FCC and ISED Test Report

Sepura Limited
TETRA Radio, Model: SC2124

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
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CB25 9TL
United Kingdom

FCC ID: XX6SC2124M IC: 8739A-SC2124M

COMMERCIAL-IN-CONFIDENCE

Document 75957666-03 Issue 03

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Matthew Russell	Chief Engineer (RF)	Authorised Signatory	05 July 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	Roscoe Harrison	05-July-2023	
Testing	Pier-Angelo Lorusso	05-July-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.

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1 Report Summary

1.1 Report Modification Record

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

Issue	Description of Change	Date of Issue
1	First Issue	08-June-2023
2	Removed reference to antenna 310-0014.	28-June-2023
3	Antenna gain revised in application form. Results in section 2.1.6 updated accordingly.	05-July-2023

Table 1

1.2 Introduction

Applicant	Sepura Limited
Manufacturer	Sepura Limited
Model Number(s)	SC2124
Serial Number(s)	1PR002247GMA2KT
Hardware Version(s)	PLX-41216515 (mod state 14)
Software Version(s)	1810 002 07367
Number of Samples Tested	1
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
Start of Test	17-February-2023
Finish of Test	25-May-2023
Name of Engineer(s)	Roscoe Harrison and 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 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 403 MHz to 430 MHz							
2.1	-	-	5.4	6.12	Maximum Conducted Output Power	Pass	
2.2	-	-	5.8	6.13	Spurious Emissions at Antenna Terminals	Pass	
2.3	-	-	5.8	6.13	Radiated Spurious Emissions	Pass	
Configuration and Mode: TETRA 450 MHz to 470 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	

Table 2

NOTE: Whilst the product supports TETRA 403 to 470 the bands permitted by Canada / US are:

- Canada 406.1-430 & 450-470
- US 450-470

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 SC2124 hand-portable terminal is a TETRA enabled radio with Bluetooth and Wi-Fi capability
Manufacturer:	Sepura Limited
Model:	SC2124
Part Number:	SC2124
Hardware Version:	PLX-41216515 (mod state 14)
Software Version:	1810 002 07367
FCC ID of the product under test – see guidance here	XX6SC2124M
IC ID of the product under test – see guidance here	8739A-SC2124M

Table 3

Intentional Radiators

Technology	TETRA	Bluetooth	WLAN 802.11b	WLAN 802.11g	WLAN 802.11n	BLE
Frequency Range (MHz to MHz)	403 to 470	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)	2 dBi (max)	1.3	1.3	1.3	1.3	1.3
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)	403	2402	2412	2412	2412	2402
Middle Frequency (MHz)	436.5	2441	2437	2437	2437	2441
Top Frequency (MHz)	470	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)	0.0	dB

Table 11

Antenna Characteristics

Antenna connector ☒ with adapter cable			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☐	Type:		Gain		dBi
External antenna ☒	Type:	310-00015 Quarter wave	Gain	2 (max)	dBi
External antenna ☒	Type:	310-00016	Gain	-1.5 (max)	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.

Since 310-00015 is the highest gain antenna and covers full band 380-470MHz , radiated tests have been performed using that.

For conducted tests an adapter is provided to a 50 Ohm impendence

The antenna port on top of the radio is not 50 Ohm impendence and should not be used for conducted tests

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
Manufacturer:	Sepura	Part Number:	300-01910
Model:	SC21 Charger Insert	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 SC2124 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: SC2124, Serial Number: 1PR002247GMA2KT			
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 403 MHz to 430 MHz		
Maximum Conducted Output Power	Pier-Angelo Lorusso and Roscoe Harrison	UKAS
Spurious Emissions at Antenna Terminals	Pier-Angelo Lorusso	UKAS
Radiated Spurious Emissions	Pier-Angelo Lorusso	UKAS
Configuration and Mode: TETRA 450 MHz to 470 MHz		
Maximum Conducted Output Power	Pier-Angelo Lorusso and Roscoe Harrison	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

SC2124, S/N: 1PR002247GMA2KT - Modification State 0

2.1.3 Date of Test

17-February-2023 to 14-April-2023

2.1.4 Test Method

The test was applied in accordance with the test method requirements of FCC 47 CFR Part 90, Industry Canada 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 30 dB of attenuation. The path loss was measured using a network analyser and entered as a reference level offset in the spectrum analyser including the manufacturers declared maximum antenna gain. The RBW of the spectrum analyser was set to 30 kHz and the video bandwidth to 100 kHz with the trace set to max hold using a RMS Max detector and the result was recorded.

2.1.5 Environmental Conditions

Ambient Temperature	19.7 - 20.8 °C
Relative Humidity	39.8 - 52.0 %

2.1.6 Test Results

TETRA 403 MHz to 430 MHz

Parameter	406.125 MHz	418.050 MHz	429.975 MHz
Conducted Output Power (dBm)	35.11	35.09	35.17
Manufacturer Declared Power (dBm)	35.0	35.0	35.0
Δ from manufacturer Power (dB)	0.11	0.09	0.17
Antenna Gain (dBd)	-0.15	-0.15	-0.15
ERP (dBm)	34.96	34.94	35.02

Table 16 - ERP

TETRA 450 MHz to 470 MHz

Parameter	450.025 MHz	460.025 MHz	469.975 MHz
Conducted RMS Output Power (dBm)	35.16	35.24	35.22
Manufacturer Declared Power (dBm)	35.0	35.0	35.0
Δ from manufacturer Power (dB)	0.16	0.24	0.22
Antenna Gain (dBd)	-0.15	-0.15	-0.15
ERP (dBm)	35.01	35.09	35.07

Table 17 – ERP

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

90.205 (s): The output power shall not exceed by more than 20 percent either the output power shown in the Radio Equipment List [available in accordance with 90.203(a)(1) for transmitters included in this list or when not so listed, the manufacturer's rated output power for the particular transmitter specifically listed on the authorization.

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
Hygrometer	Rotronic	A1	2138	12	28-Sep-2023
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	17-May-2023
1 GHz High Pass Filter	Mini-Circuits	NHP 1000+	5260	12	20-Aug-2023
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
Coaxial Fixed Attenuator DC-18GHz 5W 10dB	RF-Lambda	RFS5G18B10SMP	6177	12	17-Jul-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

SC2124, S/N: 1PR002247GMA2KT - Modification State 0

2.2.3 Date of Test

04-April-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.

For compliance with RSS-119 clause 5.8, emission mask Y was applied for both 406.1-430 MHz and 450-470 MHz. For compliance with FCC Part 90.210, emission mask B was applied in the 450-470 MHz range only.

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 600 MHz and 5 GHz a 600 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.

In the 450-470 MHz band, the limit in RSS-119, emission mask Y limit of “55 + 10 log10(p)” was considered the most stringent limit and therefore shown on the plots in the section below.

2.2.5 Environmental Conditions

Ambient Temperature	20.3 - 21.3 °C
Relative Humidity	30.7 - 42.9 %

2.2.6 Test Results

TETRA 403 MHz to 430 MHz

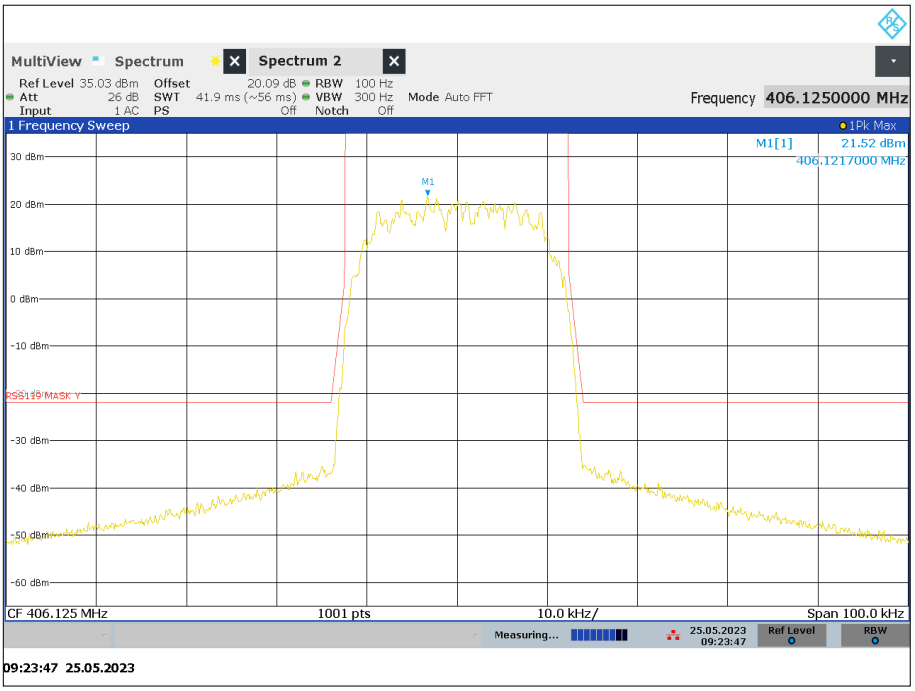

Figure 1 - 406.125 MHz, Transmitter Mask Y

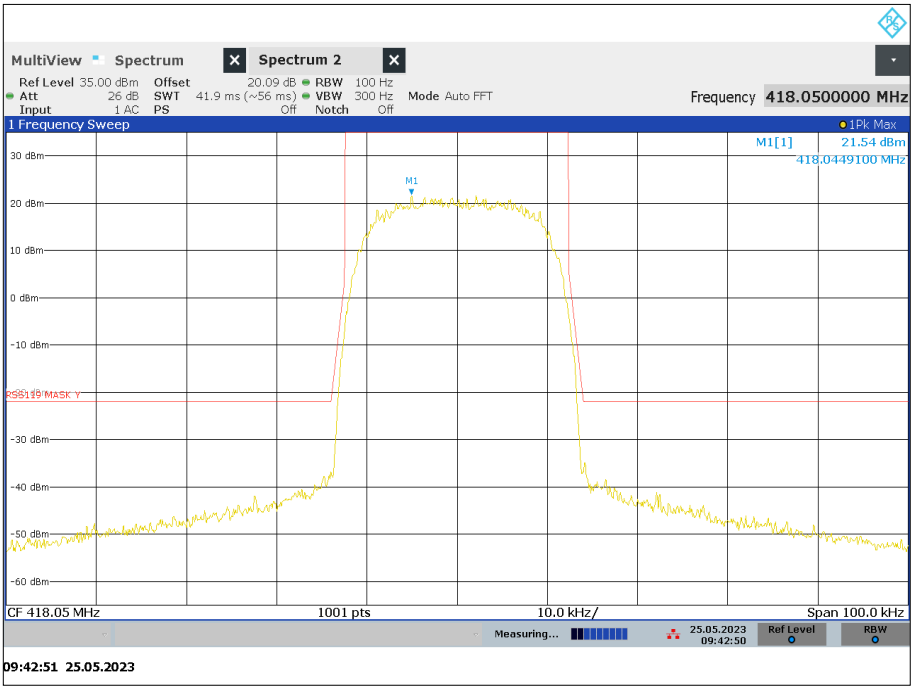

Figure 2 - 418.050 MHz, Transmitter Mask Y

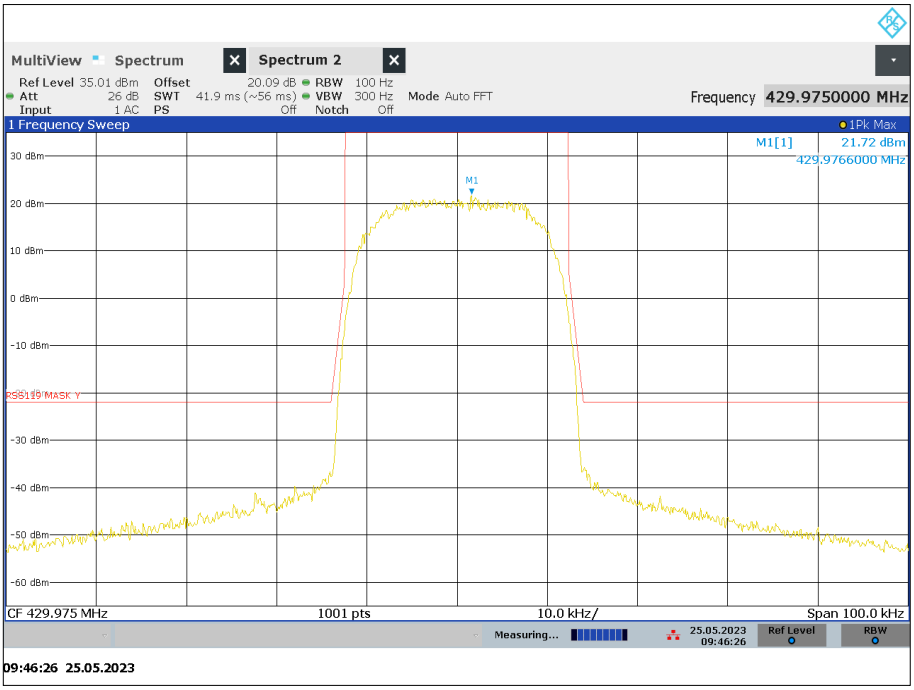

Figure 3 - 429.975 MHz, Transmitter Mask Y

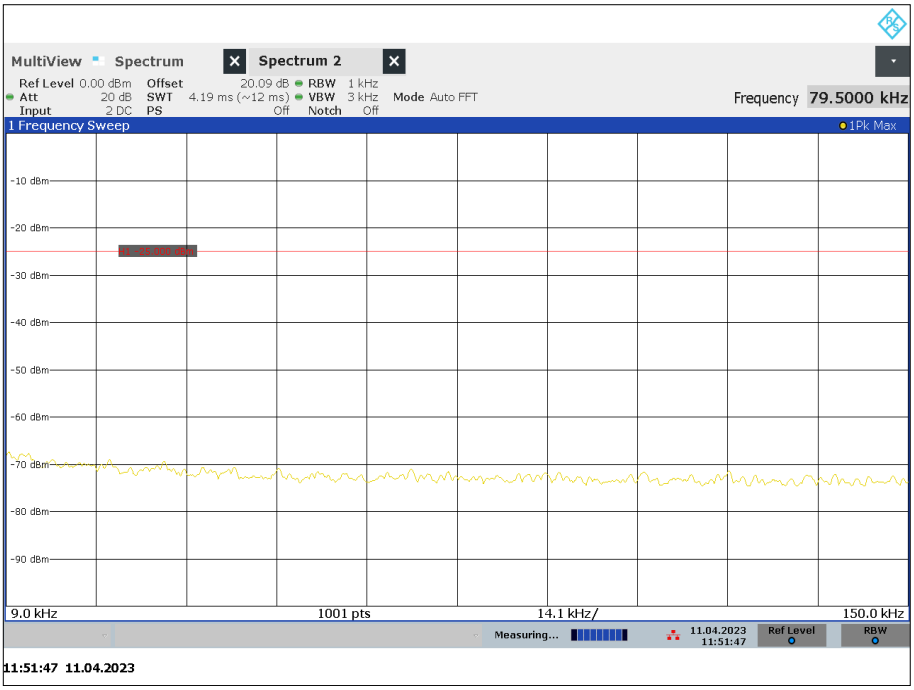

Figure 4 - 406.125 MHz, 9 kHz to 150 kHz Mask Y

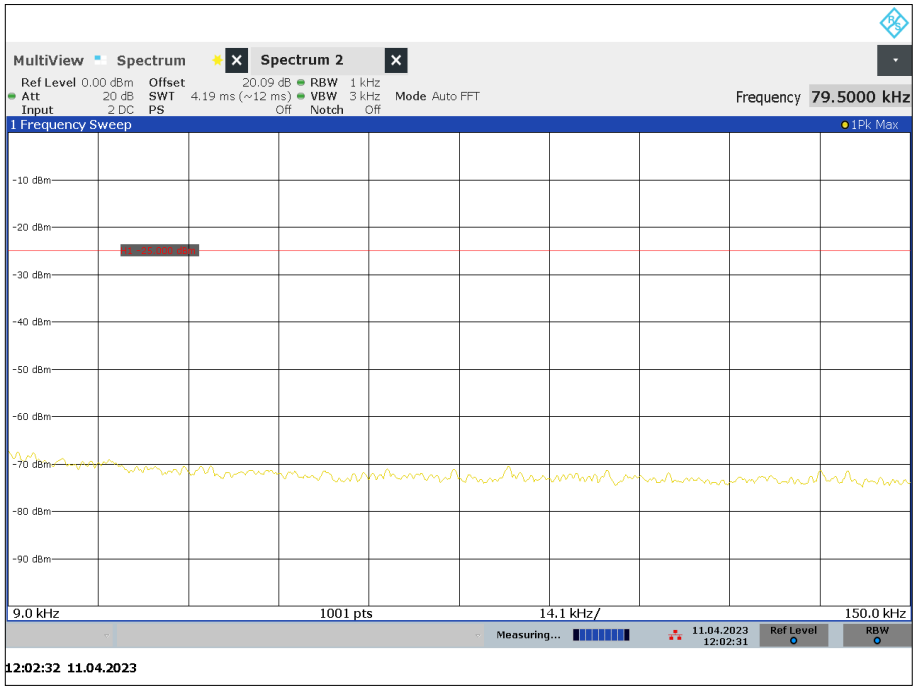

Figure 5 - 418.050 MHz, 9 kHz to 150 kHz Mask Y

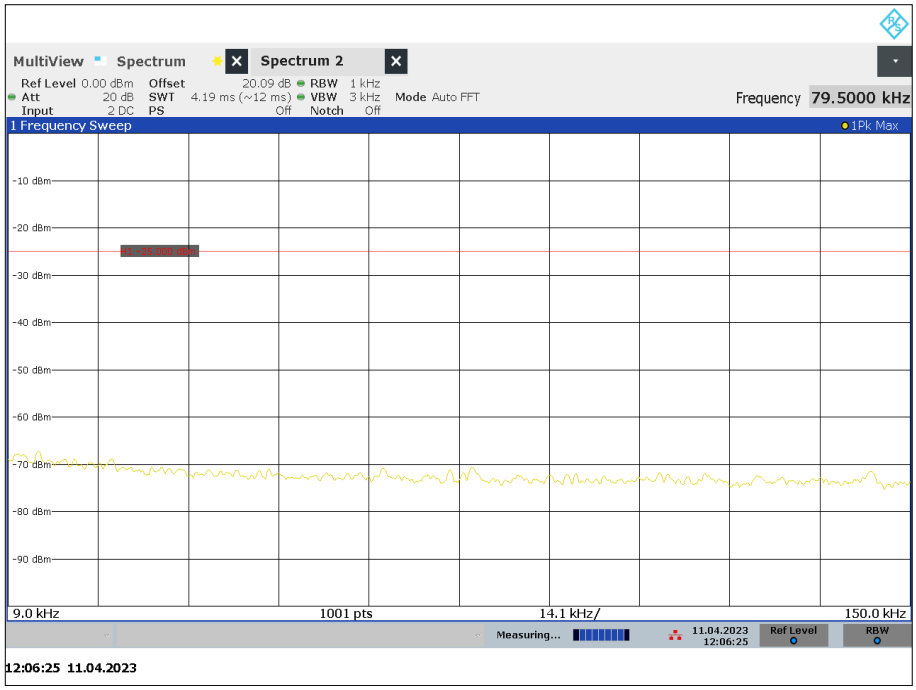

Figure 6 - 429.975 MHz - 9 kHz to 150 kHz Mask Y

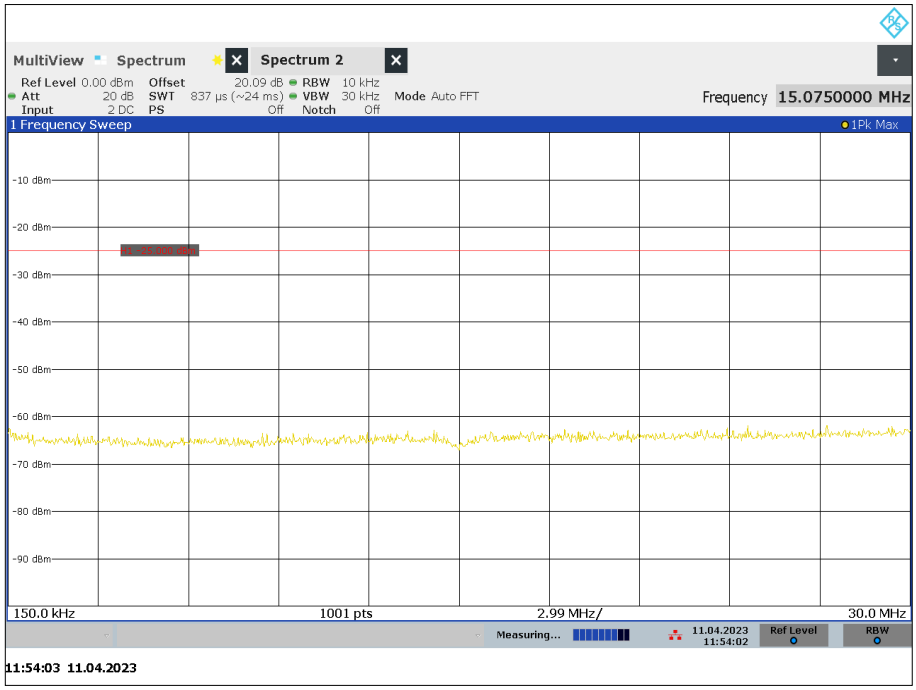

Figure 7 - 406.125 MHz, 150 kHz to 30 MHz Mask Y

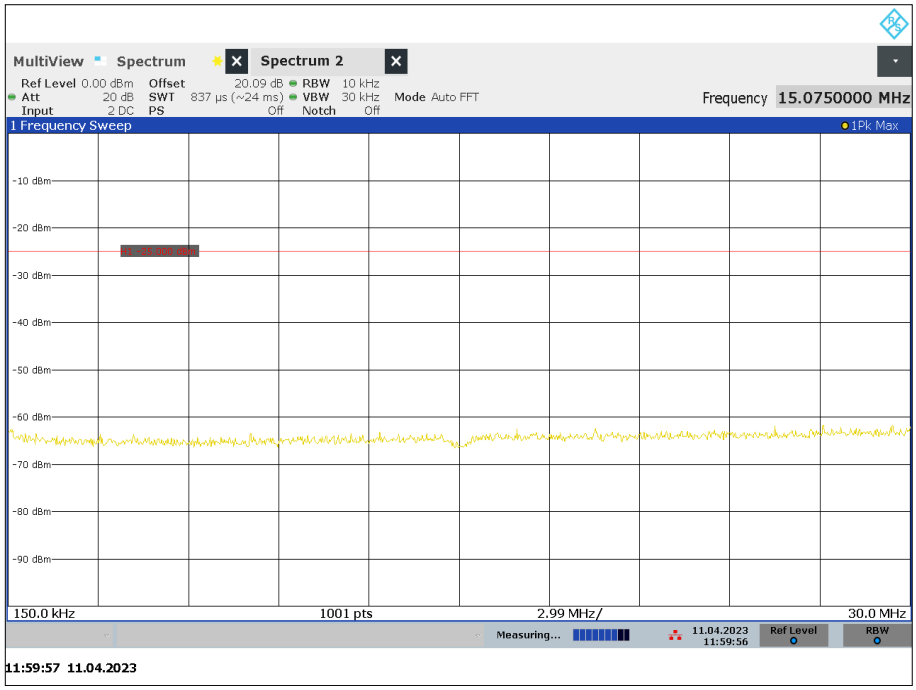

Figure 8 - 418.050 MHz, 150 kHz to 30 MHz Mask Y

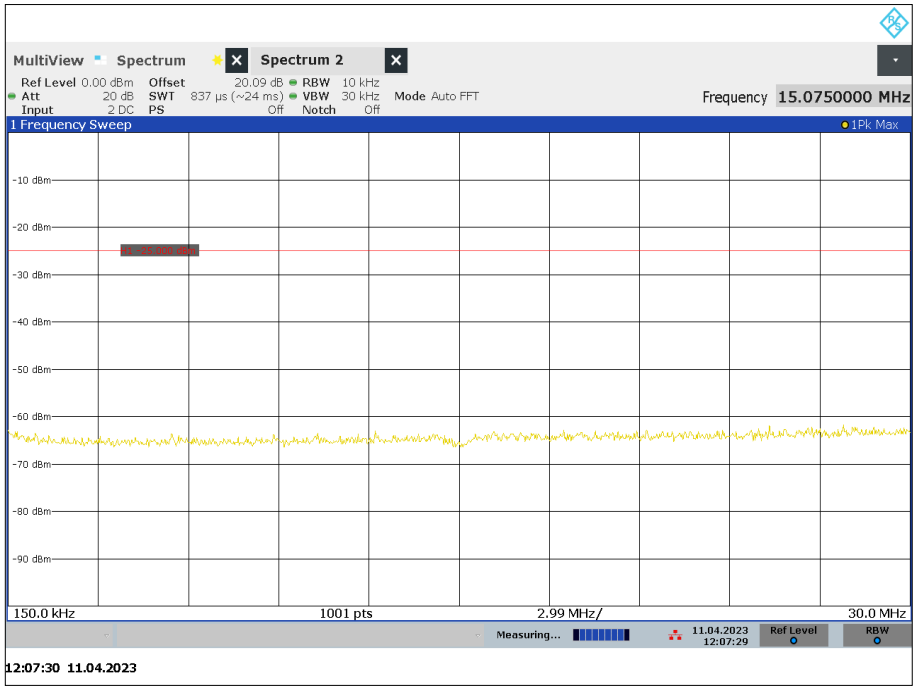

Figure 9 - 429.975 MHz - 150 kHz to 30 MHz Mask Y

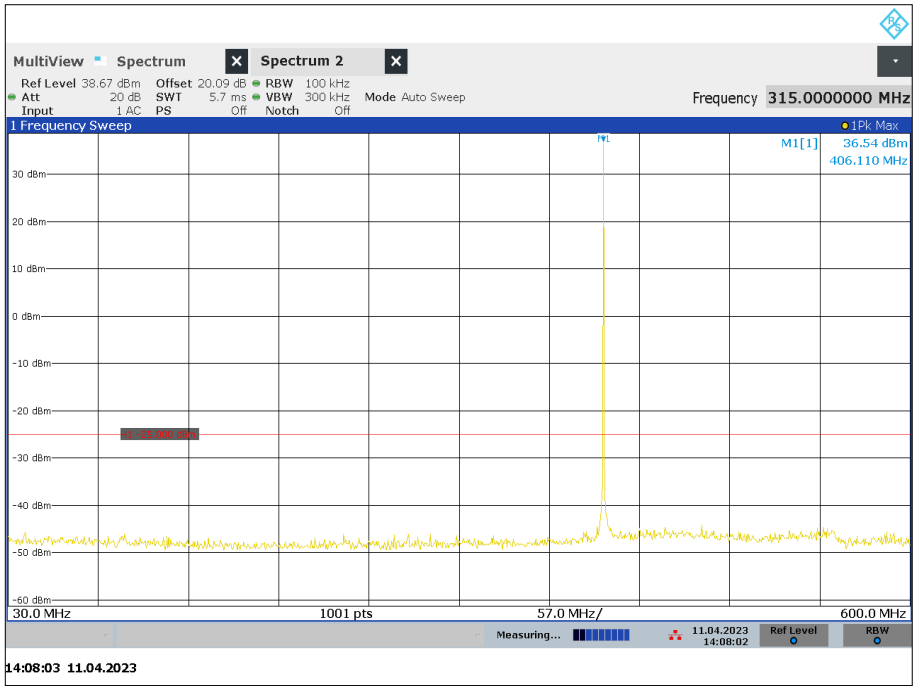

Figure 10 - 406.125 MHz, 30 MHz to 600 MHz Mask Y

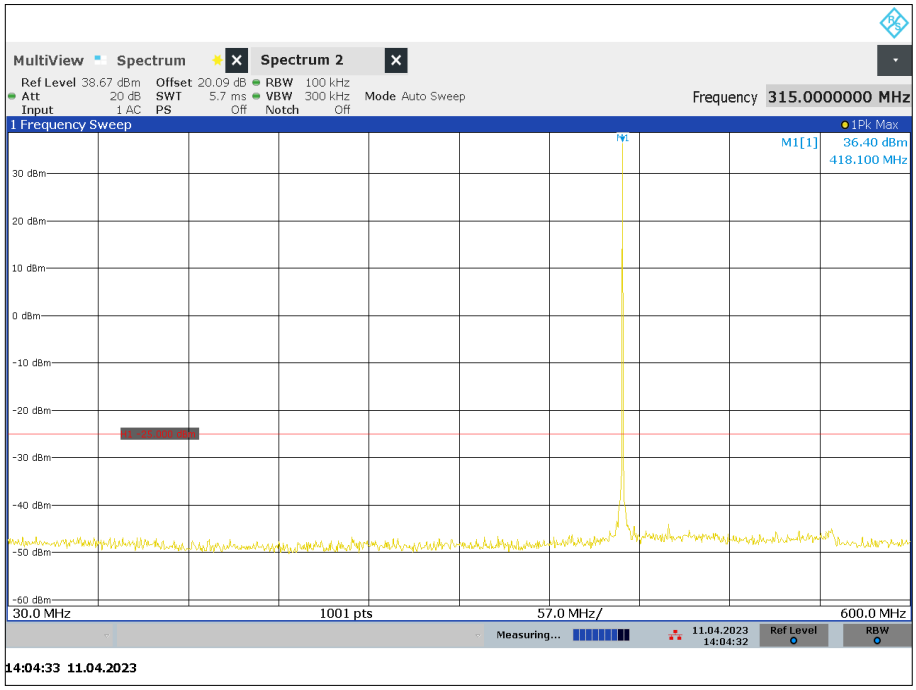

Figure 11 - 418.050 MHz, 30 MHz to 600 MHz Mask Y

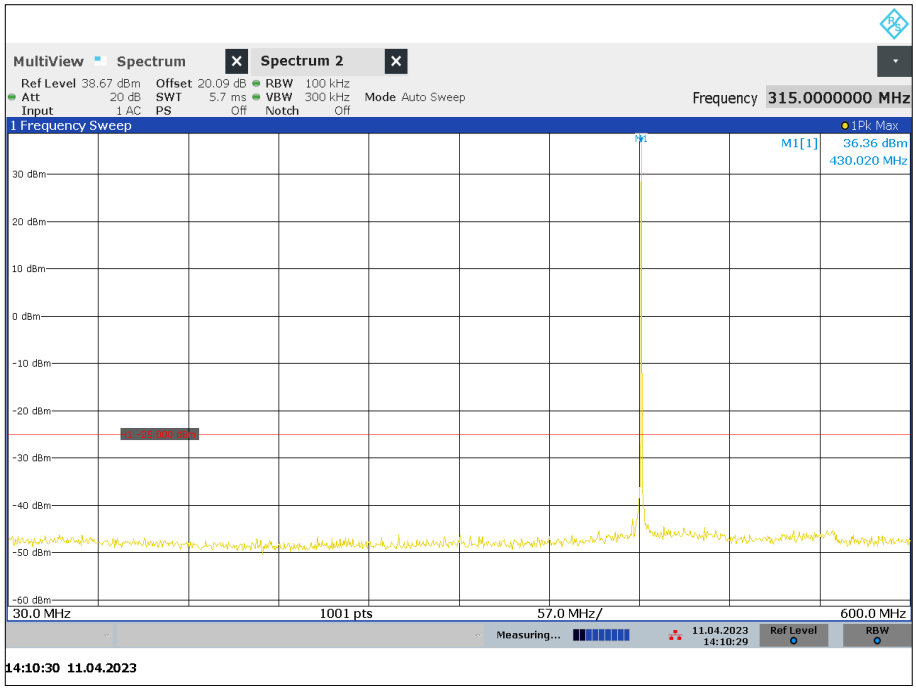

Figure 12 - 429.975 MHz - 30 MHz to 600 MHz Mask Y

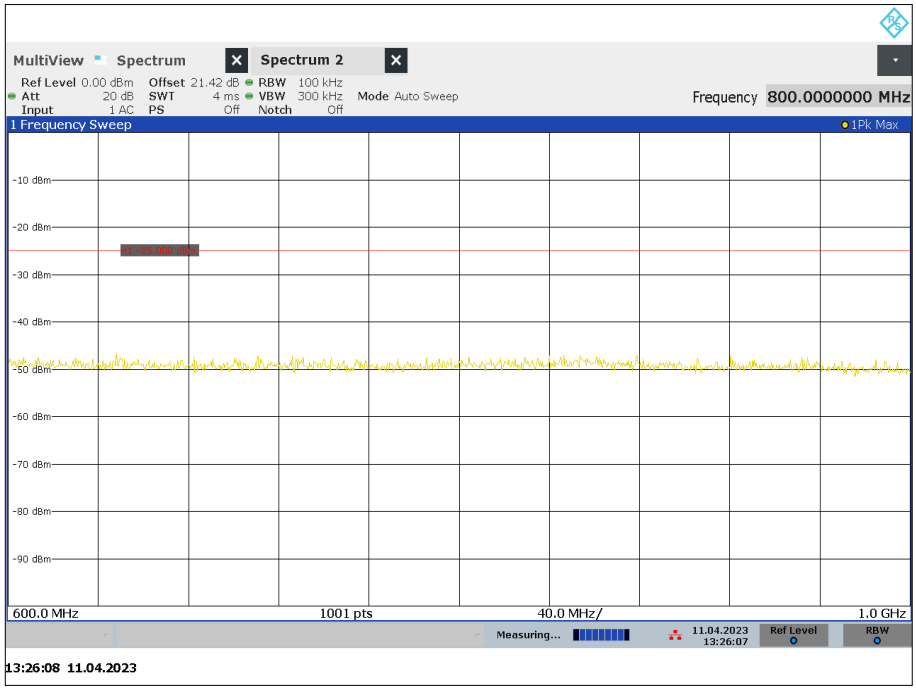

Figure 13 - 406.125 MHz, 600 MHz to 1 GHz Mask Y

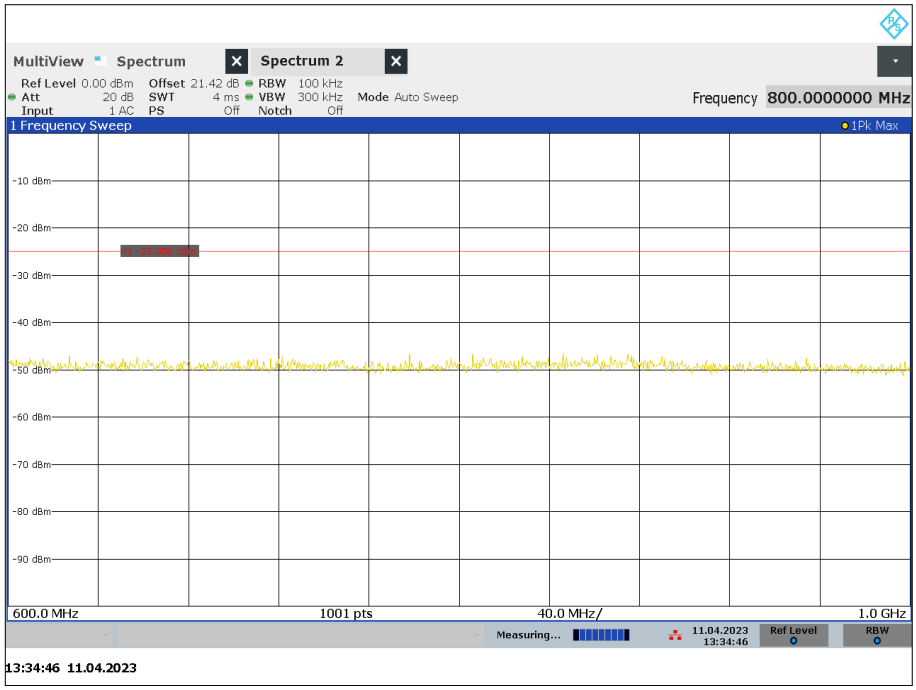

Figure 14 - 418.050 MHz, 600 MHz to 1 GHz Mask Y

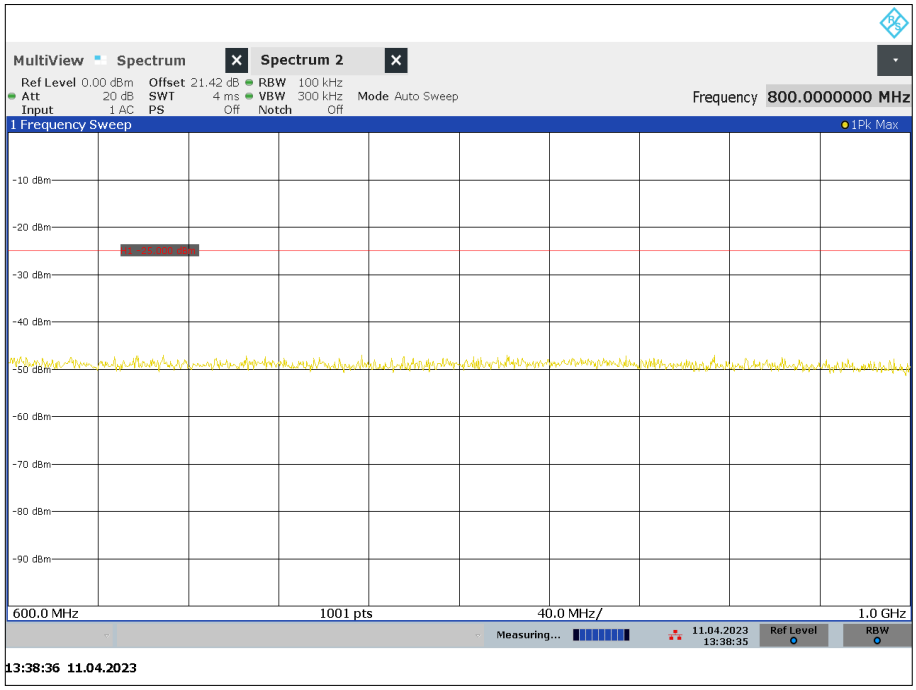

Figure 15 - 429.975 MHz - 600 MHz to 1 GHz Mask Y

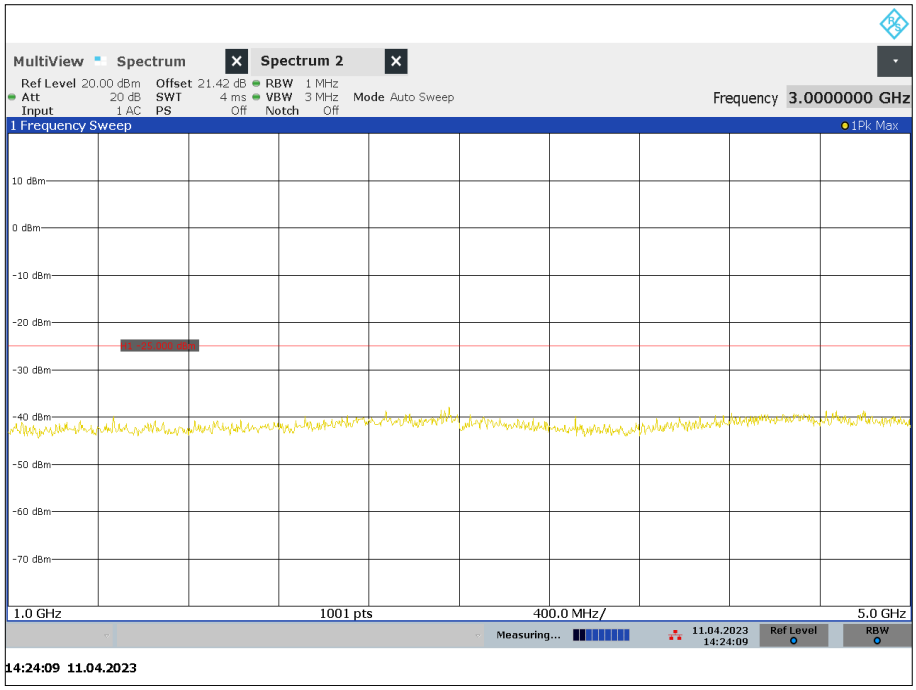

Figure 16 - 406.125 MHz, 1 GHz to 5 GHz Mask Y

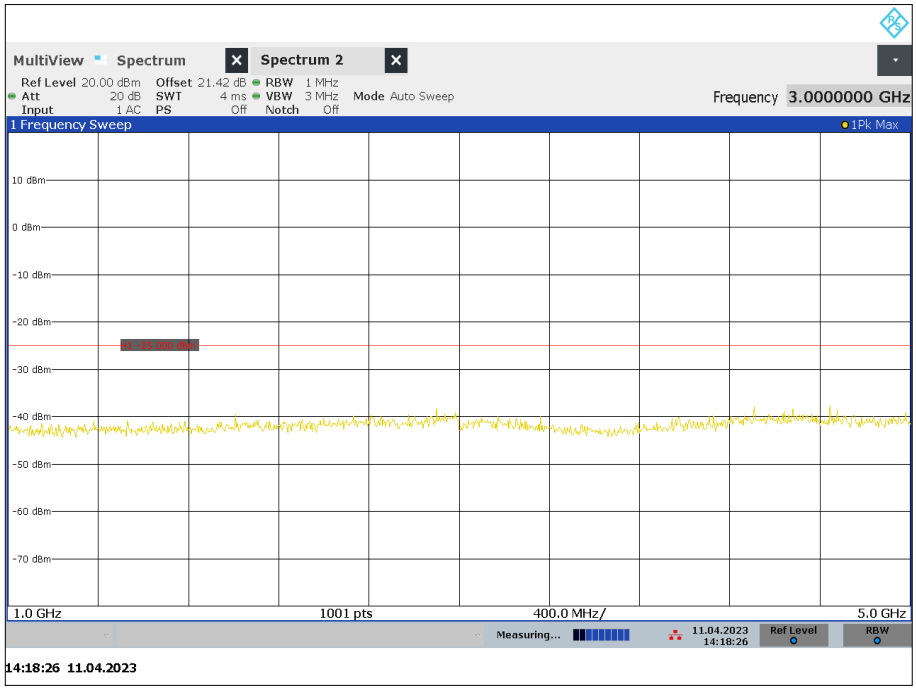

Figure 17 - 418.050 MHz, 1 GHz to 5 GHz Mask Y

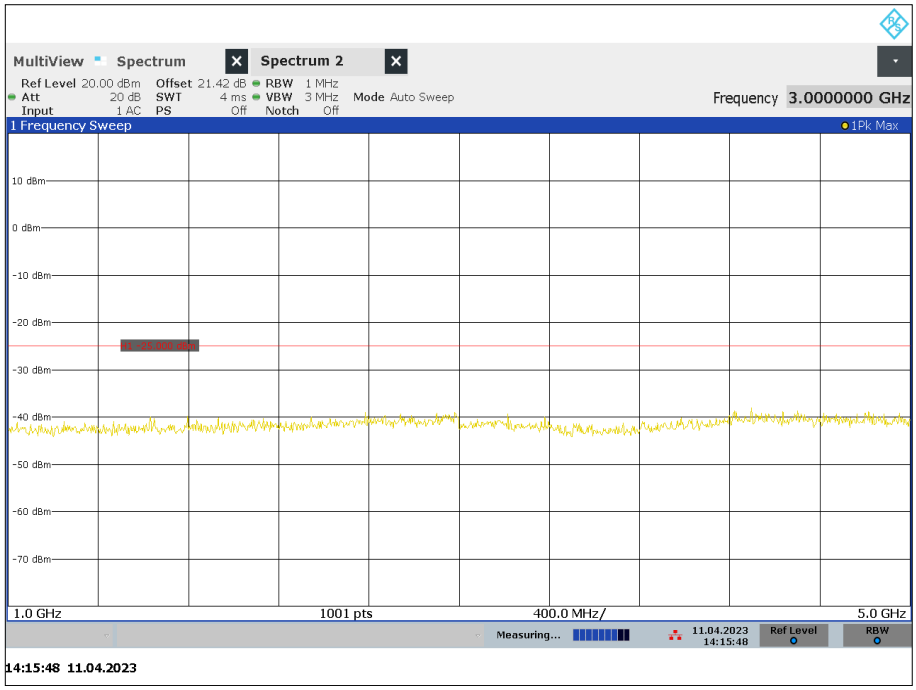

Figure 18 - 429.975 MHz - 1 GHz to 5 GHz Mask Y

<u>ISED RSS-119, Limit Clause 5.8</u>

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

TETRA 450 MHz to 470 MHz

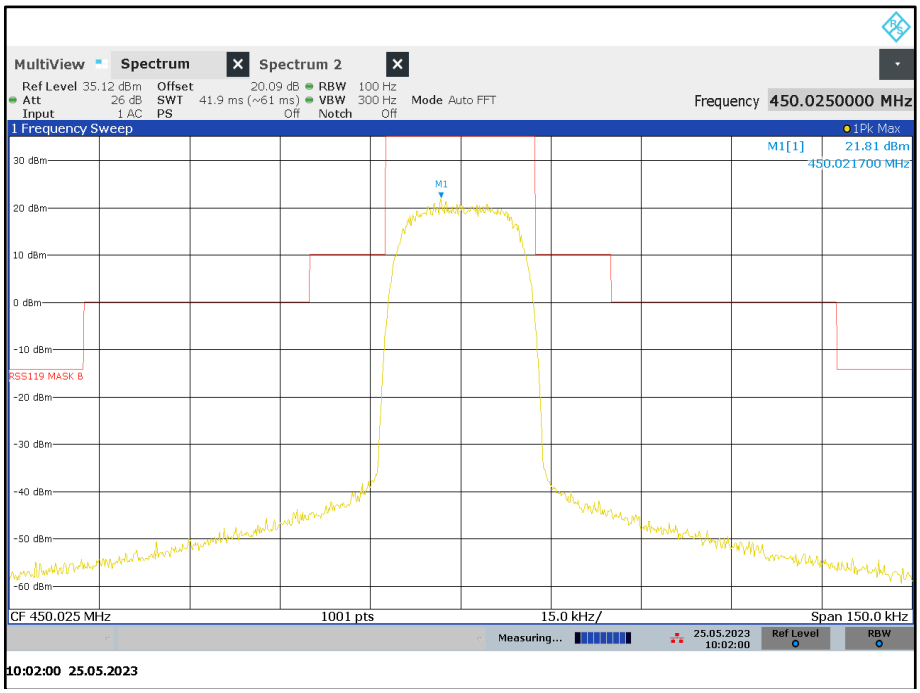

Figure 19 - 450.025 MHz, Transmitter Mask B

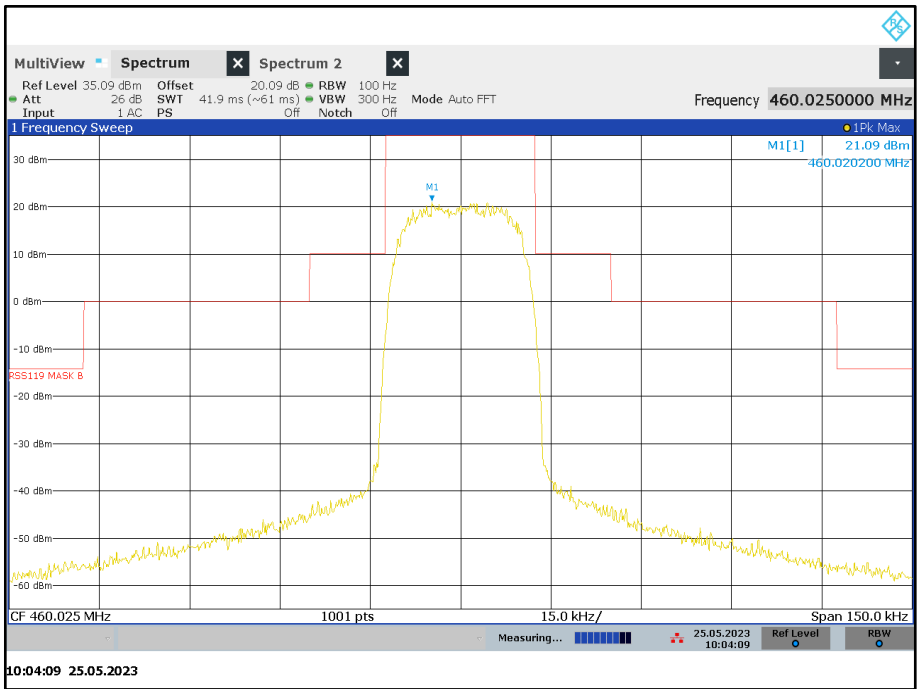

Figure 20 - 460.025 MHz, Transmitter Mask B

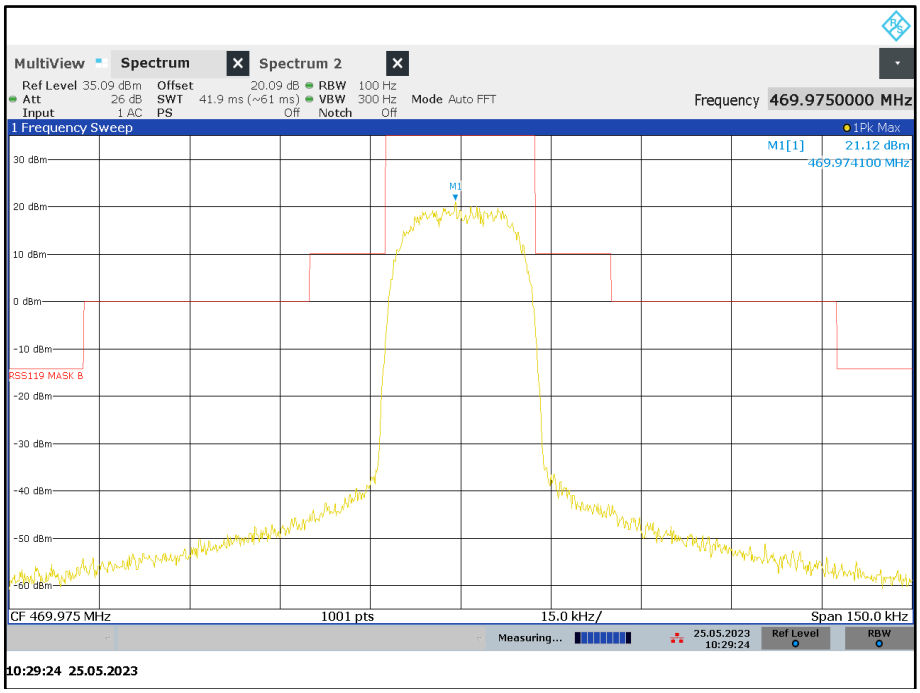

Figure 21 - 469.975 MHz, Transmitter Mask B

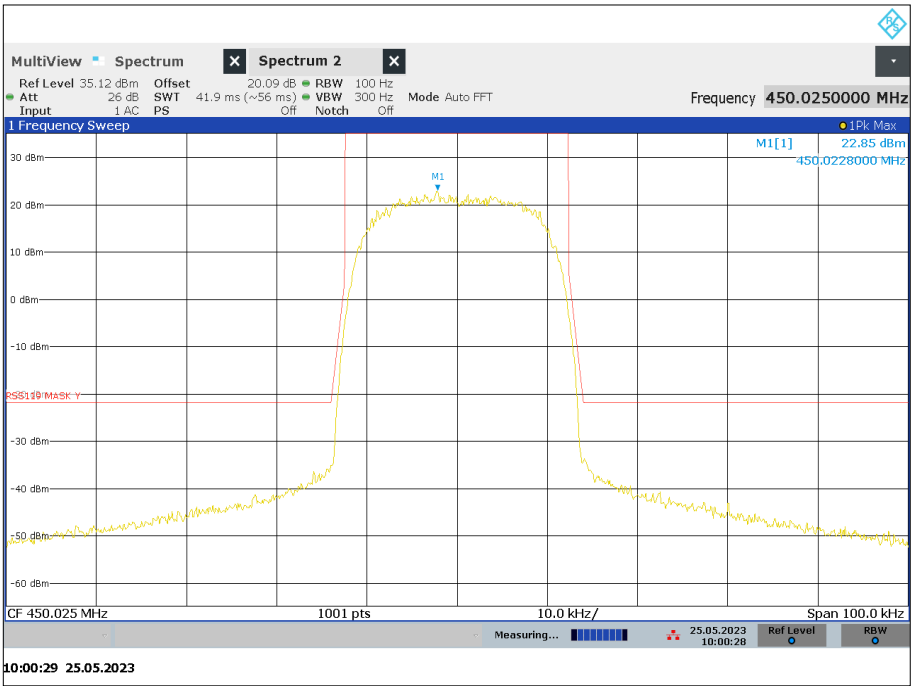

Figure 22 - 450.025 MHz, Transmitter Mask Y

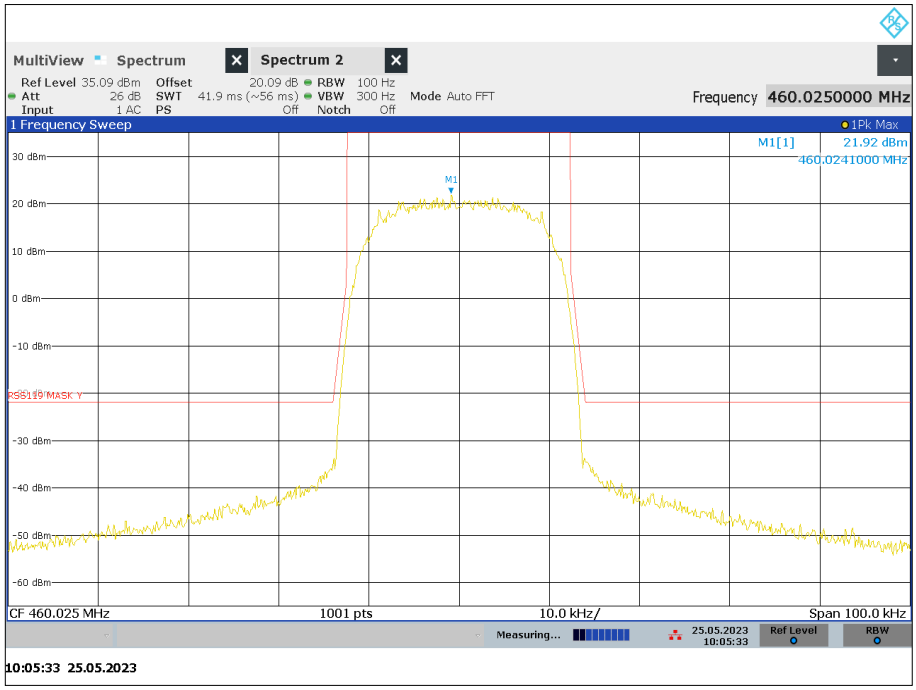

Figure 23 - 460.025 MHz, Transmitter Mask Y

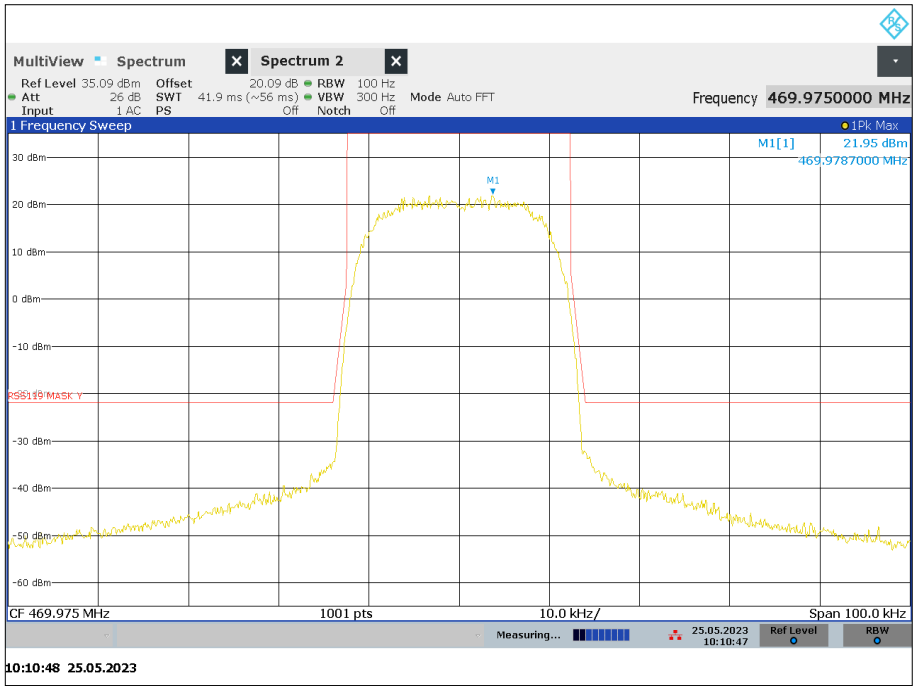

Figure 24 - 469.975 MHz, Transmitter Mask Y

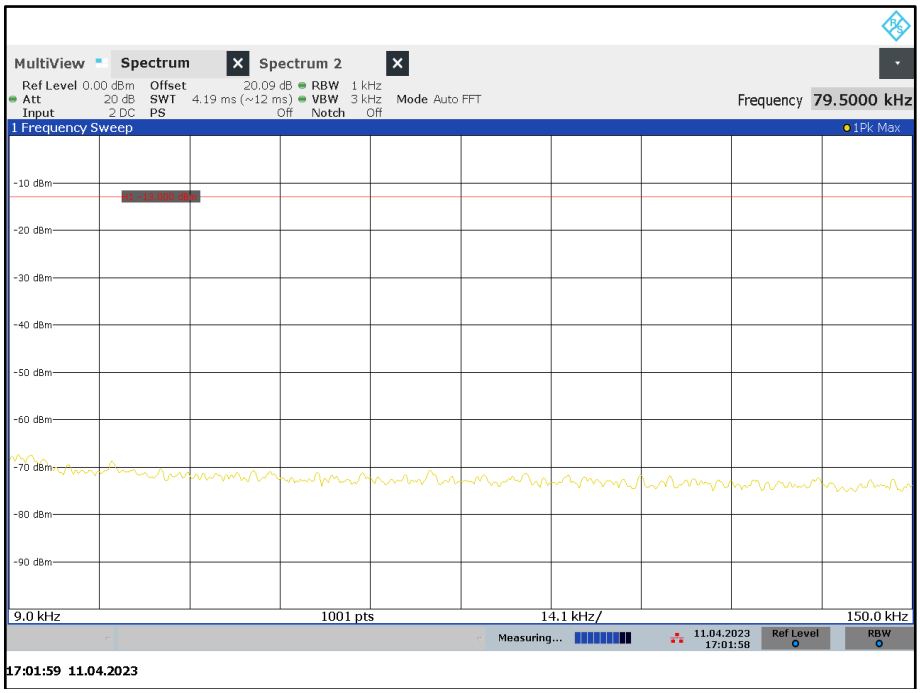

Figure 25 - 450.025 MHz, 9 kHz to 150 kHz Mask B

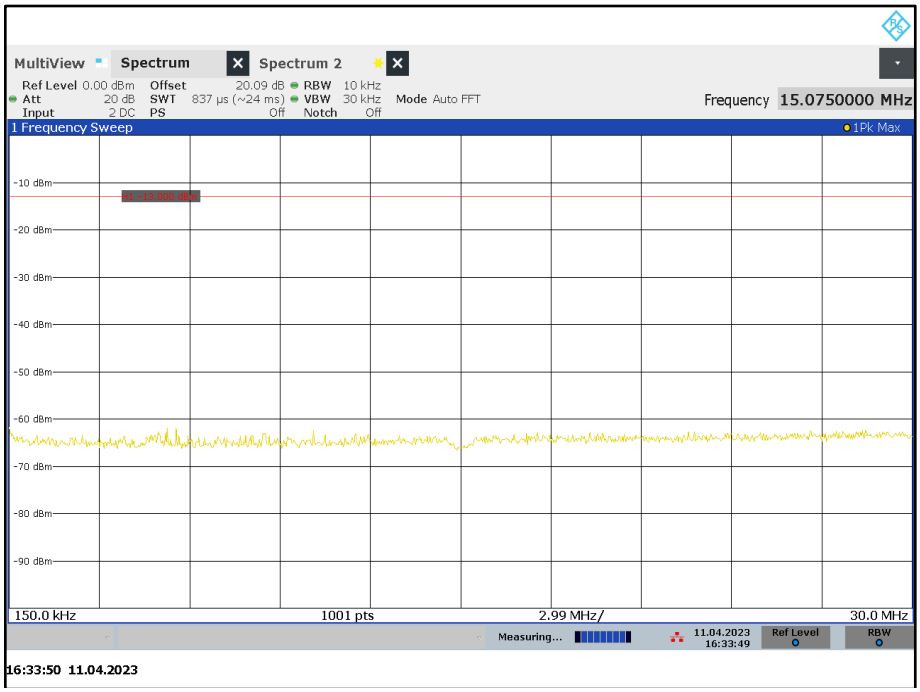

Figure 26 - 450.025 MHz, 150 kHz to 30 MHz Mask B

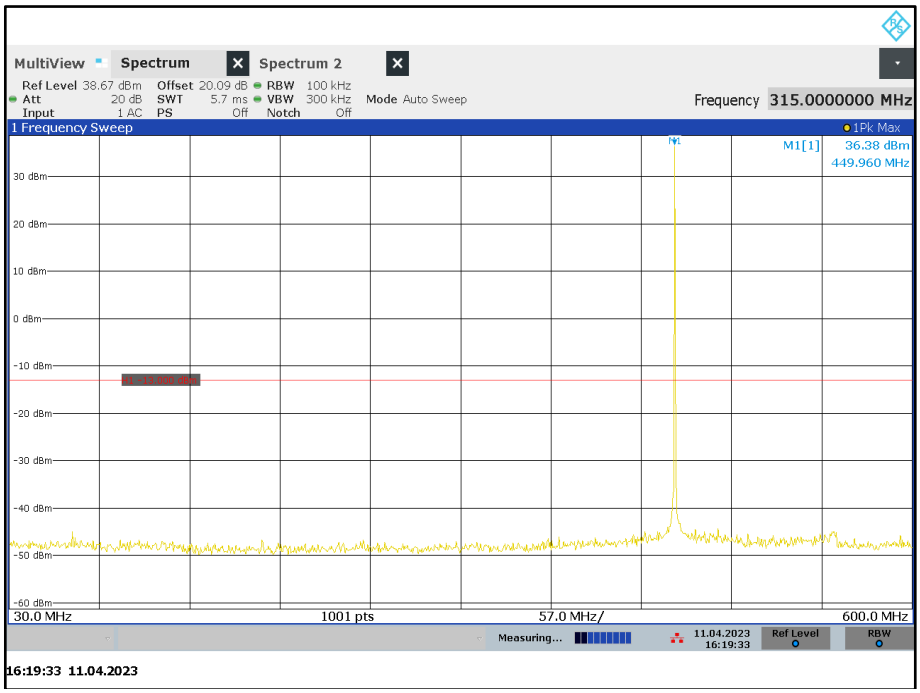

Figure 27 - 450.025 MHz, 30 MHz to 600 MHz Mask B

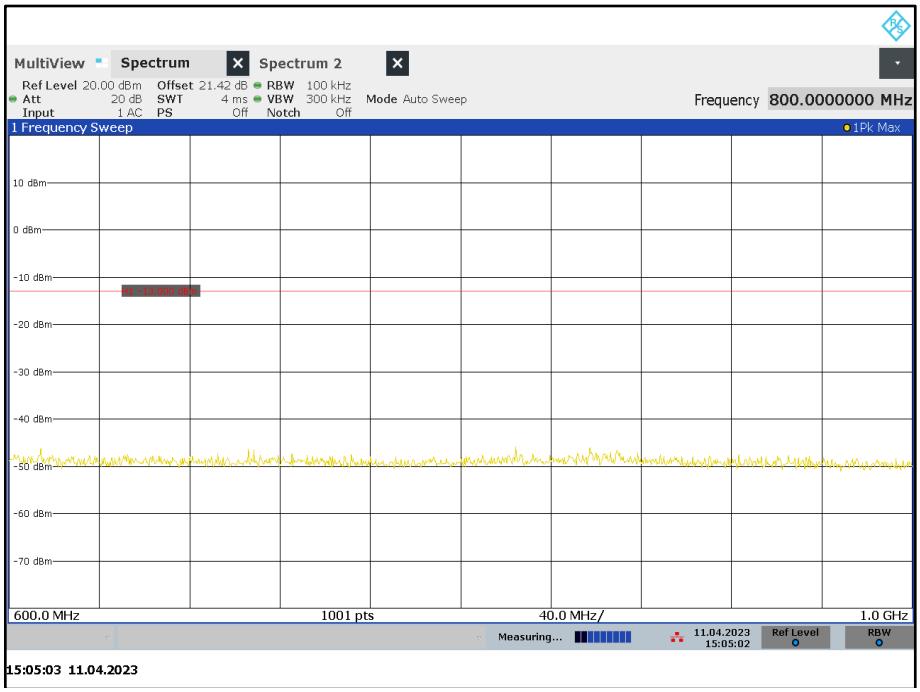

Figure 28 - 450.025 MHz, 600 MHz to 1 GHz Mask B

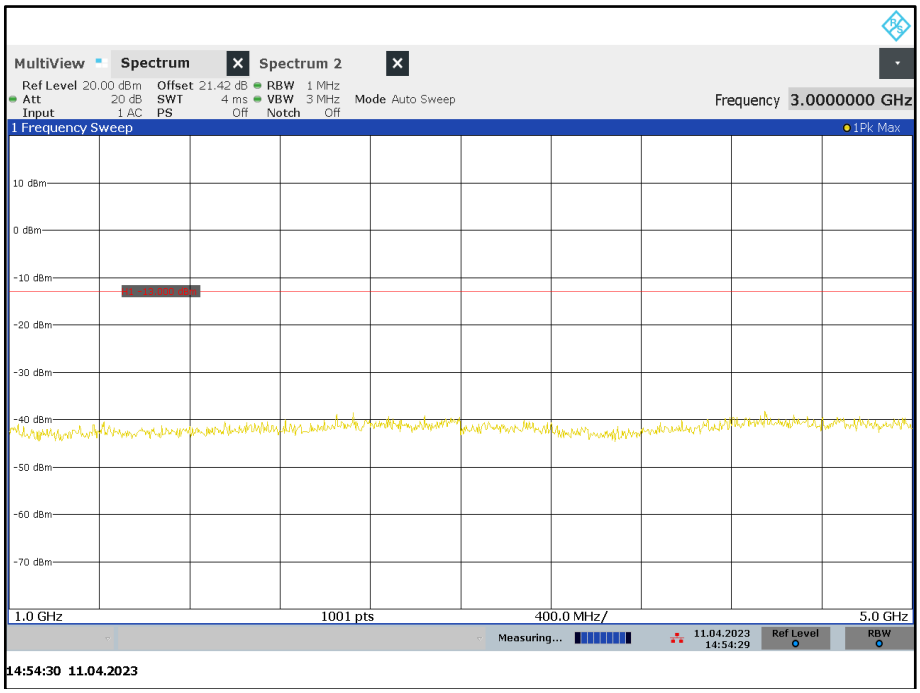

Figure 29 - 450.025 MHz, 1 GHz to 5 GHz Mask B

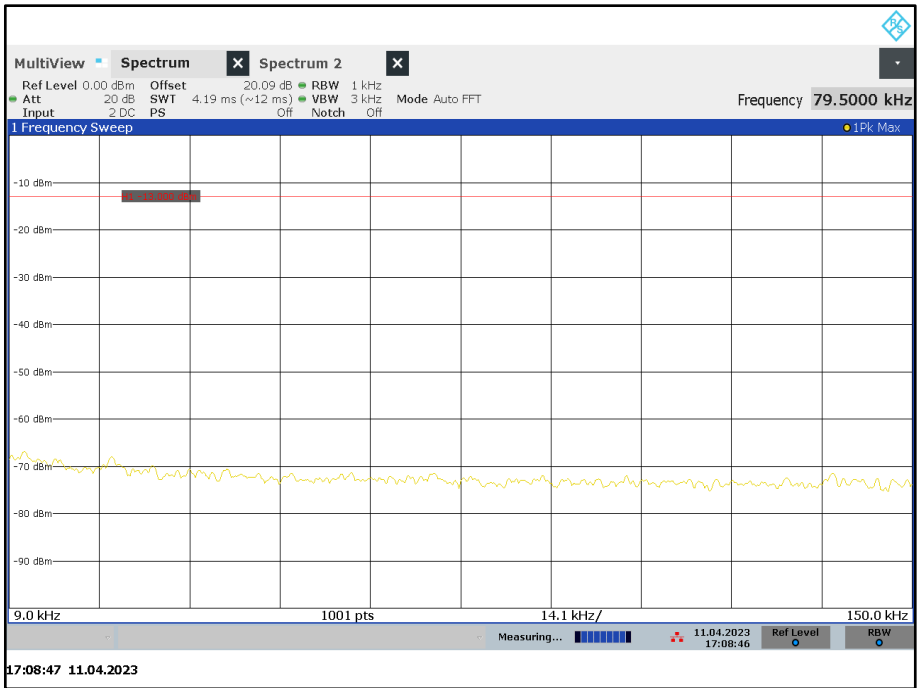

Figure 30 - 460.025 MHz, 9 kHz to 150 kHz Mask B

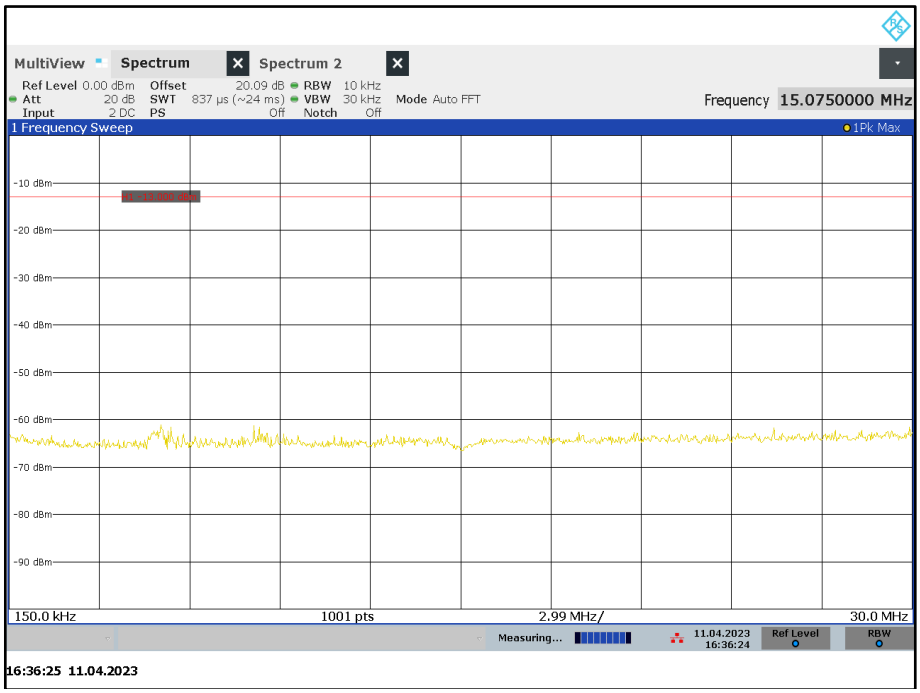

Figure 31 - 460.025 MHz, 150 kHz to 30 MHz Mask B

Figure 32 - 460.025 MHz, 30 MHz to 600 MHz Mask B

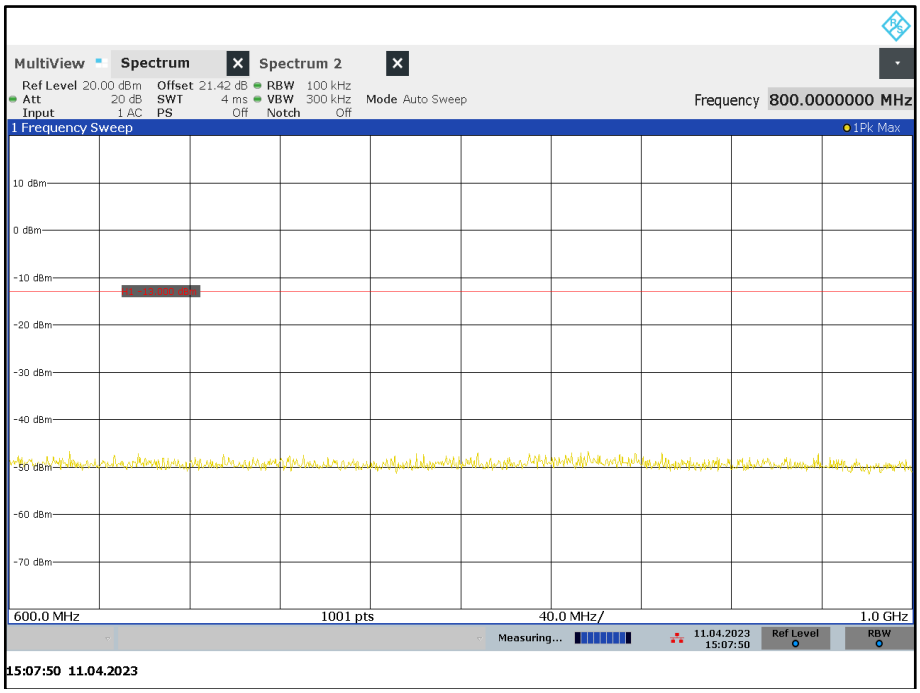

Figure 33 - 460.025 MHz, 600 MHz to 1 GHz Mask B

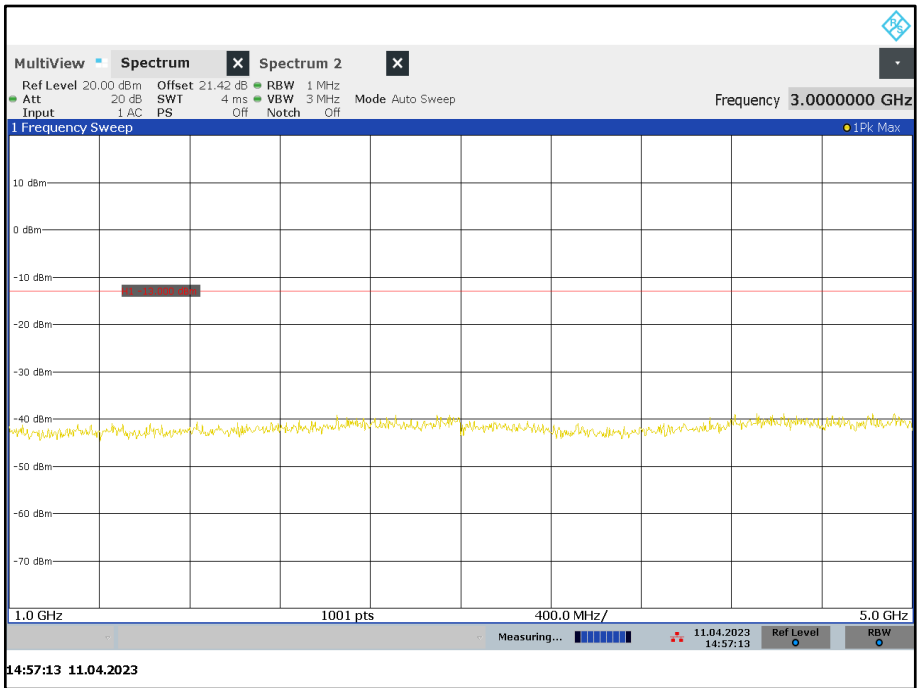

Figure 34 - 460.025 MHz, 1 GHz to 5 GHz Mask B

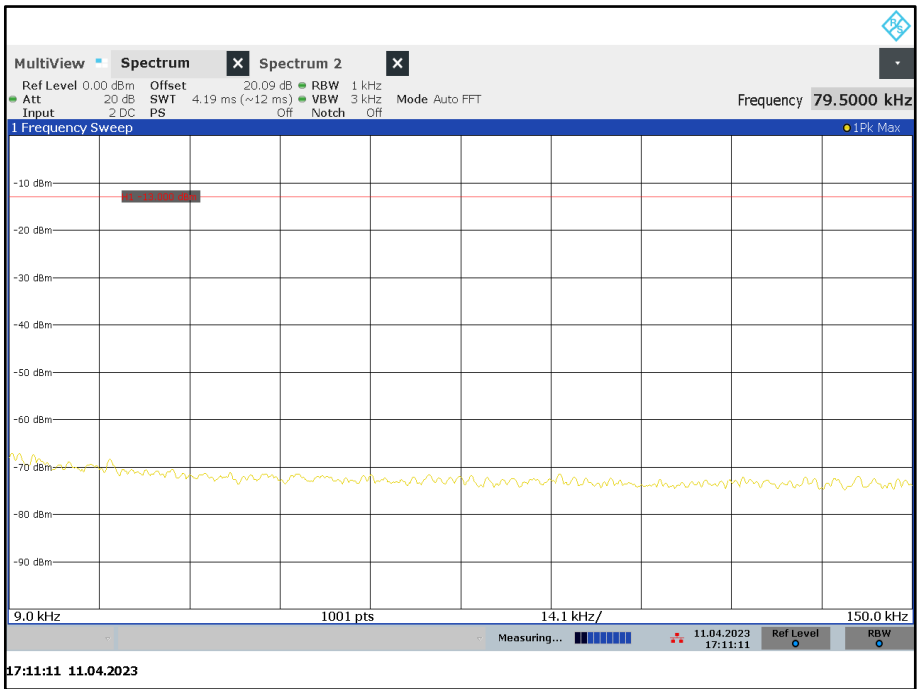

Figure 35 - 469.975 MHz, 9 kHz to 150 kHz Mask B

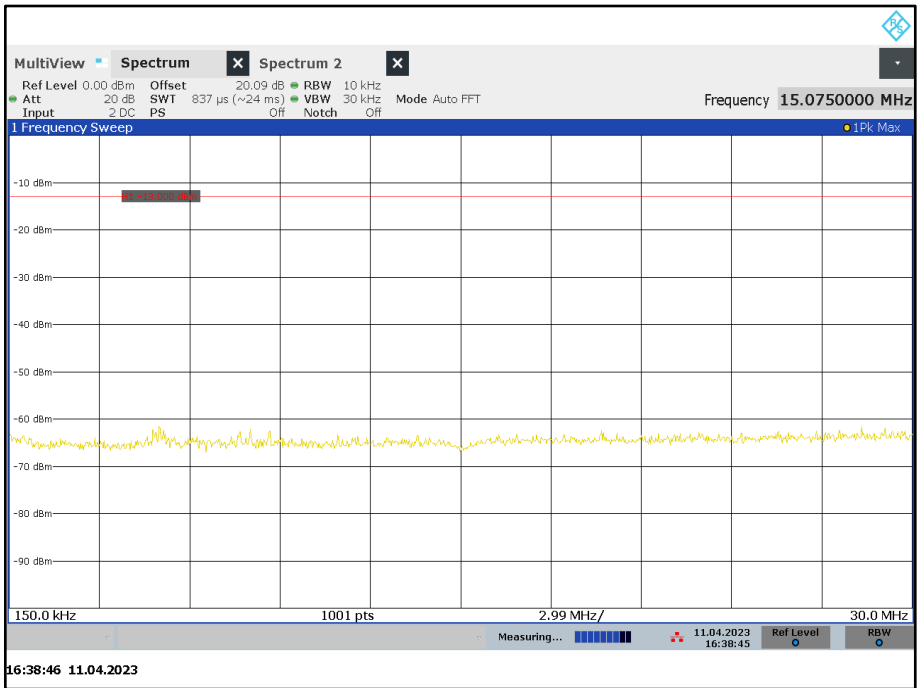

Figure 36 - 469.975 MHz, 150kHz to 30 MHz Mask B

Figure 37 - 469.975 MHz, 30 MHz to 600 MHz Mask B

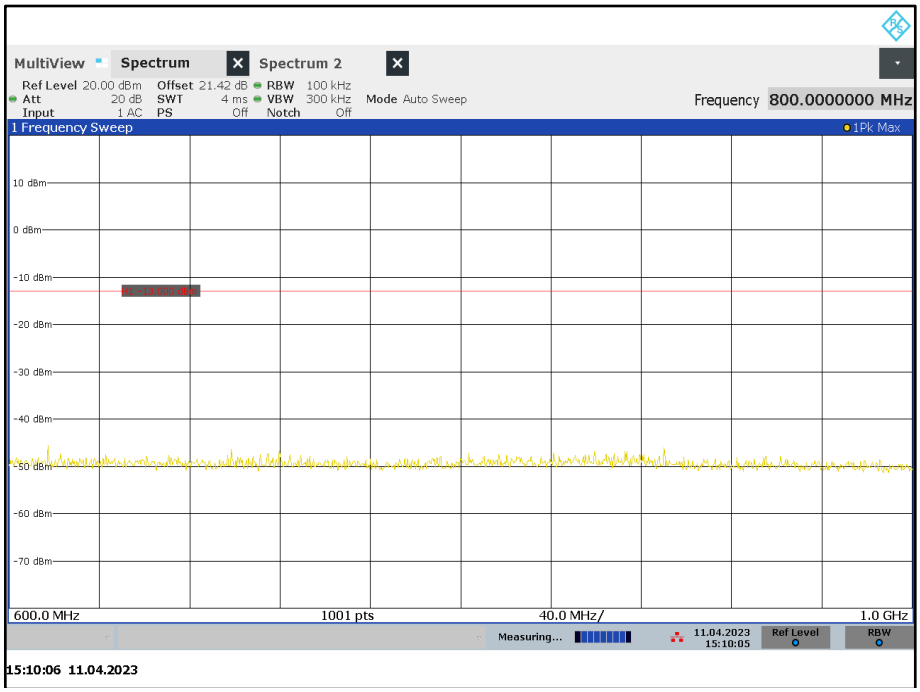

Figure 38 - 469.975 MHz, 600 MHz to 1 GHz Mask B

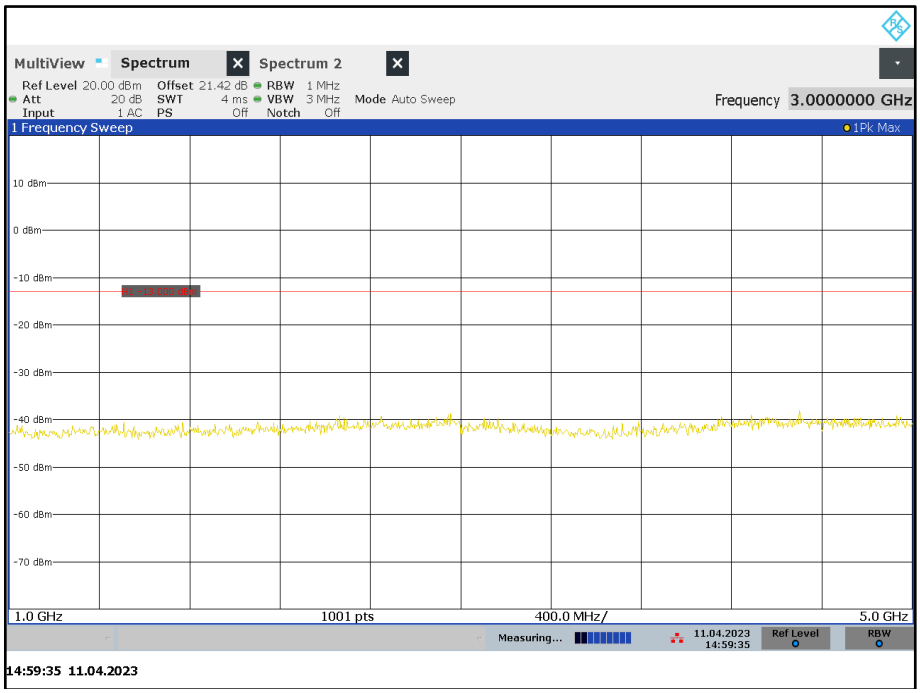

Figure 39 - 469.975 MHz, 1 GHz to 5 GHz Mask B

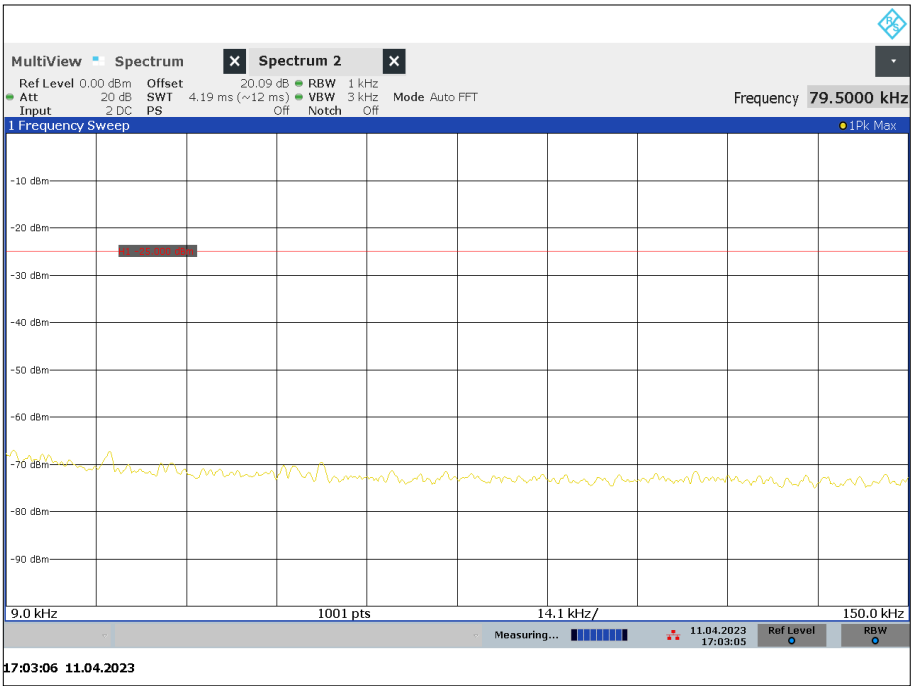

Figure 40 - 450.025 MHz, 9 kHz to 150 kHz Mask Y

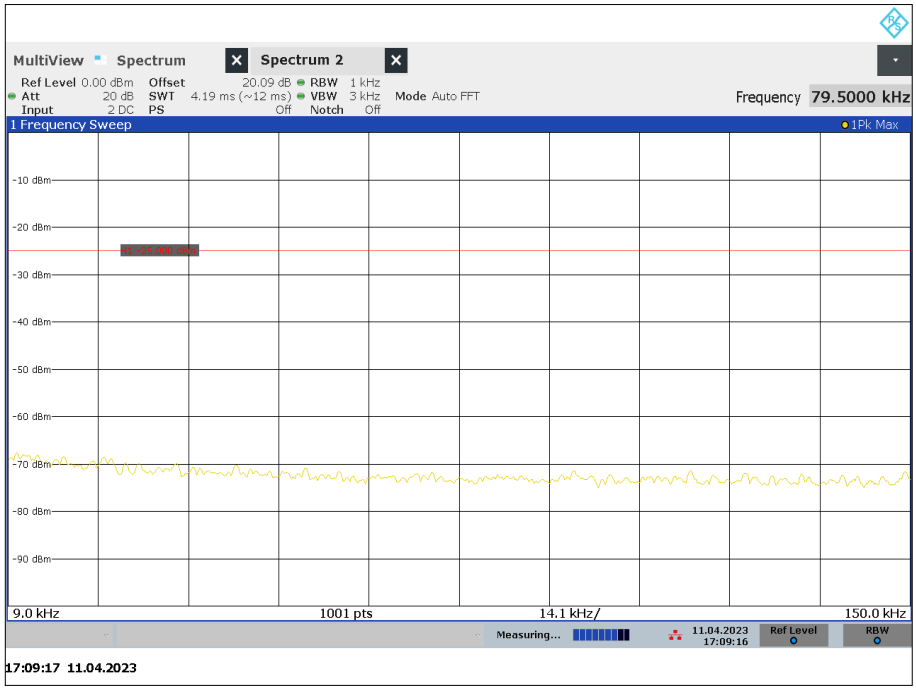

Figure 41 - 460.025 MHz, 9 kHz to 150 kHz Mask Y

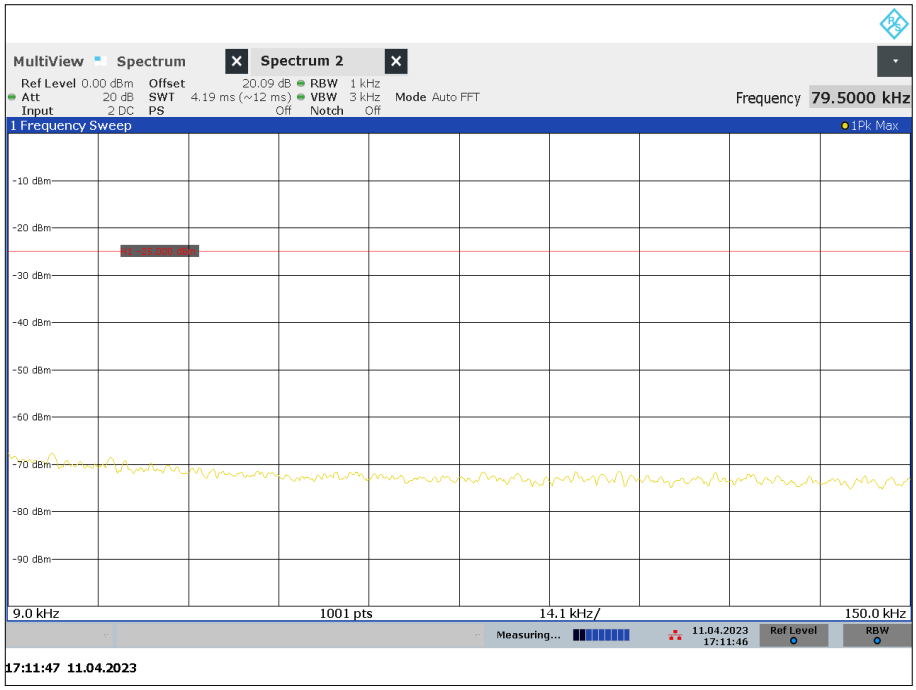

Figure 42 - 469.975 MHz, 9 kHz to 150 kHz Mask Y

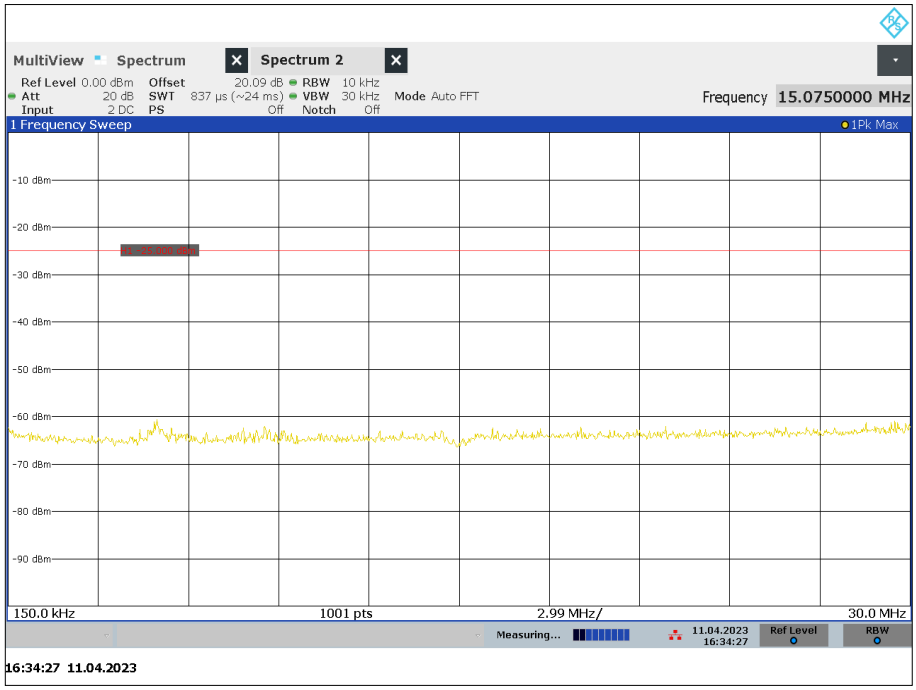

Figure 43 - 450.025 MHz, 150 kHz to 30 MHz Mask Y

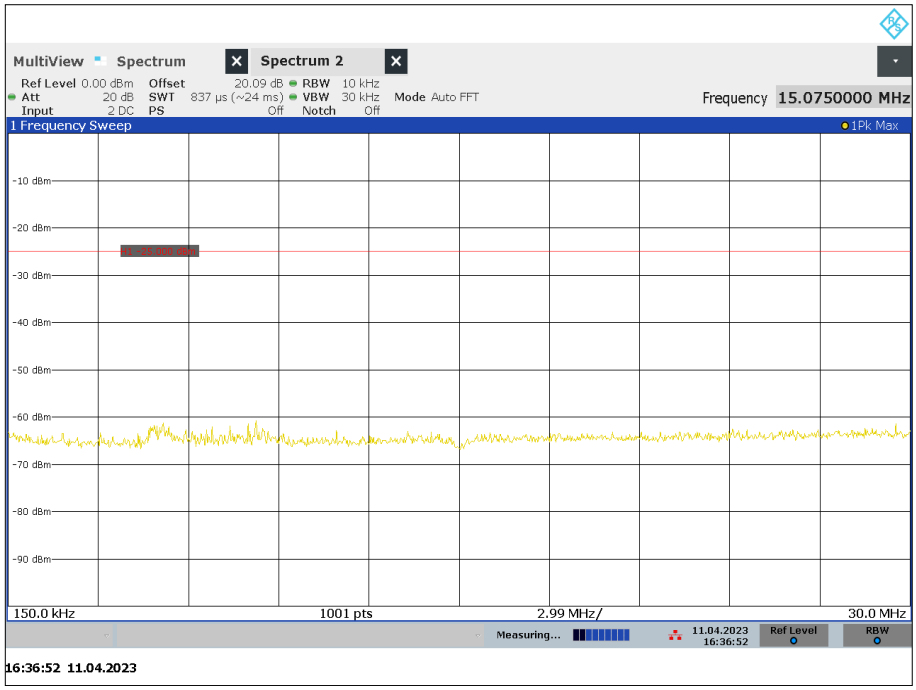

Figure 44 - 460.025 MHz, 150 kHz to 30 MHz Mask Y

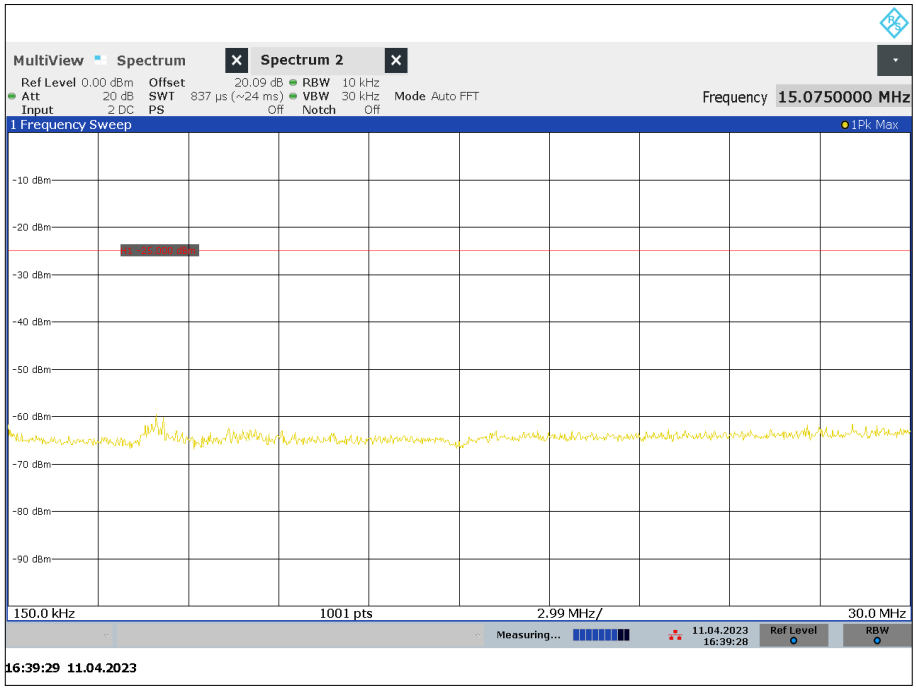

Figure 45 - 469.975 MHz, 150 kHz to 30 MHz Mask Y

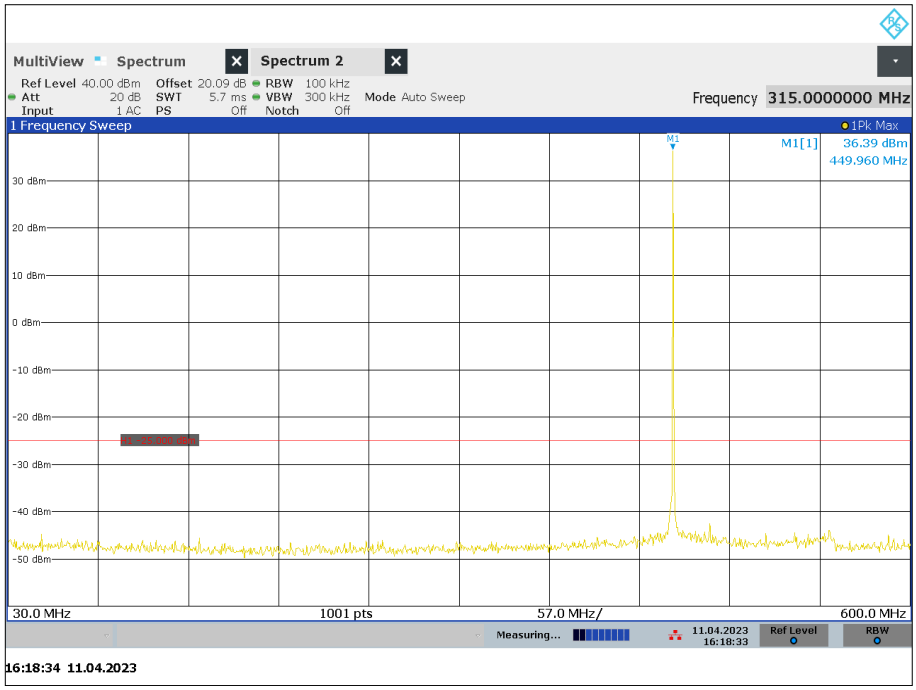

Figure 46 - 450.025 MHz, 30 MHz to 600 MHz Mask Y

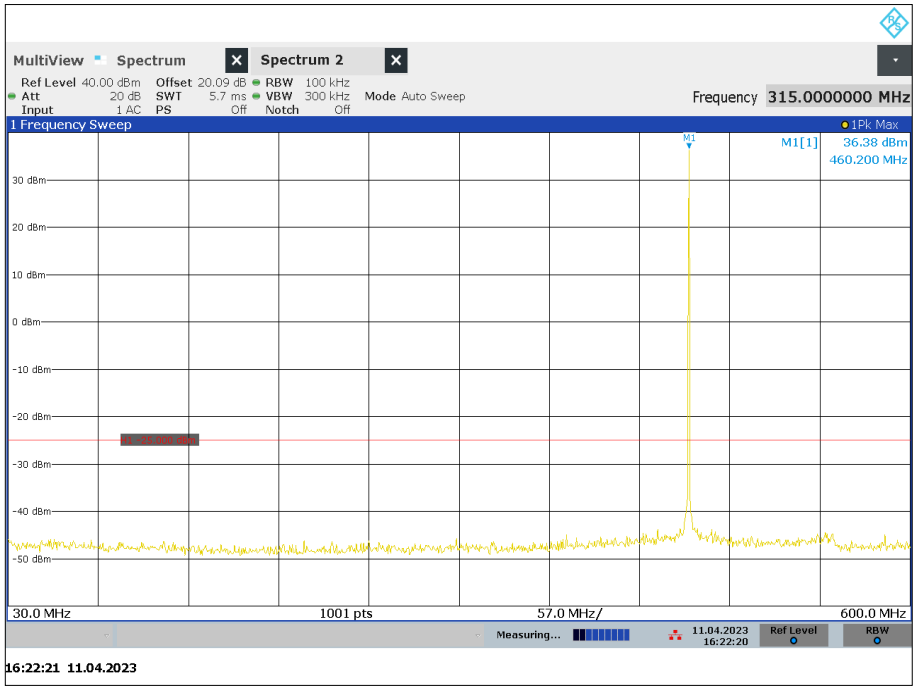

Figure 47 - 460.025 MHz, 30 MHz to 600 MHz Mask Y

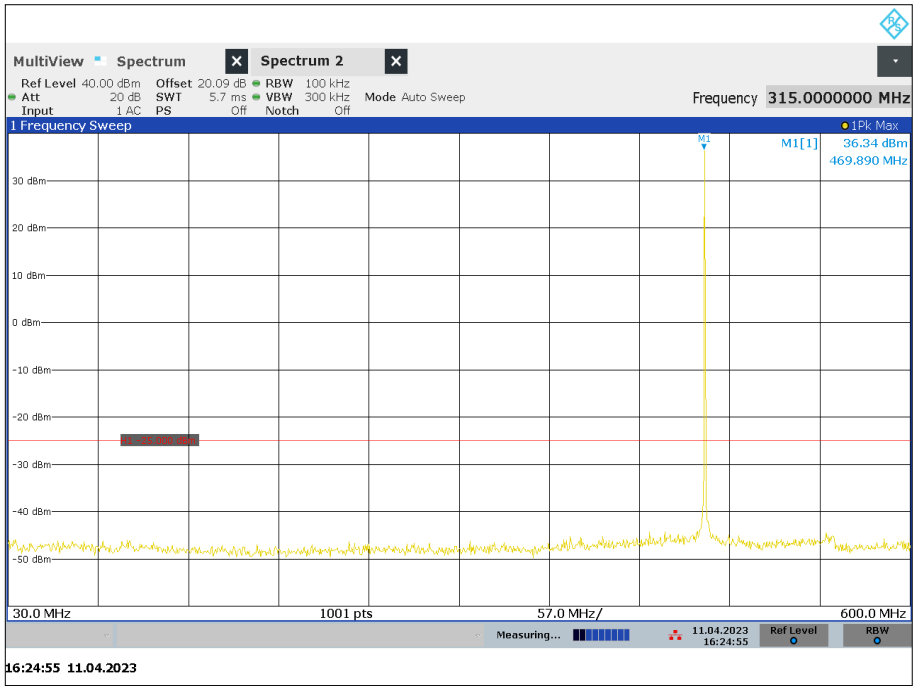

Figure 48 - 469.975 MHz, 30 MHz to 600 MHz Mask Y

Figure 49 - 450.025 MHz, 600 MHz to 1 GHz Mask Y

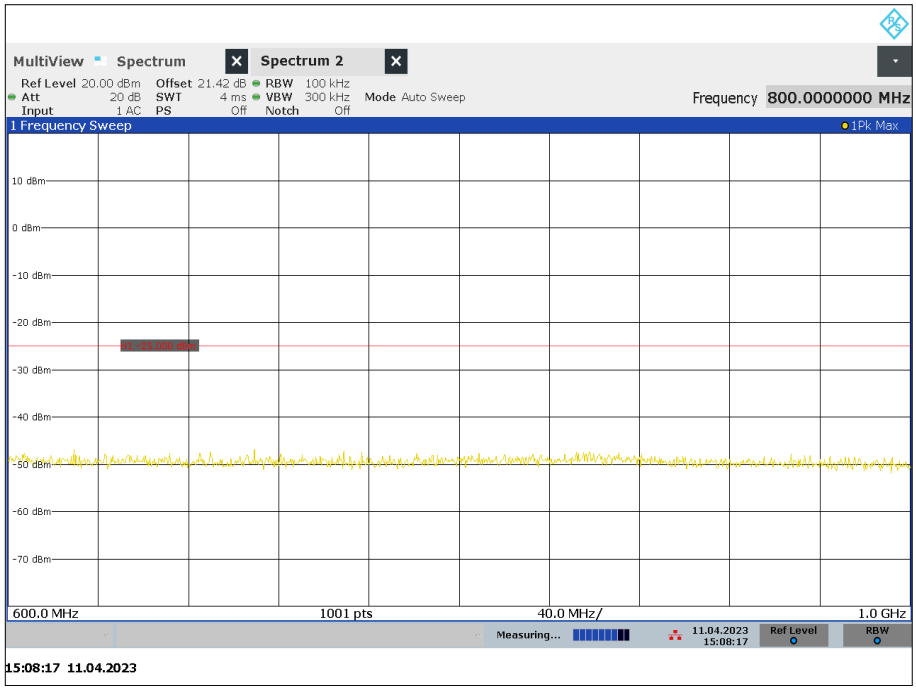

Figure 50 - 460.025 MHz, 600 MHz to 1 GHz Mask Y

Figure 51 - 469.975 MHz, 600 MHz to 1 GHz Mask Y

Figure 52 - 450.025 MHz, 1 GHz to 5 GHz Mask Y

Figure 53 - 460.025 MHz, 1 GHz to 5 GHz Mask Y

Figure 54 - 469.975 MHz, 1 GHz to 5 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
Hygrometer	Rotronic	A1	2138	12	28-Sep-2023
Filter (Hi Pass)	Mini-Circuits	NHP-600	2834	12	19-Jan-2024
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	17-May-2023
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

SC2124, S/N: 1PR002247GMA2KT - Modification State 0

2.3.3 Date of Test

30-March-2023 to 03-April-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 (dBµV/m) = EIRP (dBm) − 20log(D) + 104.8 where (D) is the measurement distance.

-25.0 (dBm) - 20log(3) + 104.8 = E (dBuV/m)

70.2 = E (dBµV/m)

2.3.5 Example Test Setup Diagram

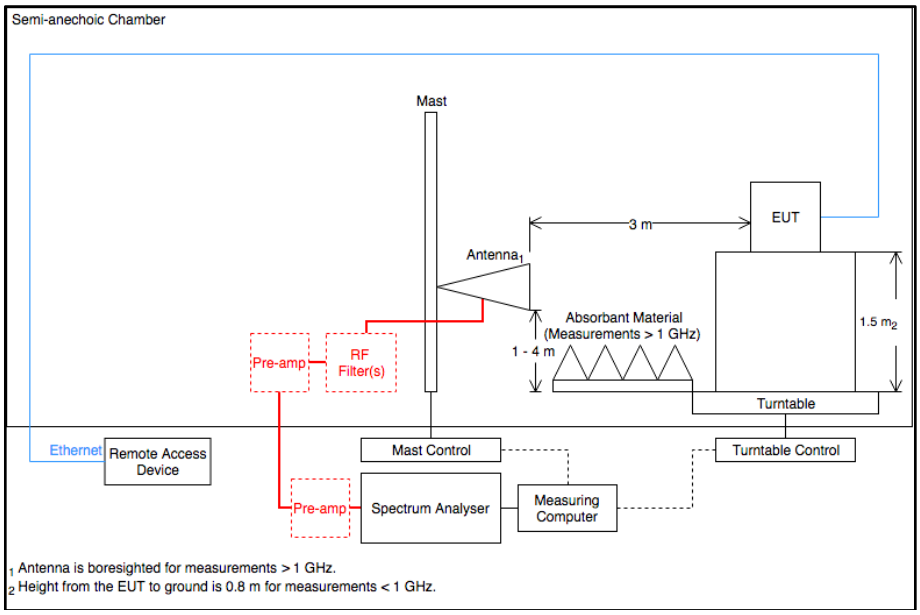

Figure 55 – Test Setup Diagram

2.3.6 Environmental Conditions

Ambient Temperature	19.8 - 21.2 °C
Relative Humidity	33.8 - 52.2 %

2.3.7 Test Results

TETRA 403 MHz to 430 MHz

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

Table 22 - 406.125 MHz

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

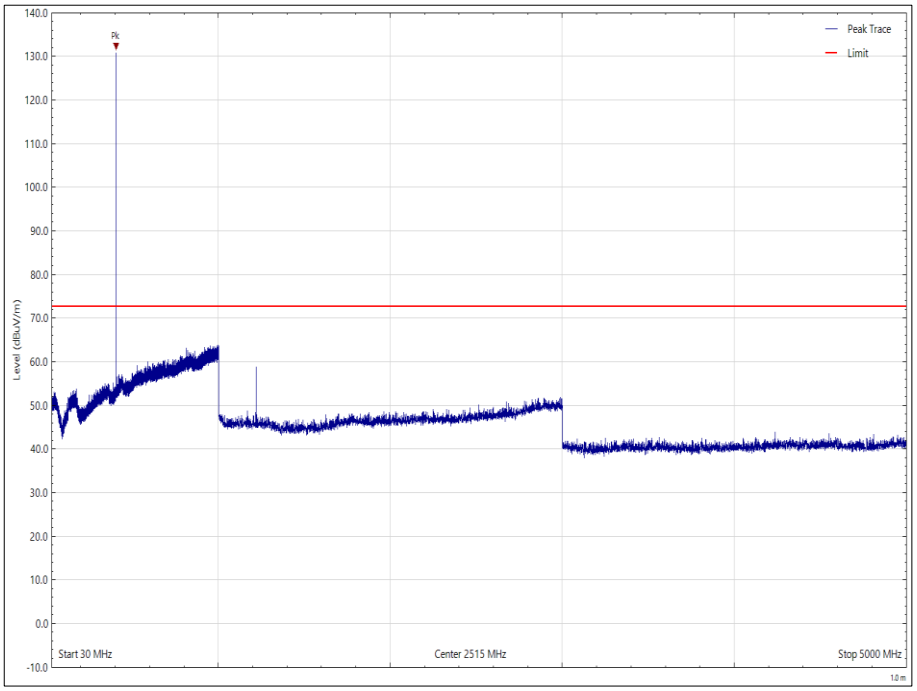

Figure 56 - 406.125 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation X

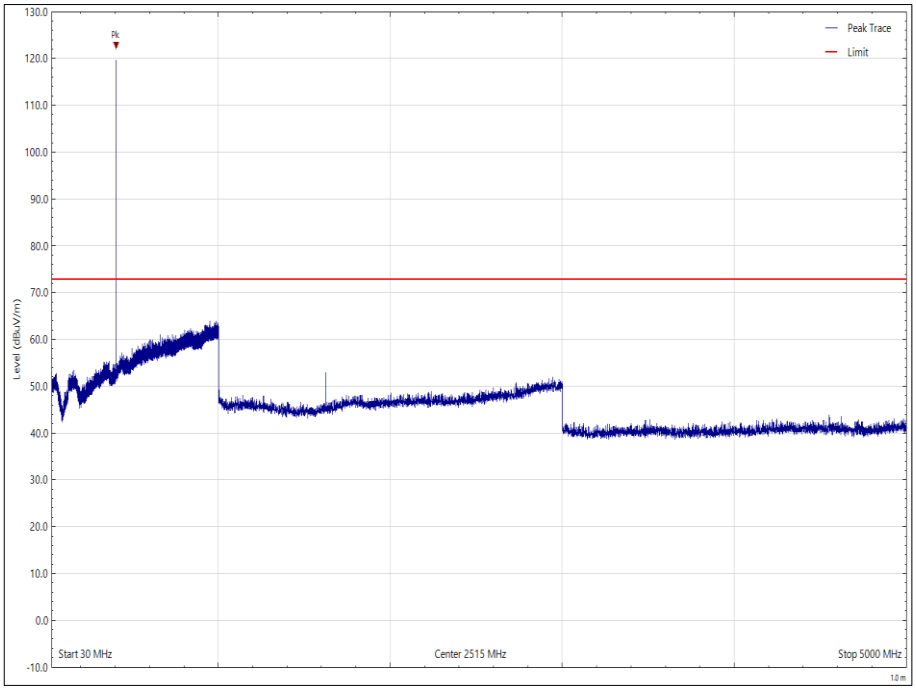

Figure 57 - 406.125 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation X

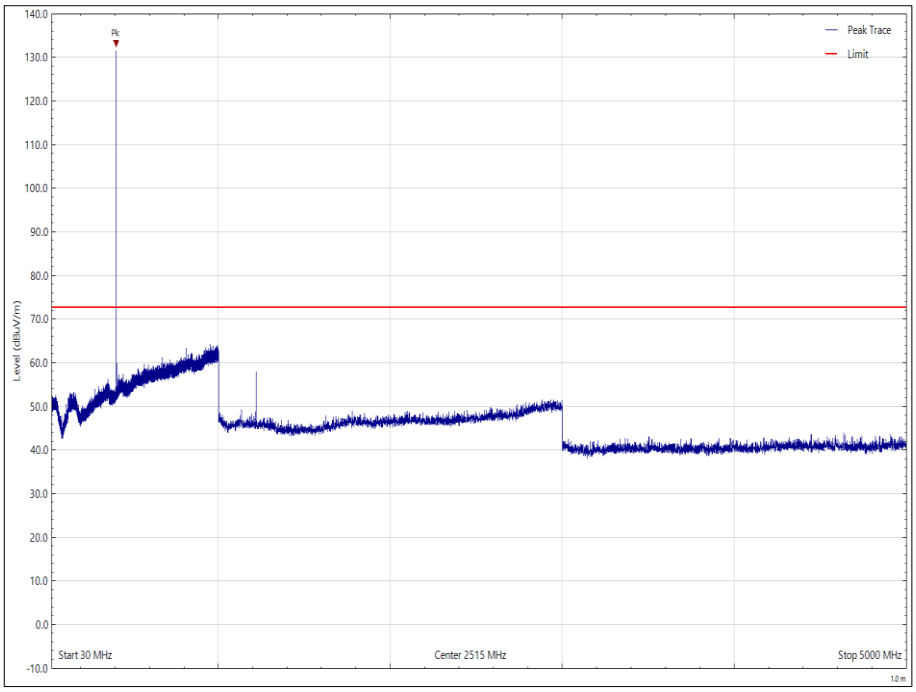

Figure 58 - 406.125 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Y

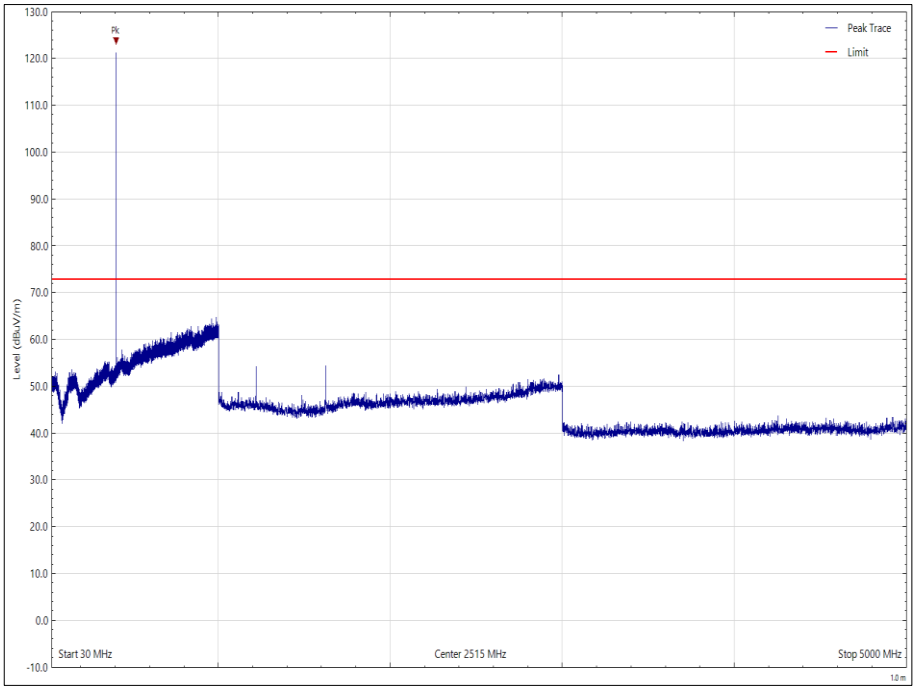

Figure 59 - 406.125 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Y

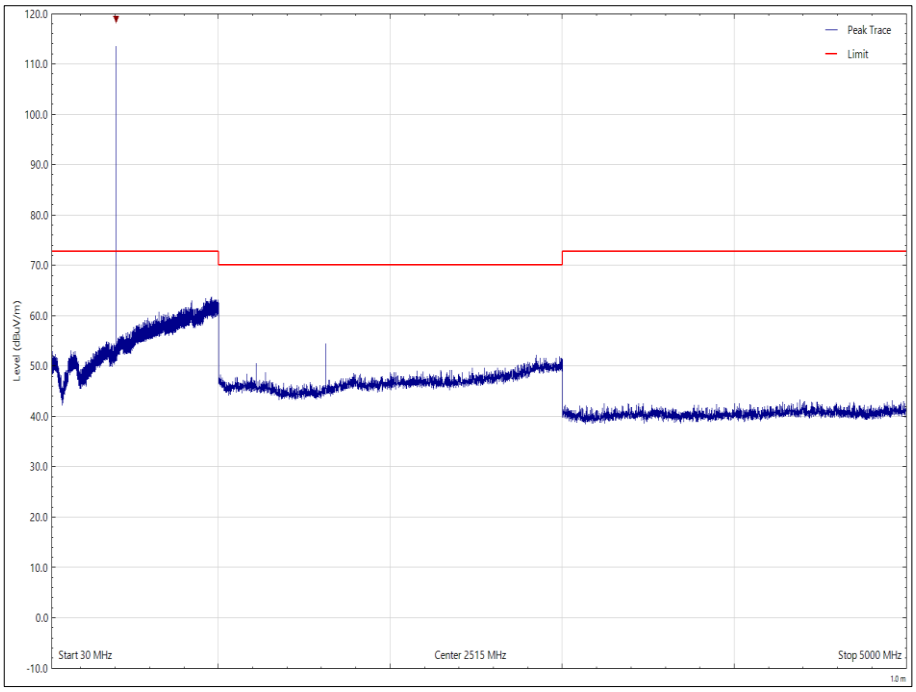

Figure 60 - 406.125 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Z

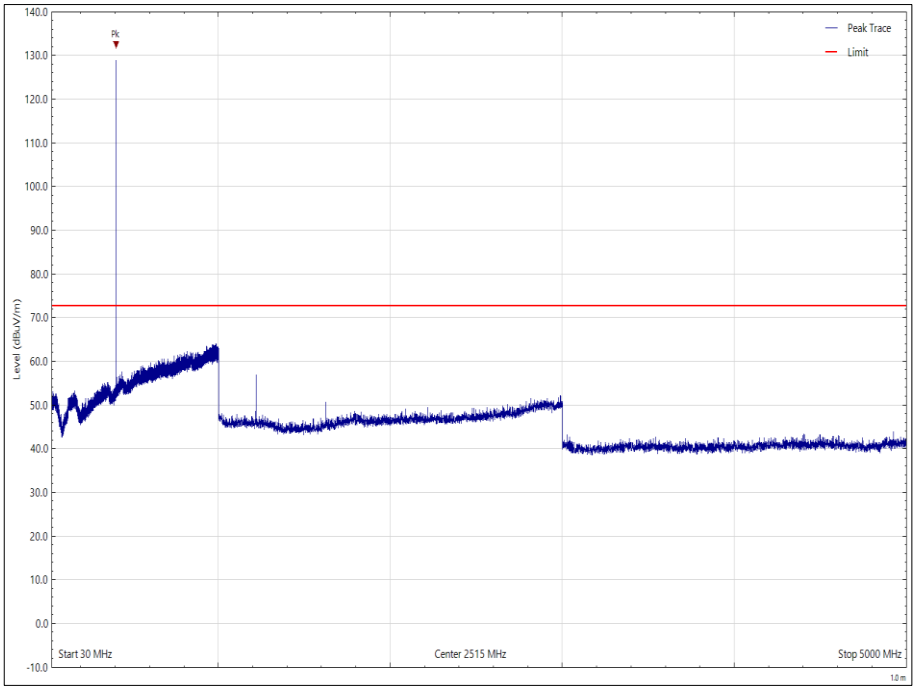

Figure 61 - 406.125 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Z

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

Table 23 - 418.050 MHz

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

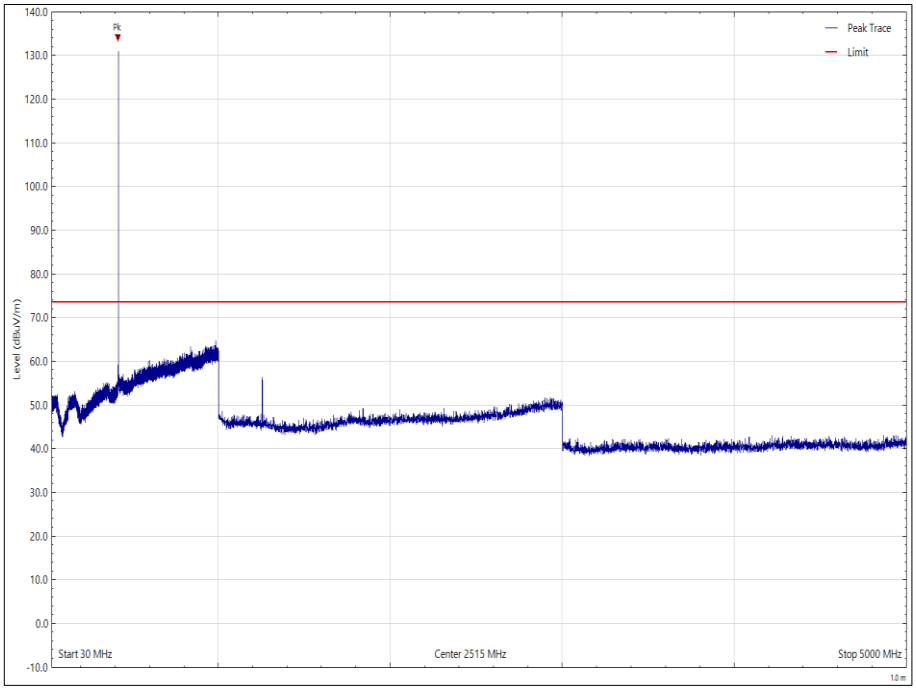

Figure 62 - 418.050 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation X

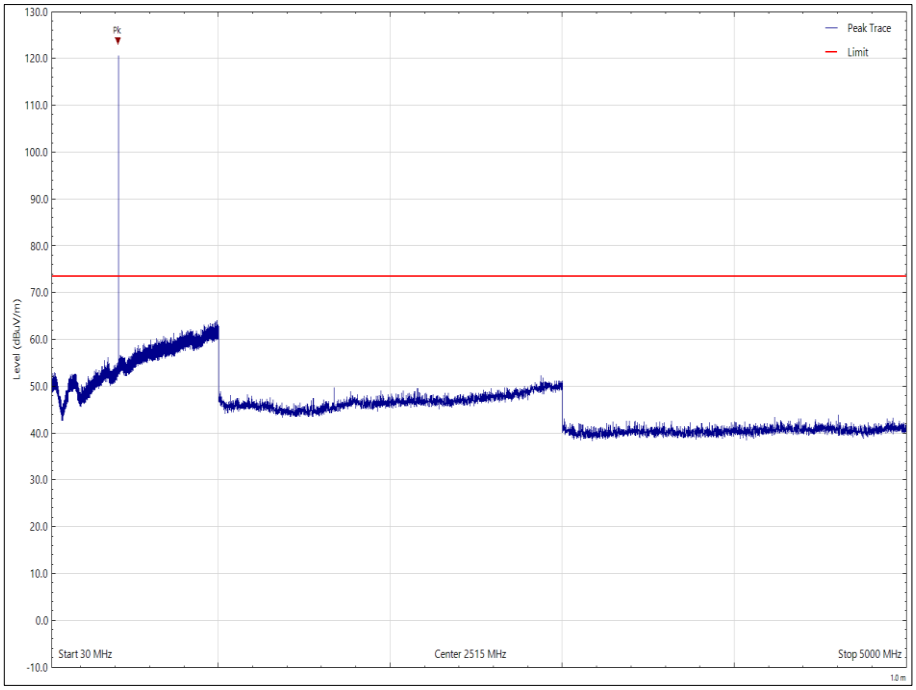

Figure 63 - 418.050 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation X

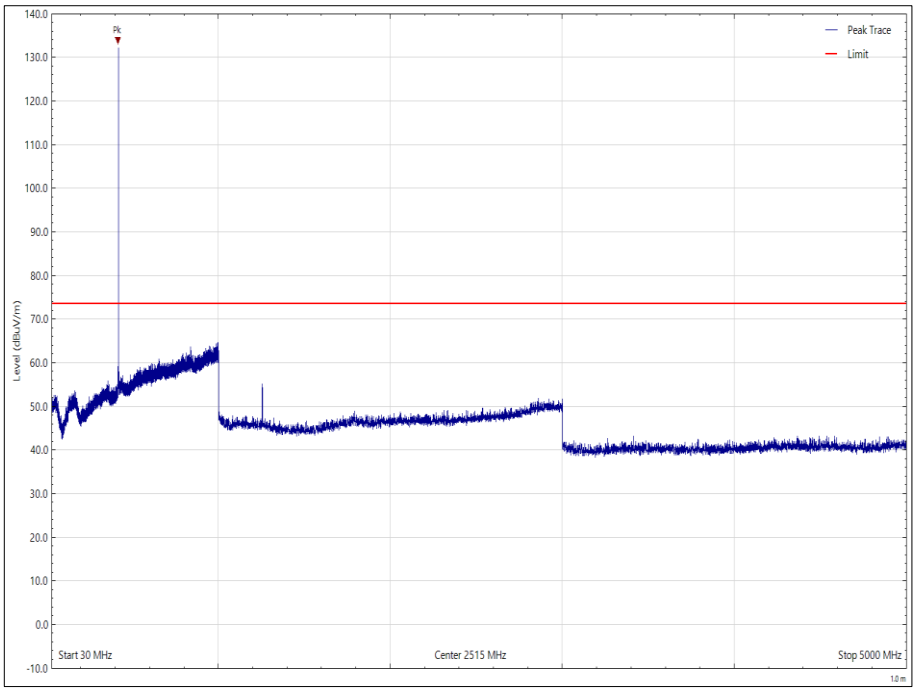

Figure 64 - 418.050 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Y

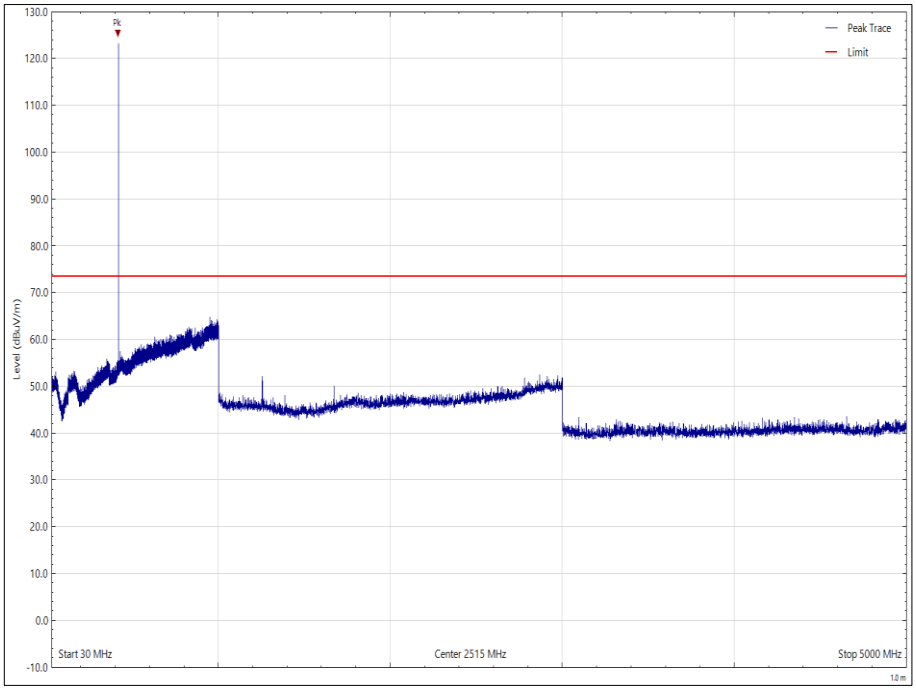

Figure 65 - 418.050 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Y

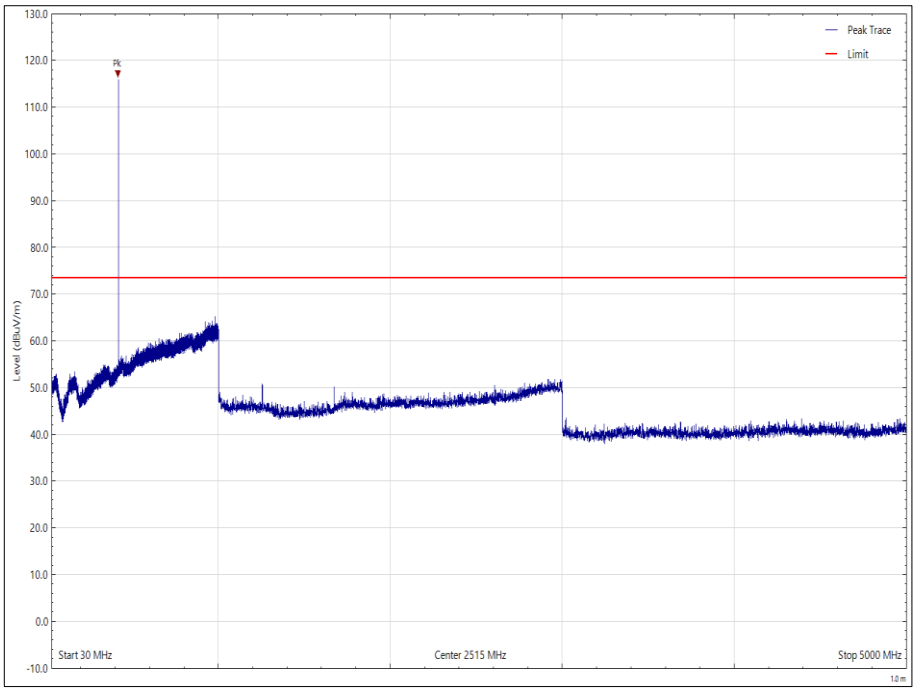

Figure 66 - 418.050 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Z

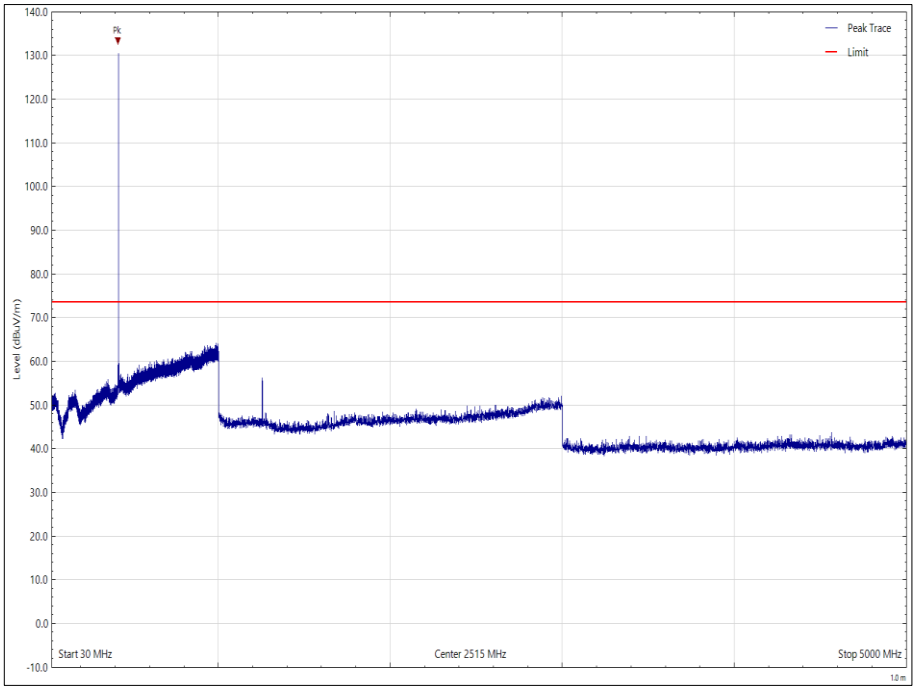

Figure 67 - 418.050 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Z

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

Table 24 - 429.975 MHz

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

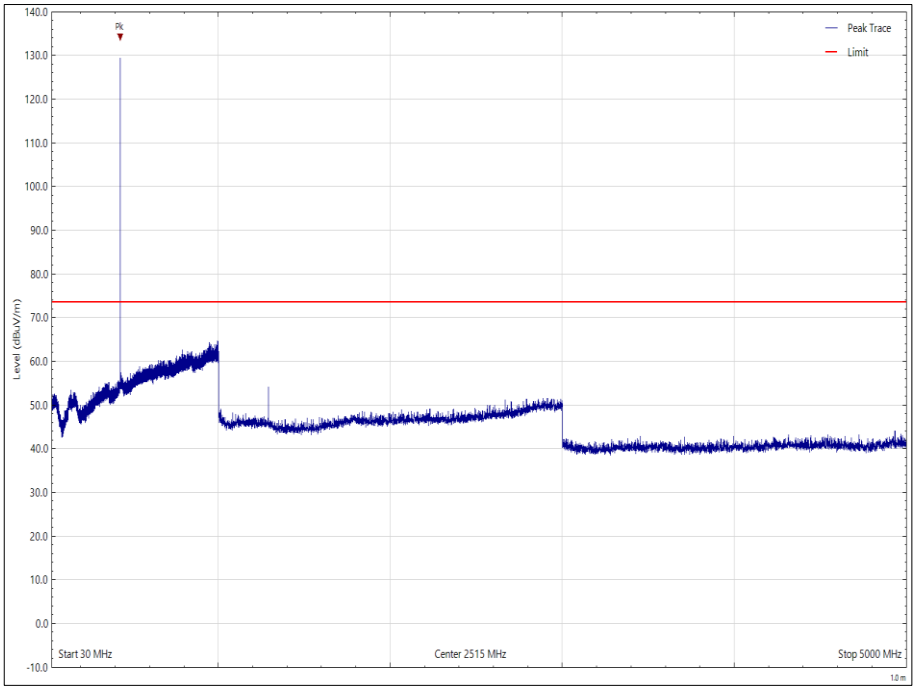

Figure 68 - 429.975 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation X

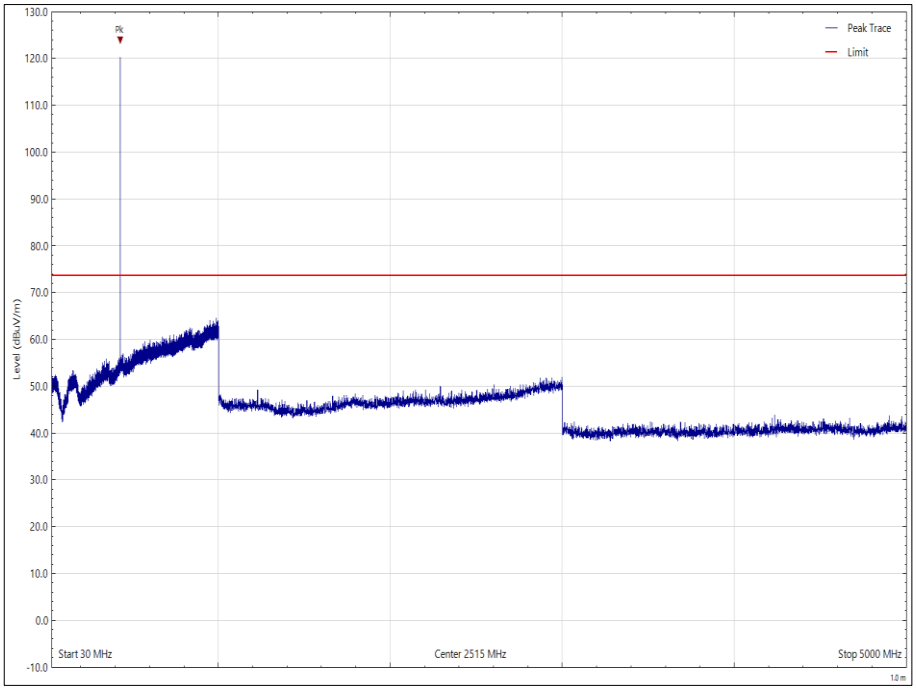

Figure 69 - 429.975 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation X

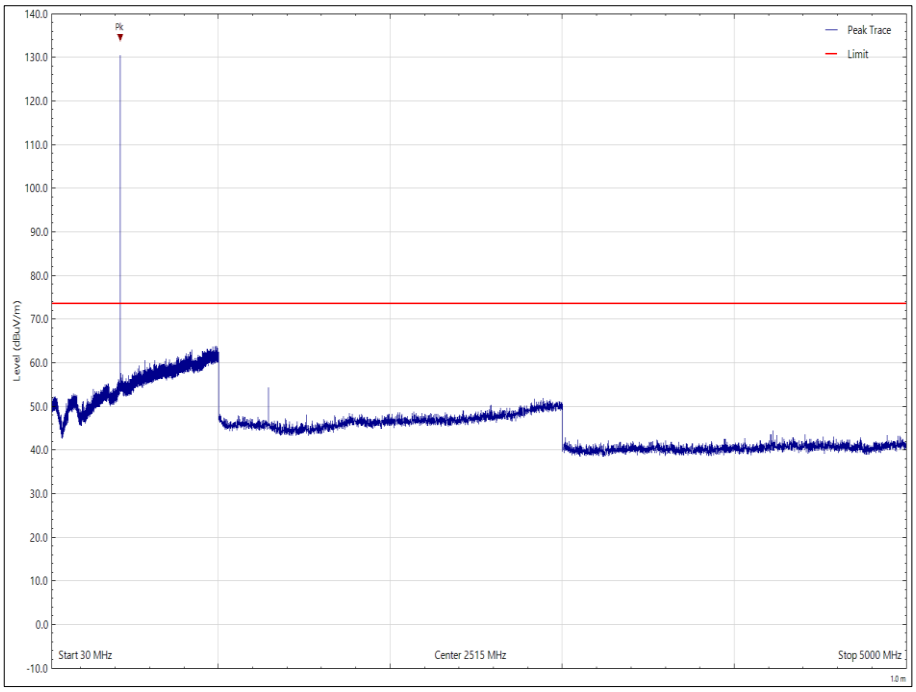

Figure 70 - 429.975 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Y

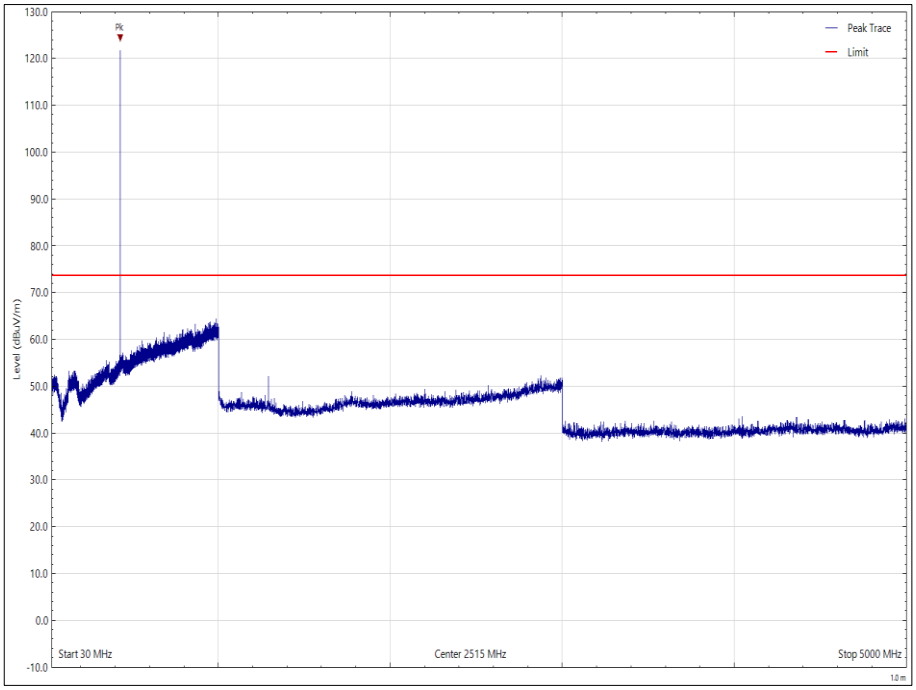

Figure 71 - 429.975 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Y

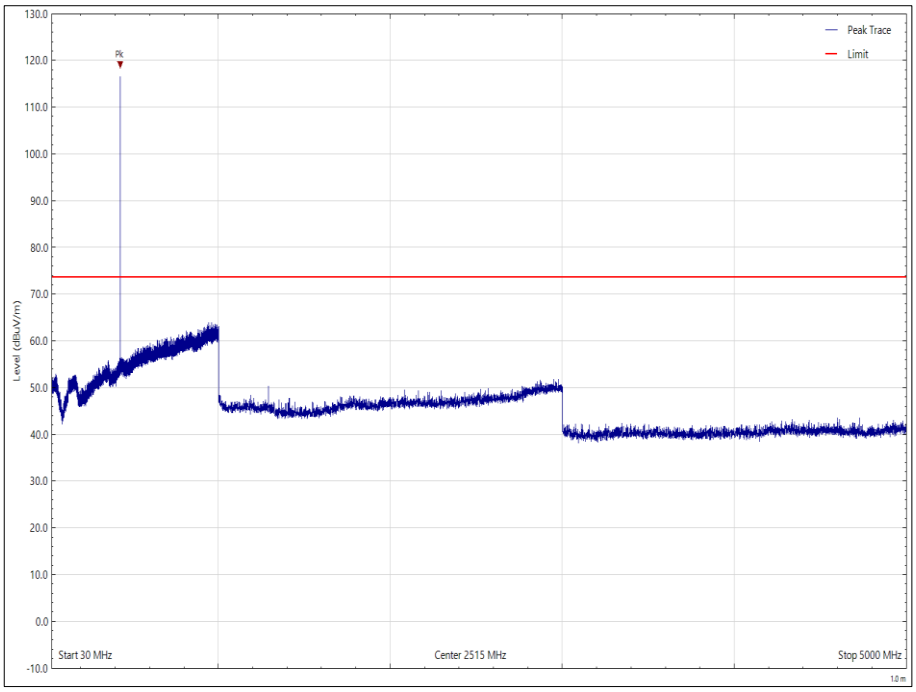

Figure 72 - 429.975 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Z

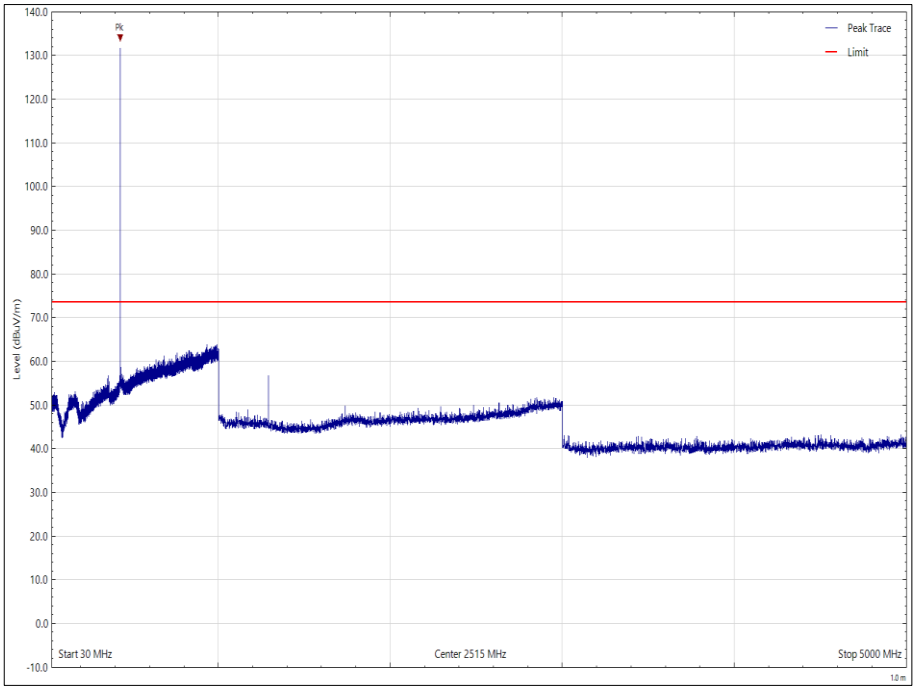

Figure 73 - 429.975 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Z

ISED RSS-119, Limit Clause 5.8

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

TETRA 450 MHz to 470 MHz

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

Table 25 - 450.025 MHz

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

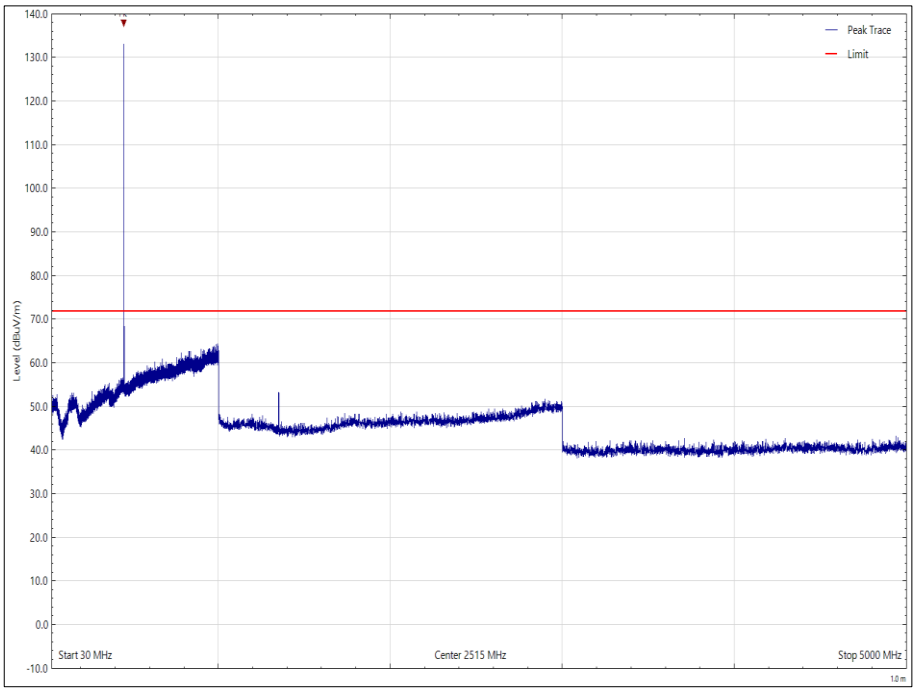

Figure 74 - 450.025 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation X

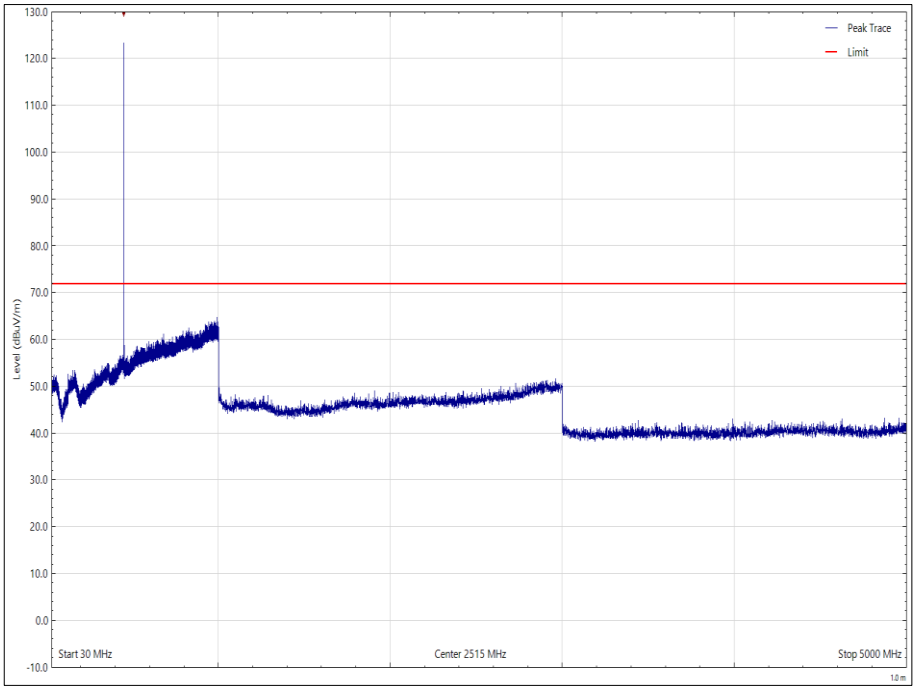

Figure 75 - 450.025 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation X

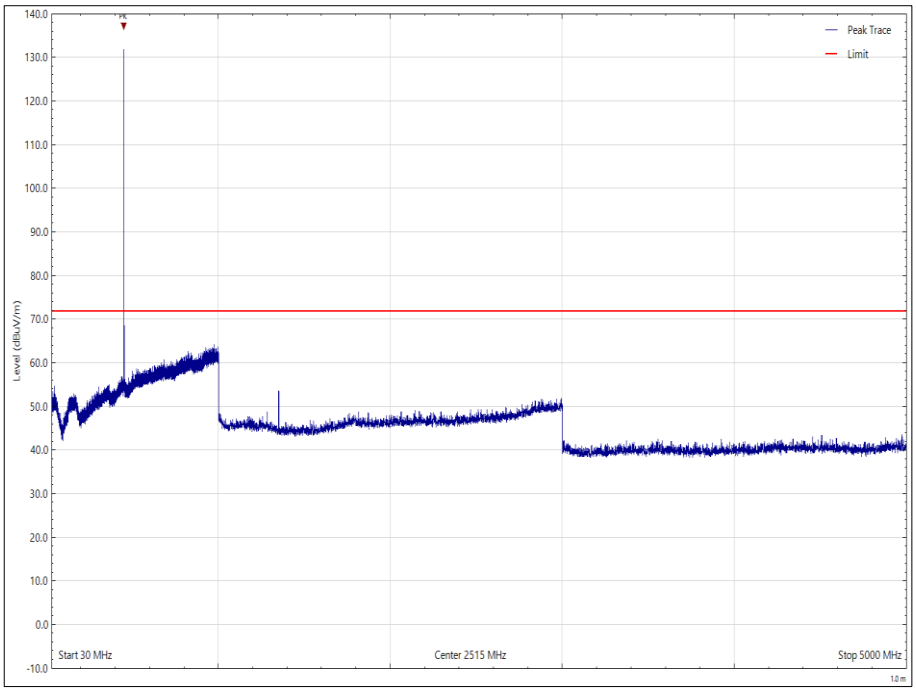

Figure 76 - 450.025 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Y

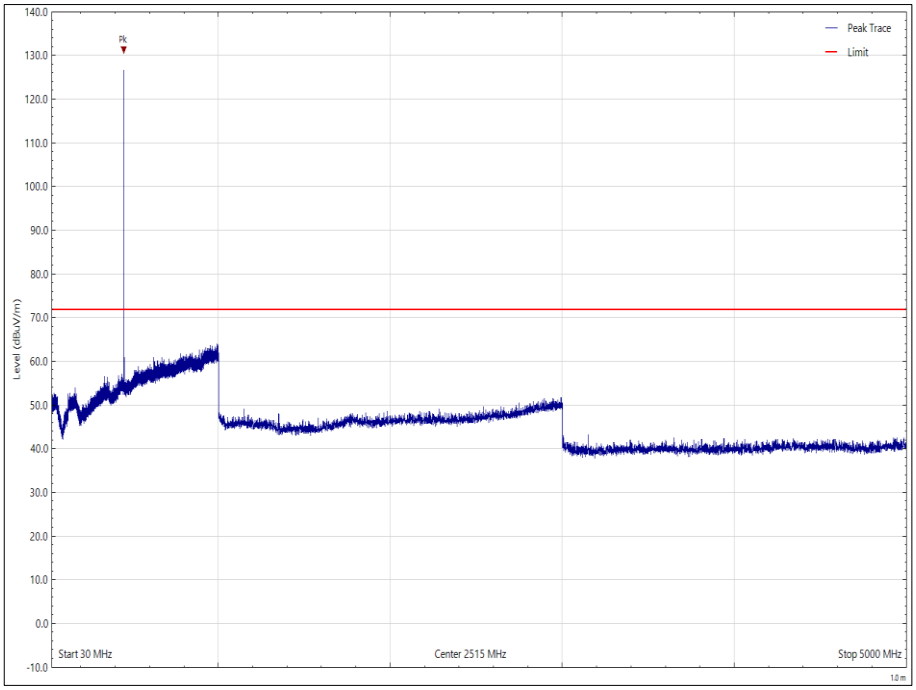

Figure 77 - 450.025 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Y

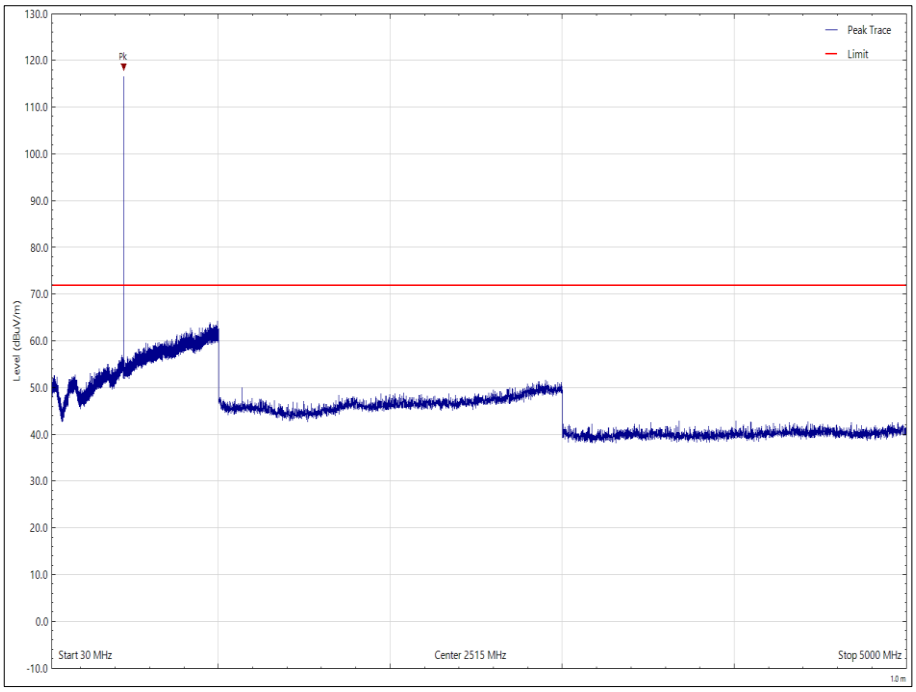

Figure 78 - 450.025 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Z

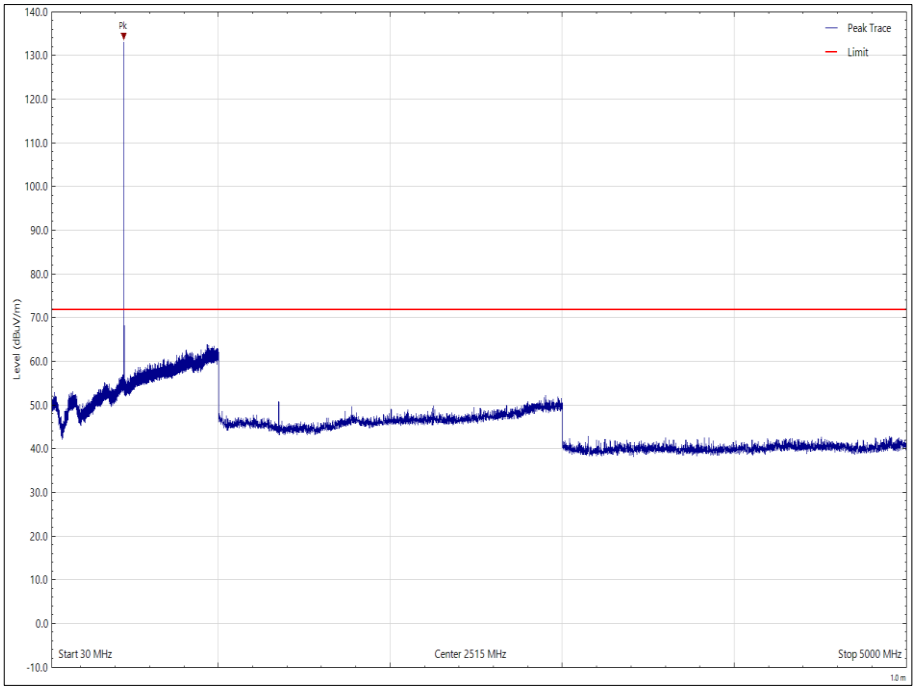

Figure 79 - 450.025 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Z

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

Table 26 - 460.025 MHz

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

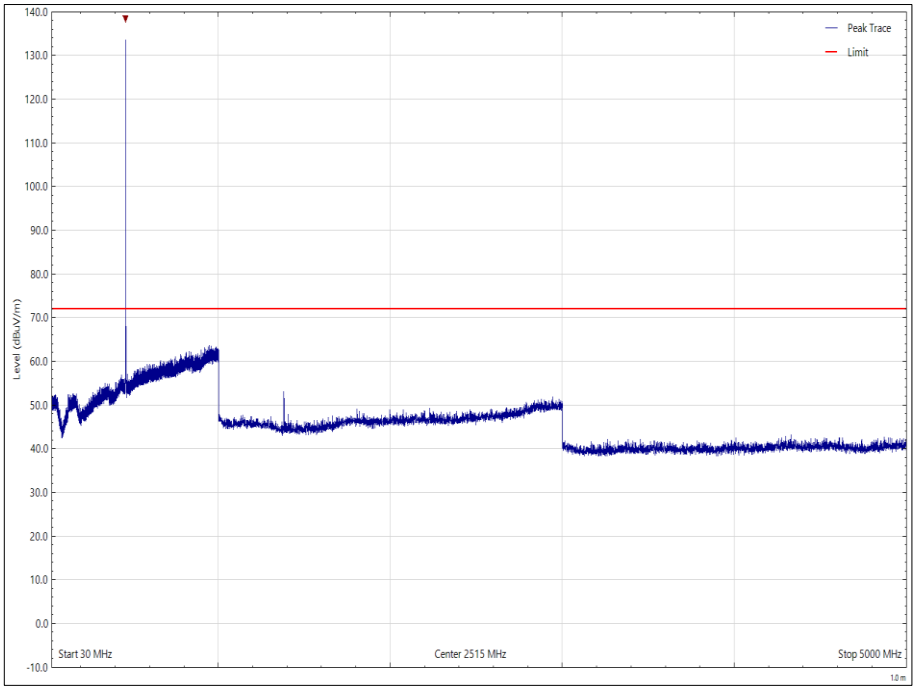

Figure 80 – 460.025 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation X

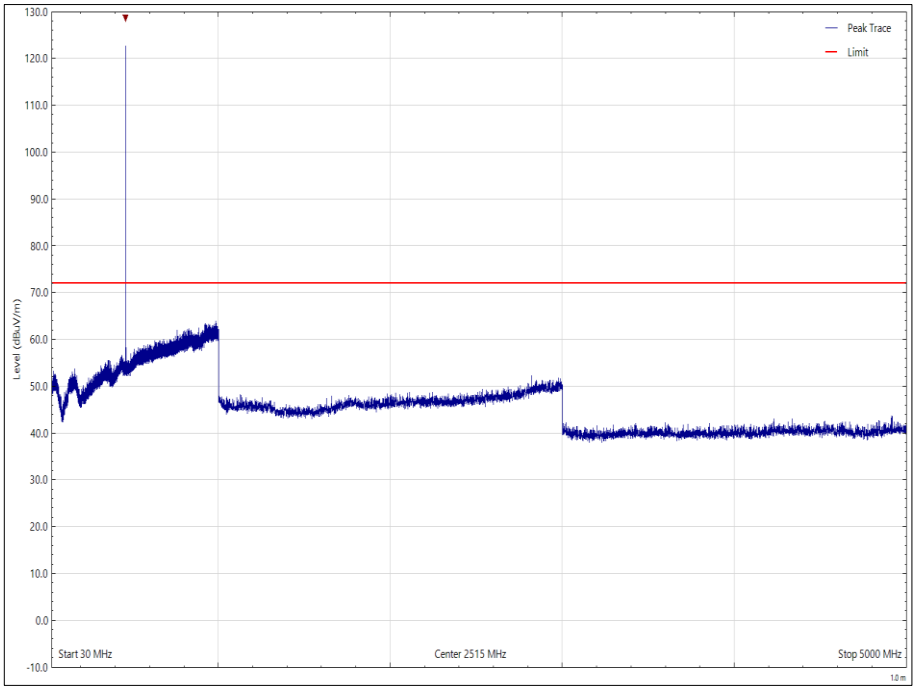

Figure 81 – 460.025 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation X

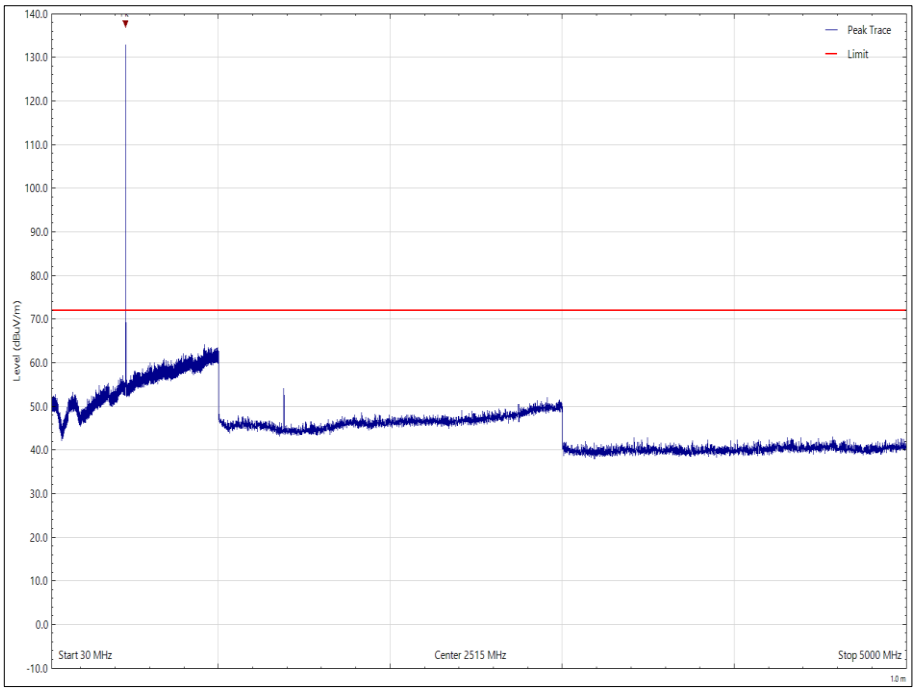

Figure 82 – 460.025 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Y

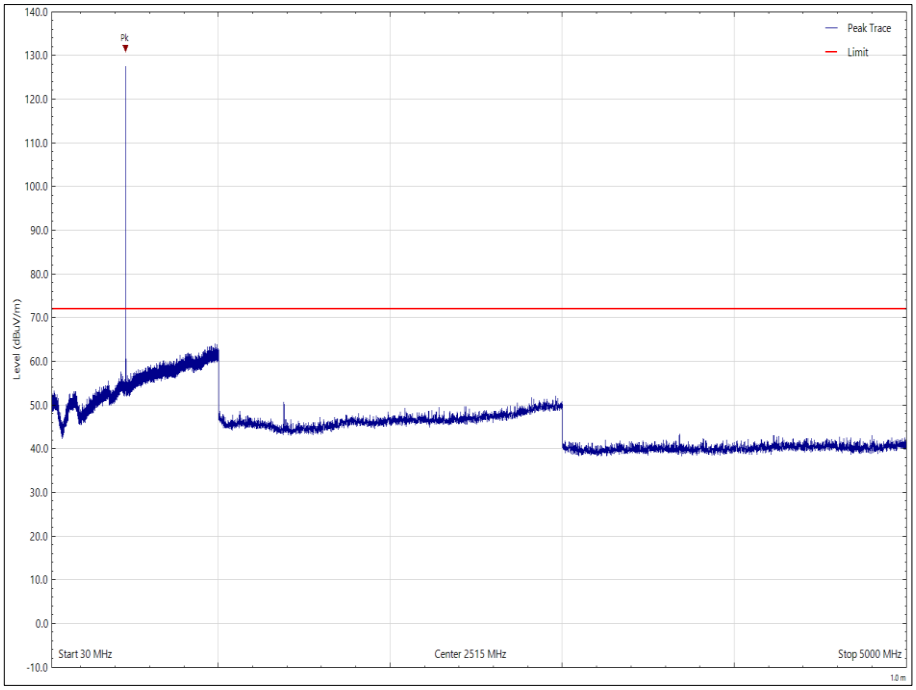

Figure 83 – 460.025 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Y

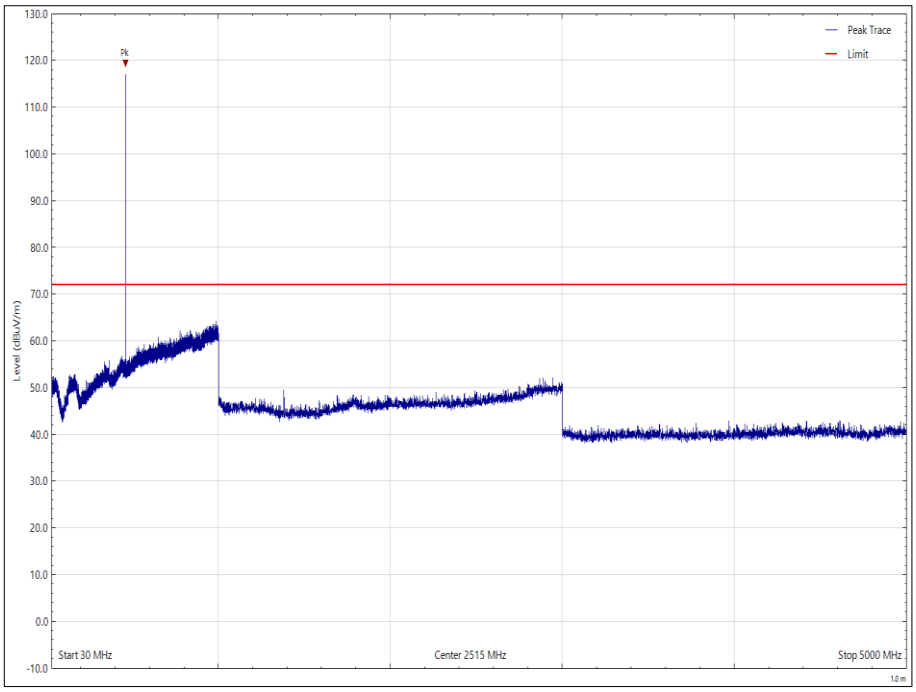

Figure 84 – 460.025 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Z

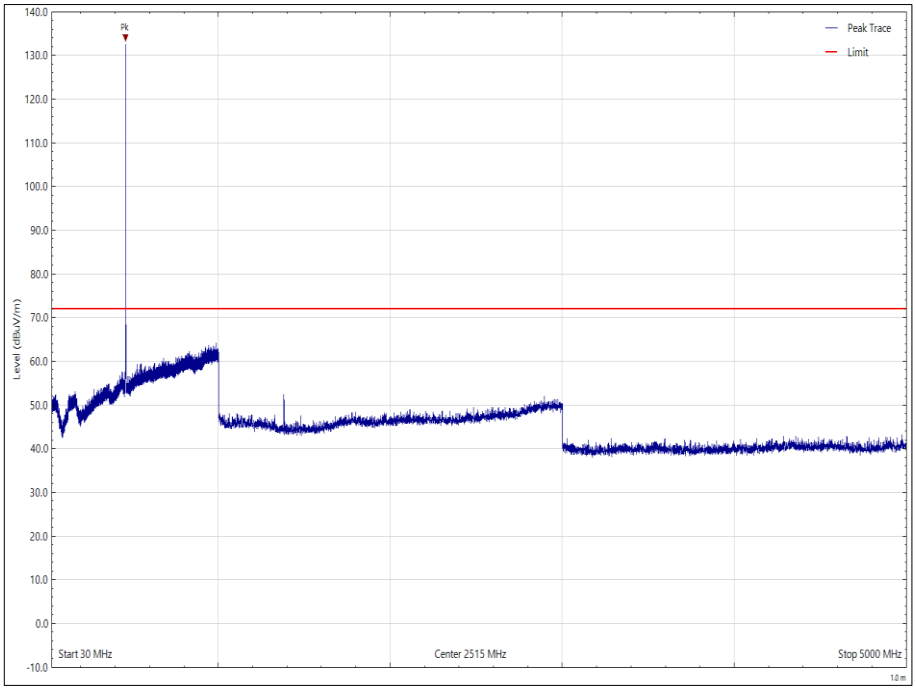

Figure 85 – 460.025 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Z

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

Table 27 - 469.975 MHz

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

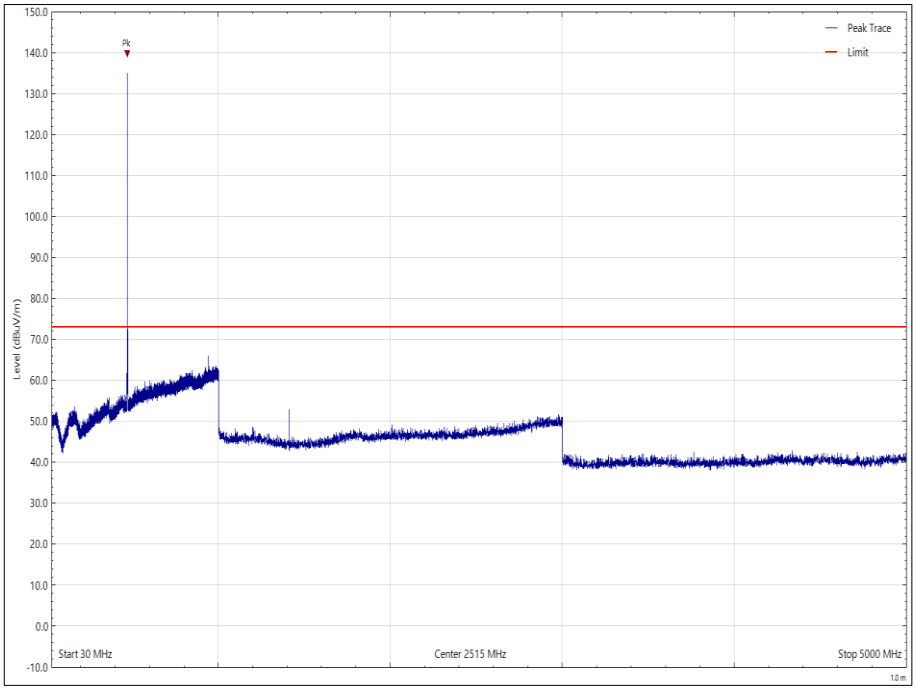

Figure 86 - 469.975 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation X

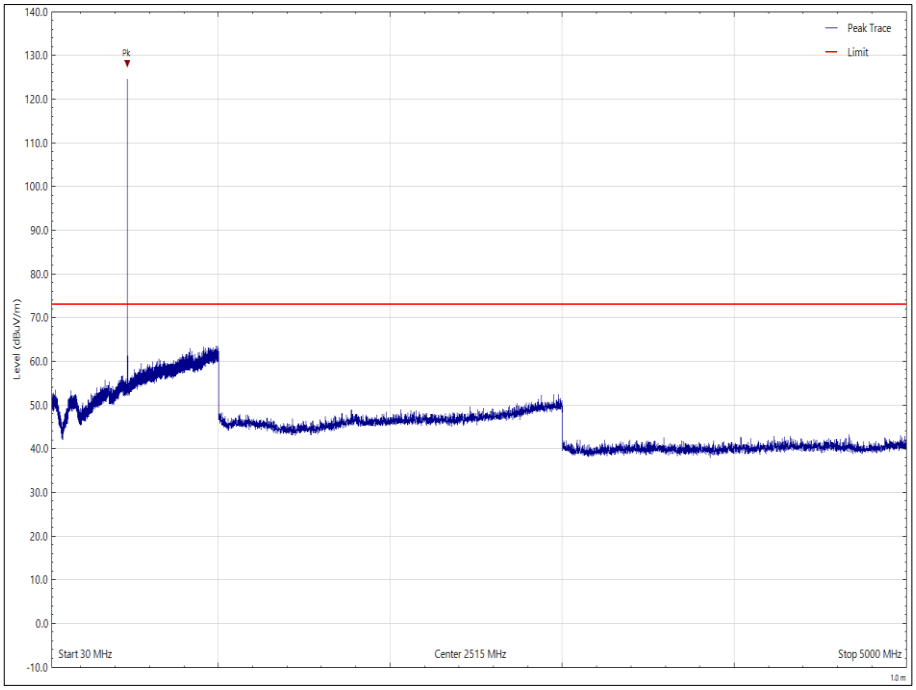

Figure 87 - 469.975 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation X

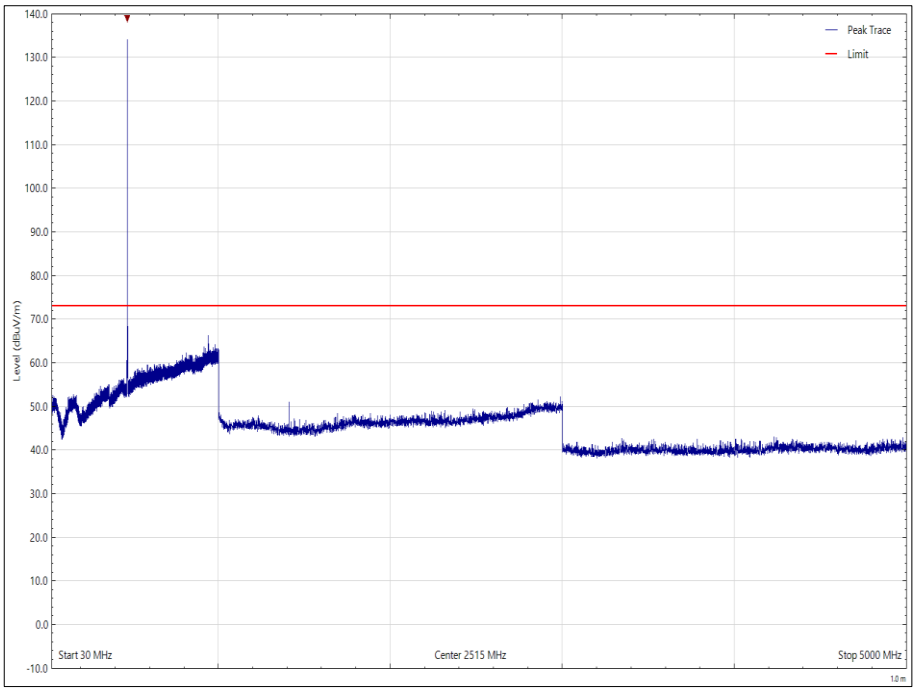

Figure 88 - 469.975 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Y

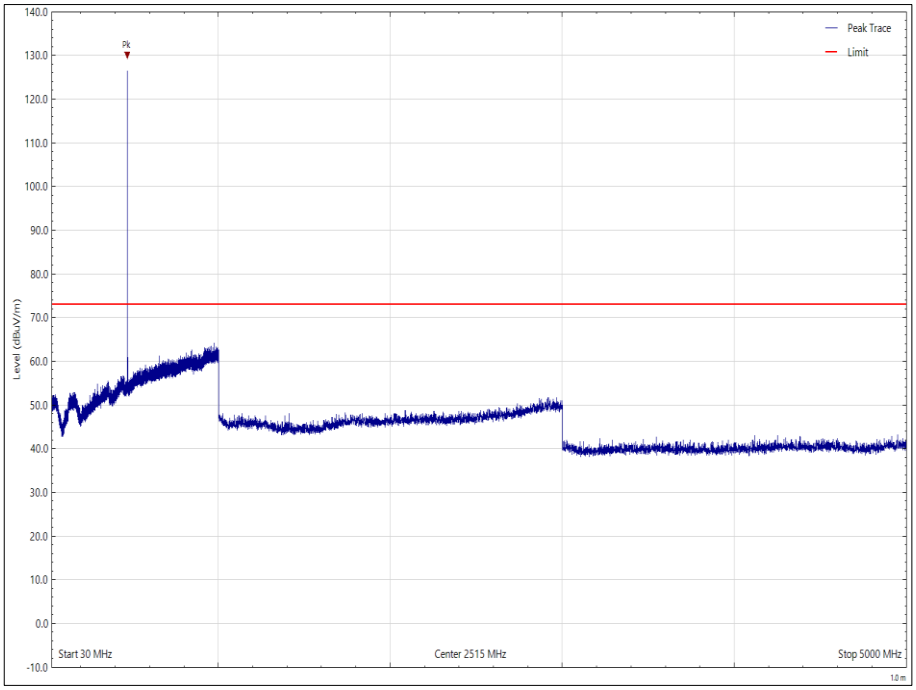

Figure 89 - 469.975 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Y

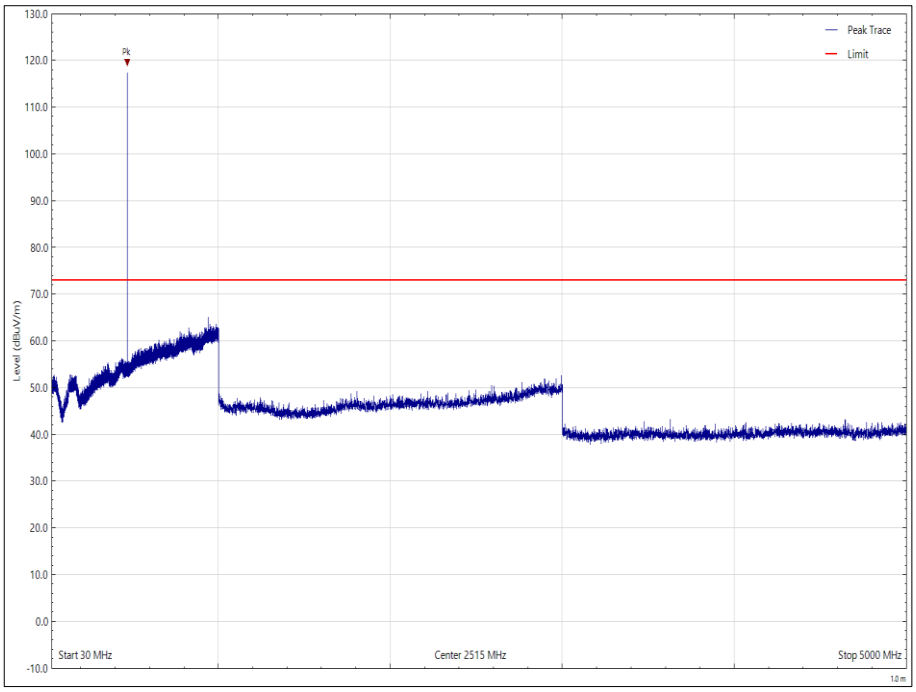

Figure 90 - 469.975 MHz - 30 MHz to 5 GHz, Horizontal, EUT Orientation Z

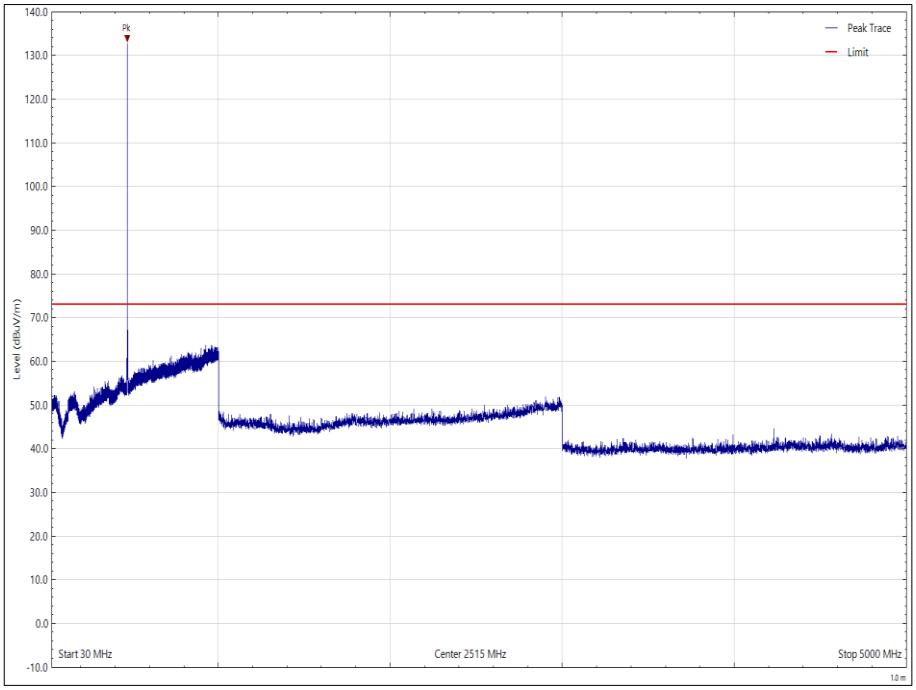

Figure 91 - 469.975 MHz - 30 MHz to 5 GHz, Vertical, EUT Orientation Z

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 5.8.10

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
Hygrometer	Rotronic	A1	2138	12	28-Sep-2023
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	17-May-2023
Emissions Software	TUV SUD	EmX V3.1.11	5125	-	Software
1.5m 40GHz RF Cable	Scott Cables	KPS-1501-2000-KPS	5127	6	15-Apr-2021
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
3 GHz High pass Filter	Wainwright	WHKX12-2580-3000-18000-80SS	5547	12	11-May-2023
Cable (K Type 2m)	Junkosha	MWX241-02000KMSKMS/B	5936	12	14-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
Cable (N to N 8m)	Junkosha	MWX221-08000NMSNMS/B	6331	12	16-Feb-2024

Table 28

TU - Traceability Unscheduled

3 Photographs

3.1 Test Setup Photographs

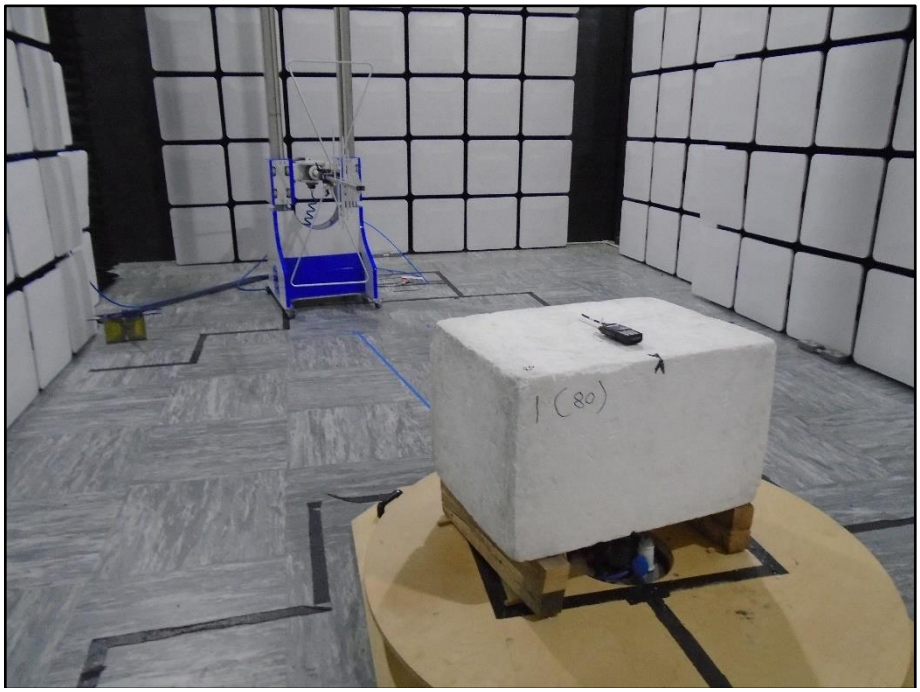

Figure 92 – Test Setup 30 MHz to 1GHz X Orientation

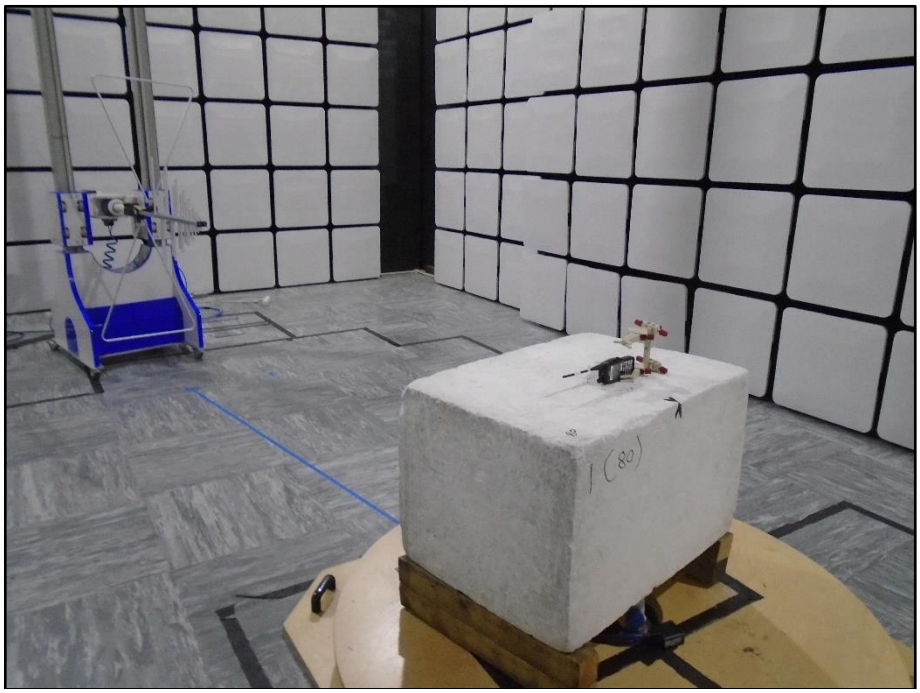

Figure 93 – Test Setup 30 MHz to 1GHz Y Orientation

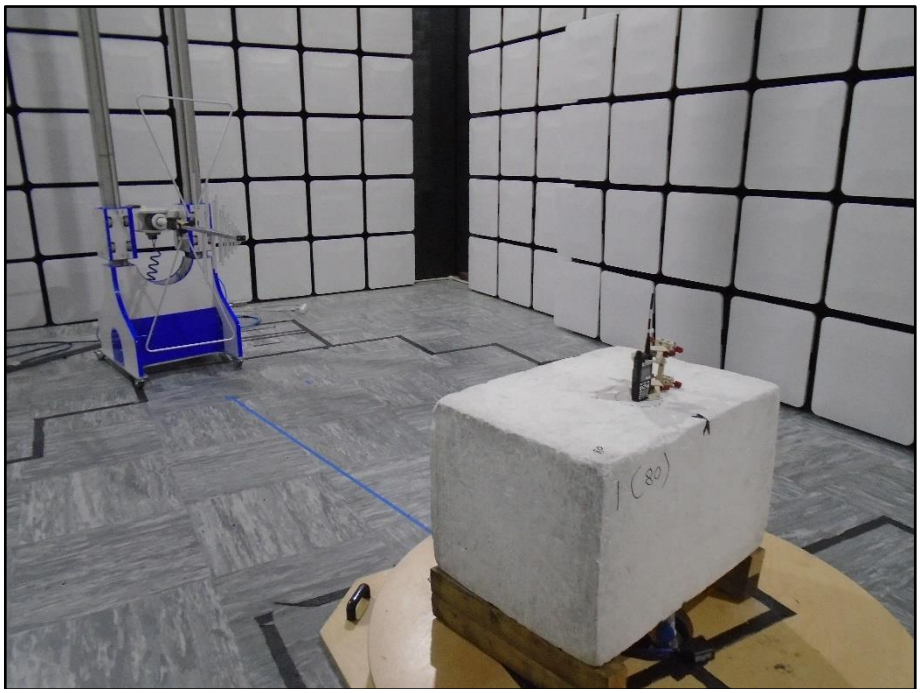

Figure 94 – Test Setup 30 MHz to 1GHz Z Orientation

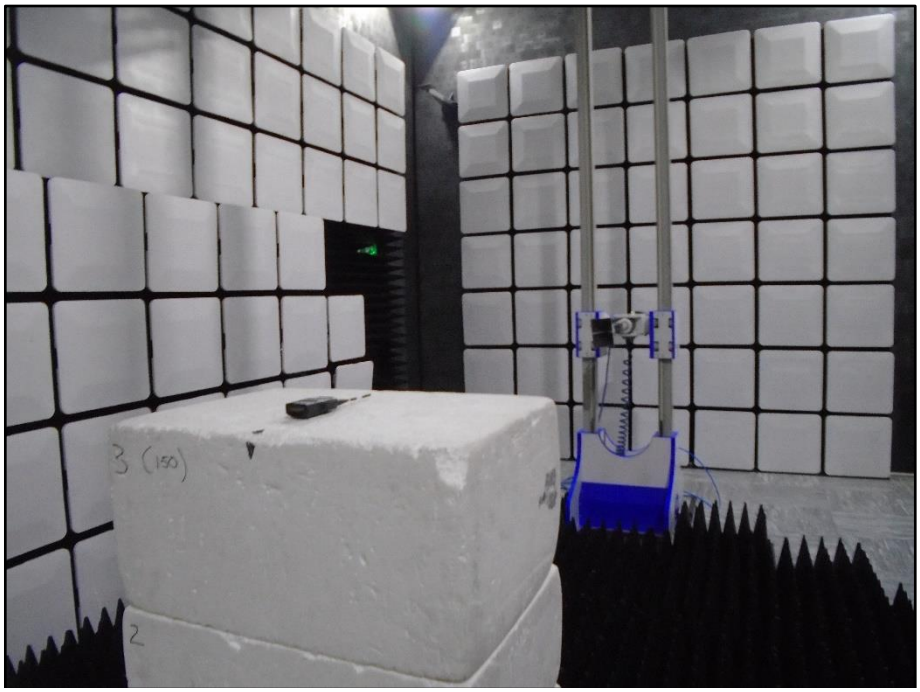

Figure 95 – Test Setup 1 GHz to 5 GHz X Orientation

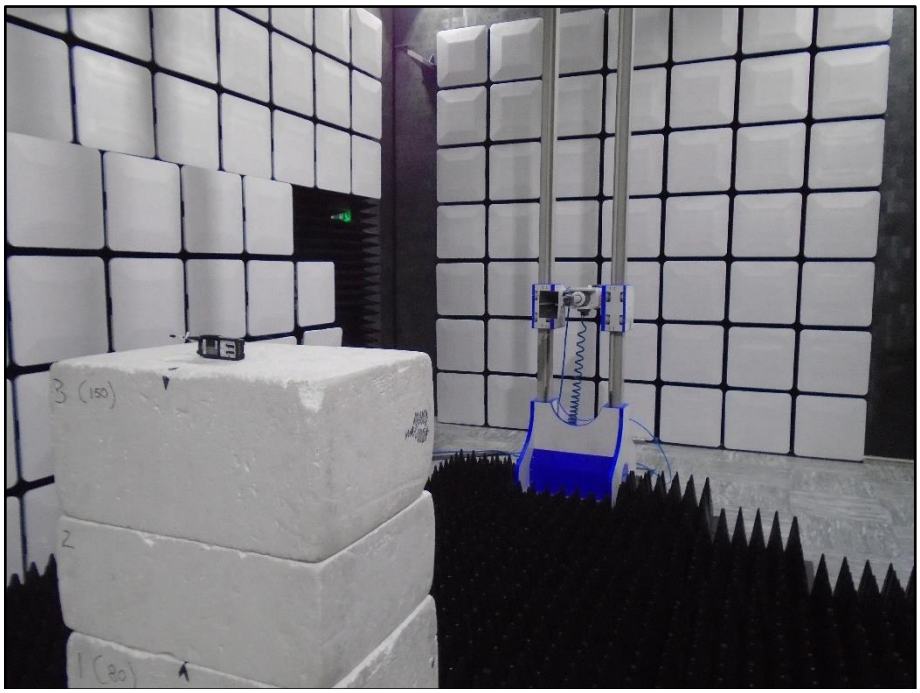

Figure 96 – Test Setup 1 GHz to 5 GHz Y Orientation

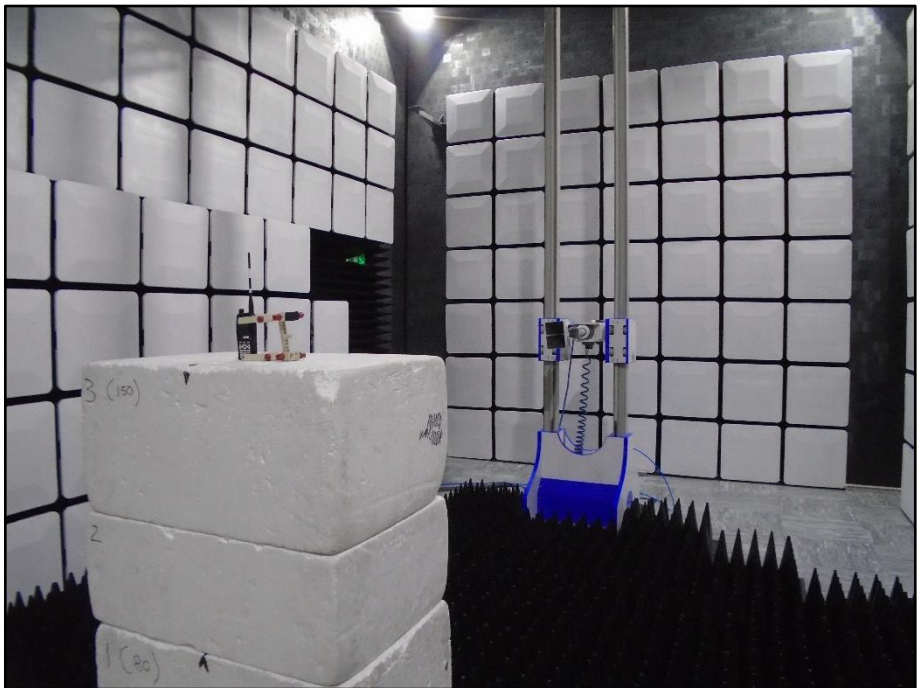

Figure 97 – Test Setup 1 GHz to 5 GHz Z Orientation

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 29

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.