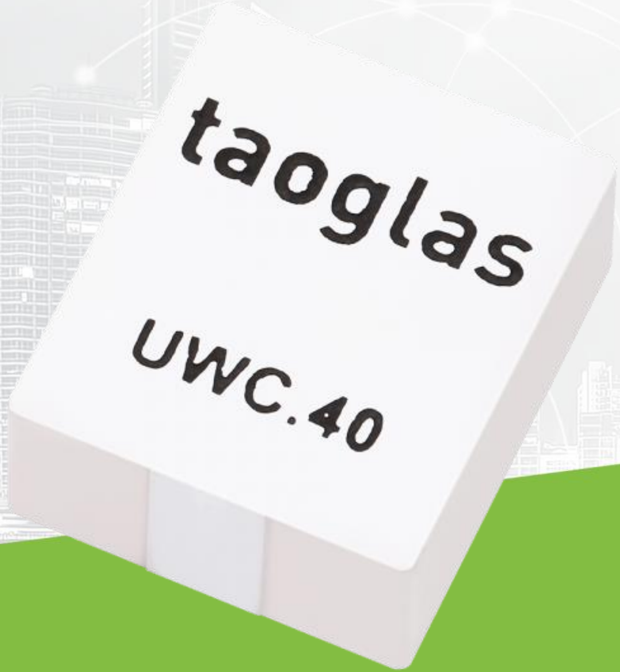



Datasheet

# Accura UWC.40

**Part No:**
**UWC.40**

**Description:**

3~5GHz Ultra-Wide Band (UWB) SMD Chip Antenna

**Features:**

SMD Chip UWB Antenna

For European and USA UWB Applications

In Channels 1-4

Uses

- Automotive sensors
- Smart airbags
- Precision surveying
- Smart home and entertainment systems
- Centimeter Level Positioning

Frequency: 3.1-4.75GHz

Dimensions: 6*7*3mm

RoHS  and REACH Compliant

# 1. Introduction


The UWC.40 chip antenna, at 6*7*3 mm, is a small form factor Ultra-Wideband (UWB) antenna with high efficiencies across the pulsed UWB communications operational bands. It enables designers to use just one antenna to simultaneously cover all common UWB commercial bands, namely bands 1-4. UWC.40 provides a peak gain of 4 dBi and efficiencies of more than 80% across most of the UWB bandwidth.

The UWC.40 antenna is a durable ceramic antenna designed to be mounted directly to a PCB via standard SMT reflow process. It is an ideal choice for any device maker that needs to keep manufacturing costs down over the lifetime of a product. Care should be taken to mount the antenna at least 1mm from metal components or surfaces, and ideally 5mm for best Radiation efficiency. Nearby metal components should be as small as possible. The antenna will not work within fully enclosed metal enclosures. Minimum recommended ground plane size is 26 mm x 20 mm, and antenna to ground clearance is fixed to 2.5 mm and should not be changed. (Please see section 7. Application Note)

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 has developed various innovative and new-to-market flexible embedded UWB antennas designed for seamless integration on plastics and using highly flexible micro-coaxial cable mounting while achieving high performance where space is limited. Taoglas UWB series antennas have been designed for use with the recently launched Decawave ScenSor DW1000 module and are also compatible with any other UWB sensor modules on the market. Note that any embedded antenna is subject to detuning and radiation efficiency decreases in any device environment. Taoglas has a range of services that can characterize the antenna performance in your device and also select and optimize the right antenna for your application. Subject to a minimum order quantity, a fully custom antenna can also be designed and supplied. Check our UWB services pages on our website or contact your regional Taoglas office for more information.

## 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.

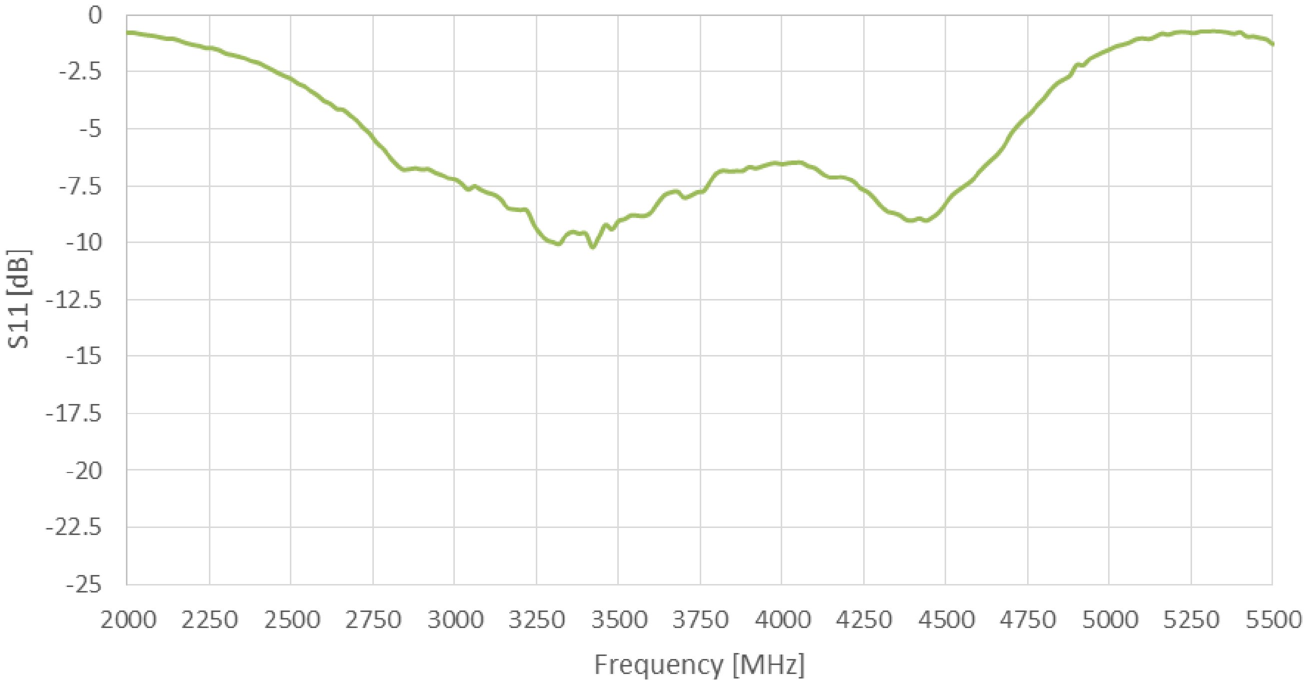
# 2. Specifications

| Electrical | | | | |
|---|---|---|---|---|
| **Standard** | **USA UWB Channel 1** | **USA UWB Channel 2** | **USA UWB Channel 3** | **USA UWB Channel 4** |
| **Frequency (GHz)** | **3.24-3.74** | **3.74-4.24** | **4.24-4.74** | **3.32-4.65** |
| Return Loss (dB) | <-7.5 | <-6.5 | <-5 | <-5 |
| Efficiency (%) | >82% | >80% | >55% | >65% |
| Peak Gain (dBi) | 3.5 | 4.5 | 4 | 4 |
| Max VSWR | 2.5:1 | 2.8:1 | 3.8:1 | 2.8:1 |
| Impedance | 50Ω | | | |
| Polarization | Linear | | | |
| Radiation Pattern | Omnidirectional | | | |
| Input Power | 10W | | | |
| **Mechanical** | | | | |
| Dimension | 6mm x 7mm x 3mm | | | |
| Material | Ceramic | | | |
| Weight | 0.4g | | | |
| **Environmental** | | | | |
| Operation Temperature | -40°C to 85°C | | | |
| Storage Temperature | -40°C to 85°C | | | |
| Humidity | 40% to 90% | | | |
| Moisture Sensitivity Level (MSL) | 3 (168 Hours) | | | |

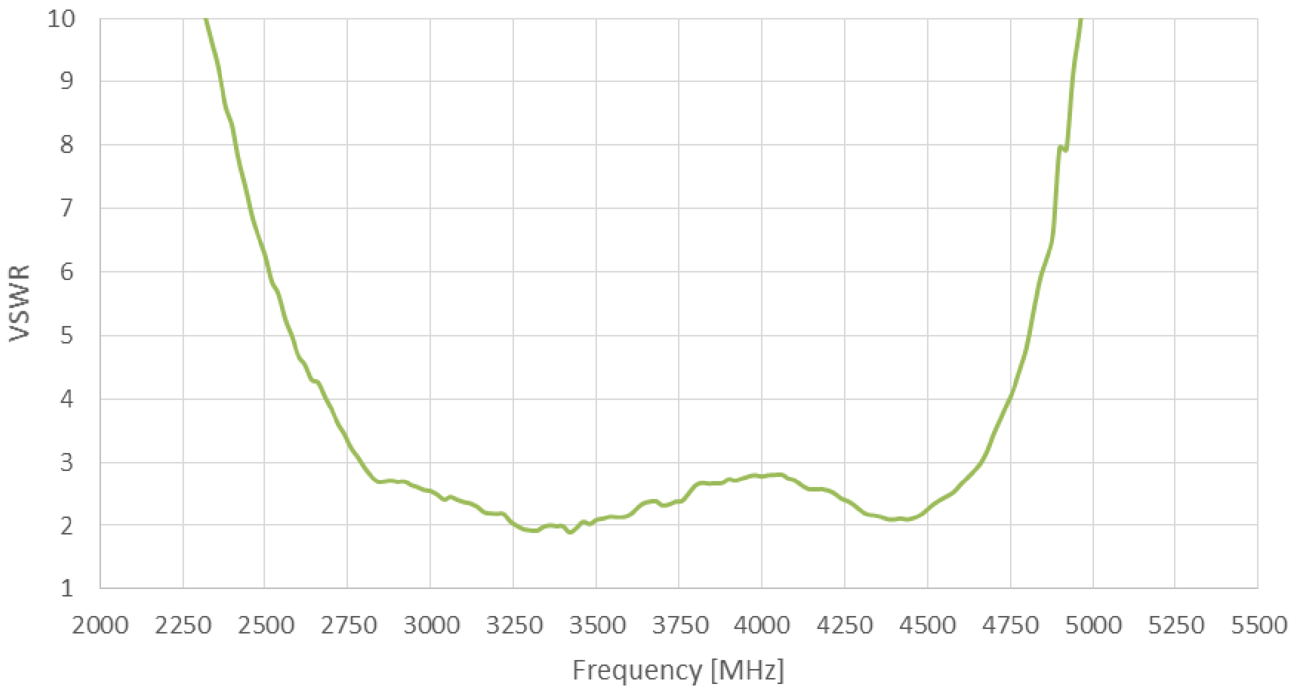
* Results obtained for antenna on Standard Evaluation Board size 37mm x 20mm, with 26mm x 20mm ground plane. See Section 4 for Standard Evaluation Board details.

# 3. Antenna Characteristics

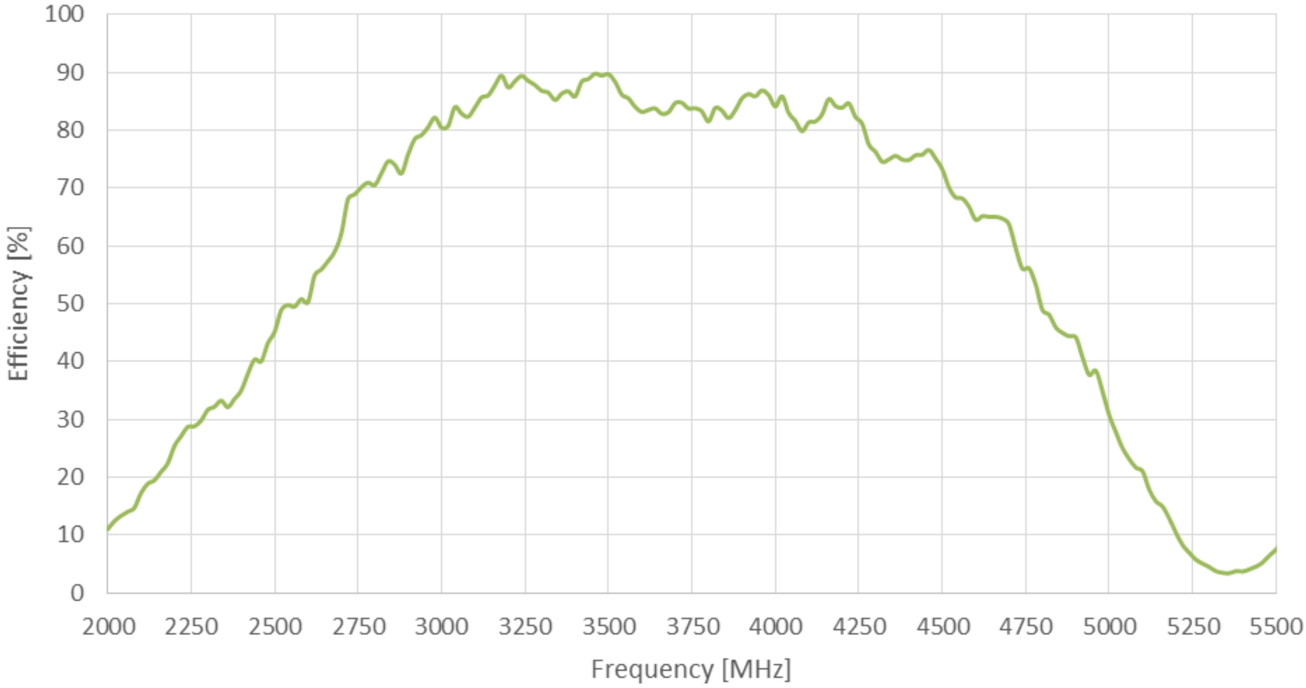
## 3.1 Return Loss



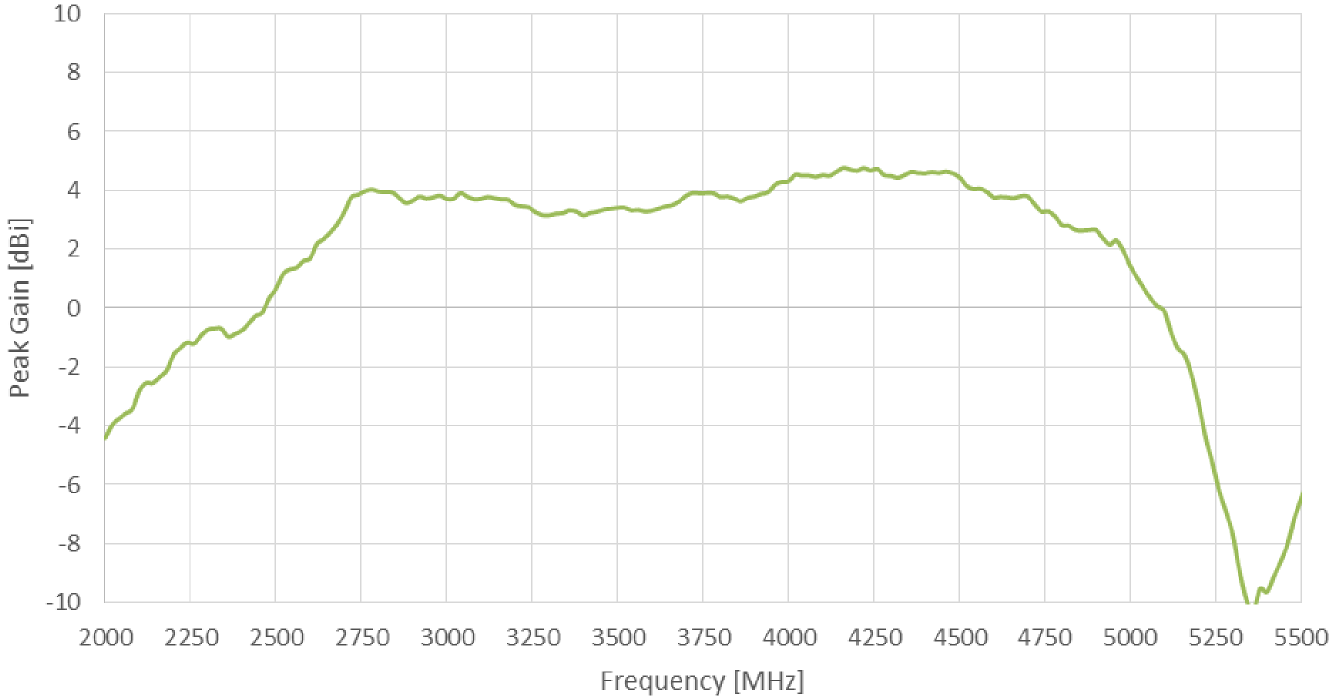

## 3.2 VSWR



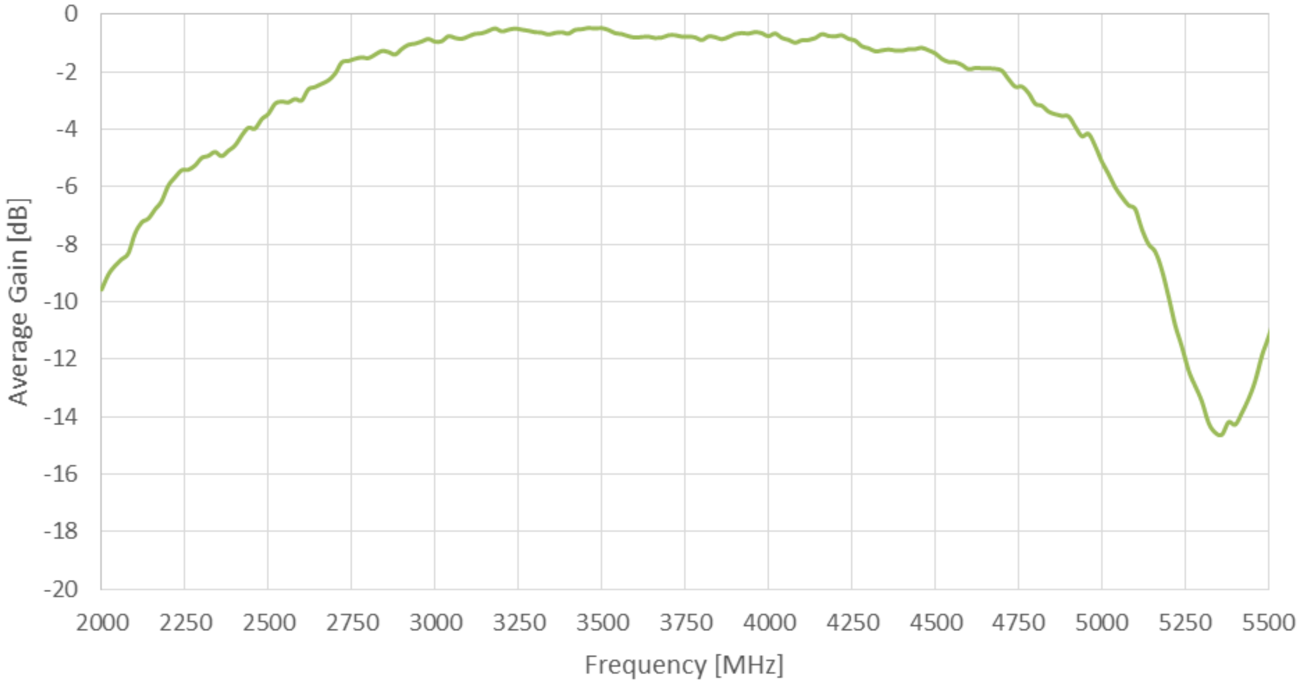
## 3.3 Efficiency




## 3.4 Peak Gain

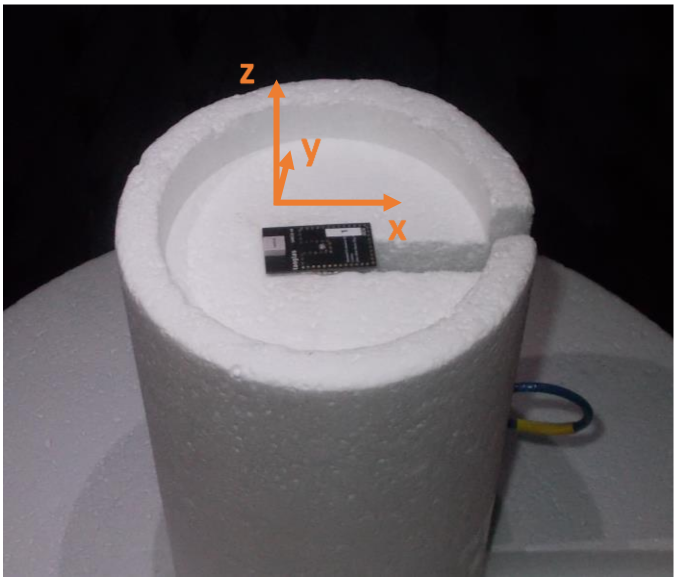


## 3.5 Average Gain

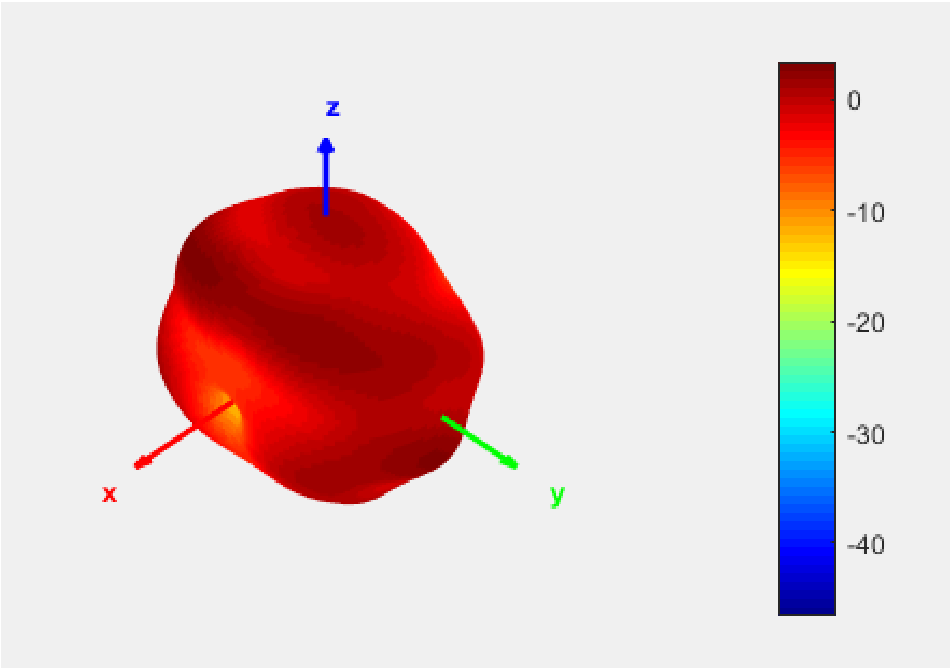


# 4. Radiation Patterns

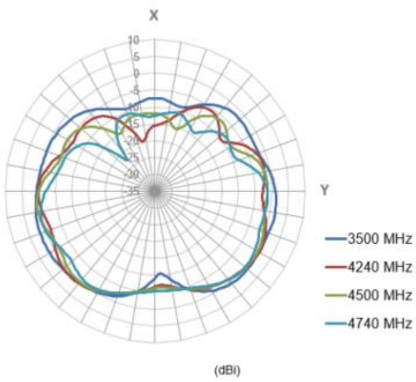
## 4.1 Test Setup

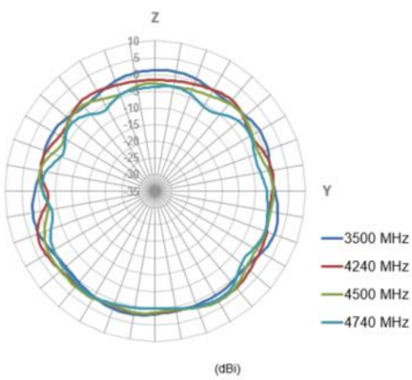


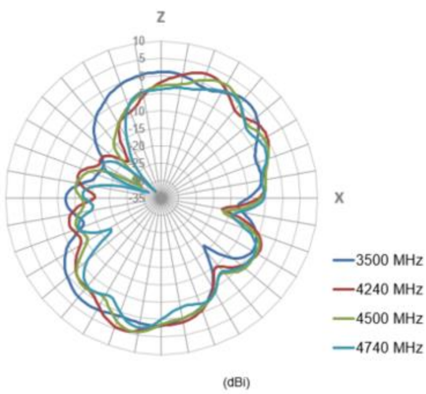
## 4.2 3.5GHz 3D and 2D Radiation Patterns



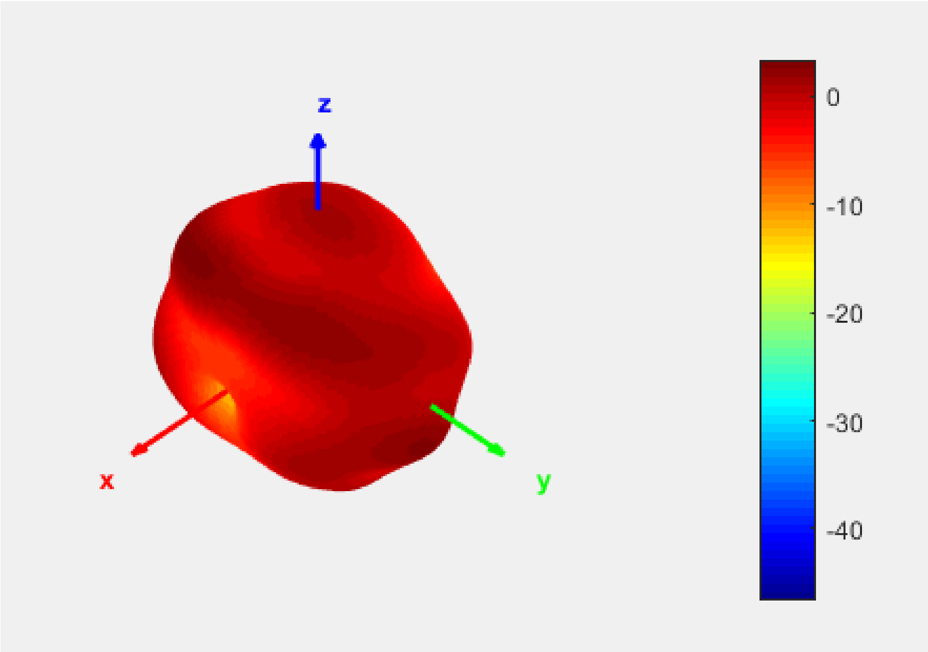

| XY Plane | XZ Plane | YZ Plane |
| --- | --- | --- |



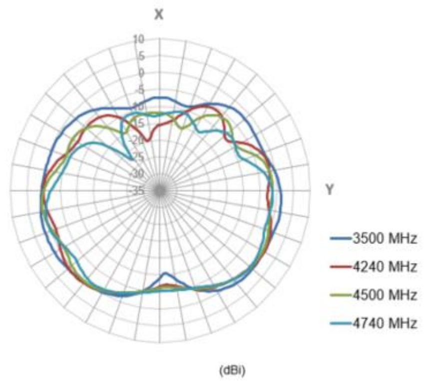



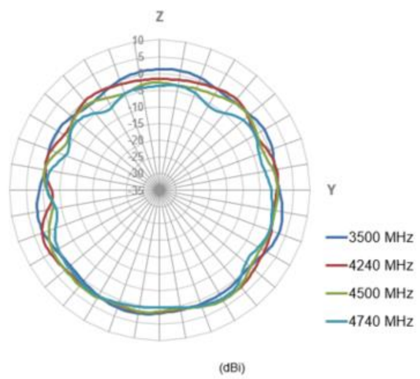



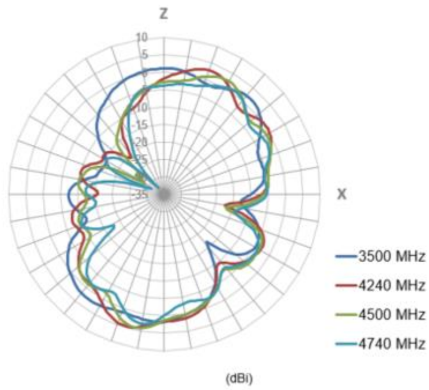
## 4GHz



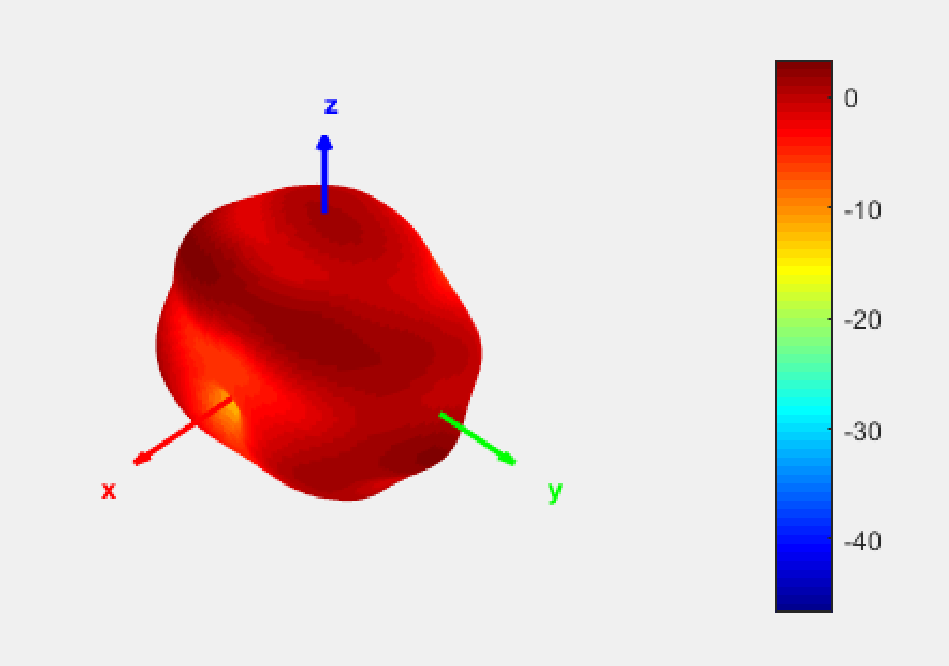

| XY Plane | XZ Plane | YZ Plane |
|---|---|---|



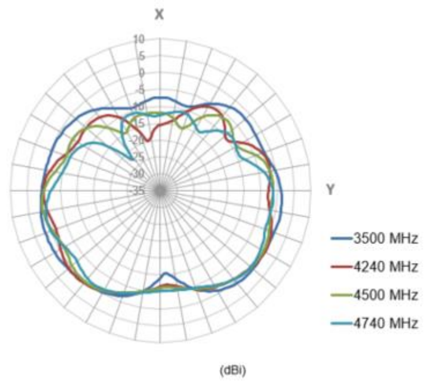



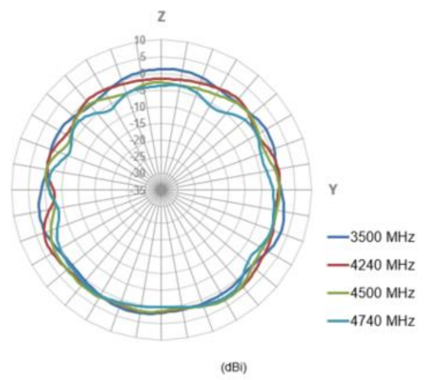



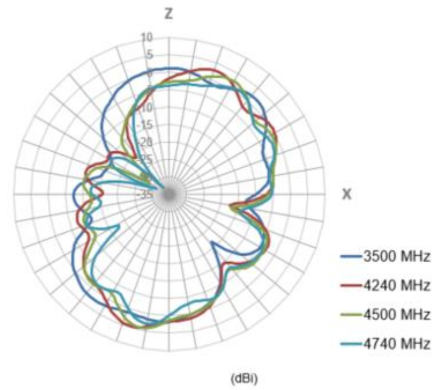
## 4.74GHz




| XY Plane | XZ Plane | YZ Plane |
|---|---|---|



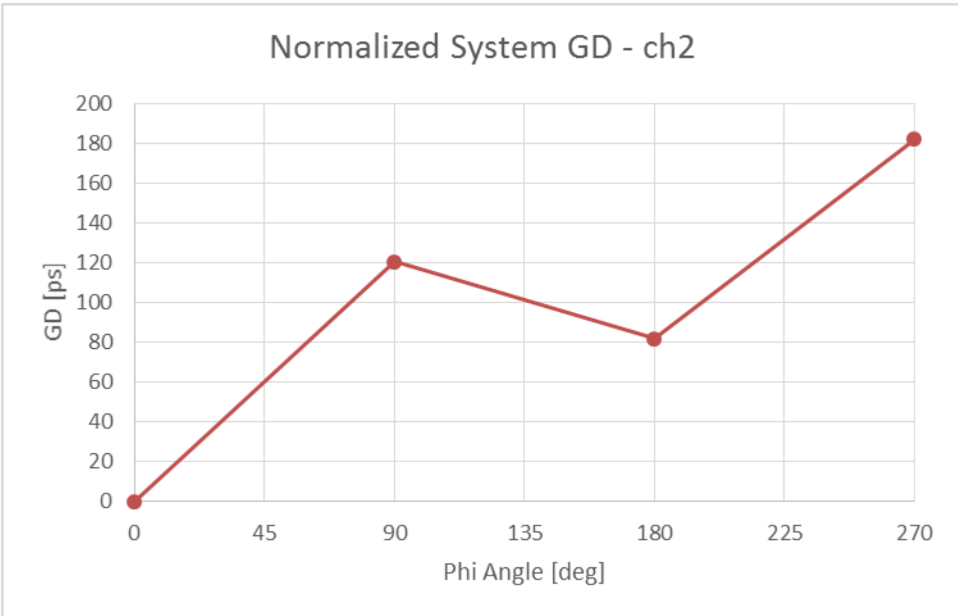



## 4.3 Group Delay vs. Angle (YZ Plane) in UWB channel 2 (4 GHz)

Total system group delay includes the propagation delay in the transmitting antenna (Tx), propagation channel (Ch), and receiving antenna (Rx). Group delay can vary across directions of propagation (theta or phi angles). This group delay variation over theta or phi represents output signal distortions and should be known and minimized if possible.

The measured and normalized group delay value for UWC.40 is presented below for 4 principal angles in the YZ plane, measured at 4 GHz (UWB channel 2). A group delay variation of 100-150 ps is considered excellent for UWB system implementation. The observed group delay variation of 182 ps for UWC.40 will provide very good performance.

The measurements were performed using the EVK1000 Decawave kit with the UWC.40 antenna as both the receiver and AUT device.

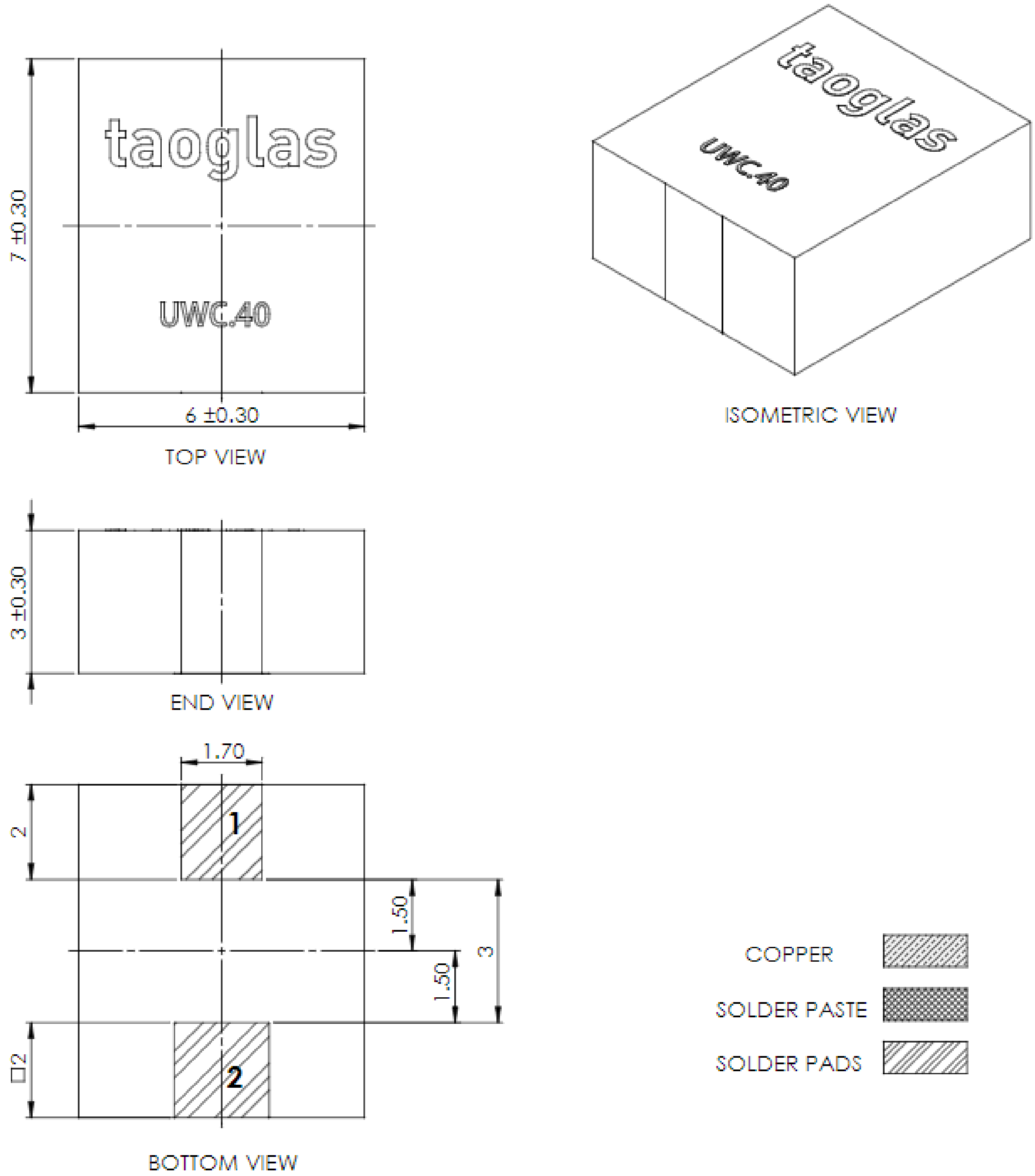


## 4.4 Fidelity Factor vs. Angle (YZ Plane) in UWB channel 2 (4 GHz)

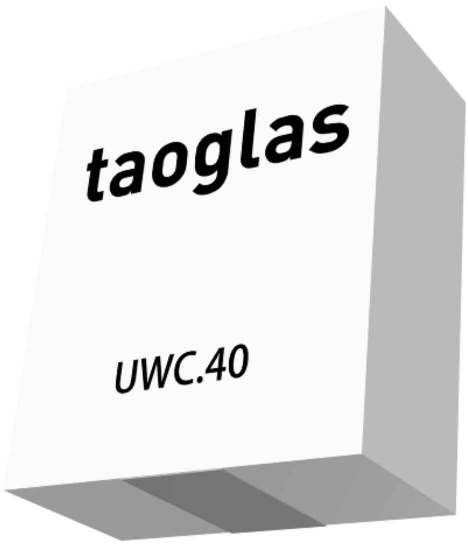
The fidelity is above 0.9 (benchmark value) for all angles, therefore UWC.40 shows excellent performance.

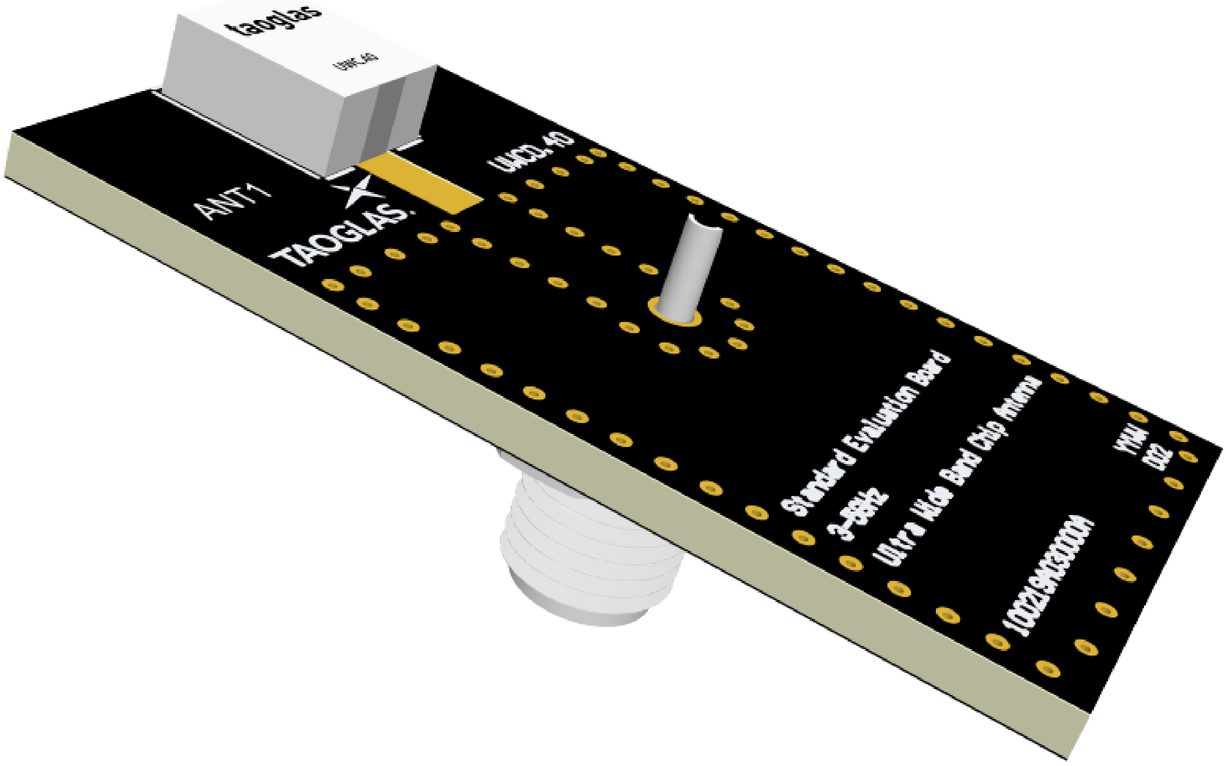
| UWC.40 Fidelity Factor | |
|---|---|
| Angle | Fidelity Factor |
| 0° | 0.99 |
| 45° | 0.99 |
| 90° | 0.99 |
| 135° | 0.99 |
| 180° | 0.99 |

# 5. Mechanical Drawing (Units: mm)



# 6. Antenna Integration Guide

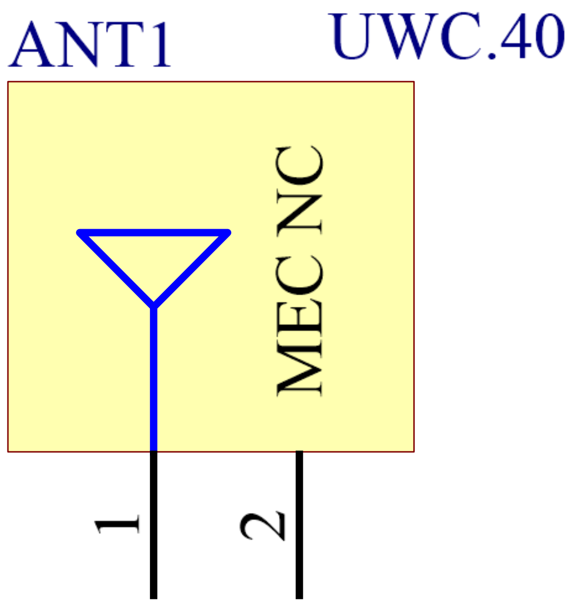


## 6.1 Schematic Symbol and Pin Definition

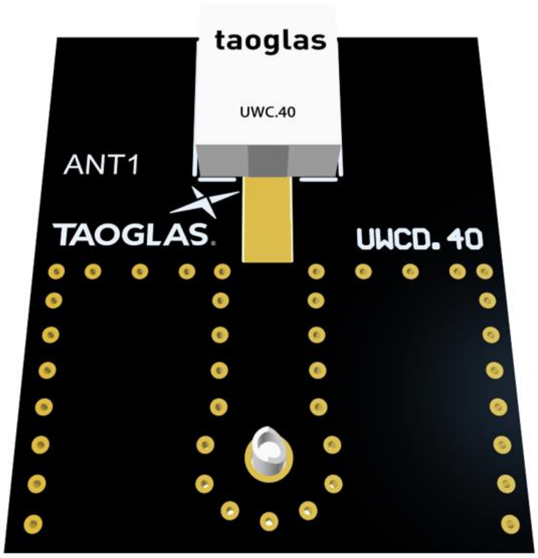
The circuit symbol for the antenna is shown below. The antenna has 4 pins with only one pins (Pin 1) as functional. Pin 2 is for mechanical strength.

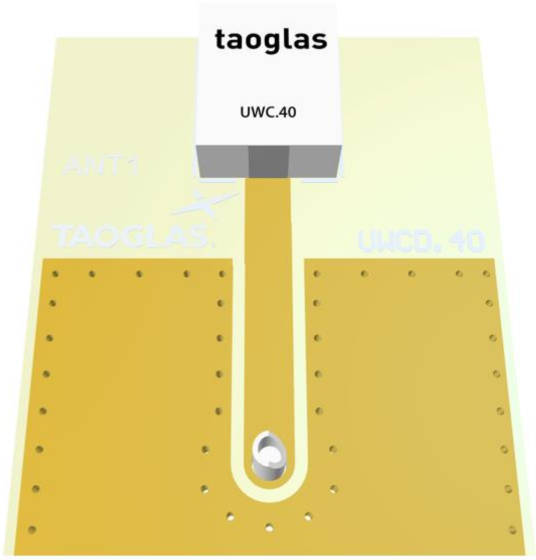
| Pin | Description |
|---|---|
| 1 | RF Feed |
| 2 | Mechanical, Not Connected |



## 6.2 Antenna Integration

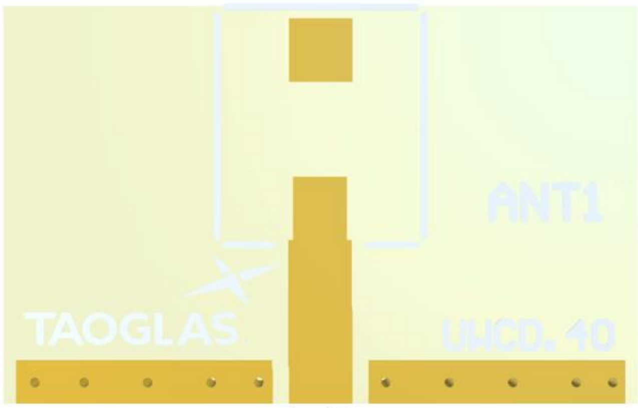
Whatever the size of the PCB, the antenna should ideally be placed on the PCB's shortest side, to take advantage of the ground plane.




## 6.3 PCB Layout

The footprint and clearance on the PCB must meet the antenna specification. An example of the PCB layout shows the antenna footprint with clearance.

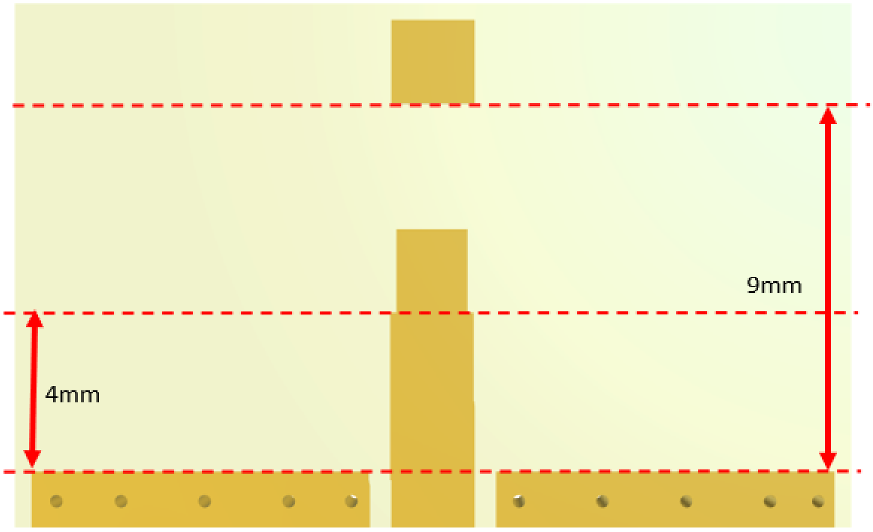


Topside

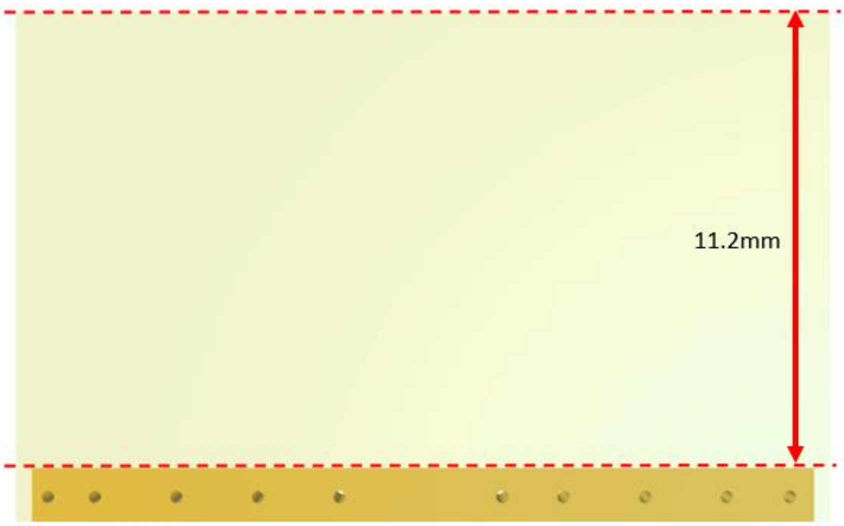

Bottom Side

## 6.4 PCB Keep Out

Below shows the antenna footprint and clearance through ALL layers on the PCB. Only the antenna pads and connections to feed and GND are present within this clearance area (marked RED). The clearance area extends to 4mm from the antenna mechanical pads to the ground area. This clearance area includes the bottom side and ALL internal layers on the PCB.

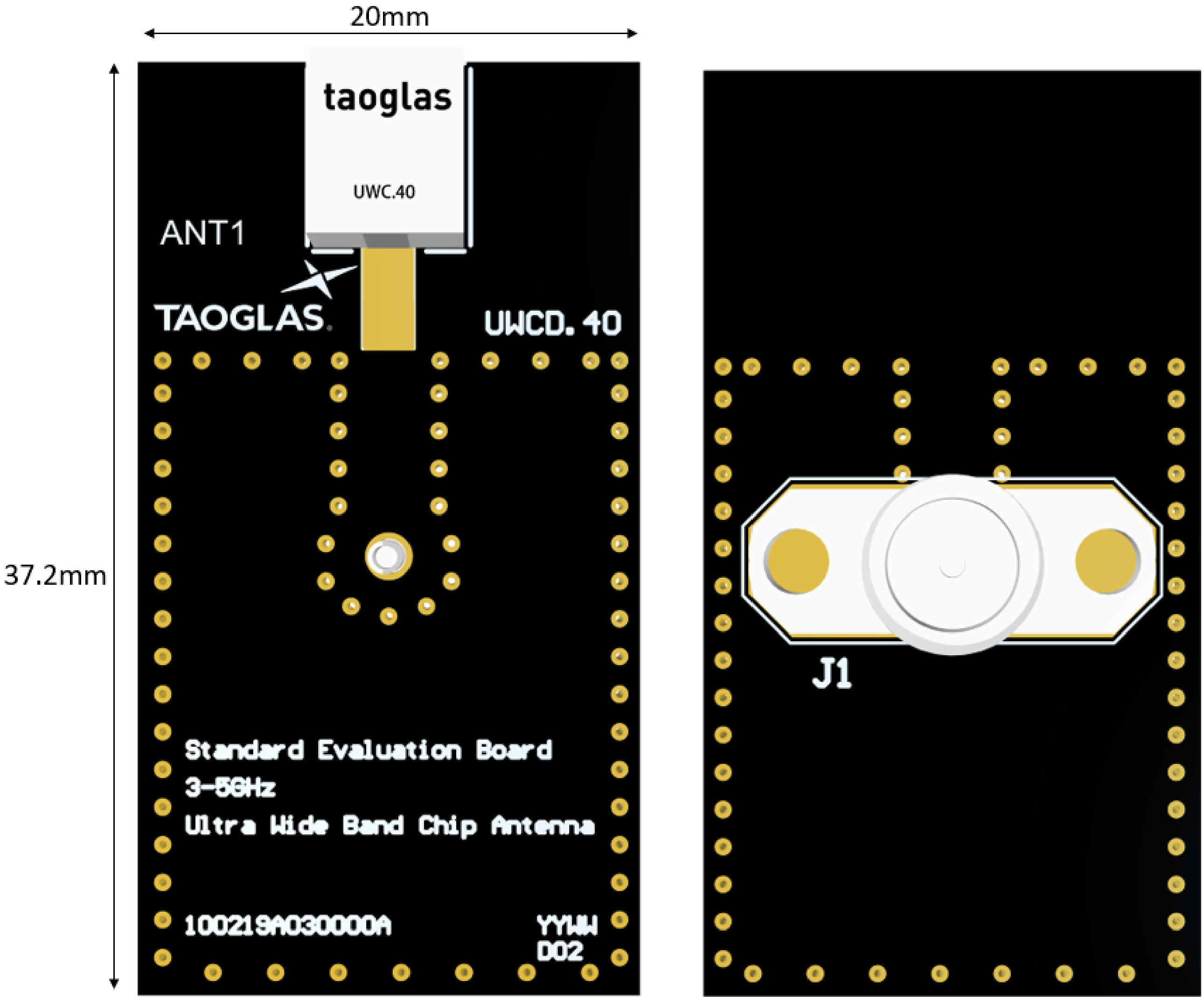


Top Side



Bottom Side

## 6.5 Evaluation Board

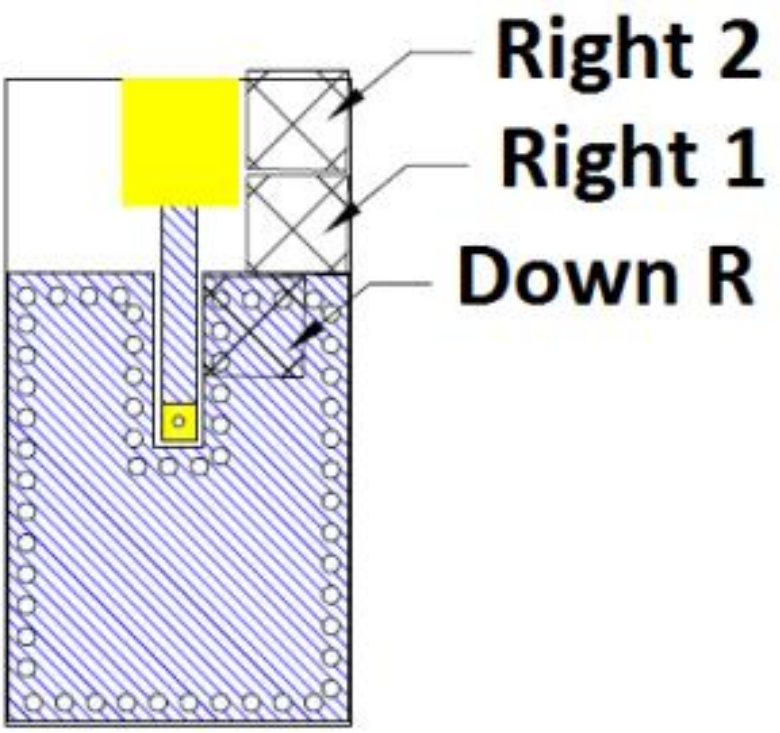



Topside Bottom Side

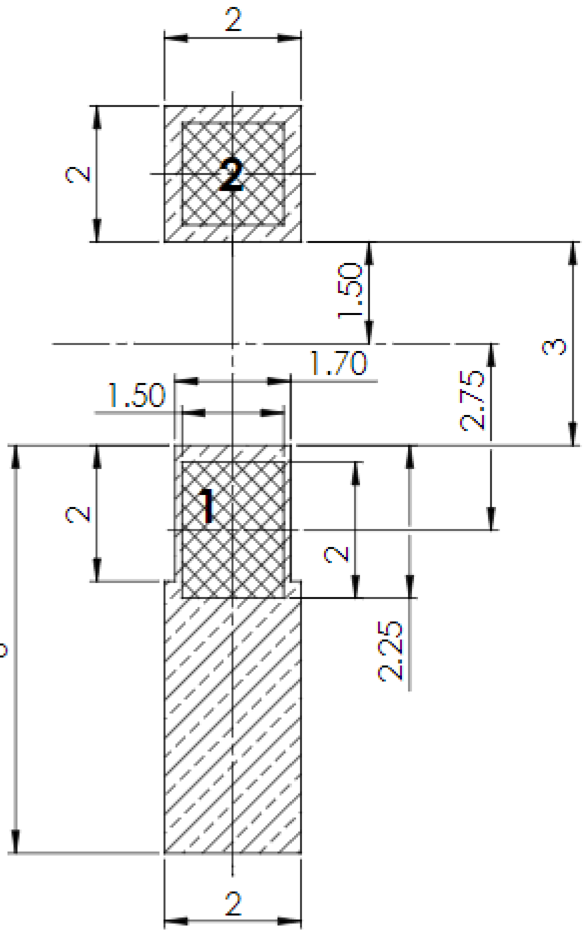
## 6.6 Evaluation Board Ground Plane Length

## 6.7 Clearance Study

A metal clearance study is also performed. A 5*5*2mm metal component is placed on different locations around the UWC.40 antenna. The figure below shows the right-side positions. Equivalent left-side positions were also tested. The smallest distance was 1 mm between the antenna and the metal component.
The results show that proximity of components on the left and right will slightly influence antenna impedance matching.
Note that the tests here specifically measure the effects of metal components unconnected to ground on the performance of UWC.40. This is not equivalent to a metal ground plane extension on the antenna sides, which should not be done.

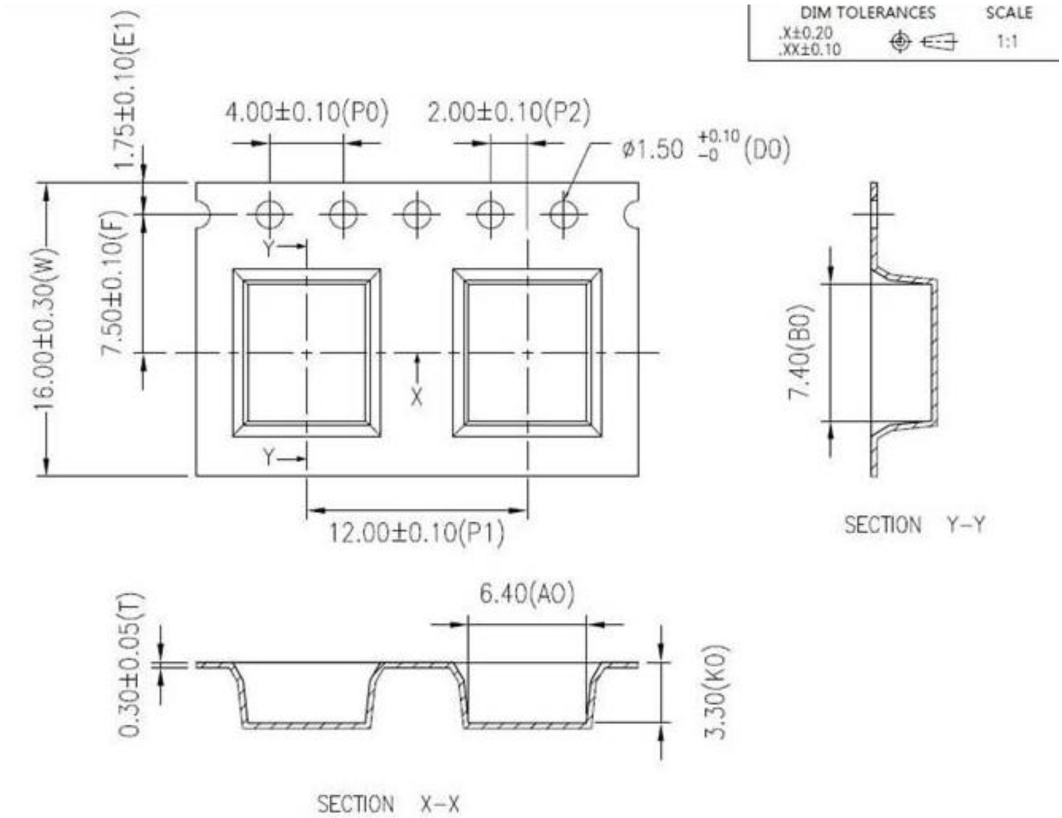


## 6.8 Footprint

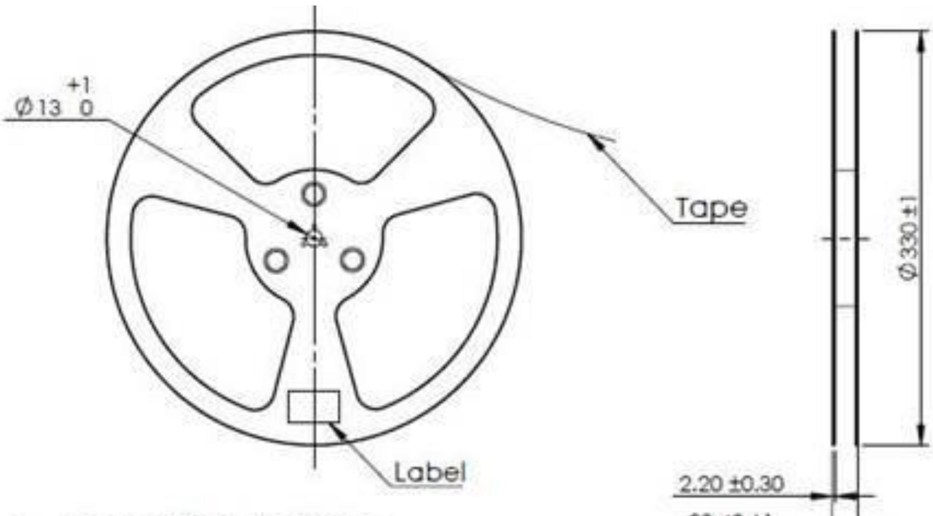



| PIN: | DESCRIPTION: |
|---|---|
| 1 | Feed (50 ohm) |
| 2 | NC |

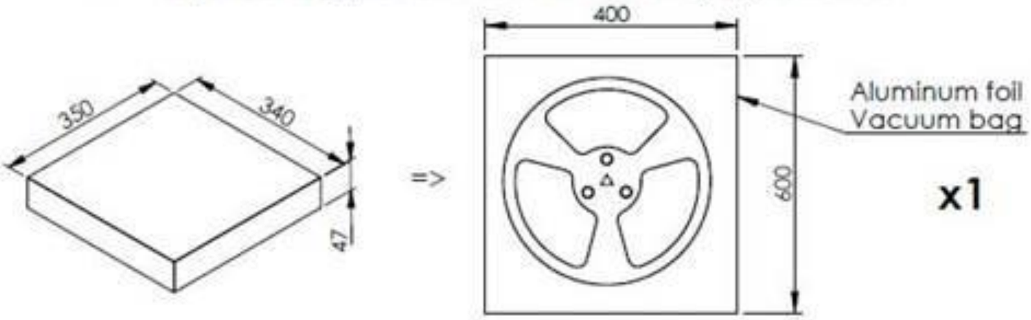
# 7. Packaging



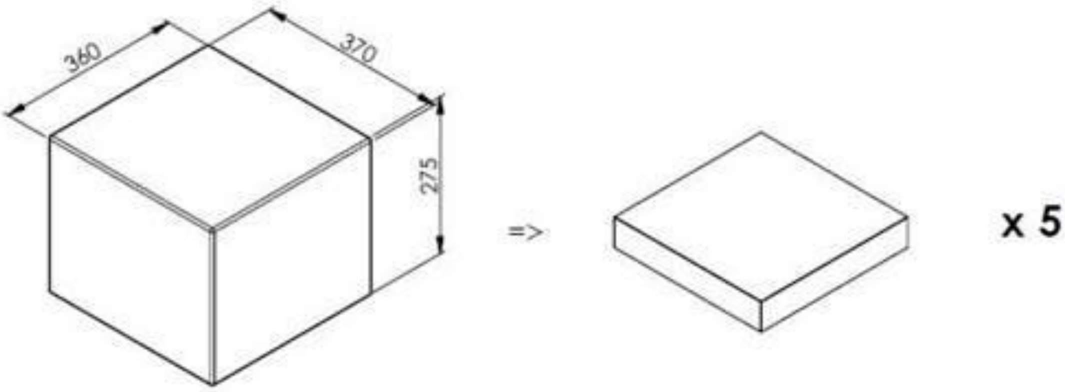

1. Part conforms to EIA–481–D standards.
2. All dimensions in millimetres unless otherwise stated.
3. Material : Conductive polystyrene.
4. Packing length for 22" reel : 57.0 Meters. (1:3)
5. Component packing to 13" reel : 1,000 pcs.




- Pieces/tape : 1,000 pcs
- Tape drawing please access the second page to review




- Carton inside(350 x 340 x 47) contained **1 reel** (1,000 pcs)



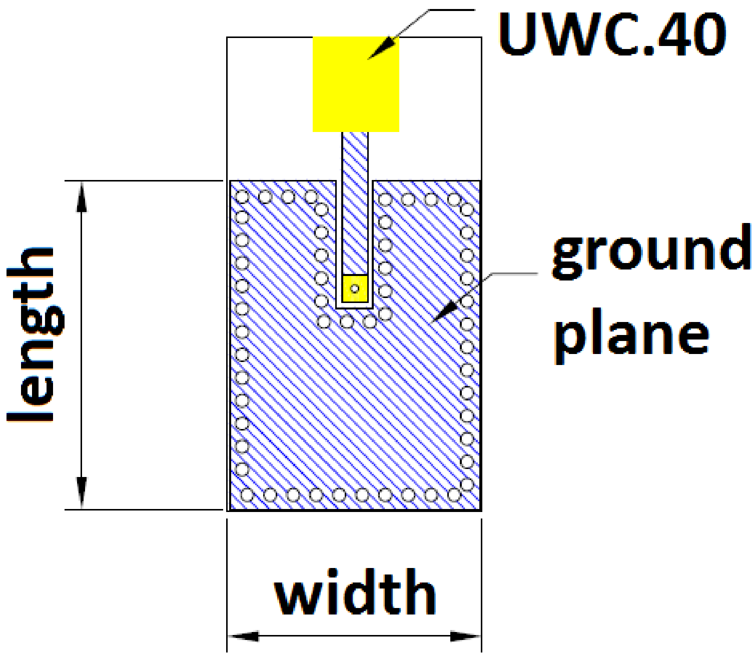

One carton box contained 5 box =>
5000 Units/Carton-Outside - Dimension 370x360x275

# 8. Application Notes

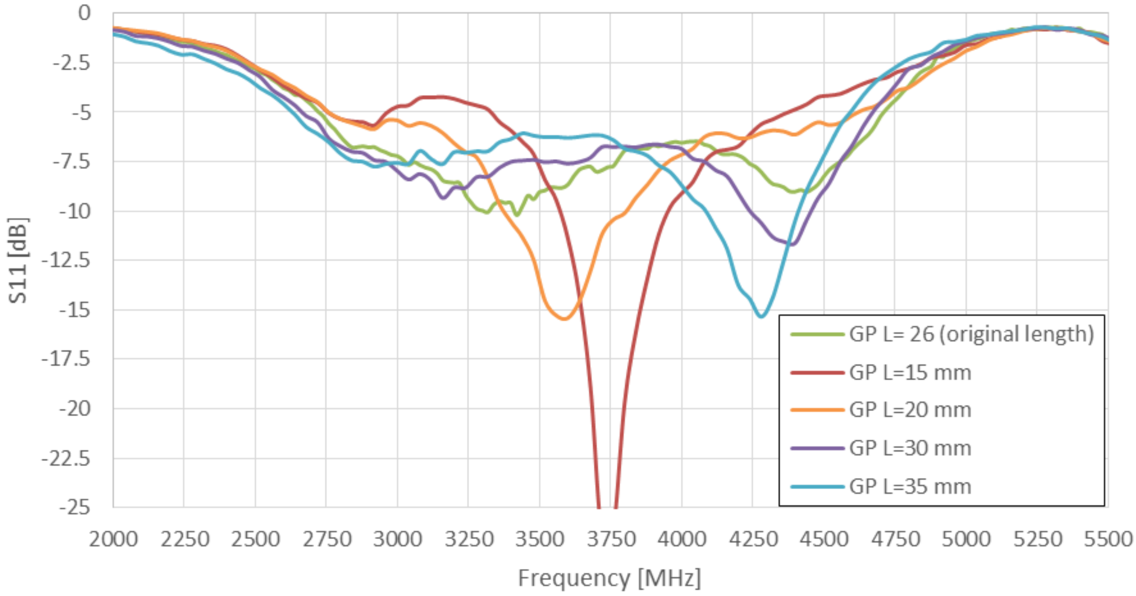
## 8.1 Ground Plane Size

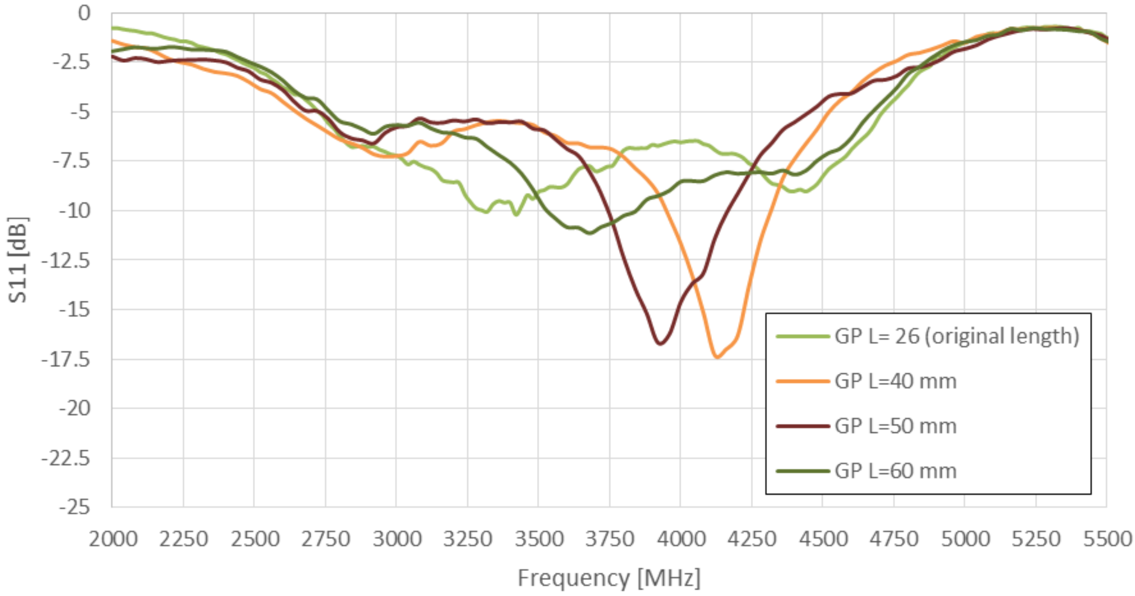
The influence of ground plane length and width on UWC.40 performance is presented below. Increasing the ground plane length does not have a significant impact on efficiency but does affect return loss (S11). Ground plane lengths of less than 26mm are not recommended.

Increasing the ground plane width affects both S11 and efficiency in the high frequency region. Ground plane width greater than 40 mm is not recommended if channel 2 will be used.

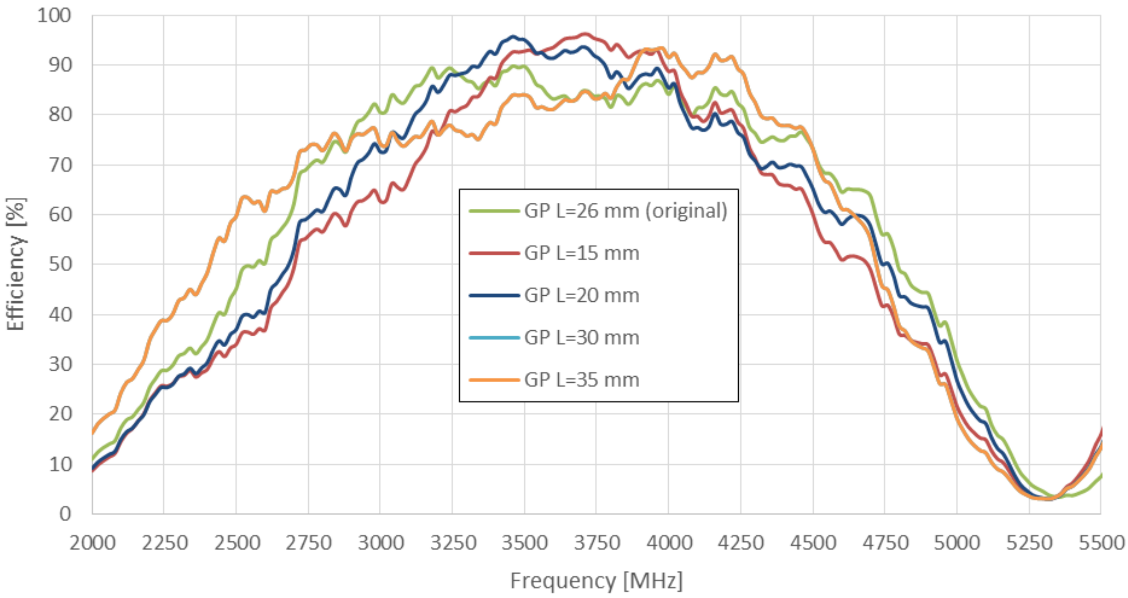


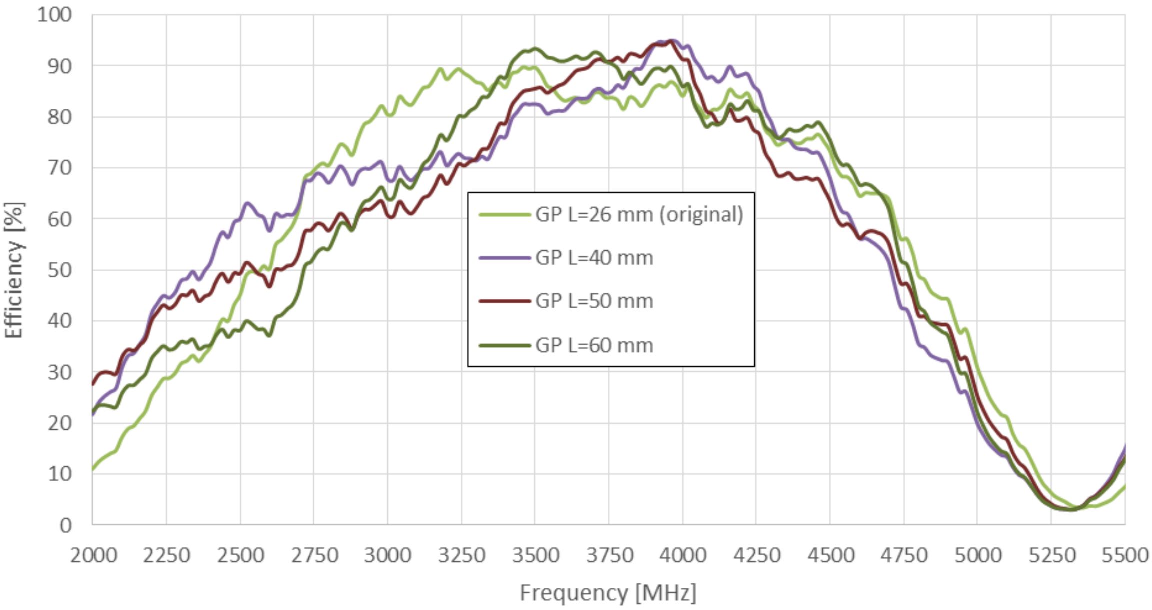
## 8.2 Return Loss for Ground Plane Length Variation



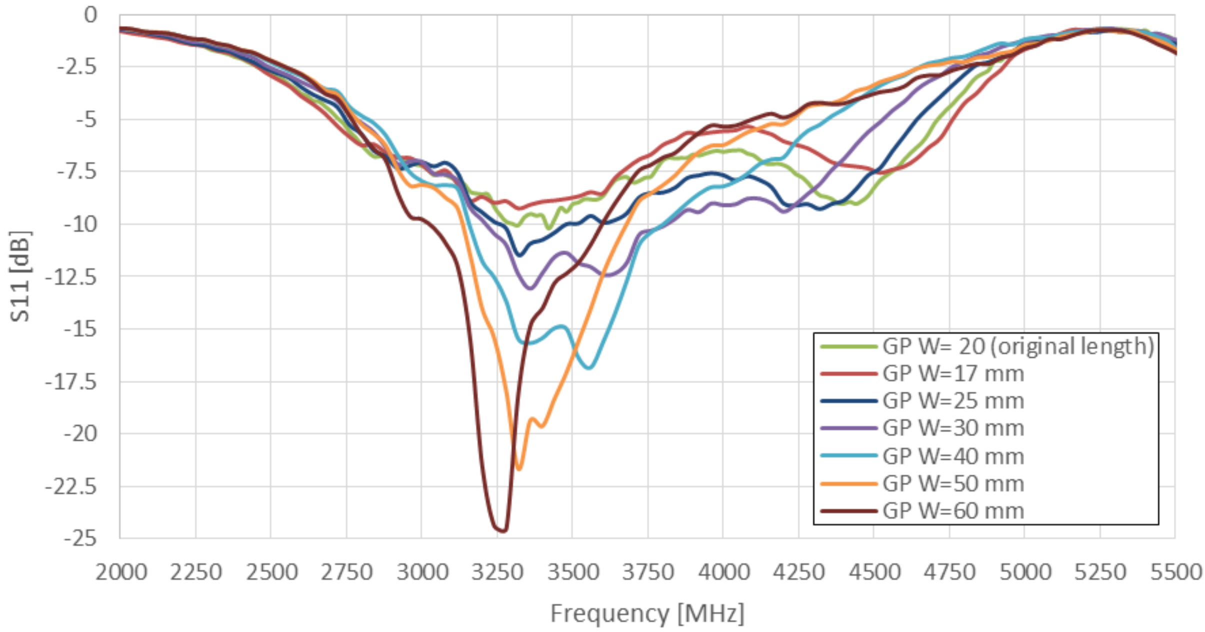



## 8.3 Efficiency for ground plane length Variation

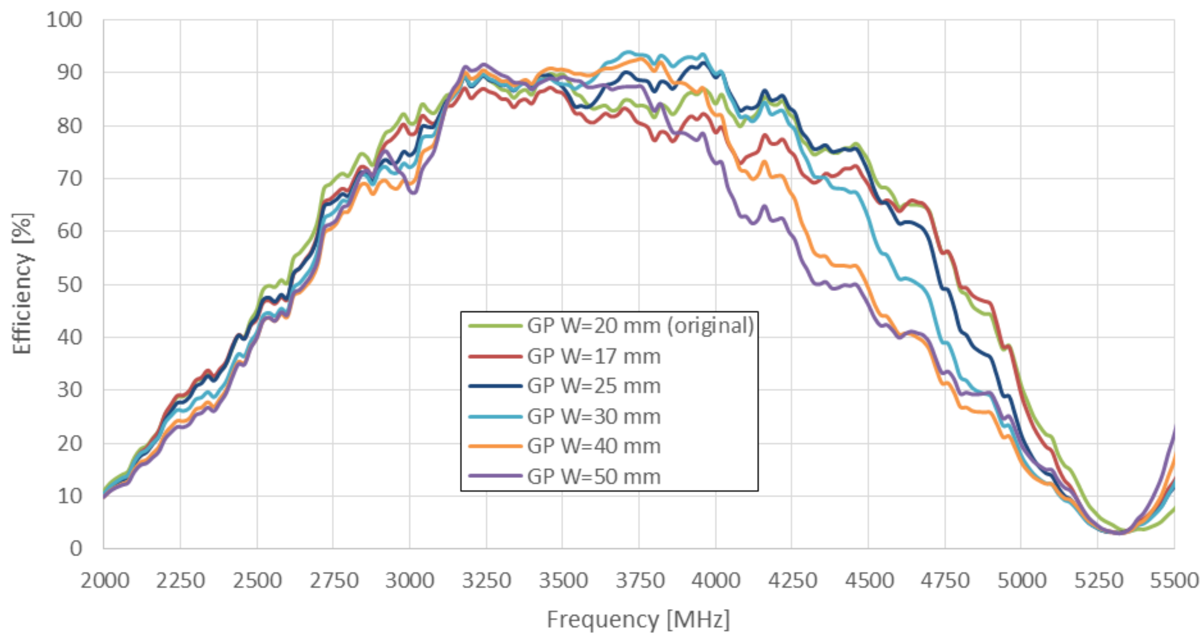


## 8.4 Return Loss for Ground Plane Width Variation




## 8.5 Efficiency for Ground Plane Width Variation



## 8.6 Clearance Study

A metal clearance study is also performed. A 5*5*2mm metal component is placed on different locations around the UWC.40 antenna. Figure 13 shows the right-side positions. Equivalent left-side positions were also tested. The smallest distance was 1 mm between the antenna and the metal component.

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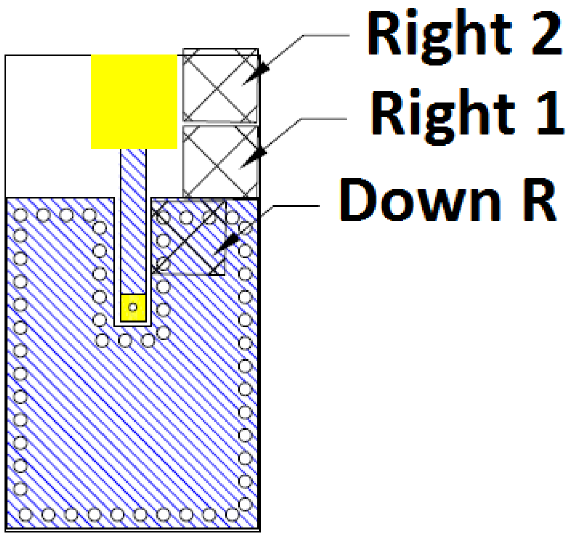
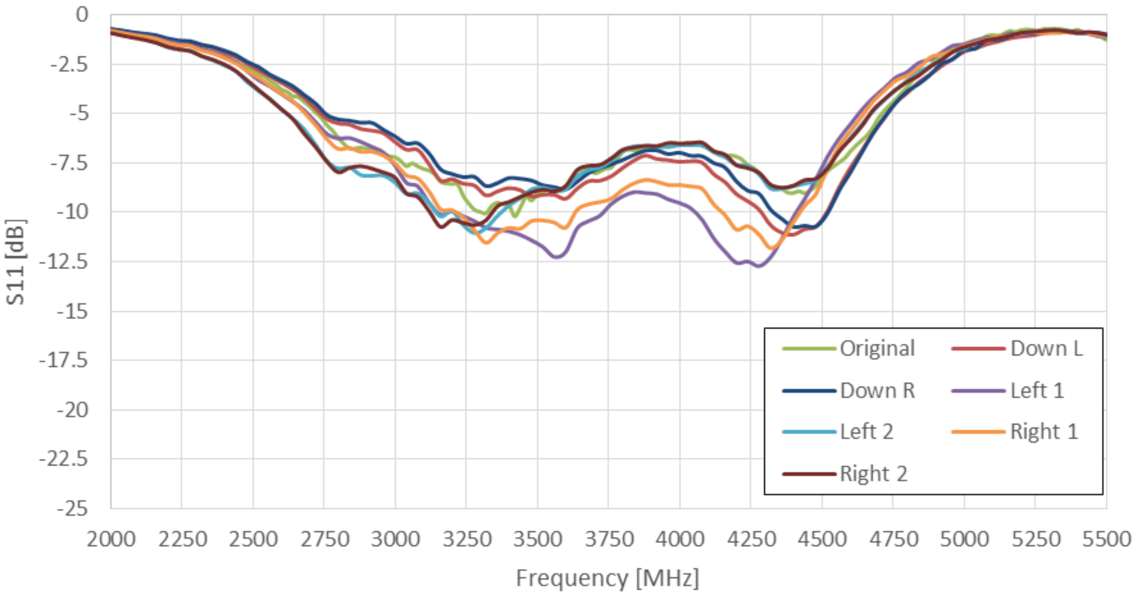
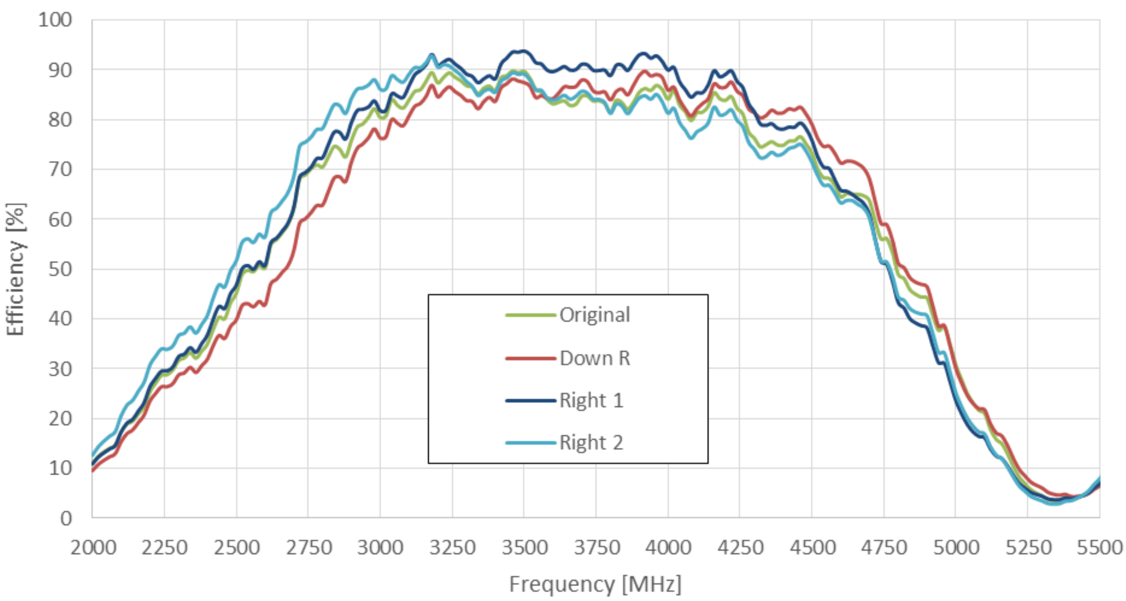



Clearance study – metal component locations

## 8.7 Return Loss for Clearance Study




## 8.8 Efficiency for Clearance Study



## Changelog for the datasheet

**SPE-18-8-059 – UWC.40**

| **Revision: D (Current Version)** | |
|---|---|
| Date: | 2021-10-04 |
| Changes: | Added MSL level to spec table |
| Changes Made by: | Gary West |

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**Previous Revisions**

| **Revision: C** | |
|---|---|
| Date: | 2021-06-22 |
| Changes: | Template updated and addition of antenna integration guide |
| Changes Made by: | Gary West |

| **Revision: B** | |
|---|---|
| Date: | 2019-06-11 |
| Changes: | Updated Drawing to match EC-19-8-068 |
| Changes Made by: | Jack Conroy |

| **Revision: A (Original First Release)** | |
|---|---|
| Date: | 2018-05-29 |
| Notes: | First Release |
| Author: | Andela Zaric |

www.taoglas.com