Radio Test Report

Blu Wireless Technology Ltd

Degas Trackside Unit

DN201SC

47 CFR Part 15.255 Effective Date 1st October 2020
DXX: Part 15 Low Power Communication Device Transmitter
Test Date: 27th January – 25th February 2022
Report Number: 02-12967-1-22 Issue 03
Supersedes report: 02-12967-1-22 Issue 02

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Certificate of Test 12967-1

The equipment noted below has been fully tested by R.N. Electronics Limited and, where appropriate, conforms to the relevant subpart of 47 CFR Part 15C. This is a certificate of test only and should not be confused with an equipment authorisation. Other standards may also apply.

Equipment:	Degas Trackside Unit
Model Number:	DN201SC-G
Unique Serial Number:	DN201G001065
Applicant:	Blu Wireless Technology Ltd 4th Floor One Castlepark Tower Hill Bristol BS2 0JA
Proposed FCC ID	2A4BS-DN201SC-G
Full measurement results are detailed in Report Number:	02-12967-1-22 Issue 03
Test Standards:	47 CFR Part 15.255 Effective Date 1st October 2020 DXX: Part 15 Low Power Communication Device Transmitter

NOTE:
Certain tests were not performed based upon applicant's declarations. Certain other requirements are subject to applicant's declaration only and have not been tested/verified. For details refer to section 3 of this report.

DEVIATIONS:
No deviations have been applied.

This certificate relates only to the unit tested as identified by a unique serial number and in the condition at the time it was tested. It does not relate to any other similar equipment and performance of the product before or after the test cannot be guaranteed. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of unit not meeting the intentions of the standard or the requirements of the Federal Regulations, particularly under different conditions to those during testing. Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Statements of compliance, where measurements were made, do not include the measurement uncertainty. The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Date Of Test: 27th January – 25th February 2022

Test Engineer:
Graham Blake

Graham Blake
Digitally signed by: Graham Blake
DN: CN = Graham Blake email = graham.blake@rnelectronics.com C = AD O = RN Electronics OU = Engineer
Date: 2022.07.29 13:28:21 Z

Approved By:
Radio Manager

Digitally signed by: Daniel Sims
DN: CN = Daniel Sims C = GB O = RN Electronics Ltd
Date: 2022.07.29 13:03:09 Z

Customer Representative:

ilac-MRA UKAS TESTING 2360

0 Revision History

Issue Number	Revision History	Page Reference(s)
01	First Issue	-
02	Added further antenna details and a reference to low level radio behaviour document	6
	Added further detail on SSH software to gain access and control EUT in specific modes.	7
	Added pre-scan PK and AV EIRP results for each mod scheme/rate for highest power radio (shows worst case rate)	22, 23
	Added further detail to the power tuning process and reference that software/firmware did not change	128
03	Revised modulation types listed	5, 8

1 Contents

2 Equipment under test (EUT)

2.1 Equipment specification

Applicant	Blu Wireless Technology Ltd 4th Floor One Castlepark Tower Hill Bristol BS2 0JA	
Manufacturer of EUT	Blu Wireless Technology Ltd	
Full Name of EUT	Degas Trackside Unit	
Model Number of EUT	DN201SC-G	
Serial Number of EUT	DN201G001065	
Date Received	24th January 2022	
Date of Test:	27th January – 25th February 2022	
Purpose of Test	To demonstrate design compliance to the relevant rules of Chapter 47 of the Code of Federal Regulations.	
Date Report Issued	29th July 2022	
Main Function	Radio communications: Multi-Gigabit/s radio equipment operating in the 60GHz band.	
Information Specification	Height	296 mm
	Width	83 mm
	Depth	170 mm
	Weight	3.9 kg
	Voltage	20 - 48 VDC
	Current	5 Amp (max)
EUT Supplied PSU	Manufacturer	Puls Power
	Model number	CP10.361
	Serial number	-
	Input voltage	100 - 240 VAC
	Input current	2.5 Amps
	Output	36 - 42 VDC

2.2 Configurations for testing

TX Parameters	
Alignment range – transmitter	57.24 - 70.2 GHz
EUT Declared Modulation Parameters	802.11ad MCS0 up to MCS12 π/2-DBPSK (MCS0), π/2-BPSK (MCS1 to MCS5), π/2-QPSK (MCS6 to MCS9) and π/2-16QAM (MCS10 to MCS12)
EUT Declared Power level	40 dBmi max
EUT Declared Signal Bandwidths	2.16 GHz, 1.08 GHz and 0.54 GHz
EUT Declared Channel Spacing's	2.16 GHz
EUT Declared Duty Cycle	99%
Unmodulated carrier available?	Yes
Declared frequency stability	+/- 2 ppm
RX Parameters	
Alignment range – receiver	57.24 - 70.2 GHz
EUT Declared RX Signal Bandwidth	Full BW mode: 1 GHz baseband, 2 GHz at RF Half BW mode: 0.5 GHz baseband, 1 GHz at RF Quarter BW mode: 0.25 GHz baseband, 0.5 GHz at RF

FCC Parameters	
FCC Transmitter Class	DXX: Part 15 Low Power Communication Device Transmitter

Fixed Link Configurations for Test

General Parameters	
EUT Normal use position	Positioned alongside a railway track
Choice of model(s) for type tests	Sample
Antenna details	There are two radio modules. Each module has independent Tx and Rx antenna arrays. So in total 2 Tx and 2 Rx arrays. Each array is a 16x4 array, made up of 16 RF paths and 1x4 sub-arrays with 23dBi gain. The antenna arrays are integral to the radio modules and are classified as "RFM Phased Array antenna". They are vertically polarised and offer 63 pencil beam widths of approximately 7 degrees each. Please refer to document "BW-000999-TD-3-Low Level Radio Behaviour.pdf" for further details. The antenna is permanently fixed and cannot be changed.
Antenna port	No
Highest Signal generated in EUT	70.2 GHz
Lowest Signal generated in EUT	25 MHz
Hardware Version	DN201SC-G (Batch B2104)
Software Version	Platform SW: R0.10
Firmware Version	RWM6050: R3.2, MPU: 0.5.3
Type of Equipment	Multi-Gigabit/s radio equipment
Technology Type	IEEE 802.11ad
Geo-location (yes/no)	Yes (not used to configure radio parameters)

2.3 Functional description

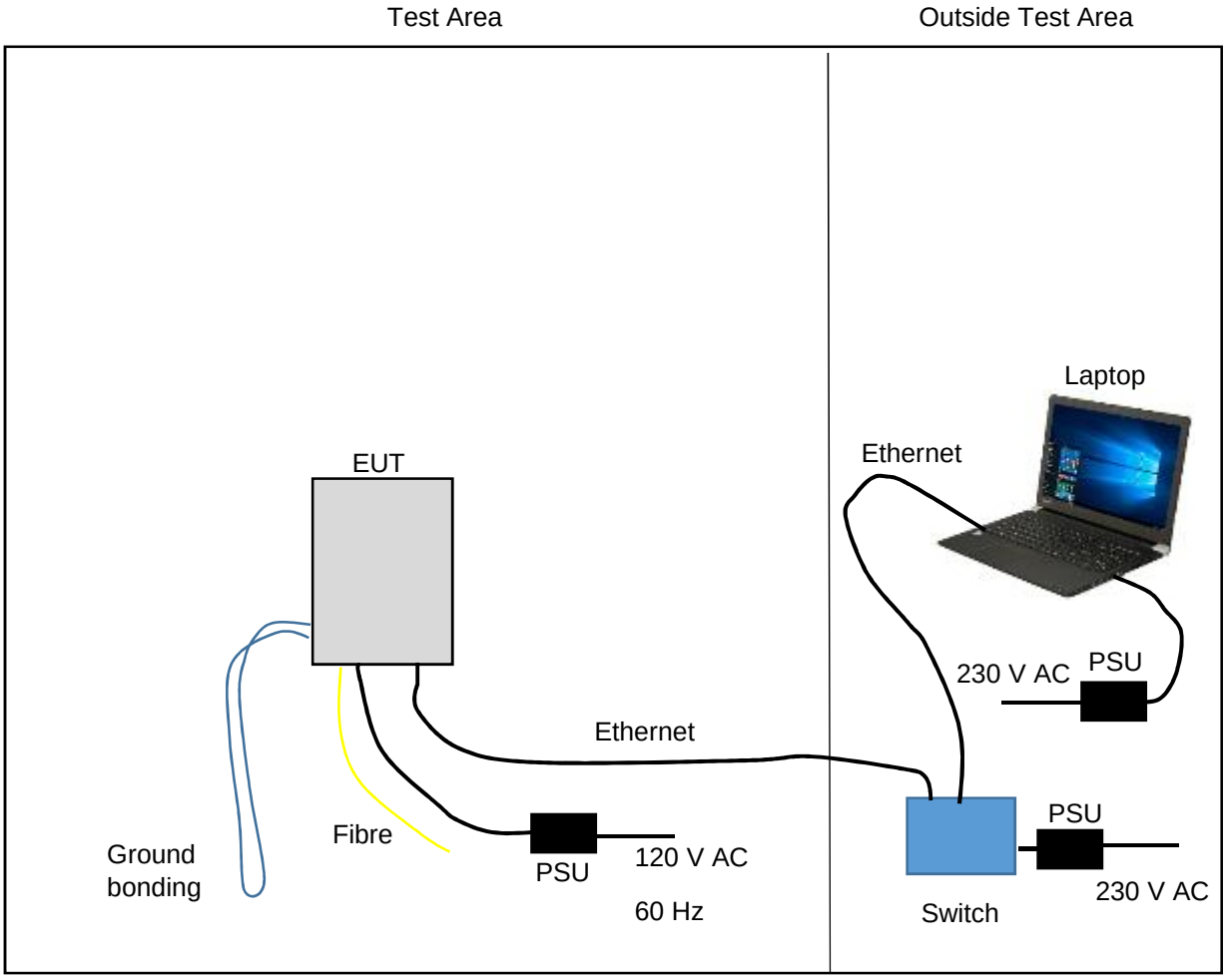
Provision of high-speed data communications to trains for internet access for a high number of users. Non-critical communications. Not used for mission critical or time sensitive applications. A system comprises of a train top unit (TTU) operating in the 57-71 GHz band which is connected to an NPU located in the roof space of the train carriage. The TTU communicates with this trackside unit operating in the 57-71 GHz band.

2.4 Modes of operation

Mode Reference	Description	Used for testing
TX1	58.32 GHz 39 dBm 2.16GHz bandwidth	Yes
TX2	60.48 GHz 39 dBm 2.16GHz bandwidth	Yes
TX3	62.64 GHz 39 dBm 2.16GHz bandwidth	Yes
TX4	64.8 GHz 39 dBm 2.16GHz bandwidth	Yes
TX5	66.96 GHz 39 dBm 2.16GHz bandwidth	Yes
TX6	69.12 GHz 39 dBm 2.16GHz bandwidth	Yes

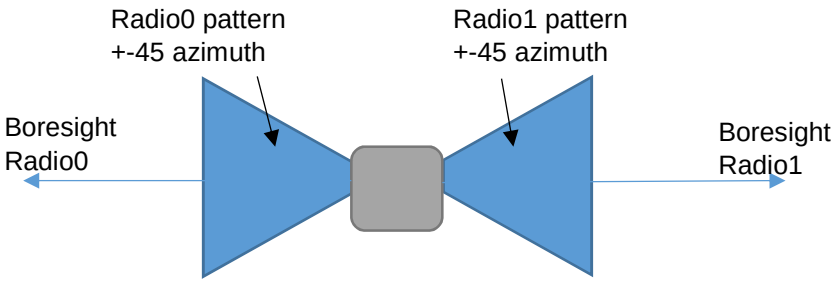
Note: Above modes were used in combination with Schemes MCS0 to MCS12 and Half Band and Quarter Band channel bandwidths for tests, Half and quarter bandwidths used the same centre frequency. Modes apply to both radio 0 and radio 1.

2.5 Emissions configuration



The unit was powered from 36 V DC via the applicant supplied power supply which was powered from a 120 V AC mains source. The unit was configured using a laptop PC and terminal software to allow permanent transmit modes of the 60 GHz function of the device on both of the EUT's 60 GHz radios with individual beam settings also settable. This was achieved using MobaXterm software which allowed an SSH connection to the EUT. Once logged in to the EUT a set of commands inputted a line at a time allowed setting of the radio parameters as required. This SSH terminal access also allowed the calibrated power levels to be adjusted/overwritten where required, in order to demonstrate compliance with the limits (see section 11.1 within this report). No EUT Software / Firmware was required to be changed in order to run these specific EUT commands from the command line prompt. The radios Antenna arrays point in opposite directions (180° apart) with each radio then covering approximately +-45° from its boresight orientation with +-10° elevation over the 64 settings of the beam book, each individual azimuth beam width is +-3.5°. Therefore no radio power beam overlap can occur between the 2 radios.

Aerial view



The power settings for each channel were as stated below: -
Channel 1 = 58.32 GHz, power level +39 dBm (all modulation schemes)
Channel 2 = 60.48 GHz, power level +39 dBm (all modulation schemes)
Channel 3 = 62.64 GHz, power level +39dBm (all modulation schemes)
Channel 4 = 64.8 GHz, power level +39 dBm (all modulation schemes)
Channel 5 = 66.96 GHz, power level +39 dBm (all modulation schemes)
Channel 6 = 69.12 GHz, power level +39 dBm (all modulation schemes)

Modulation schemes available were π/2-DBPSK (MCS0), π/2-BPSK (MCS1 to MCS5), π/2-QPSK (MCS6 to MCS9) and π/2-16QAM (MCS10 to MCS12). Channel bandwidths available were: Full Band (2.16 GHz), Half Band (1.08 GHz) and Quarter Band (0.54 GHz).

Measured duty cycles for the schemes were as follows:-
MCS0 98.9 %
MCS1 99.7 %
MCS2 99.5 %
MCS3 99.3 %
MCS4 99.3 %
MCS5 99.2 %
MCS6 99.1 %
MCS7 98.7 %
MCS8 98.6 %
MCS9 98.5 %
MCS10 98.0 %
MCS11 97.7 %
MCS12 97.2 %

2.5.1 Signal leads

Port Name	Cable Type	Connected
Power	4-core	Yes
Ethernet	Cat 6a	Yes
SFP Fibre	Single fibre	Yes
Ground bonding point	Copper braid	Yes

3 Summary of test results

The Degas Trackside Unit, DN201SC-G was tested for compliance to the following standard :

47 CFR Part 15.255 Effective Date 1st October 2020
DXX: Part 15 Low Power Communication Device Transmitter

Any compliance statements are made reliant on (a) the application of the product and use of the assigned band being acceptable to the FCC and (b) the modes of operation as instructed to us by the Customer based on their specific knowledge of the application and functionality of the EUT. Whilst every effort is made to assure quality of testing, type tests are not exhaustive and although no non-conformances may be found, this doesn't exclude the possibility of equipment not meeting the intentions of the standard or the essential requirements of the directive, particularly under different conditions to those during testing. Statements of compliance, where measurements were made, do not include the measurement uncertainty. The measurement uncertainty, where stated, is the expanded uncertainty based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Title	References	Results
Transmitter Tests		
1. AC power line conducted emissions	47 CFR Part 15C Part 15.207	PASSED
2. Radiated emissions 9 - 150 kHz	47 CFR Part 15C Part 15.209	NOT APPLICABLE[1]
3. Radiated emissions 150 kHz - 30 MHz	47 CFR Part 15C Part 15.209	PASSED
4. Radiated emissions 30 MHz -1 GHz	47 CFR Part 15C Part 15.255(d)(2)	PASSED
5. Radiated emissions above 1 GHz	47 CFR Part 15C Part 15.255(d)(2)/(3)/(4)	PASSED[2]
6. Frequency stability	47 CFR Part 15C Part 15.255(f)	PASSED
7. Peak & Average EIRP	47 CFR Part 15C Part 15.255(c)(1)(i)/(ii)	PASSED
8. Peak Conducted Power	47 CFR Part 15C Part 15.255(c)(3)/(4)	PASSED[3]
9. 6dB Occupied bandwidth	47 CFR Part 15C Part 15.255	PASSED

[1] Lowest frequency generated within the unit is declared as 25MHz
[2] Spectrum investigated started at a frequency of 150 kHz up to a frequency of 200GHz. The highest signal generated in the equipment is 70.2 GHz.
[3] EUT does not have a conducted RF port, however, calculation has been provided to determine conducted power against the limit from maximum EIRP measured and antenna gain.

4 Specifications

The tests were performed and operated in accordance with R.N. Electronics Ltd procedures and the relevant standards listed below.

4.1 Relevant standards

Ref.	Standard Number	Version	Description
4.1.1	47 CFR Part 15C	2020	Federal Communications Commission PART 15 – RADIO FREQUENCY DEVICES
4.1.2	ANSI C63.10	2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
4.1.3	ANSI C63.4	2014	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
4.1.4	KDB 842590 D01 v01	2019	Federal Communications Commission Office of Engineering and Technology Laboratory Division; Basic certification requirements and measurement procedures for Upper Microwave Flexible Use Service (UMFUS) devices

4.2 Deviations

No deviations were applied

4.3 Tests at extremes of temperature & voltage

The following test conditions were used to simulate testing at nominal or extremes.

Temperature Test Conditions		Voltage Test Conditions	
T nominal	20 °C	V nominal	120V AC
T minimum	-25 °C	V minimum	102V AC
T maximum	50 °C	V maximum	138V AC

Extremes of voltage are based on nominal +/-15%.
Extremes of temperature are based upon manufacturer's declaration.
The ambient test conditions of humidity and pressure in the laboratory were as specified in each specific test section within this report

4.4 Test fixtures

In order to measure RF parameters at temperature extremes, the EUT was tested in a temperature controlled chamber as follows:

Tests were performed radiated. To allow the fundamental transmission to pass through the temperature controlled chamber the door was replaced with a Styrofoam sheet which sealed the chamber aperture.

5 Tests, methods and results

5.1 AC power line conducted emissions

5.1.1 Test methods

Test Requirements:	47 CFR Part 15C Part 15.207 [Reference 4.1.1 of this report]
Test Method:	ANSI C63.10 Clause 6.2 [Reference 4.1.2 of this report]
Limits:	47 CFR Part 15C Part 15.207 [Reference 4.1.1 of this report]

5.1.2 Configuration of EUT

The EUT was placed on a wooden table 0.8m above the ground plane and connected to a LISN via a 1m mains cable.

During the initial scan, no discernible difference in emissions could be observed when operating on different channels or modulation schemes. For final test the EUT was operated in TX4 mode (Radio 0 and Radio 1).

5.1.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment listed in the 'Test Equipment' Section. Measurements were made on the live and neutral conductors using both average and quasi-peak detection.
At least 6 signals within 20dB and/or all signals within 10dB of the limit were investigated.

Tests were performed in Test Site F.

5.1.4 Test equipment

E150, E035, ZSW1, E412, E411

See Section 9 for more details

5.1.5 Test results

Temperature of test environment	18°C
Humidity of test environment	50%
Pressure of test environment	103kPa

Band	57-71 GHz
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS5
Mid channel	64.8 GHz

Plot refs
12967-1 Cond 1 AC Live 150k-30M Average
12967-1 Cond 1 AC Live 150k-30M Quasi-Peak
12967-1 Cond 1 AC Neutral 150k-30M Average
12967-1 Cond 1 AC Neutral 150k-30M Quasi-Peak

Table of signals measured for Cond 1 AC Live 150k-30M

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP -Lim (dB)	AV Amp (dBuV)	AV -Lim (dB)
1	0.247	48.0	47.4	-15.6	45.5	-7.7
2	0.372	50.3	48.4	-10.6	42.5	-7.2
3	0.625	41.4	39.7	-16.3	34.2	-11.8
4	1.125	43.1	39.1	-16.9	28.4	-17.6
5	1.392	42.2	36.7	-19.3	23.3	-22.7
6	2.123	41.0	36.2	-19.8	20.4	-25.6

Table of signals measured for Cond 1 AC Neutral 150k-30M

Signal No.	Freq (MHz)	Peak Amp (dBuV)	QP Amp (dBuV)	QP -Lim (dB)	AV Amp (dBuV)	AV -Lim (dB)
1	0.247	49.8	48.8	-44.2	46.7	-6.5
2	0.371	51.2	49.7	-9.4	44.3	-5.4
3	0.624	44.2	41.9	-14.1	35.7	-10.3
4	0.881	44.8	41.6	-14.4	32.6	-13.4
5	1.370	42.8	38.1	-17.9	24.1	-21.9
6	1.641	42.3	37.4	-18.6	24.0	-22.0

Peak detector “Max held” Analyser plots against the Quasi-Peak / Average limit line(s) can be found in Section 6 of this report.

LIMITS:
15.207: as given in the above tables / drawn on the respective plots.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:

150kHz to 30MHz ±3.6dB

5.2 Radiated emissions 9 - 150 kHz

NOT APPLICABLE: Lowest frequency generated within the unit is declared as 25 MHz

5.3 Radiated emissions 150 kHz - 30 MHz

5.3.1 Test methods

Test Requirements:	47 CFR Part 15C Part 15.209 [Reference 4.1.1 of this report]
Test Method:	ANSI C63.10 Clause 6.4 & 6.6 [Reference 4.1.2 of this report]
Limits:	47 CFR Part 15C Part 15.209/15.255(d)(2) [Reference 4.1.1 of this report]

5.3.2 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The EUT was examined in normal use position. Radiated Emissions testing was performed whilst powered from 120 VAC. During the initial scan, no discernible difference in emissions could be observed when operating on different channels or modulation schemes. The EUT was operated in TX4 mode (Radio 0 and Radio 1).

5.3.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment noted below.
Measurements were made in a semi-anechoic chamber (pre-scan) with any final measurements required performed on an OATS without a ground plane. The antenna was placed 1m above the ground. The equipment was rotated 360 degrees to record the worst case emissions.
At least 6 signals within 20dB and all signals within 10dB of the limit were investigated.
Tests were performed using Test Site M.

5.3.4 Test equipment

TMS81, ZSW1, E624, E411

See Section 9 for more details

5.3.5 Test results

Temperature of test environment	18°C
Humidity of test environment	50%
Pressure of test environment	103kPa

Band	57-71 GHz
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS5
Mid channel	64.8 GHz

Plot refs
12967-1 Rad 1 150k-30MHz Para
12967-1 Rad 1 150k-30MHz Perp

No emissions were observed within 20dB of limits.
Peak detector “Max held” Analyser plots against the Quasi-Peak / Average limit line(s) can be found in Section 6 of this report.

LIMITS:
15.209 limits are applicable in the restricted bands of 15.205 with the relevant detector.
The general limits of 15.209 are as drawn on the respective plots.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
9kHz - 30MHz ±3.9dB

5.4 Radiated emissions 30 MHz -1 GHz

5.4.1 Test methods

Test Requirements:	47 CFR Part 15C Part 15.255(d)(2) [Reference 4.1.1 of this report]
Test Method:	ANSI C63.10 Clause 6.3 & 6.5 [Reference 4.1.2 of this report]
Limits:	47 CFR Part 15C Part 15.255(d)(2) [Reference 4.1.1 of this report]

5.4.2 Configuration of EUT

The EUT was placed on a 0.8 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The EUT was examined in normal use position. Radiated Emissions testing was performed whilst powered from 120 VAC. During the initial scan, no discernible difference in emissions could be observed when operating on different channels or modulation schemes. The EUT was operated in TX4 mode (Radio 0 and Radio 1).

5.4.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment listed below. The equipment was rotated 360 degrees and the antenna scanned 1 – 4 metres in both horizontal and vertical polarisations to record the worst case emissions.
At least 6 signals within 20dB and all signals within 10dB of the limit were investigated.
Tests were performed using Test Site M.

5.4.4 Test equipment

LPE364, E743, NSA-M, ZSW1, E624, E411

See Section 9 for more details

5.4.5 Test results

Temperature of test environment	18°C
Humidity of test environment	50%
Pressure of test environment	101kPa

Band	57-71 GHz
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS5
Low channel	64.8 GHz

Plot refs
12967-1 Rad 1 VHF Horiz
12967-1 Rad 1 VHF Vert
12967-1 Rad 1 UHF Horiz
12967-1 Rad 1 UHF Vert

Table of signals measured for Rad 1 Horizontal Sig List

Signal No.	Freq (MHz)	Peak Amp (dBuV/m)	QP Amp (dBuV/m)	QP -Lim (dB)
1	81.531	25.7	20.8	-19.2

Table of signals measured for Rad 1 Vertical Sig List

Signal No.	Freq (MHz)	Peak Amp (dBuV/m)	QP Amp (dBuV/m)	QP -Lim (dB)
1	44.665	27.9	22.8	-17.2
2	81.668	24.0	19.4	-20.6

Peak detector “Max held” Analyser plots against the Quasi-Peak / Average limit line(s) can be found in Section 6 of this report.

Whilst Low, Mid and High channels were tested, plots are for illustrative purposes only and only Mid channel plots are shown in this report.

LIMITS:
15.209 limits are applicable in the restricted bands of 15.205 with the relevant detector.
The general limits of 15.209 are as drawn on the respective plots.
15.255 (d)(3) between 40 GHz and 200 GHz the level of the emissions shall not exceed 90pW/cm2 at a distance of 3m.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
30MHz - 1000MHz ±6.1dB

5.5 Radiated emissions above 1 GHz

5.5.1 Test methods

Test Requirements:	47 CFR Part 15C Part 15.255(d)(2)/(3)/(4) [Reference 4.1.1 of this report]
Test Method:	ANSI C63.10 Clause 6.3 & 6.6 & 9.8 [Reference 4.1.2 of this report]
Limits:	47 CFR Part 15C Part 15.255(d)(2)/(3)/(4) [Reference 4.1.1 of this report]

5.5.2 Configuration of EUT

The EUT was placed on a 1.5 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 3 metres. The EUT was examined in normal use position. Radiated Emissions testing was performed whilst powered from 120 VAC. During the initial scan, no discernible difference in emissions could be observed when operating on different channels or modulation schemes. The EUT was operated in TX4 mode (Radio 0 and Radio 1).

5.5.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment listed below. Measurements were made in a semi-anechoic chamber with appropriate absorbing material for use in this range. Horn antennas were used at heights where the whole of the EUT was contained within the main beam. The EUT was rotated through 360 degrees to record the worst case emissions. A measurement distance of 3m was used between the test range 1 - 6GHz, 1.2m was used in the test range 6 - 18GHz, 0.3m was used in the test range 18 - 75GHz, 0.1m was used in the test range 75-110GHz and 0.03m was used in the test range 110-200 GHz. At least 6 signals within 20dB and all signals within 10dB of the limit were investigated.

Tests were performed using test Site M.

5.5.4 Test equipment

E296-2, E330, E485, E487, E580, E638, E717, E718, E719, E722, E755, E760, E777, E941, E942, F015, H070

See Section 9 for more details

5.5.5 Test results

Temperature of test environment	18°C
Humidity of test environment	50%
Pressure of test environment	103kPa

Setup Table

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS5
Mid channel	64.8 GHz

Plots
12967-1 Rad 1 1-2GHz Horiz
12967-1 Rad 1 1-2GHz Vert
12967-1 Rad 1 2-5GHz Horiz
12967-1 Rad 1 2-5GHz Vert
12967-1 Rad 1 5-6GHz Horiz
12967-1 Rad 1 5-6GHz Vert
12967-1 Rad 1 6upto10GHz Horiz
12967-1 Rad 1 6upto10GHz Vert
12967-1 Rad 1 10upto12_5GHz Horiz
12967-1 Rad 1 10upto12_5GHz Vert
12967-1 Radiated emissions 12.5 – 15 GHz horizontal
12967-1 Radiated emissions 12.5 – 15 GHz vertical
12967-1 Radiated emissions 15 – 18 GHz horizontal

12967-1 Radiated emissions 15 – 18 GHz vertical
12967-1 Radiated emissions 18 – 22 GHz horizontal
12967-1 Radiated emissions 18 – 22 GHz vertical
12967-1 Radiated emissions 22 – 26.5 GHz horizontal
12967-1 Radiated emissions 22 – 26.5 GHz vertical
12967-1 Radiated emissions 26.5 – 30 GHz horizontal
12967-1 Radiated emissions 26.5 – 30 GHz vertical
12967-1 Radiated emissions 30 – 34 GHz horizontal
12967-1 Radiated emissions 30 – 34 GHz vertical
12967-1 Radiated emissions 34 – 38 GHz horizontal
12967-1 Radiated emissions 34 – 38 GHz vertical
12967-1 Radiated emissions 38 – 40 GHz horizontal
12967-1 Radiated emissions 38 – 40 GHz vertical
12967-1 TX Radiated Emissions 40 – 44 GHz Horizontal
12967-1 TX Radiated Emissions 40 – 44 GHz Vertical
12967-1 TX Radiated Emissions 44 – 48 GHz Horizontal
12967-1 TX Radiated Emissions 44 – 48 GHz Vertical
12967-1 TX Radiated Emissions 48 – 52 GHz Horizontal
12967-1 TX Radiated Emissions 48 – 52 GHz Vertical
12967-1 TX Radiated Emissions 52 – 56 GHz Horizontal
12967-1 TX Radiated Emissions 52 – 56 GHz Vertical
12967-1 TX Radiated Emissions 56 – 60 GHz Horizontal
12967-1 TX Radiated Emissions 56 – 60 GHz Vertical
12967-1 TX Radiated Emissions 60 – 64 GHz Horizontal
12967-1 TX Radiated Emissions 60 – 64 GHz Vertical
12967-1 TX Radiated Emissions 64 – 68 GHz Horizontal
12967-1 TX Radiated Emissions 64 – 68 GHz Vertical
12967-1 TX Radiated Emissions 68 – 72 GHz Horizontal
12967-1 TX Radiated Emissions 68 – 72 GHz Vertical
12967-1 TX Radiated Emissions 72 – 76 GHz Horizontal
12967-1 TX Radiated Emissions 72 – 76 GHz Vertical
12967-1 TX Radiated Emissions 76 – 80 GHz Horizontal
12967-1 TX Radiated Emissions 76 – 80 GHz Vertical
12967-1 TX Radiated Emissions 80 – 90 GHz Horizontal
12967-1 TX Radiated Emissions 80 – 90 GHz Vertical
12967-1 TX Radiated Emissions 90 – 100 GHz Horizontal
12967-1 TX Radiated Emissions 90 – 100 GHz Vertical
12967-1 TX Radiated Emissions 100 – 110 GHz Horizontal
12967-1 TX Radiated Emissions 100 – 110 GHz Vertical
102967-1 TX Radiated Emissions 110 – 120 GHz Horizontal
12967-1 TX Radiated Emissions 110 – 120 GHz Vertical
12967-1 TX Radiated Emissions 120 – 130 GHz Horizontal
12967-1 TX Radiated Emissions 120 – 130 GHz Vertical
12967-1 TX Radiated Emissions 130 – 140 GHz Horizontal
12967-1 TX Radiated Emissions 130 – 140 GHz Vertical
12967-1 TX Radiated Emissions 140 – 150 GHz Horizontal
12967-1 TX Radiated Emissions 140 – 150 GHz Vertical
12967-1 TX Radiated Emissions 150 – 160 GHz Horizontal
12967-1 TX Radiated Emissions 150 – 160 GHz Vertical
12967-1 TX Radiated Emissions 160 – 170 GHz Horizontal
12967-1 TX Radiated Emissions 160 – 170 GHz Vertical
12967-1 TX Radiated Emissions 170 – 180 GHz Horizontal
12967-1 TX Radiated Emissions 170 – 180 GHz Vertical
12967-1 TX Radiated Emissions 180 – 190 GHz Horizontal
12967-1 TX Radiated Emissions 180 – 190 GHz Vertical
12967-1 TX Radiated Emissions 190 – 200 GHz Horizontal

12967-1 TX Radiated Emissions 190 – 200 GHz Vertical

Horizontal Signal List

Signal No.	Freq (MHz)	Peak Amp (dBuV/m)	Pk –Lim (dB)	AV Amp (dBuV/m)	AV –Lim (dB)
1	4999.743	43.9	-30.1	33.5	-20.5

Vertical Signal List

Signal No.	Freq (MHz)	Peak Amp (dBuV/m)	Pk –Lim (dB)	AV Amp (dBuV/m)	AV –Lim (dB)
1	4999.778	42.8	-31.2	31.0	-23.0

“Max held” Analyser plots against the Average limit line can be found in Section 6 of this report.

Note: Whilst Low, Mid and High channels were tested, plots are for illustrative purposes only and only Mid channel plots are shown in this report to minimise report size.

LIMITS:
15.209 limits are applicable in the restricted bands of 15.205 with the relevant detector.
15.255 (d)(3) between 40 GHz and 200 GHz the level of the emissions shall not exceed 90pW/cm2 at a distance of 3m. This is equivalent to 85.1dBuV/m @ a distance of 3m. Calculations are based on ANSI C63.10 clauses 9.4 – 9.7.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows: 1 – 18 GHz ±3.5dB, 18 – 26.5 GHz ±3.9dB, 26.5 – 60 GHz ±3.9dB, 60 – 110 GHz ±4.4dB, 110 – 200 GHz ±5.9dB

5.6 Frequency stability

5.6.1 Test methods

Test Requirements: 47 CFR Part 15C Part 15.255(f) [Reference 4.1.1 of this report]
Test Method: ANSI C63.10 Clause 6.8 / 9.14 [Reference 4.1.2 of this report]
Limits: 47 CFR Part 15C Part 15.255(f) [Reference 4.1.1 of this report]

5.6.2 Configuration of EUT

The EUT was placed in a temperature controlled chamber and the measurements were performed radiated, To allow the EUT's fundamental transmission to pass through the chamber the chamber door was removed and replaced with a Styrofoam sheet. The EUT was configured to generate a CW tone which had an offset from the centre frequency of 99.687 MHz. The EUT was operated in TX1, TX4 and TX6 modes for this test (Radio 0).

5.6.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment listed below. Temperature stability was achieved at each test temperature level before taking measurements using a counter function of a spectrum analyser. Tests were performed using Test Site A.

5.6.4 Test equipment

E434, E717, E755, E777, E781, E908, E920, E994, N579

See Section 9 for more details

5.6.5 Test results

Temperature of test environment 20°C
Humidity of test environment 50%
Pressure of test environment 101kPa

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	CW Tone
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

Test conditions		Frequency Error (MHz) Low channel	Frequency Error (MHz) Mid channel	Frequency Error (MHz) High channel
-25°C	Volts Nominal (120)	58320.244445	64800.271869	69119.708336
-20°C	Volts Nominal (120)	58320.230128	64800.251847	69119.733893
-10°C	Volts Nominal (120)	58320.170235	64800.195484	69119.779901
0°C	Volts Nominal (120)	58320.135781	64800.142233	69119.852901
10°C	Volts Nominal (120)	58320.069456	64800.078661	69119.915213
20°C	Volts Minimum (102)	58320.010515	64800.011878	69119.987948
	Volts Nominal (120)	58320.010570	64800.011775	69119.988890
	Volts Maximum	58320.010176	64800.012165	69119.987624
30°C	Volts Nominal (120)	58320.037001	64800.037495	69119.961624
40°C	Volts Nominal (120)	58320.014823	64800.015582	69119.983148
50°C	Volts Nominal (120)	58320.007030	64800.006045	69119.994259
Max Frequency Error per chan (Hz)		+244445 / 7030	+271869 / 6045	+-5741 / -291664
Max Frequency Error observed (MHz)		0.244445	0.271869	-0.291664

Maximum variation observed was +-5741 and -0.291664 MHz.

LIMITS:
15.255 (f) Fundamental emissions must be contained within the frequency band specified during all conditions of operation.

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
<± 0.7 ppm

5.7 Peak & Average EIRP

5.7.1 Test methods

Test Requirements: 47 CFR Part 15C Part 15.255(c)(1)(i)/(ii) [Reference 4.1.1 of this report]
Test Method: ANSI C63.10 Clause 9.10 & 9.11 [Reference 4.1.2 of this report]
Limits: 47 CFR Part 15C Part 15.255(c)(1)(i)/(ii) [Reference 4.1.1 of this report]

5.7.2 Configuration of EUT

The EUT was placed on a 1.5 metres high turntable. The EUT antenna was positioned and aligned with the measuring antenna. The EUT was measured at a distance of 60 centimetres. During the initial scan modulation scheme MCS5 was found to be the worst case mode of operation along with the stated beams for maximum EIRP, therefore MCS5 and the beam settings stated below were used for full test. The EUT was operated in TX1 and TX4 and TX6 modes. The test was repeated with the EUT configured for Half Band and Quarter Band channel bandwidths.

5.7.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment listed below. Measurements were made in a semi-anechoic chamber with appropriate absorbing material for use in this range. A Horn antenna was used to align with and measure the radiated power from the EUT. A wideband RF detector was used with a digital oscilloscope to measure the Peak and Average power. A measurement distance of 60 cm was used to maintain the far field condition at the frequency of interest whilst maintaining enough EUT transmitted signal into the mixer. Substitution was performed to determine results. Vertical measuring polarisation provided highest EIRP results.
Tests were performed using test Site A.

5.7.4 Test equipment

E503, E577, E755, E768, E777, E781, E908, E920, F042, F136, H074

See Section 9 for more details

5.7.5 Test results

Temperature of test environment 18°C
Humidity of test environment 40%
Pressure of test environment 102kPa

Pre-scan worst case checks (radio 0 provided highest power):

	Full Band	Beam setting	29	21	32
Mod scheme/rate	RF parameter		Low channel (dBm)	Mid channel (dBm)	High channel (dBm)
MCS0	Peak EIRP measured		38.6	40.40	40.30
	Average EIRP measured		37.9	39.8	39.60
MCS1	Peak EIRP measured		38.7	40.40	40.20
	Average EIRP measured		38	39.8	39.50
MCS2	Peak EIRP measured		38.7	40.30	40.10
	Average EIRP measured		38	39.7	39.40
MCS3	Peak EIRP measured		38.7	40.50	40.30
	Average EIRP measured		38	39.9	39.60
MCS4	Peak EIRP measured		38.7	40.50	40.30
	Average EIRP measured		38	39.9	39.60
MCS5	Peak EIRP measured		38.7	40.50	40.30
	Average EIRP measured		38	39.9	39.60
MCS6	Peak EIRP measured		38.7	40.50	40.30
	Average EIRP measured		37.70	39.20	38.80

MCS7	Peak EIRP measured	38.7	40.50	40.30
	Average EIRP measured	37.10	39.20	38.50
MCS8	Peak EIRP measured	38.7	40.50	40.30
	Average EIRP measured	37.10	39.20	38.60
MCS9	Peak EIRP measured	38.7	40.50	40.30
	Average EIRP measured	37.10	39.20	38.50
MCS10	Peak EIRP measured	38.7	40.50	40.30
	Average EIRP measured	37.10	38.70	38.30
MCS11	Peak EIRP measured	38.7	40.50	40.30
	Average EIRP measured	37.10	38.90	38.30
MCS12	Peak EIRP measured	38.6	40.50	40.30
	Average EIRP measured	37.00	38.80	38.30

Final test Results Radio 0 (MCS5)

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS5
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

Full Band	Beam setting	29	21	32
		Low channel (dBm)	Mid channel (dBm)	High channel (dBm)
Peak EIRP measured		38.7	40.5	40.3
Peak Margin (dB)		-4.3	-2.5	-2.7
Average EIRP measured		38.0	39.9	39.6
Average Margin (dB)		-2.0	-0.1	-0.4

Half Band	Beam setting	29	21	32
		Low channel (dBm)	Mid channel (dBm)	High channel (dBm)
Peak EIRP measured		38.3	40.5	40.2
Peak Margin (dB)		-4.7	-2.5	-2.8
Average EIRP measured		37.6	39.7	39.6
Average Margin (dB)		-2.4	-0.3	-0.4

Quarter Band	Beam setting	29	21	32
		Low channel (dBm)	Mid channel (dBm)	High channel (dBm)
Peak EIRP measured		38.4	40.4	40.3
Peak Margin (dB)		-4.6	-2.6	-2.7
Average EIRP measured		37.7	39.7	39.6
Average Margin (dB)		-2.3	-0.3	-0.4

Final test Results Radio 1 (MCS5)

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS5
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

Full Band	Beam Setting	29	52	51
		Low channel (dBm)	Mid channel (dBm)	High channel (dBm)
Peak EIRP measured		38.8	40.4	40.4
Peak Margin (dB)		-4.2	-2.6	-2.6
Average EIRP measured		38.1	39.9	39.5
Average Margin (dB)		-1.9	-0.1	-0.5

Half Band

	Low channel (dBm)	Mid channel (dBm)	High channel (dBm)
Peak EIRP measured	39.6	40.2	40.3
Peak Margin (dB)	-3.4	-2.8	-2.7
Average EIRP measured	39.1	39.6	39.7
Average Margin (dB)	-0.9	-0.4	-0.3

Quarter Band

	Low channel (dBm)	Mid channel (dBm)	High channel (dBm)
Peak EIRP measured	39.7	39.2	40.4
Peak Margin (dB)	-3.3	-3.8	-2.6
Average EIRP measured	39.1	38.6	39.6
Average Margin (dB)	-0.9	-1.4	-0.4

Example of EIRP calculation from measured dBuV/m at 0.6m. using ANSI C63.10:2013 equation 22:

Using 148.77 dBuV/m PK @0.6m as highest measured E field (radio 0 middle channel):

(22): EIRP = E_{Meas} + 20log(d_{Meas}) -104.7, = 148.77+(-4.44)-104.7 = +40.5 dBm.

LIMITS:
15.255 (c(i) the average power of any emission shall not exceed 40 dBm and the peak power of any emission shall not exceed 43 dBm .

These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows: <± 4.6 dB

5.8 Peak Conducted Power

5.8.1 Test methods

Test Requirements: 47 CFR Part 15C Part 15.255© [Reference 4.1.1 of this report]
Test Method: ANSI C63.10 Clause 9.7 [Reference 4.1.2 of this report]
Limits: 47 CFR Part 15C Part 15.255© [Reference 4.1.1 of this report]

5.8.2 Configuration of EUT

The results from the EIRP tests in section 5.7 above were used.

5.8.3 Test procedure

A calculation was performed in accordance with ANSI C63.10:2013 clause 9.7. Equation 27 using the following formula:

$$P_{COND} = EIRP_{LINEAR} / G_{EUT}$$

Where:
P_{COND} is conducted power in Watts.
$EIRP_{LINEAR}$ is equivalent isotropically radiated power in Watts
G_{EUT} is numeric gain of EUT radiating element (Antenna)

5.8.4 Test equipment

Not required

5.8.5 Test results

Band	57-71 GHz (rad0)
Power Level	40 dBm (EIRP)
Channel Spacing	2.16 GHz
Mod Scheme	mcs5
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

Full Bandwidth

Test conditions	Low channel	Mid channel	High channel
Peak EIRP measured (dBm)	38.7	40.5	40.3
Beam setting for maximum	29	21	32
Peak EIRP measured in Watts	7.413	11.22	10.715
Calculated Peak conducted power (W)	0.037152	0.056232	0.053701

Half Bandwidth

Test conditions	Low channel	Mid channel	High channel
Peak EIRP measured (dBm)	38.3	40.5	40.2
Beam setting for maximum	29	21	32
Peak EIRP measured in Watts	6.76	11.22	10.471
Calculated Peak conducted power (W)	0.03388	0.056232	0.052478

Quarter Bandwidth

Test conditions	Low channel	Mid channel	High channel
Peak EIRP measured (dBm)	38.4	40.4	40.3
Beam setting for maximum	29	21	32
Peak EIRP measured in Watts	6.918	10.965	10.715
Calculated Peak conducted power (W)	0.034671	0.054954	0.053701

Band	57-71 GHz (rad1)
Power Level	40 dBm (EIRP)
Channel Spacing	2.16 GHz
Mod Scheme	mcs5
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

Full Bandwidth

Test conditions	Low channel	Mid channel	High channel
Peak EIRP measured (dBm)	38.8	40.4	40.4
Beam setting for maximum	29	52	51
Peak EIRP measured in Watts	7.585	10.965	10.965
Calculated Peak conducted power (W)	0.038014	0.054954	0.054954

Half Bandwidth

Test conditions	Low channel	Mid channel	High channel
Peak EIRP measured (dBm)	39.6	40.2	40.3
Beam setting for maximum	29	52	51
Peak EIRP measured in Watts	9.12	10.471	10.715
Calculated Peak conducted power (W)	0.045707	0.052478	0.053701

Quarter Bandwidth

Test conditions	Low channel	Mid channel	High channel
Peak EIRP measured (dBm)	39.7	39.2	40.4
Beam setting for maximum	29	52	51
Peak EIRP measured in Watts	9.333	8.318	10.965
Calculated Peak conducted power (W)	0.046775	0.041688	0.054954

Antenna gain is declared as 23dBi (numeric gain is therefore 199.53)

15.255 © the peak transmitter conducted output power shall not exceed 500 mW.

These results show that the EUT has PASSED this test.

5.9 6dB Occupied bandwidth

5.9.1 Test methods

Test Requirements: 47 CFR Part 15C Part 15.215 [Reference 4.1.1 of this report]
Test Method: ANSI C63.10 Clause 9.3 [Reference 4.1.2 of this report]
Limits: 47 CFR Part 15C Part 15.255©(1) [Reference 4.1.1 of this report]

5.9.2 Configuration of EUT

The EUT was placed on a 1.5 metres high turntable. The front edge of the EUT was initially positioned facing the antenna. The EUT was measured at a distance of 60 centimetres. The EUT was operated in TX1, TX4 and TX6 modes and each modulation scheme was assessed in turn.

5.9.3 Test procedure

Tests were made in accordance with FCC Part 15 using the measuring equipment listed below. A 100 kHz RBW, 3x VBW, auto sweep time and max hold settings were used for the 6 dB bandwidth. All schemes were tested in Full bandwidth mode for both radio 0 and radio 1 and the test repeated with the EUT configured for Half Band and Quarter Band channels in the worst case scheme (widest bandwidth) only (MCS4) on radio 0.

Tests were performed using test Site A.

5.9.4 Test equipment

E717, E755, E777, E781, E908, E920

See Section 9 for more details

5.9.5 Test results

Temperature of test environment 20°C
Humidity of test environment 40%
Pressure of test environment 102kPa

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS0
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.472	1.678	1.334
99% Bandwidth (GHz)	1.8827	1.8758	1.8506
Frequency Error (MHz) (include sign)	40.256	37.304	-25.261
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.624256	63.998304	68.427739
6dB BW FHIGH Worst case (GHz)	59.096256	65.676304	69.761739

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS0
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel

6dB Bandwidth (GHz)	1.581	1.554	1.458
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 0	12967-1 Radio 1 Mid mcs 0	12967-1 Radio 1 High mcs 0
99% Bandwidth (GHz)	1.825	1.8164	1.8237
Frequency Error (MHz) (include sign)	35.752	34.097	-33.938
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.565252	64.057097	68.357062
6dB BW FHIGH Worst case (GHz)	59.146252	65.611097	69.815062

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS1
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.547	1.643	1.485
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 1	12967-1 Radio 0 Mid mcs 1	12967-1 Radio 0 High mcs 1
99% Bandwidth (GHz)	1.9009	1.8866	1.8737
Frequency Error (MHz) (include sign)	18.137	15.648	-8.1626
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.564637	63.994148	68.3693374
6dB BW FHIGH Worst case (GHz)	59.111637	65.637148	69.8543374

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS1
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.647	1.495	1.437
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 1	12967-1 Radio 1 Mid mcs 1	12967-1 Radio 1 High mcs 1
99% Bandwidth (GHz)	1.8378	1.8414	1.8479
Frequency Error (MHz) (include sign)	17.609	13.48	-8.4134
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.514109	64.06598	68.3930866
6dB BW FHIGH Worst case (GHz)	59.161109	65.56098	69.8300866

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS2
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.667	1.664	1.365
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 2	12967-1 Radio 0 Mid mcs 2	12967-1 Radio 0 High mcs 2
99% Bandwidth (GHz)	1.9016	1.8896	1.8732
Frequency Error (MHz) (include sign)	18.667	15.553	-8.5693
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.505167	63.983553	68.4289307
6dB BW FHIGH Worst case (GHz)	59.172167	65.647553	69.7939307

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS2
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.654	1.348	1.413
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 2	12967-1 Radio 1 Mid mcs 2	12967-1 Radio 1 High mcs 2
99% Bandwidth (GHz)	1.8377	1.8439	1.8442
Frequency Error (MHz) (include sign)	16.488	11.955	-9.0727
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.509488	64.137955	68.4044273
6dB BW FHIGH Worst case (GHz)	59.163488	65.485955	69.8174273

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS3
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.592	1.671	1.361
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 3	12967-1 Radio 0 Mid mcs 3	12967-1 Radio 0 High mcs 3
99% Bandwidth (GHz)	1.9032	1.8897	1.8738
Frequency Error (MHz) (include sign)	17.649	14.979	-8.1115
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.541649	63.979479	68.4313885
6dB BW FHIGH Worst case (GHz)	59.133649	65.650479	69.7923885

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS3
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.619	1.44	1.489
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 3	12967-1 Radio 1 Mid mcs 3	12967-1 Radio 1 High mcs 3
99% Bandwidth (GHz)	1.8409	1.8399	1.8459
Frequency Error (MHz) (include sign)	17.988	16.615	-7.4651
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.528488	64.096615	68.3680349
6dB BW FHIGH Worst case (GHz)	59.147488	65.536615	69.8570349

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS4
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.678	1.671	1.406
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 4	12967-1 Radio 0 Mid mcs 4	12967-1 Radio 0 High mcs 4
99% Bandwidth (GHz)	1.9909	1.8894	1.8731
Frequency Error (MHz) (include sign)	18.704	15.864	-8.2585
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.499704	63.980364	68.4087415
6dB BW FHIGH Worst case (GHz)	59.177704	65.651364	69.8147415

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS4
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.527	1.451	1.372
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 4	12967-1 Radio 1 Mid mcs 4	12967-1 Radio 1 High mcs 4
99% Bandwidth (GHz)	1.8399	1.8412	1.8468
Frequency Error (MHz) (include sign)	18.261	12.205	-9.1264
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.574761	64.086705	68.4248736
6dB BW FHIGH Worst case (GHz)	59.101761	65.537705	69.7968736

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS5
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.664	1.661	1.406
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 5	12967-1 Radio 0 Mid mcs 5	12967-1 Radio 0 High mcs 5
99% Bandwidth (GHz)	1.901	1.8924	1.8735
Frequency Error (MHz) (include sign)	18.089	16.447	-8.5656
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.506089	63.985947	68.4084344
6dB BW FHIGH Worst case (GHz)	59.170089	65.646947	69.8144344

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS5
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.64	1.444	1.313
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 5	12967-1 Radio 1 Mid mcs 5	12967-1 Radio 1 High mcs 5
99% Bandwidth (GHz)	1.8358	1.8411	1.8462
Frequency Error (MHz) (include sign)	17.052	10.989	-8.3008
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.517052	64.088989	68.4551992
6dB BW FHIGH Worst case (GHz)	59.157052	65.532989	69.7681992

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS6
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.475	1.678	1.365
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 6	12967-1 Radio 0 Mid mcs 6	12967-1 Radio 0 High mcs 6
99% Bandwidth (GHz)	1.9108	1.914	1.8937
Frequency Error (MHz) (include sign)	17.94	16.217	-7.8452
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.60044	63.977217	68.4296548
6dB BW FHIGH Worst case (GHz)	59.07544	65.655217	69.7946548

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS6
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.513	1.444	1.434
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 6	12967-1 Radio 1 Mid mcs 6	12967-1 Radio 1 High mcs 6
99% Bandwidth (GHz)	1.8671	1.8687	1.8887
Frequency Error (MHz) (include sign)	19.041	11.986	-6.8799
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.582541	64.089986	68.3961201
6dB BW FHIGH Worst case (GHz)	59.095541	65.533986	69.8301201

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS7
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.523	1.674	1.361
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 7	12967-1 Radio 0 Mid mcs 7	12967-1 Radio 0 High mcs 7
99% Bandwidth (GHz)	1.9142	1.9133	1.893
Frequency Error (MHz) (include sign)	19.096	16.03	-6.1545
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.577596	63.97903	68.4333455
6dB BW FHIGH Worst case (GHz)	59.100596	65.65303	69.7943455

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS7
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.647	1.368	1.355
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 7	12967-1 Radio 1 Mid mcs 7	12967-1 Radio 1 High mcs 7
99% Bandwidth (GHz)	1.8628	1.8678	1.8841
Frequency Error (MHz) (include sign)	17.511	11.231	-6.5681
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.514011	64.127231	68.4359319
6dB BW FHIGH Worst case (GHz)	59.161011	65.495231	69.7909319

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS8
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.667	1.664	1.372
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 8	12967-1 Radio 0 Mid mcs 8	12967-1 Radio 0 High mcs 8
99% Bandwidth (GHz)	1.9146	1.9141	1.8931
Frequency Error (MHz) (include sign)	18.987	15.665	-7.1855
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.505487	63.983665	68.4268145
6dB BW FHIGH Worst case (GHz)	59.172487	65.647665	69.7988145

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS8
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.599	1.454	1.272
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 8	12967-1 Radio 1 Mid mcs 8	12967-1 Radio 1 High mcs 8
99% Bandwidth (GHz)	1.8629	1.8666	1.8862
Frequency Error (MHz) (include sign)	17.56	11.834	-8.0962
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.53806	64.084834	68.4759038
6dB BW FHIGH Worst case (GHz)	59.13706	65.538834	69.7479038

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS9
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.664	1.66	1.427
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 9	12967-1 Radio 0 Mid mcs 9	12967-1 Radio 0 High mcs 9
99% Bandwidth (GHz)	1.9137	1.9138	1.8939
Frequency Error (MHz) (include sign)	19.969	16.375	-6.2777
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.507969	63.986375	68.4002223
6dB BW FHIGH Worst case (GHz)	59.171969	65.646375	69.8272223

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS9
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.602	1.523	1.441
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 9	12967-1 Radio 1 Mid mcs 9	12967-1 Radio 1 High mcs 9
99% Bandwidth (GHz)	1.8651	1.8688	1.8873
Frequency Error (MHz) (include sign)	18.125	10.098	-8.3295
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.537125	64.048598	68.3911705
6dB BW FHIGH Worst case (GHz)	59.139125	65.571598	69.8321705

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS10
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.657	1.671	1.379
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 10	12967-1 Radio 0 Mid mcs 10	12967-1 Radio 0 High mcs 10
99% Bandwidth (GHz)	1.9123	1.9156	1.8989
Frequency Error (MHz) (include sign)	19.954	15.751	-6.213
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.511454	63.980251	68.424287
6dB BW FHIGH Worst case (GHz)	59.168454	65.651251	69.803287

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS10
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.599	1.372	1.434
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 10	12967-1 Radio 1 Mid mcs 10	12967-1 Radio 1 High mcs 10
99% Bandwidth (GHz)	1.8663	1.8682	1.8894
Frequency Error (MHz) (include sign)	18.88	12.424	-7.2827
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.53938	64.126424	68.3957173
6dB BW FHIGH Worst case (GHz)	59.13838	65.498424	69.8297173

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS11
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.448	1.654	1.341
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 11	12967-1 Radio 0 Mid mcs 11	12967-1 Radio 0 High mcs 11
99% Bandwidth (GHz)	1.9124	1.916	1.899
Frequency Error (MHz) (include sign)	18.153	15.793	-6.5282
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.614153	63.988793	68.4429718
6dB BW FHIGH Worst case (GHz)	59.062153	65.642793	69.7839718

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS11
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.437	1.358	1.423
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 11	12967-1 Radio 1 Mid mcs 11	12967-1 Radio 1 High mcs 11
99% Bandwidth (GHz)	1.8646	1.8672	1.8914
Frequency Error (MHz) (include sign)	16.473	12.253	-6.8619
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.617973	64.133253	68.4016381
6dB BW FHIGH Worst case (GHz)	59.054973	65.491253	69.8246381

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS12
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.506	1.674	1.364
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 0 Low mcs 12	12967-1 Radio 0 Mid mcs 12	12967-1 Radio 0 High mcs 12
99% Bandwidth (GHz)	1.9129	1.9164	1.8962
Frequency Error (MHz) (include sign)	18.549	16.389	-4.773
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.585549	63.979389	68.433227
6dB BW FHIGH Worst case (GHz)	59.091549	65.653389	69.797227

Band	57-71 GHz (Radio 1)
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS12
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	1.602	1.293	1.365
Plot of 6dB Bandwidth (GHz)	12967-1 Radio 1 Low mcs 12	12967-1 Radio 1 Mid mcs 12	12967-1 Radio 1 High mcs 12
99% Bandwidth (GHz)	1.8621	1.8678	1.8906
Frequency Error (MHz) (include sign)	18.074	11.207	-7.7346
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.537074	64.164707	68.4297654
6dB BW FHIGH Worst case (GHz)	59.139074	65.457707	69.7947654

Half Band

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	1.08 GHz
Mod Scheme	MCS4
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	0.8596	0.8406	0.784
Plot of 6dB Bandwidth (GHz)	12967-2 Radio 0 High mcs 4 half	12967-2 Radio 0 High mcs 4 half	12967-2 Radio 0 High mcs 4 half
99% Bandwidth (GHz)	0.96474	0.972	0.949
Frequency Error (MHz) (include sign)	2.8467	1.6239	-1.6881
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.89305	64.38132	68.72631
6dB BW FHIGH Worst case (GHz)	58.75265	65.22192	69.51031

Quarter Band

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	0.54 GHz
Mod Scheme	MCS4
Low channel	58.32 GHz
Mid channel	64.8 GHz
High channel	69.12 GHz

	Low channel	Mid channel	High channel
6dB Bandwidth (GHz)	0.4022	0.4091	0.4402
Plot of 6dB Bandwidth (GHz)	12967-2 Radio 0 Low mcs 4 quarter	12967-2 Radio 0 Mid mcs 4 quarter	12967-2 Radio 0 High mcs 4 quarter
99% Bandwidth (GHz)	0.4779	0.4872	0.4799
Frequency Error (MHz) (include sign)	1.336	-0.31	-1.6729
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	58.12024	64.59514	68.89823
6dB BW FHIGH Worst case (GHz)	58.52244	65.00424	69.33843

Analyser plots for the 6dB bandwidth can be found in Section 6 of this report.

Applying frequency stability results from Section 5.6 of +271.869 kHz or -291.664 kHz to the above results for FLOW and FHIGH shows that all emissions remain within the 57-71 GHz band.

LIMITS:
15.255©1 & 15.255(f) The 6dB bandwidth of the emission must be contained within the designated frequency band.

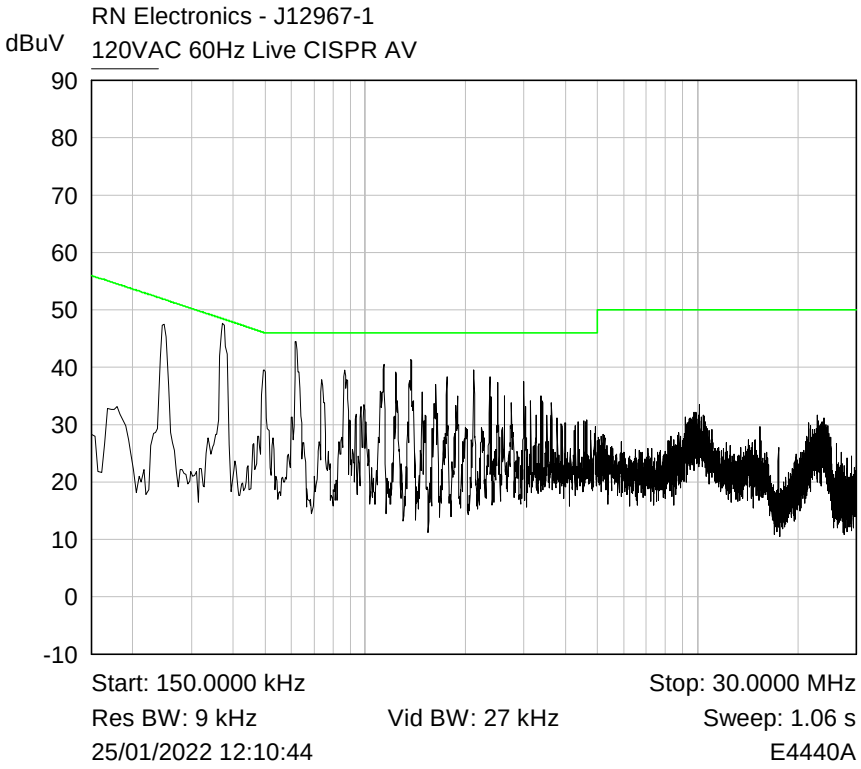
These results show that the EUT has PASSED this test.

The uncertainty gives a 95% confidence interval in the measurement. Expanded uncertainty (K=2) is as follows:
<± 1.9 %

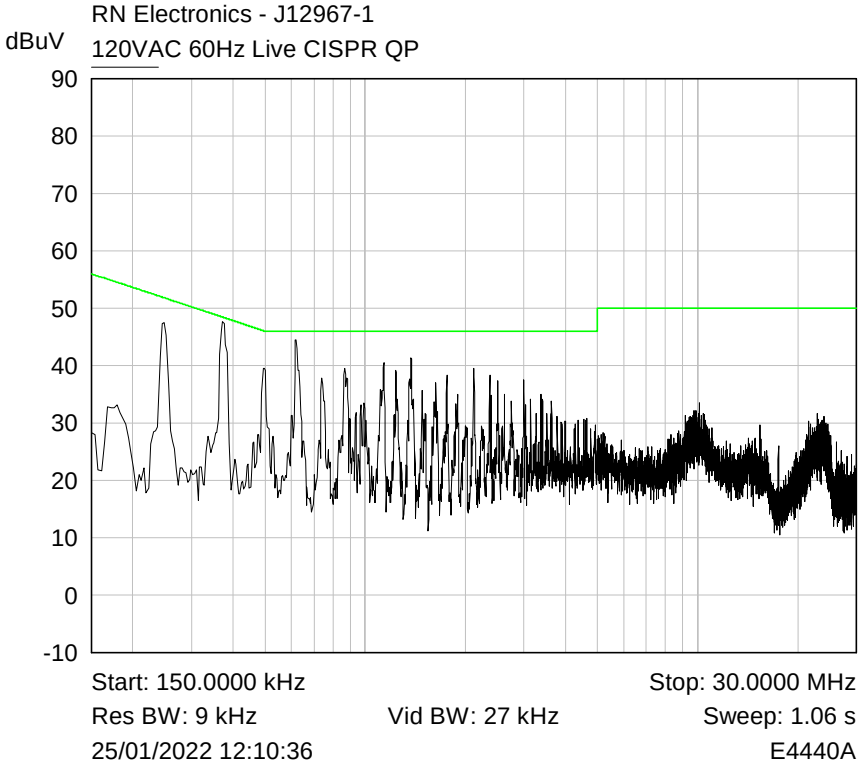
6 Plots/Graphical results

6.1 AC power line conducted emissions

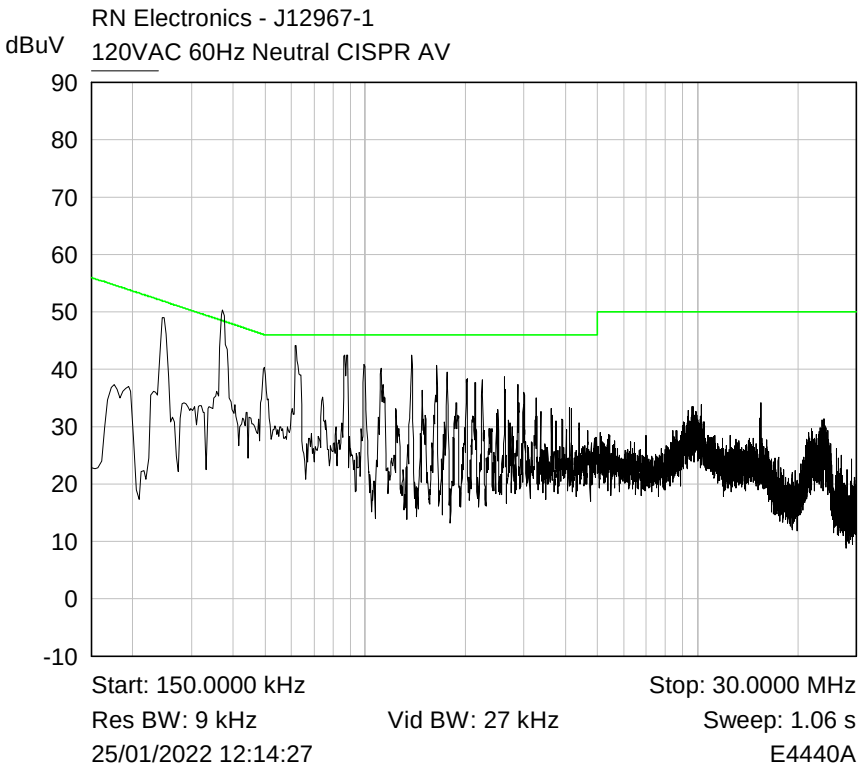
RF Parameters: Band 57-71 GHz, Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS5, Channel 58.32 GHz



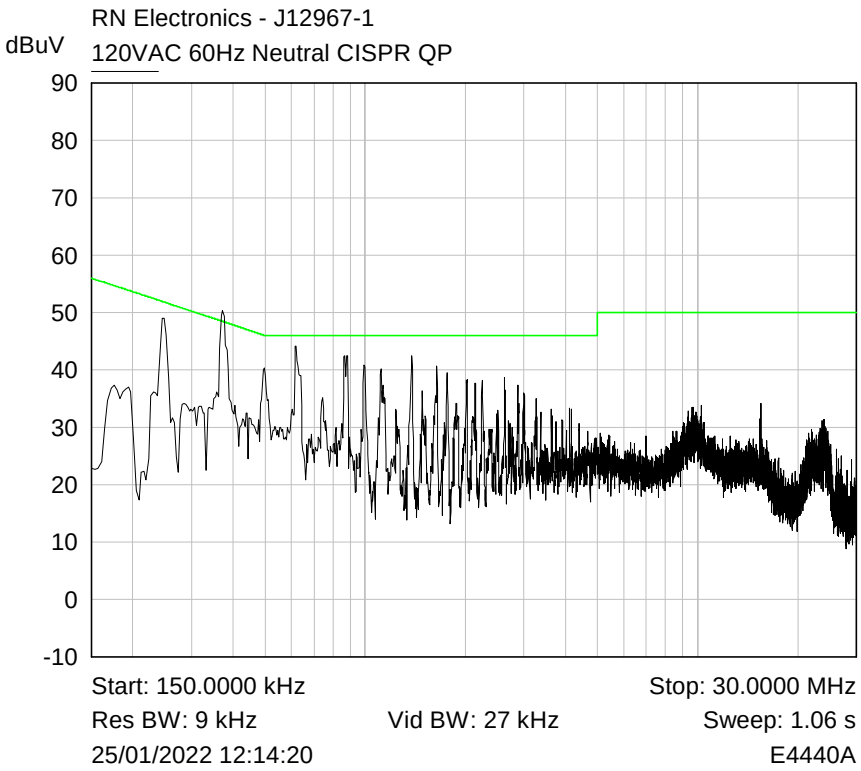
Max-held Peak plot of Live150k-30M against Average limit



Max-held Peak plot of Live150k-30M against Quasi-Peak limit



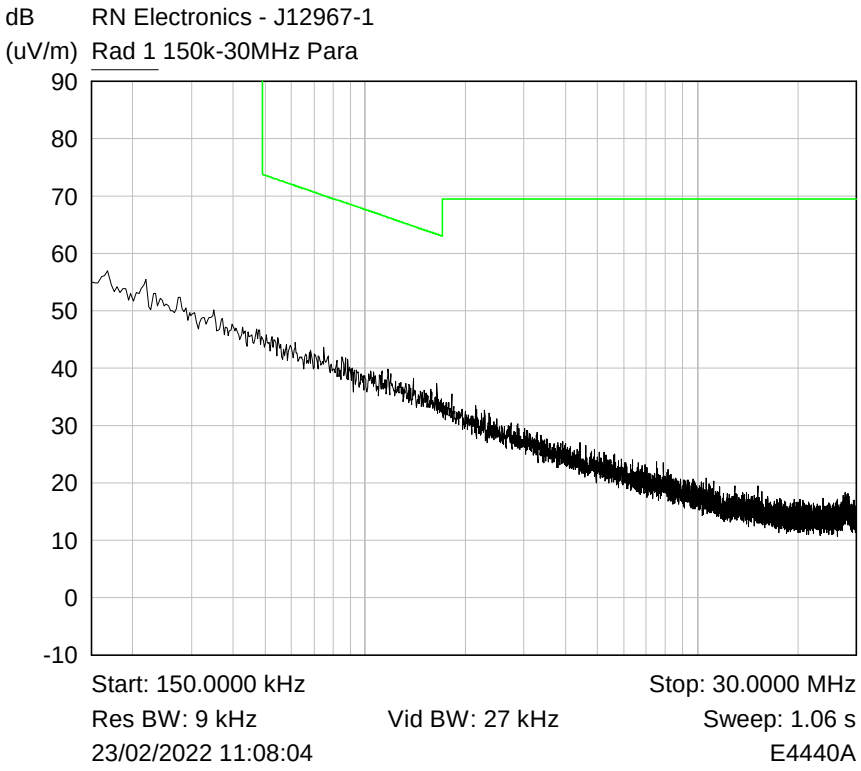
Max-held Peak plot of Neutral150k-30M against Average limit



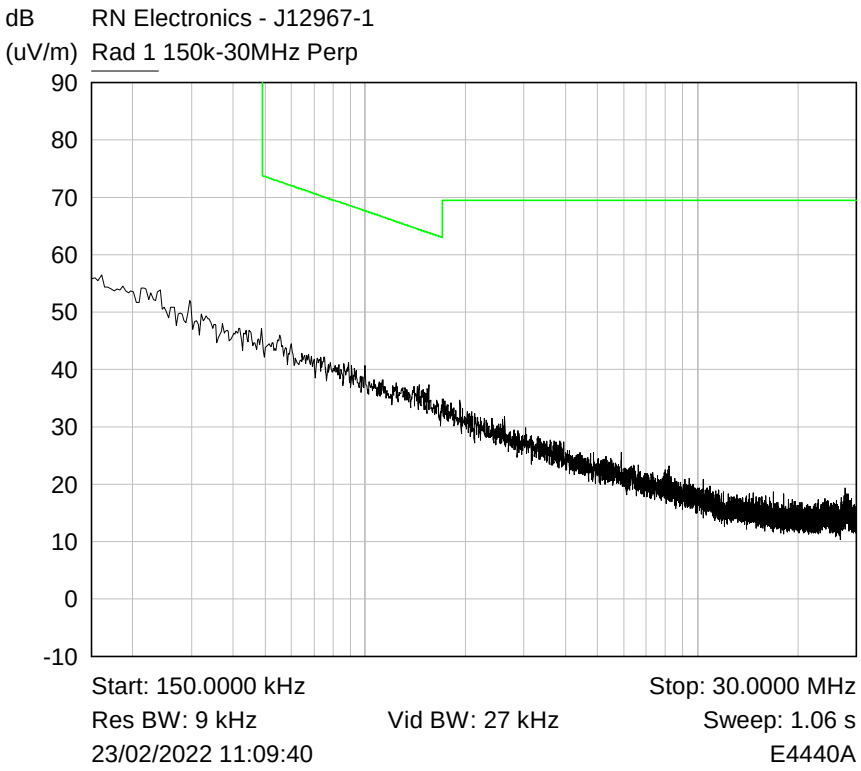
Max-held Peak plot of Neutral150k-30M against Quasi-Peak limit

6.2 Radiated emissions 150 kHz – 30 MHz

RF Parameters: Band 57-71 GHz, Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS5, Channel 58.32 GHz



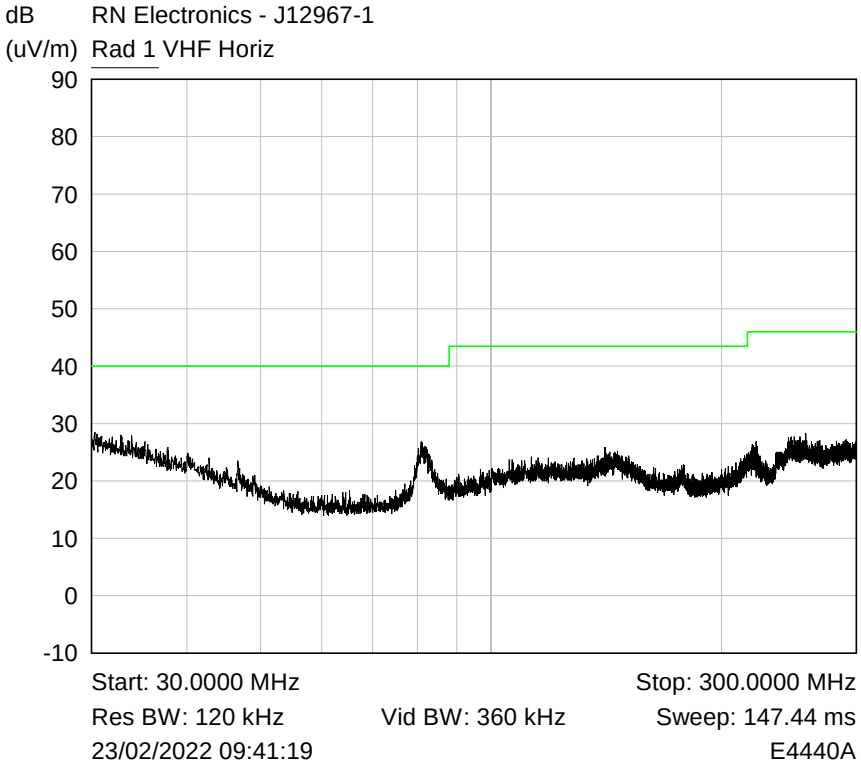
Plot of 150kHz-30MHz Parallel



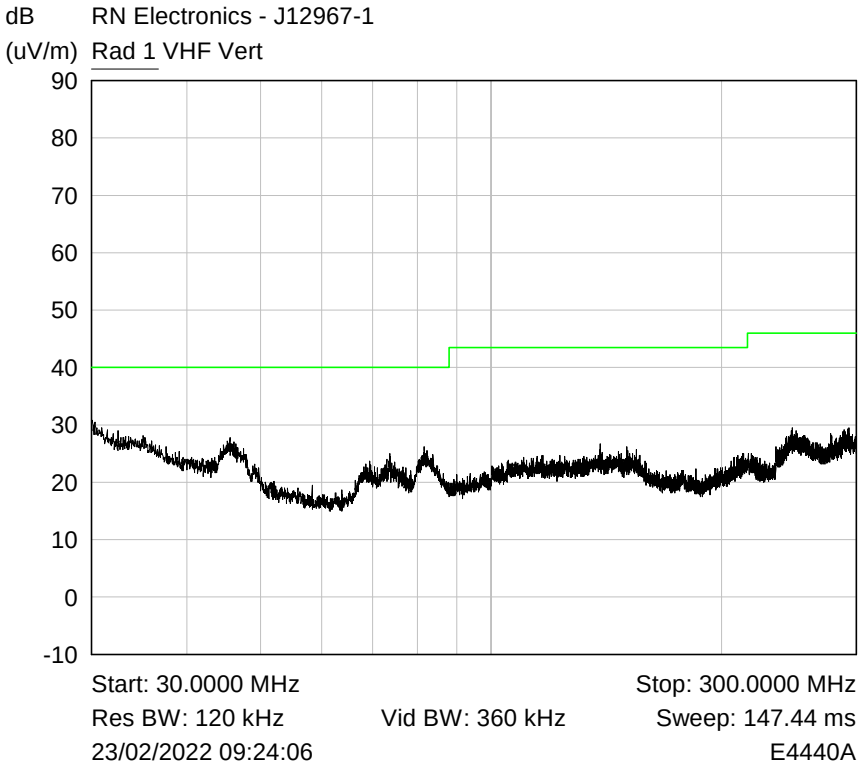
Plot of 150kHz-30MHz Perpendicular

6.3 Radiated emissions 30 MHz -1 GHz

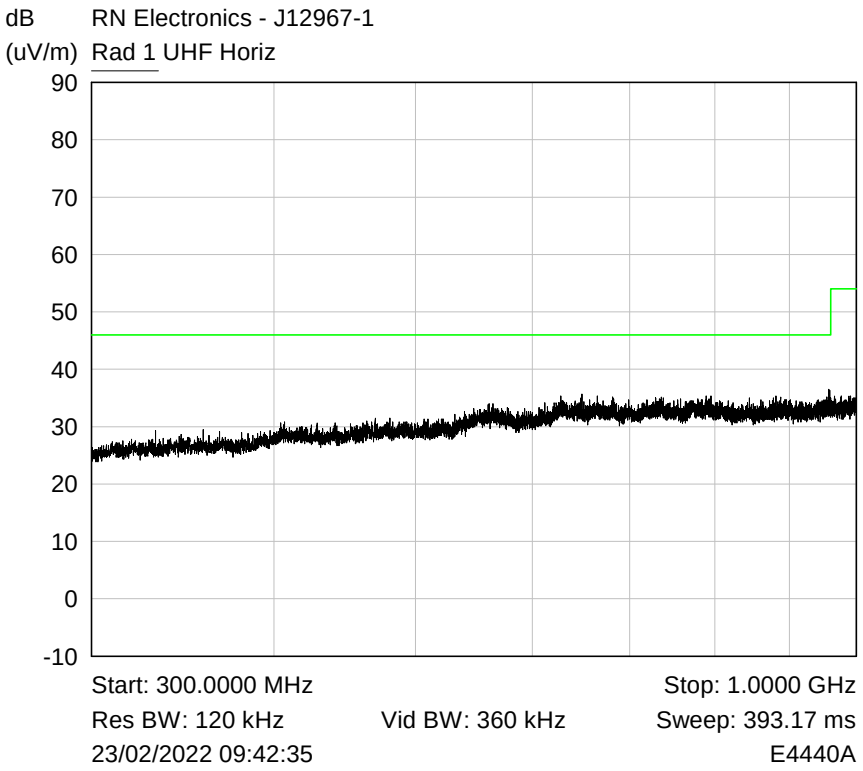
RF Parameters: Band 57-71 GHz, Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS5, Channel 58.32 GHz



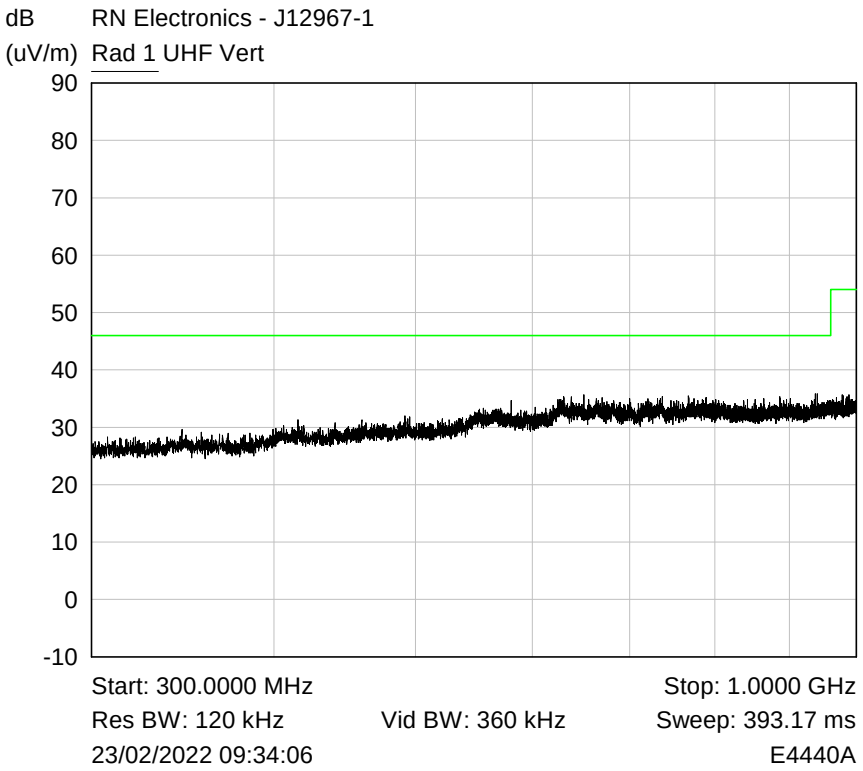
Plot of Peak emissions for VHF Horizontal against the QP limit line.



Plot of Peak emissions for VHF Vertical against the QP limit line.



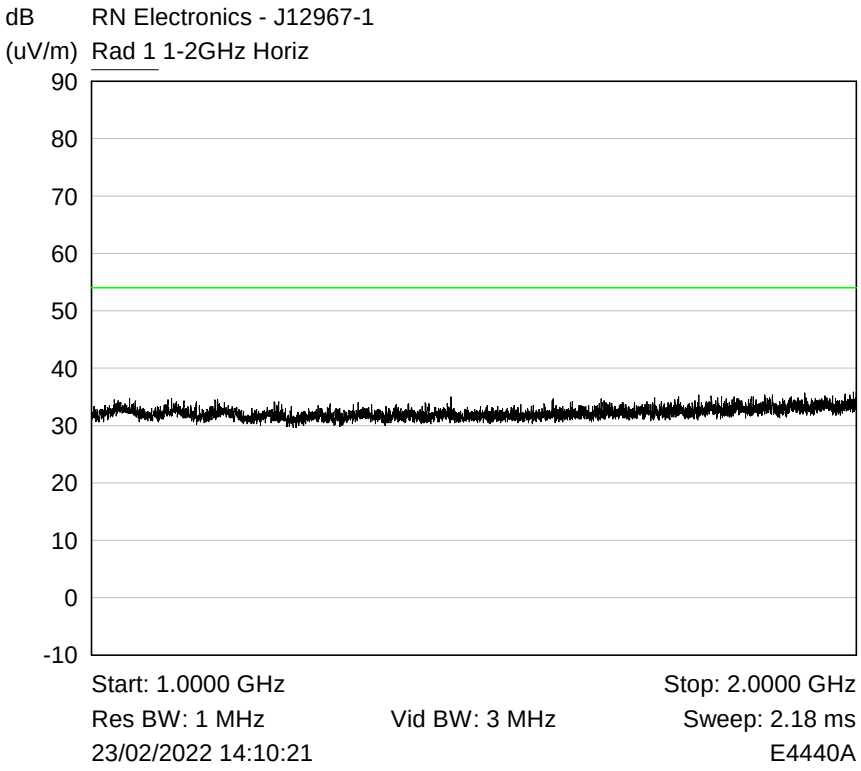
Plot of Peak emissions for UHF Horizontal against the QP limit line.

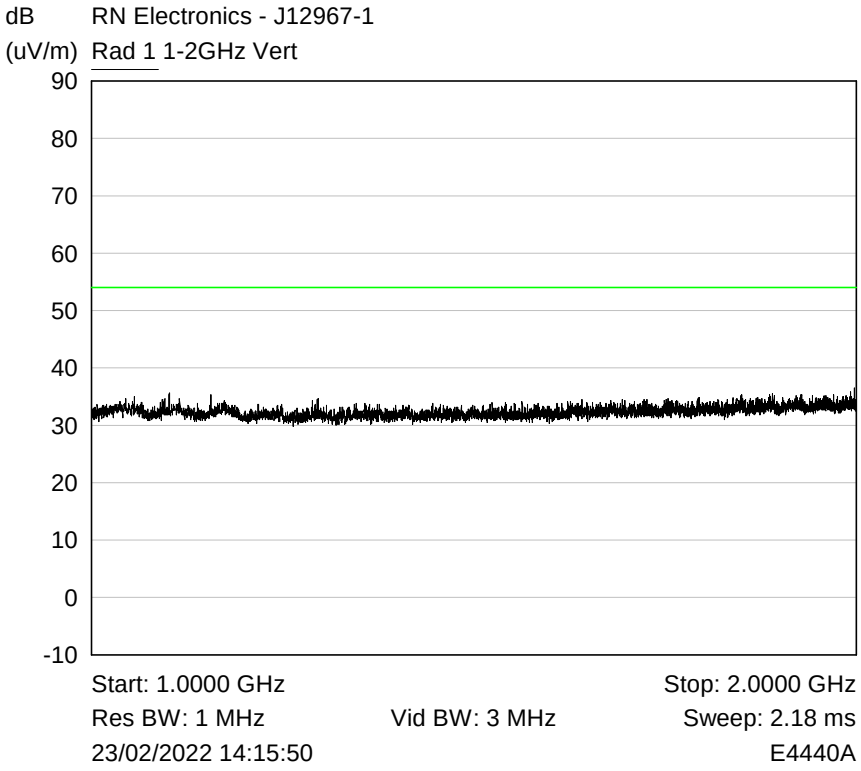


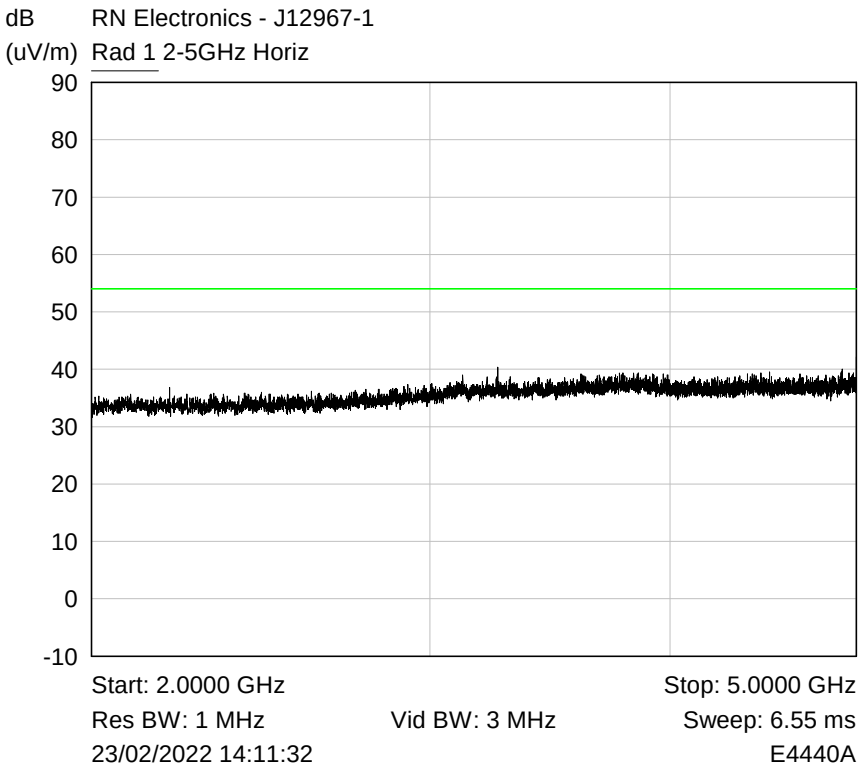
Plot of Peak emissions for UHF Vertical against the QP limit line.

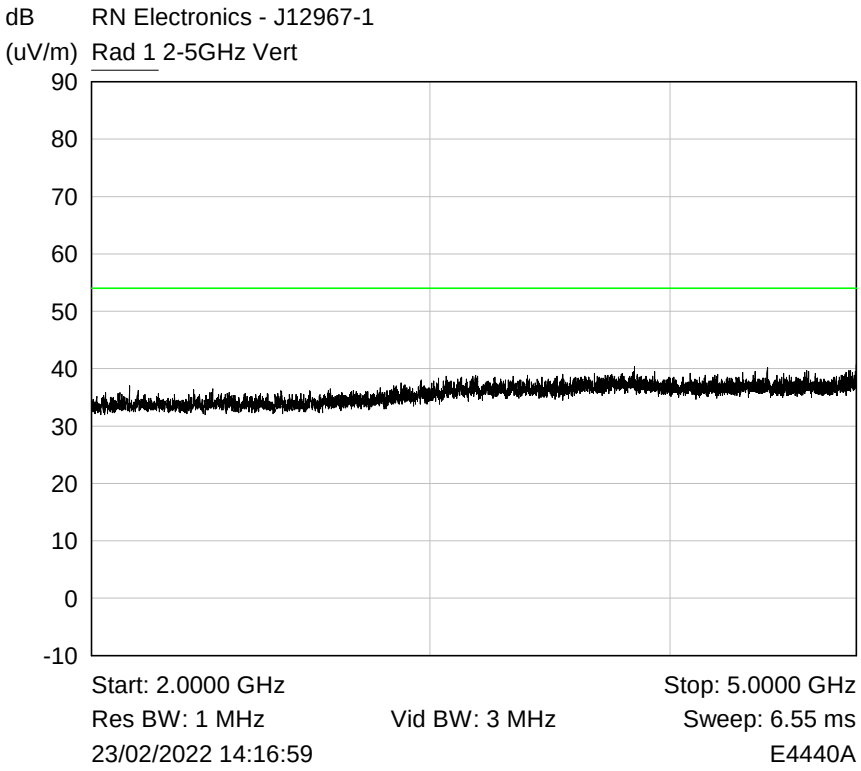
6.4 Radiated emissions above 1 GHz

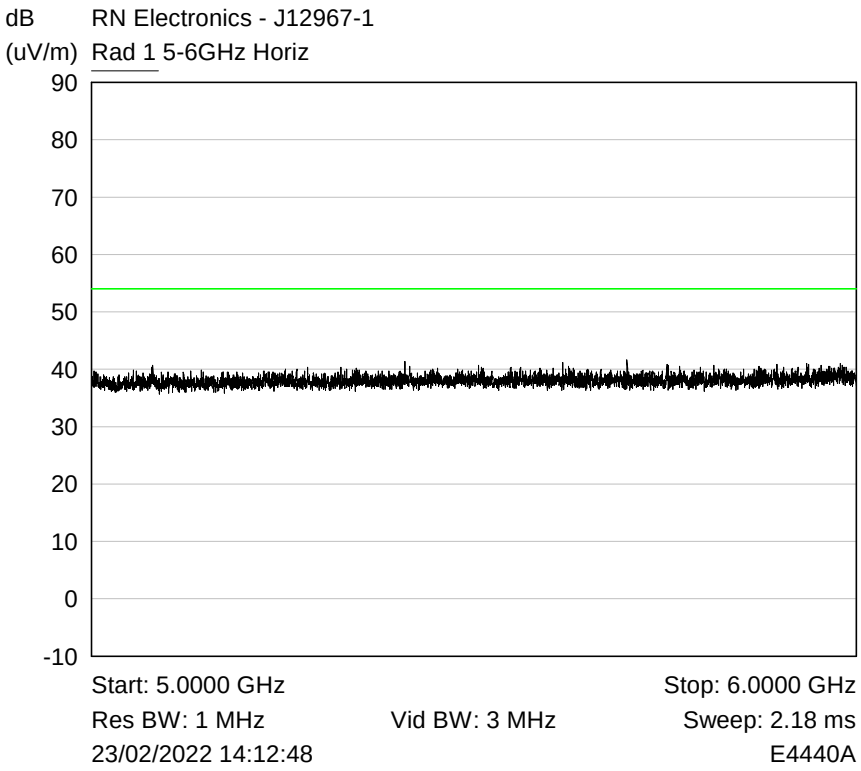
RF Parameters: Band 57-71 GHz, Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS5, Channel 58.32 GHz

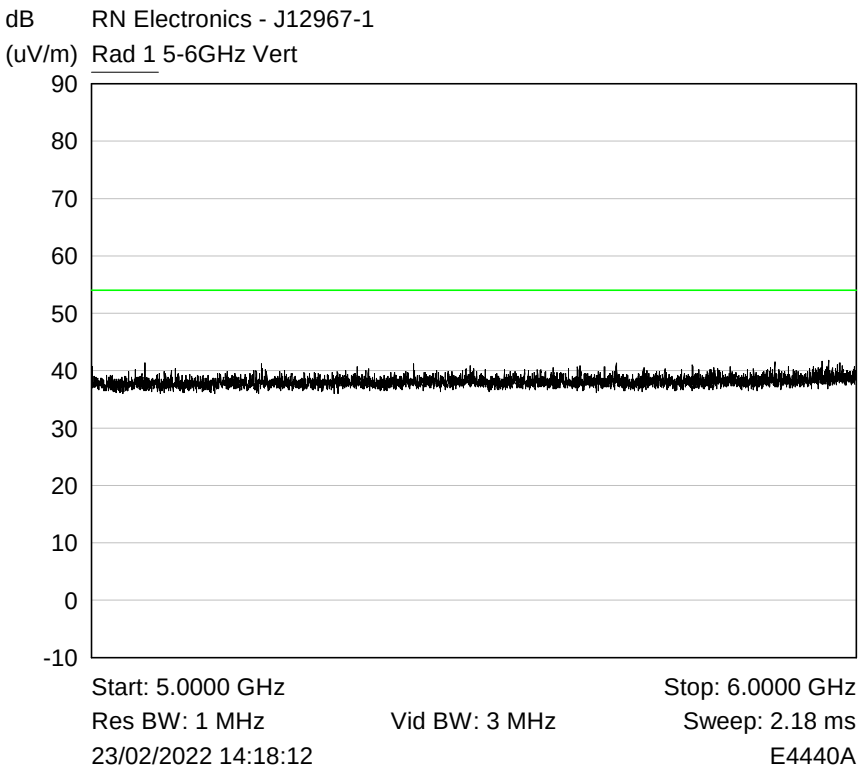


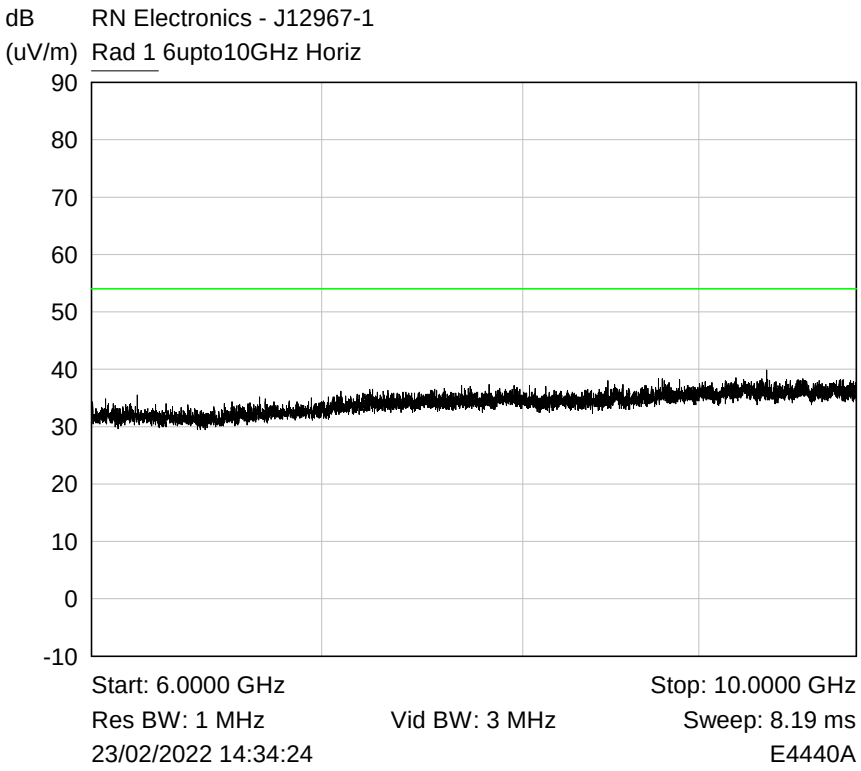


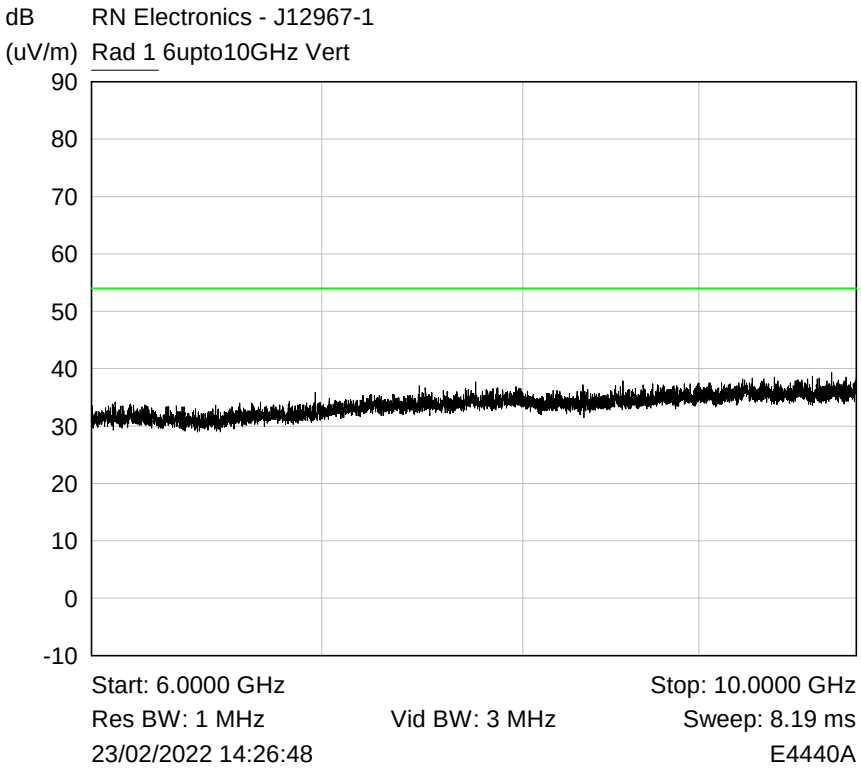


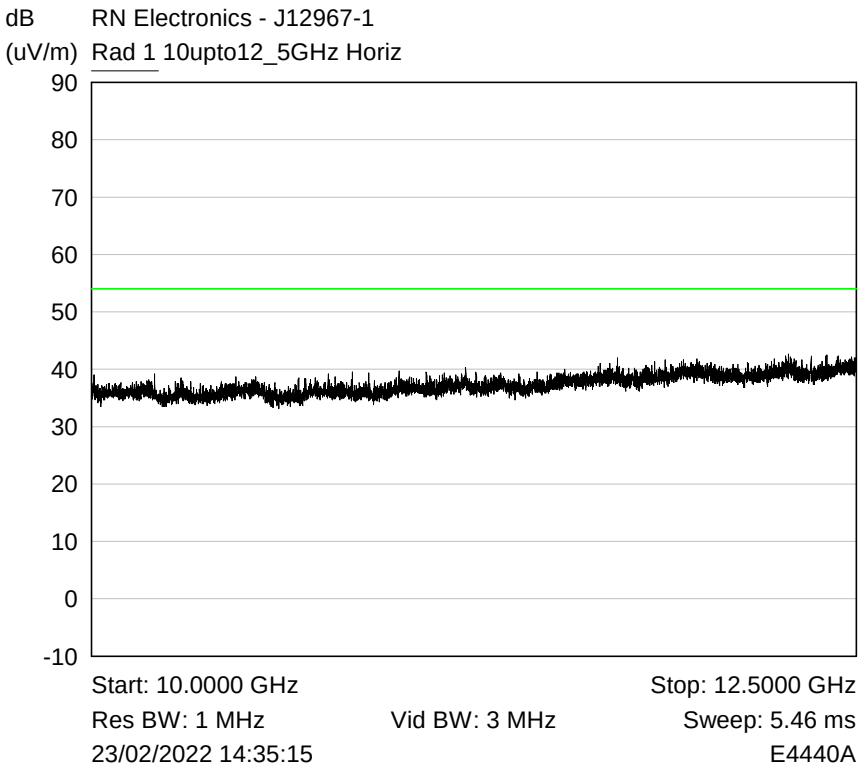


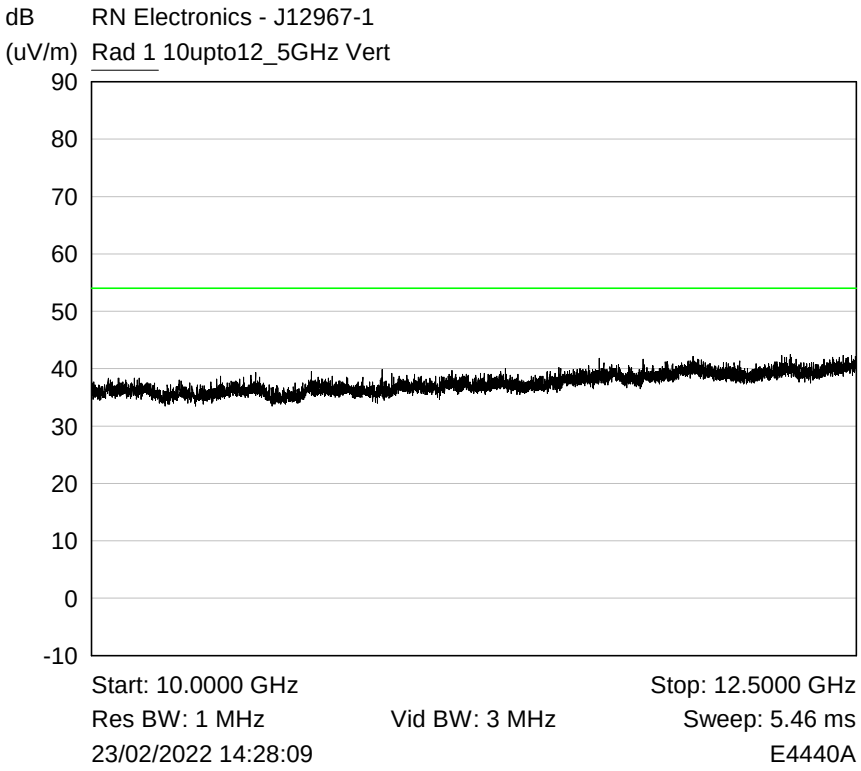


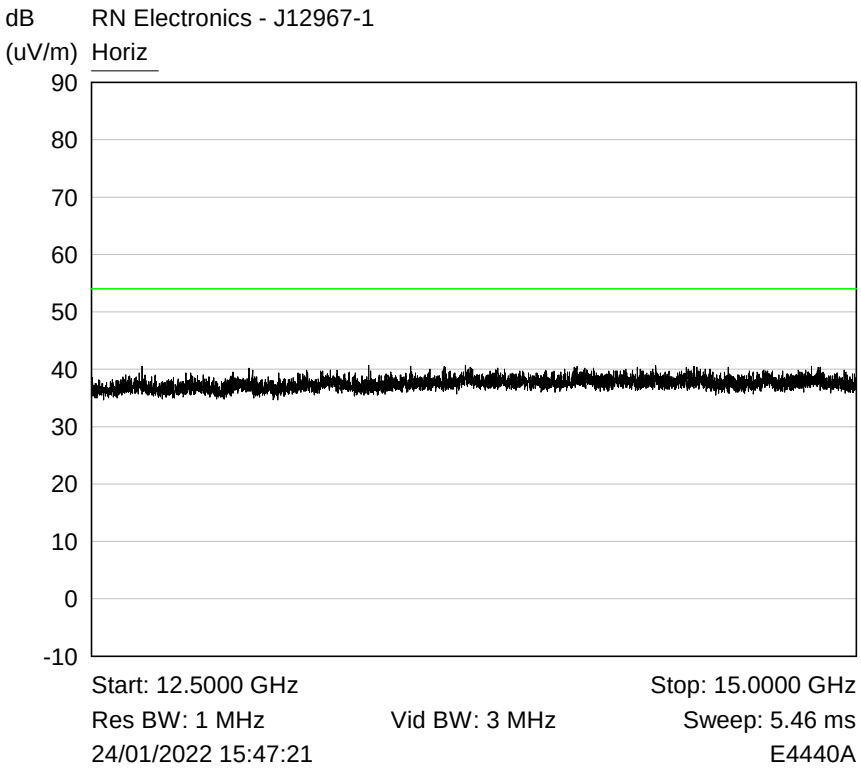


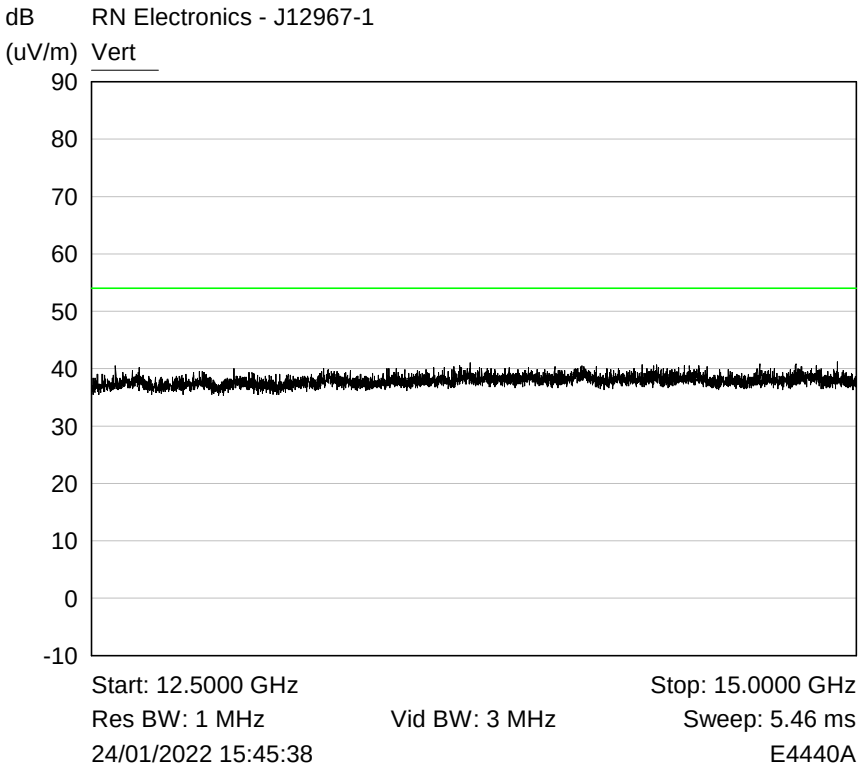


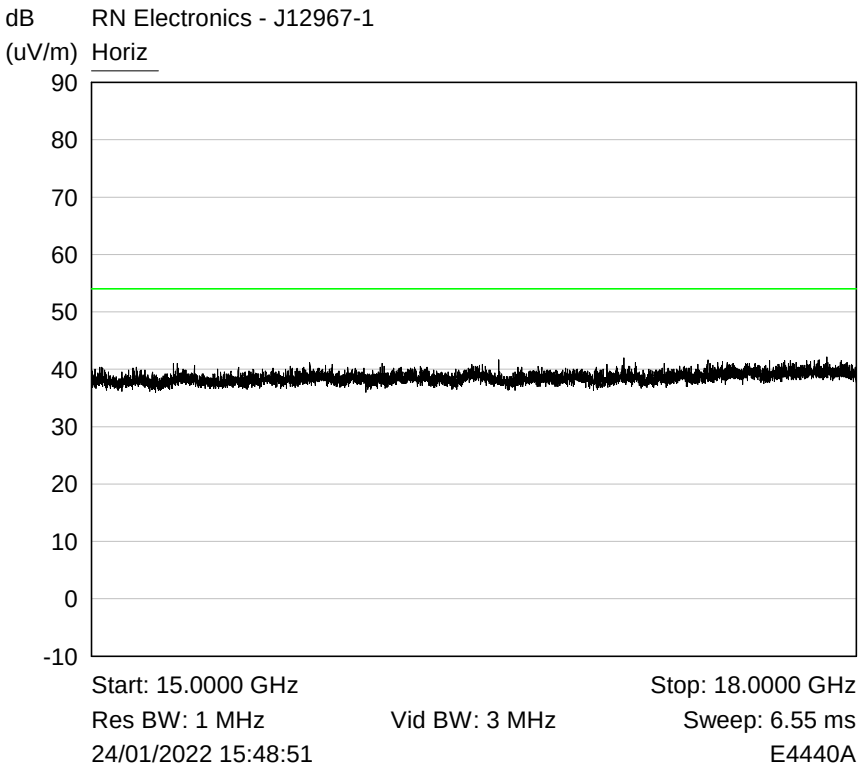


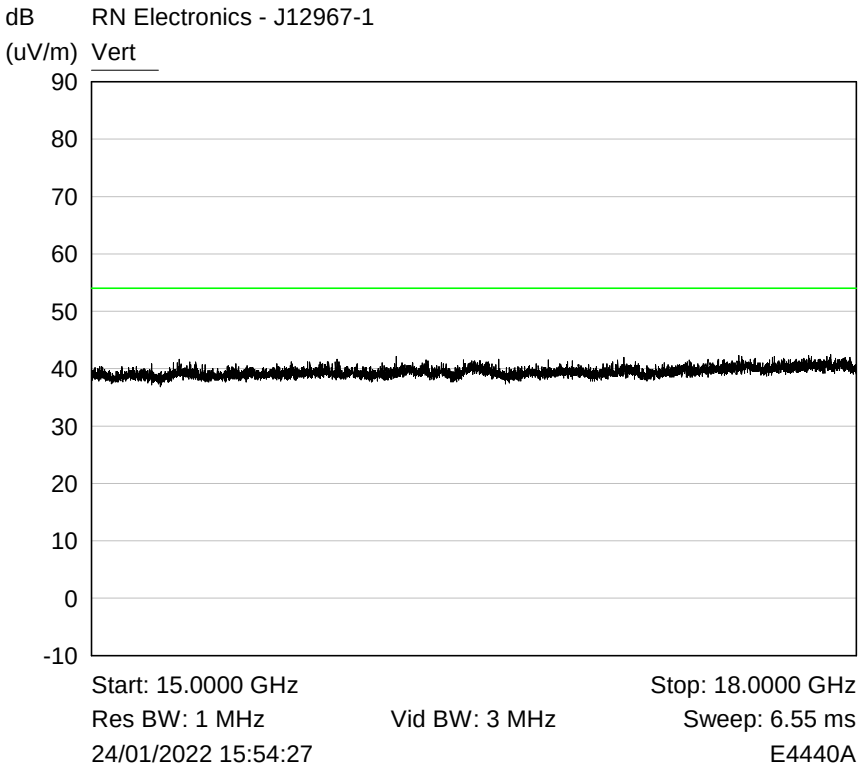

dB
(uV/m)
RN Electronics - J12967-1
Rad 1 10upto12_5GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 10.0000 GHz
Stop: 12.5000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 5.46 ms
23/02/2022 14:35:15
E4440A

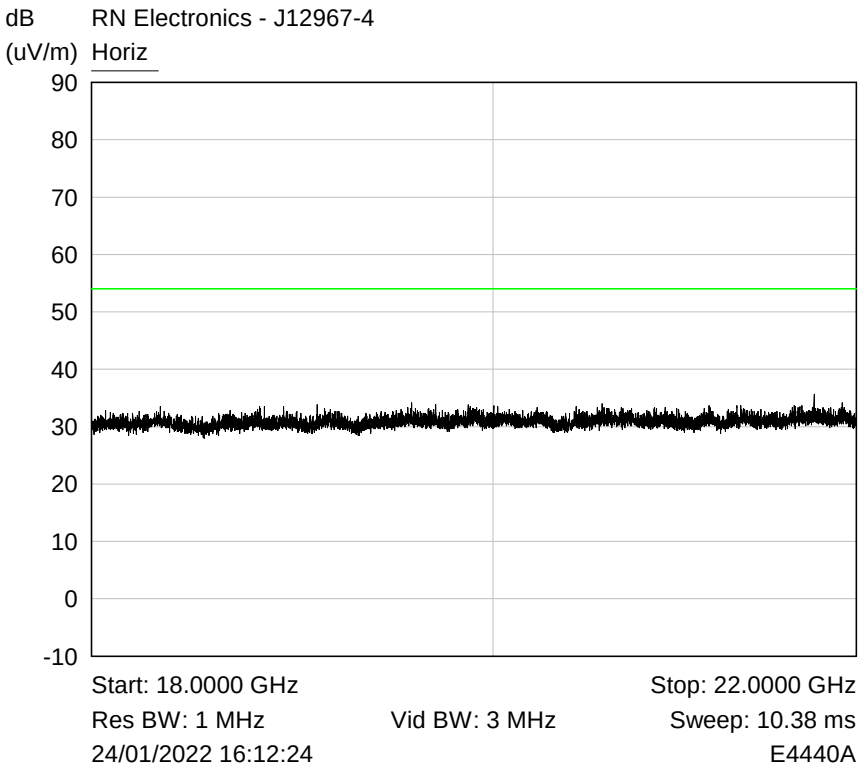

dB
(uV/m)
RN Electronics - J12967-1
Rad 1 10upto12_5GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 10.0000 GHz
Stop: 12.5000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 5.46 ms
23/02/2022 14:28:09
E4440A

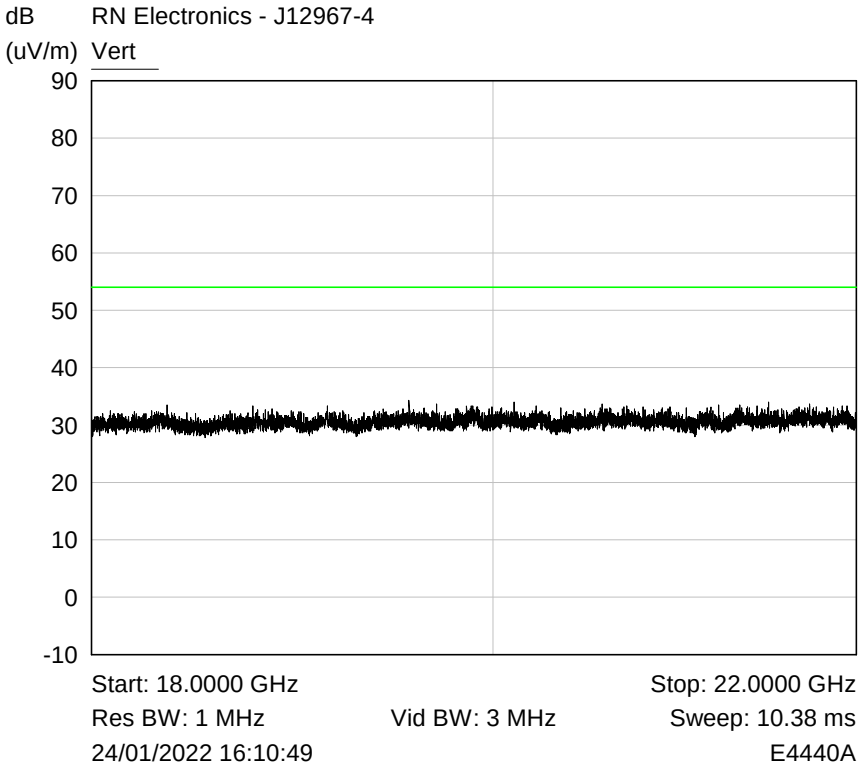

dB
(uV/m)
RN Electronics - J12967-1
Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 12.5000 GHz
Stop: 15.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 5.46 ms
24/01/2022 15:47:21
E4440A

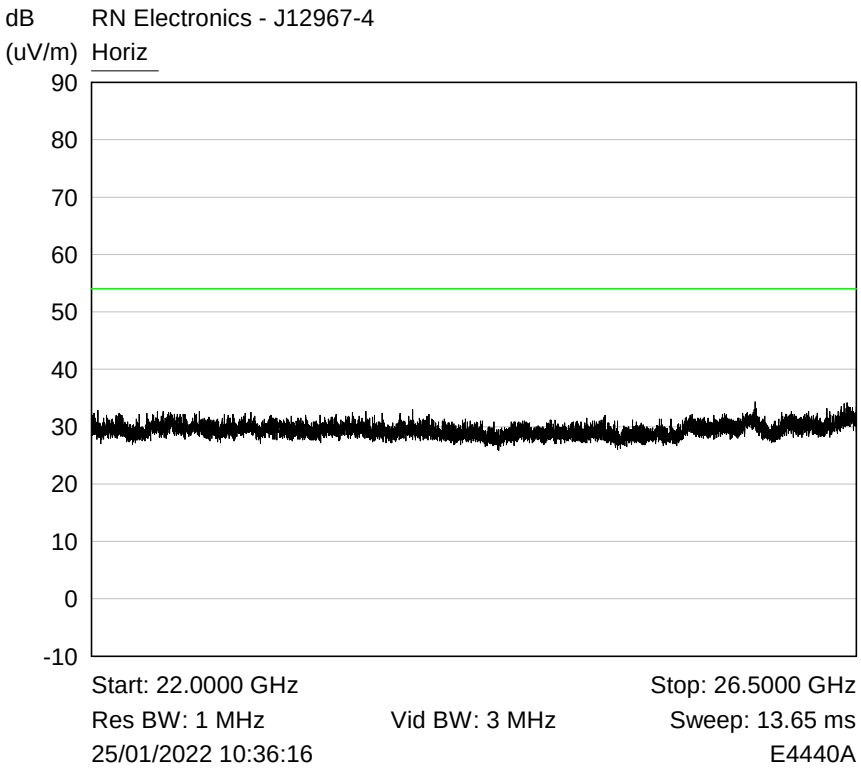

dB
(uV/m)
RN Electronics - J12967-1
Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 12.5000 GHz
Stop: 15.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 5.46 ms
24/01/2022 15:45:38
E4440A

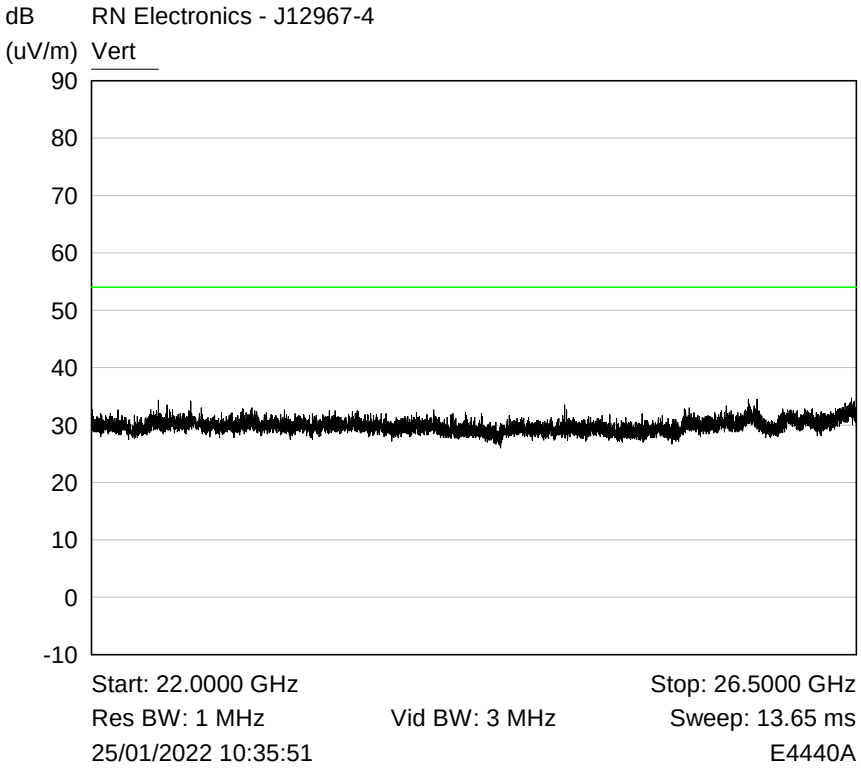

dB
(uV/m)
RN Electronics - J12967-1
Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 15.0000 GHz
Stop: 18.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 6.55 ms
24/01/2022 15:48:51
E4440A

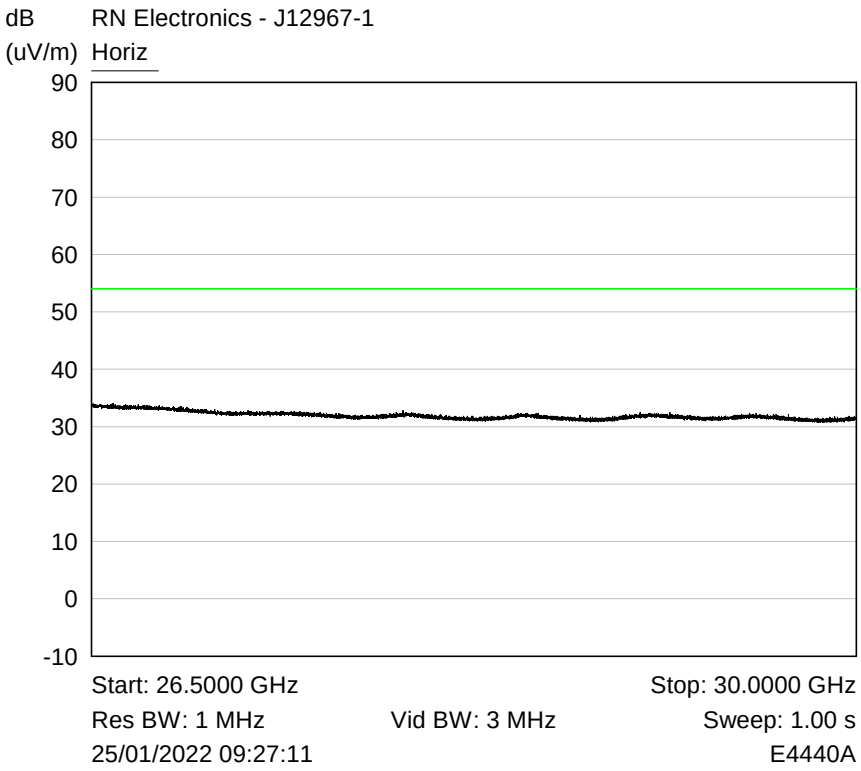

dB
(uV/m)
RN Electronics - J12967-1
Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 15.0000 GHz
Stop: 18.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 6.55 ms
24/01/2022 15:54:27
E4440A

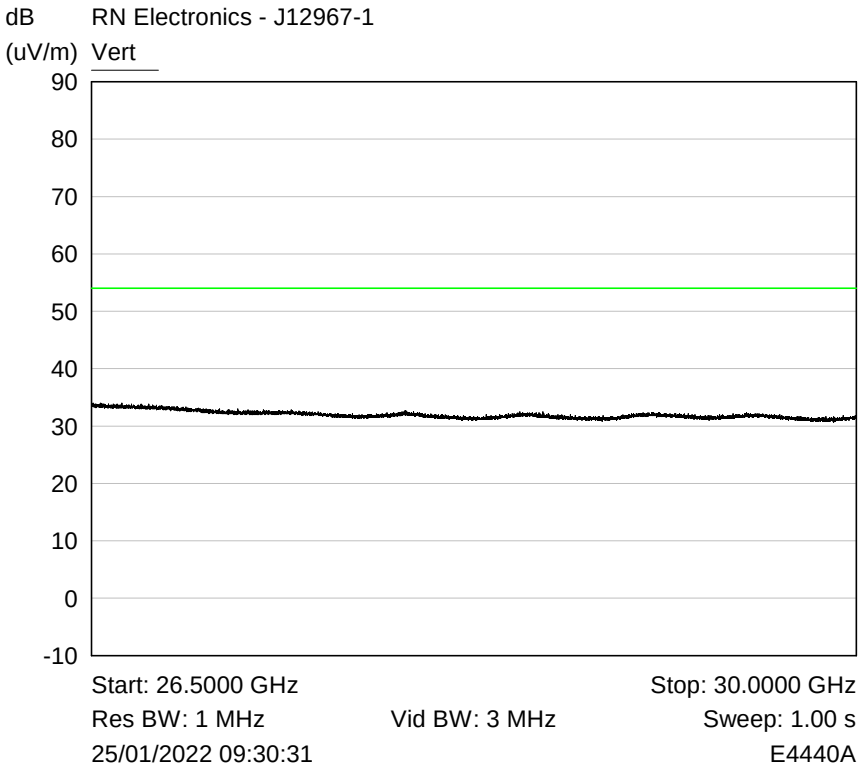

dB
(uV/m)
RN Electronics - J12967-4
Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 18.0000 GHz
Stop: 22.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 10.38 ms
24/01/2022 16:12:24
E4440A

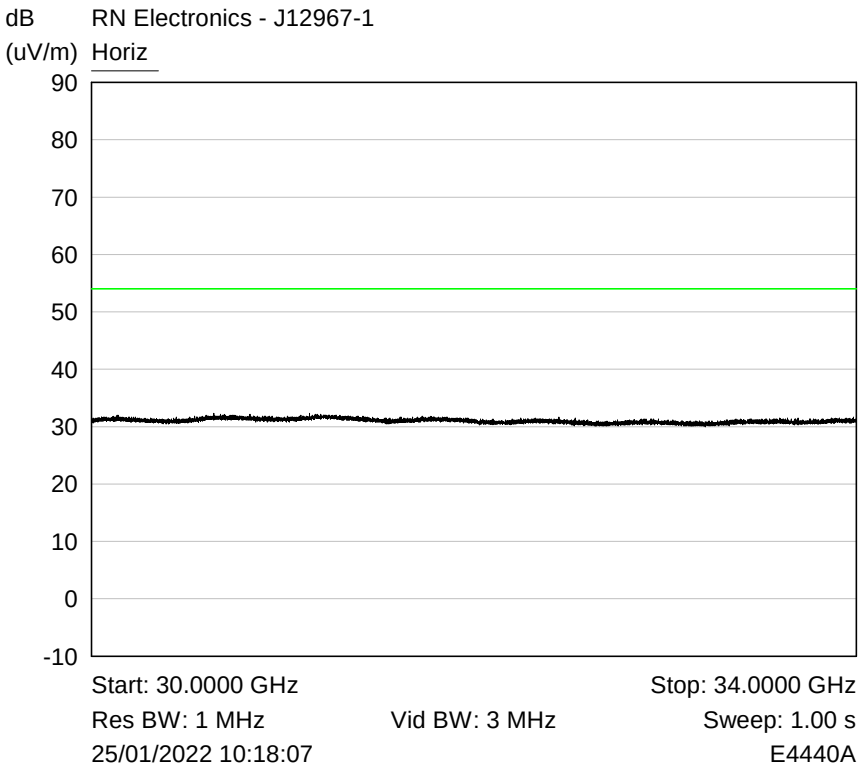

dB
(uV/m)
RN Electronics - J12967-4
Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 18.0000 GHz
Stop: 22.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 10.38 ms
24/01/2022 16:10:49
E4440A

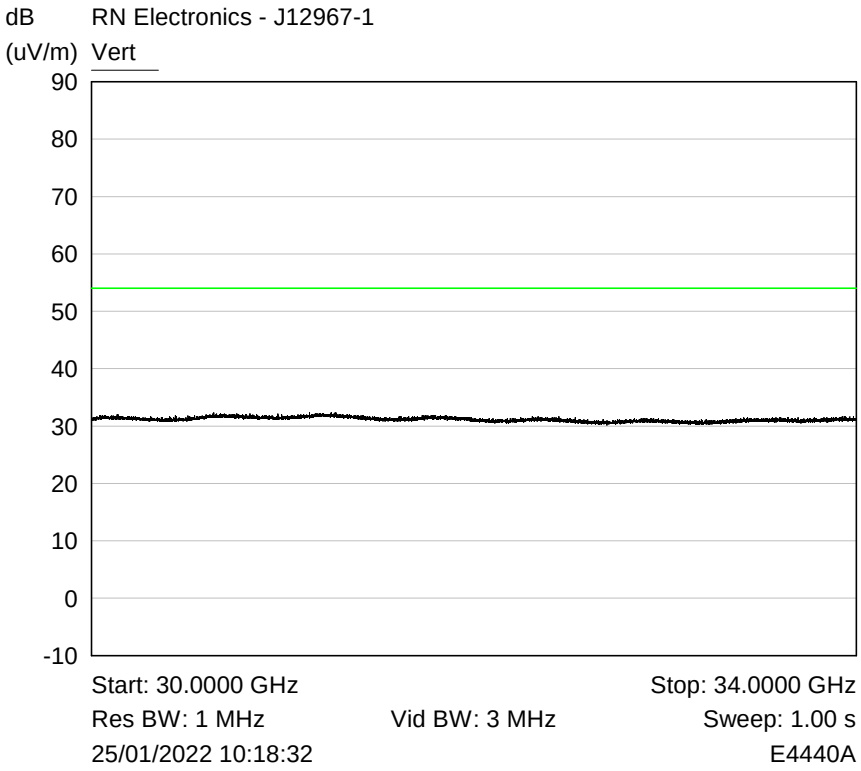


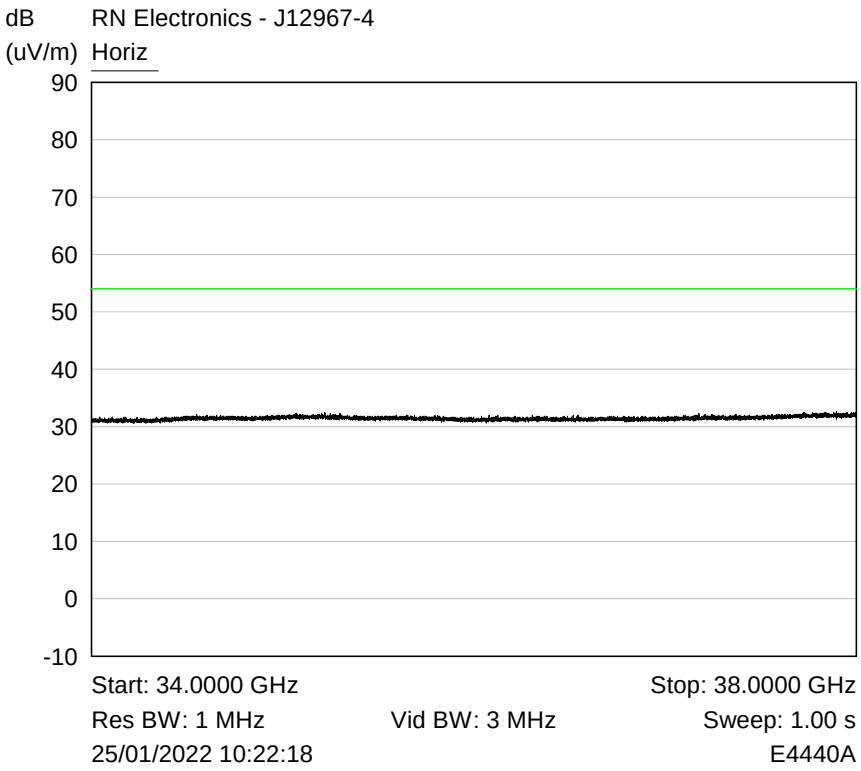


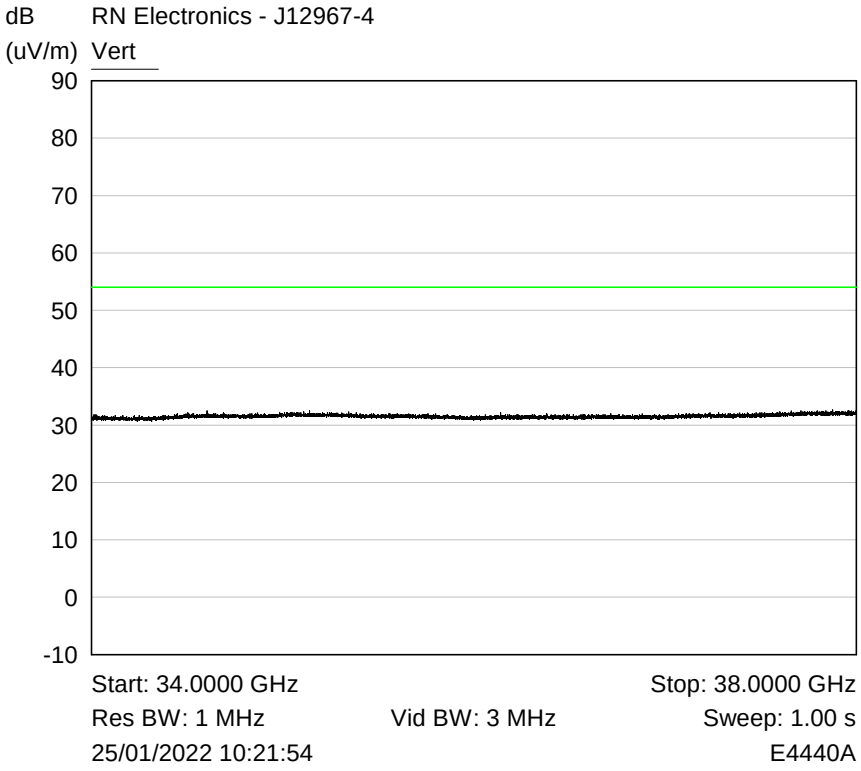


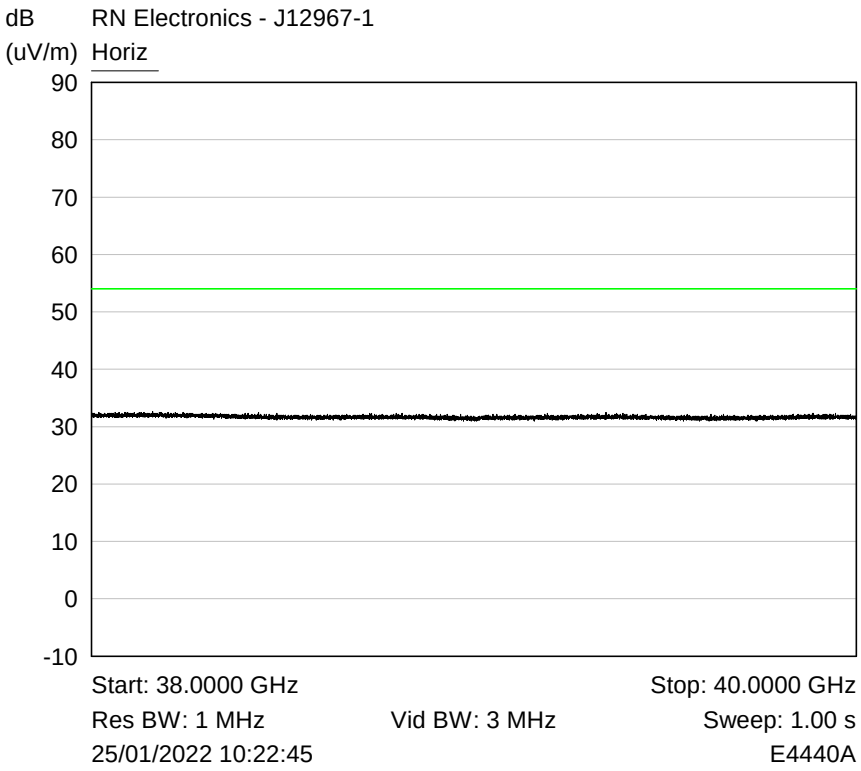


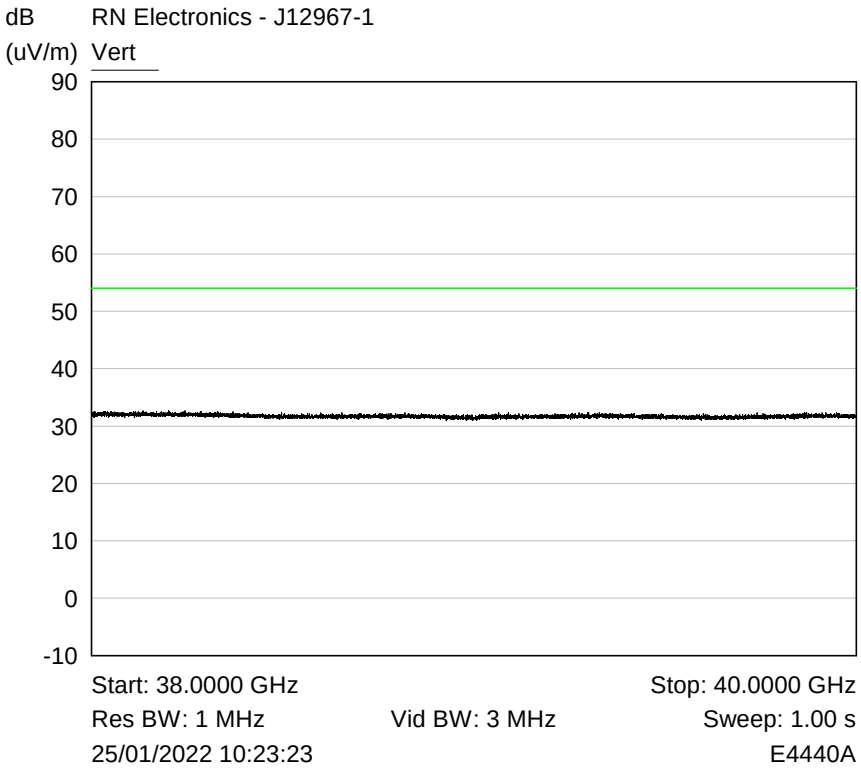

dB
(uV/m)
RN Electronics - J12967-1
Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 30.0000 GHz
Stop: 34.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 1.00 s
25/01/2022 10:18:07
E4440A

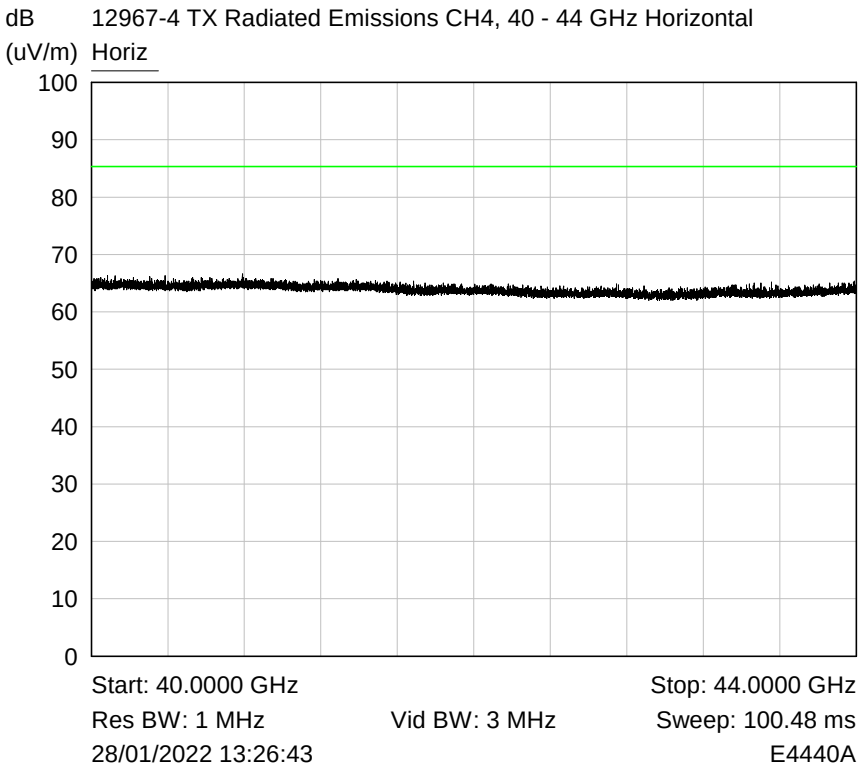

dB
(uV/m)
RN Electronics - J12967-1
Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 30.0000 GHz
Stop: 34.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 1.00 s
25/01/2022 10:18:32
E4440A

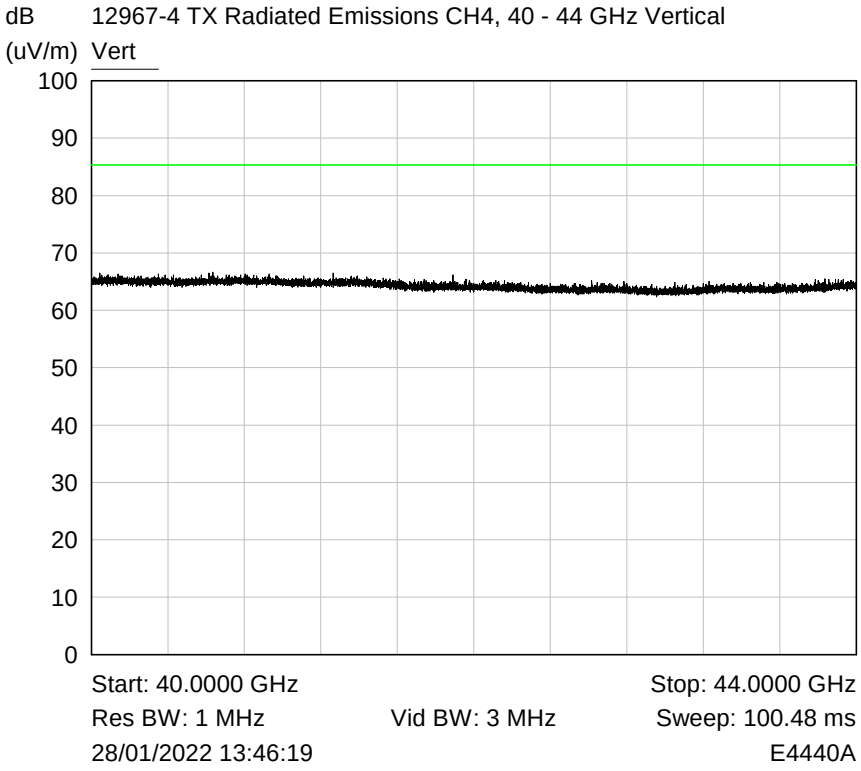

dB
(uV/m)
RN Electronics - J12967-4
Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 34.0000 GHz
Stop: 38.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 1.00 s
25/01/2022 10:22:18
E4440A

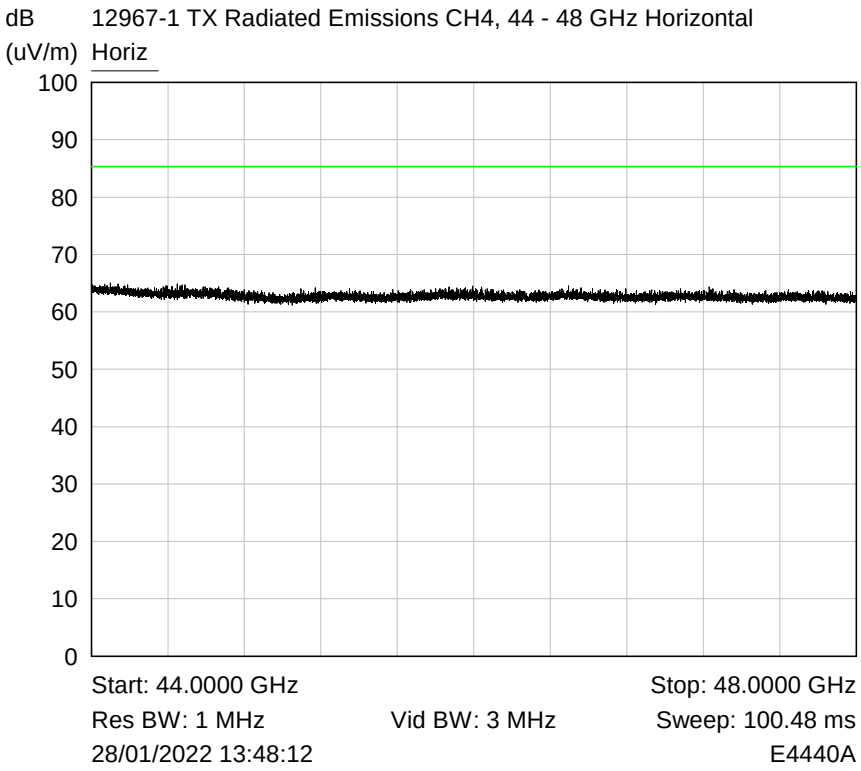

dB
(uV/m)
RN Electronics - J12967-4
Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 34.0000 GHz
Stop: 38.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 1.00 s
25/01/2022 10:21:54
E4440A

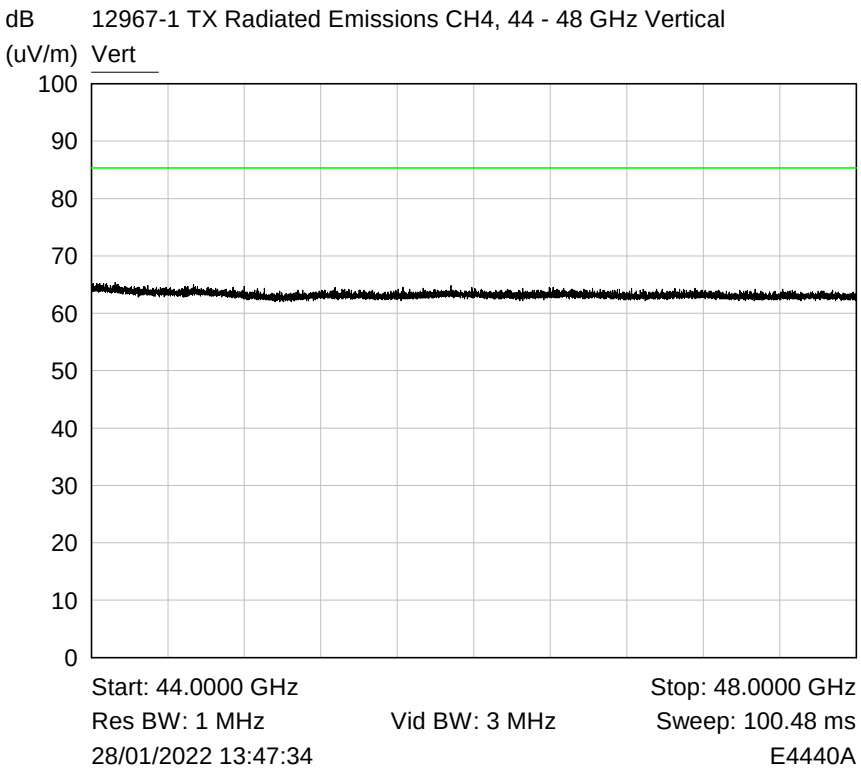

dB
(uV/m)
RN Electronics - J12967-1
Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 38.0000 GHz
Stop: 40.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 1.00 s
25/01/2022 10:22:45
E4440A

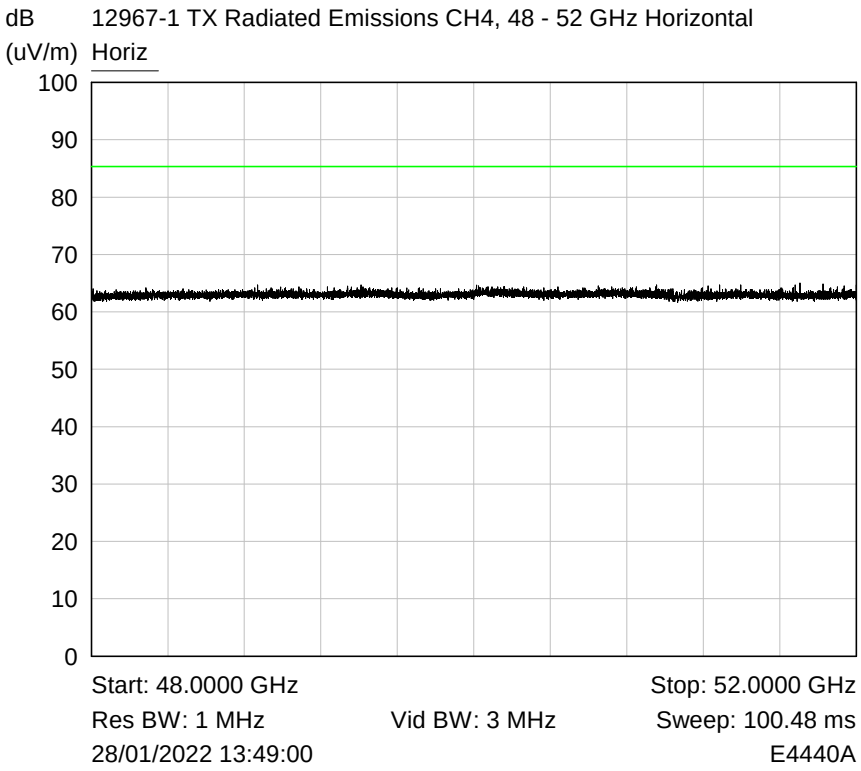

dB
(uV/m)
RN Electronics - J12967-1
Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 38.0000 GHz
Stop: 40.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 1.00 s
25/01/2022 10:23:23
E4440A

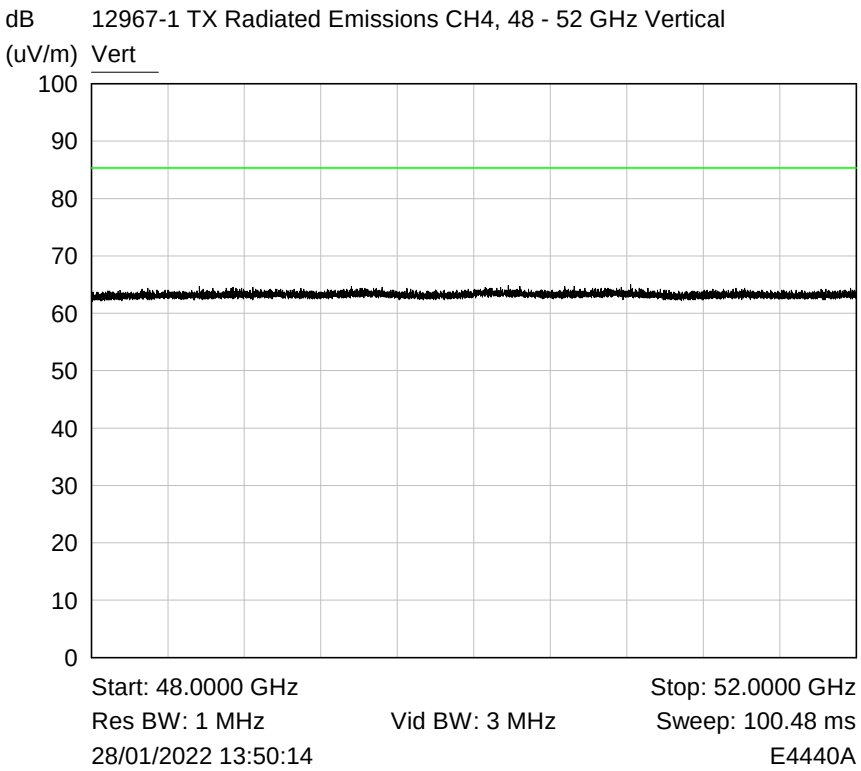


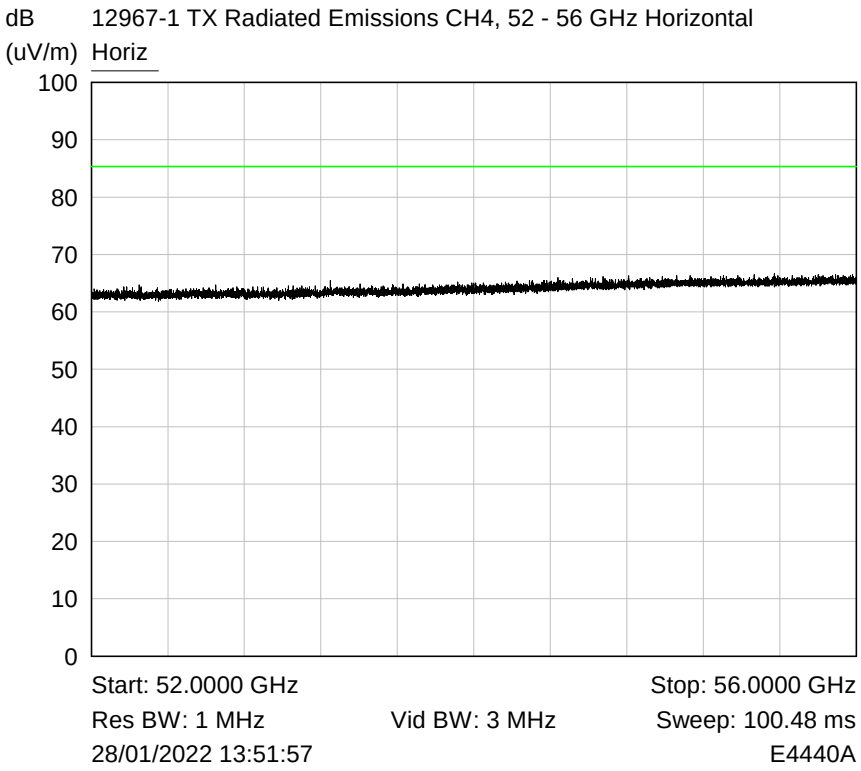


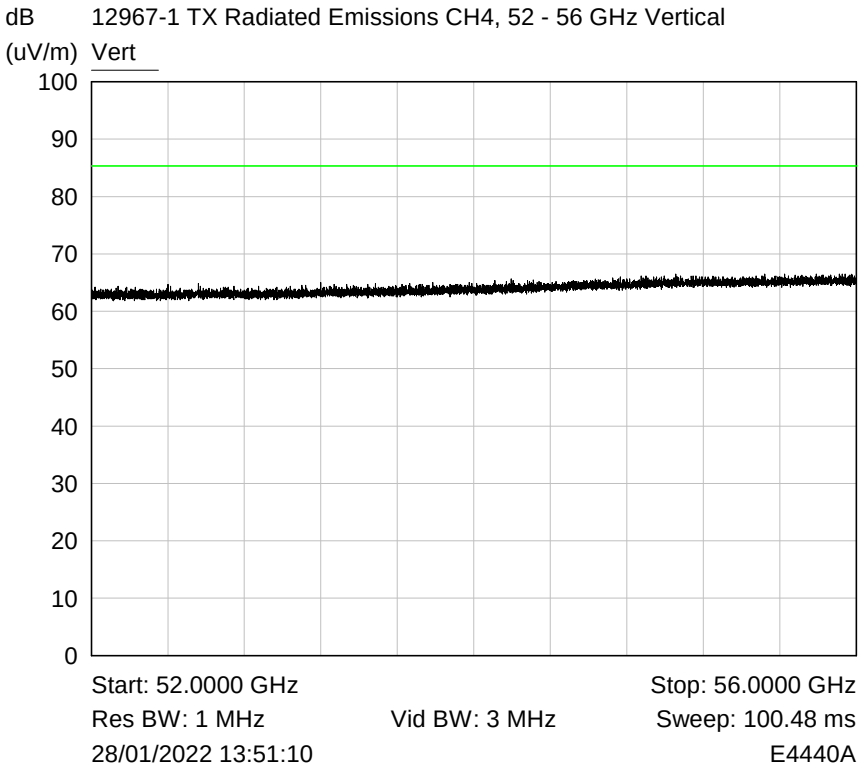


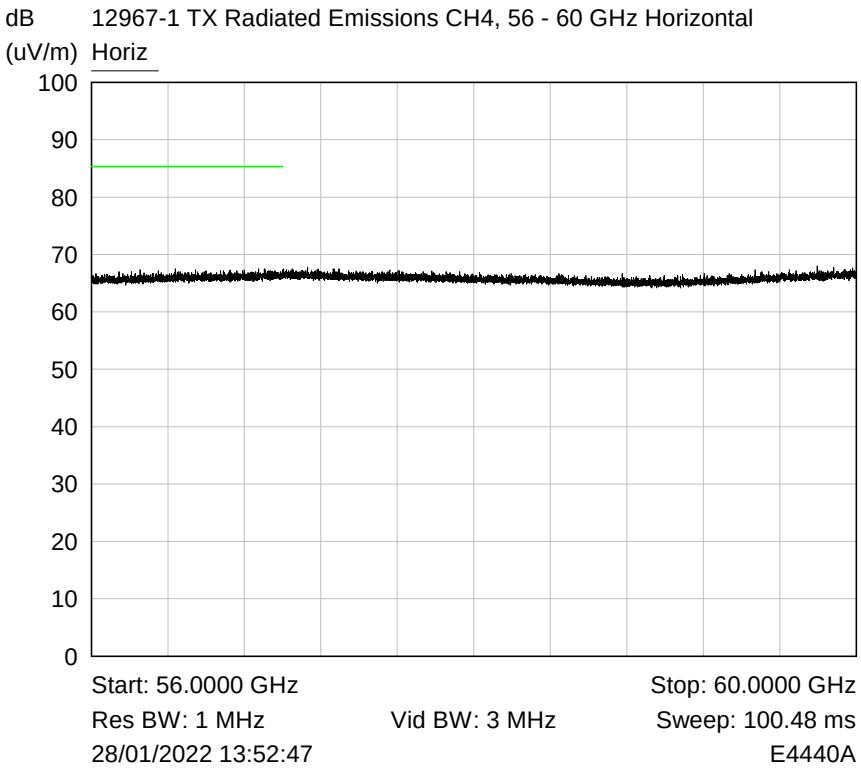


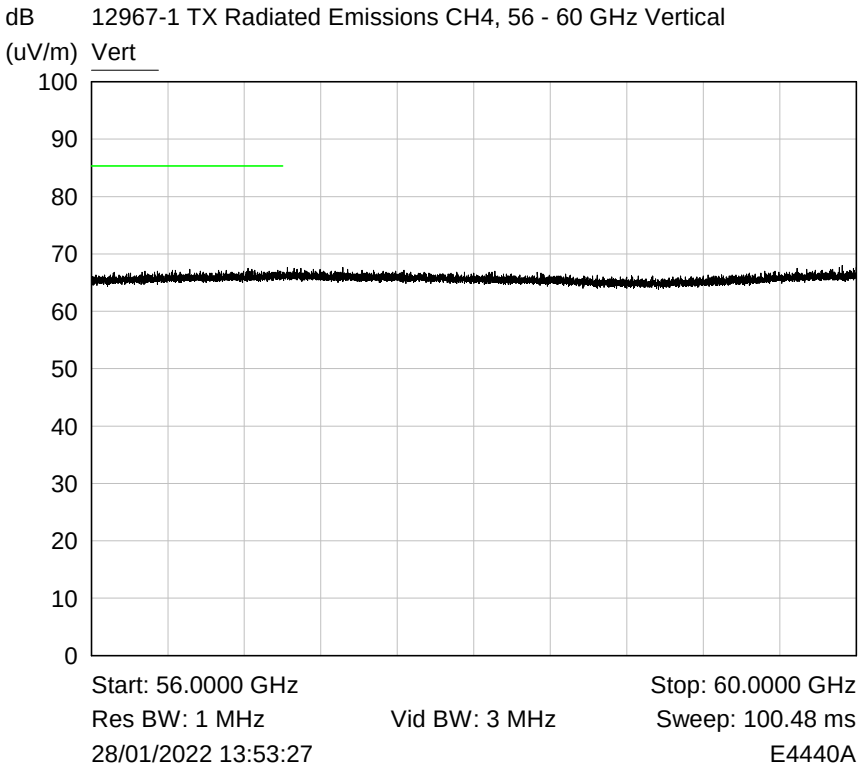


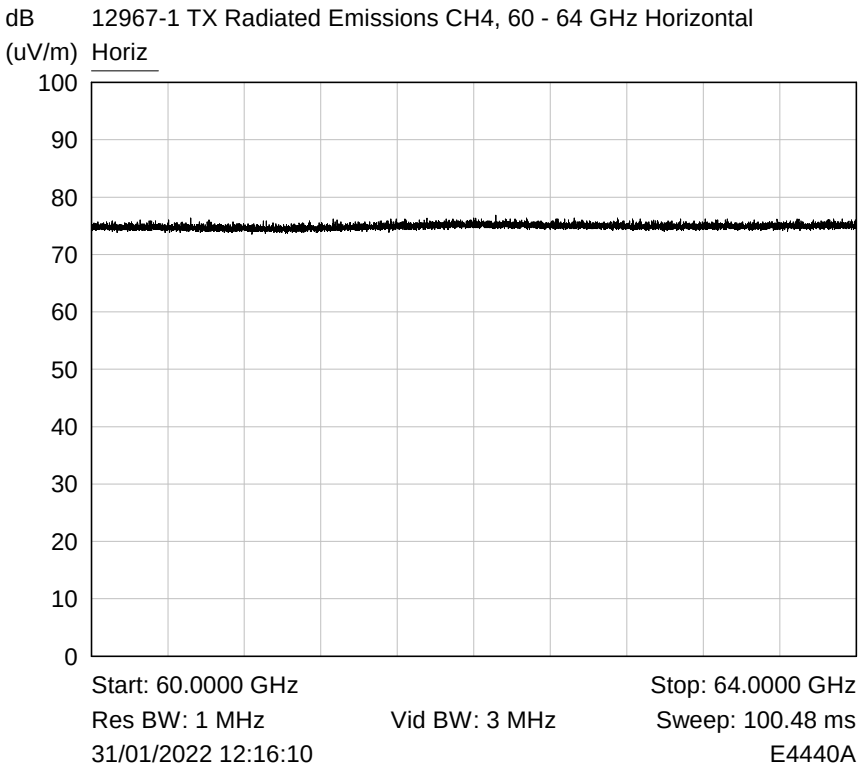


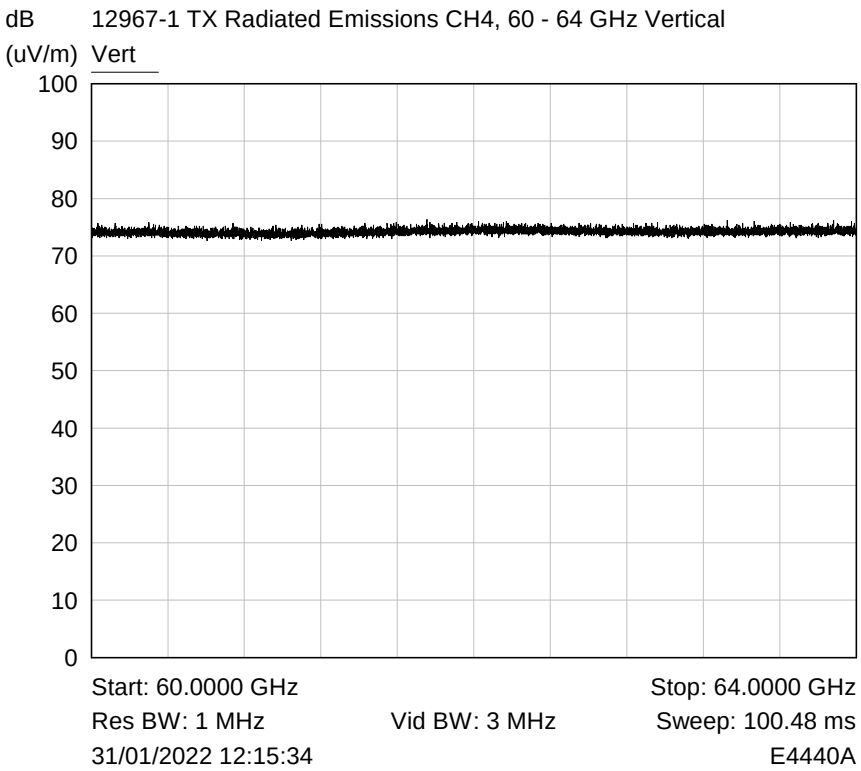


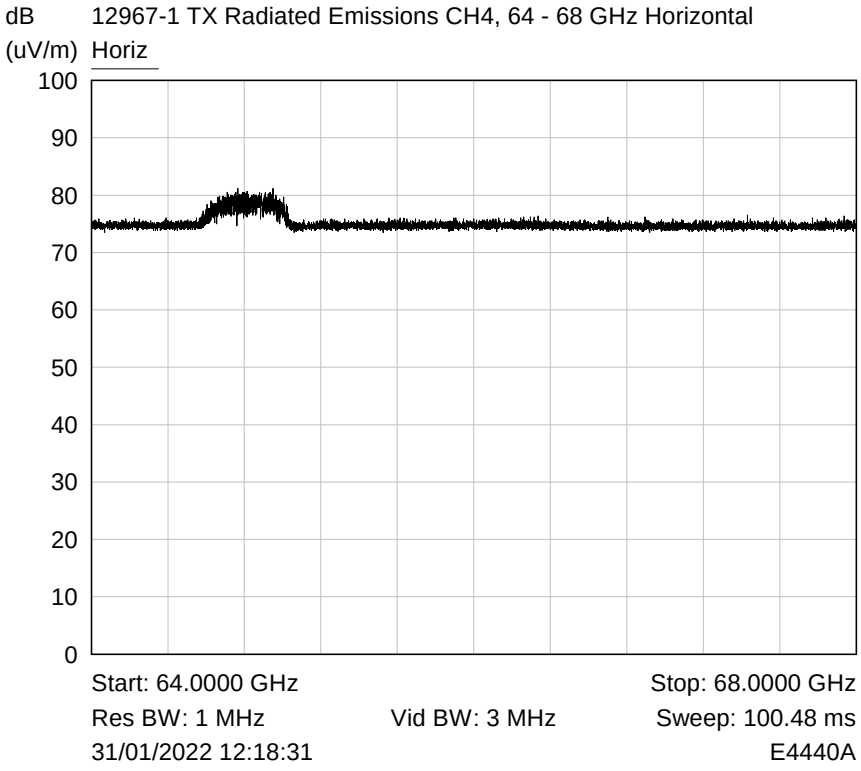



dB
(uV/m)
12967-1 TX Radiated Emissions CH4, 56 - 60 GHz Horizontal
Horiz
100
90
80
70
60
50
40
30
20
10
0
Start: 56.0000 GHz
Stop: 60.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.48 ms
28/01/2022 13:52:47
E4440A

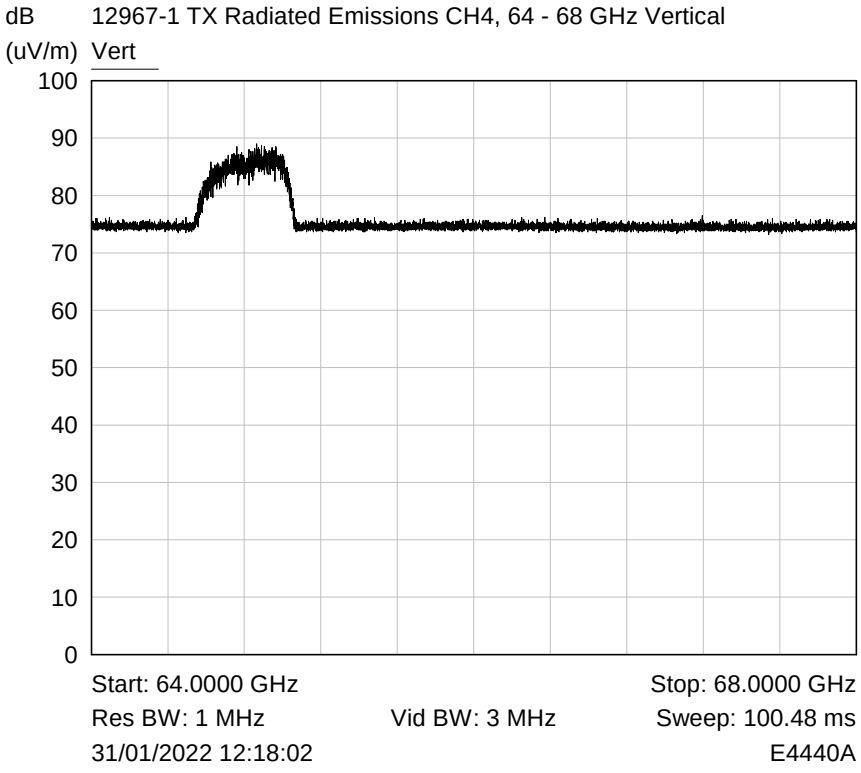

dB
(uV/m)
12967-1 TX Radiated Emissions CH4, 56 - 60 GHz Vertical
Vert
100
90
80
70
60
50
40
30
20
10
0
Start: 56.0000 GHz
Stop: 60.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.48 ms
28/01/2022 13:53:27
E4440A



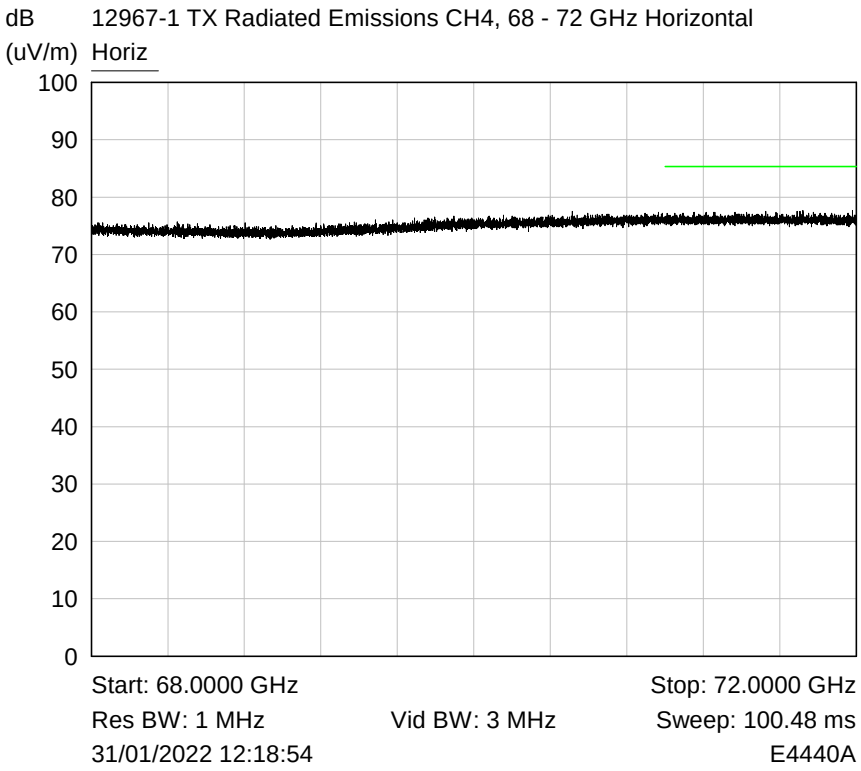


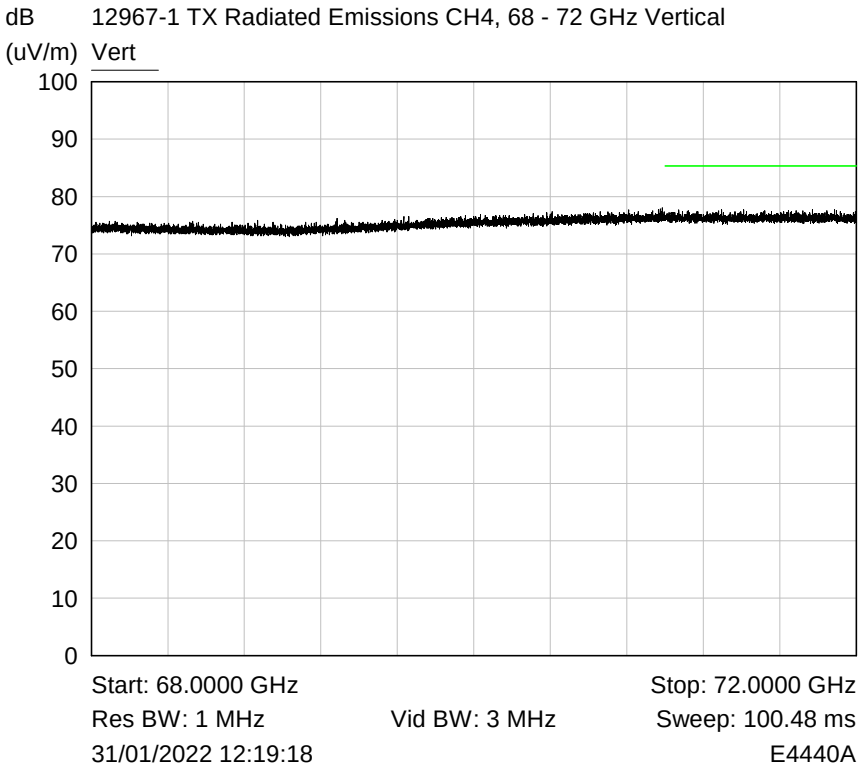


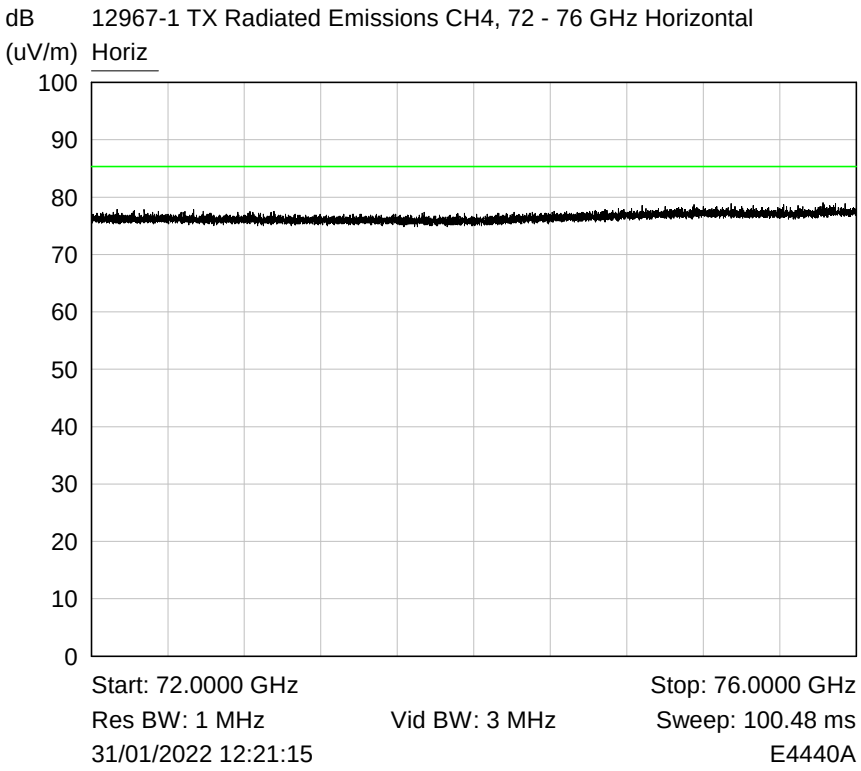
Note: fundamental shown on plot.

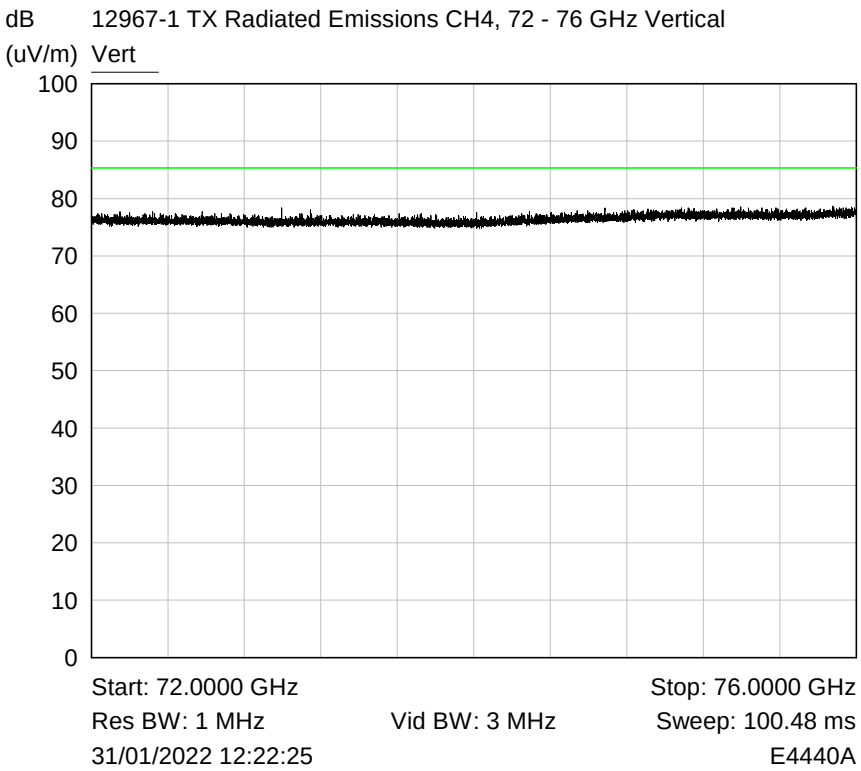


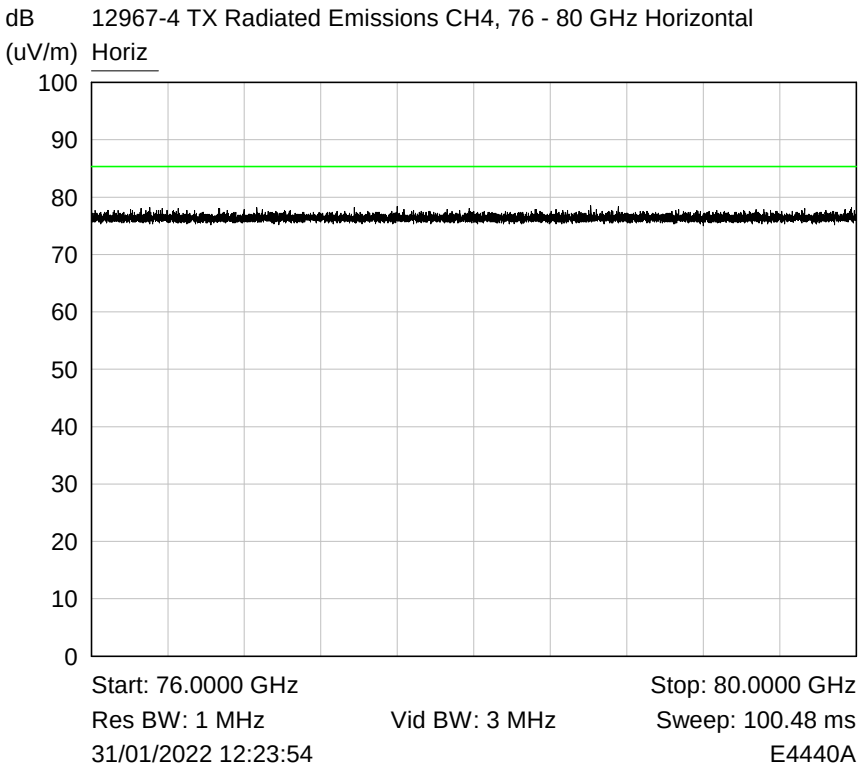
Note: fundamental shown on plot.

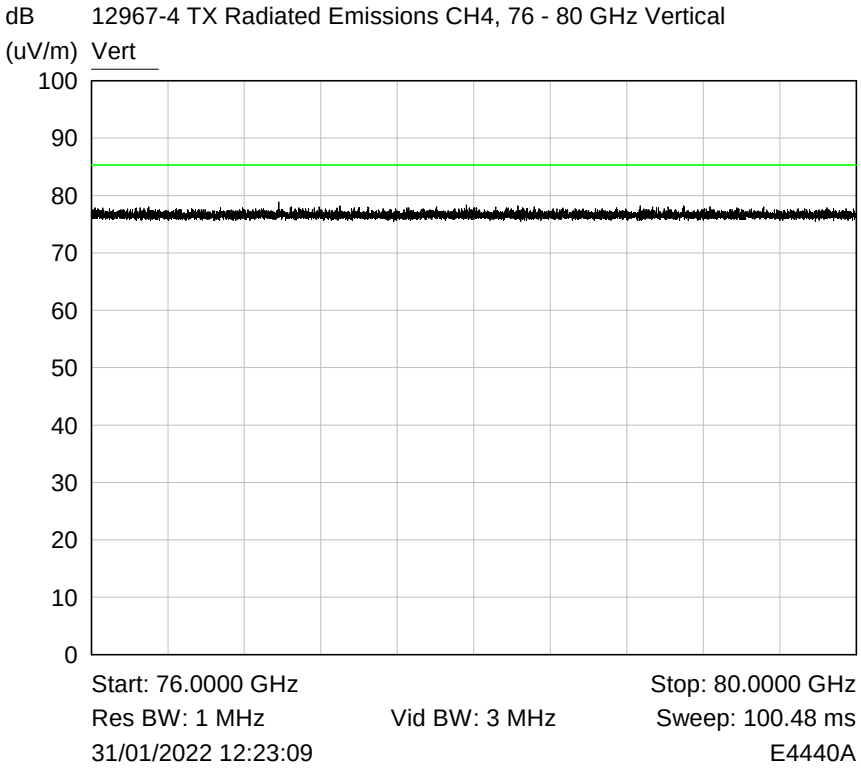


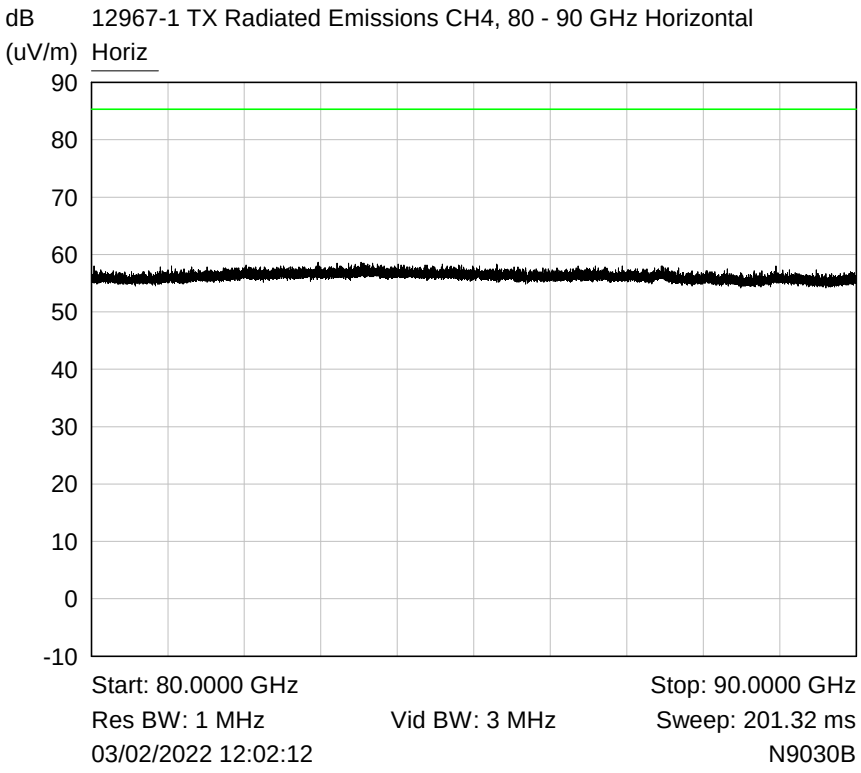


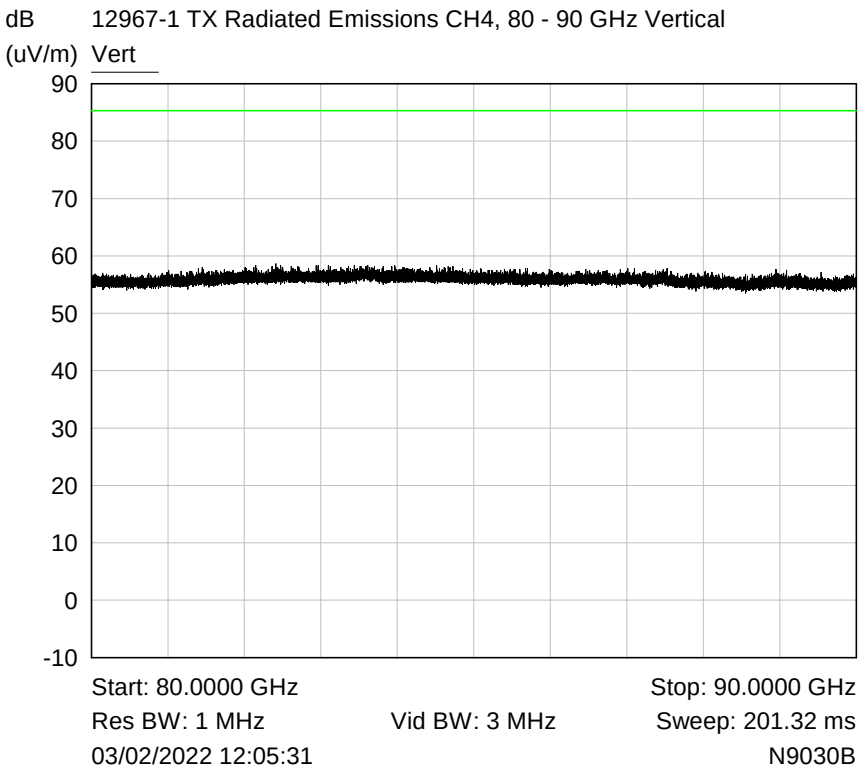


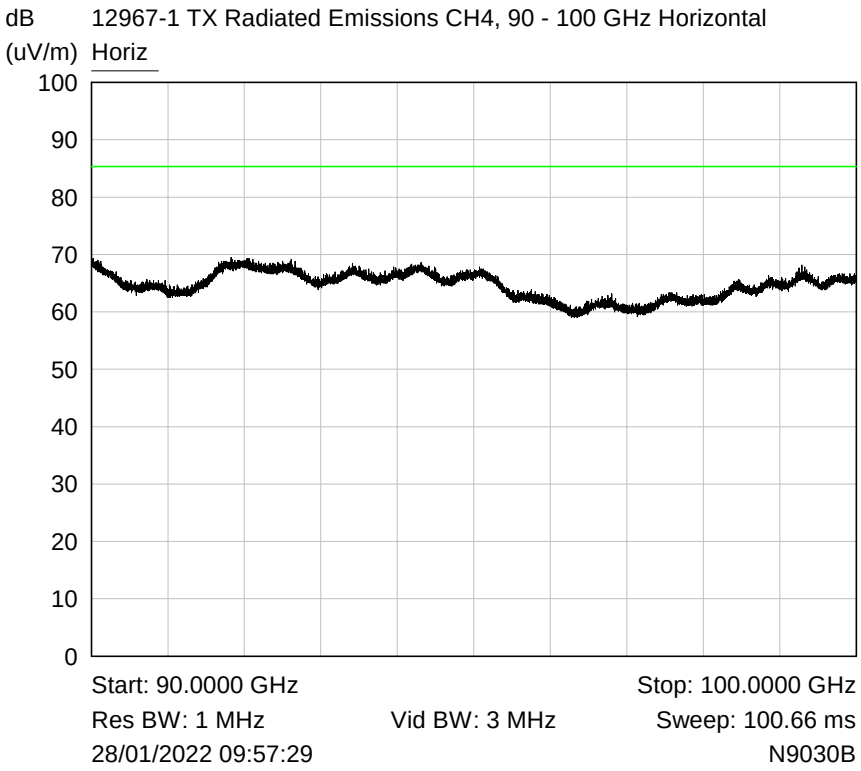


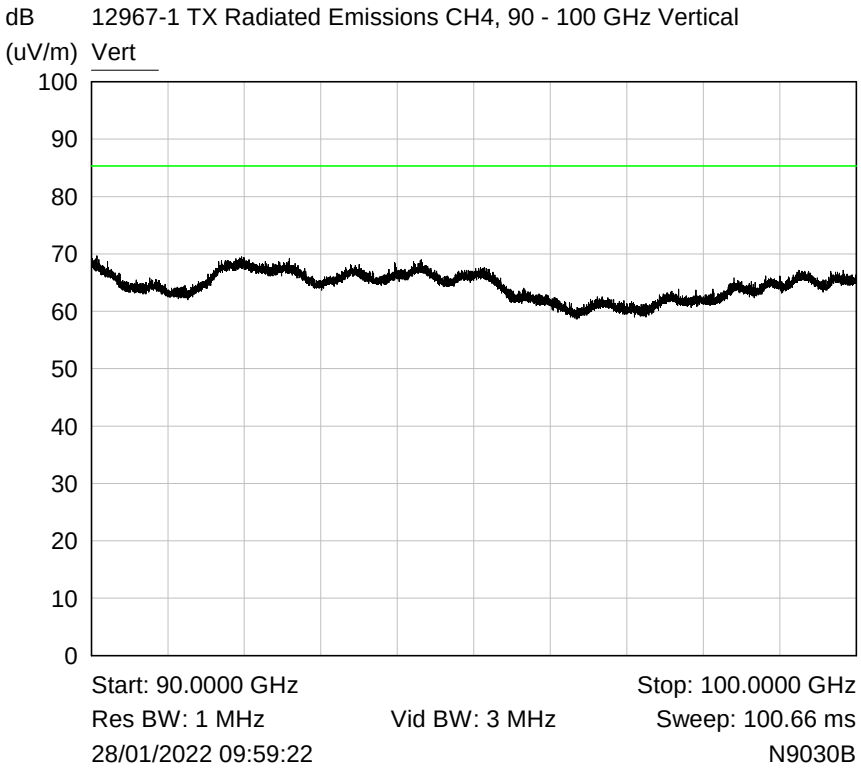


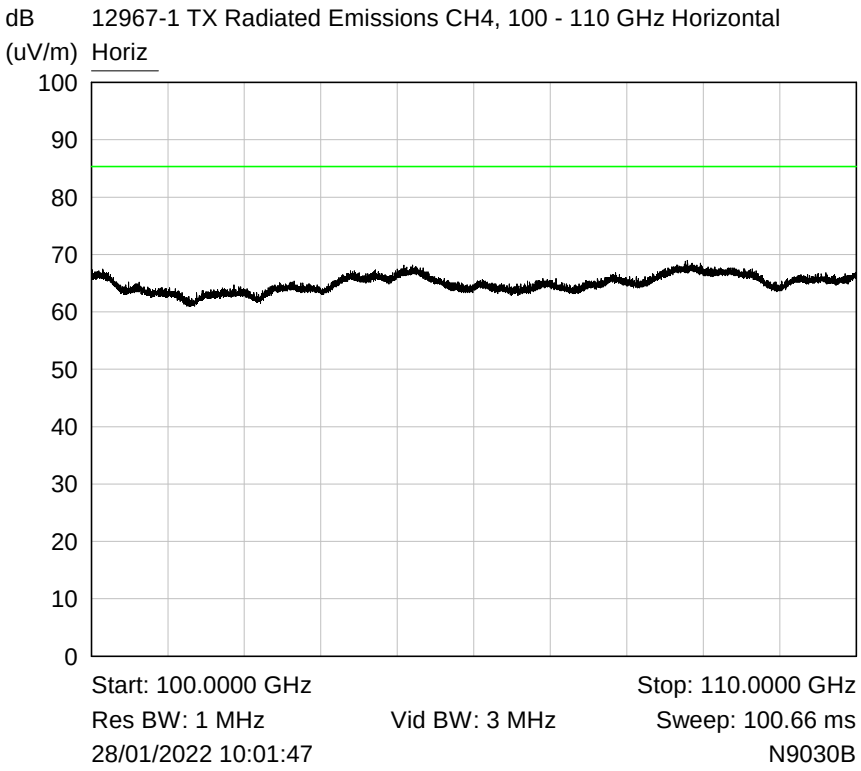


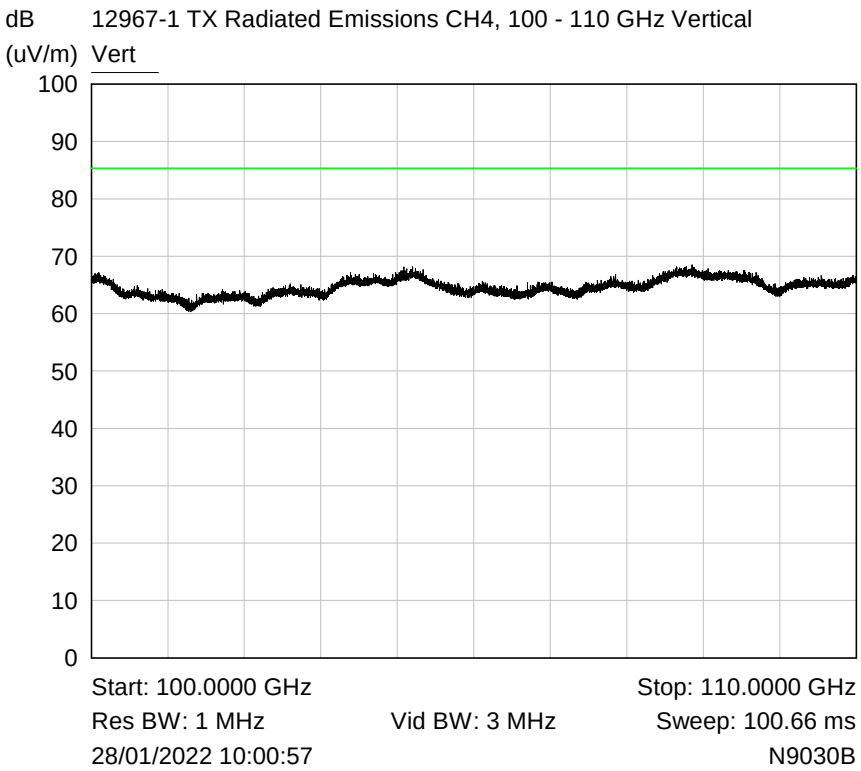


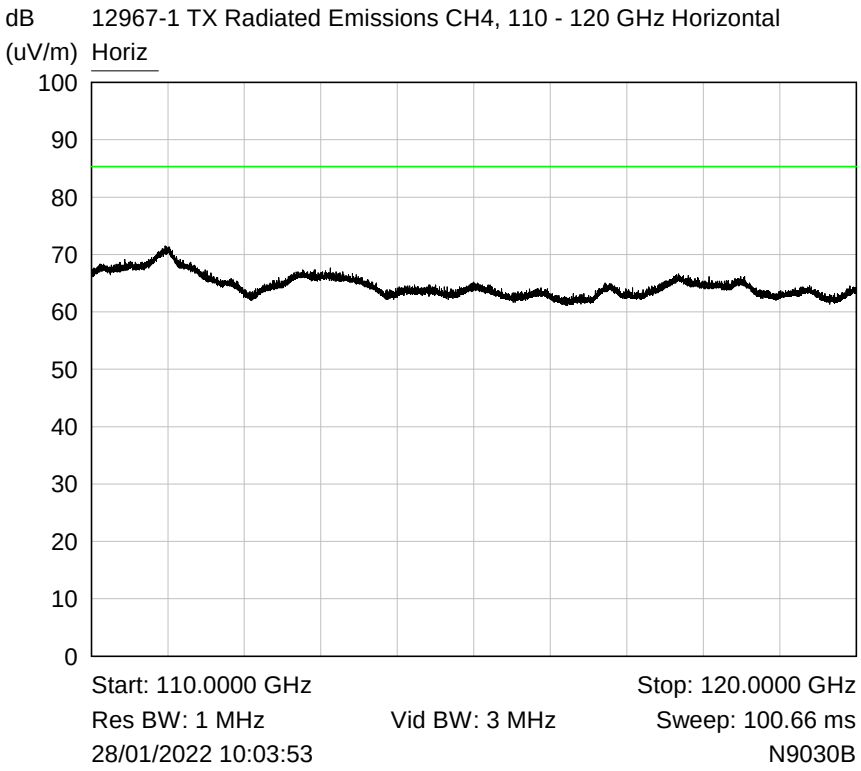


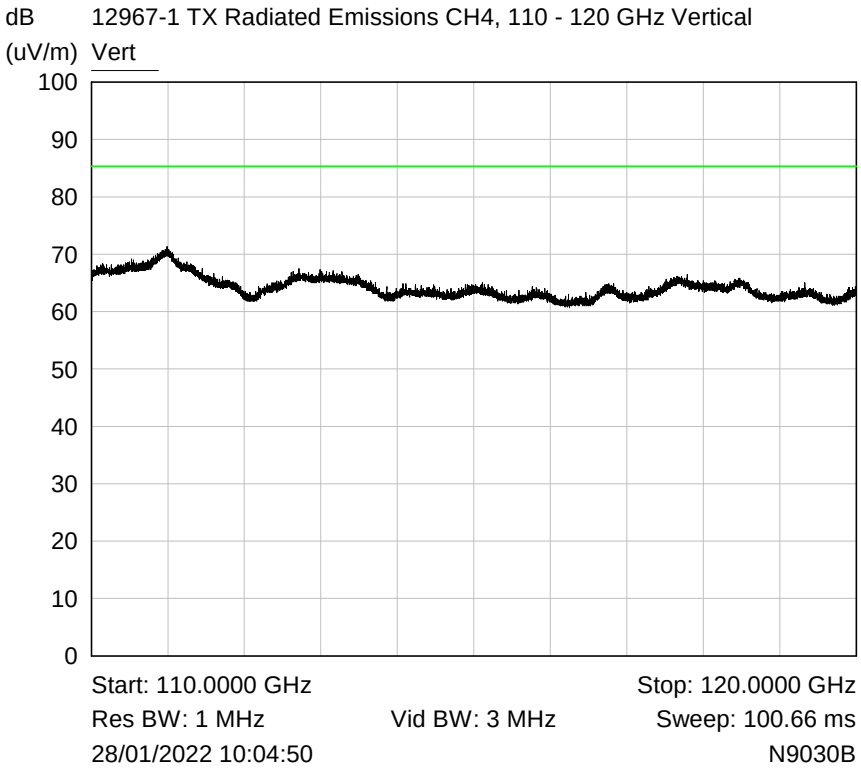

dB
(uV/m)
12967-1 TX Radiated Emissions CH4, 90 - 100 GHz Horizontal
Horiz
100
90
80
70
60
50
40
30
20
10
0
Start: 90.0000 GHz
Stop: 100.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.66 ms
28/01/2022 09:57:29
N9030B

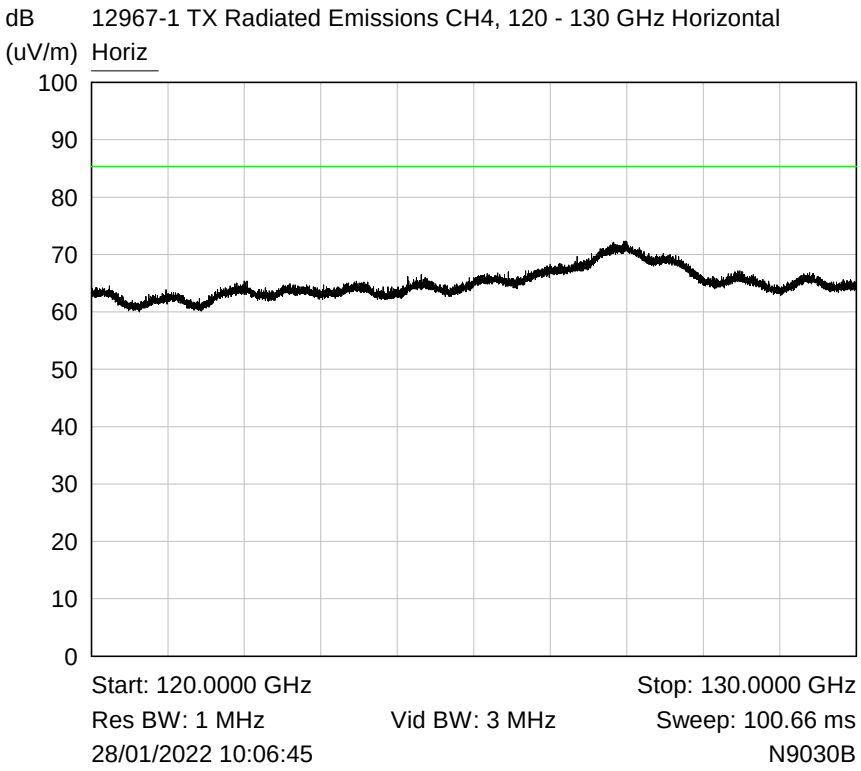

dB
(uV/m)
12967-1 TX Radiated Emissions CH4, 90 - 100 GHz Vertical
Vert
100
90
80
70
60
50
40
30
20
10
0
Start: 90.0000 GHz
Stop: 100.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.66 ms
28/01/2022 09:59:22
N9030B

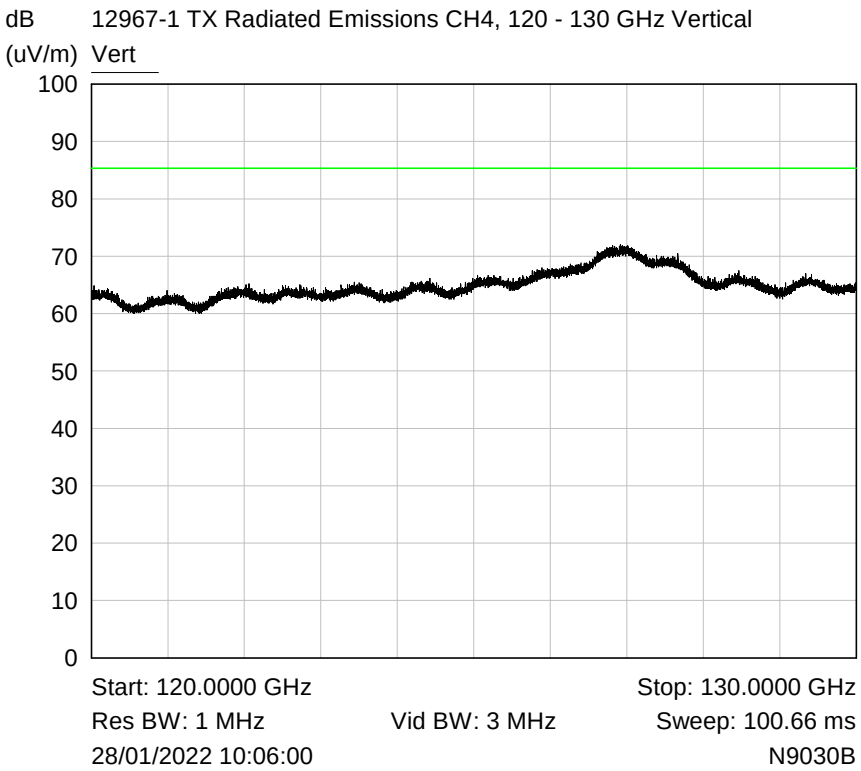


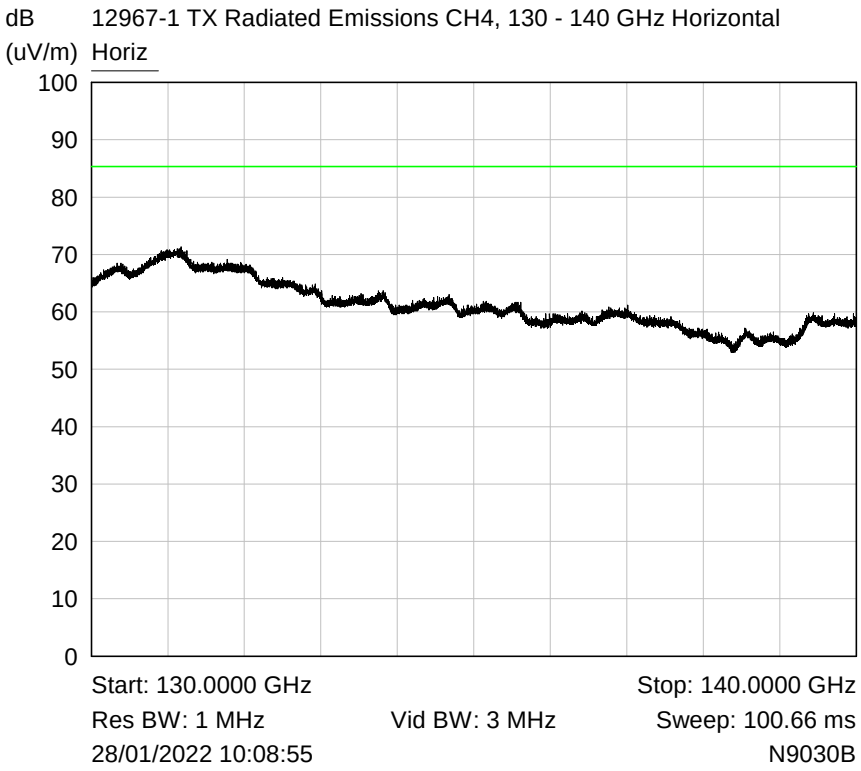


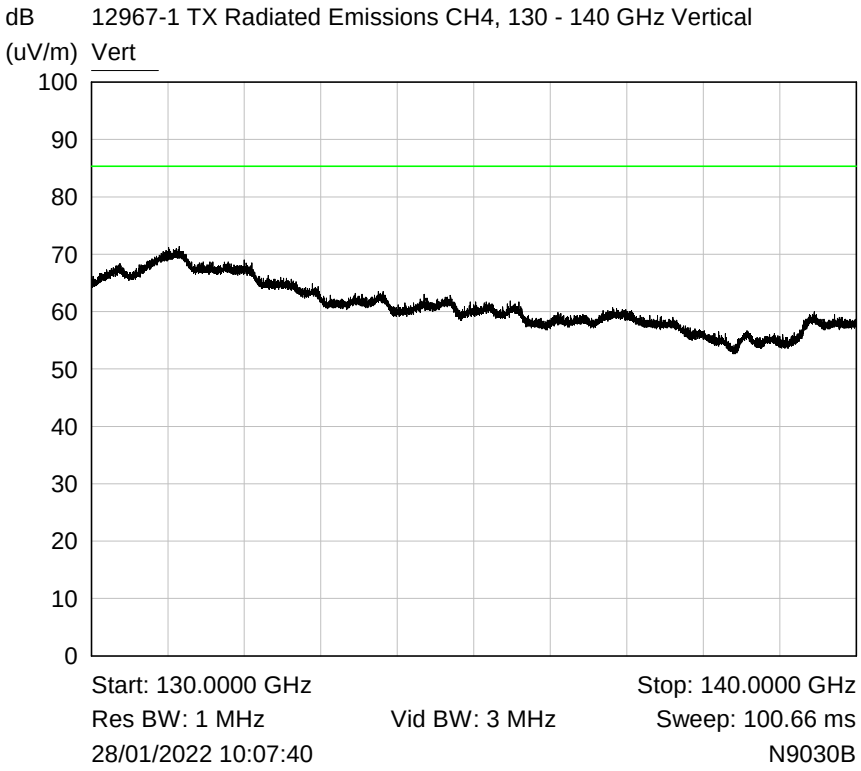


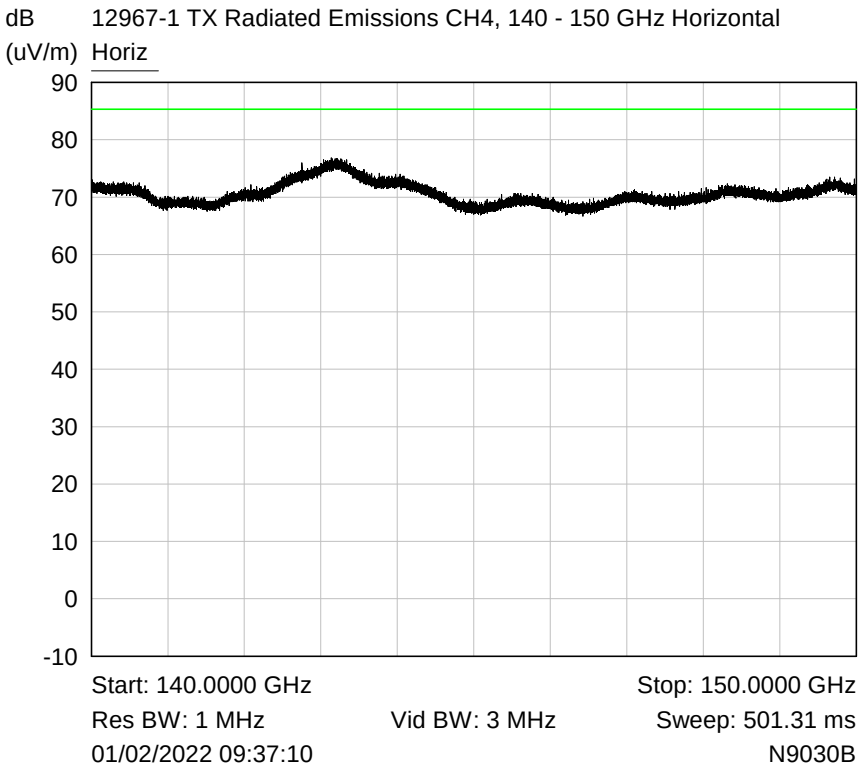


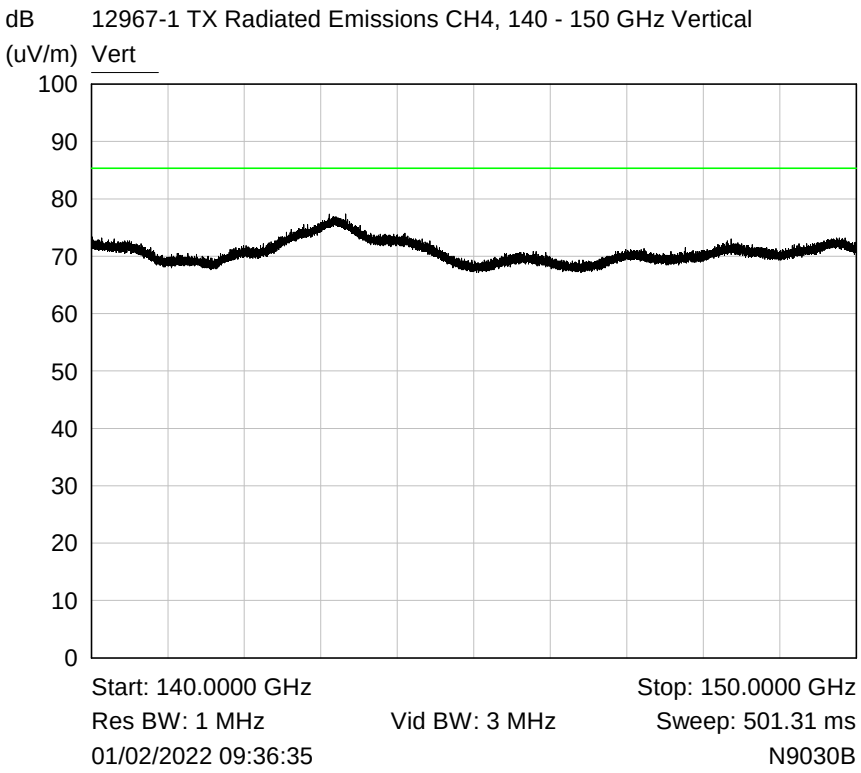


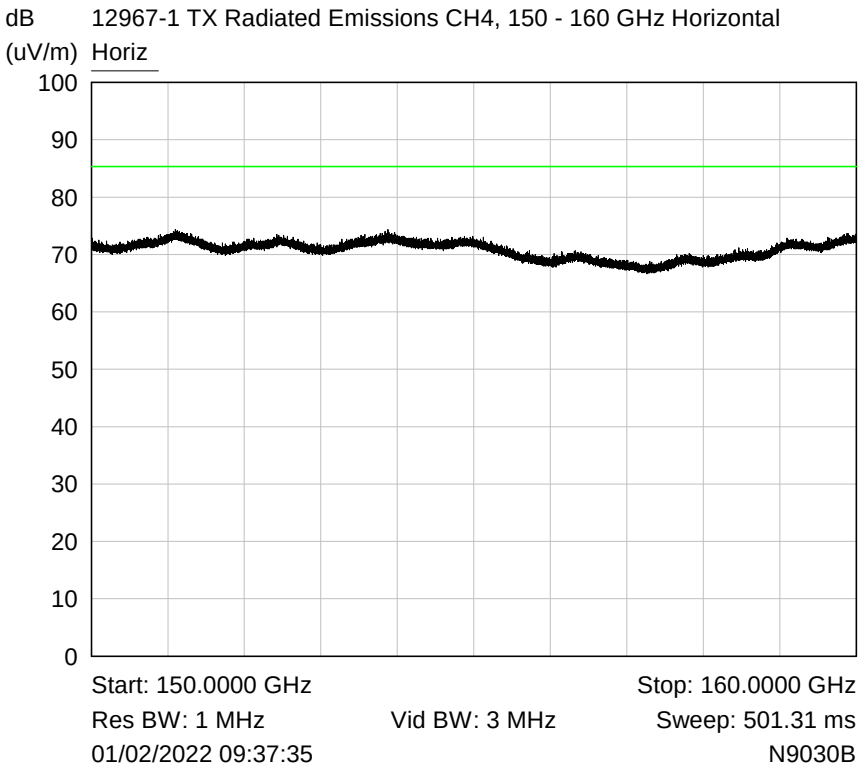


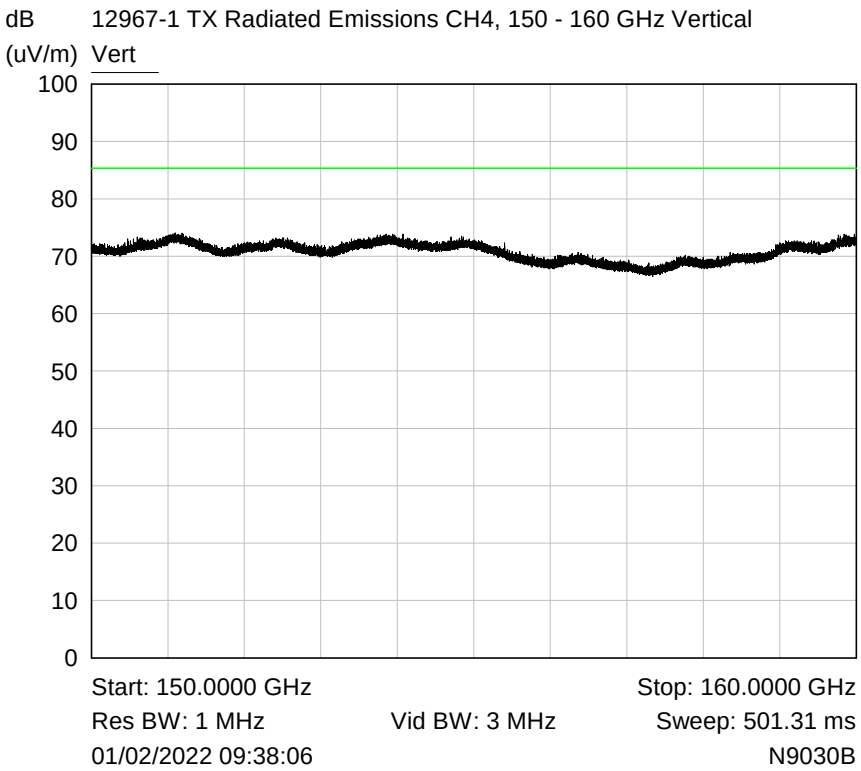


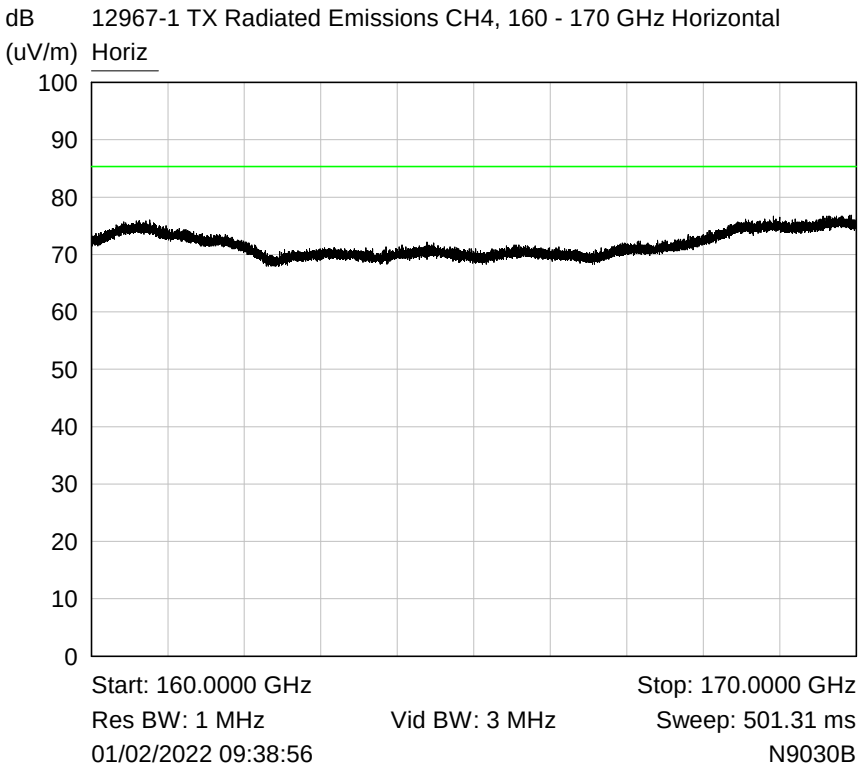


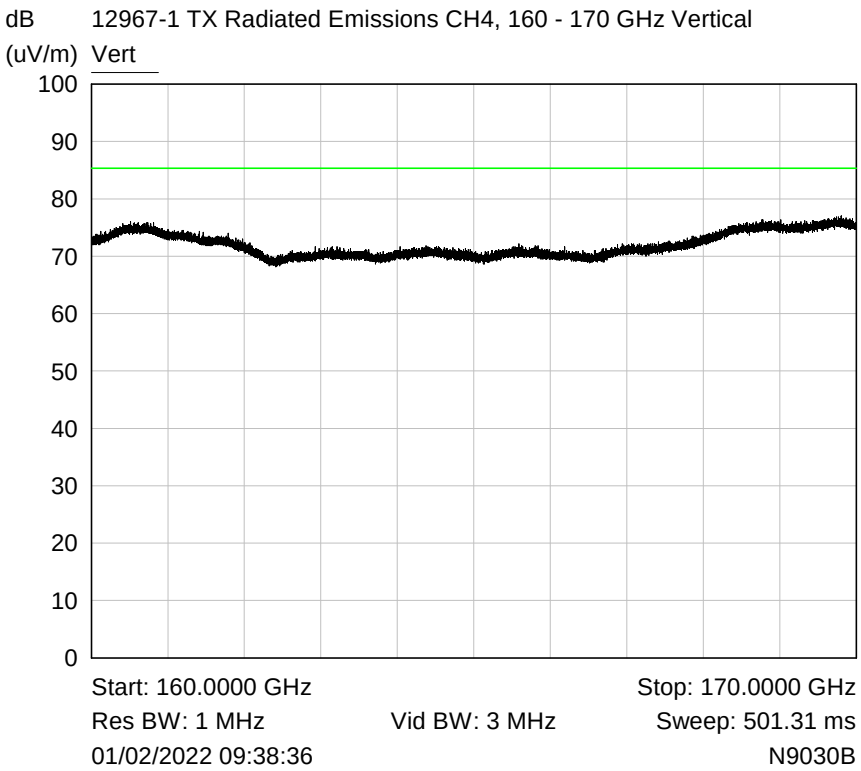


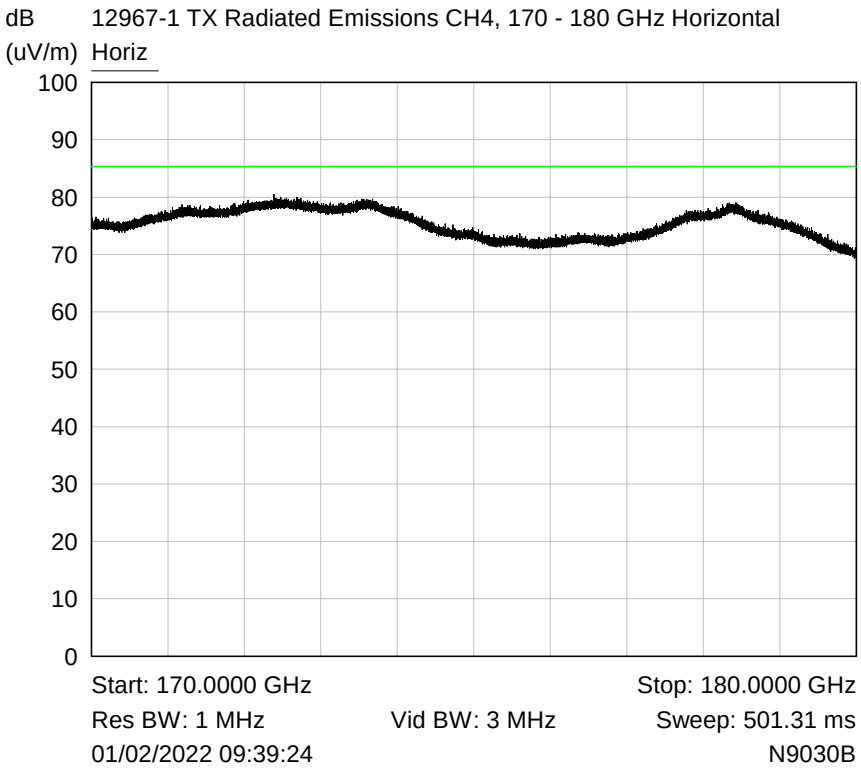


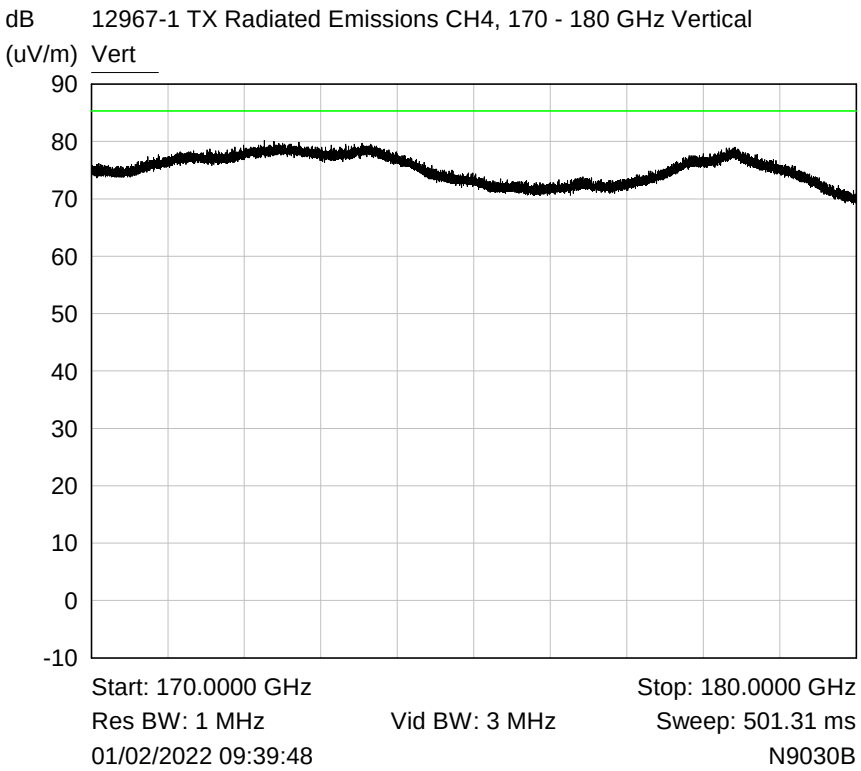


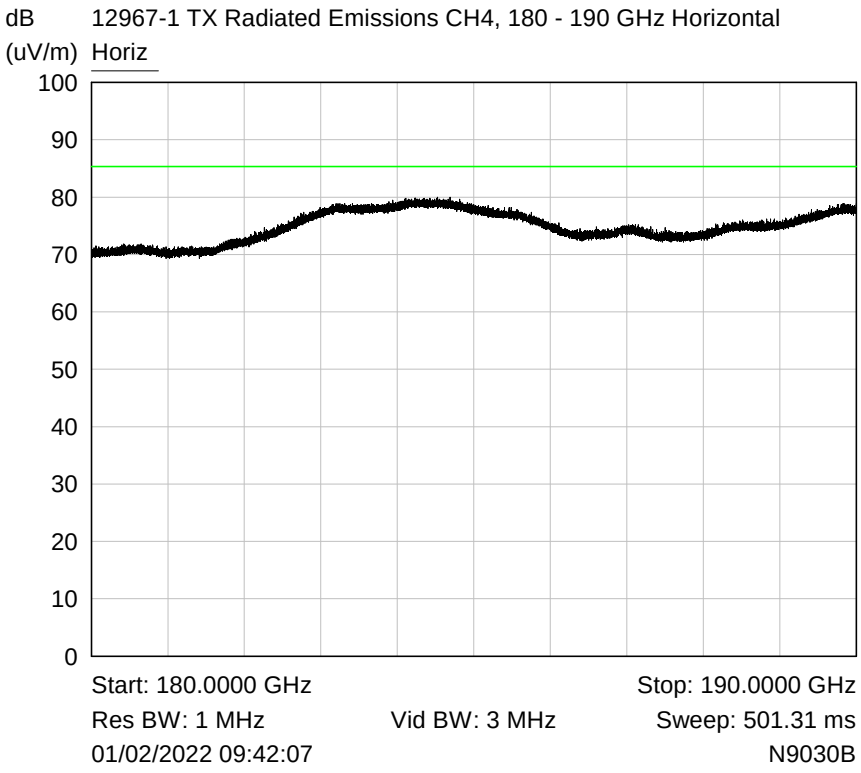


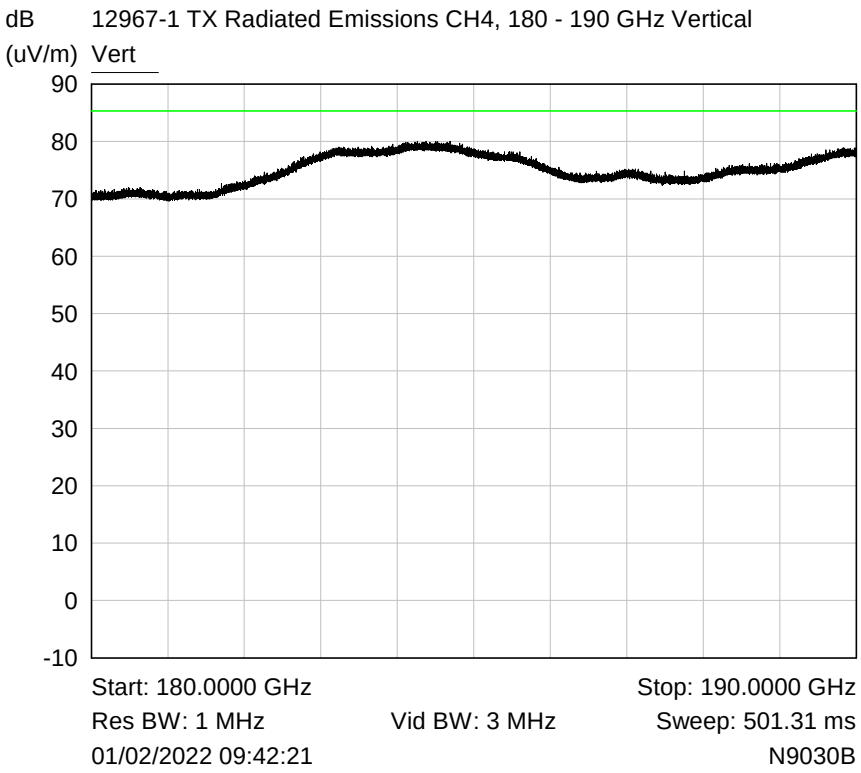


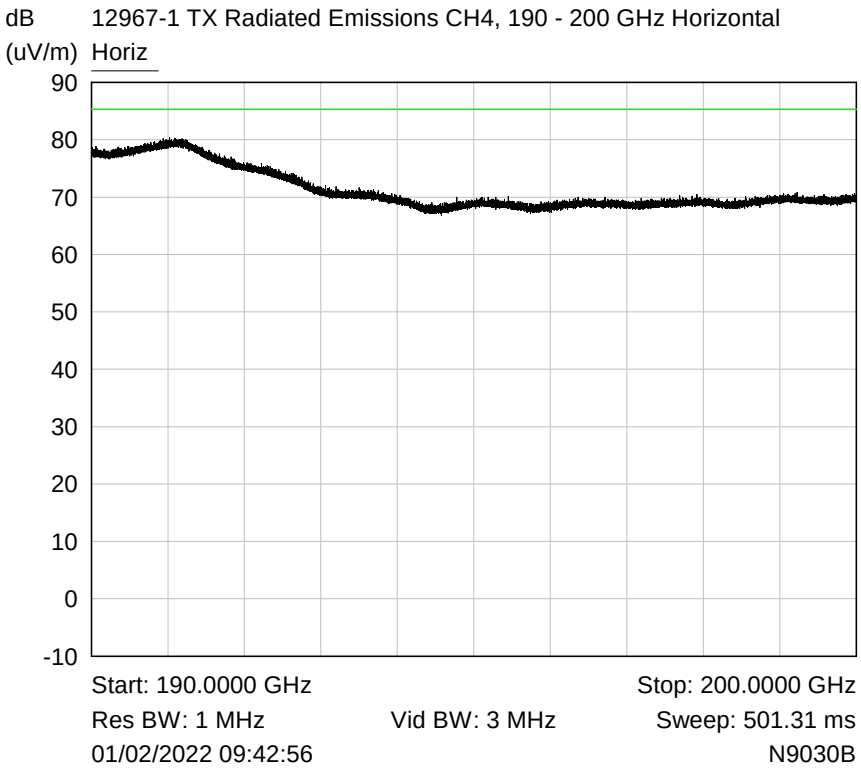


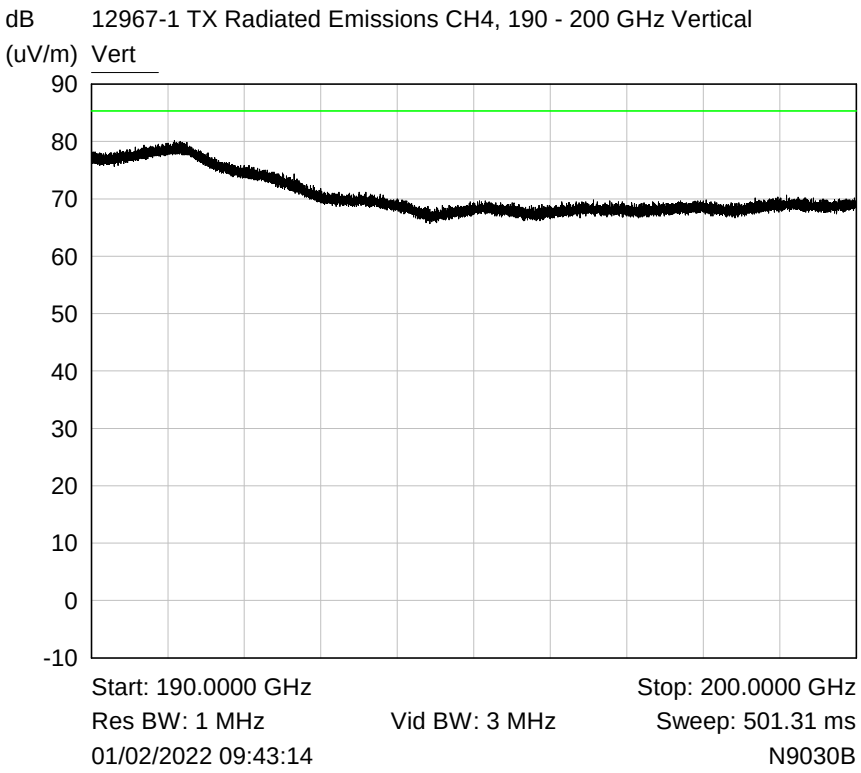






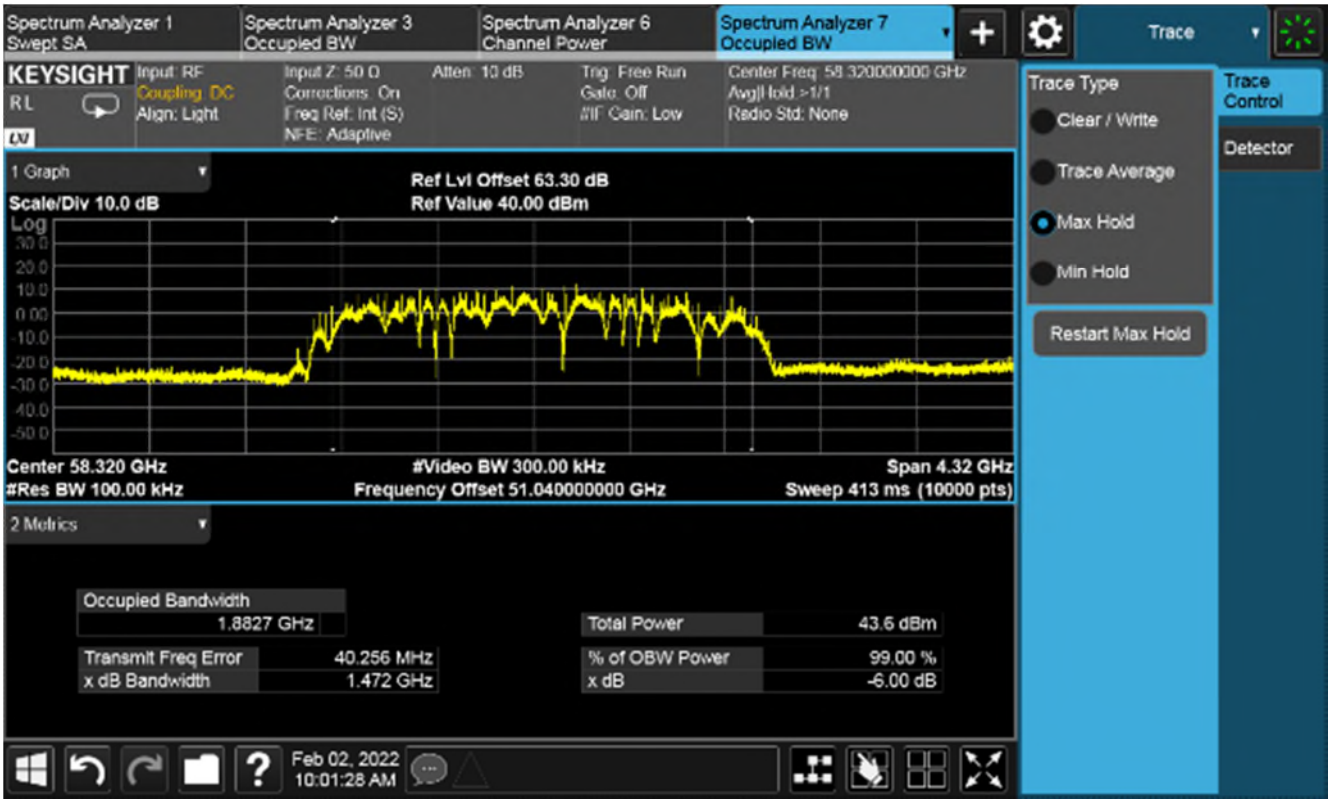






6.5 6dB Occupied bandwidth

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS0, Channel 58.32 GHz

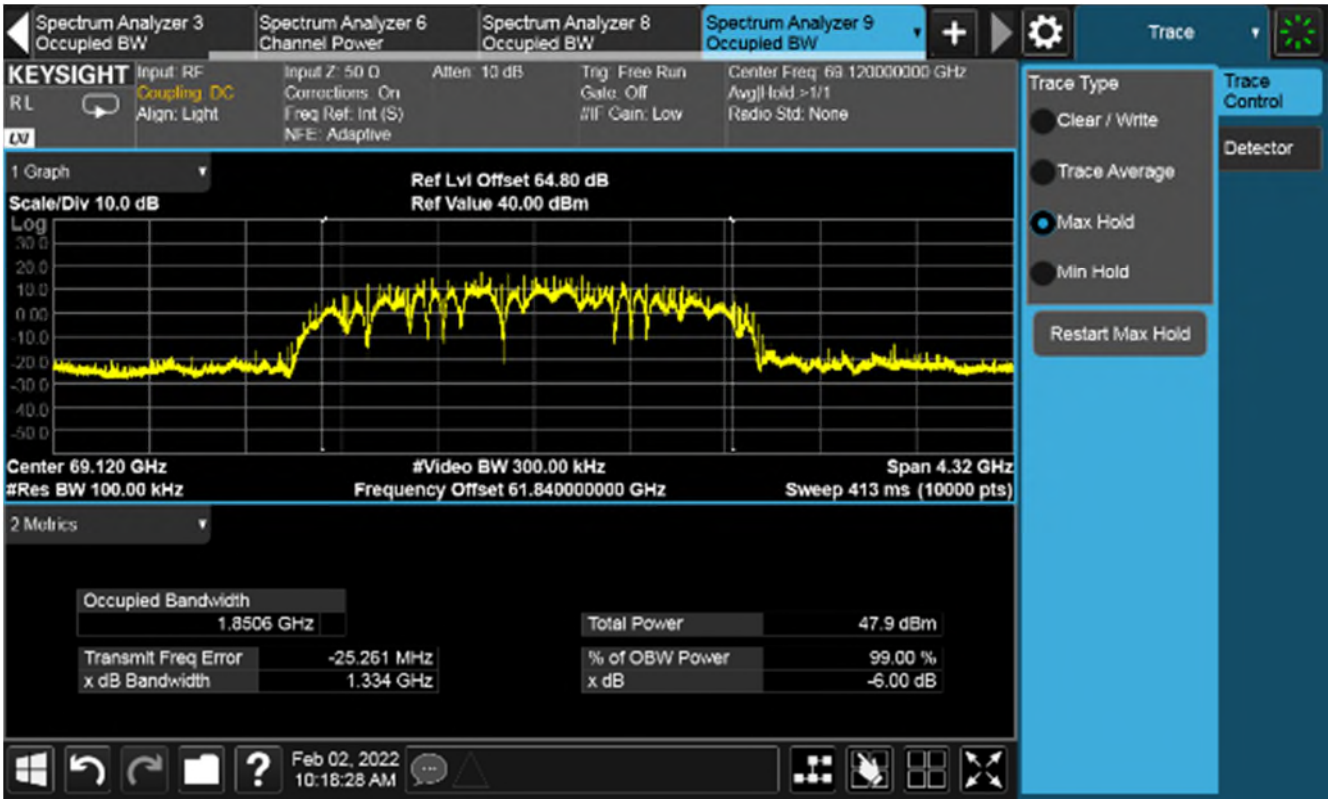


Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS0, Channel 64.8 GHz

Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS0, Channel 69.12 GHz



Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

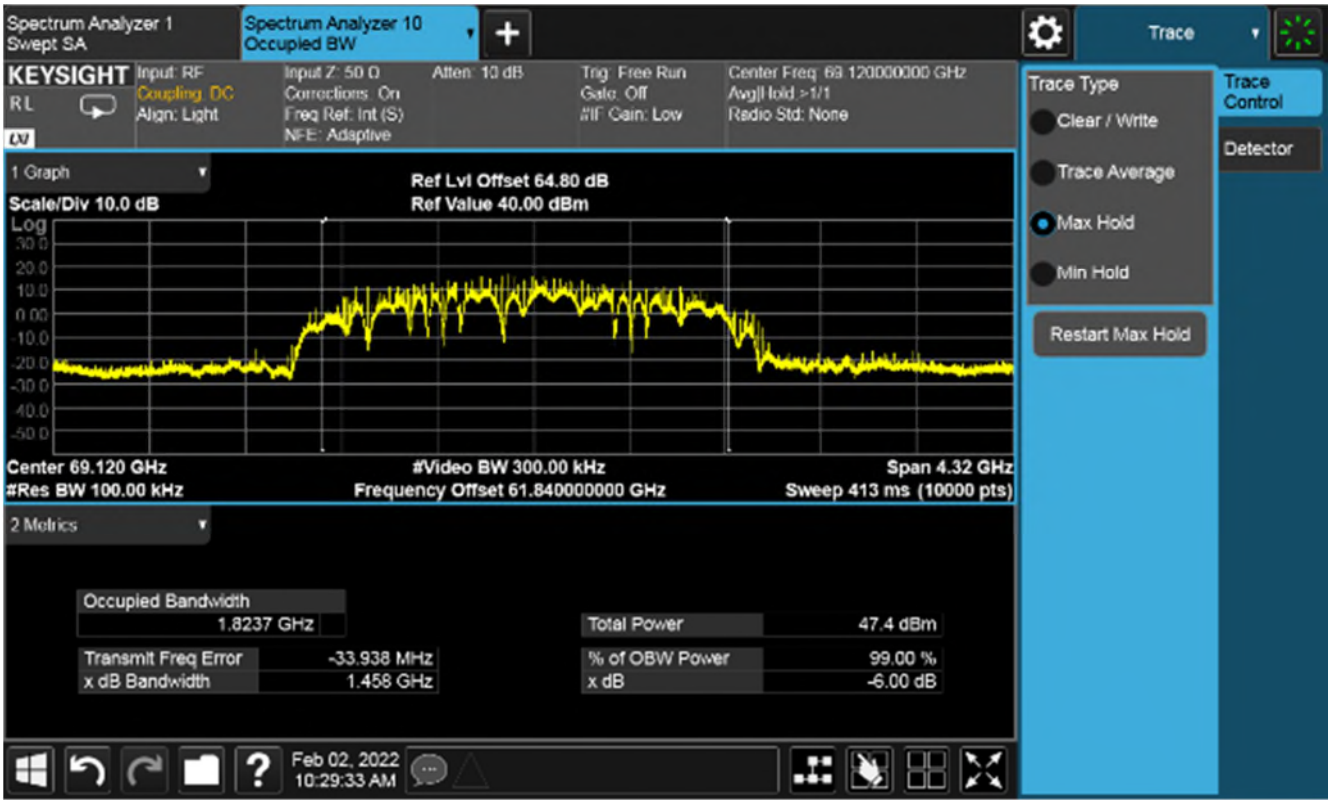
RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS0, Channel 58.32 GHz

Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS0, Channel 64.8 GHz

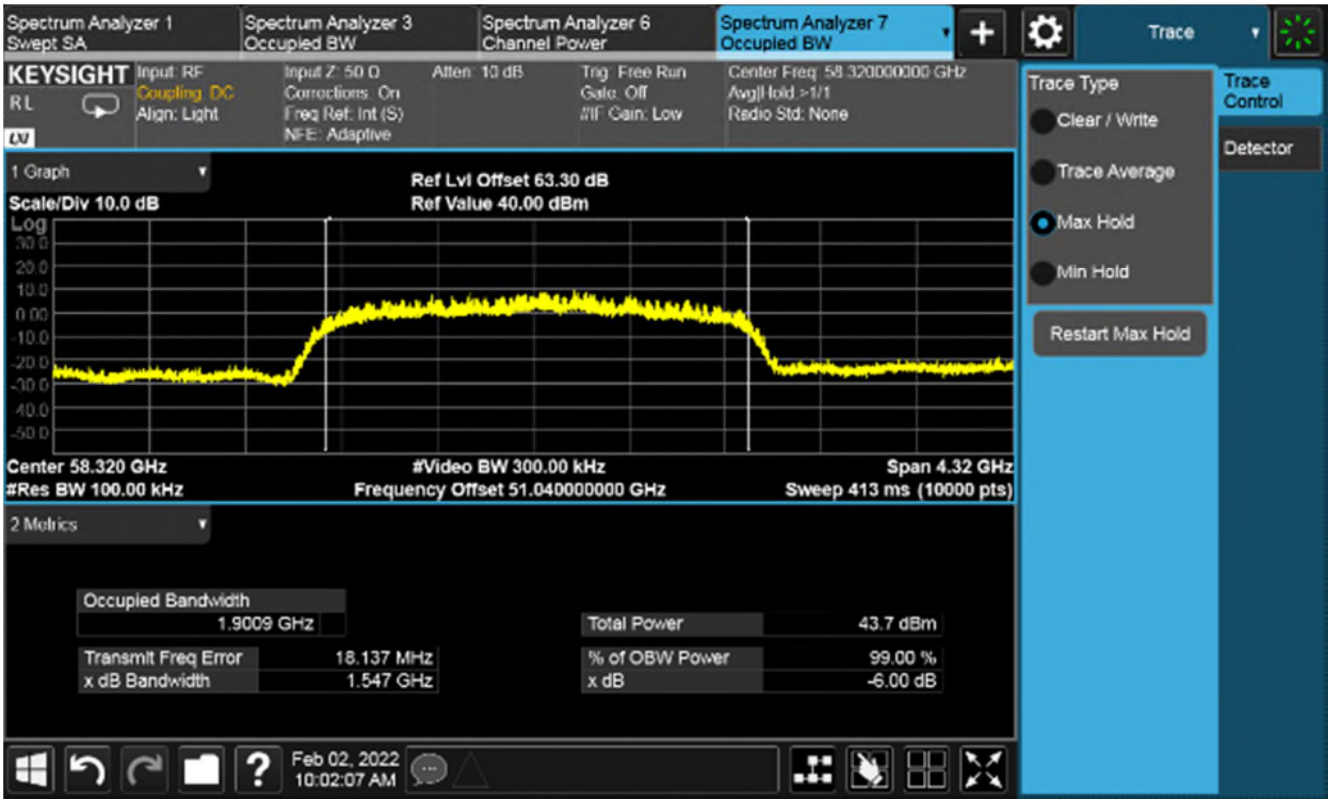
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS0, Channel 69.12 GHz



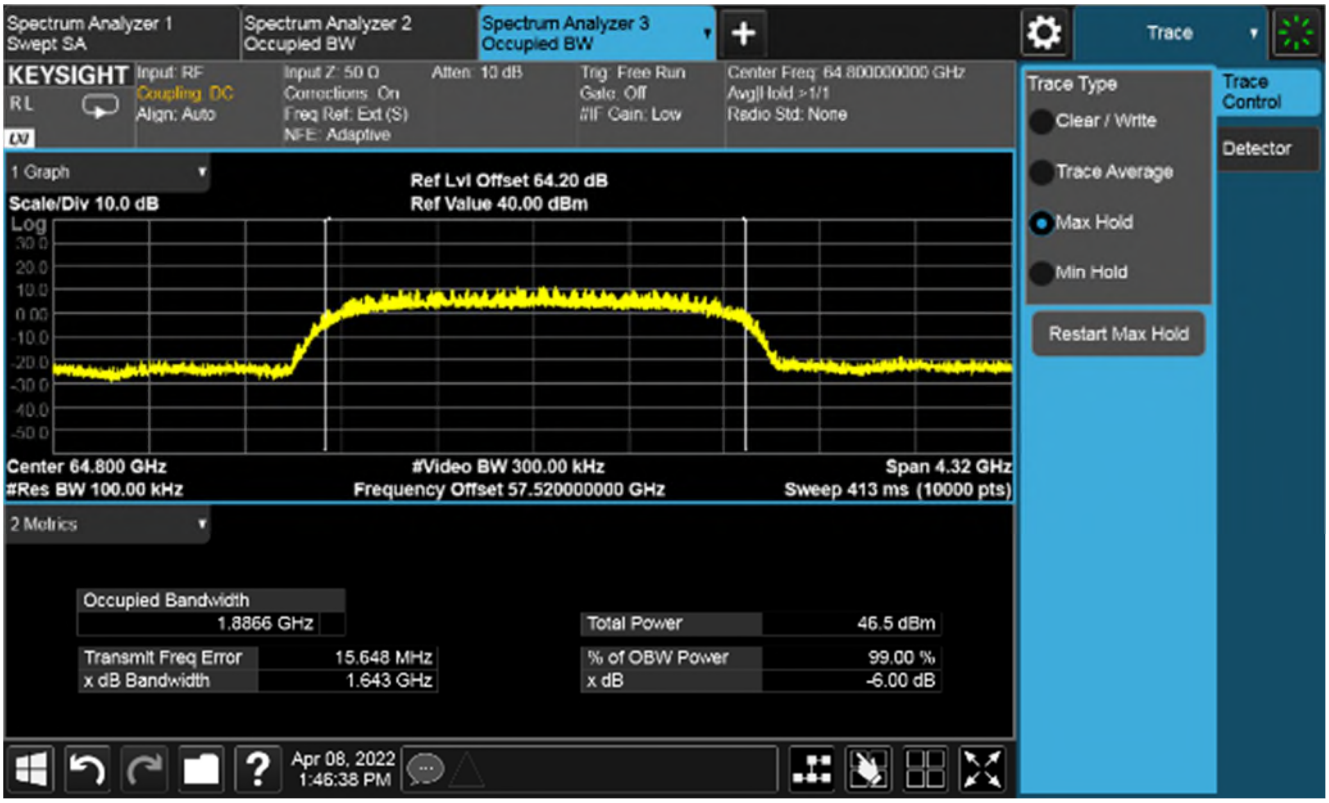
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS1, Channel 58.32 GHz



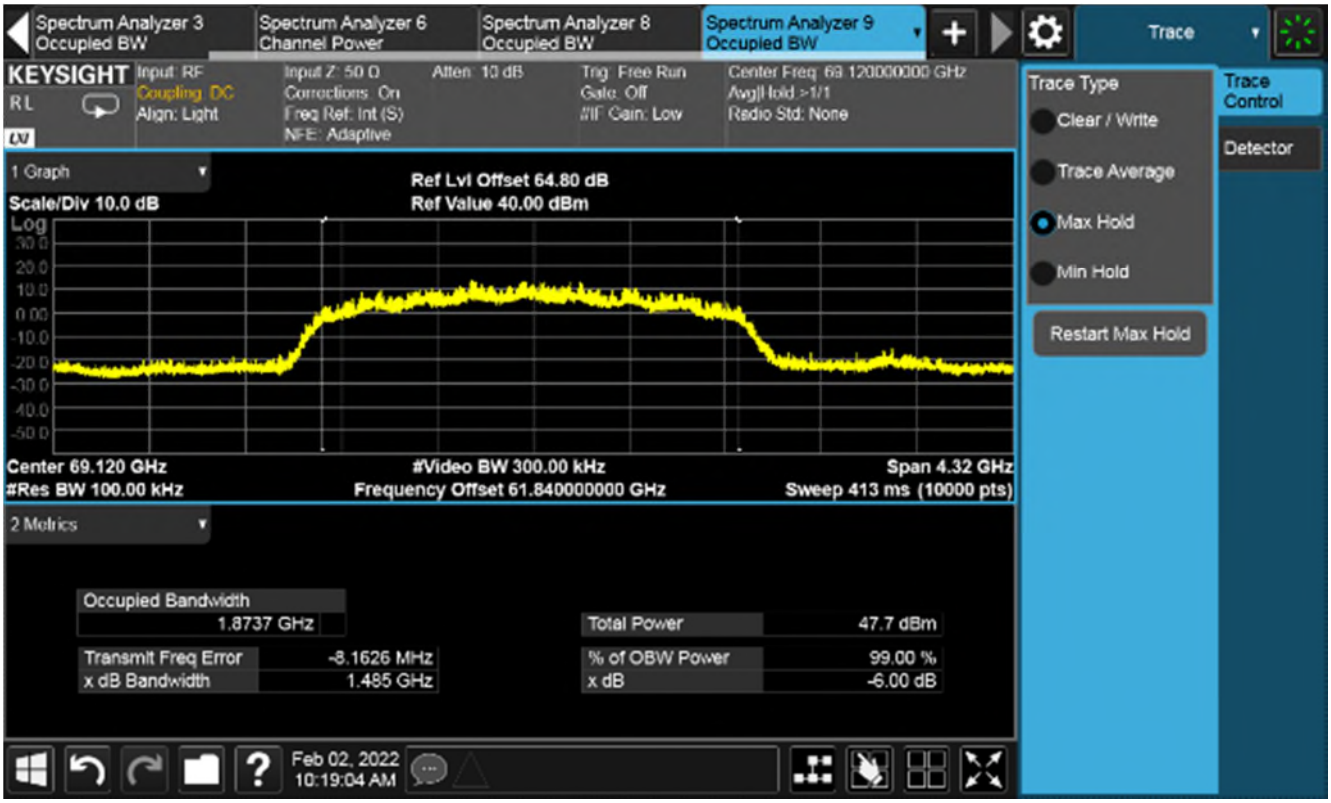
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS1, Channel 64.8 GHz



Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS1, Channel 69.12 GHz

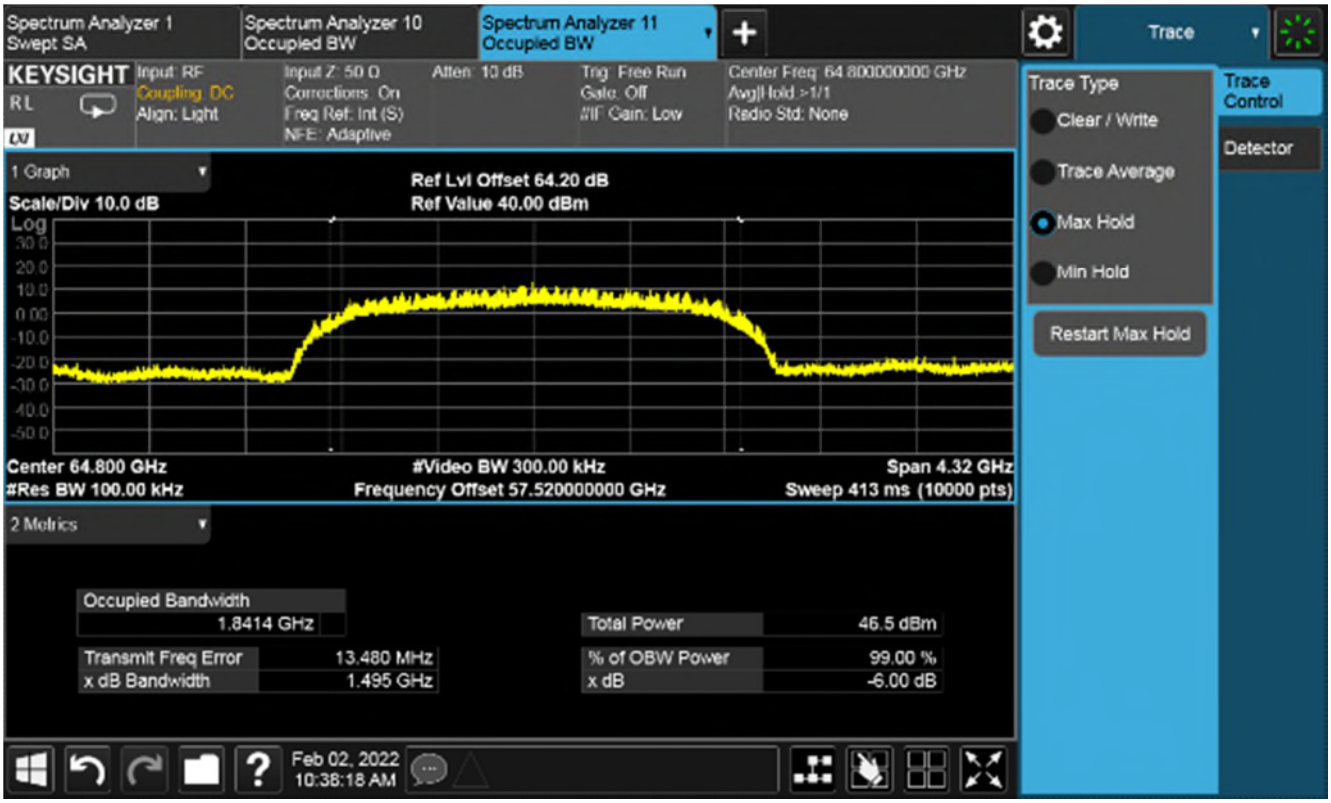


Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS1, Channel 58.32 GHz

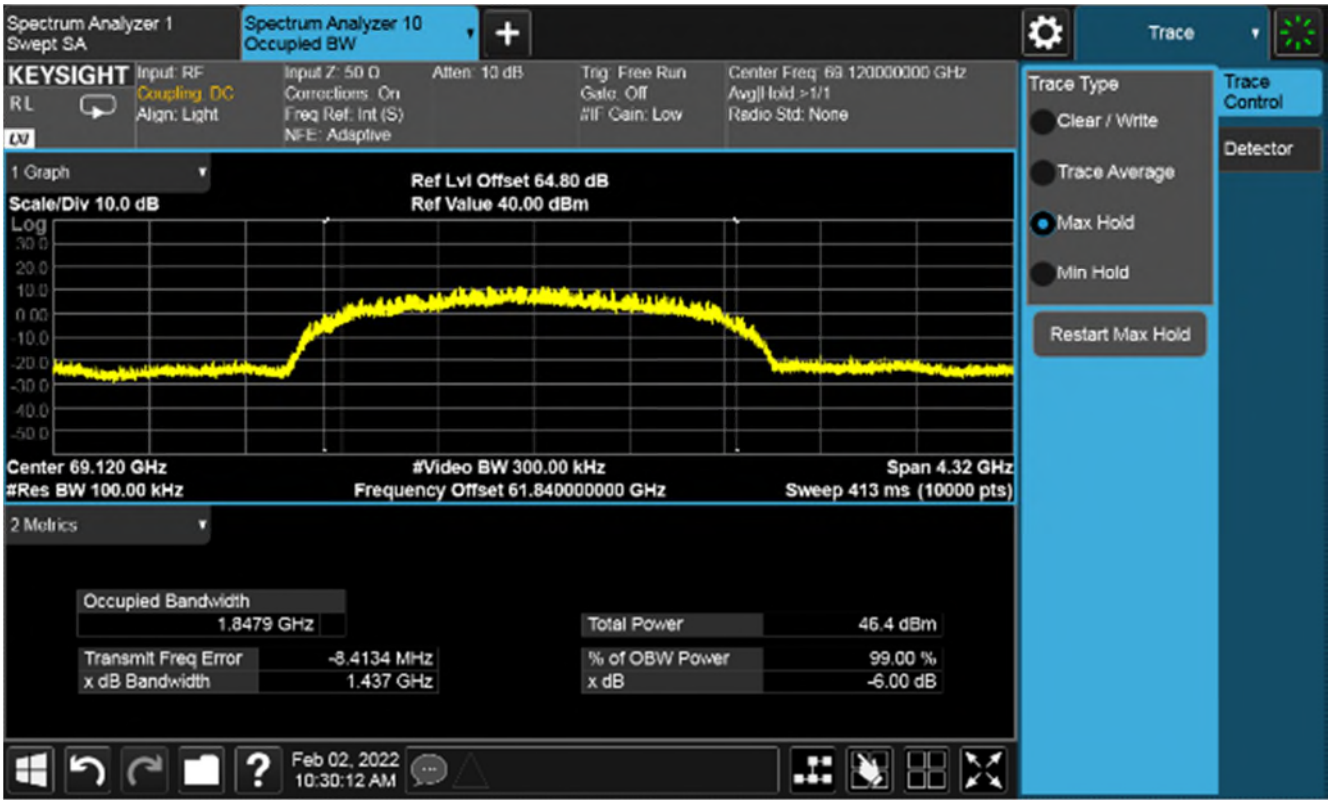
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS1, Channel 64.8 GHz



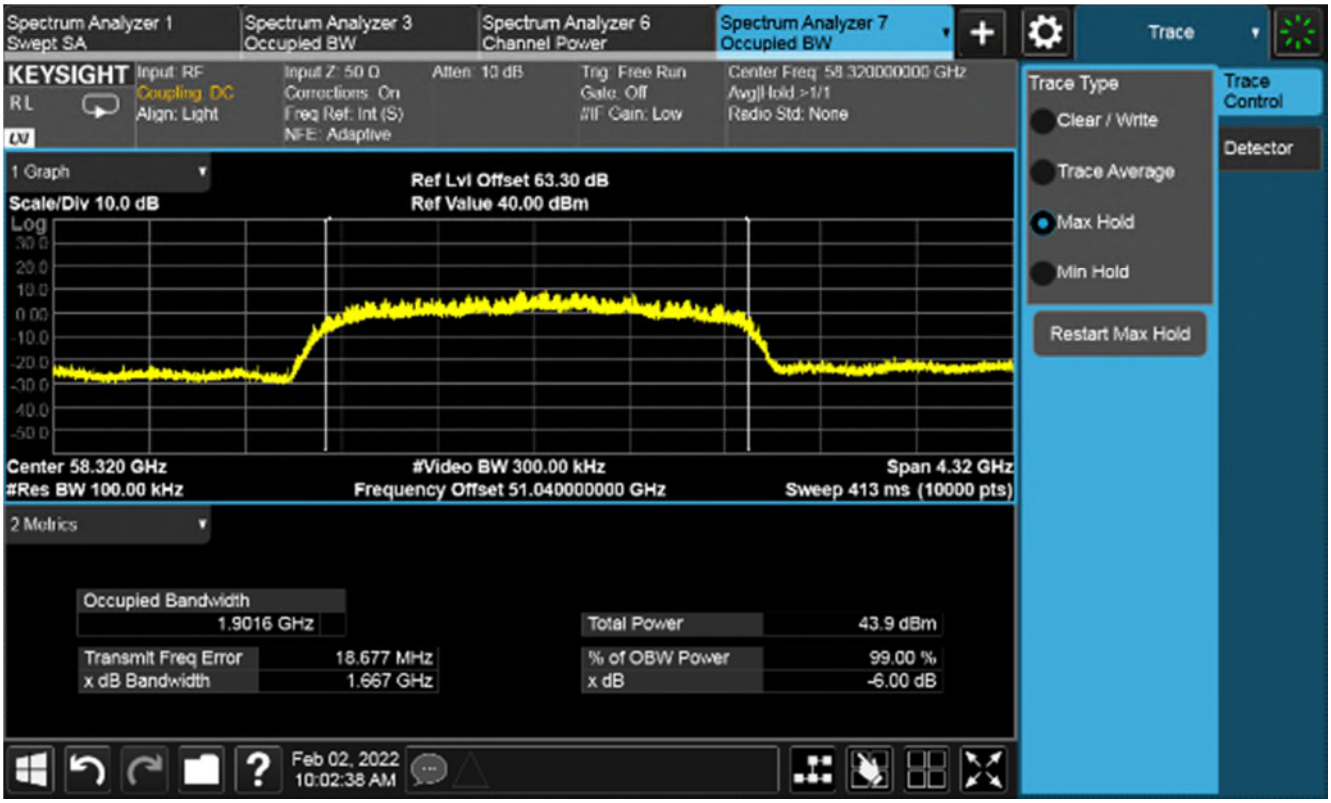
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS1, Channel 69.12 GHz



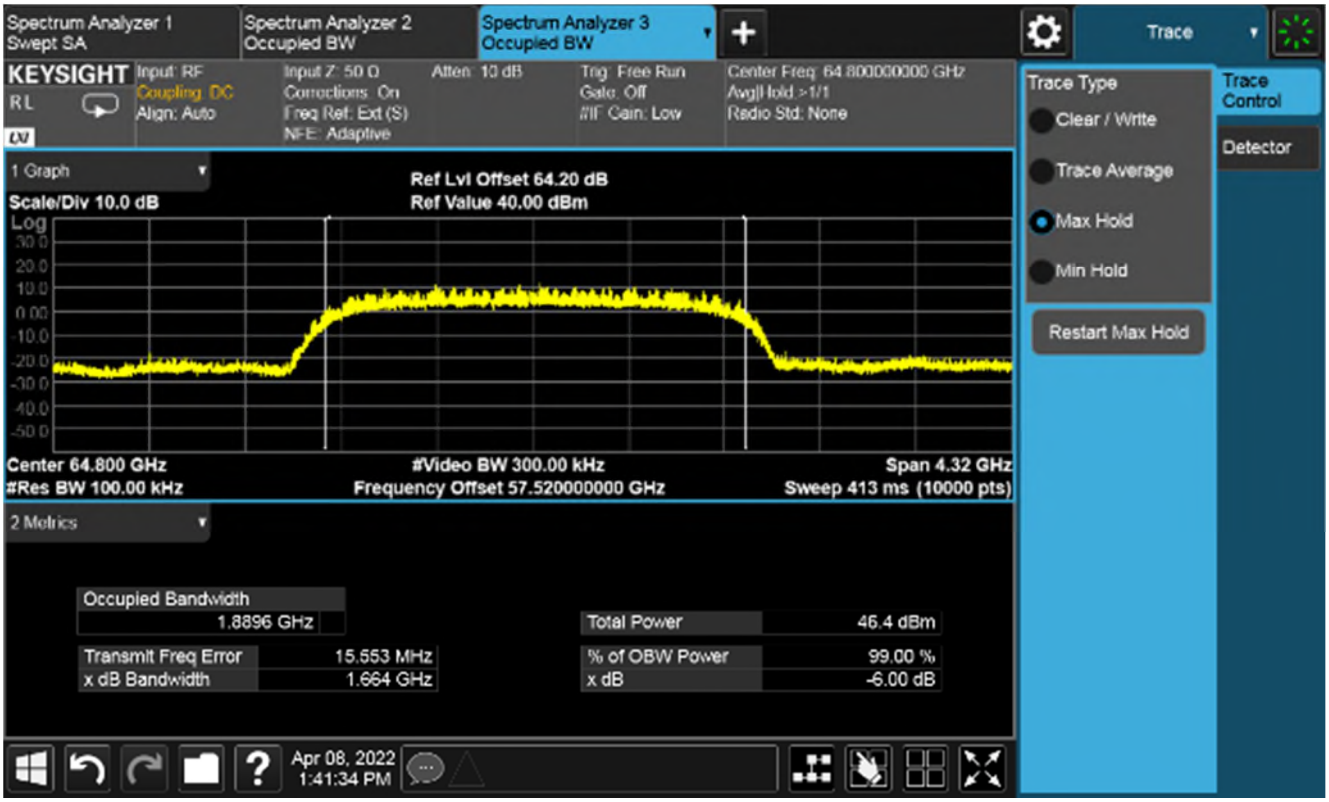
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS2, Channel 58.32 GHz



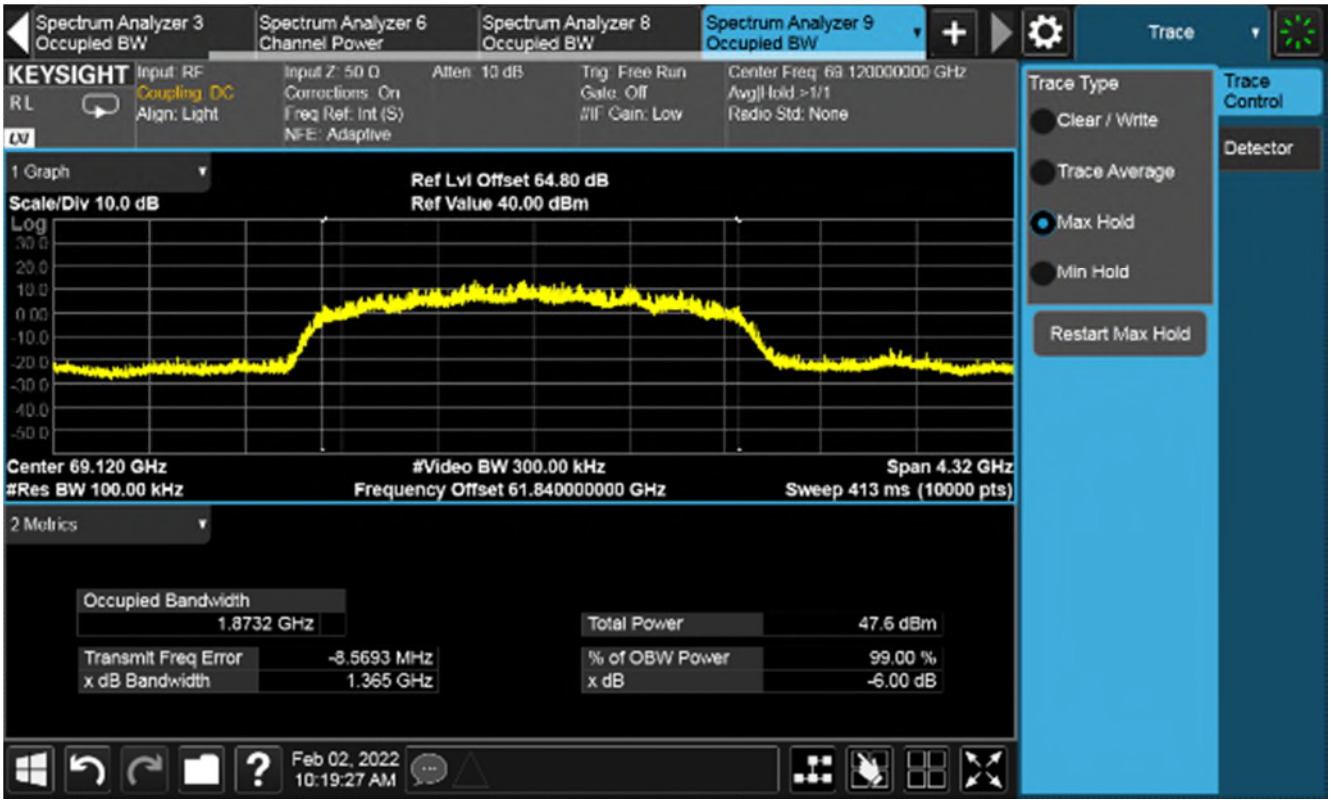
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS2, Channel 64.8 GHz



Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS2, Channel 69.12 GHz

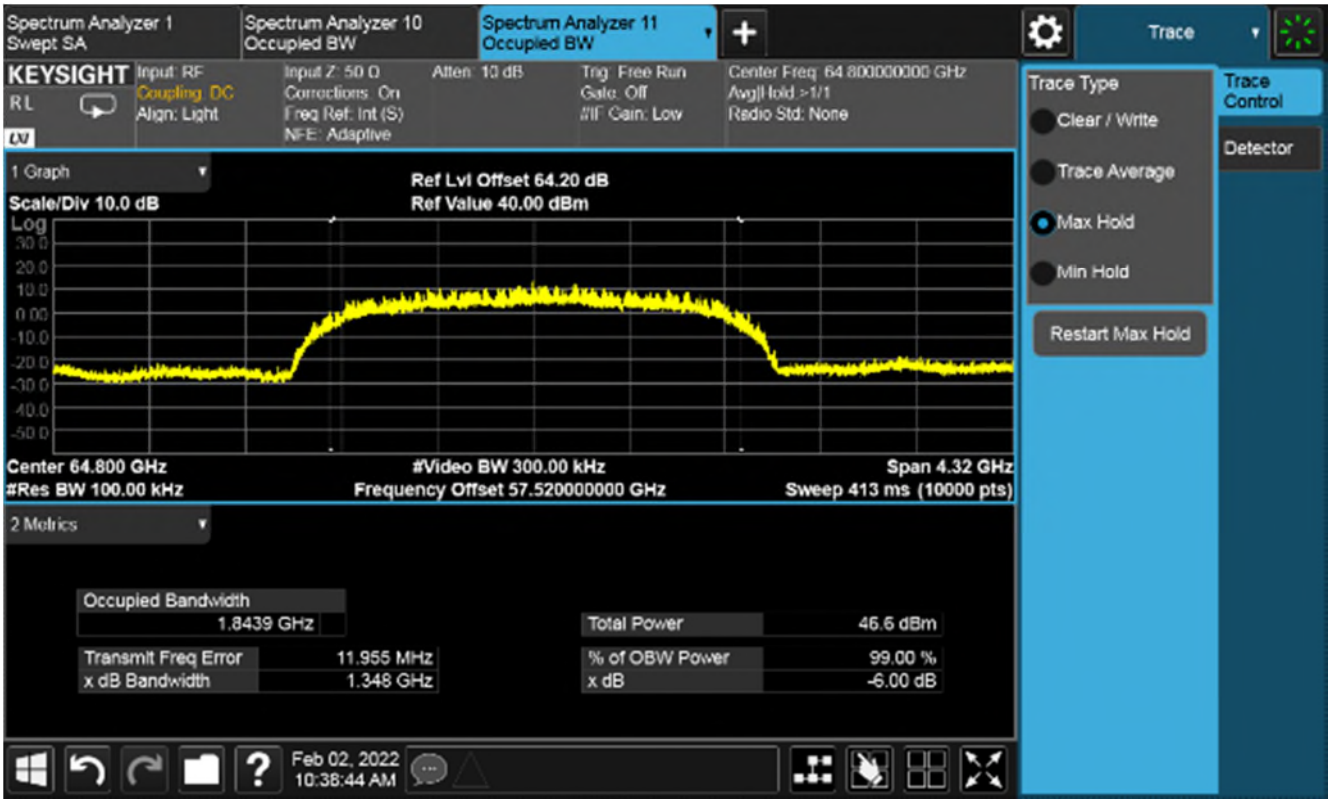


Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS2, Channel 58.32 GHz

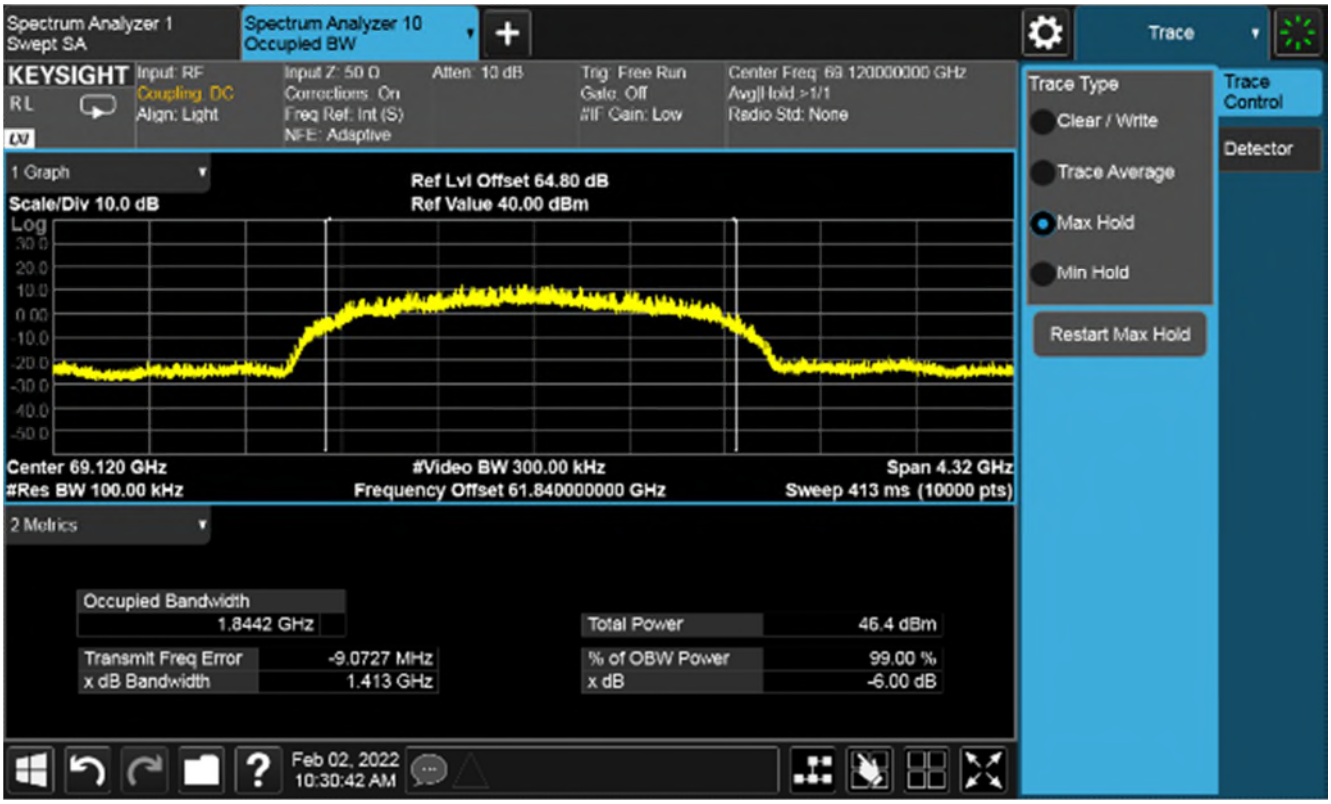
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS2, Channel 64.8 GHz



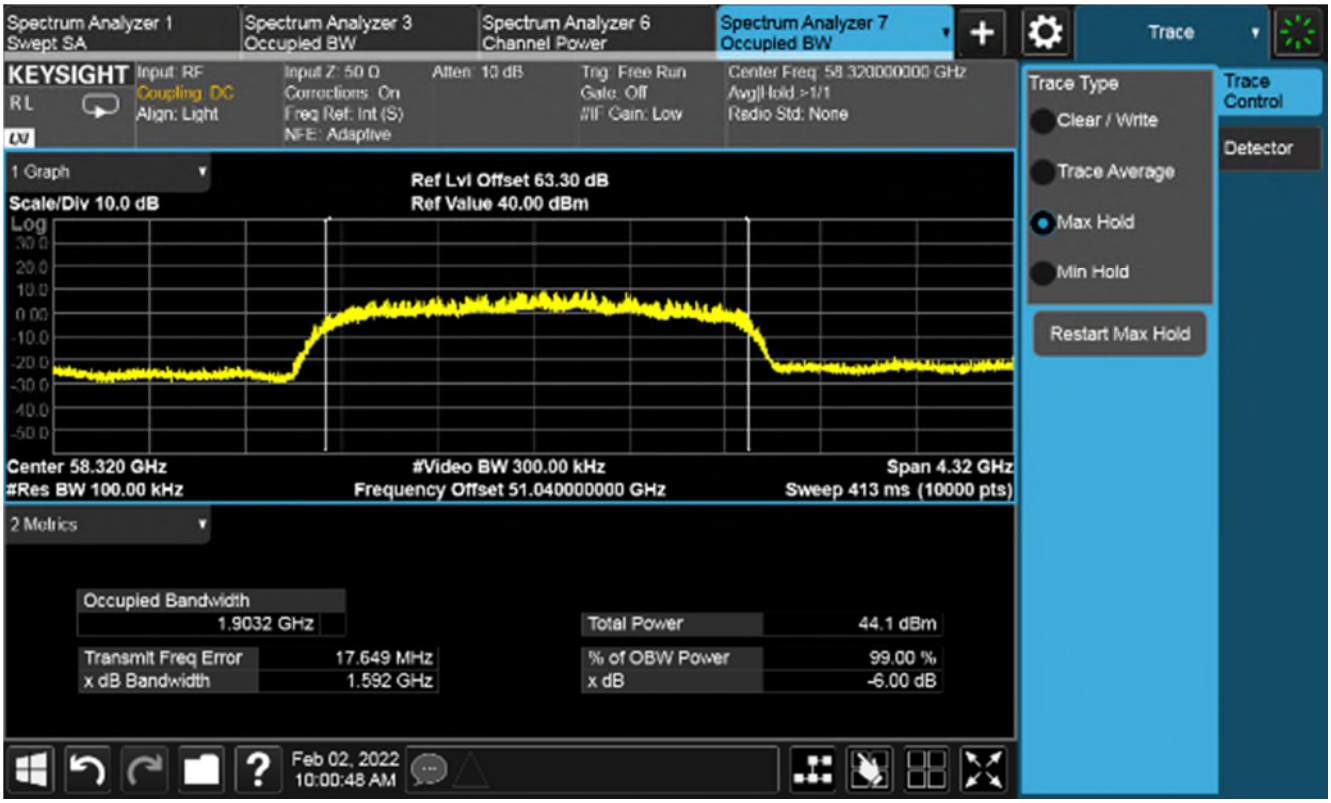
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS2, Channel 69.12 GHz



Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS3, Channel 58.32 GHz

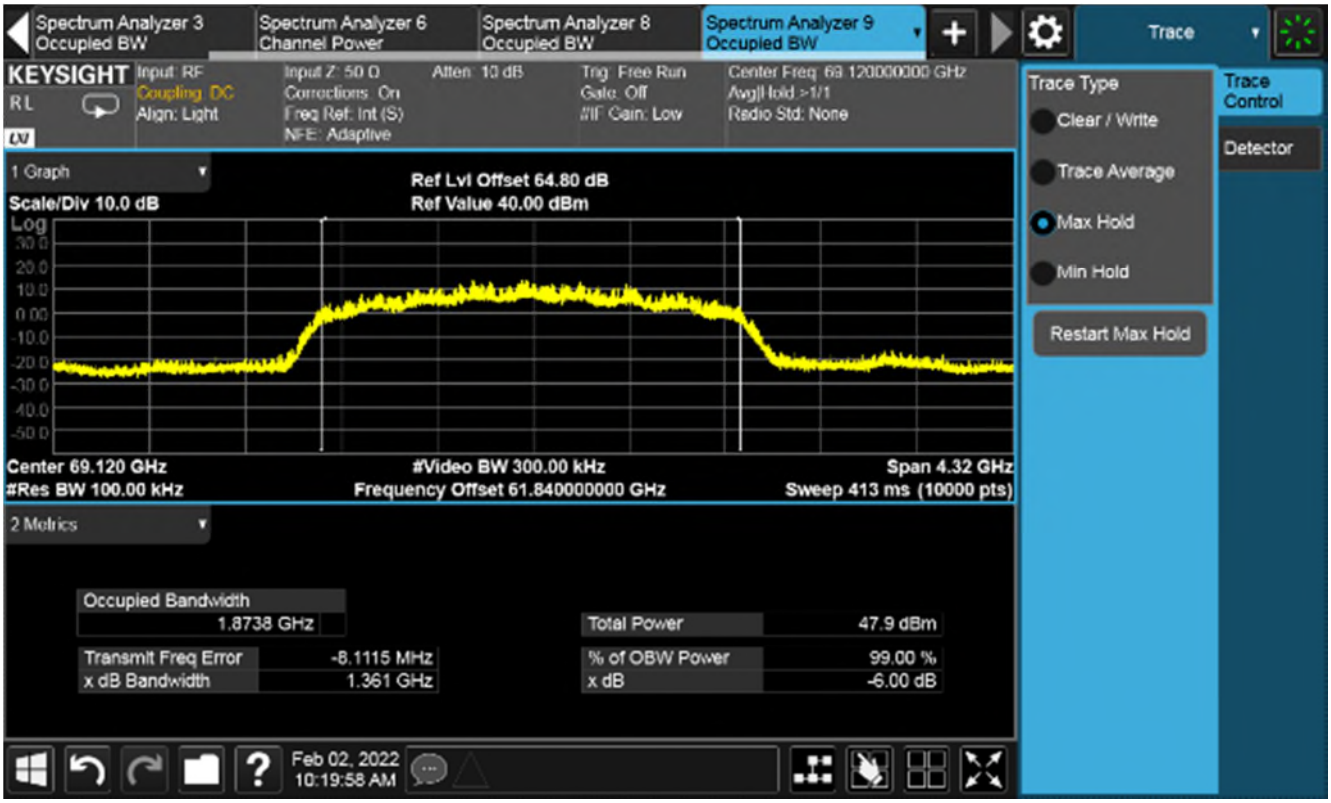


Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS3, Channel 64.8 GHz

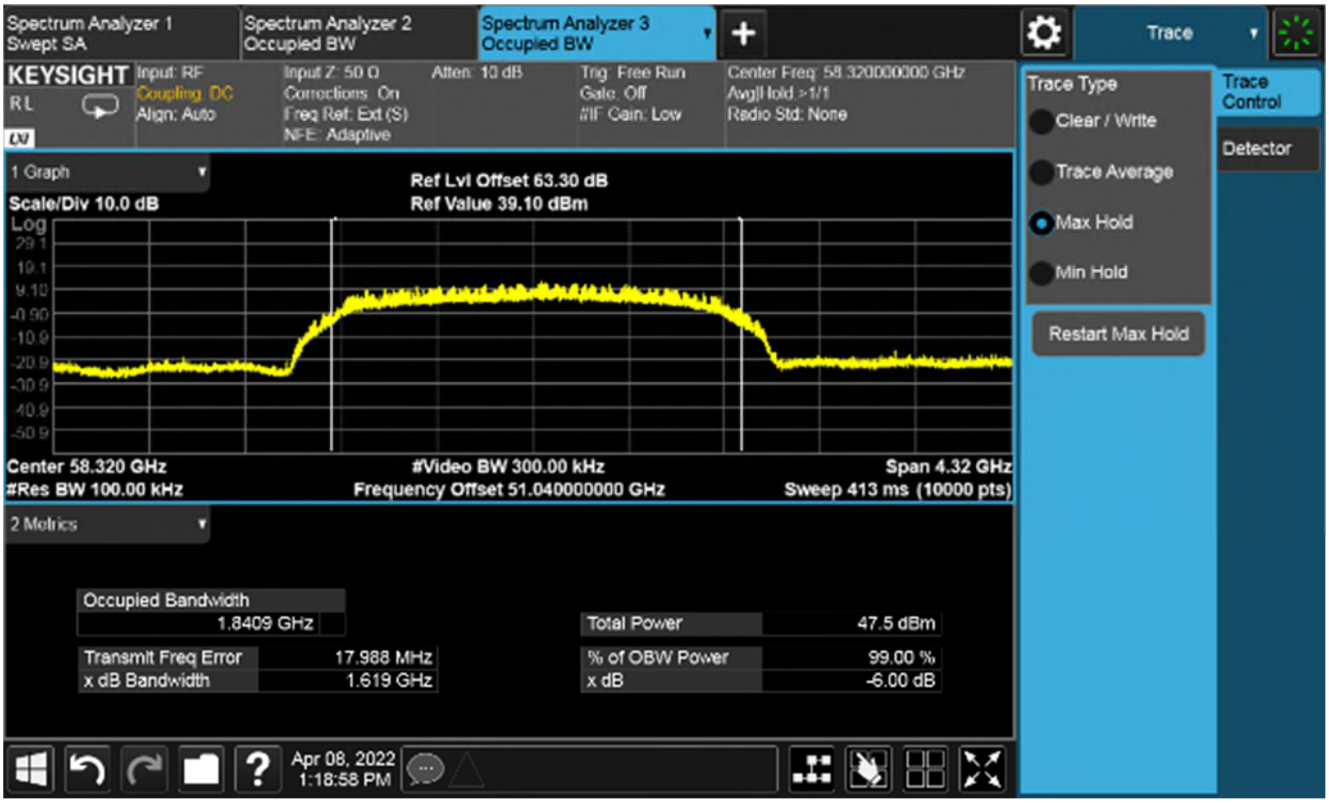
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS3, Channel 69.12 GHz



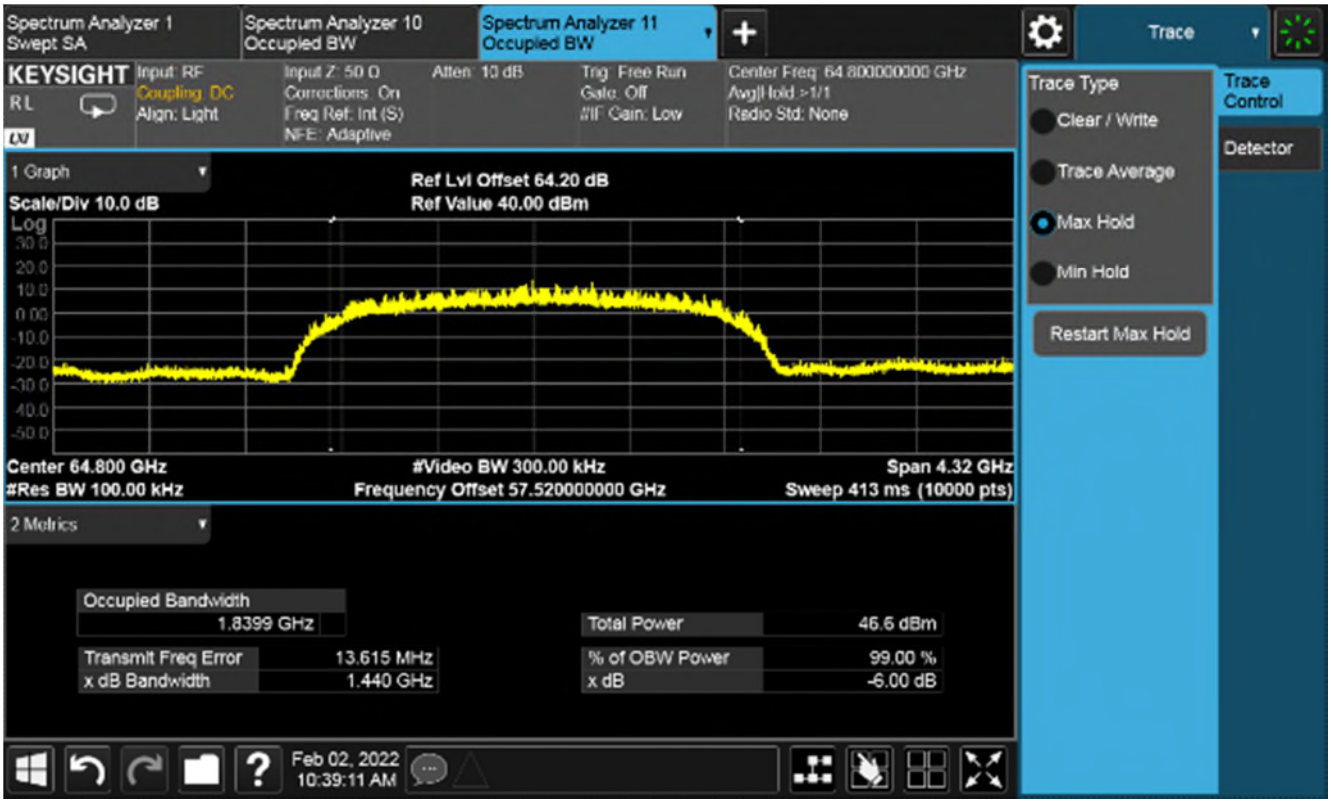
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS3, Channel 58.32 GHz



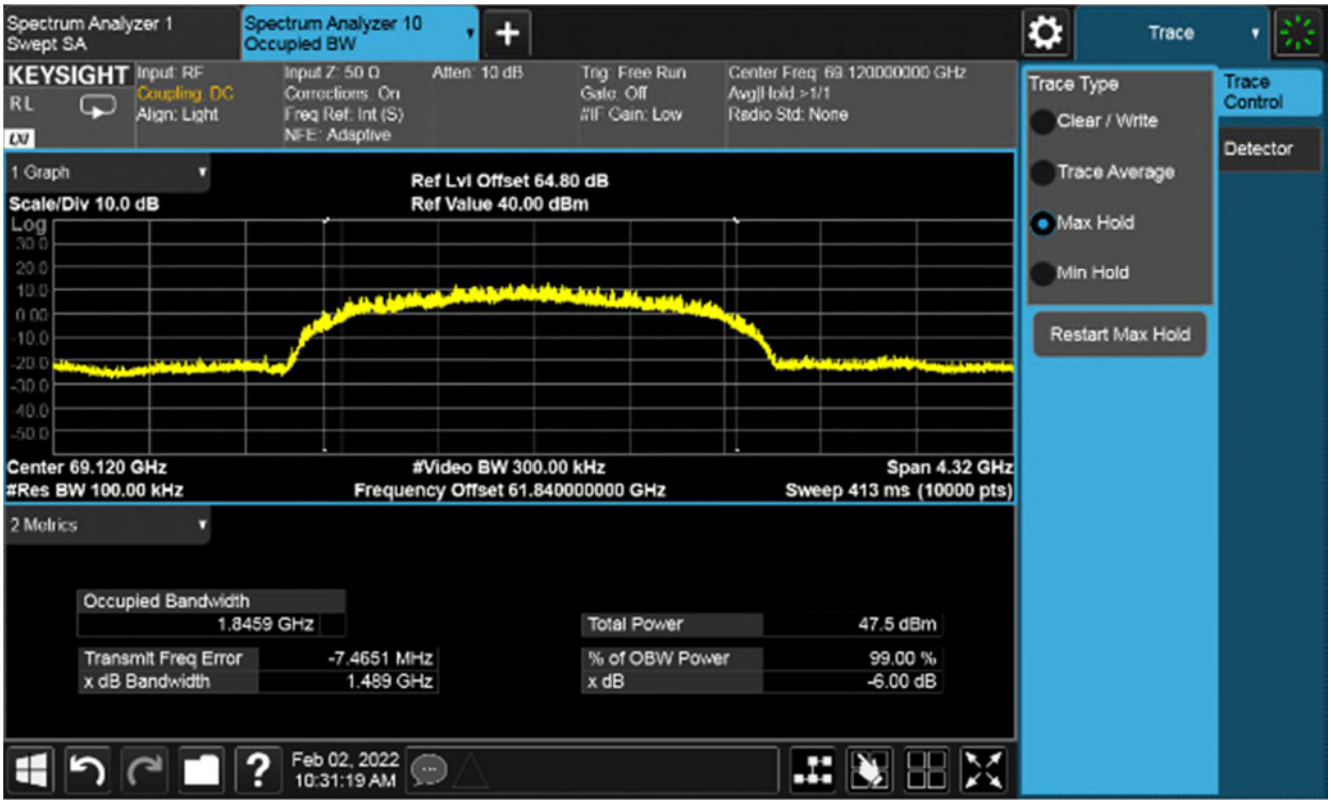
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS3, Channel 64.8 GHz



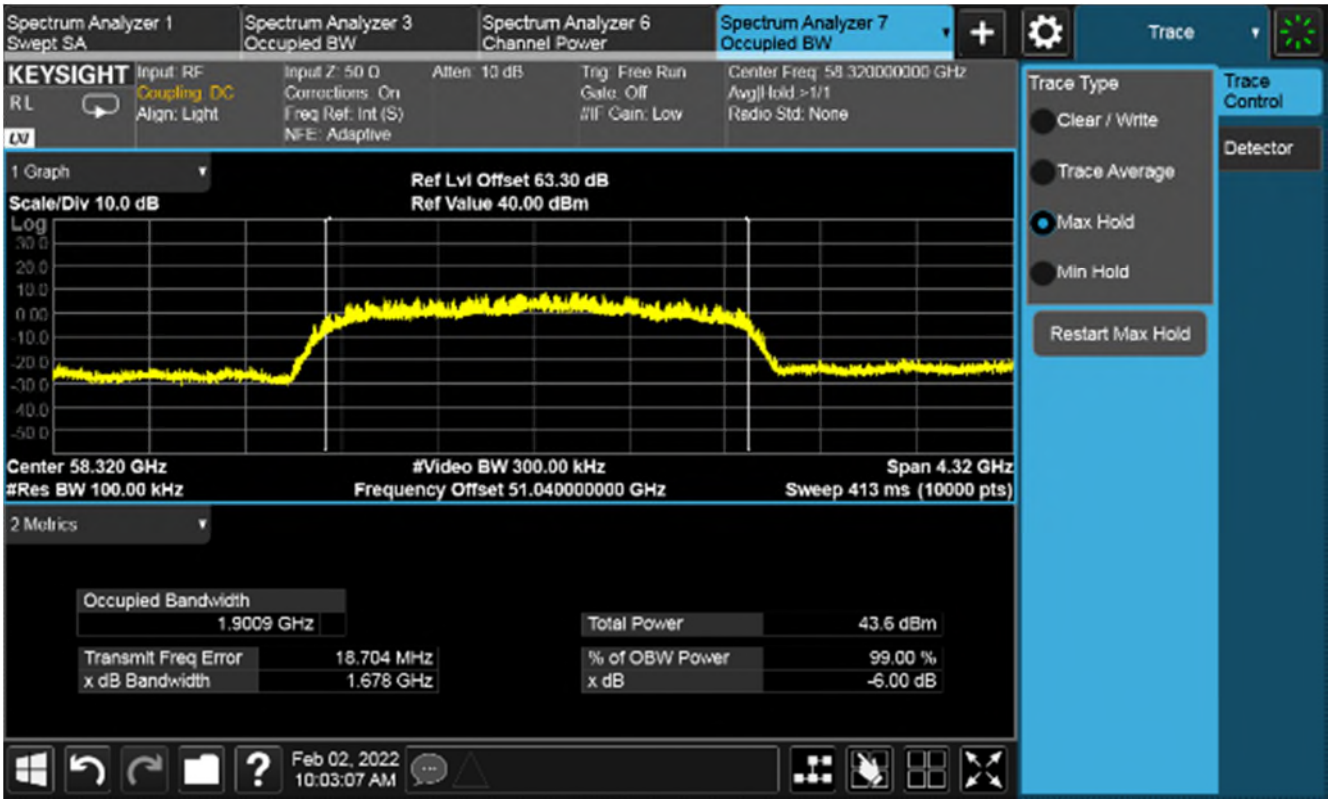
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS3, Channel 69.12 GHz



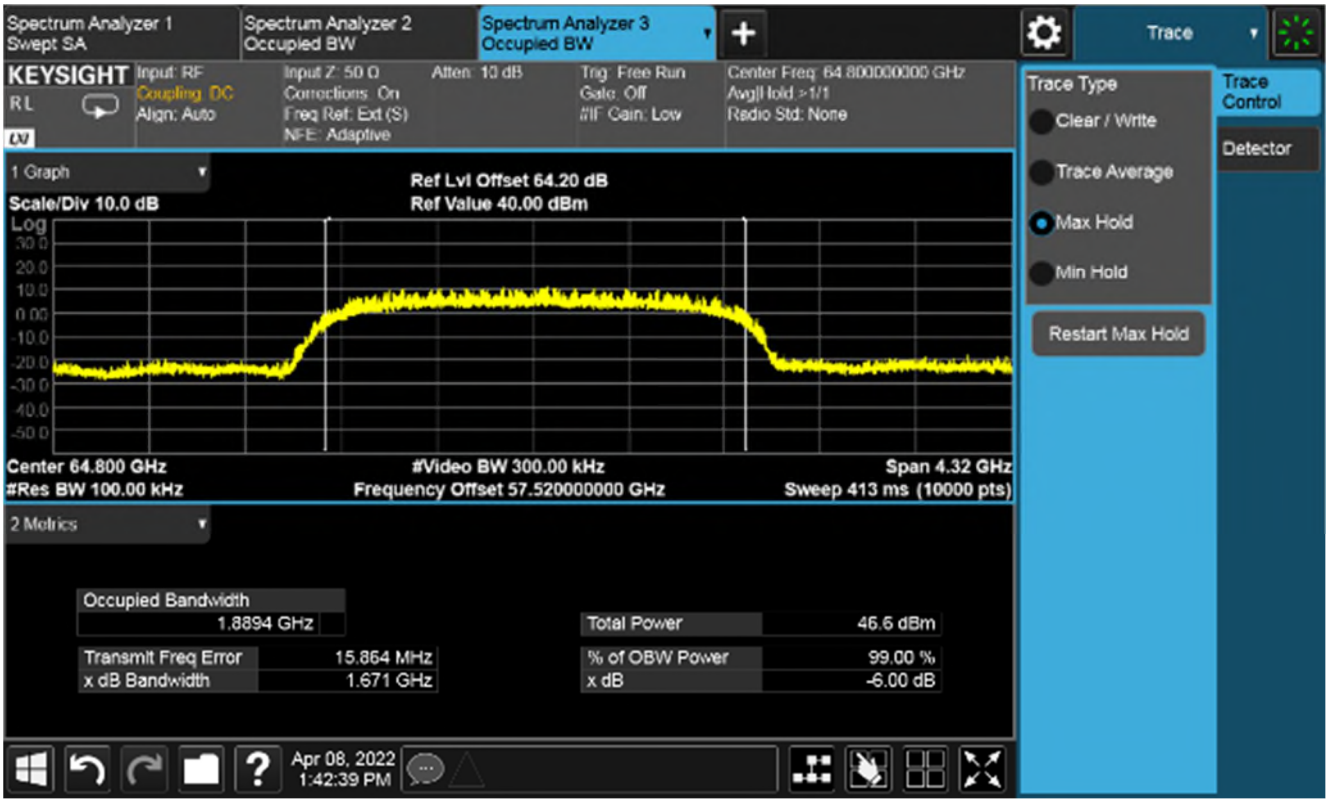
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS4, Channel 58.32 GHz



Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

RF Parameters: Band 57-71 GHz (Radio 0), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS4, Channel 64.8 GHz



Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts