TEST REPORT

Test Report No. : UL-RPT-RP14707297-316A

Manufacturer	:	Inxpect S.p.a
Model No. / HVIN	:	S203A
PMN	:	S203A
FCC ID	:	2ANOS-S203
ISED Certification No.	:	IC: 27966-S203
Test Standard(s)	:	FCC Parts 15.207, 15.209, 15.215 & 15.255 ISED Canada RSS-210 Issue 10, December 2019, Annex J & RSS-Gen Issue 5, March 2019

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 2.0 supersedes all previous versions.

Date of Issue: 07 June 2023

Checked by:

Ben Mercer
Lead Project Engineer, Radio Laboratory

Company Signatory:

Sarah Williams
RF Operations Leader, Radio Laboratory

5772

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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
Specification Reference:	RSS-Gen Issue 5 March 2019
Specification Title:	General requirements for Compliance of Radio Apparatus
Specification Reference:	RSS-210 Issue 10 December 2019
Specification Title:	License-Exempt Radio Apparatus: Category I Equipment
Site Registration:	FCC: 685609, ISEDC:20903
FCC Lab. Designation No.:	UK2011
ISEDC CABID:	UK0001
Location of Testing:	Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom
Test Dates:	26 April 2023 to 23 May 2023

2.2. Summary of Test Results

FCC Reference (47CFR)	ISED Canada Reference	Measurement	Result
Part 15.255(c)(3)	RSS-210 J.2.1b.	Transmitter EIRP	✓
Part 15.255(c)(3)	RSS-210 J.2.1b.	Transmitter Peak Output Power	✓
Part 15.255(e)(1)	RSS-210 J.4.c.	Transmitter 6 dB Bandwidth	✓
Part 15.215(c)	N/A	Transmitter 20 dB Bandwidth	✓
N/A	RSS-Gen 6.7	Transmitter 99% Emission Bandwidth	✓
Part 15.255(d) / 15.209	RSS-Gen 6.13 / RSS-210 J.3	Transmitter Spurious Emissions	✓
Part 15.255(f)	RSS-Gen 6.11 / RSS-210 J.6	Transmitter Frequency Stability (Temperature & Voltage Variation)	✓
Part 15.207	RSS-Gen 8.8	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:	S203A
Test Sample Serial Number:	ZZ106
Hardware Version:	1.0
Software Version:	Configuration tool - software Version ISA v2.7.35
Firmware Version:	RADARSS 6.3.2.6 + RadioConfig.h v1.0 + RadioConfig-WW.h v1.0 + RadioConfig-S203A.h v.1.0
FCC ID:	2ANOS-S203
ISED Canada Certification Number:	IC: 27966-S203
Date of Receipt:	18 April 2023

3.2. Description of EUT

The equipment under test was a 60GHz radar sensor 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:	11.0 dBi	
Transmit Frequency Range:	61.2 GHz to 63.4 GHz	
Transmit Channels Tested:	**Channel ID**	**Channel Frequency (GHz)**
	Single	62.3

3.5. Support Equipment

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

Description:	Control Unit
Brand Name:	Inxpect
Model Name or Number:	C201B
Serial Number:	ZZ103

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 a C201B Control Unit via a 10 m CAN cable. The C201B supplied 12 VDC to the EUT via the CAN cable. The C201B was 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 EIRP

Test Summary:

Test Engineers:	Shamraiz Ashiq	**Test Date:**	10 May 2023
Test Sample Serial Number:	ZZ106		

FCC Reference:	Part 15.255(c)(3)
ISED Canada Reference:	RSS-210 J.2.1b
Test Method Used:	ANSI C63.10 Section 9.11

Environmental Conditions:

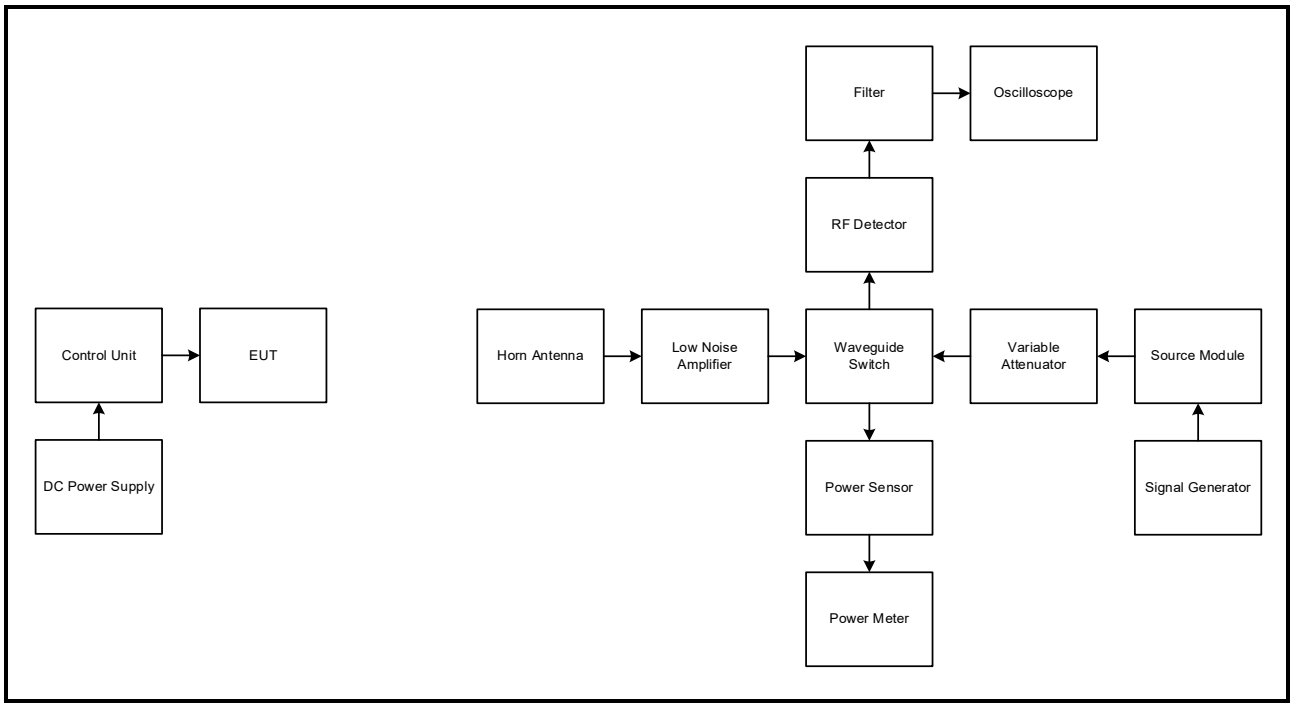
Temperature (°C):	23
Relative Humidity (%):	43

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.

Transmitter EIRP (continued)

Test setup:



Transmitter EIRP (continued)

Results: Peak

Frequency (GHz)	Level (V)	Substituted EIRP Level (dBm)	Limit (dBm)	Margin (dB)	Result
62.300	0.298	0.6	10.0	9.4	Complied

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0017	3m RSE Chamber	Rainford Solutions .	N/A	N/A	08 Nov 2023	12
M2003	Thermohygrometer	Testo	608-H1	45046641	09 Dec 2023	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 2023	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	-
A3251	Video Amplifier	Femto	HVA-200M-40B	05-01-354	Calibrated before Use	-
A3233	RF Detector	Sage Millimeter	SFD-503753-15SF-P1	18199-01	Calibrated before Use	-

5.2.2. Transmitter Peak Conducted Output Power

Test Summary:

Test Engineers:	Shamraiz Ashiq	**Test Date:**	10 May 2023
Test Sample Serial Number:	ZZ106		

FCC Reference:	Part 15.255(c)(3)
ISED Canada Reference:	RSS-210 J.2.1b
Test Method Used:	ANSI C63.10 Section 9.11

Environmental Conditions:

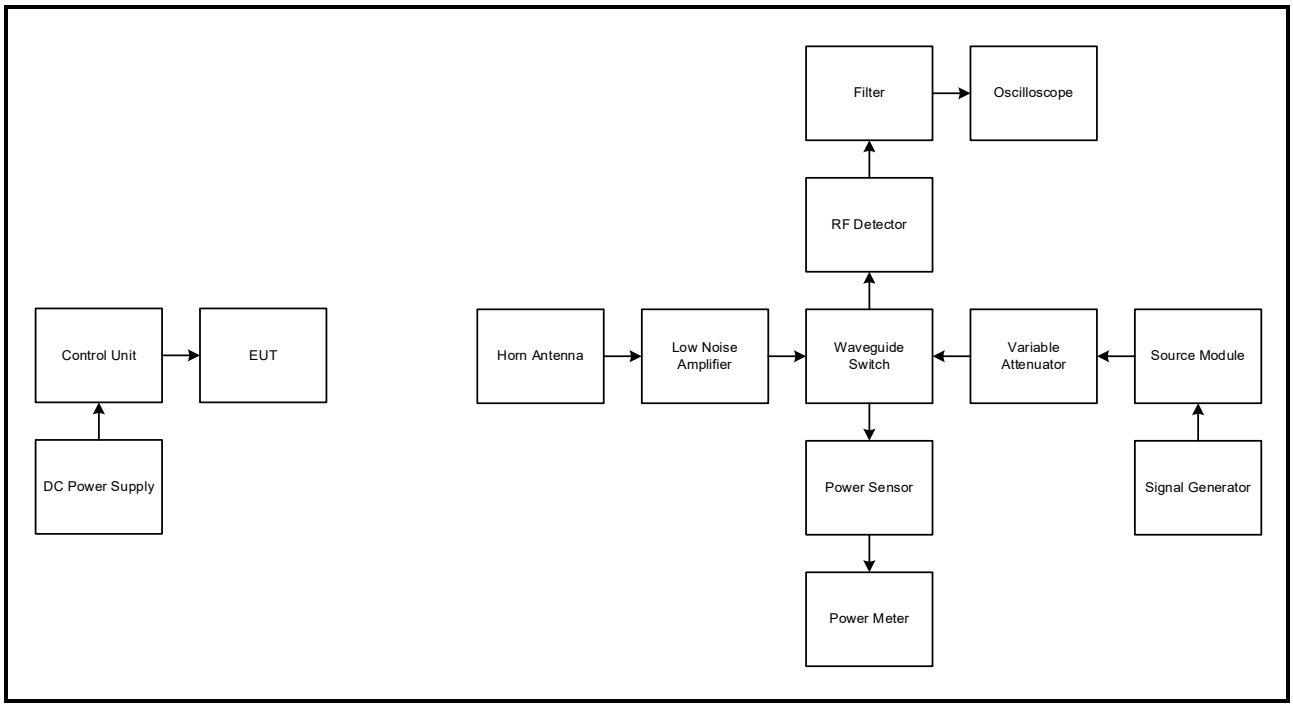
Temperature (°C):	23
Relative Humidity (%):	43

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 and average voltages were 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 voltages. 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 stated antenna gain was subtracted from the measured EIRP to obtain the conducted power.
5. The substituted levels recorded below include the calibrated path loss of the waveguide switch.

Transmitter Peak Conducted Output Power (continued)

Test setup:



Transmitter Peak Conducted Output Power (continued)

Results:

EIRP Level (dBm)	Antenna Gain (dBi)	Conducted Level (dBm)	Limit (dBm)	Margin (dB)	Result
0.6	11.0	-10.4	-10.0	0.4	Complied

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
K0017	3m RSE Chamber	Rainford Solutions .	N/A	N/A	08 Nov 2023	12
M2003	Thermohygrometer	Testo	608-H1	45046641	09 Dec 2023	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 (Opt:001)	MY59125508	22 Feb 2024	24
M281	Power Meter	Hewlett Packard	E4418A (EPM441A)	GB37170210-01	18 May 2023	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	-
A3251	Video Amplifier	Femto	HVA-200M-40B	05-01-354	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	**Test Date:**	26 April 2023
Test Sample Serial Number:	ZZ106		

FCC Reference:	Part 15.255(e)(1)
ISED Canada Reference:	RSS-210 J.4.c
Test Method Used:	ANSI C63.10 Section 9.3

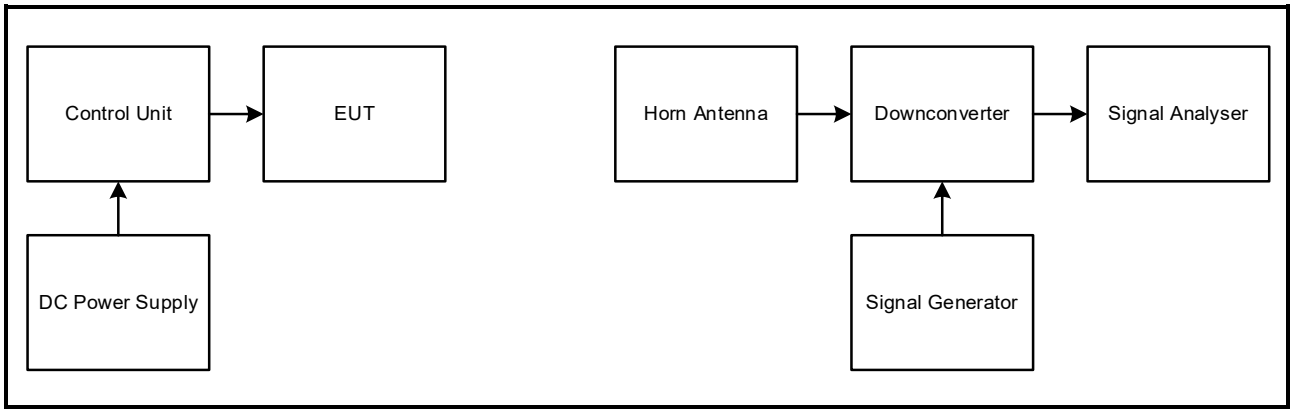
Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	39

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.

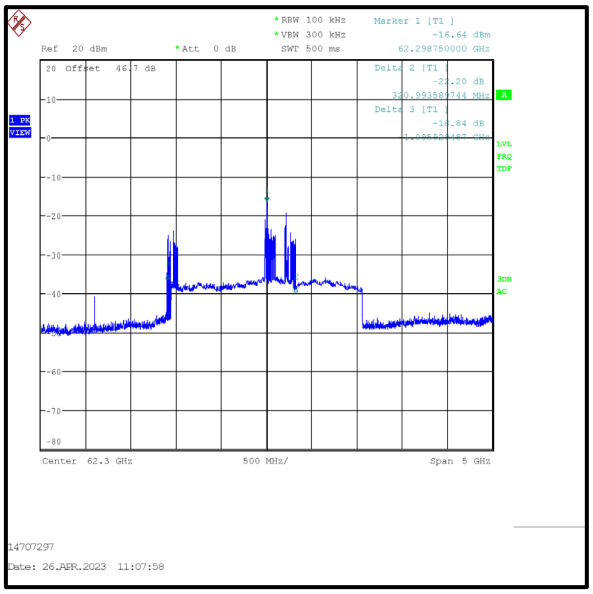
Test setup:



Transmitter 6 dB Bandwidth (continued)

Results:

Channel	RBW (kHz)	VBW (kHz)	Emission Bandwidth (MHz)
Single	100	300	1416.923



Single Channel

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	05 Oct 2023	12
M2041	Thermohygrometer	Testo	608-H1	45119912	09 Dec 2023	12
G0640	Signal Generator	Keysight	E8257D	US00000055	10 Jan 2025	24
M2069	Downconverter	Virginia Diodes,	WR15.0 SAX	SAX 394	09 Jul 2023	24
A2964	Horn Antenna	Link Microtek.	AM15HA-ULV1	14930	24 Jun 2025	36
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	08 Jul 2023	12

5.2.4 Transmitter 20 dB Bandwidth

Test Summary:

Test Engineers:	Shamraiz Ashiq	**Test Date:**	26 April 2023
Test Sample Serial Number:	ZZ106		

FCC Reference:	Part 15.215(c)
ISED Canada Reference:	N/A
Test Method Used:	ANSI C63.10 Section 6.9.2

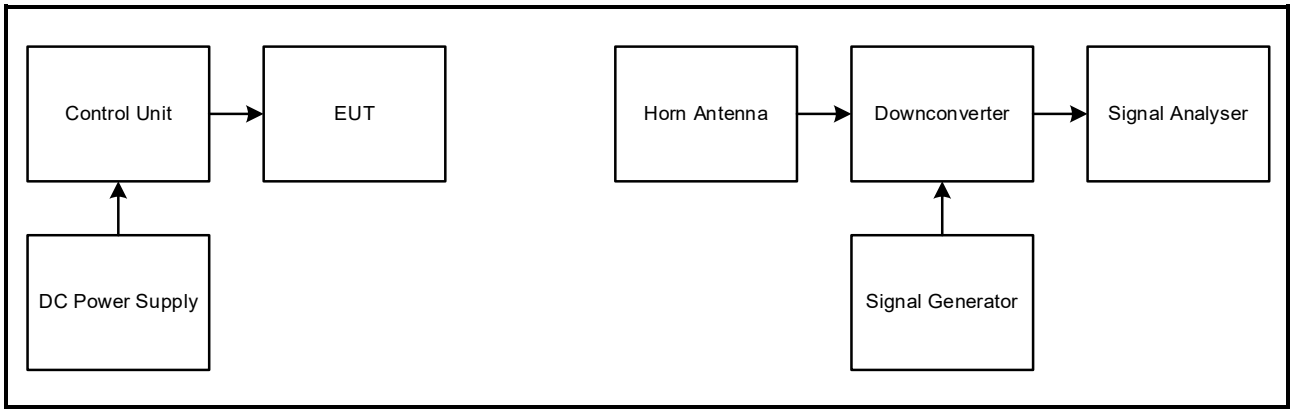
Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	39

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.

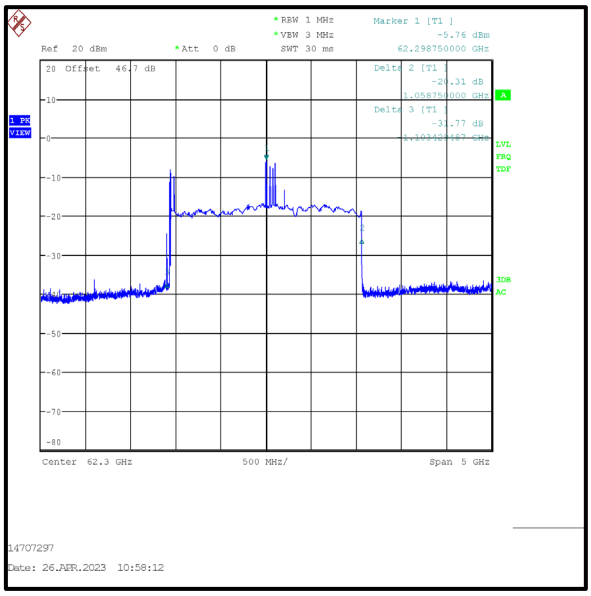
Test setup:



Transmitter 20 dB Bandwidth (continued)

Results:

Channel	20 dB Bandwidth (MHz)
Single	2162.179



Single Channel

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	05 Oct 2023	12
M2041	Thermohygrometer	Testo	608-H1	45119912	09 Dec 2023	12
G0640	Signal Generator	Keysight	E8257D	US00000055	10 Jan 2025	24
M2069	Downconverter	Virginia Diodes,	WR15.0 SAX	SAX 394	09 Jul 2023	24
A2964	Horn Antenna	Link Microtek.	AM15HA-ULV1	14930	24 Jun 2025	36
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	08 Jul 2023	12

5.2.5 Transmitter 99% Emission Bandwidth

Test Summary:

Test Engineers:	Shamraiz Ashiq	**Test Date:**	26 April 2023
Test Sample Serial Number:	ZZ106		

FCC Reference:	N/A
ISED Canada Reference:	RSS-Gen 6.7
Test Method Used:	RSS-Gen 6.7

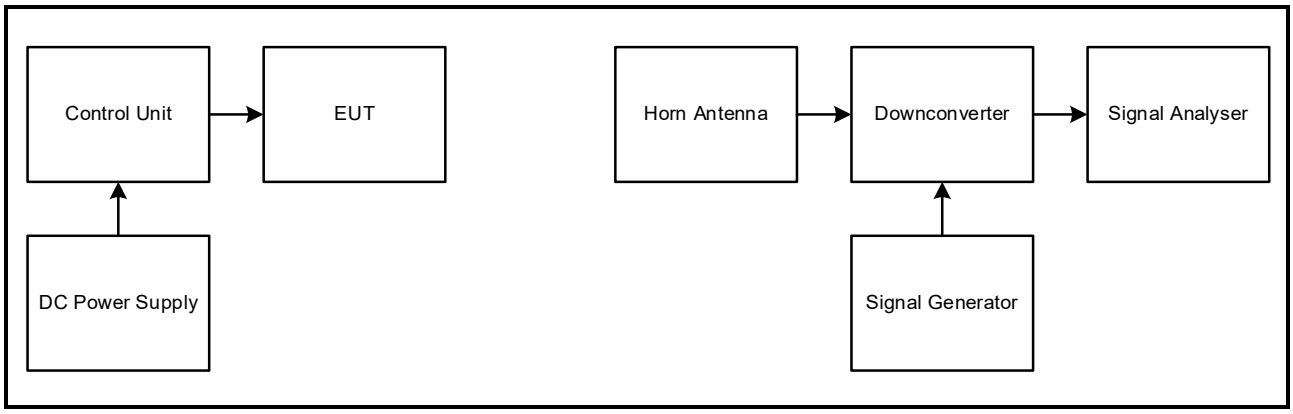
Environmental Conditions:

Temperature (°C):	21
Relative Humidity (%):	39

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 RSS-Gen 6.7. An enquiry was submitted to the ISED CEB and it was deemed acceptable to use a minimum RBW of 1 MHz.
2. The RBW was set to1 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 signal analyser occupied bandwidth function measured the 99% emission bandwidth.

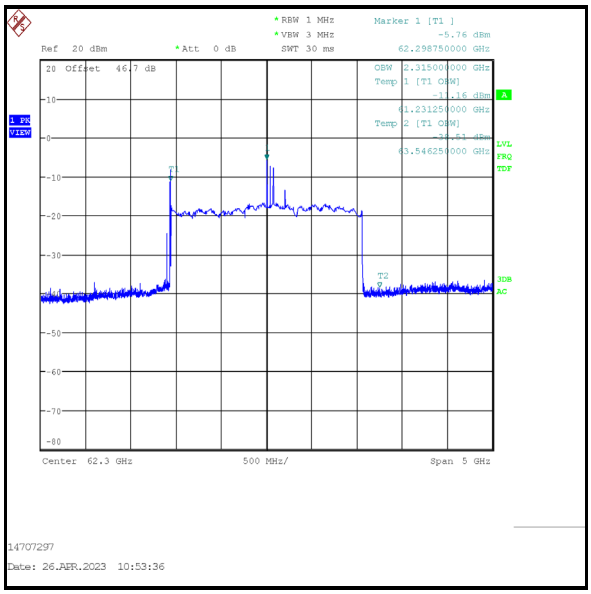
Test setup:



Transmitter 99% Emission Bandwidth (continued)

Results:

Channel	99% Emission Bandwidth (MHz)
Single	2315.000



Single Channel

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	05 Oct 2023	12
M2041	Thermohygrometer	Testo	608-H1	45119912	09 Dec 2023	12
G0640	Signal Generator	Keysight	E8257D	US00000055	10 Jan 2025	24
M2069	Downconverter	Virginia Diodes,	WR15.0 SAX	SAX 394	09 Jul 2023	24
A2964	Horn Antenna	Link Microtek.	AM15HA-ULV1	14930	24 Jun 2025	36
M1886	Test Receiver	Rohde & Schwarz	ESU26	100554	08 Jul 2023	12

5.2.6. Transmitter Radiated Spurious Emissions

Test Summary:

Test Engineers:	John Ferdinand & Nick Tye	**Test Dates:**	03 May 2023 & 23 May 2023
Test Sample Serial Number:	ZZ106		

FCC Reference:	Part 15.255(d) / 15.209
ISED Canada Reference:	RSS Gen 6.13 / RSS-210 J.3
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4 and 6.5
Frequency Range	9 kHz to 1000 MHz

Environmental Conditions:

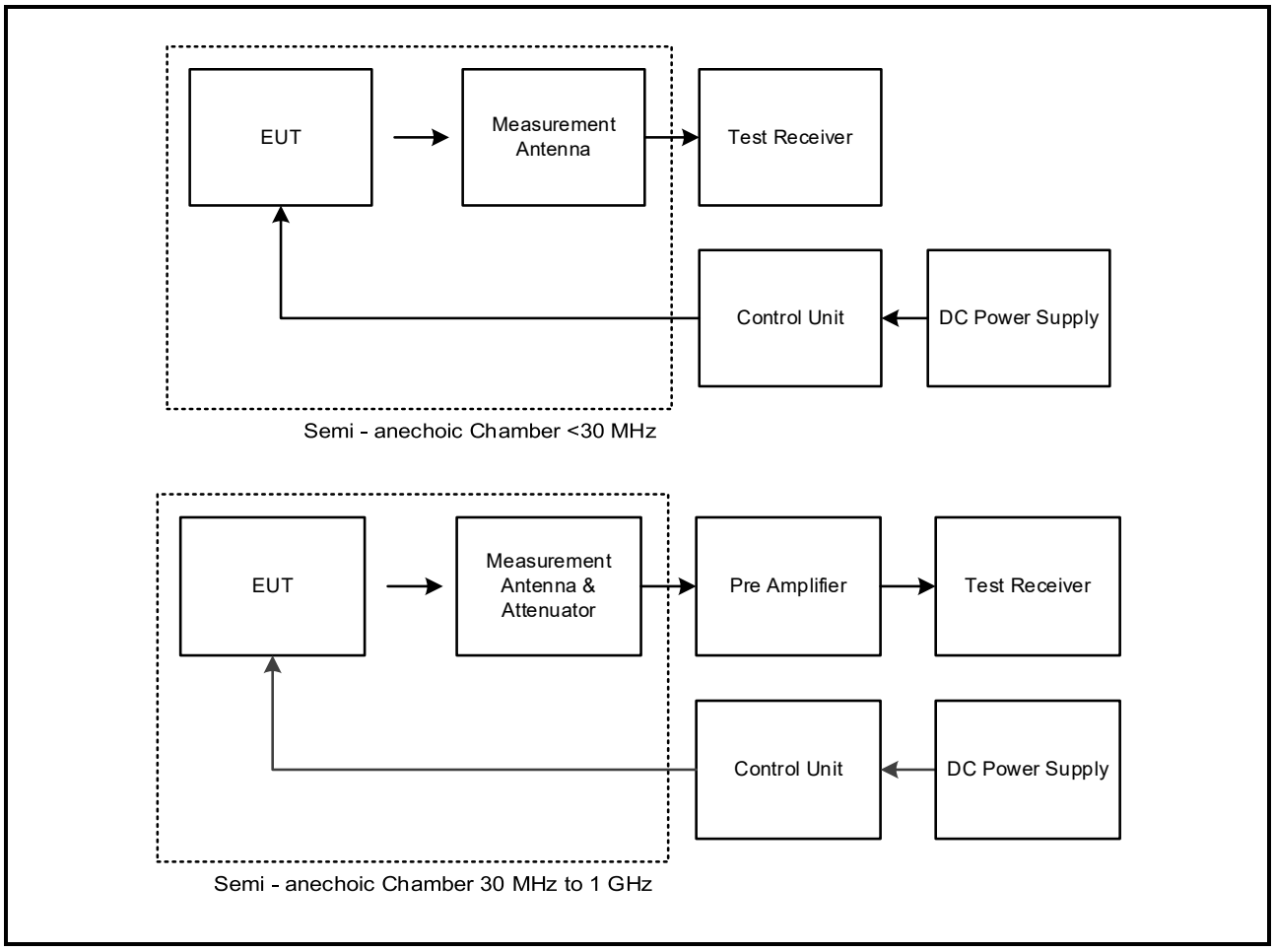
Temperature (°C):	23
Relative Humidity (%):	37 to 42

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. The limits in CFR 47, Part 15, Subpart C, paragraph 15.209 (a), are identical to those in RSS-Gen Section 8.9, Table 6, since the measurements are performed in terms of magnetic field strength and converted to electric field strength levels (as reported in the table) using the free space impedance of 377Ω. For example, the measurement frequency X kHz resulted in a level of Y dBµV/m, which is equivalent to Y - 51.5 = Z dBµA/m, which has the same margin, W dB, to the corresponding RSS-Gen Table 6 limit as it has to the 15.209(a) limit.
5. Measurements from 30 MHz to 1 GHz were performed in a semi-anechoic chamber (Asset Number K0017) 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.
6. 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)

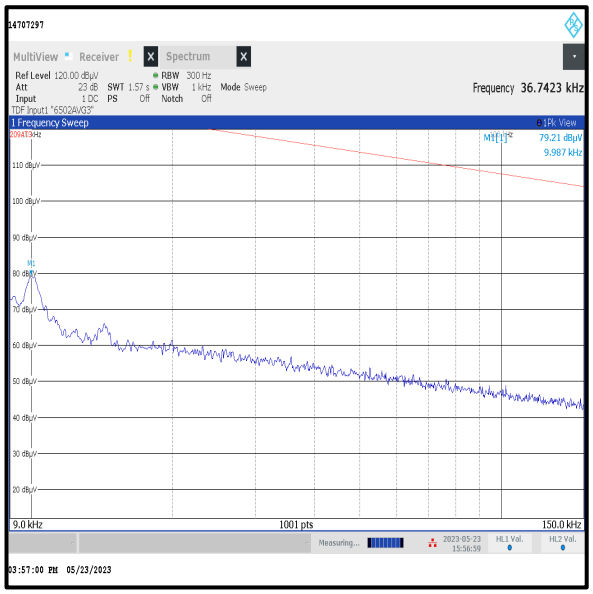
Test setup:

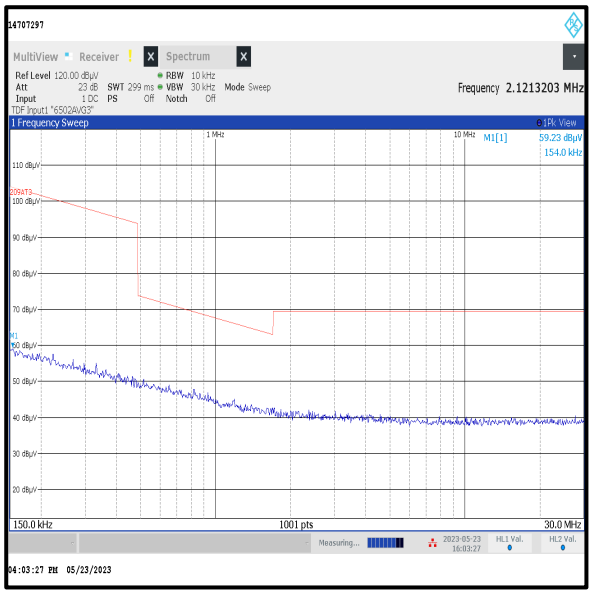


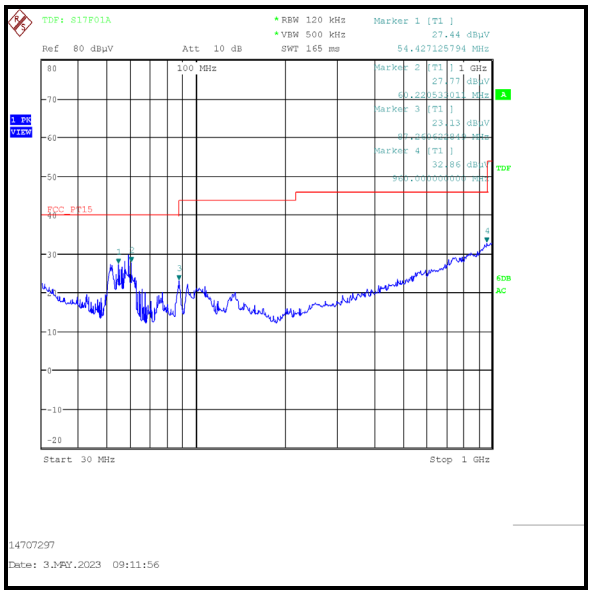
Transmitter Radiated Spurious Emissions (continued)

Results: Quasi-Peak

Frequency (MHz)	Antenna Polarity	Quasi-Peak Level (dBµV/m)	Quasi-Peak Limit (dBµV/m)	Margin (dB)	Result
53.681	Vertical	25.5	40.0	14.5	Complied
54.414	Vertical	25.6	40.0	14.4	Compiled
58.960	Vertical	27.7	40.0	12.3	Compiled







Transmitter Radiated Spurious Emissions (continued)

Test Summary:

Test Engineers:	John Ferdinand & Shamraiz Ashiq	**Test Dates:**	02 May 2023 to 10 May 2023
Test Sample Serial Number:	ZZ106		

FCC Reference:	Part 15.255(d) / 15.209
ISED Canada Reference:	RSS Gen 6.13 / RSS-210 J.3
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):	23 to 24
Relative Humidity (%):	37 to 43

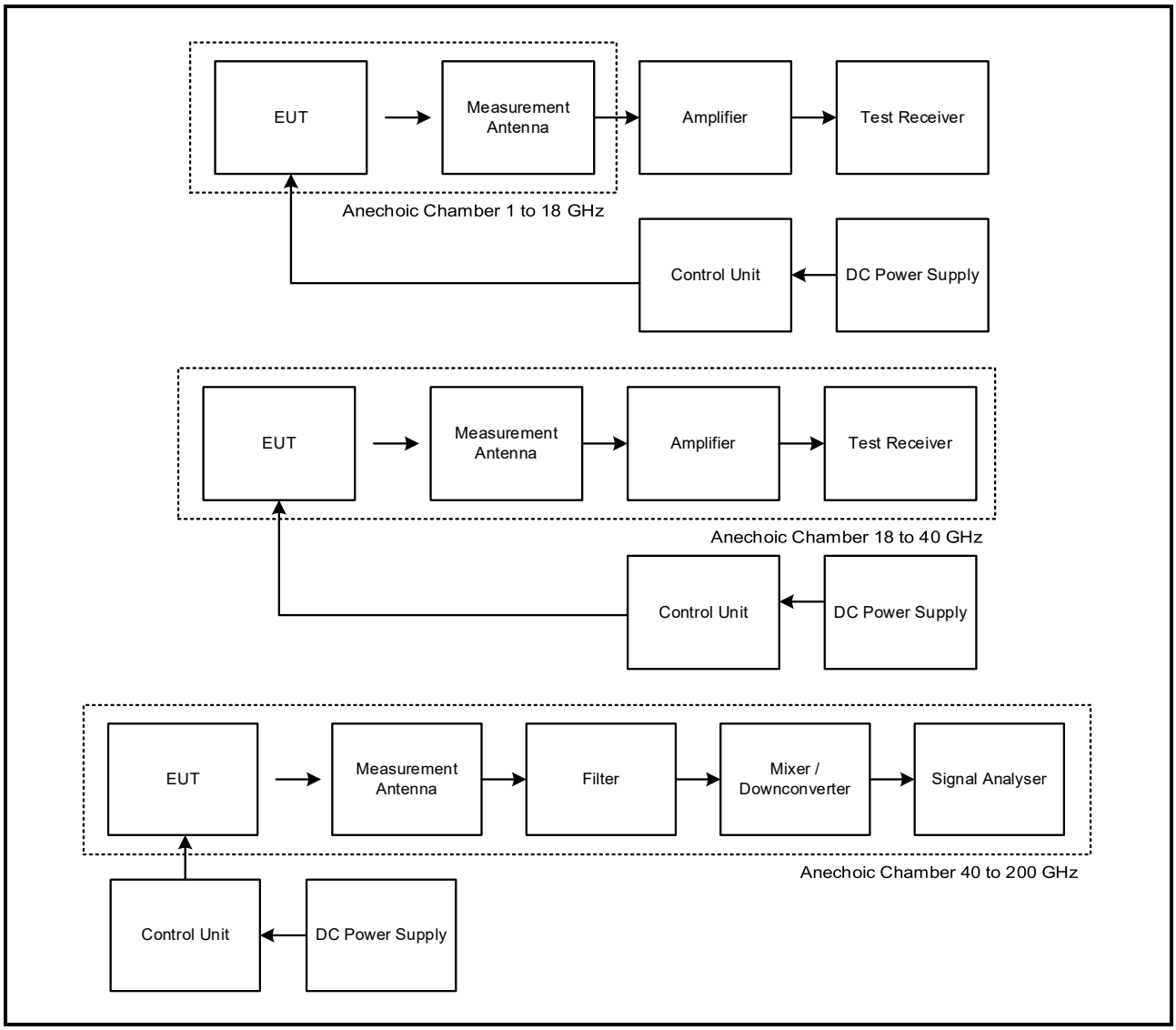
Note(s):

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 62.3 GHz is the EUT fundamental.
3. All other emissions were >20 dB below the applicable limit or below the noise floor of the measurement system.
4. Final measurements above 1 GHz were performed in a semi-anechoic chamber (Asset Number K0017) at a distance of 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. 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.
6. 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
7. 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.
8. *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)

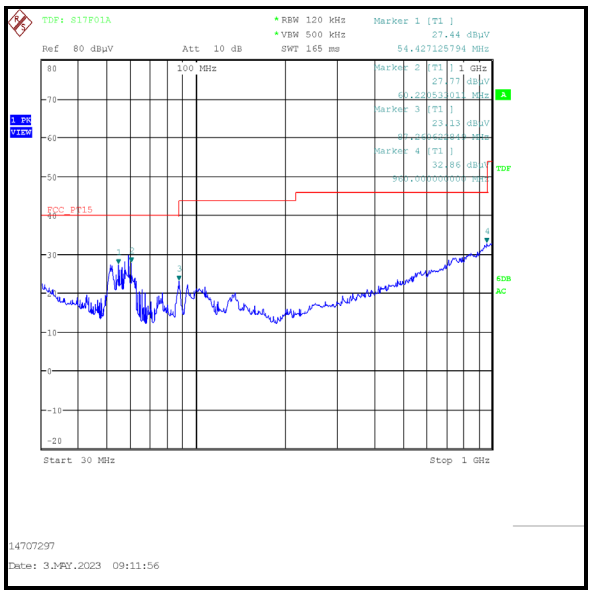
Results: Peak

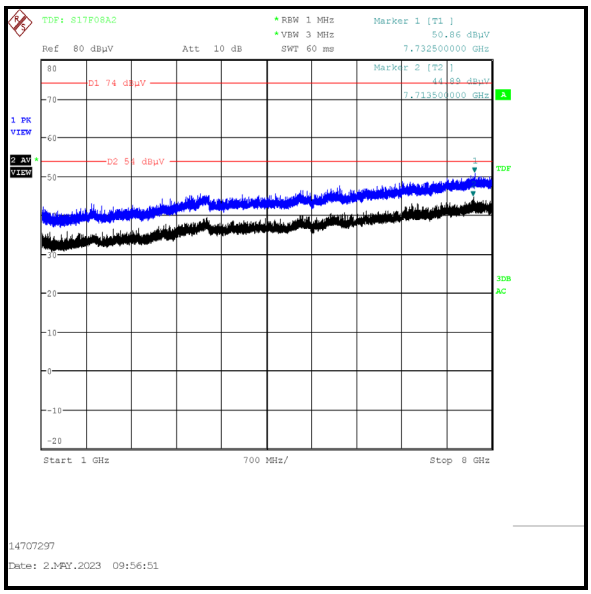
Frequency (MHz)	Antenna Polarity	Peak Level (dBµV/m)	Peak Limit (dBµV/m)	Margin (dB)	Result
14399.190	Horizontal	55.2	74.0	18.8	Compiled
19999.784	Horizontal	47.5	54.0*	6.5	Compiled
20399.840	Horizonal	45.7	54.0*	8.3	Compiled
20616.520	Horizontal	45.0	54.0*	9.0	Compiled
28799.768	Horizontal	52.9	54.0*	1.1	Compiled

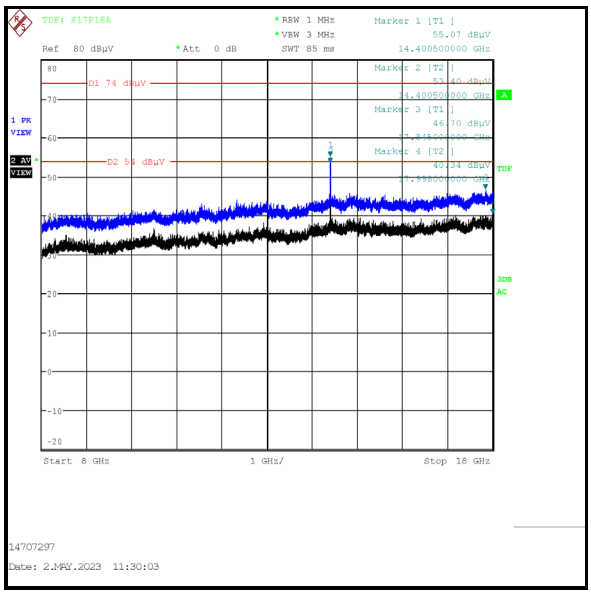
Results: Average

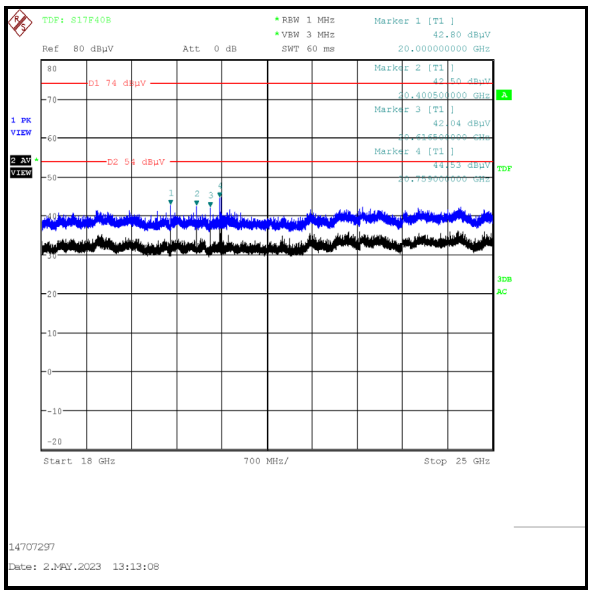
Frequency (MHz)	Antenna Polarity	Average Level (dBµV/m)	Average Limit (dBµV/m)	Margin (dB)	Result
14399.869	Horizontal	53.7	54.0	0.3	Compiled

Transmitter Radiated Spurious Emissions (continued)



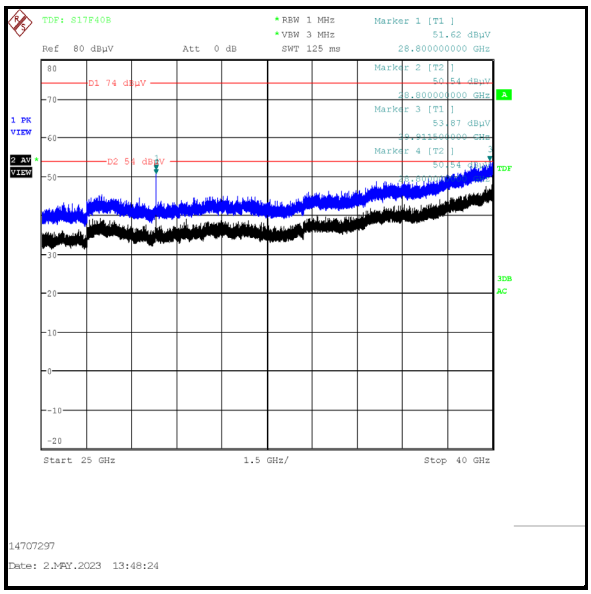


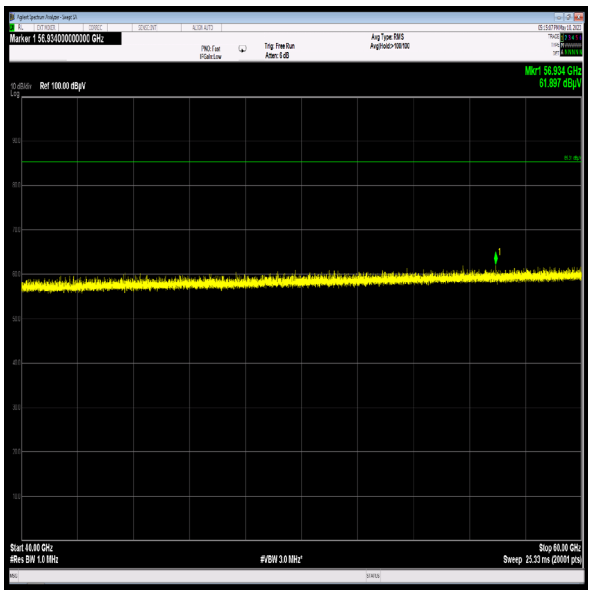


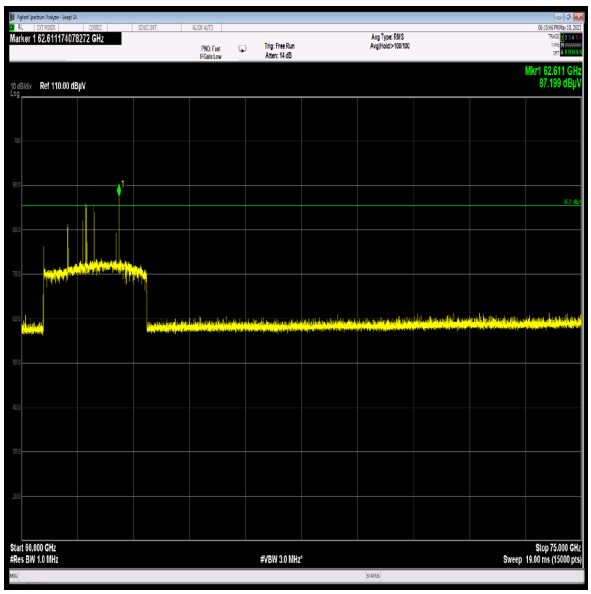


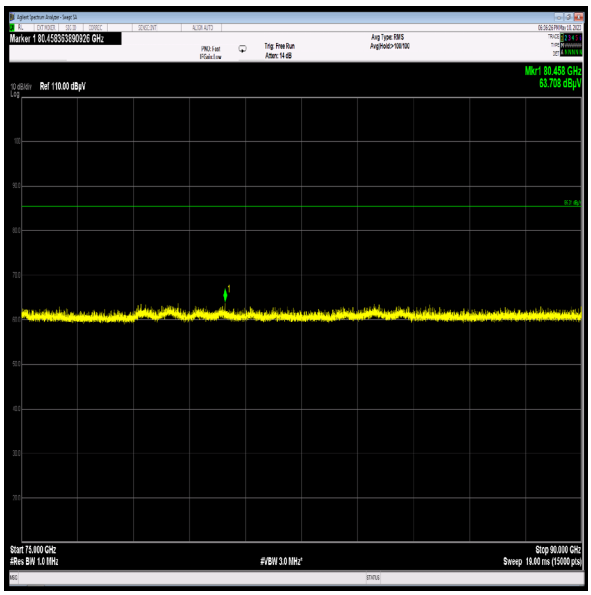
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Spurious Emissions (continued)



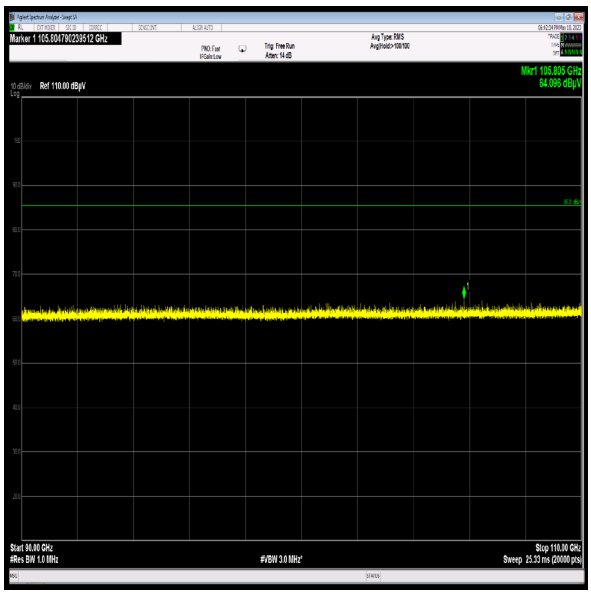


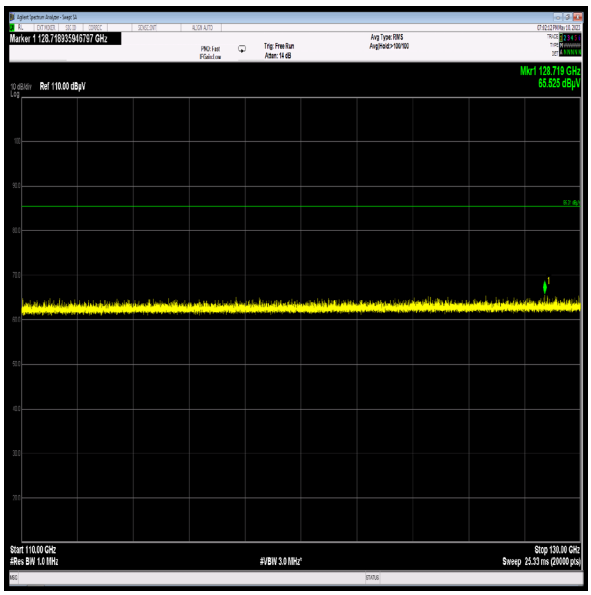


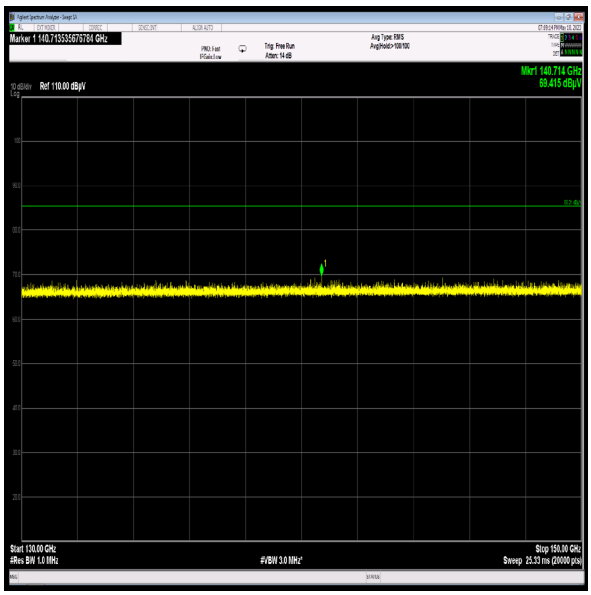


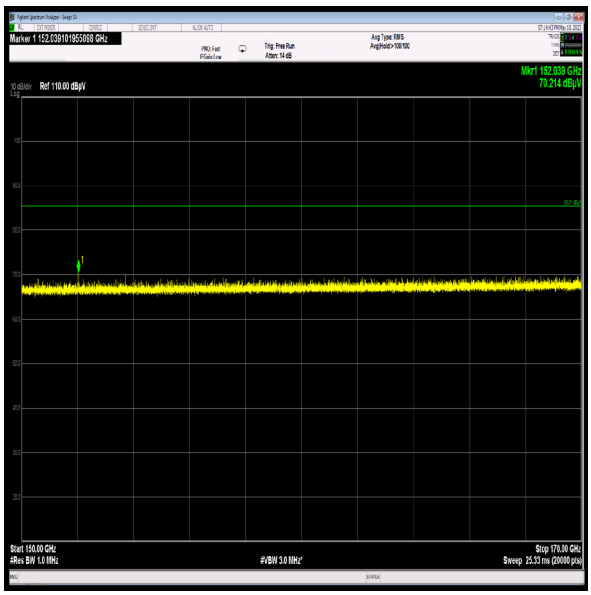
Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

Transmitter Radiated Spurious Emissions (continued)



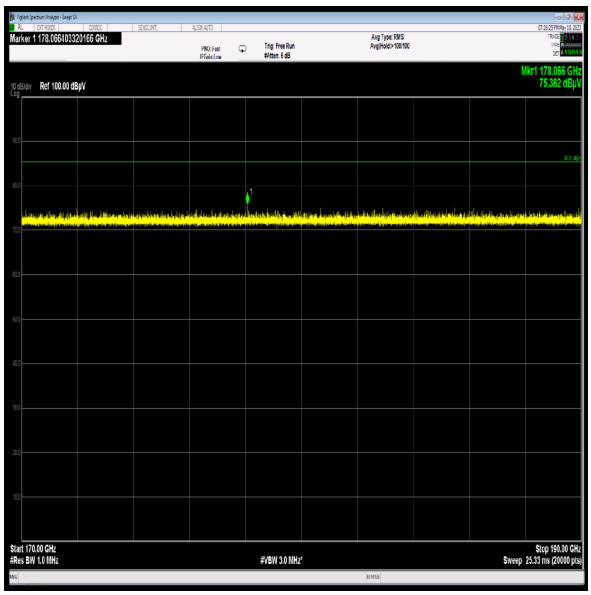


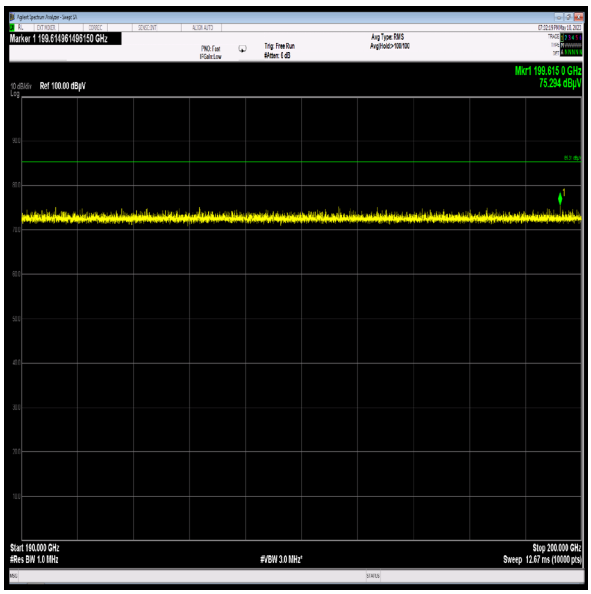




Note: These plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

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)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2003	Thermohygrometer	Testo	608-H1	45046641	09 Dec 2023	12
K0017	3m RSE Chamber	Rainford	N/A	N/A	08 Nov 2023	12
M1995	Test Receiver	Rohde & Schwarz	ESU40	100428	02 Nov 2023	12
A490	Antenna	Chase	CBL6111A	1590	06 Oct 2023	12
A2889	Antenna	Schwarzbeck	BBHA 9120 B	BBHA 9120B653	02 Nov 2023	12
A2890	Antenna	Schwarzbeck	HWRD 750	014	02 Nov 2023	12
A2892	Antenna	Schwarzbeck	BBHA 9170	9170-727	31 Oct 2023	12
A3167	Pre Amplifier	Com-Power	PAM-103	18020010	02 Nov 2023	12
A2863	Pre Amplifier	Agilent	8449B	3008A02100	07 Nov 2023	12
A3265	Pre Amplifier	Schwarzbeck	BBV 9721	9721-069	31 Oct 2023	12
A223628	Pre Amplifier	Atlantic Microwave	A-LNAKX-380116-S5S5	210837001	02 Nov 2023	12
M1832	Signal Analyzer	Keysight Technologies	N9010A	MY53470303	18 May 2024	24
G0640	Signal Generator	Keysight Technologies	E8257D	US00000055	10 Jan 2025	24
M2069	Downconverter	Virginia Diodes	WR15.0 SAX	SAX 394	09 Jul 2023	24
M2065	Downconverter	Virginia Diodes	WR10SAX	SAX 393	30 Jul 2023	24
M2066	Harmonic Mixer	Virginia Diodes	WR6.5SAX	SAX 392	31 May 2024	24
A219915	Sig gen extension module	Virginia Diodes	WR19SAX	SAX 897	14 Apr 2024	24
A2964	Horn Antenna	Link Microtek	AM15HA-ULV1	14930	24 Jun 2025	36
A2963	Horn Antenna	Link Microtek .	AM19HA-ULV1	14929	20 Jun 2025	36
A2967	Horn Antenna	Link Microtek	AM10HA-ULV1	14933	13 Jul 2025	36
A2968	Horn Antenna	Link Microtek	AM7HA-ULV1	14934	06 Mar 2024	12
A2969	Horn Antenna	Link Microtek.	AM4HA-ULV1	14935	06 Mar 2024	12

5.2.7. Transmitter Frequency Stability (Temperature Variation)

Test Summary:

Test Engineer:	Shamraiz Ashiq	**Test Date:**	11 May 2023
Test Sample Serial Number:	ZZ106		

FCC Reference:	Part 15.255(f)
ISED Canada Reference:	RSS-Gen 6.11 / RSS-210 J.6
Test Method Used:	ANSI C63.10 Section 9.14

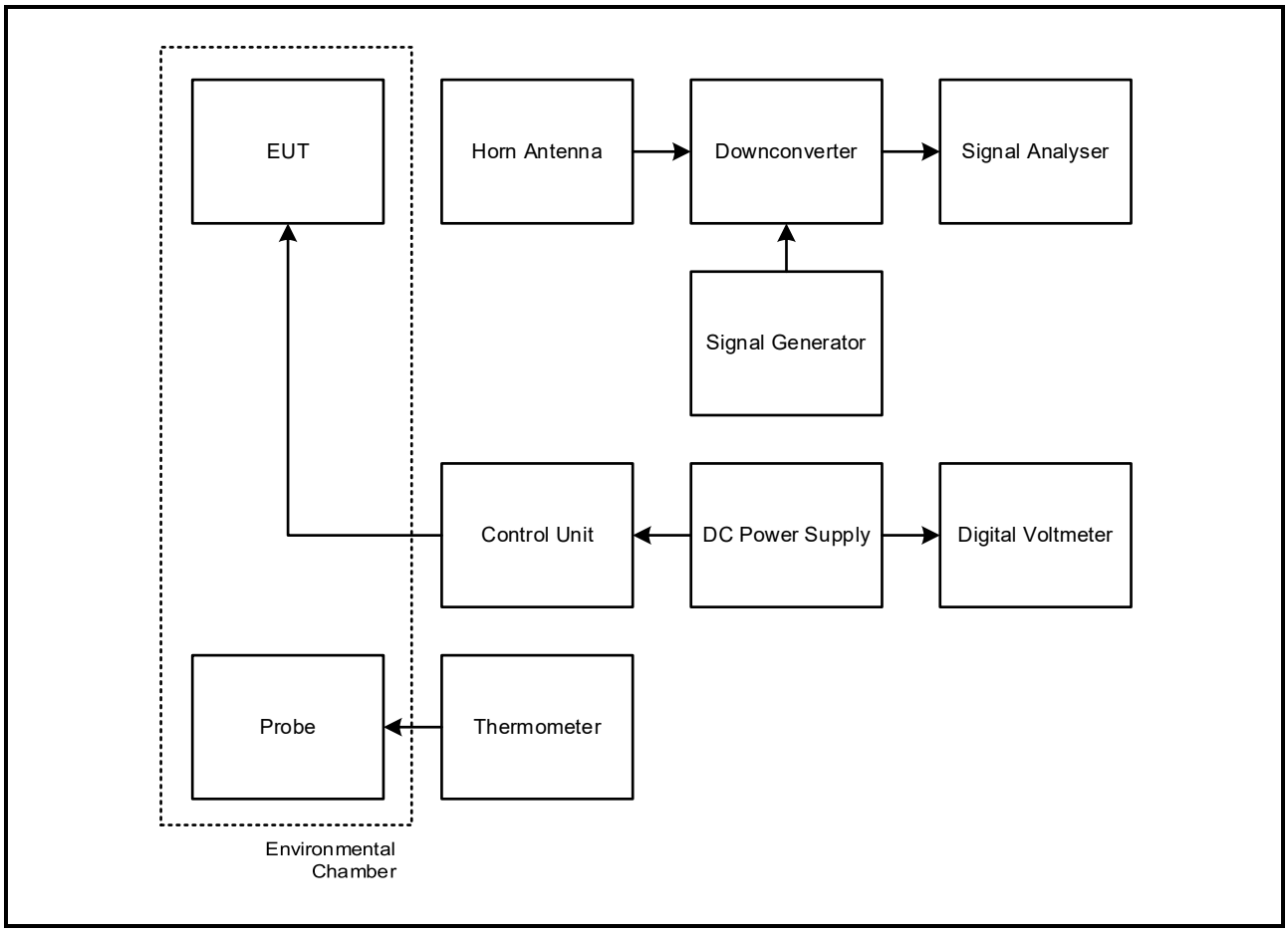
Environmental Conditions:

Ambient Temperature (°C):	22
Ambient Relative Humidity (%):	48

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. Temperature was monitored throughout the test with a calibrated digital thermometer.

Test setup:



Transmitter Frequency Stability (Temperature Variation) (continued)

Results: Lower Band Edge

Temperature (°C)	Lower Band Edge Frequency (MHz)	Lower 20 dB Emission Bandwidth Frequency (MHz)	Lower 99% Occupied Bandwidth Frequency (MHz)	Result
-20	57000.000	61201.100	61229.280	Complied
-10	57000.000	61236.100	61199.380	Complied
0	57000.000	61196.100	61229.640	Complied
10	57000.000	61236.100	61224.740	Complied
20	57000.000	61191.100	61229.450	Complied
30	57000.000	61201.100	61245.790	Complied
40	57000.000	61191.100	61215.230	Complied
50	57000.000	61221.100	61242.230	Complied
Worst-case Margin (MHz)			4191.100	

Results: Top Channel / Upper Band Edge

Temperature (°C)	Upper Band Edge Frequency (MHz)	Upper 20 dB Emission Bandwidth Frequency (MHz)	Upper 99% Occupied Bandwidth Frequency (MHz)	Result
-20	71000.000	63359.000	63343.210	Complied
-10	71000.000	63358.900	63346.150	Complied
0	71000.000	63359.000	63344.130	Complied
10	71000.000	63359.000	63343.220	Complied
20	71000.000	63358.900	63343.230	Complied
30	71000.000	63358.900	63340.610	Complied
40	71000.000	63358.900	63336.430	Complied
50	71000.000	63358.900	63348.230	Complied
Worst-case Margin (MHz)			7641.000	

Transmitter Frequency Stability (Temperature Variation) (continued)

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2041	Thermohygrometer	Testo	608-H1	45119912	09 Dec 2023	12
M221040	Signal Analyser	Rohde & Schwarz	FSV3030	101864	08 Jun 2023	12
M2069	Downconverter	Virginia Diodes	WR15SAX	SAX 394	09 Jul 2023	24
G0640	Signal Generator	Keysight	E8257D	US00000055	30 Jun 2023	24
A2964	Horn Antenna	Link Microtek	AM15HA-ULV1	14930	24 Jun 2025	36
E235136	Environmental Chamber	Espec	PU-3J	15021355	Cal Before Use	-
M1249	Digital Thermometer	Fluke	52II	88800049	26 Oct 2023	12

5.2.8. Transmitter Frequency Stability (Voltage Variation)

Test Summary:

Test Engineer:	Shamraiz Ashiq	**Test Date:**	11 May 2023
Test Sample Serial Number:	ZZ106		

FCC Reference:	Part 15.255(f)
ISED Canada Reference:	RSS-Gen 6.11 / RSS-210 J.6
Test Method Used:	ANSI C63.10 Section 9.14

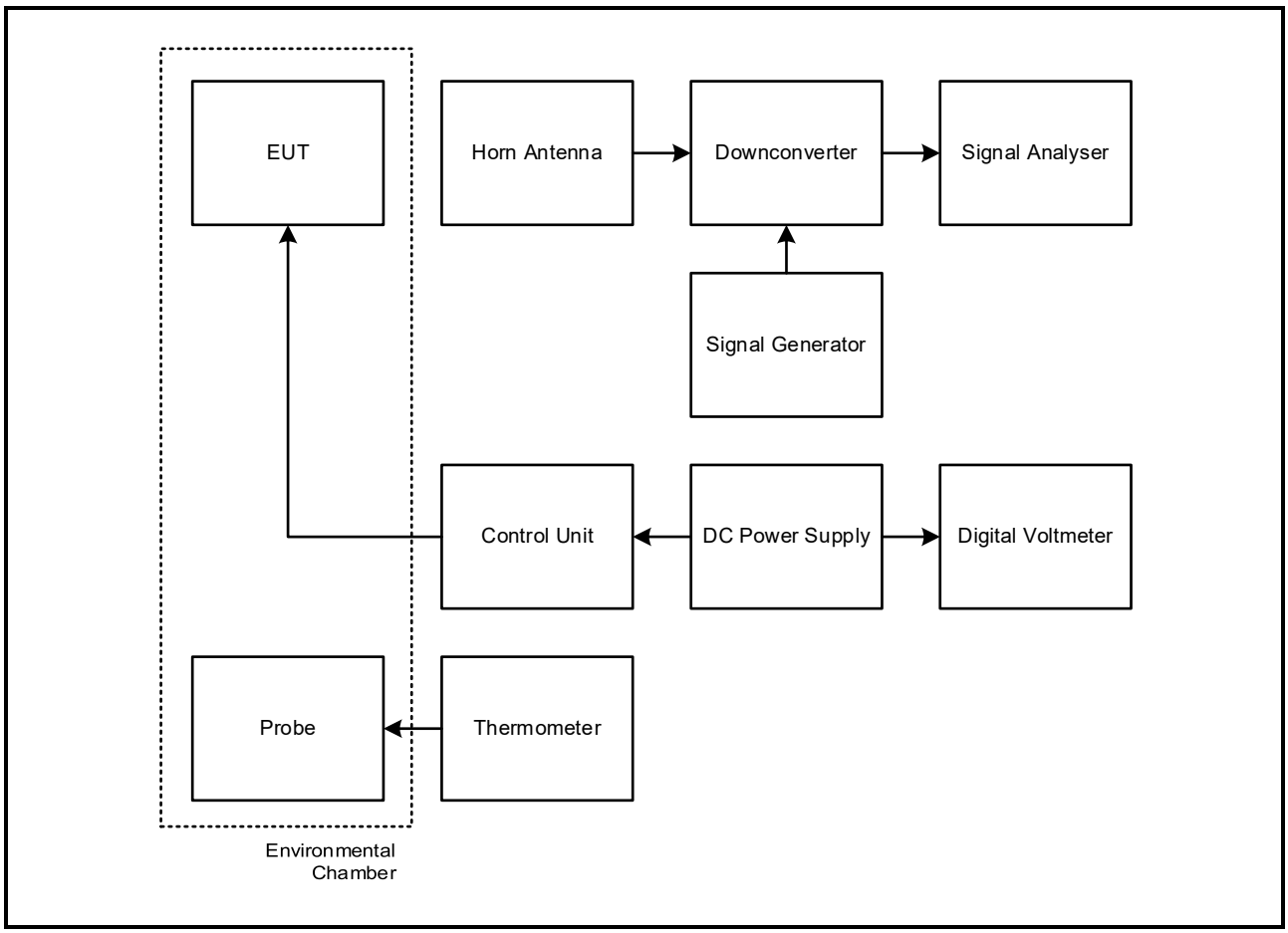
Environmental Conditions:

Ambient Temperature (°C):	22
Ambient Relative Humidity (%):	48

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: Bottom Channel / Lower Band Edge

Supply Voltage (VDC)	Lower Band Edge Frequency (MHz)	Lower 20 dB Emission Bandwidth Frequency (MHz)	Lower 99% Occupied Bandwidth Frequency (MHz)	Result
20.4	57000.000	61201.100	61202.050	Complied
24.0	57000.000	61191.100	61229.450	Complied
27.6	57000.000	61196.100	61228.840	Complied
Worst-case Margin (MHz)			4191.100	

Results: Top Channel / Upper Band Edge

Supply Voltage (VDC)	Upper Band Edge Frequency (MHz)	Upper 20 dB Emission Bandwidth Frequency (MHz)	Upper 99% Occupied Bandwidth Frequency (MHz)	Result
20.4	71000.000	63358.900	63345.730	Complied
24.0	71000.000	63358.900	63343.230	Complied
27.6	71000.000	63359.000	63343.500	Complied
Worst-case Margin (MHz)			7641.000	

Test Equipment Used:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2041	Thermohygrometer	Testo	608-H1	45119912	09 Dec 2023	12
M221040	Signal Analyser	Rohde & Schwarz	FSV3030	101864	08 Jun 2023	12
M2069	Downconverter	Virginia Diodes	WR15SAX	SAX 394	09 Jul 2023	24
G0640	Signal Generator	Keysight	E8257D	US00000055	30 Jun 2023	24
A2964	Horn Antenna	Link Microtek	AM15HA-ULV1	14930	24 Jun 2025	36
M1269	Digital Multimeter	Fluke	179	90250210	19 May 2023	12
S0579	DC Power Supply	TTI	EX1810R	444110	Cal Before Use	-

5.2.9. Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Nick Tye	**Test Date:**	22 May 2023
Test Sample Serial Number:	ZZ106		

FCC Reference:	Part 15.207
ISED Canada Reference:	RSS-Gen 8.8
Test Method Used:	ANSI C63.10 Section 6.2, FCC KDB 174176 and notes below

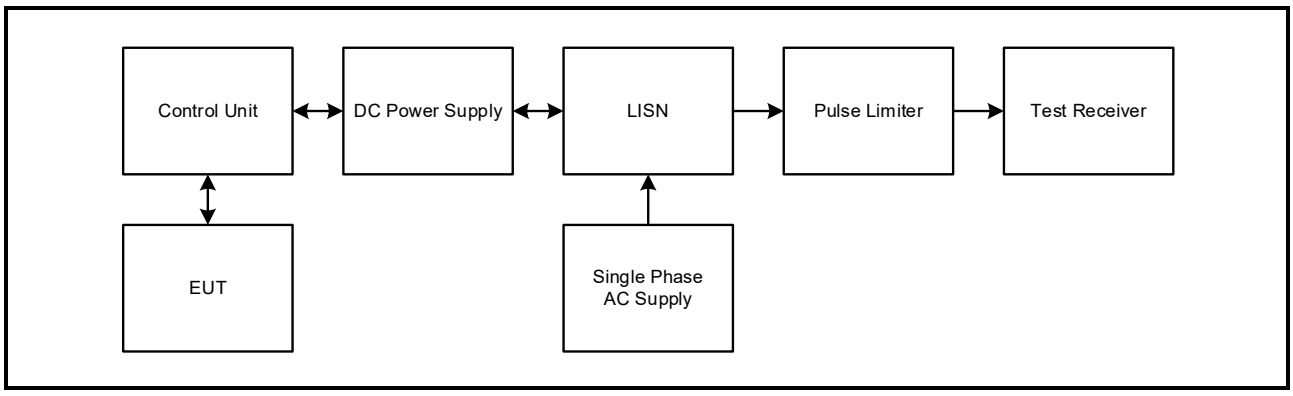
Environmental Conditions:

Temperature (°C):	25
Relative Humidity (%):	37

Note(s):

1. The EUT was connected to the C201B 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 DC power supply was connected to a 120 VAC 60 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, tests 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: Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150000	Live	17.6	66.0	48.4	Complied
0.181500	Live	16.0	64.4	48.4	Complied
0.361500	Live	22.0	58.7	36.7	Complied
4.726500	Live	18.2	56.0	37.8	Complied
12.709500	Live	29.0	60.0	31.0	Complied
18.001500	Live	29.5	60.0	30.5	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.361500	Live	20.2	48.7	28.5	Complied
0.726000	Live	9.5	46.0	36.5	Complied
4.479000	Live	13.8	46.0	32.2	Complied
9.703500	Live	17.6	50.0	32.4	Complied
13.434000	Live	23.4	50.0	26.6	Complied
18.001500	Live	27.0	50.0	23.0	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

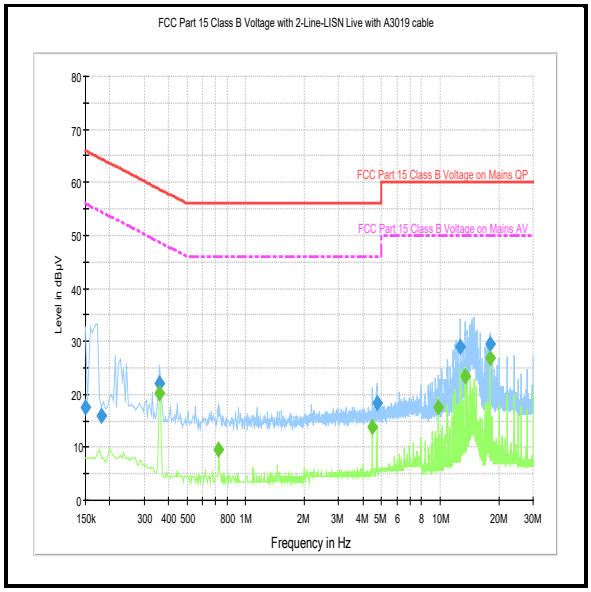
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150000	Neutral	18.0	66.0	48.0	Complied
0.361500	Neutral	21.4	58.7	37.3	Complied
4.722000	Neutral	17.9	56.0	38.1	Complied
13.420500	Neutral	30.8	60.0	29.2	Complied
18.001500	Neutral	30.1	60.0	29.9	Complied
28.000500	Neutral	28.4	60.0	31.6	Complied

Results: Neutral / Average / 120 VAC 60 Hz

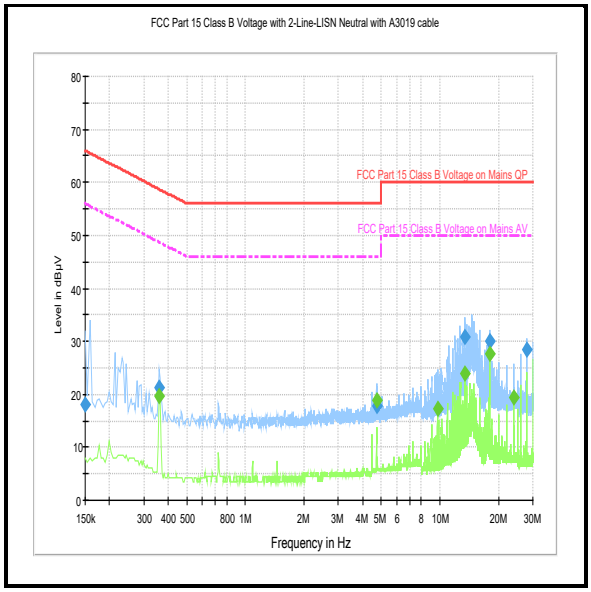
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.361500	Neutral	19.6	48.7	29.1	Complied
4.731000	Neutral	18.8	46.0	27.2	Complied
9.703500	Neutral	17.3	50.0	32.7	Complied
13.434000	Neutral	23.9	50.0	26.1	Complied
18.001500	Neutral	27.6	50.0	22.4	Complied
24.000000	Neutral	19.4	50.0	30.6	Complied

Transmitter AC Conducted Spurious Emissions (continued)

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

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.361500	Live	21.7	58.7	37.0	Complied
4.731000	Live	16.4	56.0	39.6	Complied
13.420500	Live	32.6	60.0	27.4	Complied
15.000000	Live	29.8	60.0	30.2	Complied
18.001500	Live	31.9	60.0	28.1	Complied
26.002500	Live	19.9	60.0	40.1	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.361500	Live	20.0	48.7	28.7	Complied
0.726000	Live	8.5	46.0	37.5	Complied
4.479000	Live	12.5	46.0	33.5	Complied
9.703500	Live	17.4	50.0	32.6	Complied
18.001500	Live	29.4	50.0	20.6	Complied
24.000000	Live	18.5	50.0	31.5	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

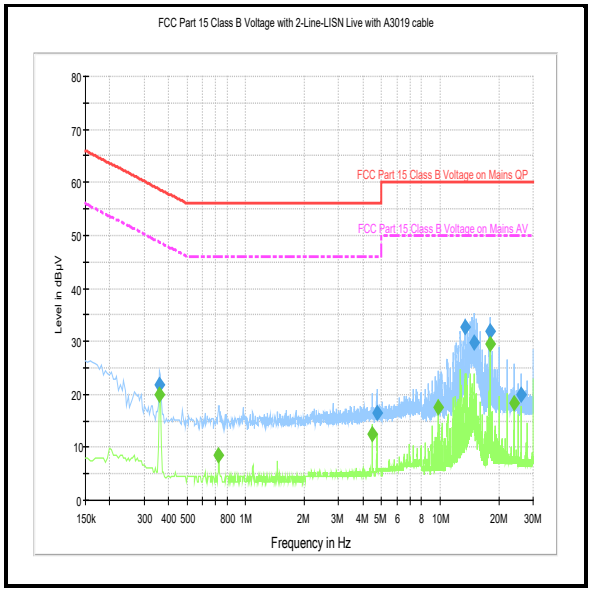
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.361500	Neutral	22.2	58.7	36.5	Complied
4.722000	Neutral	15.5	56.0	40.5	Complied
10.914000	Neutral	23.5	60.0	36.5	Complied
13.425000	Neutral	31.7	60.0	28.3	Complied
18.001500	Neutral	32.1	60.0	27.9	Complied
28.000500	Neutral	28.5	60.0	31.5	Complied

Results: Neutral / Average / 240 VAC 60 Hz

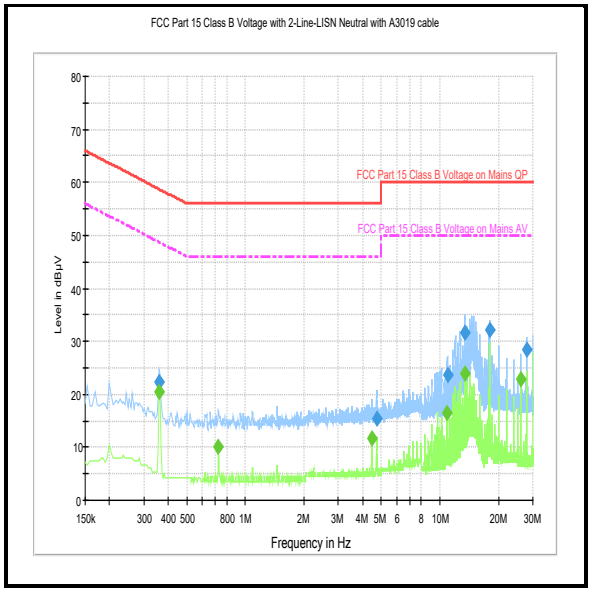
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.361500	Neutral	20.4	48.7	28.3	Complied
0.726000	Neutral	10.0	46.0	36.0	Complied
4.479000	Neutral	11.8	46.0	34.2	Complied
10.909500	Neutral	16.6	50.0	33.4	Complied
13.434000	Neutral	23.9	50.0	26.1	Complied
26.002500	Neutral	22.8	50.0	27.2	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: 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 for Transmitter AC Conducted Spurious Emissions:

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2037	Thermohygrometer	Testo	608-H1	45124925	08 Dec 2023	12
A649	LISN	Rohde & Schwarz	ESH3-Z5	825562/008	01 Sep 2023	12
A1830	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100668	31 May 2023	12
M1124	Test Receiver	Rohde & Schwarz	ESIB 26	100046	06 Oct 2023	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

The decision rule applied is based upon the accuracy method criteria. The measurement uncertainty is met and the result is considered in conformance with the requirement criteria if the observed value is within the prescribed limit.

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%	±3.16 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
2.0	-	-	TCB requested updates

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