FCC and ISED Test Report

Sepura Limited
TETRA Radio, Model: SC2028

In accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 90, ISED RSS-119 and ISED RSS-GEN (TETRA)

Add value.
Inspire trust.

Prepared for: Sepura Limited
9000 Cambridge Research Park
Beach Drive
Waterbeach
Cambridge
CB25 9TL
United Kingdom

FCC ID: XX6SC2028M IC: 8739A-SC2028M

COMMERCIAL-IN-CONFIDENCE

Document 75957666-02 Issue 02

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Matthew Russell	Chief Engineer	Authorised Signatory	02 November 2023

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

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 2, FCC 47 CFR Part 90, ISED RSS-119 and ISED RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Pier-Angelo Lorusso	02 November 2023	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

ISED Accreditation
12669A Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 2: 2021, FCC 47 CFR Part 90: 2021, ISED RSS-119: Issue 12 (05-2015) and ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021) for the tests detailed in section 1.3.

TÜV SÜD
is a trading name of TUV SUD Ltd
Registered in Scotland at East Kilbride,
Glasgow G75 0QF, United Kingdom
Registered number: SC215164

TUV SUD Ltd is a
TÜV SÜD Group Company

Phone: +44 (0) 1489 558100
Fax: +44 (0) 1489 558101
www.tuvsud.com/en

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

Contents

1 Report Summary 2

1.1 Report Modification Record 2
1.2 Introduction 2
1.3 Brief Summary of Results 3
1.4 Application Form 4
1.5 Product Information 8
1.6 Deviations from the Standard 8
1.7 EUT Modification Record 8
1.8 Test Location 9

2 Test Details 10

2.1 Maximum Conducted Output Power 10
2.2 Spurious Emissions at Antenna Terminals 18
2.3 Radiated Spurious Emissions 50

3 Photographs 75

3.1 Test Setup Photographs 75

4 Measurement Uncertainty 78

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	07-August-2023
2	Second Issue – Error status in summary of results table	02-November-2023

Table 1

1.2 Introduction

Applicant	Sepura Limited
Manufacturer	Sepura Limited
Model Number(s)	SC2028
Serial Number(s)	1PR002244GK93A9, 1PR002244GK93AH and 1PR002244GK93AI
Version(s)	PLX-2516515-01 (Mod State 11)
Software Version(s)	1810 002 07367
Number of Samples Tested	3
Test Specification/Issue/Date	FCC 47 CFR Part 2: 2021 FCC 47 CFR Part 90: 2021 ISED RSS-119: Issue 12 (05-2015) ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021)
Order Number	PLC-PO024890-1
Date	06-February-2023
Date of Receipt of EUT	02-February-2023, 17-March-2023 and 27-April-2023
Start of Test	02-May-2023
Finish of Test	20-June-2023
Name of Engineer(s)	Pier-Angelo Lorusso
Related Document(s)	ANCI C63.26: 2015

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 90, ISED RSS-119 and ISED RSS-GEN is shown below.

Section	Specification Clause				Test Description	Result	Comments/Base Standard
	Part 2	Part 90	RSS-119	RSS-GEN			
Configuration and Mode: TETRA 806 MHz to 824 MHz							
2.1	2.1046	90.205	5.4	6.12	Maximum Conducted Output Power	Pass	
2.2	2.1051	90.210	5.8	6.13	Spurious Emissions at Antenna Terminals	Pass	
2.3	2.1053	90.210	5.8	6.13	Radiated Spurious Emissions	Pass	
Configuration and Mode: TETRA 851 MHz to 869 MHz							
2.1	2.1046	90.205	5.4	6.12	Maximum Conducted Output Power	Pass	
2.3	2.1053	90.210	5.8	6.13	Radiated Spurious Emissions	Pass	
2.2	2.1051	90.210	5.8	6.13	Spurious Emissions at Antenna Terminals	Pass	

Table 2

As per FCC Report and Order FCC-12-114, the use of TETRA equipment in North America is restricted to 809-824/854-869 MHz. The applicant confirms that when the device is deployed within North America, it will be prohibited from using frequencies outside this range.

1.4 Application Form

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	The SC2028 hand-portable terminal is a TETRA enabled radio with Bluetooth and Wi-Fi capability
Manufacturer:	Sepura Limited
Model:	SC2028
Part Number:	SC2028
Hardware Version:	PLX-2516515-01 (Mod State 11)
Software Version:	1810 002 07367
FCC ID of the product under test – see guidance here	XX6SC2028M
IC ID of the product under test – see guidance here	8739A-SC2028M

Table 3

Intentional Radiators

Technology	TETRA	Bluetooth	WLAN 802.11b	WLAN 802.11g	WLAN 802.11n	BLE
Frequency Range (MHz to MHz)	806 to 825 / 851 to 870	2402-2480	2412-2462	2412-2462	2412-2462	2402-2480
Conducted Declared Output Power (dBm)	35	8	17	17	17	7.5
Antenna Gain (dBi)	1.1	2.5	2.5	2.5	2.5	2.5
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	0.025	1	20	20	20	2
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	π/4 DQPSK	GFSK / π/4-DPSK / 8-DPSK	CCK / DBPSK / DQPSK	OFDM (BPSK / QPSK / 16-QAM / 64-QAM)	BPSK / QPSK / 16-QAM / 64-QAM)	GFSK
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	22K0DXW, 20K0DXW	1M01F1D 1M01G1D	19M7G1D	19M7G1D	19M7D1D	1M81F1D
Bottom Frequency (MHz)	806 / 851	2402	2412	2412	2412	2402
Middle Frequency (MHz)	815.5 / 860.5	2441	2437	2437	2437	2441
Top Frequency (MHz)	825 / 870	2480	2462	2462	2462	2480

Table 4

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	32.768 kHz
Class A Digital Device (Use in commercial, industrial or business environment) ☒ Class B Digital Device (Use in residential environment only) ☐	

Table 5

AC Power Source

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

Table 6

DC Power Source

Nominal voltage:	7.4	V
Extreme upper voltage:	7.4	V
Extreme lower voltage:	6.2	V
Max current:	2	A

Table 7

Battery Power Source

Voltage:	7.4	V
End-point voltage:	6.2	V *(Point at which the battery will terminate)*
Alkaline ☐ Leclanche ☐ Lithium ☒ Nickel Cadmium ☐ Lead Acid* ☐ **(Vehicle regulated)*		
Other ☐ Please detail:		

Table 8

Charging

Can the EUT transmit whilst being charged	Yes ☒ No ☐

Table 9

Temperature

Minimum temperature:	-20	°C
Maximum temperature:	+60	°C

Table 10

Cable Loss

Adapter Cable Loss (Conducted sample)	N/A	dB

Table 11

Antenna Characteristics

Antenna connector ☒			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☐	Type:		Gain		dBi
External antenna ☒	Type:	300-00498 Quarter wave whip	Gain	1.1	dBi
For external antenna only: Standard Antenna Jack ☒ If yes, describe how user is prohibited from changing antenna (if not professional installed): 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. One TETRA antenna is supplied for the radiated tests: 300-00498 The antenna port on top of the radio is 50 Ohm impendence and can be used for conducted tests Frequency of Operation: US: 809-824 MHz and 854-869 MHz Canada: 806-824 MHz and 851-869 MHz					

Table 12

Ancillaries (if applicable)

Manufacturer:	Sepura	Part Number:	300-01384
Model:	Programming lead	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-01852
Model:	Standard Battery	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-01853
Model:	High Power Battery	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-01930
Model:	1+1 Charger	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00389
Model:	RSM	Country of Origin:	Unknown

Table 13

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

Name:	Chris Beecham
Position held:	Conformance Engineer
Date:	08 February 2023

1.5 Product Information

1.5.1 Technical Description

The SC2028 hand-portable terminal is a TETRA enabled radio with Bluetooth and Wi-Fi capability

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: SC2028, Serial Number: 1PR002244GK93A9			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: SC2028, Serial Number: 1PR002244GK93AH			
0	As supplied by the customer	Not Applicable	Not Applicable
Model:SC2028, Serial Number: 1PR002244GK93AI			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 14

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: TETRA 806 MHz to 824 MHz		
Maximum Conducted Output Power	Pier-Angelo Lorusso	UKAS
Radiated Spurious Emissions	Pier-Angelo Lorusso	UKAS
Spurious Emissions at Antenna Terminals	Pier-Angelo Lorusso	UKAS
Configuration and Mode: TETRA 851 MHz to 869 MHz		
Maximum Conducted Output Power	Pier-Angelo Lorusso	UKAS
Spurious Emissions at Antenna Terminals	Pier-Angelo Lorusso	UKAS
Radiated Spurious Emissions	Pier-Angelo Lorusso	UKAS

Table 15

Office Address:

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

2 Test Details

2.1 Maximum Conducted Output Power

2.1.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1046
FCC 47 CFR Part 90, Clause 90.205
ISED RSS-119, Clause 5.4
ISED RSS-GEN, Clause 6.12

2.1.2 Equipment Under Test and Modification State

1. SC2028, S/N: 1PR002244GK93AI - Modification State 0

2.1.3 Date of Test

04-May-2023

2.1.4 Test Method

The test was applied in accordance with the test method requirements of FCC 47 CFR Part 90, ISED RSS-119, and ISED RSS-GEN with reference to ANSI C63.26, clause 5.2.4.3.3.

The EUT was configured to transmit on maximum power on the bottom, middle and top channels in burst mode. The EUT was connected to a spectrum analyser via a cable and 20 dB of attenuation. The path loss was calculated from calibration data of one attenuator and a coaxial cable used, summed and entered as a reference level offset in the spectrum analyser.

The spectrum analyser was configured with an RBW of 30 kHz and with the trace set to max hold using an RMS detector.

2.1.5 Environmental Conditions

Ambient Temperature	21.9 °C
Relative Humidity	39.4 %

2.1.6 Test Results

TETRA 806 MHz to 824 MHz

Parameter	806.025 MHz	815.000 MHz	823.975 MHz
Conducted Output Power (dBm)	35.03	35.10	35.18
Manufacturer Declared Power (dBm)	35.0	35.0	35.0
Δ from manufacturer Power (dB)	0.03	0.10	0.18
Antenna Gain (dBd)	-1.05	-1.05	-1.05
ERP (dBm)	33.98	34.05	34.13

Table 16 - ERP

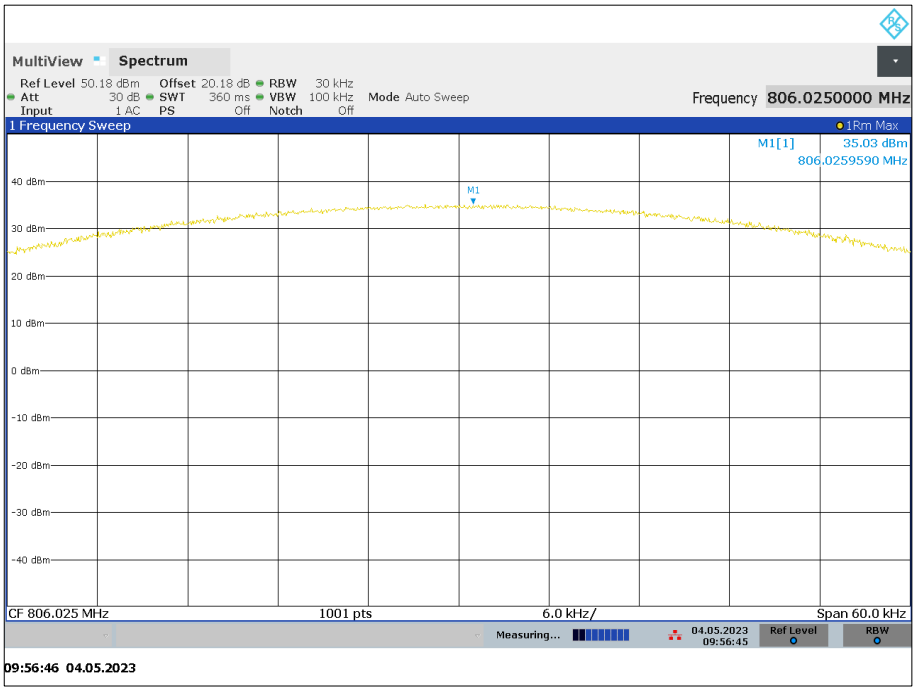

Figure 1 - 806.025 MHz

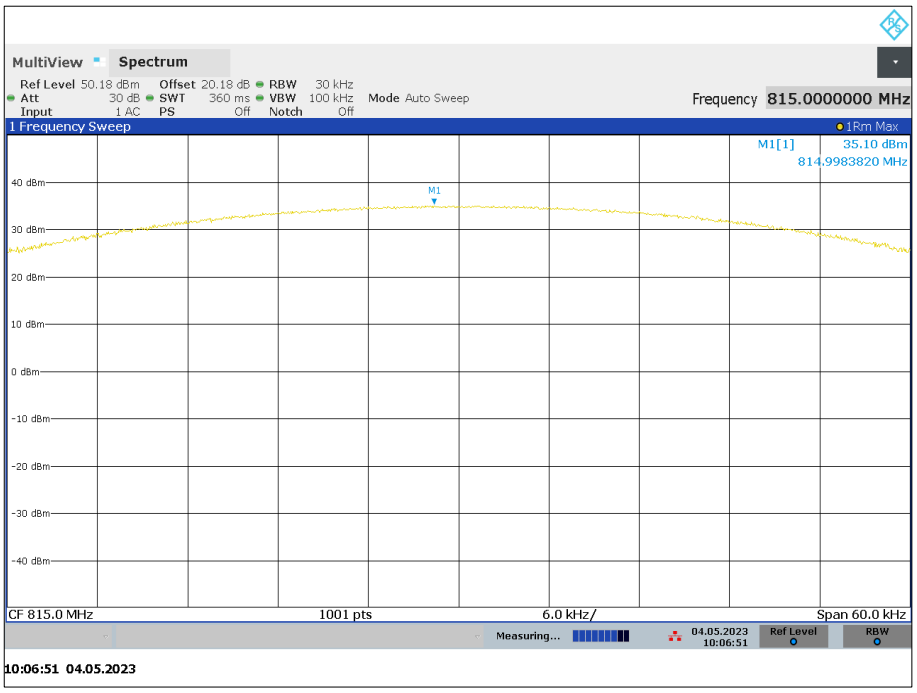

Figure 2 - 815.000 MHz

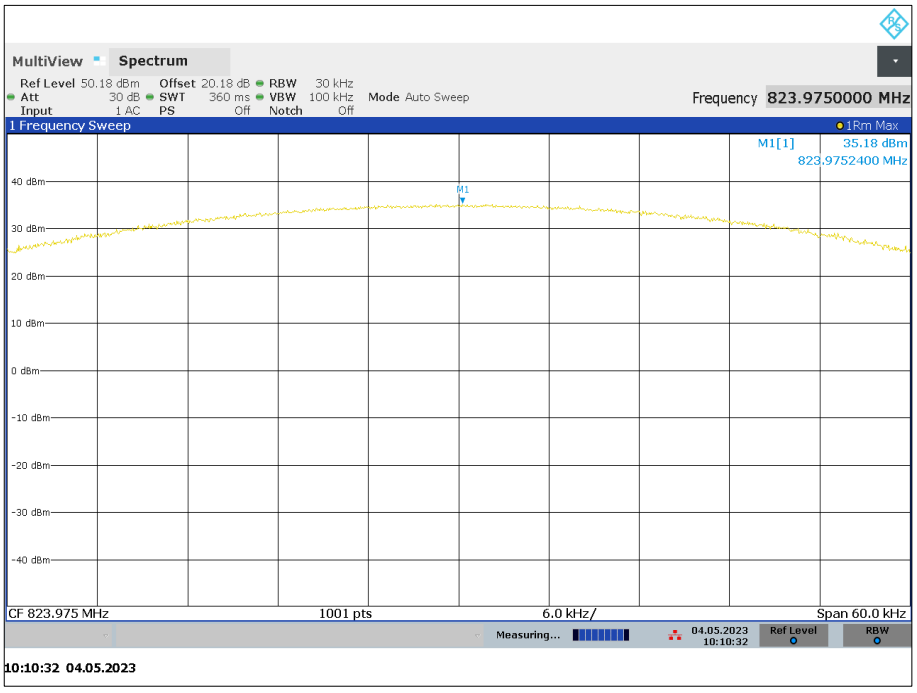

Figure 3 - 823.975 MHz

TETRA 851 MHz to 869 MHz

Parameter	851.025 MHz	860.000 MHz	868.975 MHz
Conducted RMS Output Power (dBm)	34.91	34.84	34.75
Manufacturer Declared Power (dBm)	35.0	35.0	35.0
Δ from manufacturer Power (dB)	-0.09	-0.16	-0.25
Antenna Gain (dBd)	-1.05	-1.05	-1.05
ERP (dBm)	33.86	33.79	33.70

Table 17 - ERP

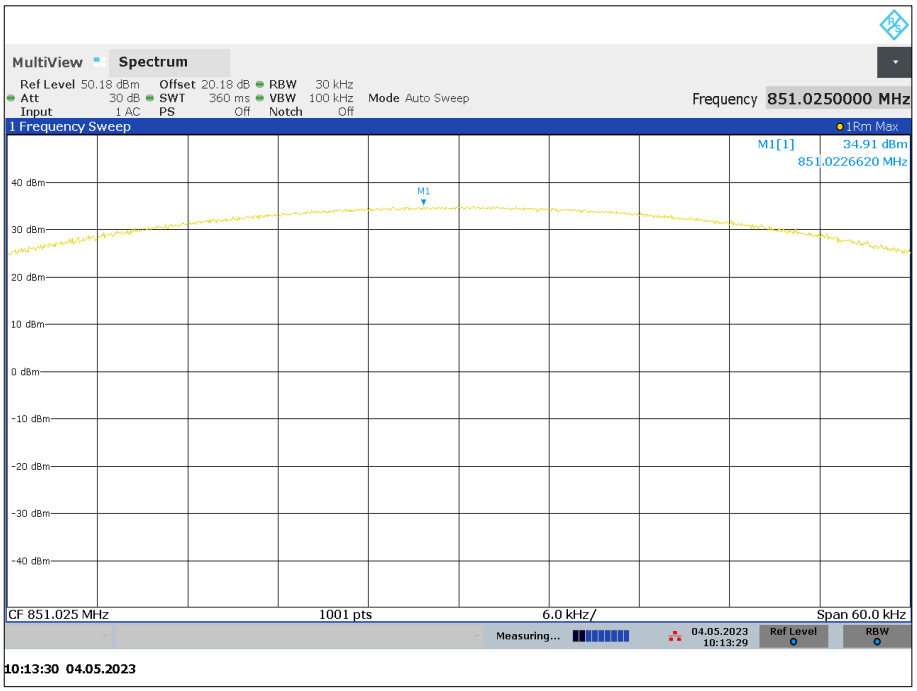

Figure 4 - 851.025 MHz

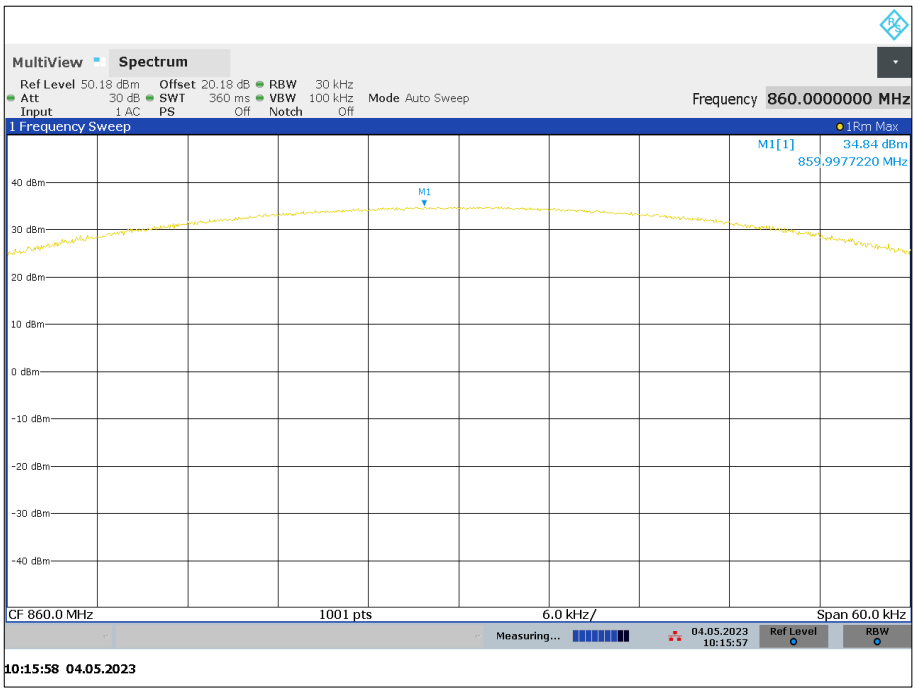

Figure 5 - 860.000 MHz

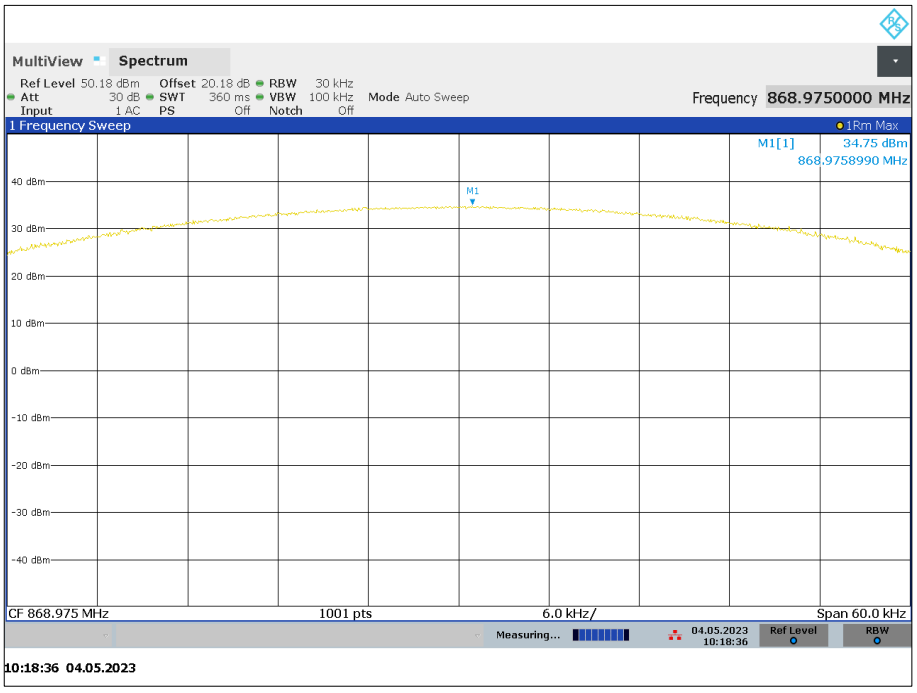

Figure 6 - 868.975 MHz

FCC 47 CFR Part 90, Limit Clause 90.205

Frequency (MHz)	Limit
< 25	1000 W
25 to 50	300 W
72 to 76	300 W
150 to 174	Refer to 90.205 (d) of the specification
217 to 220	Refer to 90.259 of the specification
220 to 222	Refer to 90.729 of the specification
421 to 430	Refer to 90.279 of the specification
450 to 470	Refer to 90.205 (h) of the specification
470 to 512	Refer to 90.307 and 90.309 of the specification
758 to 775 and 788 to 805	Refer to 90.541 and 90.542 of the specification
806 to 824, 851 to 869, 869 to 901 and 935 to 940	Refer to 90.635 of the specification
902 to 927.25	LMS systems operating pursuant to subpart M of the specification: 30 W
927.25 to 928	LMS equipment: 300 W
929 to 930	Refer to 90.494 of the specification
1427 to 1429.5 and 1429.5 to 1432	Refer to 90.259 of the specification
2450 to 2483.5	5 W
4940 to 4990	Refer to 90.1215 of the specification
5850 to 5925	Refer to subpart M of the specification
All other frequency bands	On a case-by-case basis

Table 18 - FCC Limits for Maximum ERP

ISED RSS-119, Limit Clause 5.4

The output power shall be within ±1 dB of the manufacturer's rated power listed in the equipment specifications.

Frequency (MHz)	Transmitter Output Power (W)	
	Base/Fixed Equipment	Mobile Equipment
27.41 to 28 and 29.7 to 50	300	30
72 to 76	No Limit	1
138 to 174	111100	60
217 to 217 and 219 to 220	See SRSP-512 for ERP limit	30*
220 to 222	110	50
406.1 to 430 and 450 to 470	See SRSP-511 for ERP limit	60
768 to 776 and 798 to 806	110	30 3 W ERP for portable equipment
806 to 821, 851 to 866, 821 to 824 and 866 to 869	110	30
896 to 901 and 935 to 940	110	60
929 to 930 and 931 to 932	110	30
928 to 929, 952 to 953, 932 to 932.5 and 941 to 941.5	110	30
932.5 to 935 ad 941.5 to 944	110	30
*Equipment is generally authorised for effective radiated power (ERP) of less than 5 W.		

Table 19 - ISED Limits for Transmitter Output Power

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
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	17-May-2023
Screened Room (11)	Rainford	Rainford	5136	36	24-Nov-2024
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	20-Apr-2024
Attenuator 5W 20dB DC-18GHz	Aaren	AT40A-4041-D18-20	5500	12	04-May-2023
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/A	5516	12	23-Oct-2023

Table 20

2.2 Spurious Emissions at Antenna Terminals

2.2.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1051
FCC 47 CFR Part 90, Clause 90.210
ISED RSS-119, Clause 5.8
ISED RSS-GEN, Clause 6.13

2.2.2 Equipment Under Test and Modification State

2. SC2028, S/N: 1PR002244GK93AI - Modification State 0

2.2.3 Date of Test

04-May-2023 to 25-May-2023

2.2.4 Test Method

For emissions where the frequency is removed less than 250 % of the authorised 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 into 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 47 CFR Part 90.210 (b) and RSS-119 section 5.8.10 (Mask Y) were applied.

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

Conducted: A network analyser was used to measure the path loss and the worst case was entered as a reference level offset into the spectrum analyser. The EUT was connected to a spectrum analyser via an attenuator, filter and cable. Between 1000 MHz and 9 GHz a 1000 MHz high pass filter was used. The spectrum analyser was configured with an RBW of 1 kHz for 9kHz to 150kHz, 10kHz for 150kHz to 30MHz, 100kHz for 30 to 1MHz and 1 MHz for frequencies greater than 1 GHz with the trace set to max hold using a peak detector.

2.2.5 Environmental Conditions

Ambient Temperature	19.7 - 23.0 °C
Relative Humidity	37.8 - 40.5 %

2.2.6 Test Results

TETRA 806 MHz to 824 MHz

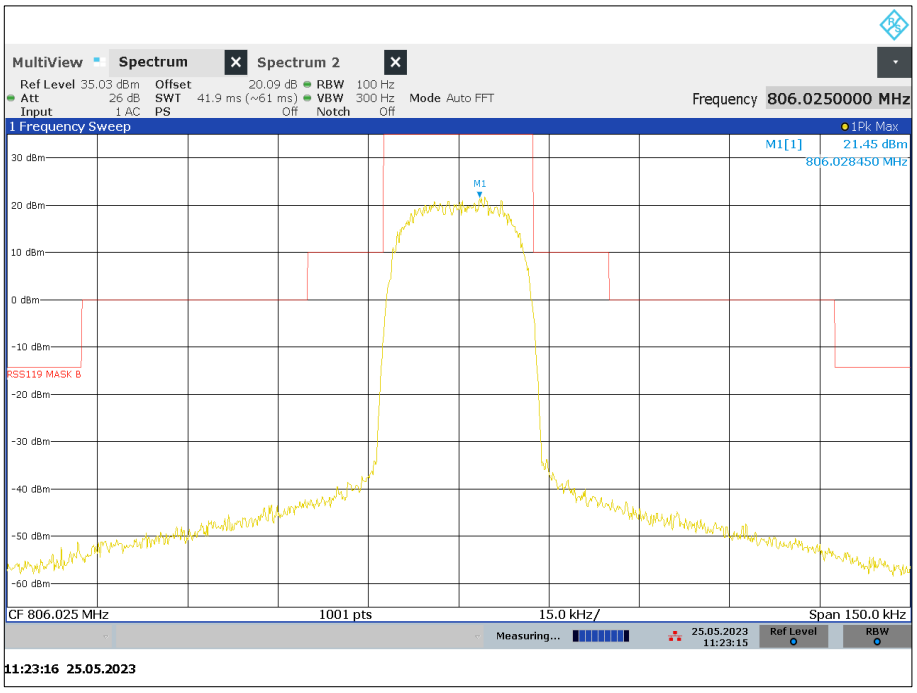

Figure 7 - 806.025 MHz, Transmitter Mask B

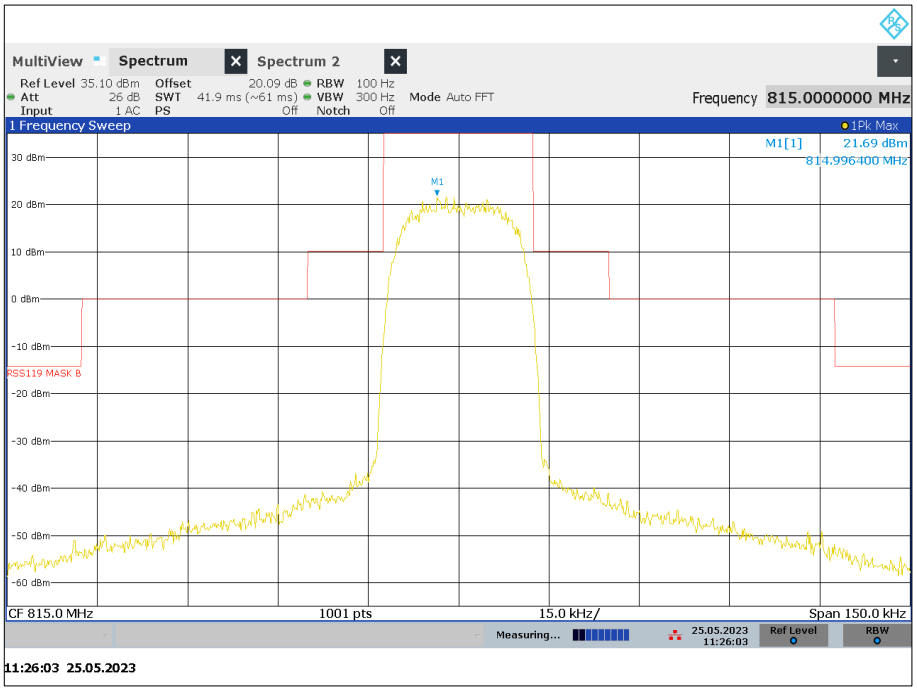

Figure 8 - 815.000 MHz, Transmitter Mask B

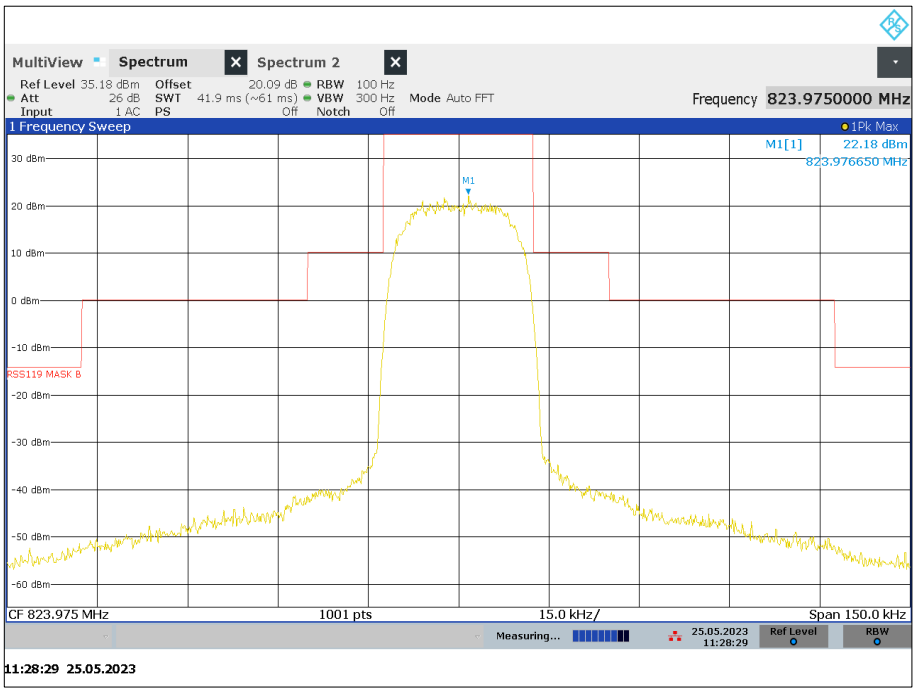

Figure 9 - 823.975 MHz, Transmitter Mask B

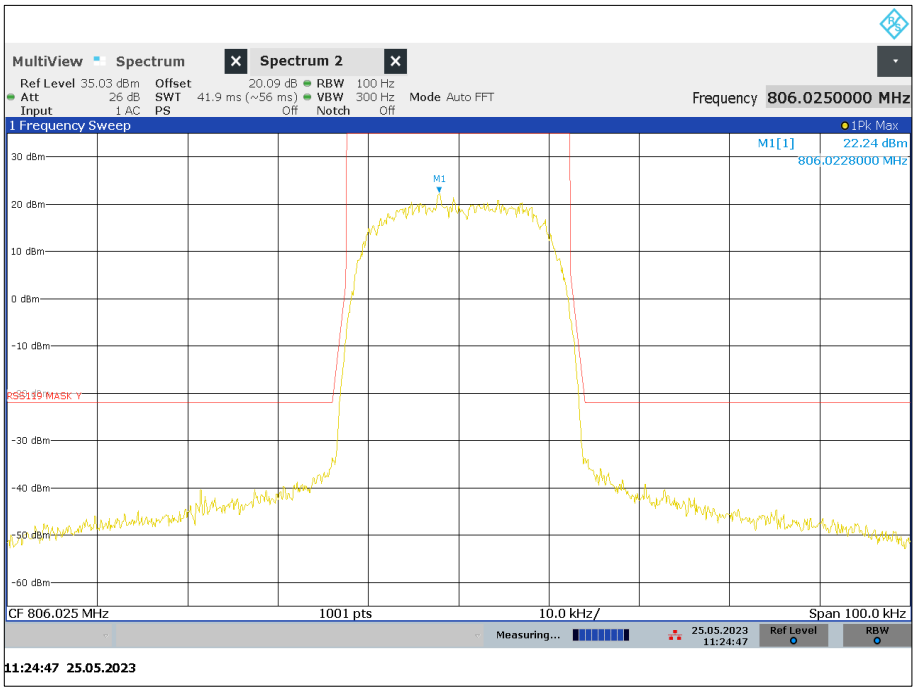

Figure 10 - 806.025 MHz, Transmitter Mask Y

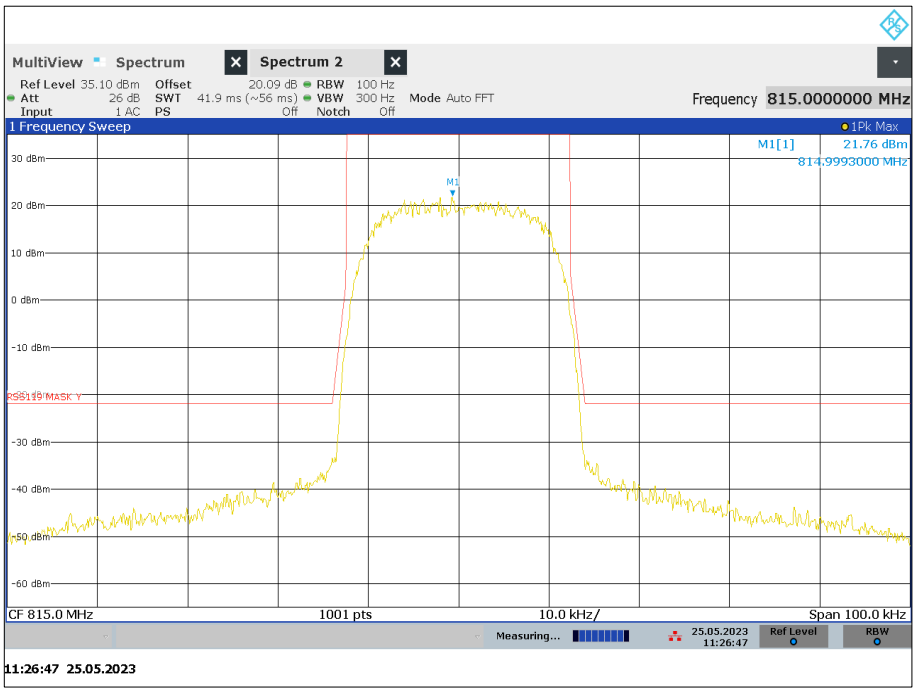

Figure 11 - 815.000 MHz, Transmitter Mask Y

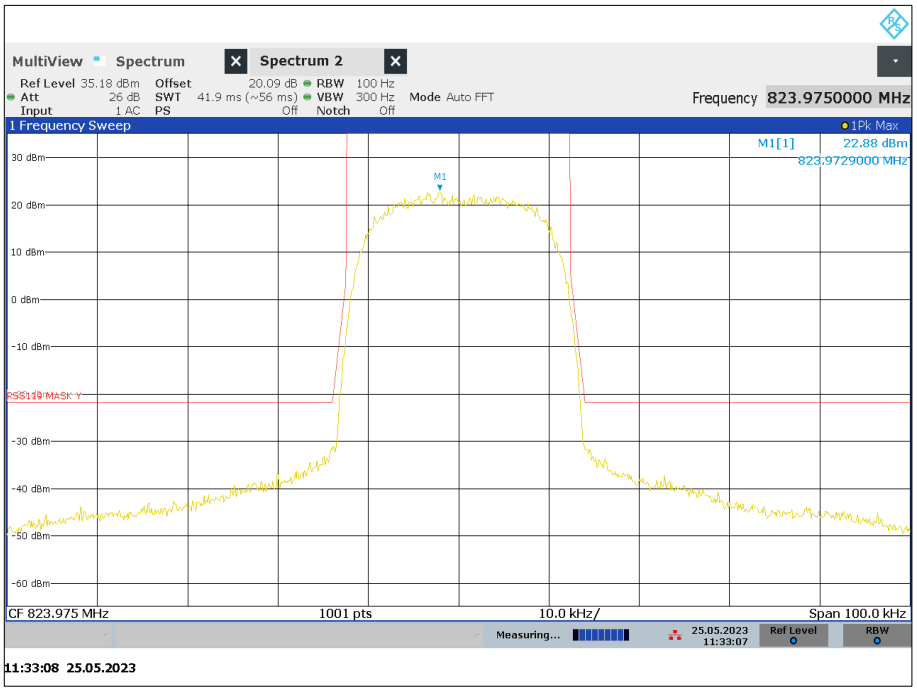

Figure 12 - 823.975 MHz, Transmitter Mask Y

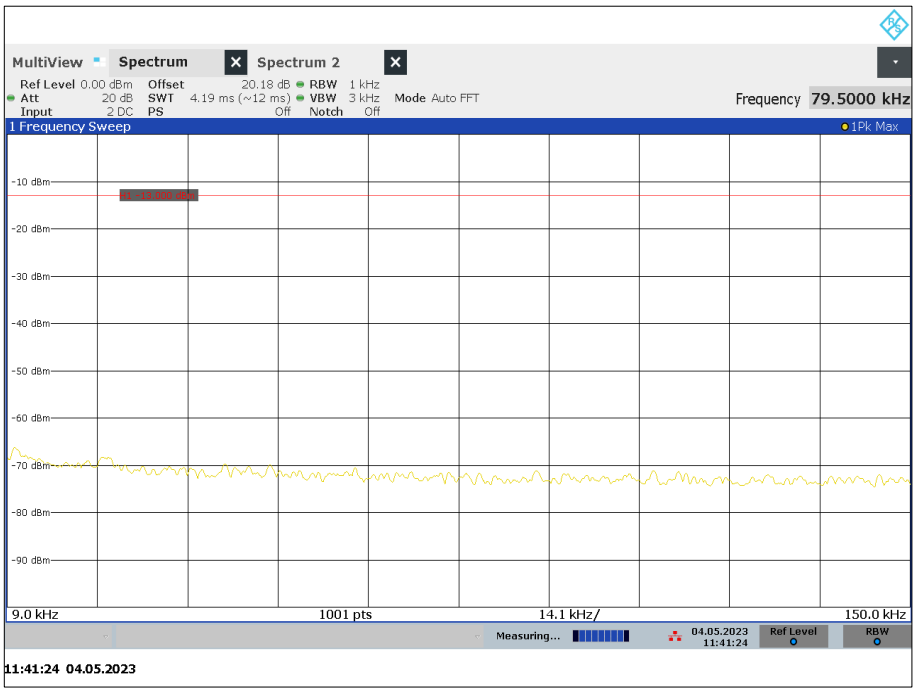

Figure 13 - 806.025 MHz, 9 kHz to 150 kHz Mask B

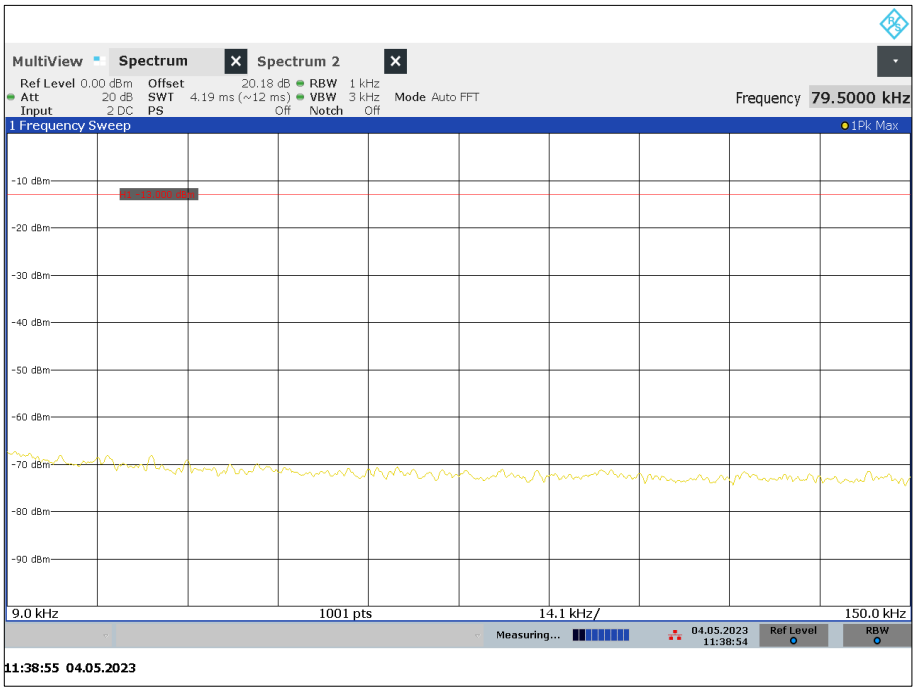

Figure 14 - 815.000 MHz, 9 kHz to 150 kHz Mask B

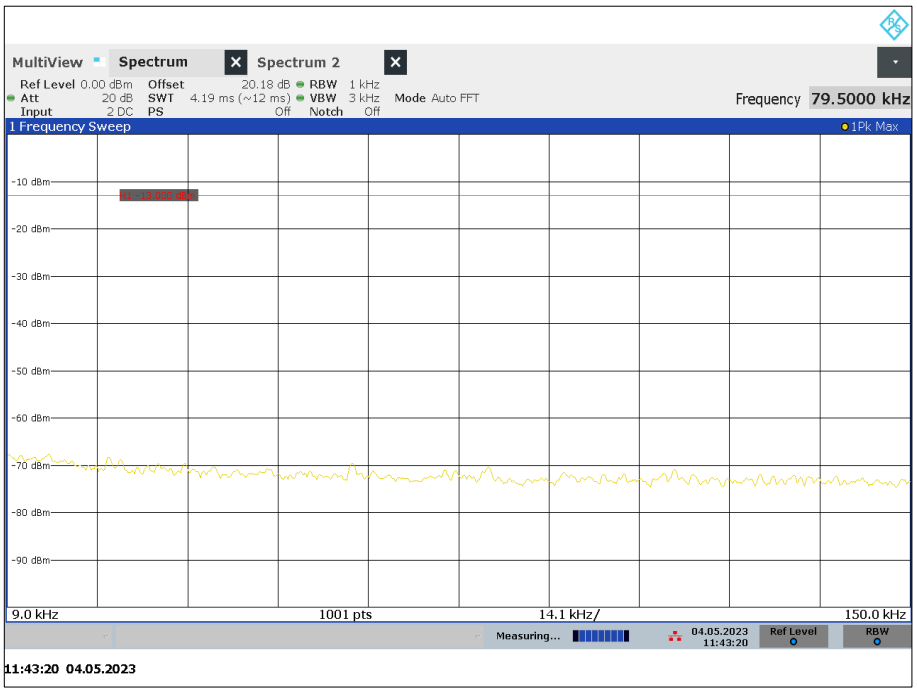

Figure 15 - 823.975 MHz - 9 kHz to 150 kHz Mask B

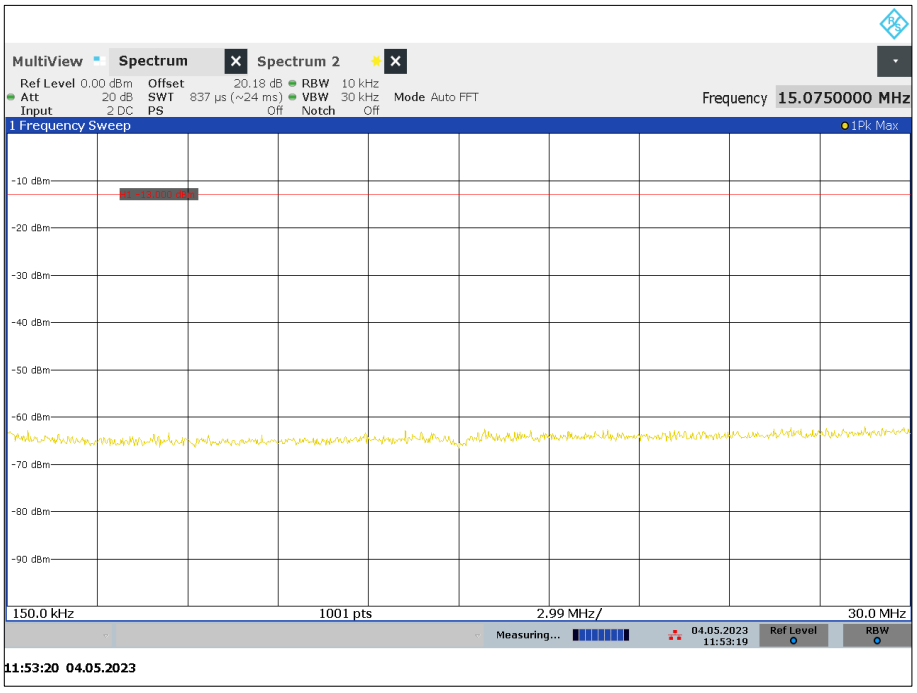

Figure 16 - 806.025 MHz, 150 kHz to 30 MHz Mask B

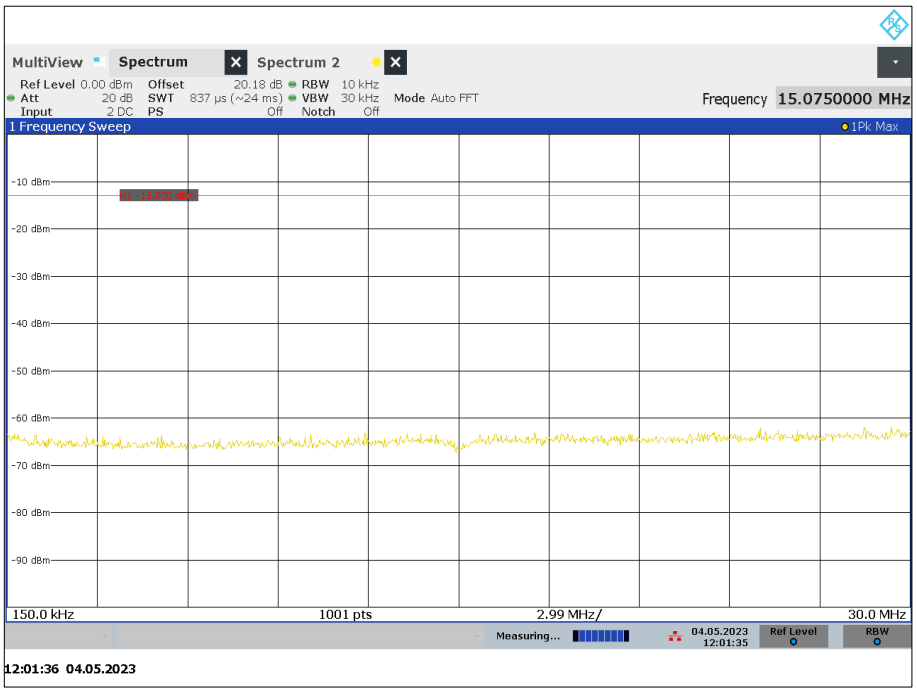

Figure 17 - 815.000 MHz, 150 kHz to 30 MHz Mask B

Figure 18 - 823.975 MHz - 150 kHz to 30 MHz Mask B

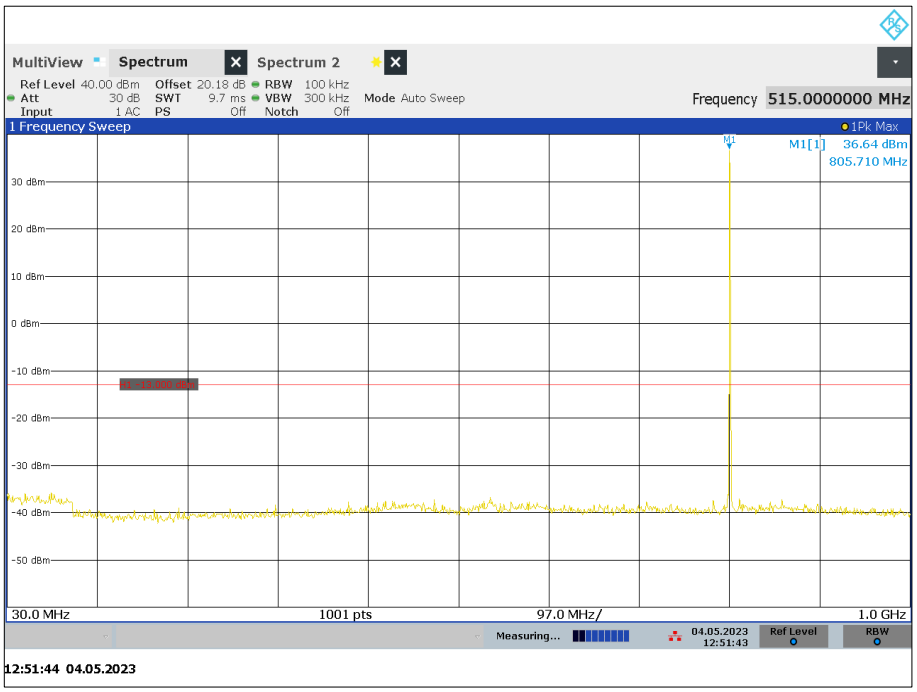

Figure 19 - 806.025 MHz, 30 MHz to 1 GHz Mask B

Figure 20 - 815.000 MHz, 30 MHz to 1 GHz Mask B

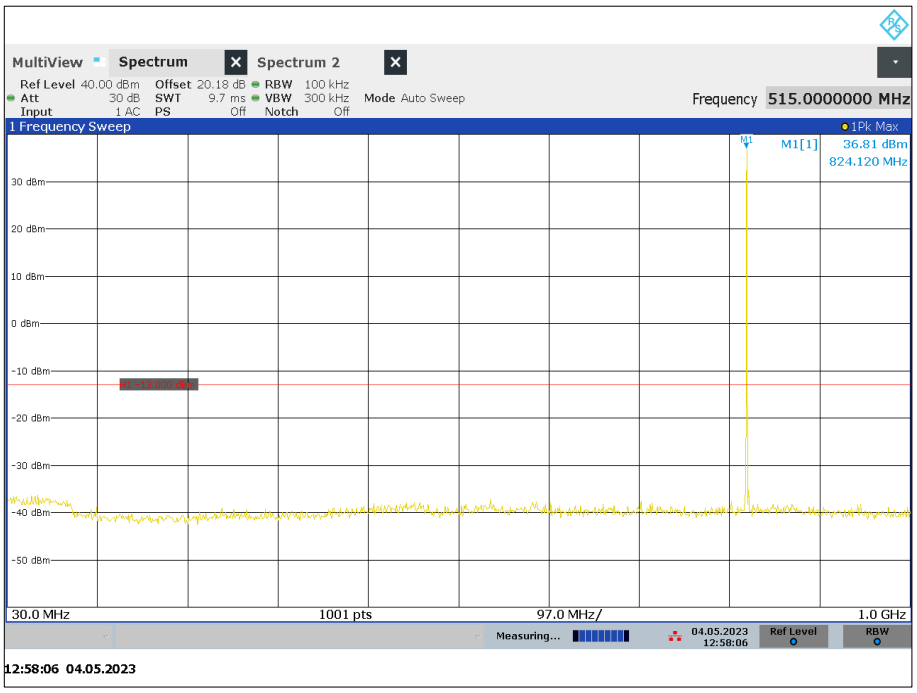

Figure 21 - 823.975 MHz - 30 MHz to 1 GHz Mask B

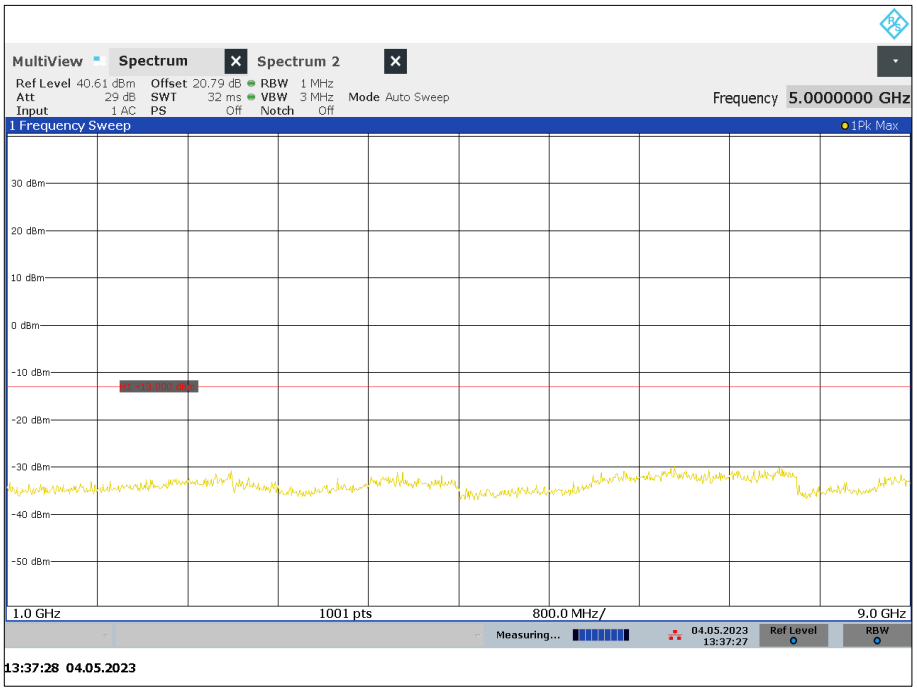

Figure 22 - 806.025 MHz, 1 GHz to 9 GHz Mask B

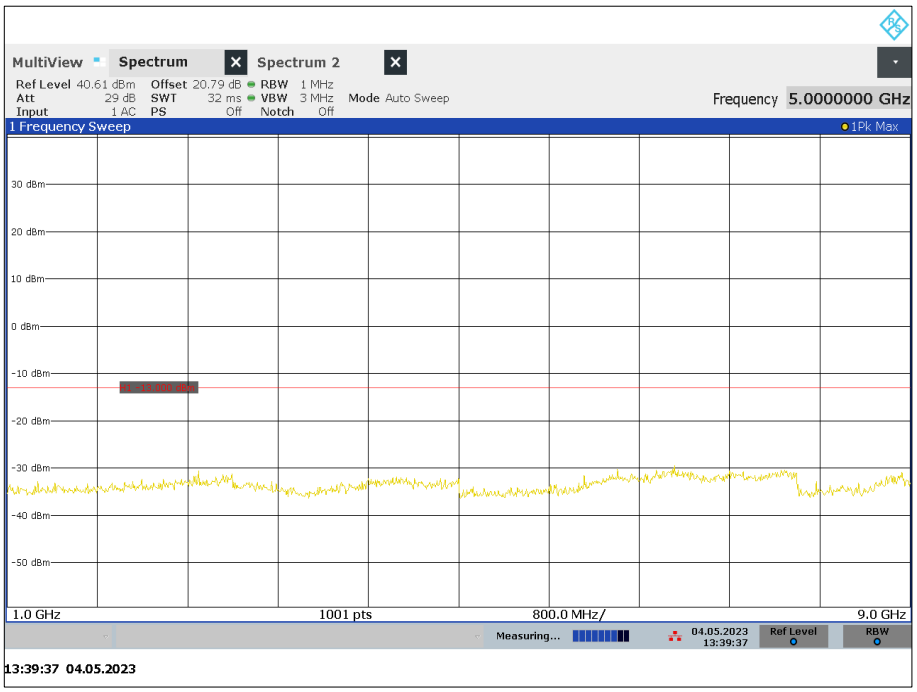

Figure 23 - 815.000 MHz, 1 GHz to 9 GHz Mask B

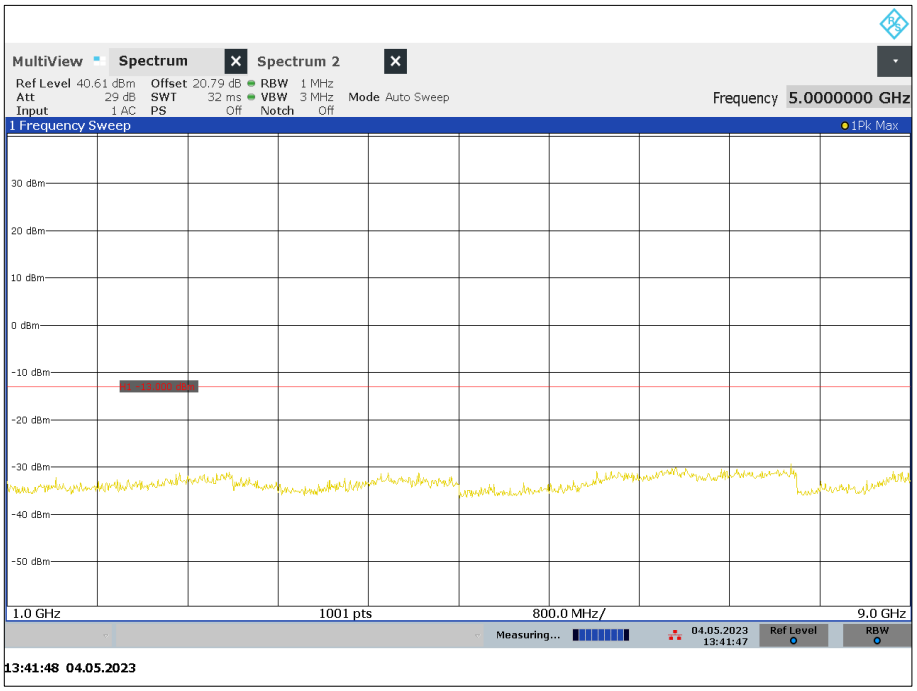

Figure 24 - 823.975 MHz - 1 GHz to 9 GHz Mask B

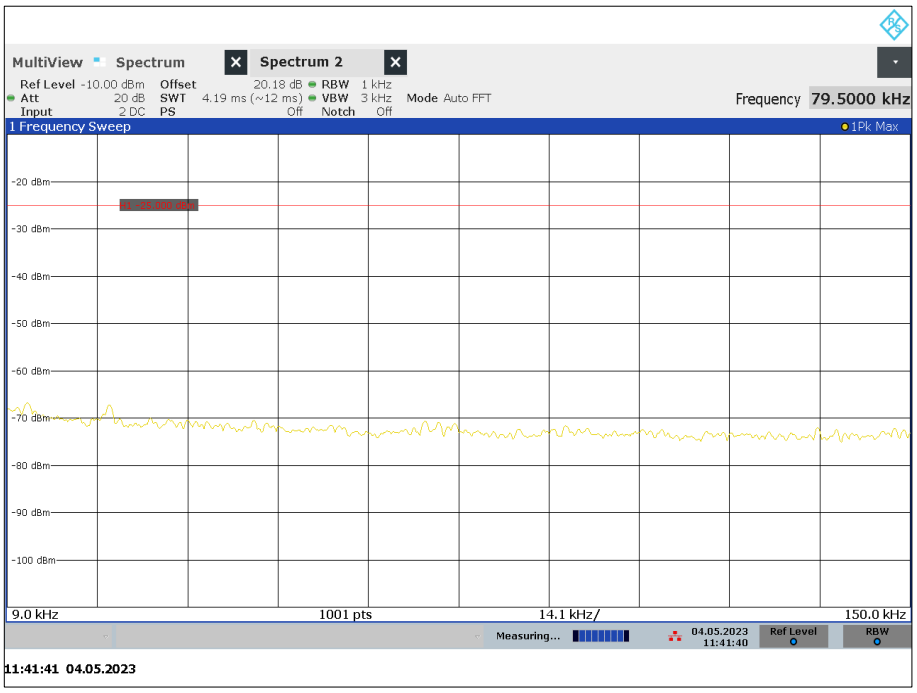

Figure 25 - 806.025 MHz, 9 kHz to 150 kHz Mask Y

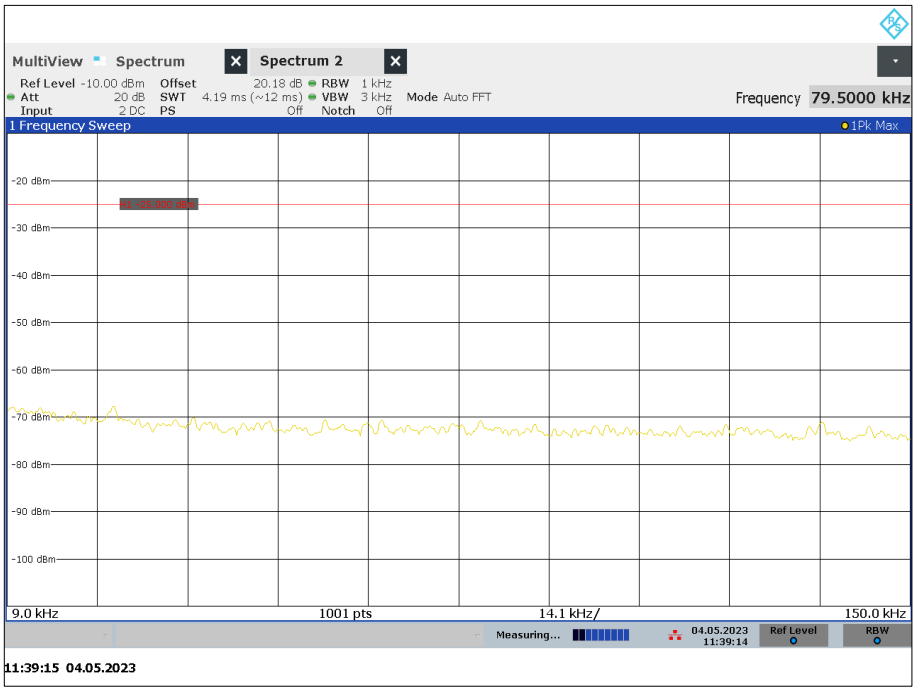

Figure 26 - 815.000 MHz, 9 kHz to 150 kHz Mask Y

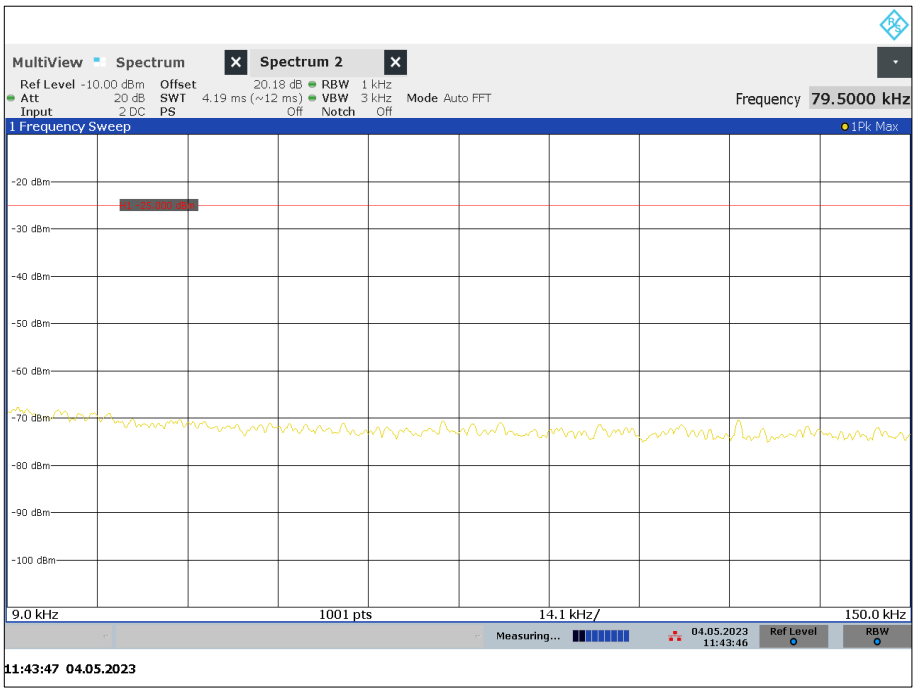

Figure 27 - 823.975 MHz - 9 kHz to 150 kHz Mask Y

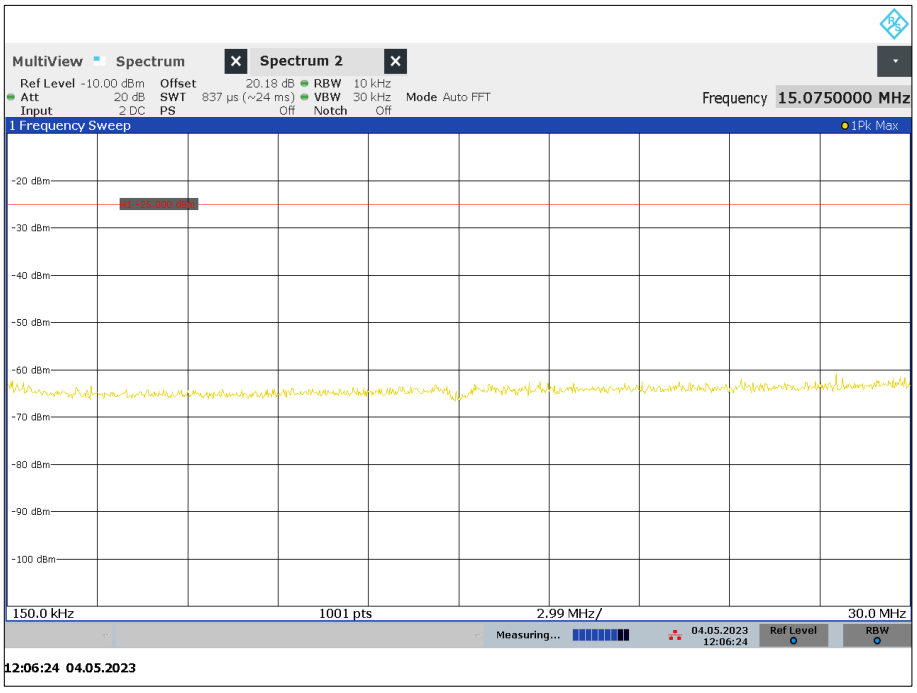

Figure 28 - 806.025 MHz, 150 kHz to 30 MHz Mask Y

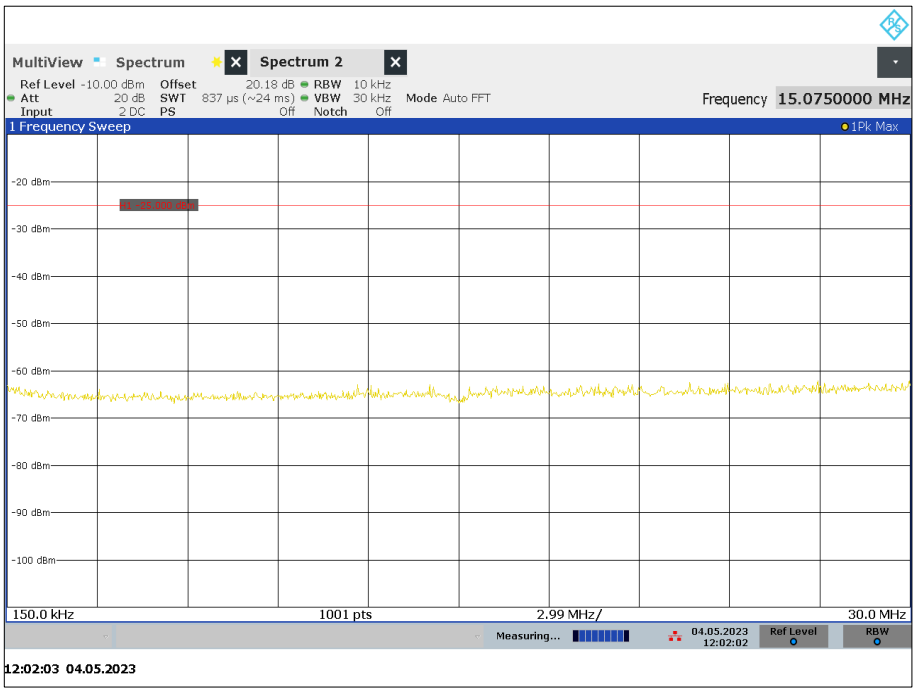

Figure 29 - 815.000 MHz, 150 kHz to 30 MHz Mask Y

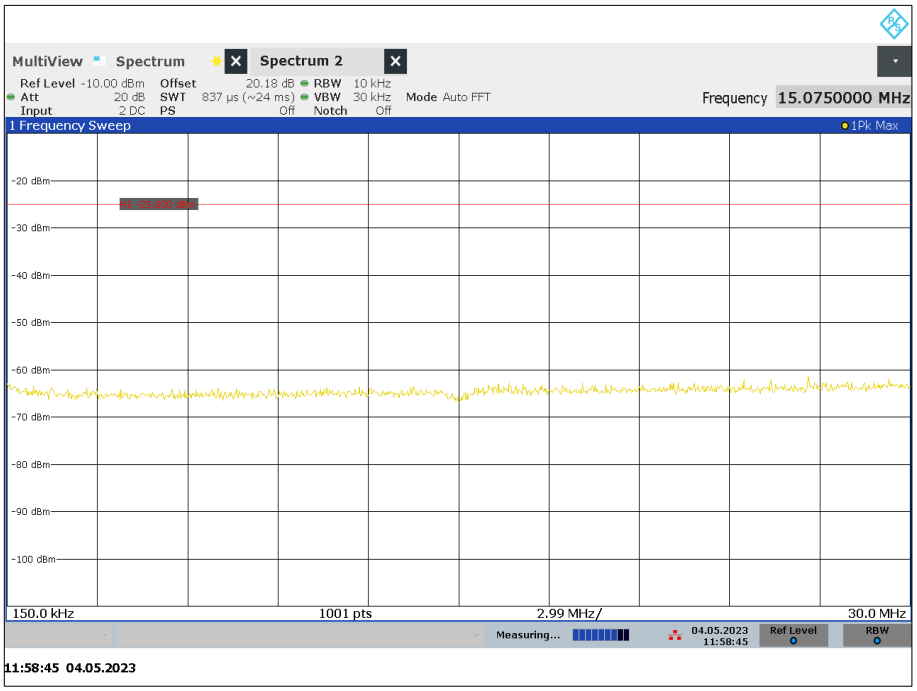

Figure 30 - 823.975 MHz - 150 kHz to 30 MHz Mask Y

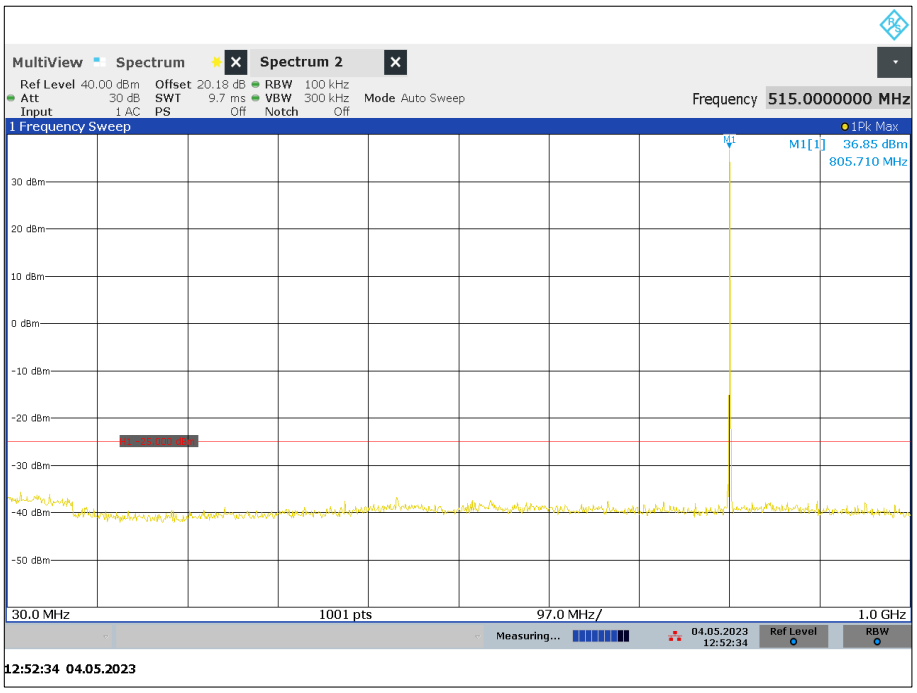

Figure 31 - 806.025 MHz, 30 MHz to 1 GHz Mask Y

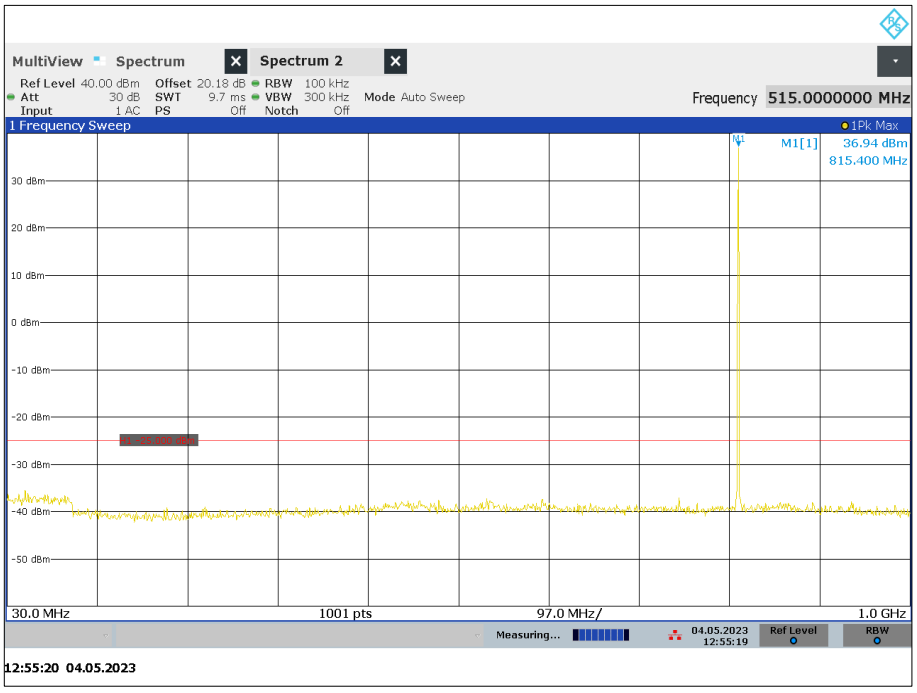

Figure 32 - 815.000 MHz, 30 MHz to 1 GHz Mask Y

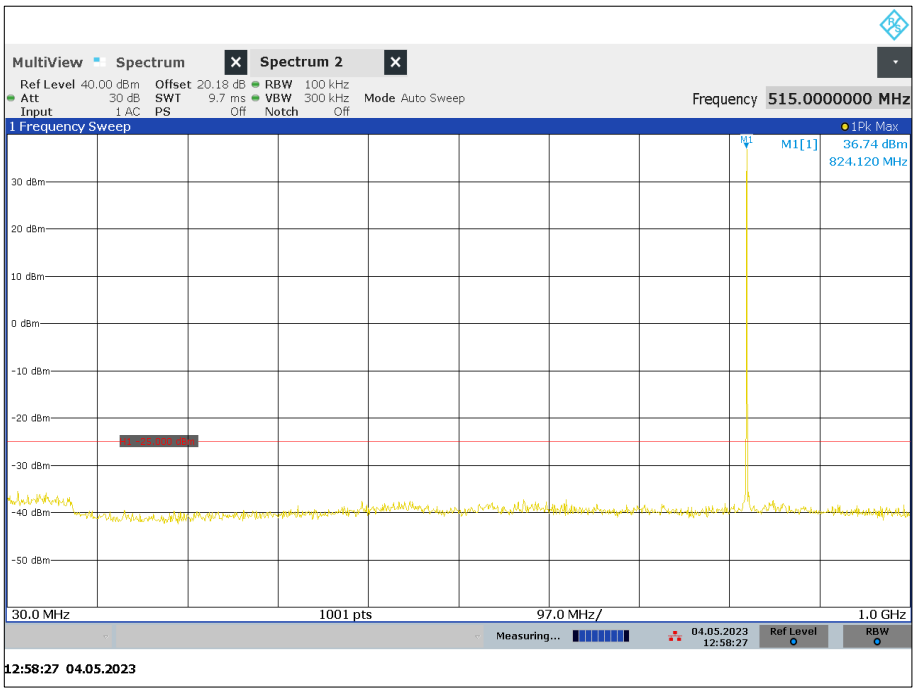

Figure 33 - 823.975 MHz - 30 MHz to 1 GHz Mask Y

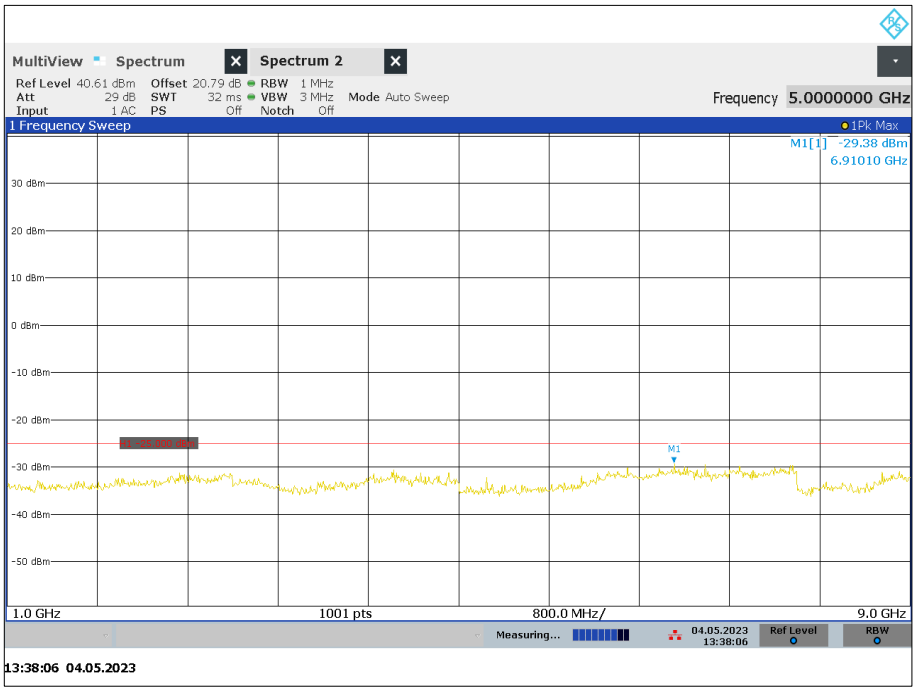

Figure 34 - 806.025 MHz, 1 GHz to 9 GHz Mask Y

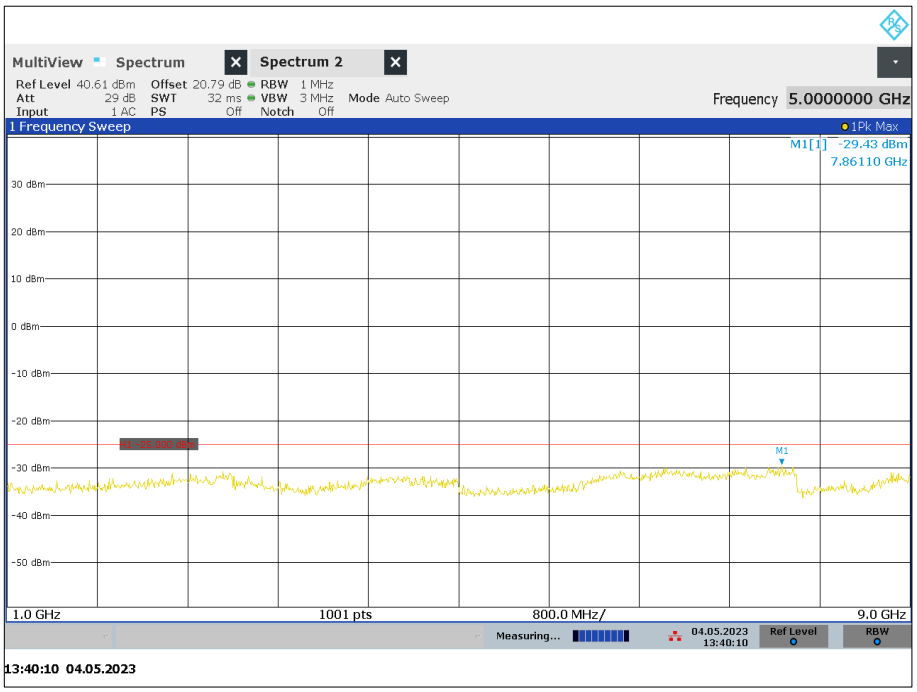

Figure 35 - 815.000 MHz, 1 GHz to 9 GHz Mask Y

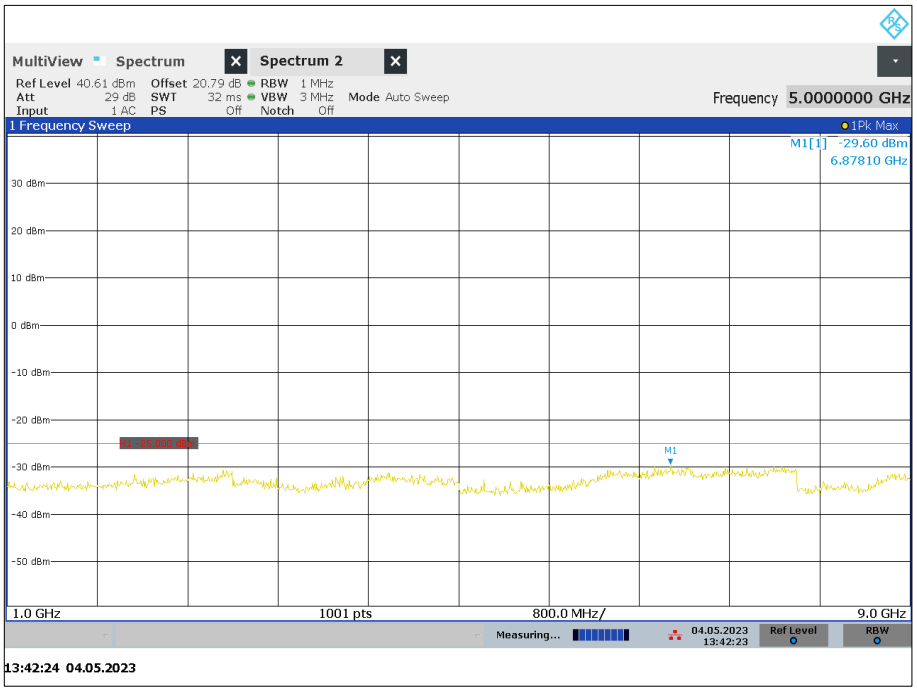

Figure 36 - 823.975 MHz - 1 GHz to 9 GHz Mask Y

TETRA 851 MHz to 869 MHz

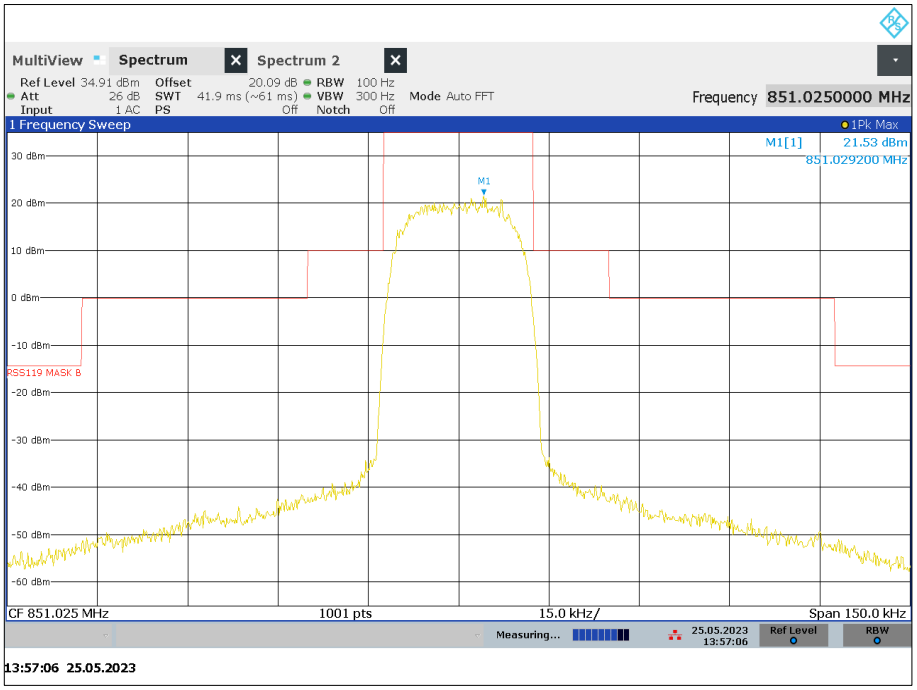

Figure 37 - 851.025 MHz, Transmitter Mask B

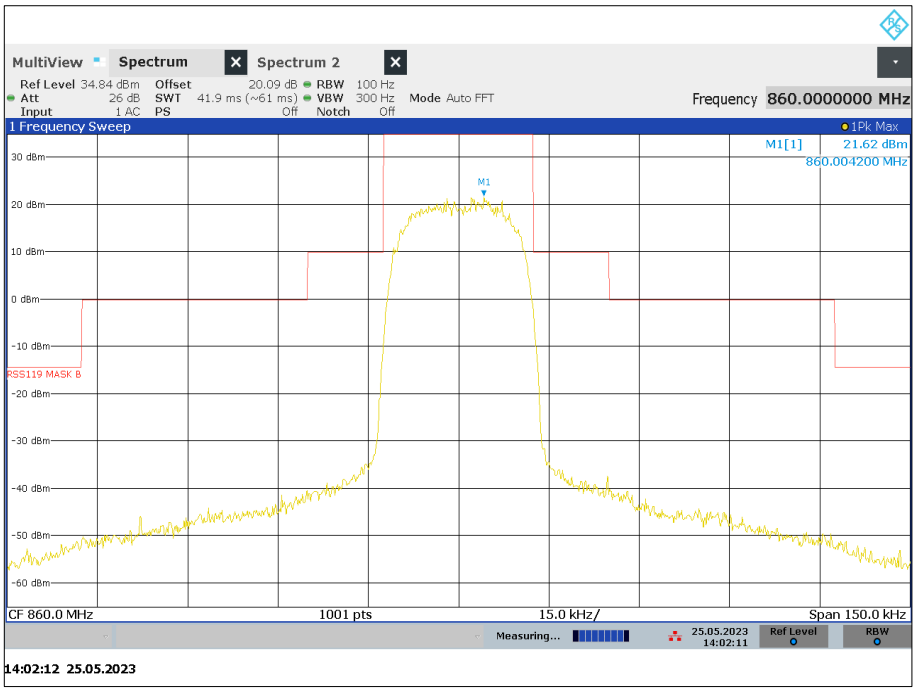

Figure 38 - 860.000 MHz, Transmitter Mask B

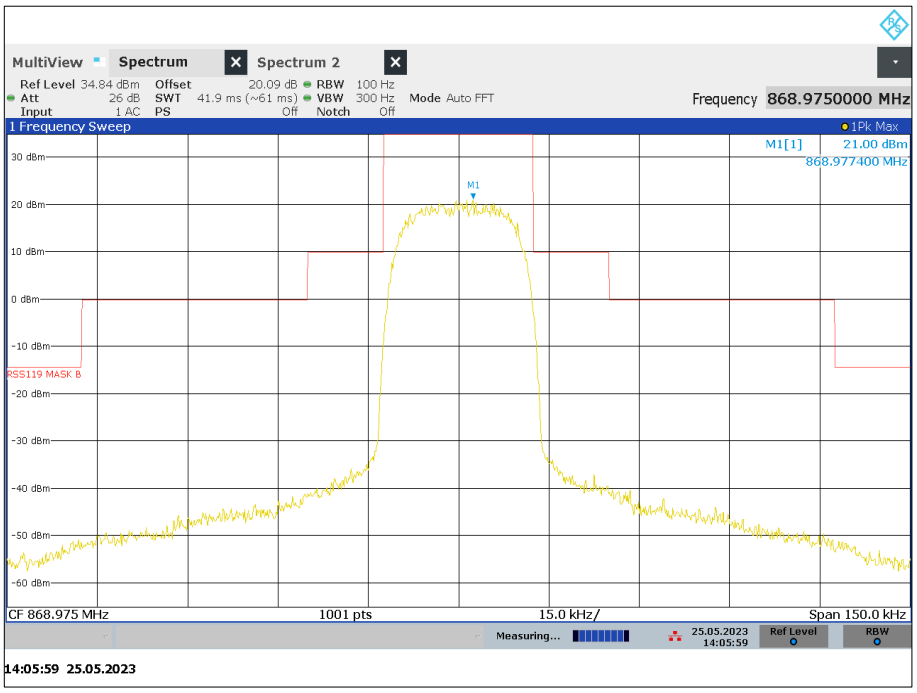

Figure 39 - 868.975 MHz, Transmitter Mask B

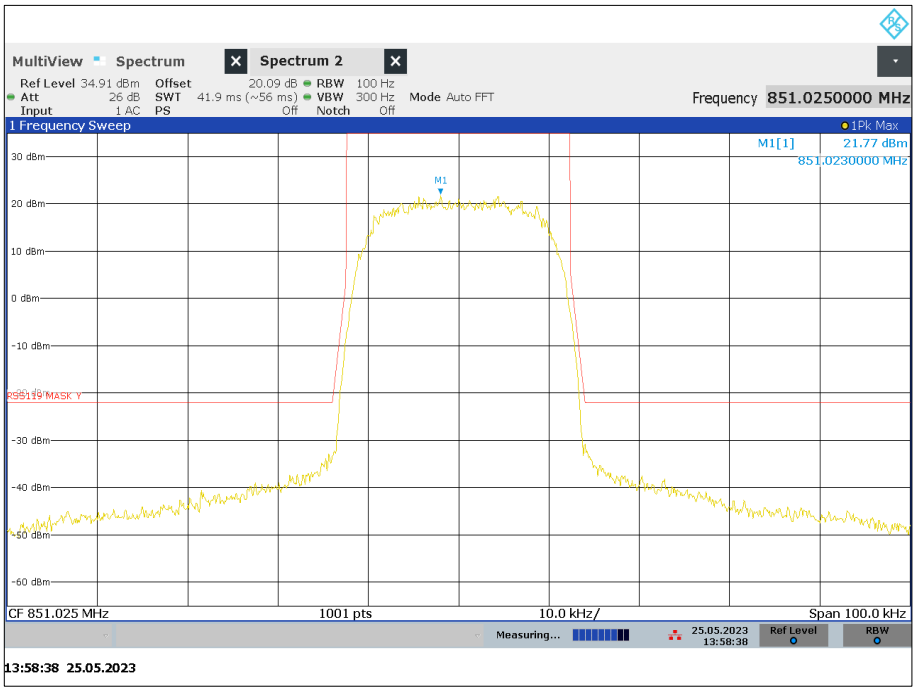

Figure 40 - 851.025 MHz, Transmitter Mask Y

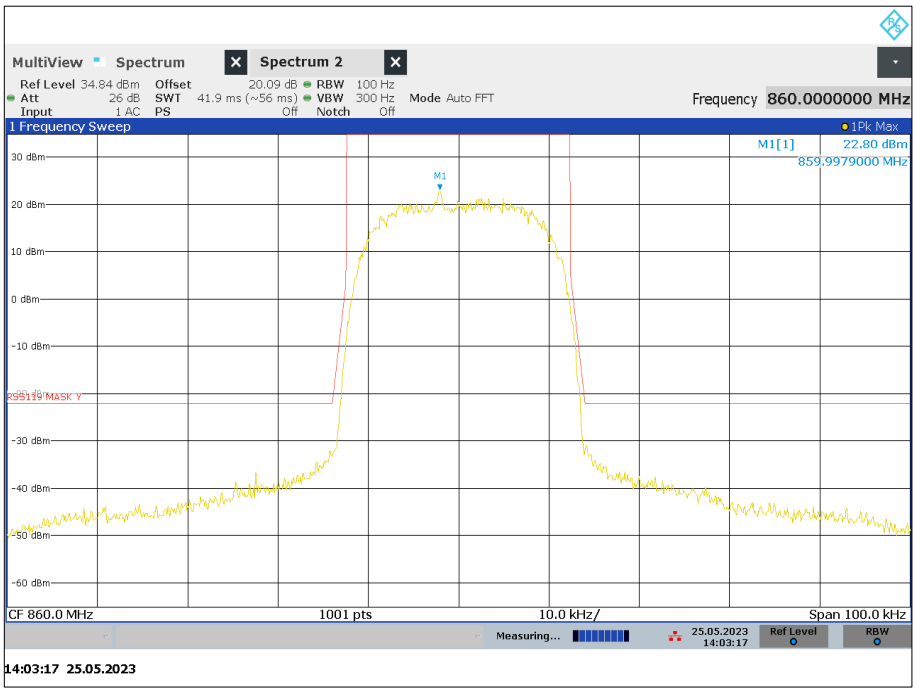

Figure 41 - 860.000 MHz, Transmitter Mask Y

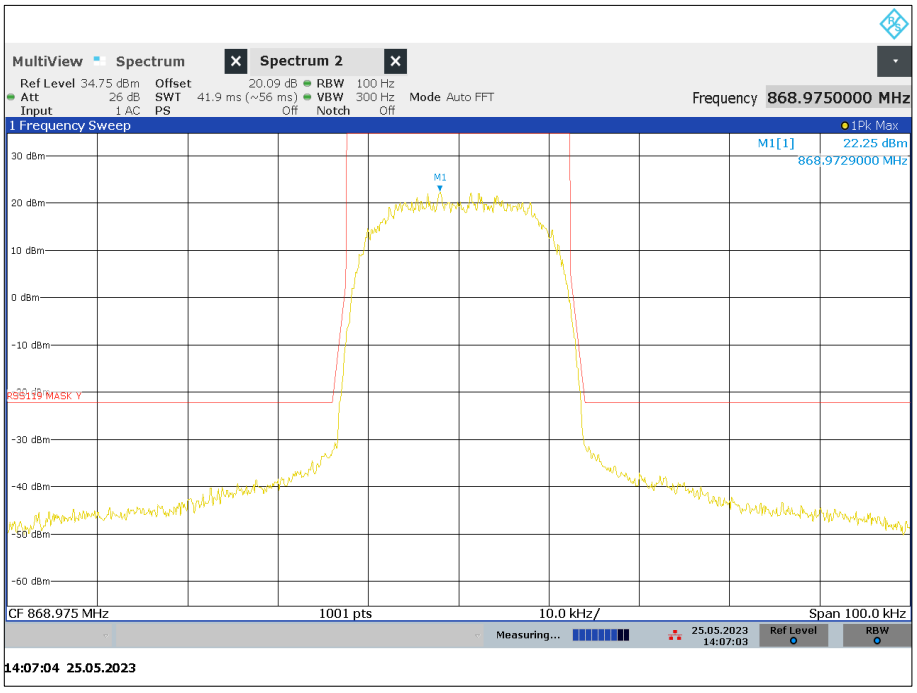

Figure 42 - 868.975 MHz, Transmitter Mask Y

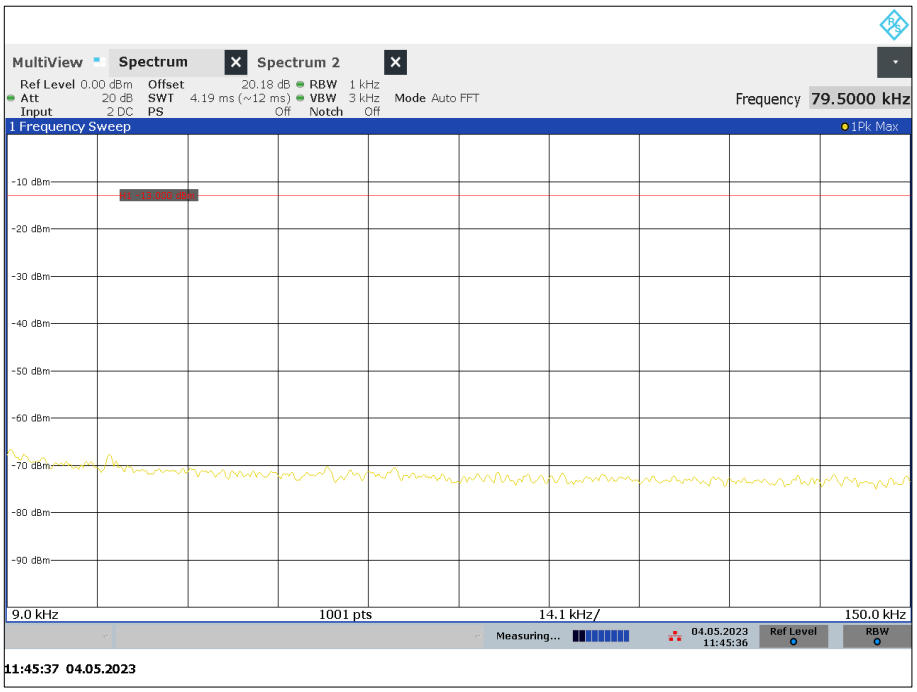

Figure 43 - 851.025 MHz, 9 kHz to 150 kHz Mask B

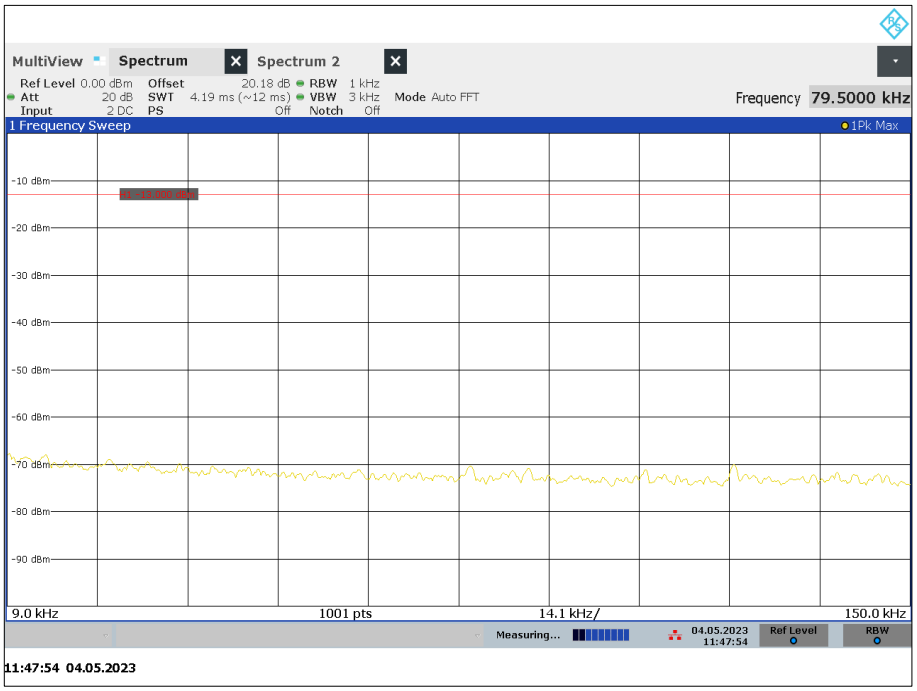

Figure 44 - 860.000 MHz, 9 kHz to 150 kHz Mask B

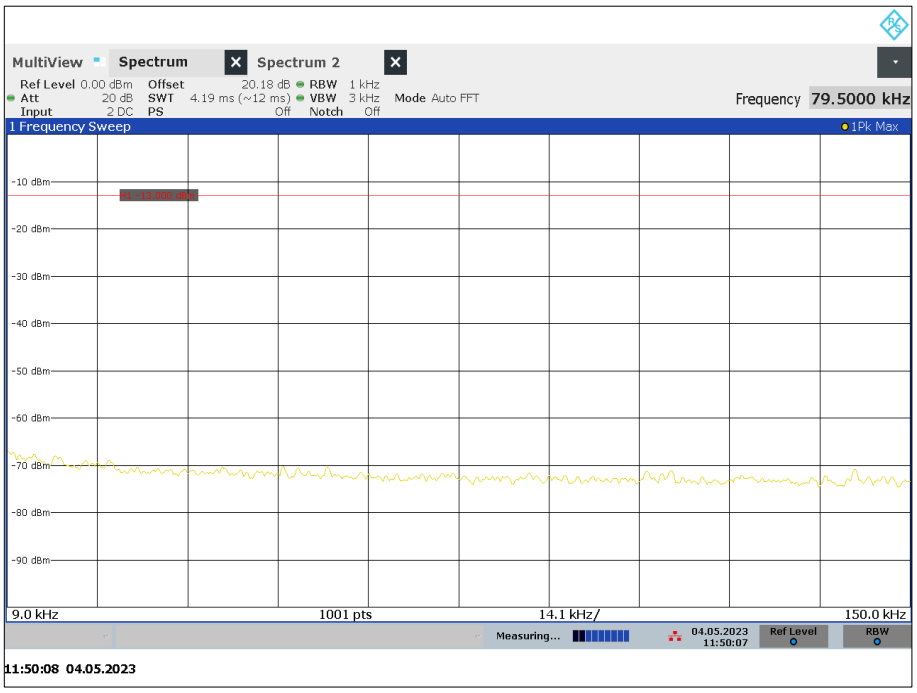

Figure 45 - 868.975 MHz - 9 kHz to 150 kHz Mask B

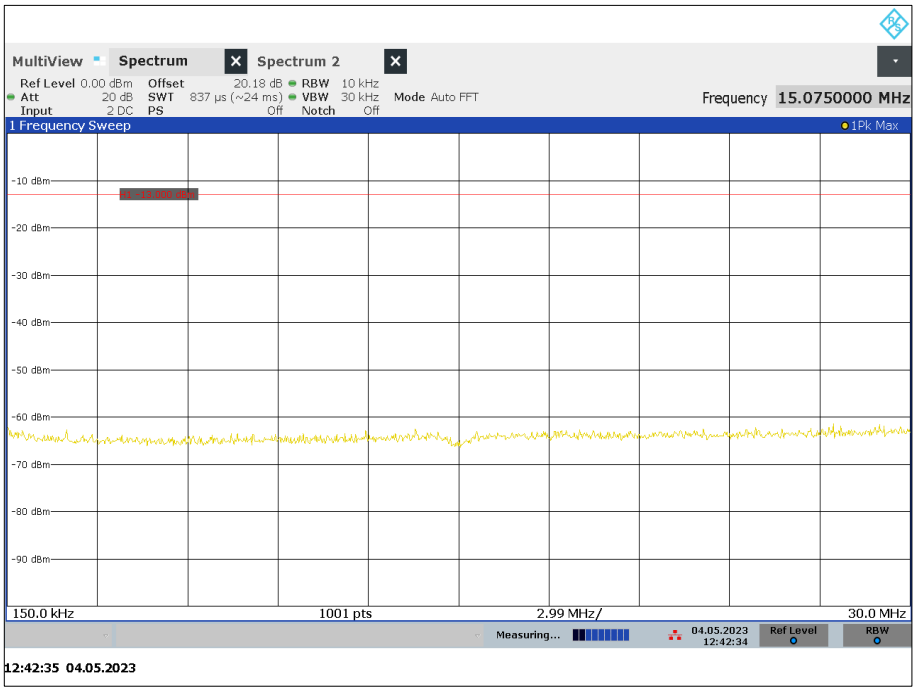

Figure 46 - 851.025 MHz, 150 kHz to 30 MHz Mask B

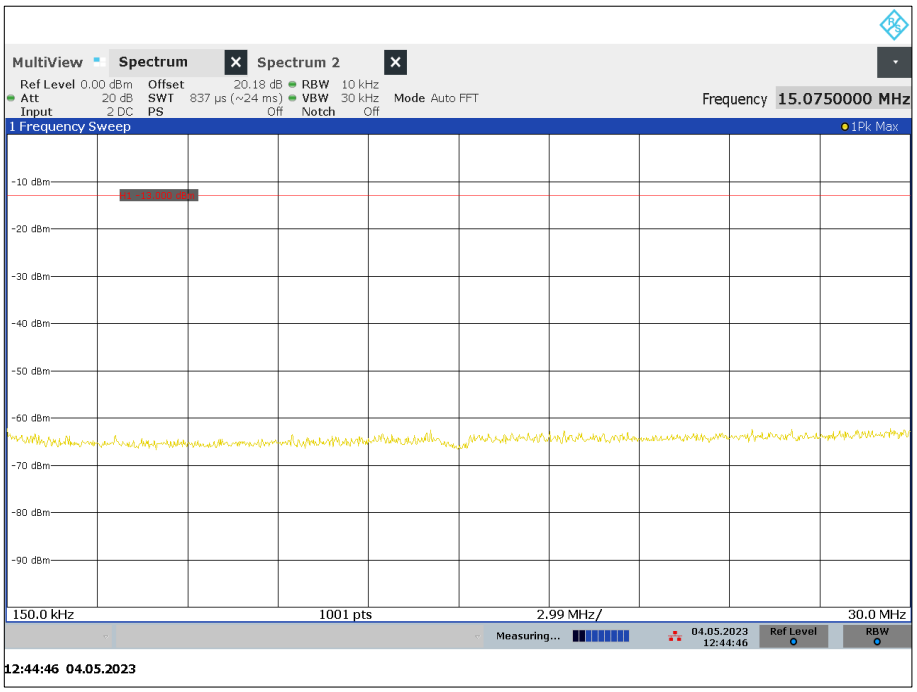

Figure 47 - 860.000 MHz, 150 kHz to 30 MHz Mask B

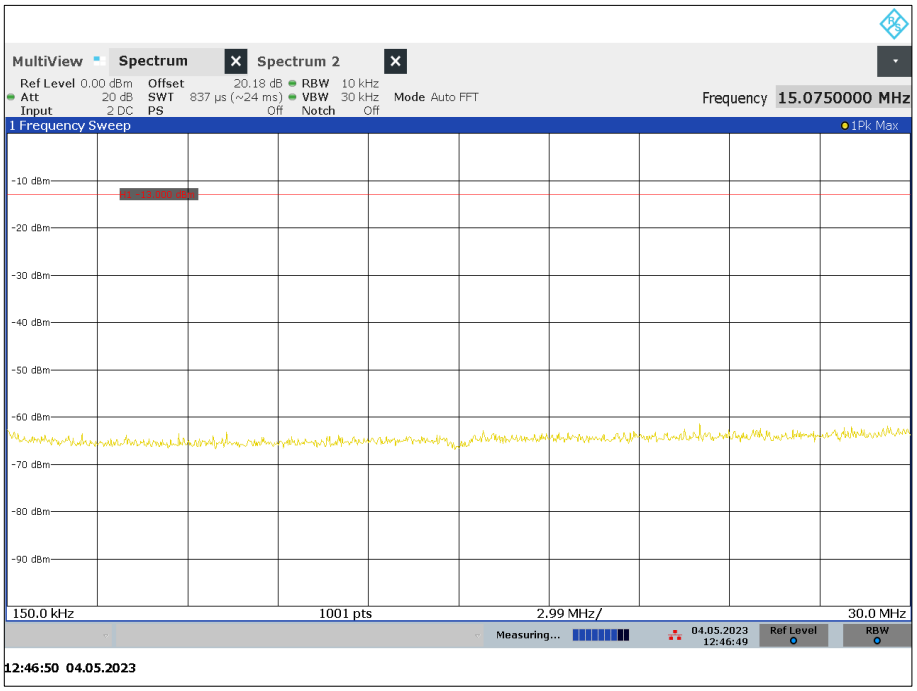

Figure 48 - 868.975 MHz - 150 kHz to 30 MHz Mask B

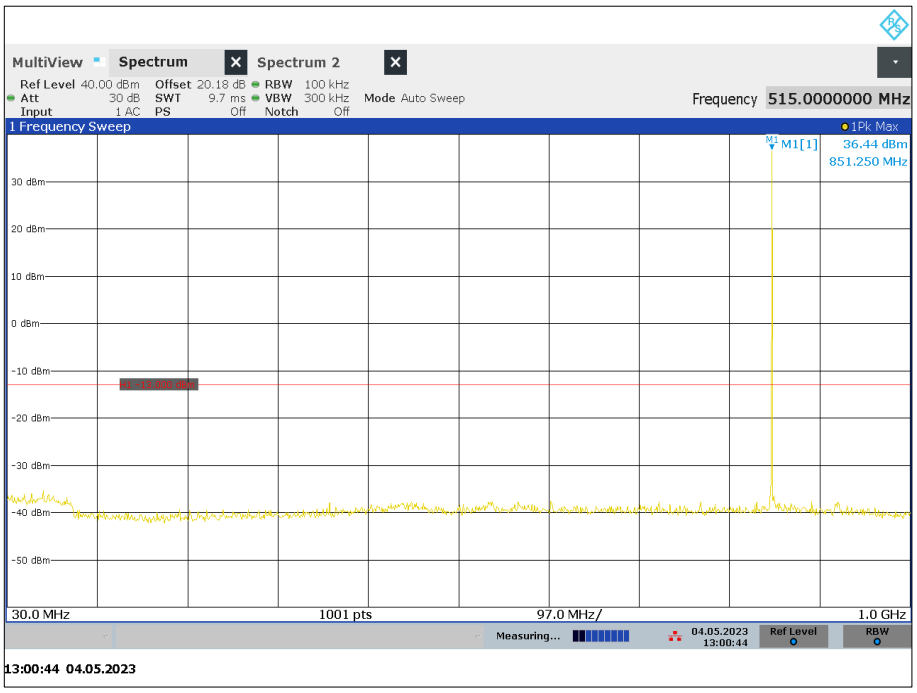

Figure 49 - 851.025 MHz, 30 MHz to 1 GHz Mask B

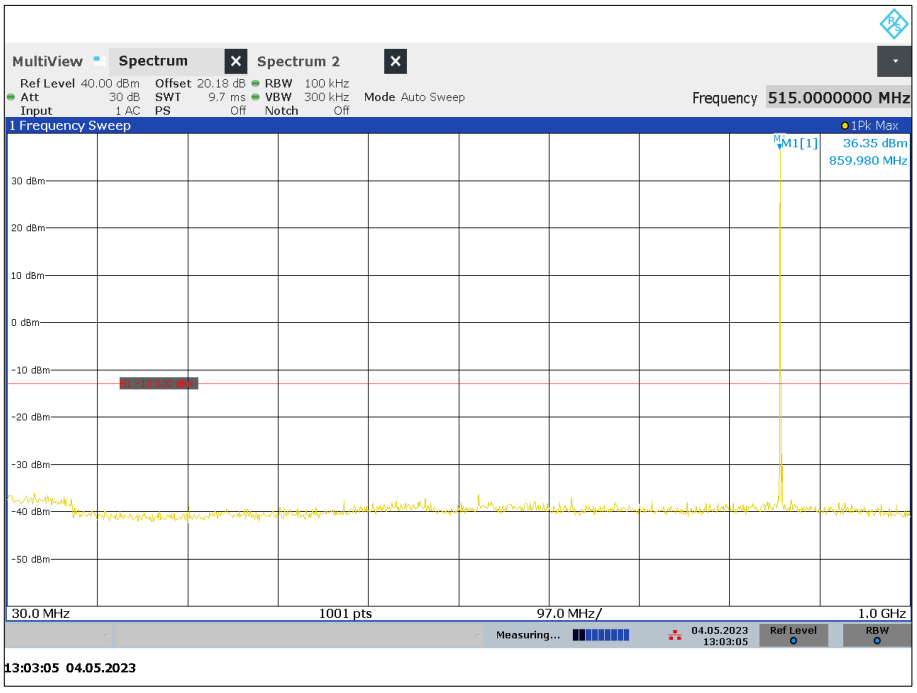

Figure 50 - 860.000 MHz, 30 MHz to 1 GHz Mask B

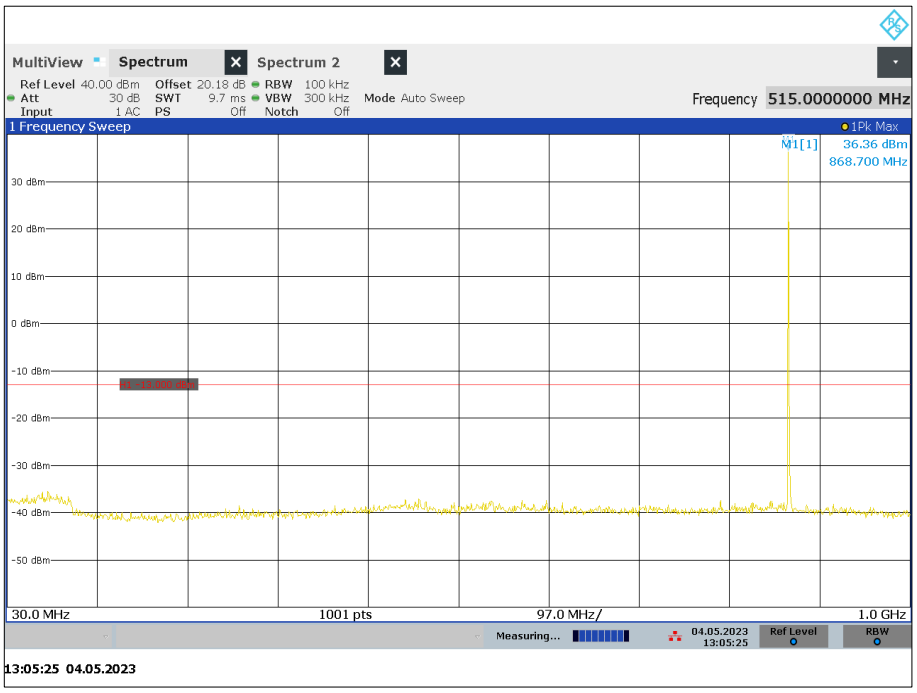

Figure 51 - 868.975 MHz - 30 MHz to 1 GHz Mask B

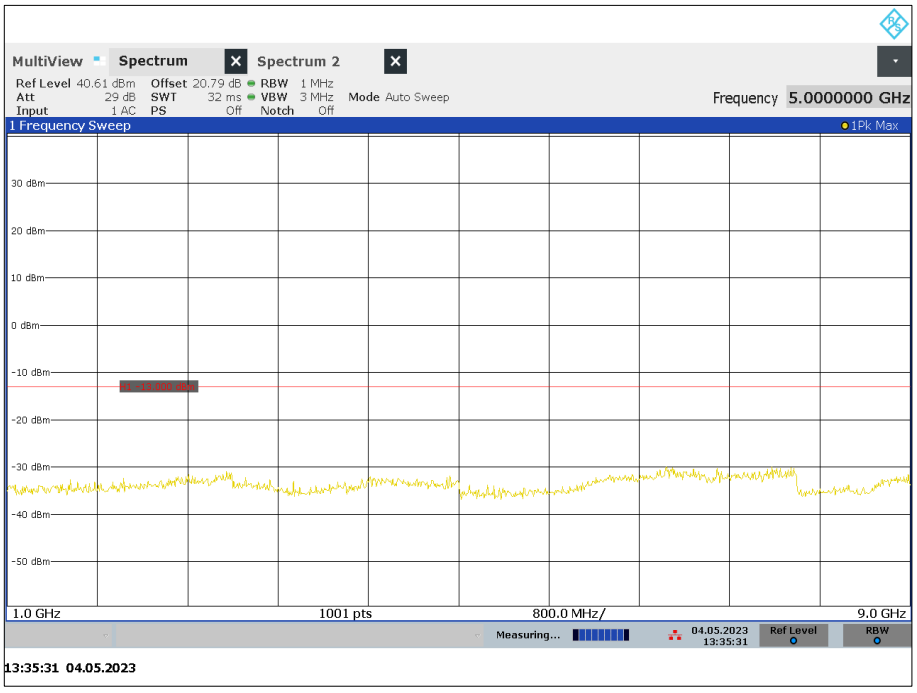

Figure 52 - 851.025 MHz, 1 GHz to 9 GHz Mask B

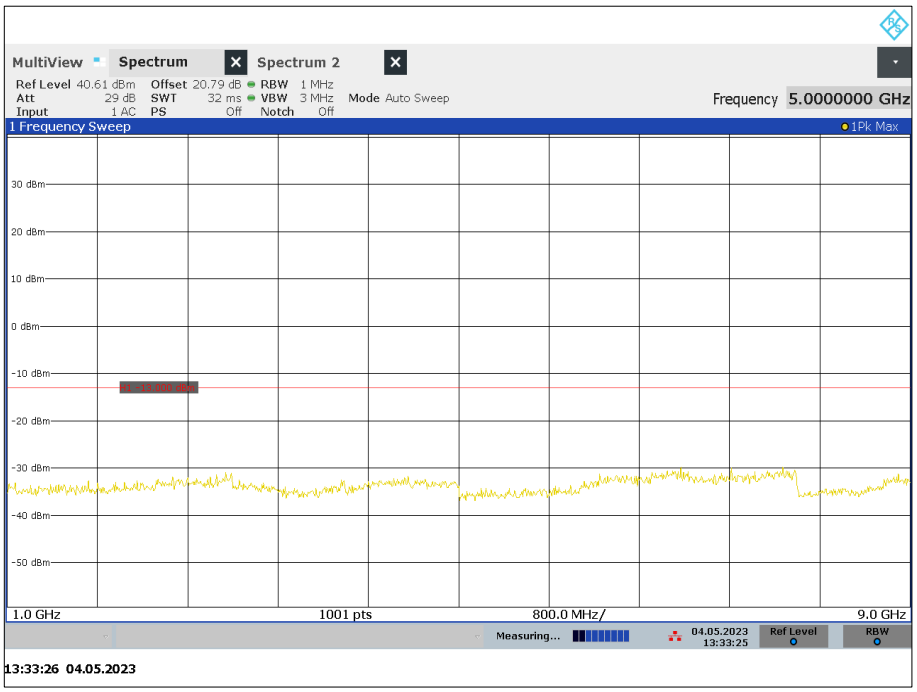

Figure 53 - 860.000 MHz, 1 GHz to 9 GHz Mask B

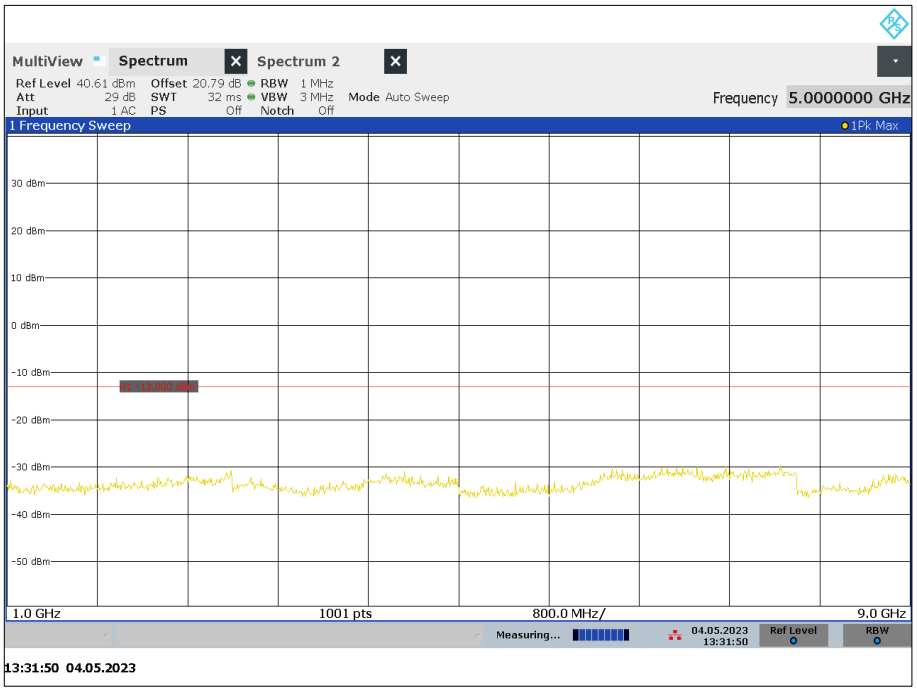

Figure 54 - 868.975 MHz - 1 GHz to 9 GHz Mask B

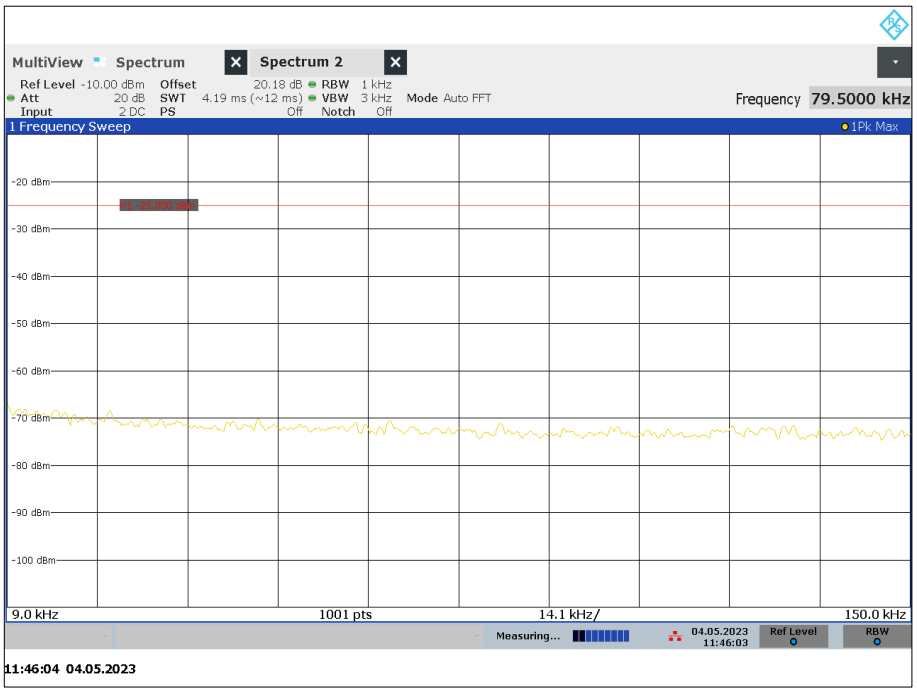

Figure 55 - 851.025 MHz, 9 kHz to 150 kHz Mask Y

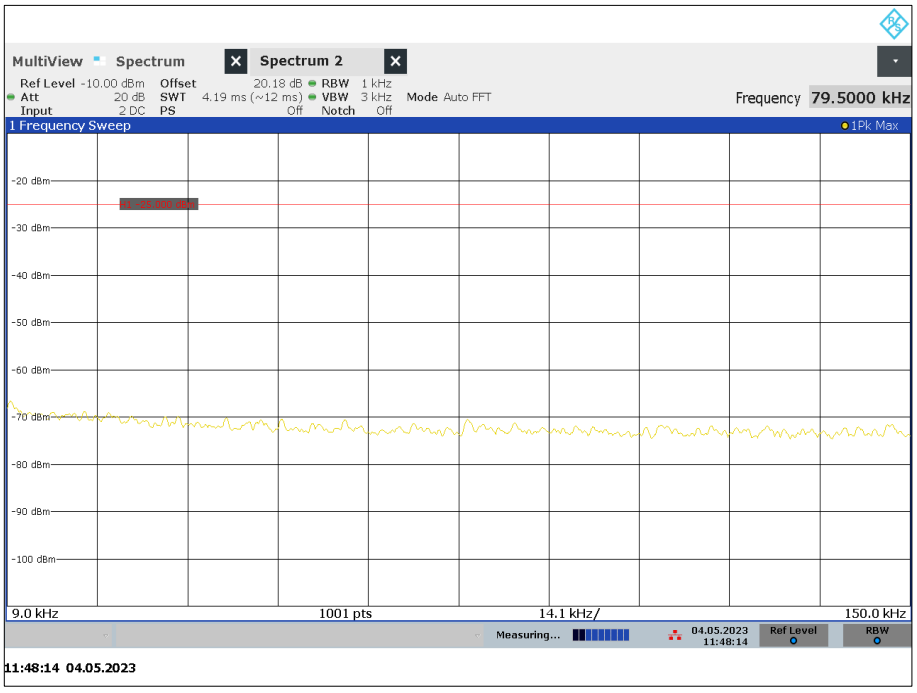

Figure 56 - 860.000 MHz, 9 kHz to 150 kHz Mask Y

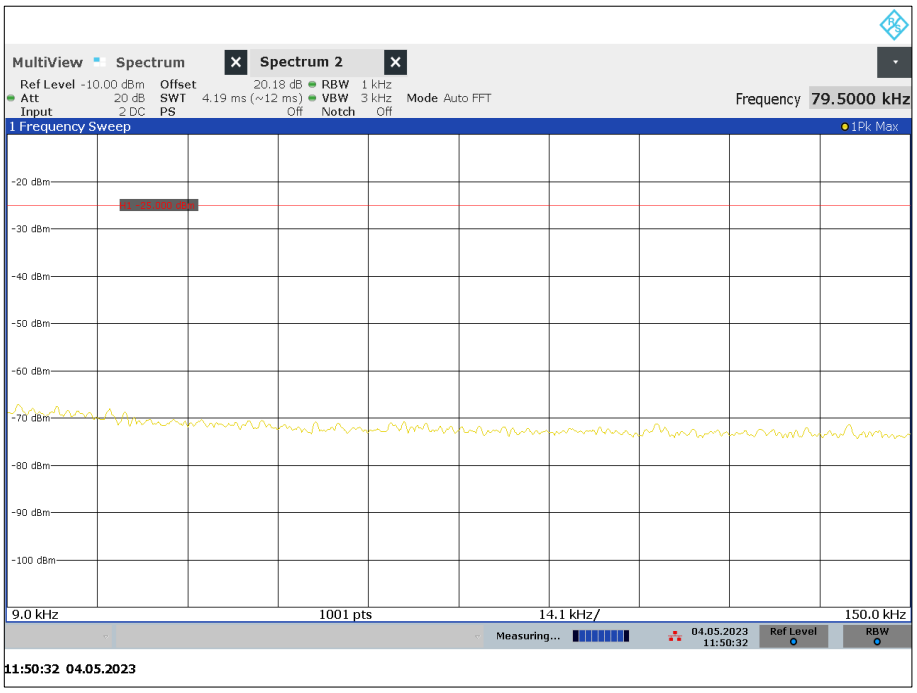

Figure 57 - 868.975 MHz - 9 kHz to 150 kHz Mask Y

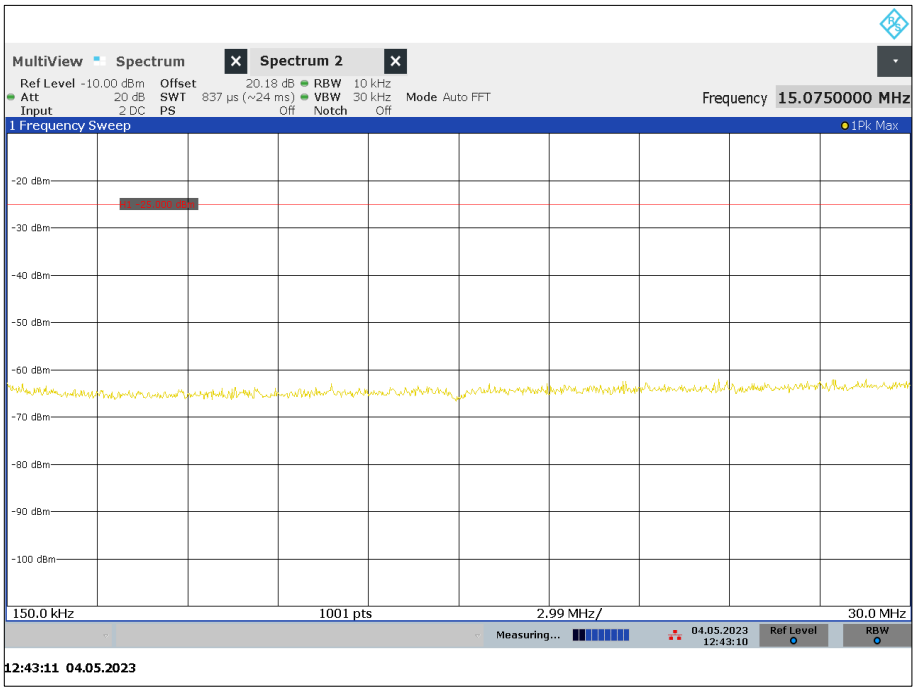

Figure 58 - 851.025 MHz, 150 kHz to 30 MHz Mask Y

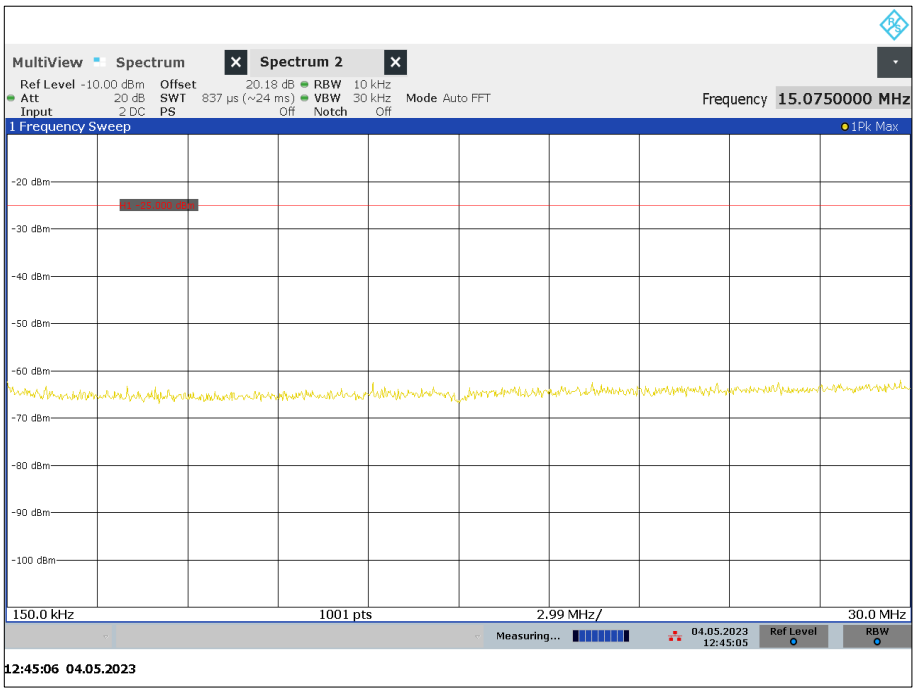

Figure 59 - 860.000 MHz, 150 kHz to 30 MHz Mask Y

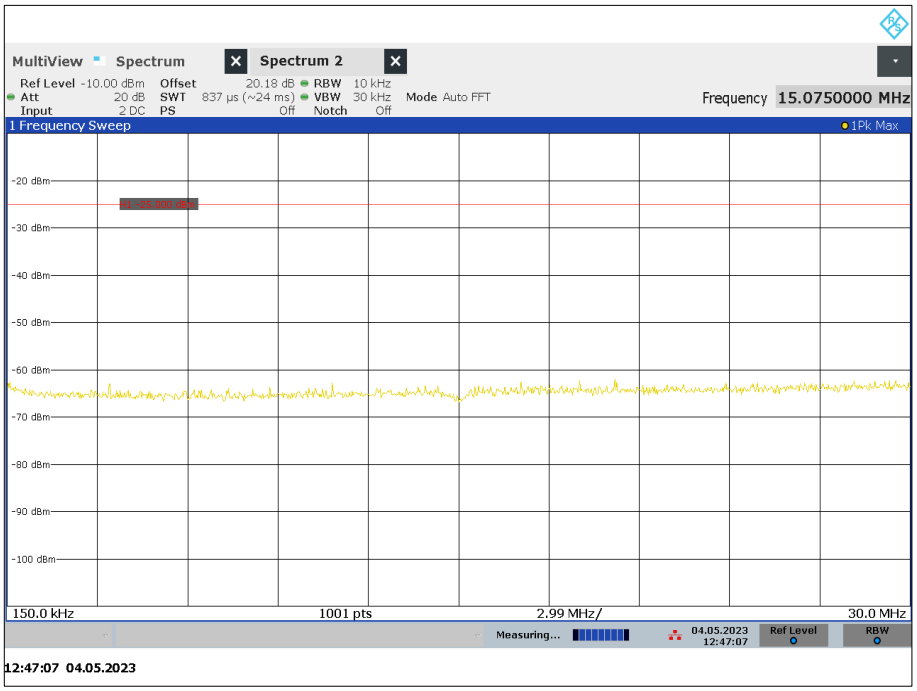

Figure 60 - 868.975 MHz - 150 kHz to 30 MHz Mask Y

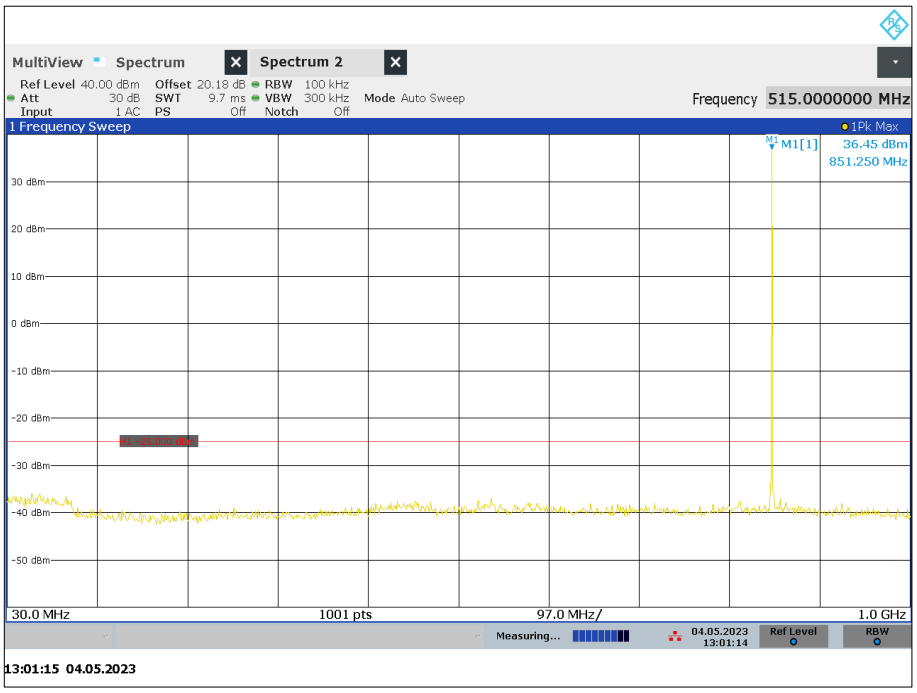

Figure 61 - 851.025 MHz, 30 MHz to 1 GHz Mask Y

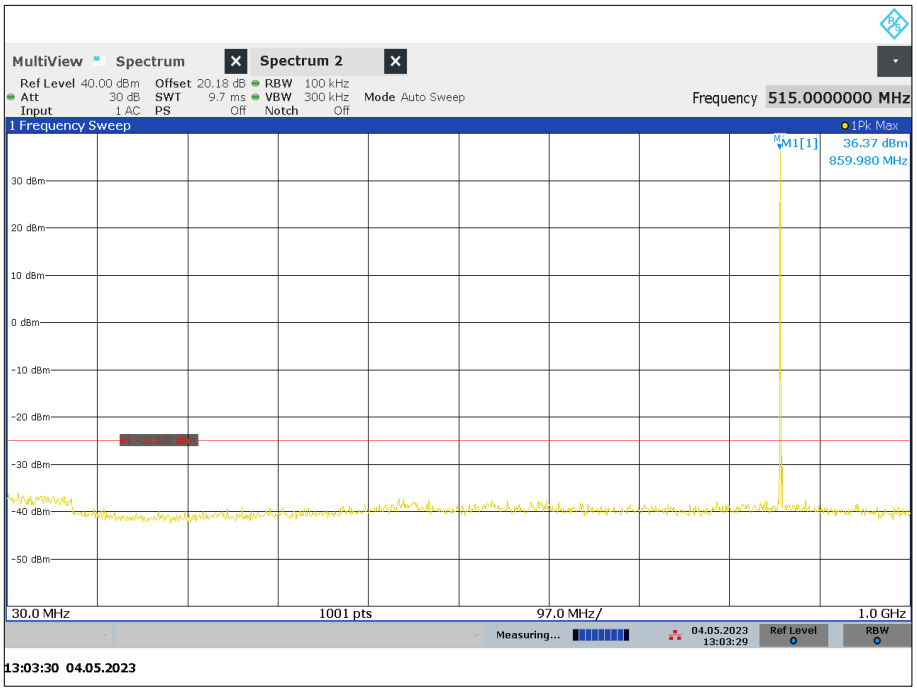

Figure 62 - 860.000 MHz, 30 MHz to 1 GHz Mask Y

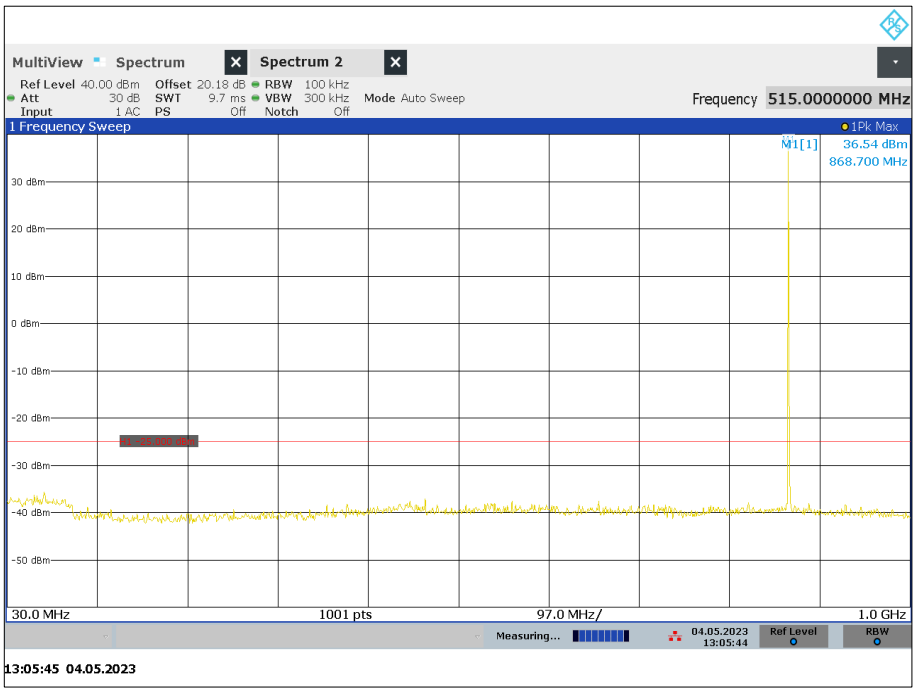

Figure 63 - 868.975 MHz - 30 MHz to 1 GHz Mask Y

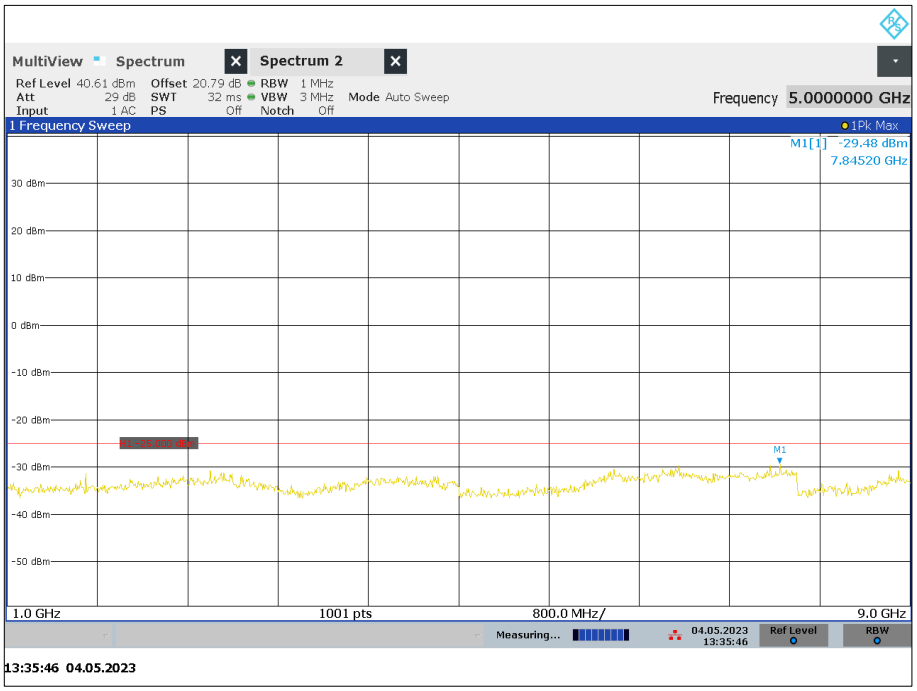

Figure 64 - 851.025 MHz, 1 GHz to 9 GHz Mask Y

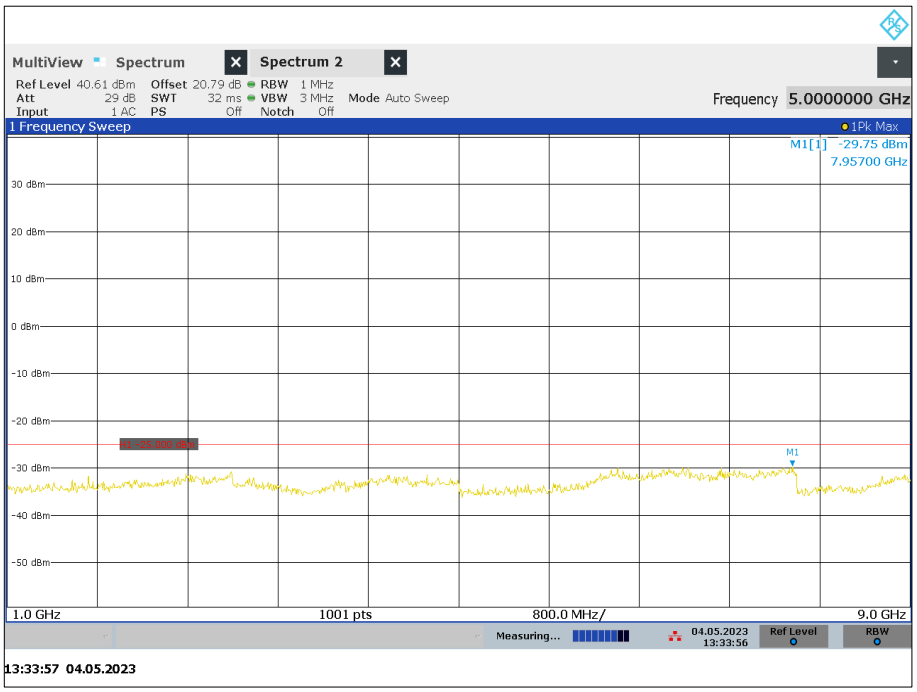

Figure 65 - 860.000 MHz, 1 GHz to 9 GHz Mask Y

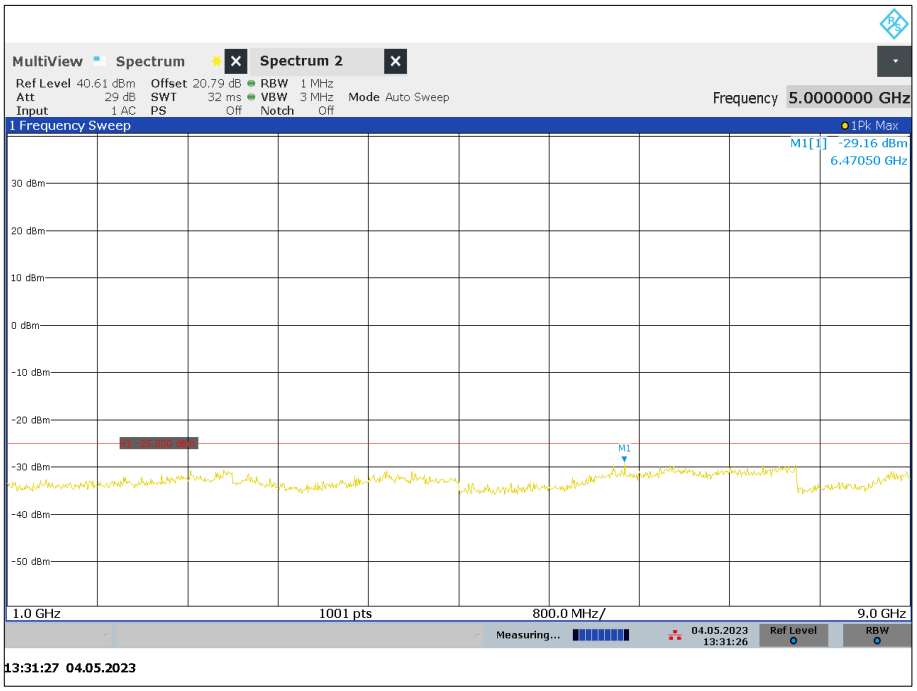

Figure 66 - 868.975 MHz - 1 GHz to 9 GHz Mask Y

FCC 47 CFR Part 90, Limit Clause 90.210

The EUT shall comply with emission mask B as per FCC 47 CFR Part 90, clause 90.210.

ISED RSS-119, Limit Clause 5.8

The EUT shall comply with emission mask Y as per ISED RSS-119, clause 5.8.

2.2.7 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
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	17-May-2023
Screened Room (11)	Rainford	Rainford	5136	36	24-Nov-2024
1 GHz High Pass Filter	Mini-Circuits	NHP 1000+	5260	12	20-Aug-2023
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	20-Apr-2024
Attenuator 5W 20dB DC-18GHz	Aaren	AT40A-4041-D18-20	5497	12	18-Apr-2024
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/A	5516	12	23-Oct-2023

Table 21

2.3 Radiated Spurious Emissions

2.3.1 Specification Reference

FCC 47 CFR Part 2, Clause 2.1053
FCC 47 CFR Part 90, Clause 90.210
ISED RSS-119, Clause 5.8
ISED RSS-GEN, Clause 6.13

2.3.2 Equipment Under Test and Modification State

3. SC2028, S/N: 1PR002244GK93AH - Modification State 0
SC2028, S/N: 1PR002244GK93AI - Modification State 0

2.3.3 Date of Test

20-June-2023

2.3.4 Test Method

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.

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)

2.3.5 Example Test Setup Diagram

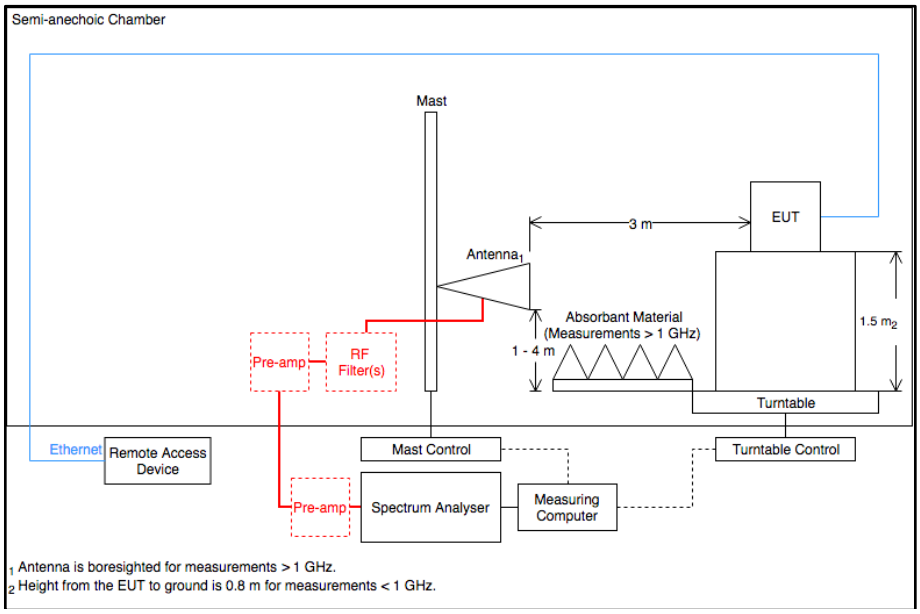

Figure 67 – Test Setup Diagram

2.3.6 Environmental Conditions

Ambient Temperature	19.4 - 23.2 °C
Relative Humidity	35.5 - 44.3 %

2.3.7 Test Results

TETRA 806 MHz to 824 MHz

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
*								

Table 22 - 806.025 MHz

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

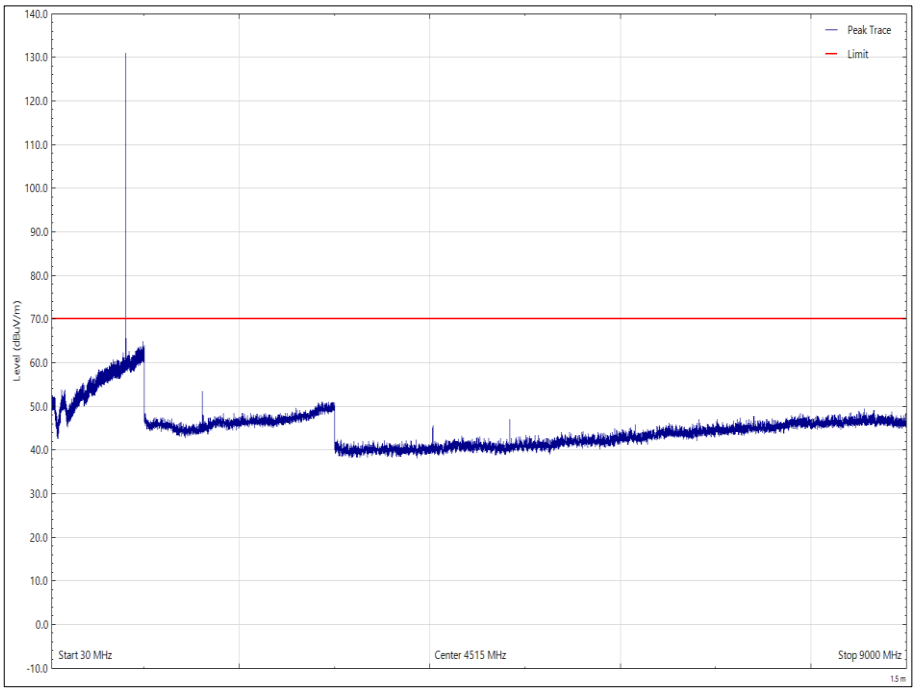

Figure 68 - 806.025 MHz - 30 MHz to 9 GHz, Horizontal, EUT Orientation X

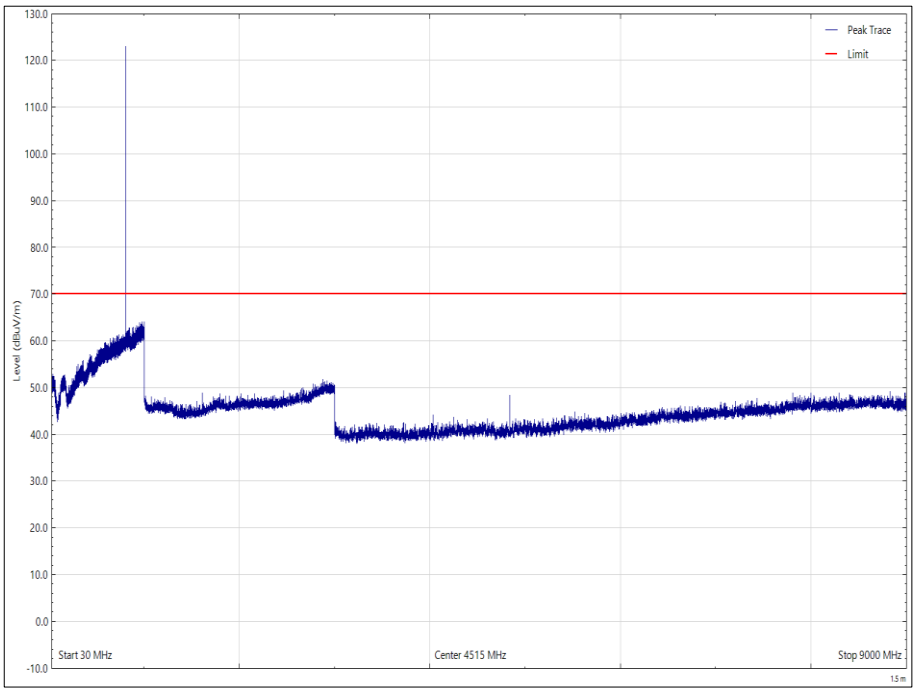

Figure 69 - 806.025 MHz - 30 MHz to 9 GHz, Vertical, EUT Orientation X

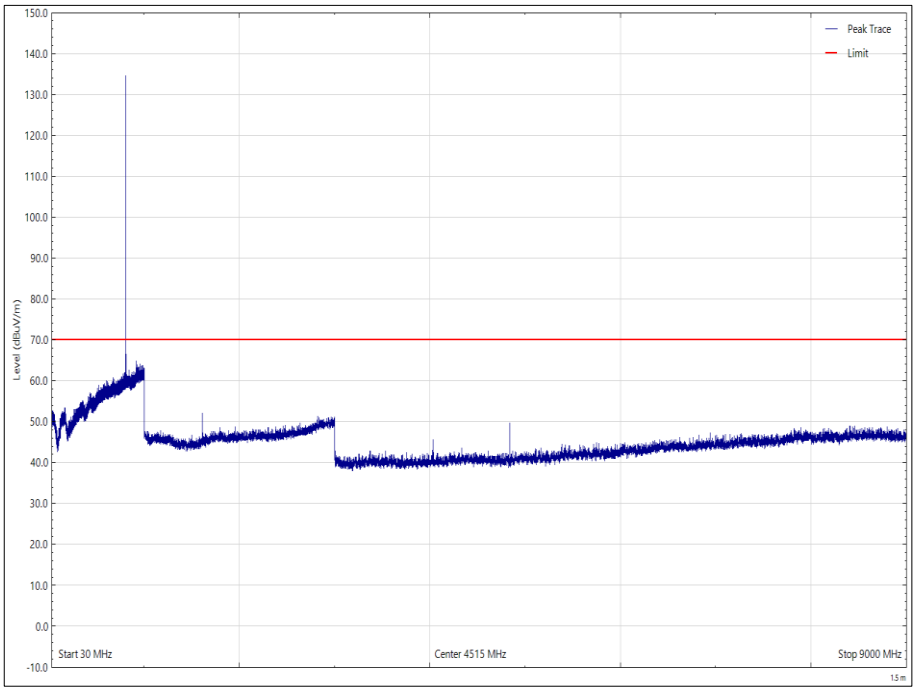

Figure 70 - 806.025 MHz - 30 MHz to 9 GHz, Horizontal, EUT Orientation Y

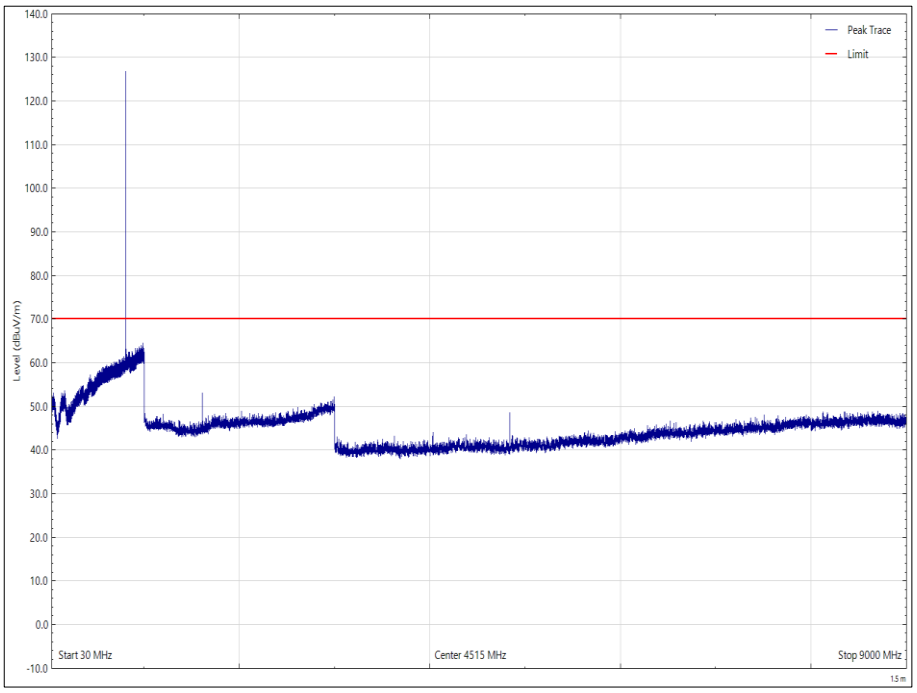

Figure 71 - 806.025 MHz - 30 MHz to 9 GHz, Vertical, EUT Orientation Y

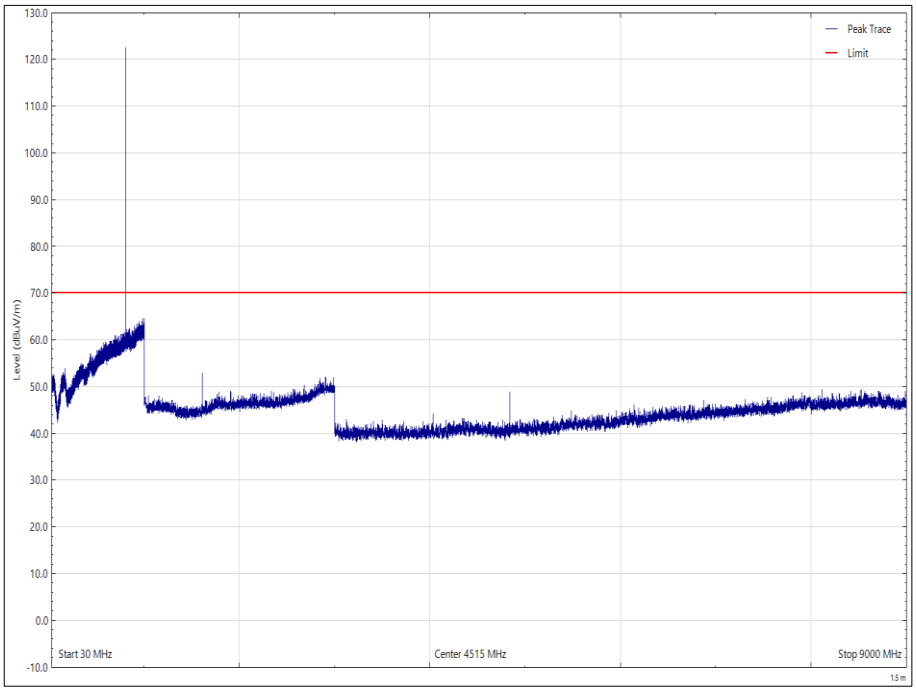

Figure 72 - 806.025 MHz - 30 MHz to 9 GHz, Horizontal, EUT Orientation Z

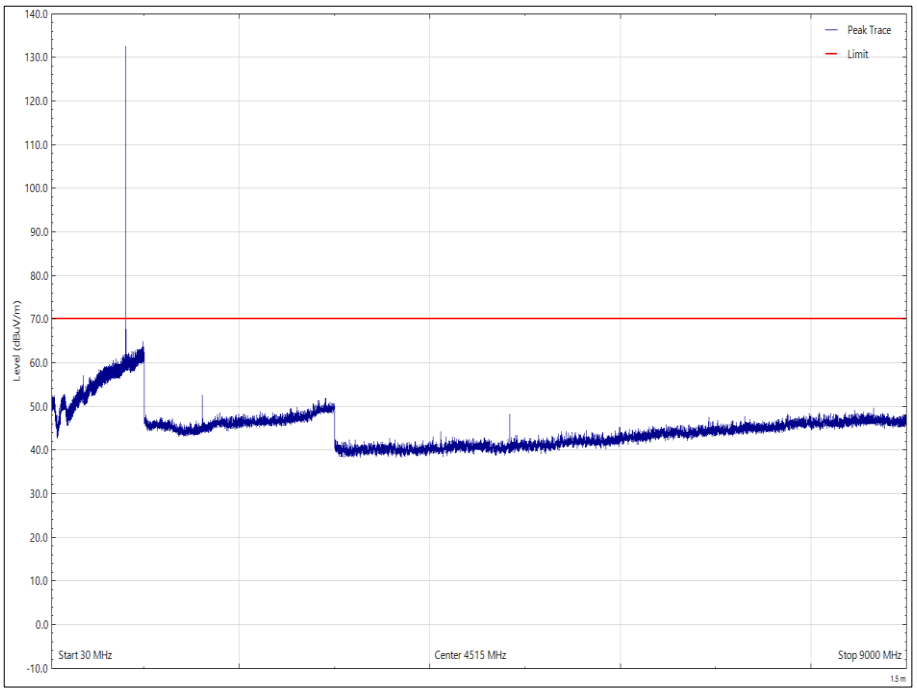

Figure 73 - 806.025 MHz - 30 MHz to 9 GHz, Vertical, EUT Orientation Z

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1630.175	61.33	70.20	-8.87	Peak	36	155	Horizontal	X

Table 23 - 815.000 MHz

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

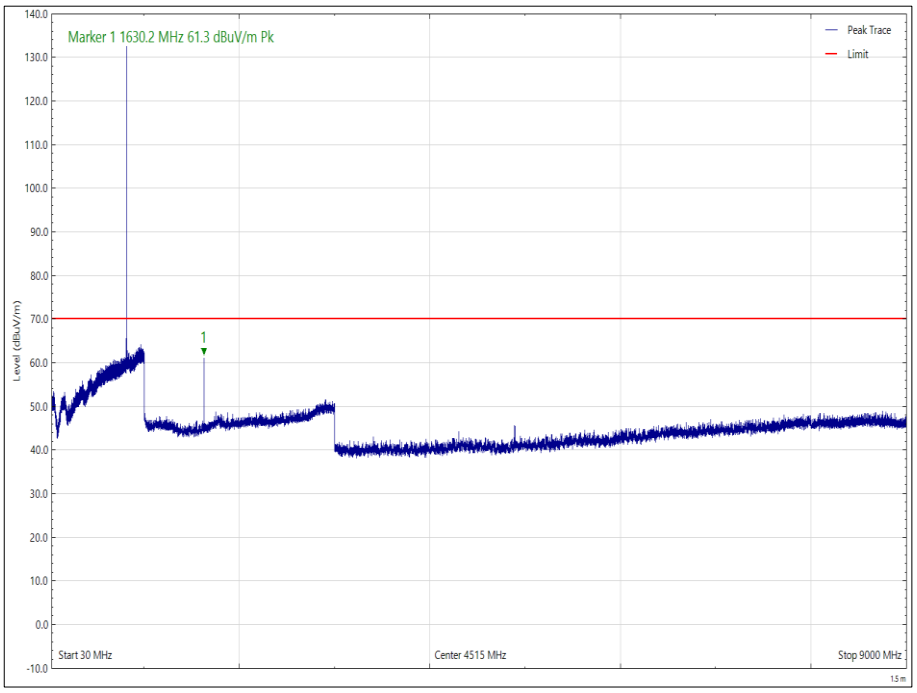

Figure 74 - 815.000 MHz - 30 MHz to 9 GHz, Horizontal, EUT Orientation X

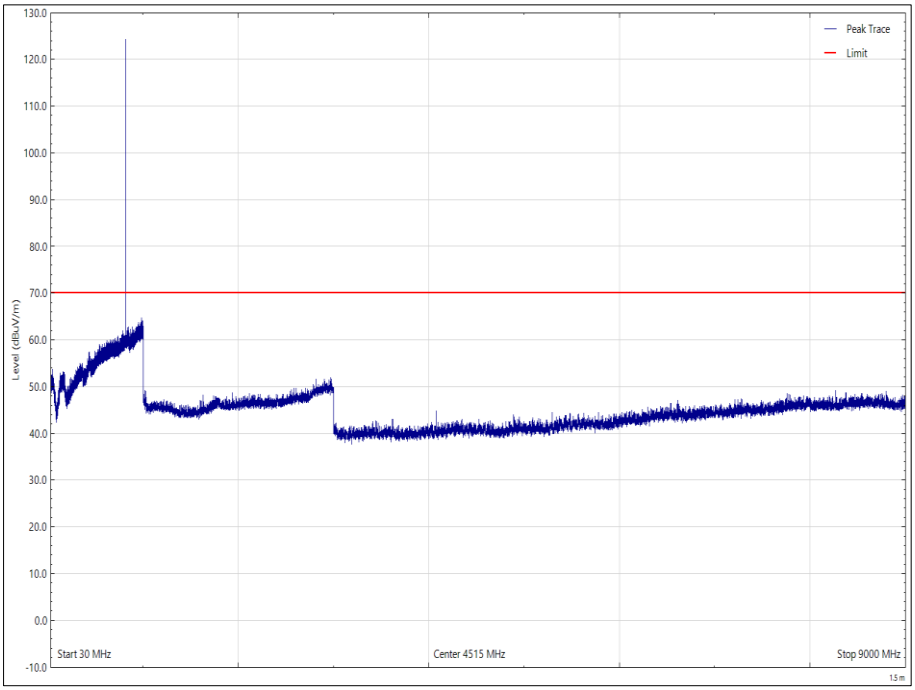

Figure 75 - 815.000 MHz - 30 MHz to 9 GHz, Vertical, EUT Orientation X

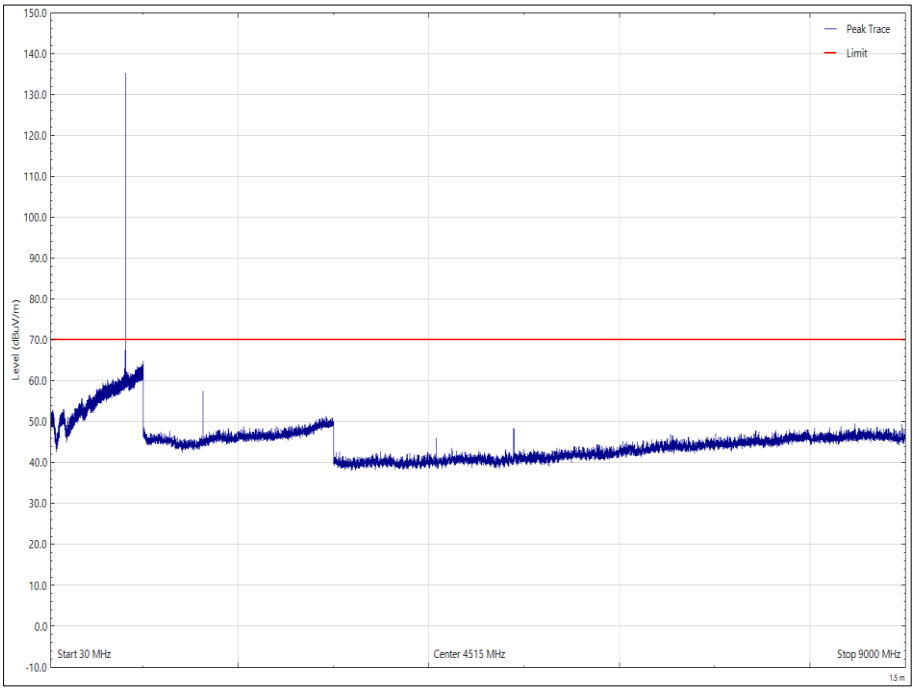

Figure 76 - 815.000 MHz - 30 MHz to 9 GHz, Horizontal, EUT Orientation Y

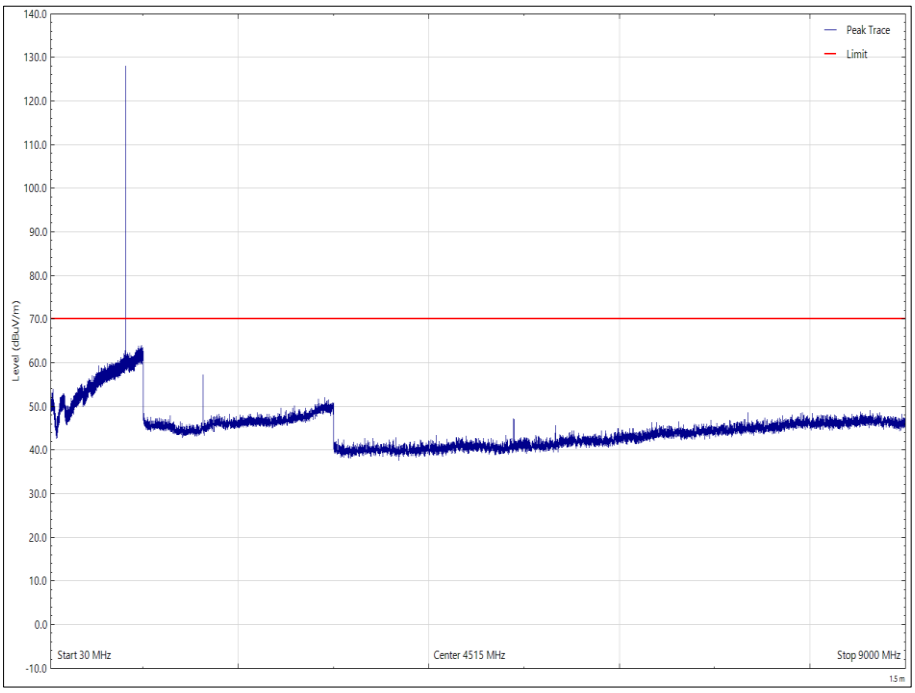

Figure 77 - 815.000 MHz - 30 MHz to 9 GHz, Vertical, EUT Orientation Y

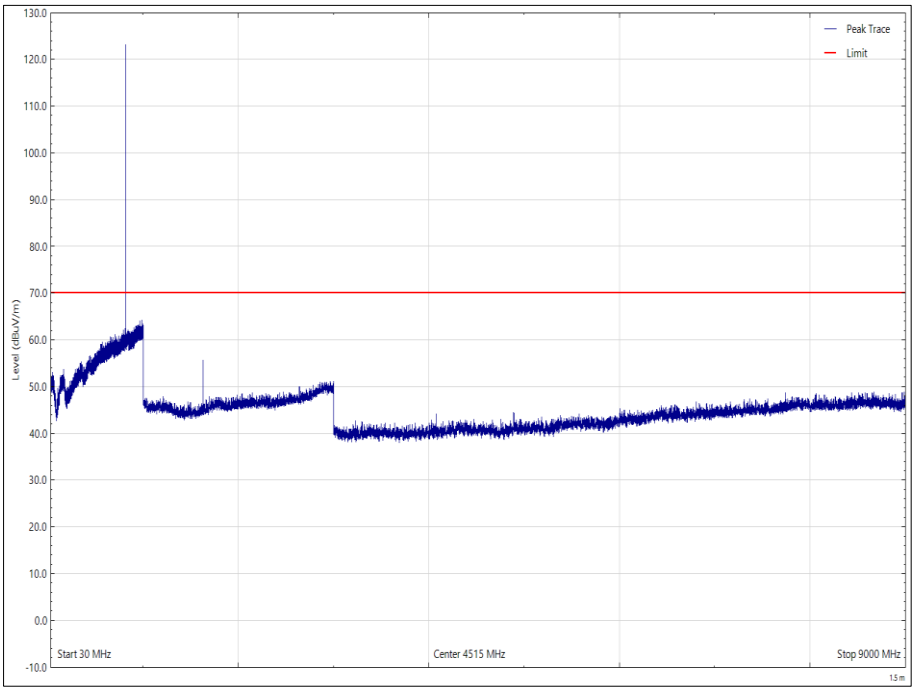

Figure 78 - 815.000 MHz - 30 MHz to 9 GHz, Horizontal, EUT Orientation Z

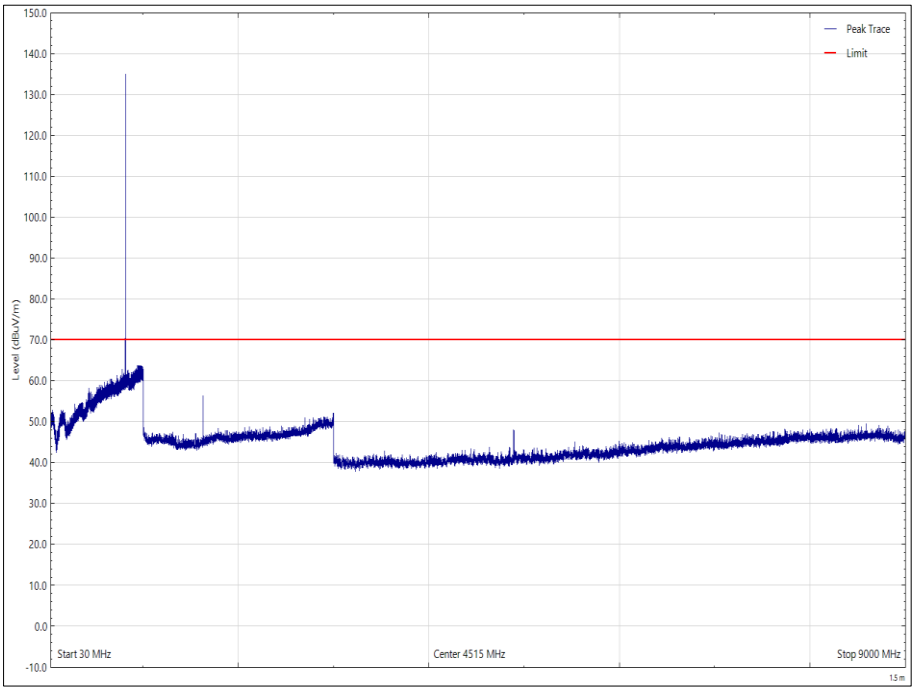

Figure 79 - 815.000 MHz - 30 MHz to 9 GHz, Vertical, EUT Orientation Z

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
1647.870	65.49	70.20	-4.71	Peak	32	150	Horizontal	X
1648.140	60.80	70.20	-9.40	Peak	120	150	Vertical	Y

Table 24 - 823.975 MHz

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

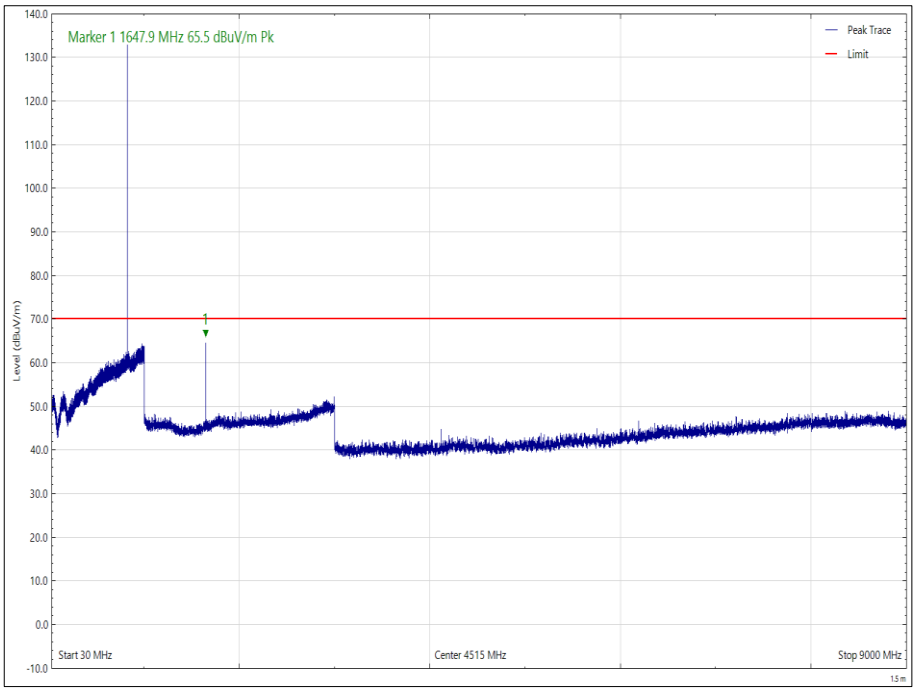

Figure 80 - 823.975 MHz - 30 MHz to 9 GHz, Horizontal, EUT Orientation X

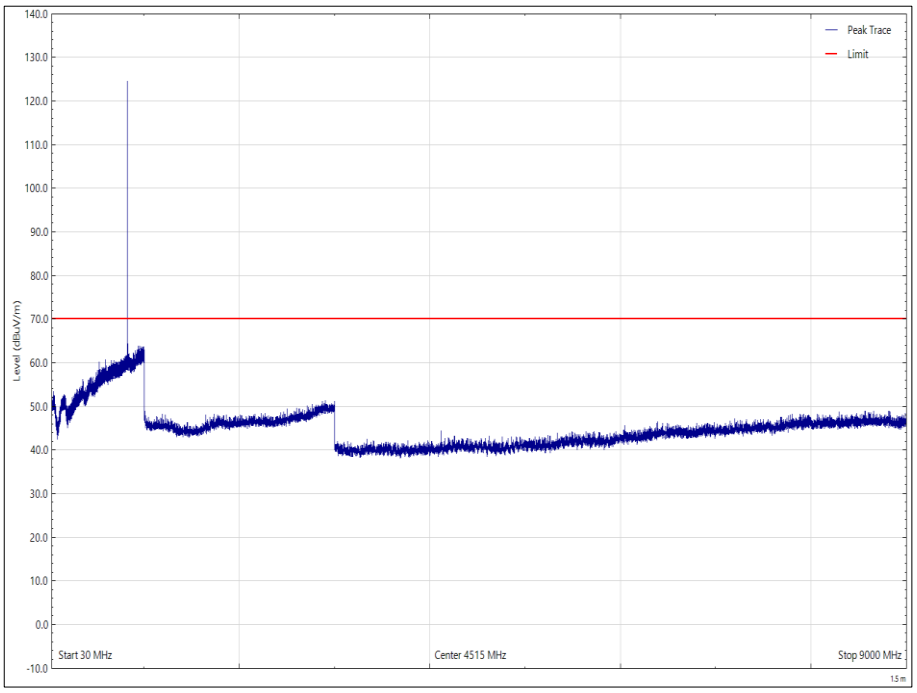

Figure 81 - 823.975 MHz - 30 MHz to 9 GHz, Vertical, EUT Orientation X

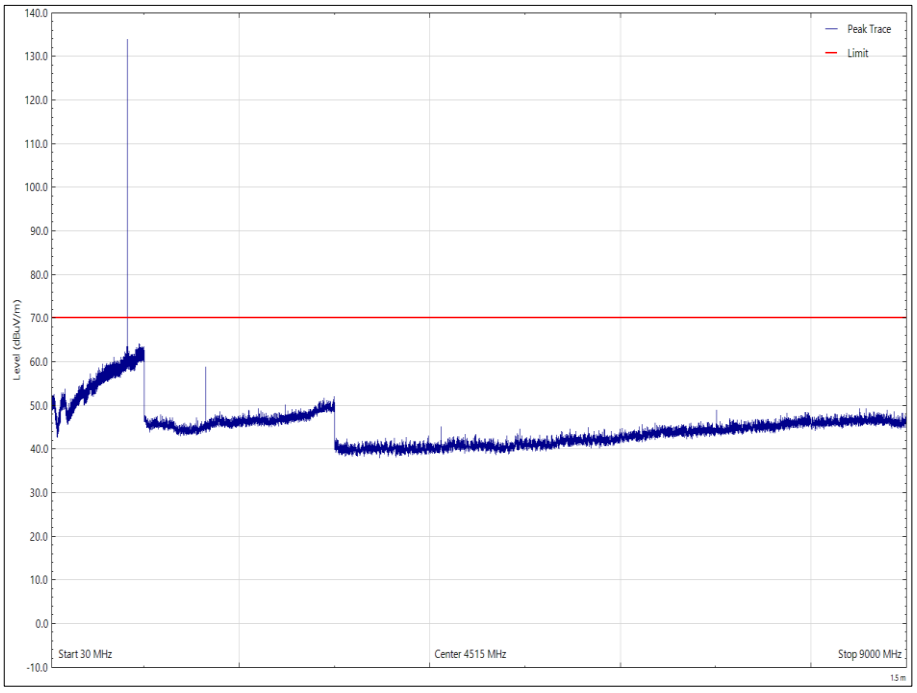

Figure 82 - 823.975 MHz - 30 MHz to 9 GHz, Horizontal, EUT Orientation Y

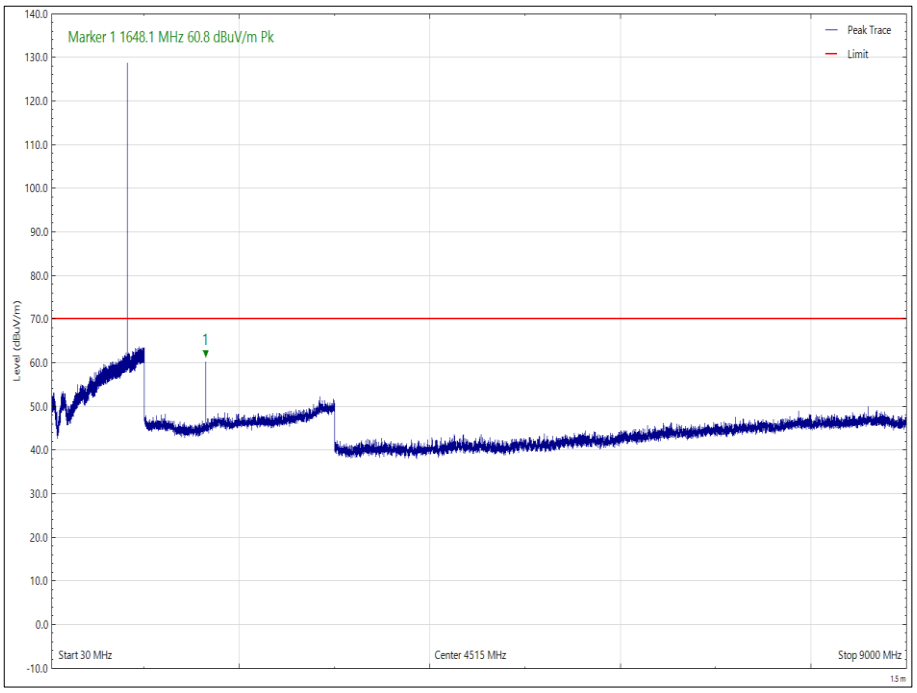

Figure 83 - 823.975 MHz - 30 MHz to 9 GHz, Vertical, EUT Orientation Y

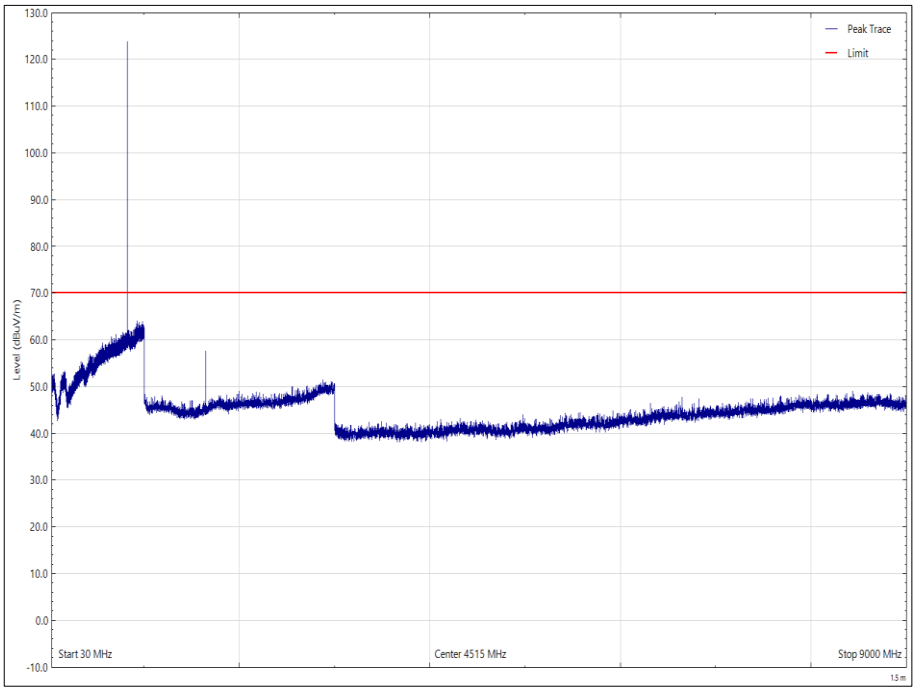

Figure 84 - 823.975 MHz - 30 MHz to 9 GHz, Horizontal, EUT Orientation Z

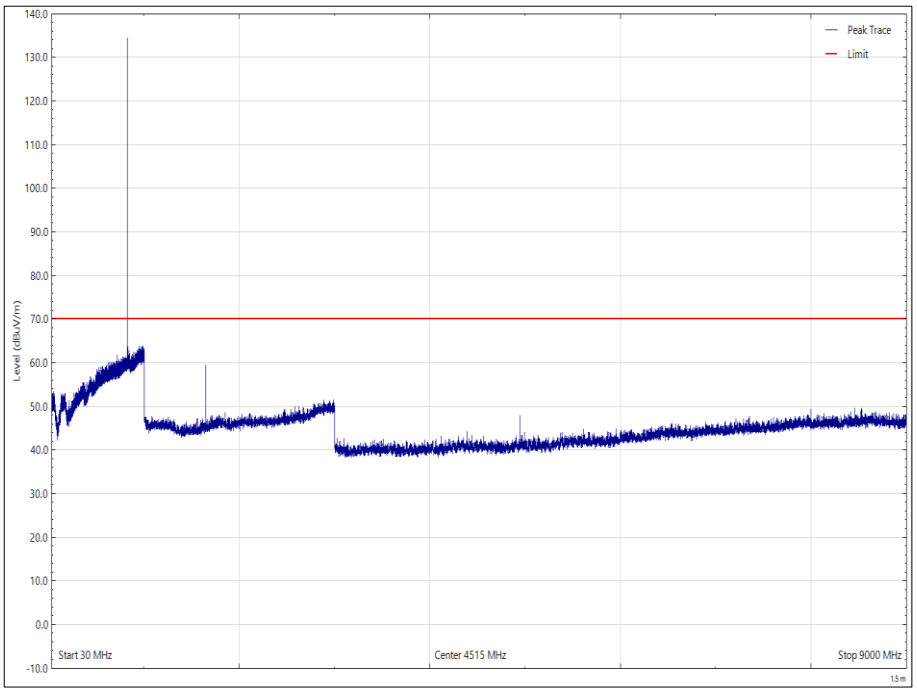

Figure 85 - 823.975 MHz - 30 MHz to 9 GHz, Vertical, EUT Orientation Z

TETRA 851 MHz to 869 MHz

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 25 - 851.025 MHz, 30 MHz to 9 GHz, EUT Orientation: X

*No emissions found within 10 dB of the limit.

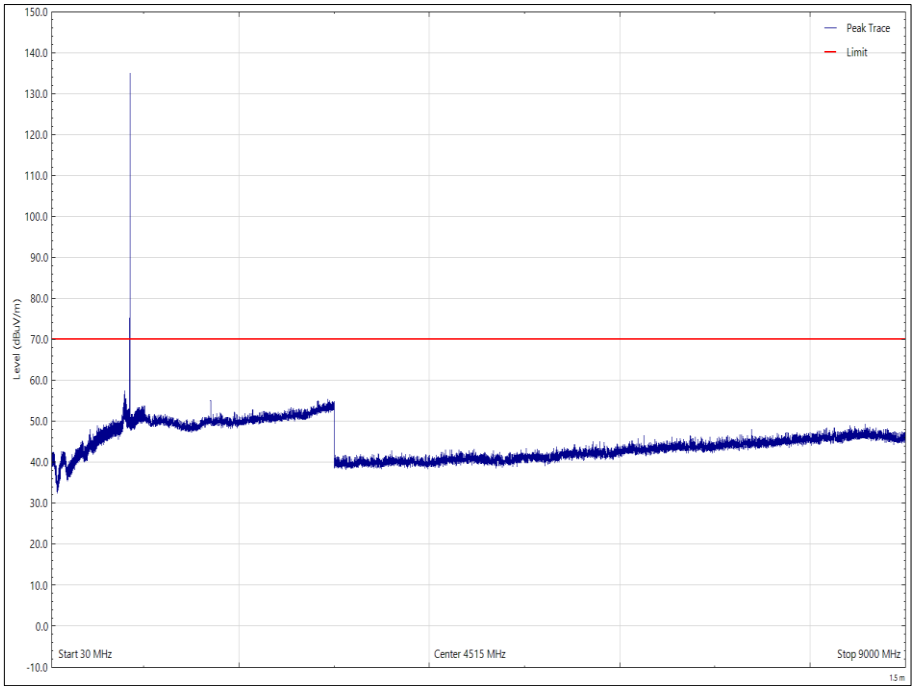

Figure 86 - 851.025 MHz, 30 MHz to 9 GHz, EUT Orientation: X, Horizontal (Peak)

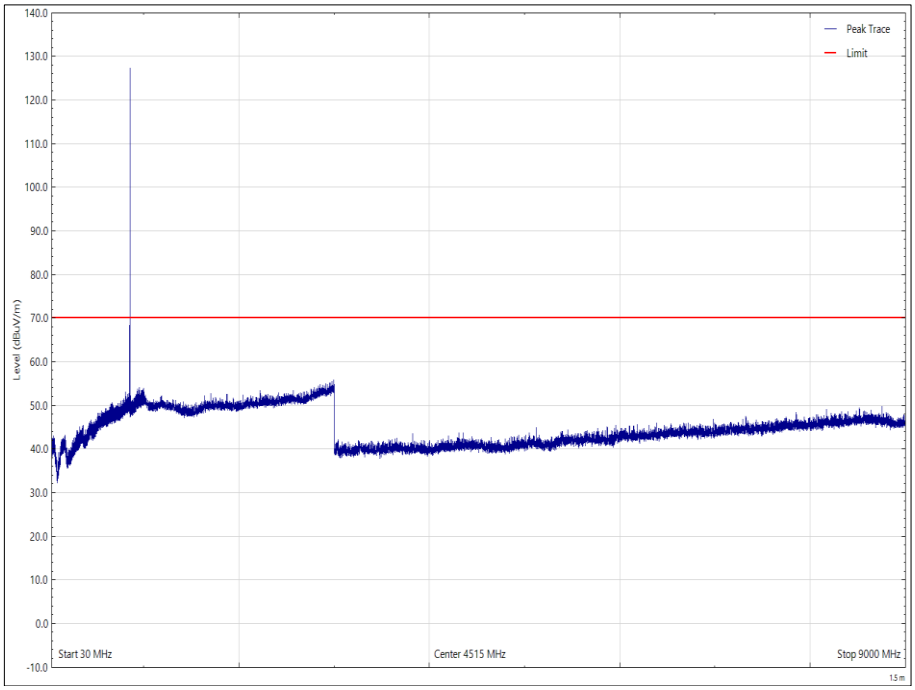

Figure 87 - 851.025 MHz, 30 MHz to 9 GHz, EUT Orientation: X, Vertical (Peak)

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 26 - 851.025 MHz, 30 MHz to 9 GHz, EUT Orientation: Y

*No emissions found within 10 dB of the limit.

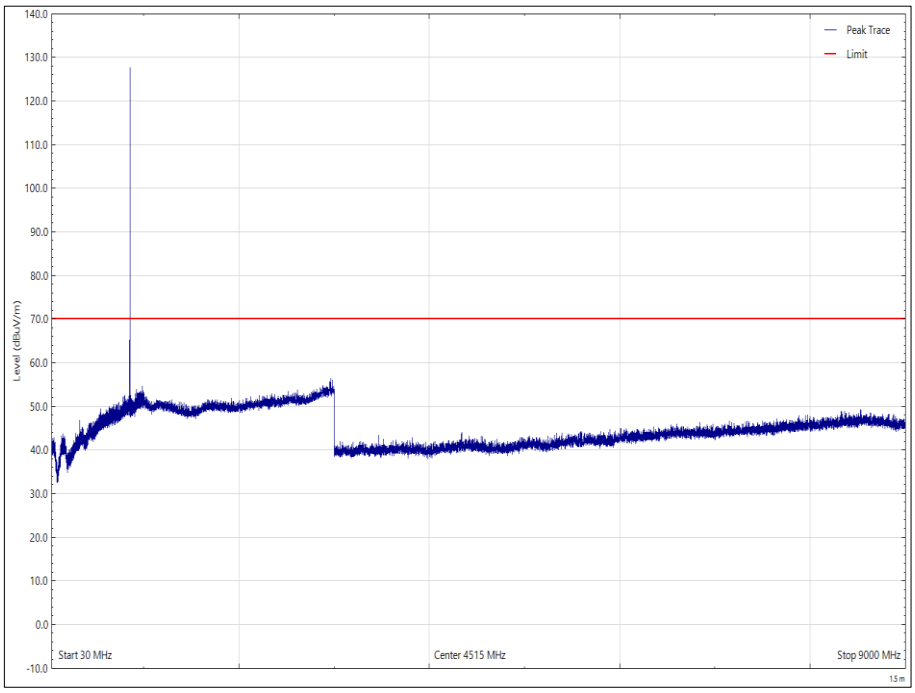

Figure 88 - 851.025 MHz, 30 MHz to 9 GHz, EUT Orientation: Y, Horizontal (Peak)

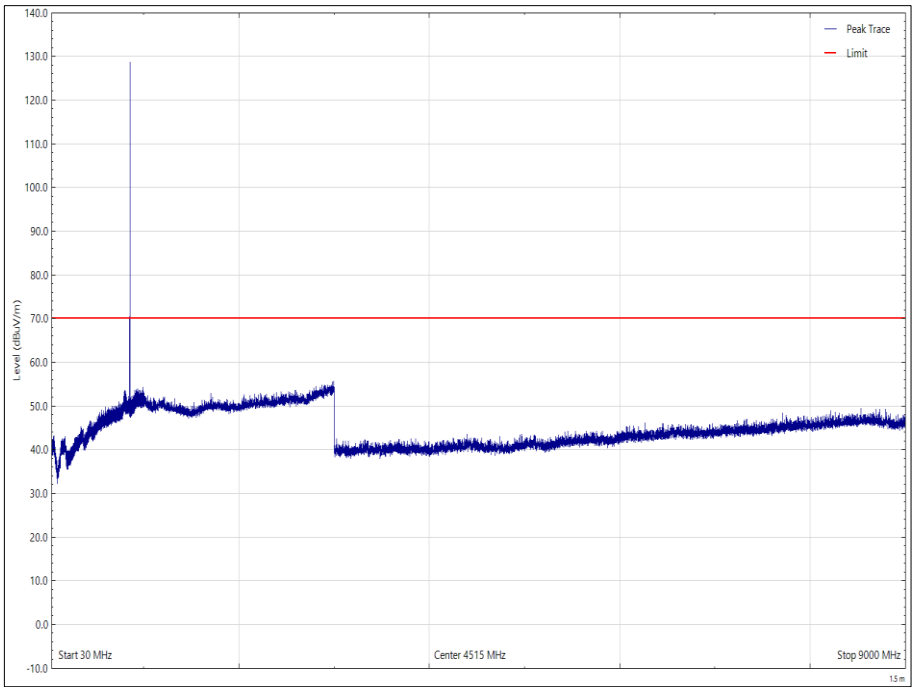

Figure 89 - 851.025 MHz, 30 MHz to 9 GHz, EUT Orientation: Y, Vertical (Peak)

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 27- 851.025 MHz, 30 MHz to 9 GHz, EUT Orientation: Z

*No emissions found within 10 dB of the limit.

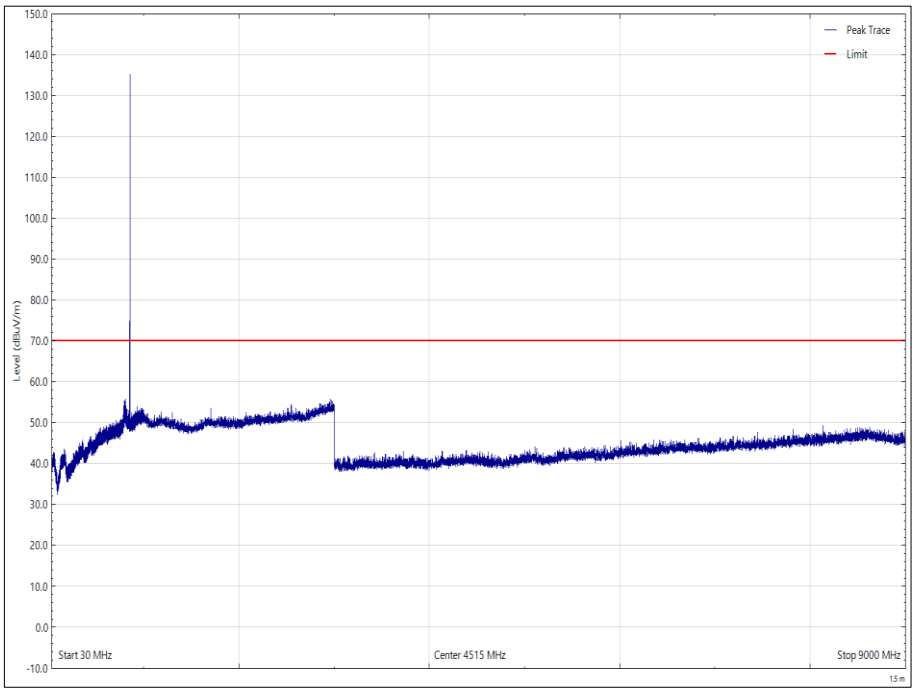

Figure 90 - 851.025 MHz, 30 MHz to 9 GHz, EUT Orientation: Z, Horizontal (Peak)

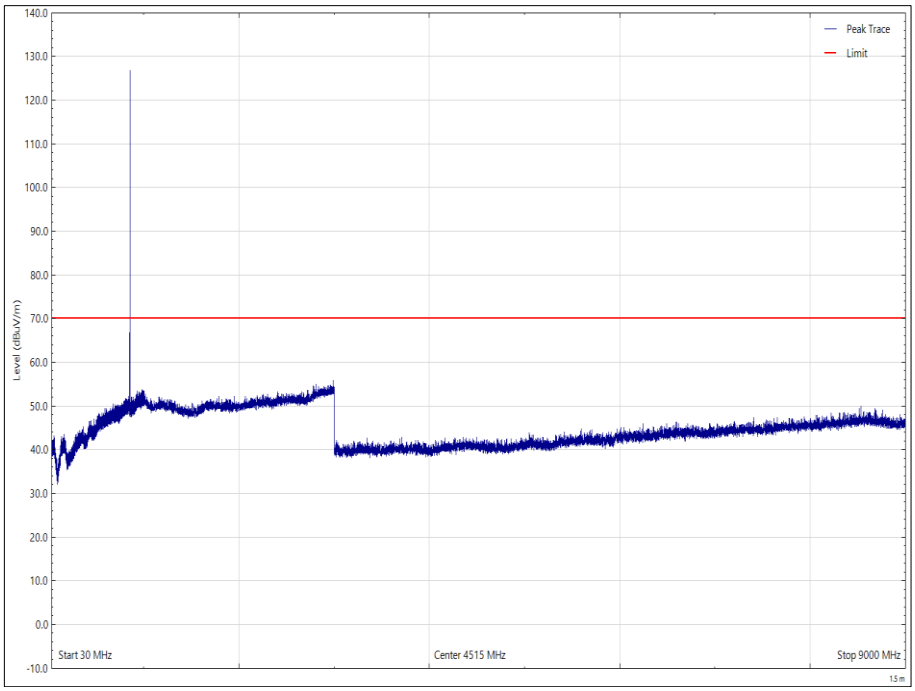

Figure 91- 851.025 MHz, 30 MHz to 9 GHz, EUT Orientation: Z, Vertical (Peak)

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
1720.050	68.33	70.20	-1.87	Peak	158	150	Horizontal

Table 28 - 860.000 MHz, 30 MHz to 9 GHz, EUT Orientation: X

No other emissions found within 10 dB of the limit.

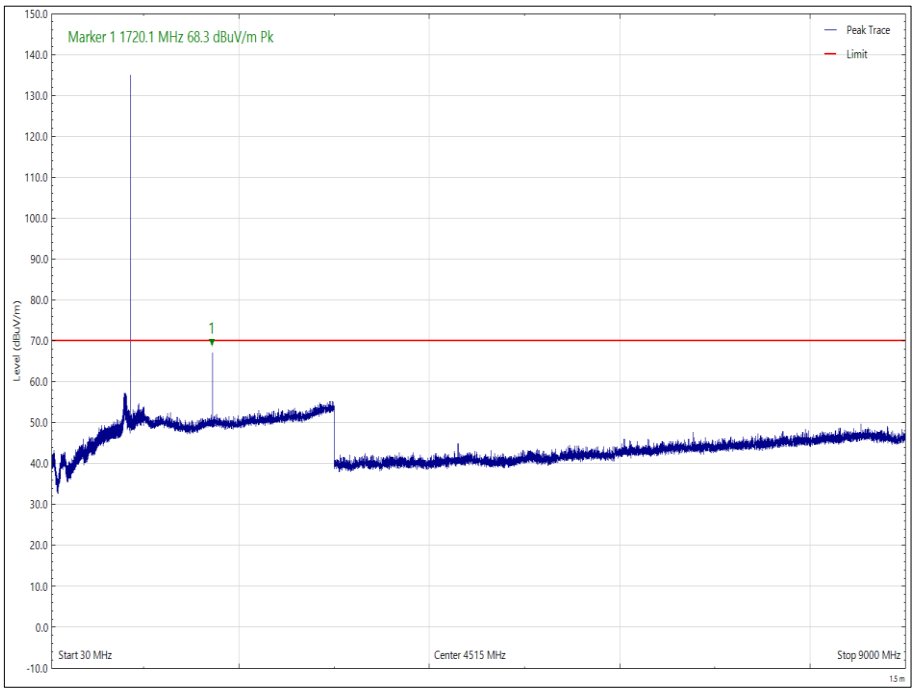

Figure 92 - 860.000 MHz, 30 MHz to 9 GHz, EUT Orientation: X, Horizontal (Peak)

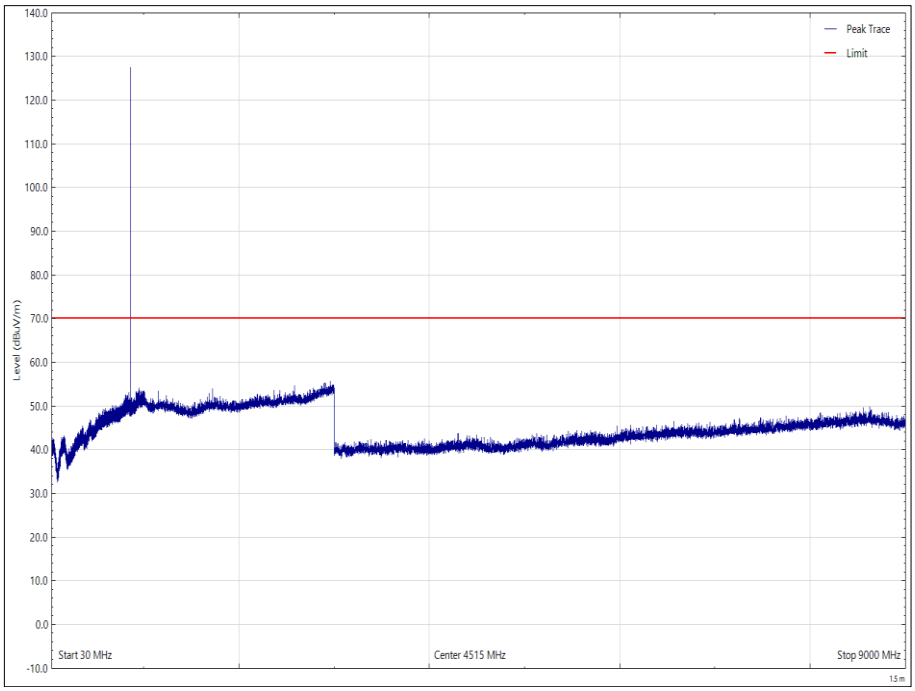

Figure 93 - 860.000 MHz, 30 MHz to 9 GHz, EUT Orientation: X, Vertical (Peak)

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
1720.095	66.27	70.20	-3.93	Peak	250	181	Vertical

Table 29 - 860.000 MHz, 30 MHz to 9 GHz, EUT Orientation: Y

No other emissions found within 10 dB of the limit.

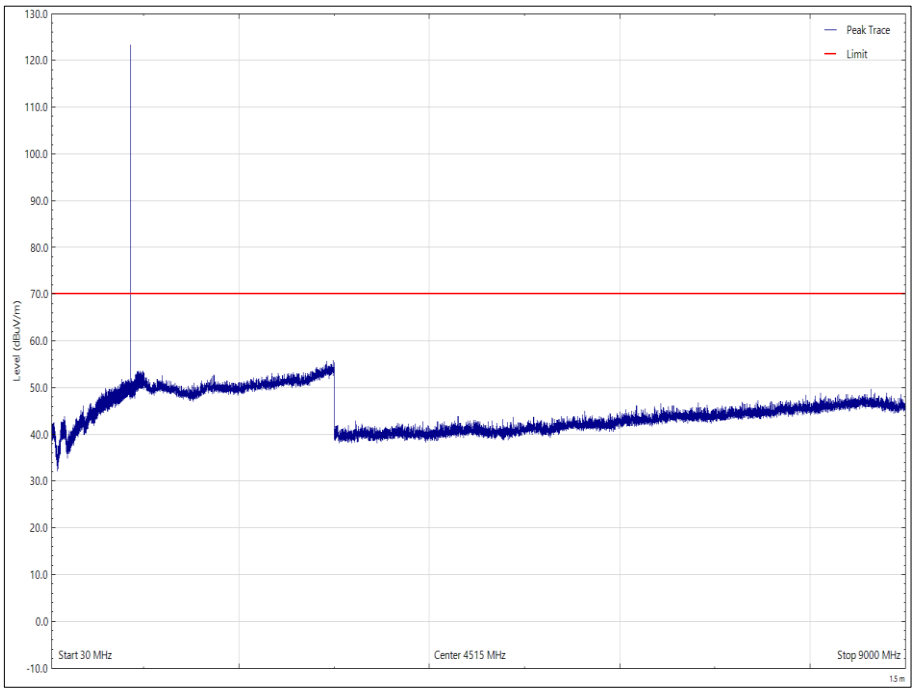

Figure 94 - 860.000 MHz, 30 MHz to 9 GHz, EUT Orientation: Y, Horizontal (Peak)

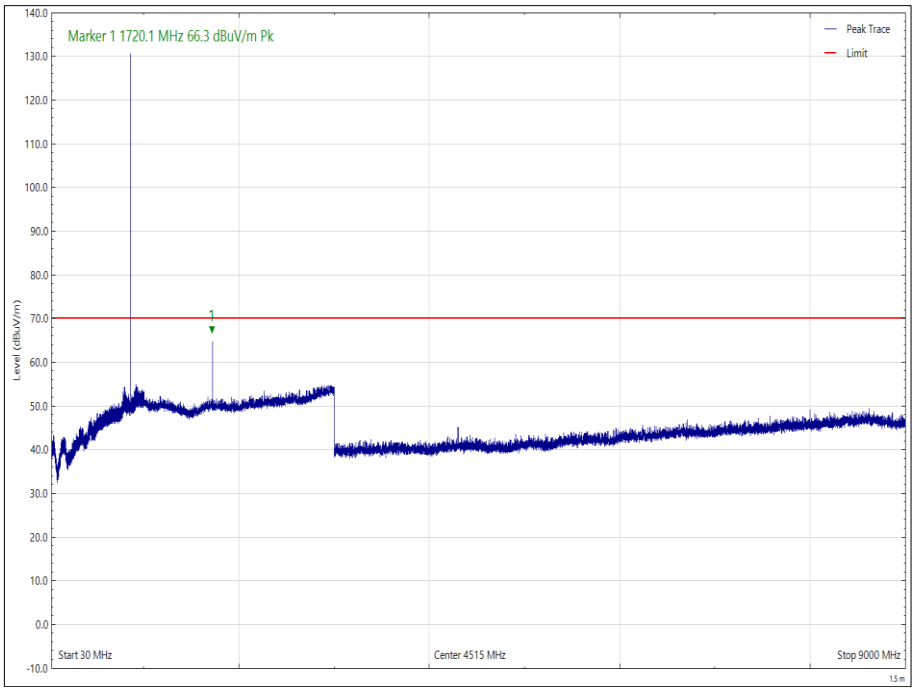

Figure 95 - 860.000 MHz, 30 MHz to 9 GHz, EUT Orientation: Y, Vertical (Peak)

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
1720.060	68.75	70.20	-1.45	Peak	111	150	Horizontal

Table 30 - 860.000 MHz, 30 MHz to 9 GHz, EUT Orientation: Z

No other emissions found within 10 dB of the limit.

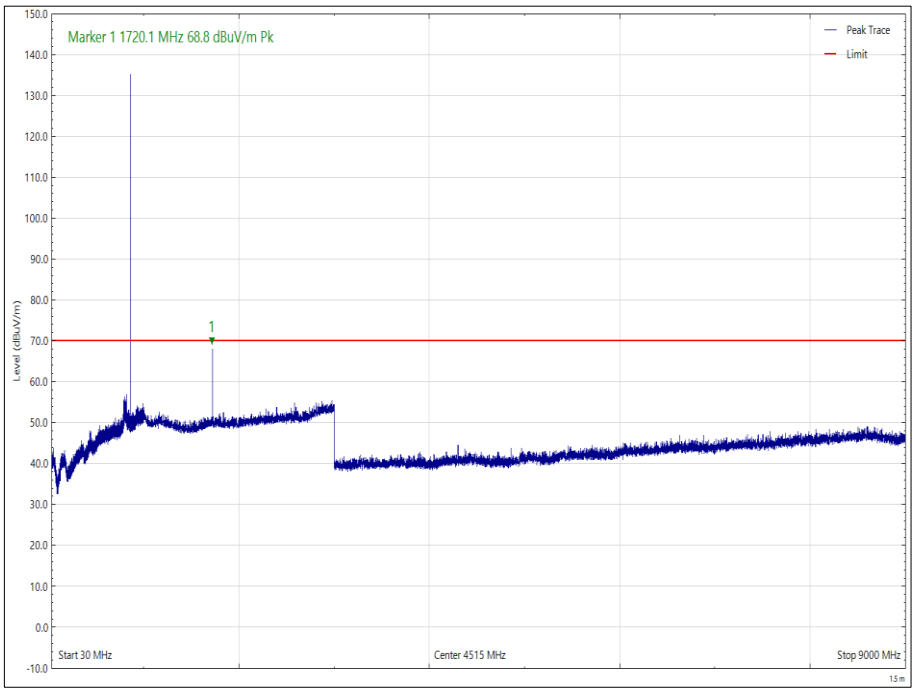

Figure 96 - 860.000 MHz, 30 MHz to 9 GHz, EUT Orientation: Z, Horizontal (Peak)

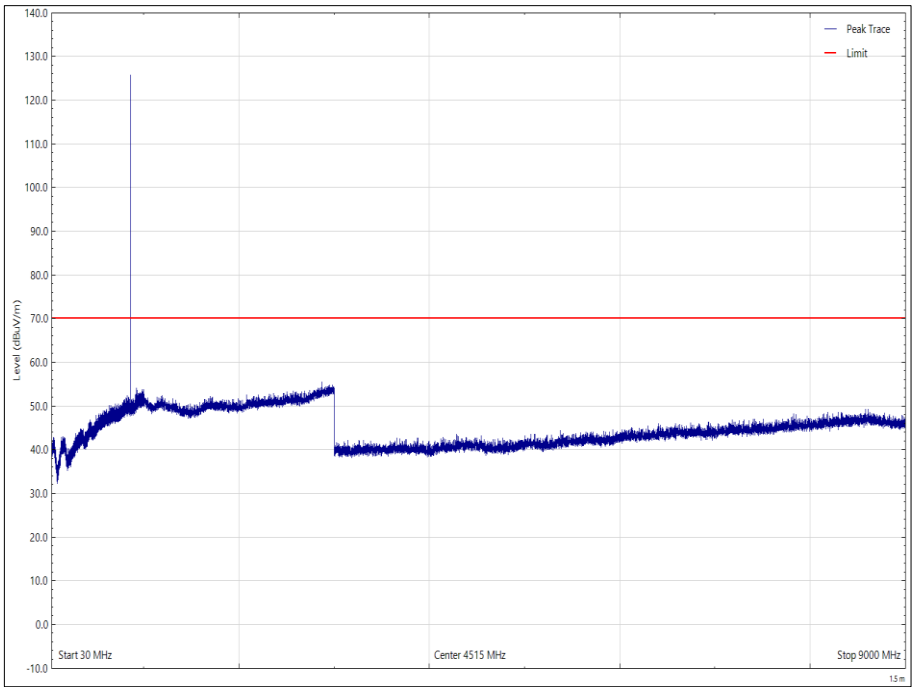

Figure 97 - 860.000 MHz, 30 MHz to 9 GHz, EUT Orientation: Z, Vertical (Peak)

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 31 - 868.975 MHz, 30 MHz to 9 GHz, EUT Orientation: X

*No emissions found within 10 dB of the limit.

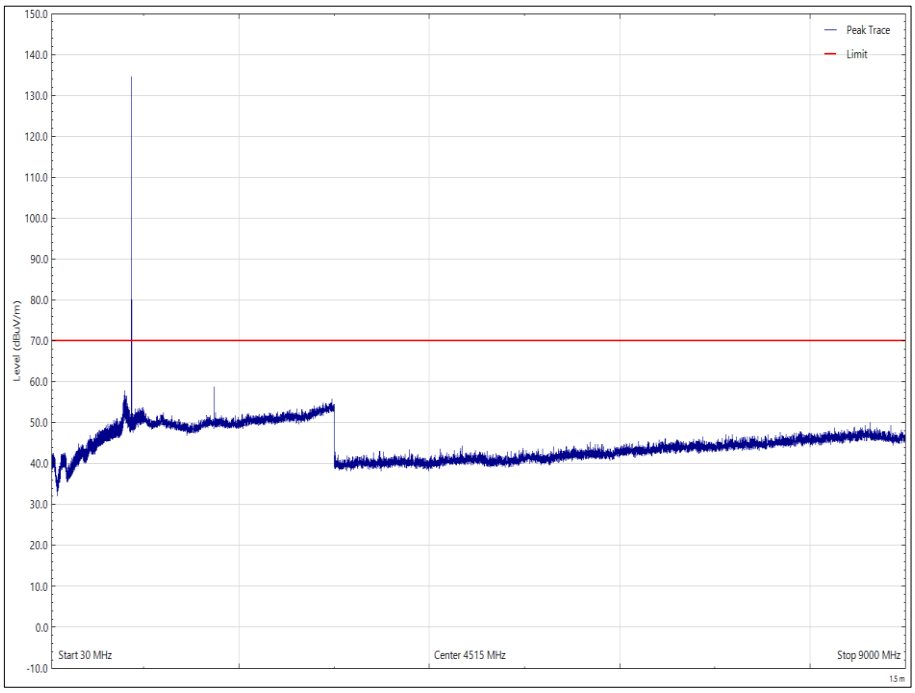

Figure 98 - 868.975 MHz, 30 MHz to 9 GHz, EUT Orientation: X, Horizontal (Peak)

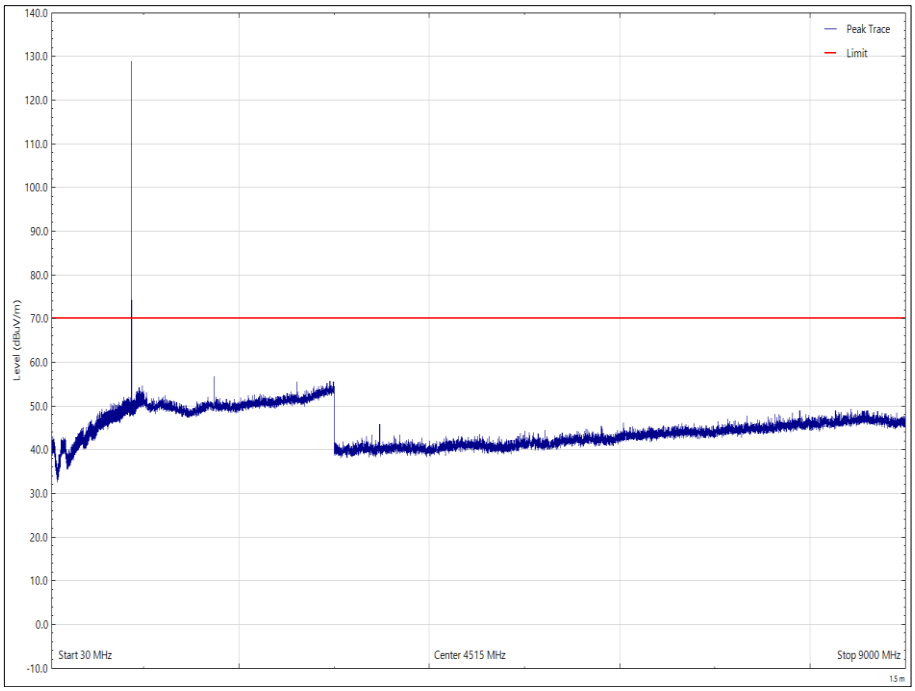

Figure 99 - 868.975 MHz, 30 MHz to 9 GHz, EUT Orientation: X, Vertical (Peak)

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 32 - 868.975 MHz, 30 MHz to 9 GHz, EUT Orientation: Y

*No emissions found within 10 dB of the limit.

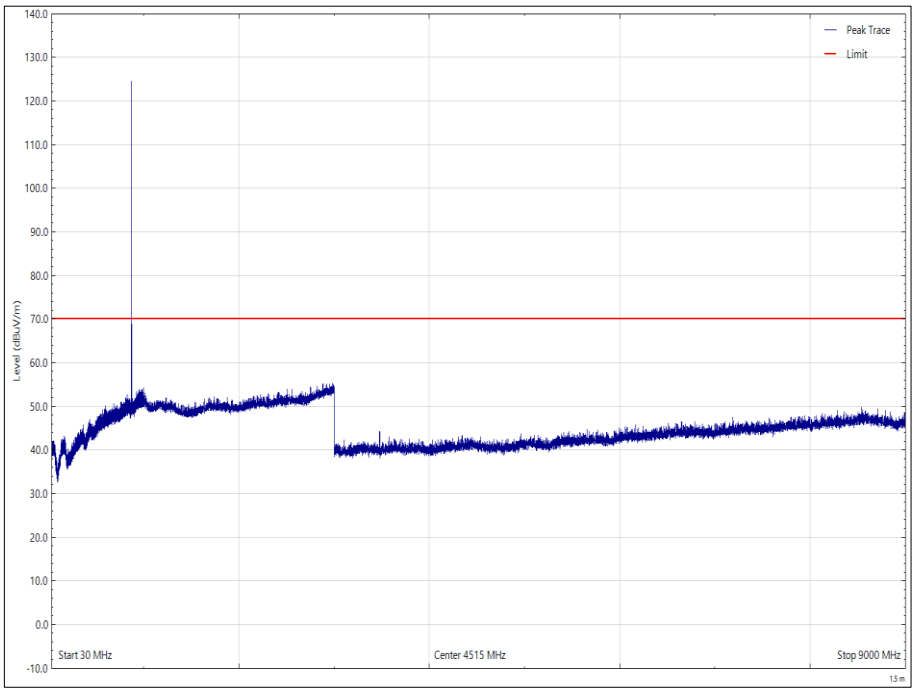

Figure 100 - 868.975 MHz, 30 MHz to 9 GHz, EUT Orientation: Y, Horizontal (Peak)

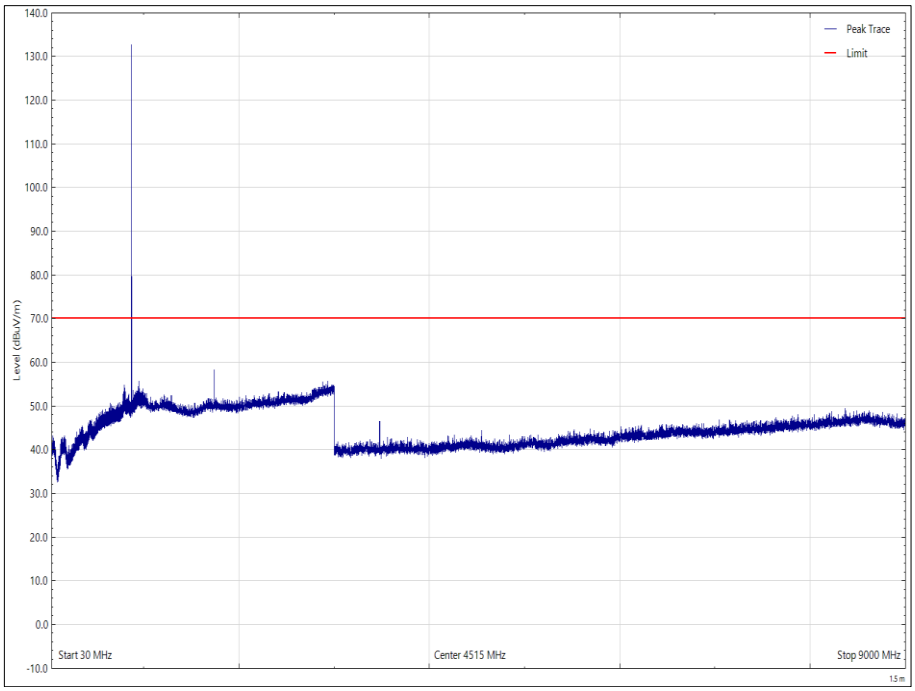

Figure 101 - 868.975 MHz, 30 MHz to 9 GHz, EUT Orientation: Y, Vertical (Peak)

Frequency (MHz)	Level (dBuv/m)	Limit (dBuv/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 33 - 868.975 MHz, 30 MHz to 9 GHz, EUT Orientation: Z

*No emissions found within 10 dB of the limit.

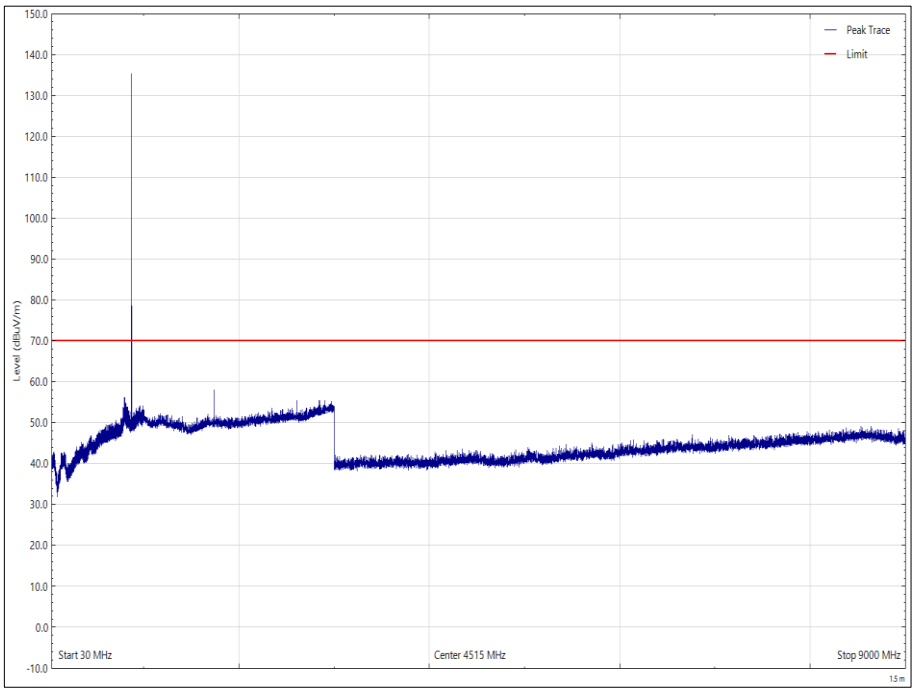

Figure 102 - 868.975 MHz, 30 MHz to 9 GHz, EUT Orientation: Z, Horizontal (Peak)

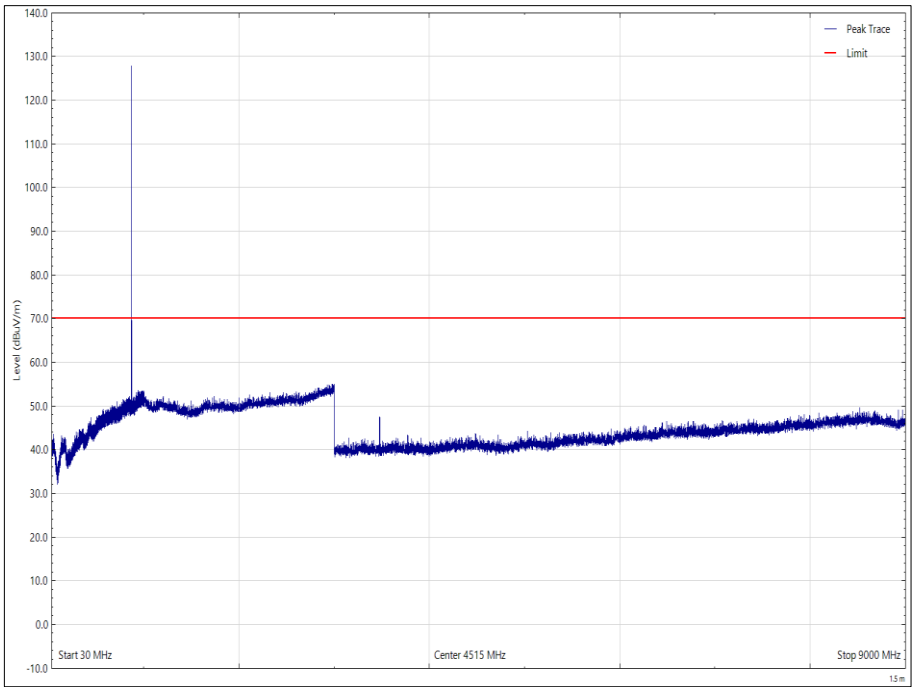

Figure 103 - 868.975 MHz, 30 MHz to 9 GHz, EUT Orientation: Z, Vertical (Peak)

FCC 47 CFR Part 90, Limit Clause 90.210

The EUT shall comply with emission mask B as per FCC 47 CFR Part 90, clause 90.210.

ISED RSS-119, Limit Clause 5.8

The EUT shall comply with emission mask Yas per ISED RSS-119. clause 5.8.

2.3.8 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
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	17-May-2023
Screened Room (11)	Rainford	Rainford	5136	36	24-Nov-2024
Mast	Maturo	TAM 4.0-P	5158	-	TU
Mast and Turntable Controller	Maturo	Maturo NCD	5159	-	TU
Turntable	Maturo	TT 15WF	5160	-	TU
Antenna (DRG 1-10.5GHz)	Schwarzbeck	BBHA9120B	5215	12	28-May-2023
Pre Amp 1 - 26.5 GHz	Agilent Technologies	8449B	5445	12	12-May-2023
Cable (SMA to SMA 1m)	Junkosha	MWX221-01000AMSAMS/A	5516	12	23-Oct-2023
2m SMA Cable	Junkosha	MWX221-02000AMSAMS/A	5518	12	14-Apr-2024
Cable (N-Type to N-Type, 8 m)	Junkosha	MWX221-08000NMSNMS/B	5522	12	14-Apr-2024
3 GHz High pass Filter	Wainwright	WHKX12-2580-3000-18000-80SS	5547	12	11-May-2023
TRILOG Super Broadband Test Antenna	Schwarzbeck	VULB 9168	5942	24	03-Feb-2024
Attenuator 4dB	Pasternack	PE7074-4	6202	24	16-Jul-2024

Table 34

TU - Traceability Unscheduled

3 Photographs

3.1 Test Setup Photographs

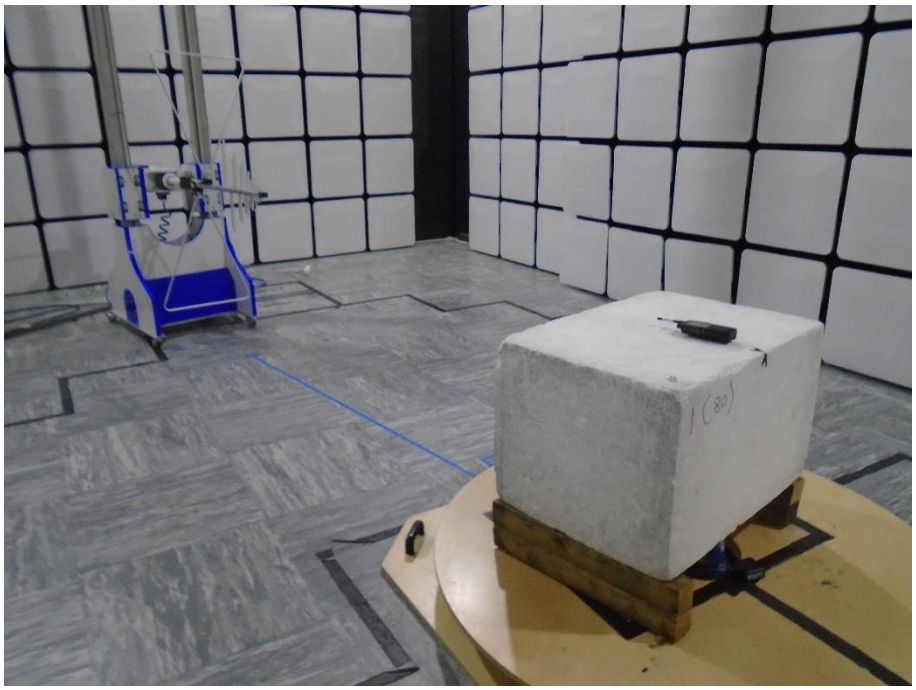

Figure 104 – Test Setup – 30 MHz to 1 GHz X Orientation

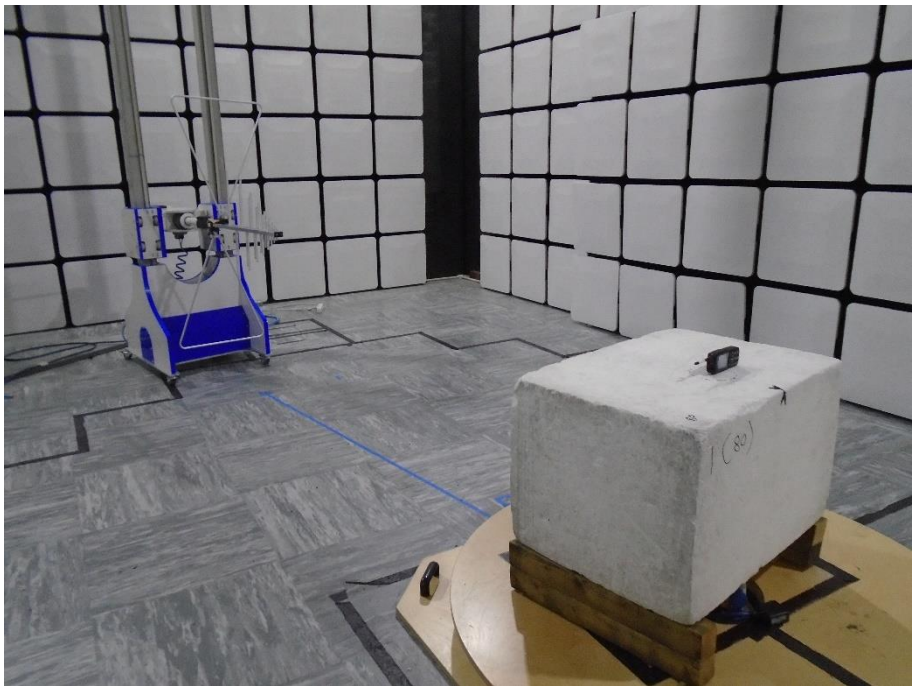

Figure 105 - Test Setup – 30 MHz to 1 GHz Y Orientation

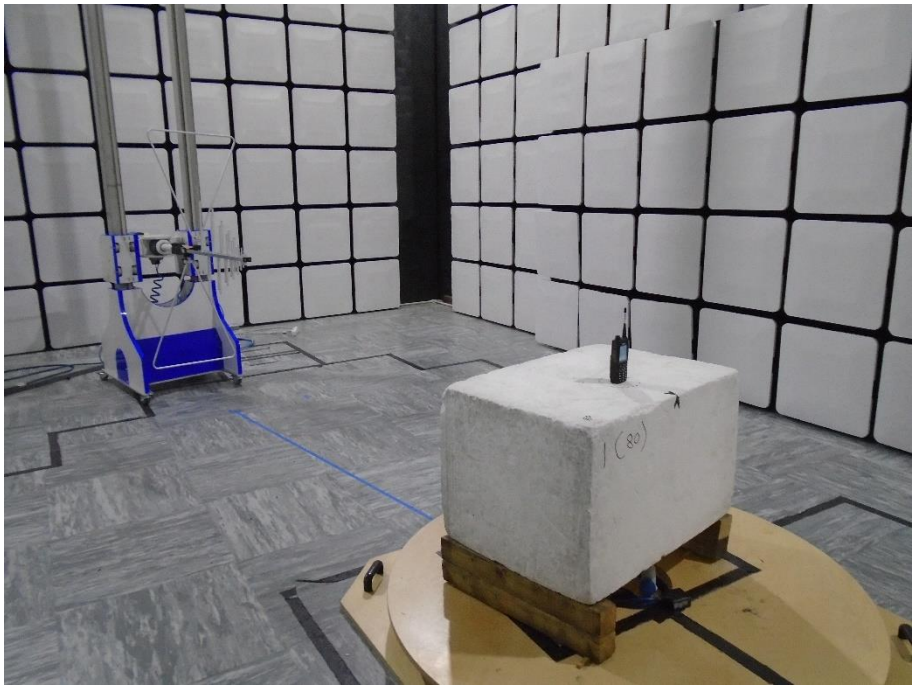

Figure 106 – Test Setup – 30 MHz to 1 GHz Z Orientation

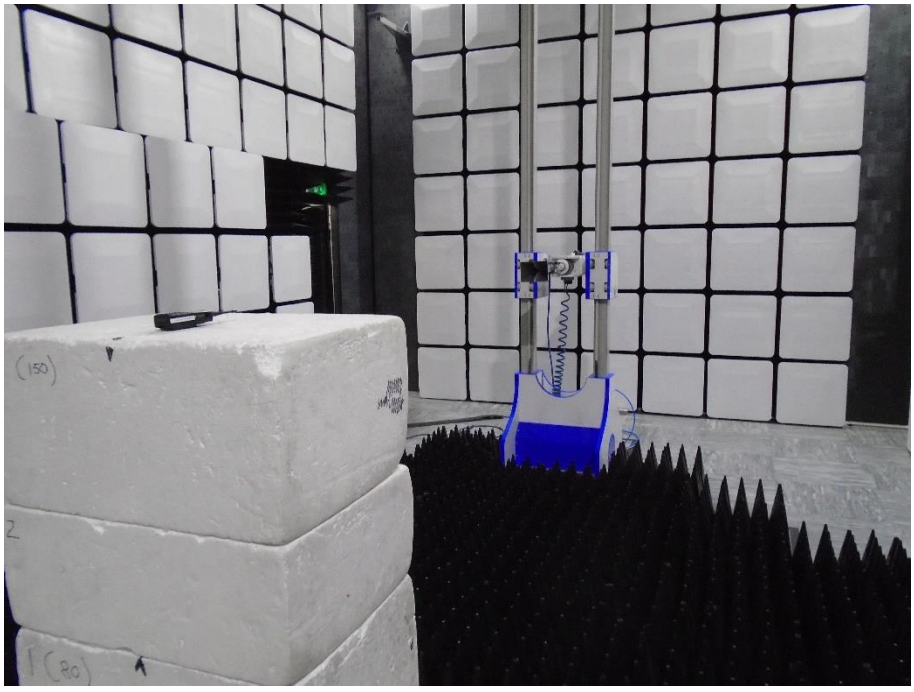

Figure 107 - Test Setup – 1 GHz to 9 GHz X Orientation

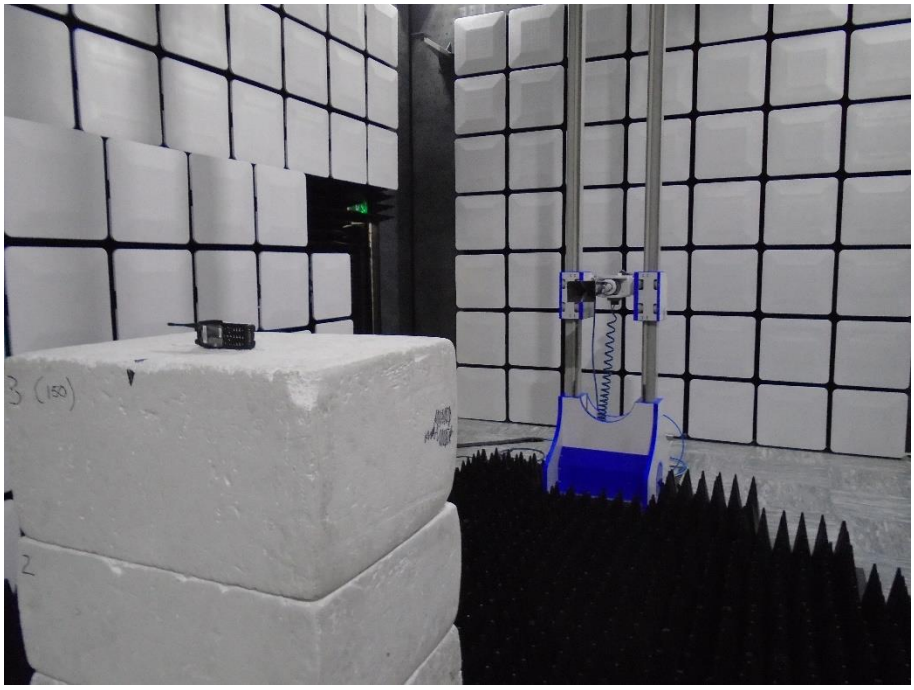

Figure 108 - Test Setup – 1 GHz to 9 GHz Y Orientation

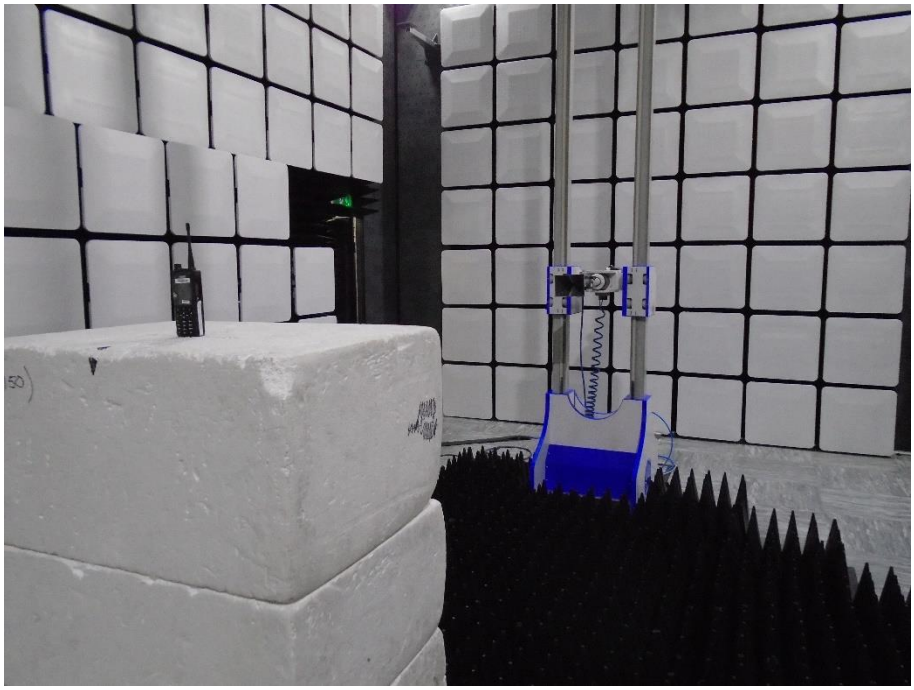

Figure 109 - Test Setup – 1 GHz to 9 GHz Z Orientation

4 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Maximum Conducted Output Power	± 3.2 dB
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

Table 35

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.