FCC and ISED Test Report

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

In accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 15, FCC 47 CFR Part 24, FCC 47 CFR Part 27, ISED RSS-130, ISED RSS-133, ISED RSS-210 & ISED RSS-GEN
(4G & 60 GHz Radio)

Prepared for: BreatheOx Limited T/A Albus Health
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Oxford, Oxfordshire
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FCC ID: 2BGXS-G2 IC: 32679-G2

COMMERCIAL-IN-CONFIDENCE

Document 75961718-03 Issue 01

SIGNATURE			
S. MM			
NAME	**JOB TITLE**	**RESPONSIBLE FOR**	**ISSUE DATE**
Steve Marshall	Senior Engineer	Authorised Signatory	30 July 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 2, FCC 47 CFR Part 15, FCC 47 CFR Part 24, FCC 47 CFR Part 27, ISED RSS-130, ISED RSS-133, ISED RSS-210 & ISED RSS-GEN. The sample tested was found to comply with the requirements defined in the applied rules.

RESPONSIBLE FOR	NAME	DATE	SIGNATURE
Testing	Aakash Rawal	30 July 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 2: 2022, FCC 47 CFR Part 15: 2022, FCC 47 CFR Part 24: 2022, FCC 47 CFR Part 27: 2022, ISED RSS-130: Issue 2 (02-2019), ISED RSS-133: Issue 6 (01-2018), ISED RSS-210: Issue 10 (12-2019) + A1 (04-2020) & ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021) for the tests detailed in section 1.3.

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Contents

1 Report Summary 2

1.1 Report Modification Record 2
1.2 Introduction 2
1.3 Brief Summary of Results 3
1.4 Application Form 4
1.5 Product Information 8
1.6 Deviations from the Standard 8
1.7 EUT Modification Record 8
1.8 Test Location 8

2 Test Details 9

2.1 Radiated Spurious Emissions (Simultaneous Transmission) 9

3 Photographs 19

3.1 Test Setup Photographs 19

4 Measurement Uncertainty 21

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

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)	28330004
Hardware Version(s)	v2
Software Version(s)	V21.00.00
Number of Samples Tested	1
Test Specification/Issue/Date	FCC 47 CFR Part 2: 2022 FCC 47 CFR Part 15: 2022 FCC 47 CFR Part 24: 2022 FCC 47 CFR Part 27: 2022 ISED RSS-130: Issue 2 (02-2019) ISED RSS-133: Issue 6 (01-2018) ISED RSS-210: Issue 10 (12-2019) + A1 (04-2020) ISED RSS-GEN: Issue 5 (04-2018) + A2 (02-2021)
Order Number	PO-0001
Date	10-June-2024
Date of Receipt of EUT	14-June-2024
Start of Test	25-June-2024
Finish of Test	26-June-2024
Name of Engineer(s)	Aakash Rawal
Related Document(s)	ANSI C63.26 (2015) ANSI C63.10 (2020) ANSI C63.4 (2014) KDB 996369 D04 Module Integration Guide v02

1.3 Brief Summary of Results

A brief summary of the tests carried out in accordance with FCC 47 CFR Part 2, FCC 47 CFR Part 24, FCC 47 CFR Part 27, ISED RSS-130, ISED RSS-133 & ISED RSS-GEN is shown below.

Section	Specification Clause								Test Description	Result	Comments/Base Standard
	Part 2	Part 15	Part 24	Part 27	RSS-130	RSS-133	RSS-210	RSS-GEN			
Configuration and Mode: 12V DC Powered - LTE FDD B2 + 60GHz Radio											
2.1	2.1053	15.255	24.238(a)	-	-	6.5.1	J.3	6.13	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	ANSI C63.26 (2015) ANSI C63.10 (2020) ANSI C63.4 (2014) KDB 996369 D04 Module Integration Guide v02
Configuration and Mode: 12V DC Powered - LTE FDD B12 + 60GHz Radio											
2.1	2.1053	15.255	-	27.53(g)	4.7.1	-	J.3	6.13	Radiated Spurious Emissions (Simultaneous Transmission)	Pass	ANSI C63.26 (2015) ANSI C63.10 (2020) ANSI C63.4 (2014) KDB 996369 D04 Module Integration Guide v02

Table 2

1.4 Application Form

Equipment Description

<table>
<tr><td>Technical Description:
(Please provide a brief description of the intended use of the equipment including the technologies the product supports)</td><td colspan="3">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.

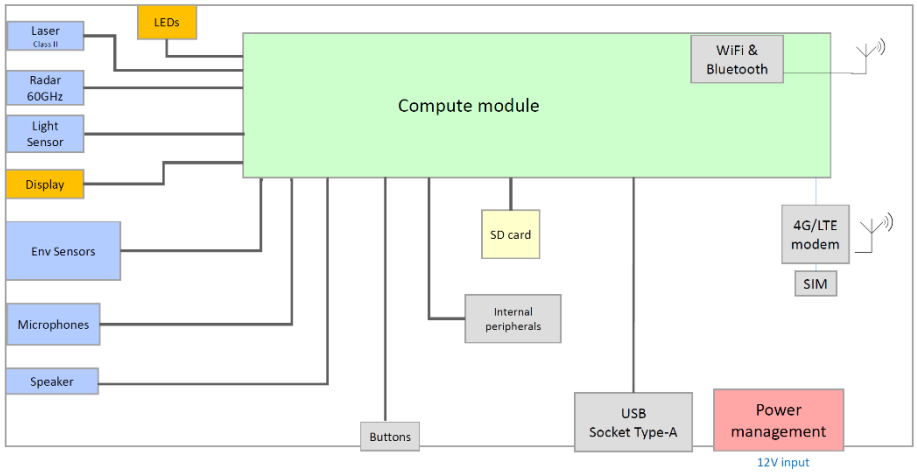
The technologies used are better described with a high level system diagram as follows:
Albus Home RD v2 - Simplified System block diagram
 
</td></tr>
<tr><td>Manufacturer:</td><td colspan="3">BreatheOx Limited (Trading as Albus Health)</td></tr>
<tr><td>Model:</td><td colspan="3">G2</td></tr>
<tr><td>Part Number:</td><td colspan="3">B5C</td></tr>
<tr><td>Hardware Version:</td><td colspan="3">v2</td></tr>
<tr><td>Software Version:</td><td colspan="3">V21.00.00</td></tr>
<tr><td colspan="2">FCC ID of the product under test – see guidance here</td><td colspan="2">2BGXS-G2</td></tr>
<tr><td colspan="2">IC ID of the product under test – see guidance here</td><td colspan="2">32679-G2</td></tr>
<tr><td>Device Category</td><td>Mobile ☒</td><td>Portable ☐</td><td>Fixed ☐</td></tr>
<tr><td colspan="2">Equipment is fitted with an Audio Low Pass Filter</td><td>Yes ☐</td><td>No ☒</td></tr>
</table>

Table 3

Intentional Radiators

Technology	**WiFi** See Laird LWB5+ datasheet (453-00046)	4G LTE cat-4 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:	4G LTE, multi band	Gain	698-960MHz: 1.2dBi 1710-2690MHz: 5.2dBi 3300-3800MHz: 2.7dBi (from datasheet)	dBi
Integral antenna ☒	Type:	WiFi dual band	Gain	2.8dBi @2.4GHz 3.4dBi @5GHz (from datasheet)	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: 11 June 2024

1.5 Product Information

1.5.1 Technical Description

Albus Home is a tabletop, 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.

1.6 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: 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 - LTE FDD B2 + 60GHz Radio		
Radiated Spurious Emissions (Simultaneous Transmission)	Aakash Rawal	UKAS
Configuration and Mode: 12V DC Powered - LTE FDD B12 + 60GHz Radio		
Radiated Spurious Emissions (Simultaneous Transmission)	Aakash Rawal	UKAS

Table 15

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 2, Clause 2.1053
FCC 47 CFR Part 15, Clause 15.255
FCC 47 CFR Part 24, Clause 24.238(a)
FCC 47 CFR Part 27, Clause 27.53(g)
ISED RSS-130, Clause 4.7.1
ISED RSS-133, Clause 6.5.1
ISED RSS-210, Clause J.3
ISED RSS-GEN, Clause 6.13

2.1.2 Equipment Under Test and Modification State

G2, S/N: 28330004 - Modification State 0

2.1.3 Date of Test

25-June-2024 to 26-June-2024

2.1.4 Test Method

12V DC Powered - LTE FDD B2 + 60GHz Radio

A preliminary profile of the Radiated Spurious Emissions was obtained up to 20 GHz in the worst case mode as required by KDB 996369 D04, clause 3.4, by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber.

Testing was performed in accordance with ANSI C63.26, Clause 5.5.

Prescans and final measurements were performed using the direct field strength method.

Field strength measurements were performed and then converted to Equivalent Power Measurements in accordance with ANSI C63.26, Clause 5.2.7 equation c)

Example calculation:

E (dBuV/m) + 20log(d) - 104.8 = EIRP (dBm) where (d) is the measurement distance.

82.2 (dBuV/m) + 20log(3) – 104.8 = EIRP (dBm)

-13.0 = EIRP (dBm)

12V DC Powered - LTE FDD B12 + 60GHz Radio

A preliminary profile of the Radiated Spurious Emissions was obtained up to 10 GHz in the worst-case mode as required by KDB 996369 D04, clause 3.4, by operating the EUT on a remotely controlled turntable within a semi-anechoic chamber.

Testing was performed in accordance with ANSI C63.26, Clause 5.5.

Prescans and final measurements were performed using the direct field strength method.

Field strength measurements were performed and then converted to Equivalent Power Measurements in accordance with ANSI C63.26, Clause 5.2.7 equation c)

Example calculation:

E (dBuV/m) + 20log(d) - 104.8 = EIRP (dBm) where (d) is the measurement distance.

82.2 (dBuV/m) + 20log(3) – 104.8 = EIRP (dBm)

-13.0 = EIRP (dBm)

2.1.5 Example Test Setup Diagram

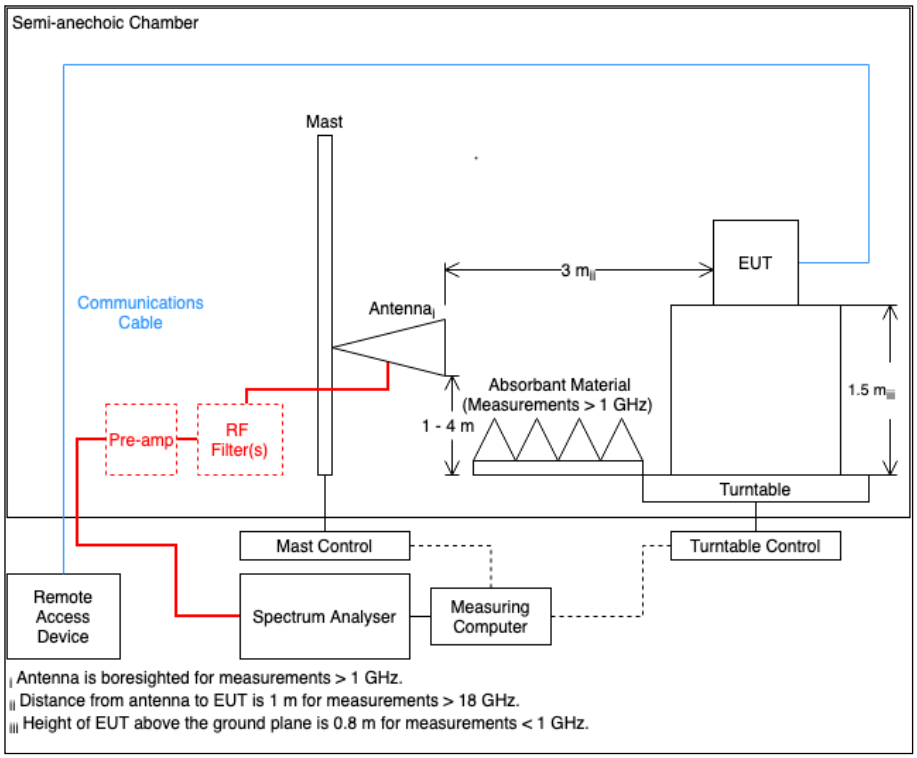


Figure 1

2.1.6 Environmental Conditions

Ambient Temperature	26.0 - 40.3 °C
Relative Humidity	26.0 - 40.3 %

2.1.7 Test Results

12V DC Powered - LTE FDD B2 + 60GHz Radio

Downlink Channel Number	Downlink Channel Frequency (MHz)	Uplink Channel Number	Uplink Channel Frequency (MHz)	Setup Configuration	Power Class
900	1960	18900	1880	QPSK	3 (23 dBm)

Table 16 – B2 Configuration

A low powered integrated 60 GHz radio module was configured to operate at 57 GHz with short frame mode to increase the duty cycle of the EUT enabling more power level to be generated from the EUT, hence, the power level could be detected using a measuring antenna. In addition, 2.4 GHz WLAN was required to be operational during testing for 60 GHz to transmit.

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 17 - LTE B2, 1880 MHz, 30 MHz to 20 GHz

*No emissions found within 10 dB of the limit.

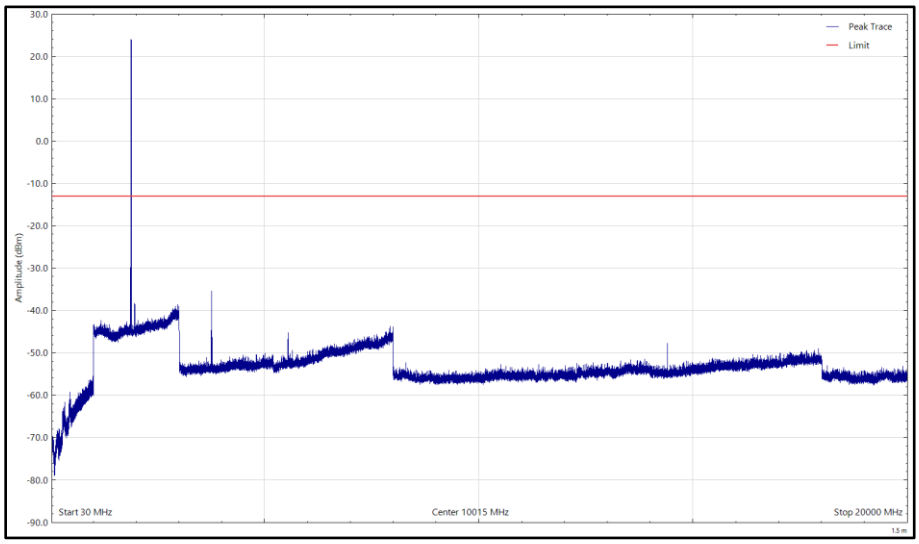


Figure 2 - LTE B2, 1880 MHz, 30 MHz to 20 GHz, Horizontal (Peak)

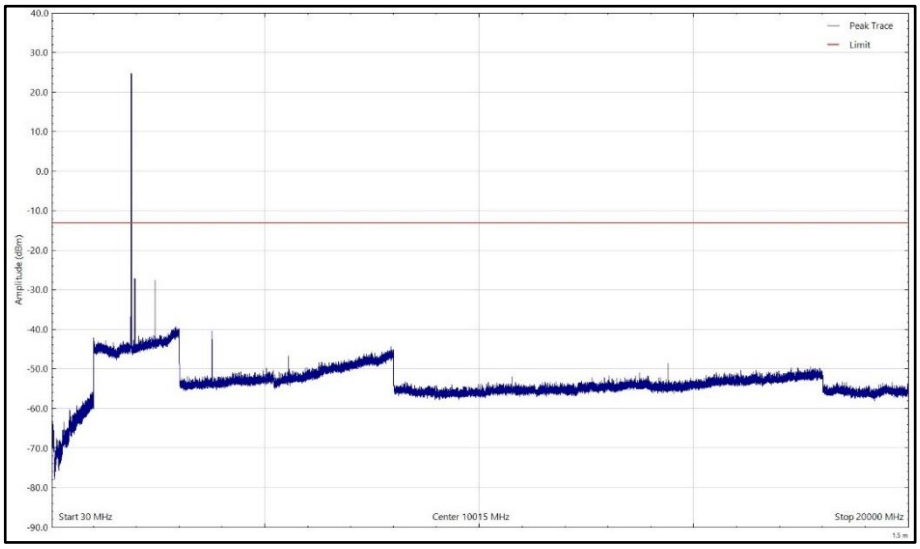


Figure 3 - LTE B2, 1880 MHz, 30 MHz to 20 GHz, Vertical (Peak)

FCC 47 CFR Part 15, FCC 47 CFR Part 24, ISED RSS-133 & ISED RSS-210

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 24.238 (a) / RSS-133 Clause 6.5.1	-13 dBm (EIRP) / 82 dBµV/m at 3m.

Table 18

12V DC Powered - LTE FDD B12 + 60GHz Radio

Downlink Channel Number	Downlink Channel Frequency (MHz)	Uplink Channel Number	Uplink Channel Frequency (MHz)	Setup Configuration	Power Class
5095	737.5	23095	707.5	QPSK	3 (23 dBm)

Table 19 - B12 Configuration

A low powered integrated 60 GHz radio module was configured to operate at 57 GHz with short frame mode to increase the duty cycle of the EUT enabling more power level to be generated from the EUT, hence, the power level could be detected using a measuring antenna. In addition, 2.4 GHz WLAN was required to be operational during testing for 60 GHz to transmit.

Frequency (MHz)	Level (dBm)	Limit (dBm)	Margin (dB)	Detector	Angle (°)	Height (cm)	Polarisation
*							

Table 20 - LTE B12, 707.5 MHz, 30 MHz to 10 GHz

*No emissions found within 10 dB of the limit.

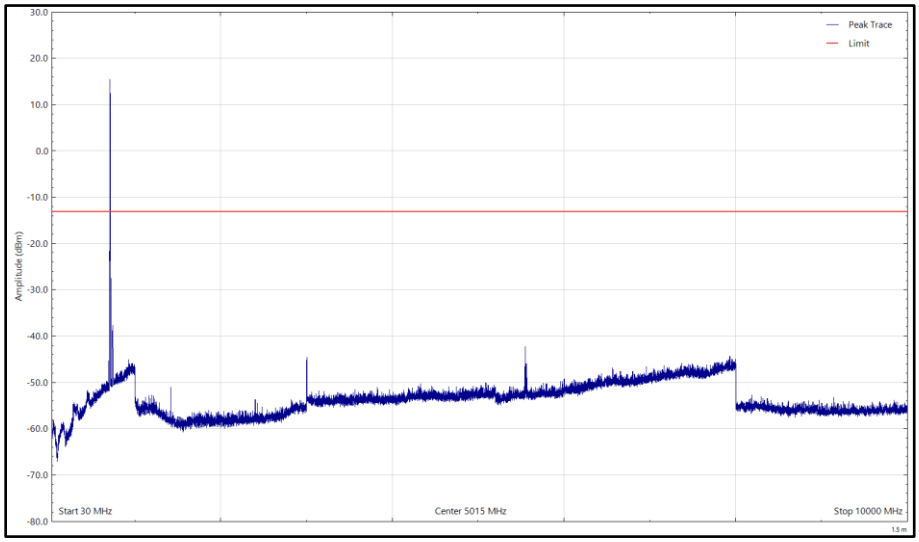


Figure 4 - LTE B12, 707.5 MHz, 30 MHz to 10 GHz, Horizontal (Peak)

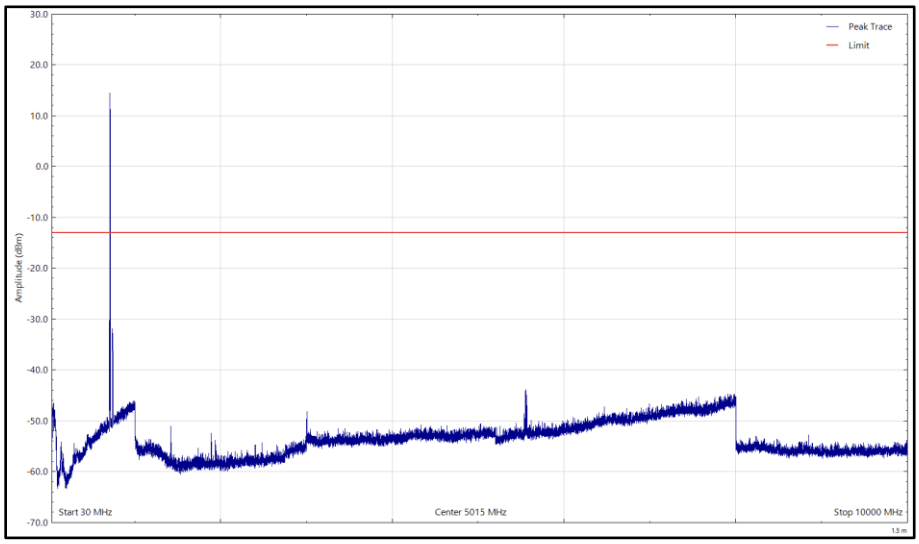


Figure 5 - LTE B12, 707.5 MHz, 30 MHz to 10 GHz, Vertical (Peak)

FCC 47 CFR Part 15, FCC 47 CFR Part 27, ISED RSS-130 & ISED RSS-210

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 27.53 (g) / RSS-130 Clause 4.7	-13 dBm (EIRP) / 82 dBµV/m at 3m.

Table 21

2.1.8 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
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)	Narda	NARDA DB02-0447	237	12	04-Dec-2024
3m Semi-Anechoic Chamber	Rainford	RF Chamber 5	1545	36	23-Apr-2027
Turntable Controller	Inn-Co GmbH	CO 1000	1606	-	TU
Programmable Power Supply	Iso-tech	IPS 2010	2437	-	O/P Mon
Mast Controller	Maturo Gmbh	NCD	4810	-	TU
Tilt Antenna Mast	Maturo Gmbh	TAM 4.0-P	4811	-	TU
4dB Attenuator	Pasternack	PE7047-4	4935	12	20-Jul-2024
Emissions Software	TUV SUD	EmX V3.2.0	5125	-	Software
Antenna (DRG, 1 GHz to 10.5 GHz)	Schwarzbeck	BBHA9120B	5215	12	09-Jul-2024
Antenna (DRG, 7.5 GHz to 18 GHz)	Schwarzbeck	HWRD750	5216	12	09-Jul-2024
1 GHz High Pass Filter	Mini-Circuits	NHP 1000+	5260	12	24-Aug-2024
Pre-amplifier (30 dB, 1GHz to 18GHz)	Schwarzbeck	BBV 9718 C	5261	12	09-Apr-2025
Test Receiver	Rohde & Schwarz	ESW44	5379	12	12-Dec-2024
Cable 2.92m	Junkosha	MWX241-01000KMS	5412	12	23-May-2025
3.5 mm 2m Cable	Junkosha	MWX221-02000DMS	5424	12	23-May-2025
Thermo-Hygro-Barometer	PCE Instruments	OCE-THB-40	5470	12	07-May-2025
Cable (SMA to SMA, 2 m)	Junkosha	MWX221-02000AMSAMS/A	5518	12	18-Apr-2025
3 GHz High pass Filter	Wainwright	WHKX12-2580-3000-18000-80SS	5547	12	29-May-2025

Instrument	Manufacturer	Type No	TE No	Calibration Period (months)	Calibration Expires
7 GHz High pass Filter	Wainwright	WHKX12-5850-6800-18000-80SS	5550	12	30-May-2025
Pre-Amplifier (8 GHz to 18 GHz)	Wright Technologies	APS06-0061	5596	12	27-Oct-2024
Cable (N-Type to N-Type, 8 m)	Junkosha	MWX221-08000NMSNMS/B	6321	12	04-Feb-2025
Cable (N to N 8m)	Junkosha	MWX221-08000NMSNMS/B	6331	12	17-Feb-2025
Communications Analyser	Anritsu	MT8821C	6541	12	04-Apr-2025
Trilog Super Broadband Test Antenna	Schwarzbeck	VULB 9168	6635	24	13-Jun-2025

Table 22

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

3 Photographs

3.1 Test Setup Photographs

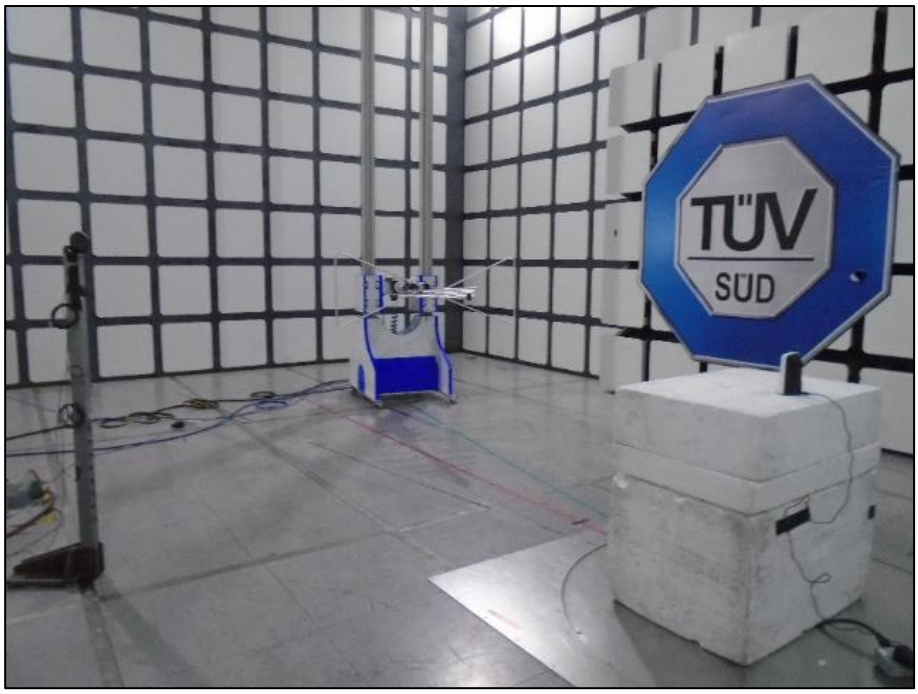


Figure 6 - Test Setup - 30 MHz to 1 GHz

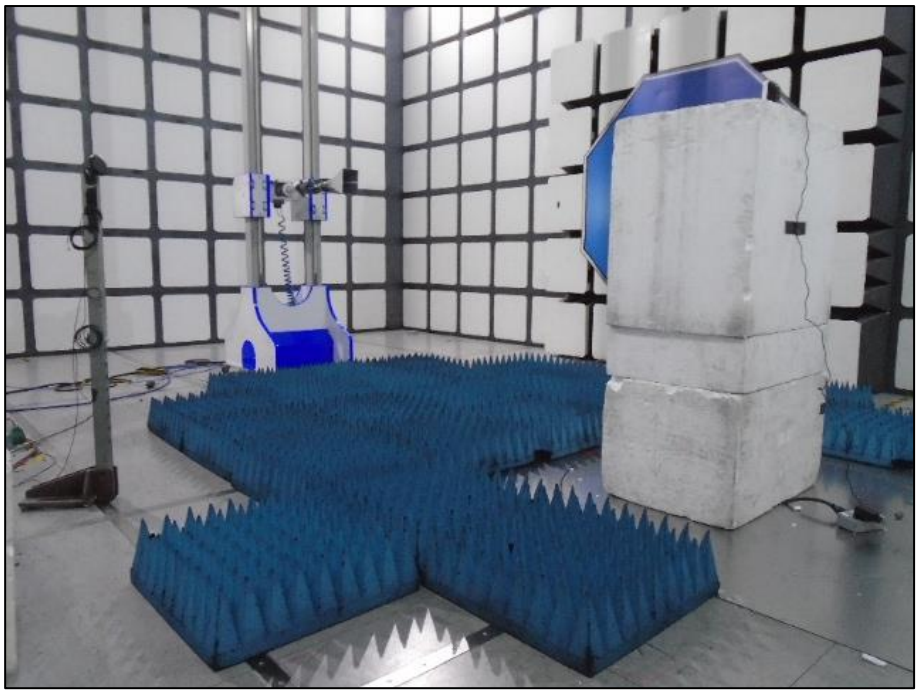


Figure 7 - Test Setup - 1 GHz to 8 GHz

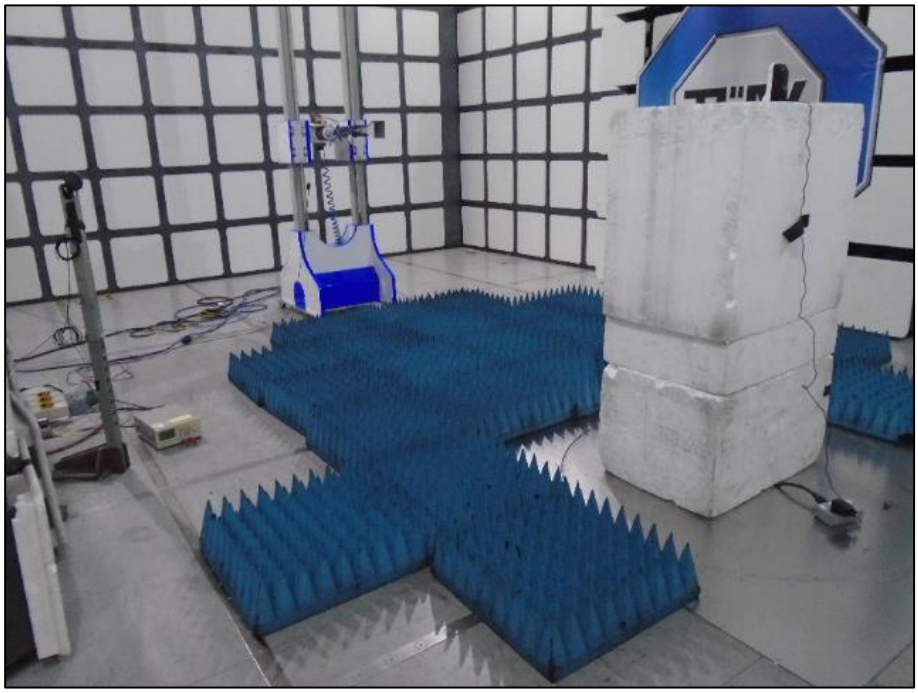


Figure 8 - Test Setup - 8 GHz to 18 GHz

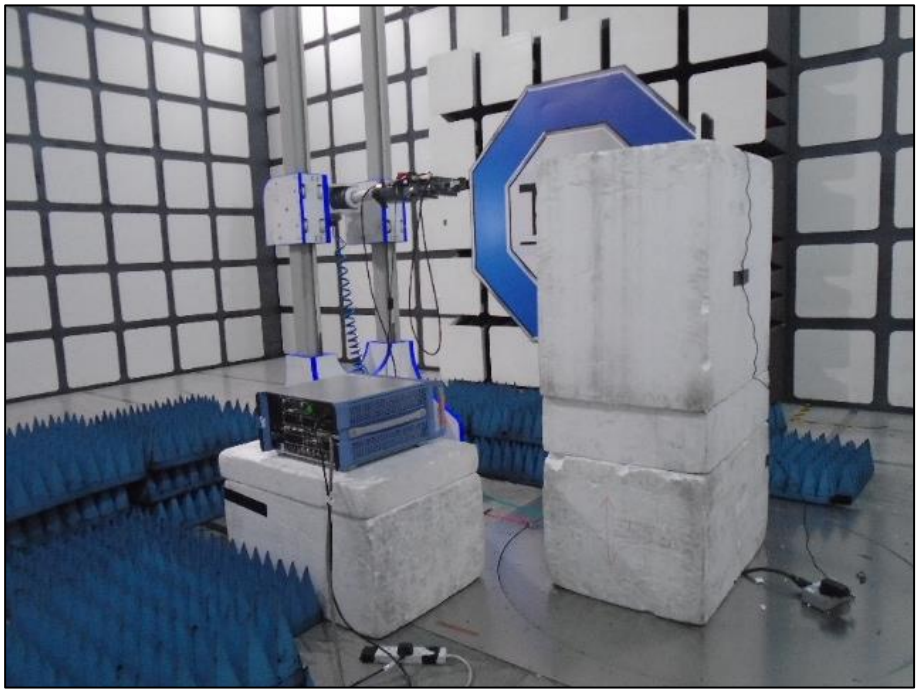


Figure 9 - Test Setup - 18 GHz to 20 GHz

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.