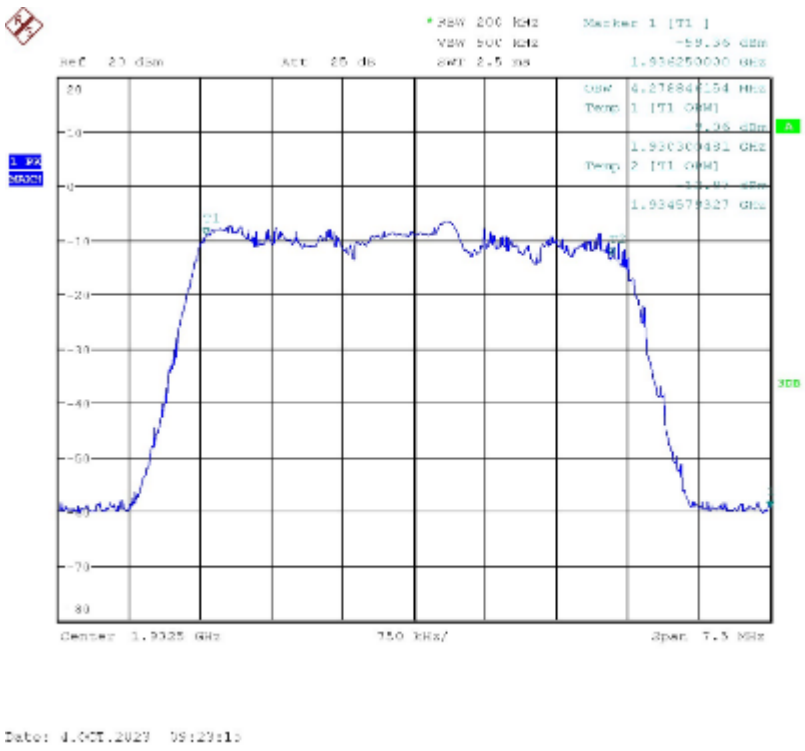


Figure 74: 99% Bandwidth, QPSK/16QAM, 5 MHz BW Low channel

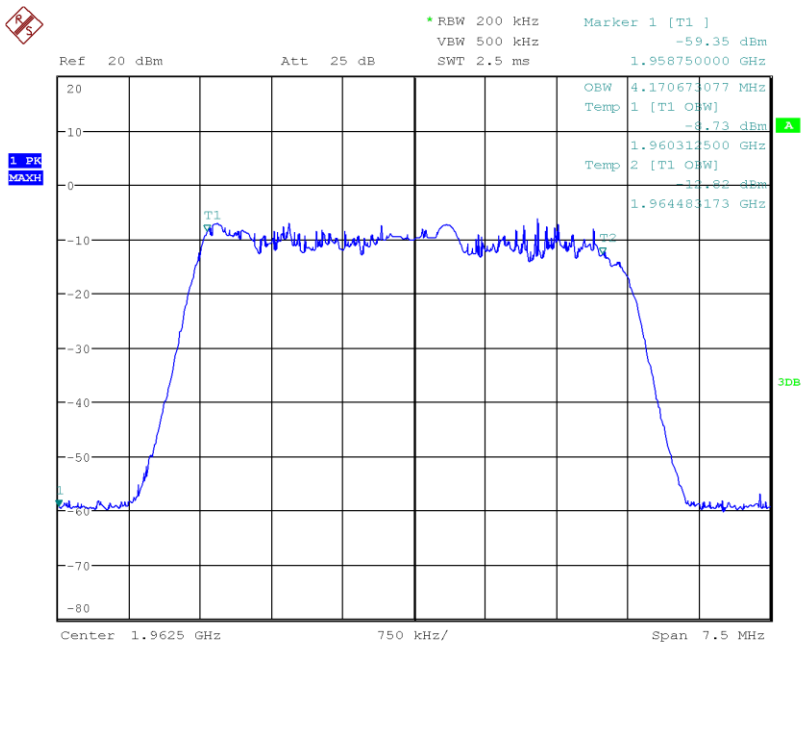
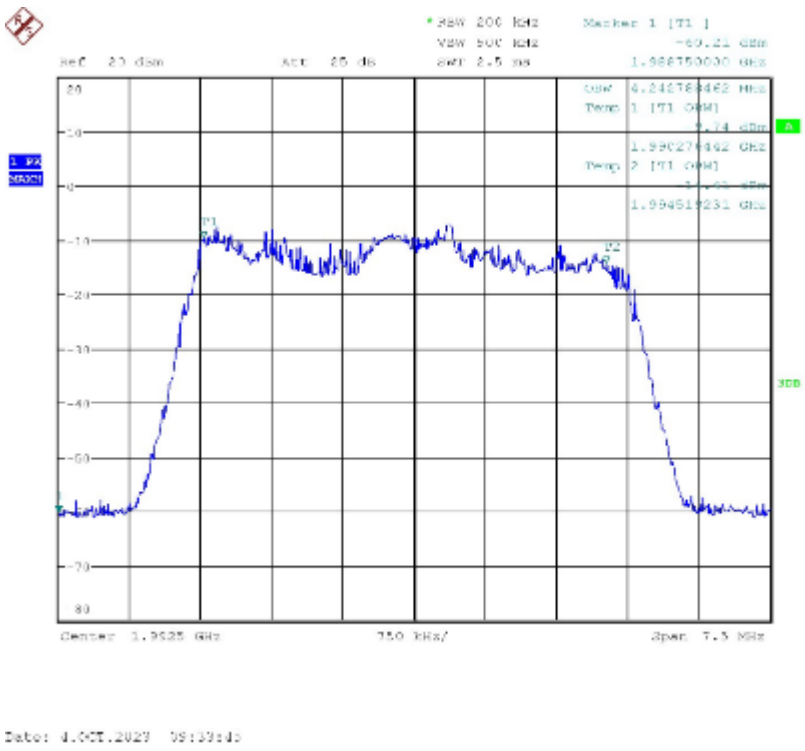
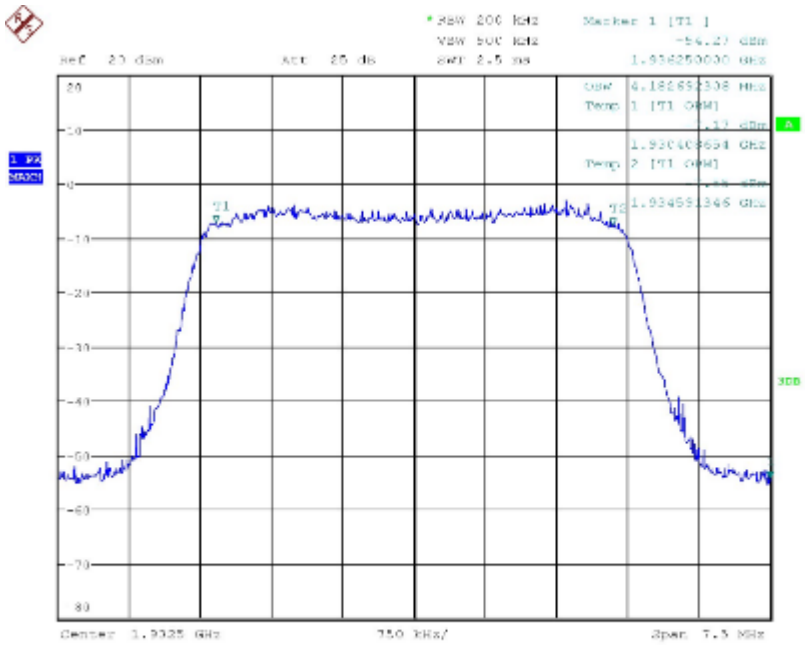


Figure 75: 99% Bandwidth, QPSK/16QAM, 5 MHz BW Mid channel



Date: 4.OCT.2023 09:39:45

Figure 76: 99% Bandwidth, QPSK/16QAM, 5 MHz BW High channel



Date: 4.OCT.2023 09:40:35

Figure 77: 99% Bandwidth, QPSK/16QAM, 5 MHz BW Low channel

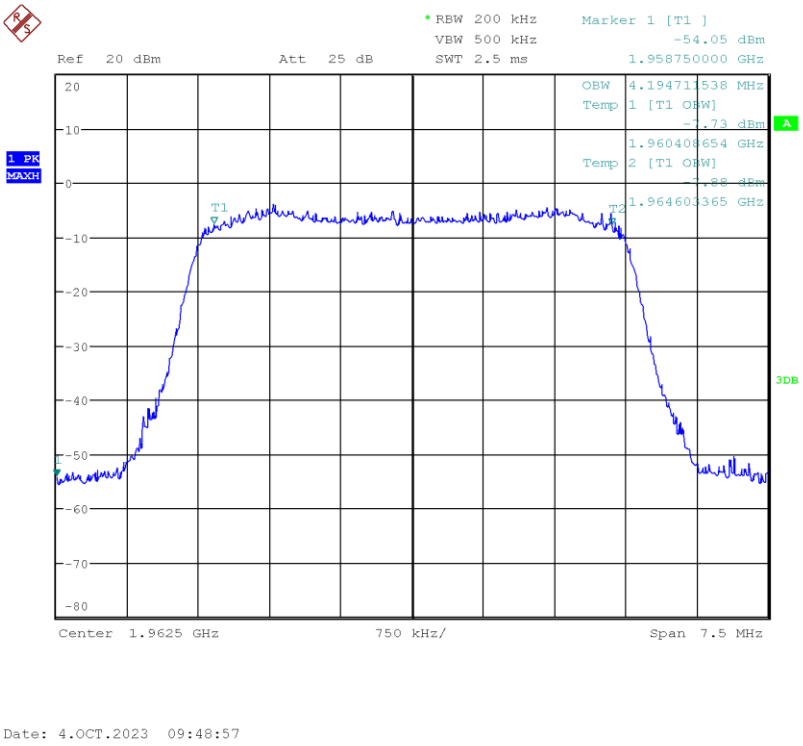


Figure 78: 99% Bandwidth, QPSK/64QAM, 5 MHz BW Mid channel

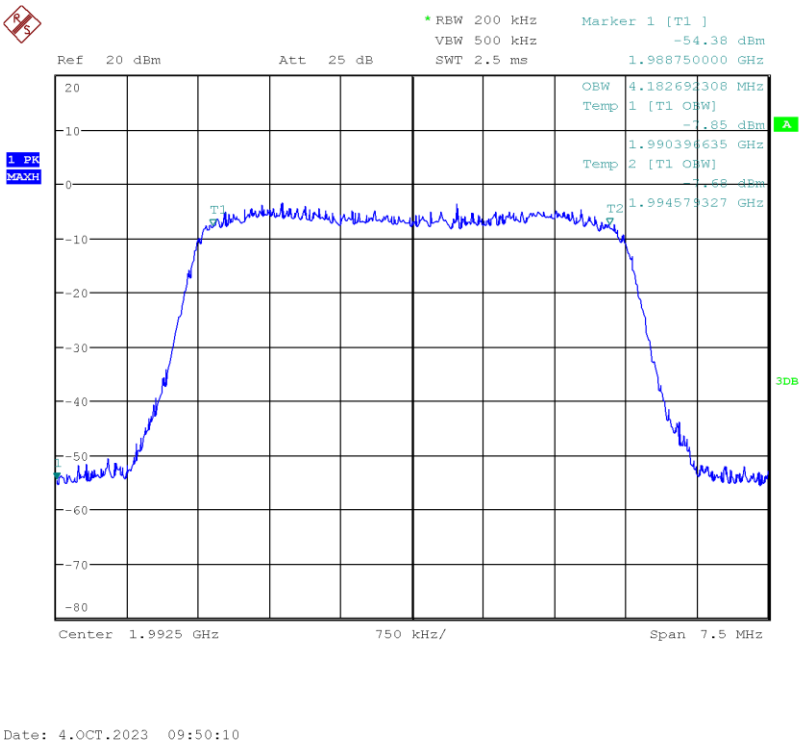


Figure 79: 99% Bandwidth, QPSK/64QAM, 5 MHz BW High channel

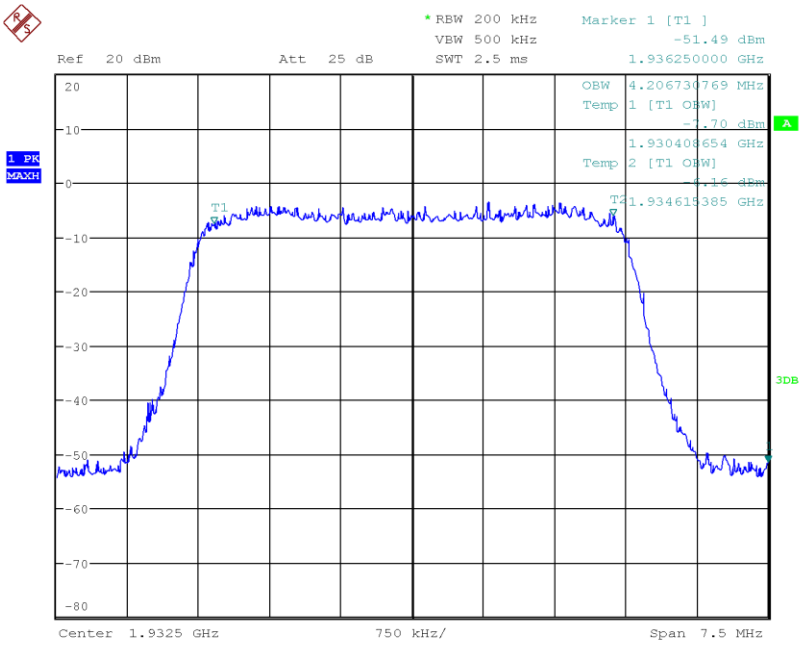


Figure 80: 99% Bandwidth, QPSK/256QAM, 5 MHz BW Low channel

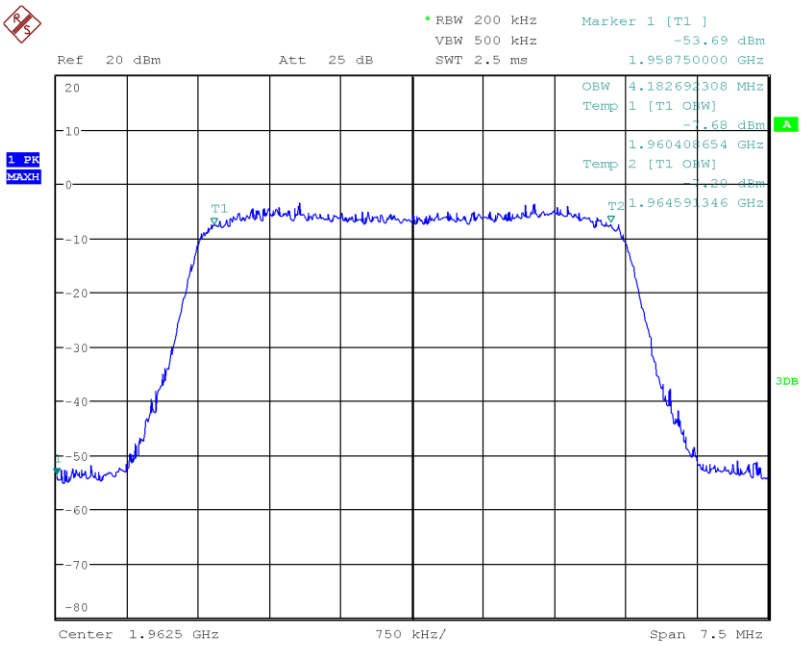


Figure 81: 99% Bandwidth, QPSK/256QAM, 5 MHz BW Mid channel

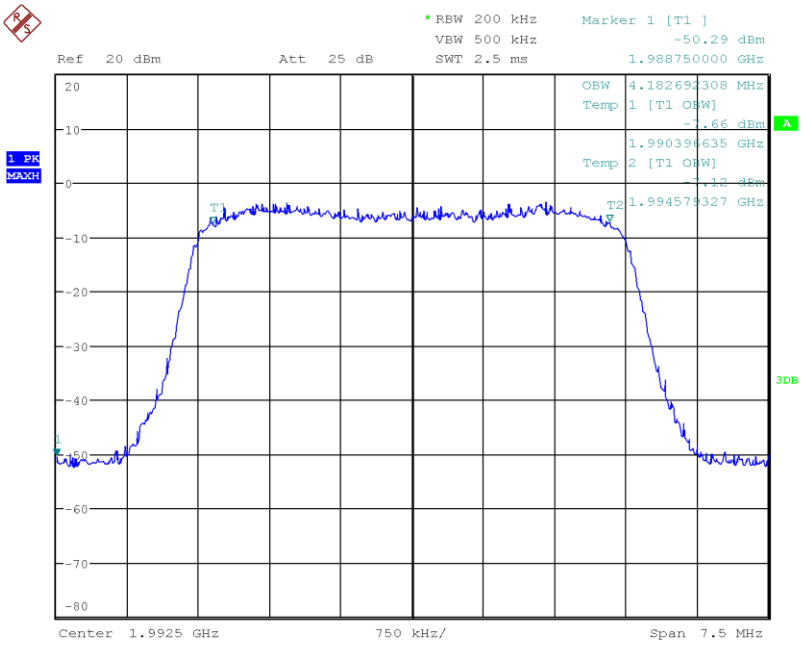


Figure 82: 99% Bandwidth, QPSK/256QAM, 5 MHz BW High channel

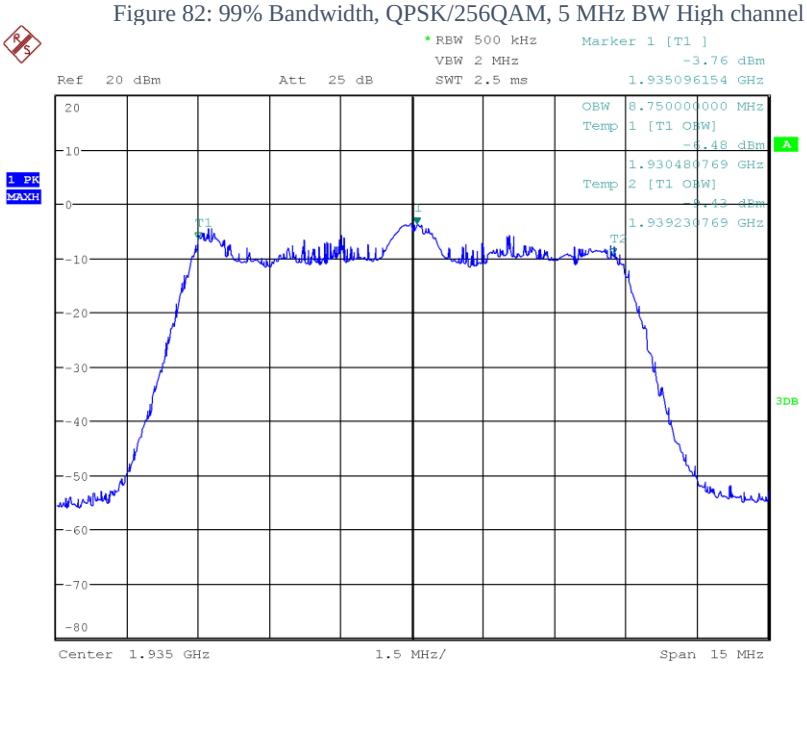


Figure 83: 99% Bandwidth, QPSK/16QAM, 10 MHz BW Low channel

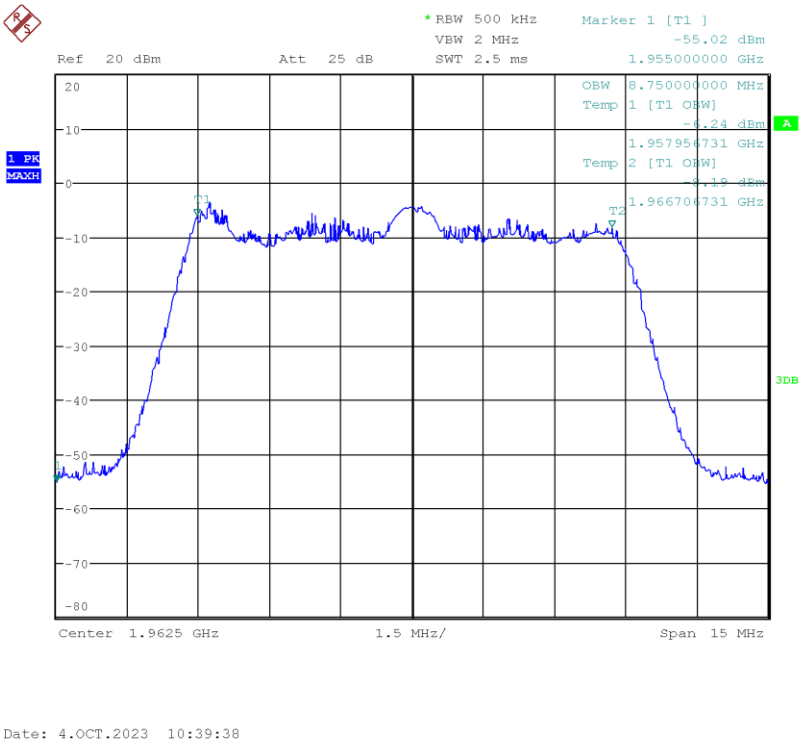


Figure 84: 99% Bandwidth, QPSK/16QAM, 10 MHz BW Mid channel

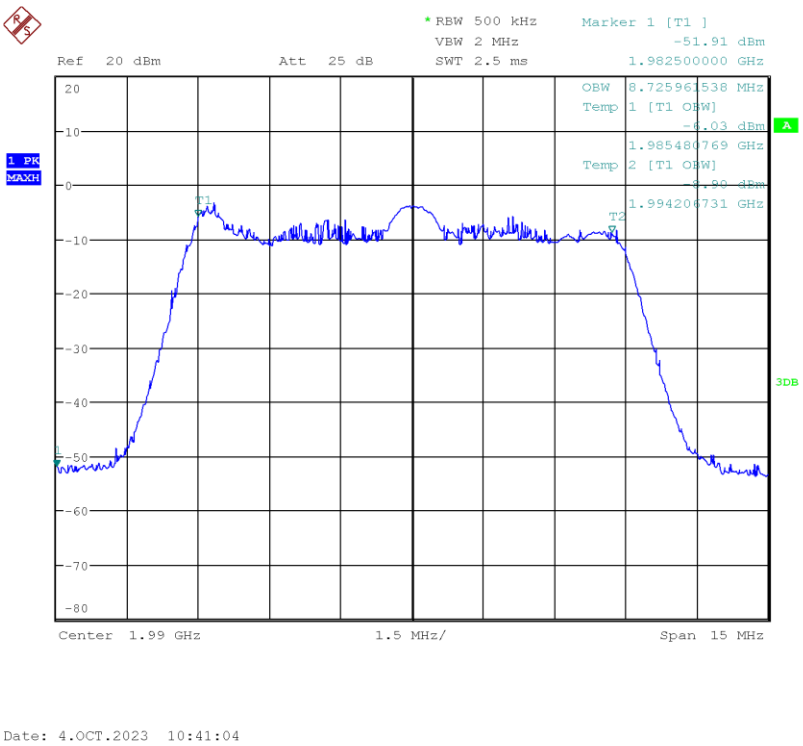


Figure 85: 99% Bandwidth, QPSK/16QAM, 10 MHz BW High channel

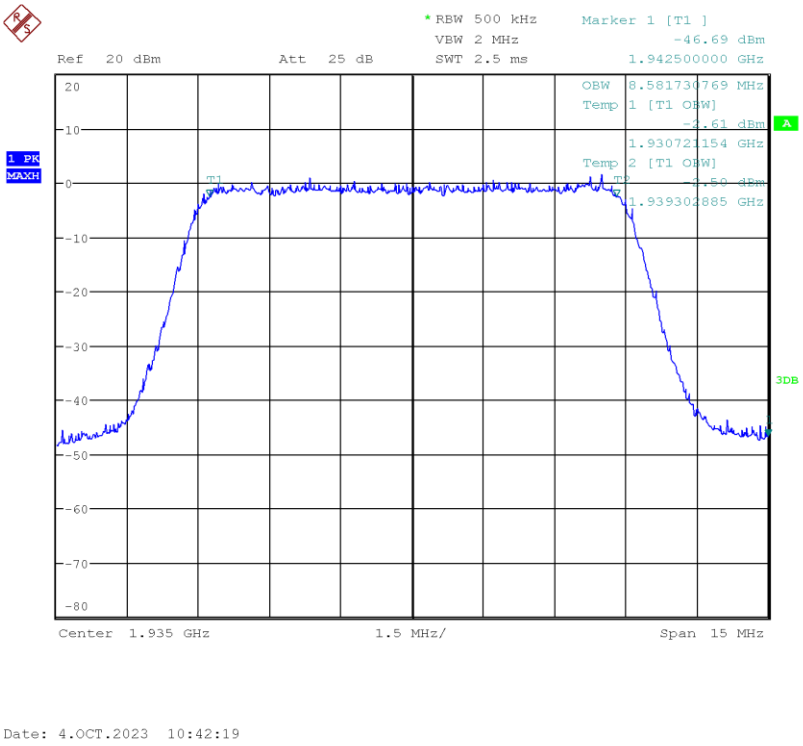


Figure 86: 99% Bandwidth, QPSK/64QAM, 10 MHz BW Low channel

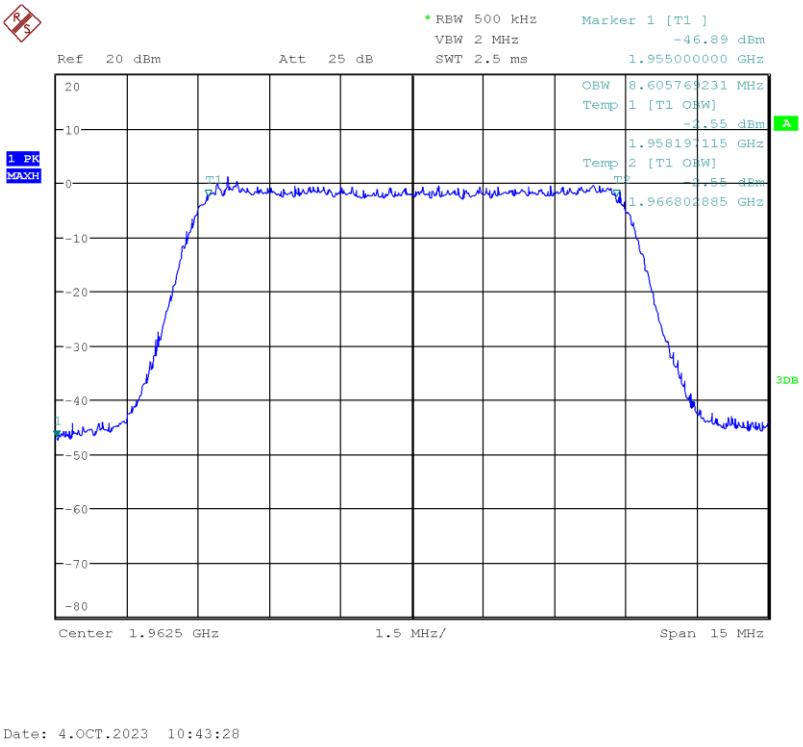


Figure 87: 99% Bandwidth, QPSK/64QAM, 10 MHz BW Mid channel

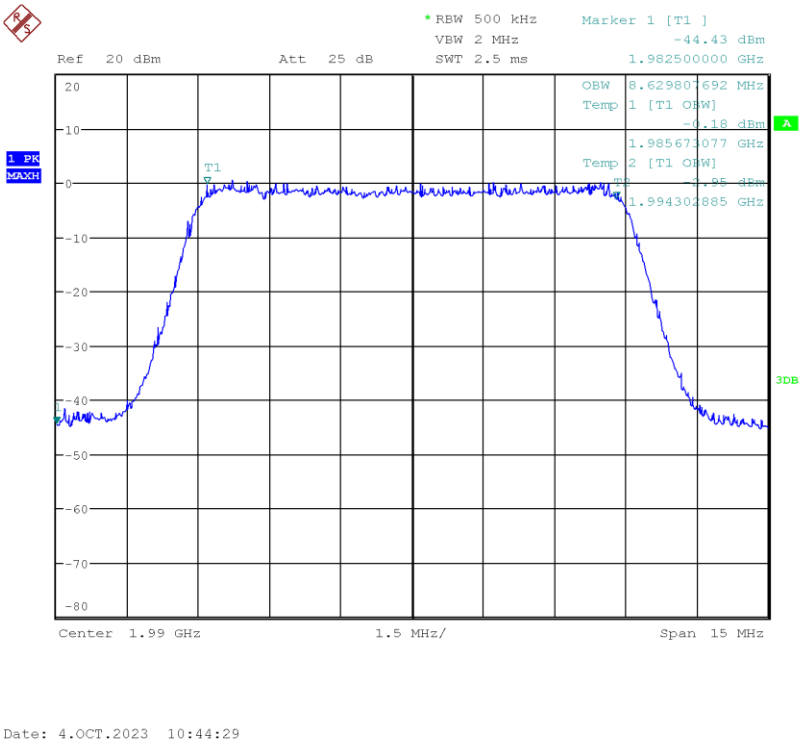


Figure 88: 99% Bandwidth, QPSK/64QAM, 10 MHz BW High channel

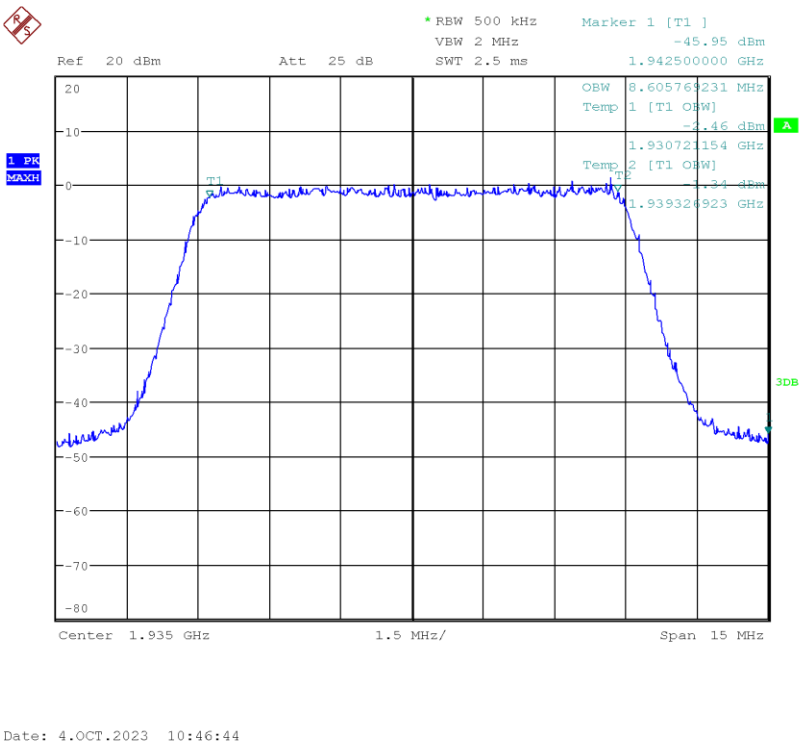


Figure 89: 99% Bandwidth, QPSK/256QAM, 10 MHz BW Low channel

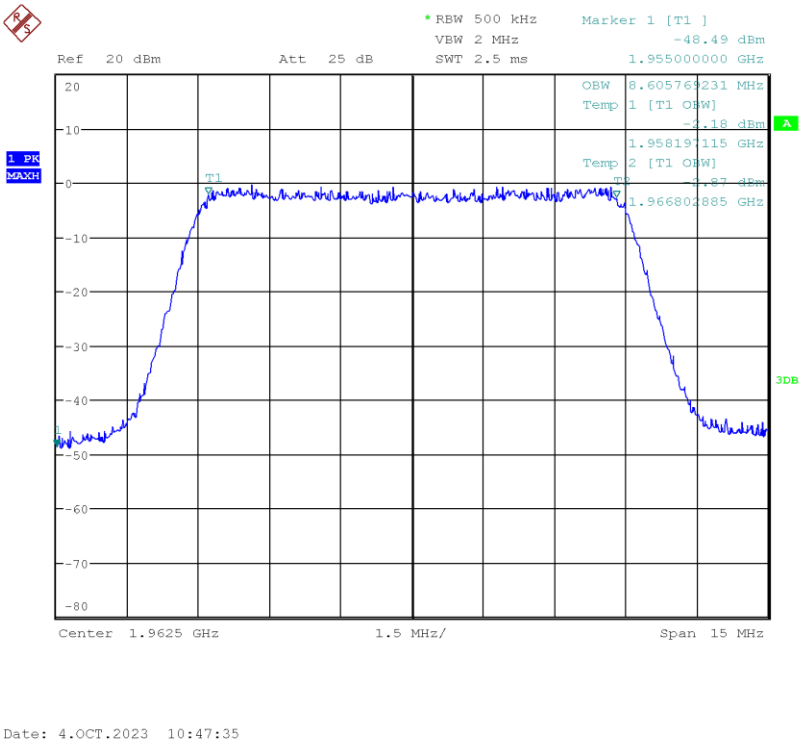


Figure 90: 99% Bandwidth, QPSK/256QAM, 10 MHz BW Mid channel

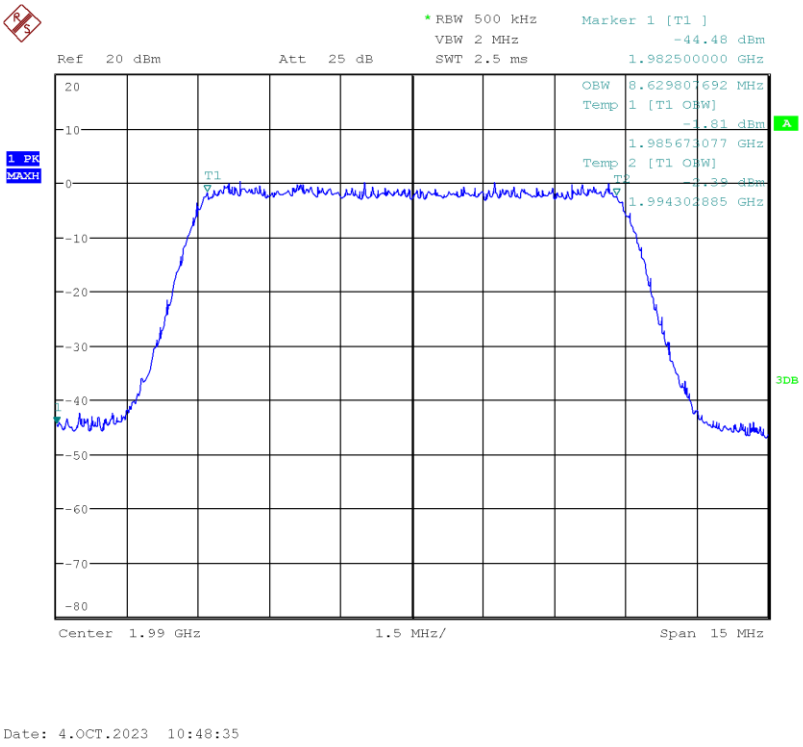


Figure 91: 99% Bandwidth, QPSK/256QAM, 10 MHz BW High channel

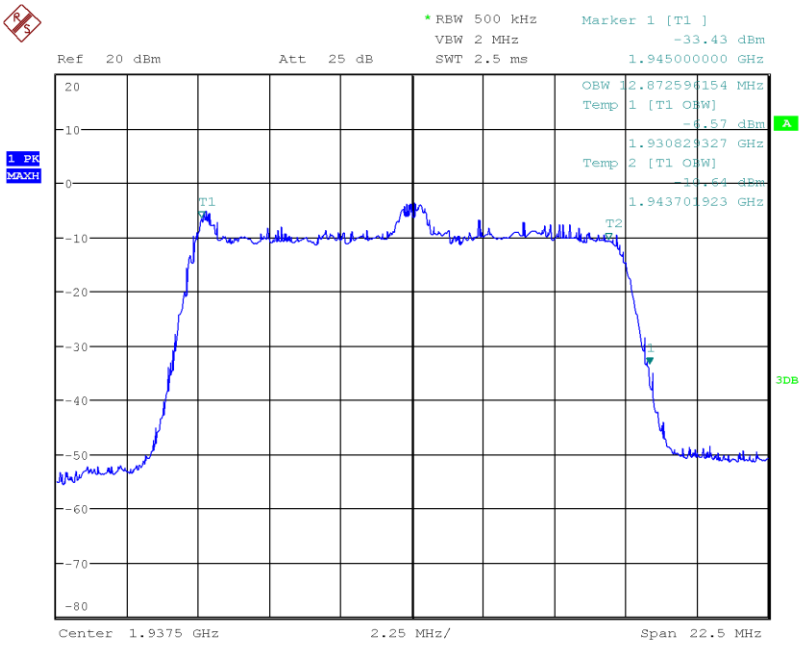


Figure 92: 99% Bandwidth, QPSK/16QAM, 10 MHz BW Low channel

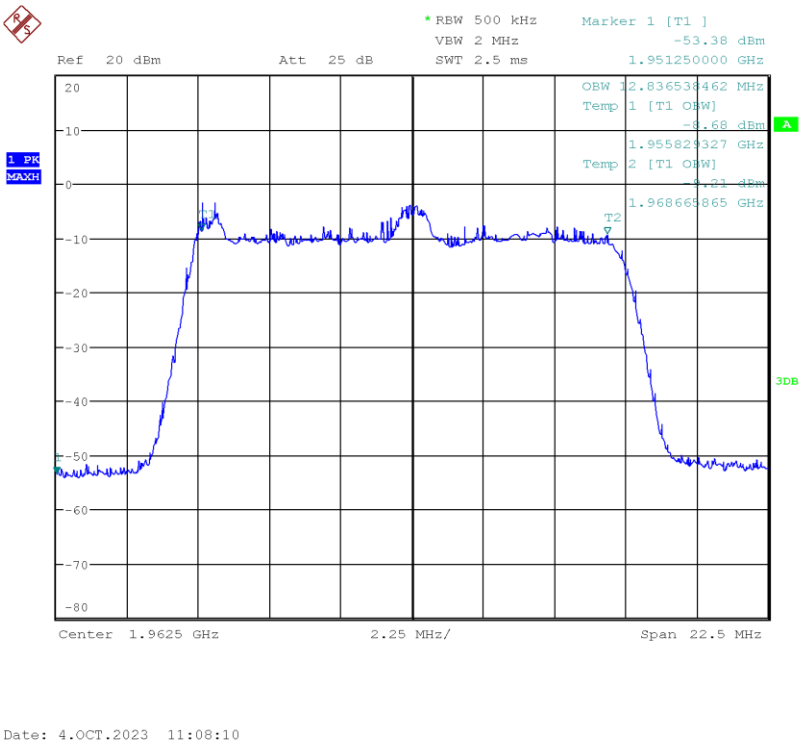


Figure 93: 99% Bandwidth, QPSK/16QAM, 15 MHz BW Mid channel

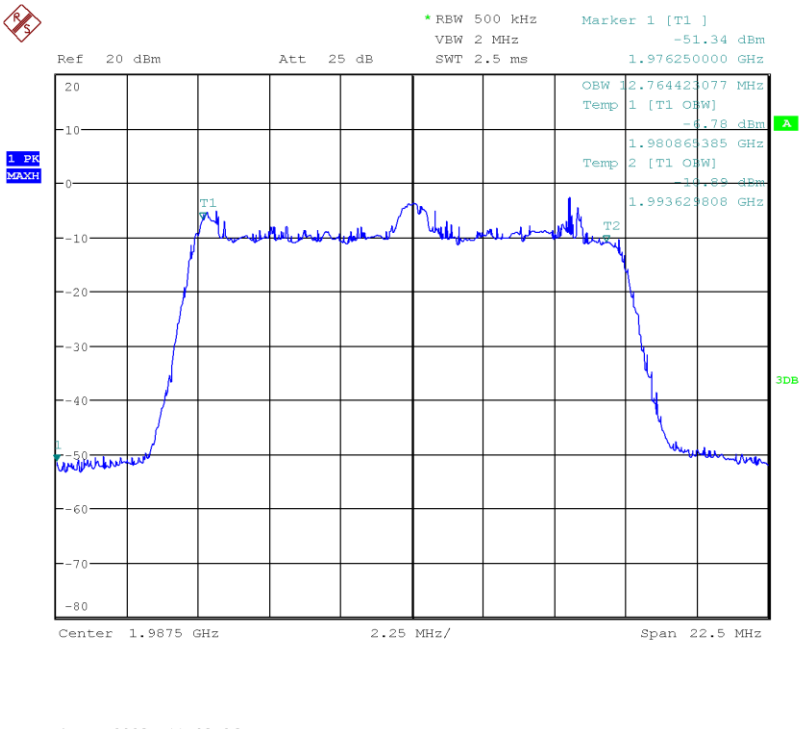


Figure 94: 99% Bandwidth, QPSK/16QAM, 15 MHz BW High channel

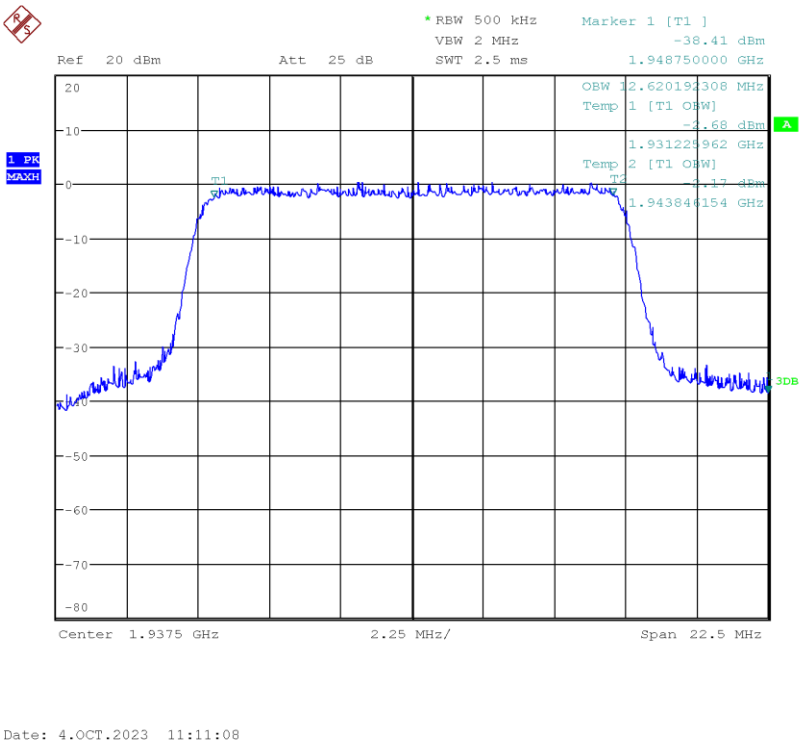


Figure 95: 99% Bandwidth, QPSK/64QAM, 15 MHz BW Low channel

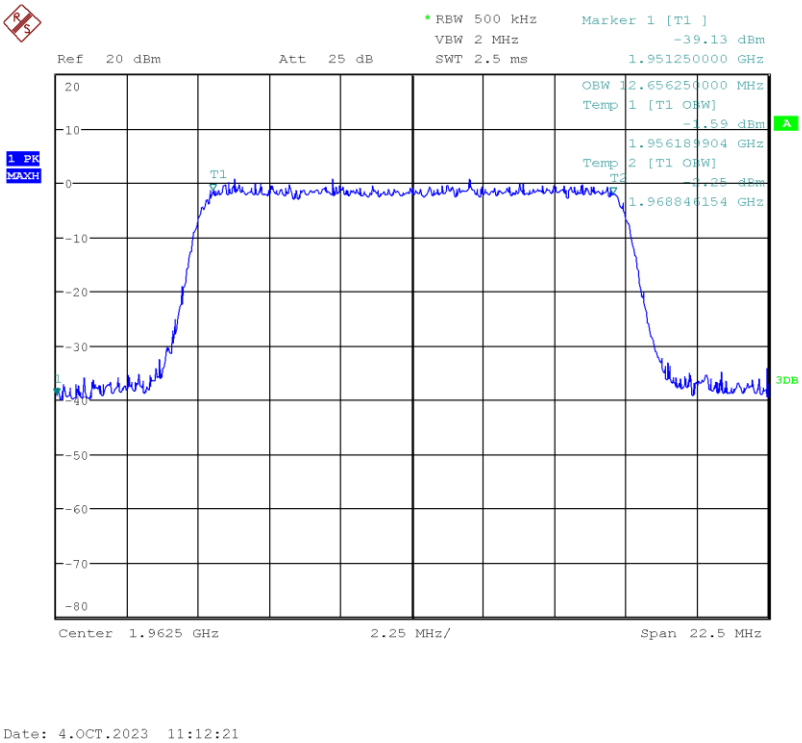


Figure 96: 99% Bandwidth, QPSK/64QAM, 15 MHz BW Mid channel

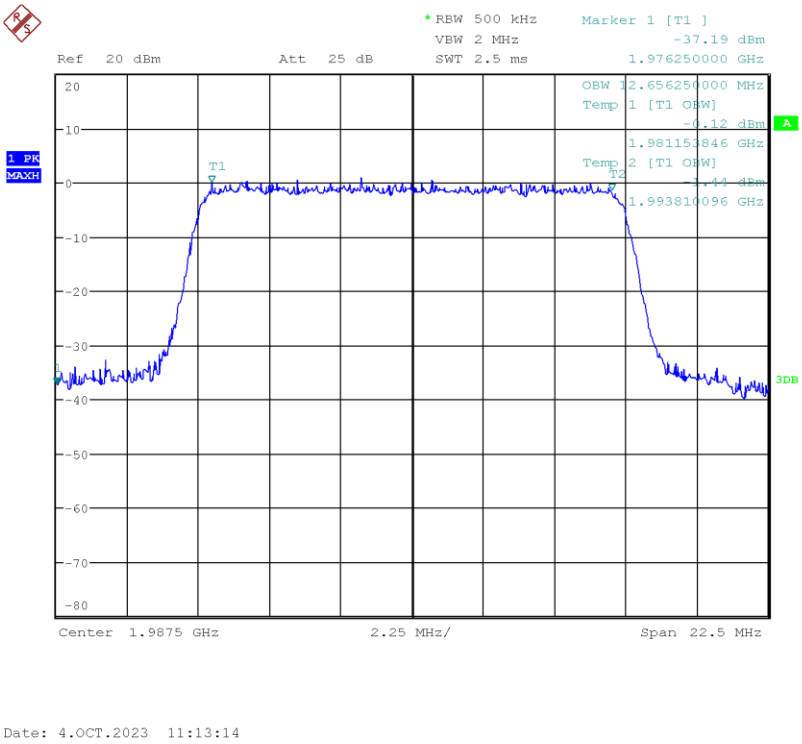


Figure 97: 99% Bandwidth, QPSK/64QAM, 15 MHz BW High channel

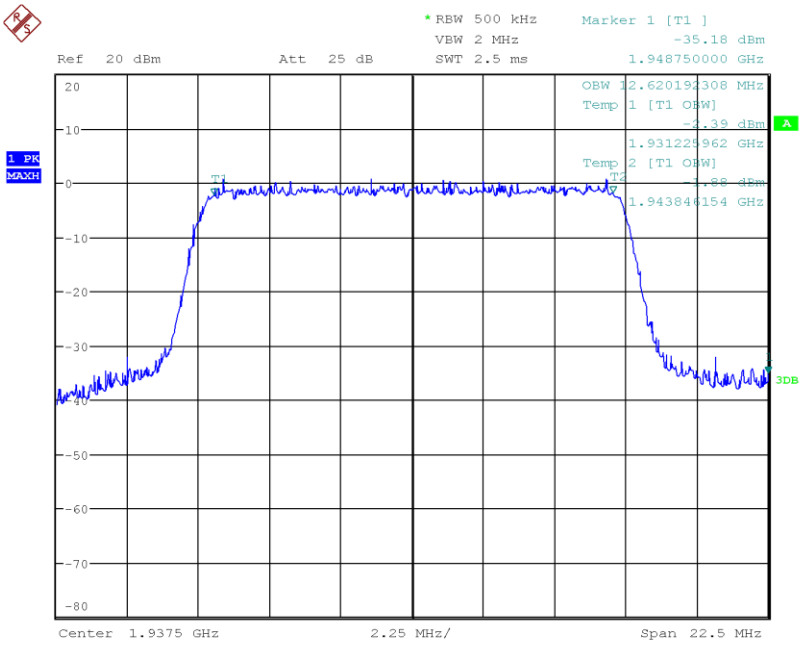


Figure 98: 99% Bandwidth, QPSK/256QAM, 15 MHz BW Low channel

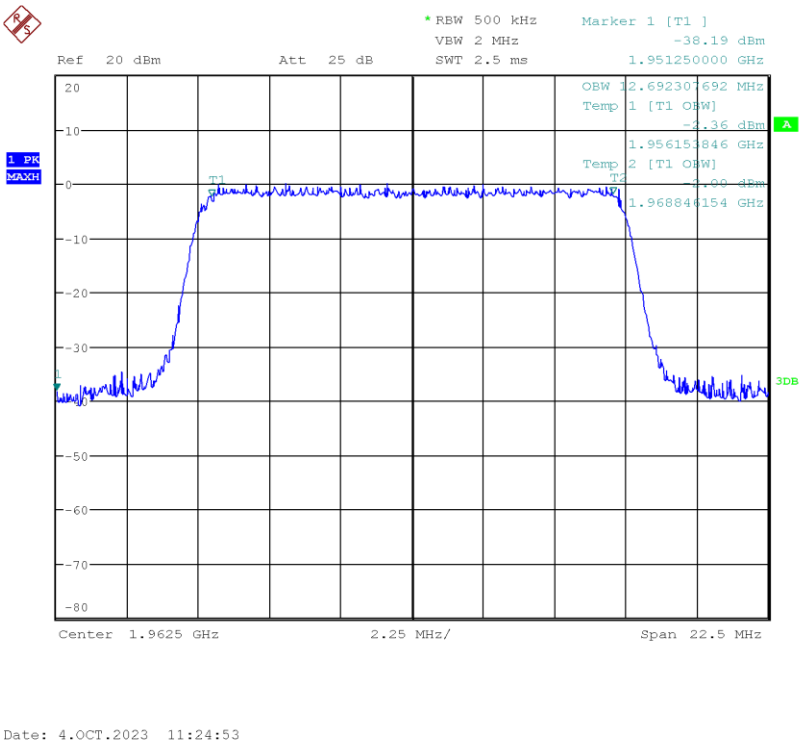


Figure 99: 99% Bandwidth, QPSK/256QAM, 15 MHz BW Mid channel

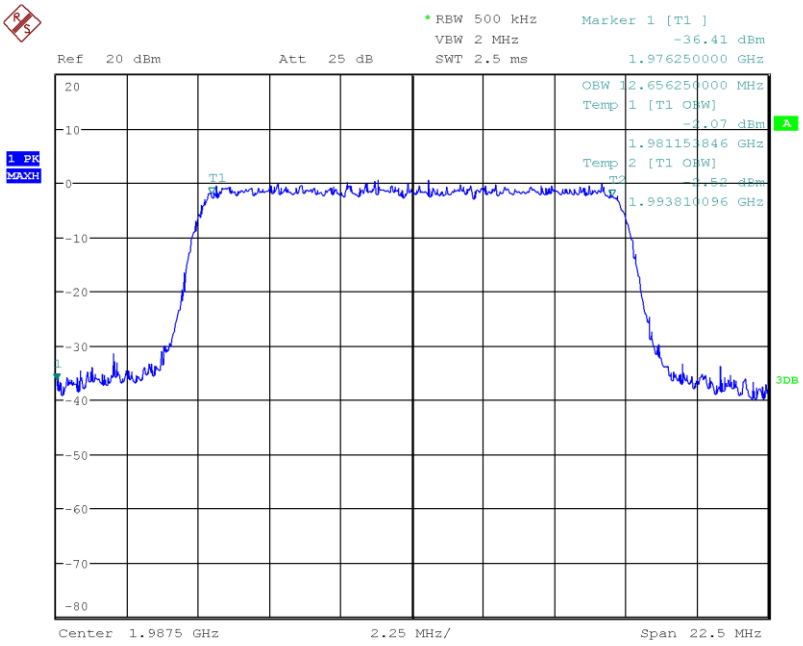


Figure 100: 99% Bandwidth, QPSK/256QAM, 15 MHz BW High channel

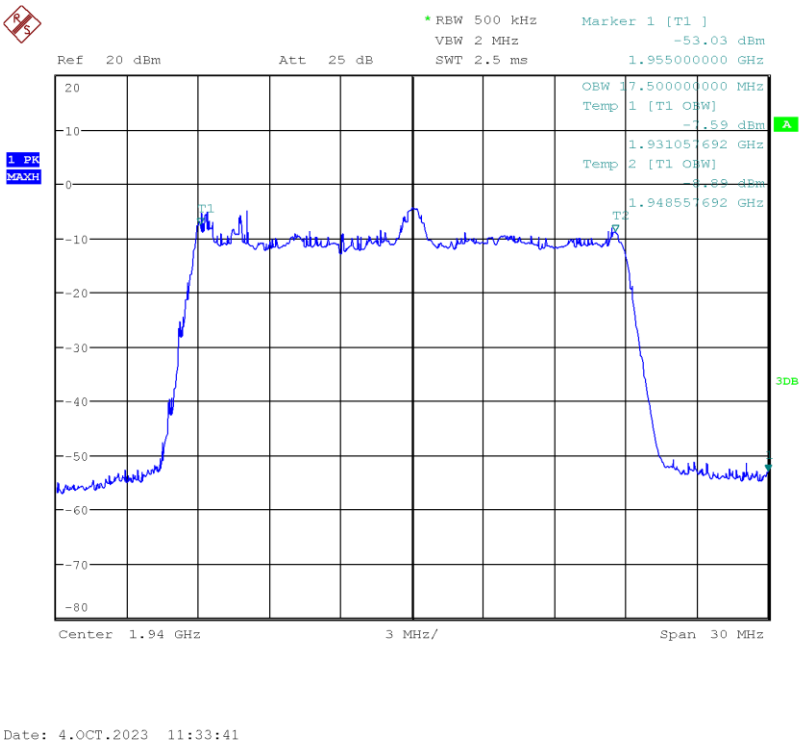


Figure 101: 99% Bandwidth, QPSK/16QAM, 20 MHz BW Low channel

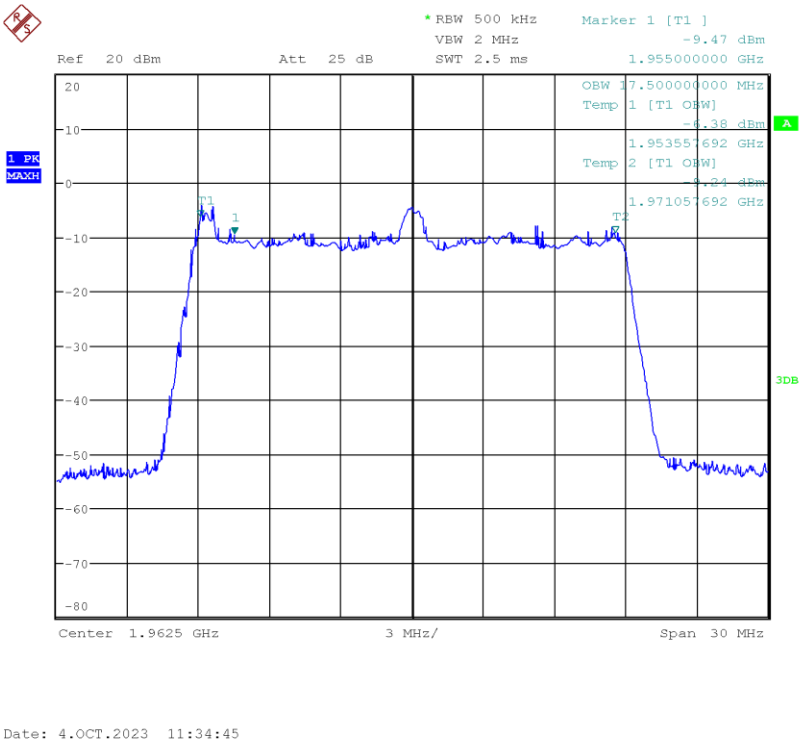


Figure 102: 99% Bandwidth, QPSK/16QAM, 20 MHz BW Mid channel

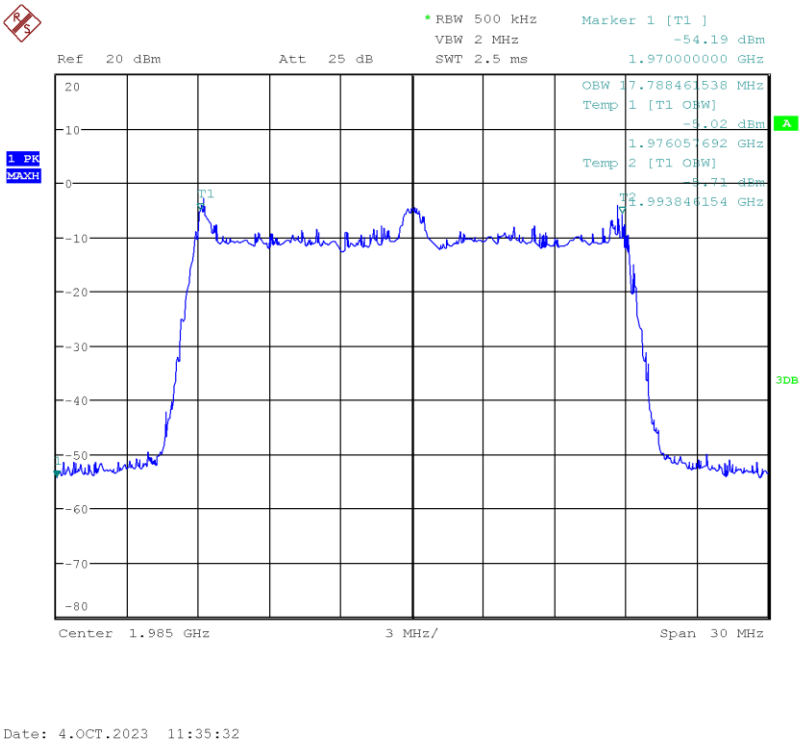


Figure 103: 99% Bandwidth, QPSK/16QAM, 20 MHz BW High channel

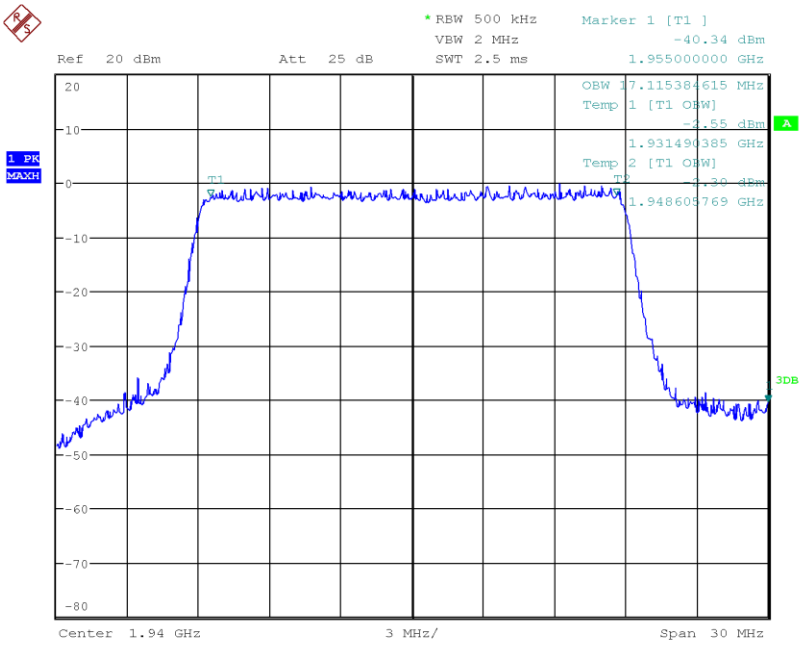


Figure 104: 99% Bandwidth, QPSK/64QAM, 20 MHz BW Low channel

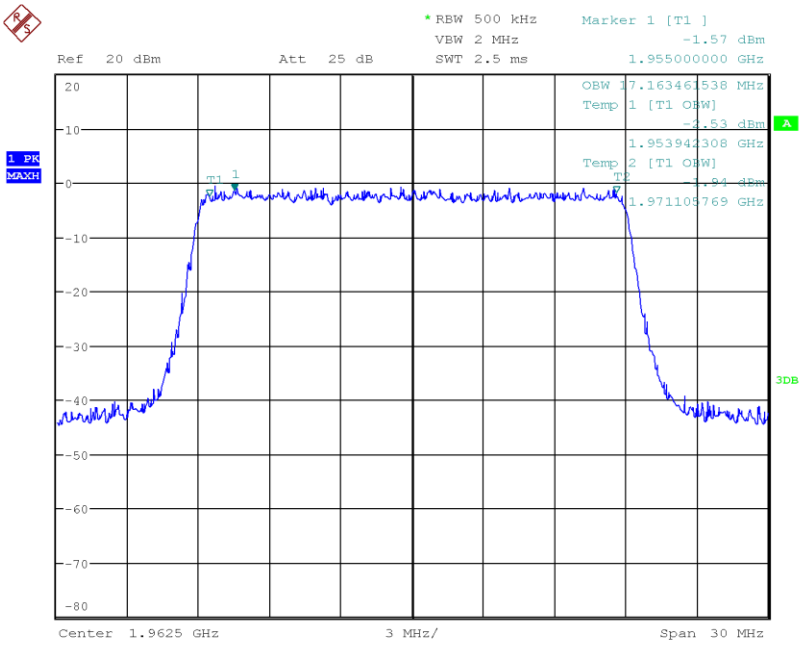


Figure 105: 99% Bandwidth, QPSK/64QAM, 20 MHz BW Mid channel

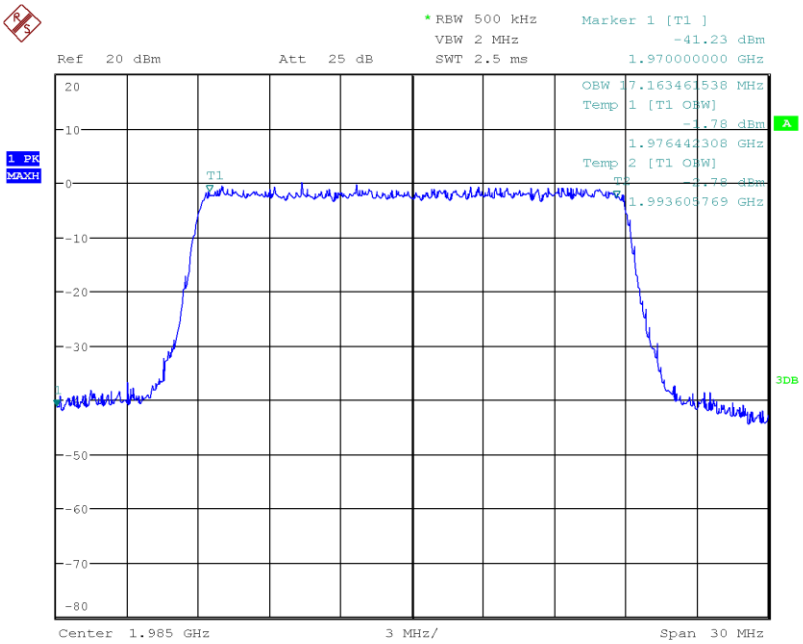


Figure 106: 99% Bandwidth, QPSK/64QAM, 20 MHz BW High channel

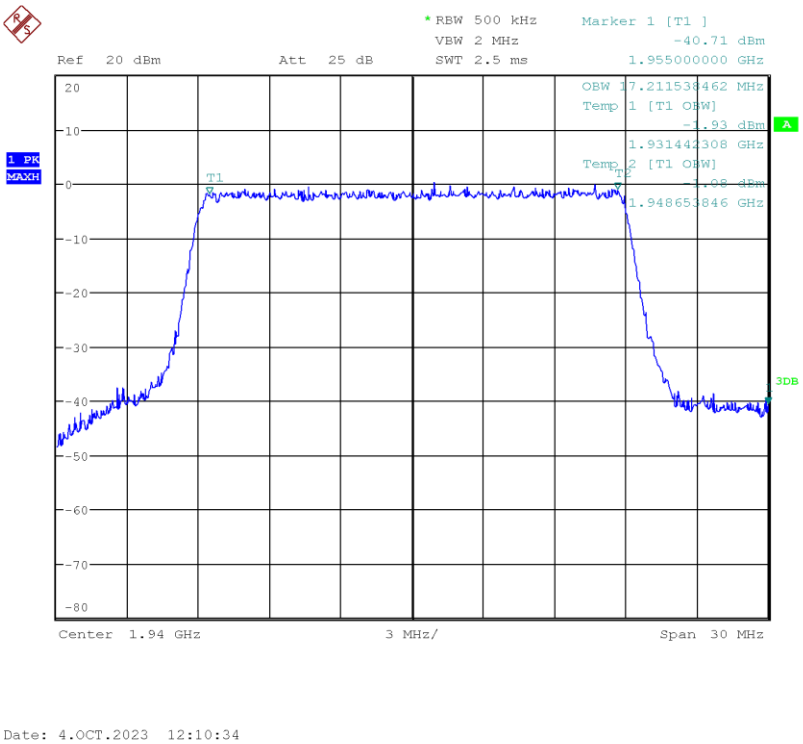


Figure 107: 99% Bandwidth, QPSK/256QAM, 20 MHz BW Low channel

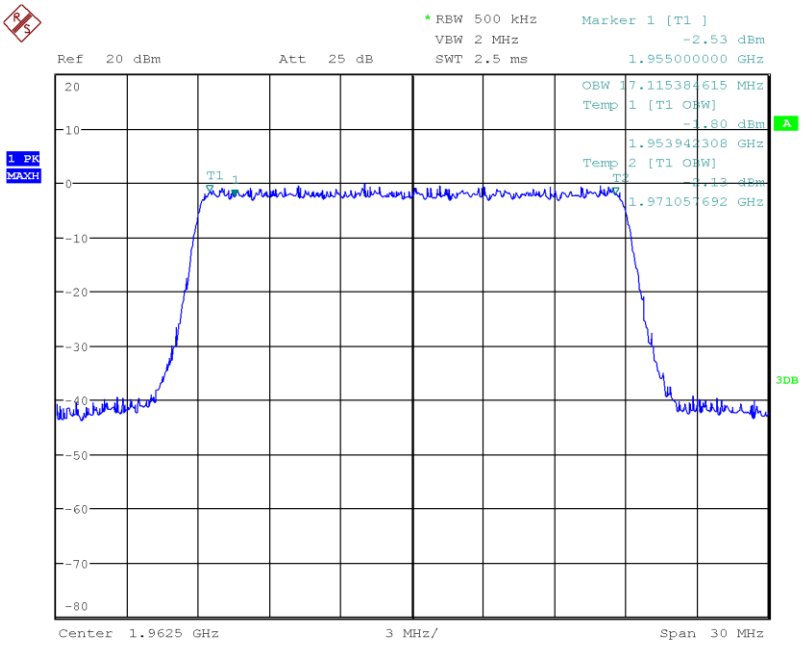


Figure 108: 99% Bandwidth, QPSK/256QAM, 20 MHz BW Mid channel

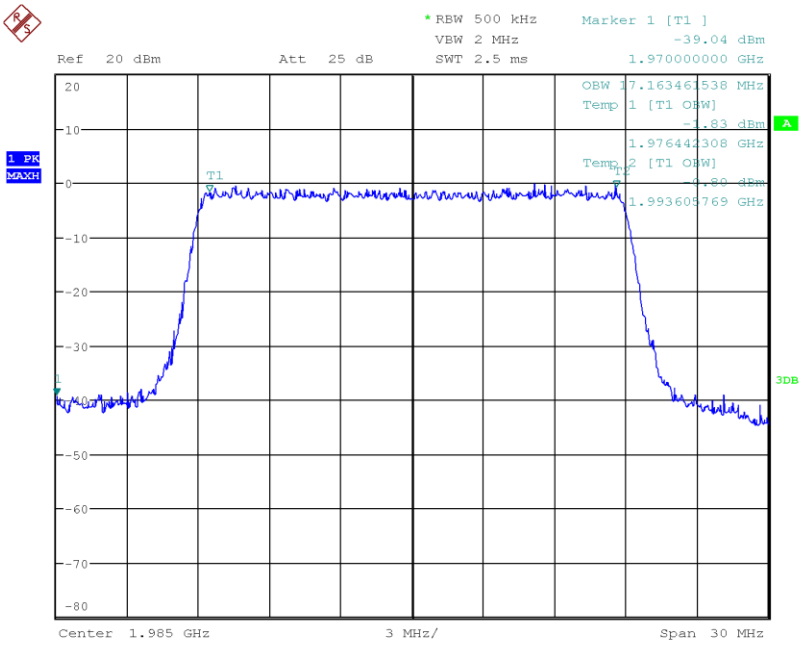


Figure 109: 99% Bandwidth, QPSK/256QAM, 20 MHz BW High channel

3.3 Band Edge

Date Performed:	October 6, 2023
Test Standard:	FCC CFR 47 Part 24.238 (a) RSS-133 Issue 6, 6.5.1(i) & (ii):
Test Method:	KDB 971168 D01 Power Meas License Digital Systems v03r01
Modifications:	None
Final Result:	Complies

Applicable Regulation:

FCC CFR 47 Part 24.238 (a):

> The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

RSS-133 Issue 6, 6.5.1 (i) & (ii):

> 6.5.1 Out-of-block emissions

i. In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$p(watts).
ii. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$p(watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

Test Setup:

The EUT was tested outside the SAC via output-conducted measurements per ANSI C63.26:2015.

Measurement Data and Plots:

Channel Frequency (MHz)	Band Edge	Modulation	Signal[1] Attenuation (dB)	Limit (dB)	Margin (dB)	Result
1932.5	Low	QPSK/16QAM	68.34	50.29	18.05	Complies
1992.5	High	QPSK/16QAM	69.62	49.90	19.72	Complies
1932.5	Low	QPSK/64QAM	61.57	54.91	6.66	Complies
1992.5	High	QPSK/64QAM	60.57	54.73	5.84	Complies
1932.5	Low	QPSK/256QAM	65.22	55.26	9.96	Complies
1992.5	High	QPSK/256QAM	64.36	54.61	9.75	Complies

[1] Signal attenuation measured from RMS peak; see section 3.1 of this report

Table 30: Band Edge, 5 MHz BW

Channel Frequency (MHz)	Band Edge	Modulation	Signal[1] Attenuation (dB)	Limit (Minimum) (dB)	Margin (dB)	Result
1935	Low	QPSK/16QAM	68.39	51.27	17.12	Complies
1990	High	QPSK/16QAM	62.01	49.91	12.10	Complies
1935	Low	QPSK/64QAM	60.96	55.96	5.00	Complies
1990	High	QPSK/64QAM	58.2	55.49	2.71	Complies
1935	Low	QPSK/256QAM	59.39	56.20	3.19	Complies
1990	High	QPSK/256QAM	58.76	55.91	2.85	Complies

[1] Signal attenuation measured from RMS peak; see section 3.1 of this report

Table 31: Band Edge, 10 MHz BW

Channel Frequency (MHz)	Band Edge	Modulation	Signal[1] Attenuation (dB)	Limit (Minimum) (dB)	Margin (dB)	Result
1935	Low	QPSK/16QAM	68.44	50.82	17.62	Complies
1990	High	QPSK/16QAM	69.84	50.74	19.10	Complies
1935	Low	QPSK/64QAM	59.87	57.29	2.58	Complies
1990	High	QPSK/64QAM	60.72	57.14	3.58	Complies
1935	Low	QPSK/256QAM	59.71	57.02	2.69	Complies
1990	High	QPSK/256QAM	60.18	57.08	3.10	Complies

[1] Signal attenuation measured from RMS peak; see section 3.1 of this report

Table 32: Band Edge, 15 MHz BW

Channel Frequency (MHz)	Band Edge	Modulation	Signal[1] Attenuation (dB)	Limit (Minimum) (dB)	Margin (dB)	Result
1935	Low	QPSK/16QAM	69.56	51.02	18.54	Complies
1990	High	QPSK/16QAM	67.04	50.59	16.45	Complies
1935	Low	QPSK/64QAM	57.54	57.07	0.47	Complies
1990	High	QPSK/64QAM	57.7	57.11	0.59	Complies
1935	Low	QPSK/256QAM	57.32	57.13	0.19	Complies
1990	High	QPSK/256QAM	57.43	57.09	0.34	Complies

[1] Signal attenuation measured from RMS peak; see section 3.1 of this report

Table 33: Band Edge, 20 MHz BW

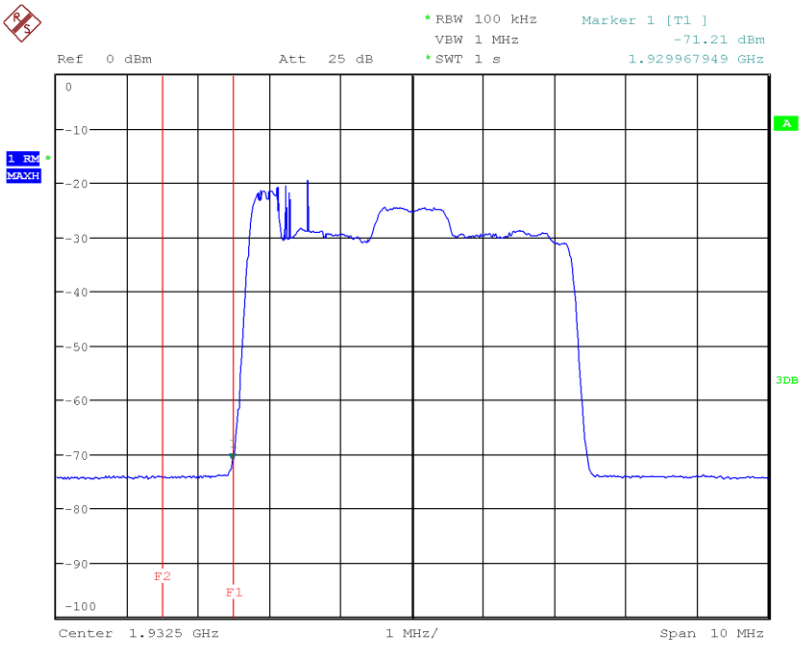


Figure 110: Low Band Edge, 5 MHz BW, QPSK/16QAM

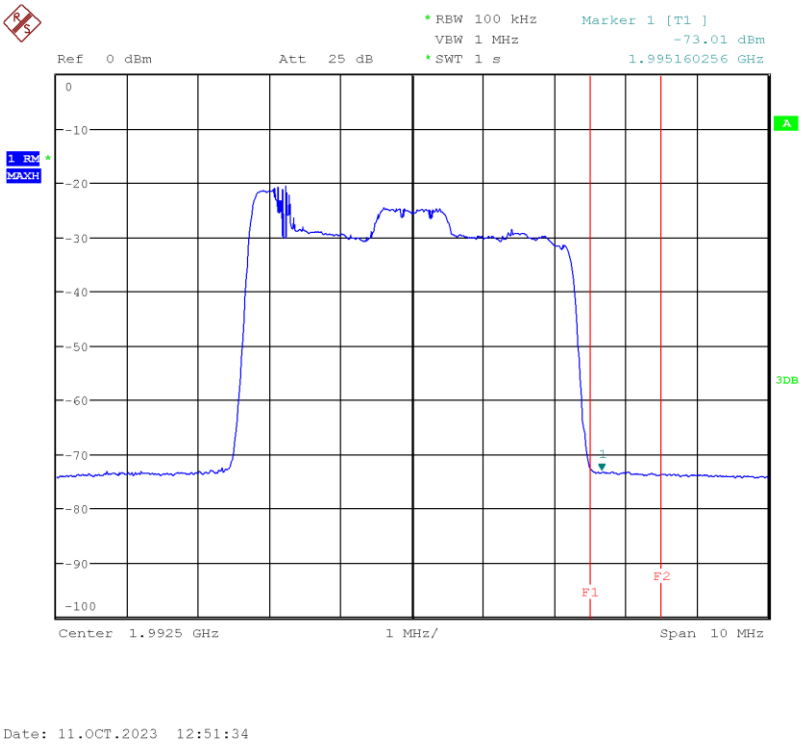


Figure 111: High Band Edge, 5 MHz BW, QPSK/16QAM

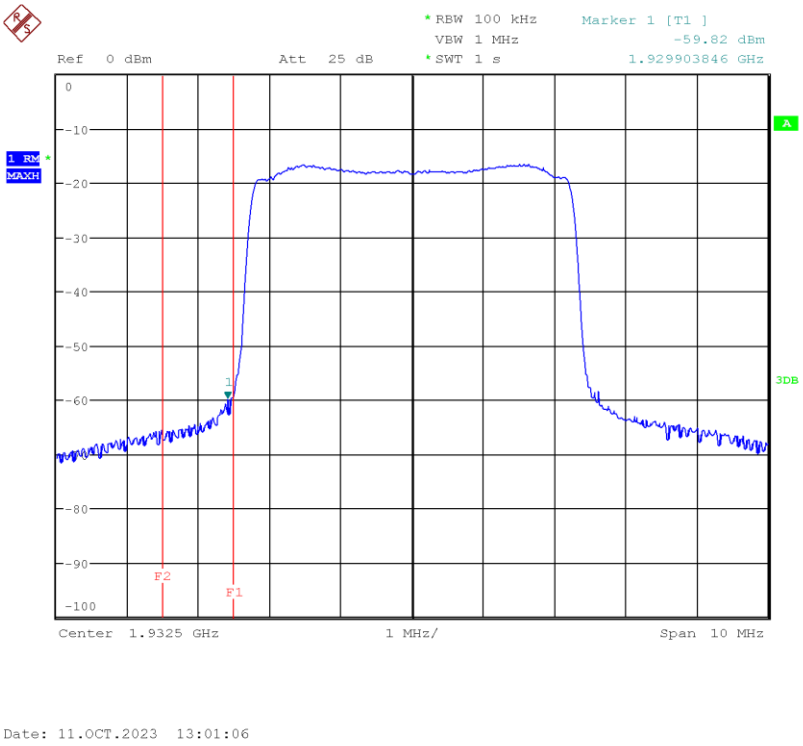


Figure 112: Low Band Edge, 5 MHz BW, QPSK/64QAM

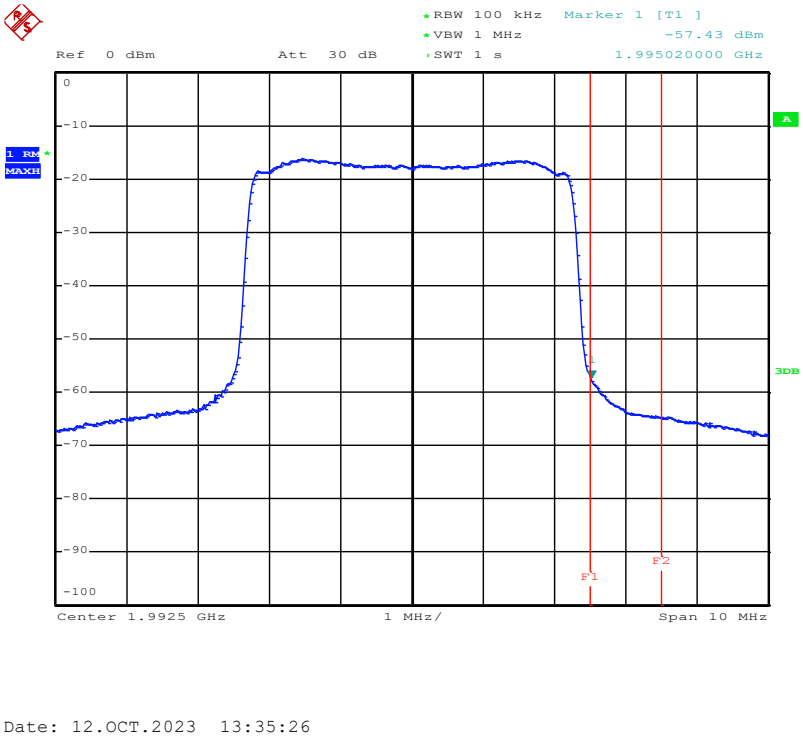


Figure 113: High Band Edge, 5 MHz BW, QPSK/64QAM

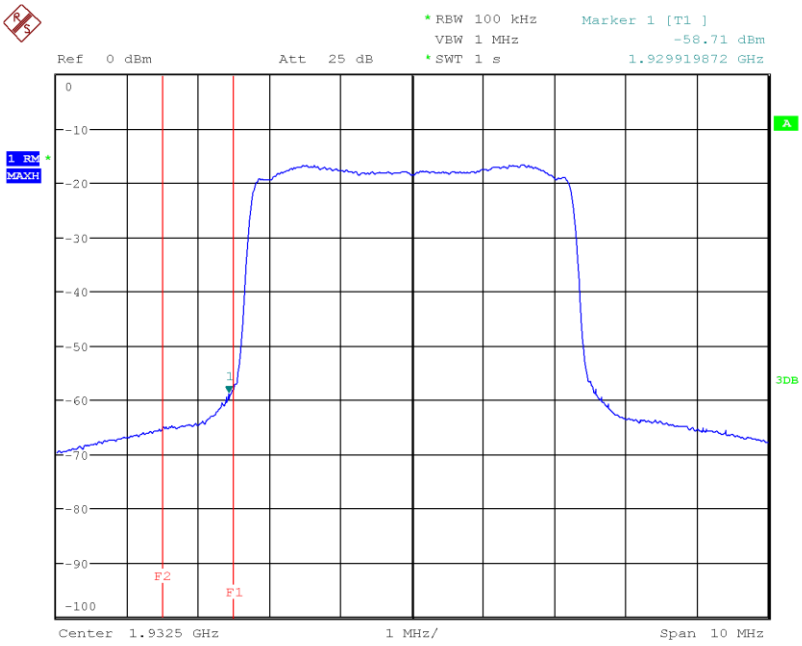


Figure 114: Low Band Edge, 5 MHz BW, QPSK/256QAM

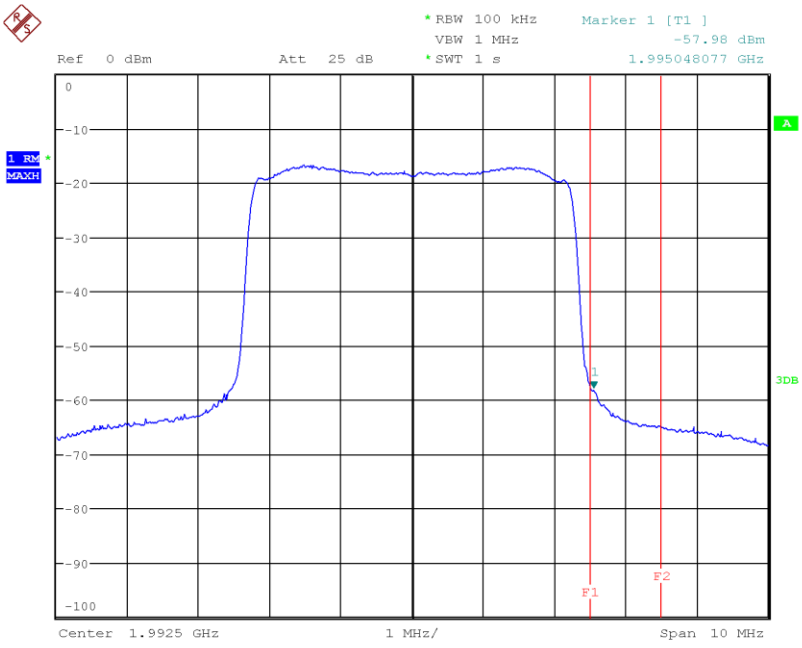


Figure 115: High Band Edge, 5 MHz BW, QPSK/256QAM

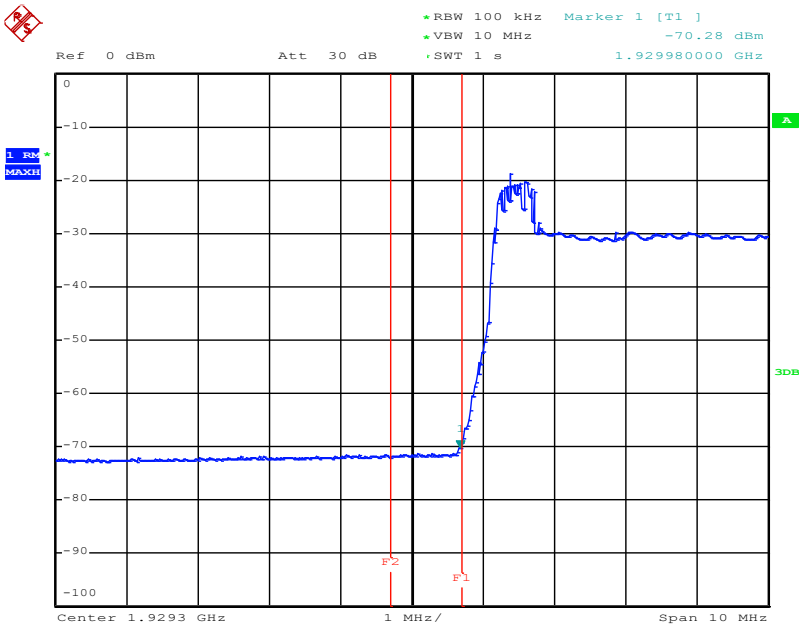


Figure 116: Low Band Edge, 10 MHz BW, QPSK/16QAM

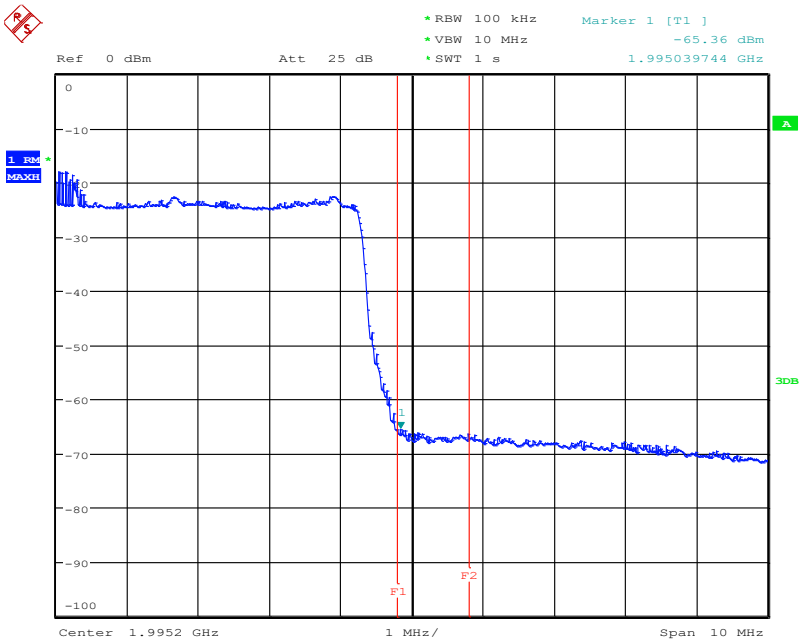
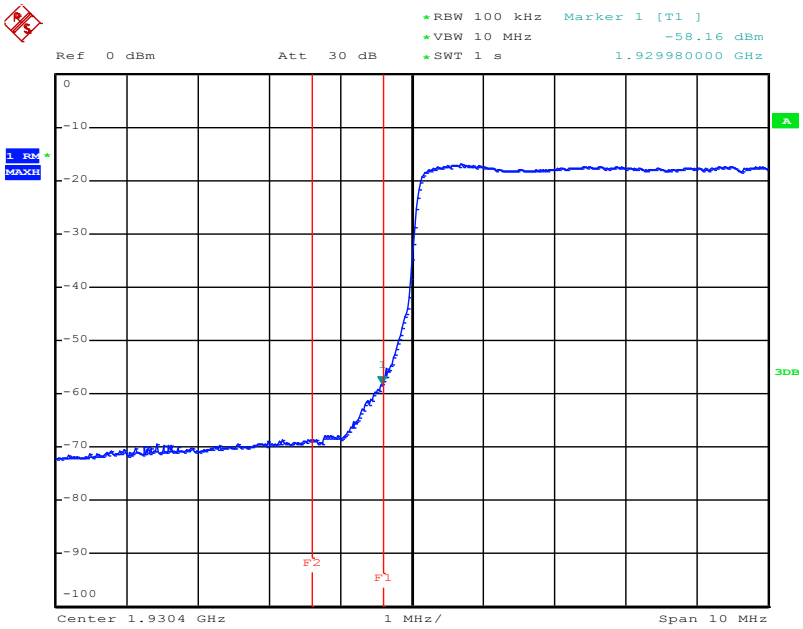
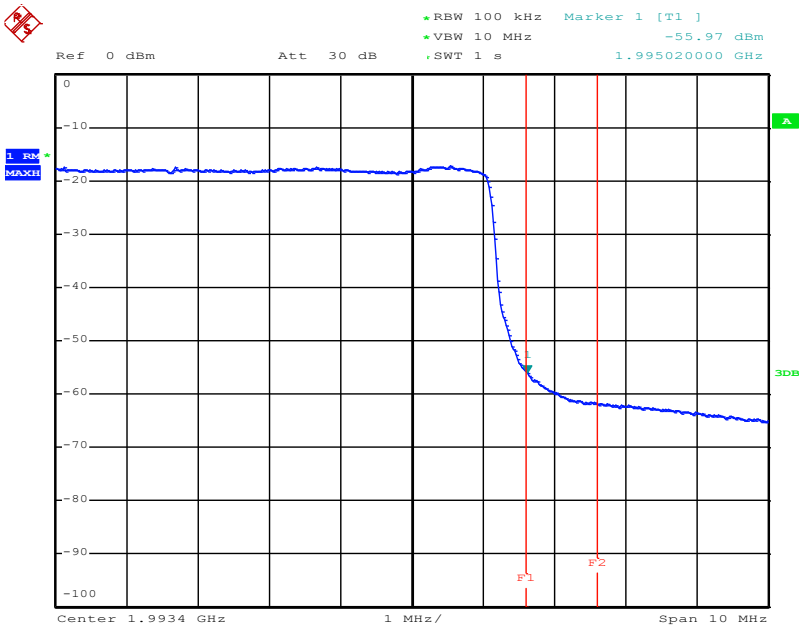


Figure 117: High Band Edge, 10 MHz BW, QPSK/16QAM



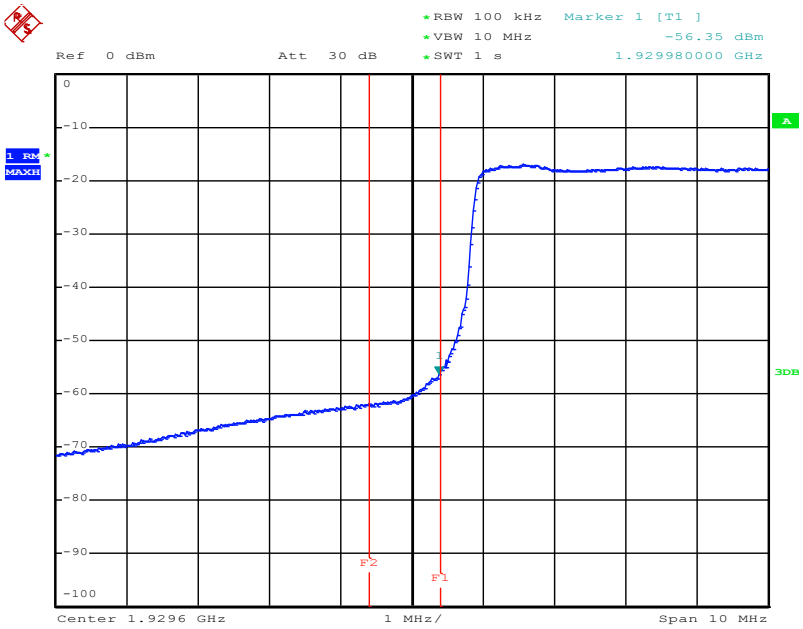
Date: 11.OCT.2023 19:20:12

Figure 118: Low Band Edge, 10 MHz BW, QPSK/64QAM



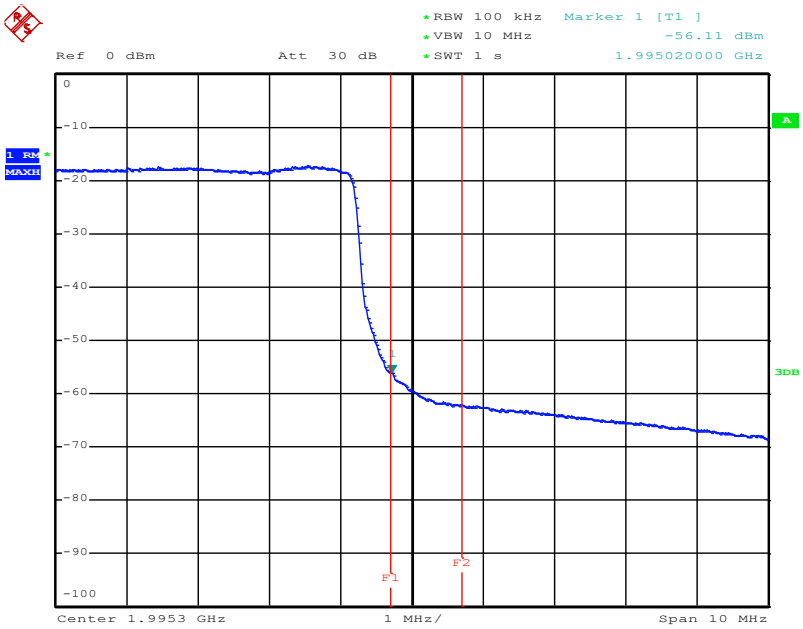
Date: 11.OCT.2023 19:24:48

Figure 119: High Band Edge, 10 MHz BW, QPSK/64QAM



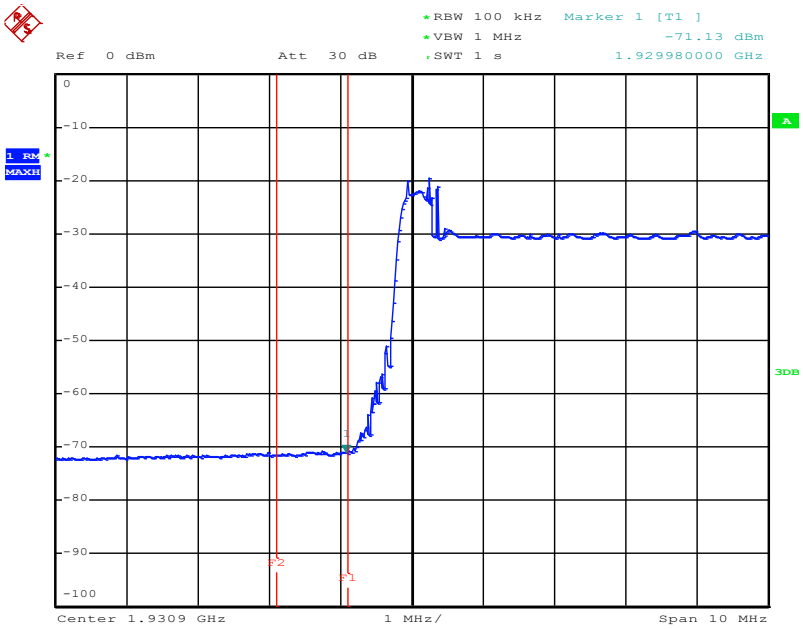
Date: 11.OCT.2023 19:30:28

Figure 120: Low Band Edge, 10 MHz BW, QPSK/256QAM



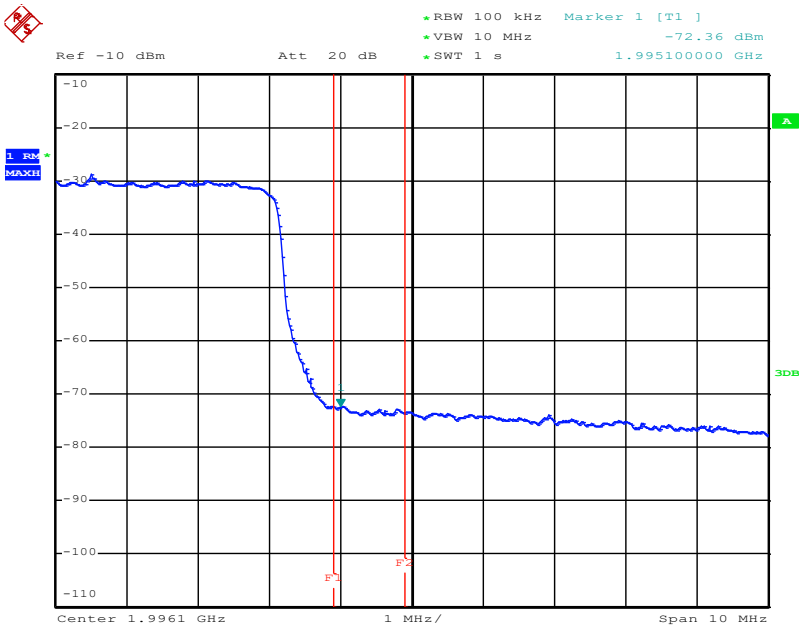
Date: 11.OCT.2023 19:35:37

Figure 121: High Band Edge, 10 MHz BW, QPSK/256QAM



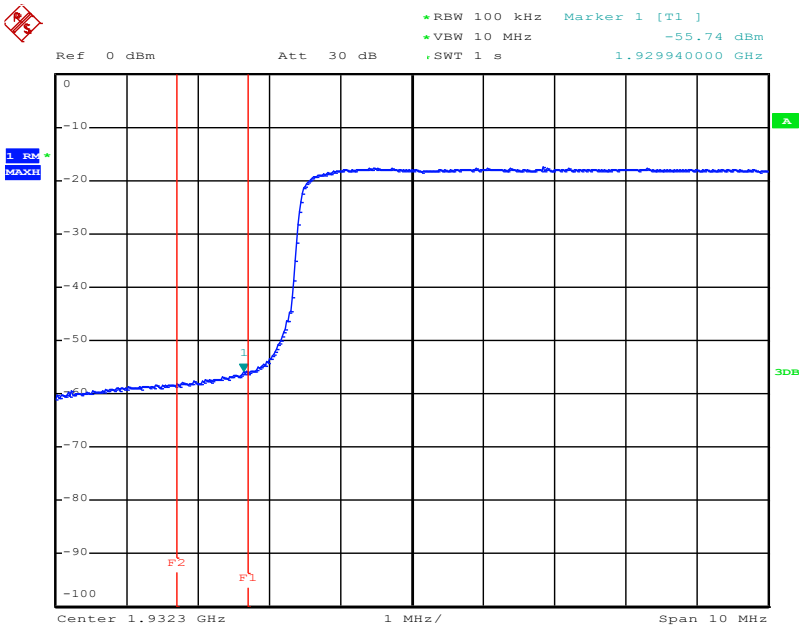
Date: 12.OCT.2023 14:02:06

Figure 122: Low Band Edge, 15 MHz BW, QPSK/16QAM



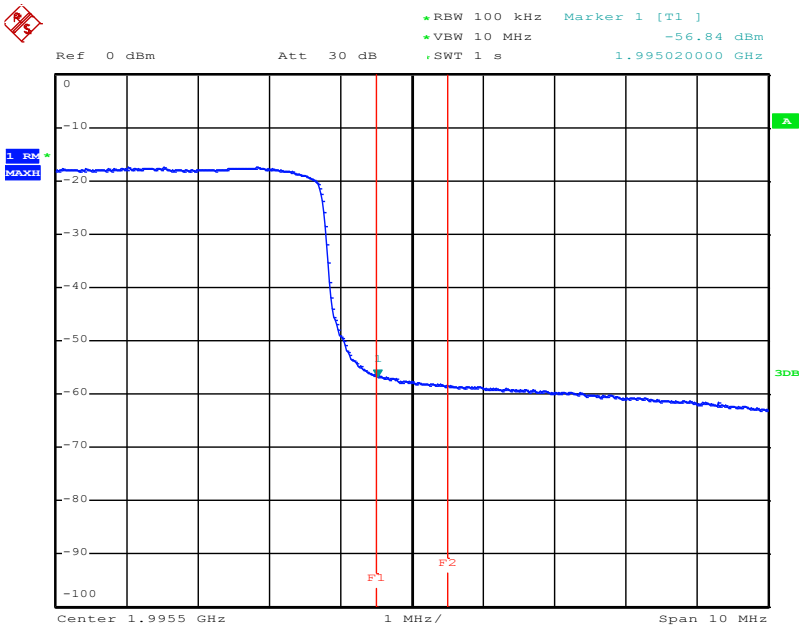
Date: 11.OCT.2023 20:18:51

Figure 123: High Band Edge, 15 MHz BW, QPSK/16QAM



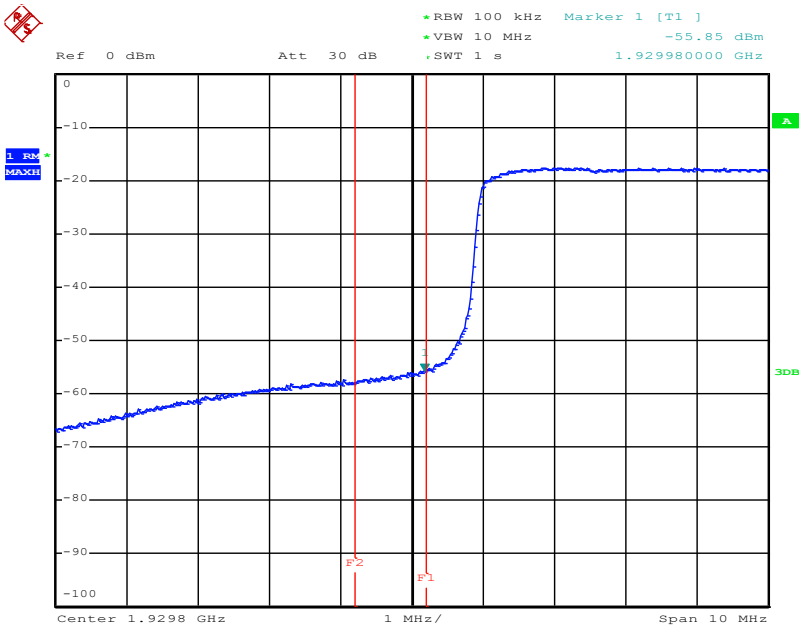
Date: 11.OCT.2023 20:24:29

Figure 124: Low Band Edge, 15 MHz BW, QPSK/64QAM



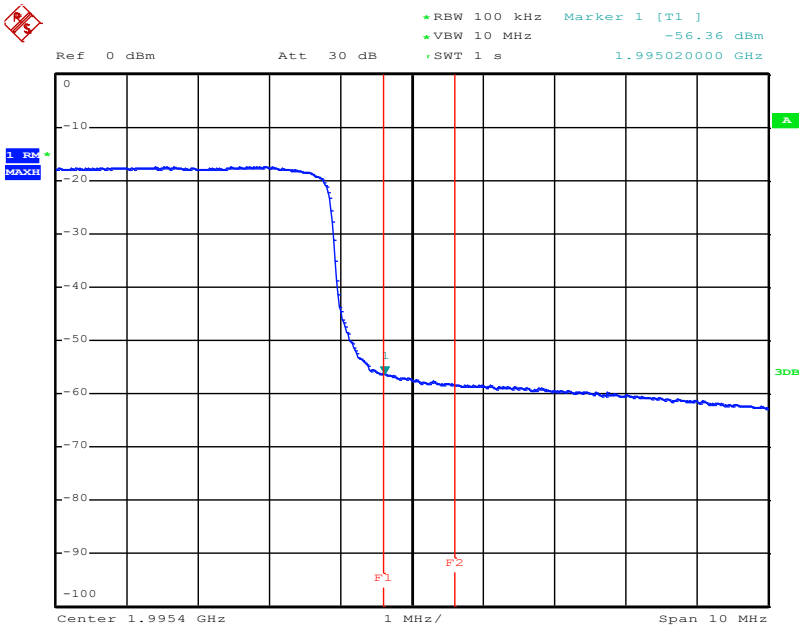
Date: 11.OCT.2023 20:26:27

Figure 125: High Band Edge, 15 MHz BW, QPSK/64QAM



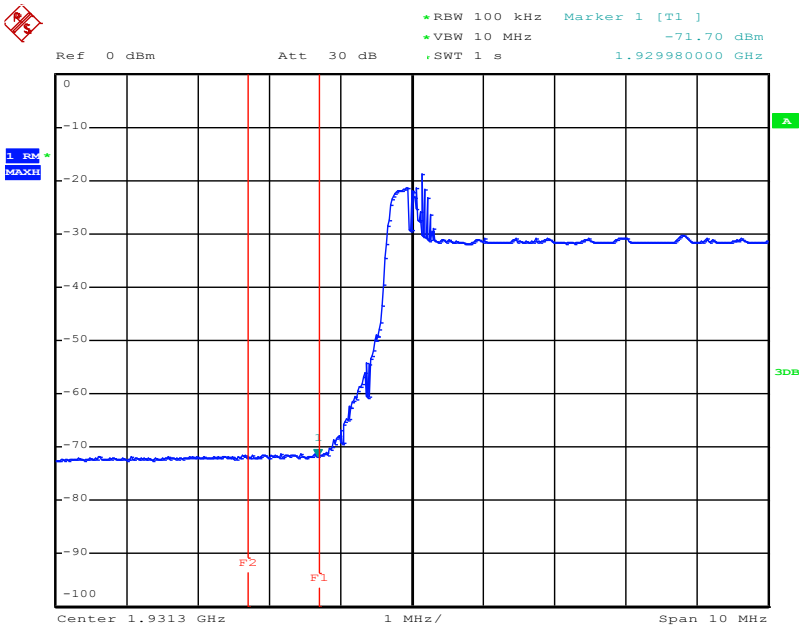
Date: 11.OCT.2023 20:30:32

Figure 126: Low Band Edge, 15 MHz BW, QPSK/256QAM



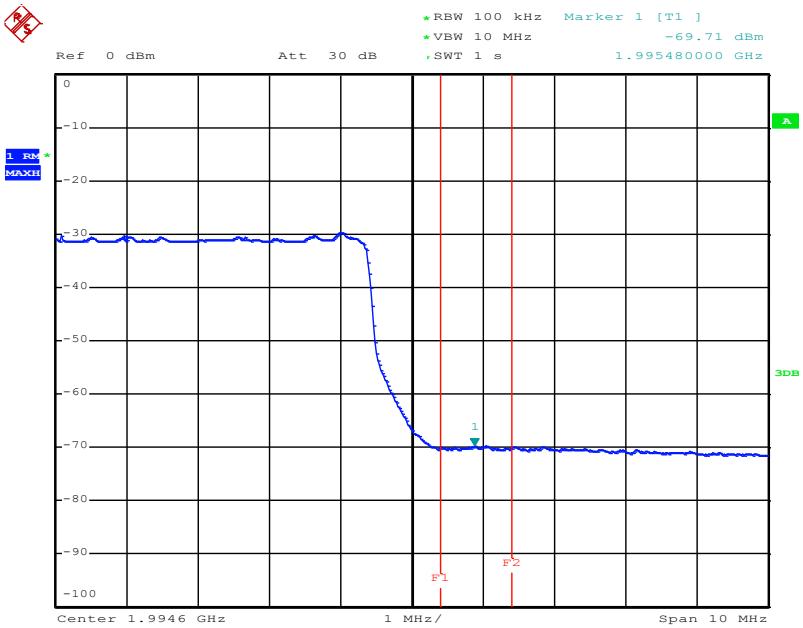
Date: 11.OCT.2023 20:33:28

Figure 127: High Band Edge, 15 MHz BW, QPSK/256QAM



Date: 11.OCT.2023 20:40:48

Figure 128: Low Band Edge, 20 MHz BW, QPSK/16QAM



Date: 11.OCT.2023 20:45:29

Figure 129: High Band Edge, 20 MHz BW, QPSK/16QAM

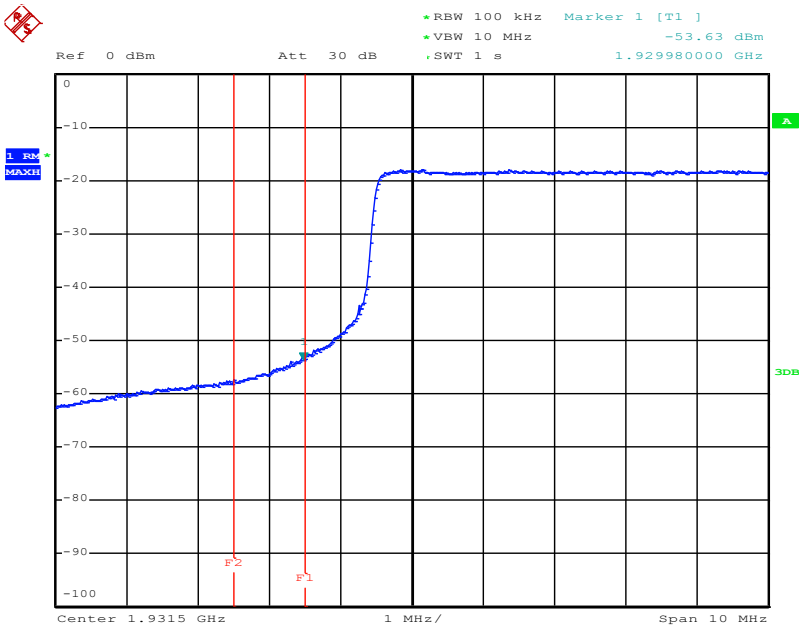


Figure 130: Low Band Edge, 20 MHz BW, QPSK/64QAM

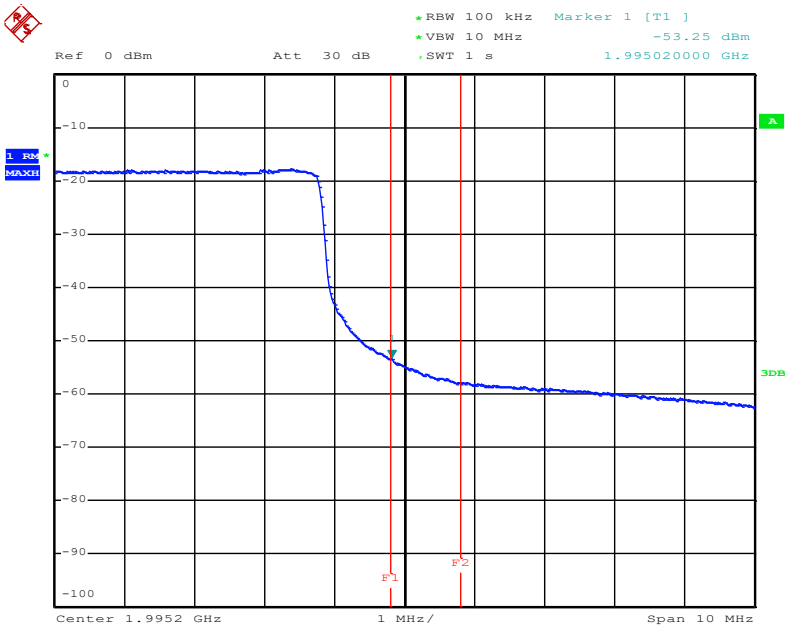
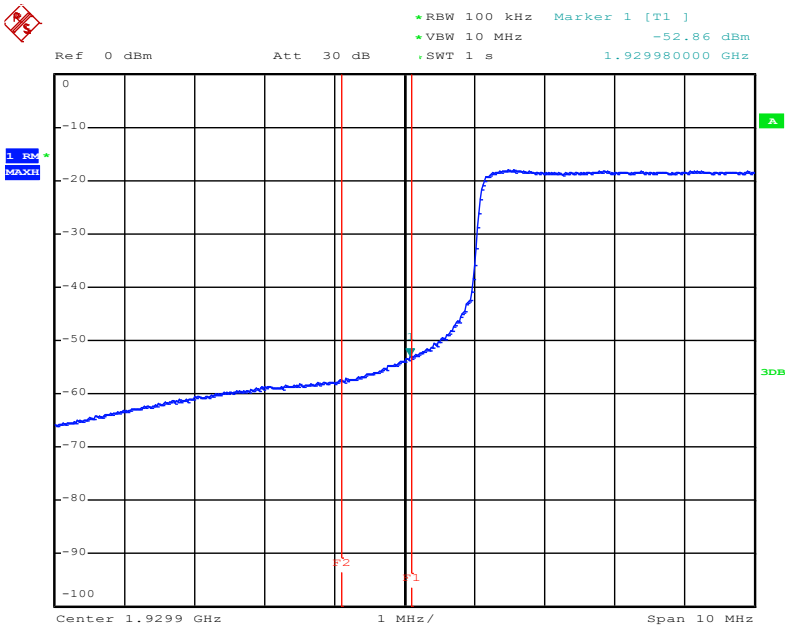
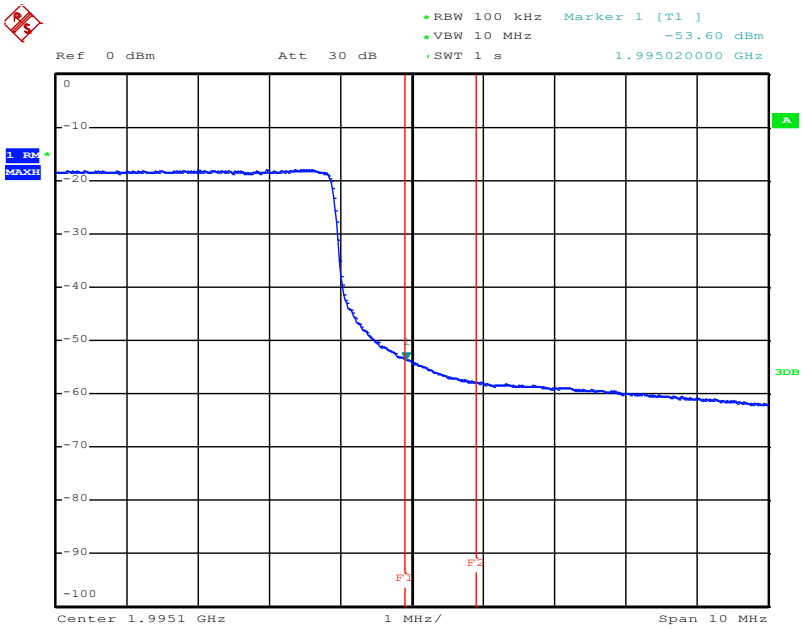


Figure 131: High Band Edge, 20 MHz BW, QPSK/64QAM



Date: 11.OCT.2023 20:57:22

Figure 132: Low Band Edge, 20 MHz BW, QPSK/256QAM



Date: 11.OCT.2023 21:03:09

Figure 133: High Band Edge, 20 MHz BW, QPSK/256QAM

3.4 RF Conducted Out of Band Emissions

Date Performed:	October 16, 2023
Test Standard:	FCC CFR 47 Part 24.238 (a) RSS-133 Issue 6 (6.5.1)
Test Method:	ANSI C63.10:2013
Modifications:	None
Final Result:	Complies

Applicable Regulation:

FCC CFR 47 Part 24.238:

> The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.

RSS-133 Issue 6 (6.5.1):

> Equipment shall comply with the limits in (i) and (ii) below.
>
> i. In the 1.0 MHz bands immediately outside and adjacent to the equipment's operating frequency block, the emission power per any 1% of the emission bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$p(watts).
>
> ii. After the first 1.0 MHz, the emission power in any 1 MHz bandwidth shall be attenuated (in dB) below the transmitter output power P (dBW) by at least 43 + 10 $\log_{10}$p(watts). If the measurement is performed using 1% of the emission bandwidth, power integration over 1.0 MHz is required.

Test Setup:

The EUT was tested outside the SAC via output conducted measurements per ANSI C63.26:2015.

Measurement Data and Plots:

Channel Frequency (MHz)	BW (MHz)	Modulation	Signal Attenuation [1] (dB)	Limit (dB)	Margin (dB)	Result
1962.5	5	QPSK/16QAM	58.91	49.47	9.44	Complies
1962.5	5	QPSK/64QAM	63.92	54.61	9.31	Complies
1962.5	5	QPSK/256QAM	63.89	54.26	9.63	Complies
1962.5	10	QPSK/16QAM	59.85	50.30	9.55	Complies
1962.5	10	QPSK/64QAM	64.87	55.22	9.65	Complies
1962.5	10	QPSK/256QAM	64.86	55.22	9.64	Complies
1962.5	15	QPSK/16QAM	59.86	50.51	9.35	Complies
1962.5	15	QPSK/64QAM	66.68	57.11	9.57	Complies
1962.5	15	QPSK/256QAM	66.37	56.83	9.54	Complies
1962.5	20	QPSK/16QAM	59.79	50.29	9.50	Complies
1962.5	20	QPSK/64QAM	66.18	56.63	9.55	Complies
1962.5	20	QPSK/256QAM	66.85	57.26	9.59	Complies

[1] Signal attenuation measured from RMS peak; see section 3.1 of this report

Table 34: RF Conducted Out of Band Emissions

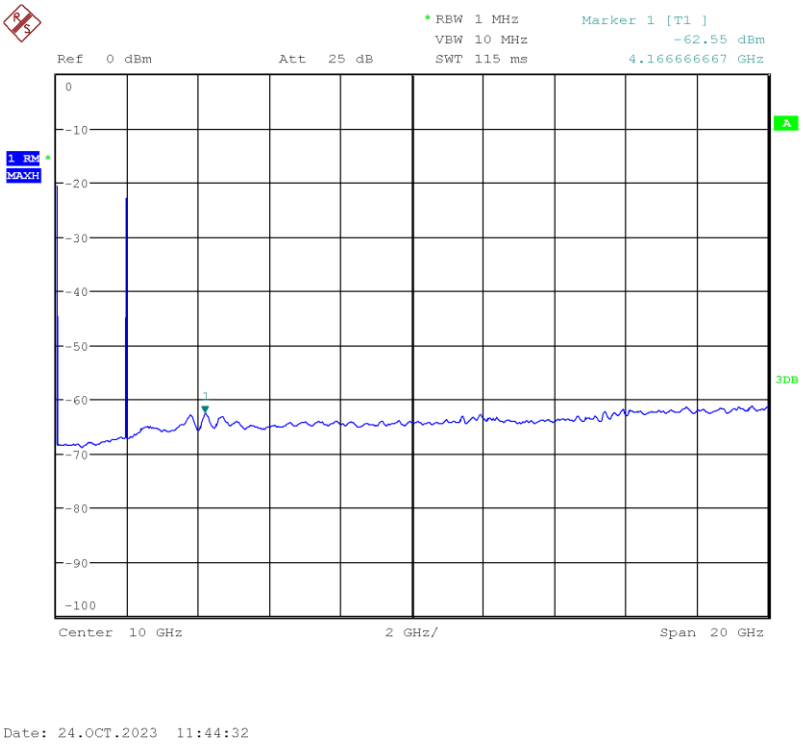


Figure 134: RF Conducted Out of Band Emissions, 5 MHz BW, QPSK/16QAM

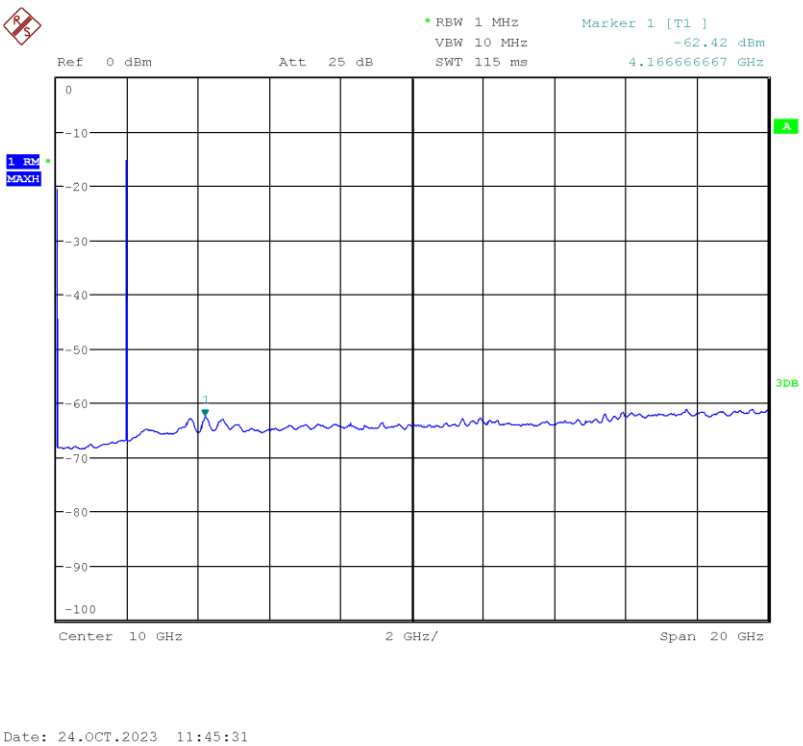


Figure 135: RF Conducted Out of Band Emissions, 5 MHz BW, QPSK/64QAM

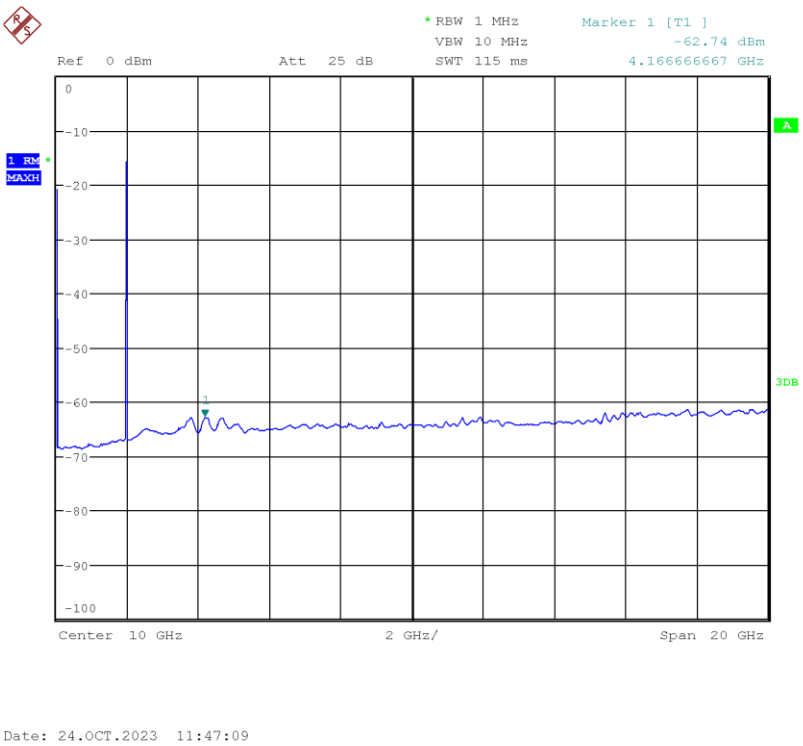


Figure 136: RF Conducted Out of Band Emissions, 5 MHz BW, QPSK/256QAM

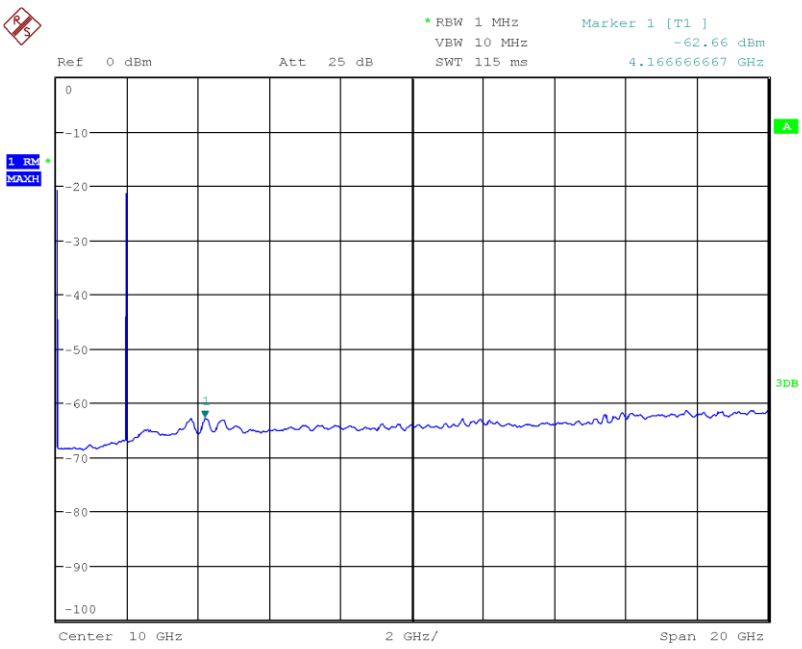


Figure 137: RF Conducted Out of Band Emissions, 10 MHz BW, QPSK/16QAM

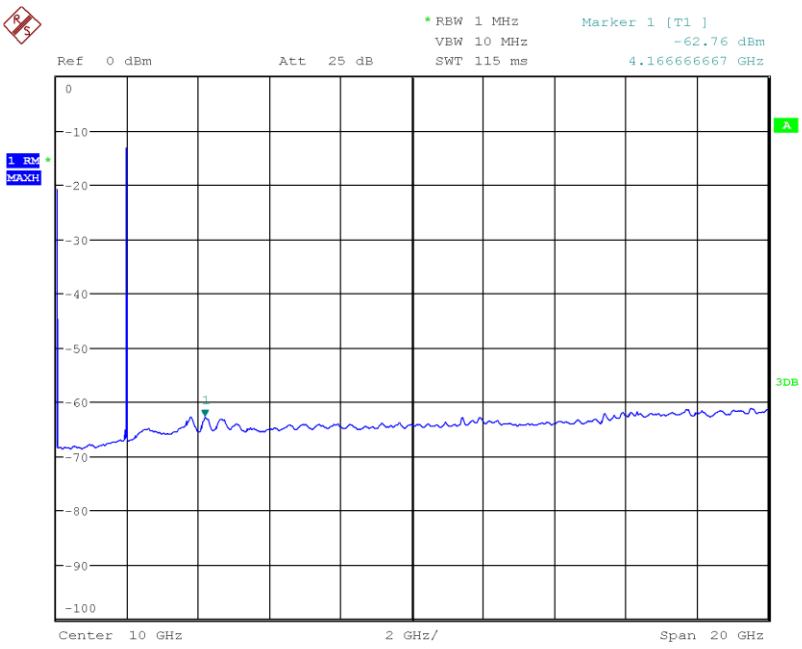


Figure 138: RF Conducted Out of Band Emissions, 10 MHz BW, QPSK/64QAM

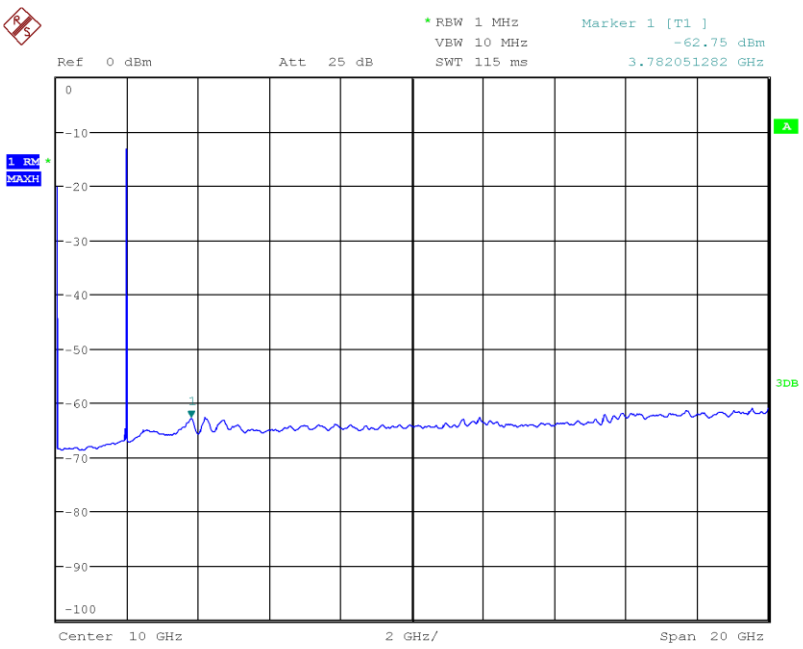


Figure 139: RF Conducted Out of Band Emissions, 10 MHz BW, QPSK/256QAM

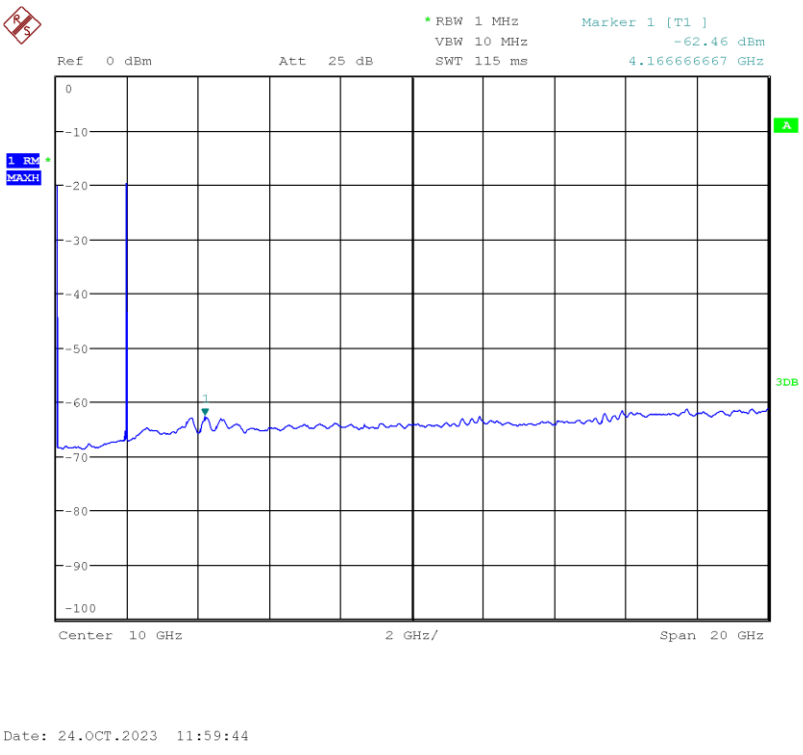


Figure 140: RF Conducted Out of Band Emissions, 15 MHz BW, QPSK/16QAM

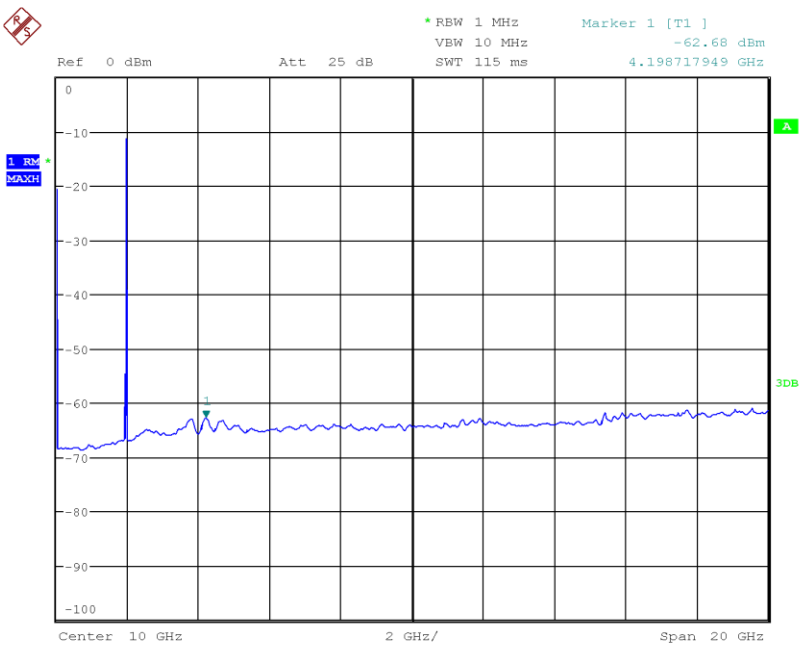


Figure 141: RF Conducted Out of Band Emissions, 15 MHz BW, QPSK/64QAM

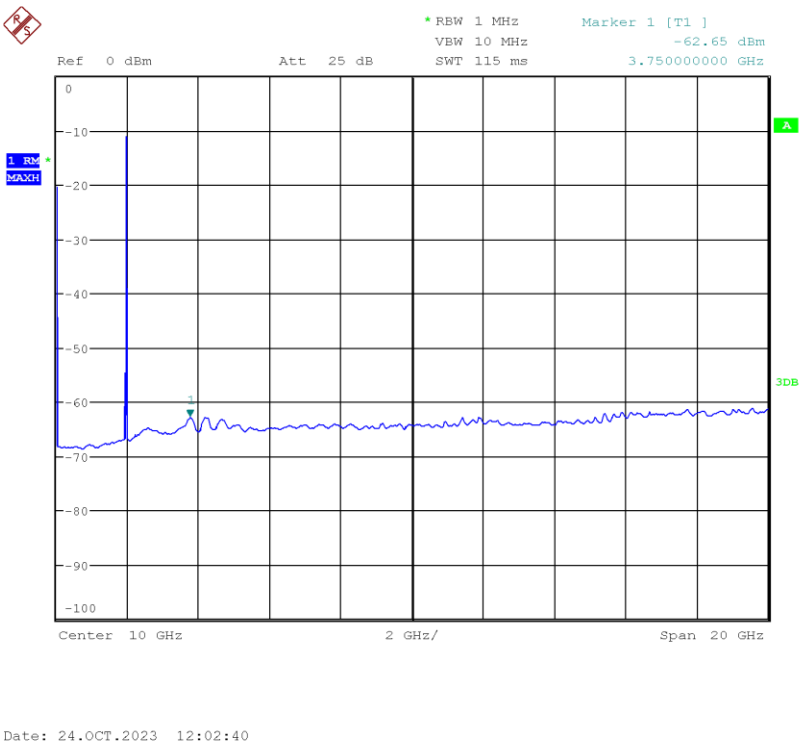


Figure 142: RF Conducted Out of Band Emissions, 15 MHz BW, QPSK/256QAM

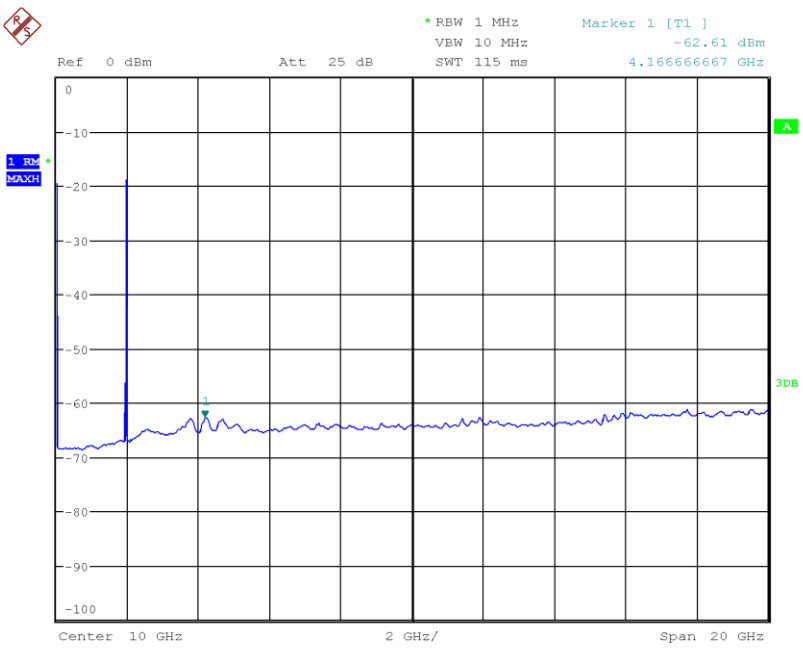


Figure 143: RF Conducted Out of Band Emissions, 20 MHz BW, QPSK/16QAM

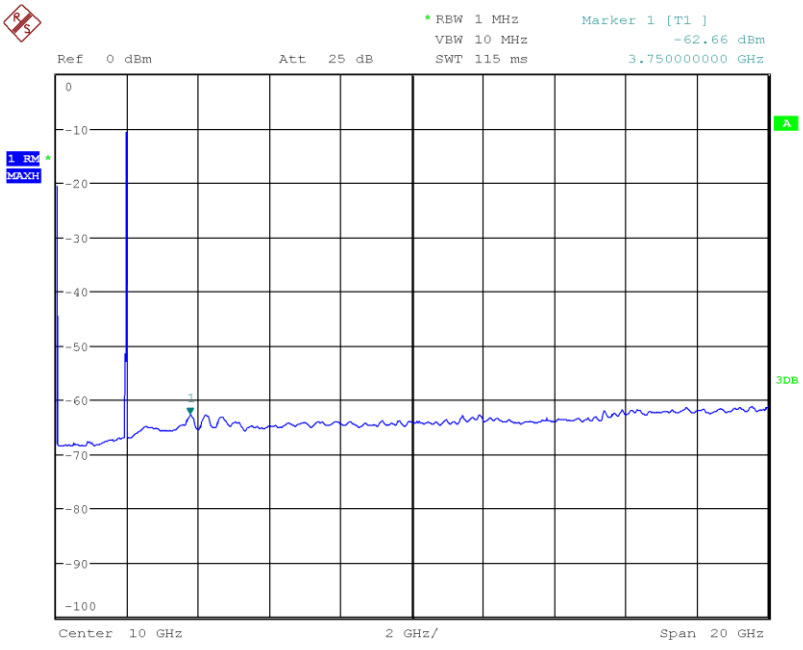


Figure 144: RF Conducted Out of Band Emissions, 20 MHz BW, QPSK/64QAM

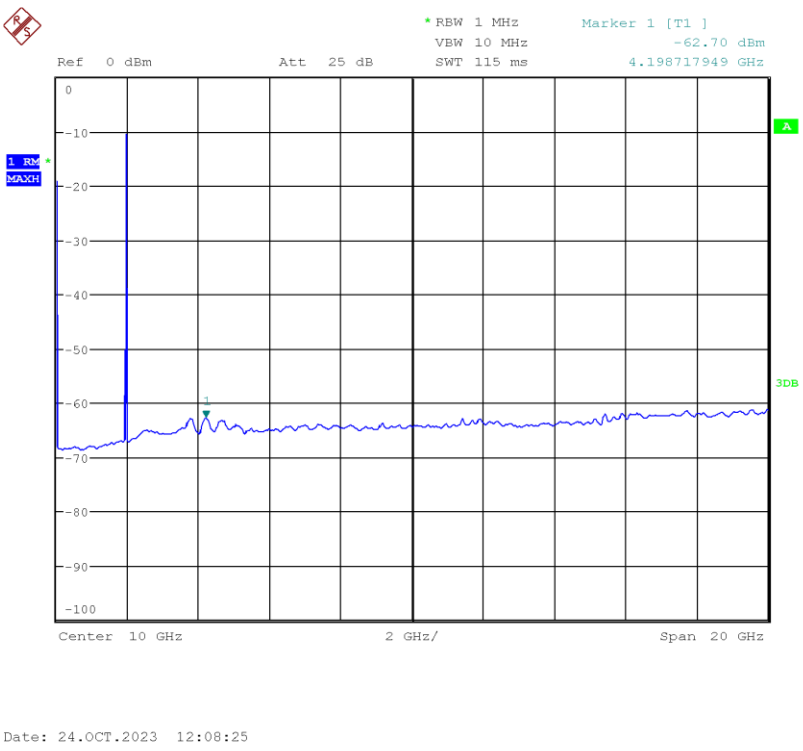


Figure 145: RF Conducted Out of Band Emissions, 20 MHz BW, QPSK/256QAM

3.5 Frequency Stability

Date Performed:	October 12, 2023
Test Standard:	FCC CFR 47 Part 24.235 FCC CFR 47 Part 2.1055 (a)(1) FCC CFR 47 Part 2.1055 (d) RSS-133 Issue 6 (6.3) RSS-Gen Issue 5
Test Method:	ANSI C63.10:2013 RSS-Gen Issue 5
Modifications:	The EUT was unable to produce an unmodulated CW signal, therefor the LO bleed through was used to monitor the EUT frequency.
Final Result:	Complies

Applicable Regulation:

FCC CFR 47 Part 24.235:

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

FCC CFR 47 Part 2.1055 (a)(1):

The frequency stability shall be measured with variation of ambient temperature from -30° to +50° centigrade.

FCC CFR 47 Part 2.1055 (d)(1):

The frequency stability shall be measured with variation of primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

RSS-133 Issue 6:

6.3 Frequency stability

The carrier frequency shall not depart from the reference frequency, in excess of ±2.5 ppm for mobile stations and ±1.0 ppm for base stations.

The frequency stability shall be sufficient to ensure that the emission bandwidth stays within the operating frequency block when tested to the temperature and supply voltage variations specified in RSS-Gen.

RSS-Gen Issue 5:

Frequency stability is a measure of frequency drift due to temperature and supply voltage variations, with reference to the frequency measured at an appropriate reference temperature and the rated supply voltage.

When the measurement method of transmitter frequency stability is not stated in the applicable RSS or reference standards, the following conditions apply:

a) The reference temperature for radio transmitters is +20°C (+68°F).
b) A hand-held device that is only capable of operating using internal batteries shall be tested at the battery's nominal voltage, and again at the battery's operating end-point voltage, which shall be specified by the equipment manufacturer. For this test, either a battery or an external power supply can be used.

c) The operating carrier frequency shall be set up in accordance with the manufacturer's published operation and instruction manual prior to the commencement of these tests. No adjustment of any frequency-determining circuit element shall be made subsequent to this initial set-up.

With the transmitter installed in an environmental test chamber, the unmodulated carrier frequency and frequency stability shall be measured under the conditions specified below for licensed and licence-exempt devices, unless specified otherwise in the applicable RSS. A sufficient stabilization period at each temperature shall be used prior to each frequency measurement.

For licensed devices, the following measurement conditions apply:

a) at the temperatures of -30°C (-22°F), +20°C (+68°F) and +50°C (+122°F), and at the manufacturer's rated supply voltage
b) at the temperature of +20°C (+68°F) and at ±15% of the manufacturer's rated supply voltage

If the frequency stability limits are only met within a temperature range that is smaller than the range specified in (a) for licensed or licence-exempt devices, the frequency stability requirement will be deemed to be met if the transmitter is automatically prevented from operating outside this smaller temperature range and if the published operating characteristics for the equipment are revised to reflect this restricted temperature range.

Test Setup:

The EUT was tested in an environmental chamber per RSS-Gen and ANSI C63.26:2015.

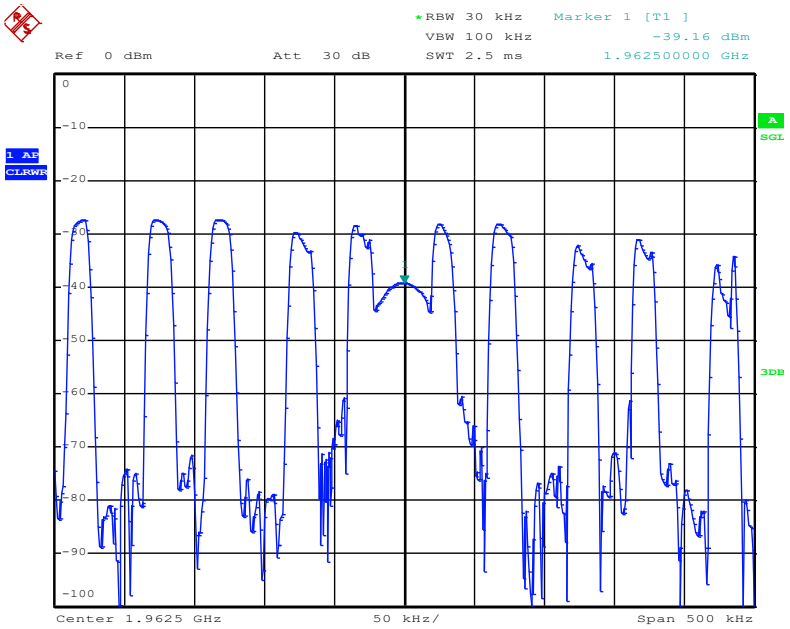
Measurement Data and Plots:

Temperature (°C)	Transmitter Frequency (MHz)	PPM Change From Reference Temp	Limit (PPM)	Margin (PPM)	Result
-30	1962.5	0	1	1	Complies
-20	1962.5	0	1	1	Complies
-10	1962.5	0	1	1	Complies
0	1962.5	0	1	1	Complies
10	1962.5	0	1	1	Complies
20	1962.5	Ref	---	---	---
30	1962.5	0	1	1	Complies
40	1962.5	0	1	1	Complies
50	1962.5	0	1	1	Complies

Table 35: Frequency Stability with Temperature Change

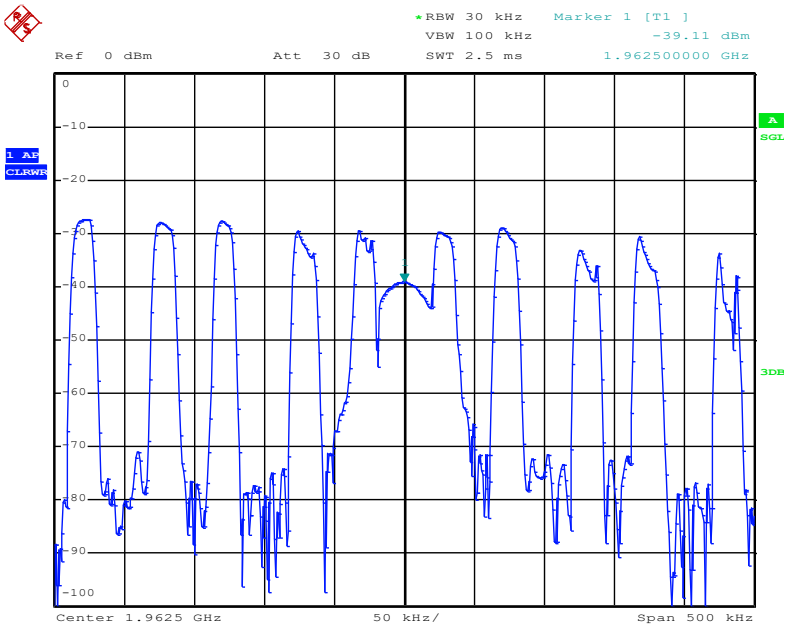
Supply Voltage (V)	Transmitter Frequency (MHz)	PPM Change From Reference Temp	Limit (PPM)	Margin (PPM)	Result
102	1962.5	0	1	1	Complies
120	1962.5	Ref	---	---	---
138	1962.5	0	1	1	Complies

Table 36: Frequency Stability with Voltage Change



Date: 12.OCT.2023 18:50:51

Figure 146: Output Frequency: 120V



Date: 12.OCT.2023 19:52:54

Figure 147: Output Frequency: 102V

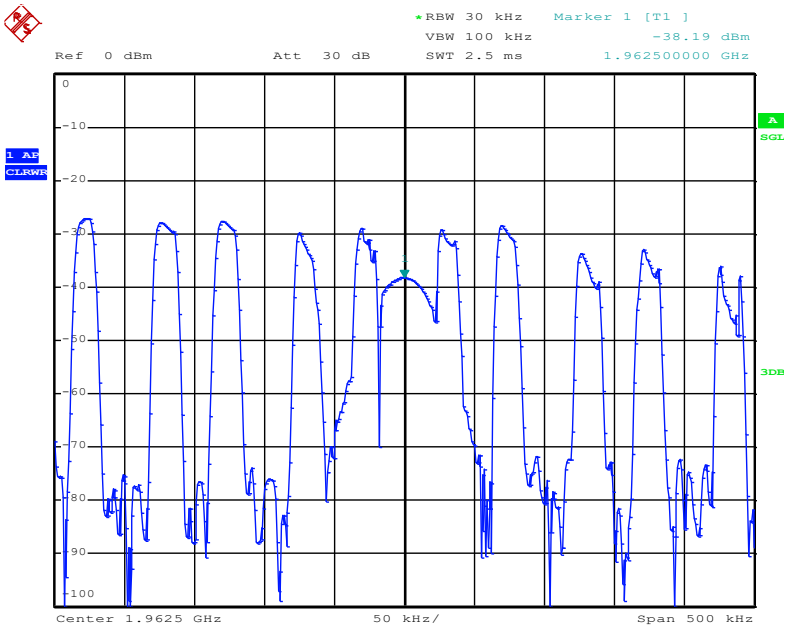


Figure 148: Output Frequency: 138V

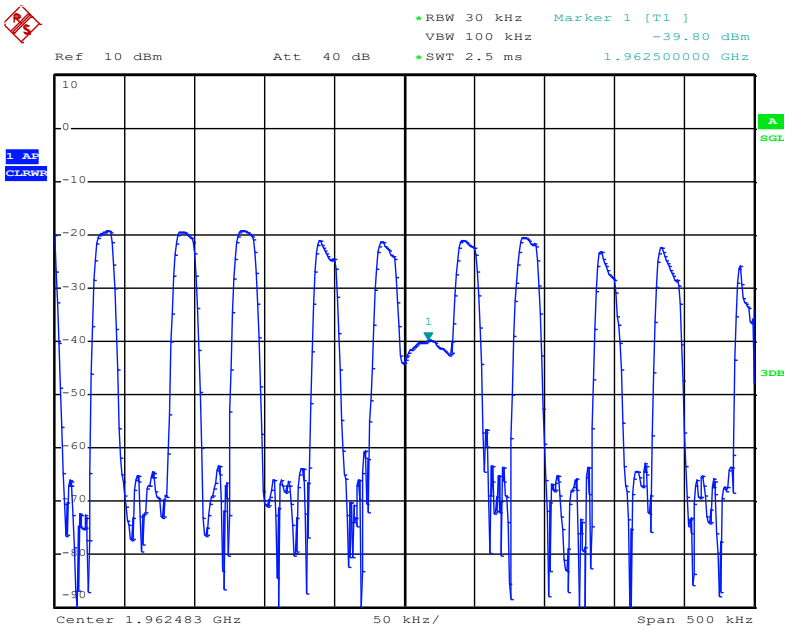
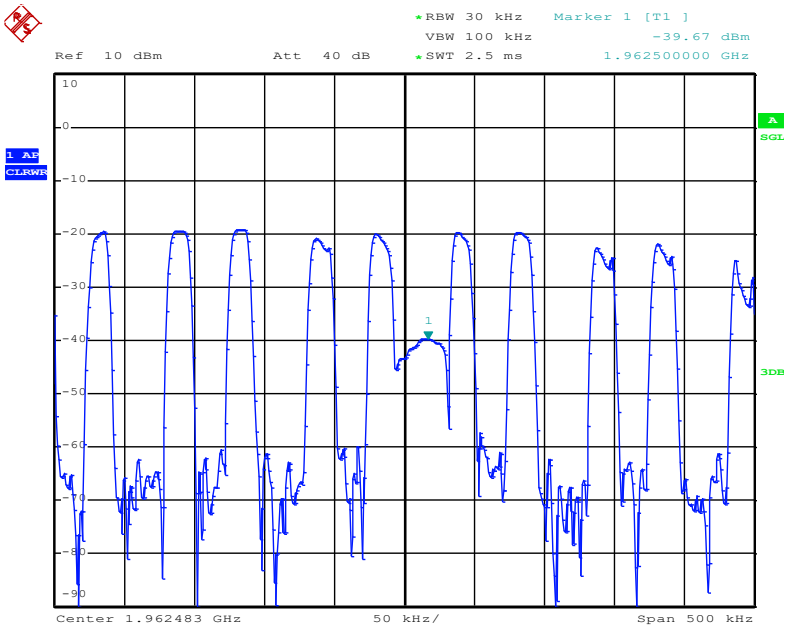
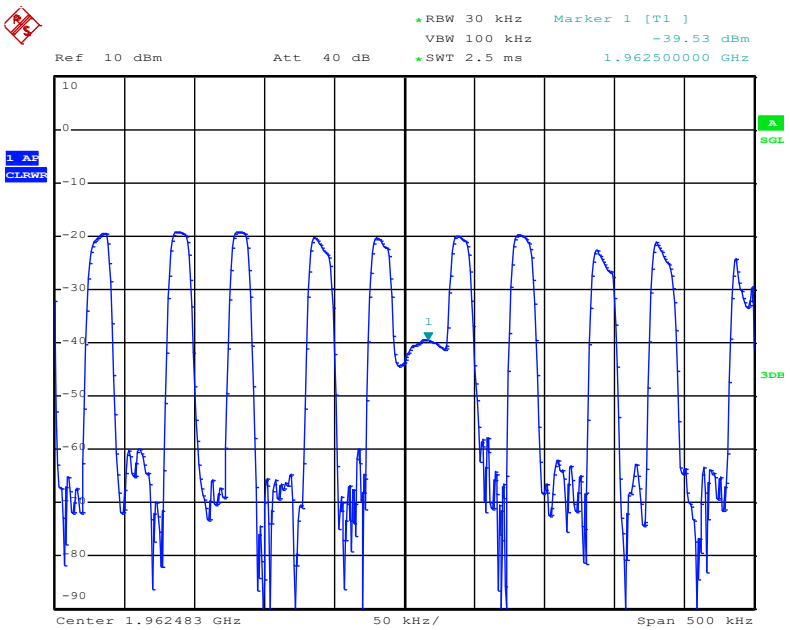


Figure 149: Output Frequency: -30 °C



Date: 13.OCT.2023 17:46:06

Figure 150: Output Frequency: -20 °C



Date: 13.OCT.2023 17:48:56

Figure 151: Output Frequency: -10 °C

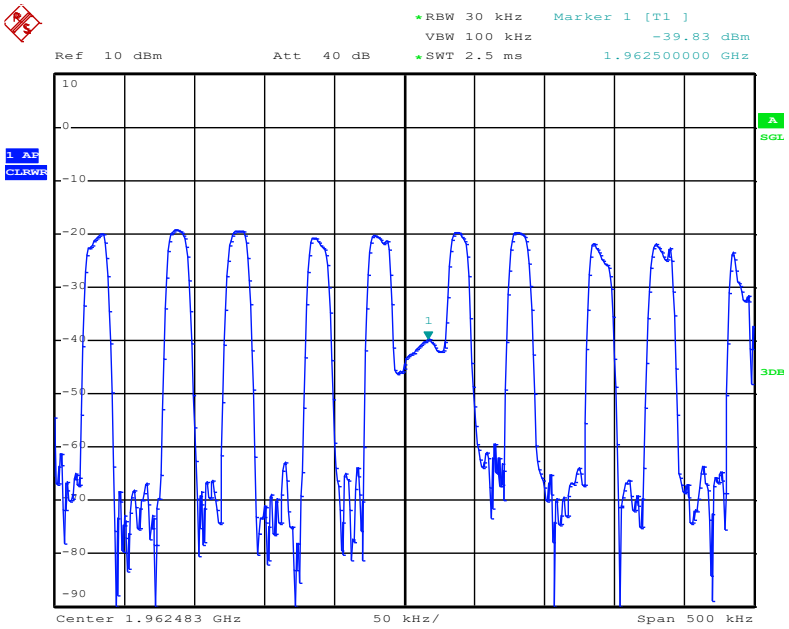


Figure 152: Output Frequency: 0 °C

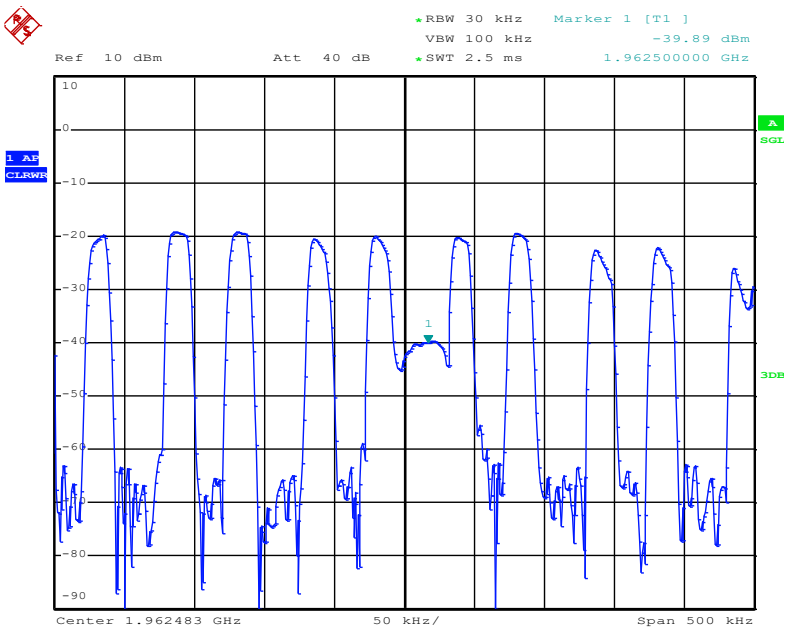
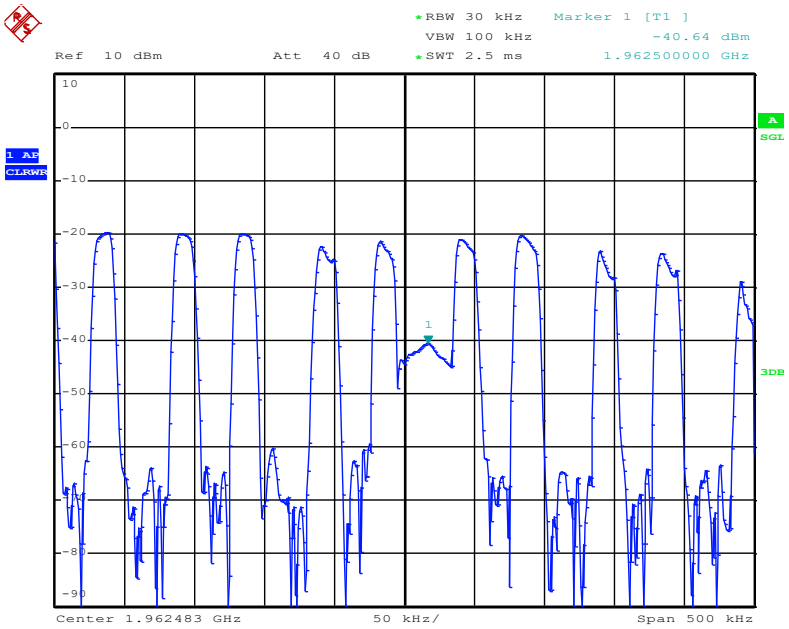
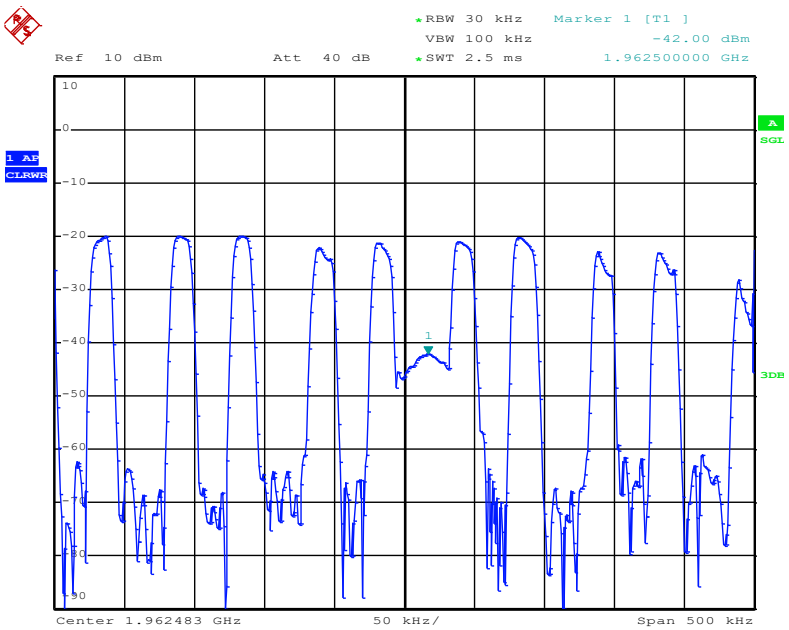


Figure 153: Output Frequency: 10 °C



Date: 13.OCT.2023 18:01:47

Figure 154: Output Frequency: 20 °C



Date: 13.OCT.2023 18:07:25

Figure 155: Output Frequency: 30 °C

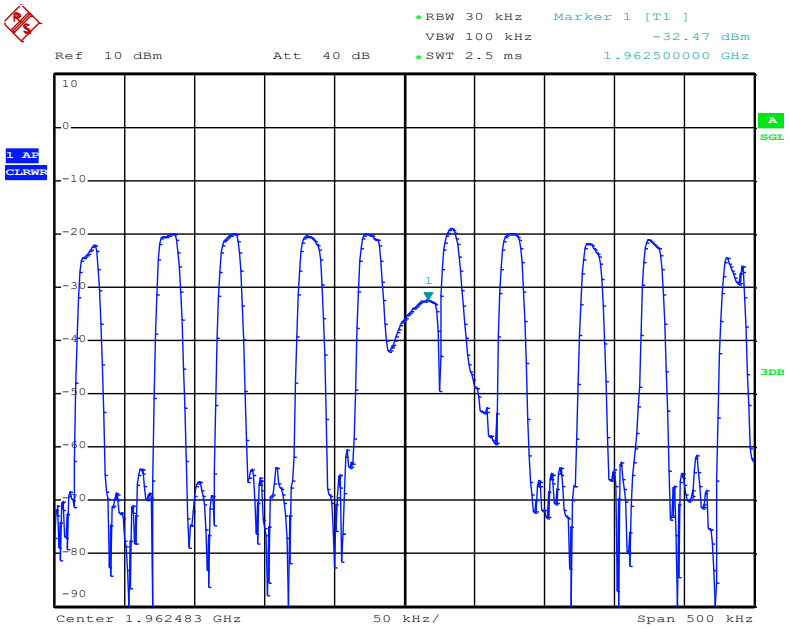


Figure 156: Output Frequency: 40 °C

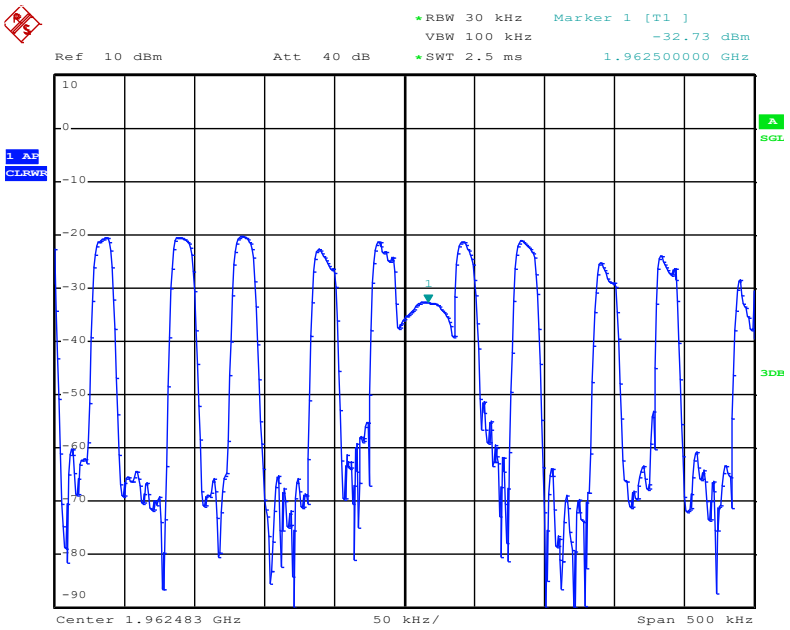


Figure 157: Output Frequency: 50 °C

3.6 Conducted Emissions: AC Power Line

Date Performed: September 27, 2023

Test Standard: FCC 15.107
ICES-003 Issue 7

Test Method: ANSI C63.10:2013

Modifications: None

Final Result: Complies

Applicable Standard:

FCC 47 CFR Part 15.107: Conducted limits

a) For Class A digital device that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, withing the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH / 50 Ω line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15 – 0.5	79	66
0.5 – 30	73	60

ICES-003 Issue 7 3.2.1: Conducted emissions limits

The ITE or digital apparatus shall comply with the conducted emission limits specified in the following table at its AC mains power terminals. The product under test shall comply with both the quasi-peak and the average limits.

Where the product under test is powered through an external device (for example, through an external power supply, or by means of a device providing power over Ethernet to the product under test), the conducted emission limits apply at the AC mains power terminals of the external device, while this is powering the product under test: see ICES-Gen.

Frequency of emission (MHz)	Conducted limit (dBµV)			
	Class A Quasi-peak	Class A Average	Class B Quasi-peak	Class B Average
0.15 – 0.5	79	66	66 to 56 Note 1	56 to 46 Note 1
0.5 – 5	73	60	56	46
5 – 30	73	60	60	50

Note 1 The level decreases linearly with the logarithm of the frequency.

Test Setup:

The EUT was tested inside the SAC using a 50 µH / 50 Ω lisn per ANSI C63.10:2013.

Frequency MHz	QuasiPeak (dBuV/m)	Average (dBuV/m)	Line	PE	Corr. (dB/m)	Limit (dBuV/m)	Margin (dB)	Result
5.3020	---	47.34	L1	GND	10.2	60.00	12.66	Complies
5.4340	---	41.67	L1	GND	10.2	60.00	18.33	Complies
5.5660	---	39.52	L1	GND	10.2	60.00	20.48	Complies
5.8320	---	43.68	L1	GND	10.2	60.00	16.32	Complies
6.0960	---	40.05	L1	GND	10.2	60.00	19.95	Complies
6.6260	---	40.69	L1	GND	10.2	60.00	19.32	Complies
10.3380	---	43.39	L1	GND	10.3	60.00	16.61	Complies
10.6020	---	46.47	L1	GND	10.3	60.00	13.53	Complies
10.8680	---	46.48	L1	GND	10.3	60.00	13.52	Complies
11.1320	---	50.75	L1	GND	10.3	60.00	9.25	Complies
11.3960	---	47.95	L1	GND	10.3	60.00	12.05	Complies
11.6620	---	47.93	L1	GND	10.3	60.00	12.07	Complies
11.9260	---	48.80	L1	GND	10.3	60.00	11.20	Complies
12.4540	---	43.03	L1	GND	10.3	60.00	16.97	Complies

Table 37: AC Conducted Emissions, Line 1

Frequency MHz	QuasiPeak (dBuV/m)	Average (dBuV/m)	Line	PE	Corr. (dB/m)	Limit (dBuV/m)	Margin (dB)	Result
6.2560	---	39.54	L2	GND	10.2	60.00	20.46	Complies
6.7580	---	48.62	L2	GND	10.2	60.00	11.38	Complies
7.2580	---	45.54	L2	GND	10.2	60.00	14.47	Complies
7.5080	---	39.47	L2	GND	10.2	60.00	20.53	Complies
7.7580	---	42.51	L2	GND	10.3	60.00	17.49	Complies
8.0100	---	43.28	L2	GND	10.2	60.00	16.72	Complies
8.5100	---	46.77	L2	GND	10.3	60.00	13.23	Complies
9.0100	---	49.52	L2	GND	10.3	60.00	10.48	Complies
9.2600	---	45.31	L2	GND	10.3	60.00	14.69	Complies
9.5100	---	42.56	L2	GND	10.3	60.00	17.44	Complies
9.7600	---	40.59	L2	GND	10.3	60.00	19.41	Complies
10.7620	---	41.86	L2	GND	10.3	60.00	18.14	Complies
11.0120	---	46.80	L2	GND	10.3	60.00	13.20	Complies
11.2620	---	44.15	L2	GND	10.3	60.00	15.85	Complies
11.5100	---	48.93	L2	GND	10.3	60.00	11.07	Complies
11.7620	---	45.07	L2	GND	10.3	60.00	14.93	Complies
12.2640	---	40.51	L2	GND	10.3	60.00	19.49	Complies

Table 38: AC Conducted Emissions, Line 2

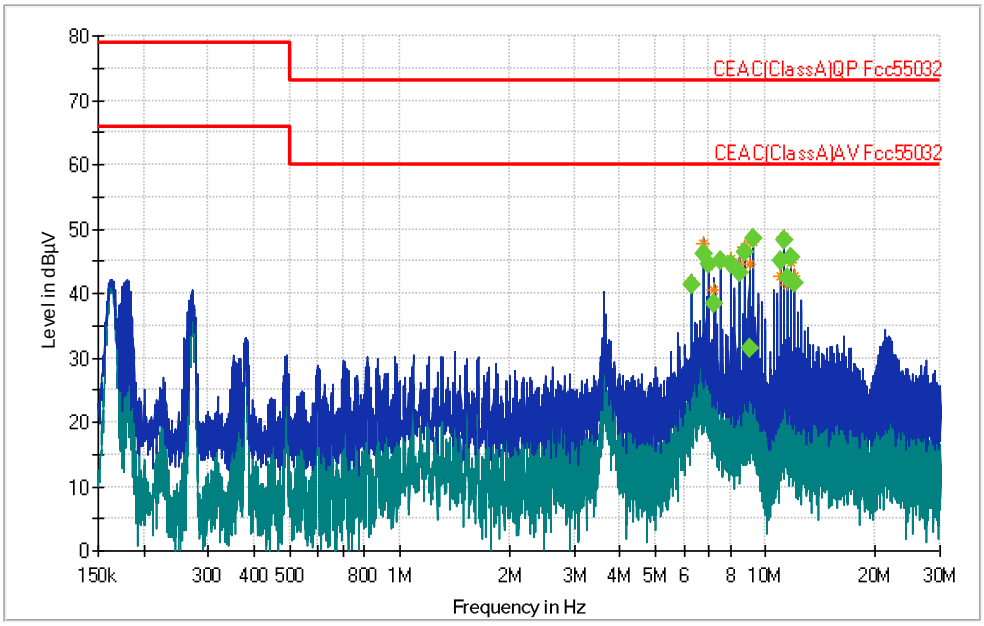


Figure 158: AC Conducted Emissions, Line 1

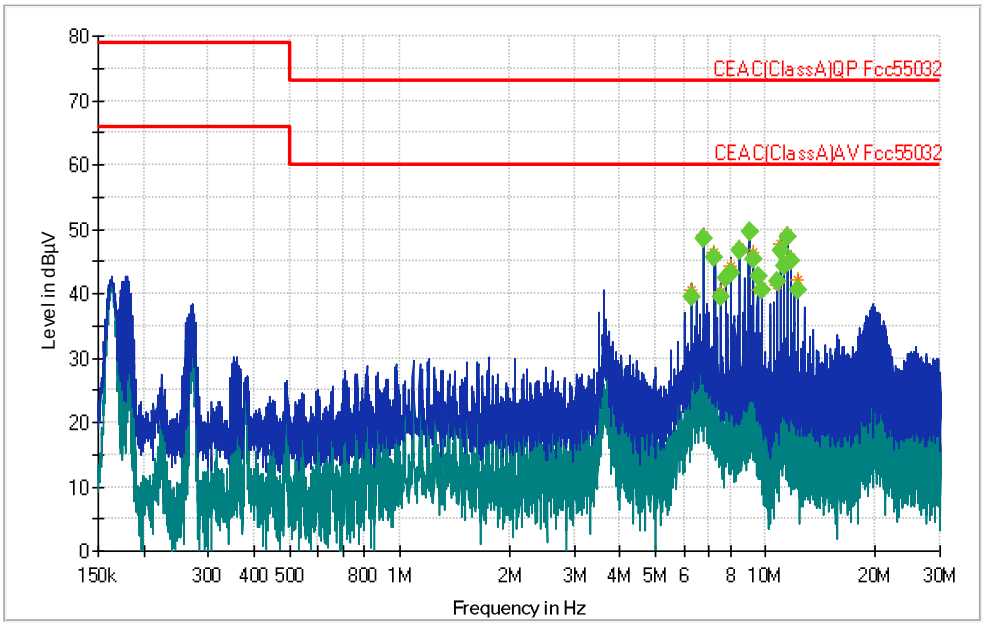


Figure 159: AC Conducted Emissions, Line 2

3.7 Conducted Emissions: Telecom

Date Performed: September 27, 2023

Test Standard: CISPR 32

Test Method: CISPR 32

Modifications: None

Final Result: Complies

Applicable Standard:

CISPR 32 Annex A.3: Requirements for conducted emissions

The EUT is deemed to comply with the conducted emission requirements when it has been shown to be compliant with all applicable limits as given in the following table(s).

Frequency of emission (MHz)	Conducted limit (dBµV)	
	Quasi-peak	Average
0.15 – 0.5	97 to 87	84 to 74
0.5 – 30	87	74

Test Setup and Measurement Method:

CISPR 32 Annex C.4.1.6.2

Measurement is made at wired network ports using AANs with longitudinal conversion losses as defined in Table C.2. The AAN for the cable category specified by the equipment documentation provided to the user shall be used. The level of emissions from the EUT shall not exceed the applicable limits of Annex A.

When emission voltage measurements are performed, the AAN shall provide a voltage measurement port suitable for connection to a measuring receiver while simultaneously satisfying the analogue/digital data port common mode termination impedance requirements.

For unscreened cables containing balanced pairs, an AAN conforming to C.41.2 shall be used. The LCL values of the AAN shall be within the tolerance given in Table C.2 for an AAN appropriate to the cable category connected to the EUT.

The procedure shall be as follows:

- Arrange the EUT, local AE and associated cabling.
- Measure the voltage at the measurement port of the AAN.
- Correct the measured voltage by adding the AAN voltage division factor defined in C.4.1.2 e)
- Compare the corrected voltage with the limit.

Frequency MHz	QuasiPeak (dBuV/m)	Average (dBuV/m)	Corr. (dB/m)	Limit (dBuV/m)	Margin (dB)	Result
1.4690	---	71.28	19.4	74.00	2.72	Complies
1.4690	74.25	---	19.4	87.00	12.75	Complies
1.4700	---	71.26	19.4	74.00	2.74	Complies
1.4700	74.16	---	19.4	87.00	12.84	Complies
Note: Ferrite used Fair-rite 0475176451						

Table 39: Conducted Emissions: Telecom

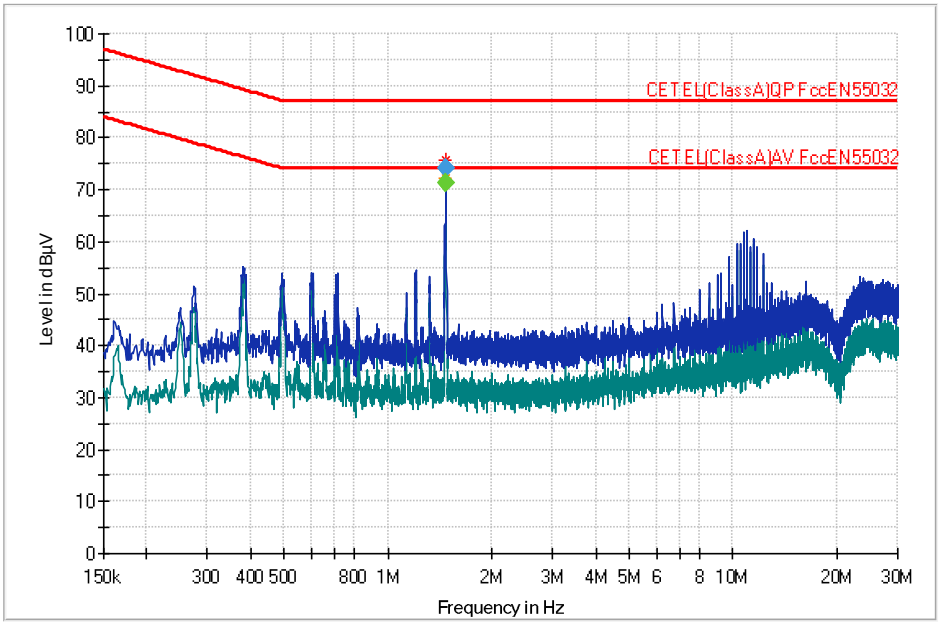


Figure 160: Conducted Emissions: Telecom

3.8 Unintentional Radiated Emissions

Date Performed: September 27, 2023

Test Standard: FCC 47 CFR Part 15.33 (a)(1), (5)
FCC 47 CFR Part 15.109
ICES-003 Issue 7
RSS-247

Test Method: ANSI C63.4:2014

Modifications: None

Final Result: Complies

Applicable Standard:

FCC 47 CFR Part 15.33 (b)(1): Frequency range of radiated measurements

For an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.075	30
1.075 – 108	1000
108 – 500	2000
500 – 1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

FCC 47 CFR Part 15.109: Radiated emission limits

b) The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:

Frequency of emission (MHz)	Field strength at 10m (microvolts/meter)	Field strength at 10m (dBuV/meter)	Field strength at 3 m (microvolts/meter)	Field strength at 3 m (dBuV/meter)
30 – 88	90	39.1	100	40.0
88 – 216	150	43.5	160	44.1
216 – 960	210	46.4	220	46.8
Above 960	300	49.5	310	49.8

ICES-003 3.2.2 Radiated emission limits

The quasi-peak limits for the electric component of the radiated field strength emitted from ITE or digital apparatus, within 30 MHz to 1 GHz, for a measurement distance of 3 m or 10 m, are:

Frequency Range (MHz)	Class A (3 m) Quasi-peak (dBµV/m)	Class A (10 m) Quasi-peak (dBµV/m)	Class B (3 m) Quasi-peak (dBµV/m)	Class B (10 m) Quasi-peak (dBµV/m)
30 – 88	50.0	40.0	40.0	30.0
88 – 216	54.0	43.5	43.5	33.1
216 – 230	56.9	46.4	46.0	35.6
230 – 960	57.0	47.0	47.0	37.0
960 - 1000	60.0	49.5	54.0	43.5

At and above 1 GHz, except for outdoor units of home satellite receiving systems, the ITE or digital apparatus shall comply with:

Frequency Range (MHz)	Class A Average (dBµV/m)	Class A Peak (dBµV/m)	Class B Average (dBµV/m)	Class B Peak (dBµV/m)
1 - F_M	60	80	54	74

F_M is determined by:

Highest internal frequency (F_X)	Highest measurement frequency (F_M)
$F_X \leq$ 108 MHz	1 GHz
108 MHz $\leq F_X \leq$ 500 MHz	2 GHz
500 MHz $\leq F_X \leq$ 1 GHz	5 GHz
$F_X >$ 1 GHz	5 x F_X up to a maximum of 40 GHz

Test Setup:

The EUT was tested in a 3 m SAC and was positioned on the front of the turntable and the radiated output of the device was measured for all emissions up to 18 GHz.

Measurement Data and Plots:

Frequency MHz	QuasiPeak (dBuV/m)	Height (cm)	Pol	Azimuth (°)	Corr. (dB/m)	Limit (dBuV/m)	Margin (dB)	Result
57.1091	14.49	124.0	V	0	12.0	49.50	35.01	Complies
96.0978	36.75	124.0	V	323	14.1	53.90	17.15	Complies
165.4992	38.44	156.0	H	228	17.4	53.90	15.46	Complies

Table 40: Unintentional Radiated Emissions: 30 MHz - 1 GHz

Frequency MHz	Average (dBuV/m)	Height (cm)	Pol	Azimuth (°)	Corr. (dB/m)	Limit (dBuV/m)	Margin (dB)	Result
1970.5840	34.26	204.0	H	334	1.0	60.00	25.74	Complies
2968.0720	33.87	302.0	H	241	1.5	60.00	26.13	Complies
5999.3610	38.28	105.0	V	333	8.4	60.00	21.72	Complies

Table 41: Unintentional Radiated Emissions: 1 GHz - 6 GHz

Frequency MHz	Average (dBuV/m)	Height (cm)	Pol	Azimuth (°)	Corr. (dB/m)	Limit (dBuV/m)	Margin (dB)	Result
15672.3840	25.44	150.0	H	282	12.2	60.00	34.56	Complies
16690.4680	27.26	400.0	V	133	12.9	60.00	32.74	Complies
16726.1360	27.11	400.0	V	0	12.9	60.00	32.89	Complies

Table 42: Unintentional Radiated Emissions: 6 GHz - 18 GHz

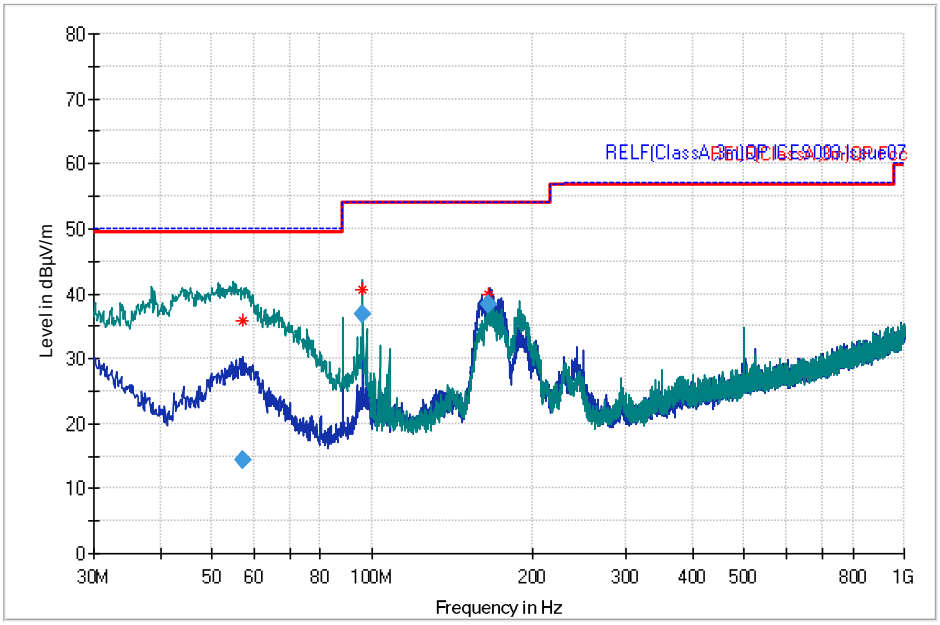


Figure 161: Radiated Emissions: 30 MHz - 1 GHz

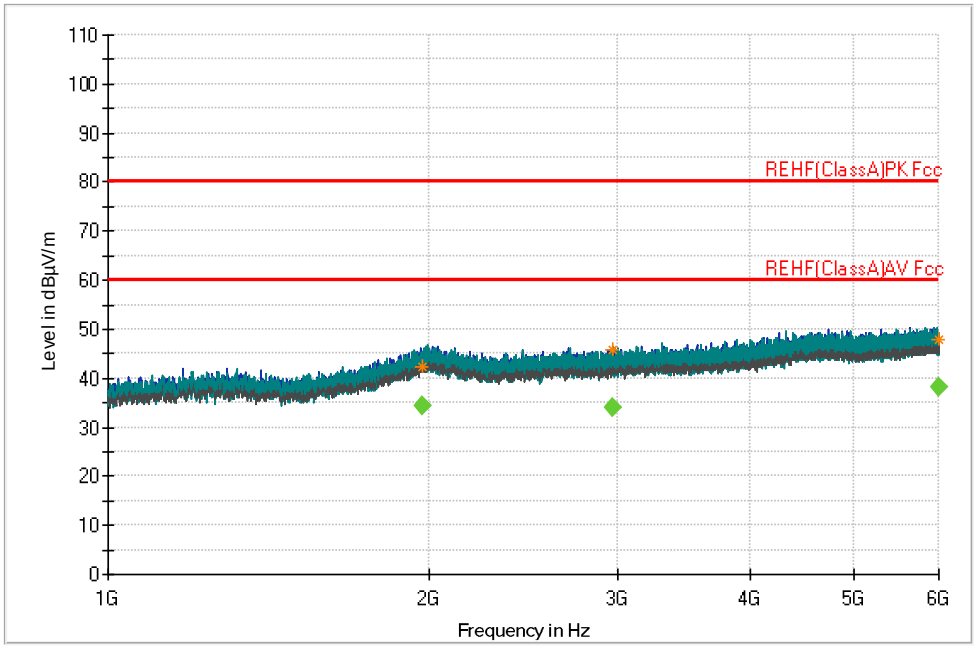


Figure 162: Radiated Emissions: 1GHz-6GHz

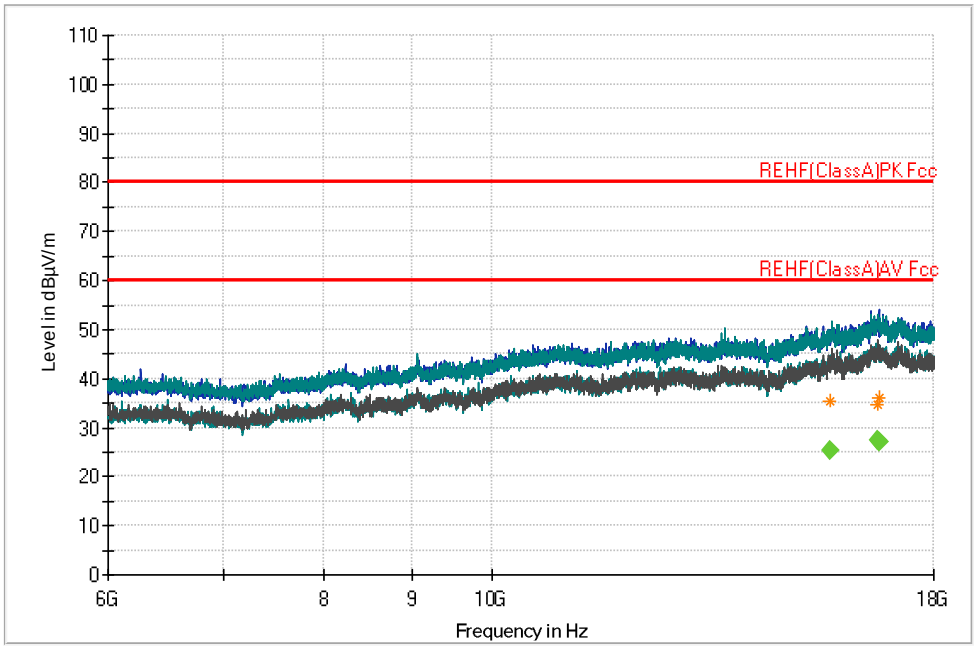


Figure 163: Radiated Emissions: 6GHz-18GHz

Appendix A: Test Setup Photos

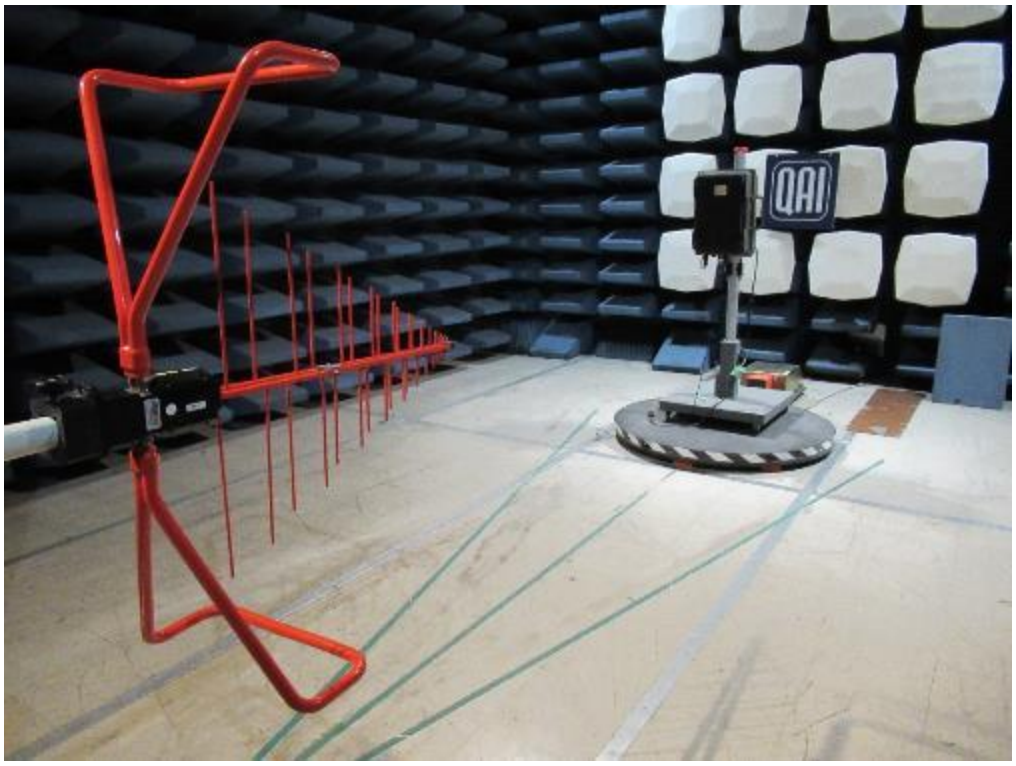


Figure 164: Radiated Emissions: 30 MHz – 1 GHz Measurement Setup

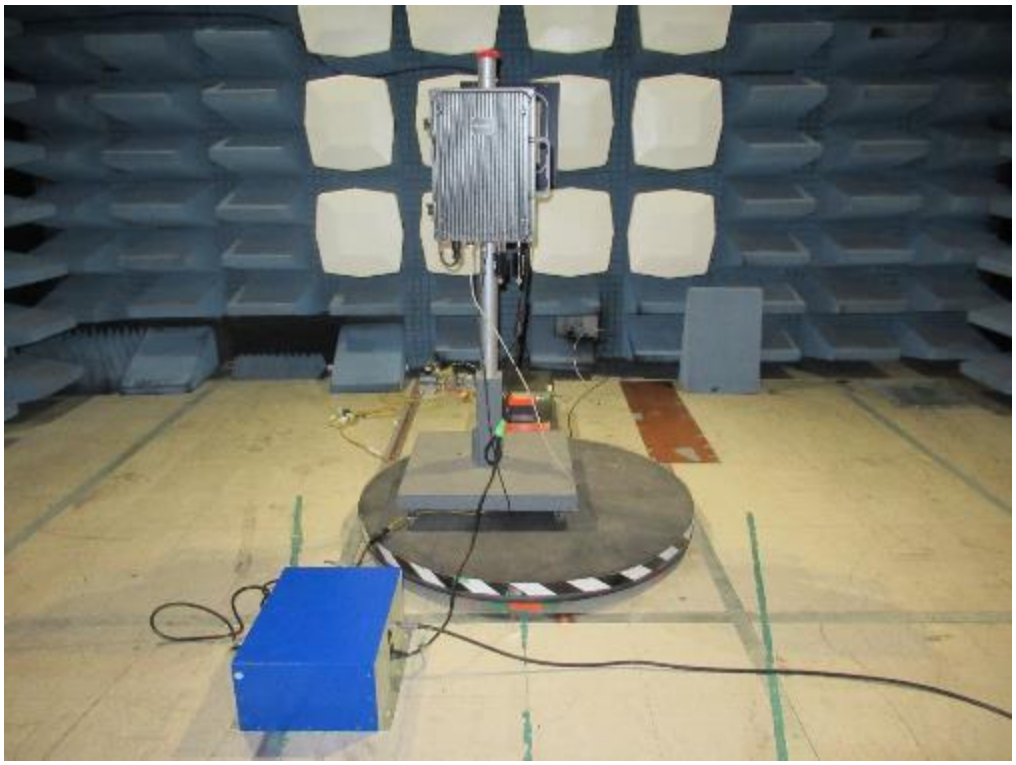


Figure 165: Conducted Emissions: AC Power Line Measurement Setup

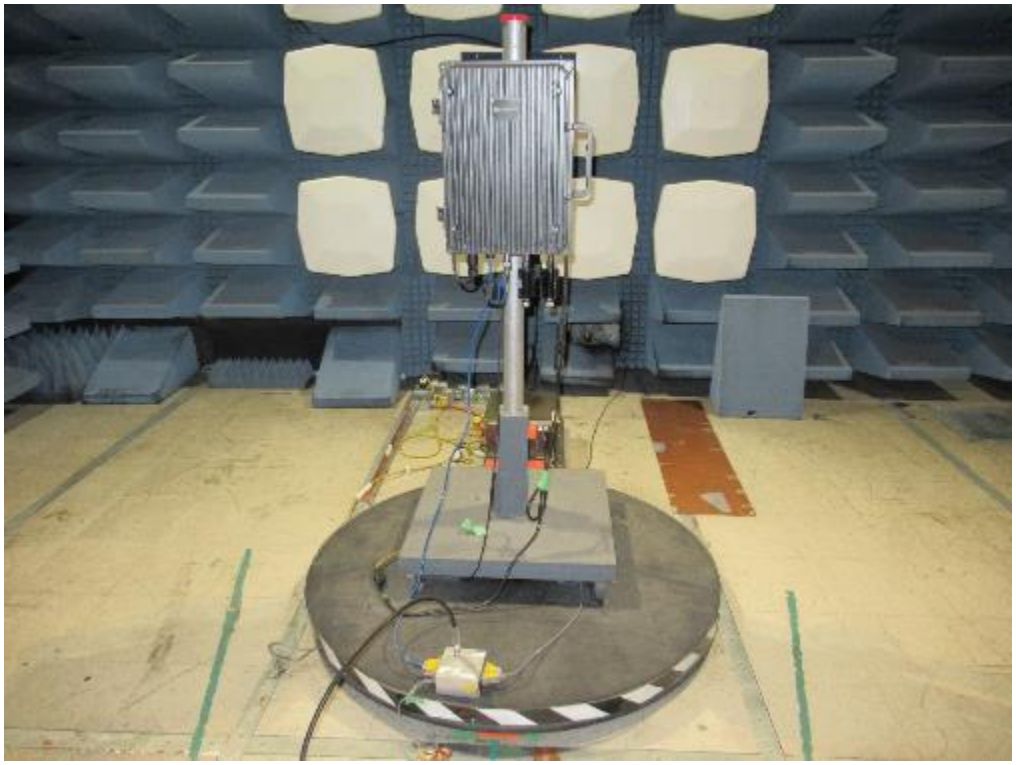


Figure 166: Conducted Emissions: Telecom Measurement Setup

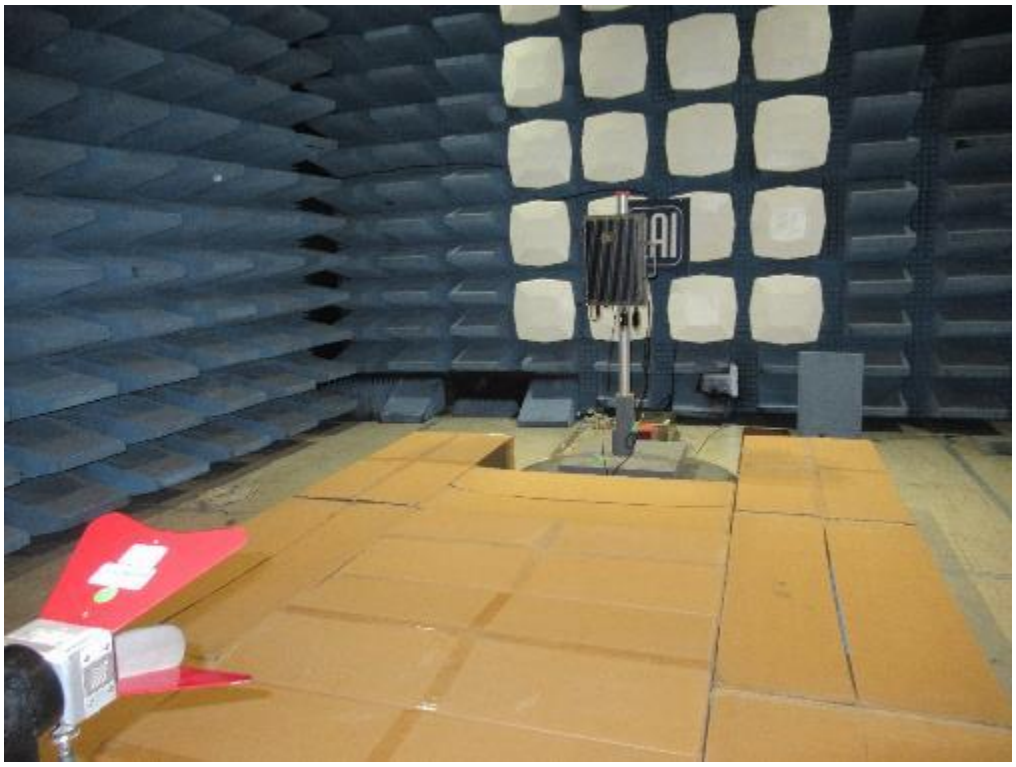


Figure 167: Radiated Emissions: 1 GHz – 18 GHz Measurement Setup

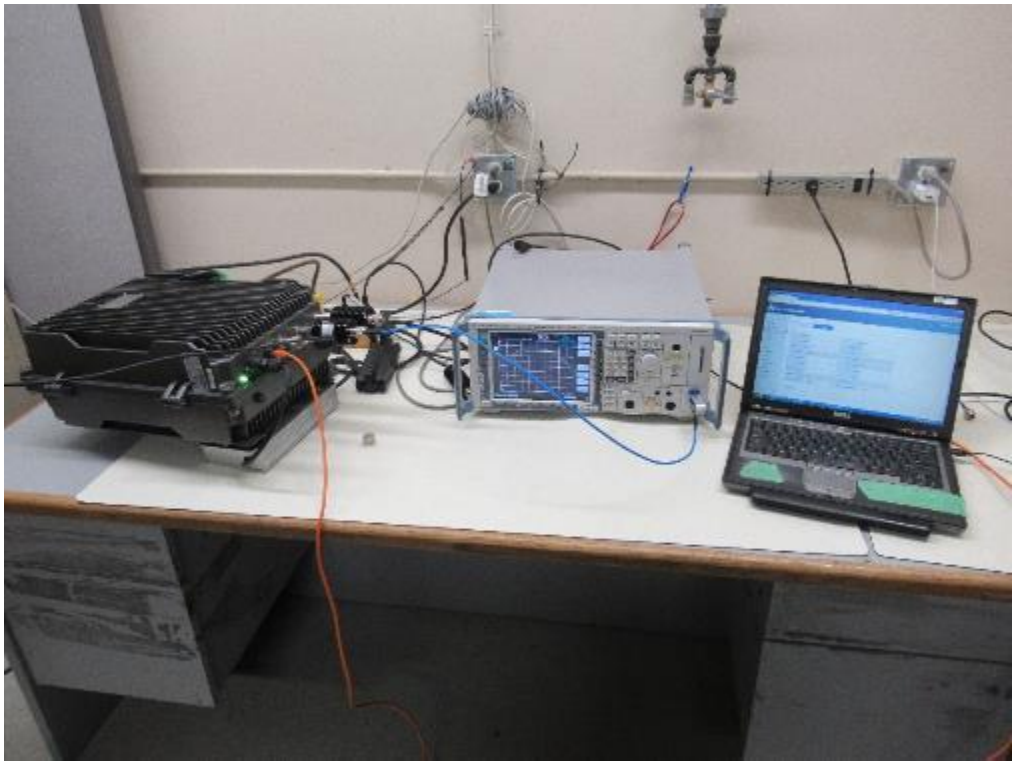


Figure 168: RF Conducted Measurement Setup

Figure 169: Frequency stability with respect to temperature test setup

Appendix B: ABBREVIATIONS

Abbreviation	Definition
AC	Alternating Current
AM	Amplitude Modulation
CE	European Conformity
CISPR	Comité International Spécial des Perturbations Radioélectriques (International Special Committee on Radio Interference)
DC	Direct Current
EFT	Electrical Fast Transient
EMC	Electro Magnetic Compatibility
EMI	Electro Magnetic Interference
ESD	Electrostatic Discharge
EUT	Equipment Under Test
FCC	Federal Communications Commission
FVIN	Firmware Version Identification Number FVIN
IC	Industry Canada
ICES	Interference Causing Equipment Standard
IEC	International Electrotechnical Commission
LISN	Line Impedance Stabilizing Network
OATS	Open Area Test Site
RF	Radio Frequency
RMS	Root-Mean-Square
SAC	Semi-Anechoic Chamber

END OF REPORT