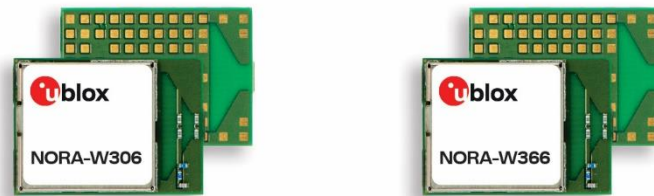


NORA-W3x6 PCB trace antenna

Lab measurements

Technical report



Document information

Title	NORA-W3x6 PCB trace antenna	
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This document applies to the following products:

Product name	Type number
NORA-W306	NORA-W306-00B
NORA-W366	NORA-W366-01B

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Contents

Document information	2
Contents	3
1 Functional description	4
1.1 Overview	4
1.2 Antenna layout	4
1.3 Antenna specifications	4
2 Measurements	5
3 Antenna performance	6
3.1 Maximum gain	6
3.2 Radiation patterns	6
4 Test equipment and dates	9
Related documentation	10
Revision history	10
Contact	10

1 Functional description

1.1 Overview

NORA-W306 and NORA-W366 incorporate a dual-band PCB trace antenna for the 2.4 GHz and 5 GHz ISM bands for Bluetooth LE and Wi-Fi operation. The antenna technology is licensed from Abracon and integrated into the module PCB.

1.2 Antenna layout

The trace antenna is incorporated onto the top side of the module, as shown in [Figure 1](#). NORA-W306 and NORA-W366 are identical, with the exception of the label contents and loaded firmware.

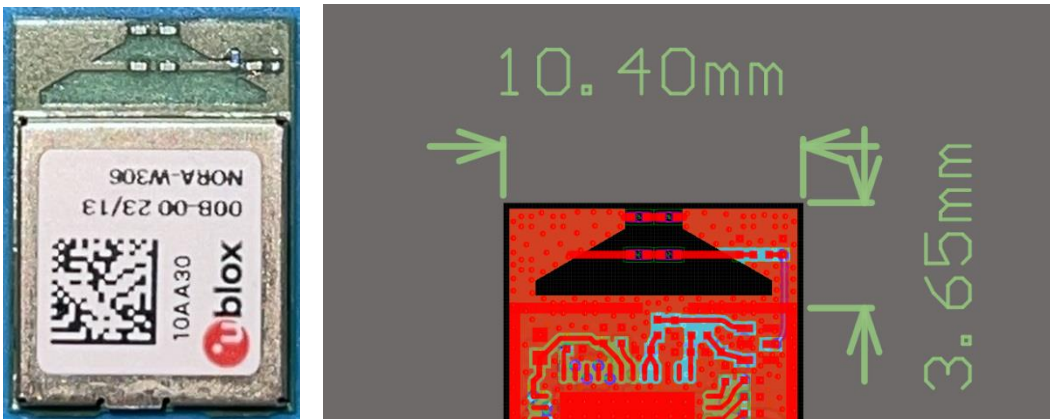


Figure 1: NORA-W3x6 antenna layout

1.3 Antenna specifications

[Table 1](#) shows the antenna specifications.

Feature	Details
Manufacturer	u-blox, licensed from Abracon
Module models	NORA-W306, NORA-W366
Type	PCB trace antenna
Antenna element dimensions	10.40 mm x 3.65 mm x 0.5 mm
Frequencies	2400 MHz to 2483.5 MHz, 5100 MHz to 5850 MHz
Nominal impedance	50 Ω

Table 1: NORA-W3x6 PCB trace antenna specifications

2 Measurements

The NORA-W306 module is used for measurements. It is soldered to its evaluation board.

As the antenna is integrated into the module PCB, the antenna performance is verified with the specific module into which the PCB trace antenna is integrated, with the module mounted on its evaluation board. The evaluation board 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.

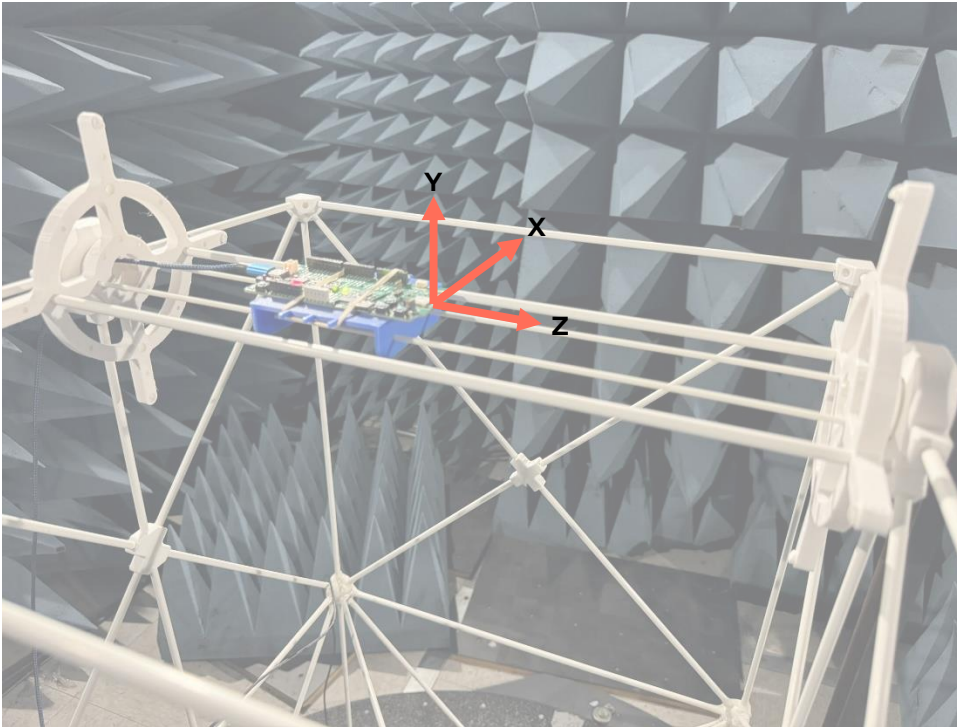


Figure 2: NORA-W3x6 patch antenna on EVK mounted in test chamber

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 (ϕ) and elevation (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.

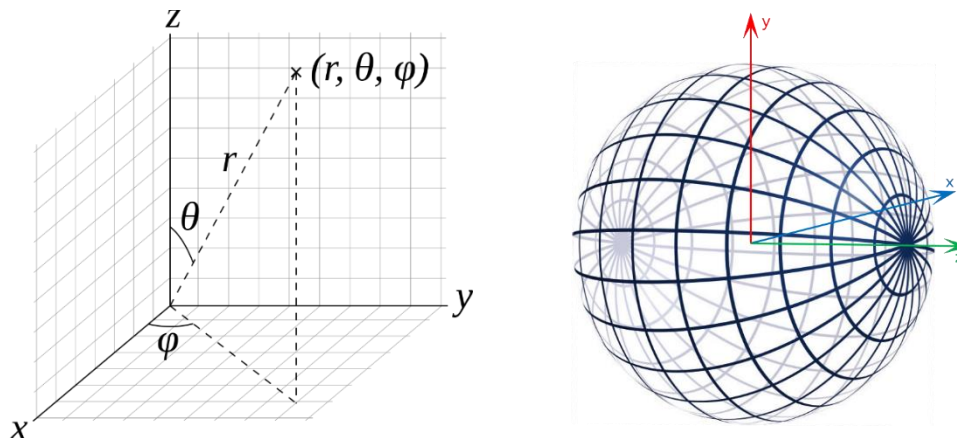


Figure 3: Spherical coordinate system and rotated sphere showing test point orientation

3 Antenna performance

3.1 Maximum gain

Table 2 shows the measured performance. Maximum gain is 0.5 dBi for the 2.4 GHz band and 2.4 dBi for the 5 GHz band.

Frequency	Maximum gain (dBi)	Efficiency (%)	Orientation at maximum gain
2412	0.5	67.6	180° azimuth, 180° elevation
2442	-0.1	56.7	270° azimuth, 45° elevation
2472	-0.7	48.3	0° azimuth, 180° elevation
5180	-1.5	20.9	255° azimuth, 0° elevation
5260	-2.7	20.8	180° azimuth, 180° elevation
5540	2.4	51.1	180° azimuth, 180° elevation
5825	-1.8	25.9	180° azimuth, 45° elevation

Table 2: Maximum antenna gain per band

3.2 Radiation patterns

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

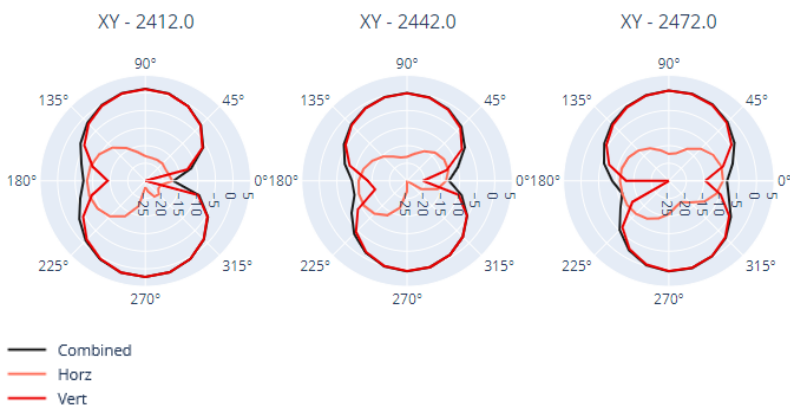


Figure 4: NORA-W3x6 antenna – 2.4 GHz, 2D X-Y plane radiation pattern

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



Figure 5: NORA-W3x6 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.

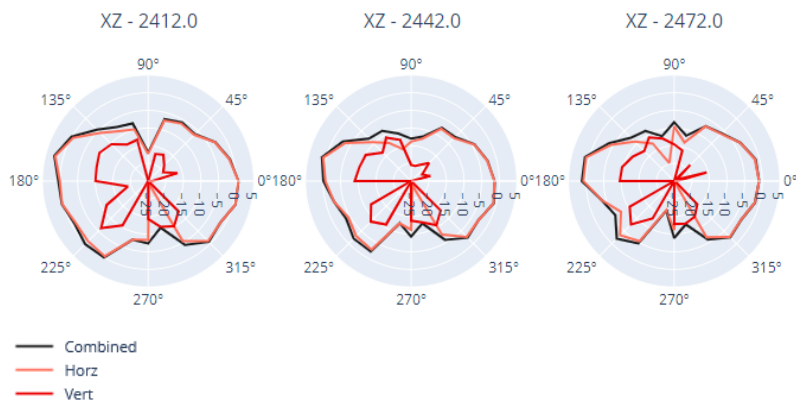


Figure 6: NORA-W3x6 antenna – 2.4 GHz, 2D X-Z plane radiation pattern

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

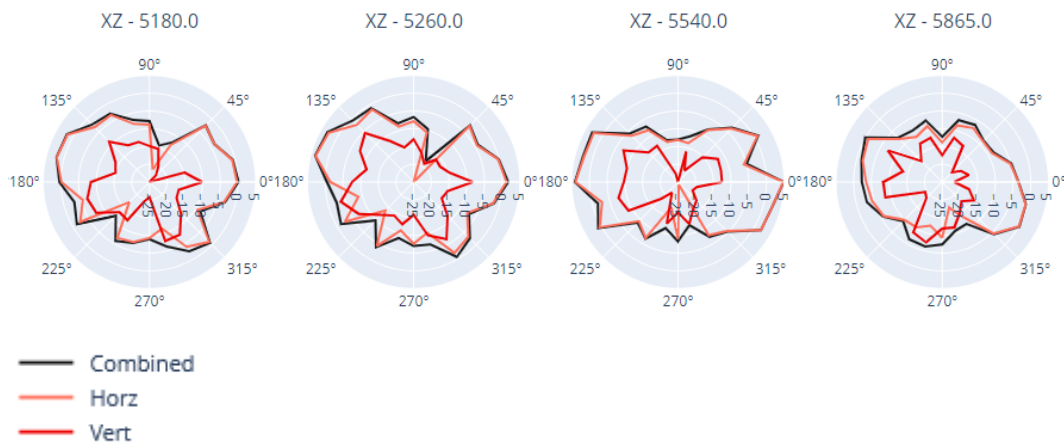


Figure 7: NORA-W3x6 antenna – 5 GHz, 2D X-Z plane radiation pattern

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

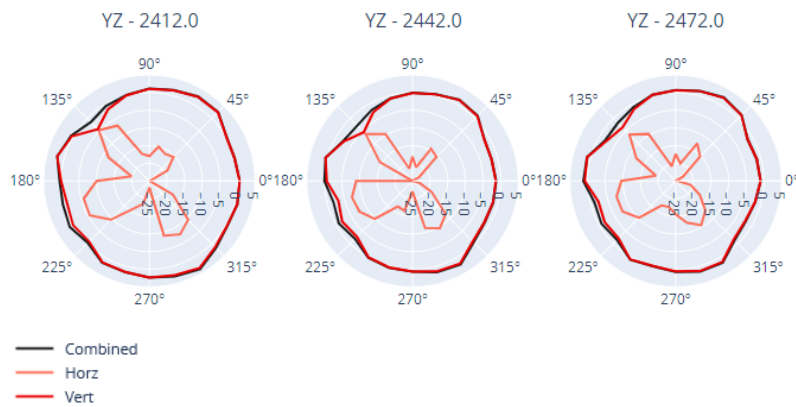


Figure 8: NORA-W3x6 antenna –2.4 GHz, 2D Y-Z plane radiation pattern

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

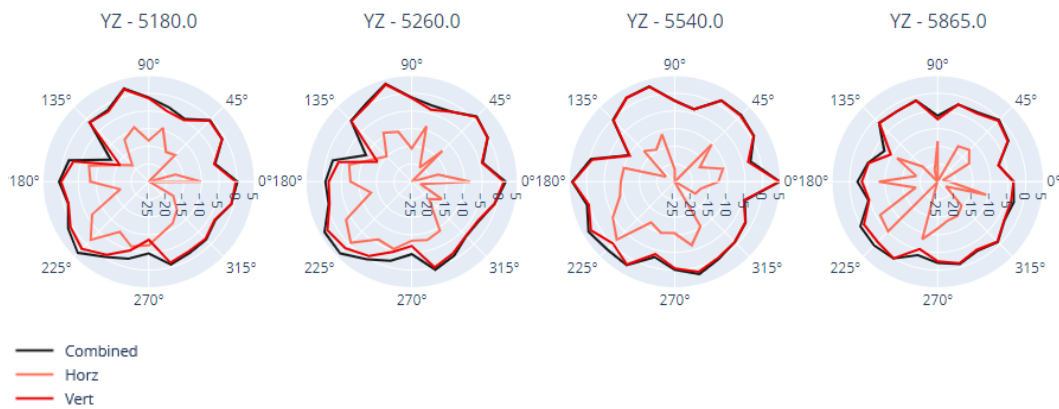


Figure 9: NORA-W3x6 antenna – 5 GHz, 2D Y-Z plane radiation pattern

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
12-Oct-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](#)

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Revision history

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

Contact

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