

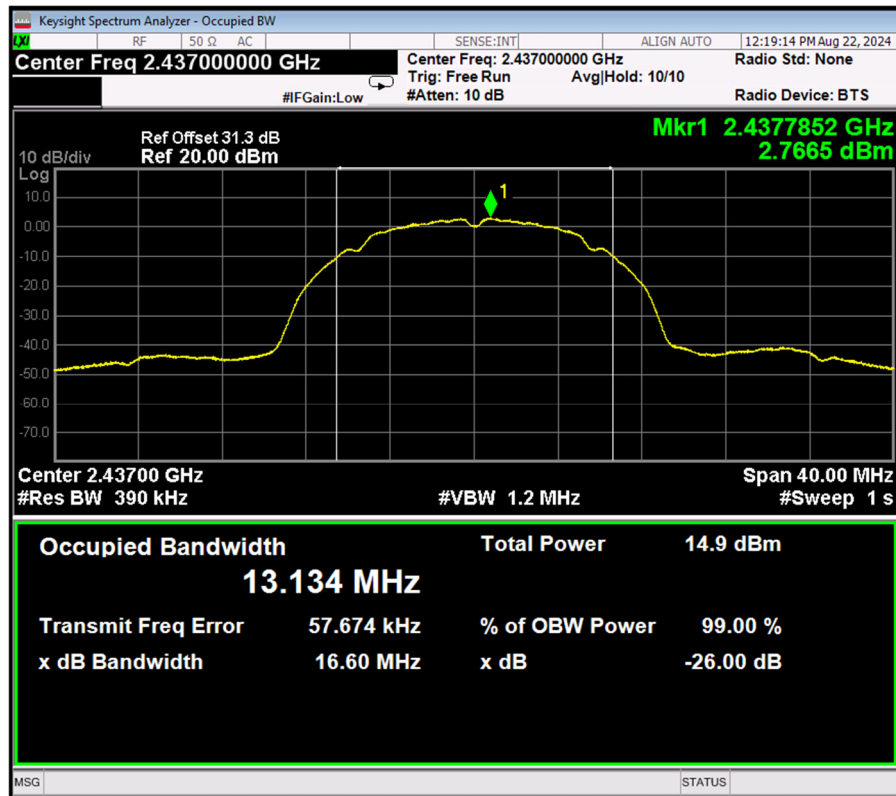


Figure 93. 2437.0 MHz, Wi-fi/b(1Mbit/s)

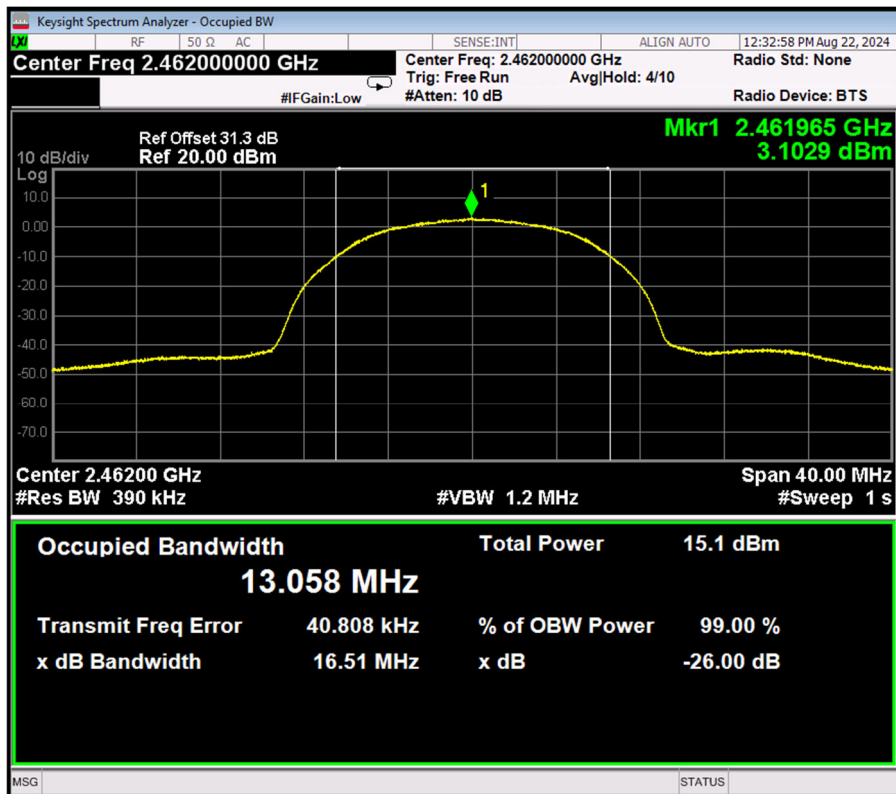


Figure 94. 2462.0 MHz, Wi-fi/b(11Mbit/s)

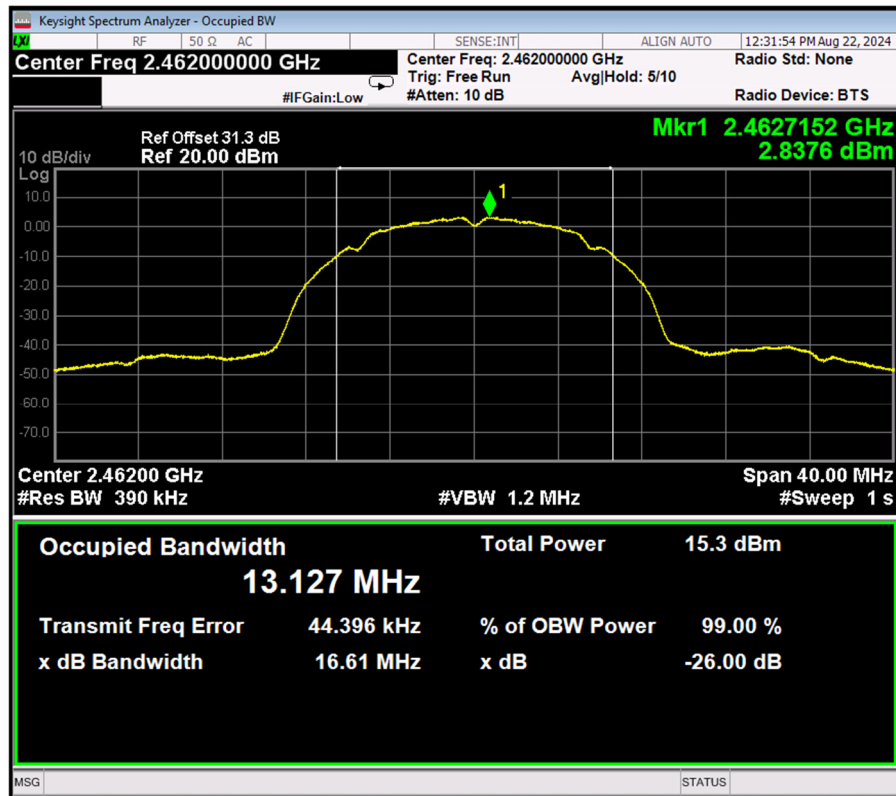


Figure 95. 2462.0 MHz, Wi-fi/b(1Mbit/s)

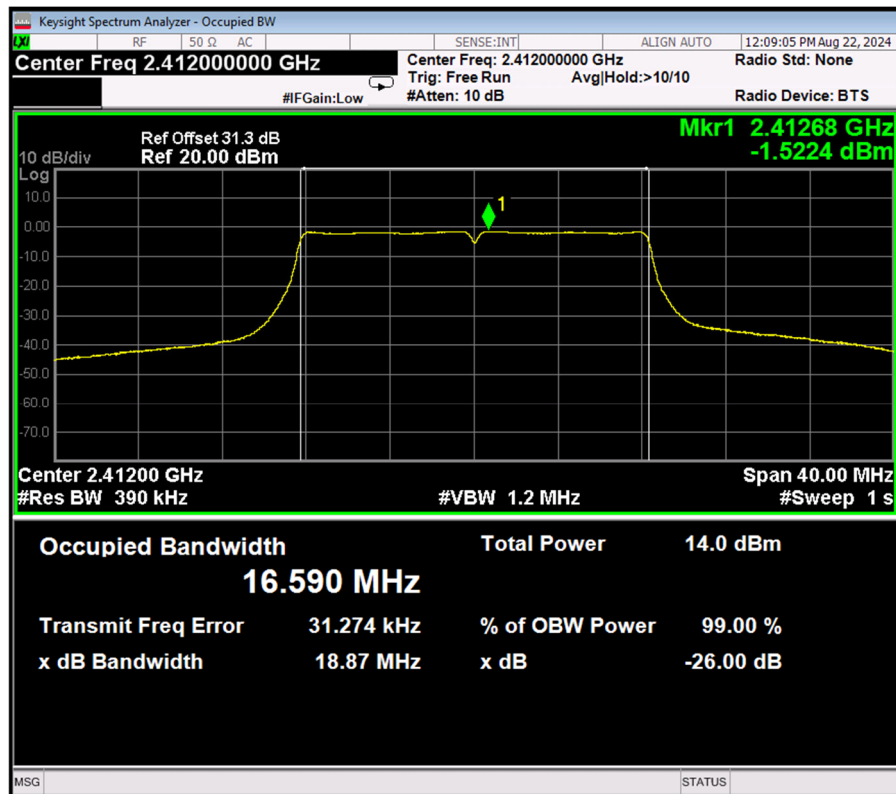


Figure 96. 2412.0 MHz, Wi-fi/g(6Mbit/s)

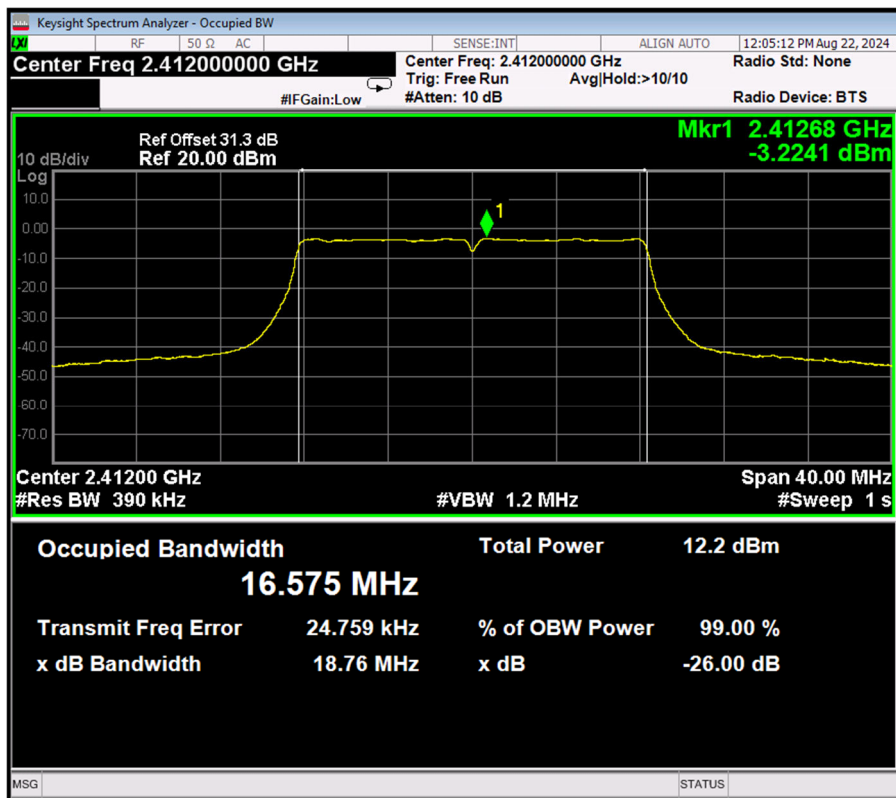


Figure 97. 2412.0 MHz, Wi-fi/g(54Mbit/s)

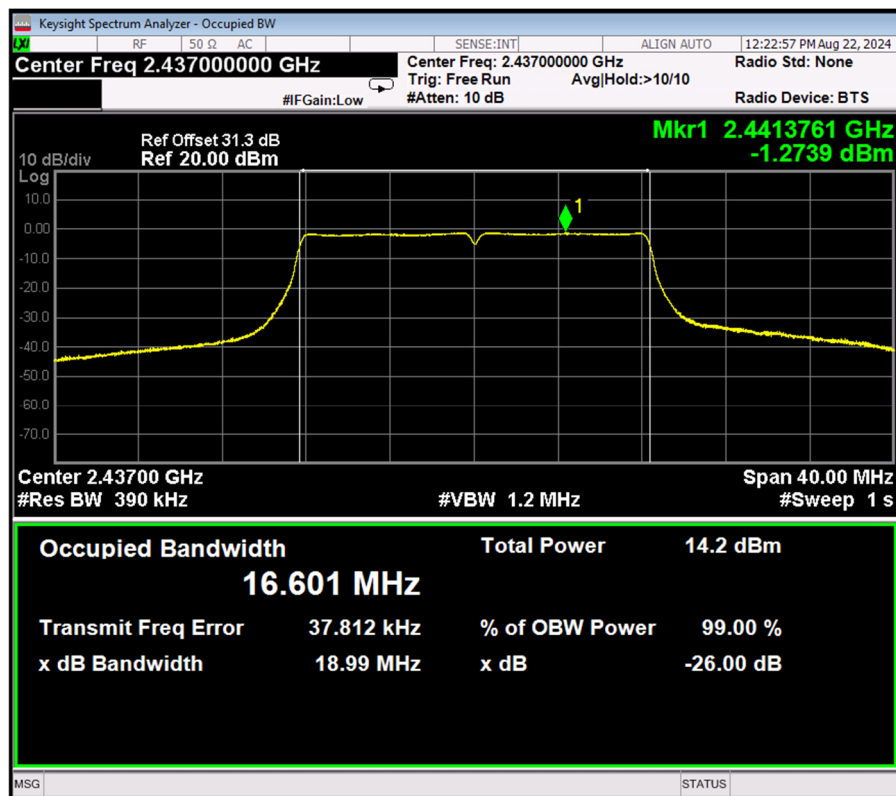


Figure 98. 2437.0 MHz, Wi-fi/g(6Mbit/s)

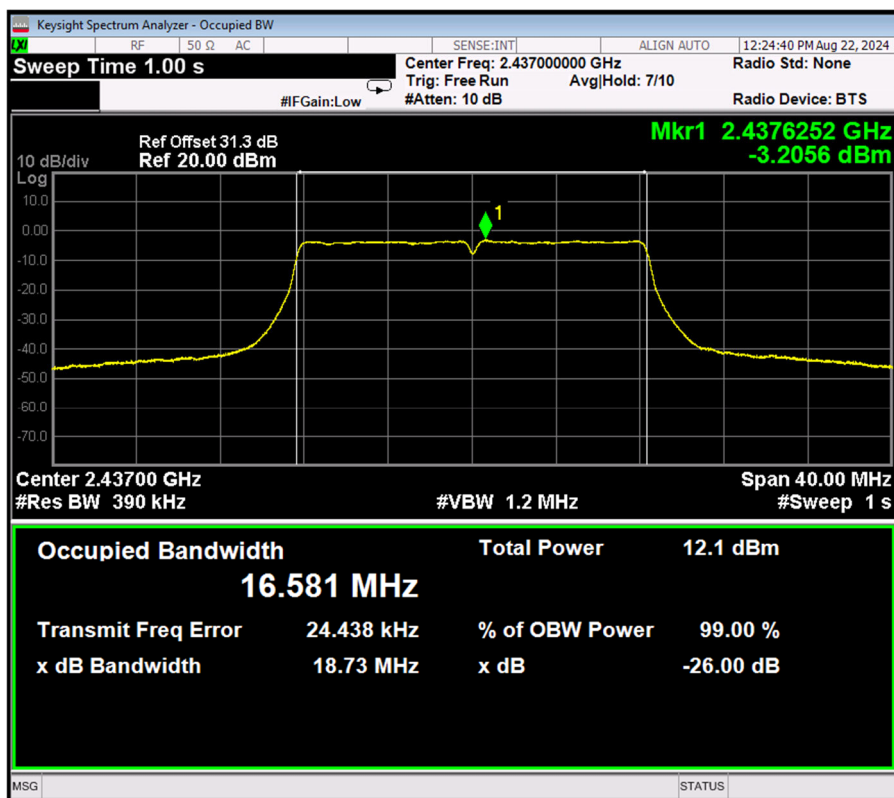


Figure 99. 2437.0 MHz, Wi-fi/g(54Mbit/s)

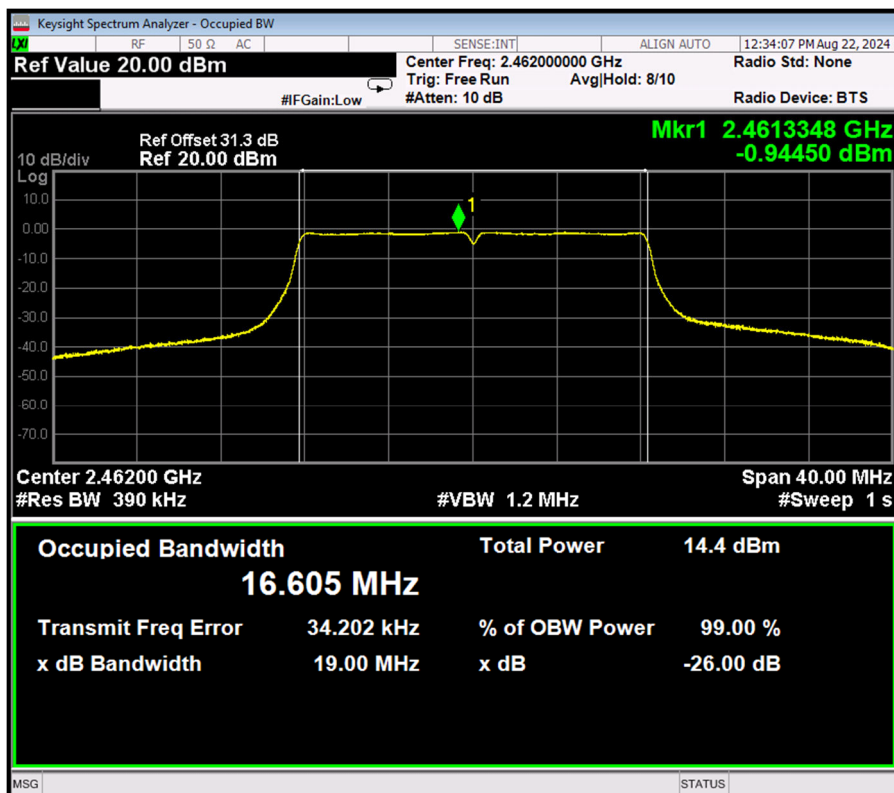


Figure 100. 2462.0 MHz, Wi-fi/g(6Mbit/s)

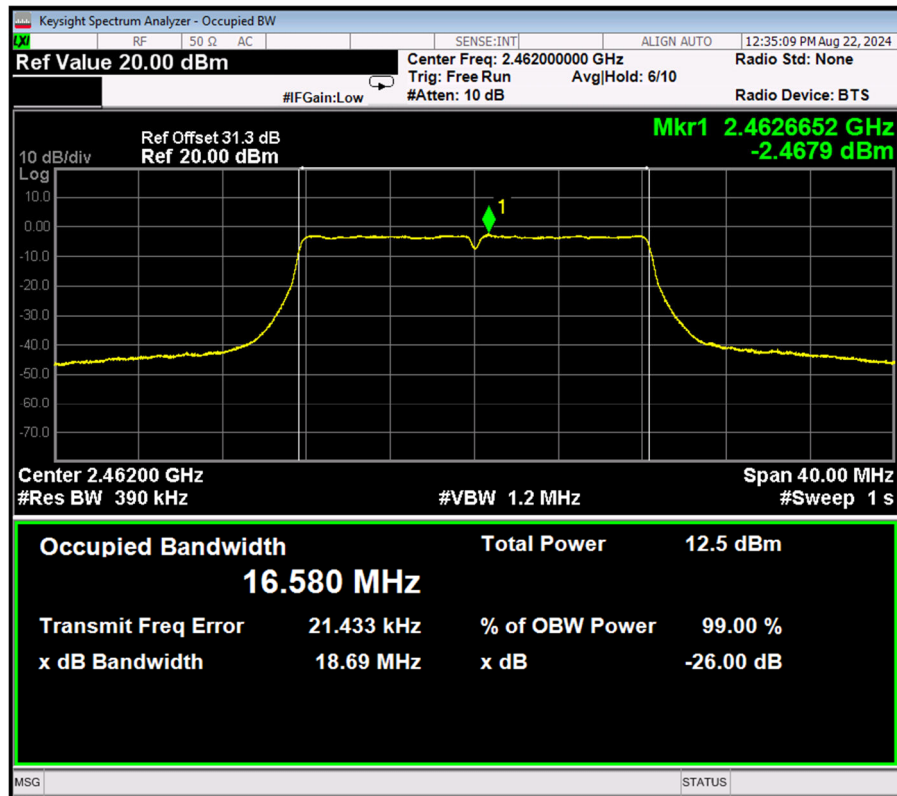


Figure 101. 2462.0 MHz, Wi-fi/g(54Mbit/s)

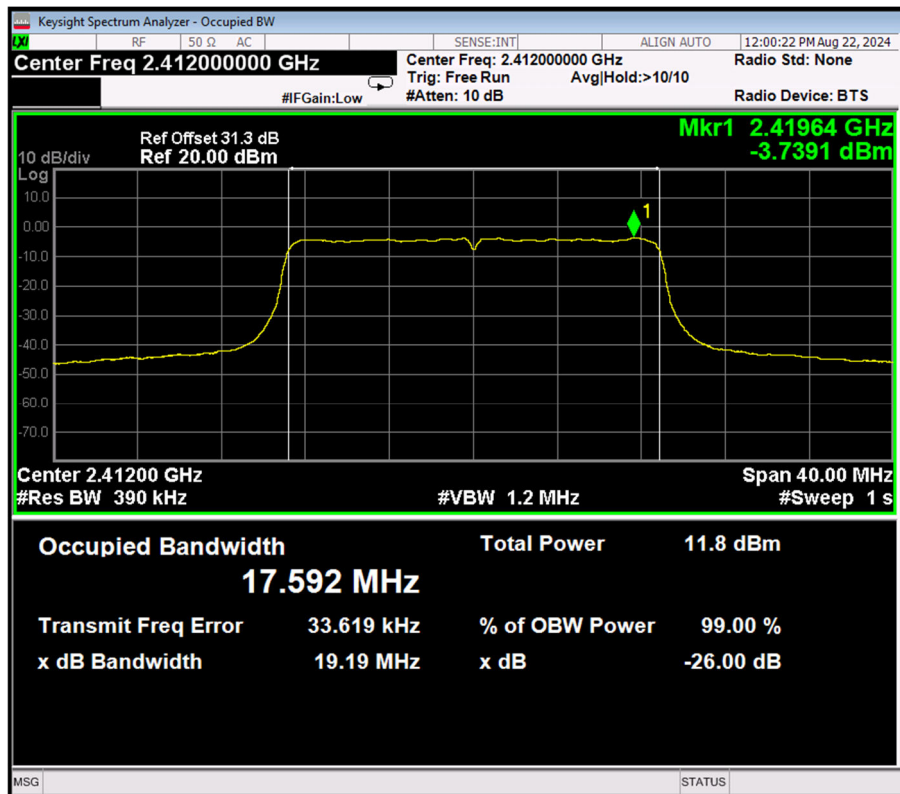


Figure 102. 2412.0 MHz, Wi-fi/n(65Mbit/s)

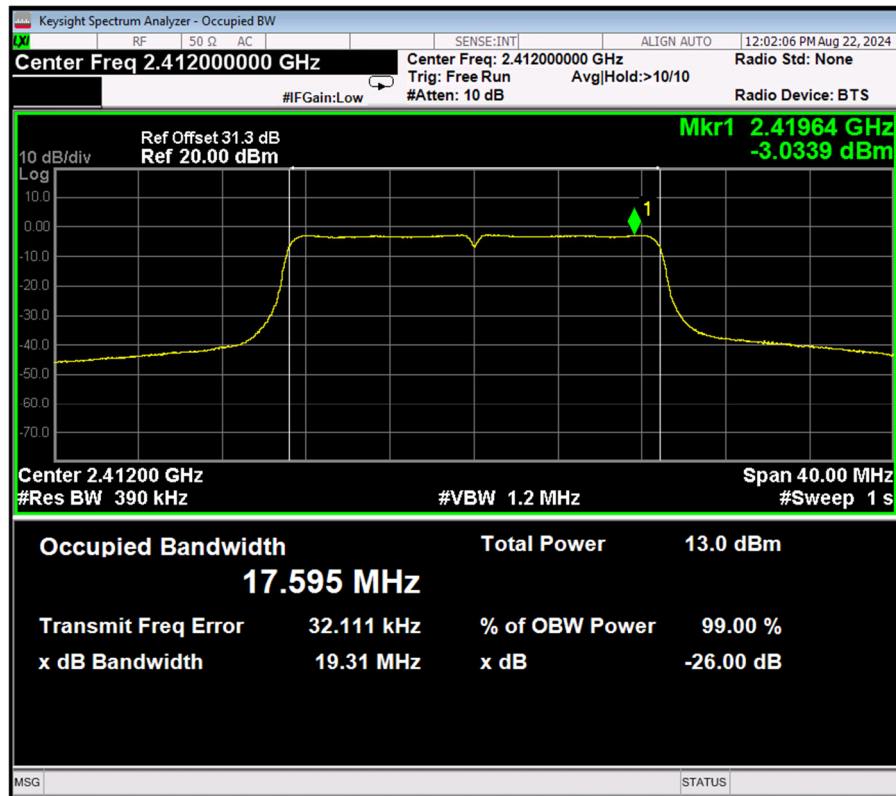


Figure 103. 2412.0 MHz, Wi-fi/n(6.5Mbit/s)

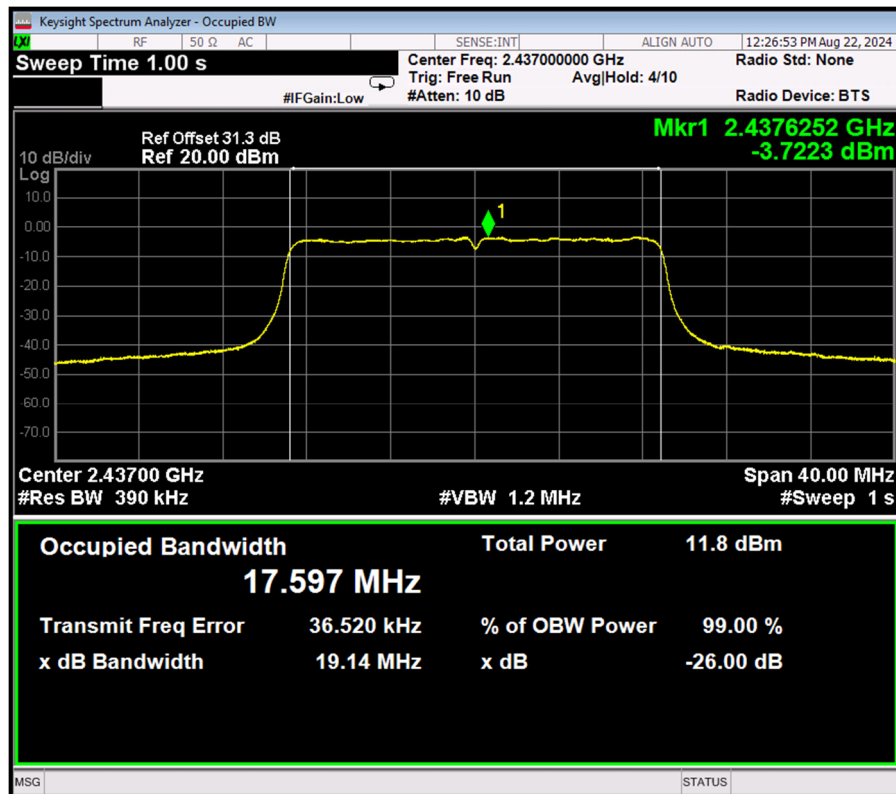


Figure 104. 2437.0 MHz, Wi-fi/n(65Mbit/s)

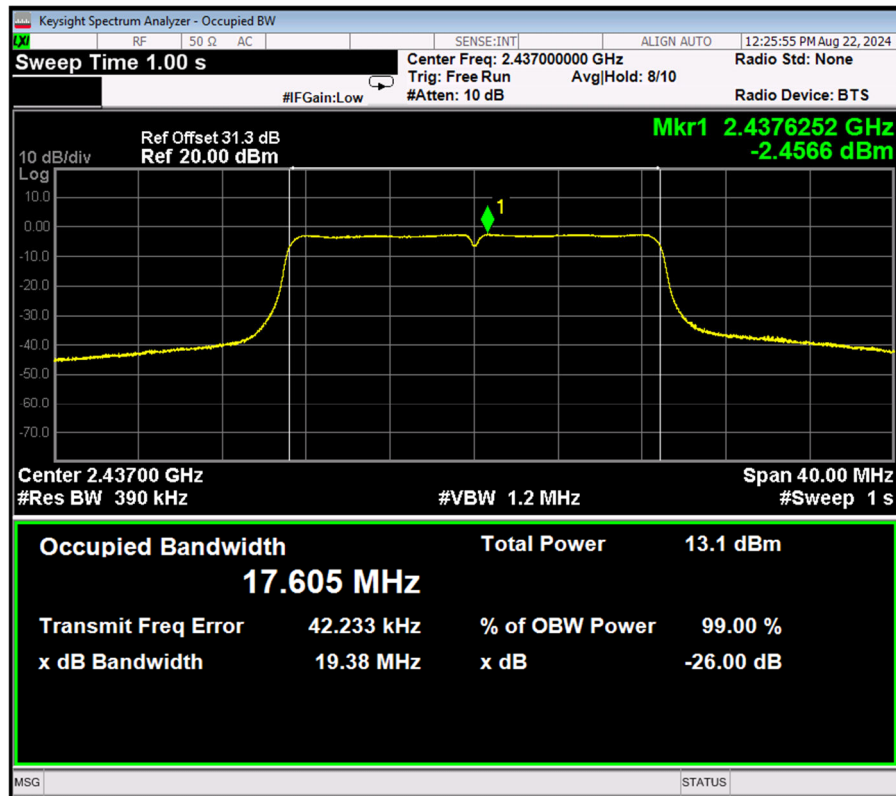


Figure 105. 2437.0 MHz, Wi-fi/n(6.5Mbit/s)

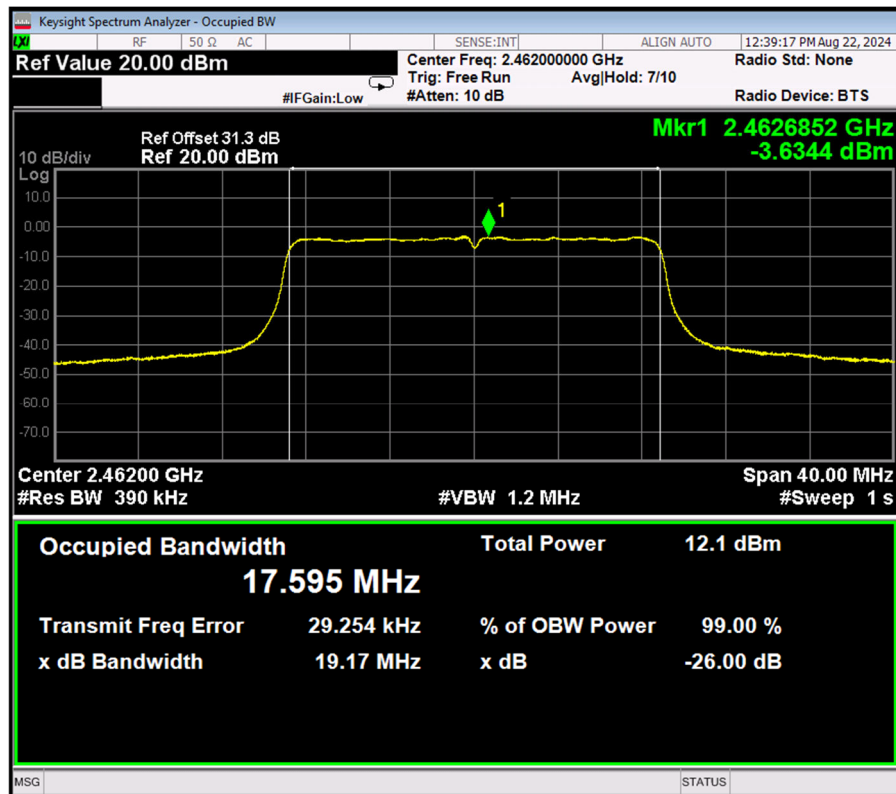


Figure 106. 2462.0 MHz, Wi-fi/n(65Mbit/s)

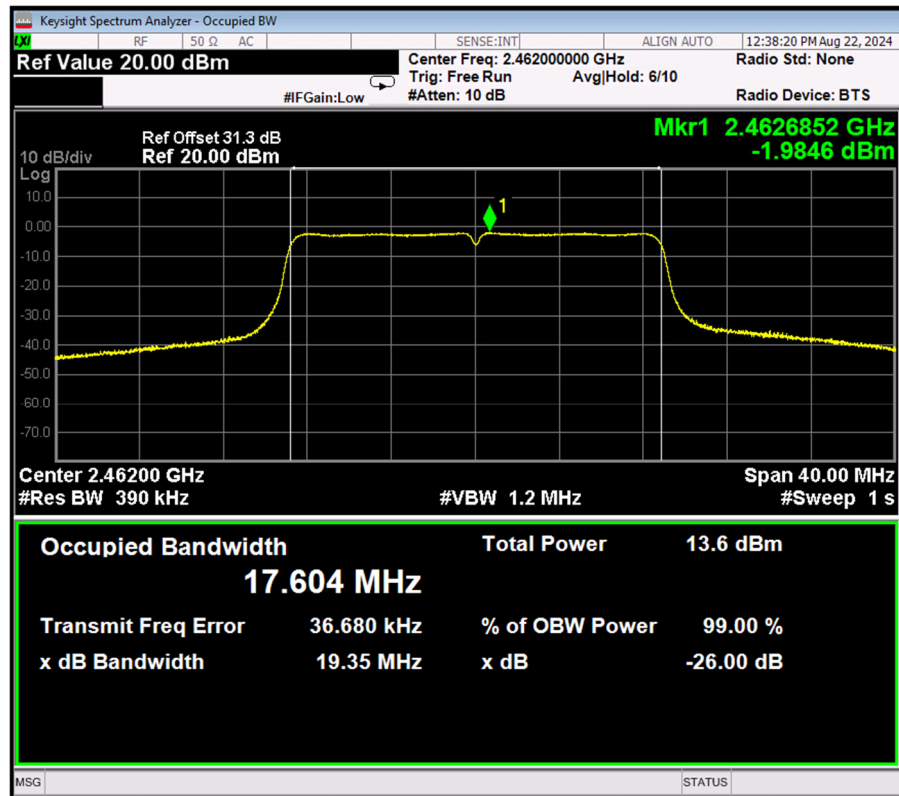


Figure 107. 2462.0 MHz, Wi-fi/n(6.5Mbit/s)

7.5 Test Equipment Used; Bandwidth

ITL #	Instrument	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
1499	Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	5 Feb 2024	5 Feb 2025
1699	Low Loss cable	Huber Suhner	Sucoflex	27502/4PEA	7 Jun 2023	7 Jun 2024
1848	Attenuator 20dB 2W DC 8.0GHz	Midwest Microwave Solutions	ATT-0217-20-NNN-02	-	6 Jun 2023	6 Jun 2024



8. Emissions in Non-Restricted Frequency Bands

8.1 Test Specification

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

RSS-247, Issue 2, Section 5.5

8.2 Test Procedure

(Temperature (22°C)/ Humidity (49%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=31.0 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”.

8.3 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.

8.4 Test Results

JUDGEMENT: Passed

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 247(d) specification. No emissions were detected within 20 dB of the limit

8.5 Test Equipment

ITL #	Instrument	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
1366	Horn Antenna	EMCO	3115	9702-511	18 Oct 2023	18 Oct 2025
1699	Low Loss cable	Huber Suhner	Sucoflex	27502/4PEA	7 Jun 2023	31 Oct 2024
2199	Trilog Broadband Antenna 30 MHz-7 GHz	Schwarzbeck	VULB 9162	585	16 Oct 2023	16 Oct 2025

Figure 108 Test Equipment



9. Emissions in Restricted Frequency Bands

9.1 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

9.2 Test Procedure

(Temperature (23°C)/ Humidity (65%RH))

The E.U.T. operation mode and test setup are as described in Section 2 of this report.

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 -25GHz was scanned.

The tests were taken for every “worst case” of each protocol type. The highest radiation is described 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.

9.3 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.

9.4 IC 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 specified when measuring with peak detector function.

9.5 Test Results

JUDGEMENT: PASS

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

Antenna Polarization: Horizontal/Vertical

Frequency Range: 9 kHz 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)
2412.0	2390.0	V	50.3	74.0	-23.7	40.5	54.0	-13.5
	2390.0	H	50.5	74.0	-23.5	40.5	54.0	-13.5
	4824.0	V	61.7	74.0	-12.3	47.5	54.0	-6.5
	4824.0	H	58.1	74.0	-15.9	43.1	54.0	-10.9
2437.0	4874.0	V	62.6	74.0	-11.4	-	54.0	-
	4874.0	H	60.2	74.0	-13.8	-	54.0	-

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)
2462.0	4924.0	V	64.2	74.0	-9.8	49.5	54.0	-4.5
	4924.0	H	58.5	74.0	-15.5	39.5	54.0	-14.5
	2483.5	V	50.5	74.0	-23.5	40.0	54.0	-14.0
	2483.5	H	51.5	74.0	-22.5	40.5	54.0	-13.5

Figure 109. Radiated Emission Results

Margin refers to the test results obtained minus specified requirement;

“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/g 6Mbps

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	50.5	74.0	-23.5	37.1	54.0	-16.9
	2390.0	H	50.6	74.0	-23.4	37.5	54.0	-16.5
	4824.0	V	56.6	74.0	-17.4	39.5	54.0	-14.5
	4824.0	H	51.1	74.0	-23	38.5	54.0	-15.2
2437.0	4874.0	V	62.6	74.0	-11.4	-	54.0	-
	4874.0	H	60.2	74.0	-13.8	-	54.0	-
2462.0	4924.0	V	59.9	74.0	-14.1	43.5	54.0	-10.5
	4924.0	H	58.4	74.0	-15.6	42.4	54.0	-11.6
	2483.5	V	49.5	74.0	-24.5	48.5	54.0	-5.5
	2483.5	H	49.4	74.0	-24.6	42.3	54.0	-11.7

Figure 110. Radiated Emission Results



Antenna Polarization: Horizontal/Vertical Frequency Range: 9kHz to 25.0 GHz
Protocol Type: WI-FI/n 6.5Mbps (MCS0) 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	49.2	74.0	-24.8	37.5	54.0	-16.5
	2390.0	H	49.5	74.0	-24.5	37.0	54.0	-17.0
	4824.0	V	56.8	74.0	-17.2	36.5	54.0	-17.5
	4824.0	H	51.9	74.0	-22.1	35.5	54.0	-18.4
2437.0	4874.0	V	55.8	74.0	-18.2	-	54.0	-
	4874.0	H	56.2	74.0	-17.8	-	54.0	-
2462.0	4924.0	V	58.7	74.0	-15.3	38.1	54.0	-15.9
	4924.0	H	56.4	74.0	-17.6	37.9	54.0	-16.1
	2483.5	V	50.6	74.0	-23.4	38.5	54.0	-15.5
	2483.5	H	51.6	74.0	-22.4	39.5	54.0	-14.5

Figure 111. Radiated Emission Results

Antenna Polarization: Horizontal/Vertical Frequency Range: 9kHz to 25.0 GHz
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	2390.0	V	49.1	74.0	-24.9	37.1	54.0	-16.9
	2390.0	H	49.2	74.0	-24.8	36.2	54.0	-17.8
	4824.0	V	56.2	74.0	-17.8	36.1	54.0	-17.9
	4824.0	H	51.3	74.0	-22.7	35.1	54.0	-18.9
2426.0	4874.0	V	55.2	74.0	-18.8	37.1	54.0	-16.9
	4874.0	H	56.1	74.0	-17.9	36.9	54.0	-17.1
2480.0	4924.0	V	53.7	74.0	-20.3	36.1	54.0	-17.9
	4924.0	H	52.4	74.0	-21.6	31.9	54.0	-22.1
	2483.5	V	52.6	74.0	-21.4	37.5	54.0	-16.5
	2483.5	H	51.8	74.0	-22.2	38.5	54.0	-15.5



9.6 Test Equipment

ITL #	Instrument	Manufacturer	Model	Serial No.	Cal. Date	Cal. Due
1117	Signal Generator	Agilent/Keysight	8648C	3623A04126	6 Feb 2024	6 Feb 2025
1366	Horn Antenna	EMCO	3115	9702-511	18 Oct 2023	18 Oct 2025
1499	Spectrum Analyzer	Rohde & Schwarz	FSL6	100194	5 Feb 2024	5 Feb 2025
1694	Directional Coupler	KRYTAR	101020010	88873	16 May 2022	16 May 2023
1699	Low Loss cable	Huber Suhner	Sucoflex	27502/4PEA	7 Jun 2023	7 Jun 2024
1776	30 dB attenuator	MCL	BW-S30W5	533	7 Jun 2023	7 Jun 2024
1778	Antenna Cable for KA Band	OSR Electronics	37297C KPS	1503-590 (05032006)	9 Aug 2023	9 Aug 2024
1783	20 cm Cable for KA Band Antenna	Rhophase Microwave	01536 263440 (A1673)	A1673	7 Jun 2023	7 Jun 2024
1844	Low-loss Coax Cable 1m	EIM	705A00930 1EIM	-	6 Jun 2023	6 Jun 2024
1848	Attenuator 20dB 2W DC 8.0GHz	Midwest Microwave Solutions	ATT-0217-20-NNN-02	-	6 Jun 2023	6 Jun 2024
2016	Power Splitter DC-18GHz	HP	11667A	16325	7 Jun 2023	7 Jun 2024
2163	Signal Analyzer	Keysight	WO-00400256-23	MY54430182	25 Feb 2023	25 Feb 2025
2199	Trilog Broadband Antenna 30 MHz-7 GHz	Schwarzbeck	VULB 9162	585	16 Oct 2023	16 Oct 2025



10. R.F. Exposure/Safety

See a separate document.

11. Setup Photos

See a separate document.

12. 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

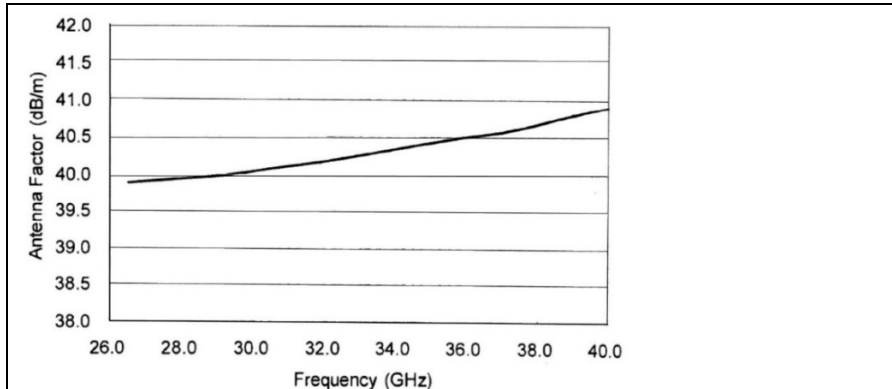
ITL # 1353: Horn Antenna (@ 3m distance) ¹			
Frequency (MHz)	Measured antenna factor (dB/m)	Frequency (MHz)	Measured antenna factor (dB/m)
18000	32.4	22500	33.0
18500	32.0	23000	33.1
19000	32.3	23500	33.8
19500	32.4	24000	33.5
20000	32.3	24500	33.5
20500	32.8	25000	33.8
21000	32.8	25500	33.9
21500	32.7	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		

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



ITL # 1777: 26.5-40 GHz Horn Antenna



ITL # 1366: Horn Antenna

Frequency (MHz)	AF (dB/m)	Frequency (MHz)	AF (dB/m)
750	25	10000	38.5
1000	23.5	10500	38.5
1500	26.0	11000	38.5
2000	29.0	11500	38.5
2500	27.5	12000	38.0
3000	30.0	12500	38.5
3500	31.5	13000	40.0
4000	32.5	13500	41.0
4500	32.5	14000	40.0
5000	33.0	14500	39.0
5500	35.0	15000	38.0
6000	36.5	15500	37.5
6500	36.5	16000	37.5
7000	37.5	16500	39.0
7500	37.5	17000	40.0
8000	37.5	17500	42.0
8500	38.0	18000	42.5
9000	37.5		
9500	38		

ITL # 1778: Low-loss RF cable

Frequency (GHz)	Loss (dB)
10.0	-2.3
20.0	-3.5
30.0	-4.5
40.0	-6.0



ITL #2199 Trilog Broadband Antenna + ITL #1911 RF cable				
Frequency (MHz)	AF (dB/m)		Frequency (MHz)	AF (dB/m)
30.00	14.30		80.00	11.10
40.00	16.20		90.00	13.40
50.00	17.40		100.00	15.20
60.00	16.30		150.00	11.40
70.00	13.00		200.00	14.10
80.00	11.10		300.00	16.10
90.00	13.40		400.00	18.10
100.00	15.20		500.00	19.50
150.00	11.40		600.00	21.10
30.00	14.30		700.00	22.50
40.00	16.20		800.00	23.50
50.00	17.40		900.00	24.70
60.00	16.30		1000.00	25.50
70.00	13.00			

ITL # 2215 BBHA 9120 L - Double Ridged Broadband Horn Antenna				
Frequency (MHz)	AF (dB/m)		Frequency (MHz)	AF (dB/m)
2500	38.30		14000	40.70
3000	37.90		14500	40.30
3500	35.50		15000	40.70
4000	37.70		15500	41.10
4500	36.50		16000	41.00
5000	37.40		16500	41.80
5500	37.30		17000	41.50
6000	36.50		17500	42.10
6500	37.10		18000	42.50
7000	37.20		18500	42.20
7500	37.40		19000	42.30
8000	37.20		19500	42.40
8500	38.30		20000	42.70
9000	37.90		20500	42.90
9500	38.70		21000	43.20
10000	39.10		21500	43.60
10500	38.60		22000	43.80
11000	38.90		22500	43.80
11500	39.30		23000	44.20
12000	39.10		23500	44.40
12500	39.20		24000	45.20



ITL # 2215 BBHA 9120 L - Double Ridged Broadband Horn Antenna				
Frequency (MHz)	AF (dB/m)		Frequency (MHz)	AF (dB/m)
13000	39.80		24500	46.30
13500	39.90		25000	47.40
25500	47.80		33000	45.20
26000	46.70		33500	45.10
26500	45.90		34000	44.90
27000	45.70		34500	44.60
27500	45.40		35000	44.60
28000	45.10		35500	44.60
28500	45.10		36000	44.60
29000	45.00		36500	45.00
29500	45.30		37000	45.20
30000	45.20		37500	45.00
30500	45.20		38000	44.80
31000	45.00		38500	45.30
31500	45.00		39000	45.30
32000	45.00		39500	45.70
32500	44.90		40000	45.90

End of Report