

Antenna Report

Report Number:

F230975E6

Equipment under Test (EUT):

**Level probing radar
Micropilot FMR43
Antenna**

Applicant:

Endress+Hauser SE+Co. KG

Manufacturer:

Endress+Hauser SE+Co. KG

References

[1] None (According customer requirements)

Tested and
written by

Signature

Reviewed and
approved by:

Signature

This test report is only valid in its original form.

Any reproduction of its contents in extracts without written permission of the accredited test laboratory PHOENIX TESTLAB GmbH is prohibited.

The test results herein refer only to the tested sample. PHOENIX TESTLAB GmbH is not responsible for any generalisations or conclusions drawn from these test results concerning further samples. Any modification of the tested samples is prohibited and leads to the invalidity of this test report. Each page necessarily contains the PHOENIX TESTLAB Logo and the TEST REPORT NUMBER.

Contents:	Page
1 Identification	4
1.1 Applicant.....	4
1.2 Manufacturer	4
1.3 Test Laboratory	4
1.4 AUT (Antenna under test)	5
1.5 Technical Data of Equipment	6
1.6 Dates	6
2 Operational States	7
3 Additional Information	7
4 Antenna photographs.....	8
4.1 Internal photographs	8
5 Antenna Charts.....	9
5.1 Results (Max. Gain).....	9
5.2 Antenna Diagrams EUT Position	10
5.2.1 Test Setup Photos	10
5.2.2 Azimuth charts of transmitter	12
5.2.2.1 Frequency near bottom (f_{low})	12
5.2.2.2 Frequency near middle (f_{mid})	13
5.2.2.3 Frequency near top (f_{high})	15
6 Test Equipment used for Tests	17
7 Report History.....	17

1 Identification

1.1 Applicant

Name:	Endress+Hauser SE+Co. KG
Address:	Hauptstr. 1
Country:	79689 Maulburg
Name for contact purposes:	Germany
Phone:	Mr. Ralf REIMELT
eMail address:	ralf.reimelt@endress.com
Applicant represented during the test by the following person:	None

1.2 Manufacturer

Name:	Endress+Hauser SE+Co. KG
Address:	Hauptstr. 1
Country:	79689 Maulburg
Name for contact purposes:	Germany
Phone:	Mr. Ralf REIMELT
eMail address:	ralf.reimelt@endress.com
Manufacturer represented during the test by the following person:	None

1.3 Test Laboratory

The tests were carried out by: **PHOENIX TESTLAB GmbH**
Königswinkel 10
32825 Blomberg
Germany

1.4 AUT (Antenna under test)

Test object: *	2.4 GHz antenna on module PCB
Model name: *	n/a

	AUT number		
	1	2	3
Serial number: *	Engineering sample #2	-	-
PCB identifier: *	Display board: 71548029	-	-
Hardware version: *	01.00.00	-	-
Software version: *	S140 V7.2.0 (Soft device)	-	-

* Declared by the applicant

One EUT was used for all tests.

Note: PHOENIX TESTLAB GmbH does not take samples. The samples used for tests are provided exclusively by the applicant.

1.5 Technical Data of Equipment

General	
Frequency Range *	2402 MHz to 2480 MHz

* Declared by the applicant

Ports / Connectors				
Identification	Connector		Length during test	Shielding (Yes / No)
	EUT	Ancillary		
---	---	---	---	---

Equipment used for testing	
FMR 43 (EUT4)	-

1.6 Dates

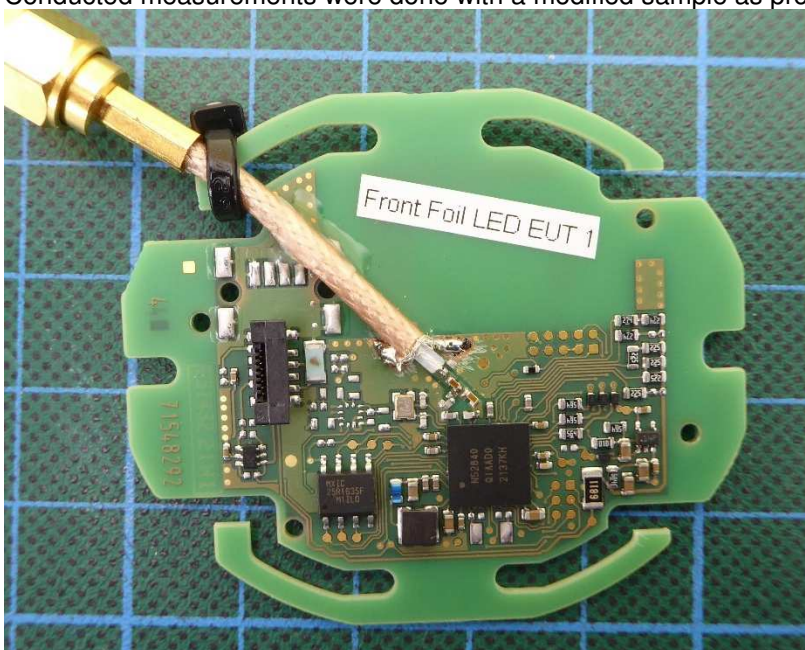
Date of receipt of test sample:	10.10.2023
Start of test:	29.02.2024
End of test:	29.02.2024

2 Operational States

During the antenna chart measurements, the antenna was supplied with a CW rf-signal generated by the EUT with a level as shown in the chapter below its antenna connector.

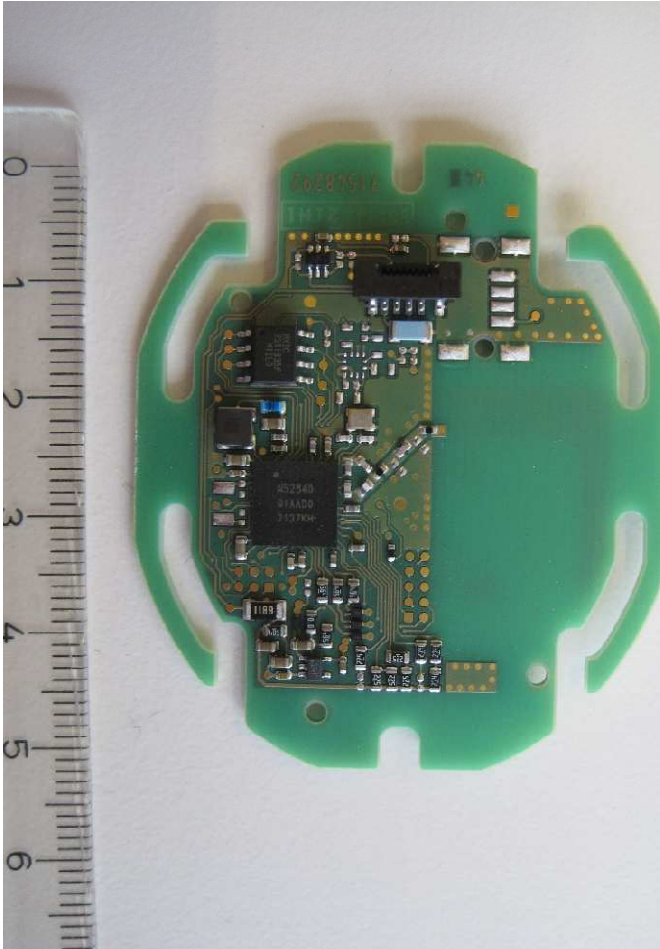
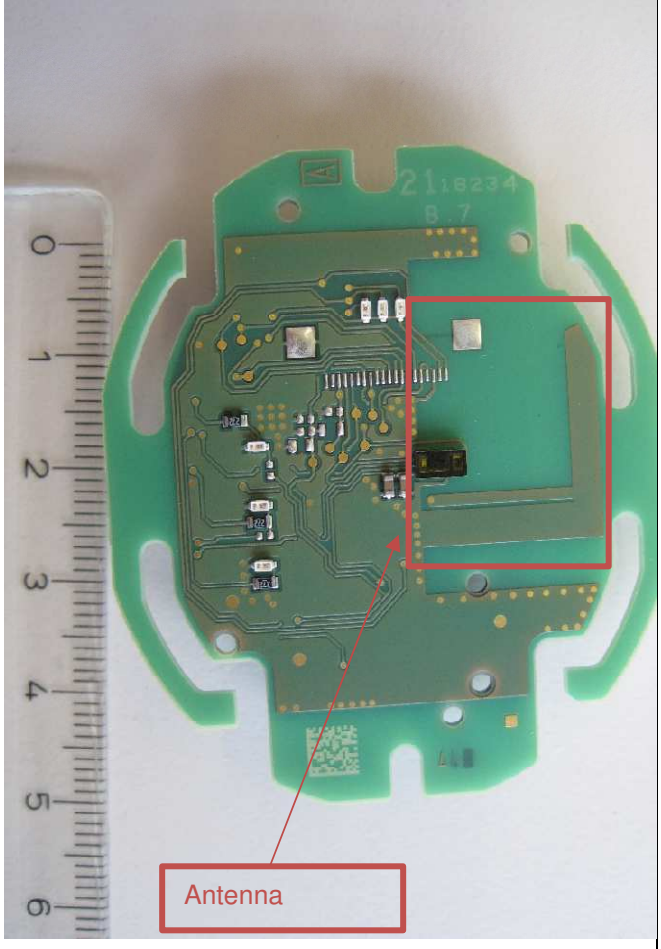
3 Additional Information

Conducted measurements were done with a modified sample as provided by the applicant.



4 Antenna photographs

4.1 Internal photographs

 A photograph of the bottom side of a green LED board (FMR43). The board is irregularly shaped with several cutouts. It features various electronic components, including a large black integrated circuit (IC) in the center, several smaller surface-mount components, and gold-plated pads. A white ruler is visible on the left side for scale.	 A photograph of the top side of the same green LED board (FMR43). It shows a different set of components, including a large black IC and several smaller components. A red rectangular box highlights a specific area on the right side of the board, which is identified as the antenna. A red arrow points from a label 'Antenna' in a red box below the image to this highlighted area. A white ruler is visible on the left side for scale.
LED board FMR43 bottom	LED board FMR43 top

Photos were provided by the applicant

5 Antenna Charts

5.1 Results (Max. Gain)

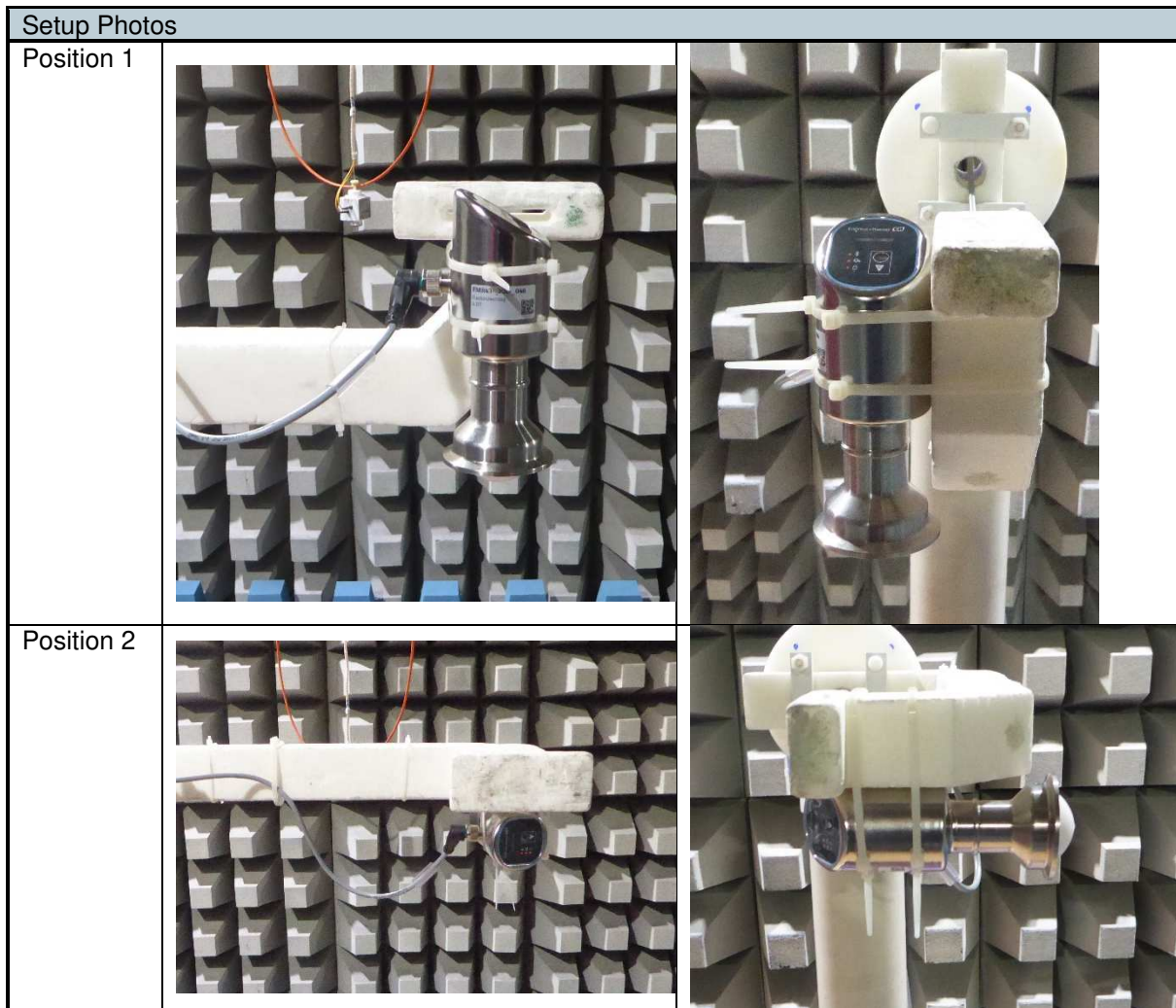
Antenna gain calculation				
		f_{low}	f_{mid}	f_{high}
Conducted output power [dBm]		6.5	6.6	6.8
Radiated EIRP [dBm EIRP]		6.7	5.0	2.4
Antenna Gain [dBi]		0.2	-1.6	-4.4
Position		Position 3	Position 3	Position 3
Position of maximum gain	Azimuth	342	16	333
	Polarisation	H	H	V

Conducted f_{low}	Meas BW (6dB) 100 kHz	Meas Time 100 ms	Step TD Scan Automatic	Frequency 2.4020000 GHz
	Att 25 dB	Notch Off	Preamp Off	
	Input 1 AC	PS		
	1 Bargraph			
Conducted f_{mid}	Meas BW (6dB) 100 kHz	Meas Time 100 ms	Step TD Scan Automatic	Frequency 2.4400000 GHz
	Att 25 dB	Notch Off	Preamp Off	
	Input 1 AC	PS		
	1 Bargraph			
Conducted f_{high}	Meas BW (6dB) 100 kHz	Meas Time 100 ms	Step TD Scan Automatic	Frequency 2.4800000 GHz
	Att 25 dB	Notch Off	Preamp Off	
	Input 1 AC	PS		
	1 Bargraph			

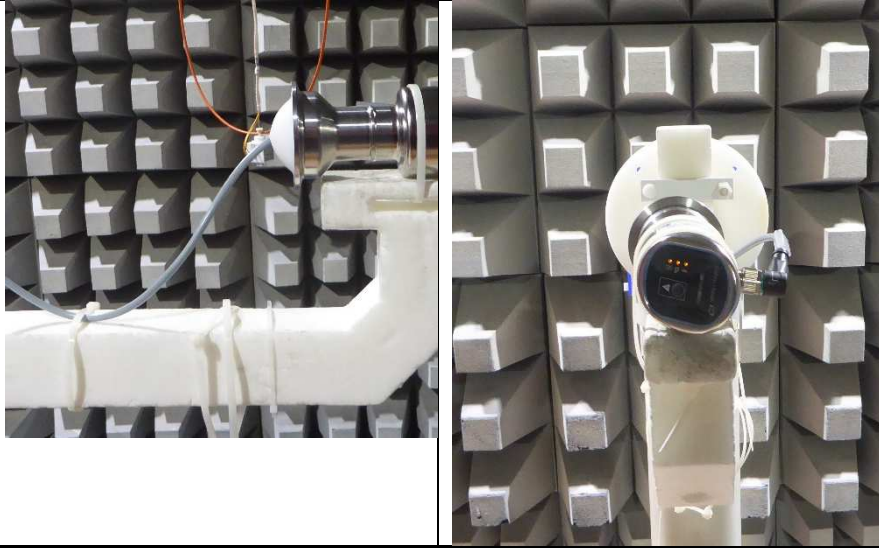
Test equipment (please refer to chapter 7 for details)
1 - 11

5.2 Antenna Diagrams EUT Position

5.2.1 Test Setup Photos

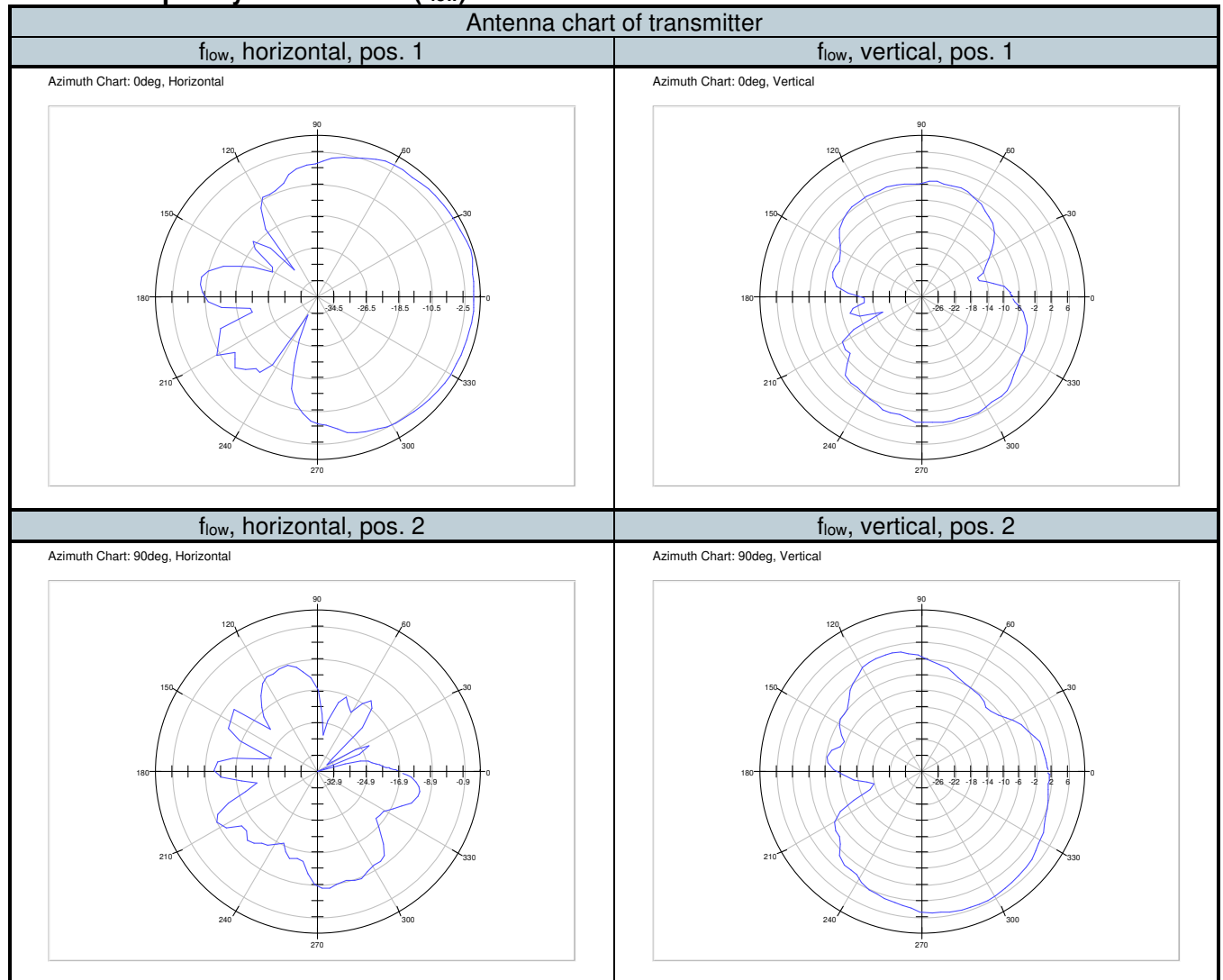


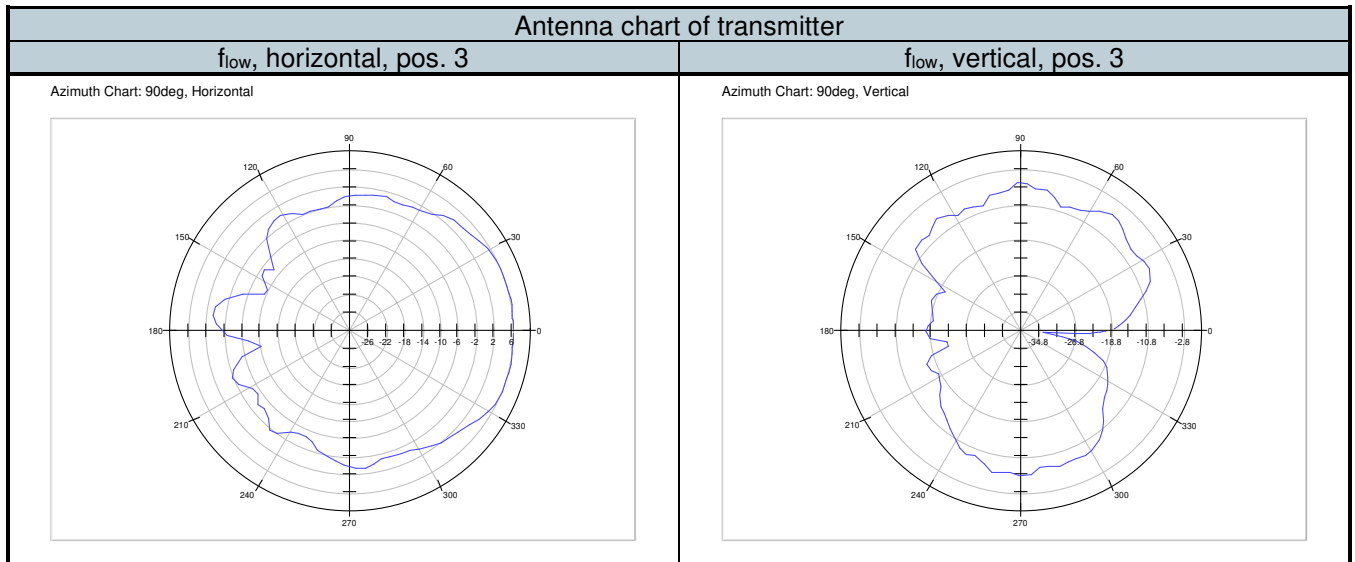
Position 3



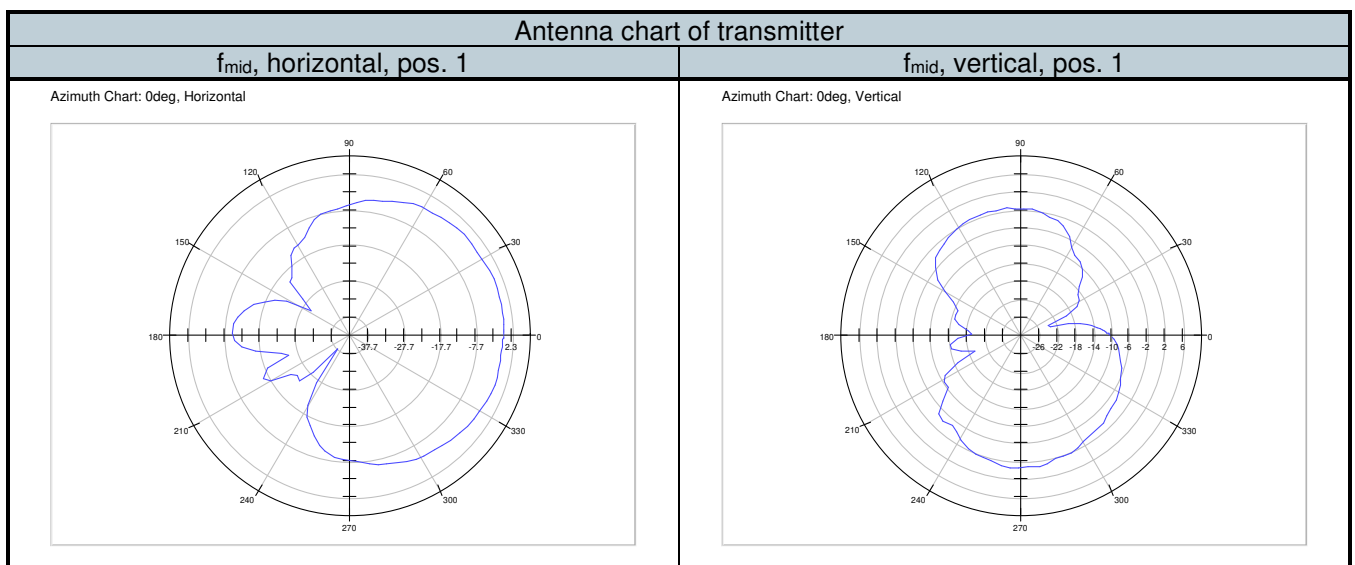
5.2.2 Azimuth charts of transmitter

5.2.2.1 Frequency near bottom (f_{low})





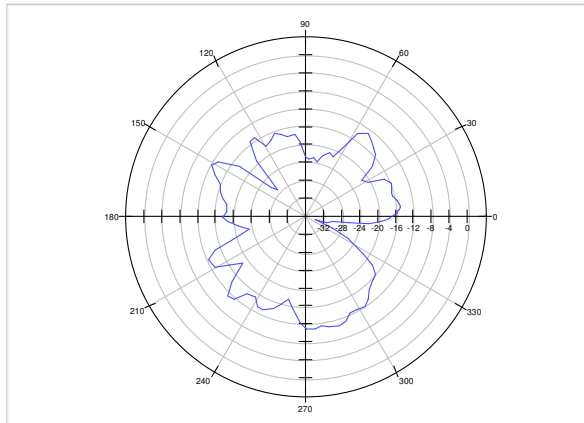
5.2.2.2 Frequency near middle (f_{mid})



Antenna chart of transmitter

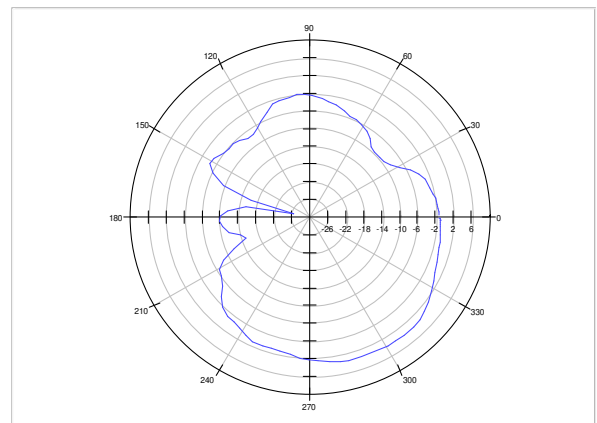
f_{mid} , horizontal, pos. 2

Azimuth Chart: 90deg, Horizontal



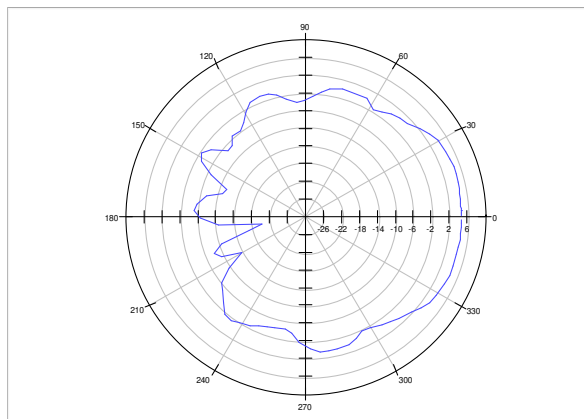
f_{mid} , vertical, pos. 2

Azimuth Chart: 90deg, Vertical



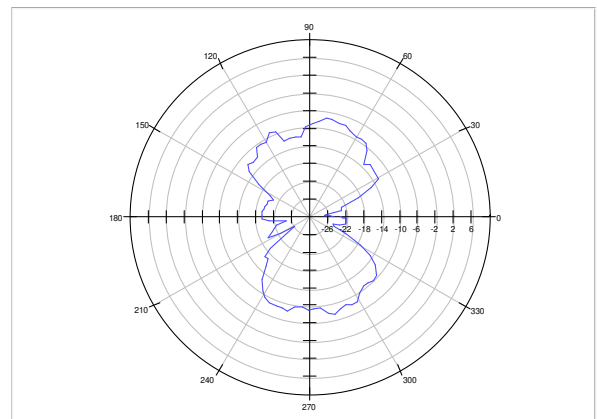
f_{mid} , horizontal, pos. 3

Azimuth Chart: 90deg, Horizontal

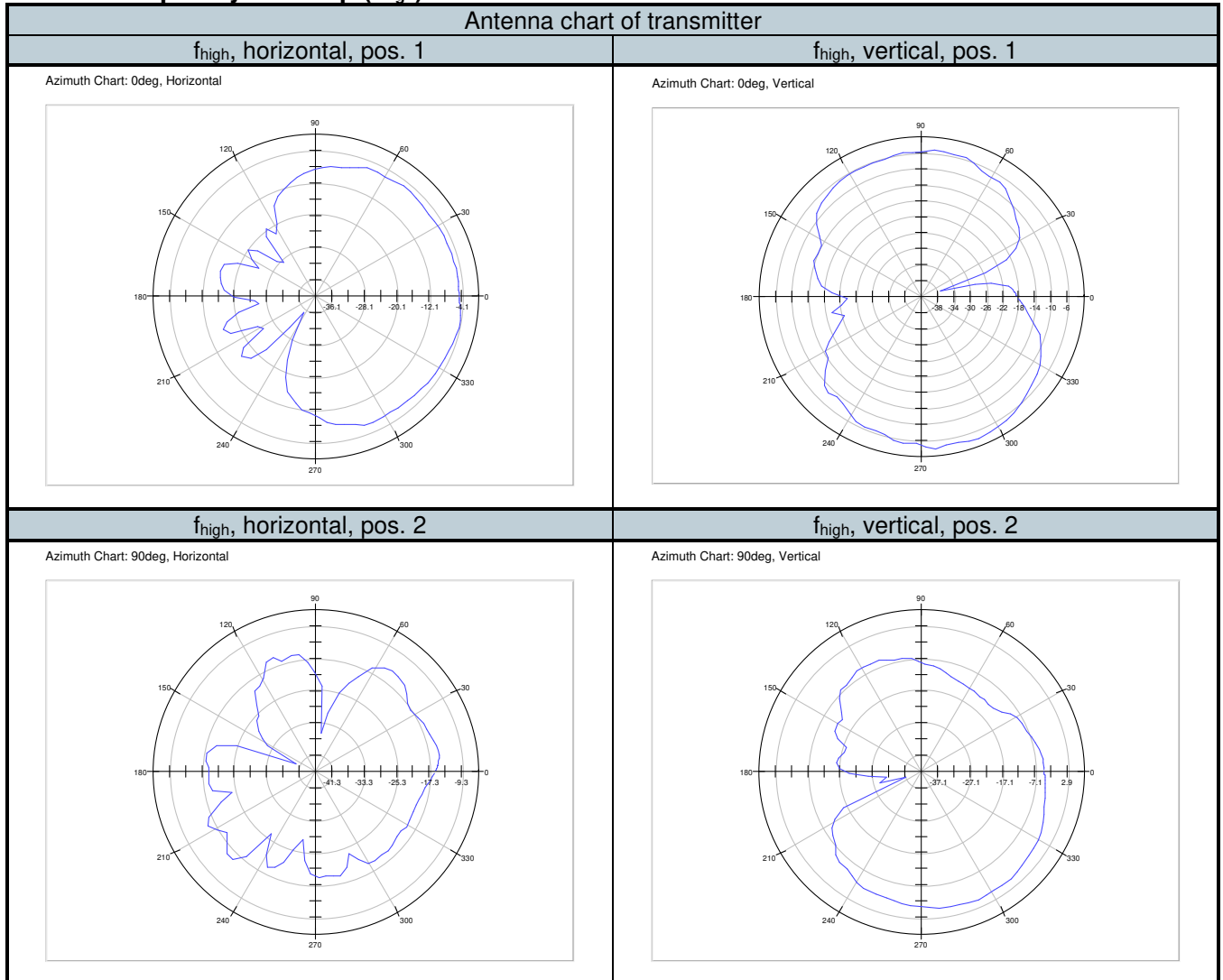


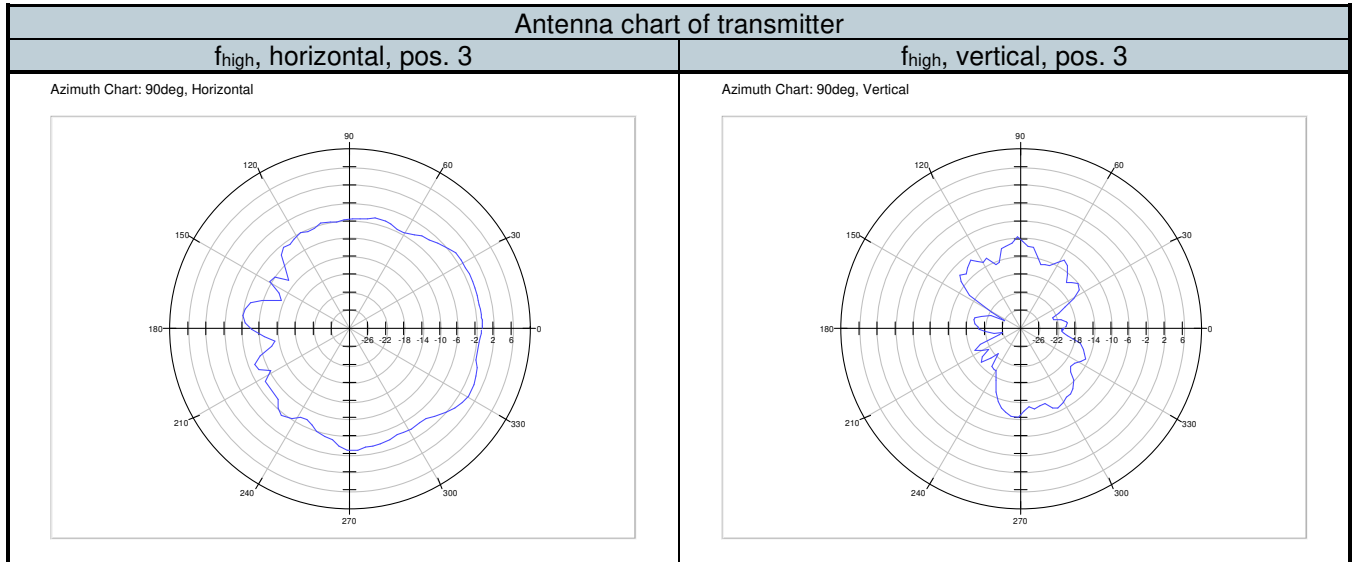
f_{mid} , vertical, pos. 3

Azimuth Chart: 90deg, Vertical



5.2.2.3 Frequency near top (f_{high})





6 Test Equipment used for Tests

No.	Test equipment	Type	Manufacturer	Serial No.	PM. No.	Cal. Date	Cal Due
1	Antenna (Horn)	3115	EMCO Elektronik GmbH	9609-4918	480183	Calibration not necessary	
2	RF cable	SF102/11SK/11S K 500.0	Huber+Suhner	521885/2	483401	Calibration not necessary	
3	Antenna support	AS620P	Deisel	620/375	480325	Calibration not necessary	
4	Fully anechoic chamber M20	B83117-E2439-T232	Albatross Projects	103	480303	Calibration not necessary	
5	Turntable	DS420 HE	Deisel	420/620/00	480315	Calibration not necessary	
6	Multiple Control Unit	MCU	Maturo GmbH	MCU/043/971107	480832	Calibration not necessary	
7	Positioners	TDF 1.5- 10Kg	Maturo	15920215	482034	Calibration not necessary	
8	Antenna (Horn)	3115	EMCO Elektronik GmbH	9609-4922	480184	14.11.2022	11.2025
9	CW Generator Microwave	83650L	Agilent	3844A00554	480333	27.02.2024	02.2026
10	Software	EMC32 V10.60.20	Rohde & Schwarz	---	483261	Calibration not necessary	

7 Report History

Report Number	Date	Comment
F230975E6	08.05.2024	Initial Test Report
-	-	-
-	-	-