

Report on the Radio Testing

For

Draeger Safety UK Ltd

on

AirBoss HUD / IMD 01

Report no. TRA-051967-47-12B

2025-06-19

RF915 11.0



0026

Report Number: TRA-051967-47-12B  
Issue: B

REPORT ON THE RADIO TESTING OF A  
Draeger Safety UK Ltd  
AirBoss HUD / IMD 01  
WITH RESPECT TO SELECTED PARTS OF SPECIFICATION(S)  
FCC 47CFR 15.247 ISSED RSS-247  
TO SATISFY MODULAR INTEGRATION REQUIREMENTS OF  
KDB 996369 D04 v02 & RSP-100

TEST DATE: 2024-03-26 to 2024-04-03

Tested by:



pp. D Winstanley  
Radio Senior Test Engineer

Written by:



S Garwell  
Radio Test Engineer

Approved by:

J Charters  
Lab Manager

Date: 2025-06-19

Disclaimers:

- [1] THIS DOCUMENT MAY BE REPRODUCED ONLY IN ITS ENTIRETY AND WITHOUT CHANGE  
[2] THE RESULTS CONTAINED IN THIS DOCUMENT RELATE ONLY TO THE ITEM(S) TESTED

RF915 11.0



## 1 Revision Record

| <i>Issue Number</i> | <i>Issue Date</i> | <i>Revision History</i>                             |
|---------------------|-------------------|-----------------------------------------------------|
| A                   | 2024-05-29        | Original                                            |
| B                   | 2025-06-19        | General corrections and updates throughout document |

## 2 Summary

|                                     |                                                                                         |
|-------------------------------------|-----------------------------------------------------------------------------------------|
| TEST REPORT NUMBER:                 | TRA-051967-47-12B                                                                       |
| WORKS ORDER NUMBER:                 | TRA-051967-21                                                                           |
| PURPOSE OF TEST:                    | Modular Integration                                                                     |
| SELECTED PARTS OF SPECIFICATION(S): | 47CFR15.247, RSS-247                                                                    |
| EQUIPMENT UNDER TEST (EUT):         | AirBoss HUD / IMD 01                                                                    |
| CONTAINS FCC IDENTIFIER:            | X6O-BT01                                                                                |
| CONTAINS ISSED IDENTIFIER:          | 5895F-BT01                                                                              |
| EUT SERIAL NUMBER:                  | ARTC-0011                                                                               |
| MANUFACTURER/AGENT:                 | Draeger Safety UK Ltd                                                                   |
| ADDRESS:                            | Ullswater Close<br>Blyth Riverside Business Park<br>Blyth<br>NE24 4RG<br>United Kingdom |
| CLIENT CONTACT:                     | Eoghan Quigley<br>☎ 01670 352 891<br>✉ eoghan.quigley@draeger.com                       |
| ORDER NUMBER:                       | 4303193234                                                                              |
| TEST DATE:                          | 2024-03-26 to 2024-04-03                                                                |
| TESTED BY:                          | D Winstanley<br>Element                                                                 |

## 2.1 Test Summary

| Test Method and Description                                                       |      | Requirement Clause 47CFR15 | Requirement Clause RSS | Applicable to this equipment        | Result / Note    |
|-----------------------------------------------------------------------------------|------|----------------------------|------------------------|-------------------------------------|------------------|
| Radiated spurious emissions (restricted bands of operation and cabinet radiation) |      | 15.247 (d)                 | 247, 3.3               | <input checked="" type="checkbox"/> | Pass             |
| AC power line conducted emissions                                                 |      | 15.207                     | Gen, 8.8               | <input type="checkbox"/>            | Note 1           |
| Occupied bandwidth                                                                |      | 15.247 (a) (2)             | 247, 5.2 (a)           | <input type="checkbox"/>            | Note 1           |
| Conducted carrier power                                                           | Peak | 15.247 (b) (3)             | 247, 5.4 (d)           | <input checked="" type="checkbox"/> | Information Only |
|                                                                                   | Max. |                            |                        | <input type="checkbox"/>            |                  |
| Out of band emissions                                                             |      | 15.247 (d)                 | 247, 5.5               | <input type="checkbox"/>            | Note 1           |
| Power spectral density                                                            |      | 15.247 (e)                 | 247, 5.2 (b)           | <input type="checkbox"/>            | Note 1           |
| Calculation of duty correction                                                    |      | 15.35 (c)                  | -                      | <input type="checkbox"/>            | Note 1           |

### Specific notes:

**Note 1:** Limited testing was performed to check conducted carrier power & radiated spurious emissions (restricted bands of operation and cabinet radiation), as requested by the client, to satisfy the modular integration requirements of KDB996369 D04 v02 & RSP-100.

### General notes:

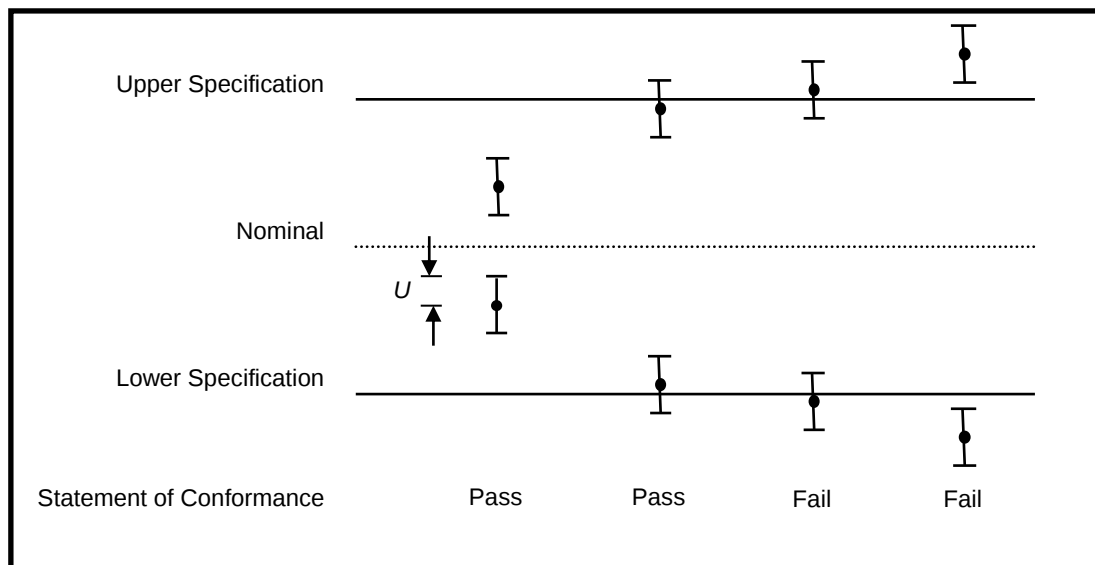
The results contained in this report relate only to the items tested, in the condition at time of test, and were obtained in the period between the date of initial receipt of samples and the date of issue of the report.

The apparatus was set up and exercised using the configurations, modes of operation and arrangements defined in this report only. Any modifications made are identified in Section 8 of this report.

Particular operating modes, apparatus monitoring methods and performance criteria required by the standards tested to have been performed except where identified in Section 5.2 of this test report (Deviations from Test Standards).

The decision rule for compliance is not inherent within this specification and compliance is based on the customer requesting a simple acceptance rule based on understanding and acceptance of Elements Measurement Uncertainty values.

### Graphical Representation of a Pass / Fail Binary Statement - Simple Acceptance



● = Measured value

U = 95 % expanded measurement uncertainty

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## 4 Introduction

This report TRA-051967-47-12B presents the results of the Radio testing on a, Draeger Safety UK Ltd, AirBoss HUD / IMD 01 to specification 47CFR15 Radio Frequency Devices. RSS-247 - Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices.

The testing was carried out for Draeger Safety UK Ltd by Element, at the address detailed below.

|                                     |                      |                          |                      |
|-------------------------------------|----------------------|--------------------------|----------------------|
| <input checked="" type="checkbox"/> | Element Skelmersdale | <input type="checkbox"/> | Element Surrey Hills |
|                                     | Unit 1               |                          | Unit 15 B            |
|                                     | Pendle Place         |                          | Henley Business Park |
|                                     | Skelmersdale         |                          | Pirbright Road       |
|                                     | West Lancashire      |                          | Normandy             |
|                                     | WN8 9PN              |                          | Guildford            |
|                                     | UK                   |                          | GU3 2DX              |
|                                     |                      |                          | UK                   |

This report details the configuration of the equipment, the test methods used and any relevant modifications where appropriate.

All test and measurement equipment under the control of the laboratory and requiring calibration is subject to an established programme and procedures to control and maintain measurement standards. The quality management system meets the principles of ISO 9001, and has quality control procedures for monitoring the validity of tests undertaken. Records and sufficient detail are retained to establish an audit trail of calibration records relating to its test results for a defined period. Under control of the established calibration programme, key quantities or values of the test & measurement instrumentation are within specification and comply with the relevant traceable internationally recognised and appropriate standard specifications, which are UKAS calibrated as such where these properties have a significant effect on results. Participation in inter-laboratory comparisons and proficiency testing ensures satisfactory correlation of results conform to Elements own procedures, as well as statistical techniques for analysis of test data providing the appropriate confidence in measurements.

Throughout this report EUT denotes equipment under test.

### FCC Site Listing:

The test laboratory is accredited for the above sites under the US-UK MRA,

### Designation number(s):

Element Skelmersdale                      UK2020

### IC Registration Numbers:

Element North West                      3930B

The test site requirements of ANSI C63.4-2014 are met up to 1GHz.

The test site SVSWR requirements of CISPR 16-1-4:2010 are met over the frequency range 1 GHz to 18 GHz.

## 5 Test Specifications

### 5.1 Normative References

- FCC 47 CFR Ch. I – Part 15 – Radio Frequency Devices.
- ISED RSS-247, Issue 3, August 2023 – Digital Transmission Systems (DTSS), Frequency Hopping Systems (FHSS) and Licence-Exempt Local Area Network (LE-LAN) Devices.
- ISED RSS-Gen – General Requirements for Compliance of Radio Apparatus - Issue 5 April 2018
- ANSI C63.10-2013 – American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices.
- ANSI C63.4-2014 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.
- 996369 D04 Module Integration Guide v02 - Modular Transmitter Integration Guide - Guidance for Host Product Manufacturers.
- RSP-100 Issue 12 August 2019 - Certification of Radio Apparatus and Broadcasting Equipment.

### 5.2 Deviations from Test Standards

Limited testing was performed to check conducted carrier power & radiated spurious emissions (restricted bands of operation and cabinet radiation), as requested by the client, to satisfy the modular integration requirements of KDB996369 D04 v02 & RSP-100.

## 6 Glossary of Terms

|               |                                                                  |
|---------------|------------------------------------------------------------------|
| <b>§</b>      | denotes a section reference from the standard, not this document |
| <b>AC</b>     | Alternating Current                                              |
| <b>ANSI</b>   | American National Standards Institute                            |
| <b>BW</b>     | bandwidth                                                        |
| <b>C</b>      | Celsius                                                          |
| <b>CFR</b>    | Code of Federal Regulations                                      |
| <b>CW</b>     | Continuous Wave                                                  |
| <b>dB</b>     | decibel                                                          |
| <b>dBm</b>    | dB relative to 1 milliwatt                                       |
| <b>DC</b>     | Direct Current                                                   |
| <b>DSSS</b>   | Direct Sequence Spread Spectrum                                  |
| <b>EIRP</b>   | Equivalent Isotropically Radiated Power                          |
| <b>ERP</b>    | Effective Radiated Power                                         |
| <b>EUT</b>    | Equipment under Test                                             |
| <b>FCC</b>    | Federal Communications Commission                                |
| <b>FHSS</b>   | Frequency Hopping Spread Spectrum                                |
| <b>Hz</b>     | hertz                                                            |
| <b>IC</b>     | Industry Canada                                                  |
| <b>ITU</b>    | International Telecommunication Union                            |
| <b>LBT</b>    | Listen before Talk                                               |
| <b>m</b>      | metre                                                            |
| <b>max</b>    | maximum                                                          |
| <b>MIMO</b>   | Multiple Input and Multiple Output                               |
| <b>min</b>    | minimum                                                          |
| <b>MRA</b>    | Mutual Recognition Agreement                                     |
| <b>N/A</b>    | Not Applicable                                                   |
| <b>PCB</b>    | Printed Circuit Board                                            |
| <b>PDF</b>    | Portable Document Format                                         |
| <b>Pt-mpt</b> | Point-to-multipoint                                              |
| <b>Pt-pt</b>  | Point-to-point                                                   |
| <b>RF</b>     | Radio Frequency                                                  |
| <b>RH</b>     | Relative Humidity                                                |
| <b>RMS</b>    | Root Mean Square                                                 |
| <b>Rx</b>     | receiver                                                         |
| <b>s</b>      | second                                                           |
| <b>SVSWR</b>  | Site Voltage Standing Wave Ratio                                 |
| <b>Tx</b>     | transmitter                                                      |
| <b>UKAS</b>   | United Kingdom Accreditation Service                             |
| <b>V</b>      | volt                                                             |
| <b>W</b>      | watt                                                             |
| <b>Ω</b>      | ohm                                                              |

## 7 Equipment under Test

### 7.1 EUT Identification

- Name: AirBoss HUD / IMD 01
- Serial Number: ARTC-0011
- Model Number: 3727319
- Software Revision: Not Stated
- Build Level / Revision Number: Rev 02

### 7.2 Module Information

- Manufacturer: Drager Safety AG & Co. KGaA
- Model: Drager Bluetooth Module 9x11
- Contains FCC ID: X6O-BT01
- Contains ISED ID: 5895F-BT01

### 7.3 System Equipment

Equipment listed below forms part of the overall test setup and is required for equipment functionality and/or monitoring during testing. The compliance levels achieved in this report relate only to the EUT and not items given in the following list.

Laptop Computer – Dell Latitude E6410

### 7.4 EUT Mode of Operation

The EUT was transmitting on the frequencies as indicated, the frequencies where programmed using nRF connect software which was supplied on a test laptop.

### 7.5 EUT Radio Parameters

#### 7.5.1 General

|                                    |                                  |
|------------------------------------|----------------------------------|
| <b>Frequencies of operation:</b>   | 2402 MHz to 2480 MHz             |
| <b>Modulation type:</b>            | GFSK                             |
| <b>Occupied channel bandwidth:</b> | 1 MHz                            |
| <b>Channel spacing:</b>            | 2 MHz                            |
| <b>Declared output power:</b>      | ≤ 0 dBm                          |
| <b>Antenna Type and Gain:</b>      | Chip antenna, -2 dBi             |
| <b>Nominal Supply Voltage:</b>     | 1.5 V dc 1 x AA Alkaline Battery |

### 7.6 EUT Description

The EUT is an Open circuit breathing apparatus with compressed air cylinder used for Fire Fighting.

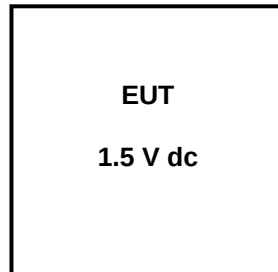
## **8 Modifications**

No modifications were performed during this assessment.

## 9 EUT Test Setup

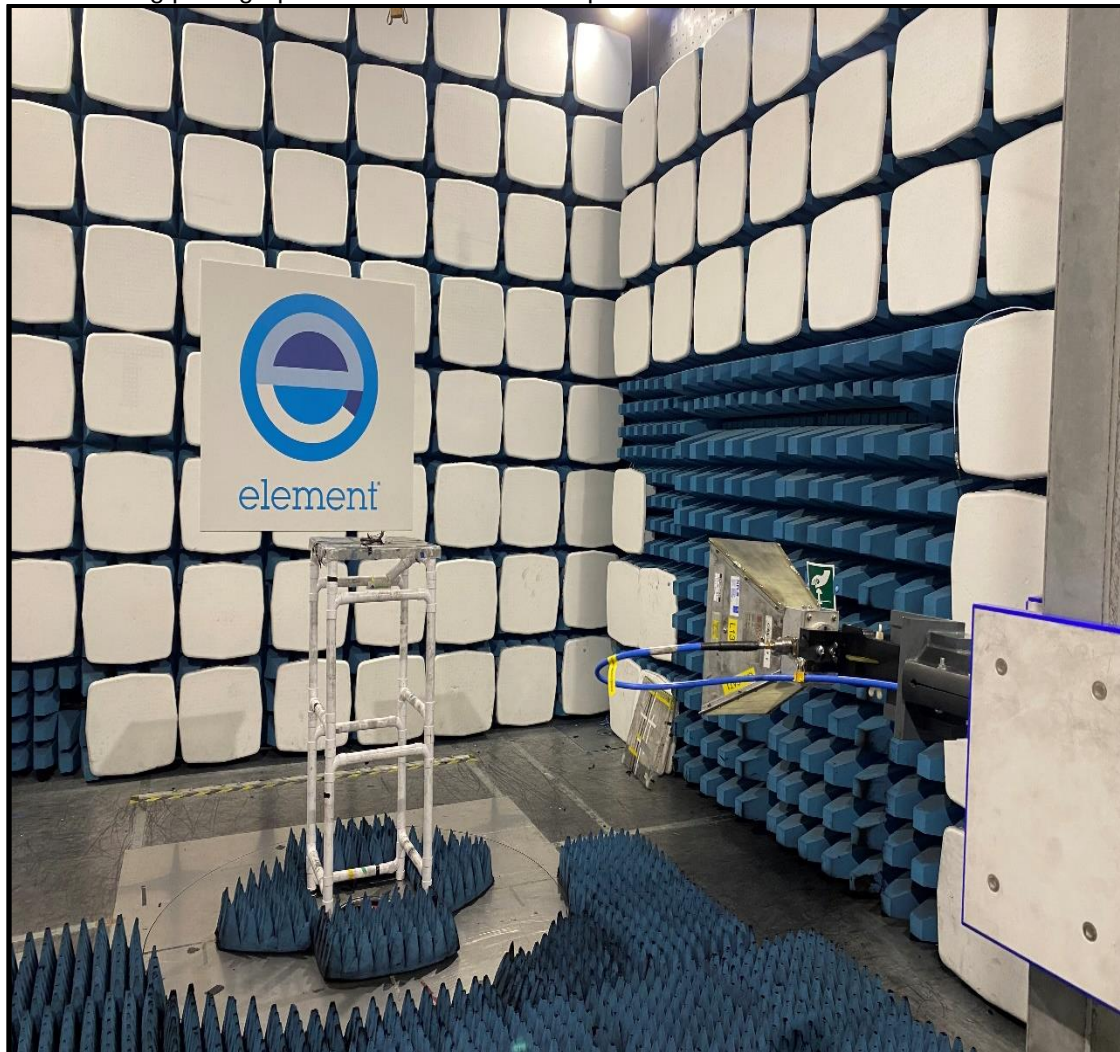
### 9.1 Block Diagram

The following diagram shows basic EUT interconnections with cable type and cable lengths identified:



### 9.2 General Set-up Photograph

The following photograph shows basic EUT set-up:



### **9.3 Measurement software**

Where applicable, the following software was used to perform measurements contained within this report.

Element Emissions R5  
Element Transmitter Bench Test  
ETS Lindgren EMPower V1.0.4.2

## **10 General Technical Parameters**

### ***10.1 Normal Conditions***

The HUD was tested under the normal environmental conditions of the test laboratory, except where otherwise stated. The normal power source applied was 1.5 V dc from 1 x AA Alkaline Battery.

### ***10.2 Varying Test Conditions***

No testing at extremes was performed during this assessment.

## 11 Radiated emissions

### 11.1 Definitions

#### *Spurious emissions*

Emissions on a frequency or frequencies, which are outside the necessary bandwidth and the level of which may be reduced without affecting the corresponding transmission of information. Spurious emissions include harmonic emissions, parasitic emissions, intermodulation products and frequency conversion products, but exclude out-of-band emissions.

#### *Restricted bands*

A frequency band in which intentional radiators are permitted to radiate only spurious emissions but not fundamental signals.

### 11.2 Test Parameters

|                           |                                                            |
|---------------------------|------------------------------------------------------------|
| Test Location:            | Element Skelmersdale                                       |
| Test Chamber:             | Chamber 1                                                  |
| Test Standard and Clause: | ANSI C63.10-2013, Clause 6.5 and 6.6                       |
| EUT Frequencies Measured: | 2402 MHz, 2440 MHz & 2480 MHz                              |
| Deviations from Standard: | None                                                       |
| Measurement BW:           | 30 MHz to 1 GHz: 120 kHz; Above 1 GHz: 1 MHz               |
| Measurement Detector:     | Up to 1 GHz: quasi-peak; Above 1 GHz: RMS average and Peak |

### Environmental Conditions (Normal Environment)

|                    |                                  |
|--------------------|----------------------------------|
| Temperature: 18 °C | +15 °C to +35 °C (as declared)   |
| Humidity: 46 % RH  | 20 % RH to 75 % RH (as declared) |
| Supply: 1.5 Vdc    | 1.5 Vdc as declared              |

### 11.3 Test Limit

Unwanted emissions that fall within the restricted frequency bands shall comply with the limits specified:

#### General Field Strength Limits for License-Exempt Transmitters at Frequencies above 30 MHz

| <b>Frequency<br/>(MHz)</b> | <b>Field Strength<br/>(<math>\mu\text{V/m}</math> at 3 m)</b> | <b>Field Strength<br/>(dB<math>\mu\text{V/m}</math> at 3 m)</b> |
|----------------------------|---------------------------------------------------------------|-----------------------------------------------------------------|
| 30 to 88                   | 100                                                           | 40.0                                                            |
| 88 to 216                  | 150                                                           | 43.5                                                            |
| 216 to 960                 | 200                                                           | 46.0                                                            |
| Above 960                  | 500                                                           | 54.0                                                            |

On frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function. On frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit.

### 11.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure i, the emissions from the EUT were measured on a spectrum analyzer / EMI receiver.

Radiated electromagnetic emissions from the EUT are checked first by preview scans. Preview scans for all spectrum and modulation characteristics are checked, using a peak detector and where applicable worst-case determined for function, operation, orientation, etc. for both vertical and horizontal polarisations. Pre-scan plots are shown with a peak detector and 100 kHz RBW.

If the EUT connects to auxiliary equipment and is table or floor standing, the configurations prescribed in ANSI C63.10 are followed. Alternatively, a layout closest to normal use (as declared by the provider) is employed, (see EUT setup photographs for more detail).

Emissions between 30 MHz and 1 GHz are measured using calibrated broadband antennas. Emissions above 1 GHz are characterized using standard gain horn antennas. Pre-amplifiers and filters are used where required. Care is taken to ensure that test receiver resolution bandwidth, video bandwidth and detector type(s) meet the regulatory requirements.

For both horizontal and vertical polarizations, the EUT is then rotated through 360 degrees in azimuth until the highest emission is detected. At the previously determined azimuth the test antenna is raised and lowered from 1 to 4 m in height until a maximum emission level is detected, this maximum value is recorded.

Power values measured on the test receiver / analyzer are converted to field strength, FS, in dBμV/m at the regulatory distance, using:

$$FS = PR + CL + AF - PA + DC - CF$$

$$\text{Factor} = + CL + AF - PA$$

Where,

PR is the power recorded on the receiver / spectrum analyzer in dBμV;

CL is the cable loss in dB;

AF is the test antenna factor in dB/m;

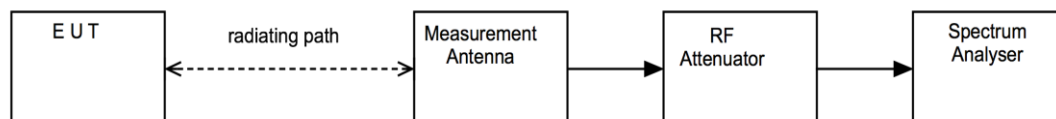
PA is the pre-amplifier gain in dB (where used);

DC is the duty correction factor in dB (where used, e.g. harmonics of pulsed fundamental);

CF is the distance factor in dB (where measurement distance different to limit distance);

This field strength value is then compared with the regulatory limit.

**Figure i Test Setup**

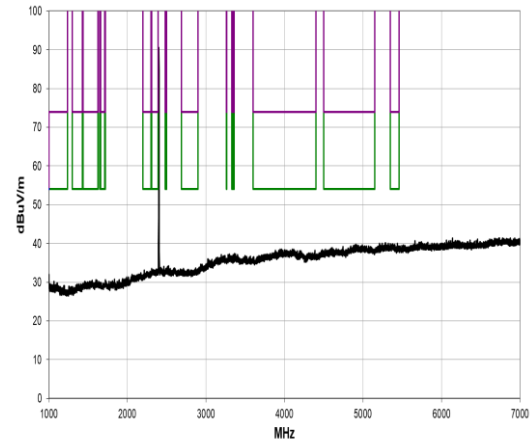
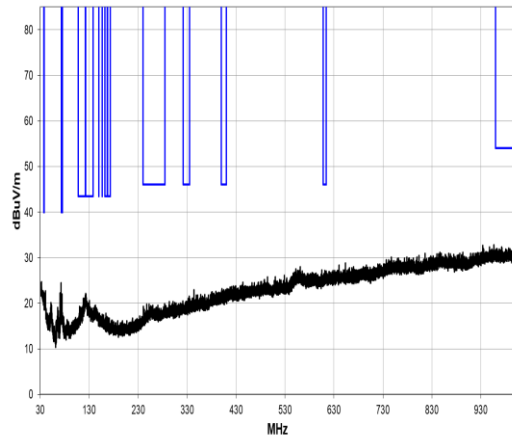


**11.5 Test Equipment**

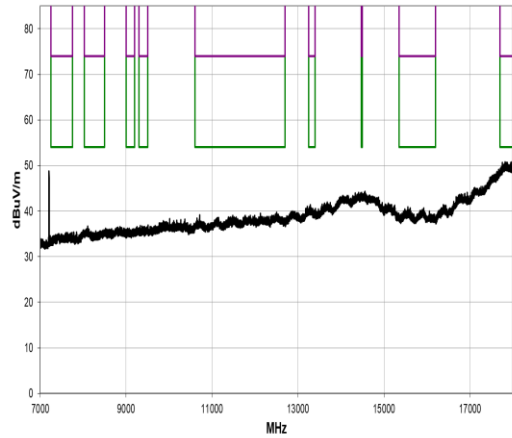
| <i><b>Equipment<br/>Description</b></i> | <i><b>Manufacturer</b></i> | <i><b>Equipment<br/>Type</b></i> | <i><b>Element<br/>No</b></i> | <i><b>Due For<br/>Calibration</b></i> |
|-----------------------------------------|----------------------------|----------------------------------|------------------------------|---------------------------------------|
| Spectrum Analyser                       | R&S                        | FSU46                            | REF910                       | 2025-01-30                            |
| Bilog                                   | Chase                      | CBL611/B                         | U573                         | 2024-10-14                            |
| Pre Amp                                 | AMETEK                     | LNA6901                          | U711                         | 2024-04-12                            |
| 1-18GHz Horn                            | EMCO                       | 3115                             | L139                         | 2024-07-01                            |
| Horn 18-26GHz (&U330)                   | Flann                      | 20240-20                         | L300                         | 2024-06-30                            |
| Pre Amp                                 | Agilent                    | 8449B                            | L572                         | 2024-10-30                            |
| High Pass Filter                        | Atlantic Microwave         | AFH-07000                        | U558                         | 2025-02-15                            |
| Chamber 1                               | Rainford EMC               | ATS                              | U387                         | 2026-01-24                            |
| Radiated Test Software                  | Element                    | Emissions R5                     | REF9000                      | Cal Not Required                      |

## 11.6 Test Results

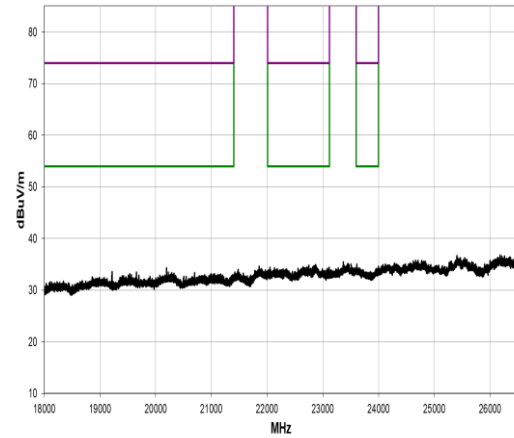
### BTLE TX 2402 MHz Power setting 0



#### 30 MHz to 1 GHz



#### 1 GHz to 7 GHz

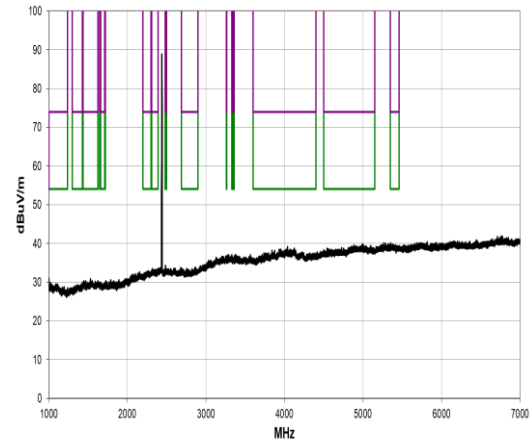
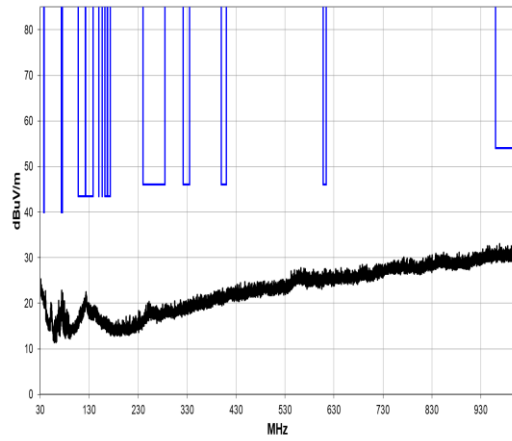


#### 7 GHz to 18 GHz

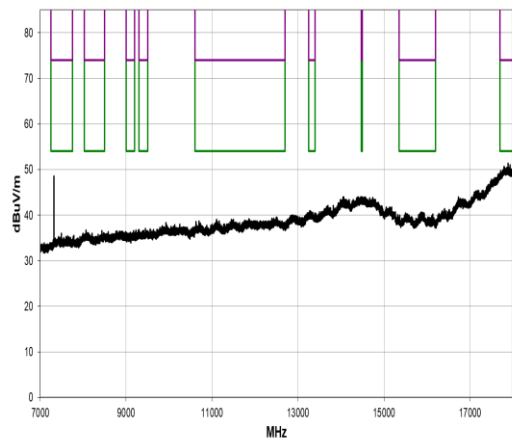
#### 18 GHz to 26.5 GHz

| BTLE TX 2402 MHz Power setting 0                   |             |                        |             |                        |                               |                         |                |             |
|----------------------------------------------------|-------------|------------------------|-------------|------------------------|-------------------------------|-------------------------|----------------|-------------|
| Detector                                           | Freq. (MHz) | Meas'd Emission (dBμV) | Factor (dB) | Duty Cycle Corr'n (dB) | Distance Extrap'n Factor (dB) | Field Strength (dBμV/m) | Limit (dBμV/m) | Margin (dB) |
| No significant emissions within 20 dB of the limit |             |                        |             |                        |                               |                         |                |             |

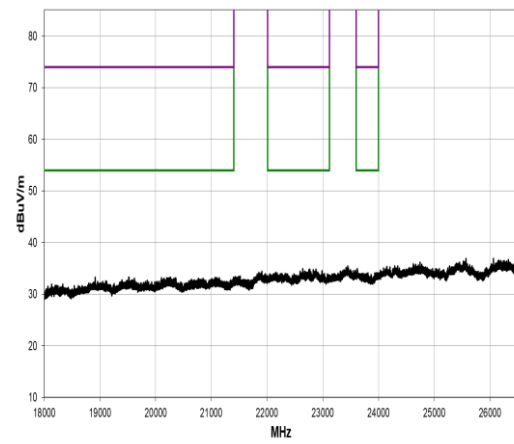
## BTLE TX 2440 MHz Power setting 0



## 30 MHz to 1 GHz



## 1 GHz to 7 GHz

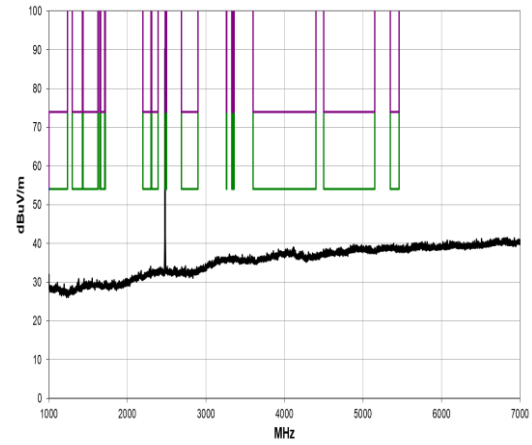
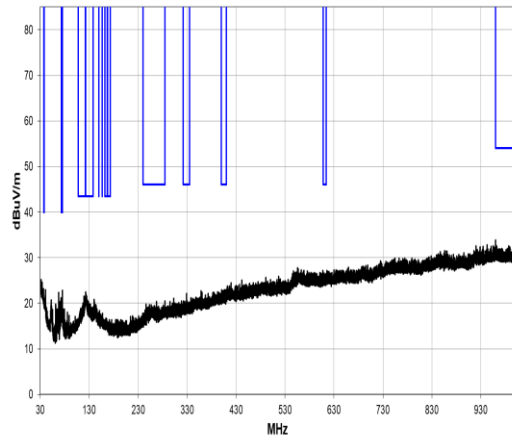


## 7 GHz to 18 GHz

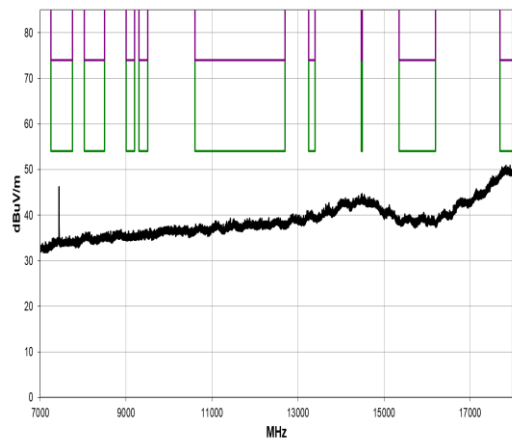
## 18 GHz to 26.5 GHz

| Freq (MHz) | Amplitude (dBuV) | Factor (dB/m) | Antenna Height (meters) | Azimuth (degrees) | Test Distance (meters) | External Attenuation (dB) | Polarity/ Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) |
|------------|------------------|---------------|-------------------------|-------------------|------------------------|---------------------------|---------------------------|----------|--------------------------|-------------------|----------------------|------------------------|
| 7320.817   | 47.8             | 8.1           | 1.76                    | 261.2             | 1.0                    | 0.0                       | Horz                      | AV       | -9.5                     | 46.4              | 54.0                 | -7.6                   |
| 7320.867   | 43.3             | 8.1           | 1.85                    | 342.9             | 1.0                    | 0.0                       | Vert                      | AV       | -9.5                     | 41.9              | 54.0                 | -12.1                  |
| 7319.283   | 57.4             | 8.1           | 1.76                    | 261.2             | 1.0                    | 0.0                       | Horz                      | PK       | -9.5                     | 56.0              | 74.0                 | -18.0                  |
| 7320.850   | 53.9             | 8.1           | 1.85                    | 342.9             | 1.0                    | 0.0                       | Vert                      | PK       | -9.5                     | 52.5              | 74.0                 | -21.5                  |

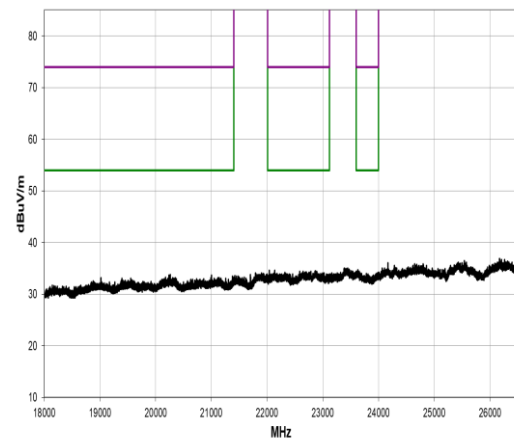
## BTLE TX 2480 MHz Power setting 0



## 30 MHz to 1 GHz



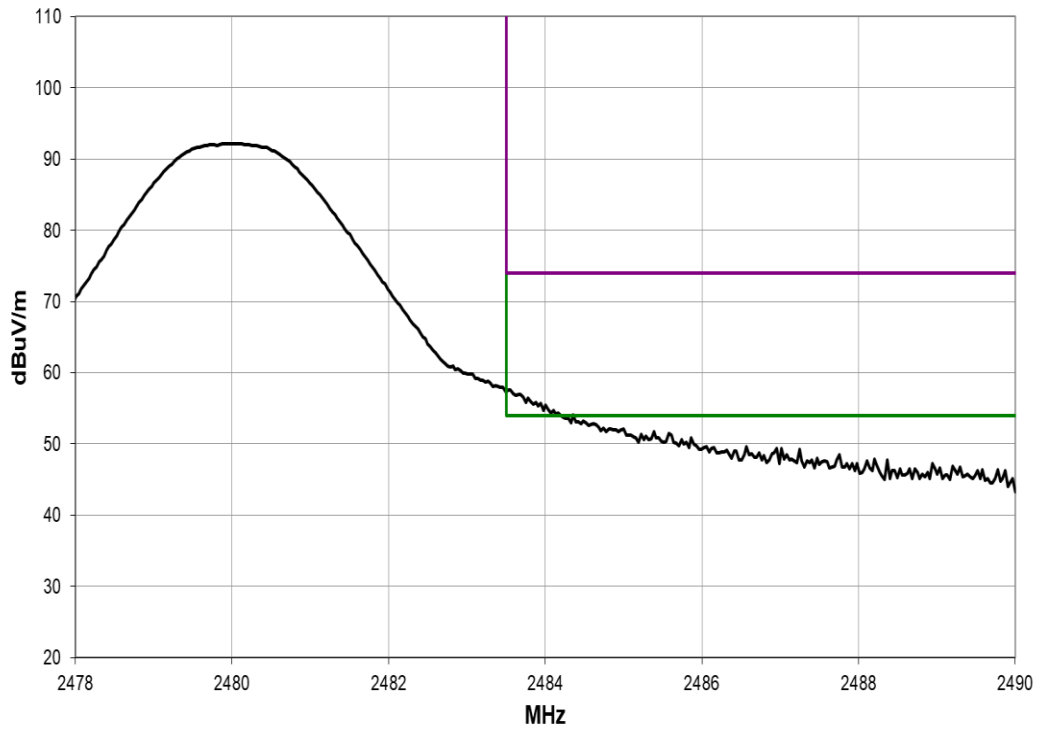
## 1 GHz to 7 GHz



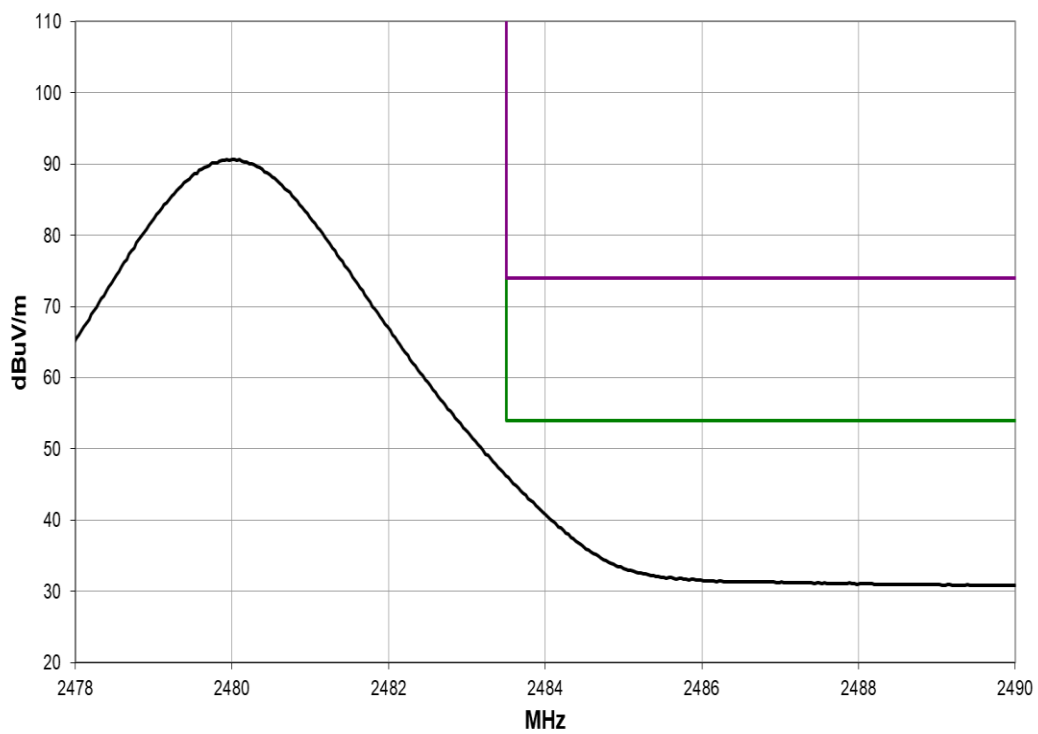
## 7 GHz to 18 GHz

## 18 GHz to 26.5 GHz

| Freq (MHz) | Amplitude (dBuV) | Factor (dB/m) | Antenna Height (meters) | Azimuth (degrees) | Test Distance (meters) | External Attenuation (dB) | Polarity/ Transducer Type | Detector | Distance Adjustment (dB) | Adjusted (dBuV/m) | Spec. Limit (dBuV/m) | Compared to Spec. (dB) |
|------------|------------------|---------------|-------------------------|-------------------|------------------------|---------------------------|---------------------------|----------|--------------------------|-------------------|----------------------|------------------------|
| 7439.242   | 46.8             | 8.3           | 1.74                    | 99.2              | 1.0                    | 0.0                       | Horz                      | AV       | -9.5                     | 45.6              | 54.0                 | -8.4                   |
| 7439.283   | 43.2             | 8.3           | 1.83                    | 175.2             | 1.0                    | 0.0                       | Vert                      | AV       | -9.5                     | 42.0              | 54.0                 | -12.0                  |
| 7440.758   | 56.5             | 8.3           | 1.74                    | 99.2              | 1.0                    | 0.0                       | Horz                      | PK       | -9.5                     | 55.3              | 74.0                 | -18.7                  |
| 7439.233   | 53.4             | 8.3           | 1.83                    | 175.2             | 1.0                    | 0.0                       | Vert                      | PK       | -9.5                     | 52.2              | 74.0                 | -21.8                  |



Upper radiated band Edge - Peak



Upper radiated band edge - RMS

## 12 Maximum peak conducted output power & Effective isotropic radiated power

### 12.1 Definition

The maximum peak conducted output power is defined as the maximum power level measured with a peak detector using a filter with width and shape of which is sufficient to accept the signal bandwidth.

The effective isotropic radiated power (EIRP) is defined as the product of the power supplied to the antenna and the antenna gain in a given direction relative to an isotropic antenna.

### 12.2 Test Parameters

|                                                              |                                 |
|--------------------------------------------------------------|---------------------------------|
| Test Location:                                               | Element Skelmersdale            |
| Test Chamber:                                                | Chamber 1                       |
| Test Standard and Clause:                                    | ANSI C63.10-2013, Clause 11.9.1 |
| EUT Frequencies Measured:                                    | 2402 MHz, 2440 MHz & 2480 MHz   |
| EUT Channel Bandwidths:                                      | 1 MHz                           |
| Deviations From Standard:                                    | None                            |
| Measurement BW:                                              | 2 MHz                           |
| Spectrum Analyzer Video BW:<br>(requirement at least 3x RBW) | 10 MHz                          |
| Measurement Detector:                                        | Peak                            |

#### Environmental Conditions (Normal Environment)

|                    |                                  |
|--------------------|----------------------------------|
| Temperature: 18 °C | +15 °C to +35 °C (as declared)   |
| Humidity: 46 % RH  | 20 % RH to 75 % RH (as declared) |

### 12.3 Test Limit

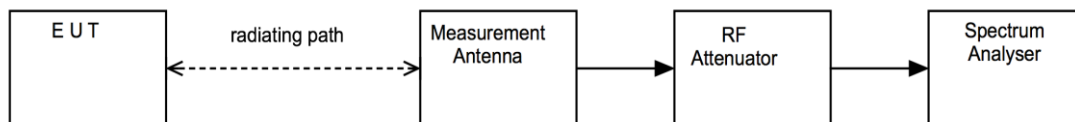
No Limits applied – information only.

## 12.4 Test Method

With the EUT setup as per section 9 of this report and connected as per Figure iv, the resolution bandwidth of the spectrum analyser was increased above the EUT occupied bandwidth and the peak emission data noted.

The measurements were performed with EUT set at its maximum duty. All modulation schemes, data rates and power settings were used to observe the worst-case configuration in each bandwidth.

**Figure iv Test Setup**



## 12.5 Test Equipment

| <i>Equipment Description</i> | <i>Manufacturer</i> | <i>Equipment Type</i> | <i>Element No</i> | <i>Due For Calibration</i> |
|------------------------------|---------------------|-----------------------|-------------------|----------------------------|
| Spectrum Analyser            | R&S                 | FSU46                 | REF910            | 2025-01-30                 |
| 1-18GHz Horn                 | EMCO                | 3115                  | L139              | 2024-07-01                 |
| Pre Amp                      | Agilent             | 8449B                 | L572              | 2024-10-30                 |
| Chamber 1                    | Rainford EMC        | ATS                   | U387              | 2026-01-24                 |
| Radiated Test Software       | Element             | Emissions R5          | REF9000           | Cal Not Required           |

## 12.6 Test Results

The following formula was used to convert field strength ( $E$ ) in volts/metre to conducted output power in watts:

$$\text{Conducted Output Power} = (E \times d)^2 / (30 \times G)$$

Where,

$E$  is the electric field strength in V/m

$d$  is the measurement distance in meters (m)

$G$  is the antenna numerical gain referenced to isotropic gain

| <b>Modulation: GFSK; Data rate: 1 Mbps; Power setting: 0</b> |                                     |                                  |                     |                     |                                                |                  |
|--------------------------------------------------------------|-------------------------------------|----------------------------------|---------------------|---------------------|------------------------------------------------|------------------|
| <b>Frequency (MHz)</b>                                       | <b>Peak Field Strength (dBμV/m)</b> | <b>Peak Field Strength (V/m)</b> | <b>Distance (m)</b> | <b>Numeric Gain</b> | <b>Maximum peak conducted output power (W)</b> | <b>Result</b>    |
| 2402                                                         | 94.3                                | 0.05188                          | 3                   | 0.63                | 0.00128                                        | Information Only |
| 2440                                                         | 94.7                                | 0.05433                          | 3                   | 0.63                | 0.00140                                        |                  |
| 2480                                                         | 92.3                                | 0.04121                          | 3                   | 0.63                | 0.00081                                        |                  |

The following formula was used to convert field strength ( $E$ ) in volts/metre to EIRP in watts:

$$\text{EIRP} = (E \times d)^2 / 30$$

Where,

$E$  is the electric field strength in V/m

$d$  is the measurement distance in meters (m)

| <b>Modulation: GFSK; Data rate: 1 Mbps; Power setting: 0</b> |                                     |                                  |                     |                 |                  |
|--------------------------------------------------------------|-------------------------------------|----------------------------------|---------------------|-----------------|------------------|
| <b>Frequency (MHz)</b>                                       | <b>Peak Field Strength (dBμV/m)</b> | <b>Peak Field Strength (V/m)</b> | <b>Distance (m)</b> | <b>EIRP (W)</b> | <b>Result</b>    |
| 2402                                                         | 94.3                                | 0.05188                          | 3                   | 0.00081         | Information Only |
| 2440                                                         | 94.7                                | 0.05433                          | 3                   | 0.00089         |                  |
| 2480                                                         | 92.3                                | 0.04121                          | 3                   | 0.00051         |                  |

## 13 Measurement Uncertainty

### Radio Testing – General Uncertainty Schedule

All statements of uncertainty are expanded standard uncertainty using a coverage factor of 1.96 to give a 95 % confidence where no required test level exists.

| <b>Test/Measurement</b>                                                                          | <b>Budget Number</b> | <b>MU</b>     |
|--------------------------------------------------------------------------------------------------|----------------------|---------------|
| <b>Conducted RF Power, Power Spectral Density, Adjacent Channel Power and Spurious emissions</b> |                      |               |
| Absolute RF power (via antenna connector) Sampling Power Meter to 8 GHz                          | MU4001               | <b>0.9 dB</b> |
| Carrier Power and PSD - Spectrum Analysers                                                       | MU4004               | <b>1.7 dB</b> |
| Adjacent Channel Power                                                                           | MU4002               | <b>1.9 dB</b> |
| Transmitter conducted spurious emissions (Including emissions due to intermodulation)            | MU4041               | <b>0.9 dB</b> |
| Conducted power and spurious emissions 40 GHz to 50 GHz                                          | MU4042               | <b>2.4 dB</b> |
| Conducted power and spurious emissions 50 GHz to 75 GHz                                          | MU4043               | <b>2.5 dB</b> |
| Conducted power and spurious emissions 75 GHz to 110 GHz                                         | MU4044               | <b>2.4 dB</b> |
| <b>Radiated RF Power and Spurious emissions ERP and EIRP</b>                                     |                      |               |
| Effective Radiated Power Reverb Chamber                                                          | MU4020               | <b>3.7 dB</b> |
| Effective Radiated Power                                                                         | MU4021               | <b>4.7 dB</b> |
| TRP Emissions 30 MHz to 1 GHz using CBL6111 or CBL6112 Bilog Antenna                             | MU4046               | <b>5.3 dB</b> |
| TRP Emissions 1 GHz to 18 GHz using HL050 Log Periodic Antenna                                   | MU4047               | <b>5.1 dB</b> |
| TRP Emissions 18 GHz to 26.5 GHz using Standard Gain Horn                                        | MU4048               | <b>2.7 dB</b> |
| TRP Emissions 26.5 GHz to 40 GHz using Standard Gain Horn                                        | MU4049               | <b>2.7 dB</b> |
| In-band (3450-3650 MHz) TRP using CATR_ASH_B2                                                    | MU4051               | <b>4.1 dB</b> |
| Cellular Radiated Spurious Emissions in a SAC 30 MHz to 180 MHz                                  | MU4052               | <b>6.3 dB</b> |
| Cellular Radiated Spurious Emissions in a SAC 180 MHz to 18 GHz                                  | MU4052               | <b>3.6 dB</b> |
| Cellular Radiated Spurious Emissions in a FAR 30 MHz to 180 MHz                                  | MU4052               | <b>5.4 dB</b> |
| Cellular Radiated Spurious Emissions in a FAR 180 MHz to 18 GHz                                  | MU4052               | <b>3.0 dB</b> |
| <b>Spurious Emissions Electric and Magnetic Field</b>                                            |                      |               |
| Radiated Spurious Emissions 30 MHz to 1 GHz (Including emissions due to intermodulation)         | MU4037               | <b>4.8 dB</b> |
| Radiated Spurious Emissions 1-18 GHz (Including emissions due to intermodulation)                | MU4032               | <b>4.5 dB</b> |
| E Field Emissions 18 GHz to 26 GHz                                                               | MU4024               | <b>3.2 dB</b> |
| E Field Emissions 26 GHz to 40 GHz                                                               | MU4025               | <b>3.3 dB</b> |
| E Field Emissions 40 GHz to 50 GHz                                                               | MU4026               | <b>3.5 dB</b> |
| E Field Emissions 50 GHz to 75 GHz                                                               | MU4027               | <b>3.6 dB</b> |
| E Field Emissions 75 GHz to 110 GHz                                                              | MU4028               | <b>3.6 dB</b> |
| Radiated Magnetic Field Emissions                                                                | MU4031               | <b>2.3 dB</b> |

| <b>Test/Measurement</b>                                  | <b>Budget Number</b> | <b>MU</b>         |
|----------------------------------------------------------|----------------------|-------------------|
| <b>Frequency Measurements</b>                            |                      |                   |
| Frequency Deviation                                      | MU4022               | <b>3.7 kHz</b>    |
| Frequency error using CMTA test set                      | MU4023               | <b>113.441 Hz</b> |
| Frequency error using GPS locked frequency source        | MU4045               | <b>0.0413 ppm</b> |
|                                                          |                      |                   |
| <b>Bandwidth/Spectral Mask Measurements</b>              |                      |                   |
| Channel Bandwidth                                        | MU4005               | <b>3.87%</b>      |
| Transmitter Mask Amplitude                               | MU4039               | <b>1.3 dB</b>     |
| Transmitter Mask Frequency                               | MU4040               | <b>2.59%</b>      |
|                                                          |                      |                   |
| <b>Time Domain Measurements</b>                          |                      |                   |
| Transmission Time                                        | MU4038               | <b>4.40%</b>      |
|                                                          |                      |                   |
| <b>Dynamic Frequency Selection (DFS) Parameters</b>      |                      |                   |
| DFS Analyser - Measurement Time                          | MU4006               | <b>678.984 µs</b> |
| DFS Generator - Frequency Error                          | MU4007               | <b>91.650 Hz</b>  |
| DFS Threshold Conducted                                  | MU4008               | <b>1.3 dB</b>     |
| DFS Threshold Radiated                                   | MU4009               | <b>3.2 dB</b>     |
|                                                          |                      |                   |
| <b>Receiver Parameters</b>                               |                      |                   |
| EN 300 328 Receiver Blocking                             | MU4010               | <b>1.1 dB</b>     |
| EN 301 893 Receiver Blocking                             | MU4011               | <b>1.1 dB</b>     |
| EN 303 340 Adjacent Channel Selectivity                  | MU4012               | <b>1.1 dB</b>     |
| EN 303 340 Overloading                                   | MU4013               | <b>1.1 dB</b>     |
| EN 303 340 Receiver Blocking                             | MU4014               | <b>1.1 dB</b>     |
| EN 303 340 Receiver Sensitivity                          | MU4015               | <b>0.9 dB</b>     |
| EN 303 372-1 Image Rejection                             | MU4016               | <b>1.4 dB</b>     |
| EN 303 372-1 Receiver Blocking                           | MU4017               | <b>1.1 dB</b>     |
| EN 303 372-2 Adjacent Channel Selectivity                | MU4018               | <b>1.1 dB</b>     |
| EN 303 372-2 Dynamic Range                               | MU4019               | <b>0.9 dB</b>     |
| Receiver Blocking Talk Mode Conducted                    | MU4033               | <b>1.2 dB</b>     |
| Receiver Blocking Talk Mode- radiated                    | MU4034               | <b>3.4 dB</b>     |
| Rx Blocking, listen mode, blocking level                 | MU4035               | <b>3.2 dB</b>     |
| Rx Blocking, listen mode, radiated Threshold Measurement | MU4036               | <b>3.4 dB</b>     |
| Adjacent Sub Band Selectivity                            | MU4003               | <b>4.2 dB</b>     |

| <b>Test/Measurement</b>                                                  | <b>Budget Number</b> | <b>MU</b>      |
|--------------------------------------------------------------------------|----------------------|----------------|
| <b>Rohde &amp; Schwarz TS8997</b>                                        |                      |                |
| Carrier frequency                                                        | MU4050               | <b>5.2 ppm</b> |
| RF Output Power                                                          | MU4050               | <b>1.0 dB</b>  |
| Peak Power                                                               | MU4050               | <b>0.8 dB</b>  |
| Power Spectral Density                                                   | MU4050               | <b>1.0 dB</b>  |
| Occupied Channel Bandwidth                                               | MU4050               | <b>2.08 %</b>  |
| Transmitter unwanted emissions in-band                                   | MU4050               | <b>0.9 dB</b>  |
| Transmitter unwanted emissions in the spurious domain 30 MHz to 1 GHz    | MU4050               | <b>0.6 dB</b>  |
| Transmitter unwanted emissions in the spurious domain 1 GHz to 12.75 GHz | MU4050               | <b>1.8 dB</b>  |
| Receiver Spurious emission 30 MHz to 1 GHz                               | MU4050               | <b>0.6 dB</b>  |
| Receiver Spurious emission 1 GHz to 12.75 GHz                            | MU4050               | <b>1.8 dB</b>  |
| Duty Cycle                                                               | MU4050               | <b>0.02 %</b>  |
| Tx Sequence                                                              | MU4050               | <b>0.02 %</b>  |
| Tx Gap                                                                   | MU4050               | <b>0.02 %</b>  |
| Medium Utilisation                                                       | MU4050               | <b>0.1 %</b>   |
| Accumulated Transmit Time                                                | MU4050               | <b>0.01 %</b>  |
| Minimum Frequency Occupation Time                                        | MU4050               | <b>0.01 %</b>  |
| Hopping Frequency Separation                                             | MU4050               | <b>0.6 %</b>   |
| Receiver blocking (for bit streams)                                      | MU4050               | <b>3.0 dB</b>  |
| Channel Access Mechanism / Adaptivity / DFS / Contention Based Protocol  | MU4050               | <b>1.8 dB</b>  |