TEST REPORT

Test Report No. : UL-RPT-RP15051752-416A

Manufacturer	:	Inxpect S.p.a
Model No.	:	S201A
FCC ID	:	2ANOS-S201A
Test Standard(s)	:	FCC Parts 15.207, 15.209, 15.215 & 15.255

1. This test report shall not be reproduced except in full, without the written approval of UL International (UK) Ltd.
2. The results in this report apply only to the sample(s) tested.
3. The sample tested is in compliance with the above standard(s).
4. The test results in this report are traceable to the national or international standards.
5. Version 1.0.

Date of Issue: 30 January 2024

Checked by:

Sarah Williams
RF Operations Leader, Radio Laboratory

Company Signatory:

Ben Mercer
Lead Project Engineer, Radio Laboratory

5772

UL International (UK) Ltd
Unit 1-4 Horizon, Kingsland Business Park, Wade Road, Basingstoke, Hampshire, RG24 8AH, UK
Telephone: +44 (0)1256 312000

This page has been left intentionally blank.

Table of Contents

1. Customer Information

Company Name:	Inxpect S.p.A
Address:	Via Serpente 91, 25131 Brescia (BS) Italy

2. Summary of Testing

2.1. General Information

Specification Reference:	47CFR15.255
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Radio Frequency Devices) – Section 15.255
Specification Reference:	47CFR15.207 and 47CFR15.209
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Sections 15.207 & 15.209
Specification Reference:	47CFR15.215
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) - Section 15.215
Site Registration:	685609
FCC Lab. Designation No.:	UK2011
Location of Testing:	Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	06 December 2023 to 23 January 2024

2.2. Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.255(c)(2)	Transmitter Duty Cycle	✓
Part 15.255(c)(2)	Transmitter EIRP	✓
Part 15.255(e)(1)	Transmitter 6 dB Bandwidth	✓
Part 15.215(c)	Transmitter 20 dB Bandwidth	✓
Part 15.255(d) / 15.209	Transmitter Spurious Emissions	✓
Part 15.255(f)	Transmitter Frequency Stability (Temperature & Voltage Variation)	✓
Part 15.207	AC Conducted Emissions	✓

Key to Results

✓ = Complied ✗ = Did not comply

2.3. Methods and Procedures

Reference:	ANSI C63.10-2013
Title:	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices
Reference:	FCC KDB 174176 D01 Line Conducted FAQ v01r01 June 3, 2015
Title:	AC Power-Line Conducted Emissions Frequently Asked Questions

2.4. Deviations from the Test Specification

For the measurements contained within this test report, there were no deviations from, additions to, or exclusions from the test specification identified above.

3. Equipment Under Test (EUT)

3.1. Identification of Equipment Under Test (EUT)

Brand Name:	Inxpect
Model Name or Number:	S201A
Test Sample Serial Number:	Z1600 (Profile 2)
Hardware Version:	1.0
Software Version:	N/A
Firmware Version:	RADAR 6.3.2.6 + RadioConfig.h v1.0 + RadioConfig-WW.h v1.0
FCC ID:	2ANOS-S201A
Date of Receipt:	04 December 2023

Brand Name:	Inxpect
Model Name or Number:	S201A
Test Sample Serial Number:	Z1599 (Profile 3)
Hardware Version:	1.0
Software Version:	N/A
Firmware Version:	RADAR 6.3.2.6 + RadioConfig.h v1.0 + RadioConfig-WW.h v1.0
FCC ID:	2ANOS-S201A
Date of Receipt:	04 December 2023

3.2. Description of EUT

The equipments under test were 60 GHz radar sensors using FMCW.

3.3. Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.4. Additional Information Related to Testing

Category of Equipment:	Transceiver	
Modulation Type:	FMCW	
Power Supply Requirement:	Nominal	12 VDC
Antenna Type:	Integrated Patch	
Antenna Gain:	10 dBi	
Transmit Frequency Range:	60.6 GHz to 62.8 GHz	
Transmit Channels Tested:	**Channel ID**	**Channel Frequency (GHz)**
	Single	61.72

3.5. Support Equipment

The following support equipment was used to exercise the EUT during testing:

Description:	Control Unit (Profile 2)
Brand Name:	Inxpect
Model Name or Number:	C203A
Serial Number:	ZZ102

Description:	Control Unit (Profile 3)
Brand Name:	Inxpect
Model Name or Number:	C201B
Serial Number:	ZZ020

Description:	CAN Cable. Length 10 m.
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Description:	CAN Termination
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

4. Operation and Monitoring of the EUT during Testing

4.1. Operating Modes

- Transmit Mode: transmitting at maximum power with a FMCW modulated signal.

4.2. Configuration and Peripherals

The EUT was tested in the following configuration(s):

- Transmit tests: The EUT powered up in transmit mode. No configuration was required.
- The EUT was connected to either a C203A or C201B control unit via a 10m CAN cable The control unit supplied 12 VDC to the EUT via the CAN cable. The control units were powered by a 24 VDC bench DC power supply. The DC power supply was connected to a 120 VAC 60 Hz single phase main supply.
- Transmitter radiated spurious emission tests were performed with the EUT in the position/orientation that produced the worst case with respect to emissions. The unused CAN port was fitted with a CAN termination.

5. Measurements, Examinations and Derived Results

5.1. General Comments

Measurement uncertainties are evaluated in accordance with current best practice. Our reported expanded uncertainties are based on standard uncertainties, which are multiplied by an appropriate coverage factor to provide a statistical confidence level of approximately 95%. Please refer to *Section 6: Measurement Uncertainties* for details.

In accordance with UKAS requirements all the measurement equipment is on a calibration schedule. All equipment was within the calibration period on the date of testing.

5.2. Test Results

5.2.1 Transmitter Duty Cycle

Test Summary:

Test Engineers:	Shamraiz Ashiq & Ben Mercer	**Test Date:**	17 January 2024
Test Sample Serial Numbers:	ZZ1600 & Z1955		

FCC Reference:	Part 15.255(c)(2)(iii)
Test Method Used:	ANSI C63.10 Section 7.5 and notes below

Environmental Conditions:

Temperature (°C):	24
Relative Humidity (%):	21

Note(s):

1. Transmitter duty cycle was measured using an RF detector connected to a digital storage oscilloscope. The raw data was captured and analysed to calculate the duty cycle.

   On Time / [Period or 100 ms whichever is the lesser].

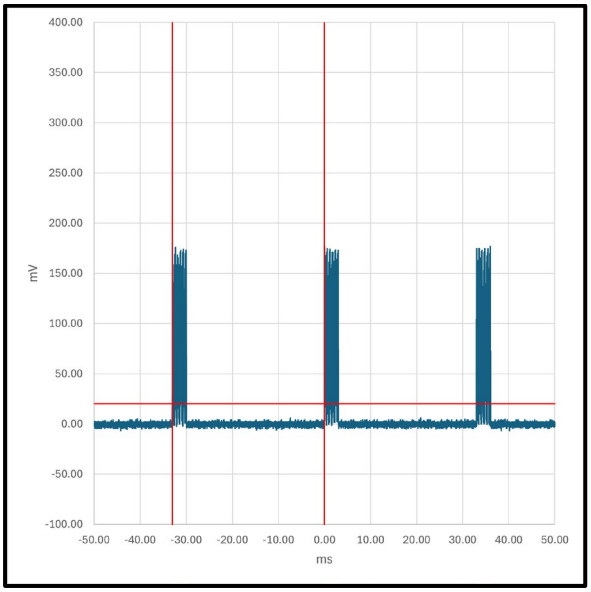
   Profile 2 duty cycle: 3.07 ms / 33.00 ms = 0.0930
   Profile 3 duty cycle: 5.13 ms / 16.00 ms = 0.3206

2. Transmitter off times exceeding 2 ms were summed over a rolling 33 ms period. The minimum combined off time in any 33 ms period was recorded below.

Transmitter Duty Cycle (continued)

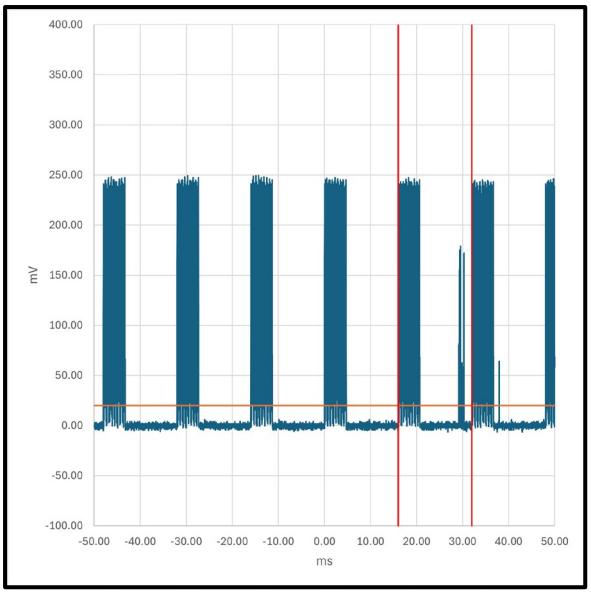
Results: Profile 2

Tx On Duration (ms)	Period (ms)	Duty Cycle (%)	Minimum Tx Off Duration (ms)	Tx Off Limit (ms)	Result
3.07	33.0	9.3	29.93	>25.5	Complied



Results: Profile 3

Tx On Duration (ms)	Period (ms)	Duty Cycle (%)	Minimum Tx Off Duration (ms)	Tx Off Limit (ms)	Result
5.13	16.0	32.1	22.1	>16.5	Complied



5.2.2. Transmitter EIRP

Test Summary:

Test Engineers:	Shamraiz Ashiq & Ben Mercer	**Test Date:**	23 January 2024
Test Sample Serial Numbers:	ZZ1600 & Z1955		

FCC Reference:	Part 15.255(c)(2)(iii)
Test Method Used:	ANSI C63.10 Section 9.11

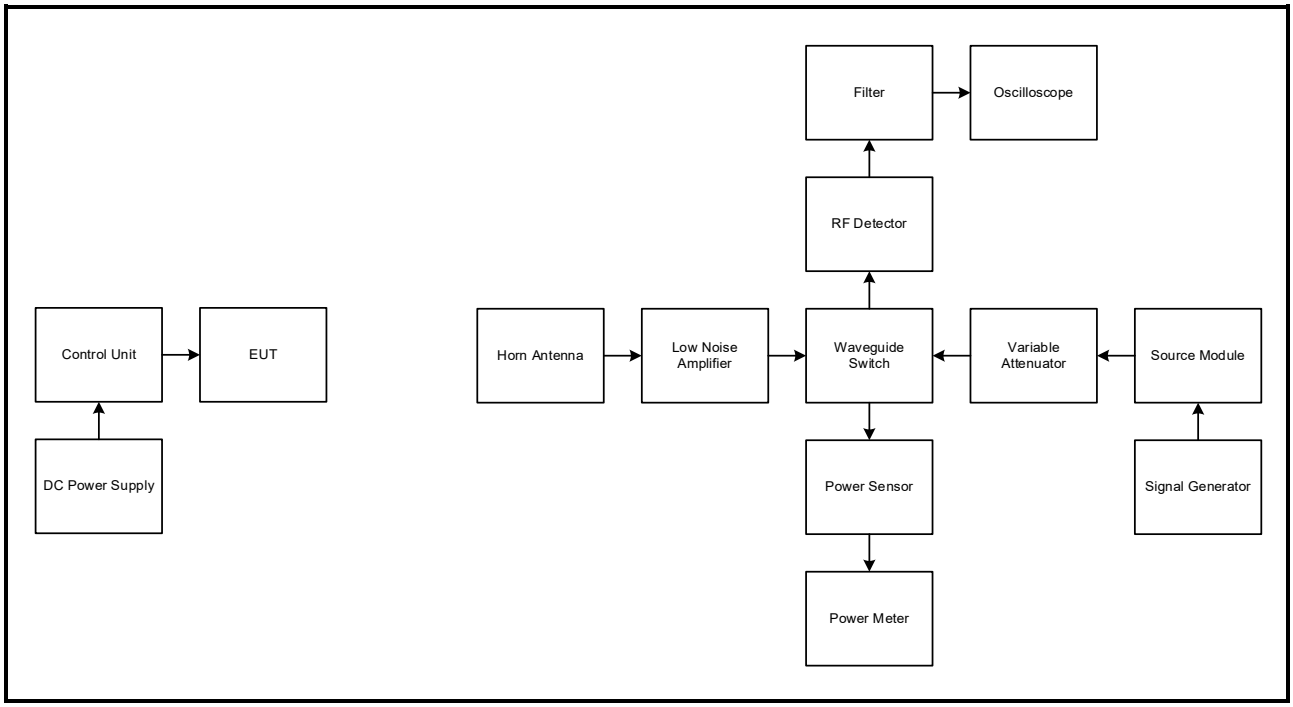
Environmental Conditions:

Temperature (°C):	19
Relative Humidity (%):	46

Note(s):

1. The measurement antenna was connected to an RF detector via a low noise amplifier and 4-way waveguide switch. A CW signal generator and wideband thermocouple power sensor were connected to the remaining two ports.
2. The RF detector was connected to the 50 Ω input of a digital storage oscilloscope via a 10 MHz low pass filter.
3. The EUT peak voltage was measured on the oscilloscope. The waveguide switch was then rotated to connect the signal generator to the RF detector, and the signal generator output was adjusted to match the previously measured voltage. The waveguide switch was then rotated to connect the signal generator output to the thermocouple power sensor, and the signal generator output power was measured.
4. The substituted level recorded below includes the calibrated path loss of the waveguide switch.

Test setup:



Transmitter EIRP (continued)

Results: Profile 2 / Peak

Frequency (GHz)	Level (V)	Substituted EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Result
61.720	2.1	12.9	14.0	1.1	Complied

Results: Profile 3 / Peak

Frequency (GHz)	Level (V)	Substituted EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Result
61.720	5.8	19.9	20.0	0.1	Complied

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0010	3m RSE chamber	Rainford Solutions	N/A	N/A	11 Oct 2024	12
M2041	Thermohygrometer	Testo	608-H1	45119912	27 Dec 2024	12
A3236	Amplifier	Sage Millimeter	SBL-5037533550-1515-E1	18199-01	Calibrated before Use	-
A2964	Horn Antenna	Link Microtek	AM15HA-ULV1	14930	24 Jun 2025	36
G0640	Signal Generator	Keysight	E8257D	US00000055	10 Jan 2025	24
M2070	Oscilloscope	Keysight	DSOX2024A	MY59125508	22 Feb 2024	24
M281	Power Meter	Hewlett Packard	E4418A	GB37170210-01	18 May 2024	12
M291	Power Sensor	Hewlett Packard	V8486A	US39010039	01 Feb 2025	24
M1255	Source Module	Hewlett Packard	83557A	2948A00169	Calibrated before use	-
A3252	Low Pass Filter	Mini-Circuits	BLP-10.7+	YUU54901833	Calibrated before use	-
A3232	Attenuator	Sage Millimeter	STA-30-15-M2	18199-01	Calibrated before use	-
A3233	RF Detector	Sage Millimeter	SFD-503753-15SF-P1	18199-01	Calibrated before use	-

5.2.3. Transmitter 6 dB Bandwidth

Test Summary:

Test Engineers:	Shamraiz Ashiq & Ben Mercer	**Test Dates:**	06 December 2023 to 22 January 2024
Test Sample Serial Numbers:	ZZ1600 & Z1955		

FCC Reference:	Part 15.255(e)(1)
Test Method Used:	ANSI C63.10 Section 9.3

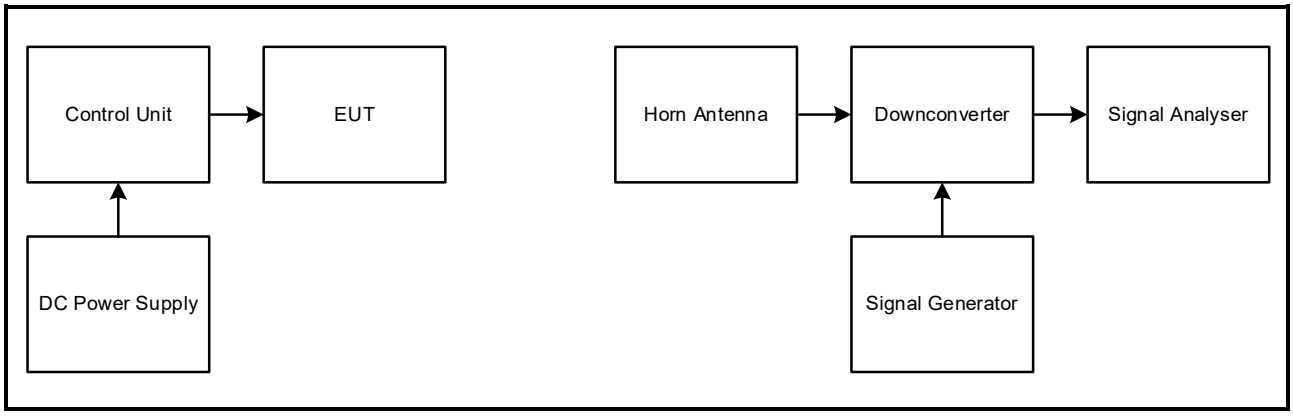
Environmental Conditions:

Temperature (°C):	17 to 21
Relative Humidity (%):	45 to 50

Note(s):

1. The analyser span was set to between two and three times the emission bandwidth. The RBW was set to 100 kHz, and the VBW was set to three times the RBW. The marker delta function was used to measure 6 dB down from the peak on both sides of the emission. The resulting frequency delta between the two markers was recorded as the emission bandwidth.

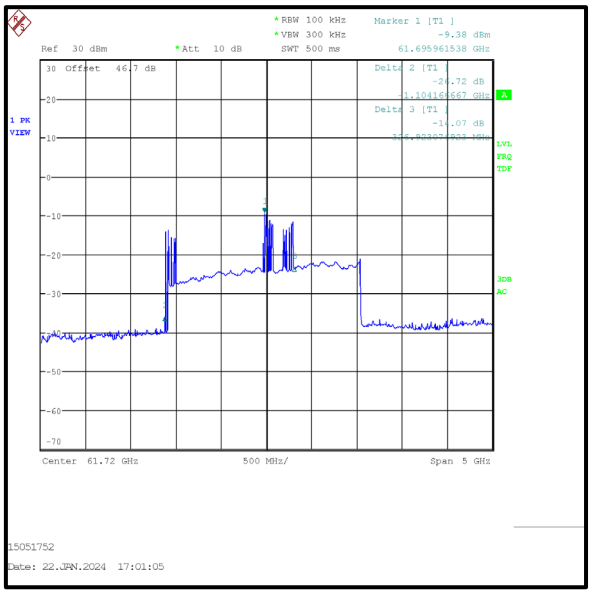
Test setup:



Transmitter 6 dB Bandwidth (continued)

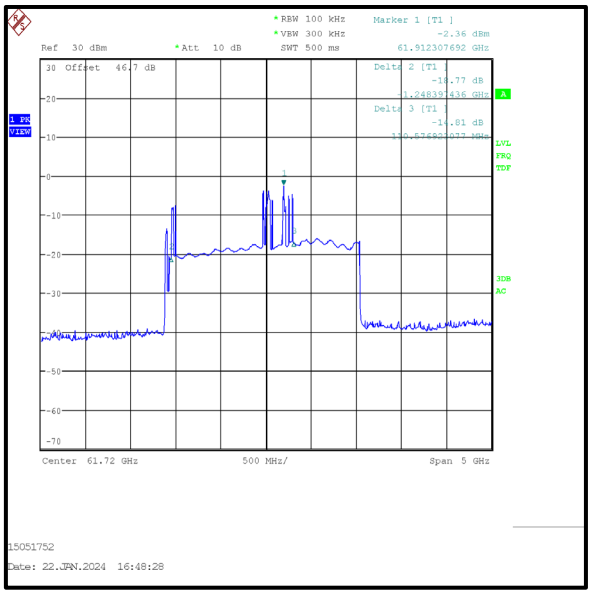
Results: Profile 2

Channel	RBW (kHz)	VBW (kHz)	Emission Bandwidth (MHz)
Single	100	300	1431.090



Results: Profile 3

Channel	RBW (kHz)	VBW (kHz)	Emission Bandwidth (MHz)
Single	100	300	1358.974



Transmitter 6 dB Bandwidth (Continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0010	3m RSE chamber	Rainford Solutions	N/A	N/A	11 Oct 2024	12
M2041	Thermohygrometer	Testo	608-H1	45119912	27 Dec 2024	12
G0640	Signal Generator	Keysight	E8257D	US00000055	10 Jan 2025	24
M2069	Downconverter	Virginia Diodes	WR15.0 SAX	SAX 394	16 Oct 2025	24
A2964	Horn Antenna	Link Microtek	AM15HA-ULV1	14930	24 Jun 2025	36
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	02 Aug 2024	12

5.2.4 Transmitter 20 dB Bandwidth

Test Summary:

Test Engineers:	Shamraiz Ashiq & Ben Mercer	**Test Date:**	06 December 2023
Test Sample Serial Numbers:	ZZ1600 & Z1955		

FCC Reference:	Part 15.215(c)
Test Method Used:	ANSI C63.10 Section 6.9.2

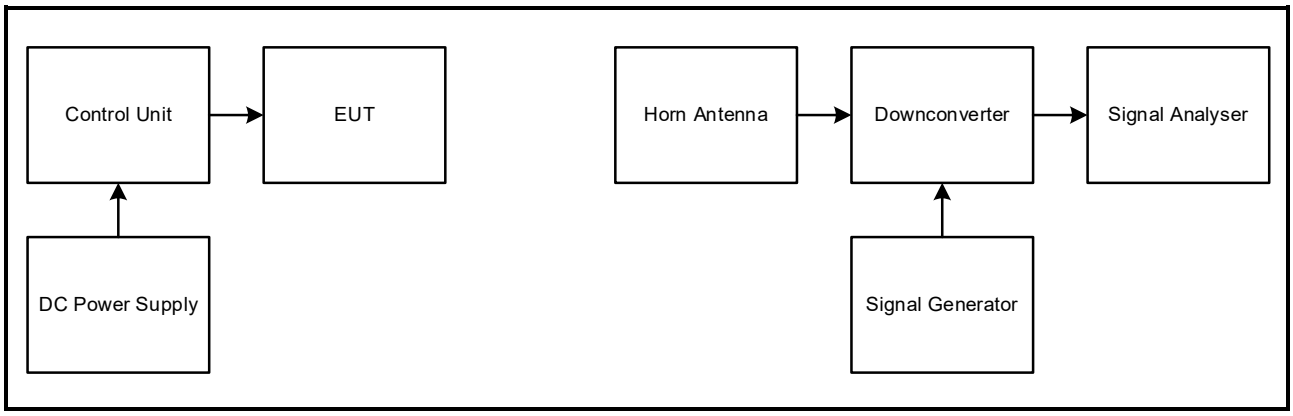
Environmental Conditions:

Temperature (°C):	17
Relative Humidity (%):	50

Note(s):

1. Due to instrument limitations, it was not possible to set the RBW in the range 1% to 5% of OBW as required by ANSI C63.10 Section 6.9.2. An enquiry was submitted to the FCC OET and it was deemed acceptable to use a minimum RBW of 1 MHz.
2. The signal analyser resolution bandwidth was set to 1 MHz and the video bandwidth to 3 MHz. A peak detector was used, sweep time was set to auto and the trace mode was Max Hold. The span was set to 5 GHz. The marker delta function was used to measure 20 dB down from the peak on both sides of the emission. The resulting frequency delta between the two markers was recorded as the 20 dB bandwidth.

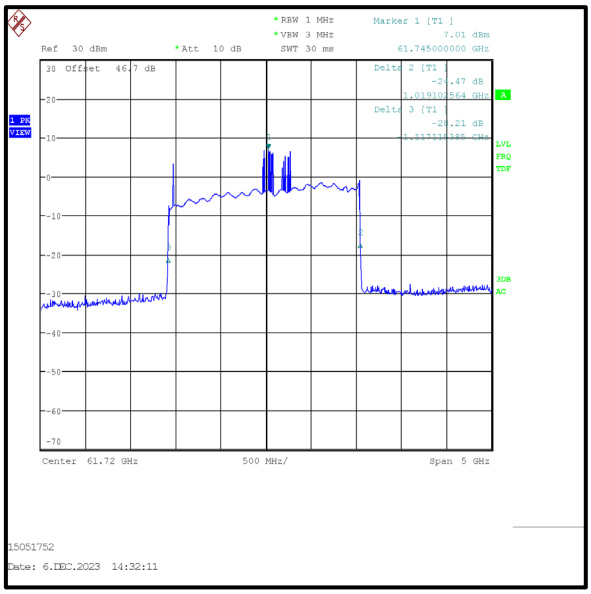
Test setup:



Transmitter 20 dB Bandwidth (continued)

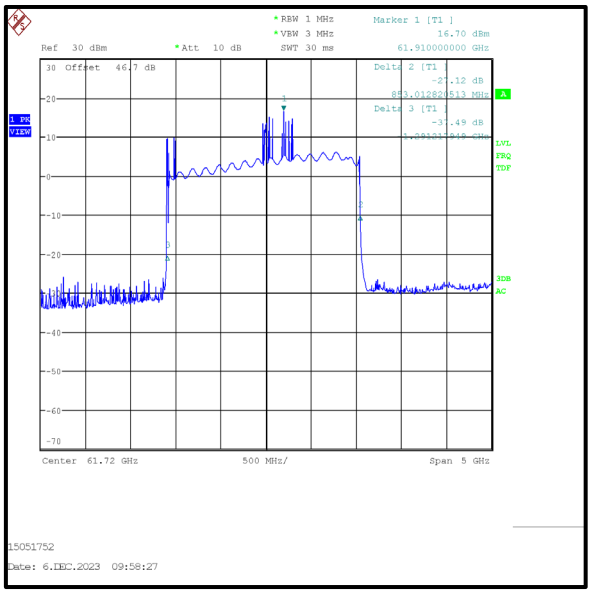
Results: Profile 2

Channel	20 dB Bandwidth (MHz)
Single	2136.212



Results: Profile 3

Channel	20 dB Bandwidth (MHz)
Single	2144.231



Transmitter 20 dB Bandwidth (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0010	3m RSE chamber	Rainford Solutions	N/A	N/A	11 Oct 2024	12
M2041	Thermohygrometer	Testo	608-H1	45119912	27 Dec 2024	12
G0640	Signal Generator	Keysight	E8257D	US00000055	10 Jan 2025	24
M2069	Downconverter	Virginia Diodes,	WR15.0 SAX	SAX 394	16 Oct 2025	24
A2964	Horn Antenna	Link Microtek.	AM15HA-ULV1	14930	24 Jun 2025	36
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	02 Aug 2024	12

5.2.5. Transmitter Radiated Spurious Emissions

Test Summary:

Test Engineers:	Shamraiz Ashiq & Andrew Edwards	**Test Dates:**	19 December 2023 to 04 January 2024
Test Sample Serial Numbers:	ZZ1600 & Z1955		

FCC Reference:	Part 15.255(d) / 15.209
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4 and 6.5
Frequency Range	9 kHz to 1000 MHz

Environmental Conditions:

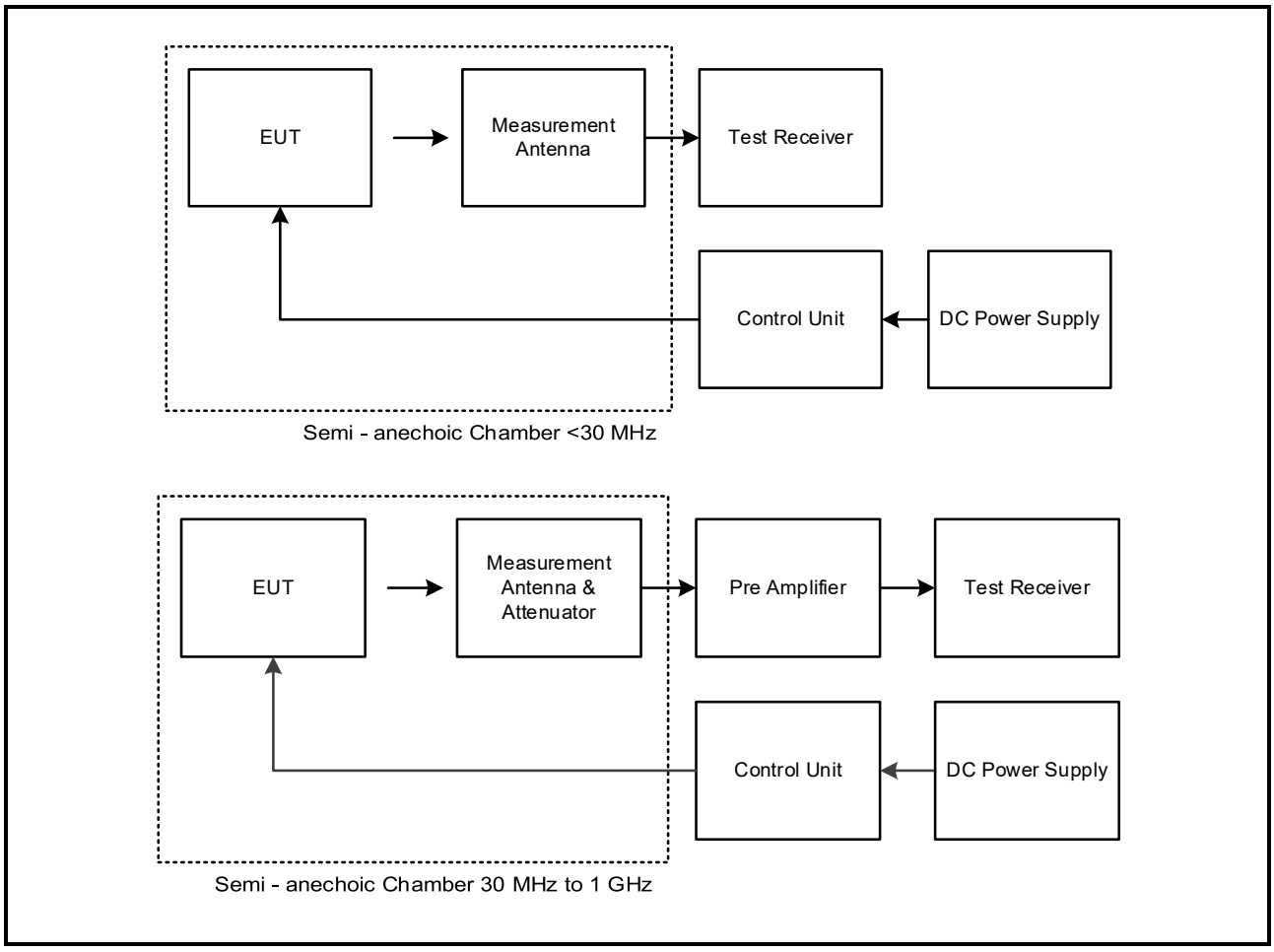
Temperature (°C):	19 to 20
Relative Humidity (%):	45 to 47

Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. All other emissions shown on the pre-scan plot were investigated and found to be ambient or >20 dB below the applicable limit or below the measurement system noise floor.
3. Measurements below 30 MHz were performed in a semi-anechoic chamber (Asset Number K0001) at 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. The limit was extrapolated to 3 metres in accordance with ANSI C63.10 clause 6.4.3 using the method described in clause 6.4.4.2. ANSI C63.10 clause 5.2 states an alternative test site that can demonstrate equivalence to an open area test site may be used for measurements below 30 MHz. Therefore, measurements were performed in a semi-anechoic chamber. The correlation data between semi-anechoic chamber and an open field test site is available upon request.
4. Measurements from 30 MHz to 1 GHz were performed in a semi-anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 80 cm above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. Pre-scans were performed and markers placed on the highest measured levels. The test receiver was configured as follows: For 9 kHz to 150 kHz, the resolution bandwidth was set to 300 Hz and video bandwidth 1 kHz. A peak detector was used and trace mode was Max Hold. For 150 kHz to 30 MHz, the resolution bandwidth was set to 10 kHz and video bandwidth 30 kHz, trace mode was Max Hold. For 30 MHz to 1 GHz, the resolution bandwidth was set to 120 kHz and video bandwidth 500 kHz. A peak detector was used, sweep time was set to auto and trace mode was Max Hold.

Transmitter Radiated Spurious Emissions (continued)

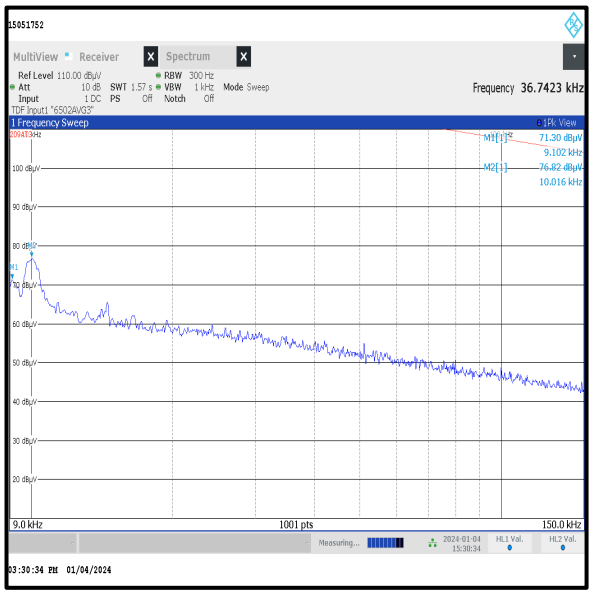
Test setup:

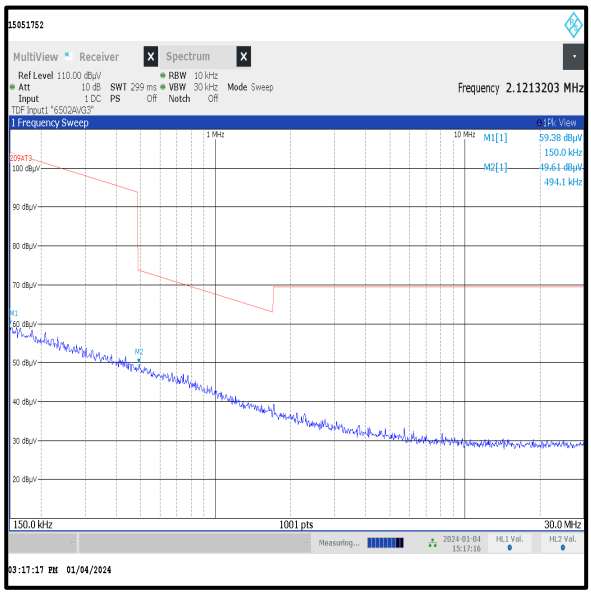


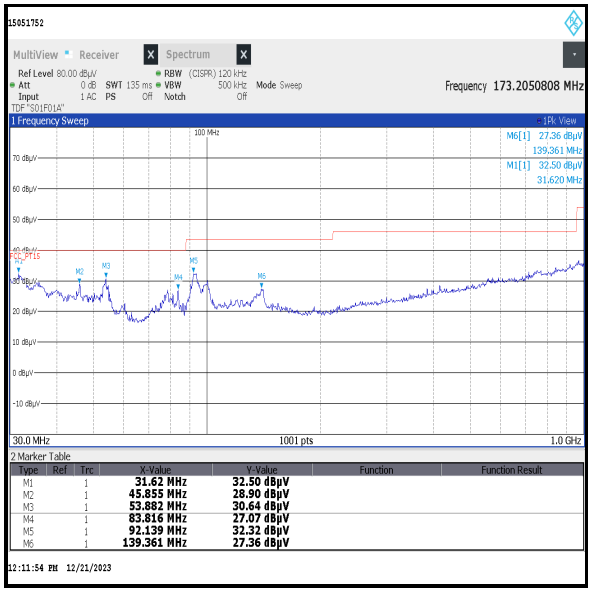
Transmitter Radiated Spurious Emissions (continued)

Results: Profile 2

Frequency (MHz)	Antenna Polarity	Quasi-Peak Level (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Margin (dB)	Result
45.945	Vertical	27.1	40.0	12.9	Complied
53.862	Vertical	30.2	40.0	9.8	Compiled
83.816	Vertical	21.9	40.0	18.1	Compiled
92.988	Vertical	29.3	43.5	14.2	Compiled
137.063	Vertical	23.0	43.5	20.5	Compiled



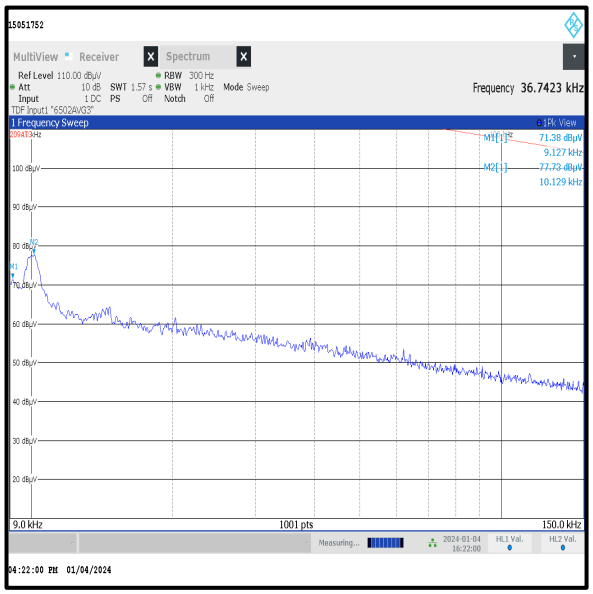


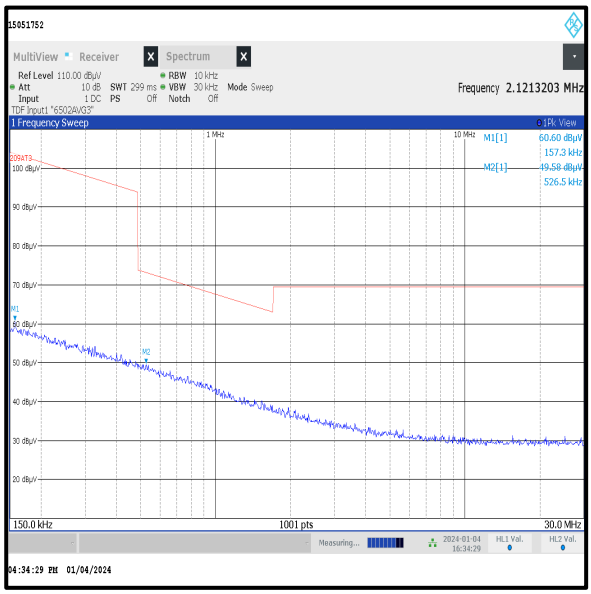


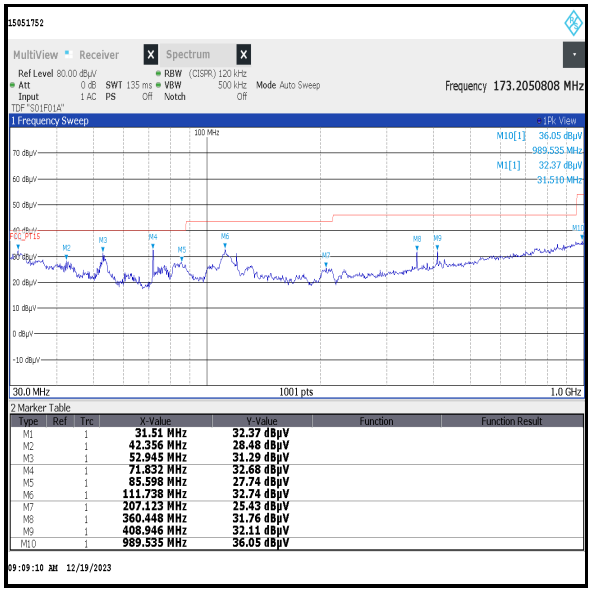
Transmitter Radiated Spurious Emissions (continued)

Results: Profile 3

Frequency (MHz)	Antenna Polarity	Quasi-Peak Level (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Margin (dB)	Result
53.807	Vertical	28.4	40.0	11.6	Complied
79.984	Vertical	15.3	40.0	24.7	Compiled
93.988	Vertical	35.1	43.5	8.4	Compiled
207.123	Vertical	17.9	43.5	25.6	Compiled
360.048	Vertical	25.3	46.0	20.7	Compiled







Transmitter Radiated Spurious Emissions (continued)

Test Summary:

Test Engineers:	Shamraiz Ashiq & Ben Mercer	**Test Dates:**	11 December 2023 to 20 December 2023
Test Sample Serial Number:	ZZ1600 & Z1955		

FCC Reference:	Part 15.255(d) / 15.209
Test Method Used:	ANSI C63.10 Sections 6.3, 6.6, 9.8, 9.9, 9.12 & 9.13
Frequency Range:	1 GHz to 200 GHz

Environmental Conditions:

Temperature (°C):	17 to 20
Relative Humidity (%):	45 to 52

Note(s):

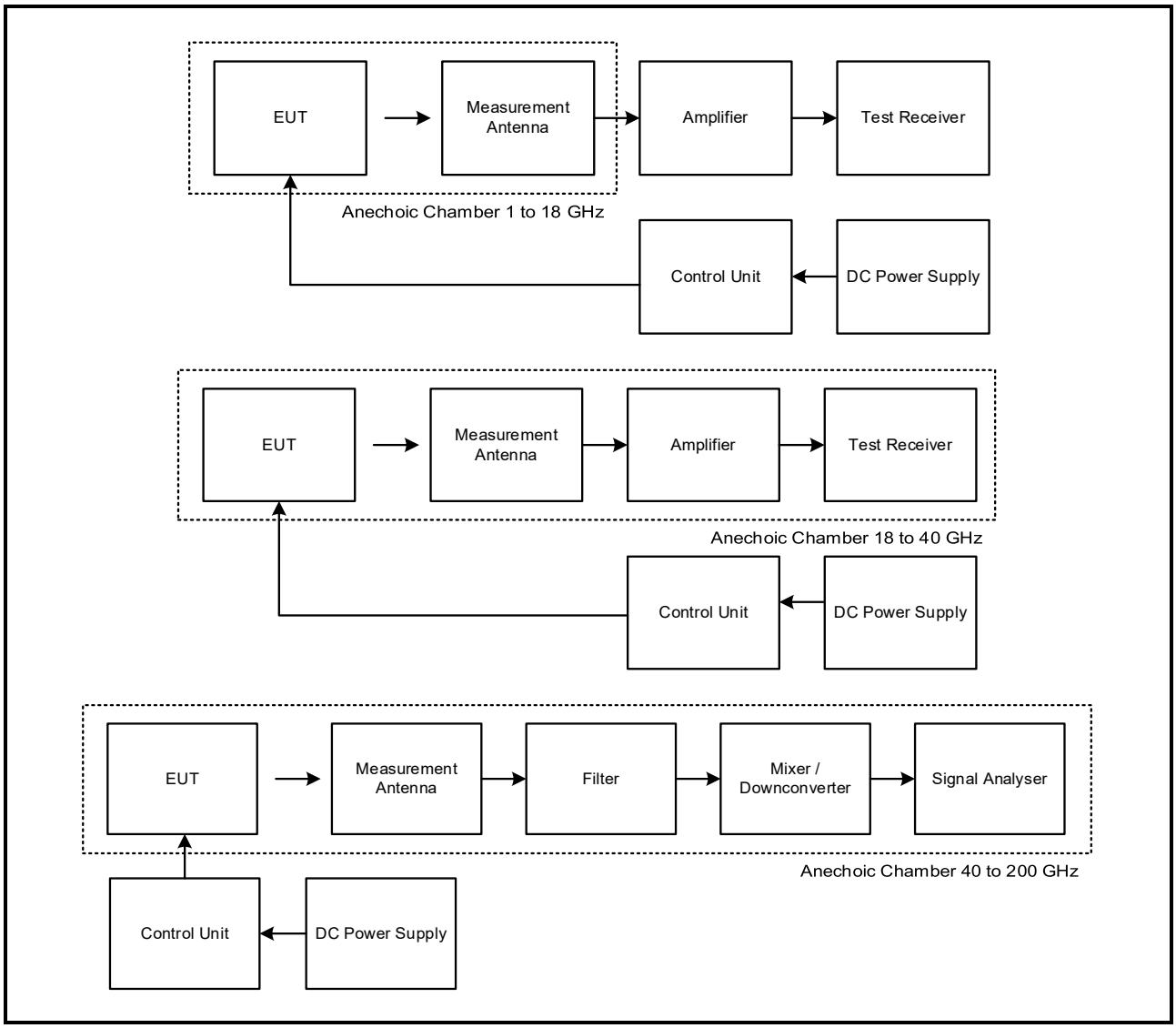
1. The final measured value, for the given emission in the field strength result tables, incorporates the calibrated antenna factor and cable loss.
2. The emission at approximately 61.72 GHz is the EUT fundamental.
3. All other emissions were >20 dB below the applicable limit, below the noise floor of the measurement system, or mixing products.
4. Measurements from 1 GHz to 18 GHz were performed in a semi-anechoic chamber (Asset Number K226202) at 3 metres.. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable. Maximum emission levels were determined by height searching the measurement antenna over the range 1 metre to 4 metres.
5. Measurements from 18 GHz to 40 GHz were performed in a semi-anechoic chamber (Asset Number K226202) at 1 metre.. The EUT was placed at a height of 1.5 m above the reference ground plane in the centre of the chamber turntable
6. Part 15.255(d)(3) defines a power density limit of 90 pW/cm^2 at 3 metres for spurious emissions between 40 GHz and 200 GHz. This was converted to a field strength limit of 85.31 dBuV/m using the equations provided in section 9.6 of ANSI C63.10.
7. Measurements distances above 40 GHz were determined using the procedure defined in section 9.8 of ANSI C63.10. Measurements were made at the following distances:

   40 GHz to 200 GHz – 1 metre

8. Where measurements were performed at a distance other than that specified by the limit, a correction factor was calculated using the equation provided in section 9.4 of ANSI C63.10. This correction factor was included in the transducer factor entered on the signal analyser.
9. *In accordance with ANSI C63.10 Section 6.6.4.3 Note 1, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

Transmitter Radiated Spurious Emissions (continued)

Test setup:

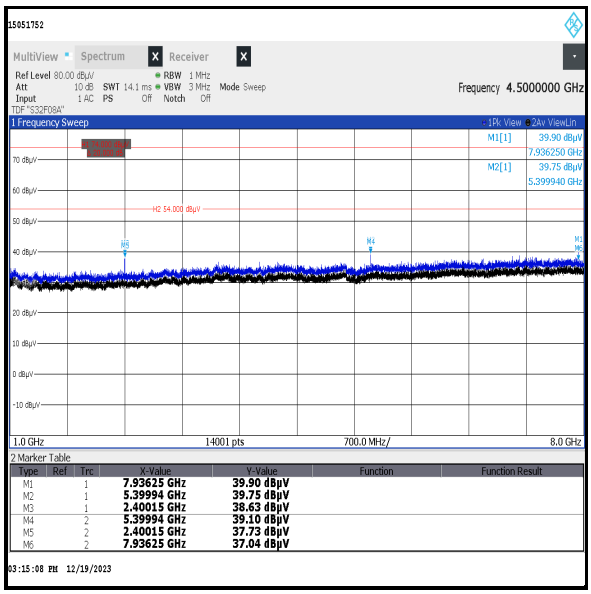


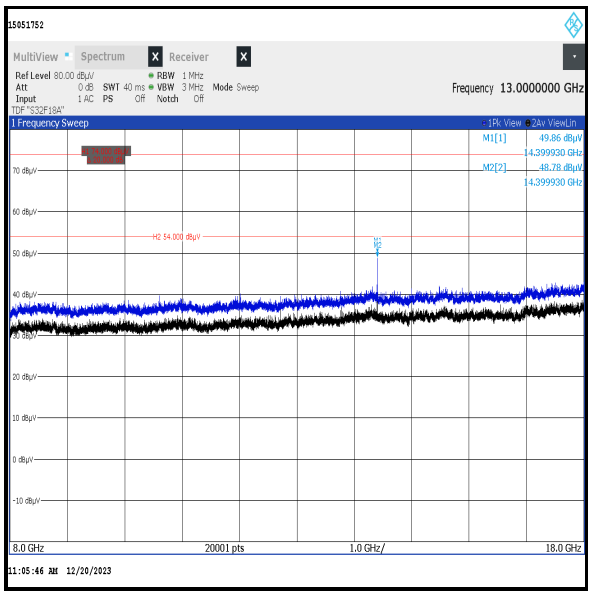
Transmitter Radiated Spurious Emissions (continued)

Results: Profile 2 / Peak

Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
2400.150	Horizontal	40.2	54.0*	13.8	Compiled
5399.940	Horizontal	41.7	54.0*	12.3	Compiled
7936.250	Horizontal	39.9	54.0*	14.1	Compiled
14399.930	Horizontal	50.9	54.0*	3.1	Compiled
20560.090	Horizontal	50.1	54.0*	3.9	Compiled
20200.110	Horizontal	53.1	54.0*	0.9	Compiled
28800.150	Horizontal	50.8	54.0*	3.2	Compiled

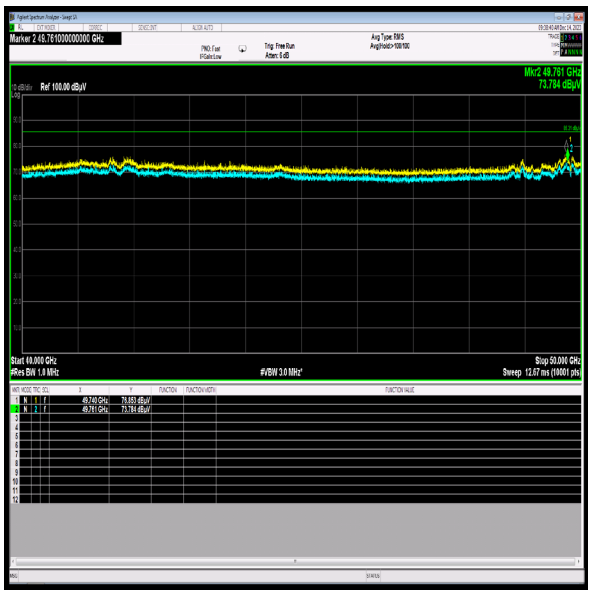
Transmitter Radiated Spurious Emissions (continued)

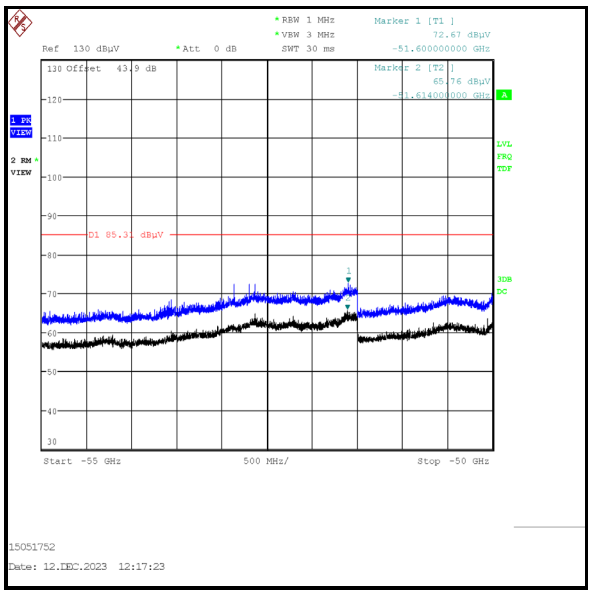


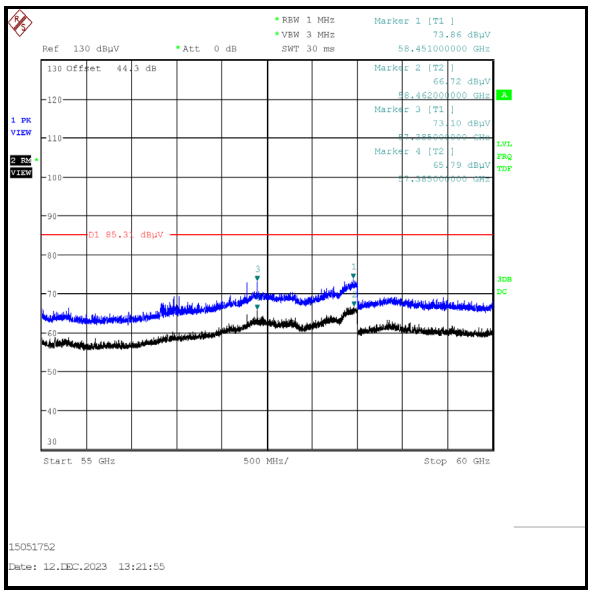


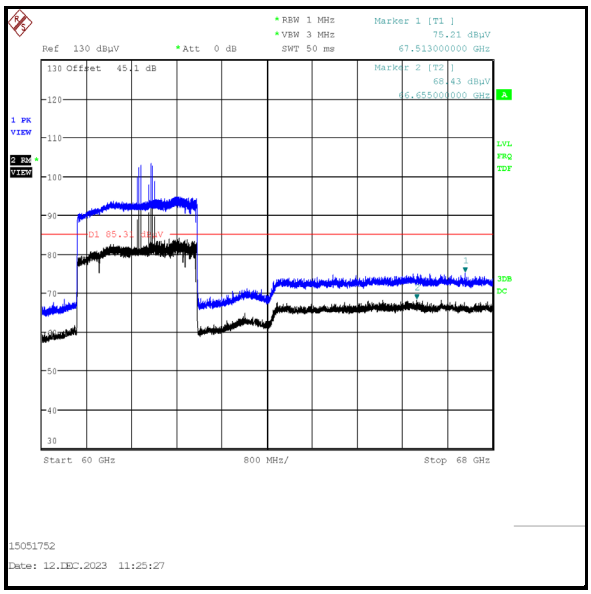
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Spurious Emissions (continued)



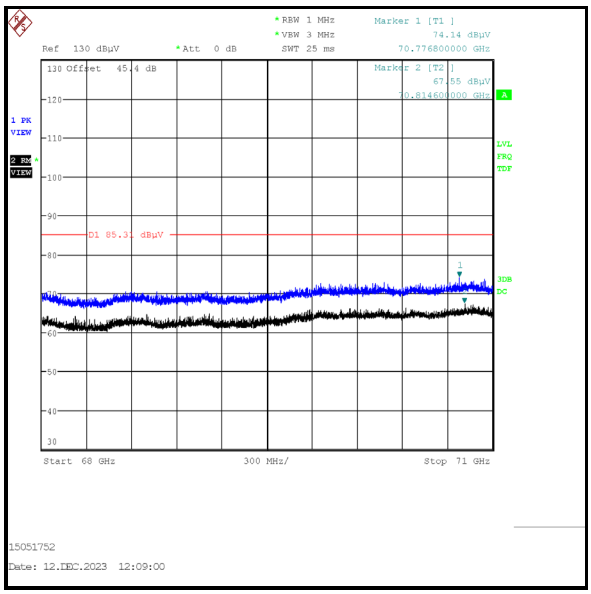


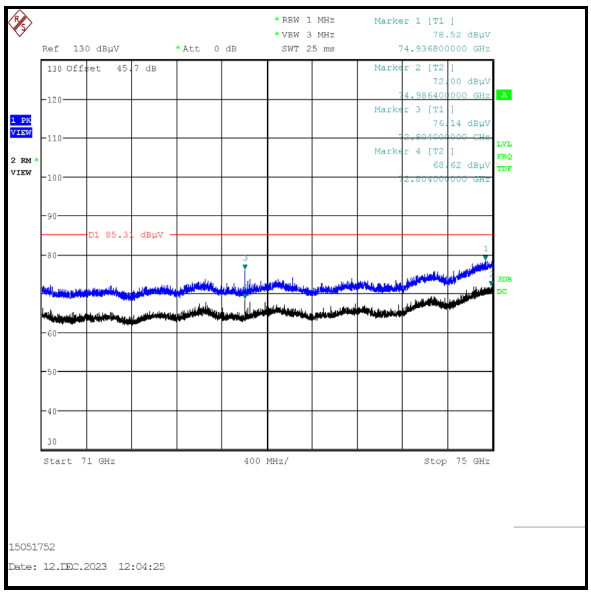


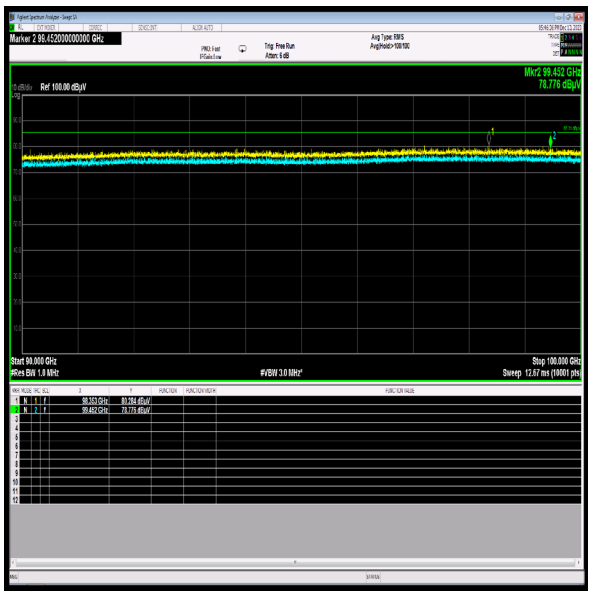


Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Spurious Emissions (continued)

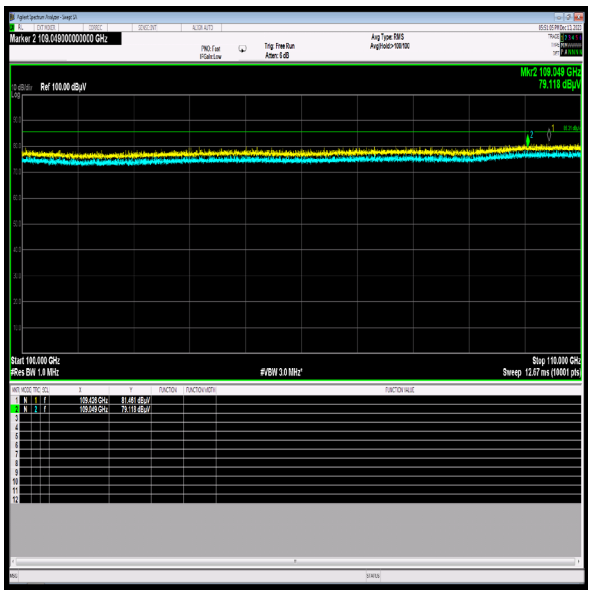






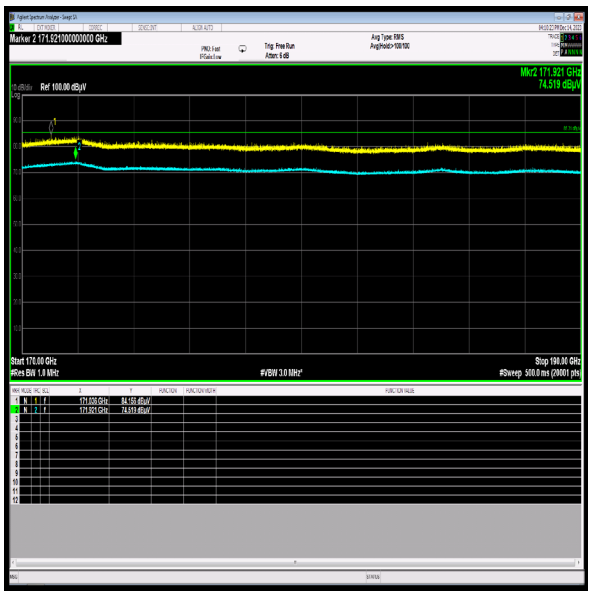
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

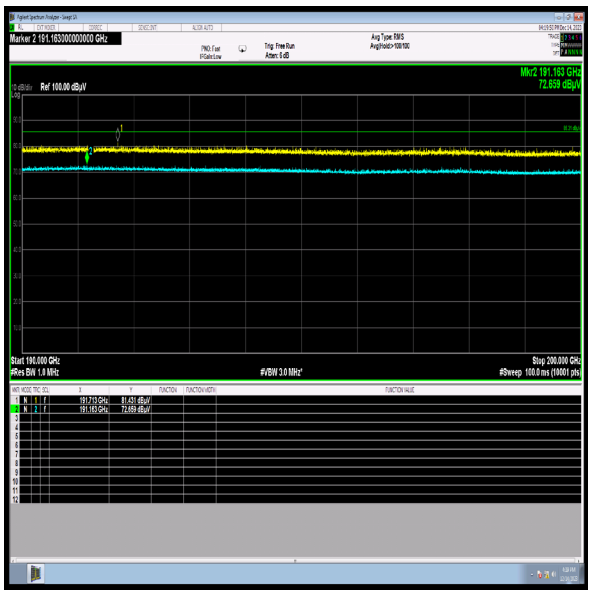
Transmitter Radiated Spurious Emissions (continued)



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Spurious Emissions (continued)





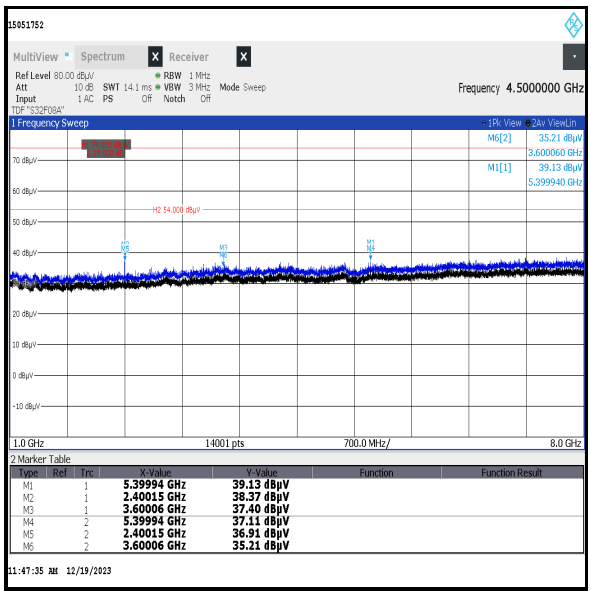
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

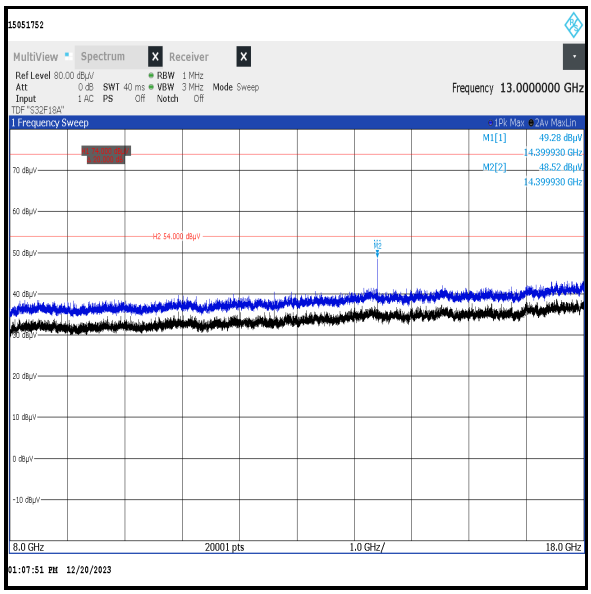
Transmitter Radiated Spurious Emissions (continued)

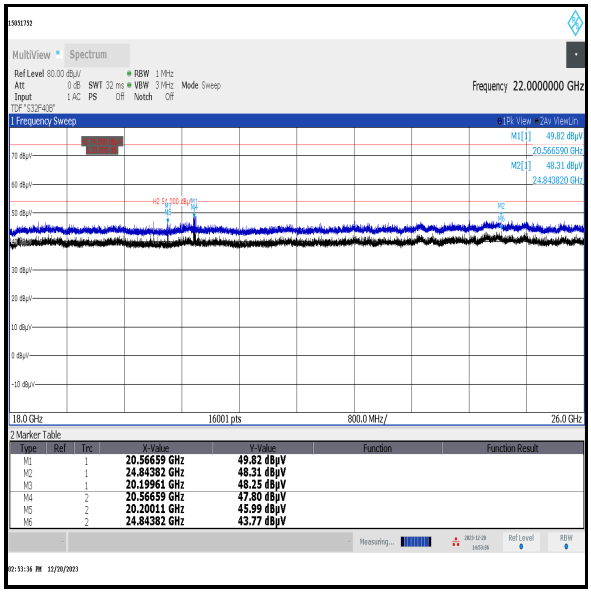
Results: Profile 3 / Peak

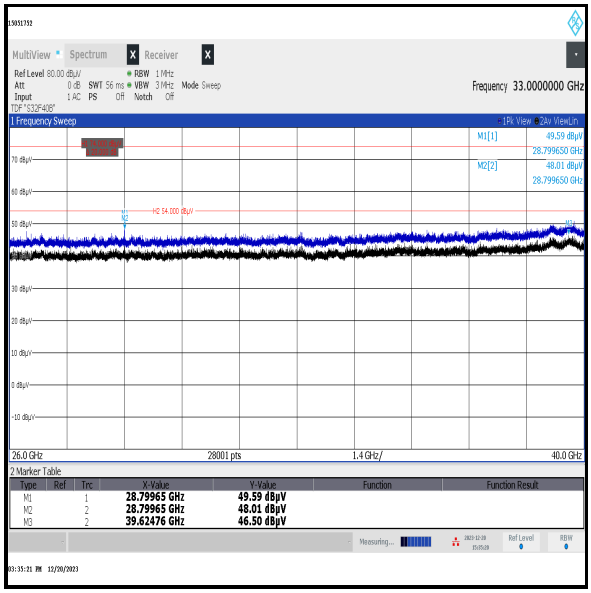
Frequency (MHz)	Antenna Polarity	Peak Level (dBμV/m)	Average Limit (dBμV/m)	Margin (dB)	Result
2400.150	Horizontal	41.3	54.0*	12.7	Compiled
3600.060	Horizontal	39.1	54.0*	14.9	Compiled
5399.940	Horizontal	42.3	54.0*	11.7	Compiled
14399.930	Horizontal	52.0	54.0*	2.0	Compiled
20199.000	Horizontal	49.7	54.0*	4.3	Compiled
20566.590	Horizontal	51.8	54.0*	2.2	Compiled
24843.820	Horizontal	46.8	54.0*	7.2	Compiled
28799.000	Horizontal	51.5	54.0*	2.5	Compiled

Transmitter Radiated Spurious Emissions (continued)



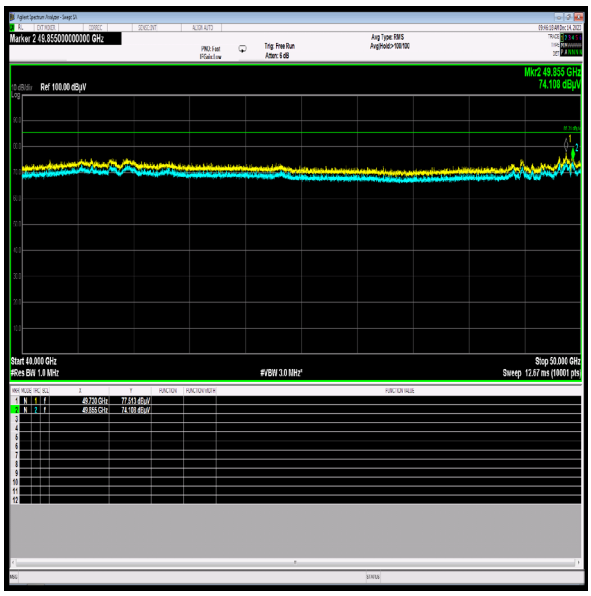


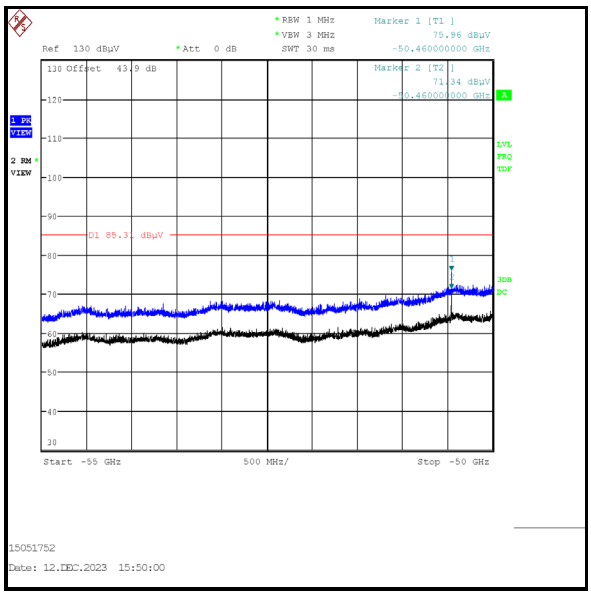


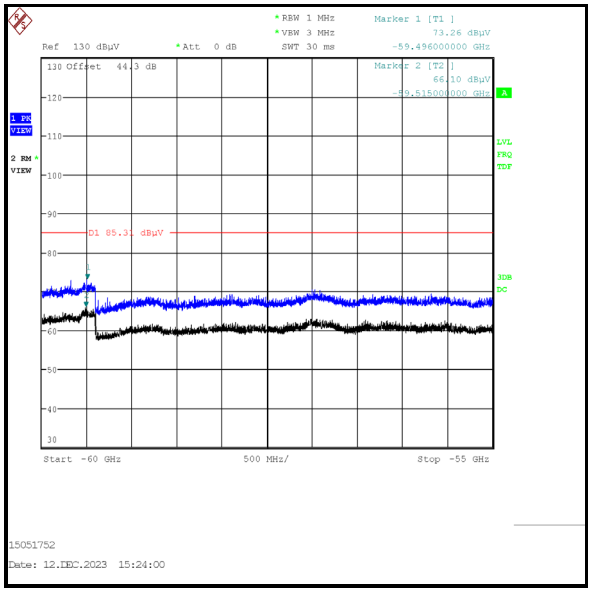


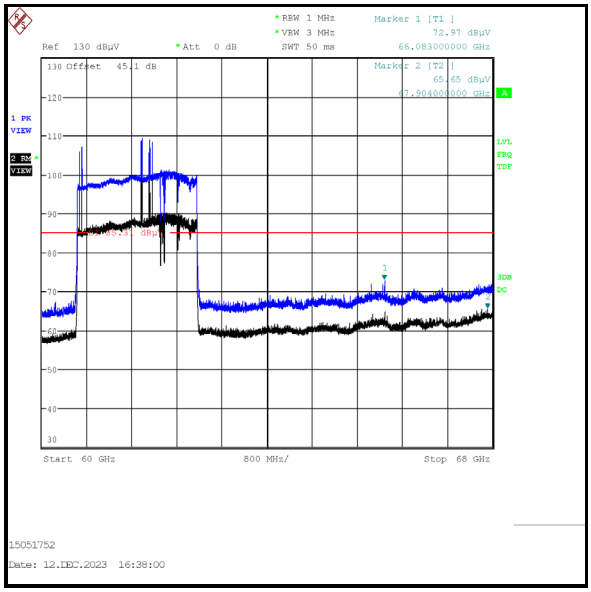
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Spurious Emissions (continued)



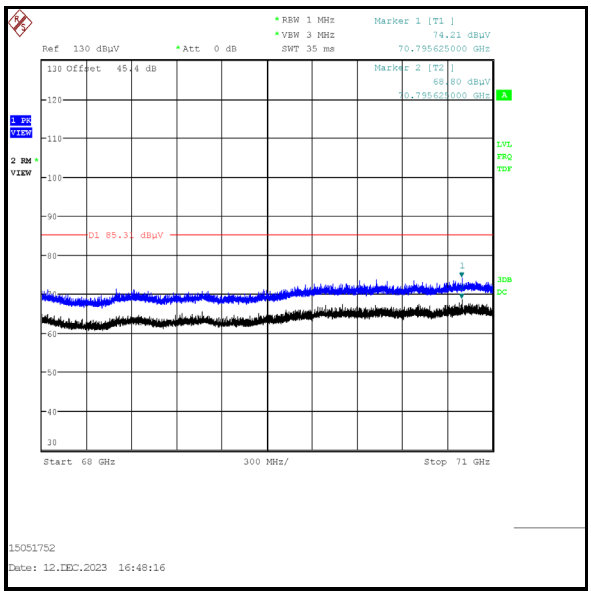


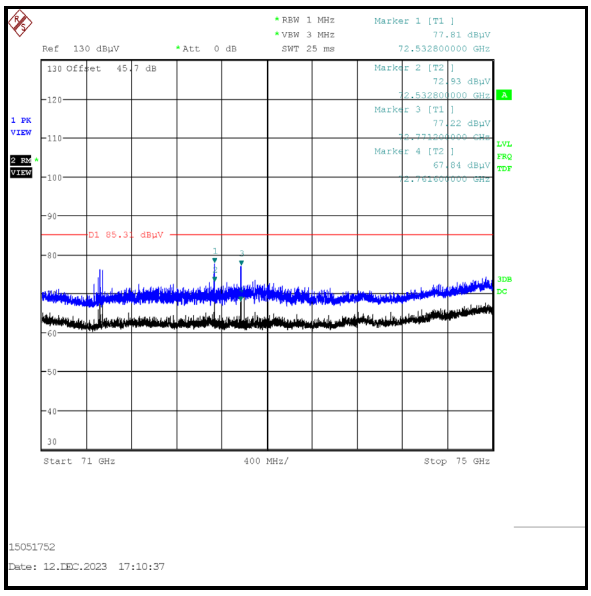


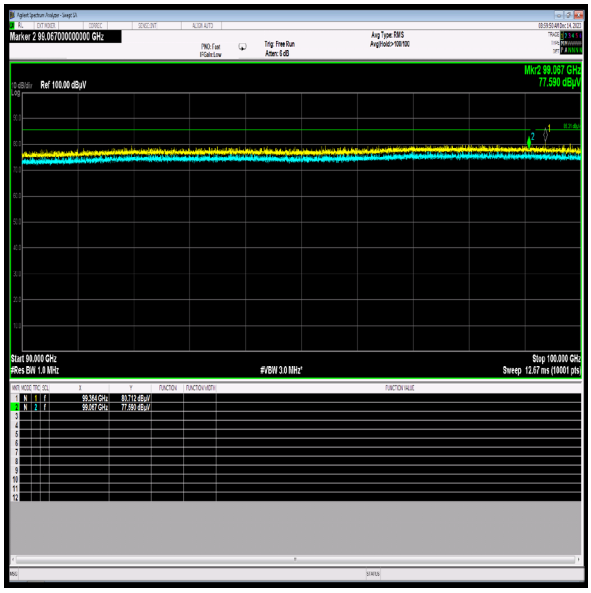


Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Spurious Emissions (continued)

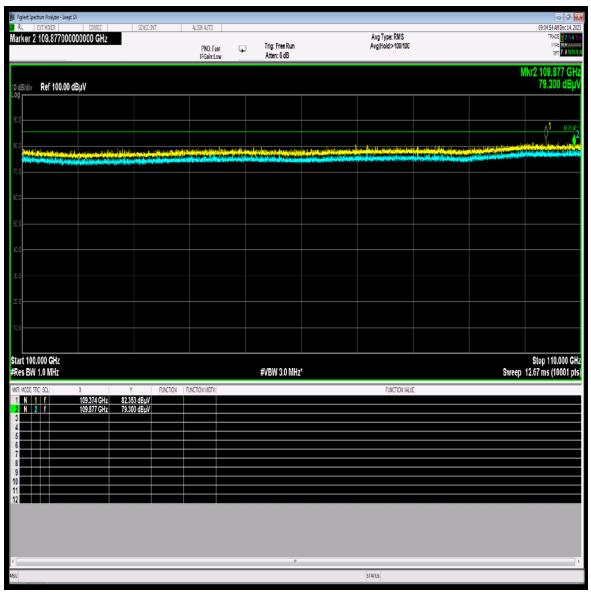






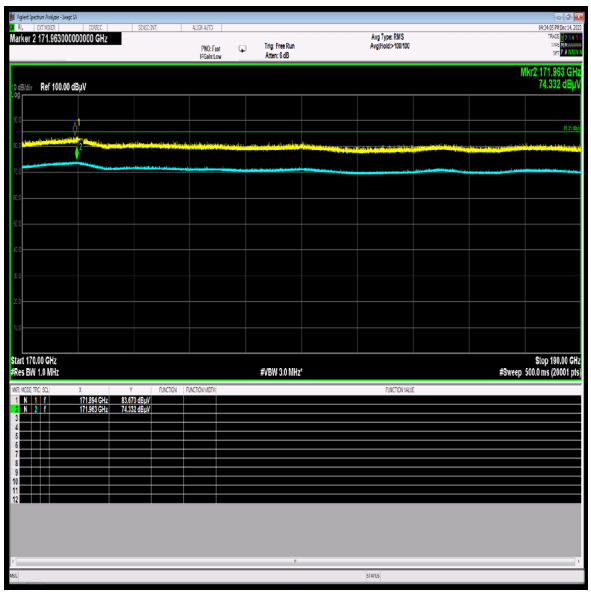
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Spurious Emissions (continued)



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Spurious Emissions (continued)



Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Spurious Emissions (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2041	Thermohygrometer	Testo	608-H1	45119912	27 Dec 2024	12
M226553	Thermohygrometer	Testo	608-H1	83800731	28 Dec 2024	12
M2040	Thermohygrometer	Testo	608-H1	45124934	27 Dec 2024	12
K0010	3m RSE Chamber	MVG Industries	N/A	N/A	11 Oct 2024	12
K0001	3m RSE Chamber	MVG Industries	N/A	N/A	06 Sep 2024	12
K226202	3m RSE Chamber	Albatross	N/A	N/A	21 Apr 2024	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	02 Aug 2024	12
M236226	Test Receiver	Rohde & Schwarz	ESW26	103134	21 Apr 2024	12
M1832	Signal Analyser	Keysight	N9010A	MY53470303	18 May 2024	24
M227312	Test Receiver	Rohde & Schwarz	ESW44	103203	11 May 2024	12
A2963	Antenna	Link Microtek	AM19HA-ULV1	14929	20 Jun 2025	36
A2964	Antenna	Link Microtek	AM15HA-ULV1	14930	24 Jun 2025	36
A2967	Antenna	Link Microtek	AM10HA-ULV1	14933	13 Jul 2025	36
A2968	Antenna	Link Microtek	AM7HA-ULV1	14934	06 Mar 2024	12
A2969	Antenna	Link Microtek	AM4HA-ULV1	14935	06 Mar 2024	12
A231045	Antenna	Schwarzbeck	HWRD 750	00064	25 Mar 2025	12
A231043	Antenna	Schwarzbeck	BBHA 9120 B	00834	25 Mar 2025	12
A231050	Antenna	Schwarzbeck	BBHA 9170	01280	25 Mar 2024	12
A231925	Antenna	Teseq, Inc	CBL6111D	63584	27 Apr 2024	12
A3165	Antenna	ETS-Lindgren	6502	00224383	13 Apr 2024	12
A219915	Downconverter	Virginia Diodes	WR19SAX	SAX 897	14 Apr 2024	24
M2069	Downconverter	Virginia Diodes	WR15SAX	SAX 394	16 Oct 2025	24
M2065	Downconverter	Virginia Diodes	WR10SAX	SAX 393	30 Jul 2025	24
M2066	Downconverter	Virginia Diodes	WR6.5SAX	SAX 392	31 May 2024	24
M2067	Downconverter	Virginia Diodes	WR4.3SAX	SAX 391	31 May 2024	24
G0640	Signal Generator	Keysight	E8257D	US00000055	10 Jan 2025	24
A3213	High Pass Filter	Sage Millimeter	SWF-75370340-10-H1	18199-01	25 Aug 2024	24
A3212	Low Pass Filter	Sage Millimeter	SWF-50354340-22-L1	B10754-01	25 Aug 2024	24
A3010	Attenuator	AtlanTecRF	AN18-06	208801#5	27 Apr 2024	12
A3154	Pre-Amplifier	Com-Power	PAM-103	18020012	21 Aug 2024	12
A231863	Amplifier	Atlantic Microwave	A-LNAKX-380116-S5S5	221044001	25 Mar 2024	12
A230567	Amplifier	Atlantic Microwave	A-HPAKX-380143-K5K5	VJ3601001	25 Mar 2024	12

5.2.6. Transmitter Frequency Stability (Temperature Variation)

Test Summary:

Test Engineers:	Shamraiz Ashiq & Ben Mercer	**Test Dates:**	29 December 2023 & 02 January 2024
Test Sample Serial Numbers:	ZZ1600 & Z1955		

FCC Reference:	Part 15.255(f)
Test Method Used:	ANSI C63.10 Section 9.14

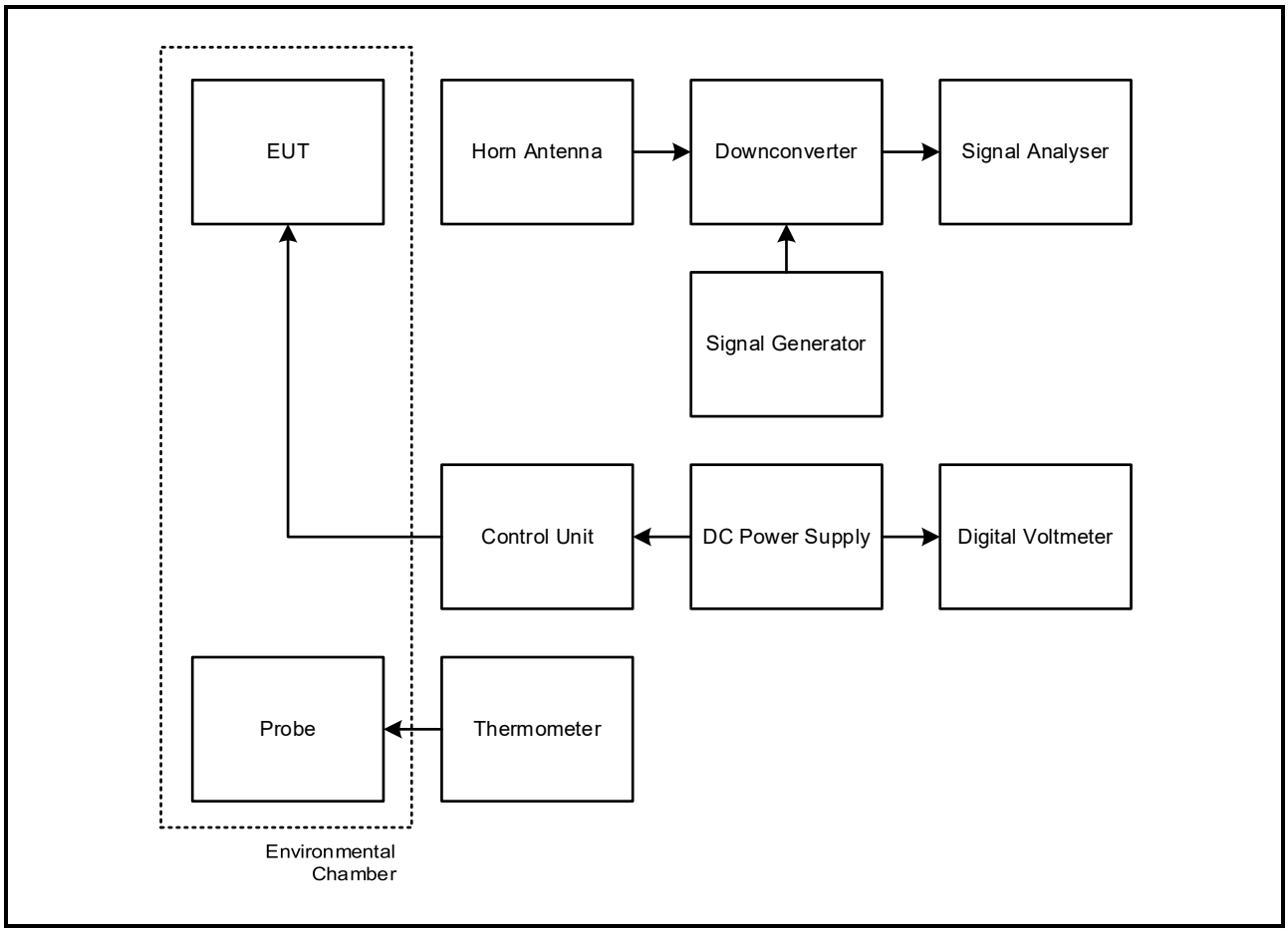
Environmental Conditions:

Ambient Temperature (°C):	19 to 20
Ambient Relative Humidity (%):	50 to 52

Note(s):

1. The 20 dB emission bandwidth was recorded on a signal analyser and compared to the lower and upper emission edges.
2. Temperature was monitored throughout the test with a calibrated digital thermometer.

Test setup:



Transmitter Frequency Stability (Temperature Variation) (continued)

Results: Profile 2 / Lower Band Edge

Temperature (°C)	Lower Band Edge Frequency (MHz)	Lower 20 dB Emission Bandwidth Frequency (MHz)	Result
-20	57000.000	60625.000	Complied
-10	57000.000	60595.000	Complied
0	57000.000	60590.000	Complied
10	57000.000	60635.000	Complied
20	57000.000	60610.000	Complied
30	57000.000	60595.000	Complied
40	57000.000	60600.000	Complied
50	57000.000	60610.000	Complied
Worst-case Margin (MHz)		3590.000	

Results: Profile 2 / Upper Band Edge

Temperature (°C)	Upper Band Edge Frequency (MHz)	Upper 20 dB Emission Bandwidth Frequency (MHz)	Result
-20	64000.000	62765.000	Complied
-10	64000.000	62765.000	Complied
0	64000.000	62765.000	Complied
10	64000.000	62760.000	Complied
20	64000.000	62765.000	Complied
30	64000.000	62760.000	Complied
40	64000.000	62765.000	Complied
50	64000.000	62765.000	Complied
Worst-case Margin (MHz)		1235.000	

Transmitter Frequency Stability (Temperature Variation) (continued)

Results: Profile 3 / Lower Band Edge

Temperature (°C)	Lower Band Edge Frequency (MHz)	Lower 20 dB Emission Bandwidth Frequency (MHz)	Result
-20	57000.000	60600.000	Complied
-10	57000.000	60600.000	Complied
0	57000.000	60620.000	Complied
10	57000.000	60630.000	Complied
20	57000.000	60600.000	Complied
30	57000.000	60600.000	Complied
40	57000.000	60600.000	Complied
50	57000.000	60610.000	Complied
Worst-case Margin (MHz)		3600.000	

Results: Profile 3 / Upper Band Edge

Temperature (°C)	Upper Band Edge Frequency (MHz)	Upper 20 dB Emission Bandwidth Frequency (MHz)	Result
-20	64000.000	62765.000	Complied
-10	64000.000	62765.000	Complied
0	64000.000	62760.000	Complied
10	64000.000	62765.000	Complied
20	64000.000	62765.000	Complied
30	64000.000	62760.000	Complied
40	64000.000	62760.000	Complied
50	64000.000	62765.000	Complied
Worst-case Margin (MHz)		1235.000	

Transmitter Frequency Stability (Temperature Variation) (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2004	Thermohygrometer	Testo	608-H1	45046425	27 Dec 2024	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	02 Aug 2024	12
M2069	Downconverter	Virginia Diodes	WR15SAX	SAX 394	16 Oct 2025	24
M2053	Thermomter	Fluke Corporation	52II	4232071WS	13 Mar 2024	12
M1251	Multimeter	Fluke Corporation	175	89170179	08 Jun 2024	12
G0640	Signal Generator	Keysight	E8257D	US00000055	10 Jan 2025	24
E235136	Environmental Chamber	Espec	PU-3J	15021355	Calibrated before use	-
A2964	Antenna	Link Microtek.	AM15HA-ULV1	14930	24 Jun 2025	36

5.2.7. Transmitter Frequency Stability (Voltage Variation)

Test Summary:

Test Engineers:	Shamraiz Ashiq & Ben Mercer	**Test Dates:**	29 December 2023 & 02 January 2024
Test Sample Serial Numbers:	ZZ1600 & Z1955		

FCC Reference:	Part 15.255(f)
Test Method Used:	ANSI C63.10 Section 9.14

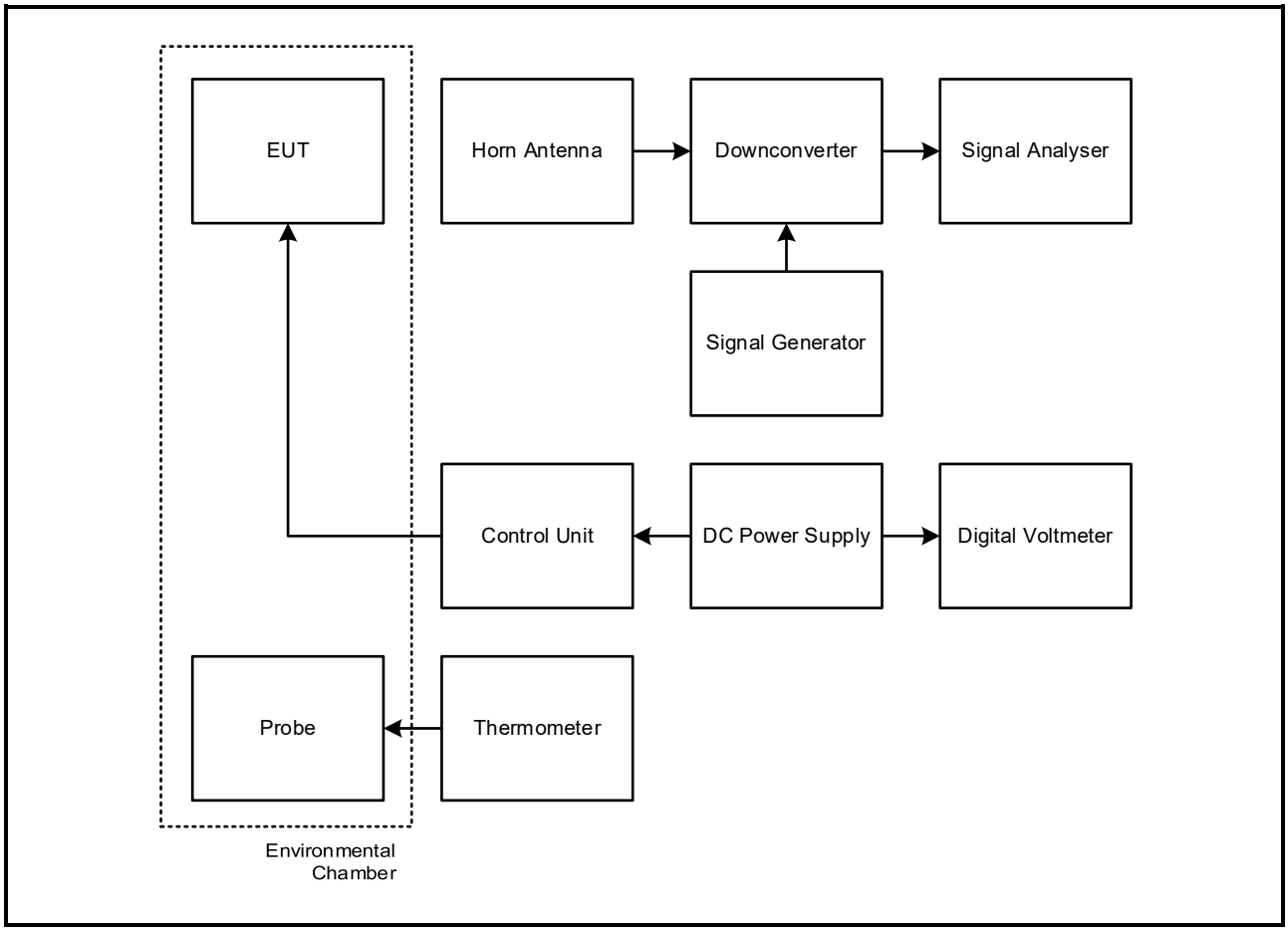
Environmental Conditions:

Ambient Temperature (°C):	19 & 20
Ambient Relative Humidity (%):	50 & 52

Note(s):

1. The 20 dB emission bandwidth and 99% occupied bandwidth was recorded on a signal analyser and compared to the lower and upper emission edges.
2. The DC power supply voltage was set to 85% and 115% of the stated Control Unit input voltage of 24 VDC.
3. Voltage was monitored throughout the test with a calibrated digital voltmeter.

Test setup:



Transmitter Frequency Stability (Voltage Variation) (continued)

Results: Profile 2 / Lower Band Edge

Supply Voltage (VDC)	Lower Band Edge Frequency (MHz)	Lower 20 dB Emission Bandwidth Frequency (MHz)	Result
20.4	57000.000	60630.000	Complied
24.0	57000.000	60610.000	Complied
27.6	57000.000	60635.000	Complied
Worst-case Margin (MHz)		3610.000	

Results: Profile 2 / Upper Band Edge

Supply Voltage (VDC)	Upper Band Edge Frequency (MHz)	Upper 20 dB Emission Bandwidth Frequency (MHz)	Result
20.4	64000.000	62760.000	Complied
24.0	64000.000	62765.000	Complied
27.6	64000.000	62765.000	Complied
Worst-case Margin (MHz)		1235.000	

Results: Profile 3 / Lower Band Edge

Supply Voltage (VDC)	Lower Band Edge Frequency (MHz)	Lower 20 dB Emission Bandwidth Frequency (MHz)	Result
20.4	57000.000	60630.000	Complied
24.0	57000.000	60600.000	Complied
27.6	57000.000	60605.000	Complied
Worst-case Margin (MHz)		3600.000	

Results: Profile 3 / Upper Band Edge

Supply Voltage (VDC)	Upper Band Edge Frequency (MHz)	Upper 20 dB Emission Bandwidth Frequency (MHz)	Result
20.4	64000.000	62765.000	Complied
24.0	64000.000	62765.000	Complied
27.6	64000.000	62765.000	Complied
Worst-case Margin (MHz)		1235.000	

Transmitter Frequency Stability (Voltage Variation) (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2004	Thermohygrometer	Testo	608-H1	45046425	27 Dec 2024	12
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	02 Aug 2024	12
M2069	Downconverter	Virginia Diodes	WR15SAX	SAX 394	16 Oct 2025	24
M2053	Thermomter	Fluke Corporation	52II	4232071WS	13 Mar 2024	12
M1251	Multimeter	Fluke Corporation	175	89170179	08 Jun 2024	12
G0640	Signal Generator	Keysight	E8257D	US00000055	10 Jan 2025	24
E235136	Environmental Chamber	Espec	PU-3J	15021355	Calibrated before use	-
A2964	Antenna	Link Microtek.	AM15HA-ULV1	14930	24 Jun 2025	36
S0557	DC Power supply	Thurlby Thandar	EL303R	395819	Calibrated before use	-

5.2.8. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Alison Johnston	**Test Dates:**	08 January 2024 & 09 January 2024
Test Sample Serial Numbers:	Z1599 and Z1600		

FCC Reference:	Part 15.207
Test Method Used:	ANSI C63.10 Section 6.2, FCC KDB 174176 and notes below

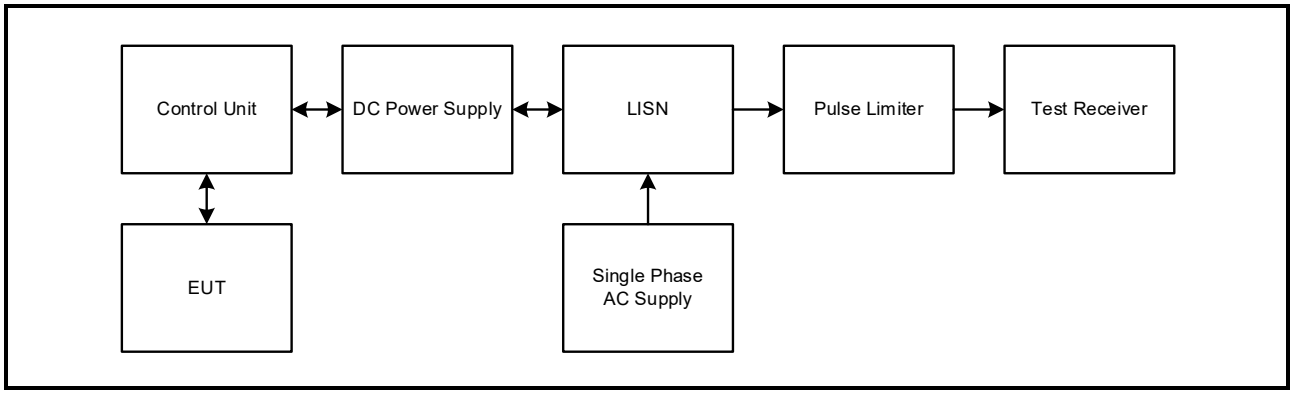
Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	40

Note(s):

1. The EUT was connected to the Control Unit via CAN cable. The Control Unit supplied 12 VDC to the EUT. The Control Unit was powered from a 24 VDC bench power supply. The bench power supply was connected to a 120 VAC 60 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, all tests above were also performed with a 240 VAC 60 Hz single phase supply.
3. Pre-scans were performed and markers placed on the highest live and neutral measured levels. Final measurements were performed on the marker frequencies and the results entered into the tables below.
4. A pulse limiter was fitted between the LISN and the test receiver.

Test Setup Diagrams



Transmitter AC Conducted Spurious Emissions (continued)

Results: Profile 2 / Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
13.560000	Live	31.9	60.0	28.1	Complied
13.906500	Live	30.4	60.0	29.6	Complied
14.293500	Live	28.7	60.0	31.3	Complied
14.856000	Live	21.8	60.0	38.2	Complied
15.468000	Live	20.3	60.0	39.7	Complied
21.304500	Live	13.6	60.0	46.4	Complied

Results: Profile 2 / Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
13.110000	Live	24.0	50.0	26.0	Complied
13.560000	Live	29.0	50.0	21.0	Complied
13.906500	Live	27.9	50.0	22.1	Complied
15.360000	Live	12.9	50.0	37.1	Complied
17.875500	Live	22.8	50.0	27.2	Complied
24.000000	Live	24.9	50.0	25.1	Complied

Results: Profile 2 / Neutral / Quasi Peak / 120 VAC 60 Hz

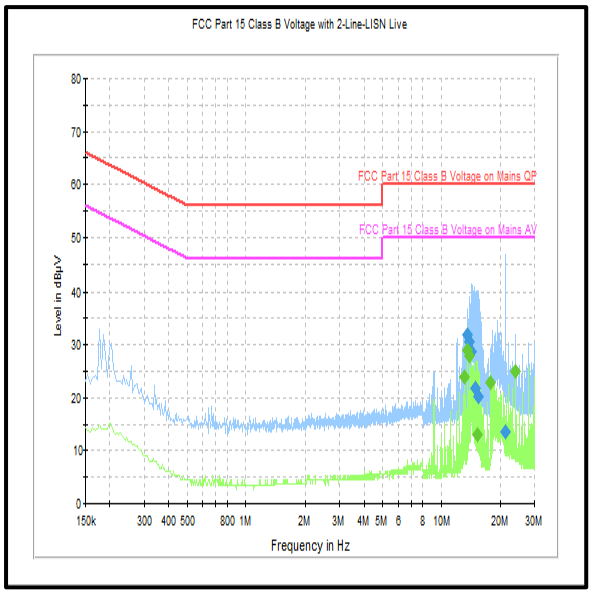
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
13.897500	Neutral	31.1	60.0	28.9	Complied
14.361000	Neutral	21.7	60.0	38.3	Complied
14.815500	Neutral	21.0	60.0	39.0	Complied
15.162000	Neutral	21.8	60.0	38.2	Complied
15.468000	Neutral	20.6	60.0	39.4	Complied
23.739000	Neutral	18.0	60.0	42.0	Complied

Results: Profile 2 / Neutral / Average / 120 VAC 60 Hz

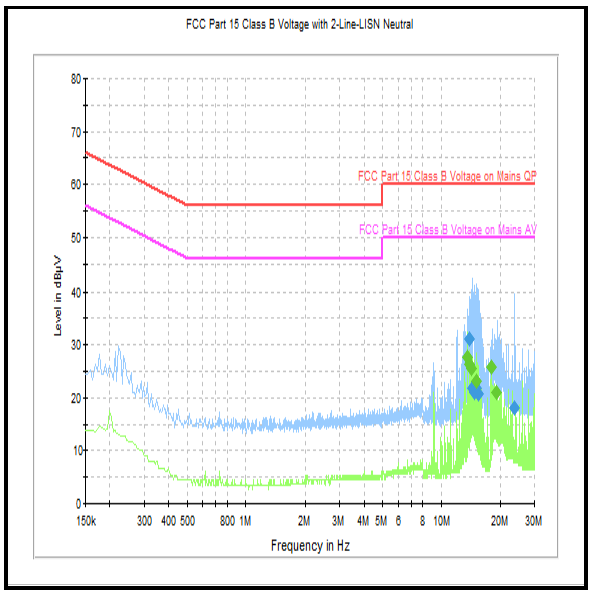
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
13.560000	Neutral	27.6	50.0	22.4	Complied
13.906500	Neutral	26.3	50.0	23.7	Complied
14.302500	Neutral	25.4	50.0	24.6	Complied
15.094500	Neutral	23.1	50.0	26.9	Complied
18.001500	Neutral	25.7	50.0	24.3	Complied
19.068000	Neutral	20.9	50.0	29.1	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: Profile 2 / 120 VAC 60 Hz



Live



Neutral

Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Transmitter AC Conducted Spurious Emissions (continued)

Results: Profile 2 / Live / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
13.902000	Live	29.7	60.0	30.3	Complied
14.298000	Live	29.8	60.0	30.2	Complied
15.162000	Live	21.3	60.0	38.7	Complied
15.468000	Live	20.2	60.0	39.8	Complied
19.581000	Live	21.1	60.0	38.9	Complied
23.806500	Live	16.1	60.0	43.9	Complied

Results: Profile 2 / Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
13.906500	Live	25.6	50.0	24.4	Complied
14.302500	Live	24.6	50.0	25.4	Complied
15.094500	Live	22.3	50.0	27.7	Complied
18.001500	Live	21.7	50.0	28.3	Complied
18.663000	Live	20.5	50.0	29.5	Complied
24.000000	Live	23.0	50.0	27.0	Complied

Results: Profile 2 / Neutral / Quasi Peak / 240 VAC 60 Hz

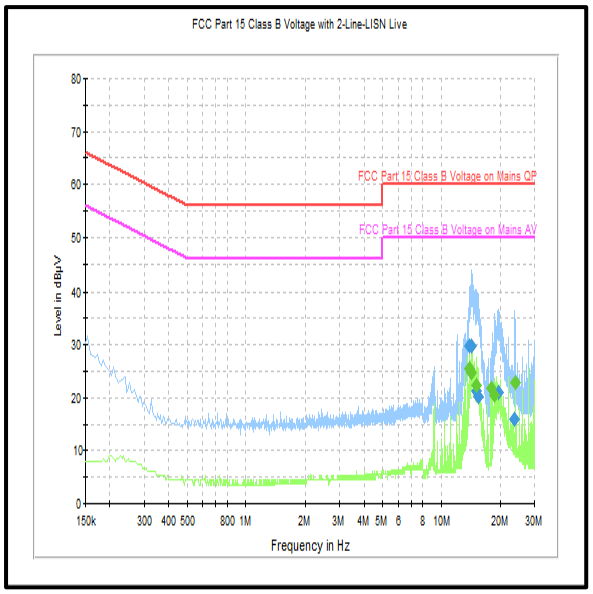
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
13.920000	Neutral	25.0	60.0	35.0	Complied
14.311500	Neutral	26.8	60.0	33.2	Complied
14.815500	Neutral	21.1	60.0	38.9	Complied
15.121500	Neutral	20.7	60.0	39.3	Complied
19.369500	Neutral	23.0	60.0	37.0	Complied
23.235000	Neutral	14.1	60.0	45.9	Complied

Results: Profile 2 / Neutral / Average / 240 VAC 60 Hz

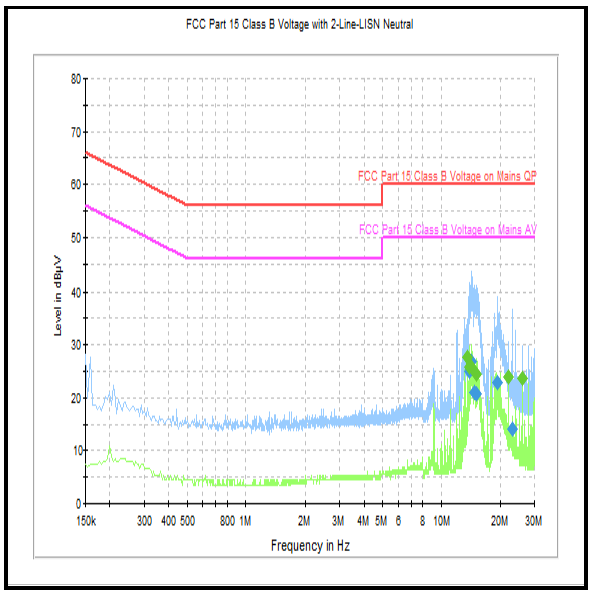
Frequency (MHz)	Line	Level (dBµV)	Limit (dBµV)	Margin (dB)	Result
13.560000	Neutral	27.7	50.0	22.3	Complied
13.911000	Neutral	25.8	50.0	24.2	Complied
14.302500	Neutral	25.7	50.0	24.3	Complied
15.094500	Neutral	24.4	50.0	25.6	Complied
22.002000	Neutral	24.0	50.0	26.0	Complied
26.002500	Neutral	23.5	50.0	26.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: Profile 2 / 240 VAC 60 Hz



Live



Neutral

Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Transmitter AC Conducted Spurious Emissions (continued)

Results: Profile 3 / Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
11.998500	Live	14.6	60.0	45.4	Complied
13.560000	Live	34.5	60.0	25.5	Complied
14.361000	Live	21.7	60.0	38.3	Complied
15.310500	Live	21.6	60.0	38.4	Complied
17.776500	Live	31.7	60.0	28.3	Complied
24.000000	Live	31.8	60.0	28.2	Complied

Results: Profile 3 / Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
12.687000	Live	19.7	50.0	30.3	Complied
13.560000	Live	30.2	50.0	19.8	Complied
13.960500	Live	26.4	50.0	23.6	Complied
14.811000	Live	23.9	50.0	26.1	Complied
15.090000	Live	11.3	50.0	38.7	Complied
18.240000	Live	23.7	50.0	26.3	Complied

Results: Profile 3 / Neutral / Quasi Peak / 120 VAC 60 Hz

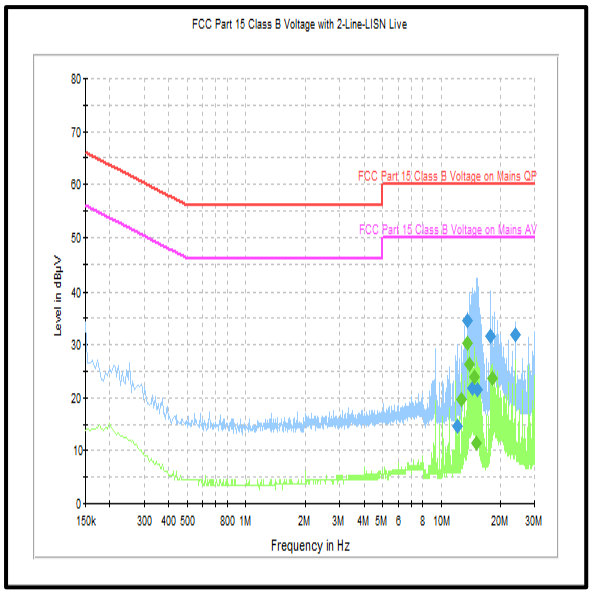
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
11.998500	Neutral	16.3	60.0	43.7	Complied
13.564500	Neutral	30.8	60.0	29.2	Complied
14.401500	Neutral	29.0	60.0	31.0	Complied
14.820000	Neutral	26.7	60.0	33.3	Complied
15.274500	Neutral	28.2	60.0	31.8	Complied
18.240000	Neutral	32.2	60.0	27.8	Complied

Results: Profile 3 / Neutral / Average / 120 VAC 60 Hz

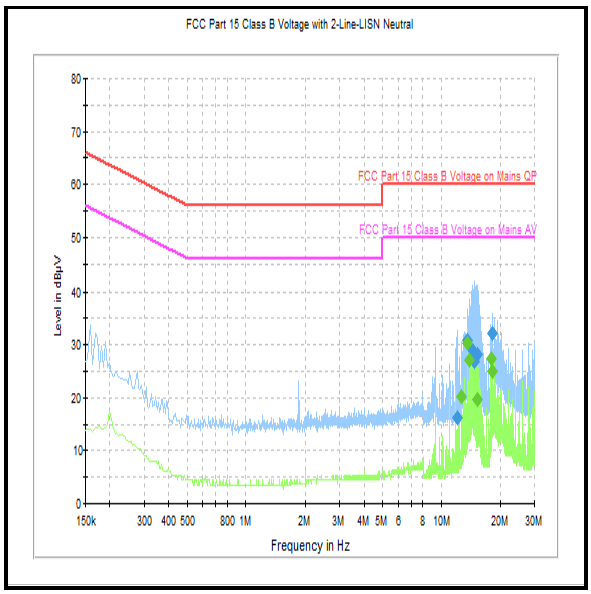
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
12.687000	Neutral	20.2	50.0	29.8	Complied
13.560000	Neutral	30.3	50.0	19.7	Complied
13.956000	Neutral	27.2	50.0	22.8	Complied
15.270000	Neutral	19.7	50.0	30.3	Complied
18.001500	Neutral	27.5	50.0	22.5	Complied
18.244500	Neutral	24.9	50.0	25.1	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: Profile 3 / 120 VAC 60 Hz



Live



Neutral

Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Transmitter AC Conducted Spurious Emissions (continued)

Results: Profile 3 / Live / Quasi Peak / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
13.830000	Live	19.8	60.0	40.2	Complied
13.987500	Live	27.6	60.0	32.4	Complied
14.284500	Live	23.2	60.0	36.8	Complied
15.162000	Live	21.2	60.0	38.8	Complied
18.676500	Live	28.4	60.0	31.6	Complied
23.995500	Live	24.2	60.0	35.8	Complied

Results: Profile 3 / Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
13.560000	Live	28.0	50.0	22.0	Complied
14.280000	Live	14.6	50.0	35.4	Complied
14.815500	Live	23.1	50.0	26.9	Complied
18.618000	Live	25.4	50.0	24.6	Complied
22.002000	Live	23.3	50.0	26.7	Complied
24.000000	Live	25.5	50.0	24.5	Complied

Results: Profile 3 / Neutral / Quasi Peak / 240 VAC 60 Hz

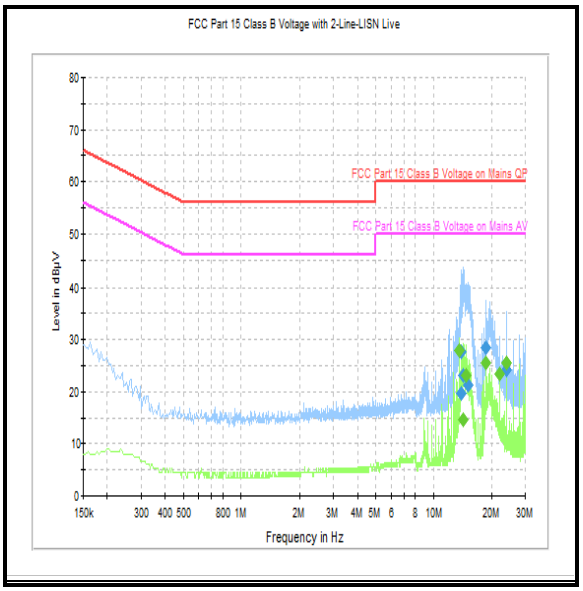
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
13.992000	Neutral	32.5	60.0	27.5	Complied
14.361000	Neutral	25.2	60.0	34.8	Complied
14.820000	Neutral	26.3	60.0	33.7	Complied
15.463500	Neutral	20.2	60.0	39.8	Complied
18.600000	Neutral	33.5	60.0	26.5	Complied
24.000000	Neutral	26.1	60.0	33.9	Complied

Results: Profile 3 / Neutral / Average / 240 VAC 60 Hz

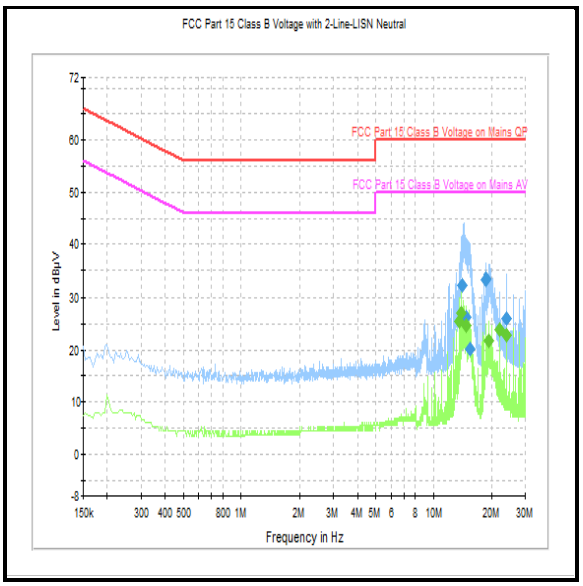
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
13.555500	Neutral	25.6	50.0	24.4	Complied
13.947000	Neutral	27.1	50.0	22.9	Complied
14.802000	Neutral	24.7	50.0	25.3	Complied
19.455000	Neutral	21.9	50.0	28.1	Complied
22.002000	Neutral	23.9	50.0	26.1	Complied
24.000000	Neutral	22.8	50.0	27.2	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: Profile 3 / 240 VAC 60 Hz



Live



Neutral

Note: This plot is a pre-scan and for indication purposes only. For final measurements, see accompanying tables.

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2037	Thermohygrometer	Testo	608-H1	45124925	27 Dec 2024	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	23 Aug 2024	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	01 Jun 2024	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046	02 Oct 2024	12

Test Measurement Software/Firmware Used:

Name	Version	Release Date
Rohde & Schwarz EMC32	6.30.0	2018

6 Measurement Uncertainty & Decision Rule

Overview

No measurement or test can ever be perfect and the imperfections give rise to error of measurement in the results. Consequently the result of a measurement is only an approximation to the value of the measurand (the specific quantity subject to measurement) and is only complete when accompanied by a statement of the uncertainty of the approximation.

The expression of uncertainty of a measurement result allows realistic comparison of results with reference values and limits given in specifications and standards.

Decision Rule

Measurement system instrumentation shall be used with an accuracy specification meeting the accuracy specification limits according to IEC/IECEE OD-5014.

As applicable, unless specified otherwise in this report, the compliance “Decision Rule” is based on Simple Acceptance. If the measured value is on the limit, the result is defined as a pass. In this case the risk of a false positive is 50%. For further information regarding risk assessment refer to ILAC G8:09/2019.

Measurement Uncertainty

The reported expanded uncertainties below are based on a standard uncertainty multiplied by an appropriate coverage factor such that a confidence level of approximately 95% is maintained. For the purposes of this document “approximately” is interpreted as meaning “effectively” or “for most practical purposes”.

Measurement Type	Range	Confidence Level (%)	Calculated Uncertainty
Transmitter EIRP	57 to 71 GHz	95%	±2.70 dB
Transmitter Peak Output Power	57 to 71 GHz	95%	±2.70 dB
Transmitter 6 dB Bandwidth	57 to 71 GHz	95%	±4.59 %
Transmitter 20 dB Bandwidth	57 to 71 GHz	95%	±4.59 %
Transmitter 99% Occupied Bandwidth	57 to 71 GHz	95%	±3.92 %
Transmitter Radiated Emissions	30 MHz to 1 GHz	95%	±3.30 dB
Transmitter Radiated Emissions	1 GHz to 40 GHz	95%	±3.13 dB
Transmitter Radiated Emissions	40 GHz to 200 GHz	95%	±5.12 dB
AC Conducted Spurious Emissions	0.15 MHz to 30 MHz	95%	±2.42 dB

The methods used to calculate the above uncertainties are in line with those recommended within the various measurement specifications. Where measurement specifications do not include guidelines for the evaluation of measurement uncertainty the published guidance of the appropriate accreditation body is followed.

7. Report Revision History

Version Number	Revision Details		
	Page No(s)	Clause	Details
1.0	-	-	Initial Version

--- END OF REPORT ---