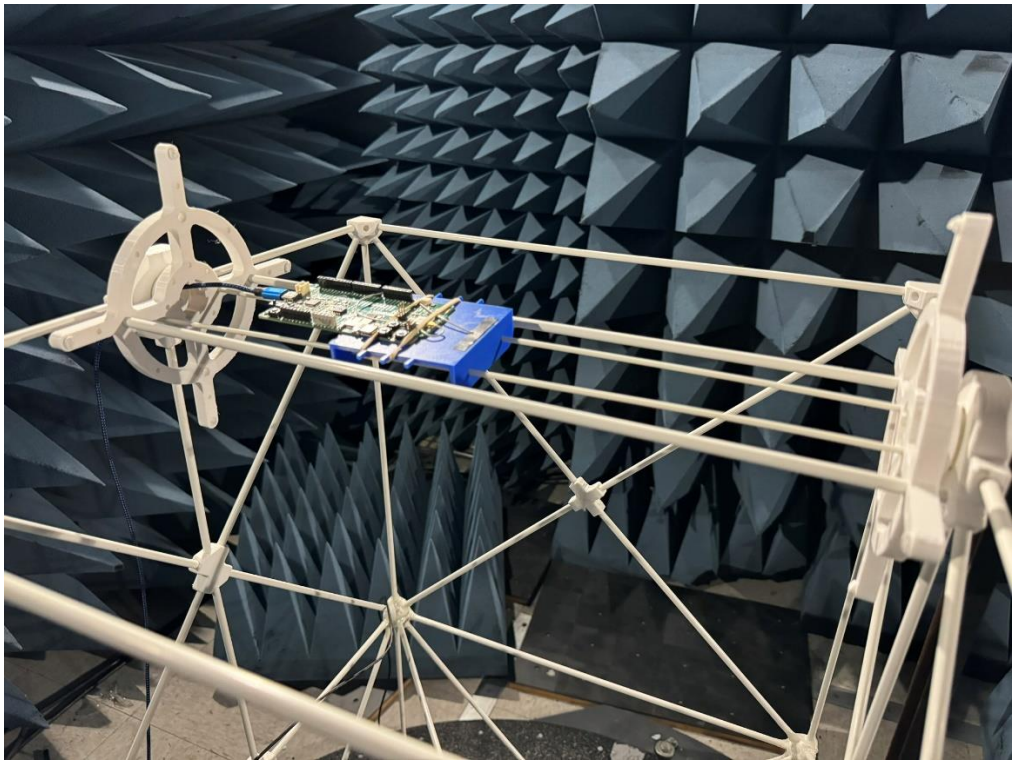
NORA-W3 with Abracon AFG4507W2S-0200S antenna

Lab measurements

Technical report



UBXDOC-1023859458-38546
C1-Public

Document information

Title	**NORA-W3 with Abracon AFG4507W2S-0200S antenna**	
Subtitle	Lab measurements	
Document type	Technical report	
Document number	UBXDOC-1023859458-38546	
Revision and date	R01	12-Mar-2024
Disclosure restriction	C1-Public	

This document applies to the following products:

Product name	Type number
NORA-W300	NORA-W300-00B
NORA-W301	NORA-W301-00B
NORA-W360	NORA-W360-01B
NORA-W361	NORA-W361-01B

Contents

1 Functional description

1.1 Overview

Certain models of the NORA-W3 series utilize an external antenna. This report provides test results for use of the Abracon AFG4507W2S-0200S patch antenna for the 2.4 GHz and 5 GHz ISM bands for Bluetooth LE and Wi-Fi operation. The antenna is provided from the factory with a soldered 200 mm coaxial jumper and a U.FL connector, which connects directly to the module.

1.2 AFG4507W2S-0200S antenna

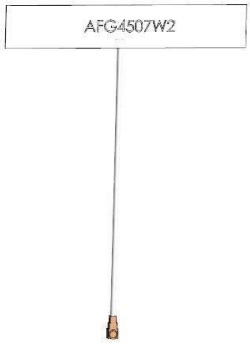


Figure 1: Abracon AFG4507W2S-0200S patch antenna

1.3 Antenna specifications

Nominal impedance	**50 Ω**

Table 1 shows the antenna specifications.

Feature	Details
Manufacturer	Abracon
Manufacturer P/N	AFG4507W2S-0200S
Type	Patch
Antenna element dimensions	45.0 mm x 7.8 mm x 2.5 mm
Frequencies	2400 MHz to 2483.5 MHz, 5100 MHz to 5850 MHz
Nominal impedance	50 Ω

Table 1: Antenna specifications

2 Measurements

The NORA-W300 module is used for measurements. It is soldered to its evaluation board.

The antenna with U.FL coaxial jumper, and evaluation board are mounted onto a plastic bracket, oriented with the antenna on the X-Z plane and the longest side along the X-axis. The assembly is then mounted into a positioning apparatus inside the anechoic chamber. Figure 2 shows the antenna orientation in X-Y-Z cartesian coordinate system. In the anechoic chamber, the initial DUT orientation is such that the Z-axis initially points toward the receive antenna at the far end of the chamber.

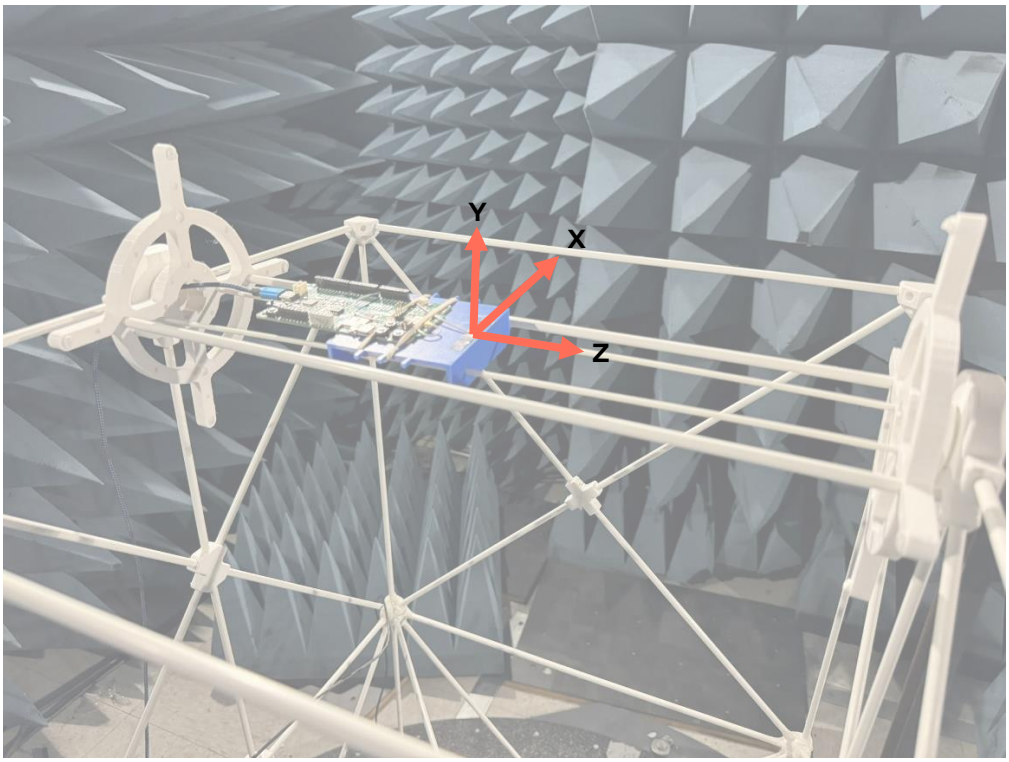


Figure 2: AFG4507W2S-0200S connected to NORA-W3, mounted in chamber

Radiation patterns are measured in a far-field anechoic chamber with a measurement distance of 3 m. The device under test (DUT) is positioned using a 2-axis positioning apparatus, allowing rotation along azimuth (phi φ) and elevation (theta θ). The intensity of the received (*r*) signal is plotted as the distance from the origin at the azimuth and elevation angles. Measurements are taken at 15° angular increments for azimuth and elevation. Horizontal and vertical polarizations are measured.

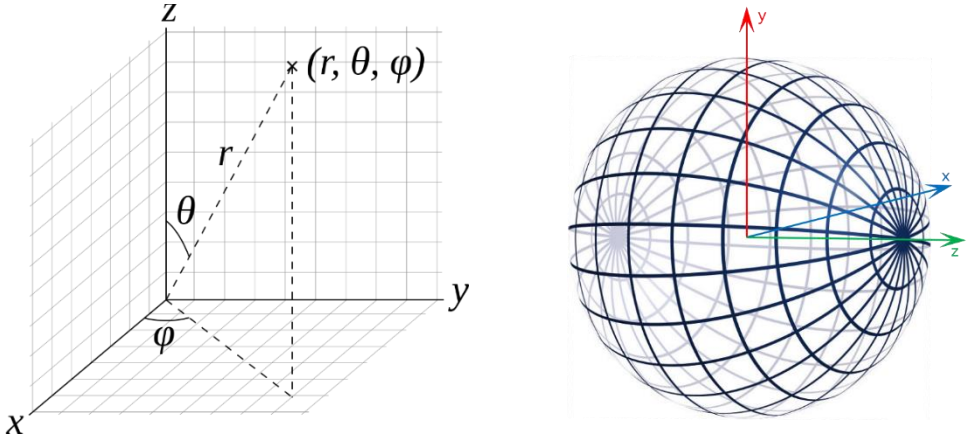


Figure 3: Spherical coordinate system and rotated sphere showing test point orientation

3 Antenna performance

3.1 Maximum gain

Table 2 shows the measured performance. Maximum gain is 3.5 dBi for the 2.4 GHz band and 5.3 dBi for the 5 GHz band.

Frequency	Maximum gain (dBi)	Efficiency (%)	Orientation at maximum gain
2412	**3.5**	98.2	270° azimuth, 60° elevation
2442	2.0	67.7	270° azimuth, 60° elevation
2472	2.2	70.8	90° azimuth, 60° elevation
5180	2.5	64.0	255° azimuth, 135° elevation
5260	3.7	77.4	0° azimuth, 165° elevation
5540	**5.3**	77.7	180° azimuth, 180° elevation
5865	0.5	45.1	240° azimuth, 45° elevation

Table 2: Antenna performance

3.2 Radiation patterns

Figure 4 shows the 2.4 GHz, 2D, X-Y plane antenna gain plot as a function of direction.

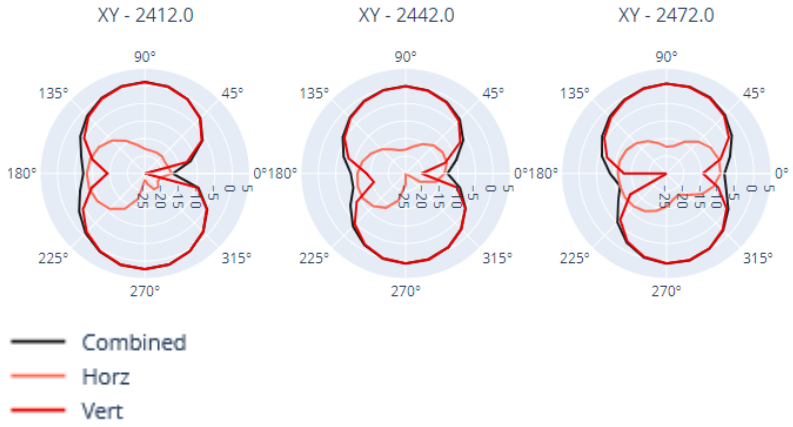


Figure 4: AFG4507W2S-0200S antenna – 2.4 GHz, 2D X-Y plane radiation pattern

Figure 5 shows the 5 GHz, 2D, X-Y plane antenna gain plot as a function of direction.

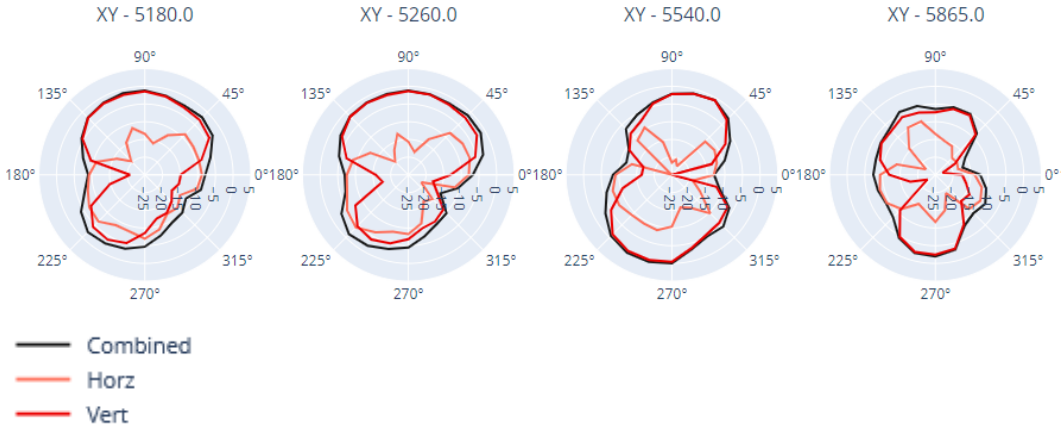


Figure 5: AFG4507W2S-0200S antenna – 5 GHz, 2D X-Y plane radiation pattern

Figure 6 shows the 2.4 GHz, 2D, X-Z plane antenna gain plot as a function of direction.

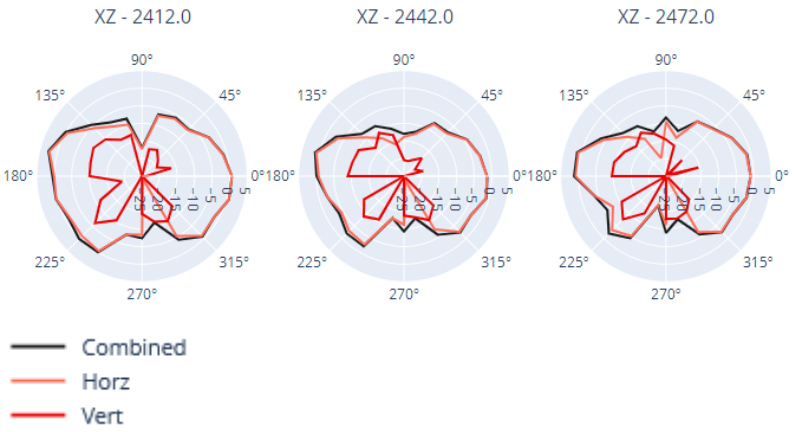


Figure 6: AFG4507W2S-0200S antenna – 2.4 GHz, 2D X-Z plane radiation pattern

Figure 7 shows the 5 GHz, 2D, X-Z plane antenna gain plot as a function of direction.

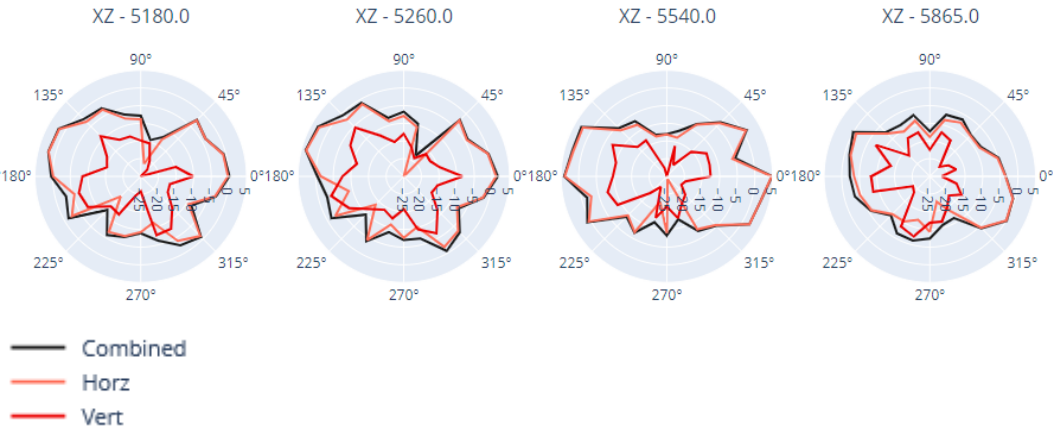


Figure 7: AFG4507W2S-0200S antenna – 5 GHz, 2D X-Z plane radiation pattern

Figure 8 shows the 2.4 GHz, 2D, Y-Z plane antenna gain plot as a function of direction.

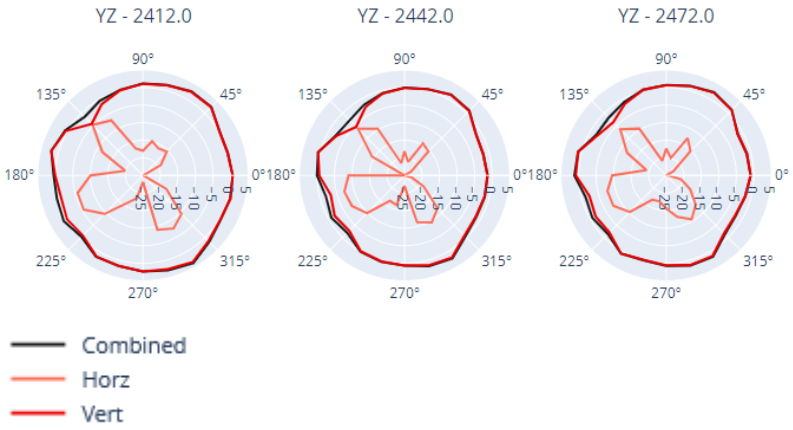


Figure 8: AFG4507W2S-0200S antenna –2.4 GHz, 2D Y-Z plane radiation pattern

Figure 9 shows the 5 GHz, 2D, Y-Z plane antenna gain plot as a function of direction.

Figure 9: AFG4507W2S-0200S antenna – 5 GHz, 2D Y-Z plane radiation pattern

4 Test equipment and dates

Equipment name	Model number	Manufacturer	Serial Number	Date of last calibration
RF chamber	Space Saver PC	ETS Lindgren	AP563	N/A
Spectrum analyzer	N9000B	Keysight	MY60251554	26-May-2022
300 MHz to 6 GHz Quad-ridged Horn Antenna	3164-06	ETS Lindgren	00092216	N/A

Table 3: Test equipment

Test date
18-Jul-2023

Table 4: Test date

Related documentation

[1] NORA-W30 series data sheet, UBX-22021117
[2] NORA-W36 series data sheet, UBX-22021118
[3] NORA-W30 series system integration manual, UBX-22021119
[4] NORA-W36 series system integration manual, UBX-22021120
[5] Abracon AFG4507W2S-0200S data sheet

☞ For product change notifications and regular updates of u-blox documentation, register on our website, www.u-blox.com.

Revision history

Revision	Date	Author	Description
R01	12-Mar-2024	brec	Initial release

Contact

For further support and contact information, visit us at www.u-blox.com/support.