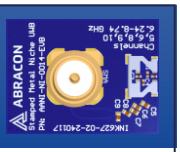
# Stamped Metal Niche UWB – Evaluation Kit



**AANI-NI-0014-EVB**

Request Samples | Check Inventory

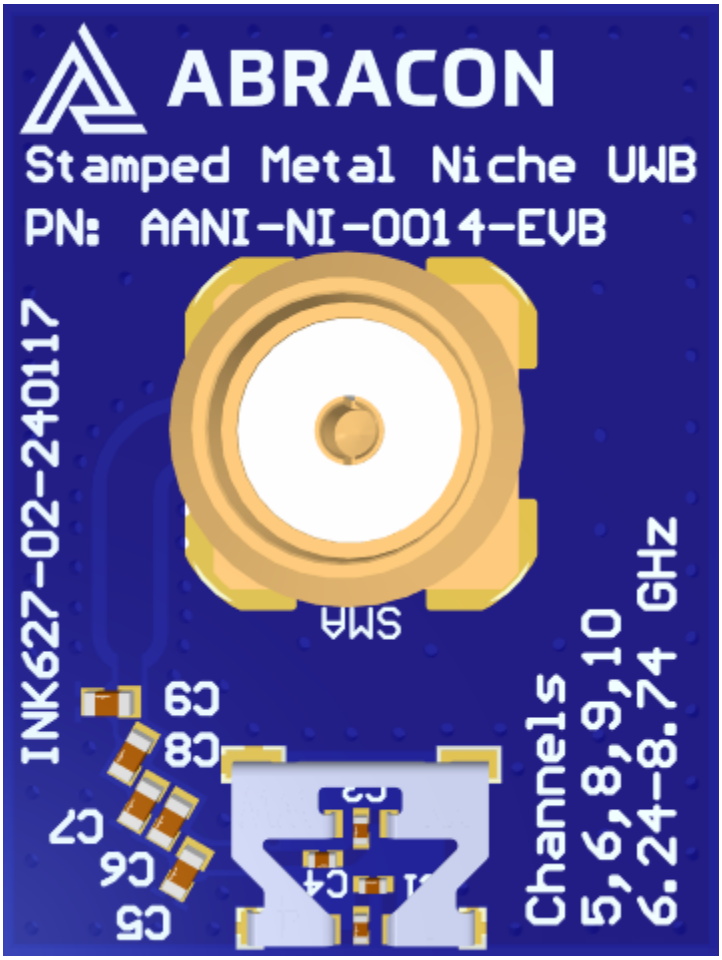
**20.5 x 15.5 x 10.3 mm**
**RoHS/RoHS II Compliant**
**MSL Level = 1**

## Description

The AANI-NI-0014-EVB evaluation kit is designed to provide a means to facilitate engineering evaluation of the “Stamped Metal Niche UWB” antenna: AANI-NI-0014

The kit includes an evaluation board with SMA connector + three additional antennas for further testing.

## Product Image

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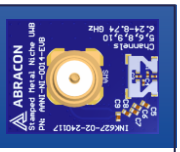

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**20.5 x 15.5 x 10.3 mm**
**RoHS/RoHS II Compliant**
**MSL Level = 1**

## Electrical Specification

| Parameter | Specification | | | | | Unit |
|---|---|---|---|---|---|---|
| UWB Channel | 5 | 6 | 8 | 9 | 10 | - |
| Operating Frequency | 6240 - 6739 | 6739 - 7238 | 7238 – 7738 | 7738 - 8237 | 8237 - 8736 | MHz |
| Return Loss | < -8.9 | < -7.5 | < -7.4 | < -7.7 | < - 9.1 | dB |
| VSWR | < 2.1 | < 2.5 | < 2.5 | < 2.4 | < 2.1 | :1 |
| Polarization | Linear | | | | | - |
| Peak Gain | 2.2 | 2.7 | 1.7 | 2.9 | 2.1* | dBi |
| Minimum Total Efficiency | -2.3 (59) | -2.5 (56) | -2.8 (53) | -3.2 (48) | -3.4 (46)* | dB (%) |
| Average Total Efficiency | -2.0 (64) | -2.0 (62) | -2.2 (60) | -2.8 (52) | -2.9 (51)* | dB (%) |
| Maximum Total Efficiency | -1.6 (70) | -1.4 (72) | -1.5 (72) | -2.4 (57) | -2.4 (57)* | dB (%) |
| Impedance | 50 | | | | | Ω |

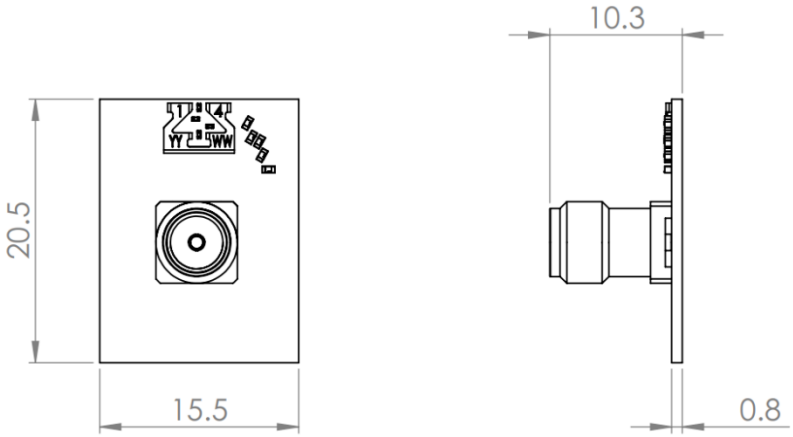
*Note: All measurements were conducted on the evaluation board in free space. Performance will vary depending on the ground plane, application, and environment.*

**Channel 10 radiation measurements (efficiency/gain) are limited to a maximum measured frequency of 8500 MHz.*

## Mechanical Specification

| Parameter | Specification |
|---|---|
| Evaluation Board Dimensions | 20.5 x 15.5 x 10.3 mm |
| Evaluation Board Ground Plane Dimensions | 20 x 15 mm |

## Product Dimensions




*Unit: mm*

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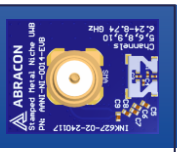

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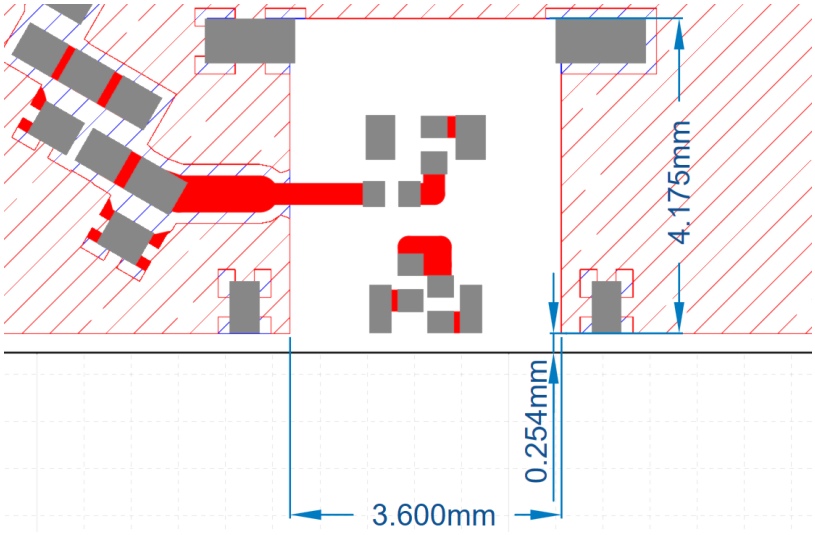
**20.5 x 15.5 x 10.3 mm**
**RoHS/RoHS II Compliant**
**MSL Level = 1**

## Antenna Footprint

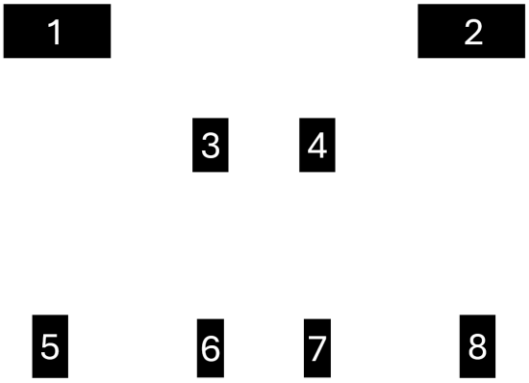
The dimensions of the copper cutout and solder pad positions are shown in the image below. The antenna and the footprint are symmetrical. This means that the antenna can be fed from either side (from the left in the example).

For a detailed antenna footprint example: https://abracon.com/Support/Footprint/AANI-NI-0014-EVB-Footprint.zip




## Antenna Pin Numbering

The antenna should be mounted on a ground (GND) plane, keeping the correct clearance area(s). If there are several layers in the PCB, there is an advantage to add vias for smooth interconnection of the ground areas to avoid splits in the ground plane. It is also important that there is ground clearance around the non-connected (NC) pads, through all layers of the PCB. Thanks to symmetry, the antenna can be fed on either pad 3 or 4. Pads 6 and 7 are connected via top load capacitors. Thermal relief connections can be utilized on the GND pads.




| Pin | Feeding from the Left | Feeding from the Right |
|---|---|---|
| 1 | **GND** | **NC** |
| 2 | **NC** | **GND** |
| 3 | **NC** | **RF-feed** |
| 4 | **RF-feed** | **NC** |
| 5 | GND | GND |
| 6 | Top Load | Top Load |
| 7 | Top Load | Top Load |
| 8 | GND | GND |

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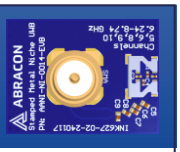

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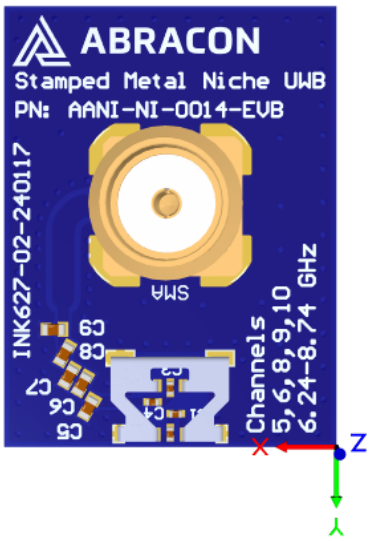
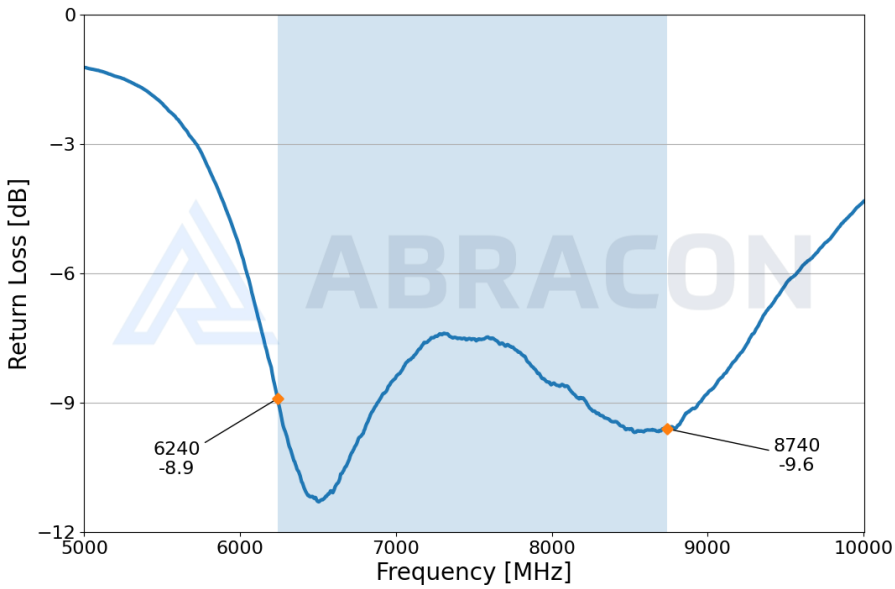
## Measurement Setup

The antenna measurements were all done in free space, with the Stamped Metal Niche UWB antenna implemented on its evaluation board that has a PCB ground plane size of 15 by 20 (X by Y) mm.




## Reflection Characteristics – Return Loss





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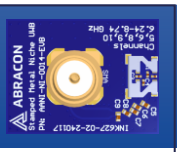

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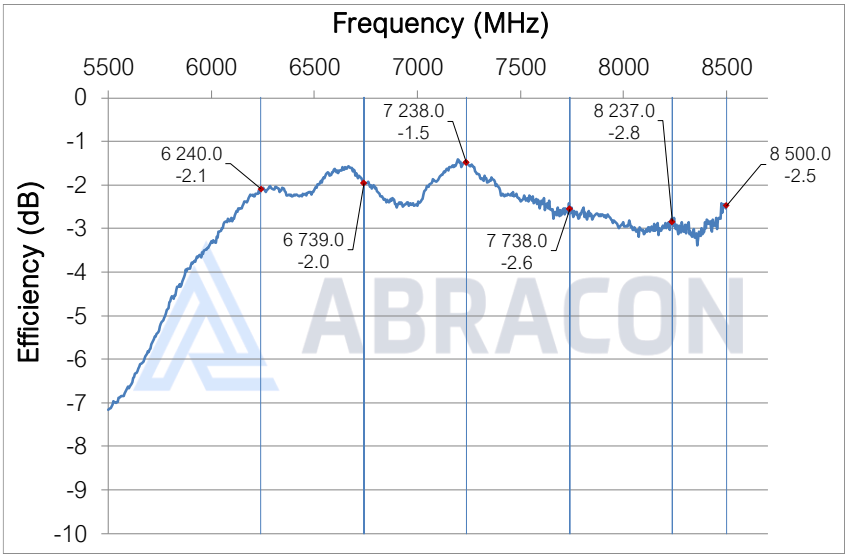
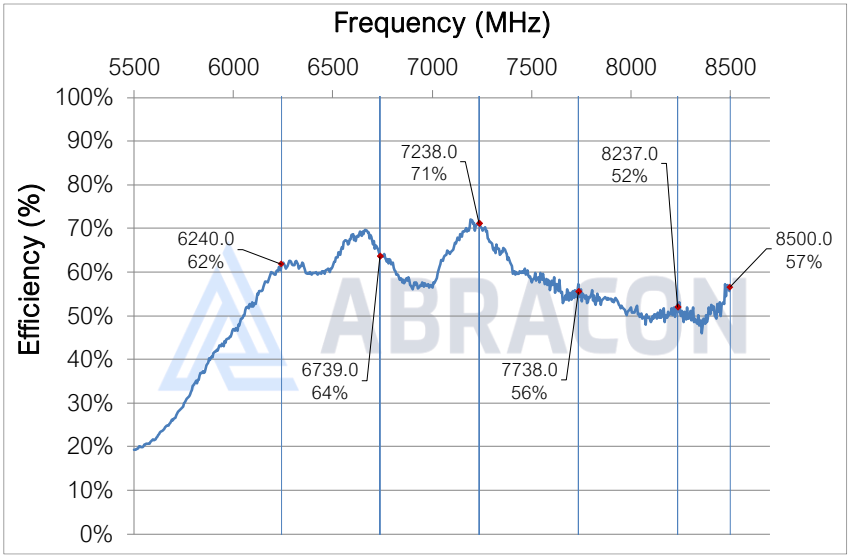
**RoHS/RoHS II Compliant**
**MSL Level = 1**

## Radiation Characteristics – Total Efficiency (dB)




## Radiation Characteristics – Total Efficiency (%)





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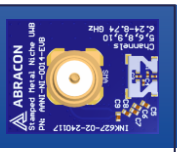

**AANI-NI-0014-EVB**

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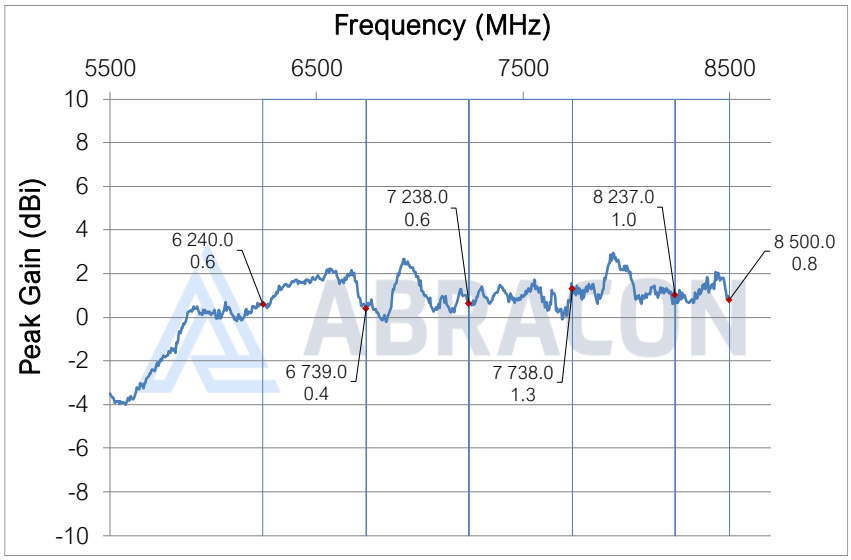
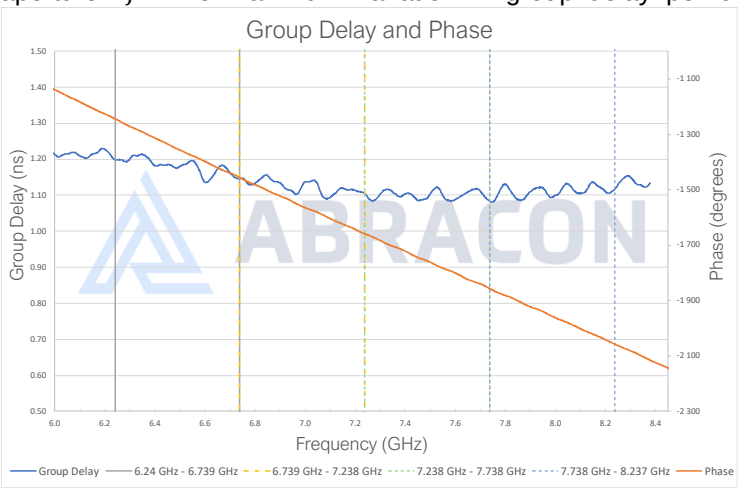
**MSL Level = 1**

## Radiation Characteristics – Maximum Gain




## Radiation Characteristics – Group Delay

Two identical antennas were placed a distance $d_{sep}$ apart in an anechoic chamber. The Group Delay, $\tau_{GD}$, is then calculated from the transmission S-parameter (S12) by $\tau_{GD} = -\frac{1}{2 \cdot 360}\frac{\Delta\phi}{\Delta f}$, where $\Delta\phi$ is the change of phase over an aperture $\Delta f$. The maximum variation in group delay per channel, $\Delta_{\max}\tau_{GD}$, can be found in the table below.




| Used Parameters | |
|---|---|
| Distance $d_{sep}$ (cm) | Aperture $\Delta f$ (MHz) |
| 50 | 220 |

| Maximum Group Delay Variation | | | |
|---|---|---|---|
| UWB Ch.* | Freq. Low (GHz) | Freq. High (GHz) | $\Delta_{\max}\tau_{GD}$ $(ps)$ |
| 5 | 6.240 | 6.739 | 79 |
| 6 | 6.739 | 7.238 | 66 |
| 8 | 7.238 | 7.738 | 39 |
| 9 | 7.738 | 8.237 | 57 |

**Channel 10 group delay is missing due to a limited frequency span in the used measurement equipment.*

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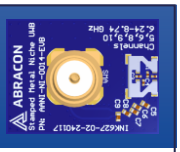

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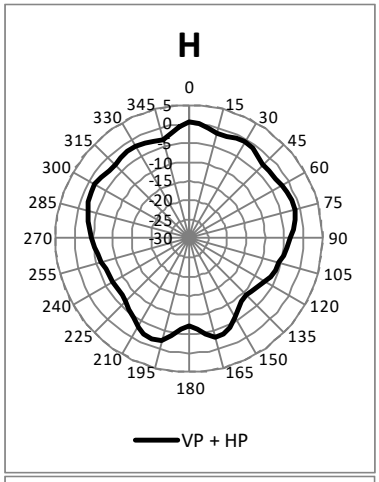
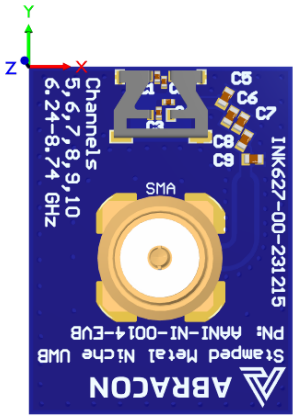
**RoHS/RoHS II Compliant**
**MSL Level = 1**

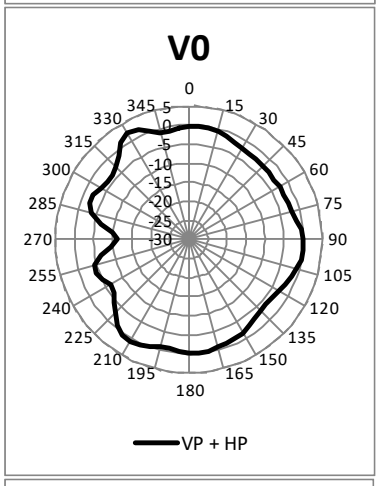
## Radiation Characteristics – 2D Pattern @ 6500 MHz

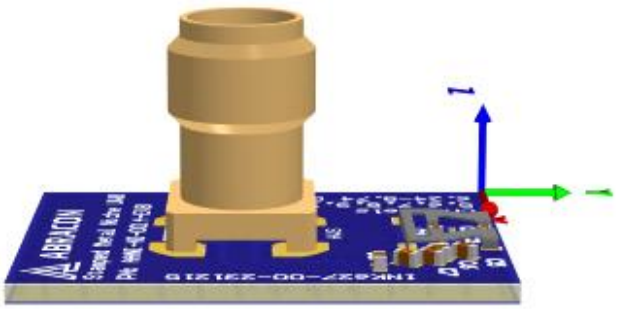
**XY-plane:**



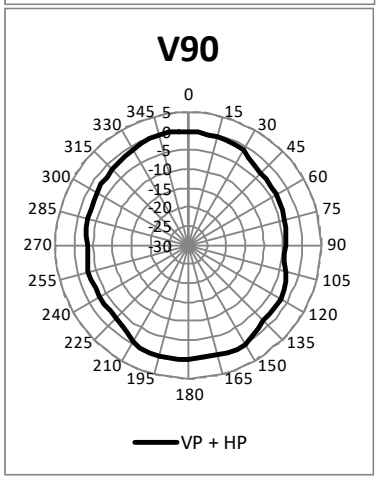



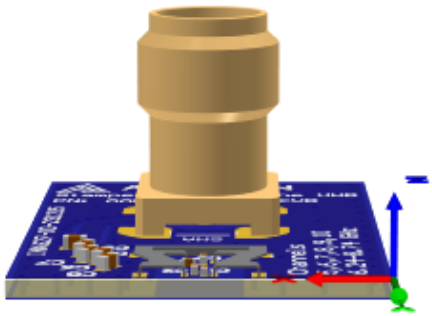

**YZ-plane:**



**XZ-plane:**



*VP: Vertical Polarization*
*HP: Horizontal Polarization*

*Unit: dBi*

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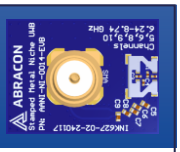

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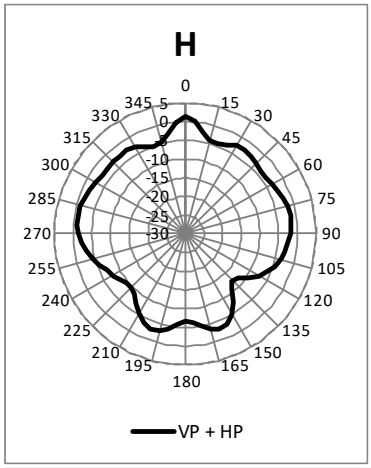
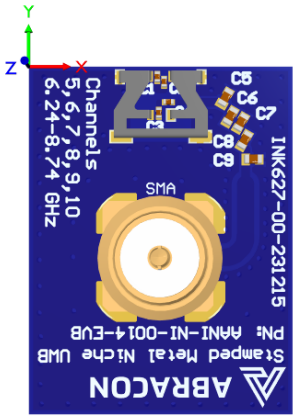
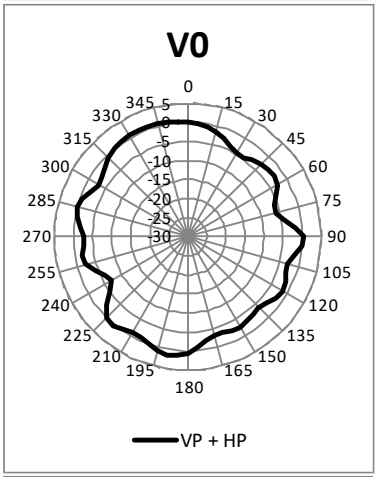
## Radiation Characteristics – 2D Pattern @ 7500 MHz

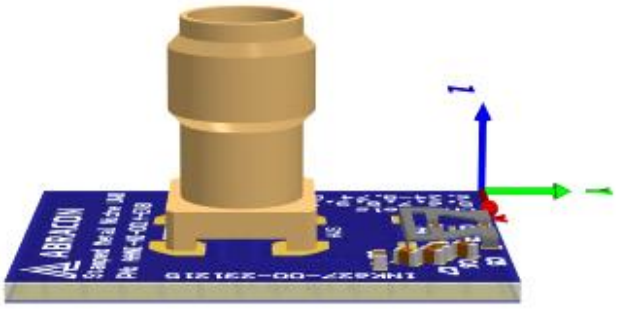
**XY-plane:**



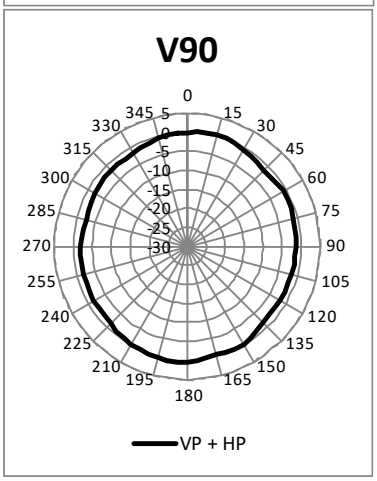



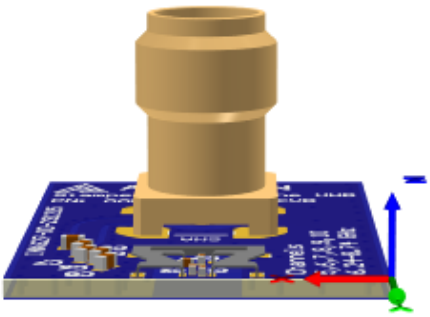

**YZ-plane:**



**XZ-plane:**



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*Unit: dBi*

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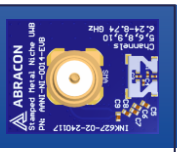

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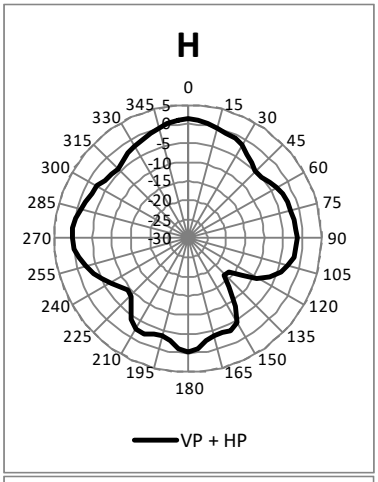
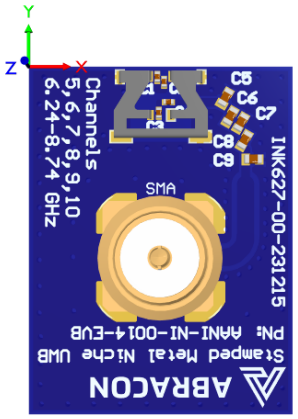
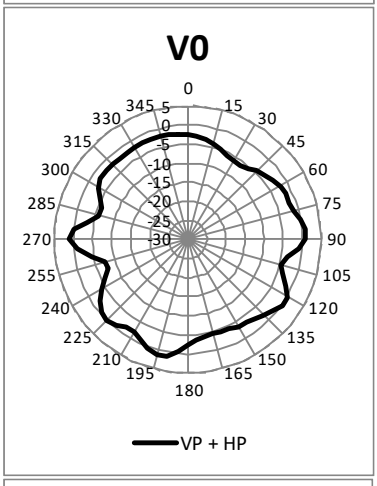
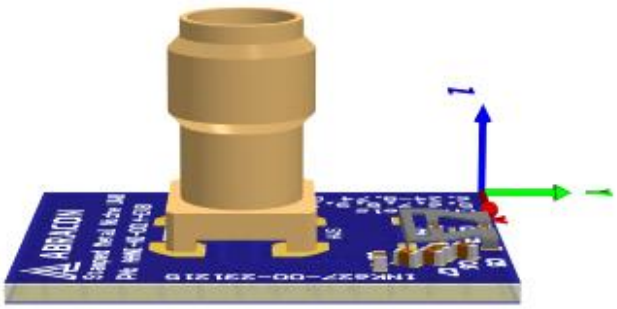


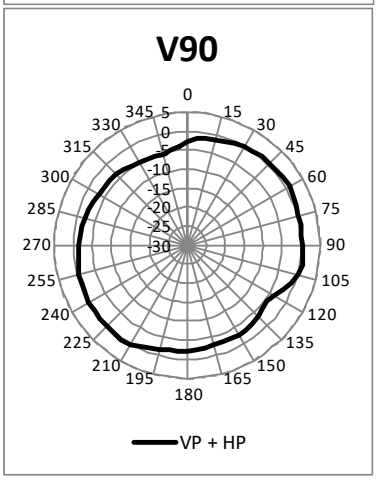



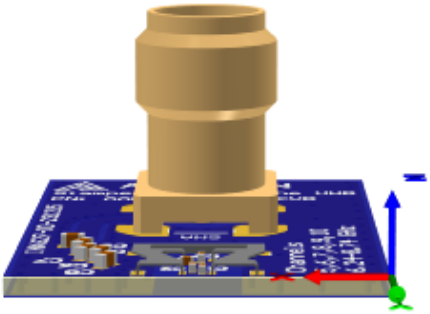

**YZ-plane:**



**XZ-plane:**



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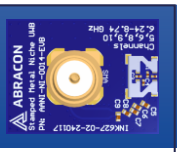

**AANI-NI-0014-EVB**

Request Samples | Check Inventory

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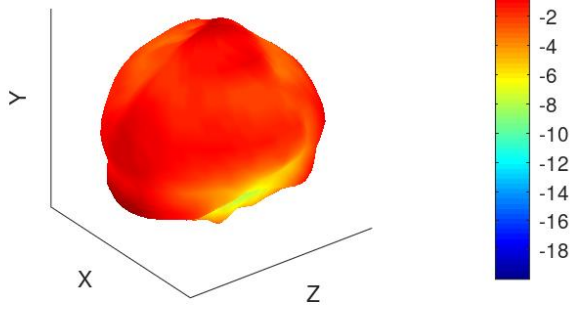
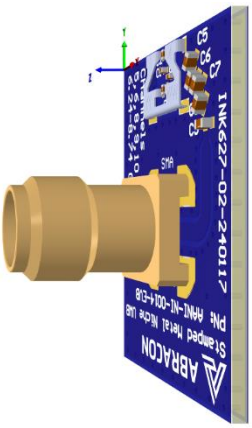
**RoHS/RoHS II Compliant**
**MSL Level = 1**

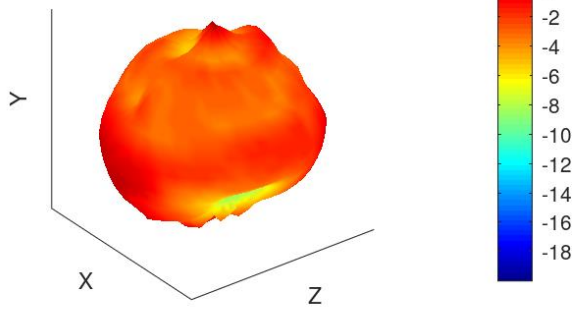
## Radiation Characteristics – 3D Pattern

**6500 MHz**



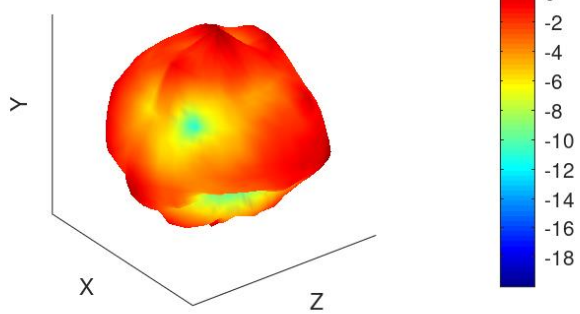



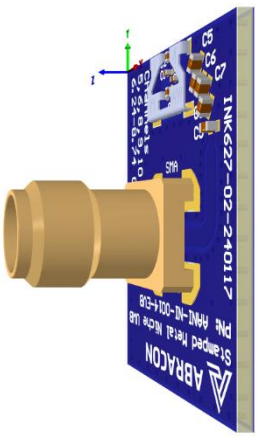

**7500 MHz**





**8500 MHz**

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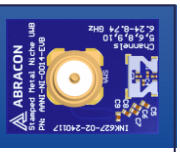
**REVISION I.R.: 09-27-24**

# Stamped Metal Niche UWB – Evaluation Kit



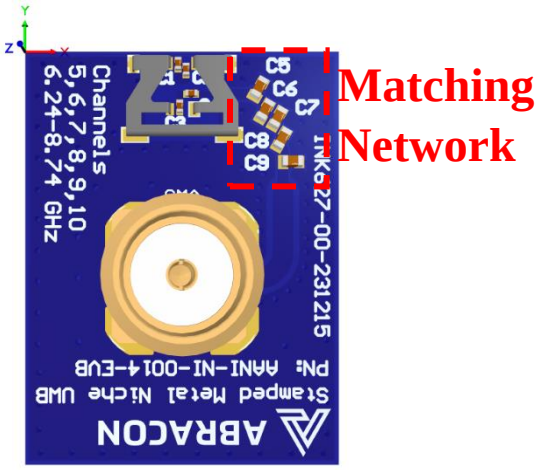
**AANI-NI-0014-EVB**

Request Samples | Check Inventory

**20.5 x 15.5 x 10.3 mm**
**RoHS/RoHS II Compliant**
**MSL Level = 1**

## Evaluation Board Outline & Matching Circuit

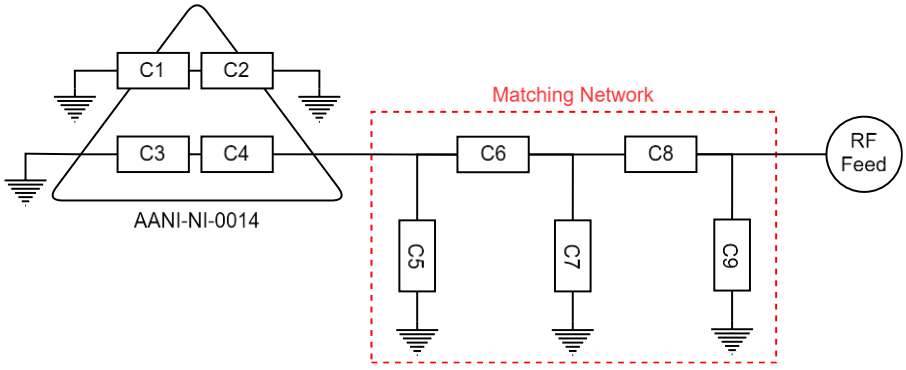
The evaluation board (Abracon P/N: AANI-NI-0014-EVB) is developed to showcase the performance of the Stamped Metal Niche UWB antenna on a typical PCB and to simplify antenna testing and evaluation. It has a ground plane size of 15 x 20 mm and includes an SMA connector. The performance will vary with different PCB sizes. Abracon can offer support to optimize the antenna for specific applications.




The evaluation board has a matching circuit implemented next to the antenna to enable optimization possibilities for the user. The C1-C4 component footprints are sized for 0201 (0603 metric) SMD components. The matching network (C5-C9) component footprints are sized for 0402 (1005 metric) SMD components.

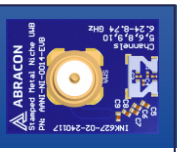
The standard tuning for the evaluation board is the following (can be replaced by equivalent):

C1, C2, C5, C7, C9 = Not Mounted
C3, C4 = 0.4 pF (Murata GJM0335C1HR40WB01)
C6, C8 = Zero Ohm (KOA Speer RK73Z1ETTP)




However, it is common that the resonant frequency will shift during implementation in an arbitrary device. Therefore, this matching may be changed with other values/components/brands for compensation of such effects. This is further described in the General Implementation Guidelines section below.

# Stamped Metal Niche UWB – Evaluation Kit



**AANI-NI-0014-EVB**

Request Samples | Check Inventory

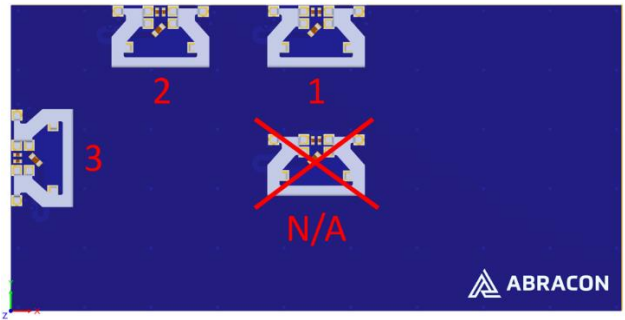
**20.5 x 15.5 x 10.3 mm**
**RoHS/RoHS II Compliant**
**MSL Level = 1**

## General Implementation Guidelines for the Stamped Metal Niche Antenna

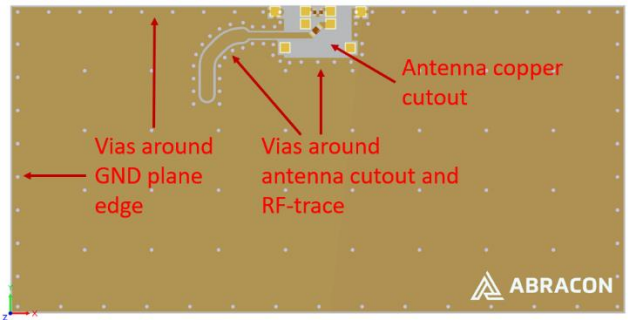
The antenna can be positioned in different ways, although there are some positions which are more beneficial. The left picture shows a typical PCB with examples on different antenna positions. The antenna must be placed along the PCB edge, i.e., it cannot be placed in the middle of the ground plane.

The optimal position is option 3 for a 15 x 20 mm PCB. Option 2 may be the best option for much larger PCBs (>> 15 x 20 mm) and option 1 for smaller PCBs (< 15 x 20 mm).

Antenna Positions:




Antenna cutout & via-structure:




The rectangular copper cutout in the footprint needs to go through all the layers in the PCB stackup, meaning that there cannot be copper on any layer in this area. It is also recommended to have a good via-structure around the cutout and the edge of the ground plane, see the right image above.

It shall also be highlighted that plastic and metal parts in the near proximity of antennas may influence the antenna tuning and/or performance. This aspect should be noted as a general guideline for all antennas. The effects are difficult to estimate without detailed information, but it is common that a plastic housing above the antenna shifts the resonant frequency down. It is recommended to measure the antenna in the actual device after implementation and to implement a matching network on the antenna feed to adjust for the potential frequency shift.

The Stamped Metal Niche antenna shows great performance when potted compared to other antenna solutions and has also shown good performance in proximity of metal and other harsh antenna environments.

## Packaging Information

The evaluation kit consists of one complete evaluation board + three additional AANI-NI-0014 antennas.

One evaluation kit per Box

Dimension of the Box: 15 x 10 x 4 cm

34 Boxes per Carton

Dimension of the Carton: 43 x 34 x 19 cm



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