

SENSUS METERING SYSTEMS INC.

TEST REPORT

SCOPE OF WORK

RADIO TESTING – KV2C RADIO MODULE

REPORT NUMBER

106182196ATL-001

ISSUE DATE**[REVISED DATE]**

05 June 2025

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69

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Non-Specific Radio Report Shell Rev. January 2025

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RADIO TEST REPORT**Report Number:** 106182196ATL-001**Project Number:** G106182196**Report Issue Date:** 05 June 2025**Model(s) Tested:** FLEXKV2C**FCC ID:** SDBFLEXKV2C**IC:** 2220A-FLEXKV2C**47 CFR Part 24 Subpart D****47 CFR Part 101 Subpart C****Standards:** RSS-119, Issue 12

RSS-134, Issue 2

ANSI C63.26-2015

RSS-GEN, Issue 5

Test Location

Intertek
1950 Evergreen Blvd., Suite 100
Duluth, GA 30096 USA
FCC Designation: US1046
ISED CAB Designator: US0128

Client

Sensus Metering Systems Inc.
639 Davis Drive
Morrisville, NC 27560 USA

Report prepared by:



Jeremy Pickens / Senior Staff Engineer

Report reviewed by:



Brian Lackey / EMC Staff Engineer

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Table of Contents

1	<i>Introduction and Conclusion</i>	4
2	<i>Test Summary</i>	4
3	<i>Client Information</i>	5
4	<i>Description of Equipment Under Test and Variant Models</i>	5
5	<i>System Setup and Method</i>	7
6	<i>RF Output Power</i>	9
7	<i>Out of Band Unwanted Emissions</i>	11
8	<i>Occupied Bandwidth</i>	34
9	<i>Spurious Emissions at Antenna Terminals</i>	53
10	<i>Field Strength of Spurious Emissions</i>	59
11	<i>Measurement Uncertainty</i>	68
12	<i>Revision History</i>	69

1 Introduction and Conclusion

The tests indicated in Section 2 were performed on the product constructed as described in Section 4. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

2 Test Summary

Section	Test Description	Test Specification		Result
		FCC Rule Part	ISED RSS	
6	RF Output Power	2.1046 24.132 101.113(a)	RSS-GEN S6.12 RSS-119 S5.4 RSS-134 S4.3(a),(b)	Compliant
7	Out of Band Unwanted Emissions	2.1051 24.133(a)(1),(2) 101.111(a)(5) 101.111(a)(6)	RSS-Gen S6.13 RSS-119 S5.8.3 RSS-119 S5.8.6 RSS-134 S4.4	Compliant
8	Occupied Bandwidth	2.1049 101.109 24.131	RSS-GEN S6.7 RSS-119 S5.5 RSS-134 S4.1	Compliant
9	Spurious Emissions at Antenna Terminals	2.1051 24.133(a)(1),(2) 101.111(a)(5) 101.111(a)(6)	RSS-Gen S6.13 RSS-119 S5.8.3 RSS-119 S5.8.6 RSS-134 S4.4	Compliant
10	Field Strength of Spurious Emissions	2.1053 24.133(a)(1),(2) 101.111(a)(5) 101.111(a)(6)	RSS-Gen S6.13 RSS-119 S5.8.3 RSS-119 S5.8.6 RSS-134 S4.4	Compliant
NA	Frequency Stability	2.1055 24.135 101.107	RSS-GEN S6.11 RSS-119 S5.3 RSS-134 S4.5	NA ¹

1) Because the TXCO was not changed from the original certification, frequency stability was not required to support this Class II Permissive Change.

3 Client Information

This evaluation was performed at the request of:

Client: Sensus Metering Systems Inc.
639 Davis Drive
Morrisville, NC 27560 USA

Contact: James Francisco
Email: James.francisco@xylem.com

4 Description of Equipment Under Test and Variant Models

Manufacturer: Sensus Metering Systems Inc.
639 Davis Drive
Morrisville, NC 27560 USA

Equipment Under Test			
Description	Manufacturer	Model Number (HVIN)	Serial Number
Transceiver Module	Sensus Metering Systems Inc.	FLEXKV2C	083 ¹ 057 ²
1) Antenna port conducted measurements 2) Radiated spurious emissions measurements			
Receive Date:	27 May 2025		
Received Condition:	Good		
Type:	Production		

Description of Equipment Under Test

This transceiver module is a standard FlexNet protocol with FEM controlled output capable of 1W nominal conducted output power. The modular design enables Sensus partner with Aclara to locate the transceiver in several standard S form meters retailed to Utilities.

Certification Purpose

Class II Permissive Change: Sensus is updating the PCBA with a new Skyworks Front End Module (FEM), P/N: CC1120.

Equipment Under Test Power Configuration			
Rated Voltage	Rated Current	Rated Frequency	Number of Phases
20Vdc	450mA	NA	NA

Operating modes of the EUT

No.	Descriptions of EUT Exercising
1	Using FlexNet Spotlight software, commands were sent over USB and then over the air via an adapter board equipped with a magnetic loop. The EUT was configured to transmit modulated signals at max power at the following defined test channels (per 47CFR 2.1046 – 2.1057).

Test Channels			
FCC Rule Part	Frequency Band (MHz)	Channel Location	Test Frequency (MHz)
24D	901.0 – 902.0	Middle	901.5
101	928.85 – 929.0	Middle	928.925
24D	930.0 – 931.0	Middle	930.5
101	932.0 – 932.5	Middle	932.25
24D	940.0 – 941.0	One near top and one near bottom	940.0125
101	941.0 – 941.5		941.4875
101	952.0 – 953.0	Middle	952.5
101	959.85 – 960.0	Middle	959.925

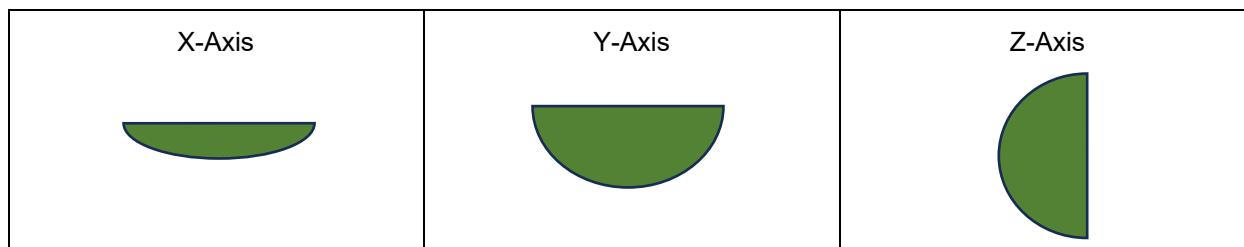
Software used by the EUT

No.	Description of Control Software
1	FlexNet Spotlight v2.2.3.0

Radio/Receiver Characteristics

Frequency Range	901-960MHz
Modulation Type(s)	7-FSK, 13-FSK, 2-GFSK, 4-GFSK, 2-SFSK, 4-SFSK, 8-SFSK
Maximum Output Power (Conducted):	30.47dBm (1.11W)
Power Setting	Max
MIMO Information (# of Transmit and Receive antenna ports)	1 (SISO)
Equipment Type	Full Module
Antenna Type and Gain	Integral (-0.47dBi)

Note: The worst-case modulations for radiated and conducted spurious emissions were determined to be Normal and mPass 5k. The worst-case orientation for radiated field strength measurements was the Y-Axis.



Emissions Designators				
Frequency (MHz)	Rule Part	Mode	Designator	Modulation
901-902 928.85-929.0 932-932.5	24D 101 101	Normal	9K60F2D	7-FSK
		Double Density	9K60F2D	13-FSK
		C&I (Half Baud)	4K80F2D	7-FSK
		Priority	4K80F2D	13-FSK
		2SFSK (Half Baud)	5K00F1D	2-SFSK
		4SFSK (Half Baud)	5K60F1D	4-SFSK
		8SFSK (Half Baud)	5K90F1D	8-SFSK
		2SFSK	10K0F1D	2-SFSK
		4SFSK	11K3F1D	4-SFSK
		8SFSK	11K9F1D	8-SFSK
930.0 - 931.0 940.0 - 941.0 941.0 - 941.5 952.0 - 953.0 959.85 - 960.0	24D 24D 101 101 101	MPass (5kbps)	5K90F1D	2-GFSK
		MPass (10kbps)	11K8F1D	2-GFSK
		M4Pass (10k)	4K70F1D	4-GFSK
		M4Pass (20k)	9K30F1D	4-GFSK

5 System Setup and Method

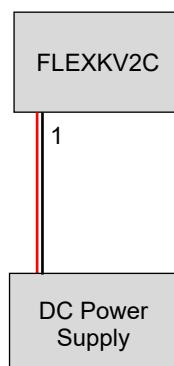
Cables					
ID	Description	Length (m)	Shielding	Ferrites	Termination
1	DC Power	10.0	None	None	DC Power Supply

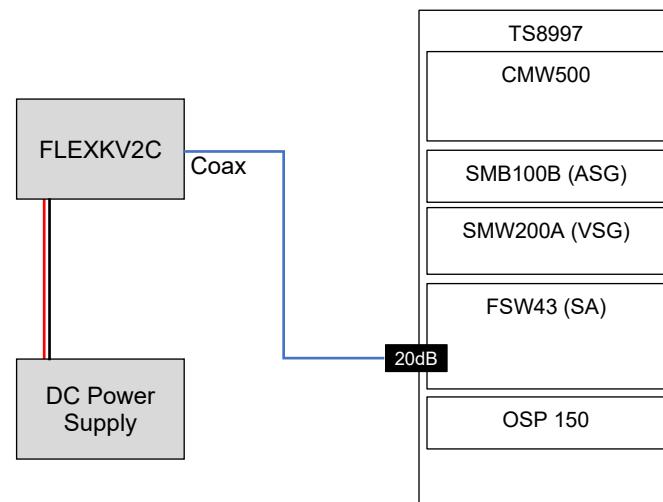
System Configuration			
Description	Manufacturer	Model Number	Serial Number
Transceiver Module	Sensus Metering Systems Inc.	FLEXKV2C	083 057
DC Power Supply	Kikusui	PAS 60-18	ML000349

5.1 Method

Configuration as required by ANSI C63.26.

5.2 EUT Block Diagram – Radiated Measurements



5.3 EUT Block Diagram – Conducted Measurements

6 RF Output Power

6.1 Method

The methods defined in ANSI C63.26, Section 5.2.3.2 were applied for measuring the peak output power. The antenna port was connected directly to a spectrum analyzer through a cable and 20dB attenuator (20.7dB of total loss). The attenuation was accounted for by applying an offset to the spectrum analyzer.

TEST SITE: RF Bench

The RF bench consists of a Rohde & Schwarz TS8997 automated test system coupled with a temperature/humidity environmental chamber. Where applicable, 2.4 and 5GHz radio measurements are automated using the Rohde & Schwarz EMC32 test software. The TS8997 system houses a switch matrix (OSP), along with a spectrum analyzer, vector network analyzer, and analog signal generator.

6.2 Test Equipment

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
200001	Attenuator, 20 dB, <18GHz	Weinschel Corp	2	BK1848	07/26/2024	07/26/2025
212164	Barometric Pressure/Humidity Datalogger	Extech	SD700	109402	06/14/2024	06/14/2025
213502	Spectrum Analyzer (2Hz-43.5GHz)	Rohde & Schwarz	FSW43	102972	08/01/2024	08/01/2025

Software Utilized

Name	Manufacturer	Version
RSCommander	Rohde & Schwarz	2.4.2 64-bit (2023)

6.3 Results

The sample tested was found to Comply.

6.4 Test Data

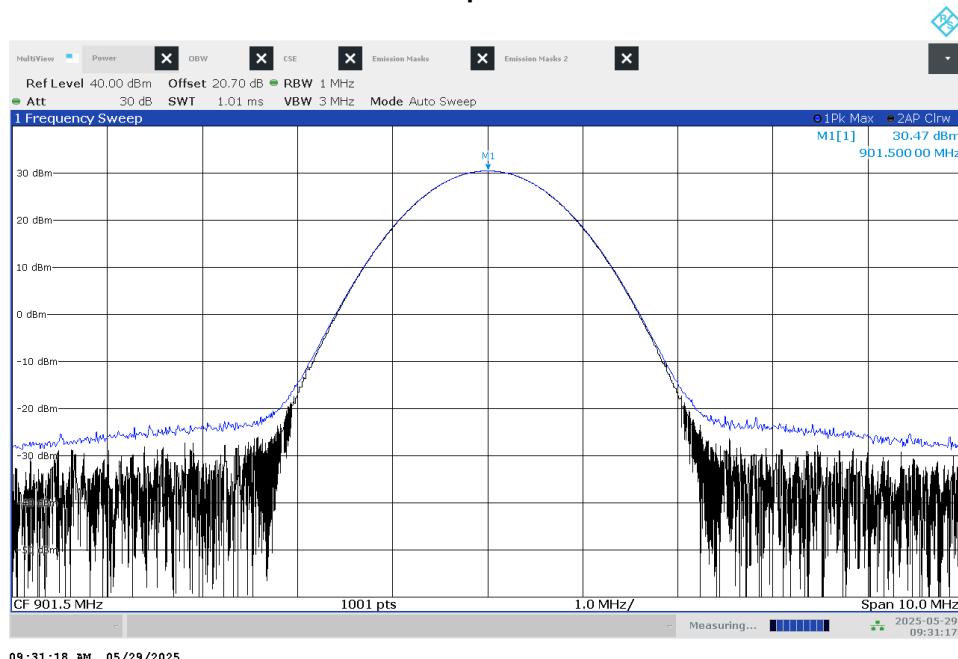
FCC Rule Part	Frequency (MHz)	Peak Power (dBm)	Peak Power (mW)	Antenna Gain (dBi)	ERP/EIRP (dBm)	Limit (dBm)
24D	901.5	30.47	1114.295	-0.47	27.85	38.45
24D	930.5	30.01	1002.305	-0.47	27.39	38.45
24D	940.0125	29.92	981.7479	-0.47	27.3	38.45
101	928.925	30.13	1030.386	-0.47	29.66	47
101	932.25	30.06	1013.911	-0.47	29.59	47
101	941.4875	29.93	984.0111	-0.47	29.46	44
101	952.5	29.73	939.7233	-0.47	29.26	44
101	959.925	29.48	887.156	-0.47	29.01	44

Calculation: $P_{EIRP} = \text{Peak Power} + \text{Antenna Gain (dBi)} \text{ (Part 101)}$

$P_{ERP} = \text{Peak Power} + \text{Antenna Gain (dBi)} - 2.15 \text{ (Part 24)}$

2.15 is the conversion from EIRP to ERP

Sample Plot

Test Personnel: Jeremy Pickens Test Date: 28-29 May 2025Reference Standard: ANSI C63.26Ambient Temperature: 20.4 - 21.4°CRelative Humidity: 53.8 - 58.7%Atmospheric Pressure: 97.9 - 98.2kPa

7 Out of Band Unwanted Emissions

7.1 Method

The methods defined in ANSI C63.26, Section 5.7.3 were applied for measuring the out of band emissions. The antenna port was connected directly to a spectrum analyzer through a cable and 20dB attenuator (20.7dB of total loss). The attenuation was accounted for by applying an offset to the spectrum analyzer. For FCC, RSS-119 Mask G, and RSS-134 testing, the spectrum analyzer was configured with a 300Hz Resolution Bandwidth (RBW) and a 3kHz Video Bandwidth (VBW). For RSS-119 Mask D measurements, the spectrum analyzer was configured with a 100Hz RBW and a 300kHz VBW.

For modulations/bands where the channel spacing may be 12.5kHz or 25kHz, only the plots for 12.5kHz spacing was tested as worst-case.

TEST SITE: RF Bench

The RF bench consists of a Rohde & Schwarz TS8997 automated test system coupled with a temperature/humidity environmental chamber. Where applicable, 2.4 and 5GHz radio measurements are automated using the Rohde & Schwarz EMC32 test software. The TS8997 system houses a switch matrix (OSP), along with a spectrum analyzer, vector network analyzer, and analog signal generator.

7.2 Test Equipment

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
200001	Attenuator, 20 dB, <18GHz	Weinschel Corp	2	BK1848	07/26/2024	07/26/2025
212164	Barometric Pressure/Humidity Datalogger	Extech	SD700	109402	06/14/2024	06/14/2025
213502	Spectrum Analyzer (2Hz-43.5GHz)	Rohde & Schwarz	FSW43	102972	08/01/2024	08/01/2025

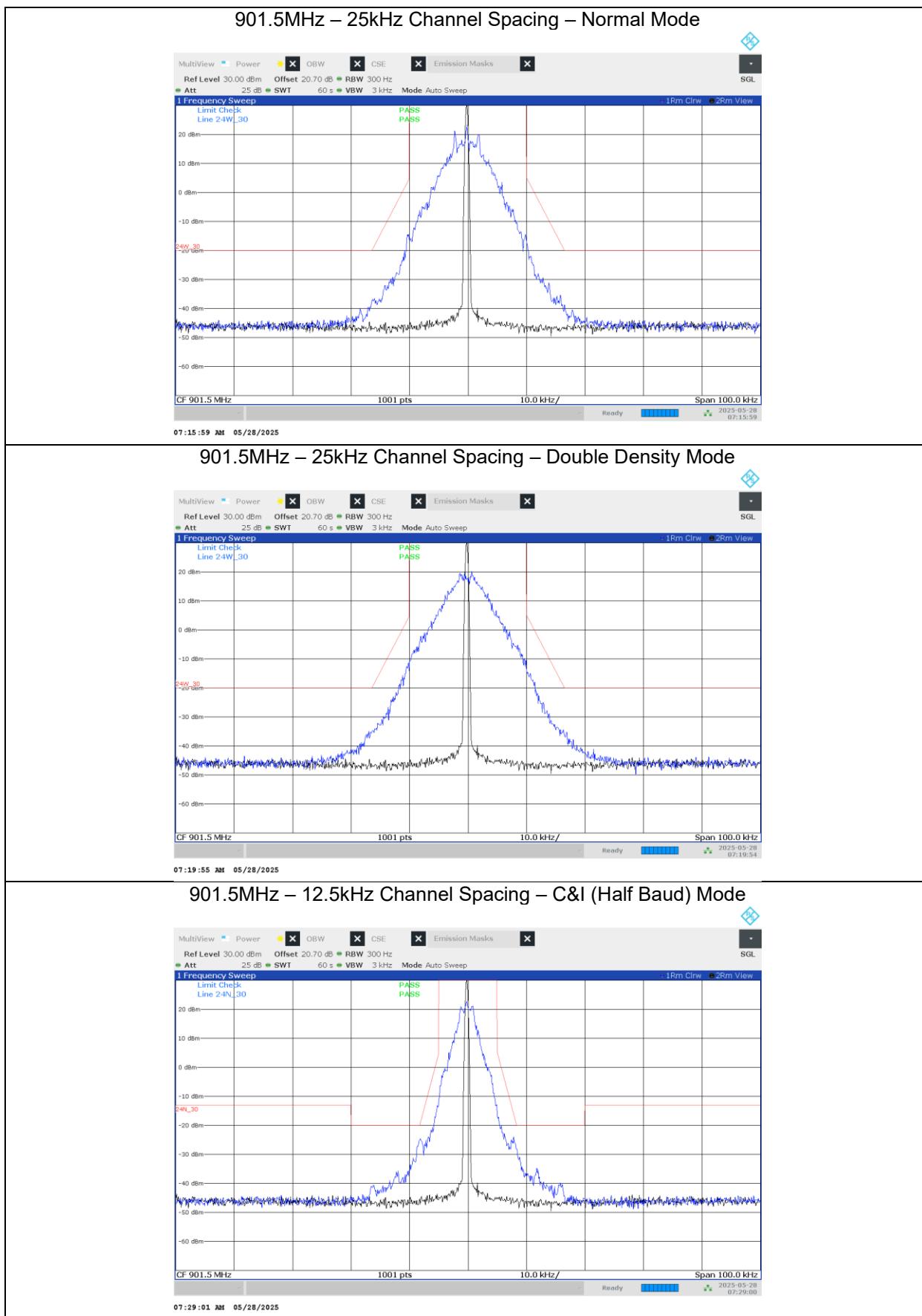
Software Utilized

Name	Manufacturer	Version
RSCommander	Rohde & Schwarz	2.4.2 64-bit (2023)

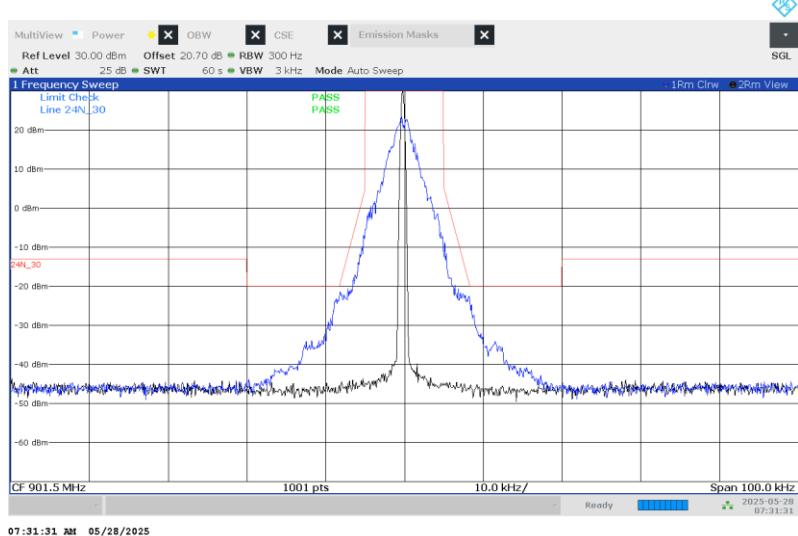
7.3 Results

The sample tested was found to Comply.

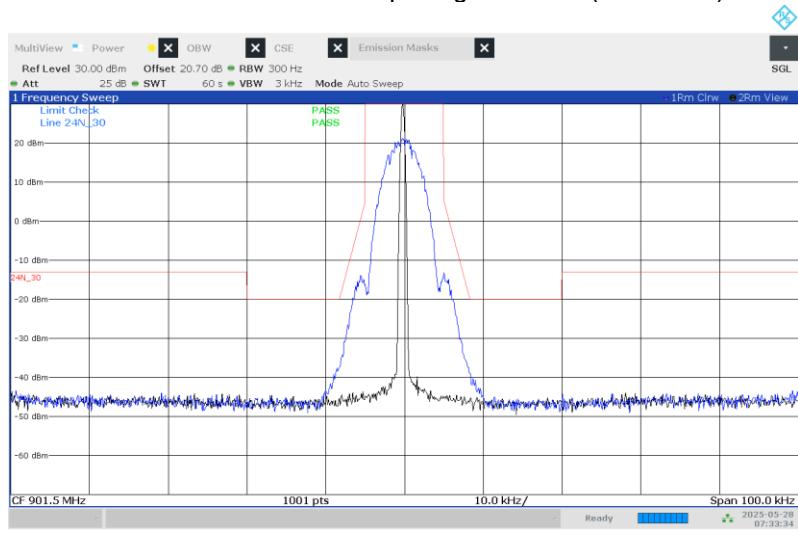
7.4 Test Data – Part 24.133(a)(1)/(a)(2) and RSS-134 S4.4.1(a)/(b), S4.4.2(a)/(b)



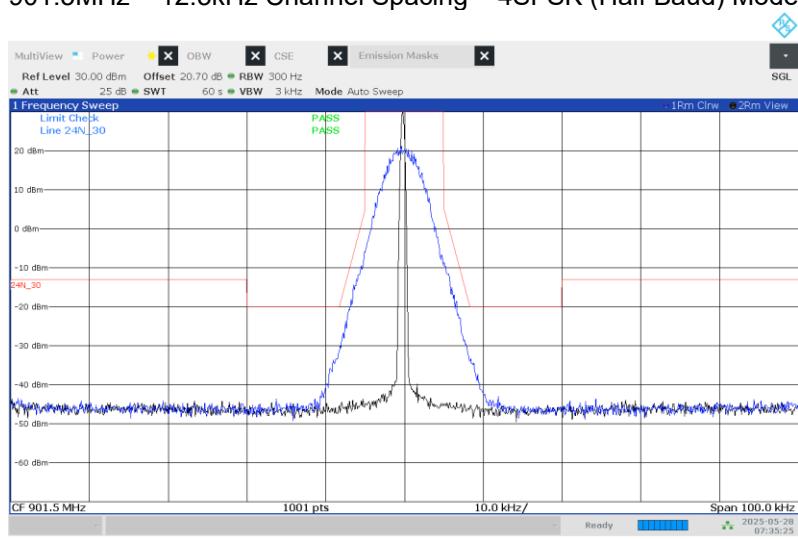
901.5MHz – 12.5kHz Channel Spacing – Priority Mode



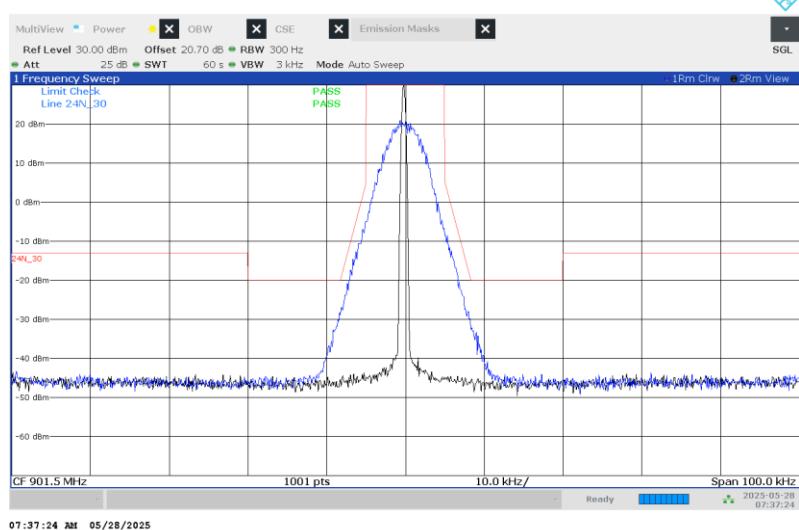
901.5MHz – 12.5kHz Channel Spacing – 2SFSK (Half Baud) Mode



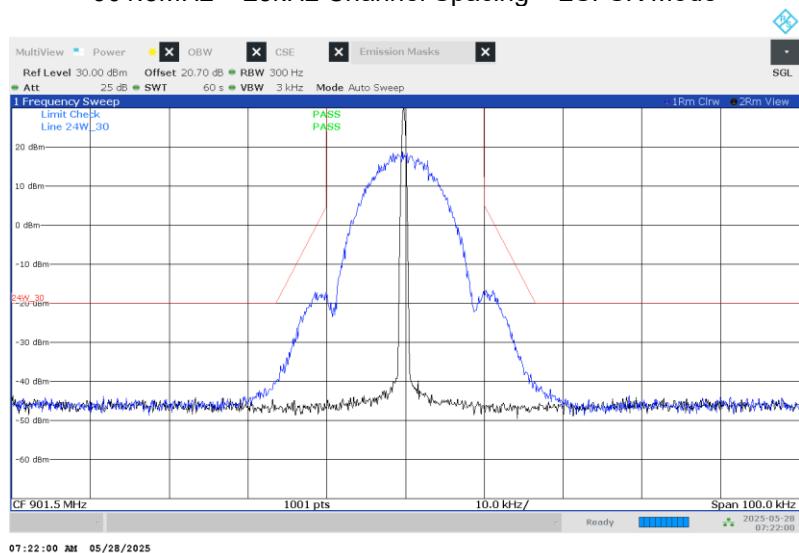
901.5MHz – 12.5kHz Channel Spacing – 4SFSK (Half Baud) Mode



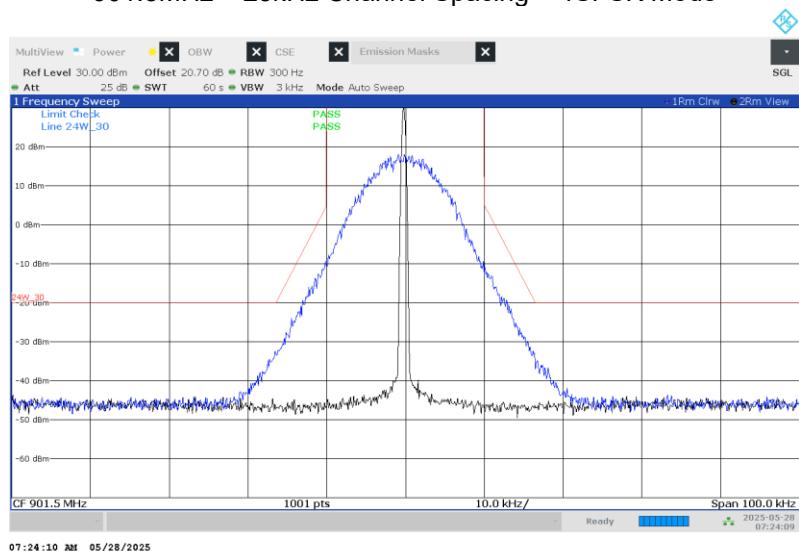
901.5MHz – 12.5kHz Channel Spacing – 8SFSK (Half Baud) Mode



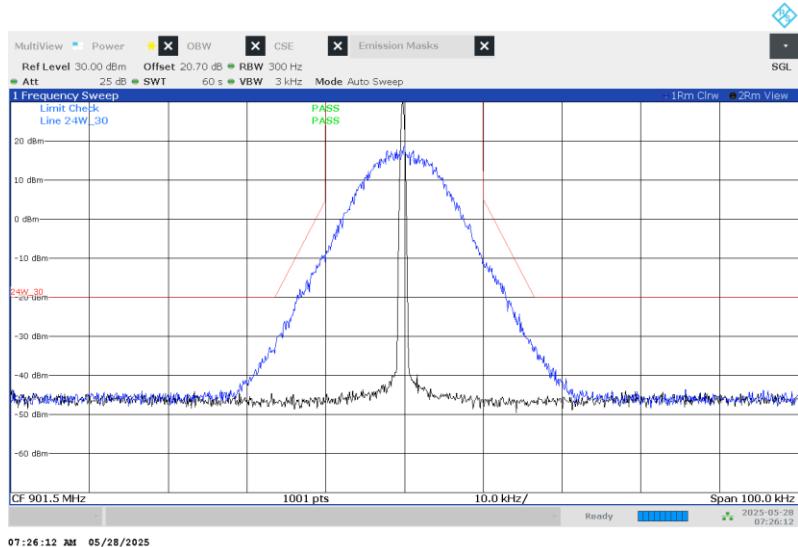
901.5MHz – 25kHz Channel Spacing – 2SFSK Mode



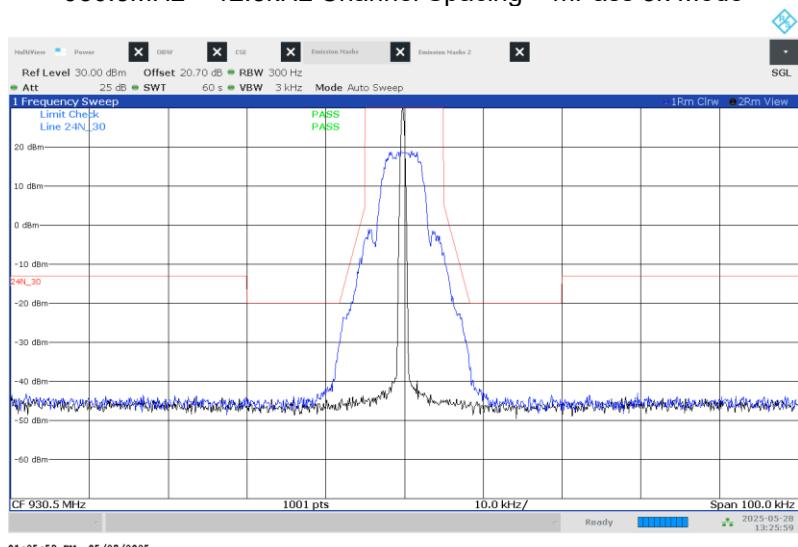
901.5MHz – 25kHz Channel Spacing – 4SFSK Mode



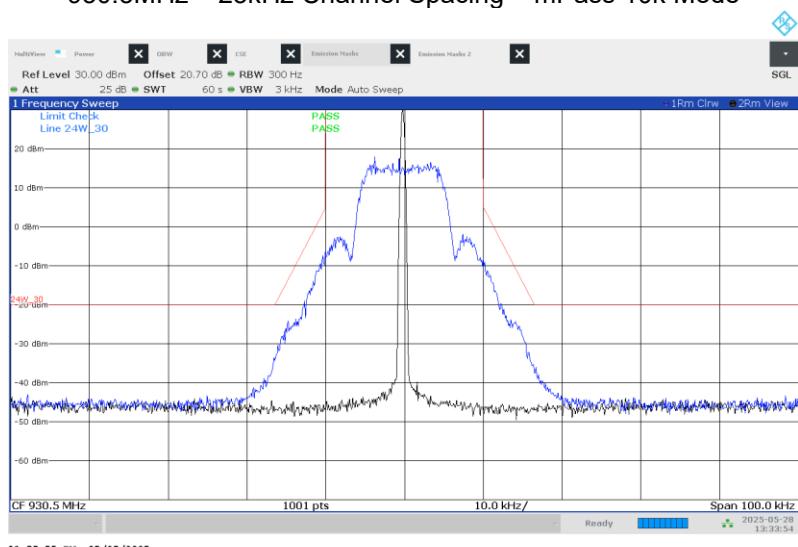
901.5MHz – 25kHz Channel Spacing – 8SFSK Mode



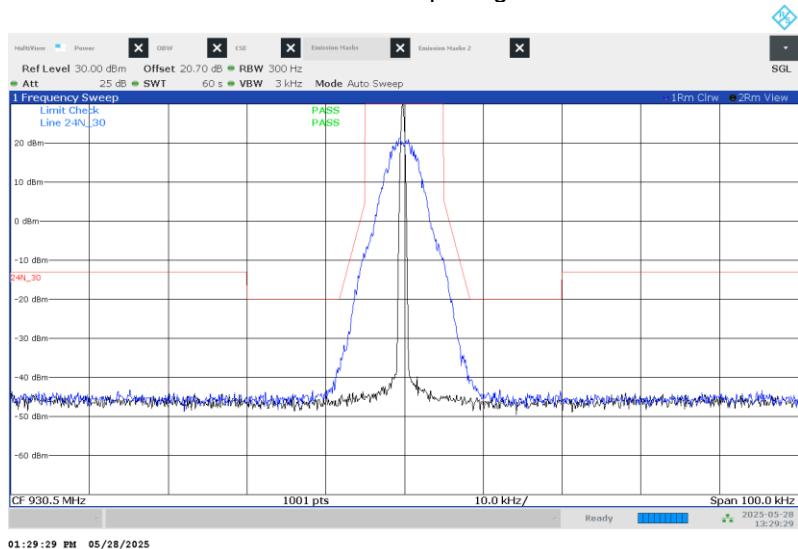
930.5MHz – 12.5kHz Channel Spacing – mPass 5k Mode



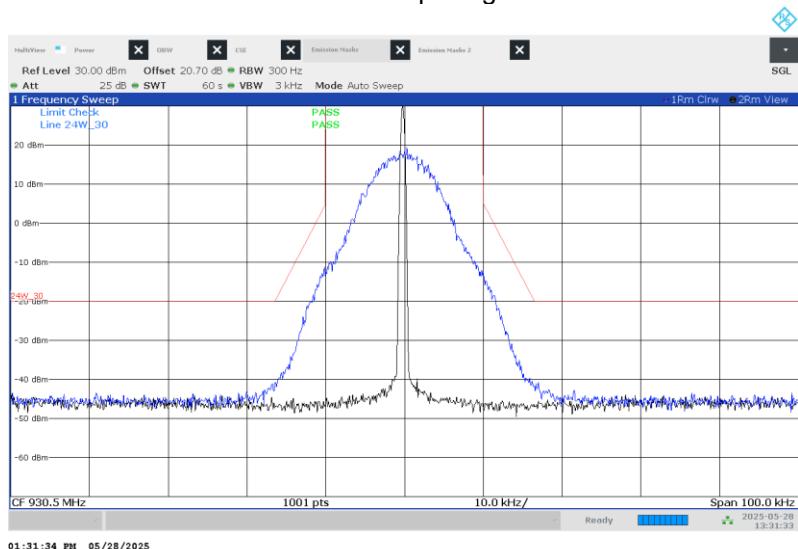
930.5MHz – 25kHz Channel Spacing – mPass 10k Mode



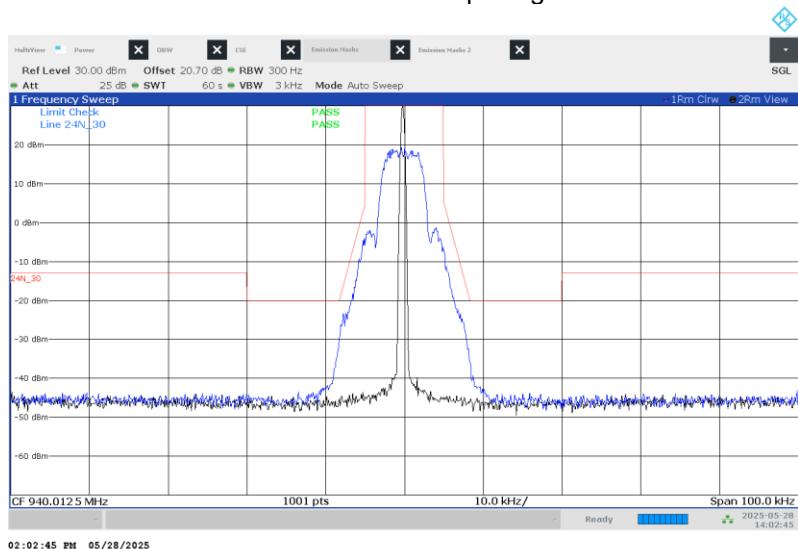
930.5MHz – 12.5kHz Channel Spacing – m4Pass 10k Mode



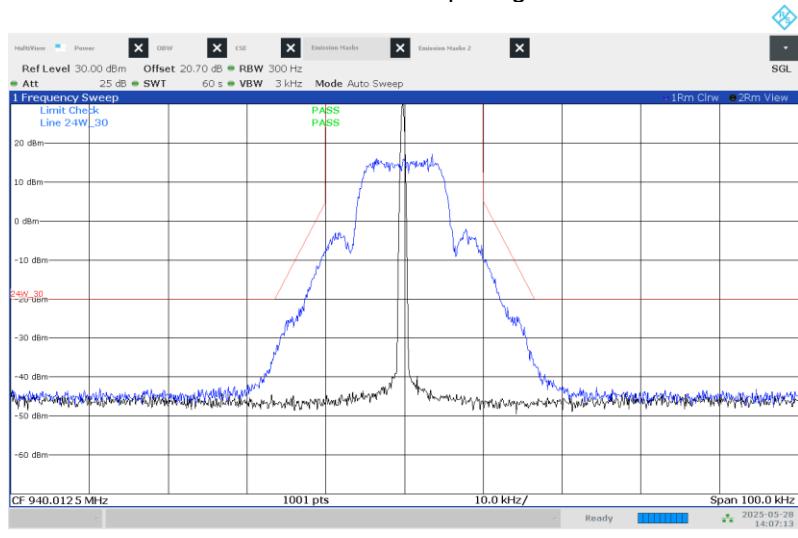
930.5MHz – 25kHz Channel Spacing – m4Pass 20k Mode



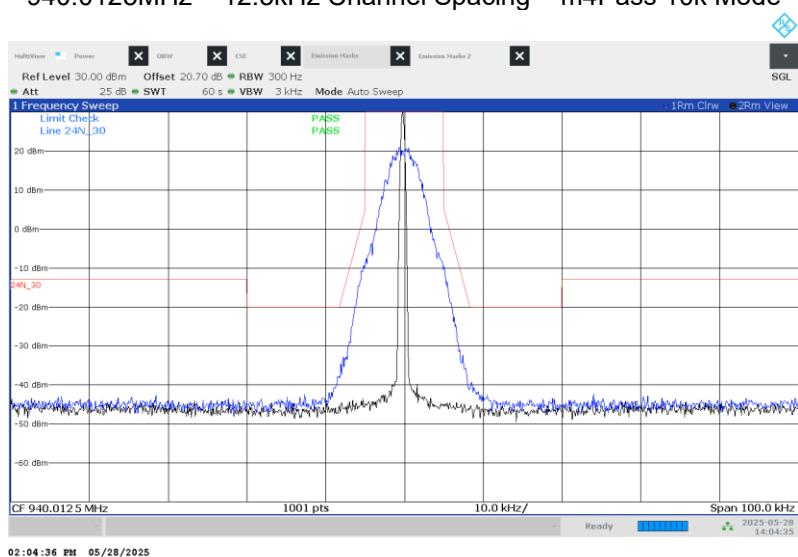
940.0125MHz – 12.5kHz Channel Spacing – mPass 5k Mode



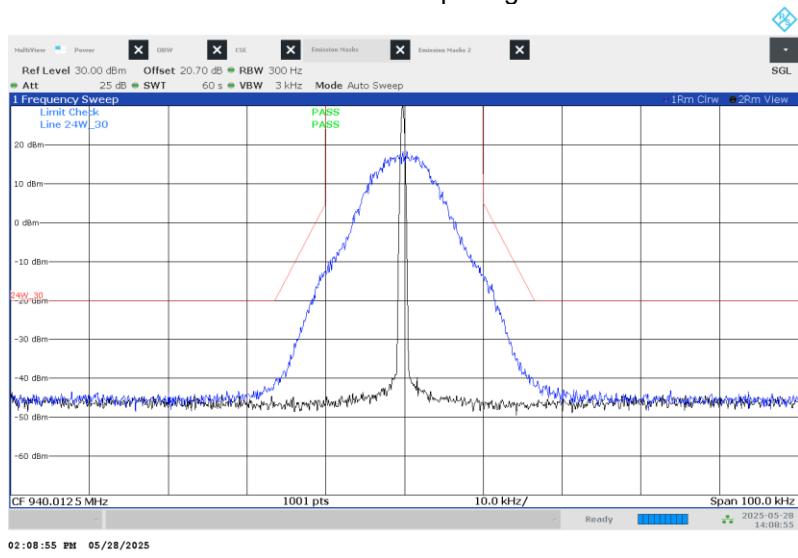
940.0125MHz – 25kHz Channel Spacing – mPass 10k Mode



940.0125MHz – 12.5kHz Channel Spacing – m4Pass 10k Mode

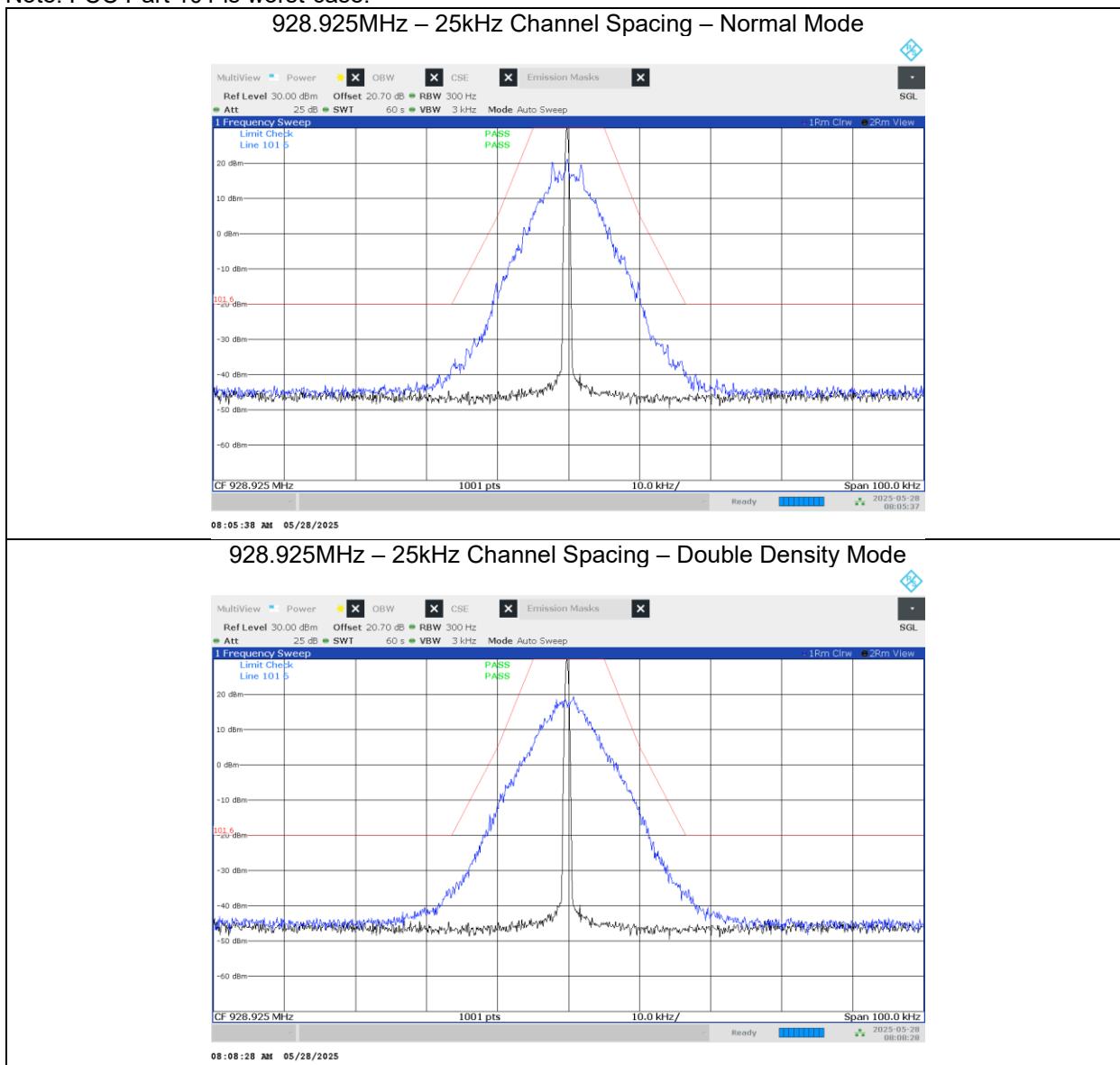


940.0125MHz – 25kHz Channel Spacing – m4Pass 20k Mode

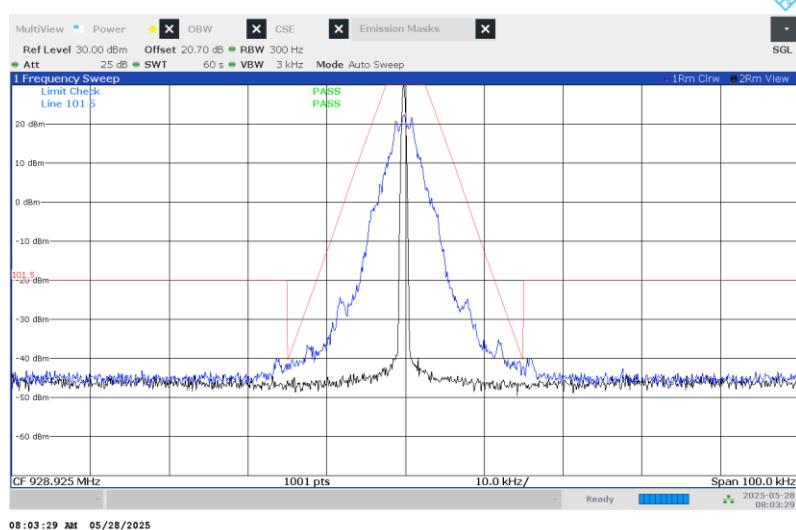


7.5 Test Data – Parts 101.111(a)(5)/101.111(a)(6) and RSS-119 S5.8.6 (Mask G)

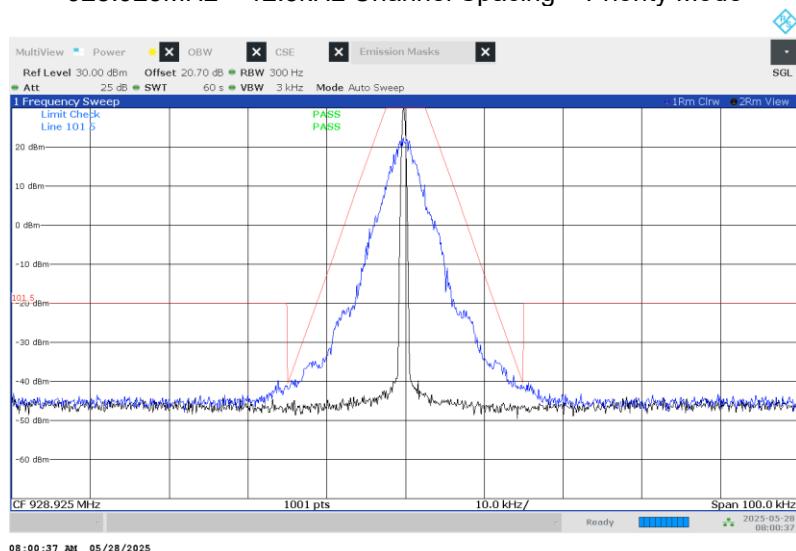
Note: FCC Part 101 is worst-case.



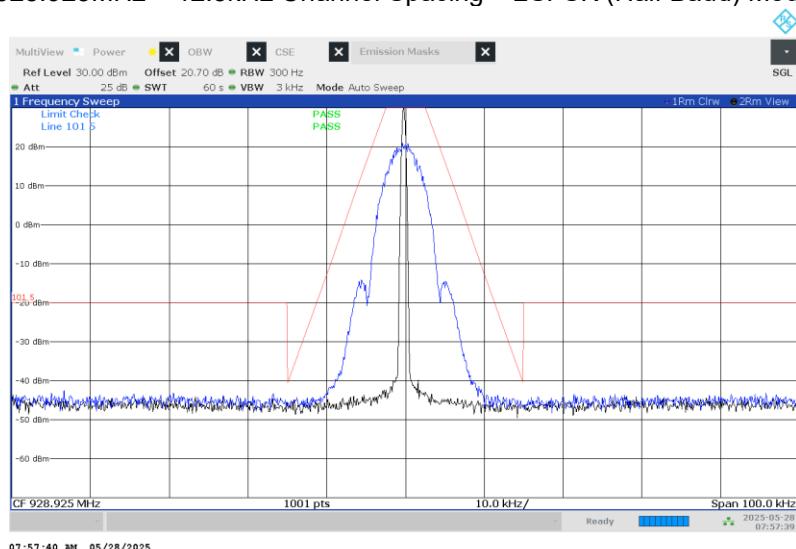
928.925MHz – 12.5kHz Channel Spacing – C&I (Half Baud) Mode



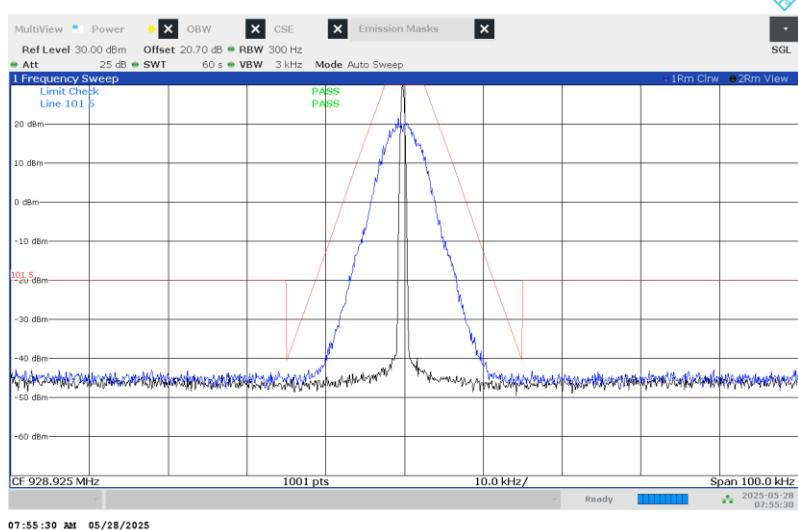
928.925MHz – 12.5kHz Channel Spacing – Priority Mode



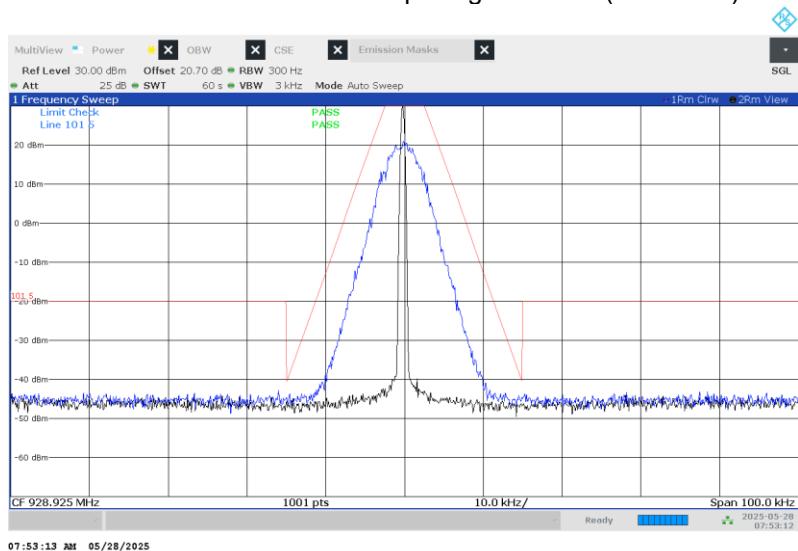
928.925MHz – 12.5kHz Channel Spacing – 2SFSK (Half Baud) Mode



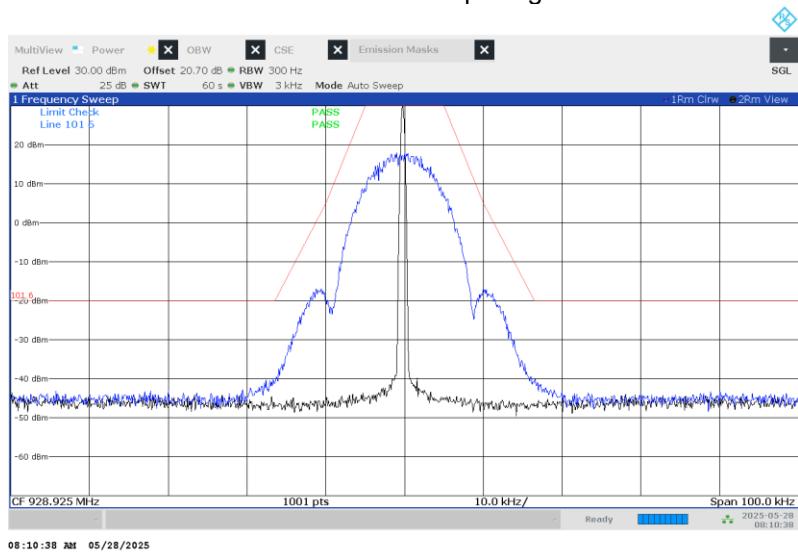
928.925MHz – 12.5kHz Channel Spacing – 4SFSK (Half Baud) Mode

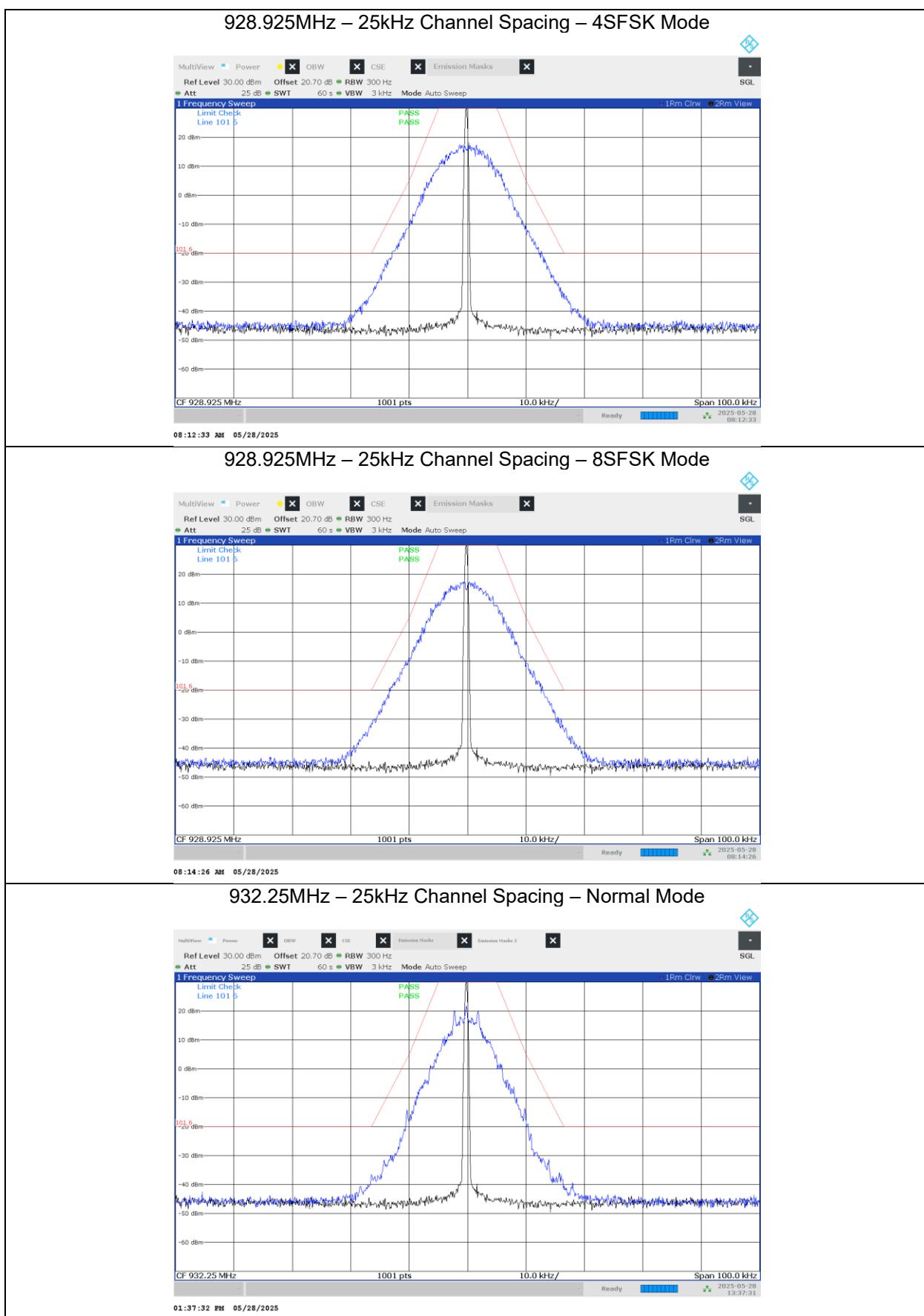


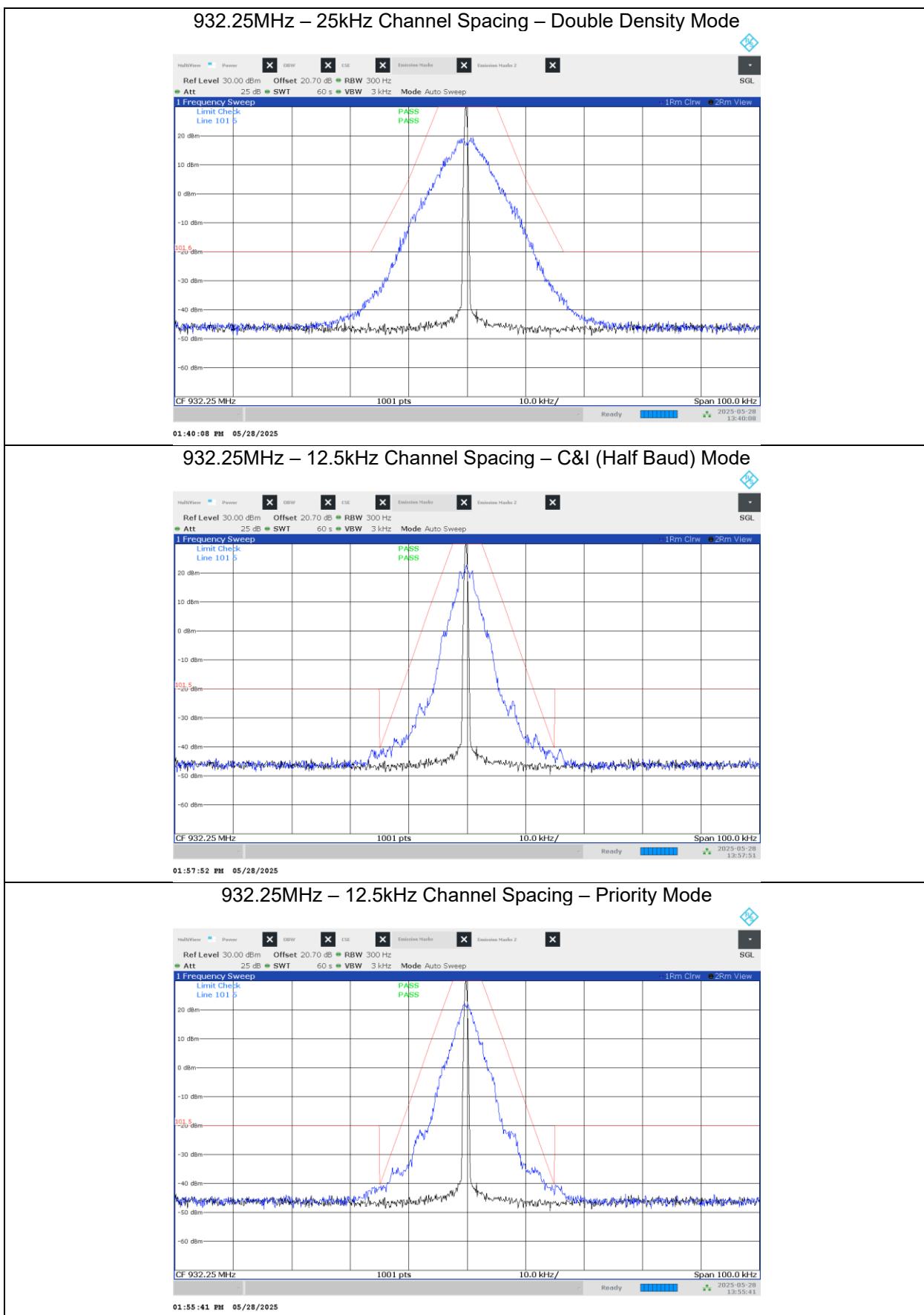
928.925MHz – 12.5kHz Channel Spacing – 8SFSK (Half Baud) Mode



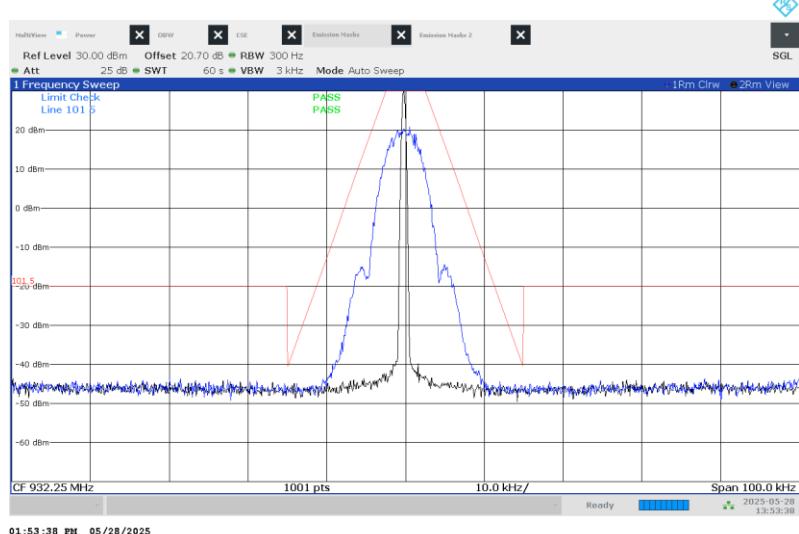
928.925MHz – 25kHz Channel Spacing – 2SFSK Mode



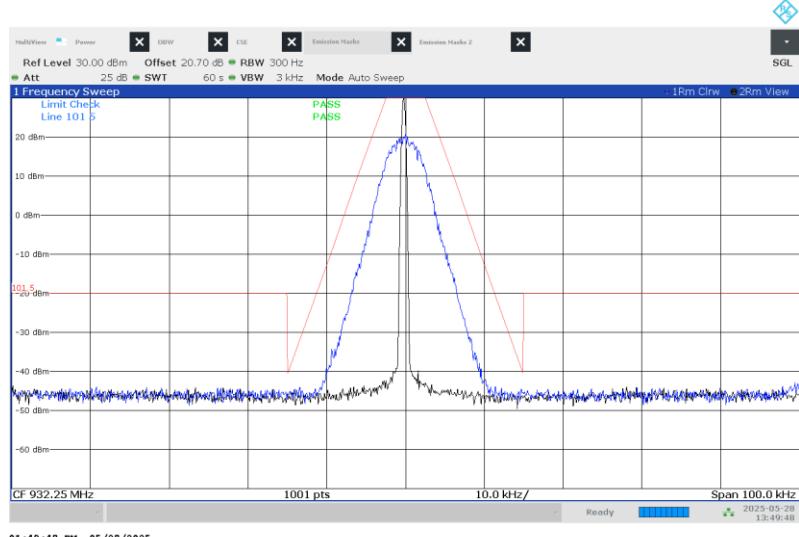




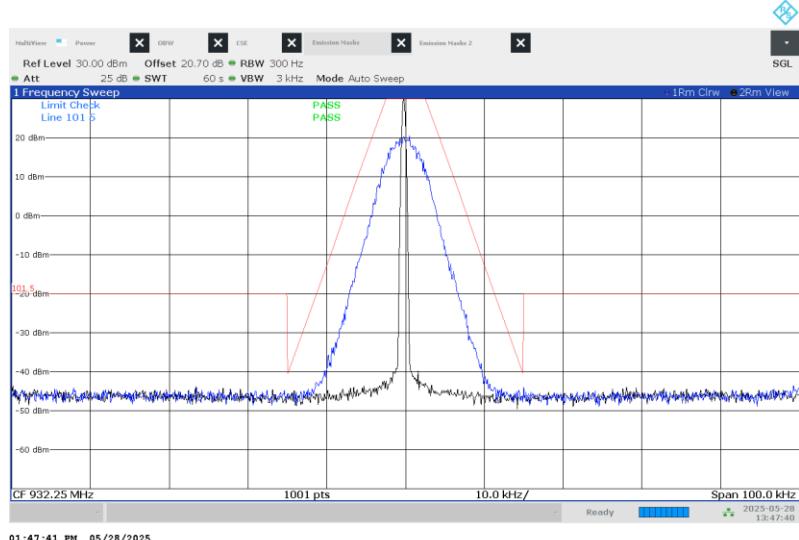
932.25MHz – 12.5kHz Channel Spacing – 2SFSK (Half Baud) Mode

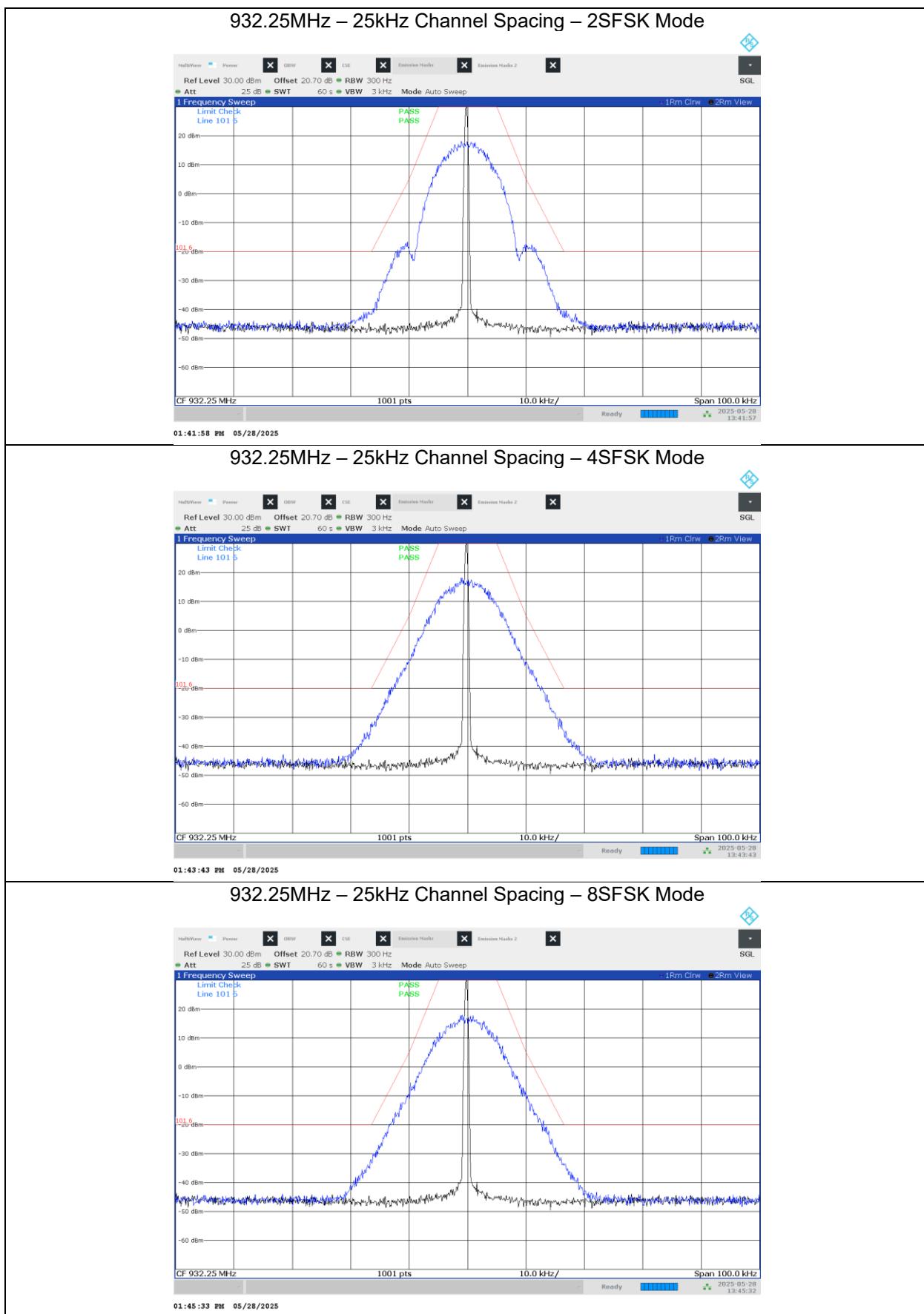


932.25MHz – 12.5kHz Channel Spacing – 4SFSK (Half Baud) Mode

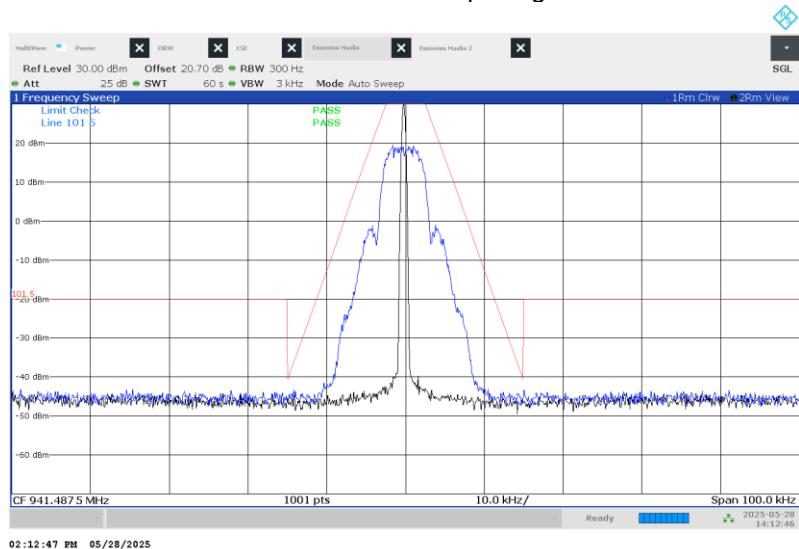


932.25MHz – 12.5kHz Channel Spacing – 8SFSK (Half Baud) Mode

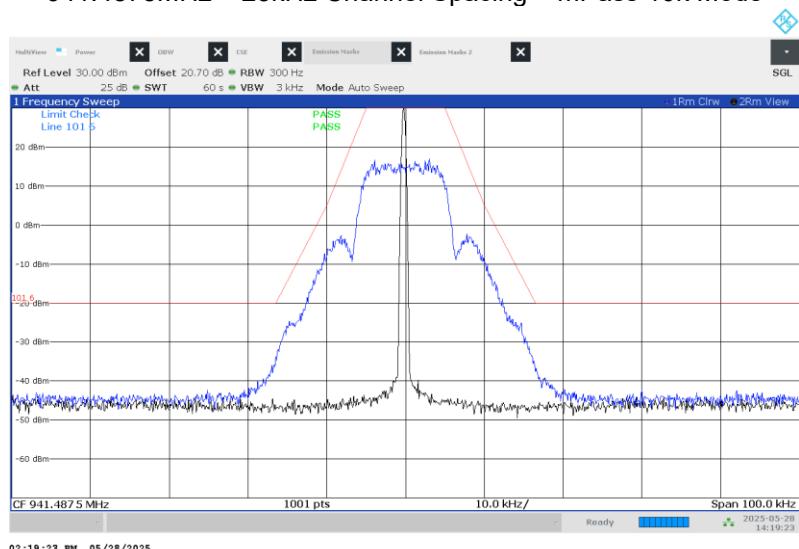




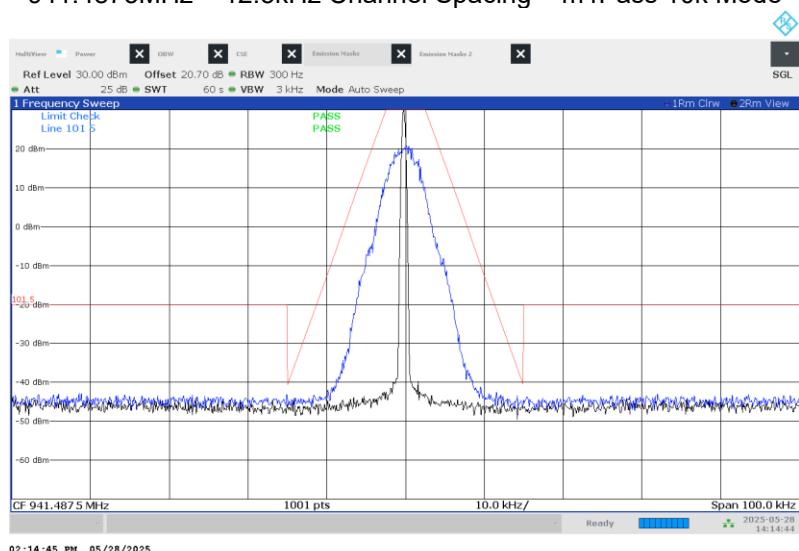
941.4875MHz – 12.5kHz Channel Spacing – mPass 5k Mode



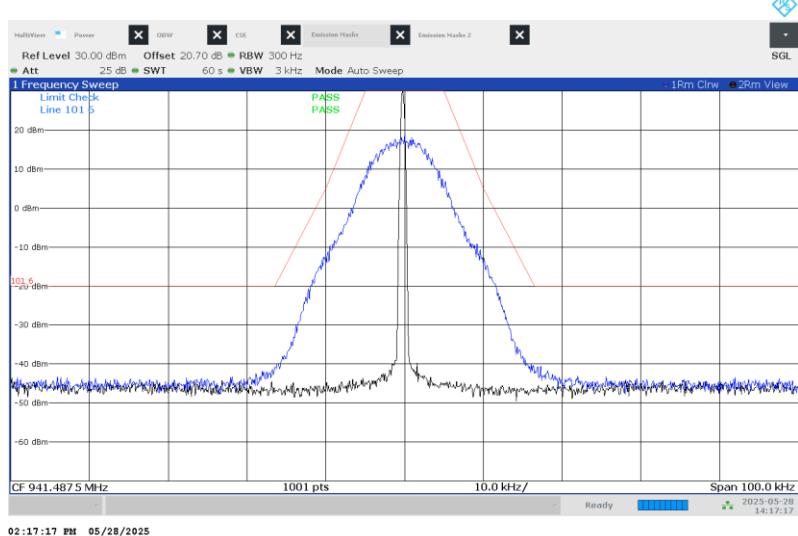
941.4875MHz – 25kHz Channel Spacing – mPass 10k Mode



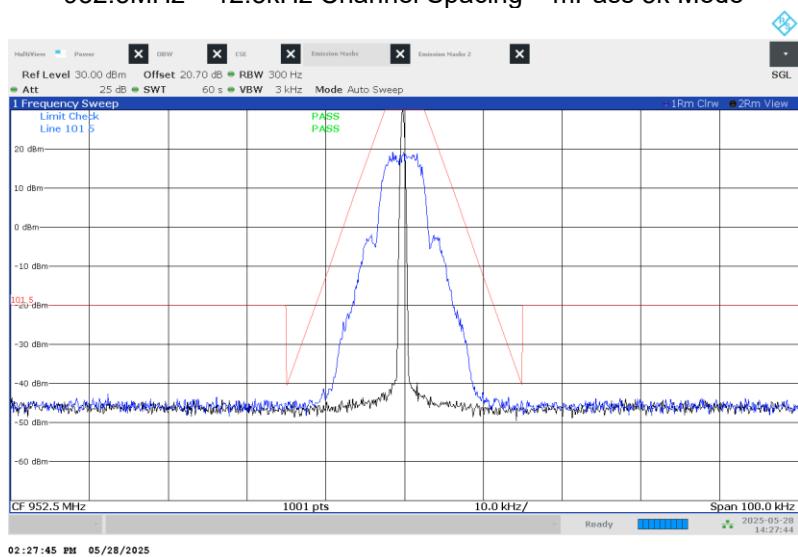
941.4875MHz – 12.5kHz Channel Spacing – m4Pass 10k Mode



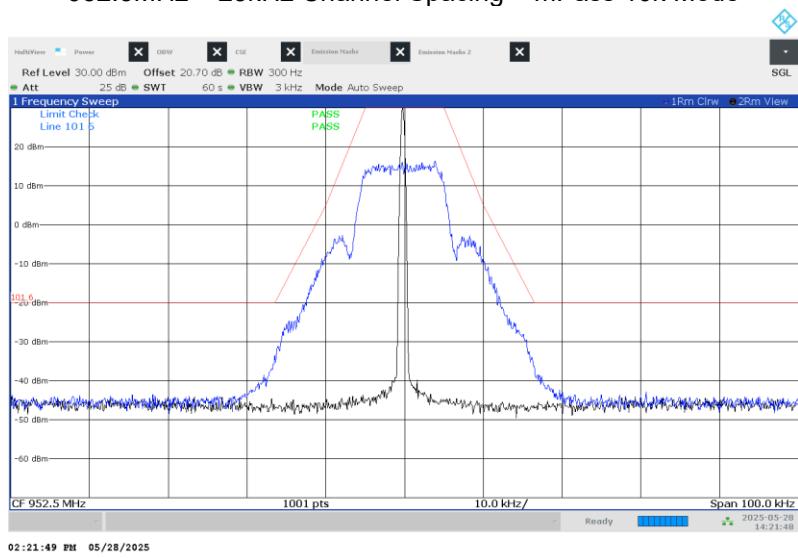
941.4875MHz – 25kHz Channel Spacing – m4Pass 20k Mode



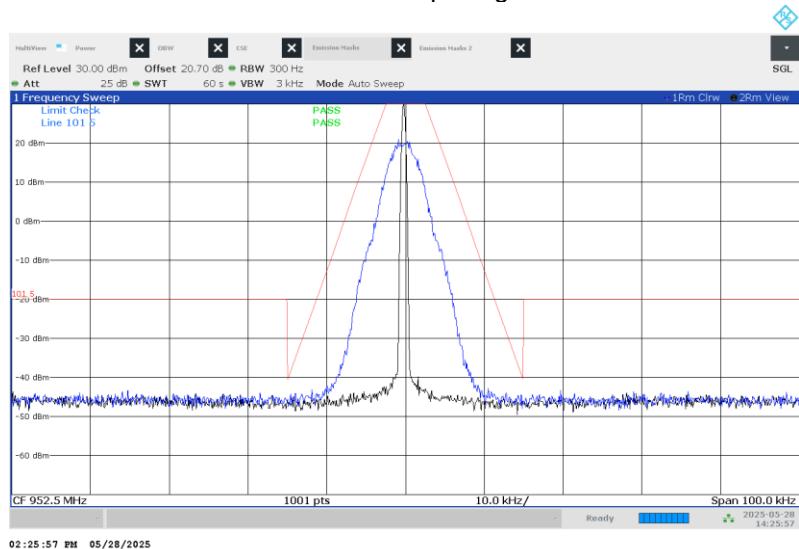
952.5MHz – 12.5kHz Channel Spacing – mPass 5k Mode



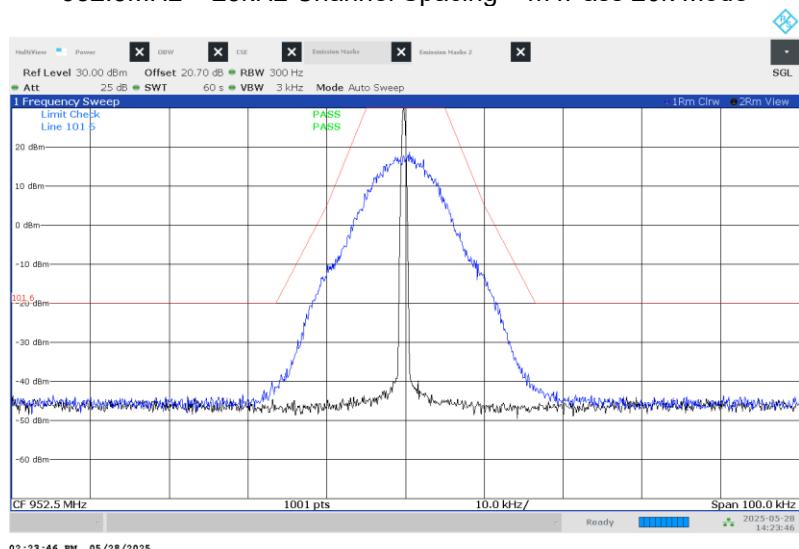
952.5MHz – 25kHz Channel Spacing – mPass 10k Mode



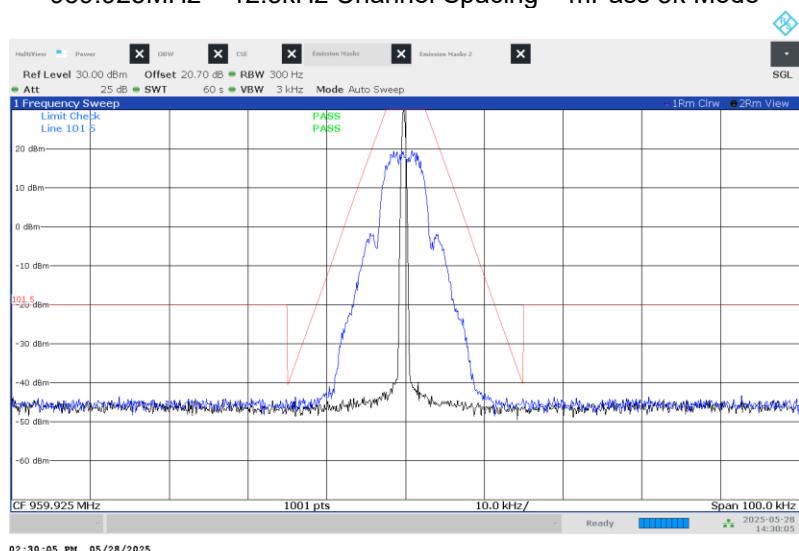
952.5MHz – 12.5kHz Channel Spacing – m4Pass 10k Mode



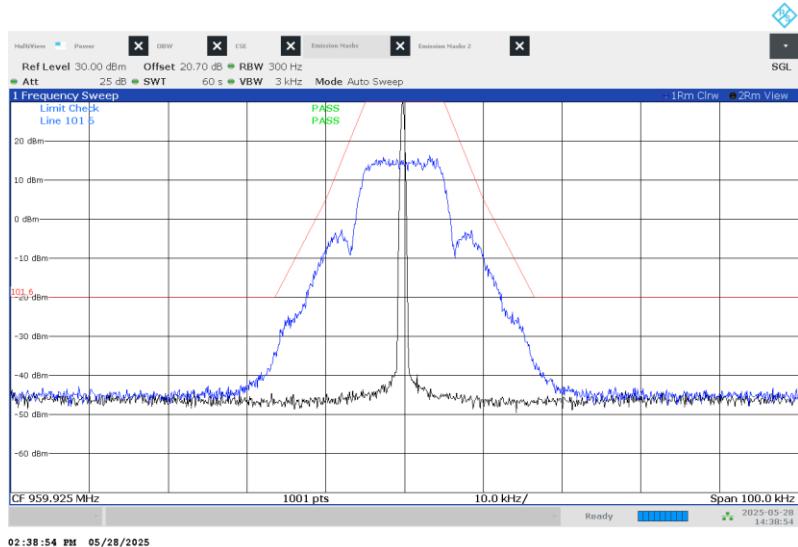
952.5MHz – 25kHz Channel Spacing – m4Pass 20k Mode



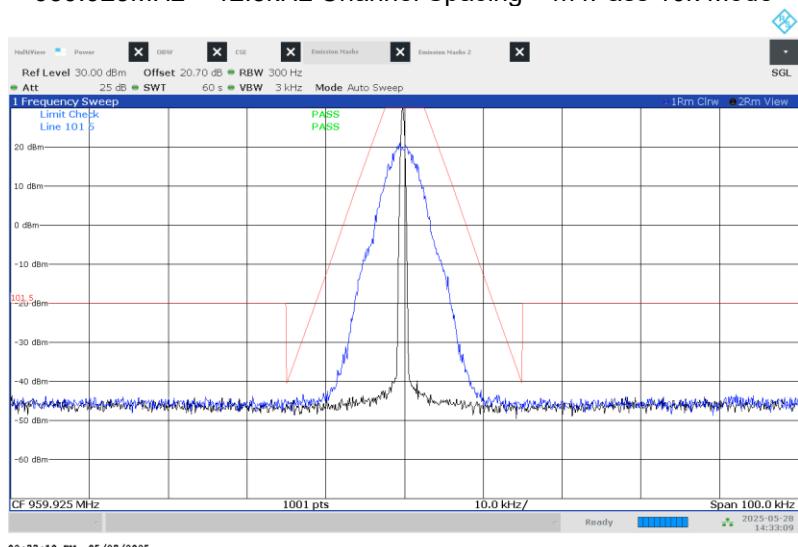
959.925MHz – 12.5kHz Channel Spacing – mPass 5k Mode



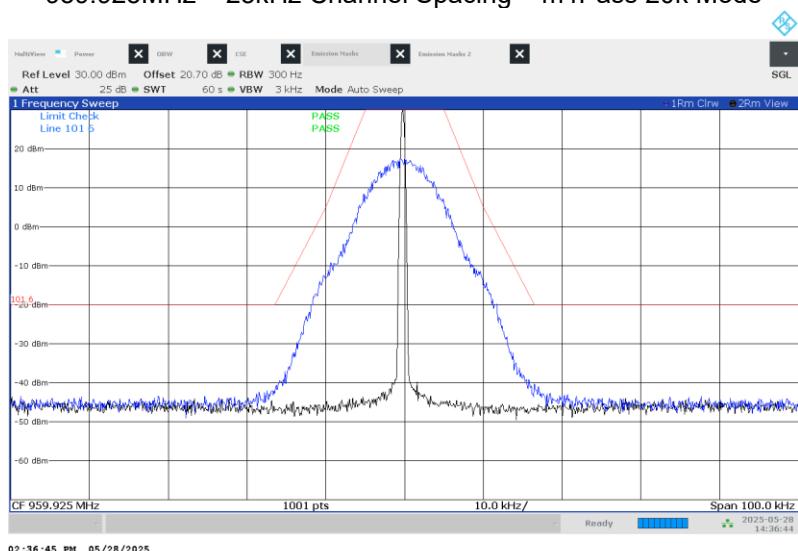
959.925MHz – 25kHz Channel Spacing – mPass 10k Mode



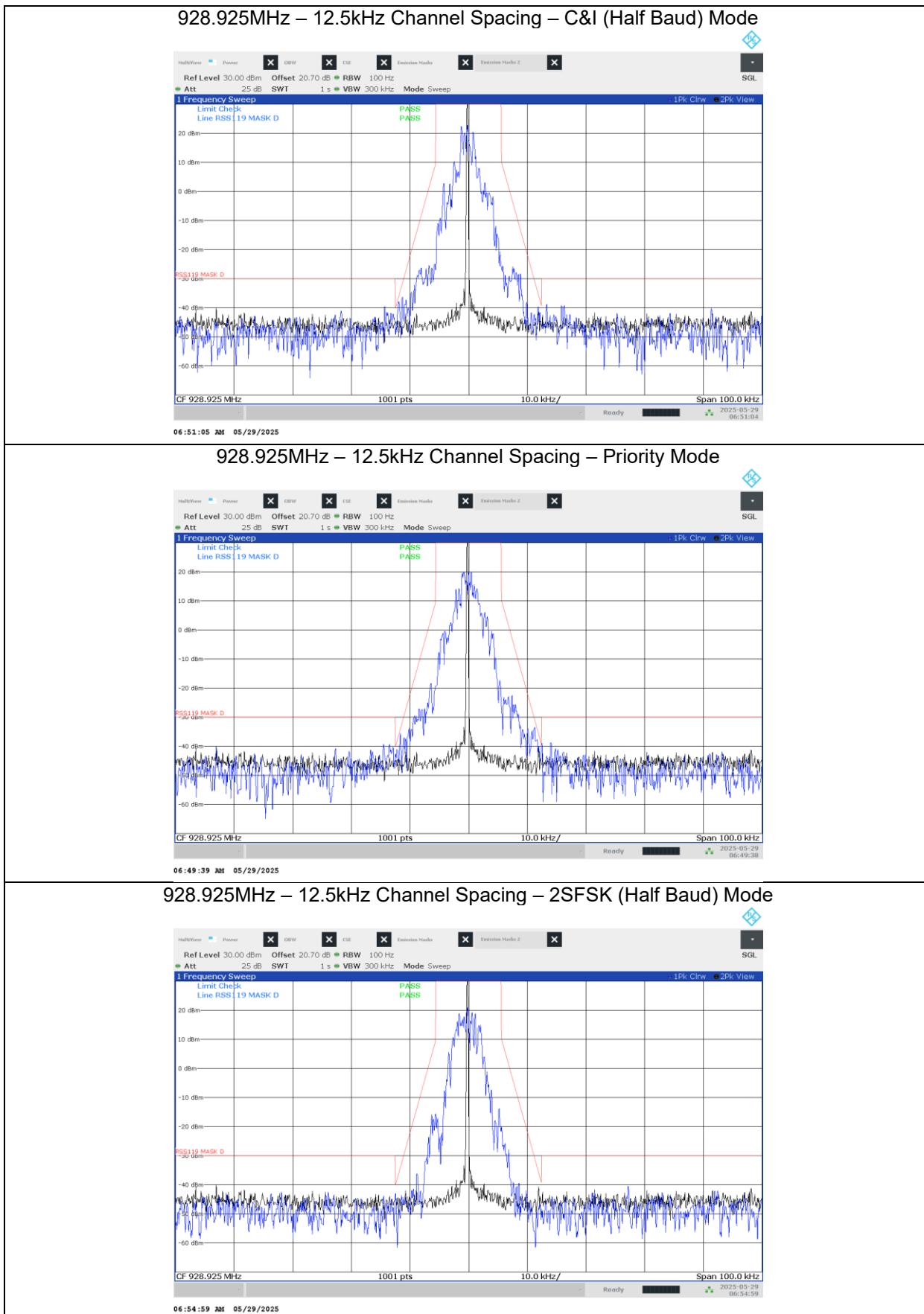
959.925MHz – 12.5kHz Channel Spacing – m4Pass 10k Mode



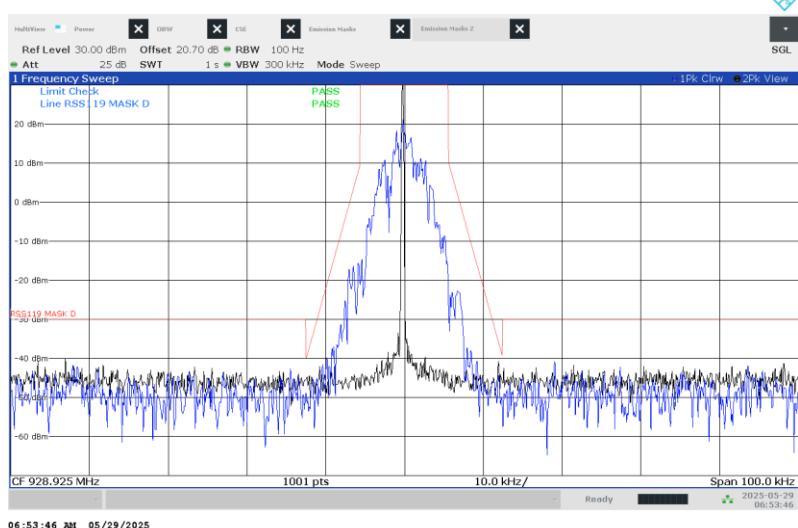
959.925MHz – 25kHz Channel Spacing – m4Pass 20k Mode



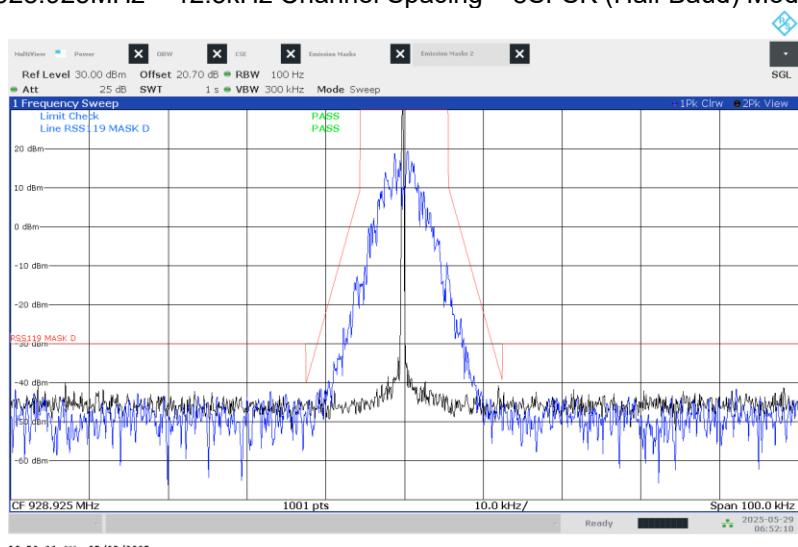
7.6 Test Data –RSS-119 S5.8.3 (Mask D)



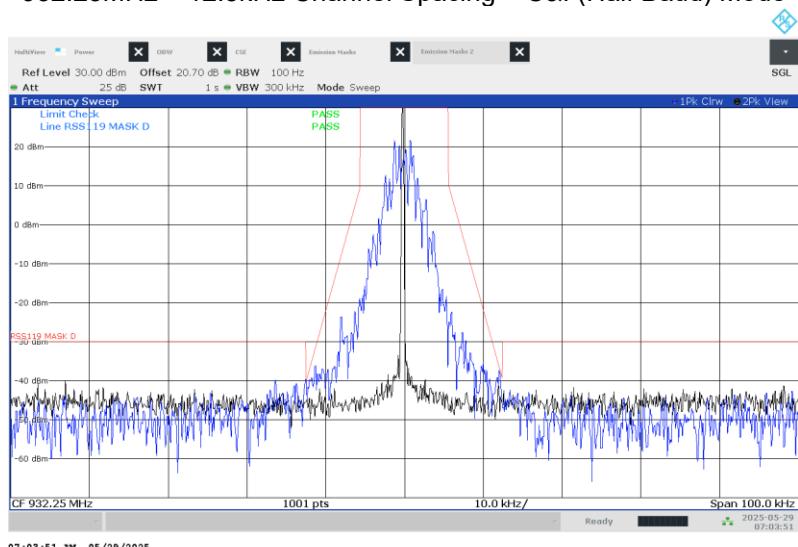
928.925MHz – 12.5kHz Channel Spacing – 4SFSK (Half Baud) Mode



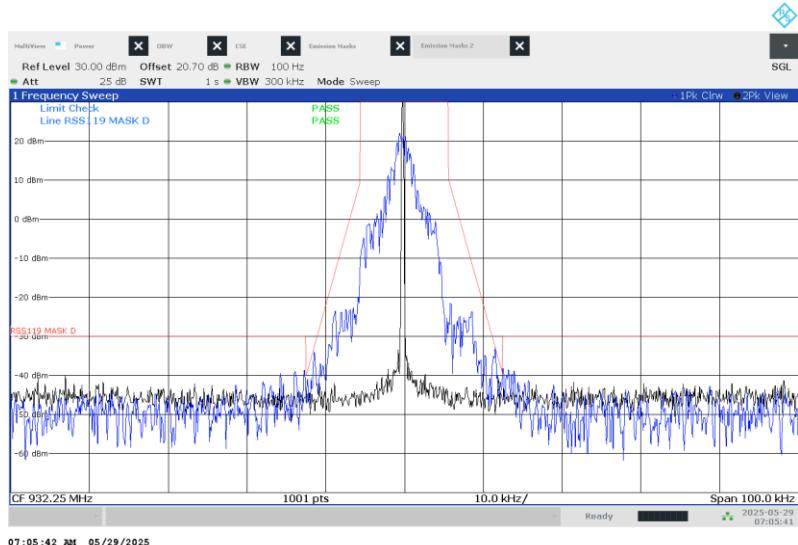
928.925MHz – 12.5kHz Channel Spacing – 8SFSK (Half Baud) Mode



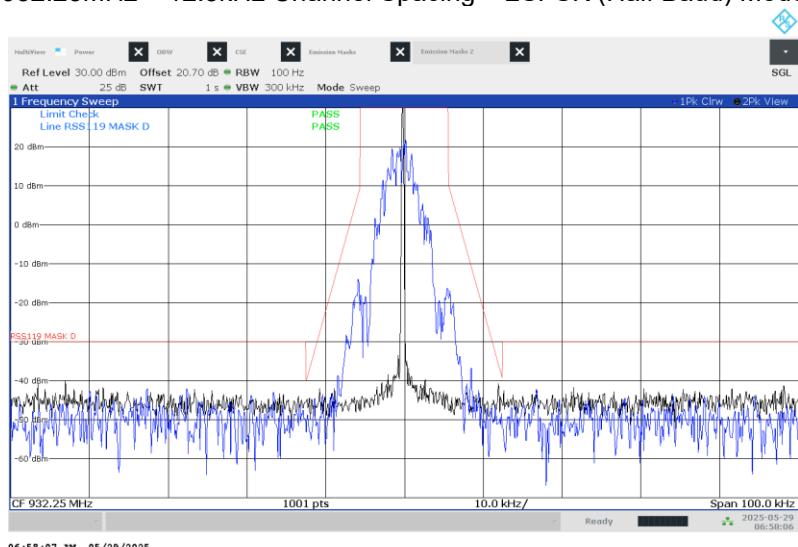
932.25MHz – 12.5kHz Channel Spacing – C&I (Half Baud) Mode



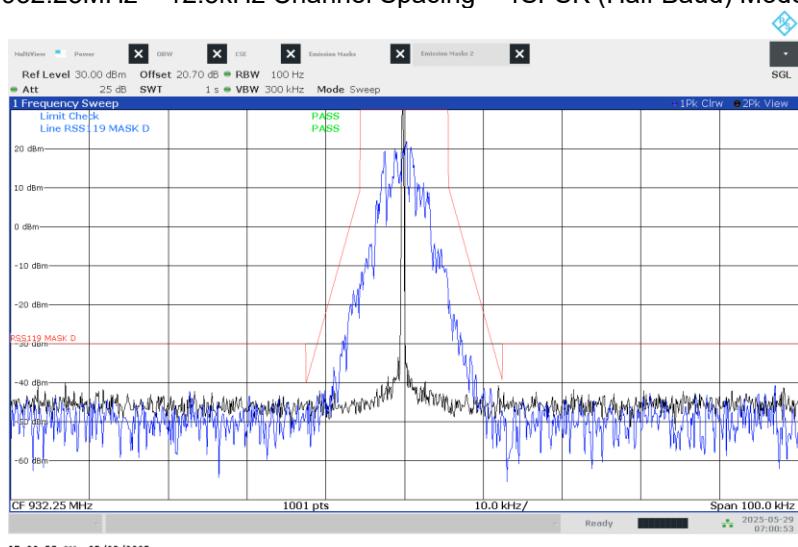
932.25MHz – 12.5kHz Channel Spacing – Priority Mode



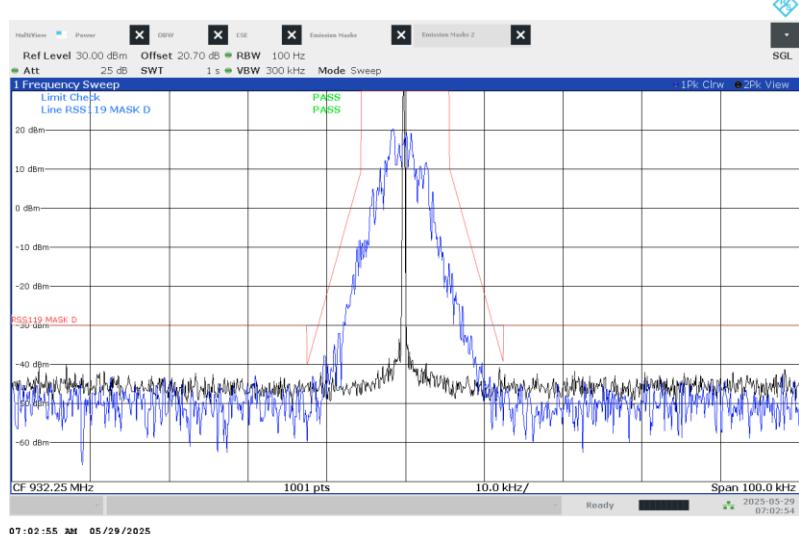
932.25MHz – 12.5kHz Channel Spacing – 2SFSK (Half Baud) Mode



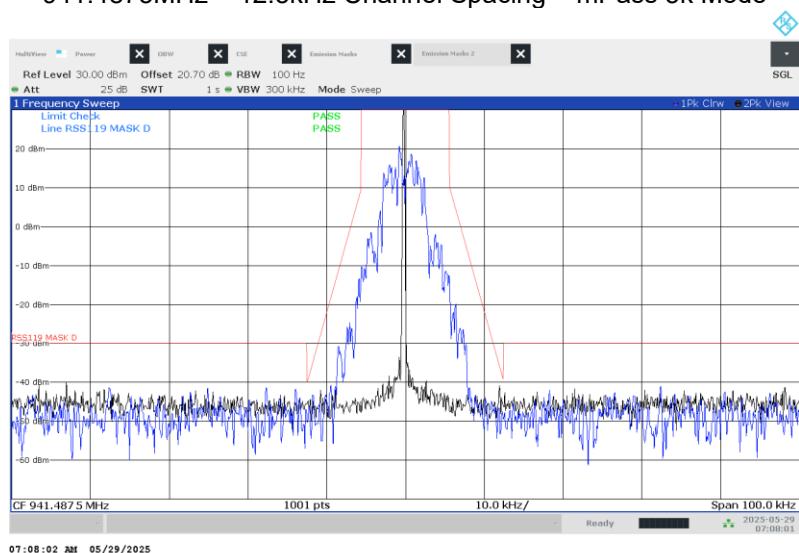
932.25MHz – 12.5kHz Channel Spacing – 4SFSK (Half Baud) Mode



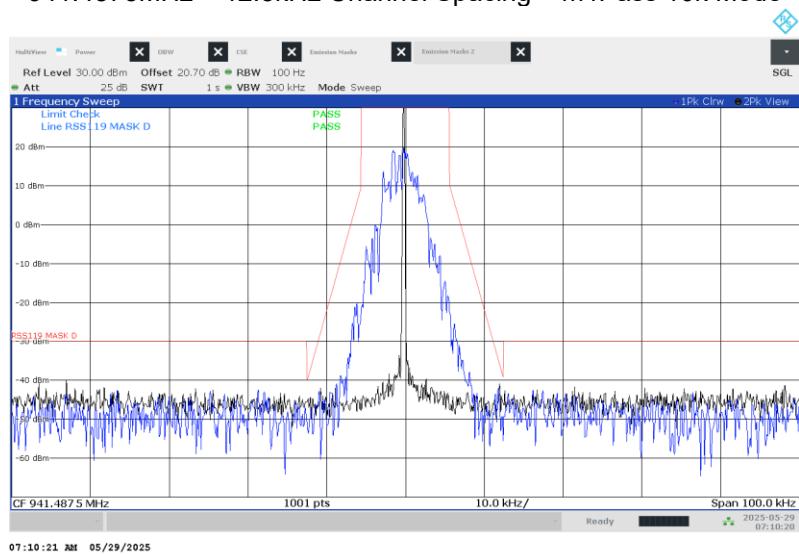
932.25MHz – 12.5kHz Channel Spacing – 8SFSK (Half Baud) Mode



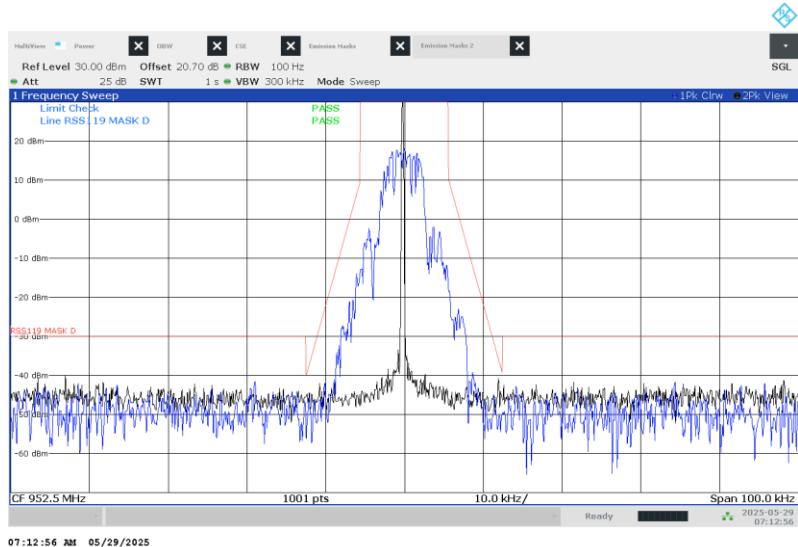
941.4875MHz – 12.5kHz Channel Spacing – mPass 5k Mode



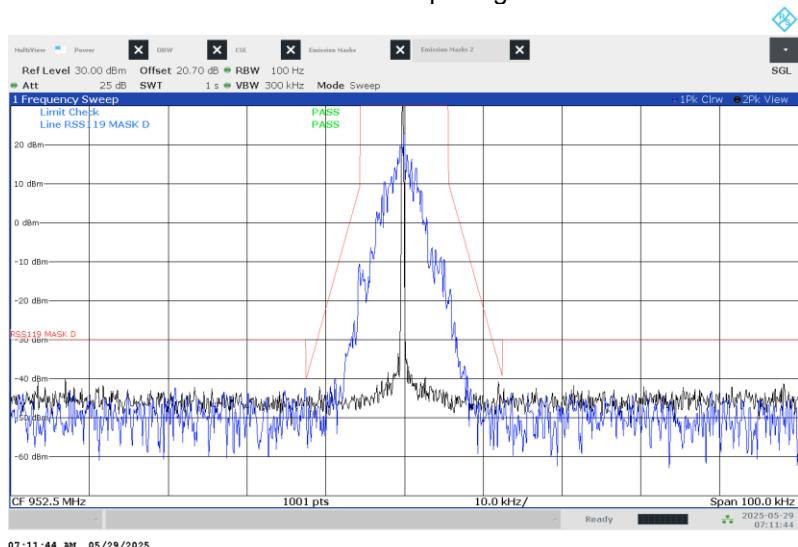
941.4875MHz – 12.5kHz Channel Spacing – m4Pass 10k Mode



952.5MHz – 12.5kHz Channel Spacing – mPass 5k Mode



952.5MHz – 12.5kHz Channel Spacing – m4Pass 10k Mode

Test Personnel: Jeremy Pickens Test Date: 28 and 29 May 2025Reference Standard: ANSI C63.26Ambient Temperature: 20.4 - 21.4°CRelative Humidity: 53.8 - 58.7%Atmospheric Pressure: 97.9 - 98.2 kPa

8 Occupied Bandwidth

8.1 Method

The methods defined in ANSI C63.26, Section 5.4.4 were applied for measuring the 99% Occupied (Power) Bandwidth (OBW). The antenna port was connected directly to a spectrum analyzer through a cable and 20dB attenuator (20.7dB of total loss). The attenuation was accounted for by applying an offset to the spectrum analyzer. The spectrum analyzer was configured with a 3dB Resolution Bandwidth (RBW) between 1% and 5% of the anticipated occupied bandwidth, the Video Bandwidth (VBW) was set to at least 3 x RBW, and the span was configured to at least 1.5 times the OBW. The 99% OBW function of the spectrum analyzer was used to take the measurements.

TEST SITE: RF Bench

The RF bench consists of a Rohde & Schwarz TS8997 automated test system coupled with a temperature/humidity environmental chamber. Where applicable, 2.4 and 5GHz radio measurements are automated using the Rohde & Schwarz EMC32 test software. The TS8997 system houses a switch matrix (OSP), along with a spectrum analyzer, vector network analyzer, and analog signal generator.

8.2 Test Equipment

Asset	Description	Manufacturer	Model	Serial	Cal Date	Cal Due
200001	Attenuator, 20 dB, <18GHz	Weinschel Corp	2	BK1848	07/26/2024	07/26/2025
212164	Barometric Pressure/Humidity Datalogger	Extech	SD700	109402	06/14/2024	06/14/2025
213502	Spectrum Analyzer (2Hz-43.5GHz)	Rohde & Schwarz	FSW43	102972	08/01/2024	08/01/2025

Software Utilized

Name	Manufacturer	Version
EMC32	Rohde & Schwarz	11.70.00

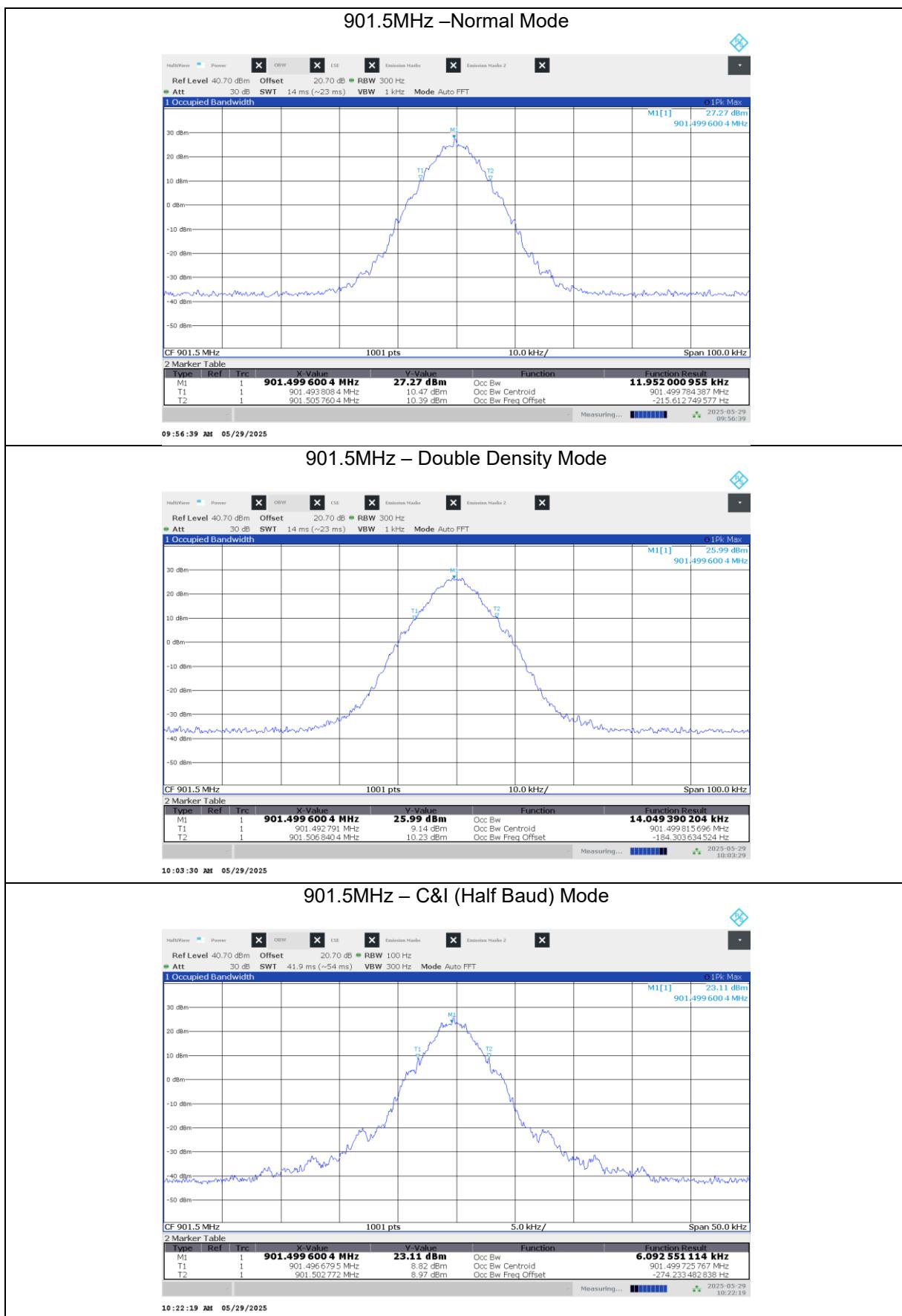
8.3 Results

The sample tested was found to Comply.

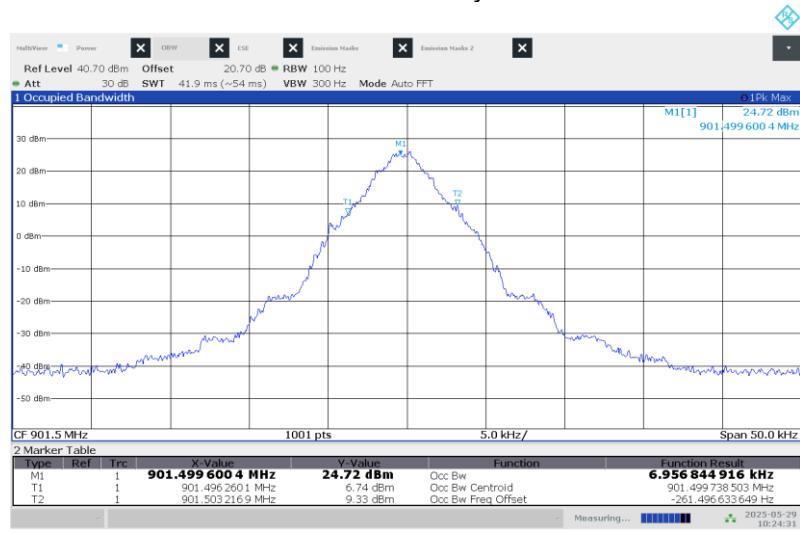
8.4 Test Data

Frequency (MHz)	Mode	99% Bandwidth (kHz)
901.5	Normal	11.952
901.5	Double Density	14.049
901.5	C&I (Half Baud)	6.093
901.5	Priority	6.957
901.5	2SFSK (Half Baud)	5.953
901.5	4SFSK (Half Baud)	6.997
901.5	8SFSK (Half Baud)	7.263
901.5	2SFSK	11.889
901.5	4SFSK	14.021
901.5	8SFSK	14.745
930.5	mPass 5k	5.790
930.5	mPass 10k	11.798
930.5	m4Pass 10k	6.054
930.5	m4Pass 20k	12.189
940.0125	mPass 5k	5.834

Frequency (MHz)	Mode	99% Bandwidth (kHz)
940.0125	mPass 10k	11.847
940.0125	m4Pass 10k	6.042
940.0125	m4Pass 20k	12.056
928.925	Normal	11.935
928.925	Double Density	13.973
928.925	C&I (Half Baud)	6.139
928.925	Priority	6.870
928.925	2SFSK (Half Baud)	5.932
928.925	4SFSK (Half Baud)	6.947
928.925	8SFSK (Half Baud)	7.301
928.925	2SFSK	11.923
928.925	4SFSK	14.056
928.925	8SFSK	14.753
932.25	Normal	11.973
932.25	Double Density	14.039
932.25	C&I (Half Baud)	6.200
932.25	Priority	6.908
932.25	2SFSK (Half Baud)	5.958
932.25	4SFSK (Half Baud)	6.988
932.25	8SFSK (Half Baud)	7.339
932.25	2SFSK	11.874
932.25	4SFSK	14.018
932.25	8SFSK	14.757
941.4875	mPass 5k	5.844
941.4875	mPass 10k	11.809
941.4875	m4Pass 10k	6.098
941.4875	m4Pass 20k	12.317
952.5	mPass 5k	5.791
952.5	mPass 10k	11.783
952.5	m4Pass 10k	5.996
952.5	m4Pass 20k	12.249
959.925	mPass 5k	5.749
959.925	mPass 10k	11.832
959.925	m4Pass 10k	6.014
959.925	m4Pass 20k	12.278



901.5MHz – Priority Mode



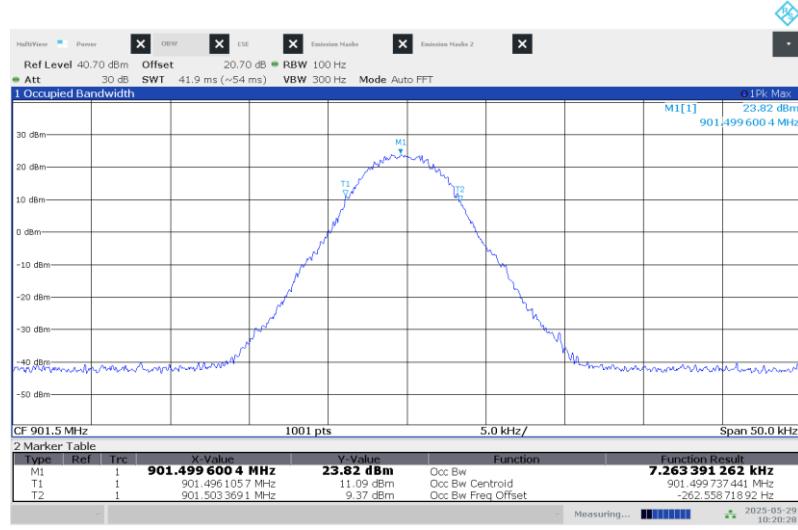
901.5MHz – 2SFSK (Half Baud) Mode



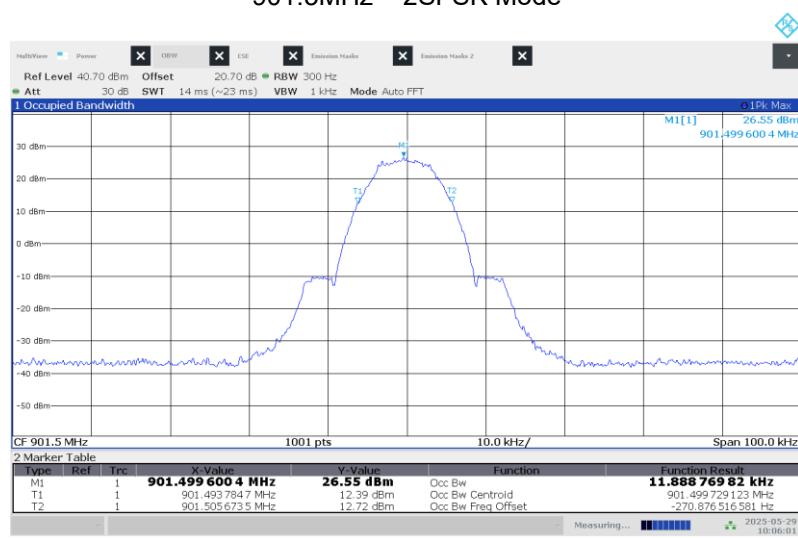
901.5MHz – 4SFSK (Half Baud) Mode



901.5MHz – 8SFSK (Half Baud) Mode



901.5MHz – 2SFSK Mode



901.5MHz – 4SFSK Mode

