

Antenna Performance

Test Report 1-2921-26-01-02_TR1-R01

Number of pages:	17	Date of Report:	2026-Jun-26
Testing company:	cetecom advanced GmbH Untertuerkheimer Str. 6-10 66117 Saarbruecken Germany	Customer:	Busch & Müller KG
Product:	Remote Control		
Model:	Blucon 456BT		
Frequency Range:	2402 MHz, 2440 MHz, 2480 MHz		
Test Specification:	CTIA Test Plan for Wireless Device Over the Air Performance, Method of Measurement for Radiated RF Power and Receiver Performance. [1]		

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Test Execution and Author of Report

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The listed attachments are separate documents.

1 General information

1.1 Disclaimer and Notes

The test results of this test report relate exclusively to the test item specified in this test report. cetecom advanced GmbH does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of cetecom advanced GmbH.

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1.2 Summary of Test Results

As summary in the table below are stated worst case values for selected frequency bands. The term worst case means applicable maximum or minimum values in respect to device certification, such as e.g. the maximum gain per frequency band.

Frequency [MHz]	Maximum Gain [dBi]
2402	-3.4
2440	-3.7
2480	-5.6

Tab 1: Data Summary

Remark: Measured peak realized gain with correction of conducted power.

2 Administrative Data

2.1 Identification of Entity Providing the Service

Company address: cetecom advanced GmbH
Untertuerkheimer Str. 6-10
66117 Saarbruecken
Germany

Internet site: cetecomadvanced.com

Accreditation scope: [DAkKS Webpage](#)

Test location: cetecom advanced GmbH
Im Teelbruch 116
45219 Essen
Germany

2.2 General Limits for Environmental Conditions

Temperature: Room temperature: (22 ± 2) °C

Humidity: Relative. humidity: 45±15% rH

2.3 Organizational Items

Project number: 1-2921-26-01

Test Date(s): 2026-May-20

Responsible for test
report: Martin Nunier

Date of report: 2026-Jun-26

2.4 Customer Details

Customer address: Busch & Müller KG
Auf dem Bamberg 1
58540 Meinerzhagen
Germany

Contact person: Vito Huhn

2.5 EUT: Type, S/N etc. and short descriptions used in this test report

EUT No.*)	Sample No.	Product	Model	Type	S/N	HW	SW
EUT 1	59.072	Remote Control	Blucon 456BT	--	--	V06	1.0.0
EUT 2	48.246	Remote Control	Blucon 456BT	--	--	V06	1.0.0

*) EUT short description is used to simplify the identification of the EUT in this test report.

Remark: EUT 1 was used for conducted measurements, EUT 2 was used for radiated measurements.

3 Test Set Up and Method

3.1 Total Radiated Power (TRP) Test

The measurement of the total radiated power was done in a CTIA certified OTA lab and according to the appropriate test specification [1]. A schematic drawing of the actual set up is shown in Fig. 1. The antenna was fed using an external RF source and the antenna pattern have been measured (taking both polarizations into account) with an angular resolution of 15°.

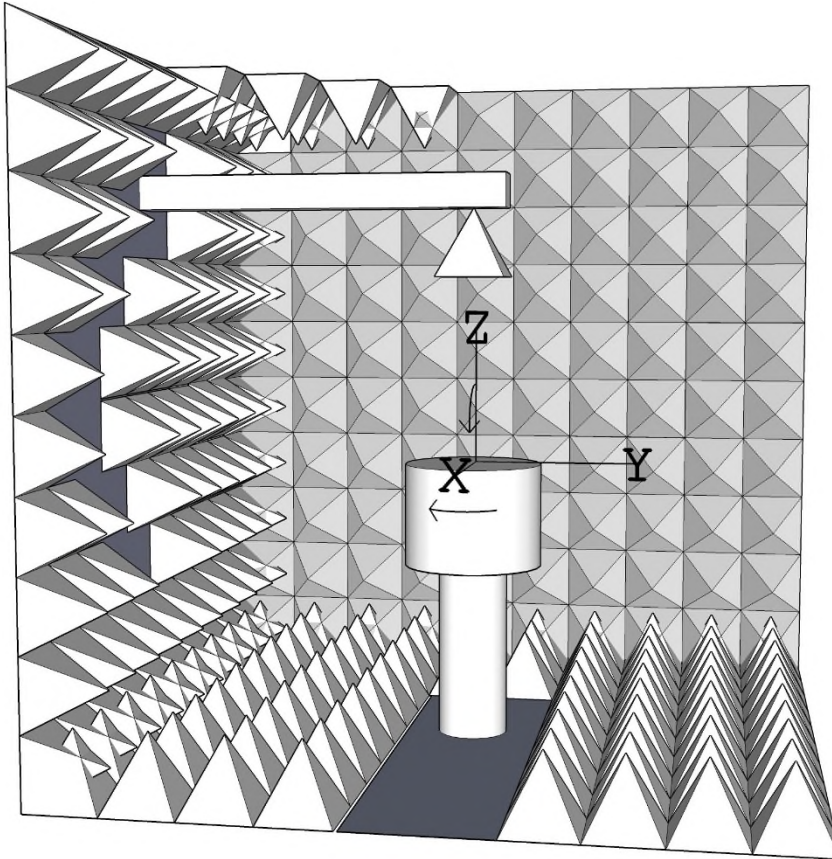


Fig 1: 3D OTA test set up

3.1.1 Conducted Power Measurements

Band	Channel	Frequency [MHz]	Data rate [Mbit]	TX power [dBm]	Conducted Power [dBm]
BLE	2	2402	1	0	-2.8
BLE	40	2440	1	0	-3.0
BLE	80	2480	1	0	-3.2

Tab 2: Values for the conducted power in the configuration used.

3.1.2 Antenna Performance

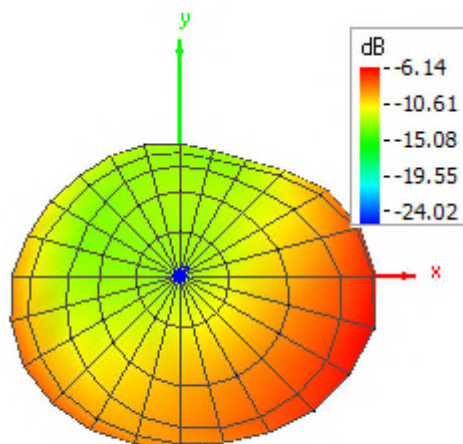
Band	Frequency [MHz]	TRP [dBm]	Peak EIRP [dBm]	Efficiency [dB]	Efficiency [%]	Directivity [dBi]	Gain [dBi]
BLE	2402	-10.5	-6.1	-7.8	17%	4.4	-3.4
BLE	2440	-10.7	-6.7	-7.7	17%	4.1	-3.7
BLE	2480	-11.9	-8.8	-8.7	14%	3.1	-5.6

Tab 3: Selected numerical results for efficiency, directivity and gain.

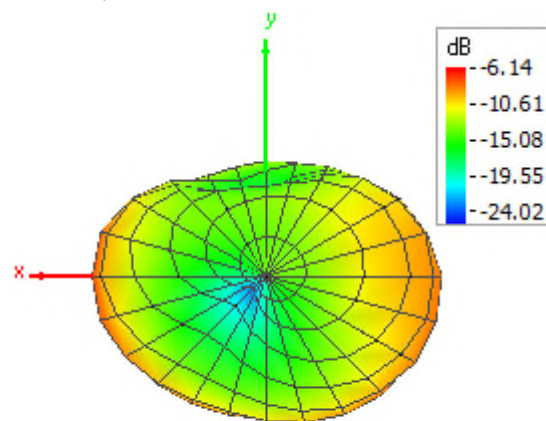
Remark: Efficiency and Gain values calculated based on measured conducted power values.

3.1.3 Measurement diagrams for the antenna (2402 MHz)

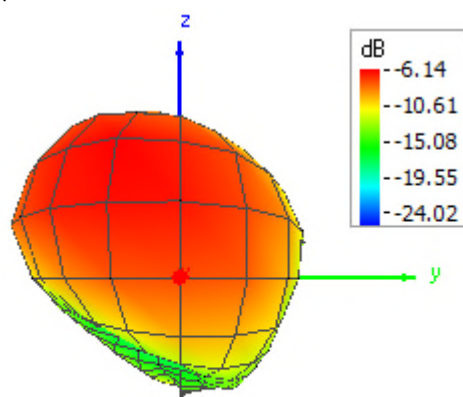
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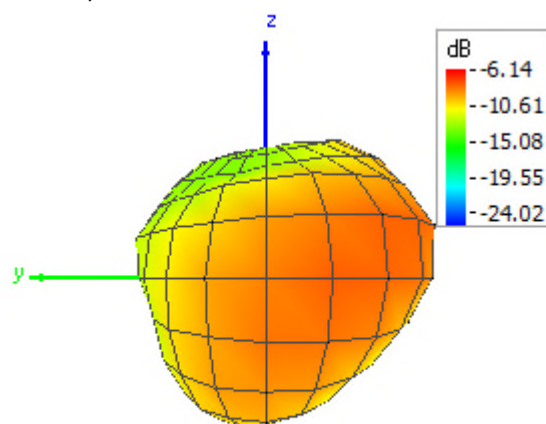
Theta = 180, Phi = 0



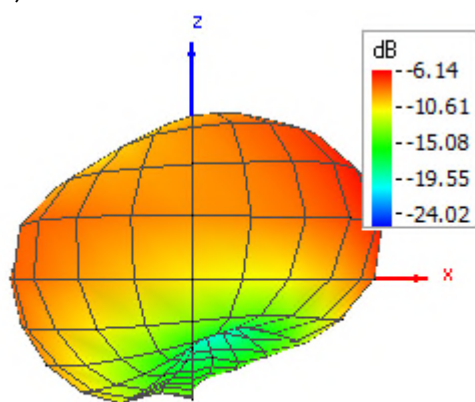
Theta = 90, Phi = 0



Theta = 90, Phi = 180



Theta = 90, Phi = 270



Theta = 90, Phi = 90

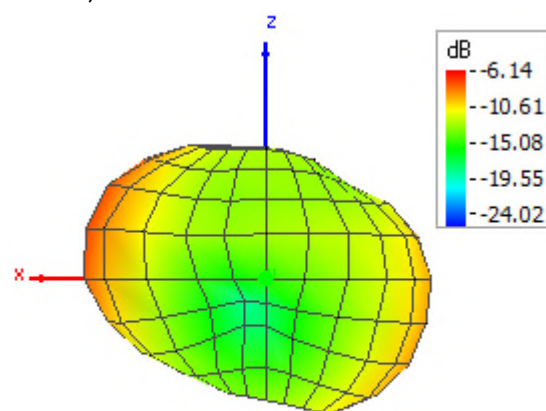


Fig 2: 3D OTA test result: Antenna pattern for low channel

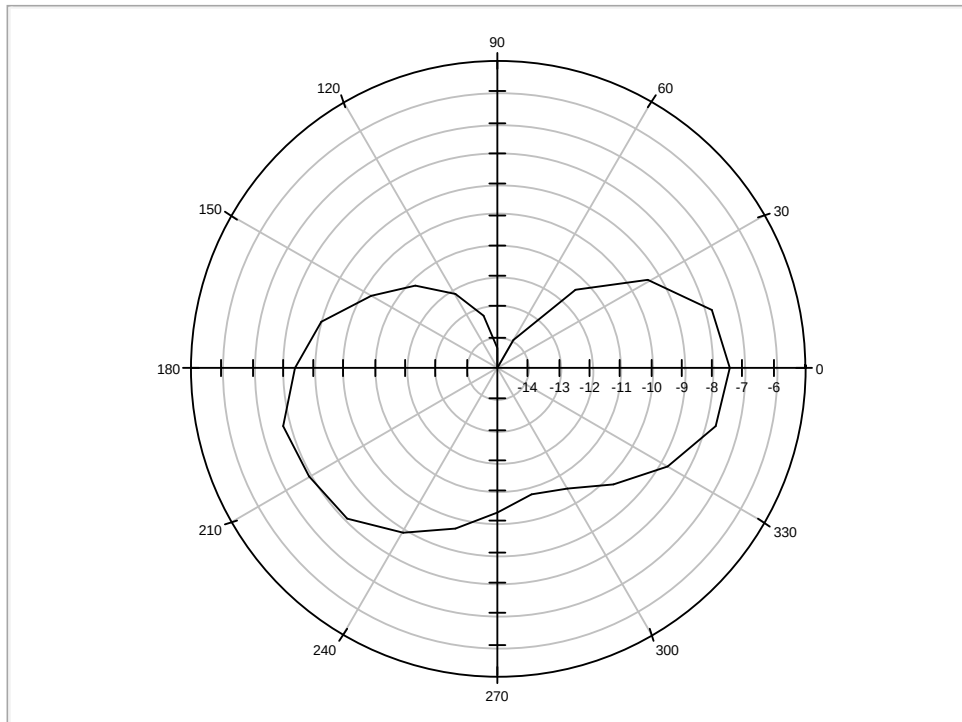


Fig 3: Main Cut Plot XY Plane for low channel

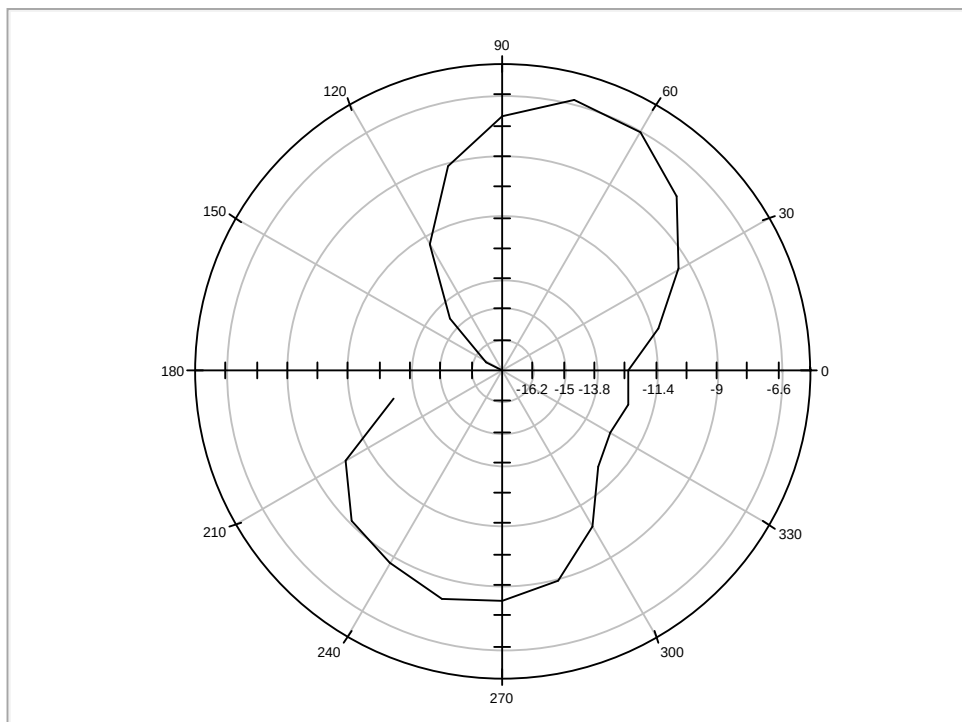
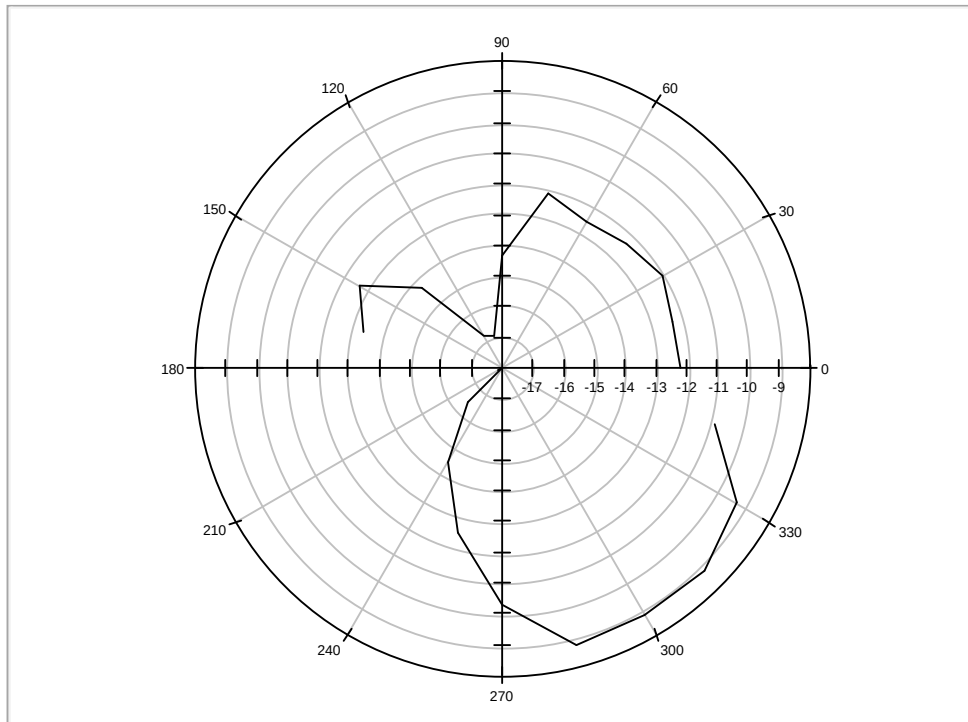


Fig 4: Main Cut Plot XZ Plane for low channel

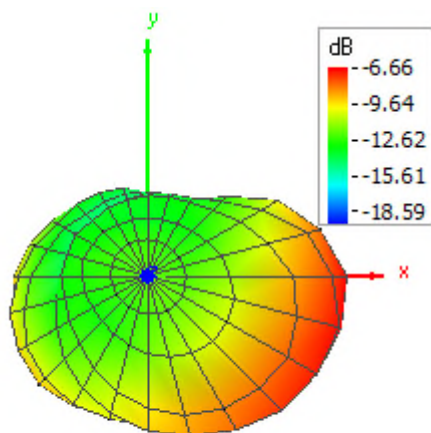


— 2402.000 MHz [Level]

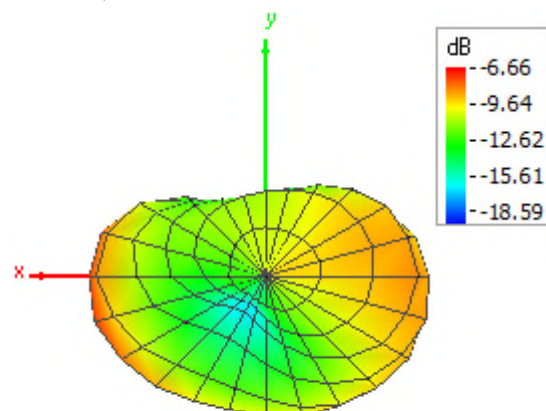
Fig 5: Main Cut Plot YZ Plane for low channel

3.1.4 Measurement diagrams for the antenna (2440 MHz)

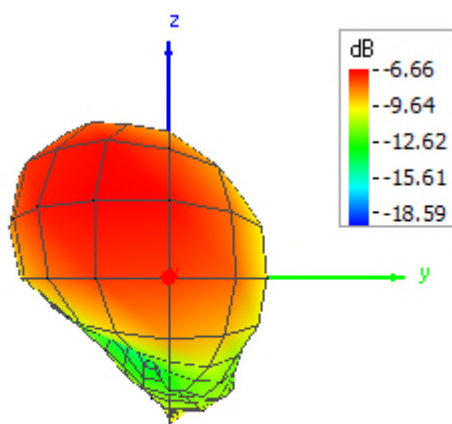
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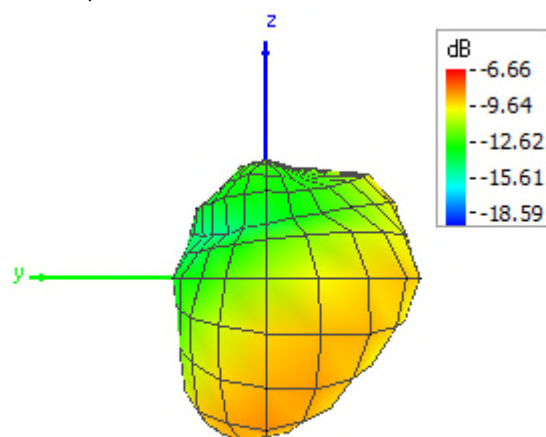
Theta = 180, Phi = 0



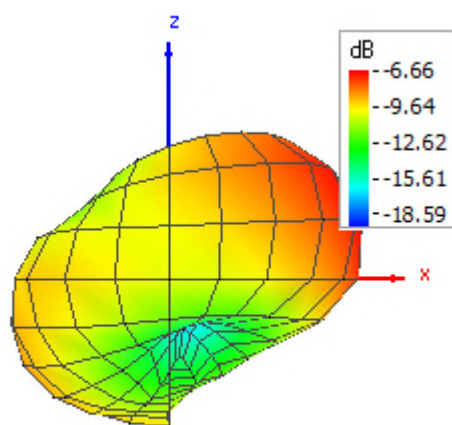
Theta = 90, Phi = 0



Theta = 90, Phi = 180



Theta = 90, Phi = 270



Theta = 90, Phi = 90

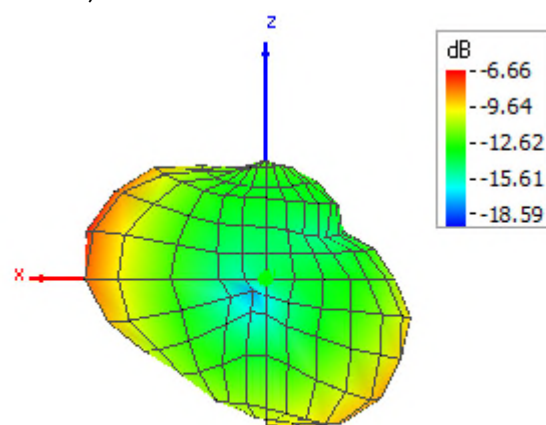
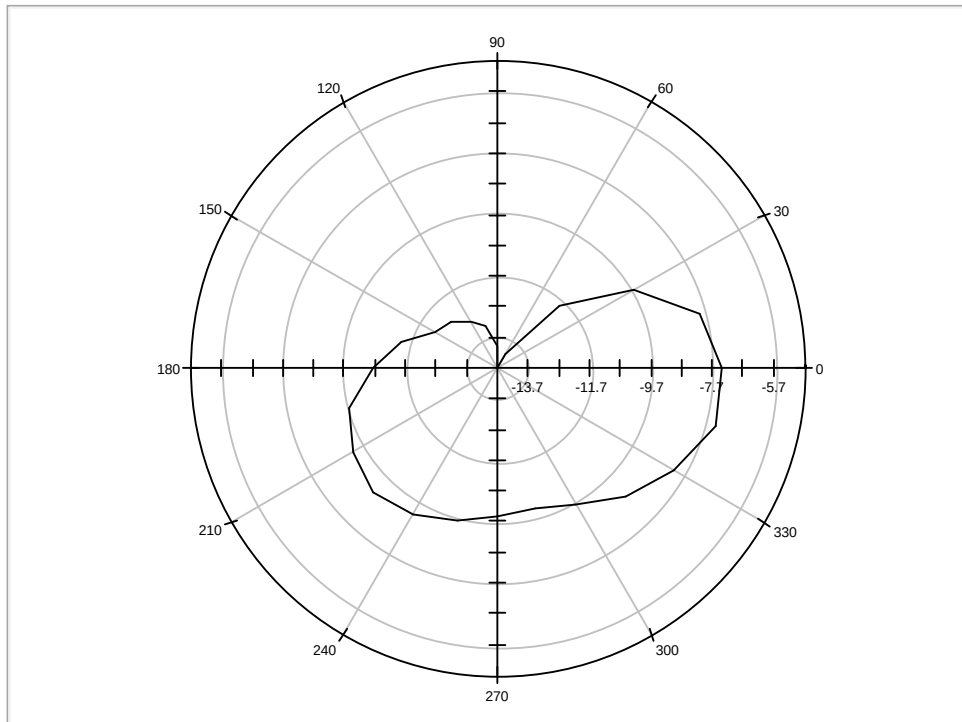
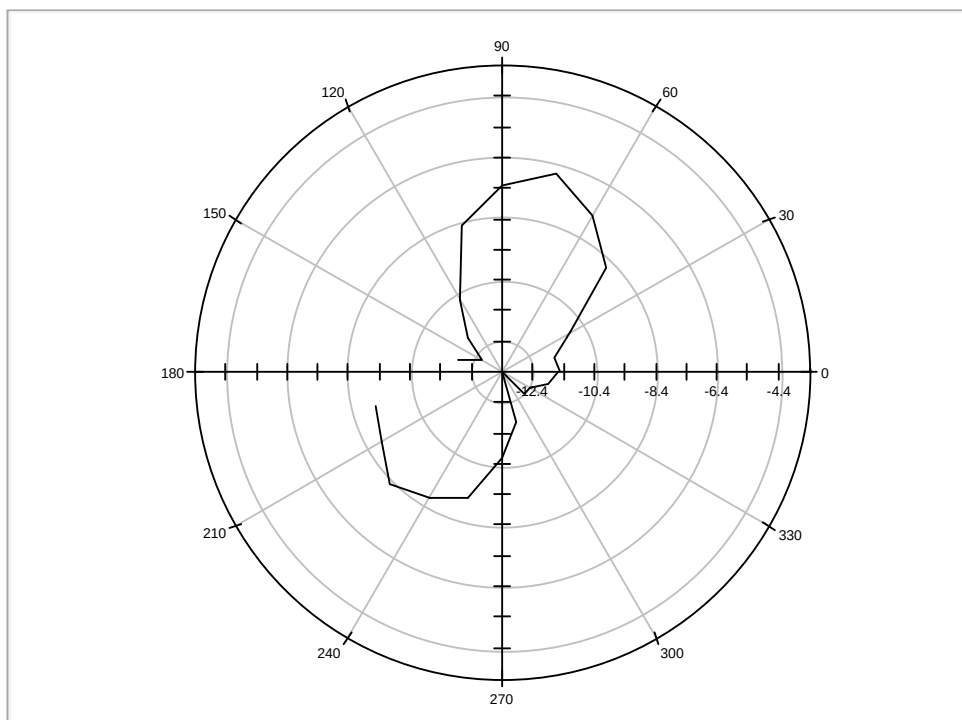


Fig 6: 3D OTA test result: Antenna pattern for mid channel



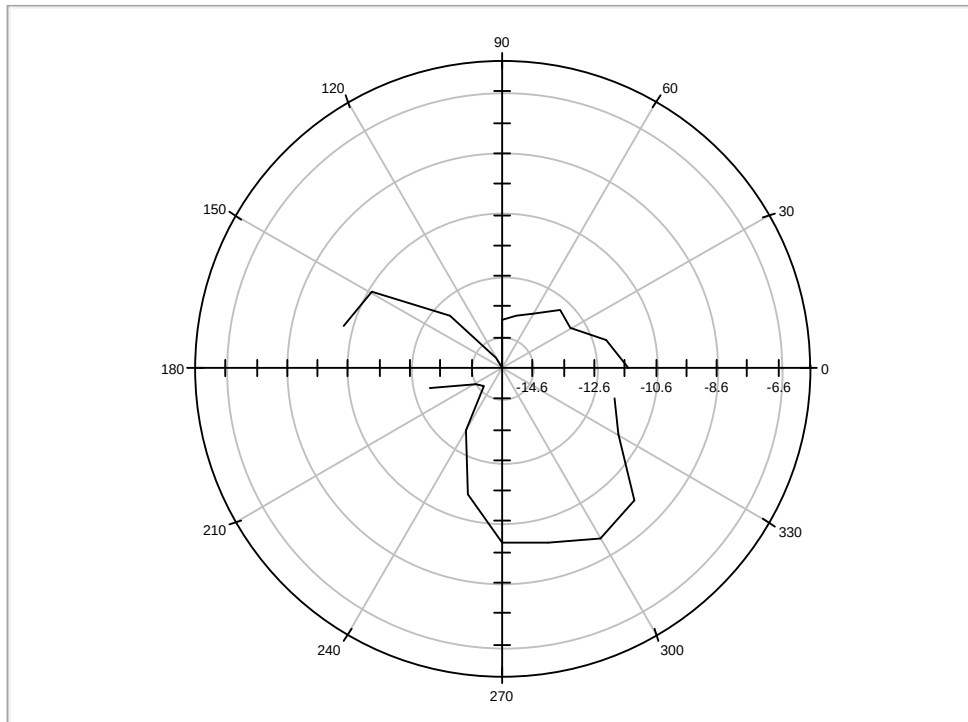
— 2440.000 MHz [Level]

Fig 7: Main Cut Plot XY Plane for mid channel



— 2440.000 MHz [Level]

Fig 8: Main Cut Plot XZ Plane for mid channel

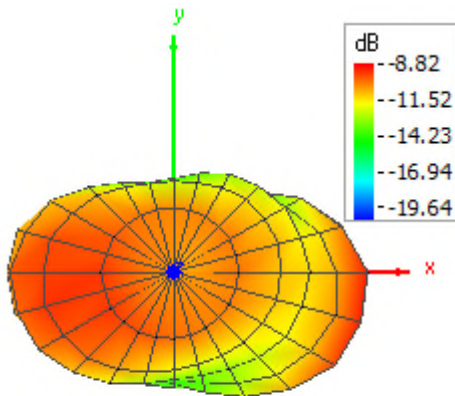


— 2440.000 MHz [Level]

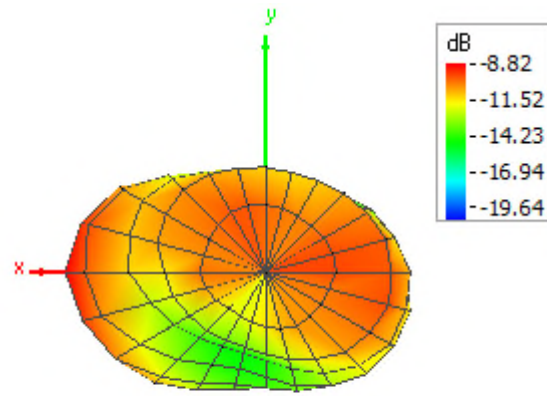
Fig 9: Main Cut Plot YZ Plane for mid channel

3.1.5 Measurement diagrams for the antenna (2480 MHz)

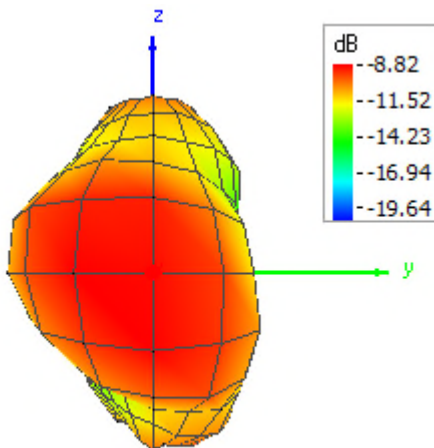
Theta = 0, Phi = 0



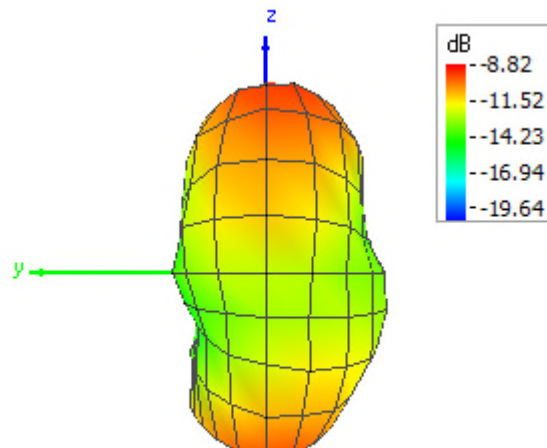
Theta = 180, Phi = 0



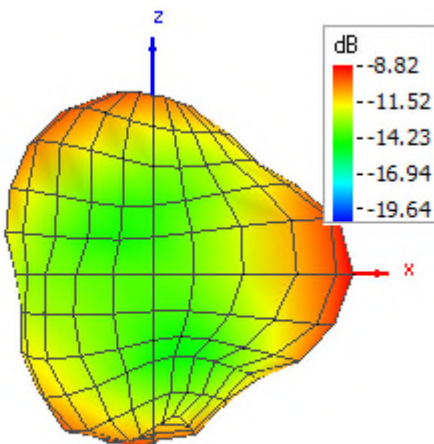
Theta = 90, Phi = 0



Theta = 90, Phi = 180



Theta = 90, Phi = 270



Theta = 90, Phi = 90

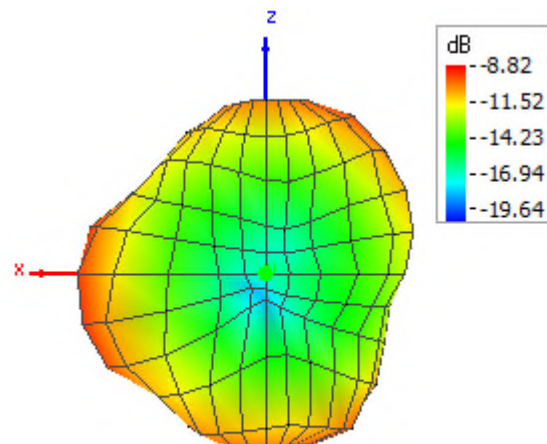


Fig 10: 3D OTA test result: Antenna pattern for high channel

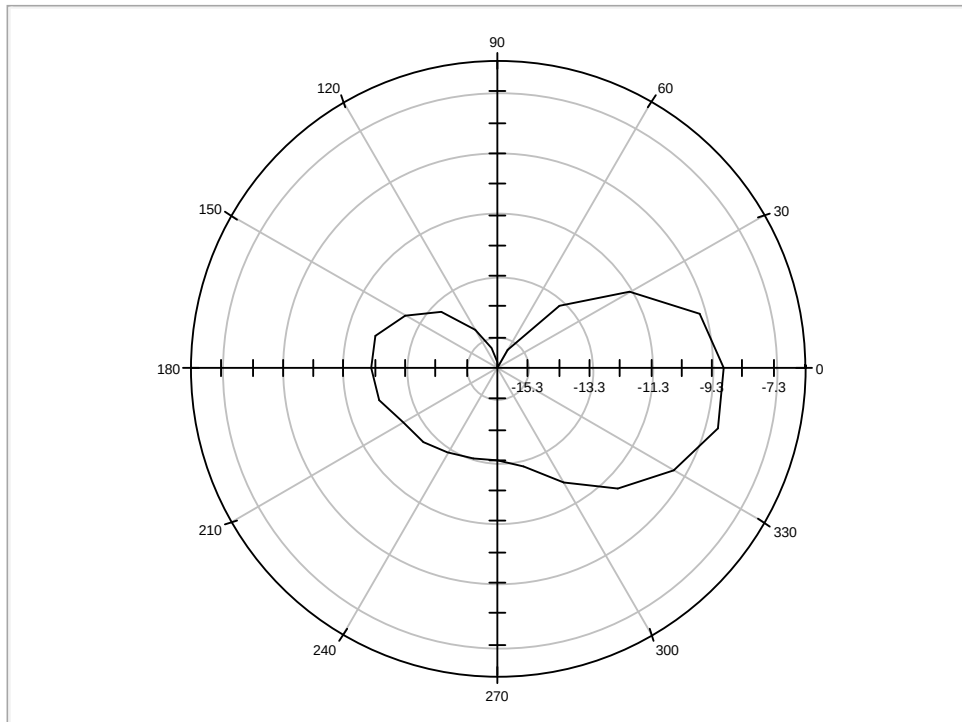


Fig 11: Main Cut Plot XY Plane for high channel

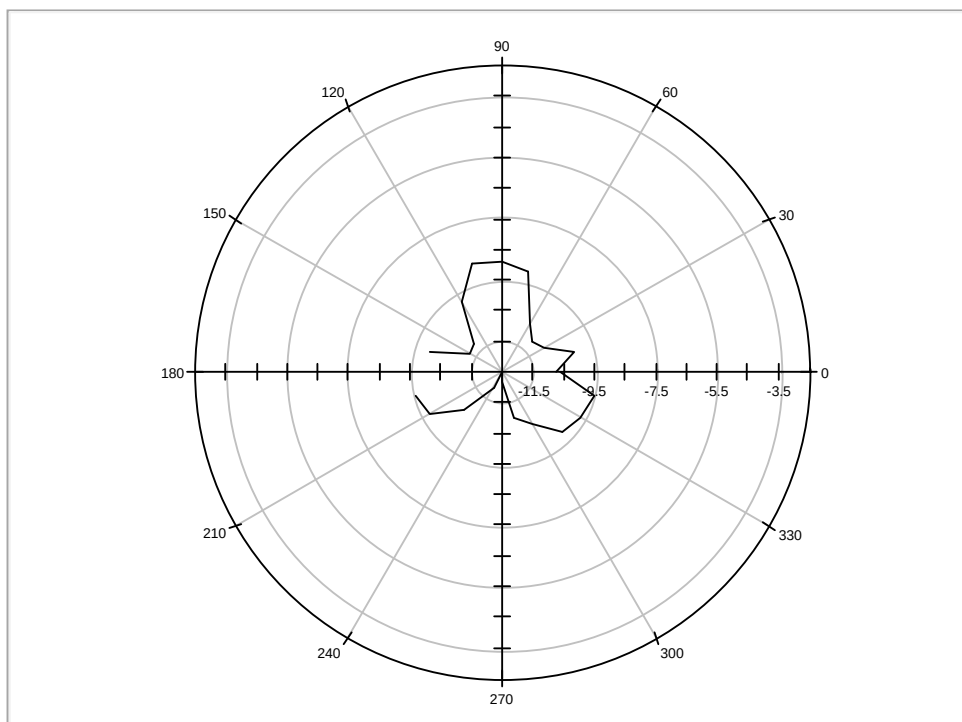
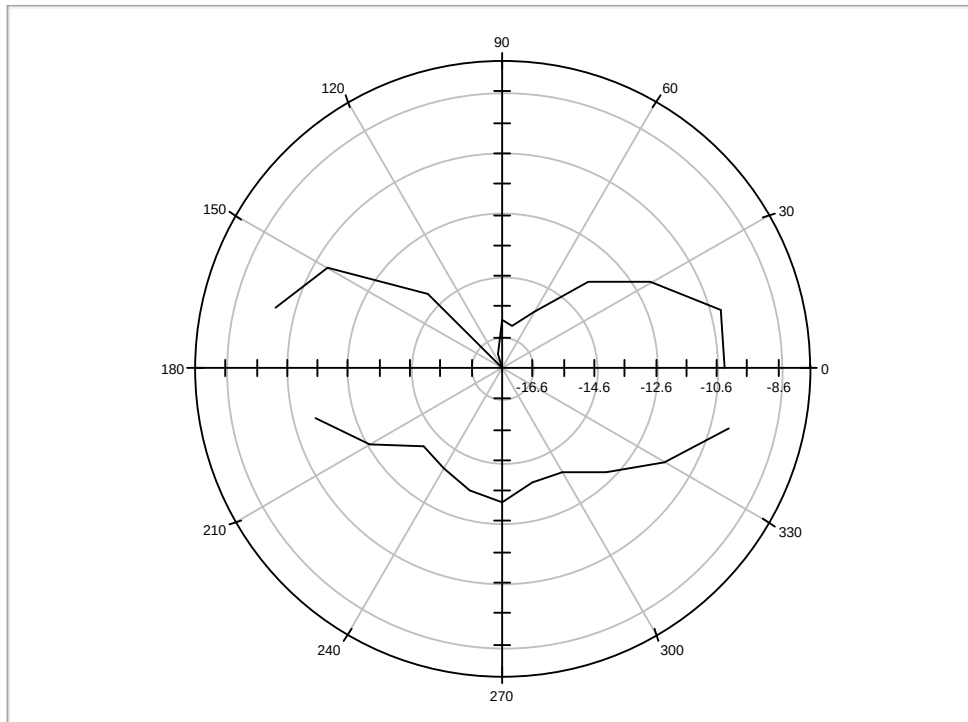


Fig 12: Main Cut Plot XZ Plane for high channel



— 2480.000 MHz [Level]

Fig 13: Main Cut Plot YZ Plane for high channel

4 Equipment lists

ID	Description	Manufacturer / Type	Serial Number
20557	System CTC-OTA-2 R&S TS8991	Rohde & Schwarz Messgerätebau GmbH	--
20560	Power Sensor NRP-Z11	Rohde & Schwarz Messgerätebau GmbH	100404
20562	Power Sensor NRP-Z11	Rohde & Schwarz Messgerätebau GmbH	100404
20566	Open switch and control Platform OSP120 with OSP-B105	Rohde & Schwarz Messgerätebau GmbH	100057
20567	Quad Ridged Horn Antenna QR-1	The Howland Company Inc.	1007-5V978
20570	Motion Control Unit P008 Motion Control Unit	The Howland Company Inc.	123
20690	Spectrum Analyzer FSU26	Rohde & Schwarz Messgerätebau GmbH	100302

4.1 Measurement Uncertainty

4.1.1 Total Radiated Power

According to a separate uncertainty calculation following the procedure as outlined by CTIA [1], for free space and frequencies below 3 GHz for TRP an uncertainty of ± 1.1 dB has been calculated [2].

5 References

- [1] CTIA OTA Test Requirement, "Test Plan for Wireless Device Over the Air Performance, Method of Measurement for Radiated RF Power and Receiver Performance", Revision 3.9.4, February 2022.
- [2] Document "OTA v3.9.x LAD v1.2" incl. "v3.9.X Measurement Uncertainty Template", Version 1.2 for calculating the measurement uncertainty according CTIA OTA Test Plan v3.9.x.

6 Versions of the document (change history)

Version	Applied changes	Date of release
R01	Initial release	2026-Jun-26
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