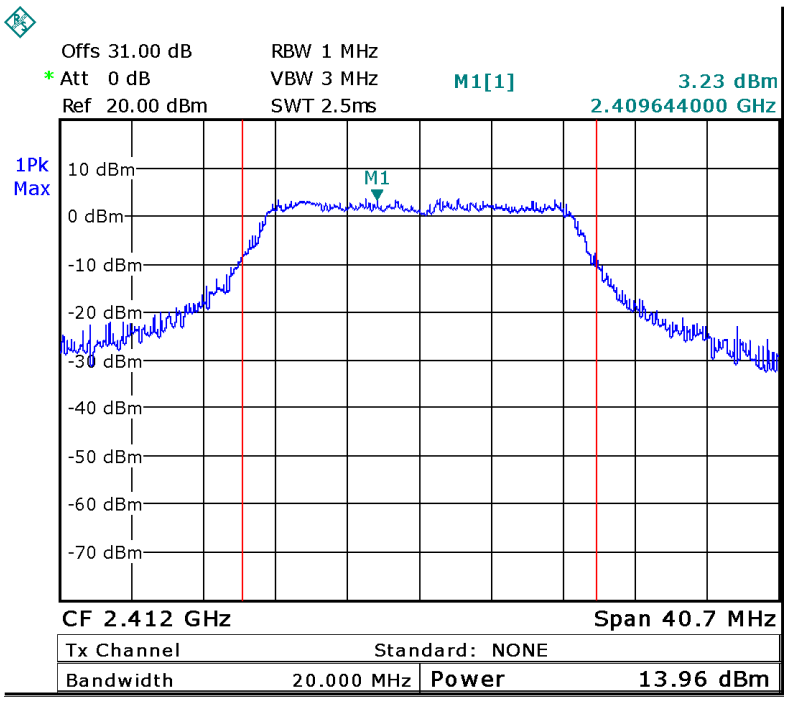


Figure 47. 2412.0 MHz, Wi-fi/n (65Mbit/s)

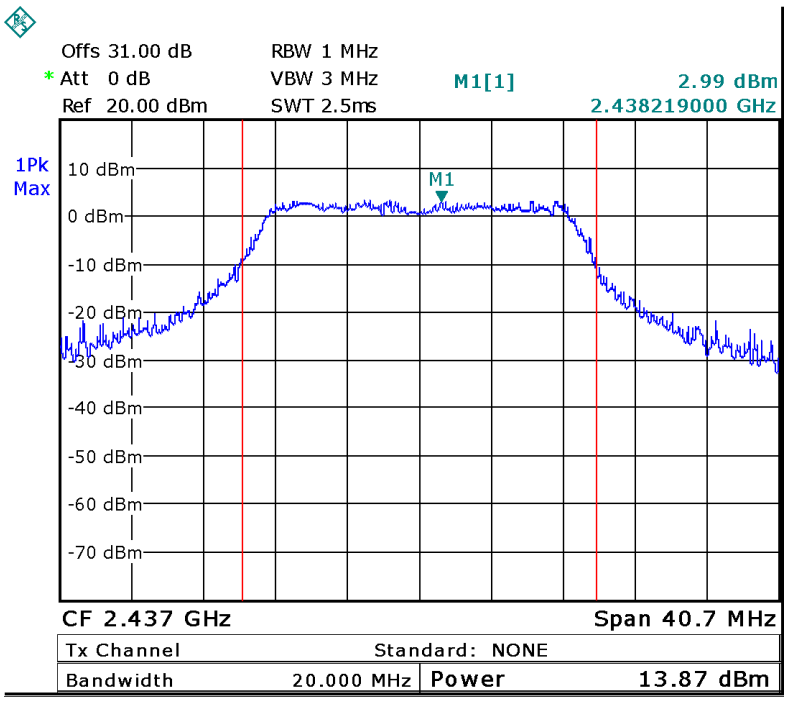


Figure 48. 2437.0 MHz, Wi-fi/n (65Mbit/s)

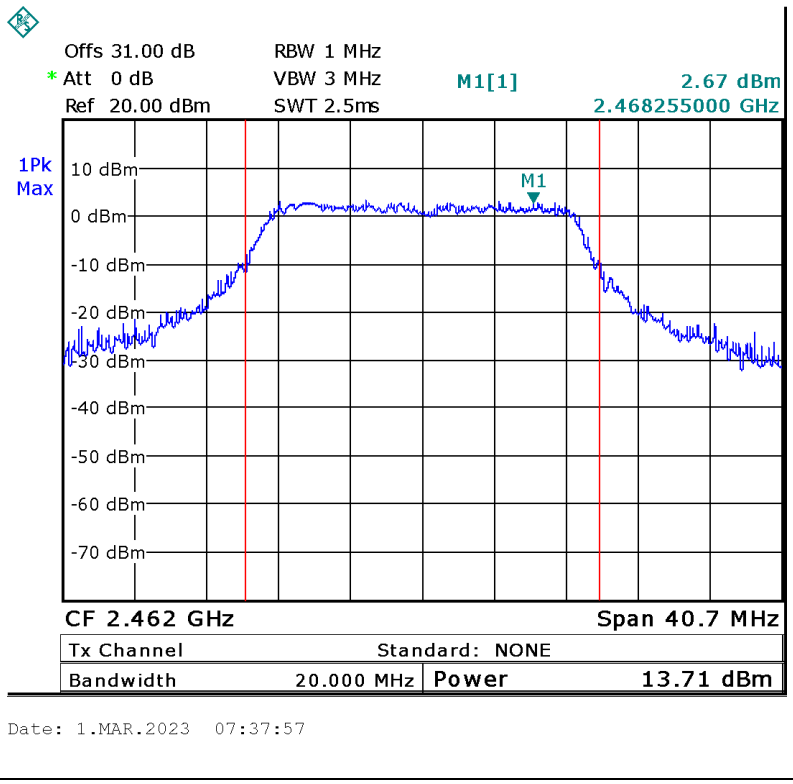


Figure 49. 2462.0 MHz, Wi-fi/n (65Mbit/s)

5.5 Test Equipment Used; Maximum Peak Power Output

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	February 20, 2023	February 20, 2024
30 dB attenuator	MCL	BW-S30W5	533	May 16, 2022	May 16, 2023
RF Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS\KPS (KPS-1503 -590-KPS	1503-590 (05032006)	May 16, 2022	May 16, 2023

Figure 50 Test Equipment Used

6 Band Edge Spectrum

6.1 Test Specification

FCC, Part 15, Subpart C, Section 247(d)

RSS-247, Issue 2, Section 5.5

6.2 Test Procedure

(Temperature (23.8°C)/ Humidity (40%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report. The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (loss=31.0 dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

The RBW was set to 100 kHz.

6.3 Test Limit

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.

6.3.1 BLE

Protocol Type	Operation Frequency	Band Edge Frequency	Spectrum Level	Limit	Margin
	(MHz)	(MHz)	(dBm)	(dBm)	(dB)
BLE	2402.0	2400.0	-48.09	-21.33	-26.76
	2480.0	2483.5	-46.44	-21.85	-24.59

Figure 51 Band Edge Spectrum

JUDGEMENT: Passed by_-4.8 dB

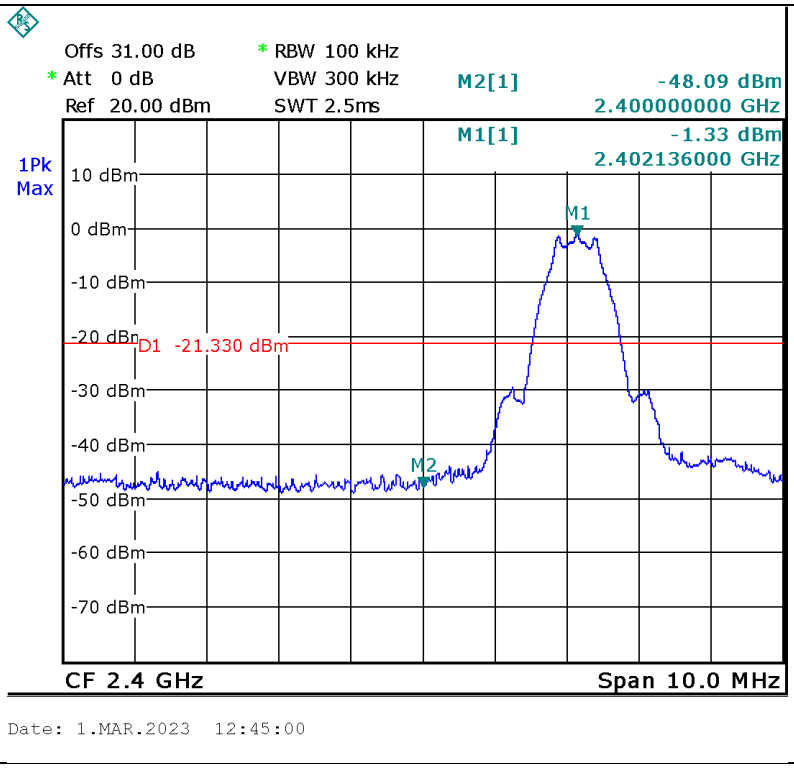


Figure 52. 2402.0 MHz, BLE

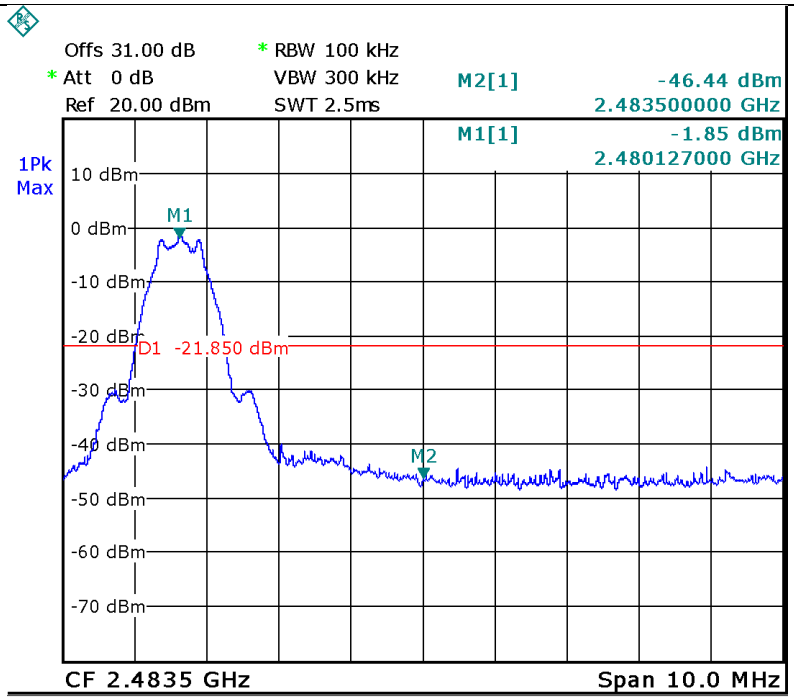


Figure 53. 2480.0 MHz, BLE

6.4 Test Results

6.4.1 Wi-Fi

Protocol Type	Operation Frequency (MHz)	Band Edge Frequency (MHz)	Spectrum Level (dBm)	Limit (dBm)	Margin (dB)
Wi-fi/b (1Mbit/s)	2412.0	2400.0	-45.17	-20.87	-24.3
	2462.0	2483.5	-45.77	-21.03	-24.74
Wi-fi/b (11Mbit/s)	2412.0	2400.0	-38.2	-19.5	-18.7
	2462.0	2483.5	-44.56	-19.49	-25.07
Wi-fi/g (6Mbit/s)	2412.0	2400.0	-24.05	-19.25	-4.8
	2462.0	2483.5	-37.58	-19.89	-17.69
Wi-Fi/g (54Mbit/s)	2412.0	2400.0	-33.75	-24.08	-9.67
	2462.0	2483.5	-46.35	-24.28	-22.07
Wi-Fi/n (6.5Mbit/s)	2412.0	2400.0	-26.16	-20.53	-5.63
	2462.0	2483.5	-37.68	-19.69	-17.99
Wi-fi/n (65Mbit/s)	2412.0	2400.0	-34.58	-25.2	-9.38
	2462.0	2483.5	-47.45	-26	-21.45

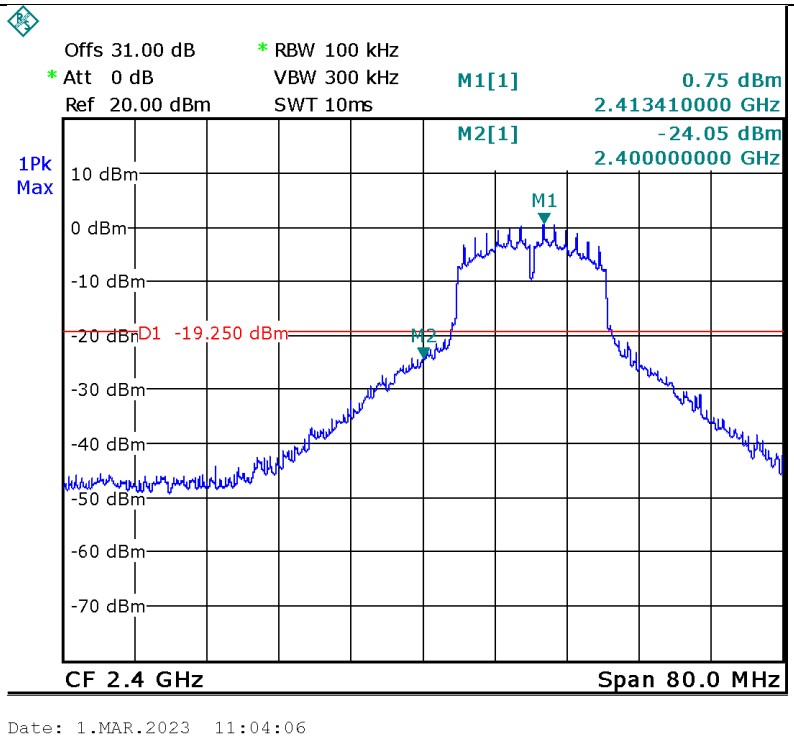


Figure 54. 2412.0 MHz, Wi-fi/g (6Mbit/s)

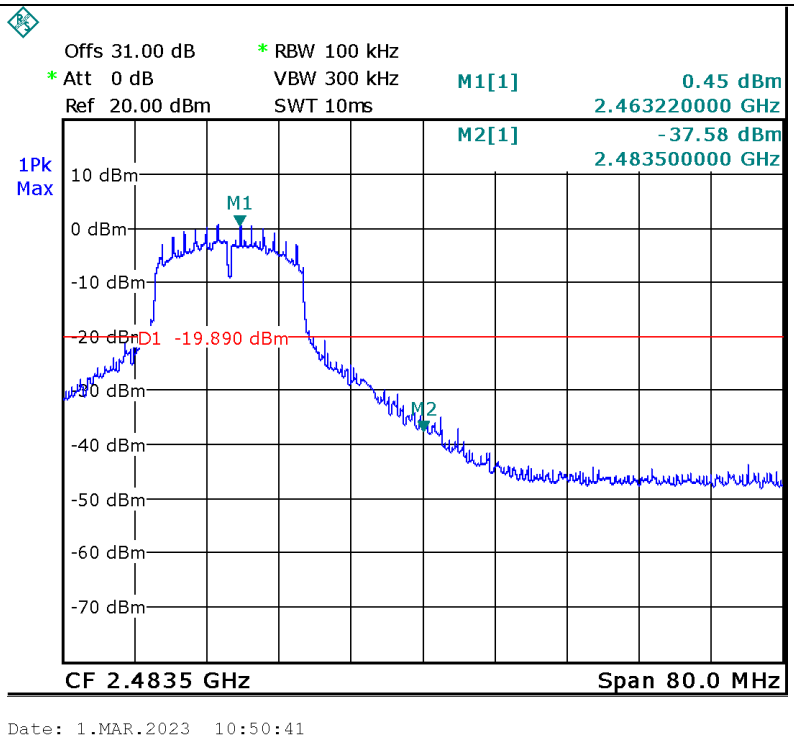


Figure 55. 2462.0 MHz, Wi-fi/g (6Mbit/s)

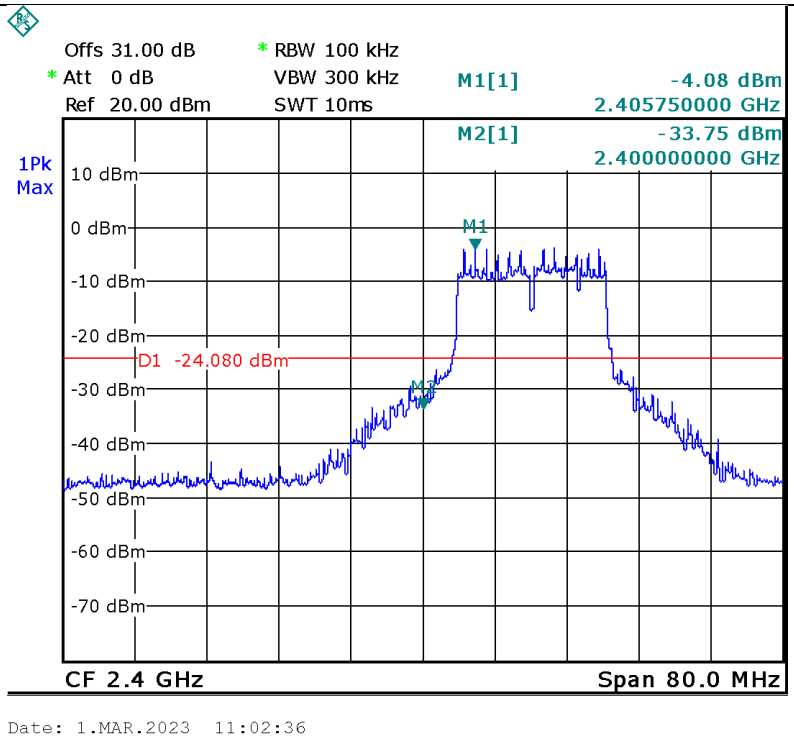


Figure 56. 2412.0 MHz, Wi-fi/g (54Mbit/s)

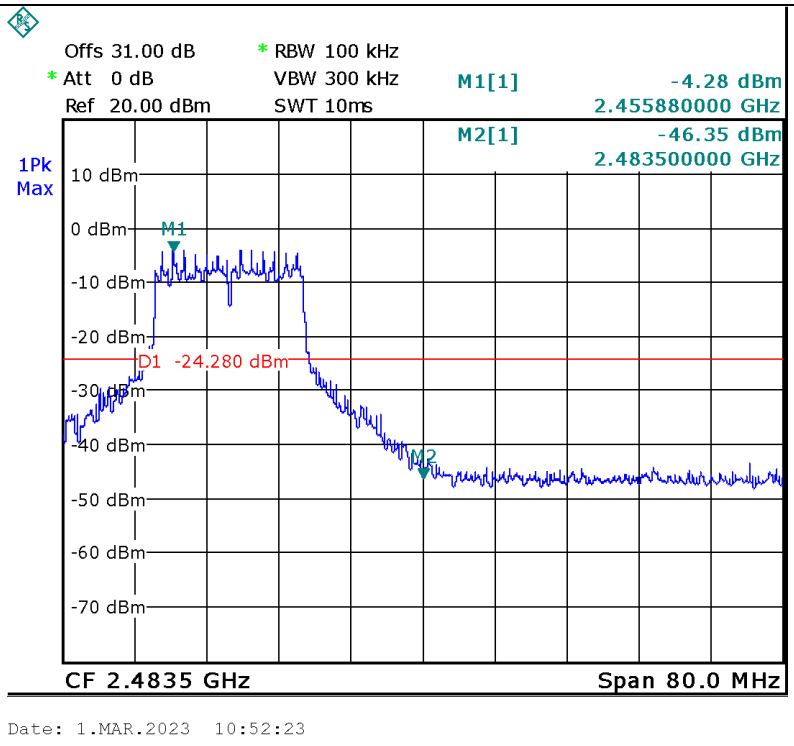


Figure 57. 2462.0 MHz, Wi-fi/g (54Mbit/s)

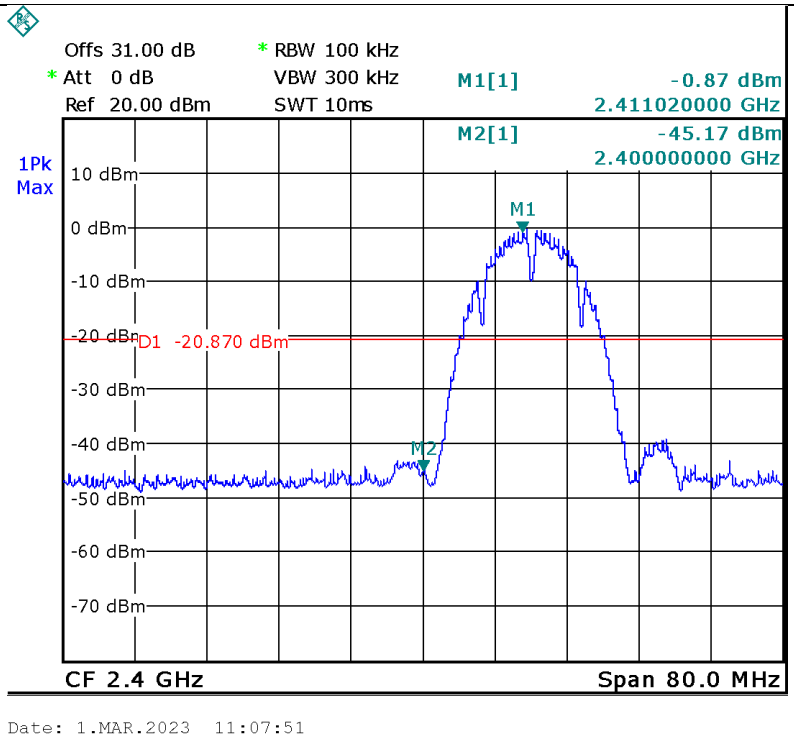


Figure 58. 2412.0 MHz, Wi-fi/b (1Mbit/s)

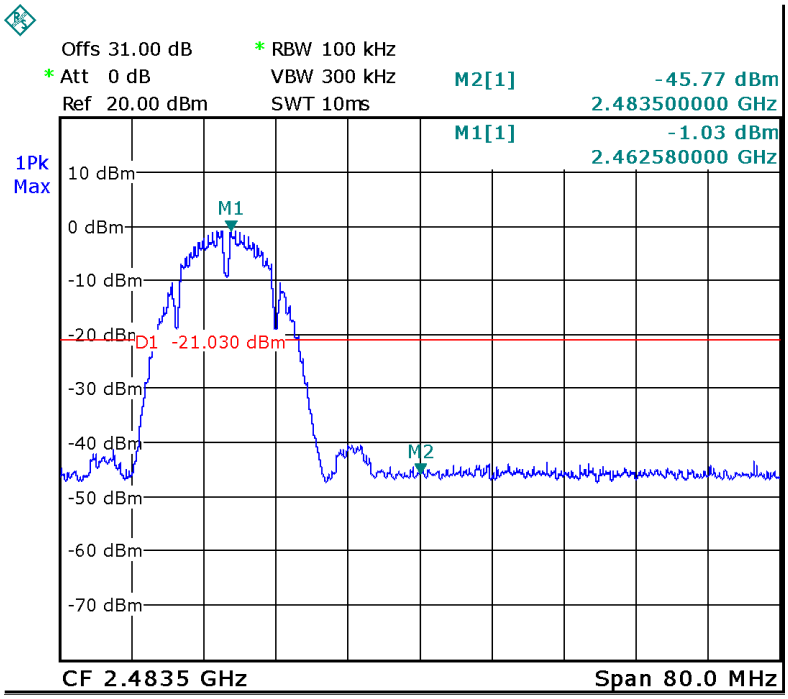


Figure 59. 2462.0 MHz, Wi-fi/b (1Mbit/s)

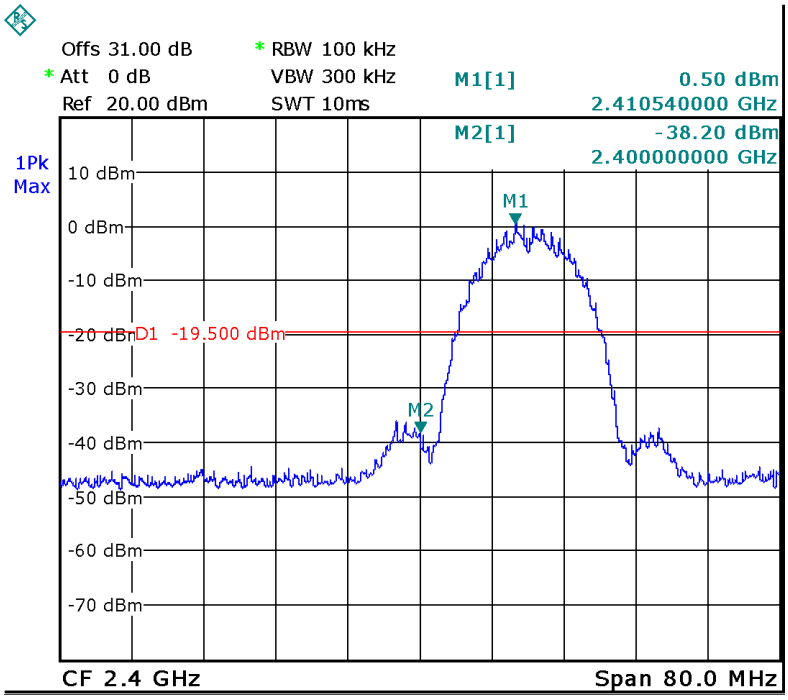


Figure 60. 2412.0 MHz, Wi-fi/b (11Mbit/s)

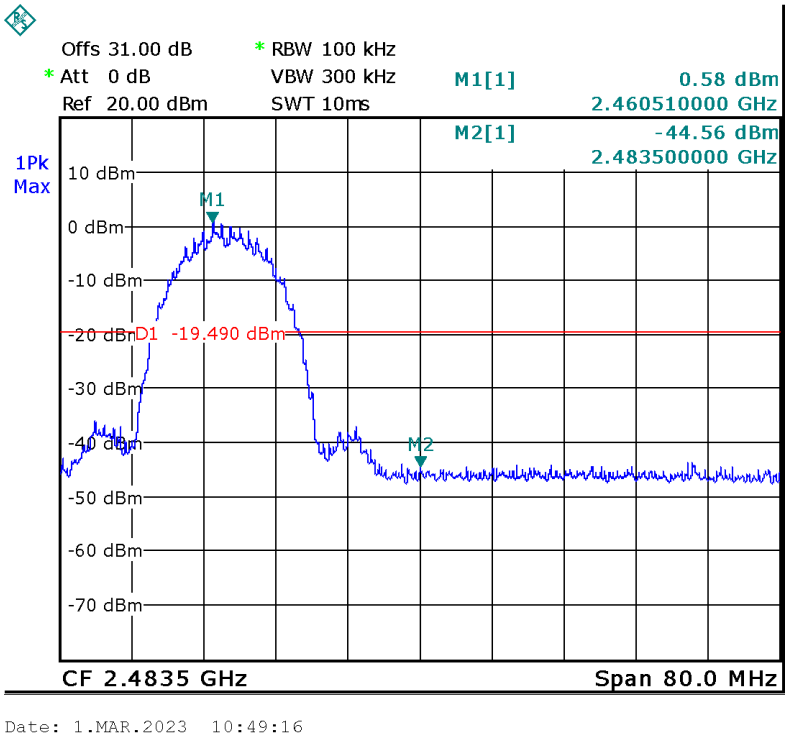


Figure 61. 2462.0 MHz, Wi-fi/b (11Mbit/s)

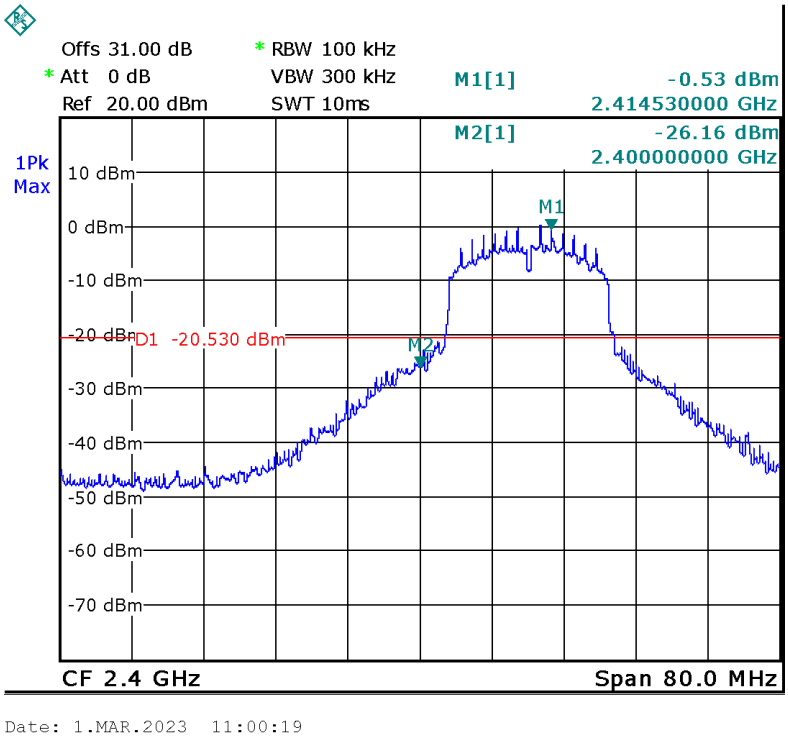


Figure 62. 2412.0 MHz, Wi-fi/n (6.5Mbit/s)

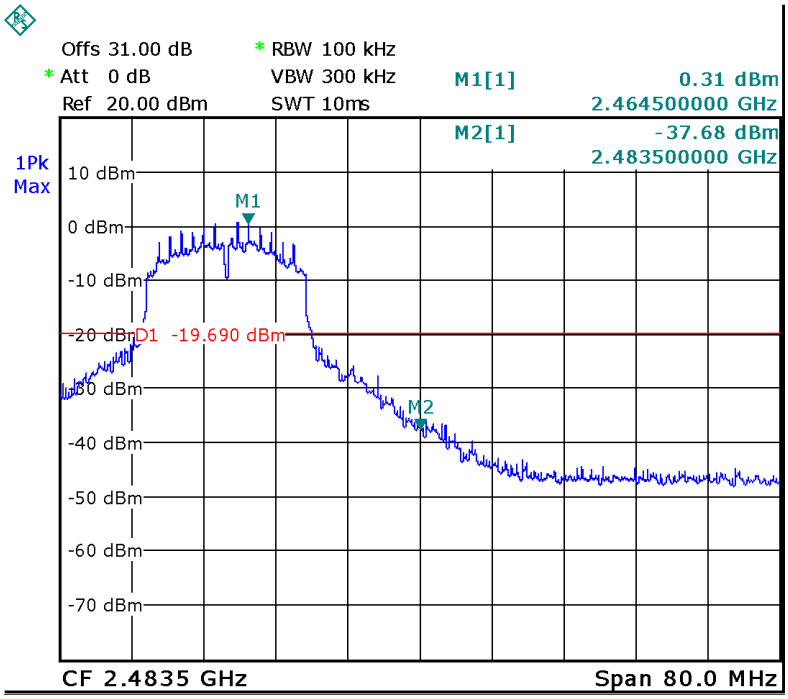


Figure 63. 2462.0 MHz, Wi-fi/n (6.5Mbit/s)

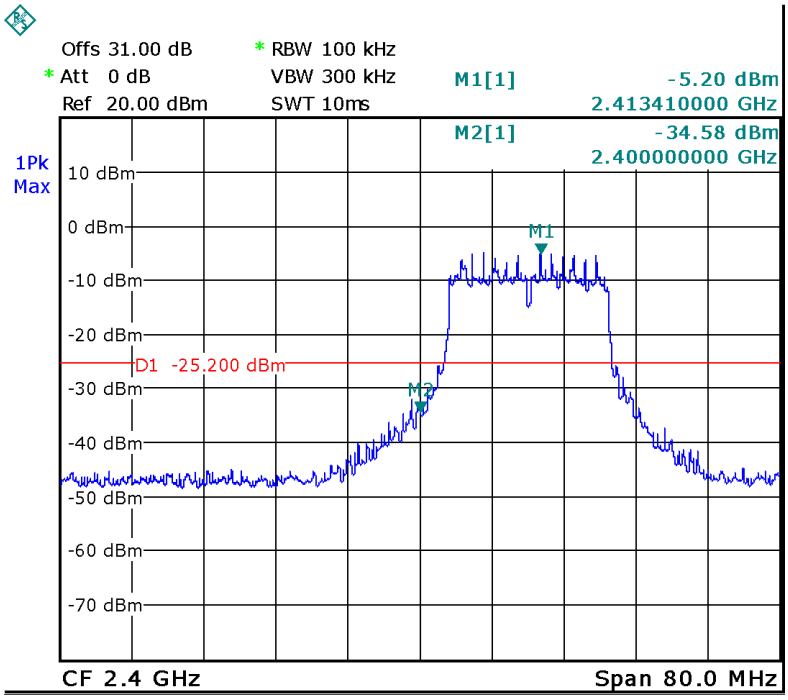


Figure 64. 2412.0 MHz, Wi-fi/n (65Mbit/s)

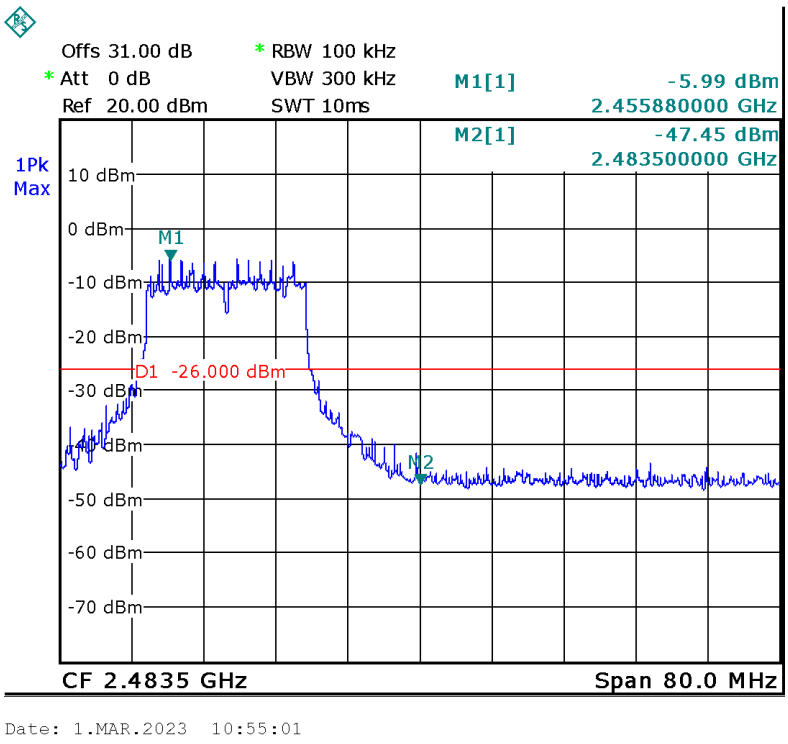


Figure 65. 2462.0 MHz, Wi-fi/n (65Mbit/s)

6.5 Test Equipment Used; Band Edge

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	February 20, 2023	February 20, 2024
30 dB attenuator	MCL	BW-S30W5	533	May 16, 2022	May 16, 2023
RF Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS\KPS (KPS-1503 -590-KPS	1503-590 (05032006)	May 16, 2022	May 16, 2023

Figure 66 Test Equipment Used

7 Transmitted Power Density

7.1 Test Specification

FCC, Part 15, Subpart C, Section 247(e)

RSS-247, Issue 2, Section 5.2(b)

7.2 Test Procedure

(Temperature (23.8°C)/ Humidity (40%RH))

The E.U.T operation mode and test set-up are as described in Section 2 of this report. The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss= 31.0dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

The spectrum analyzer was set to 3 kHz RBW.

7.3 Test Limit

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.

7.4 Test Results

7.4.1 BLE

Operation Frequency	PSD Reading	Limit	Margin
(MHz)	(dBm)	(dBm)	(dB)
2402.0	-18.15	8.0	-26.15
2426.0	-18.18	8.0	-26.18
2480.0	-18.48	8.0	-26.48

Figure 67 Test Results

JUDGEMENT: Passed by -23.01 dB

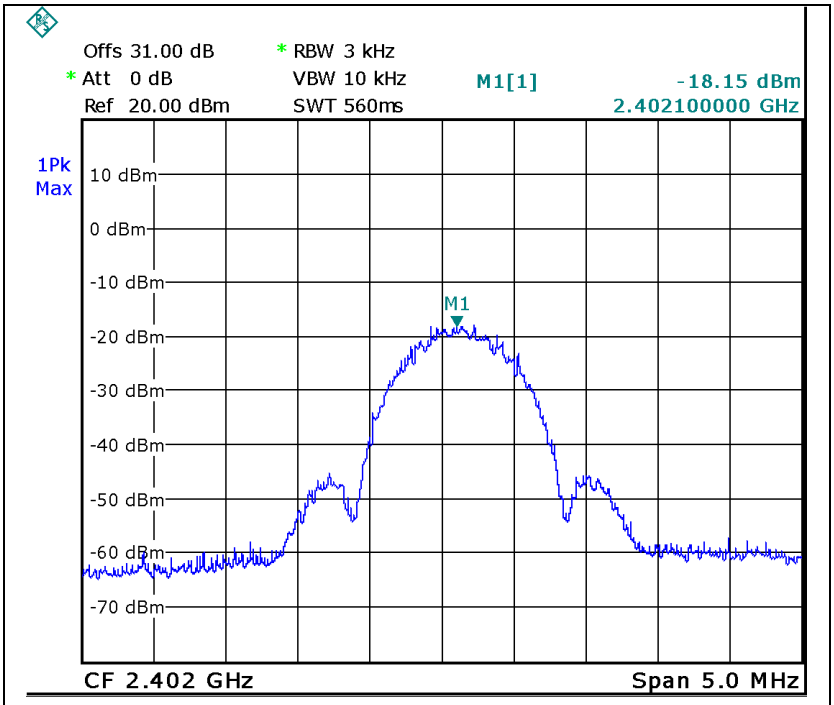


Figure 68. 2402.0 MHz, BLE

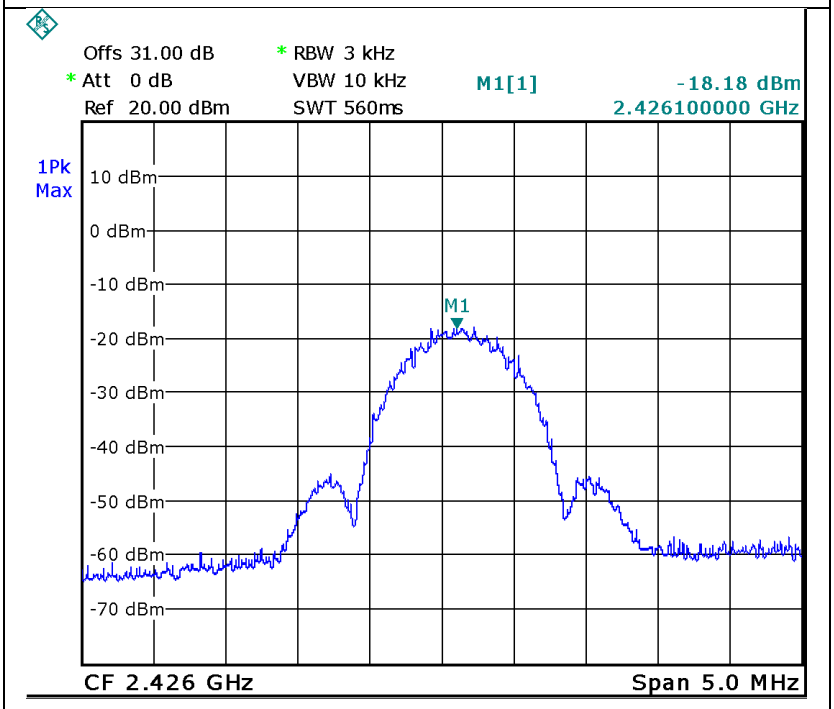


Figure 69. 2426.0 MHz, BLE

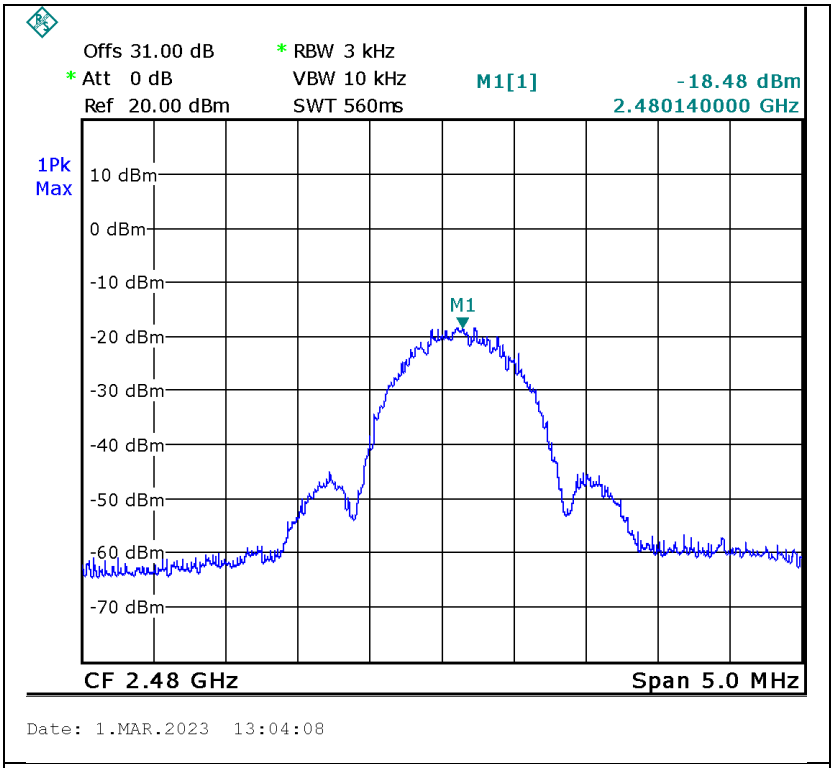


Figure 70. 2480.0 MHz, BLE

7.4.2 Wi-Fi

Protocol Type	Operation Frequency (MHz)	PSD Reading (dBm)	Limit (dBm)	Margin (dB)
Wi-fi/b (1Mbit/s)	2412.0	-16.05	8.0	-24.05
	2437.0	-16.30	8.0	-24.3
	2462.0	-16.44	8.0	-24.44
Wi-fi/b (11Mbit/s)	2412.0	-14.99	8.0	-22.99
	2437.0	-15.13	8.0	-23.13
	2462.0	-15.39	8.0	-23.39
Wi-fi/g (6Mbit/s)	2412.0	-16.30	8.0	-24.3
	2437.0	-16.04	8.0	-24.04
	2462.0	-16.95	8.0	-24.95
Wi-fi/g (54Mbit/s)	2412.0	-15.01	8.0	-23.01
	2437.0	-25.11	8.0	-33.11
	2462.0	-25.04	8.0	-33.04

Protocol Type	Operation Frequency	PSD Reading	Limit	Margin
	(MHz)	(dBm)	(dBm)	(dB)
Wi-fi/n (6.5Mbit/s)	2412.0	-15.01	8.0	-23.01
	2437.0	-15.43	8.0	-23.43
	2462.0	-15.89	8.0	-23.89
Wi-fi/n (65Mbit/s)	2412.0	-24.93	8.0	-32.93
	2437.0	-23.44	8.0	-31.44
	2462.0	-25.51	8.0	-33.51

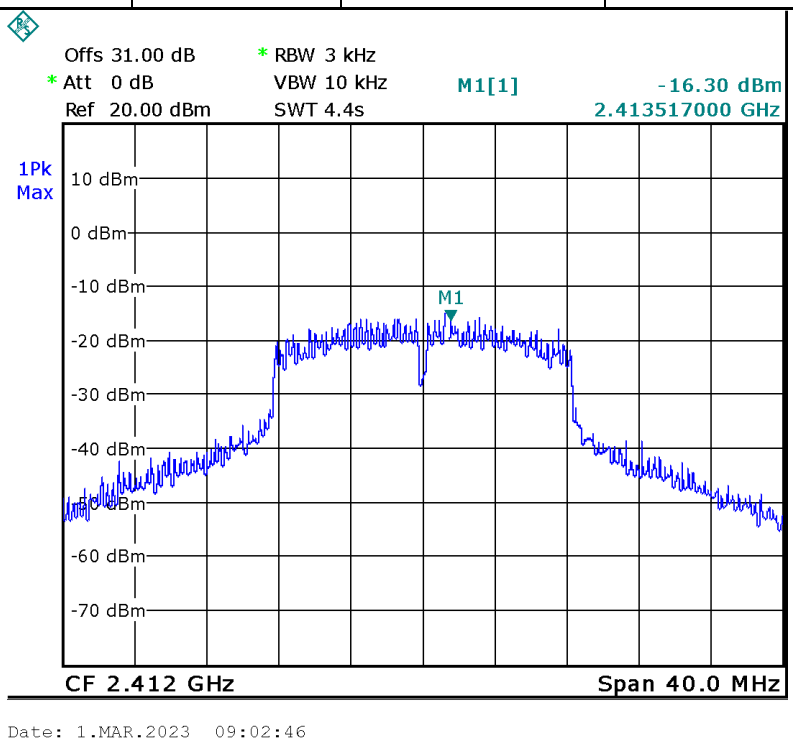


Figure 71. 2412.0 MHz, Wi-fi/g (6Mbit/s)

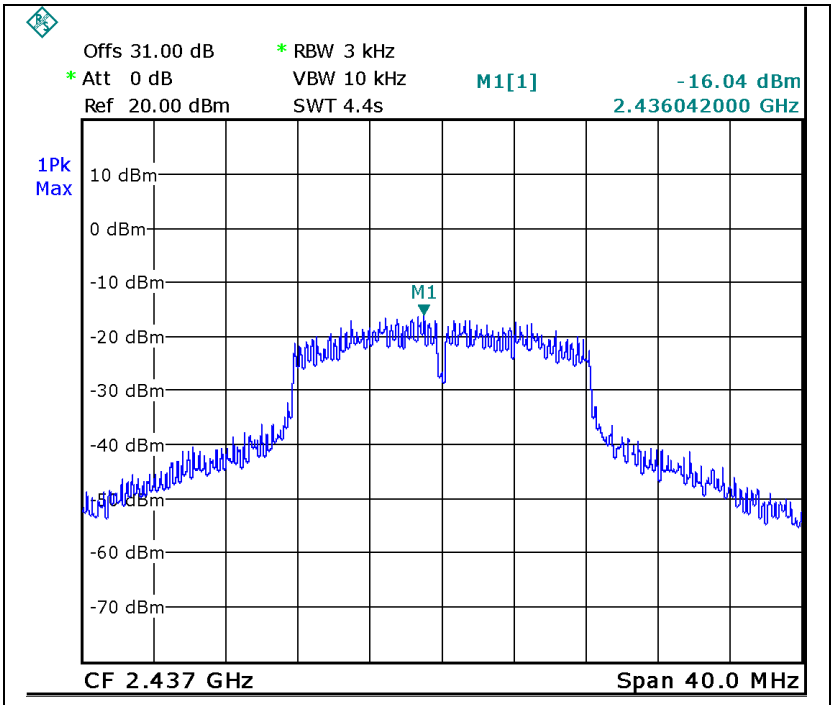


Figure 72. 2437.0 MHz, Wi-fi/g (6Mbit/s)

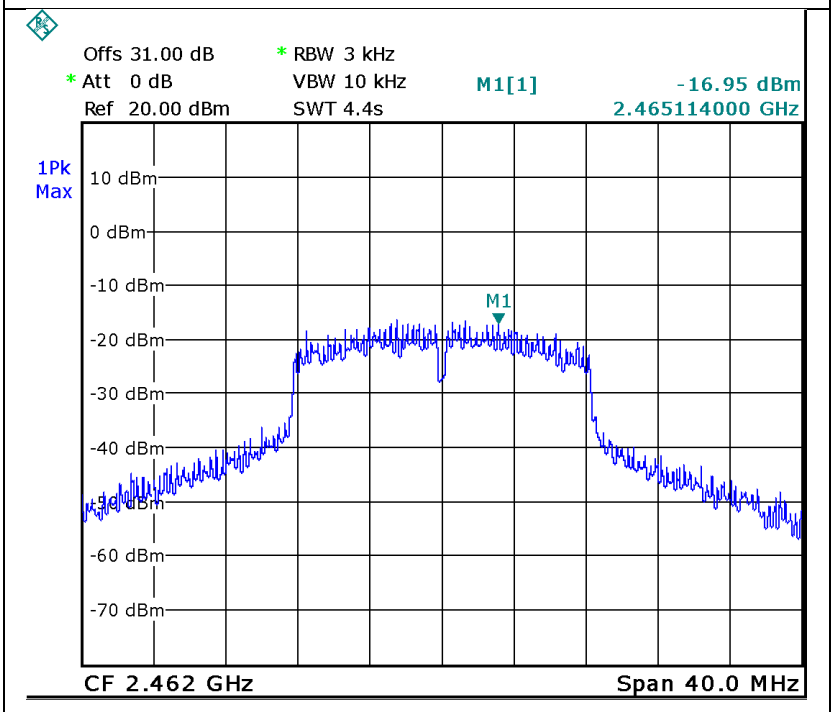


Figure 73. 2462.0 MHz, Wi-fi/g (6Mbit/s)

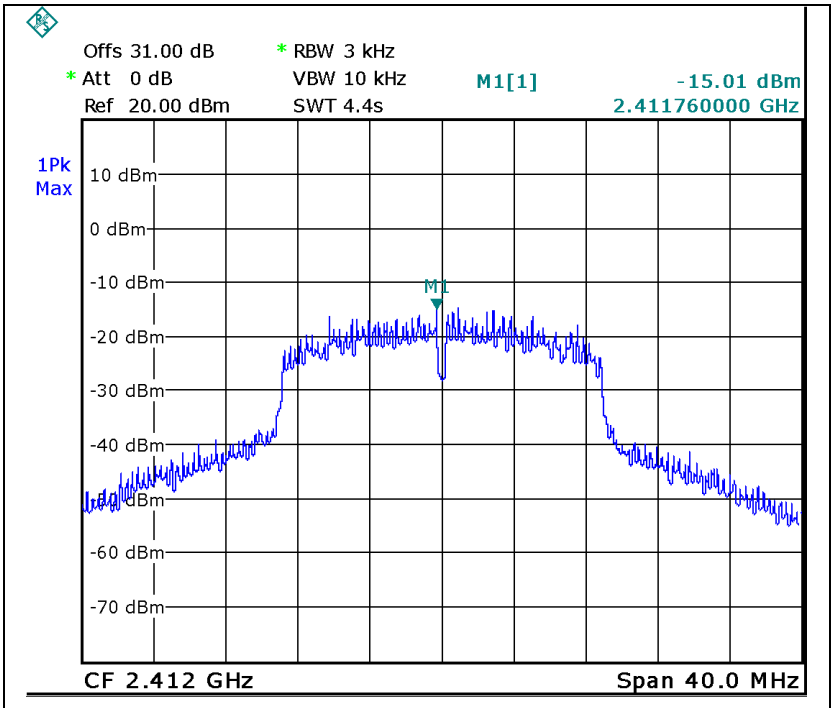


Figure 74. 2412.0 MHz, Wi-fi/g (54Mbit/s)

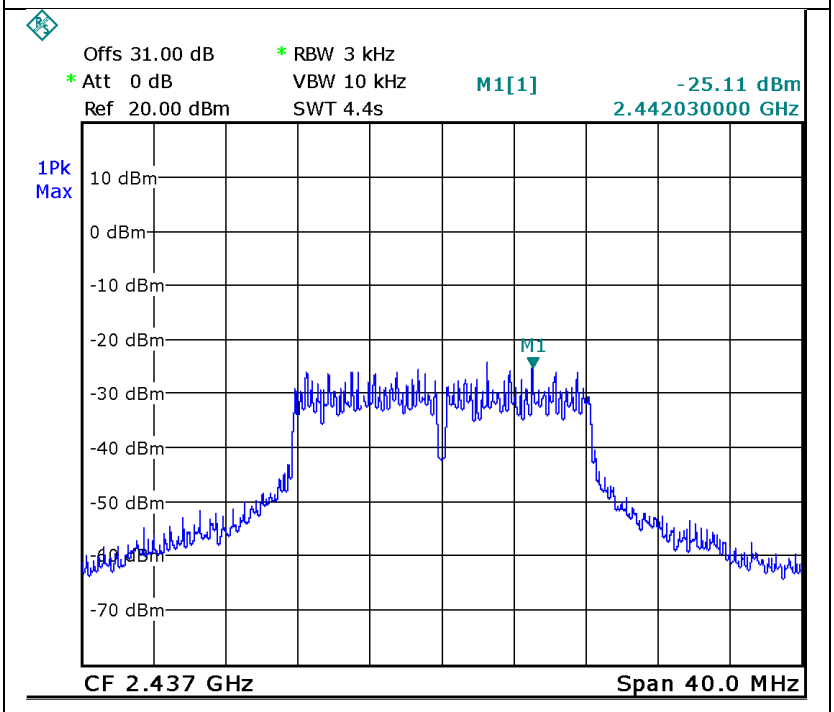


Figure 75. 2437.0 MHz, Wi-fi/g (54Mbit/s)

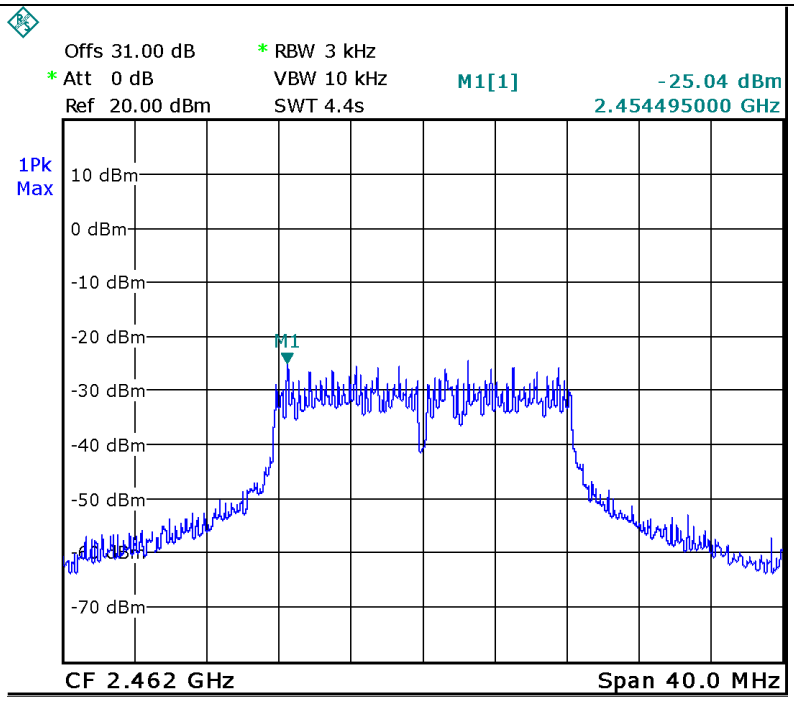


Figure 76. 2462.0 MHz, Wi-fi/g (54Mbit/s)

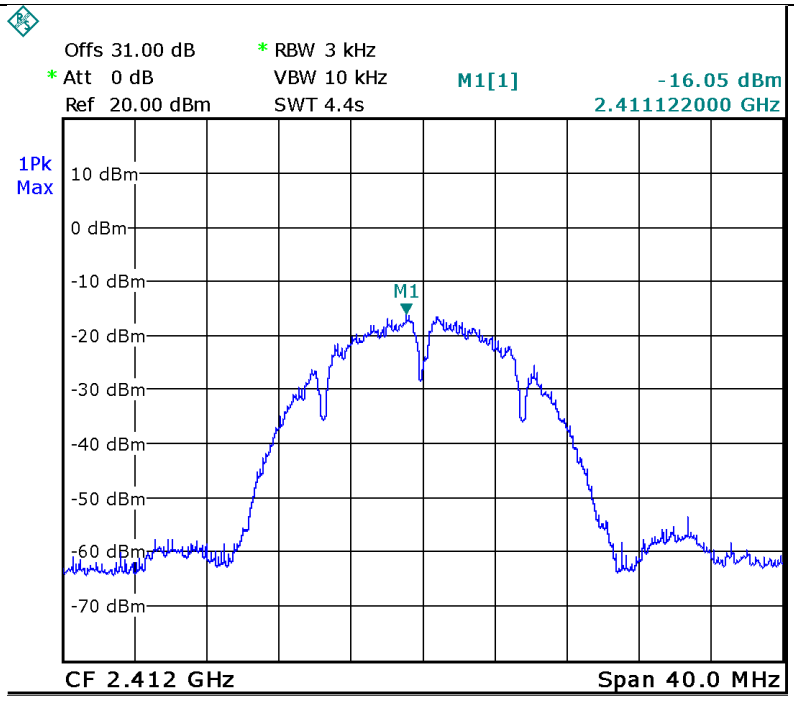


Figure 77. 2412.0 MHz, Wi-fi/b (1Mbit/s)

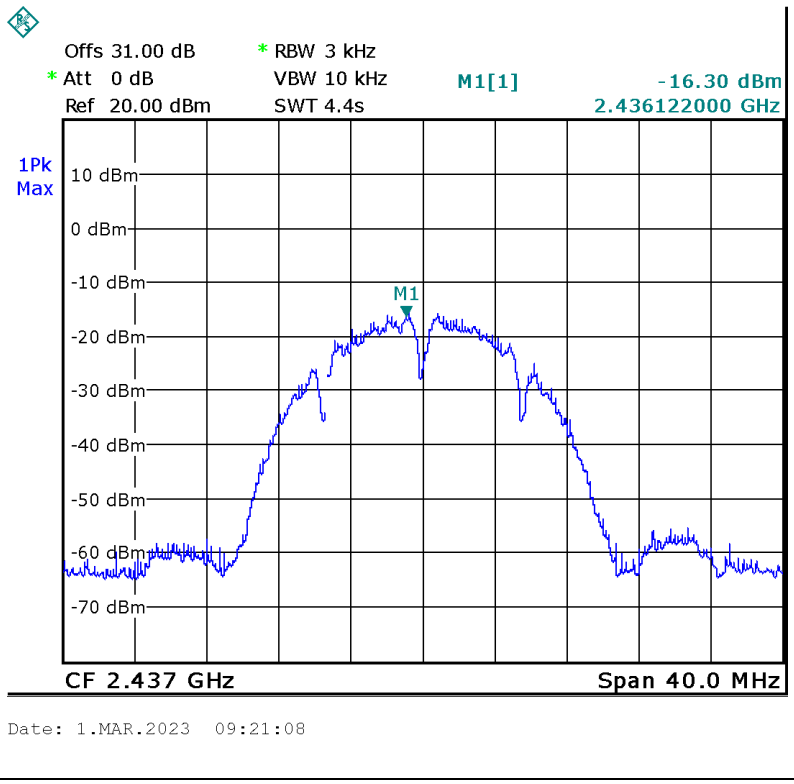


Figure 78. 2437.0 MHz, Wi-fi/b (1Mbit/s)

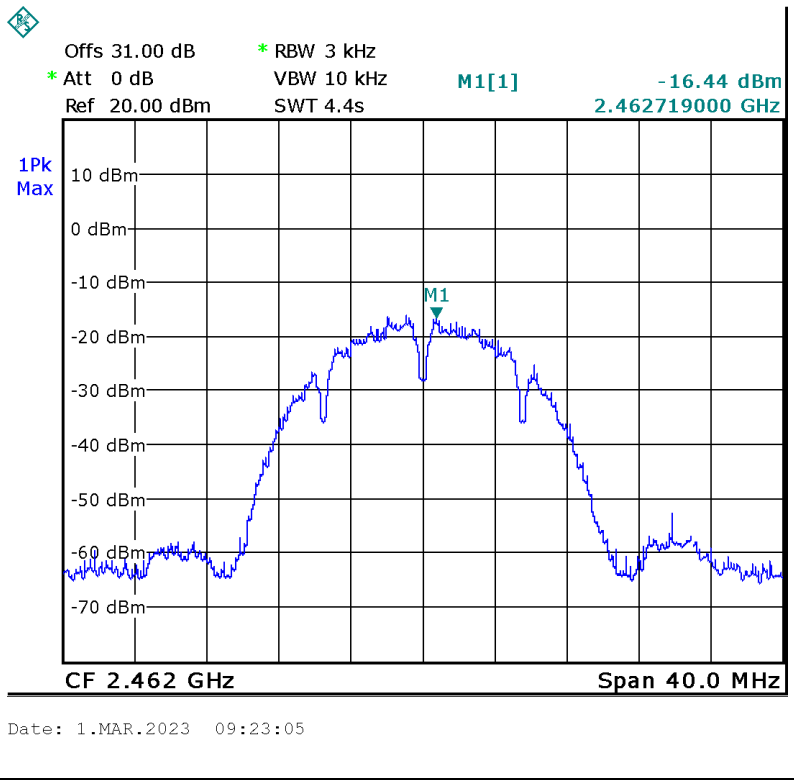


Figure 79. 2462.0 MHz, Wi-fi/b (1Mbit/s)

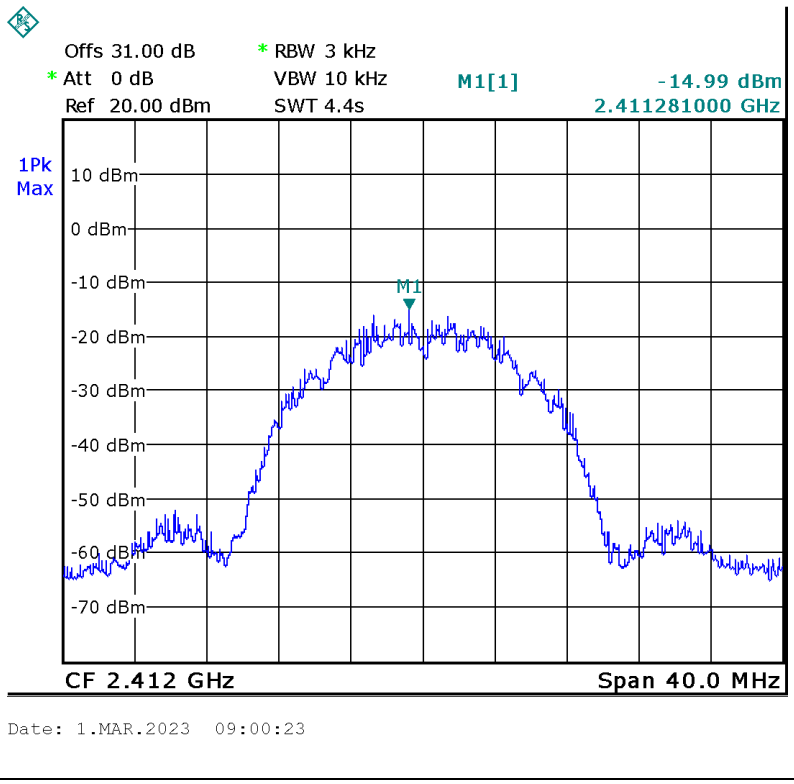


Figure 80. 2412.0 MHz, Wi-fi/b (11Mbit/s)

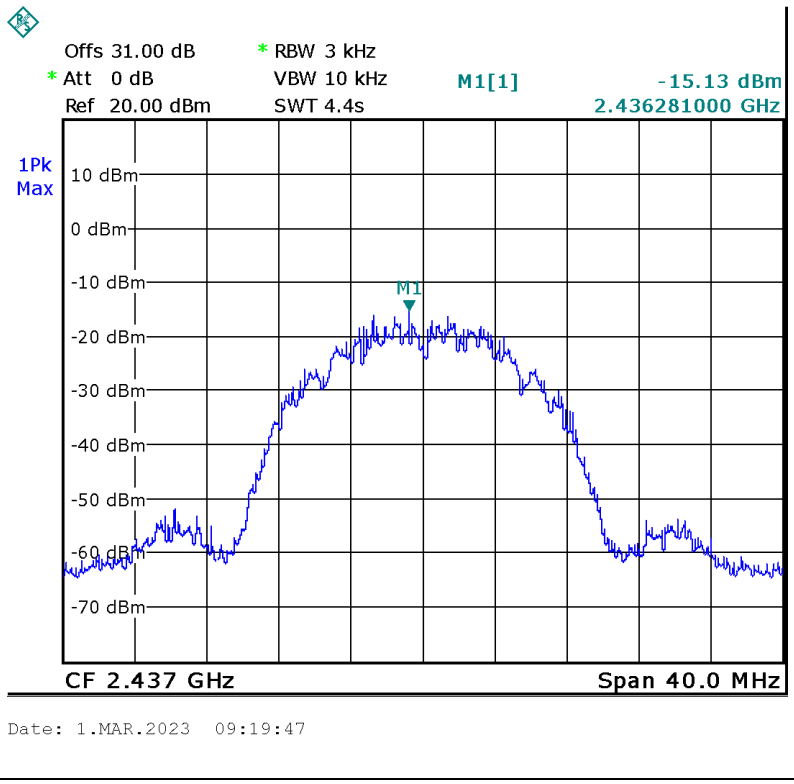


Figure 81. 2437.0 MHz, Wi-fi/b (11Mbit/s)

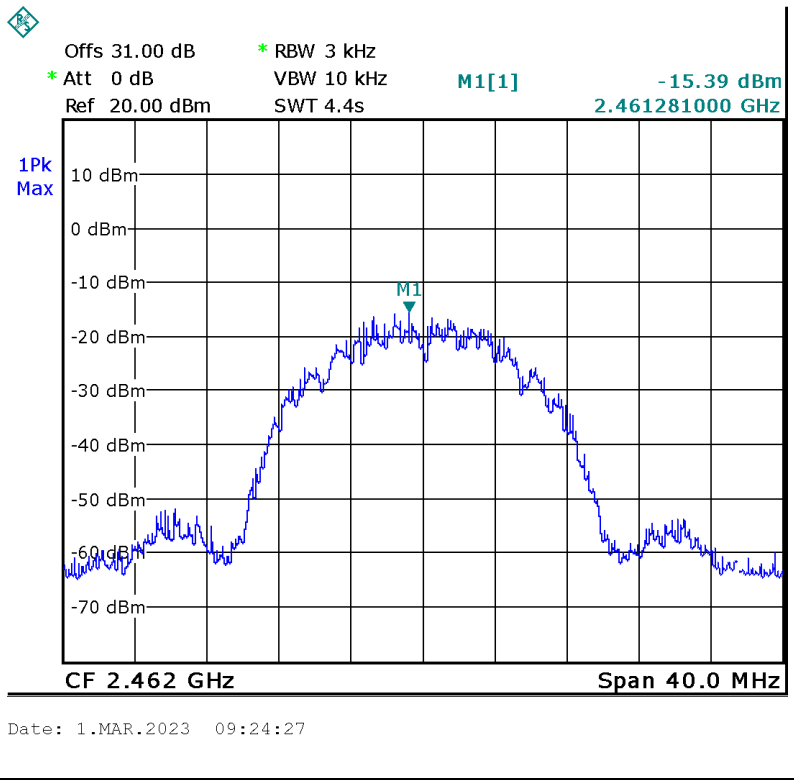


Figure 82. 2462.0 MHz, Wi-fi/b (11Mbit/s)

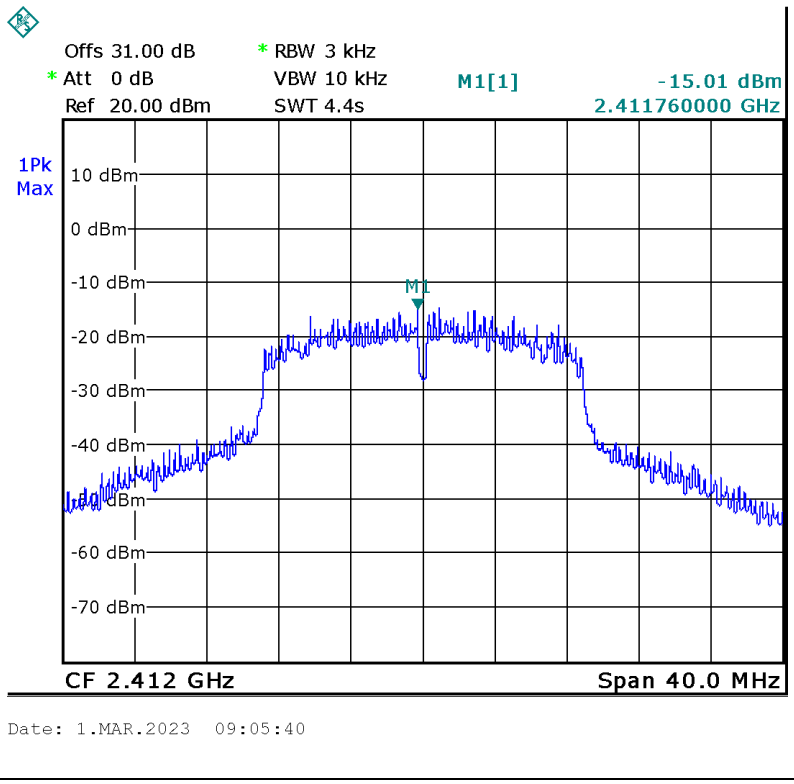


Figure 83. 2412.0 MHz, Wi-fi/n (6.5Mbit/s)

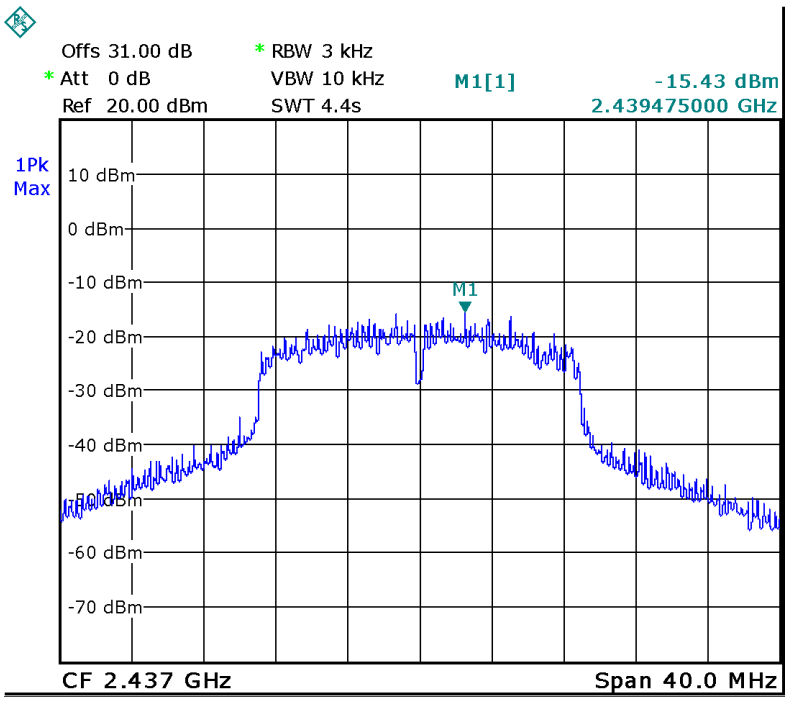


Figure 84. 2437.0 MHz, Wi-fi/n (6.5Mbit/s)

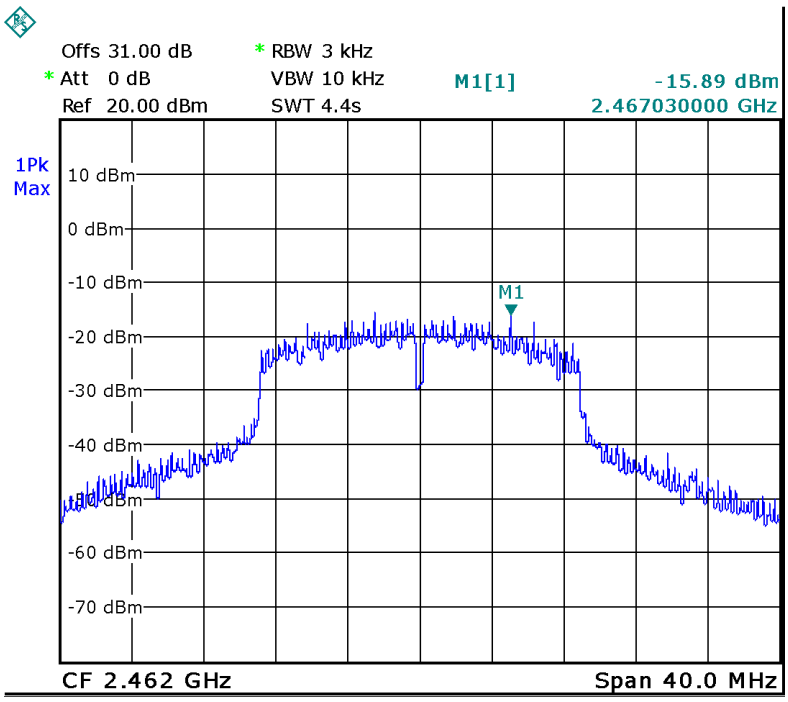


Figure 85. 2462.0 MHz, Wi-fi/n (6.5Mbit/s)

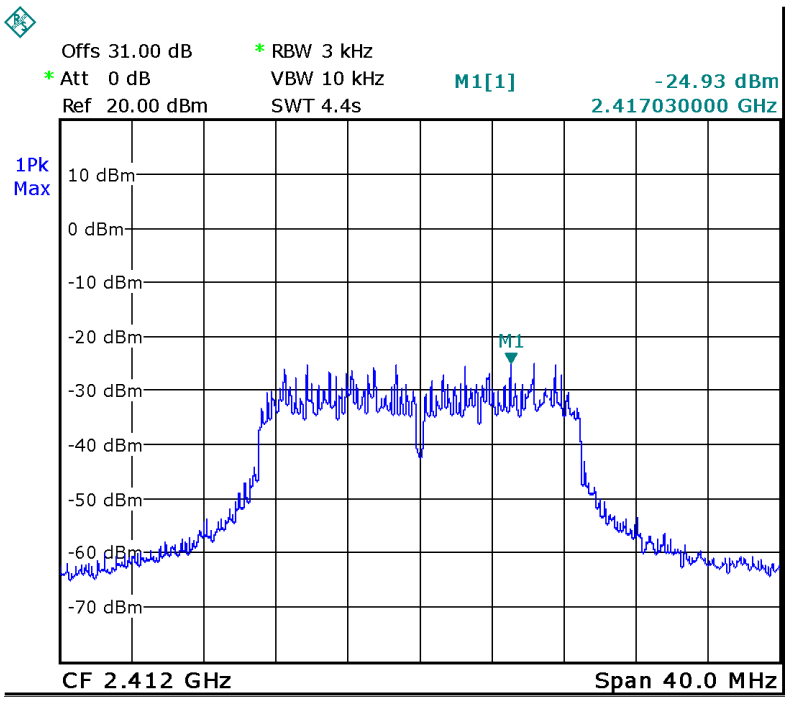


Figure 86. 2412.0 MHz, Wi-fi/n (65Mbit/s)

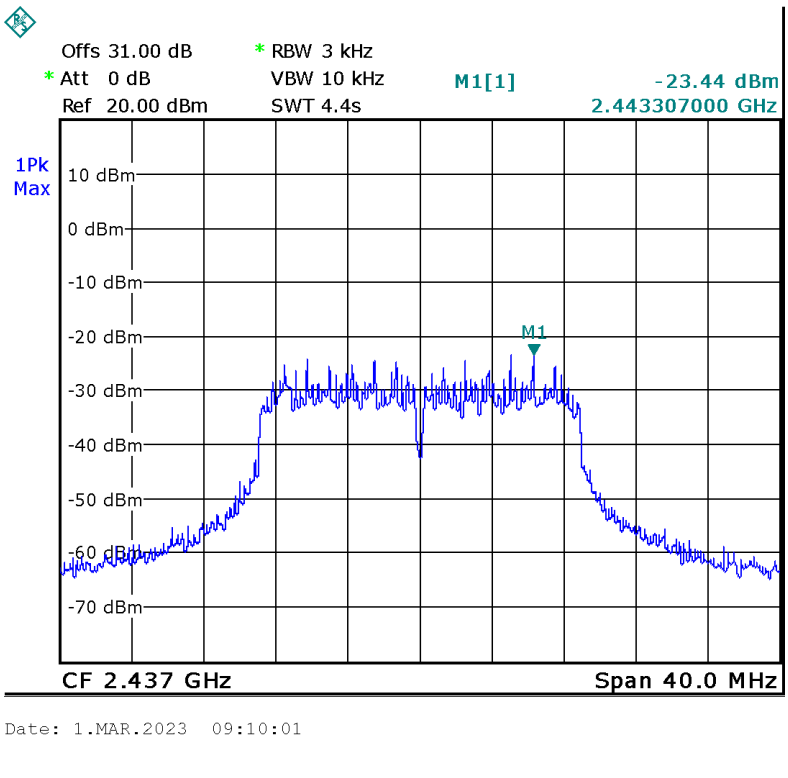


Figure 87. 2437.0 MHz, Wi-fi/n (65Mbit/s)

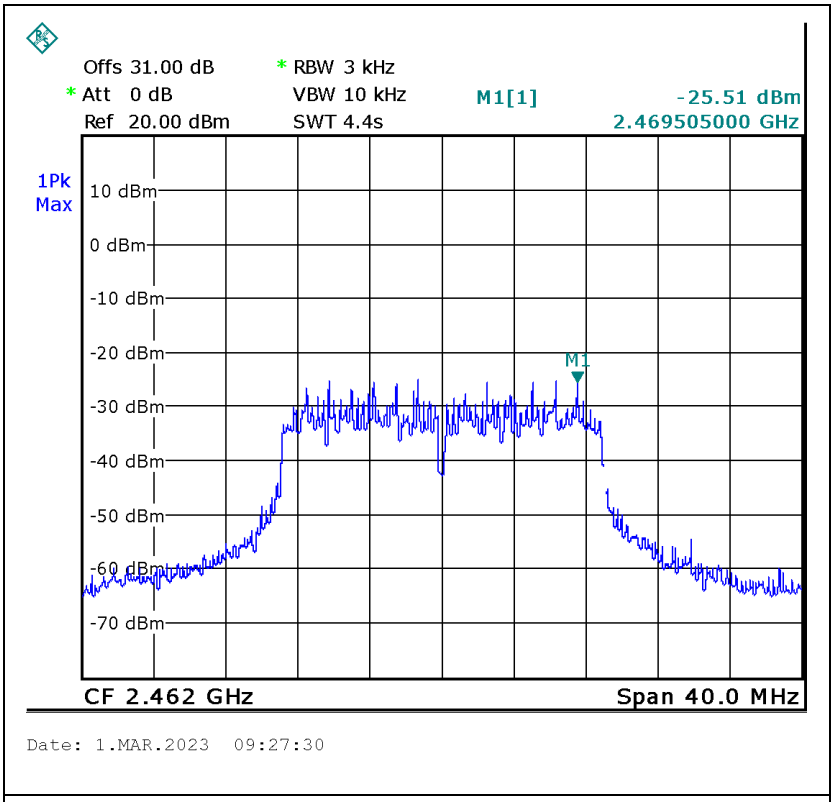


Figure 88. 2462.0 MHz, Wi-fi/n (65Mbit/s)

7.5 Test Equipment Used; Transmitted Power Density

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	February 20, 2023	February 20, 2024
30 dB attenuator	MCL	BW-S30W5	533	May 16, 2022	May 16, 2023
RF Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS\KPS (KPS-1503 -590-KPS	1503-590 (05032006)	May 16, 2022	May 16, 2023

Figure 89 Test Equipment Used

8 Occupied Bandwidth

8.1 Test Specification

FCC, Part 2, Sub part J, Section 2.1049

RSS-Gen, Issue 5: 2014, Section 6.6

8.2 Test Procedure

(Temperature (23°C)/ Humidity (40%RH))
The E.U.T. operation mode and test set-up are as described in Section 2 of this report. The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (total loss= 31.0dB). Special attention was taken to prevent Spectrum Analyzer RF input overload.

The RBW set to the range of 1% to 5% of the OBW.

The span was set between 1.5 to 5 times of the OBW.
99% occupied bandwidth function was set on.

8.3 Test Limit

N/A

8.4 Test Results

8.4.1 BLE

Protocol Type	Operation Frequency (MHz)	Reading (kHz)
BLE	2402.0	1053.9
	2426.0	1059.9
	2480.0	1065.8

Figure 90. Bandwidth Test Results

JUDGEMENT: N/A

See additional information in Figure 91 to Figure 111.

Occupied Bandwidth

E.U.T Description	Asset Tag
Model Number	T12SB
Part Number:	N/A

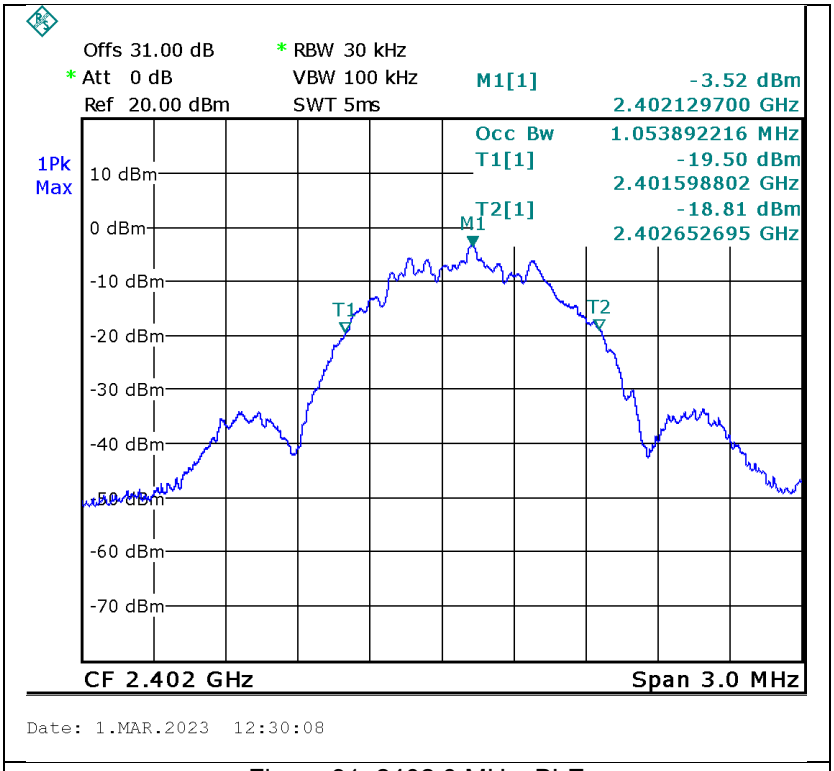


Figure 91. 2402.0 MHz, BLE

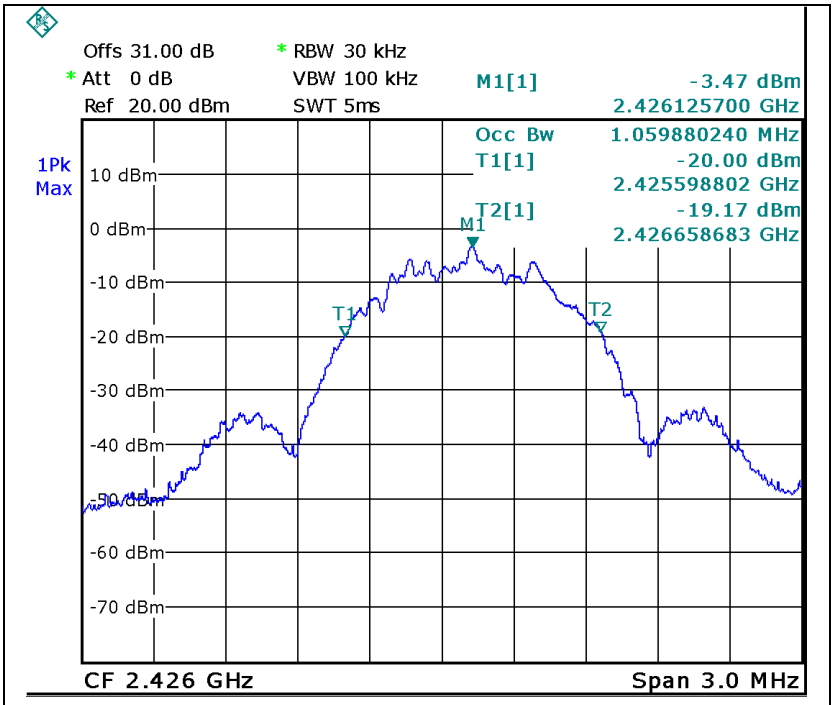


Figure 92. 2426.0 MHz, BLE

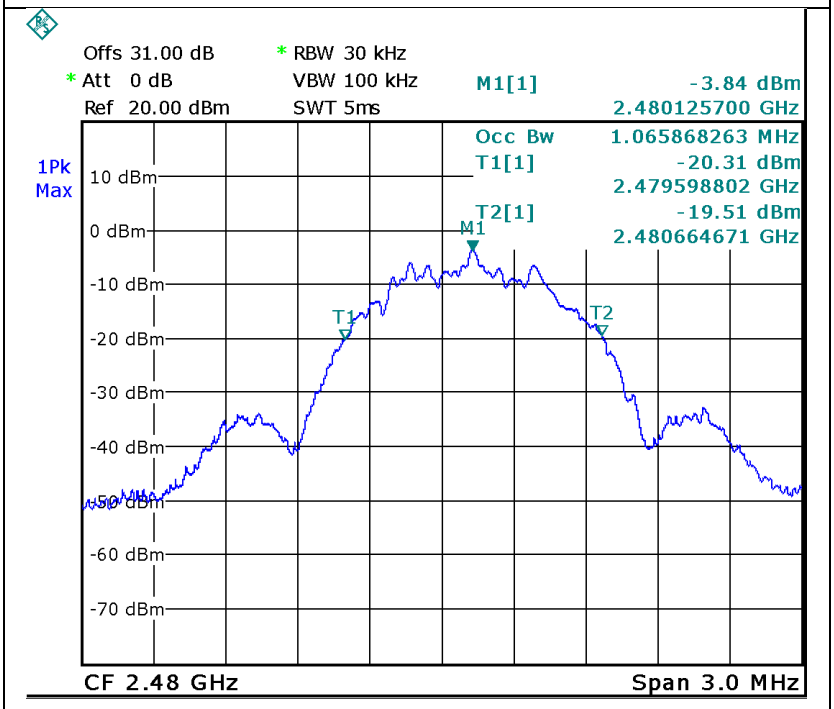


Figure 93. 2480.0 MHz, BLE

8.4.2 Wi-Fi

Protocol Type	Operation Frequency (MHz)	Reading (kHz)
Wi-fi/b (1Mbit/s)	2412.0	13972.0
	2437.0	13892.2
	2462.0	13892.2
Wi-fi/b (11Mbit/s)	2412.0	14530.9
	2437.0	14530.9
	2462.0	14451.1
Wi-fi/g (6Mbit/s)	2412.0	18123.7
	2437.0	18283.4
	2462.0	17644.7
Wi-fi/g (54Mbit/s)	2412.0	17564.9
	2437.0	17564.9
	2462.0	17485.0
Wi-fi/n (6.5Mbit/s)	2412.0	18682.6
	2437.0	18682.6
	2462.0	18602.8
Wi-fi/n (65Mbit/s)	2412.0	18203.6
	2437.0	18123.7
	2462.0	18283.4

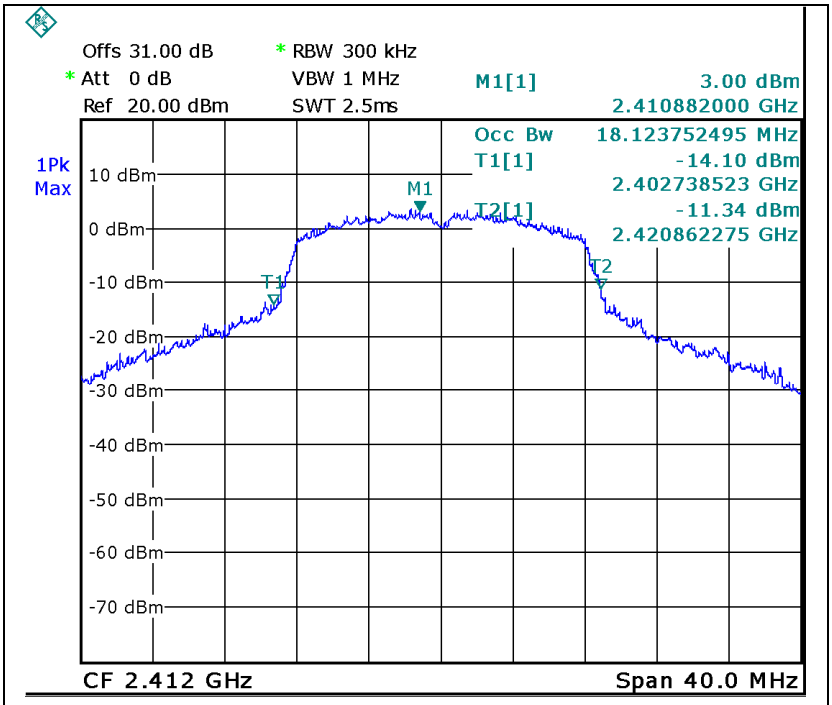


Figure 94. 2412.0 MHz, Wi-fi/g (6Mbit/s)

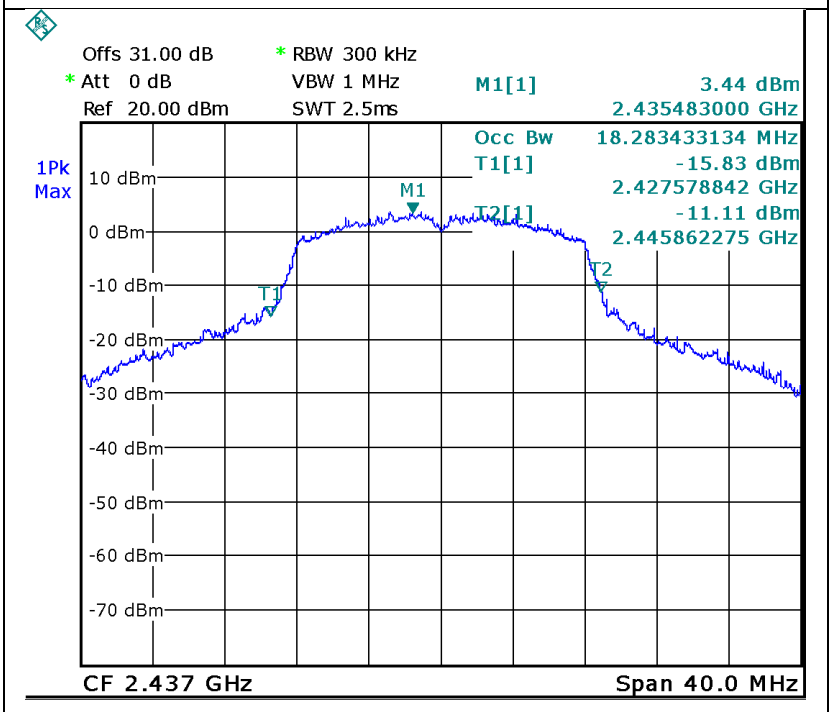


Figure 95. 2437.0 MHz, Wi-fi/g (6Mbit/s)

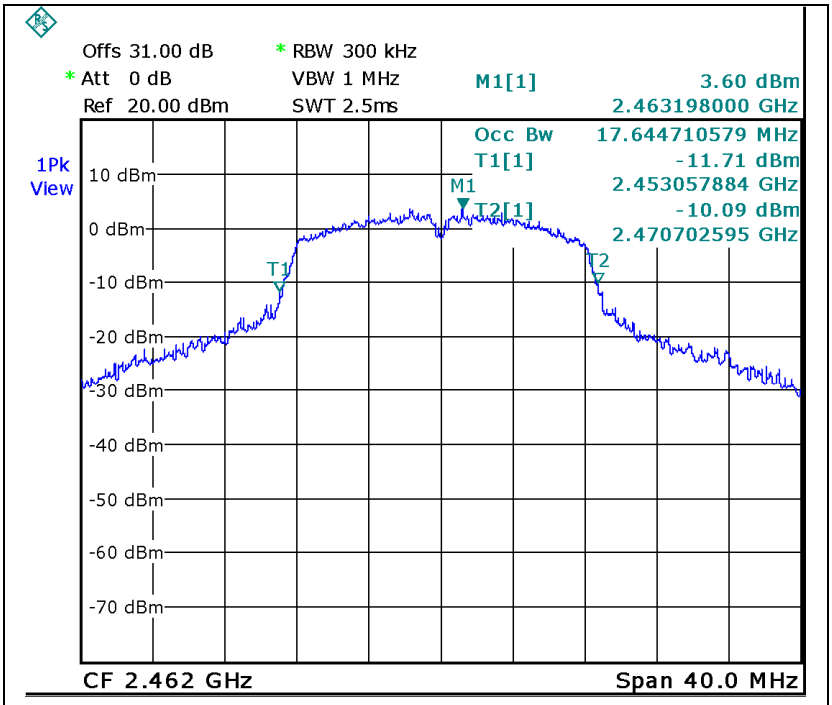


Figure 96. 2462.0 MHz, Wi-fi/g (6Mbit/s)

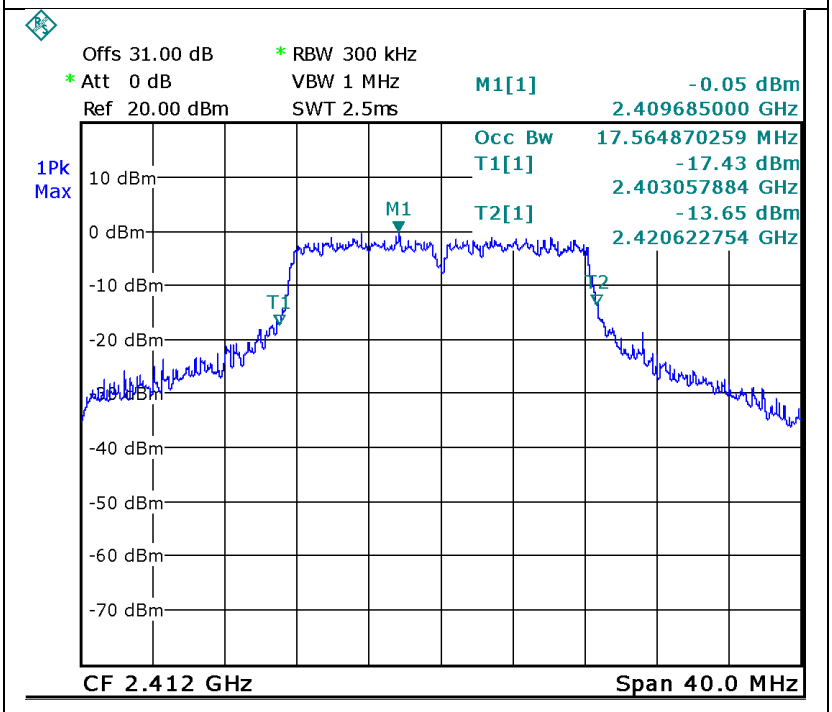


Figure 97. 2412.0 MHz, Wi-fi/g (54Mbit/s)

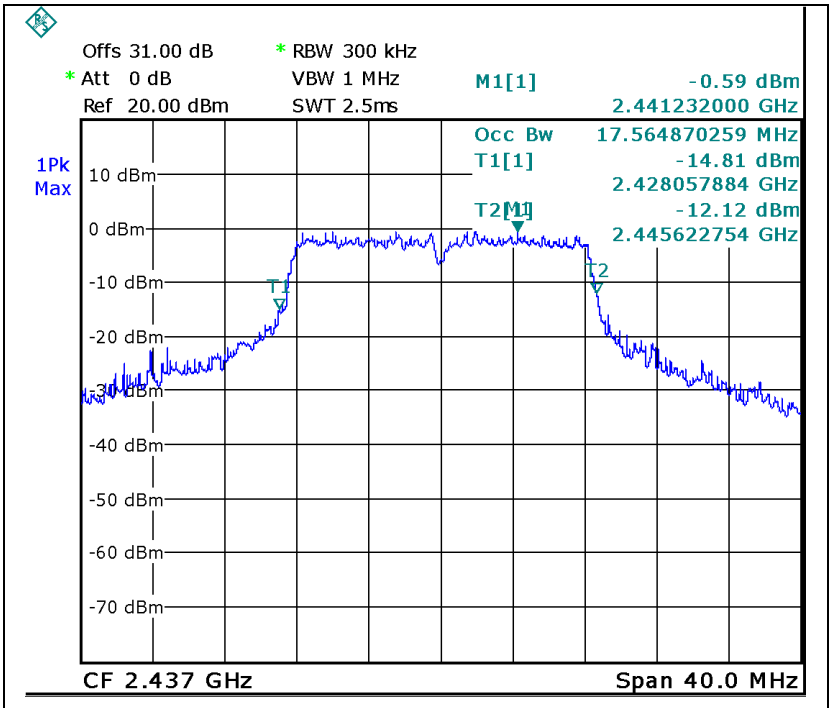


Figure 98. 2437.0 MHz, Wi-fi/g (54Mbit/s)

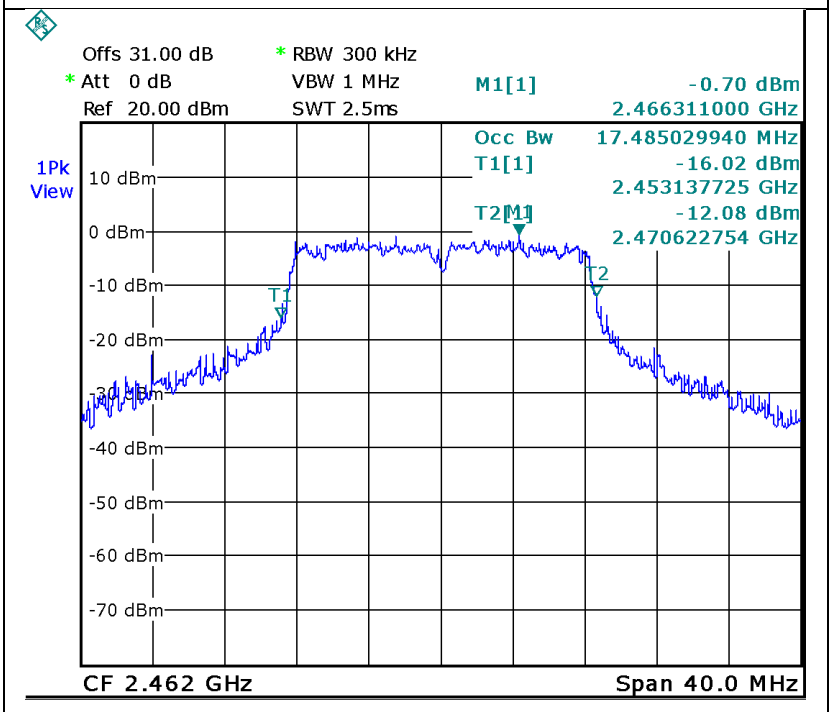


Figure 99. 2462.0 MHz, Wi-fi/g (54Mbit/s)

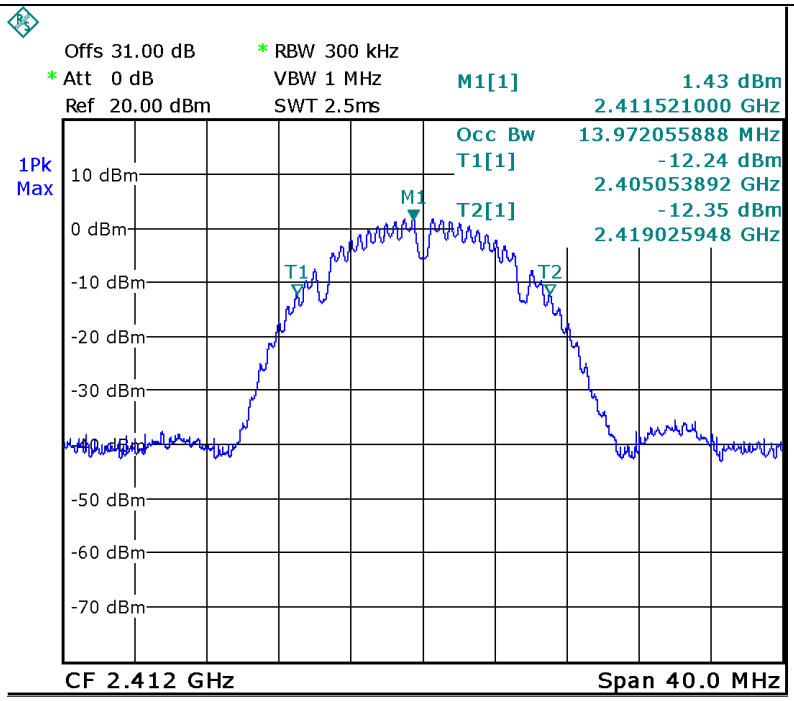


Figure 100. 2412.0 MHz, Wi-fi/b (1Mbit/s)

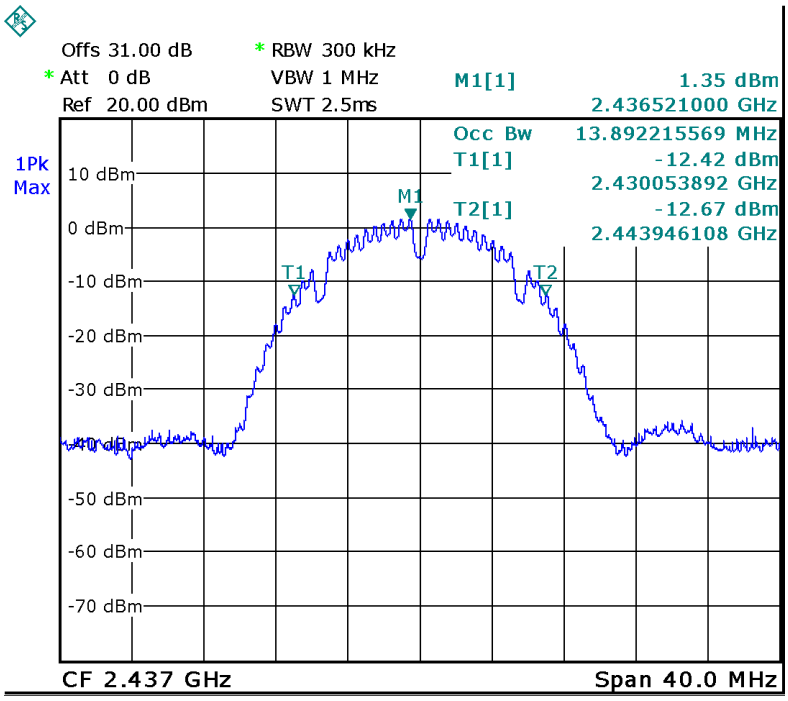


Figure 101. 2437.0 MHz, Wi-fi/b (1Mbit/s)

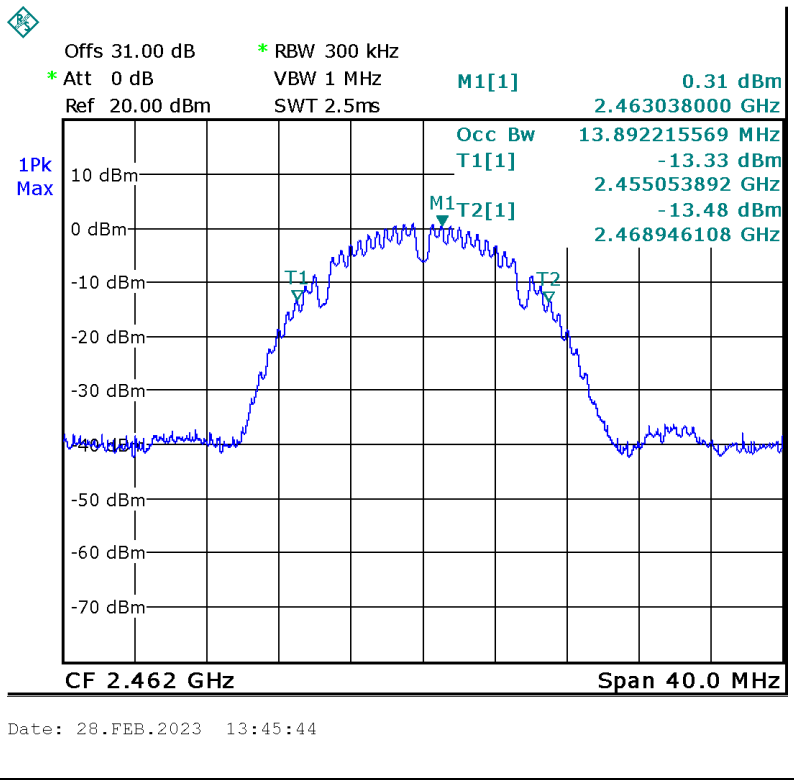


Figure 102. 2462.0 MHz, Wi-fi/b (1Mbit/s)

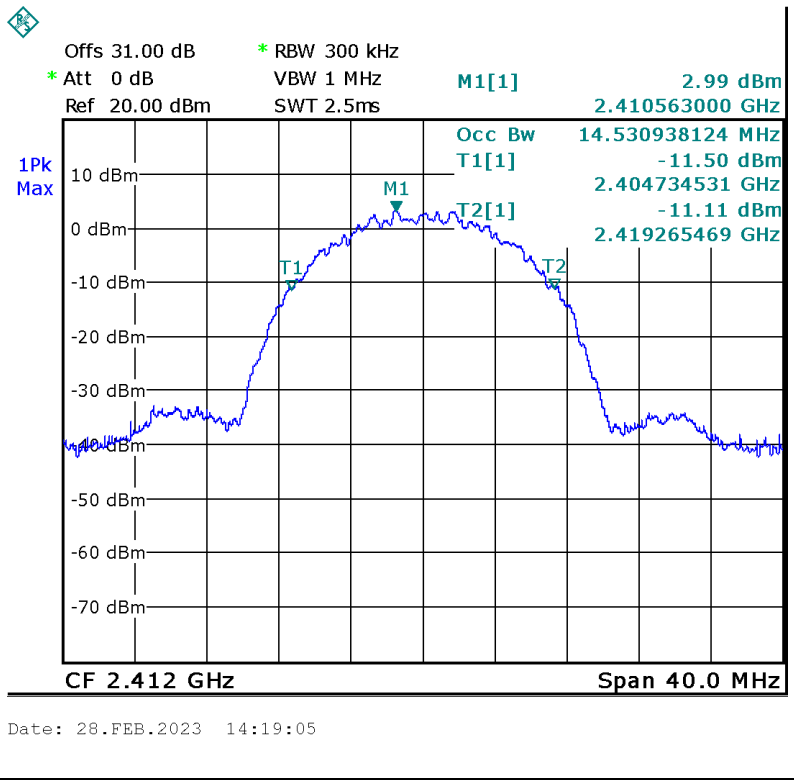


Figure 103. 2412.0 MHz, Wi-fi/b (11Mbit/s)

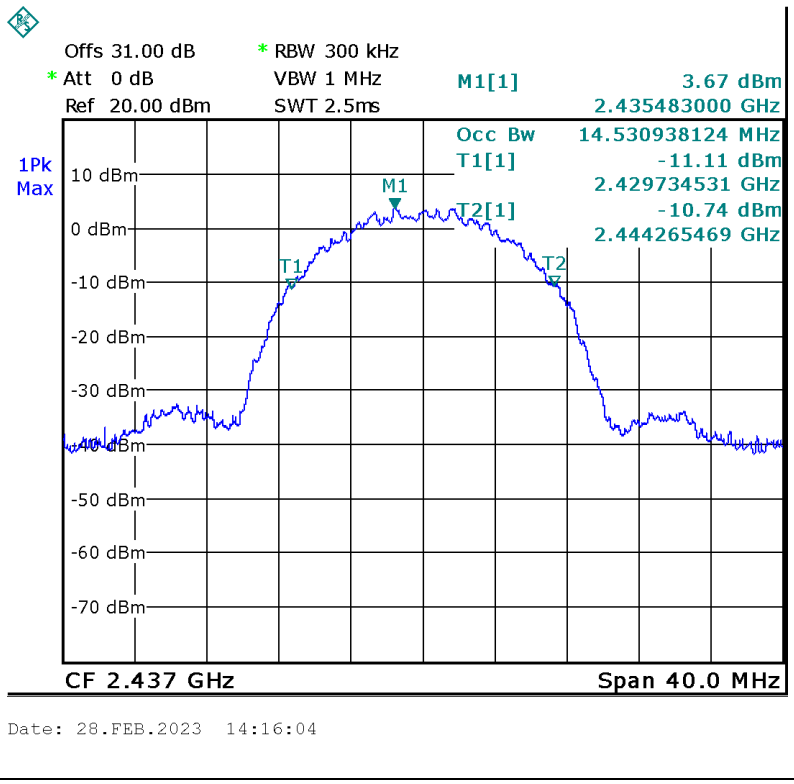


Figure 104. 2437.0 MHz, Wi-fi/b (11Mbit/s)

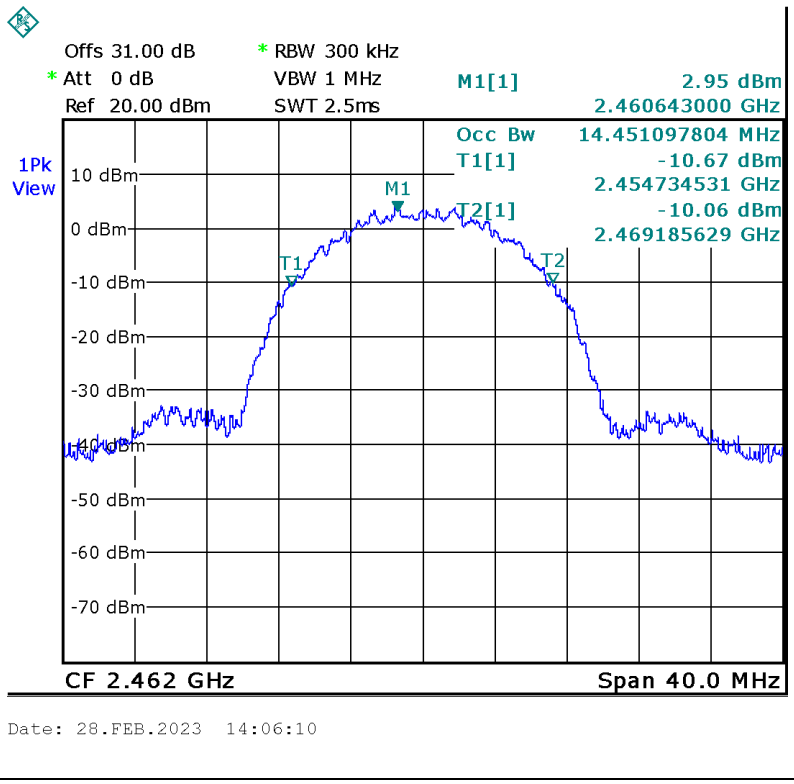


Figure 105. 2462.0 MHz, Wi-fi/b (11Mbit/s)

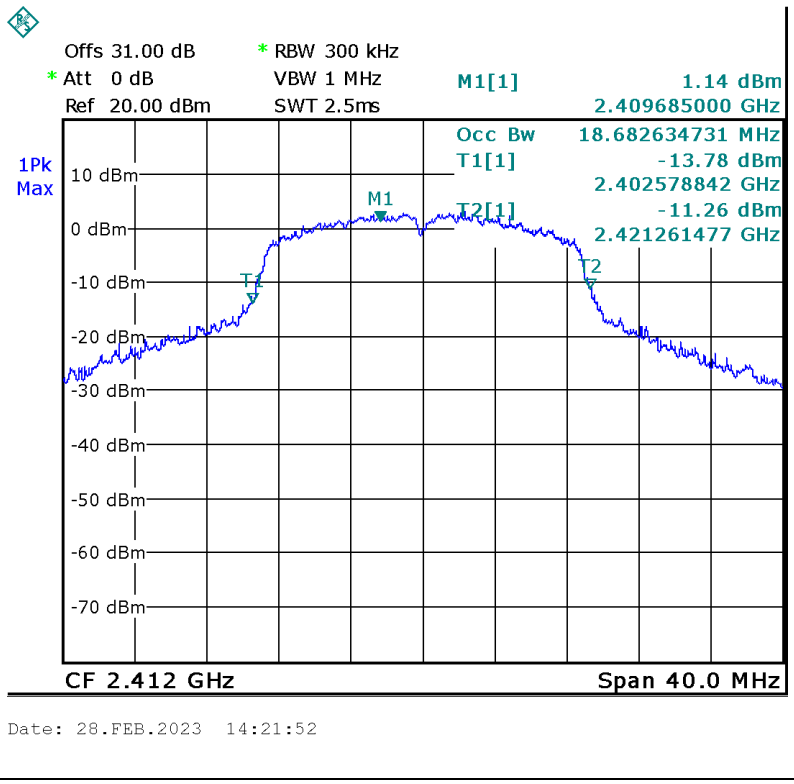


Figure 106. 2412.0 MHz, Wi-fi/n (6.5Mbit/s)

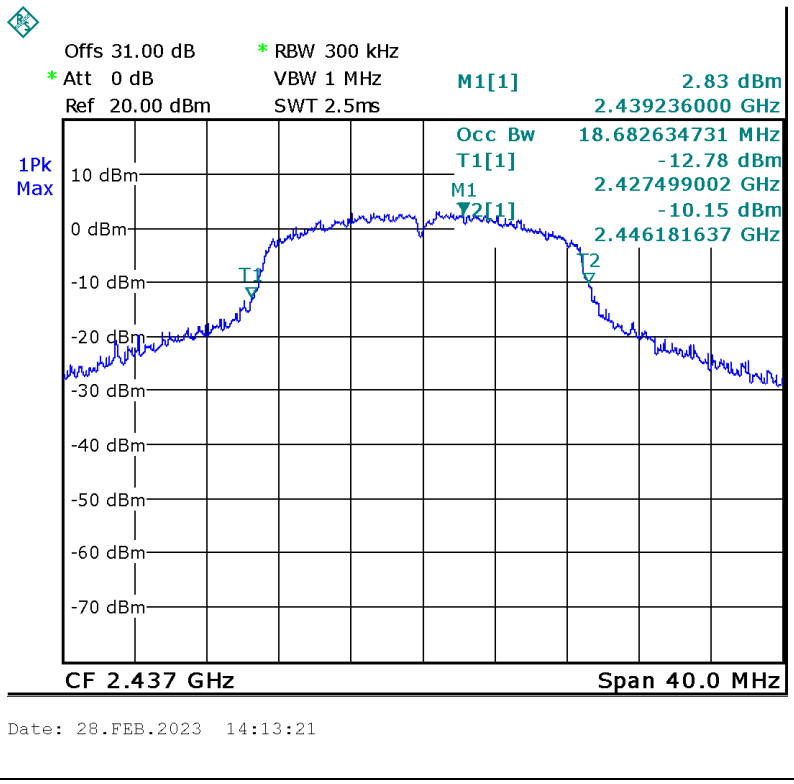


Figure 107. 2437.0 MHz, Wi-fi/n (6.5Mbit/s)

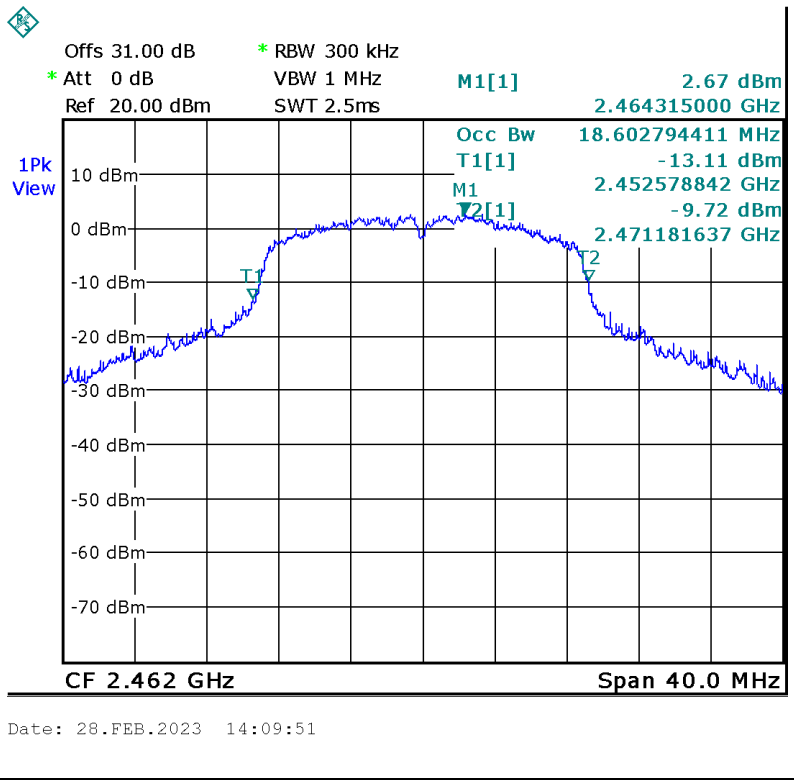


Figure 108. 2462.0 MHz, Wi-fi/n (6.5Mbit/s)

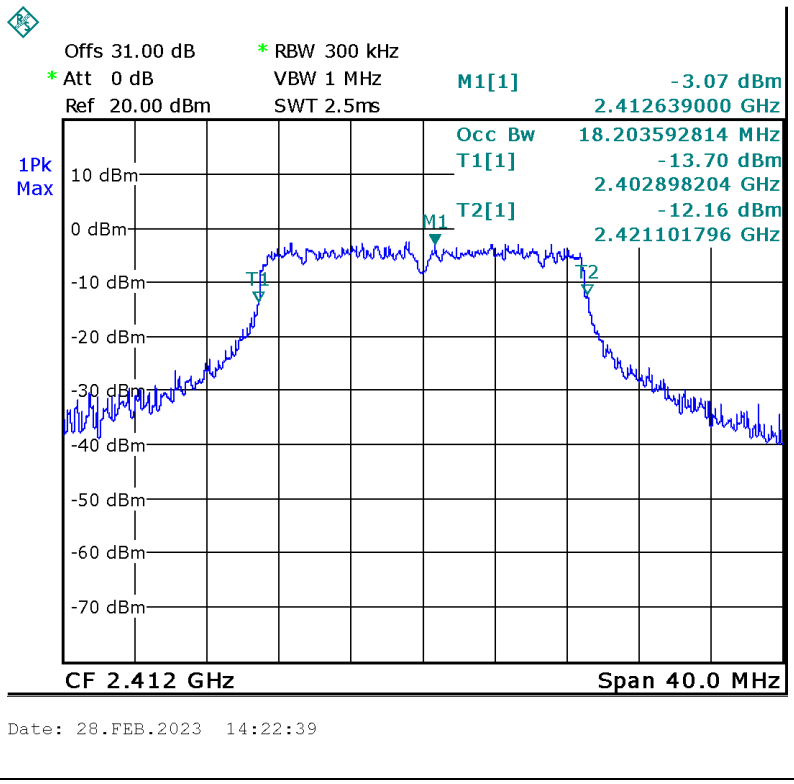


Figure 109. 2412.0 MHz, Wi-fi/n (65Mbit/s)

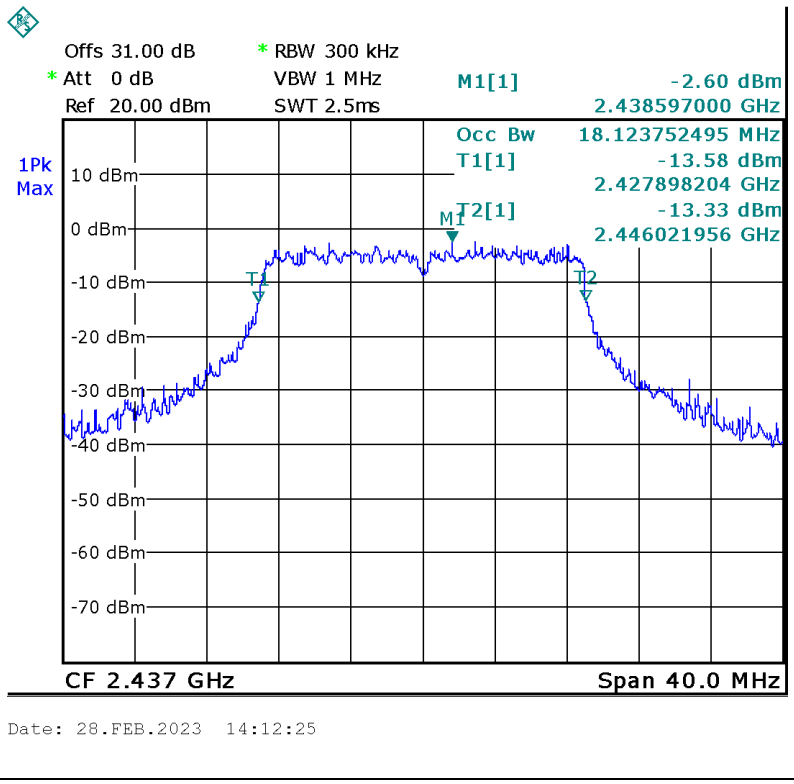


Figure 110. 2437.0 MHz, Wi-fi/n (65Mbit/s)

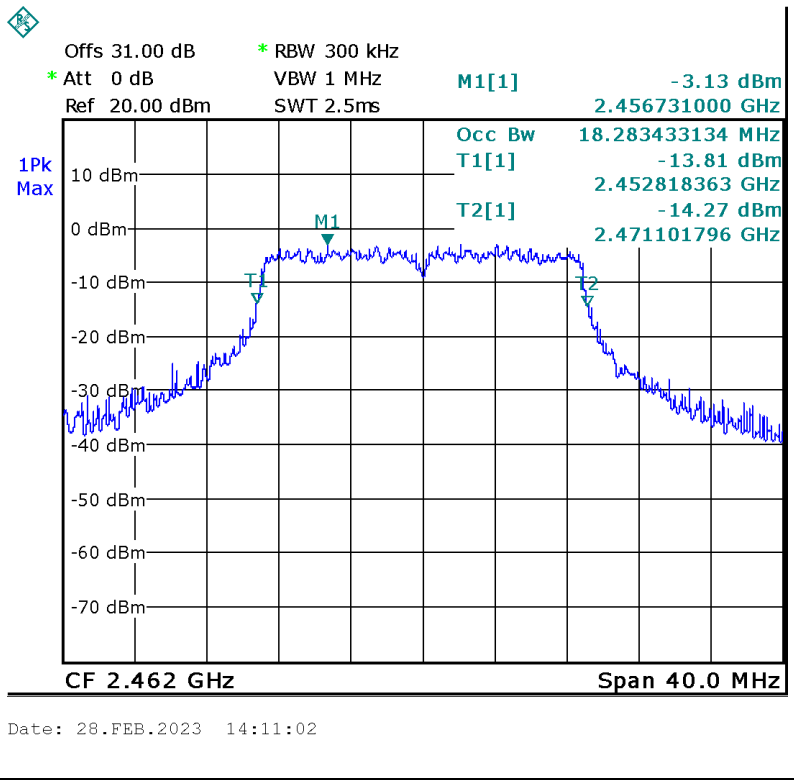


Figure 111. 2462.0 MHz, Wi-fi/n (65Mbit/s)

8.5 Test Equipment Used

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	February 20, 2023	February 20, 2024
30 dB attenuator	MCL	BW-S30W5	533	May 16, 2022	May 16, 2023
RF Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS\KPS (KPS-1503 -590-KPS	1503-590 (05032006)	May 16, 2022	May 16, 2023

Figure 112 Test Equipment Used

9 Emissions in non-Restricted Frequency Bands

9.1 Test Specification

FCC, Part 15, Subpart C, Section 247(d)

RSS-247, Issue 2, Section 5.5

9.2 Test Procedure

(Temperature (23.8°C)/ Humidity (40%RH))
The E.U.T. operation mode and test set-up are as described in Section 2 of this report.
The E.U.T. antenna terminal was connected to the Spectrum Analyzer through an external attenuator and an appropriate coaxial cable (max total loss=34.0 dB).
Special attention was taken to prevent Spectrum Analyzer RF input overload.
RBW was set to 100kHz, detector set to max peak and trace to "max hold".

9.3 Test Limit

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.

9.4 Test Results

JUDGEMENT: Pass
No emissions were detected at least 20 dB below the fundamental.
The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 247(d) specification.

9.1 Test Instrumentation Used, Emission in Non Restricted Frequency Bands

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Next Calibration Due
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	February 20, 2023	February 20, 2024
30 dB attenuator	MCL	BW-S30W5	533	May 16, 2022	May 16, 2023
RF Cable for KA Band Antenna	OSR Electronics (Serge)	37297C KPS\KPS (KPS-1503 -590-KPS	1503-590 (05032006)	May 16, 2022	May 16, 2023

Figure 113 Test Equipment Used

10 Emissions in Restricted Frequency Bands

10.1 Test Specification

FCC Part 15, Subpart C, Sections 15.209, 15.205, 15.247(d)

RSS-247, Issue 2, Section 3.3

RSS-Gen, Issue 5, Section 8.10

10.2 Test Procedure

(Temperature (23.8°C)/ Humidity (40%RH))
The E.U.T. operation mode and test set-up are as described in Section 2 of this report.

For measurements between 0.009-30MHz:

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The frequency range 0.009MHz-30MHz was scanned.

For measurements between 30-1000MHz:
A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. The frequency range 30MHz -1000MHz was scanned and the list of the highest emissions was verified and updated accordingly.

For measurements between 1GHz-25GHz:

The E.U.T was tested inside the shielded room and placed on a non-metallic table, 1.5 meters above the ground. The emissions were measured at a distance of 3 meters. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The frequency range 1GHz -25GHz was scanned.

Tests done for all “worst case”, each protocol type. The highest radiation describes in the tables below

The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

10.3 FCC Test Limit

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)).

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement distance (meters)	Field Strength* (dBµV/m)	Field Strength* (dBµV/m)@3m
0.009-0.490	2400/F(kHz)	300	48.5-13.8	128.5-73.8
0.490-1.705	24000/F(kHz)	30	33.8-23.0	73.8-63.0
1.705-30.0	30	30	29.5	69.5
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

Figure 114 FCC Table of Limits

10.4 ISED Test Limit

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Magnetic Field strength (microampere/meter)	Measurement distance (meters)	Magnetic Field strength (dBµA/m)	Magnetic Field strength* (dBµA/m)@3m
0.009-0.490	6.37/F(kHz)	300	-3.0-(-37.7)	77.0-42.2
0.490-1.705	63.7/F(kHz)	30	-17.7-(-28.5)	22.3-11.4
1.705-30.0	0.08	30	-21.9	18.0
Frequency (MHz)	**Field strength (microvolts/meter)**	**Measurement distance (meters)**	**Field strength (dBµV/m)**	**Field strength* (dBµV/m)@3m**
30-88	100	3	40.0	40.0
88-216	150	3	43.5	43.5
216-960	200	3	46.0	46.0
Above 960	500	3	54.0	54.0

*The emission limits shown in the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emission limits in these three bands are based on

measurements employing an average detector. For average radiated emission measurements above 1000 MHz, there is also a limit corresponding to 20 dB above the indicated values in the table is specified when measuring with peak detector function.

Figure 115 ISED Table of Limits

10.5 Test Results

JUDGEMENT: Passed by -6.7 dB

For the WI-FI/b, the margin between the emission level and the specification limit is in the worst case -4.7 dB at the frequency of 4924.1 MHz, vertical polarization.

For the WI-FI/g, the margin between the emission level and the specification limit is in the worst case -10.2 dB at the frequency of 4925.8 MHz, vertical polarization.

For the WI-FI/n, the margin between the emission level and the specification limit is in the worst case -10.0 dB at the frequency of 4919.4 MHz, vertical polarization.

The EUT met the requirements of the F.C.C. Part 15, Subpart C Sections 15.209, 15.205, 15.247(d) specifications.

The details of the highest emissions are given in Figure 116 to Figure 122.

Radiated Emission

E.U.T Description Asset Tag
Type T12SB
Serial Number: N/A

Specifications: FCC, Part 15, Subpart C, Sections 15.209, 15.205, 15.247(d)
RSS-247, Issue 2, Section 3.3; RSS-Gen, Issue 5, Section 8.10

Antenna Polarization: Horizontal/Vertical
Frequency Range: 9kHz to 25.0 GHz
Protocol Type: BLE
Detector: Peak, Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2402.0	No emissions detected above the spectrum anlyzer noise level, which have at least 20dB margin below the limit							
2440.0								
2480.0								

Figure 116. Radiated Emission Results

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

"Peak Amp" includes correction factor.

* "Correction Factor" = Antenna Factor + Cable Loss- Low Noise Amplifier Gain

Antenna Polarization: Horizontal/Vertical

Frequency Range: 9kHz to 25.0 GHz

Protocol Type: WI-FI/b (1Mbps)

Detector: Peak, Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2412	2390.0	V	60.4	74.0	-13.6	44.6	54.0	-9.4
	2390.0	H	54.5	74.0	-19.5	39.0	54.0	-15.0
	4019.3	V	54.6	74.0	-19.4	42.6	54.0	-11.4
	4019.3	H	49.3	74.0	-24.7	40.3	54.0	-13.7
	4823.8	V	55.5	74.0	-18.5	46.2	54.0	-7.8
	4823.8	H	47.8	74.0	-26.2	37.1	54.0	-16.9
2437	4018.1	V	49.3	74.0	-24.7	39.8	54.0	-14.2
	4018.1	H	48.4	74.0	-25.6	39.0	54.0	-15.0
	4823.8	V	54.1	74.0	-19.9	48.4	54.0	-5.6
	4823.8	H	46.0	74.0	-28.0	36.5	54.0	-17.5
2462	2483.5	V	60.5	74.0	-13.5	38.2	54.0	-15.8
	2483.5	H	52.5	74.0	-21.5	35.1	54.0	-18.9
	4101.8	V	49.8	74.0	-24.2	40.7	54.0	-13.3
	4101.8	H	51.9	74.0	-22.1	40.6	54.0	-13.4
	4924.1	V	55.43	74.0	-18.57	49.3	54.0	-4.7
	4924.1	H	51.0	74.0	-23.0	36.2	54.0	-17.8

Figure 117. Radiated Emission Results

Antenna Polarization: Horizontal/Vertical

Frequency Range: 9kHz to 25.0 GHz

Protocol Type: WI-FI/b (11Mbps)

Detector: Peak, Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2412	2390.0	V	63.0	74.0	-11.0	45.5	54.0	-8.5
	2390.0	H	55.5	74.0	-18.5	45.5	54.0	-8.5
	4019.3	V	57.2	74.0	-16.8	41.4	54.0	-12.6
	4019.3	H	51.9	74.0	-22.1	38.5	54.0	-15.5
	4823.8	V	56.7	74.0	-17.3	41.1	54.0	-12.9
	4823.8	H	47.0	74.0	-27	36.2	54.0	-17.8
2437	4018.1	V	53.8	74.0	-20.2	41.7	54.0	-12.3
	4018.1	H	53.1	74.0	-20.9	38.4	54.0	-15.6
	4823.8	V	55.0	74.0	-19	40.8	54.0	-13.2
	4823.8	H	46.6	74.0	-27.4	36.6	54.0	-17.4
2462	2483.5	V	60.2	74.0	-13.8	46.5	54.0	-7.5
	2483.5	H	63.0	74.0	-11.0	35.5	54.0	-8.5
	4101.8	V	51.4	74.0	-22.6	39.7	54.0	-14.3
	4101.8	H	51.6	74.0	-22.4	39.5	54.0	-14.5
	4924.1	V	57.6	74.0	-16.4	47.3	54.0	-6.7
	4924.1	H	47.6	74.0	-26.4	37.2	54.0	-16.8

Figure 118. Radiated Emission Results

Antenna Polarization: Horizontal/Vertical

Frequency Range: 9kHz to 25.0 GHz

Protocol Type: WI-FI/g (6 Mbps)

Detector: Peak, Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2412.0	2390.0	V	67.0	74.0	-7.0	47.0	54.0	-7.0
	2390.0	H	69.0	74.0	-5.0	48.0	54.0	-6.0
	4019.3	V	53.4	74.0	-20.6	39.5	54.0	-14.5
	4019.3	H	49.1	74.0	-24.9	37.7	54.0	-16.3
	4823.8	V	53.8	74.0	-20.2	39.0	54.0	-15.1
	4823.8	H	46.3	74.0	-27.7	36.4	54.0	-17.6
2437.0	4018.1	V	56.6	74.0	-17.4	38.2	54.0	-15.8
	4018.1	H	50.5	74.0	-23.5	37.6	54.0	-16.4
	4823.8	V	52.7	74.0	-21.3	41.3	54.0	-12.7
	4823.8	H	47.0	74.0	-27.0	36.6	54.0	-17.4
2462.0	2483.5	V	68.3	74.0	-5.7	48.2	54.0	-5.8
	2483.5	H	62.0	74.0	-12.0	41.2	54.0	-12.8
	4100.0	V	50.5	74.0	-23.5	36.0	54.0	-18.0
	4100.0	H	48.4	74.0	-25.6	37.2	54.0	-16.8
	4925.8	V	59.8	74.0	-14.2	43.8	54.0	-10.2
	4925.8	H	46.9	74.0	-27.1	37.0	54.0	-17.0

Figure 119. Radiated Emission Results

Antenna Polarization: Horizontal/Vertical
Frequency Range: 9kHz to 25.0 GHz
Protocol Type: WI-FI/g (54 Mbps)
Detector: Peak, Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2412.0	2390.0	V	68.5	74.0	-5.5	46.6	54.0	-7.4
	2390.0	H	65.6	74.0	-8.4	45.8	54.0	-5.2
	4019.3	V	46.5	74.0	-27.5	36.2	54.0	-17.8
	4019.3	H	51.3	74.0	-22.7	36.9	54.0	-17.1
	4823.8	V	45.0	74.0	-29.0	36.3	54.0	-17.7
	4823.8	H	46.6	74.0	-27.4	36.4	54.0	-17.6
2437.0	4018.1	V	49.8	74.0	-24.2	36.5	54.0	-17.5
	4018.1	H	46.4	74.0	-27.6	36.0	54.0	-18.0
	4823.8	V	47.0	74.0	-27.0	36.5	54.0	-17.5
	4823.8	H	46.1	74.0	-27.9	36.0	54.0	-18.0
2462.0	2483.5	V	60.1	74.0	-13.9	36.1	54.0	-17.9
	2483.5	H	57.4	74.0	-16.6	35.6	54.0	-18.4
	4100.1	V	47.6	74.0	-26.4	35.8	54.0	-18.2
	4100.1	H	45.7	74.0	-28.3	36.3	54.0	-17.7
	4925.8	V	54.3	74.0	-19.7	37.2	54.0	-16.8
	4925.8	H	45.0	74.0	-29.0	36.3	54.0	-17.7

Figure 120. Radiated Emission Results

Antenna Polarization: Horizontal/Vertical
Protocol Type: WI-FI/n (MCS 0)
Frequency Range: 9kHz to 25.0 GHz
Detector: Peak, Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2412.0	2390.0	V	63.0	74.0	-11.0	45.5	54.0	-8.5
	2390.0	H	66.3	74.0	-7.7	46.9	54.0	-7.1
	4019.3	V	49.9	74.0	-24.1	37.8	54.0	-16.2
	4019.3	H	53.4	74.0	-20.6	39.5	54.0	-14.5
	4823.8	V	46.3	74.0	-27.7	36.5	54.0	-17.5
	4823.8	H	51.7	74.0	-22.3	38.8	54.0	-15.2
2437.0	4018.1	V	51.9	74.0	-22.1	39.3	54.0	-14.7
	4018.1	H	50.8	74.0	-23.2	37.9	54.0	-16.1
	4823.8	V	54.1	74.0	-19.9	38.7	54.0	-15.3
	4823.8	H	46.1	74.0	-27.9	36.2	54.0	-17.8
2462.0	2483.5	V	66.6	74.0	-7.4	49.1	54.0	-4.9
	2483.5	H	62.7	74.0	-11.3	40.4	54.0	-13.6
	4100.1	V	50.9	74.0	-23.1	36.0	54.0	-18.0
	4100.1	H	49.8	74.0	-24.2	36.3	54.0	-17.7
	4919.4	V	60.4	74.0	-13.6	44.0	54.0	-10.0
	4919.4	H	46.6	74.0	-27.4	36.5	54.0	-17.5

Figure 121. Radiated Emission Results

Antenna Polarization: Horizontal/Vertical
Protocol Type: WI-FI/n (MCS 7)
Frequency Range: 9kHz to 25.0 GHz
Detector: Peak, Average

Operation Frequency	Freq.	Pol	Peak Reading	Peak Limit	Peak Margin	Average Reading	Average Limit	Average Margin
(MHz)	(MHz)	(H/V)	(dBµV/m)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV/m)	(dB)
2412.0	2390.0	V	61.8	74.0	-12.2	46.1	54.0	-7.9
	2390.0	H	56.3	74.0	-7.7	45.9	54.0	-8.1
	4019.3	V	48.5	74.0	-25.5	36.5	54.0	-17.5
	4019.3	H	48.4	74.0	-25.6	36.4	54.0	-17.6
	4823.8	V	45.4	74.0	-28.6	36.4	54.0	-17.6
	4823.8	H	46.1	74.0	-27.9	36.5	54.0	-17.5
2437.0	4018.1	V	45.4	74.0	-28.6	36.3	54.0	-17.7
	4018.1	H	48.7	74.0	-25.3	36.0	54.0	-18.0
	4823.8	V	46.5	74.0	-27.5	36.9	54.0	-17.1
	4823.8	H	46.6	74.0	-27.4	36.3	54.0	-17.7
2462.0	2483.5	V	66.2	74.0	-7.8	45.2	54.0	-8.8
	2483.5	H	52.6	74.0	-11.4	35.2	54.0	-18.8
	4100.1	V	48.4	74.0	-25.6	36.0	54.0	-18.0
	4100.1	H	45.6	74.0	-28.4	36.6	54.0	-17.4
	4892.2	V	52.6	74.0	-21.4	36.6	54.0	-17.4
	4924.1	H	46.2	74.0	-27.8	36.7	54.0	-17.3

Figure 122. Radiated Emission Results

10.6 Test Instrumentation Used; Emissions in Restricted Frequency Bands

Instrument	Manufa.	Model	Serial No.	Last Calibration Date	Next Calibration Due
Active Loop Antenna	EMCO	6502	2950	July 5, 2022	July 5, 2023
EMI Receiver	HP (Agilent)	8542E	3906A00276	February 20, 2023	February 20, 2024
RF Filter	HP (Agilent)	85420E	3705A00248	February 20, 2023	February 20, 2024
Low Noise Amplifier 16-30 GHz	Sophia Wireless	LNA28-B	232	May. 16, 22	Jun 16, 23
Log-periodic Antenna	EMCO	3146	9505-4081	April 27, 2021	April 27, 2024
Biconical Antenna	EMCO	3110B	9912-3337	January 18, 2022	January 18, 2024
Multi device Controller	EMCO	2090	9908-1456	NCR	NCR
LOD Semi anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR
Pass Band Filter	Meuro	MFL040120H50	902252	May 16, 2022	May 16, 2023
Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	February 20, 2023	February 20, 2024
EMI Test Receiver	Rohde & Schwarz	ESCI7	100724	February 20, 2023	February 20, 2024
Wideband RF Amplifier 100K-26.5GHz	OSR	N.A.	N.A	May 16, 2022	May 16, 2023
RF Cable for KA Band Antenna	OSR Electronics (Serge)	37297C (1503-590-KPS	1503-590 (05032006)	May 16, 2022	May 16, 2023
35m coaxial cable for oats	EIM (Huber Suhner)	RG214-11N(X2) RG214/U	(blank)	June 22, 2022	June 22, 2023
Antenna Mast	ETS	2070-2	9608-1497	NCR	NCR
Turntable	ETS	2087	-	NCR	NCR

Figure 123 Test Equipment Used

11 Antenna Gain/Information

Antenna gain: +0.7dBi dBi, type: integral.

12 RF Exposure/Safety

See a separate file.

13 Appendix A - Correction Factors

ITL # 1075: Active Loop Antenna					
Frequency (MHz)	**MAF (dBs/m)**	**AF (dB/m)**	**Frequency (MHz)**	**MAF (dBs/m)**	**AF (dB/m)**
0.01	-33.1	18.4	2	-40.0	11.5
0.02	-37.2	14.3	3	-40.0	11.5
0.03	-38.2	13.3	4	-40.1	11.4
0.05	-39.8	11.7	5	-40.2	11.3
0.1	-40.1	11.4	6	-40.4	11.1
0.2	-40.3	11.2	7	-40.4	11.1
0.3	-40.3	11.2	8	-40.4	11.1
0.5	-40.3	11.2	9	-40.5	11.0
0.7	-40.3	11.2	10	-40.5	11.0
1	-40.1	11.4	20	-41.5	10.0

ITL # 1349: Log Periodic Antenna			
Frequency (MHz)	**AF (dB/m)**	**Frequency (MHz)**	**AF (dB/m)**
200	11.58	600	18.66
250	12.04	700	20.87
300	14.76	800	21.15
400	15.55	900	22.32
500	17.85	1000	24.22
ITL # 1352: Horn Antenna			
Frequency (MHz)	**AF (dB/m)**	**Frequency (MHz)**	**AF (dB/m)**
0.75	25	9.5	38
1.0	23.5	10.0	38.5
1.5	26.0	10.5	38.5
2.0	29.0	11.0	38.5
2.5	27.5	11.5	38.5
3.0	30.0	12.0	38.0
3.5	31.5	12.5	38.5
4.0	32.5	13.0	40.0
4.5	32.5	13.5	41.0
5.0	33.0	14.0	40.0
5.5	35.0	14.5	39.0
6.0	36.5	15.0	38.0
6.5	36.5	15.5	37.5
7.0	37.5	16.0	37.5
7.5	37.5	16.5	39.0
8.0	37.5	17.0	40.0

8.5	38.0		17.5	42.0
9.0	37.5		18.0	42.5
ITL # 1353: Horn Antenna (@ 3m distance)[1]				
Frequency (MHz)	**Measured antenna factor (dB/m)**		**Frequency (MHz)**	**Measured antenna factor (dB/m)**
18000	32.4		22500	33.0
18500	32.0		23000	33.1
19000	32.3		23500	33.8
19500	32.4		24000	33.5
20000	32.3		24500	33.5
20500	32.8		25000	33.8
21000	32.8		25500	33.9
21500	32.7		26000	34.2
22000	33.1		26500	34.7
ITL #1356: Biconical Antenna				
Frequency (MHz)	**AF (dB/m)**		**Frequency (MHz)**	**AF (dB/m)**
30	13.00		90	8.23
35	10.89		100	11.12
40	10.59		120	13.16
45	10.63		140	13.07
50	10.12		160	14.80
60	9.26		180	16.95
70	7.74		200	17.17
80	6.63			
ITL #1840: Anechoic Chamber RF Cable				
Frequency (MHz)	**Cable Loss (dB)**		**Frequency (MHz)**	**Cable Loss (dB)**
1000.0	-1.4		10000.0	-6.0
1500.0	-1.7		10500.0	-6.2
2000.0	-2.0		11000.0	-6.2
2500.0	-2.3		11500.0	-6.0
3000.0	-2.6		12000.0	-6.0
3500.0	-2.8		12500.0	-6.1
4000.0	-3.1		13000.0	-6.3
4500.0	-3.3		13500.0	-6.5
5000.0	-3.6		14000.0	-6.7
5500.0	-3.7		14500.0	-7.0
6000.0	-4.0		15000.0	-7.3
6500.0	-4.4		15500.0	-7.5

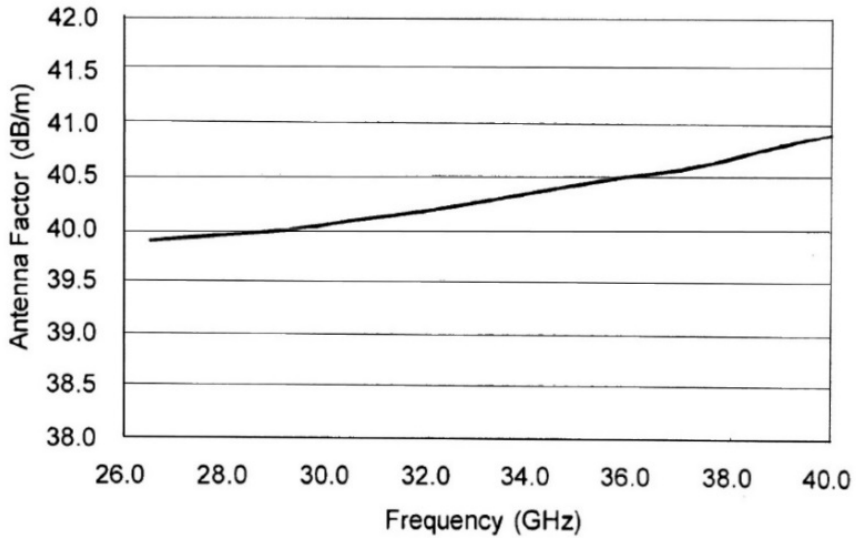
[1] The antenna factor shall be added to the receiver reading in dBµV to obtain field strength in dBµ V/m

7000.0	-4.7		16000.0	-7.6
7500.0	-4.8		16500.0	-8.0
8000.0	-5.0		17000.0	-8.0
8500.0	-5.1		17500.0	-8.1
9000.0	-5.6		18000.0	-8.2
9500.0	-5.8			

ITL #1911: OATS RF Cable

Frequency (MHz)	Cable Loss (dB)		Frequency (MHz)	Cable Loss (dB)
1.0	0.5		450.00	5.83
10.00	1.0		500.00	6.33
20.00	1.34		550.00	6.67
30.00	1.5		600.00	6.83
50.00	1.83		650.00	7.17
100.00	2.67		700.00	7.66
150.00	3.17		750.00	7.83
200.00	3.83		800.00	8.16
250.00	4.17		850.00	8.5
300.00	4.5		900.00	8.83
350.00	5.17		950.00	8.84
400.00	5.5		1000.00	9.0

ITL # 1777: 26.5-40 GHz Horn Antenna



End of Test Report