ANTENNA TEST REPORT **Antenna operating within the 2400.0 MHz - 2483.5 MHz and 5180MHz-5720MHz band**	
Report Reference No	G0M-2309-2217-TJPAUT-ANT162442DT-2001A2-V01
Testing Laboratory	Eurofins Product Service GmbH
Address	Storkower Str. 38c 15526 Reichenwalde Germany
Applicant	Panasonic Industrial Devices Europe GmbH
Address	Zeppelinstr. 19 21337 Lüneburg GERMANY
Equipment under Test (EUT):	
Product Description	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model(s)	ENWF9511C1KF
Additional Model(s)	None
Brand Name(s)	PAN9019A
Hardware Version(s)	03
Software Version(s)	01
FCC ID	N/A

Testing:		
Test Lab Temperature	20 °C - 30 °C	
Test Lab Humidity	25 % - 55 %	
Date of receipt of test item	2022-12-19	
Report:		
Compiled by	Md Abu Bakar Siddique	
Tested by (+ signature) (Responsible for Test)	Md Abu Bakar Siddique	
Approved by (+ signature)	Radwan Jaafar	
Date of Issue	2024-08-23	
Total number of pages	23	
General Remarks:		
The test results presented in this report relate only to the object tested. **The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.** This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.		
Additional Comments:		

VERSION HISTORY

Version History			
Version	Issue Date	Remarks	Revised By
01	2024-08-23	Initial Release	

ABBREVIATIONS AND ACRONYMS

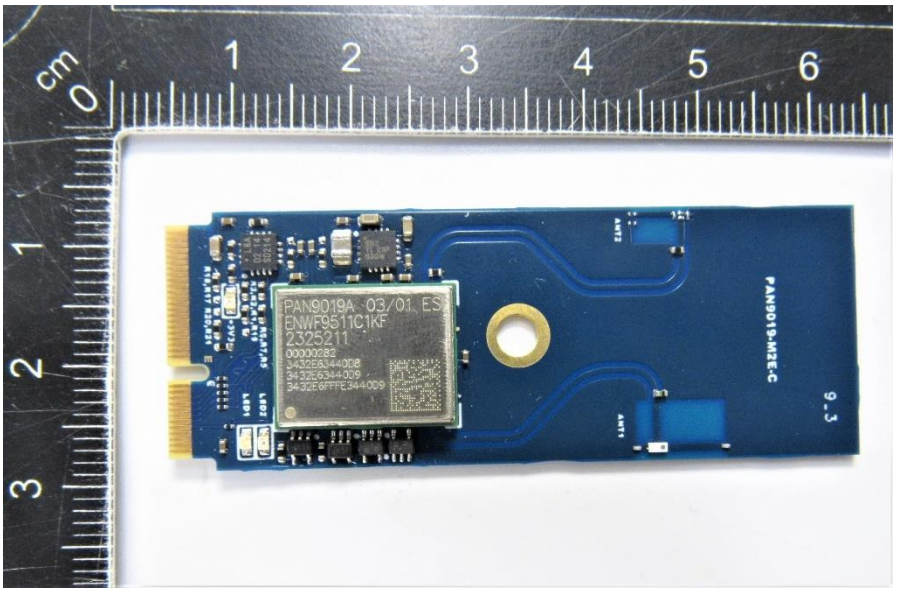
Acronyms	
Acronym	Description
EUT	Equipment Under Test
T_{NOM}	Nominal temperature
V_{NOM}	Nominal supply voltage

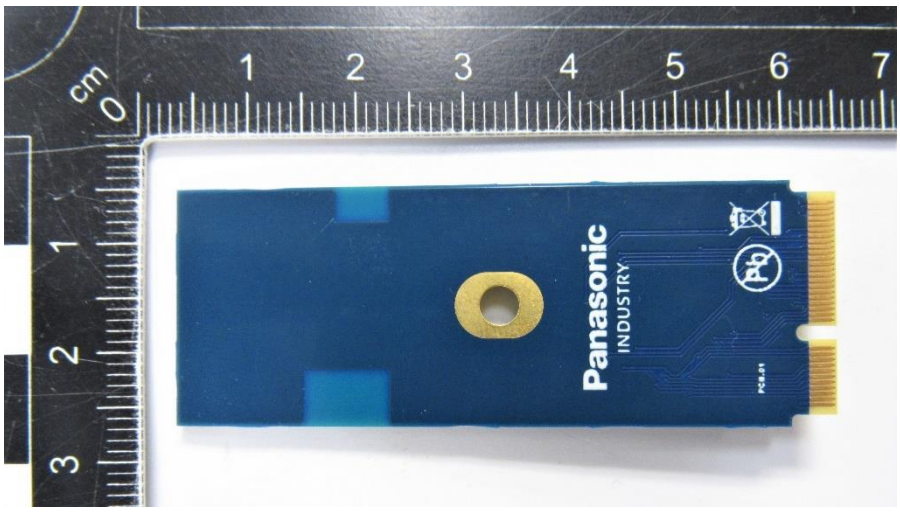
REPORT INDEX

1 Equipment (Test Item) Under Test

Description	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module		
Model	ENWF9511C1KF		
Additional Model(s)	None		
Brand Name(s)	PAN9019A		
Sample identification	Sample description		Test Sample ID
	PAN9019A with ANT162442DT-2001A2		46898
Hardware Version(s)	03		
Software Version(s)	01		
Equipment type	End Product		
Radio type	Transceiver		
Assigned frequency bands	2400.0 MHz - 2483.5 MHz and 5180MHz-5720MHz		
Radio technology	WiFi 2.4 GHz and 5GHz		
Modulation	BPSK, QPSK, 16-QAM, 64-QAM		
Number of antenna ports	1		
Antenna	Type	External antenna	
	Model	ANT162442DT-2001A2	
	Manufacturer	TDK	
	Gain	3.715	
Supply Voltage	V_{NOM}	1.8/3.3 VDC	
Operating Temperature	T_{NOM}	25 °C	
AC/DC-Adaptor	None		
Manufacturer	Panasonic Industrial Devices Europe GmbH Zeppelinstr. 19 21337 Lüneburg GERMANY		

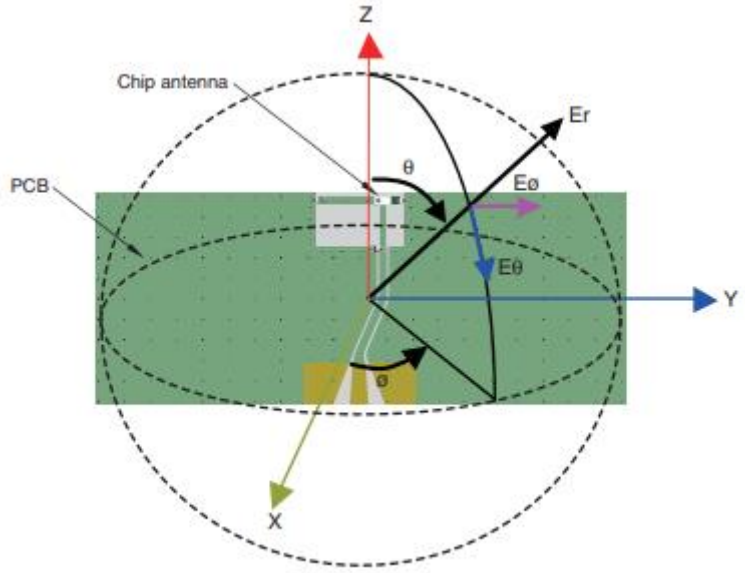
1.1 Photos – Equipment External

Antenna - Top


Antenna - Bottom


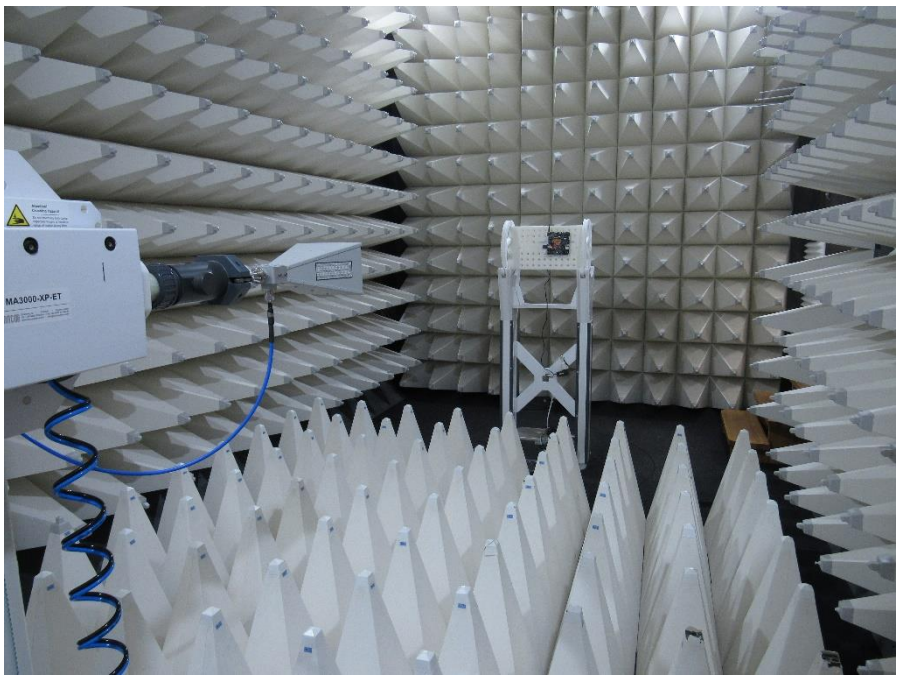
EUT on host board with ANT162442DT-2001A2

Test setup- Antenna position to the axis

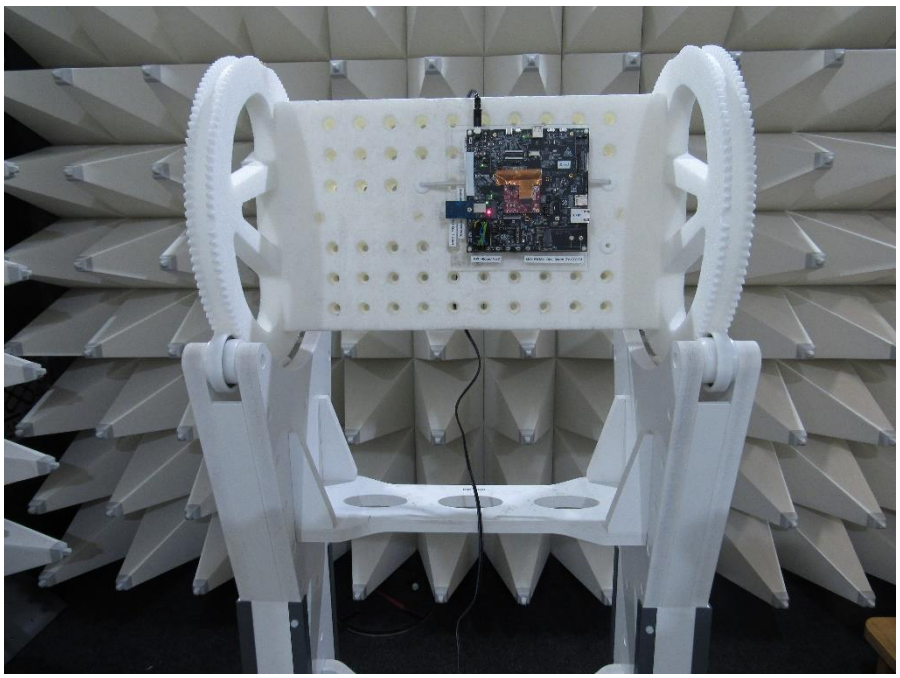


1.2 Photos Test Setup

Setup for measurement of antenna pattern - ANT162442DT-2001A2



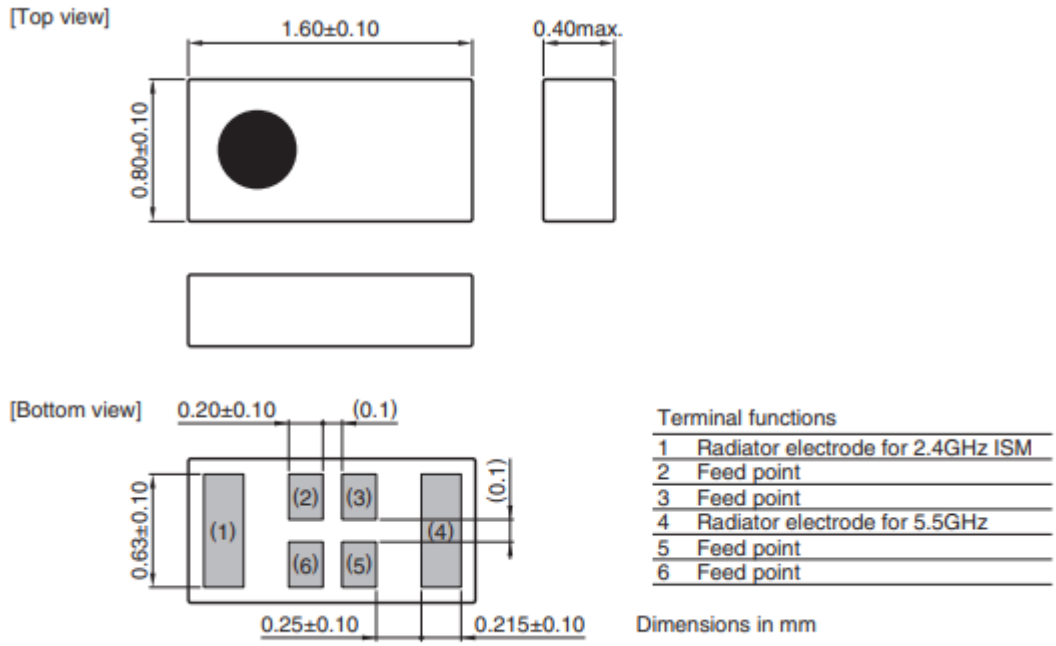
EUT on tilt unit antenna - ANT162442DT-2001A2



1.3 Anntenna Mechanical Properties

PCB size	50mm x 20mm x 1mm
Antenna area	8 x 5 mm
Operation Temperature	**–**40 to +85
Storage temperature	–40 to +85

Dimensions*:



**Reference: Manufacturer datasheet "ANT162442DT-2001A2" issued in September 2016*

1.4 Support Equipment

Product Type	Device	Manufacturer	Model	Comment
AE	Host-Board-iMX8M Mini Developer´s Kit V3	Embedded Artists	EAK00393	For configuring test modes
AE	Notebook	Lenovo	Thinkpad	
AE	AC/DC Adapter	Phihong Technology Co. Ltd.	PSAA30R-120	To power the evaluation board
CBL	Ethernet	---	---	Connection between evaluation board and notebook
SFT	Web GUI	Panasonic	---	For test mode activation
Description:				
AE	Auxiliary Equipment			
SIM	Simulator			
CBL	Connecting Cable			
SFT	Software			
SFT : The Equipment Under Test used an operating system with a test firmware. The driver for the tested technology was running in a manufacturer mode.				
Comment: --				

1.5 Test Modes

Mode	Description
OFDM (IEEE 802.11g)	Mode = Transmit Modulation = OFDM Bandwidth = 20 MHz Duty cycle = 100% Data rate = 6 Mbps Power setting = 16 dBm
Note: The power level is set according to customer plan using software provided by customer.	

1.6 Test Frequencies

Designator	Mode	Channel	Frequency [MHz]
F1	Tx	7	2442
F1	Tx	120	5600

2 Test Conditions and Results

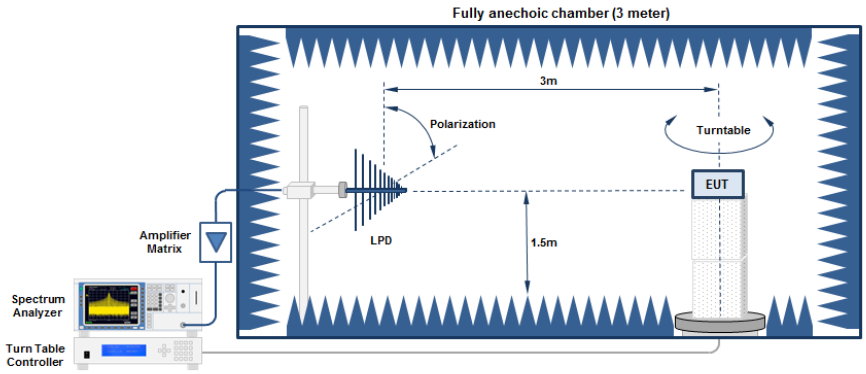
2.1 Test Conditions and Results – Antenna pattern

2.1.1 Information

Test Information	
Operator	Md Abu Bakar Siddique
Measurement uncertainty	±2.86 %
Date	2024-07-30

2.1.2 Setup

Test Setup



2.1.3 Equipment

Test Equipment					
Description	Manufacturer	Model	Identifier	Cal. Date	Cal. Due
Anechoic chamber	Frankonia	AC 2	EF01616	2023-12	2024-12
Spectrum analyzer	R&S	FSW43	EF00896	2023-08	2024-08
Antenna	Schwarzbeck	BBHA 9120B	EF01678	2024-05	2027-05

2.1.4 Procedure

Test Procedure

1. EUT set to the test mode and the conducted output power has been determined as reference value
2. EUT is placed on a non conducting support at the center of a turn table 1.5 m above the ground
3. The Spectrum analyzer is set to the appropriate RBW, and detector.
4. The EIRP is measured and recorded in the azimuth plane through 0° to 360° and in the elevation plane through 0° to 180°.
5. procedure is repeated for horizontal and vertical polarization.

2.1.5 Results

Test Result - ANT162442DT-2001A2				
Channel [MHz]	Receive antenna polarization	Conducted Power [dBm]	Max. rad. Power [dBm e.i.r.p]	Max. antenna gain [dBi]
2442	Vertical	14.26	16.015	1.755
	Horizontal	14.26	17.975	3.715
5600	Vertical	12.07	15.642	3.572
	Horizontal	12.07	15.782	3.712

ANNEX A Antenna patterns (2.4 Ghz band)

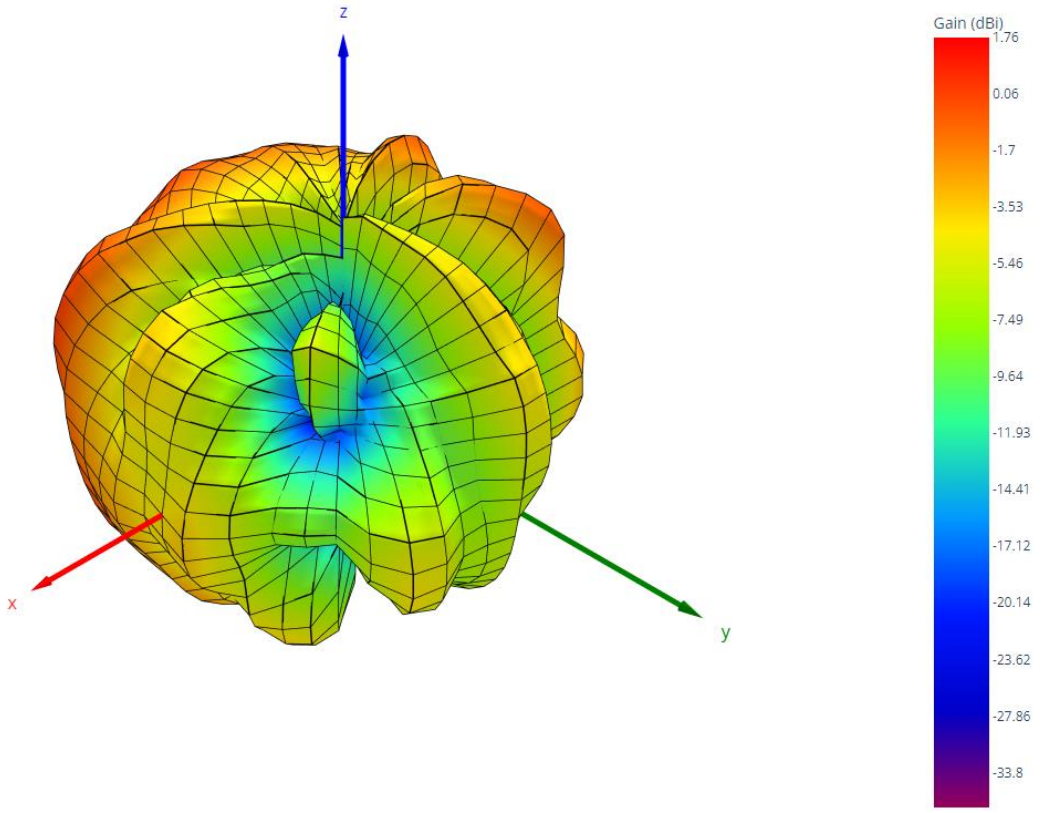
Antenna Pattern (Vertical Polarization)

Project Number:	G0M-2309-2217
Product:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
EUT Antenna:	External
Operating Conditions:	Tnom / Vnom
Operating Frequency:	2442 MHz
Detector:	RMS
RBW:	1 MHz
VBW:	10 MHz
Sweep Time:	20 ms
Conducted Power:	14.26 dBm
Operator:	Mr. Siddique
Date:	2024-07-30

Result Summary

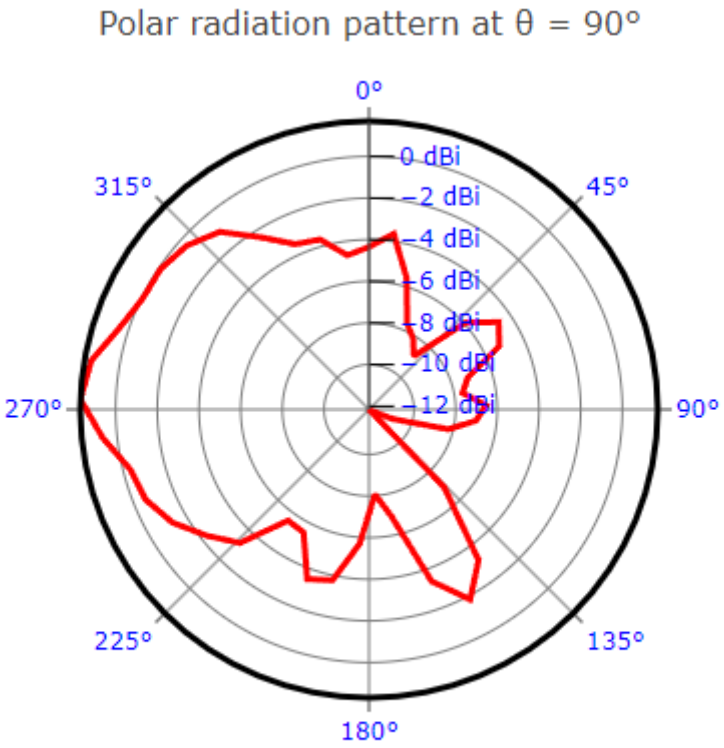
Turn table Angle [°]	Max. rad. power [dBm e.i.r.p.]	Max. antenna gain [dBi]
272	16.015	1.755

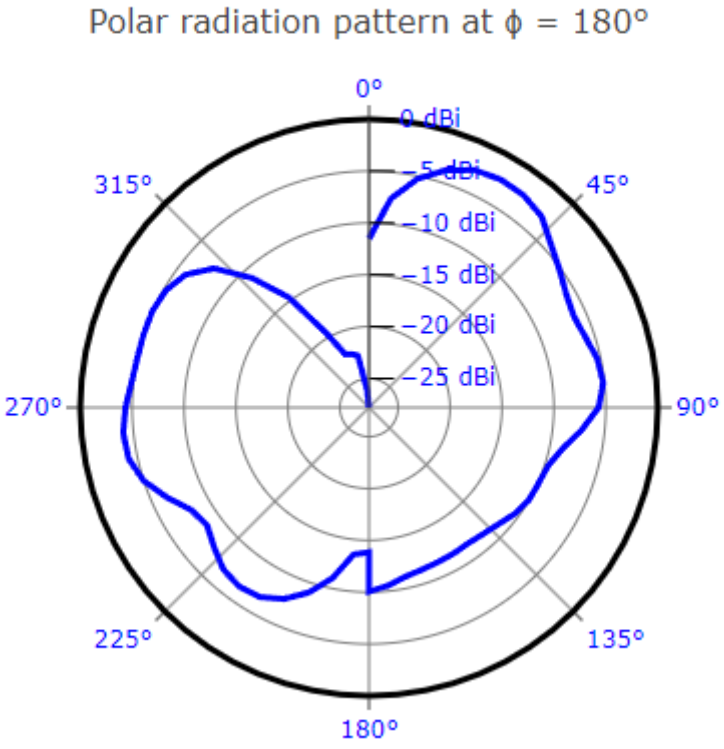
3D Radiation pattern



Rotating 3D-view: **Antenna pattern 2.4 GHz-Vertical.html**

2D Polar plot at maximum radiation





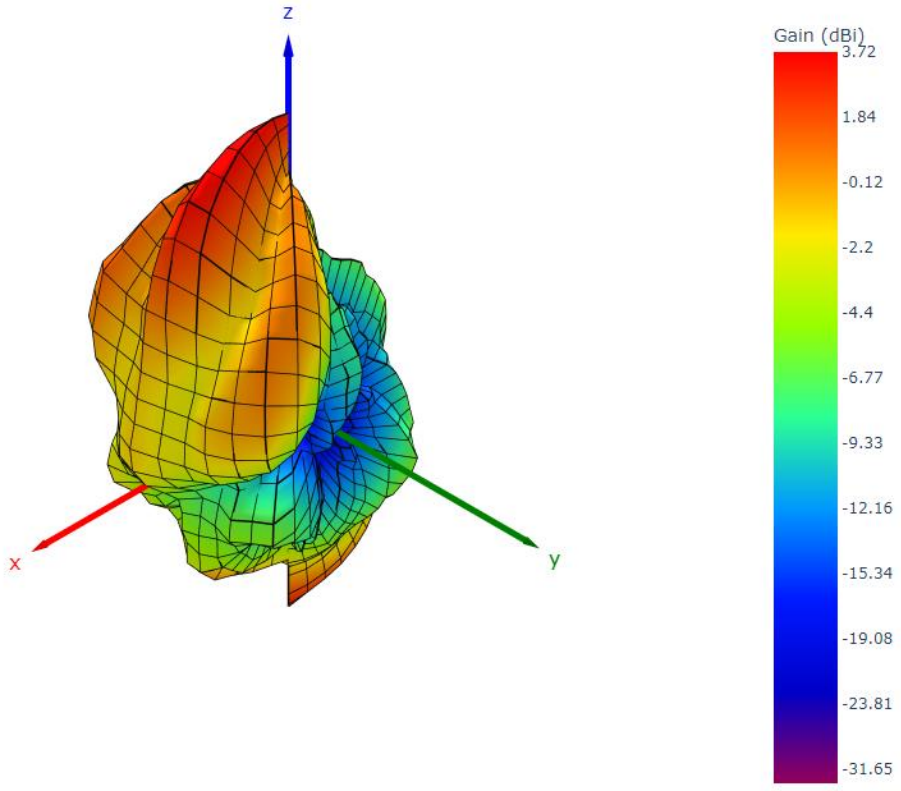
Antenna Pattern (Horizontal Polarization)

Project Number:	G0M-2309-2217
Product:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
EUT Antenna:	External
Operating Conditions:	Tnom / Vnom
Operating Frequency:	2442 MHz
Detector:	RMS
RBW:	1 MHz
VBW:	10 MHz
Sweep Time:	20 ms
Conducted Power:	14.26 dBm
Operator:	Mr. Siddique
Date:	2024-07-30

Result Summary

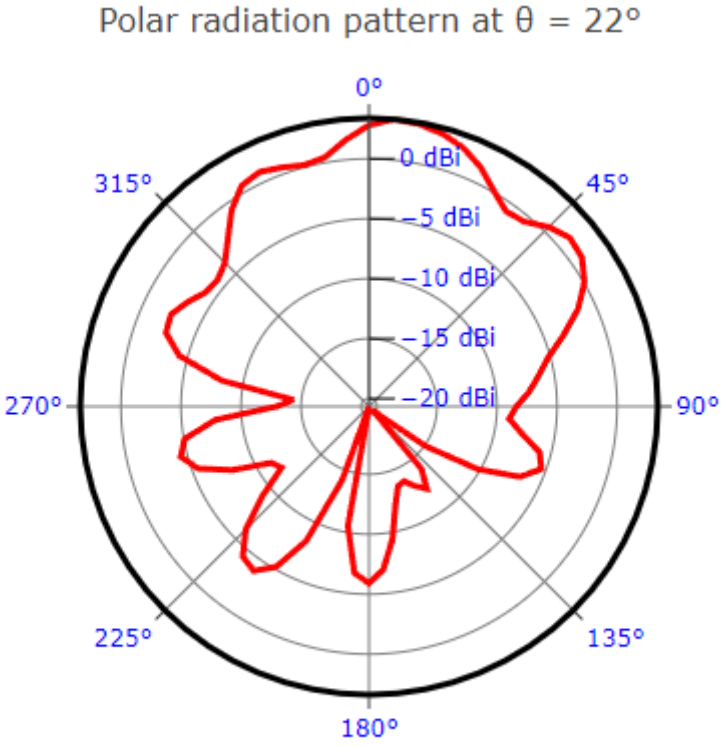
Turn table Angle [°]	Max. rad. power [dBm e.i.r.p.]	Max. antenna gain [dBi]
	17.975	3.715

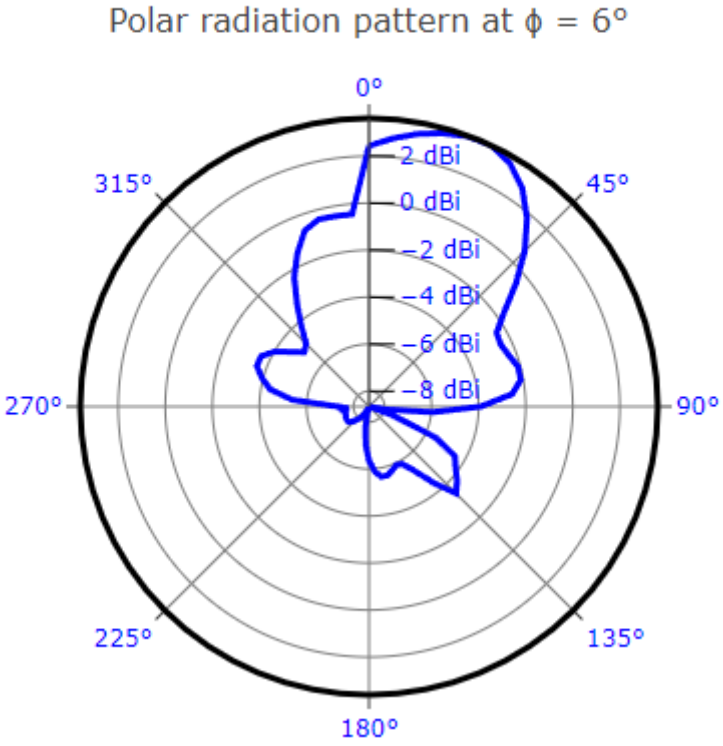
3D Radiation pattern



Rotating 3D-view: **Antenna pattern 2.4 GHz-Horizontal.html**

2D Polar plot at maximum radiation





ANNEX B Antenna patterns (5.0 Ghz band)

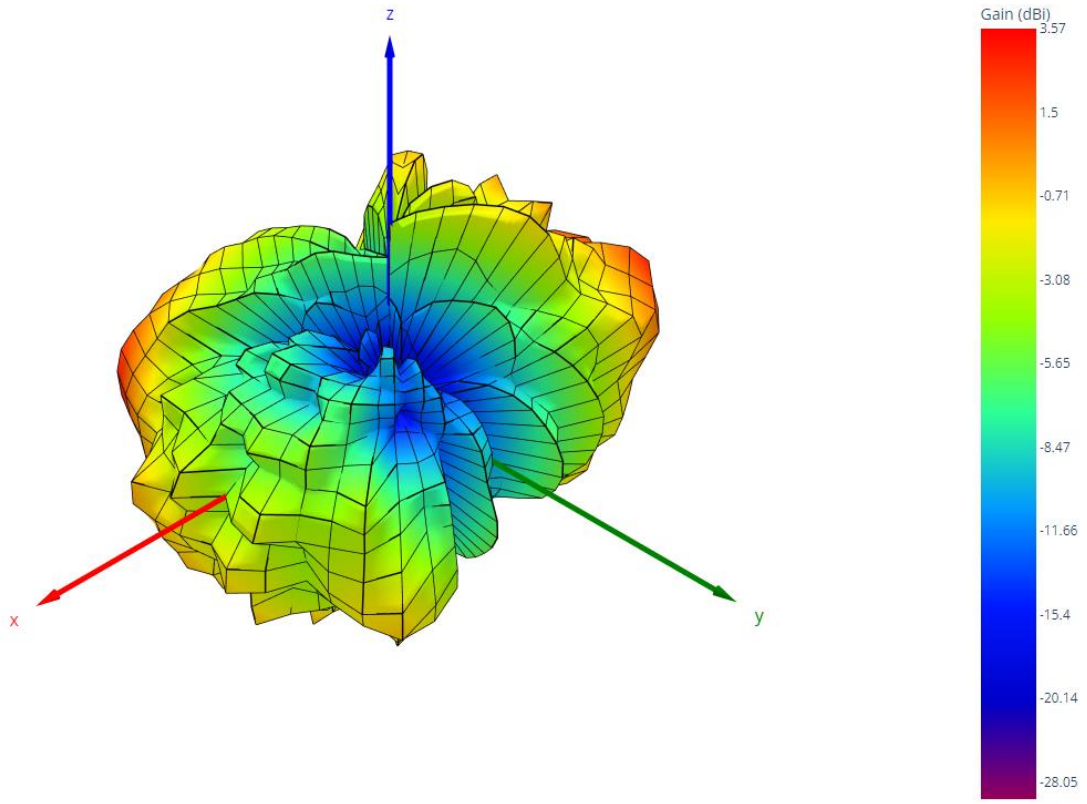
Antenna Pattern (Vertical Polarization)

Project Number:	G0M-2309-2217
Product:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
EUT Antenna:	External
Operating Conditions:	Tnom / Vnom
Operating Frequency:	5600 MHz
Detector:	RMS
RBW:	1 MHz
VBW:	10 MHz
Sweep Time:	20 ms
Conducted Power:	12.07 dBm
Operator:	Mr. Siddique
Date:	2024-07-30

Result Summary

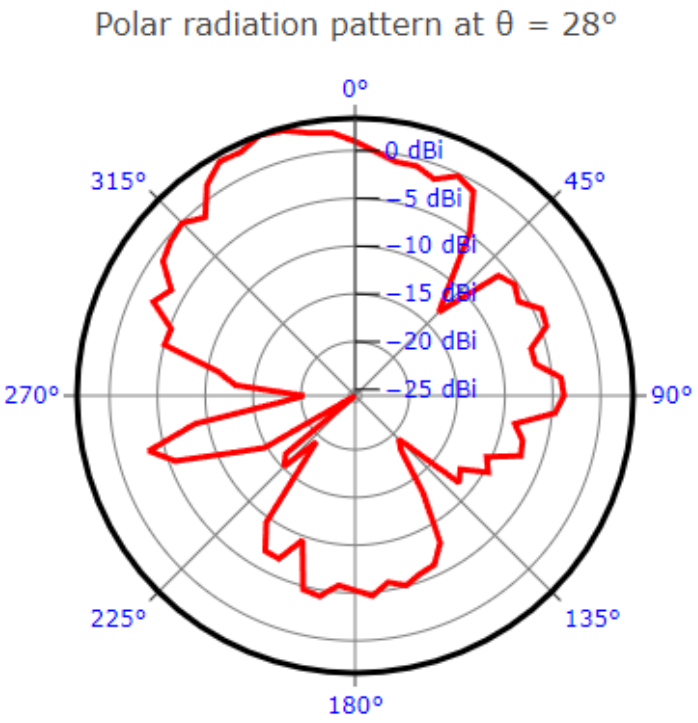
Turn table Angle [°]	Max. rad. power [dBm e.i.r.p.]	Max. antenna gain [dBi]
296	15.642	3.572

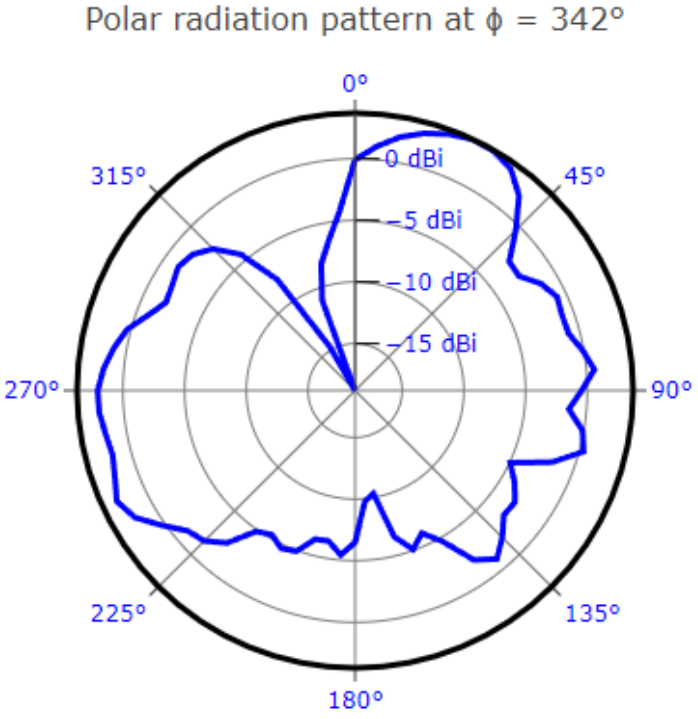
3D Radiation pattern



Rotating 3D-view: **Antenna pattern 5 GHz-Vertical.html**

2D Polar plot at maximum radiation





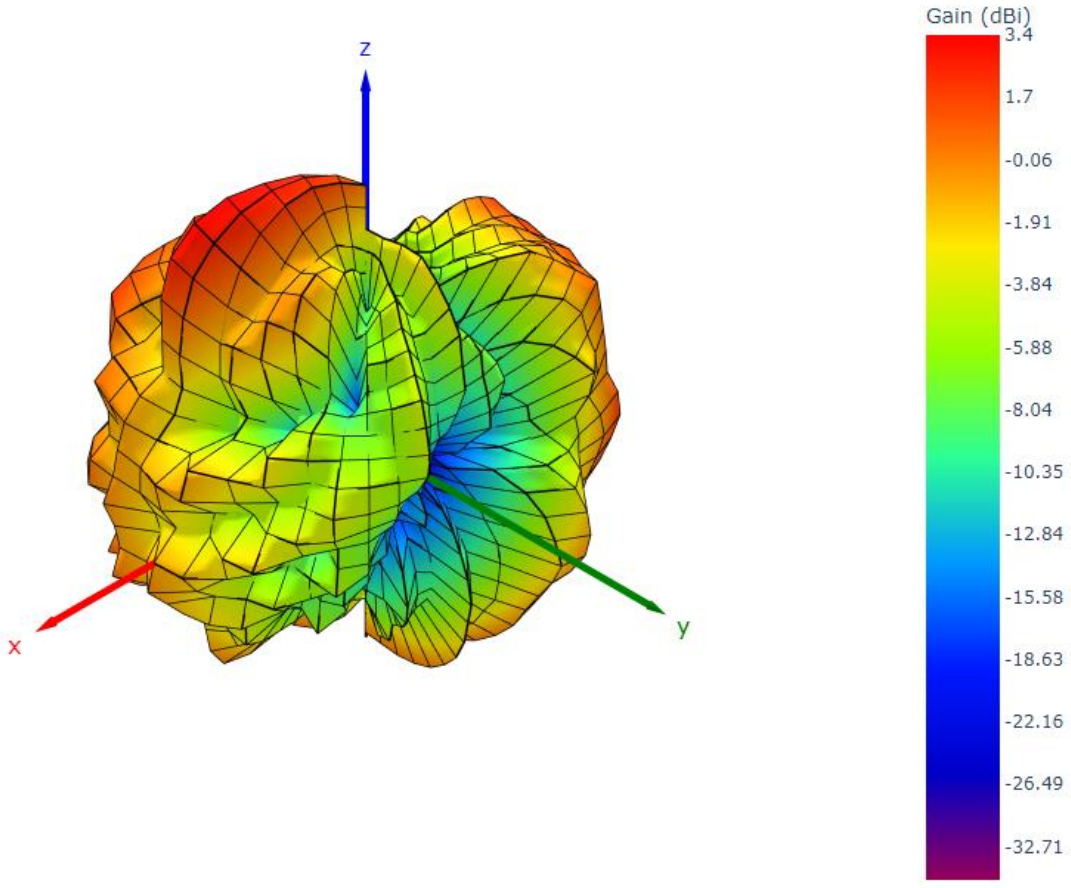
Antenna Pattern (Horizontal Polarization)

Project Number:	G0M-2309-2217
Product:	Wi-Fi 6 Dual Band 2.4 GHz/5 GHz, Bluetooth® and 802.15.4 Module
Model:	ENWF9511C1KF
EUT Antenna:	External
Operating Conditions:	Tnom / Vnom
Operating Frequency:	5600 MHz
Detector:	RMS
RBW:	1 MHz
VBW:	10 MHz
Sweep Time:	20 ms
Conducted Power:	12.07 dBm
Operator:	Mr. Siddique
Date:	2024-07-30

Result Summary

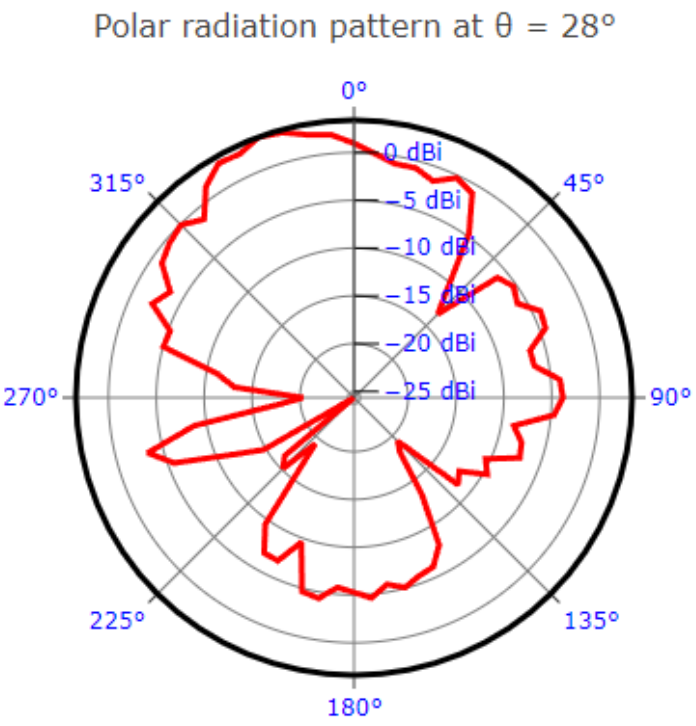
Turn table Angle [°]	Max. rad. power [dBm e.i.r.p.]	Max. antenna gain [dBi]
344	15.782	3.712

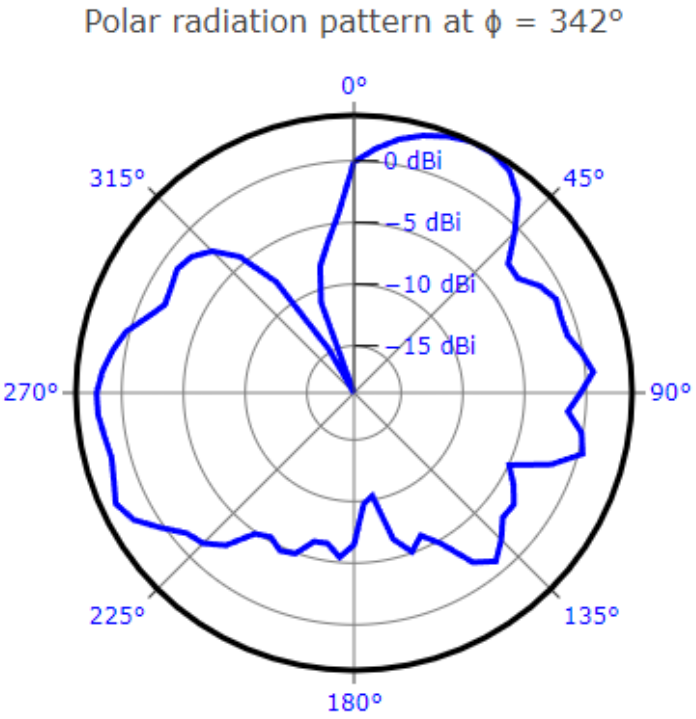
3D Radiation pattern



Rotating 3D-view: **Antenna pattern 5 GHz-Horizontal.html**

2D Polar plot at maximum radiation





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