

Antenna Report

Report Number:

F231413E5

Equipment under Test (EUT):

Display with Bluetooth communication

VU231C 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, 79689 Maulburg
Country:	Germany
Name for contact purposes:	Mr. Florian SEIDLER, Mr. Ralf REIMELT
Phone:	+49-7622-28-1450
eMail address:	florian.seidler@endress.com
Applicant represented during the test by the following person:	-

1.2 Manufacturer

Name:	Endress+Hauser SE+Co. KG
Address:	Hauptstr. 1, 79689 Maulburg
Country:	Germany
Name for contact purposes:	Mr. Florian SEIDLER, Mr. Ralf REIMELT
Phone:	+49-7622-28-1450
eMail address:	florian.seidler@endress.com
Manufacturer represented during the test by the following person:	-

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: *	Display with Bluetooth communication
Model name: *	VU231C
Model number: *	VU231C
Order number: *	-

* Declared by the applicant

	EUT number		
	1 Radiated	2	3
Serial number: *	FMR30B_DISP_237	FMR30B_DISP_239	-
PCB identifier: *	VU231C: 71599593	VU231C: 71599593	-
Hardware version: *	01.00.00	01.00.00	-
Software version: *	S140 V7.2.0	Radio Test S140	-

* Declared by the applicant

Two EUTs were 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	
USB-2-Serial converter* ¹	FTDI-USB_RS232_3V3
Laptop computer * ²	Fujitsu Limited LIFEBOOK S26391 (SN: DSAK019176)

*¹ Provided by the applicant

*² Provided by the laboratory

1.6 Dates

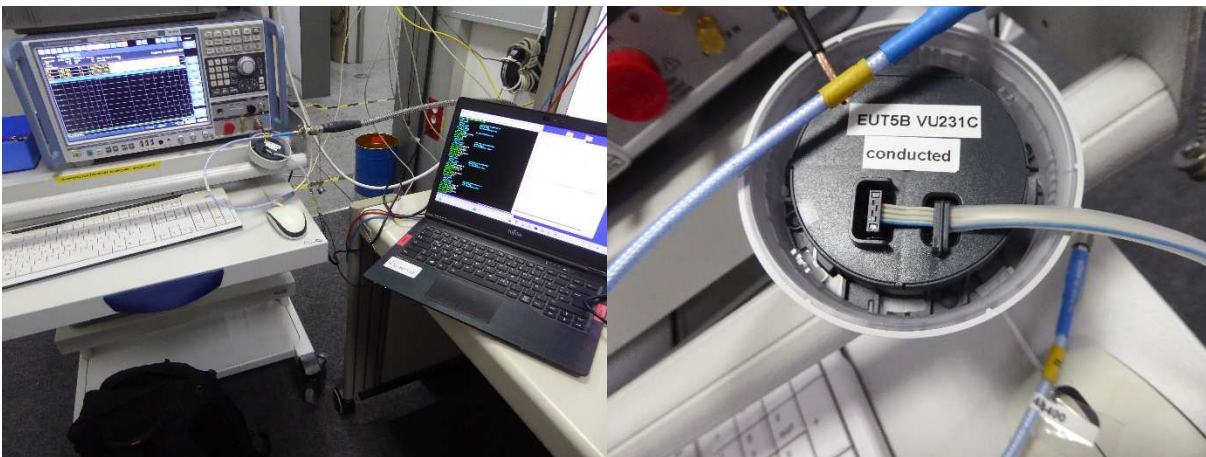
Date of receipt of test sample:	10.09.2024
Start of test:	07.10.2024
End of test:	07.10.2024

2 Operational States

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

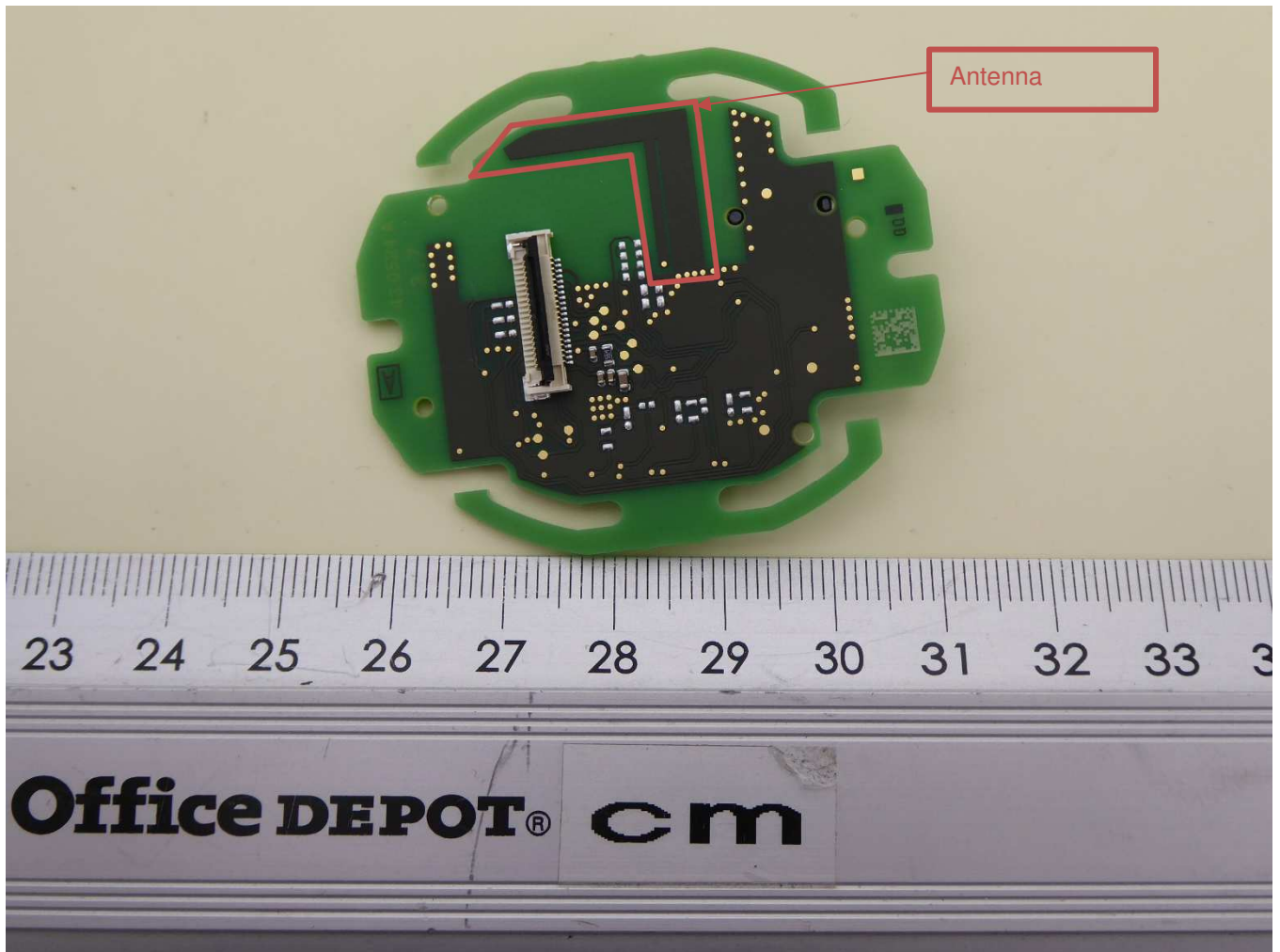
3 Additional Information

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



4 Antenna photographs

4.1 Internal photographs



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]	7.7	7.7	7.5	
Radiated EIRP [dBm EIRP]	8.1	8.8	8.0	
Antenna Gain [dBi]	0.4	1.1	0.5	
Position	Pos 3	Pos 1	Pos 1	
Position of maximum gain	Azimuth 207	146	146	
	Polarisation Horizontal	Horizontal	Horizontal	

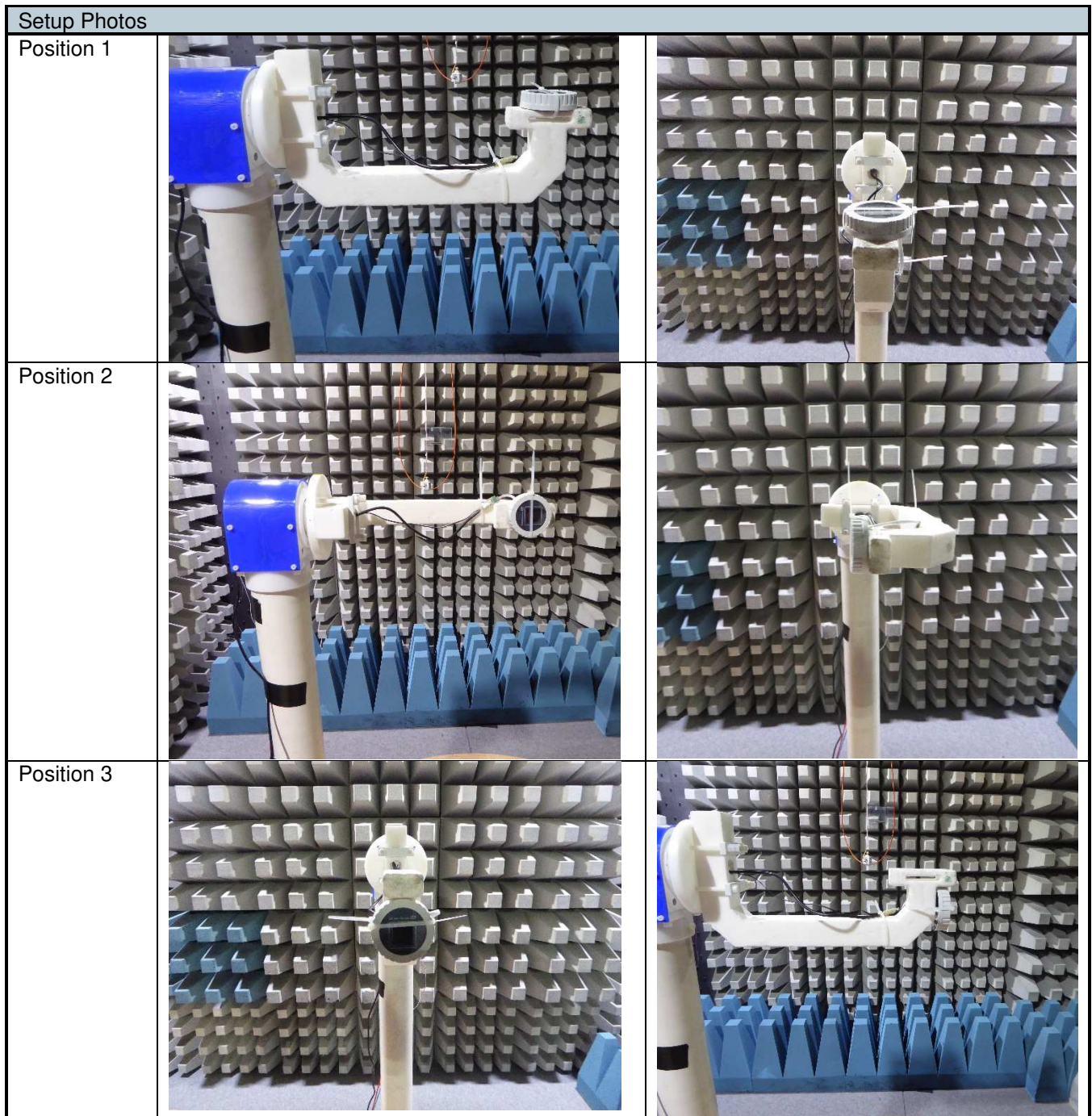
Conducted f_{low}	MultiView Receiver Meas BW (6dB) 1 MHz Meas Time 100 ms Att 30 dB Notch Off Step TD Scan Automatic Input 1 AC PS Preamp Off Frequency 2.4020000 GHz 1 Bargraph Pk+ 7.70 dBm 7.7 2.4020000 GHz -85 -70 -60 -50 -40 -30 -20 -10 0 15 AV 7.68 dBm 7.7 2.4020000 GHz -85 -70 -60 -50 -40 -30 -20 -10 0 15 RMS 7.68 dBm 7.7 2.4020000 GHz -85 -70 -60 -50 -40 -30 -20 -10 0 15
Conducted f_{mid}	MultiView Receiver Meas BW (6dB) 1 MHz Meas Time 100 ms Att 30 dB Notch Off Step TD Scan Automatic Input 1 AC PS Preamp Off Frequency 2.4400000 GHz 1 Bargraph Pk+ 7.70 dBm 7.7 2.4400000 GHz -85 -70 -60 -50 -40 -30 -20 -10 0 15 AV 7.68 dBm 7.7 2.4400000 GHz -85 -70 -60 -50 -40 -30 -20 -10 0 15 RMS 7.68 dBm 7.7 2.4400000 GHz -85 -70 -60 -50 -40 -30 -20 -10 0 15
Conducted f_{high}	MultiView Receiver Meas BW (6dB) 1 MHz Meas Time 100 ms Att 30 dB Notch Off Step TD Scan Automatic Input 1 AC PS Preamp Off Frequency 2.4800000 GHz 1 Bargraph Pk+ 7.54 dBm 7.5 2.4800000 GHz -85 -70 -60 -50 -40 -30 -20 -10 0 15 AV 7.52 dBm 7.5 2.4800000 GHz -85 -70 -60 -50 -40 -30 -20 -10 0 15 RMS 7.52 dBm 7.5 2.4800000 GHz -85 -70 -60 -50 -40 -30 -20 -10 0 15

Test equipment (please refer to chapter 7 for details)

1 - 12

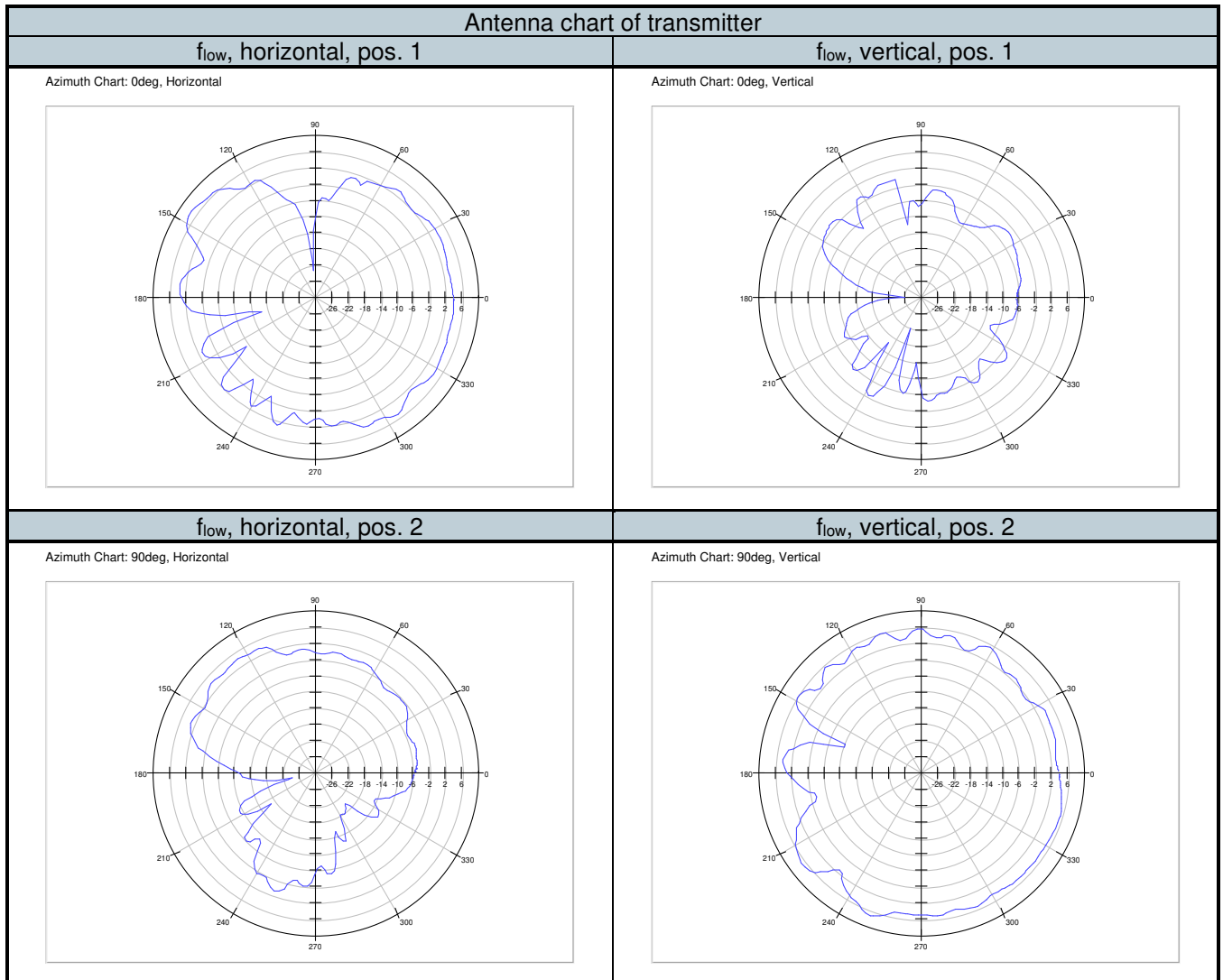
5.2 Antenna Diagrams EUT Position

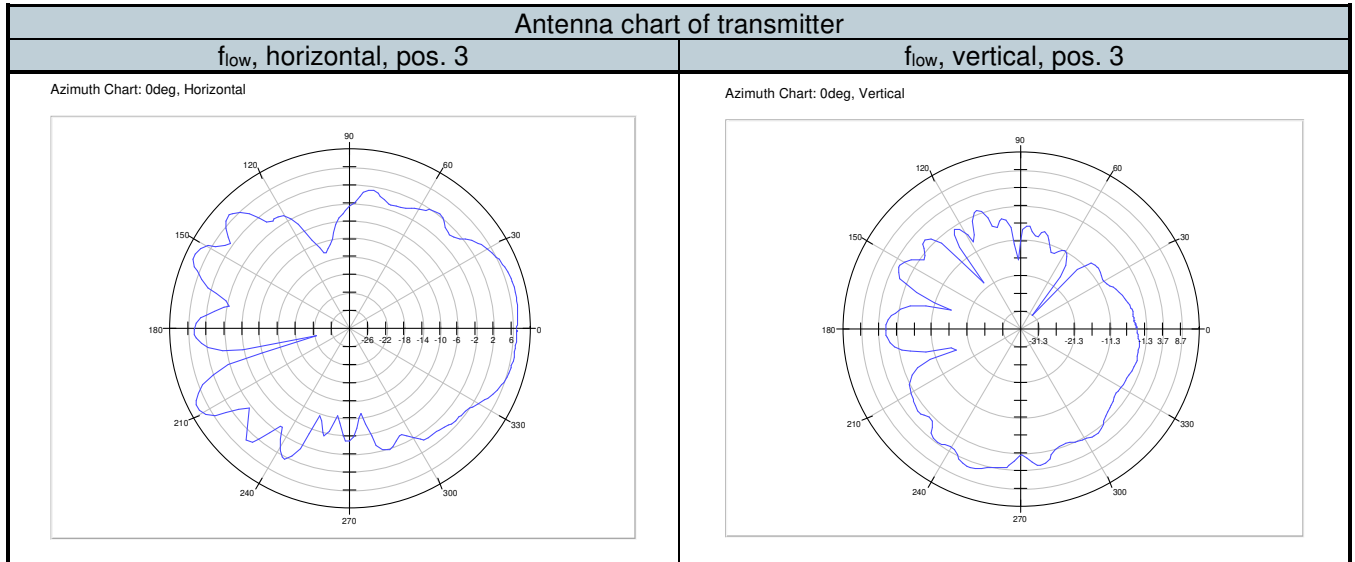
5.2.1 Test Setup Photos



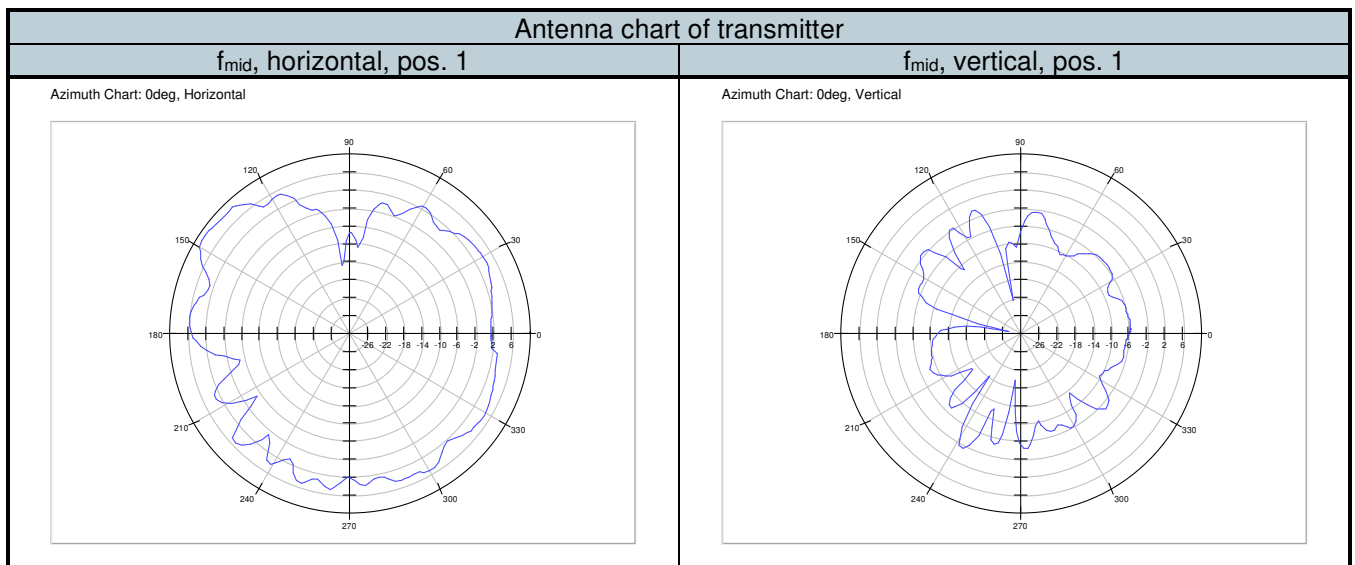
5.2.2 Azimuth charts of transmitter

5.2.2.1 Frequency near bottom (f_{low})





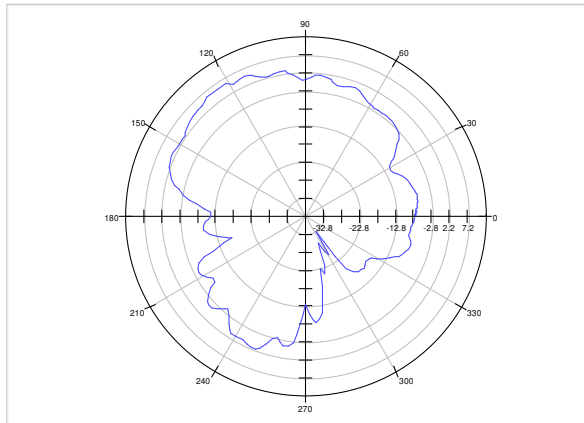
5.2.2.2 Frequency near middle (f_{mid})



Antenna chart of transmitter

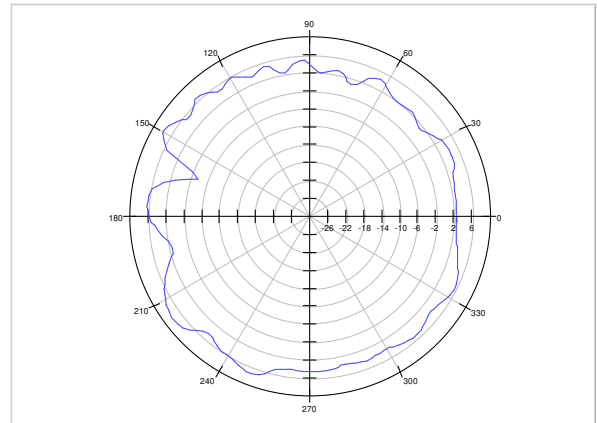
f_{mid} , horizontal, pos. 2

Azimuth Chart: 90deg, Horizontal



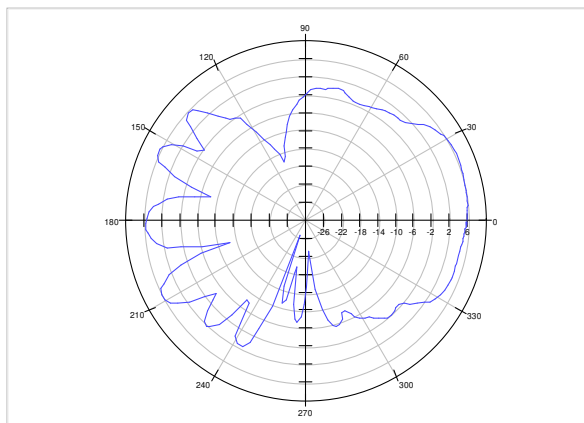
f_{mid} , vertical, pos. 2

Azimuth Chart: 90deg, Vertical



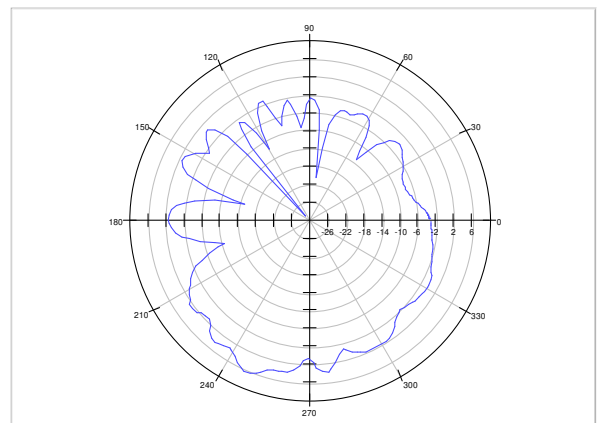
f_{mid} , horizontal, pos. 3

Azimuth Chart: 0deg, Horizontal

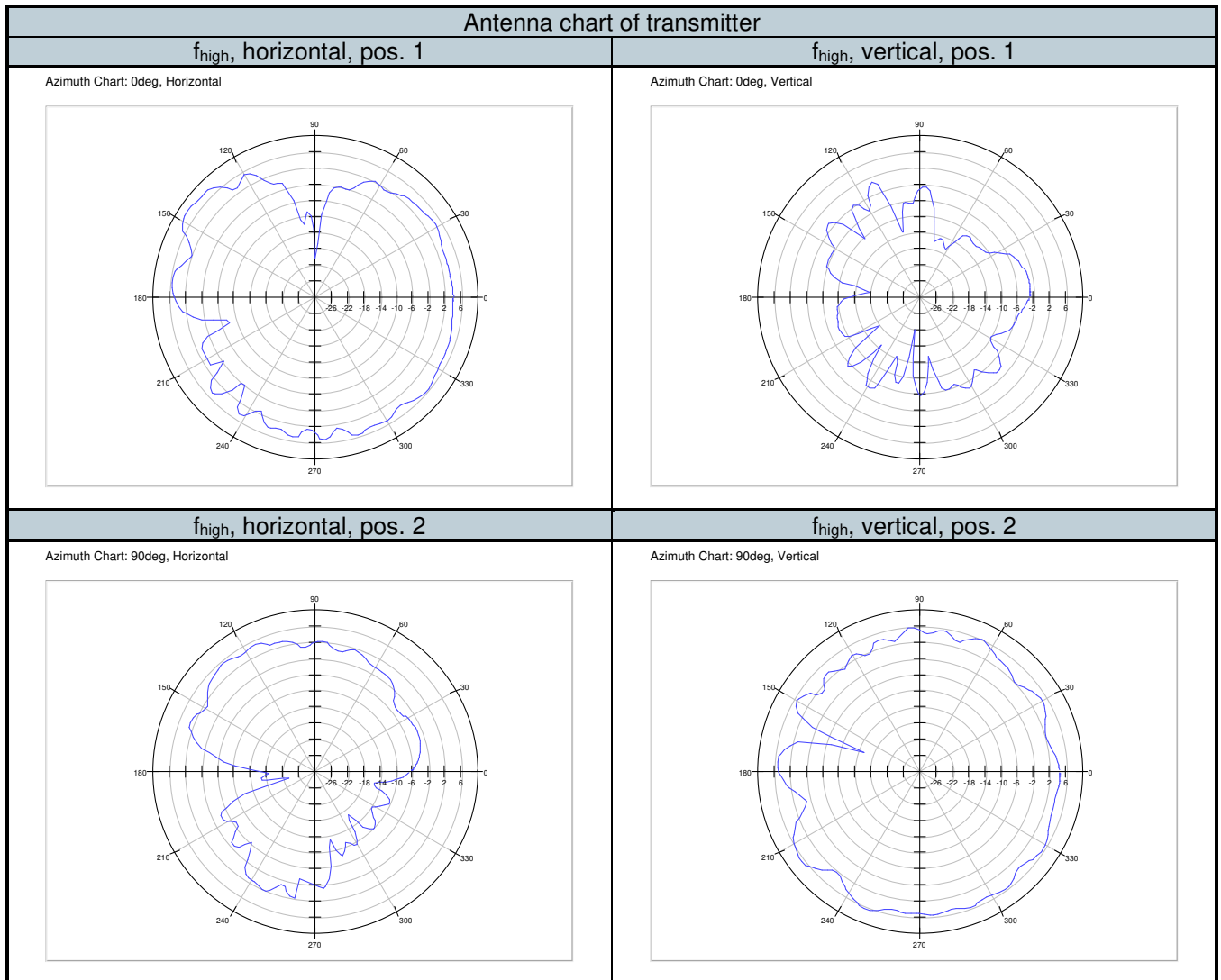


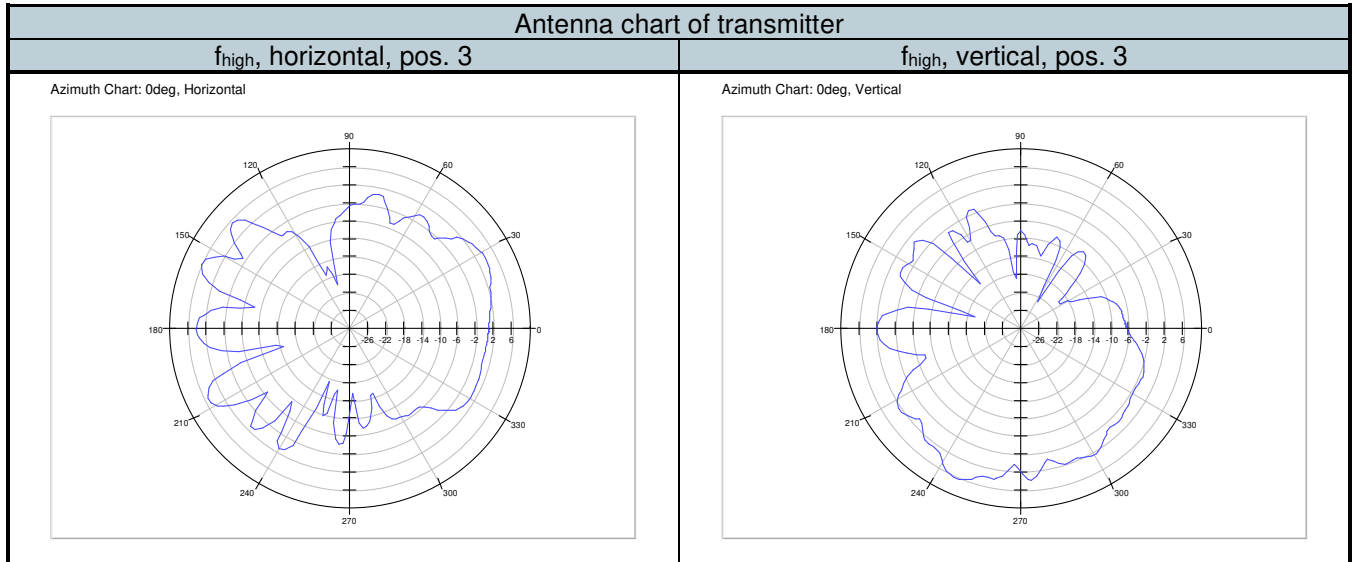
f_{mid} , vertical, pos. 3

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/11 N/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
F231413E5	13.01.2025	Initial Test Report
-	-	-
-	-	-

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