

Radio Test Report

Manufacturer: SRT Marine Technology Limited
DSC/VHF Radio, Model: X-100



In accordance with IEC 62287-2

Prepared for: SRT Marine Technology Limited
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COMMERCIAL-IN-CONFIDENCE

Document 75955807-15 Issue 01

SIGNATURE

A handwritten signature in blue ink, appearing to read 'Matthew Russell'.

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Matthew Russell	Chief Engineer	Authorised Signatory	02 April 2025

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with IEC 62287-2: Edition 2 (2017) for the tests detailed in section 1.3.



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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	02-Apr-2025

Table 1

1.2 Introduction

Applicant	SRT Marine Technology Limited
Manufacturer	SRT Marine Technology Limited
Model Number(s)	X-100
Serial Number(s)	4310002011730002
Hardware Version(s)	1.0
Software Version(s)	220200.01.00.00/20400.01.00.00
Number of Samples Tested	1
Test Specification/Issue/Date	IEC 62287-2: Edition 2 (2017)
Test Plan/Issue/Date	Not Applicable
Order Number	POR102834
Date	09-June-2022
Date of Receipt of EUT	14-April-2023
Start of Test	22-April-2024
Finish of Test	10-June-2024
Name of Engineer(s)	Neil Rousell
Related Document(s)	Not Applicable



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with IEC 62287-2 is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: AIS Transceiver - Operational				
2.1	11.1.1	Frequency Error	Pass	
2.2	11.1.2	Carrier Power	Pass	
2.3	11.1.3	Transmission Spectrum	Pass	
2.4	11.1.4	Modulation Accuracy	Pass	
2.5	11.1.5	Transmitter Output Power Versus Time Function	Pass	
2.6	11.2.1	Sensitivity	Pass	
2.7	11.2.2	Error Behaviour at High Input Levels	Pass	
2.8	11.2.3	Co-channel Rejection	Pass	
2.9	11.2.4	Adjacent Channel Selectivity	Pass	
2.10	11.2.5	Spurious Response Rejection	Pass	
2.11	11.2.6	Intermodulation Response Rejection	Pass	
2.12	11.2.7	Blocking or Desensitisation	Pass	
2.13	11.3.1	Spurious Emissions from the Receiver	Pass	
2.14	11.3.2	Spurious Emissions from the Transmitter	Pass	

Table 2



1.4 Application Form

Technical Description: <i>(Please provide a brief description of the intended use of the equipment)</i>	VHF Radio with Class D DSC and AIS Class B SOTDMA <u>Form 3 of 3: AIS MODE</u>
Manufacturer:	Em-trak Marine Electronics Limited
Model:	Nexus Base
Part Number:	431-0002
Hardware Version:	1.0
Software Version:	220200.01.00.00 and 220400.01.00.00

Transmitter Technical Characteristics – Frequency Characteristics

Transmitter frequency alignment range:	156.025 to 162.025 MHz
Transmitter channel switching frequency range:	156.025 to 162.025 MHz

Transmitter RF Power Characteristics

Maximum effective rated power (rated as stated by the manufacturer):	5	W
Average effected radiated power (rated as stated by the manufacturer):	N/A	W
Is transmitter intended for:	Continuous duty: Yes ☐ No ☐ Intermittent duty: Yes ☒ No ☐	
If intermittent state DUTY CYCLE:	Transmitter ON: 0.027	seconds
	Transmitter OFF:3	seconds
Is transmitter output power variable?	Continuous duty: Yes ☒ No ☐	
Maximum power:	5	W
	Continuously variable	☐
	Stepped	☒
		dB per step
Maximum RF output power:	5	W
Minimum RF output power:	1	W

Transmitter Modulation Input Character Characteristics (FM)

Modulation input signal level for 60% of maximum deviation at:			
Microphone socket:	N/A	mV	Impedance (Ohms)
Accessory socket:	N/A	mV	Impedance (Ohms)
Other (4):	N/A	mV	Impedance (Ohms)
Lowest audio modulation frequency transmitted by the equipment			N/A Hz



Transmitter Modulation

Frequency ☐ Phase ☐ Other ☒	
If Other, Please Detail:	TDMA-GMSK
Channel spacing	25 kHz
State the maximum number of channels over which the equipment can operate: 241	

Receiver Technical Characteristics – Frequency Characteristics

Receiver frequency alignment range:	156.025 to 162.025 MHz
Receiver channel switching frequency:	156.025 to 162.025 MHz
Method of Frequency Generation	Crystal ☐ Synthesizer ☒ Other ☐ Please Detail:
Intermediate Frequencies:	1 st ☒ 2 nd ☒ 3 rd ☐ RX2, IF1 = 29.255 MHz, IF2 = 0.455 MHz, RX3, IF1 = 51.655 MHz, IF2 = 0.455 MHz
Is local oscillator injection frequency higher or lower than the receiver nominal frequency?	Higher ☒ Lower ☐

Receiver Audio (AF) Characteristics – Maximum Rated Audio (AF) Frequency Output Power

Into Loudspeaker:	N/A	W
Into Line:	N/A	W
Into Earpiece:	N/A	W
Balanced:	Yes ☐ No ☐	
Unbalanced:	Yes ☐ No ☐	
Does connection carry DC voltage?	Yes ☐ No ☐ if Yes, please state voltage	
Normal Audio load impedance:	At Loudspeaker:	Ohms
	At Line:	Ohms
	At Earpiece:	Ohms
At audio accessory connection or facility socket (if fitted):	Output:	W
	Impedance:	W
Max input level at audio accessory socket:	Output:	W
	Impedance:	W

AC Power Source

AC supply frequency:		Hz	
V	V	Max current:	A
Single phase ☐ Three phase ☐			



DC Power Source

Nominal voltage: 12 to 24	V
Extreme upper voltage: 31.2	V
Extreme lower voltage: 9.6	V
Max current:3	A

Battery Power Source

Voltage:	V
End-point voltage:	V (Point at which the battery will terminate)
Alkaline ☐ Leclanche ☐ Lithium ☐ Nickel Cadmium ☐ Lead Acid* ☐ *(Vehicle regulated)	
Other ☐ Please detail:	

Temperature (over which equipment is to be type tested)

Minimum Temperature: -25	°C
Maximum Temperature: +55	°C
Other, please specify:	

Automatic Equipment Switch Off

If the equipment is designed to automatically switch off at a predetermined voltage level which is higher or lower in value than the battery minimum and minimum calculated values this shall be clearly stated.		
Applies ☐	Cut off voltage	V
Does not apply ☐		

Channel Identification

Each equipment, whether one or more submitted for tests shall carry clear identification (such as a serial number), together with the frequencies associated with the channel identification displayed on the equipment.			
Channel Position	Channel Number	Transmit Nominal Frequency (MHz)	Receive Nominal Frequency (MHz)
N/A	AIS1, AIS2	161.975 , 162.025 MHz	161.975 , 162.025 MHz

I hereby declare that the information supplied is correct and complete.

Name: Shannon Parsons
Position held: Compliance Technician
Date: 02-July-2024



1.5 Product Information

1.5.1 Technical Description

VHF Radio with Class D DSC and AIS Class B SOTDMA.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.

The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Model: Class D, Serial Number: 4310002011730002			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3



1.8 Test Location

TÜV SÜD conducted the following tests at our Octagon House Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: AIS Transceiver - Operational		
Frequency Error	Neil Rousell	UKAS
Carrier Power	Neil Rousell	UKAS
Transmission Spectrum	Neil Rousell	UKAS
Modulation Accuracy	Neil Rousell	UKAS
Transmitter Output Power Versus Time Function	Neil Rousell	UKAS
Sensitivity	Neil Rousell	UKAS
Error Behaviour at High Input Levels	Neil Rousell	UKAS
Co-channel Rejection	Neil Rousell	UKAS
Adjacent Channel Selectivity	Neil Rousell	UKAS
Spurious Response Rejection	Neil Rousell	UKAS
Intermodulation Response Rejection	Neil Rousell	UKAS
Blocking or Desensitisation	Neil Rousell	UKAS
Spurious Emissions from the Receiver	Neil Rousell	UKAS
Spurious Emissions from the Transmitter	Neil Rousell	UKAS

Table 4

Office Address:

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire
PO15 5RL
United Kingdom



2 Test Details

2.1 Frequency Error

2.1.1 Specification Reference

IEC 62287-2, Clause 11.1.1

2.1.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.1.3 Date of Test

22-April-2024 to 03-June-2024

2.1.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.1.1.2.

2.1.5 Environmental Conditions

Ambient Temperature 21.6 - 21.8 °C
Relative Humidity 35.1 - 54.6 %

2.1.6 Test Results

AIS Transceiver - Operational

Temperature	Voltage	156.025 MHz		162.025 MHz	
		Error (Hz) - Tx1	Error (Hz) - Tx2	Error (Hz) - Tx1	Error (Hz) - Tx2
+ 21.6 °C	12.0 V DC	110.6	111.2	111.0	113.0
-25 °C	9.6 V DC	-612.6	-619.0	-619.3	-619.7
+55 °C	31.2 V DC	302.2	300.6	303.3	303.1

Table 5 - Frequency Error Results

IEC 62287-2, Limit Clause 11.1.1.3

The frequency error shall not exceed ±0.5 kHz under normal and ± 1 kHz under extreme test conditions.



2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Counter	Hewlett Packard	53181A	159	12	03-Aug-2024
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Aug-2024
Attenuator (10dB, 150W)	Narda	769-10	3368	12	21-Mar-2025
Meter & T/C	R.S Components	Meter 615-8206 & Type K T/C	3612	12	14-Sep-2024
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	17-Feb-2025
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	24-Oct-2024
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 6

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

2.2 Carrier Power

2.2.1 Specification Reference

IEC 62287-2, Clause 11.1.2

2.2.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.2.3 Date of Test

22-April-2024 to 03-June-2024

2.2.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.1.2.2.

2.2.5 Environmental Conditions

Ambient Temperature 21.6 - 21.8 °C
Relative Humidity 35.1 - 54.6 %

2.2.6 Test Results

AIS Transceiver - Operational

Temperature	Voltage	156.025 MHz		162.025 MHz	
		Power (dBm) - Tx1	Power (dBm) - Tx2	Power (dBm) - Tx1	Power (dBm) - Tx2
21.6 °C	12.0 V DC	37.342	37.341	37.231	37.250
-25 °C	9.6 V DC	37.091	37.110	37.031	37.110
+55 °C	31.2 V DC	37.536	37.569	37.478	37.494

Table 7 - Carrier Power Results - High Power

Temperature	Voltage	156.025 MHz		162.025 MHz	
		Power (dBm) - Tx1	Power (dBm) - Tx2	Power (dBm) - Tx1	Power (dBm) - Tx2
21.6 °C	12.0 V DC	30.191	30.189	30.208	30.206
-25 °C	9.6 V DC	30.070	30.051	30.150	30.133
+55 °C	31.2 V DC	30.335	30.350	30.379	30.355

Table 8 - Carrier Power Results – Low Power

IEC 62287-2, Limit Clause 11.1.2.3

At all test frequencies, the carrier power shall be for high power 37 dBm $\pm$ 1,5 dBm and 30 dBm $\pm$ 1,5 dBm for low power under normal test conditions.



2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Aug-2024
Attenuator (10dB, 150W)	Narda	769-10	3368	12	21-Mar-2025
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	20-Feb-2025
Meter & T/C	R.S Components	Meter 615-8206 & Type K T/C	3612	12	14-Sep-2024
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	26-Feb-2025
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	17-Feb-2025
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	24-Oct-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 9

O/P Mon – Output Monitored using calibrated equipment

2.3 Transmission Spectrum

2.3.1 Specification Reference

IEC 62287-2, Clause 11.1.3

2.3.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.3.3 Date of Test

23-April-2024

2.3.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.1.3.2.

2.3.5 Environmental Conditions

Ambient Temperature 21.9 °C
Relative Humidity 37.3 %

2.3.6 Test Results

AIS Transceiver - Operational

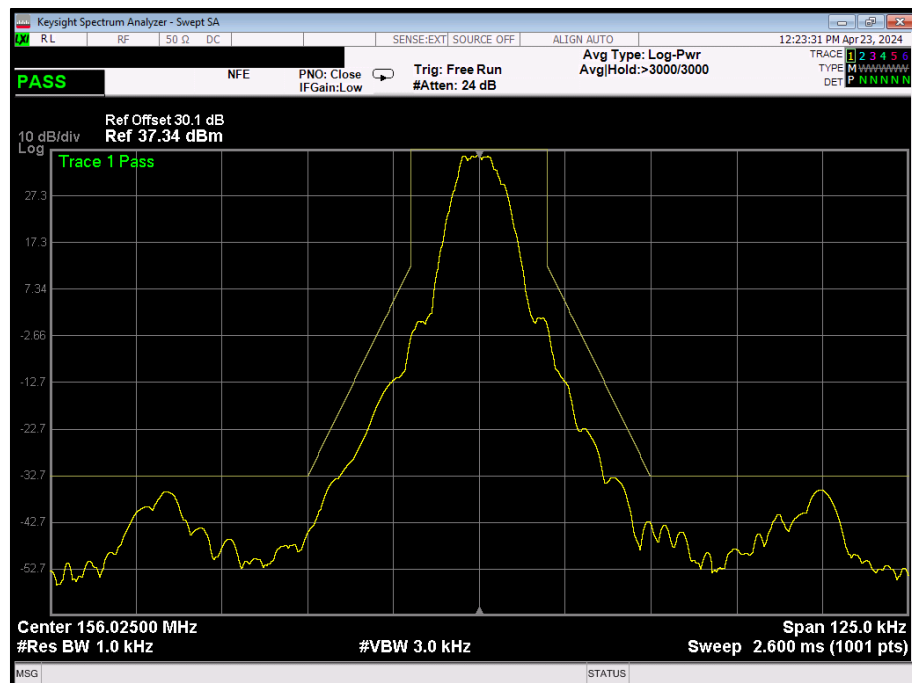


Figure 1 - 156.025 MHz - Tx1

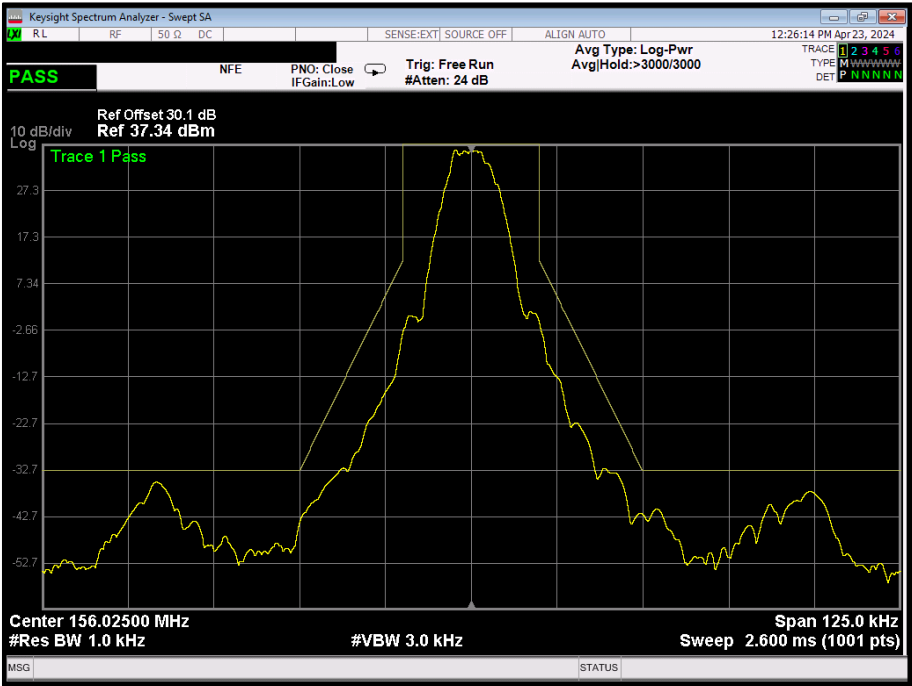


Figure 2 - 156.025 MHz – Tx2

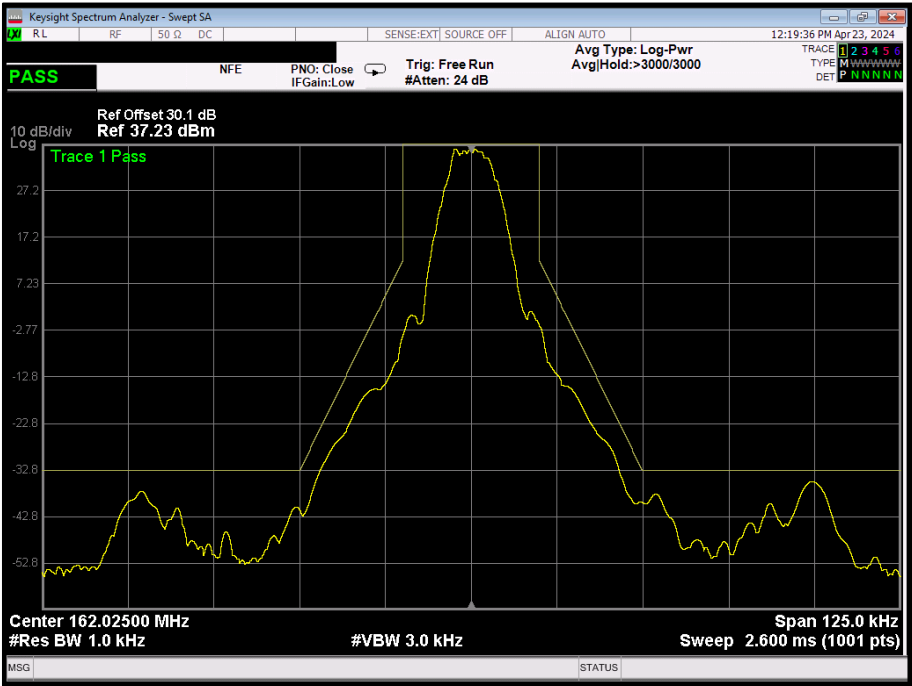


Figure 3 - 162.025 MHz - Tx1

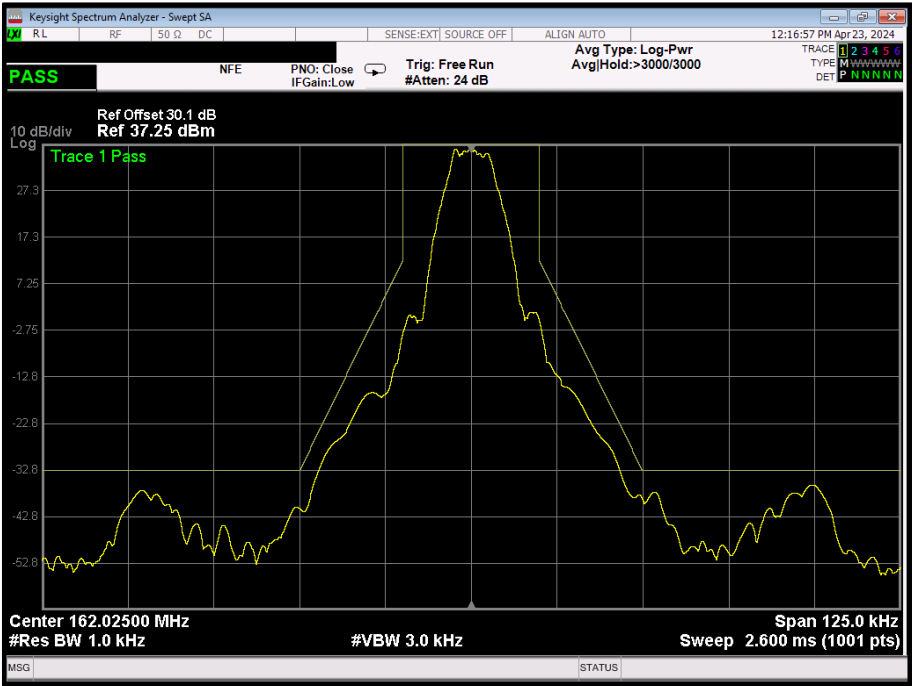


Figure 4 - 162.025 MHz – Tx2

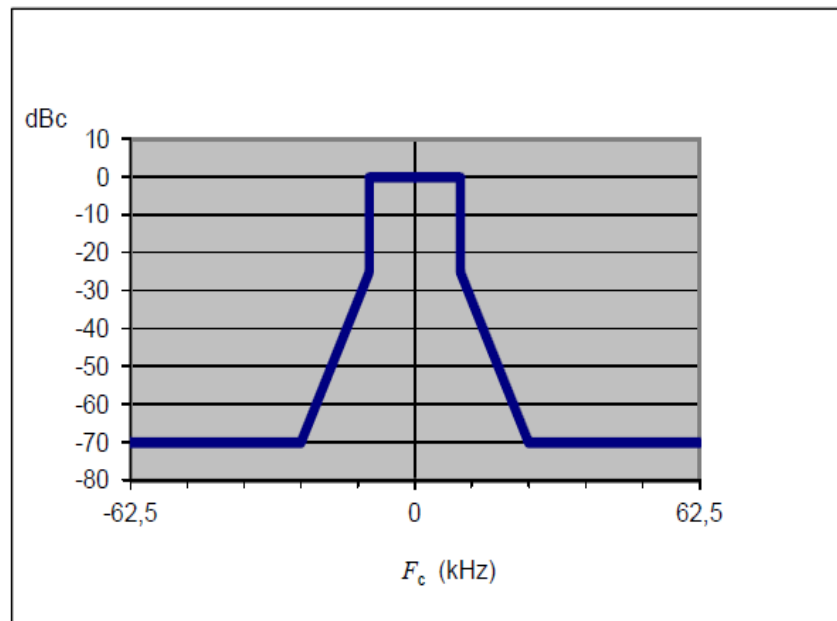
IEC 62287-2, Limit Clause 11.1.3.3

The spectrum for slotted transmission shall be within the emission mask as follows:

- in the region between the carrier and ± 10 kHz removed from the carrier, the modulation and transient sidebands shall be below 0 dBc;
- at ± 10 kHz removed from the carrier, the modulation and transient sidebands shall be below -25 dBc;
- at ± 25 kHz to $\pm 62,5$ kHz removed from the carrier, the modulation and transient sidebands shall be below the lower value of -70 dBc;
- in the region between ± 10 kHz and ± 25 kHz removed from the carrier, the modulation and transient sidebands shall be below a line specified between these two points.

The reference level for the measurement shall be the carrier power (conducted) recorded for the appropriate test frequency in clause 11.1.2 of the test specification.

For information the emission mask specified above is shown below.



IEC 552/13

Figure 5 - Transmission Spectrum Mask Limit



2.3.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Aug-2024
Attenuator (10dB, 150W)	Narda	769-10	3368	12	21-Mar-2025
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	20-Feb-2025
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	26-Feb-2025
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	17-Feb-2025
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	24-Oct-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 10

O/P Mon – Output Monitored using calibrated equipment

2.4 Modulation Accuracy

2.4.1 Specification Reference

IEC 62287-2, Clause 11.1.4

2.4.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.4.3 Date of Test

23-April-2024 to 03-June-2024

2.4.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.1.4.2.

2.4.5 Environmental Conditions

Ambient Temperature 21.6 - 22.2 °C
Relative Humidity 31.7 - 54.6 %

2.4.6 Test Results

AIS Transceiver - Operational

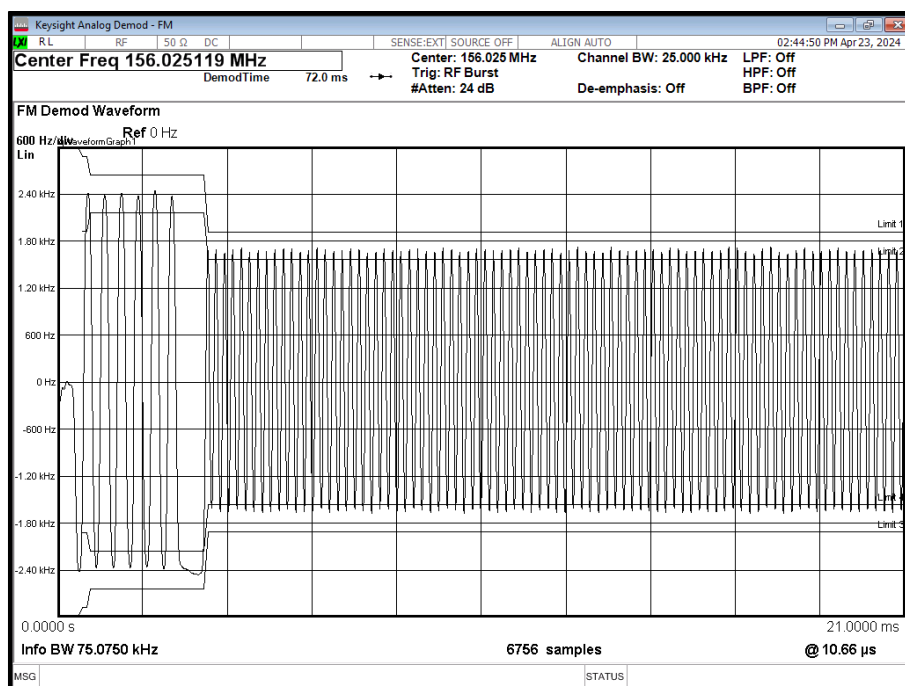


Figure 6 - 156.025 MHz, Test Signal #1, Tx1, +21.6 °C, 12.0 V DC

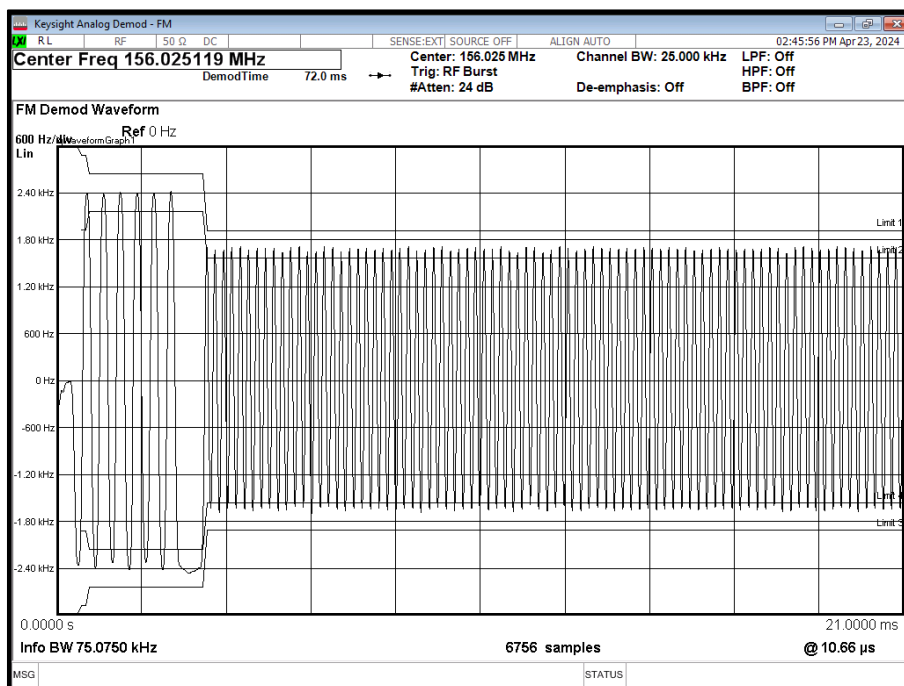


Figure 7 - 156.025 MHz, Test Signal #1, Tx2, +21.6 °C, 12.0 V DC

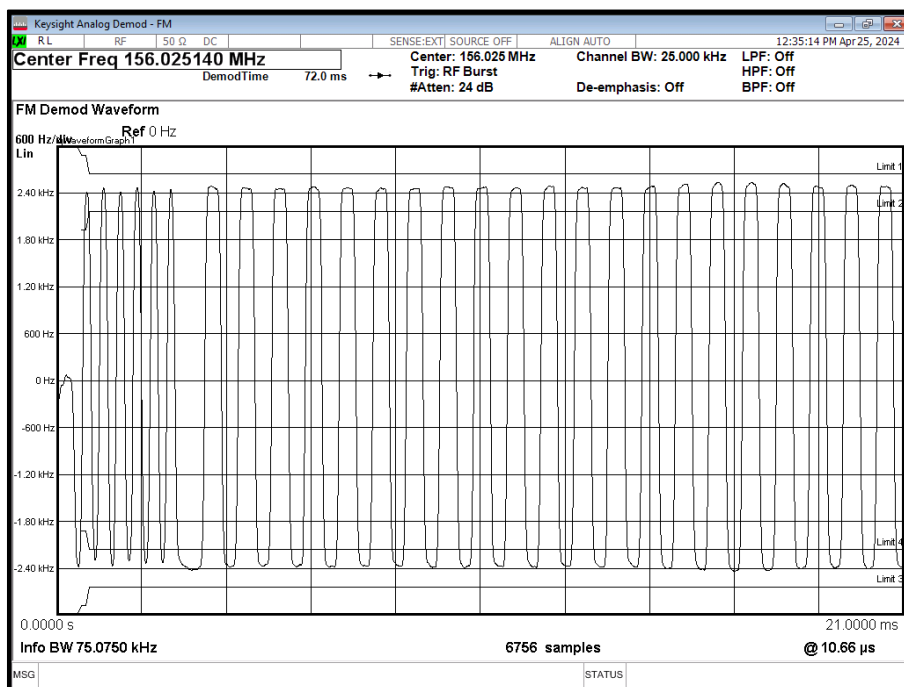


Figure 8 - 156.025 MHz, Test Signal #2, Tx1, +21.6 °C, 12.0 V DC

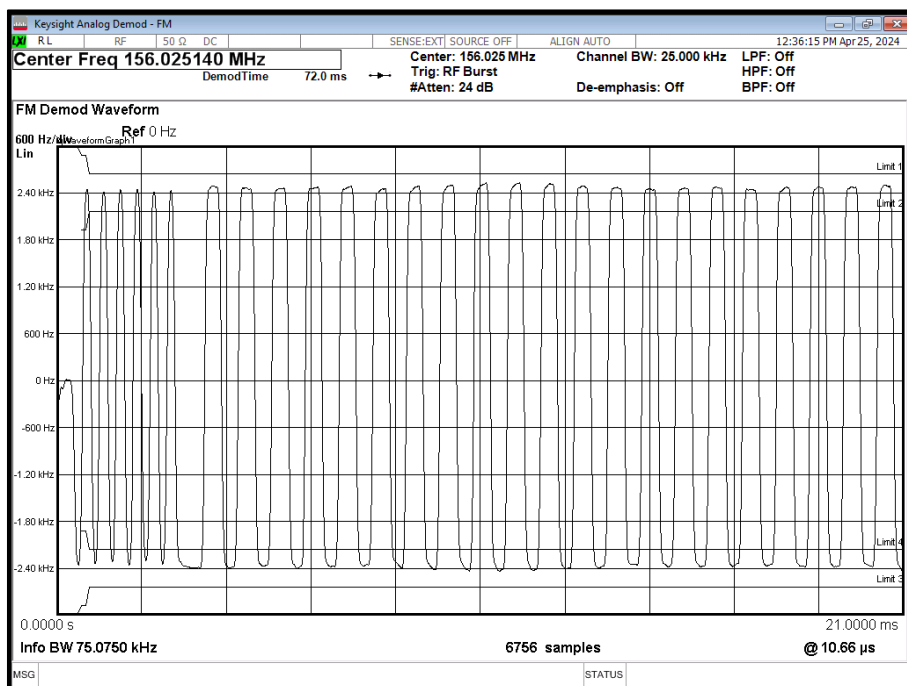


Figure 9 - 156.025 MHz, Test Signal #2, Tx2, +21.6 °C, 12.0 V DC

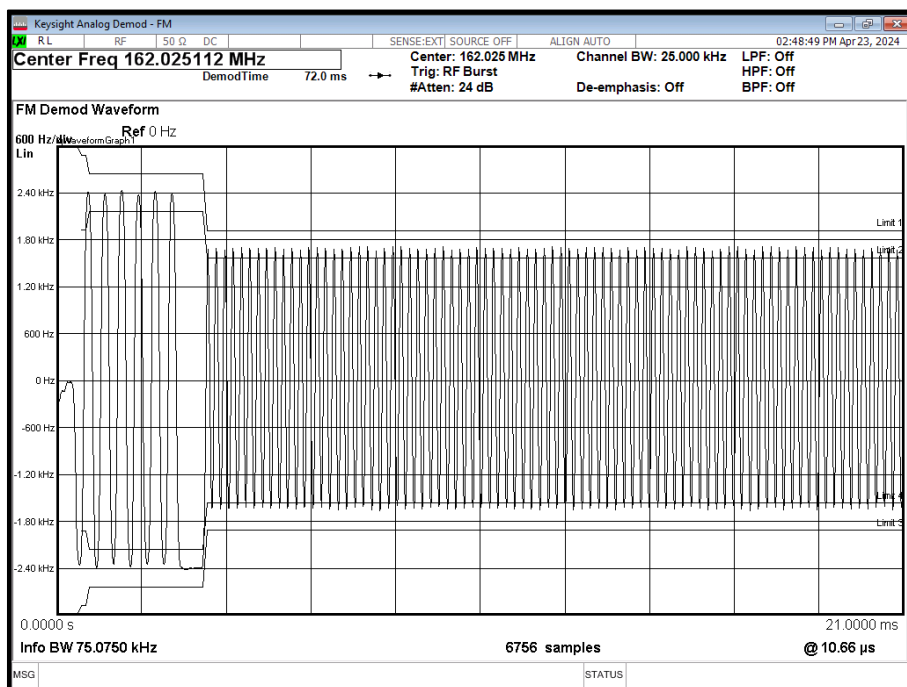


Figure 10 - 162.025 MHz, Test Signal #1, Tx1, +21.6 °C, 12.0 V DC

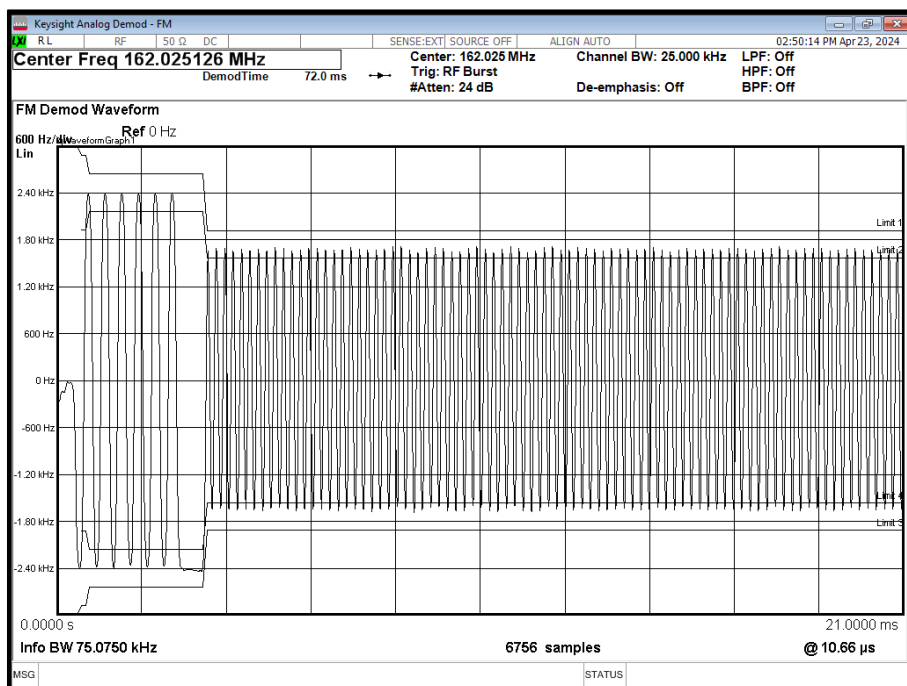


Figure 11 - 162.025 MHz, Test Signal #1, Tx2, +21.6 °C, 12.0 V DC

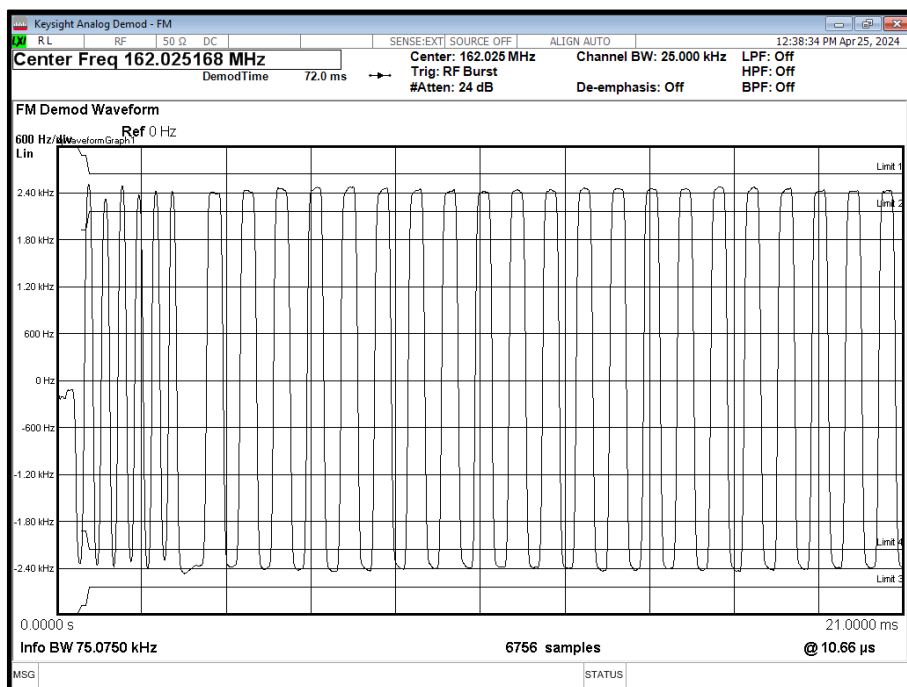


Figure 12 - 162.025 MHz, Test Signal #2, Tx1, +21.6 °C, 12.0 V DC

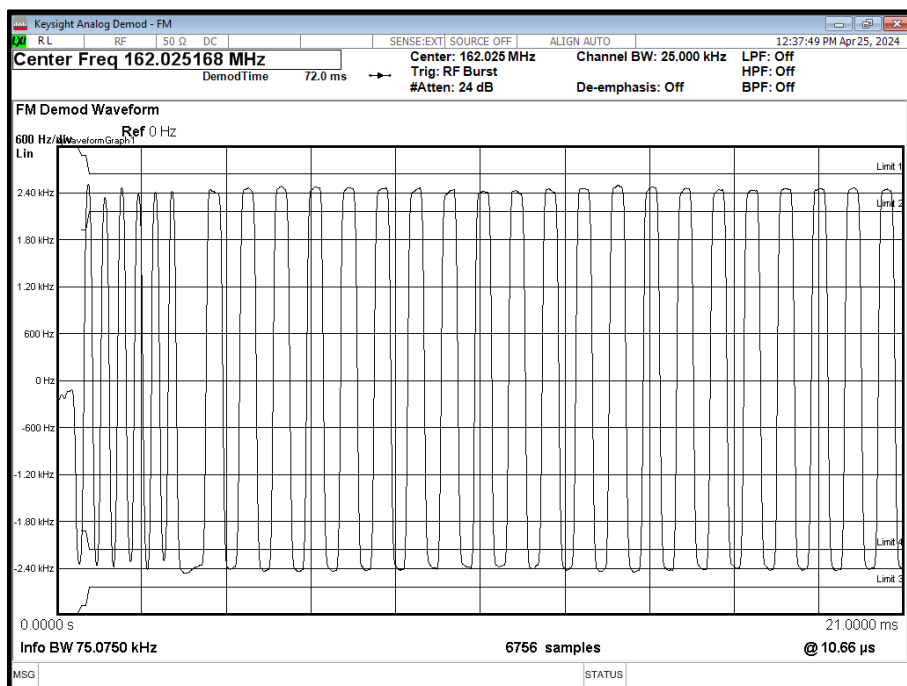


Figure 13 - 162.025 MHz, Test Signal #2, Tx2, +21.6 °C, 12.0 V DC

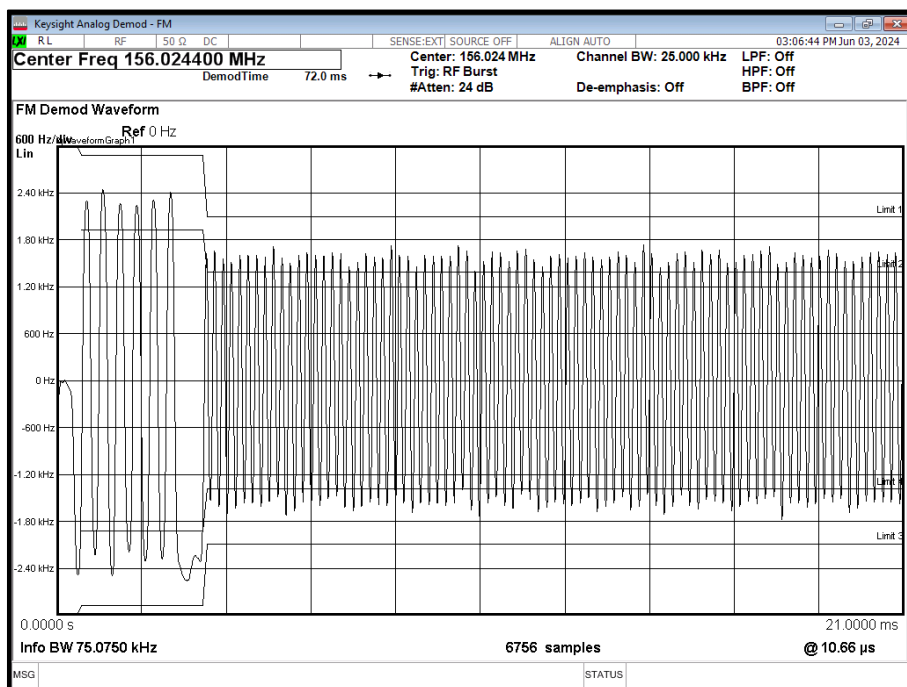


Figure 14 - 156.025 MHz, Test Signal #1, Tx1, -25 °C, 9.6 V DC

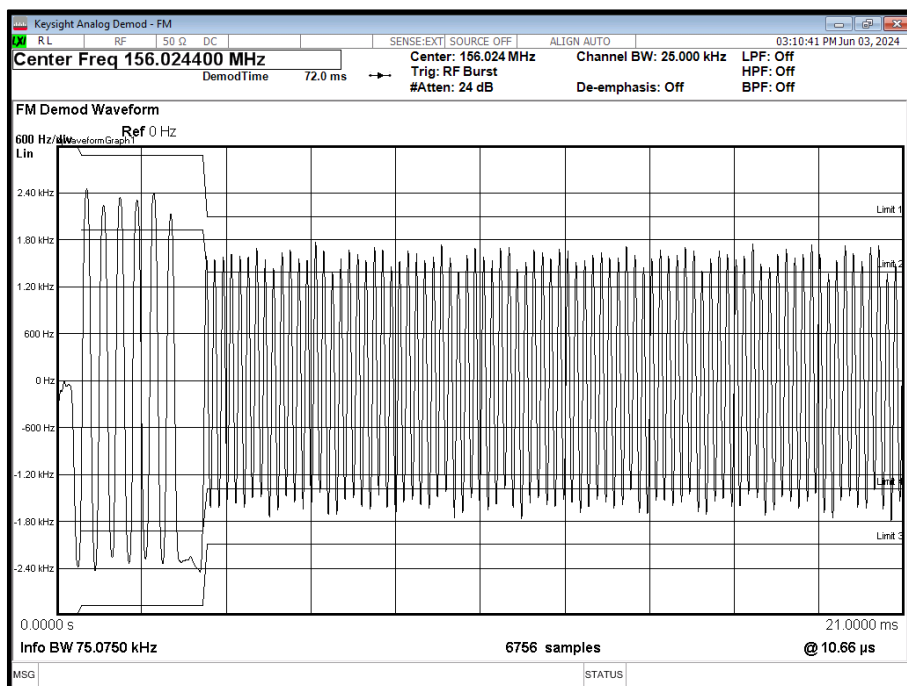


Figure 15 - 156.025 MHz, Test Signal #1, Tx2, -25 °C, 9.6 V DC

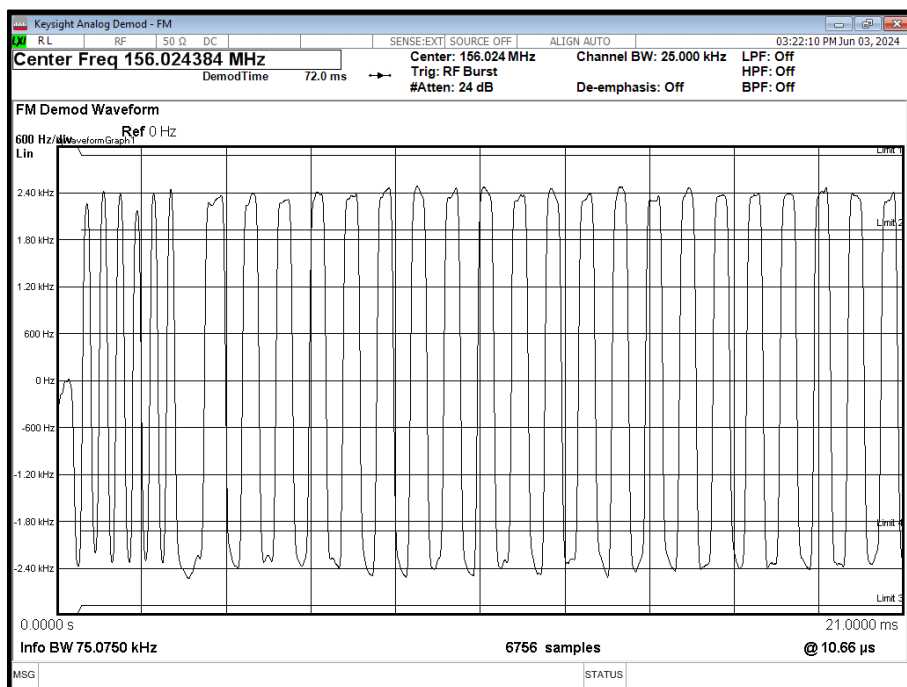


Figure 16 - 156.025 MHz, Test Signal #2, Tx1, -25 °C, 9.6 V DC

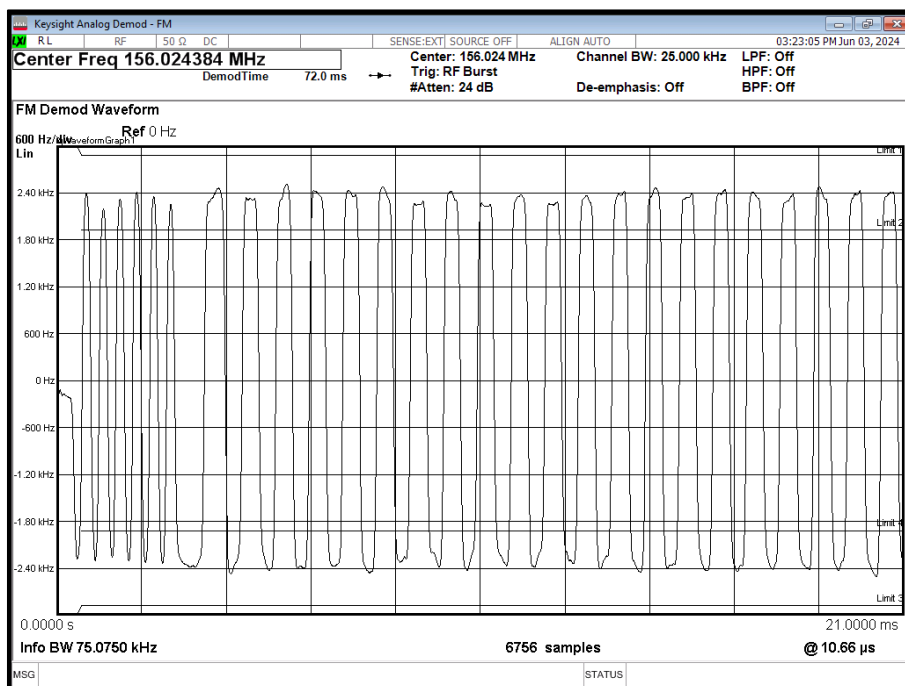


Figure 17 - 156.025 MHz, Test Signal #2, Tx2, -25 °C, 9.6 V DC

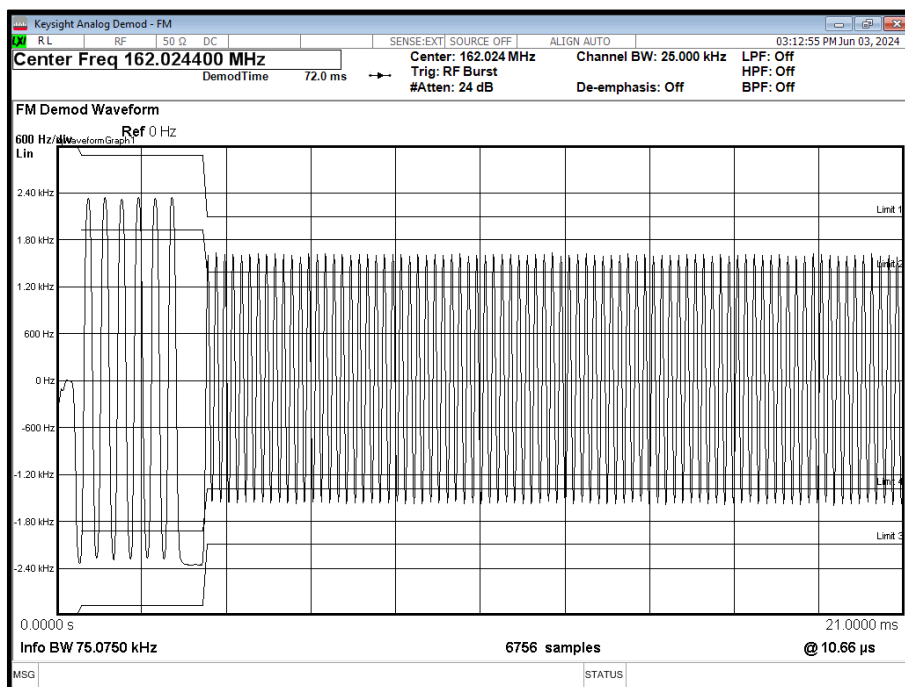


Figure 18 - 162.025 MHz, Test Signal #1, Tx1, -25 °C, 9.6 V DC

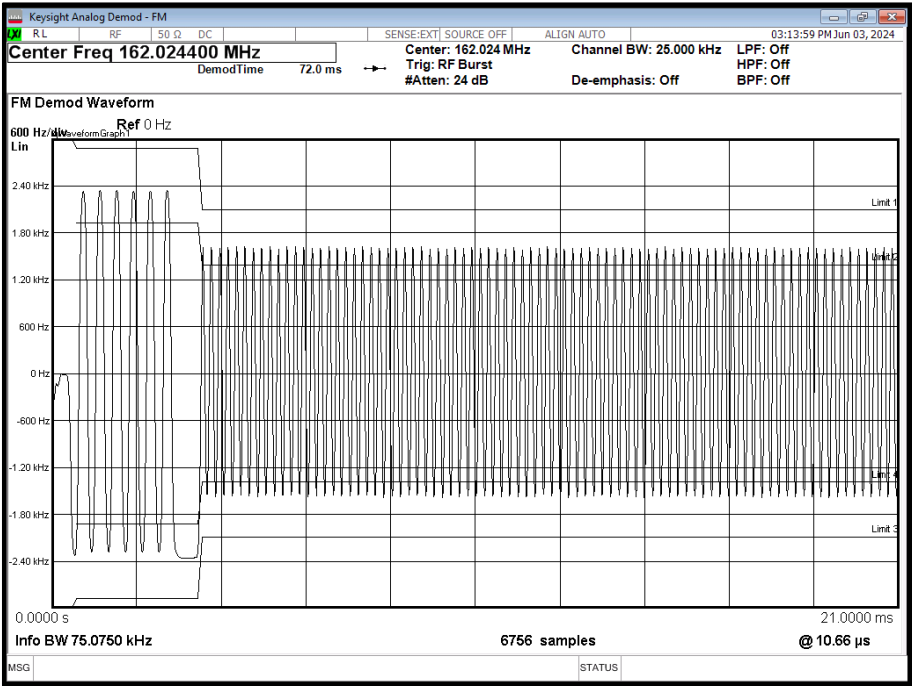


Figure 19 - 162.025 MHz, Test Signal #1, Tx2, -25 °C, 9.6 V DC

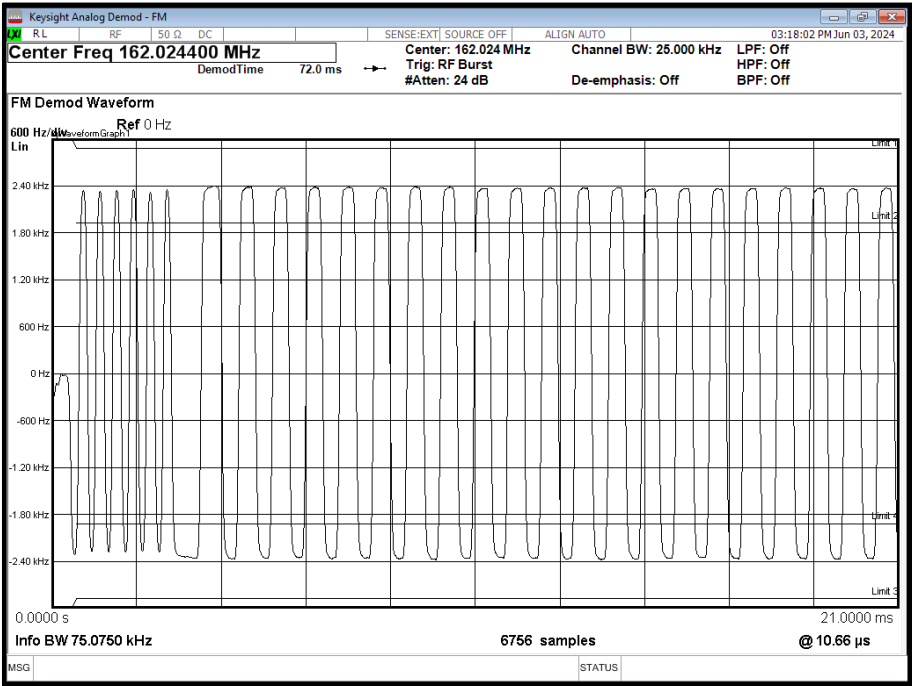


Figure 20 - 162.025 MHz, Test Signal #2, Tx1, -25 °C, 9.6 V DC

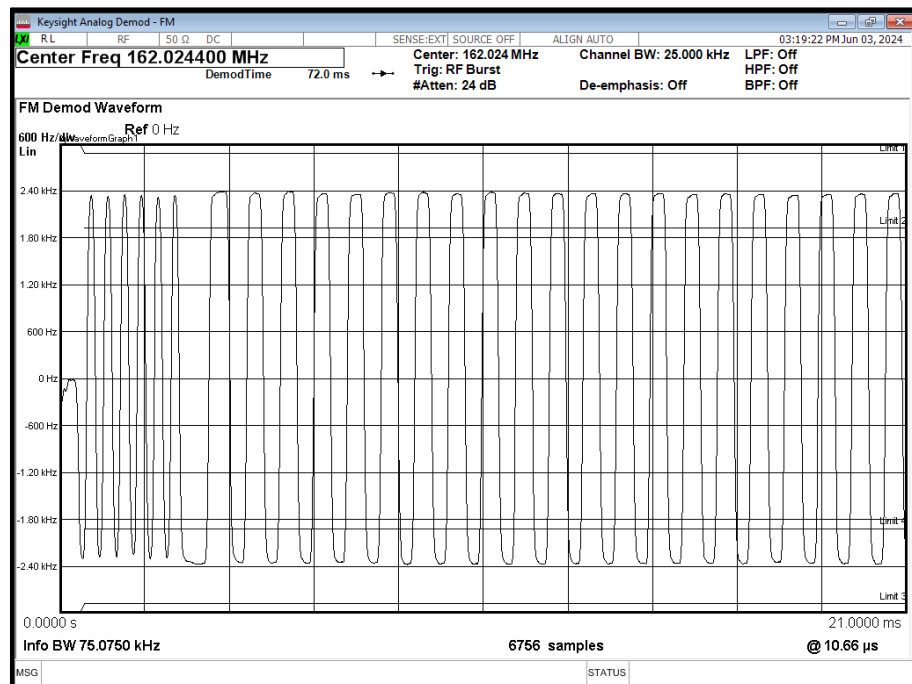


Figure 21 - 162.025 MHz, Test Signal #2, Tx2, -25 °C, 9.6 VDC

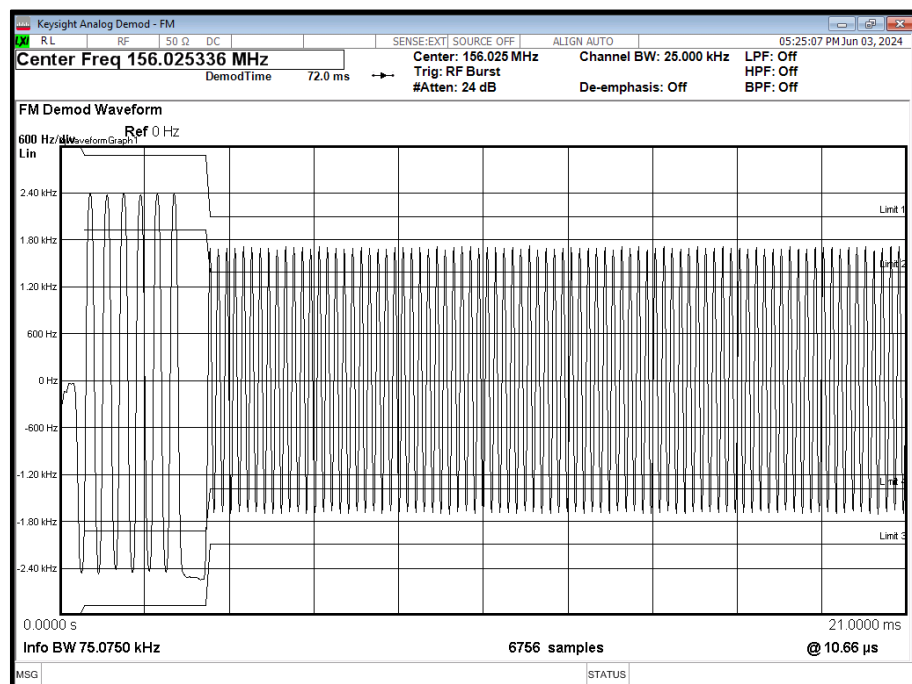


Figure 22 - 156.025 MHz, Test Signal #1, Tx1, +55 °C, 31.2 V DC

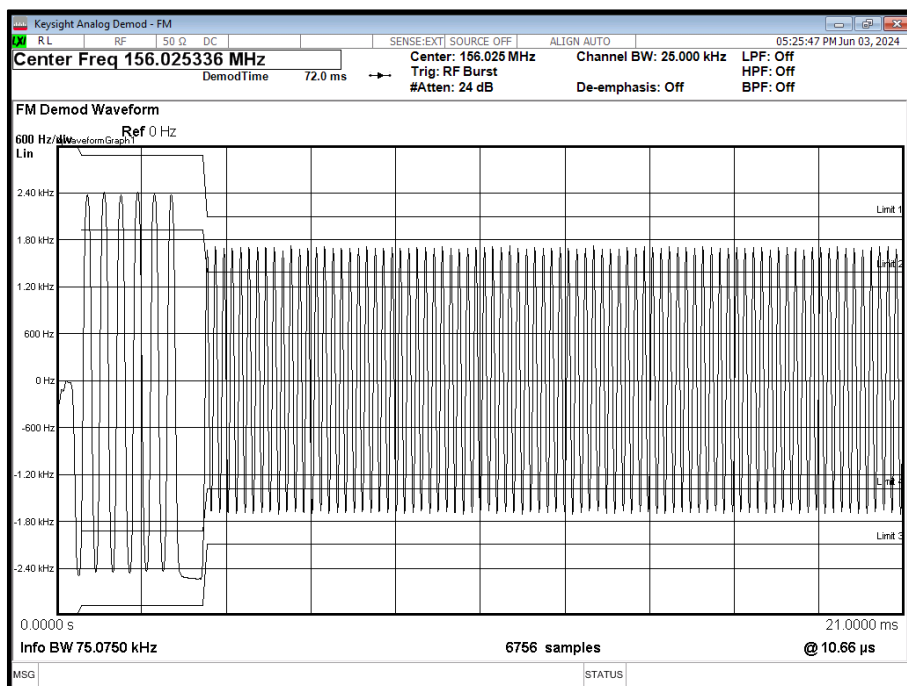


Figure 23 - 156.025 MHz, Test Signal #1, Tx2, +55 $^{\circ}$ C, 31.2 V DC

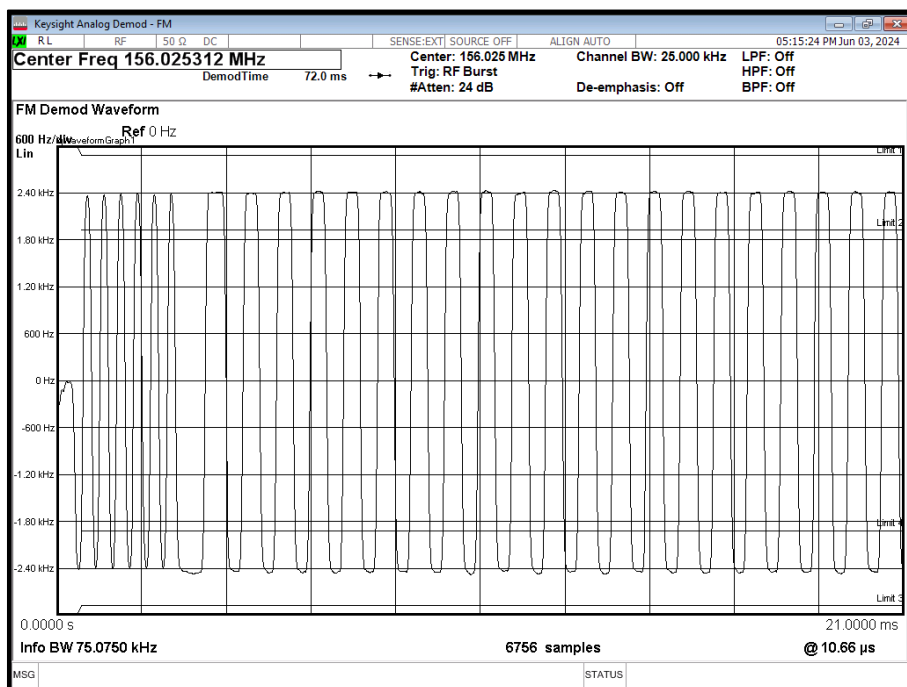


Figure 24 - 156.025 MHz, Test Signal #2, Tx1, +55 $^{\circ}$ C, 31.2 V DC

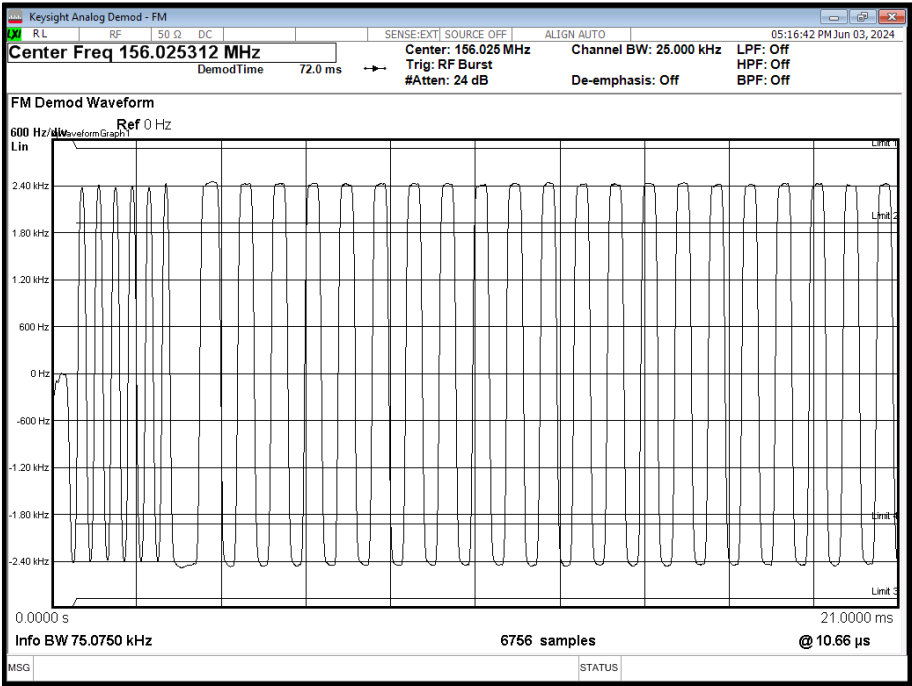


Figure 25 - 156.025 MHz, Test Signal #2, Tx2, +55 °C, 31.2 V DC

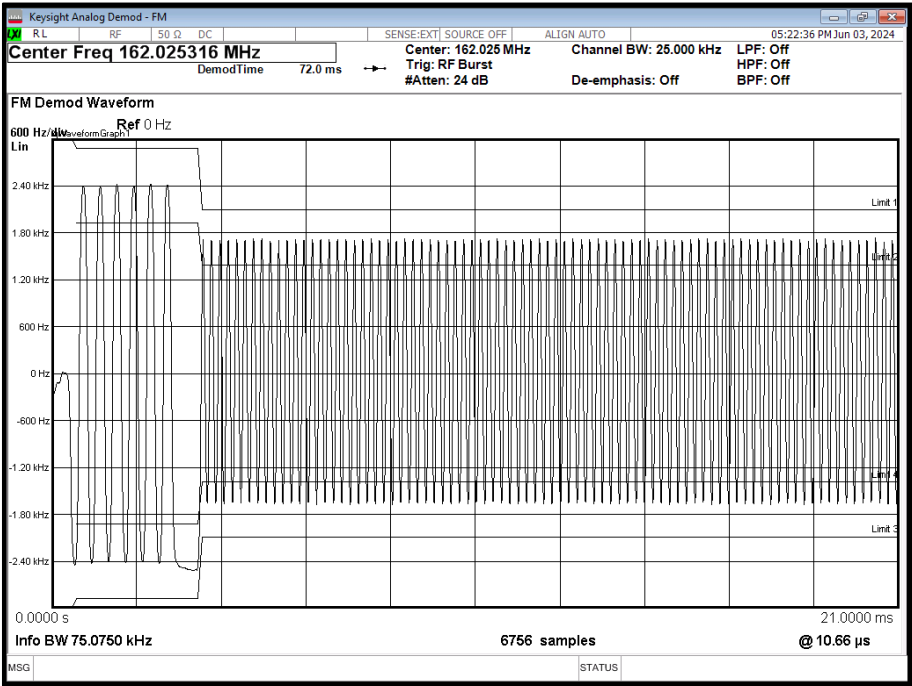


Figure 26 - 162.025 MHz, Test Signal #1, Tx1, +55 °C, 31.2 V DC

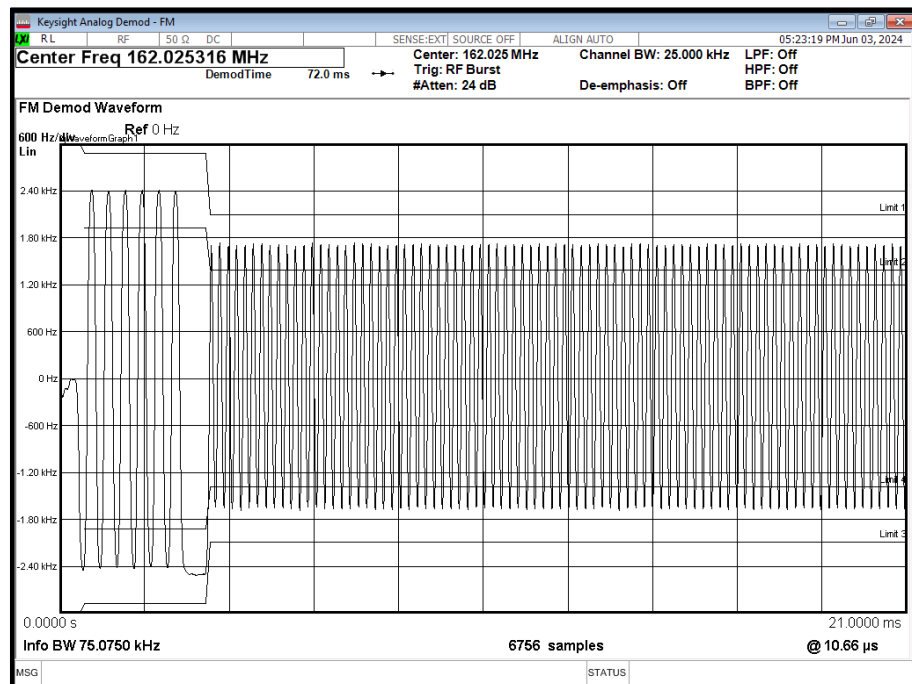


Figure 27 - 162.025 MHz, Test Signal #1, Tx2, +55 °C, 31.2 V DC

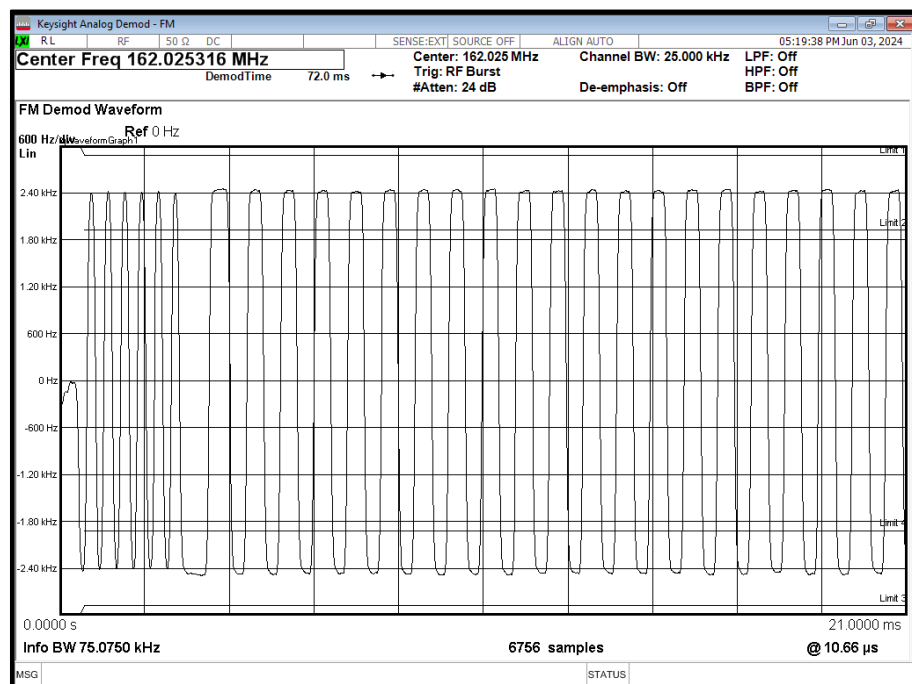


Figure 28 - 162.025 MHz, Test Signal #2, Tx1, +55 °C, 31.2 V DC

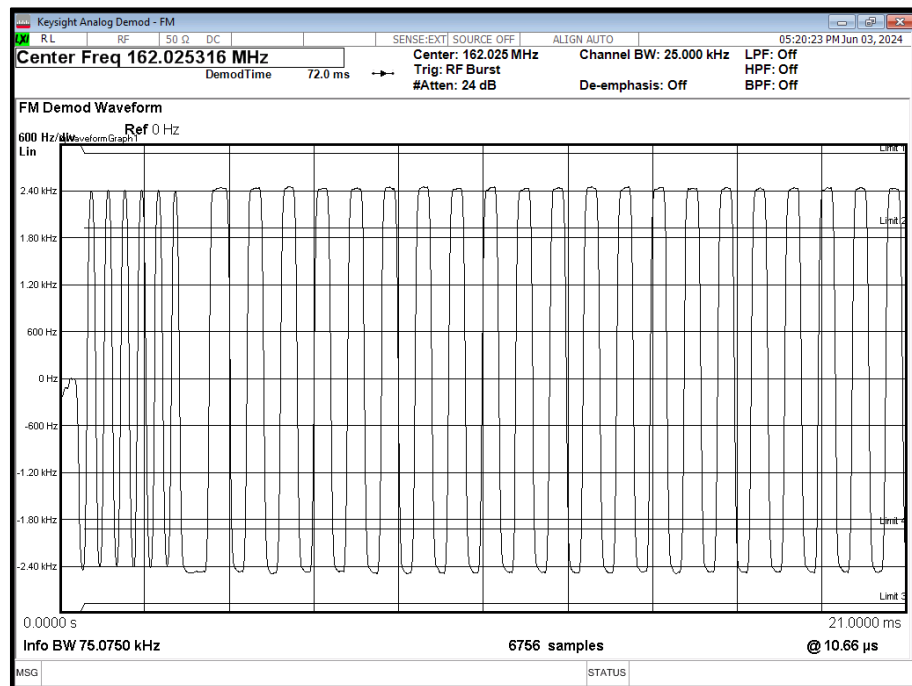


Figure 29 - 162.025 MHz, Test Signal #2, Tx2, +55 °C, 31.2 V DC

IEC 62287-2, Limit Clause 11.1.4.3

Measurement Period from Centre to Centre of each Bit	Test Signal 1		Test Signal 2	
	Normal	Extreme	Normal	Extreme
Ramp Up	< 3400 Hz			
Bit 0 to Bit 1	< 3400 Hz			
Bit 2 to Bit 3	2400 ± 480 Hz			
Bit 4 to Bit 31	2400 ± 240 Hz	2400 ± 480 Hz	2400 ± 240 Hz	2400 ± 480 Hz
Bit 32 to Bit 199	1740 ± 175 Hz	1740 ± 350 Hz	2400 ± 240 Hz	2400 ± 480 Hz

Table 11 - Peak Frequency Deviation versus Time Limit



2.4.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Aug-2024
Attenuator (10dB, 150W)	Narda	769-10	3368	12	21-Mar-2025
Meter & T/C	R.S Components	Meter 615-8206 & Type K T/C	3612	12	14-Sep-2024
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	17-Feb-2025
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	24-Oct-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 12

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

2.5 Transmitter Output Power Versus Time Function

2.5.1 Specification Reference

IEC 62287-2, Clause 11.1.5

2.5.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.5.3 Date of Test

23-April-2024

2.5.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.1.5.2.

Note. To fully display zoom ramp down the analyser settings were changed. This resulted in display of the trace update symbol "*" shown on the ramp down zoom captured image.

2.5.5 Environmental Conditions

Ambient Temperature 21.9 °C

Relative Humidity 37.3 %

2.5.6 Test Results

AIS Transceiver - Operational

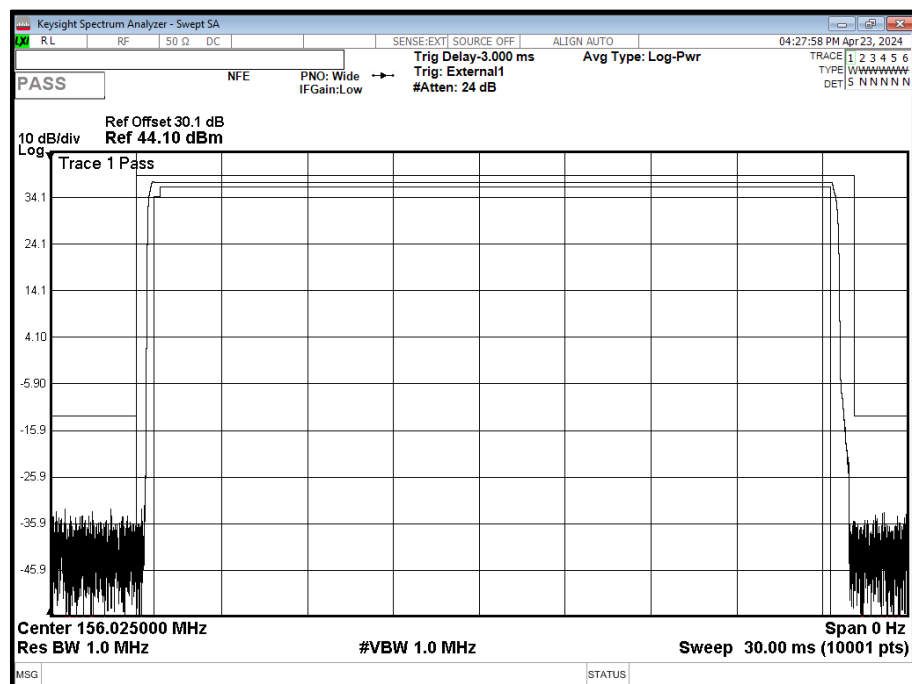


Figure 30 - 156.025 MHz - Tx1 - Complete Burst



Figure 31 - 156.025 MHz – Tx2 - Complete Burst

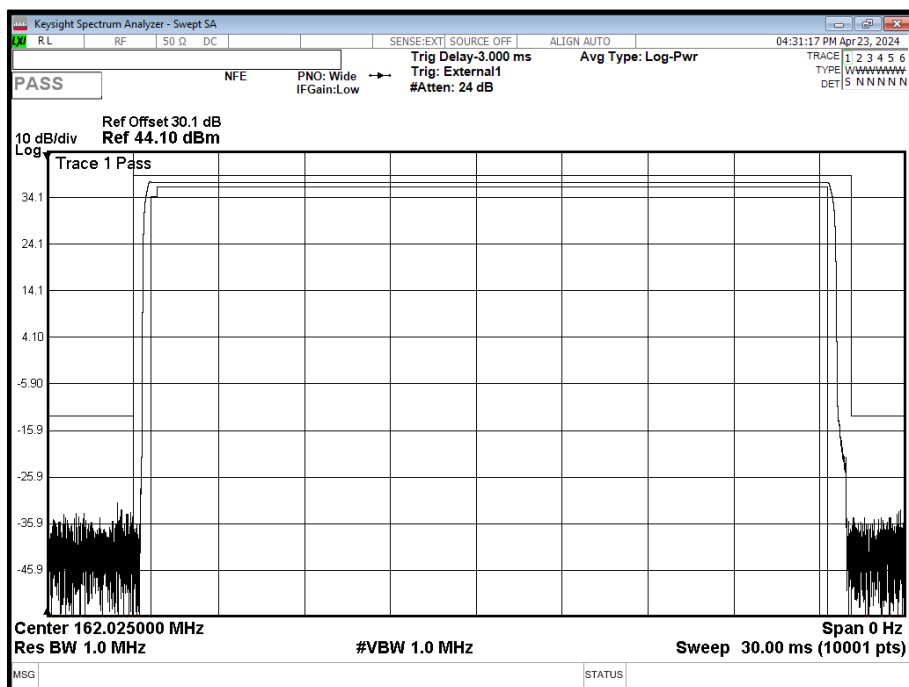


Figure 32 - 162.025 MHz - Tx1 - Complete Burst

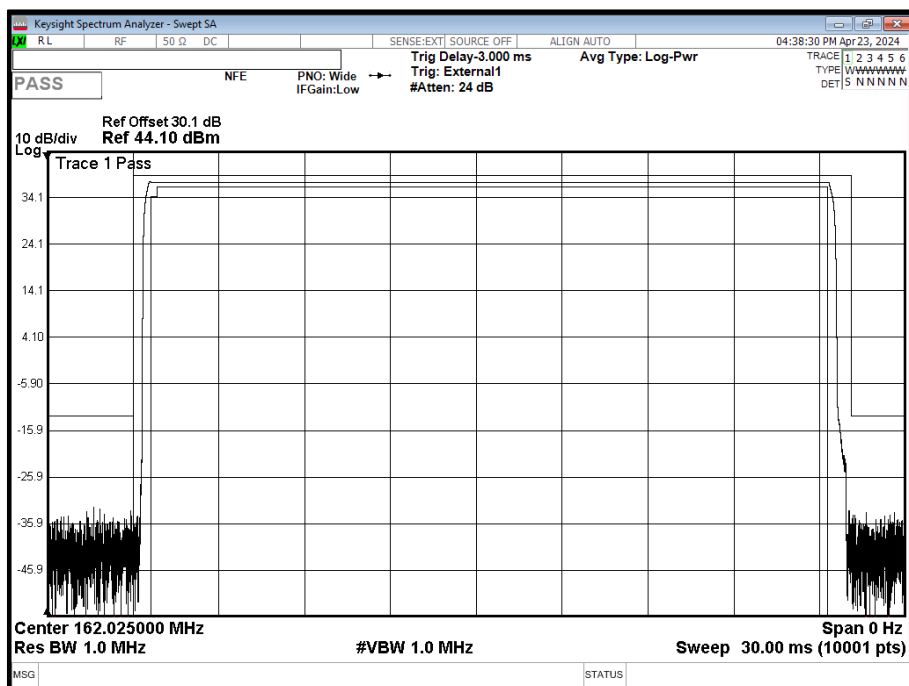


Figure 33 - 162.025 MHz – Tx2 - Complete Burst

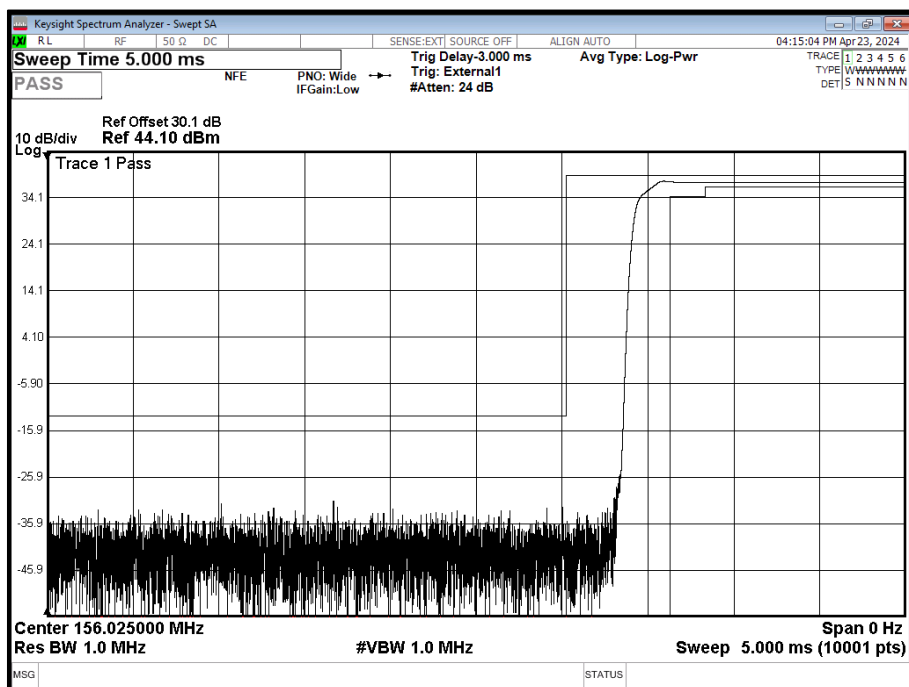


Figure 34 - 156.025 MHz - Tx1 - Ramp Up Zoomed

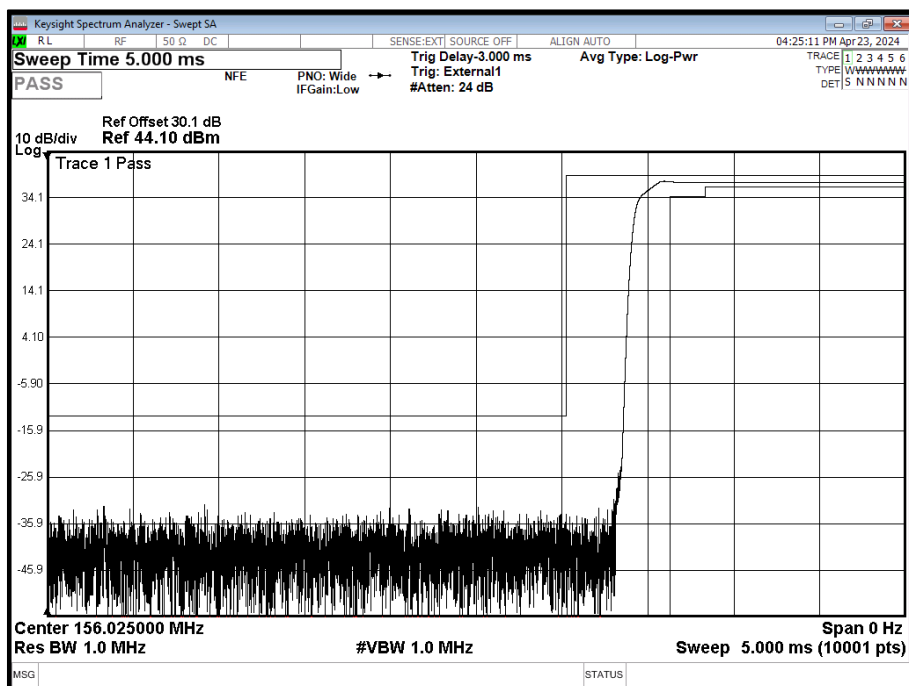


Figure 35 - 156.025 MHz – Tx2 - Ramp Up Zoomed

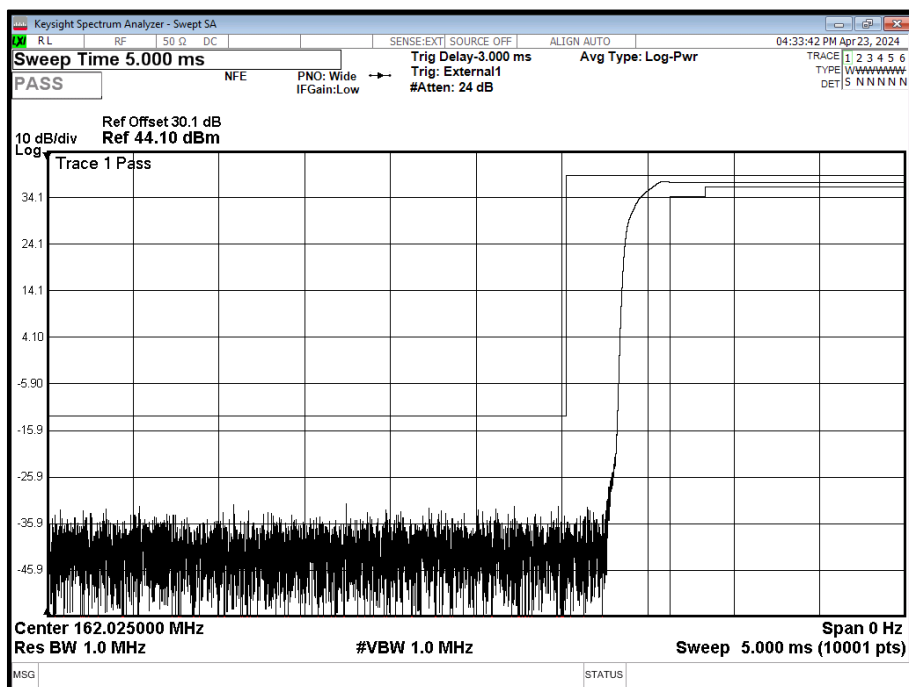


Figure 36 - 162.025 MHz - Tx1 - Ramp Up Zoomed

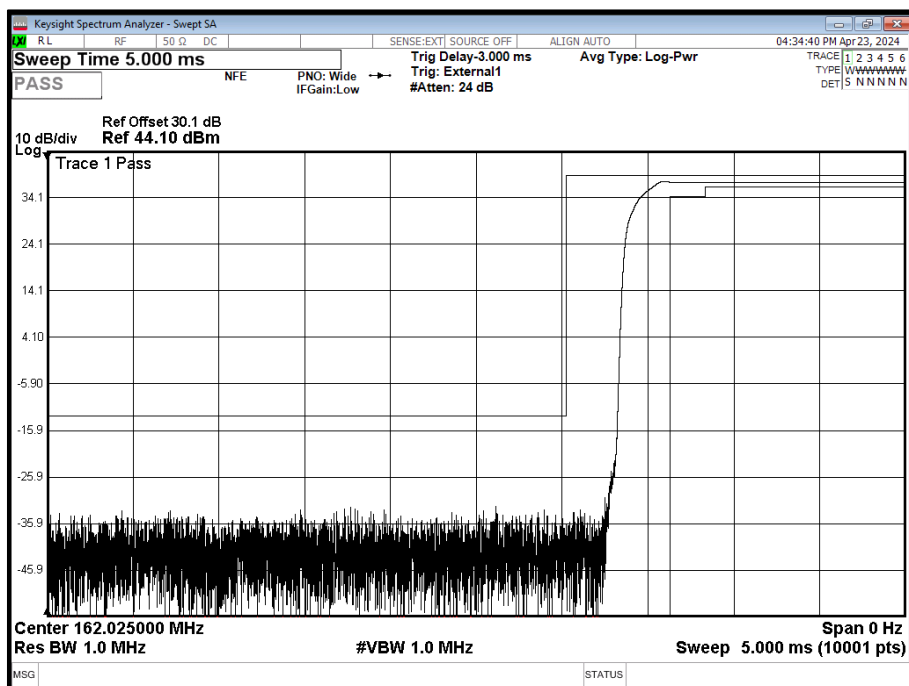


Figure 37 - 162.025 MHz – Tx2 - Ramp Up Zoomed

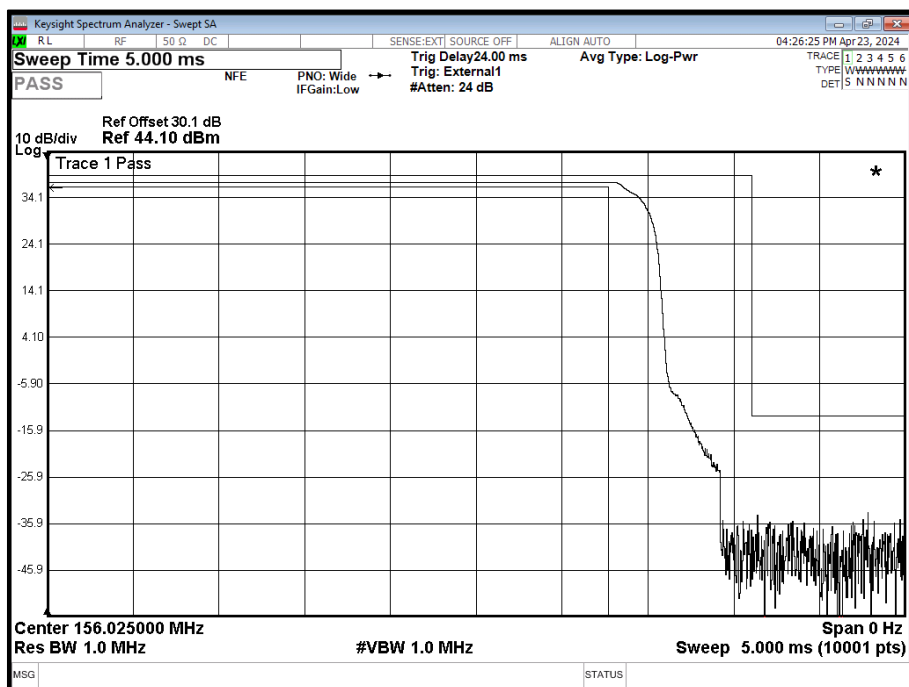


Figure 38 - 156.025 MHz - Tx1 - Ramp Down Zoomed

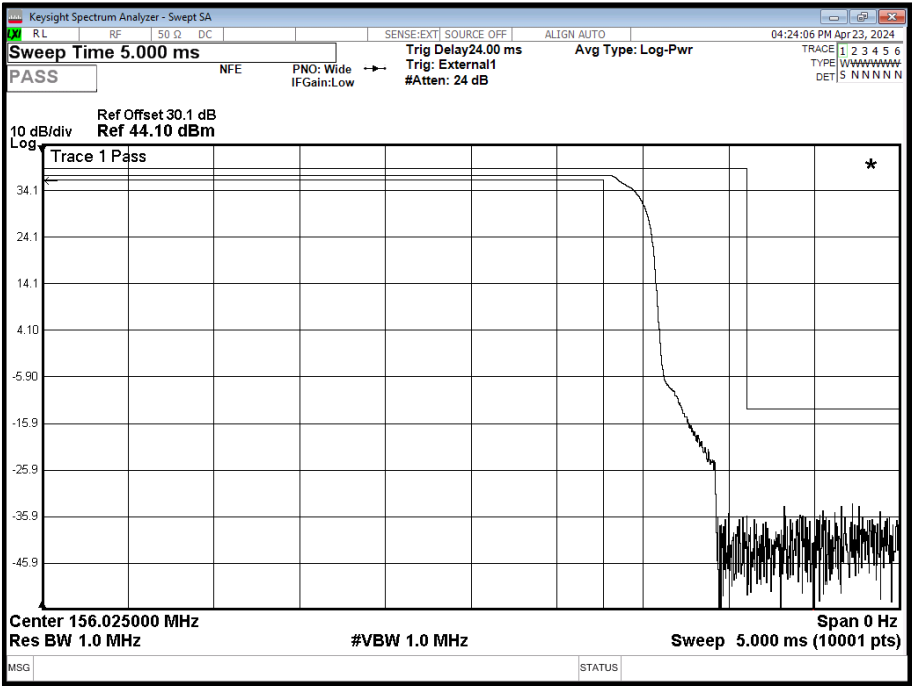


Figure 39 - 156.025 MHz – Tx2 - Ramp Down Zoomed

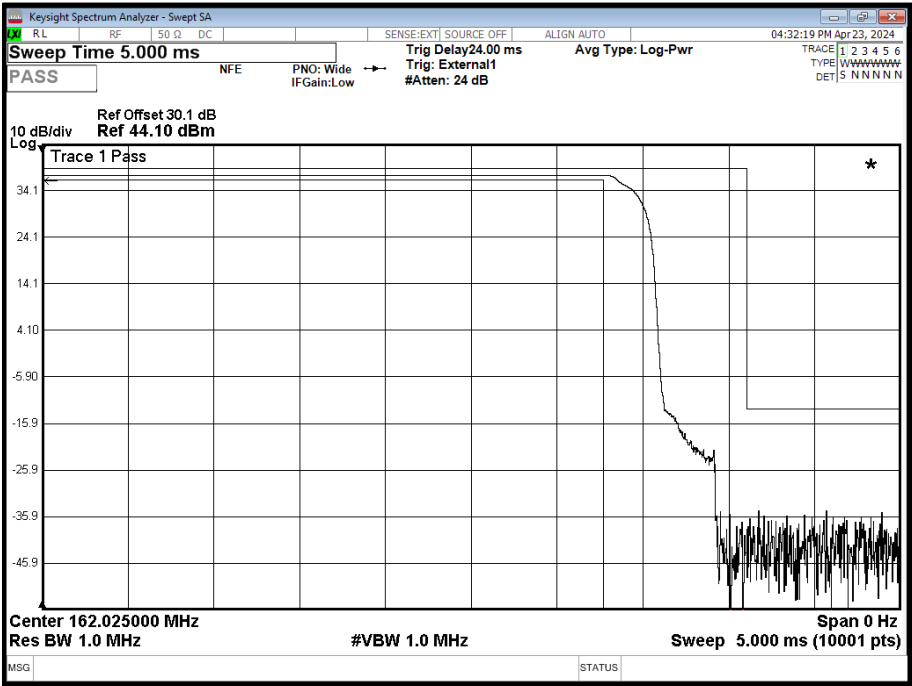


Figure 40 - 162.025 MHz - Tx1 - Ramp Down Zoomed

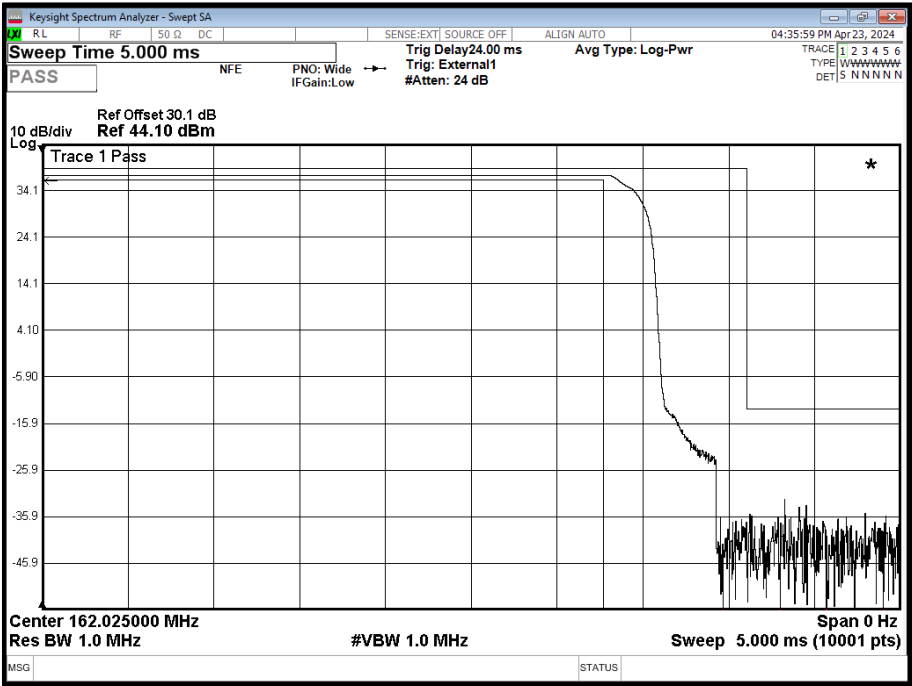


Figure 41 - 162.025 MHz – Tx2 - Ramp Down Zoomed

IEC 62287-2, Limit Clause 11.1.5.3

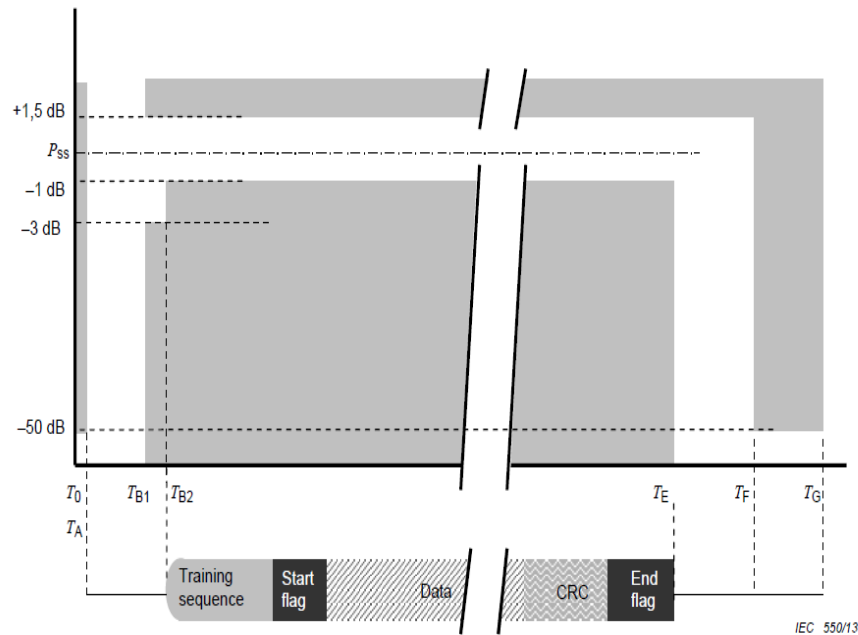


Figure 42 - Power Versus Time Mask

Reference		Bits	Time (ms)	Definitions
T ₀		0	0	Start of transmission slot. Power shall NOT exceed -50 dB of P _{SS} before T ₀
T _A		0 to 6	0 to 0.625	Power exceeds -50 dB of P _{SS}
T _B	T _{B1}	6	0.625	Power shall be within ±1.5 or -3 dB of P _{SS}
	T _{B2}	8	0.833	Power shall be within +1.5 or -1 dB of P _{SS} during the period T _{B2} to T _E (start of training sequence)
T _E (includes 1 stuffing bit)		233	24.271	Power shall remain within +1.5 or -1 dB of P _{SS} during the period T _{BE} to T _E
T _F (includes 1 stuffing bit)		241	25.104	Power shall be -50 dB of P _{SS} and stay below this
T _G		256	26.667	Start of next transmission time period

Table 13 - Definitions of Timing for Power Versus Time Mask



2.5.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Aug-2024
Attenuator (10dB, 150W)	Narda	769-10	3368	12	21-Mar-2025
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	20-Feb-2025
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	26-Feb-2025
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	17-Feb-2025
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	24-Oct-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 14

O/P Mon – Output Monitored using calibrated equipment

2.6 Sensitivity

2.6.1 Specification Reference

IEC 62287-2, Clause 11.2.1

2.6.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.6.3 Date of Test

04-June-2024

2.6.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.2.1.2.

2.6.5 Environmental Conditions

Ambient Temperature 21.7 °C

Relative Humidity 57.4 %

2.6.6 Test Results

AIS Transceiver - Operational

Frequency Offset (Hz)	156.025 MHz		162.025 MHz	
	PER (%) – Rx2	PER (%) – Rx3	PER (%) – Rx2	PER (%) – Rx3
-500	0.0	0.0	0.2	0.0
0	0.0	0.0	0.0	0.0
500	0.0	0.0	0.0	0.2

Table 15 - Sensitivity Results at Normal Test Conditions

Temperature	Voltage	156.025 MHz		162.025 MHz	
		PER (%) – Rx2	PER (%) – Rx3	PER (%) – Rx2	PER (%) – Rx3
-25 °C	9.6 V DC	0.2	0.3	0.3	0.2
+55 °C	31.2 V DC	0.0	0.0	0.0	0.0

Table 16 - Sensitivity Results at Extreme Test Conditions

IEC 62287-2, Limit Clause 11.2.1.3

The PER shall not exceed 20%.



2.6.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	02-Jan-2025
Power Splitter	Weinschel	1506A	606	12	25-Jul-2024
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	O/P Mon
DC to TTL Converter	TUV SUD	-	3599	-	TU
Meter & T/C	R.S Components	Meter 615-8206 & Type K T/C	3612	12	14-Sep-2024
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Vector Signal Generator	Keysight Technologies	ESG E4438C	4731	12	20-Feb-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 17

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

2.7 Error Behaviour at High Input Levels

2.7.1 Specification Reference

IEC 62287-2, Clause 11.2.2

2.7.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.7.3 Date of Test

04-June-2024

2.7.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.2.2.2.

2.7.5 Environmental Conditions

Ambient Temperature 21.7 °C

Relative Humidity 57.4 %

2.7.6 Test Results

AIS Transceiver - Operational

Input Signal Level (dBm)	156.025 MHz		162.025 MHz	
	PER (%) – Rx2	PER (%) – Rx3	PER (%) – Rx2	PER (%) – Rx3
-77	0.0	0.0	0.0	0.0
-7	0.3	0.2	0.0	0.0

Table 18 - Error Behaviour at High Input Level Results

IEC 62287-2, Limit Clause 11.2.2.3

The PER shall not exceed 2% for an input signal level of -77 dBm and 10% for an input signal level of -7 dBm.



2.7.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	02-Jan-2025
Power Splitter	Weinschel	1506A	606	12	25-Jul-2024
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	O/P Mon
DC to TTL Converter	TUV SUD	-	3599	-	TU
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Vector Signal Generator	Keysight Technologies	ESG E4438C	4731	12	20-Feb-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 19

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.8 Co-channel Rejection

2.8.1 Specification Reference

IEC 62287-2, Clause 11.2.3

2.8.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.8.3 Date of Test

05-June-2024

2.8.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.2.3.2.

2.8.5 Environmental Conditions

Ambient Temperature 21.6 °C
Relative Humidity 54.1 %

2.8.6 Test Results

AIS Transceiver - Operational

Unwanted Signal Frequency Offset (Hz)	156.025 MHz		162.025 MHz	
	PER (%) – Rx2	PER (%) – Rx3	PER (%) – Rx2	PER (%) – Rx3
-1000	5.0	2.0	3.5	3.5
0	2.5	2.5	3.0	2.0
+1000	5.0	1.0	3.0	1.5

Table 20 - Co-channel Rejection Results

IEC 62287-2, Limit Clause 11.2.3.3

The PER shall not exceed 20%.



2.8.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	02-Jan-2025
Power Splitter	Weinschel	1506A	606	12	25-Jul-2024
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	O/P Mon
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	24-Oct-2024
DC to TTL Converter	TUV SUD	-	3599	-	TU
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Vector Signal Generator	Keysight Technologies	ESG E4438C	4731	12	20-Feb-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Attenuator 5W 10dB DC-18GHz	Aaren	AT40A-4041-D18-10	5487	12	11-Oct-2024
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 21

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.9 Adjacent Channel Selectivity

2.9.1 Specification Reference

IEC 62287-2, Clause 11.2.4

2.9.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.9.3 Date of Test

05-June-2024

2.9.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.2.4.2.

2.9.5 Environmental Conditions

Ambient Temperature 21.6 °C
Relative Humidity 54.1 %

2.9.6 Test Results

AIS Transceiver - Operational

Unwanted Signal Frequency Offset (kHz)	156.025 MHz		162.025 MHz	
	PER (%) – Rx2	PER (%) – Rx3	PER (%) – Rx2	PER (%) – Rx3
-25	1.5	4.0	0.0	3.0
25	0.5	1.0	0.0	1.0

Table 22 - Adjacent Channel Selectivity Results

IEC 62287-2, Limit Clause 11.2.4.3

The PER shall not exceed 20%.



2.9.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	02-Jan-2025
Power Splitter	Weinschel	1506A	606	12	25-Jul-2024
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	O/P Mon
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	24-Oct-2024
DC to TTL Converter	TUV SUD	-	3599	-	TU
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Vector Signal Generator	Keysight Technologies	ESG E4438C	4731	12	20-Feb-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Attenuator 5W 10dB DC-18GHz	Aaren	AT40A-4041-D18-10	5487	12	11-Oct-2024
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 23

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.10 Spurious Response Rejection

2.10.1 Specification Reference

IEC 62287-2, Clause 11.2.5

2.10.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.10.3 Date of Test

05-June-2024 to 10-June-2024

2.10.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.2.5.4 and 11.2.5.5 using PER measurements.

2.10.5 Environmental Conditions

Ambient Temperature 21.6 - 22.2 °C

Relative Humidity 43.6 - 54.1 %

2.10.6 Test Results

AIS Transceiver - Operational

Test Parameter	Value
List of Intermediate Frequencies	RX2, IF1 = 29.255 MHz, IF2 = 0.455 MHz, RX3, IF1 = 51.655 MHz, IF2 = 0.455 MHz
Switching Range of the Receiver	6 MHz
Frequency of the Local Oscillator at 156.025 MHz	RX2, 185.28 MHz RX3, 207.68 MHz
Frequency of the Local Oscillator at 162.025 MHz (AIS2)	RX2, 191.28 MHz, RX3, 213.68 MHz
Calculated Limited Frequency Range	RX2, 152.57 MHz to 223.99 MHz, RX3, 152.57 MHz to 268.79 MHz

Table 24 - Test Parameters for Spurious Response Rejection



Frequency (MHz)	PER (%)
*	

Table 25 - Spurious Responses - 156.025 MHz, Rx2

*No responses were identified during the Limited Frequency Range Sweep.

Frequency (MHz)	PER (%)
*	

Table 26 - Spurious Responses - 162.025 MHz, Rx2

*No responses were identified during the Limited Frequency Range Sweep.

Frequency (MHz)	PER (%)
*	

Table 27 - Spurious Responses - 156.025 MHz, Rx3

*No responses were identified during the Limited Frequency Range Sweep.

Frequency (MHz)	PER (%)
*	

Table 28 - Spurious Responses - 162.025 MHz, Rx3

*No responses were identified during the Limited Frequency Range Sweep.

K	F _{LOH} (MHz)	IF ₁ (MHz)	SFI ₁ (MHz)	PER (%)
2	191.28	29.255	411.815	0
3	191.28	29.255	603.095	0
4	191.28	29.255	794.375	0
2	191.28	29.255	353.305	0
3	191.28	29.255	544.585	0
4	191.28	29.255	735.685	0

Table 29 - Identified Frequencies Spurious Responses (SFI1) for Rx2

K	F _{LOL} (MHz)	IF ₁ (MHz)	SFI ₂ (MHz)	PER (%)
2	185.28	29.255	399.815	0
3	185.28	29.255	585.095	0
4	185.28	29.255	770.375	0
2	185.28	29.255	341.305	0
3	185.28	29.255	526.585	0
4	185.28	29.255	711.865	0

Table 30 - Identified Frequencies Spurious Responses (SFI2) for Rx2

K	F _{LOH} (MHz)	IF ₁ (MHz)	SFI ₁ (MHz)	PER (%)
2	213.68	51.655	479.015	0
3	213.68	51.655	692.695	0
4	213.68	51.655	906.375	0
2	213.68	51.655	375.705	0
3	213.68	51.655	589.385	0
4	213.68	51.655	803.065	0

Table 31 - Identified Frequencies Spurious Responses (SFI1) for Rx3

K	F _{LOL} (MHz)	IF ₁ (MHz)	SFI ₂ (MHz)	PER (%)
2	207.68	51.655	467.015	0
3	207.68	51.655	674.695	0
4	207.68	51.655	882.375	0
2	207.68	51.655	363.705	0
3	207.68	51.655	571.385	0
4	207.68	51.655	779.065	0

Table 32 - Identified Frequencies Spurious Responses (SFI2) for Rx3

IEC 62287-2 Limit Clause 11.2.6.3

The PER shall not exceed 20%.



2.10.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Power Divider	Weinschel	1506A	603	12	14-Dec-2024
Power Splitter	Weinschel	1506A	606	12	25-Jul-2024
Audio Analyser	Hewlett Packard	8903B	1350	12	26-Jan-2025
Attenuator (10dB, 150W)	Narda	769-10	3368	12	21-Mar-2025
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	24-Oct-2024
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
GPSDR Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Feb-2024
PSA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Vector Signal Generator	Keysight Technologies	ESG E4438C	4731	12	20-Feb-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
DC to TTL Converter	TUV SUD	-	3599	-	TU
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	O/P Mon
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 33

TU – Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.11 Intermodulation Response Rejection

2.11.1 Specification Reference

IEC 62287-2, Clause 11.2.6

2.11.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.11.3 Date of Test

05-June-2024

2.11.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.2.6.2.

2.11.5 Environmental Conditions

Ambient Temperature 21.6 °C
Relative Humidity 54.1 %

2.11.6 Test Results

AIS Transceiver - Operational

Test No.	Generator A (Wanted AIS Signal)	Generator B (Unmodulated ±50 kHz)	Generator C (Modulated ±100 kHz)	PER (%)	
				Rx2	Rx3
1	162.025 MHz	162.075 MHz	162.125 MHz	0.0	0.0
2	162.025 MHz	161.975 MHz	161.925 MHz	0.0	0.0
3	156.025 MHz	156.075 MHz	156.125 MHz	0.0	0.0
4	156.025 MHz	155.975 MHz	155.925 MHz	0.0	0.0

Table 34 - Intermodulation Results

IEC 62287-2 Limit clause 11.2.6.3

The PER shall not exceed 20%.



2.11.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	02-Jan-2025
Attenuator: 10dB/20W	Narda	766-10	480	12	12-Oct-2024
Power Divider	Weinschel	1506A	603	12	14-Dec-2024
Power Splitter	Weinschel	1506A	606	12	25-Jul-2024
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	O/P Mon
Signal Generator, 9kHz to 3GHz	Rohde & Schwarz	SMA 100A	3494	12	22-Sep-2024
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	24-Oct-2024
DC to TTL Converter	TUV SUD	-	3599	-	TU
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Vector Signal Generator	Keysight Technologies	ESG E4438C	4731	12	20-Feb-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Attenuator 5W 10dB DC-18GHz	Aaren	AT40A-4041-D18-10	5487	12	11-Oct-2024
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 35

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

2.12 Blocking or Desensitisation

2.12.1 Specification Reference

IEC 62287-2, Clause 11.2.7

2.12.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.12.3 Date of Test

05-June-2024

2.12.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.2.7.2.

2.12.5 Environmental Conditions

Ambient Temperature 21.6 °C
Relative Humidity 54.1 %

2.12.6 Test Results

AIS Transceiver - Operational

Unwanted Signal Frequency Offset (MHz)	Packet Error Ratio (%)			
	156.025 MHz		162.025 MHz	
	Rx2	Rx3	Rx2	Rx3
-10	0.0	0.0	0.0	0.0
-5	0.0	0.0	0.0	0.0
-2	0.0	0.0	0.0	0.0
-1	0.0	0.0	0.0	0.0
-0.5	0.0	0.0	0.0	0.0
0.5	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0

Table 36 - Blocking Results

IEC 62287-2, Limit Clause 11.2.7.3

The maximum packet error rate shall not exceed 20%.



2.12.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Attenuator 10dB/25W	Weinschel	46-10-43	400	12	02-Jan-2025
Power Splitter	Weinschel	1506A	606	12	25-Jul-2024
Programmable Modulation Waveform Generator	Sine Qua Non	PMG1	3291	-	O/P Mon
Signal Generator, 9kHz - 3GHz	Rohde & Schwarz	SMA 100A	3504	12	24-Oct-2024
DC to TTL Converter	TUV SUD	-	3599	-	TU
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Vector Signal Generator	Keysight Technologies	ESG E4438C	4731	12	20-Feb-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Attenuator 5W 10dB DC-18GHz	Aaren	AT40A-4041-D18-10	5487	12	11-Oct-2024
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 37

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment



2.13 Spurious Emissions from the Receiver

2.13.1 Specification Reference

IEC 62287-2, Clause 11.3.1

2.13.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.13.3 Date of Test

25-April-2024

2.13.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.3.1.2.

2.13.5 Environmental Conditions

Ambient Temperature 22.2 °C
Relative Humidity 31.7 %

2.13.6 Test Results

AIS Transceiver - Operational

Frequency (MHz)	Level (dBm)
207.5	-61.6

Table 38 - Receiver Emissions Results - 156.025 MHz

No other emissions were detected within 10 dB of the limit.

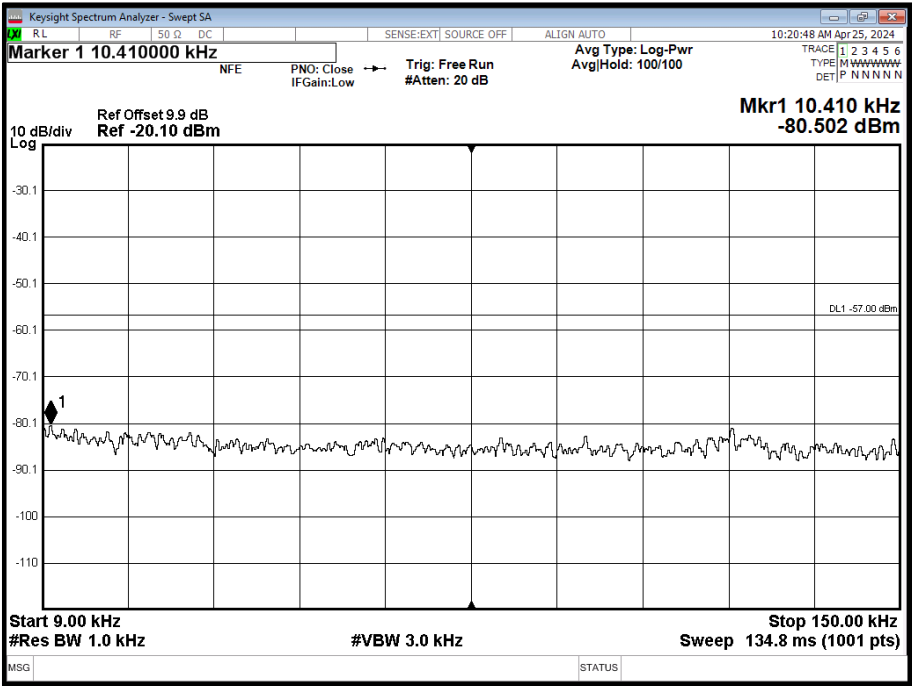


Figure 43 - 156.025 MHz - 9 kHz to 150 kHz

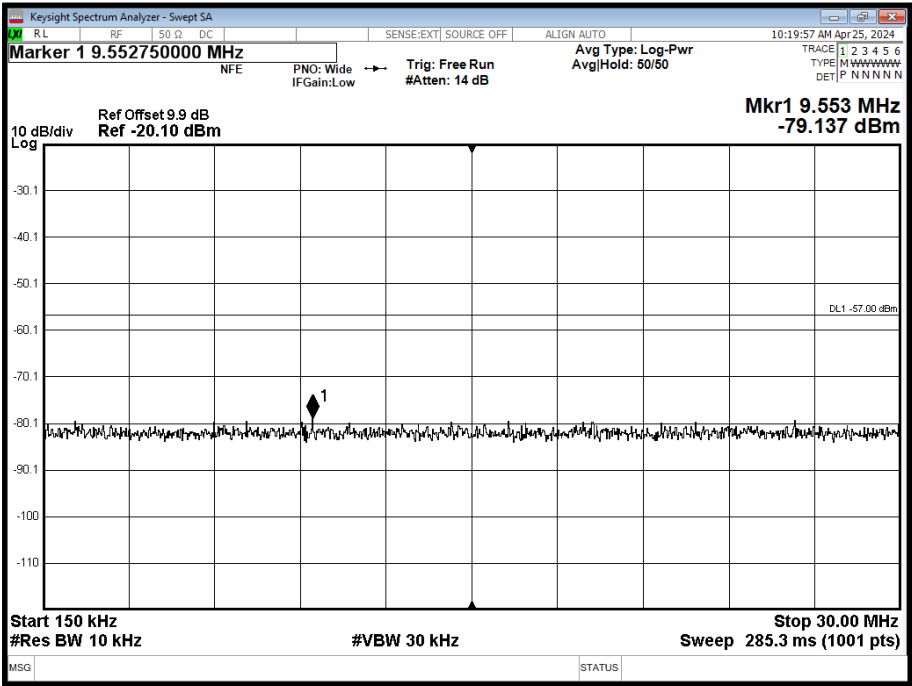


Figure 44 - 156.025 MHz - 150 kHz to 30 MHz

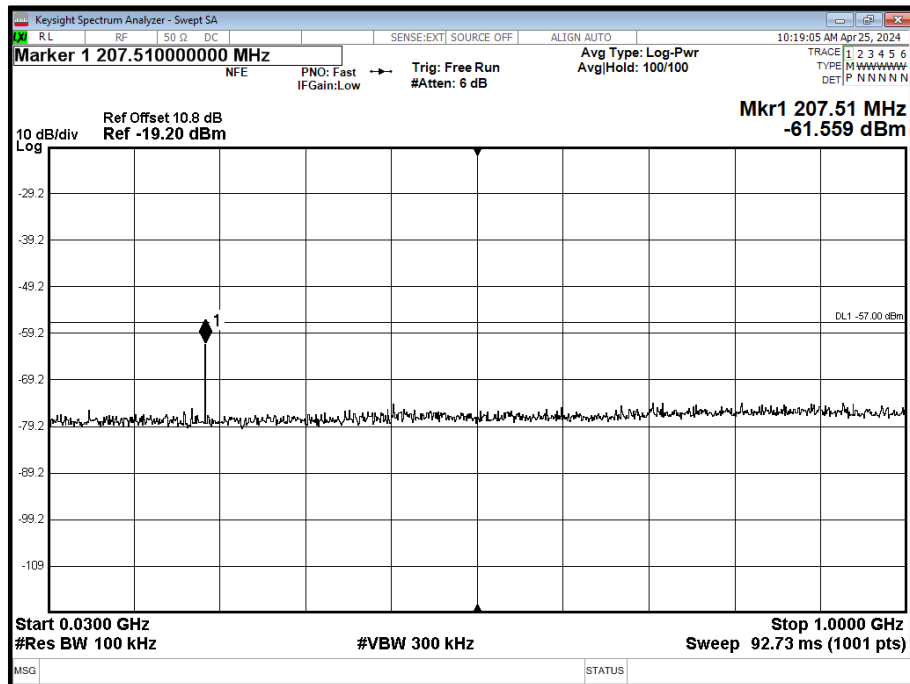


Figure 45 - 156.025 MHz - 30 MHz to 1 GHz

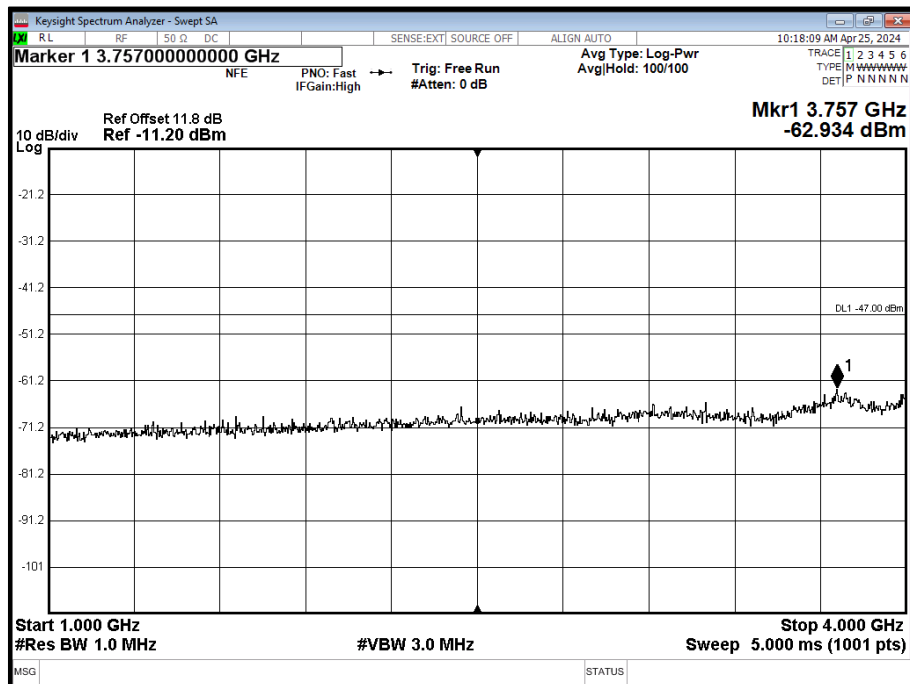


Figure 46 - 156.025 MHz - 1 GHz to 4 GHz

Frequency (MHz)	Level (dBm)
213.3	-59.7

Table 39 - Receiver Emissions Results - 162.025 MHz

No other emissions were detected within 10 dB of the limit.

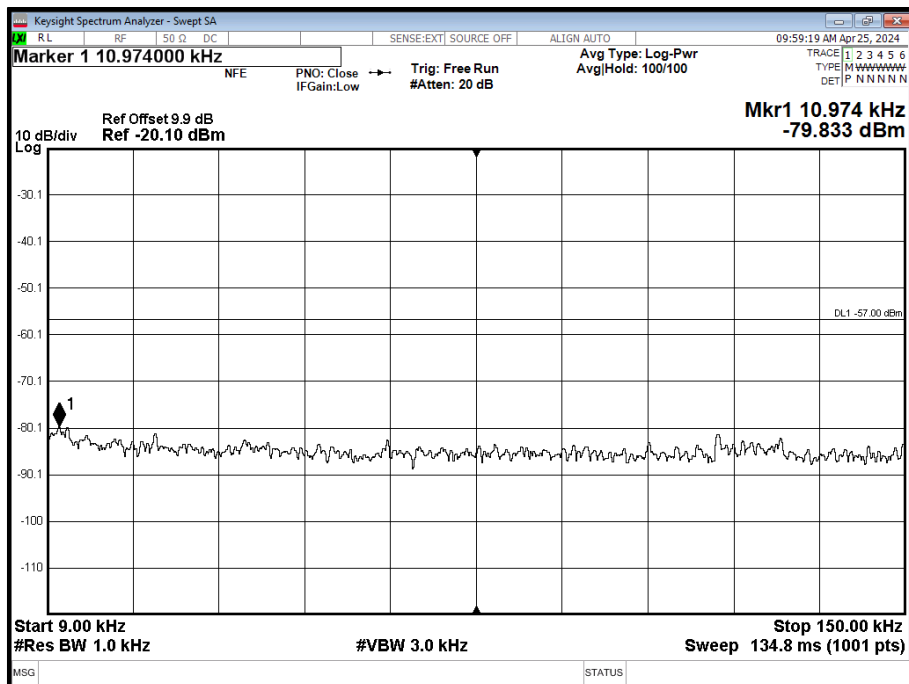


Figure 47 - 162.025 MHz - 9 kHz to 150 kHz

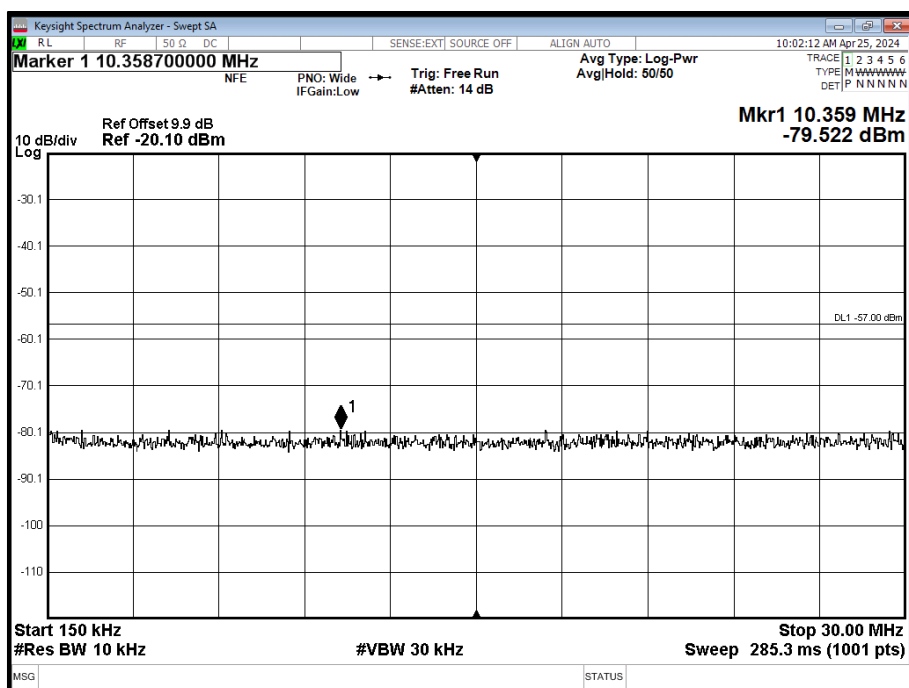


Figure 48 - 162.025 MHz - 150 kHz to 30 MHz

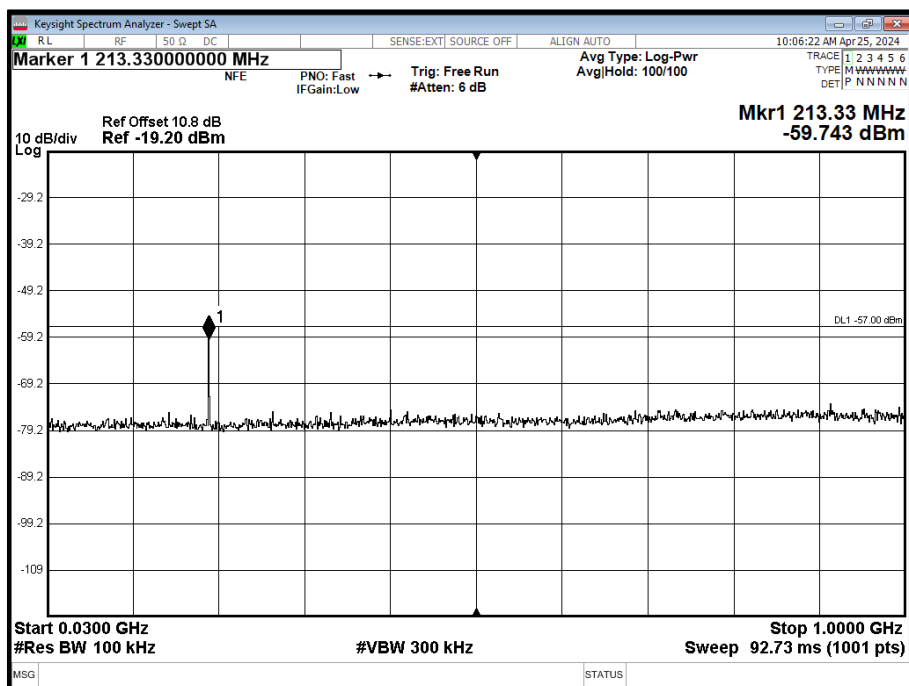


Figure 49 - 162.025 MHz - 30 MHz to 1 GHz

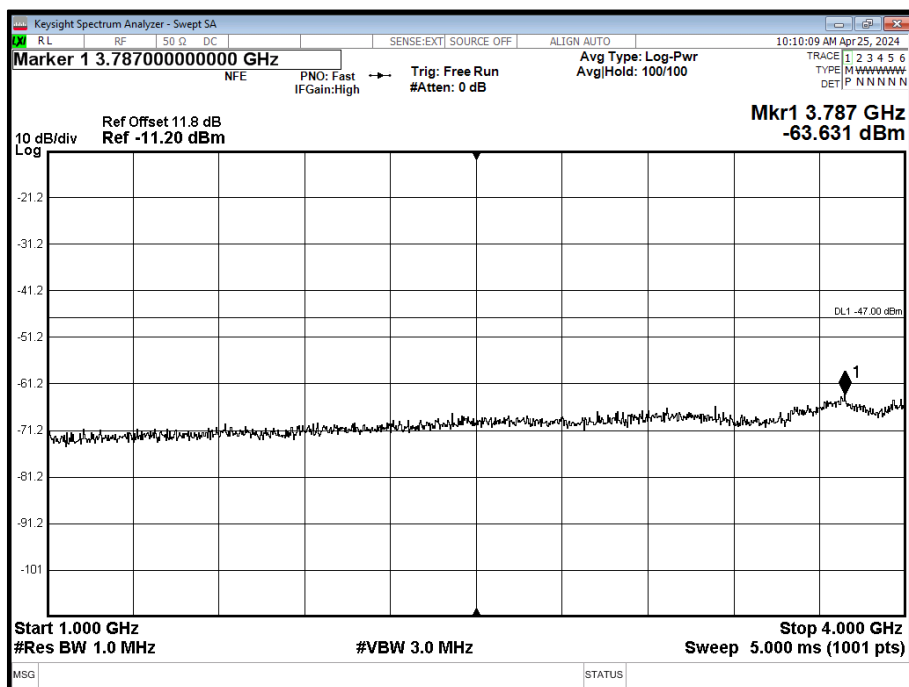


Figure 50 - 162.025 MHz - 1 GHz to 4 GHz

IEC 62287-2, Limit Clause 11.3.1.3

The power of any spurious emission in the specified range at the antenna terminal shall not exceed – 57 dBm (2 nW) in the frequency range 9 kHz to 1 GHz and –47 dBm (20 nW) in the frequency range 1 GHz to 4 GHz.



2.13.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Attenuator (10dB, 150W)	Narda	769-10	3368	12	21-Mar-2025
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	20-Feb-2025
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	26-Feb-2025
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	17-Feb-2025
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	24-Oct-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 40

O/P Mon – Output Monitored using calibrated equipment



2.14 Spurious Emissions from the Transmitter

2.14.1 Specification Reference

IEC 62287-2, Clause 11.3.2

2.14.2 Equipment Under Test and Modification State

X-100, S/N: 4310002011730002 - Modification State 0

2.14.3 Date of Test

24-April-2024

2.14.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with IEC 62287-2, clause 11.3.2.2.

2.14.5 Environmental Conditions

Ambient Temperature 22.7 °C
Relative Humidity 33.2 %

2.14.6 Test Results

AIS Transceiver - Operational

Frequency (MHz)	Level (dBm)
154.0	-45.6
155.6	-41.6
156.5	-41.4
166.1	-41.7

Table 41 - Transmitter Emissions Results - 156.025 MHz, Tx1

No other emissions were detected within 10 dB of the limit.

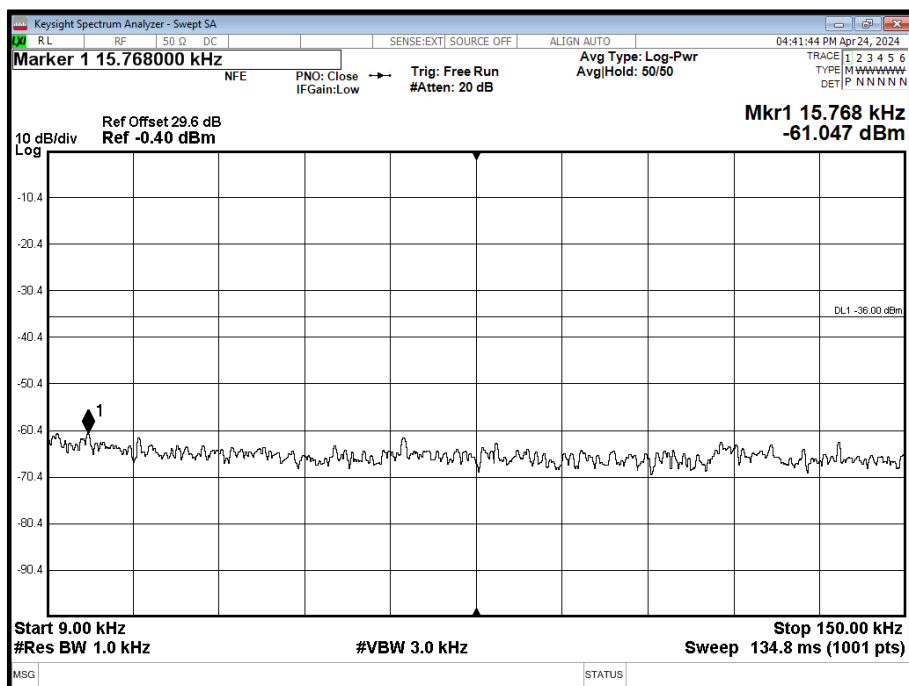


Figure 51 - 156.025 MHz - 9 kHz to 150 kHz, Tx1

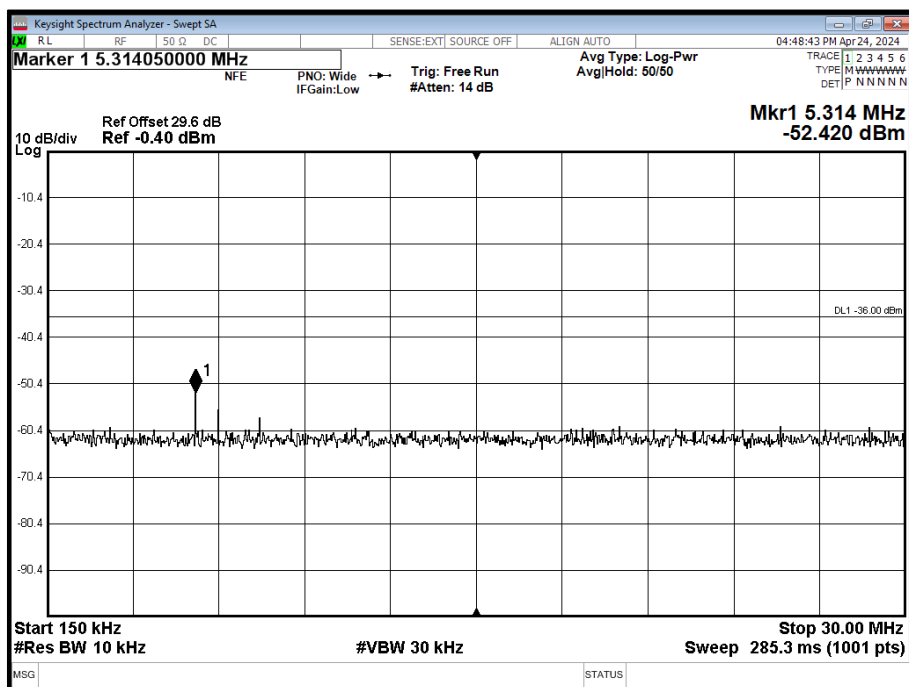


Figure 52 - 156.025 MHz - 150 kHz to 30 MHz, Tx1

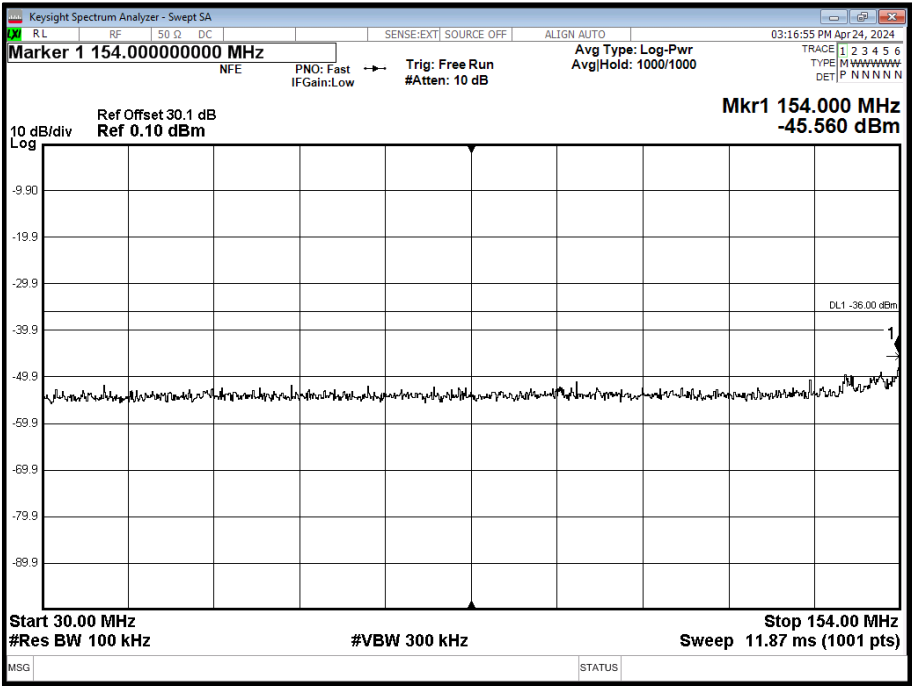


Figure 53 - 156.025 MHz - 30 MHz to 154 MHz, Tx1

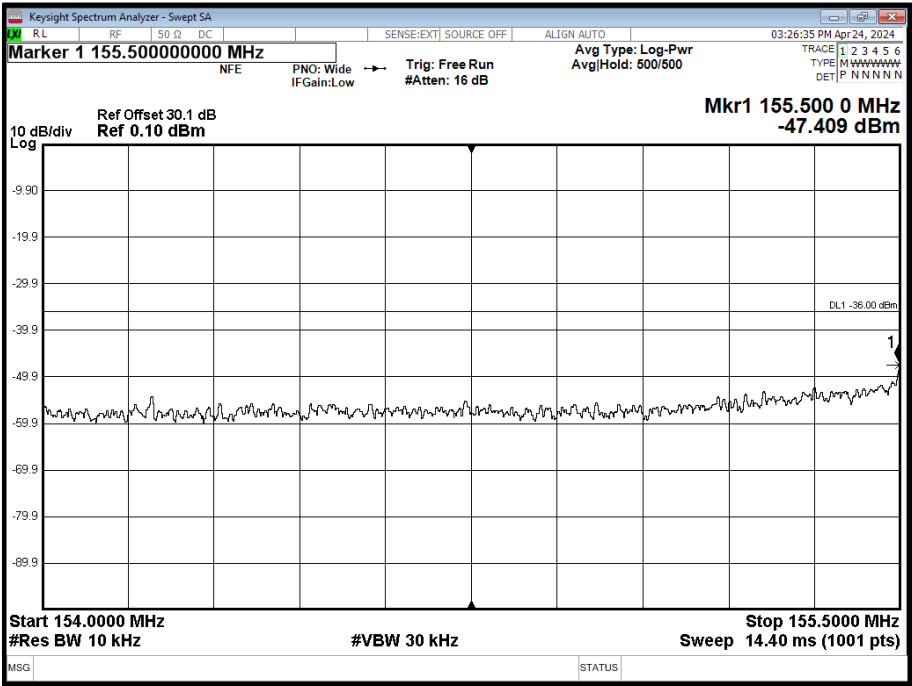


Figure 54 - 156.025 MHz - 154 MHz to 155.5 MHz, Tx1

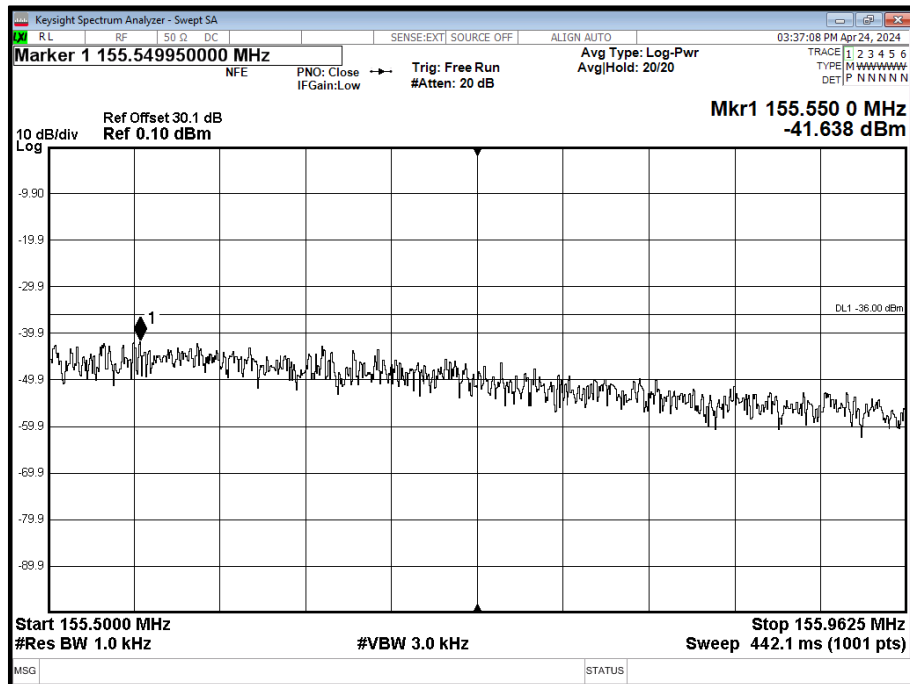


Figure 55 - 156.025 MHz - 155.5 MHz to 155.9625 MHz, Tx1

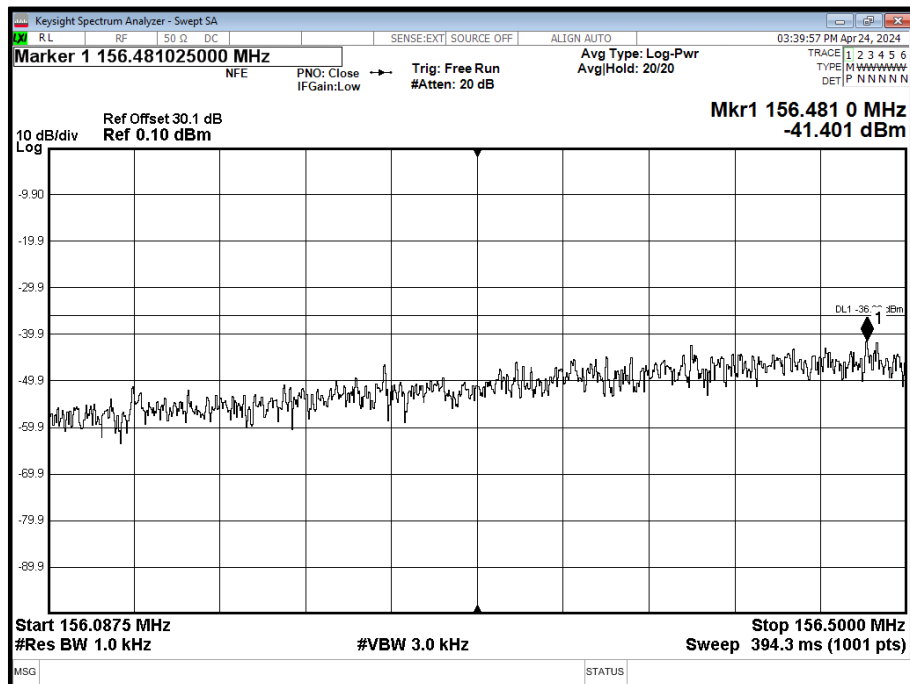


Figure 56 - 156.025 MHz - 156.0875 MHz to 156.5 MHz, Tx1

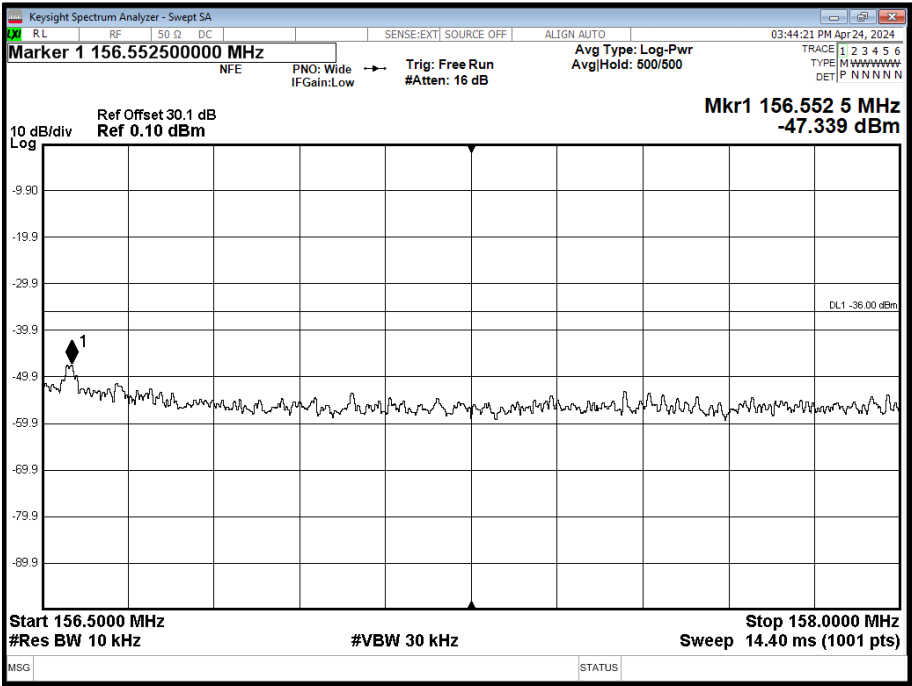


Figure 57 - 156.025 MHz - 156.5 MHz to 158 MHz, Tx1

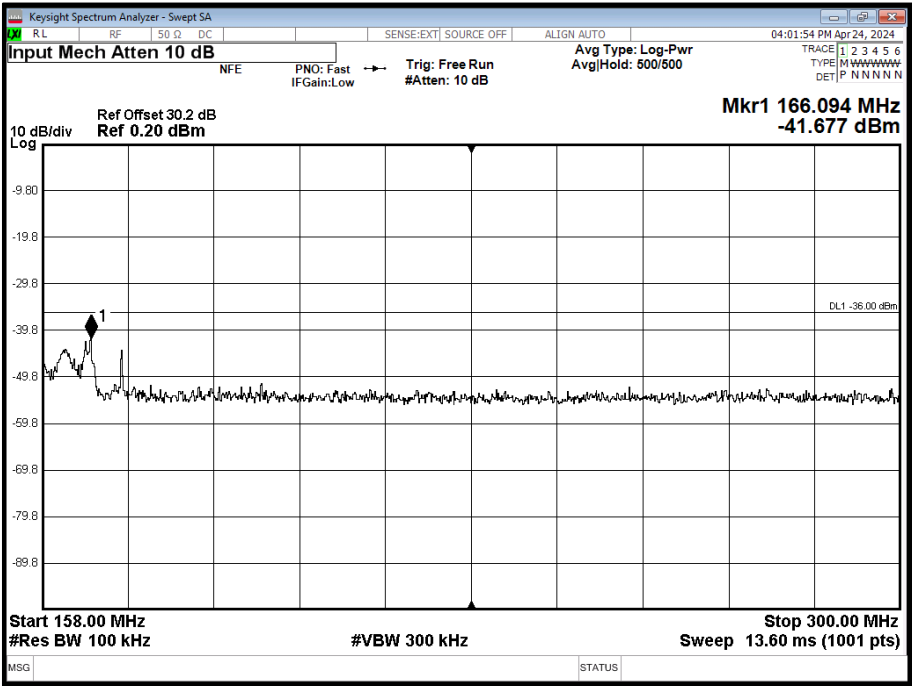


Figure 58 - 156.025 MHz - 158 MHz to 300 MHz, Tx1

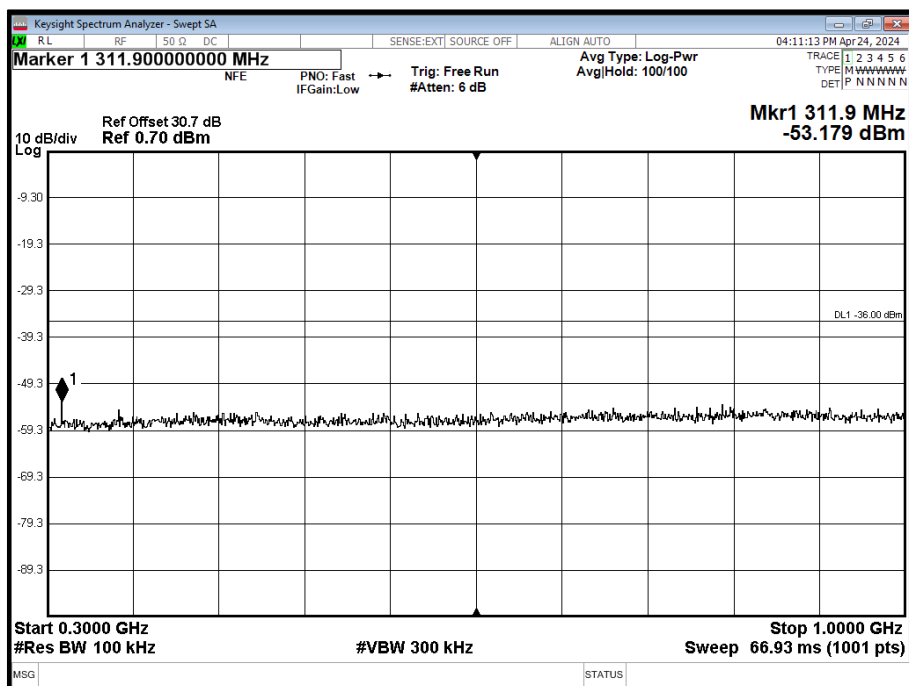


Figure 59 - 156.025 MHz - 300 MHz to 1 GHz, Tx1

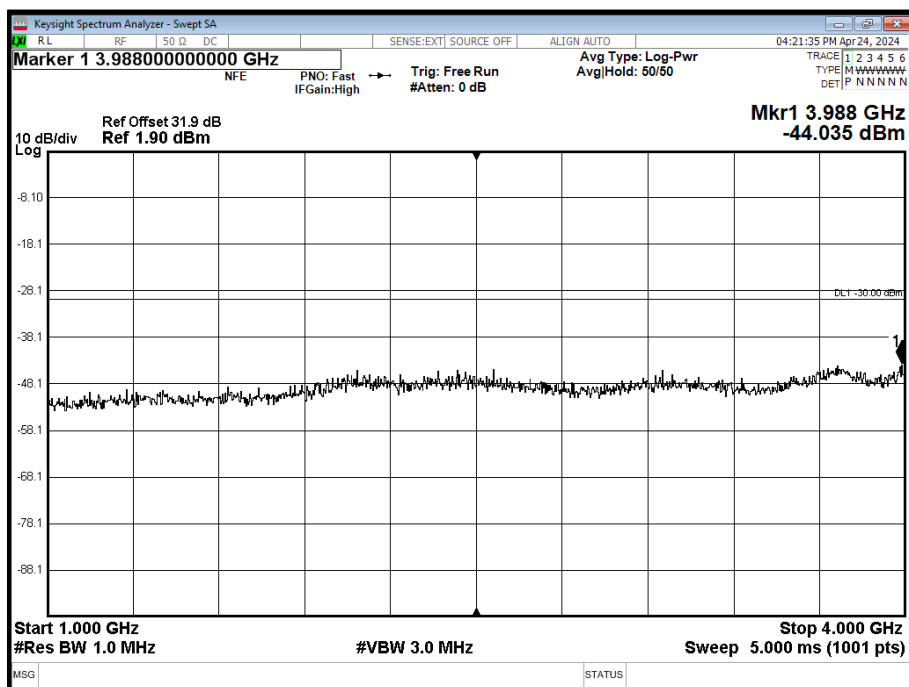


Figure 60 - 156.025 MHz - 1 GHz to 4 GHz, Tx1

Frequency (MHz)	Level (dBm)
161.5	-41.6
162.5	-42.3

Table 42 - Transmitter Emissions Results - 162.025 MHz

No other emissions were detected within 10 dB of the limit.

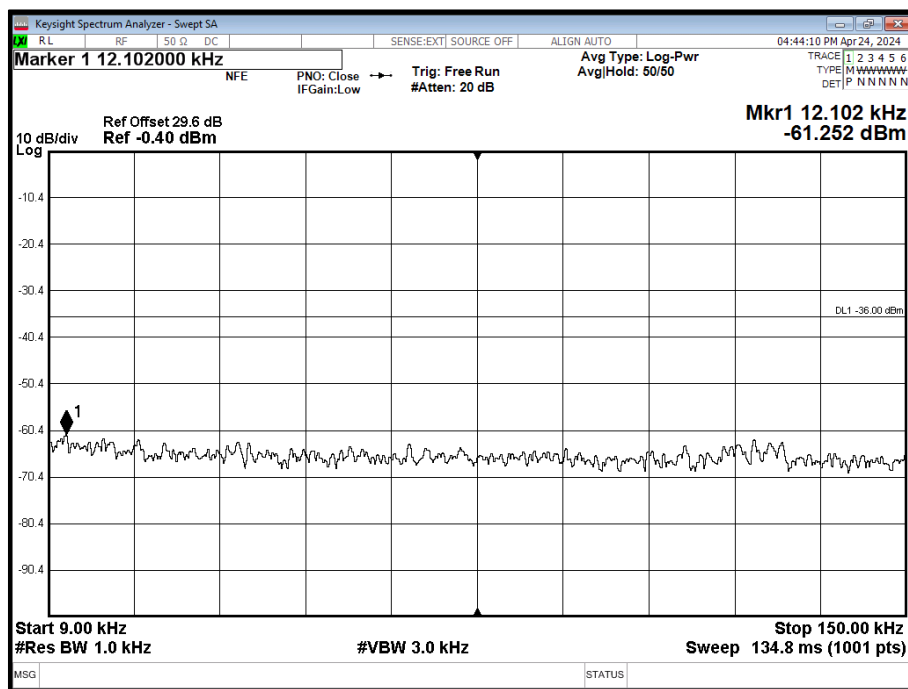


Figure 61 - 162.025 MHz - 9 kHz to 150 kHz, Tx1

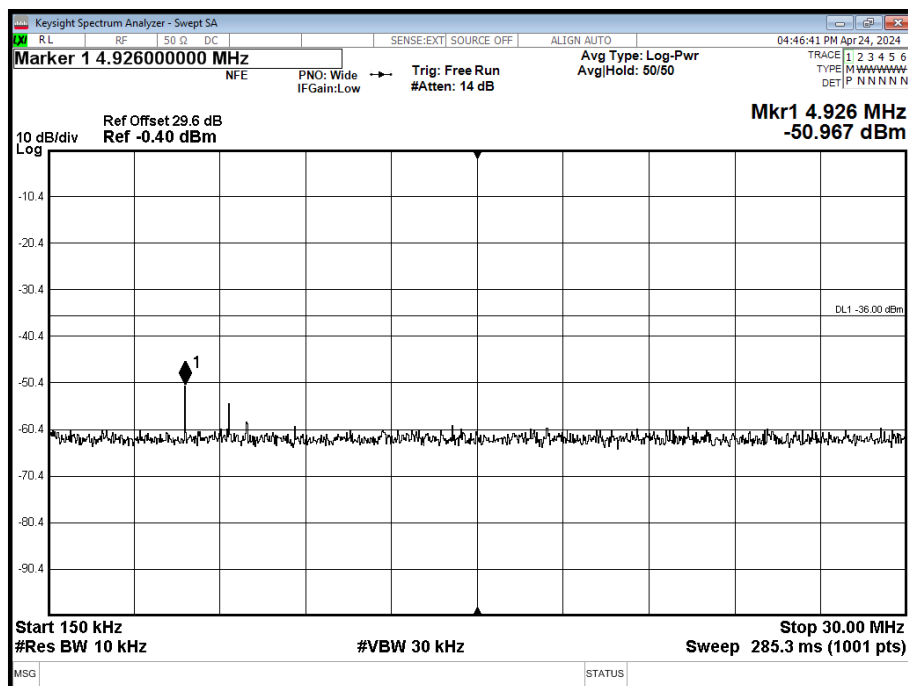


Figure 62 - 162.025 MHz - 150 kHz to 30 MHz, Tx1

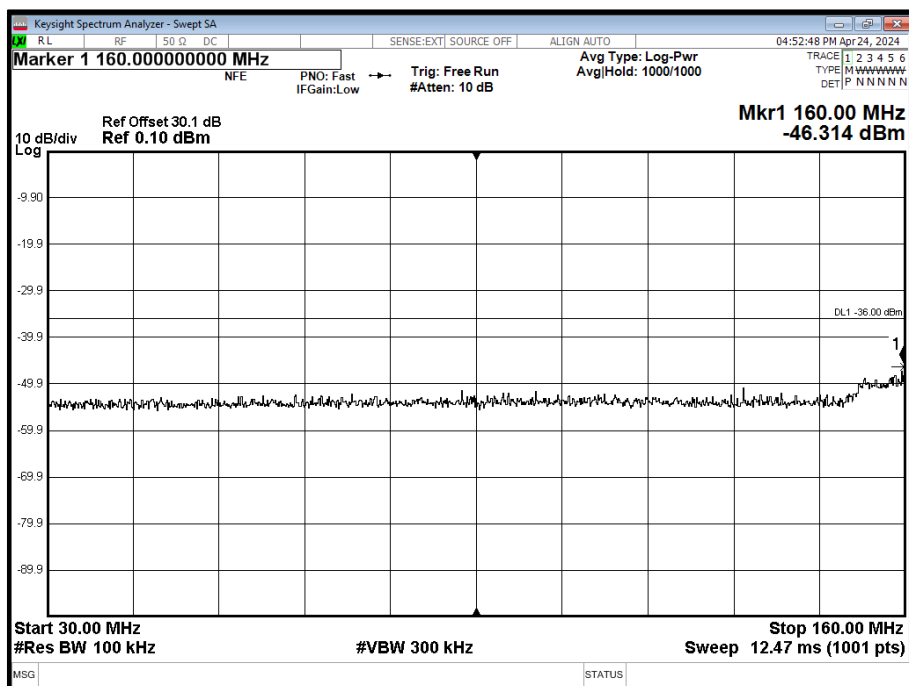


Figure 63 - 162.025 MHz - 30 MHz to 160 MHz, Tx1

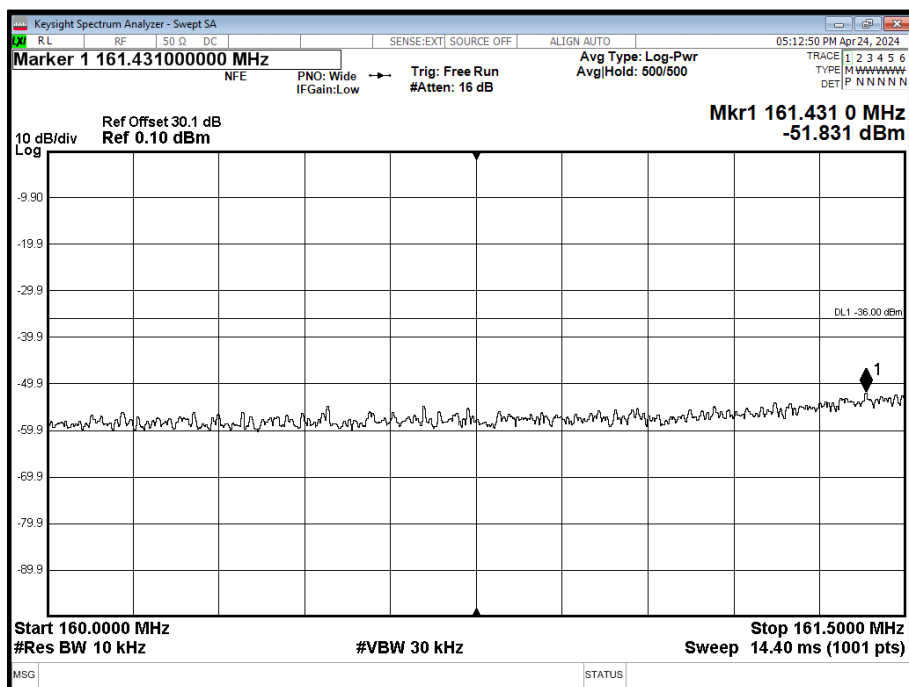


Figure 64 - 162.025 MHz - 160 MHz to 161.5 MHz, Tx1

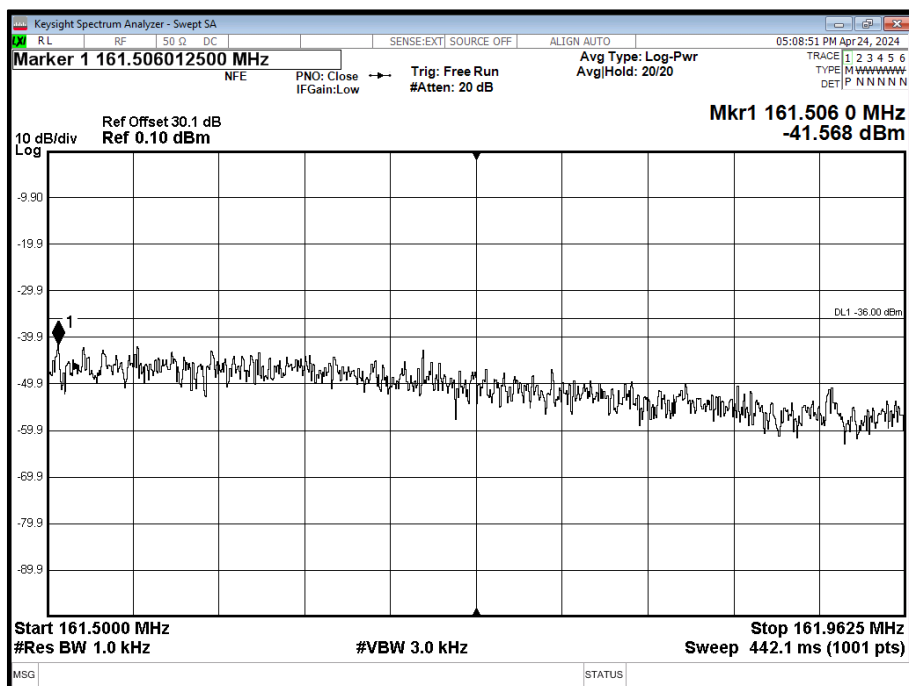


Figure 65 - 162.025 MHz - 161.5 MHz to 161.9625 MHz, Tx1

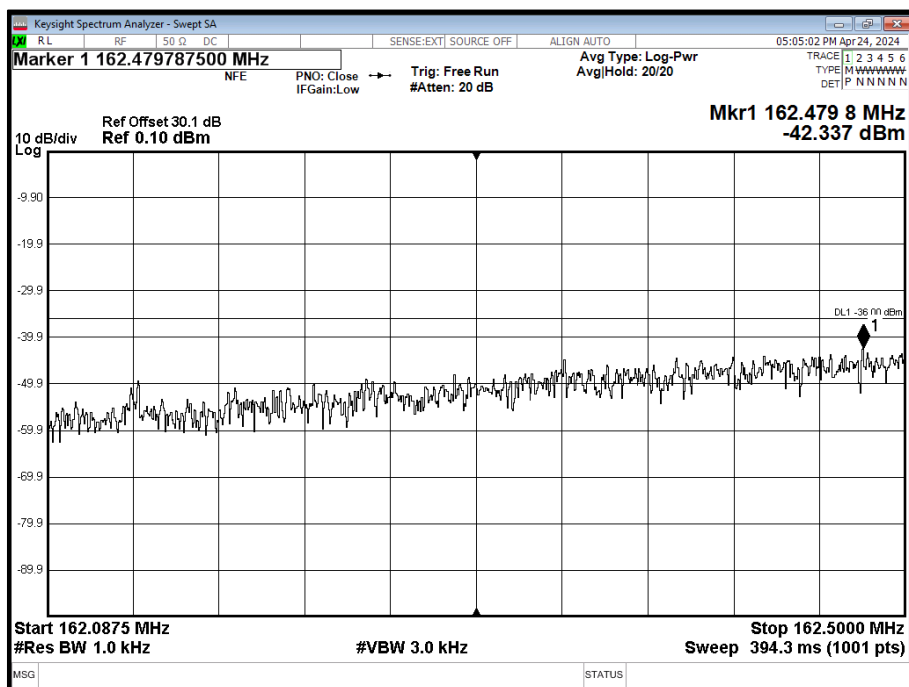


Figure 66 - 162.025 MHz - 162.0875 MHz to 162.5 MHz, Tx1

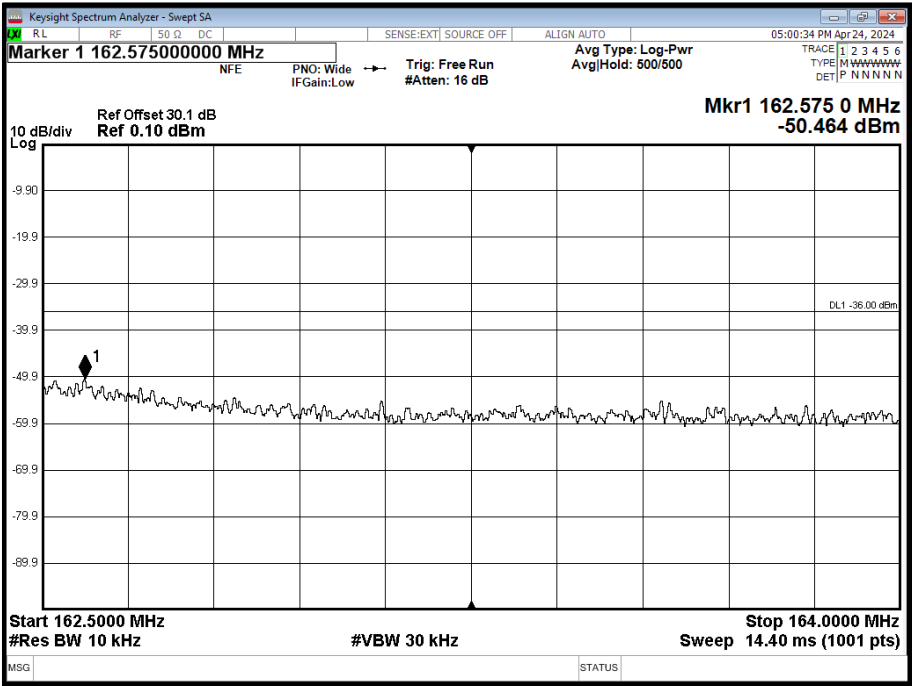


Figure 67 - 162.025 MHz - 162.5 MHz to 164 MHz, Tx1

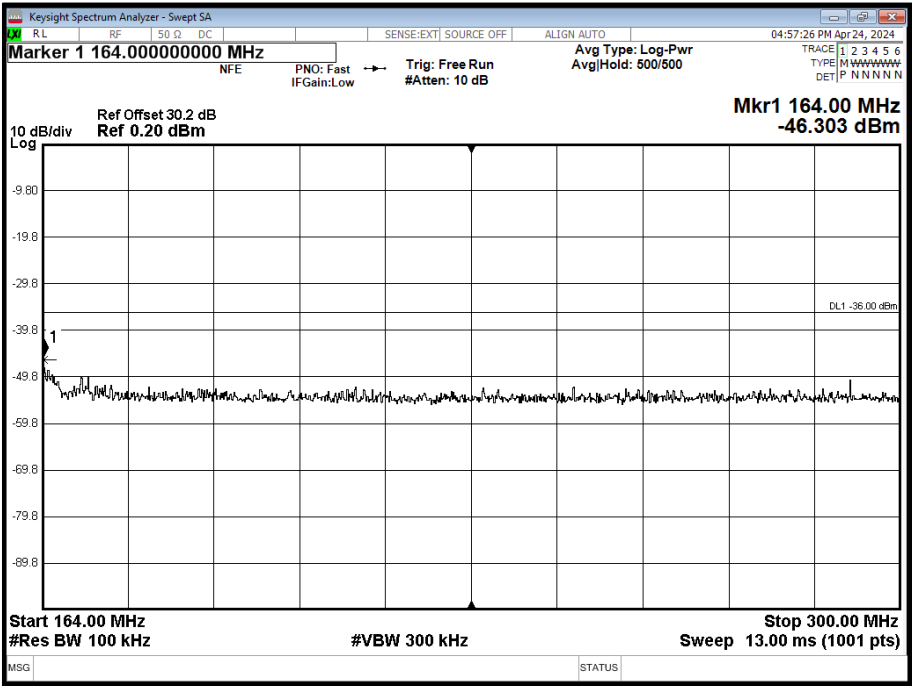


Figure 68 - 162.025 MHz - 164 MHz to 300 MHz, Tx1

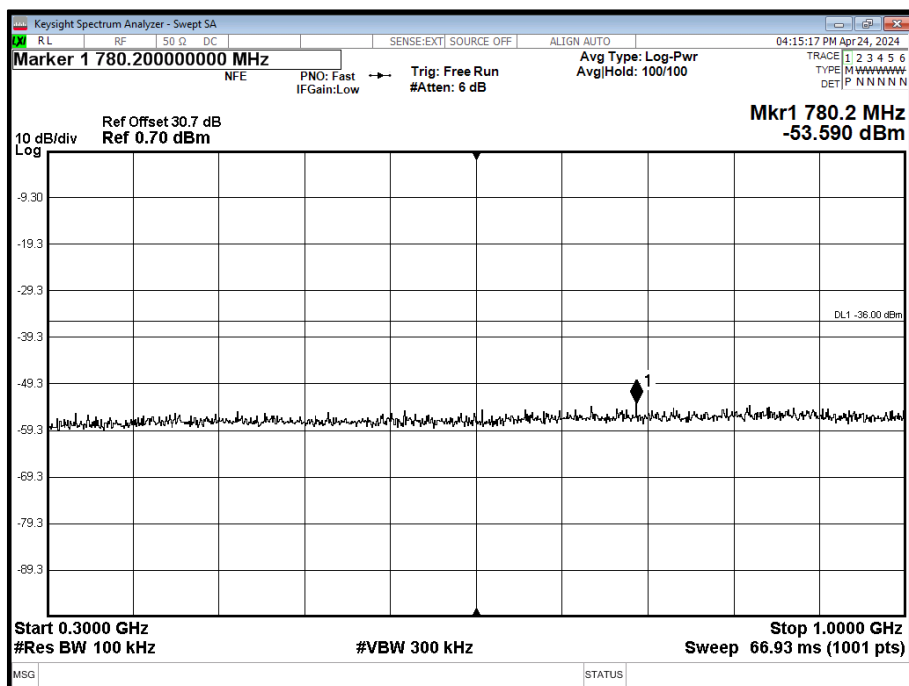


Figure 69 - 162.025 MHz - 300 MHz to 1 GHz, Tx1

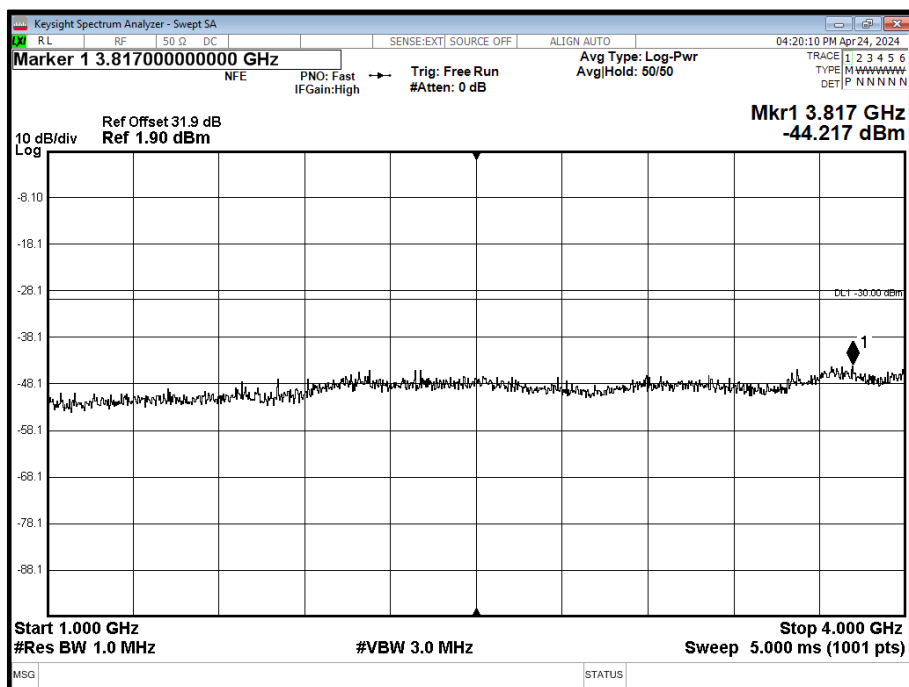


Figure 70 - 162.025 MHz - 1 GHz to 4 GHz, Tx1

Frequency (MHz)	Level (dBm)
155.6	-40.7
156.4	-41.7
166.1	-41.6

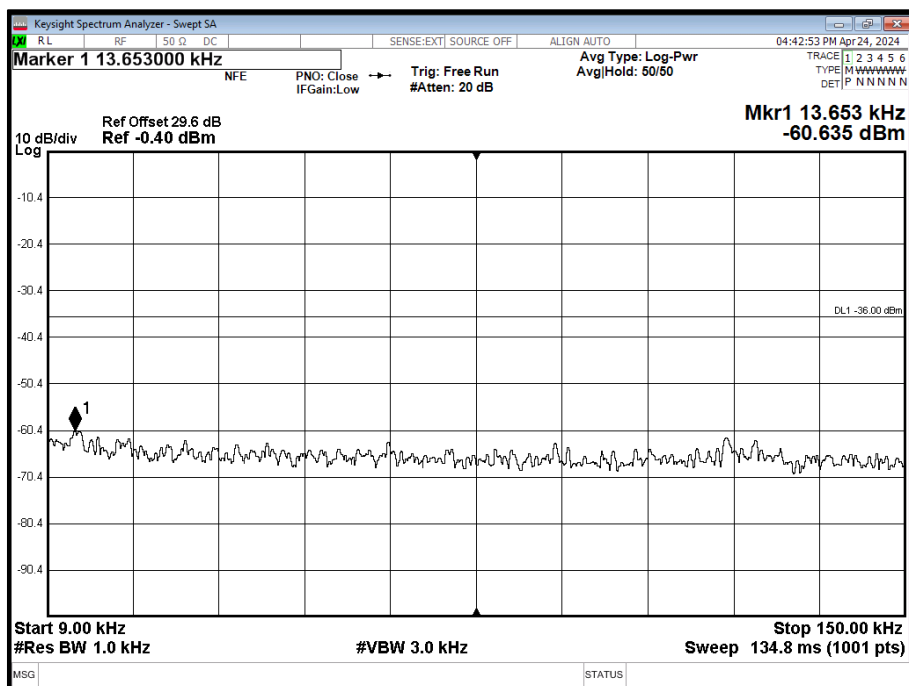


Figure 71 - 156.025 MHz - 9 kHz to 150 kHz, Tx2

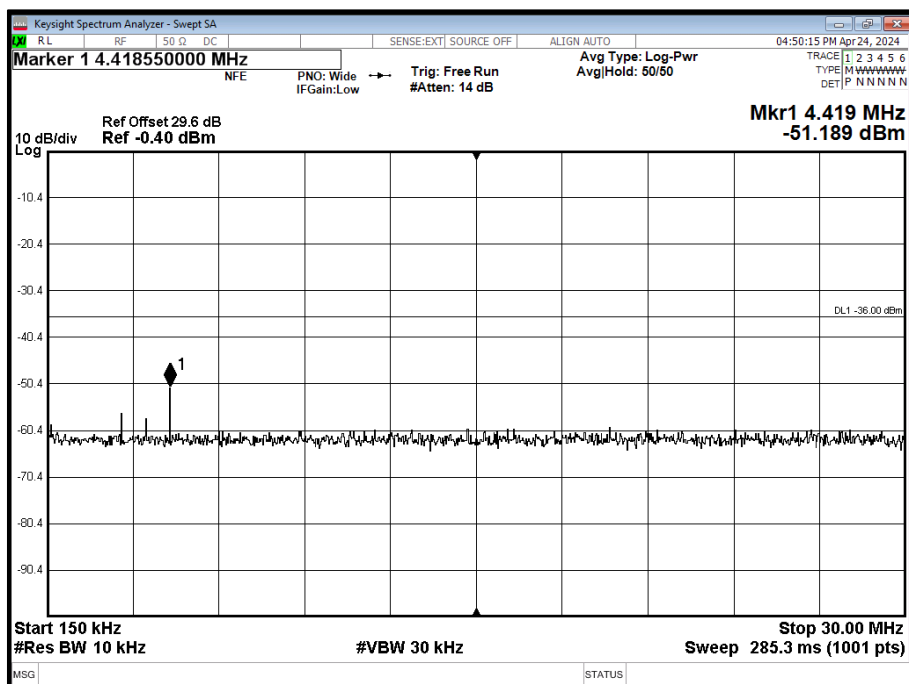


Figure 72 - 156.025 MHz - 150 kHz to 30 MHz, Tx2

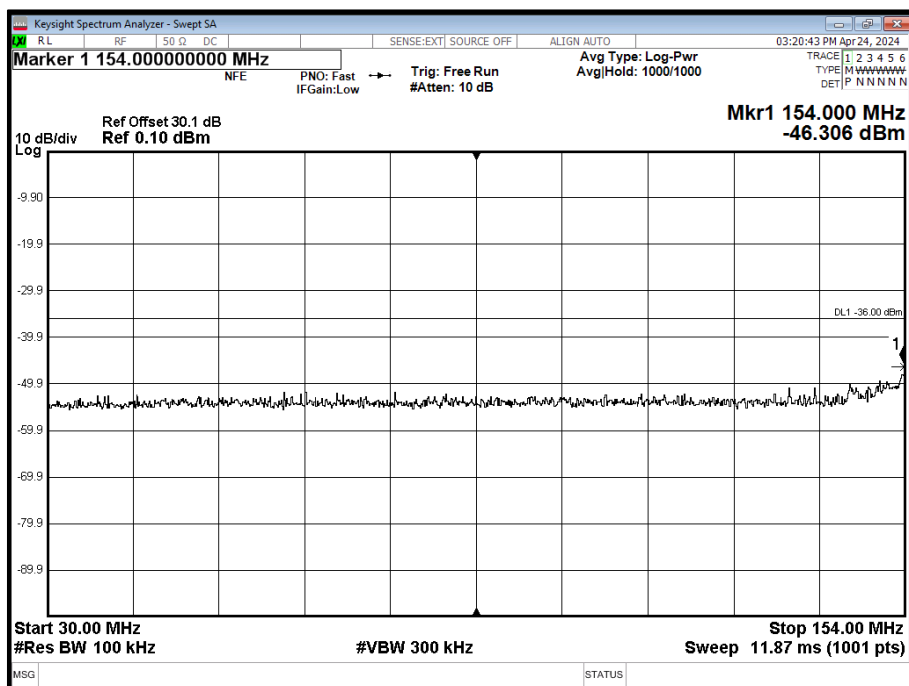


Figure 73 - 156.025 MHz - 30 MHz to 154 MHz, Tx2

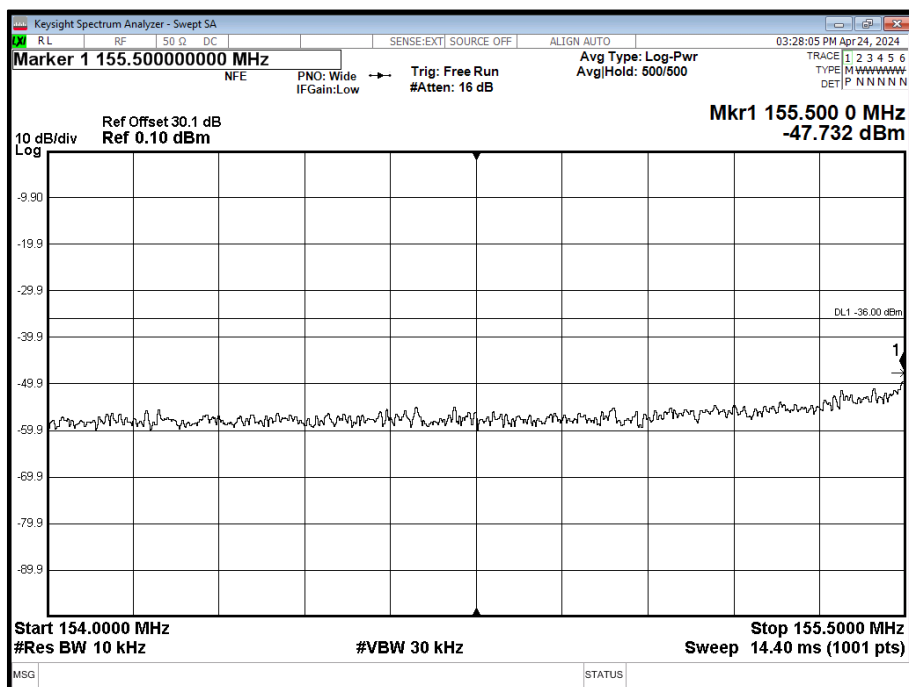


Figure 74 - 156.025 MHz - 154 MHz to 155.5 MHz, Tx2

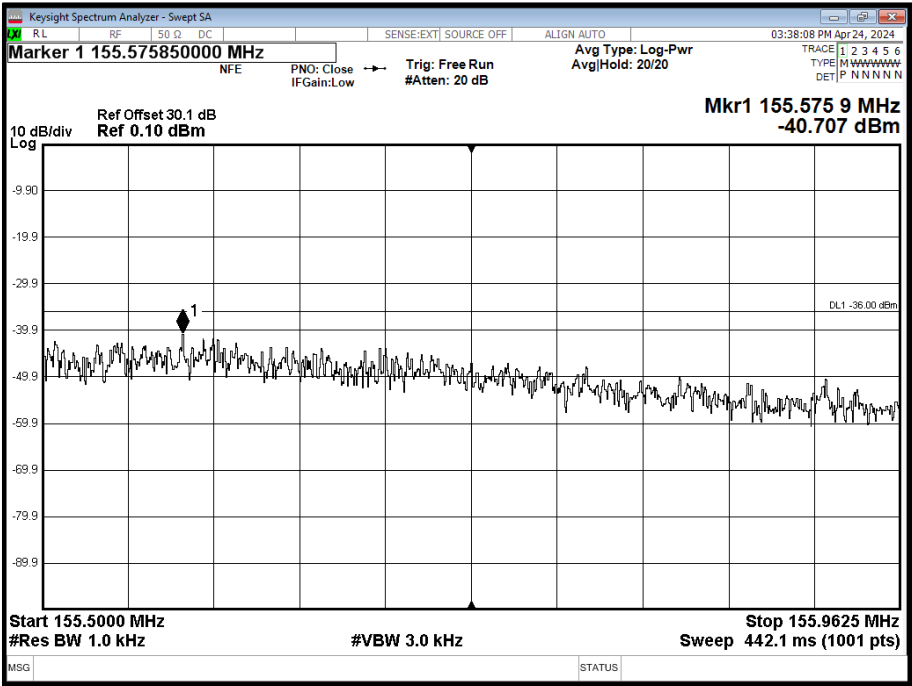


Figure 75 - 156.025 MHz - 155.5 MHz to 155.9625 MHz, Tx2

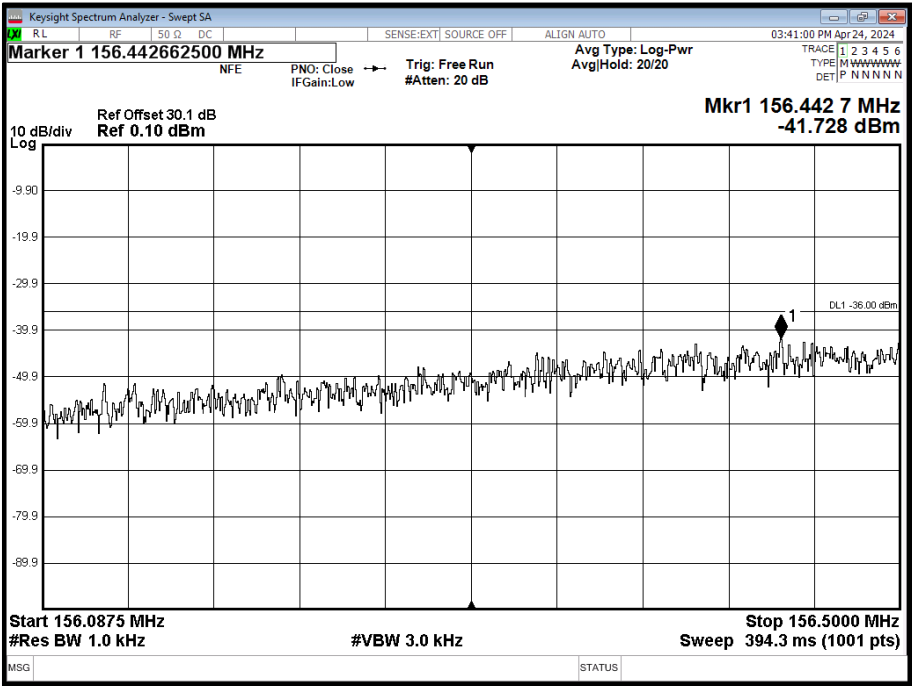


Figure 76 - 156.025 MHz - 156.0875 MHz to 156.5 MHz, Tx2

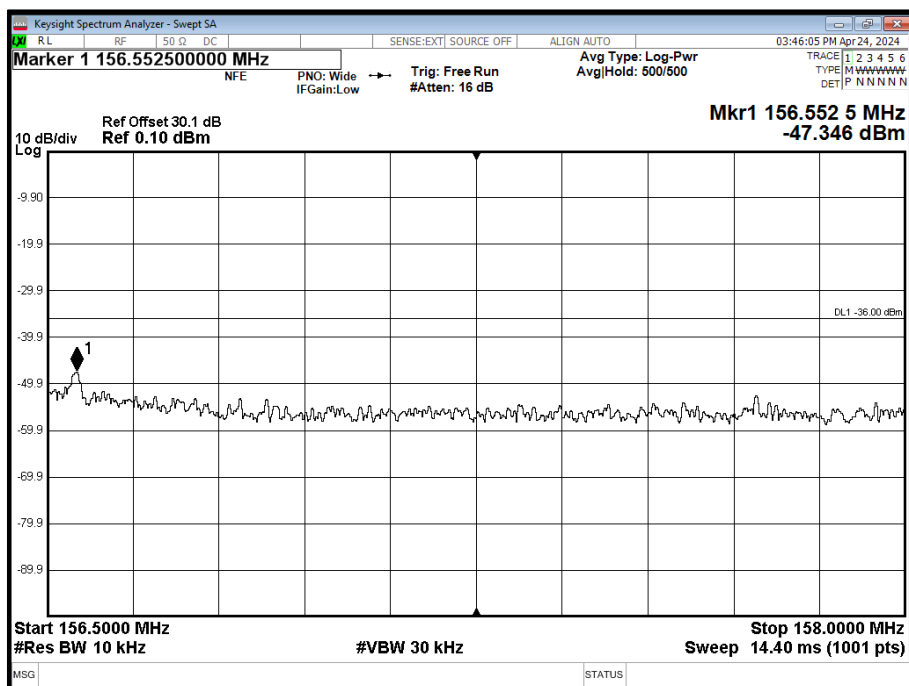


Figure 77 - 156.025 MHz - 156.5 MHz to 158 MHz, Tx2

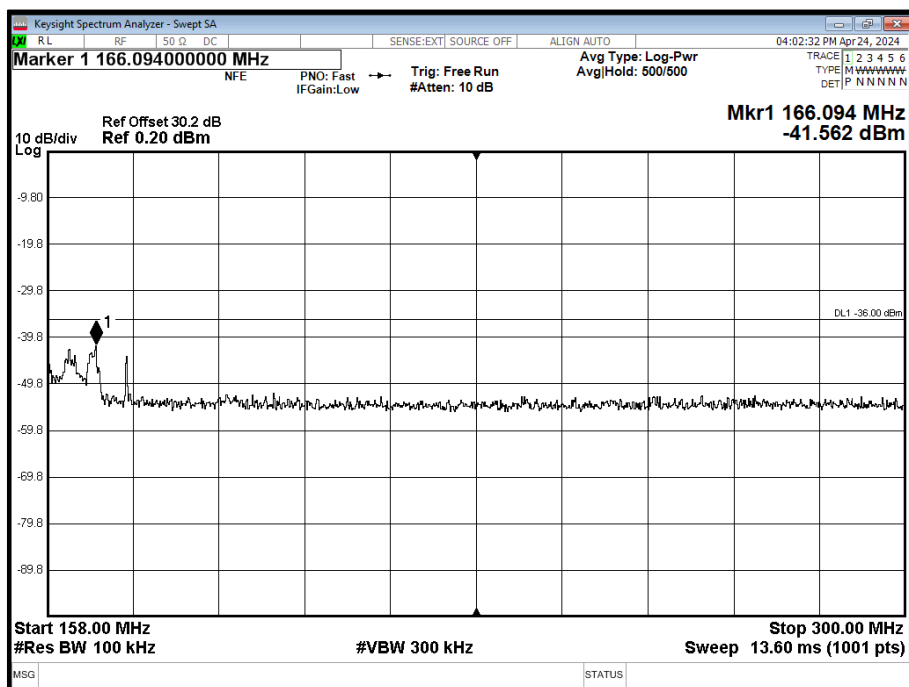


Figure 78 - 156.025 MHz - 158 MHz to 300 MHz, Tx2

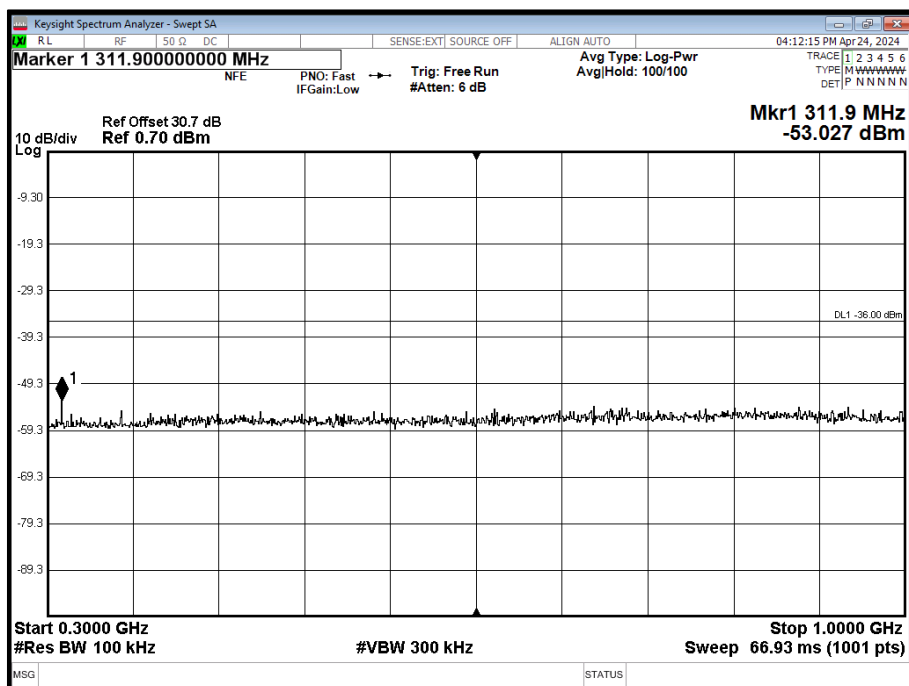


Figure 79 - 156.025 MHz - 300 MHz to 1 GHz, Tx2

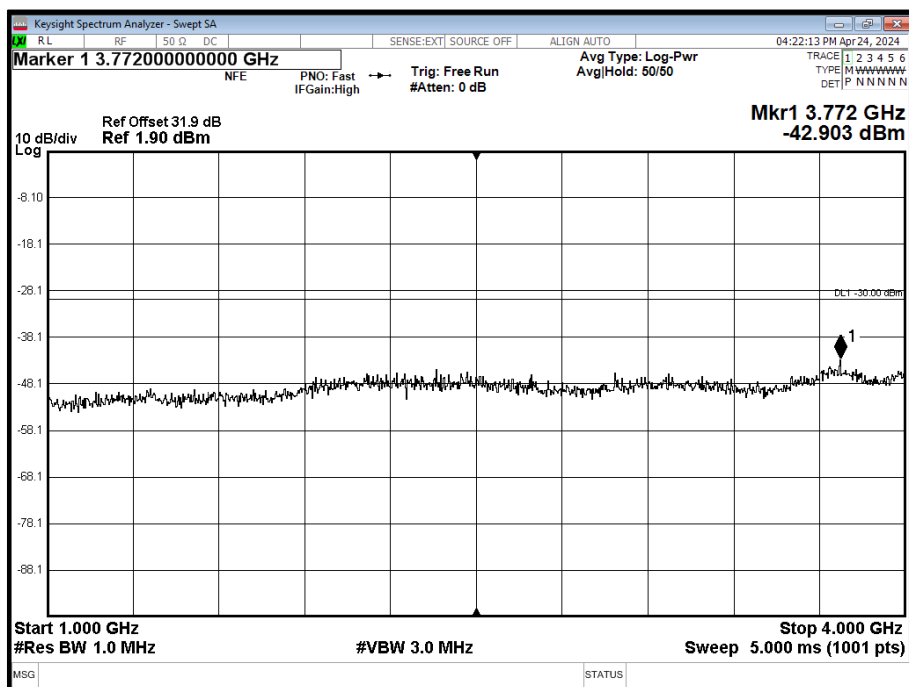


Figure 80 - 156.025 MHz - 1 GHz to 4 GHz, Tx2



Frequency (MHz)	Level (dBm)
161.5	-40.1
162.4	-41.5

Table 43 - Transmitter Emissions Results - 162.025 MHz

No other emissions were detected within 10 dB of the limit.

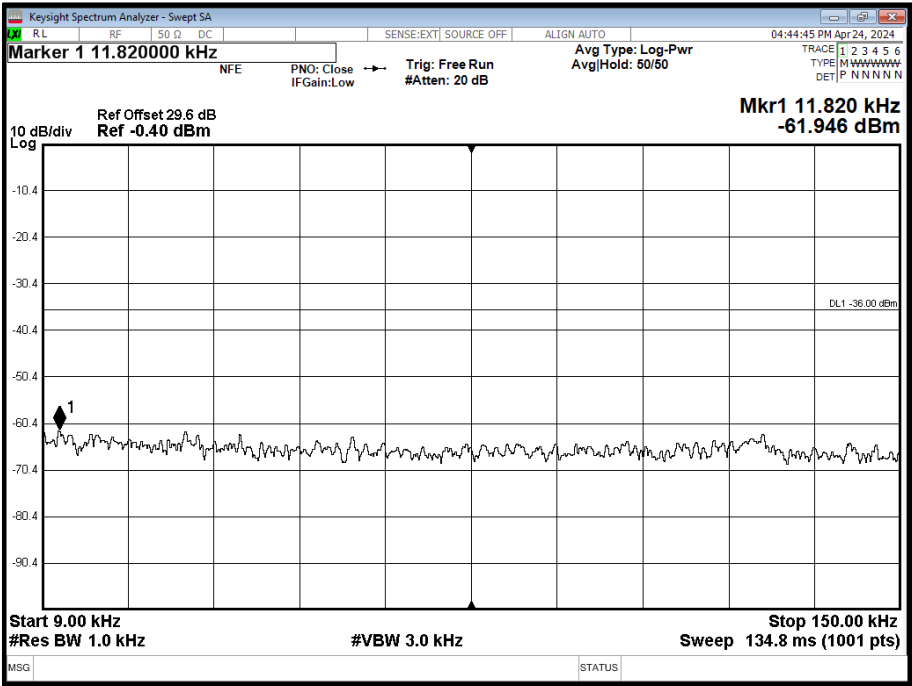


Figure 81 - 162.025 MHz - 9 kHz to 150 kHz, Tx2

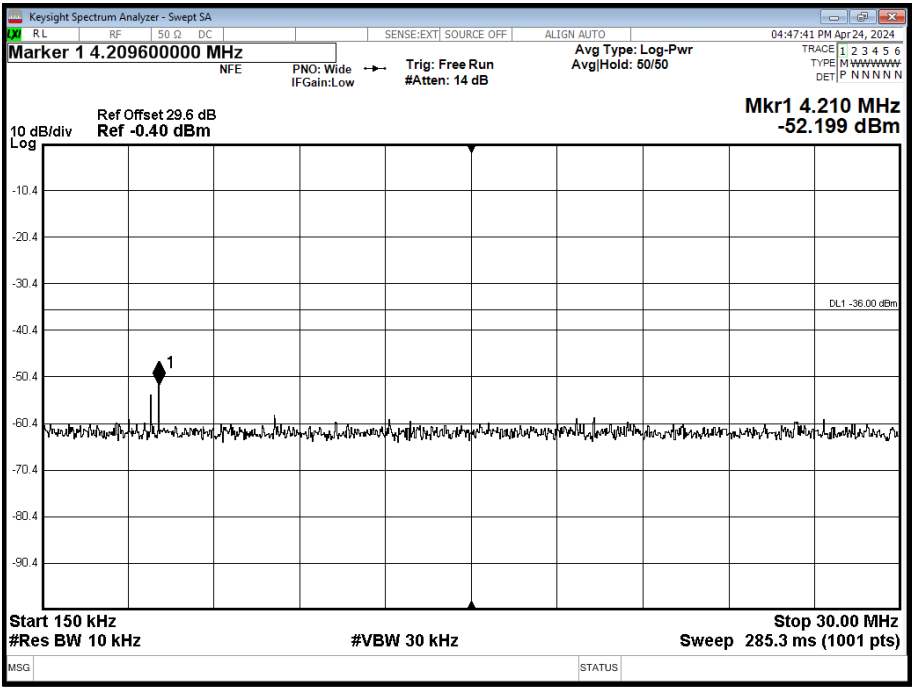


Figure 82 - 162.025 MHz - 150 kHz to 30 MHz, Tx2

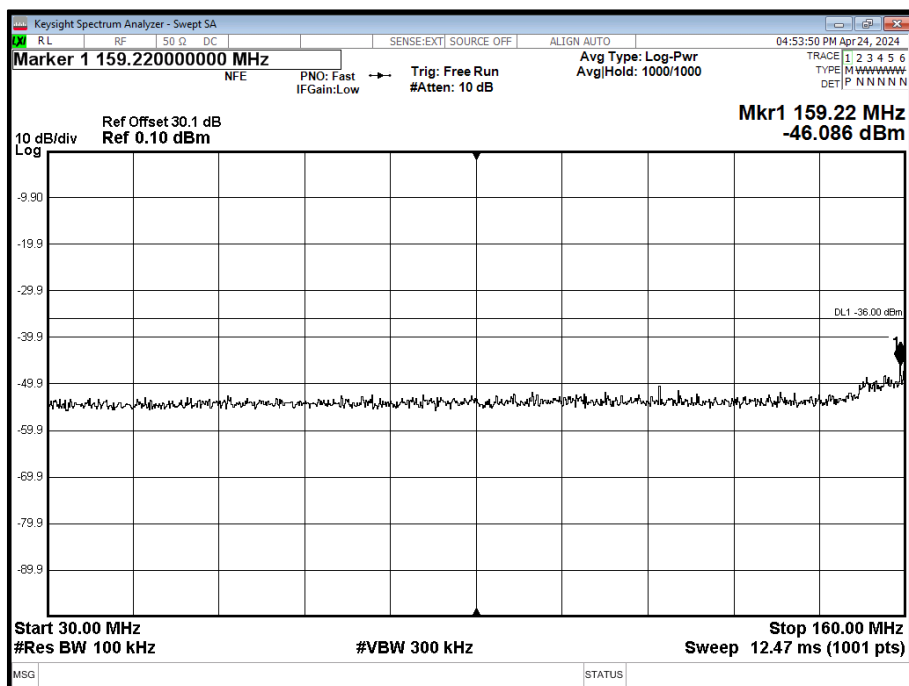


Figure 83 - 162.025 MHz - 30 MHz to 160 MHz, Tx2

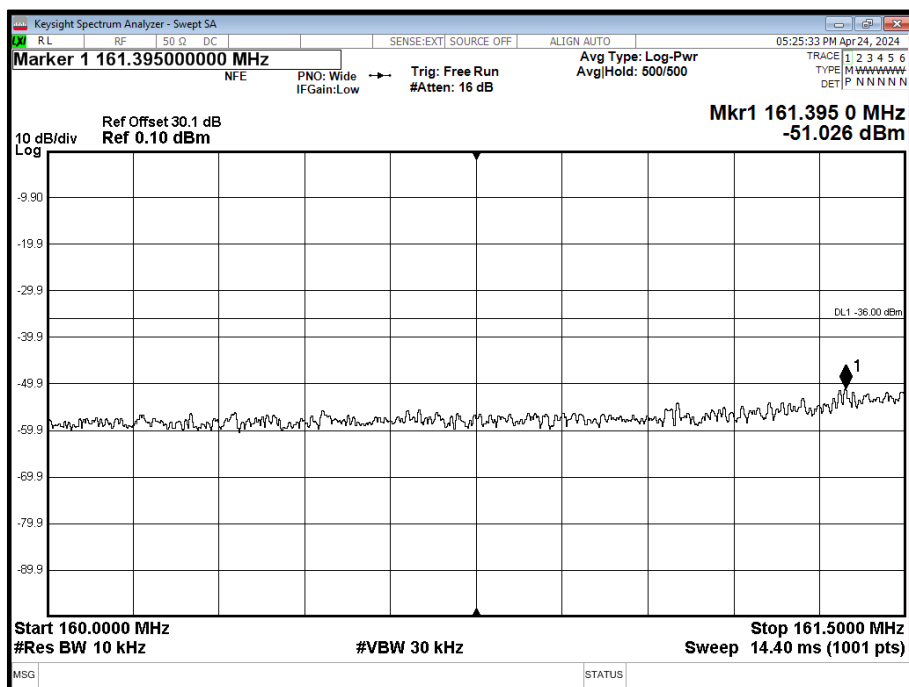


Figure 84 - 162.025 MHz - 160 MHz to 161.5 MHz, Tx2

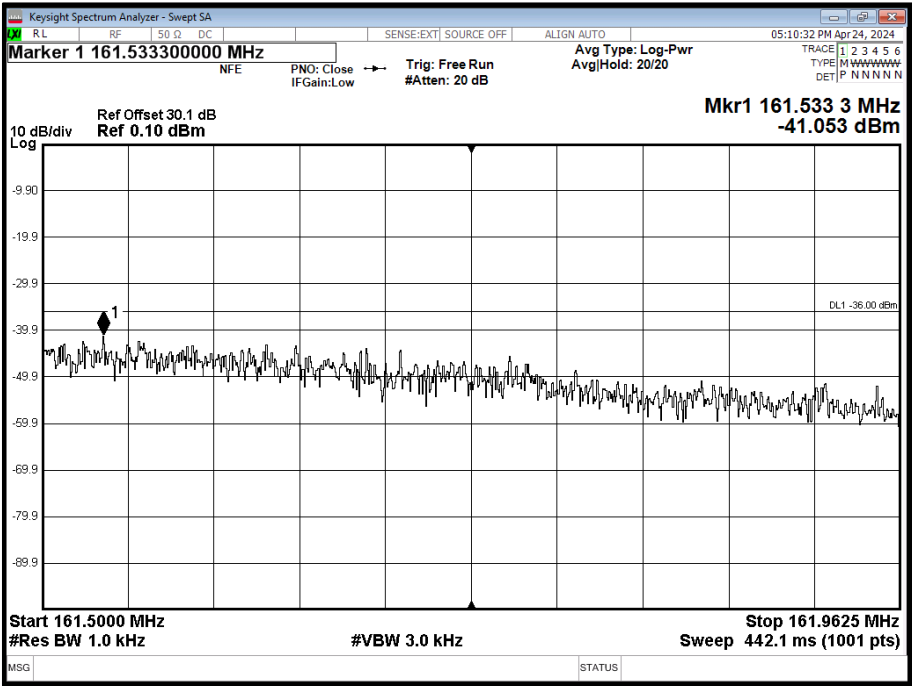


Figure 85 - 162.025 MHz - 161.5 MHz to 161.9625 MHz, Tx2

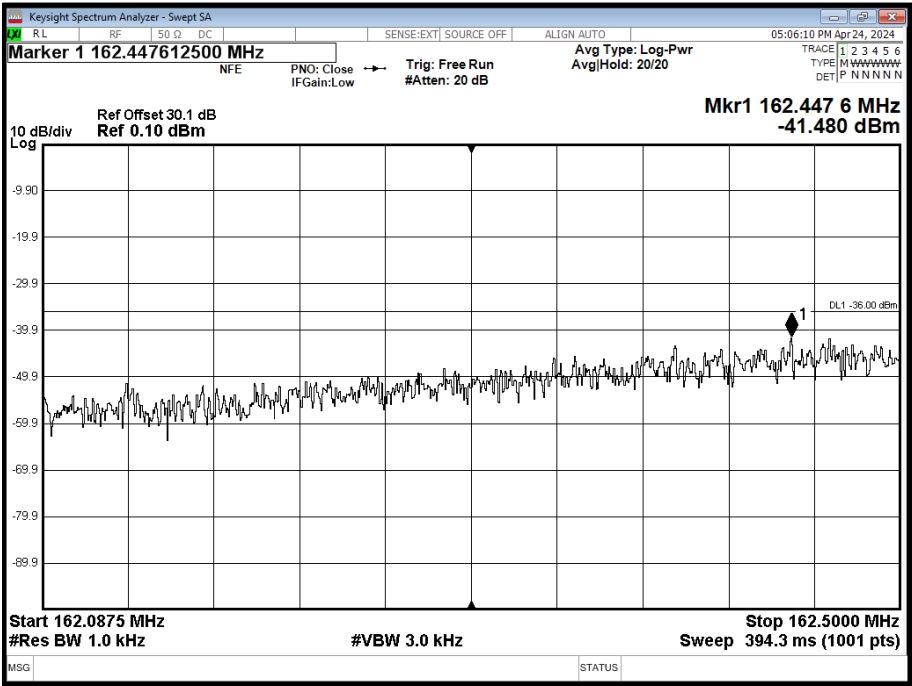


Figure 86 - 162.025 MHz - 162.0875 MHz to 162.5 MHz, Tx2

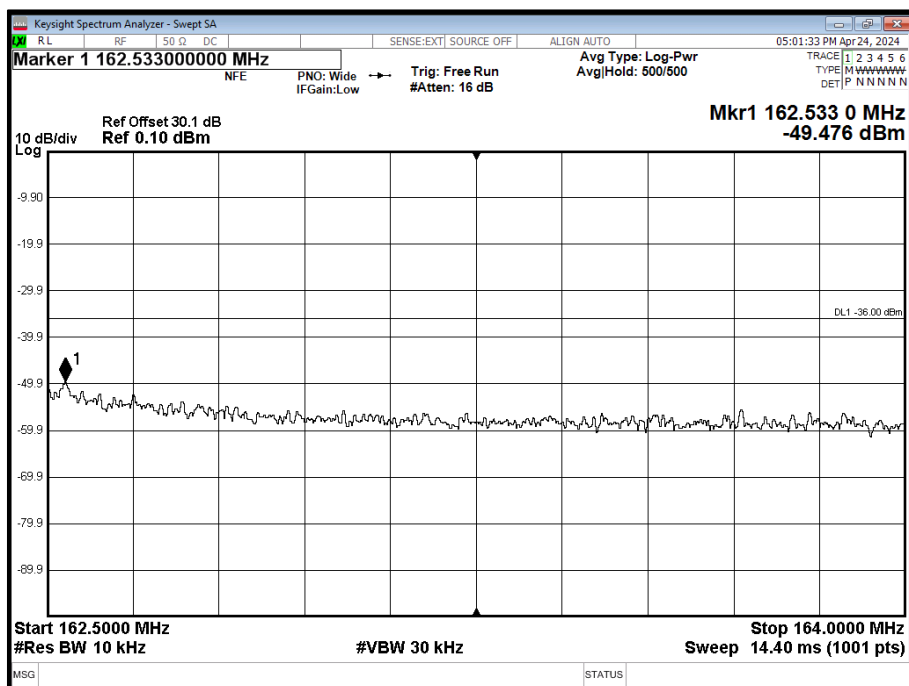


Figure 87 - 162.025 MHz - 162.5 MHz to 164 MHz, Tx2

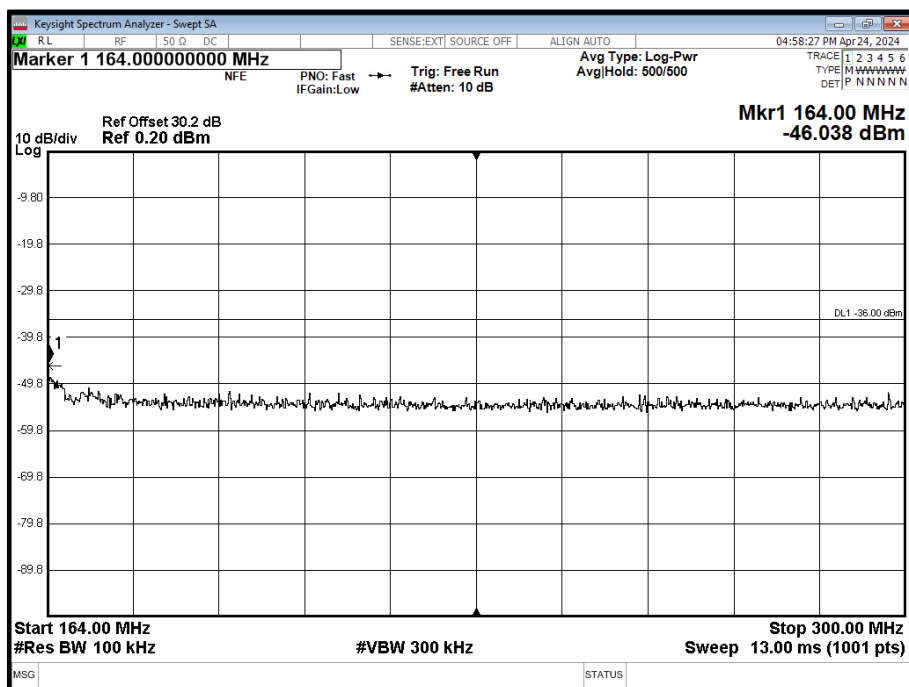


Figure 88 - 162.025 MHz - 164 MHz to 300 MHz, Tx2

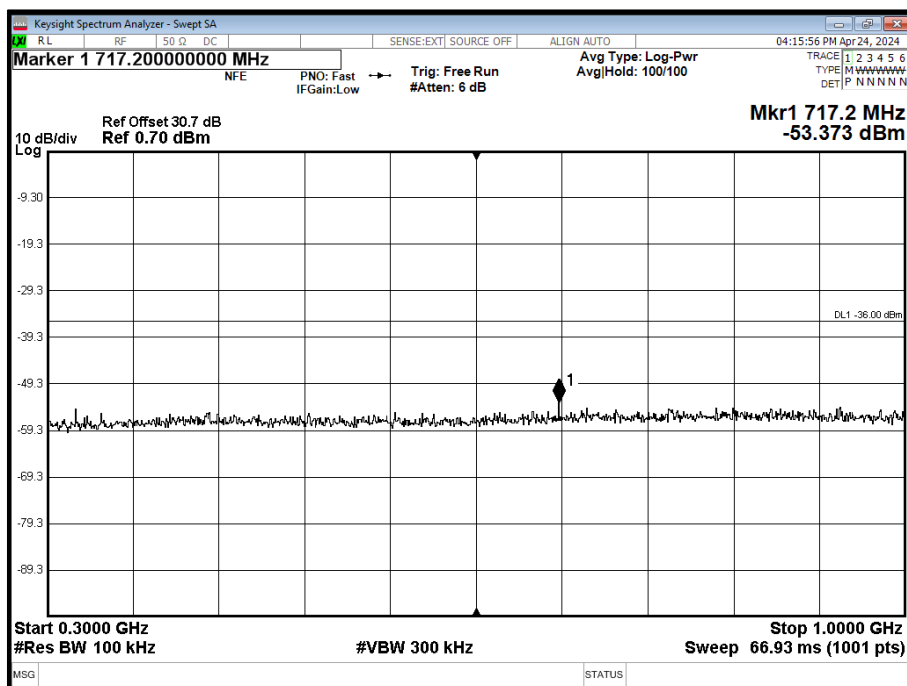


Figure 89 - 162.025 MHz - 300 MHz to 1 GHz, Tx2

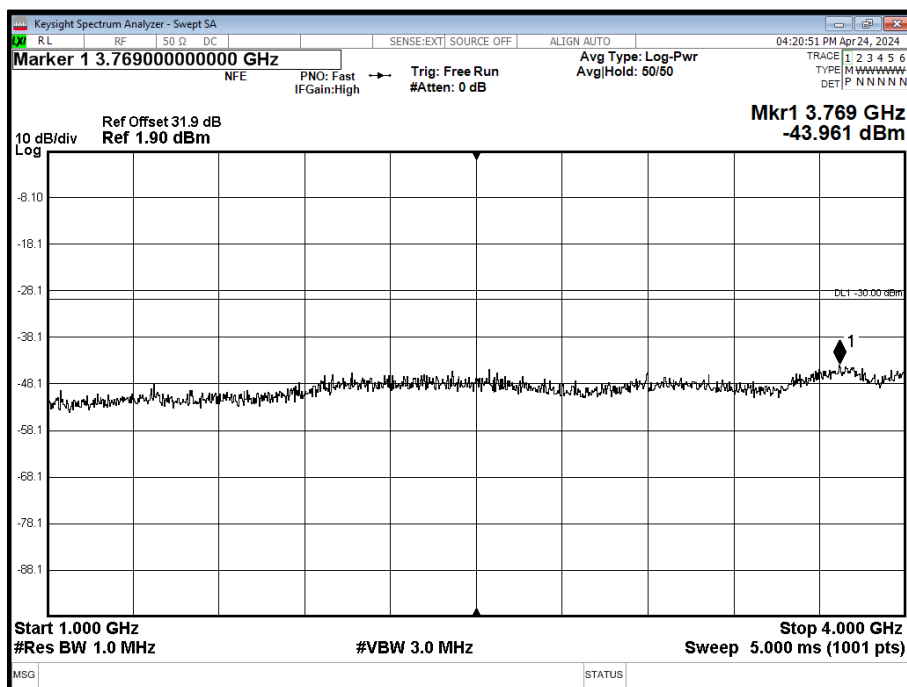


Figure 90 - 162.025 MHz - 1 GHz to 4 GHz, Tx2

IEC 62287-2, Limit Clause 11.3.2.3

The power of any spurious emission on any discrete frequency shall not exceed $0,25 \mu\text{W}$ (-36 dBm) in the frequency range 9 kHz to 1 GHz and $1 \mu\text{W}$ (-30 dBm) in the frequency range 1 GHz to 4 GHz.



2.14.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
High Pass Filter	Mini-Circuits	NHP-300	1640	12	26-May-2024
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Aug-2024
Attenuator (10dB, 150W)	Narda	769-10	3368	12	21-Mar-2025
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	20-Feb-2025
True RMS Multimeter	Fluke	179	4007	12	17-Nov-2024
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	26-Feb-2025
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	17-Feb-2025
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4512	12	24-Oct-2024
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	23-Jan-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB 40	5605	12	07-Nov-2024
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	14-Sep-2024

Table 44

O/P Mon – Output Monitored using calibrated equipment

3 Photographs

3.1 Equipment Under Test (EUT)



Figure 91 – X-100 Front View



Figure 92 – X-100 Rear View

4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Frequency Error	± 11 Hz
Carrier Power	± 0.45 dB
Transmission Spectrum	± 2.0 dB
Modulation Accuracy	± 2.0 dB
Transmitter Output Power Versus Time Function	± 2.0 dB
Sensitivity	± 1.8 dB
Error Behaviour at High Input Levels	± 1.8 dB
Co-channel Rejection	± 2.6 dB
Adjacent Channel Selectivity	± 2.6 dB
Spurious Response Rejection	± 2.6 dB
Intermodulation Response Rejection	± 1.7 dB
Blocking or Desensitisation	± 2.6 dB
Spurious Emissions from the Receiver	± 3.45 dB
Spurious Emissions from the Transmitter	± 3.45 dB

Table 45

Measurement Uncertainty Decision Rule – Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2021, Clause 4.4.3 (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8.