

FCC Test Report

Dyson Technology Limited
Air Purifying Headphones, Model: WP01

In accordance with FCC 47 CFR Part 15C
(2.4 GHz Bluetooth)

Prepared for: Dyson Technology Limited
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Malmesbury
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United Kingdom



Add value.
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FCC ID: QVHWP01001

IC: 7968A-WP01001

COMMERCIAL-IN-CONFIDENCE

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SIGNATURE

NAME	JOB TITLE	RESPONSIBLE FOR	ISSUE DATE
Steve Marshall	Senior Engineer	Authorised Signatory	23 March 2023

Signatures in this approval box have checked this document in line with the requirements of TÜV SÜD document control rules.

ENGINEERING STATEMENT

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported testing was carried out on a sample equipment to demonstrate limited compliance with FCC 47 CFR Part 15C. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Pier Lorusso	23 March 2023	

FCC Accreditation
90987 Octagon House, Fareham Test Laboratory

EXECUTIVE SUMMARY

A sample of this product was tested and found to be compliant with FCC 47 CFR Part 15C: 2020 for the tests detailed in section 1.3.



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1 Report Summary

1.1 Report Modification Record

Alterations and additions to this report will be issued to the holders of each copy in the form of a complete document.

Issue	Description of Change	Date of Issue
1	First Issue	13-January-2023
2	Amended application form Conducted Power and Temperature Ranges	23-March-2023

Table 1

1.2 Introduction

Applicant	Dyson Technology Limited
Manufacturer	Dyson Technology Limited
Model Number(s)	WP01
Serial Number(s)	M8D-CN-FDN0071X
Hardware Version(s)	OR1
Software Version(s)	10.3
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 15C: 2020
Order Number	6000091736
Date	06-November-2020
Date of Receipt of EUT	18-October-2022
Start of Test	22-October-2022
Finish of Test	22-October-2022
Name of Engineer(s)	Pier Lorusso
Related Document(s)	KDB 996369 D04 Module Integration Guide v02 ANSI C63.10: 2013 ANSI C63.10: 2020



1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C is shown below.

Section	Specification Clause	Test Description	Result	Comments/Base Standard
Configuration and Mode: 2.4 GHz Bluetooth - BDR/EDR - Right Cup + Left Cup				
2.1	15.209 and 15.247 (d)	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	Measurements as per KDB 996369 D04, clause 3.4 only.

Table 2



1.4 Application Form

Equipment Description

Technical Description: (Please provide a brief description of the intended use of the equipment including the technologies the product supports)	The EUT is an Air Purifying Headphone with Bluetooth BR/EDR and Bluetooth Low Energy technologies	
Manufacturer:	Dyson Technology Limited	
Model:	WP01	
Part Number:	WP01	
Hardware Version:	OR1	
Software Version:	10.3	
FCC ID of the product under test – see guidance here	QVHWP01001	
IC ID of the product under test – see guidance here	7968A-WP01001	

Table 3

Intentional Radiators

Technology	Bluetooth (BR+EDR)	Bluetooth Low Energy				
Frequency Range (MHz to MHz)	2400-2483.5	2400-2483.5				
Conducted Declared Output Power (dBm)	11.5	7.70				
Antenna Gain (dBi)	2.25	2.25				
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	1	1, 2				
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	GFSK, $\pi/4$ DQPSK, 8-DPSK	GFSK				
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	1M00GXW	1M00GXW, 2M00GXW				
Bottom Frequency (MHz)	2402	2402				
Middle Frequency (MHz)	2441	2440				
Top Frequency (MHz)	2480	2480				

Table 4

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	2483.5
Lowest frequency generated or used in the device or on which the device operates or tunes	2400
Class A Digital Device (Use in commercial, industrial or business environment) ☐	
Class B Digital Device (Use in residential environment only) ☒	

Table 5



Battery Power Source

Voltage:	3.85	V
End-point voltage:	4.4	V (Point at which the battery will terminate)
Alkaline ☐ Leclanche ☐ Lithium ☒ Nickel Cadmium ☐ Lead Acid* ☐ *(Vehicle regulated)		
Other ☐	Please detail:	

Table 6

Charging

Can the EUT transmit whilst being charged	Yes ☒ No ☐
---	---

Table 7

Temperature

Minimum temperature:	-10	°C
Maximum temperature:	40	°C

Table 8

Cable Loss

Adapter Cable Loss (Conducted sample)	0.6	dB
--	-----	----

Table 9



Antenna Characteristics

Antenna connector ☐			State impedance		Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☒	Type:		Gain	2.25	dBi
External antenna ☐	Type:		Gain		dBi
For external antenna only: Standard Antenna Jack ☐ If yes, describe how user is prohibited from changing antenna (if not professional installed): Equipment is only ever professionally installed ☐ Non-standard Antenna Jack ☐					

Table 10

Ancillaries (if applicable)

Manufacturer:		Part Number:	
Model:		Country of Origin:	

Table 11

The above information was provided by the applicant.



1.5 Product Information

1.5.1 Technical Description

The EUT is an Air Purifying Headphone with Bluetooth BR/EDR and Bluetooth Low Energy technologies.

1.6 Deviations from the Standard

No deviations from the applicable test standard were made during testing.

1.7 EUT Modification Record

The table below details modifications made to the EUT during the test programme.

The modifications incorporated during each test are recorded on the appropriate test pages.

Modification State	Description of Modification still fitted to EUT	Modification Fitted By	Date Modification Fitted
Model: WP01, Serial Number: M8D-CN-FDN0071X			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 12

1.8 Test Location

TÜV SÜD conducted the following tests at our Octagon House Test Laboratory.

Test Name	Name of Engineer(s)	Accreditation
Configuration and Mode: 2.4 GHz Bluetooth - BDR/EDR - Right Cup + Left Cup		
Radiated Spurious Emissions (Simultaneous Transmission)	Pier Lorusso	UKAS

Table 13

Office Address:

TÜV SÜD
Octagon House
Concorde Way
Fareham
Hampshire
PO15 5RL
United Kingdom



2 Test Details

2.1 Radiated Spurious Emissions (Simultaneous Transmission)

2.1.1 Specification Reference

FCC 47 CFR Part 15, Clause 15.209 and 15.247 (d)

2.1.2 Equipment Under Test and Modification State

WP01, S/N: M8D-CN-FDN0071X - Modification State 0

2.1.3 Date of Test

22-October-2022

2.1.4 Test Method

This test was performed in accordance with ANSI C63.10, clause 6.3, 6.5 and 6.6.

The EUT was placed on the non-conducting platform in a manner typical of a normal installation.

For frequencies > 1 GHz, plots for average measurements were taken in accordance with ANSI C63.10, clause 4.1.4.2.5 to characterize the EUT. Where emissions were detected, final average measurements were taken in accordance with ANSI C63.10, clause 4.1.4.2.2, 11.11, 11.12, 12.7.2 or 12.7.3 depending on the nature of the emission measured.

The plots shown are the characterisation of the EUT. The limits on the plots represent the most stringent case for restricted bands, (74/54 dBuV/m) when compared to non-restricted band limits. The limits shown have been used as a threshold to determine where further measurements are necessary. Where results are within 10 dB of the limits shown on the plots, further investigation was carried out and reported in results tables.

The following conversion can be applied to convert from dBuV/m to $\mu\text{V/m}$:
 $10^{(\text{Field Strength in dBuV/m}/20)}$

At a measurement distance of 1 meter the limit line was increased by $20 \cdot \text{LOG}(3/1) = 9.54 \text{ dB}$.

2.1.5 Example Test Setup Diagram

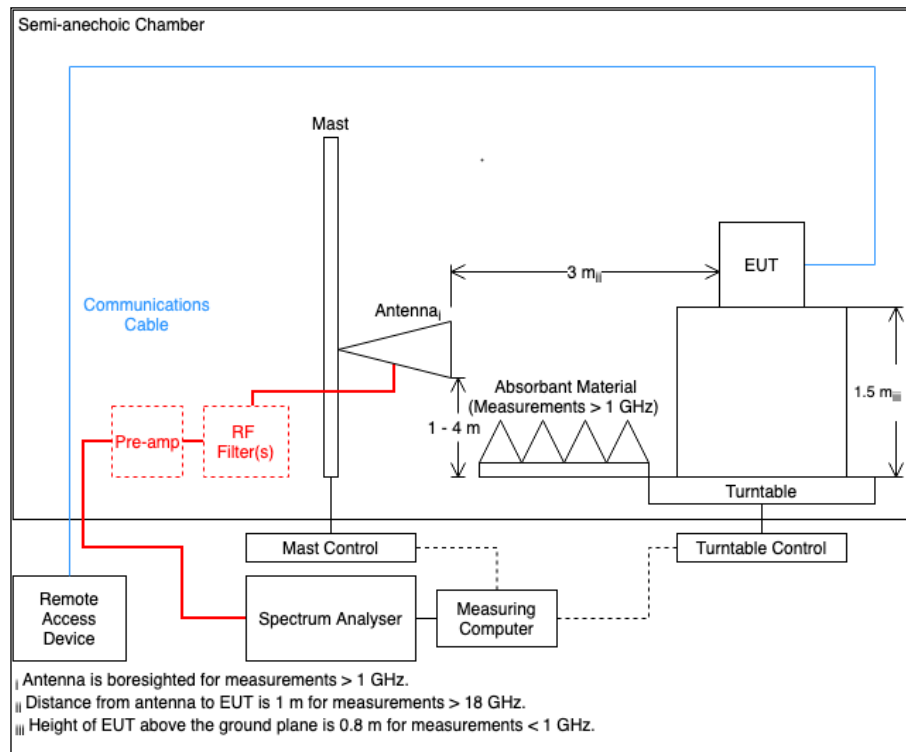


Figure 1

2.1.6 Environmental Conditions

Ambient Temperature	20.5 °C
Relative Humidity	58.7 %



2.1.7 Test Results

2.4 GHz Bluetooth - BDR/EDR - Right Cup + Left Cup

The EUT was configured for simultaneous transmission in the following mode of operation:

Headphone	Technology	Frequency Band	Channel Frequency (MHz)
Left Cup	Bluetooth BDR/EDR (DH5)	2400 MHz to 2483.5 MHz	2402
Right Cup	Bluetooth BDR/EDR (DH5)	2400 MHz to 2483.5 MHz	2480

Table 14 - Modes of Operation

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 15 - 30 MHz to 1 GHz

* No emissions were detected within 10 dB of the limit.

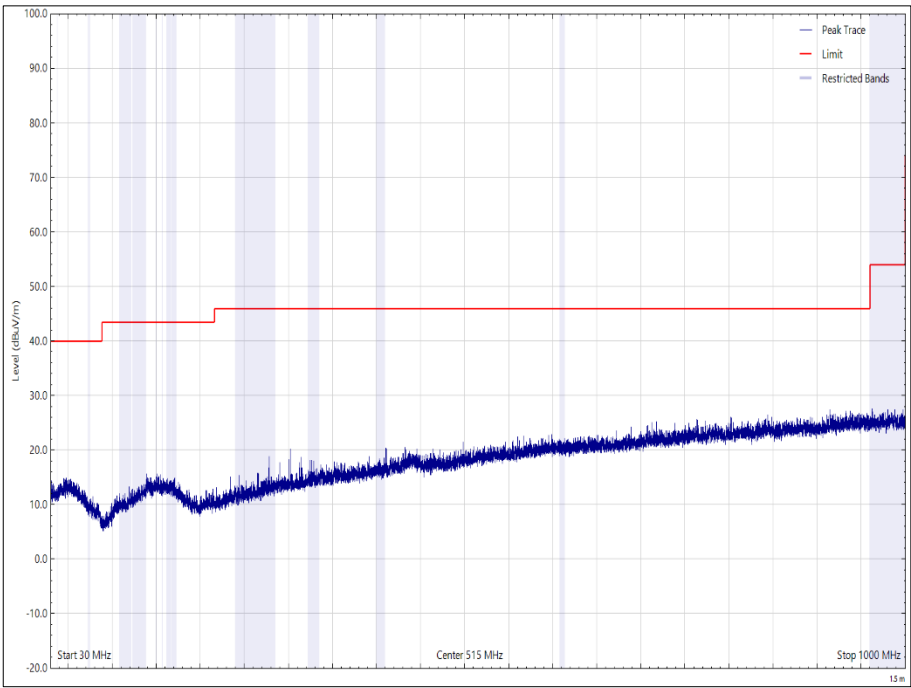


Figure 2 - 30 MHz to 1 GHz, Peak, Vertical



Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 16 - 30 MHz to 1 GHz

* No emissions were detected within 10 dB of the limit.

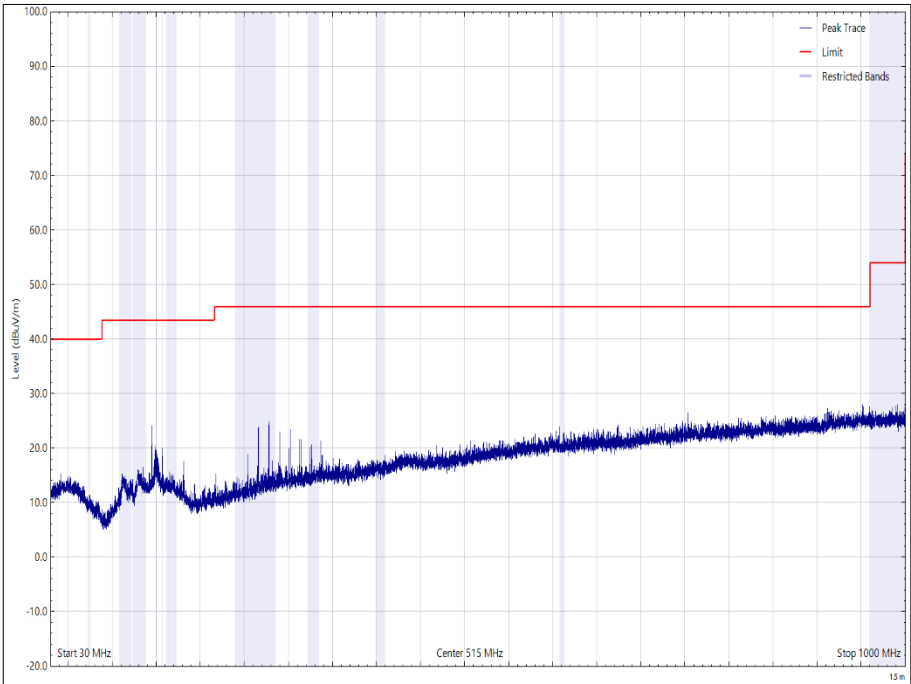


Figure 3 - 30 MHz to 1 GHz, Peak, Horizontal



Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 17 - 1 GHz to 25 GHz

* No emissions were detected within 10 dB of the limit.

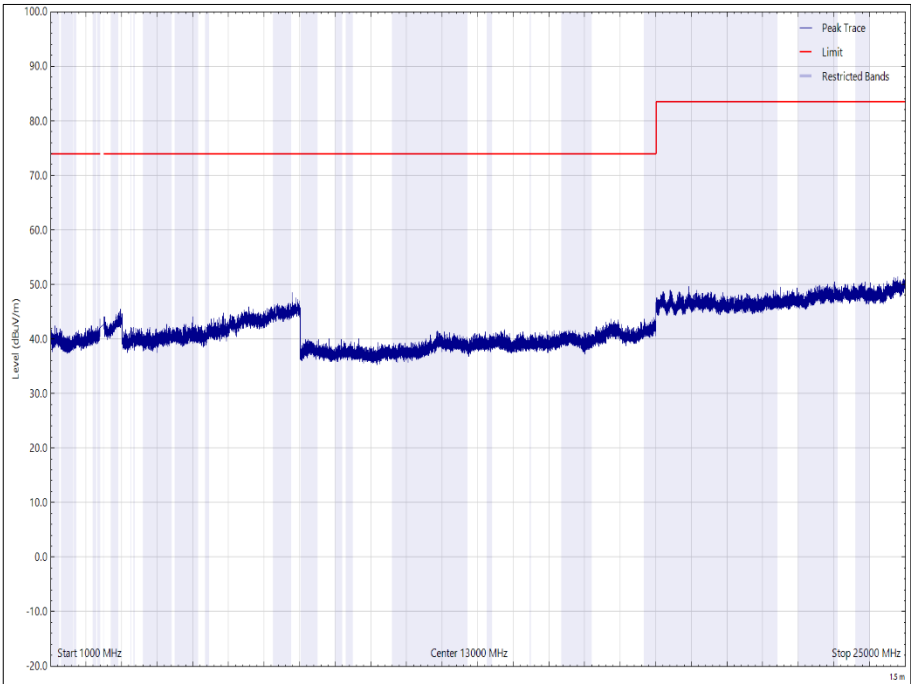


Figure 4 - 1 GHz to 25 GHz, Peak, Vertical



Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 18 - 1 GHz to 25 GHz

* No emissions were detected within 10 dB of the limit.

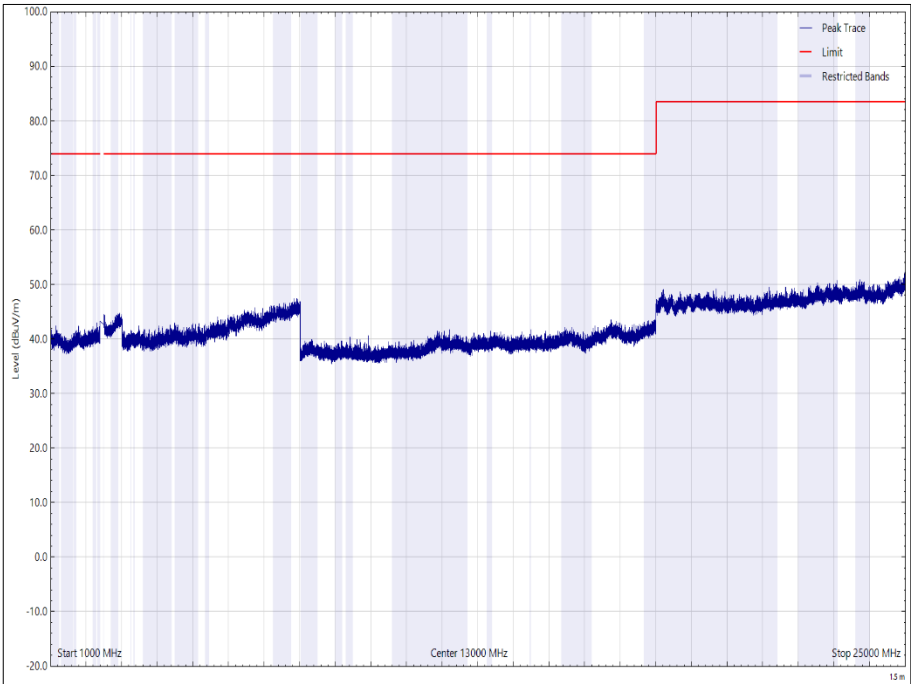


Figure 5 - 1 GHz to 25 GHz, Peak, Horizontal



Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 19 - 1 GHz to 25 GHz

* No emissions were detected within 10 dB of the limit.

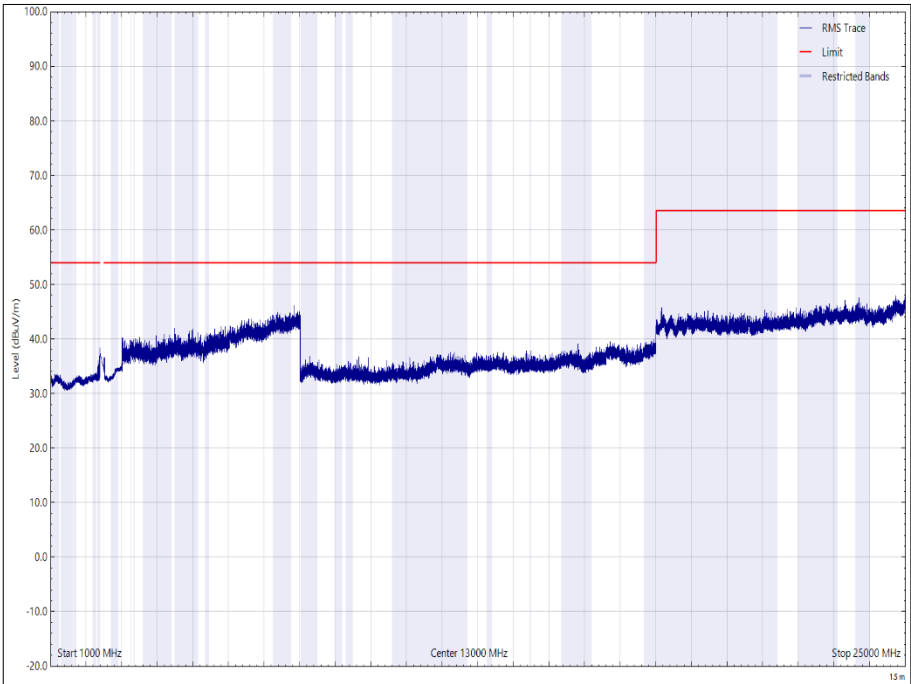


Figure 6 - 1 GHz to 25 GHz, Average, Vertical



Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 20 - 1 GHz to 25 GHz

* No emissions were detected within 10 dB of the limit.

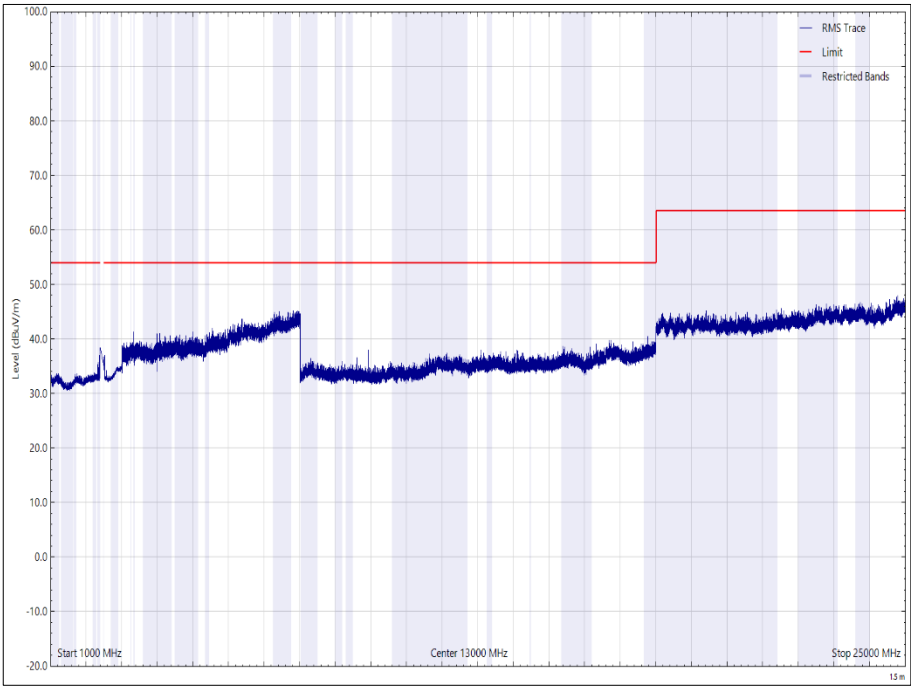


Figure 7 - 1 GHz to 25 GHz, Average, Horizontal

FCC 47 CFR Part 15

The least stringent limit from the applicable rule parts was used to determine compliance for Radiated Emissions testing of multiple transmission sources.

The least stringent applicable limit was:

Clause	Limit
Part 15.247 (d)	-20 dBc

Table 21



2.1.8 Test Location and Test Equipment Used

This test was carried out in RF Chamber 11.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Programmable Power Supply	Iso-tech	IPS 2010	2437	-	O/P Mon
True RMS Multimeter	Fluke	179	4006	12	29-Mar-2023
Pre-Amplifier (8 GHz to 18 GHz)	Wright Technologies	PS06-0061/PS06-0060	4971	6	19-Nov-2022
EMI Test Receiver	Rohde & Schwarz	ESW44	5084	12	17-May-2023
Cable (18 GHz)	Rosenberger	LU7-071-1000	5103	12	17-Nov-2022
Emissions Software	TUV SUD	EmX V3.1.4	5125	-	Software
Screened Room (11)	Rainford	Rainford	5136	36	24-Nov-2024
Mast	Maturo	TAM 4.0-P	5158	-	TU
Mast and Turntable Controller	Maturo	Maturo NCD	5159	-	TU
Turntable	Maturo	TT 15WF	5160	-	TU
Antenna (DRG 1-10.5GHz)	Schwarzbeck	BBHA9120B	5215	12	28-May-2023
DRG Horn Antenna (7.5-18GHz)	Schwarzbeck	HWRD750	5216	12	29-May-2023
3 GHz High pass filter	Wainwright	WHKX12-2580-3000-18000-80SS	5220	12	23-Mar-2023
Preamplifier (30dB 1GHz to 18GHz)	Schwarzbeck	BBV 9718 C	5261	12	08-Apr-2023
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	07-Apr-2023
Cable (SMA to SMA, 2 m)	Junkosha	MWX221-02000AMSAMS/A	5517	12	12-Apr-2023
2m SMA Cable	Junkosha	MWX221-02000AMSAMS/A	5518	12	12-Apr-2023
Cable (N-Type to N-Type, 8 m)	Junkosha	MWX221-08000NMSNMS/B	5520	12	24-Mar-2023
8m N Type Cable	Junkosha	MWX221-08000NMSNMS/B	5522	12	24-Mar-2023
7 GHz High pass Filter	Wainwright	WHKX12-5850-6800-18000-80SS	5550	12	19-May-2023
Cable (K Type 2m)	Junkosha	MWX241-01000KMSKMS/B	5934	12	14-May-2023
TRILOG Super Broadband Test Antenna	Schwarzbeck	VULB 9168	5942	24	03-Feb-2024

Table 22

TU - Traceability Unscheduled

O/P Mon – Output Monitored using calibrated equipment

3 Photographs

3.1 Test Setup Photographs

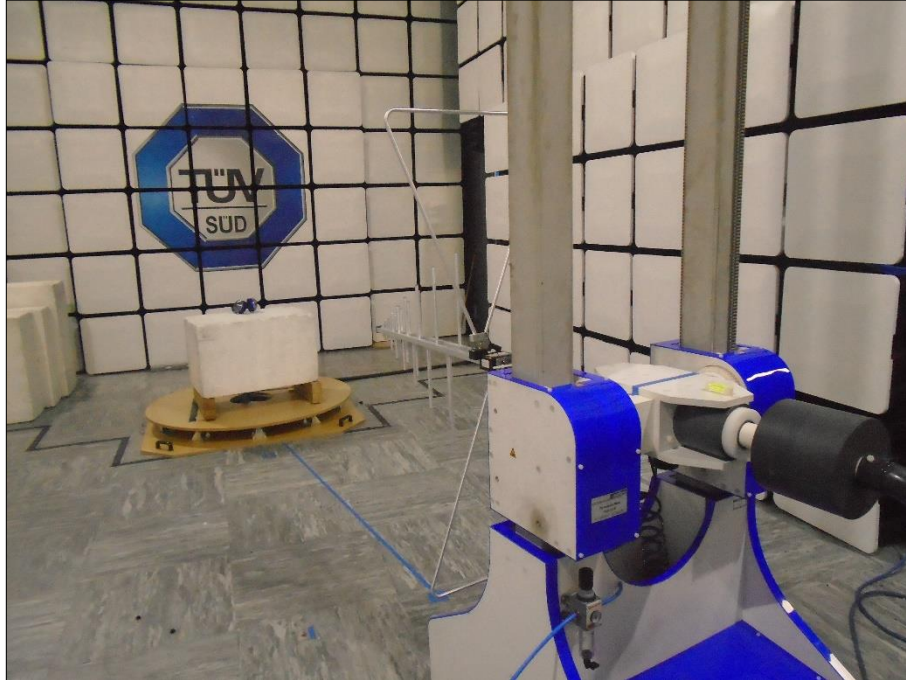


Figure 8 - Test Setup - 30 MHz to 1 GHz

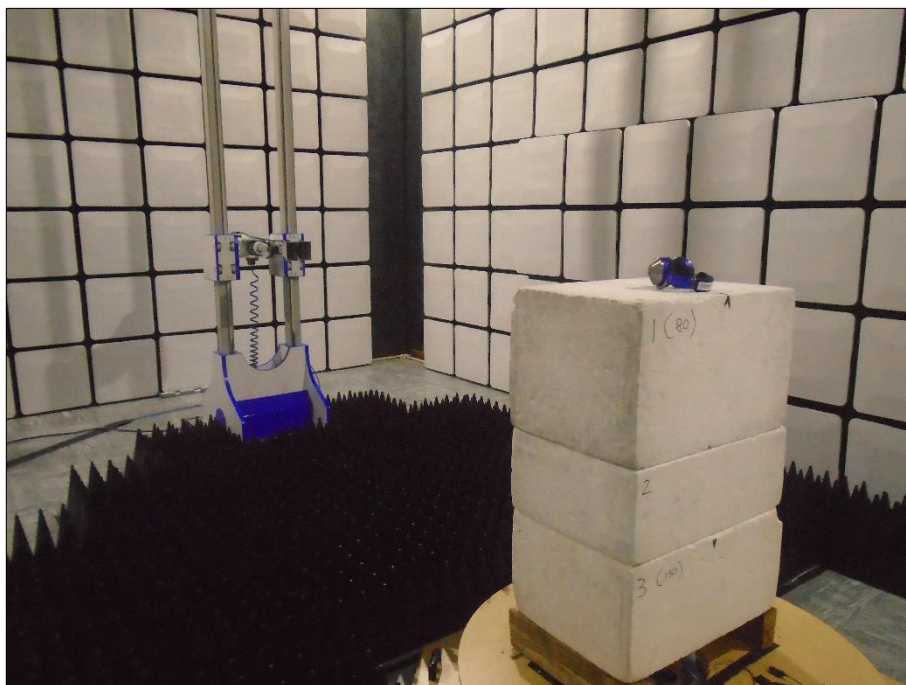


Figure 9 - Test Setup - 1 GHz to 8 GHz

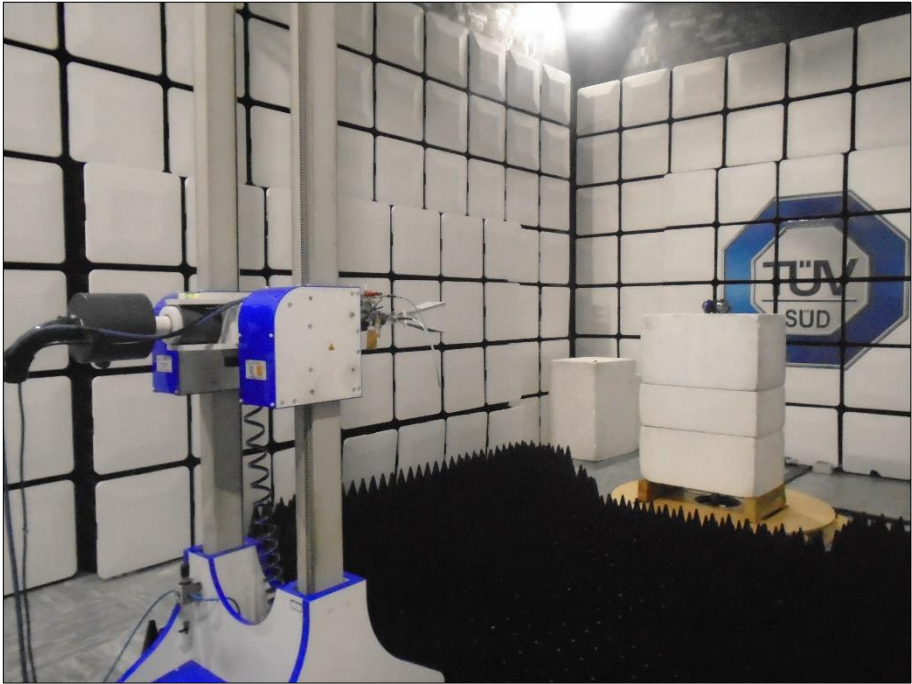


Figure 10 - Test Setup - 8 GHz to 18 GHz

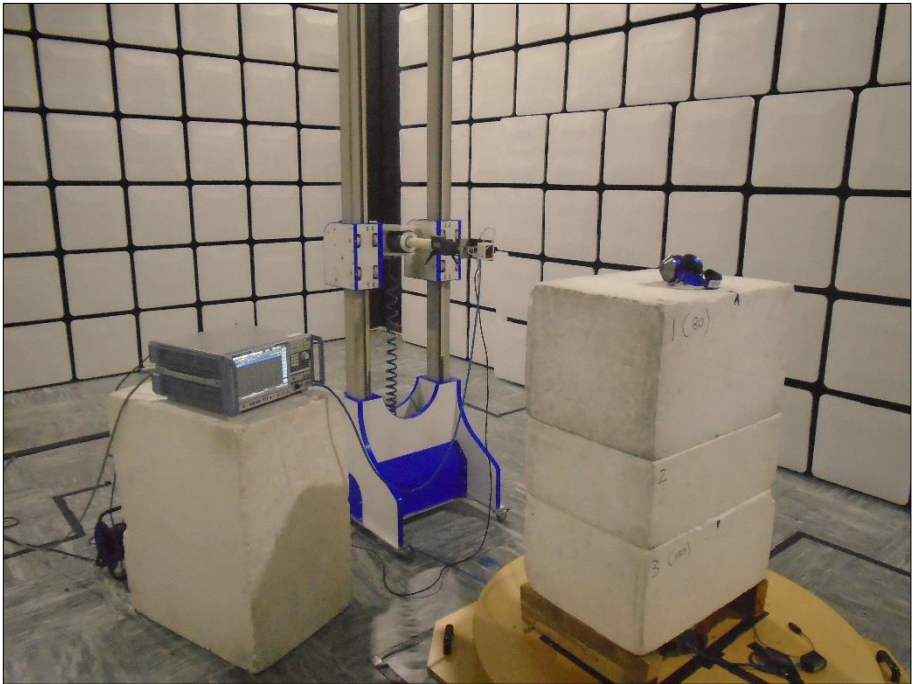


Figure 11 - Test Setup - 18 GHz to 25 GHz



4 Measurement Uncertainty

For a 95% confidence level, the measurement uncertainties for defined systems are:

Test Name	Measurement Uncertainty
Radiated Spurious Emissions (Simultaneous Transmission)	30 MHz to 1 GHz: ± 5.2 dB 1 GHz to 40 GHz: ± 6.3 dB

Table 23

Measurement Uncertainty Decision Rule – Accuracy Method

Determination of conformity with the specification limits is based on the decision rule according to IEC Guide 115:2021, Clause 4.4.3 (Procedure 2). The measurement results are directly compared with the test limit to determine conformance with the requirements of the standard.

Risk: The uncertainty of measurement about the measured result is negligible with regard to the final pass/fail decision. The measurement result can be directly compared with the test limit to determine conformance with the requirement (compare IEC Guide 115). The level of risk to falsely accept and falsely reject items is further described in ILAC-G8.