TAOGLAS®

Datasheet

Part No:
UWA.01

Description

6-9GHz UWB Ceramic Substrate Chip Antenna 3.2*1.6*0.5(mm)

Features:

Dimensions: 3.2mm *1.6mm * 0.5mm
High Efficiency
6-9GHz Coverage
Covers from Channels 5-12
Low profile and Compact Size
Surface-Mount Device
RoHS and REACH compliant

1. Introduction

Ultra-Wideband (also known as UWB) is a low power digital wireless technology for transmitting large amounts of digital data over a wide spectrum of frequency bands typically spanning more than 500MHz with very low power for short distances.

The low power requirements of UWB mean increased battery life of sensors and tags leading to reduction in overall operational costs. Taoglas UWB antennas have been designed for use with the recently launched UWB modules and are also compatible with any other UWB sensor modules on the market.

The Taoglas UWA.01 chip antenna, at 3.2mm *1.6mm * 0.5mm, is a small form factor Ultra-Wideband (UWB) antenna with high efficiencies across the pulsed UWB communications operational bands. It is mounted to a PCB via standard SMT reflow process. It enables designers to use only one antenna that covers most common UWB commercial bands, namely bands, 5 through 12 simultaneously.

The UWA.01 antenna is a high efficiency, miniature SMD, edge mounted ceramic antenna that has a peak gain of more than 4dBi, an efficiency of more than 60% across the bands and is designed to be mounted directly onto a PCB. It is an ideal choice for any device maker that needs to keep manufacturing costs down over the lifetime of a product. Like all such antennas, care should be taken to mount the antenna at least 3mm from metal components or surfaces, and ideally 5mm for best Radiation efficiency.

The results below are based on an 80mm x 40mm ground-plane. If your ground-plane is smaller the performance will change. Optimum position for this chip antenna is in the middle of the longest edge on the PCB.

1.1 Applications of Pulsed UWB antenna Technology

Radar-These short-pulsed antennas provide very fine range resolution and precision distance and positioning measurement capabilities. UWB signals enable inexpensive high-definition radar antennas which find use in automotive sensors, smart airbags, and precision surveying applications amongst many others.

Home Network Connectivity- Smart home and entertainment systems can take advantage of high data rates for streaming high-quality audio and video contents in real time for consumer electronics and computing within a home environment.

Position location & Tracking- UWB antennas also find use in Position Location and Tracking applications such as locating patients in case of critical condition, hikers injured in remote areas, tracking cars, and managing a variety of goods in a big shopping mall. UWB offers better noise immunity and better accuracy to within a few cm compared to current localization technologies such as Assisted GPS for Indoors, Wi-Fi and cellular which are at best able to offer meter level precision. Tethered Indoor positioning UWB systems that measure the angles of arrival of ultra-wideband (UWB) radio signals perform triangulation by using multiple sensors to communicate with a tag device.

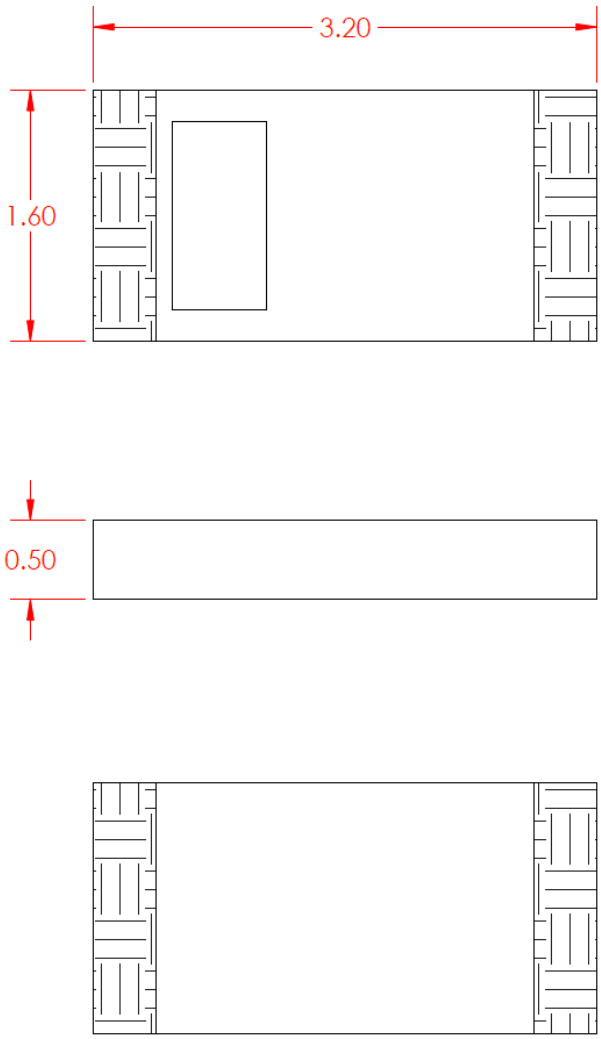
2. Specification

Electrical								
Band	Frequency (MHz)	Efficiency (%)	Average Gain (dB)	Peak Gain (dBi)	Impedance	Polarization	Radiation Pattern	Max. input power
Channel 5	6240-6739	80.4	-0.95	4.52	50 Ω	Linear	Omni	2W
Channel 6	6739-7238	81.1	-0.91	4.61				
Channel 7	5948-7030	80.2	-0.96	5.74				
Channel 8	7238-7737	72.1	-1.42	5.18				
Channel 9	7737-8236	63.6	-1.96	5.34				
Channel 10	8236-8736	63.0	-2.00	3.44				
Channel 11	7321-8652	65.3	-1.85	5.34				
Channel 12	8736-9235	58.5	-2.33	3.10				

Mechanical	
Antenna Dimensions	3.2mm x 1.6mm x 0.5mm
EVB Dimensions	80mm x 40mm
Weight	0.02g

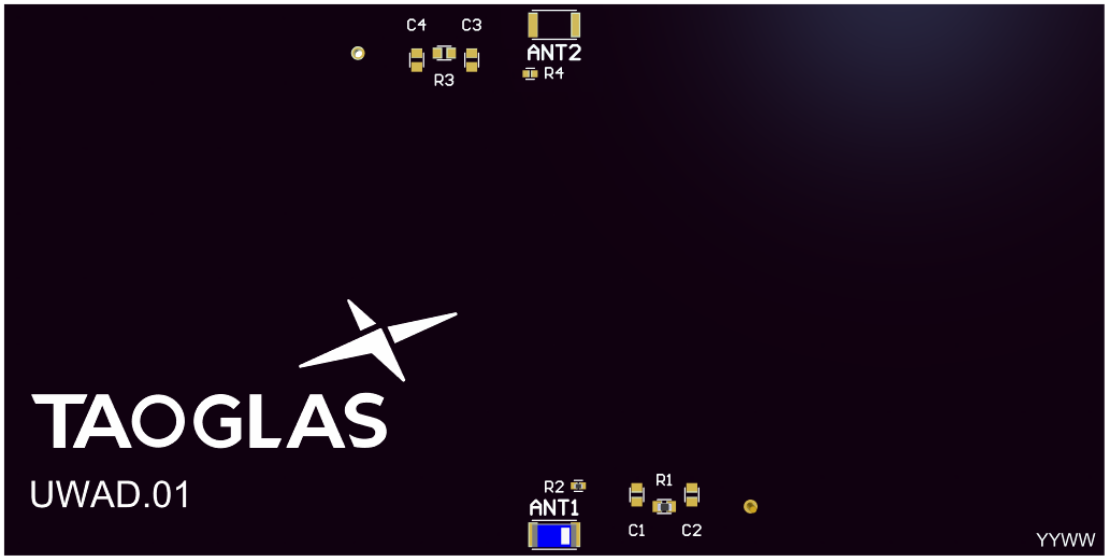
Environmental	
Temperature Range	-40°C to 105°C
Humidity	Non-condensing 65°C 95% RH
Moisture Sensitivity Level (MSL)	3 (168 Hours)

3. Mechanical Drawing



4. Antenna Integration Guide

The following is an example on how to integrate the UWA.01 into a design. This antenna has 3 pins, where one pin is used for the RF Feed. Taoglas recommends using a minimum of 80x40mm ground plane (PCB) to ensure optimal performance.

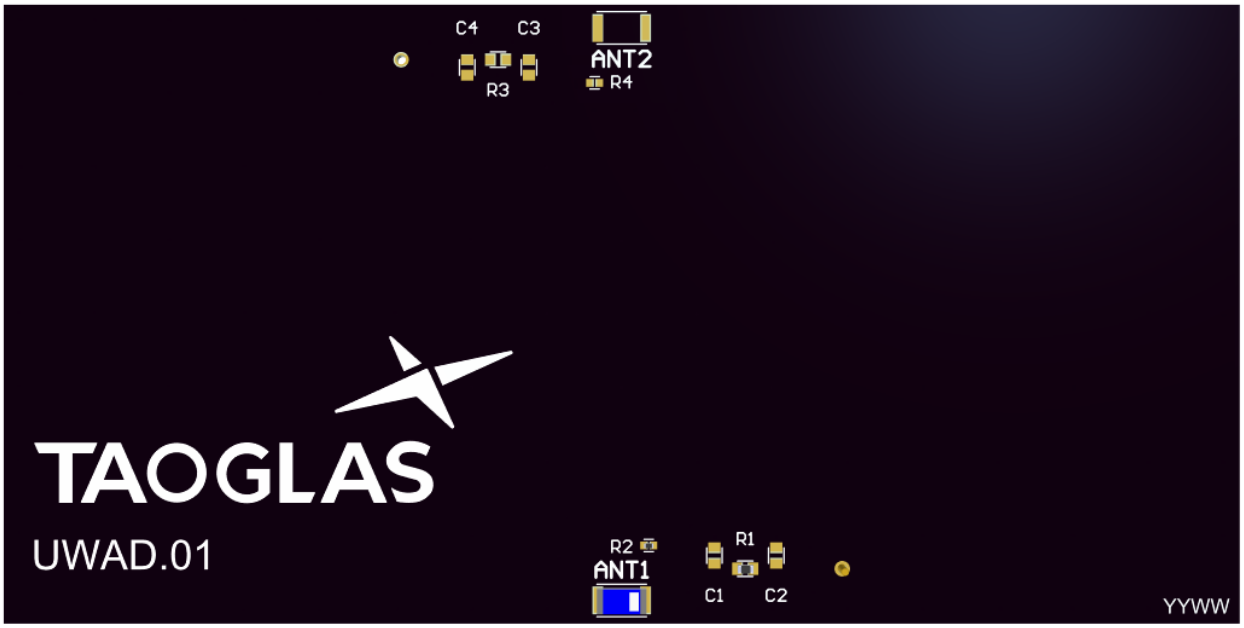


Top view of a reference PCB.

Please find the Integration files in Altium, 2D formats and the 3D model for the UWA.01 here:
https://www.taoglas.com/product/evaluation-board-for-uwa-01-6-9ghz-miniature-chip-antenna/

4.1 Schematic and Symbol Definition

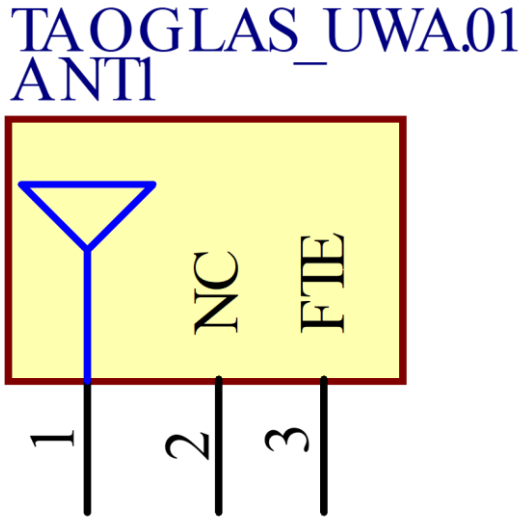
The circuit symbol for the antenna is shown below. The antenna has 3 pins with only two pins as functional.



Above is a 3D model of the UWA.01 on a reference PCB.

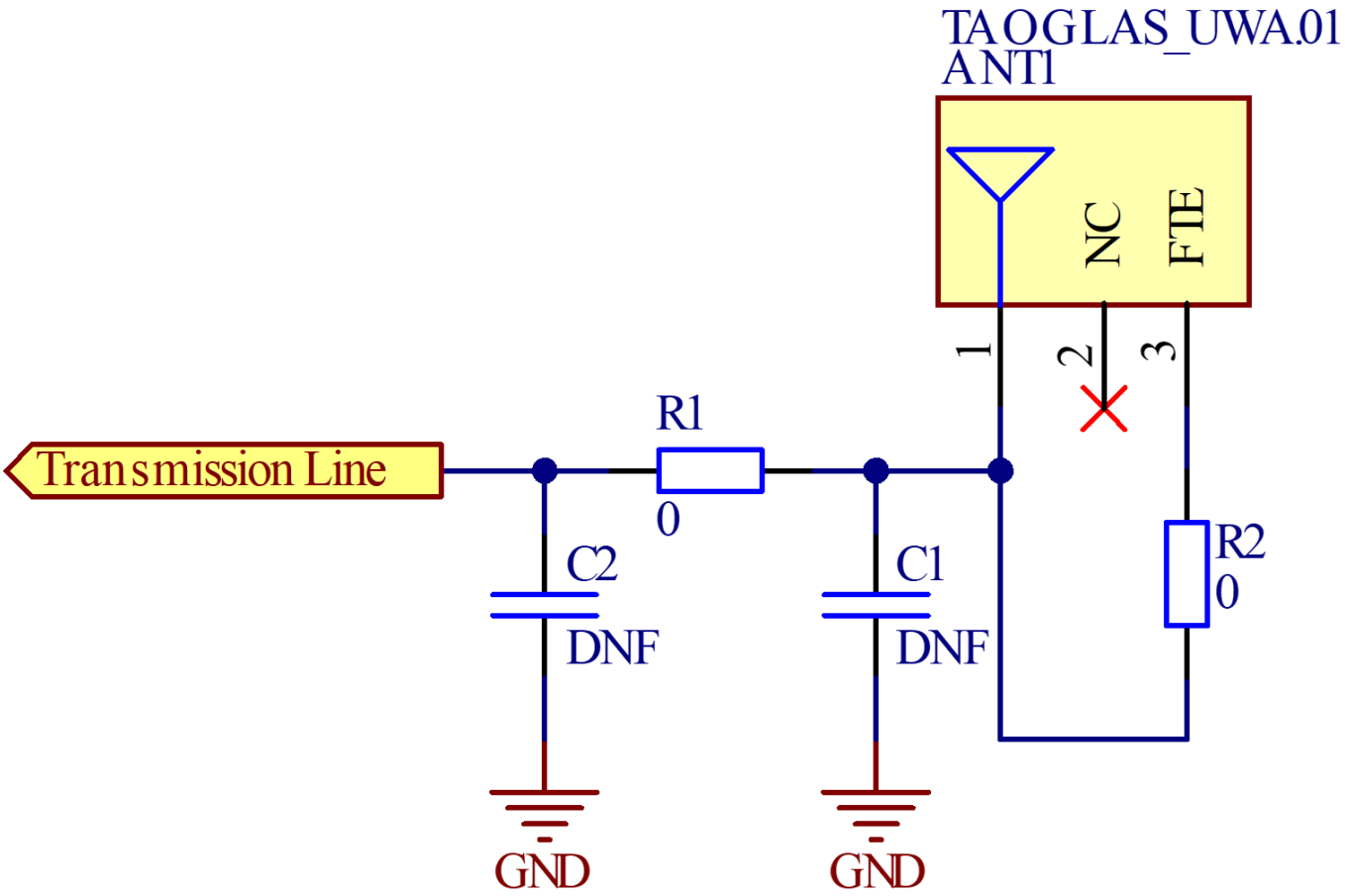
The circuit symbol for the UWA.01 is shown below. The antenna has 3 pins as indicated below.

Pin	Description
1	RF Feed
2	Mechanical, Not Connected
3	FTE (Fine Tuning Element)



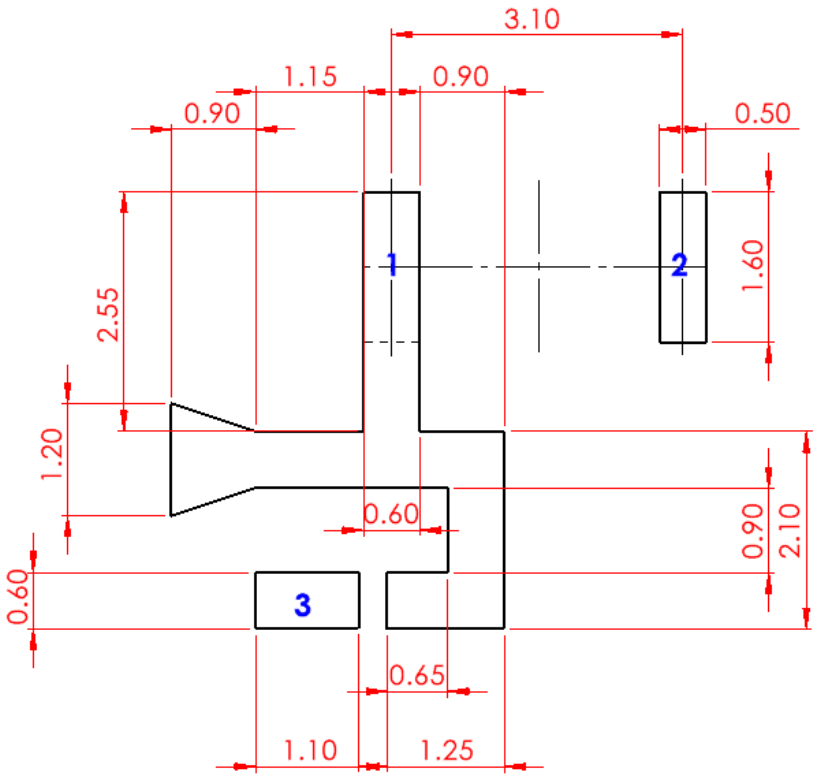
4.2 Schematic Layout

Matching components with the UWA.01 are required for the antenna to have optimal performance in the spaces specified in the schematic below. Additional matching components may be necessary for your device, Taoglas recommends incorporating extra component footprints, forming a “pi” network, for the UWA.01.

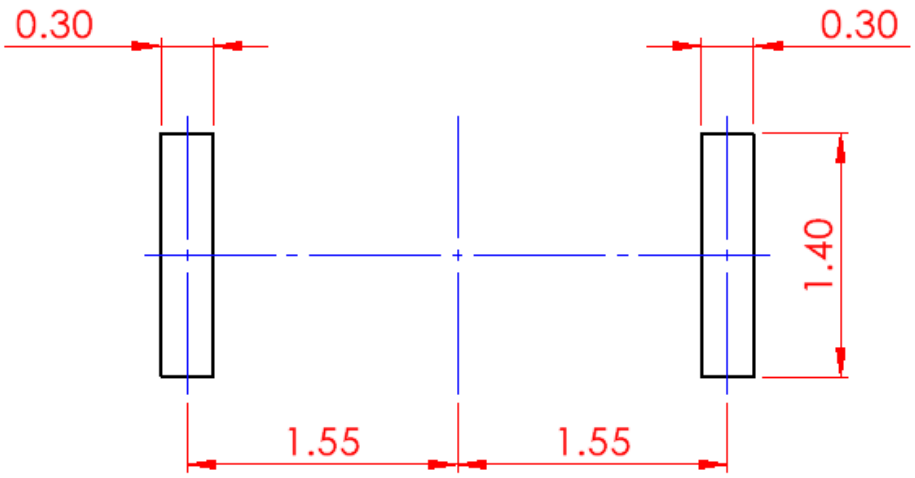


Designator	Type	Value	Manufacturer	Manufacturer Part Number
R1	Resistor	0 Ohm	Yageo	RC0402JR-070RL
R2	Resistor	0 Ohm	Yageo	ERJ-1GN0R00C

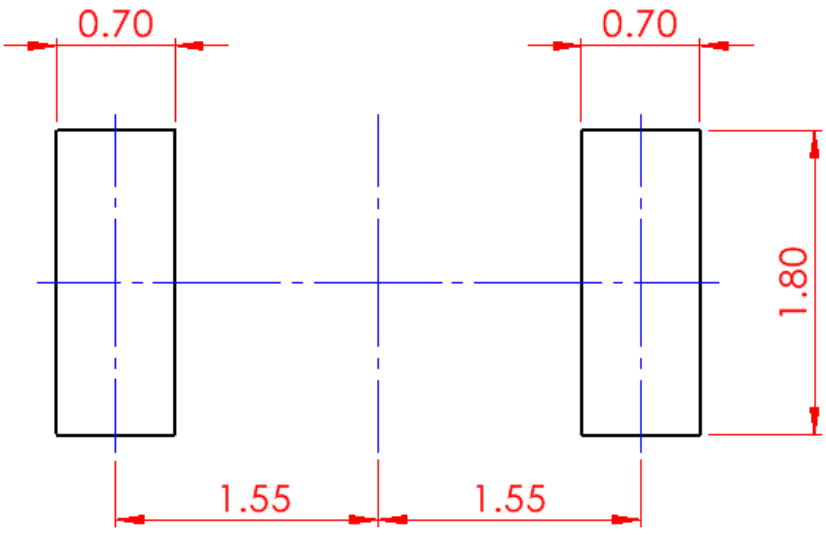
4.3 Antenna Footprint



4.4 Top Solder Paste



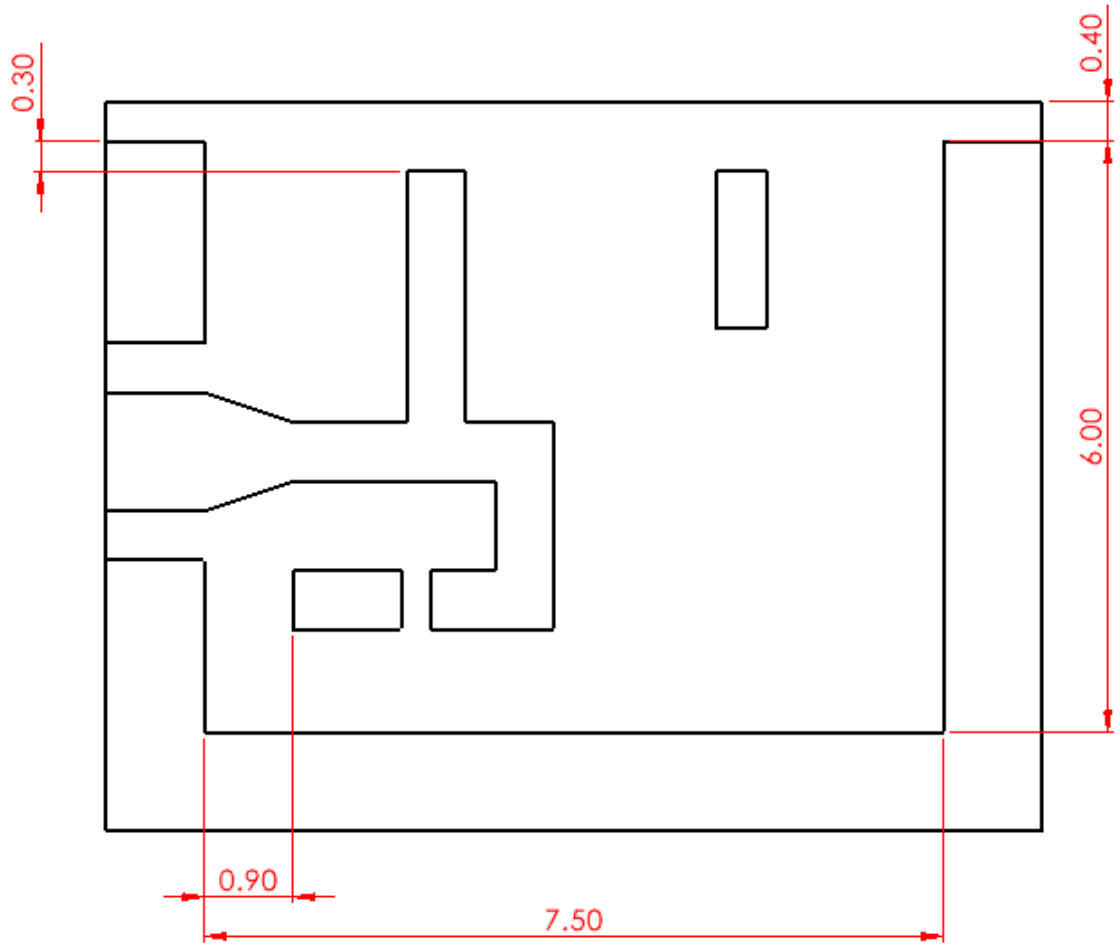
4.5 Top Solder Mask



4.6 Copper Clearance for UWA.01

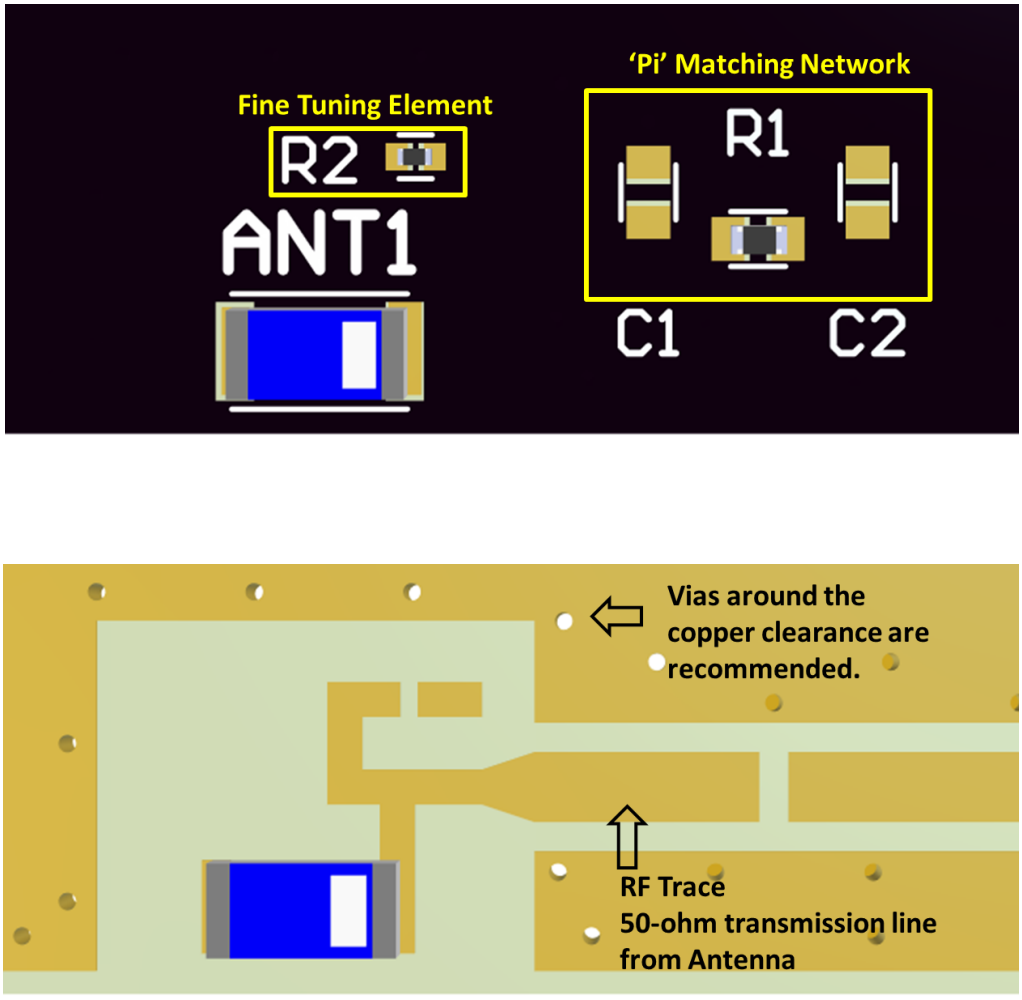
The footprint and clearance on the PCB must comply with the antenna's specification. The PCB layout shown in the diagrams below demonstrates the UWA.01 clearance area. The copper keep out area applies to all layers that are below the UWA.01.

The copper clearance area extends to 7.5mm in width and 6mm in length. The PCB Edge Clearance should be a minimum of 0.1mm, example below is 0.4mm.



4.7 Antenna Integration

The UWA.01 should be placed in the centre, as close to the edge on the long side of the PCB as possible, to take advantage of the ground plane. The RF trace must maintain a 50 Ohm transmission line. A “Pi” Matching Network is recommended for the RF transmission line, the values and components for the matching circuit will depend on the tuning needed. Ground vias should be placed around the copper clearance area and RF transmission line.

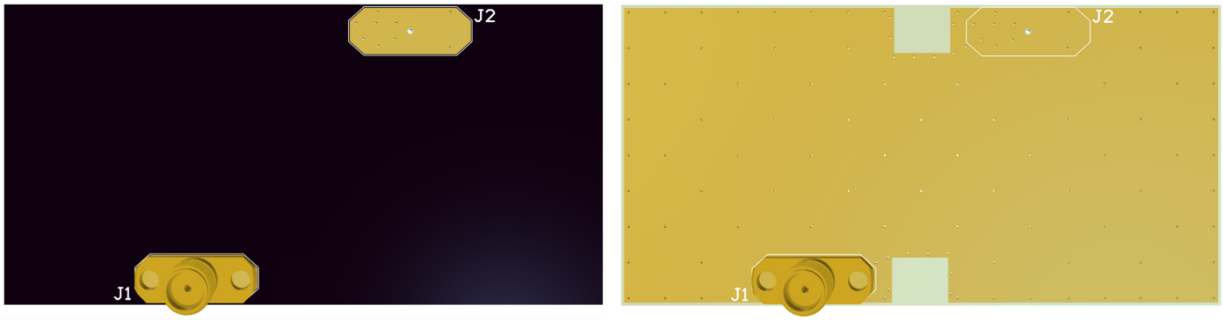


UWA.01 antenna mounted on a reference PCB, showing transmission lines and integration notes.

4.8 Final Integration

The top side image shown below highlights the antenna transmission line. Taoglas recommends using a minimum of 80x40mm ground plane (PCB) to ensure optimal performance.

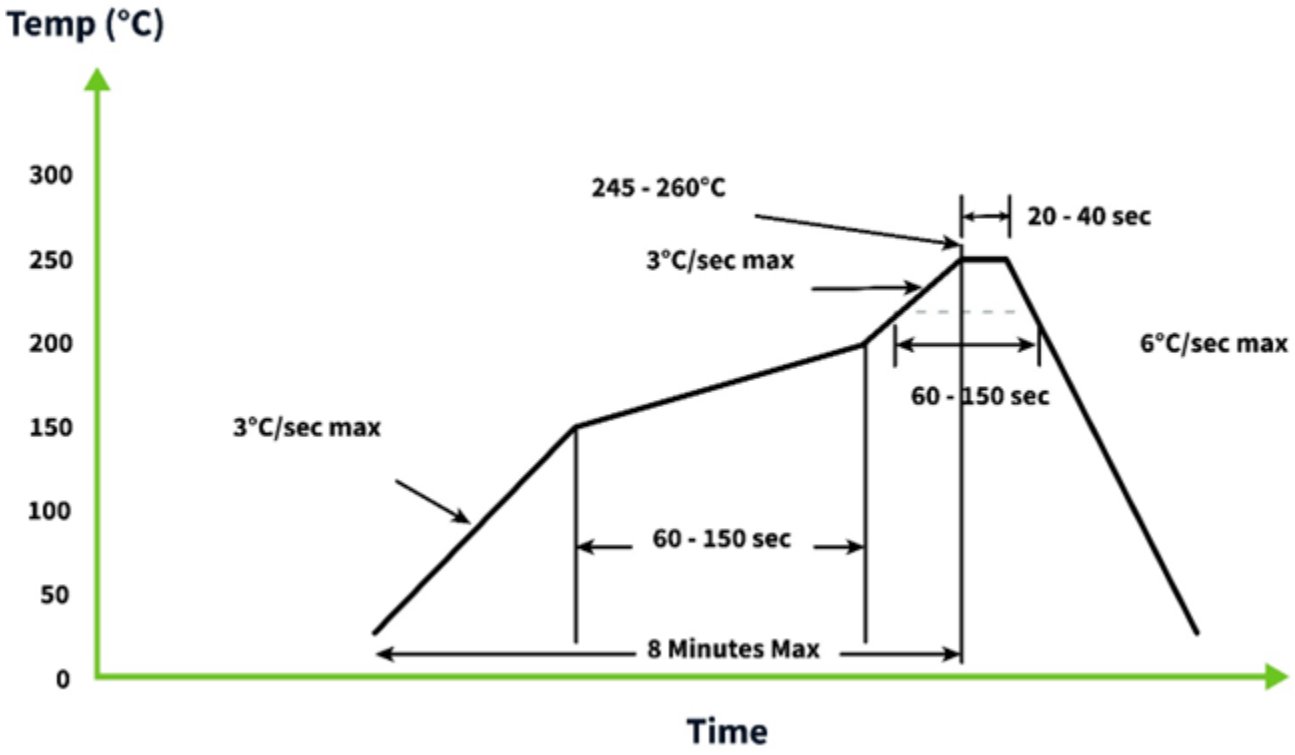
Top Side (UWA.01 placement on 80x40mm reference PCB)



Bottom Side (UWA.01 placement on 80x40mm reference PCB)

5. Solder Reflow Profile

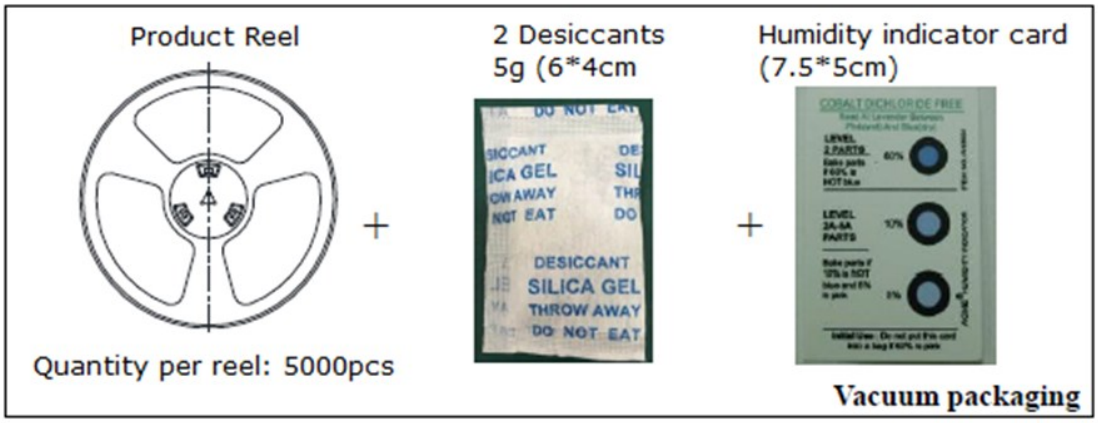
The UWA.01 can be assembled by following the recommended soldering temperatures are as follows:



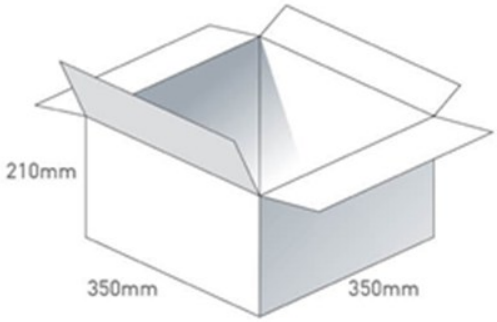
*Temperatures listed within a tolerance of +/- 10º C

Smaller components are typically mounted on the first pass, however, we do advise mounting the UWA.01 when placing larger components on the board during subsequent reflows.

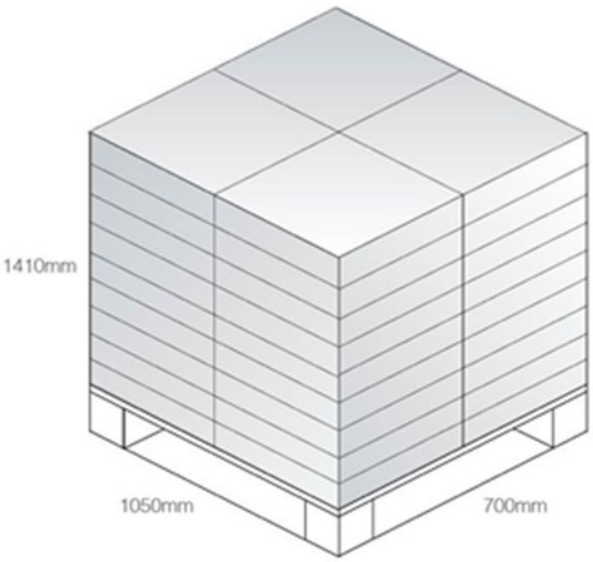
6. Packaging



9 reels / 45000 pcs in one carton
Carton Dimensions - 350*350*210mm
Weight - 9Kg

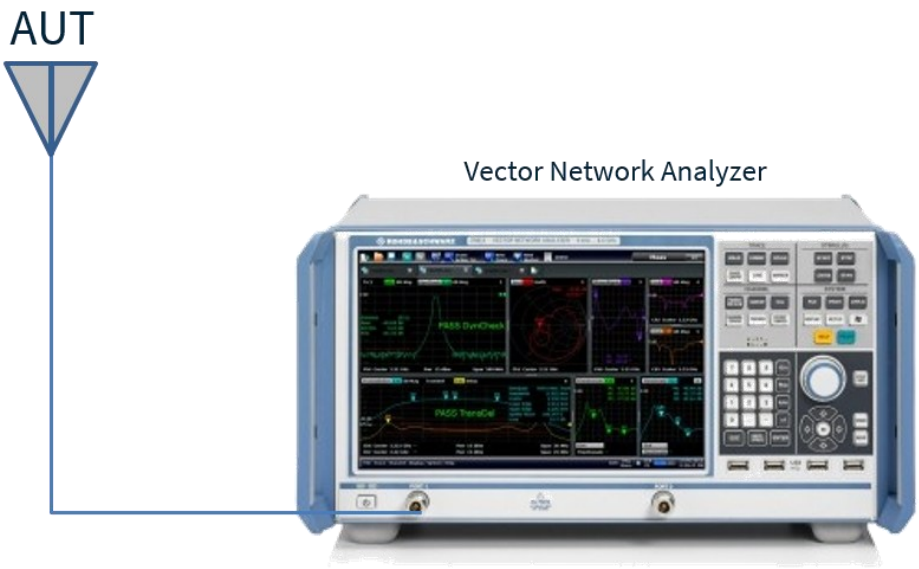


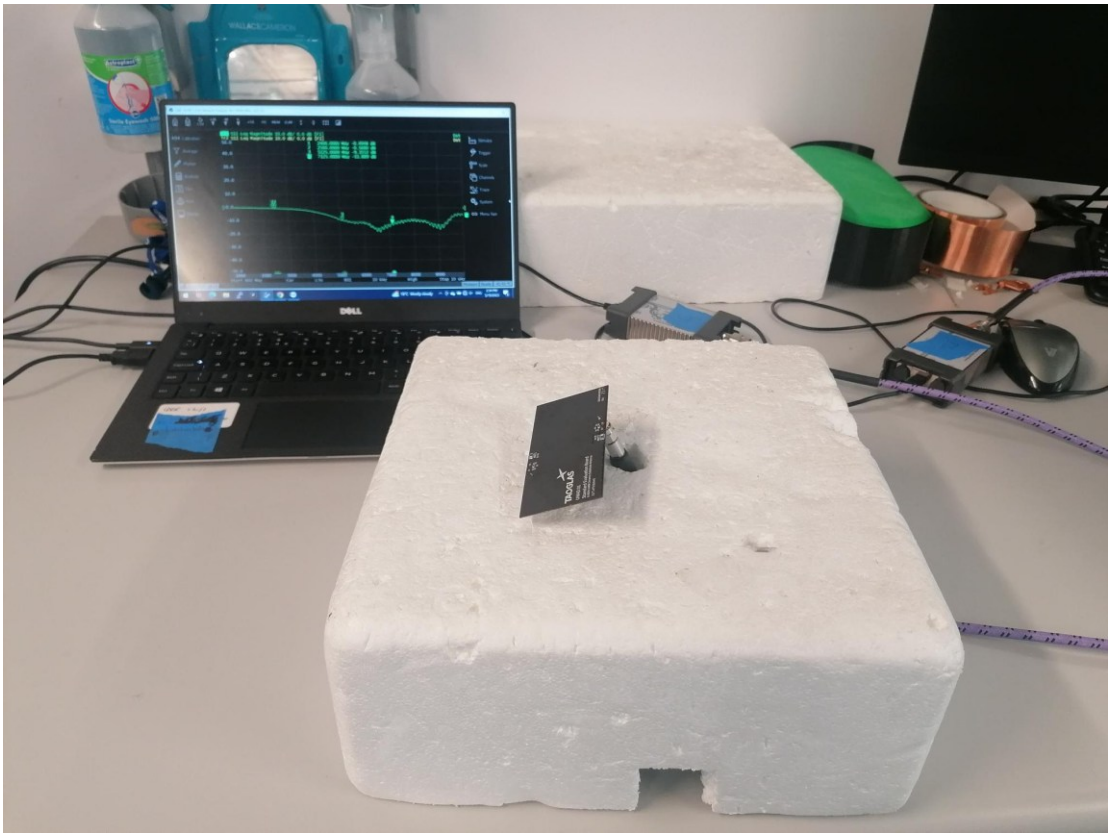
Pallet Dimensions 1050*700*1410mm
36 Cartons per Pallet
4 Cartons per layer
9 Layers



7. Antenna Characteristics

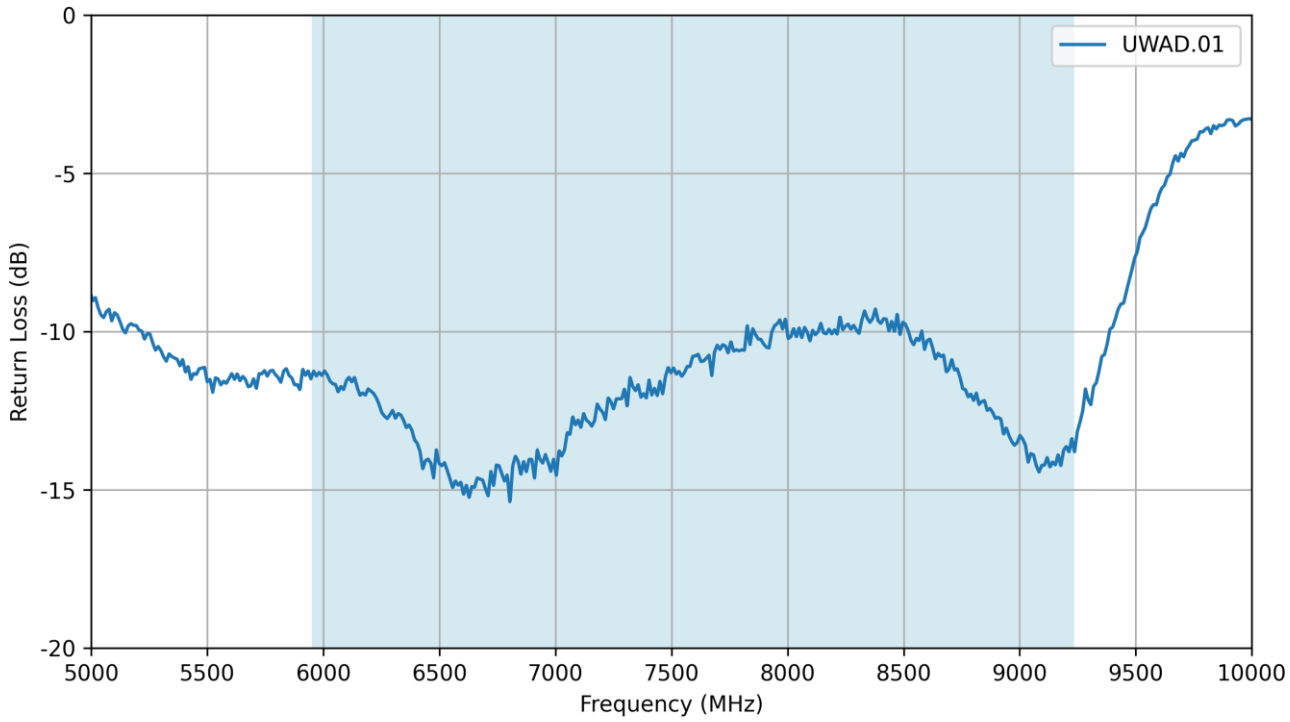
7.1 Test Setup



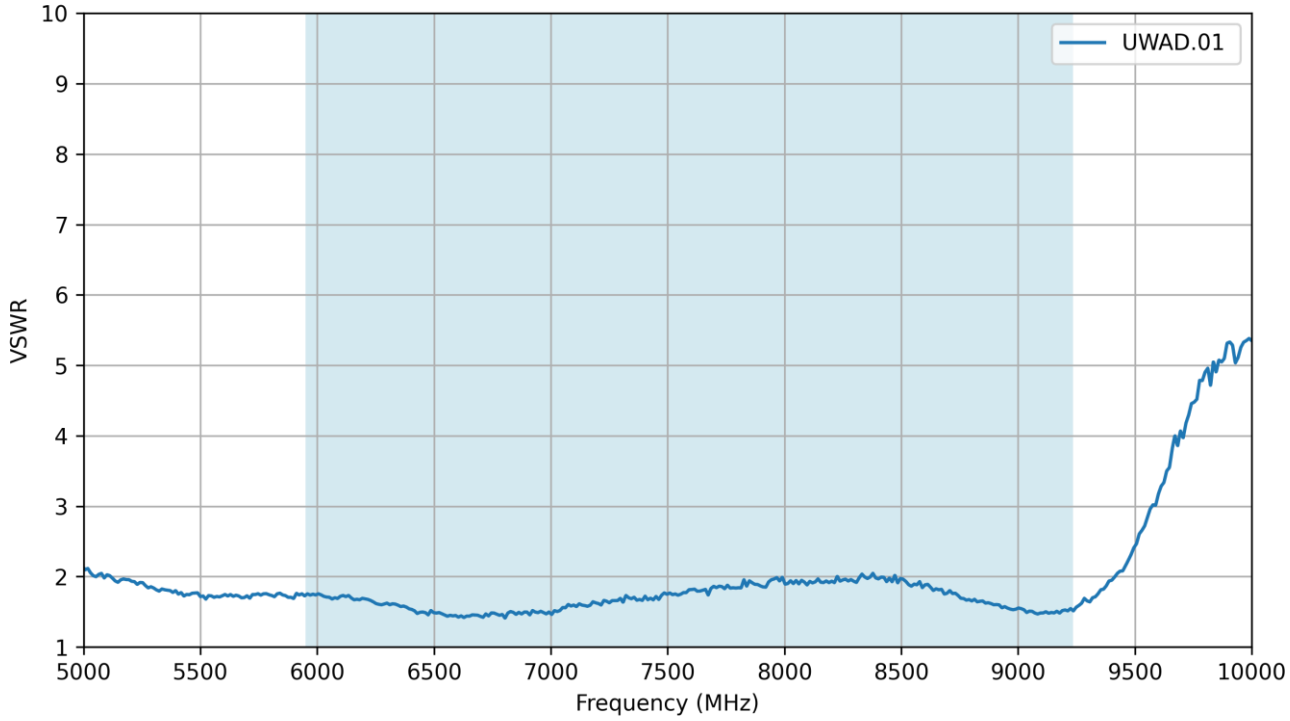


VNA Test Set-up

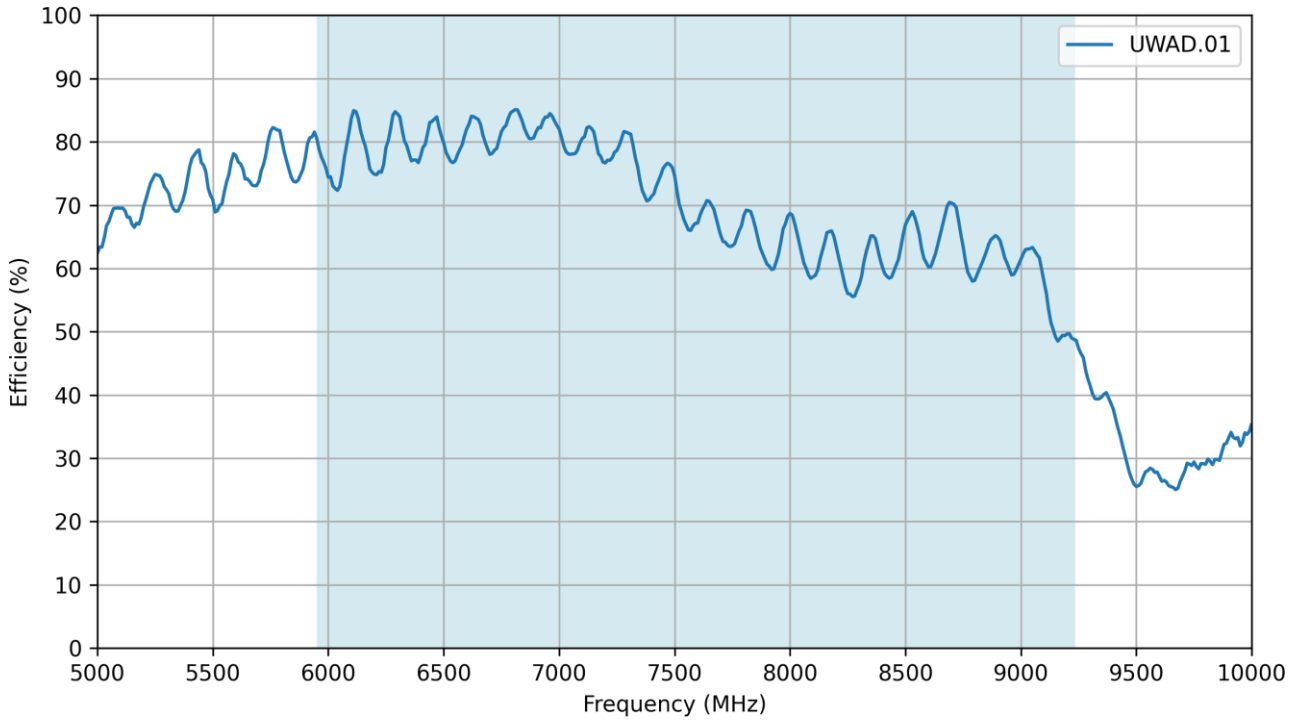
7.2 Return Loss



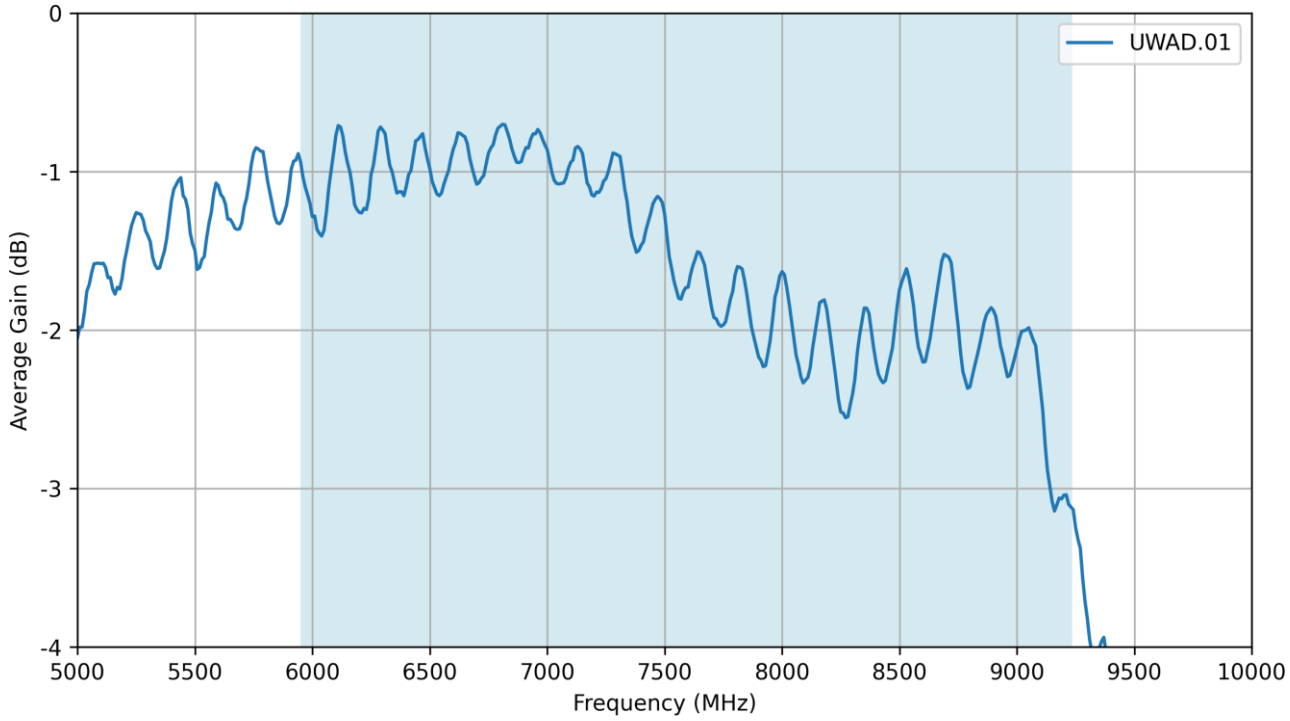
7.3 VSWR



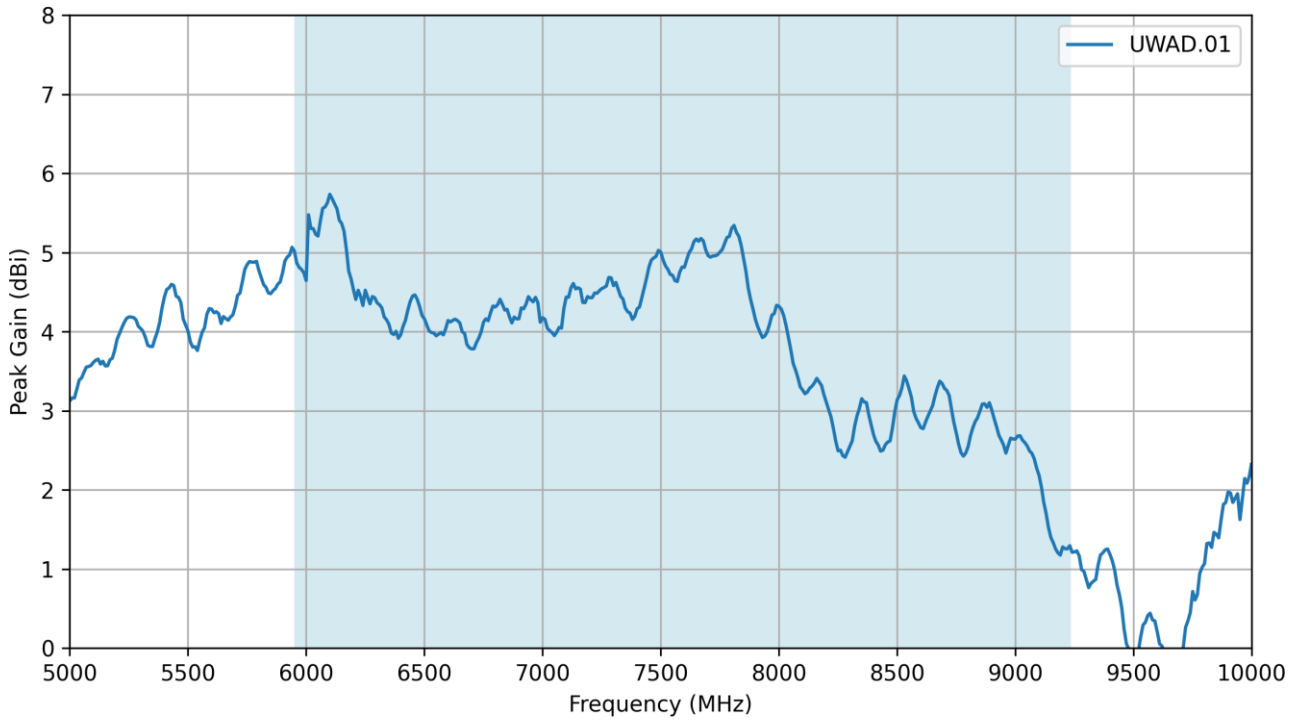
7.4 Efficiency



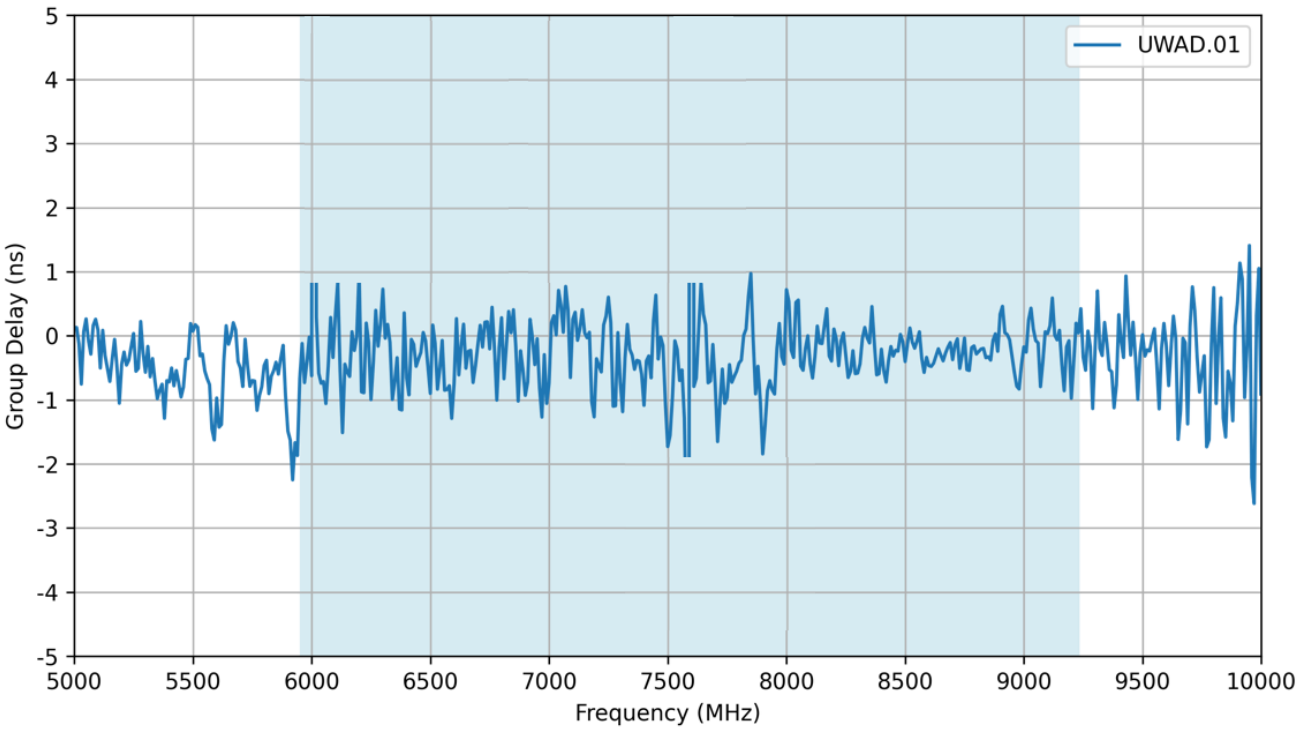
7.5 Average Gain



7.6 Peak Gain

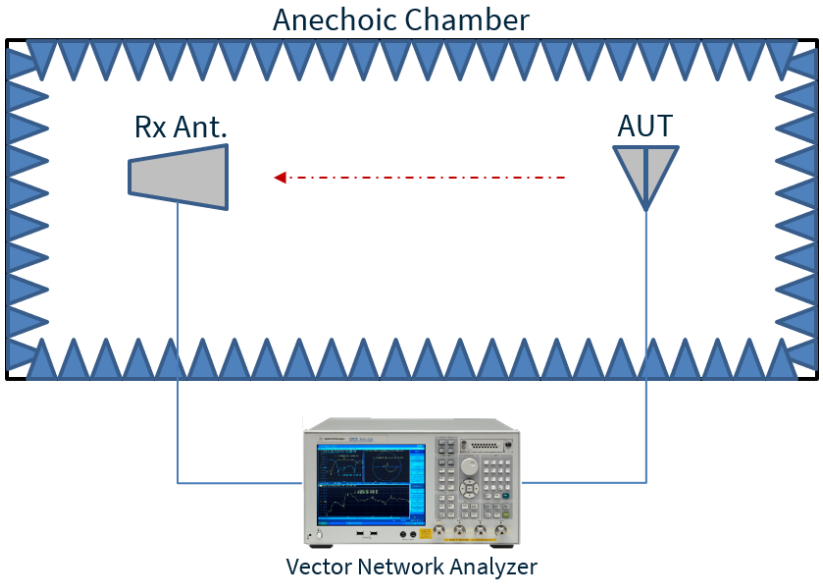


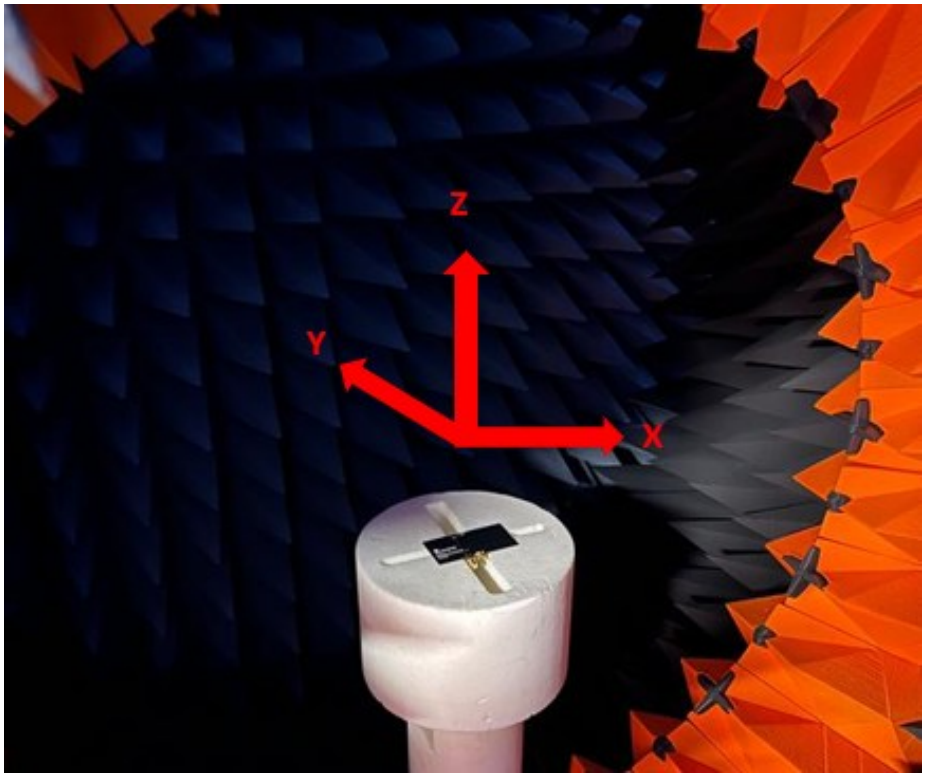
7.7 Group Delay



8. Radiation Patterns

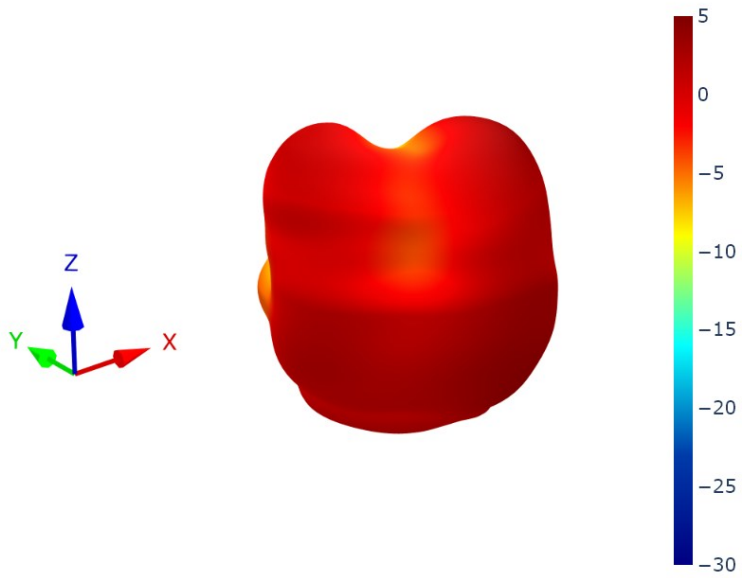
8.1 Test Setup



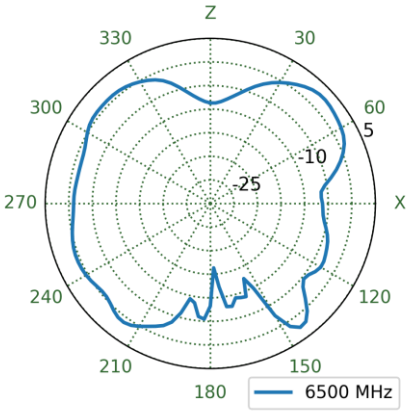


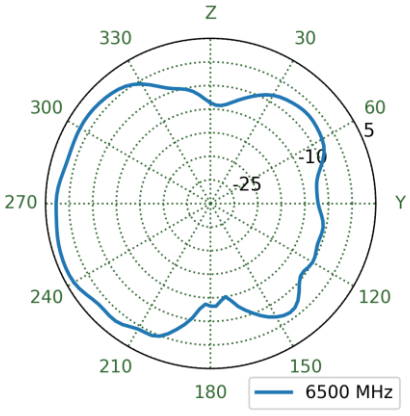
VNA Test Set-up

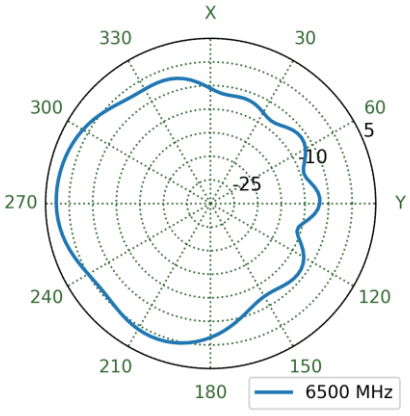
8.1 Patterns at 6500 MHz



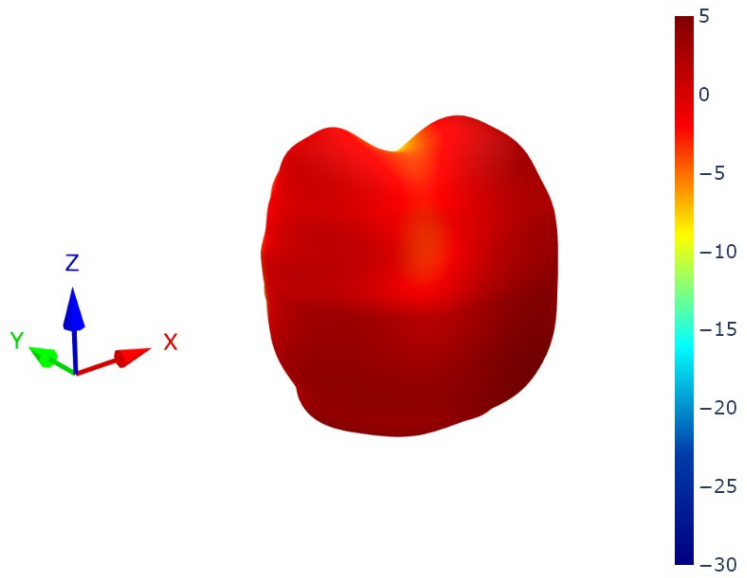
XZ Plane	YZ Plane	XY Plane



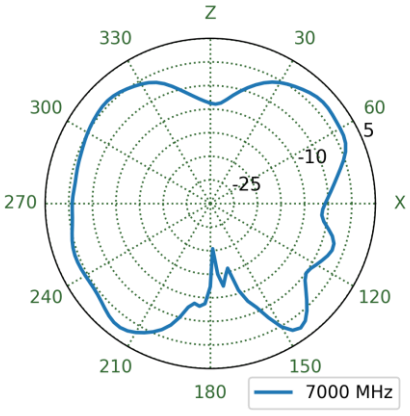


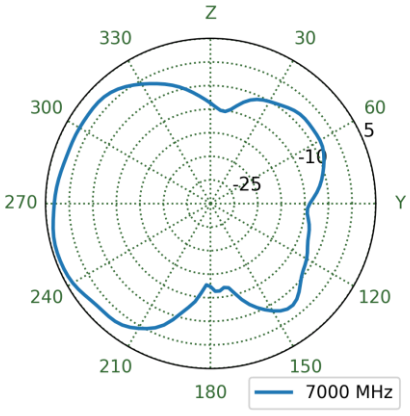


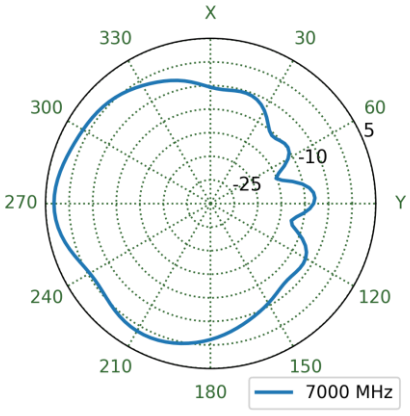
8.2 Patterns at 7000 MHz



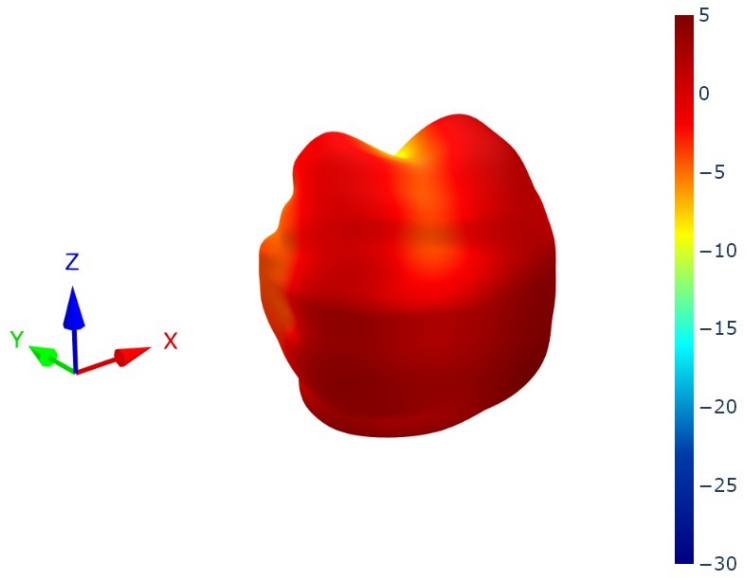
XZ Plane	YZ Plane	XY Plane

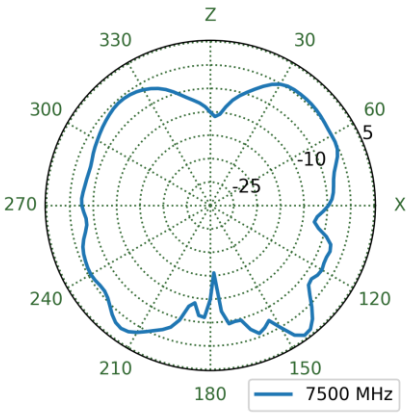
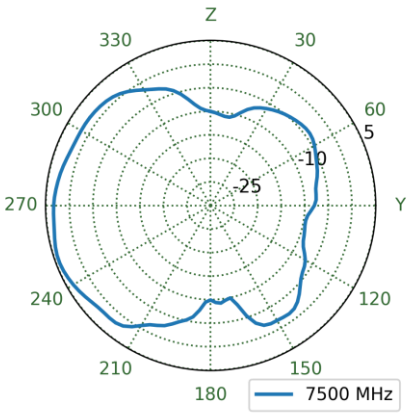
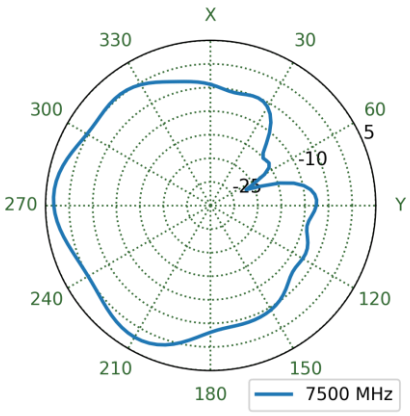




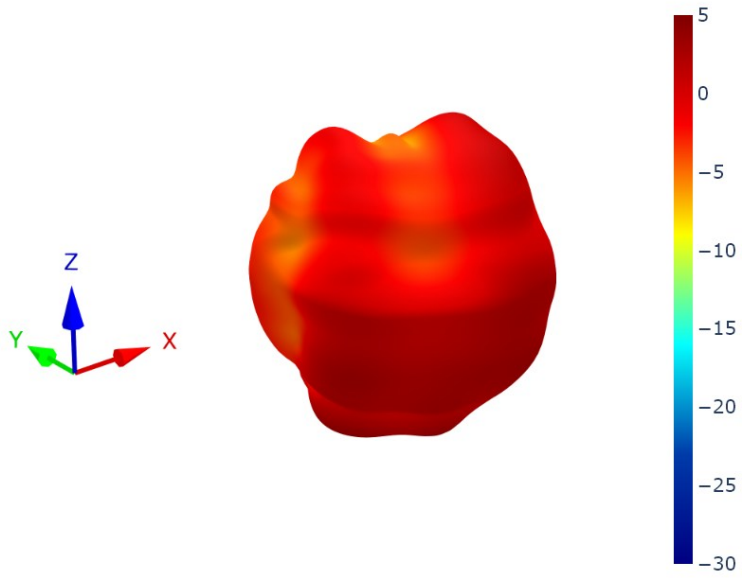


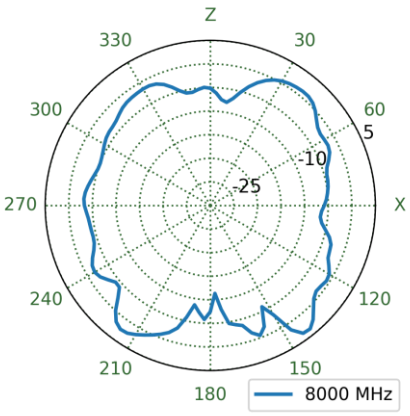
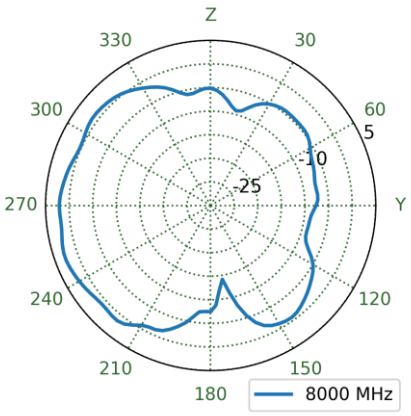
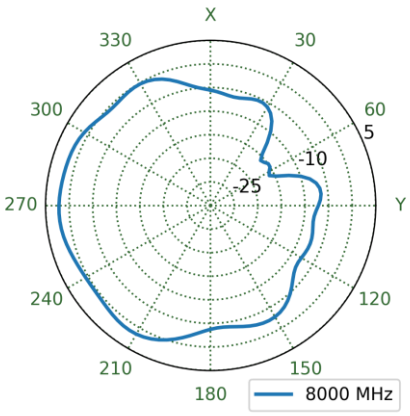
8.3 Patterns at 7500 MHz



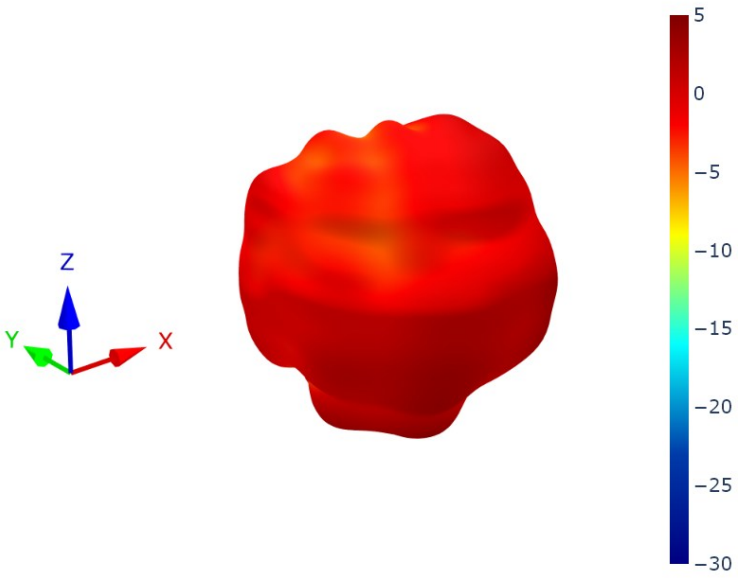
XZ Plane	YZ Plane	XY Plane
		

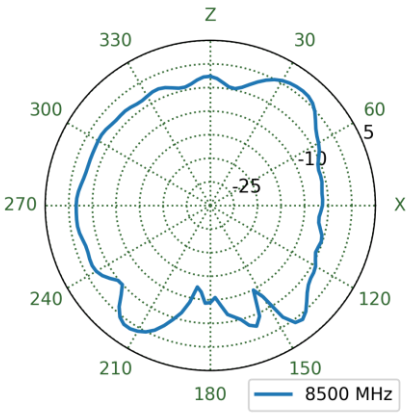
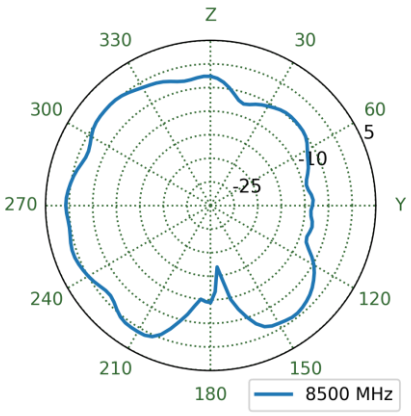
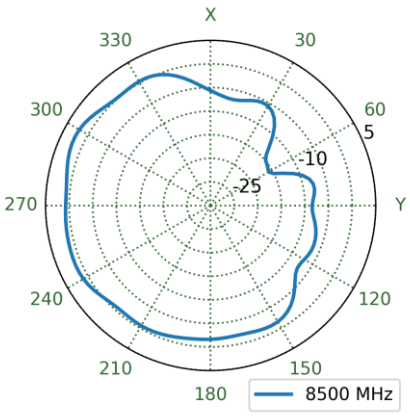
8.4 Patterns at 8000 MHz



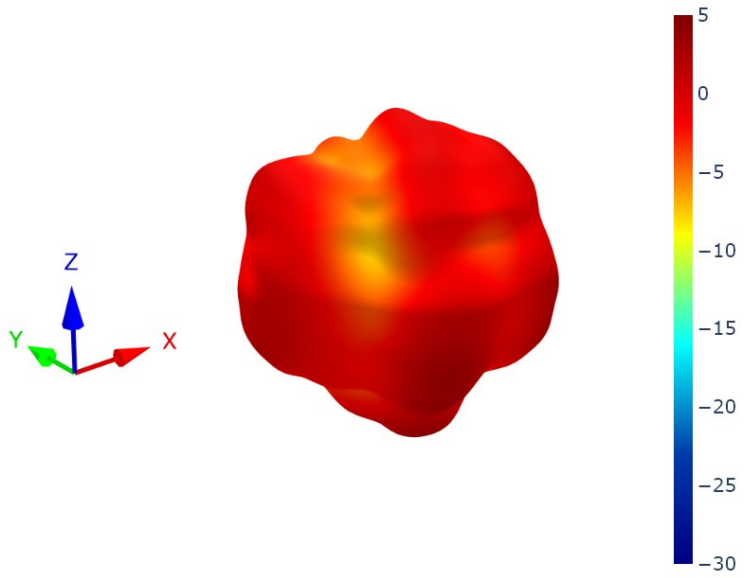
XZ Plane	YZ Plane	XY Plane
		

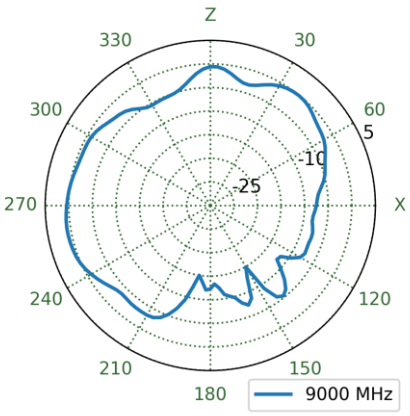
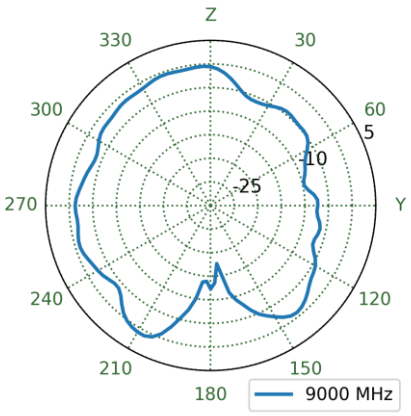
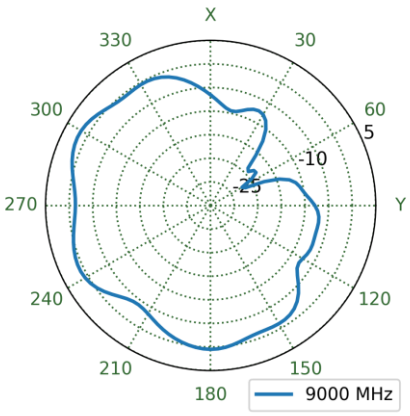
8.5 Patterns at 8500 MHz



XZ Plane	YZ Plane	XY Plane
		

8.6 Patterns at 9000 MHz



XZ Plane	YZ Plane	XY Plane
		

Changelog for the datasheet

SPE-23-8-017 - UWA.01

Revision: C (Current Version)	
Date:	2025-03-11
Notes:	Updated antenna integration guide and solder reflow profile graphic.
Author:	Gary West

Previous Revisions

Revision: B	
Date:	2023-05-22
Notes:	Updated test data.
Author:	Gary West

Revision: A (Original First Release)	
Date:	2023-01-30
Notes:	Initial Release.
Author:	Gary West

TAOGLAS®

www.taoglas.com