Radio Test Report

Blu Wireless Technology Ltd

Degas Train Unit

TN201SC

TTU (TN201SP) used in conjunction with an NPU (TN001XC)

47 CFR Part 15.255 Effective Date 1st October 2020
DXX: Part 15 Low Power Communication Device Transmitter
Test Date: 31st January 2022 to 28th February 2022
Report Number: 02-12968-1-22 Issue 03
Supersedes report 02-12968-1-22 Issue 02

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Certificate of Test 12968-1

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 Train Unit
Model Number:	TN201SC-B TTU (TN201SP) used in conjunction with an NPU (TN001XC)
Unique Serial Number:	TN201A002446 (In-train mounted unit) TT201A003446 (Train-top mounted unit)
Applicant:	Blu Wireless Technology Ltd 4th Floor, One Castlepark Tower Hill Bristol BS2 0JA
Proposed FCC ID	2A4BS-TN201SC-B
Full measurement results are detailed in Report Number:	02-12968-1-22 Issue 03
Test Standards:	47 CFR Part 15.255 Effective Date 1st October 2020 DXX: Part 15 Low Power Communication Device Transmitter

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: 31st January 2022 to 28th 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 13:28:36 Z

Approved By:
Radio Manager

Digitally signed by: Daniel Sims
DN: CN = Daniel Sims C = GB O = RN Electronics Ltd
Date: 2022.07.29 13:12:57 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 reference to low level radio behaviour document	6
	Added further detail on SSH software to gain access and control EUT in specific modes.	8
	Added pre-scan PK and AV EIRP results for each mod scheme/rate for highest power radio (shows worst case rate)	24, 25
	Added further detail to the power tuning process and reference that software/firmware did not change	132
03	Revised modulation types listed	6, 9

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 Train Unit	
Model Number of EUT	TN201SC-B TTU (TN201SP) used in conjunction with an NPU (TN001XC)	
Serial Number of EUT	TN201A002446 (In-train mounted unit) TT201A003446 (Train-top mounted unit)	
Date Received	24th January 2022	
Date of Test:	31st January 2022 to 28th 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	NPU: 38mm, TTU: 75mm
	Width	NPU: 205mm, TTU: 154mm
	Depth	NPU: 250mm, TTU: 206mm
	Weight	NPU: 3.0kg, TTU: 2.6kg
	Voltage	36V nominal (20V minimum, 48V maximum)
	Current	5A (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	The Train-Top-Unit (TTU) is mounted on the outside roof of a train. The Network-Processing-Unit (NPU) is mounted in the attic of the inside of a train.
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
Baseband Data port (yes/no)?	No
Highest Signal generated in EUT	70.20GHz
Lowest Signal generated in EUT	12 MHz
Hardware Version	TN201SC-B (Batch: B2141 06)
Software Version	Platform SW: R0.10
Firmware Version	RWM6050: R3.2, MPU: 0.5.3
Type of Equipment	Multi-Gigabit/s radio equipment operating in the 60GHz band
Technology Type	IEEE 802.11ad
Geo-location (yes/no)	Yes (not used to configure radio parameters)

2.3 Functional description

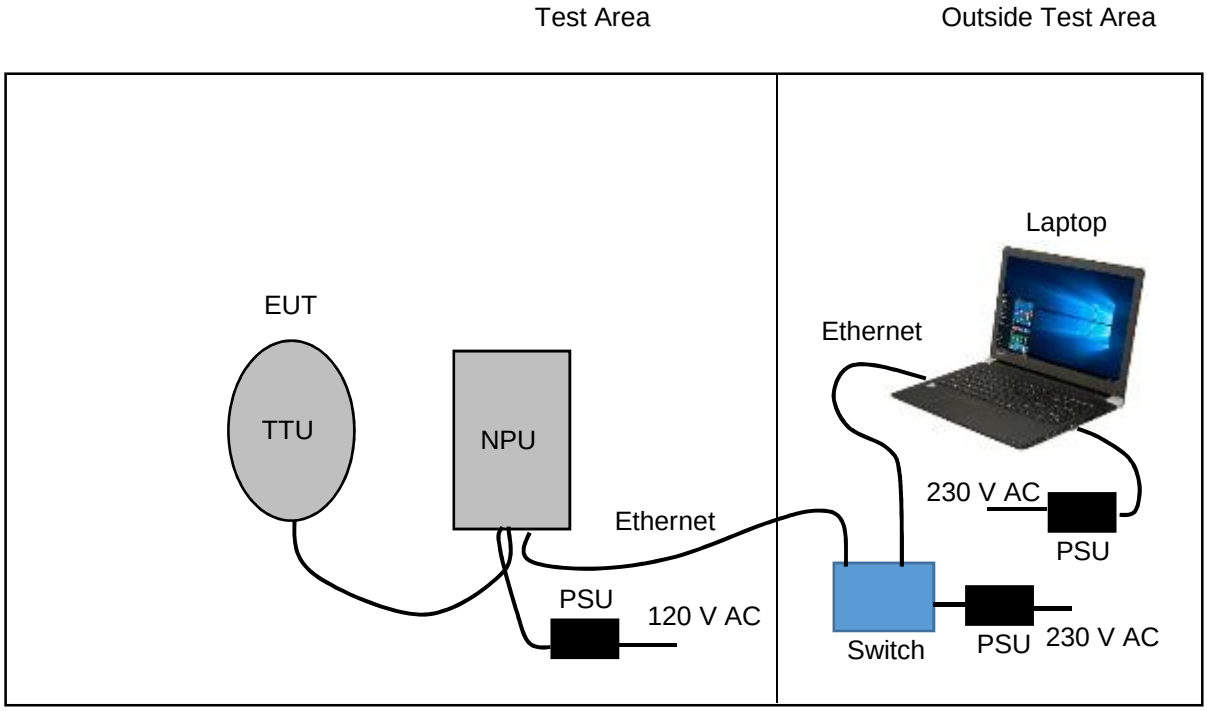
Provision of high-speed data communications to trains for internet access for a high number of users. Non-critical communications. Not used for mission critical or time sensitive applications. A system comprises of a train top unit (TTU) operating in the 57-71 GHz band which is connected to an NPU located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

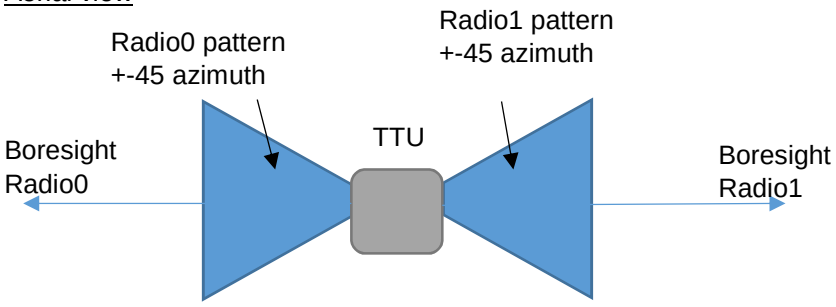
Note: Above modes were used in combination with Schemes MCS0 to MCS12 and Half Band and Quarter Band channel bandwidths for tests, Half and quarter bandwidths used the same centre frequency. Modes apply to both radio 0 and radio 1.

2.5 Emissions configuration



The unit was powered from via the applicant supplied power supply powered from 120V AC mains. The unit was configured with engineering menus via a terminal program to allow permanent transmit modes of the device on each of 2 radios, and on the channels and modulation schemes as stated within section 2.4 of this report. 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 degrees apart) with each radio then Covering approximately +-45 degrees from its boresight orientation with +-10 degrees elevation over the 64 settings of the beam book, each individual azimuth beam width is +-3.5 degrees. 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 99.0 %
MCS1 99.8 %
MCS2 99.6 %
MCS3 99.5 %
MCS4 99.4 %
MCS5 99.3 %
MCS6 99.2 %
MCS7 98.9 %
MCS8 98.7 %
MCS9 98.6 %
MCS10 98.3 %
MCS11 98.7 %
MCS12 97.6 %

2.5.1 Signal leads

Port Name	Cable Type	Connected
Power	4-core shielded	Yes
Ethernet	Cat-6A	Yes
Unit interconnect	Thunderbolt (screened)	Yes
Grounding	Braided copper	Yes

3 Summary of test results

The Degas Train Unit, TN201SC-B, TTU (TN201SP) used in conjunction with an NPU (TN001XC) was tested for compliance to the following standard(s) :

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 channel/ 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, E624, 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	MCS9
Mid channel	64.8 GHz

Plot refs
12968-1 Cond 1 AC Live 150k-30M Average
12968-1 Cond 1 AC Live 150k-30M Quasi-Peak
12968-1 Cond 1 AC Neutral 150k-30M Average
12968-1 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	47.5	46.8	-16.2	44.9	-8.3
2	0.618	43.6	42.2	-13.8	38.6	-7.4
3	1.127	44.2	40.5	-15.5	29.6	-16.4
4	1.626	41.3	38.5	-17.5	25.6	-20.4
5	11.044	39.7	36.0	-24.0	28.1	-21.9
6	23.664	34.8	31.1	-28.9	24.2	-25.8

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	48.1	47.2	-15.8	45.0	-8.2
2	0.372	50.2	48.2	-10.8	42.6	-7.1
3	0.619	45.1	42.8	-13.2	38.5	-17.5
4	0.879	43.3	40.8	-15.2	32.4	-23.6
5	2.383	40.4	37.2	-18.8	22.8	-33.2
6	11.035	38.4	35.7	-24.3	28.3	-21.7

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 25MHz

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	101kPa

Band	57-71 GHz
Power Level	39 dBm
Channel Spacing	2.16 GHz
Mod Scheme	MCS9
Mid channel	64.8 GHz

Plot refs
12968-1 Rad 1 150k-30MHz Para
12968-1 Rad 1 150k-30MHz Perp

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.
Measurements were made on a site listed with the FCC. 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	MCS9
Mid channel	64.8 GHz

Plot refs
12968-1 Rad 1 VHF Horiz
12968-1 Rad 1 VHF Vert
12968-1 Rad 1 UHF Horiz
12968-1 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	246.680	27.2	20.7	-19.3

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	74.570	29.7	24.3	-15.7
2	75.048	23.6	17.6	-22.4
3	81.445	26.4	21.3	-18.7
4	257.529	27.2	21.0	-25.0

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

LIMITS:
15.209 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:
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 20°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	MCS9
Mid channel	64.8 GHz

Spurious Frequency (MHz)	Measured Peak Level (dBµV/m)	Difference to Peak Limit (dB)	Measured Average Level (dBµV/m)	Difference to Average Limit (dB)	EUT Polarisation	Antenna Polarisation
2537.426	46.0	-28.0	38.0	-16.0	Normal Use Position	Vertical
2584.579	43.3	-30.7	34.0	-20.0	Normal Use Position	Vertical
5000	46.6	-27.4	38.8	-15.2	Normal Use Position	Horizontal

5000	46.3	-27.7	38.4	-15.6	Normal Use Position	Vertical

Plots
12968-1 Rad 1 1-2GHz Horiz
12968-1 Rad 1 1-2GHz Vert
12968-1 Rad 1 2-5GHz Horiz
12968-1 Rad 1 2-5GHz Vert
12968-1 Rad 1 5-6GHz Horiz
12968-1 Rad 1 5-6GHz Vert
12968-1 Rad 1 6upto10GHz Horiz
12968-1 Rad 1 6upto10GHz Vert
12968-1 Rad 1 10upto12_5GHz Horiz
12968-1 Rad 1 10upto12_5GHz Vert
12968-1 Rad 1 12.5-15GHz Horiz
12968-1 Rad 1 12.5-15GHz Vert
12968-1 Rad 1 15-18GHz Horiz
12968-1 Rad 1 15-18GHz Vert
12968-1 Rad 1 18-22GHz Horiz
12968-1 Rad 1 18-22GHz Vert
12968-1 Rad 1 22-25GHz Horiz
12968-1 Rad 1 22-25GHz Vert
12968-1 Rad 1 25-26.5GHz Horiz
12968-1 Rad 1 25-26.5GHz Vert
12968-1 TX Radiated Emissions CH4, 26.5 - 30 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 26.5 - 30 GHz Vertical
12968-1 TX Radiated Emissions CH4, 30 - 34 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 30 - 34 GHz Vertical
12968-1 TX Radiated Emissions CH4, 34 - 38 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 34 - 38 GHz Vertical
12968-1 TX Radiated Emissions CH4, 38 - 40 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 38 - 40 GHz Vertical
12968-1 TX Radiated Emissions CH4, 40 - 44 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 40 - 44 GHz Vertical
12968-1 TX Radiated Emissions CH4, 44 - 48 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 44 - 48 GHz Vertical
12968-1 TX Radiated Emissions CH4, 48 - 52 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 48 - 52 GHz Vertical
12968-1 TX Radiated Emissions CH4, 52 - 56 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 52 - 56 GHz Vertical
12968-1 TX Radiated Emissions CH4, 56 - 60 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 56 - 60 GHz Vertical
12968-1 TX Radiated Emissions CH4, 60 - 64 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 60 - 64 GHz Vertical
12968-1 TX Radiated Emissions CH4, 64 - 68 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 64 - 68 GHz Vertical
12968-1 TX Radiated Emissions CH4, 68 - 72 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 68 - 72 GHz Vertical
12968-1 TX Radiated Emissions CH4, 72 - 76 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 72 - 76 GHz Vertical
12968-1 TX Radiated Emissions CH4, 76 - 80 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 76 - 80 GHz Vertical
12968-1 TX Radiated Emissions CH4, 80 - 90 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 80 - 90 GHz Vertical
12968-1 TX Radiated Emissions CH4, 90 - 100 GHz Horizontal

12968-1 TX Radiated Emissions CH4, 90 - 100 GHz Vertical
12968-1 TX Radiated Emissions CH4, 100 - 110 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 100 - 110 GHz Vertical
12968-1 TX Radiated Emissions CH4, 110 - 120 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 110 - 120 GHz Vertical
12968-1 TX Radiated Emissions CH4, 120 - 130 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 120 - 130 GHz Vertical
12968-1 TX Radiated Emissions CH4, 130 - 140 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 130 - 140 GHz Vertical
12968-1 TX Radiated Emissions CH4, 140 - 150 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 140 - 150 GHz Vertical
12968-1 TX Radiated Emissions CH4, 150 - 160 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 150 - 160 GHz Vertical
12968-1 TX Radiated Emissions CH4, 160 - 170 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 160 - 170 GHz Vertical
12968-1 TX Radiated Emissions CH4, 170 - 180 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 170 - 180 GHz Vertical
12968-1 TX Radiated Emissions CH4, 180 - 190 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 180 - 190 GHz Vertical
12968-1 TX Radiated Emissions CH4, 190 - 200 GHz Horizontal
12968-1 TX Radiated Emissions CH4, 190 - 200 GHz Vertical

“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.

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: 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, adjusted for the tone offset (99.687MHz).
Tests were performed using Test Site A.

5.6.4 Test equipment

E434, E555, E717, E755, E777, E781, E810, E908, E920, N579, S034, TMS38

See Section 9 for more details

5.6.5 Test results

Temperature of test environment	20°C
Humidity of test environment	60%
Pressure of test environment	103kPa

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)	58320.129939	64800.145402	69119.842641
-20°C	Volts Nominal (120)	58320.144475	64800.176615	69119.831679
-10°C	Volts Nominal (120)	58320.077274	64800.088583	69119.870377
0°C	Volts Nominal (120)	58320.060972	64800.066994	69119.928767
10°C	Volts Nominal (120)	58320.059427	64800.065996	69119.928821
20°C	Volts Minimum (102)	58320.082755	64800.094235	69119.898355
	Volts Nominal (120)	58320.082563	64800.093974	69119.898288
	Volts Maximum (138)	58320.082117	64800.093966	69119.897129
30°C	Volts Nominal (120)	58320.072240	64800.072866	69119.938922
40°C	Volts Nominal (120)	58320.071247	64800.075088	69119.926442
50°C	Volts Nominal (120)	58320.103137	64800.116749	69119.873994
Max Frequency Error per chan (Hz)		+144475 / -0	+176615 / -0	+0 / -168321
Max Frequency Error observed (MHz)		0.144475	0.176615	-0.168321

Maximum variation observed was +17.6615 kHz, -0 kHz. Refer to 6 dB BW test results for BW of signal contained within the band 57-71 GHz.

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 and therefore this mode was 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 channels.

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.
Tests were performed using test Site A.

5.7.4 Test equipment

E005, 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	20°C
Humidity of test environment	50%
Pressure of test environment	101kPa

Pre-scan worst case checks (radio 1 provided highest power):

Radio 1	Full Band	Beam setting	27	40	27
Mod scheme/rate	RF parameter		Low channel (dBm)	Mid channel (dBm)	High channel (dBm)
MCS0	Peak EIRP measured		39.00	40.70	38.55
	Average EIRP measured		38.10	39.80	37.21
MCS1	Peak EIRP measured		39.20	40.70	38.50
	Average EIRP measured		38.20	39.80	37.26
MCS2	Peak EIRP measured		39.20	40.70	38.50
	Average EIRP measured		38.20	39.80	37.16
MCS3	Peak EIRP measured		39.20	41.00	38.50
	Average EIRP measured		38.20	39.80	37.26
MCS4	Peak EIRP measured		39.20	41.00	38.70
	Average EIRP measured		38.30	39.70	37.36
MCS5	Peak EIRP measured		39.30	41.00	38.70
	Average EIRP measured		38.20	39.90	37.70
MCS6	Peak EIRP measured		39.30	41.00	38.70
	Average EIRP measured		38.30	39.70	37.70

MCS7	Peak EIRP measured	39.30	40.90	38.70
	Average EIRP measured	38.30	39.60	37.70
MCS8	Peak EIRP measured	39.30	40.90	38.70
	Average EIRP measured	38.30	39.40	37.30
MCS9	Peak EIRP measured	39.30	40.90	38.60
	Average EIRP measured	38.30	39.40	37.10
MCS10	Peak EIRP measured	39.20	40.90	38.70
	Average EIRP measured	37.70	39.10	37.00
MCS11	Peak EIRP measured	39.20	40.90	38.70
	Average EIRP measured	37.70	39.20	37.00
MCS12	Peak EIRP measured	39.20	40.90	38.70
	Average EIRP measured	37.70	39.10	36.90

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	30	27
		dBm	dBm	dBm
Peak EIRP measured		40.2	40.6	39.4
Peak Margin (dB)		-2.8	-2.4	-3.6
Average EIRP measured		39.2	39.8	38.3
Average Margin (dB)		-0.8	-0.2	-1.7

Half Band

	dBm	dBm	dBm
Peak EIRP measured	40.5	39.5	39.5
Peak Margin (dB)	-2.5	-3.5	-3.5
Average EIRP measured	39.6	38.8	38.4
Average Margin (dB)	-0.4	-1.2	-1.6

Quarter Band

	dBm	dBm	dBm
Peak EIRP measured	40.3	38.9	39.4
Peak Margin (dB)	-2.7	-4.1	-3.6
Average EIRP measured	39.6	38.2	39.0
Average Margin (dB)	-0.4	-1.8	-1.0

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	27	40	27
		dBm	dBm	dBm
Peak EIRP measured		39.3	41.0	38.7
Peak Margin (dB)		-3.7	-2.0	-4.3
Average EIRP measured		38.2	39.9	37.7
Average Margin (dB)		-1.8	-0.1	-2.3

Half Band

	dBm	dBm	dBm
Peak EIRP measured	39.5	40.1	38.7
Peak Margin (dB)	-3.5	-2.9	-4.3
Average EIRP measured	38.6	39.3	37.9
Average Margin (dB)	-1.4	-0.7	-2.1

Quarter Band

	dBm	dBm	dBm
Peak EIRP measured	39.3	39.1	39.0
Peak Margin (dB)	-3.7	-3.9	-4.0
Average EIRP measured	38.8	38.3	38.2
Average Margin (dB)	-1.2	-1.7	-1.8

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

Using 150.14 dBuV/m PK @0.6m as highest measured E field (radio 1 middle channel):

(22): EIRP = E_{Meas} + 20log(d_{Meas}) -104.7, = 150.14+(-4.44) - 104.7 = +41.0 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(e) [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(e) [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)	40.2	40.6	39.4
Beam setting for maximum	29	30	27
Peak EIRP measured in Watts	10.47	11.48	8.71
Calculated Peak conducted power (W)	0.05248	0.05754	0.04365

Half Bandwidth

Test conditions	Low channel	Mid channel	High channel
Peak EIRP measured (dBm)	40.5	39.5	39.5
Beam setting for maximum	29	30	27
Peak EIRP measured in Watts	11.22	8.91	8.91
Calculated Peak conducted power (W)	0.05623	0.04467	0.04467

Quarter Bandwidth

Test conditions	Low channel	Mid channel	High channel
Peak EIRP measured (dBm)	40.3	38.9	39.4
Beam setting for maximum	29	30	27
Peak EIRP measured in Watts	10.72	7.76	8.71
Calculated Peak conducted power (W)	0.05370	0.03890	0.04365

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)	39.3	41.0	38.7
Beam setting for maximum	27	40	27
Peak EIRP measured in Watts	8.51	12.59	7.41
Calculated Peak conducted power (W)	0.04266	0.06309	0.03715

Half Bandwidth

Test conditions	Low channel	Mid channel	High channel
Peak EIRP measured (dBm)	39.5	40.1	38.7
Beam setting for maximum	27	40	27
Peak EIRP measured in Watts	8.91	10.23	7.41
Calculated Peak conducted power (W)	0.04467	0.05129	0.03715

Quarter Bandwidth

Test conditions	Low channel	Mid channel	High channel
Peak EIRP measured (dBm)	39.3	39.1	39.0
Beam setting for maximum	27	40	27
Peak EIRP measured in Watts	8.51	8.13	7.94
Calculated Peak conducted power (W)	0.04266	0.04074	0.03981

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

15.255 (e) 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(e)(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 (MCS8) 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	50%
Pressure of test environment	101kPa

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)	1.527	1.554	1.458
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 0	12968-1 Radio 0 Mid mcs 0	12968-1 Radio 0 High mcs 0
99% Bandwidth (GHz)	1.8966	1.8745	1.8841
Frequency Error (MHz) (include sign)	40.652	37.567	-34.484
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.597152	64.060567	68.356516
6dB BW FHIGH Worst case (GHz)	59.124152	65.614567	69.814516

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)	1.348	1.581	1.347
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 0	12968-1 Radio 1 Mid mcs 0	12968-1 Radio 1 High mcs 0
99% Bandwidth (GHz)	1.8301	1.8388	1.8199
Frequency Error (MHz) (include sign)	36.631	31.748	-27.271
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.682631	64.040748	68.419229
6dB BW FHIGH Worst case (GHz)	59.030631	65.622748	69.766229

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)	1.588	1.664	1.592
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 1	12968-1 Radio 0 Mid mcs 1	12968-1 Radio 0 High mcs 1
99% Bandwidth (GHz)	1.9133	1.8934	1.9058
Frequency Error (MHz) (include sign)	18.092	11.415	-10.024
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.544092	63.979415	68.313976
6dB BW FHIGH Worst case (GHz)	59.132092	65.643415	69.905976

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)	1.502	1.585	1.451
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 1	12968-1 Radio 1 Mid mcs 1	12968-1 Radio 1 High mcs 1
99% Bandwidth (GHz)	1.8467	1.8562	1.8412
Frequency Error (MHz) (include sign)	21.111	13.491	-6.0167
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.590111	63.989991	68.3884833
6dB BW FHIGH Worst case (GHz)	59.092111	65.636991	69.8394833

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)	1.588	1.592	1.485
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 2	12968-1 Radio 0 Mid mcs 2	12968-1 Radio 0 High mcs 2
99% Bandwidth (GHz)	1.9122	1.8919	1.9036
Frequency Error (MHz) (include sign)	17.87	11.224	-11.632
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.54387	64.015224	68.365868
6dB BW FHIGH Worst case (GHz)	59.13187	65.607224	69.850868

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)	1.482	1.492	1.355
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 2	12968-1 Radio 1 Mid mcs 2	12968-1 Radio 1 High mcs 2
99% Bandwidth (GHz)	1.8464	1.8587	1.8426
Frequency Error (MHz) (include sign)	20.905	14.089	-4.0023
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.599905	63.989089	68.4384977
6dB BW FHIGH Worst case (GHz)	59.081905	65.639089	69.7934977

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)	1.444	1.506	1.561
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 3	12968-1 Radio 0 Mid mcs 3	12968-1 Radio 0 High mcs 3
99% Bandwidth (GHz)	1.9164	1.8929	1.9056
Frequency Error (MHz) (include sign)	17.845	12.736	-10.727
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.615845	64.059736	68.328773
6dB BW FHIGH Worst case (GHz)	59.059845	65.565736	69.889773

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)	1.451	1.527	1.296
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 3	12968-1 Radio 1 Mid mcs 3	12968-1 Radio 1 High mcs 3
99% Bandwidth (GHz)	1.8467	1.8568	1.843
Frequency Error (MHz) (include sign)	22.006	14.095	-5.7975
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.616506	63.984095	68.4662025
6dB BW FHIGH Worst case (GHz)	59.067506	65.644095	69.7622025

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)	1.447	1.647	1.506
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 4	12968-1 Radio 0 Mid mcs 4	12968-1 Radio 0 High mcs 4
99% Bandwidth (GHz)	1.9117	1.8901	1.9051
Frequency Error (MHz) (include sign)	18.608	12.726	-11.266
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.615108	63.989226	68.355734
6dB BW FHIGH Worst case (GHz)	59.062108	65.636226	69.861734

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)	1.447	1.454	1.364
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 4	12968-1 Radio 1 Mid mcs 4	12968-1 Radio 1 High mcs 4
99% Bandwidth (GHz)	1.8467	1.8568	1.843
Frequency Error (MHz) (include sign)	22.006	14.095	-5.7975
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.616506	63.984095	68.4662025
6dB BW FHIGH Worst case (GHz)	59.067506	65.644095	69.7622025

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)	1.53	1.661	1.499
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 5	12968-1 Radio 0 Mid mcs 5	12968-1 Radio 0 High mcs 5
99% Bandwidth (GHz)	1.9135	1.8936	1.9014
Frequency Error (MHz) (include sign)	18.954	12.871	-11.004
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.573954	63.982371	68.359496
6dB BW FHIGH Worst case (GHz)	59.103954	65.643371	69.858496

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)	1.509	1.647	1.533
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 5	12968-1 Radio 1 Mid mcs 5	12968-1 Radio 1 High mcs 5
99% Bandwidth (GHz)	1.8456	1.858	1.8446
Frequency Error (MHz) (include sign)	20.714	13.602	-4.3642
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.586214	63.973102	68.3491358
6dB BW FHIGH Worst case (GHz)	59.095214	65.654102	69.8821358

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)	1.599	1.657	1.533
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 6	12968-1 Radio 0 Mid mcs 6	12968-1 Radio 0 High mcs 6
99% Bandwidth (GHz)	1.9366	1.925	1.9341
Frequency Error (MHz) (include sign)	17.89	13.784	-10.27
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.53839	63.985284	68.34323
6dB BW FHIGH Worst case (GHz)	59.13739	65.642284	69.87623

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)	1.509	1.664	1.403
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 6	12968-1 Radio 1 Mid mcs 6	12968-1 Radio 1 High mcs 6
99% Bandwidth (GHz)	1.8764	1.9021	1.8842
Frequency Error (MHz) (include sign)	21.089	15.91	-5.8835
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.586589	63.98891	68.4126165
6dB BW FHIGH Worst case (GHz)	59.095589	65.64291	69.8156165

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)	1.516	1.671	1.547
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 7	12968-1 Radio 0 Mid mcs 7	12968-1 Radio 0 High mcs 7
99% Bandwidth (GHz)	1.9384	1.924	1.9344
Frequency Error (MHz) (include sign)	19.284	12.697	-10.209
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.581284	63.977197	68.336291
6dB BW FHIGH Worst case (GHz)	59.097284	65.648197	69.883291

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)	1.286	1.575	1.495
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 7	12968-1 Radio 1 Mid mcs 7	12968-1 Radio 1 High mcs 7
99% Bandwidth (GHz)	1.8759	1.9026	1.8809
Frequency Error (MHz) (include sign)	21.21	16.827	-5.3497
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.69821	63.984827	68.3671503
6dB BW FHIGH Worst case (GHz)	58.98421	65.648827	69.8621503

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)	1.581	1.691	1.471
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 8	12968-1 Radio 0 Mid mcs 8	12968-1 Radio 0 High mcs 8
99% Bandwidth (GHz)	1.9372	1.9234	1.9334
Frequency Error (MHz) (include sign)	17.623	11.801	-9.9879
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.547123	63.966301	68.3745121
6dB BW FHIGH Worst case (GHz)	59.128123	65.657301	69.8455121

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)	1.434	1.592	1.523
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 8	12968-1 Radio 1 Mid mcs 8	12968-1 Radio 1 High mcs 8
99% Bandwidth (GHz)	1.8753	1.9018	1.8825
Frequency Error (MHz) (include sign)	20.479	17.325	-6.3527
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.623479	63.981825	68.3521473
6dB BW FHIGH Worst case (GHz)	59.057479	65.652825	69.8751473

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)	1.575	1.668	1.444
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 9	12968-1 Radio 0 Mid mcs 9	12968-1 Radio 0 High mcs 9
99% Bandwidth (GHz)	1.9364	1.9248	1.932
Frequency Error (MHz) (include sign)	18.221	12.111	-10.576
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.550721	63.978111	68.387424
6dB BW FHIGH Worst case (GHz)	59.125721	65.646111	69.831424

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)	1.362	1.653	1.289
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 9	12968-1 Radio 1 Mid mcs 9	12968-1 Radio 1 High mcs 9
99% Bandwidth (GHz)	1.8789	1.9036	1.8849
Frequency Error (MHz) (include sign)	20.608	17.319	-6.4584
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.659608	63.981819	68.4690416
6dB BW FHIGH Worst case (GHz)	59.021608	65.652819	69.7580416

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)	1.595	1.643	1.53
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 10	12968-1 Radio 0 Mid mcs 10	12968-1 Radio 0 High mcs 10
99% Bandwidth (GHz)	1.9407	1.9283	1.9421
Frequency Error (MHz) (include sign)	18.251	12.99	-8.4284
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.540751	63.99149	68.3465716
6dB BW FHIGH Worst case (GHz)	59.135751	65.63449	69.8765716

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)	1.475	1.592	1.592
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 10	12968-1 Radio 1 Mid mcs 10	12968-1 Radio 1 High mcs 10
99% Bandwidth (GHz)	1.8788	1.905	1.8885
Frequency Error (MHz) (include sign)	22.091	17.793	-6.0702
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.604591	63.989293	68.3179298
6dB BW FHIGH Worst case (GHz)	59.079591	65.646293	69.9099298

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)	1.344	1.681	1.454
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 11	12968-1 Radio 0 Mid mcs 11	12968-1 Radio 0 High mcs 11
99% Bandwidth (GHz)	1.9406	1.928	1.9425
Frequency Error (MHz) (include sign)	17.212	13.388	-7.9903
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.665212	63.972888	68.3850097
6dB BW FHIGH Worst case (GHz)	59.009212	65.653888	69.8390097

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)	1.513	1.585	1.362
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 11	12968-1 Radio 1 Mid mcs 11	12968-1 Radio 1 High mcs 11
99% Bandwidth (GHz)	1.8784	1.9056	1.8884
Frequency Error (MHz) (include sign)	21.24	18.049	-5.9749
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.58474	63.989549	68.4330251
6dB BW FHIGH Worst case (GHz)	59.09774	65.646549	69.7950251

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)	1.619	1.674	1.444
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low mcs 12	12968-1 Radio 0 Mid mcs 12	12968-1 Radio 0 High mcs 12
99% Bandwidth (GHz)	1.9432	1.9284	1.9367
Frequency Error (MHz) (include sign)	18.651	12.159	-9.8134
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.529151	63.975159	68.3881866
6dB BW FHIGH Worst case (GHz)	59.148151	65.649159	69.8321866

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)	1.454	1.657	1.385
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 1 Low mcs 12	12968-1 Radio 1 Mid mcs 12	12968-1 Radio 1 High mcs 12
99% Bandwidth (GHz)	1.8788	1.9056	1.8919
Frequency Error (MHz) (include sign)	21.498	17.656	-6.3217
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.614498	63.984156	68.4211783
6dB BW FHIGH Worst case (GHz)	59.068498	65.651156	69.8061783

Half Band

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	1.08 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)	0.8048	0.8598	0.8322
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low	12968-1 Radio 0 Mid	12968-1 Radio 0 High
99% Bandwidth (GHz)	0.97338	0.98788	0.97142
Frequency Error (MHz) (include sign)	2.6432	1.6024	-3.9141
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	57.92024	64.3717	68.69999
6dB BW FHIGH Worst case (GHz)	58.72504	65.2315	69.53219

Quarter Band

Band	57-71 GHz (Radio 0)
Power Level	39 dBm
Channel Spacing	0.54 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)	0.4161	0.4402	0.4298
Plot of 6dB Bandwidth (GHz)	12968-1 Radio 0 Low	12968-1 Radio 0 Mid	12968-1 Radio 0 High
99% Bandwidth (GHz)	0.4899	0.49461	0.48711
Frequency Error (MHz) (include sign)	1.0784	0.37005	-3.2705
Operating frequency (GHz)	58.32	64.8	69.12
6dB BW FLOW Worst case (GHz)	58.11303	64.58027	68.90183
6dB BW FHIGH Worst case (GHz)	58.52913	65.02047	69.33163

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

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

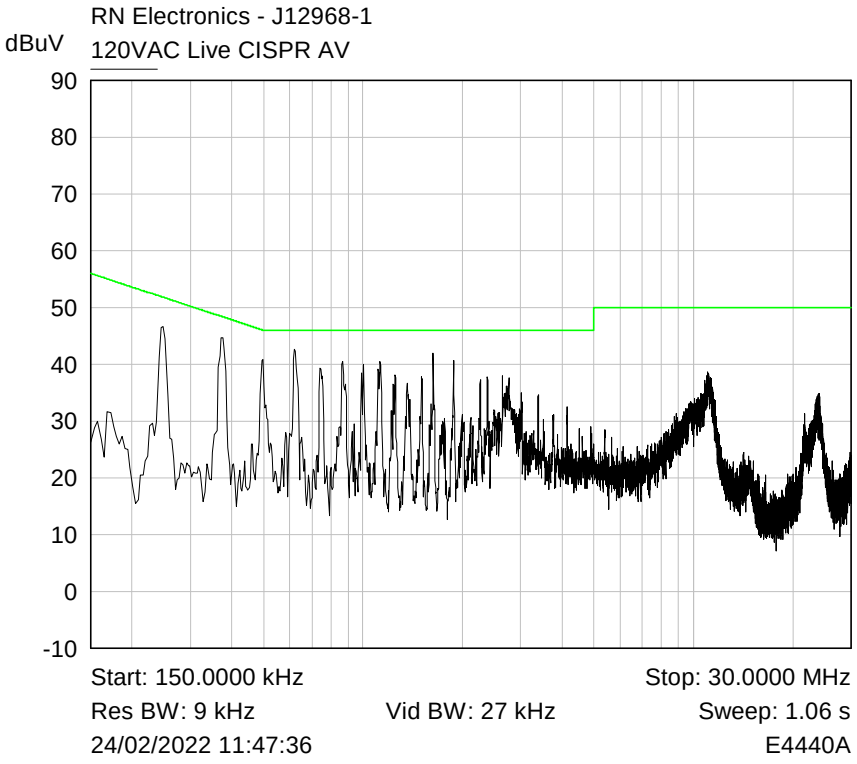
These results show that the EUT has PASSED this test.

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

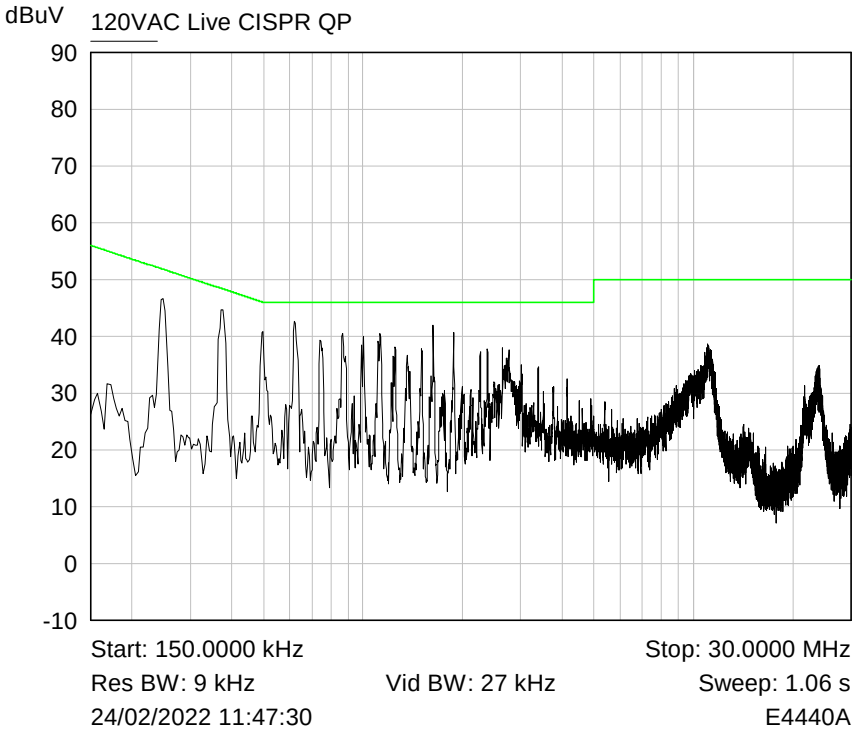
6 Plots/Graphical results

6.1 AC power line conducted emissions

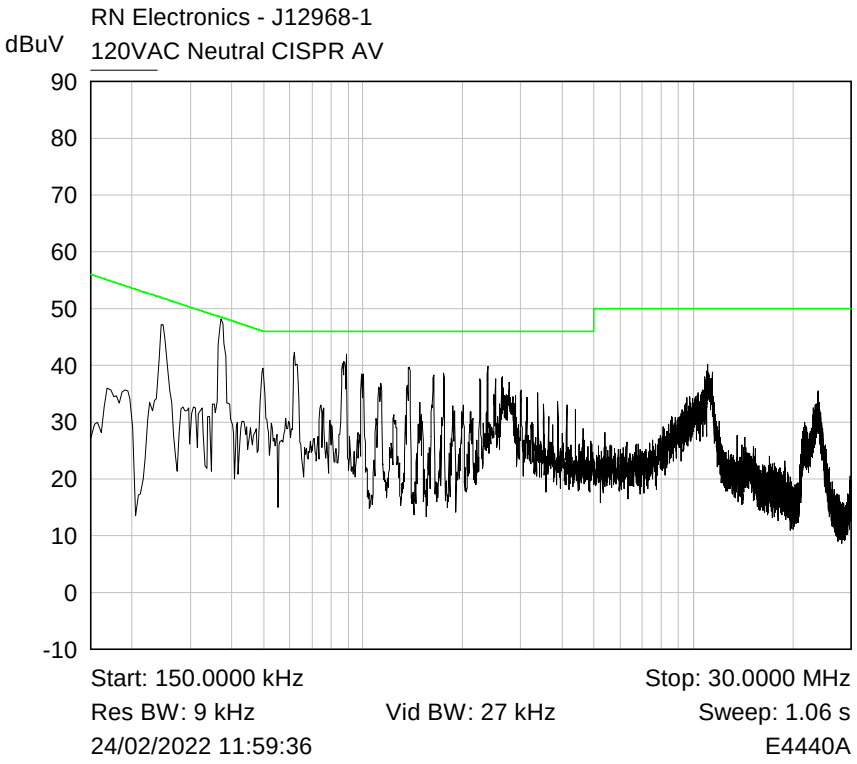
RF Parameters: Band 57-71 GHz, Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS9, Channel 58.32 GHz



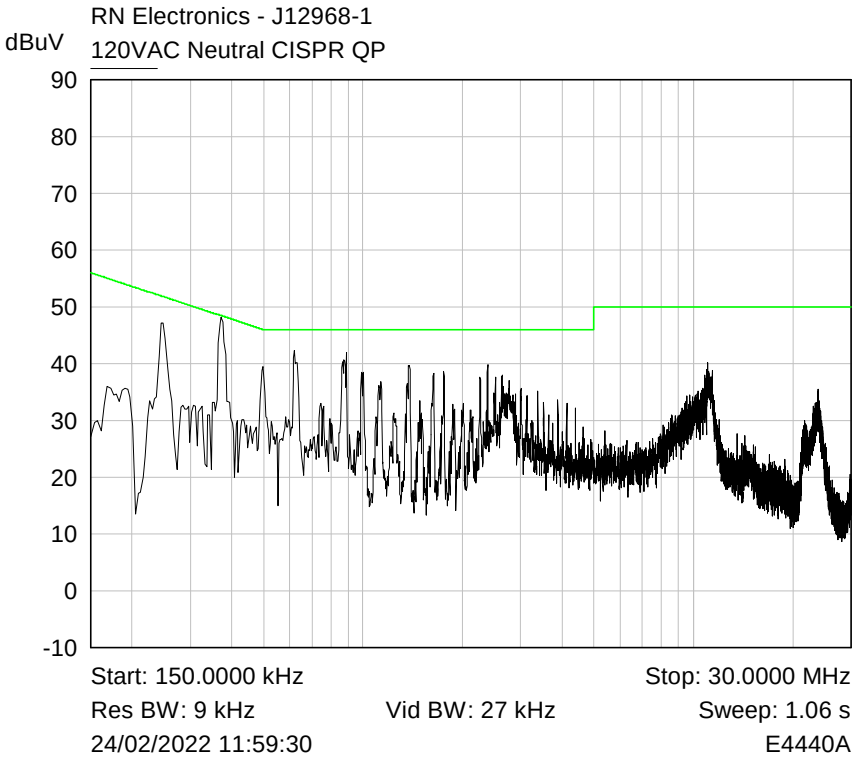
Max-held plot of Live150k-30M against an Average limit



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



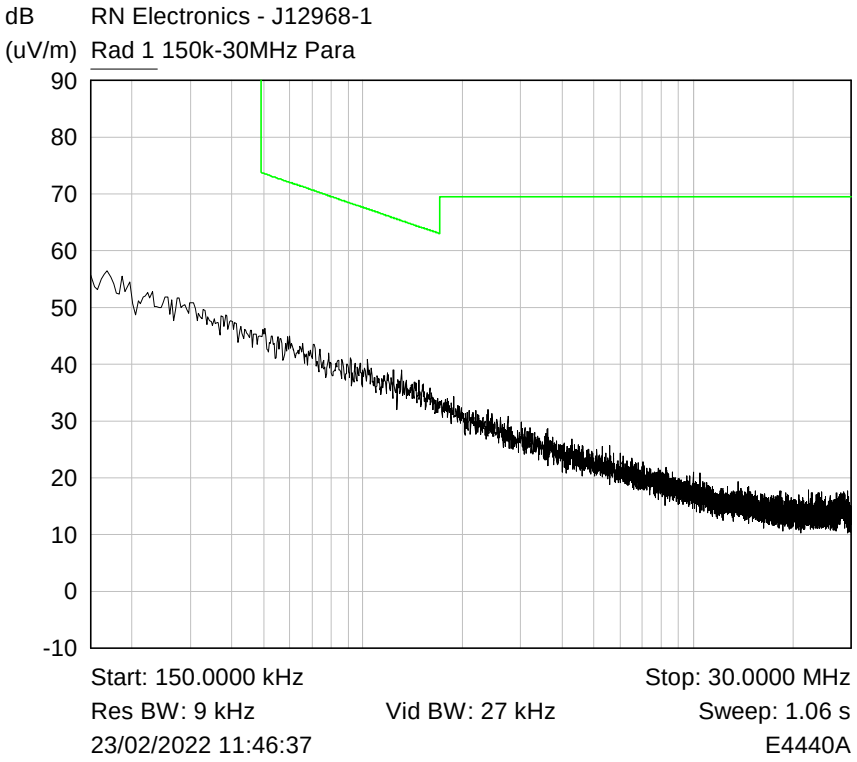
Max-held plot of Neutral150k-30M against an Average limit



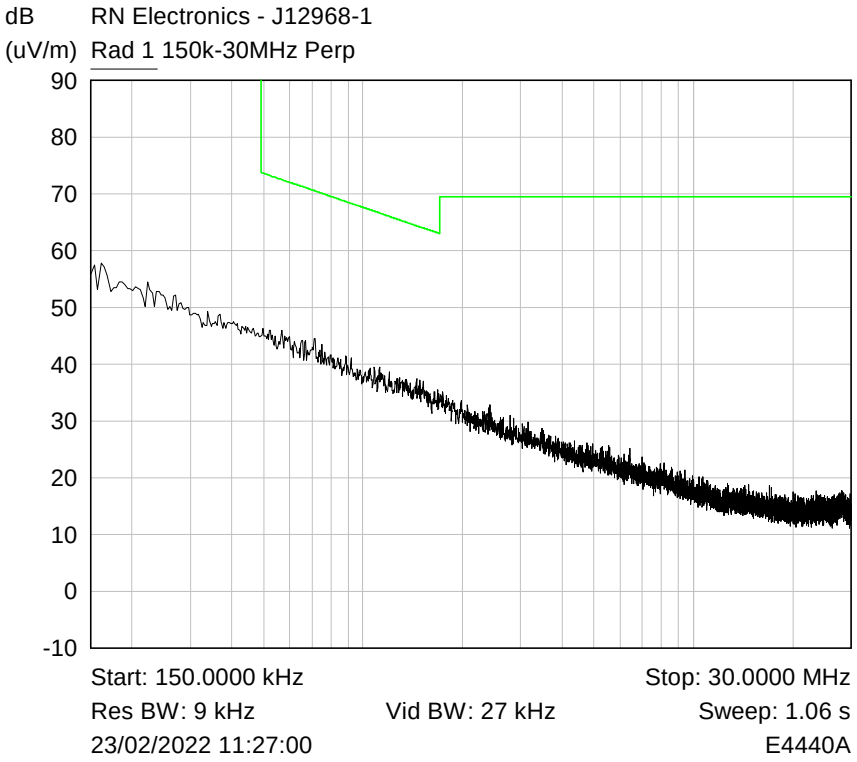
Max-held plot of Neutral150k-30M against a Quasi-Peak limit

6.2 Radiated emissions 150 kHz - 30 MHz

RF Parameters: Band 57-71 GHz, Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS9, Channel 58.32 GHz



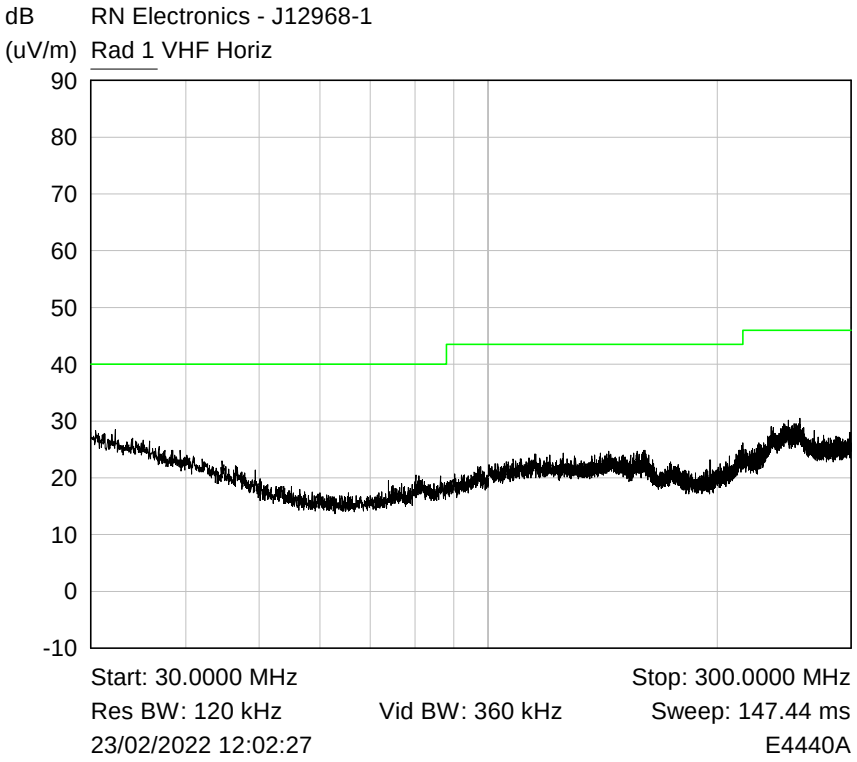
Plot of 150kHz-30MHz Parallel



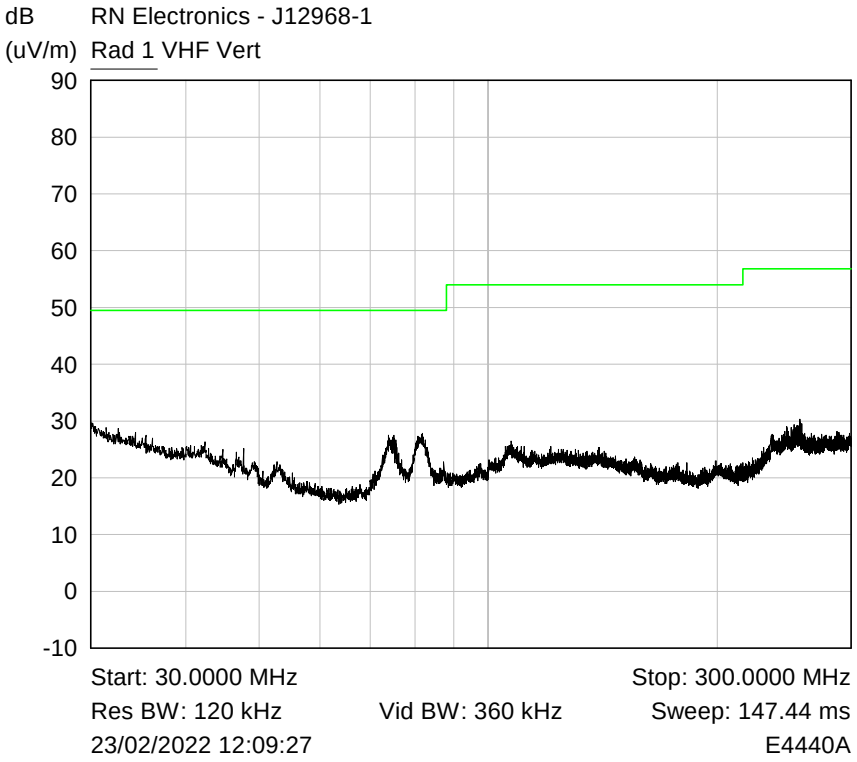
Plot of 150kHz-30MHz Perpendicular

6.3 Radiated emissions 30 MHz -1 GHz

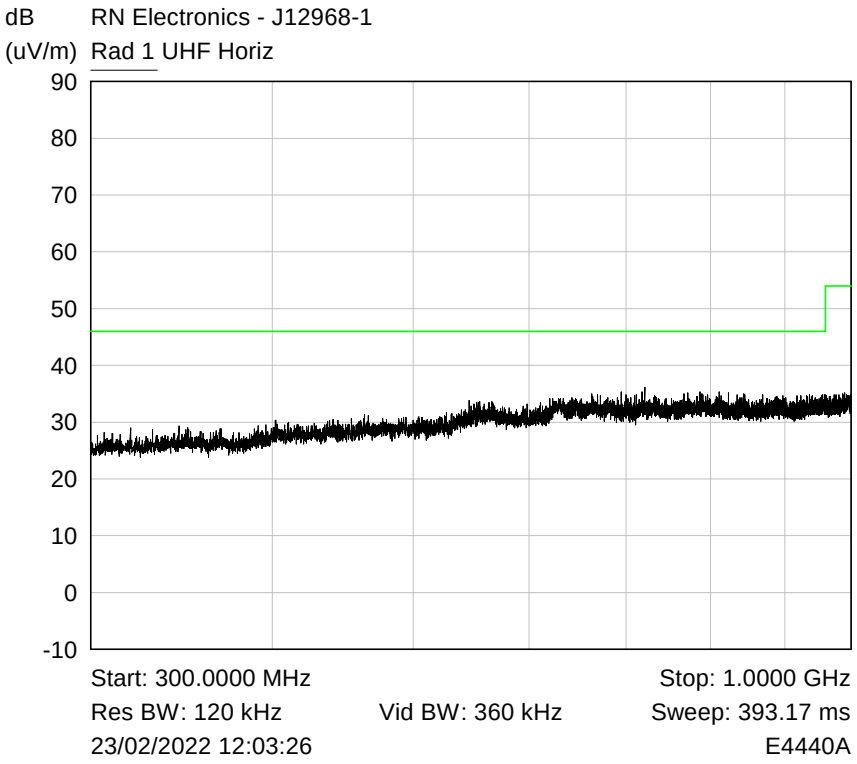
RF Parameters: Band 57-71 GHz, Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS9, Channel 58.32 GHz



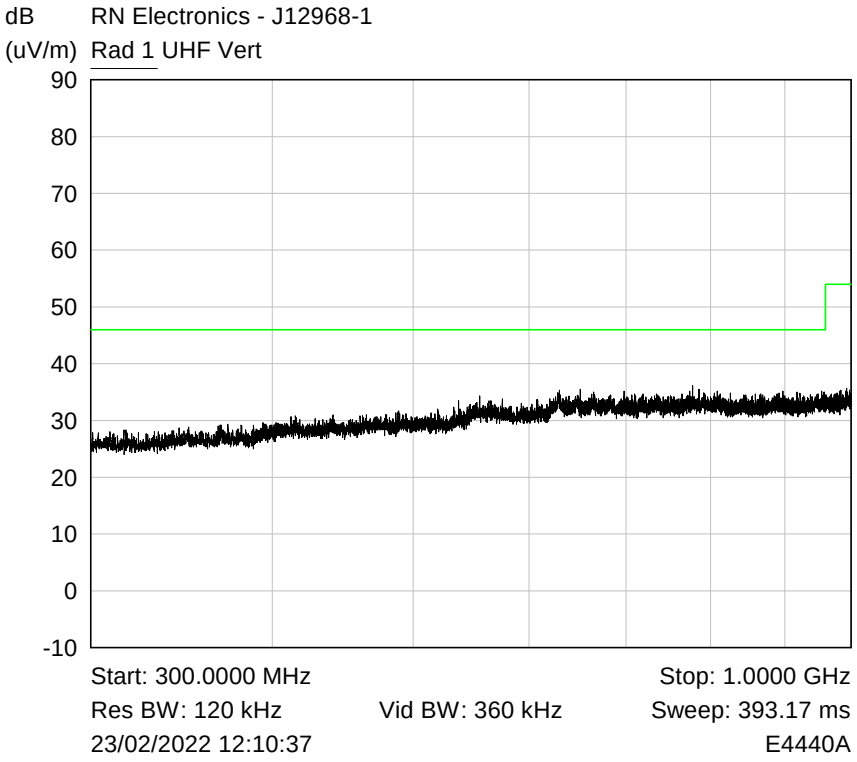
Plot of Peak emissions for VHF Horizontal against the QP limit line.



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



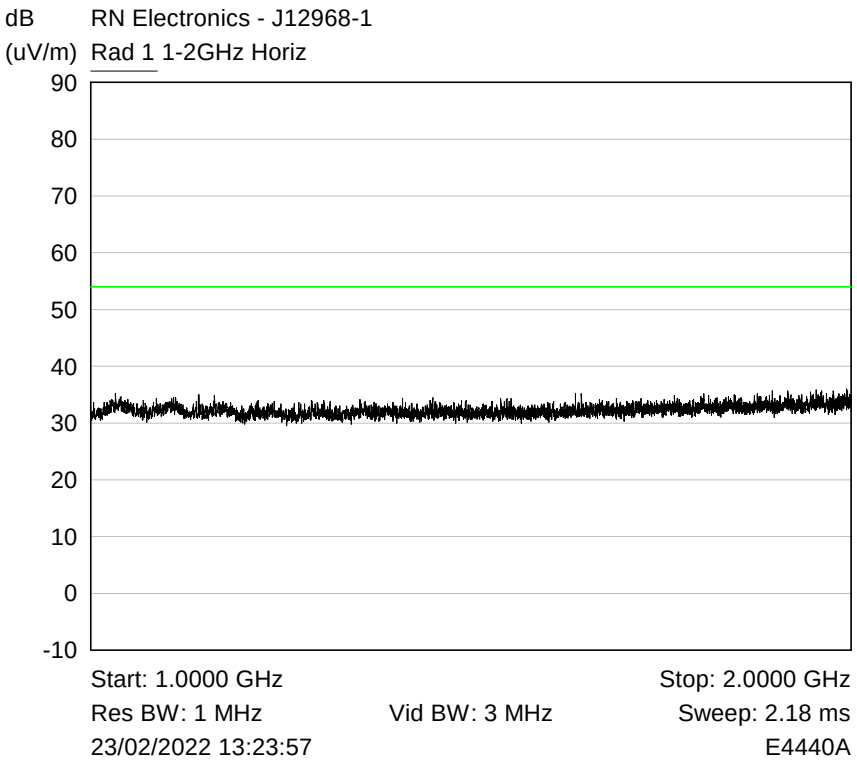
Plot of Peak emissions for UHF Horizontal against the QP limit line.

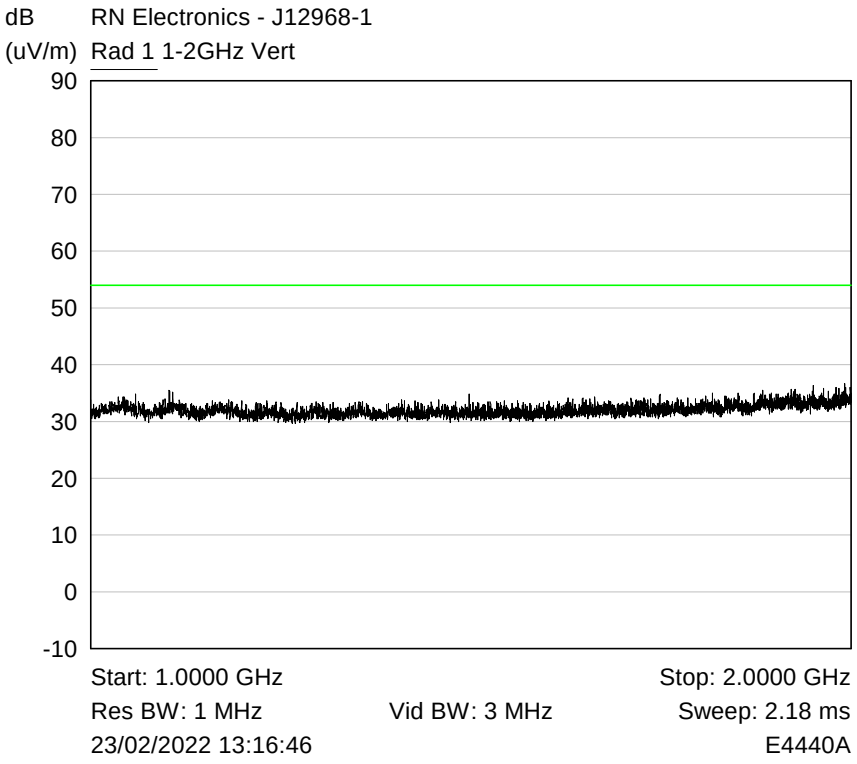


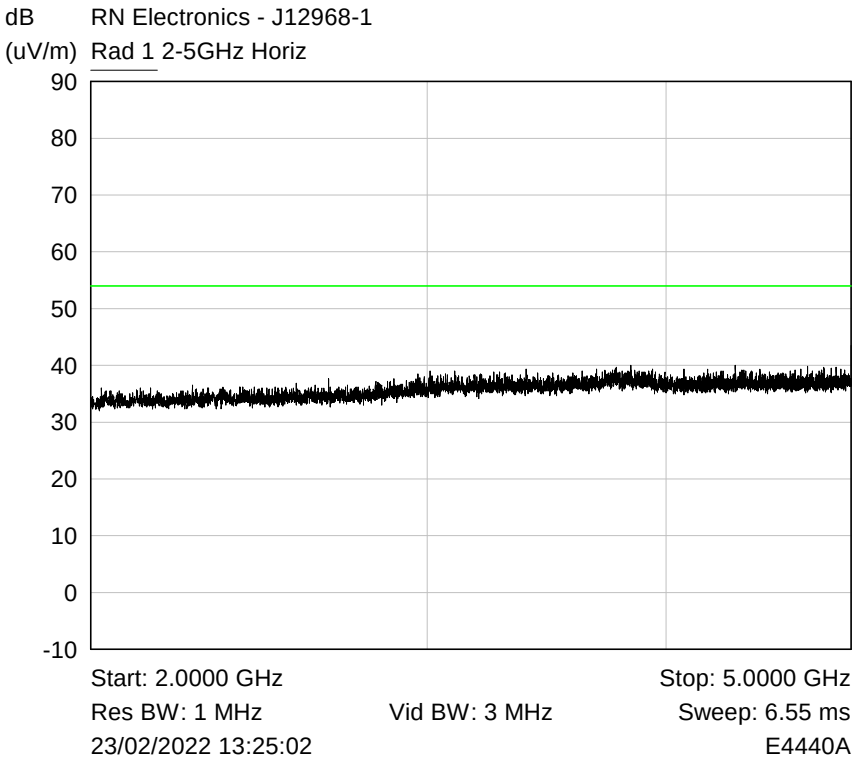
Plot of Peak emissions for UHF Vertical against the QP limit line.

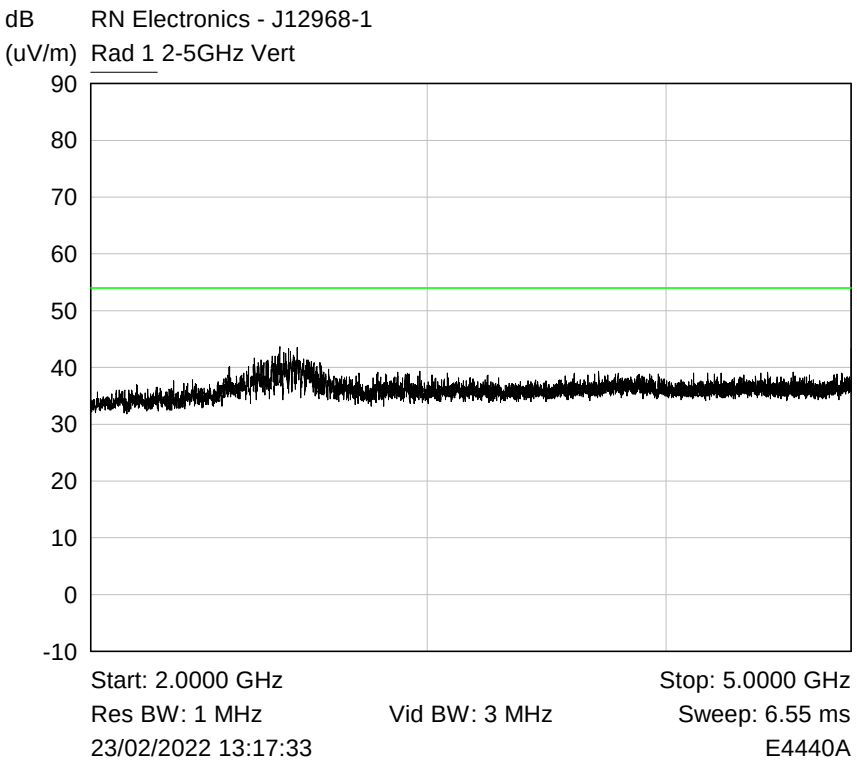
6.4 Radiated emissions above 1 GHz

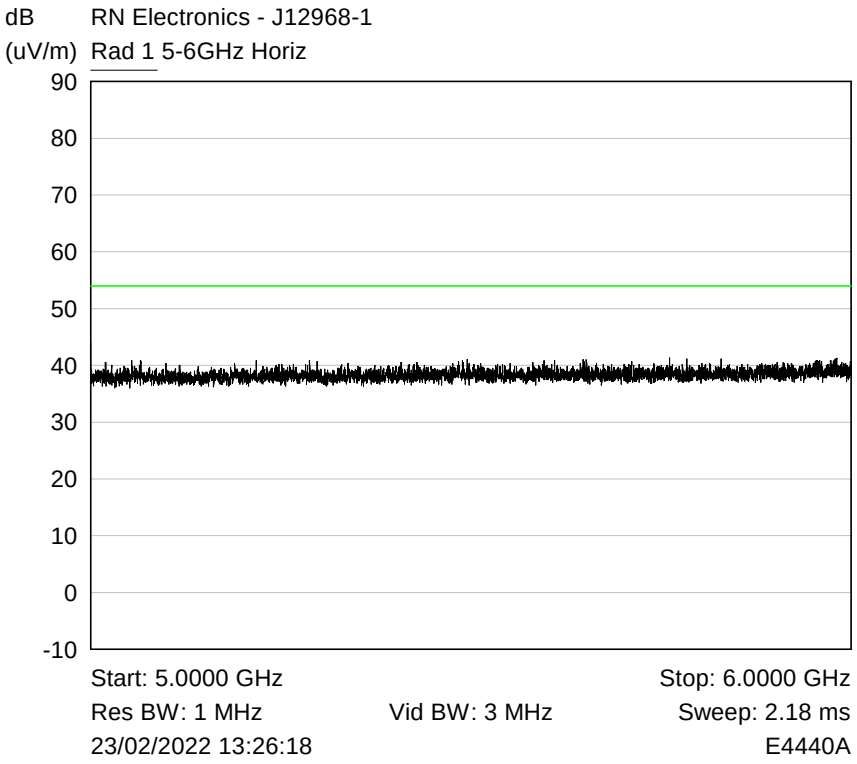
RF Parameters: Band 57-71 GHz, Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS9, Channel 58.32 GHz

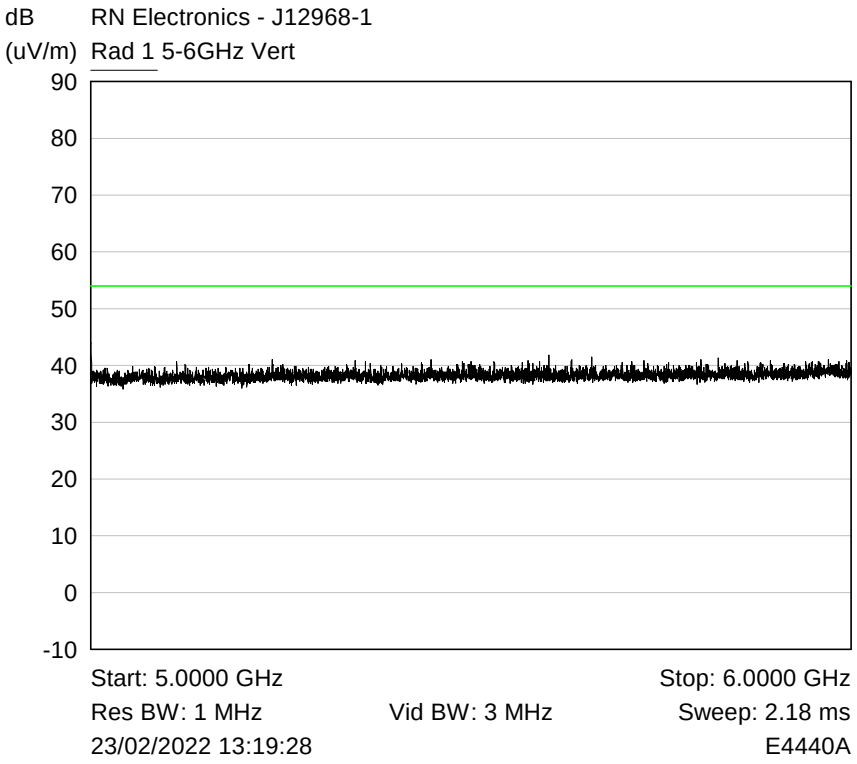


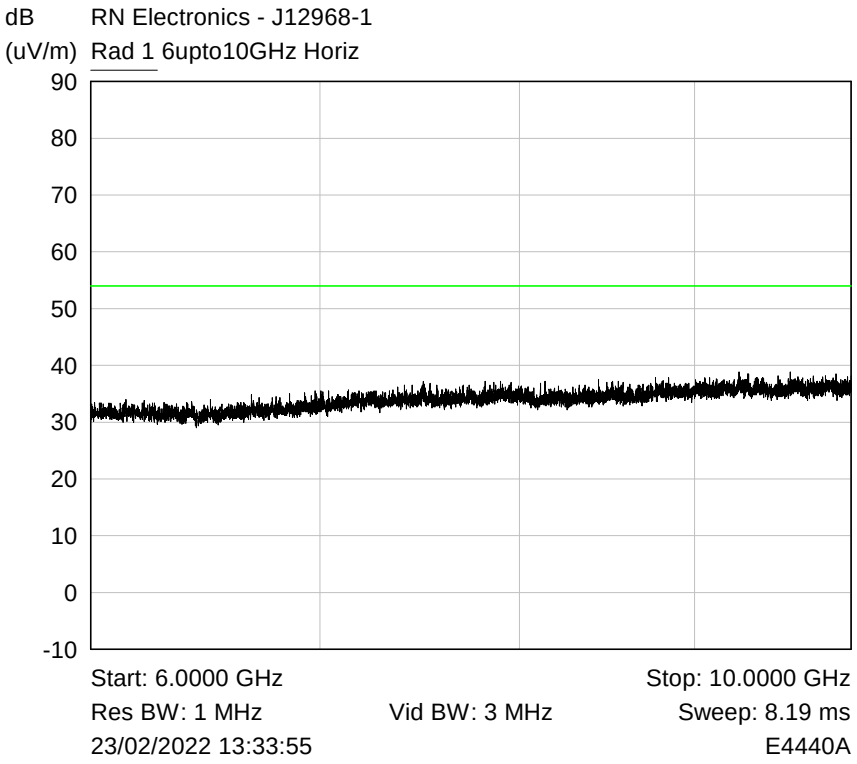


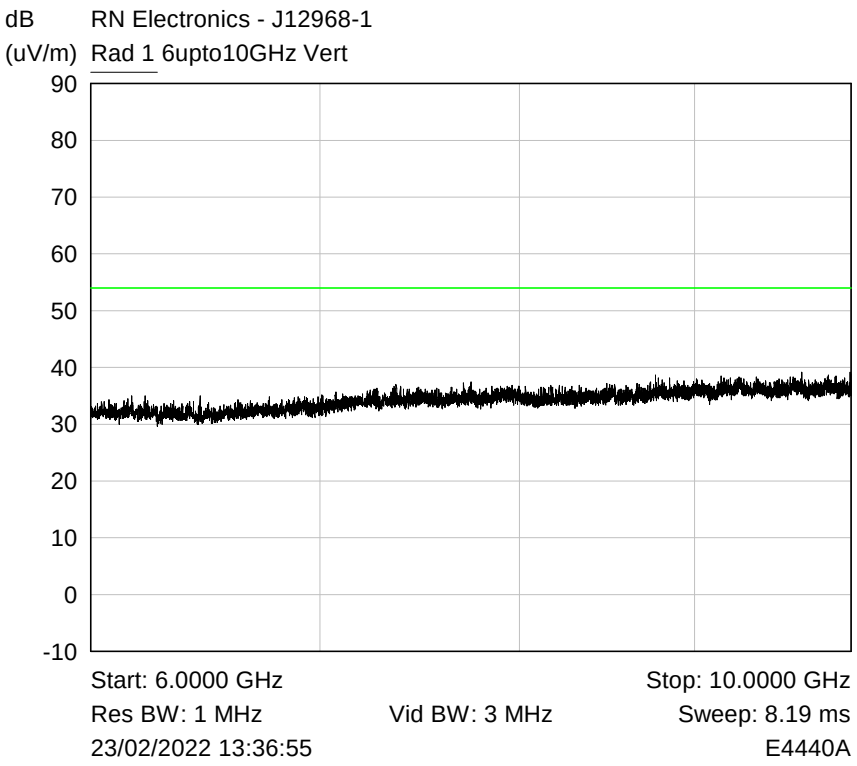


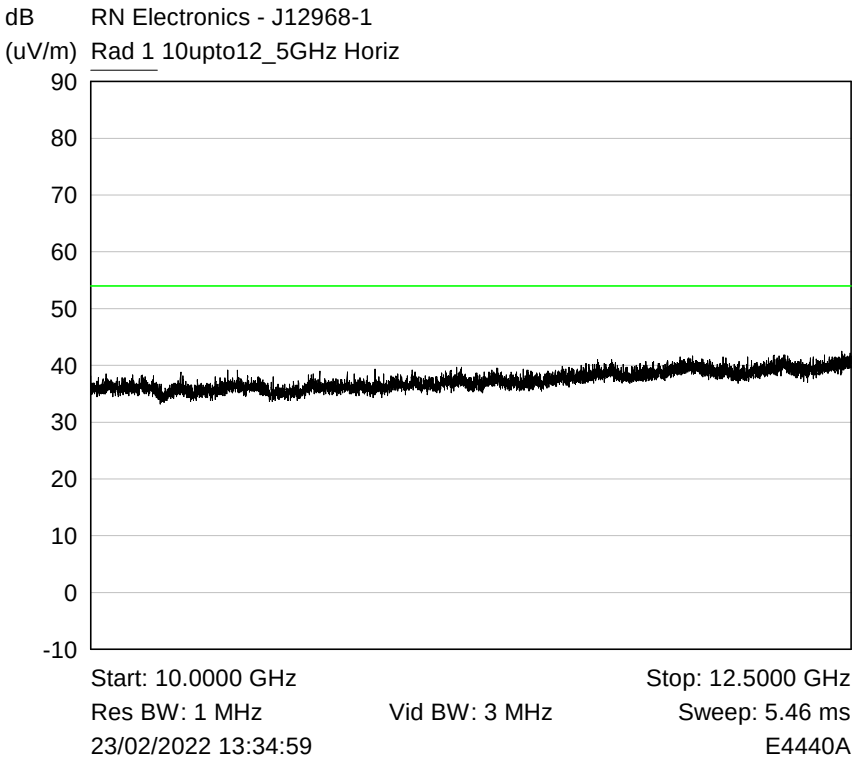


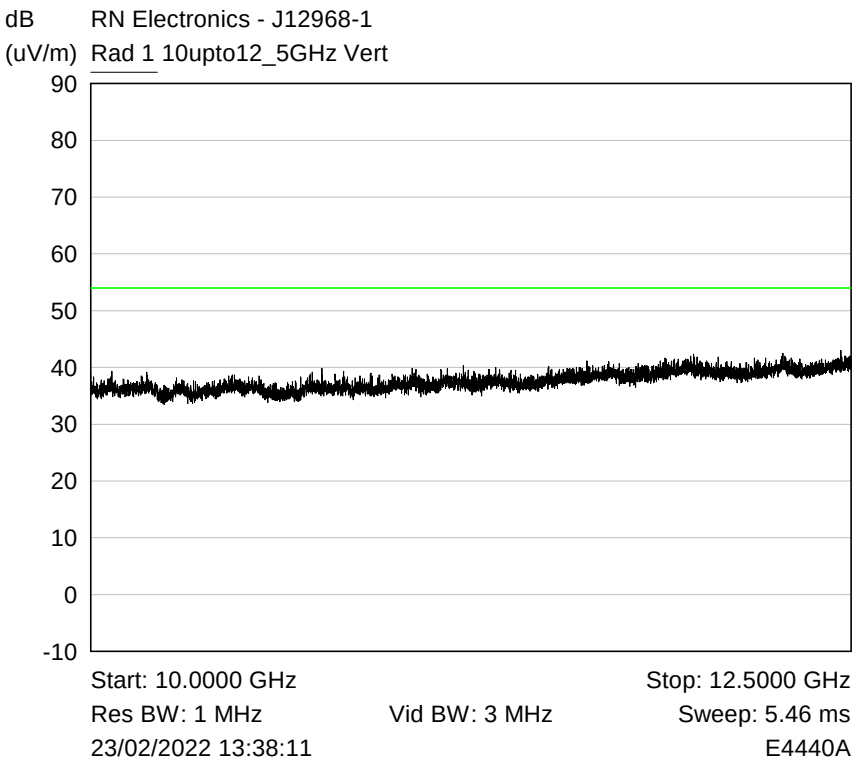


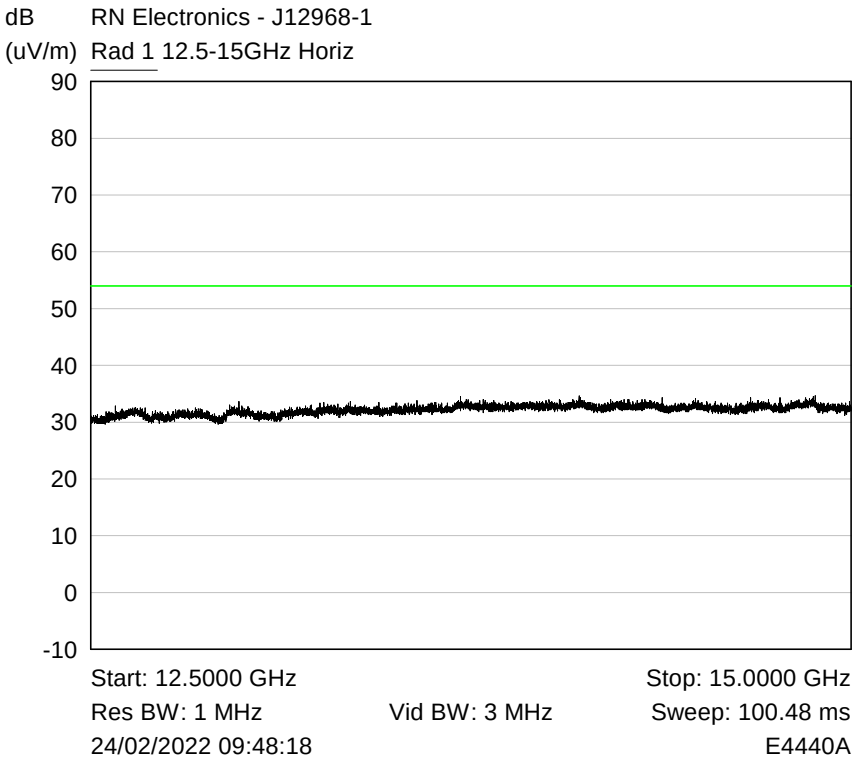


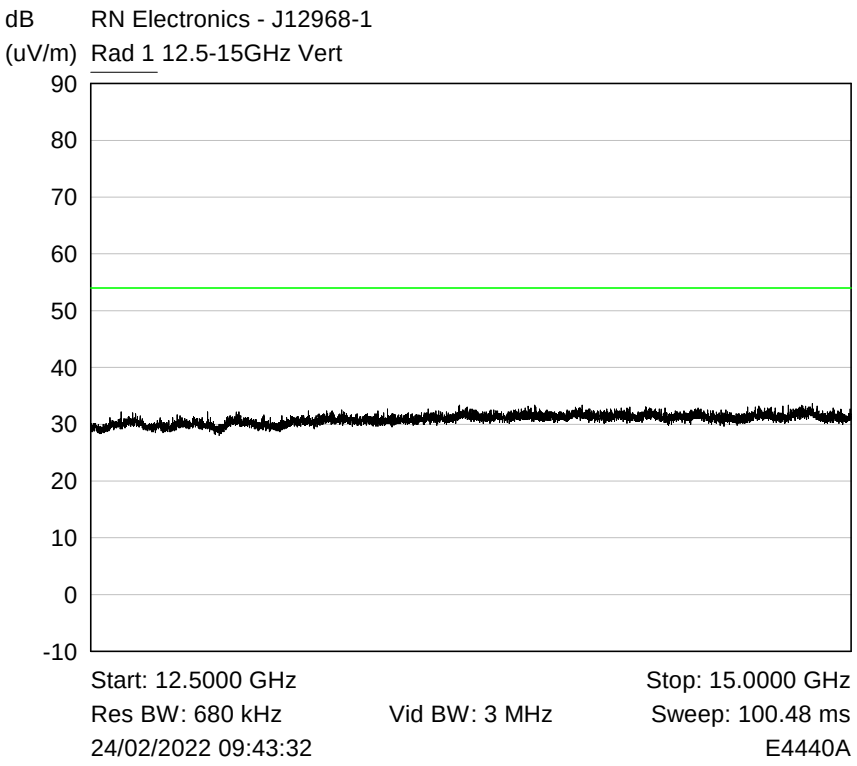


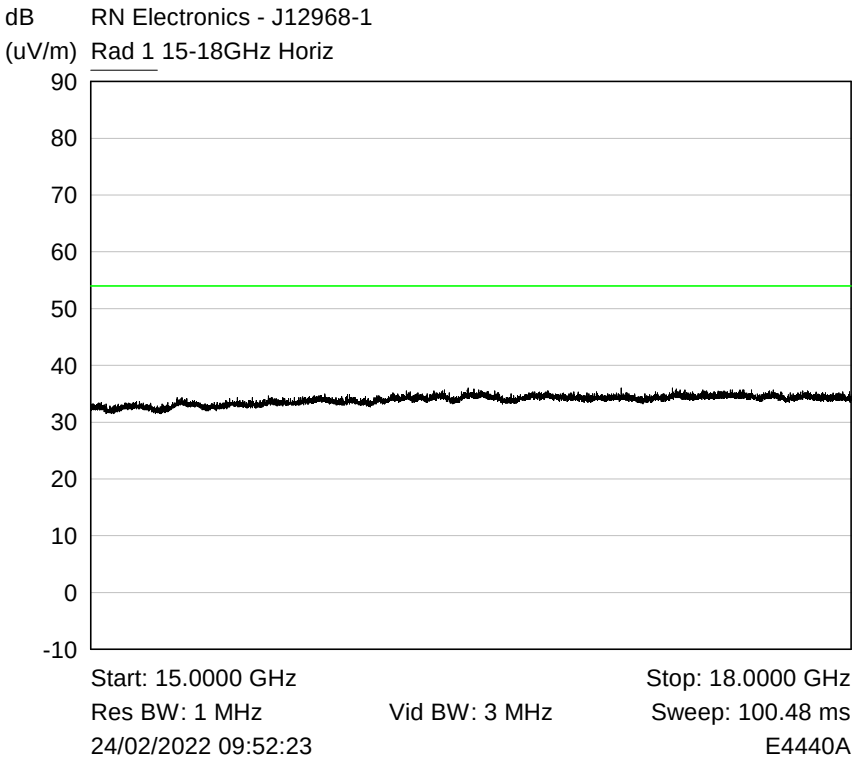


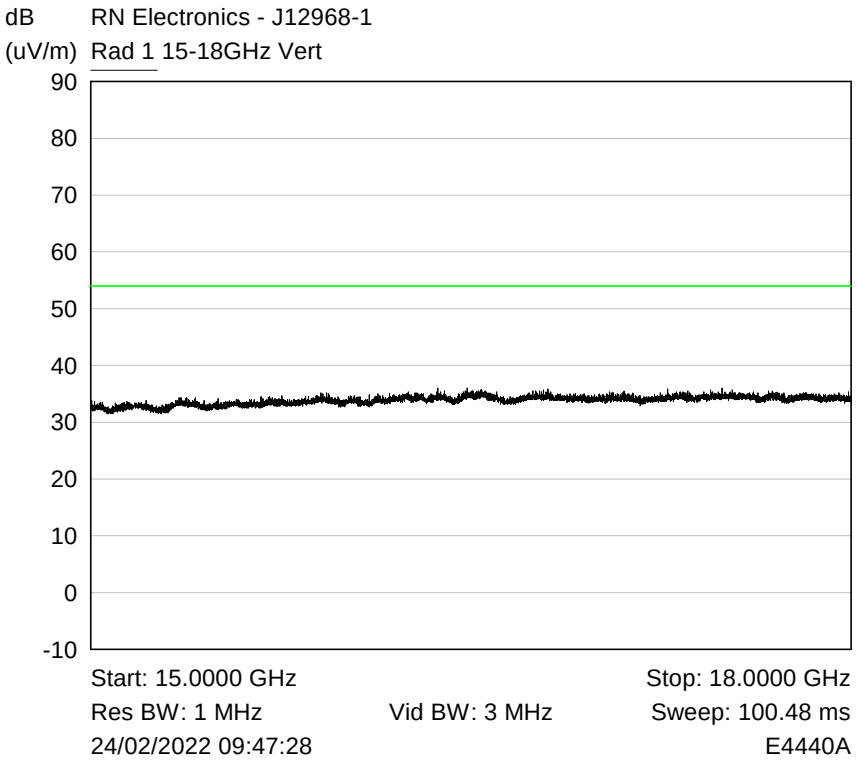


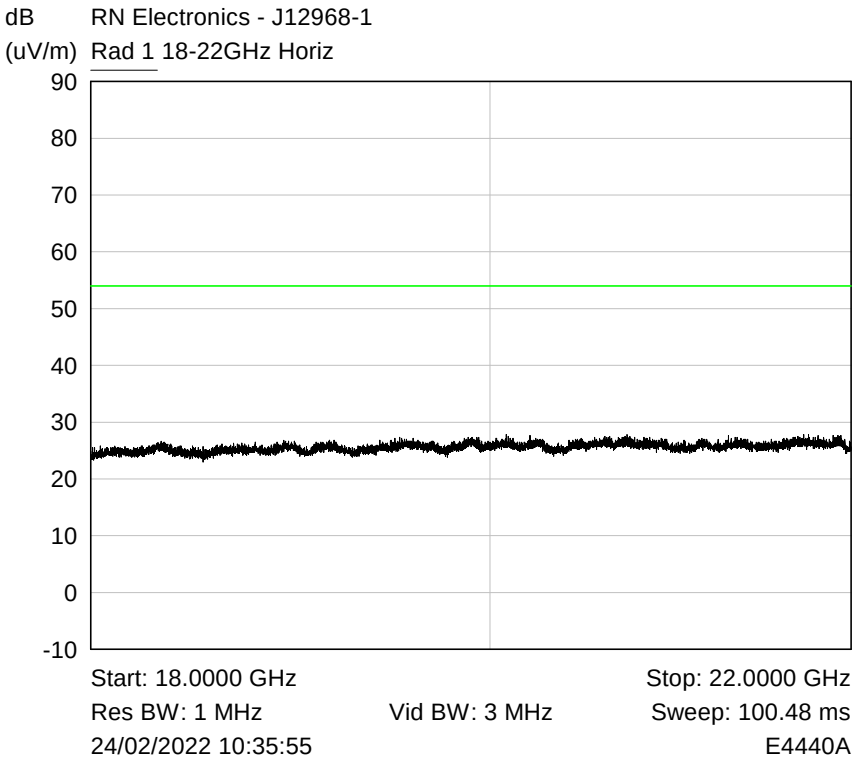


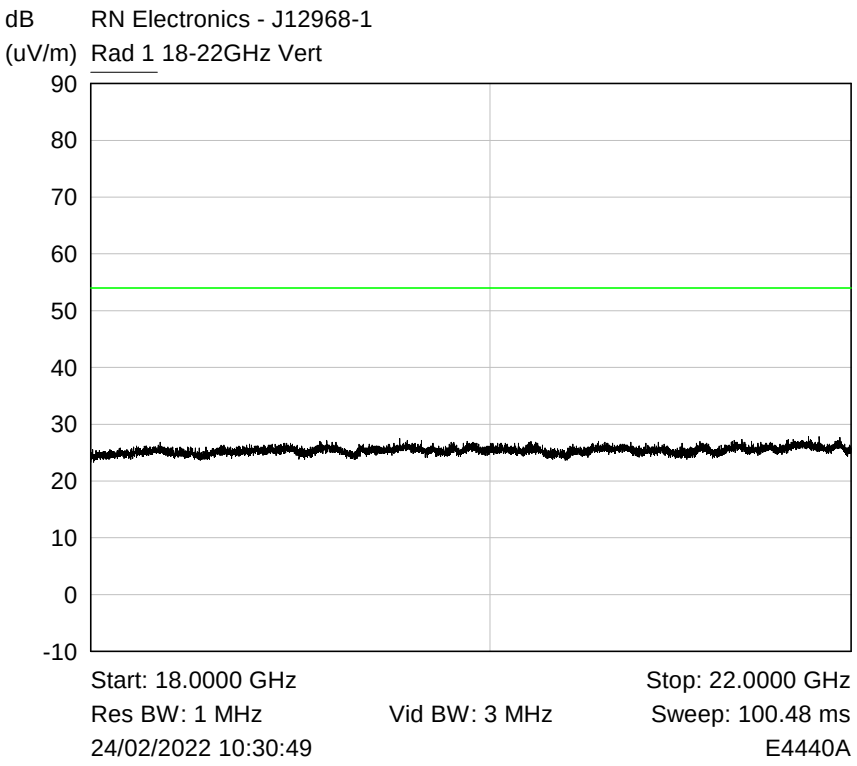


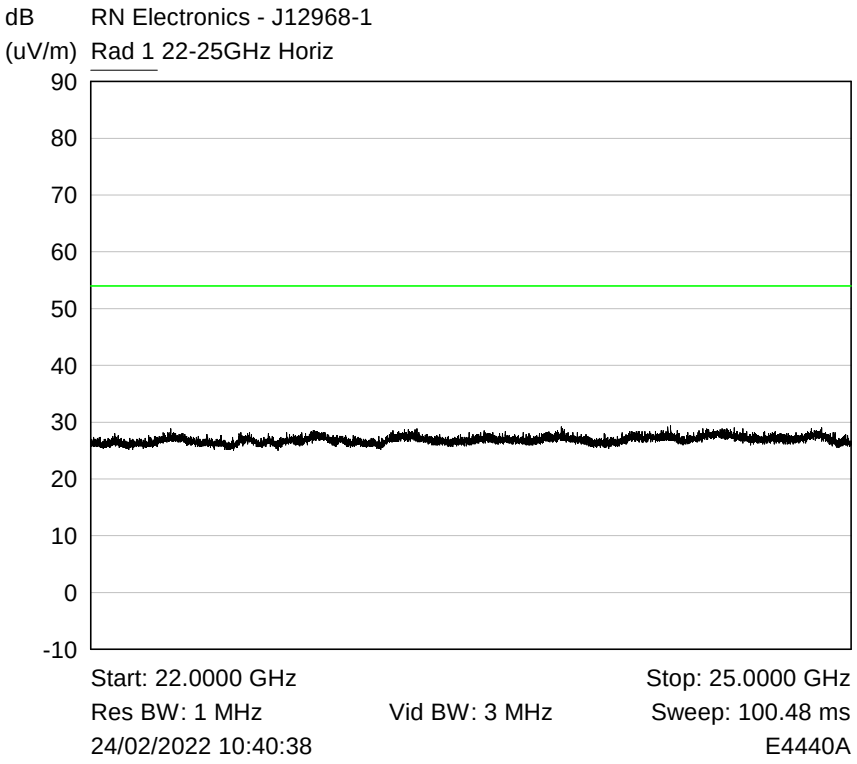


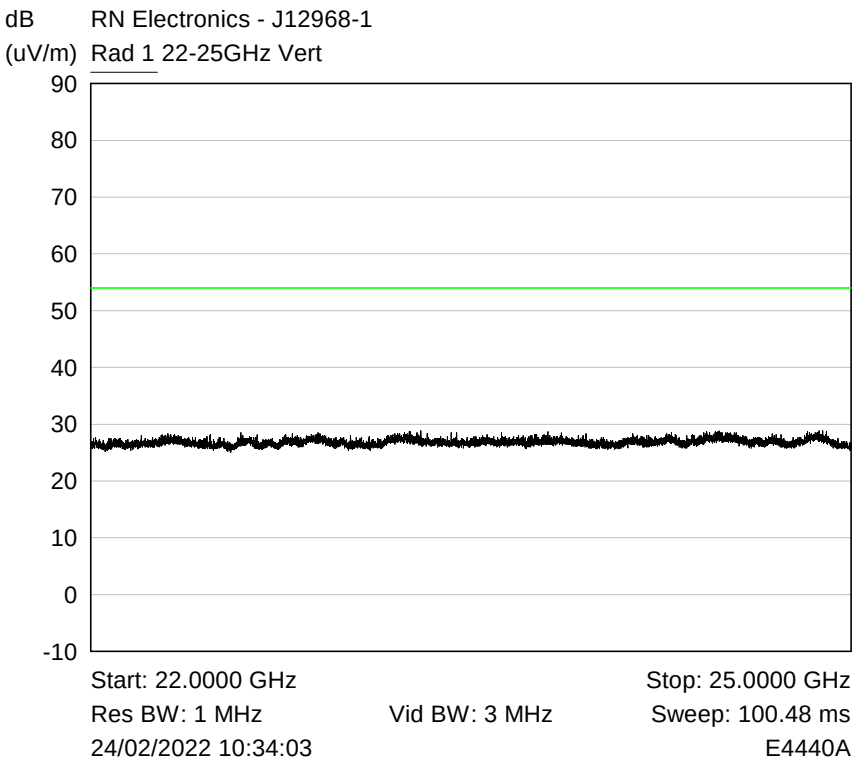

dB
(uV/m)
RN Electronics - J12968-1
Rad 1 15-18GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 15.0000 GHz
Stop: 18.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.48 ms
24/02/2022 09:52:23
E4440A

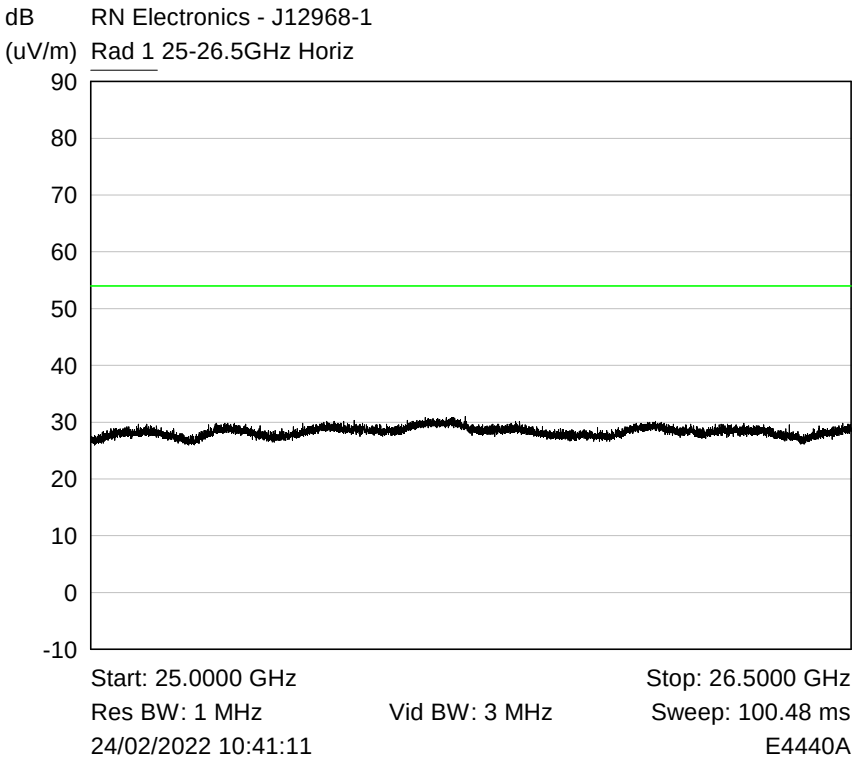

dB
(uV/m)
RN Electronics - J12968-1
Rad 1 15-18GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 15.0000 GHz
Stop: 18.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.48 ms
24/02/2022 09:47:28
E4440A

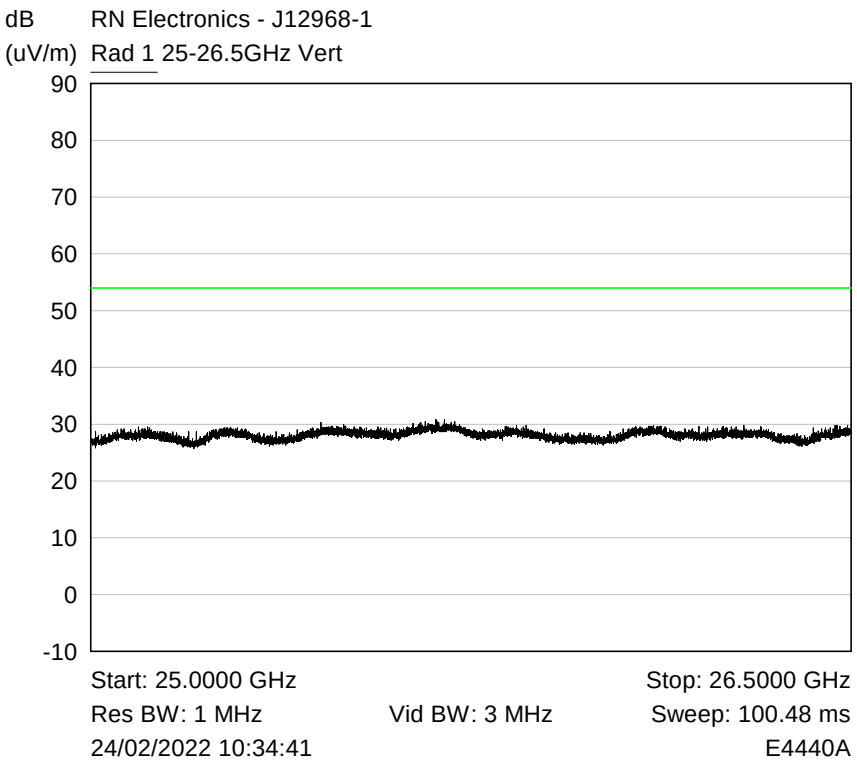


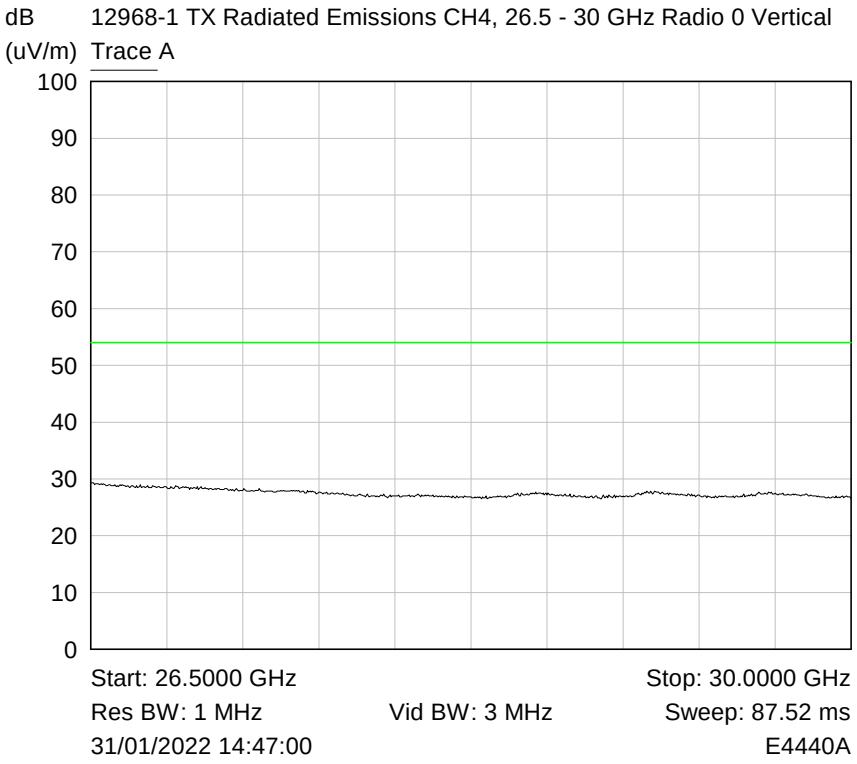


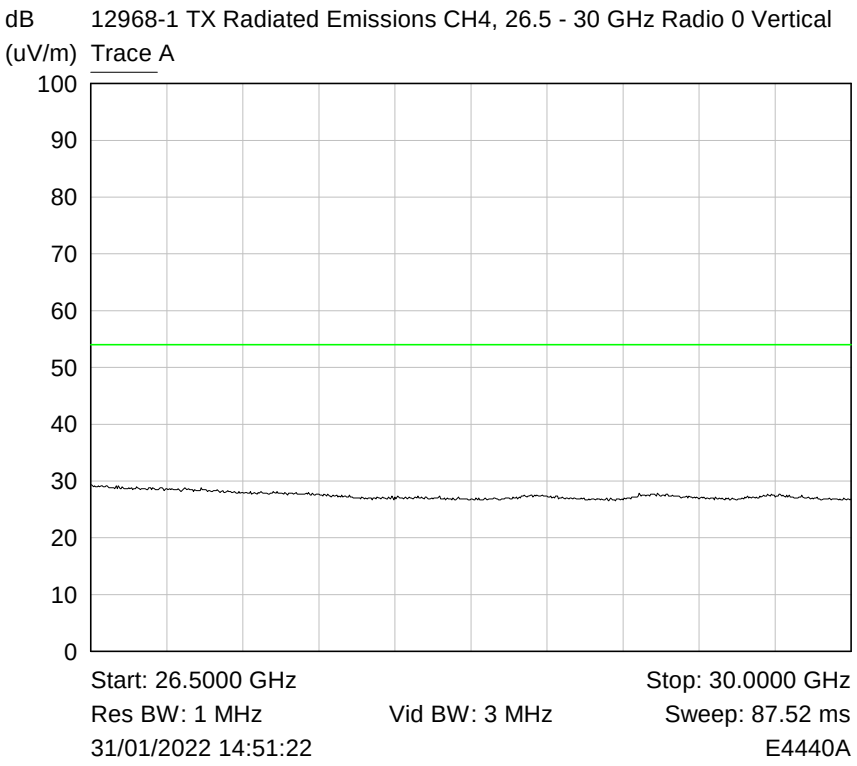

dB
(uV/m)
RN Electronics - J12968-1
Rad 1 22-25GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 22.0000 GHz
Stop: 25.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.48 ms
24/02/2022 10:40:38
E4440A

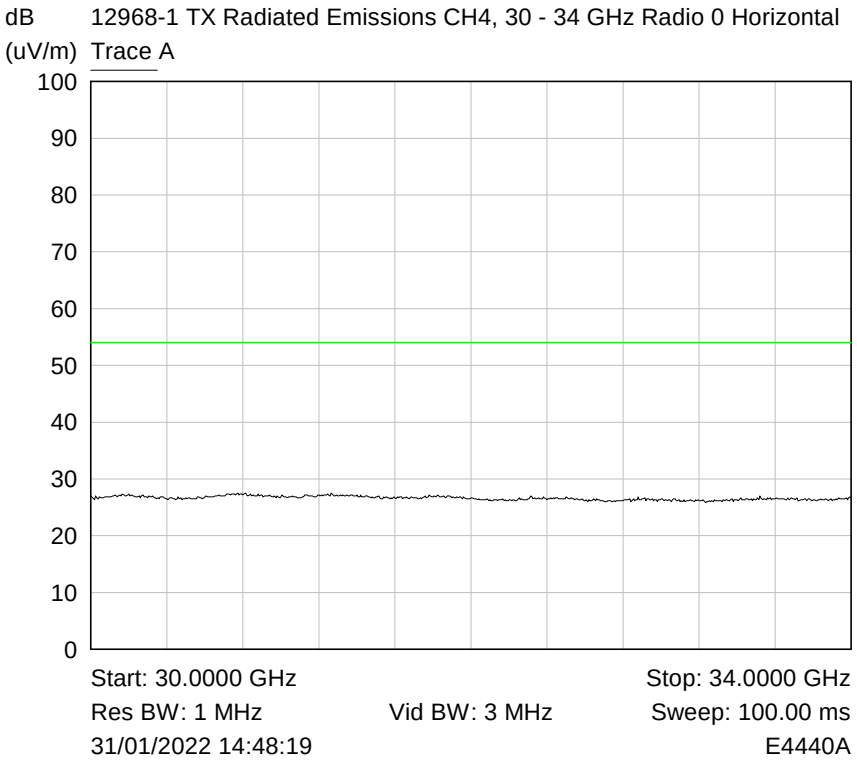

dB
(uV/m)
RN Electronics - J12968-1
Rad 1 22-25GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 22.0000 GHz
Stop: 25.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.48 ms
24/02/2022 10:34:03
E4440A

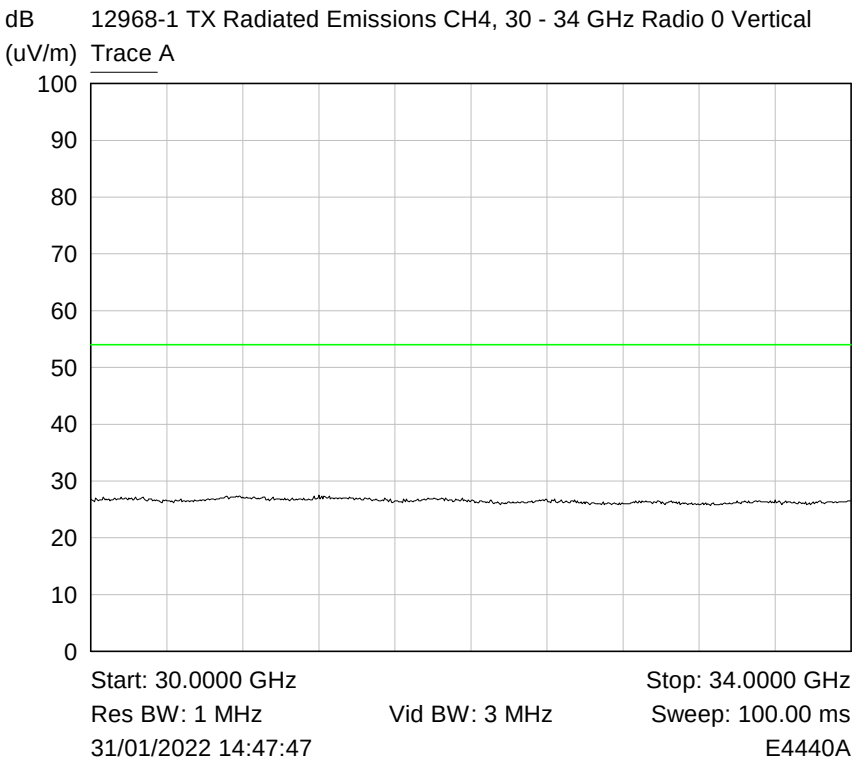

dB
(uV/m)
RN Electronics - J12968-1
Rad 1 25-26.5GHz Horiz
90
80
70
60
50
40
30
20
10
0
-10
Start: 25.0000 GHz
Stop: 26.5000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.48 ms
24/02/2022 10:41:11
E4440A

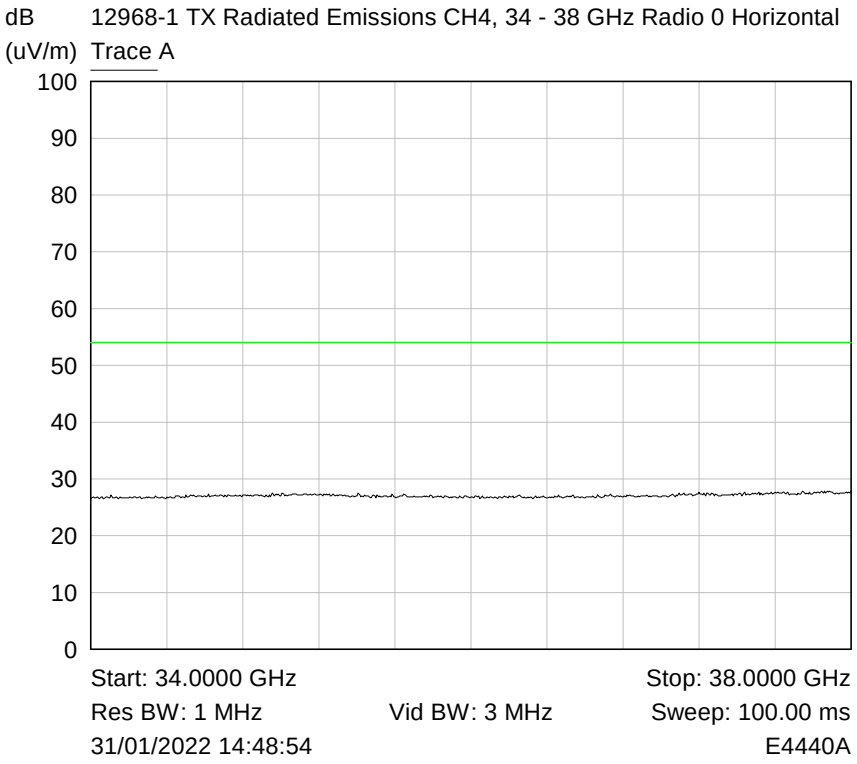

dB
(uV/m)
RN Electronics - J12968-1
Rad 1 25-26.5GHz Vert
90
80
70
60
50
40
30
20
10
0
-10
Start: 25.0000 GHz
Stop: 26.5000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.48 ms
24/02/2022 10:34:41
E4440A

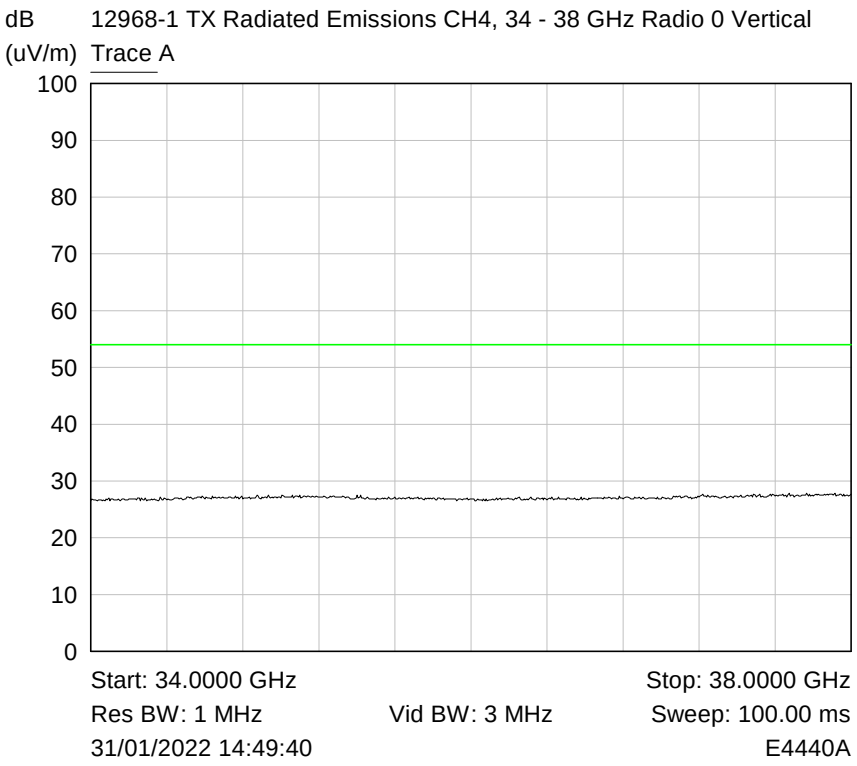


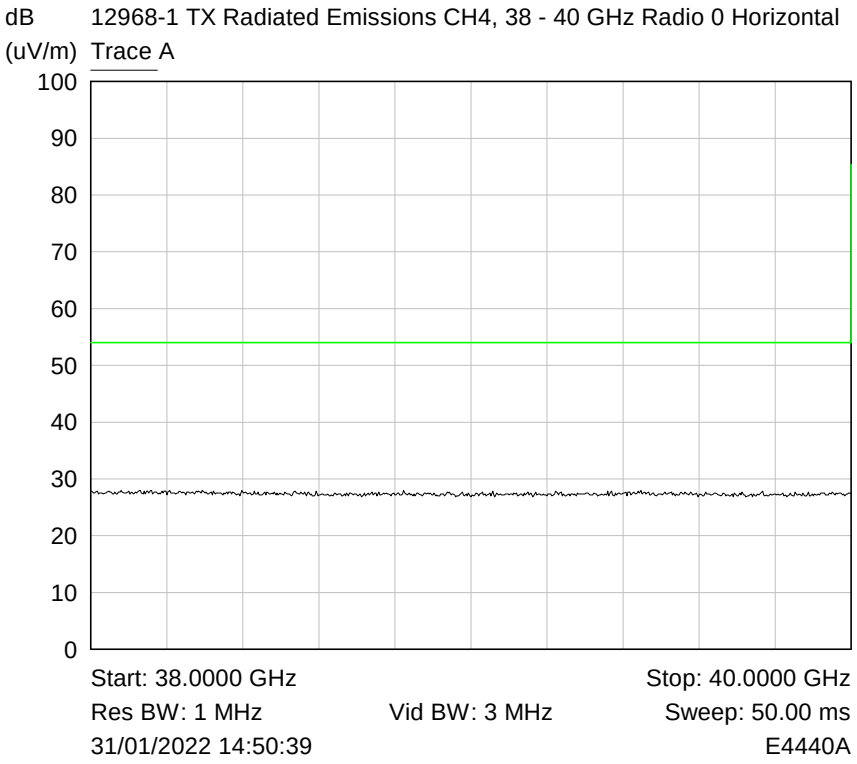


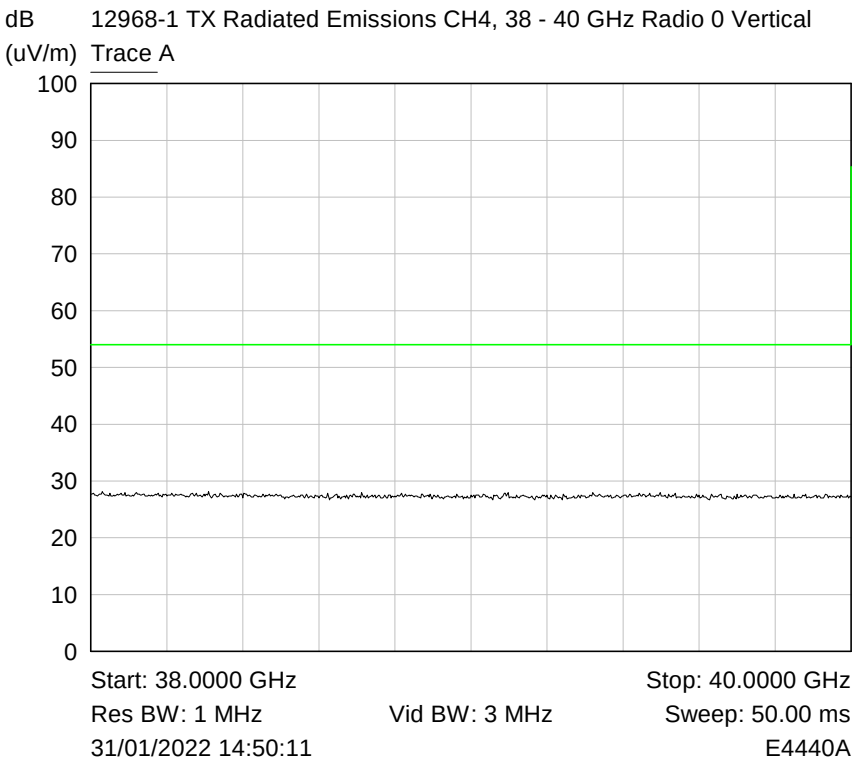


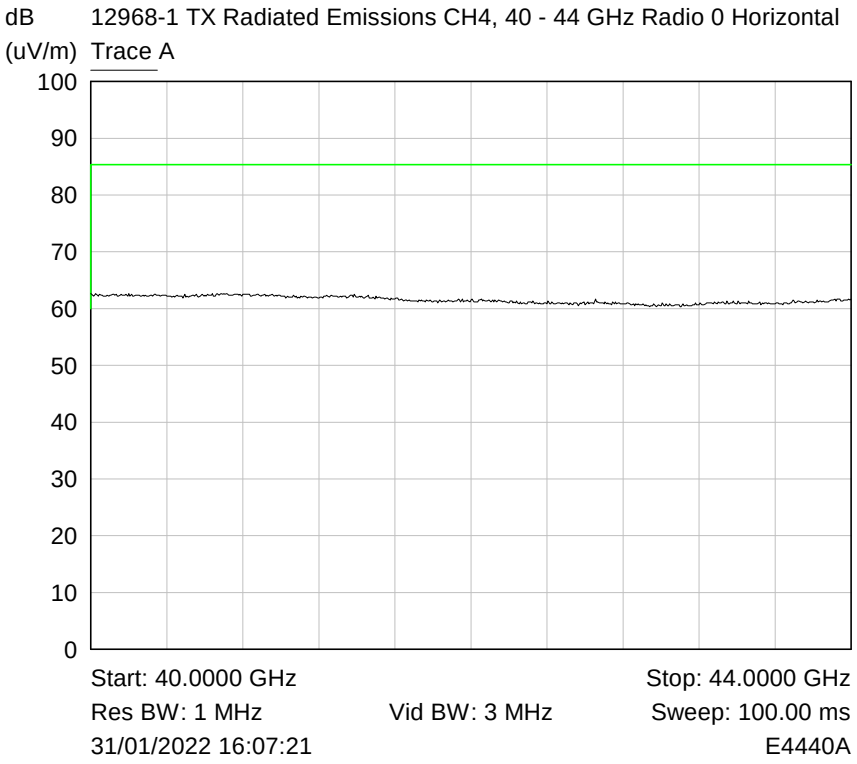


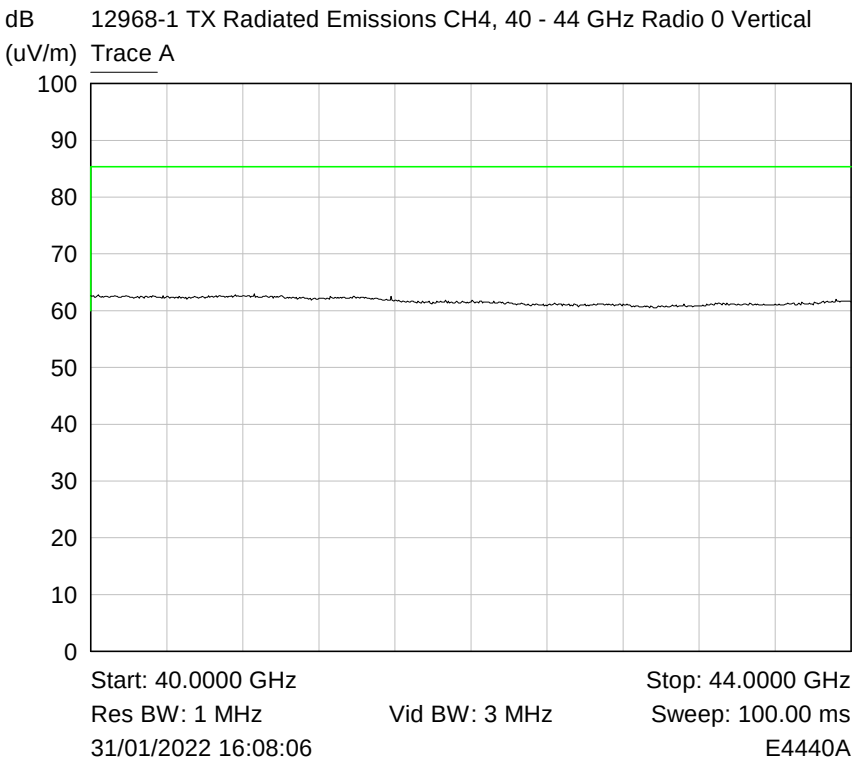

dB
(uV/m)
12968-1 TX Radiated Emissions CH4, 34 - 38 GHz Radio 0 Horizontal
Trace A
100
90
80
70
60
50
40
30
20
10
0
Start: 34.0000 GHz
Stop: 38.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.00 ms
31/01/2022 14:48:54
E4440A

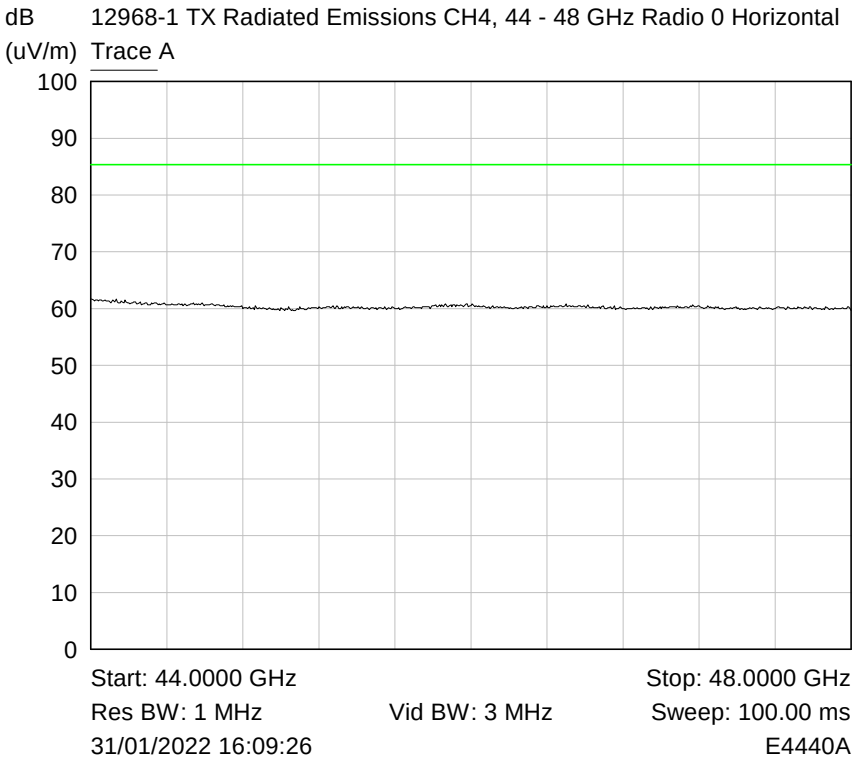

dB
(uV/m)
12968-1 TX Radiated Emissions CH4, 34 - 38 GHz Radio 0 Vertical
Trace A
100
90
80
70
60
50
40
30
20
10
0
Start: 34.0000 GHz
Stop: 38.0000 GHz
Res BW: 1 MHz
Vid BW: 3 MHz
Sweep: 100.00 ms
31/01/2022 14:49:40
E4440A

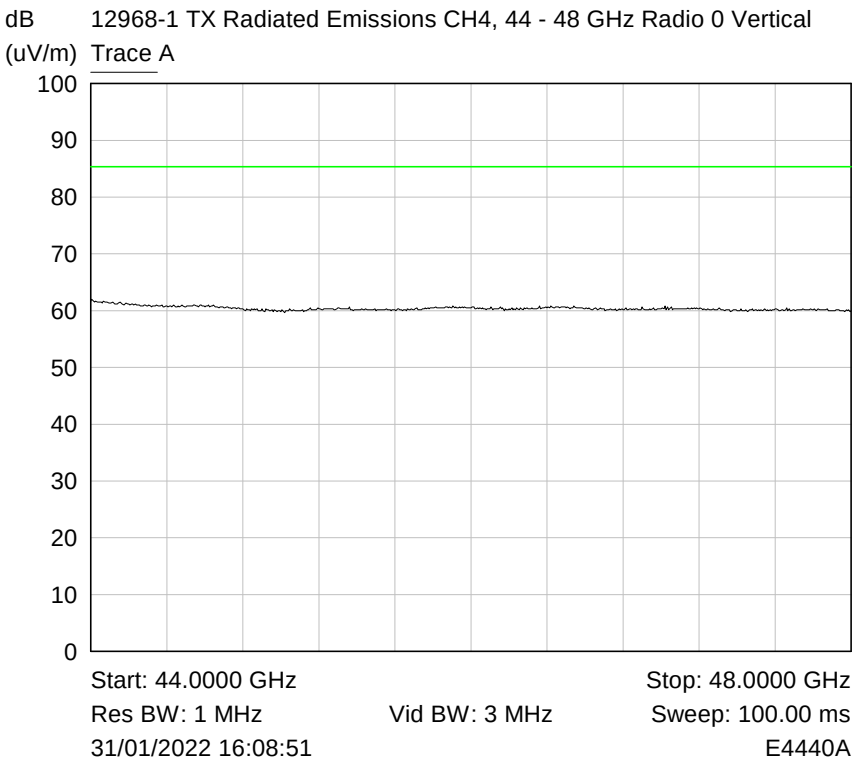


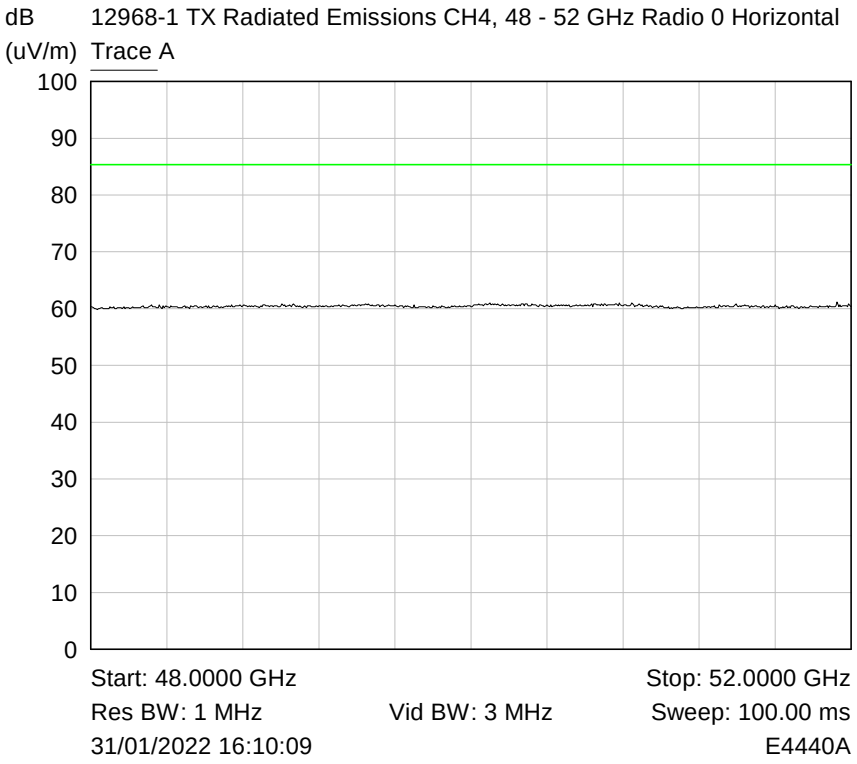


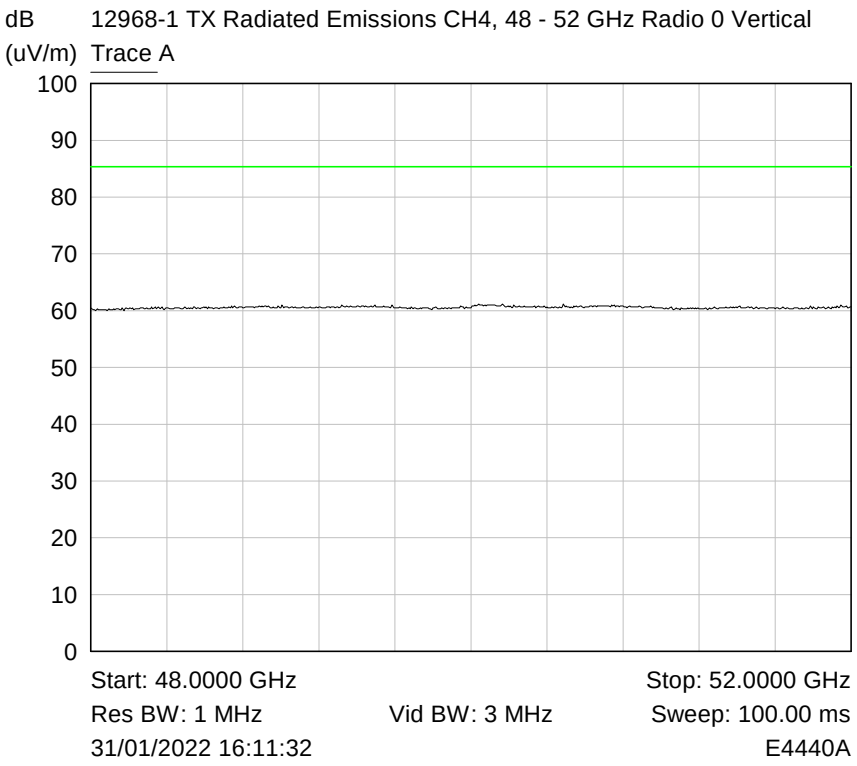


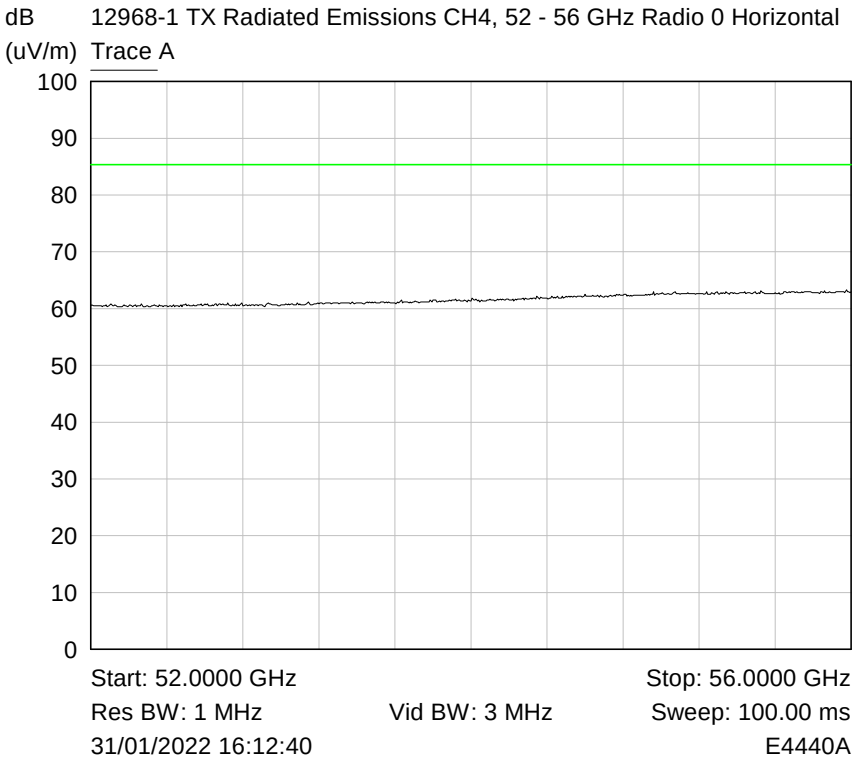


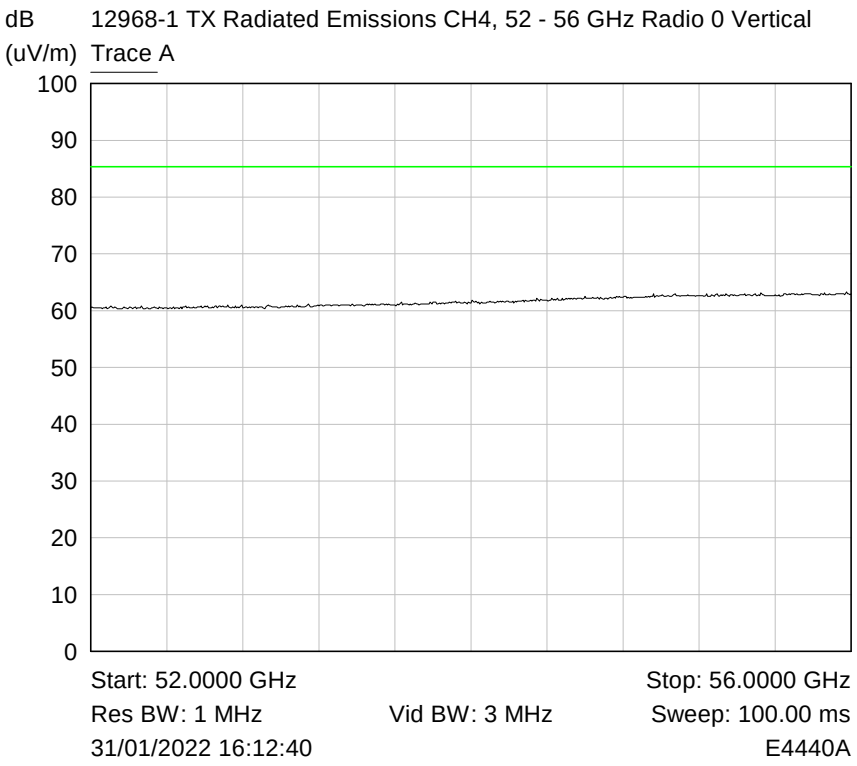


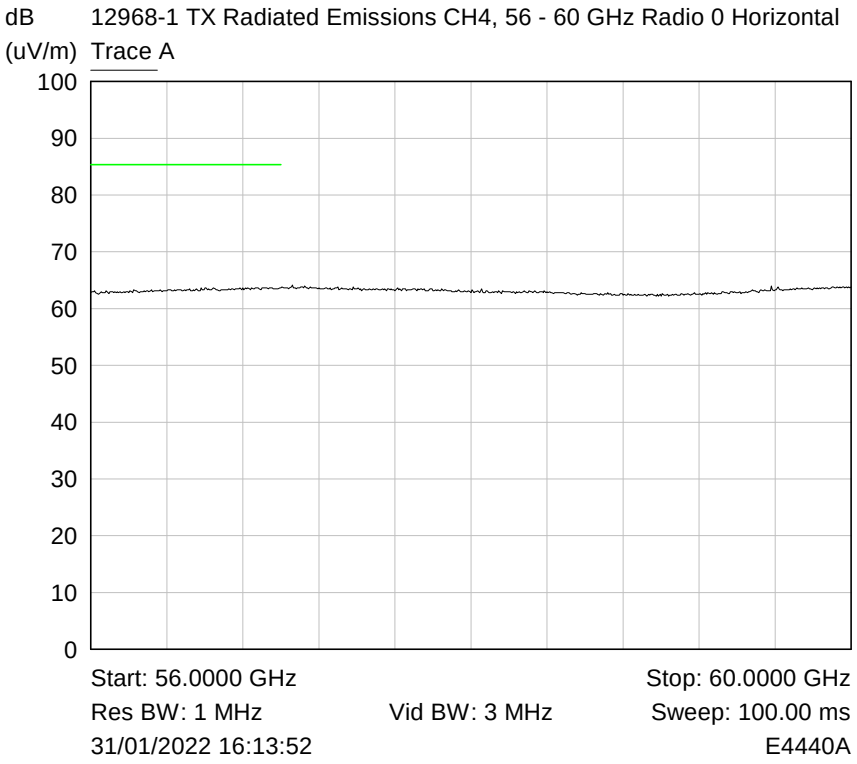


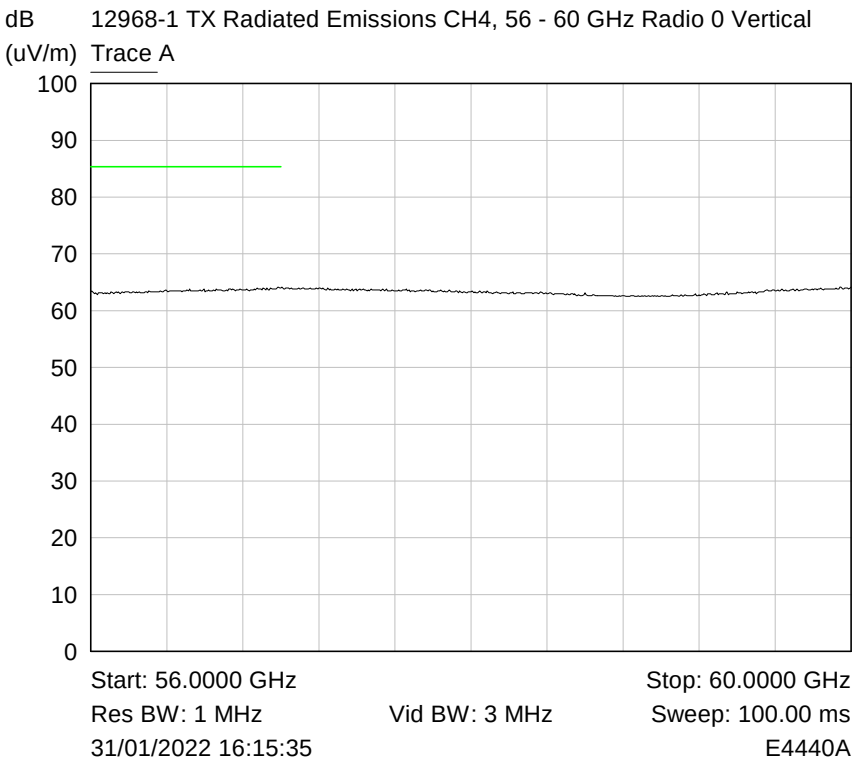


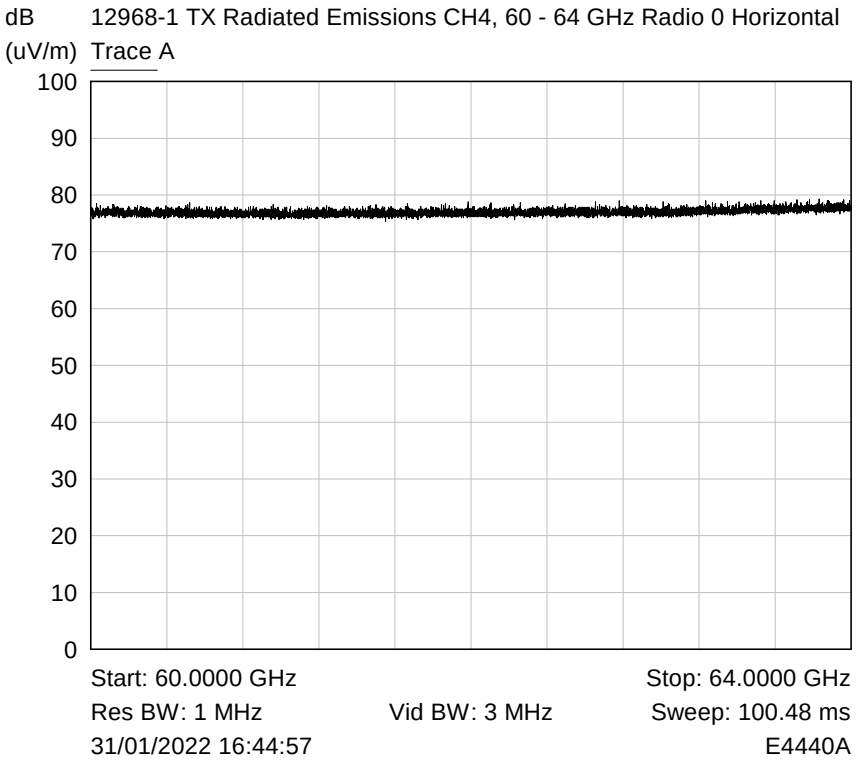


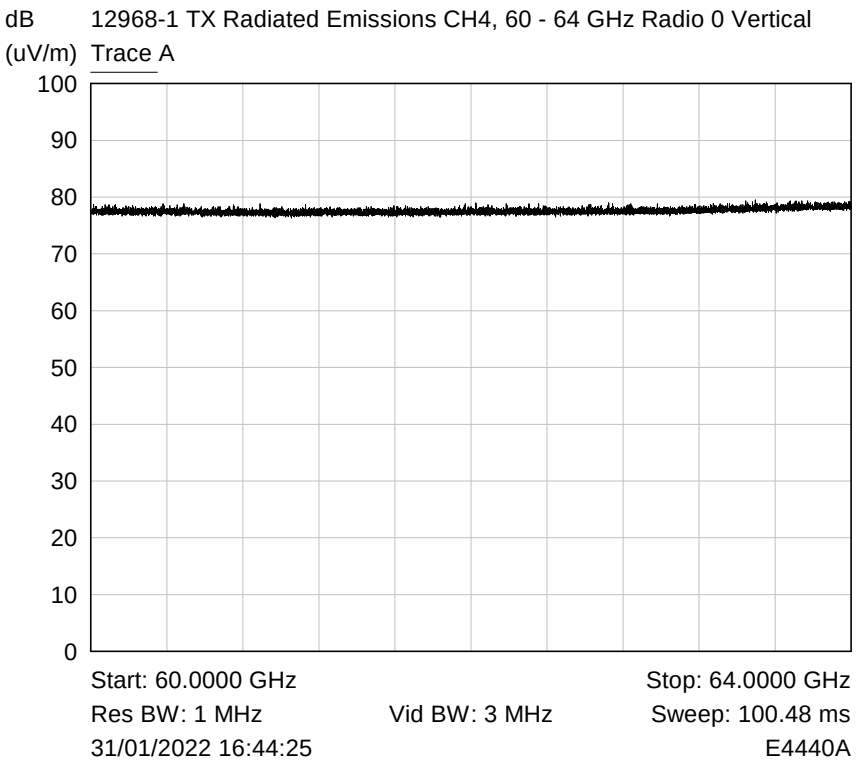


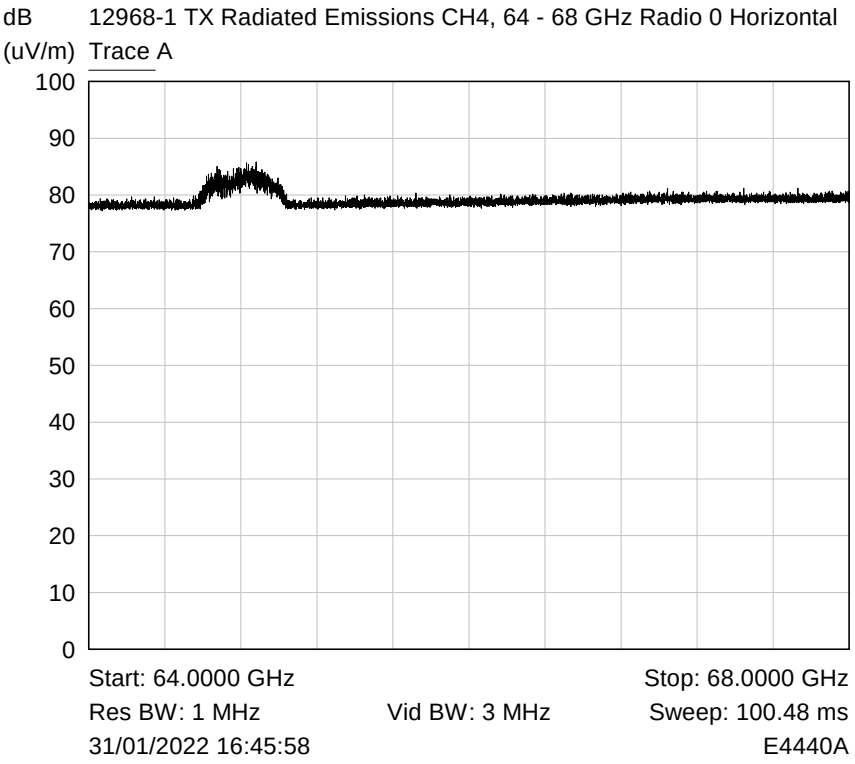


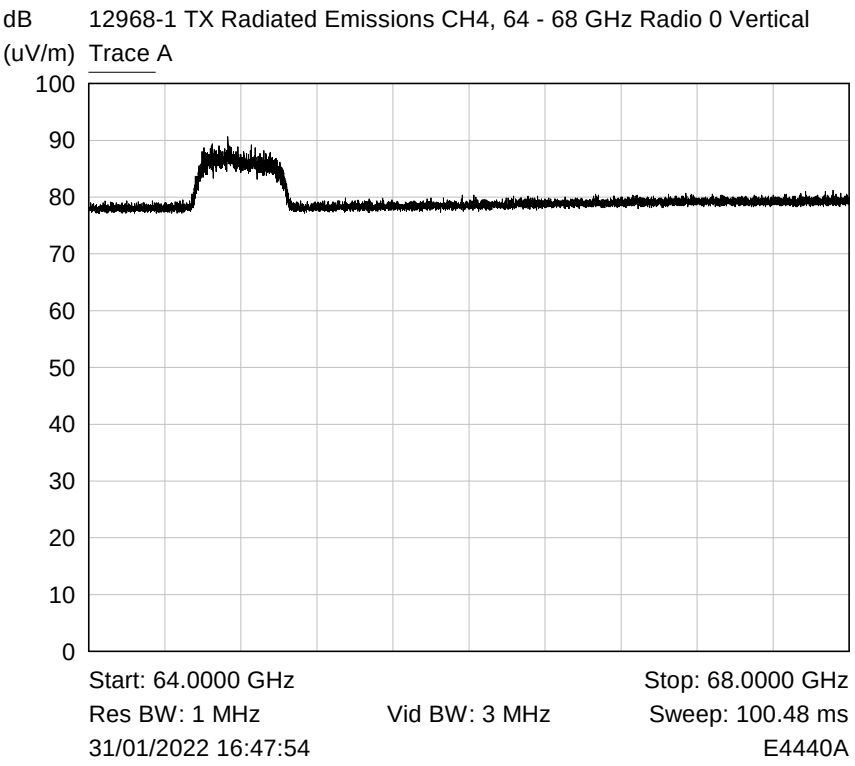


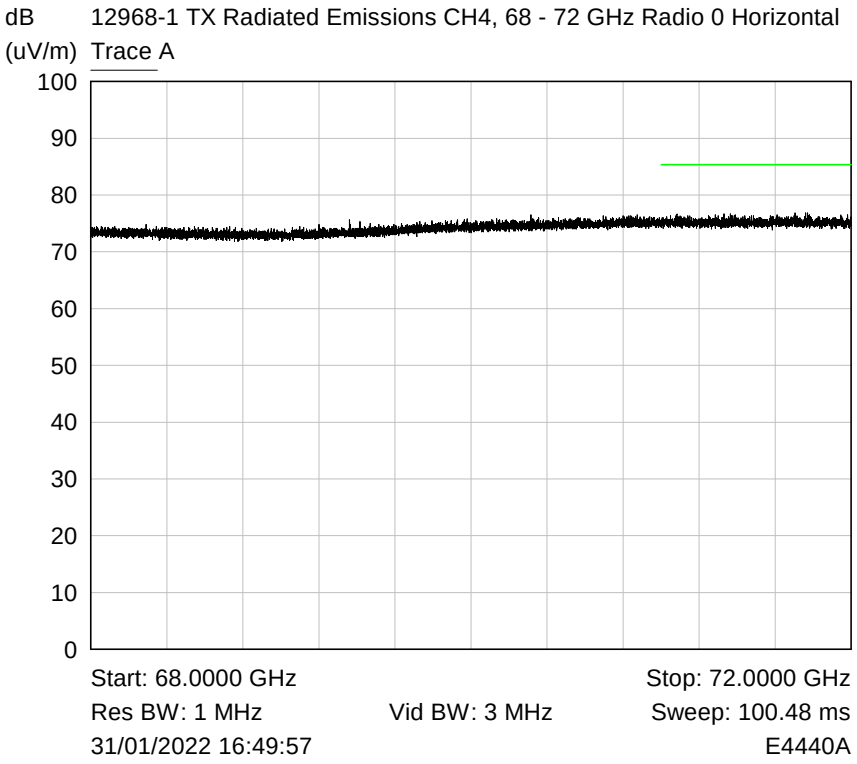


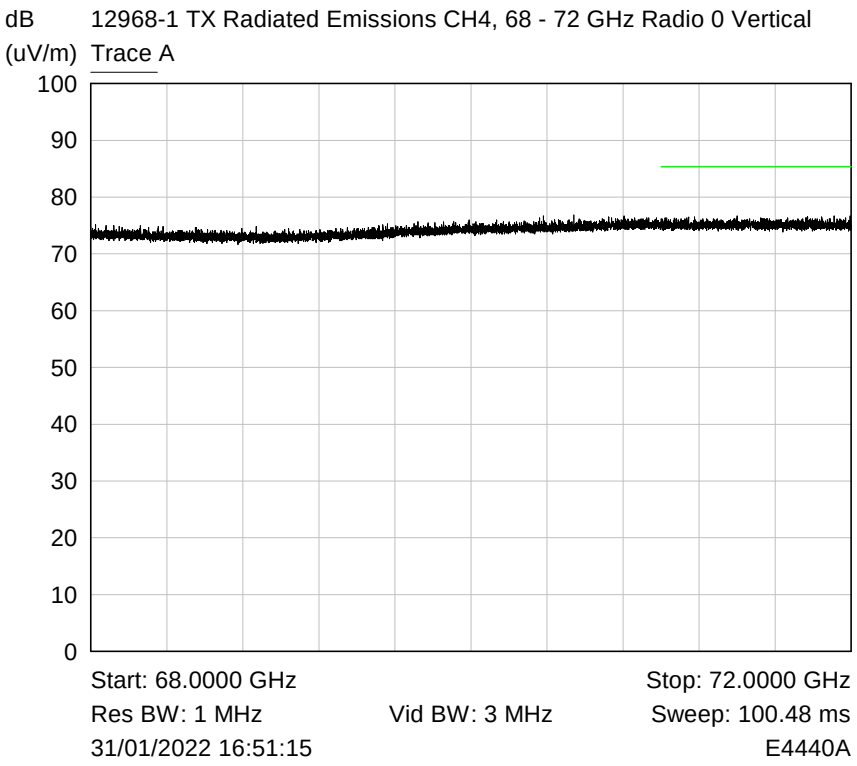


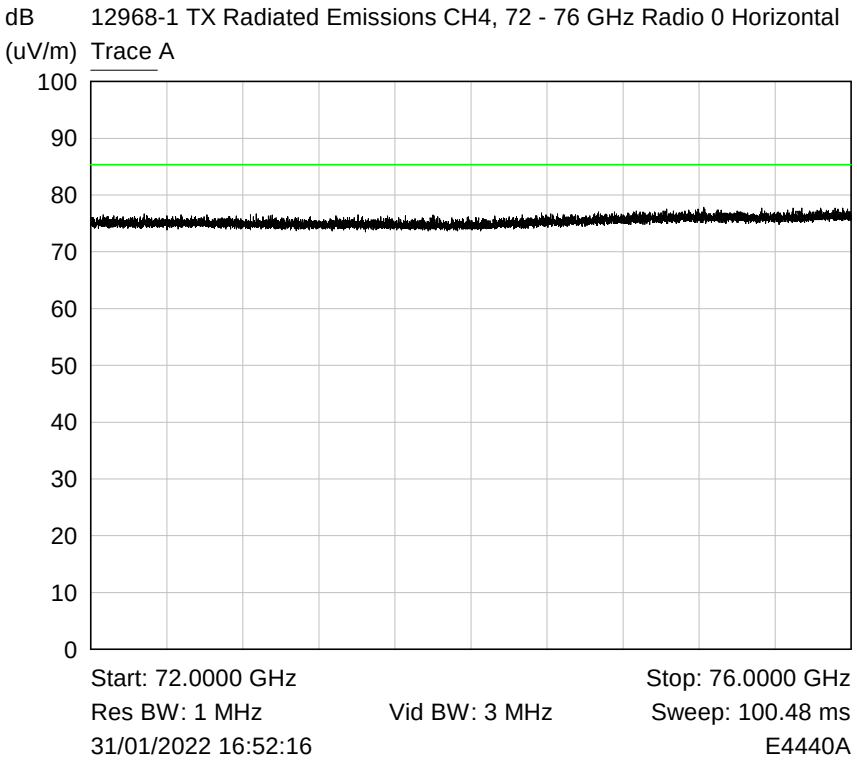


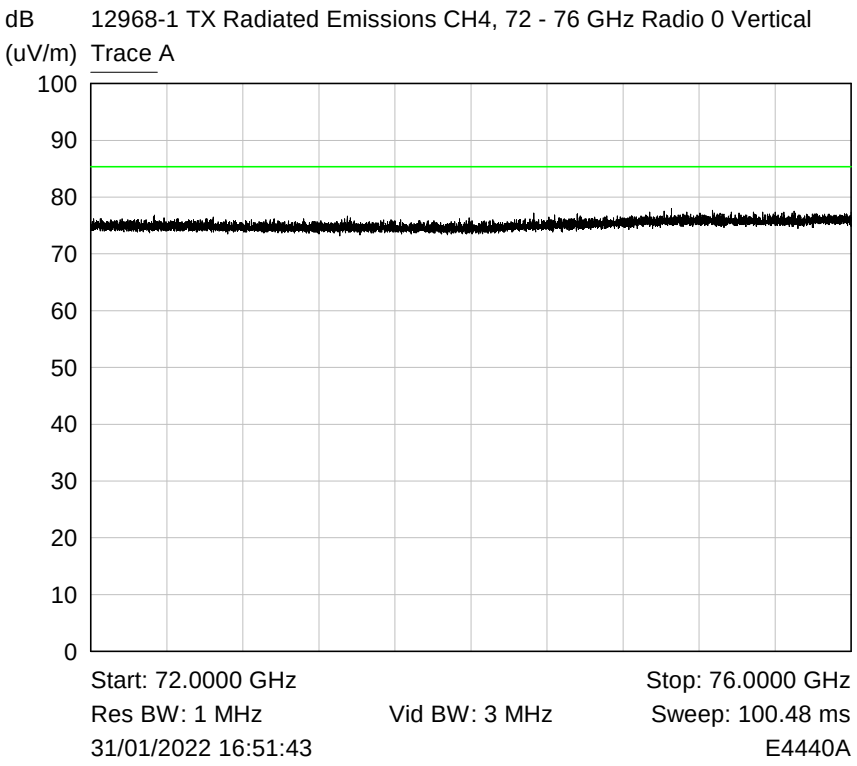


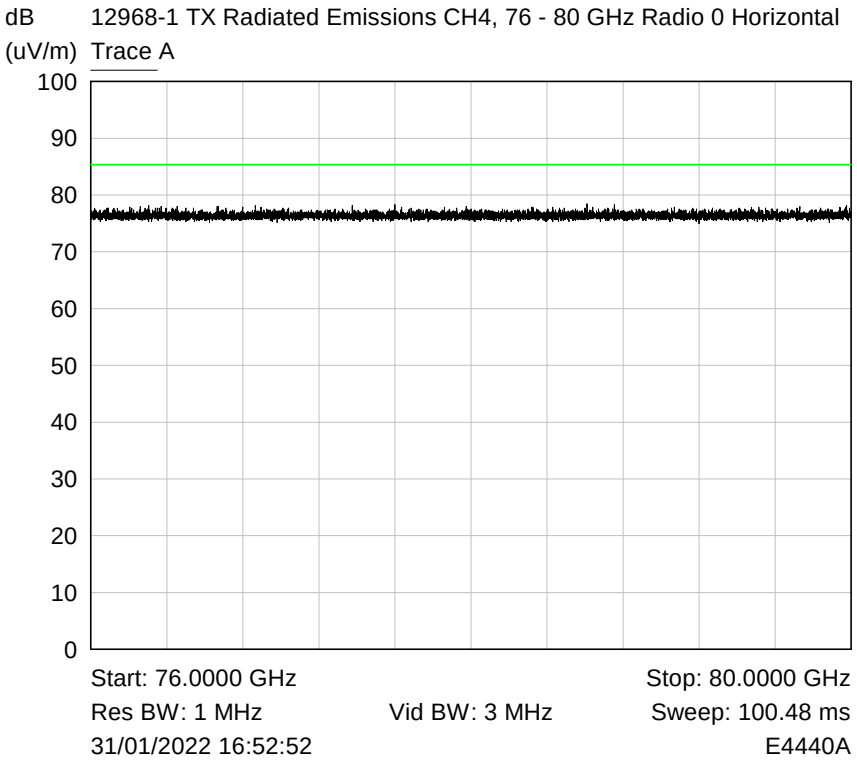


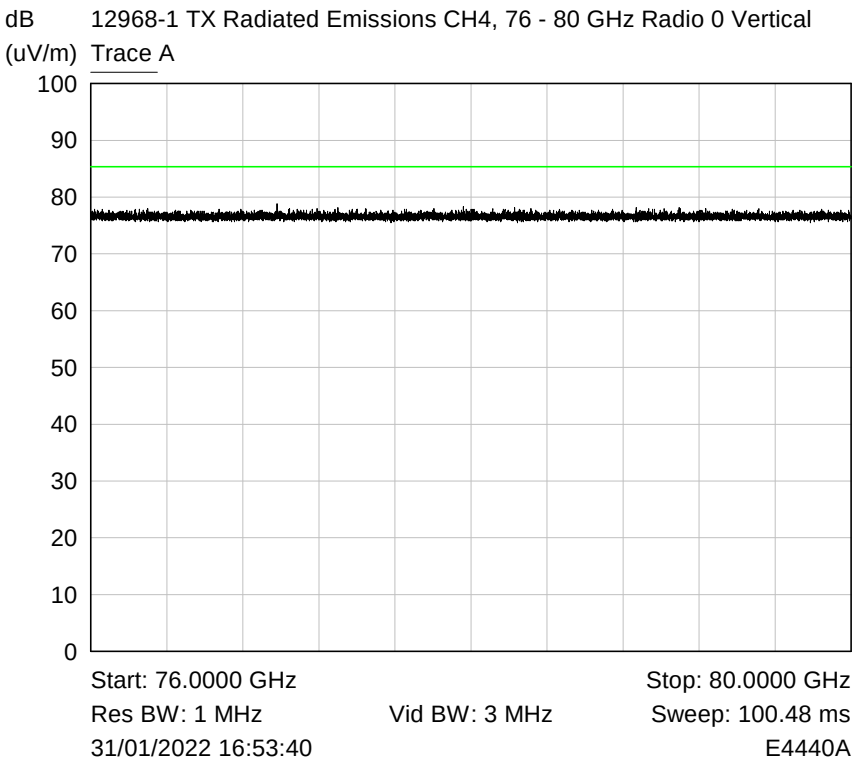


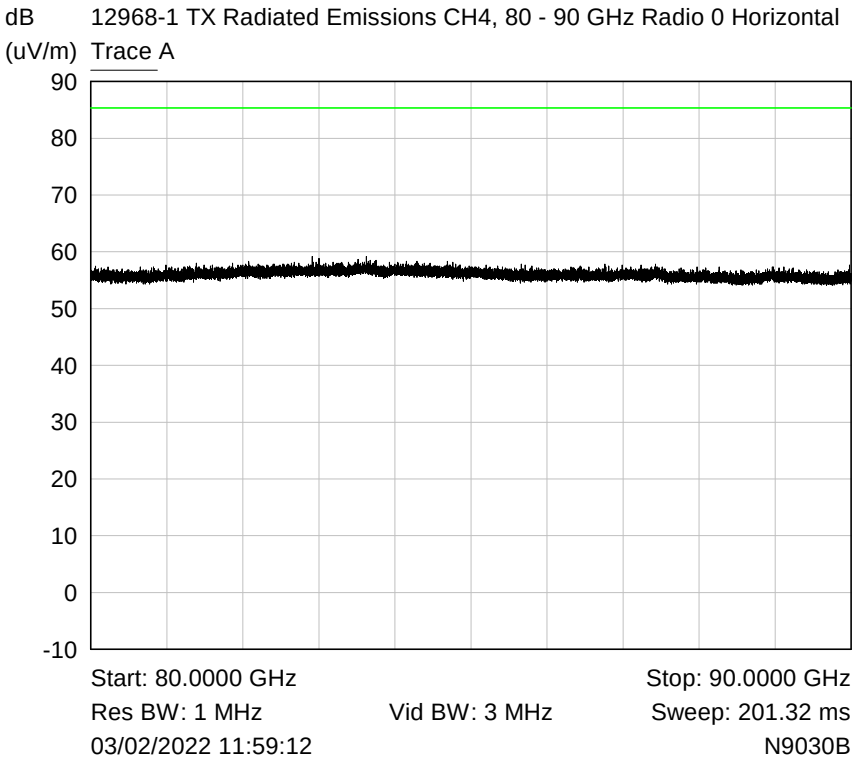


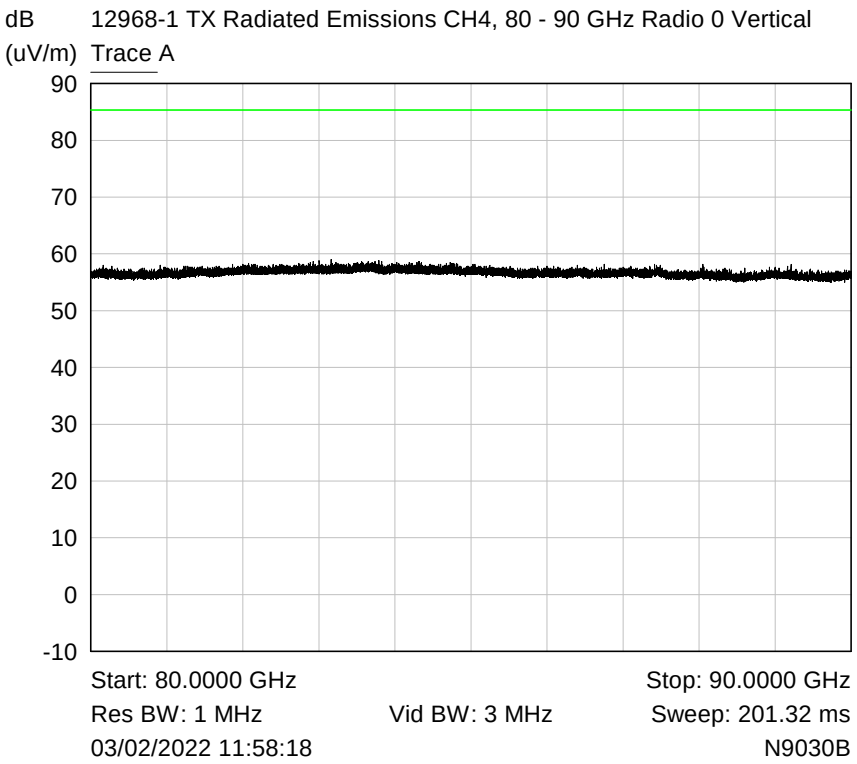


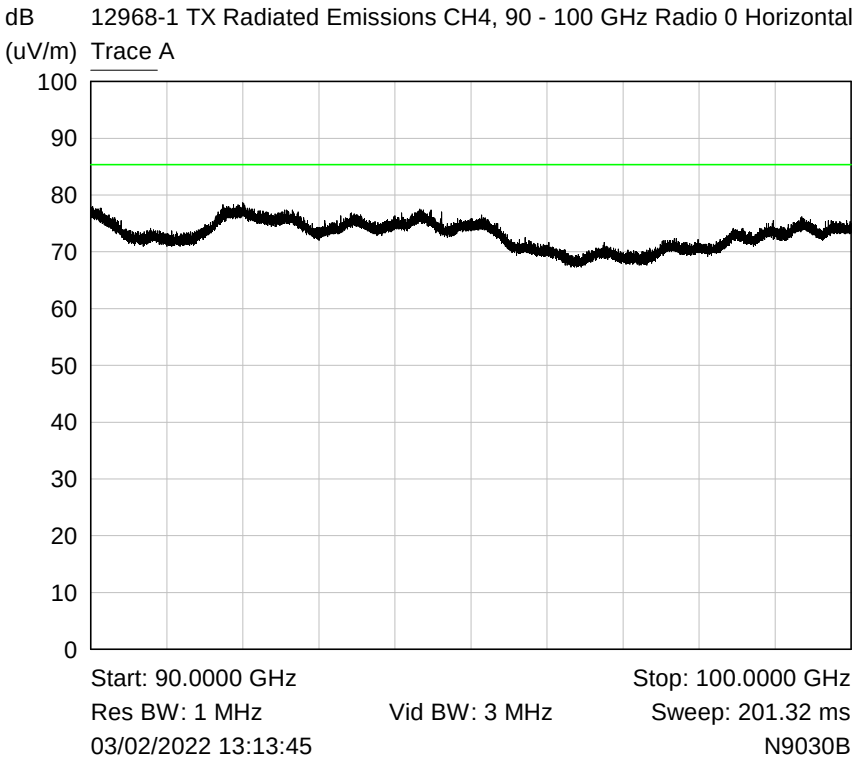


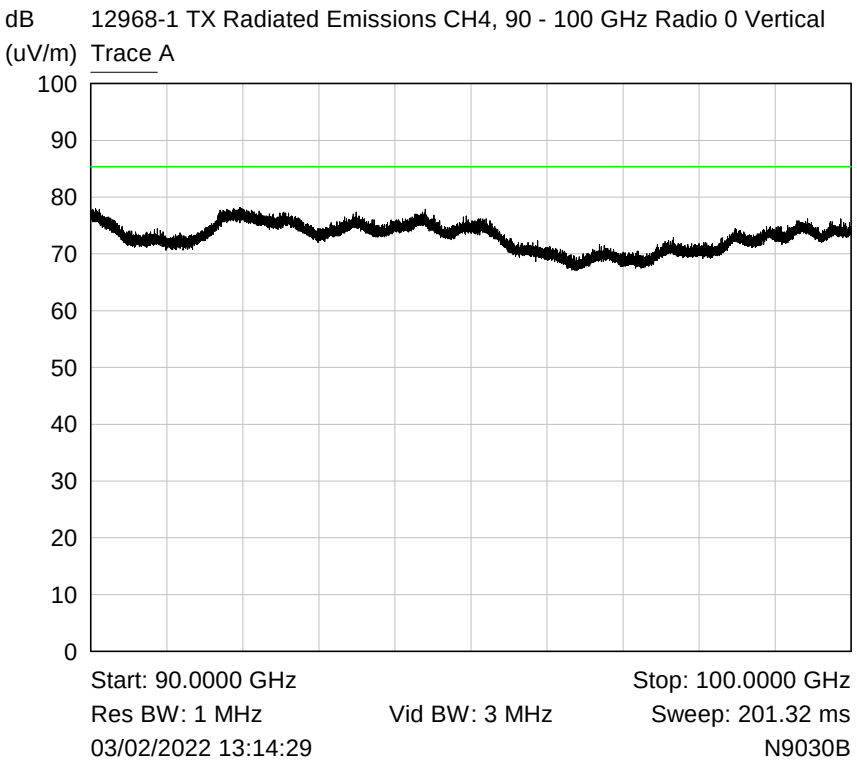


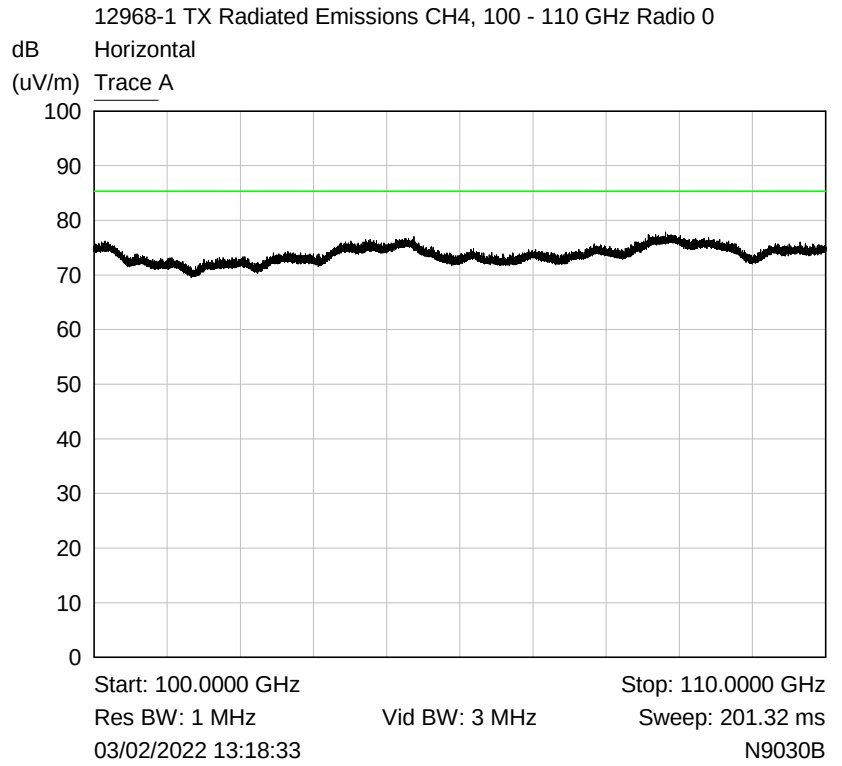


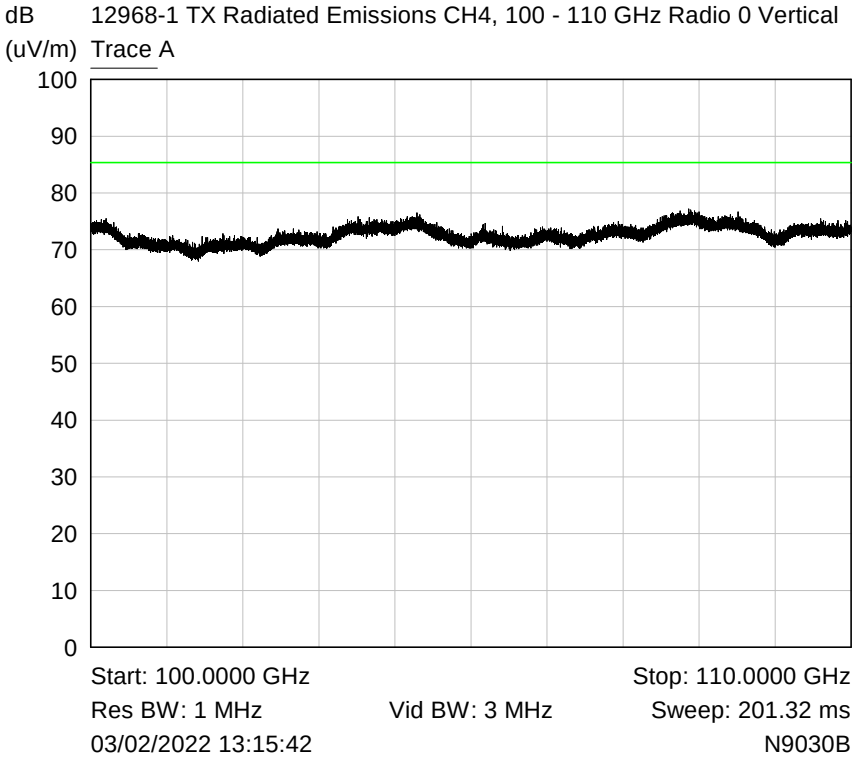


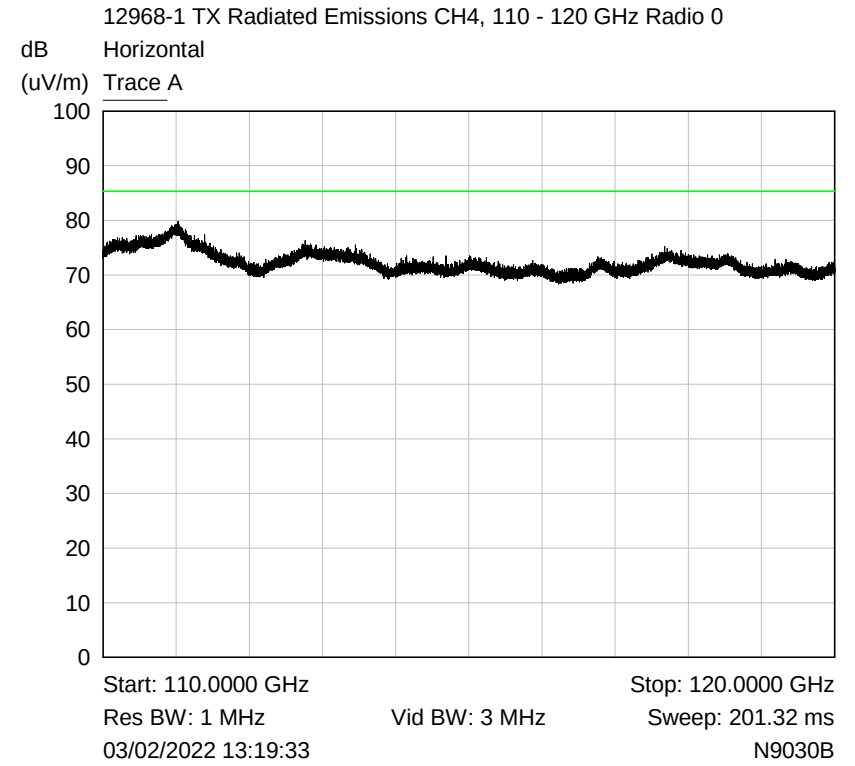


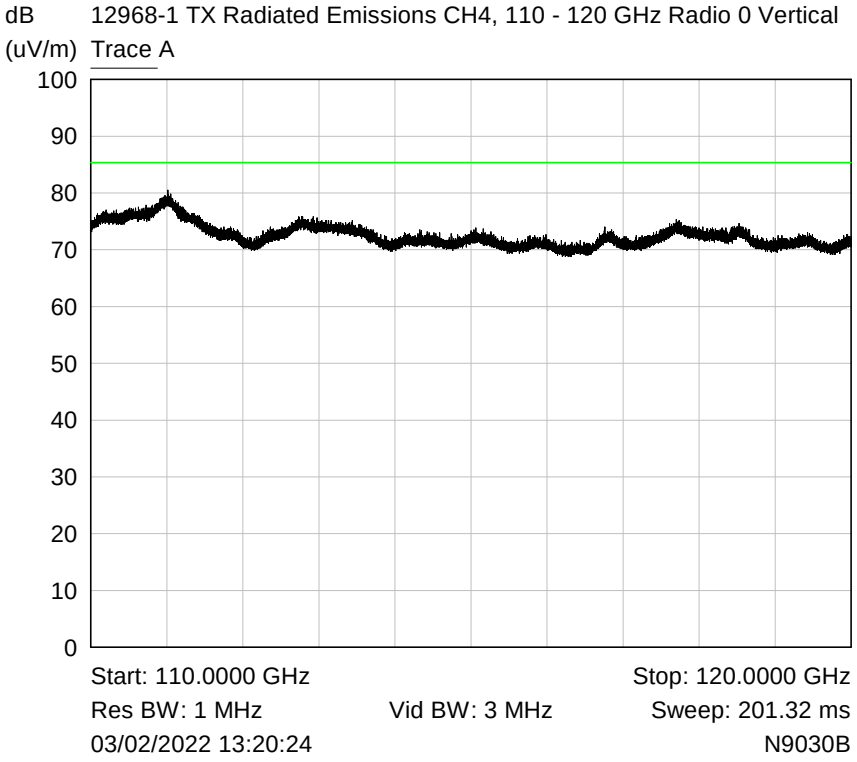


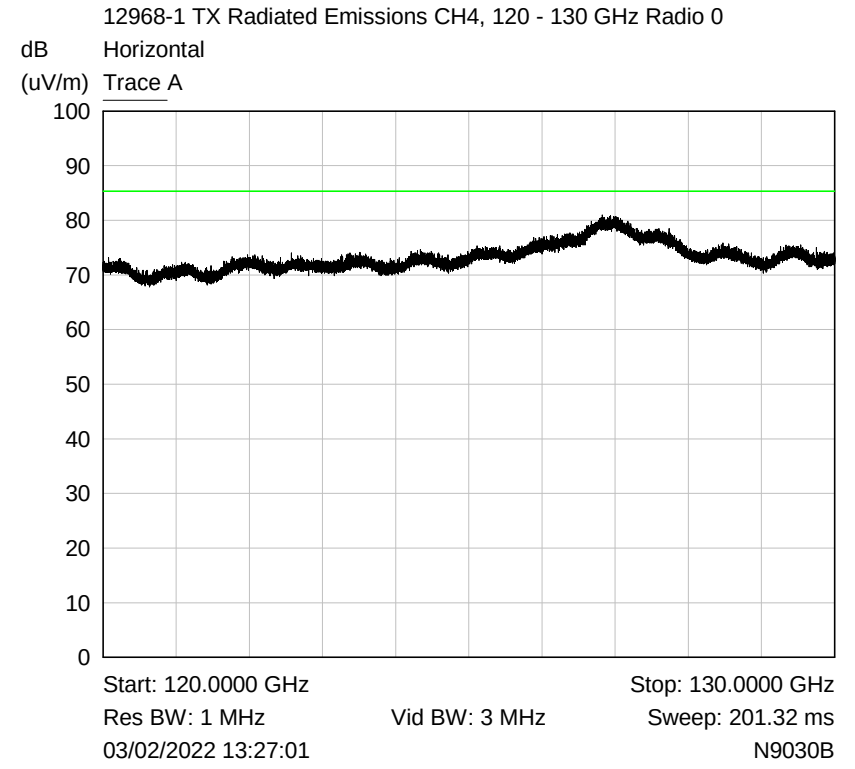


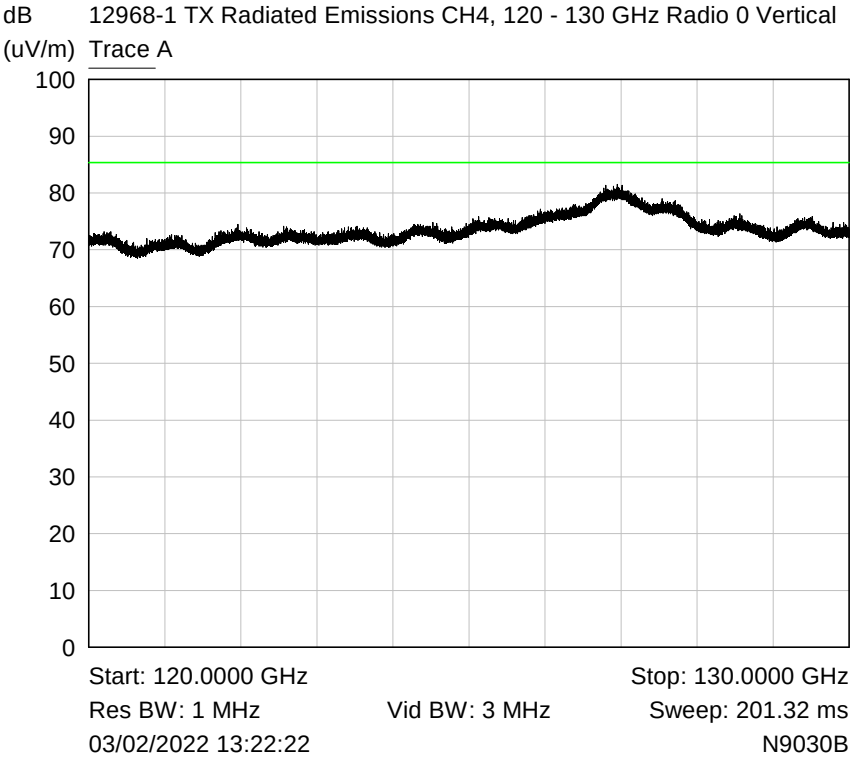


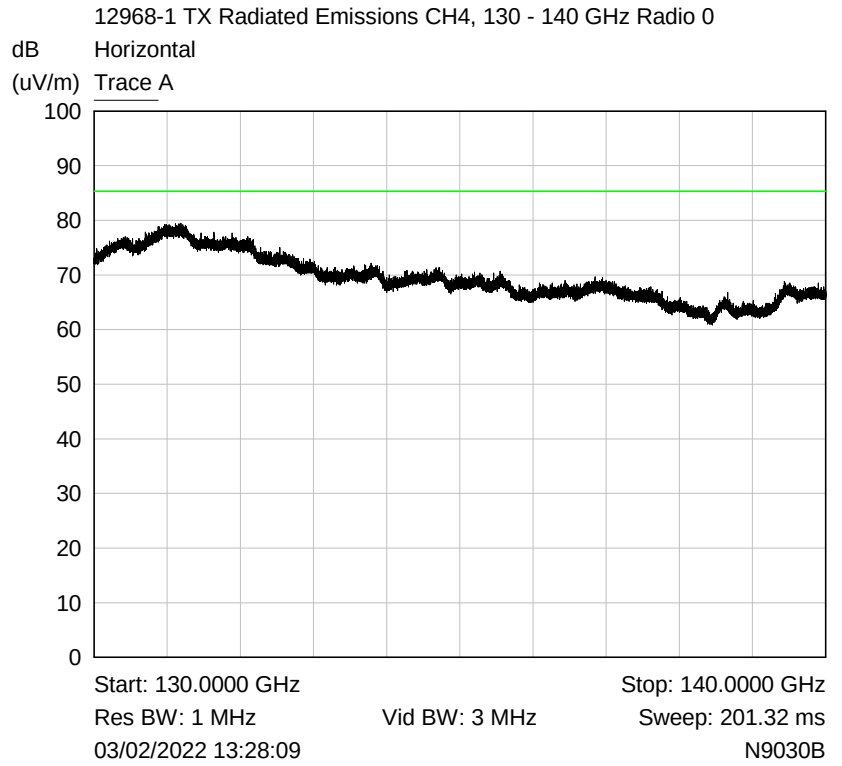


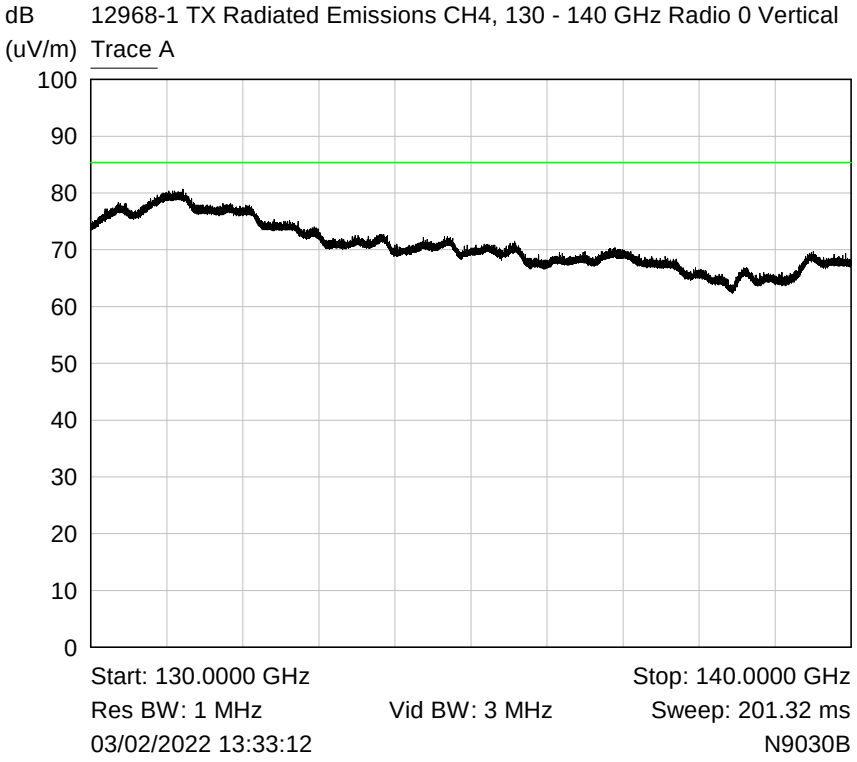


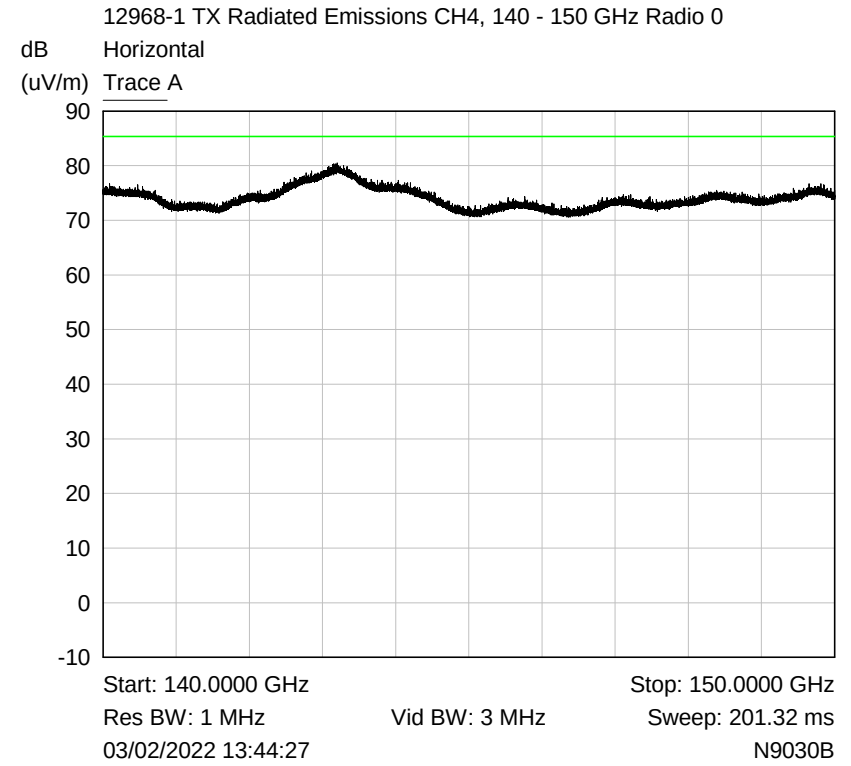


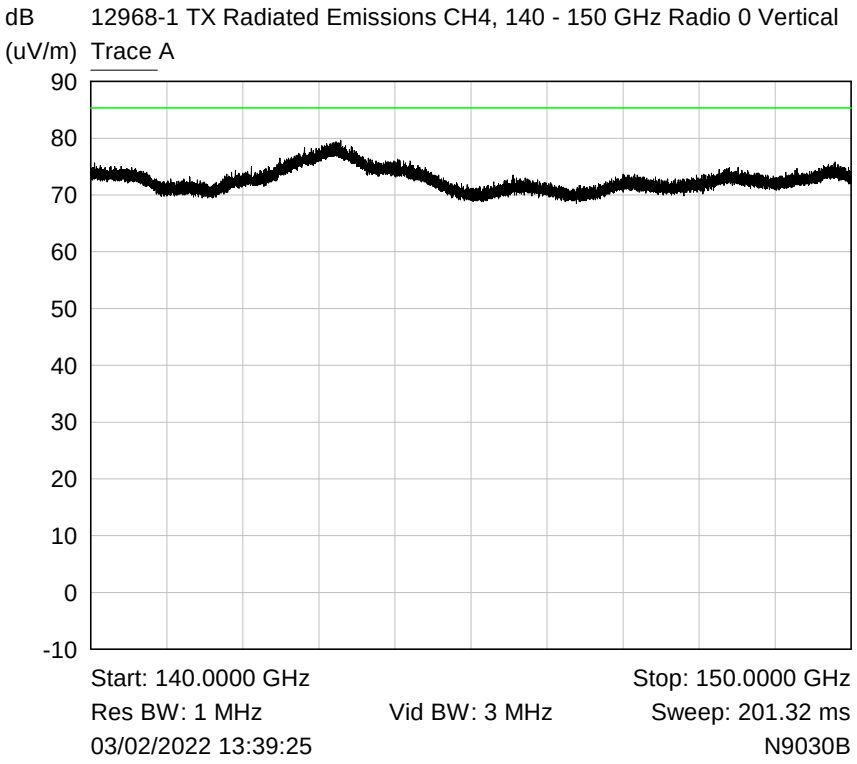


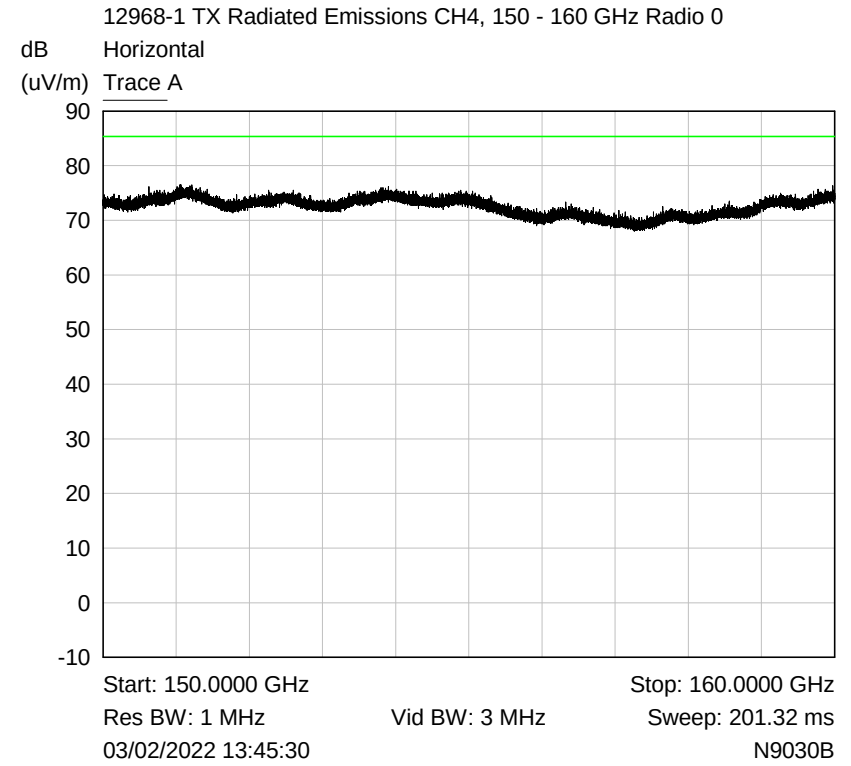


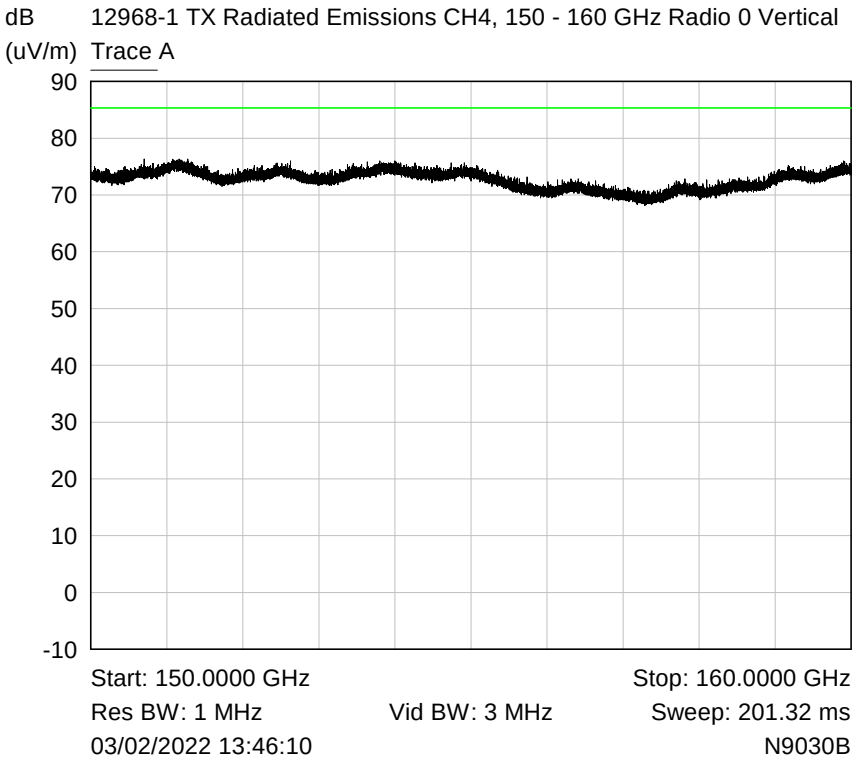


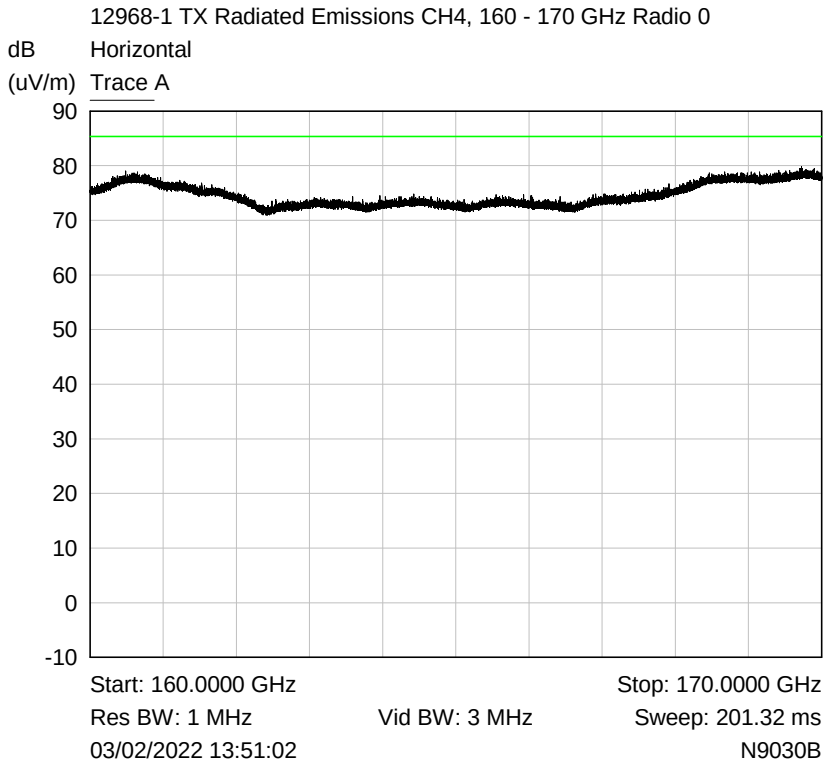


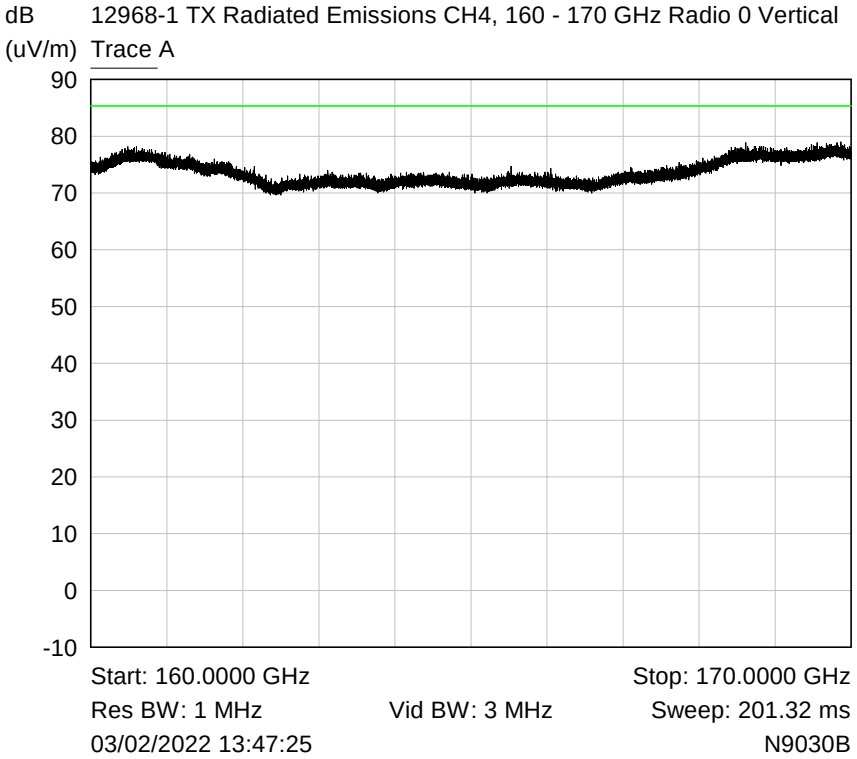


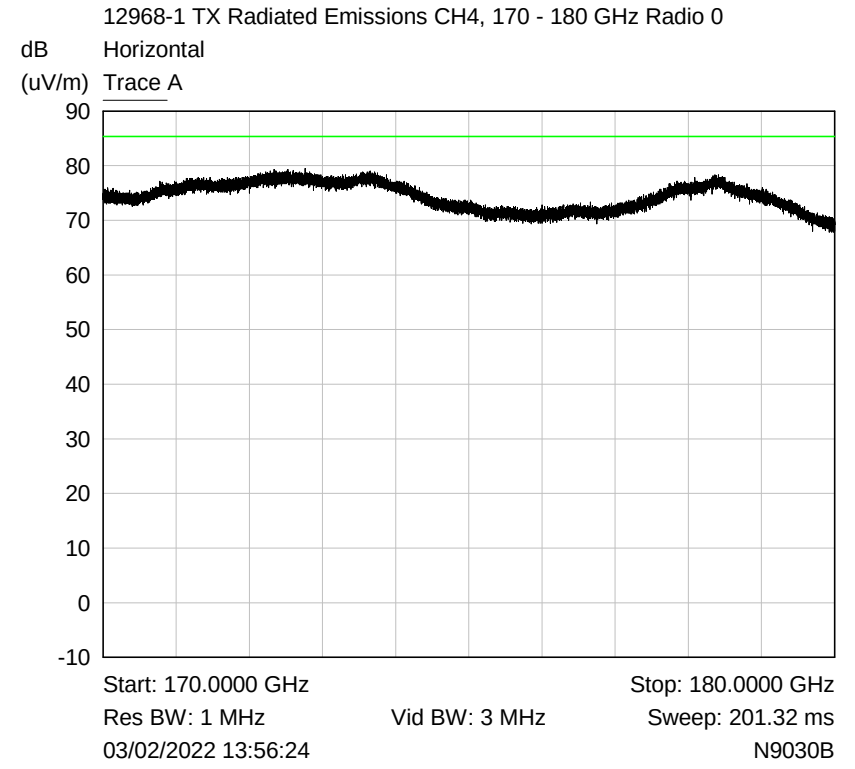


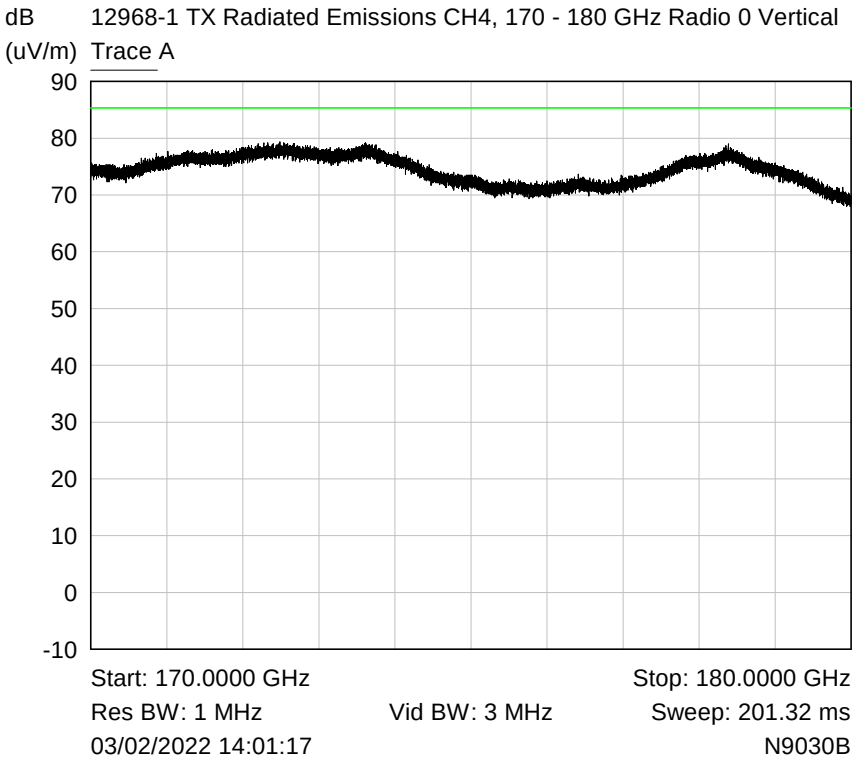


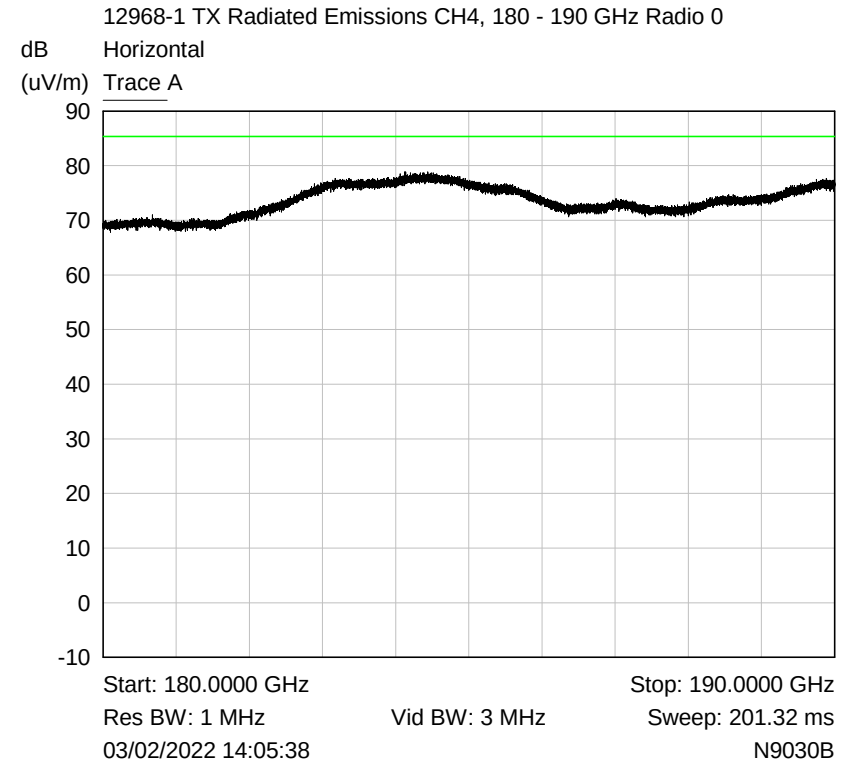


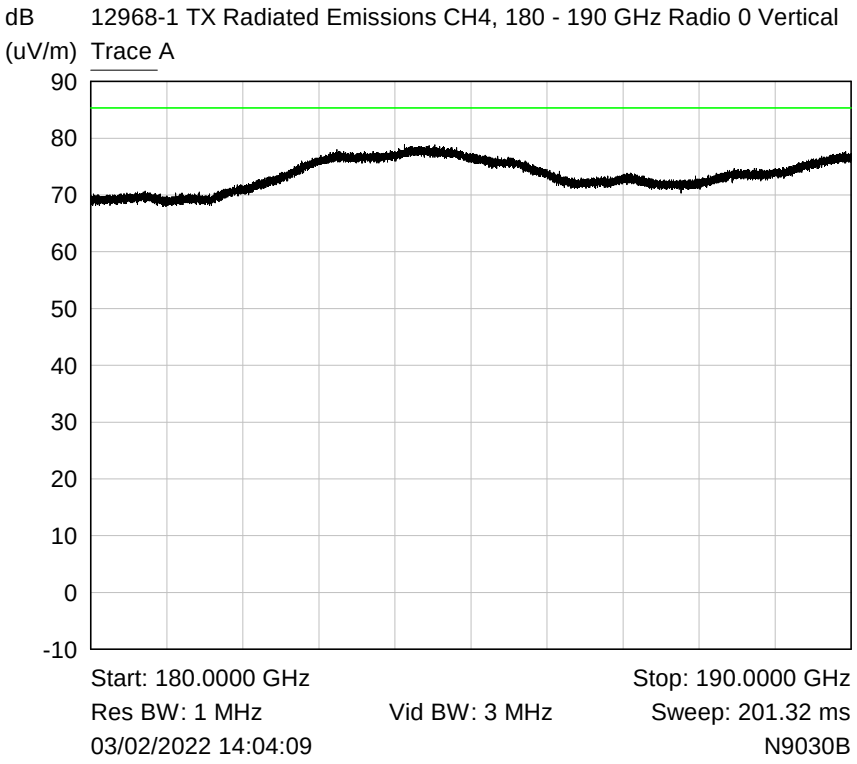


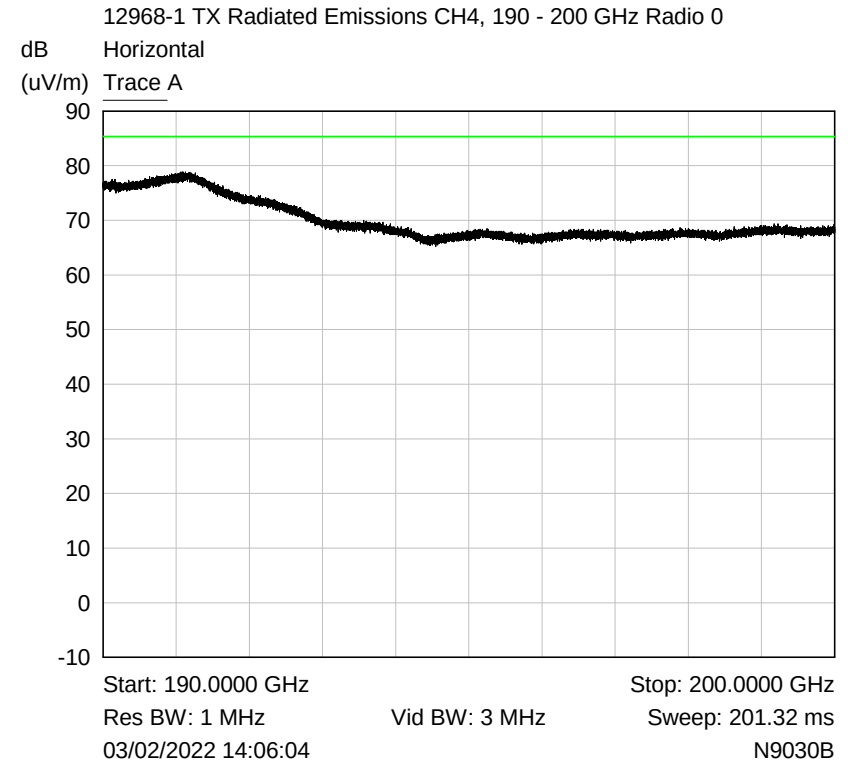


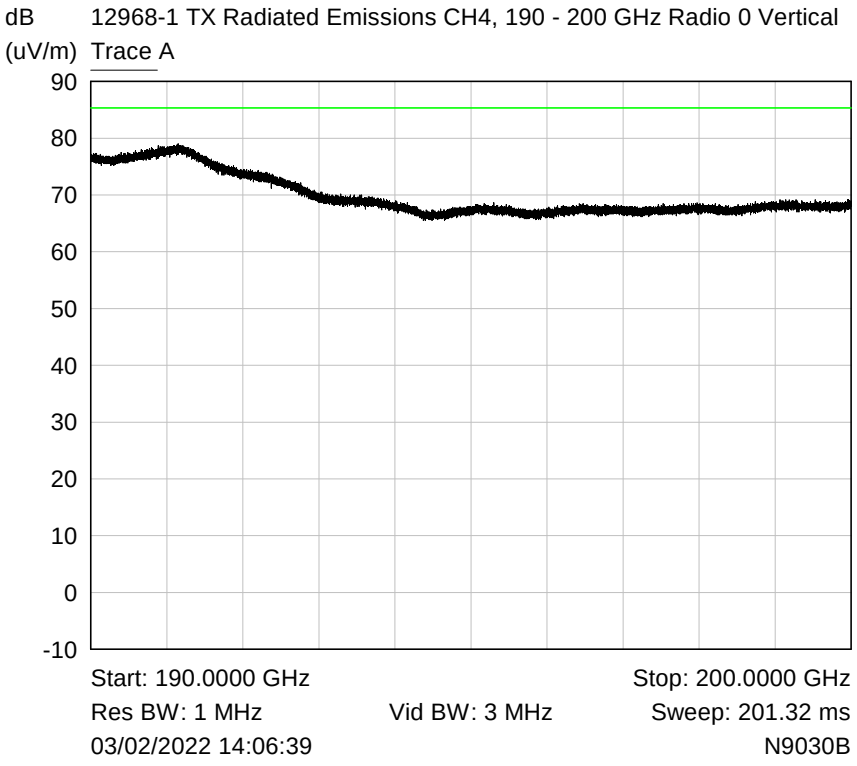






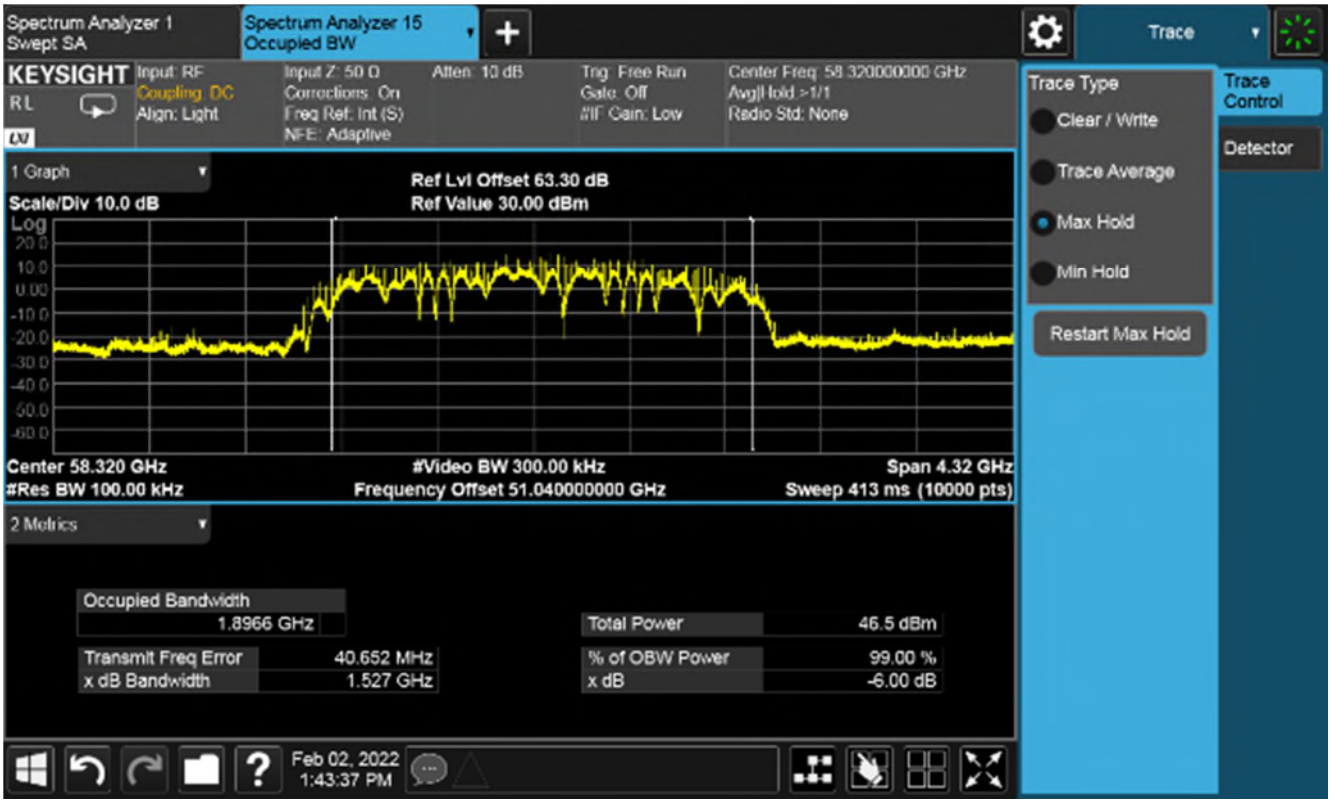






6.5 6dB Occupied bandwidth

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

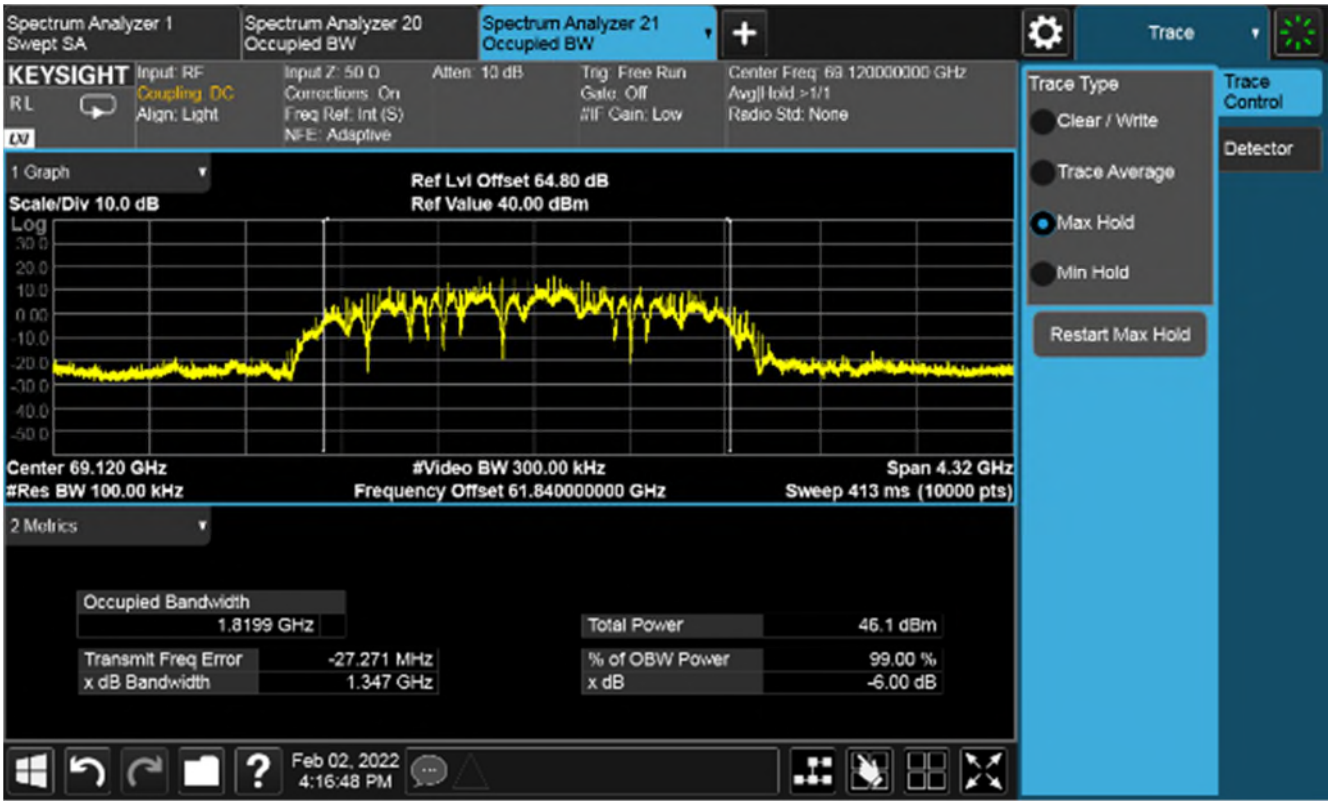
RF Parameters: Band 57-71 GHz (Radio 1), Power 39 dBm, Channel Spacing 2.16 GHz, Modulation MCS0, Channel 58.32 GHz

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

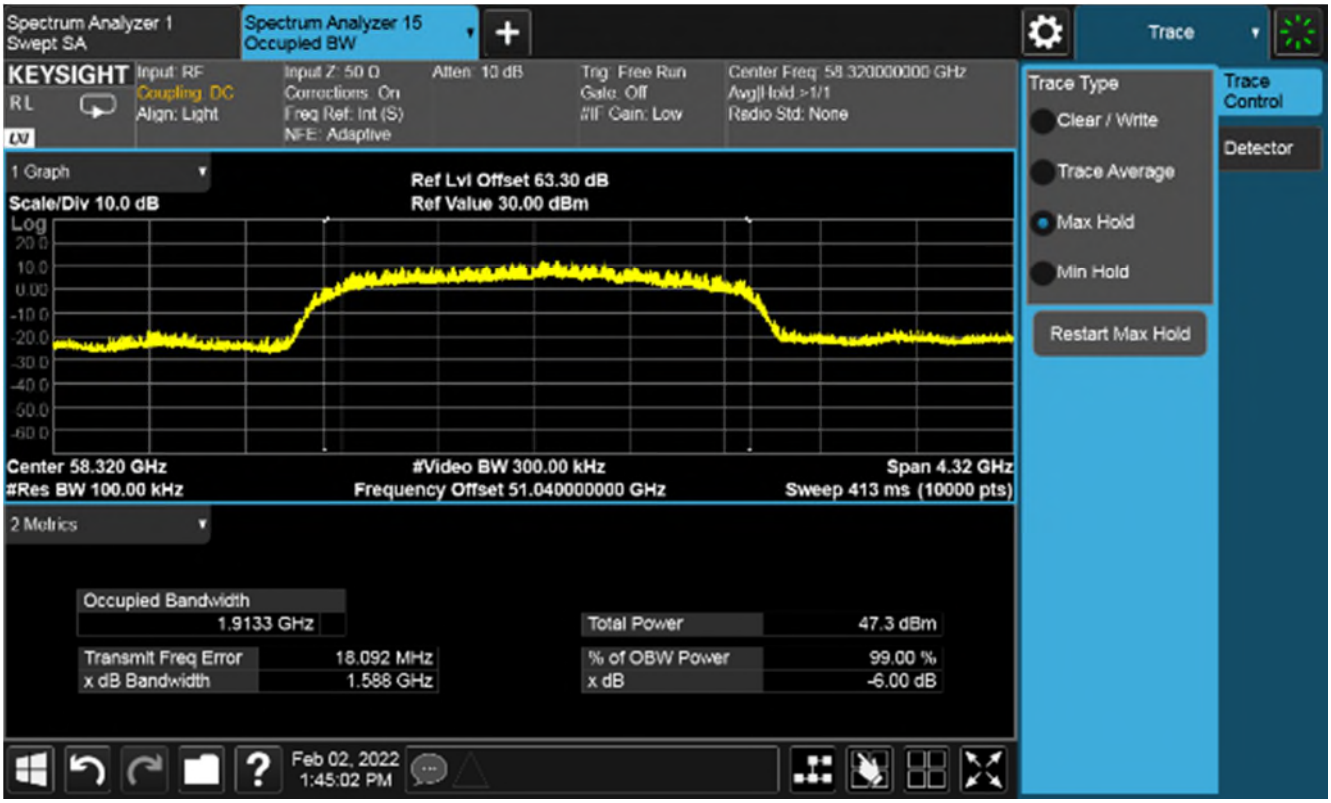
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

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

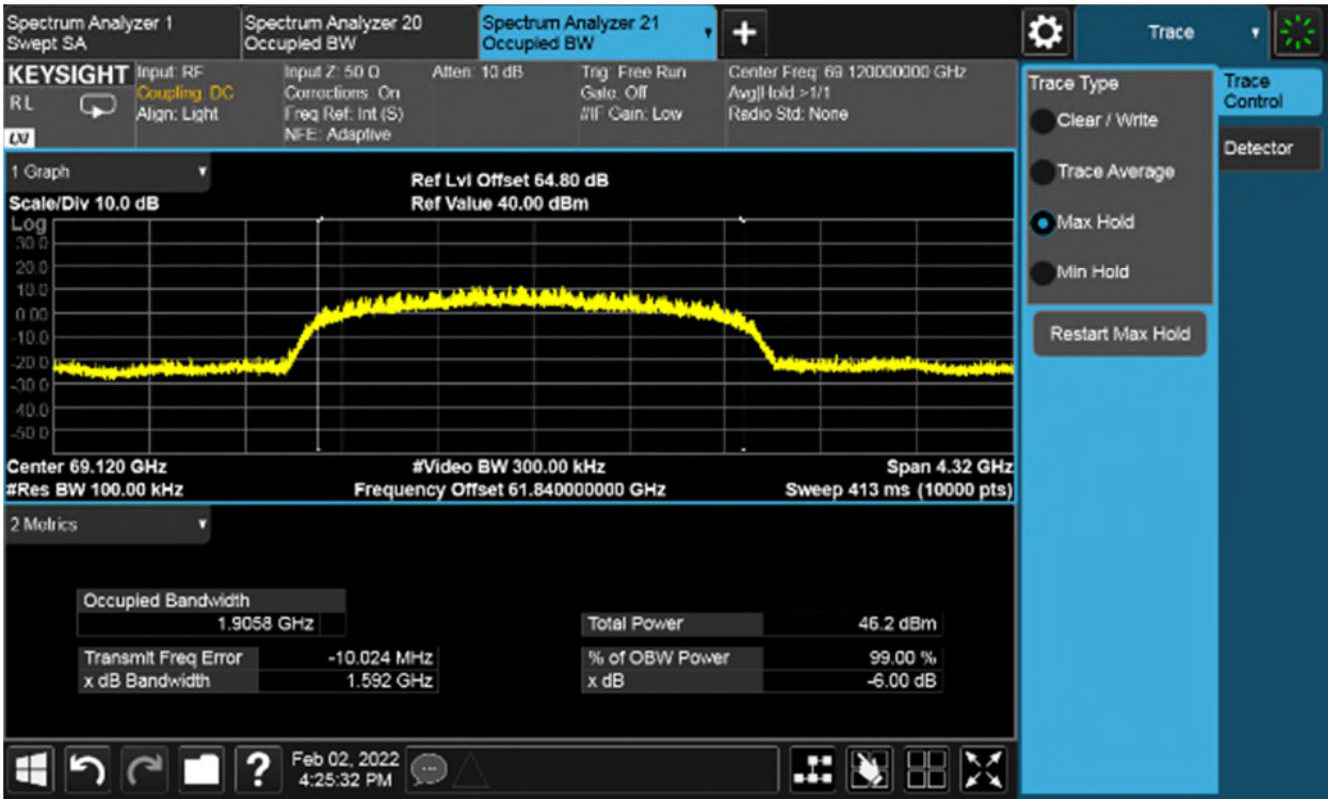


Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

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

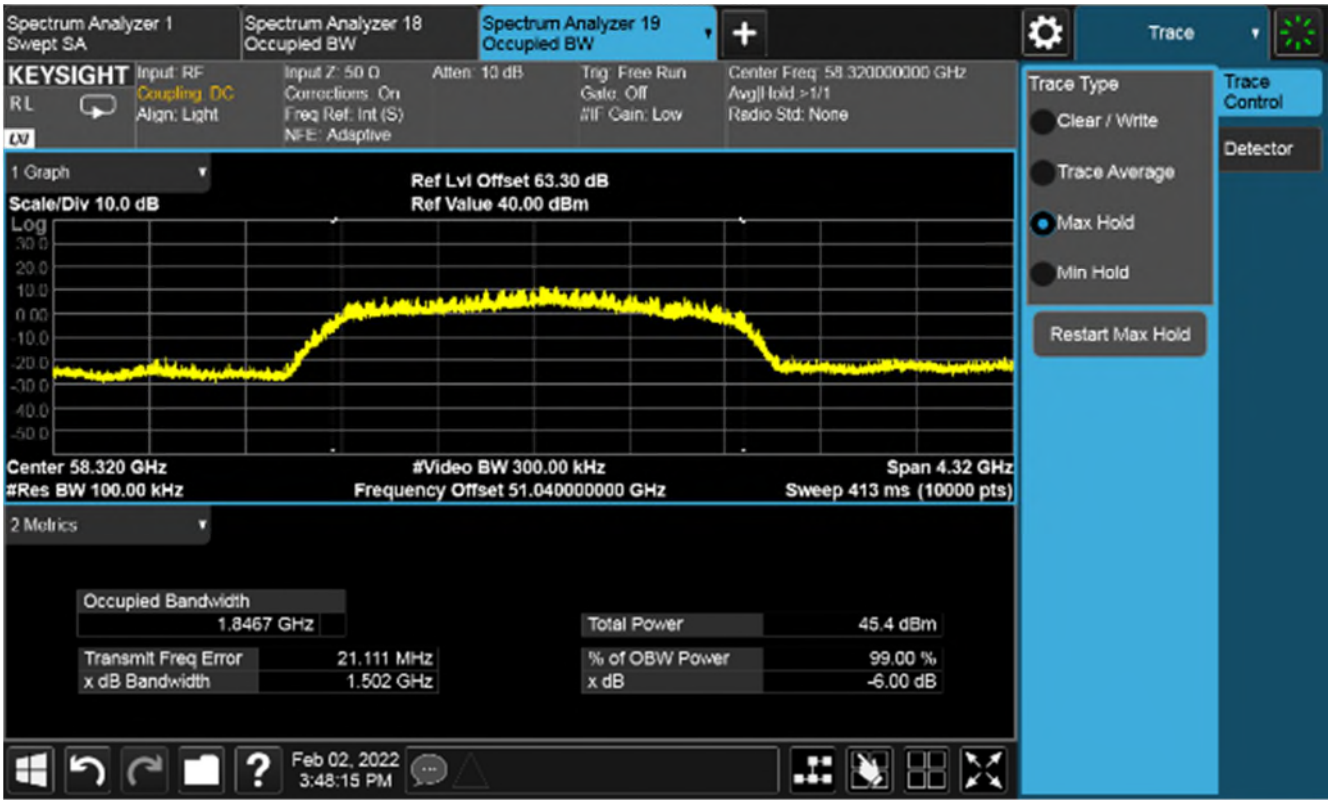
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

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

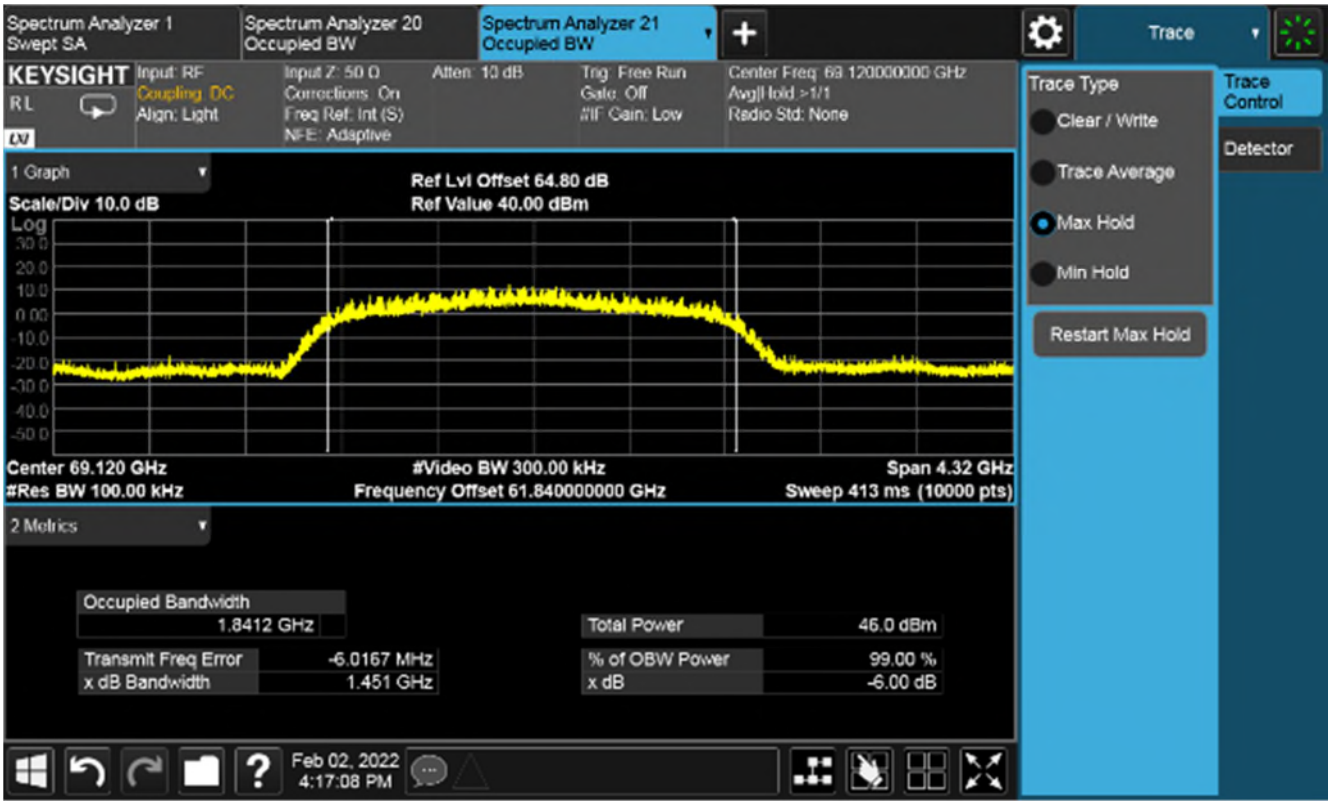


Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

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

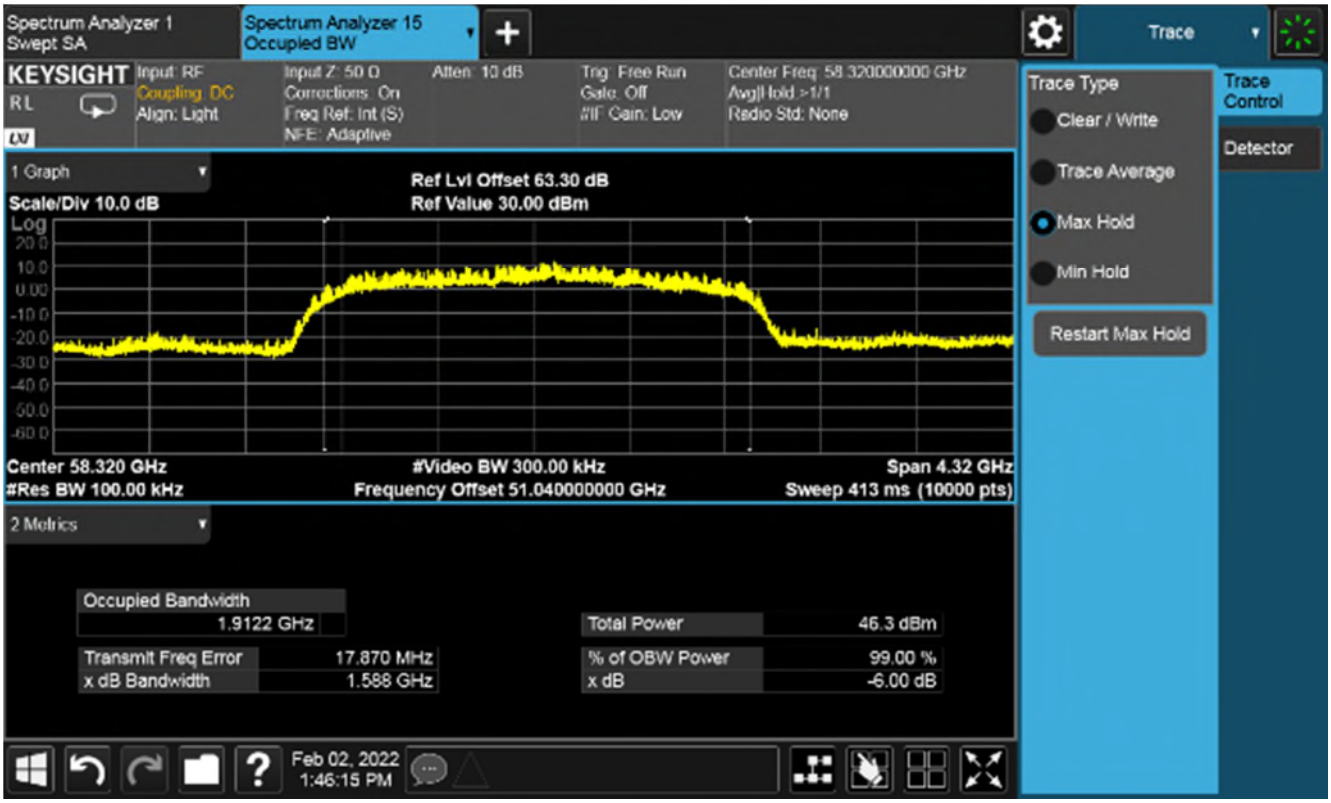
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

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



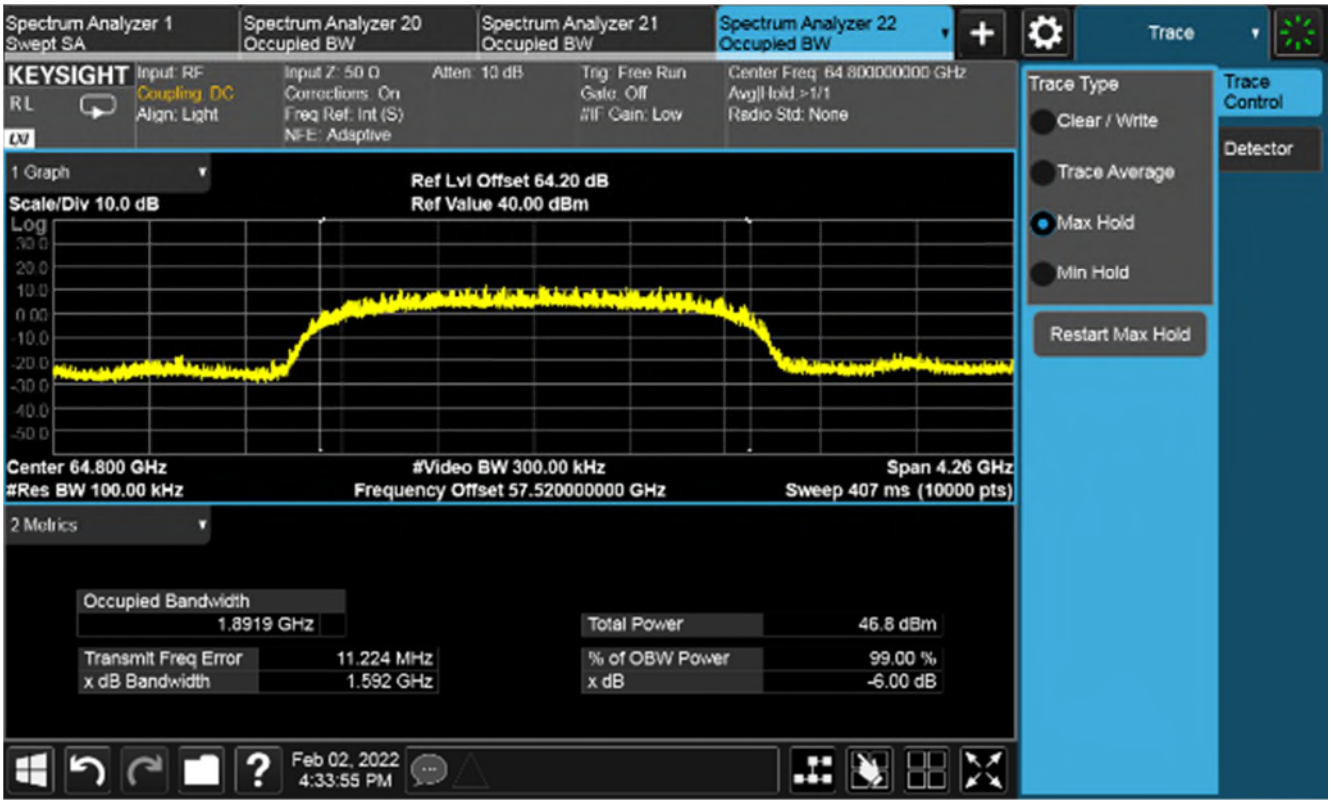
Plot for 6 dB Bandwidth (MHz) Nominal Temp & Volts

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