

# Antenna Performance

## Test Report TR21-1-0171407T001a



Deutsche  
Akkreditierungsstelle  
D-PL-12047-01-01  
D-PL-12047-01-03  
D-PL-12047-01-04

<b>Number of pages:</b>	12	<b>Date of Report:</b>	2023-Apr-25
<b>Testing company:</b>	cetecom advanced GmbH Im Teelbruch 116 45219 Essen Germany Tel. + 49 (0) 20 54 / 95 19-0 Fax: + 49 (0) 20 54 / 95 19-150	<b>Customer:</b>	Siemens AG Oestliche Rheinbrueckenstrasse 50 D-76181 Karlsruhe Germany
<b>Product:</b>	Antenna		
<b>Model:</b>	SIEMENS A5E50089486AC		
<b>Frequency Range:</b>	2400 MHz to 2480 MHz		
<b>Test Specification:</b>	CTIA Test Plan for Wireless Device Over the Air Performance, Method of Measurement for Radiated RF Power and Receiver Performance [1].		
<b>Signatures:</b>	<div style="border: 1px solid black; height: 100px; width: 100%;"></div>		
	<b>Dipl. Ing. Ninovic Perez</b> Authorization of Test Report	<b>B.Eng. Martin Nunier</b> 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

Frequency [MHz]	2400	2440	2480
Efficiency [dB]	-3.36	-3.07	-3.13
Directivity [dBi]	3.76	3.74	3.87
Gain [dBi]	0.40	0.66	0.74

Tab 1: Data Summary

## 2 Administrative Data

### 2.1 Identification of Entity Providing the Service

Company address:	cetecom advanced GmbH / Im Teelbruch 116 / 45219 Essen / Germany
Internet site:	<a href="http://www.cetecom.com">www.cetecom.com</a>
Responsible for laboratory:	Dipl. Ing. Ninovic Perez
Accreditation scope:	<a href="#">DAkS Webpage</a>
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:	TR21-1-0171407T001a
Test Date(s):	2023-Mar-31
Witness during tests:	None
Responsible for test report:	B.Eng. Martin Nunier
Date of report:	2023-Apr-25

### 2.4 Customer Details

Customer address:	Siemens AG Oestliche Rheinbrueckenstrasse 50 D-76181 Karlsruhe Germany
Contact person:	Mr. Vadim Baskal

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

Short description*)	PMT Sample No.	Product	Model	Type	S/N	HW status	SW status
EUT 01	21-1-01714S32_C01	Antenna	SIEMENS ASE50089486AC	--	--	003	--

### 3 Test Set Up and Method

#### 3.1 TRP Test

The measurement of the total radiated power was done in a CTIA certified OTA lab and according to the appropriate test specification [0]. 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°.

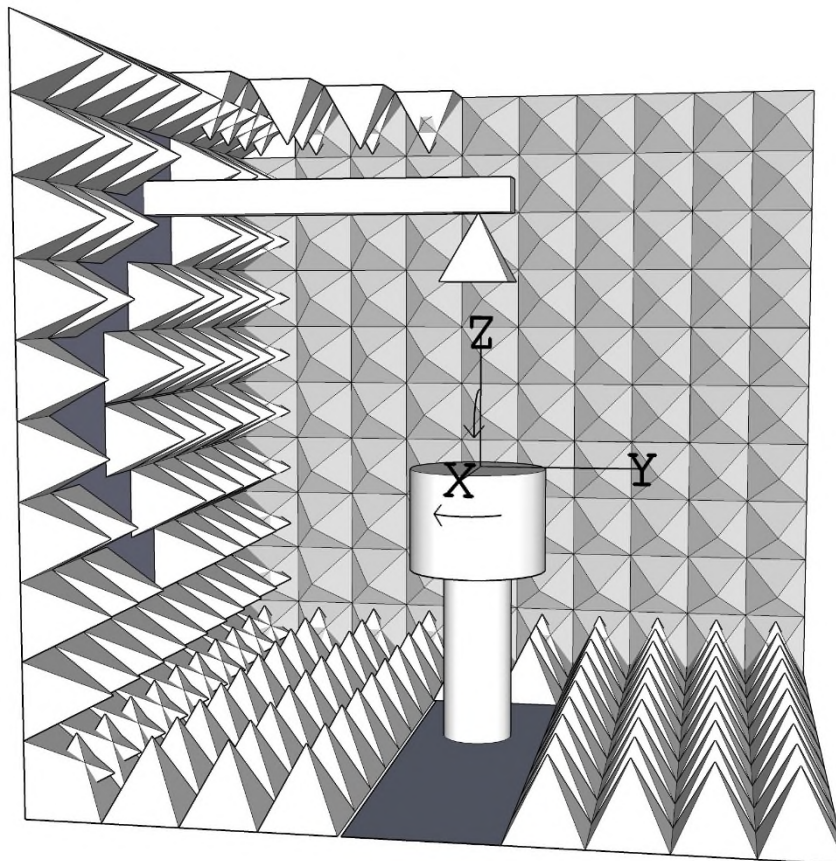
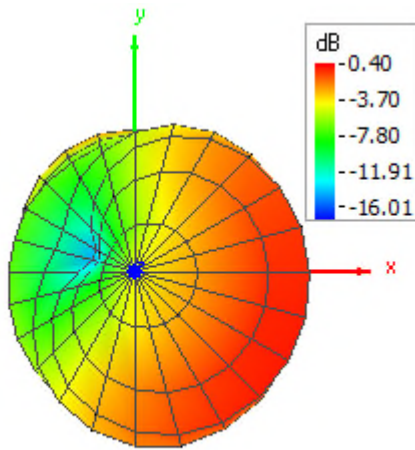


Fig 1: 3D OTA test set up.

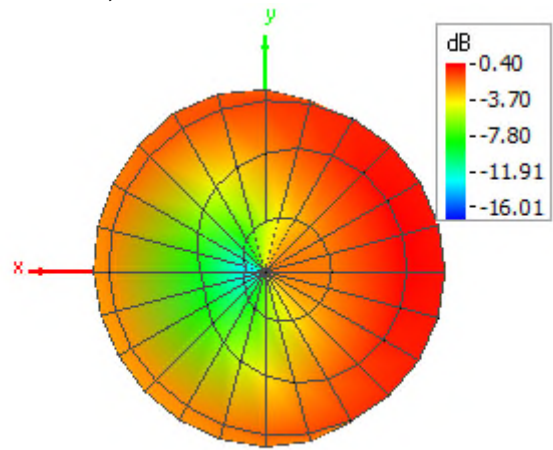
MHz	Efficiency [%]	Directivity [dBi]	Gain [dBi]
2400	46.15	3.76	0.40
2440	49.29	3.74	0.66
2480	48.69	3.87	0.74

Tab 2: Selected numerical results for efficiency, directivity and gain.

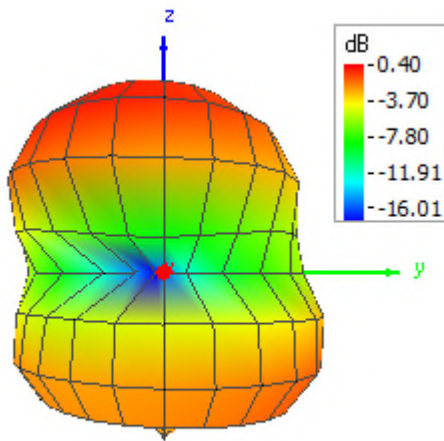
Theta = 0, Phi = 0



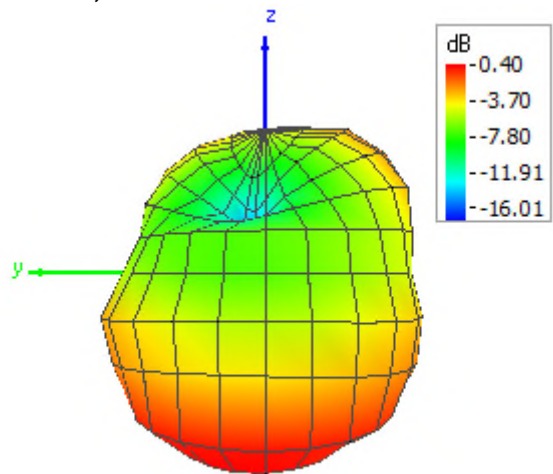
Theta = 180, Phi = 0



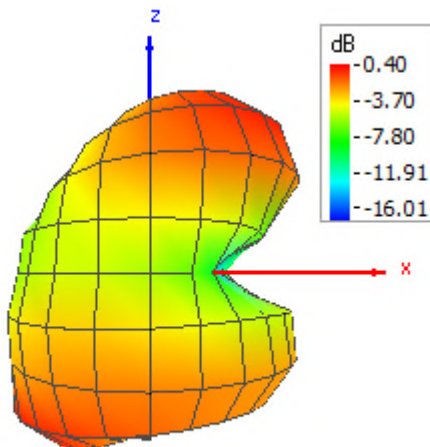
Theta = 90, Phi = 0



Theta = 90, Phi = 180



Theta = 90, Phi = 270



Theta = 90, Phi = 90

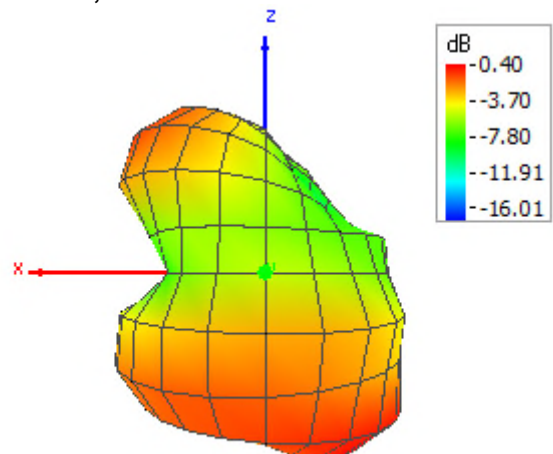
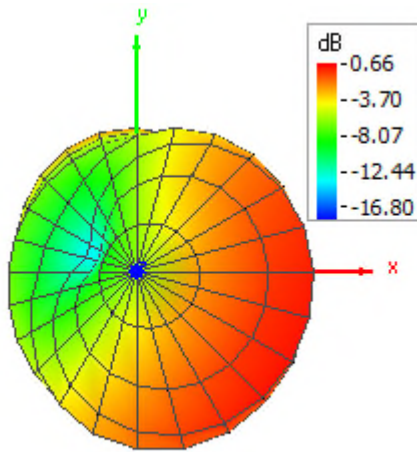


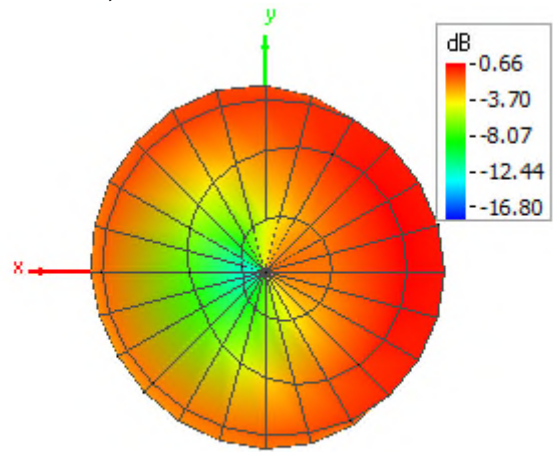
Fig 2: 3D OTA test result: Antenna pattern for 2400 MHz, Test antenna input power setting was 0 dBm.



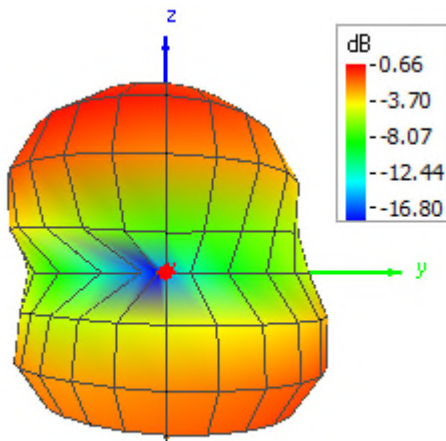
Theta = 0, Phi = 0



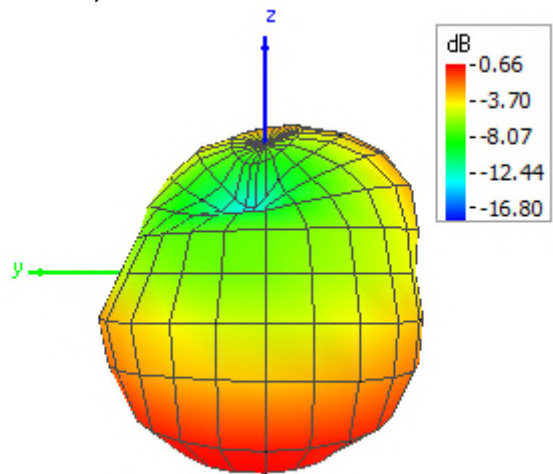
Theta = 180, Phi = 0



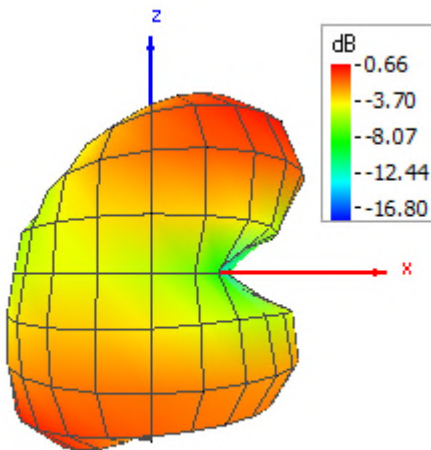
Theta = 90, Phi = 0



Theta = 90, Phi = 180



Theta = 90, Phi = 270



Theta = 90, Phi = 90

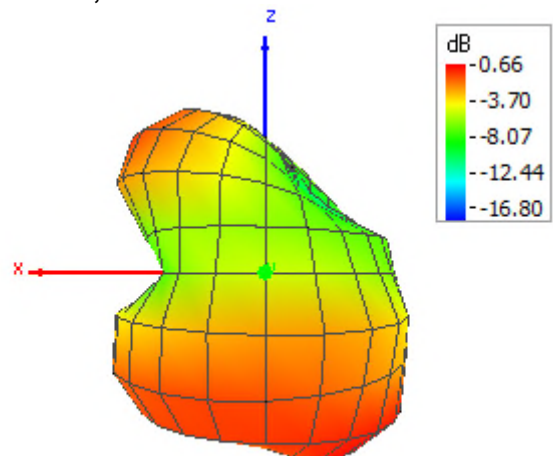
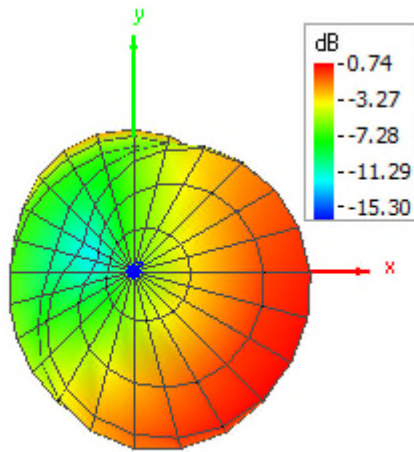


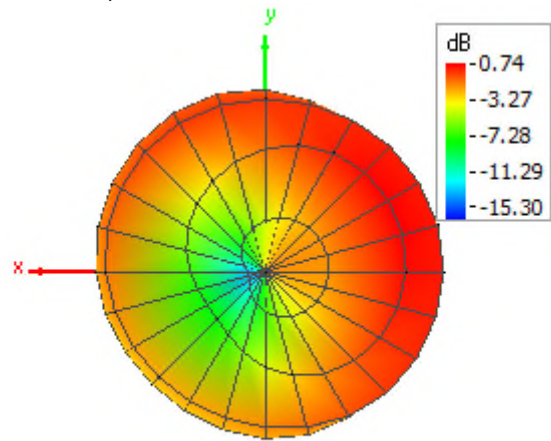
Fig 3: 3D OTA test result: Antenna pattern for 2440 MHz. Test antenna input power setting was 0 dBm.



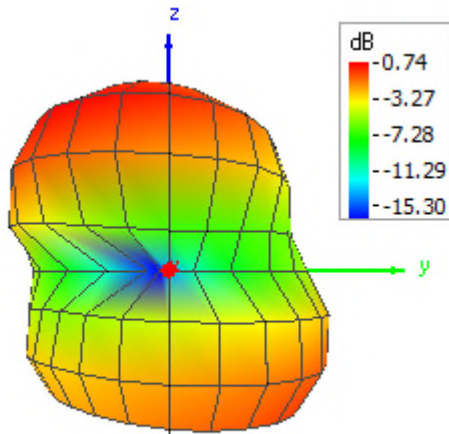
Theta = 0, Phi = 0



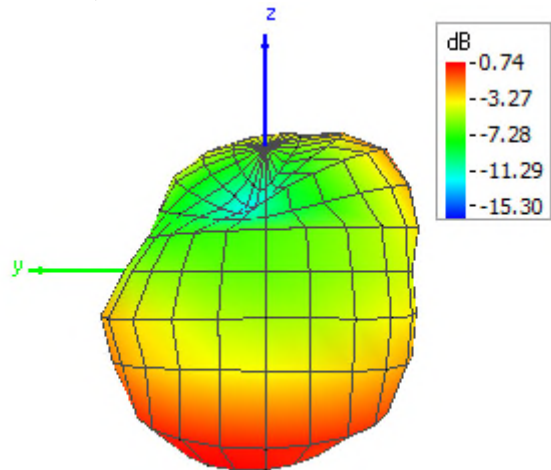
Theta = 180, Phi = 0



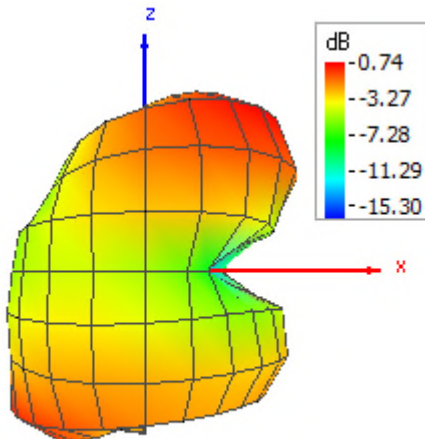
Theta = 90, Phi = 0



Theta = 90, Phi = 180



Theta = 90, Phi = 270



Theta = 90, Phi = 90

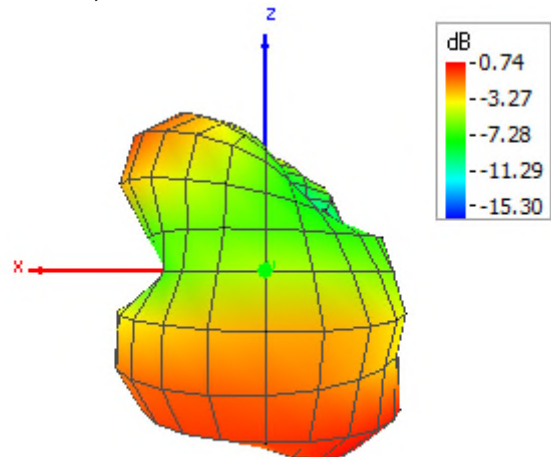
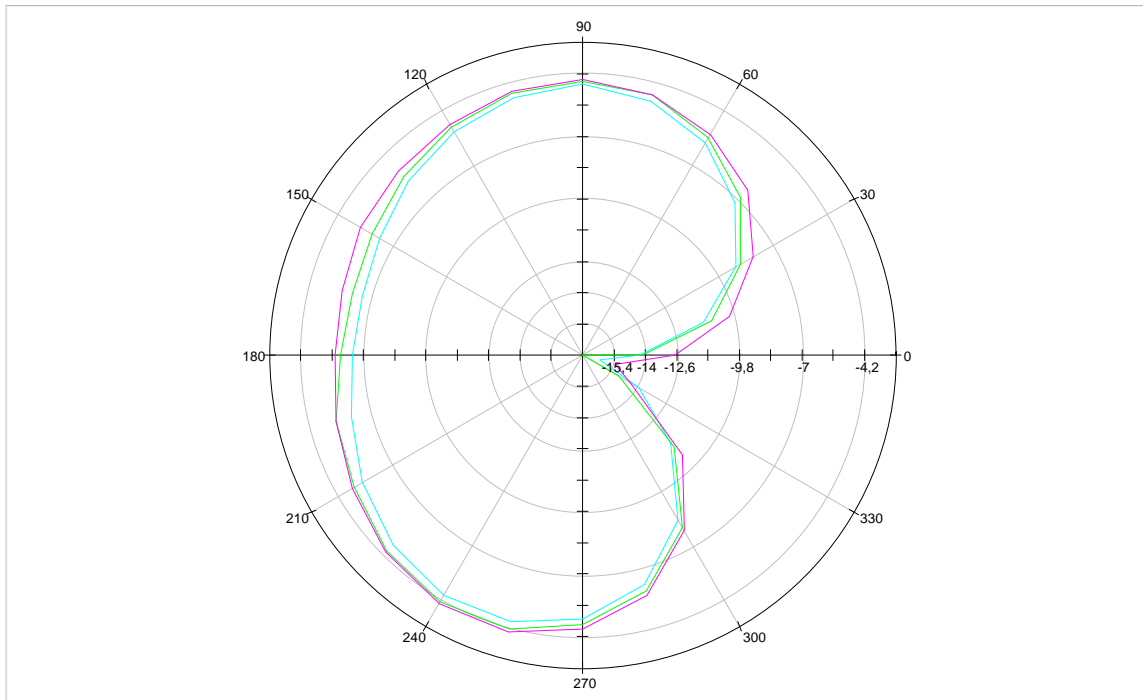
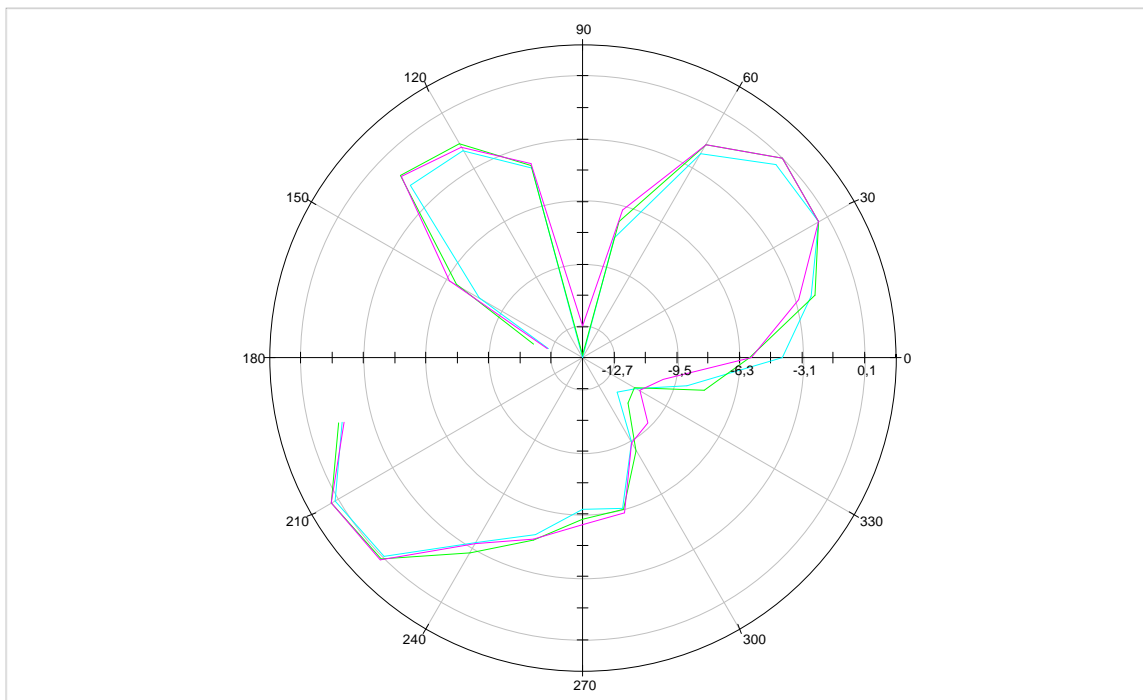


Fig 4: 3D OTA test result: Antenna pattern for 2480 MHz. Test antenna input power setting was 0 dBm.



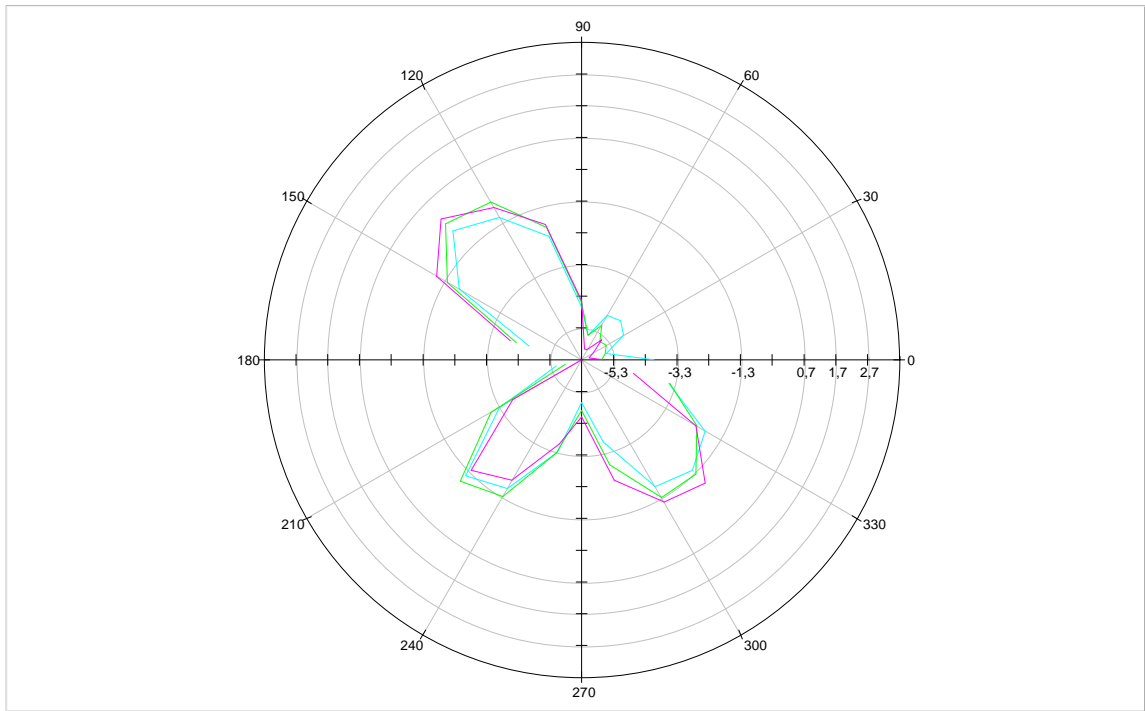
— 2400.000 MHz [dB]   
 — 2440.000 MHz [dB]   
 — 2480.000 MHz [dB]

Fig 5: MainCutsPlot\_XY\_Plane



— 2400.000 MHz [dB]   
 — 2440.000 MHz [dB]   
 — 2480.000 MHz [dB]

Fig 6: MainCutsPlot\_XZ\_Plane



— 2400.000 MHz [dB]    — 2440.000 MHz [dB]    — 2480.000 MHz [dB]

Fig 7: MainCutsPlot\_YZ\_Plane

## 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

### 4.1 Measurement Uncertainty

#### 4.1.1 TRP and Efficiency

According to a separate uncertainty calculation following the procedure as outlined by CTIA [1], for free space and frequencies below 3 GHz for TRP and also efficiency results an uncertainty of  $\pm 1.1$  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 test reports (change history)

Version	Applied changes	Date of release
--	Initial release	25-Mar-2023
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**End of Test Report**