FCC and ISED Test Report

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

In accordance with FCC 47 CFR Part 80, FCC 47 CFR Part 2, ISED RSS-182 and ISED RSS-GEN

Prepared for: SRT Marine Technology Limited
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Midsomer Norton
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FCC ID: YYG-4310002 IC: 9384A-4310002B

COMMERCIAL-IN-CONFIDENCE

Document 75955807-17 Issue 01

SIGNATURE			
			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Simon Bennett	Technical Director (Lab Ops)	Authorised Signatory	18 June 2025

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

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Roscoe Harrison	18 June 2025	
Testing	Joshua Peploe-Williams	18 June 2025	

EXECUTIVE SUMMARY / ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on the test pages A sample of this product was tested to demonstrate limited compliance with FCC 47 CFR Part 80 (2024), FCC 47 CFR Part 2 (2023), ISED RSS-182 Issue 6 (2021-06) and ISED RSS-GEN Issue 5 (04-2018) + A2 (02-2021) for the tests detailed in section 1.3. The sample tested was found to comply with the requirements defined in the applied rules.

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Contents

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
01	First version	18-Jun-2025

Table 1

1.2 Introduction

Applicant	SRT Marine Technology Limited
Manufacturer	SRT Marine Technology Limited
Model Number(s)	X-100
Serial Number(s)	230587 and 4310002011730002
Hardware Version(s)	1.0
Software Version(s)	220200.01.00.00/20400.01.00.00
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 80 (2024), FCC 47 CFR Part 2 (2023), ISED RSS-182 Issue 6 (2021-06) and ISED RSS-GEN Issue 5 (04-2018) + A2 (02-2021)
Order Number	POR102834
Date	09-June-2022
Date of Receipt of EUT	14-April-2023
Start of Test	14-April-2025
Finish of Test	28-May-2025
Name of Engineer(s)	Roscoe Harrison and Joshua Peploe-Williams
Related Document(s)	ANSI C63.26 (2015) KDB 971168

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 80, FCC 47 CFR Part 2 and ISED RSS-182 and ISED RSS-GEN is shown below.

Section	Specification Clause				Test Description	Result	Comments/Base Standard
	Part 80	Part 2	RSS 182	RSS GEN			
Configuration and Mode: VHF - Voice Config Mode							
2.1	80.205,	2.1049	5.2	6.7	Bandwidths	Pass	ANSI C63.26 (2015)
2.2	80.209,	2.1055	5.5	6.11	Transmitter Frequency Tolerances	Pass	
2.3	80.211,	2.1051	5.9	6.13	Spurious Emissions at Antenna Terminals	Pass	ANSI C63.26 (2015)
2.4	80.211,	2.1051	5.9	6.13	Radiated Spurious Emissions	Pass	ANSI C63.26 (2015)
2.5	80.213,	2.1047	5.4	N/A	Modulation Requirements	Pass	
2.6	80.215,	2.1046	5.6	6.12	Transmitter Power	Pass	ANSI C63.26 (2015)
2.7	80.217(b)	N/A	N/A	N/A	Suppression of Interferance Aboard Ships	Pass	

Table 2

1.4 Customer Supplied Form

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	Class D DSC/VHF radio equipped with a class B transceiver and Digital Selective Calling (DSC) capabilities.		
Manufacturer:	Em-trak Marine Electronics		
Model:	X100		
Part Number:	431-0002		
Hardware Version:	1.0		
Software Version:	220200.00.08.12, 220400.00.08.09		
FCC ID of the product under test – see guidance here		YYG-4310002	
IC ID of the product under test – see guidance here		9384A-4310002B	
Device Category	Mobile ☒	Portable ☐	Fixed ☐
Equipment is fitted with an Audio Low Pass Filter		Yes ☒	No ☐

Intentional Radiators

Technology	Radio-telephone	DSC	AIS	WiFi	Bluetooth	
Frequency Range (MHz to MHz)	156.050 to 157.425	156.525	156.025 to 162.025	2412 to 2462	2402 to 2480	
Conducted Declared Output Power (dBm)	42.5	42.5	37	19.5	9	
Antenna Gain (dBi)	3	3	3	2.33	2.33	
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	0.025	0.025	0.025	20 to 40	0.9	
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	FM	AFSK	GMSK	DSSS, OFDM	GFSK	
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	16K0F3E	16K0G1D	16K0G1B	-	-	
Bottom Frequency (MHz)	156.050	156.525	156.025	2412	2402	
Middle Frequency (MHz)	156.725	156.525	159.025	2437	2441	
Top Frequency (MHz)	157.425	156.525	162.025	2462	2480	

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	2480 MHz
Lowest frequency generated or used in the device or on which the device operates or tunes	19.2 MHz
Class A Digital Device (Use in commercial, industrial or business environment) ☒ Class B Digital Device (Use in residential environment only) ☐	

AC Power Source

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

DC Power Source

Nominal voltage:	12	V
Extreme upper voltage:	31.2	V
Extreme lower voltage:	9.6	V
Max current:	6	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:		

Charging

Can the EUT transmit whilst being charged	Yes ☐ No ☐

Temperature

Minimum temperature:	-25	°C
Maximum temperature:	55	°C

Cable Loss

Adapter Cable Loss (Conducted sample)		dB

Antenna Characteristics

Antenna connector ☒			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☐	Type:		Gain		dBi
External antenna ☒	Type:	VHF Vertical Omni	Gain	3	dBi
For external antenna only: Standard Antenna Jack ☒ If yes, describe how user is prohibited from changing antenna (if not professional installed): It is specified in the User Instructions to only fit a 3dBi antenna. Equipment is only ever professionally installed ☐ Non-standard Antenna Jack ☐ All part 15 applications will need to show how the antenna gain was derived either from a manufacturer data sheet or a measurement. Where the gain of the antenna is inherently accounted for as a result of the measurement, such as field strength measurements on a part 15.249 or 15.231 device, so the gain does not necessarily need to be verified. However, enough information regarding the construction of the antenna shall be provided. Such information maybe photographs, length of wire antenna etc.					

Ancillaries (if applicable)

Manufacturer:		Part Number:	
Model:		Country of Origin:	

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

Name: Shannon Parsons
Position held: Compliance Technician
Date: 17 April 2025

1.5 Product Information

1.5.1 Technical Description

X-100 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
DSC/VHF Radio, Model: X-100, Serial Number: 4310002011730002			
0	As supplied by the customer	Not Applicable	Not Applicable
DSC/VHF Radio - Model: X-100, Serial Number: 230587			
8	Software update to v 00.08.12	Manufacturer	29-January-2025

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		
Bandwidths	Roscoe Harrison	UKAS
Transmitter Frequency Tolerances	Joshua Peploe-Williams	UKAS
Spurious Emissions at Antenna Terminals	Joshua Peploe-Williams	UKAS
Radiated Spurious Emissions	Joshua Peploe-Williams	UKAS
Modulation Requirements	Joshua Peploe-Williams	UKAS
Transmitter Power	Joshua Peploe-Williams	UKAS
Suppression of Interferance Aboard Ships	Joshua Peploe-Williams	UKAS

Table 4

Laboratory Address: TÜV SÜD, Octagon House,
Concorde Way, Fareham, Hampshire,
PO15 5RL, United Kingdom

2 Test Details

2.1 Bandwidths

2.1.1 Specification Reference

FCC 47 CFR Part 80, Clause 80.205
FCC 47 CFR Part 2, Clause 2.1049
ISED RSS-182, Clause 5.2
ISED RSS-GEN, Clause 6.7

2.1.2 Equipment Under Test and Modification State

X-100, S/N: 230587 - Modification State 8

2.1.3 Date of Test

14-April-2025

2.1.4 Test Method

AIS Transceiver - Operational

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 80.205, Part 2.1049, ISED RSS-GEN Clause 6.6 and ANSI C63.26-2015, Subclause 5.4.3.

The EUT was transmitting at maximum power, modulated by the standard AIS test signals using a PRBS packet payload. The EUT was connected to a spectrum analyser via a coaxial cable and attenuators, the RBW of the spectrum analyser was set to at least 1% of the emission bandwidth and a video bandwidth of 3 times RBW, the occupied bandwidth measurement function of the analyser was used and the 99% bandwidth was recorded.

The plots on the following pages show the resultant display from the Spectrum Analyser.

2.1.5 Environmental Conditions

Ambient Temperature	21.2 °C
Relative Humidity	36.8 %

2.1.6 Test Results

AIS Transceiver - Operational

99% Occupied Bandwidth (kHz)	
156.025 MHz	162.025 MHz
9.47	9.44

Table 5 - Occupied Bandwidth Results

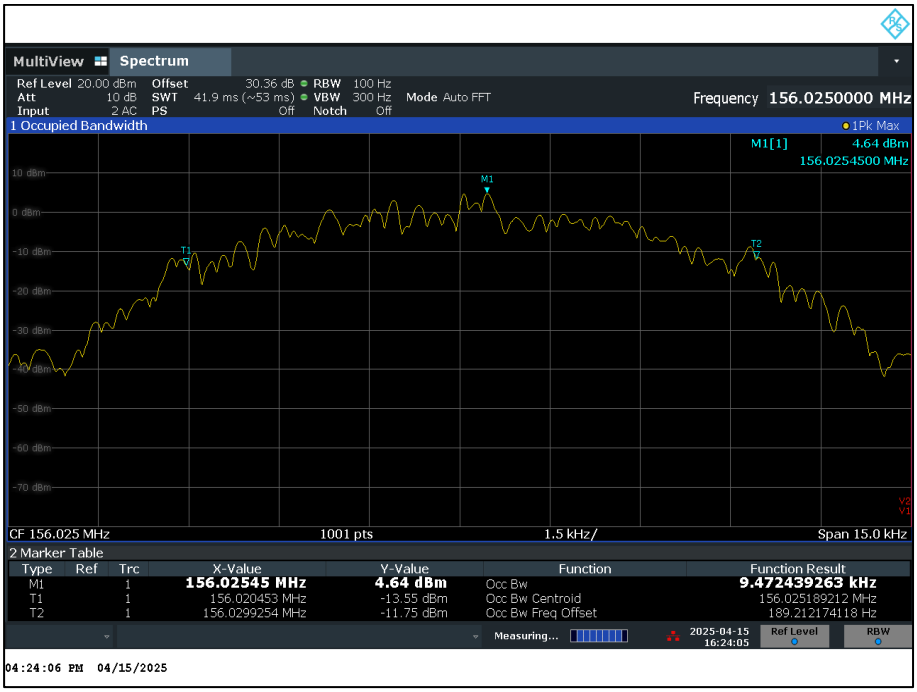

Figure 1 - 156.025 MHz Occupied Bandwidth

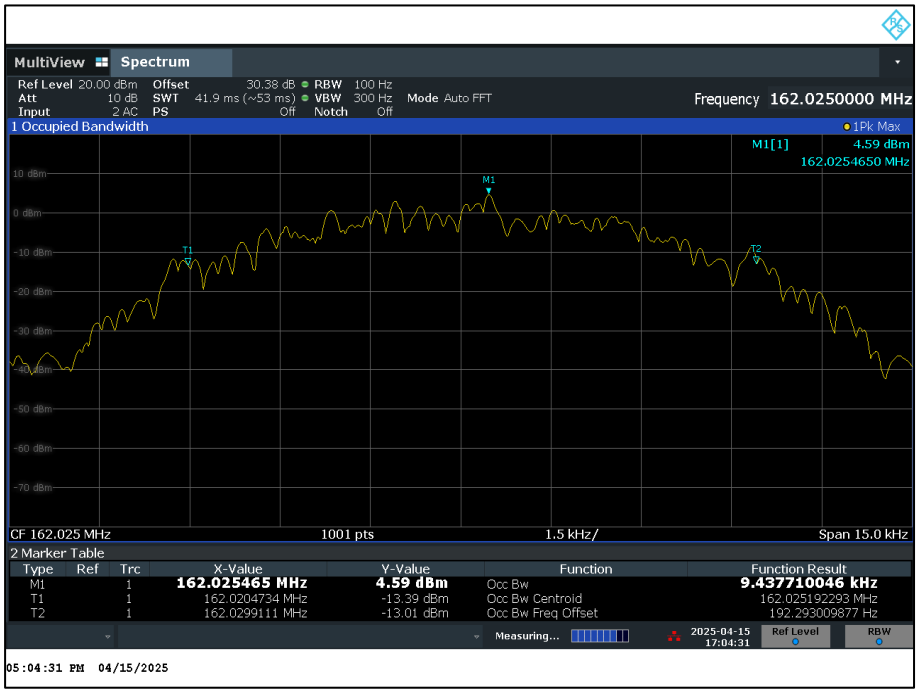

Figure 2 - 162.025 MHz Occupied Bandwidth

FCC 47 CFR Part 80, Limit Clause 80.205

20 kHz

ISED RSS-182, Limit Clause 5.4

20 kHz

2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Chamber 11.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
True RMS Multimeter	Fluke	79 Series III	411	12	09-Jan-2026
Hygrometer	Rotronic	I-1000	2891	12	02-Dec-2025
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Sep-2025
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Mar-2026
2m N(m) - N(m) RF Cable	Rhophase	NPS-2303-2000-NPS	3604	12	19-Feb-2026
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	17-Mar-2026
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	01-Feb-2026
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	06-May-2026
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Attenuator 30dB 100W	Weinschel	48-30-43-LIM	5135	12	05-Feb-2026

Table 6

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

2.2 Transmitter Frequency Tolerances

2.2.1 Specification Reference

FCC 47 CFR Part 80, Clause 80.209
FCC 47 CFR Part 2, Clause 2.1055
ISED RSS-182, Clause 5.5
ISED RSS-GEN, Clause 6.11.

2.2.2 Equipment Under Test and Modification State

X-100, S/N: 230587 - Modification State 8

2.2.3 Date of Test

15-May-2025

2.2.4 Test Method

AIS Transceiver - Operational
The test was applied in accordance with the test method requirements of FCC CFR 47 Part 80.209 (a) and FCC CFR 47 Part 2.1055 (a) (2), (d) (1).

The EUT was set to transmit on maximum power with an unmodulated carrier on bottom and top channels. The EUT was connected to a Spectrum Analyser using an external 10 MHz frequency reference. The difference between the frequency of the fundamental and the frequency of the assigned channel in accordance with the manufacture's documentation was recorded, this was done using a single marker method on the analyser. In accordance with 2.1055, the temperature was varied from -20°C to +50° in 10° steps. At both minimum and maximum voltage extremes the frequency error was measured at nominal temperature.

The settings on the Spectrum analyser were as follows:
RBW - 100 Hz
VBW - 300 Hz
Span - 25 KHz
Sweep points - 100001
Sweep time - Auto
Trace - Max Hold
Detector - Peak

2.2.5 Environmental Conditions

Ambient Temperature	20.4 °C
Relative Humidity	40.0 %

2.2.6 Test Results

AIS Transceiver - Operational

Voltage	Frequency Error (ppm)	
	156.025 MHz	162.025 MHz
10.2 V	1.461	1.384
13.8 V	1.445	1.390

Table 7
Table 8 - Frequency Stability Under Voltage Variations

Temperature	Frequency Error (ppm)	
	156.025 MHz	162.025 MHz
-20 °C	3.490	3.391
-10 °C	2.851	2.780
0 °C	2.157	2.085
10 °C	0.884	0.748
20 °C	0.043	0.056
30 °C	1.484	1.526
40 °C	2.043	1.966
50 °C	2.543	2.436

Table 9
Table 10 - Frequency Stability Under Temperature Variations

FCC 47 CFR Part 80, Limit Clause 80.209

± 10 ppm.

ISED RSS-182, Limit Clause 5.5

Coast Station: ±10.0 ppm for transmitter power less than 3 W.
±5.0 ppm for transmitter power between 3 W and 50 W.

Ship Station: ±10 ppm.

2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	75 Mk3	455	12	09-Jan-2026
Hygrometer	Rotronic	I-1000	2891	12	02-Dec-2025
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Sep-2025
2m N(m) - N(m) RF Cable	Rhophase	NPS-2303-2000-NPS	3604	12	19-Feb-2026
Meter & T/C	R.S Components	Meter 615-8206 & Type K T/C	3612	12	25-Sep-2025
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	01-Feb-2026
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	06-May-2026
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Attenuator 30dB 100W	Weinschel	48-30-43-LIM	5135	12	05-Feb-2026
Climatic Chamber	Weiss Technik	TempEvent T/180/40/3	5894	12	O/P Mon
GPSDR Frequency standard	Orolia	SecureSync 2402-053	6339	6	18-Sep-2025

Table 11

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

2.3 Spurious Emissions at Antenna Terminals

2.3.1 Specification Reference

FCC 47 CFR Part 80, Clause 80.211
FCC 47 CFR Part 2, Clause2.1051
ISED RSS-182, Clause 5.9
ISED RSS-GEN Clause 6.13.

2.3.2 Equipment Under Test and Modification State

X-100, S/N: 230587 - Modification State 8

2.3.3 Date of Test

16-May-2025 to 21-May-2025

2.3.4 Test Method

AIS Transceiver – Operational

For emissions where the frequency is removed less than 250% of the authorized bandwidth measurements were performed conducted as follows:

The EUT was connected to a spectrum analyser via a cable and attenuator. The path loss between the EUT and analyser was calibrated using a network analyser and entered in to the spectrum analyser as a reference level offset. The reference level for the mask was established with an RBW approximately 2 or 3 times the emission bandwidth. The RBW was then reduced to at least 1% of the emission bandwidth, with a VBW of 3 times RBW. The mask as per FCC CFR 47 Part 80.211 (f) was applied.

For emissions where the frequency is removed more than 250% of the authorized bandwidth measurements were performed conducted as follows:

Conducted: A network analyser was used to measure the path loss, and the worst case was entered as a reference level offset in to the spectrum analyser. The EUT was connected to a spectrum analyser via an attenuator, filter and cable. Between 9 kHz and 300 MHz a 50.4dB of attenuation was used to protect the analyser. Between 300 MHz and 2 GHz a 300 MHz high pass filter was used. The spectrum analyser was configured with an RBW of 100 kHz below 1 GHz and 1 MHz for frequencies greater than 1 GHz with the trace set to max hold using a peak detector.

2.3.5 Environmental Conditions

Ambient Temperature	21.0 - 21.2 °C
Relative Humidity	40.1 - 47.1 %

2.3.6 Test Results

AIS Transceiver - Operational

Figure 3 – Tx1, 156.025 MHz - Transmitter Spectrum Mask

Figure 4 – Tx1, 162.025 MHz - Transmitter Spectrum Mask

Figure 5 – Tx2, 156.025 MHz - Transmitter Spectrum Mask

Figure 6 – Tx2, 162.025 MHz - Transmitter Spectrum Mask

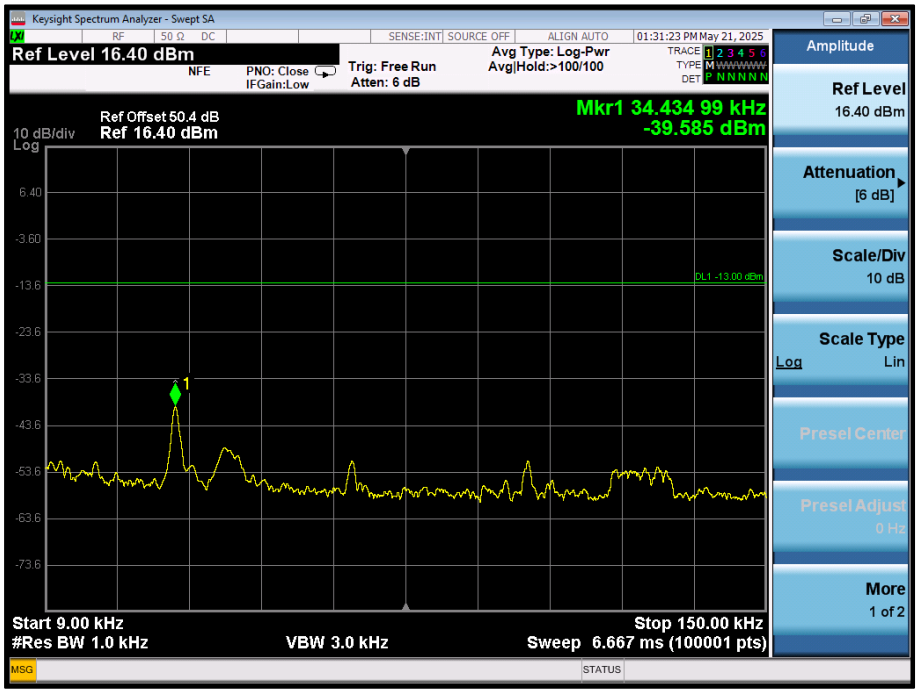

Figure 7 – Tx1, 156.025 MHz - 9 kHz to 150 kHz

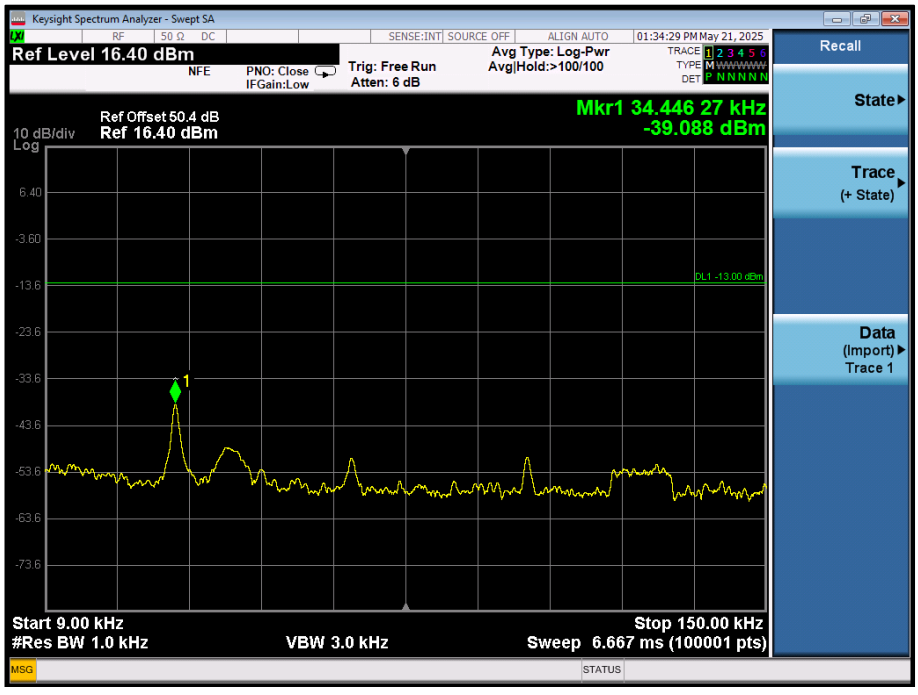

Figure 8 - Tx1, 162.025 MHz - 9 kHz to 150 kHz

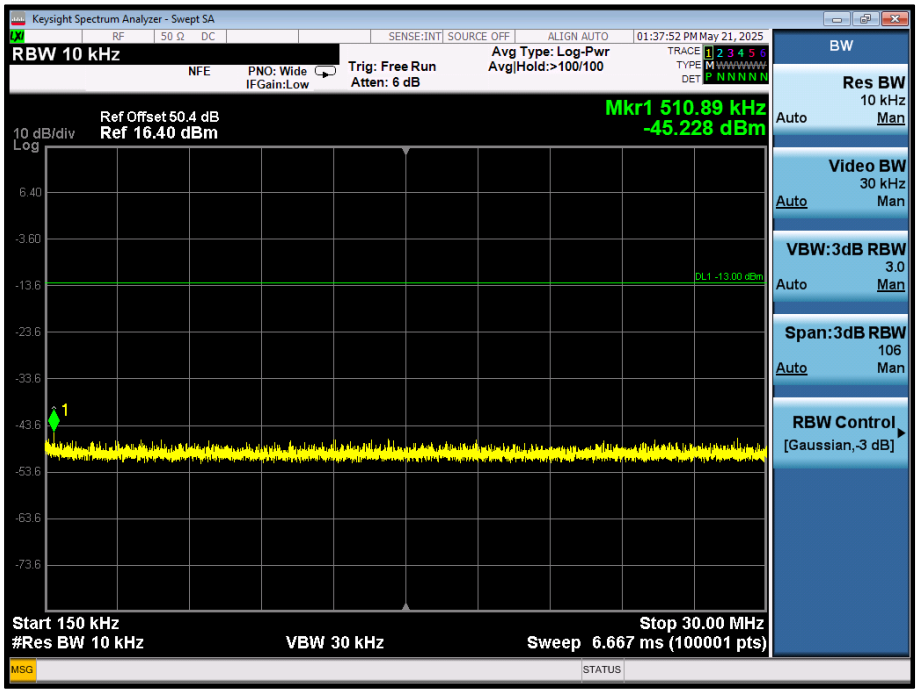

Figure 9 - Tx1, 156.025 MHz - 150 kHz to 30 MHz

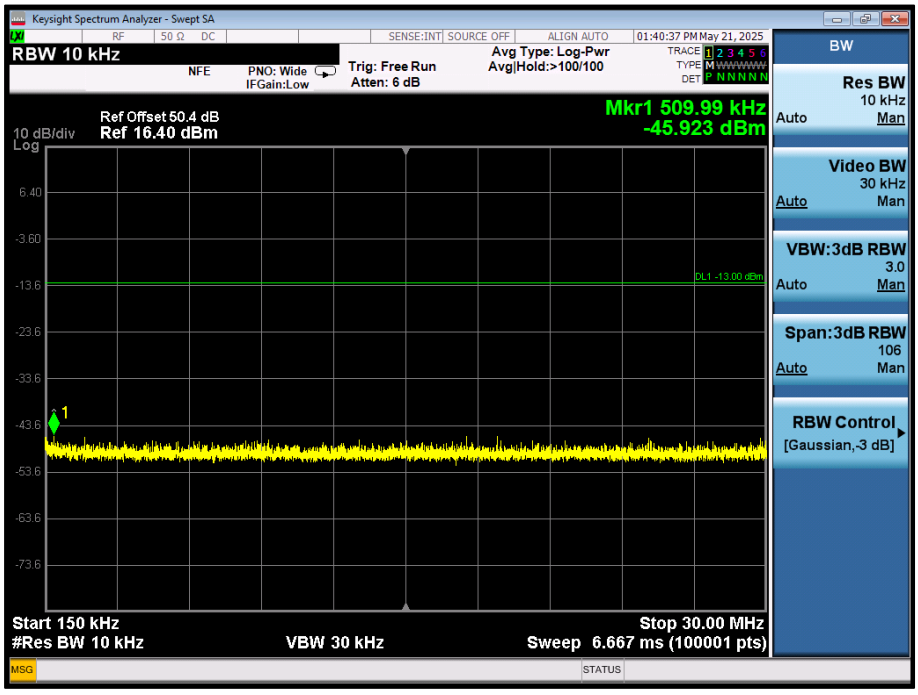

Figure 10 - Tx1, 162.025 MHz - 150 kHz to 30 MHz

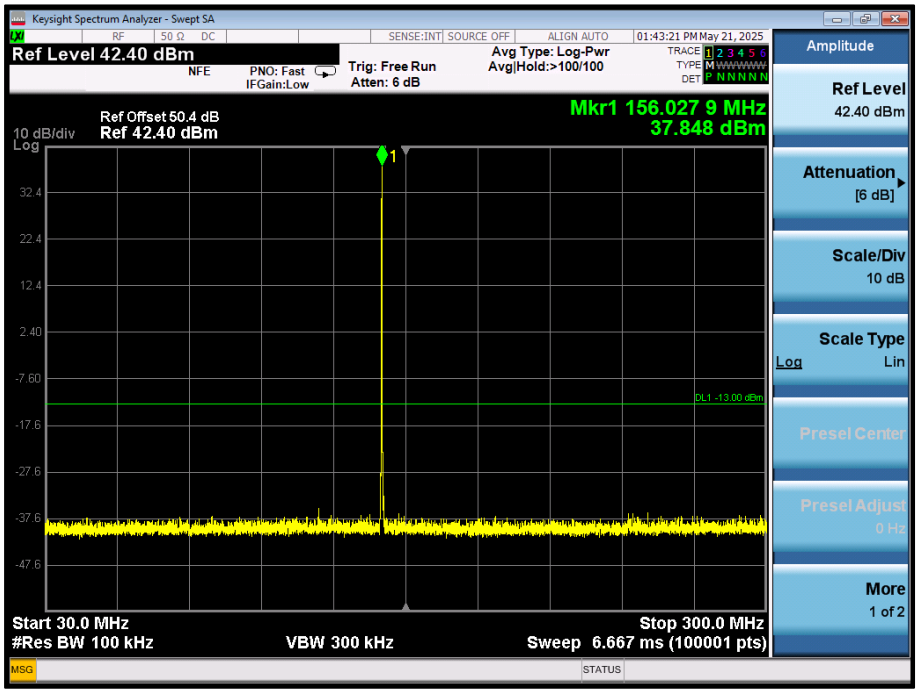

Figure 11 - Tx1, 156.025 MHz - 30 MHz to 300 MHz

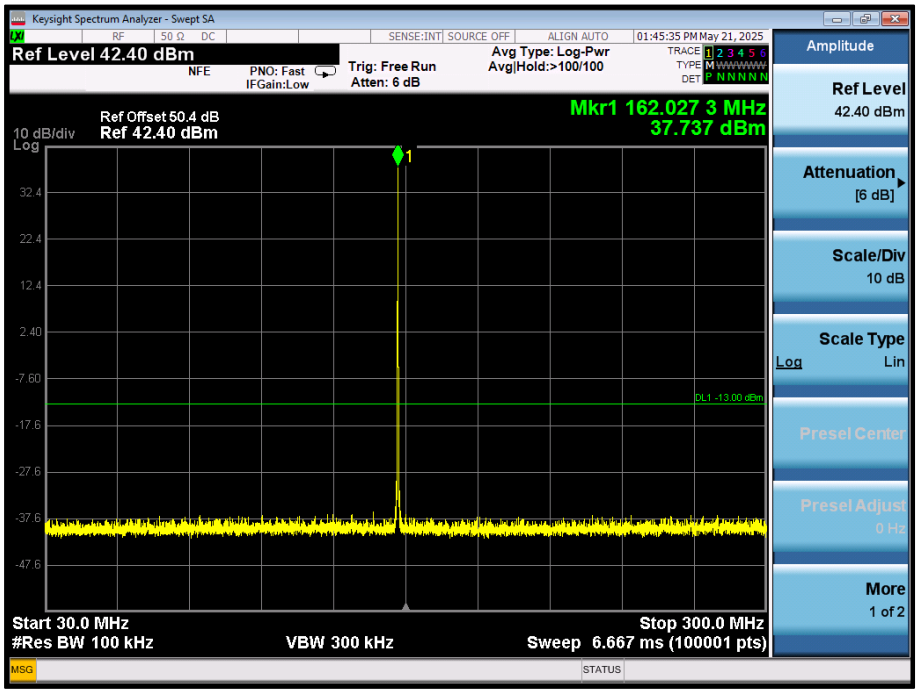

Figure 12 - Tx1, 162.025 MHz - 30 MHz to 300 MHz

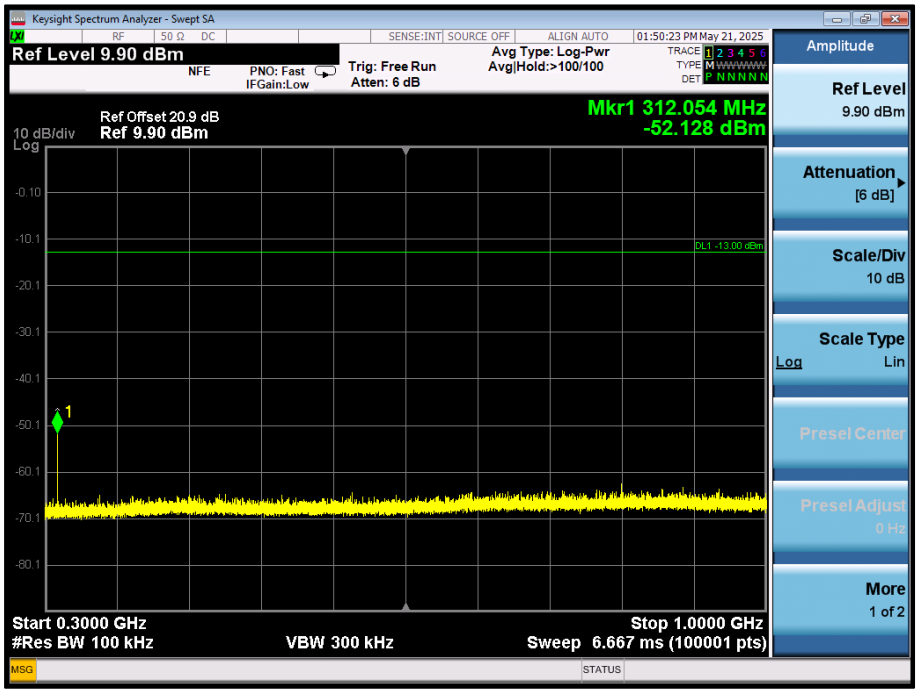

Figure 13 - Tx1, 156.025 MHz - 300 MHz to 1 GHz

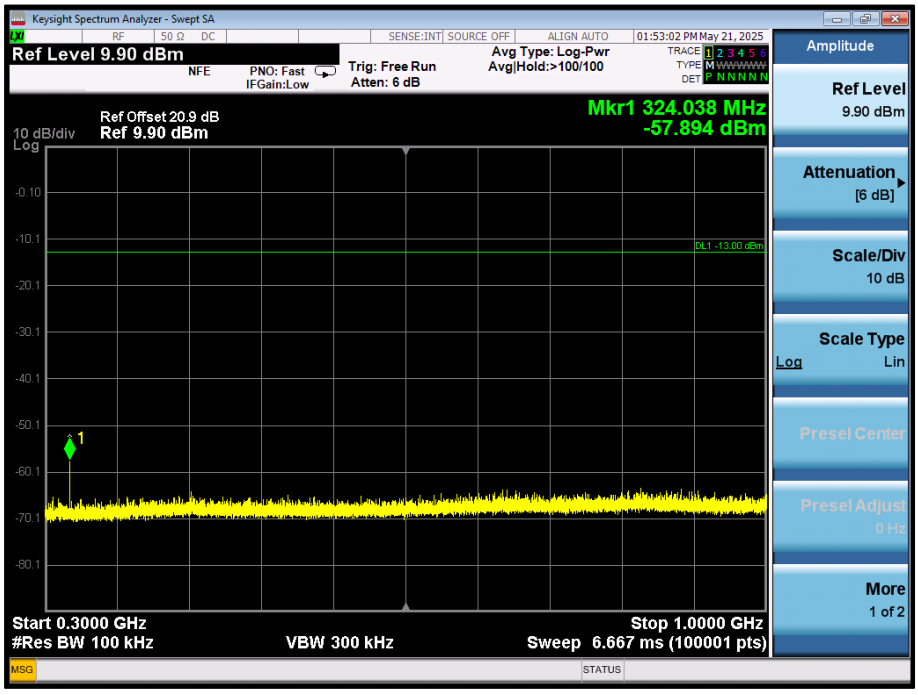

Figure 14 - Tx1, 162.025 MHz - 300 MHz to 1 GHz

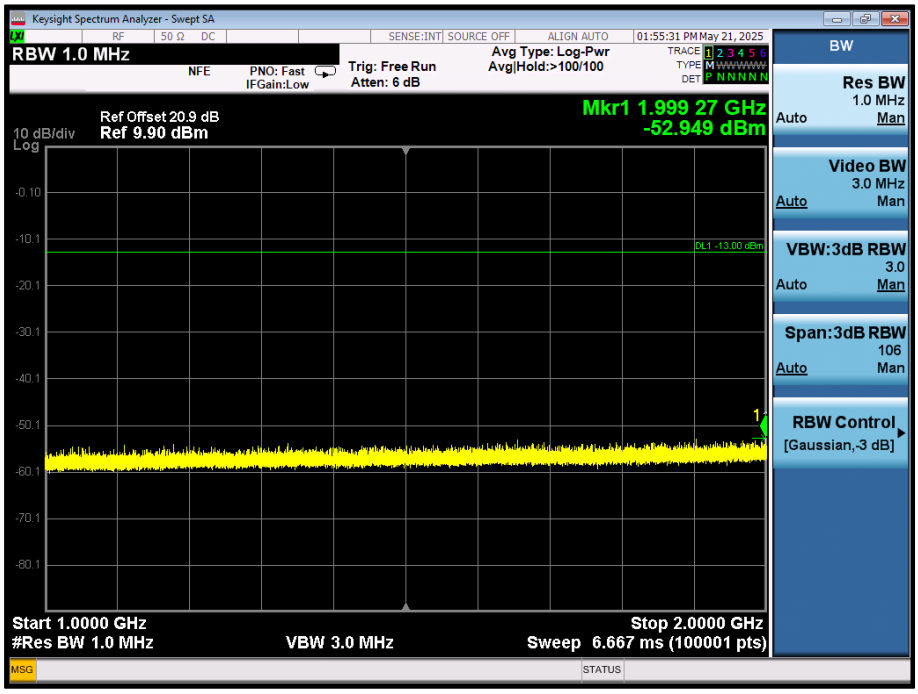

Figure 15 - Tx1, 156.025 MHz - 1 GHz to 2 GHz

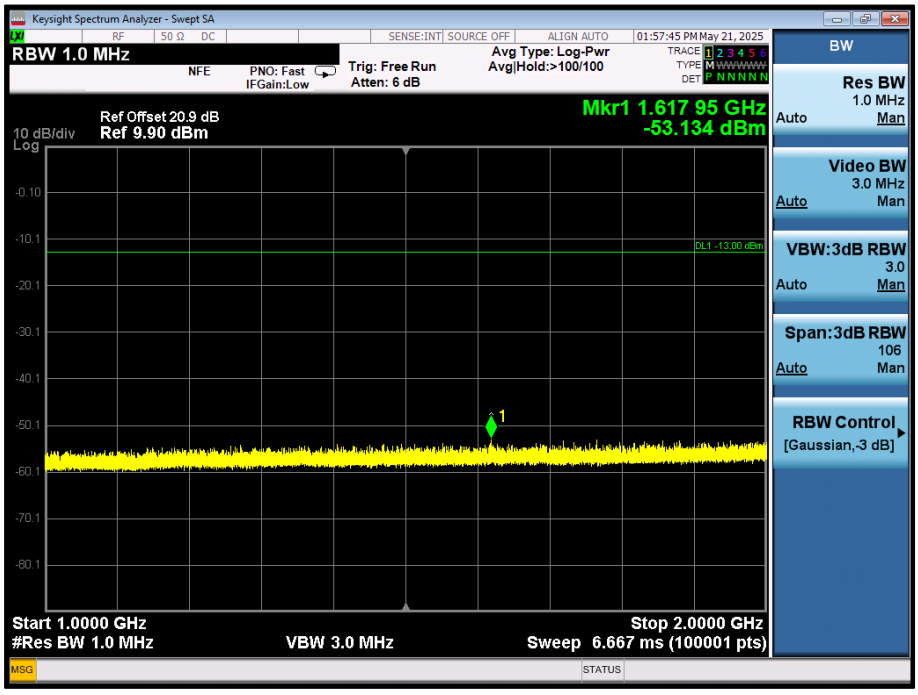

Figure 16 - Tx1, 162.025 MHz - 1 GHz to 2 GHz

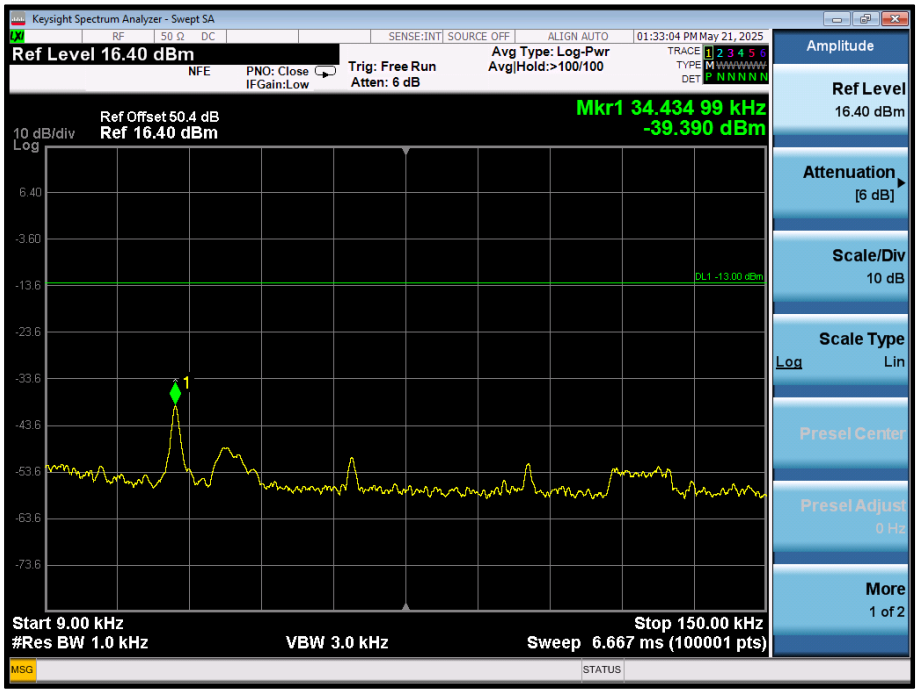

Figure 17 – Tx2, 156.025 MHz - 9 kHz to 150 kHz

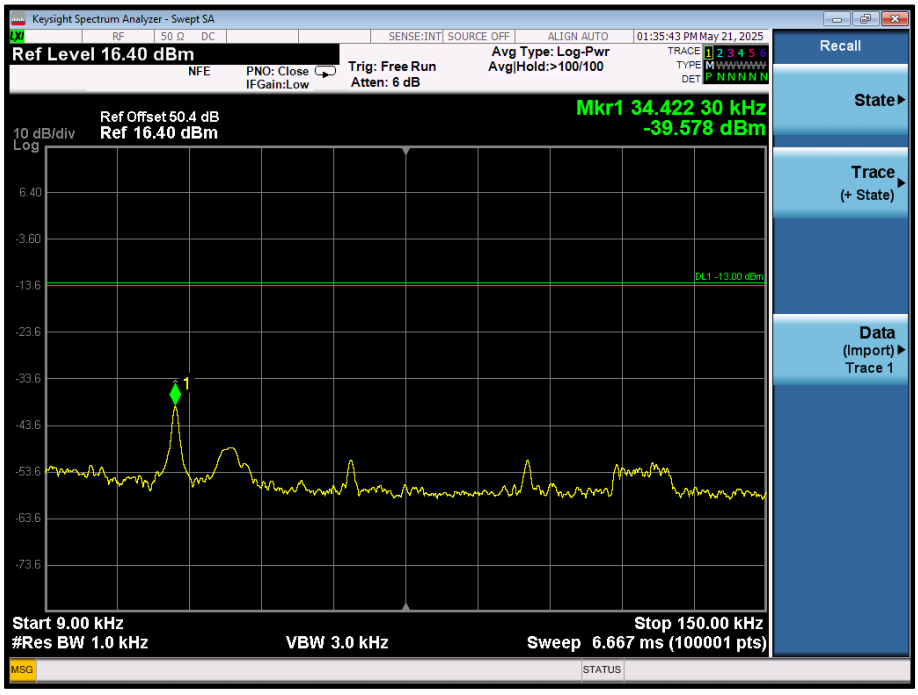

Figure 18 - Tx2, 162.025 MHz - 9 kHz to 150 kHz

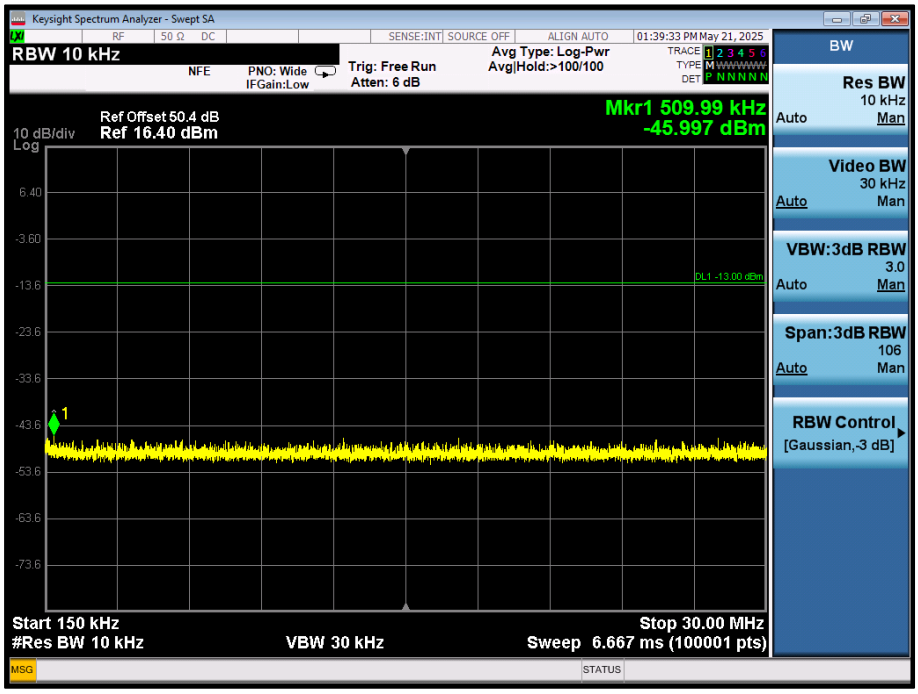

Figure 19 - Tx2, 156.025 MHz - 150 kHz to 30 MHz

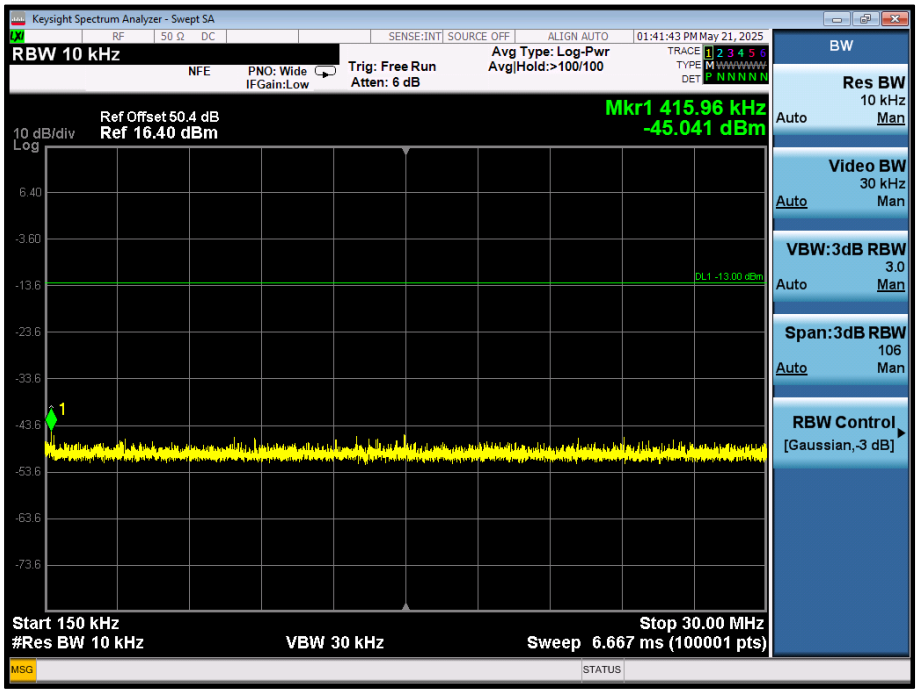

Figure 20 - Tx2, 162.025 MHz - 150 kHz to 30 MHz

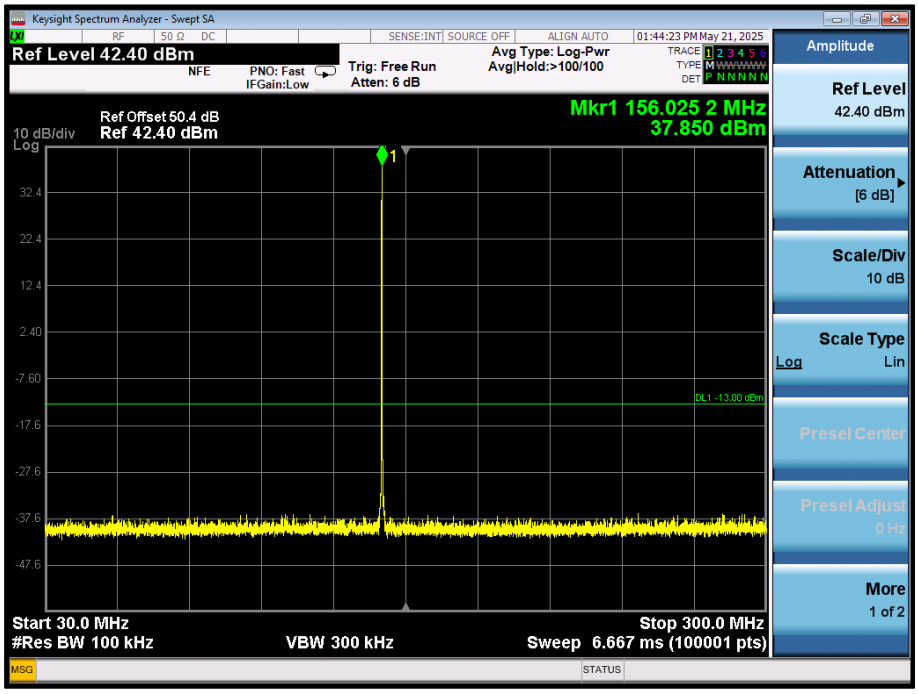

Figure 21 - Tx2, 156.025 MHz - 30 MHz to 300 MHz

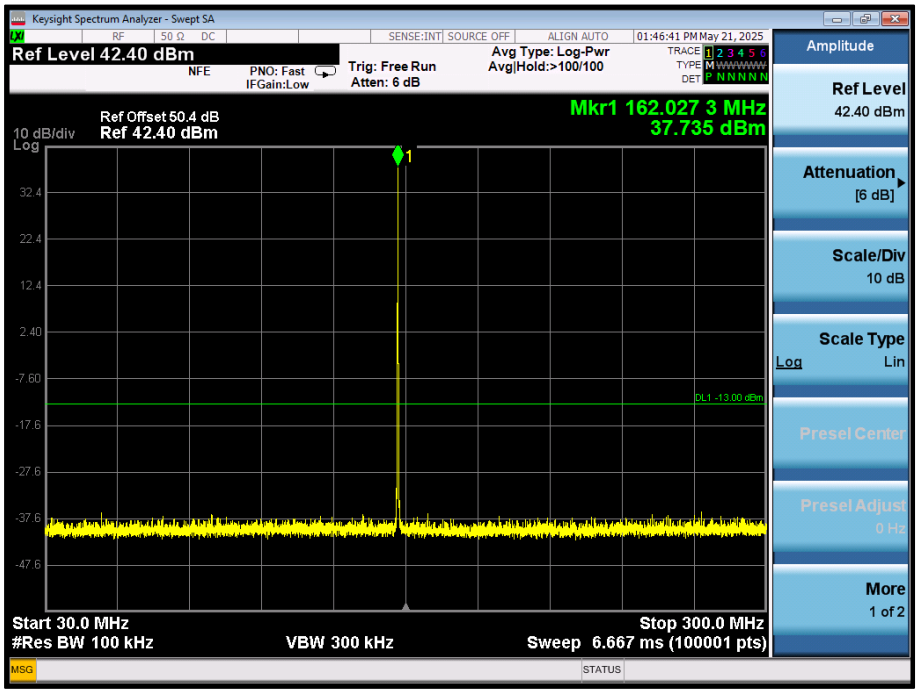

Figure 22 - Tx2, 162.025 MHz - 30 MHz to 300 MHz

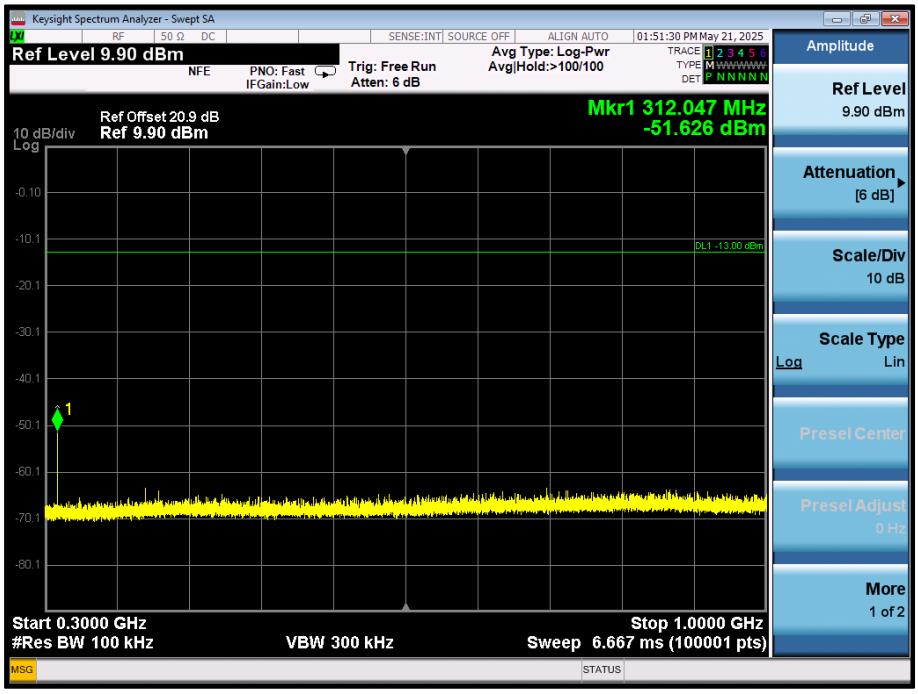

Figure 23 - Tx2, 156.025 MHz - 300 MHz to 1 GHz

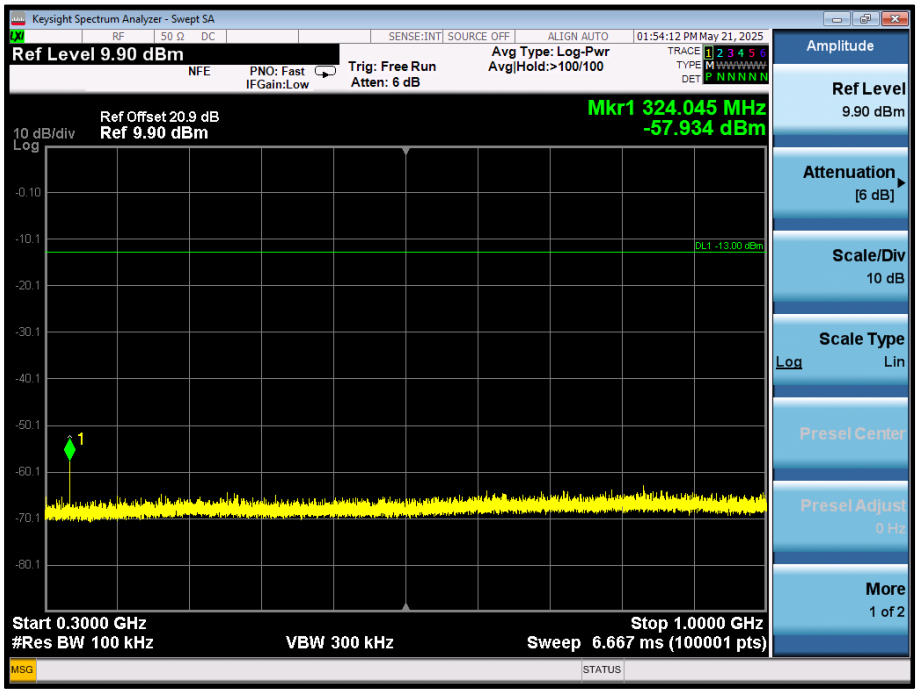

Figure 24 - Tx2, 162.025 MHz - 300 MHz to 1 GHz

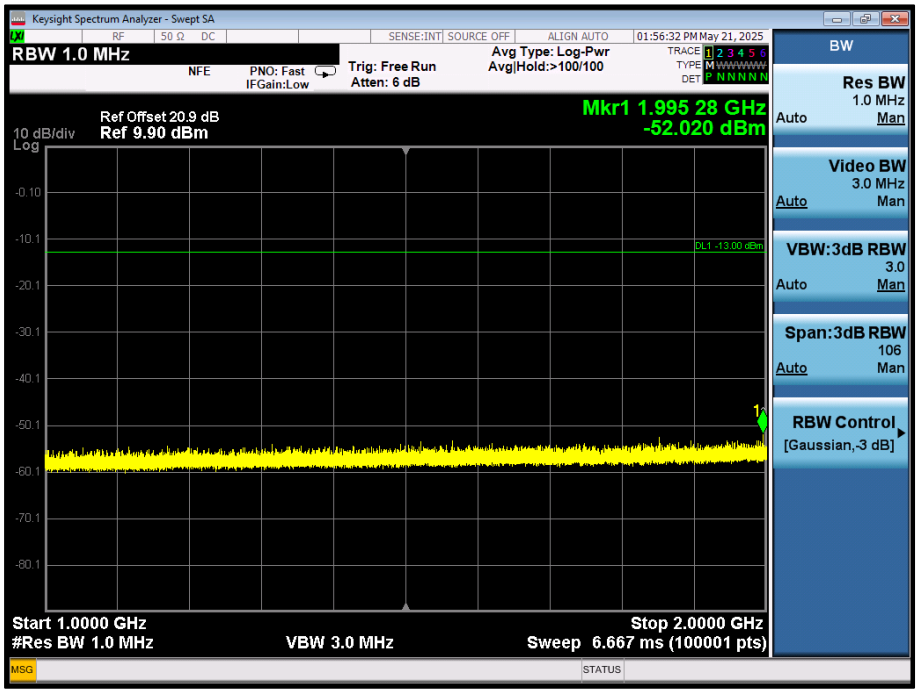

Figure 25 - Tx2, 156.025 MHz - 1 GHz to 2 GHz

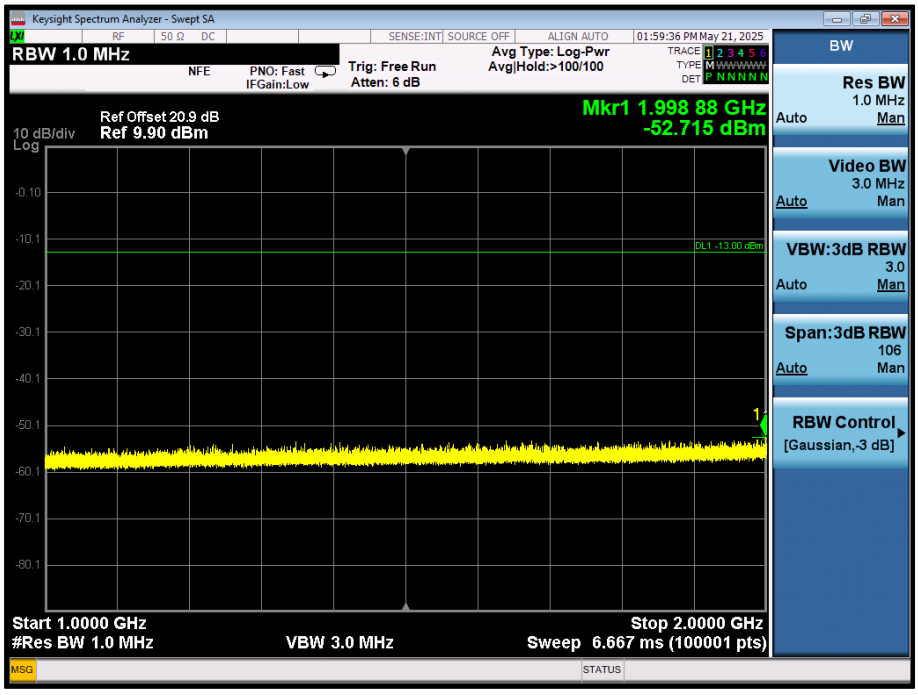

Figure 26 - Tx2, 162.025 MHz - 1 GHz to 2 GHz

FCC 47 CFR Part 80, Limit Clause 80.211

Within 250% of the Authorised Bandwidth:

On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB;

On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB

More than 250% of the Authorised Bandwidth:

On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB.

ISED RSS-182, Limit Clause 5.9.1

On any frequency removed from the carrier frequency by more than 50%, but not more than 100% of the authorized bandwidth: at least 25 dB, measured with a bandwidth of 300 Hz.

On any frequency removed from the carrier frequency by more than 100%, but not more than 250% of the authorized bandwidth: at least 35 dB, measured with a bandwidth of 300 Hz.

On any frequency removed from the carrier frequency by more than 250% of the authorized bandwidth: at least 43 + 10 log10 p(watts) dB, measured with a bandwidth of 30 kHz.

2.3.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Modulation Analyser	Hewlett Packard	8901B	45	12	03-Sep-2025
Multimeter	Fluke	75 Mk3	455	12	09-Jan-2026
Sensor	Hewlett Packard	11722A	493	12	04-Sep-2025
Audio Analyser	Hewlett Packard	8903B	576	12	04-Feb-2026
High Pass Filter	Mini-Circuits	NHP-300	1640	12	28-May-2025
Power Supply	Iso-tech	IPS 2010	2439	12	O/P Mon
Hygrometer	Rotronic	I-1000	2891	12	02-Dec-2025
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Sep-2025
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Mar-2026
2m N(m) - N(m) RF Cable	Rhophase	NPS-2303-2000-NPS	3604	12	19-Feb-2026
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	17-Mar-2026
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	01-Feb-2026
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	06-May-2026
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Attenuator 30dB 100W	Weinschel	48-30-43-LIM	5135	12	05-Feb-2026

Table 12

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

2.4 Radiated Spurious Emissions

2.4.1 Specification Reference

FCC 47 CFR Part 80, Clause 80.211
FCC 47 CFR Part 2, Clause 2.1051
ISED RSS-182, Clause 5.9
ISED RSS GEN, Clause 6.13.

2.4.2 Equipment Under Test and Modification State

X-100, S/N: 230587 - Modification State 8

2.4.3 Date of Test

27-May-2025

2.4.4 Test Method

AIS Transceiver – Operational

A preliminary profile of the Radiated Spurious Emissions was obtained up to the 10th harmonic by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst-case emissions together with the EUT azimuth and antenna polarisation.

The EUT was powered using a DC power supply at 12 V.

Testing was performed in accordance with ANSI C63.26, Clause 5.5.

Prescans and final measurements were performed using the direct field strength method. Field strength measurements were performed and then converted to Equivalent Power Measurements in accordance with ANSI C63.26, Clause 5.2.7 equation c)

Example calculation:
E (dBuV/m) + 20log(d) - 104.8 = EIRP (dBm) where (d) is the measurement distance.
82.2 (dBuV/m) + 20log(3) – 104.8 = EIRP (dBm)
-13.0 = EIRP (dBm)

2.4.5 Example Test Setup Diagram

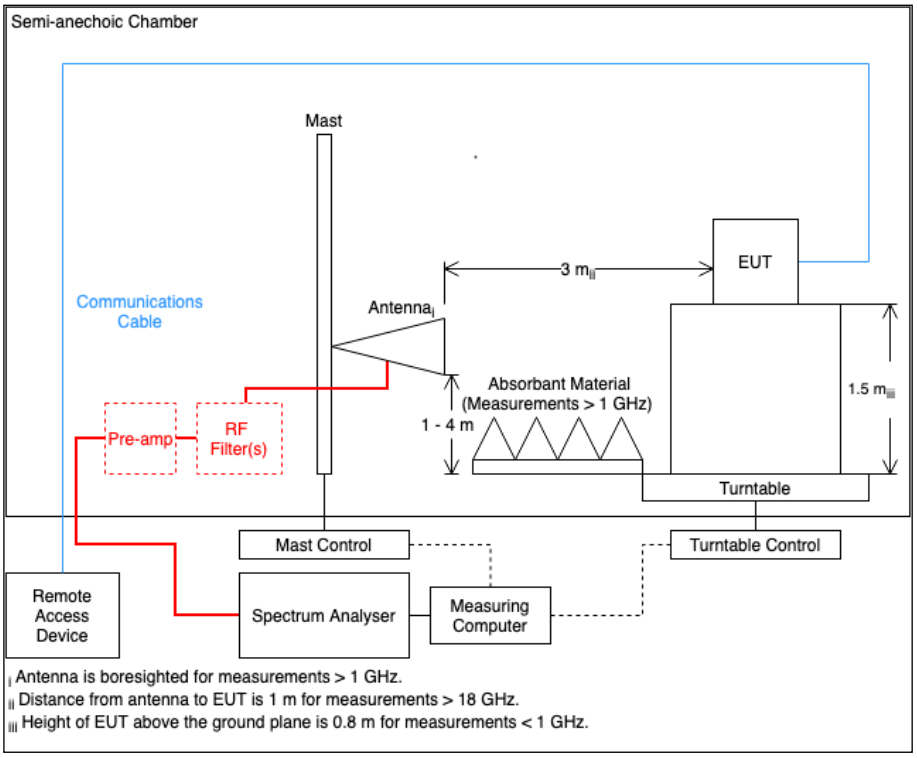

Figure 27

2.4.6 Environmental Conditions

Ambient Temperature	19.8 °C
Relative Humidity	42.9 %

2.4.7 Test Results

AIS Transceiver - Operational

Frequency (MHz)	Level (dBm)
*	

Table 13 - 156.025 MHz - Emissions Results

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

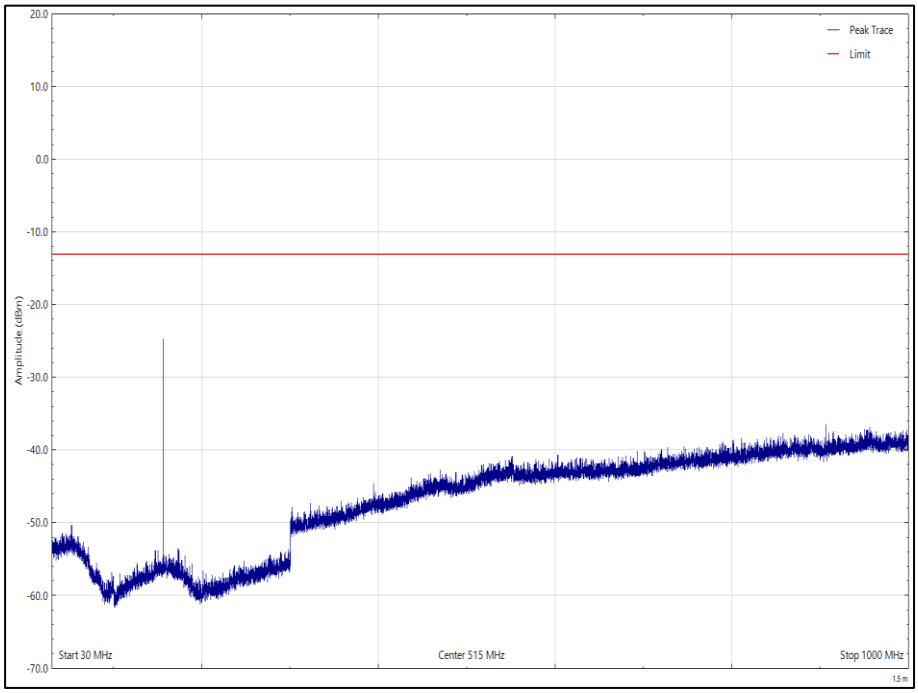

Figure 28 - 156.025 MHz - 30 MHz to 1 GHz, Horizontal Polarisation

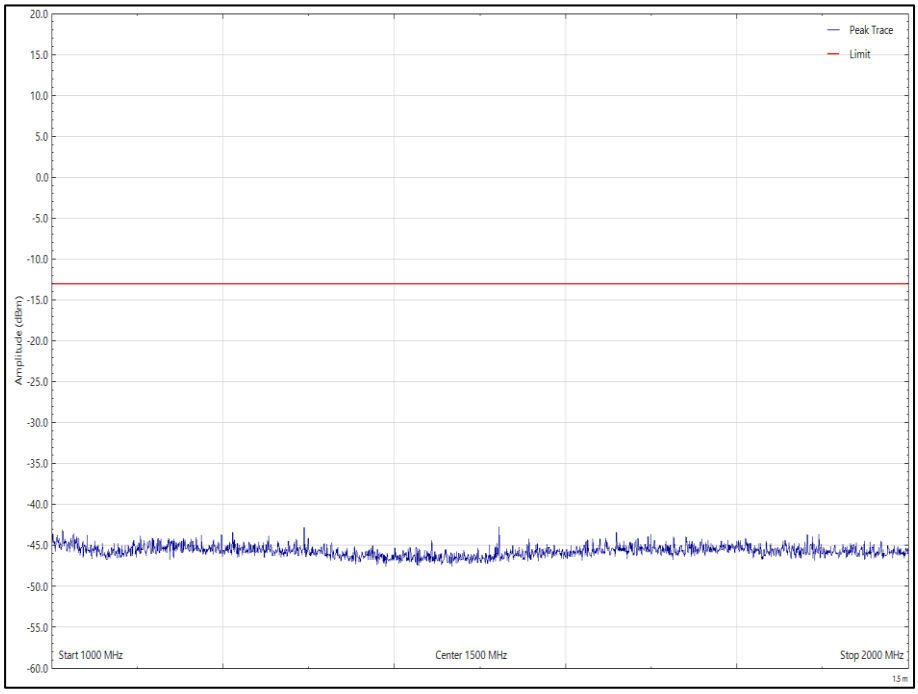

Figure 29 - 156.025 MHz - 1 GHz to 2 GHz, Horizontal Polarisation

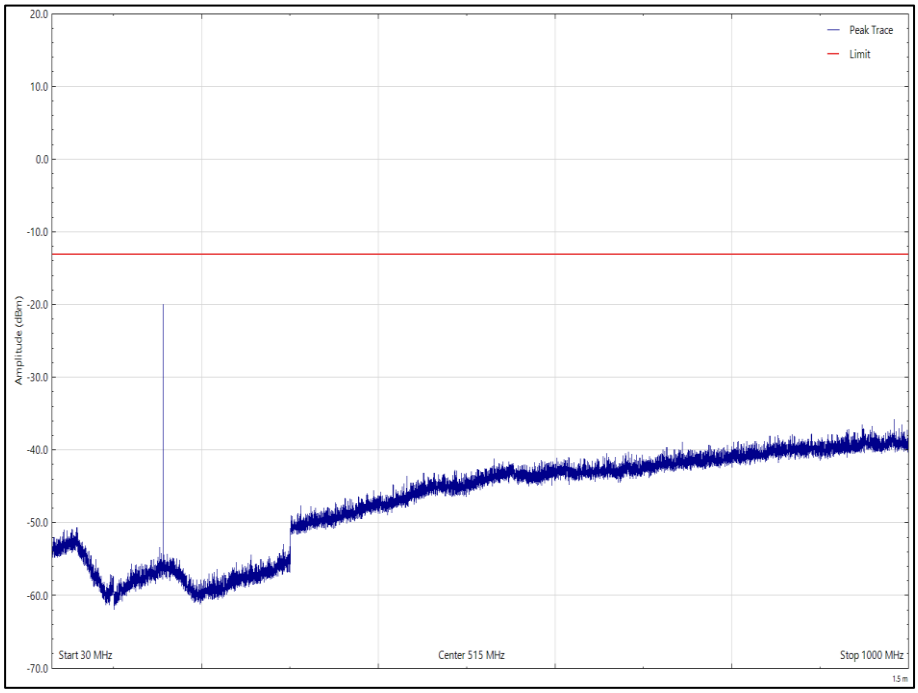

Figure 30 - 156.025 MHz - 30 MHz to 1 GHz, Vertical Polarisation

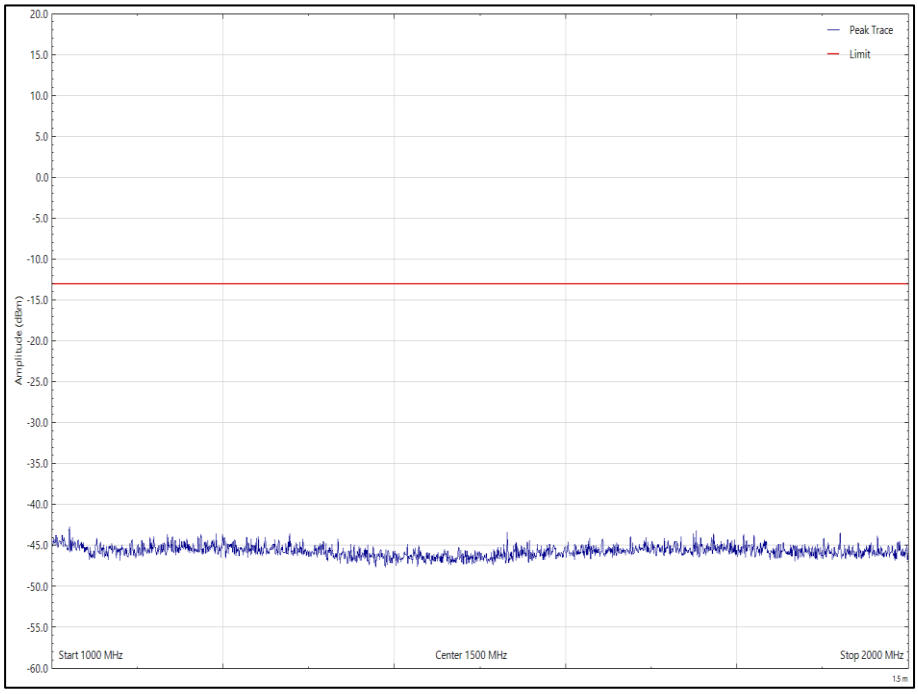

Figure 31 - 156.025 MHz - 1 GHz to 2 GHz, Vertical Polarisation

Frequency (MHz)	Level (dBm)
*	

Table 14 - 162.025 MHz - Emissions Results

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

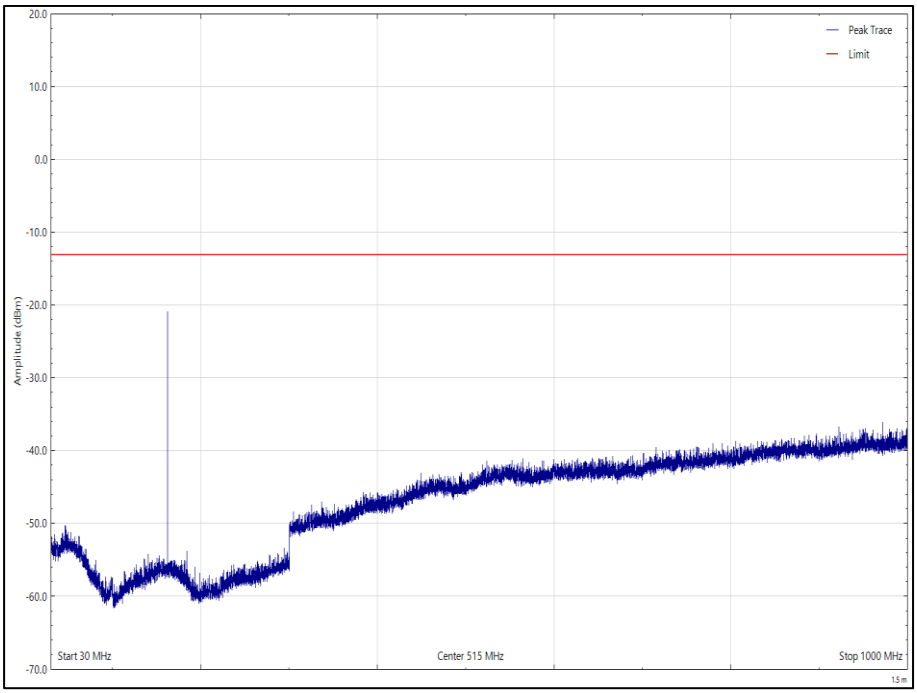

Figure 32 - 162.025 MHz - 30 MHz to 1 GHz, Horizontal Polarisation

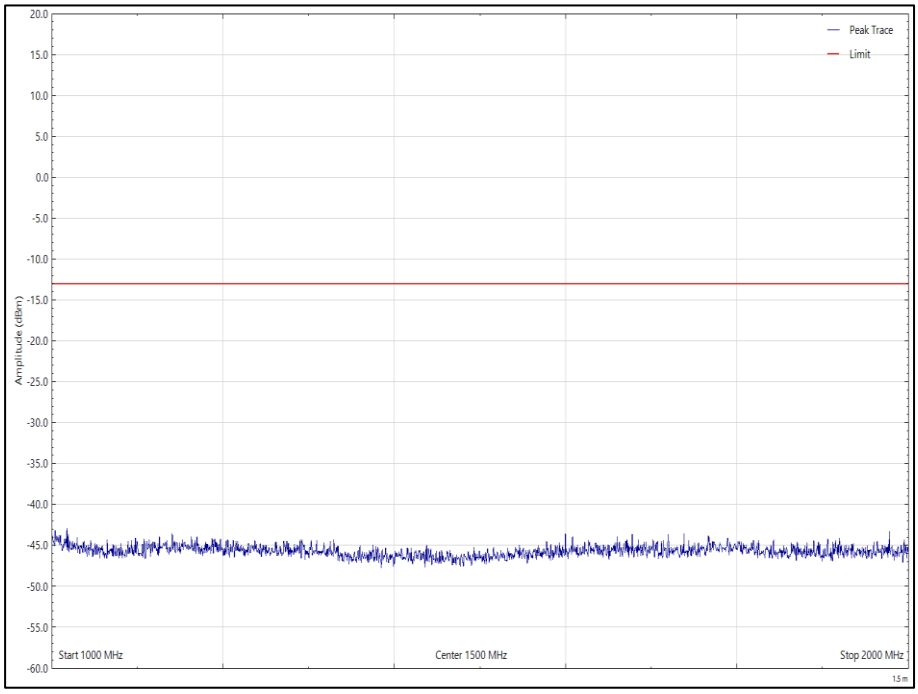

Figure 33 - 162.025 MHz - 1 GHz to 2 GHz, Horizontal Polarisation

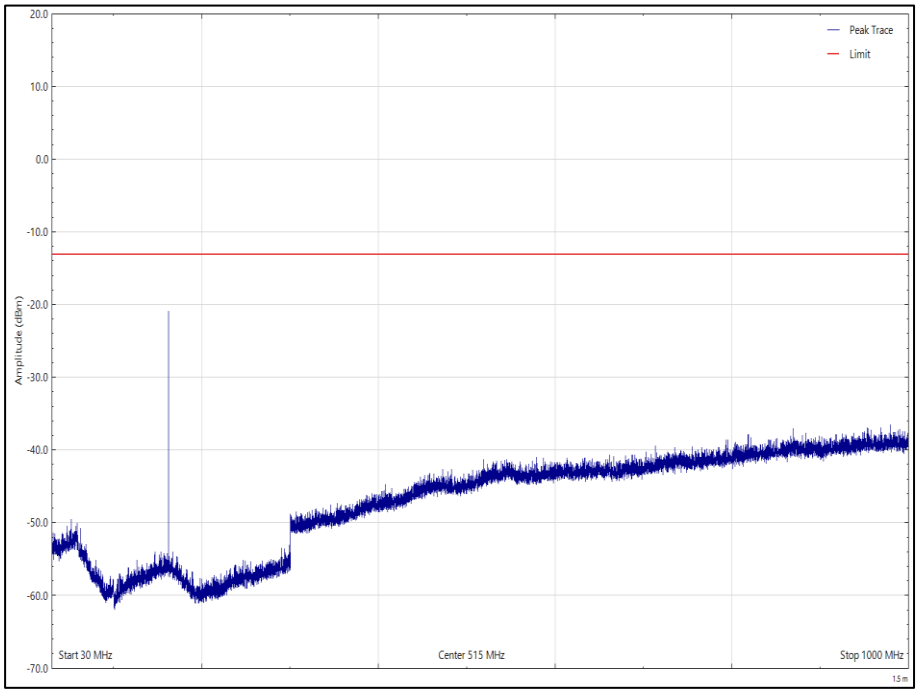

Figure 34 - 162.025 MHz - 30 MHz to 1 GHz, Vertical Polarisation

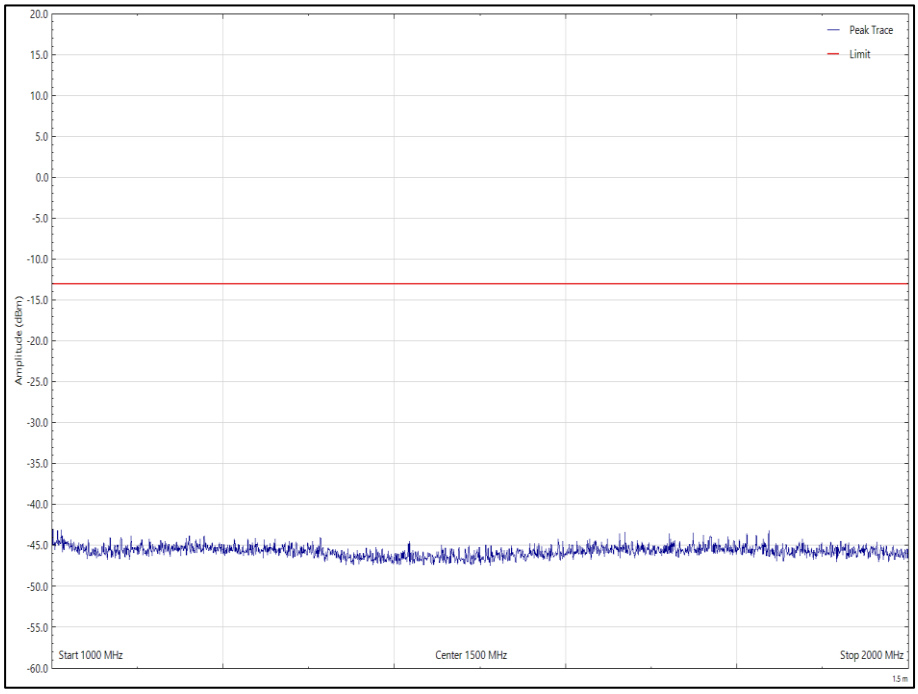

Figure 35 - 162.025 MHz - 1 GHz to 2 GHz, Vertical Polarisation

FCC 47 CFR Part 80, Limit Clause 80.211

More than 250% of the Authorised Bandwidth:

On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB.

ISED RSS-182, Limit Clause 5.9.1

On any frequency removed from the carrier frequency by more than 250% of the authorized bandwidth: at least 43 + 10 log10 p(watts) dB, measured with a bandwidth of 30 kHz.

2.4.8 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Termination 50ohm/50W	Bird	8085	389	12	15-Jul-2025
Audio Analyser	Hewlett Packard	8903B	576	12	04-Feb-2026
3m Semi-Anechoic Chamber	Rainford	RF Chamber 5	1545	36	23-Apr-2027
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
High Pass Filter	Mini-Circuits	NHP-300	1640	12	28-May-2025
Hygrometer	Rotronic	Hygropalm 0	3028	12	12-Aug-2025
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Sep-2025
True RMS Multimeter	Fluke	179	4007	12	10-Dec-2025
Mast Controller	Maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	4811	-	TU
Antenna (DRG, 1 GHz to 10.5 GHz)	Schwarzbeck	BBHA9120B	4848	12	14-Jul-2025
4dB Attenuator	Pasternack	PE7047-4	4935	12	31-Jul-2025
Quad Power Supply	Rohde & Schwarz	HMP4040	4955	-	O/P Mon
Emissions Software	TUV SUD	EmX V3.5.2	5125	-	Software
EMI Test Receiver	Rohde & Schwarz	ESW44	5527	12	26-Jul-2025
2m Coaxial Cable Assy	Junkosha	MWX221-02000AMSAMS/A	6357	12	13-May-2026
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	6635	24	13-Jun-2025
Cable (N-Type to N-Type, 8 m)	Scott Cables	SCB800-A-NMNM-08.00M	6719	6	06-Jun-2025

Table 15

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

2.5 Modulation Requirements

2.5.1 Specification Reference

FCC 47 CFR Part 80, Clause 80.213
FCC 47 CFR Part 2, Clause 2.1047
ISED RSS-182, Clause 5.4

2.5.2 Equipment Under Test and Modification State

X-100, S/N: 230587 - Modification State 8

2.5.3 Date of Test

16-May-2025

2.5.4 Test Method

AIS Transceiver – Operational

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 80.213 (d).

The EUT was transmitting at maximum power, modulated by the standard AIS test signals using either PRBS, 01010101 or 00001111 packet payloads. The EUT was connected to a spectrum analyser via a cable and attenuator, using the FM demodulation function of the spectrum analyser, the peak frequency deviation was observed and shown in the plots on the following pages.

2.5.5 Environmental Conditions

Ambient Temperature	20.3 °C
Relative Humidity	39.8 %

2.5.6 Test Results

AIS Transceiver - Operational

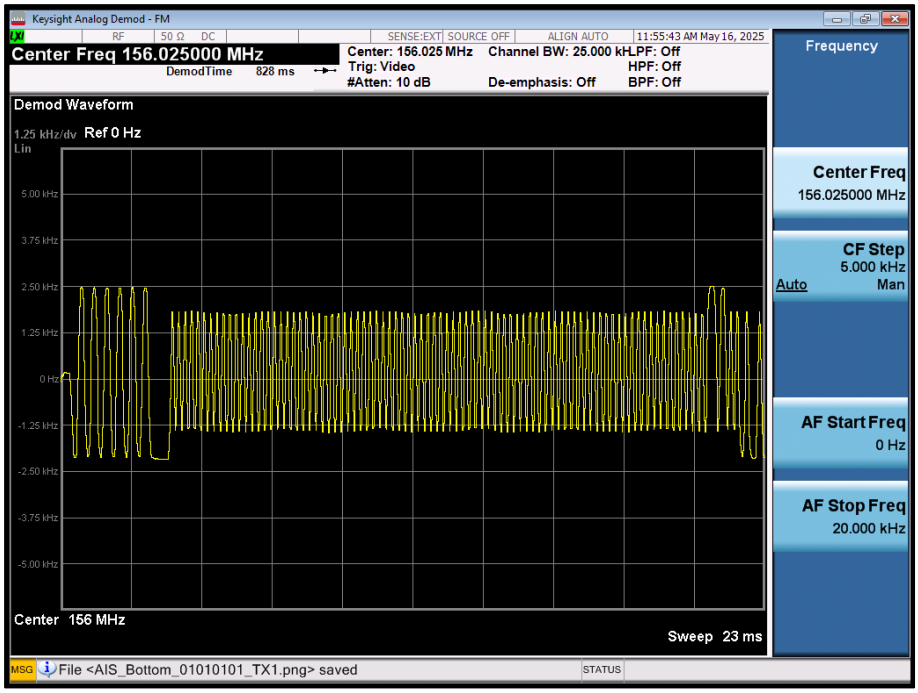

Figure 36 – 156.025 MHz - 01010101

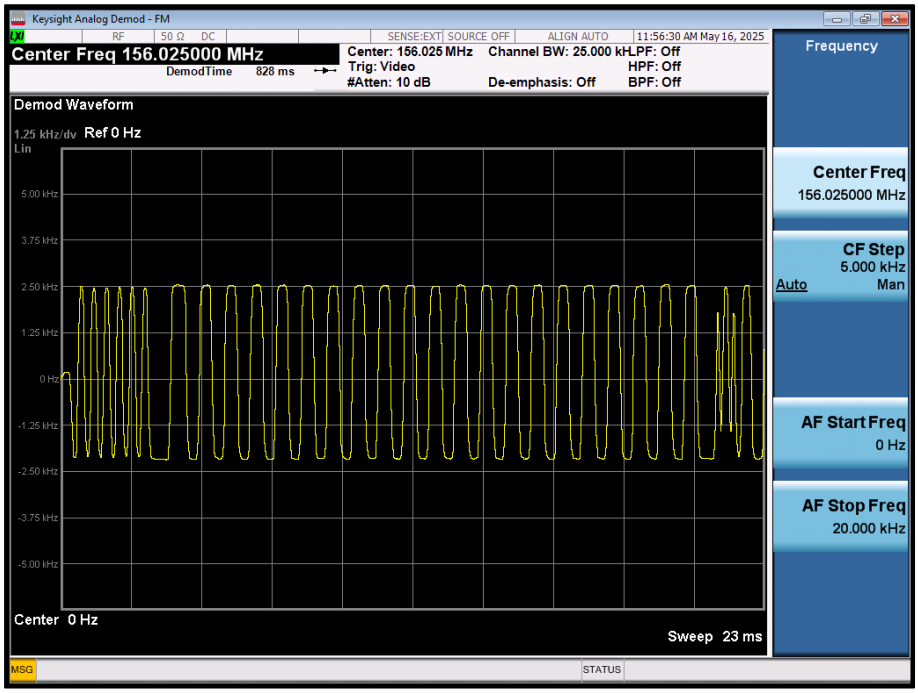

Figure 37- 156.025 MHz - 00001111

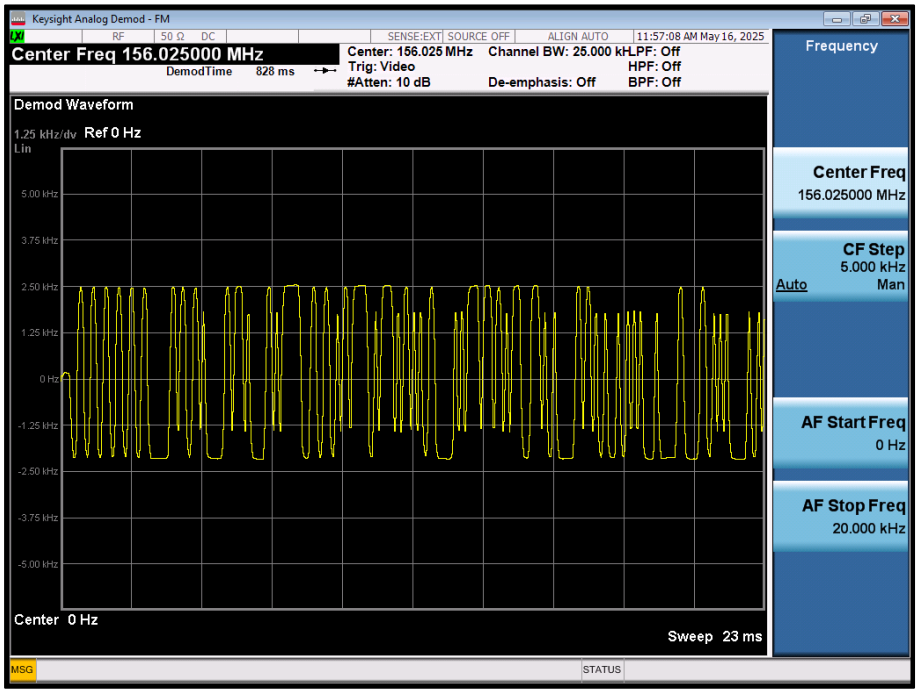

Figure 38- 156.025 MHz - PRBS

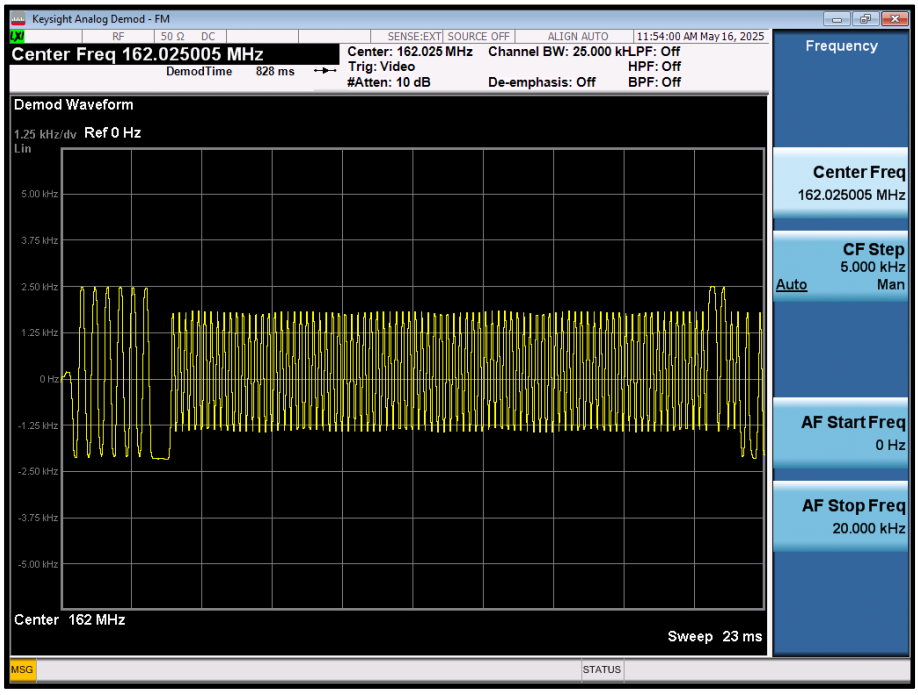

Figure 39 - 162.025 MHz - 01010101

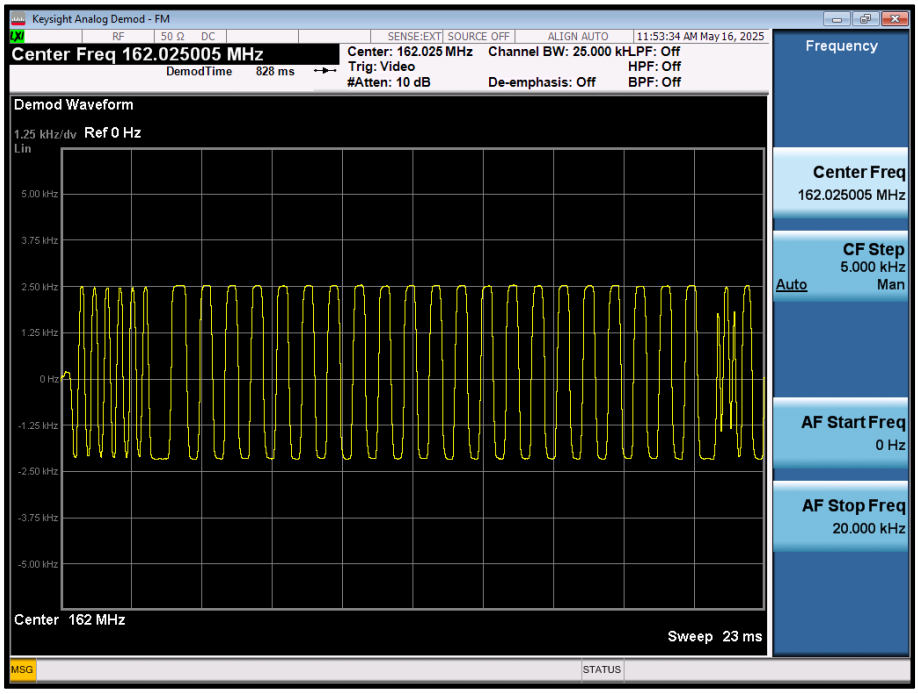

Figure 40- 162.025 MHz - 00001111

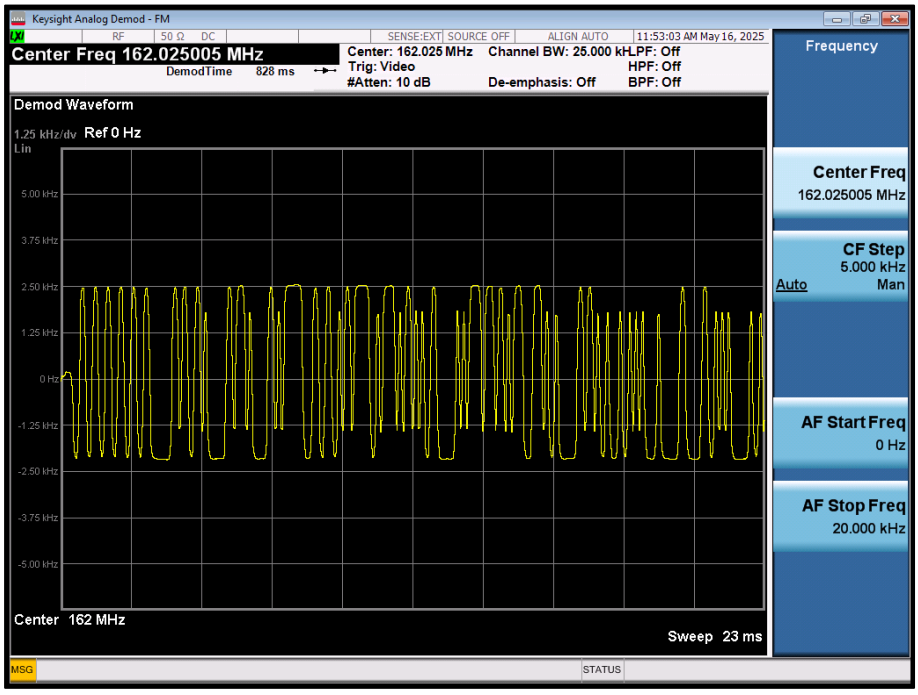

Figure 41- 162.025 MHz - PRBS

FCC 47 CFR Part 80, Limit Clause 80.213(d)

Ship and coast station transmitters operating in the 156–162 MHz and 216–220 bands must be capable of proper operation with a frequency deviation that does not exceed ±5 kHz when using any emission authorized by § 80.207

ISED RSS-182, Limit Clause 5.7

The VHF AIS equipment shall comply with the following characteristics.

Transmitter frequency:	161.975 MHz (channel AIS1) 162.025 MHz (channel AIS2
Channel spacing:	25 kHz or 12.5 kHz
Modulation scheme:	GMSK/FM
Modulation index:	0.5 max. for 25 kHz channel spacing 0.25 max. for 12.5 kHz channel spacing
Transmission rate:	9600 bps

2.5.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Modulation Analyser	Hewlett Packard	8901B	45	12	03-Sep-2025
Multimeter	Fluke	75 Mk3	455	12	09-Jan-2026
Sensor	Hewlett Packard	11722A	493	12	04-Sep-2025
Audio Analyser	Hewlett Packard	8903B	576	12	04-Feb-2026
Power Supply	Iso-tech	IPS 2010	2439	12	O/P Mon
Hygrometer	Rotronic	I-1000	2891	12	02-Dec-2025
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Sep-2025
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Mar-2026
2m N(m) - N(m) RF Cable	Rhophase	NPS-2303-2000-NPS	3604	12	19-Feb-2026
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	17-Mar-2026
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	01-Feb-2026
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	06-May-2026
2 Channel PSU	Rohde & Schwarz	HMP2020	4735	-	TU
Attenuator 30dB 100W	Weinschel	48-30-43-LIM	5135	12	05-Feb-2026

Table 16

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

2.6 Transmitter Power

2.6.1 Specification Reference

FCC 47 CFR Part 80, Clause 80.215
FCC 47 CFR Part 2, Clause 2.1046
ISED RSS-182, Clause 5.6
ISED RSS-GEN, Clause 6.12.

2.6.2 Equipment Under Test and Modification State

X-100, S/N: 230587 - Modification State 8

2.6.3 Date of Test

13-May-2025

2.6.4 Test Method

AIS Transceiver – Operational

This test was performed in accordance with ANSI C63.26, clause 5.2.3.3.

2.6.5 Environmental Conditions

Ambient Temperature	20.6 °C
Relative Humidity	40.4 %

2.6.6 Test Results

AIS Transceiver - Operational

Transmitter	156.025 MHz		162.025 MHz	
	Result (dBm)	Result (W)	Result (dBm)	Result (W)
Tx1	37.502	5.63	37.185	5.23
Tx2	37.552	5.69	37.188	5.23

Table 17 - Transmitter Power

FCC 47 CFR Part 80, Limit Clause 80.215 (e)

Ship station frequencies above 27500 kHz. The maximum power must not exceed the values listed below:

1. Ships Stations: 156 to 162 MHz - 25 W
2. Marine Utility Stations and Handheld Portable Transmitters: 156 to 162 MHz - 10 W

ISED RSS-182, Limit Clause 5.6

The output power for equipment certified under RSS-182 shall not exceed the limits specified in the table below:

Radio Equipment Type	Maximum Power
Coast Station	50 W
Ship Stations	25 W
Shipborne hand-held portable transmitter	6 W

Table 18 - Power Limits Table (RSS-182)

Ship station transmitters shall have power control features implemented to reduce the carrier power to 1 W or less for use at short ranges, except for DSC equipment operating on the 156.525 MHz (channel 70) frequency, for which the power reduction facility is optional.

Survival two-way radiotelephones should have a minimum equivalent isotropically radiated power (e.i.r.p.) of 0.25 W.

2.6.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	75 Mk3	455	12	09-Jan-2026
Power Supply	Iso-tech	IPS 2010	2439	12	O/P Mon
Hygrometer	Rotronic	I-1000	2891	12	02-Dec-2025
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Sep-2025
Network analyser	Rhode & Schwarz	ZVA-40	3548	12	17-Mar-2026
2m N(m) - N(m) RF Cable	Rhophase	NPS-2303-2000-NPS	3604	12	19-Feb-2026
Calibration unit	Rhode & Schwarz	ZV-Z54	4368	12	17-Mar-2026
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	01-Feb-2026
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	06-May-2026
Attenuator 30dB 100W	Weinschel	48-30-43-LIM	5135	12	05-Feb-2026

Table 19

O/P Mon – Output Monitored using calibrated equipment

2.7 Suppression of Interference Aboard Ships

2.7.1 Specification Reference

FCC 47 CFR Part 80, Clause 80.217(b)

2.7.2 Equipment Under Test and Modification State

X-100, S/N: 230587 - Modification State 8

2.7.3 Date of Test

21-May-2025

2.7.4 Test Method

AIS Transceiver – Operational

The test was applied in accordance with the test method requirements of FCC CFR 47 Part 80.217 (b) and KDB 971168.

A network analyser was used to measure the path loss and the worst case was entered as a reference level offset in to the spectrum analyser for each frequency range of interest. The EUT was connected to a spectrum analyser via a cable and attenuator. The EUT was configured in a receive only state. The spectrum analyser settings were configured with an RBW of 100 kHz below 1 GHz and 1 MHz for frequencies greater than 1 GHz using a VBW of 3 times the RBW. The trace set to max hold using a peak detector and the plots recorded as shown.

2.7.5 Environmental Conditions

Ambient Temperature	21.4 °C
Relative Humidity	40.0 %

2.7.6 Test Results

AIS Transceiver

EUT Receive Frequency (MHz)	Frequency of Interfering Emissions	Maximum Power delivered to Artificial Antenna (dBm)	Maximum Power delivered to Artificial Antenna (µW)
156.025 MHz	9 kHz to 150 kHz	-66.67	0.000215278
156.025 MHz	150 kHz to 30 MHz	-74.04	0.0000394457
156.025 MHz	30 MHz to 1 GHz	-59.96	0.001009253
156.025 MHz	1 GHz to 2 GHz	-63.71	0.000425598
162.025 MHz	9 kHz to 150 kHz	-66.74	0.000211836
162.025 MHz	150 kHz to 30 MHz	-74.91	0.0000322849
162.025 MHz	30 MHz to 1 GHz	-59.93	0.001016249
162.025 MHz	1 GHz to 2 GHz	-54.26	0.00374973

Table 20 - Receive Mode Spurious Emissions Results

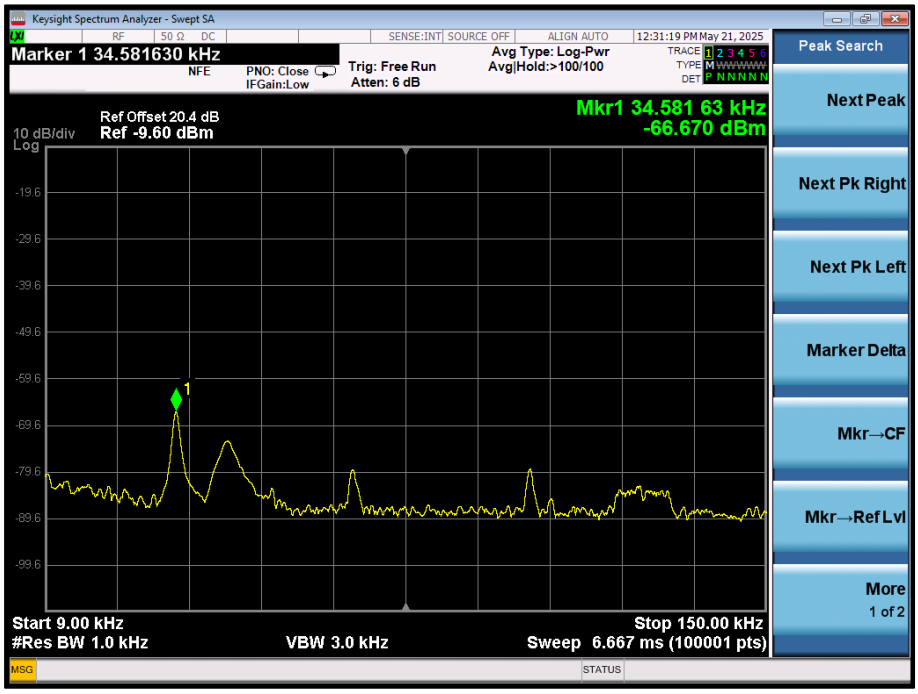

Figure 42 - (156.025 MHz) 9 kHz to 150 kHz

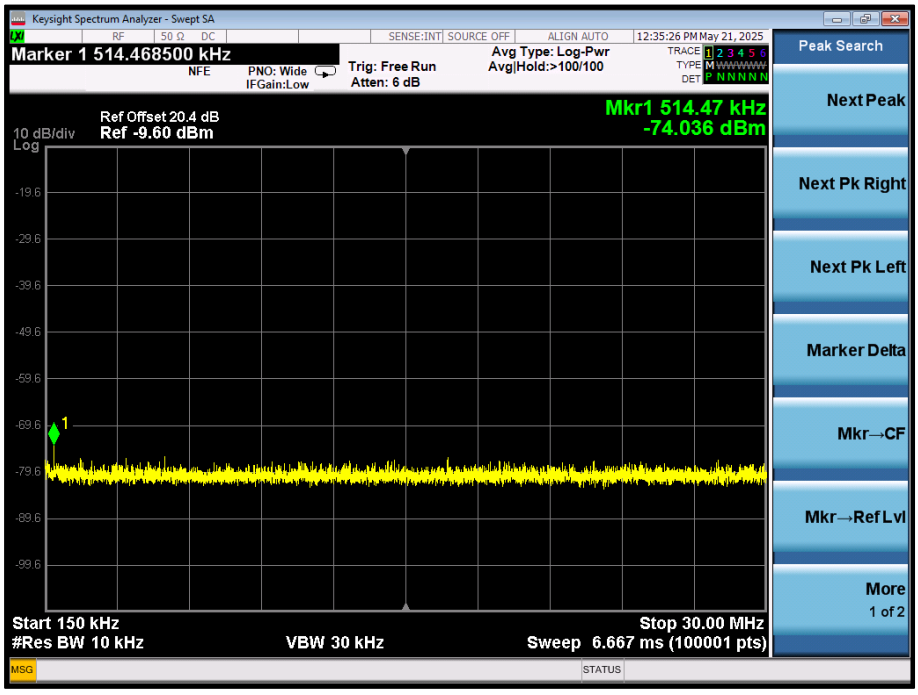

Figure 43 - (156.025 MHz) 150 kHz to 30 MHz

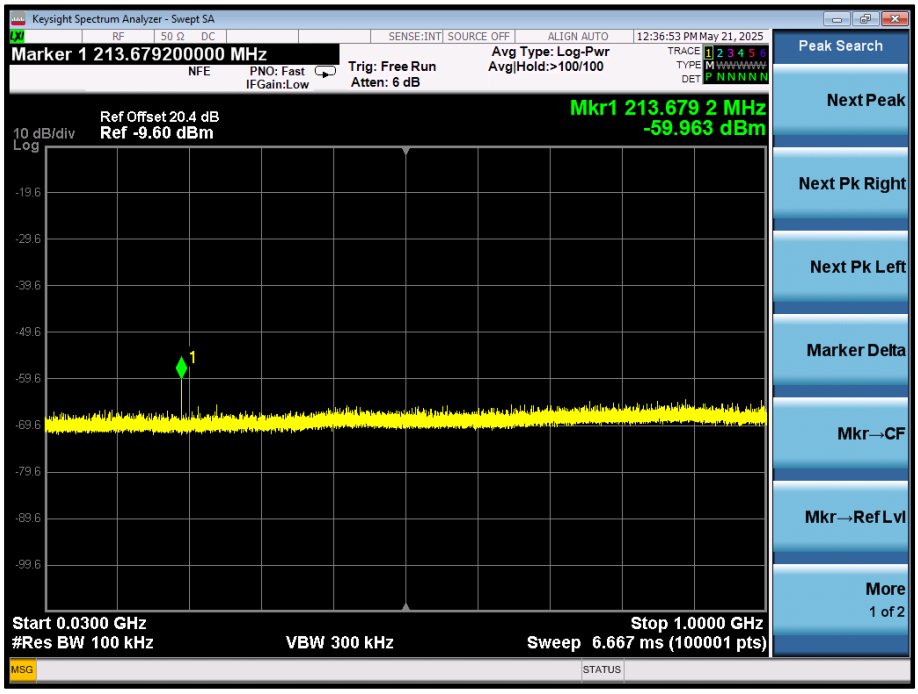

Figure 44 - (156.025 MHz) 30 MHz to 1 GHz

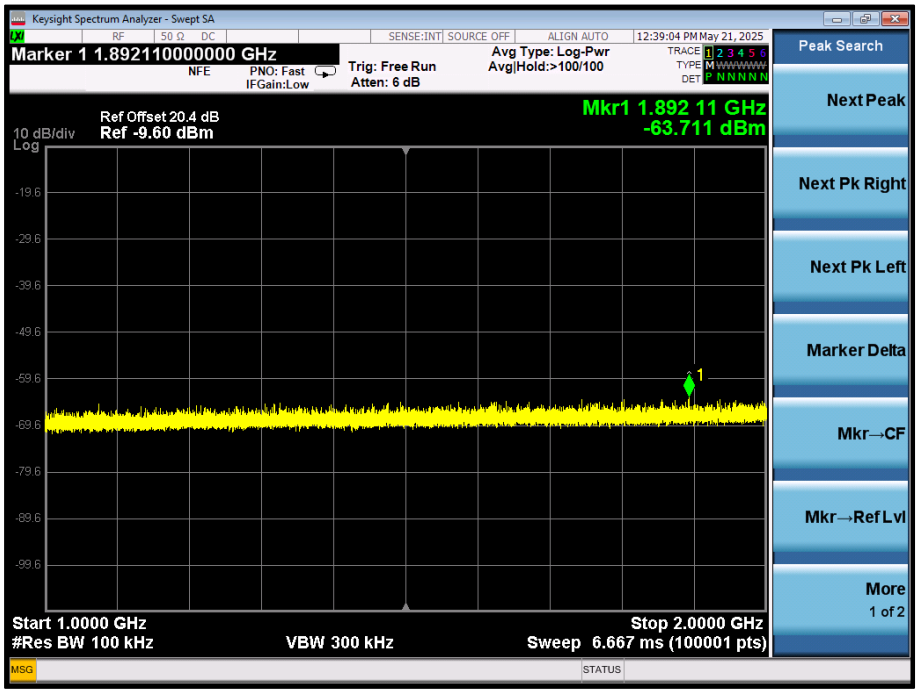

Figure 45 - (156.025 MHz) 1 GHz to 2 GHz

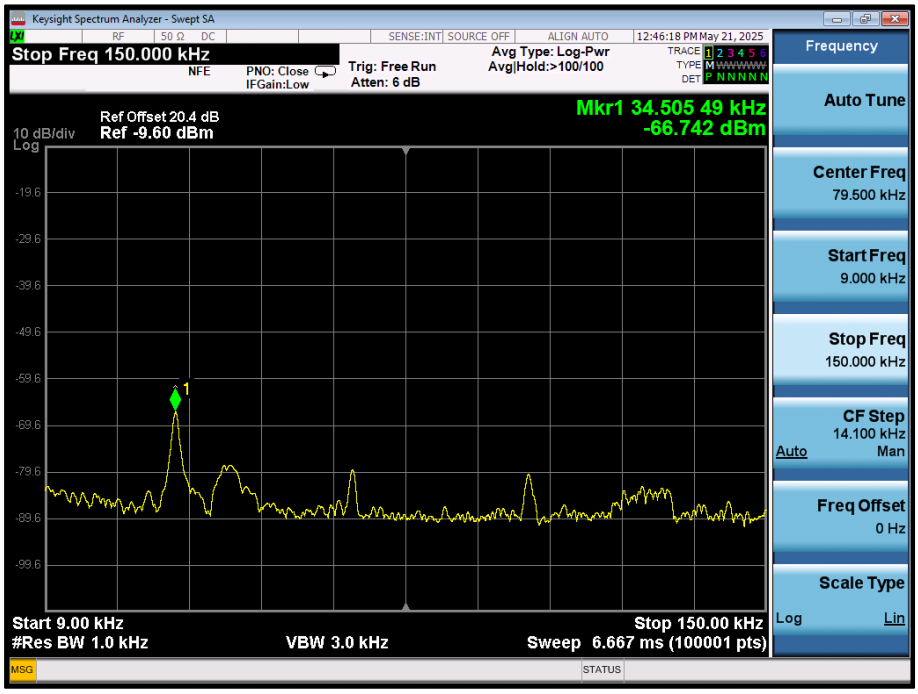

Figure 46 - (162.025 MHz) 9 kHz to 150 kHz

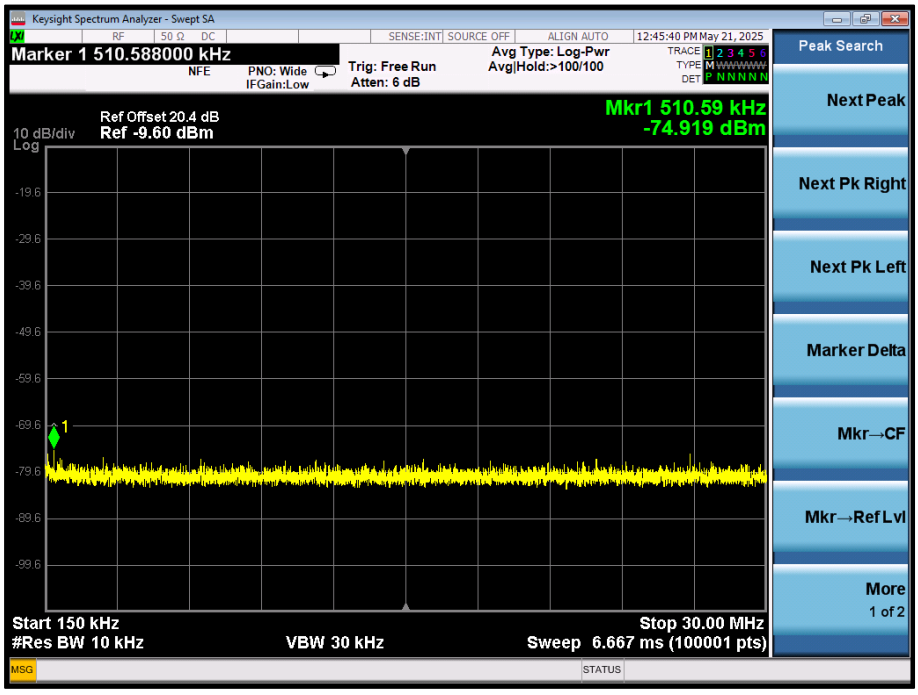

Figure 47 - (162.025 MHz) 150 kHz to 30 MHz

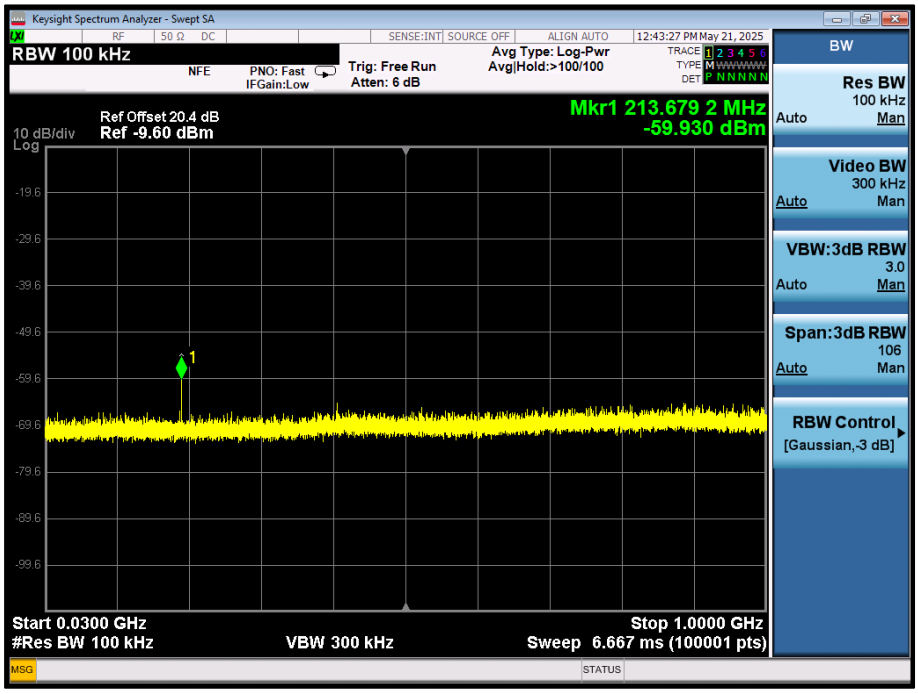

Figure 48 - (162.025 MHz) 30 MHz to 1 GHz

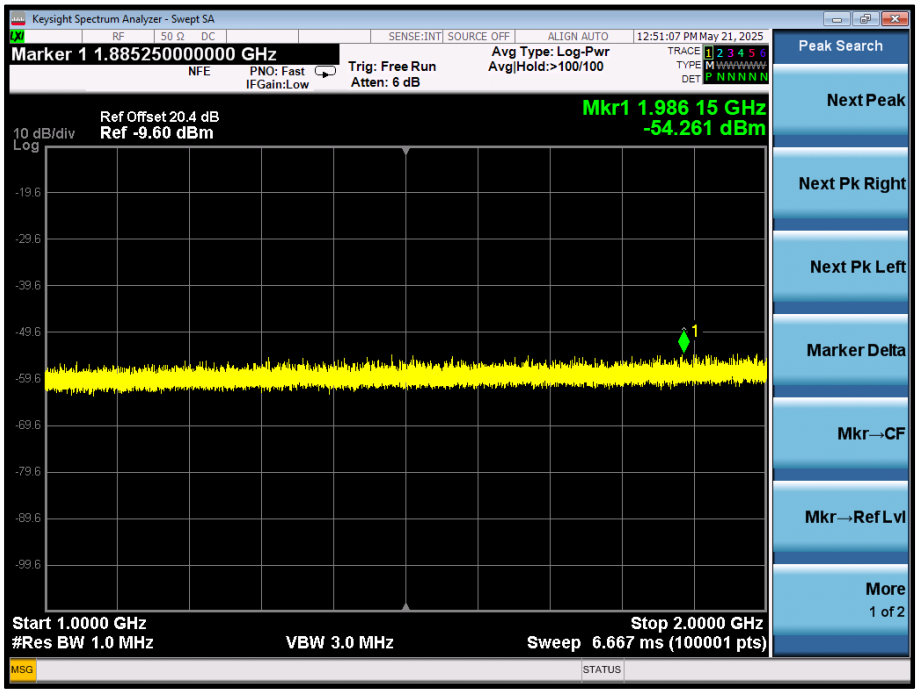

Figure 49 - (162.025 MHz) 1 GHz to 2 GHz

FCC 47 CFR Part 80, Limit Clause 80.217 (b)

The EUT shall deliver not more than the following amounts of power, to an artificial antenna having electrical characteristics equivalent to those of the average receiving antenna(s) use on shipboard:

Frequency of interfering emissions	Power to artificial antenna in µW
Below 30 MHz	400
30 to 100 MHz	4,000
100 to 300 MHz	40,000
Over 300 MHz	400,000

Table 21

2.7.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Multimeter	Fluke	75 Mk3	455	12	09-Jan-2026
Power Supply	Iso-tech	IPS 2010	2439	12	O/P Mon
Hygrometer	Rotronic	I-1000	2891	12	02-Dec-2025
Attenuator (20 dB, 150 W)	Narda	769-20	3367	12	02-Sep-2025
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	17-Mar-2026
2m N(m) - N(m) RF Cable	Rhophase	NPS-2303-2000-NPS	3604	12	19-Feb-2026
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	17-Mar-2026
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4511	12	01-Feb-2026
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	06-May-2026

Table 22

O/P Mon – Output Monitored using calibrated equipment

3 Photographs

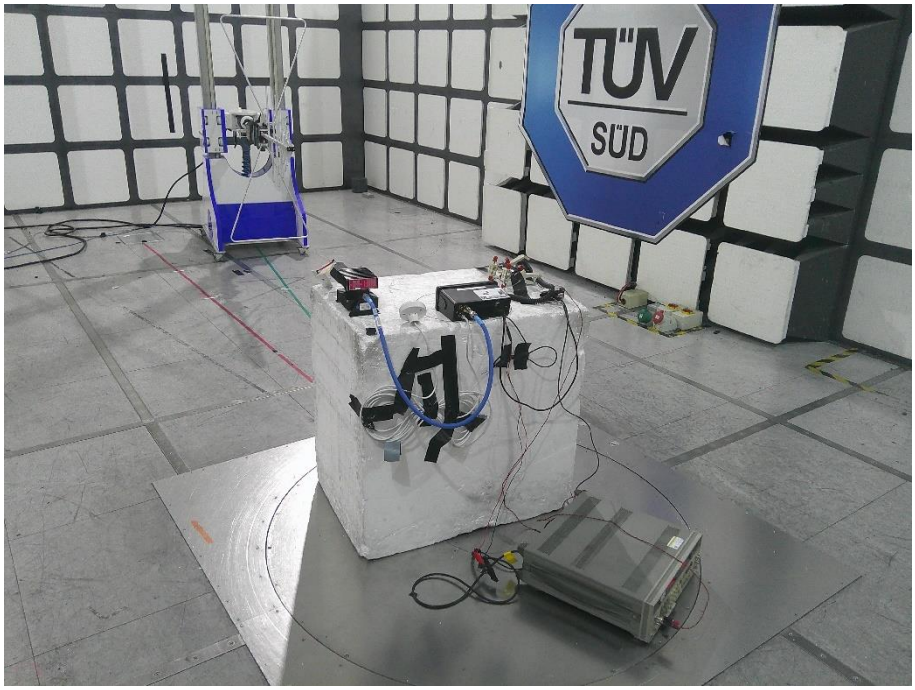

Figure 50 – Test setup 30 MHz to 1 GHz

Figure 51 – Test setup 1 GHz to 2 GHz

4 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Bandwidths	± 58.05 Hz
Transmitter Frequency Tolerances	± 11 Hz
Spurious Emissions at Antenna Terminals	± 3.45 dB
Radiated Spurious Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 18 GHz: ± 6.3 dB
Modulation Requirements	-
Transmitter Power	± 3.2 dB
Suppression of Interferance Aboard Ships	±3.45 dB

Table 23

Measurement Uncertainty Decision Rule

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.