

Antenna Report

Report Number:

F231415E5

Equipment under Test (EUT):

Level Probing Radar

**Micropilot FMR20B
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

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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: *1	Level Probing Radar
Model name: *1	Micropilot
Model number: *1	FMR20B
Order number: *2	- *2

*1 Declared by the applicant

*2 No information provided by the applicant

		EUT number	
		1 (radiated)	2 (conducted)
Serial number: *		FMR20B_HA2W_0276	FMR20B_EUT2C
PCB identifier: *	Sensor board:	71574004	71574004
	Power board:	71502179	71502179
	Main board:	71499710	71499710
	Terminal board:	71581272	71581272
Hardware version: *		V01.00.00	V01.00.00
Software version: *		V01.00.00	V01.00.00

* Declared by the applicant

Two EUTs were used for the 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	
USB-2-Serial converter* ¹	USB-2-Serial converter* ¹
Laptop computer * ²	Laptop computer * ²

*¹ Provided by the applicant

*² Provided by the laboratory

1.6 Dates

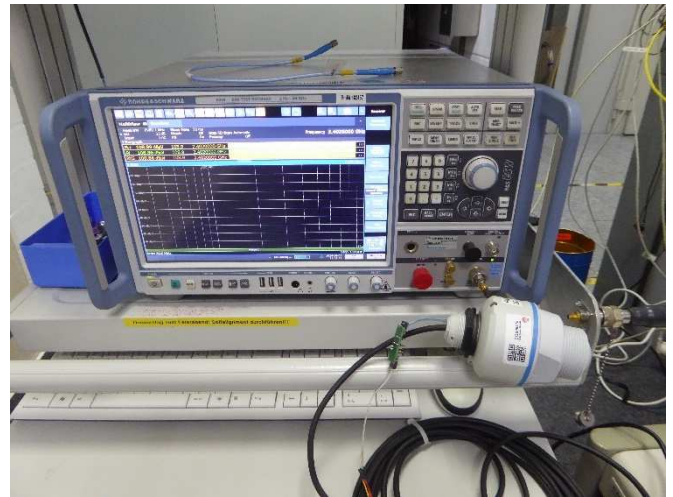
Date of receipt of test sample:	02.09.2024
Start of test:	07.10.2024
End of test:	07.10.2024

2 Operational States

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

3 Additional Information

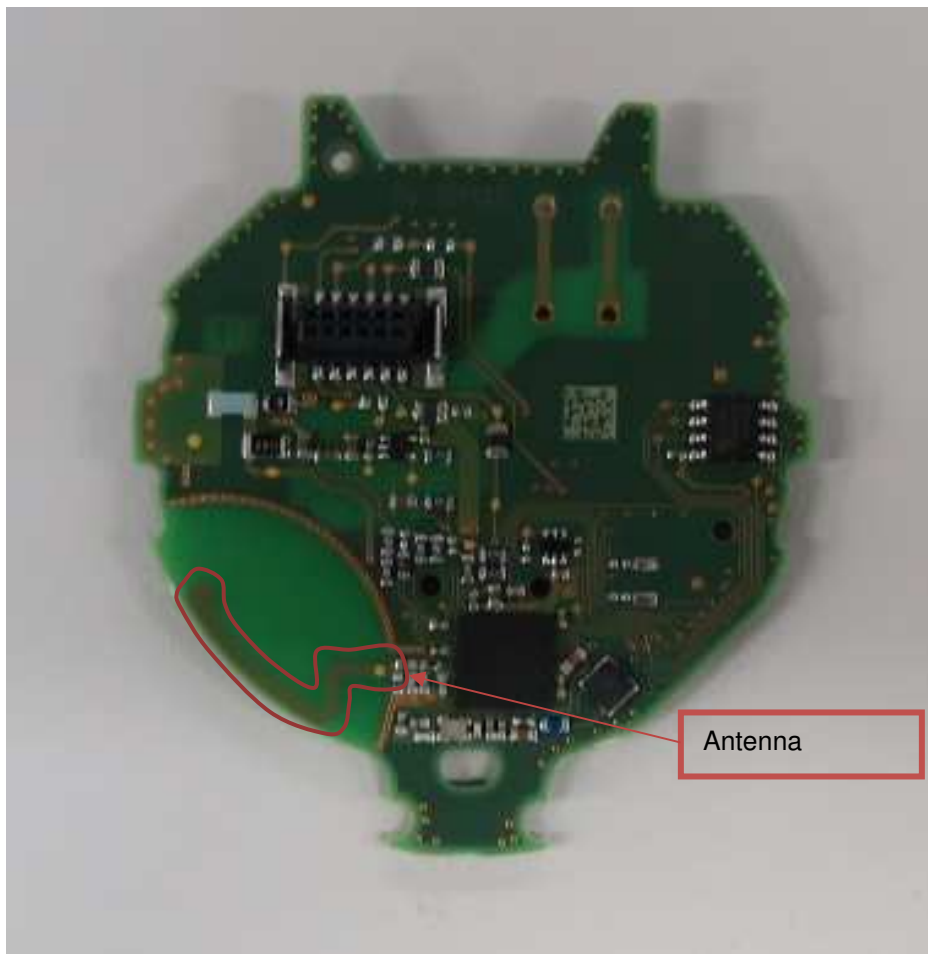
Conducted measurements were done with a modified sample as provided by the applicant.



4 Antenna photographs

4.1 Internal photographs

Internal photos were provided by the applicant



EUT PCB (PCB side with antenna trace)

5 Antenna Charts

5.1 Results (Max. Gain)

Antenna gain calculation				
		f_{low}	f_{mid}	f_{high}
Conducted output power [dBm]		1.8	1.8	1.9
Radiated EIRP [dBm EIRP]		4.3	4.2	3.6
Antenna Gain [dBi]		2.5	2.4	1.7
Position		Pos 3	Pos 3	Pos 3
Position of maximum gain	Azimuth	211	209	210
	Polarisation	Horizontal	Horizontal	Horizontal

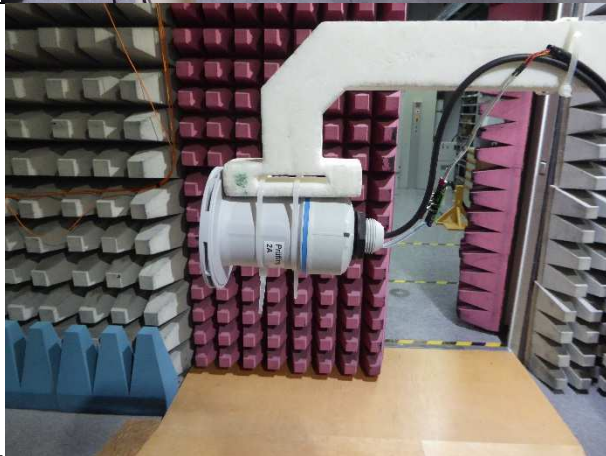
Conducted f_{low}	MultiView ☐ Receiver ☒ Meas BW (6dB) 1 MHz Att 20 dB Input 1 AC Meas Time 50 ms Notch Off PS On Step TD Scan Automatic Preamp Off Frequency 2.4020000 GHz 1 Bargraph Pk+ 1.81 dBm 1.8 2.4020000 GHz -95 -80 -70 -60 -50 -40 -30 -20 -10 5 AV 1.79 dBm 1.8 2.4020000 GHz -95 -80 -70 -60 -50 -40 -30 -20 -10 5 RMS 1.79 dBm 1.8 2.4020000 GHz -95 -80 -70 -60 -50 -40 -30 -20 -10 5
	MultiView ☐ Receiver ☒ Meas BW (6dB) 1 MHz Att 20 dB Input 1 AC Meas Time 50 ms Notch Off PS On Step TD Scan Automatic Preamp Off Frequency 2.4400000 GHz 1 Bargraph Pk+ 1.85 dBm 1.9 2.4400000 GHz -95 -80 -70 -60 -50 -40 -30 -20 -10 5 AV 1.83 dBm 1.8 2.4400000 GHz -95 -80 -70 -60 -50 -40 -30 -20 -10 5 RMS 1.83 dBm 1.8 2.4400000 GHz -95 -80 -70 -60 -50 -40 -30 -20 -10 5
	MultiView ☐ Receiver ☒ Meas BW (6dB) 1 MHz Att 20 dB Input 1 AC Meas Time 50 ms Notch Off PS On Step TD Scan Automatic Preamp Off Frequency 2.4800000 GHz 1 Bargraph Pk+ 1.93 dBm 1.9 2.4800000 GHz -95 -80 -70 -60 -50 -40 -30 -20 -10 5 AV 1.90 dBm 1.9 2.4800000 GHz -95 -80 -70 -60 -50 -40 -30 -20 -10 5 RMS 1.90 dBm 1.9 2.4800000 GHz -95 -80 -70 -60 -50 -40 -30 -20 -10 5

Test equipment (please refer to chapter 7 for details)

1 - 12

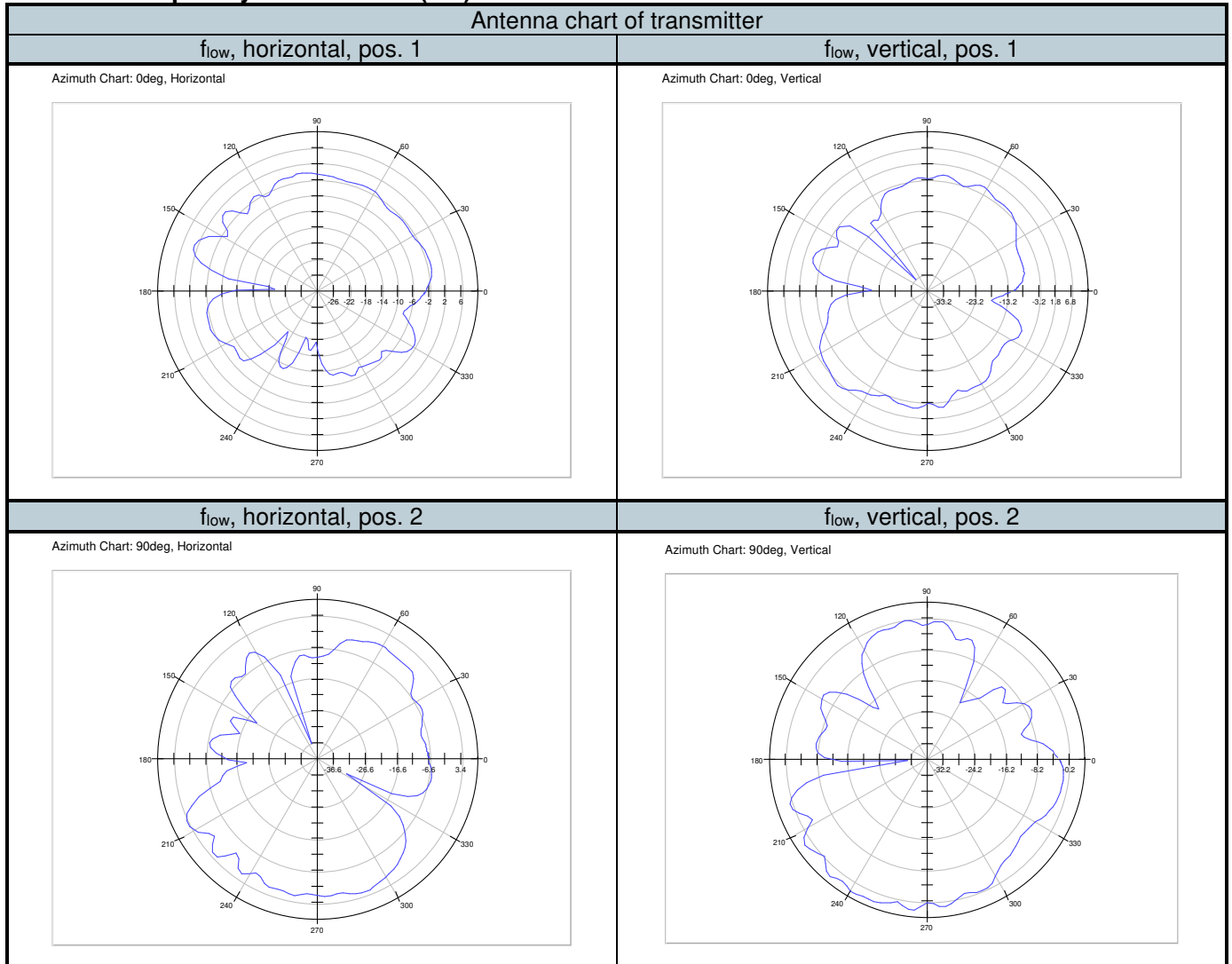
5.2 Antenna Diagrams EUT Position

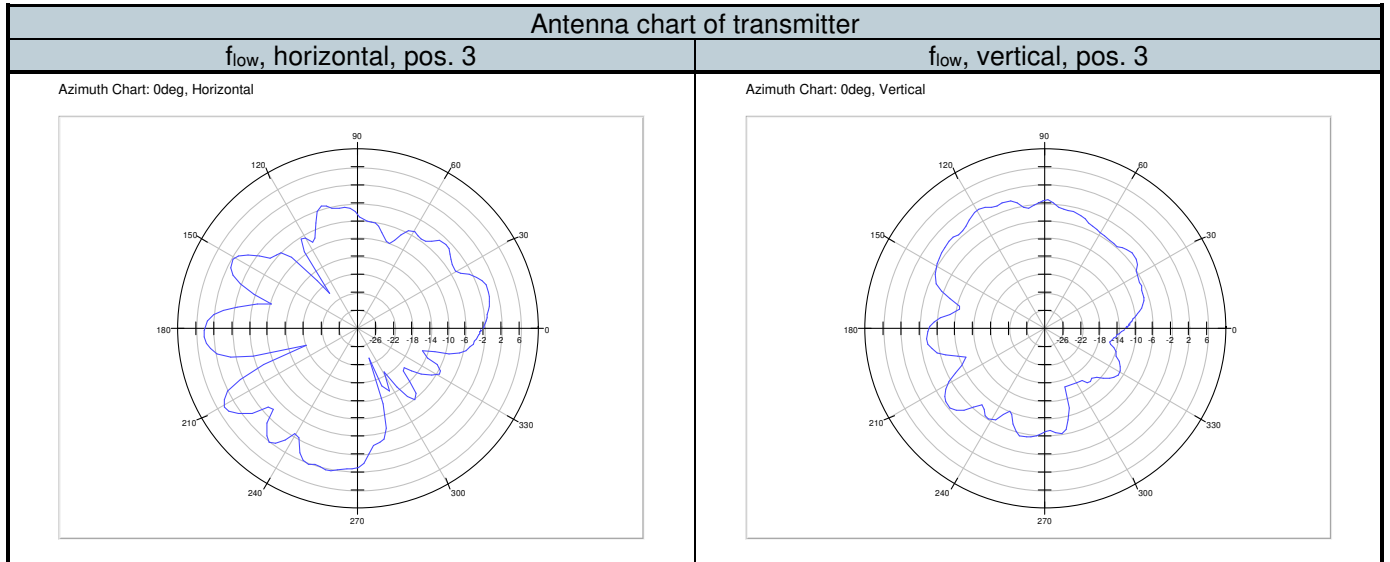
5.2.1 Test Setup Photos

Setup Photos		
Position 1		
Position 2		
Position 3		

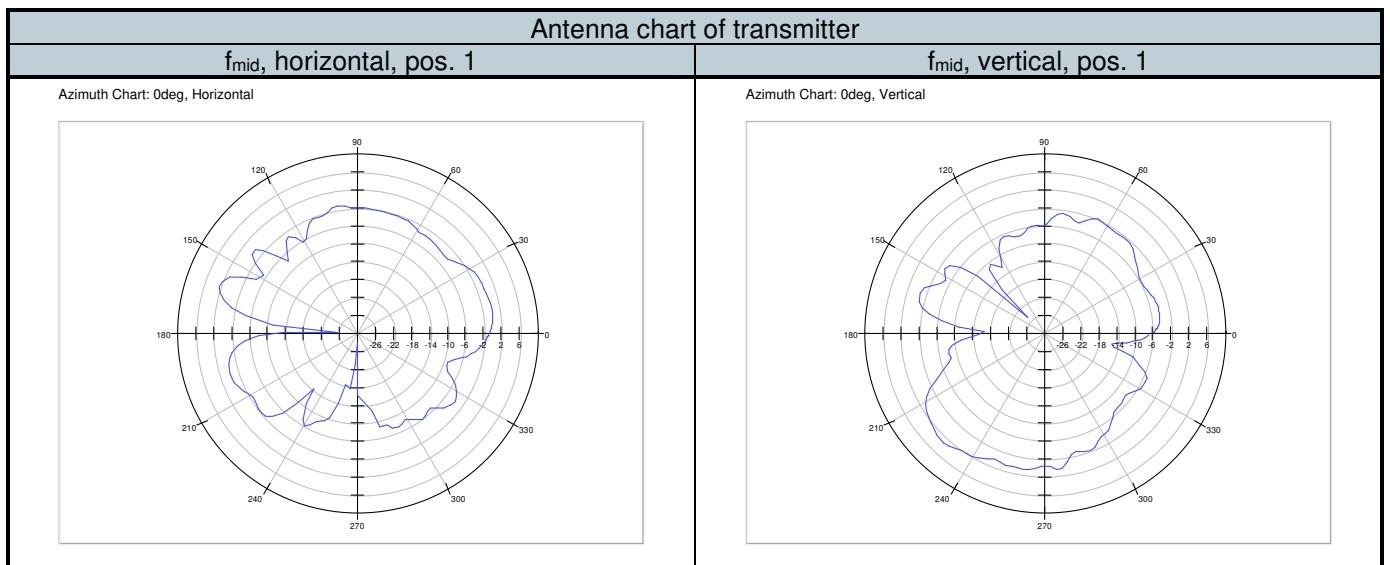
5.2.2 Azimuth charts of transmitter

5.2.2.1 Frequency near bottom (f_{low})





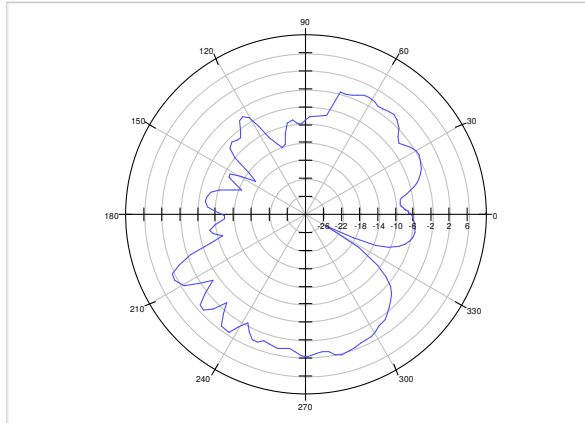
5.2.2.2 Frequency near middle (f_{mid})



Antenna chart of transmitter

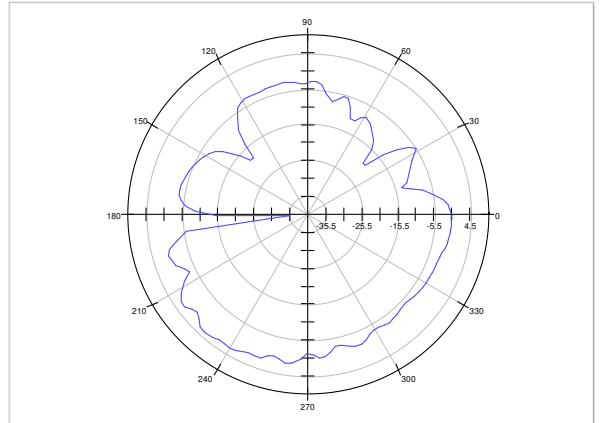
f_{mid} , horizontal, pos. 2

Azimuth Chart: 90deg, Horizontal



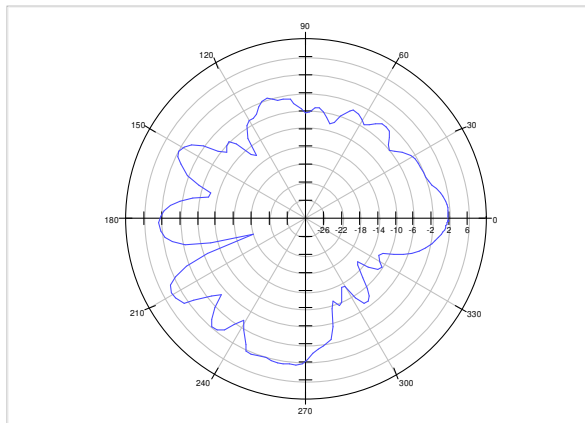
f_{mid} , vertical, pos. 2

Azimuth Chart: 90deg, Vertical



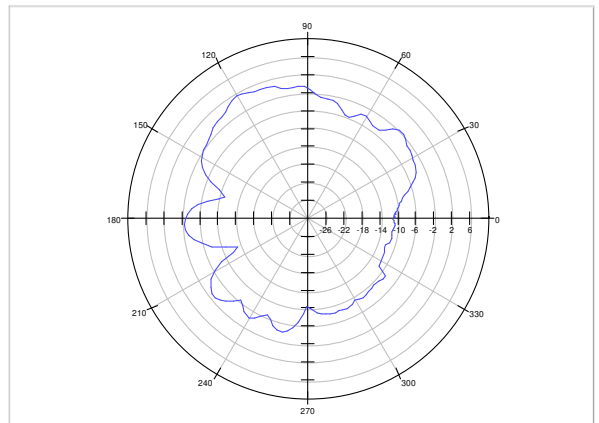
f_{mid} , horizontal, pos. 3

Azimuth Chart: 0deg, Horizontal

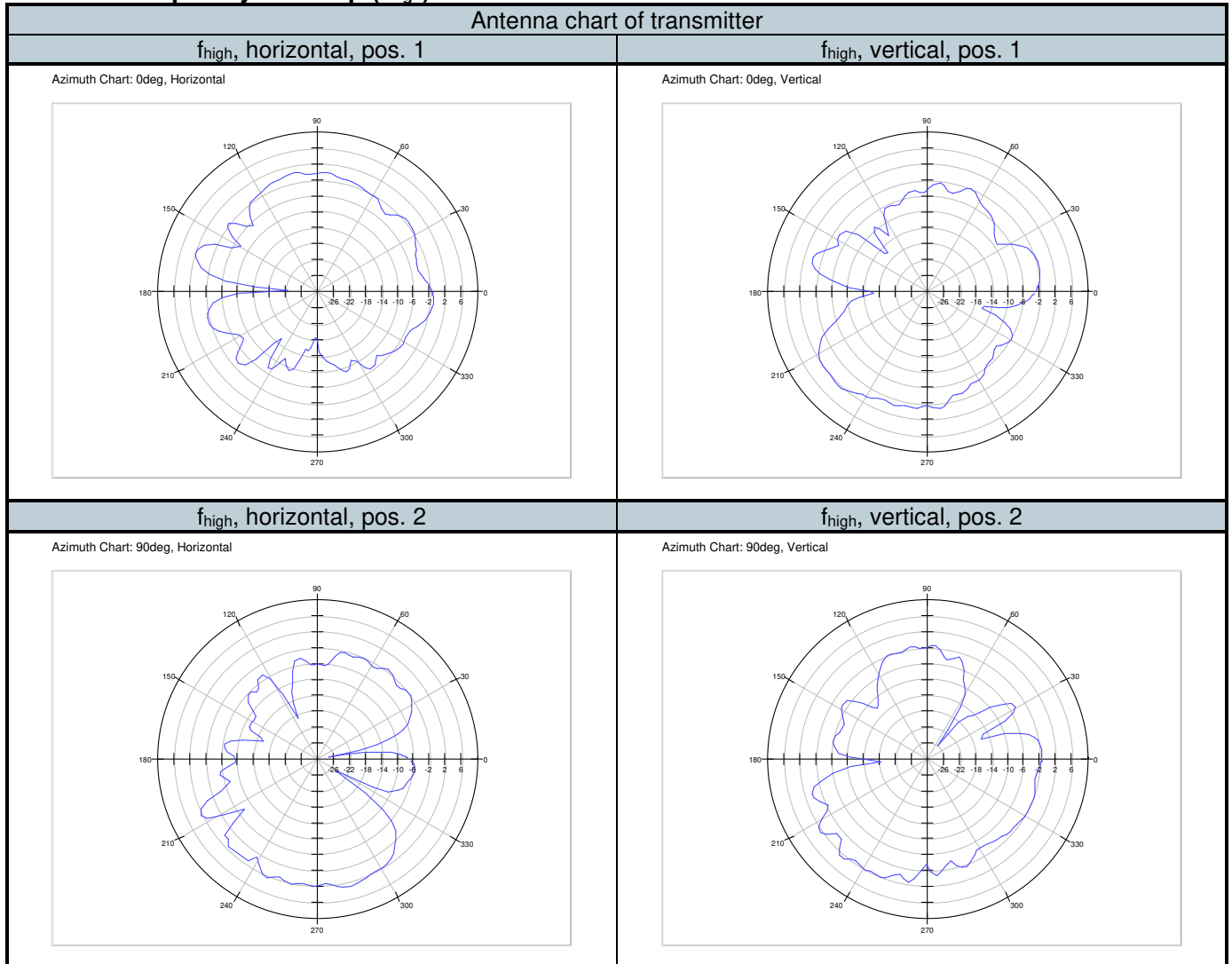


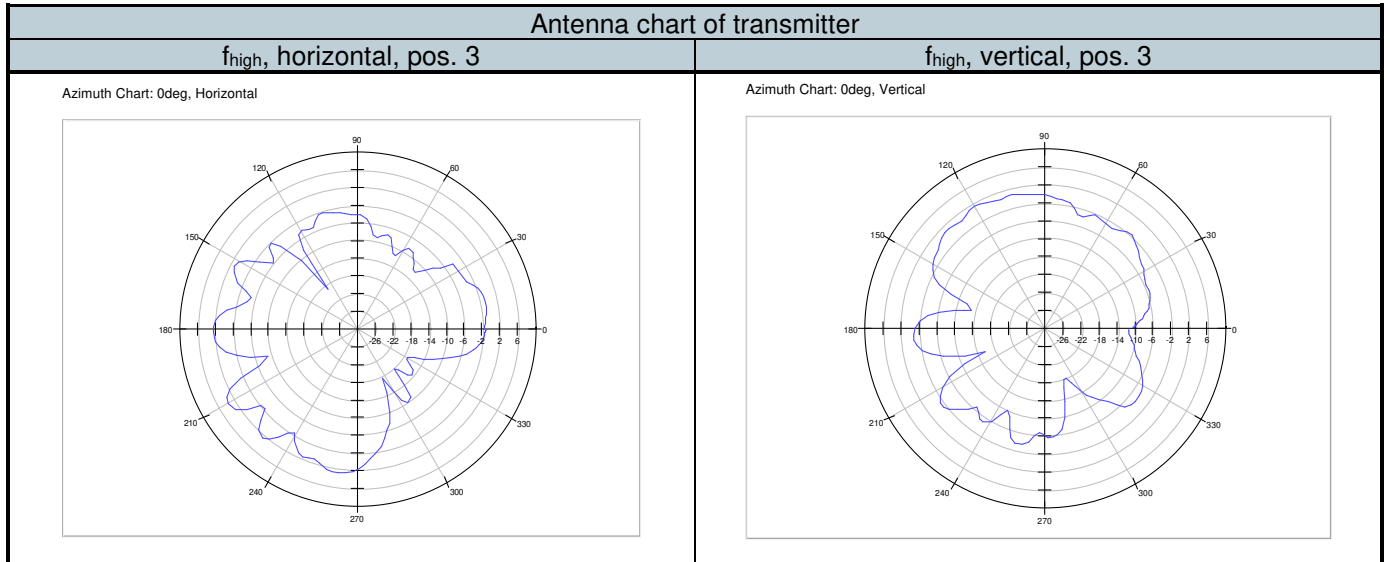
f_{mid} , vertical, pos. 3

Azimuth Chart: 0deg, 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	RF cable	Sucoflex 102	Suhner	521885/2	483401	Calibration not necessary	
2	Horn antenna 1 GHz - 18 GHz	3115	EMCO Elektronik GmbH	9609-4918	480183	13.02.2024	02.2027
3	Software	EMC32 V10.60.20	Rohde & Schwarz	---	483261	Calibration not necessary	
4	RF cable	SF106B/11N/11N /4500.0	Huber & Suhner	500218/6B	482415	Calibration not necessary	
5	Antenna support	AS620P	Deisel	620/375	480325	Calibration not necessary	
6	Fully anechoic chamber M20	B83117-E2439- T232	Albatross Projects	103	480303	Calibration not necessary	
7	Turntable	DS420 HE	Deisel	420/620/00	480315	Calibration not necessary	
8	Multiple Control Unit	MCU	Maturo GmbH	MCU/043/97110 7	480832	Calibration not necessary	
9	EMI Receiver / Spectrum Analyser	ESW44	Rohde & Schwarz	101635	482467	27.02.2024	02.2026
10	Positioner	TDF 1.5- 10Kg	Maturo	15920215	482034	Calibration not necessary	
11	Horn antenna 1 GHz - 18 GHz	3115	EMCO Elektronik GmbH	9609-4922	480184	14.11.2022	11.2025
12	Microwave CW generator	83650L	Agilent	3844A00554	480333	27.02.2024	02.2026

7 Report History

Report Number	Date	Comment
F231415E5	17.01.2025	Initial Test Report
-	-	-
-	-	-

--- end of test report ---