Report on Radio Testing of the Laerdal Medical AS

Model: AED Trainer
2D Antenna Diagram

Prepared for: Laerdal Medical AS
Tanke Svilandsgate
4002 Stavanger; Norway

COMMERCIAL-IN-CONFIDENCE

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Product Service

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Content

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1 Report Summary

1.1 Modification Report

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

Revision	*Description of changes*	*Date of Issue*
0	First Issue	2023-02-13

Table 1: Report of Modifications

1.2 Introduction

Applicant	Laerdal Medical AS Tanke Svilands Gate 30 4002 Stavanger; Norway
Manufacturer	Laerdal Medical; Suzhou
Model Number(s)	AED Trainer
Serial Number(s)	N/A
Hardware Version(s)	N/A
Software Version(s)	N/A
Number of Samples Tested	1
Test Specification(s) / Issue / Date	ETSI EN 300 328 V2.2.2 (2019-07)
Test Plan/Issue/Date	N/A
Order Number	PG002359
Date	2023-02-01
Date of Receipt of EUT	2023-02-02
Start of Test	2023-02-10
Finish of Test	2023-02-10
Name of Engineer(s)	M. Steindl
Related Document(s)	---

1.3 Brief Summary of Results

A brief summary of the tests carried out is shown below.

Section	*Test Description*	*Result*
2.1	Antenna Diagram	Result noted

Table 2: Results

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1.4 Product Information

1.4.1 General Technical Description

AED trainer is used in combination with simulated AED pads. The AED pads can be used a limited number of times and are available for purchase seperately (consumable). There are several alternative simulated AED pads, ranging from dummy pads with no transfere signals or data to advance pads where there is a transfer of signals or data.

Frequency Band:	2400.0 MHz – 2483.5 MHz
Supply Voltage:	6 V
Supply Frequency:	0 Hz (DC)
Highest clock frequency (non-radio part):	64 MHz

1.4.2 EUT Ports / Cables identification

Port	Max Cable Length specified	Usage	Screened
DC supply	2 m	DC supply	No
RS-232	1 m	Signal/Control port	Yes

Table 3

1.5 Test Configuration

The EUT was provided as printed board. Radiated emissions were tested with the EUT in three orthogonal positions.

1.6 Modes of Operation

The EUT was configured to transmit on lowest and highest frequency channel.

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1.7 EUT Modifications 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*
0	As supplied by the customer	Not Applicable	Not Applicable

Table 4

1.8 Test Location

TÜV SÜD Product Service conducted the following tests at our Straubing test laboratory:

Test Name	*Name of Engineer(s)*
Antenna diagram	Martin Steindl

Office Address:
Äußere Frühlingstraße 45
94315 Straubing
Germany

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2 Test Details

2.1 Antenna diagram

2.1.1 Equipment under Test and Modification State

AED Trainer; Modification State 0

2.1.2 Date of Test

2023-02-10

2.1.3 Environmental Conditions

Ambient Temperature	20 °C
Relative Humidity	27 %

2.1.4 Test Method

First a conducted test was performed to obtain the reference levels. Then an e.i.r.p. radiated test was performed each 2° in azimuth. The antenna gain in dBi was calculated as difference of the radiated values to the conducted value.
Test was performed on lowest and highest frequency channel in *x*-, *y*-, and *z*-plane of the EUT in horizontal and vertical polarization.
The conducted test was performed according to EN 300 328, clause 5.4.2.; the radiated test on basis of EN 300 328.
Note: The average gain is the geometric mean of the single values.

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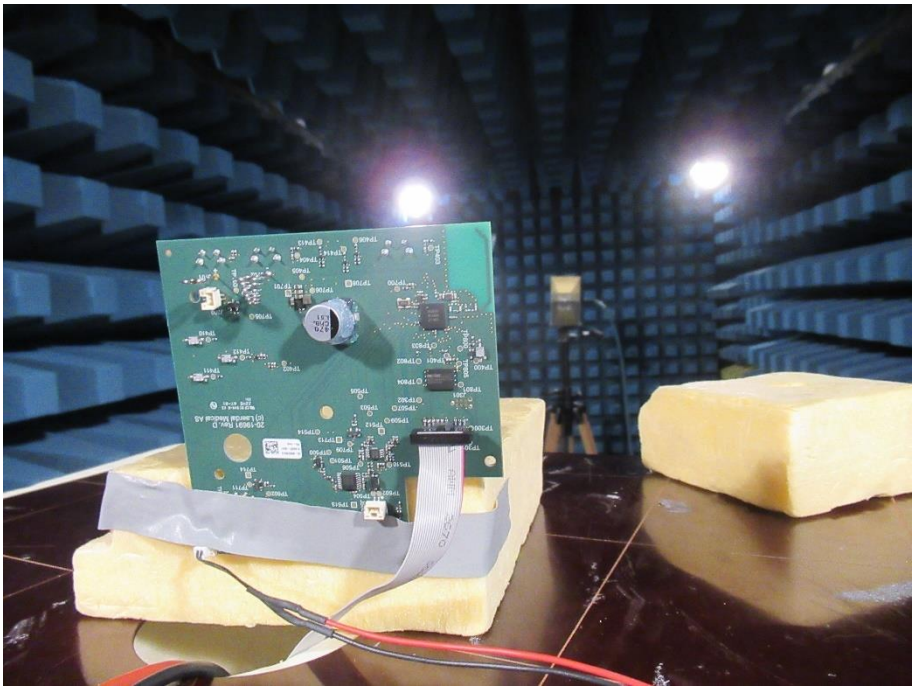
2.1.5 Test Results

2.1.5.1 Rotating x-axis



Frequency MHz	*Max. Value dBi*	*Azimuth max. deg*	*Pol max.*	*Min. Value dBi*	*Azimuth min. deg*	*Pol min.*
2402.000000	0.72	120	H	-22.23	34	V
2480.000000	-0.74	106	V	-21.29	38	V

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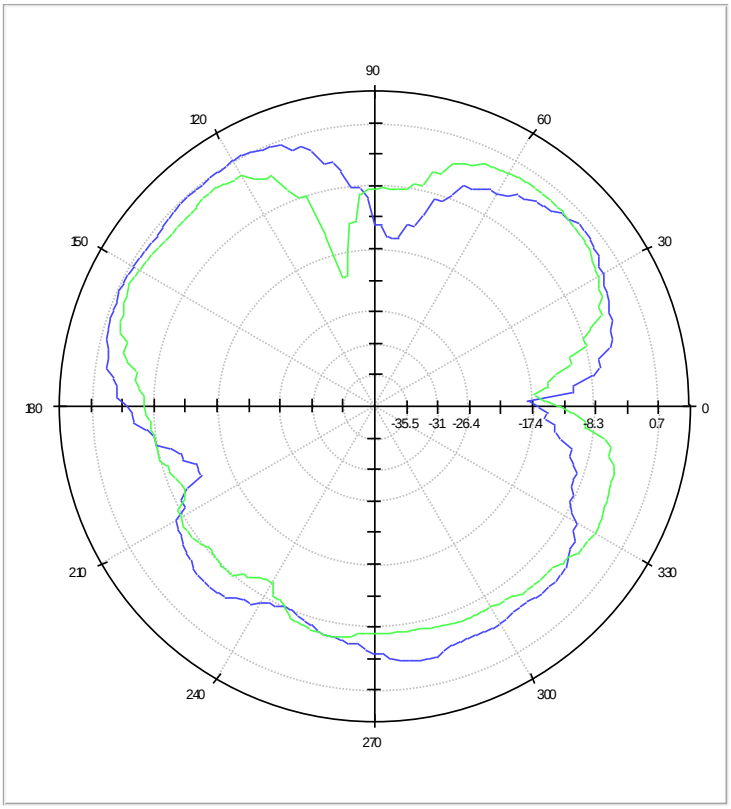
2.1.5.1.1 Horizontal polarization

Azimuth Chart Horizontal



Frequency MHz	*Max. value dBi*	*Azimuth deg*	*Min. value dBi*	*Azimuth deg*	*Average dBi*
2402.000000	0.72	120	-18.19	0	-5.54
2480.000000	-0.85	150	-20.97	102	-6.33

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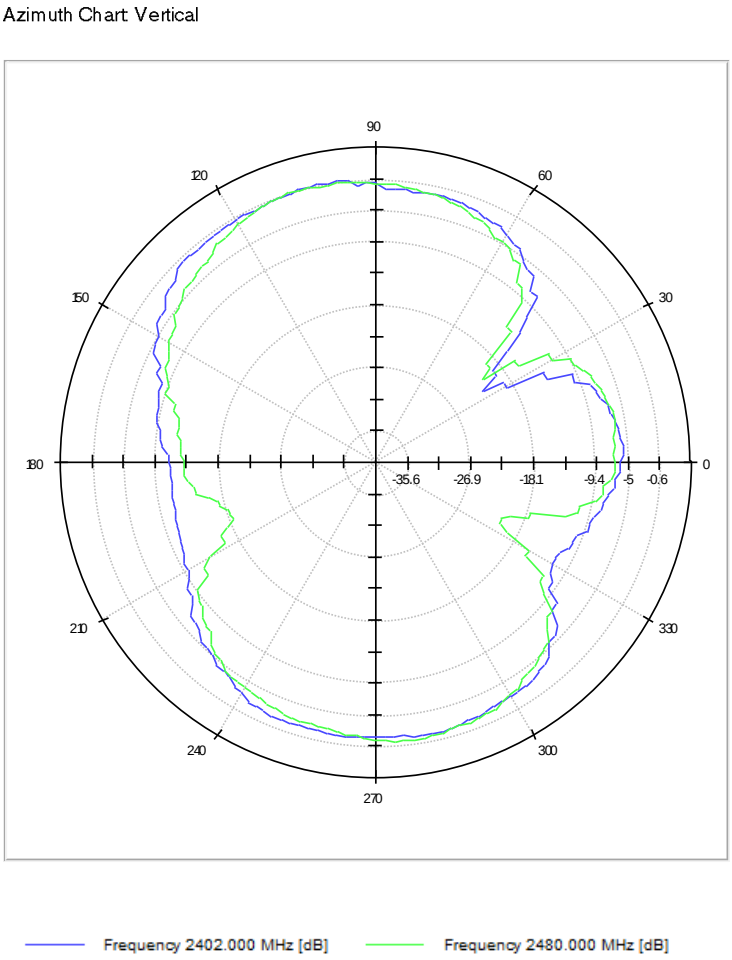
2.1.5.1.2 Vertical polarization



Frequency MHz	*Max. value dBi*	*Azimuth deg*	*Min. value dBi*	*Azimuth deg*	*Average dBi*
2402.000000	-0.63	98	-22.23	34	-5.86
2480.000000	-0.74	106	-21.29	38	-7.23

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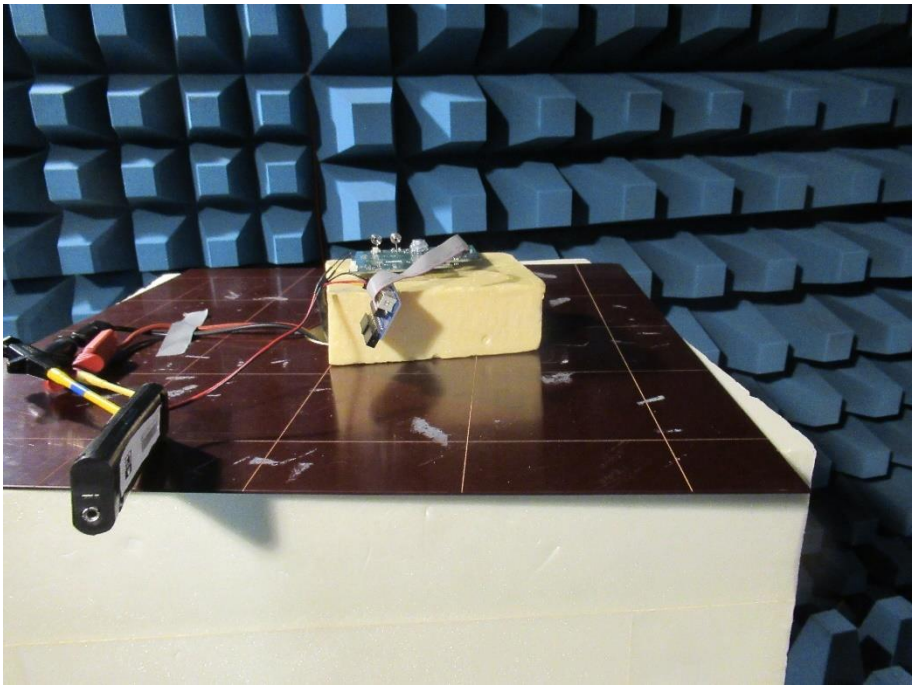
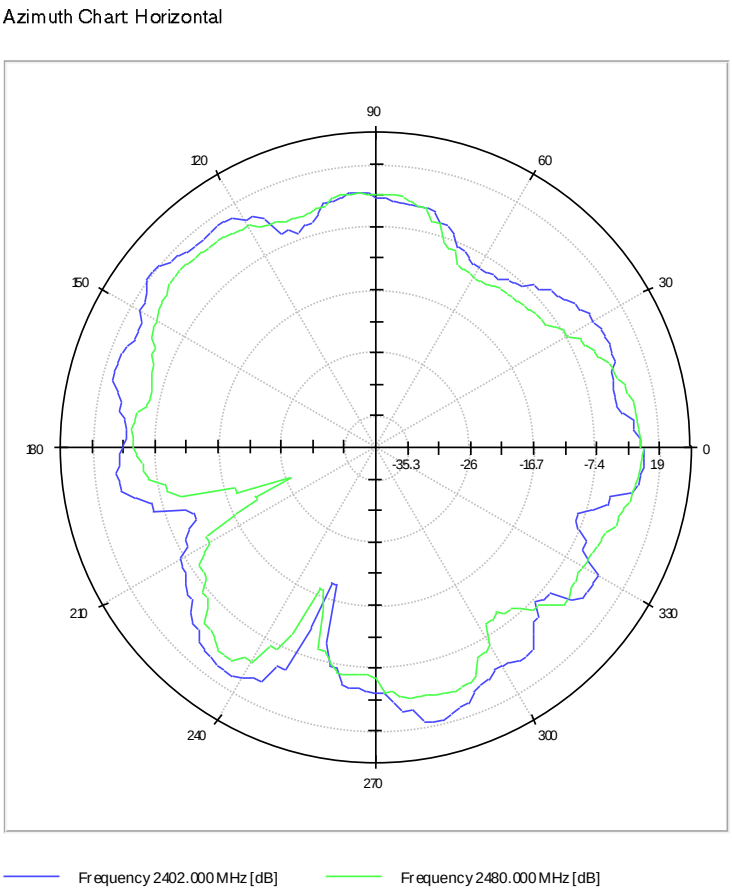
2.1.5.2 Rotating y-axis



Frequency MHz	*Max. Value dBi*	*Azimuth max. deg*	*Pol max.*	*Min. Value dBi*	*Azimuth min. deg*	*Pol min.*
2402.000000	1.90	142	H	-33.88	270	V
2480.000000	-0.93	0	H	-31.23	134	V

Product Service

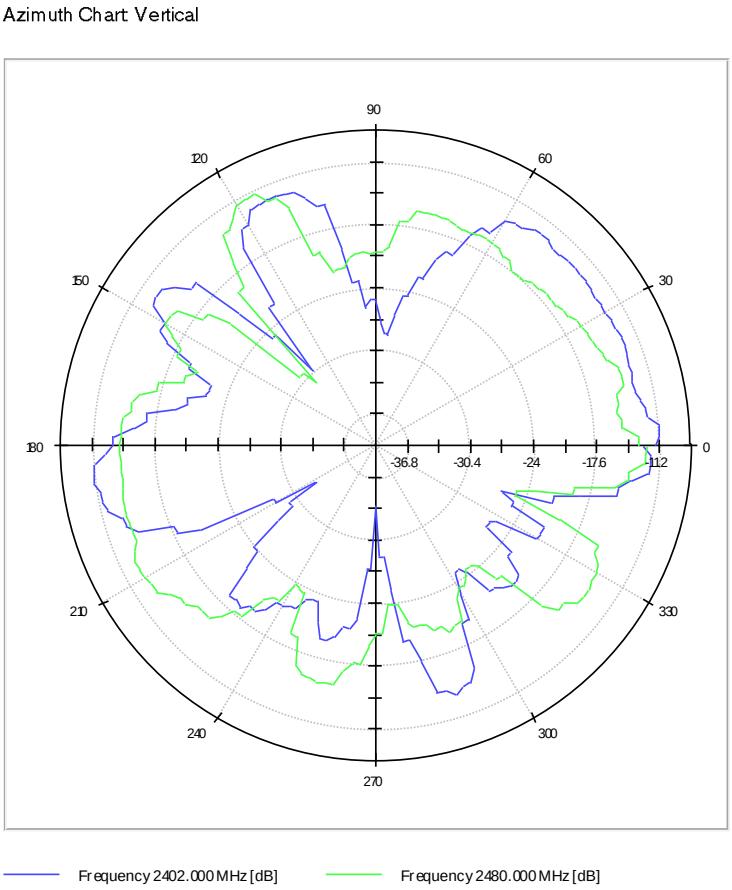
2.1.5.2.1 Horizontal polarization



Frequency MHz	*Max. value dBi*	*Azimuth deg*	*Min. value dBi*	*Azimuth deg*	*Average dBi*
2402.000000	1.90	142	-19.02	252	-3.64
2480.000000	-0.93	0	-26.56	200	-5.66

Product Service

2.1.5.2.2 Vertical polarization



Frequency MHz	*Max. value dBi*	*Azimuth deg*	*Min. value dBi*	*Azimuth deg*	*Average dBi*
2402.000000	-11.15	4	-33.88	270	-18.55
2480.000000	-11.65	116	-31.23	134	-17.32

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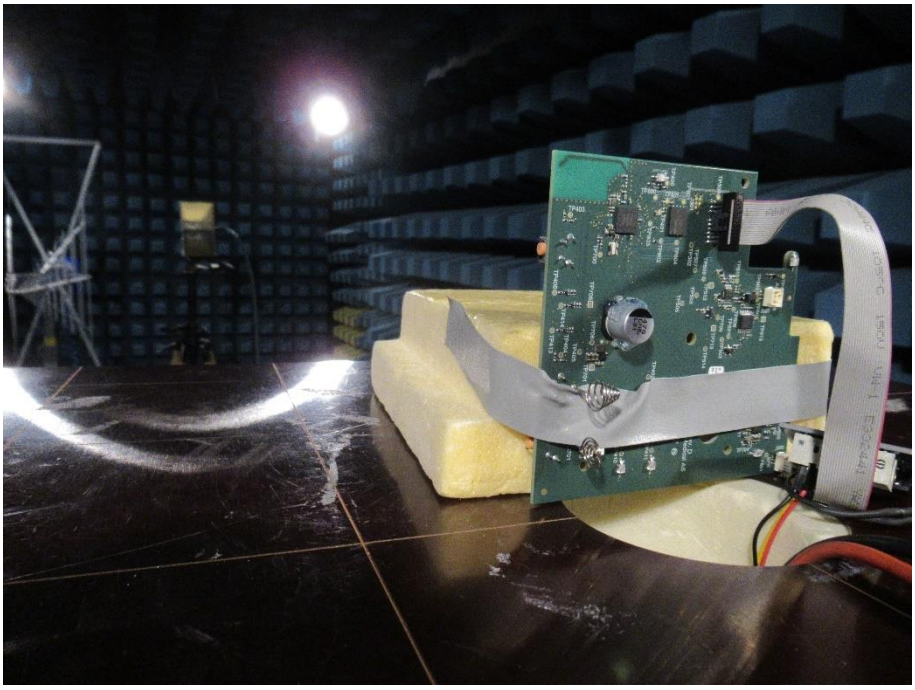
2.1.5.3 Rotating z-axis



Frequency MHz	*Max. Value dBi*	*Azimuth max. deg*	*Pol max.*	*Min. Value dBi*	*Azimuth min. deg*	*Pol min.*
2402.000000	-3.07	184	H	-36.84	280	V
2480.000000	-5.16	74	V	-26.08	252	H

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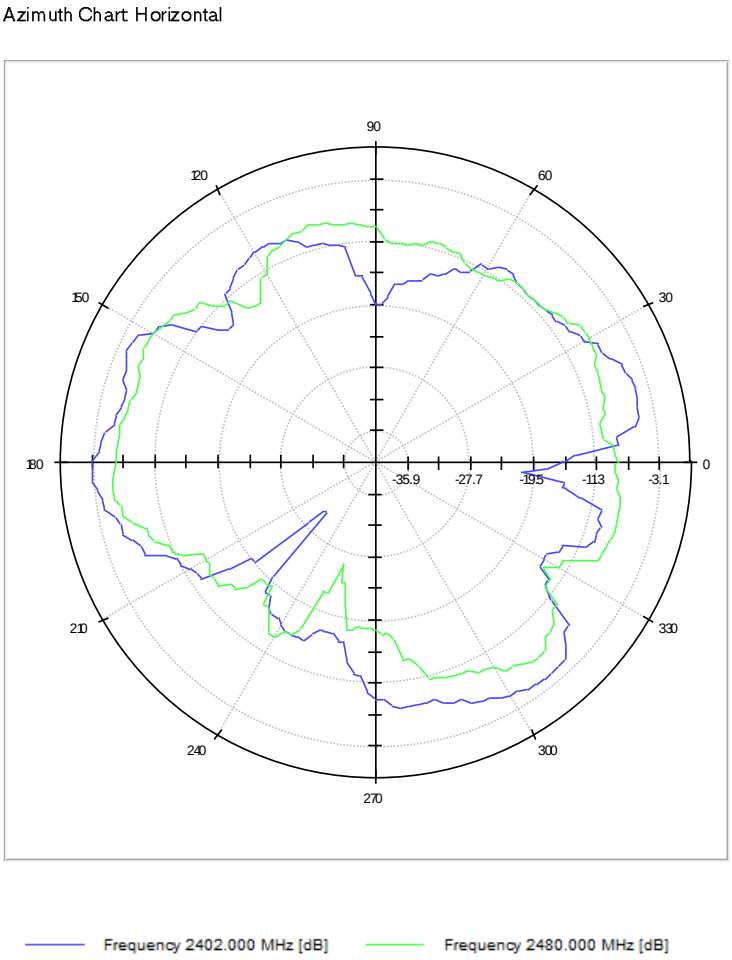
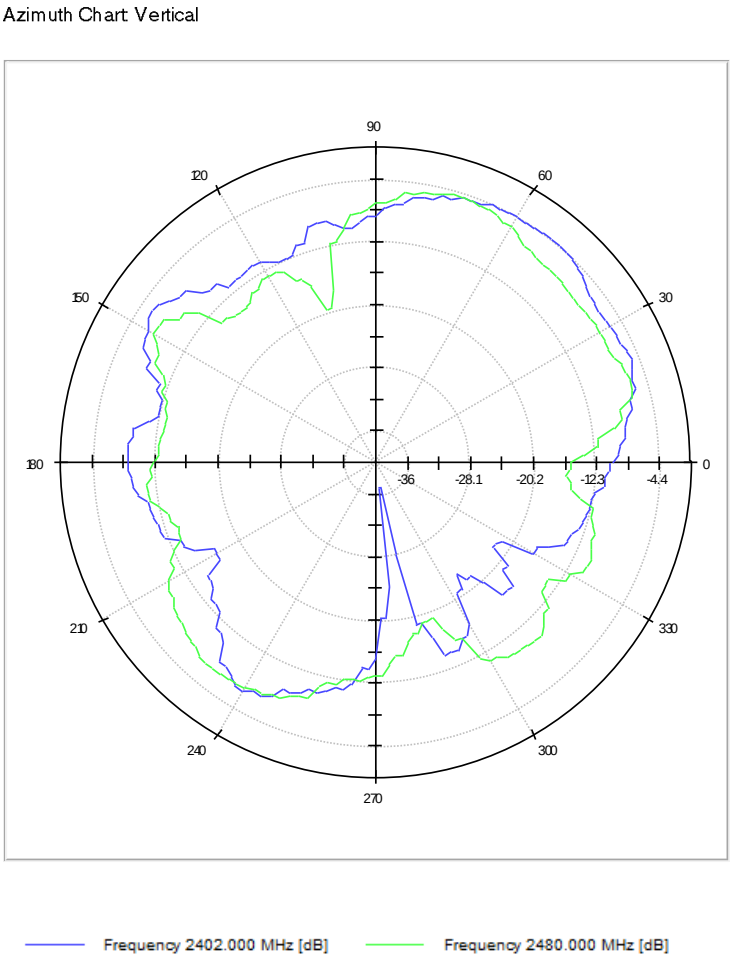
2.1.5.3.1 Horizontal polarization



Frequency MHz	*Max. value dBi*	*Azimuth deg*	*Min. value dBi*	*Azimuth deg*	*Average dBi*
2402.000000	-3.07	184	-30.76	226	-10.69
2480.000000	-5.63	188	-26.08	252	-10.92

Product Service

2.1.5.3.2 Vertical polarization



Frequency MHz	*Max. value dBi*	*Azimuth deg*	*Min. value dBi*	*Azimuth deg*	*Average dBi*
2402.000000	-4.45	52	-36.84	280	-11.30
2480.000000	-5.16	74	-19.92	108	-10.91

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2.1.6 Test Location and Test Equipment

The test was carried out in semi anechoic room, cabin no. 2

Instrument	*Manufacturer*	*Type No*	*TE No*	*Calibration Period (months)*	*Calibration Due*
Double ridged waveguide horn antenna	EMCO	3115	19383	36	2023-03-31
Signal and spectrum analyser	Rohde & Schwarz	FSW43	53496	12	2023-04-30
EMC measurement software	Rohde & Schwarz	EMC32 V10.60.20	44375		
Fully anechoic room	Albatross	Cabin No. 2	19312		

Table 5

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3 Measurement Uncertainty

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

Test Name	*kp*	*Expanded Uncertainty*
Occupied Bandwidth	2	±5 %
Conducted Power		
9 kHz ≤ f < 30 MHz	2	±1.0 dB
30 MHz ≤ f < 1 GHz	2	±1.5 dB
1 GHz ≤ f ≤ 40 GHz	2	±2.5 dB
1 MS/s power sensor (TS8997)	2	±1.5 dB
Power Spectral Density	2	±3.0 dB
Radiated Power		
25 MHz – 6 GHz	1.96	±4.4 dB
1 GHz – 18 GHz	1.96	±4.7 dB
18 GHz – 40 GHz	1.96	±4.9 dB
40 GHz – 325 GHz	1.96	±6.1 dB
Conducted Spurious Emissions	2	±3.0 dB
Radiated Field Strength 9 kHz – 40 GHz	2	±6.0 dB
Voltage		
DC	2	±1.0 %
AC	2	±2.0 %
Time (automatic)	2	±5 %
Frequency	2	$\pm 10^{-7}$
The expanded uncertainty reported according to to ETSI TR 100 028:2001 and ETSI TR 102 273:2001 is based on a standard uncertainty multiplied by a coverage factor of kp = 2, providing a level of confidence of p = 95.45%		

Table 6 Measurement uncertainty based on ETSI TR 100 028 and ETSI TS 102 273

The measurement uncertainty in the laboratory is less than or equal to the maximum measurement uncertainty as specified in the test report below. This normative regulation means that the measured value is also the value to be assessed in relation to the limit value.

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Test Name	*Expanded Uncertainty*
Occupied Bandwidth	±5 %
Conducted Power	
9 kHz ≤ f < 30 MHz	±1.0 dB
30 MHz ≤ f < 1 GHz	±1.5 dB
1 GHz ≤ f ≤ 40 GHz	±2.5 dB
1 MS/s power sensor (2.4 / 5 GHz band)	±1.5 dB
Power Spectral Density	±3.0 dB
Radiated Power	
25 MHz – 26.5 GHz	±6.0 dB
26.5 GHz – 66 GHz	±8.0 dB
40 GHz – 325 GHz	±10.0 dB
Conducted Spurious Emissions	±3.0 dB
Radiated Field Strength 9 kHz – 40 GHz	±6.0 dB
Voltage	
DC	± 1.0 %
AC	± 2.0 %
Time (automatic)	± 5 %
Frequency	± 10^{-7}

Table 7 Decision Rule: Maximum allowed measurement uncertainty