

NORA-W3 with Abracon AFG4507W2S-0200S antenna

Lab measurements

Technical report



Document information

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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

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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

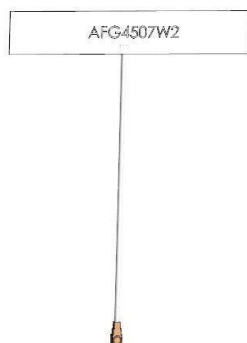


Figure 1: Abracon AFG4507W2S-0200S patch antenna

1.3 Antenna specifications

Nominal impedance	50 Ω
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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.

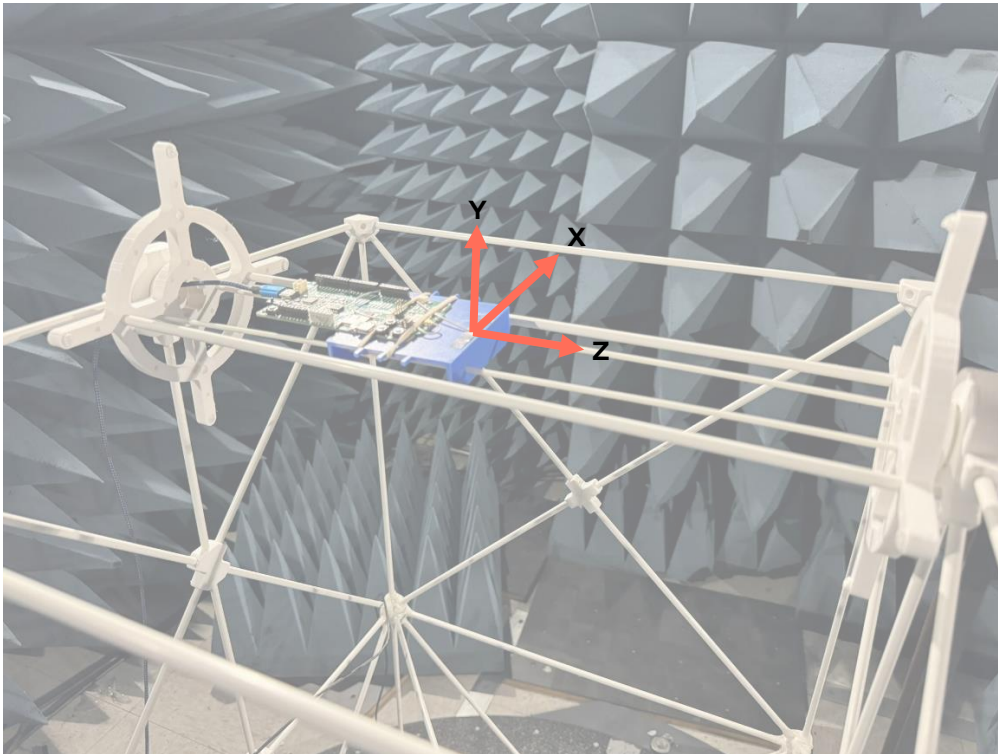


Figure 2: AFG4507W2S-0200S connected to NORA-W3, mounted in chamber

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.

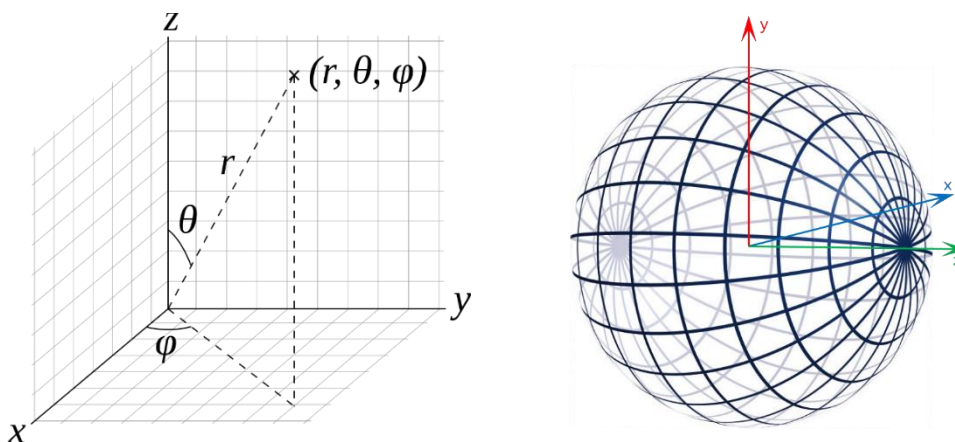


Figure 3: Spherical coordinate system and rotated sphere showing test point orientation

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.

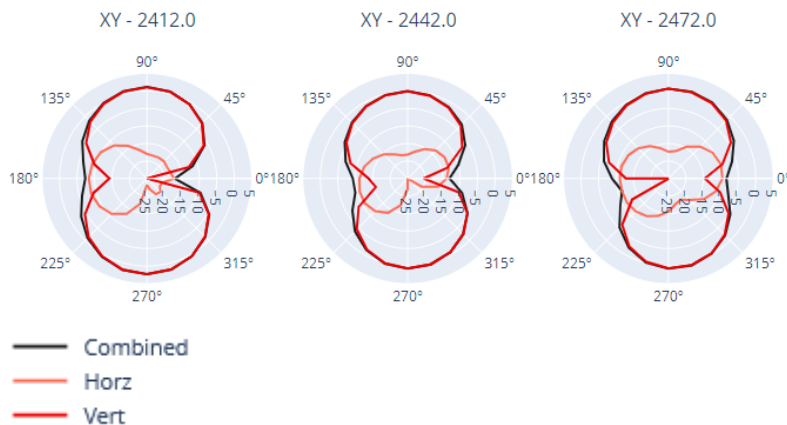


Figure 4: AFG4507W2S-0200S antenna – 2.4 GHz, 2D X-Y plane radiation pattern

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.

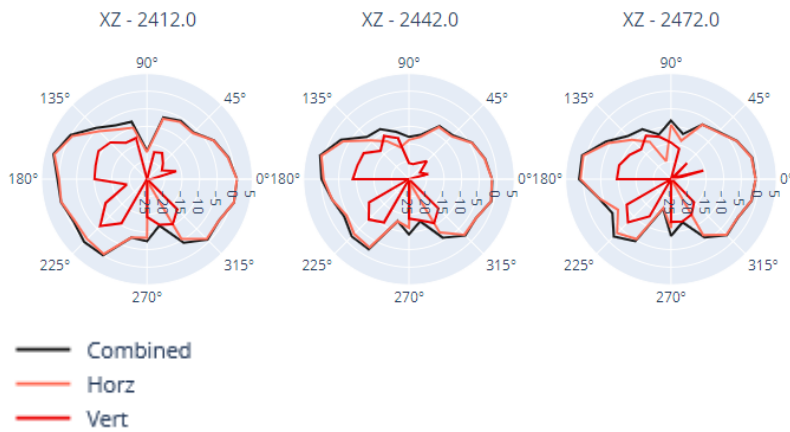


Figure 6: AFG4507W2S-0200S antenna – 2.4 GHz, 2D X-Z plane radiation pattern

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

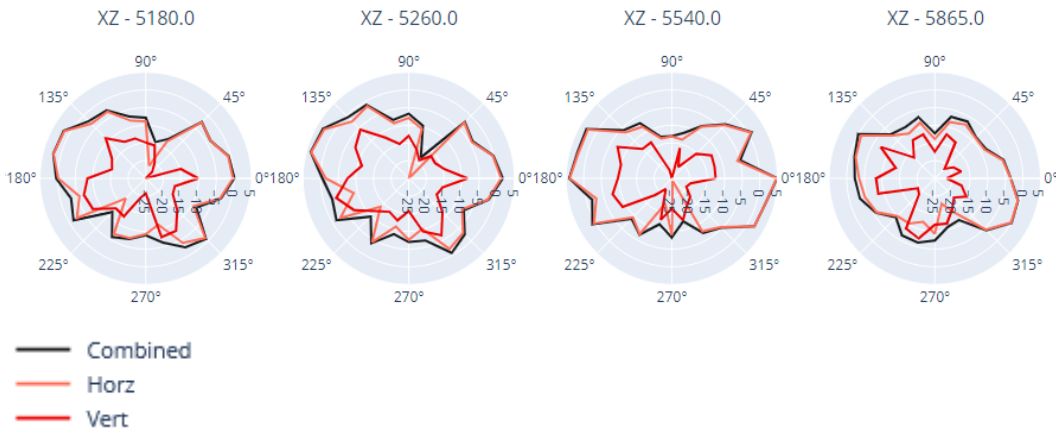


Figure 7: AFG4507W2S-0200S antenna – 5 GHz, 2D X-Z plane radiation pattern

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

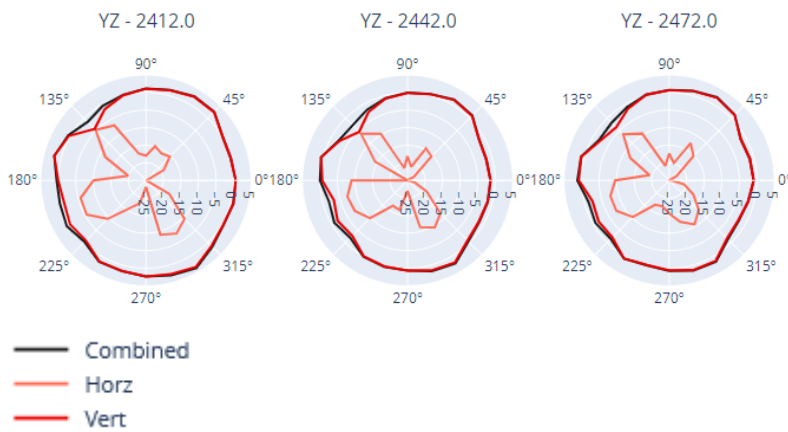


Figure 8: AFG4507W2S-0200S antenna –2.4 GHz, 2D Y-Z plane radiation pattern

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

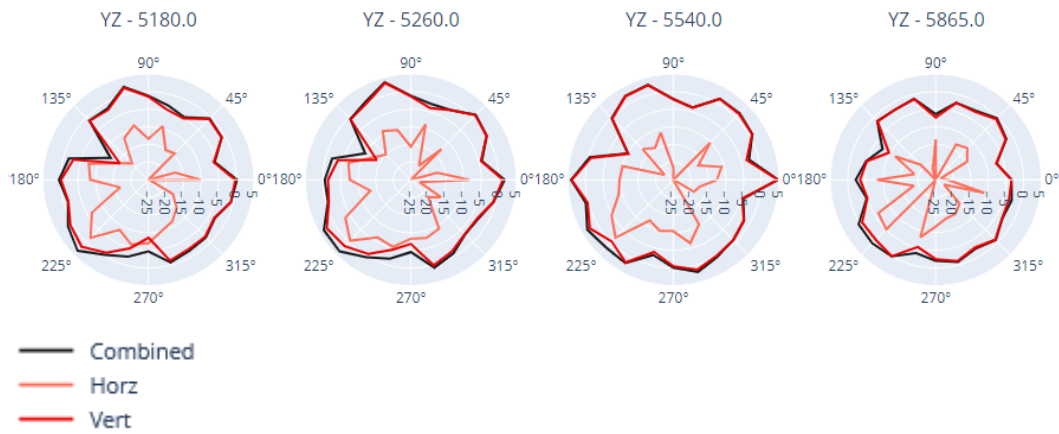


Figure 9: AFG4507W2S-0200S antenna – 5 GHz, 2D Y-Z plane radiation pattern

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](#)

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Revision history

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

Contact

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