FCC and ISED Test Report

Sepura Limited
Tetra Radio, Model: SC2324

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

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

FCC ID: XX6SC2324X IC: 8739A-SC2324X

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Document 75959251-02 Issue 01

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	18 January 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	Ahmad Javid	18 January 2023	
	Roscoe Harrison	18 January 2023	
	Thomas Biddlecombe	18 January 2023	

FCC Accreditation
492497/UK2010 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: 2022, ISED RSS-119: Issue 12 (05-2015) and ISED RSS-GEN: and Issue 5 (04-2018) + A2 (02-2021) for the tests detailed in section 1.3.

TÜV SÜD
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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

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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	18-January-2023

Table 1

1.2 Introduction

Applicant	Sepura Limited
Manufacturer	Sepura Limited
Model Number(s)	SC2324
Serial Number(s)	1PR002331GKK87R and 1PR002336GKM4HR
Hardware Version(s)	PLX-2116505-02 (mod state 12)
Software Version(s)	1807 018 07367
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 2: 2021 FCC 47 CFR Part 90: 2022 ISED RSS-119: Issue 12 (05-2015) ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021)
Order Number	PLC-PO026657-1
Date	24-August-2023
Date of Receipt of EUT	01-September-2023 and 13-October-2023
Start of Test	18-October-2023
Finish of Test	21-December-2023
Name of Engineer(s)	Ahmad Javid, Roscoe Harrison and Thomas Biddlecombe
Related Document(s)	ANSI 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 - 450-470 MHz							
2.1	2.1046	90.205	5.4	6.12	Maximum Conducted Output Power	Pass	ANSI C63.26: 2015
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	ANSI C63.26: 2015
Configuration and Mode: Tetra - 406.1-430 MHz							
2.1	-		5.4	6.12	Maximum Conducted Output Power	Pass	ANSI C63.26: 2015
2.2	-	-	5.8	6.13	Spurious Emissions at Antenna Terminals	Pass	
2.3	-	-	5.8	6.13	Radiated Spurious Emissions	Pass	ANSI C63.26: 2015

Table 2

NOTE: Whilst the product supports TETRA 403 to 470 MHz, the bands permitted by Canada / US are:
- Canada : 406.1-430 MHz & 450-470 MHz
- US : 450-470 MHz

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 SC2324 is a portable TETRA radio with GNSS functionality. It has a TETRA transmit frequency range of 403-470 MHz and a TETRA receive frequency range of 403-470 MHz.		
Manufacturer:	Sepura Limited		
Model:	SC2324		
Part Number:	SC2324		
Hardware Version:	PLX-2116505-02 (mod state 12)		
Software Version:	1807 018 07367		
FCC ID of the product under test – see guidance here	XX6SC2324X		
IC ID of the product under test – see guidance here	8739A-SC2324X		
Device Category	Mobile ☐	Portable ☒	Fixed ☐
Equipment is fitted with an Audio Low Pass Filter		Yes ☒	No ☐

Table 3

Intentional Radiators

Technology	TETRA					
Frequency Range (MHz to MHz)	403 - 470					
Conducted Declared Output Power (dBm) (averaged RMS)	35					
Antenna Gain (dBi)	1. 1.22 2. 7					
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	22 kHz, 25 kHz					
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	π/4 DQPSK					
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	20K0DXW, 22K0DXW					
Bottom Frequency (MHz)	403					
Middle Frequency (MHz)	436.5					
Top Frequency (MHz)	470					

Table 4

Two antenna gains are given:

1. The maximum free space dBi for the specified frequency range of antennas used in a handheld system using the top antenna connector.
2. The maximum dBi provided by the antenna manufacturer for antennas used in a vehicle system using the rear connector.

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	1610 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:	6.29	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:	300-00499 Extended helical (handheld system)	Gain	0.8	dBi
External antenna ☒	Type:	300-01031 Quarter wave whip (handheld system)	Gain	0.95	dBi
External antenna ☒	Type:	300-01032 Quarter wave whip (handheld system)	Gain	0.32	dBi
External antenna ☒	Type:	300-00662 Quarter wave whip (handheld system)	Gain	1.12	dBi
External antenna ☒	Type:	300-00663 Quarter wave whip (handheld system)	Gain	1.22	dBi
External antenna ☒	Type:	310-00006 Quarter wave whip (vehicle system)	Gain	2	dBi
External antenna ☒	Type:	320-00008 High gain (vehicle system)	Gain	7	dBi
External antenna ☒	Type:	330-00009 Quarter wave whip (vehicle system)	Gain	2	dBi
External antenna ☒	Type:	330-00010 High gain (vehicle system)	Gain	7	dBi
External antenna ☒	Type:	360-00001 dual band (vehicle system)	Gain	2	dBi
External antenna ☒	Type:	390-00005 whip (vehicle system)	Gain	2	dBi
External antenna ☒	Type:	390-00006 whip (vehicle system)	Gain	2	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.

The antenna port on top of the radio is 50 Ohm impendence and can 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:	300-02064
Model:	High Retention 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: 29 September 2023

1.5 Product Information

1.5.1 Technical Description

The SC2324 is a portable TETRA radio with GNSS functionality.

It has a TETRA transmit frequency range of 403-470 MHz and a TETRA receive frequency range of 403-470 MHz.

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: SC2324, Serial Number: 1PR002331GKK87R			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: SC2324, Serial Number: 1PR002336GKM4HR			
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 - 450-470 MHz		
Maximum Conducted Output Power	Ahmad Javid and Roscoe Harrison	UKAS
Spurious Emissions at Antenna Terminals	Roscoe Harrison	UKAS
Radiated Spurious Emissions	Ahmad Javid	UKAS
Configuration and Mode: Tetra - 406.1-430 MHz		
Maximum Conducted Output Power	Roscoe Harrison	UKAS
Spurious Emissions at Antenna Terminals	Roscoe Harrison and Thomas Biddlecombe	UKAS
Radiated Spurious Emissions	Ahmad Javid	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 90, Clause 90.205
FCC 47 CFR Part 2, Clause 2.1046
ISED RSS-119, Clause 5.4
ISED RSS-GEN, Clause 6.12

2.1.2 Equipment Under Test and Modification State

SC2324, S/N: 1PR002331GKK87R - Modification State 0

2.1.3 Date of Test

19-October-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 5.2.4.3.2

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 coaxial cable and 30 dB of attenuation. The path loss was calculated from calibration data, summed with the Duty Cycle Correction Factor and entered as a reference level offset in the spectrum analyser.

The RBW of the spectrum analyser was set to 30 kHz and the video bandwidth to 100 kHz with the trace set to average using an RMS detector and the result was recorded.

2.1.5 Environmental Conditions

Ambient Temperature	21.3 °C
Relative Humidity	55.2 %

2.1.6 Test Results

Tetra - 450-470 MHz

Parameter	450.025 MHz	460.025 MHz	469.975 MHz
Conducted Output Power (dBm)	34.41	34.46	34.52
Manufacturer Declared Power (dBm)	35.00	35.00	35.00
Δ from manufacturer Power (dB)	-0.59	-0.54	-0.48
Antenna Gain (dBi)	7.00	7.00	7.00
ERP (dBm)	39.26	39.31	39.37

Table 16 - ISED RSS-119 ERP

Note : ERP powers are quoted, therefore the antenna gains must be converted to dBd by subtracting 2.15dB before summing with the “Conducted Output Power” figure.

The antenna gain refers to the highest, “worst case” figure of all applicable antenna options.

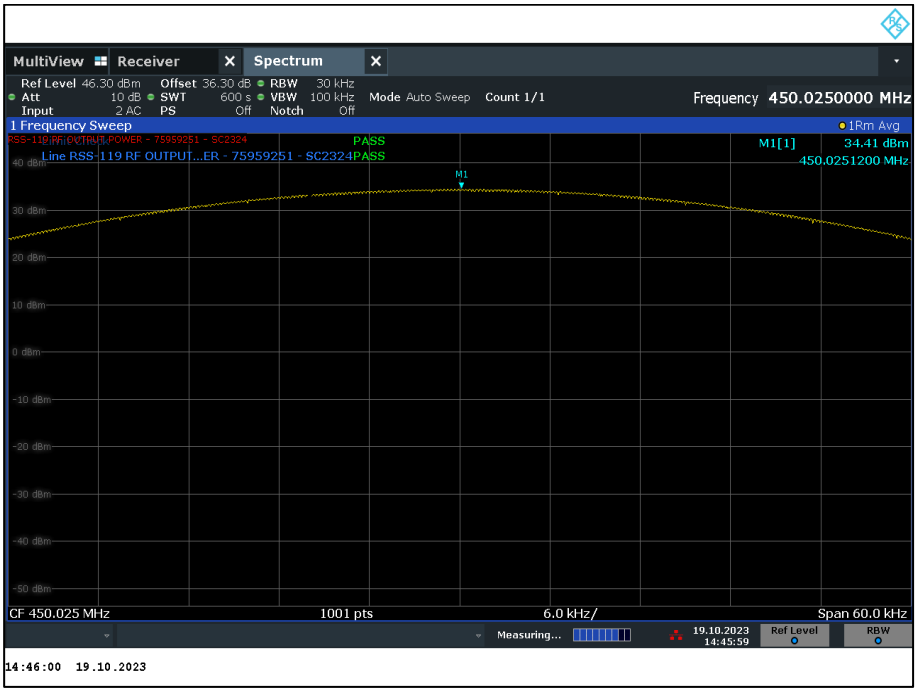


Figure 1 – ISED RSS-119, 450.025 MHz

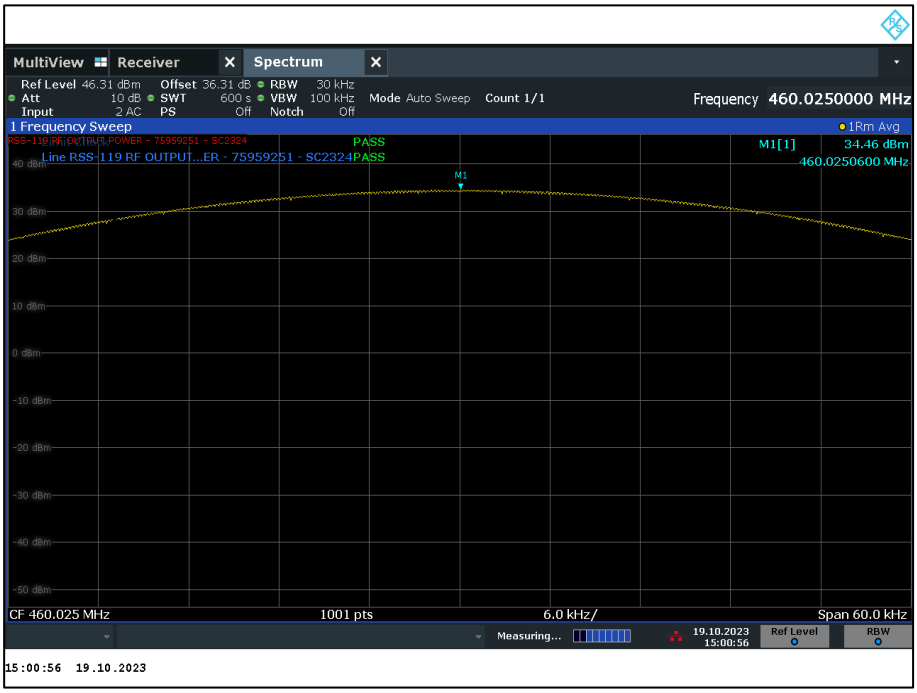


Figure 2 – ISED RSS-119, 460.025 MHz

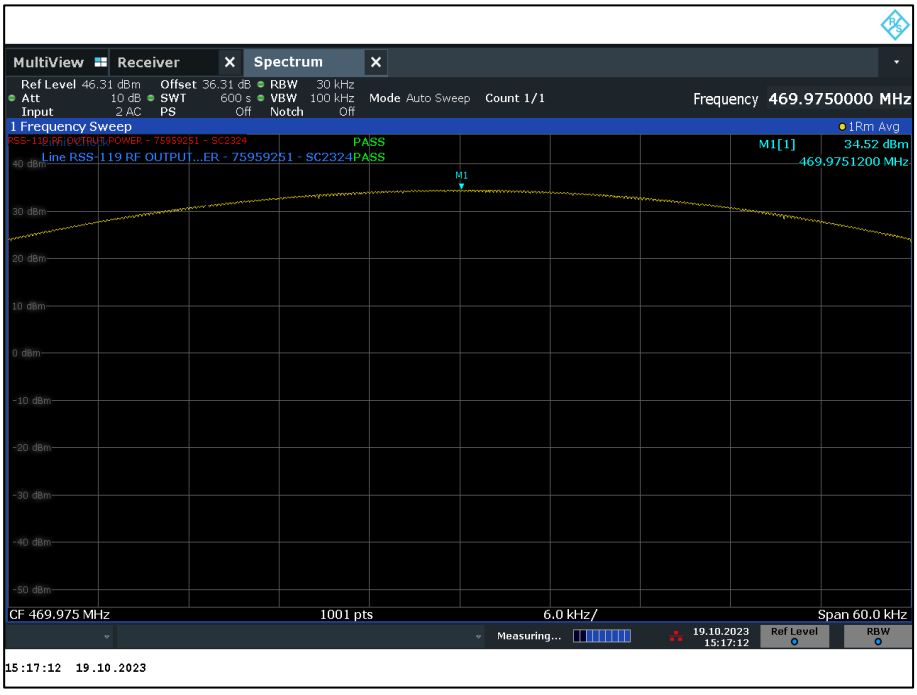


Figure 3 - ISED RSS-119, 469.975 MHz

Parameter	450.025 MHz	460.025 MHz	469.975 MHz
Conducted Output Power (dBm)	34.42	34.46	34.53
Manufacturer Declared Power (dBm)	35.00	35.00	35.00
Δ from manufacturer Power (dB)	-0.58	-0.54	-0.47
Antenna Gain (dBi)	7.00	7.00	7.00
ERP (dBm)	39.27	39.31	39.38

Table 17 - FCC Part 90 ERP

Note : ERP powers are quoted, therefore the antenna gains must be converted to dBd by subtracting 2.15dB before summing with the “Conducted Output Power” figure.

The antenna gain refers to the highest, “worst case” figure of all applicable antenna options.

Figure 4 – FCC Part 90, 450.025 MHz

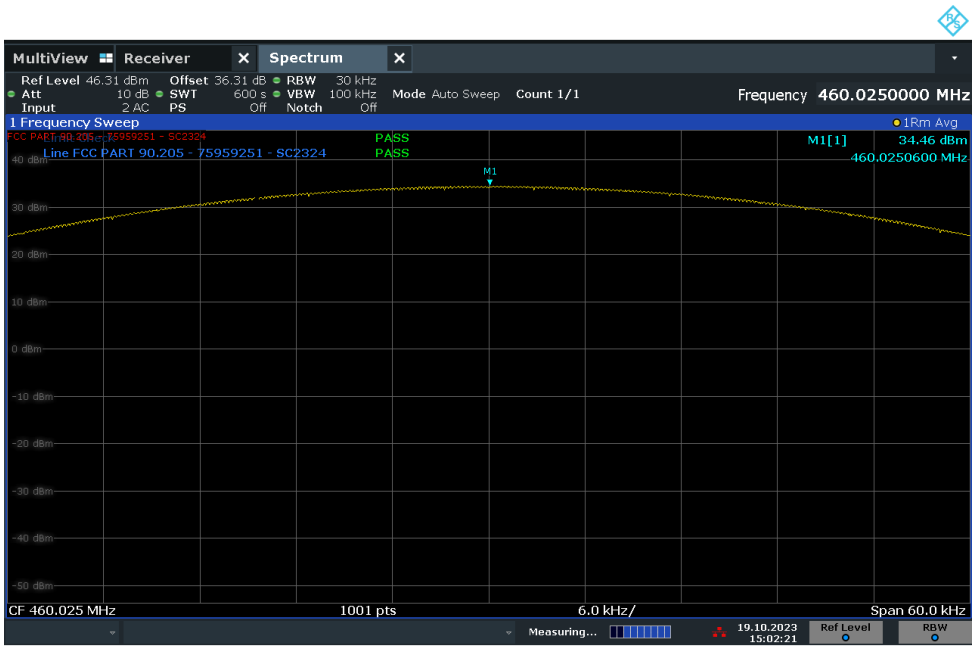


Figure 5 – FCC Part 90, 460.025 MHz

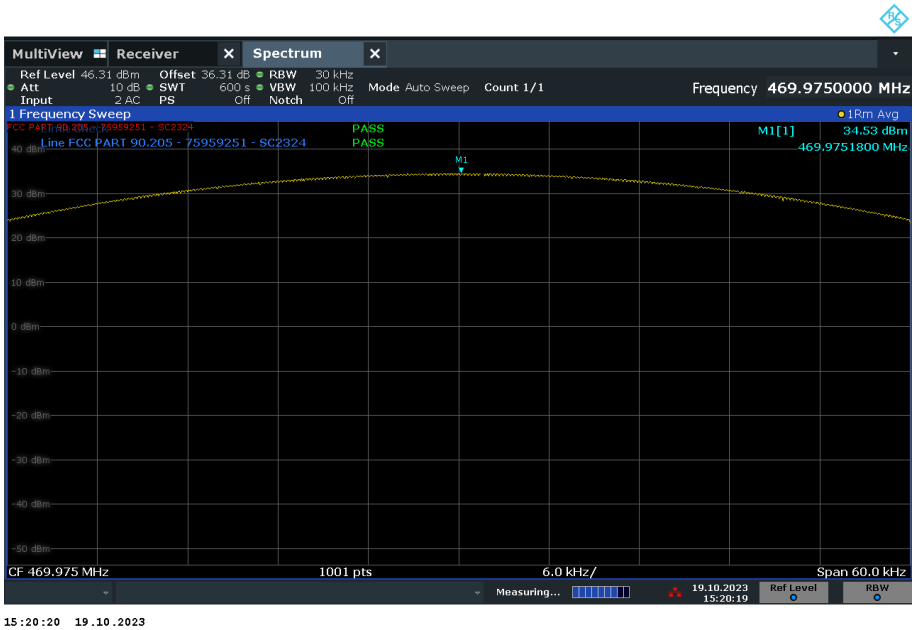


Figure 6 – FCC Part 90, 469.975 MHz

Tetra - 406.1-430 MHz

Parameter	406.125 MHz	418.000 MHz	429.975 MHz
Conducted Output Power (dBm)	34.56	34.32	34.37
Manufacturer Declared Power (dBm)	35.00	35.00	35.00
Δ from manufacturer Power (dB)	-0.44	-0.68	-0.63
Antenna Gain (dBi)	7.00	7.00	7.00
ERP (dBm)	39.41	39.17	39.22

Table 18 - ERP

Note : ERP powers are quoted, therefore the antenna gains must be converted to dBd by subtracting 2.15dB before summing with the “Conducted Output Power” figure.

The antenna gain refers to the highest, “worst case” figure of all applicable antenna options.

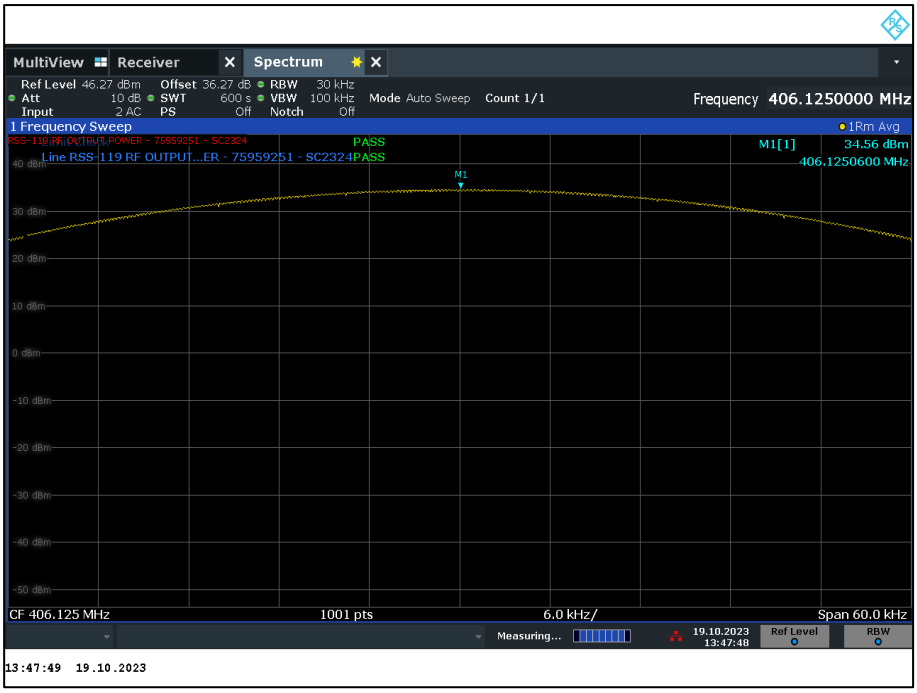


Figure 7 – ISED RSS-119, 406.125 MHz

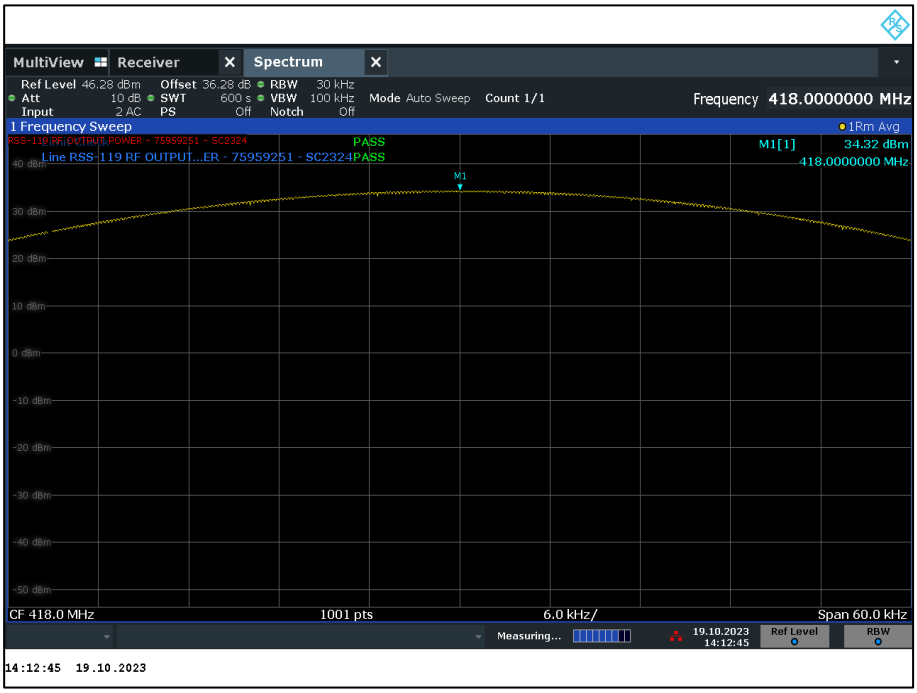


Figure 8 – ISED RSS-119, 418.000 MHz

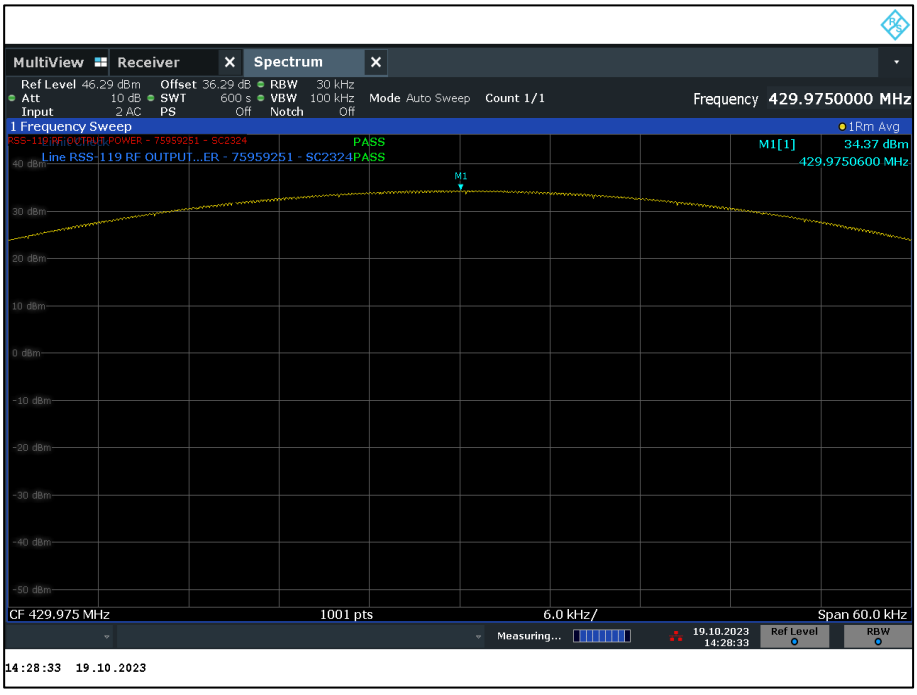


Figure 9 – ISED RSS-119, 429.975 MHz

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 19 - 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 20 - Industry Canada Limits for Transmitter Output Power

2.1.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Screened Room (5)	Rainford	Rainford	1545	36	15-Apr-2024
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	13-Mar-2024
Hygropalm Temperature and Humidity Meter	Rotronic	HP21	4410	12	08-Aug-2024
Cable (40 GHz)	Rosenberger	LU1-001-1000	5022	12	29-Jan-2024
EMI Test Receiver	Rohde & Schwarz	ESW44	5527	12	15-Jun-2024
DVM - Digital Multimeter	Iso-tech	IDM101	5601	12	20-Feb-2024

Table 21

O/P Mon – Output Monitored using calibrated equipment

2.2 Spurious Emissions at Antenna Terminals

2.2.1 Specification Reference

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

2.2.2 Equipment Under Test and Modification State

SC2324, S/N: 1PR002331GKK87R - Modification State 0

2.2.3 Date of Test

19-October-2023 to 21-December-2023

2.2.4 Test Method

This test was performed in accordance with FCC Part 90.210 b) and ANSI C63.26 Section 5.7 and 5.2.3.3.

This test was performed in accordance with RSS-119 Sections 4.2.2, 5.8.10, RSS-GEN Section 6.13 and ANSI C63.26 Section 5.7 and 5.2.4.3.2 where measurements are referenced to averaged RMS power measurements, and Section 5.2.3.3 where measurements are referenced to Peak RF power measurements.

FCC Part 90:
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 losses between the EUT and analyser were calculated using interpolated calibration data for each item, summed with the duty cycle correction factor and entered into the spectrum analyser as a reference level offset. The reference level for the mask was established with an RBW that encompasses the emission bandwidth.

For FCC Part 90 compliant measurements, the RBW was then reduced to at least 1 % of the emission bandwidth (300Hz), with a VBW of 3 times RBW (1kHz). The mask as per FCC 47 CFR Part 90.210 (b) was applied using a Peak detector.

For RSS-119 compliant measurements, the RBW was reduced to 100Hz, with a VBW of 300Hz and the mask as per RSS-119 Section 5.8.10 (Mask Y) was applied using a Peak detector.
For emissions where the frequency is removed more than 250 % of the authorized bandwidth measurements were performed both conducted and radiated as follows:

Measurements are performed in accordance with FCC Part 90

Additionally, to ensure compliance with FCC Part 90.543 (c) and RSS-119 Section 4.2.2, Channel power measurements have been performed over a 100kHz bandwidth immediately outside the spectral mask to ensure the peak power measured is below the out of band spurious emission test limit.

Conducted Emissions: The reference level is set to the measured RF power (RMS) level. The total pathloss (excluding any filters used) was entered as a reference level offset into the spectrum analyser.

The EUT was connected to a spectrum analyser via a 30dB attenuator, filter (where used) and coaxial cable.

Between measurement frequencies 9 kHz and 1000 MHz, no filter is used.

Between measurement frequencies 1000 MHz and 3000 MHz, a 1000 MHz high pass filter was used upto it's maximum calibrated frequency range (3000MHz).

Between 3000 MHz and 5000 MHz a 3000 MHz high pass filter was used upto a frequency which allows upto the 10th harmonic of the fundamental frequency to be measured. The 3000 MHz high pass filter is calibrated to a maximum frequency of 18GHz.

The spectrum analyser was configured with an RBW of 100 kHz for test frequencies below 1 GHz except for the 9kHz-150kHz and 150kHz-30MHz ranges (FCC Part 90 plots), where the RBW is reduced and the test limit is reduced accordingly by 10*Log(100kHz/RBW).

The spectrum analyser was configured with an RBW of 1 MHz for test frequencies greater than 1 GHz.

For FCC compliant measurements, the trace is set to Max Hold using a Peak detector and reference level is set to the Peak RF power measured at the test frequency.

For RSS-119 compliant measurements, the trace is set to Average using an RMS detector and reference level is set to the Averaged RMS power measured at the test frequency.

Radiated spurious emissions measurements are performed in accordance with FCC Part 90.210 (b) and RSS-119 Section 4.2.2 and 5.8.10 and RSS-Gen Section 6.13.

2.2.5 Environmental Conditions

Ambient Temperature	19.7 - 26.4 °C
Relative Humidity	27.6 - 59.3 %

2.2.6 Test Results

Tetra - 450-470 MHz

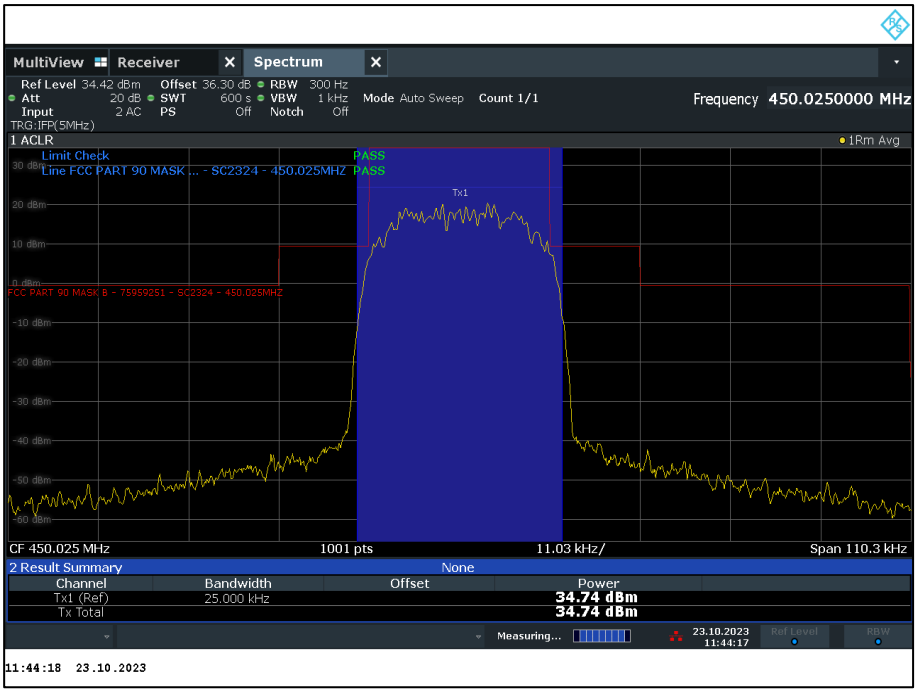


Figure 10 – 450.025 MHz, FCC Part 90, Mask B

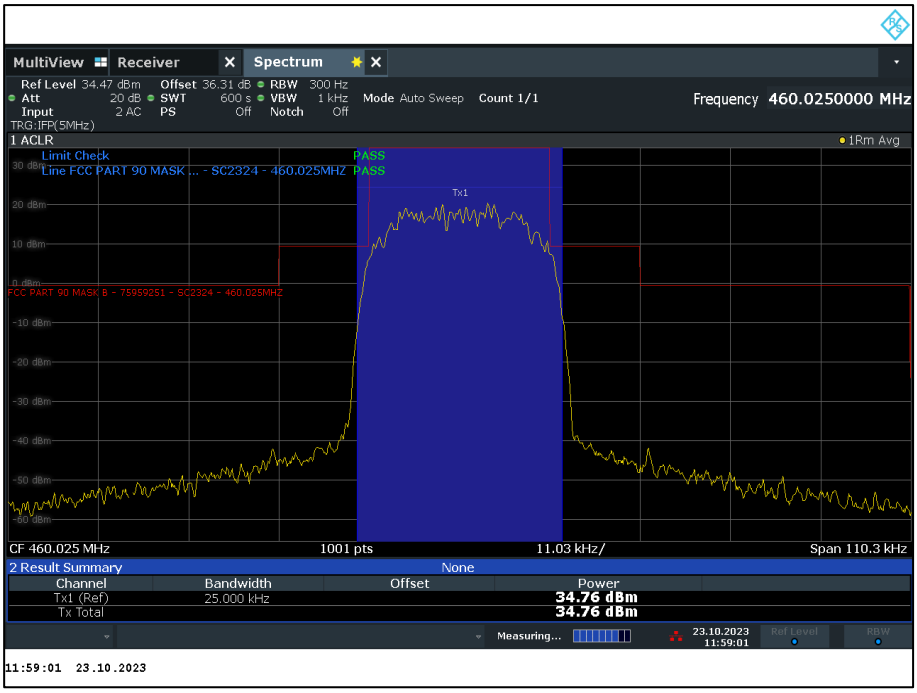


Figure 11 – 460.025 MHz, FCC Part 90, Mask B

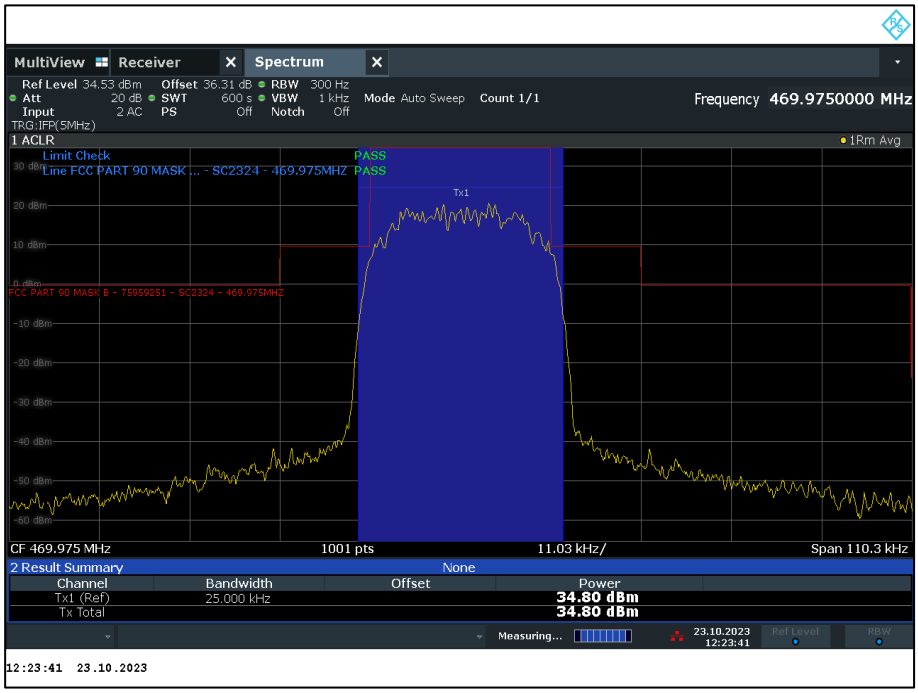


Figure 12 – 469.975 MHz, FCC Part 90, Mask B

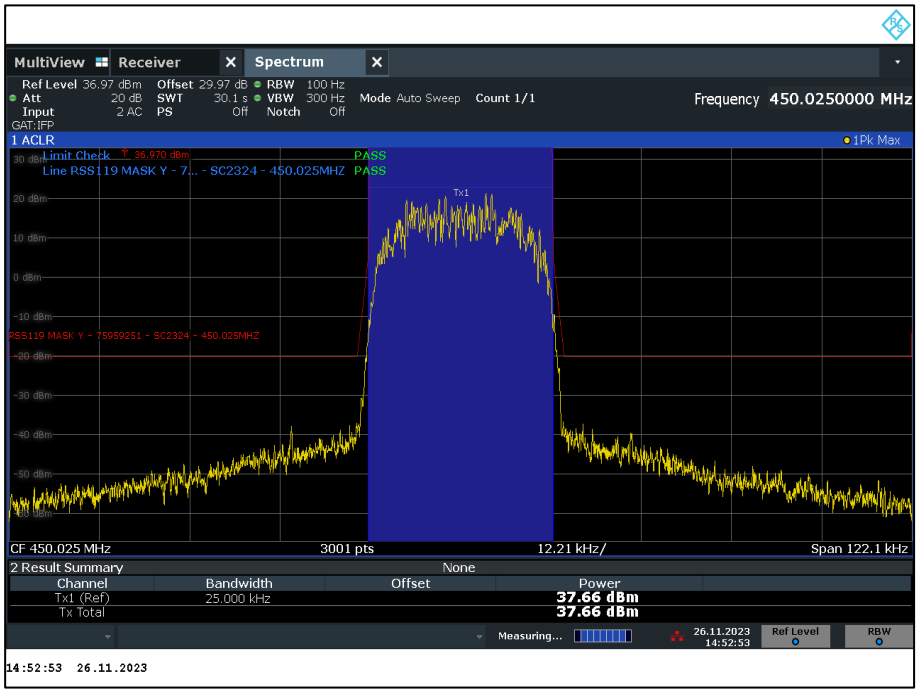


Figure 13 – 450.025 MHz, ISED RSS-119, Mask Y

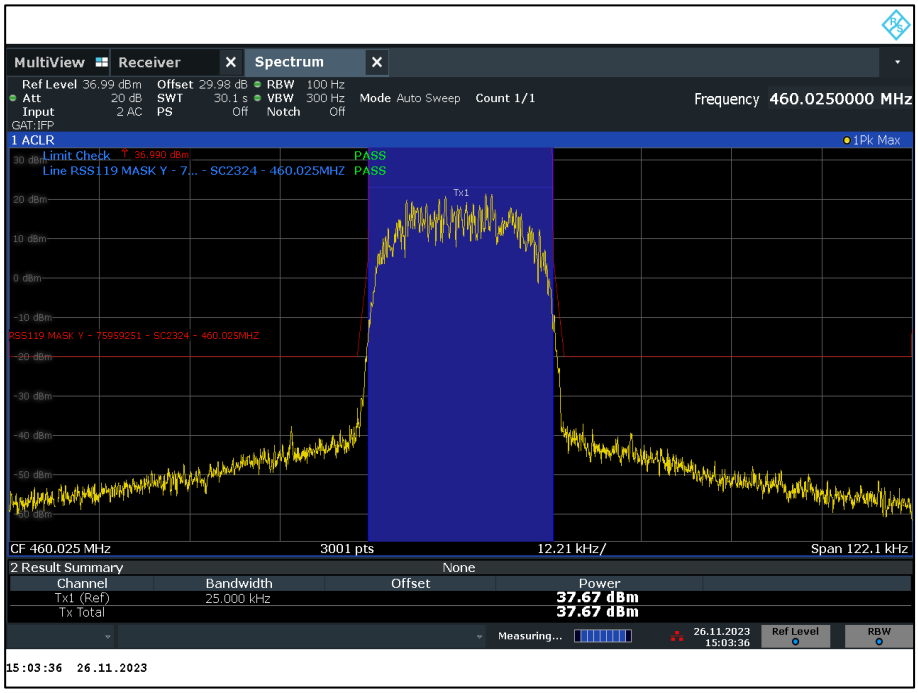


Figure 14 – 460.025 MHz, ISED RSS-119, Mask Y

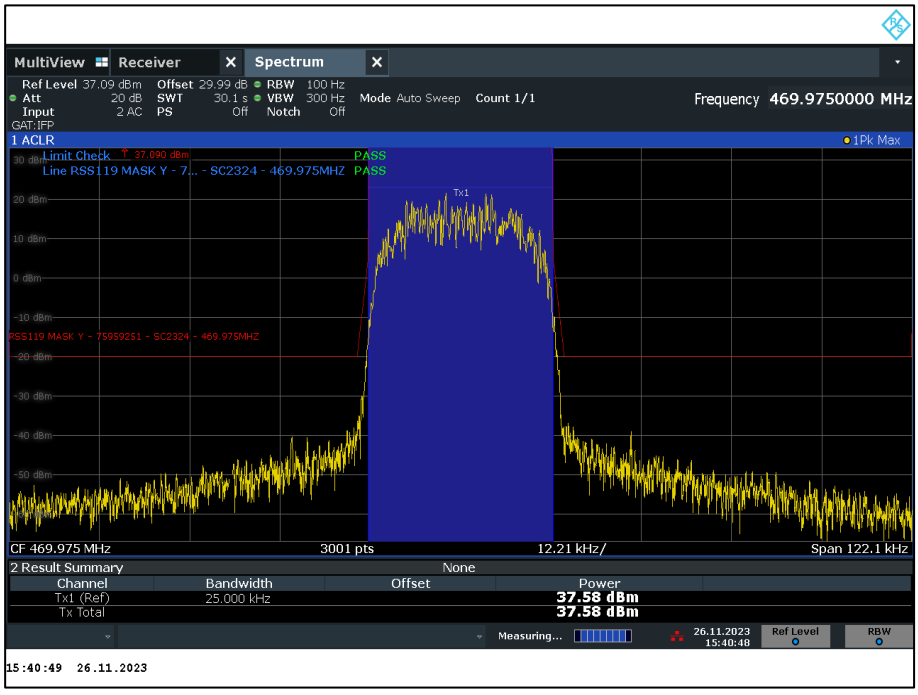


Figure 15 – 469.975 MHz, ISED RSS-119, Mask Y

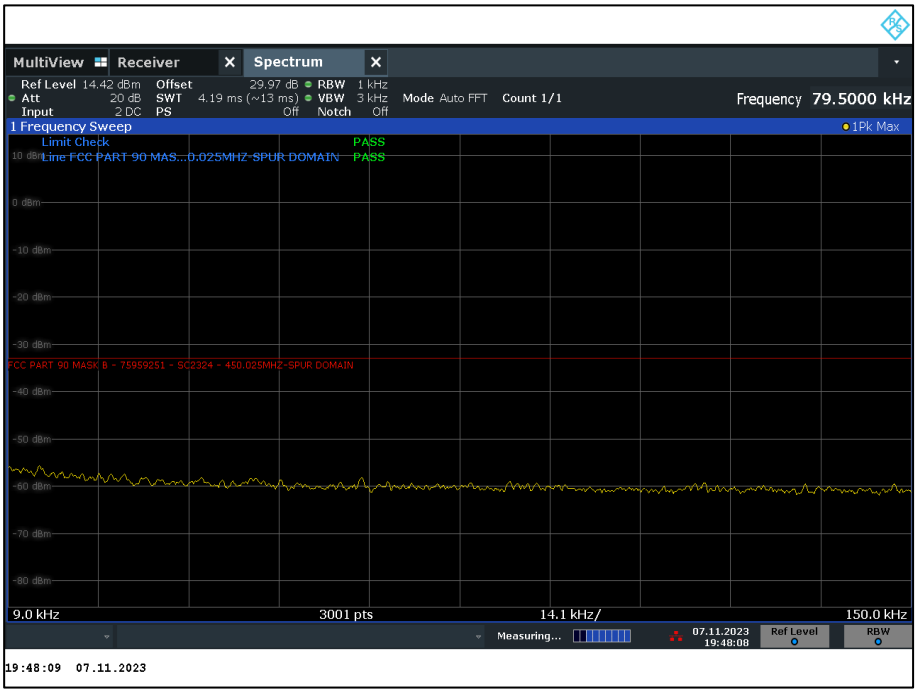


Figure 16 – 450.025 kHz, 9 kHz to 150 kHz, No Filter, FCC Part 90, Mask B

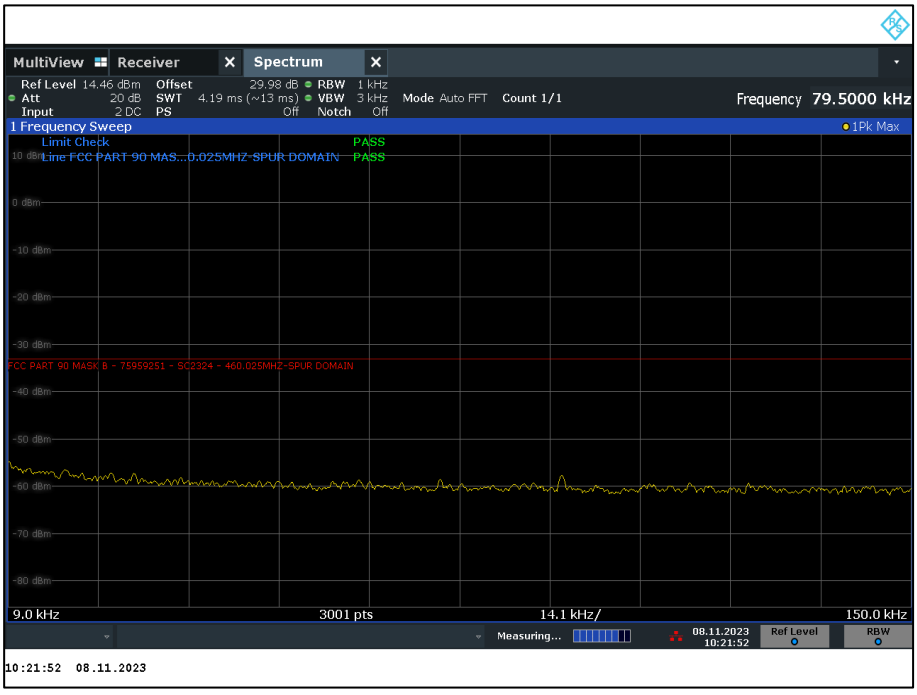


Figure 17 – 460.025 MHz, 9 kHz to 150 kHz, No Filter, FCC Part 90, Mask B

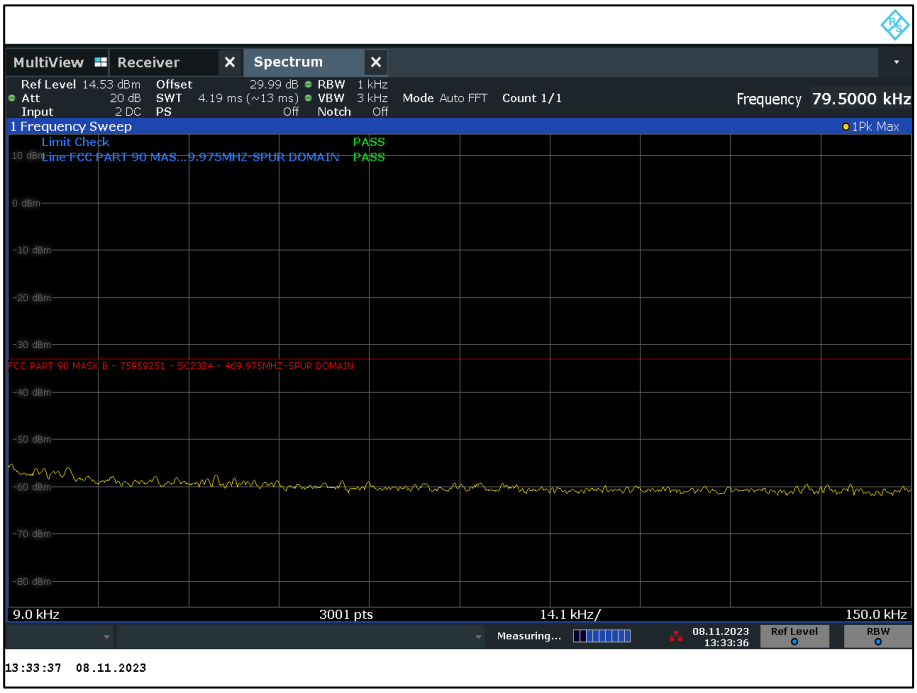


Figure 18 – 469.975 MHz, 9 kHz to 150 kHz, No Filter, FCC Part 90, Mask B

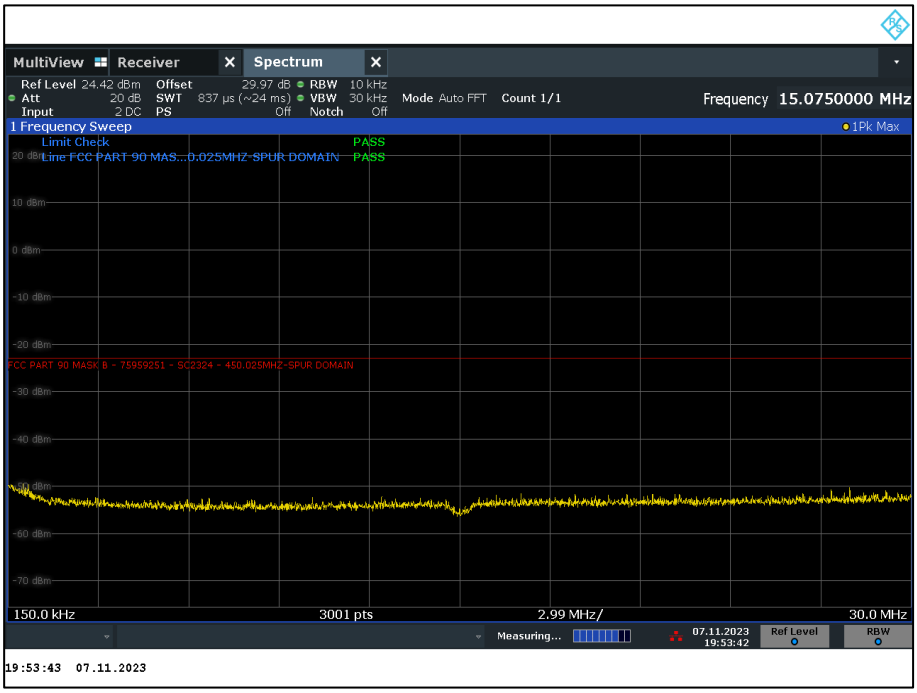


Figure 19 – 450.025 MHz,150 kHz to 30 MHz, No Filter, FCC Part 90, Mask B

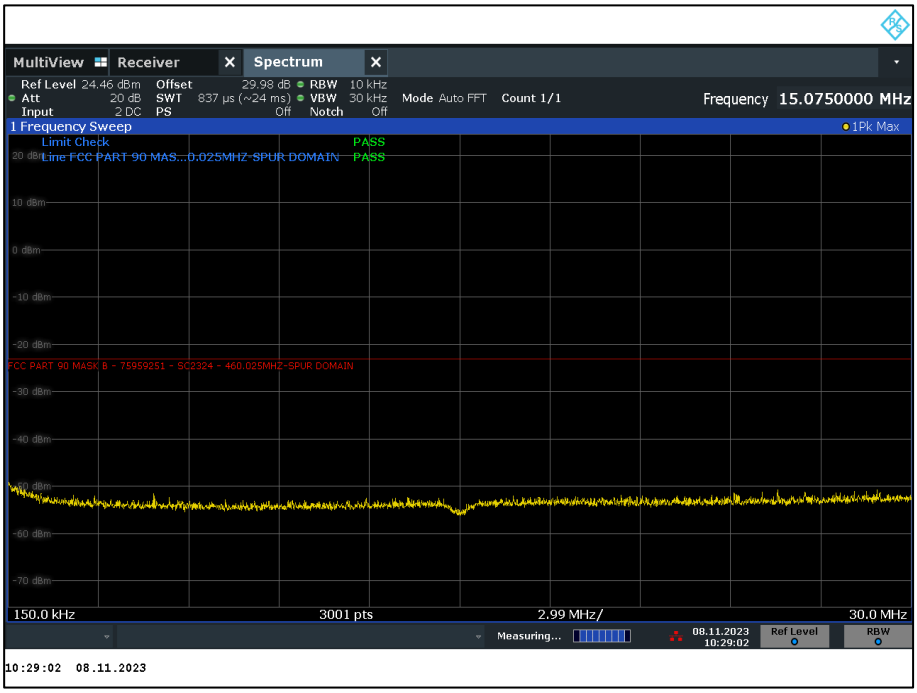


Figure 20 – 460.025 MHz, 150 kHz to 30 MHz, No Filter, FCC Part 90, Mask B

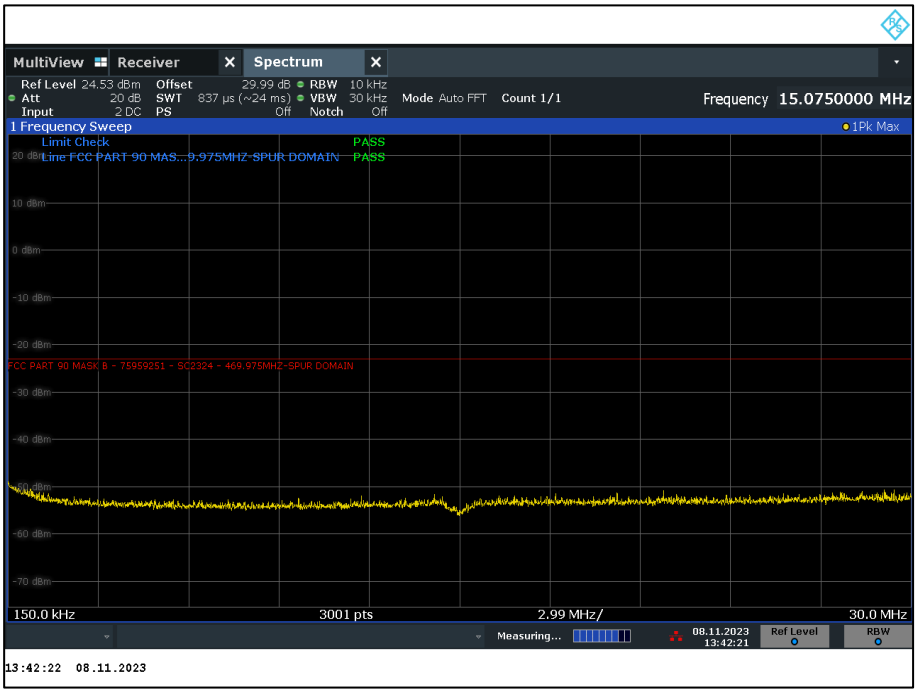


Figure 21 – 469.975 MHz, 150 kHz to 30 MHz, No Filter, FCC Part 90, Mask B

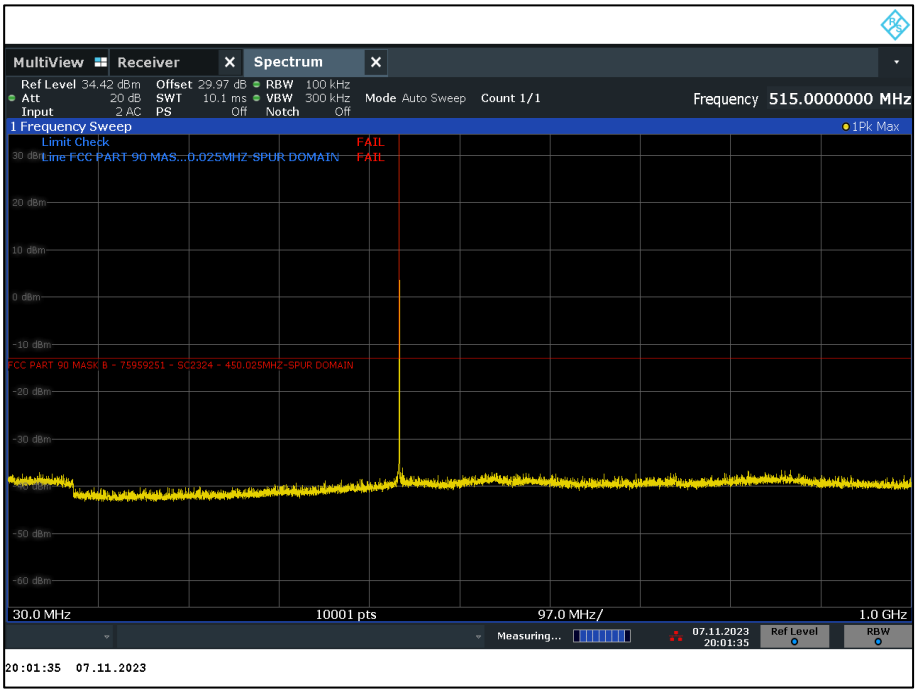


Figure 22 – 450.025 MHz, 30 MHz to 1 GHz, No Filter, FCC Part 90, Mask B

Note : A limit line “Fail” is displayed due to the narrow exclusion band and wide frequency span covered. The analyser does not have sufficient display resolution to draw trace between upper and lower frequency limits of the emissions mask. Channel power plots shown in Figure 31 and Figure 34 shows that emission is compliant with the test limit.

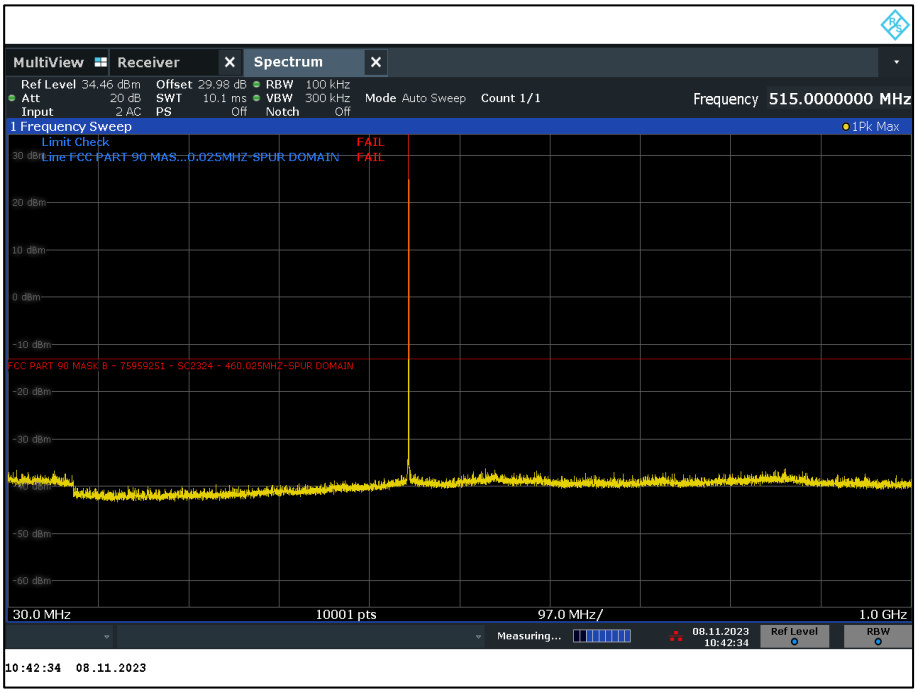


Figure 23 – 460.025 MHz, 30 MHz to 1 GHz, No Filter, FCC Part 90, Mask B

Note : A limit line “Fail” is displayed due to the narrow exclusion band and wide frequency span covered. The analyser does not have sufficient display resolution to draw trace shown between upper and lower frequency limits of the emissions mask. Channel power plots shown in Figure 32 and Figure 35 show that the emission is compliant with the test limit.

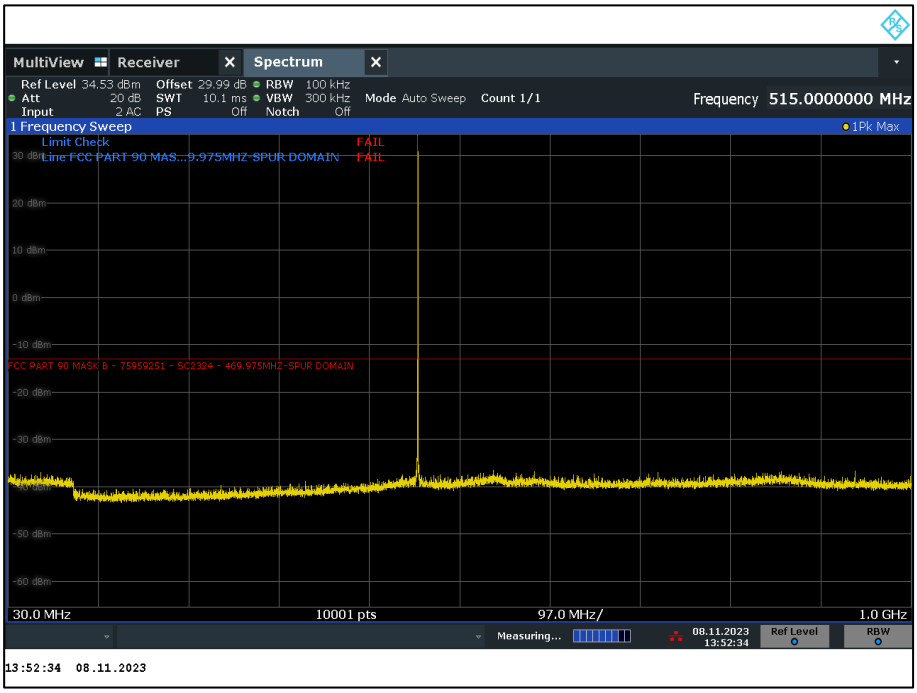


Figure 24 – 469.975 MHz - 30 MHz to 1 GHz, No Filter, FCC Part 90, Mask B

Note : A limit line “Fail” is displayed due to the narrow exclusion band and wide frequency span covered. The analyser does not have sufficient display resolution to draw trace between upper and lower frequency limits of the emissions mask. Channel power plots shown in Figure 33 and Figure 36 show that the emission is compliant with the test limit.

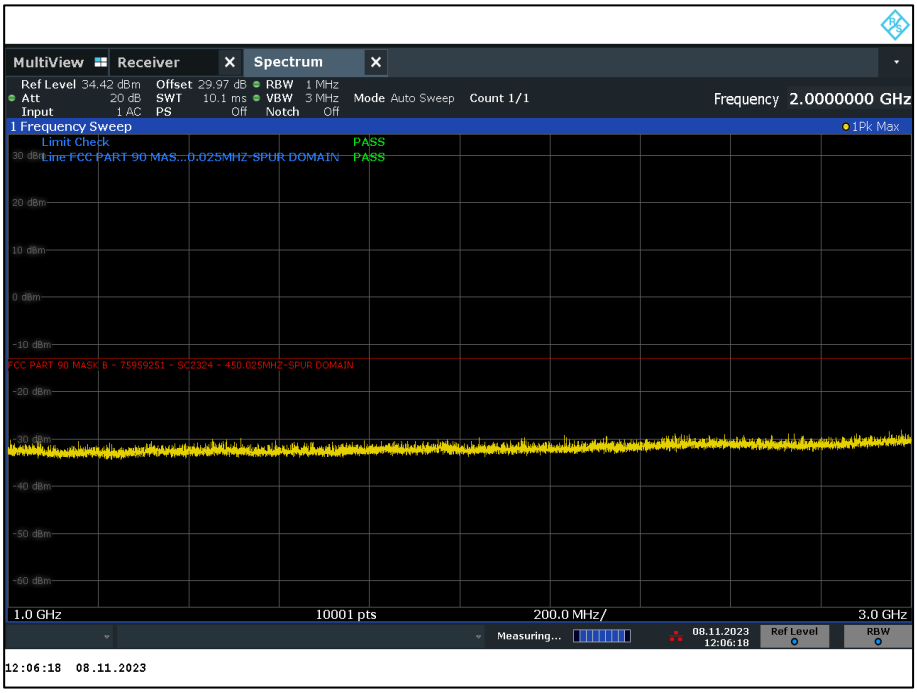


Figure 25 – 450.025 MHz, 1 GHz to 3 GHz, TE5260 Filter inline, FCC Part 90, Mask B

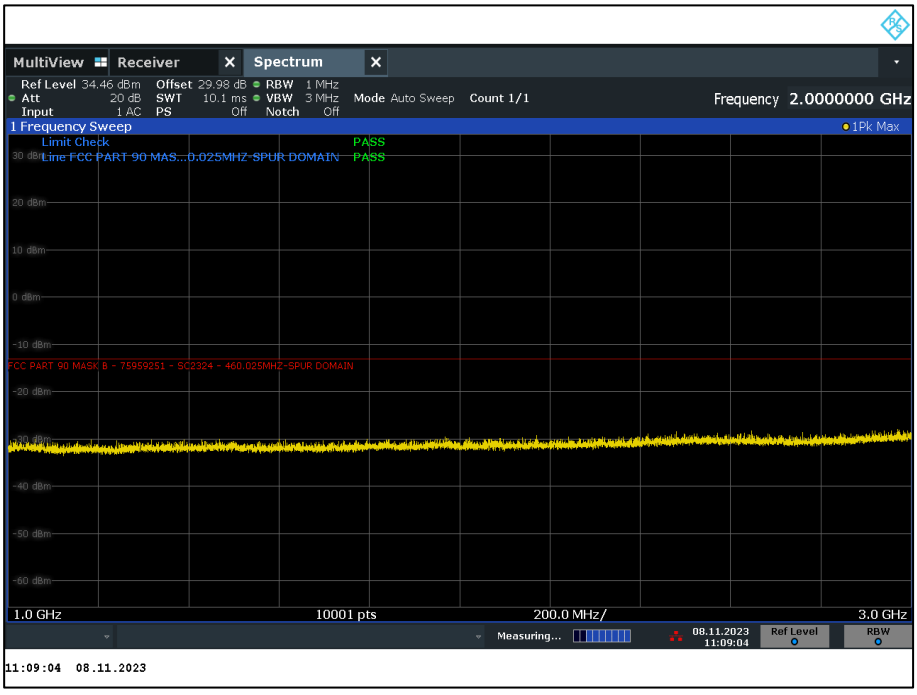


Figure 26 – 460.025 MHz, 1 GHz to 3 GHz, TE5260 Filter inline, FCC Part 90, Mask B

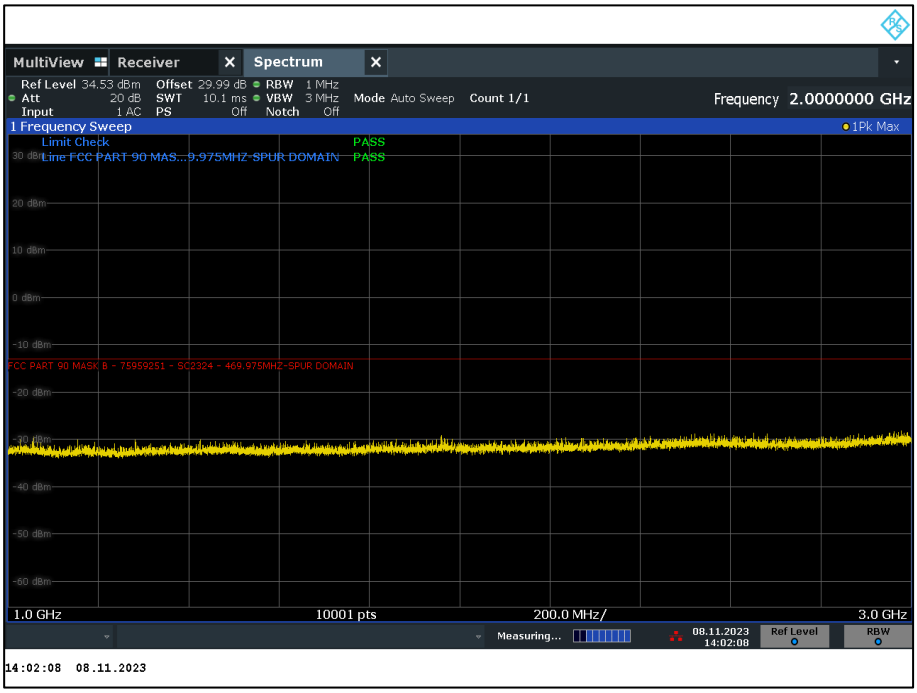


Figure 27 – 469.975MHz - 1 GHz to 3 GHz, TE5260 Filter inline, FCC Part 90, Mask B

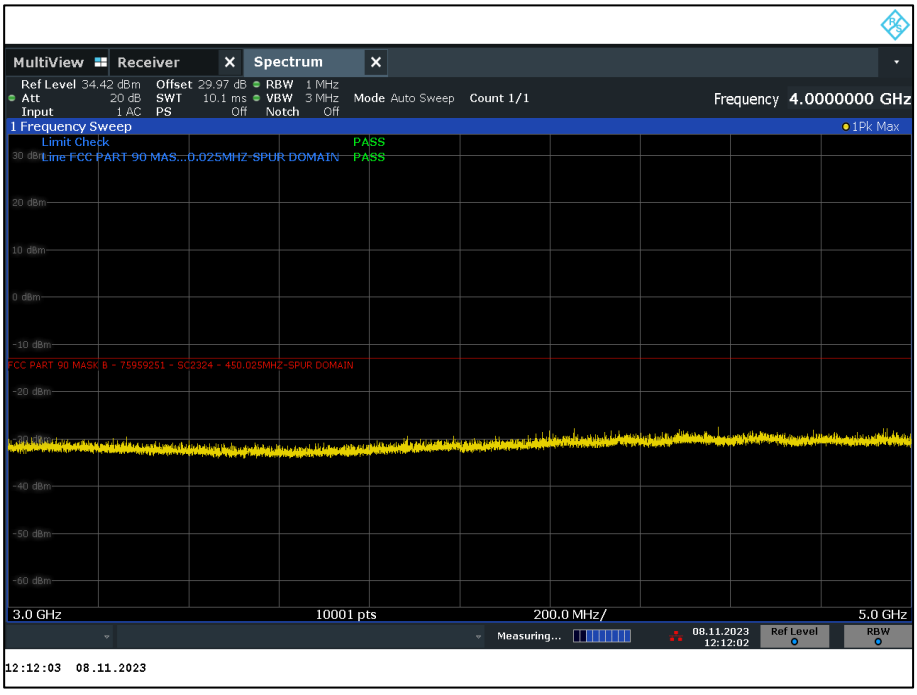


Figure 28 – 450.025 MHz,3 GHz to 5 GHz, TE5548 Filter inline, FCC Part 90, Mask B

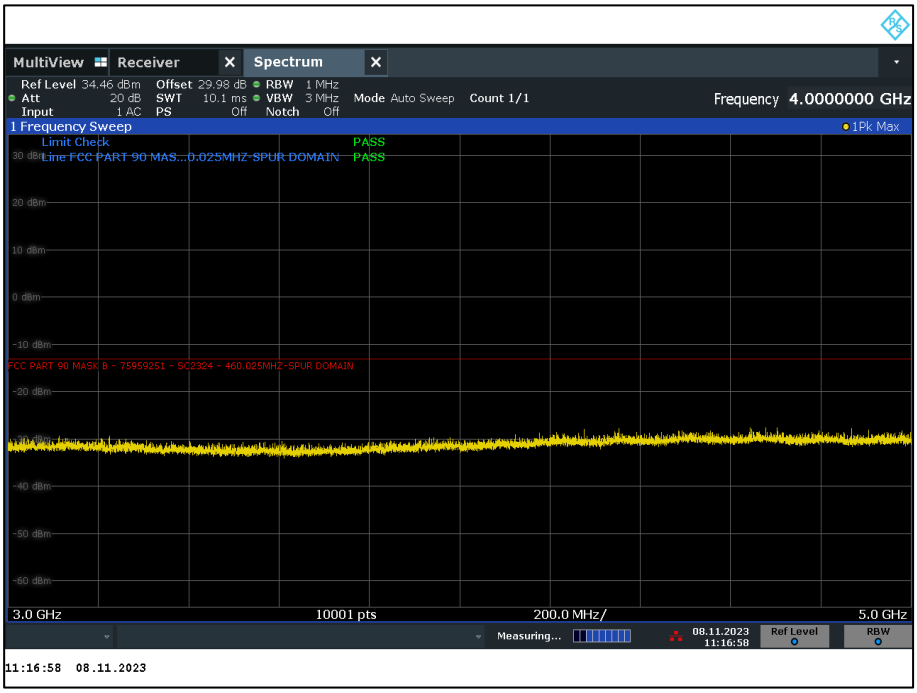


Figure 29 – 460.025 MHz, 3 GHz to 5 GHz, TE5548 Filter inline, FCC Part 90, Mask B

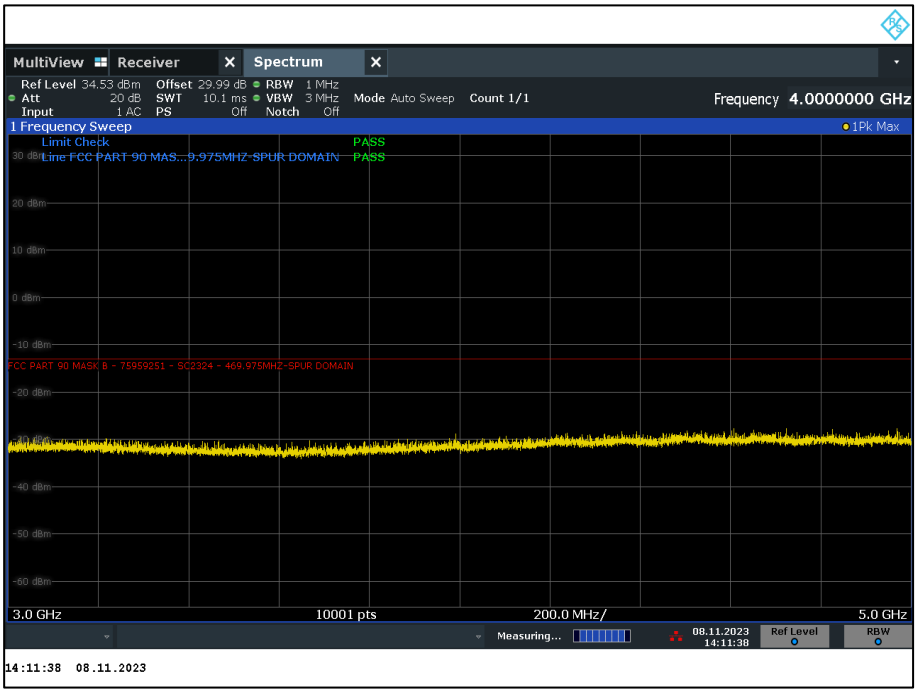


Figure 30 – 469.975 MHz - 3 GHz to 5 GHz, TE5548 Filter inline, FCC Part 90, Mask B

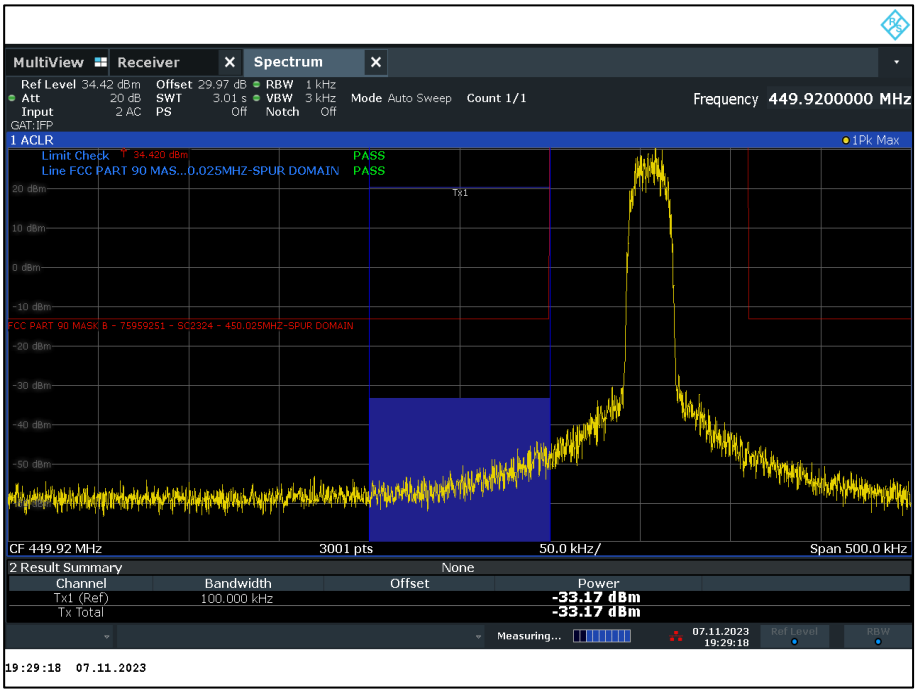


Figure 31 – 450.025 MHz, Channel Power Below FCC Part 90 Mask edge (100kHz Band), No Filter, Mask B

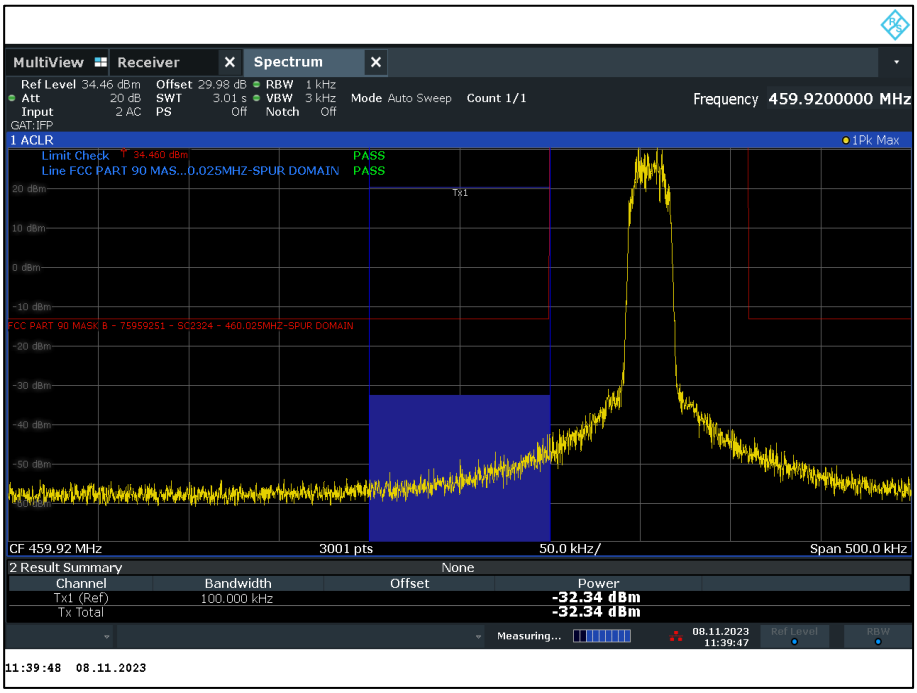


Figure 32 – 460.025 MHz, Channel Power Below FCC Part 90 Mask edge (100kHz Band), No Filter, Mask B

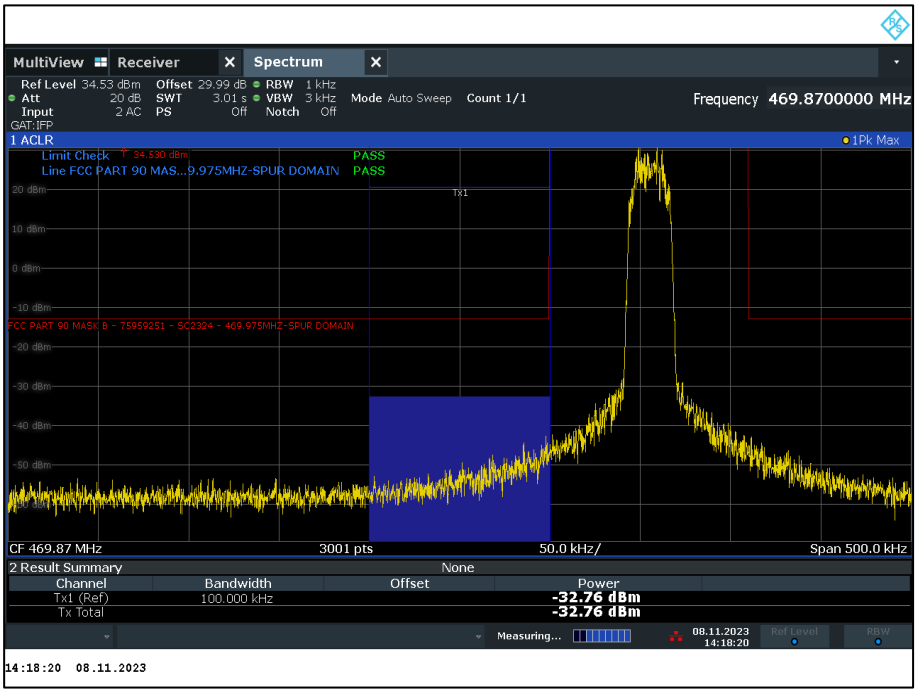


Figure 33 – 469.975 MHz - Channel Power Below FCC Part 90 Mask edge (100kHz Band), No Filter, Mask B

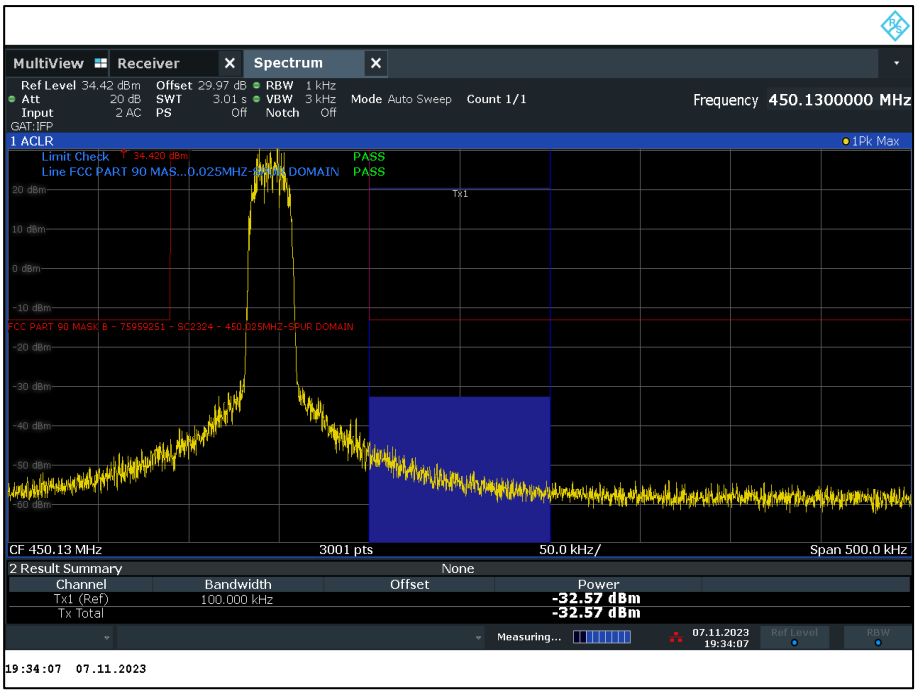


Figure 34 – 450.025 MHz, Channel Power Above FCC Part 90 Mask edge (100kHz Band), No Filter, Mask B

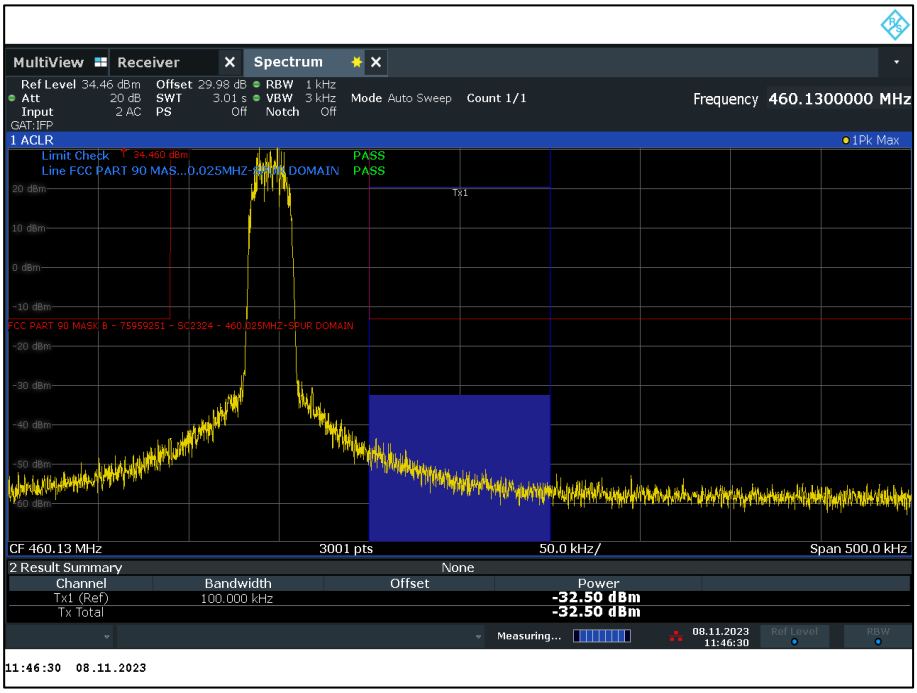


Figure 35 – 460.025 MHz, Channel Power Above FCC Part 90 Mask edge (100kHz Band), No Filter, Mask B

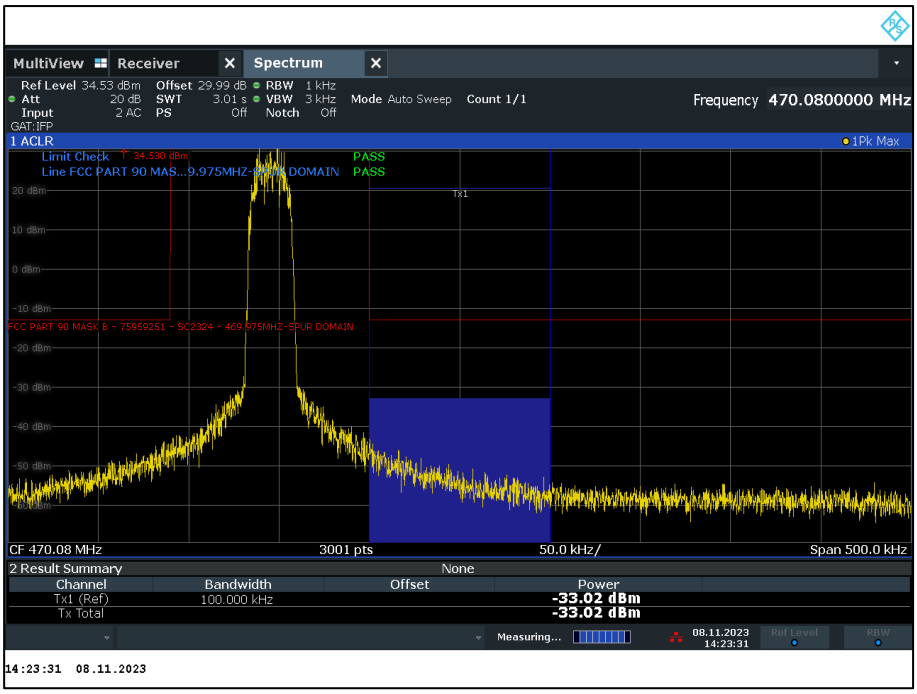


Figure 36 – 469.975 MHz - Channel Power Above FCC Part 90 Mask edge (100kHz Band), No Filter, Mask B

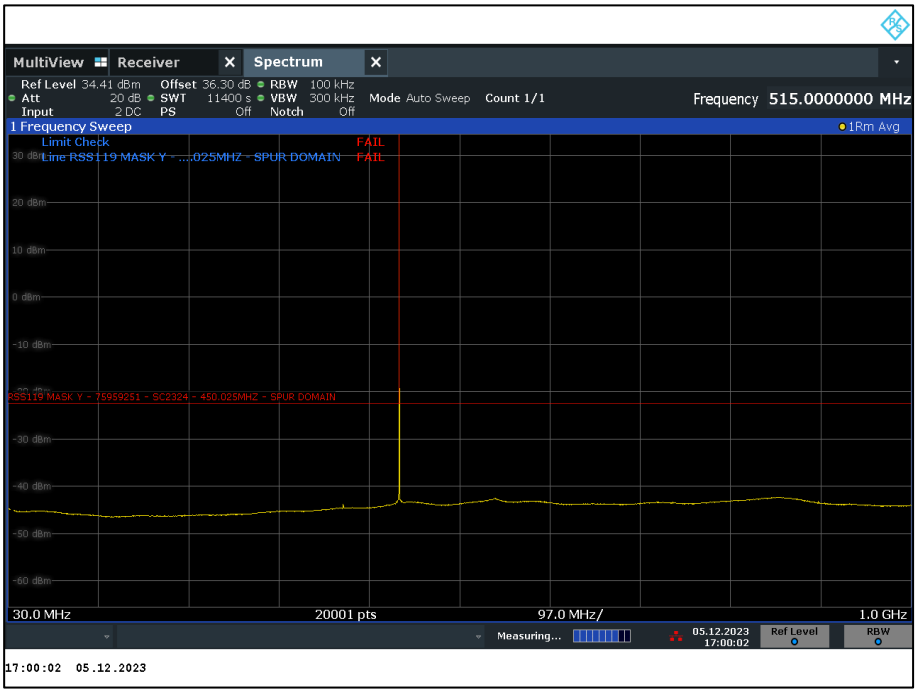


Figure 37 – 450.025 MHz, 30 MHz to 1 GHz, No Filter, ISED RSS-119, Mask Y

Note : A limit line “Fail” is displayed due to the narrow exclusion band and wide frequency span covered. The analyser display does not have sufficient resolution to draw trace between upper and lower frequency limits of the emissions mask. Channel power plots shown in Figure 52 and Figure 55 show that the emissions are compliant with the test limit.

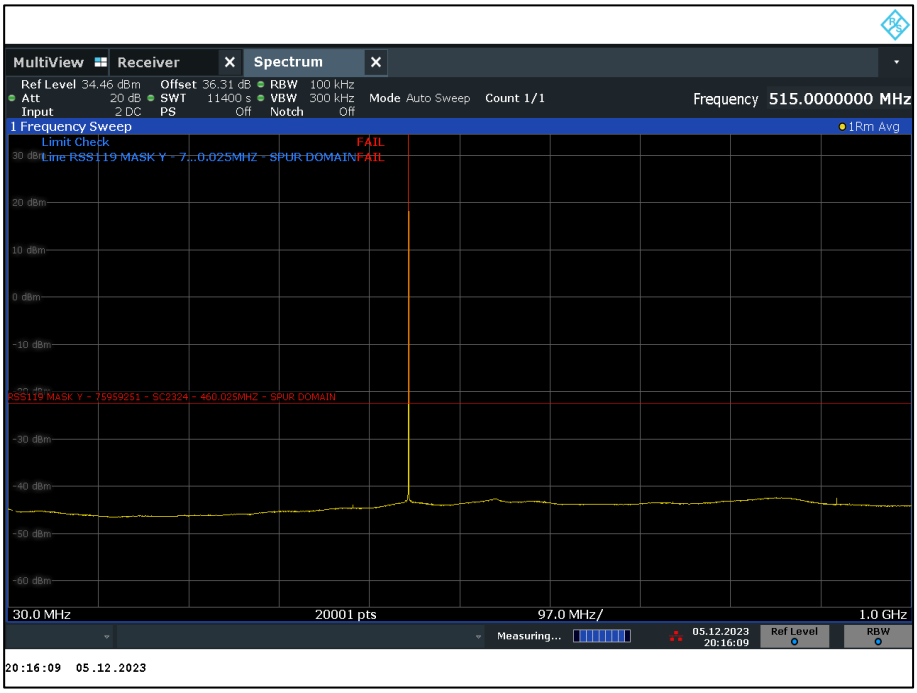


Figure 38 – 460.025 MHz, 30 MHz to 1 GHz, No Filter, ISED RSS-119, Mask Y

Note : A limit line “Fail” is displayed due to the narrow exclusion band and wide frequency span covered. The analyser display does not have sufficient resolution to draw the trace between upper and lower frequency limits of the emissions mask. Channel power plots shown in Figure 53 and Figure 56 show that the emissions are compliant with the test limit.

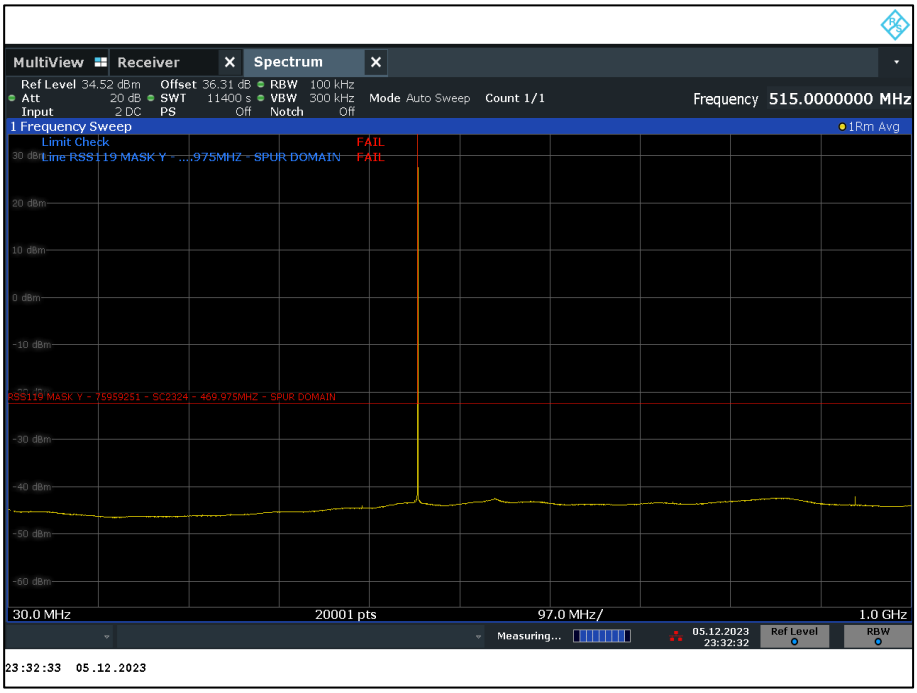


Figure 39 – 469.975 MHz - 30 MHz to 1 GHz, No Filter, ISED RSS-119, Mask Y

Note : A limit line “Fail” is displayed due to the narrow exclusion band and wide frequency span covered. The analyser does not have sufficient display resolution to draw trace between the upper and lower frequency limits of the emissions mask. Channel power plots shown in Figure 54 and Figure 57 shows that emissions are compliant with the test limit.

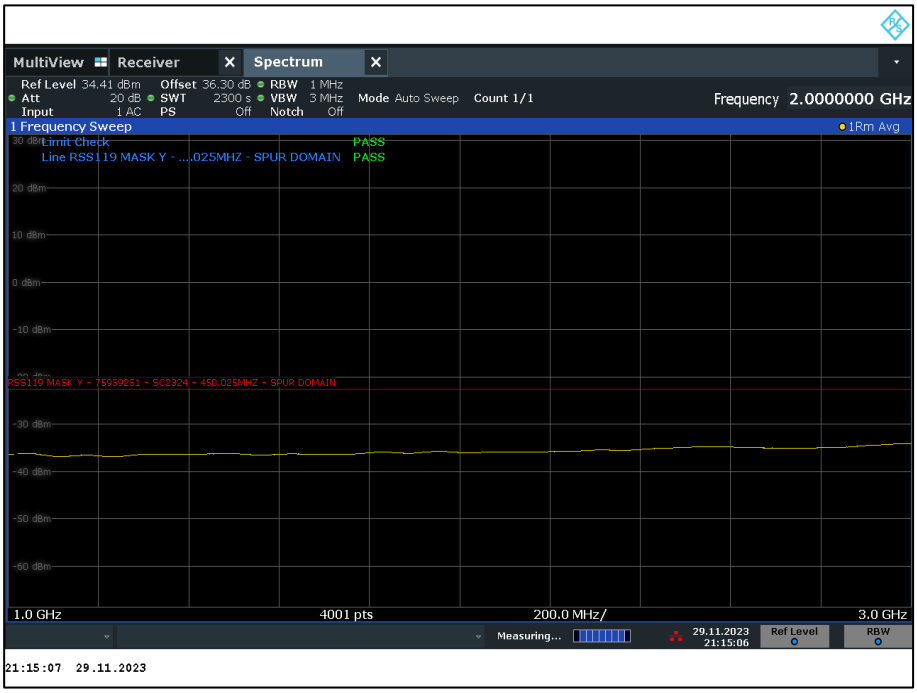


Figure 40 – 450.025 MHz,1 GHz to 3 GHz, TE5260 Filter inline, ISED RSS-119, Mask Y

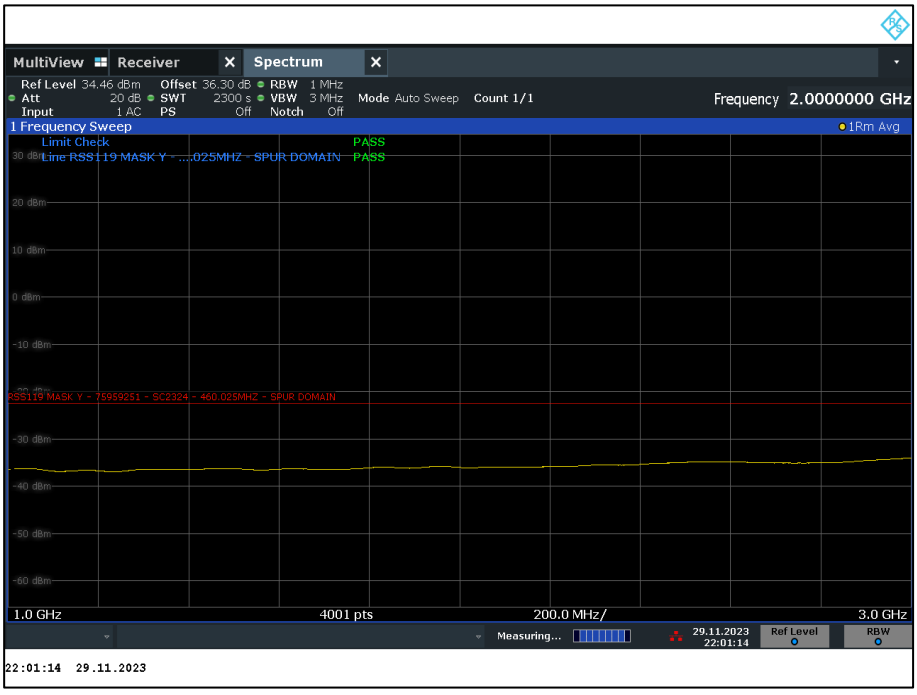


Figure 41 – 460.025 MHz, 1 GHz to 3 GHz, TE5260 Filter inline, ISED RSS-119, Mask Y

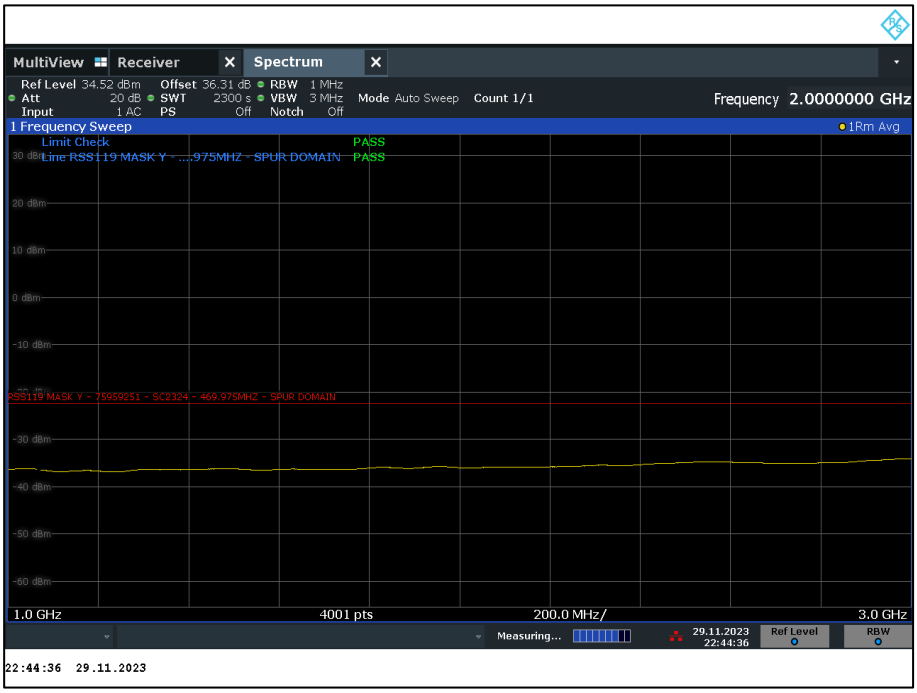


Figure 42 – 469.975 MHz - 1 GHz to 3 GHz, TE5260 Filter inline, ISED RSS-119, Mask Y

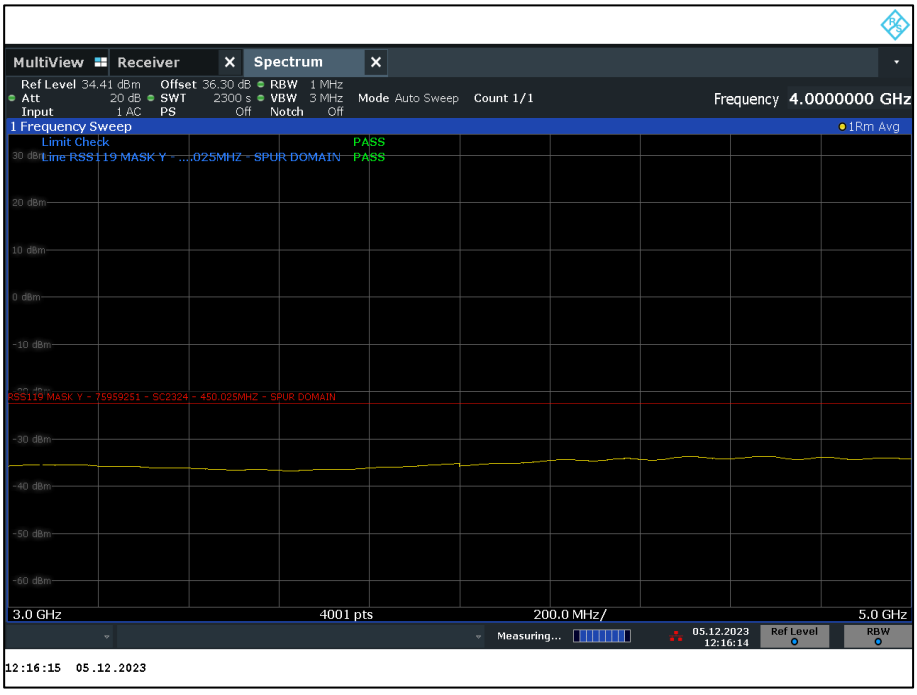


Figure 43 – 450.025 MHz, 3 GHz to 5 GHz, TE5548 Filter inline, ISED RSS-119, Mask Y

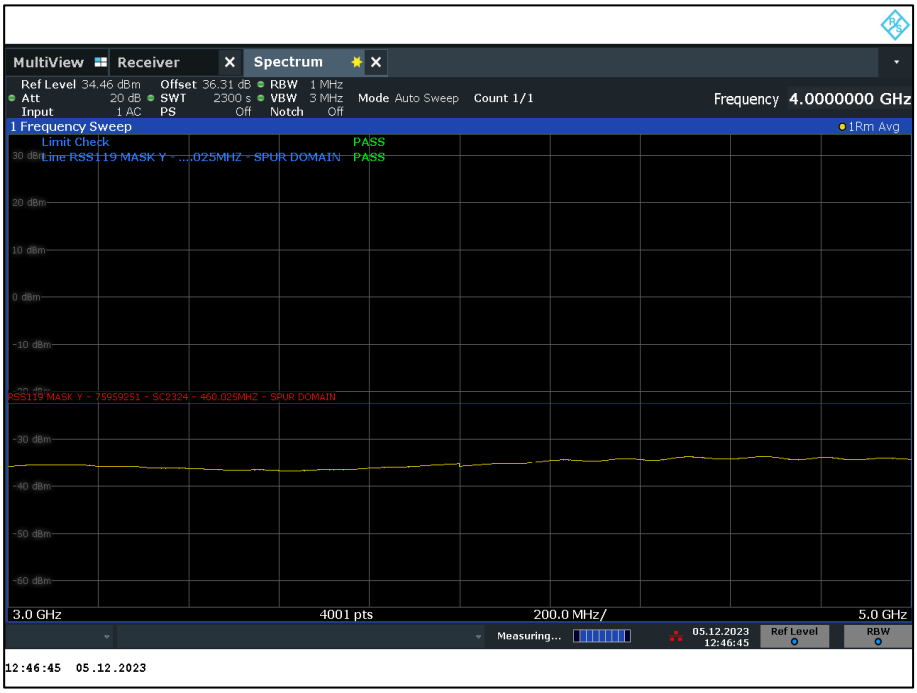


Figure 44 – 460.025 MHz, 3 GHz to 5 GHz, TE5548 Filter inline, ISED RSS-119, Mask Y

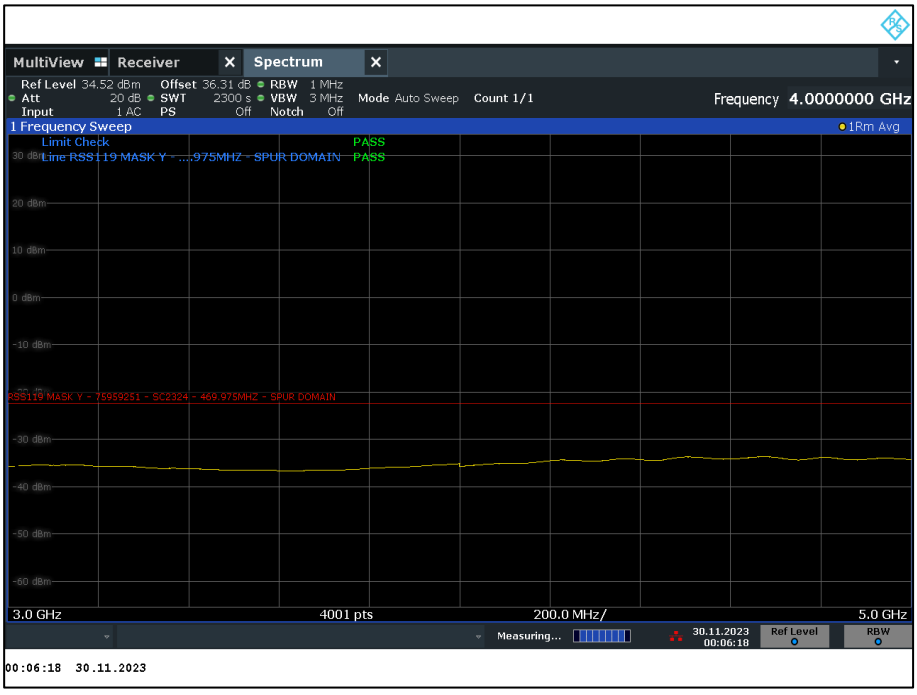


Figure 45 – 469.975 GHz - 3 GHz to 5 GHz, TE5548 Filter inline, ISED RSS-119, Mask Y

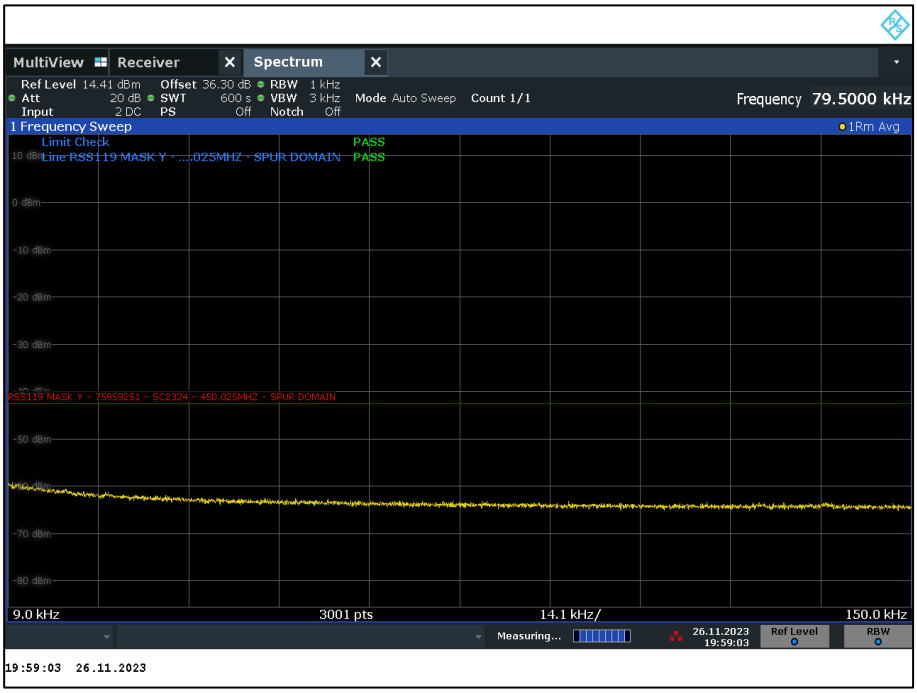


Figure 46 – 450.025 MHz, 9 kHz to 150 kHz, No Filter, RSS-119, Mask Y

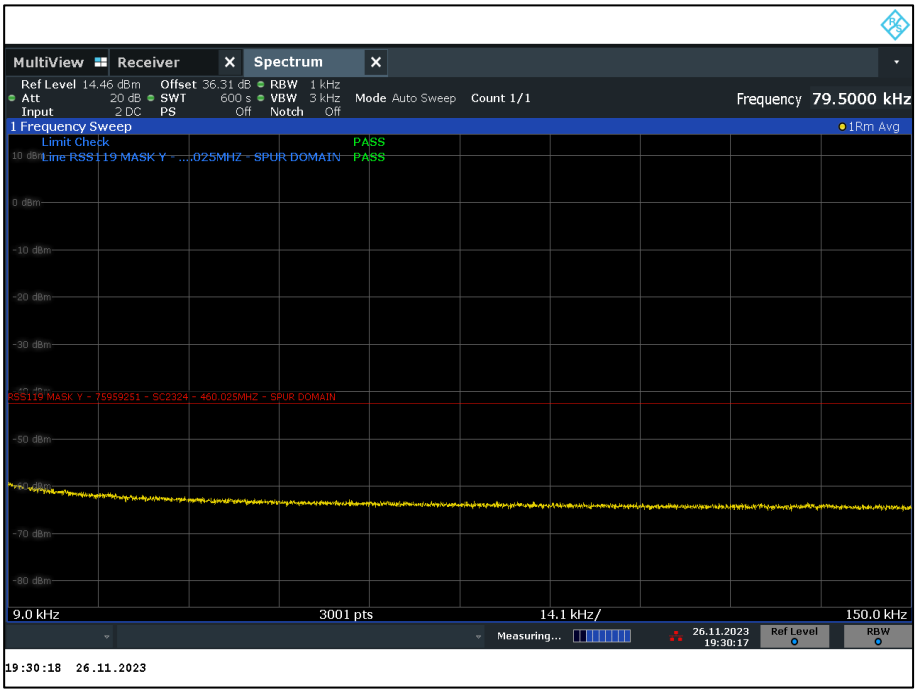


Figure 47 – 460.025 MHz, 9 kHz to 150 kHz, No Filter, RSS-119, Mask Y

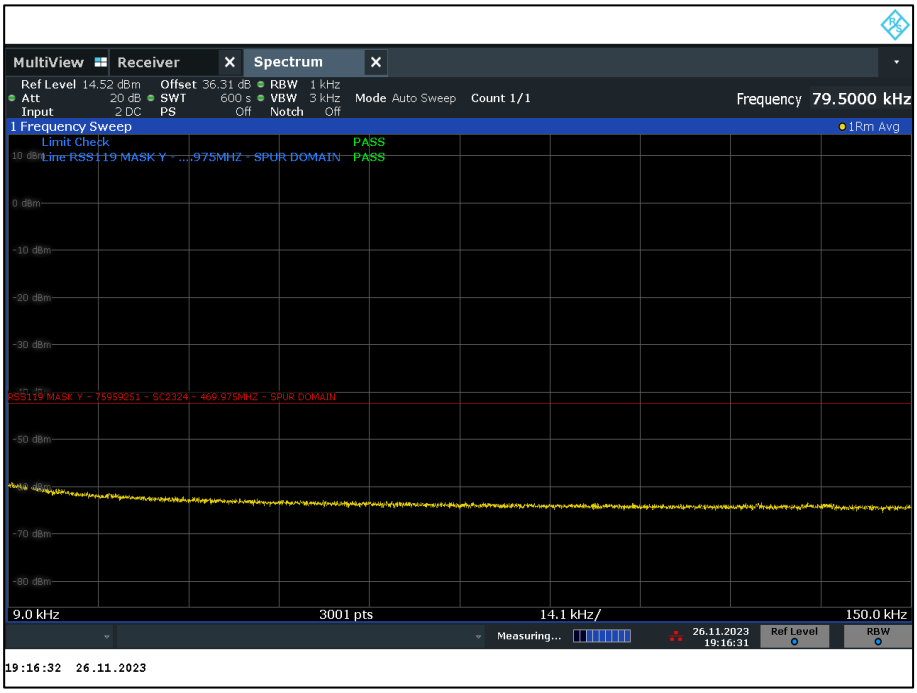


Figure 48 – 469.975 MHz - 9 kHz to 150 kHz, No Filter, RSS-119, Mask Y

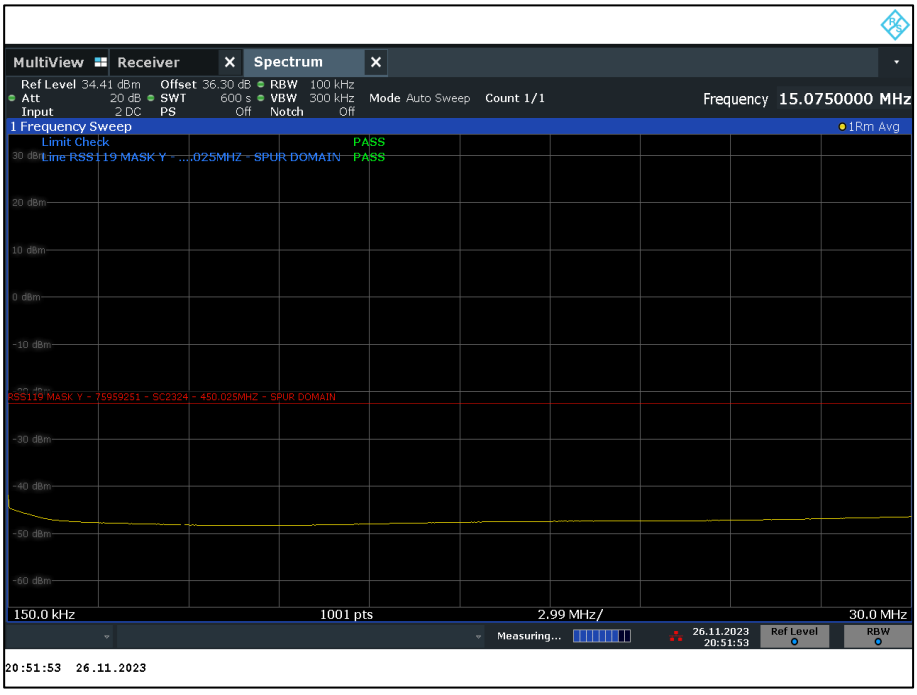


Figure 49 – 450.025 MHz, 150 kHz to 30 MHz, No Filter, RSS-119, Mask Y

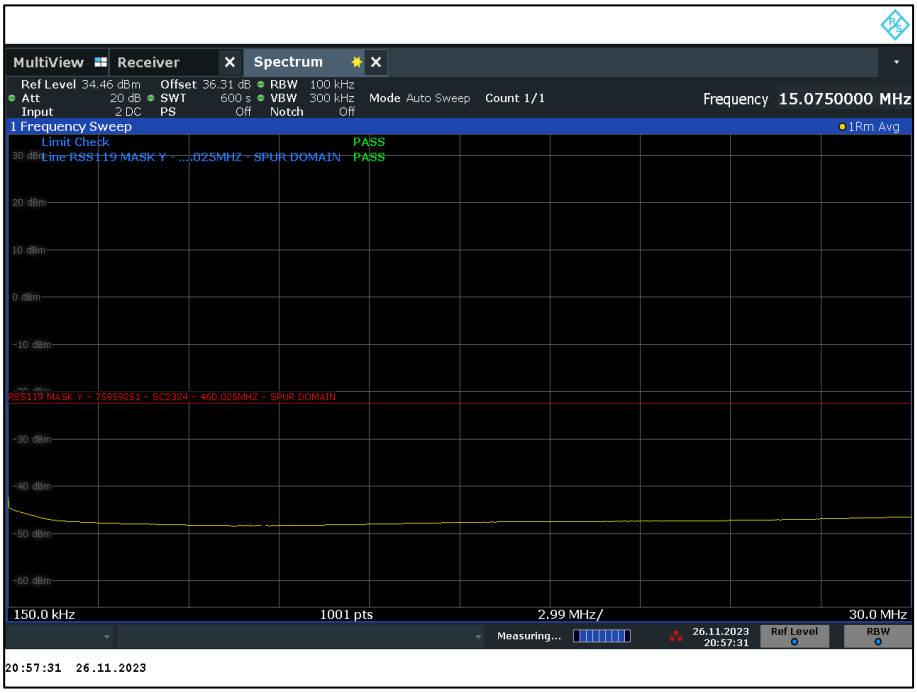


Figure 50 – 460.025 MHz, 150 kHz to 30 MHz, No Filter, RSS-119, Mask Y

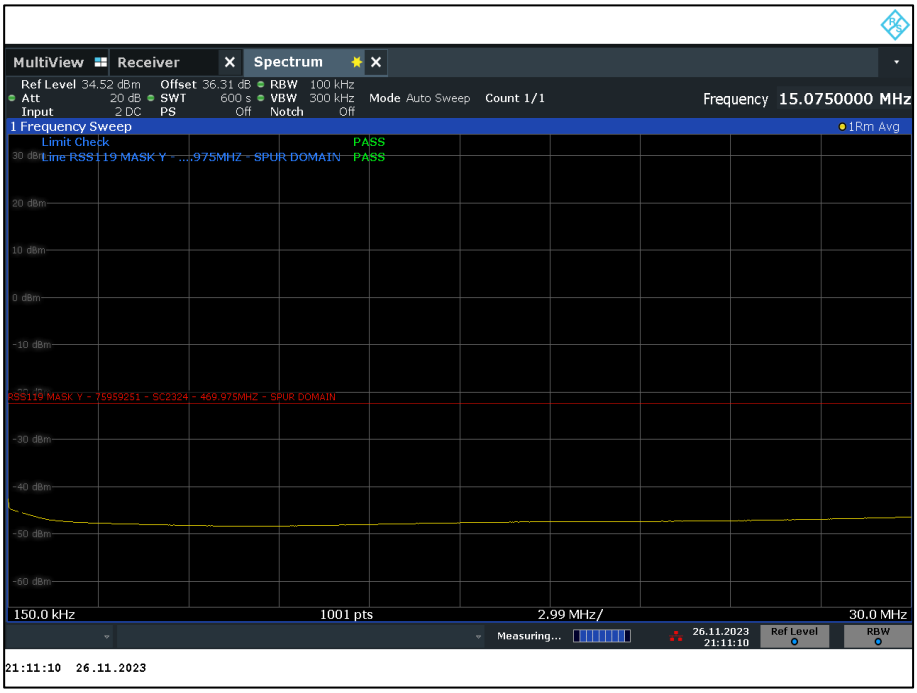


Figure 51 – 469.975 MHz - 150 kHz to 30 MHz, No Filter, RSS-119, Mask Y

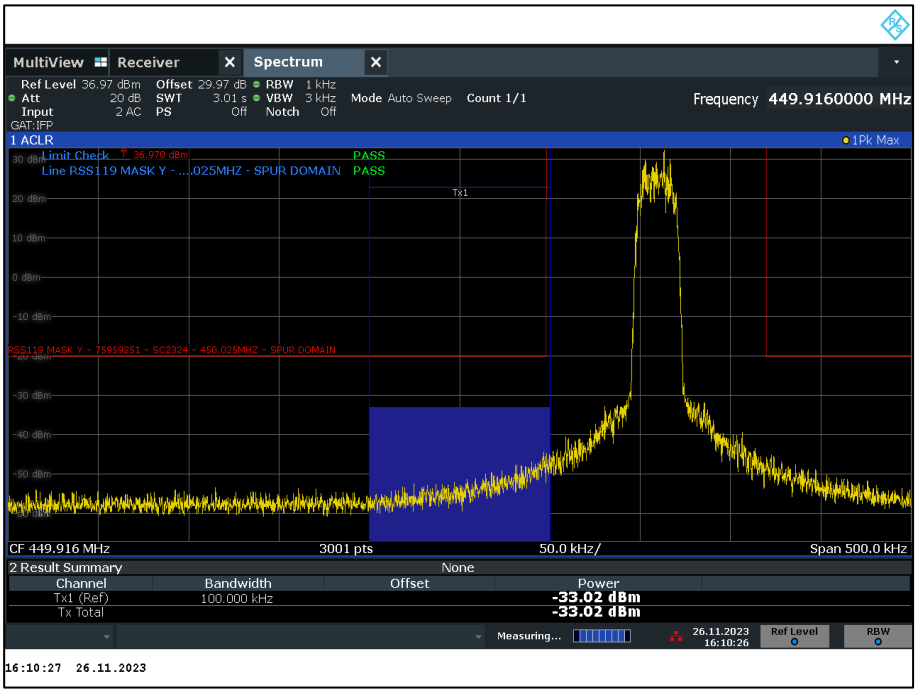


Figure 52 – 450.025 MHz, Channel Power Below ISED RSS-119 Mask edge (100kHz Band), No Filter, Mask Y

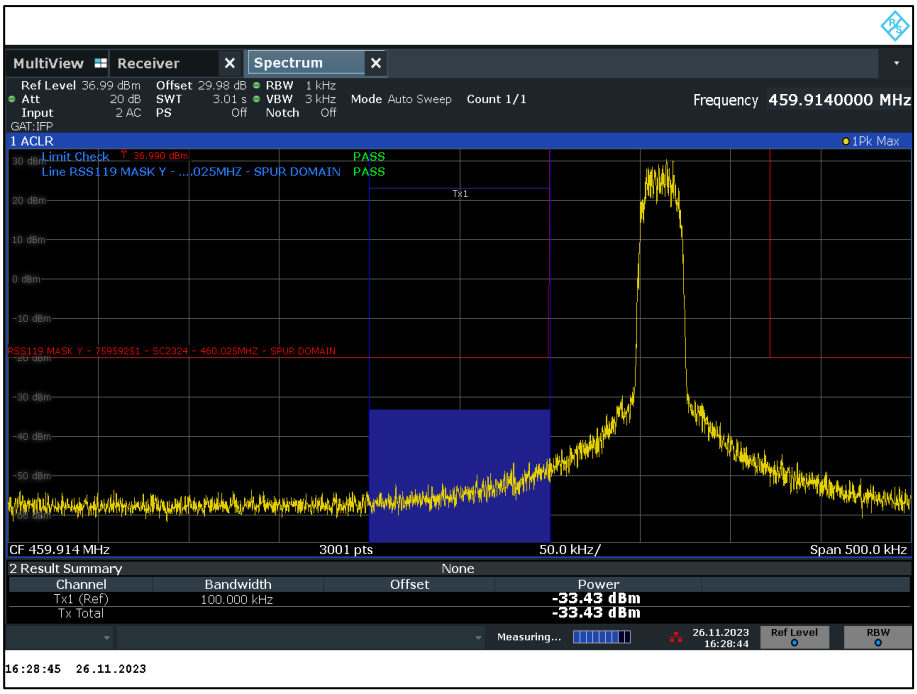


Figure 53 – 460.025 MHz, Channel Power Below ISED RSS-119 Mask edge (100kHz Band), No Filter, Mask Y

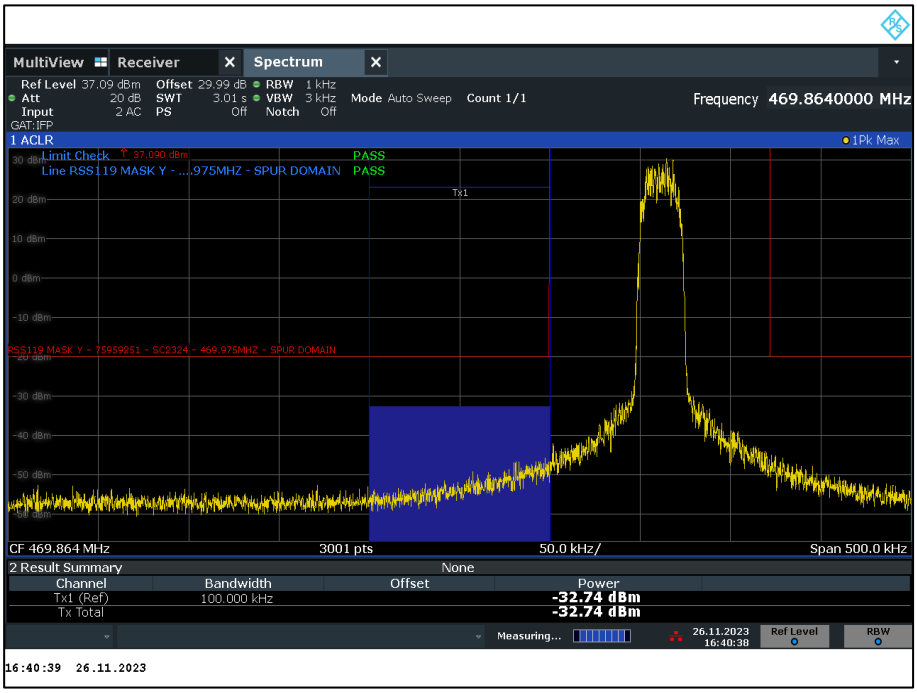


Figure 54 – 469.975 MHz - Channel Power Below ISED RSS-119 Mask edge (100kHz Band), No Filter, Mask Y

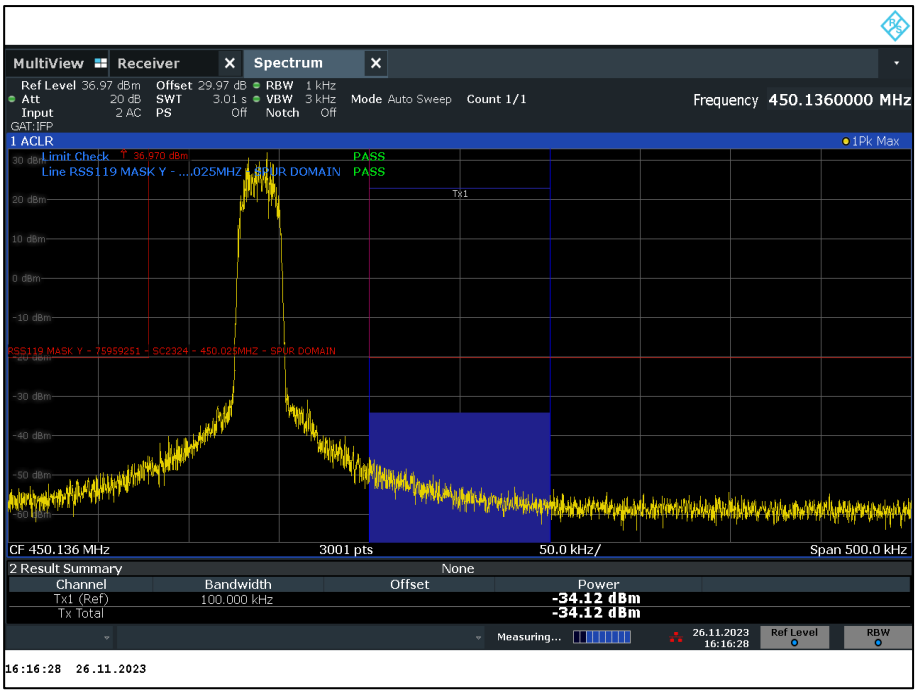


Figure 55 – 450.025 MHz, Channel Power Above ISED RSS-119 Mask edge (100kHz Band), No Filter, Mask Y

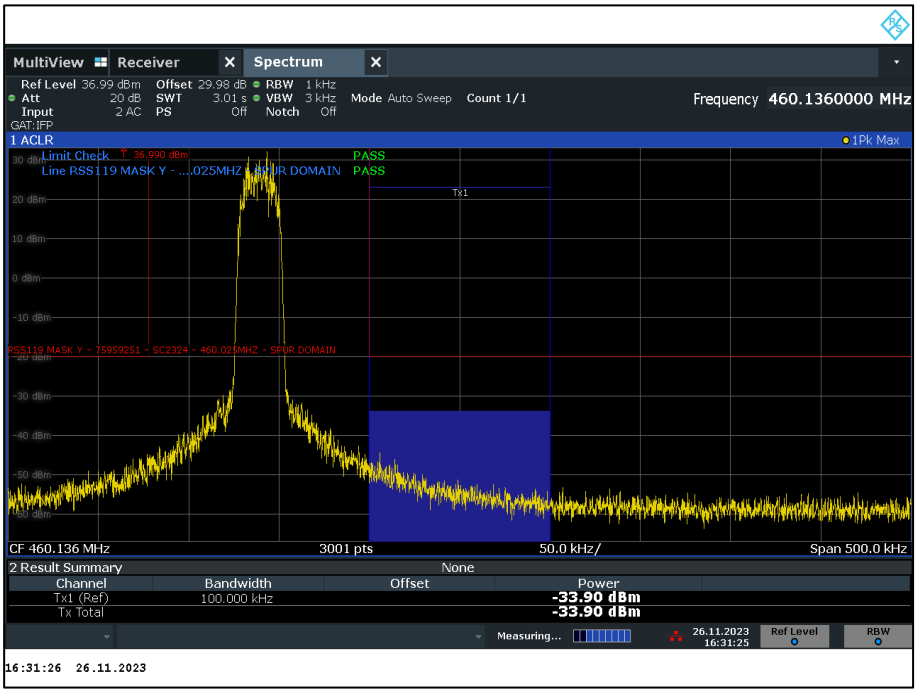


Figure 56 – 460.075 MHz, Channel Power Above ISED RSS-119 Mask edge (100kHz Band), No Filter, Mask Y

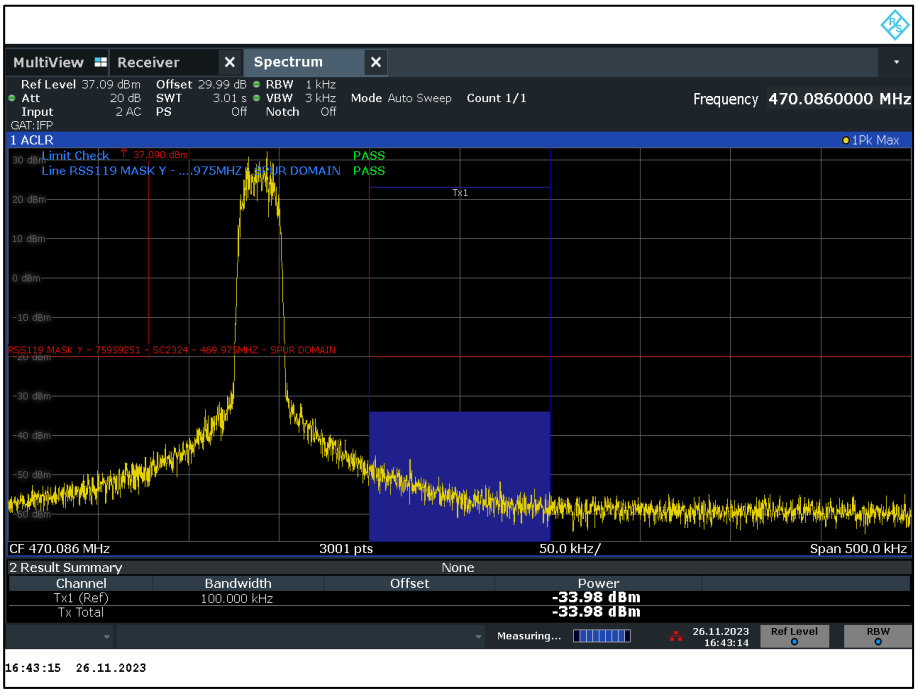


Figure 57 – 469.975 MHz - Channel Power Above ISED RSS-119 Mask edge (100kHz Band), No Filter, Mask Y

Tetra - 406.1-430 MHz

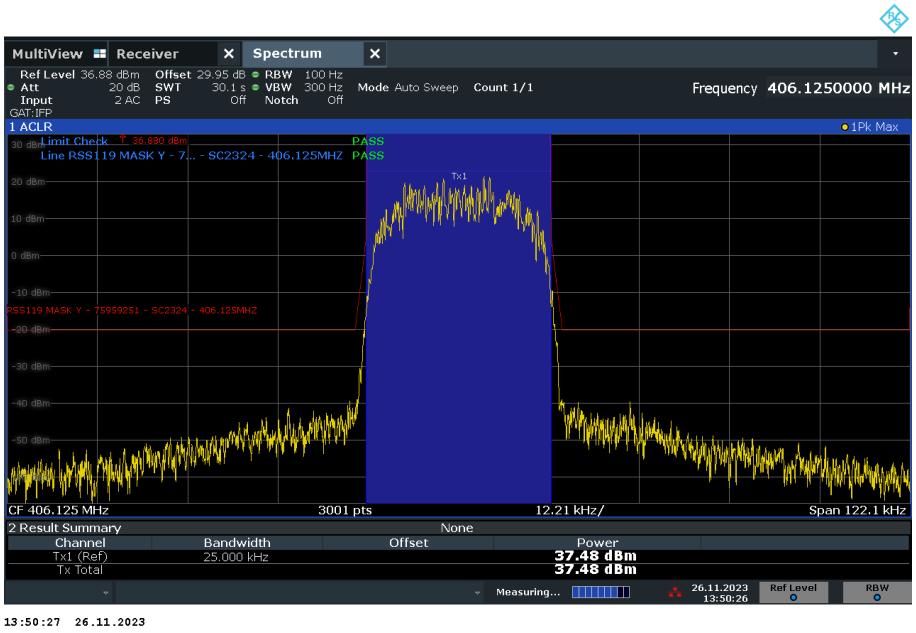


Figure 58 – 406.125 MHz, ISED RSS-119, Mask Y

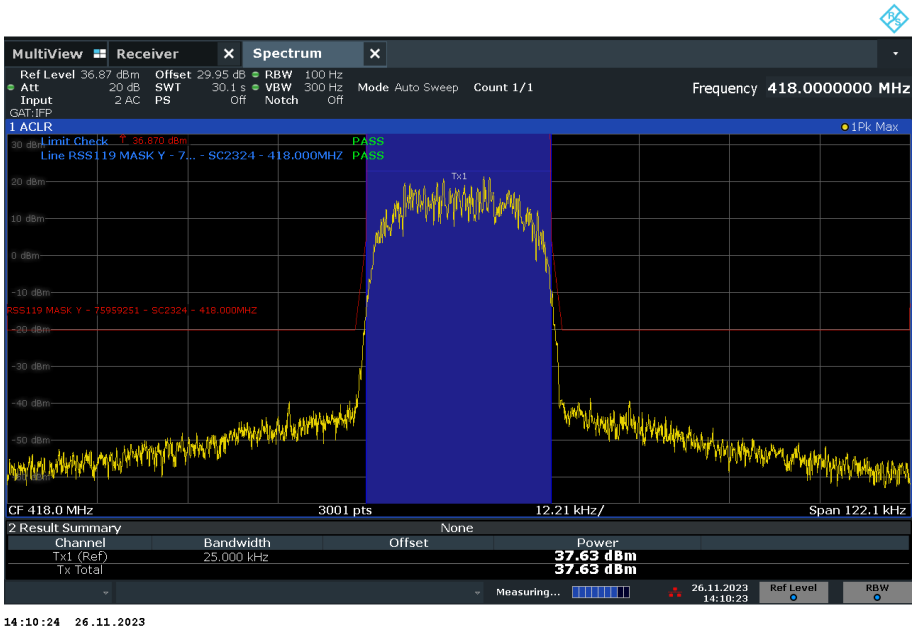


Figure 59 – 418.000 MHz, ISED RSS-119, Mask Y

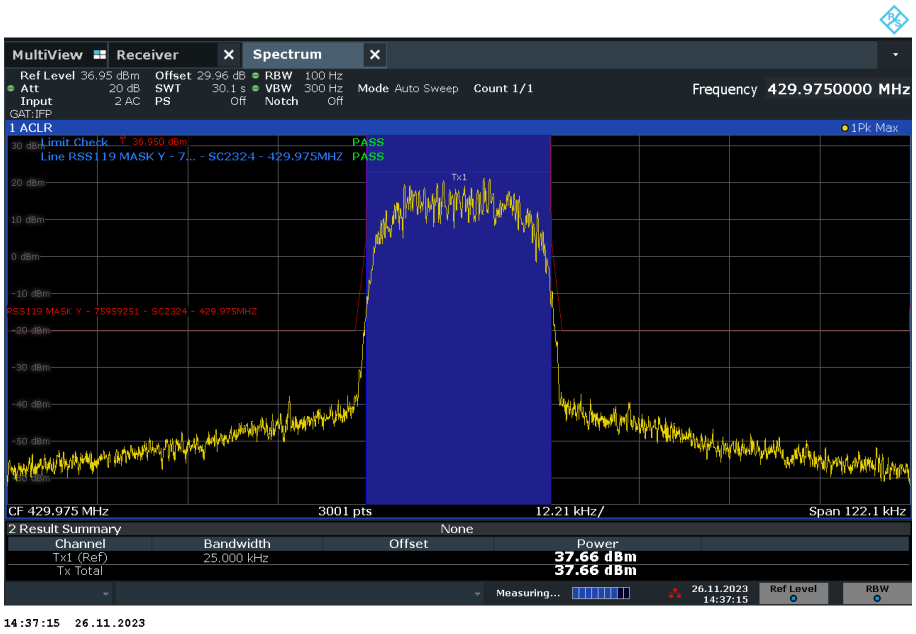


Figure 60 – 429.975 MHz, ISED RSS-119 , Mask Y

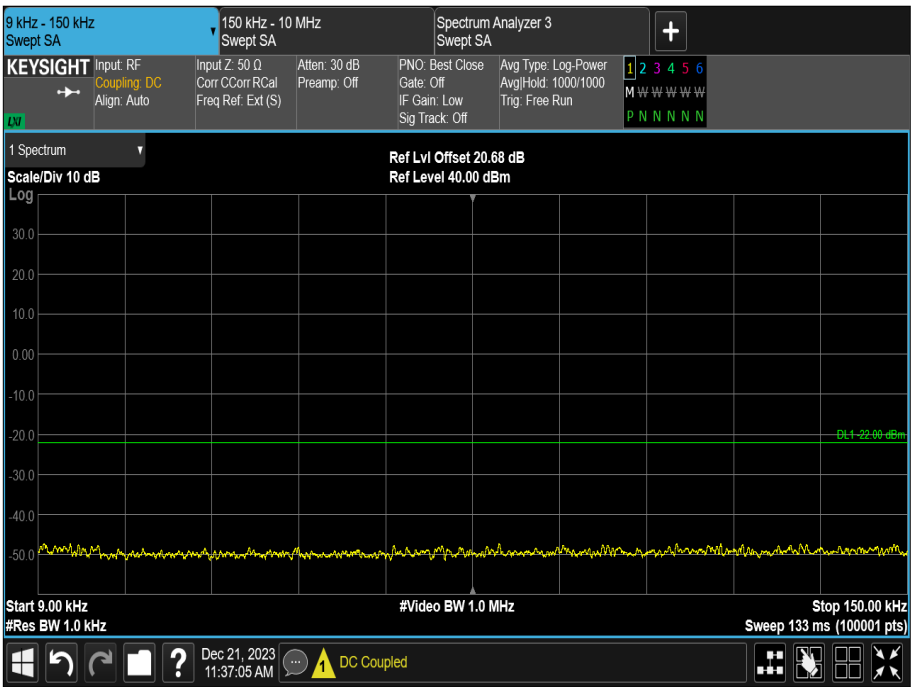


Figure 61 - 406.125 MHz, 9 kHz to 150 kHz

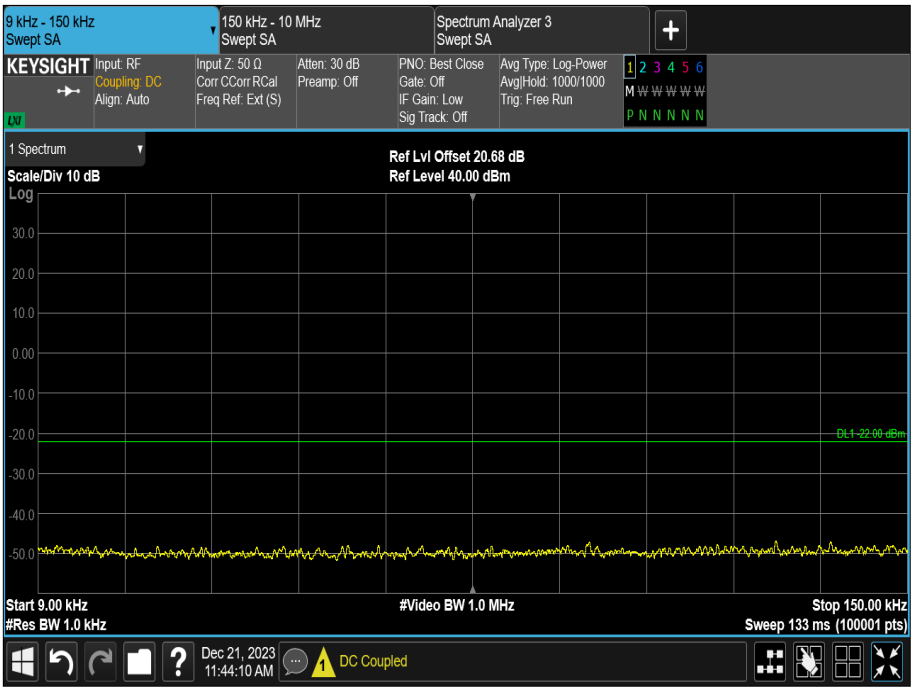


Figure 62 - 418 MHz, 9 kHz to 150 kHz

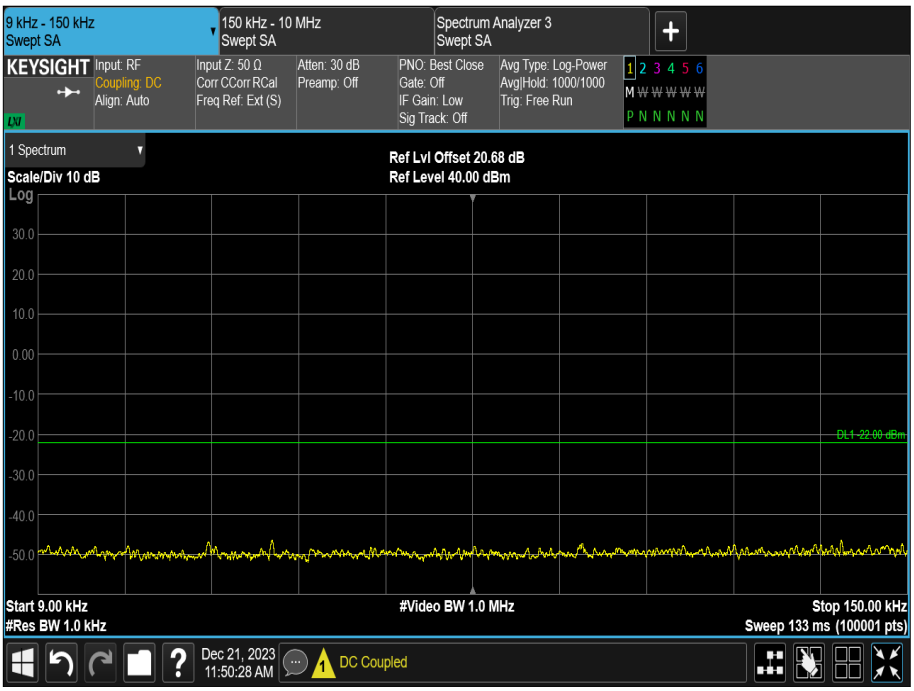


Figure 63 - 429.975 MHz - 9 kHz to 150 kHz

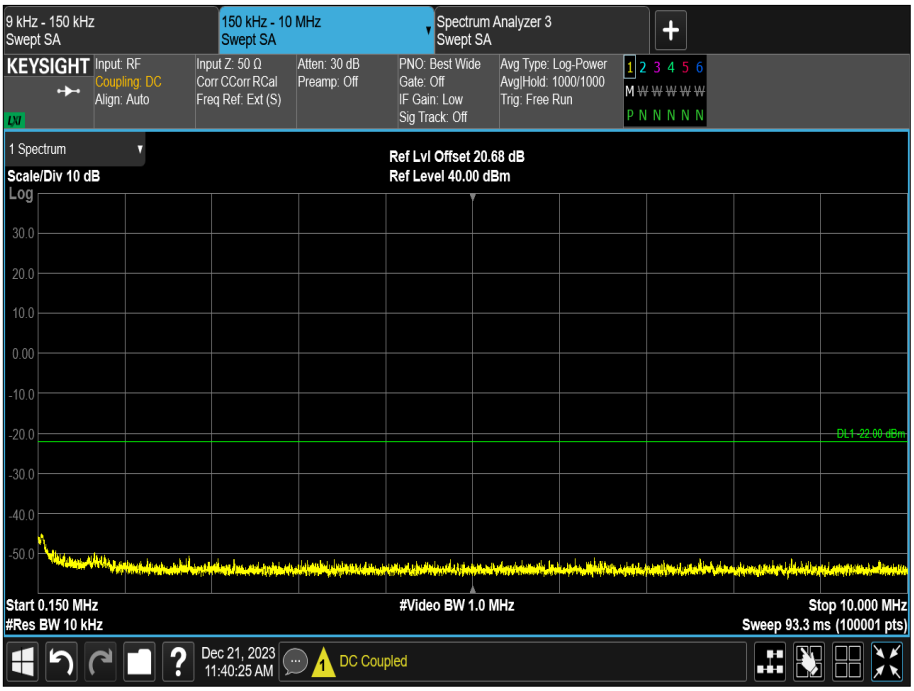


Figure 64 - 406.125 MHz, 150 kHz to 10 MHz

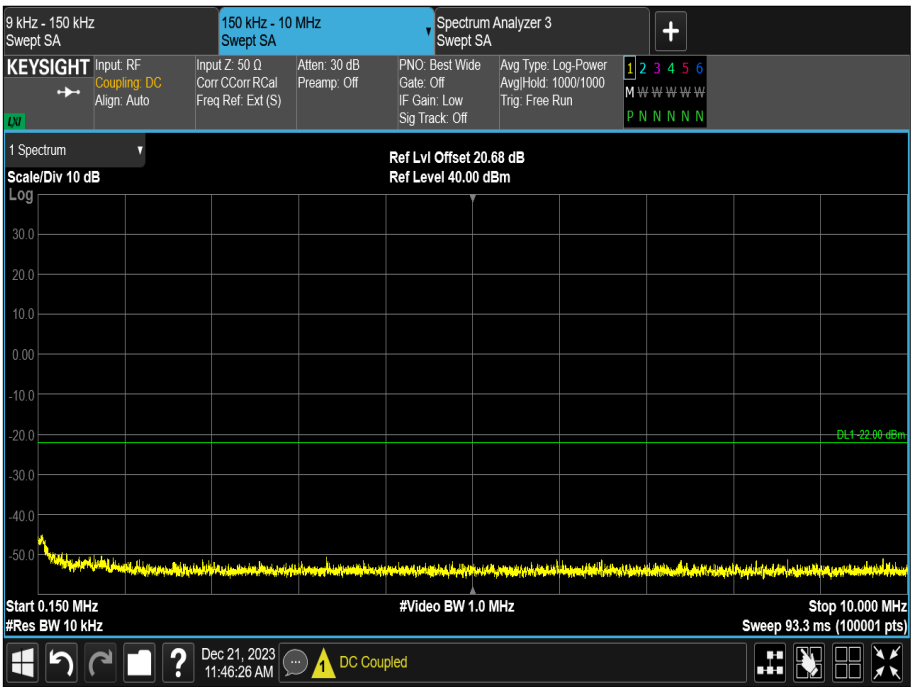


Figure 65 - 418 MHz, 150 kHz to 10 MHz

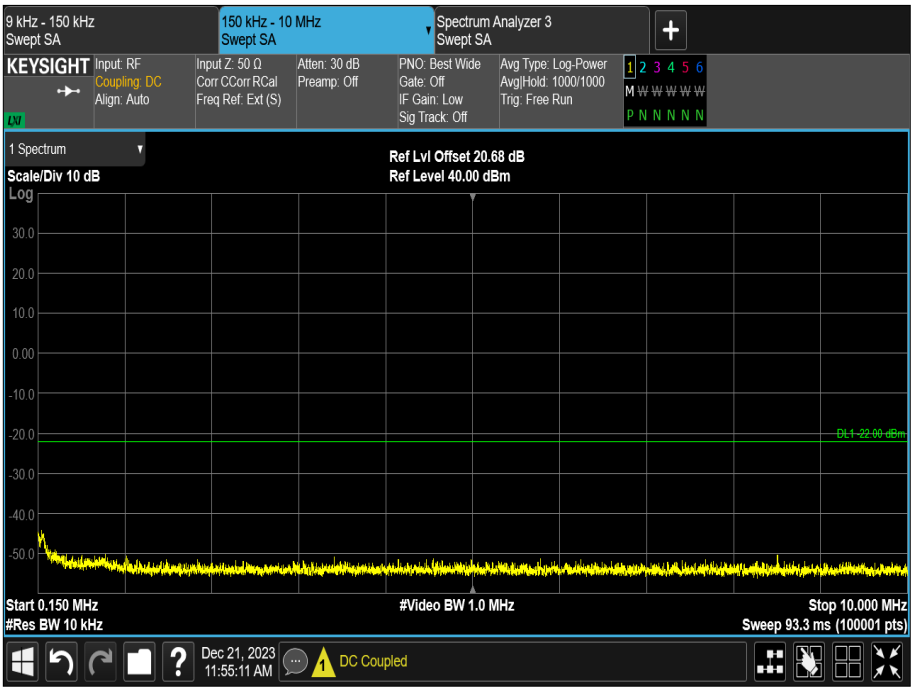


Figure 66 - 429.975 MHz - 150 kHz to 10 MHz

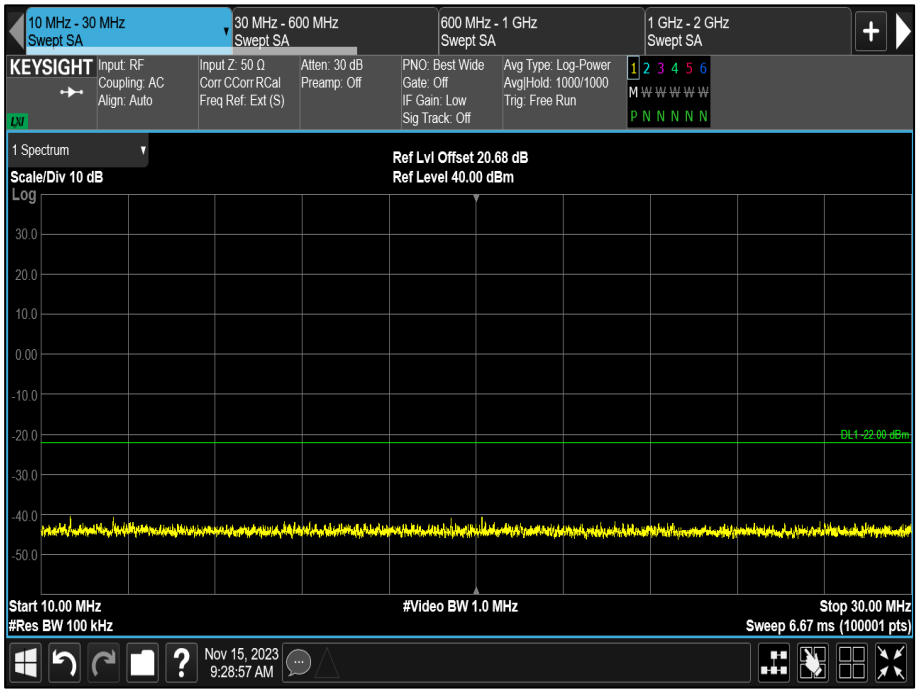


Figure 67 – 406.125 MHz, ISED RSS-119, 10 MHz to 30 MHz, Mask Y

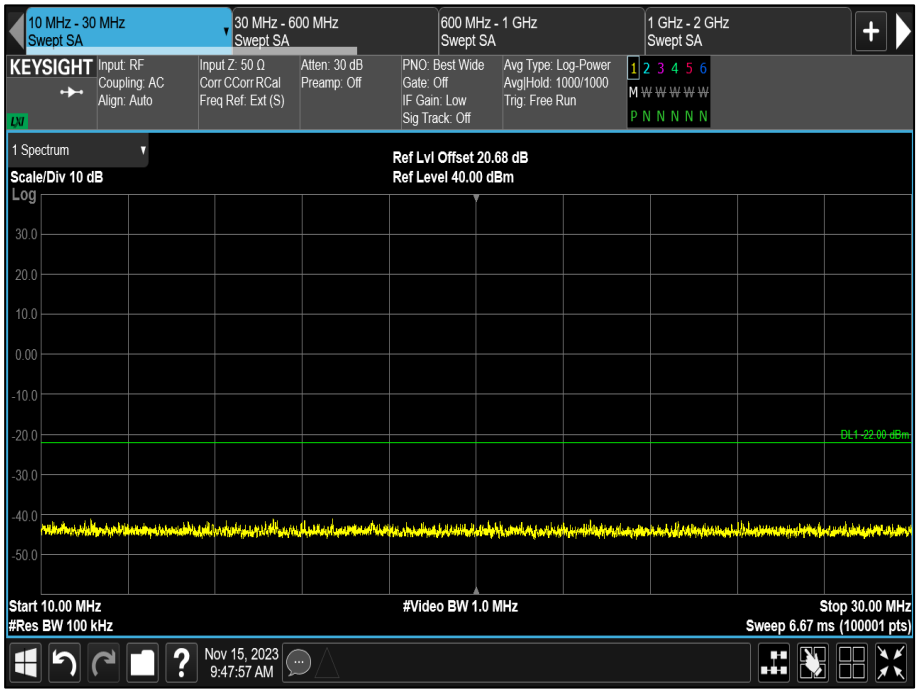


Figure 68 – 418.000 MHz, ISED RSS-119, 10 MHz to 30 MHz, Mask Y

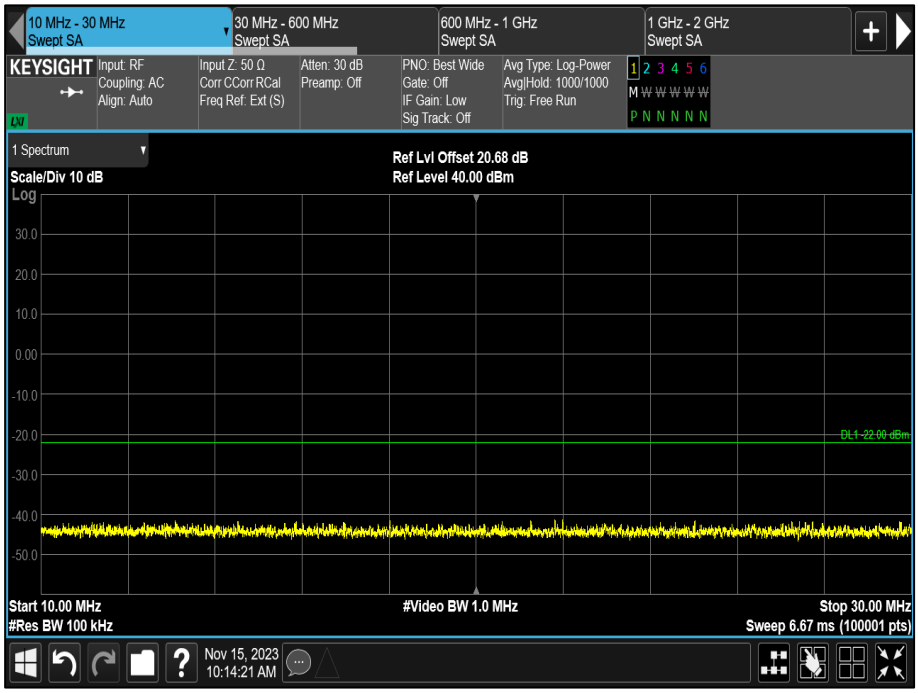


Figure 69 – 429.975 MHz, ISED RSS-119, 10 MHz to 30 MHz, Mask Y

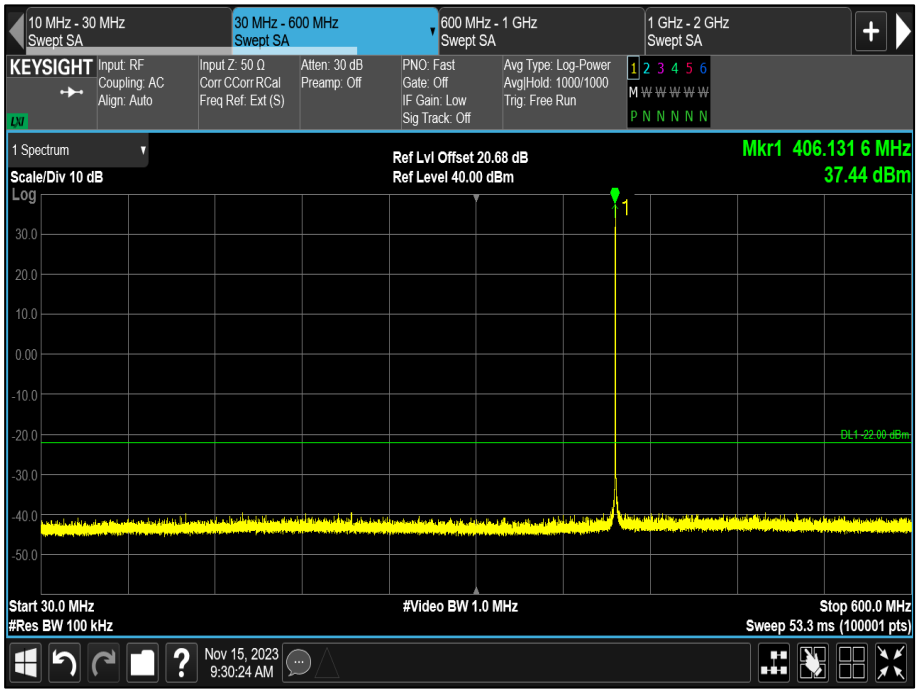


Figure 70 – 406.125 MHz, ISED RSS-119, 30 MHz to 600 MHz, Mask Y

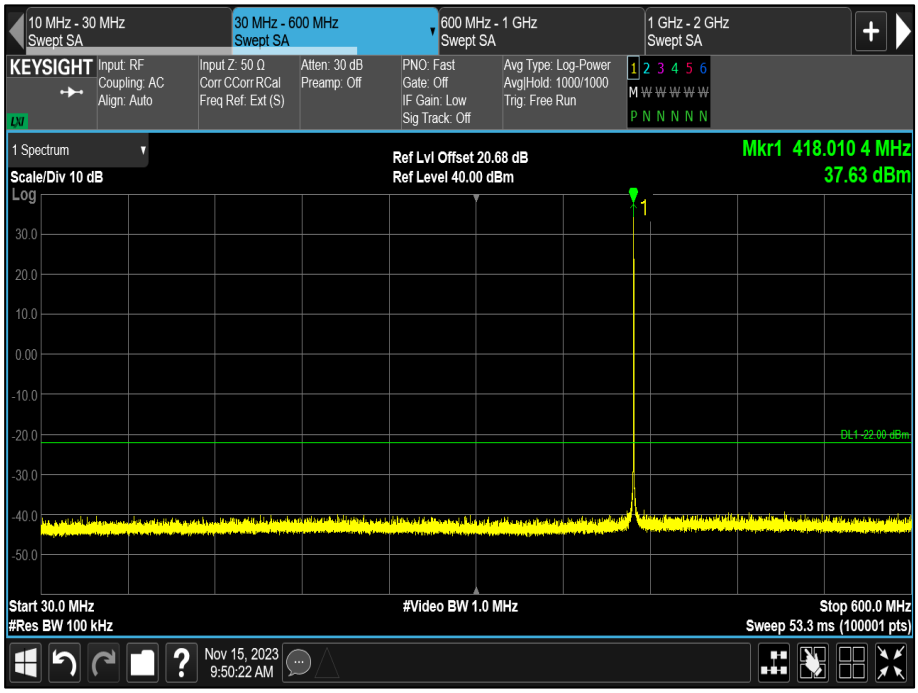


Figure 71 – 418.000 MHz, ISED RSS-119, 30 MHz to 600 MHz, Mask Y

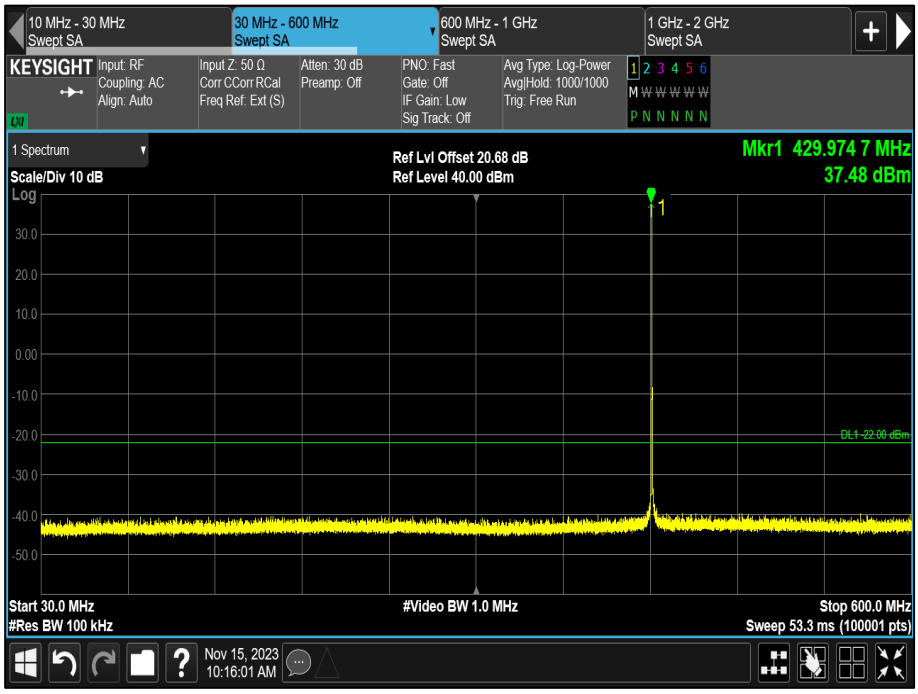


Figure 72 – 429.975 MHz, ISED RSS-119, 30 MHz to 600 MHz, Mask Y

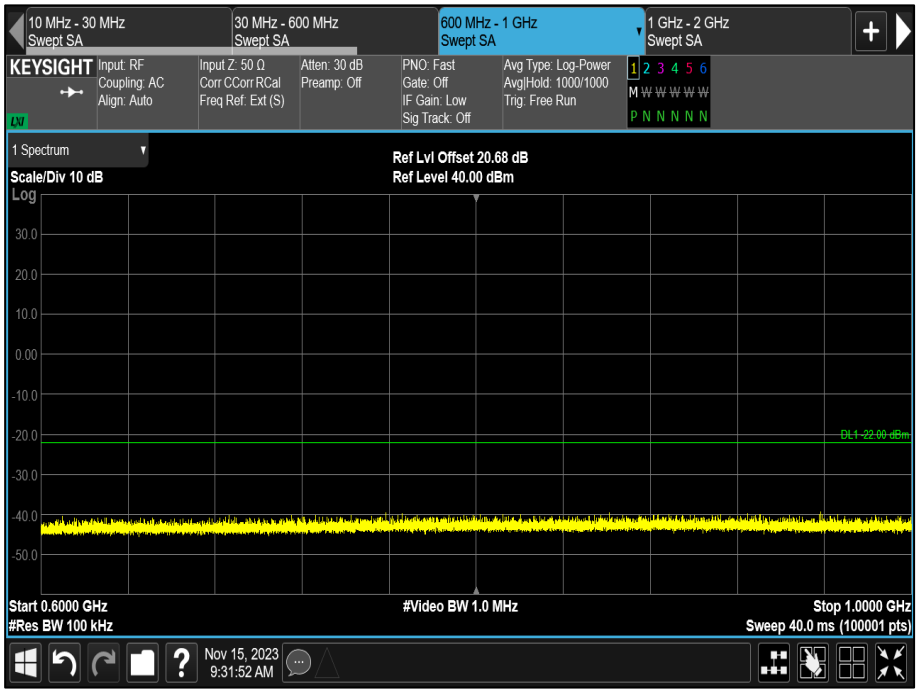


Figure 73 – 406.125 MHz, ISED RSS-119, 600 MHz to 1 GHz, Mask Y

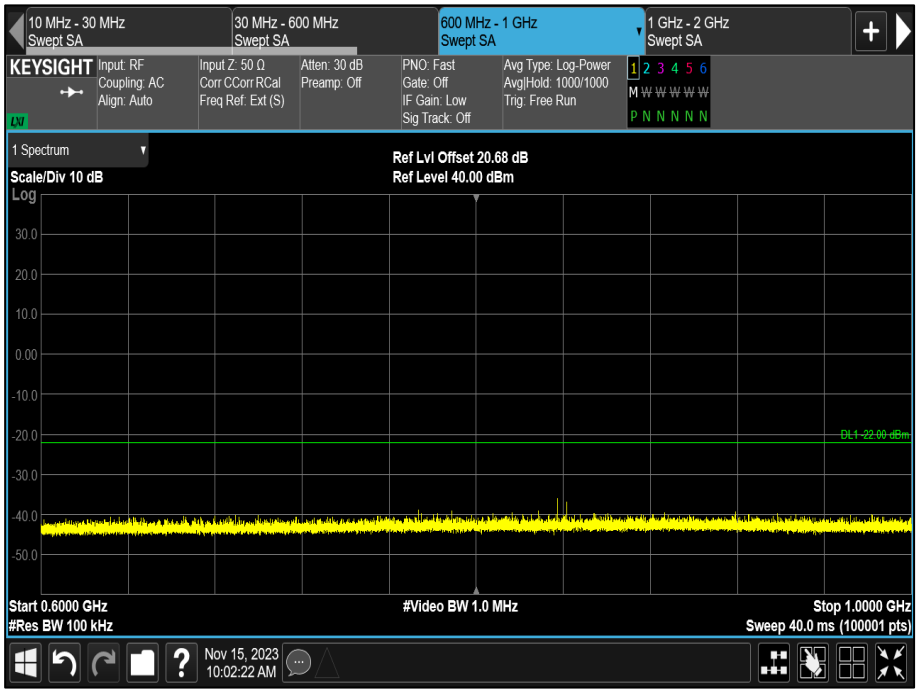


Figure 74 – 418.000 MHz, ISED RSS-119, 600 MHz to 1 GHz, Mask Y

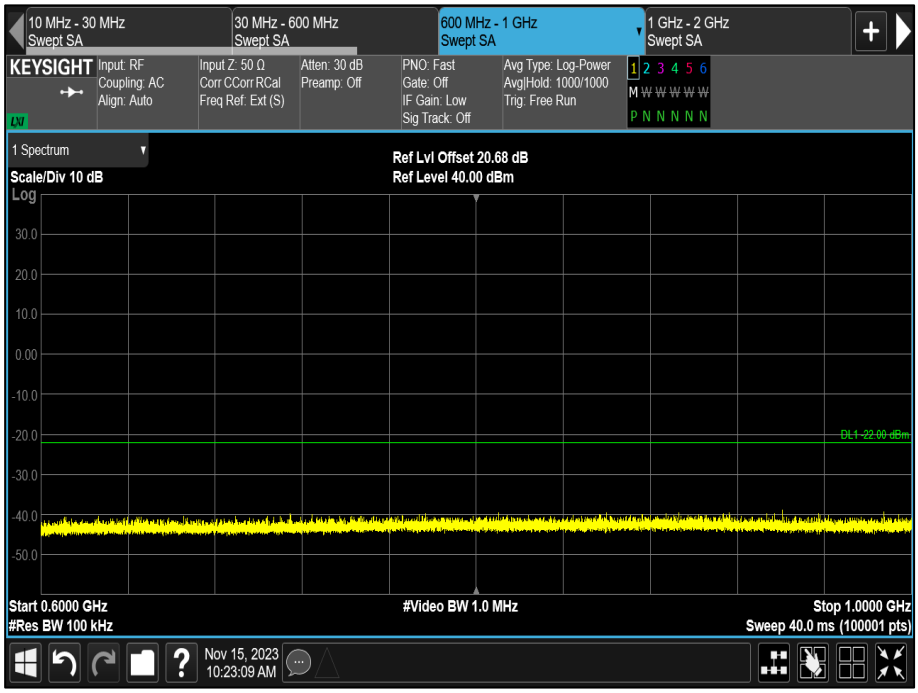


Figure 75 – 429.975 MHz, ISED RSS-119, 600 MHz to 1 GHz, Mask Y

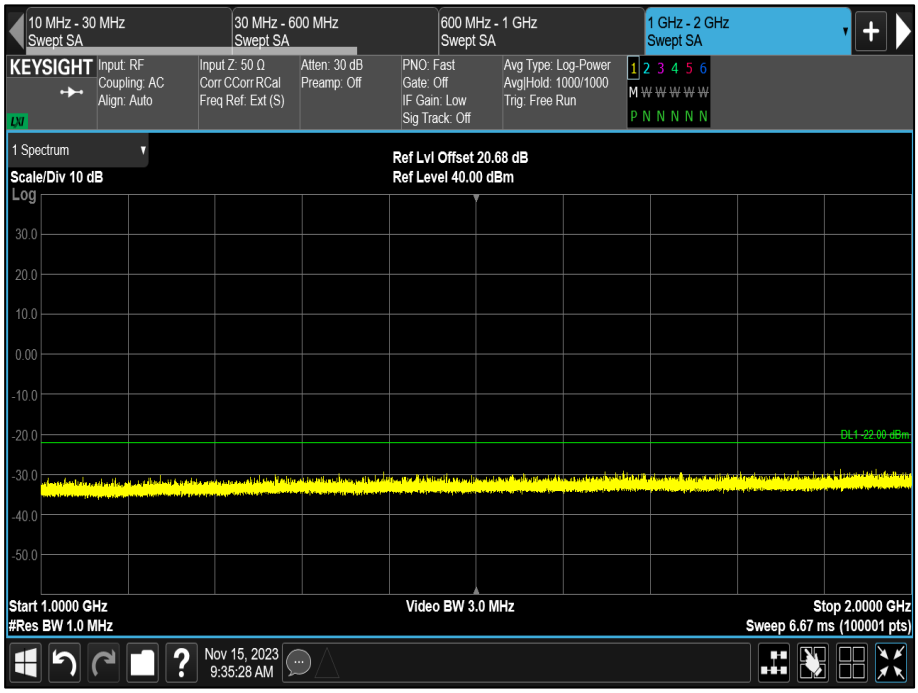


Figure 76 – 406.125 MHz, ISED RSS-119, 1 GHz to 2 GHz, Mask Y

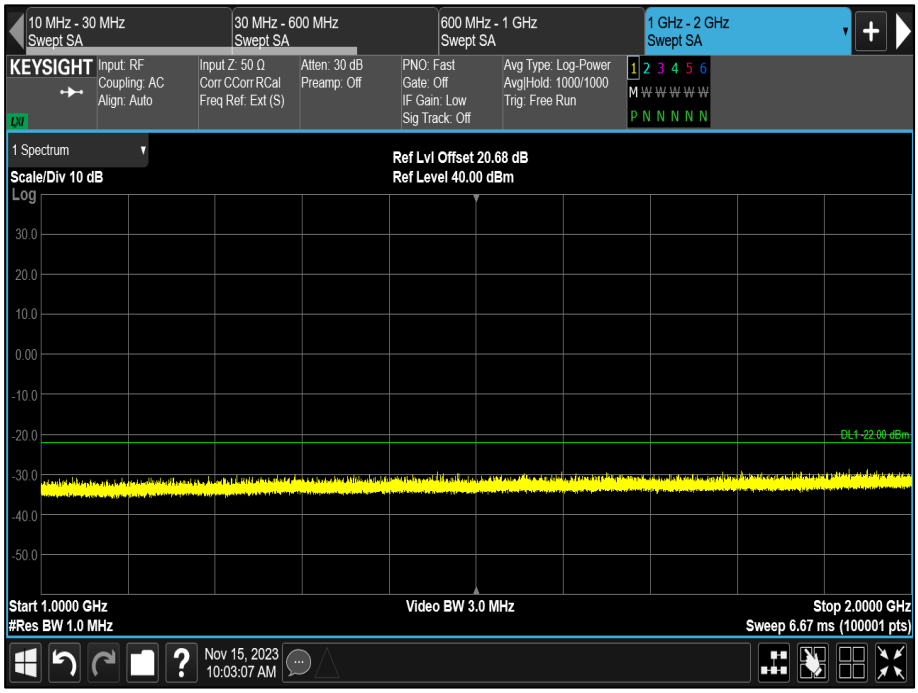


Figure 77 – 418.000 MHz, ISED RSS-119, 1 GHz to 2 GHz, Mask Y

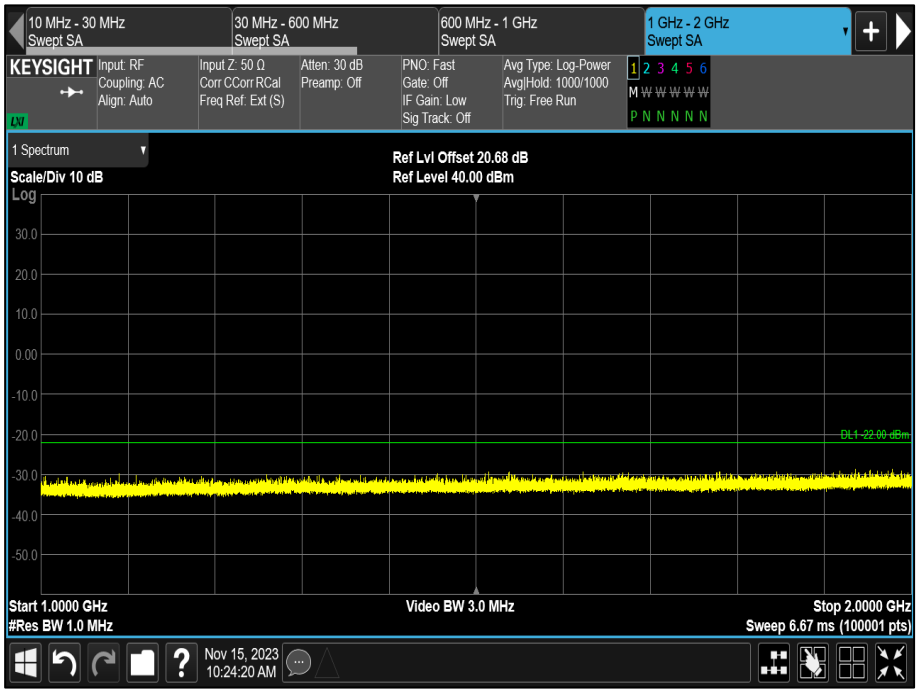


Figure 78 – 429.975 MHz, ISED RSS-119, 1 GHz to 2 GHz, Mask Y

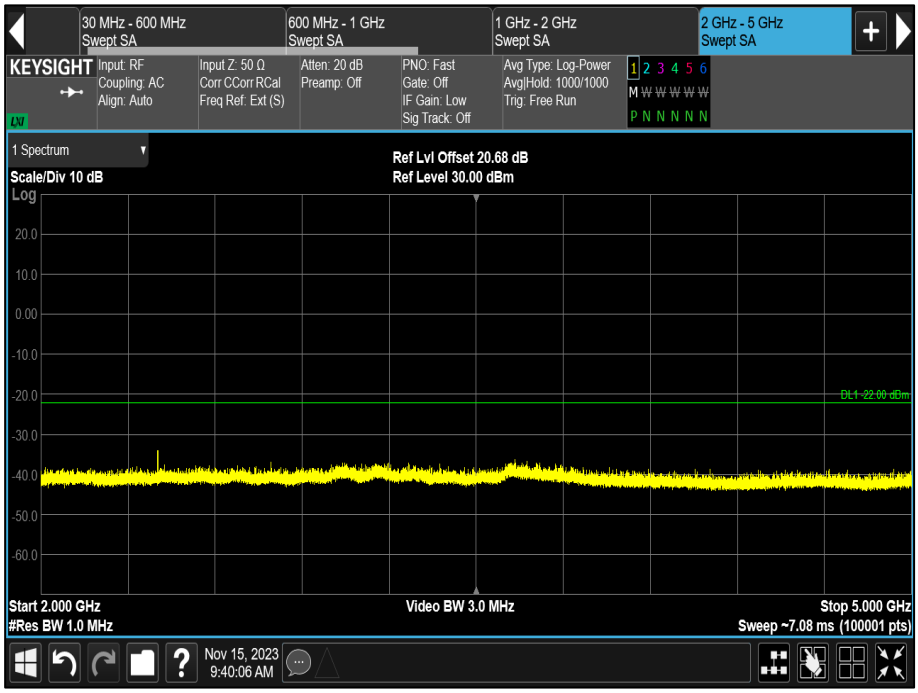


Figure 79 – 406.125 MHz, ISED RSS-119, 2 GHz to 5 GHz, Mask Y

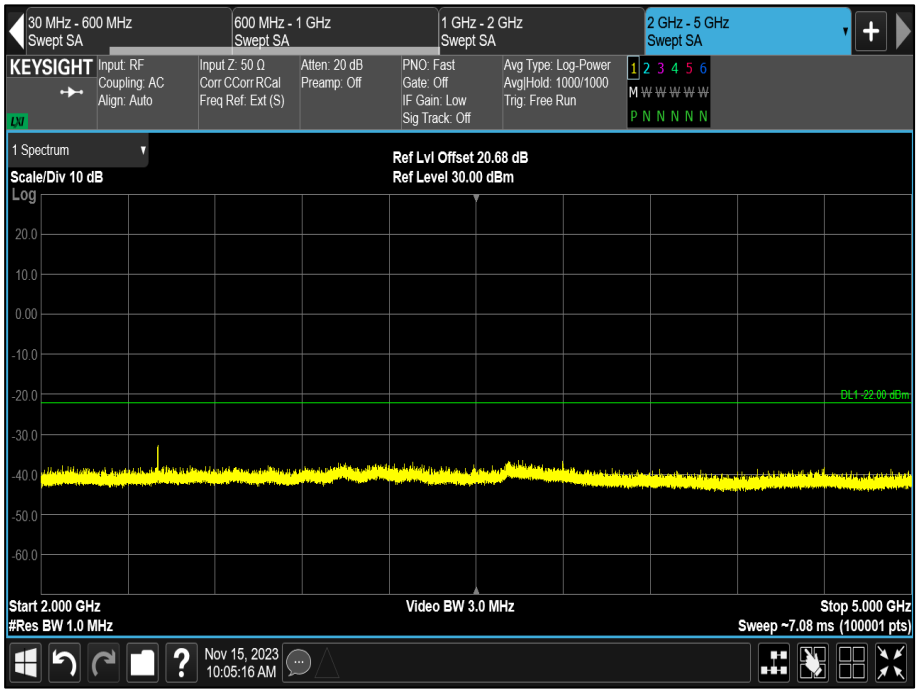


Figure 80 – 418.000 MHz, ISED RSS-119, 2 GHz to 5 GHz, Mask Y

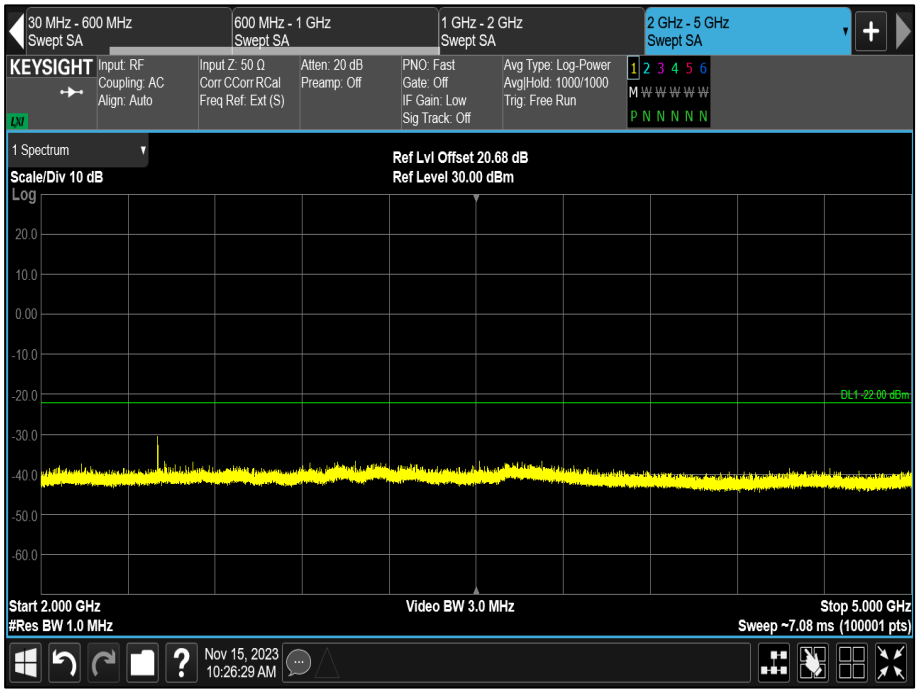


Figure 81 – 429.975 MHz, ISED RSS-119, 2 GHz to 5 GHz, Mask Y

x

FCC 47 CFR Part 90, Limit Clause 90.210

The EUT shall comply with emission mask 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 Industry Canada RSS-119, clause 5.8.

2.2.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5 and RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Power Supply Unit	Hewlett Packard	6282A	132	-	TU
Climatic Chamber	Votsch	VT4002	161	-	O/P Mon
Screened Room (5)	Rainford	Rainford	1545	36	15-Apr-2024
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	13-Mar-2024
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Feb-2024
Hygropalm Temperature and Humidity Meter	Rotronic	HP21	4410	12	08-Aug-2024
Cable (40 GHz)	Rosenberger	LU1-001-1000	5022	12	29-Jan-2024
Hygrometer with pressure meter	Testo	622	5047	12	28-Sep-2024
1 GHz High Pass Filter	Mini-Circuits	NHP 1000+	5260	12	24-Aug-2024
Attenuator 5W 20dB DC-18GHz	Aaren	AT40A-4041-D18-20	5500	12	21-May-2024
EMI Test Receiver	Rohde & Schwarz	ESW44	5527	12	15-Jun-2024
3 GHz High pass Filter	Wainwright	WHKX12-2580-3000-18000-80SS	5547	12	30-May-2024
3 GHz High pass Filter	Wainwright	WHKX12-2580-3000-18000-80SS	5548	12	16-Aug-2024
DVM - Digital Multimeter	Iso-tech	IDM101	5601	12	20-Feb-2024
Modular Power System Mainframe	Keysight Technologies	N6701C	5835	-	TU
DC Power Module 60V 20A 300W	Keysight Technologies	N6754A	5836	-	O/P Mon
1m K-Type Cable	Junkosha	MWX221/B	5908	12	21-May-2024
MXA Signal Analyser	Keysight Technologies	N9020B	6418	24	27-Feb-2025

Table 22

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

2.3 Radiated Spurious Emissions

2.3.1 Specification Reference

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

2.3.2 Equipment Under Test and Modification State

SC2324, S/N: 1PR002336GKM4HR - Modification State 0
SC2324, S/N: 1PR002331GKK87R - Modification State 0

2.3.3 Date of Test

18-October-2023 to 28-October-2023

2.3.4 TestTh 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:

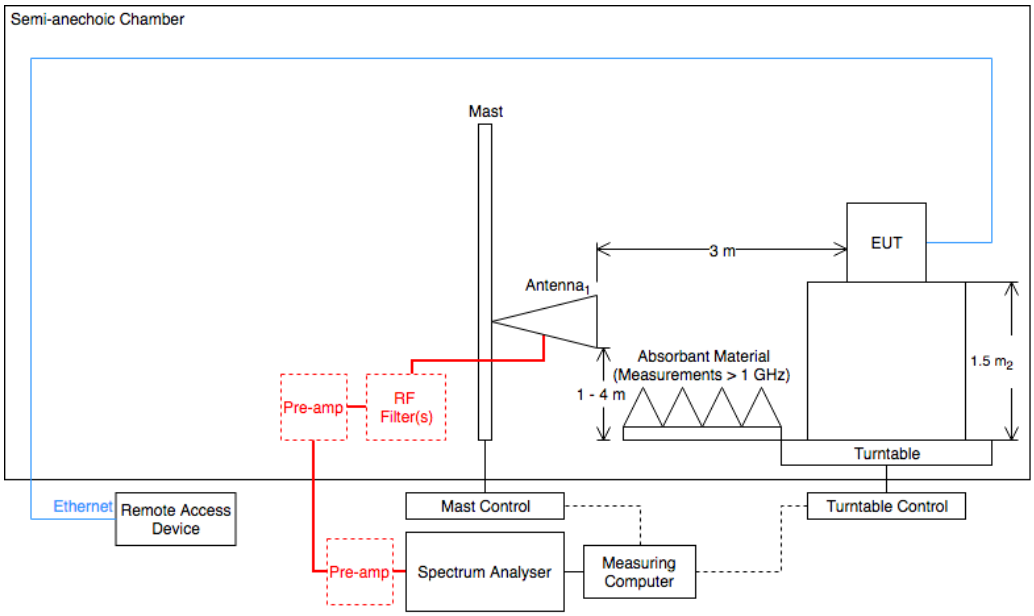
E (dBuV/m) + 20log(d) - 104.8 = EIRP (dBm) where (d) is the measurement distance.

70.2 (dBuV/m) + 20log(3) – 104.8 = EIRP (dBm)

-25.0 = EIRP (dBm)

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.

2.3.5 Example Test Setup Diagram



1 Antenna is boresighted for measurements > 1 GHz.
2 Height from the EUT to ground is 0.8 m for measurements < 1 GHz.

Figure 82

2.3.6 Environmental Conditions

Ambient Temperature	20.1 - 21.3 °C
Relative Humidity	48.3 - 50.6 %

2.3.7 Test Results

Tetra - 450-470 MHz

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
899.989	66.00	70.2	-4.2	Peak	154	100	Horizontal	X
900.073	66.99	70.2	-3.21	Peak	207	107	Vertical	Y
900.028	66.85	70.2	-3.35	Peak	115	100	Horizontal	Z

Table 23 - 450.025 MHz, 30 MHz to 5 GHz

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

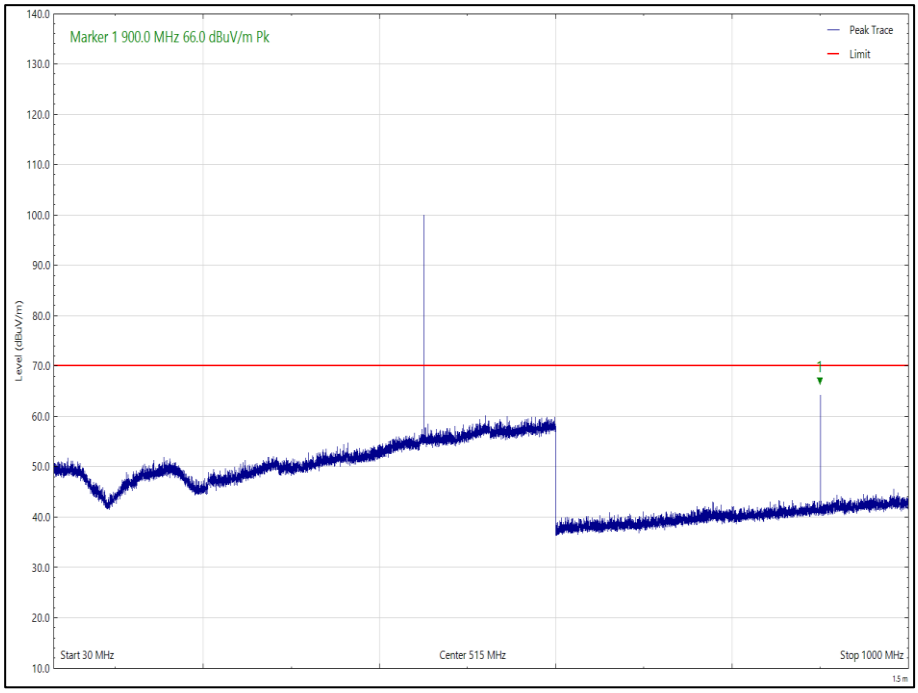


Figure 83 - 450.025 MHz - 30 MHz to 1 GHz, EUT Orientation X Horizontal

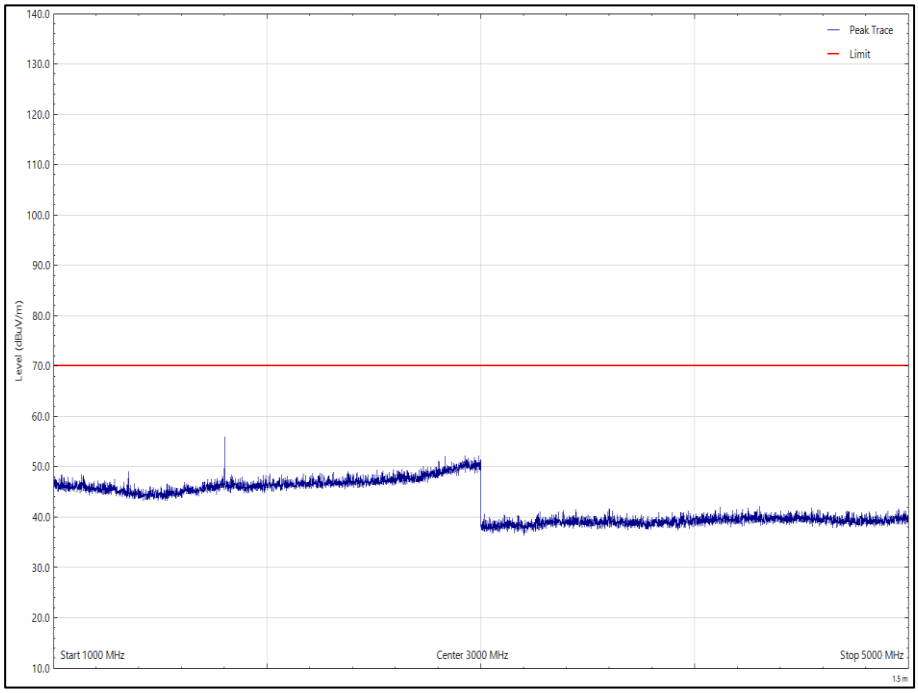


Figure 84 - 450.025 MHz - 1 GHz to 5 GHz, EUT Orientation X Horizontal

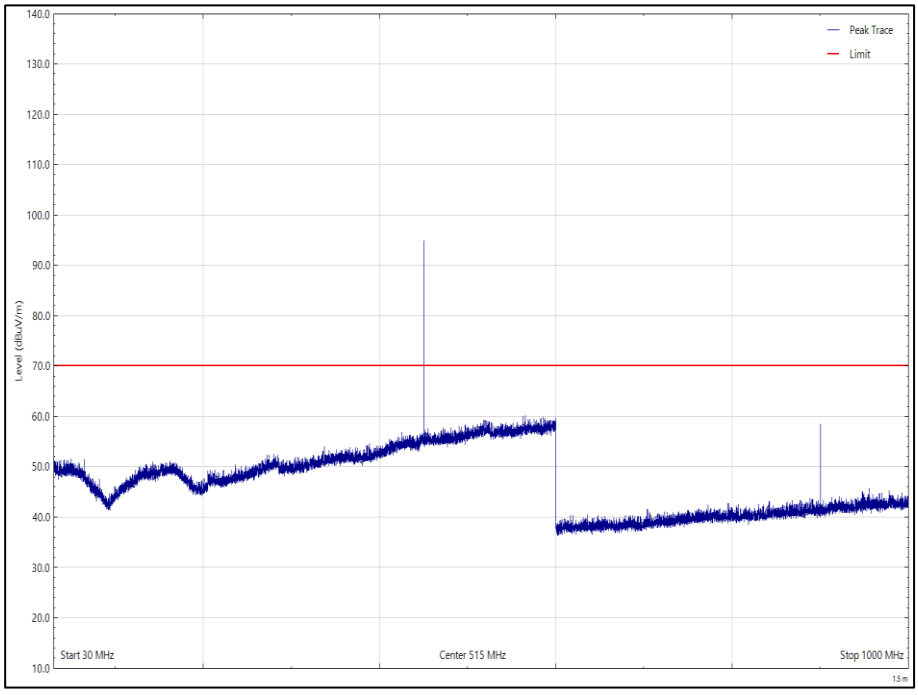


Figure 85 - 450.025 MHz - 30 MHz to 1 GHz, EUT Orientation X Vertical

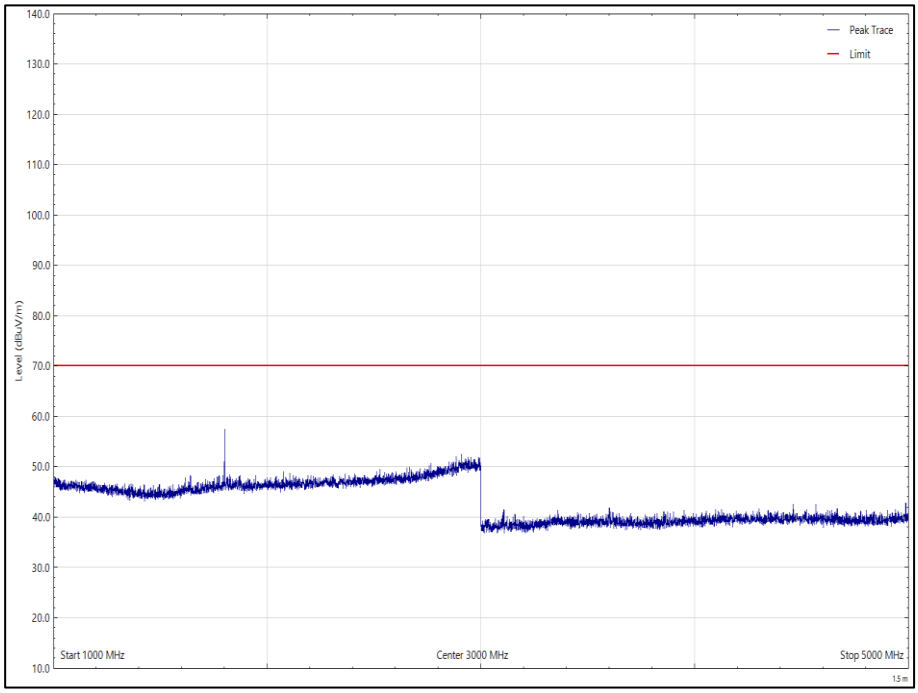


Figure 86 - 450.025 MHz - 1 GHz to 5 GHz, EUT Orientation X Vertical

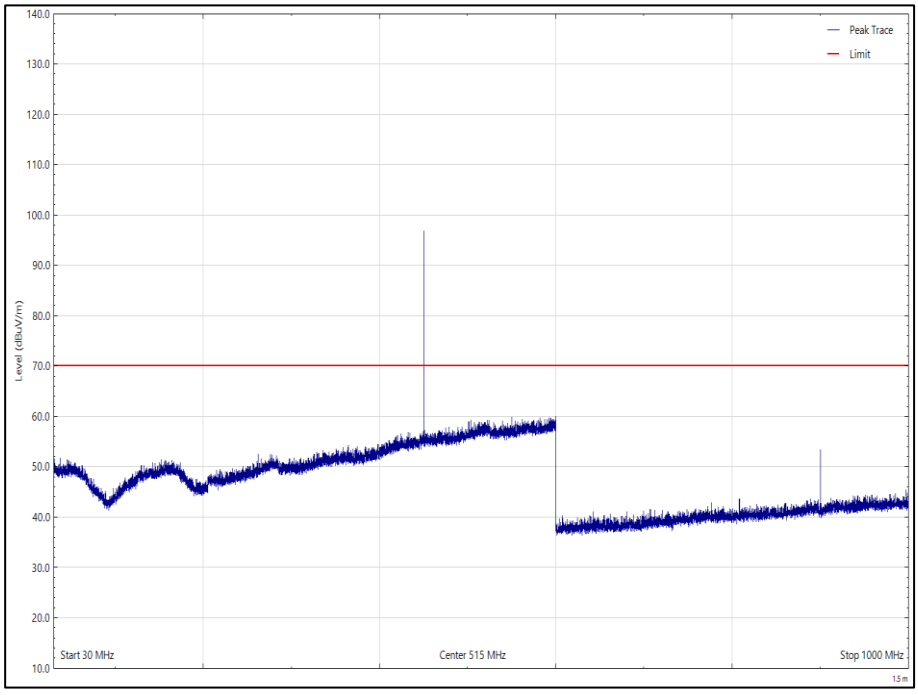


Figure 87 - 450.025 MHz - 30 MHz to 1 GHz, EUT Orientation Y Horizontal

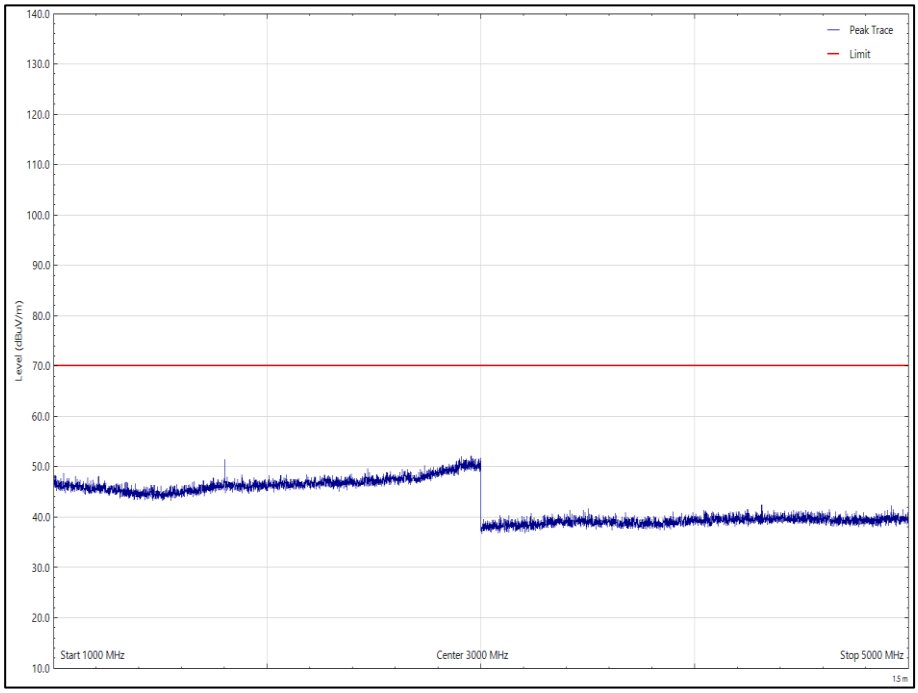


Figure 88 - 450.025 MHz - 1 GHz to 5 GHz, EUT Orientation Y Horizontal

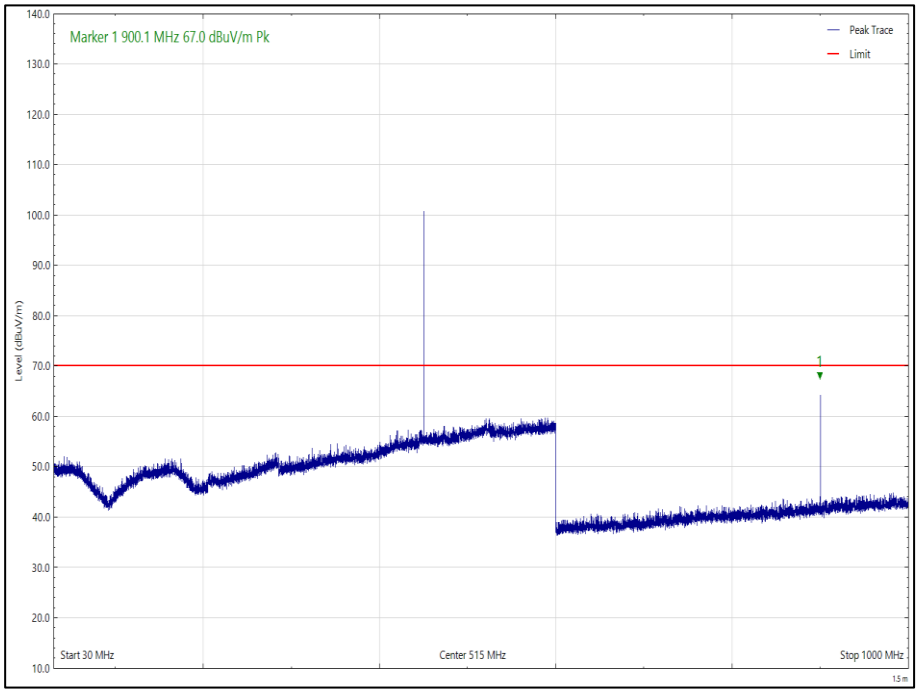


Figure 89 - 450.025 MHz - 30 MHz to 1 GHz, EUT Orientation Y Vertical

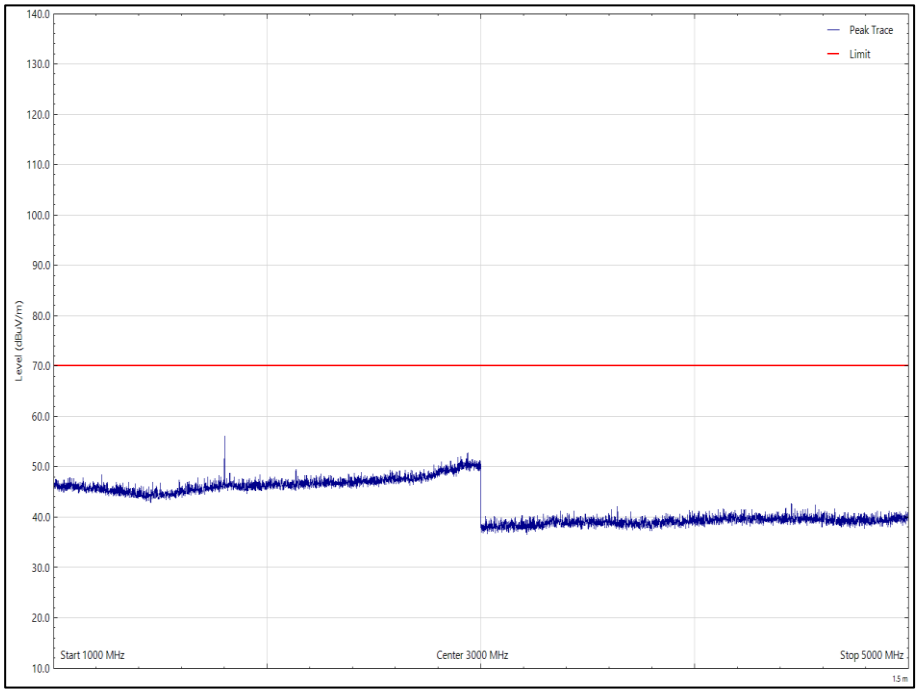


Figure 90 - 450.025 MHz - 1 GHz to 5 GHz, EUT Orientation Y Vertical

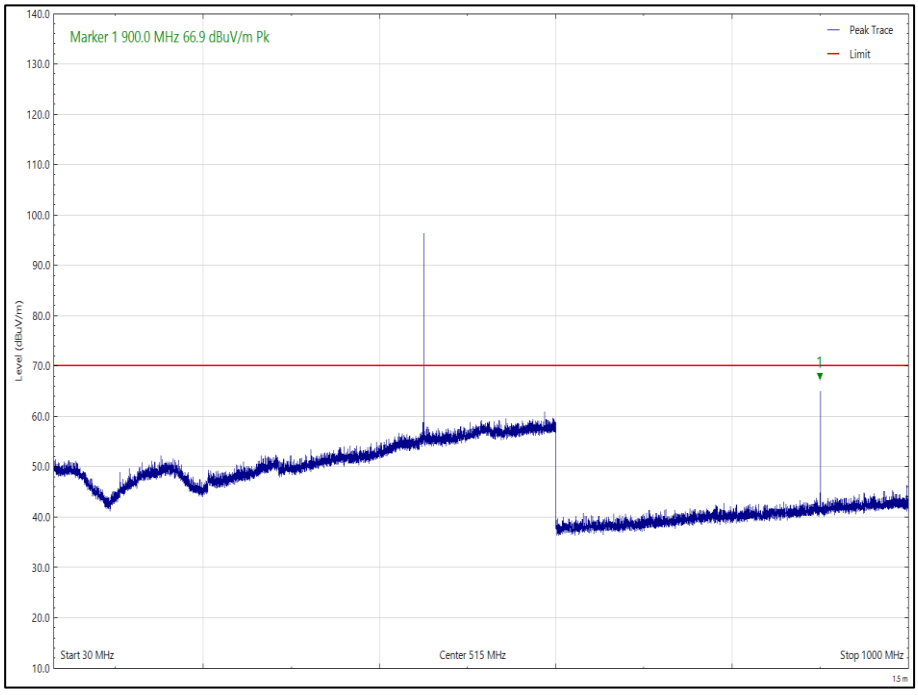


Figure 91 - 450.025 MHz - 30 MHz to 1 GHz, EUT Orientation Z Horizontal

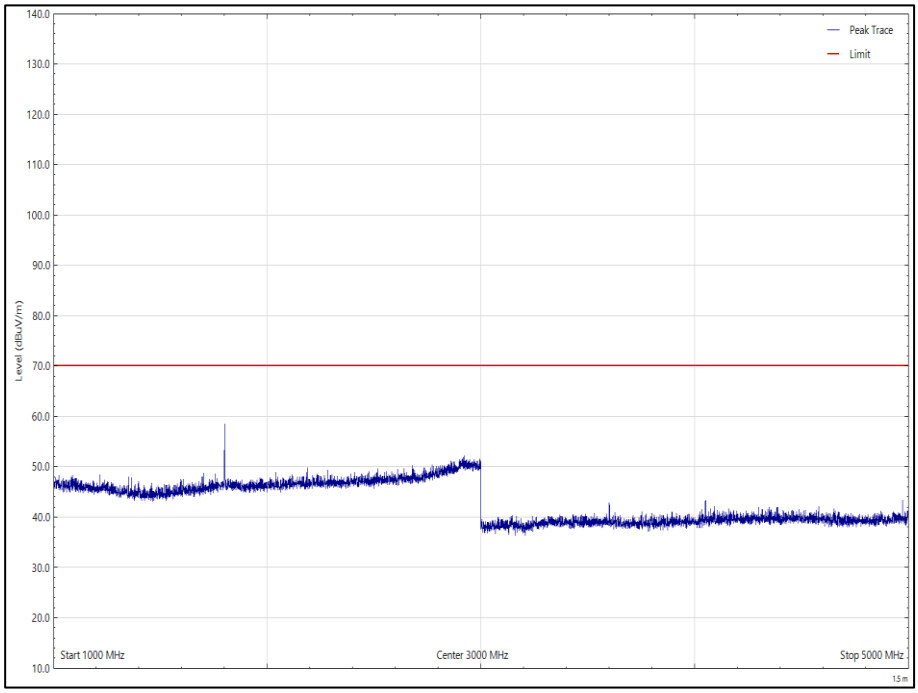


Figure 92 - 450.025 MHz - 1 GHz to 5 GHz, EUT Orientation Z Horizontal

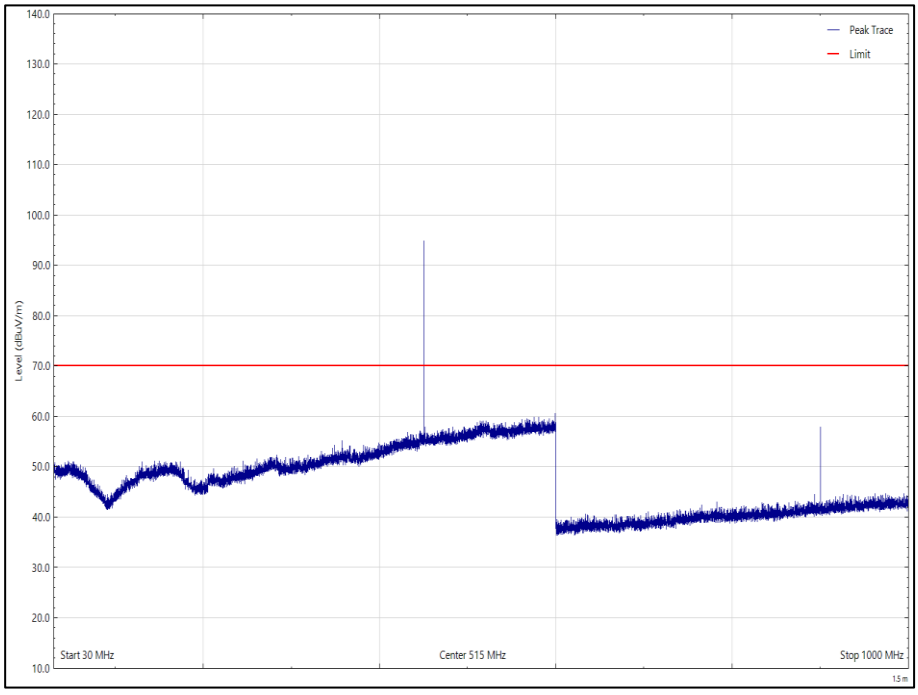


Figure 93 - 450.025 MHz - 30 MHz to 1 GHz, EUT Orientation Z Vertical

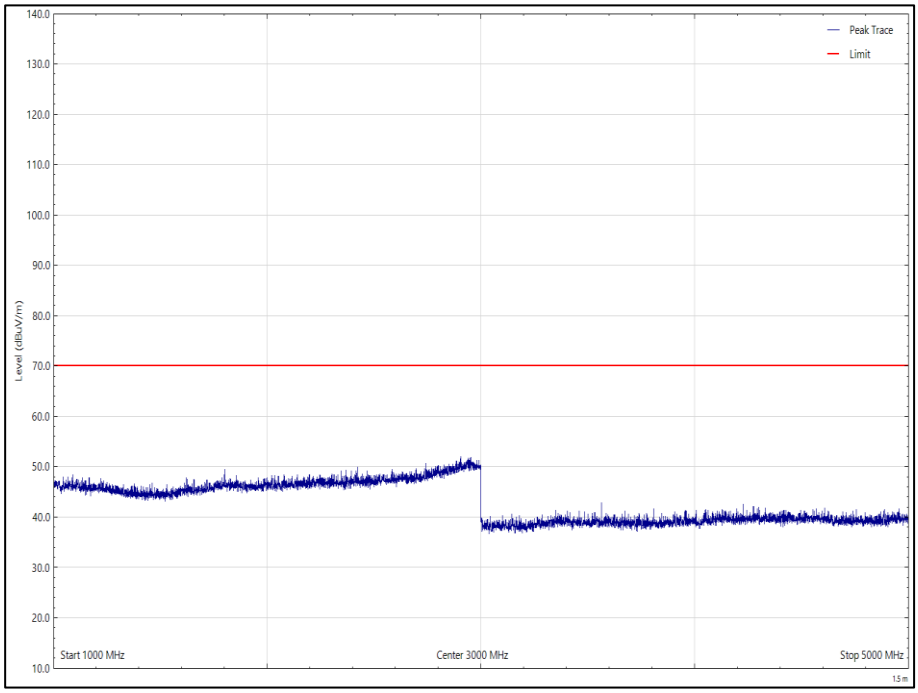


Figure 94 - 450.025 MHz - 1 GHz to 5 GHz, EUT Orientation Z Vertical

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
920.106	63.79	70.2	-6.41	Peak	181	100	Vertical	X
920.033	65.90	70.2	-4.3	Peak	162	100	Horizontal	X
920.036	66.99	70.2	-3.21	Peak	198	110	Vertical	Y
920.064	63.34	70.2	-6.86	Peak	151	101	Vertical	Z
920.124	67.46	70.2	-2.74	Peak	125	100	Horizontal	Z

Table 24 - 460.025 MHz, 30 MHz to 5 GHz

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

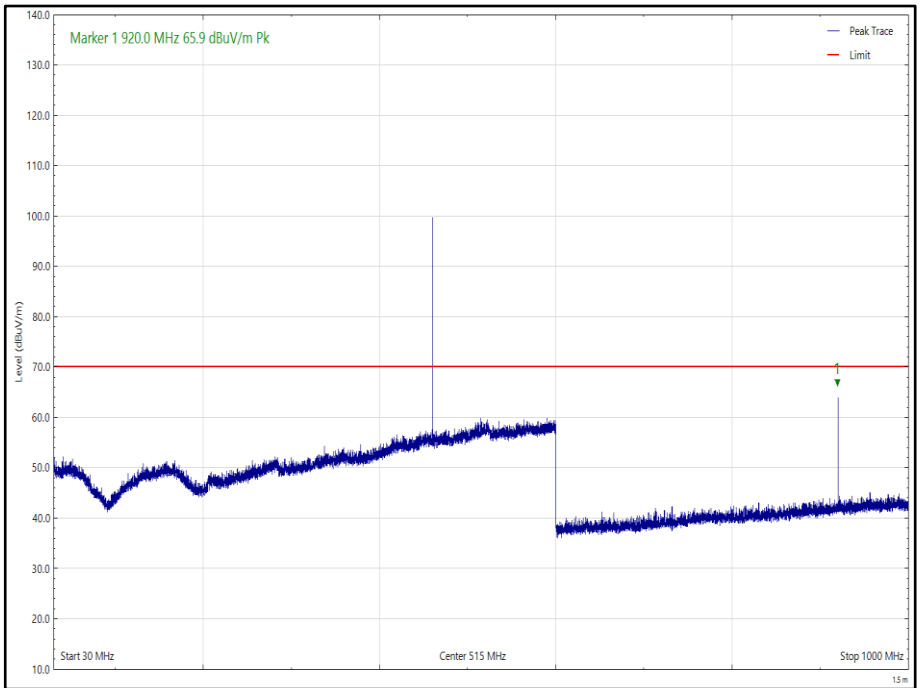


Figure 95 - 460.025 MHz - 30 MHz to 1 GHz, EUT Orientation X Horizontal

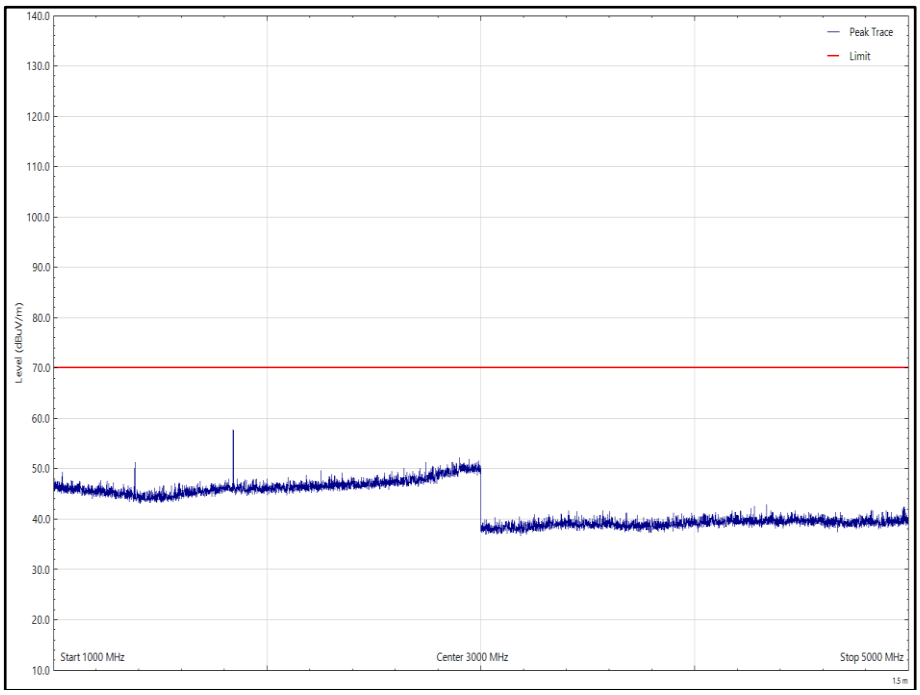


Figure 90 - 460.025 MHz – 1 GHz to 5 GHz, EUT Orientation X Horizontal

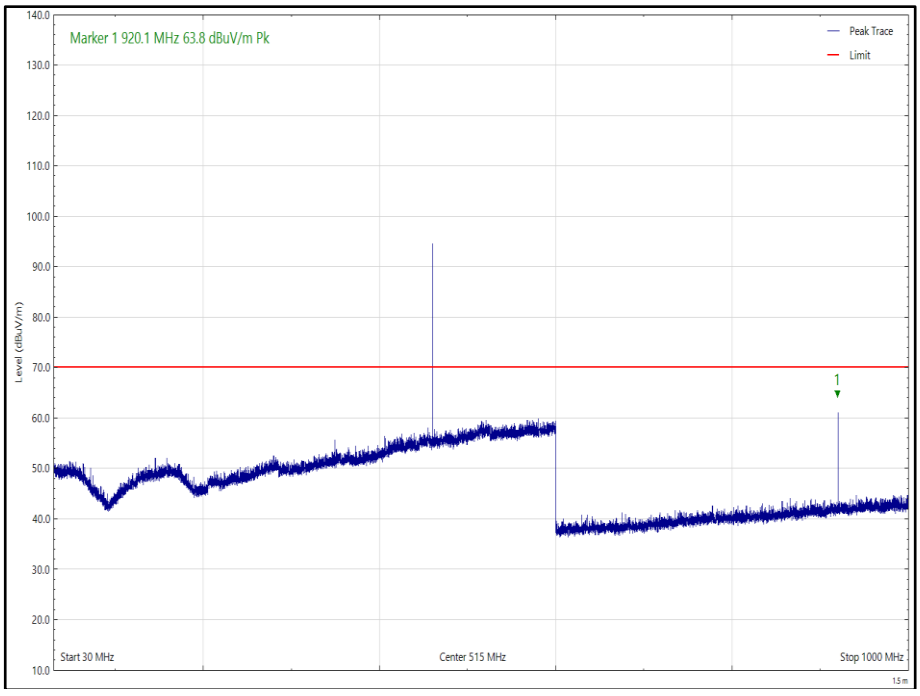


Figure 91 - 460.025 MHz - 30 MHz to 1 GHz, EUT Orientation Y Vertical

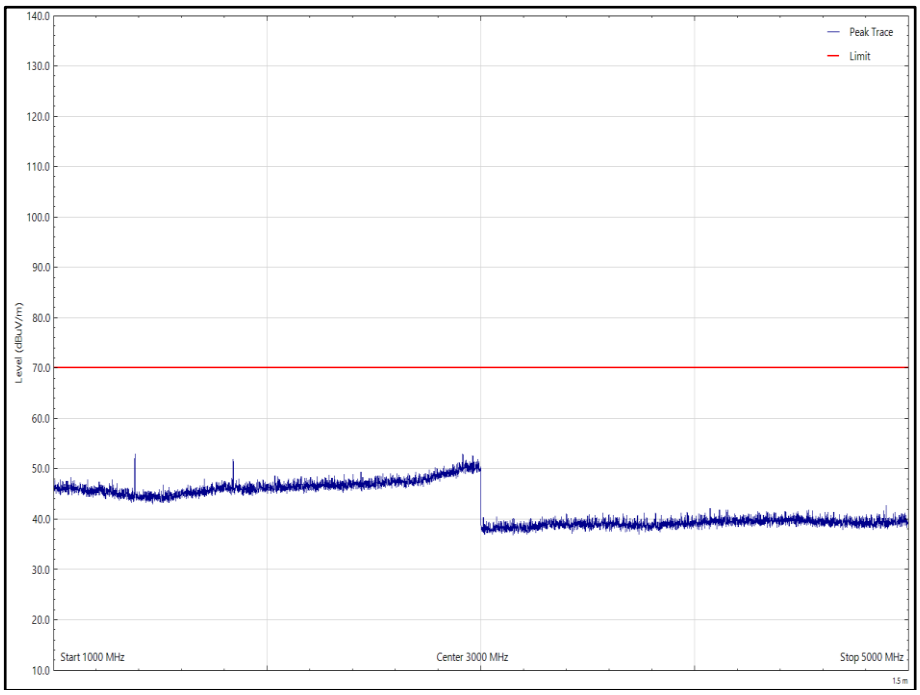


Figure 962 - 460.025 MHz - 1 GHz to 5 GHz, EUT Orientation Y Vertical

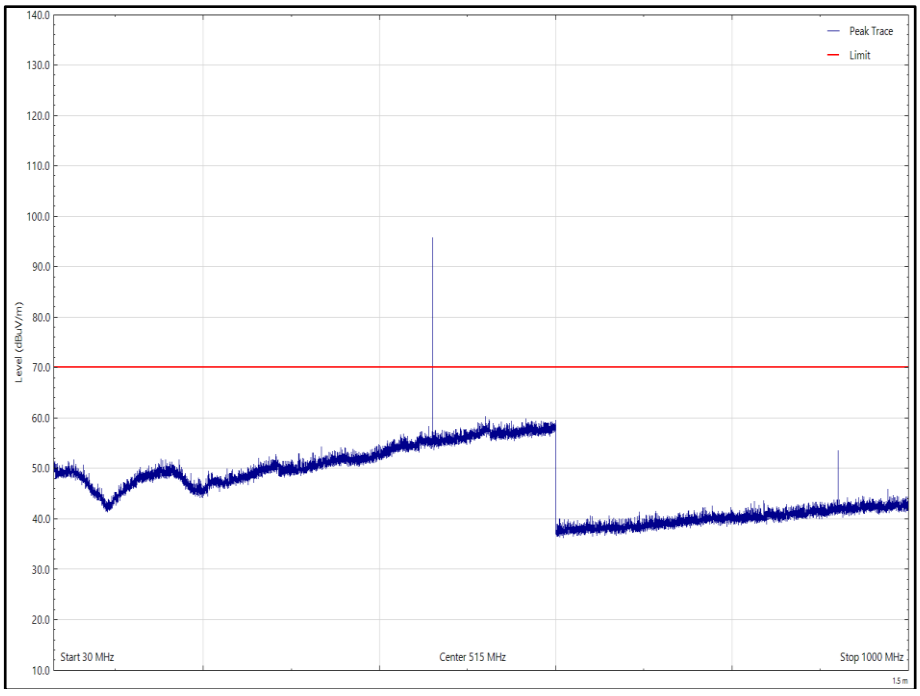


Figure 93 - 460.025 MHz - 30 MHz to 1 GHz, EUT Orientation Y Horizontal

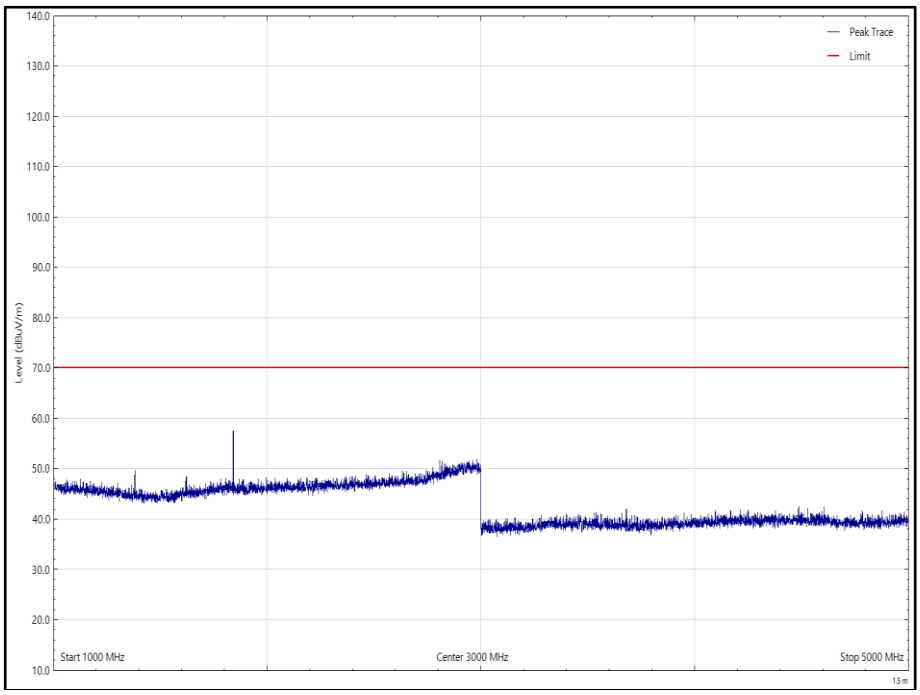


Figure 94 - 460.025 MHz – 1 GHz to 5 GHz, EUT Orientation Y Horizontal

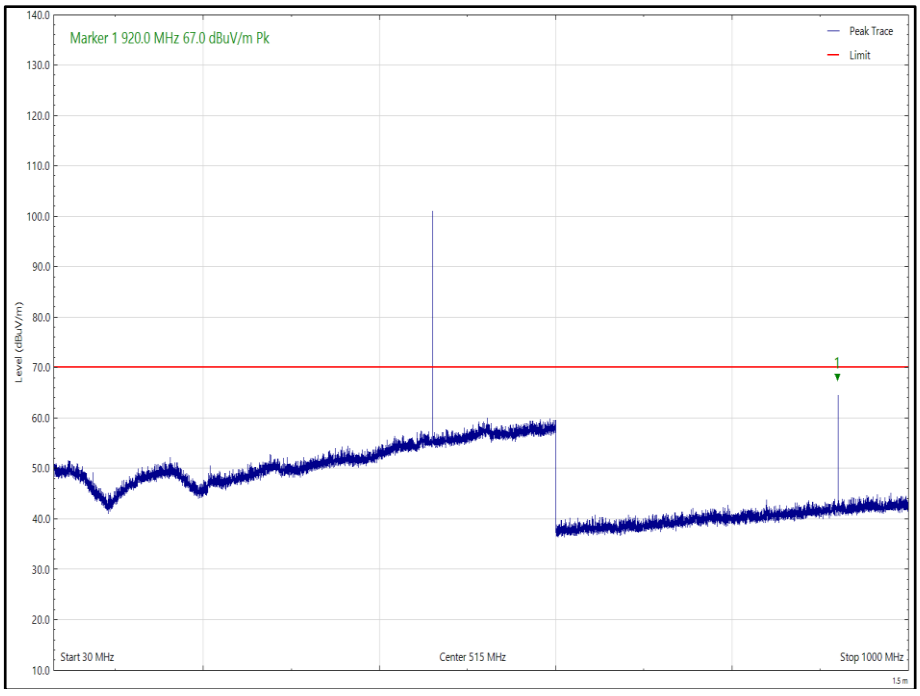


Figure 95 - 460.025 MHz - 30 MHz to 1 GHz, EUT Orientation Y Vertical

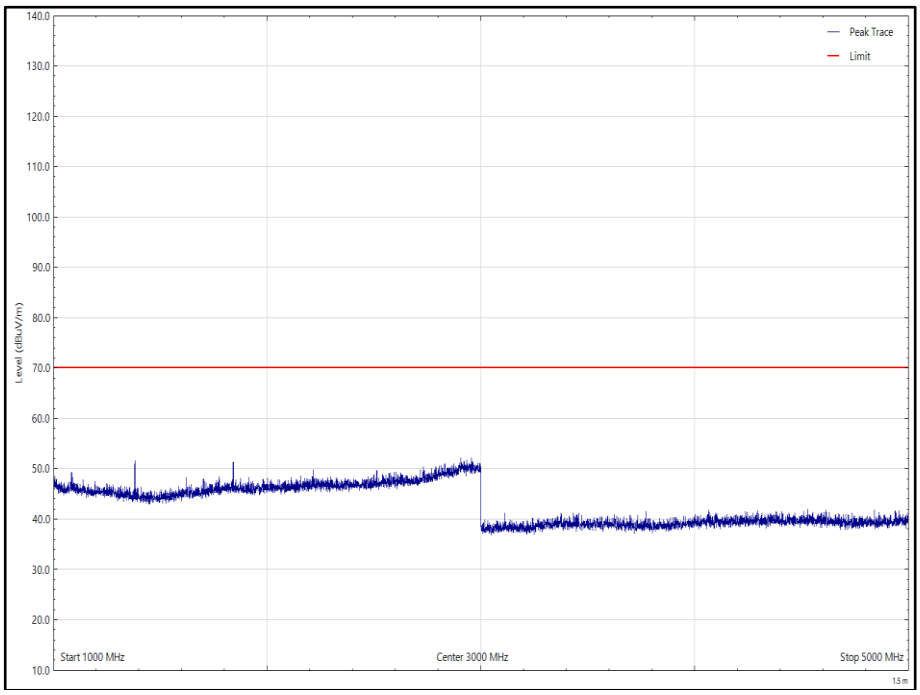


Figure 976 - 460.025 MHz - 1 GHz to 5 GHz, EUT Orientation Y Vertical

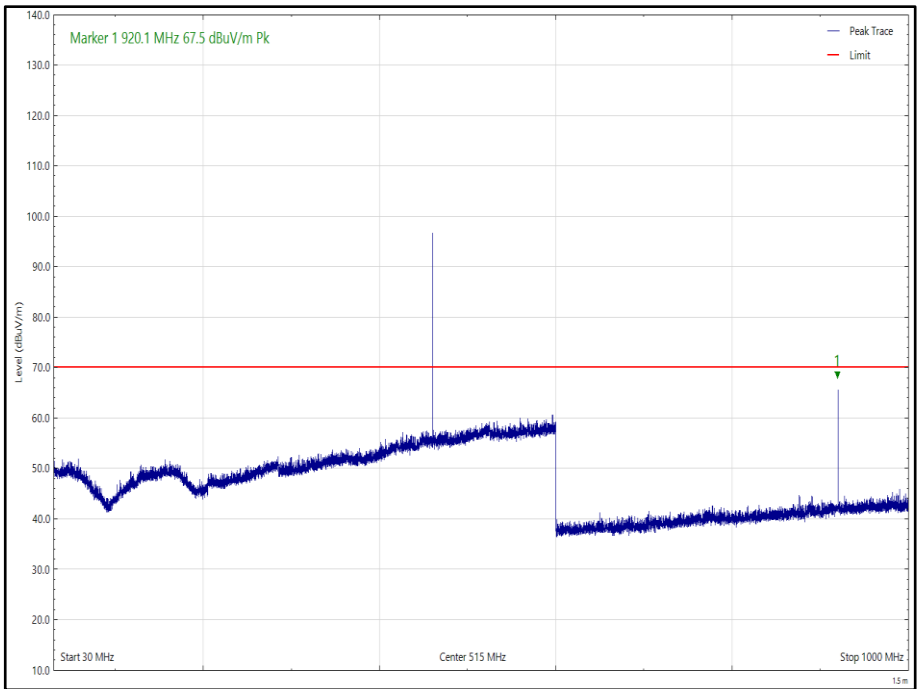


Figure 97 - 460.025 MHz - 30 MHz to 1 GHz, EUT Orientation Z Horizontal

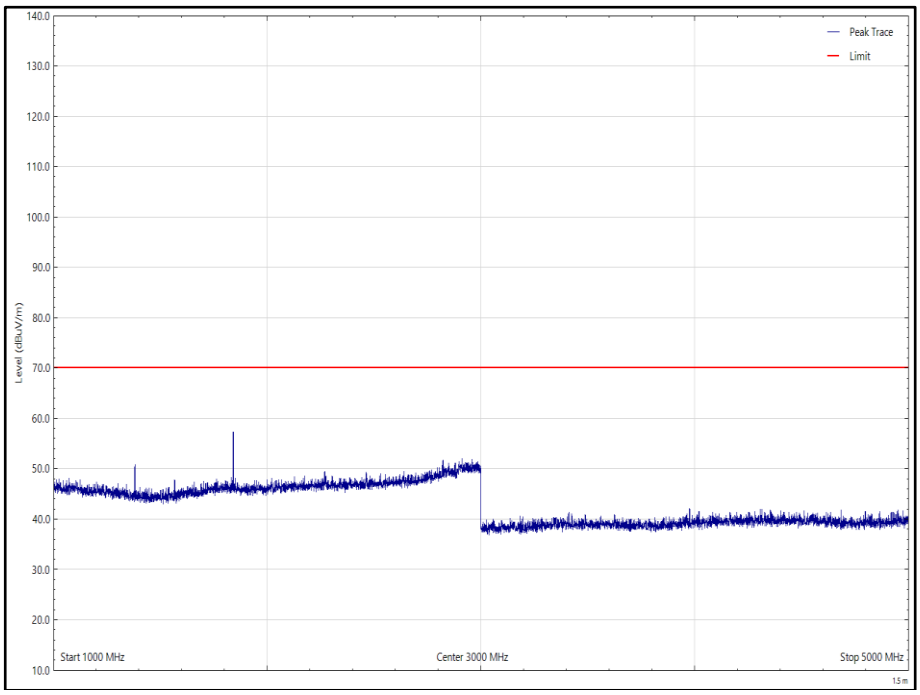


Figure 98 - 460.025 MHz – 1 GHz to 5 GHz, EUT Orientation Z Horizontal

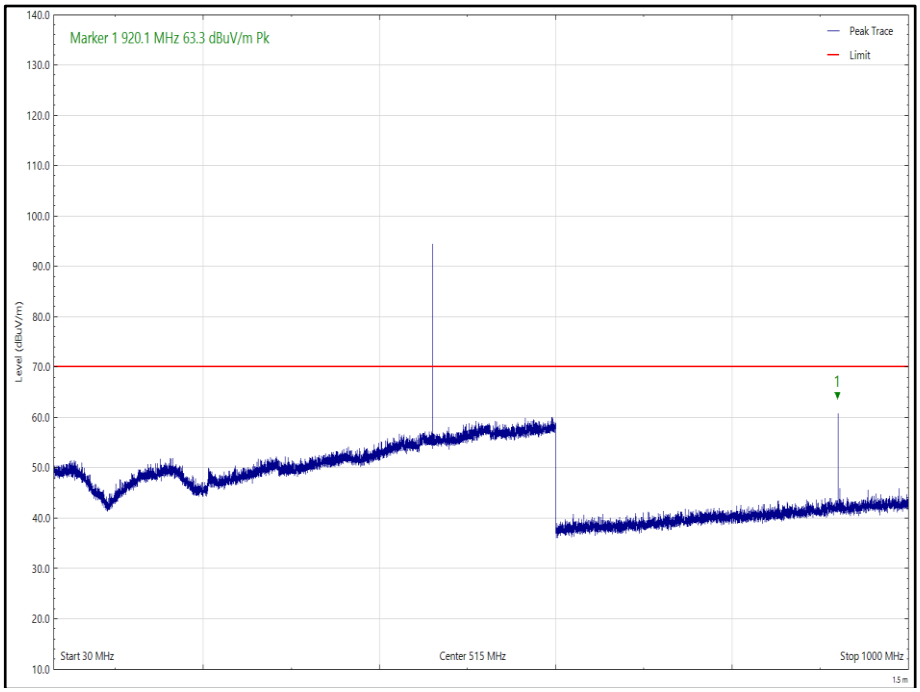


Figure 99 - 460.025 MHz - 30 MHz to 1 GHz, EUT Orientation Z Vertical

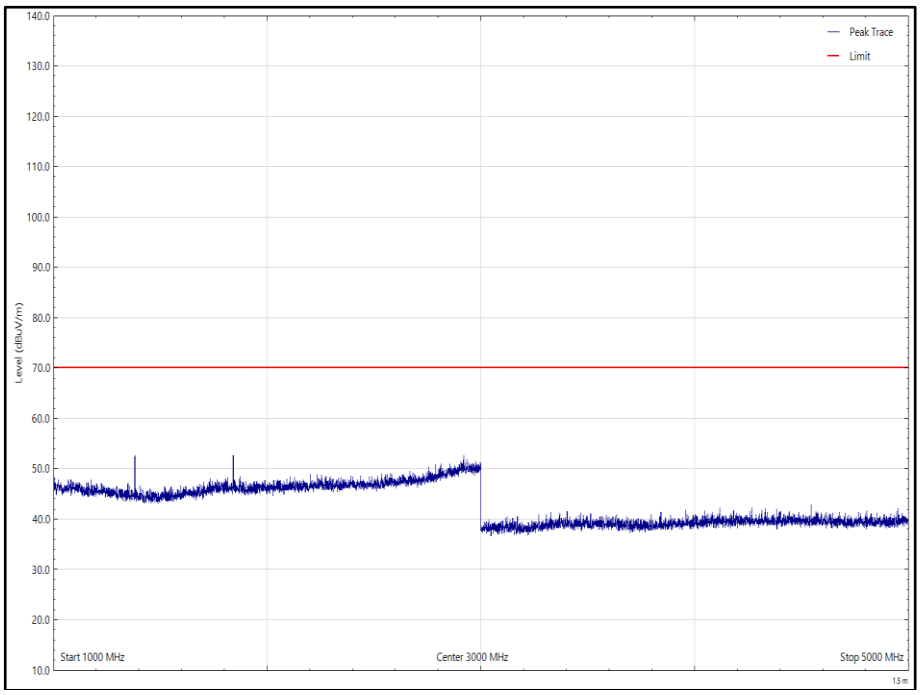


Figure 100 - 460.025 MHz - 1 GHz to 5 GHz, EUT Orientation Z Vertical

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
939.891	65.41	70.20	-4.79	Peak	158	147	Horizontal	X
940.101	64.00	70.20	-6.20	Peak	172	111	Vertical	X
939.993	66.66	70.20	-3.54	Peak	213	104	Vertical	Y
939.901	64.16	70.20	-6.04	Peak	161	150	Vertical	Z
940.005	67.30	70.20	-2.90	Peak	128	100	Horizontal	Z

Table 24 - 469.975 MHz, 30 MHz to 5 GHz

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

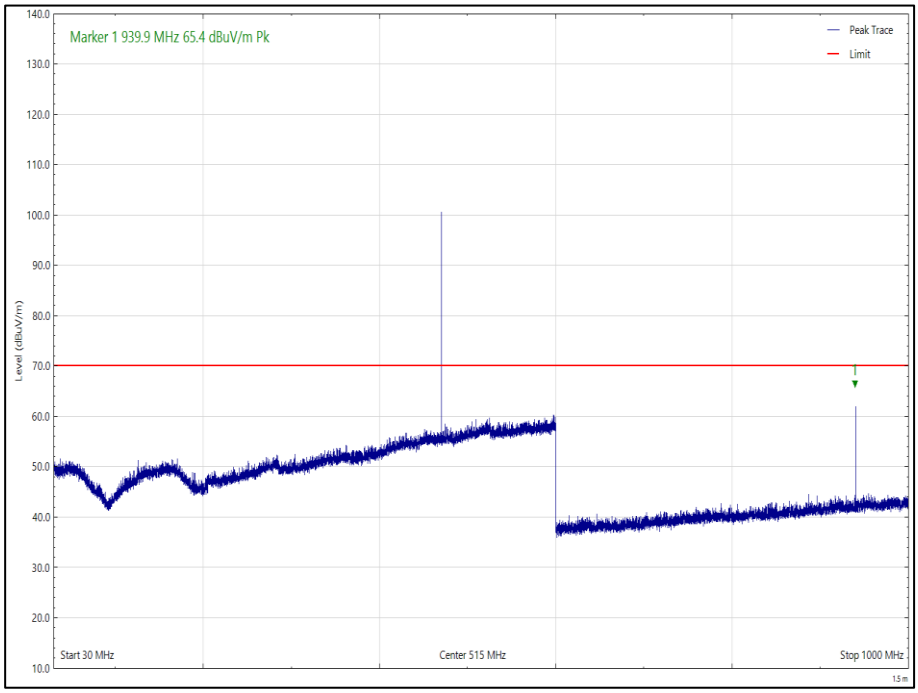


Figure 101 - 469.975 MHz - 30 MHz to 1 GHz, EUT Orientation X Horizontal

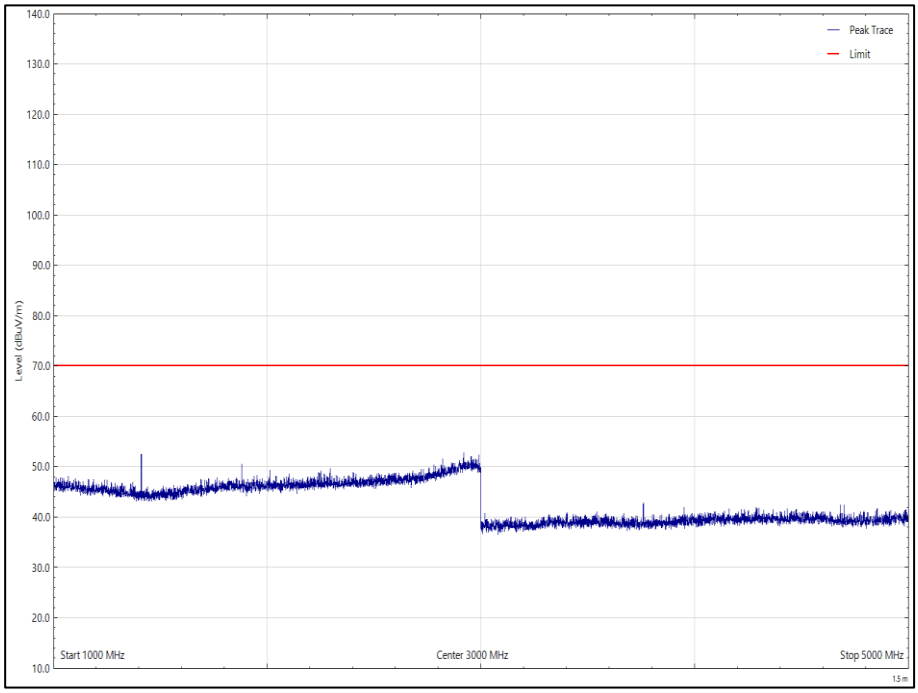


Figure 102 - 469.975 MHz - 1 GHz to 5 GHz, EUT Orientation X Horizontal

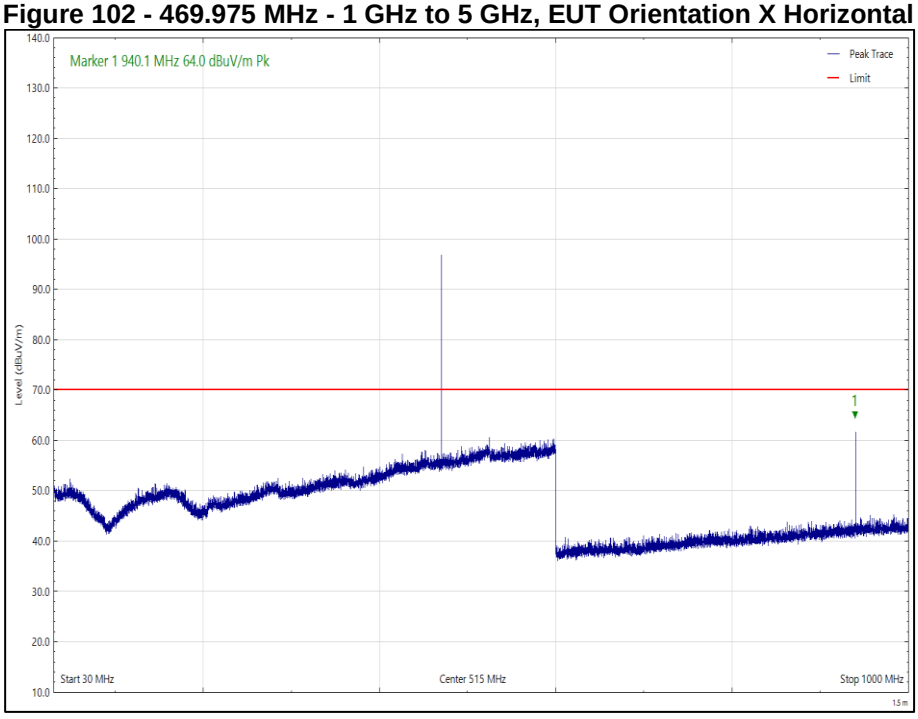


Figure 103 - 469.975 MHz - 30 MHz to 1 GHz, EUT Orientation X Vertical