TEST REPORT

Test Report No. : UL-RPT-RP14703704-1116A

Customer	:	Sportable Technologies Ltd
Model No.	:	Lynx
FCC ID	:	2A929-161803
Technology	:	Wideband
Test Standard(s)	:	FCC Parts 15.207, 15.209(a) & 15.250
Test Laboratory	:	UL International (UK) Ltd, Basingstoke, Hampshire, RG24 8AH, United Kingdom

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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: 29 September 2023

Checked by:

Ben Mercer
Lead Project Engineer, Radio Laboratory

Company Signatory:

Sarah Williams
RF Operations Leader, Radio Laboratory

5772

Customer Information

Company Name:	Sportable Technologies Ltd
Address:	Gate A, StoneX Stadium Greenlands Lane Hendon London NW4 1RL United Kindgom

Report Revision History

Version Number	Issue Date	Revision Details	Revised By
1.0	31/05/2023	Initial Version	Ben Mercer
2.0	29/09/2023	Removed <30 MHz equipment and diagram	Ben Mercer

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1 Attestation of Test Results

1.1 Description of EUT

The equipment under test was a UWB enabled device operating at 6.5 GHz, designed to be used for location tracking of sports balls when in use in a game. It is a battery-powered device, rechargeable via USB connection, and intended for temporary pitch-side mounting.

1.2 General Information

Specification Reference:	47CFR15.250
Specification Title:	Code of Federal Regulations Volume 47 (Telecommunications): Part 15 Subpart C (Intentional Radiators) – Section 15.250
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 and 15.209
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:	04 April 2023 to 14 April 2023

1.3 Summary of Test Results

FCC Reference (47CFR)	Measurement	Result
Part 15.250(a) & (b)	Transmitter -10 dB Bandwidth	✓
Part 15.250(a)	Transmitter Frequency Stability	✓
Parts 15.250(d)(4) & 15.209(a)	Transmitter Radiated Emissions Below 960 MHz	✓
Part 15.250(d)(1) & (2)	Transmitter Radiated Emissions Above 960 MHz	✓
Part 15.250(d)(3)	Transmitter Emission Peak Level	✓
Part 15.207	Transmitter AC Conducted Emissions	✓
Key to Results ✓ = Complied ✗ = Did not comply		

1.4 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.

2 Summary of Testing

2.1 Facilities and Accreditation

The test site and measurement facilities used to collect data are located at Unit 3 Horizon, Wade Road, Kingsland Business Park, Basingstoke, Hampshire, RG24 8AH, United Kingdom. The following table identifies which facilities were utilised for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

Site 1	X
Site 2	-
Site 17	-

UL International (UK) Ltd is accredited by the United Kingdom Accreditation Service (UKAS). UKAS is one of the signatories to the International Laboratory Accreditation Co-operation (ILAC) Arrangement for the mutual recognition of test reports. The tests reported herein have been performed in accordance with its terms of accreditation.

2.2 Methods and Procedures

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

2.3 Calibration and Uncertainty

Measuring Instrument Calibration

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.

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 -10 dB Bandwidth	5.925 GHz to 7.250 GHz	95%	±4.59 %
Frequency Stability	5.925 GHz to 7.250 GHz	95%	±4.59 %
Radiated Spurious Emissions	9 kHz to 30 MHz	95%	±5.32 dB
Radiated Spurious Emissions	30 MHz to 1 GHz	95%	±3.30 dB
Radiated Spurious Emissions	1 GHz to 40 GHz	95%	±2.49 dB
Transmitter Emissions Peak Level	5.925 GHz to 7.250 GHz	95%	±3.16 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.

2.4 Test and Measurement Equipment

Test Equipment Used for Transmitter -10 dB Bandwidth and Emissions Peak Level Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2040	Thermohygrometer	Testo	608-H1	45124934	09 Dec 2023	12
K0001	3m RSE Chamber	Rainford EMC	N/A	N/A	05 Sep 2023	12
M227313	Signal Analyser	Rohde & Schwarz	FSW43	102471	15 Oct 2023	12
A222867	Pre-Amplifier	Atlantic Microwave	A-LNAKX-380116-S5S5	220705002	26 Aug 2023	12
A3138	Antenna	Schwarzbeck	BBHA 9120 B	00702	22 Aug 2023	12

Test Equipment Used for Transmitter Frequency Stability Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2037	Thermohygrometer	Testo	608-H1	45124925	08 Dec 2023	12
M227313	Signal Analyser	Rohde & Schwarz	FSW43	102471	15 Oct 2023	12
M1643	Thermometer	Fluke	52II	18890136	26 Oct 2023	12
M1229	Digital Multimeter	Fluke	179	87640015	27 Apr 2023	12
S0557	DC Power Supply	TTI	EL303R	395819	Calibrated Before Use	-
E138277	Environmental Chamber	Espec	SH-642	93009444	Calibrated Before Use	-

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
M1124	Test Receiver	Rohde & Schwarz	ESIB26	100046	06 Oct 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

Test Measurement Software/Firmware Used:

Name	Version	Release Date
Rohde & Schwarz EMC32	6.30.0	2018

Test and Measurement Equipment (continued)

Test Equipment Used for Transmitter Radiated Emissions Tests

Asset No.	Instrument	Manufacturer	Type No.	Serial No.	Date Calibration Due	Cal. Interval (Months)
M2040	Thermohygrometer	Testo	608-H1	45124934	09 Dec 2023	12
K0001	3m RSE Chamber	Rainford EMC	N/A	N/A	05 Sep 2023	12
M1874	Test Receiver	Rohde & Schwarz	ESU26	100553	19 May 2023	12
M227313	Signal Analyser	Rohde & Schwarz	FSW43	102471	15 Oct 2023	12
A3154	Pre-Amplifier	Com-Power	PAM-103	18020012	18 Aug 2023	12
A231567	Pre-Amplifier	RF Bay Inc.	LNA-1070	2	20 Feb 2024	12
A222867	Pre-Amplifier	Atlantic Microwave	A-LNAKX-380116-S5S5	220705002	26 Aug 2023	12
A2896	Pre-Amplifier	Schwarzbeck	BBV 9721	9721 - 023	01 Mar 2024	12
A3138	Antenna	Schwarzbeck	BBHA 9120 B	00702	22 Aug 2023	12
A3139	Antenna	Schwarzbeck	HWRD 750	00027	22 Aug 2023	12
A2895	Antenna	Schwarzbeck	BBHA 9170	9170-728	27 Feb 2024	12
A212031	Low Pass Filter	Micro-Tronics	LPS20721	002	10 Nov 2023	12
A212036	High Pass Filter	Micro-Tronics	HPS20722	002	10 Nov 2023	12
A3113	Attenuator	AtlanTecRF	AN18-06	AN18-06	03 May 2023	12
A3097	Antenna	Link Microtek Ltd.	AM1-18HA	15275	24 Aug 2024	36
G0640	Signal Generator	Keysight	E8257D	US00000055	10 May 2025	24
M1435	Power Meter	Hewlett Packard	437B	3125U14631	28 Jul 2023	12
M1436	Power Sensor	Hewlett Packard	8485D	3318A02321	23 Feb 2024	12
M1649	Attenuator	Hewlett Packard	11708A	26584	09 Feb 2024	12
A221643	Attenuator	Atlantic Microwave	ATT06KXP-483034-N4N5	ATT06KXP-483034-N4N5_1	26 Jan 2024	12

3 Equipment Under Test (EUT)

3.1 Identification of Equipment Under Test (EUT)

Brand Name:	Sportable
Model Name or Number	Lynx
Test Sample Serial Number:	CB80MP *(Radiated sample #1)*
Hardware Version:	Civet HW03
Software Version:	1.6.0.23
FCC ID:	2A929-161803

Brand Name:	Sportable
Model Name or Number	Lynx
Test Sample Serial Number:	CB80NH *(Radiated sample #2)*
Hardware Version:	Civet HW03
Software Version:	1.6.0.23
FCC ID:	2A929-161803

3.2 Modifications Incorporated in the EUT

No modifications were applied to the EUT during testing.

3.3 Additional Information Related to Testing

Technology Tested:	Wideband	
Power Supply Requirement(s):	Nominal	3.9 VDC
Type of Unit:	Transceiver	
Modulation:	OOK	
Duty Cycle:	100%	
Transmit Frequency Range:	5925 to 7250 MHz	
Transmit Channels Tested:	**Channel ID**	**Channel Frequency (MHz)**
	Single	6500

3.4 Description of Available Antennas

The radio utilizes an integrated antenna, with the following maximum gain:

Frequency Range (MHz)	Antenna Gain (dBi)
5925 - 7250	6.5

3.5 Description of Test Setup

Support Equipment

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

Description:	Lynx Master Companion
Brand Name:	Sportable
Model Name or Number:	Lynx
Serial Number:	CB80H5

Description:	Test Laptop
Brand Name:	Samsung
Model Name or Number:	NP300E5A
Serial Number:	HLGF93DBC00160E

Description:	USB AC to DC Power Adapter
Brand Name:	Sony
Model Name or Number:	AC-0061-UK
Serial Number:	3018W354000017

Description:	USB A to Micro USB B Cable. Quantity 1. Length 3m.
Brand Name:	Not marked or stated
Model Name or Number:	Not marked or stated
Serial Number:	Not marked or stated

Operating Modes

The EUT was tested in the following operating mode(s):

- Constantly transmitting at full power with a wideband modulated pulse train representing the maximum possible data payload.

Configuration and Peripherals

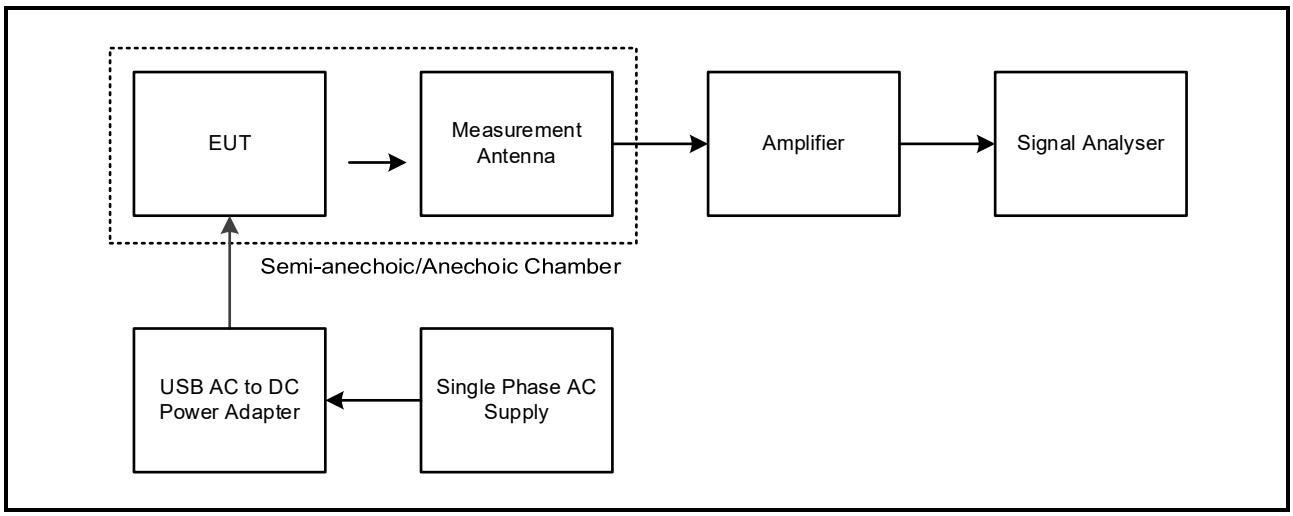
The EUT was tested in the following configuration(s):

- Controlled in test mode using a terminal application on the laptop PC and a companion device supplied by the customer. The laptop was connected to the companion device via USB. The terminal commands were used to enable a continuous transmission from the EUT via the companion device. The customer supplied a document containing the setup instructions 'Configuration Instructions for Sportable Devices.docx'.
- Frequency stability measurements were performed using sample with serial number CB80NH. This sample had a retrofitted connector which allowed the EUT to be powered directly from a DC power supply. This DC power supply was monitored throughout the test using a calibrated digital voltmeter. All other measurements were performed using sample with serial number CB80MP.
- Radiated measurements were performed with the EUT in the worst-case position with the USB AC to DC power adapter connected to the EUT. The input of the power adapter was connected to a 120 VAC 60 Hz single phase mains supply.
- All active ports were terminated using the appropriate terminations during radiated emissions testing.

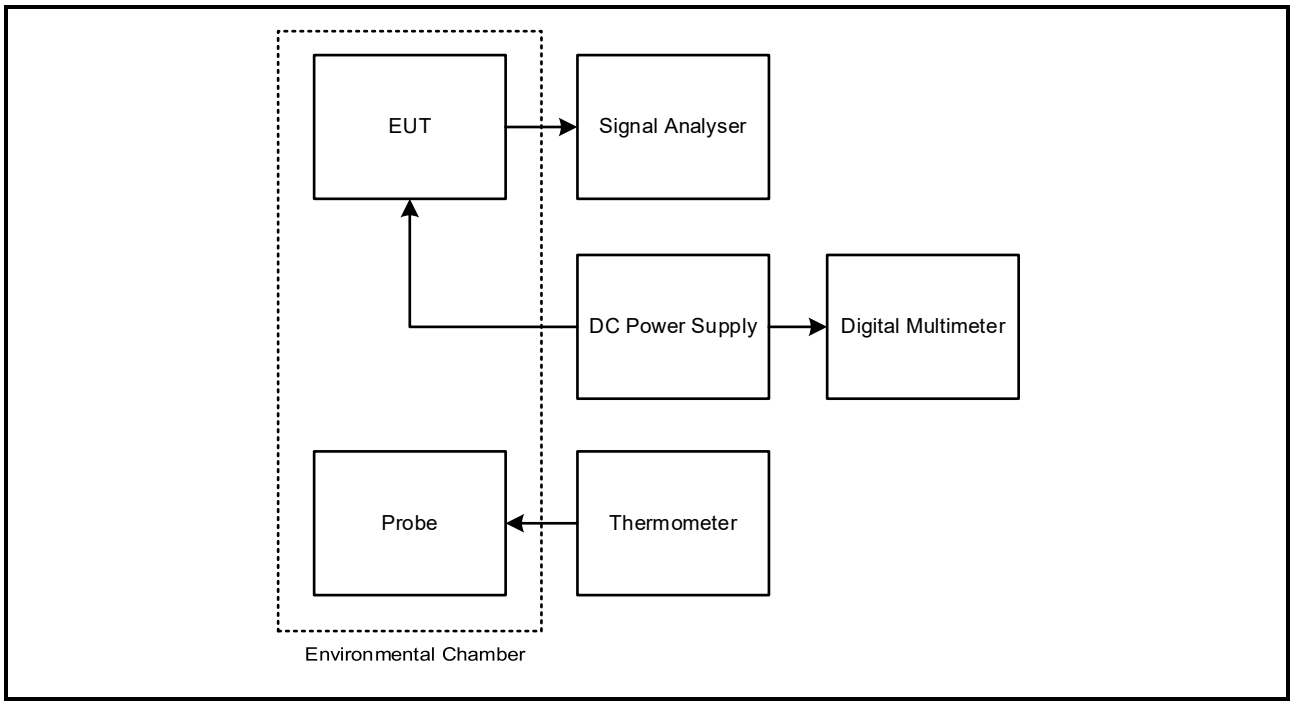
Test Setup Diagrams

Radiated Tests:

Test Setup Diagram: Transmitter -10 dB Bandwidth and Emissions Peak Level Tests

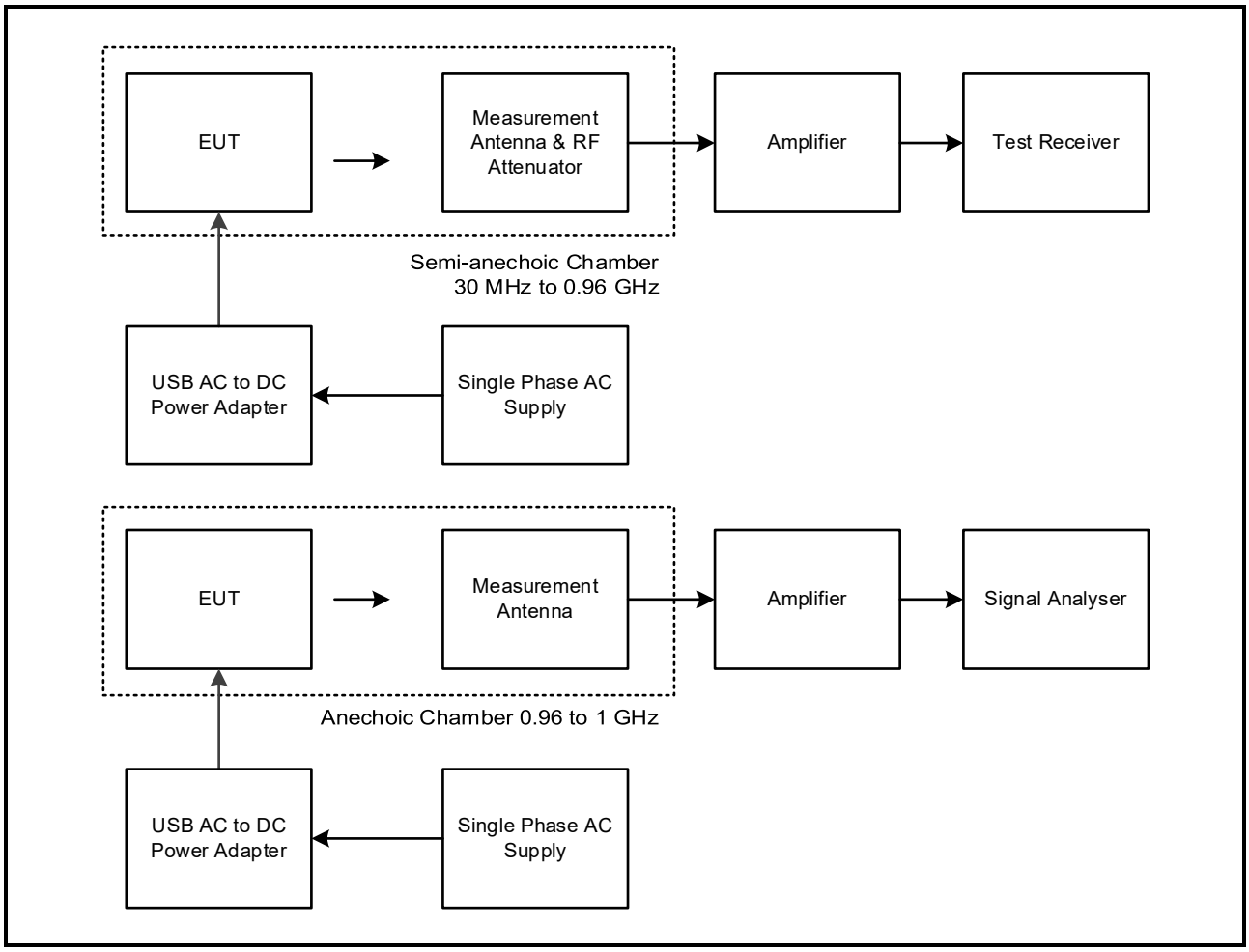


Test Setup for Transmitter Frequency Stability Tests



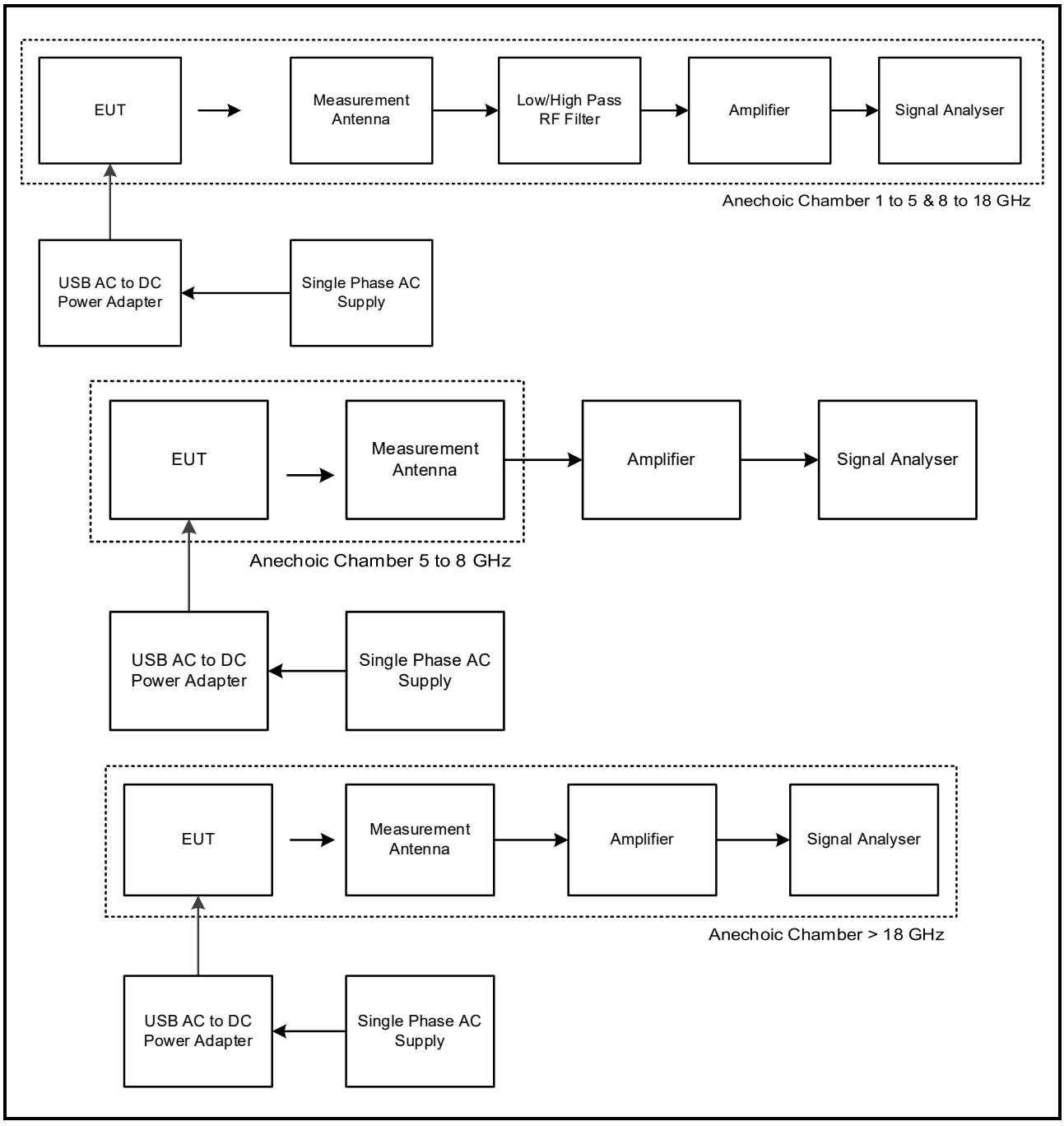
Test Setup Diagrams (continued)

Test Setup for Transmitter Radiated Emissions



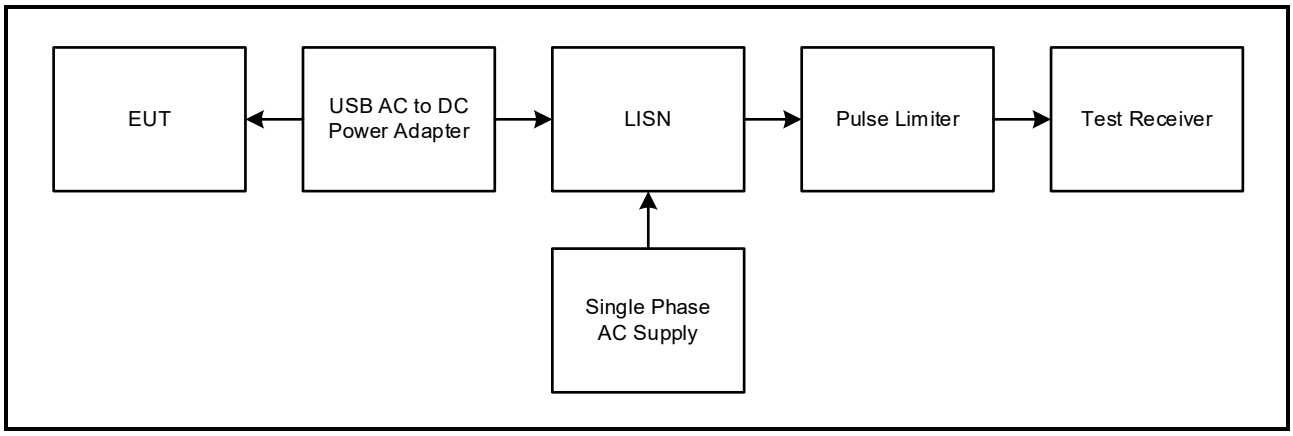
Test Setup Diagrams (continued)

Test Setup for Transmitter Radiated Emissions (continued)



Test Setup Diagrams (continued)

Test Setup for Transmitter AC Conducted Spurious Emissions



4 Radiated Test Results

4.1. Transmitter -10 dB Bandwidth

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	04 April 2023
Test Sample Serial Number:	CB80MP		

FCC Reference:	Part 15.250(a) & (b)
Test Method Used:	Part 15.250(e)(4) & ANSI C63.10 Section 10.1

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	37

Note(s):

1. The -10 dB bandwidth was measured using a peak detector in a 1 MHz resolution bandwidth and a video bandwidth greater than or equal to the resolution bandwidth. Markers were placed on the lower and upper -10 dB points and the frequencies recorded.
2. The -10 dB Bandwidth was calculated in accordance with ANSI C63.10 section 10.1

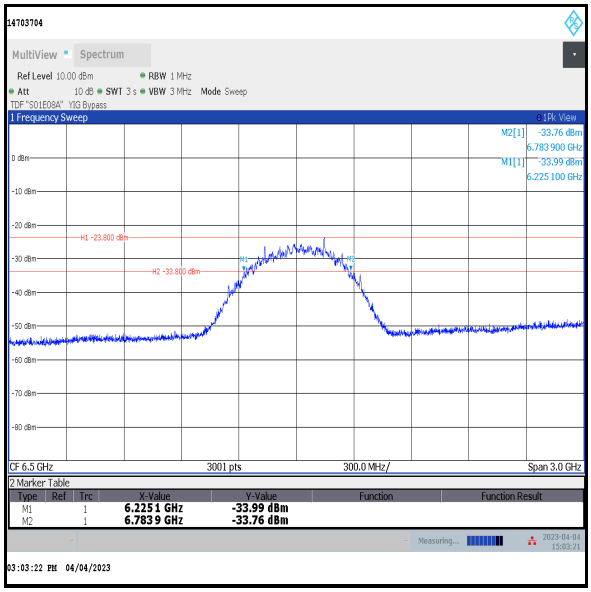
Transmitter -10 dB Bandwidth (continued)

Results: 15.250(a)

Lower -10 dB Frequency (MHz)	Upper -10 dB Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Result
6225.100	6783.900	5925	7250	Complied

Results: 15.250(b)

-10 dB Bandwidth (MHz)	Limit (MHz)	Margin (MHz)	Result
558.8	>50.0	508.8	Complied



4.2. Transmitter Frequency Stability (Temperature Variation)

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	14 April 2023
Test Sample Serial Number:	CB80NH		

FCC Reference:	Part 15.250(a)
Test Method Used:	Part 15.250(e)(4), ANSI C63.10 Section 6.8 and Notes below

Environmental Conditions:

Ambient Temperature (°C):	24
Ambient Relative Humidity (%):	33

Note(s):

1. The -10 dB bandwidth was measured using a peak detector in a 1 MHz resolution bandwidth and a video bandwidth greater than or equal to the resolution bandwidth. -10 dB points were measured at the manufacturer's stated minimum and maximum temperatures of -10°C and +45°C. Markers were placed on the lower and upper -10 dB points and the results recorded in the table below.
2. A sufficient stabilisation period was allowed at each temperature level and temperature was monitored throughout the test with a calibrated digital thermometer.
3. Result plots are archived on the company IT server and available for inspection if required.

Results:

Temperature	Lower -10 dB Frequency (MHz)	Upper -10 dB Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Result
-10ºC	6178.005	6756.464	5925	7250	Complied
20ºC	6215.146	6793.700	5925	7250	Complied
45ºC	6178.576	6775.035	5925	7250	Complied

4.3. Transmitter Frequency Stability (Voltage Variation)

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	14 April 2023
Test Sample Serial Number:	CB80NH		

FCC Reference:	Part 15.250(a)
Test Method Used:	Parts 15.250(e)(4), ANSI C63.10 Section 6.8 and notes below

Environmental Conditions:

Ambient Temperature (°C):	24
Ambient Relative Humidity (%):	33

Note(s):

1. The -10 dB bandwidth was measured using a peak detector in a 1 MHz resolution bandwidth and a video bandwidth greater than or equal to the resolution bandwidth. -10 dB points were measured at the manufacturer's stated minimum, nominal and maximum voltages. Markers were placed on the lower and upper -10 dB points and the results recorded in the table below.
2. Voltage was monitored throughout the test with a calibrated digital voltmeter.
3. Result plots are archived on the company IT server and available for inspection if required.

Results:

Voltage (DC)	Lower -10 dB Frequency (MHz)	Upper -10 dB Frequency (MHz)	Lower Limit (MHz)	Upper Limit (MHz)	Result
3.5	6216.670	6793.796	5925	7250	Complied
3.9	6215.146	6793.700	5925	7250	Complied
4.2	6215.146	6793.986	5925	7250	Complied

4.4 Transmitter Radiated Emissions Below 960 MHz

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	05 April 2023
Test Sample Serial Number:	CB80MP		

FCC Reference:	Parts 15.250(d)(4) & 15.209(a)
Test Method Used:	ANSI C63.10 Sections 6.3, 6.4 and 6.5
Frequency Range	30 MHz to 960 MHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	37

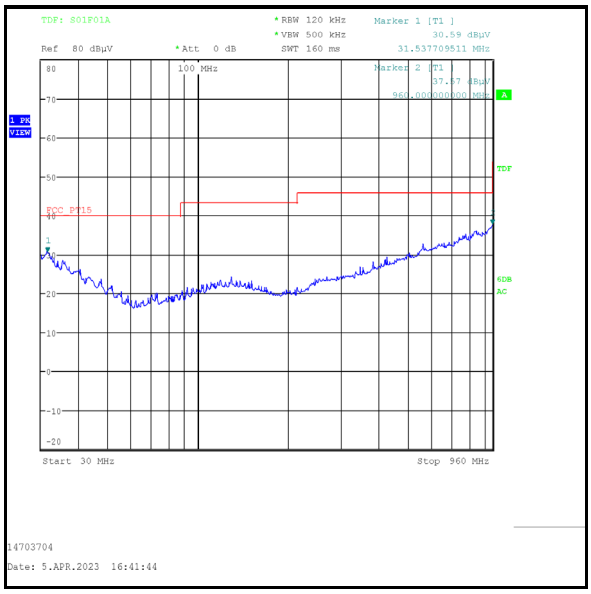
Note(s):

1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. No spurious emissions were detected above the noise floor of the measuring receiver therefore the highest peak noise floor reading of the measuring receiver was recorded as shown in the table below.
3. Measurements from 30 MHz to 960 MHz 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.
4. Pre-scans were performed and markers placed on the highest measured levels. The test receiver was configured as follows: 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 Emissions (continued)

Results: Peak

Frequency (MHz)	Antenna Polarity	Level (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Result
960.000	Vertical	37.6	46.0	8.4	Complied



4.5 Transmitter Radiated Emissions Above 960 MHz

Test Summary:

Test Engineer:	Andrew Edwards	**Test Dates:**	04 April 2023 to 11 April 2023
Test Sample Serial Number:	CB80MP		

FCC Reference:	Part 15.250(d)(1)(2)
Test Method Used:	Part 15.250(e)(1) & ANSI C63.10 Sections 6.3, 6.6 & 10.3
Frequency Range	960 MHz to 40 GHz

Environmental Conditions:

Temperature (°C):	22
Relative Humidity (%):	37 to 39

Transmitter Radiated Emissions Above 960 MHz (continued)

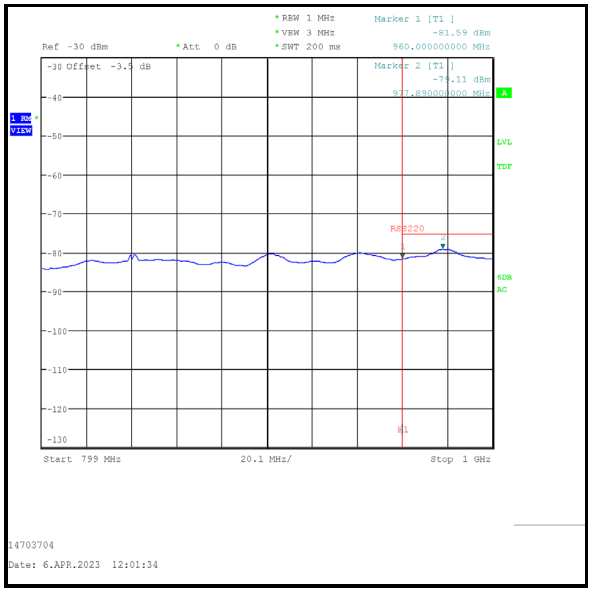
Note(s):

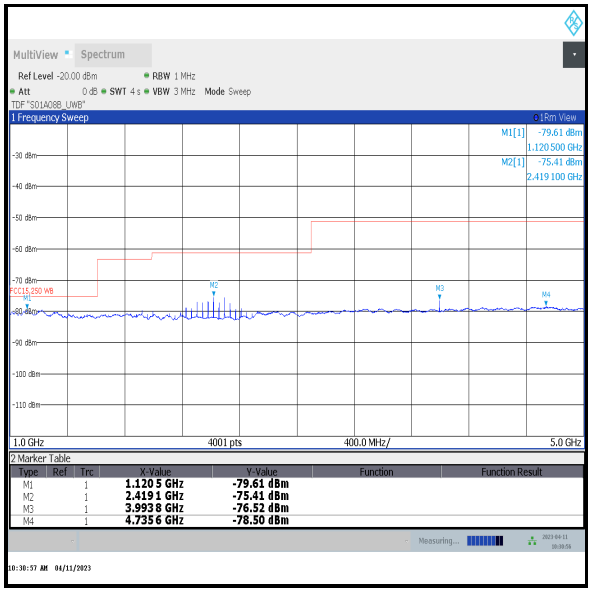
1. The final measured value, for the given emission, in the table below incorporates the calibrated antenna factor and cable loss.
2. The emission shown on the 5 GHz to 8 GHz plot at approximately 6500 MHz is the EUT fundamental.
3. The emissions shown on the 1164 MHz to 1240 MHz and 1559 MHz to 1610 MHz plots at approximately 1200.060 MHz and 1600 MHz were investigated and found to be ambient. These plots are archived on the company IT server and available for inspection if required.
4. All other emissions shown on the pre-scans were investigated and found to be ambient, or > 20 dB below the appropriate limit or below the noise floor of the measurement system.
5. In certain frequency ranges it was not possible to perform the measurements at the required distance due to the level of the measurement system noise floor compared with the limit. Therefore, the test distance was reduced and a correction offset was applied to the measurements.
6. Pre-scans below 1 GHz were performed in a fully anechoic chamber (Asset Number K0001) at a distance of 2 metres. The EUT was placed at a height of 80 cm above the test chamber floor in the centre of the chamber turntable. The measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT.
7. Pre-scans and Final measurements between 1 to 5 GHz & 8 to 40 GHz were performed in a fully anechoic chamber (Asset Number K0001) at a distance between 0.2 to 1 metres (the test distance for each range is stated in Appendix 1 of this test report). The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable.
8. Pre-scans between 5 to 8 GHz were performed in a fully anechoic chamber (Asset Number K0001) at a distance of 3 metres (the test distance for each range is stated in Appendix 1 of this test report). The EUT was placed at a height of 1.5 metres above the test chamber floor in the centre of the chamber turntable. All measurement antennas were placed at a fixed height of 1.5 metres above the test chamber floor, in line with the EUT. Final measurements between 5 to 8 GHz were performed in an anechoic chamber (Asset Number K0001) at a distance of 3 metres. The EUT was placed at a height of 1.5 metres 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.
9. Pre-scans were performed and a marker placed on the highest measured level of the appropriate plot. The signal analyser resolution bandwidth was set to 1 MHz and video bandwidth 3 MHz. The sweep time was set in accordance with FCC Part 15.250(e)(1). An RMS detector was used and trace mode was Max Hold.
10. Due to limitations of the signal analyser it was necessary to overlap the start and stop frequencies of pre-scan measurement ranges to satisfy the sweep point requirement in FCC Part 15.250(e)(1). Pre-scan measurements < 1 GHz were performed between 799 MHz to 1 GHz; A frequency line has been placed at 960 MHz to indicate the actual measurement start frequency. Appendix 1 of this report details the frequency range, sweep points and sweep time used.

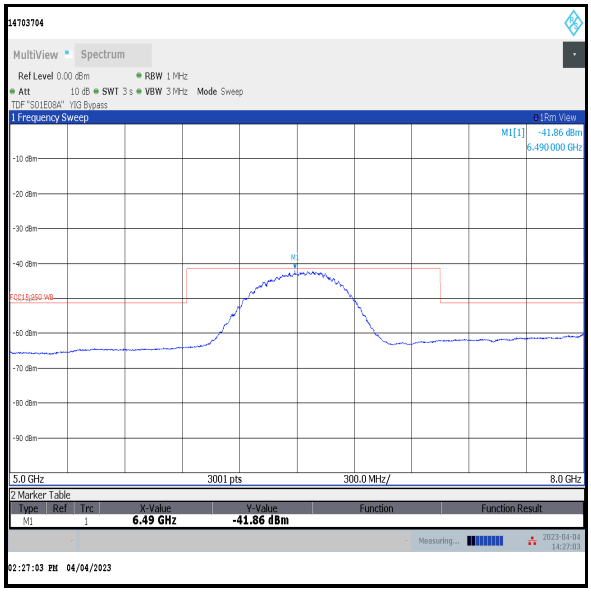
Transmitter Radiated Emissions Above 960 MHz (continued)

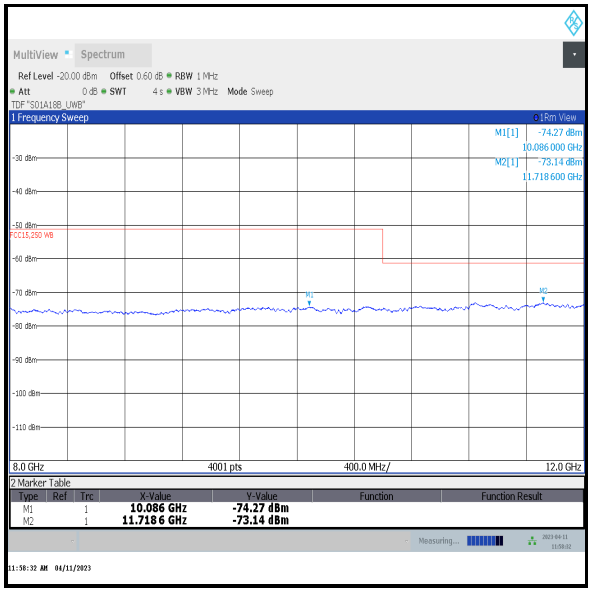
Results: Part 15.250(d)(1)

Frequency (MHz)	Antenna Polarity	RMS Level (dBm)	Limit (dBm)	Margin (dB)	Result
2495.900	Horizontal	-74.7	-61.3	13.4	Complied
6490.000	Vertical	-41.9	-41.3	0.6	Complied
12979.000	Horizontal	-68.7	-61.3	7.4	Complied

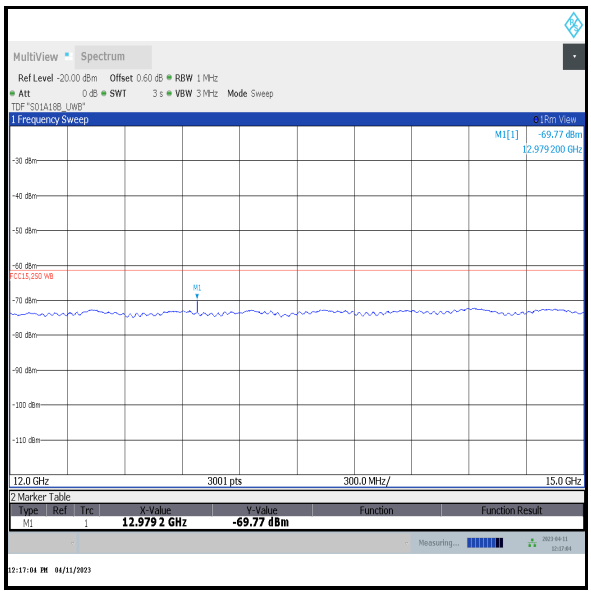


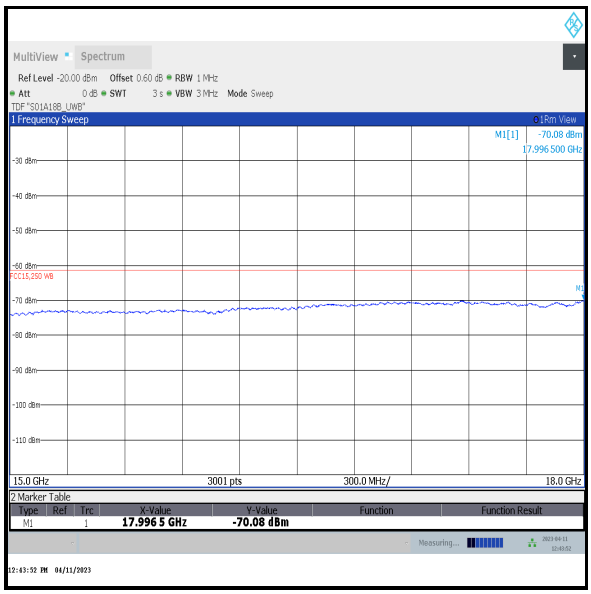


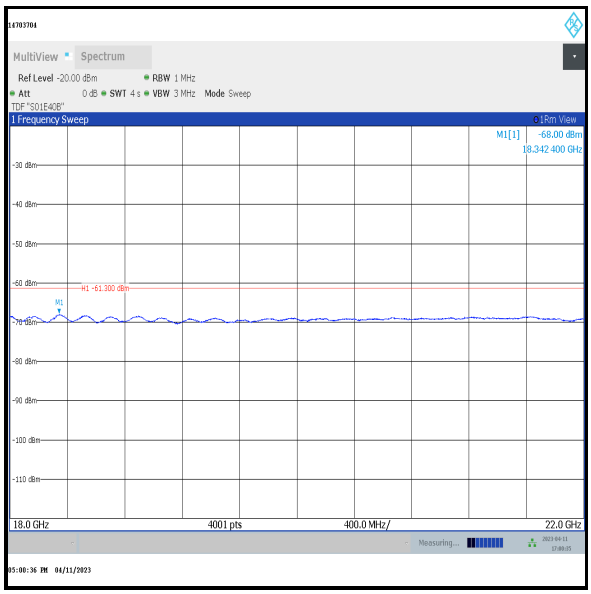


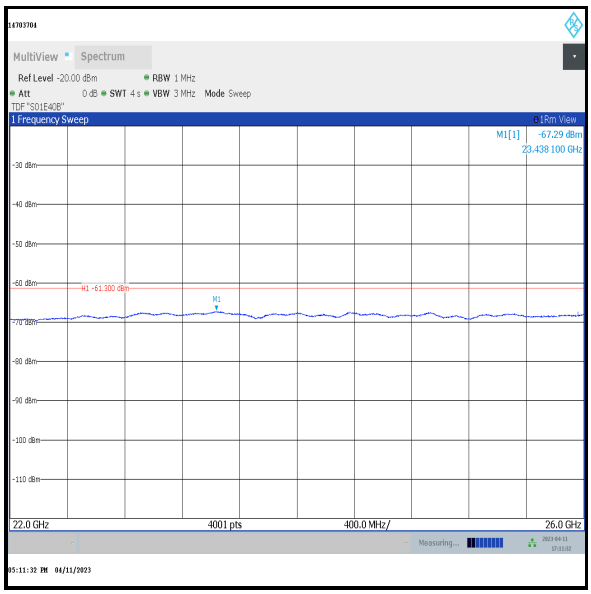


Transmitter Radiated Emissions Above 960 MHz (continued)

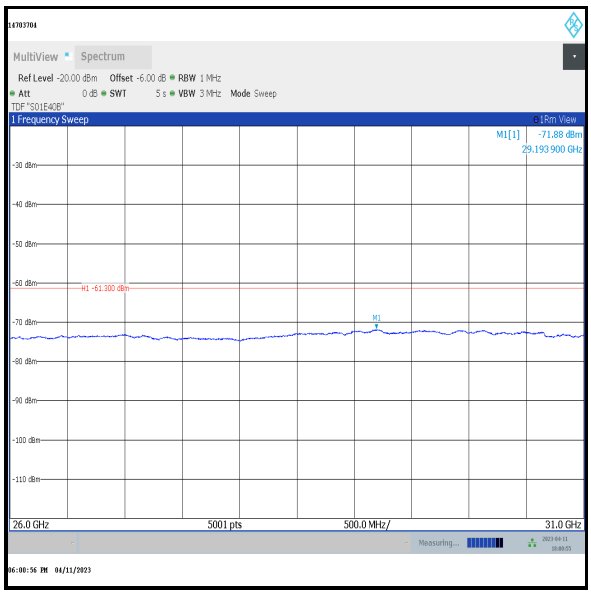


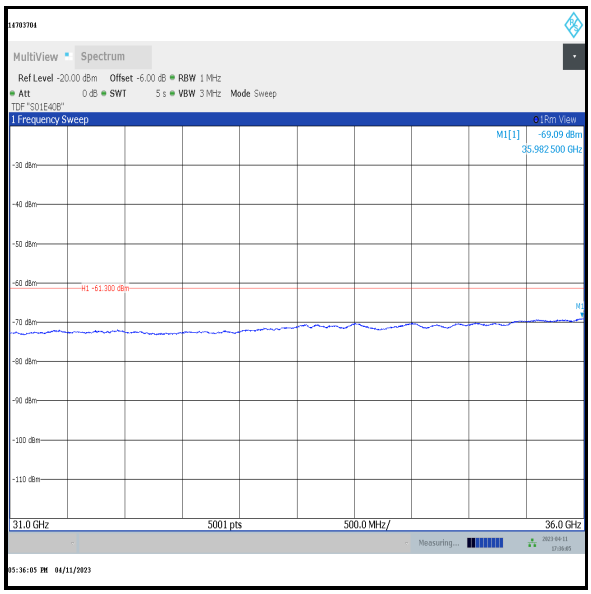


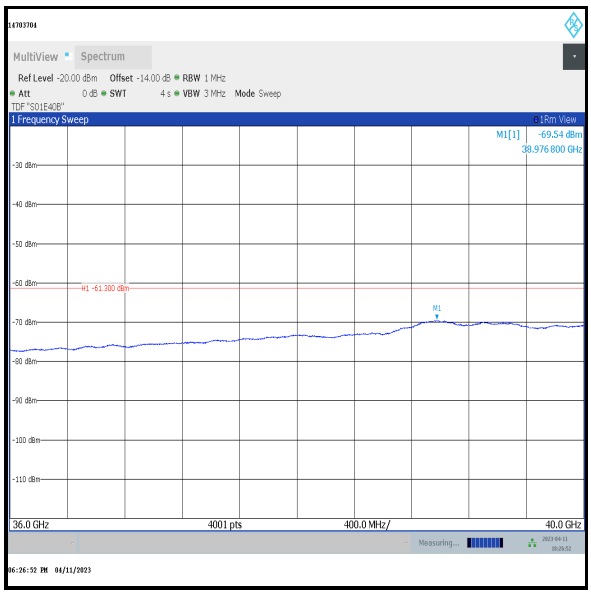




Transmitter Radiated Emissions Above 960 MHz (continued)





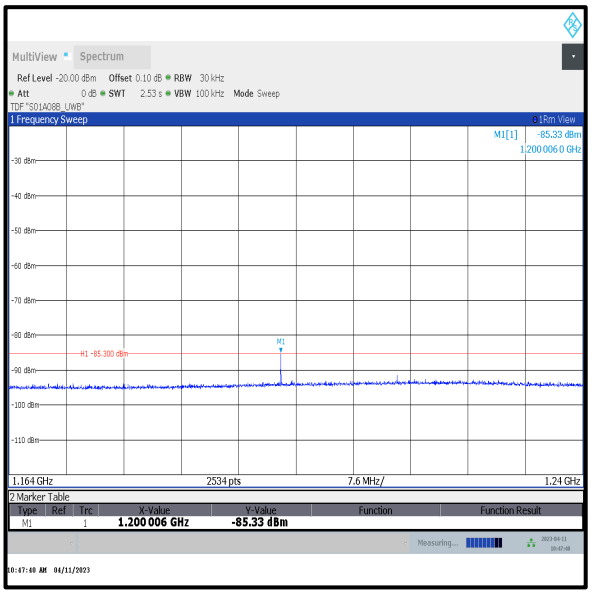


Note: The above plots are pre-scans and for indication purposes only. For final measurements, see accompanying tables.

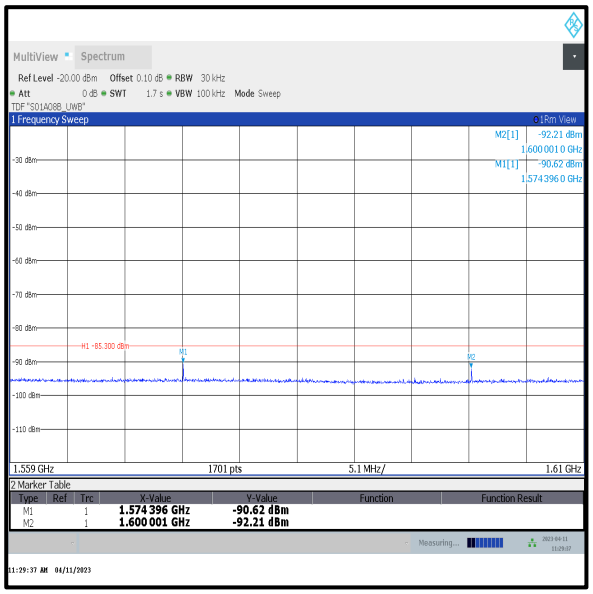
Transmitter Radiated Emissions Above 960 MHz (continued)

Results: Part 15.250(d)(2)

Frequency (MHz)	Antenna Polarity	RMS Level (dBm)	Limit (dBm)	Margin (dB)	Result
1574.396	Vertical	-90.6	-85.3	5.3	Complied



1164 to 1240 MHz
-85.3 dBm limit / 30 kHz resolution bandwidth



1559 to 1610 MHz
-85.3 dBm limit / 30 kHz resolution bandwidth

4.6 Transmitter Emissions Peak Level

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	04 April 2023
Test Sample Serial Number:	CB80MP		

FCC Reference:	Part 15.250(d)(3)
Test Method Used:	Part 15.250(e)(2) & ANSI C63.10 Section 10.3.6

Environmental Conditions:

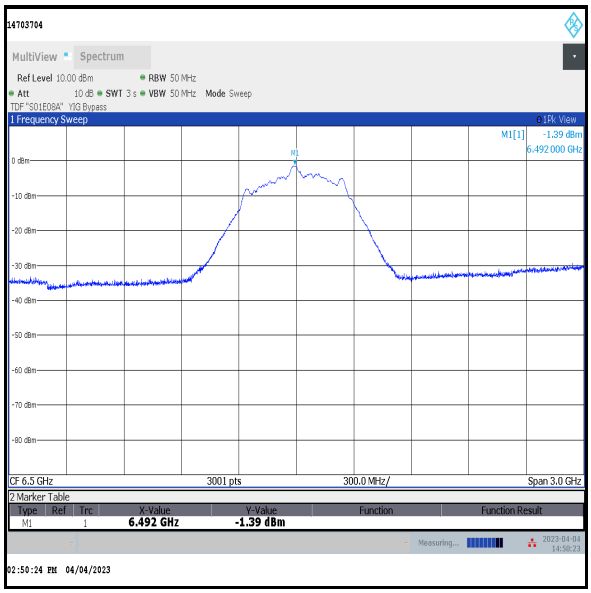
Temperature (°C):	22
Relative Humidity (%):	37

Note(s):

1. The signal analyser was set to the maximum available resolution bandwidth of 50 MHz and video bandwidth of 50 MHz. The measurement span was set to 3 GHz and a sweep time of 3 seconds with 3001 sweep points were used. The signal analyser was set to the centre frequency of the peak signal. A peak detector and max hold function were used.

Results:

Frequency FM (MHz)	Antenna Polarity	Level (dBm/50 MHz)	Limit (dBm/50 MHz)	Margin (dB)	Result
6492.000	Vertical	-1.4	0.0	1.4	Complied



5 AC Power Line Conducted Emissions Test Results

5.1 Transmitter AC Conducted Spurious Emissions

Test Summary:

Test Engineer:	Andrew Edwards	**Test Date:**	13 April 2023
Test Sample Serial Number:	CB80MP		

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

Environmental Conditions:

Temperature (°C):	23
Relative Humidity (%):	35

Note(s):

1. The EUT was connected to an AC charger via a USB cable. The AC charger was connected to a 120 VAC 60 Hz single phase supply via a LISN.
2. In accordance with FCC KDB 174176 Q4, tests were performed with a 240 VAC 60 Hz single phase supply as this was within the voltage range marked on the USB AC to DC power supply.
3. A pulse limiter was fitted between the LISN and the test receiver.
4. 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.

Transmitter AC Conducted Spurious Emissions (continued)

Results: Live / Quasi Peak / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150	Live	46.4	66.0	19.6	Complied
0.186	Live	40.4	64.2	23.8	Complied
0.272	Live	30.4	61.1	30.7	Complied
0.605	Live	23.6	56.0	32.4	Complied
0.668	Live	26.3	56.0	29.7	Complied
12.845	Live	26.3	60.0	33.7	Complied

Results: Live / Average / 120 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150	Live	22.9	56.0	33.1	Complied
0.199	Live	21.0	53.6	32.6	Complied
0.609	Live	16.9	46.0	29.1	Complied
0.672	Live	19.1	46.0	26.9	Complied
1.068	Live	17.7	46.0	28.3	Complied
12.818	Live	16.6	50.0	33.4	Complied

Results: Neutral / Quasi Peak / 120 VAC 60 Hz

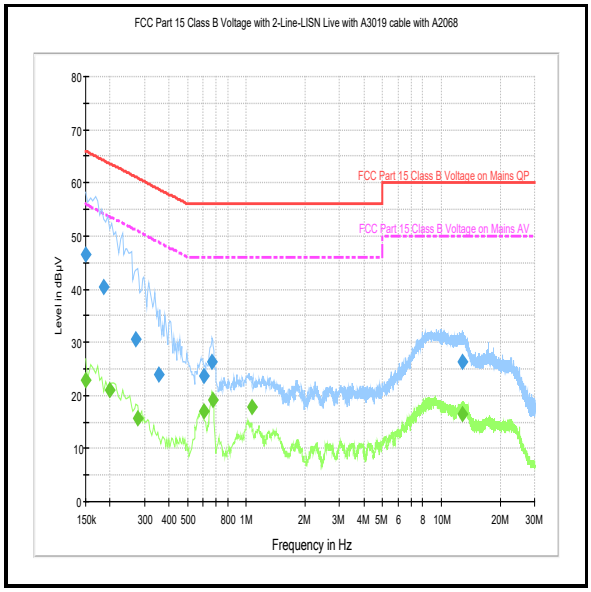
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.150	Neutral	35.8	66.0	30.2	Complied
0.186	Neutral	32.4	64.2	31.8	Complied
0.209	Neutral	30.8	63.3	32.5	Complied
0.618	Neutral	21.4	56.0	34.6	Complied
0.681	Neutral	22.4	56.0	33.6	Complied
9.411	Neutral	26.6	60.0	33.4	Complied

Results: Neutral / Average / 120 VAC 60 Hz

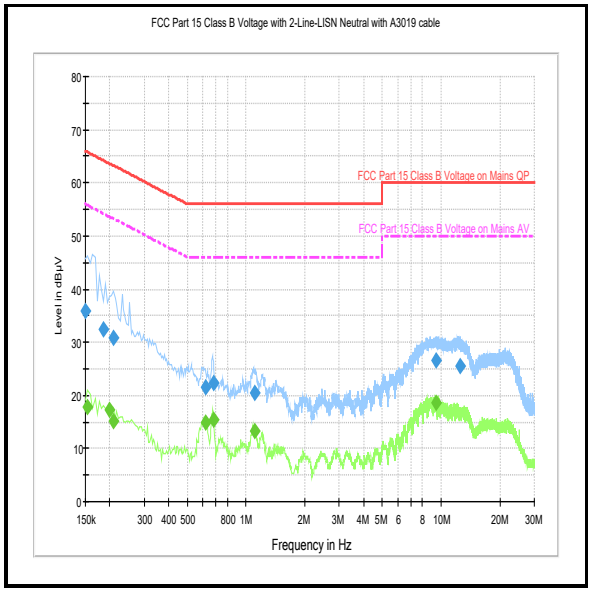
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.155	Neutral	17.8	55.8	38.0	Complied
0.200	Neutral	17.3	53.6	36.4	Complied
0.623	Neutral	14.8	46.0	31.2	Complied
0.681	Neutral	15.5	46.0	30.5	Complied
1.109	Neutral	13.4	46.0	32.6	Complied
9.380	Neutral	18.5	50.0	31.5	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: 120 VAC 60 Hz



Live



Neutral

Note: These plots are pre-scans 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
0.155	Live	27.5	65.8	38.3	Complied
0.591	Live	23.2	56.0	32.8	Complied
0.686	Live	23.6	56.0	32.4	Complied
1.140	Live	17.7	56.0	38.3	Complied
8.345	Live	28.4	60.0	31.6	Complied
9.177	Live	29.0	60.0	31.0	Complied

Results: Live / Average / 240 VAC 60 Hz

Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.312	Live	12.7	49.9	37.2	Complied
0.600	Live	16.9	46.0	29.1	Complied
0.686	Live	17.3	46.0	28.7	Complied
1.122	Live	16.2	46.0	29.8	Complied
8.259	Live	20.6	50.0	29.4	Complied
9.078	Live	21.0	50.0	29.0	Complied

Results: Neutral / Quasi Peak / 240 VAC 60 Hz

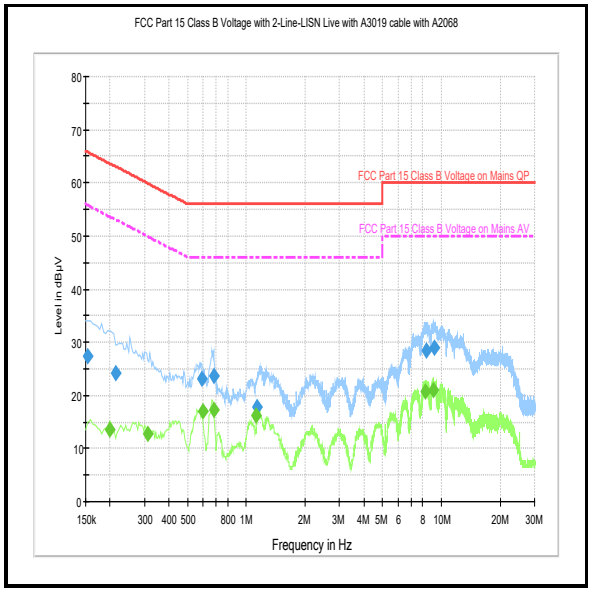
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.164	Neutral	27.2	65.3	38.1	Complied
0.623	Neutral	20.5	56.0	35.5	Complied
0.686	Neutral	22.5	56.0	33.5	Complied
8.363	Neutral	26.8	60.0	33.2	Complied
9.083	Neutral	27.8	60.0	32.2	Complied
10.091	Neutral	27.0	60.0	33.0	Complied

Results: Neutral / Average / 240 VAC 60 Hz

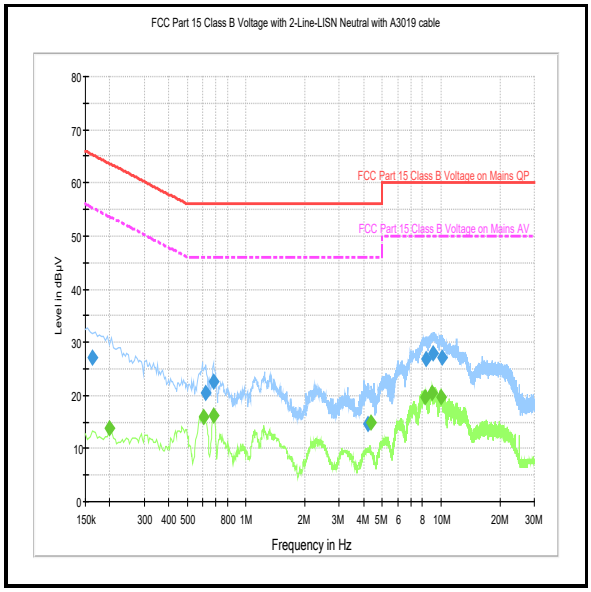
Frequency (MHz)	Line	Level (dBμV)	Limit (dBμV)	Margin (dB)	Result
0.605	Neutral	16.0	46.0	30.0	Complied
0.686	Neutral	16.2	46.0	29.8	Complied
4.340	Neutral	15.0	46.0	31.0	Complied
8.286	Neutral	19.6	50.0	30.4	Complied
8.997	Neutral	20.5	50.0	29.5	Complied
10.037	Neutral	19.7	50.0	30.3	Complied

Transmitter AC Conducted Spurious Emissions (continued)

Results: 240 VAC 60 Hz



Live



Neutral

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

6. Appendix 1

In accordance with FCC 15.250(e)(1), the test receiver span, sweep time and sweep points must be set to achieve a 1 ms dwell time over each 1 MHz segment. The test receiver settings used during testing are detailed in the table below.

Using a 1 MHz Bandwidth

Frequency Range (GHz)	Span (MHz)	Sweep Points	Sweep Time (s)	Test Distance (m)
0.799 to 1	201	201	0.2	2.0
1 to 5	4000	4001	4.0	1.0
5 to 8	3000	3001	3.0	1.0
8 to 12	4000	4001	4.0	1.0
12 to 15	3000	3001	3.0	1.0
15 to 18	3000	3001	3.0	1.0
18 to 22	4000	4001	4.0	1.0
22 to 26	4000	4001	4.0	1.0
26 to 31	5000	5001	5.0	0.5
31 to 36	5000	5001	5.0	0.5
36 to 40	4000	4001	4.0	0.2

Using a 30 kHz Bandwidth

Frequency Range (GHz)	Span (MHz)	Sweep Points	Sweep Time (s)	Test Distance (m)
1.164 to 1.24	76	2534	2.53	1.0
1.559 to 1.61	51	1701	1.7	1.0

--- END OF REPORT ---