FCC and IC Test Report

Sepura Limited
Tetra Mobile Radio
Model: SCG2229 Variant 1-89*A0-0****

In accordance with FCC 47 CFR Part 90, FCC 47 CFR Part 2, Industry Canada RSS-119 and ISED RSS-GEN

Add value.
Inspire trust.

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

FCC ID: XX6SCG2229W IC: 8739A-SCG2229

COMMERCIAL-IN-CONFIDENCE

Document 75948283-05 Issue 03

SIGNATURE			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Simon Bennett	Senior Engineer	Authorised Signatory	21 February 2022

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 90, FCC 47 CFR Part 2, Industry Canada 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	George Porter	21 February 2022	
Testing	Graeme Lawler	21 February 2022	
Testing	Neil Rousell	21 February 2022	

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 90: 2019, FCC 47 CFR Part 2: 2019, Industry Canada RSS-119: Issue 12 (05-2015) and ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019) for the tests detailed in section 1.3.

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Contents

1 Report Summary

1.1 Report Modification Record

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

Issue	Description of Change	Date of Issue
1	First Issue	06 May 2020
2	Correction of configuration-mode title	11 August 2020
3	New Results for Maximum Conducted Output Power and addition of ISED RSS-119 Emission Mask Y to Spurious Emissions at Antenna Terminals.	18 September 2020
4	Add Declared Variants, Part Number for Variant Tested and update FCC ID.	21 February 2022

Table 1

1.2 Introduction

Applicant	Sepura Limited
Manufacturer	Sepura Limited
Model Number(s)	SCG2229 Variant 1-89*A0-0****
Manufacturer's Declared Variant(s)	1-89*00-0**** 1-89*60-0**** 1-89*50-0****
Serial Number(s)	1PR002007GPH5XV
Hardware Version(s)	Pre-production
Software Version(s)	1785 004 10138
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 90:2019 FCC 47 CFR Part 2: 2019 Industry Canada RSS-119: Issue 12 (05-2015) ISED RSS-GEN: Issue 5 (04-2018) + A1 (03-2019)
Order Number Date	PLC-PO015398-1 12-February-2020
Date of Receipt of EUT	10-March-2020
Start of Test	16-March-2020
Finish of Test	15-September-2020
Name of Engineer(s)	George Porter, Graeme Lawler and Neil Rousell
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 90, FCC 47 CFR Part 2 and Industry Canada RSS-119 and ISED Canada RSS-GEN is shown below.

Section	Specification Clause				Test Description	Result	Comments/Base Standard
	Part 90	Part 2	RSS-119	RSS-GEN			
Configuration and Mode: TETRA 406 MHz to 430 MHz - Transmit							
2.1	90.205	2.1046	5.4	6.12	Maximum Conducted Output Power	Pass	ANSI C63.26: 2015
2.2	90.207	2.1047	5.2	-	Types of Emissions	Pass	-
2.3	90.209	2.1049	5.5	6.7	Bandwidth Limitations	Pass	ANSI C63.26: 2015
2.4	90.210	2.1051	5.8	6.13	Spurious Emissions at Antenna Terminals	Pass	ANSI C63.26: 2015
2.5	90.210	2.1053	5.8	6.13	Radiated Spurious Emissions	Pass	ANSI C63.26: 2015
2.6	90.213	2.1055	5.3	6.11	Frequency Stability	Pass	ANSI C63.26: 2015
2.7	90.214	-	5.9	-	Transient Frequency Behaviour	Pass	-
2.8	90.221	-	5.8.9.1	-	Adjacent Channel Power	Pass	-
Configuration and Mode: TETRA 450 MHz to 470 MHz - Transmit							
2.1	90.205	2.1046	5.4	6.12	Maximum Conducted Output Power	Pass	ANSI C63.26: 2015
2.2	90.207	2.1047	5.2	-	Types of Emissions	Pass	ANSI C63.26: 2015
2.3	90.209	2.1049	5.5	6.7	Bandwidth Limitations	Pass	ANSI C63.26: 2015
2.4	90.210	2.1051	5.8	6.13	Spurious Emissions at Antenna Terminals	Pass	-
2.5	90.210	2.1053	5.8	6.13	Radiated Spurious Emissions	Pass	ANSI C63.26: 2015
2.6	90.213	2.1055	5.3	6.11	Frequency Stability	Pass	ANSI C63.26: 2015
2.7	90.214	-	5.9	-	Transient Frequency Behaviour	Pass	-
2.8	90.221	-	5.8.9.1	-	Adjacent Channel Power	Pass	-

Table 2

1.4 Manufacturer's Declared Variant(s)

FCC ID	Commercial Part Number	Description
XX6SCG2229X	1-89*00-0****	Basic single console No BT/WLAN No SD
XX6SCG2229X	1-89*50-0****	Basic single console No BT/WLAN SD
XX6SCG2229W	1-89*60-0****	Basic single console BT/WLAN SD

The models listed above have the same main PCB and layout, with a connectors for power, GNSS and a console, and a multifunction connector (GPIO, Loudspeaker, USB). The components are also the same apart from:

Variant 1-89*00-0**** has no expanded dual console board, no Bluetooth/WLAN module and no SD card.

Variant 1-89*60-0**** has no expanded dual console board.

Variant 1-89*50-0**** has no expanded dual console board and no Bluetooth/WLAN module.

1.5 Application Form

Equipment Description

Technical Description: *(Please provide a brief description of the intended use of the equipment)*	TETRA mobile radio for use within cars, trucks, mobile and fixed control rooms, motorcycles, boats and trains, with Wi-Fi, Bluetooth, GPS and Ethernet functions
Manufacturer:	Sepura
Model:	SCG2229
Part Number:	1-89*A0-0****
Hardware Version:	Pre-production
Software Version:	1785 004 10138
FCC ID (if applicable)	XX6SCG2229W
IC ID (if applicable)	8739A-SCG2229

Intentional Radiators

Technology	TETRA	Bluetooth LE	Bluetooth Classic / EDR	Wi-Fi 802.11b, g	Wi-Fi 802.11n	Wi-Fi 802.11n
Frequency Band (MHz)	380 - 470 MHz	2402 - 2480 MHz	2402 - 2480 MHz	2412 - 2462 MHz	2412 - 2462 MHz	2422 - 2452 MHz
Conducted Declared Output Power (dBm)	41.5	7.4	7.382	16.5	16.5	16.5
Antenna Gain (dBi)	2	Element 3: 2 dBi	Element 3: 2 dBi	Element 3: 2 dBi	Element 3: 2 dBi	Element 3: 2 dBi
Supported Bandwidth(s) (MHz)	0.025 / 0.02	1	1	20	20	40
Modulation Scheme(s)	π/4 DQPSK	GFSK	GFSK π/4 DQPSK 8DPSK	802.11b: CCK, DBPSK, DQPSK 802.11g: BPSK, QPSK, 16QAM, 64QAM	BPSK, QPSK, 16QAM, 64QAM	BPSK, QPSK, 16QAM, 64QAM
ITU Emission Designator	22K0DXW 20K0DXW	1M18F1D	1M01F1D 1M01G1D	19M7G1D	19M7D1D	36M8D1D
Bottom Frequency (MHz)	380	2402	2402	2412	2412	2422
Middle Frequency (MHz)	425	2441	2441	2437	2437	2437
Top Frequency (MHz)	470	2480	2480	2462	2462	2452

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) ☐	

AC Power Source

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

DC Power Source

Nominal voltage:	12	V
Extreme upper voltage:	15.6	V
Extreme lower voltage:	10.8	V
Max current:	5	A

Battery Power Source None

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

Charging

Can the EUT transmit whilst being charged	Yes ☐ No ☐

Temperature

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

Antenna Characteristics

Antenna connector ☒			State impedance	50	Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☐	Type:		Gain		dBi
External antenna ☒	Type:		Gain		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 ☐					

Ancillaries (if applicable)

Manufacturer:	Sepura	Part Number:	GPSB4
Model:	GPSB4 Vehicle Roof Antenna	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	AFB-TET
Model:	AFB-VAR 380-430 MHz antenna	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	AFB-UT
Model:	AFB-VAR 406-472 MHz antenna	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-02012 rev001
Model:	Extended SCG Loudspeaker / IO USB Host lead	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-02014 rev001
Model:	Extended SCG Expansion Board Loudspeaker / 8 GPIO lead	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	Netgear GS105 ProSAFE Gigabit Switch
Model:	Netgear GS105 ProSAFE Gigabit Switch	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-02010
Model:	SCG Power/ignition Lead	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00069
Model:	Mobile Remote Cable 5.0M	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00670
Model:	HBC Interface and Hands-free Box	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00079
Model:	Remote Microphone And Switch Set	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00292
Model:	Remote Microphone (Handsfree Kit) 3m	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-01801
Model:	Handset Based Console (HBC3)	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00082
Model:	Detachable Loudspeaker extension Cable	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00062
Model:	Fist microphone	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-01808
Model:	SCC3 (colour console)	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-01961
Model:	CC VAC RSM (Long Cable)	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-00719
Model:	Loudspeaker	Country of Origin:	Unknown
Manufacturer:	Sepura	Part Number:	300-01837
Model:	Loudspeaker	Country of Origin:	Unknown

I hereby declare that the information supplied is correct and complete.
Name: Chris Beecham
Position held: Conformance Engineer
Date: 10 March 2020

1.6 Product Information

1.6.1 Technical Description

TETRA mobile radio for use within cars, trucks, mobile and fixed control rooms, motorcycles, boats and trains, with Wi-Fi, Bluetooth, GPS and Ethernet functions.

1.6.2 Test Setup Diagrams

Unless otherwise specified, conducted tests were performed using the setup in the diagram below:

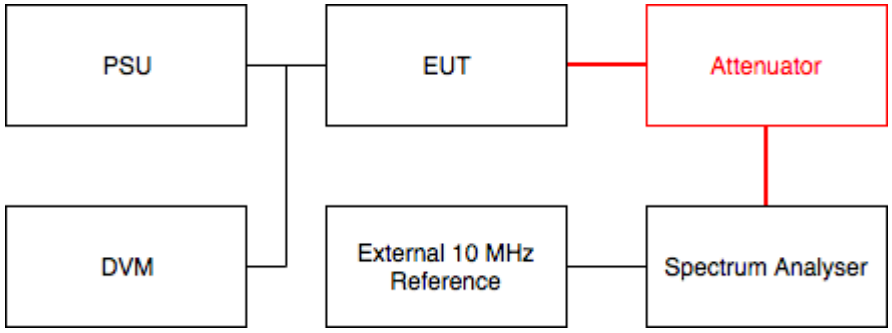

Figure 1 – Conducted Test Setup Diagram

1.7 Deviations from the Standard

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

1.8 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: SCG22, Serial Number: 1PR002007GPH5XV			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 3

1.9 Test Location

TÜV SÜD conducted the following tests at our Fareham Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: TETRA 406 MHz to 430 MHz - Transmit		
Maximum Conducted Output Power	Neil Rousell	UKAS
Types of Emissions	George Porter	UKAS
Bandwidth Limitations	George Porter	UKAS
Spurious Emissions at Antenna Terminals	George Porter and Neil Rousell	UKAS
Radiated Spurious Emissions	Graeme Lawler	UKAS
Frequency Stability	George Porter	UKAS
Transient Frequency Behaviour	George Porter	UKAS
Adjacent Channel Power	George Porter	UKAS
Configuration and Mode: TETRA 450 MHz to 470 MHz - Transmit		
Maximum Conducted Output Power	Neil Rousell	UKAS
Types of Emissions	George Porter	UKAS
Bandwidth Limitations	George Porter	UKAS
Spurious Emissions at Antenna Terminals	George Porter and Neil Rousell	UKAS
Radiated Spurious Emissions	Graeme Lawler	UKAS
Frequency Stability	George Porter	UKAS
Transient Frequency Behaviour	George Porter	UKAS
Adjacent Channel Power	George Porter	UKAS

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
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
Industry Canada RSS-119, Clause 5.4
ISED RSS-GEN, Clause 6.12

2.1.2 Equipment Under Test and Modification State

SCG22 S/N: 1PR002007GPH5XV - Modification State 0

2.1.3 Date of Test

14-September-2020 to 15-September-2020

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 5.2.3.3.

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 100 kHz and the video bandwidth to 300 kHz with the trace set to max hold using a peak detector and the result was recorded.

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 5.2.3.3.

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 40 dB of attenuation. The path loss was measured using a network analyser 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 91 kHz with the trace set to max hold using a peak detector and the result was recorded.

2.1.5 Environmental Conditions

Ambient Temperature	23.4 - 23.8 °C
Relative Humidity	49.9 - 53.7 %

2.1.6 Test Results

TETRA 403 MHz to 430 MHz - Transmit

Parameter	406.1125 MHz	418.0500 MHz	429.9875 MHz
	Result (dBm)	Result (dBm)	Result (dBm)
Conducted Output Power (dBm)	42.31	42.41	42.46
Maximum Declared Conducted Output Power (dBm)	41.50	41.50	41.50
Δ (dB)	0.81	0.91	0.96
Antenna Gain (dBi)	2.00	2.00	2.00
ERP (dBm)	42.16	42.26	42.31

Table 5

Figure 2 – 406.1125 MHz

Figure 3 – 418.0500 MHz

Figure 4 – 429.9875 MHz

TETRA 450 MHz to 470 MHz - Transmit

Parameter	450.025 MHz	460.025 MHz	469.975 MHz
	Result (dBm)	Result (dBm)	Result (dBm)
Conducted Output Power (dBm)	42.39	42.35	42.24
Maximum Declared Conducted Output Power (dBm)	41.50	41.50	41.50
Δ (dB)	0.89	0.85	0.74
Antenna Gain (dBi)	2.00	2.00	2.00
ERP (dBm)	42.24	42.20	42.09

Table 6

Figure 5 – 450.0250 MHz

Figure 6 – 460.0250 MHz

Figure 7 – 469.9875 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 7 - FCC Limits for Maximum ERP

Industry Canada 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 8 - Industry Canada Limits for Transmitter Output Power

2.1.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 2.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	08-Nov-2020
Multimeter	Fluke	79 Series II	3057	12	21-Aug-2021
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	11-Dec-2020
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	28-Nov-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	08-Nov-2020
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	10-Feb-2021
30dB Attenuator	Narda	766-30	4783	12	24-Mar-2021
Quad Power Supply	Rohde & Schwarz	HMP4040	4954	-	O/P Mon
Cable (40 GHz)	Rosenberger	LU1-001-1000	5022	12	12-Nov-2020
Cable (18 GHz)	Rosenberger	LU7-071-2000	5108	12	06-Oct-2020
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5480	12	18-Mar-2021

Table 9

O/P Mon – Output Monitored using calibrated equipment

2.2 Types of Emissions

2.2.1 Specification Reference

FCC 47 CFR Part 90, Clause 90.207
FCC 47 CFR Part 2, Clause 2.1047
Industry Canada RSS-119, Clause 5.2

2.2.2 Equipment Under Test and Modification State

SCG22 S/N: 1PR002007GPH5XV - Modification State 0

2.2.3 Date of Test

25-March-2020 to 26-March-2020

2.2.4 Test Method

This test was performed on middle frequency using a modulated carrier output from the EUT and measured on a spectrum analyser. 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 spectrum analyser was set to the transmit frequency. The burst measurements were made in zero span mode and the frequency spectrum with a span sufficient to show the transmitters response. The signal was maximised and stabilised for >1 minute and the marker function of the spectrum analyser was used. The trace plots were recorded.

2.2.5 Environmental Conditions

Ambient Temperature	22.2 - 23.2 °C
Relative Humidity	22.4 - 23.9 %

2.2.6 Test Results

TETRA 406 MHz to 430 MHz - Transmit

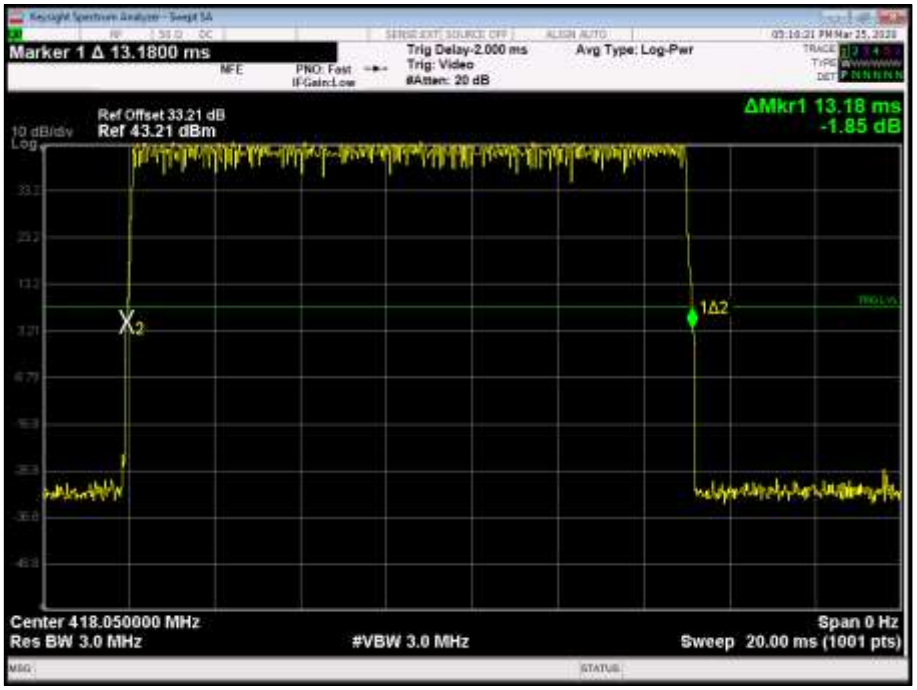

Figure 8 - Burst Length

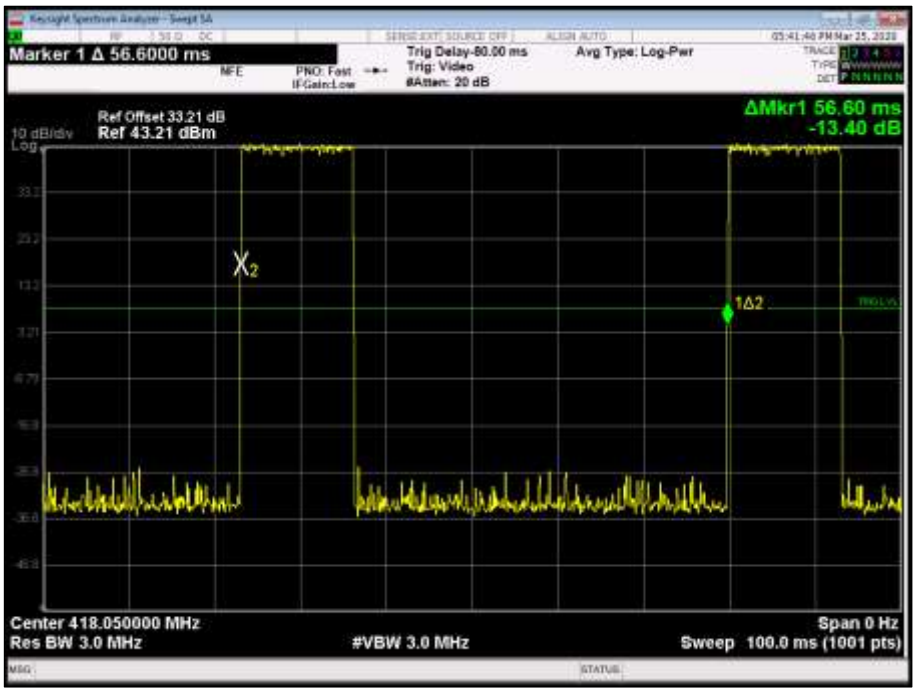

Figure 9 - Burst Period

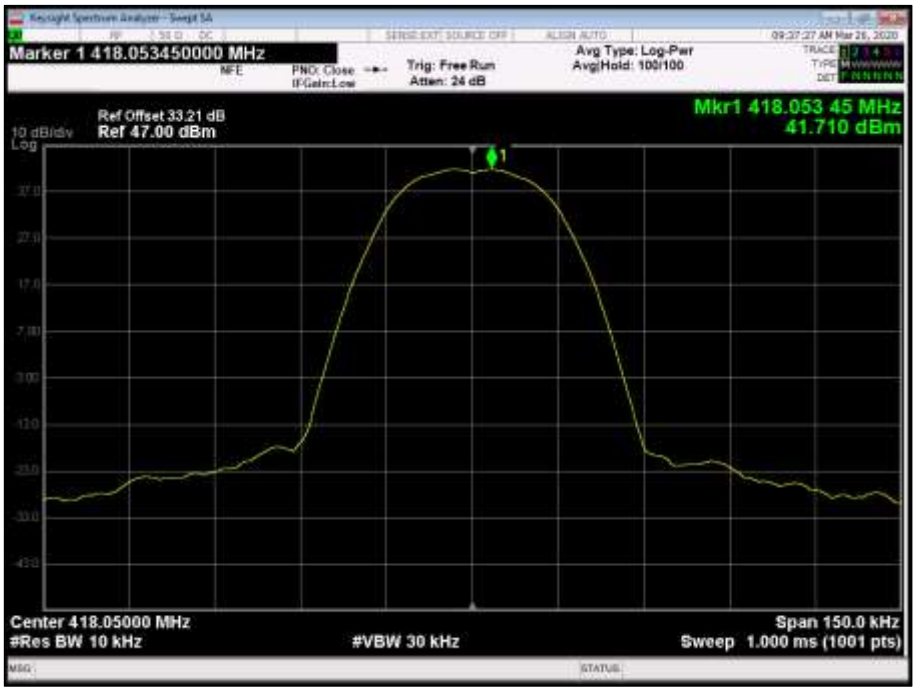

Figure 10 - Frequency Spectrum

TETRA 450 MHz to 470 MHz - Transmit

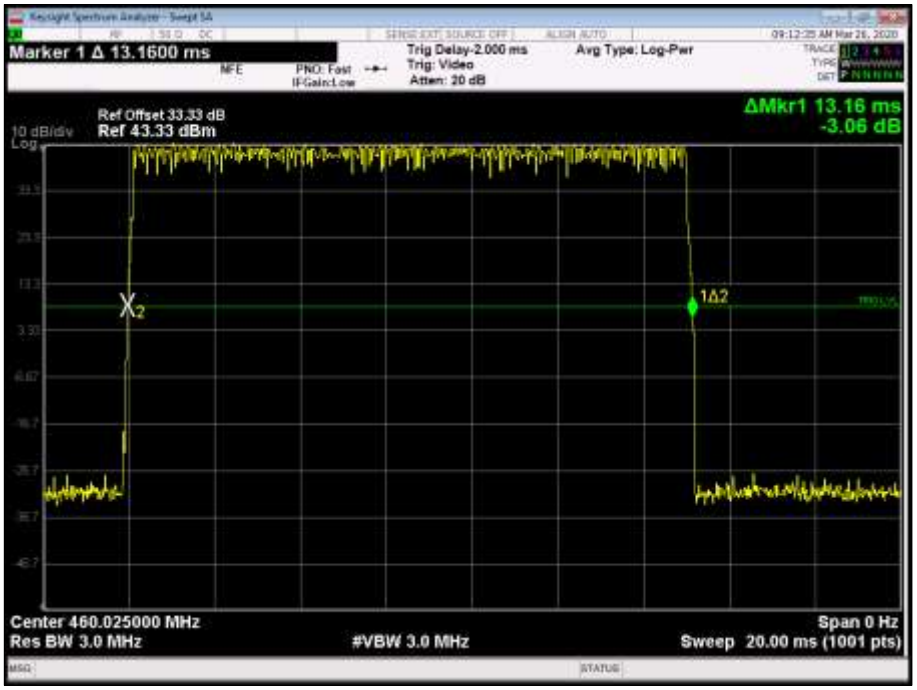

Figure 11 - Burst Length

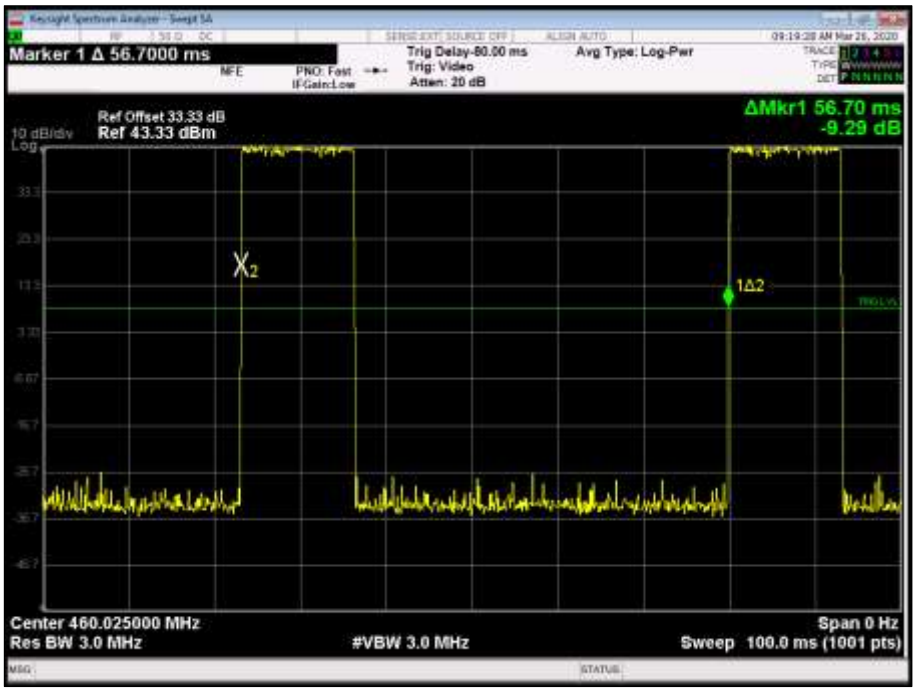

Figure 12 - Burst Period

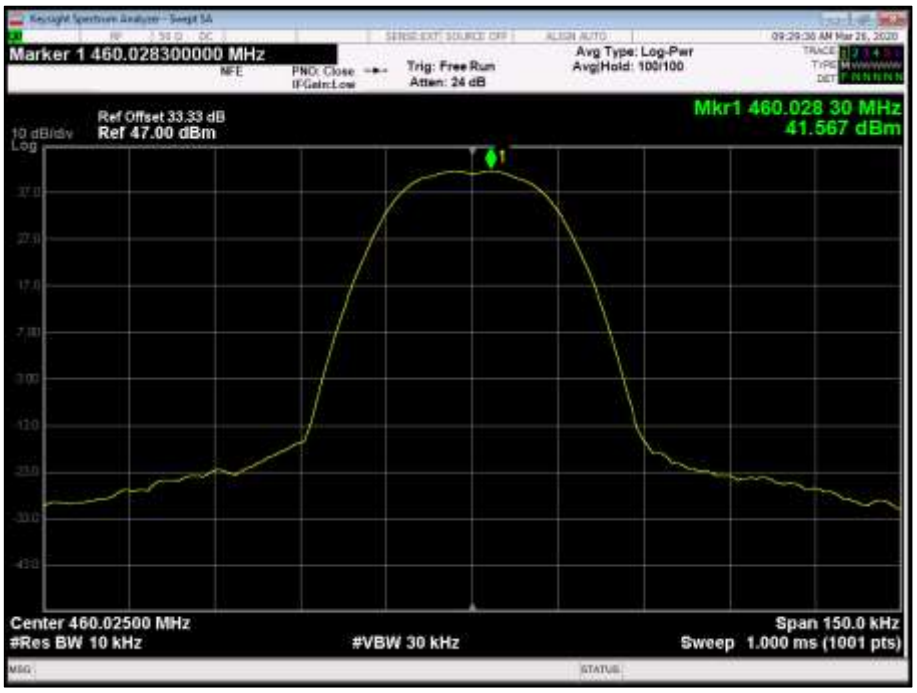

Figure 13 - Frequency Spectrum

FCC 47 CFR Part 90, Limit Clause 90.207

As per FCC Part 90.207 (b) through (n).

FCC 47 CFR Part 2, Limit Clause 2.1047

Voice modulated communication equipment. A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

Equipment which employs modulation limiting. A curve or family of curves showing the percentage of modulation versus the modulation input voltage shall be supplied. The information submitted shall be sufficient to show modulation limiting capability throughout the range of modulating frequencies and input modulating signal levels employed.

Industry Canada RSS-119, Limit Clause 5.3

Equipment that operates in the bands 768-776 MHz and 798-806 MHz shall use digital modulation. Mobile and portable transmitters that operate in these bands may have analogue modulation capability only as a secondary mode in addition to their primary digital mode. However, mobile and portable transmitters that operate only on the low-power channels as defined in SRSP-511 may employ any type of modulation.

2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Attenuator (10 dB, 75 W)	Bird	8308-100	386	12	23-Jul-2020
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Attenuator (10dB, 10W)	Bird	8343-100	478	-	O/P Mon
Attenuator (10dB/100W)	Bird	8343-100	495	12	18-Nov-2020
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	16-Apr-2020
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	16-Apr-2020
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	21-Oct-2020
Network Analyser	Keysight Technologies	E5063A	5018	12	20-May-2020
Electronic Calibration Module	Keysight Technologies	85093C	5188	12	21-May-2020
1 Meter Cable	Teledyne	PR90-088-1MTR	5193	12	30-Jul-2020

Table 10

O/P Mon – Output Monitored using calibrated equipment

2.3 Bandwidth Limitations

2.3.1 Specification Reference

FCC 47 CFR Part 90, Clause 90.209
FCC 47 CFR Part 2, Clause 2.1049
Industry Canada RSS-119, Clause 5.5
ISED RSS-GEN, Clause 6.7

2.3.2 Equipment Under Test and Modification State

SCG22 S/N: 1PR002007GPH5XV - Modification State 0

2.3.3 Date of Test

24-March-2020 to 25-March-2020

2.3.4 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 5.4.

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 300 Hz and the video bandwidth to 1 kHz with the trace set to max hold using a peak detector and the result was recorded.

2.3.5 Environmental Conditions

Ambient Temperature	24.7 - 24.8 °C
Relative Humidity	20.2 - 24.8 %

2.3.6 Test Results

TETRA 406 MHz to 430 MHz - Transmit

406.1125 MHz	418.0500 MHz	429.9875 MHz
20.933	20.914	20.935

Table 11

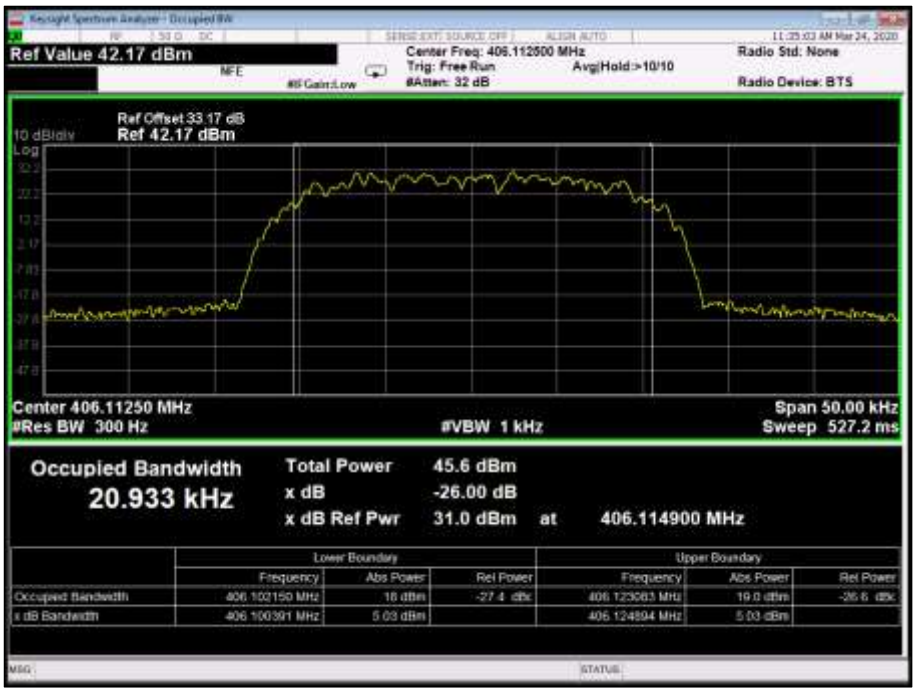

Figure 14 - 406.1125 MHz

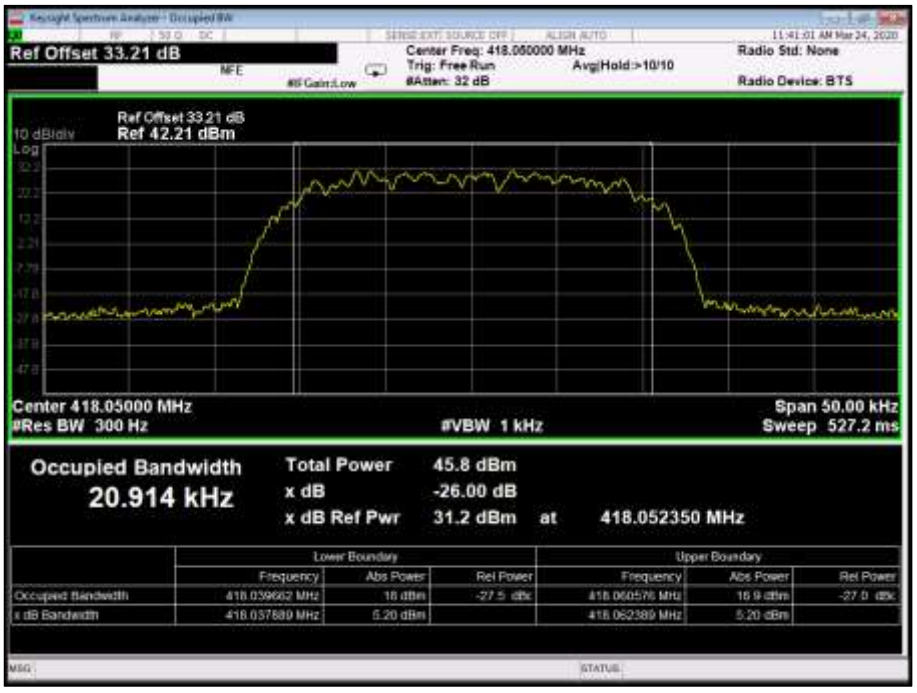

Figure 15 - 418.0500 MHz

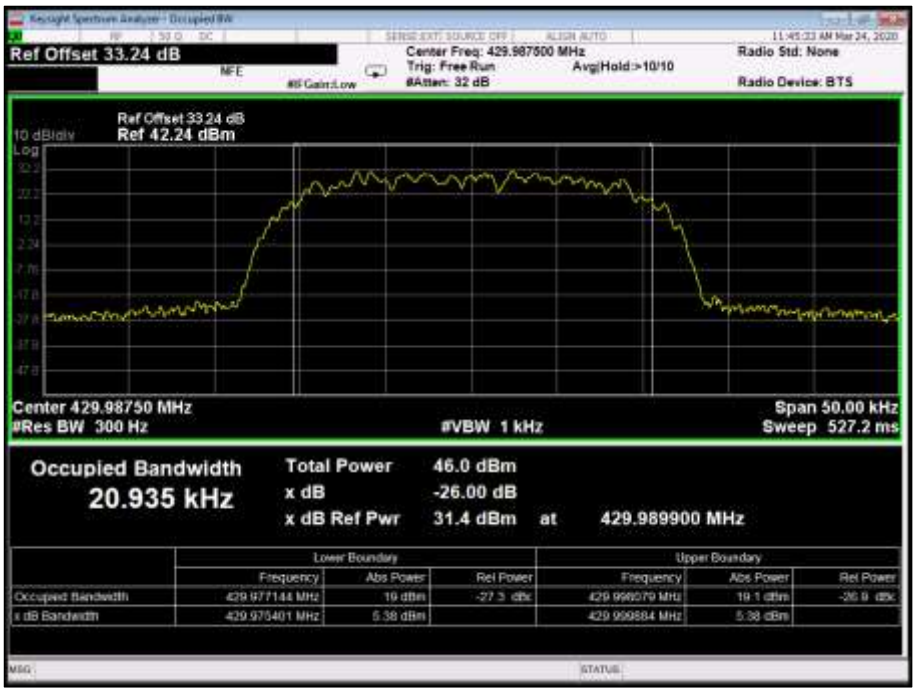

Figure 16 - 429.9875 MHz

TETRA 450 MHz to 470 MHz - Transmit

450.025 MHz	460.025 MHz	469.975 MHz
20.932	20.923	20.940

Table 12

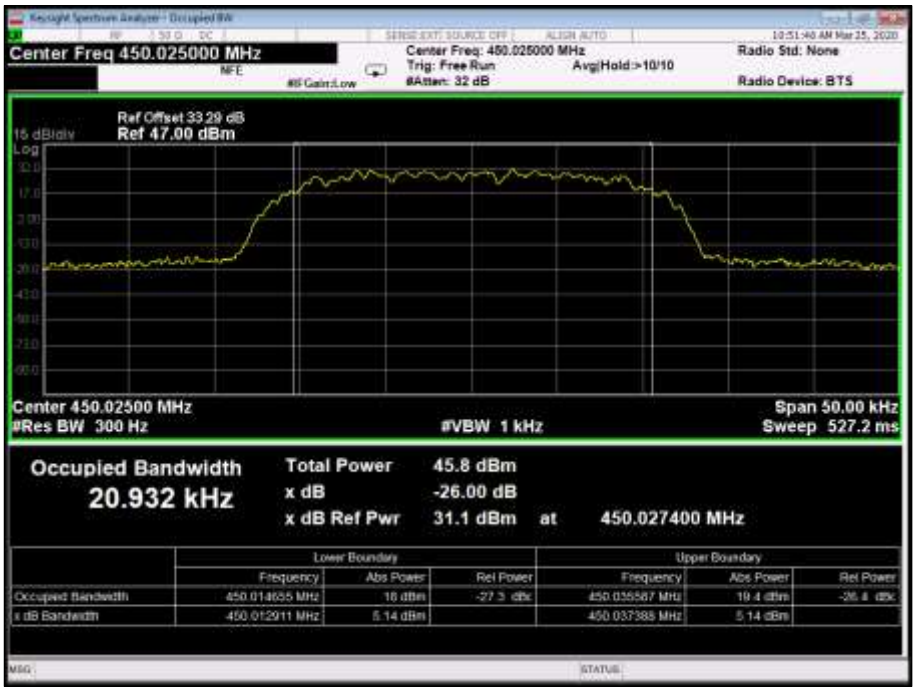

Figure 17 - 450.025 MHz

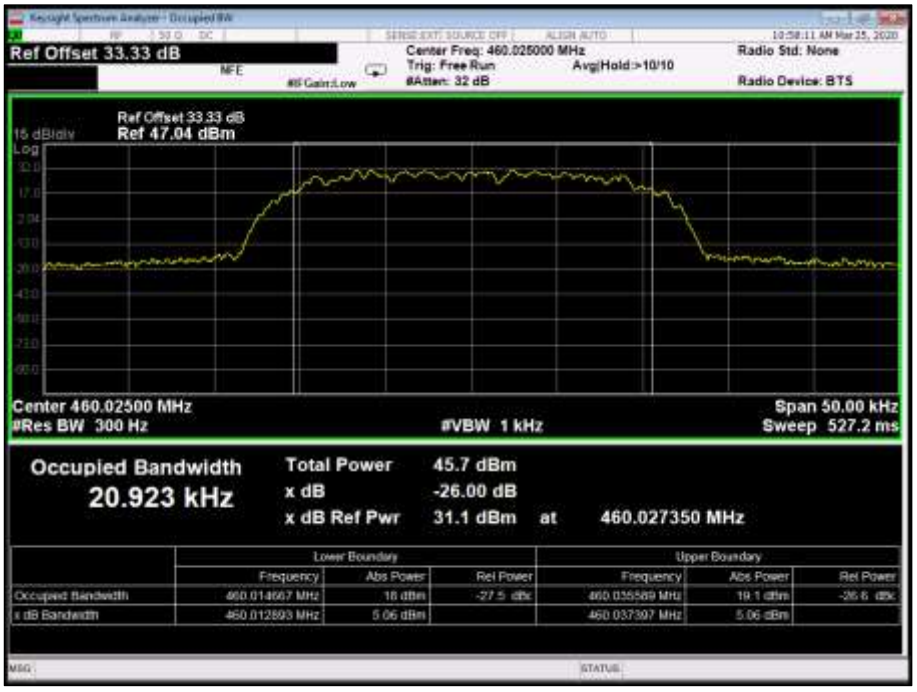

Figure 18 - 460.025 MHz

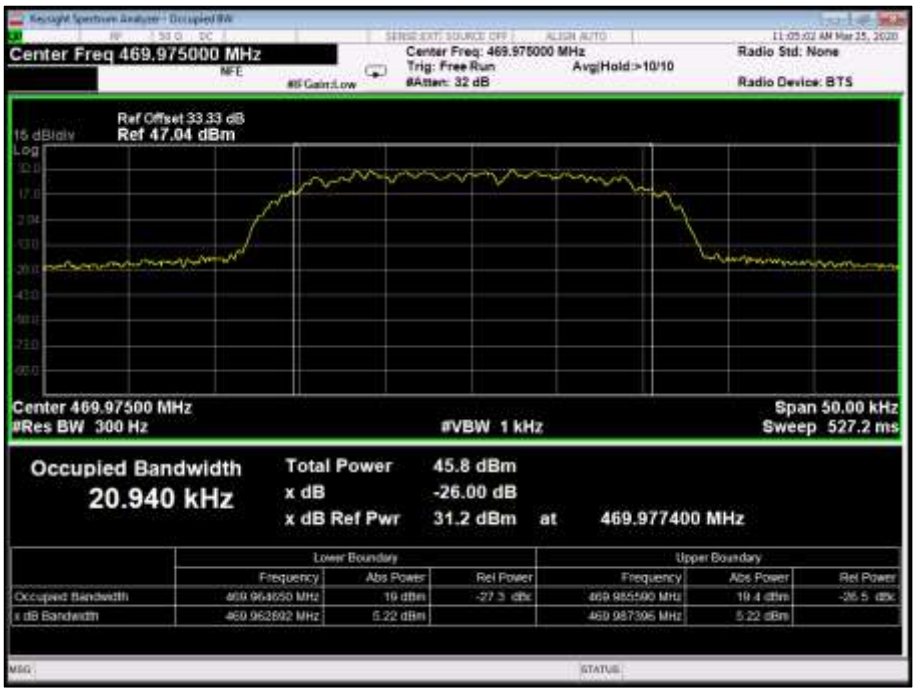

Figure 19 - 469.975 MHz

FCC 47 CFR Part 90, Limit Clause 90.209

< 22 kHz

Operations using equipment designed to operate with a 25 kilohertz channel bandwidth may be authorized up to a 20 kilohertz bandwidth unless the equipment meets the Adjacent Channel Power limits of Part 90.221 in which case operations may be authorized up to a 22 kilohertz bandwidth.

Industry Canada RSS-119, Limit Clause 5.5

The maximum permissible occupied bandwidth shall not exceed the authorized bandwidth specified in table 3 of the test specification for the equipment's frequency band as specified below.

< 22 kHz (Where Spectrum Mask Y is applied).

2.3.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Attenuator (10 dB, 75 W)	Bird	8308-100	386	12	23-Jul-2020
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Attenuator (10dB, 10W)	Bird	8343-100	478	-	O/P Mon
Attenuator (10dB/100W)	Bird	8343-100	495	12	18-Nov-2020
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	16-Apr-2020
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	16-Apr-2020
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	21-Oct-2020
Network Analyser	Keysight Technologies	E5063A	5018	12	20-May-2020
Electronic Calibration Module	Keysight Technologies	85093C	5188	12	21-May-2020
1 Meter Cable	Teledyne	PR90-088-1MTR	5193	12	30-Jul-2020

Table 13

O/P Mon – Output Monitored using calibrated equipment

2.4 Spurious Emissions at Antenna Terminals

2.4.1 Specification Reference

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

2.4.2 Equipment Under Test and Modification State

SCG22 S/N: 1PR002007GPH5XV - Modification State 0

2.4.3 Date of Test

26-March-2020 to 30-March-2020

2.4.4 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 100 Hz as stated in RSS-119, clause 4.2.2, with a VBW of 3 times RBW. The mask as per FCC 47 CFR Part 90.210 (b) was applied.

2.4.5 Environmental Conditions

Ambient Temperature	23.2 - 24.1 °C
Relative Humidity	16.0 - 22.3 %

2.4.6 Test Results

TETRA 406 MHz to 430 MHz - Transmit

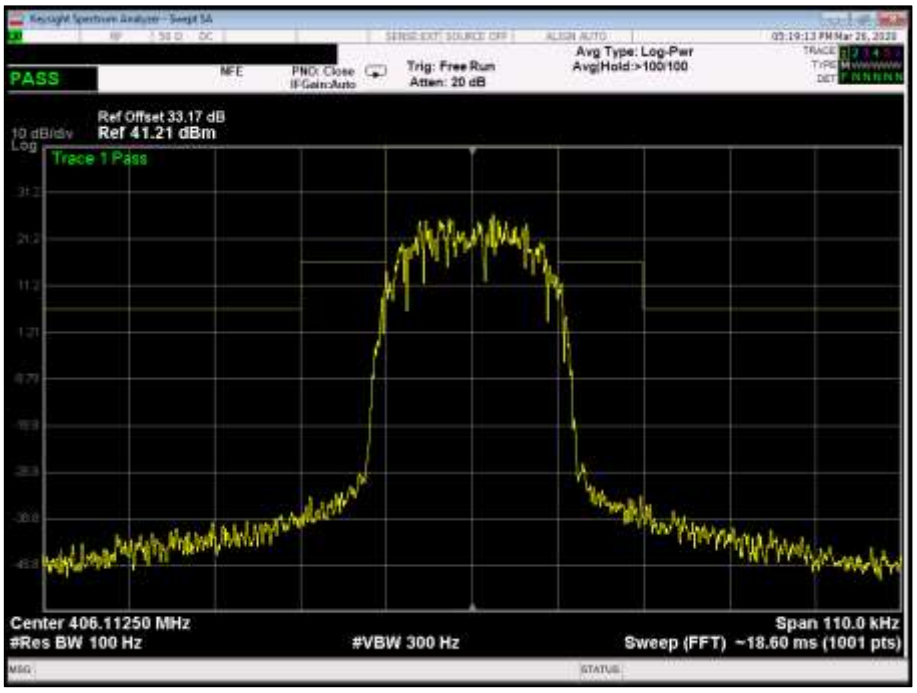

Figure 20 - 406.1125 MHz, FCC Transmitter Mask B

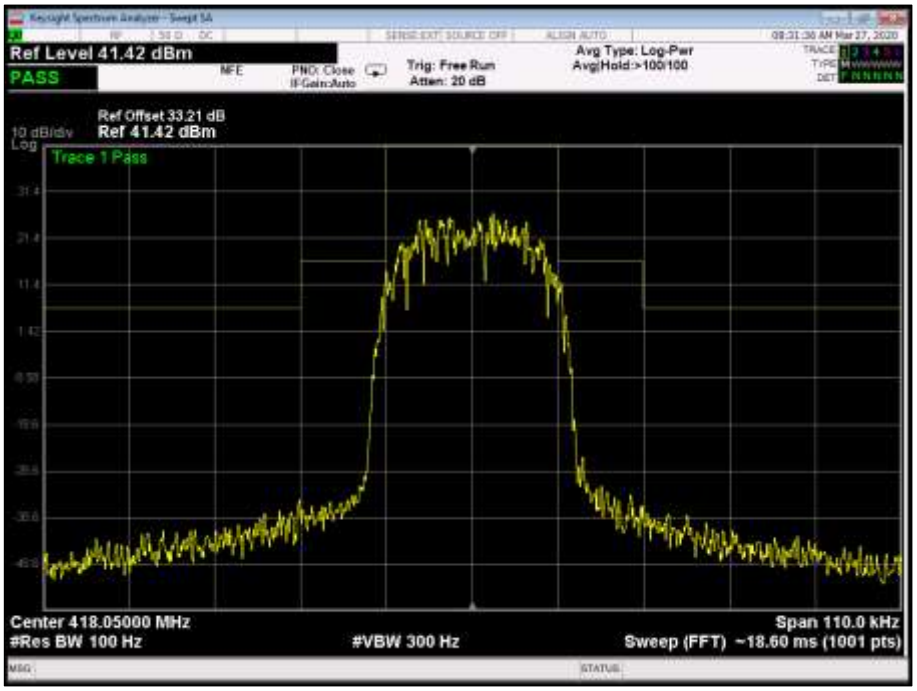

Figure 21 - 418.0500 MHz, FCC Transmitter Mask

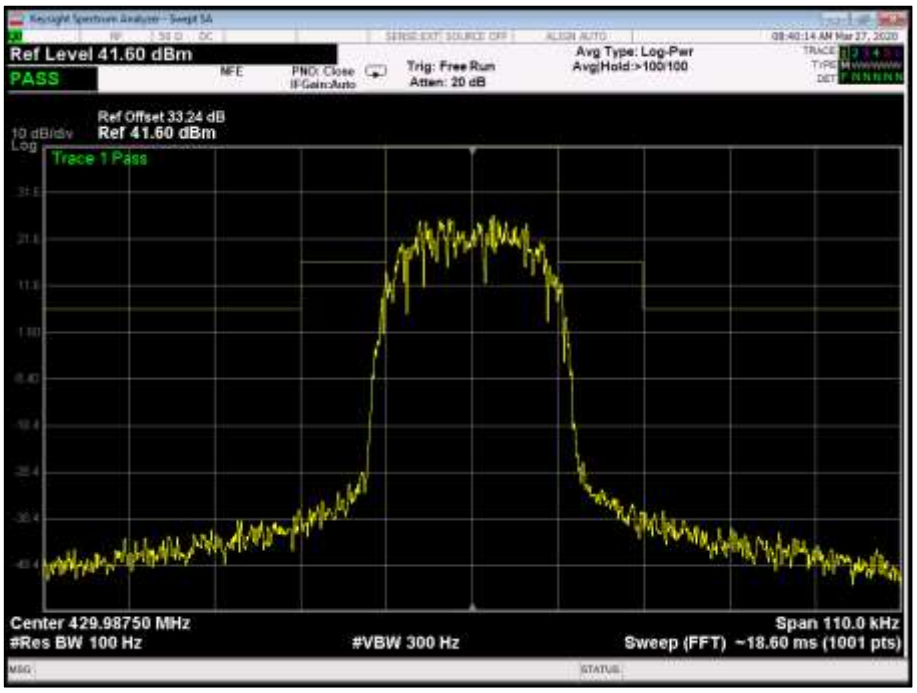

Figure 22 - 429.9875 MHz, FCC Transmitter Mask B

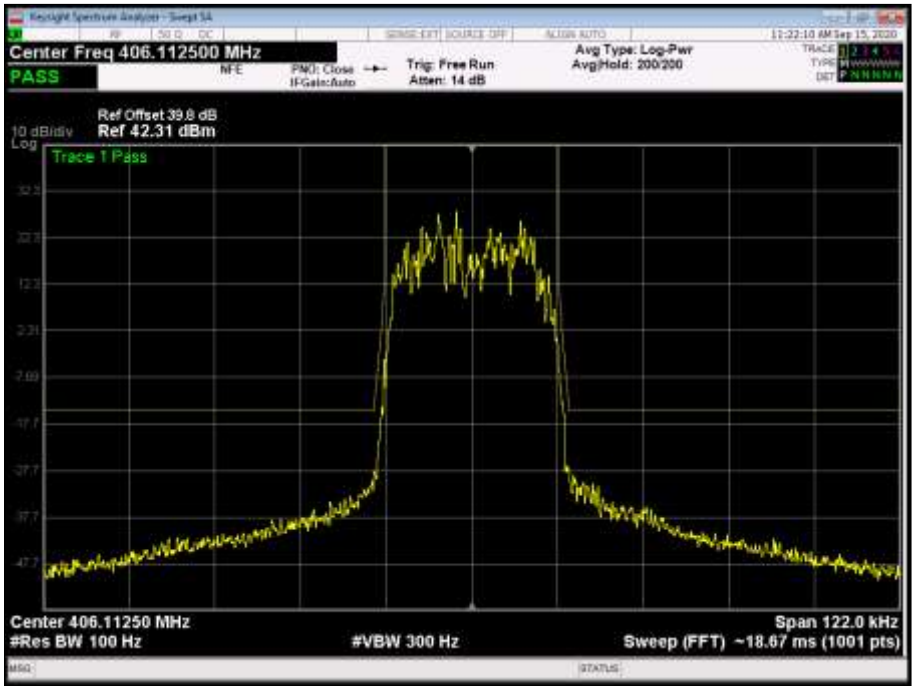

Figure 23 - 406.1125 MHz, ISED Transmitter Mask Y

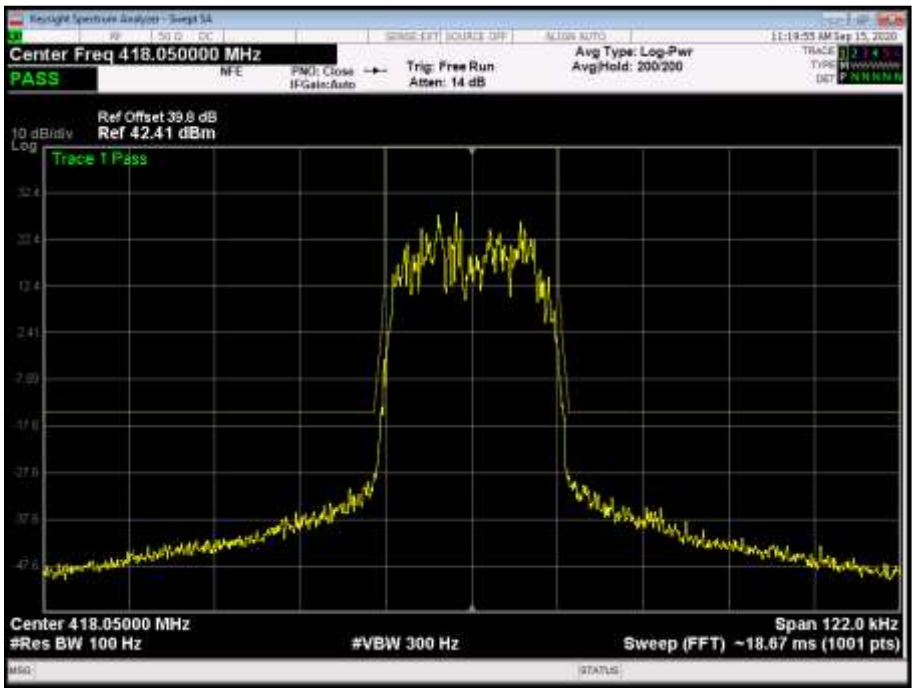

Figure 24 - 418.0500 MHz, ISED Transmitter Mask Y

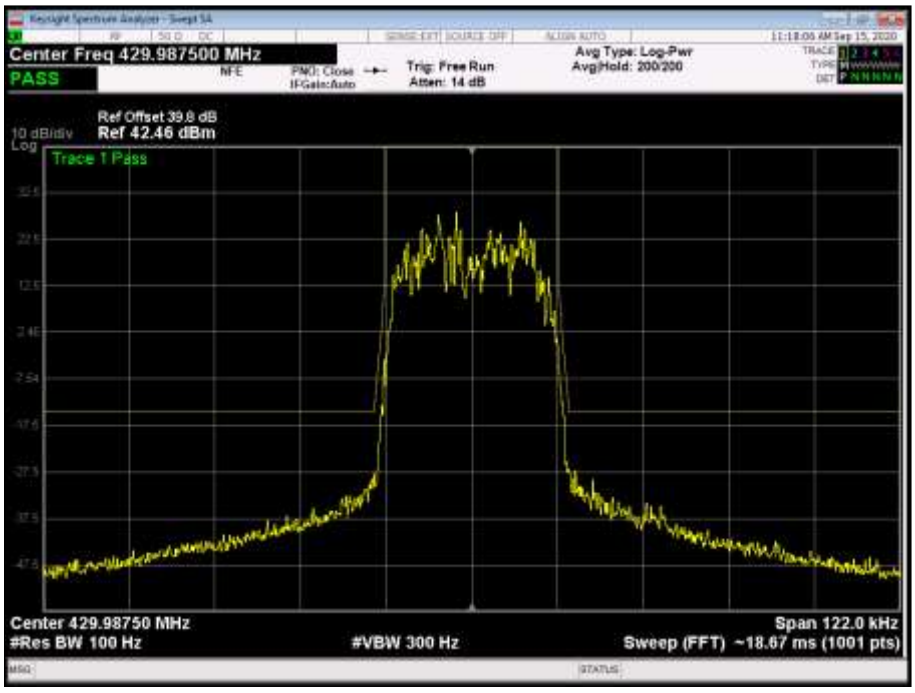

Figure 25 - 429.9875 MHz, ISED Transmitter Mask Y

Figure 26 - 406.1125 MHz, 9 kHz to 150 kHz

Figure 27 - 418.0500 MHz, 9 kHz to 150 kHz

Figure 28 - 429.9875 MHz - 9 kHz to 150 kHz

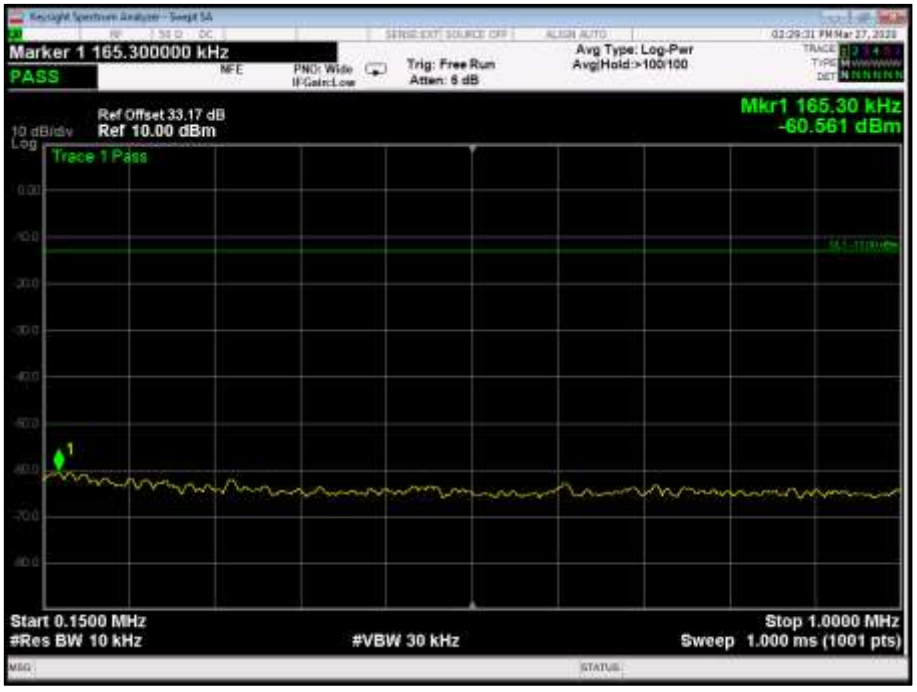

Figure 29 - 406.1125 MHz, 150 kHz to 1 MHz

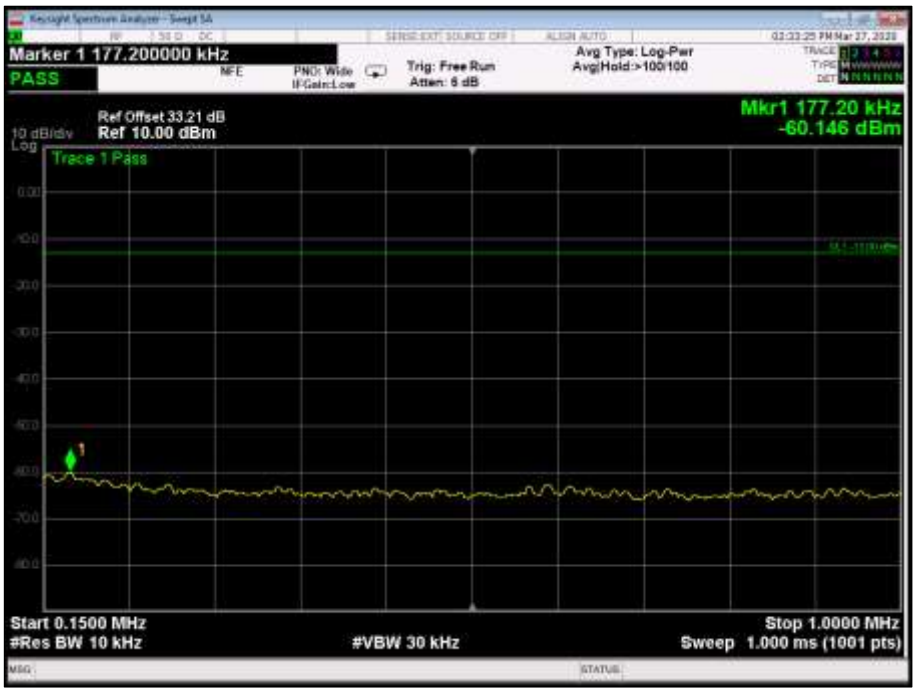

Figure 30 - 418.0500 MHz, 150 kHz to 1 MHz

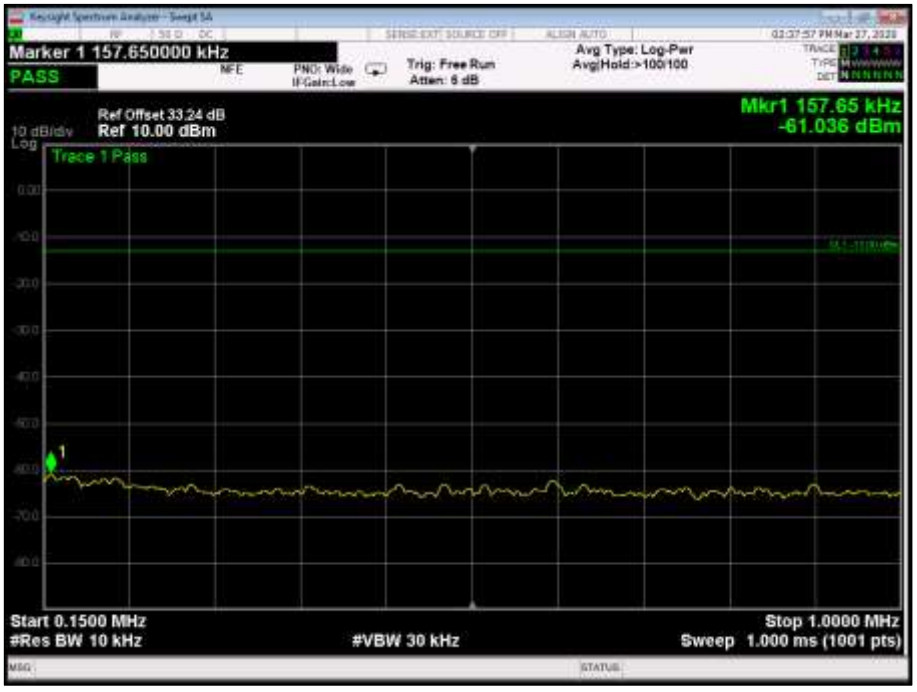

Figure 31 - 429.9875 MHz - 150 kHz to 1 MHz

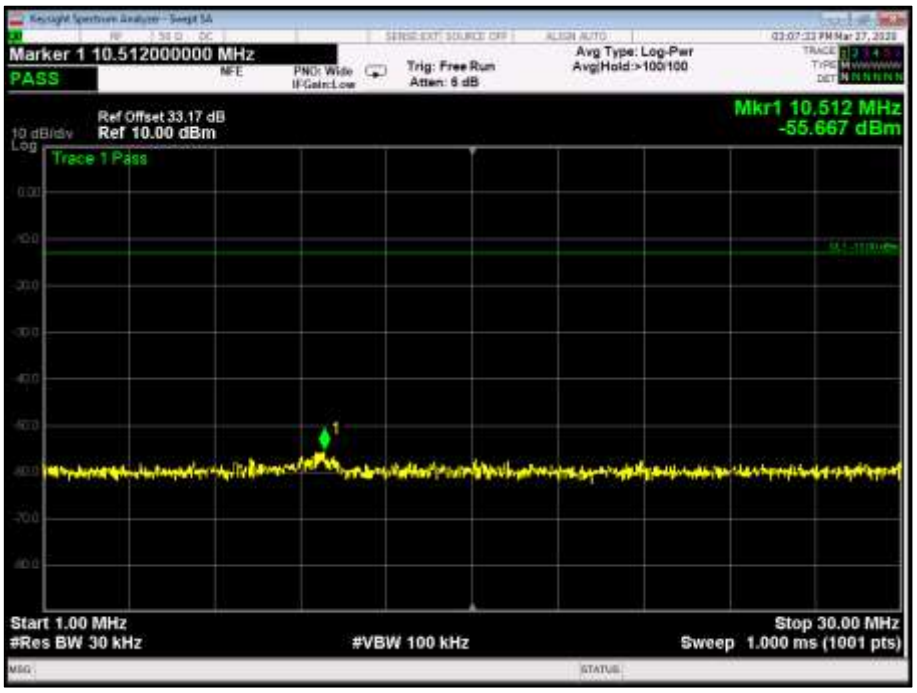

Figure 32 - 406.1125 MHz, 1 MHz to 30 MHz

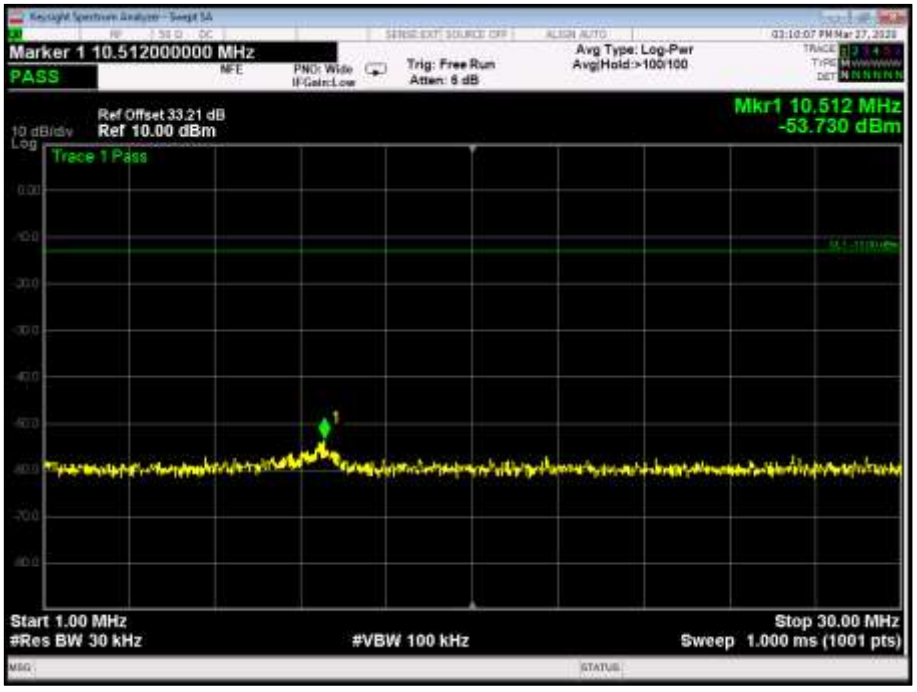

Figure 33 - 418.0500 MHz, 1 MHz to 30 MHz

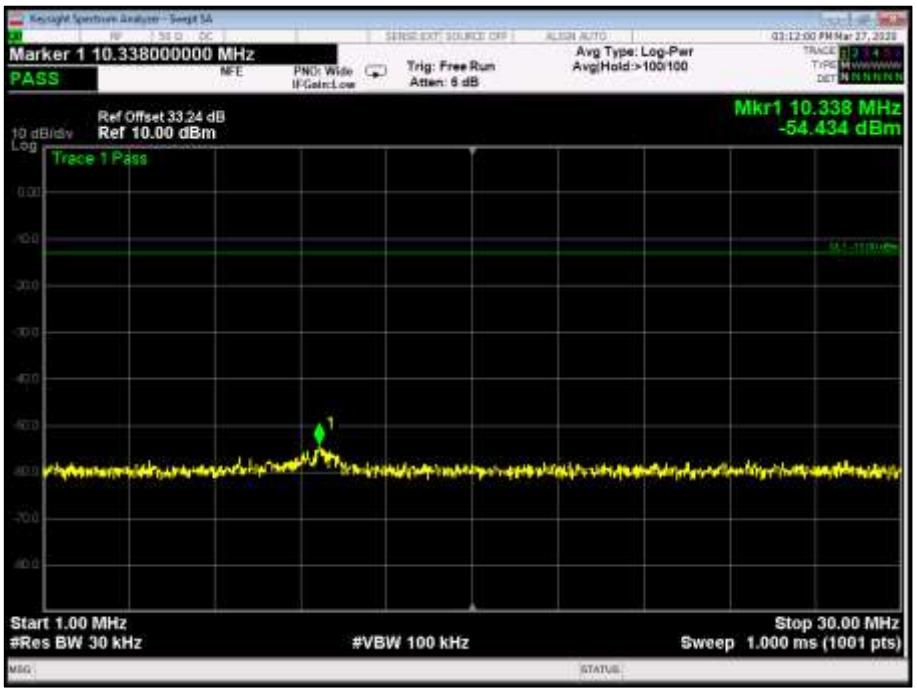

Figure 34 - 429.9875 MHz - 1 MHz to 30 MHz

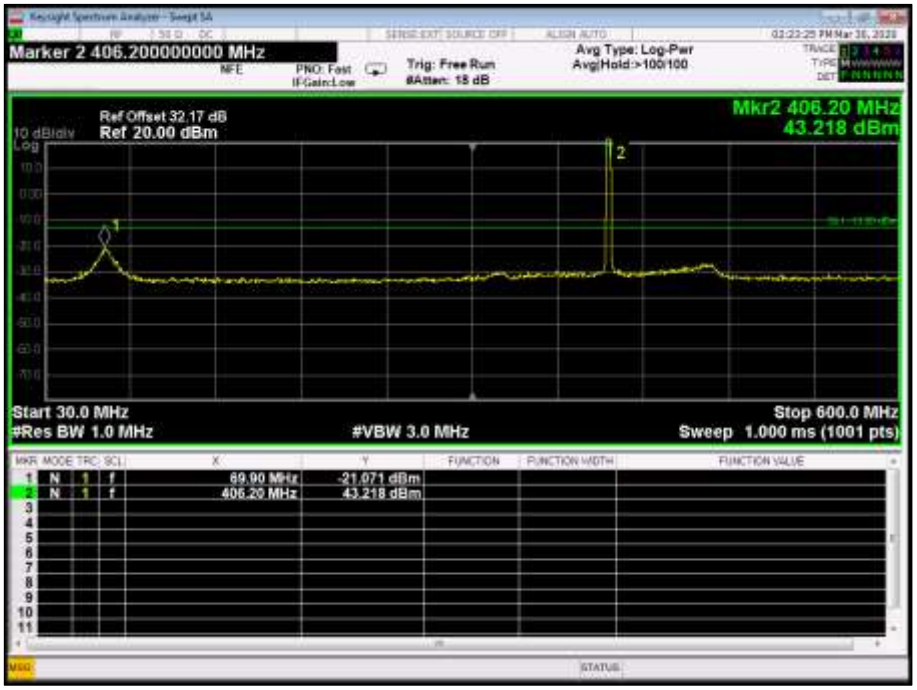

Figure 35 - 406.1125 MHz, 30 MHz to 600 MHz

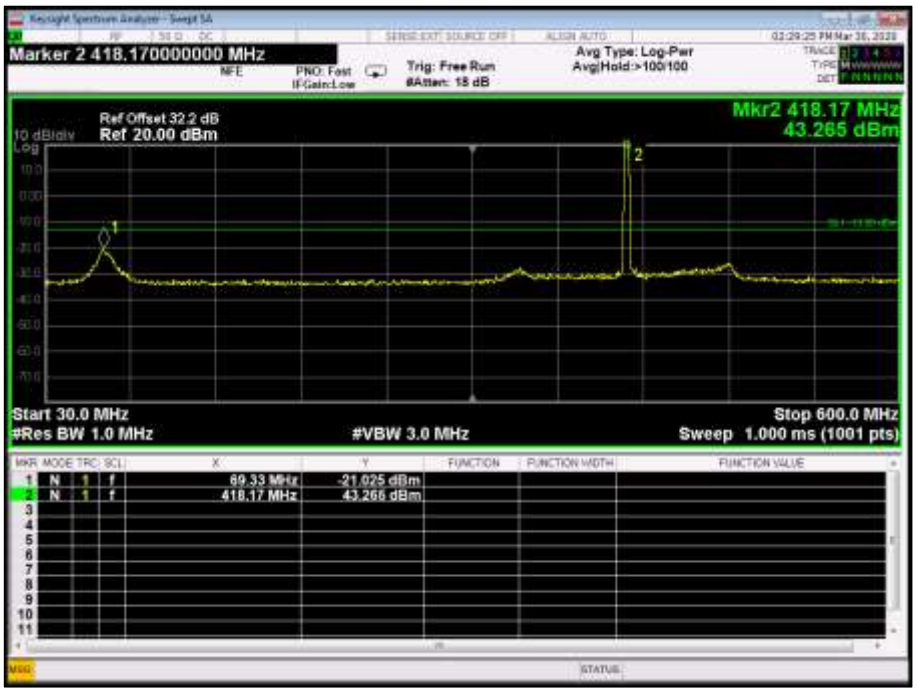

Figure 36 - 418.0500 MHz, 30 MHz to 600 MHz

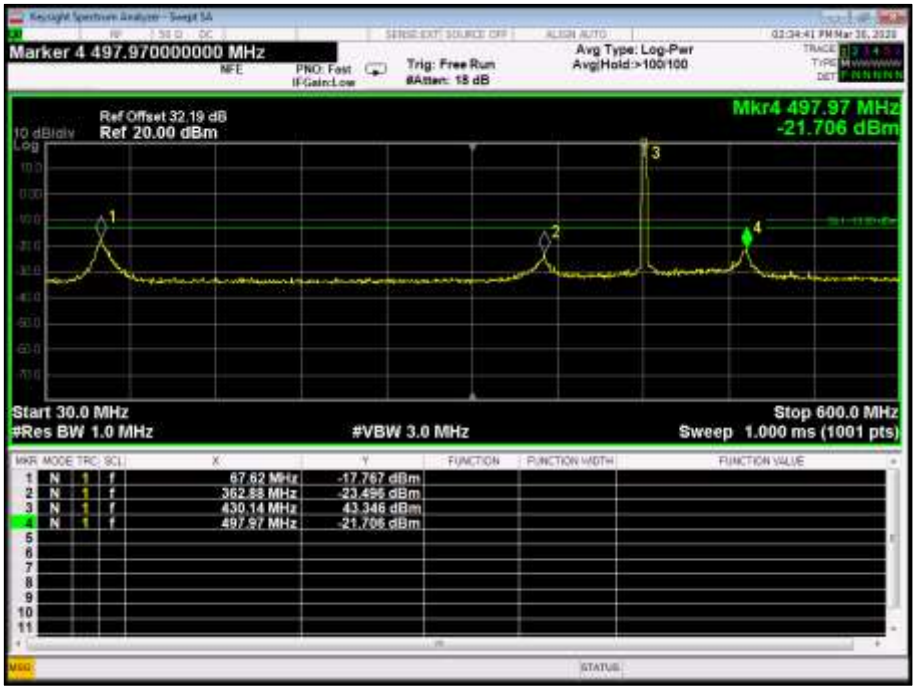

Figure 37 - 429.9875 MHz - 30 MHz to 600 MHz

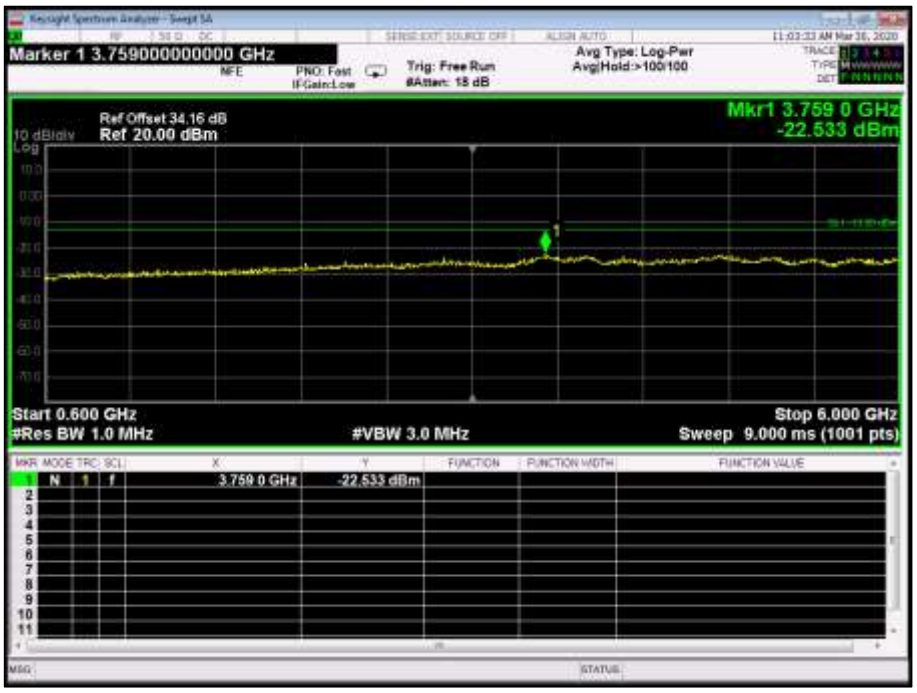

Figure 38 - 406.1125 MHz, 600 MHz to 6 GHz

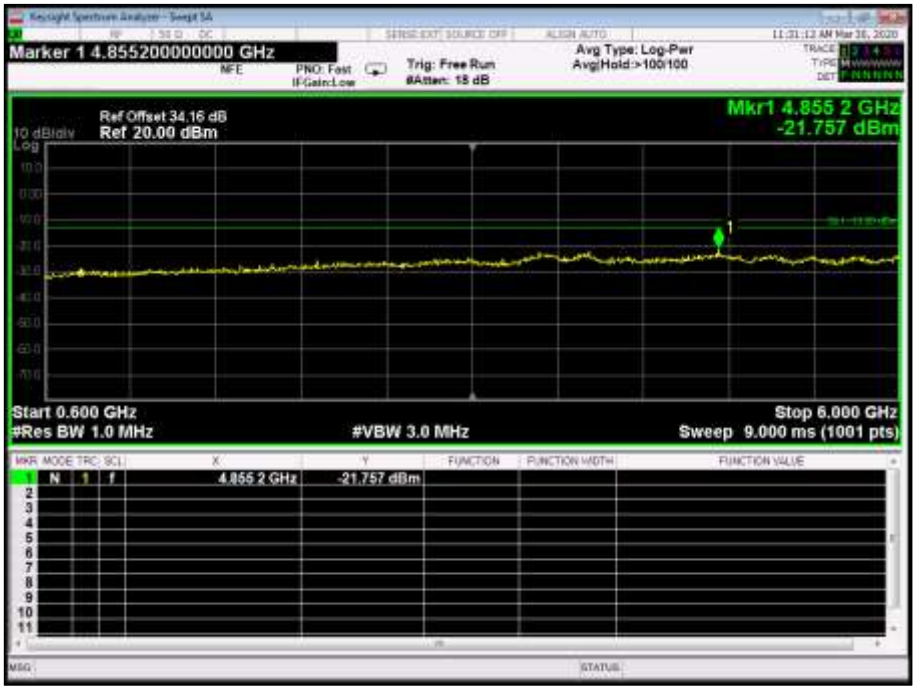

Figure 39 - 418.0500 MHz, 600 MHz to 6 GHz

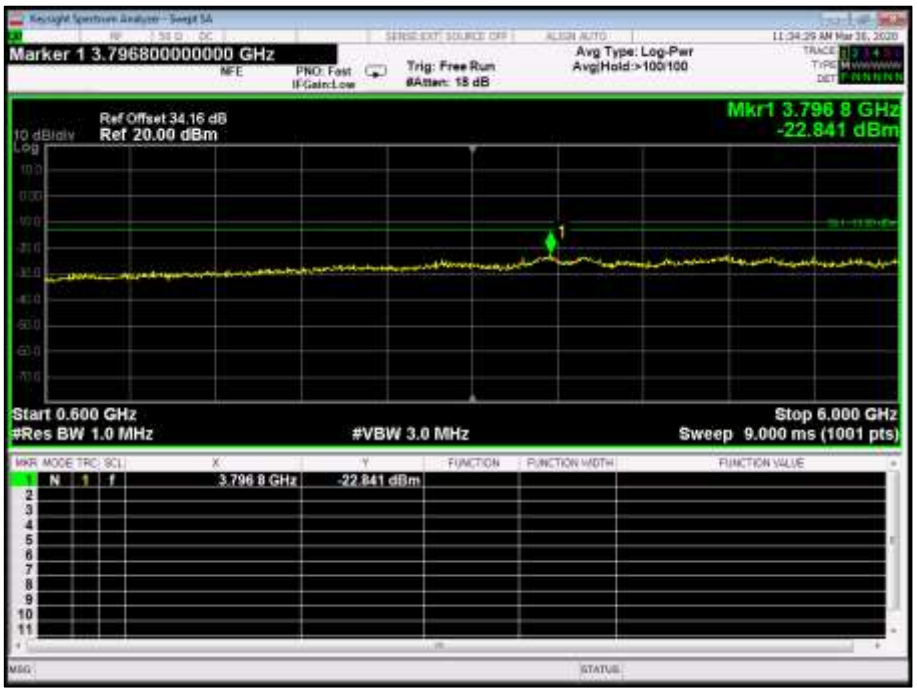

Figure 40 - 429.9875 MHz - 600 MHz to 6 GHz

TETRA 450 MHz to 470 MHz - Transmit

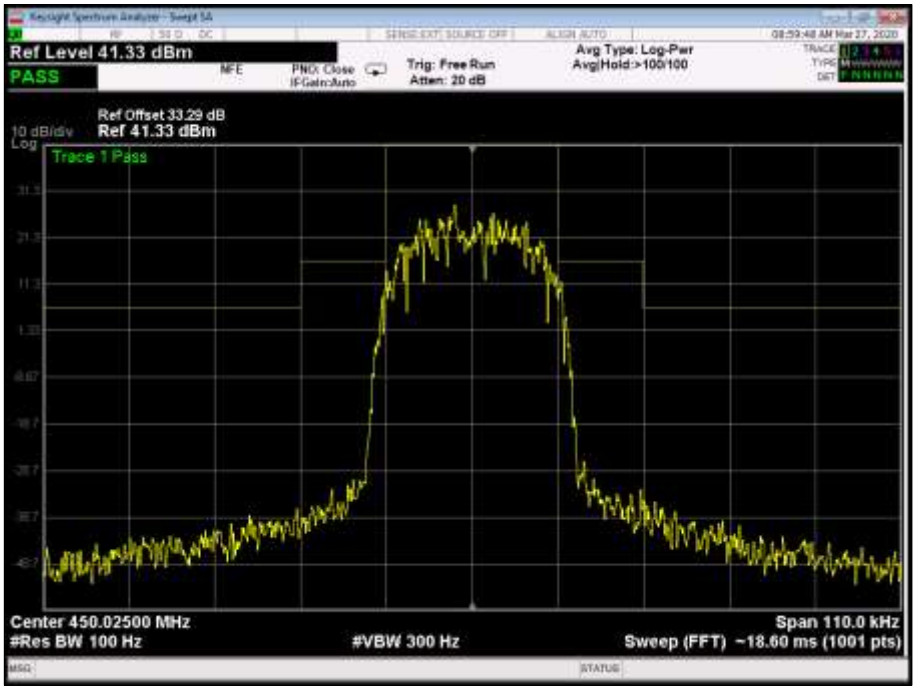

Figure 41 - 450.025 MHz, FCC Transmitter Mask B

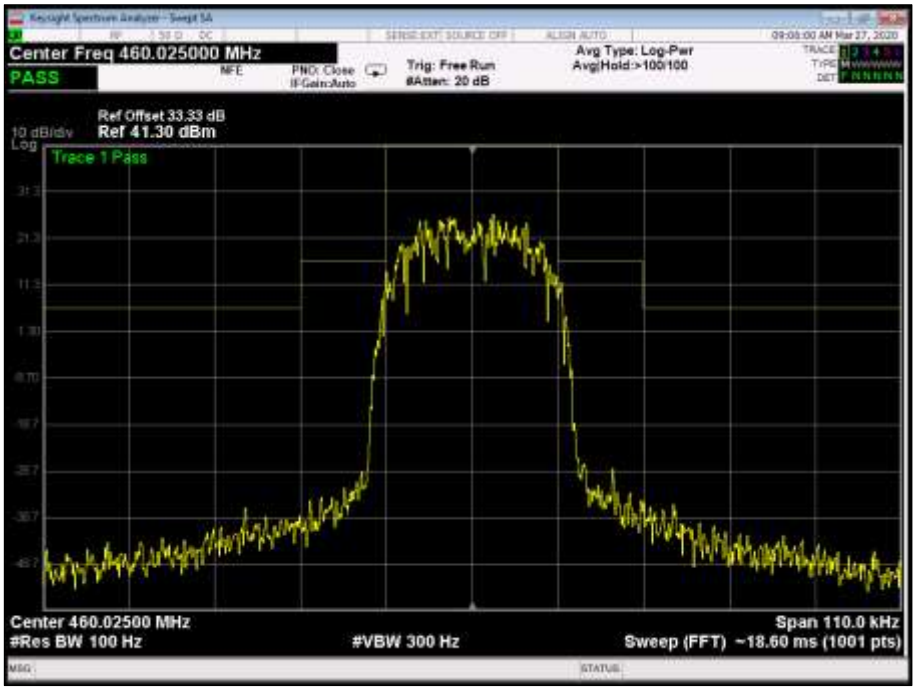

Figure 42 - 460.025 MHz, FCC Transmitter Mask B

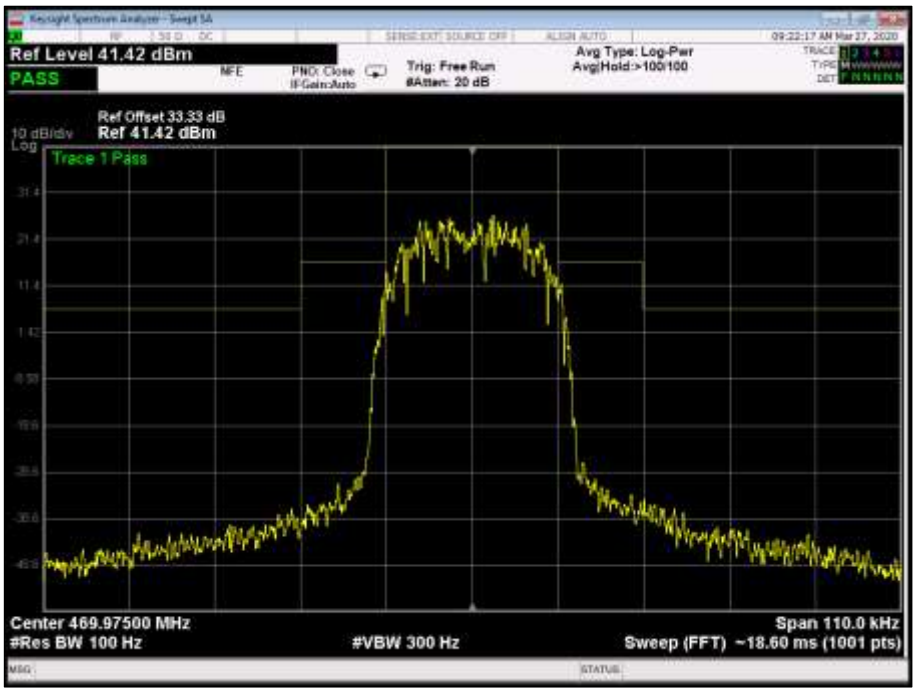

Figure 43 - 469.975 MHz, FCC Transmitter Mask B

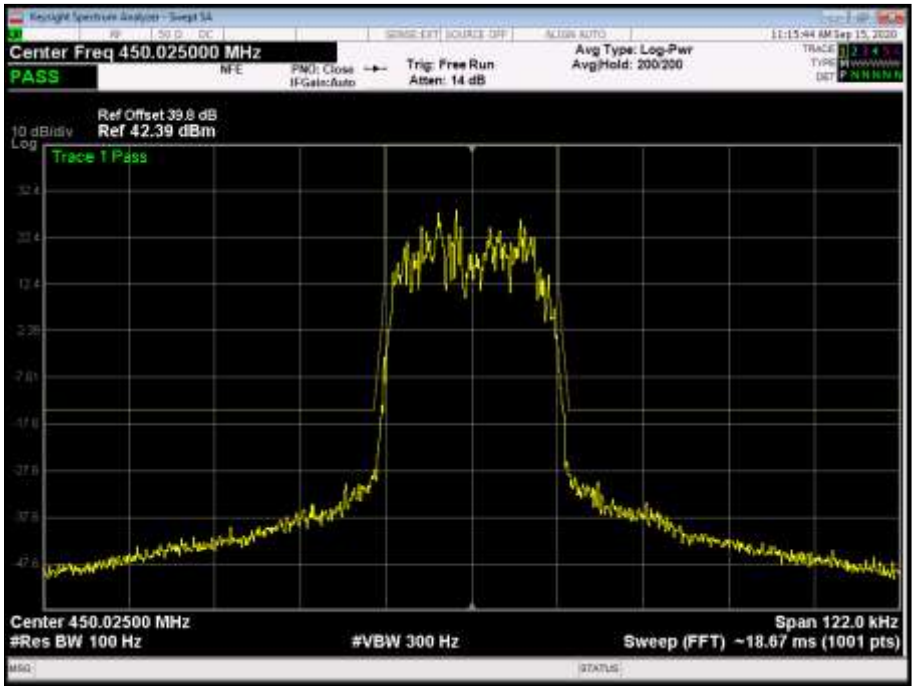

Figure 44 - 450.025 MHz, ISED Transmitter Mask Y

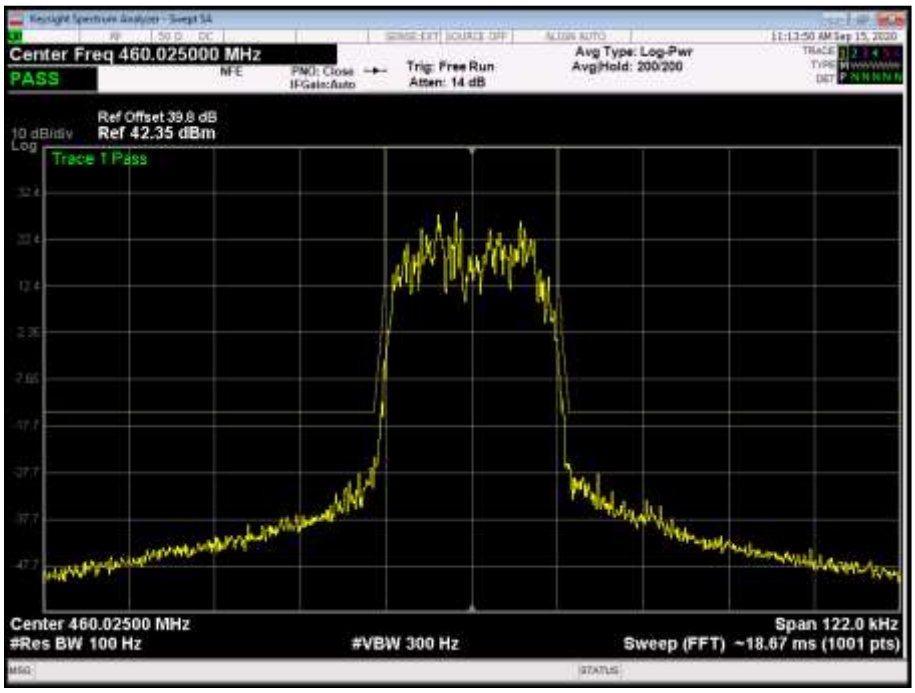

Figure 45 - 460.025 MHz, ISED Transmitter Mask Y

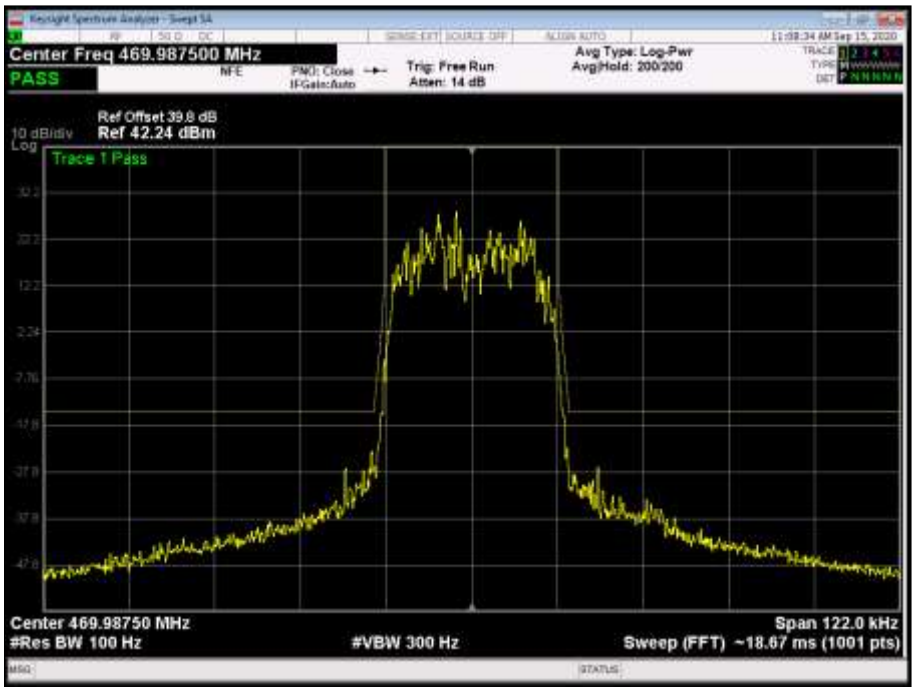

Figure 46 - 469.975 MHz, ISED Transmitter Mask Y

Figure 47 - 450.025 MHz, 9 kHz to 150 kHz

Figure 48 - 460.025 MHz, 9 kHz to 150 kHz

Figure 49 - 469.975 MHz - 9 kHz to 150 kHz

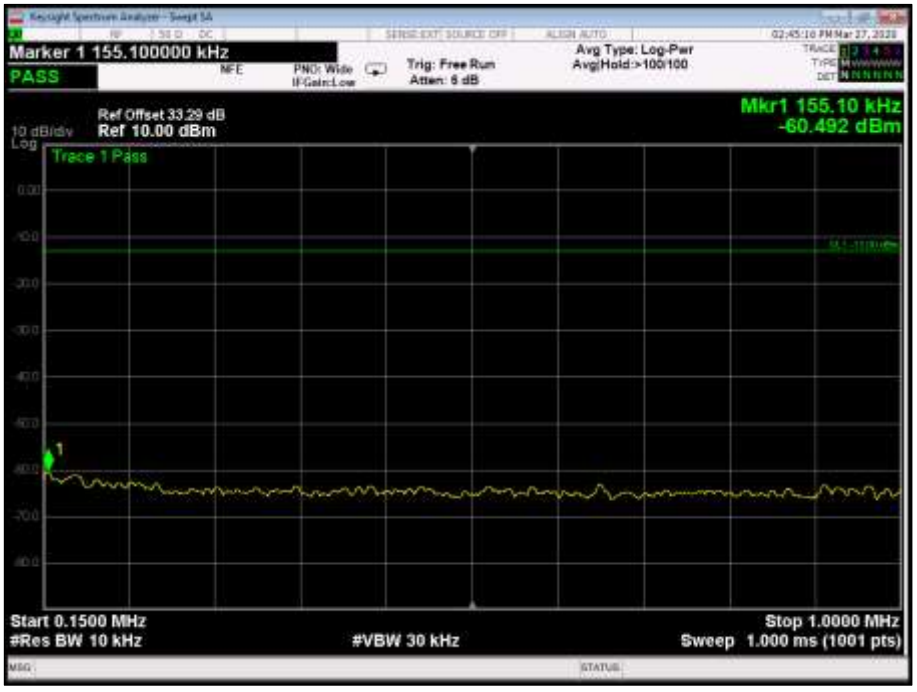

Figure 50 - 450.025 MHz, 150 kHz to 1 MHz

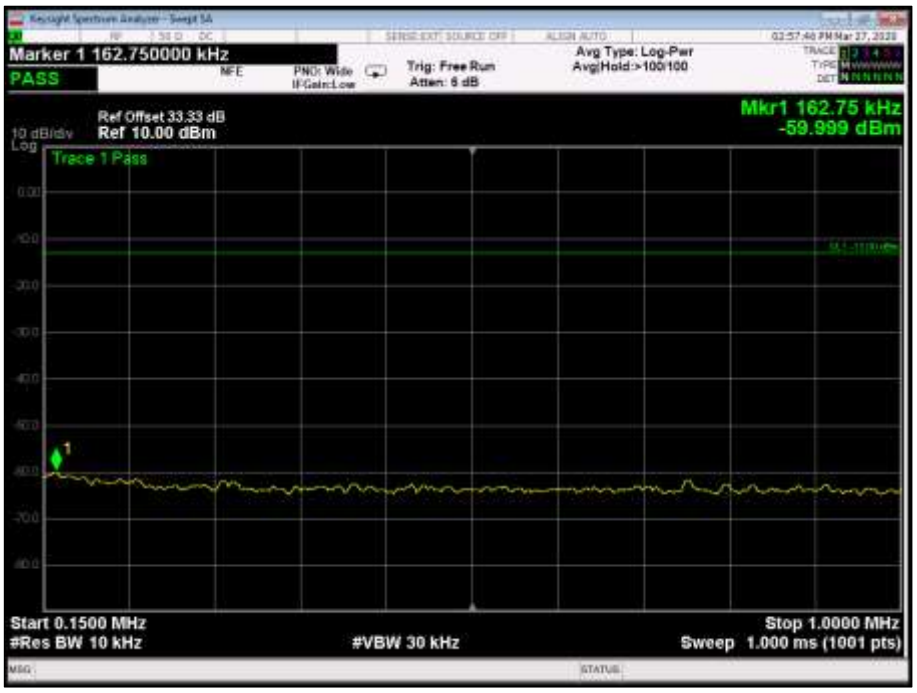

Figure 51 - 460.025 MHz, 150 kHz to 1 MHz

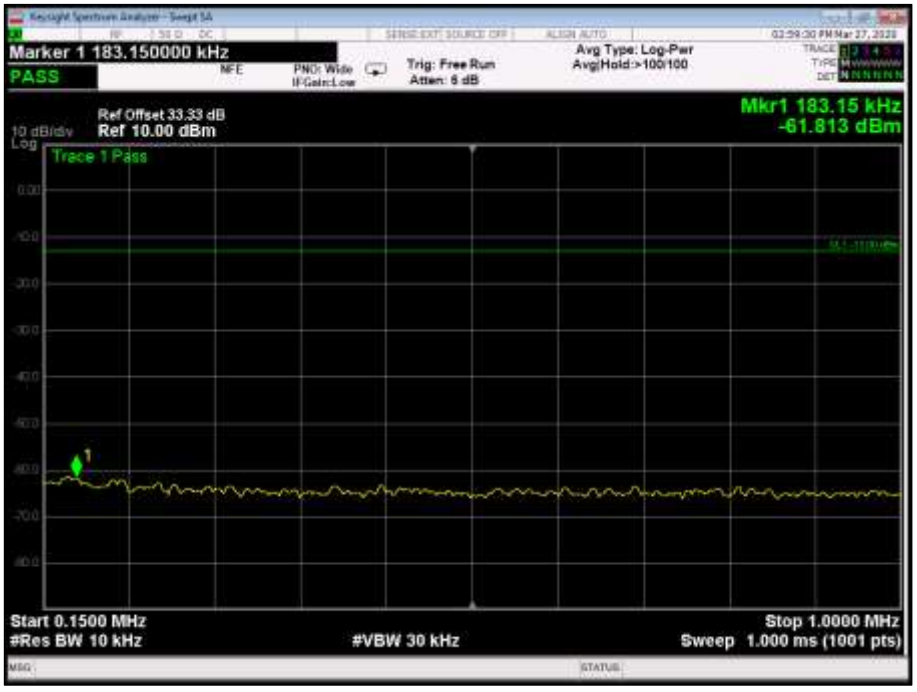

Figure 52 - 469.975 MHz - 150 kHz to 1 MHz

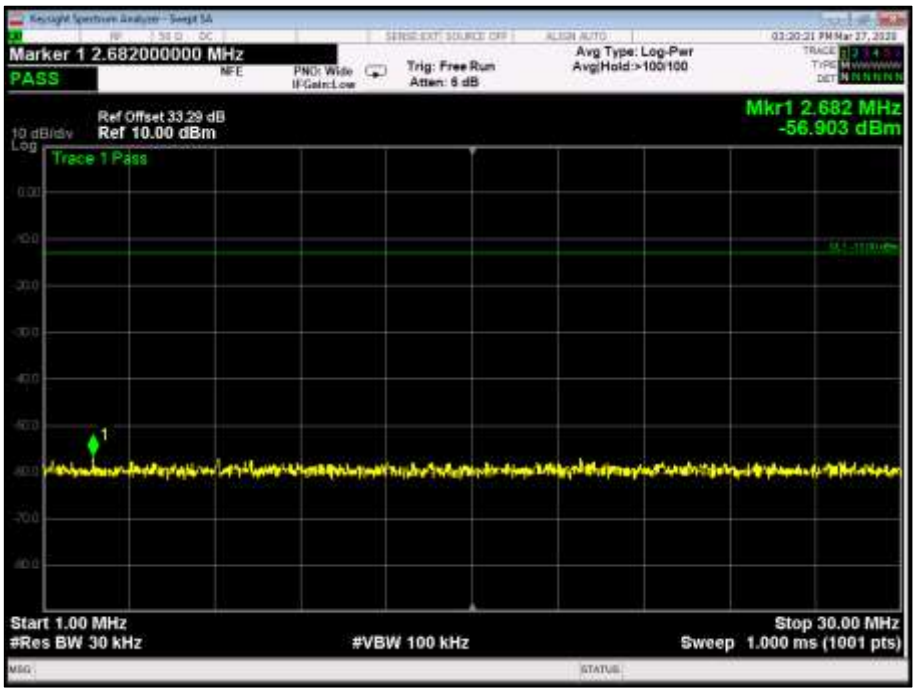

Figure 53 - 450.025 MHz, 1 MHz to 30 MHz

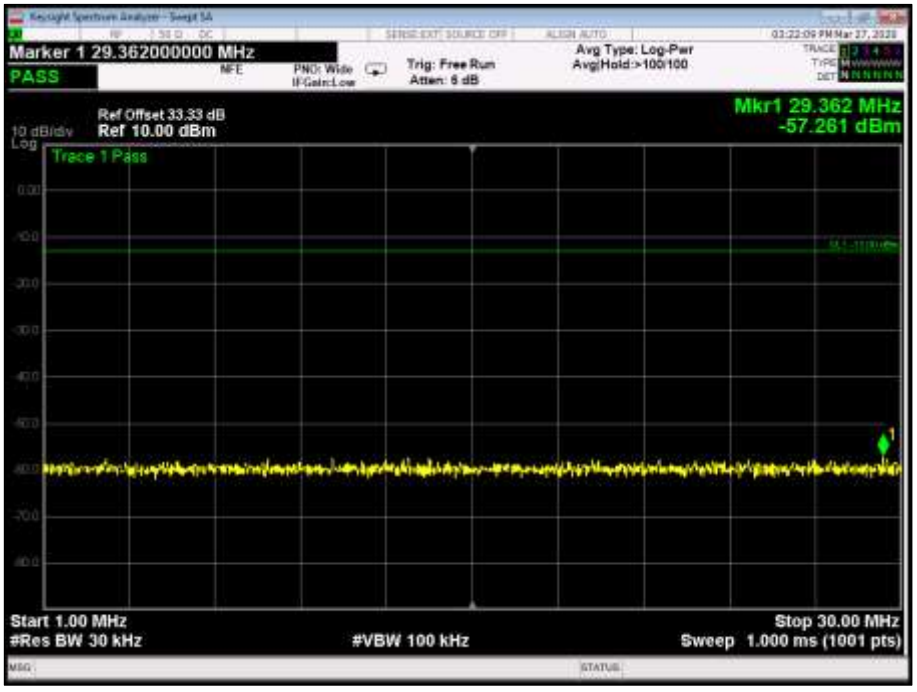

Figure 54 - 460.025 MHz, 1 MHz to 30 MHz

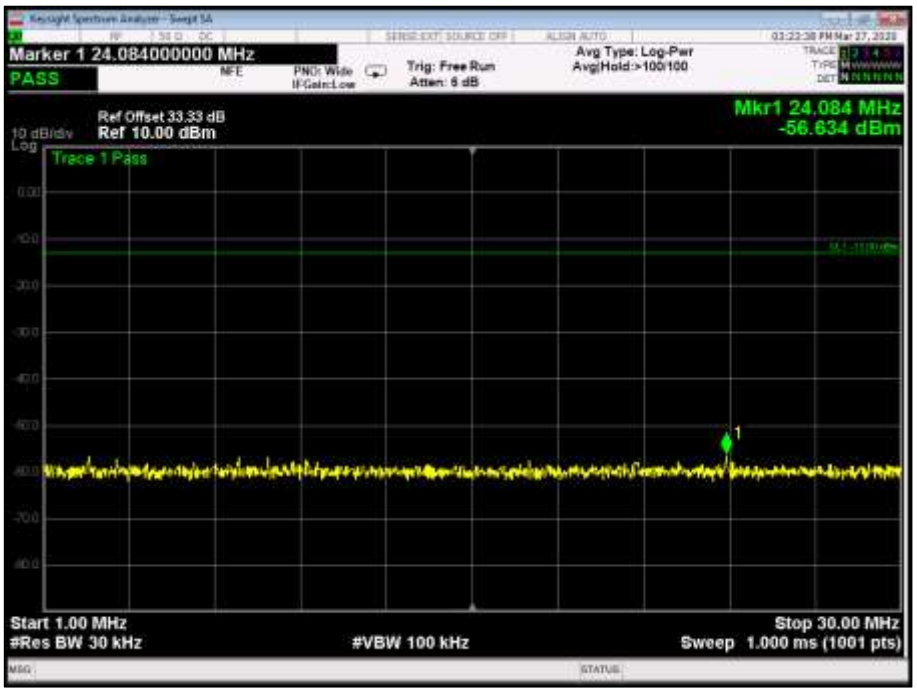

Figure 55 - 469.975 MHz - 1 MHz to 30 MHz

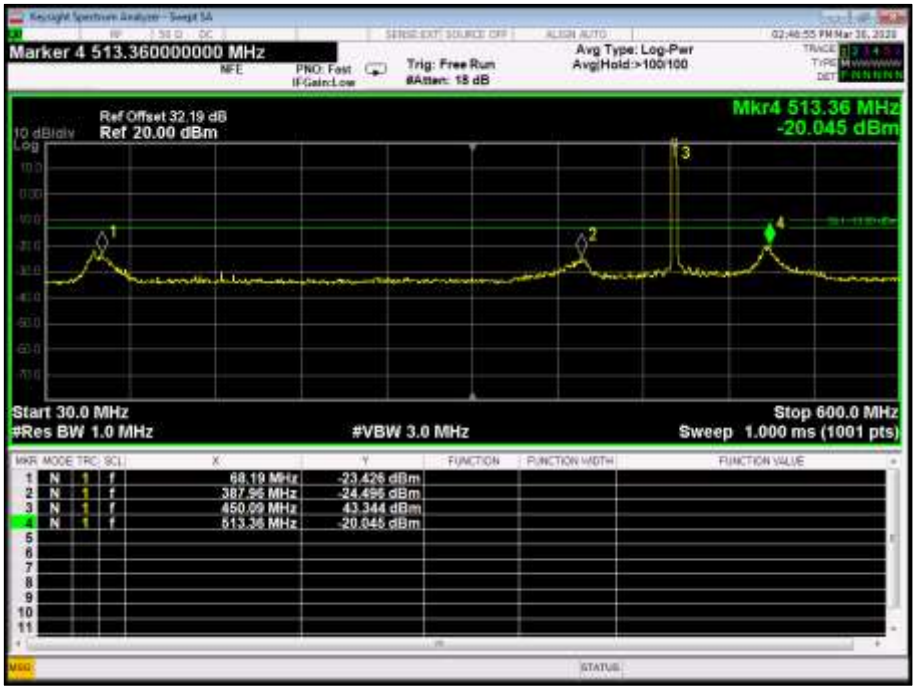

Figure 56 - 450.025 MHz, 30 MHz to 600 MHz

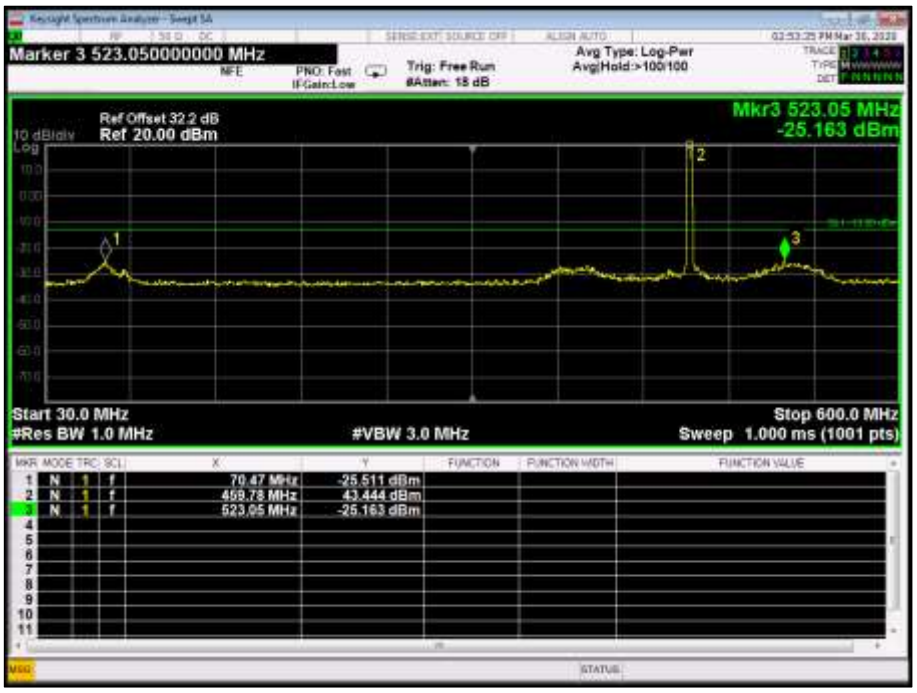

Figure 57 - 460.025 MHz, 30 MHz to 600 MHz

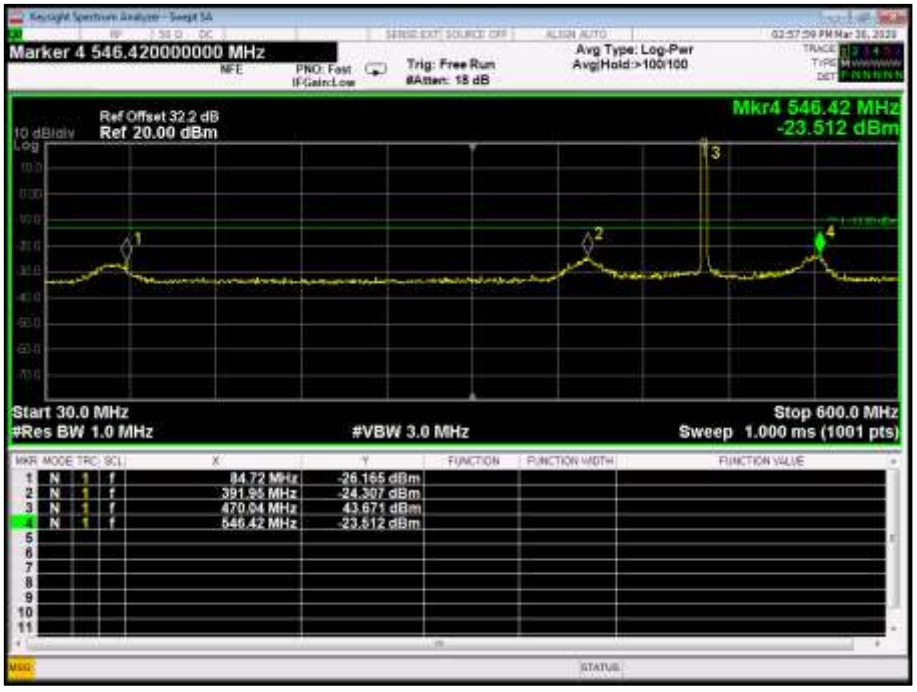

Figure 58 - 469.975 MHz - 30 MHz to 600 MHz

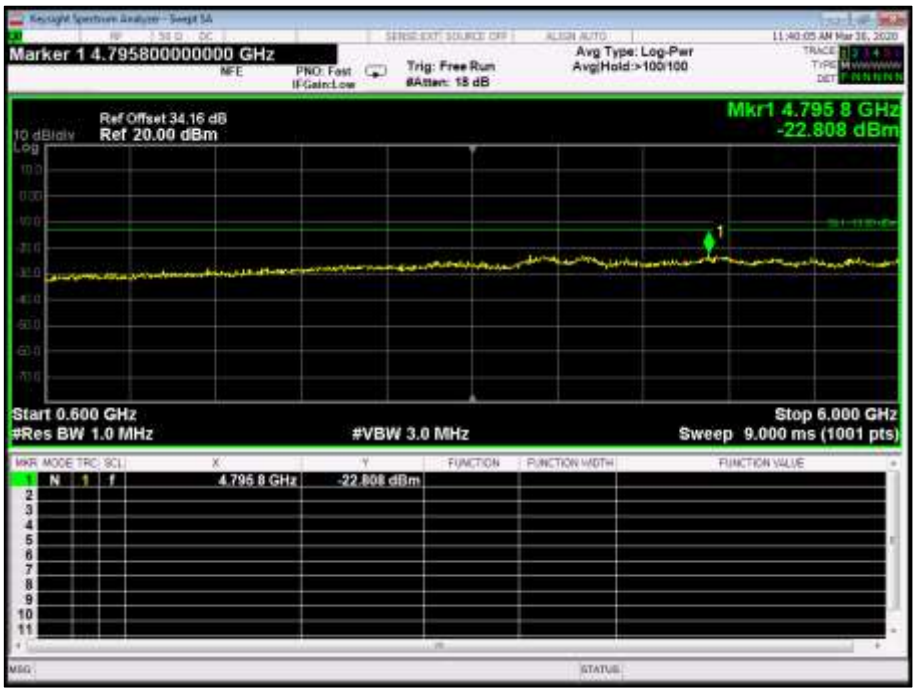

Figure 59 - 450.025 MHz, 600 MHz to 6 GHz

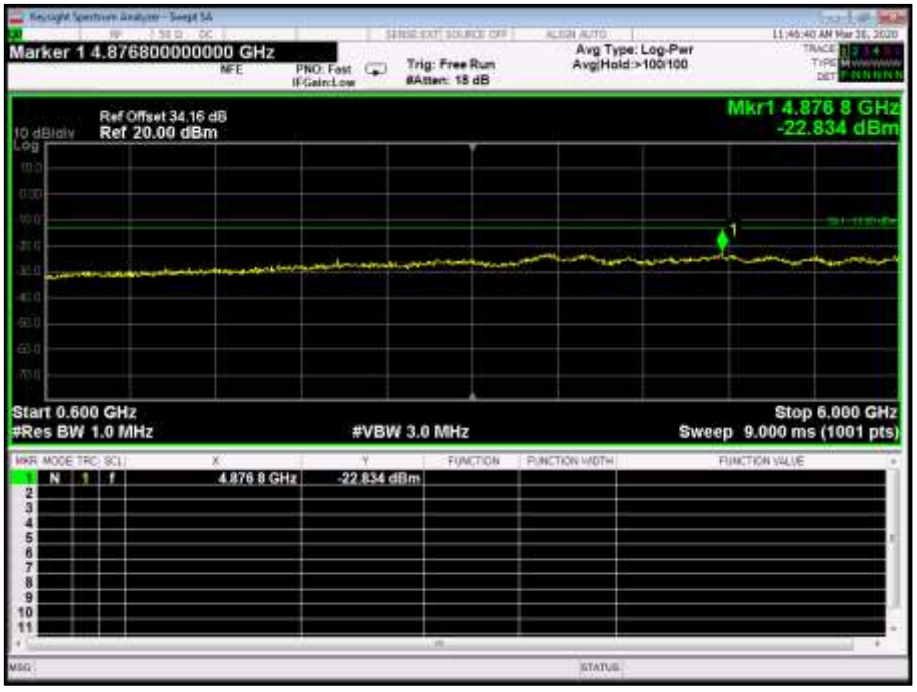

Figure 60 - 460.025 MHz, 600 MHz to 6 GHz

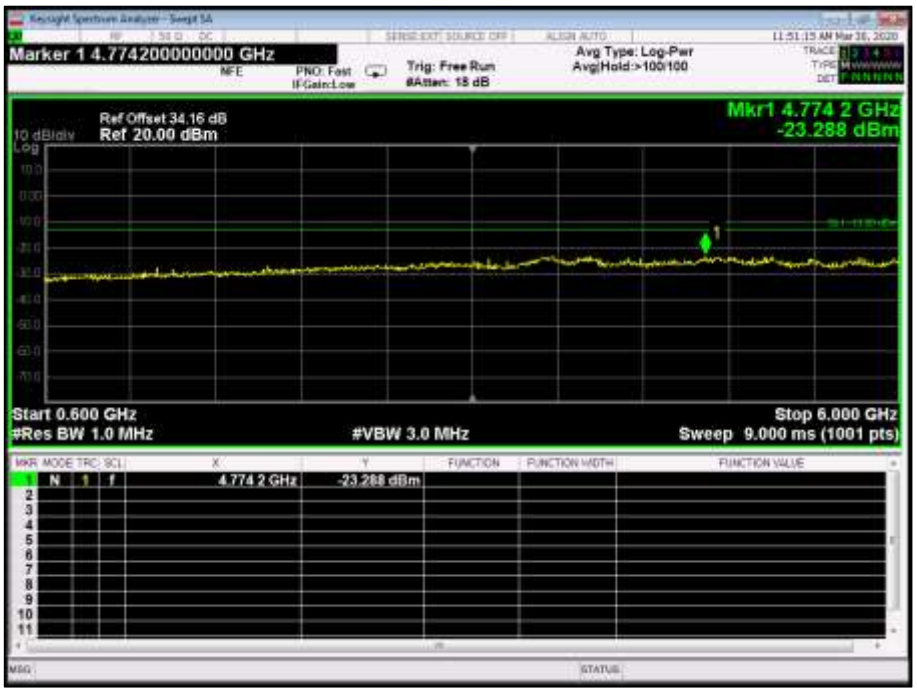

Figure 61 - 469.975 MHz - 600 MHz to 6 GHz

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.

Industry Canada RSS-119, Limit Clause 5.8

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

2.4.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Attenuator (10 dB, 75 W)	Bird	8308-100	386	12	23-Jul-2020
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Attenuator (10dB, 10W)	Bird	8343-100	478	-	O/P Mon
Attenuator (10dB/100W)	Bird	8343-100	495	12	18-Nov-2020
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	16-Apr-2020
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Filter (Hi Pass)	Mini-Circuits	NHP-600	2834	12	25-Oct-2018
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	26-Feb-2021
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	16-Apr-2020
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	21-Oct-2020
Network Analyser	Keysight Technologies	E5063A	5018	12	20-May-2020

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Cable (18 GHz)	Rosenberger	LU7-036-2000	5035	-	O/P Mon
Electronic Calibration Module	Keysight Technologies	85093C	5188	12	21-May-2020
1 Meter Cable	Teledyne	PR90-088-1MTR	5193	12	30-Jul-2020

Table 14

O/P Mon – Output Monitored using calibrated equipment

2.5 Radiated Spurious Emissions

2.5.1 Specification Reference

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

2.5.2 Equipment Under Test and Modification State

SCG22 S/N: 1PR002007GPH5XV - Modification State 0

2.5.3 Date of Test

16-March-2020

2.5.4 Test Method

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

Prescans and final measurements were performed using the direct field strength method. The regulatory limit of -13 dBm/MHz has been converted to a field strength limit in accordance with ANSI C63.26, clause 5.2.7 equation c)

Example calculation
E (dBuV/m) = EIRP (dBm) - 20log(d) + 104.8 where (d) is the measurement distance.
E (dBuV/m) = -13 - 20log(3) + 104.8
E (dBuV/m) = 82.26

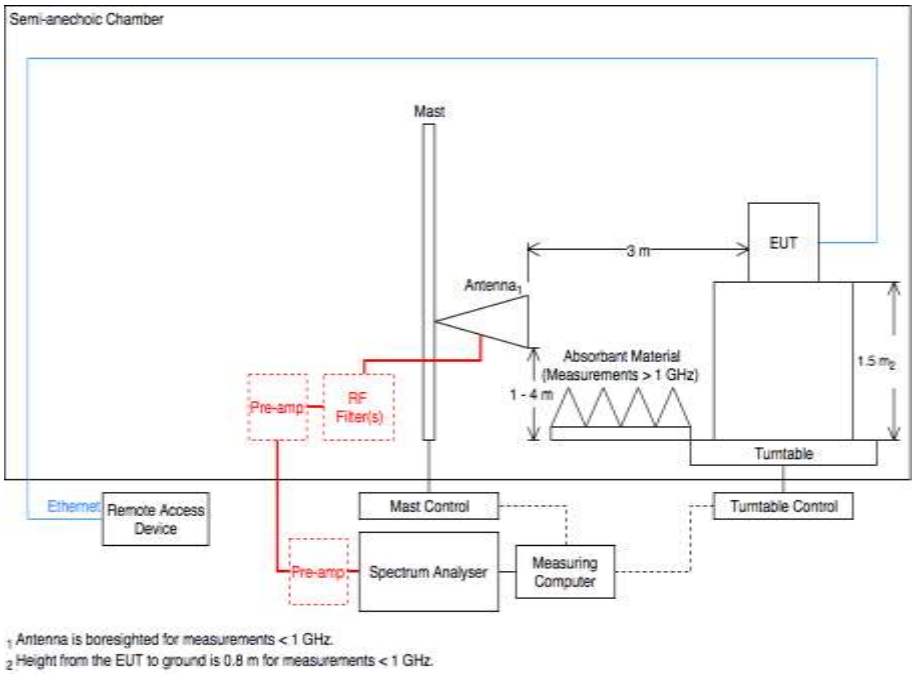

Figure 62 – Test Setup Diagram

The EUT was placed on the non-conducting platform in a manner typical of a normal installation. Ports on the EUT were terminated with loads as described in ANSI C63.4 clause 6.2.4. For multiple connectors of the same type, additional interconnecting cables were connected and pre-scans performed to determine whether the level of the emissions were increased by >2 dB.

2.5.5 Environmental Conditions

Ambient Temperature 18.3 °C
Relative Humidity 35.1 %

2.5.6 Test Results

TETRA 406 MHz to 430 MHz - Transmit

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

Table 15 - 406.1125 MHz – 30 MHz to 5 GHz

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

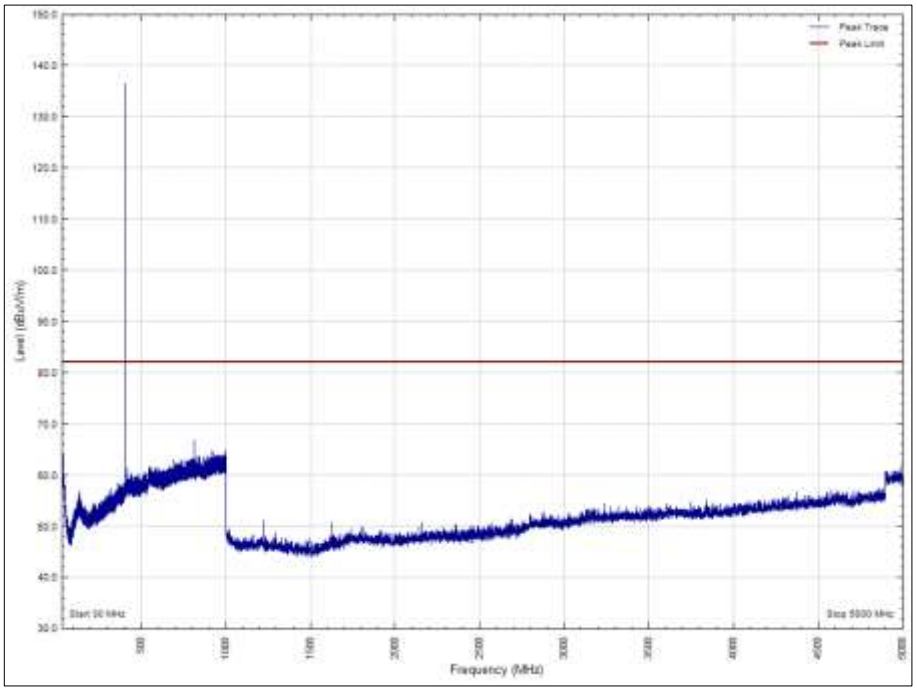

Figure 63 - 406.1125 MHz - 30 MHz to 5 GHz – Vertical

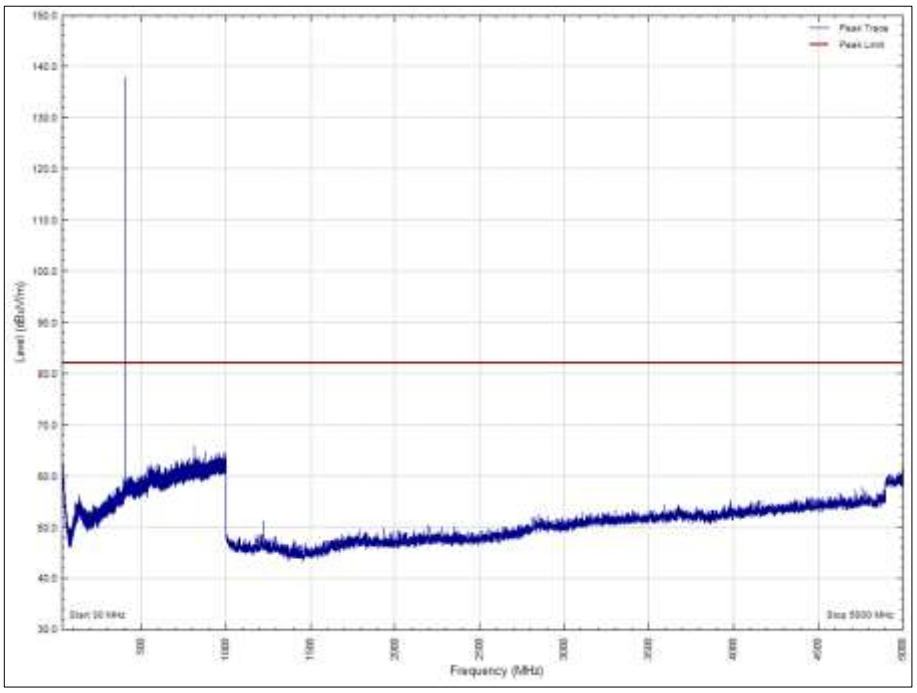

Figure 64 - 406.1125 MHz - 30 MHz to 5 GHz - Horizontal

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

Table 16 - 418.0500 MHz – 30 MHz to 5 GHz

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

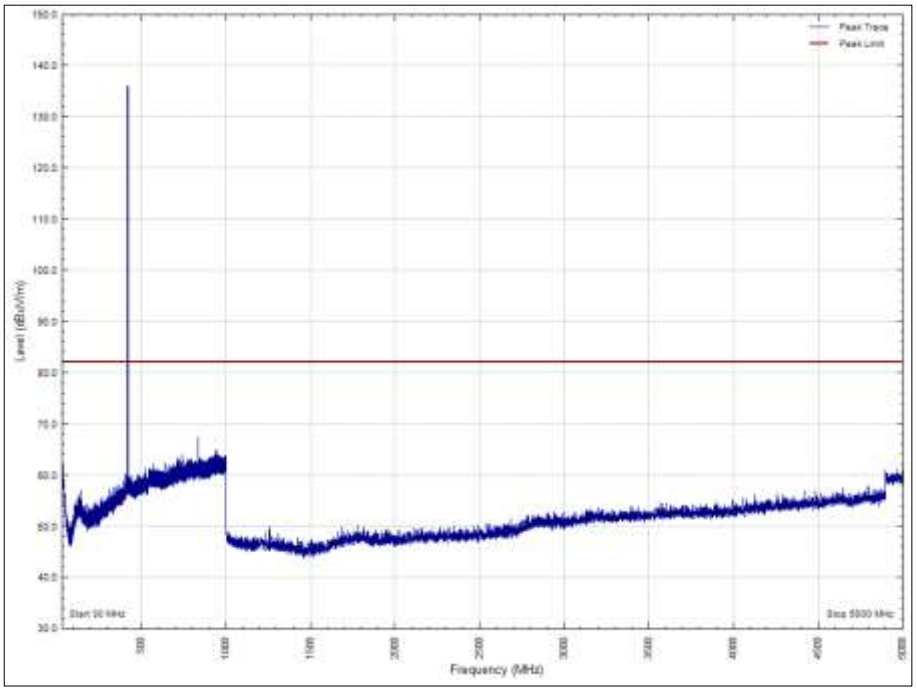

Figure 65 - 418.0500 MHz - 30 MHz to 5 GHz - Vertical

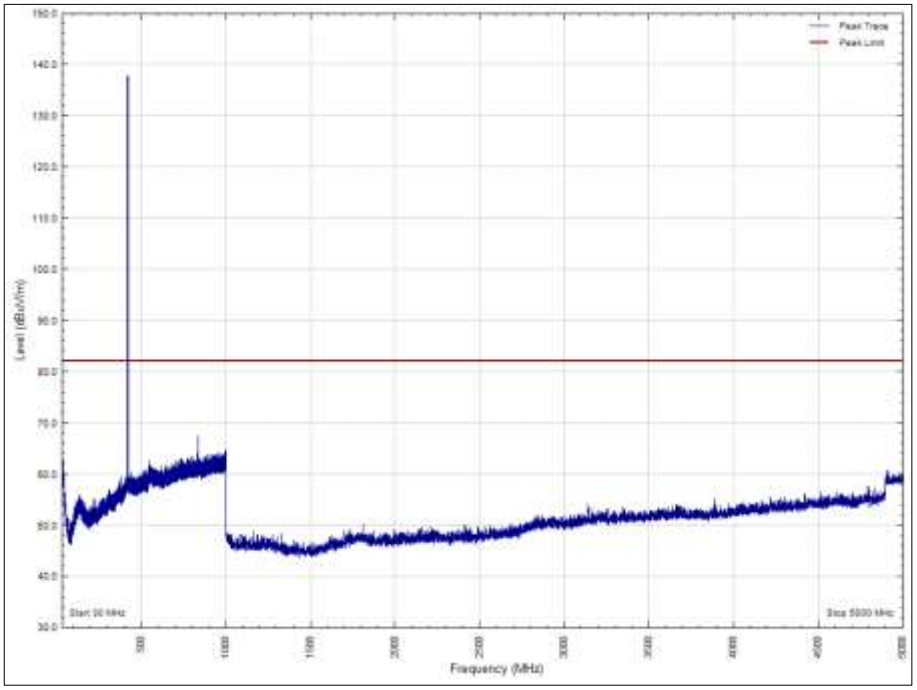

Figure 66 - 418.0500 MHz - 30 MHz to 5 GHz - Horizontal

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

Table 17 - 429.9875 MHz – 30 MHz to 5 GHz

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

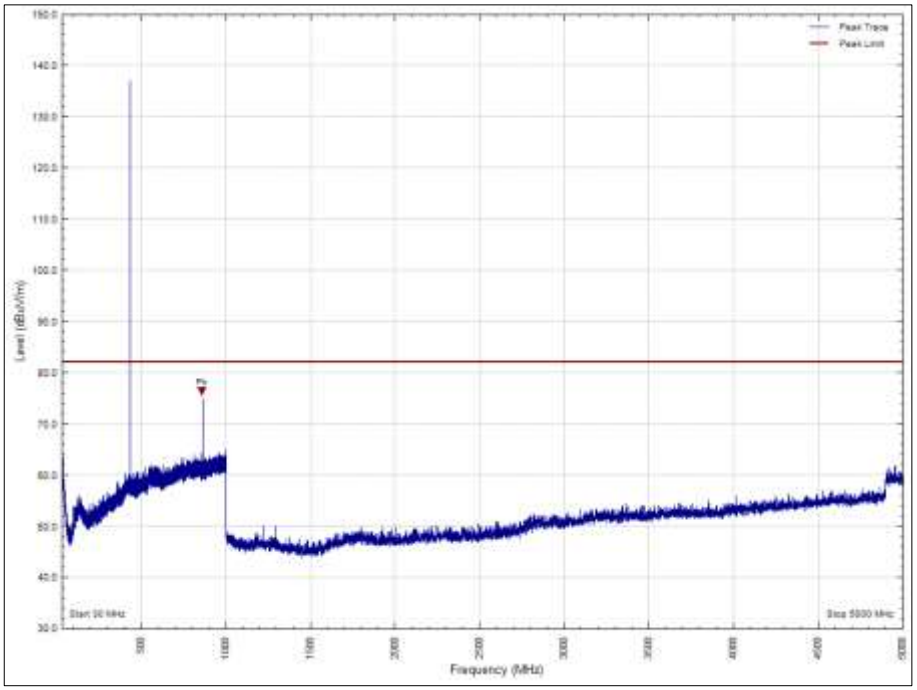

Figure 67 - 429.9875 MHz - 30 MHz to 5 GHz - Vertical

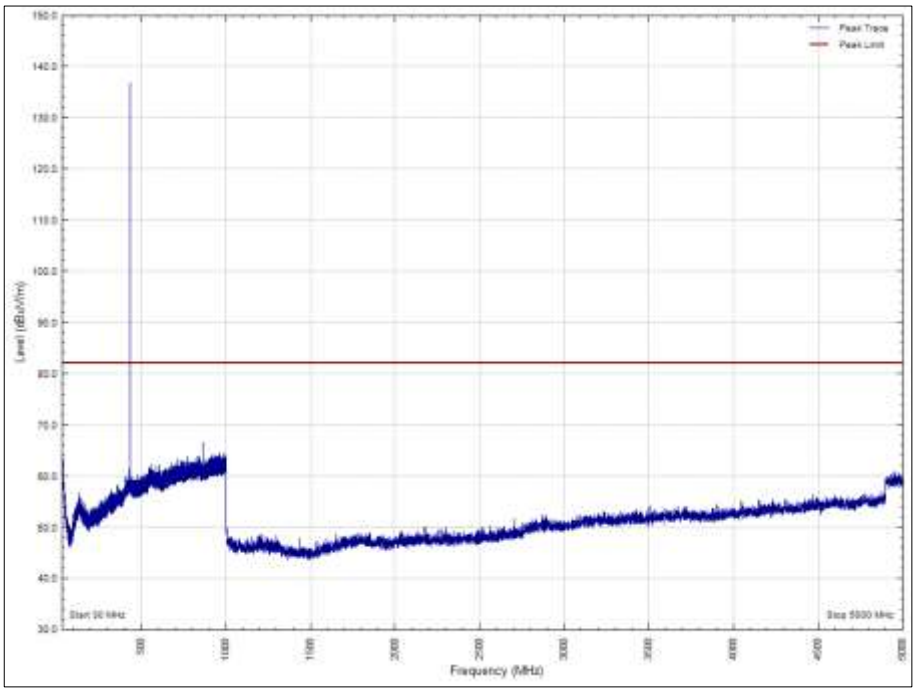

Figure 68 - 429.9875 MHz - 30 MHz to 5 GHz - Horizontal

TETRA 450 MHz to 470 MHz - Transmit

Frequency (MHz)	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation	Orientation
899.931	76.14	82.20	6.06	Peak	301	105	Vertical	-

Table 18 - 450.025 MHz – 30 MHz to 5 GHz

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

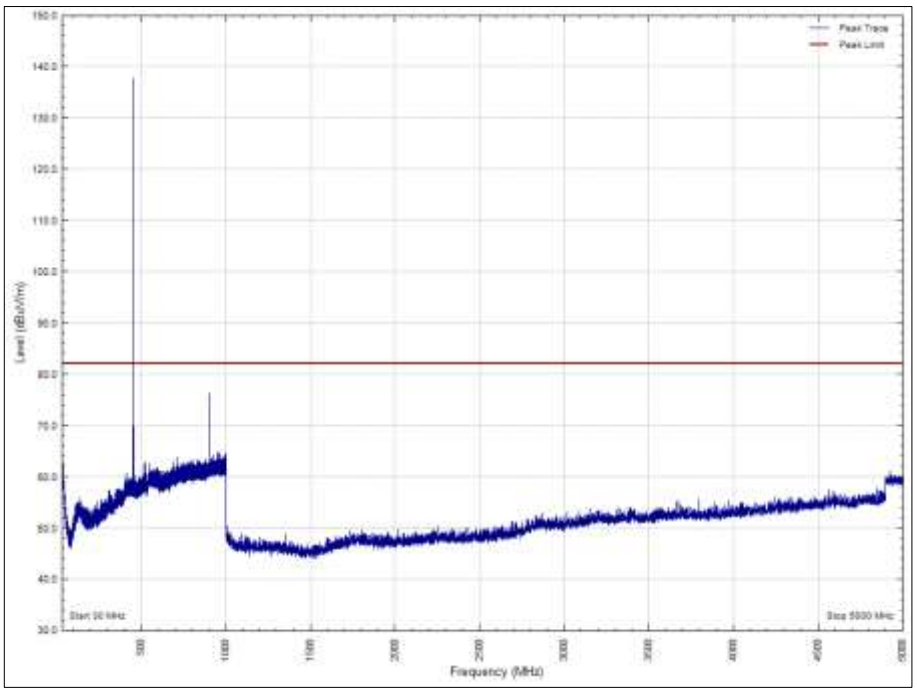

Figure 69 - 450.025 MHz - 30 MHz to 1 GHz - Vertical

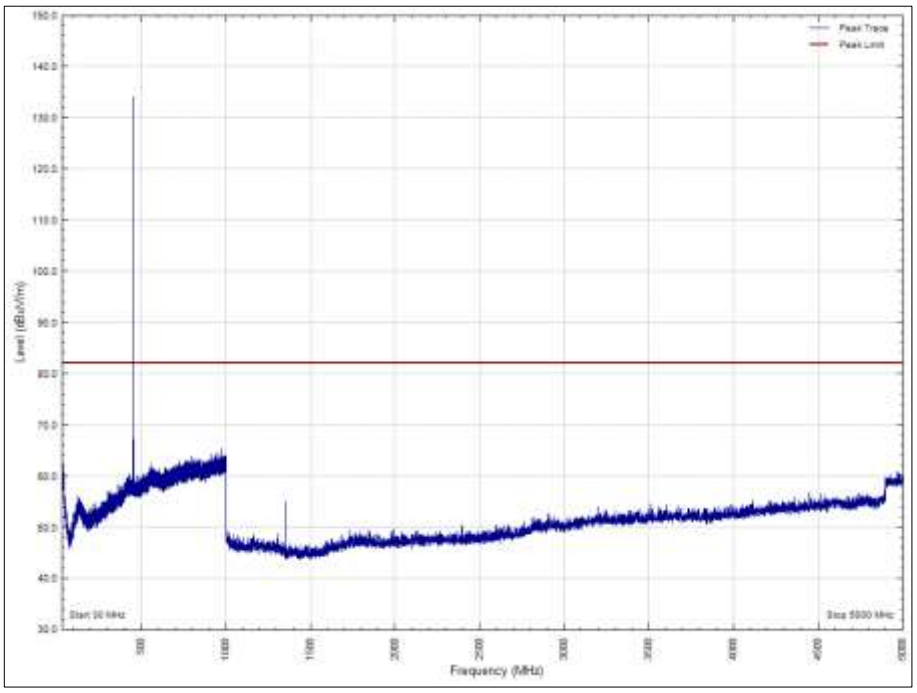

Figure 70 - 450.025 MHz - 30 MHz to 1 GHz – Horizontal

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

Table 19 - 460.025 MHz – 30 MHz to 5 GHz

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

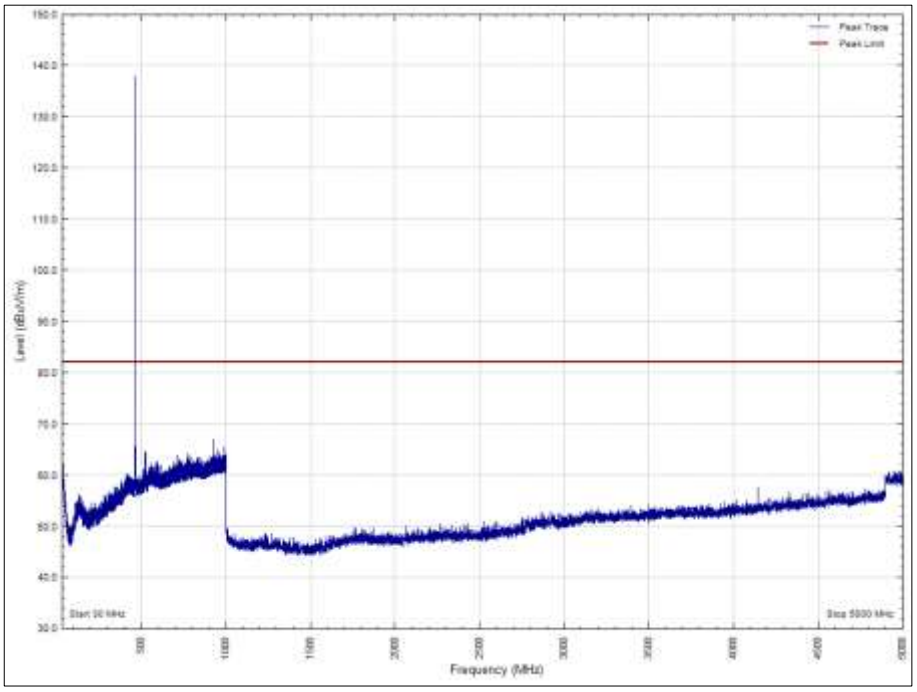

Figure 71 - 460.025 MHz - 30 MHz to 5 GHz - Vertical

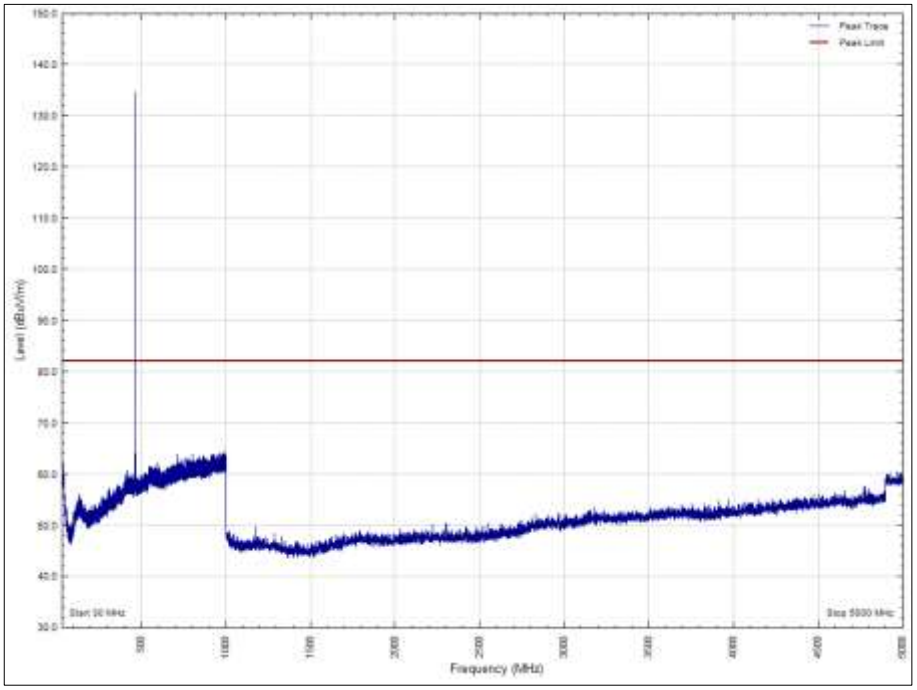

Figure 72 - 460.025 MHz - 30 MHz to 5 GHz - Horizontal

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

Table 20 - 469.975 MHz – 30 MHz to 5 GHz

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

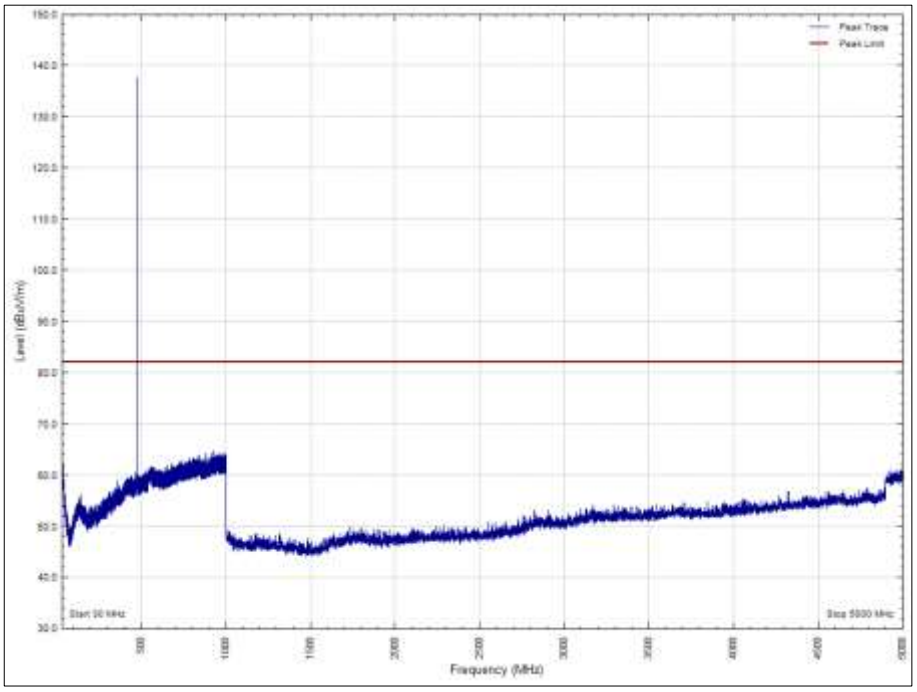

Figure 73 - 469.975 MHz - 30 MHz to 5 GHz - Vertical

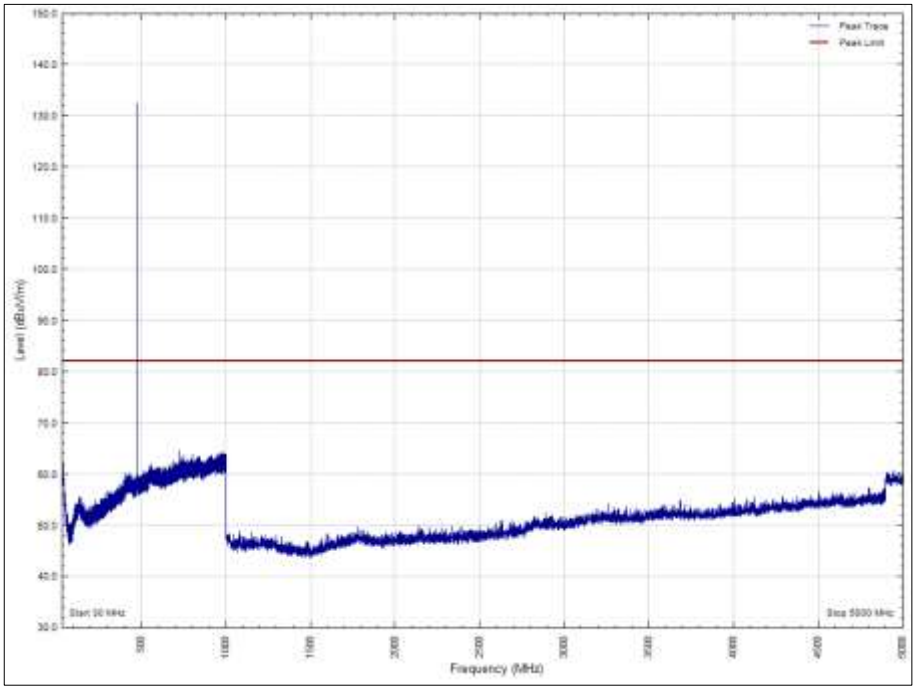

Figure 74 - 469.975 MHz - 30 MHz to 5 GHz - Horizontal

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.

Industry Canada RSS-119, Limit Clause 5.8

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

2.5.7 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 Due
Screened Room (5)	Rainford	Rainford	1545	36	23-Jan-2021
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
DC Power Supply	Hewlett Packard	6269B	1909	-	TU
Multimeter	Iso-tech	IDM101	2417	12	11-Nov-2020
Antenna with permanent attenuator (Bilog)	Chase	CBL6143	2904	24	30-Sep-2021
Comb Generator	Schaffner	RSG1000	3034	-	TU
Cable (Yellow, Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4527	6	09-Jun-2020
Mast Controller	Maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	4811	-	TU
4dB Attenuator	Pasternack	PE7047-4	4935	24	30-Sep-2021
Hygrometer	Rotronic	HP21	4989	12	02-May-2020
EmX Emissions Software	TUV SUD	EmX	5125	-	Software
8 Meter Cable	Teledyne	PR90-088-8MTR	5212	12	30-Aug-2020
Horn Antenna (1-10GHz)	Schwarzbeck	BBHA 9120 B	5215	12	10-Mar-2021
EMI Test Receiver	Rohde & Schwarz	ESW44	5382	12	08-Oct-2020

Table 21

TU - Traceability Unscheduled

2.6 Frequency Stability

2.6.1 Specification Reference

FCC 47 CFR Part 90, Clause 90.213
FCC 47 CFR Part 2, Clause 2.1055
Industry Canada RSS-119, Clause 5.3
ISED RSS-GEN, Clause 6.11

2.6.2 Equipment Under Test and Modification State

SCG22 S/N: 1PR002007GPH5XV - Modification State 0

2.6.3 Date of Test

31-March-2020 to 06-April-2020

2.6.4 Test Method

This test was performed in accordance with ANSI C63.26, Clause 5.6. and the requirements of FCC 47 CFR Part 2, Clause 2.1055 (a)(2), (d)(1).

The EUT was set to transmit on maximum power with an unmodulated carrier on bottom, middle and top channels. The EUT was connected to a spectrum analyser using an external 10 MHz frequency reference. The difference between the frequency of the fundamental and the frequency of the assigned channel in accordance with the manufacturer's documentation was recorded. In accordance with FCC 47 CFR, Clause 2.1055, the temperature was varied from -30 °C to +50 °C in 10 ° steps at nominal voltage and at ambient temperature for both minimum and maximum voltage extremes.

2.6.5 Environmental Conditions

Ambient Temperature	22.2 - 25.7 °C
Relative Humidity	18.6 - 39.3 %

2.6.6 Test Results

TETRA 406 MHz to 430 MHz - Transmit

Voltage	Frequency Error (ppm)		
	406.1125 MHz	418.0500 MHz	429.9875 MHz
10.8 V DC	0.092	0.090	0.087
15.6 V DC	0.111	0.072	0.070

Table 22 - Frequency Stability Under Voltage Variations

Temperature	Frequency Error (ppm)		
	406.1125 MHz	418.0500 MHz	429.9875 MHz
+50.0 °C	0.055	0.072	0.070
+40.0 °C	0.073	0.072	0.070
+30.0 °C	0.055	0.054	0.052
+20.0 °C	0.037	0.036	0.035
+10.0 °C	0.074	0.090	0.070
0 °C	0.185	0.197	0.192
-10.0 °C	0.148	0.144	0.140
-20.0 °C	0.203	0.179	0.192
-30.0 °C	0.092	0.126	0.140

Table 23 - Frequency Stability Under Temperature Variations

TETRA 450 MHz to 470 MHz - Transmit

Voltage	Frequency Error (ppm)		
	450.025 MHz	460.025 MHz	469.975 MHz
10.8 V DC	0.083	0.081	0.080
15.6 V DC	0.083	0.098	0.096

Table 24 - Frequency Stability Under Voltage Variations

Temperature	Frequency Error (ppm)		
	450.025 MHz	460.025 MHz	469.975 MHz
+50.0 °C	0.083	0.082	0.064
+40.0 °C	0.067	0.065	0.064
+30.0 °C	0.033	0.049	0.048
+20.0 °C	0.033	0.049	0.048
+10.0 °C	0.083	0.082	0.080
0 °C	0.183	0.196	0.207
-10.0 °C	0.167	0.147	0.144
-20.0 °C	0.183	0.179	0.176
-30.0 °C	0.133	0.130	0.144

Table 25 - Frequency Stability Under Voltage Variations

FCC 47 CFR Part 90, Limit Clause 90.213

5 ppm

Industry Canada RSS-199, Limit Clause 5.3

5 ppm

2.6.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	16-Apr-2020
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Climatic Chamber	TAS	Micro 225	2892	-	O/P Mon
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	26-Feb-2021
Thermocouple Thermometer	Fluke	51	3172	12	02-Jan-2021
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	16-Apr-2020
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	21-Oct-2020
Network Analyser	Keysight Technologies	E5063A	5018	12	20-May-2020
Cable (18 GHz)	Rosenberger	LU7-036-2000	5035	-	O/P Mon
Electronic Calibration Module	Keysight Technologies	85093C	5188	12	21-May-2020
1 Meter Cable	Teledyne	PR90-088-1MTR	5193	12	30-Jul-2020

Table 26

O/P Mon – Output Monitored using calibrated equipment

2.7 Transient Frequency Behaviour

2.7.1 Specification Reference

FCC 47 CFR Part 90, Clause 90.214
Industry Canada RSS-119, Clause 5.9

2.7.2 Equipment Under Test and Modification State

SCG22 S/N: 1PR002007GPH5XV - Modification State 0

2.7.3 Date of Test

06-April-2020 to 07-April-2020

2.7.4 Test Method

This test was performed on bottom, middle and top frequencies using an unmodulated carrier output from the EUT and measured on a spectrum analyser in accordance with TIA Standard 603 (Referenced in Industry Canada RSS-119, Clause 5.9).

The EUT configuration application used to transmit an unmodulated signal was 2.25 kHz higher than the nominal centre frequency of the channel. Therefore, the trace plots recorded were centred on 2.25 kHz higher than the bottom, middle and top nominal centre frequencies.

2.7.5 Environmental Conditions

Ambient Temperature	23.0 - 25.0 °C
Relative Humidity	27.8 - 33.2 %

2.7.6 Test Results

TETRA 406 MHz to 430 MHz - Transmit

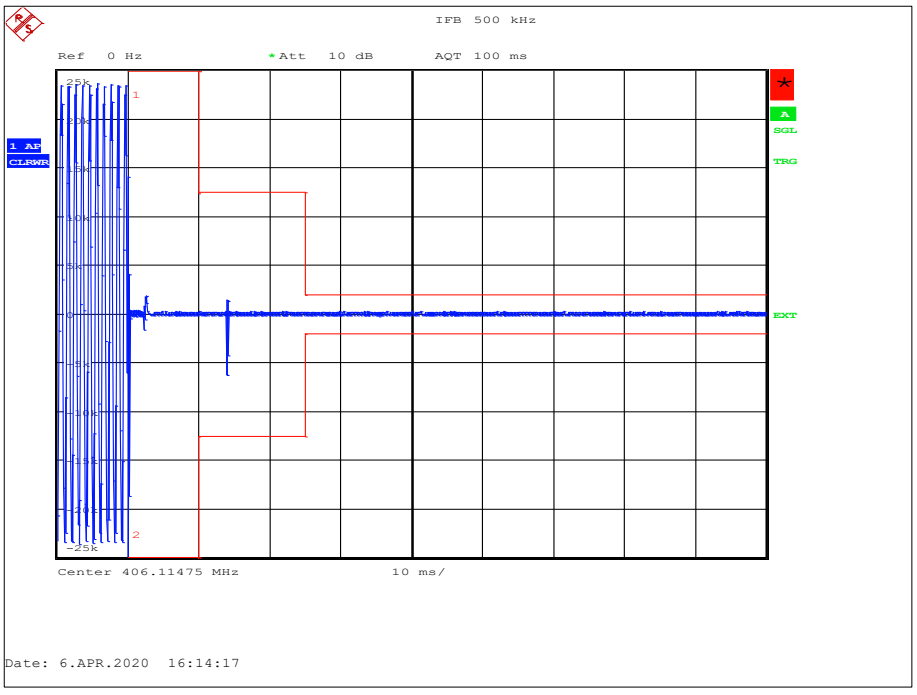

Figure 75 - 406.1125 MHz, Switch On Transients

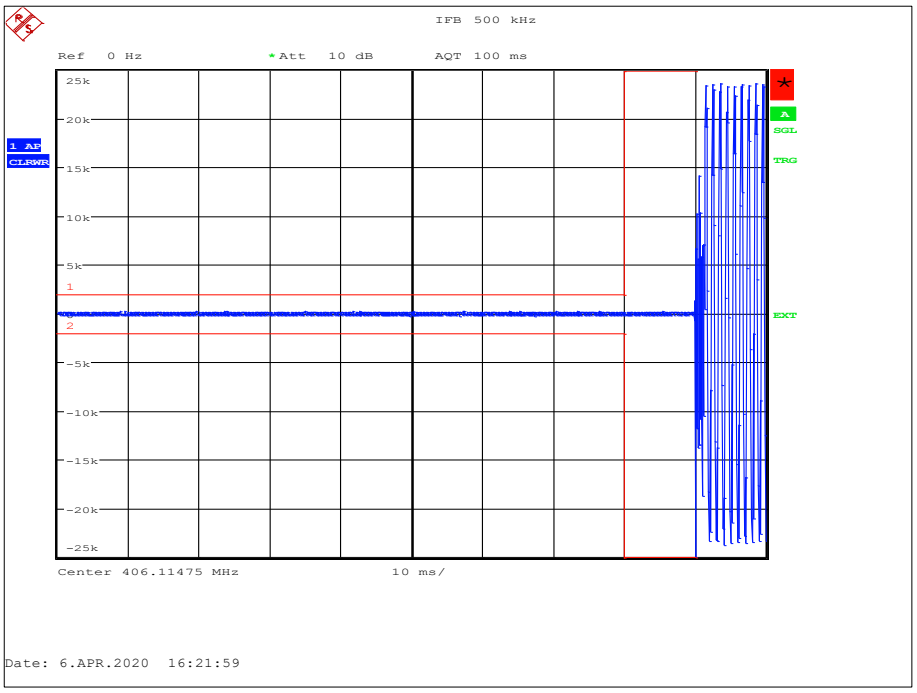

Figure 76- 406.1125 MHz, Switch Off Transients

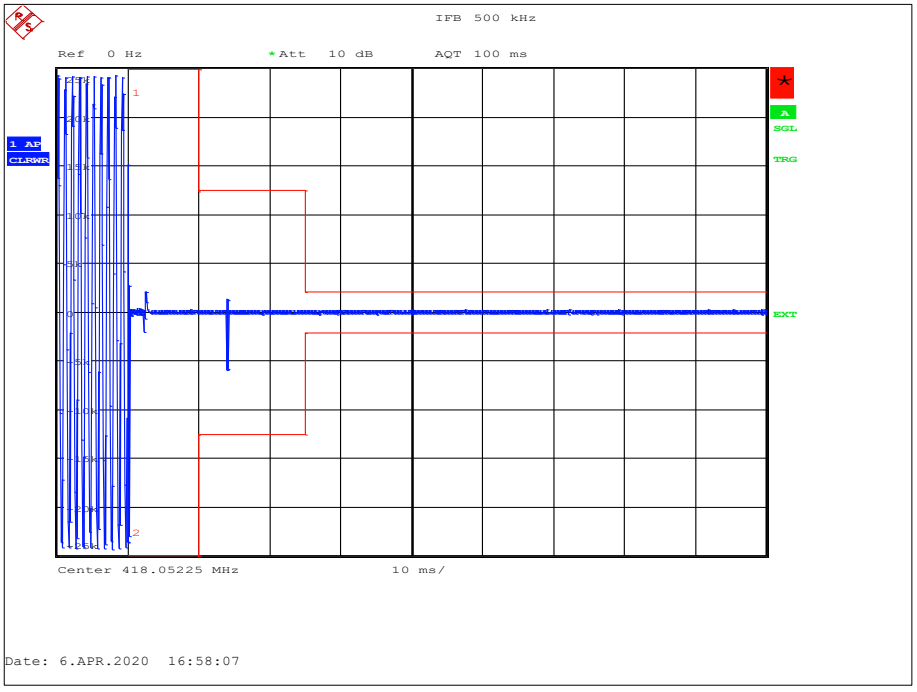

Figure 77 - 418.0500 MHz, Switch On Transients

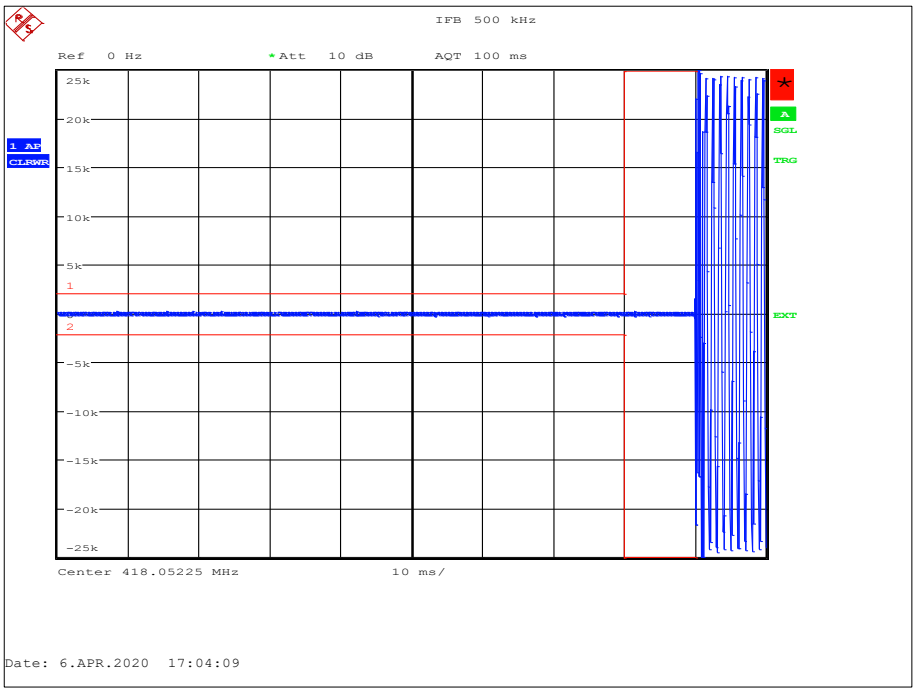

Figure 78- 418.0500 MHz, Switch Off Transients

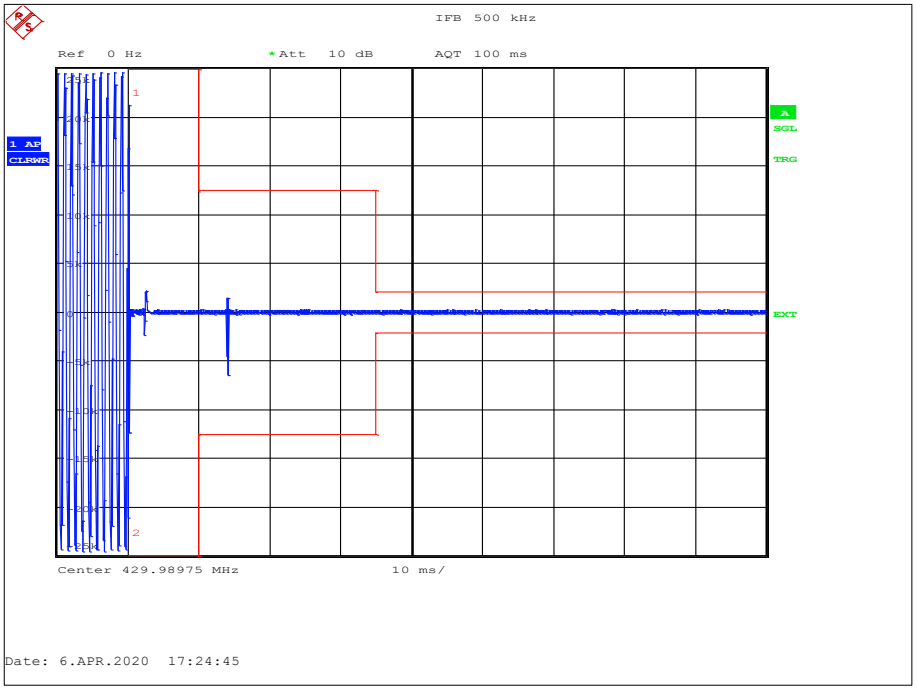

Figure 79 - 429.9875 MHz, Switch On Transients

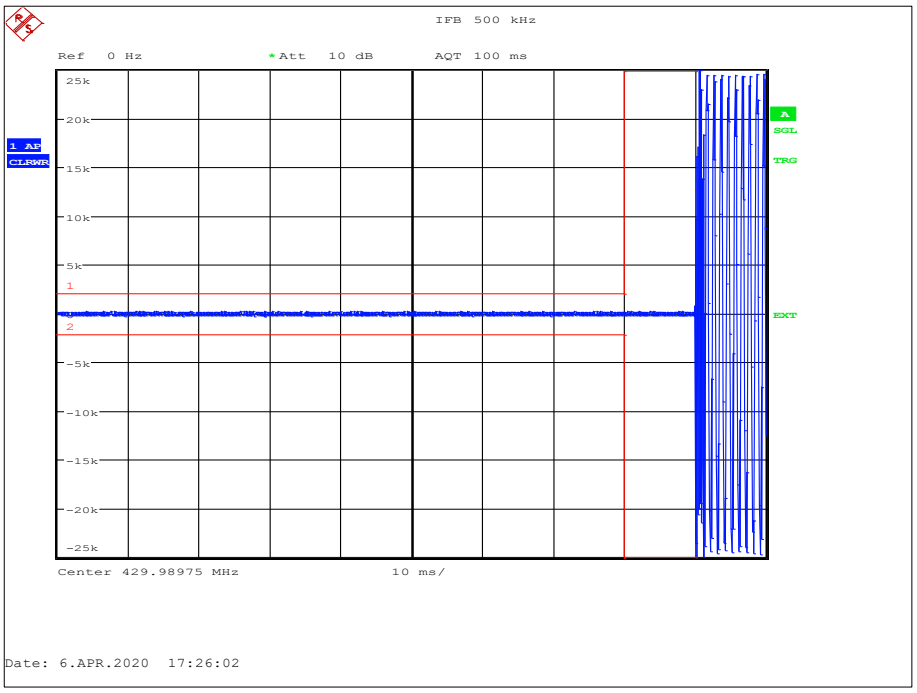

Figure 80- 429.9875 MHz, Switch Off Transients

TETRA 450 MHz to 470 MHz - Transmit

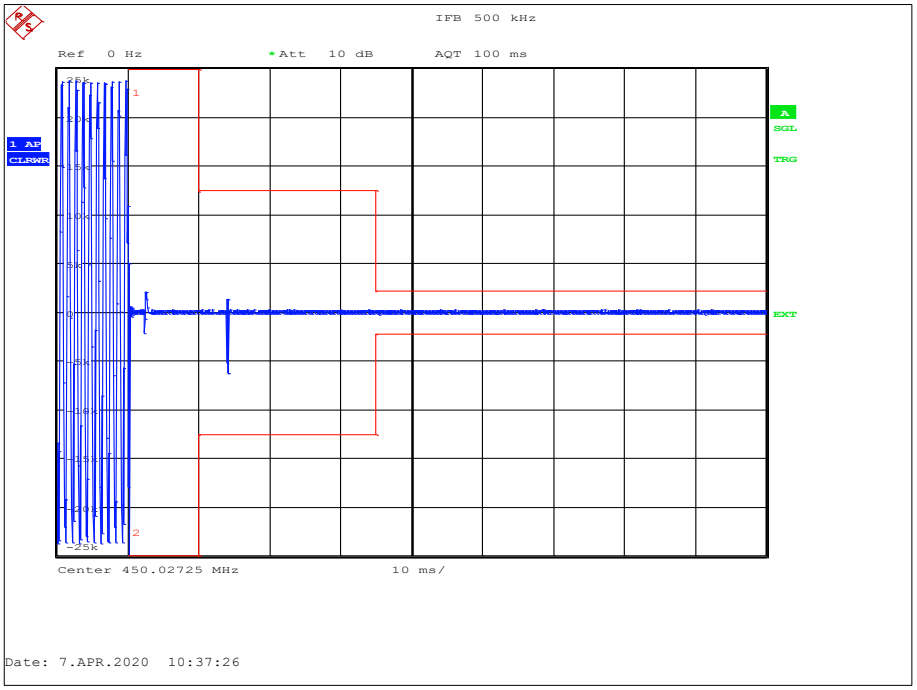

Figure 81 - 450.025 MHz, Switch On Transients

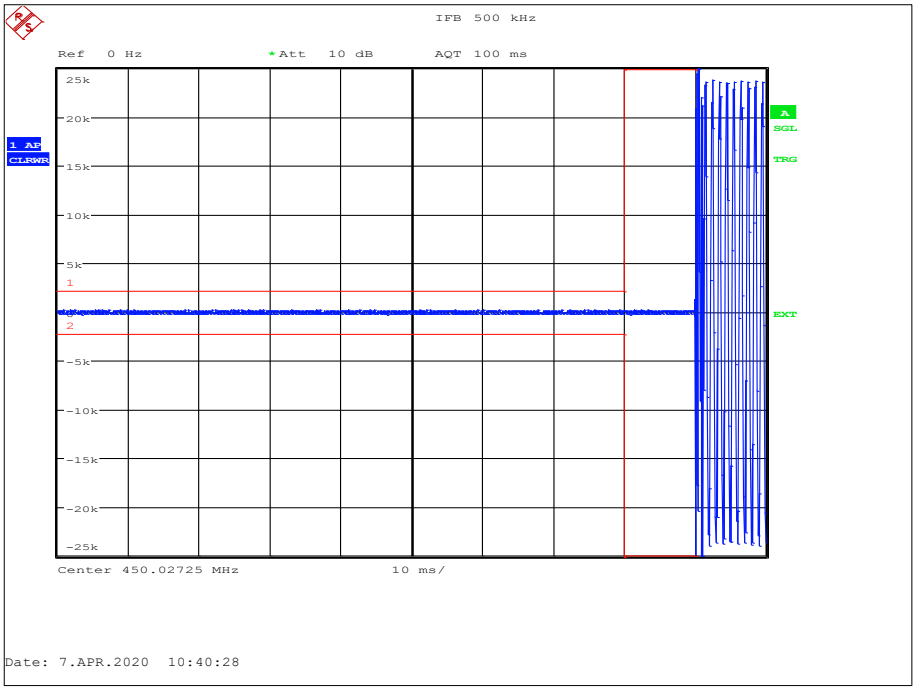

Figure 82- 450.025 MHz, Switch Off Transients

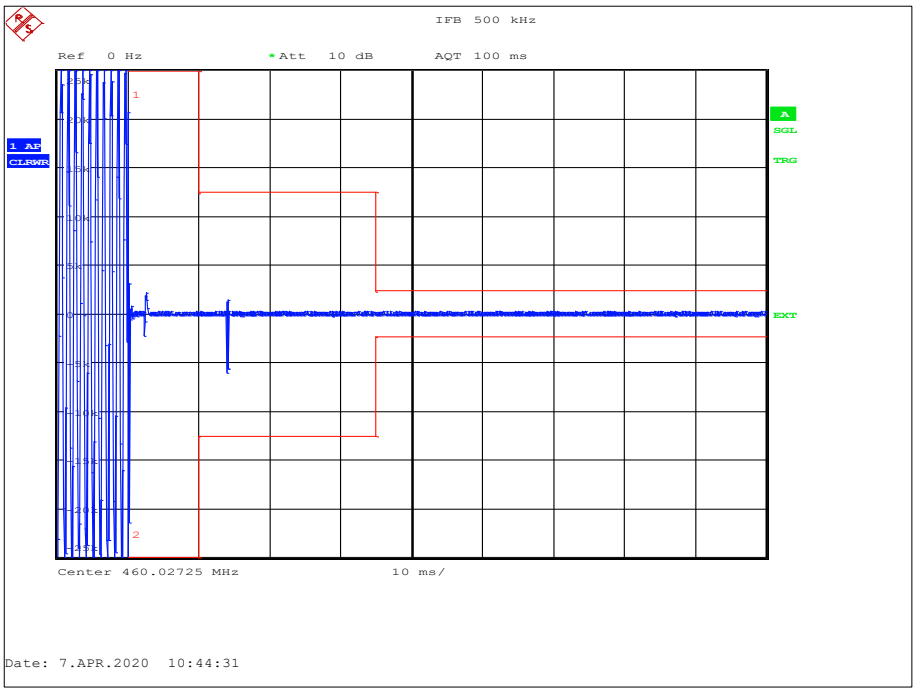

Figure 83 - 460.025 MHz, Switch On Transients

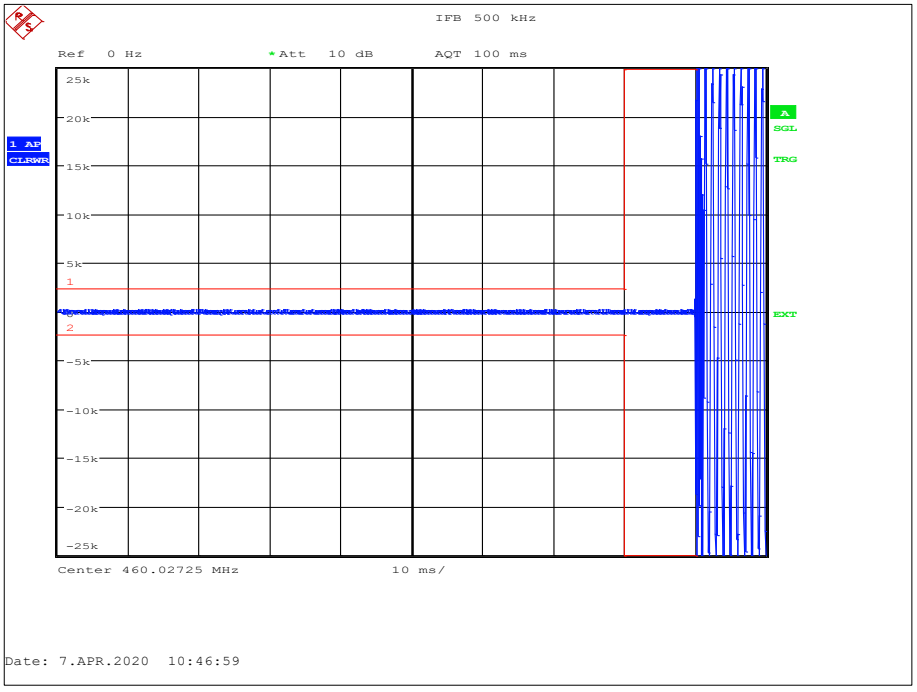

Figure 84- 460.025 MHz, Switch Off Transients

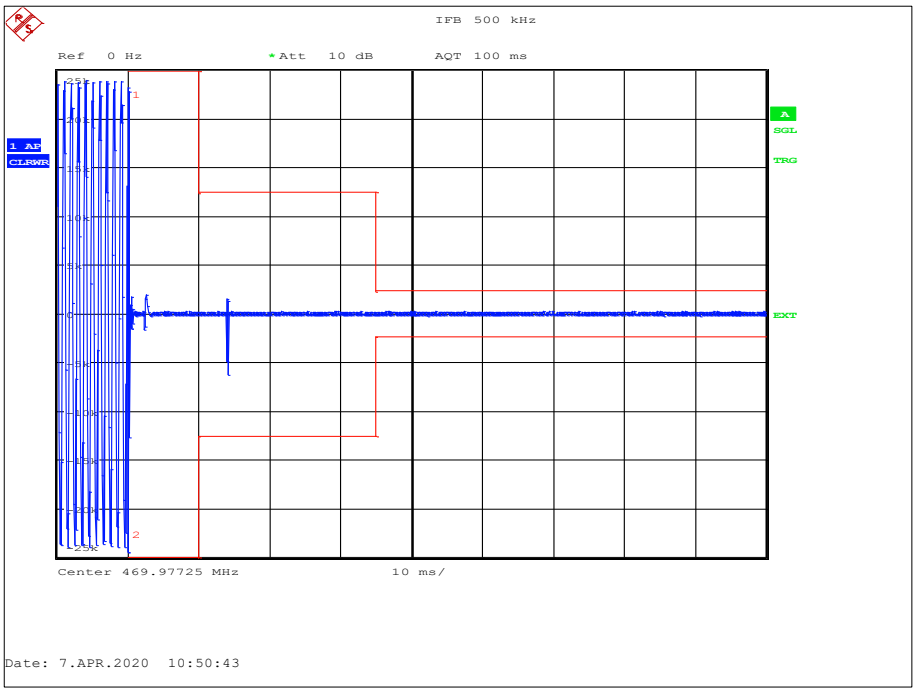

Figure 85 - 469.975 MHz, Switch On Transients

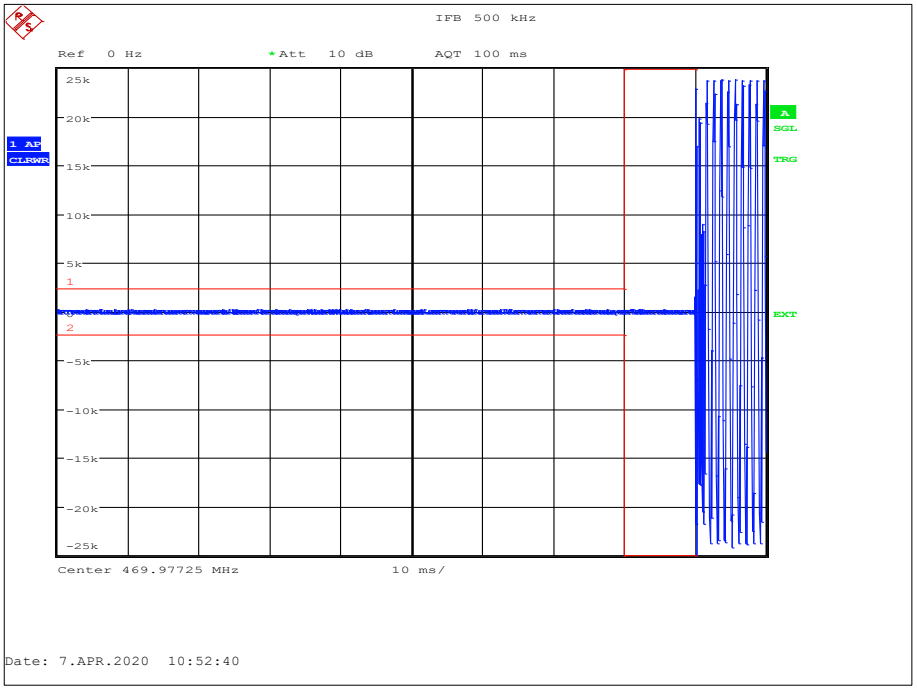

Figure 86- 469.975 MHz, Switch Off Transients

FCC 47 CFR Part 90, Limit Clause 90.214

Time Interval	Maximum Frequency Difference	150 to 174 MHz	421 to 512 MHz
Transient Frequency Behaviour for Equipment Designed to Operate on 25 kHz Channels			
T_1	± 25.0 kHz	5.0 ms	10.0 ms
T_2	± 12.5 kHz	20.0 ms	25.0 ms
T_3	± 25.0 kHz	5.0 ms	10.0 ms
Transient Frequency Behaviour for Equipment Designed to Operate on 12.5 kHz Channels			
T_1	± 12.5 kHz	5.0 ms	10.0 ms
T_2	± 6.25 kHz	20.0 ms	25.0 ms
T_3	± 12.5 kHz	5.0 ms	10.0 ms
Transient Frequency Behaviour for Equipment Designed to Operate on 6.25 kHz Channels			
T_1	± 6.25 kHz	5.0 ms	10.0 ms
T_2	± 3.125 kHz	20.0 ms	25.0 ms
T_3	± 6.25 kHz	5.0 ms	10.0 ms

Table 27

Industry Canada RSS-119, Limit Clause 5.9

Channel Bandwidth (kHz)	Time Intervals	Maximum Frequency Difference (kHz)	Transient Duration Limit (ms)	
			138 to 174 MHz	406.1 to 512 MHz
25.0	t_1	± 25.0	5	10
	t_2	±12.5	20	25
	t_3	± 25.0	5	10
12.5	t_1	± 12.5	5	10
	t_2	± 6.25	20	25
	t_3	± 12.5	5	10
6.25	t_1	± 6.25	5	10
	t_2	± 3.125	20	25
	t_3	± 6.25	5	10

Table 28

2.7.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Signal Generator	Rohde & Schwarz	SMX	115	12	15-Jul-2020
Power Divider	Weinschel	1506A	604	12	23-Apr-2020
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	16-Apr-2020
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	26-Feb-2021
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	27-Mar-2021
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	16-Apr-2020
1 metre N-Type Cable	Florida Labs	NMS-235SP-39.4-NMS	4510	12	18-Jul-2020
Network Analyser	Keysight Technologies	E5063A	5018	12	20-May-2020
Cable (18 GHz)	Rosenberger	LU7-036-2000	5035	-	O/P Mon
Electronic Calibration Module	Keysight Technologies	85093C	5188	12	21-May-2020
1 Meter Cable	Teledyne	PR90-088-1MTR	5193	12	30-Jul-2020

Table 29

2.8 Adjacent Channel Power

2.8.1 Specification Reference

FCC 47 CFR Part 90, Clause 90.221
Industry Canada RSS-119, Clause 5.8.9.1

2.8.2 Equipment Under Test and Modification State

SCG22 S/N: 1PR002007GPH5XV - Modification State 0

2.8.3 Date of Test

07-April-2020

2.8.4 Test Method

This test was performed conducted on the modulated carrier output from the EUT, measured using a spectrum analyser. The spectrum analyser was set to the transmit frequency, span to 0.2 MHz to measure the 3 x 25 kHz adjacent channels below and above the carrier.

A measurement integration bandwidth of 18 kHz was set, and the measurement used the Adjacent Channel Power function of the spectrum analyser.

2.8.5 Environmental Conditions

Ambient Temperature	22.2 - 22.6 °C
Relative Humidity	31.4 - 33.6 %

2.8.6 Test Results

TETRA 406 MHz to 430 MHz - Transmit

Offset (kHz)	Adjacent Channel Power (dB)		
	406.1125 MHz	418.0500 MHz	429.9875 MHz
-25	-63.62	-63.47	-63.23
+25	-62.47	-62.57	-61.55
-50	-71.52	-71.45	-71.61
+50	-71.57	-71.84	-72.11
-75	-76.97	-76.88	-76.92
+75	-76.89	-76.88	-77.20

Table 30

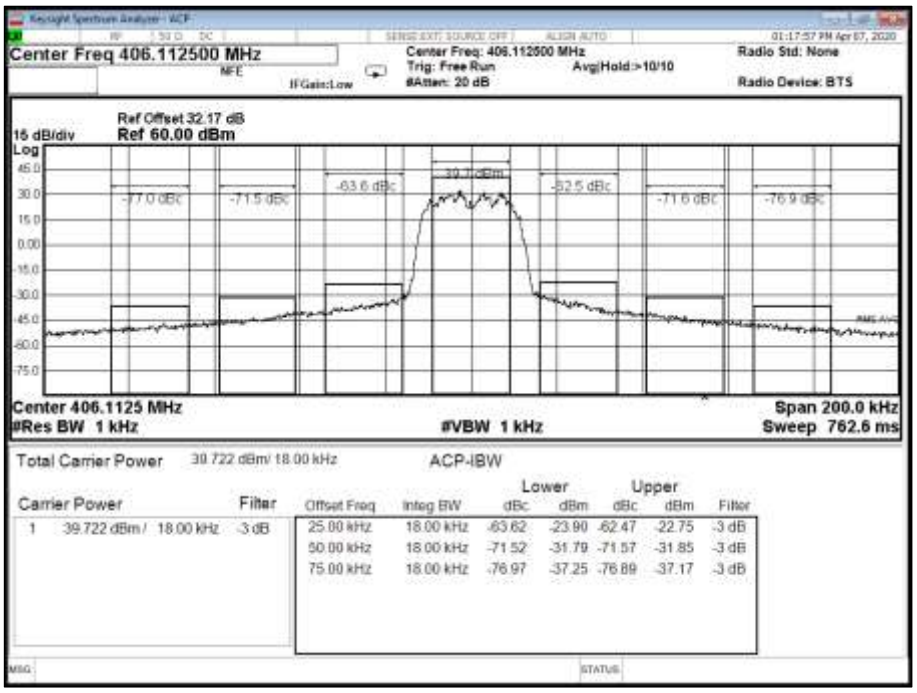

Figure 87 - 406.1125 MHz

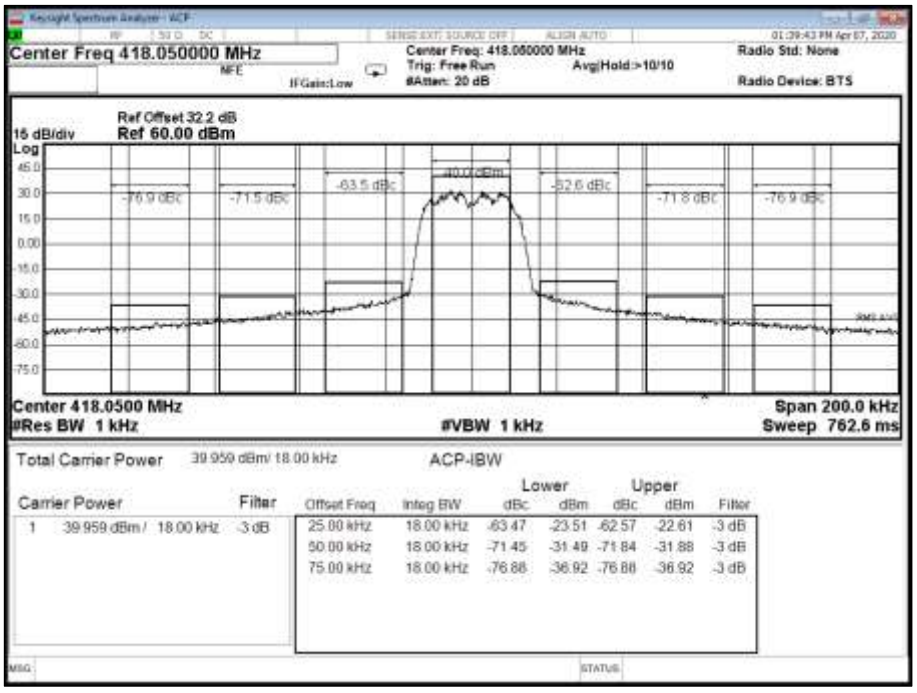

Figure 88 - 418.0500 MHz

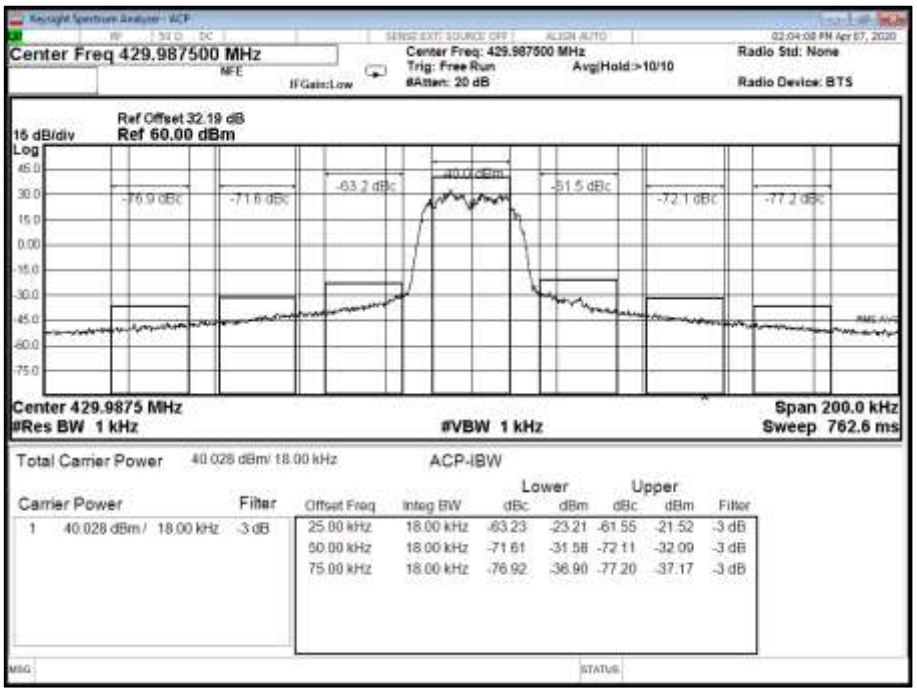

Figure 89 - 429.9875 MHz

TETRA 450 MHz to 470 MHz - Transmit

Offset (kHz)	Adjacent Channel Power (dB)		
	450.025 MHz	460.025 MHz	469.975 MHz
-25	-62.93	-61.93	-61.45
+25	-62.57	-61.43	-60.94
-50	-71.99	-72.12	-71.89
+50	-71.94	-72.27	-72.14
-75	-77.17	-77.01	-77.23
+75	-76.99	-77.30	-77.18

Table 31

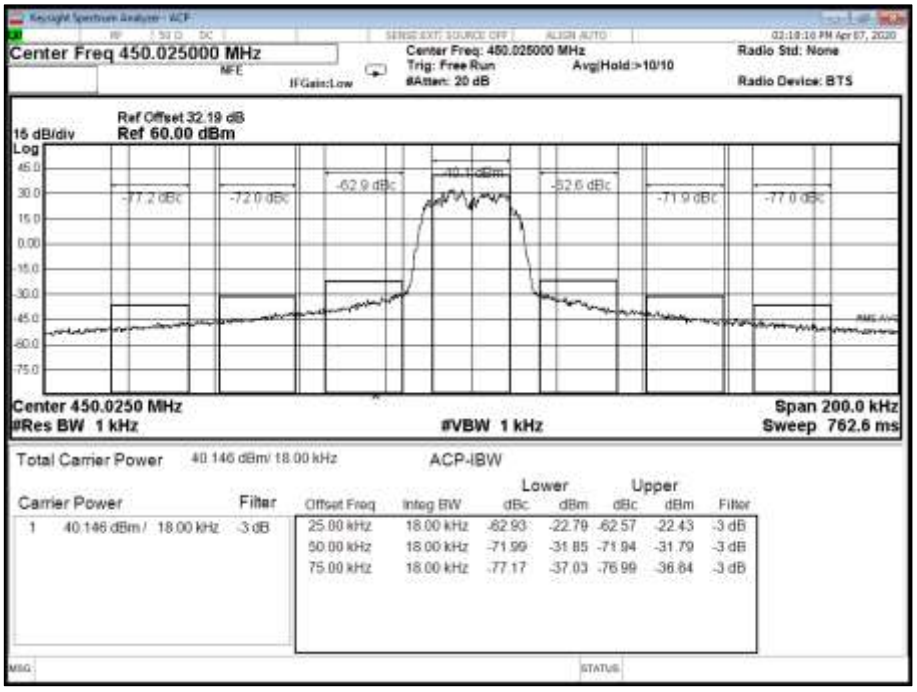

Figure 90 - 450.025 MHz

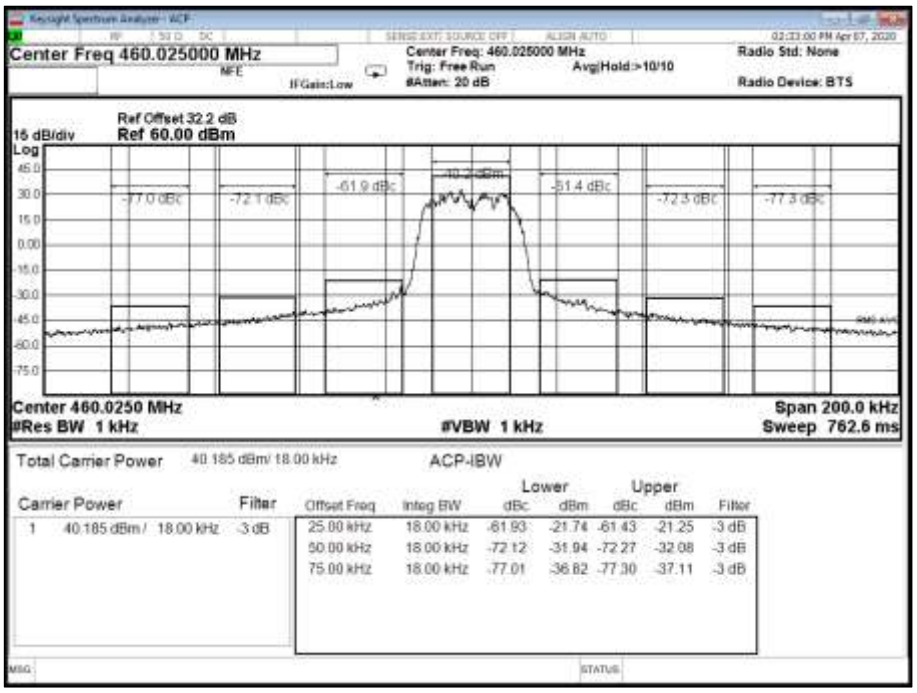

Figure 91 - 460.025 MHz

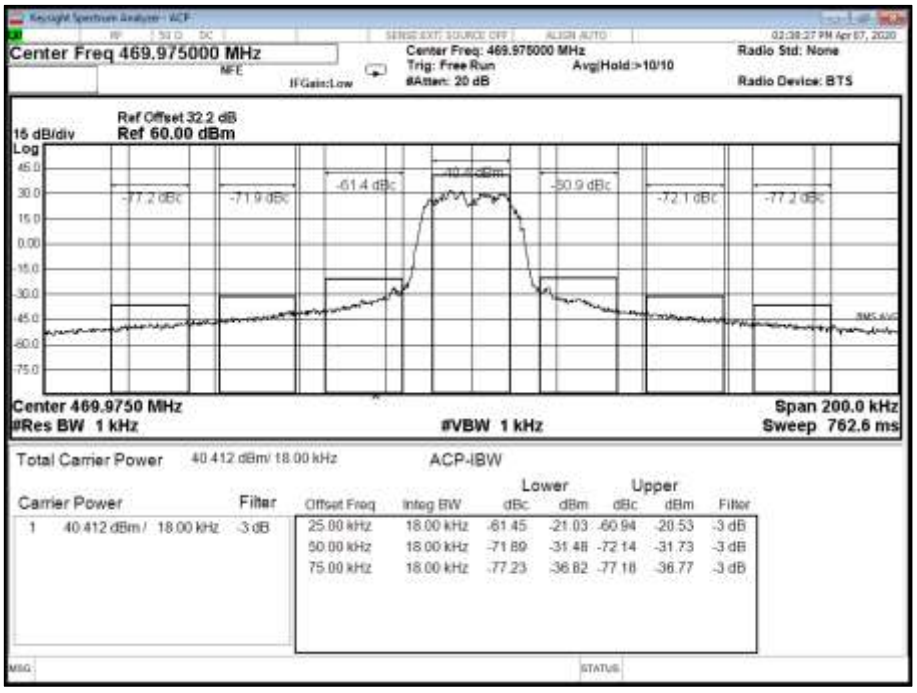

Figure 92 - 469.975 MHz

FCC Part 90, Limit Clause 90.221(b)

Frequency Offset	Maximum ACP (dBc) for devices ≤ 1W	Maximum ACP (dBc) for devices > 1W
25 kHz	-55	-60
50 kHz	-70	-70
75 kHz	-70	-70

Table 32

NOTE: In any case, no requirement in excess of -36 dBm shall apply.

Industry Canada RSS-119. Limit Clause

None specified for 406 to 430 MHz and 450 to 470 MHz.

2.8.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Power Supply Unit	Hewlett Packard	6253A	441	-	O/P Mon
Rubidium Standard	Rohde & Schwarz	XSRM	1316	6	16-Apr-2020
Multimeter	Iso-tech	IDM101	2424	12	12-Dec-2020
Attenuator (30dB/50W)	Aeroflex / Weinschel	47-30-34	3164	12	26-Feb-2021
Hygrometer	Rotronic	I-1000	3220	12	25-Sep-2020
Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	16-Apr-2020
PXA Signal Analyser	Keysight Technologies	N9030A	4654	12	21-Oct-2020
Network Analyser	Keysight Technologies	E5063A	5018	12	20-May-2020
Cable (18 GHz)	Rosenberger	LU7-036-2000	5035	-	O/P Mon
Electronic Calibration Module	Keysight Technologies	85093C	5188	12	21-May-2020
1 Meter Cable	Teledyne	PR90-088-1MTR	5193	12	30-Jul-2020

Table 33

O/P Mon – Output Monitored using calibrated equipment

3 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
Transient Frequency Behaviour	± 0.2 Hz
Types of Emissions	-
Adjacent Channel Power	± 3.0 dB
Frequency Stability	± 11 Hz
Radiated Spurious Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 18 GHz: ± 6.3 dB
Spurious Emissions at Antenna Terminals	± 3.45 dB
Bandwidth Limitations	± 58.05 Hz
Maximum Conducted Output Power	± 3.2 dB

Table 34

Measurement Uncertainty Decision Rule

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115: 2007, clause 4.4.3 and 4.5.1.