

FCC Testing of the Axnes Aviation AS Transceiver. Model: MP50 In accordance with FCC 47 CFR Part 80 and FCC 47 CFR Part 2

Prepared for: Axnes Aviation AS
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FCC ID: 2AOHP MP50A (MP50)

COMMERCIAL-IN-CONFIDENCE

Date: May 2018

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Product Service

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RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Project Management	Steven White	15 May 2018	
Authorised Signatory	Simon Bennett	15 May 2018	

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD Product Service 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 80 and FCC 47 CFR Part 2. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Mehadi Choudhury	15 May 2018	
Testing	Graeme Lawler	15 May 2018	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 80: 2016 and FCC 47 CFR Part 2: 2016.



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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	15 May 2018

Table 1

1.2 Introduction

Applicant	Axnes Aviation AS
Manufacturer	Axnes Aviation AS
Model Number(s)	MP50
Serial Number(s)	000 451 and 000 452
Hardware Version(s)	R13
Software Version(s)	AXS-SW-0221
Number of Samples Tested	2
Test Specification/Issue/Date	FCC 47 CFR Part 80: 2016 and FCC 47 CFR Part 2: 2016
Order Number	801584
Date	10-August-2017
Date of Receipt of EUT	11-August-2017
Start of Test	31-October-2017
Finish of Test	12-April-2018
Name of Engineer(s)	Matthew Russell, Mehadi Choudhury and Graeme Lawler
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 80 and FCC 47 CFR Part 2 is shown below.

Section	Specification Clause		Test Description	Result	Comments/Base Standard
	Part 80	Part 2			
Configuration and Mode: PNG MP50 (Stand Alone) VHF Transceiver					
2.1	80.205	2.1049	Bandwidths	Pass	
2.2	80.209	2.1055	Transmitter Frequency Tolerances	Pass	
2.3	80.211	2.1051	Spurious Emissions at Antenna Terminals	Pass	
2.4	80.211	2.1051	Radiated Spurious Emissions	Pass	
2.5	80.213	2.1047	Modulation Requirements	Pass	
2.6	80.215	2.1046	Transmitter Power	Pass	
2.7	80.217(b)	-	Suppression of Interference Aboard Ships	Pass	

Table 2



1.4 Application Form

EQUIPMENT DESCRIPTION	
Model Name/Number	PNG MP50
Part Number	AXS-HH-D0100-N-C0
Hardware Version	R13
Software Version	AXS-SW-0221
FCC ID (if applicable)	2AOHPMP50A
Industry Canada ID (if applicable)	n/a
Technical Description (Please provide a brief description of the intended use of the equipment)	PNG system is a wireless intercom extension, for use in demanding high noise environments as tracked vehicles, around helicopters and aircrafts and similar. The base station (BST50) and control panel (CP50) is mounted in the vehicle, while the crew is equipped with MP50 connected to a helmet or headset. Two alternative charging stations are available CHG50 and CHG55.

INTENTIONAL RADIATORS									
Technology	Frequency Band (MHz)	Conducted Declared Output Power (dBm)	Antenna Gain (dBi)	Supported Bandwidth (s) (MHz)	Modulation Scheme(s)	ITU Emission Designator	Test Channels (MHz)		
							Bottom	Middle	Top
UHF 16QAM	405-470	26	5	0.025	16QAM	22K0 D7WXT	405.0125	434.9875	469.98750
VHF FM	156-162	26	5	0.025	FM	16KOG3E	156.025	159.025	162.025

UN-INTENTIONAL RADIATOR	
Highest frequency generated or used in the device or on which the device operates or tunes	1880 MHz used in VCO Divide by for before distribution



Power Source			
AC	Single Phase	Three Phase	Nominal Voltage
External DC	Nominal Voltage		Maximum Current
Battery	Nominal Voltage		Battery Operating End Point Voltage
	3.6		3.2
Can EUT transmit whilst being charged?			Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

EXTREME CONDITIONS			
Maximum temperature	50	°C	Minimum temperature -20 °C

Ancillaries
Please list all ancillaries which will be used with the device.

ANTENNA CHARACTERISTICS			
<input type="checkbox"/> Antenna connector		State impedance	Ohm
<input type="checkbox"/> Temporary antenna connector		State impedance	Ohm
<input checked="" type="checkbox"/> Integral antenna	Type Monopole		
<input type="checkbox"/> External antenna	Type		

I hereby declare that the information supplied is correct and complete

Name: Petter Johnsen

Position held: CTO

Date: 5 Sep 2017

1.5 Product Information

1.5.1 Technical Description

PNG system is a wireless intercom extension, for use in demanding high noise environments as tracked vehicles, around helicopters and aircrafts and similar. The base station (BST50) and control panel (CP50) is mounted in the vehicle, while the crew is equipped with MP50 connected to a helmet or headset. Two alternative charging stations are available CHG50 and CHG55.

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
Serial Number: 000 451			
0	As supplied by the customer	Not Applicable	Not Applicable
Serial Number: 000 452			
0	As supplied by the customer	Not Applicable	Not Applicable
1	Firmware Update to reduce Occupied Bandwidth and Improve ACP for UHF.	Axnes Aviation AS	04 April 2018

Table 3

1.8 Test Location

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

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: PNG MP50 (Stand Alone) VHF Transceiver		
Bandwidths	Matthew Russell	UKAS
Transmitter Frequency Tolerances	Mehadi Choudhury	UKAS
Spurious Emissions at Antenna Terminals	Matthew Russell and Mehadi Choudhury	UKAS
Radiated Spurious Emissions	Graeme Lawler	UKAS
Modulation Requirements	Mehadi Choudhury	UKAS
Transmitter Power	Mehadi Choudhury	UKAS
Suppression of Interference Aboard Ships	Mehadi Choudhury	UKAS

Table 4

Office Address:

Octagon House
Concorde Way
Segensworth North
Fareham
Hampshire
PO15 5RL
United Kingdom

2 Test Details

2.1 Bandwidths

2.1.1 Specification Reference

FCC 47 CFR Part 80 and FCC 47 CFR Part 2, Clause 80.205 and 2.1049

2.1.2 Equipment Under Test and Modification State

MP50, S/N: 000 452 - Modification State 1

2.1.3 Date of Test

12 April 2017

2.1.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.4.4.

The EUT was modulated using an internally generated test tone provided by the manufacturer.

2.1.5 Environmental Conditions

Ambient Temperature 22.6 °C

Relative Humidity 39.6 %

2.1.6 Test Results

PNG MP50 (Stand Alone) VHF Transceiver

Occupied Bandwidth (kHz)		
156.0125 MHz	159.0000 MHz	161.9875 MHz
13.690	14.319	10.797

Table 5 - Occupied Bandwidth Results

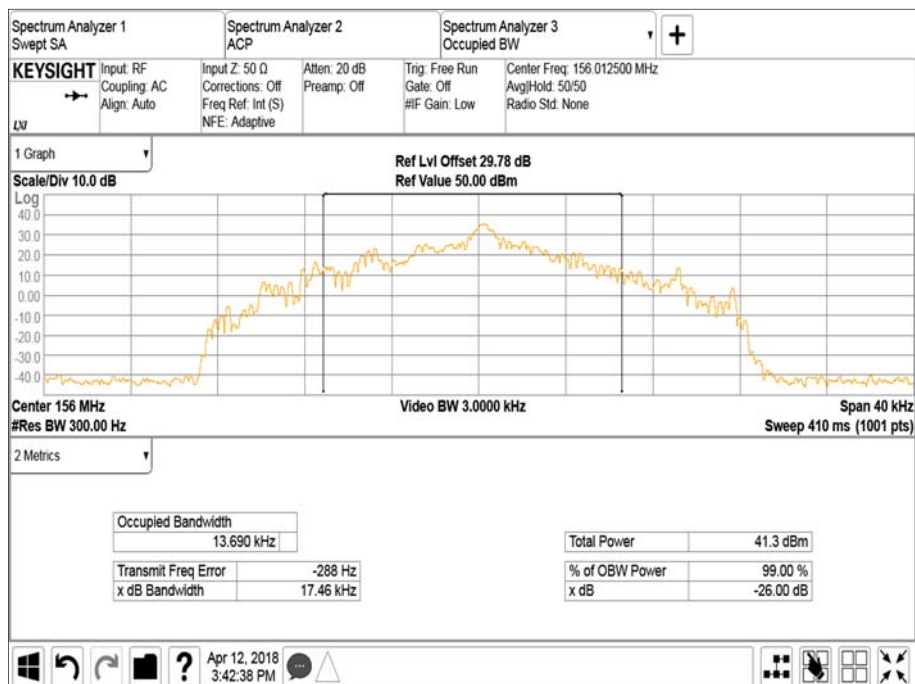


Figure 1 - 156.0125 MHz Occupied Bandwidth

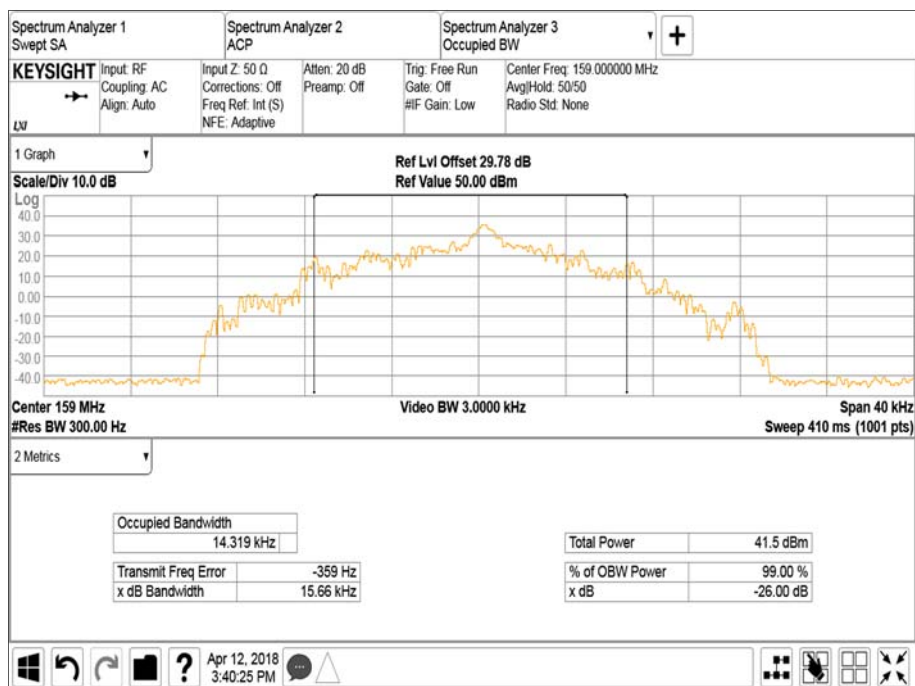


Figure 2 - 159.0000 MHz Occupied Bandwidth



Product Service

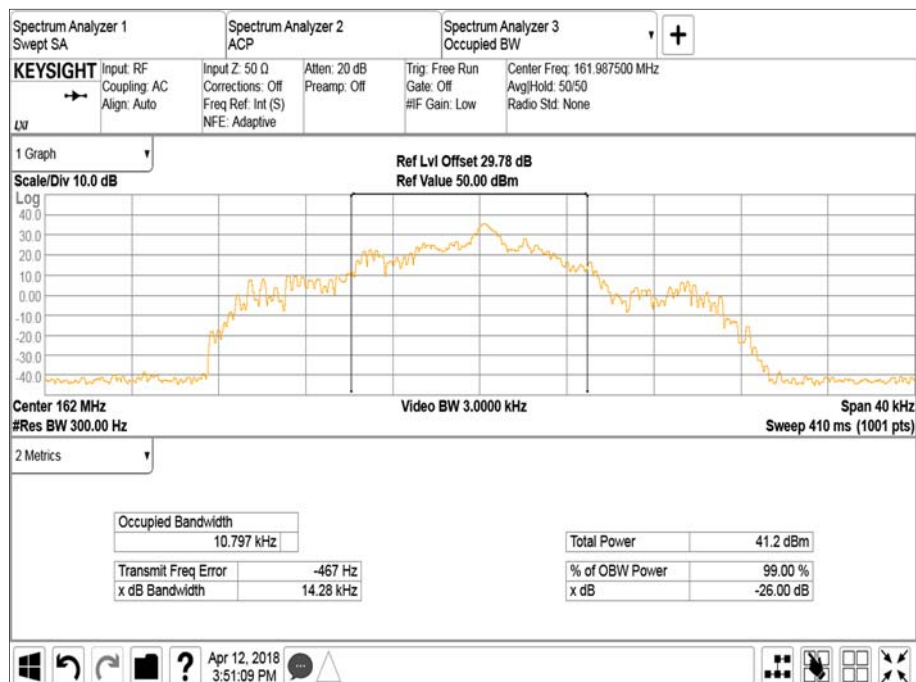


Figure 3 - 161.9875 MHz Occupied Bandwidth

FCC 47 CFR Part 80, Limit Clause 80.205(a)

Authorized Bandwidth 20 kHz
 (Emissions Designator, 16K0G3E)

2.1.7 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
Multimeter	Fluke	75 Mk3	455	12	14-Sep-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Attenuator (20dB, 150W)	Narda	769-20	3367	12	31-May-2018
1 Metre SMA Cable	Rhophase	3PS-1801A-1000-3PS	4099	12	19-Sep-2018
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	19-Sep-2018
4 Channel PSU	Rohde & Schwarz	HMP4040	4736	-	TU
EXA	Keysight Technologies	N9010B	4968	12	21-Dec-2018

Table 6

TU - Traceability Unscheduled

2.2 Transmitter Frequency Tolerances

2.2.1 Specification Reference

FCC 47 CFR Part 80 and FCC 47 CFR Part 2, Clause 80.209 and 2.1055

2.2.2 Equipment Under Test and Modification State

MP50, S/N: 000 452 - Modification State 0

2.2.3 Date of Test

01 November 2017

2.2.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.6. A spectrum analyser was used to measure the unmodulated carrier frequency.

2.2.5 Environmental Conditions

Ambient Temperature 23.4 °C
Relative Humidity 43.1 %

2.2.6 Test Results

PNG MP50 (Stand Alone) VHF Transceiver

Voltage	Frequency Error (ppm)	
	156.0125 MHz	161.9875 MHz
3.2 V DC	0.462	0.475
3.6 V DC	0.668	0.681

Table 7 - Frequency Stability Under Voltage Variations

Temperature	Frequency Error (ppm)	
	156.0125 MHz	161.9875 MHz
+50.0 °C	0.575	0.574
+40.0 °C	0.462	0.455
+30.0 °C	0.586	0.584
+20.0 °C	0.729	0.722
+10.0 °C	0.883	0.861
0 °C	0.770	0.772
-10.0 °C	0.534	0.554
-20.0 °C	0.606	0.613

Table 8 - Frequency Stability Under Temperature Variations

FCC 47 CFR Part 80, Limit Clause 80.209(a)

± 10 ppm.

2.2.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Power Supply	Hewlett Packard	6267B	21	-	O/P Mon
Climatic Chamber	Votsch	VT4002	161	12	O/P Mon
Multimeter	Iso-tech	IDM-101	466	12	02-Oct-2018
Digital Temperature Indicator	Fluke	51	2267	12	05-Jul-2018
Cable(3m, SMA(m) - SMA(m))	Reynolds	262-0248-3000	2402	12	19-Sep-2018
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	02-Feb-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	12-Mar-2018
30dB Attenuator	Narda	766-30	4783	12	03-Oct-2018

Table 9

O/P Mon – Output Monitored using calibrated equipment

2.3 Spurious Emissions at Antenna Terminals

2.3.1 Specification Reference

FCC 47 CFR Part 80 and FCC 47 CFR Part 2, Clause 80.211 and 2.1051

2.3.2 Equipment Under Test and Modification State

MP50, S/N: 000 452 - Modification State 0

MP50, S/N: 000 452 - Modification State 1 (Emission Mask Only)

2.3.3 Date of Test

21 November 2017 and 12 April 2018

2.3.4 Test Method

This test was performed in accordance with ANSI C63.26, clause 5.7.

The EUT was modulated using an internally generated test tone provided by the manufacturer.

2.3.5 Environmental Conditions

Ambient Temperature 22.6-24.1 °C

Relative Humidity 39.6-40.3 %

2.3.6 Test Results

PNG MP50 (Stand Alone) VHF Transceiver

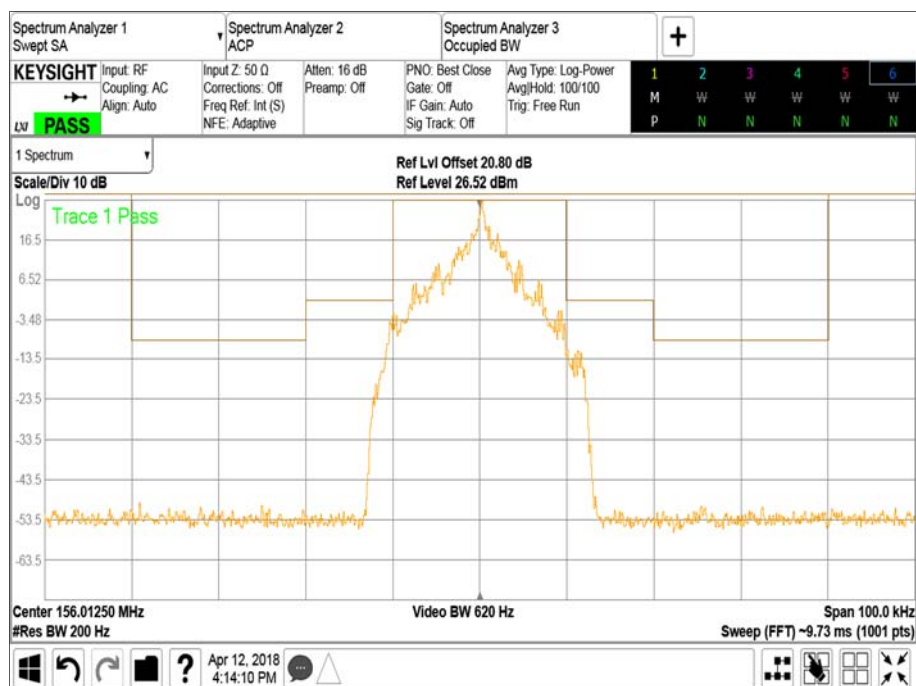


Figure 4 - 156.0125 MHz - Transmitter Spectrum Mask

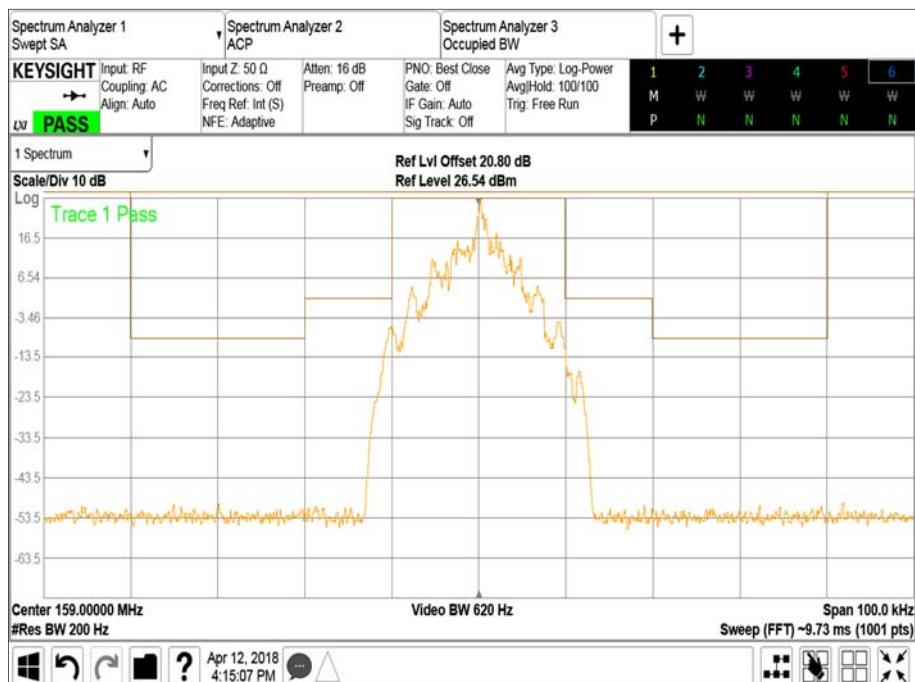


Figure 5 - 159.0000 MHz - Transmitter Spectrum Mask

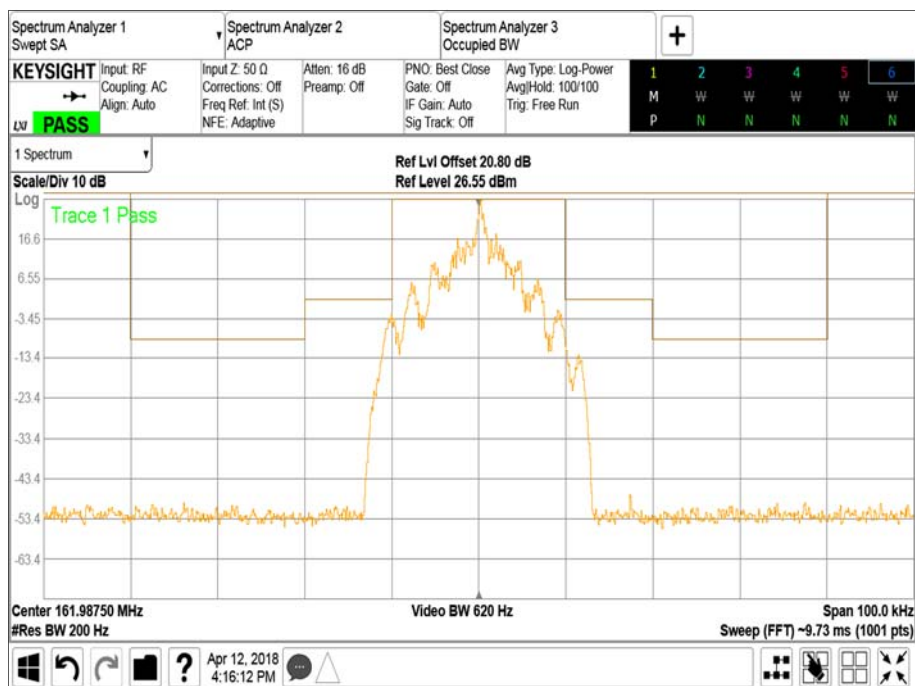


Figure 6 - 161.9875 MHz - Transmitter Spectrum Mask

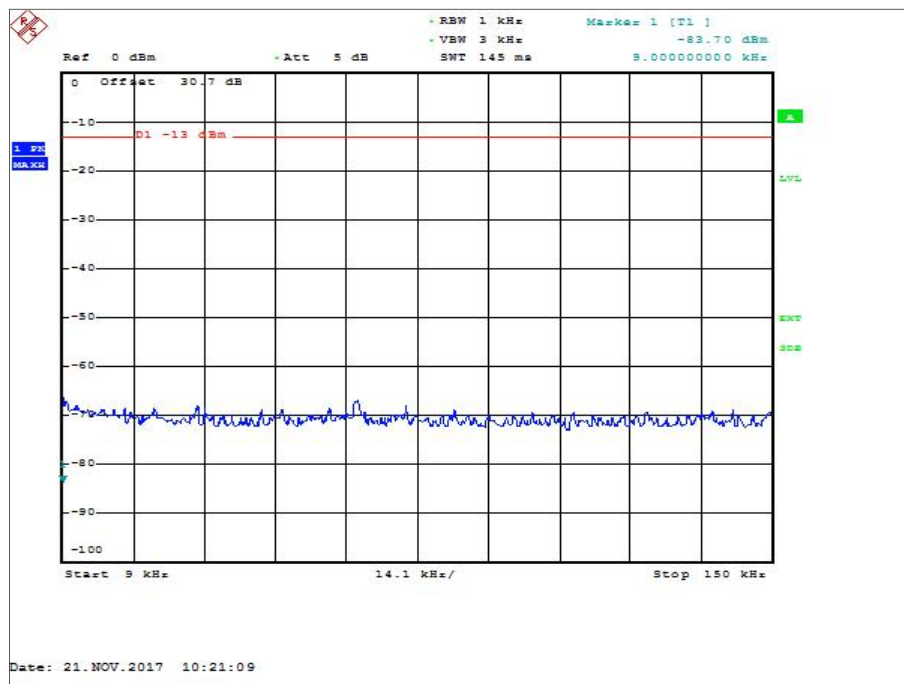


Figure 7 - 156.0125 MHz - 9 kHz to 150 kHz

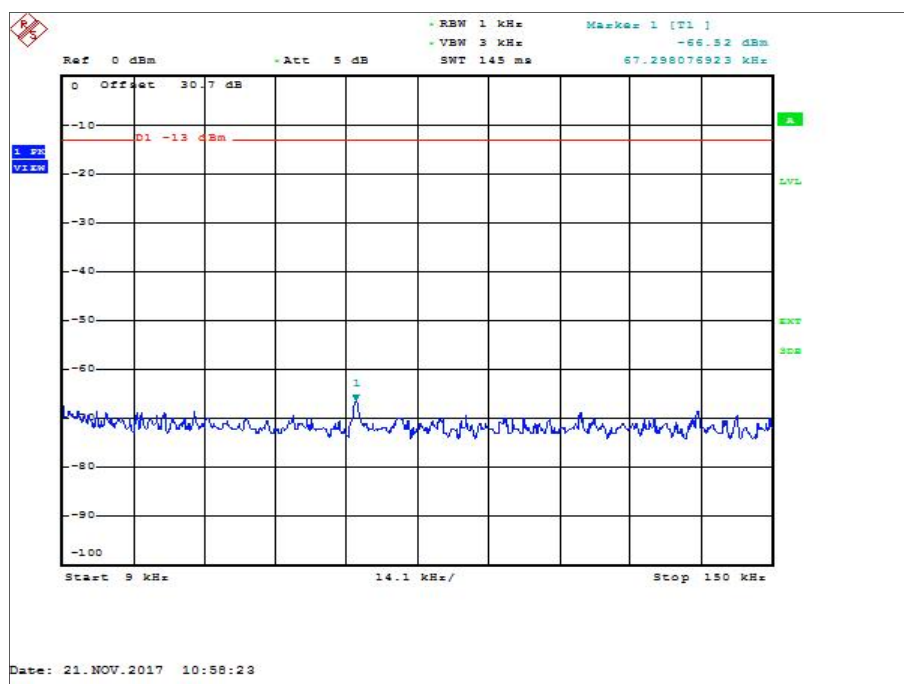


Figure 8 - 159.0000 MHz - 9 kHz to 150 kHz

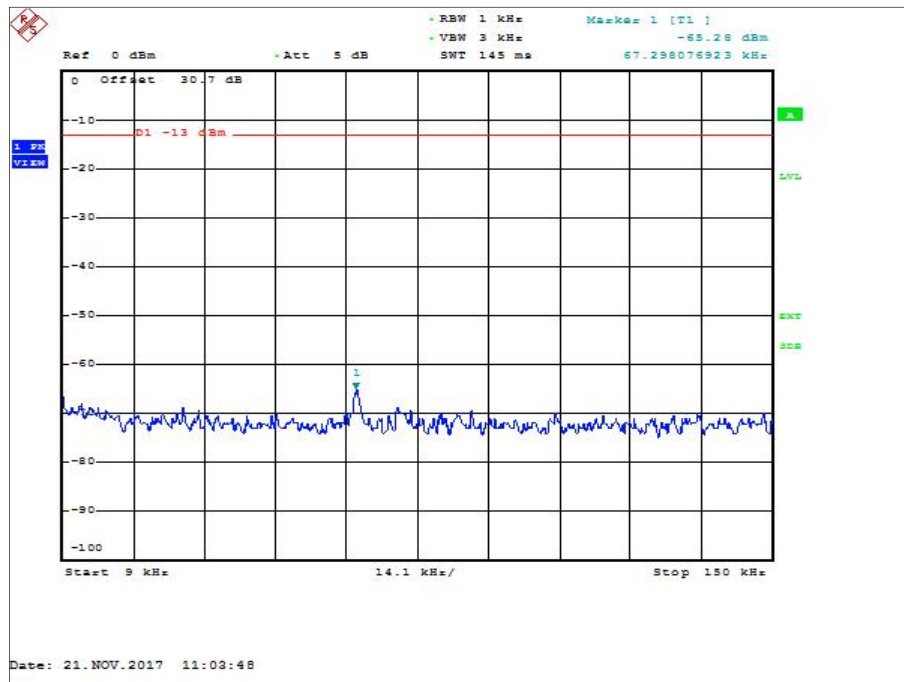


Figure 9 - 161.9875 MHz - 9 kHz to 150 kHz

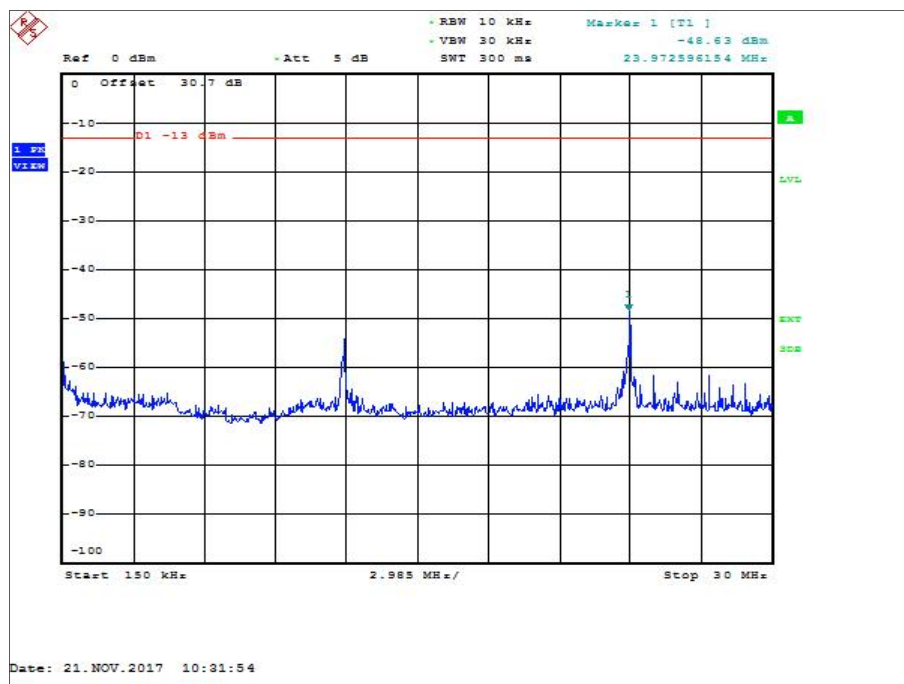


Figure 10 - 156.0125 MHz - 150 kHz to 30 MHz

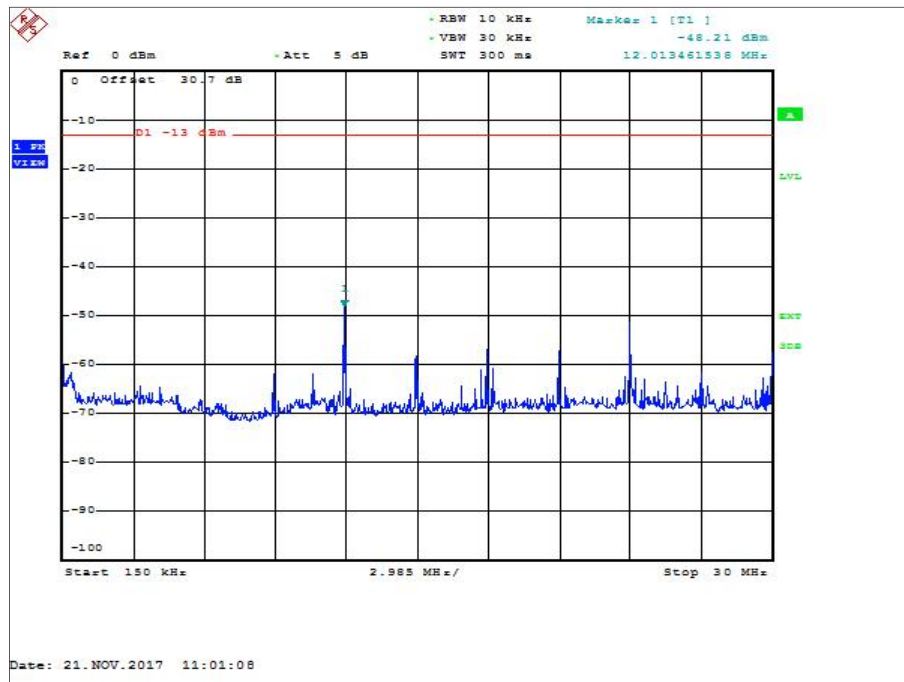


Figure 11 - 159.0000 MHz - 150 kHz to 30 MHz

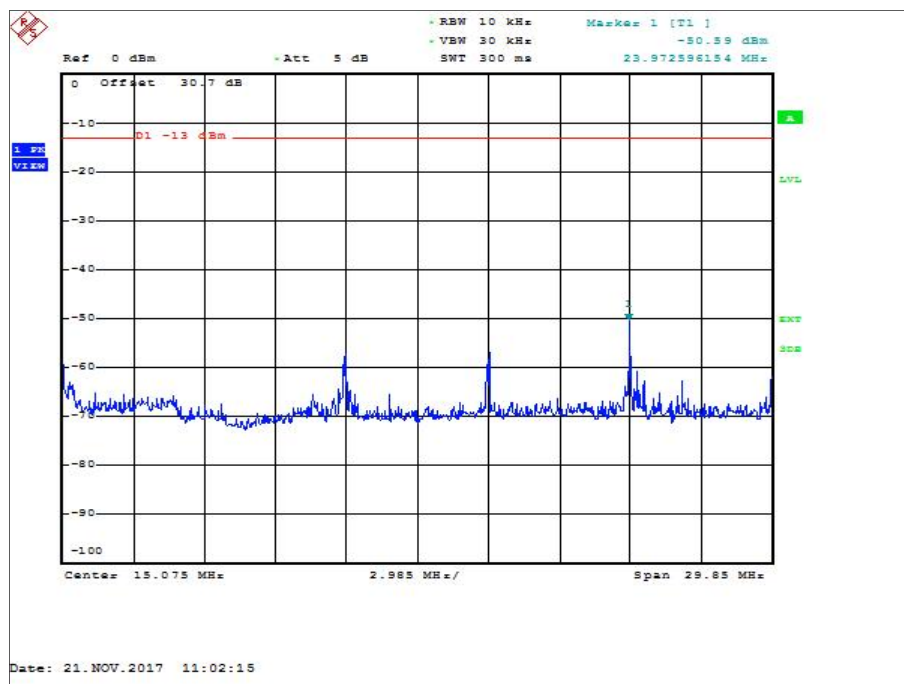


Figure 12 - 161.9875 MHz - 150 kHz to 30 MHz

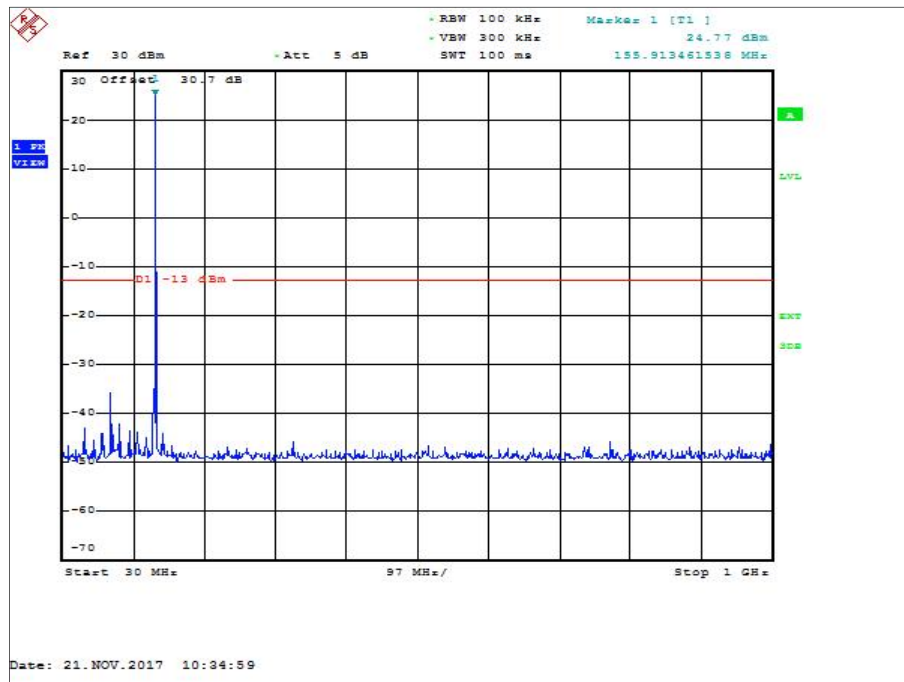


Figure 7 - 156.0125 MHz - 30 MHz to 1 GHz

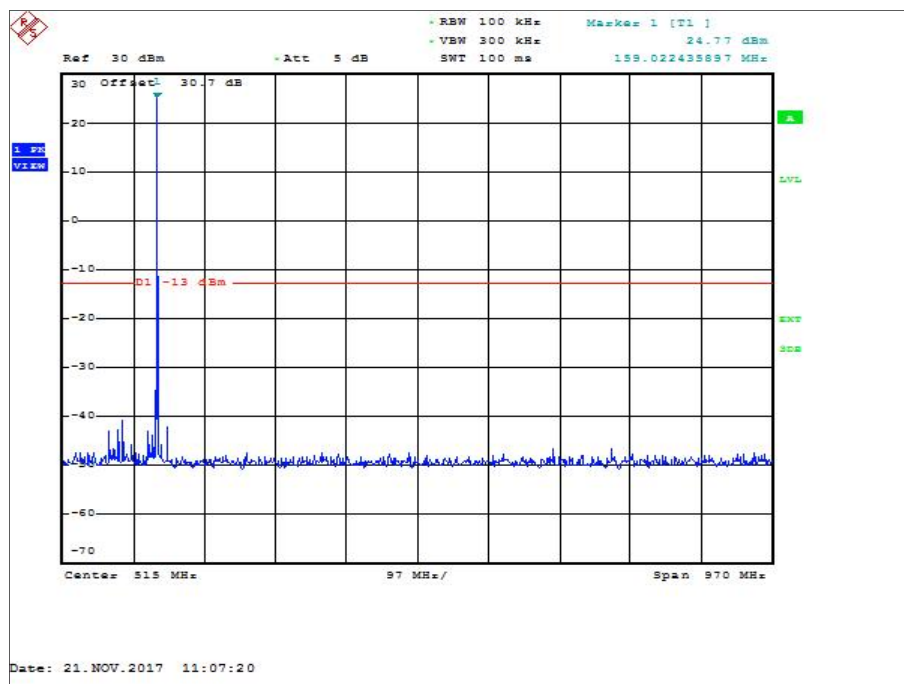


Figure 8 - 159.0000 MHz - 30 MHz to 1 GHz

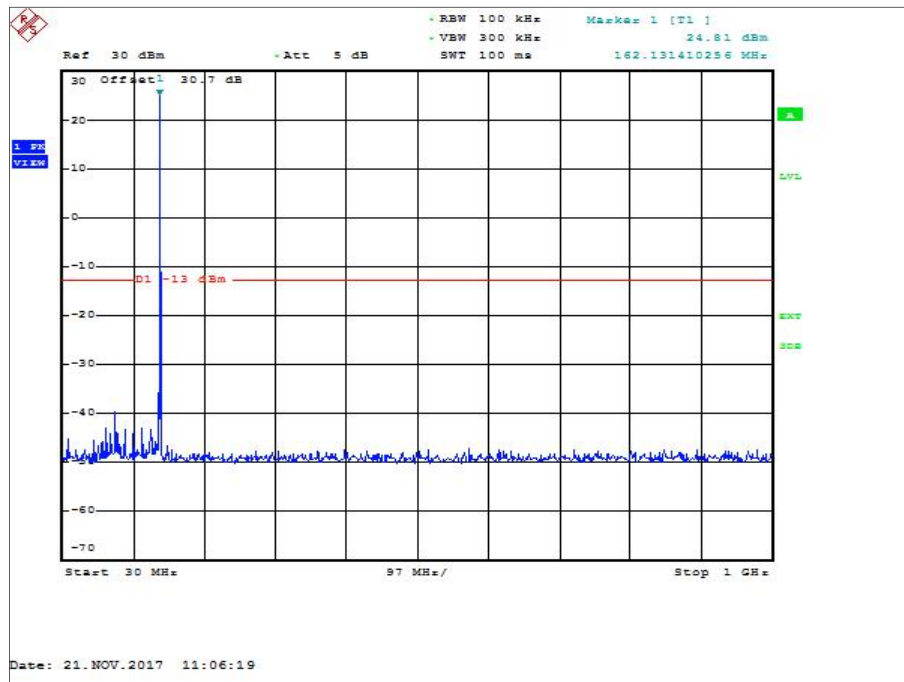


Figure 9 - 161.9875 MHz - 30 MHz to 1 GHz

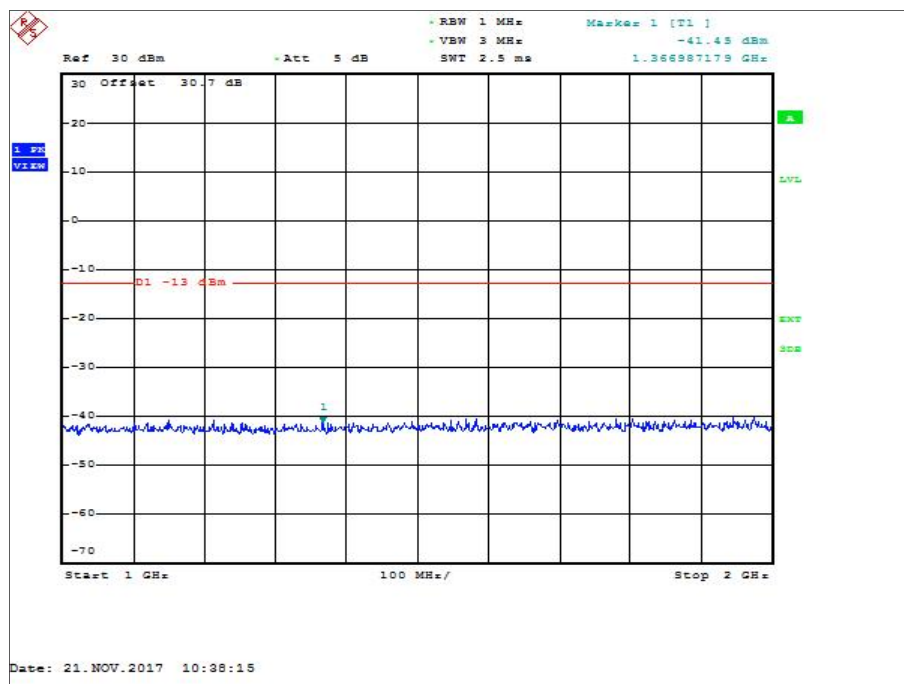


Figure 10 - 156.0125 MHz - 1 GHz to 2 GHz

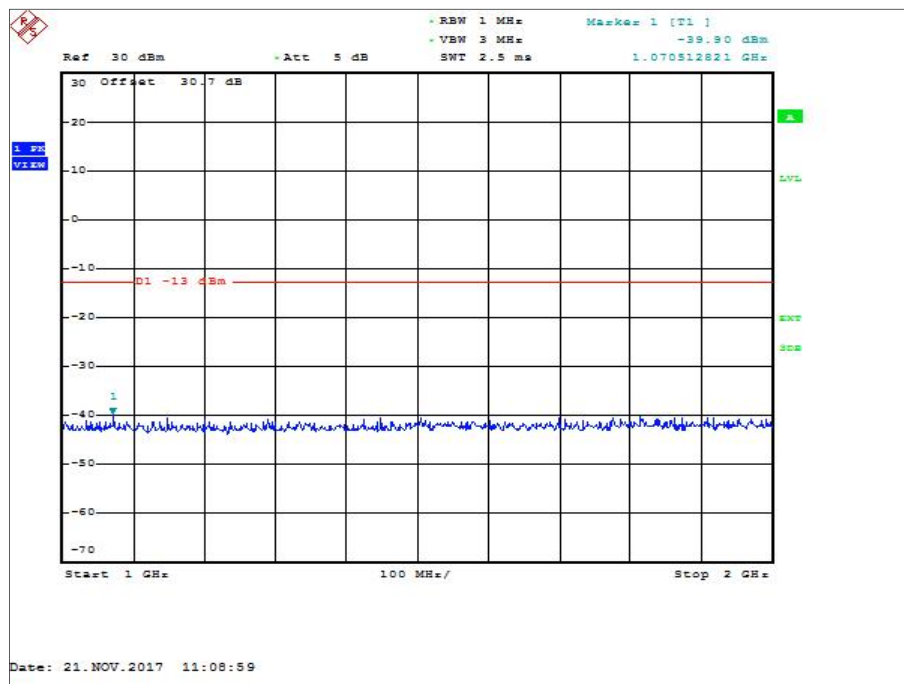


Figure 11 - 159.0000 MHz - 1 GHz to 2 GHz

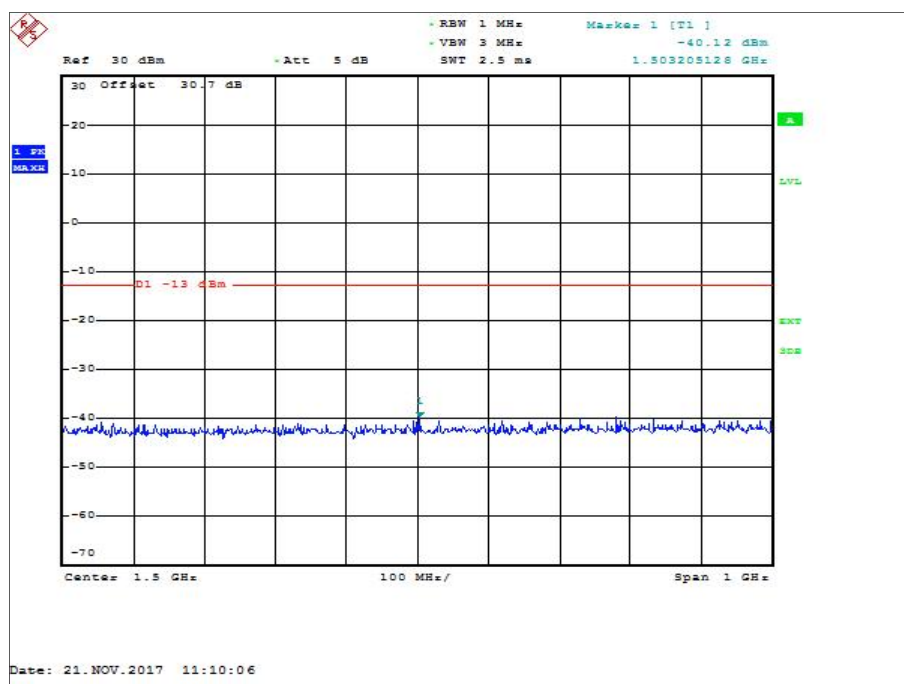


Figure 12 - 161.9875 MHz - 1 GHz to 2 GHz



Product Service

FCC 47 CFR Part 80, Limit Clause 80.211(a)

Within 250% of the Authorised Bandwidth:

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

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

More than 250% of the Authorised Bandwidth:

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

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
Power Supply Unit	Farnell	LB30-4	158	12	O/P Mon
Multimeter	White Gold	WG022	190	12	24-Nov-2017
Directional Coupler	Narda	3020A	419	6	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	14-Sep-2018
Step Attenuator	Rohde & Schwarz	DPSP	1672	-	O/P Mon
Audio Analyser	Hewlett Packard	8903B	2212	12	11-Aug-2018
Cable(3m, SMA(m) - SMA(m))	Reynolds	262-0248-3000	2402	12	19-Sep-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	23-Oct-2018
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
1 Metre SMA Cable	Rhophase	3PS-1801A-1000-3PS	4099	12	19-Sep-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	12-Mar-2018
1 metre SMA Cable	Florida Labs	SMS-235SP-39.4-SMS	4514	12	19-Sep-2018
2 metre SMA Cable	Florida Labs	SMS-235SP-78.8-SMS	4518	12	19-Sep-2018
4 Channel PSU	Rohde & Schwarz	HMP4040	4736	-	TU
30dB Attenuator	Narda	766-30	4783	12	19-Dec-2018
EXA	Keysight Technologies	N9010B	4968	12	21-Dec-2018

Table 10

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

2.4 Radiated Spurious Emissions

2.4.1 Specification Reference

FCC 47 CFR Part 80 and FCC 47 CFR Part 2, Clause 80.211 and 2.1051

2.4.2 Equipment Under Test and Modification State

MP50, S/N: 000 451 - Modification State 0

2.4.3 Date of Test

18 November 2017 to 19 November 2017

2.4.4 Test Method

Testing was performed in accordance with ANSI C63.26-2015 clause 5.5.

Pre-scans were performed using the direct field strength method. Any emissions found within 10dB of the specification limit were formally measured using the substitution method.

The limit line on the pre-scan plots was calculated using the equation c) in clause 5.2.7.

$E \text{ (dB}\mu\text{V/m)} = \text{EIRP (dBm)} - 20\log(D) + 104.8$; where D is the measurement distance (in the far field region) in m.

$82.2 \text{ dB}\mu\text{V/m} = -13 \text{ dBm} - 20\log(3) + 104.8$

2.4.5 Environmental Conditions

Ambient Temperature 16.5 °C
Relative Humidity 44.0 %

2.4.6 Test Results

PNG MP50 (Stand Alone) VHF Transceiver

Frequency (MHz)	Level (dBm)
*	

Table 11 - 156.0125 MHz - Emissions Results

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

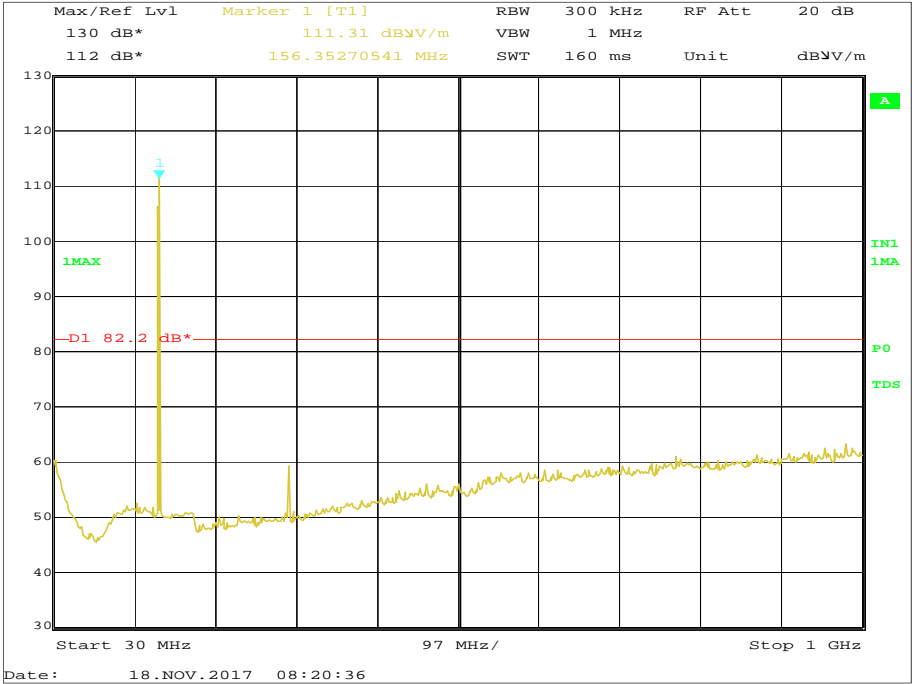


Figure 13 - 156.0125 MHz - 30 MHz to 1 GHz

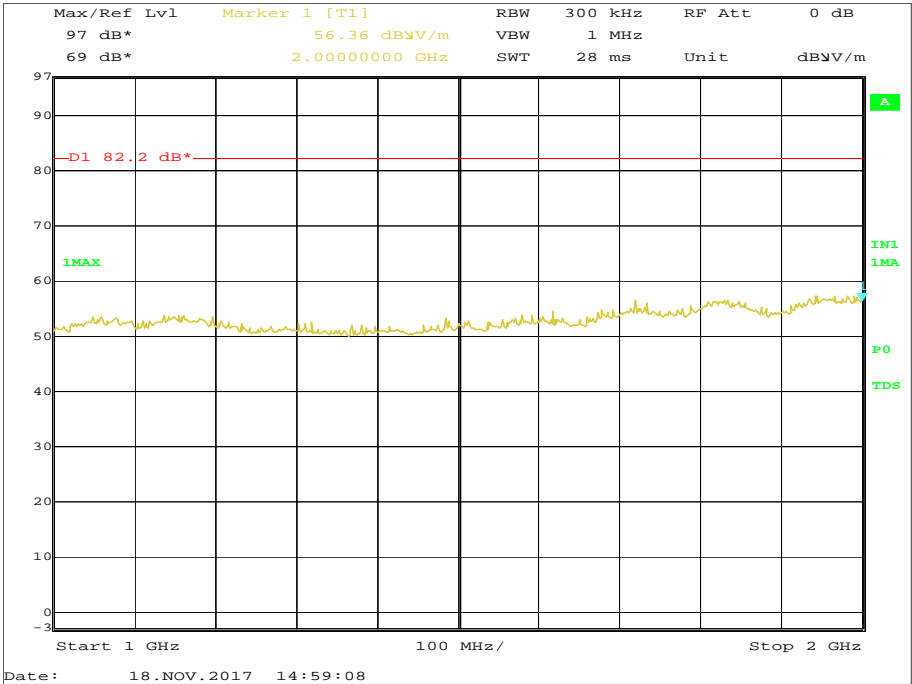


Figure 14 - 156.0125 MHz - 1 GHz to 2 GHz



Frequency (MHz)	Level (dBm)
*	

Table 12 - 159.0000 MHz - Emissions Results

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

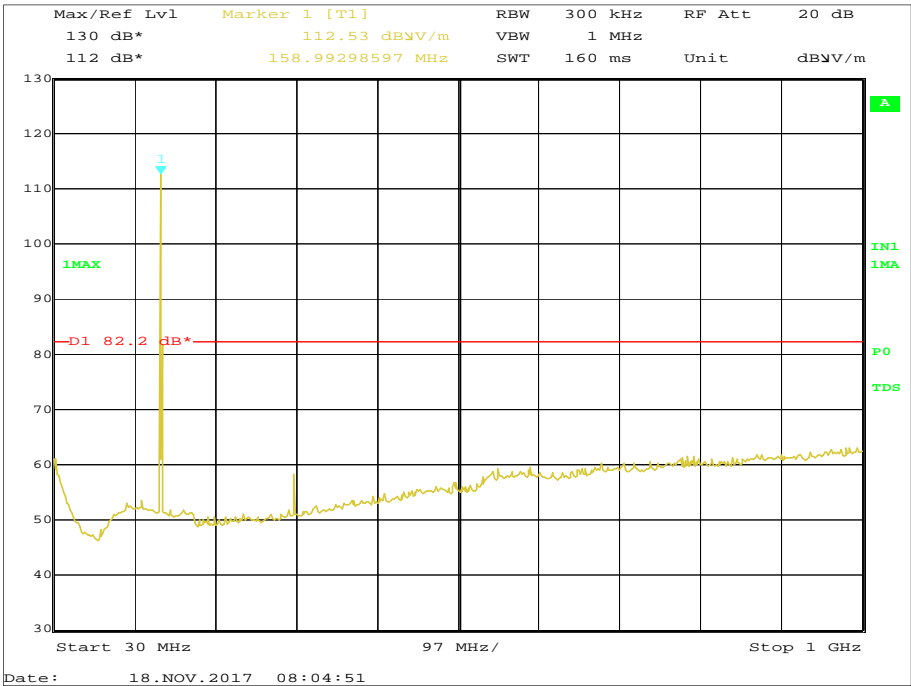


Figure 15 - 159.0000 MHz - 30 MHz to 1 GHz



Product Service

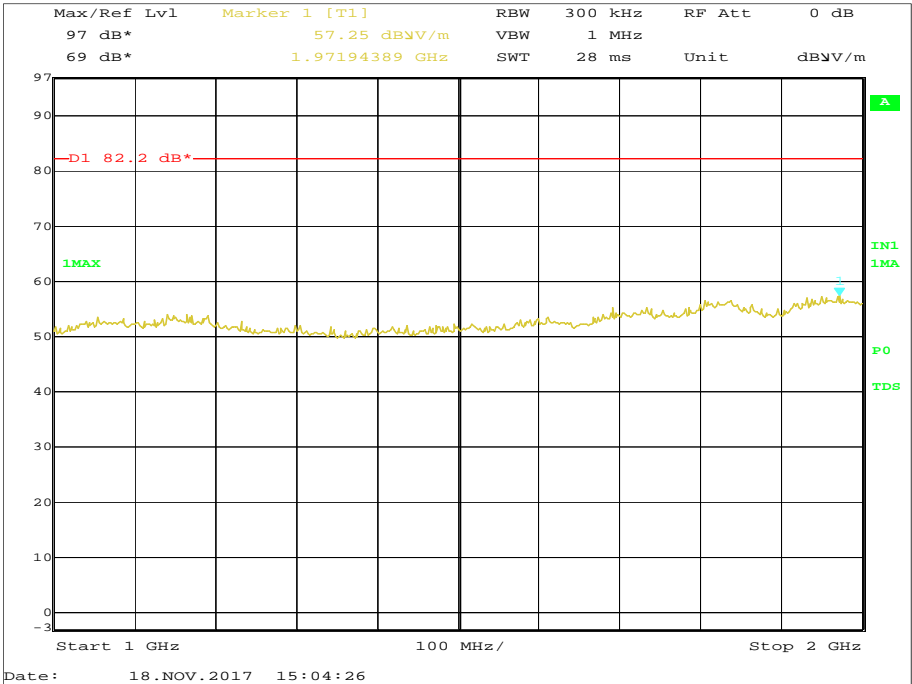


Figure 16 - 159.0000 MHz - 1 GHz to 2 GHz



Frequency (MHz)	Level (dBm)
*	

Table 13 - 159.0000 MHz - Emissions Results

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

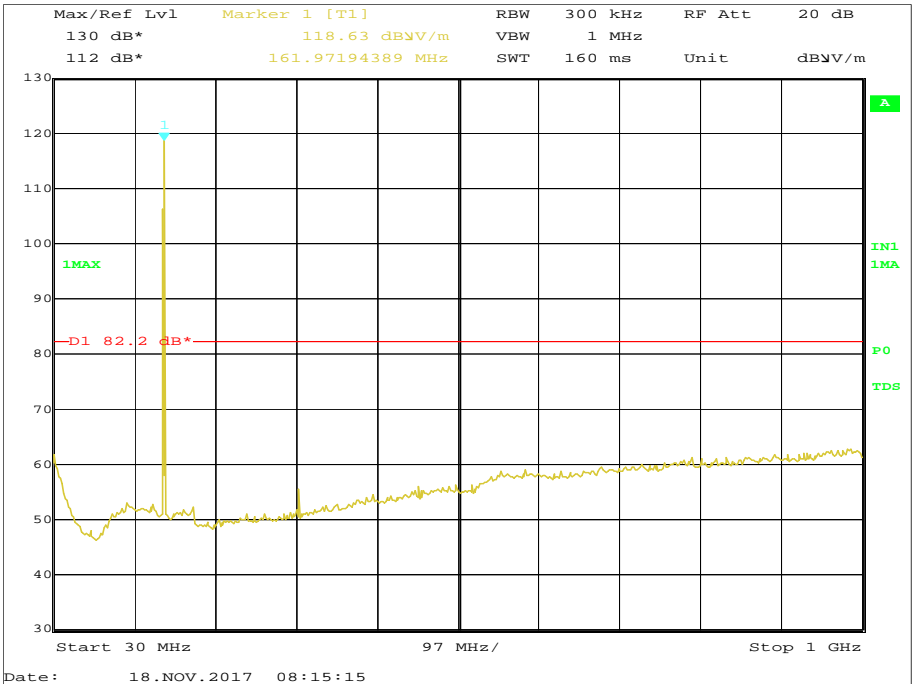


Figure 17 - 161.9875 MHz - 30 MHz to 1 GHz



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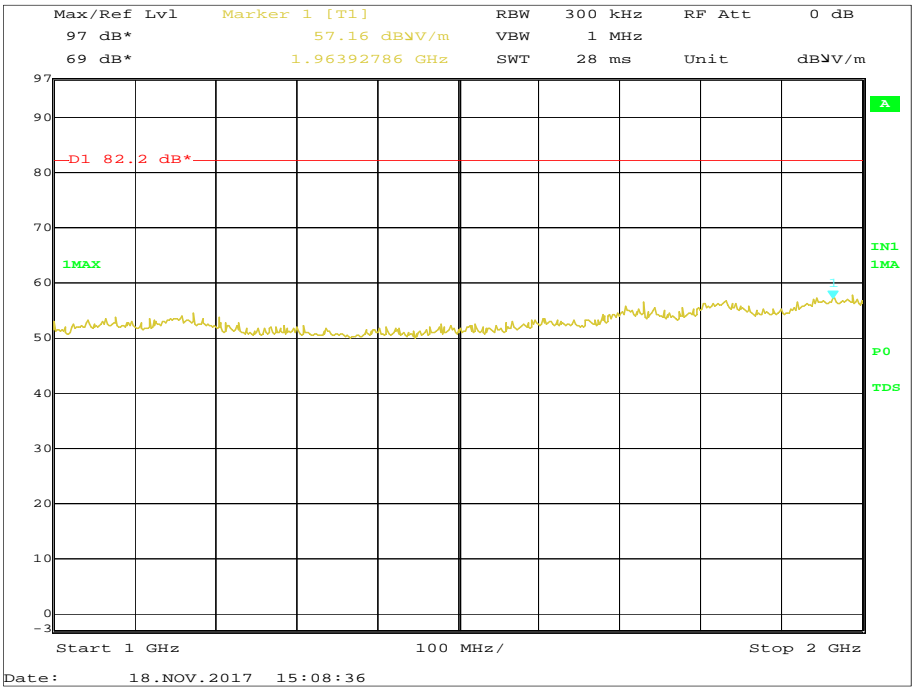


Figure 18 - 161.9875 MHz - 1 GHz to 2 GHz

FCC 47 CFR Part 80, Limit Clause 80.211(a)

More than 250% of the Authorised Bandwidth:

On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus 10log₁₀ (mean power in watts) dB.

2.4.7 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
Test Receiver	Rohde & Schwarz	ESIB26	242	12	19-Jun-2018
Antenna (Bilog)	Schaffner	CBL6143	287	24	18-Apr-2018
Signal Generator (10MHz to 40GHz)	Rohde & Schwarz	SMR40	1002	12	20-Oct-2018
Screened Room (5)	Rainford	Rainford	1545	36	20-Dec-2017
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Hygrometer	Rotronic	HYGROPALM 1	2338	12	24-Oct-2018
Digital Multimeter	Iso-tech	IDM-101	2895	12	20-Jul-2018
Antenna (Log Periodic)	Schaffner	UPA6108	3109	12	16-Jun-2018
Cable (N-N, 8m)	Rhophase	NPS-2302-8000-NPS	3248	12	02-May-2018
EMI Test Receiver	Rohde & Schwarz	ESU40	3506	12	22-Nov-2018
Tilt Antenna Mast	maturo GmbH	TAM 4.0-P	3916	-	TU
Mast Controller	maturo GmbH	NCD	3917	-	TU
TRUE RMS MULTIMETER	Fluke	179	4006	12	13-Dec-2017
Cable (Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4526	6	22-May-2018
Cable (Yellow, Rx, Km-Km 2m)	Scott Cables	KPS-1501-2000-KPS	4527	6	04-Dec-2017
Double Ridge Broadband Horn Antenna	Schwarzbeck	BBHA 9120 B	4848	12	17-Feb-2018

Table 14

TU - Traceability Unscheduled



2.5 Modulation Requirements

2.5.1 Specification Reference

FCC 47 CFR Part 80 and FCC 47 CFR Part 2, Clause 80.213 and 2.1047

2.5.2 Equipment Under Test and Modification State

MP50, S/N: 000 452 - Modification State 0

2.5.3 Date of Test

03 November 2017

2.5.4 Test Method

The EUT was connected to a spectrum analyser via a cable and attenuator. The EUT was configured to transmit at maximum power. The audio input was initially set at a level of 50 mV and the audio frequency varied between 100 Hz and 5 kHz to show the audio frequency response.

At frequencies of 100 Hz, 1 kHz and 5 kHz, the audio input voltage was varied between 1 mV and 1000 mV to show the EUT's capability to limit the level of modulation for different input signal levels and frequencies. The results are shown on the graph below.

2.5.5 Environmental Conditions

Ambient Temperature	22.6 °C
Relative Humidity	42.6 %



2.5.6 Test Results

PNG MP50 (Stand Alone) VHF Transceiver

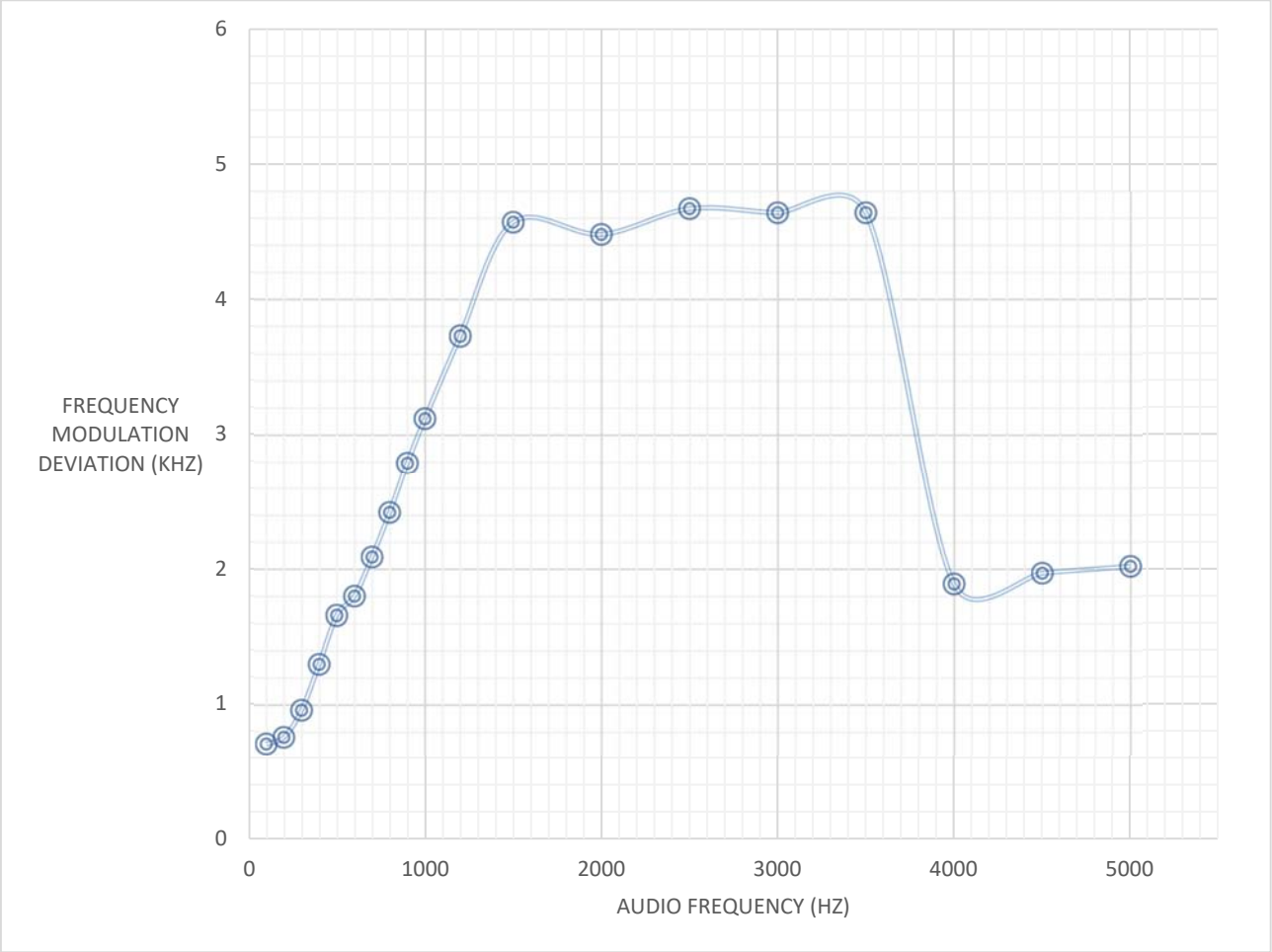


Figure 19 – Audio Frequency Response

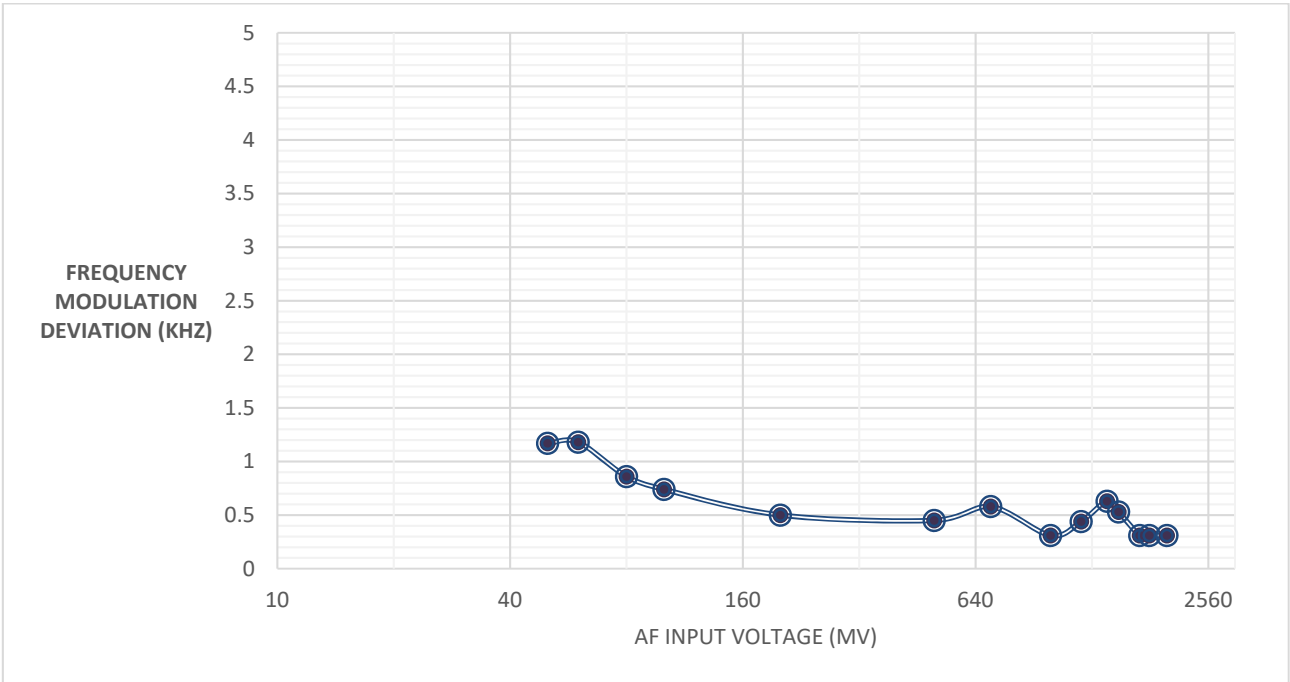


Figure 20 - Modulation Limiting Capability -100 Hz AF

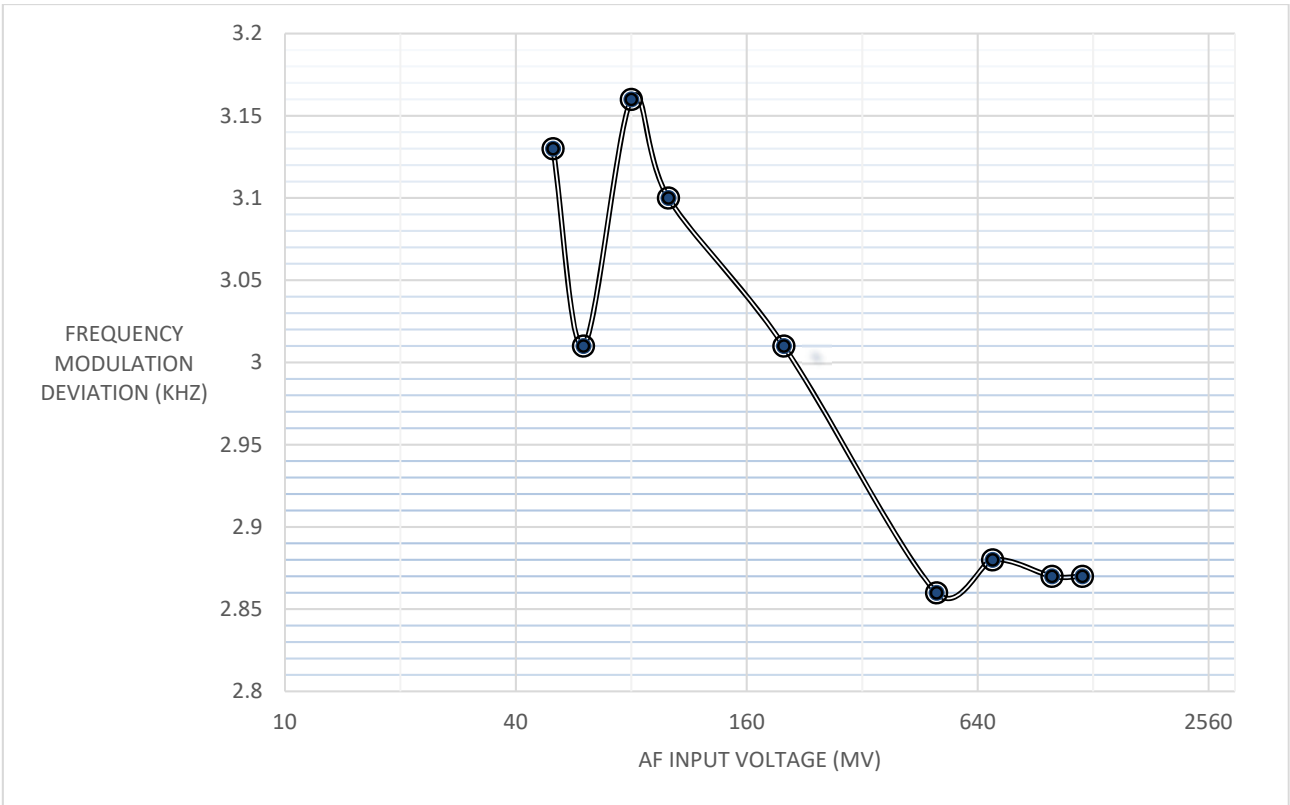


Figure 21 - Modulation Limiting Capability - 1 kHz AF

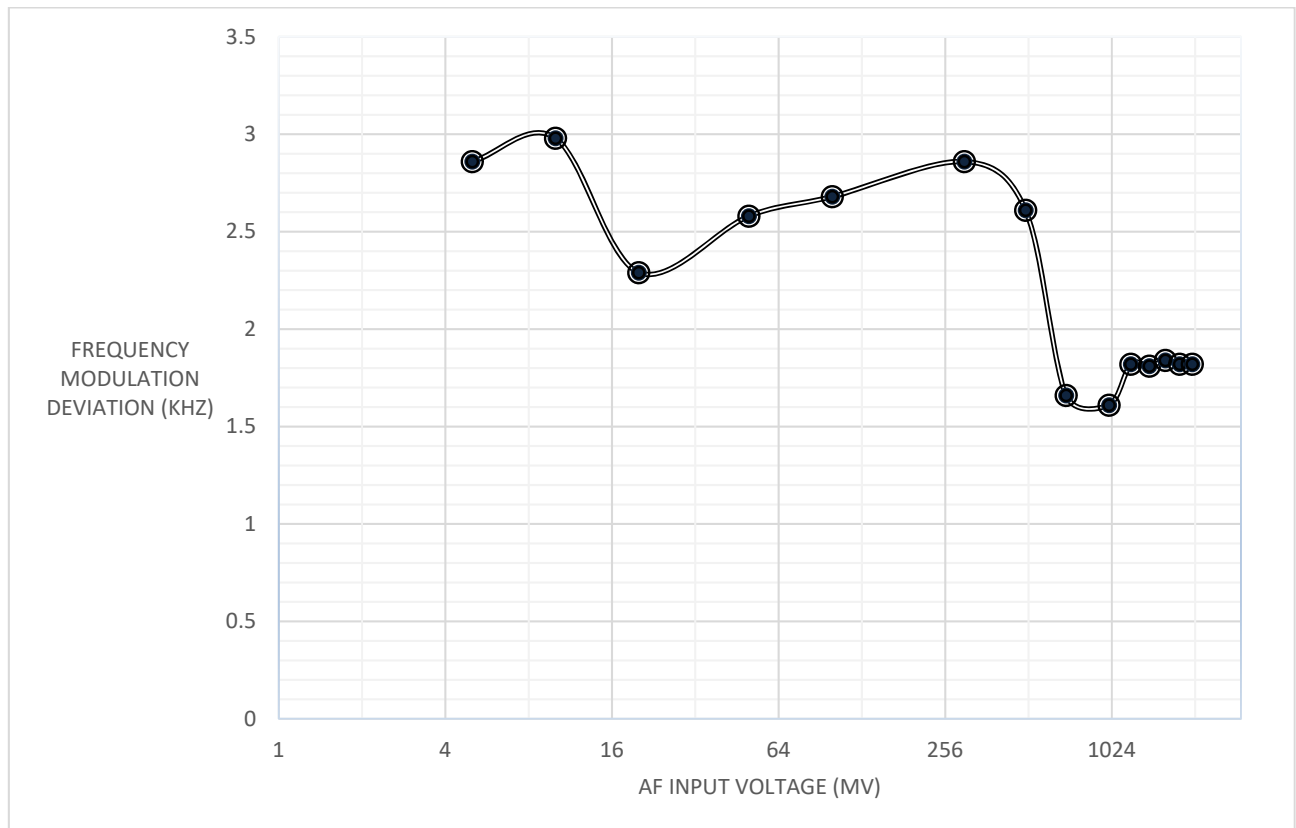


Figure 22 - Modulation Limiting Capability - 5 kHz AF

FCC 47 CFR Part 80, Limit Clause 80.213

Radiotelephone transmitters using A3E, F3E and G3E emission must have a modulation limiter to prevent any modulation over 100 percent.

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.

2.5.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Multimeter	Iso-tech	IDM-101	466	12	02-Oct-2018
Audio Analyser	Hewlett Packard	8903B	1350	12	16-Nov-2017
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Cable(3m, SMA(m) - SMA(m))	Reynolds	262-0248-3000	2402	12	19-Sep-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Signal Analyser	Rohde & Schwarz	FSQ 26	3545	12	23-Oct-2018
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	12-Mar-2018
30dB Attenuator	Narda	766-30	4783	12	19-Dec-2018

Table 15

O/P Mon – Output Monitored using calibrated equipment

2.6 Transmitter Power

2.6.1 Specification Reference

FCC 47 CFR Part 80 and FCC 47 CFR Part 2, Clause 80.215 and 2.1046

2.6.2 Equipment Under Test and Modification State

MP50, S/N: 000 452 - Modification State 0

2.6.3 Date of Test

31 October 2017

2.6.4 Test Method

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

The peak power was measured as this was considered worst case.

2.6.5 Environmental Conditions

Ambient Temperature 22.2 °C
Relative Humidity 44.7 %

2.6.6 Test Results

PNG MP50 (Stand Alone) VHF Transceiver

156.0125 MHz		159.0000 MHz		161.9875 MHz	
Result (dBm)	Result (W)	Result (dBm)	Result (W)	Result (dBm)	Result (W)
26.67	0.46	26.76	0.47	26.74	0.47

Table 16 - Transmitter Power Results

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

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

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

2.6.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Due
Power Supply Unit	Hewlett Packard	6267B	21	-	TU
Signal Generator	Hewlett Packard	ESG4000A	38	12	31-May-2018
Multimeter	Iso-tech	IDM-101	466	12	02-Oct-2018
Power Supply Unit	Farnell	TSV-70	2043	-	O/P Mon
Cable(3m, SMA(m) - SMA(m))	Reynolds	262-0248-3000	2402	12	19-Sep-2018
Spectrum Analyser	Rohde & Schwarz	FSU26	2747	12	02-Feb-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	12-Mar-2018
30dB Attenuator	Narda	766-30	4783	12	12-Dec-2018

Table 17

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

2.7 Suppression of Interference Aboard Ships

2.7.1 Specification Reference

FCC 47 CFR Part 80 and FCC 47 CFR Part 2, Clause 80.217(b)

2.7.2 Equipment Under Test and Modification State

MP50, S/N: 000 452 - Modification State 0

2.7.3 Date of Test

23 November 2017

2.7.4 Test Method

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

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

2.7.5 Environmental Conditions

Ambient Temperature 24.2 °C
Relative Humidity 28.4 %

2.7.6 Test Results

PNG MP50 (Stand Alone)

Frequency of Interfering Emissions	Maximum Power delivered to Artificial Antenna (dBm)	Maximum Power delivered to Artificial Antenna (µW)
9 kHz to 150 kHz	-48.220	0.020
150 kHz to 30 MHz	-50.052	0.010
30 MHz to 100 MHz	-50.426	0.010
100 MHz to 300 MHz	-49.455	0.010
300 MHz to 1 GHz	-47.590	0.020
1 GHz to 2 GHz	-37.399	0.180

Table 18 - Receive Mode Spurious Emissions Results



Product Service

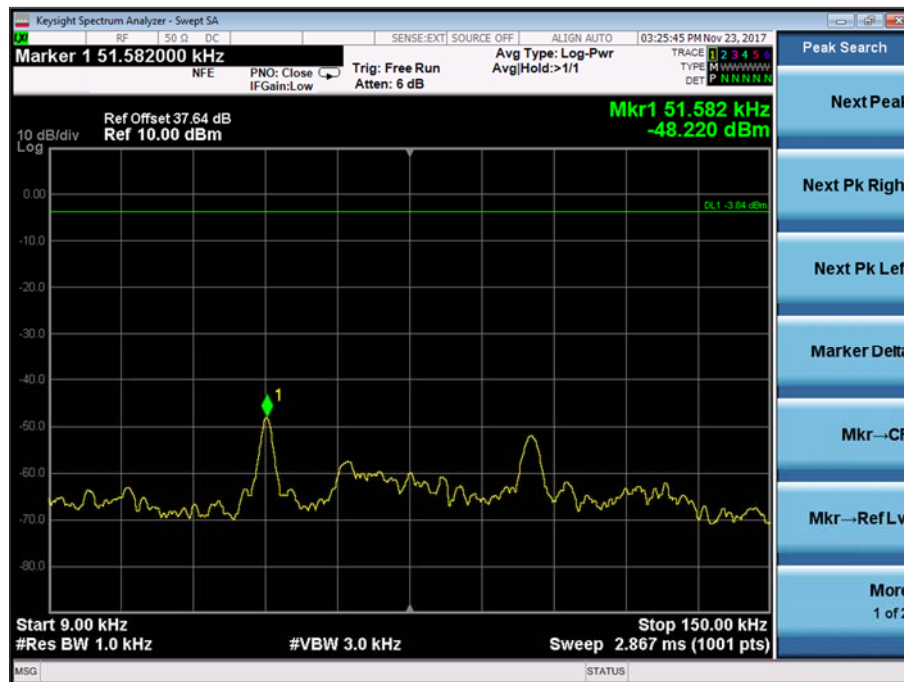


Figure 23 - 9 kHz to 150 kHz

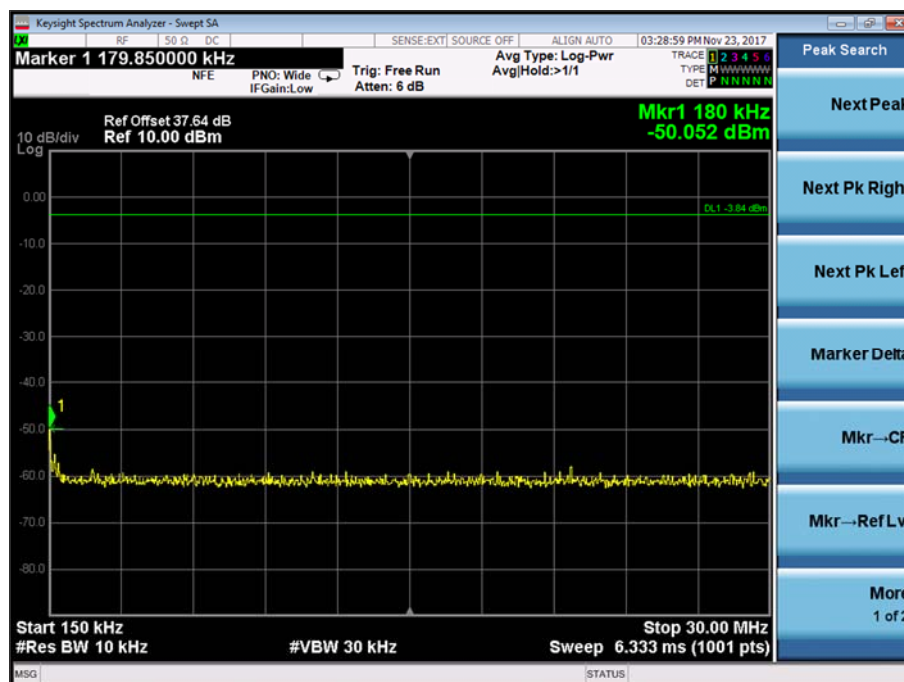


Figure 24 - 150 kHz to 30 MHz



Product Service

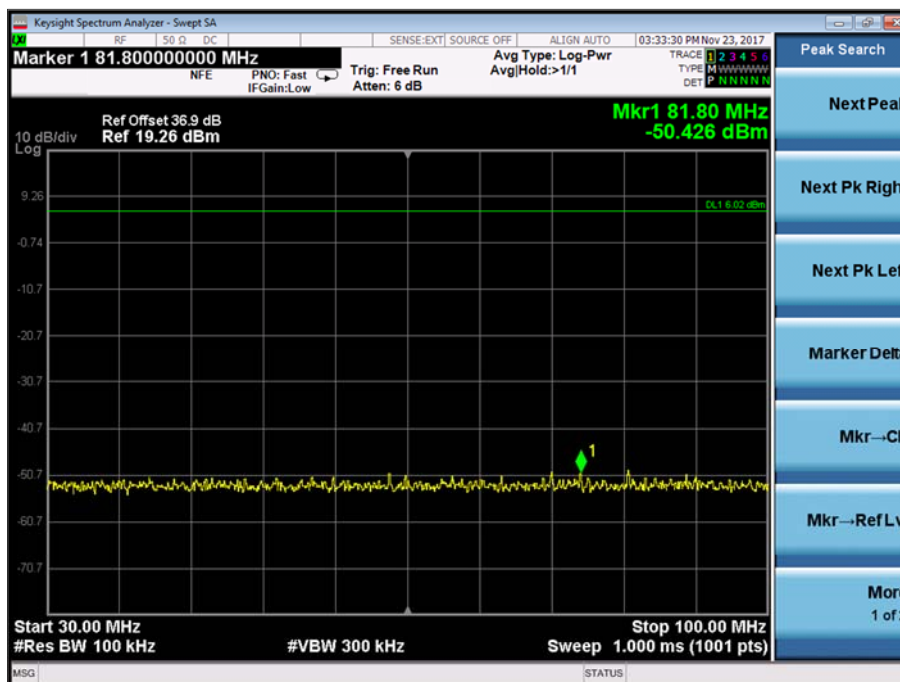


Figure 25 - 30 MHz to 100 MHz

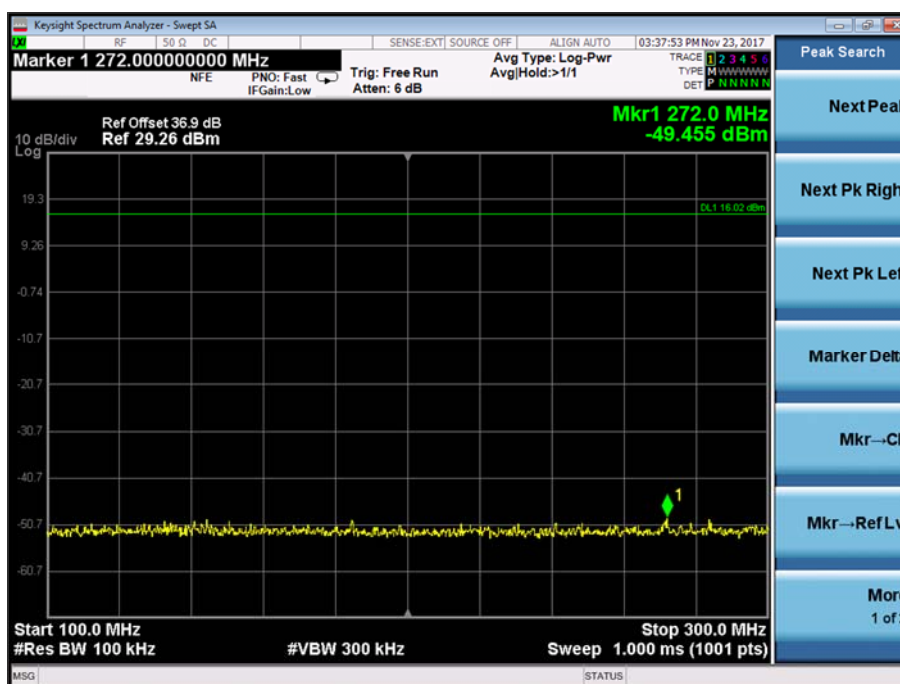


Figure 26 - 100 MHz to 300 MHz



Product Service

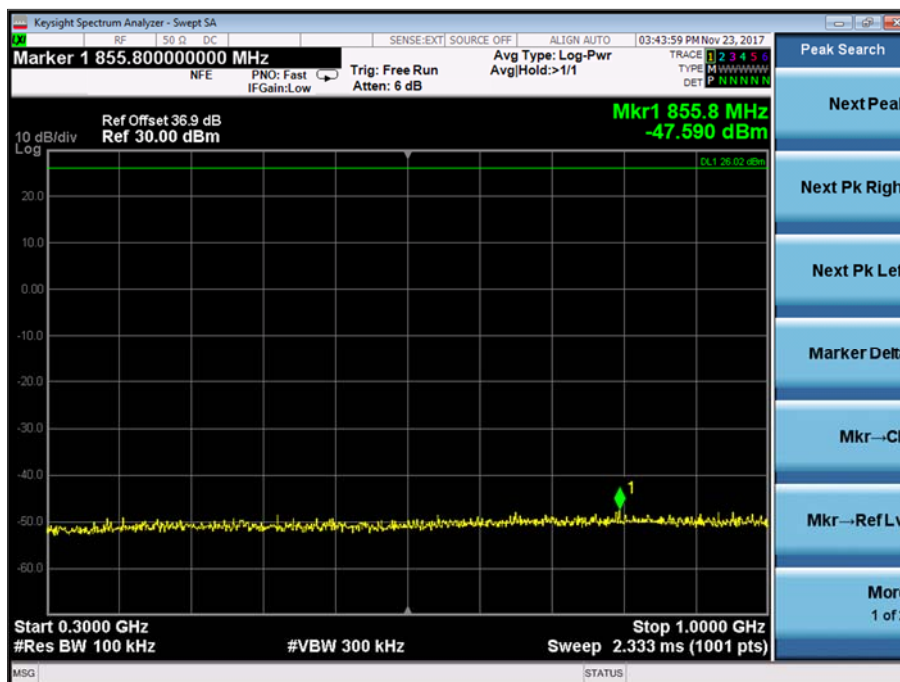


Figure 27 - 300 MHz to 1 GHz

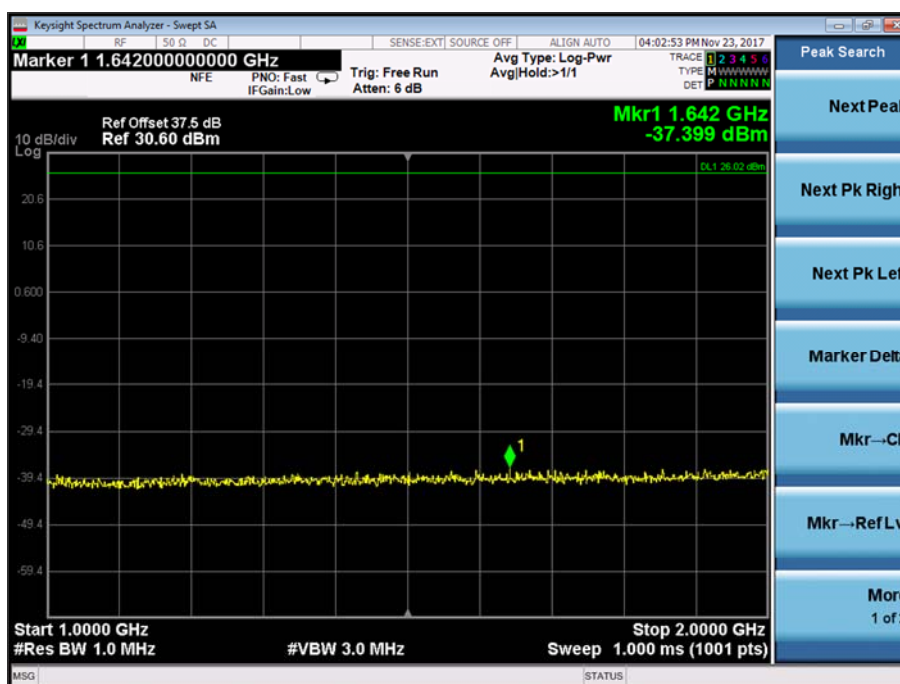


Figure 28 - 1 GHz to 2 GHz

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

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

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

Table 19

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
Power Supply Unit	Farnell	LB30-4	158	12	O/P Mon
Multimeter	Fluke	75 Mk3	455	12	14-Sep-2018
Cable(3m, SMA(m) - SMA(m))	Reynolds	262-0248-3000	2402	12	19-Sep-2018
Hygrometer	Rotronic	I-1000	3220	12	30-Aug-2018
Network Analyser	Rohde & Schwarz	ZVA 40	3548	12	02-Oct-2018
Calibration Unit	Rohde & Schwarz	ZV-Z54	4368	12	19-Sep-2018
Frequency Standard	Spectracom	Secure Sync 1200-0408-0601	4393	6	12-Mar-2018
PXA Signal Analyser	Keysight Technologies	N9030A	4653	12	12-Jan-2018
4 Channel PSU	Rohde & Schwarz	HMP4040	4736	-	O/P Mon
30dB Attenuator	Narda	766-30	4783	12	12-Dec-2018

Table 20

TU - Traceability Unscheduled

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
Authorisation of Transmitters for Licensing	-
Bandwidths	± 58.05 Hz
Transmitter Frequency Tolerances	± 11 Hz
Spurious Emissions at Antenna Terminals	± 3.45 dB
Radiated Spurious Emissions	± 3.08 dB
Modulation Requirements	-
Transmitter Power	± 3.2 dB
Suppression of Interference Aboard Ships	± 3.45 dB
Requirements for Selective Calling Equipment	-

Table 21