TEST REPORT

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Manufacturer:	**Star Solutions International Inc**
Address:	#120, 4600 Jacombs Rd Richmond, BC V6V 3B1
Equipment Tested:	LTE Base Station: Band Class 25
Model Number(s):	NL-2511
FCC ID:	S52-7-12-25-00-1
ISED ID:	8076A-71225001

REVISION HISTORY

Date	Report Number	Details	Author's Initials
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November 1, 2023	E10599-2302_StarSolutions_iCell COMPAC-N LTE BC25_Rev0.1	Draft	AH
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November 16, 2023	E10599-2302_StarSolutions_iCell COMPAC-N LTE BC25_Rev1.0	Final	AH
All previous versions of this report have been superseded by the latest dated revision as listed in the above table. Please dispose of all previous electronic and paper printed revisions accordingly.			

REPORT AUTHORIZATION

The data documented in this report is for the test equipment provided by the manufacturer and the results relate only to the item tested. The tests were conducted on the sample equipment as requested by the manufacturer for the purpose of demonstrating compliance with the standards outlined in Section I of this report as agreed upon by the Manufacturer under the quote 23RH09011.

The Manufacturer is responsible for the tested product configurations, continued product compliance, and for the appropriate auditing of subsequent products as required.

This report may comprise a partial list of tests that are required for FCC and ISED. A Declaration of Conformity can only be produced by the manufacturer. This is to certify that the following report is true and correct to the best of our knowledge.

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QAI EMC ACCREDITATION

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EMC Laboratory Location	FCC Designation (3m SAC)	IC Registration (3m SAC)	A2LA Certificate
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1 EXECUTIVE SUMMARY

1.1 Purpose

The purpose of this report is to demonstrate and document the compliance of Star Solutions COMPAC-N LTE BC25 as per Sections 1.2 and 1.3.

1.2 Scope

The information documented in this report is based on the test methods and levels as per Quote 23RH09011:

CFR Title 47 FCC Part 2 – Frequency allocations and Radio treaty matters; General Rules and Regulations

CFR Title 47 FCC Part 15 – Radio Frequency Devices, Subpart B – Unintentional Radiators

CFR Title 47 FCC Part 27 – Miscellaneous Wireless Communications Services

CFR Title 47 FCC Part 24 – Personal Communications Services

ICES-003 Issue 7 – Digital Apparatus Spectrum – Information Technologies and Telecommunications.

SRSP-510 Issue 5 – Technical Requirements for Personal Communications Services (PCS) in the Bands 1850-1915 MHz, 1930-1995 MHz

RSS-133 Issue 6 – 2GHz Personal Communication Services

RSS-Gen Issue 5 – General Requirements for Compliance of Radio Apparatus

1.3 Summary of Results

The following testing was performed pursuant to FCC Title 47 Part 15 and Industry Canada ICES-003 to demonstrate the testimony to "FCC, IC, & CE" mark Electromagnetic Compatibility testing for the product.

No.	Test	Applicable Standard	Test Method	Result
1	Peak Power and Peak to Average Ratio	FCC CFR 47 Part 24.232 RSS-133 Issue 6 SRSP-510 Issue 5	ANSI C63.26:2015 KDB 971168 D01	Complies
2	99% Bandwidth	FCC CFR 47 Part 24.232 SRSP-510 Issue 5 RSS-Gen Issue 5	ANSI C63.26:2015	Complies
3	Band Edge	FCC CFR 47 Part 24.238 RSS-133 Issue 6	KDB 971168 D01 ANSI C63.26:2015	Complies
4	RF Conducted Out of Band Emissions	FCC CFR 47 Part 24.238 RSS-133 Issue 6	ANSI C63.26:2015	Complies
5	Conducted Emissions: AC Power Line	FCC CFR 47 Part 15.107 ICES-003 Issue 7	ANSI C63.4:2014	Complies
6	Conducted Emissions: Telecom	Client Request	CISPR 32	Complies
7	Unintentional Radiated Emissions	FCC CFR 47 Part 15.109 RSS-Gen Issue 5	ANSI C63.4:2014	Complies
8	Frequency Stability	FCC CFR 47 Part 27.235 FCC CFR 47 Part 2.1055 RSS-Gen Issue 5 RSS-133 Issue 6	ANSI C63.4:2014	Complies

Table 1: Applicable test standards and descriptions

2 GENERAL INFORMATION

2.1 Product Description

The information provided in this section is for the Equipment Under Test (EUT) and the corresponding Auxiliary Equipment needed to perform the tests as a complete system.

Figure 1: EUT

Equipment Under Test (EUT)

Equipment	iCell COMPAC-N LTE BC25
Description	LTE Base Station: Band Class 25
Manufacturer	Star Solutions International Inc
Model No.	NL-2511
Serial No.	1240R23081600001A0
Clock frequencies tuned upon within the EUT: Highest frequency generated within the EUT:	19.2 MHz, 25 MHz, 38.4 MHz 1930 MHz

Equipment Under Test (EUT) – RF Information

RF device type	LTE Base Station
Model No. (HVIN)	NL-2511
Operating frequency	1930 – 1995 MHz
Channel bandwidth	5 MHz, 10 MHz, 15 MHz, 20 MHz
Output Power/Transmitter	2x20 W (43dBm)
Modulation type	QPSK 16-QAM 64-QAM 256-QAM
Test Channels (L, M, H)	5 MHz BW: 1932.5, 1962.5, 1992.5 MHz 10 MHz BW: 1935, 1962.5, 1990 MHz 15 MHz BW: 1937.5, 1962.5, 1987.5 MHz 20 MHz BW: 1940, 1962.5, 1985 MHz
Adaptive	No
Geo-location-capable	Yes
Number of antennas	2

Notes: None.

Equipment Under Test (EUT) – General Information

Tested as	Tabletop
Dimensions	47 x 33 x 18.5 cm
Declared operating temperature range:	-40 °C to +55 °C
Input power	250 Watts (max) 215 Watts (average)
Grounded	Yes
Device use	Fixed location

Notes: None.

Test Modes

Mode	Transmitter State	Power
1	On – No data connection (QPSK/16QAM)	48 VDC, 5A, 250W peak
2	On – Phone connected, no data transmission	48 VDC, 5A, 250W peak
3	On – Phone connected, transmitting data	48 VDC, 5A, 250W peak
4	Off – Receive Only	48 VDC, 5A, 250W peak

Auxiliary Manufacturer Supplied Equipment

Equipment	Manufacturer	Product Description	Model No.
Aux 1	Dell	Laptop	D630 PP18L
Aux 2	Apple	Test Phone: iPhone	iPhone SE 2020

2.2 Environmental Conditions

The equipment under test was operated and tested under the following environmental conditions:

Parameter	Conditions
Location	Indoors
Temperature	24°C
Relative Humidity	35 %rh

2.3 Measurement Uncertainty

Parameter	Uncertainty
Radiated Emissions, 30MHz-1GHz	± 2.40 dB
Radiated Emissions, 1GHz-40GHz	± 2.48 dB
Radio Frequency	±1.5 x 10-5 MHz
Total RF Power Conducted	±1.36 dB
Spurious Emissions, Conducted	±1.36 dB
RF Power Density, Conducted	±1.36 dB
Temperature	±1ºC
Humidity	±5 %
DC and low frequency voltages	±3 %

2.4 Worst Test Case

Worst-case orientation was determined during the preliminary testing. The final radiated emissions were performed in the worst-case orientation.

2.5 Sample Calculations of Emissions Data

Radiated and conducted emissions were performed using EMC32 software developed by Rohde & Schwarz. Transducer factors such as antenna factors, cable losses and amplifier gains were stored in the test templates which are used to perform the emissions measurements. After the test is finished, data is generated from the EMC32 consisting of product details, emission plots and final data tables as shown below.

Frequency (MHz)	Q-Peak (dBµV/m)	Meas. Time (ms)	Bandwidth (kHz)	Ant. Ht. (cm)	Pol	Turntable Position (deg)	Corr. (dB)	Margin (dB)	Limit (dBµV/m)
42.663900	33.0	1000.000	120.000	100.0	H	70.0	13.2	7.5	40.5

Table 2: Sample Quasi-Peak Correction Data – Radiated

Quasi-Peak reading shown in the table above is already corrected by the software using the correction factor shown in column "Corr." The correction factor listed under "Corr." table calculated as:

Corr.(dB) = Antenna factor + Cable loss

Or

Corr.(dB) = Antenna factor + Cable Loss - Amp gain (if pre-amplifier was used)

The final Quasi peak reading shown in the data is calculated by the software using following equation:

Corrected Quasi-Peak (dBµV/m) = Raw Quasi-Peak Reading + Antenna factor + Cable loss

To obtain the final Quasi-Peak or Average reading during power line conducted emissions, transducer factors are included in the final measurement as shown below.

Frequency (MHz)	Q-Peak (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	44.3	1000.000	9.000	GND	0.6	21.7	66.0

Table 3: Sample Quasi-Peak Correction Data - Conducted Emissions

Frequency (MHz)	Average (dBµV)	Meas. Time (ms)	Bandwidth (kHz)	PE	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.150	27.2	1000.000	9.000	GND	0.6	28.8	56.0

Table 4: Sample Average Correction Data- Conducted Emissions

Quasi Peak or Average reading shown in the preceding table is already corrected by the software using the correction factor shown in column "Corr." The correction factor listed under "Corr." table calculated as:

Corr.(dB) = Antenna factor + Cable loss

The final Quasi-peak or Average reading shown in the data is calculated by the software using following equation:

Corr. Quasi-Peak/Average Reading (dBµV) = Raw Quasi-Peak/Average Reading + Antenna factor + Cable loss

The allowable margin from the limits, as per the standards, were calculated for both radiated and conducted emissions:

Margin(dB) = Limit – Quasi-Peak or Average reading

3 DATA & TEST RESULTS

3.1 RF Peak Output Power & Peak to Average Ratio

Date Performed: September 28, 2023

Test Standard: FCC CFR 47 Part 24.232 (a)(2), (a)(3), (b)(2), (b)(3), (d)
RSS-133 Issue 6 (6)(6)(4)
SRSP-510 Issue 5

Test Method: FCC KDB 971168 D01 Power Meas License Digital Systems v03r01
ANSI C63.26: 2015

Modifications: None.

Final Result: Complies
Peak Output Measured: 30.48 W (Single output)

Applicable Regulation:

FCC CFR 47 Part 24.232 (a)(2)

Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

FCC CFR 47 Part 24.232 (a)(3)

Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; see Table below.

Antenna height (AAT) in Meters (feet)	Maximum equivalent isotropic radiated power (EIRP) in Watts / MHz
≤300	1640
≤500	1070
≤1000	490
≤1500	270
≤2000	160

FCC CFR 47 Part 24.232 (b)(2)

Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth greater than 1 MHz are limited to 3280 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

FCC CFR 47 Part 24.232 (b)(3)

Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; see table below.

Antenna height (AAT) in Meters (feet)	Maximum equivalent isotropic radiated power (EIRP) in Watts / MHz
≤300	3280
≤500	2140
≤1000	980
≤1500	540
≤2000	320

FCC CFR 47 Part 24.232 (d)

In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

RSS-133 Issue 6:

6.6.4

The transmitter output power shall be measured in terms of average power. In addition, the transmitter's peak-to-average power ratio (PAPR) shall not exceed 13 dB for more than 0.1% of the time using a signal corresponding to the highest PAPR during periods of continuous transmission.

For base and fixed equipment other than fixed subscriber equipment, refer to SRSP-510 for the e.i.r.p. limits.

SRSP-510 Issue 5:

5.1 Radiated power and antenna height limits for fixed and base stations

For base stations with a channel bandwidth greater than 1 MHz, the maximum e.i.r.p. is limited to 3280 watts/MHz. e.i.r.p. (i.e., no more than 3280 watts e.i.r.p. in any 1 MHz band segment) with an antenna height above average terrain (HAAT) up to 300 metres. Fixed or base stations operating in urban areas are limited to a maximum allowable e.i.r.p. of 1640 watts/MHz e.i.r.p. Base station antenna heights above average terrain may exceed 300 metres with a corresponding reduction in e.i.r.p. according to the following table:

Antenna height (AAT) in Meters (feet)	Maximum equivalent isotropic radiated power (EIRP) in Watts / MHz
≤300	3280 or 1640
≤500	1070
≤1000	490
≤1500	270
≤2000	160

Test Setup:

The EUT was tested outside the SAC via output-conducted measurements per KDB 971168 D01 Power Meas License Digital Systems v03r01 and ANSI C63.26:2015.

Measurement Data and Plots:

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1932.5	3.8	-2.87	40.16	37.29	5.36	6.67	13	6.33	Complies
1962.5	3.62	-3.64	40.11	36.47	4.44	7.26	13	5.74	Complies
1992.5	3.38	-3.36	40.26	36.9	4.90	6.74	13	6.26	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 5: Ant 1 RF Output Power:5 MHz BW, QPSK/16-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1932.5	5.24	-3.03	40.16	37.13	5.16	8.27	13	4.73	Complies
1962.5	4.76	-3.56	40.11	36.55	4.52	8.32	13	4.68	Complies
1992.5	5.37	-2.9	40.26	37.36	5.45	8.27	13	4.73	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 6: Ant 2 RF Output Power:5 MHz BW, QPSK/16-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1932.5	6.49	1.75	40.16	41.91	15.52	4.74	13	8.26	Complies
1962.5	5.8	1.5	40.11	41.61	14.49	4.3	13	8.7	Complies
1992.5	6.41	1.47	40.26	41.73	14.89	4.94	13	8.06	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 7: Ant 1 RF Output Power:5 MHz BW, QPSK/64-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1932.5	6.85	1.84	40.16	42	15.85	5.01	13	7.99	Complies
1962.5	6.31	1.35	40.11	41.46	14.00	4.96	13	8.04	Complies
1992.5	6.81	1.68	40.26	41.94	15.63	5.13	13	7.87	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 8: Ant 2 RF Output Power:5 MHz BW, QPSK/64-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1932.5	6.51	2.1	40.16	42.26	16.83	4.41	13	8.59	Complies
1962.5	5.86	1.15	40.11	41.26	13.37	4.71	13	8.29	Complies
1992.5	6.38	1.35	40.26	41.61	14.49	5.03	13	7.97	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 9: Ant 1 RF Output Power:5 MHz BW, QPSK/256-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1932.5	6.86	2.04	40.16	42.2	16.60	4.82	13	8.18	Complies
1962.5	6.4	1.54	40.11	41.65	14.62	4.86	13	8.14	Complies
1992.5	6.93	1.87	40.26	42.13	16.33	5.06	13	7.94	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 10: Ant 2 RF Output Power:5 MHz BW, QPSK/256-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1935	5.19	-1.89	40.16	38.27	6.71	7.08	13	5.92	Complies
1962.50	6.21	-2.81	40.11	37.3	5.37	9.02	13	3.98	Complies
1990	4.53	-3.35	40.26	36.91	4.91	7.88	13	5.12	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 11: Ant 1 RF Output Power:10 MHz BW, QPSK/16-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1935	4.22	-2.52	40.16	37.64	5.81	6.74	13	6.26	Complies
1962.50	3.71	-3.47	40.11	36.64	4.61	7.18	13	5.82	Complies
1990	4.24	-2.93	40.26	37.33	5.41	7.17	13	5.83	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 12: Ant 2 RF Output Power:10 MHz BW, QPSK/16-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1935	9.25	2.8	40.16	42.96	19.77	6.45	13	6.55	Complies
1962.50	8.47	2.11	40.11	42.22	16.67	6.36	13	6.64	Complies
1990	9.05	2.23	40.26	42.49	17.74	6.82	13	6.18	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 13: Ant 1 RF Output Power:10 MHz BW, QPSK/64-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1935	9.51	3.53	40.16	43.69	23.39	5.98	13	7.02	Complies
1962.50	9.11	2.71	40.11	42.82	19.14	6.4	13	6.6	Complies
1990	9.61	2.77	40.26	43.03	20.09	6.84	13	6.16	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 14: Ant 2 RF Output Power:10 MHz BW, QPSK/64-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1935	8.83	3.04	40.16	43.2	20.89	5.79	13	7.21	Complies
1962.50	8.38	2.11	40.11	42.22	16.67	6.27	13	6.73	Complies
1990	8.9	2.65	40.26	42.91	19.54	6.25	13	6.75	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 15: Ant 1 RF Output Power:10 MHz BW, QPSK/256-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1935	9.63	2.83	40.16	42.99	19.91	6.8	13	6.2	Complies
1962.50	9.15	2.46	40.11	42.57	18.07	6.69	13	6.31	Complies
1990	9.47	2.91	40.26	43.17	20.75	6.56	13	6.44	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 16: Ant 2 RF Output Power:10 MHz BW, QPSK/256-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1937.50	5.91	-2.34	40.16	37.82	6.05	8.25	13	4.75	Complies
1962.50	4.82	-2.6	40.11	37.51	5.64	7.42	13	5.58	Complies
1987.50	6.19	-2.52	40.26	37.74	5.94	8.71	13	4.29	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 17: Ant 1 RF Output Power:15 MHz BW, QPSK/16-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1937.50	4.46	-3.72	40.16	36.44	4.41	8.18	13	4.82	Complies
1962.50	5.87	-2.49	40.11	37.62	5.78	8.36	13	4.64	Complies
1987.50	4.63	-3.21	40.26	37.05	5.07	7.84	13	5.16	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 18: Ant 2 RF Output Power:15 MHz BW, QPSK/16-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1937.50	10.81	4.13	40.16	44.29	26.85	6.68	13	6.32	Complies
1962.50	10.56	4	40.11	44.11	25.76	6.56	13	6.44	Complies
1987.50	10.6	3.88	40.26	44.14	25.94	6.72	13	6.28	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 19: Ant 1 RF Output Power:15 MHz BW, QPSK/64-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1937.50	9.88	3.08	40.16	43.24	21.09	6.8	13	6.2	Complies
1962.50	10.36	4.02	40.11	44.13	25.88	6.34	13	6.66	Complies
1987.50	9.98	3.31	40.26	43.57	22.75	6.67	13	6.33	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 20: Ant 2 RF Output Power:15 MHz BW, QPSK/64-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1937.50	10.85	3.86	40.16	44.02	25.23	6.99	13	6.01	Complies
1962.50	10.53	3.72	40.11	43.83	24.15	6.81	13	6.19	Complies
1987.50	10.64	3.82	40.26	44.08	25.59	6.82	13	6.18	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 21: Ant 1 RF Output Power:15 MHz BW, QPSK/256-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1937.50	8.76	2.04	40.16	42.2	16.60	6.72	13	6.28	Complies
1962.50	10.28	3.81	40.11	43.92	24.66	6.47	13	6.53	Complies
1987.50	10.04	3.63	40.26	43.89	24.49	6.41	13	6.59	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 22: Ant 2 RF Output Power:15 MHz BW, QPSK/256-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1940	5.61	-2.14	40.16	38.02	6.34	7.75	13	5.25	Complies
1962.50	5.57	-2.82	40.11	37.29	5.36	8.39	13	4.61	Complies
1985	5.73	-2.67	40.26	37.59	5.74	8.4	13	4.6	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 23: Ant 1 RF Output Power:20 MHz BW, QPSK/16-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1940	3.88	-4.36	40.16	35.8	3.80	8.24	13	4.76	Complies
1962.50	4.62	-3.16	40.11	36.95	4.95	7.78	13	5.22	Complies
1985	5.93	-1.5	40.26	38.76	7.52	7.43	13	5.57	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 24: Ant 2 RF Output Power:20 MHz BW, QPSK/16-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1940	10.76	3.91	40.16	44.07	25.53	6.85	13	6.15	Complies
1962.50	10.47	3.52	40.11	43.63	23.07	6.95	13	6.05	Complies
1985	10.72	3.85	40.26	44.11	25.76	6.87	13	6.13	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 25: Ant 1 RF Output Power:20 MHz BW, QPSK/64-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1940	9.88	4.32	40.16	44.48	28.05	5.56	13	7.44	Complies
1962.50	10.01	3.13	40.11	43.24	21.09	6.88	13	6.12	Complies
1985	9.88	4.58	40.26	44.84	30.48	5.3	13	7.7	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 26: Ant 2 RF Output Power:20 MHz BW, QPSK/64-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1940	10.58	3.97	40.16	44.13	25.88	6.61	13	6.39	Complies
1962.50	10.56	4.15	40.11	44.26	26.67	6.41	13	6.59	Complies
1985	10.49	3.83	40.26	44.09	25.64	6.66	13	6.34	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 27: Ant 1 RF Output Power:20 MHz BW, QPSK/256-QAM

Carrier Frequency (MHz)	Raw Peak (dBm)	Raw Avg (dBm)	Correction Factor[1] (dB)	Corrected Avg Output Power (dBm)	Corrected Avg Output Power (W)	PAPR (dB)	Limit (dB)	Margin (dB)	Results
1940	10.39	3.57	40.16	43.73	23.60	6.82	13	6.18	Complies
1962.50	10.16	3.27	40.11	43.38	21.78	6.89	13	6.11	Complies
1985	9.77	4.3	40.26	44.56	28.58	5.47	13	7.53	Complies

[1] Correction factor consists of cable loss, external attenuator, and adapter(s)

Table 28: Ant 2 RF Output Power:20 MHz BW, QPSK/256-QAM

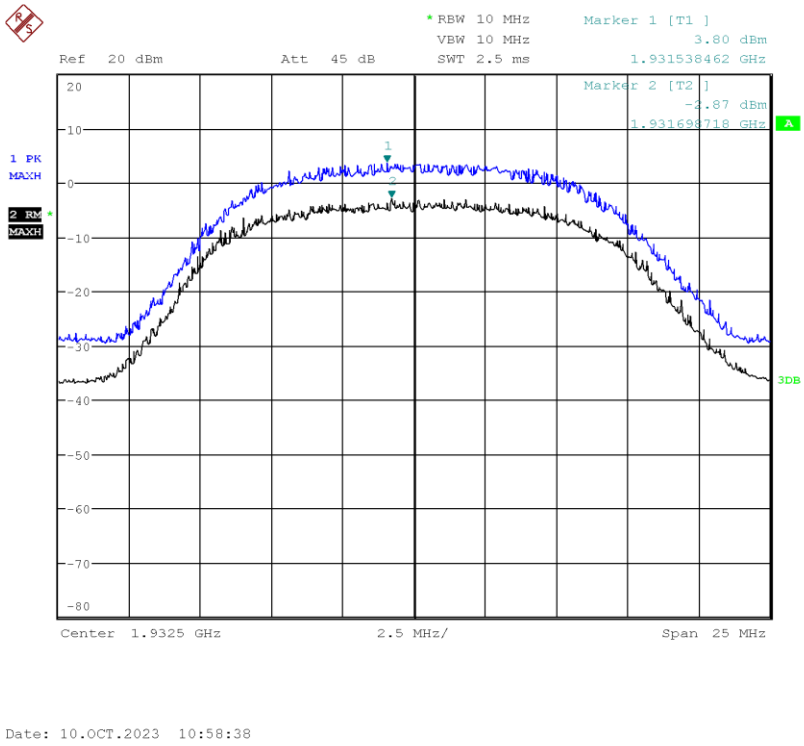

Figure 2: Ant 1 Output Power, 5 MHz BW, QPSK/16QAM, Low Channel

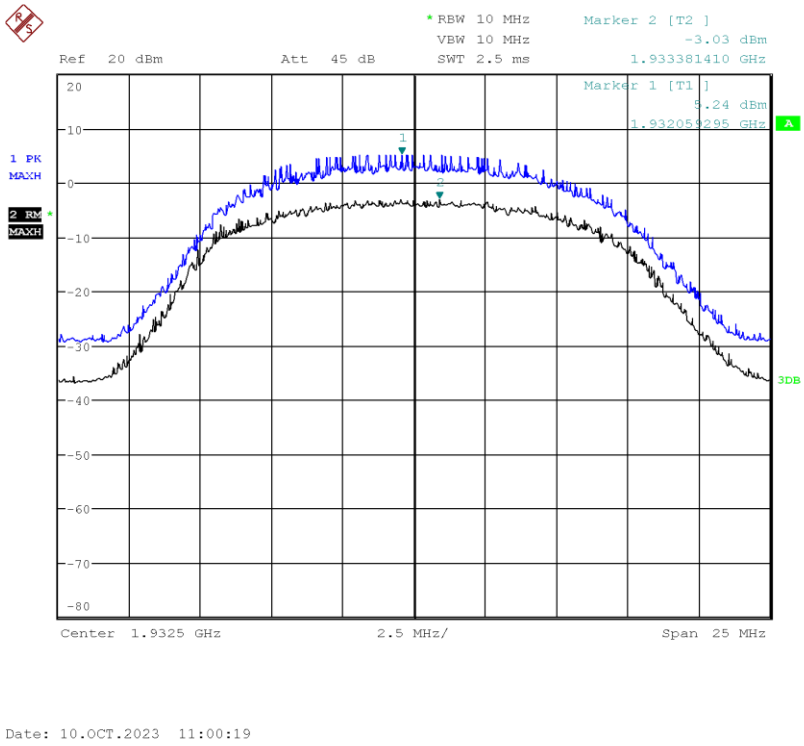

Figure 3: Ant 2 Output Power, 5 MHz BW, QPSK/16QAM, Low Channel

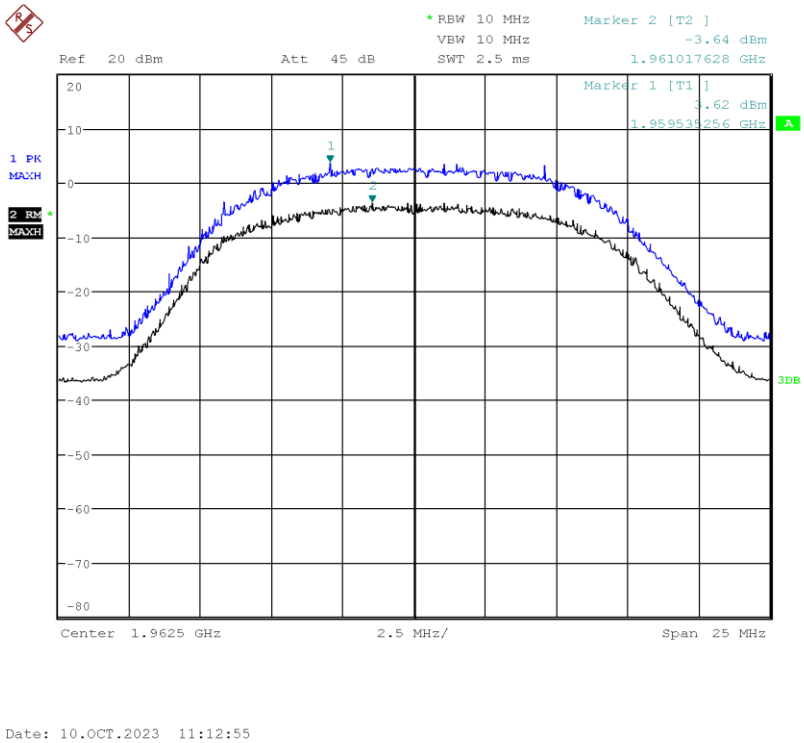

Figure 4: Ant 1 Output Power, 5 MHz BW, QPSK/16QAM, Mid Channel

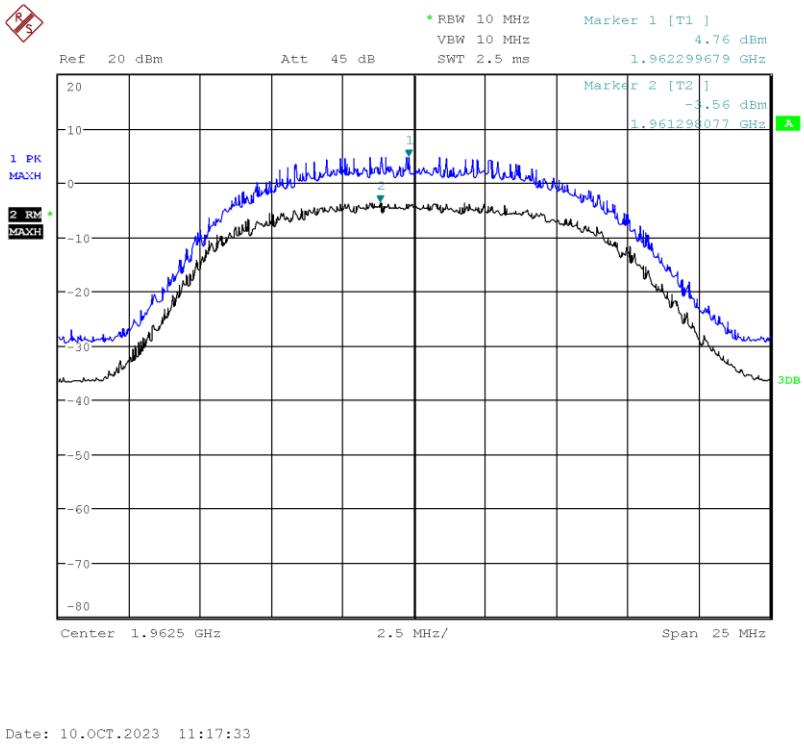

Figure 5: Ant 2 Output Power, 5 MHz BW, QPSK/16QAM, Mid Channel

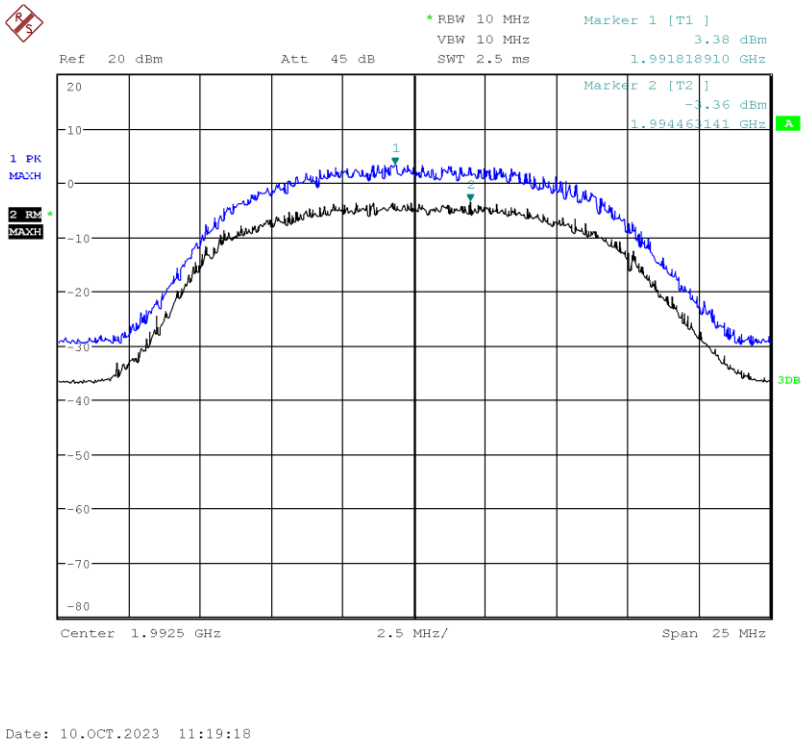

Figure 6: Ant 1 Output Power, 5 MHz BW, QPSK/16QAM, High Channel

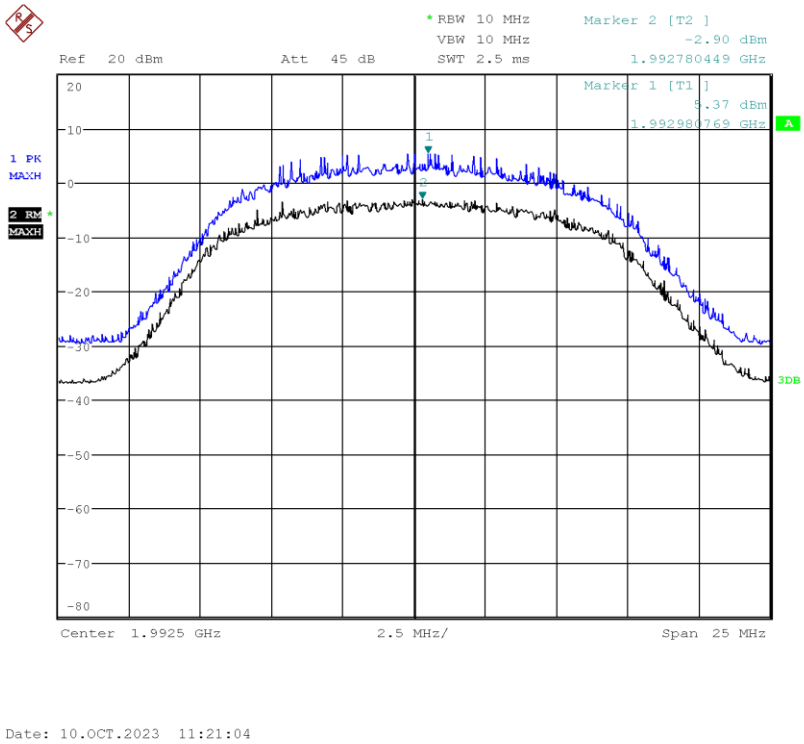

Figure 7: Ant 2 Output Power, 5 MHz BW, QPSK/16QAM, High Channel

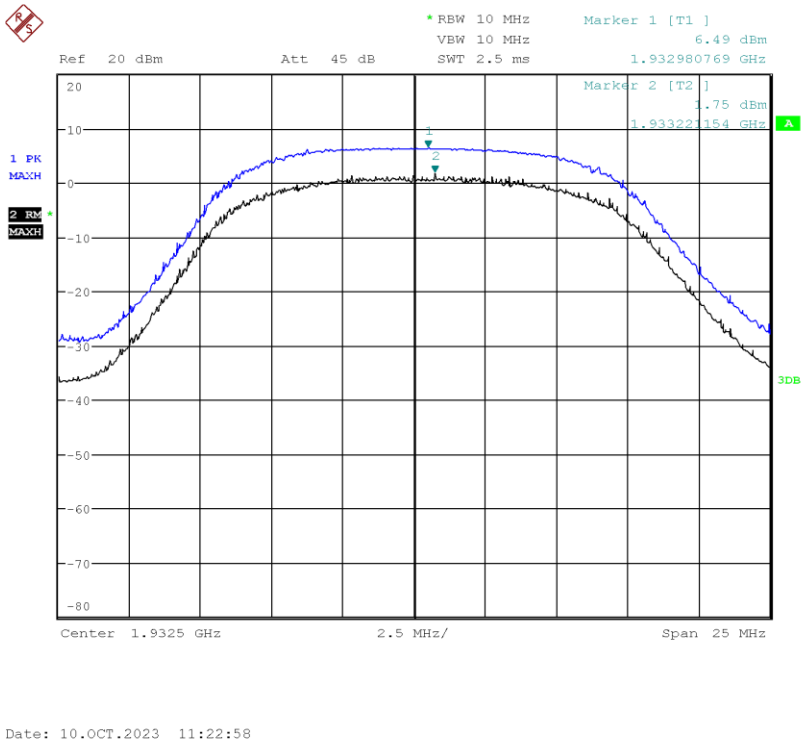

Figure 8: Ant 1 Output Power, 5 MHz BW, QPSK/64QAM, Low Channel

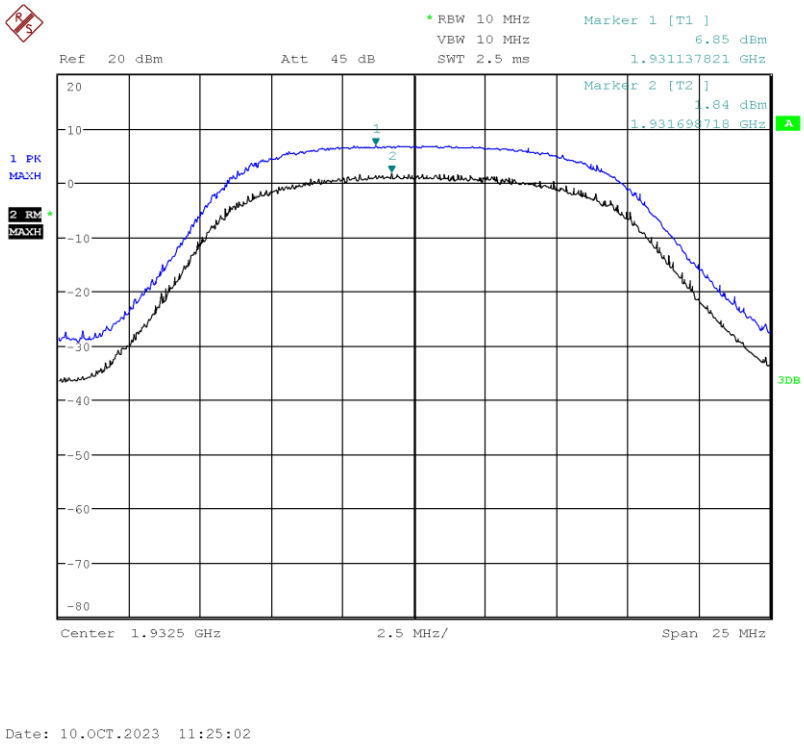

Figure 9: Ant 2 Output Power, 5 MHz BW, QPSK/64QAM, Low Channel

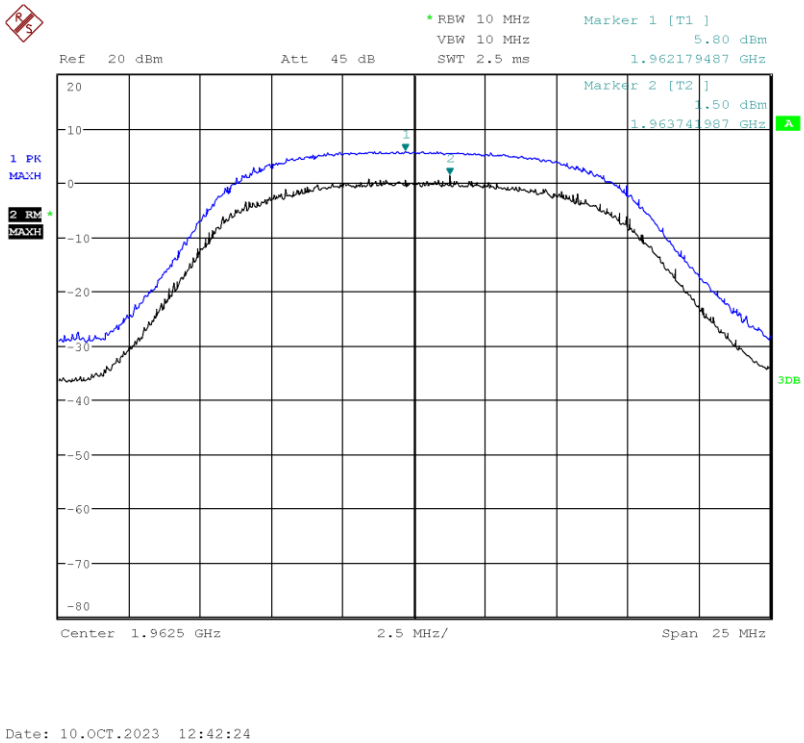

Figure 10: Ant 1 Output Power, 5 MHz BW, QPSK/64QAM, Mid Channel

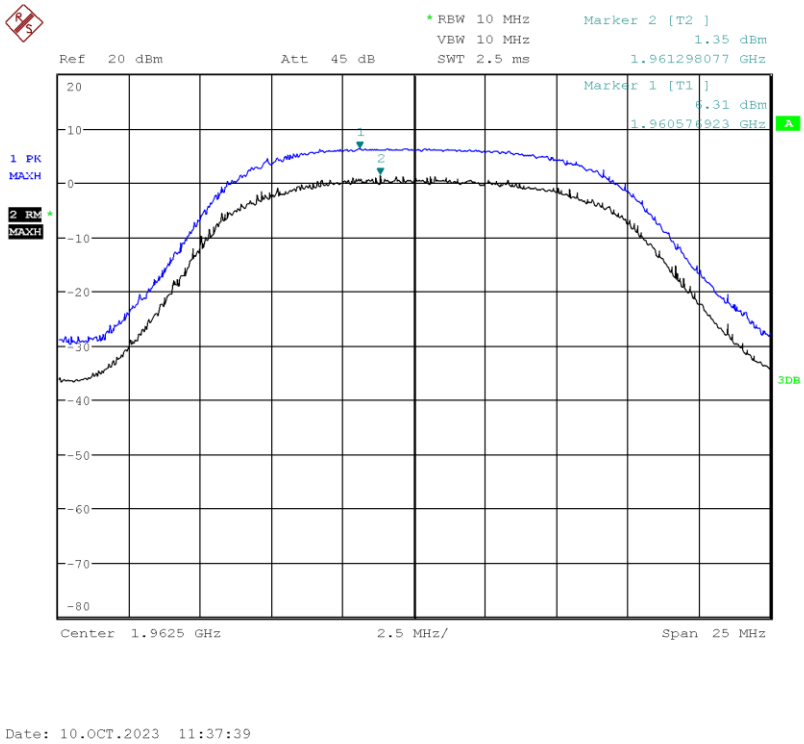

Figure 11: Ant 2 Output Power, 5 MHz BW, QPSK/64QAM, Mid Channel

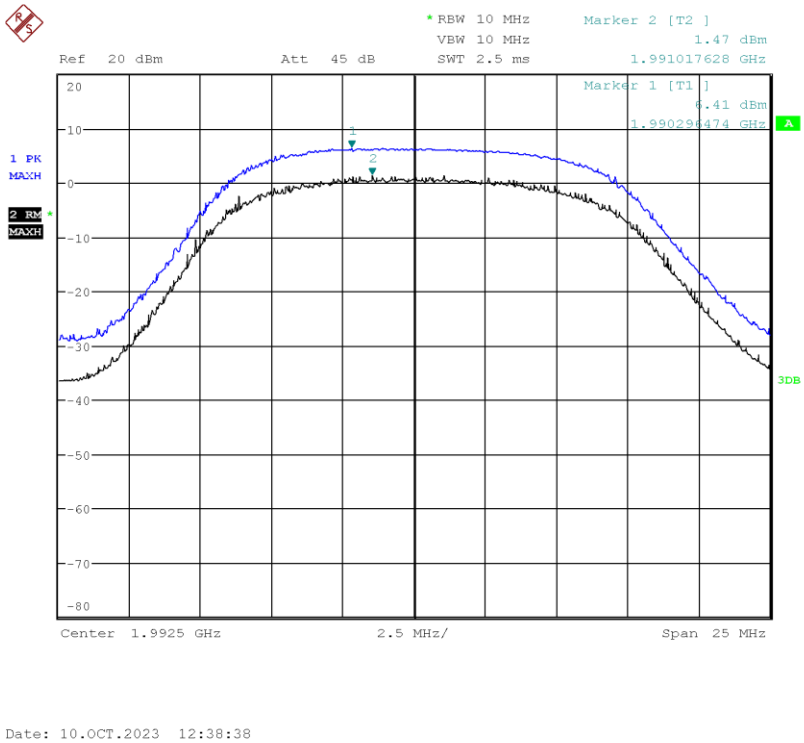

Figure 12: Ant 1 Output Power, 5 MHz BW, QPSK/64QAM, High Channel

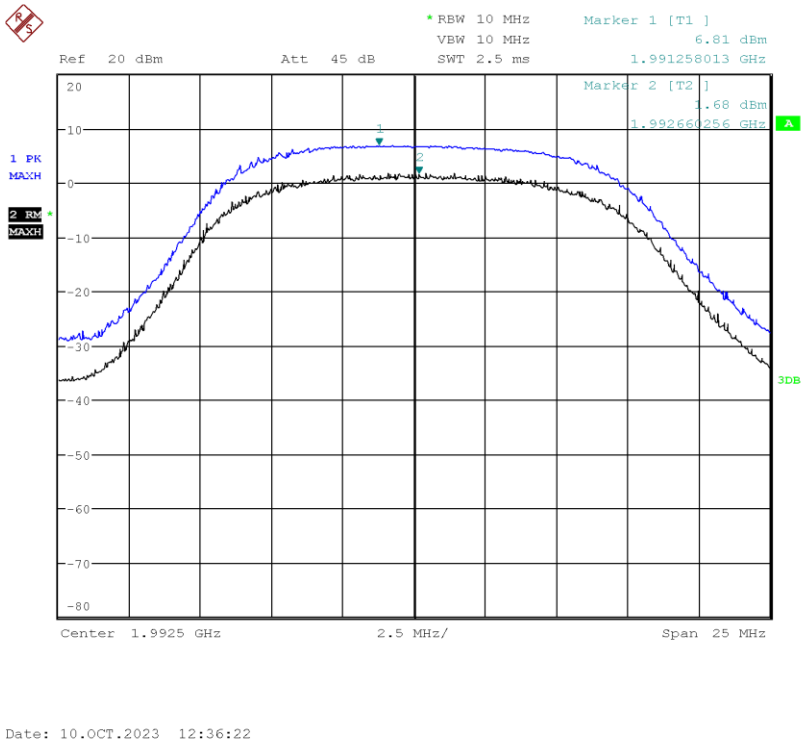

Figure 13: Ant 2 Output Power, 5 MHz BW, QPSK/64QAM, High Channel

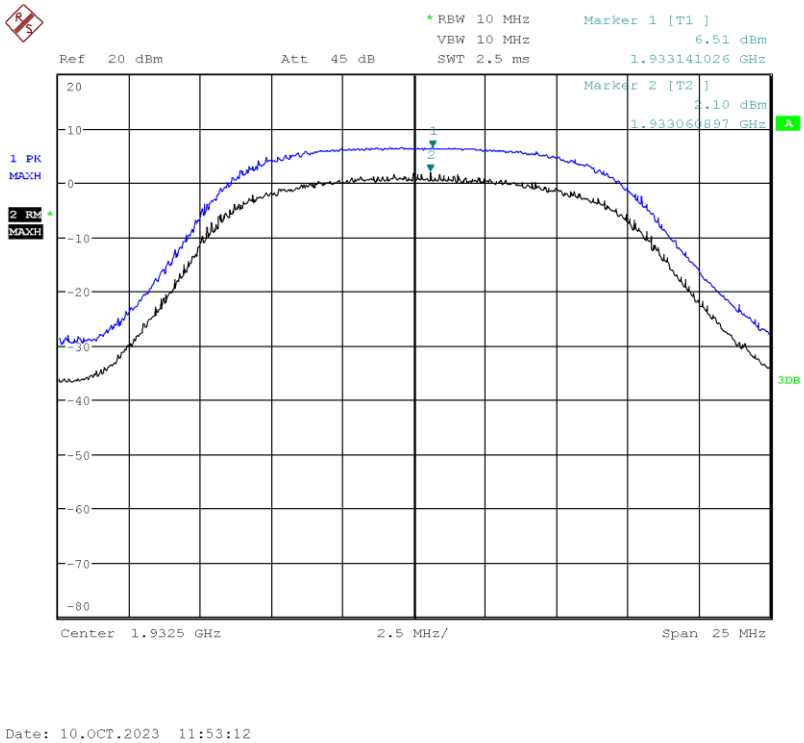

Figure 14: Ant 1 Output Power, 5 MHz BW, QPSK/256QAM, Low Channel

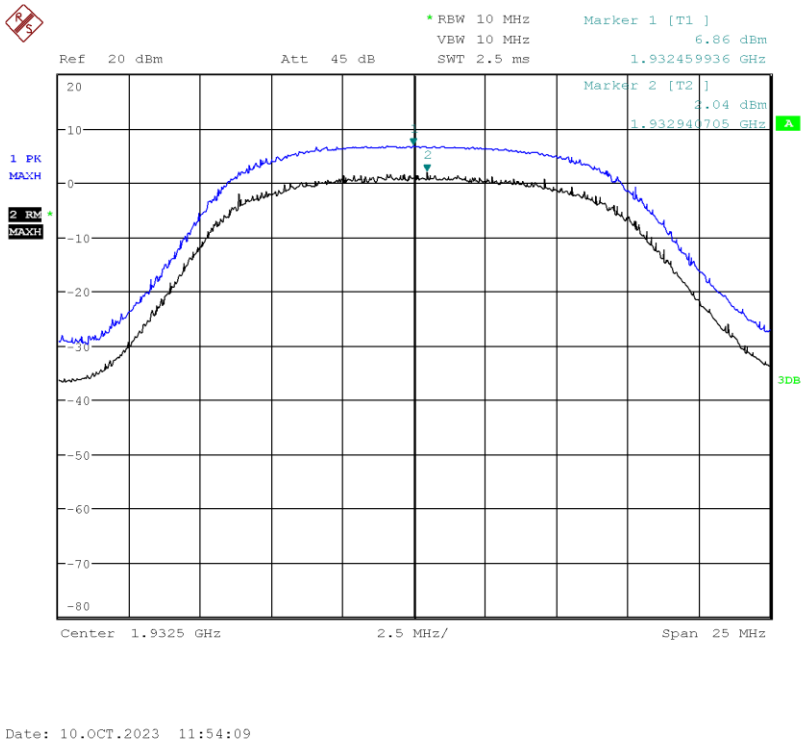

Figure 15: Ant 2 Output Power, 5 MHz BW, QPSK/256QAM, Low Channel

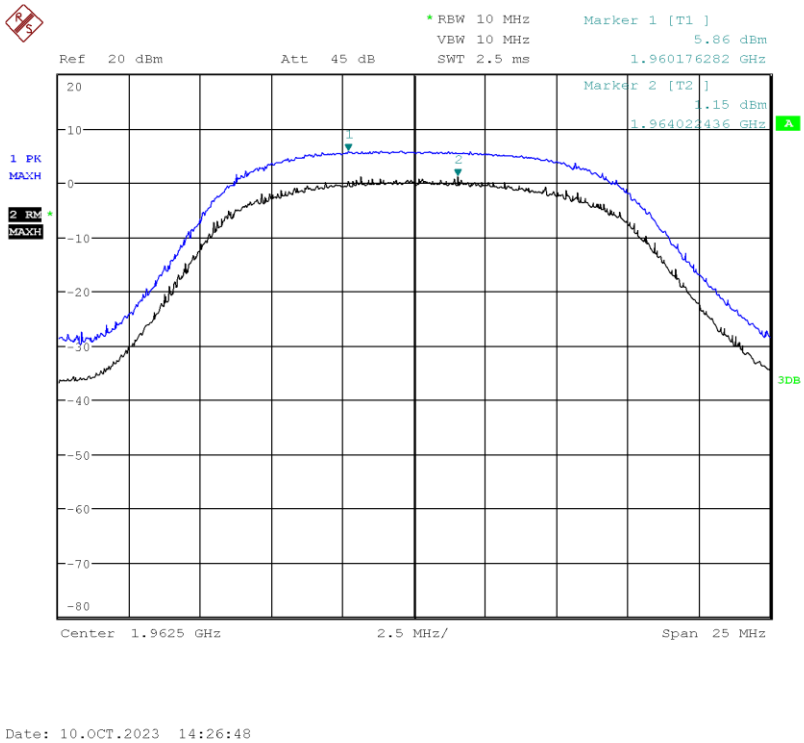

Figure 16: Ant 1 Output Power, 5 MHz BW, QPSK/256QAM, Mid Channel

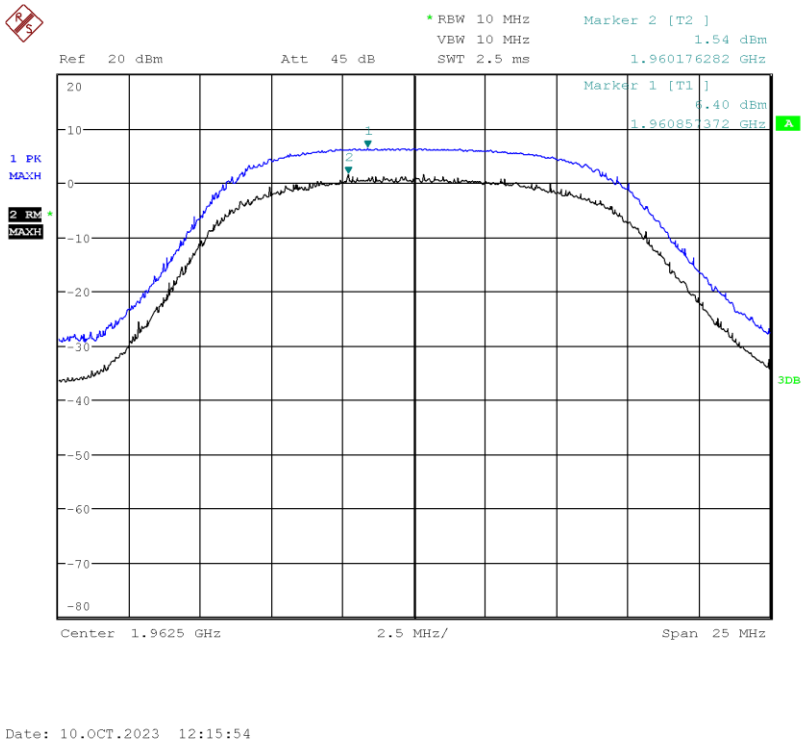

Figure 17: Ant 2 Output Power, 5 MHz BW, QPSK/256QAM, Mid Channel

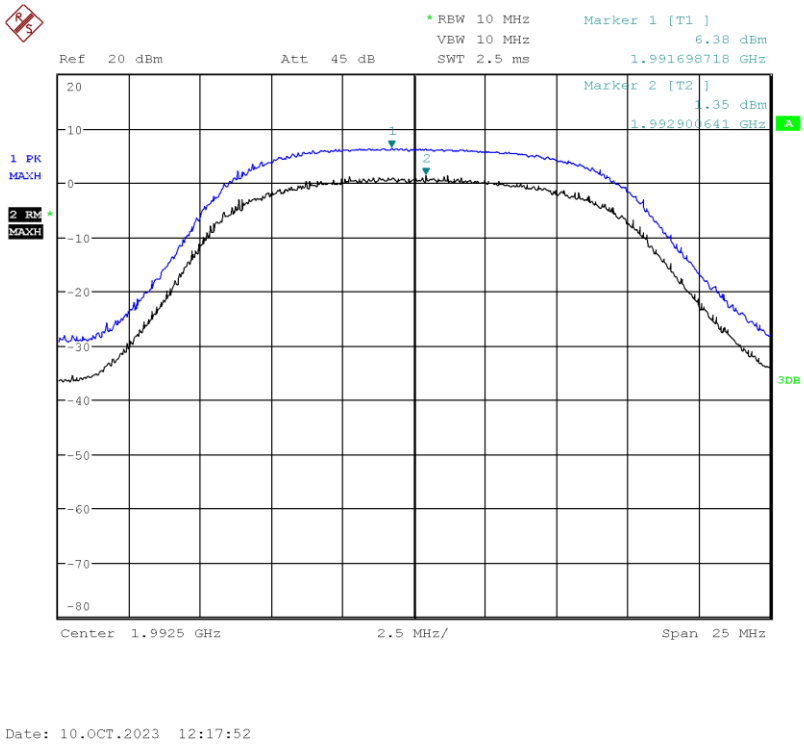

Figure 18: Ant 1 Output Power, 5 MHz BW, QPSK/256QAM, High Channel

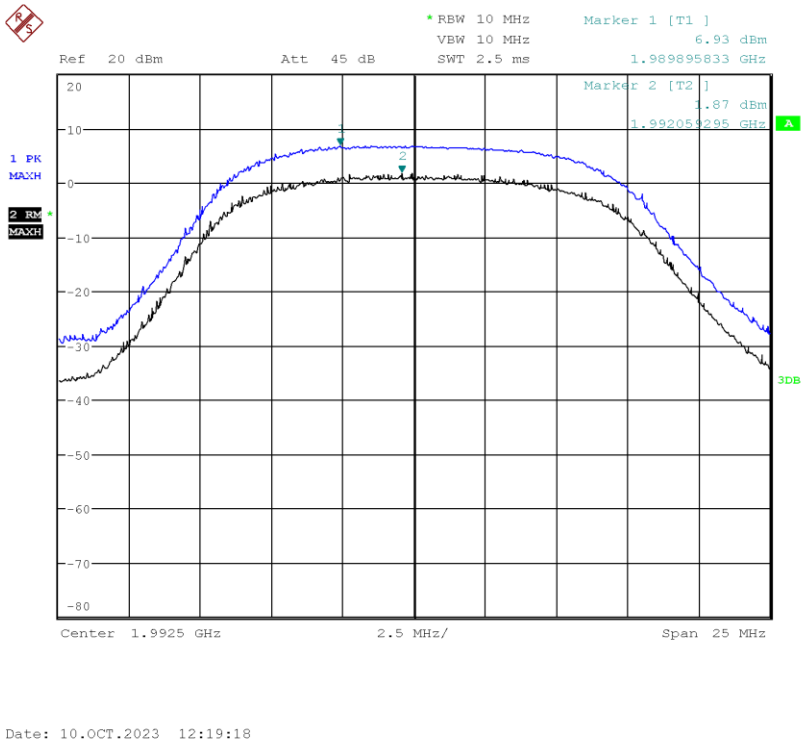

Figure 19: Ant 2 Output Power, 5 MHz BW, QPSK/256QAM, High Channel

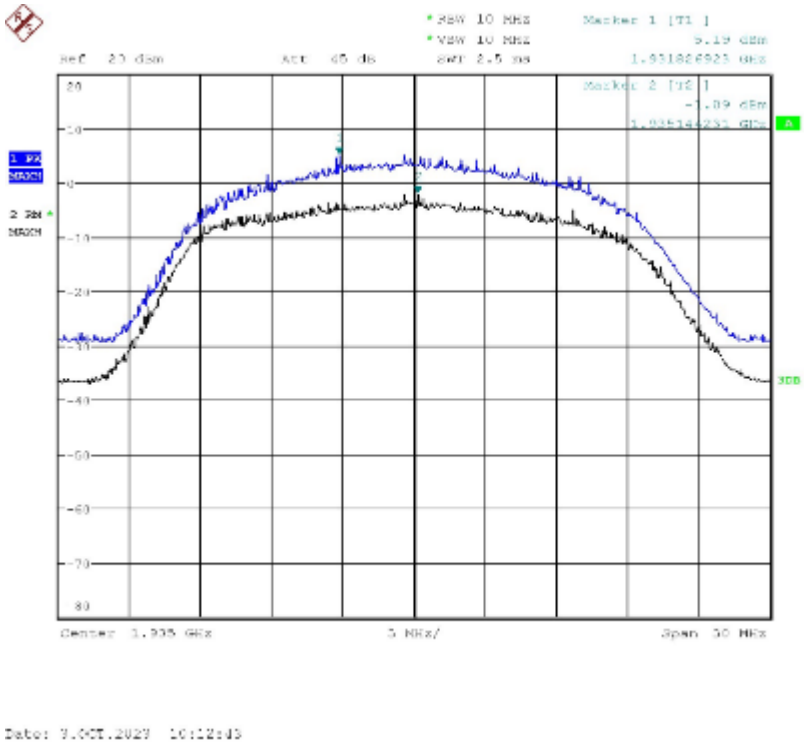

Figure 20: Ant 1 Output Power, 10 MHz BW, QPSK/16QAM, Low Channel

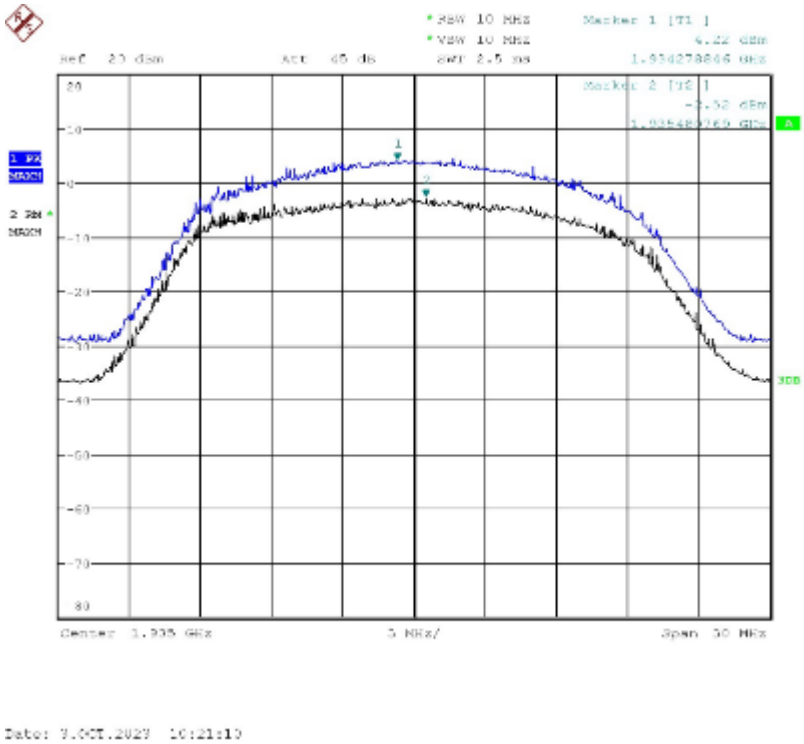

Figure 21: Ant 2 Output Power, 10 MHz BW, QPSK/16QAM, Low Channel

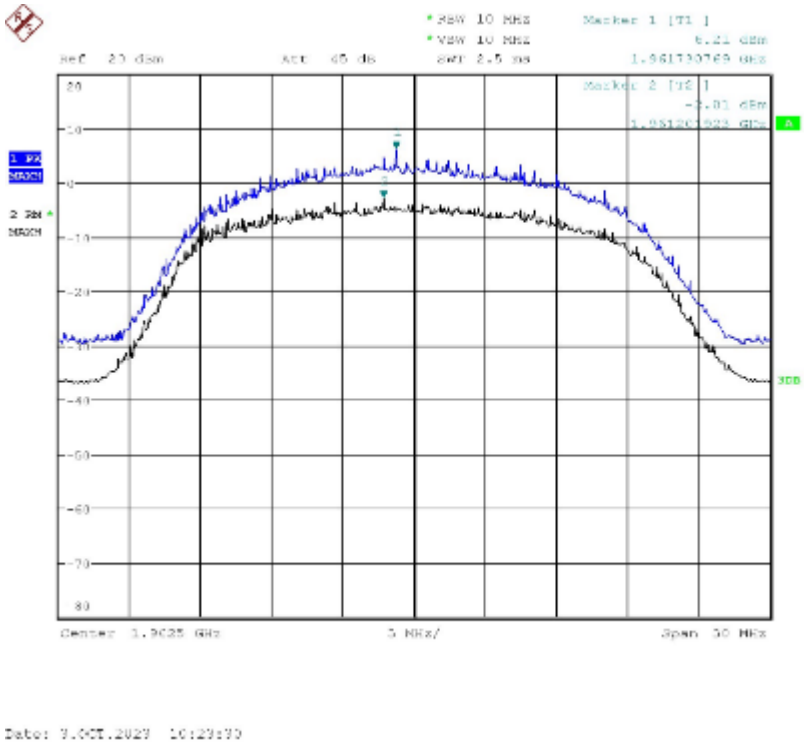

Figure 22: Ant 1 Output Power, 10 MHz BW, QPSK/16QAM, Mid Channel

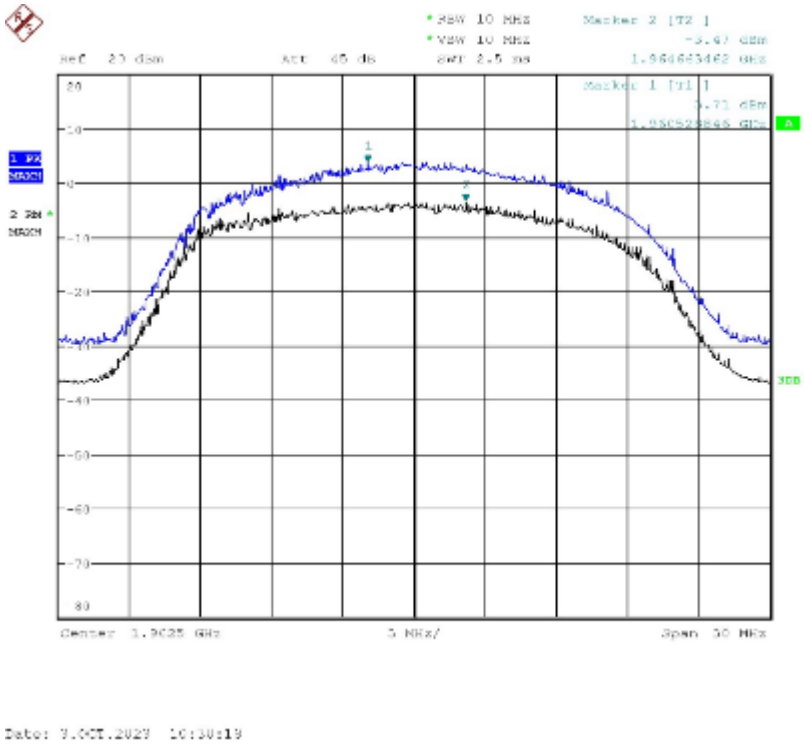

Figure 23: Ant 2 Output Power, 10 MHz BW, QPSK/16QAM, Mid Channel

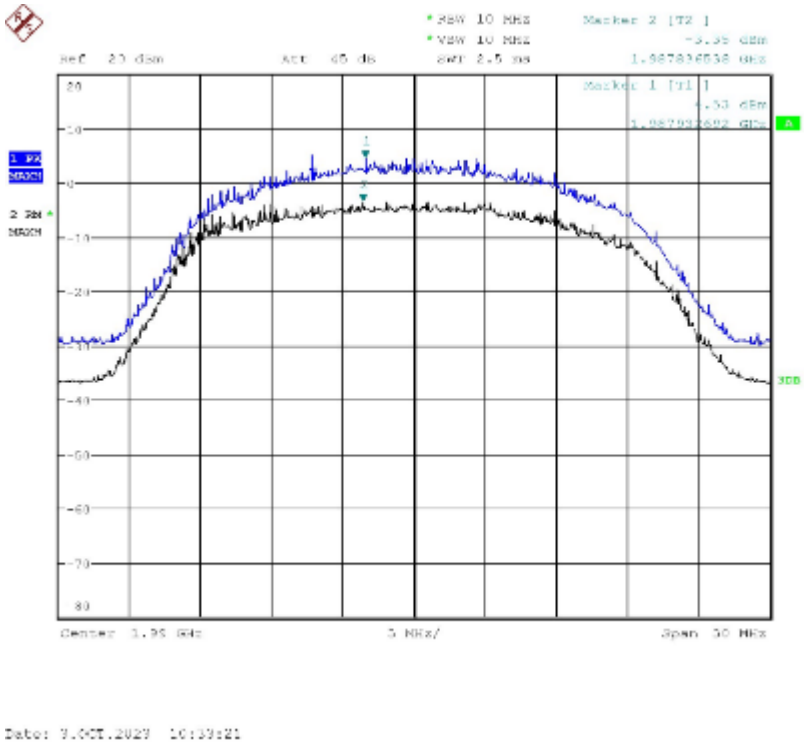

Figure 24: Ant 1 Output Power, 10 MHz BW, QPSK/16QAM, High Channel

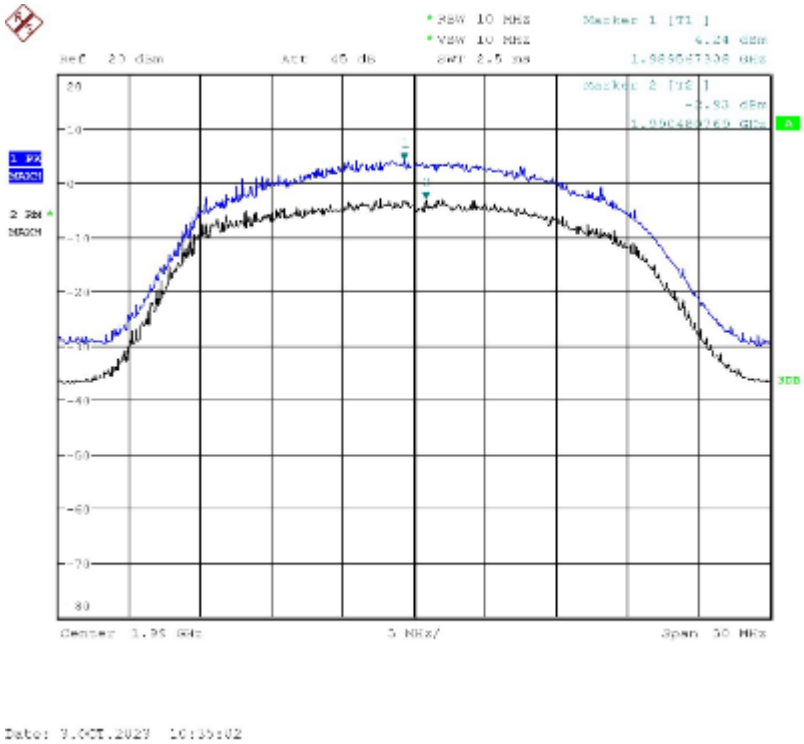

Figure 25: Ant 2 Output Power, 10 MHz BW, QPSK/16QAM, High Channel

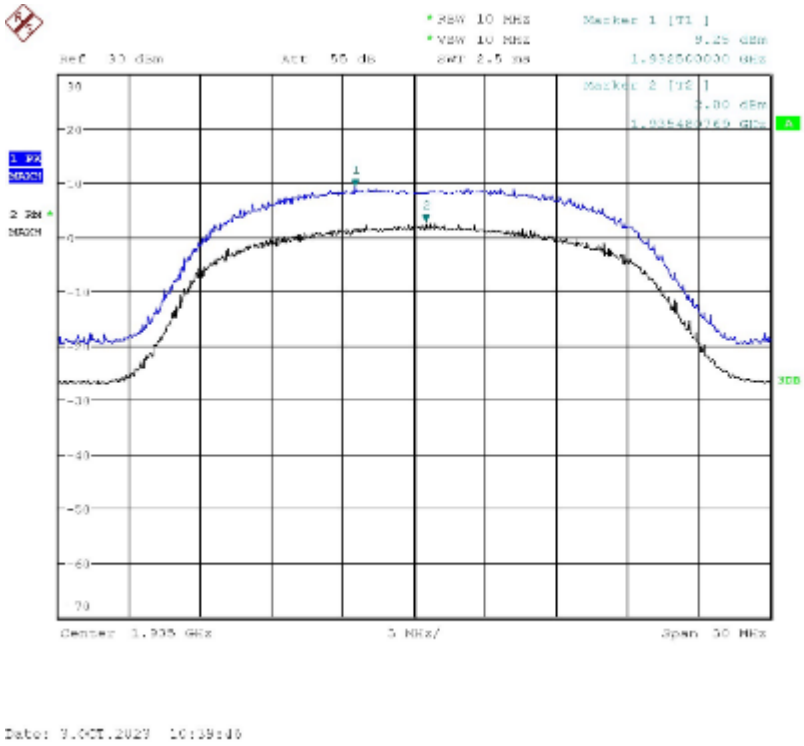

Figure 26: Ant 1 Output Power, 10 MHz BW, QPSK/64QAM, Low Channel

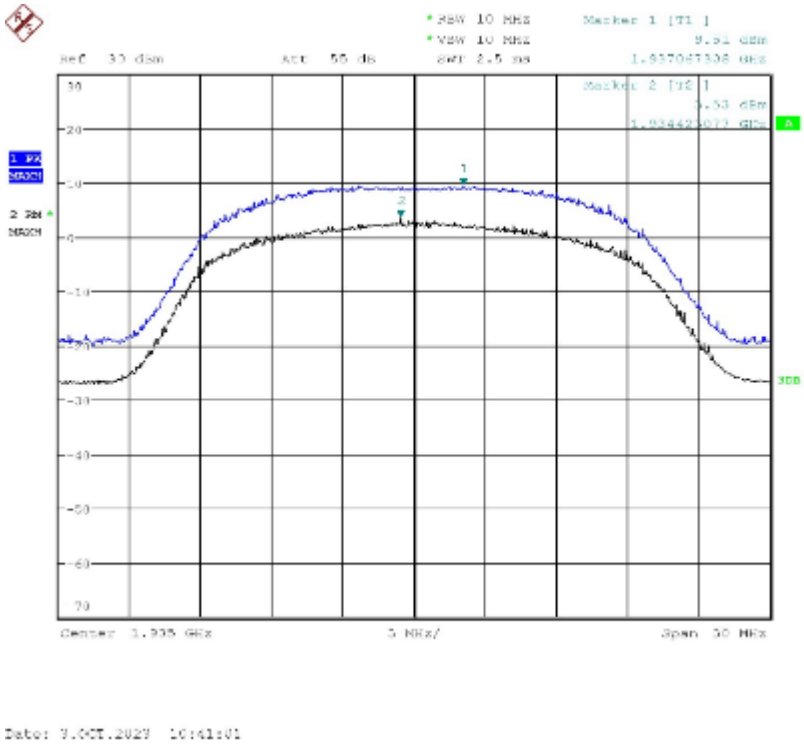

Figure 27: Ant 2 Output Power, 10 MHz BW, QPSK/64QAM, Low Channel

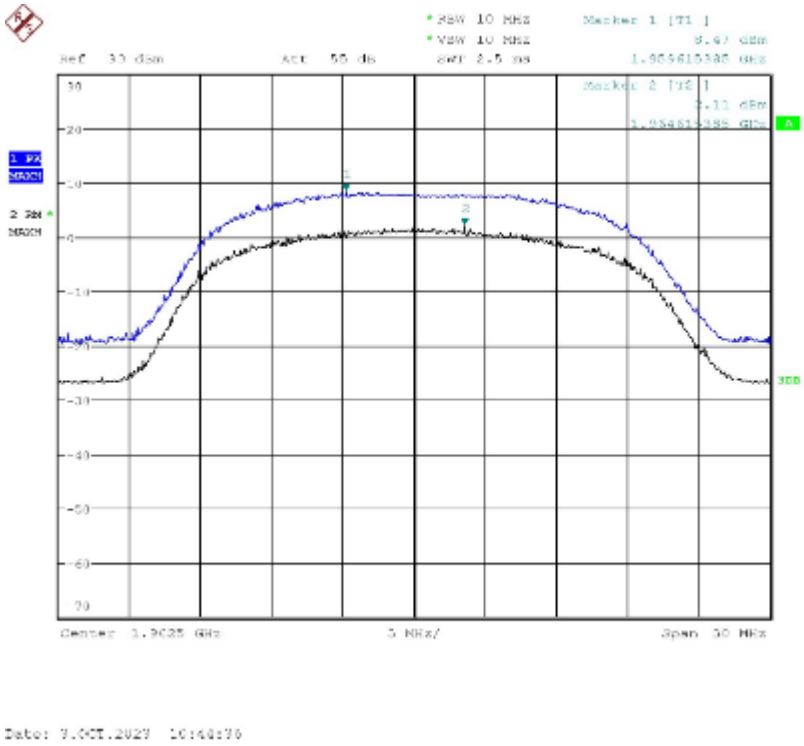

Figure 28: Ant 1 Output Power, 10 MHz BW, QPSK/64QAM, Mid Channel

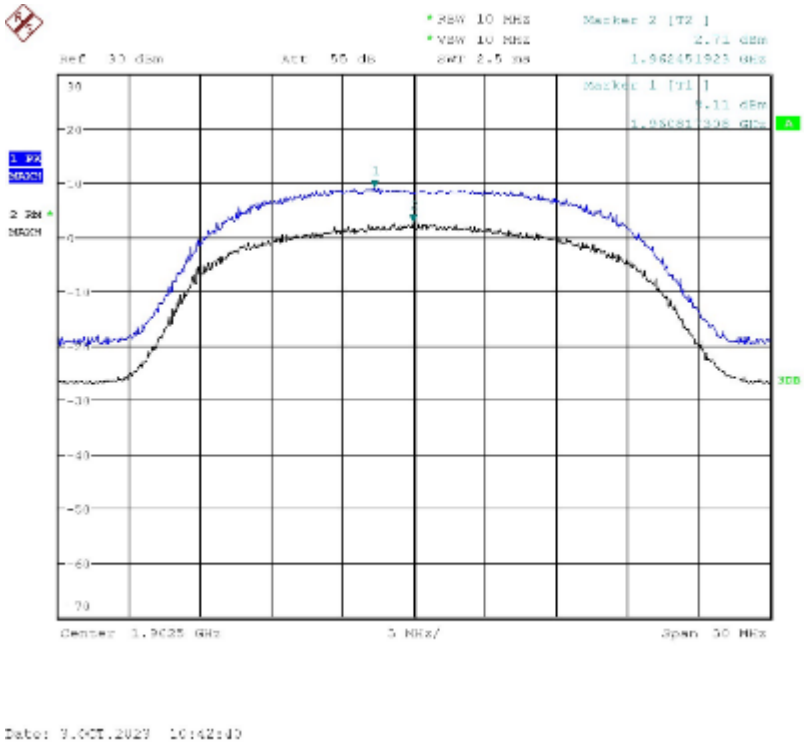

Figure 29: Ant 2 Output Power, 10 MHz BW, QPSK/64QAM, Mid Channel

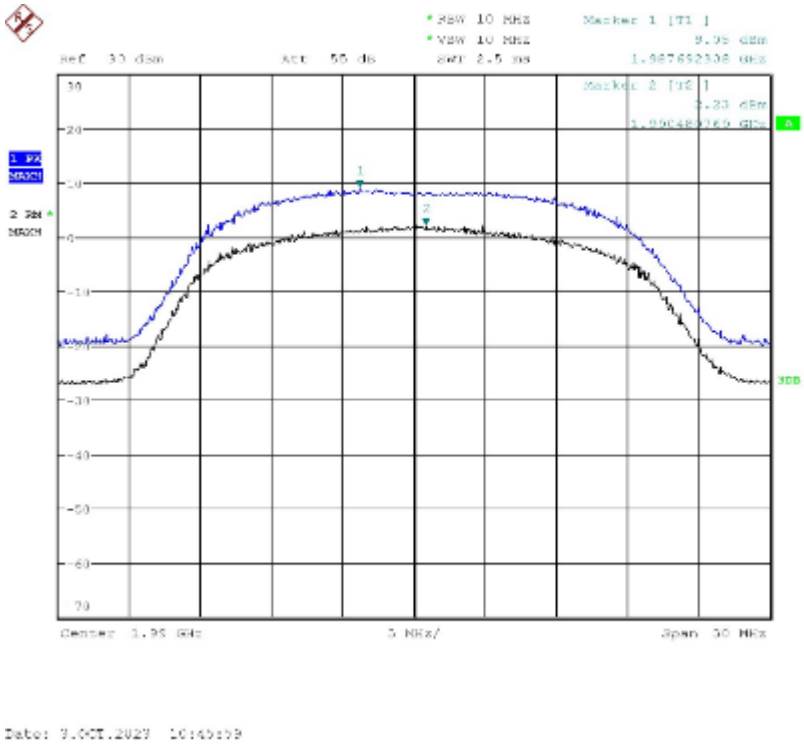

Figure 30: Ant 1 Output Power, 10 MHz BW, QPSK/64QAM, High Channel

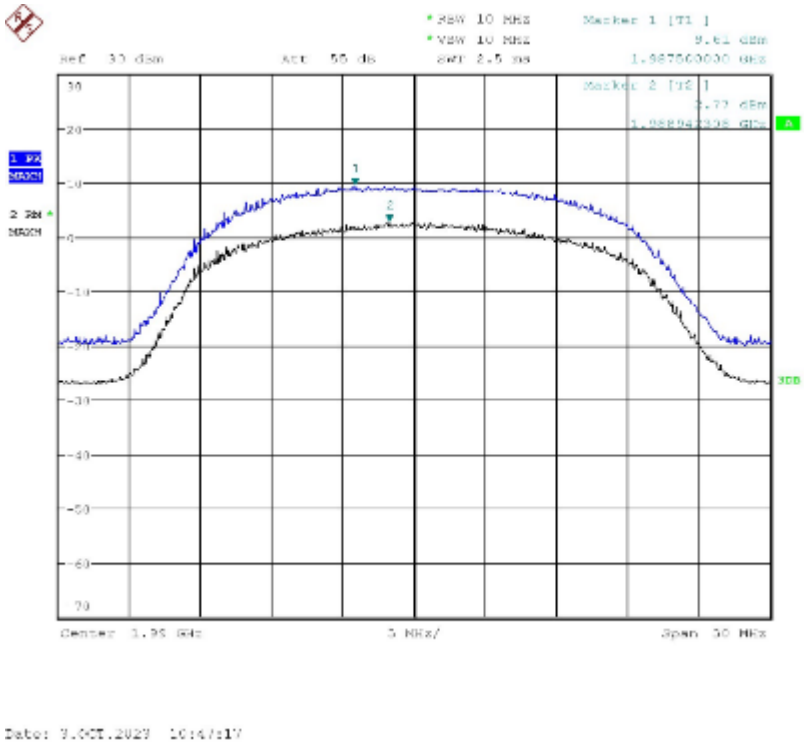

Figure 31: Ant 2 Output Power, 10 MHz BW, QPSK/64QAM, High Channel

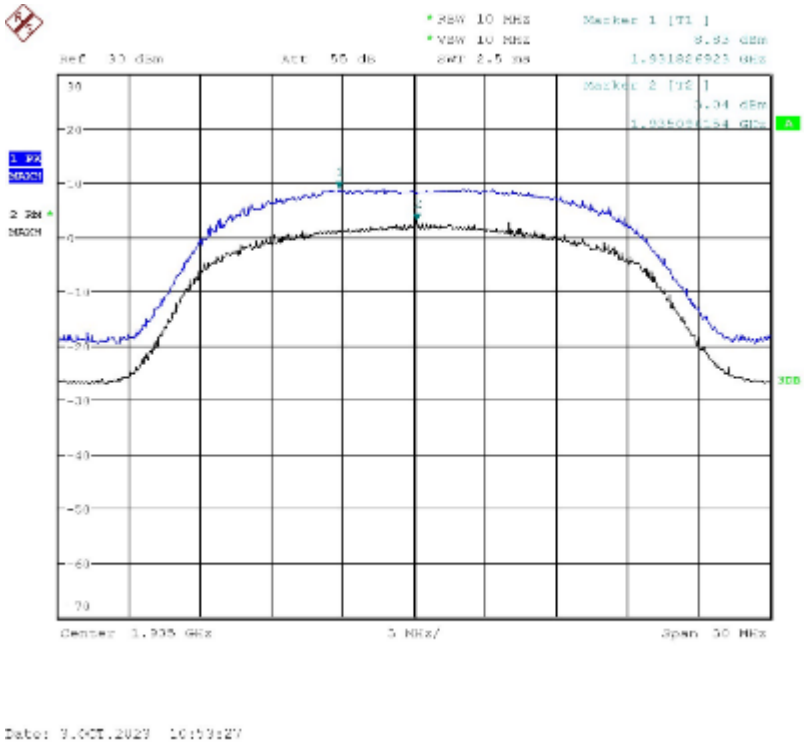

Figure 32: Ant 1 Output Power, 10 MHz BW, QPSK/256QAM, Low Channel

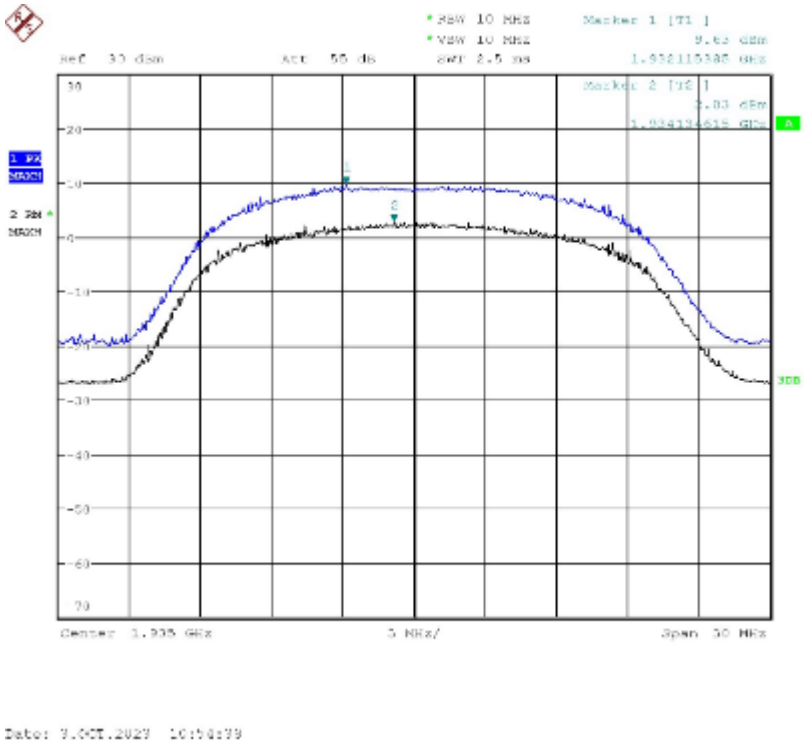

Figure 33: Ant 2 Output Power, 10 MHz BW, QPSK/256QAM, Low Channel

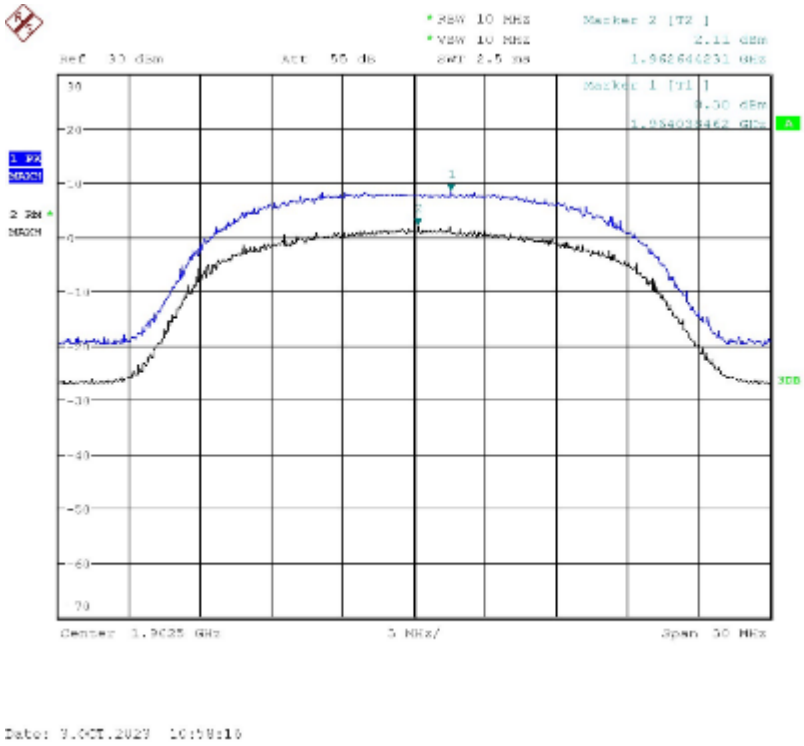

Figure 34: Ant 1 Output Power, 10 MHz BW, QPSK/256QAM, Mid Channel

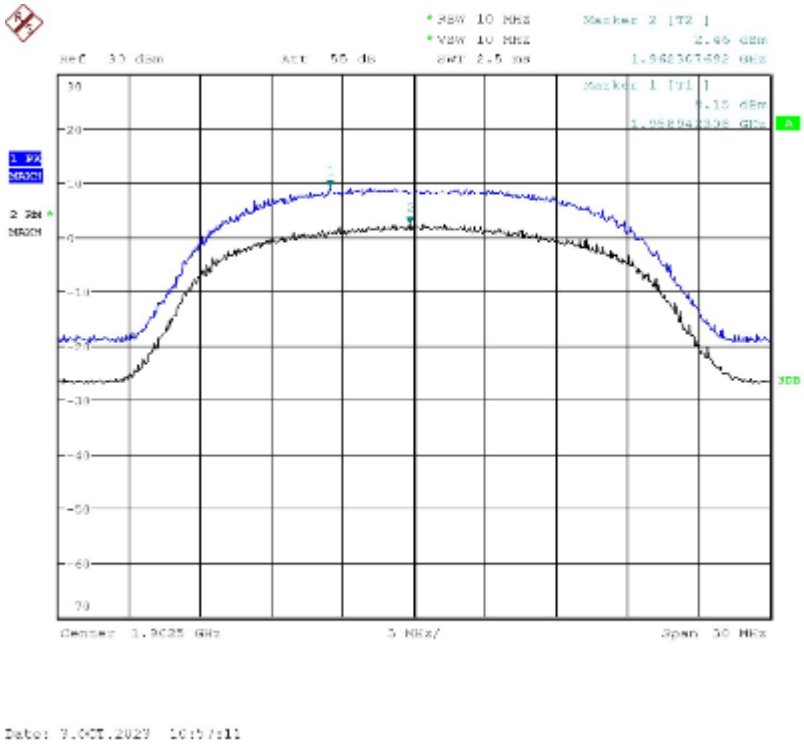

Figure 35: Ant 2 Output Power, 10 MHz BW, QPSK/256QAM, Mid Channel

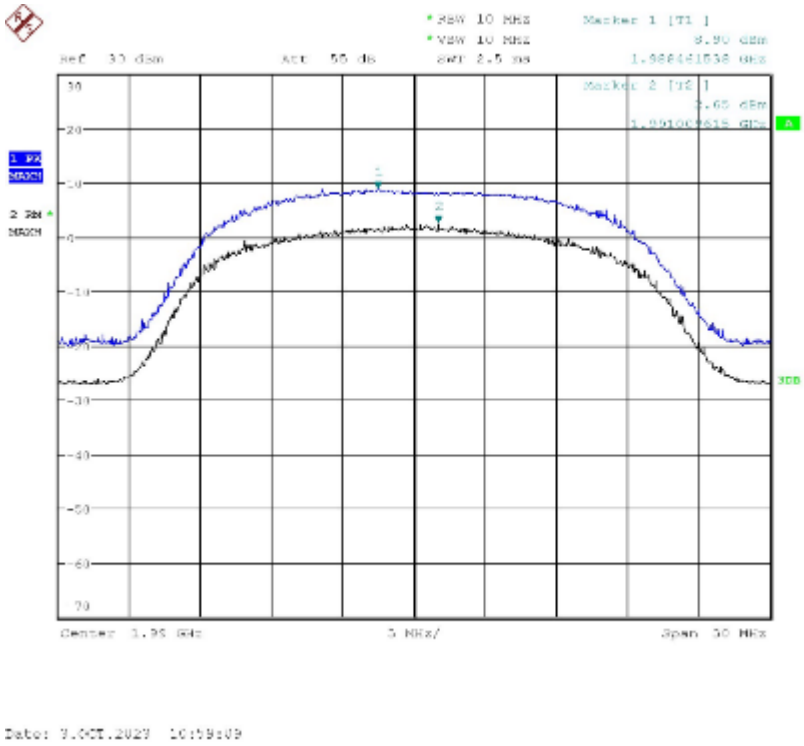

Figure 36: Ant 1 Output Power, 10 MHz BW, QPSK/256QAM, High Channel

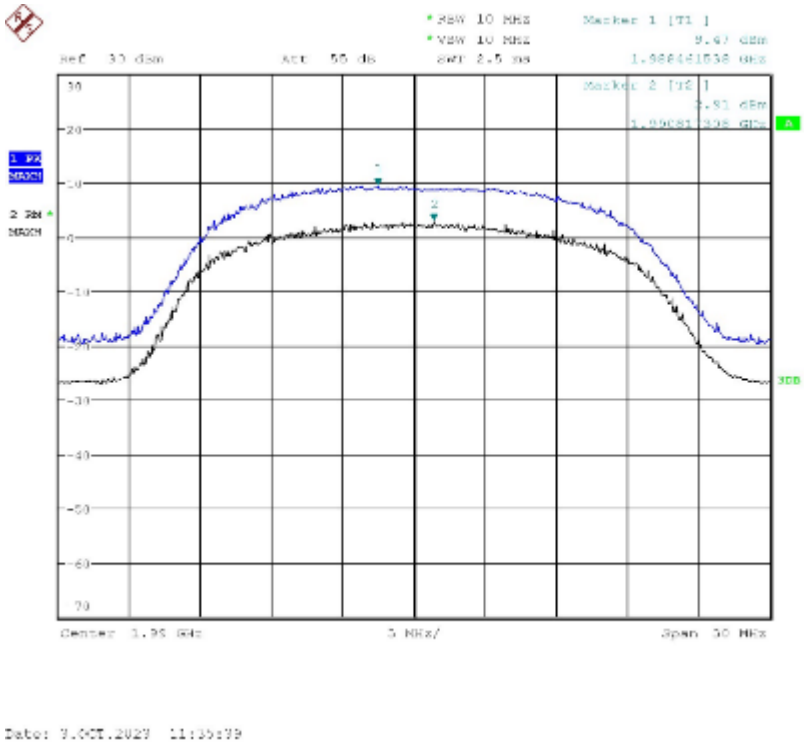

Figure 37: Ant 2 Output Power, 10 MHz BW, QPSK/256QAM, High Channel

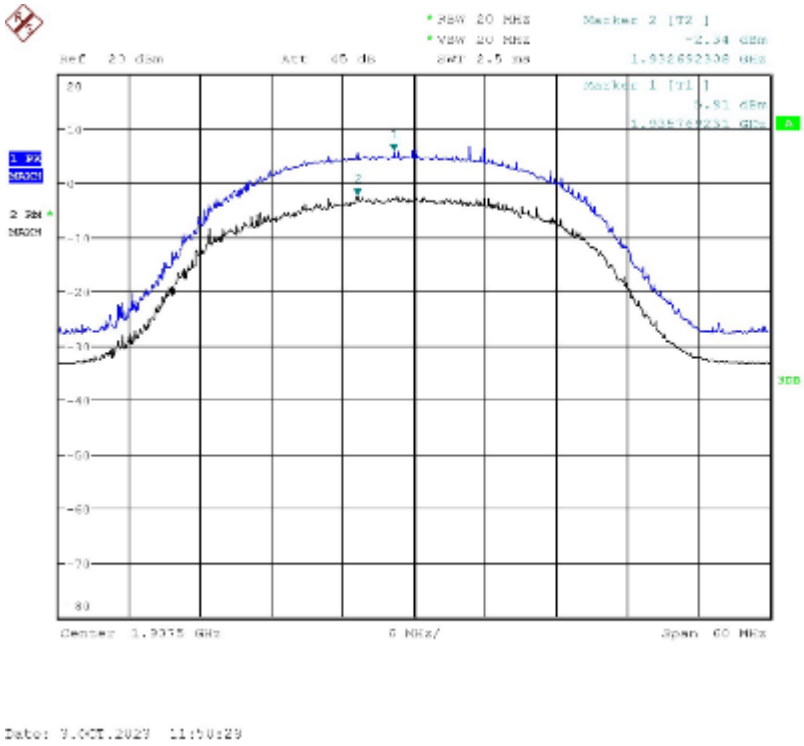

Figure 38: Ant 1 Output Power, 15 MHz BW, QPSK/16QAM, Low Channel

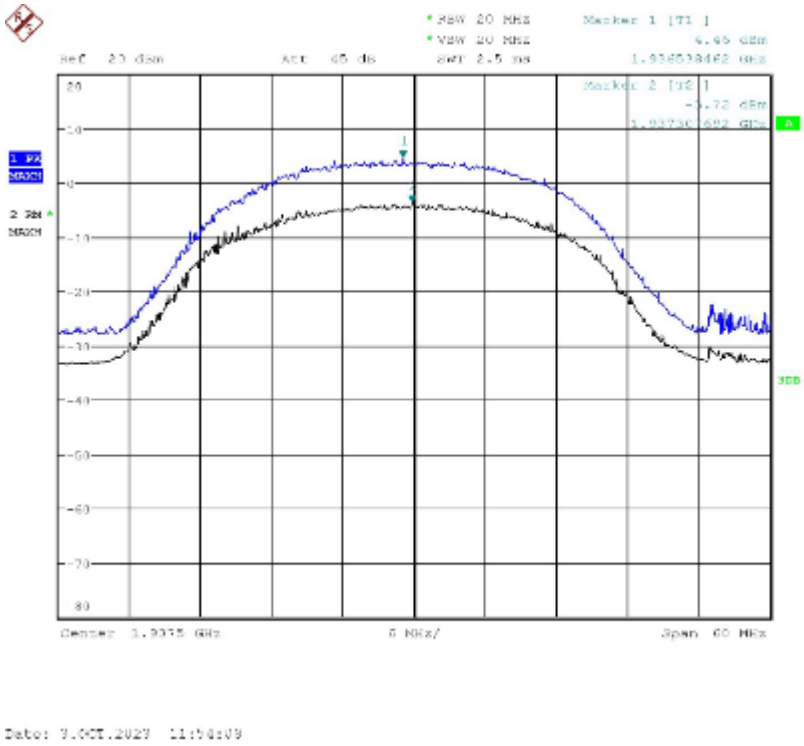

Figure 39: Ant 2 Output Power, 15 MHz BW, QPSK/16QAM, Low Channel

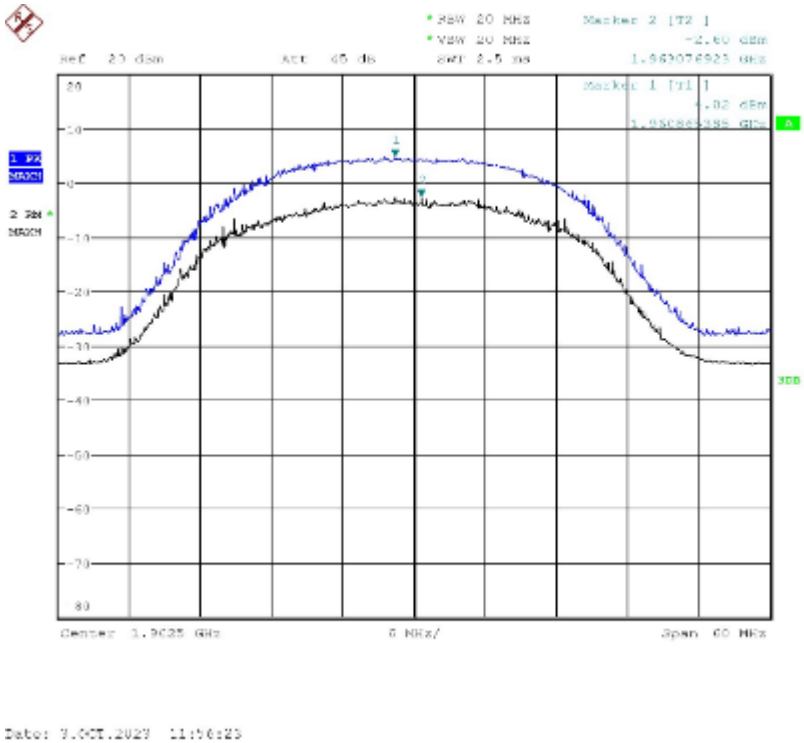

Figure 40: Ant 1 Output Power, 15 MHz BW, QPSK/16QAM, Mid Channel

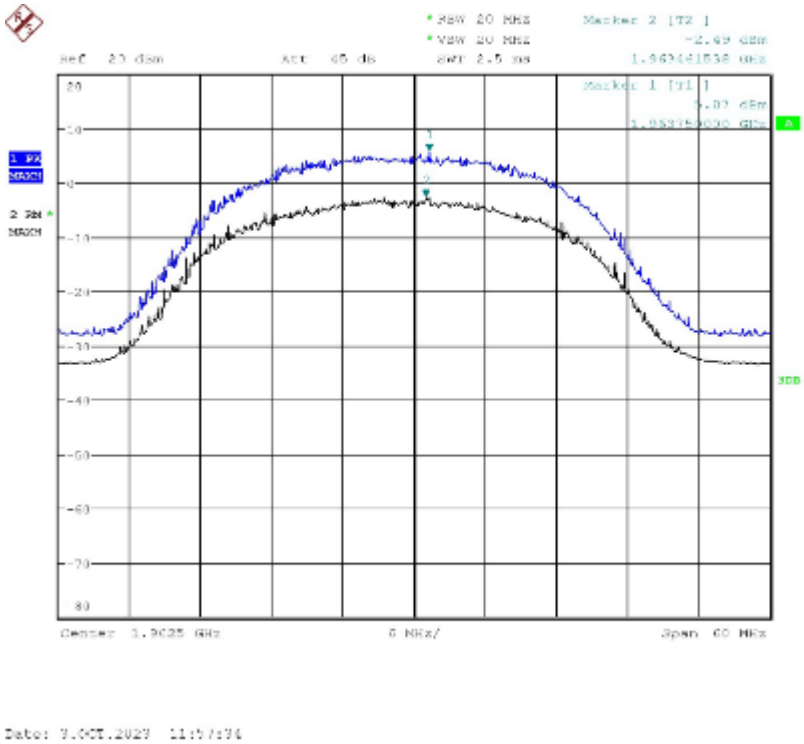

Figure 41: Ant 2 Output Power, 15 MHz BW, QPSK/16QAM, Mid Channel

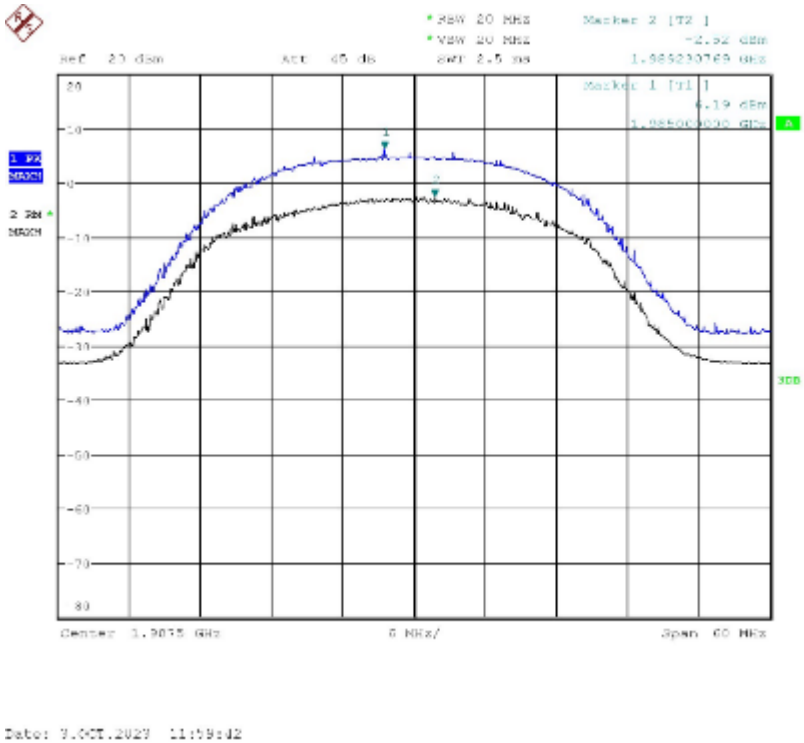

Figure 42: Ant 1 Output Power, 15 MHz BW, QPSK/16QAM, High Channel

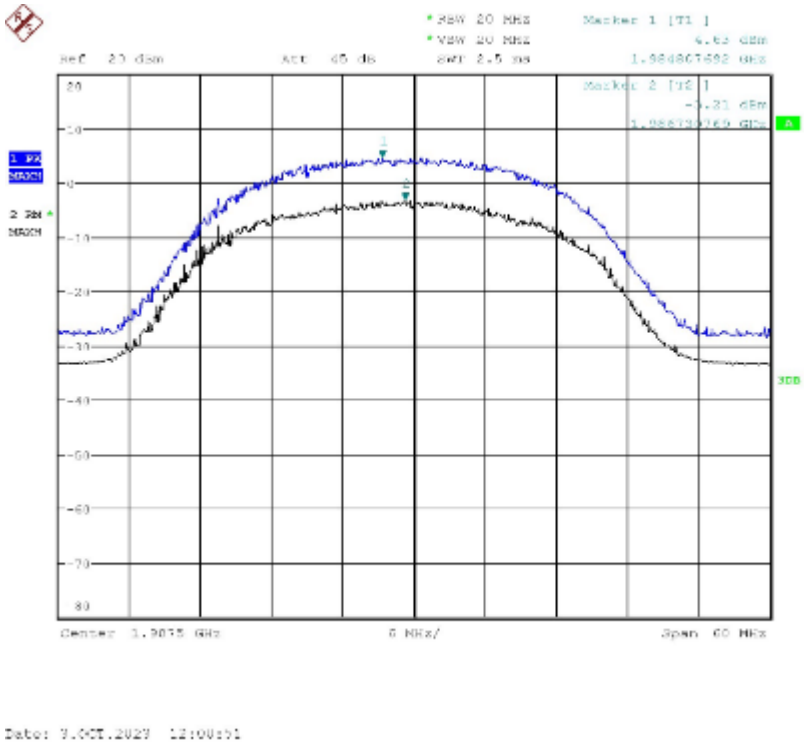

Figure 43: Ant 2 Output Power, 15 MHz BW, QPSK/16QAM, High Channel

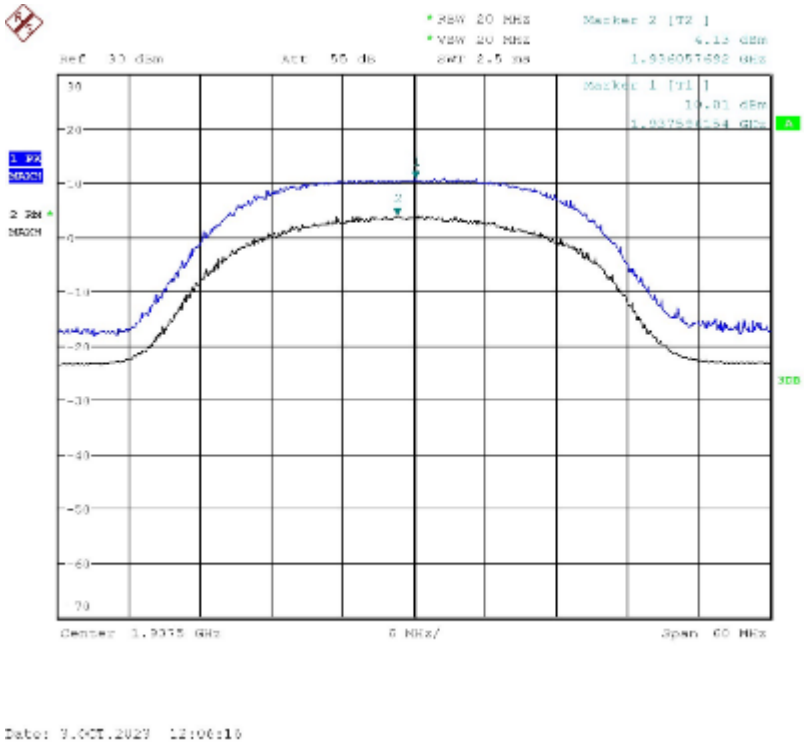

Figure 44: Ant 1 Output Power, 15 MHz BW, QPSK/64QAM, Low Channel

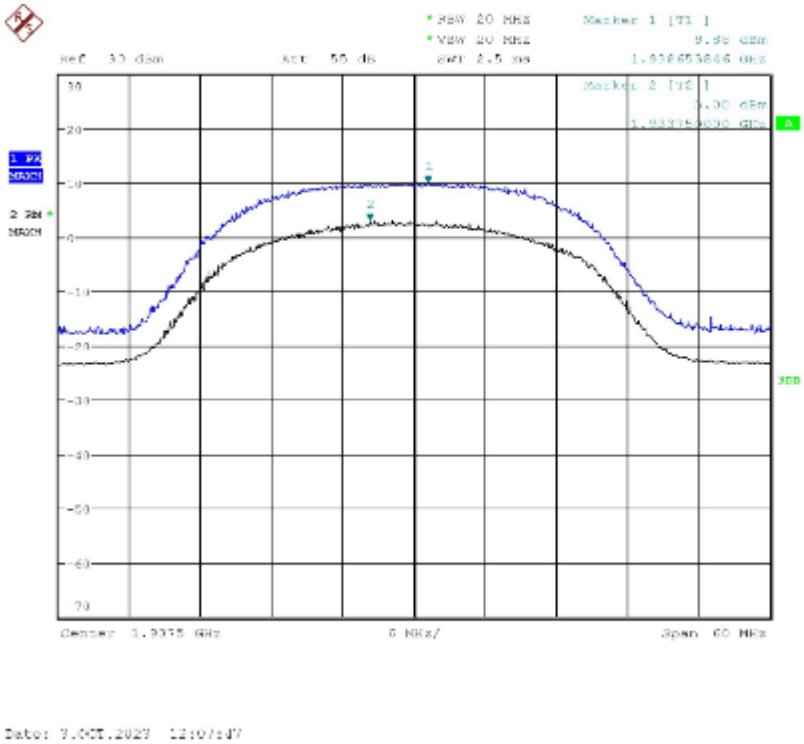

Figure 45: Ant 2 Output Power, 15 MHz BW, QPSK/64QAM, Low Channel

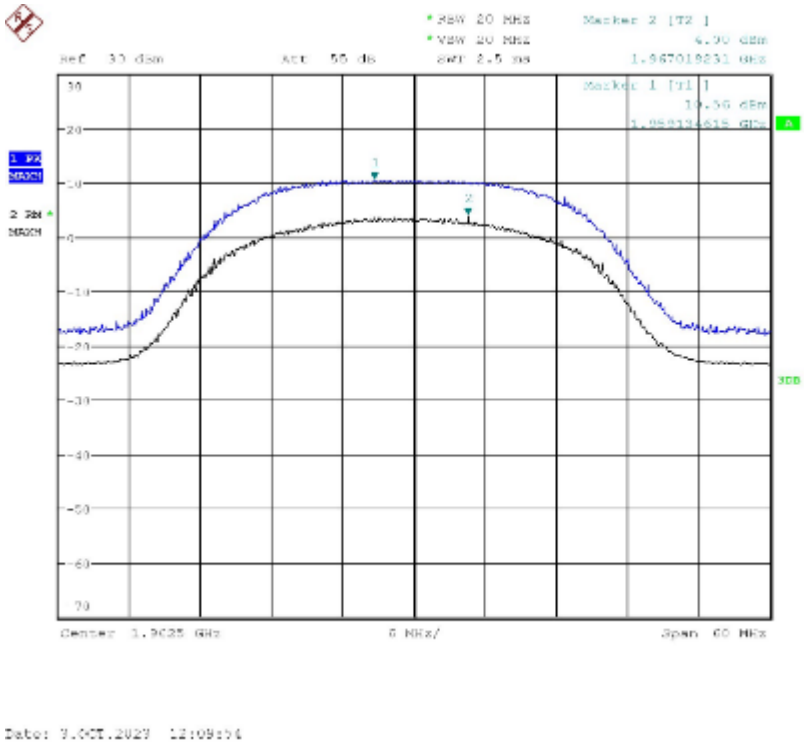

Figure 46: Ant 1 Output Power, 15 MHz BW, QPSK/64QAM, Mid Channel

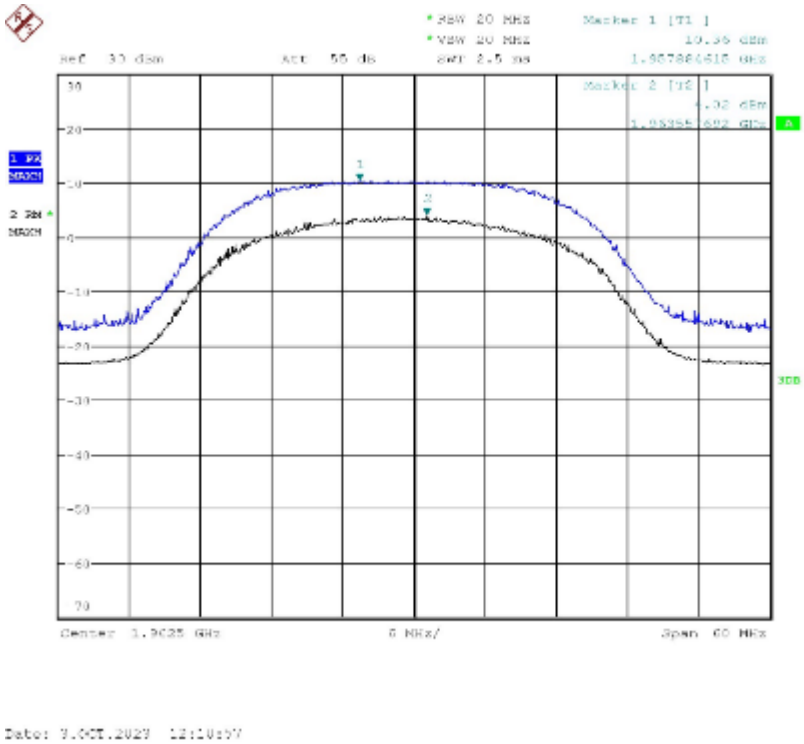

Figure 47: Ant 2 Output Power, 15 MHz BW, QPSK/64QAM, Mid Channel

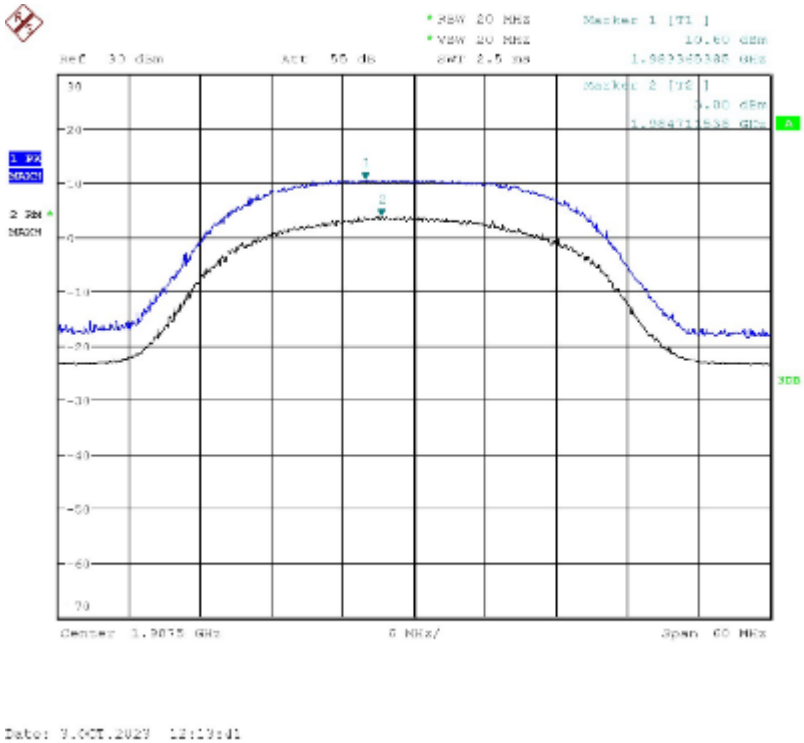

Figure 48: Ant 1 Output Power, 15 MHz BW, QPSK/64QAM, High Channel

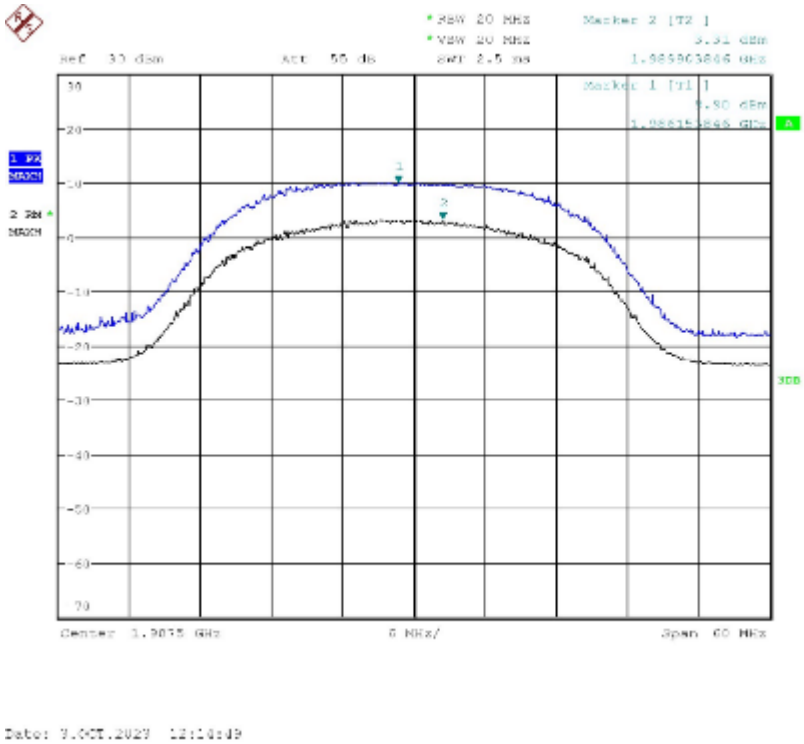

Figure 49: Ant 2 Output Power, 15 MHz BW, QPSK/64QAM, High Channel

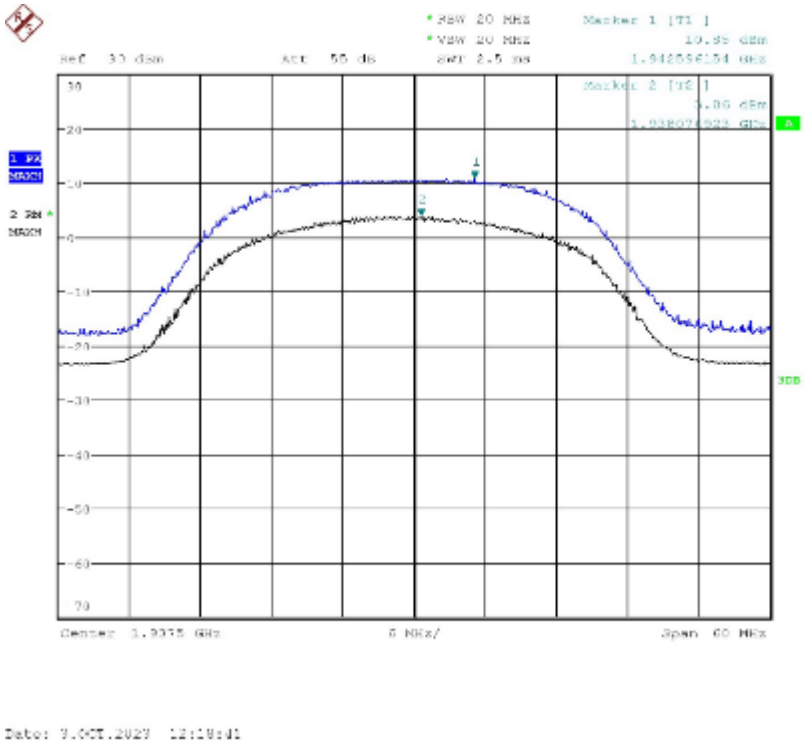

Figure 50: Ant 1 Output Power, 15 MHz BW, QPSK/256QAM, Low Channel

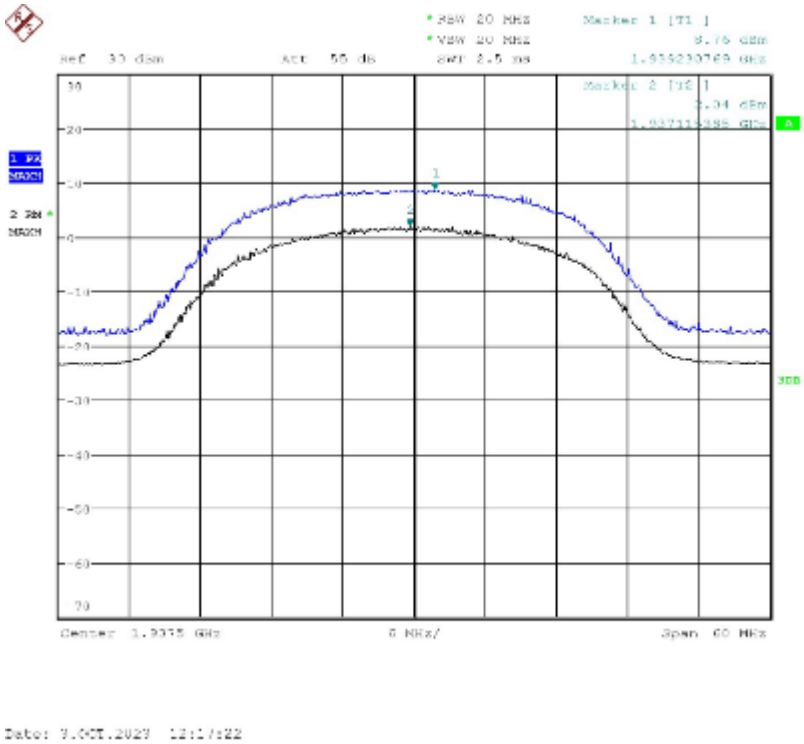

Figure 51: Ant 2 Output Power, 15 MHz BW, QPSK/256QAM, Low Channel

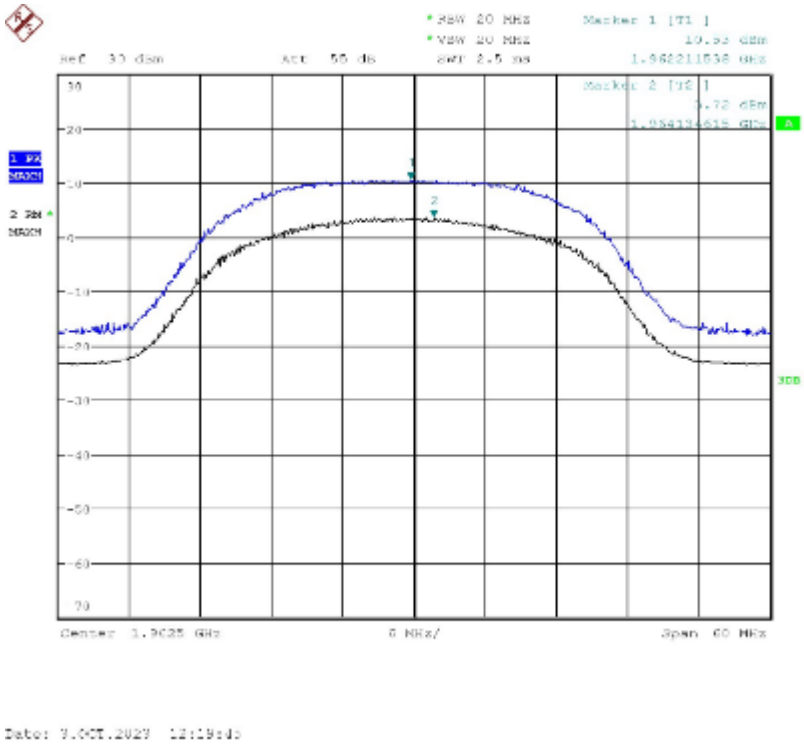

Figure 52: Ant 1 Output Power, 15 MHz BW, QPSK/256QAM, Mid Channel

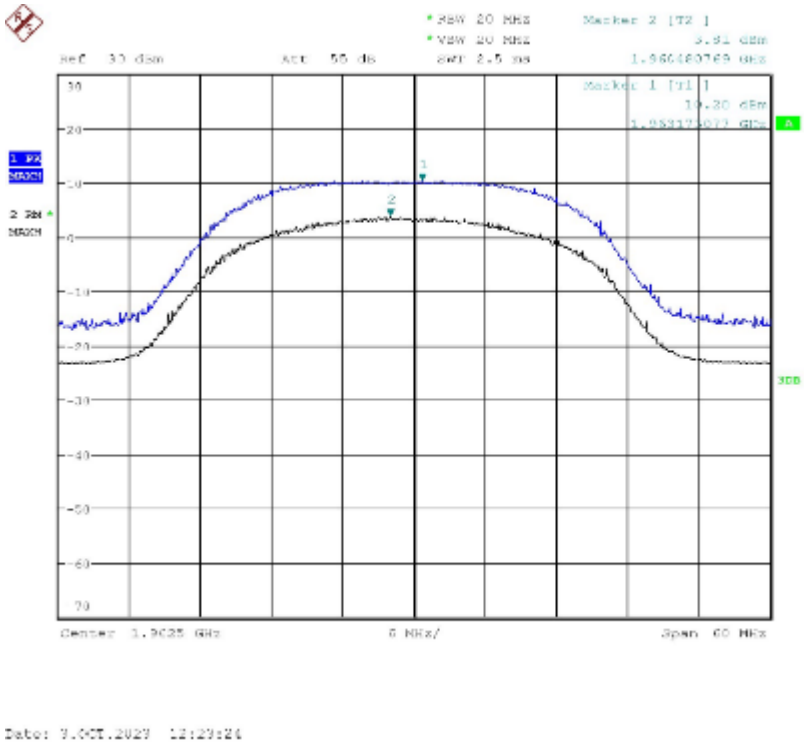

Figure 53: Ant 2 Output Power, 15 MHz BW, QPSK/256QAM, Mid Channel

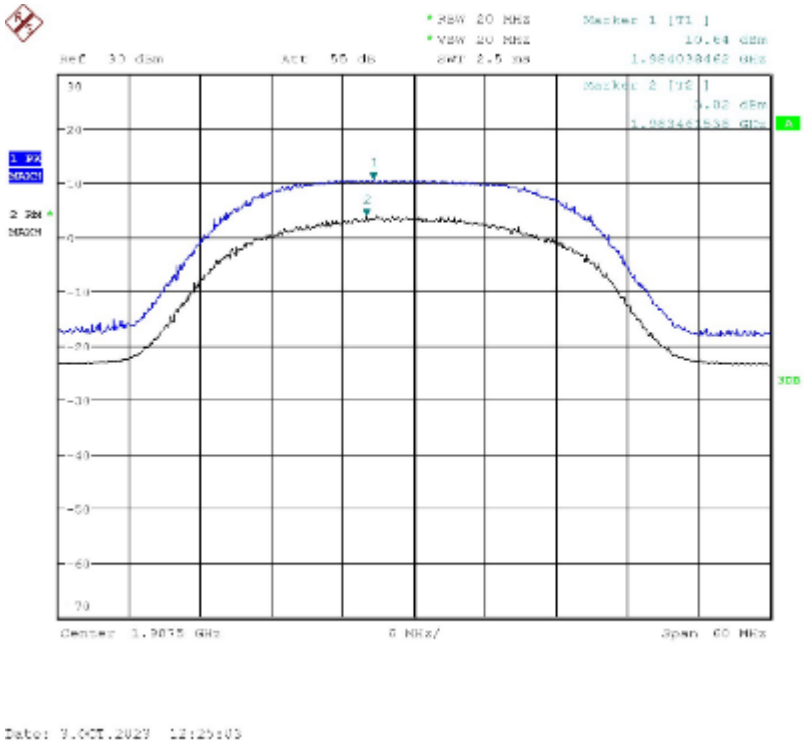

Figure 54: Ant 1 Output Power, 15 MHz BW, QPSK/256QAM, High Channel

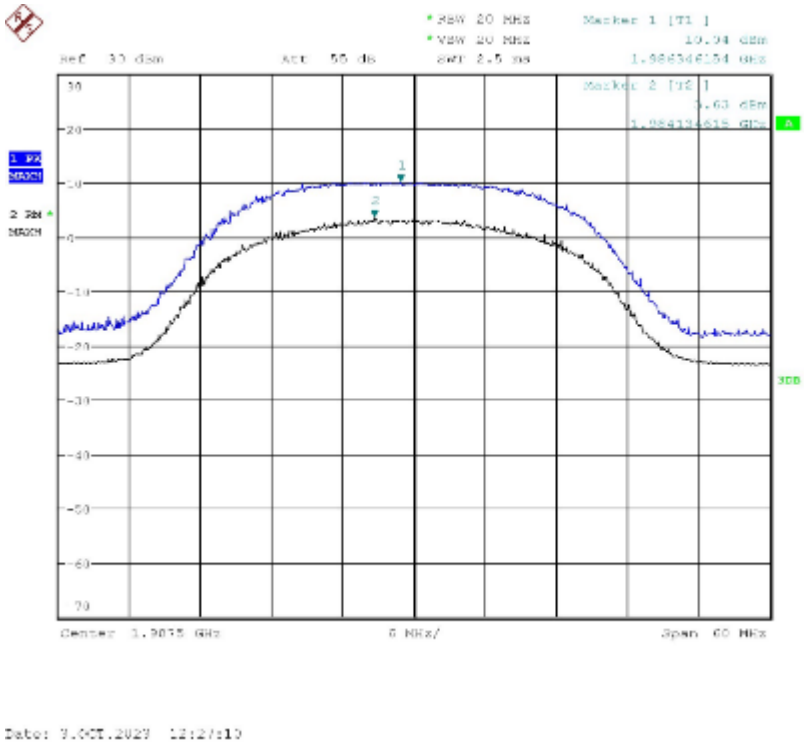

Figure 55: Ant 2 Output Power, 15 MHz BW, QPSK/256QAM, High Channel

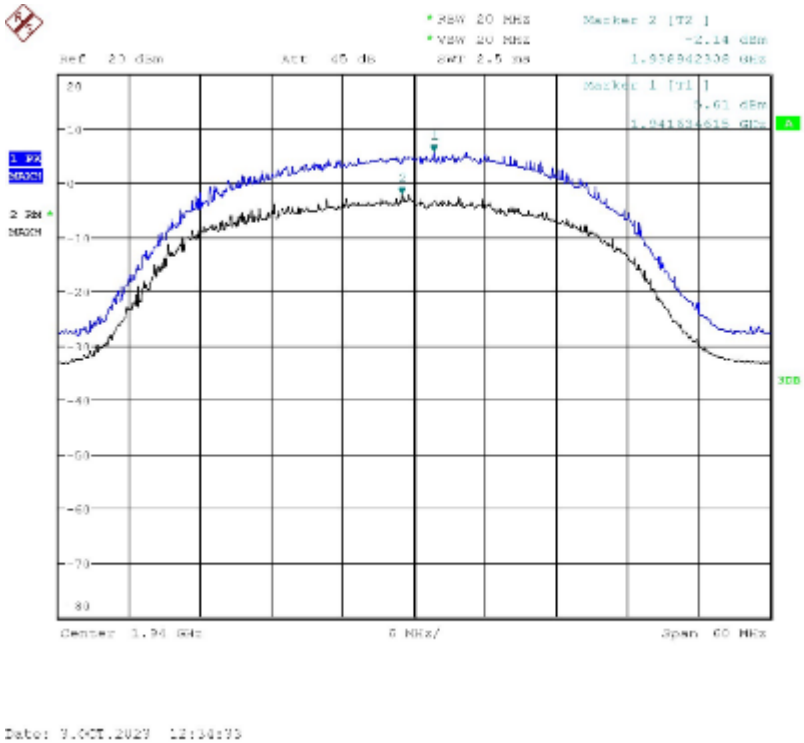

Figure 56: Ant 1 Output Power, 20 MHz BW, QPSK/16QAM, Low Channel

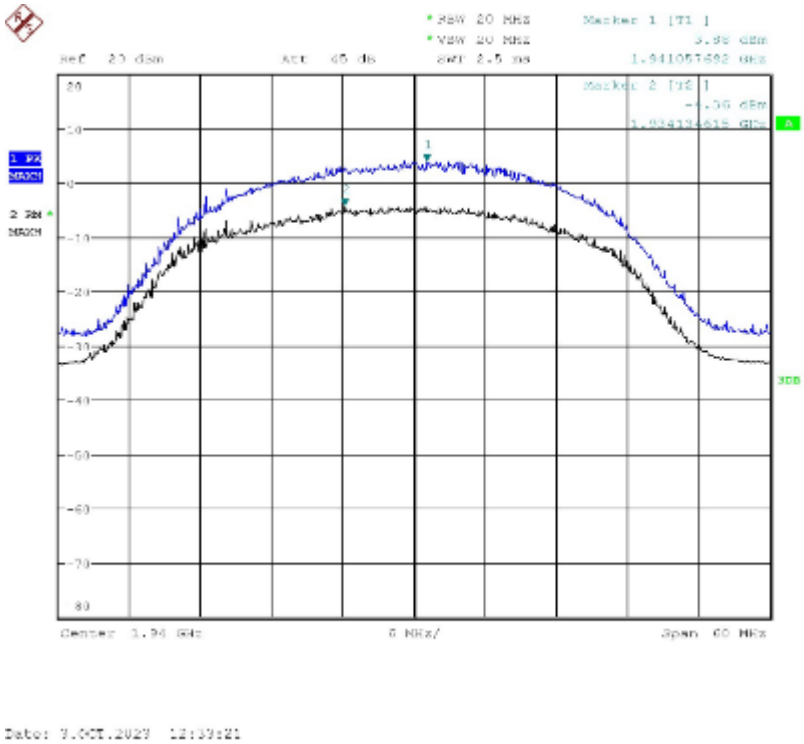

Figure 57: Ant 2 Output Power, 20 MHz BW, QPSK/16QAM, Low Channel

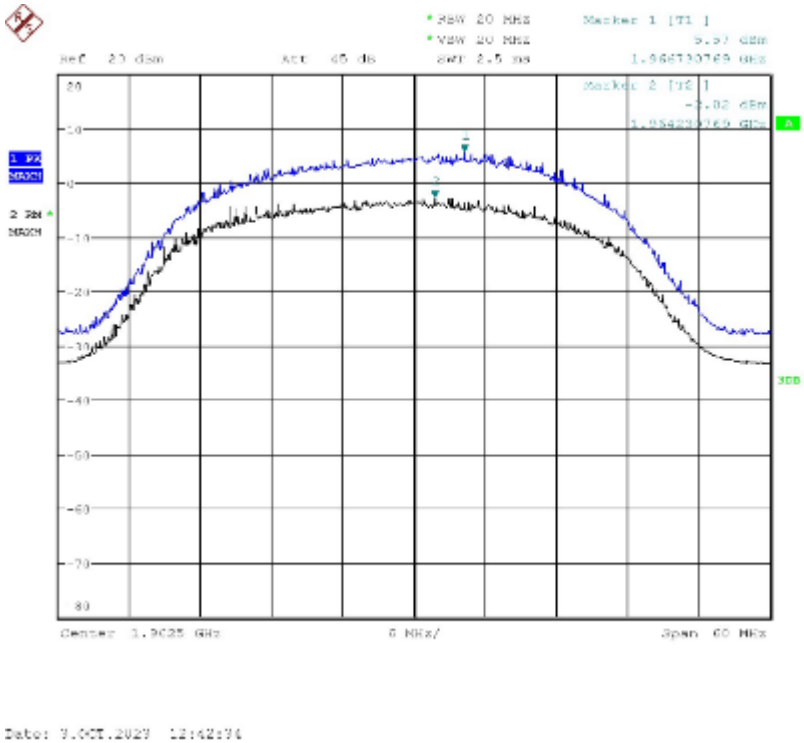

Figure 58: Ant 1 Output Power, 20 MHz BW, QPSK/16QAM, Mid Channel

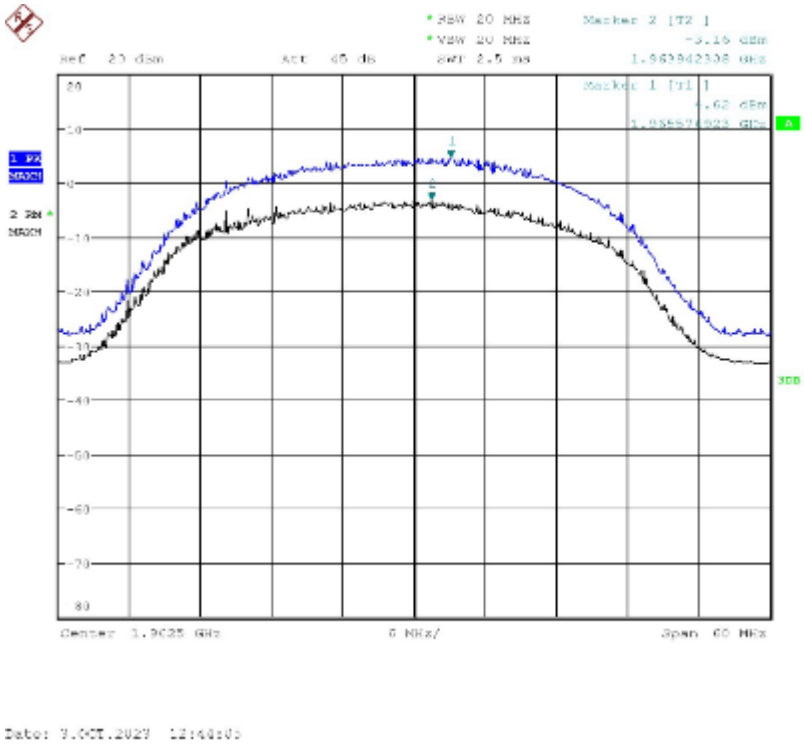

Figure 59: Ant 2 Output Power, 20 MHz BW, QPSK/16QAM, Mid Channel

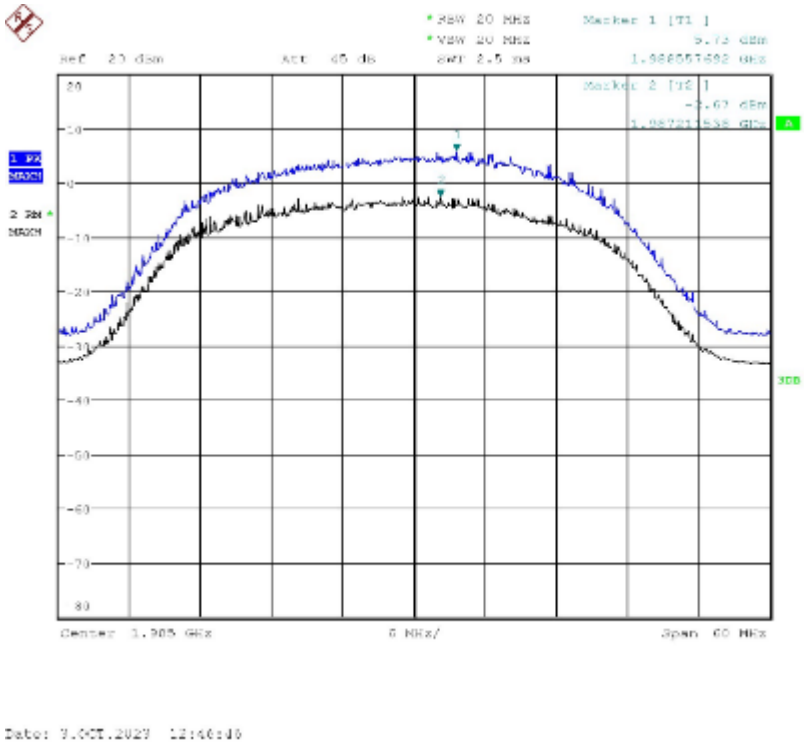

Figure 60: Ant 1 Output Power, 20 MHz BW, QPSK/16QAM, High Channel

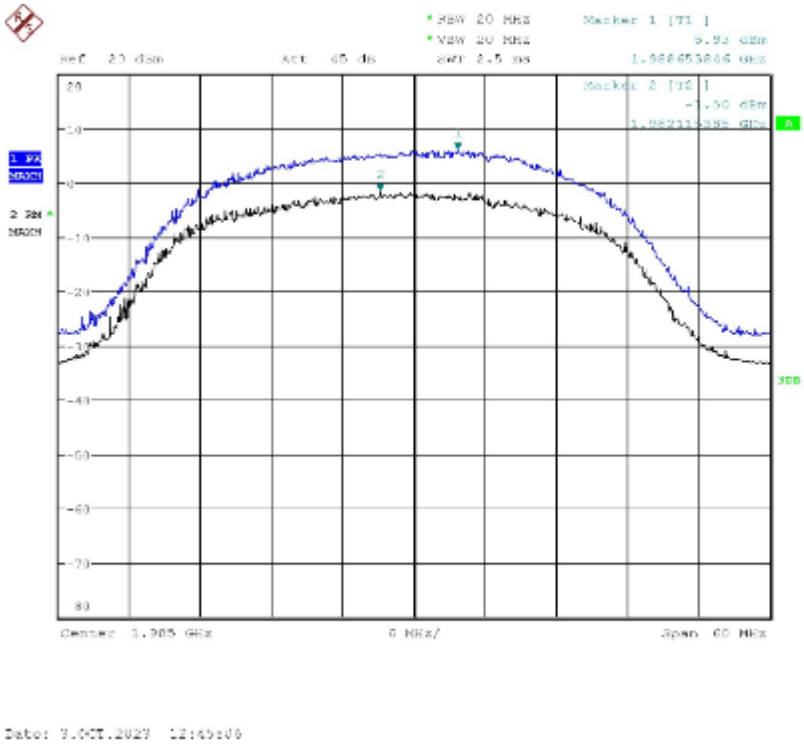

Figure 61: Ant 2 Output Power, 20 MHz BW, QPSK/16QAM, High Channel

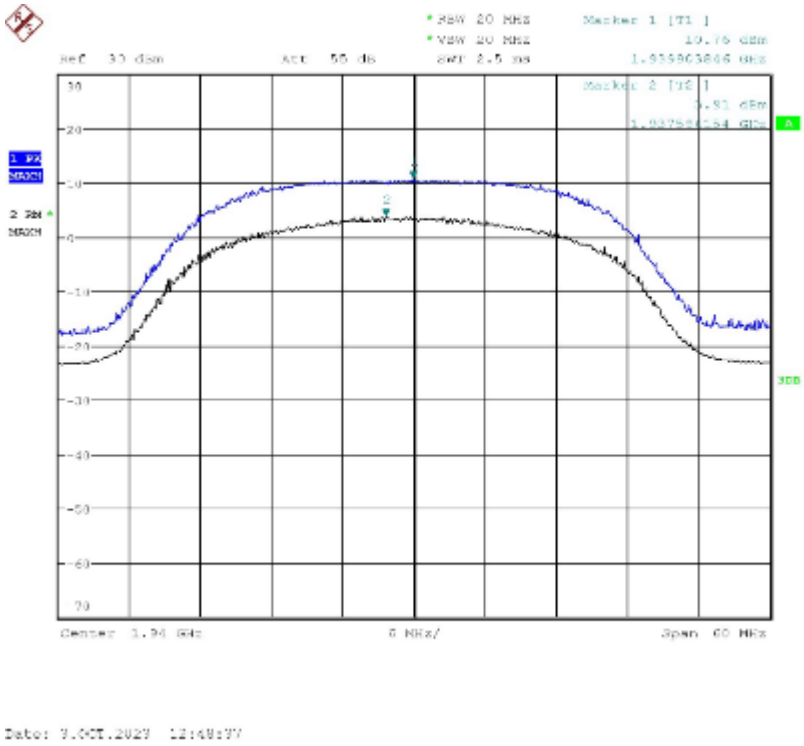

Figure 62: Ant 1 Output Power, 20 MHz BW, QPSK/64QAM, Low Channel

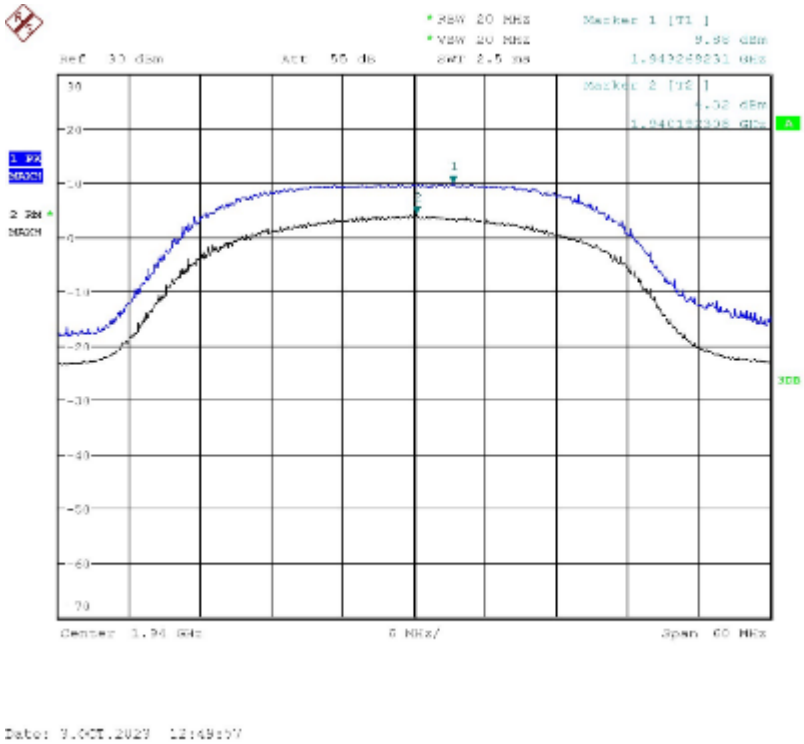

Figure 63: Ant 2 Output Power, 20 MHz BW, QPSK/64QAM, Low Channel

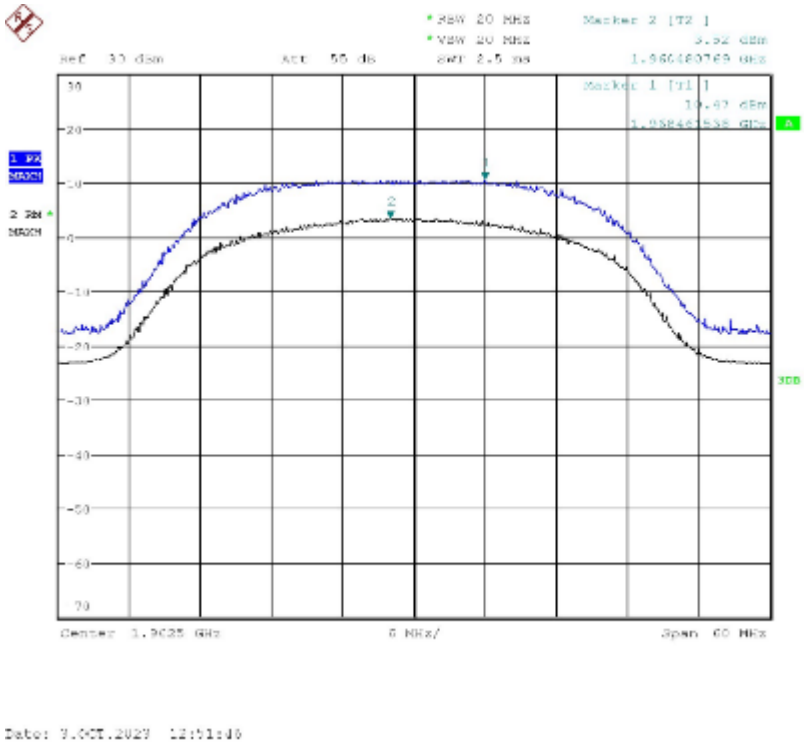

Figure 64: Ant 1 Output Power, 20 MHz BW, QPSK/64QAM, Mid Channel

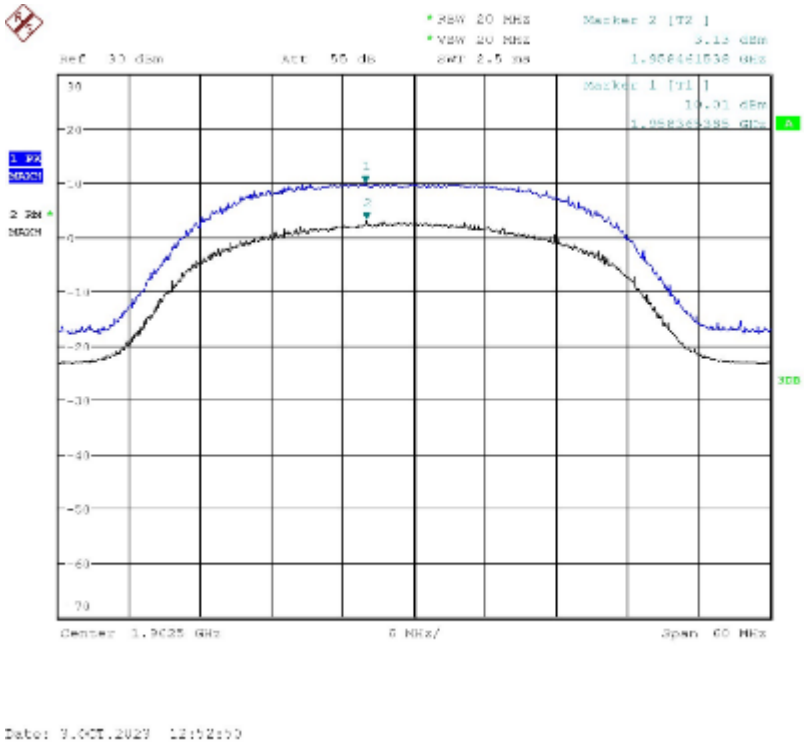

Figure 65: Ant 2 Output Power, 20 MHz BW, QPSK/64QAM, Mid Channel

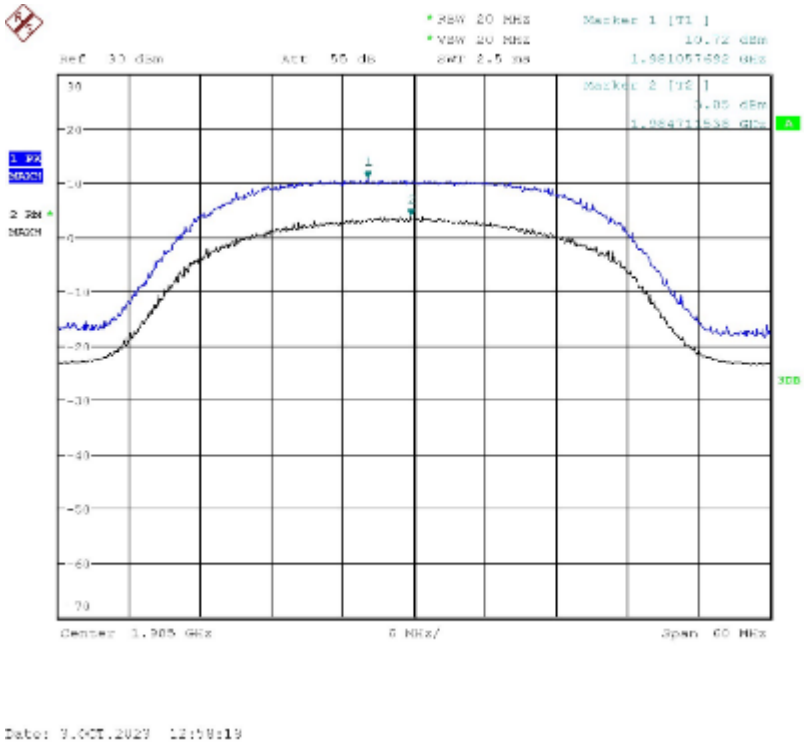

Figure 66: Ant 1 Output Power, 20 MHz BW, QPSK/64QAM, High Channel

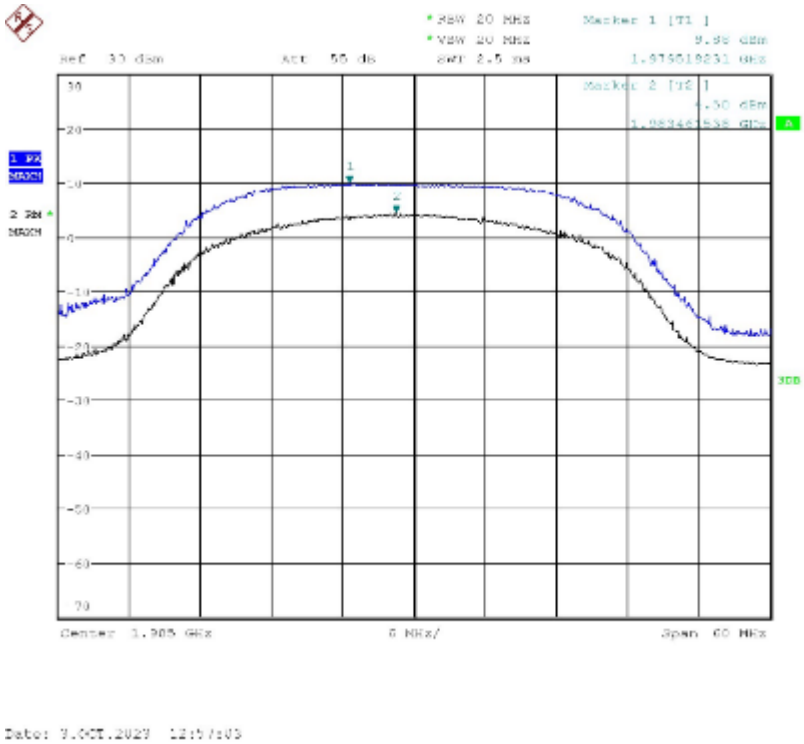

Figure 67: Ant 2 Output Power, 20 MHz BW, QPSK/64QAM, High Channel

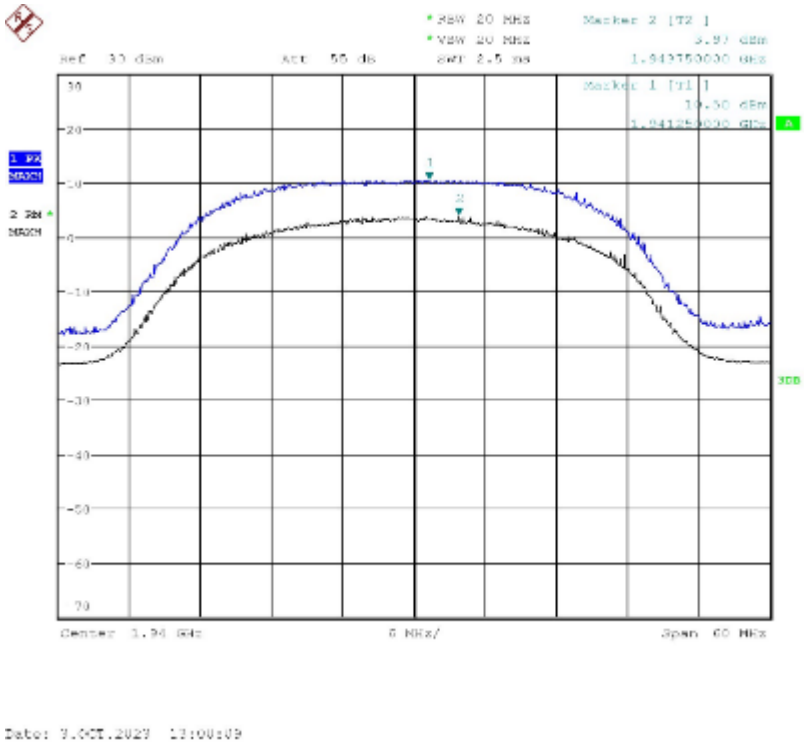

Figure 68: Ant 1 Output Power, 20 MHz BW, QPSK/256QAM, Low Channel

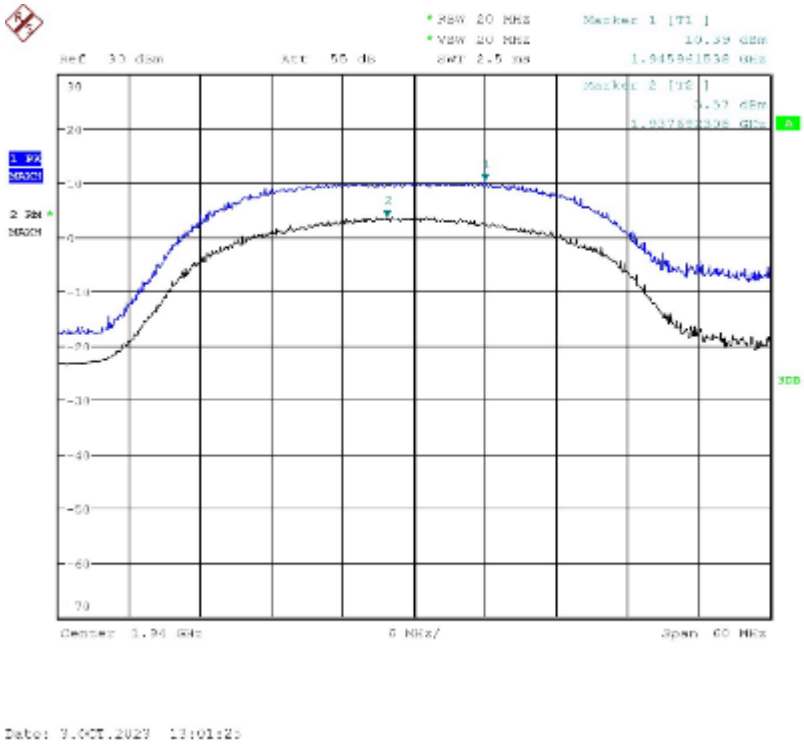

Figure 69: Ant 2 Output Power, 20 MHz BW, QPSK/256QAM, Low Channel

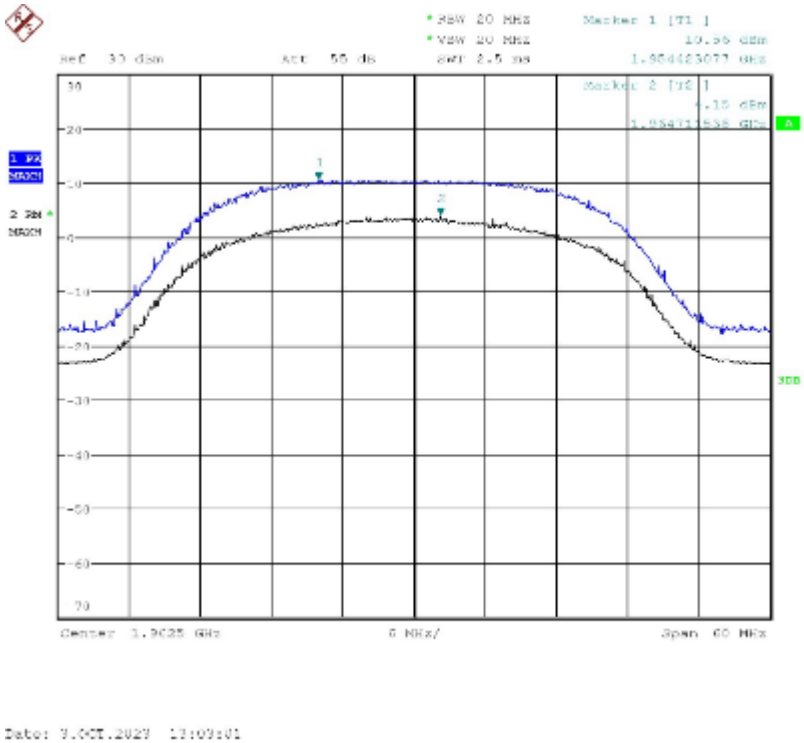

Figure 70: Ant 1 Output Power, 20 MHz BW, QPSK/256QAM, Mid Channel

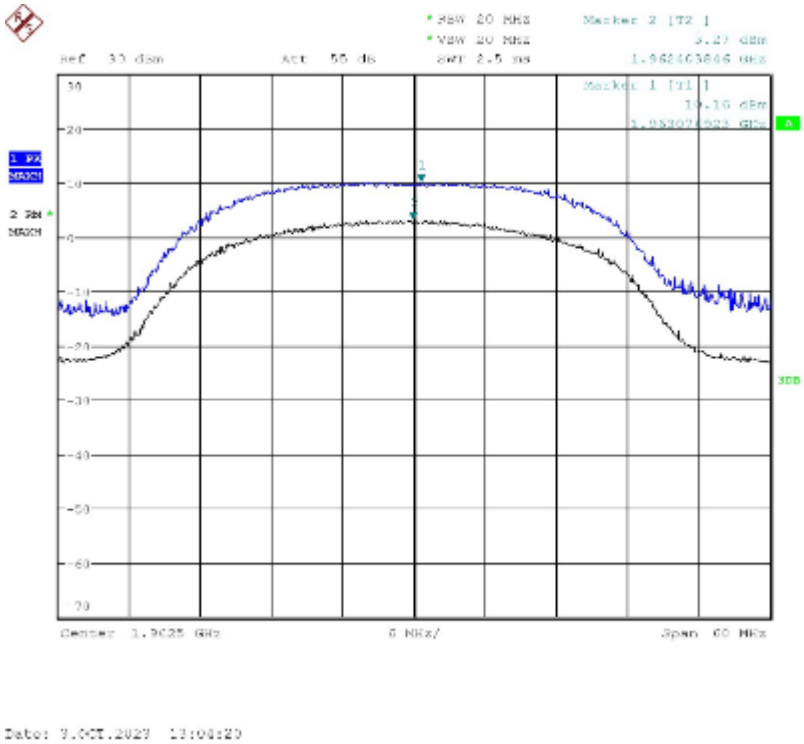

Figure 71: Ant 2 Output Power, 20 MHz BW, QPSK/256QAM, Mid Channel

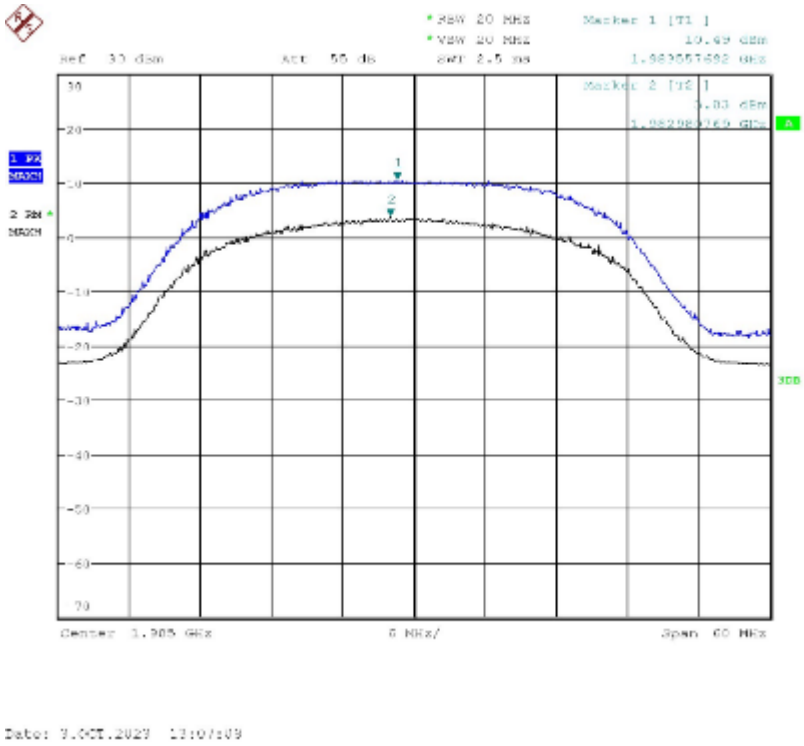

Figure 72: Ant 1 Output Power, 20 MHz BW, QPSK/256QAM, High Channel

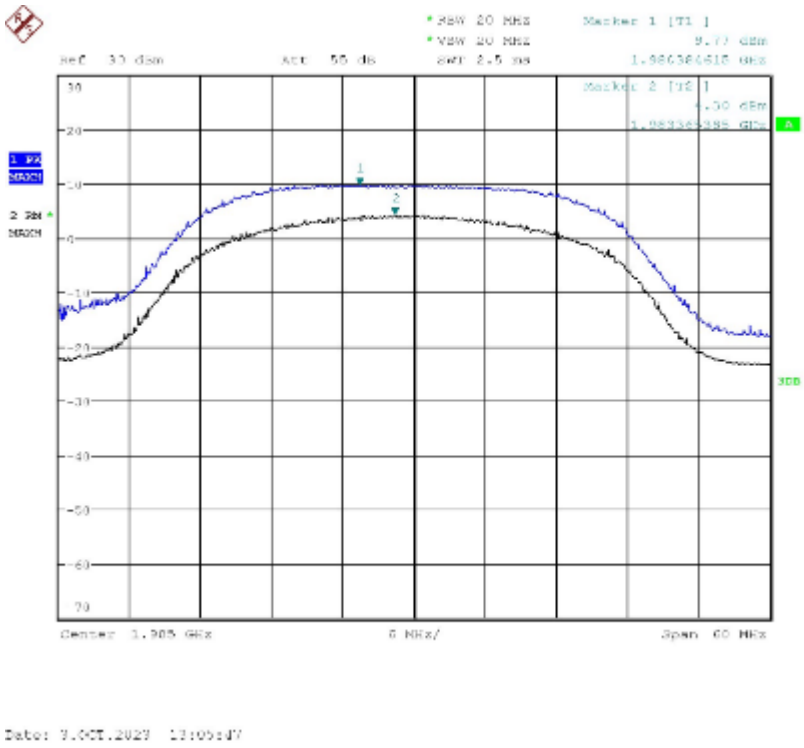

Figure 73: Ant 1 Output Power, 20 MHz BW, QPSK/256QAM, High Channel

3.2 99% Bandwidth

Date Performed: October 4, 2023

Test Standard: FCC CFR 47 Part 24.232 (a)(2), (a)(3), (b)(2), (b)(3)
RSS-Gen Issue 5
SRSP-510 Issue 5 (5.1)

Test Method: RSS-Gen Issue 5
ANSI C63.26: 2015

Modifications: None.

Final Result: Complies
Maximum Bandwidth Measured:
5 MHz Set: 4.27 MHz
10 MHz Set: 8.75 MHz
15 MHz Set: 12.87 MHz
20 MHz Set: 17.78 MHz

Applicable Regulation:

FCC CFR 47 Part 24.232 (a)(2)

Base stations with an emission bandwidth greater than 1 MHz are limited to 1640 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT, except as described in paragraph (b) below.

FCC CFR 47 Part 24.232 (a)(3)

Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; see Table below

Antenna height (AAT) in Meters (feet)	Maximum equivalent isotropic radiated power (EIRP) in Watts / MHz
≤300	1640
≤500	1070
≤1000	490
≤1500	270
≤2000	160

FCC CFR 47 Part 24.232 (b)(2)

Base stations that are located in counties with population densities of 100 persons or fewer per square mile, based upon the most recently available population statistics from the Bureau of the Census, with an emission bandwidth greater than 1 MHz are limited to 3280 watts/MHz equivalent isotropically radiated power (EIRP) with an antenna height up to 300 meters HAAT.

FCC CFR 47 Part 24.232 (b)(3)

Base station antenna heights may exceed 300 meters HAAT with a corresponding reduction in power; see table below.

Antenna height (AAT) in Meters (feet)	Maximum equivalent isotropic radiated power (EIRP) in Watts / MHz
≤300	3280
≤500	2140
≤1000	980
≤1500	540
≤2000	320

SRSP-510 Issue 5:

5.1 Radiated power and antenna height limits for fixed and base stations

For base stations with a channel bandwidth greater than 1 MHz, the maximum e.i.r.p. is limited to 3280 watts/MHz e.i.r.p. (i.e., no more than 3280 watts e.i.r.p. in any 1 MHz band segment) with an antenna height above average terrain (HAAT) up to 300 metres. Fixed or base stations operating in urban areas are limited to a maximum allowable e.i.r.p. of 1640 watts/MHz e.i.r.p. Base station antenna heights above average terrain may exceed 300 metres with a corresponding reduction in e.i.r.p. according to the following table:

Antenna height (AAT) in Meters (feet)	**Maximum equivalent isotropic radiated power (EIRP) in Watts / MHz**
≤300	3280 or 1640
≤500	1070
≤1000	490
≤1500	270
≤2000	160

RSS-Gen Issue 5:

6.7 Occupied bandwidth (or 99% emission bandwidth) and x dB bandwidth)

The occupied bandwidth or the "99% emission bandwidth" is defined as the frequency range between two points, one above and the other below the carrier frequency, within which 99% of the total transmitted power of the fundamental transmitted emission is contained. The occupied bandwidth shall be reported for all equipment in addition to the specified bandwidth required in the applicable RSSs.

In some cases, the "x dB bandwidth" is required, which is defined as the frequency range between two points, one at the lowest frequency below and one at the highest frequency above the carrier frequency, at which the maximum power level of the transmitted emission is attenuated x dB below the maximum in-band power level of the modulated signal, where the two points are on the outskirts of the in-band emission.

The following conditions shall be observed for measuring the occupied bandwidth and x dB bandwidth:

- The transmitter shall be operated at its maximum carrier power measured under normal test conditions.
- The span of the spectrum analyzer shall be set large enough to capture all products of the modulation process, including the emission skirts, around the carrier frequency, but small enough to avoid having other emissions (e.g., on adjacent channels) within the span.
- The detector of the spectrum analyzer shall be set to "Sample". However, a peak, or peak hold, may be used in place of the sampling detector since this usually produces a wider bandwidth than the actual bandwidth (worst-case measurement). Use of a peak hold (or "Max Hold") may be necessary to determine the occupied / x dB bandwidth if the device is not transmitting continuously.
- The resolution bandwidth (RBW) shall be in the range of 1% to 5% of the actual occupied / x dB bandwidth and the video bandwidth (VBW) shall not be smaller than three times the RBW value. Video averaging is not permitted.

Note: It may be necessary to repeat the measurement a few times until the RBW and VBW are in compliance with the above requirement.

For the 99% emission bandwidth, the trace data points are recovered and directly summed in linear power level terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached, and that frequency recorded. The process is repeated for the highest frequency data points (starting at the highest frequency, at the right side of the span, and going down in frequency). This frequency is then recorded. The difference between the two recorded frequencies is the occupied bandwidth (or the 99% emission bandwidth).

Test Setup:

The EUT was tested outside the SAC via output-conducted measurements per RSS-Gen Issue 5 and ANSI C63.26:2015.

Measurement Data and Plots:

Modulation Scheme	Carrier Frequency (MHz)	BW Setting (MHz)	99% Bandwidth (MHz)	Result
QPSK / 16QAM	1932.5	5	4.27	Complies
QPSK / 16QAM	1962.5	5	4.17	Complies
QPSK / 16QAM	1992.5	5	4.24	Complies
QPSK / 64QAM	1932.5	5	4.18	Complies
QPSK / 64QAM	1962.5	5	4.19	Complies
QPSK / 64QAM	1992.5	5	4.18	Complies
QPSK / 256QAM	1932.5	5	4.20	Complies
QPSK / 256QAM	1962.5	5	4.18	Complies
QPSK / 256QAM	1992.5	5	4.18	Complies
QPSK / 16QAM	1935	10	8.75	Complies
QPSK / 16QAM	1962.5	10	8.75	Complies
QPSK / 16QAM	1990	10	8.72	Complies
QPSK / 64QAM	1935	10	8.58	Complies
QPSK / 64QAM	1962.5	10	8.60	Complies
QPSK / 64QAM	1990	10	8.62	Complies
QPSK / 256QAM	1935	10	8.60	Complies
QPSK / 256QAM	1962.5	10	8.60	Complies
QPSK / 256QAM	1990	10	8.62	Complies
QPSK / 16QAM	1937.5	15	12.87	Complies
QPSK / 16QAM	1962.5	15	12.83	Complies
QPSK / 16QAM	1987.5	15	12.76	Complies
QPSK / 64QAM	1937.5	15	12.62	Complies
QPSK / 64QAM	1962.5	15	12.65	Complies
QPSK / 64QAM	1987.5	15	12.65	Complies
QPSK / 256QAM	1937.5	15	12.62	Complies
QPSK / 256QAM	1962.5	15	12.69	Complies
QPSK / 256QAM	1987.5	15	12.65	Complies
QPSK / 16QAM	1940	20	17.50	Complies
QPSK / 16QAM	1962.5	20	17.50	Complies
QPSK / 16QAM	1985	20	17.78	Complies
QPSK / 64QAM	1940	20	17.11	Complies
QPSK / 64QAM	1962.5	20	17.16	Complies
QPSK / 64QAM	1985	20	17.16	Complies
QPSK / 256QAM	1940	20	17.21	Complies
QPSK / 256QAM	1962.5	20	17.11	Complies
QPSK / 256QAM	1985	20	17.16	Complies

Table 29: 99% Bandwidth