FCC and ISED Test Report

BreatheOx Limited T/A Albus Health
Albus Home, Model: G2

In accordance with FCC 47 CFR Part 15C and ISED RSS-210 and ISED RSS-GEN

(60 GHz Radio)

Prepared for: BreatheOx Limited T/A Albus Health
9400 Garsington Road, Oxford Business Park,
Oxford, Oxfordshire, OX4 2HN
UNITED KINGDOM

FCC ID: 2BGXS-G2 IC: 32679-G2

COMMERCIAL-IN-CONFIDENCE

Document 75961718-02 Issue 02

SIGNATURE			
S. MM			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	16 August 2024

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 and ISED RSS-210 and ISED RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Matthew Dawkins	16 August 2024	
Testing	Matthew Russell	16 August 2024	

FCC Accreditation
492497/UK2010 Octagon House, Fareham Test Laboratory

ISED Accreditation
12669A/UK0003 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: 2023, ISED RSS-210: Issue 10 (12-2019) + A1 (2020-04) and ISED RSS-GEN:Issue 05 (2018-04) + A2 (2021-02) for the tests detailed in section 1.3.

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Contents

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	30-July-2024
2	Second Issue – UKAS accreditation status	16-August-2024

Table 1

1.2 Introduction

Applicant	BreatheOx Limited T/A Albus Health
Manufacturer	BreatheOx Limited T/A Albus Health
Model Number(s)	G2
Serial Number(s)	28330003 and 28330004
Hardware Version(s)	v2
Software Version(s)	V21.00.00
Number of Samples Tested	2
Test Specification/Issue/DateR	FCC 47 CFR Part 15C: 2023 ISED RSS-210: Issue 10 (12-2019) + A1 (2020-04) ISED RSS-GEN: Issue 05 (2018-04) + A2 (2021-02)
Order Number	PO-0001
Date	10-June-2024
Date of Receipt of EUT	14-June-2024
Start of Test	29-June-2024
Finish of Test	19-July-2024
Name of Engineer(s)	Matthew Dawkins and Matthew Russell
Related Document(s)	ANSI C63.10 (2020) KDB 364244 D01 Meas 15.255 Radars v01 ISED RSS-210: Issue 11 (06-2024)

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 15C and ISED RSS-210 and ISED RSS-GEN is shown below.

Section	Specification Clause			Test Description	Result	Comments/Base Standard
	FCC Part 15C	RSS-210	RSS-GEN			
Configuration and Mode: 12V DC Powered - 60GHz Radar Transmit						
2.1	15.207	N/A	8.8	AC Power Line Conducted Emissions	Pass	EUT can be connected to AC Mains via AC/DC Adaptor.
2.2	15.255(c)	J.2	N/A	Equivalent Isotropically Radiated Power	Pass	KDB 364244 D01 ANSI C63.10 (2020)
2.3	15.255(d) and 15.209	J.3	8.9	Spurious Radiated Emissions	Pass	KDB 364244 D01 ANSI C63.10 (2020)
2.4	15.255(f)	J.4(c) and J.6	8.11	Frequency Stability and Emission Bandwidth	Pass	KDB 364244 D01 ANSI C63.10 (2020)

Table 2

1.4 Application Form

Equipment Description

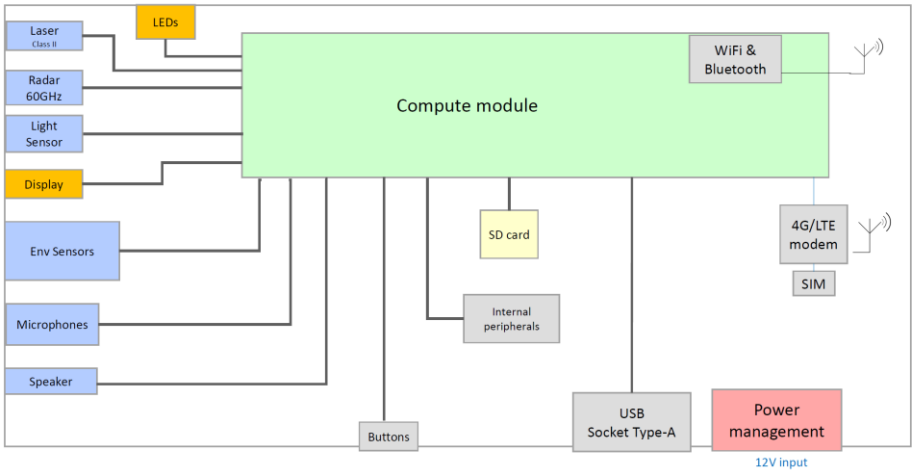
Technical Description: *(Please provide a brief description of the intended use of the equipment including the technologies the product supports)*	Albus Home is a table top, plug & play passive device that normally sits on the user's bedside and that records audio, movement information and environmental parameters for the purpose of assessing various biomarkers for participants in clinical studies. These will typically be run by pharmaceutical companies with health participants or those with some conditions such as respiratory. The purpose of the device is to record data for future analysis in the cloud. The technologies used are better described with a high level system diagram as follows: Albus Home RD v2 - Simplified System block diagram  **Figure 1**
Manufacturer:	BreatheOx Limited (Trading as Albus Health)
Model:	G2
Part Number:	B5C
Hardware Version:	v2
Software Version:	V21.00.00
FCC ID of the product under test – see guidance here	2BGXS-G2
IC ID of the product under test – see guidance here	32679-G2
Device Category	Mobile ☒ / Portable ☐ / Fixed ☐
Equipment is fitted with an Audio Low Pass Filter	Yes ☐ / No ☒

Table 3

Intentional Radiators

Technology	**WiFi (Pre-Approved Module)** See Laird LWB5+ datasheet (453-00046)	4G LTE cat-4 (Pre-Approved Module) See Quectel EG25-G datasheet	60GHz Radar TI IWR6843AOP
Frequency Range (MHz to MHz)	2.4-2.473 GHz 5.15-5.35 GHz 5.47-5.725 GHz 5.725-5.85 GHz	LTE-FDD: B1/B2/B3/B4/B5/B7/B8/B12/ B13/B18/B19/B20/B25/B26/ B28 LTE-TDD: B38/B39/B40/B41 WCDMA: B1/B2/B4/B5/B6/B8/B19 GSM: 850/900/1800/1900MHz	60-64GHz
Conducted Declared Output Power (dBm)	max 16.5dBm but depends on freq and modulation	max 33dBm but depends on band used	-
Antenna Gain (dBi)	EMF2449A1-10MH4L 2.8dBi @2.4GHz 3.4dBi @5G	Molex 2091420180 698-960MHz: 1.2dBi 1710-2690MHz: 5.2dBi 3300-3800MHz: 2.7dBi	Single RF chip with built in antenna
Supported Bandwidth(s) (MHz) (e.g. 1 MHz, 20 MHz, 40 MHz)	20/40/80MHz	1.4/3/5/10/15/20 MHz	<4GHz
Modulation Scheme(s) (e.g. GFSK, QPSK etc)	BPSK, QPSK, CCK, 16-QAM, 64-QAM, and 256-QAM	various	FMCW
ITU Emission Designator (see guidance here) (not mandatory for Part 15 devices)	N/A	8M93G7D / 8M91G7D	N/A
Bottom Frequency (MHz)	2.4GHz		57GHz
Middle Frequency (MHz)			
Top Frequency (MHz)	5.85GHz		64GHz

Table 4

Un-intentional Radiators

Highest frequency generated or used in the device or on which the device operates or tunes	
Lowest frequency generated or used in the device or on which the device operates or tunes	40 MHz
Class A Digital Device (Use in commercial, industrial or business environment) ☐ Class B Digital Device (Use in residential environment only) ☒	

Table 5

AC Power Source

AC supply frequency:	Not Applicable	Hz
Voltage		V
Max current:		A
Single Phase ☐ Three Phase ☐		

Table 6

DC Power Source

Nominal voltage:	12V	V
Extreme upper voltage:	13.3V	V
Extreme lower voltage:	10V	V
Max current:	1.5A	A

Table 7

Battery Power Source

Voltage:	No battery	V
End-point voltage:		V *(Point at which the battery will terminate)*
Alkaline ☐ Leclanche ☐ Lithium ☐ Nickel Cadmium ☐ Lead Acid* ☐ **(Vehicle regulated)*		
Other ☐ Please detail:		

Table 8

Charging

Can the EUT transmit whilst being charged	Yes ☐ No ☐

Table 9

Temperature

Minimum temperature:	0	°C
Maximum temperature:	40	°C

Table 10

Cable Loss

Adapter Cable Loss (Conducted sample)		dB

Table 11

Antenna Characteristics

Antenna connector ☐			State impedance		Ohm
Temporary antenna connector ☐			State impedance		Ohm
Integral antenna ☒	Type:	AOP (Antenna on Package)	Gain	2.0	dBi
Integral antenna ☐	Type:		Gain		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 ☐ All part 15 applications will need to show how the antenna gain was derived either from a manufacturer data sheet or a measurement. Where the gain of the antenna is inherently accounted for as a result of the measurement, such as field strength measurements on a part 15.249 or 15.231 device, so the gain does not necessarily need to be verified. However, enough information regarding the construction of the antenna shall be provided. Such information maybe photographs, length of wire antenna etc.					

Table 12

Ancillaries (if applicable)

Manufacturer:	Globtek power supply	Part Number:	
Model:	WR9QE1500CCPCIMNAR6B	Country of Origin:	China

Table 13

I hereby declare that the information supplied is correct and complete.

Name: Jose Sanchez
Position held: CTO
Date: 11th June 2024

1.5 Product Information

1.5.1 Technical Description

Albus Home is a table top, plug & play passive device that normally sits on the user's bedside and that records audio, movement information and environmental parameters for the purpose of assessing various biomarkers for participants in clinical studies. These will typically be run by pharmaceutical companies with health participants or those with some conditions such as respiratory. The purpose of the device is to record data for future analysis in the cloud.

1.5.2 Additional Information

The equipment under test (EUT) was configured to transmit an FMCW radar transmission which consisted of six 64 µs chirps every 50 ms which is representative of normal operation. For the purposes of testing all test cases other than EIRP, the EUT was configured in to a high duty cycle mode where the period was reduced from 50 ms to 2 ms via SSH commands sent over a WiFi connection to a test laptop.

For all tests other than Frequency Stability and Emission Bandwidth, the EUT was powered by the external AC/DC adaptor provided by the applicant, as listed in the ancillary equipment in section 1.4. The nominal power to this supply was 120 VAC, 60 Hz.

1.6 Deviations from the Standard

The limit for EIRP (section 2.2) for ISED RSS-210 used was taken from ISED RSS-210 Issue 11 clause J.3.2(b)(iii)(1). The applicable limit in ISED RSS-210 Issue 10, clause J.2.1 included a peak conducted output power limit of -10 dBm and an EIRP limit of 10 dBm, however the revised limit of the updated standard has been applied.

At the time of issue of this report, RSS-210 Issue 11 is pending review with TUV SUD UK accreditation body and conformance to RSS-210 Issue 10 is accepted during the transition period expiring December 2024. RSS-210 Issue 10 is listed on TUV SUD's UKAS scope of accreditation.

No other 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: G2, Serial Number: 28330003			
0	As supplied by the customer	Not Applicable	Not Applicable
Model: G2, Serial Number: 28330004			
0	As supplied by the customer	Not Applicable	Not Applicable

Table 14

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: 12V DC Powered - 60GHz Radar Transmit		
AC Power Line Conducted Emissions	Matthew Dawkins	UKAS
Equivalent Isotropically Radiated Power	Matthew Russell	UKAS
Spurious Radiated Emissions	Matthew Russell	UKAS
Frequency Stability and Emission Bandwidth	Matthew Russell	UKAS

Table 15

Office Address:

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

2 Test Details

2.1 AC Power Line Conducted Emissions

2.1.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.207
ISED RSS-GEN, Clause 8.8

2.1.2 Equipment Under Test and Modification State

G2, S/N: 28330003 - Modification State 0

2.1.3 Date of Test

29-June-2024

2.1.4 Test Method

The test was performed in accordance with ANSI C63.10, clause 6.2.

2.1.5 Environmental Conditions

Ambient Temperature	24.1 °C
Relative Humidity	41.3 %

2.1.6 Test Results

12V DC Powered - 60GHz Radar Transmit

Applied supply Voltage: 60 Hz
Applied supply frequency: 120 V AC

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.153	50.51	65.90	-15.39	Q-Peak
0.153	29.93	55.90	-25.97	CISPR Avg
0.170	47.94	65.00	-17.06	Q-Peak
0.170	29.74	55.00	-25.26	CISPR Avg
0.197	42.62	63.70	-21.08	Q-Peak
0.197	24.86	53.70	-28.84	CISPR Avg
0.285	21.17	50.70	-29.53	CISPR Avg
0.285	33.58	60.70	-27.12	Q-Peak
0.323	32.68	59.60	-26.92	Q-Peak
0.323	13.83	49.60	-35.77	CISPR Avg
0.372	37.83	58.50	-20.67	Q-Peak
0.372	29.71	48.50	-18.79	CISPR Avg

Table 16 - Live Line Emissions Results

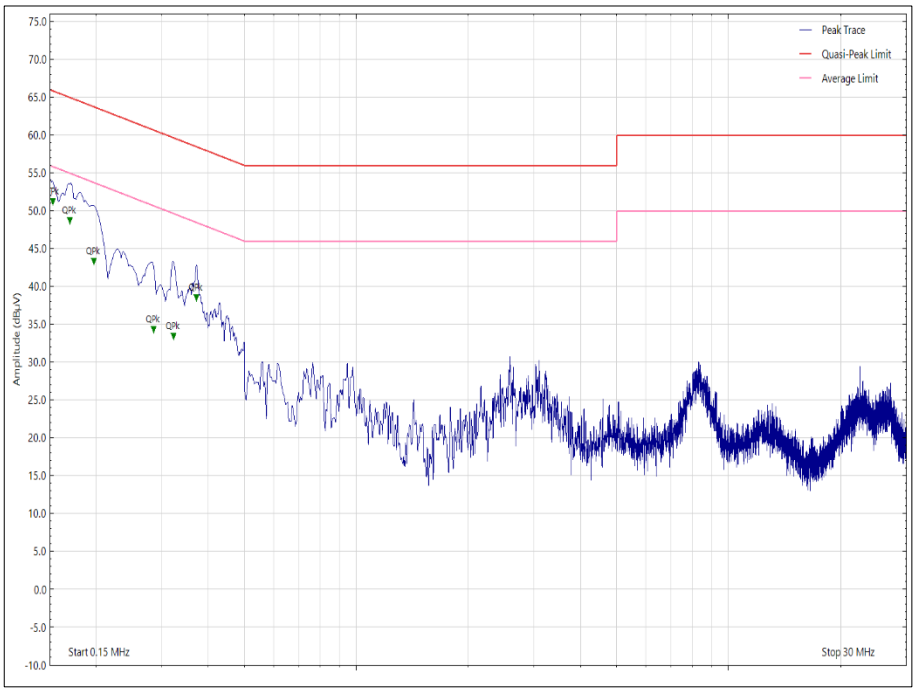


Figure 2 - Live Line - 150 kHz to 30 MHz

Frequency (MHz)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector
0.154	33.78	55.80	-22.02	CISPR Avg
0.154	50.23	65.80	-15.57	Q-Peak
0.171	32.01	54.90	-22.89	CISPR Avg
0.171	47.82	64.90	-17.08	Q-Peak
0.200	26.46	53.60	-27.14	CISPR Avg
0.200	42.39	63.60	-21.21	Q-Peak
0.232	27.05	52.40	-25.35	CISPR Avg
0.232	40.32	62.40	-22.08	Q-Peak
0.308	14.85	50.00	-35.15	CISPR Avg
0.308	32.78	60.00	-27.22	Q-Peak
0.370	31.00	48.50	-17.50	CISPR Avg
0.370	39.35	58.50	-19.15	Q-Peak

Table 17 - Neutral Line Emissions Results

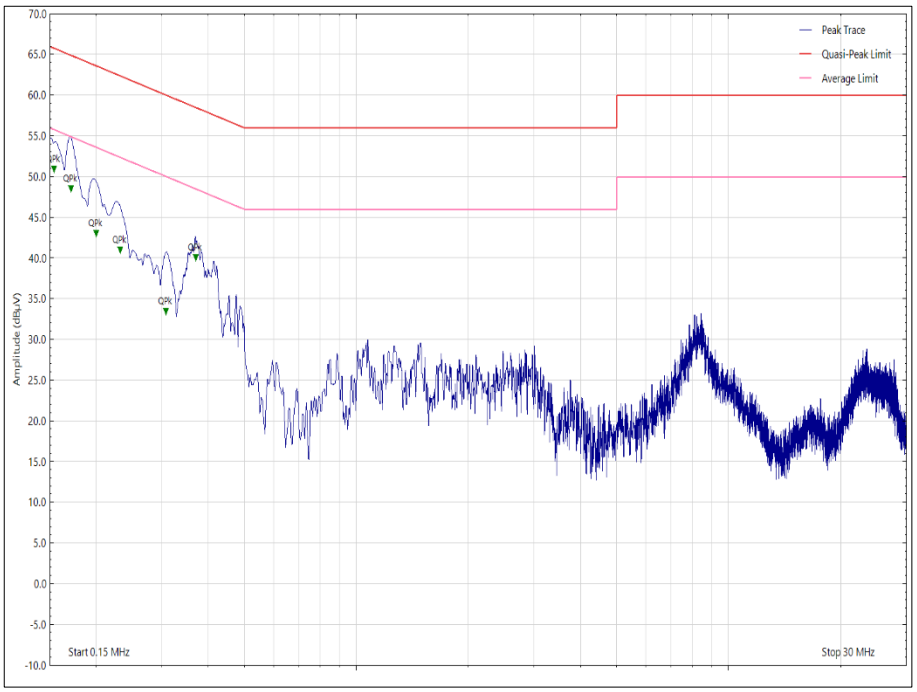


Figure 3 - Neutral Line - 150 kHz to 30 MHz

FCC 47 CFR Part 15, Limit Clause 15.207 and Industry Canada RSS-GEN, Limit Clause 8.8

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50

Table 18

*Decreases with the logarithm of the frequency.

2.1.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 5.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Transient Limiter	Hewlett Packard	11947A	15	12	24-Oct-2024
LISN (CISPR 16, Single Phase)	Rohde & Schwarz	ESH3-Z5	1390	12	1-Feb-2025
3m Semi-Anechoic Chamber	Rainford	RF Chamber 5	1545	36	23-Apr-2027
Emissions Software	TUV SUD	EmX V3.2.0 V.	5125	-	N/A - Software
Test Receiver	Rohde & Schwarz	ESW44	5379	12	12-Dec-2024
Cable (SMA to SMA, 2 m)	Junkosha	MWX221-02000AMSAMS/A	5518	12	18-Apr-2025
Cable (N to N 8m)	Junkosha	MWX221-08000NMSNMS/B	6331	12	17-Feb-2025

Table 19

2.2 Equivalent Isotropically Radiated Power

2.2.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.255(c)
ISED RSS-210, Clause J.2

2.2.2 Equipment Under Test and Modification State

G2, S/N: 28330004 - Modification State 0

2.2.3 Date of Test

17-July-2024

2.2.4 Test Method

This test was performed in accordance with ANSI C63.10 clause 9.8.

The EUT was setup at a height of 1.5m on a non-conducting platform. The measurement antenna was attached to the external mixer and all faces of the EUT was swept to determine the position resulting in the maximum level. The EUT was then positioned in this orientation and the measurement antenna was placed at a distance of 1m.

The external mixer conversion loss factor was loaded in to the spectrum analyser. The centre frequency was set to 62 GHz with a span of 6 GHz, 1 MHz RBW, 3 MHz VBW and peak detector with max-hold trace. The peak search marker was used to determine the peak level and this value was noted.

ANSI C63.10 equation 22 was used to determine the EIRP from the power level noted above.

$$EIRP = 21.98 - 20\log(\lambda) + 20\log(d_{Meas}) + P - G$$

where

$EIRP$	is the equivalent isotropic radiated power, in dBm
λ	is the wavelength of the emission under investigation [300/f(MHz)], in m
d_{Meas}	is the measurement distance, in m
P	is the power measured at the output of the measurement antenna, in dBm
G	is the gain of the measurement antenna, in dBi

As the EUT uses FMCW modulation, as per ANSI C63.10 Annex L the desensitization correction factor was calculated in accordance with equation L.1

$$\alpha = \frac{1}{\sqrt{1+\left(\frac{2\ln(2)}{\pi}\right)^2\left(\frac{BW_{Chirp}}{T_{Chirp}B^2}\right)^2}}$$

where

α	is the reduction in amplitude
BW_{Chirp}	is the FMCW Chirp Bandwidth
T_{Chirp}	is the FMCW Chirp Time
B	is the 3 dB IF Bandwidth = RBW

where the BWchirp = 4000 MHz, Tchirp = 64 us and RBW = 1 MHz.

α= 14.41 dB.

2.2.5 Environmental Conditions

Ambient Temperature	21.2 °C
Relative Humidity	41.8 %

2.2.6 Test Results

12V DC Powered - 60GHz Radar Transmit

Modulation Bandwidth (MHz)	On-Time (ms)	Off Time (ms)	Interval Period (ms)	Verdict
4000	0.33	49.67	50.0	Pass

Table 20 - Timing Parameters

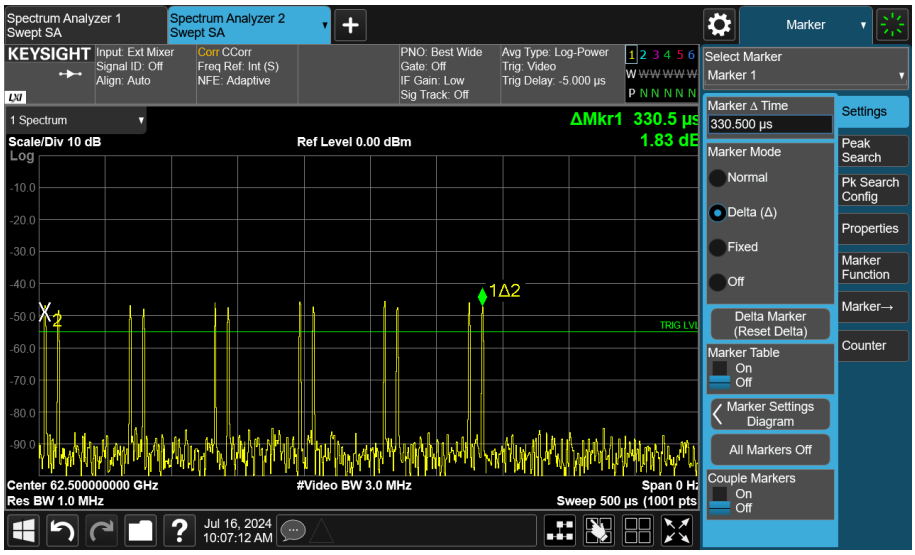


Figure 4 – Radar Chirp Sequence Duration

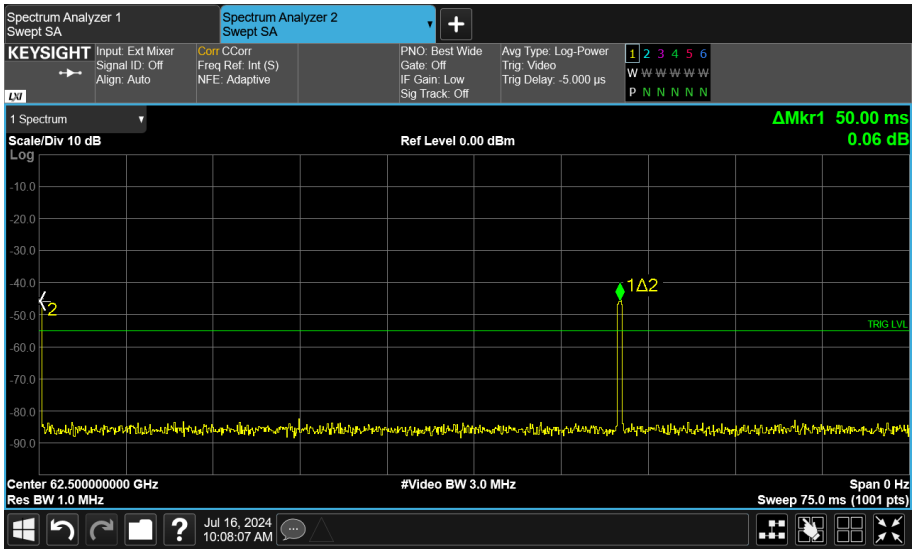


Figure 5 – Radar Period

Modulation Bandwidth (MHz)	Measurement Type	Result (dBm)	Limit	Verdict
4000	Peak EIRP	13.65	14.0	Pass

Table 21 - Radiated Power Results, 62 GHz MHz

FCC Part 15.255 Limit Clause 15.255(c)(2)(iii)(A)

Any terrestrial radar operating within the 57.0-64.0 GHz band segment can be certified under §15.255(c)(2)(iii)(A), with a peak EIRP limit of 14 dBm and a corresponding off-time requirement of 25.5 milliseconds within any 33.0-millisecond interval.

ISED RSS-210 Issue 11, Limit Clause J.3.2(b)(iii)(1)

The peak e.i.r.p. shall not exceed 14 dBm and the sum of continuous transmitter off-times of at least 2 ms shall equal at least 25.5 ms within any contiguous interval of 33 ms.

2.2.7 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Signal Analyzer	Keysight Technologies	PXA N9030B	5432	12	22-Jul-2024
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	07-May-2025
3m Semi-Anechoic Chamber	MVG	EMC Chamber 12	5621	36	07-Aug-2026
SAX WR15 (50-75 GHz)	Virginia Diodes	N9029AV15	6076	12	O/P Mon
SGX WR15 (50-75 GHz)	Virginia Diodes	N5179V-W15	6080	12	O/P Mon
Signal Generator (250 MHz - 67 GHz	Keysight Technologies	E8257D	6090	24	30-May-2026
Horn Antenna 50-75GHz	Custom Microwave Inc.	HO15R	6108	12	12-Apr-2025
Horn Antenna 50-75GHz	Custom Microwave Inc.	HO15R	6109	12	12-Apr-2025
WR15 Attenuator	Eravant	STA 30 15 M1	6125		O/P Mon

Table 22

O/P Mon – Output Monitored using calibrated equipment

2.3 Spurious Radiated Emissions

2.3.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.255(d), 15.209
ISED RSS-210, Clause J.3
ISED RSS-GEN, Clause 8.9

2.3.2 Equipment Under Test and Modification State

G2, S/N: 28330004 - Modification State 0

2.3.3 Date of Test

16-July-2024 to 18-July-2024

2.3.4 Test Method

Measurements below 40 GHz were performed in accordance with ANSI C63.10 clause 6.5 and 6.6.

The measurement distance was reduced from 3m to 1m for measurements between 18 GHz and 40 GHz and the limit corrected by:

20*LOG(3/1) = 9.54 dB

Measurements above 40 GHz were performed in accordance with ANSI C63.10 clause 9.6, 9.8, 9.9 and 9.12.

The measurement distance was determined from the table below where:

$D_{Far\text{-}Field} = 2 \times D^2 / \lambda$

Antenna Frequency Range	D (cm)	λ (cm) at upper frequency range	$D_{Far\text{-}Field}$ (cm)	Measurement distance (cm)
40 to 50 GHz	4.44	0.60	65.71	100
50 to 75 GHz	3.75	0.40	70.31	100
75 to 90 GHz	3.05	0.33	56.38	100
90 to 140 GHz	2.08	0.21	41.20	50
140 to 200 GHz	1.42	0.15	26.89	50

Table 23

Th33.2e plots shown below include the mixer conversion loss as an internal correction factor. From the peak marker on the plot the EIRP was calculated using ANSI C63.10 equation 22.

$$EIRP = 21.98 - 20\log(\lambda) + 20\log(d_{Meas}) + P - G$$

where

$EIRP$	is the equivalent isotropic radiated power, in dBm
λ	is the wavelength of the emission under investigation [300/f(MHz)], in m
d_{Meas}	is the measurement distance, in m
P	is the power measured at the output of the measurement antenna, in dBm
G	is the gain of the measurement antenna, in dBi

The linear EIRP was then calculated using ANSI 63.10 equation 24.

$$EIRP_{Linear} = 10^{[(EIRP_{LOG} - 30)/10]}$$

where

$EIRP_{Linear}$	is the equivalent isotropic radiated power, in Watts
$EIRP_{Log}$	is the equivalent isotropic radiated power, in dBm

The power density was then determined using ANSI C63.10 equation 25 and converted to pW/cm2.

$$PD = \frac{EIRP_{Linear}}{(4\pi d^2)}$$

2.3.1 Example Test Setup Diagrams

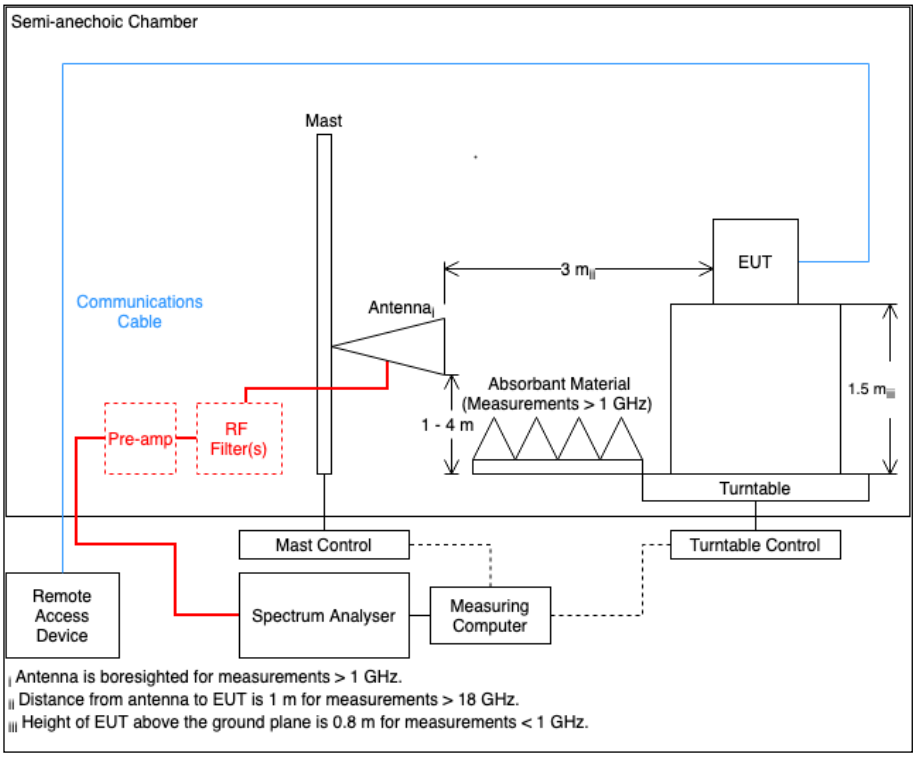


Figure 6 - 30 MHz to 40 GHz

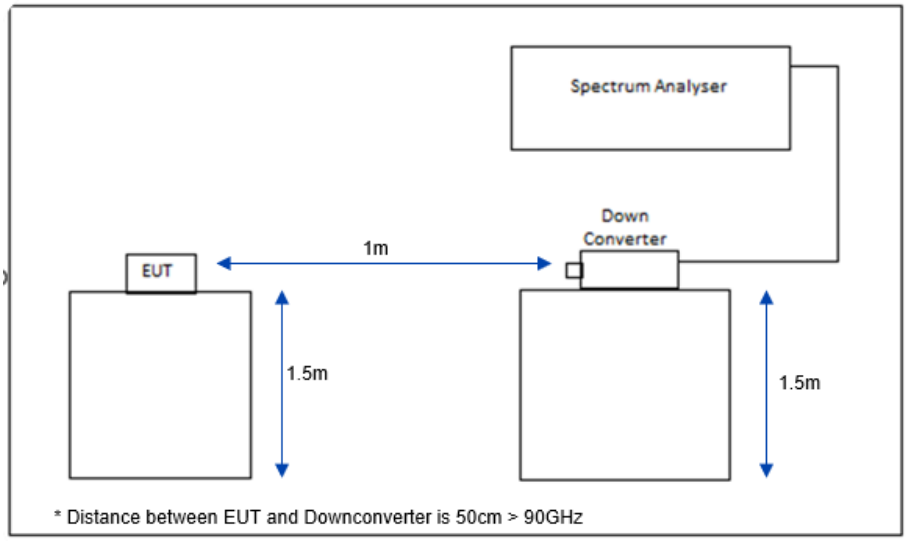


Figure 7 - 40 GHz to 200 GHz

2.3.2 Environmental Conditions

Ambient Temperature	19.3 - 21.1 °C
Relative Humidity	59.8 - 61.2 %

2.3.3 Test Results

12V DC Powered - 60GHz Radar Transmit

Frequency (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector:	Angle (°)	Height (cm)	Polarisation	EUT Orientation
40.806	26.63	40.0	-13.37	Q-Peak	83	102	Vertical	X
441.307	35.27	46.0	-10.73	Q-Peak	22	117	Vertical	X
465.847	33.24	46.0	-12.76	Q-Peak	83	100	Horizontal	X
2999.810	57.04	74.0	-16.96	Peak	157	270	Horizontal	X
2999.995	48.35	54.0	-5.65	RMS	157	270	Horizontal	X
3000.020	43.48	54.0	-10.52	RMS	257	368	Vertical	X
14400.070	40.46	54.0	-13.54	RMS	257	368	Vertical	X
14400.090	43.83	54.0	-10.17	RMS	351	104	Horizontal	X
28800.145	48.92	54.0	-14.58	RMS	322	110	Horizontal	X

Table 24 - 62 GHz - Spurious Emissions Results

No other emissions were found within 10 dB of the limit.

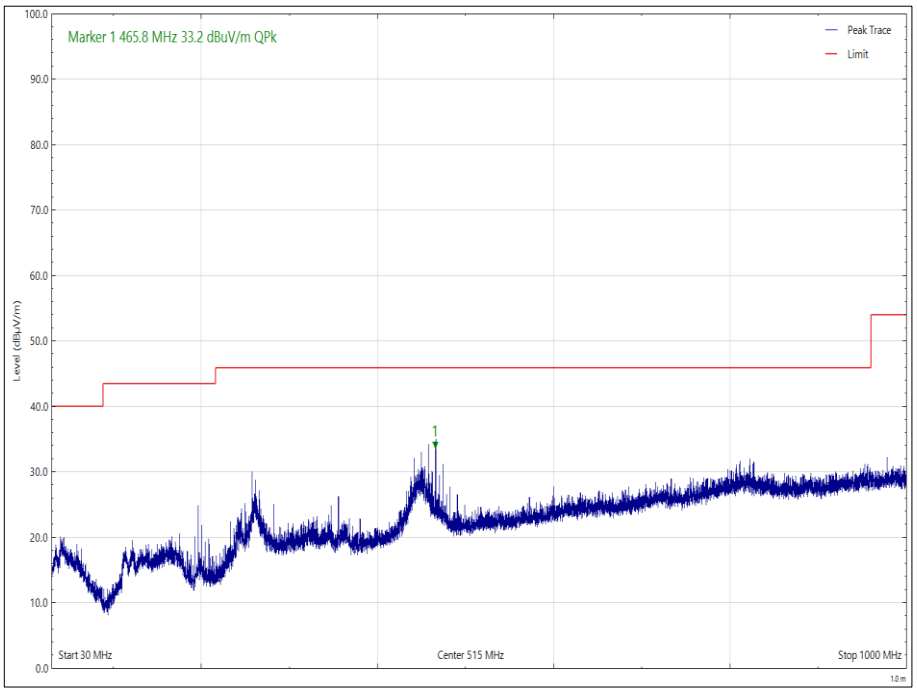


Figure 8 - 62 GHz MHz, Frequency Range 30 MHz to 1 GHz, Polarisation: Horizontal, EUT Orientation: X

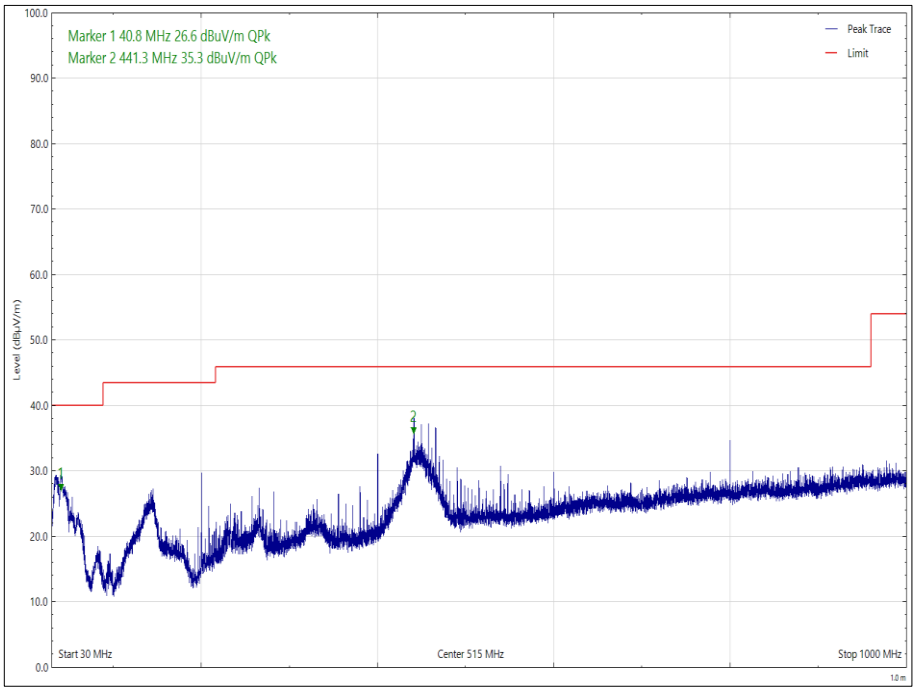


Figure 9 - 62 GHz MHz, Frequency Range 30 MHz to 1 GHz, Polarisation: Vertical, EUT Orientation: X

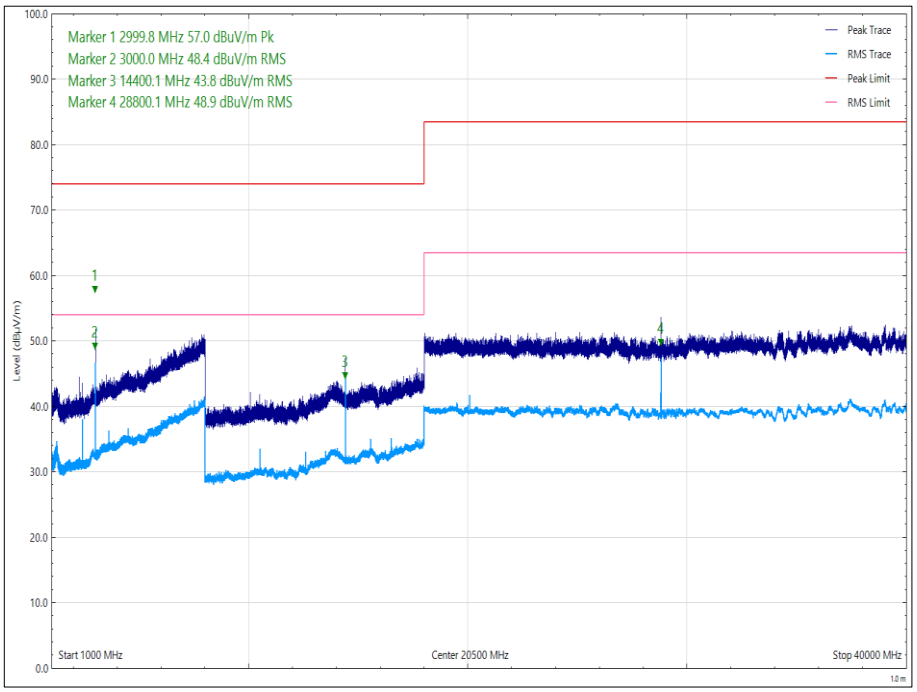


Figure 10 - 62 GHz MHz, Frequency Range 1 GHz to 40 GHz, Polarisation: Horizontal, EUT Orientation: X

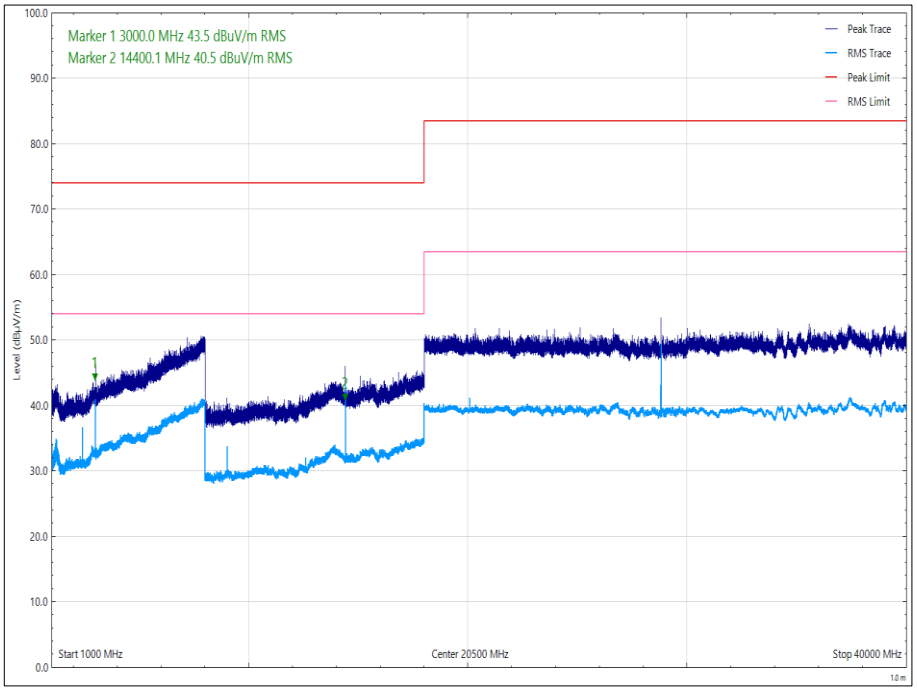


Figure 11 - 62 GHz MHz, Frequency Range 1 GHz to 40 GHz, Polarisation: Vertical, EUT Orientation: X

Frequency (MHz)	Level (pW/cm^2)	Limit (pW/cm^2)
48.48	11.17	90.0
53.27	0.32	90.0
64.09	2.15	90.0
76.71	0.67	90.0
124.65	0.01	90.0
141.62	0.09	90.0

Table 25 - 62 GHz - 40 GHz to 200 GHz

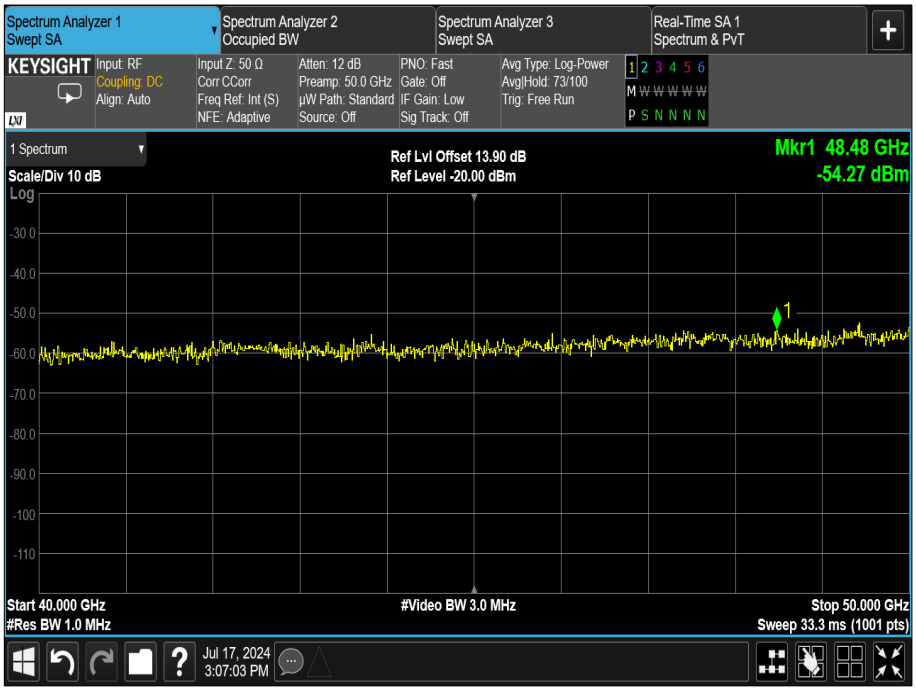


Figure 12 - 62 GHz MHz, Frequency Range 40 to 50 GHz

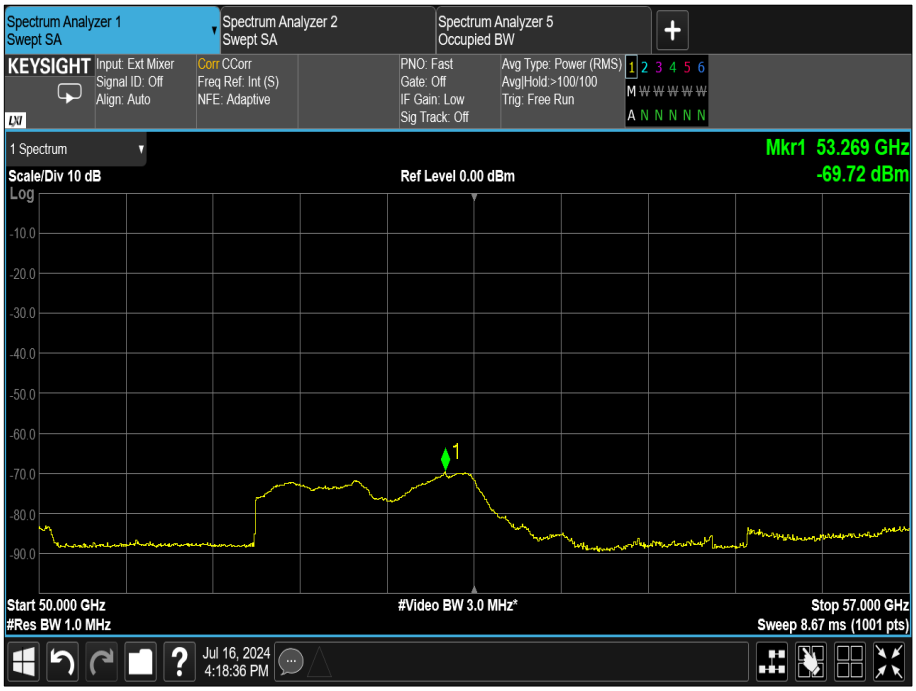


Figure 13 - 62 GHz MHz, Frequency Range 50 to 57 GHz

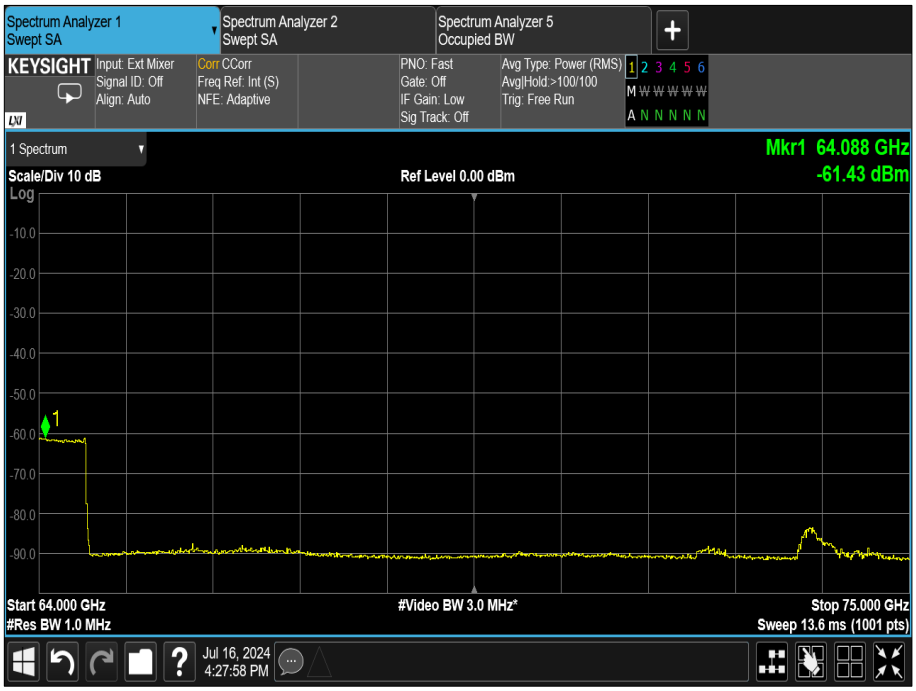


Figure 14 - 62 GHz MHz, Frequency Range 64 to 75 GHz

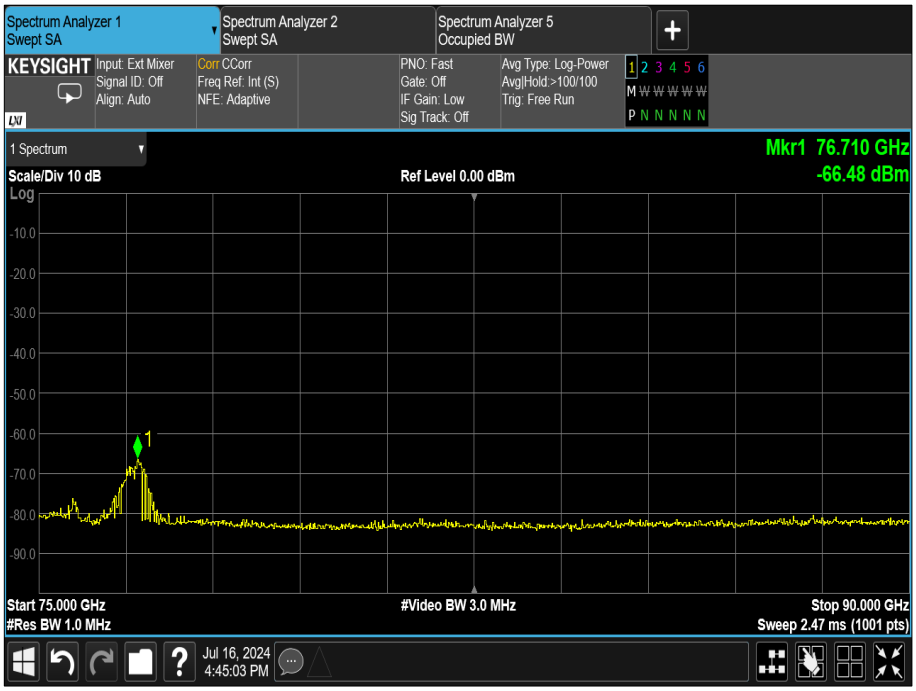


Figure 15 - 62 GHz MHz, Frequency Range 75 to 90 GHz

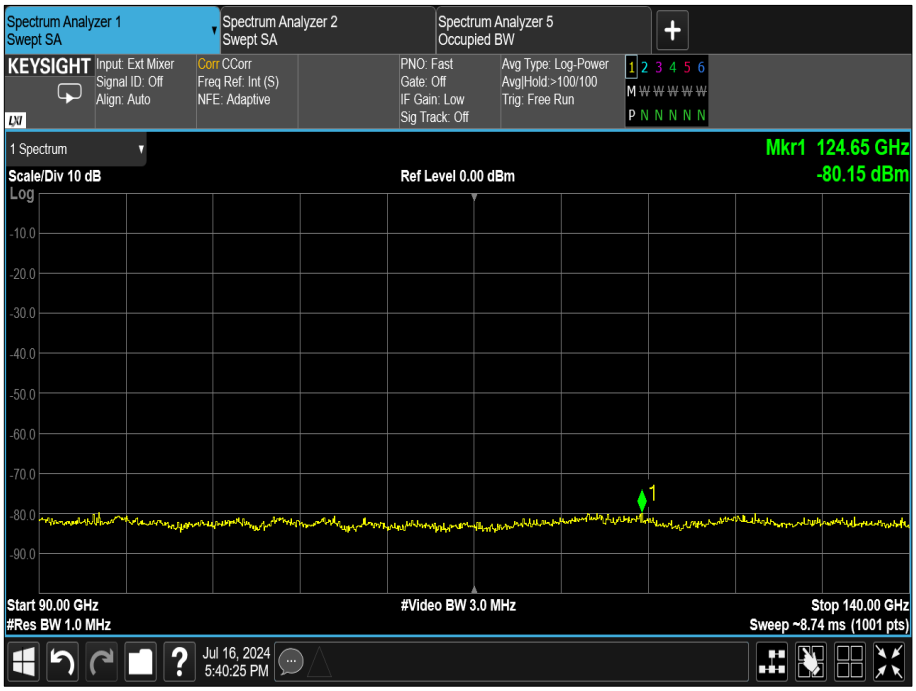


Figure 16 - 62 GHz MHz, Frequency Range 90 to 140 GHz

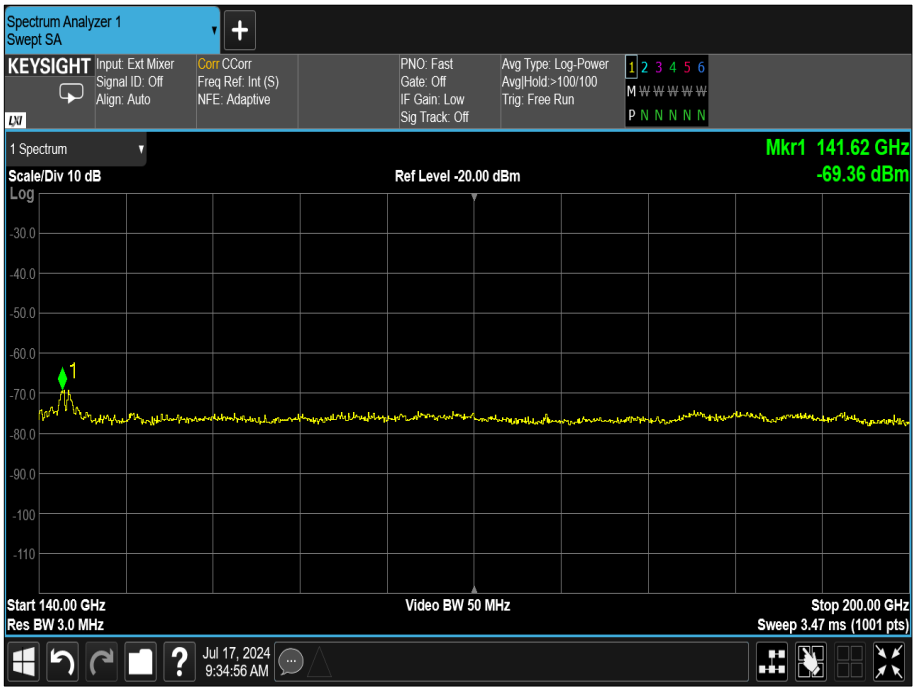


Figure 17 - 62 GHz MHz, Frequency Range 140 to 200 GHz

FCC Part 15, Limit Clause 15.255(d)

1) The power density of any emissions outside the 57–71 GHz band shall consist solely of spurious emissions.
2) Radiated emissions below 40 GHz shall not exceed the general limits in 47 CFR Part 15.209.
3) Between 40 GHz and 200 GHz, the level of these emissions shall not exceed 90 pW/cm2 at a distance of 3 meters.
4) The levels of the spurious emissions shall not exceed the level of the fundamental emission.

FCC 47 CFR Part 15, Limit Clause 15.209

Frequency (MHz)	Field Strength (µV/m)	Measurement Distance
30 to 88	100	3
88 to 216	150	3
216 to 960	200	3
Above 960	500	3

Table 26 - 15.209 Radiated Emission Limits

ISED RSS-210, Limit Clause J.3

The power of any emissions outside the band 57-71 GHz shall consist solely of spurious emissions and shall not exceed:

a) The fundamental emission levels
b) The general field strength limits specified in RSS-Gen for emissions below 40 GHz
c) 90 pW/cm2 at a distance of 3 m for emissions between 40 GHz and 200 GHz

ISED RSS-GEN, Limit Clause 8.9

Frequency (MHz)	Field Strength (µV/m at 3 m)	Field Strength (dBµV/m at 3 m)
30 to 88	100	40.00
88 to 216	150	43.52
216 to 960	200	46.02
Above 960	500	53.98

Table 27 - RSS-GEN Radiated Emission Limits

2.3.4 Test Location and Test Equipment Used

This test was carried out in EMC Chamber 12 and RF Chamber 11.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
Antenna (DRG, 18 GHz to 40 GHz)	Link Microtek Ltd	AM180HA-K-TU2	230	24	23-Sep-2024
Pre-Amplifier (18 GHz to 40 GHz)	Phase One	PSO4-0087	1534	12	13-Feb-2025
Multimeter	Iso-tech	IDM 101	2118	12	23-May-2025
Programmable Power Supply	Iso-tech	IPS 2010	2437	-	O/P Mon
True RMS Multimeter	Fluke	179	4006	12	22-Mar-2025
4dB Attenuator	Pasternack	PE7047-4	4935	12	20-Jul-2024
Test Receiver	Rohde & Schwarz	ESW44	5084	12	04-Nov-2024
3m Semi-Anechoic Chamber	Rainford	RF Chamber 11	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 GHz to 10.5 GHz)	Schwarzbeck	BBHA9120B	5215	12	14-Jul-2025
Antenna (DRG, 7.5 GHz to 18 GHz)	Schwarzbeck	HWRD750	5348	12	15-Oct-2024
Cable 2.92m	Junkosha	MWX241-01000KMS	5412	12	23-May-2025
Cable 2.92mm 1m	Junkosha	MWX241-01000KMS	5414	12	27-Jul-2024
Signal Analyzer	Keysight Technologies	PXA N9030B	5432	12	22-Jul-2024
Pre-Amplifier (1 GHz to 26.5 GHz)	Agilent Technologies	8449B	5445	12	23-May-2025
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	07-May-2025
Thermo-Hygro-Barometer	PCE Instruments	PCE-THB-40	5481	12	13-May-2025
Cable (K-Type to K-Type, 1 m)	Junkosha	MWX241-01000KMSKMS/A	5512	12	23-May-2025
Pre-Amplifier (8 GHz to 18 GHz)	Wright Technologies	APS06-0061	5596	12	27-Oct-2024
3m Semi-Anechoic Chamber	MVG	EMC Chamber 12	5621	36	07-Aug-2026
Cable (K-Type to K-Type, 2 m)	Junkosha	MWX241/B	5909	12	18-Feb-2025
Cable 1.85mm MM 40inch	Eravant	SCW VMVM040 F1	6075	-	O/P Mon
SAX WR15 (50-75 GHz)	Virginia Diodes	N9029AV15	6076	12	O/P Mon

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
SAX WR5.1 (140-220 GHz)	Virginia Diodes	N9029AV05	6077	12	O/P Mon
SGX WR12 (60-90 GHz)	Virginia Diodes	N5179V W12	6078	12	O/P Mon
SAX WR8.0 (90-140 GHz)	Virginia Diodes	N9029AV08	6079	12	O/P Mon
SAX WR15 (50-75 GHz)	Virginia Diodes	N5179V-W15	6080	12	O/P Mon
SGX WR5.1 (140-220 GHz)	Virginia Diodes	N5179V W05	6081	12	O/P Mon
Signal Generator (250 MHz - 67 GHz	Keysight Technologies	E8257D	6090	24	30-May-2026
SAX WR12 (60-90 GHz)	Virginia Diodes	N9029AV12	6091	-	O/P Mon
SXG WR8.0 (90-140 GHz)	Virginia Diodes	N5179V W08	6092	-	O/P Mon
6 dB Attenuator (DC-67 GHz)	Keysight Technologies	8490G	6095	-	O/P Mon
6 dB Attenuator (DC-67 GHz)	Keysight Technologies	8490G	6096	-	O/P Mon
Cable 1.85mm MM 48inch	Eravant	SCW VMVM048 F1	6100		O/P Mon
Horn Antenna 140-220GHz	Custom Microwave Inc.	HO5R	6102	12	12-Apr-2025
Horn Antenna 140-220GHz	Custom Microwave Inc.	HO5R	6103	12	12-Apr-2025
Horn Antenna 90-140GHz	Custom Microwave Inc.	HO8R	6104	12	12-Apr-2025
Horn Antenna 60-90GHZ	Custom Microwave Inc.	HO12R	6105	12	01-Feb-2025
Horn Antenna 60-90GHZ	Custom Microwave Inc.	HO12R	6106	12	12-Apr-2025
Horn Antenna 60-90GHZ	Custom Microwave Inc.	HO12R	6107	12	12-Apr-2025
Horn Antenna 50-75GHz	Custom Microwave Inc.	HO15R	6108	12	12-Apr-2025
Horn Antenna 50-75GHz	Custom Microwave Inc.	HO15R	6109	12	12-Apr-2025
Horn Antenna 40-60GHz	Custom Microwave Inc.	HO19R	6110	12	12-Apr-2025
Horn Antenna 40-60GHz	Custom Microwave Inc.	HO19R	6111	12	12-Apr-2025
WR15 2 inch Waveguide Section	Eravant	SWG 15020 FB	6121		O/P Mon
WR12 2inch Waveguide Section	Eravant	SWG 12020 FB	6122		O/P Mon
WR08 2 inch Waveguide Section	Eravant	SWG 08020 FB	6123		O/P Mon
WR05 2 inch Waveguide Section	Eravant	SWG 05020 FB	6124		O/P Mon
WR15 Attenuator	Eravant	STA 30 15 M1	6125		O/P Mon
WR12 Attenuator	Eravant	STA 30 12 M1	6126		O/P Mon
WR08 Attenuator	Eravant	STA 30 08 M1	6127		O/P Mon
WR05 Attenuator	Eravant	STA 30 05 M3 2	6128		O/P Mon

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
1.85mm End launch Adapter	Eravant	SWC 19VF E1	6138		O/P Mon
1.85mm End launch Adapter	Eravant	SWC 19VF E1	6139		O/P Mon
Cable (N to N 8m)	Junkosha	MWX221-08000NMSNMS/B	6330	12	17-Feb-2025
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	6635	24	13-Jun-2025

Table 28

TU - Traceability Unscheduled
O/P Mon – Output Monitored using calibrated equipment

2.4 Frequency Stability and Emission Bandwidth

2.4.1 Specification Reference

FCC 47 CFR Part 15C, Clause 15.255(f)
ISED RSS-210, Clause J.4(c), J.6
ISED RSS-GEN, Clause 6.7 and 8.11

2.4.2 Equipment Under Test and Modification State

G2, S/N: 28330004 - Modification State 0

2.4.3 Date of Test

19-July-2024

2.4.4 Test Method

This test was performed in accordance with ANSI C63.10 clause 9.5, RSS-GEN clause 6.11 and KDB 364244 D01 clause 9.

2.4.5 Environmental Conditions

Ambient Temperature	21.6 °C
Relative Humidity	51.9 %

2.4.6 Test Results

12V DC Powered - 60GHz Radar Transmit

Temperature	Voltage	Modulation Bandwidth (MHz)	62 GHz MHz					
			99% OBW			6 dB BW		
			F_L (GHz)	F_U (GHz)	$F_U - F_L$ (GHz)	F_L (GHz)	F_U (GHz)	$F_U - F_L$ (GHz)
-20 ˚C	12.0 V DC	4000	60.321	63.928	3.607	60.308	63.947	3.639
-10 ˚C	12.0 V DC	4000	60.323	63.930	3.607	60.31	63.950	3.640
0 ˚C	12.0 V DC	4000	60.325	63.931	3.606	60.31	63.948	3.638
10 ˚C	12.0 V DC	4000	60.324	63.930	3.600	60.31	63.948	3.638
20 ˚C	12.0 V DC	4000	60.321	63.930	3.609	60.309	63.949	3.640
30 ˚C	12.0 V DC	4000	60.326	63.924	3.598	60.313	63.943	3.630
40 ˚C	12.0 V DC	4000	60.327	63.921	3.594	60.31	63.947	3.637
50 ˚C	12.0 V DC	4000	60.326	63.921	3.595	60.31	63.947	3.637

Table 29 - Occupied Bandwidth & Frequency Stability Under Temperature Variations

Temperature	Voltage	Modulation Bandwidth (MHz)	62 GHz					
			99% OBW			6 dB BW		
			F_L (GHz)	F_U (GHz)	F_L (GHz)	F_U (GHz)	F_L (GHz)	F_U (GHz)
20 ˚C	10.2 V DC	4000	60.322	63.928	3.606	60.310	63.948	3.638
20 ˚C	13.8 V DC	4000	60.323	63.926	3.603	60.309	63.947	3.638

Table 30 - Occupied Bandwidth & Frequency Stability Under Voltage Variations

Figure 18 – Occupied Bandwidth, 20 ˚C, 10.2 V DC

Figure 19 – Occupied Bandwidth, 20 ˚C, 13.8 V DC

FCC Part 15, Limit Clause 15.255(f)

Fundamental emissions must be contained within the frequency bands specified in this section during all conditions of operation. Equipment is presumed to operate over the temperature range −20 to +50 degrees Celsius with an input voltage variation of 85% to 115% of rated input voltage, unless justification is presented to demonstrate otherwise.

ISED RSS-210, Limit Clause J.6

Fundamental emissions shall be contained within the 57-71 GHz frequency band during all conditions of operation when tested at the temperature and voltage variations specified for the frequency stability measurement in RSS-Gen.

2.4.7 Test Location and Test Equipment Used

This test was carried out in RF Laboratory 1.

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
True RMS Multimeter	Fluke	79 Series II	411	12	12-Jan-2025
Hygrometer	Rotronic	I-1000	3220	12	28-Nov-2024
GPSDR Frequency Standard	Spectracom	SecureSync 1200-0408-0601	4393	6	14-Sep-2024
Quad Power Supply	Rohde & Schwarz	HMP4040	4955	-	O/P Mon
Signal Analyzer	Keysight Technologies	PXA N9030B	5432	12	22-Jul-2024
Climatic Chamber	Weiss Technik	TempEvent T/180/40/3	5894	12	15-Aug-2024
SAX WR15 (50-75 GHz)	Virginia Diodes	N9029AV15	6076	12	O/P Mon
Horn Antenna 50-75GHz	Custom Microwave Inc.	HO15R	6109	12	12-Apr-2025

Table 31

O/P Mon – Output Monitored using calibrated equipment

3 Photographs

3.1 Test Setup Photographs

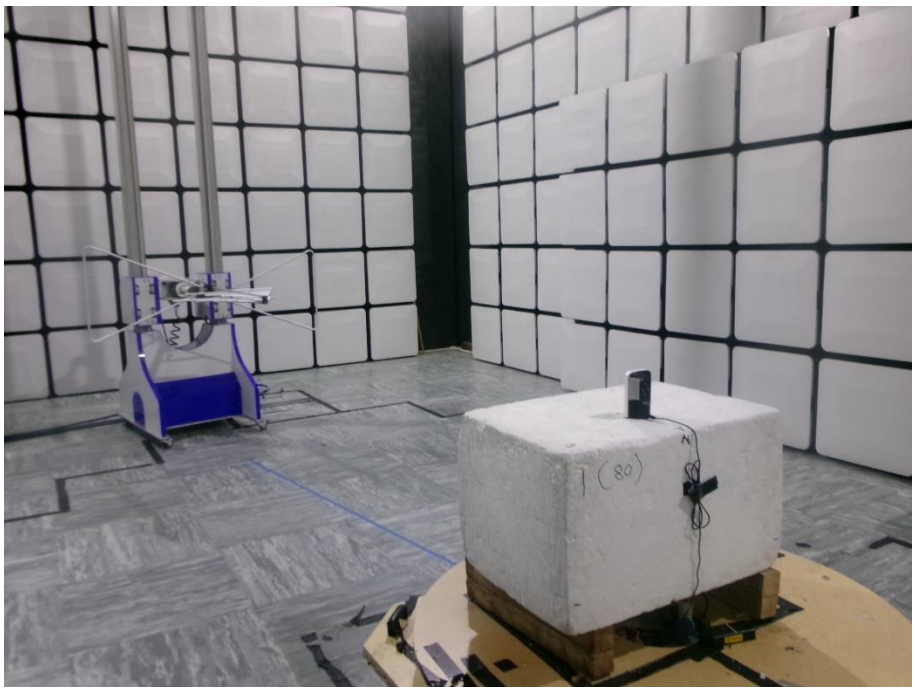


Figure 20 - 30 MHz to 1 GHz

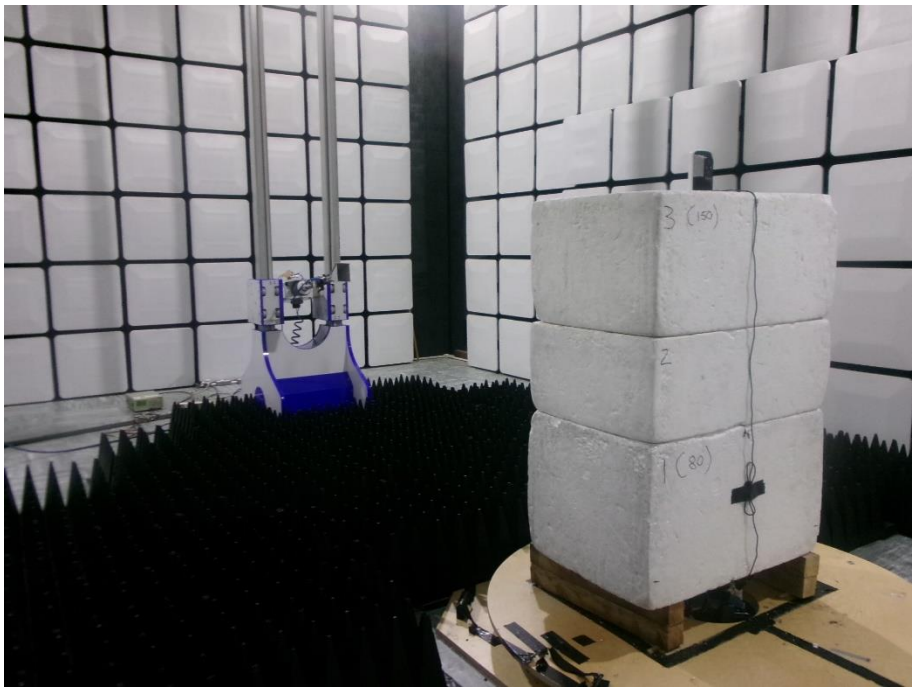


Figure 21 - 1 GHz to 18 GHz

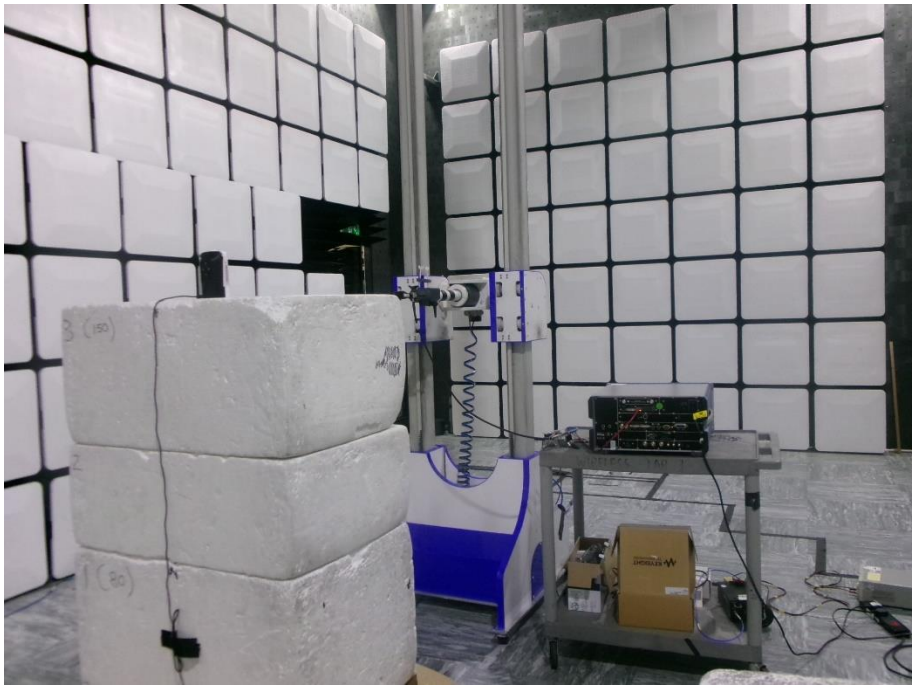


Figure 22 - 18 GHz to 40 GHz

Figure 23 - 40 GHz to 90 GHz

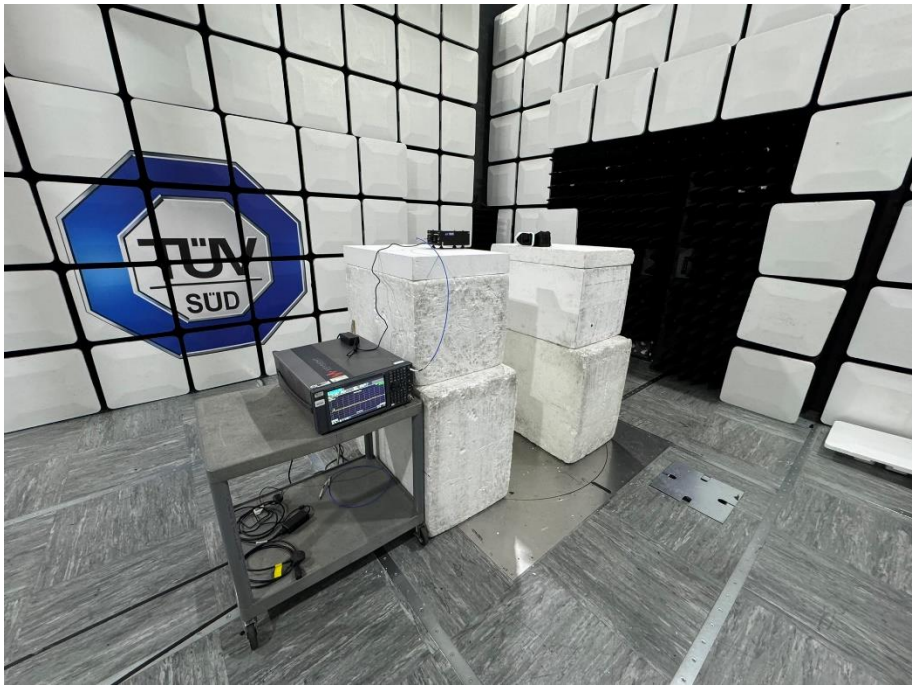


Figure 24 - 90 GHz to 200 GHz

4 Measurement Uncertainty

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

Test Name	Measurement Uncertainty
AC Power Line Conducted Emissions	150 kHz to 30 MHz, LISN, ±3.7 dB
Equivalent Isotropically Radiated Power	50 to 120 GHz: ±4.91 dB
Spurious Radiated Emissions	30 MHz to 1 GHz: ± 5.2 dB 1 to 40 GHz: ± 6.3 dB 40 to 67 GHz: ±3.06 dB 50 to 120 GHz: ±4.91 dB 90 to 220 GHz: ±4.09 dB
Frequency Stability and Emission Bandwidth	±51.46 MHz

Table 32

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.