

# Product Datasheet AC94541

## Multiband LTE Antenna for Smart Utility Applications

---

October 2023

Rev. 4.0



# Revision History

Date	Rev.	Summary of Changes
September 2022	1.0	First version of Preliminary Product Datasheet
March 2023	2.0	Efficiency and VSWR values updated Mounting guidelines added
July 2023	3.0	Efficiency table updated to account for measurement tolerances
October 2023	4.0	Efficiency graphs updated

# 1 Multiband LTE Antenna

## 1.1 Scope and purpose

This document describes the AC94541 antenna and its specifications. It is intended for customers deploying infrastructure for smart utility applications:

- Smart Utility infrastructure
- High-, medium- and low-voltage substations monitoring
- Asset management, attack protection and self-healing grids
- Power plants and industry

## 1.2 AC94541 features

- Compact terminal antenna designed for indoor and outdoor conditions
- Excellent Multiband coverage: 410-470MHz, 600-960MHz and 1700-3800MHz
- Optimized performance at 410MHz to 470MHz
  - VSWR  $\leq$  2.0 :1
  - Efficiency up to 90%
  - Peak Gain  $\leq$  2.9dBi
- Performance robust against cable length variations
- Performance robust against mounting on conductive and non-conductive surfaces
- Weatherized assembly for outdoor installation
  - Antenna rated IP67
  - UV protection
  - Impact resistance rated IK10
- RoHS and REACH compliant

## 1.3 Antenna specifications

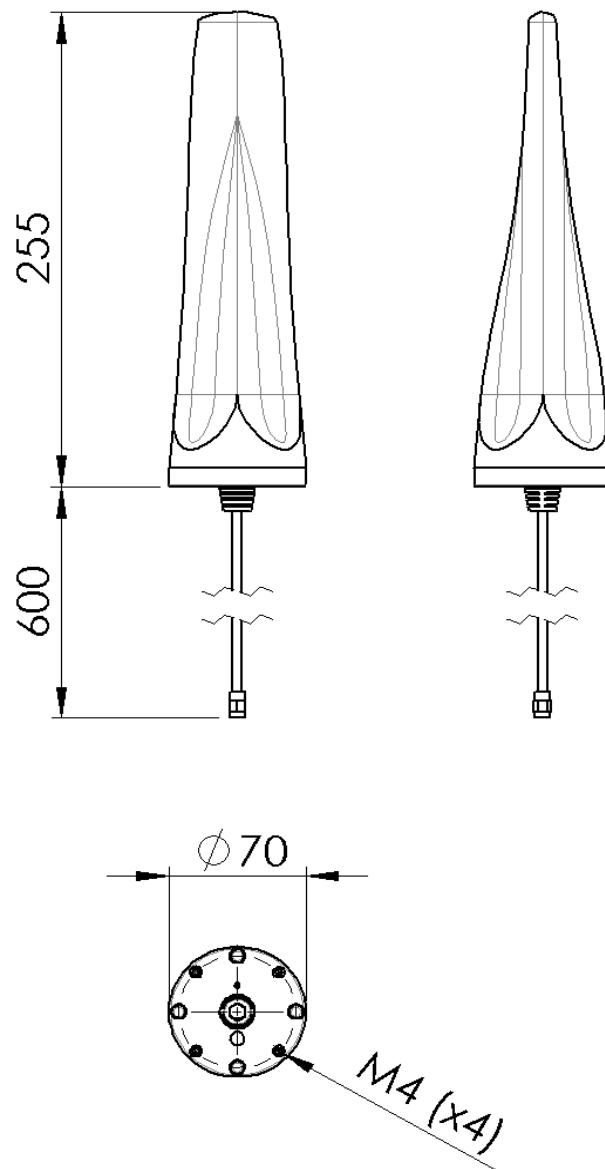
**Table 1: AC94541 RF specifications**

<b>Electrical Specifications*</b>			
Frequency Range (MHz)	410 – 470	650 – 960	1700 – 2700
VSWR	≤ 1.9:1	≤ 2.3:1	≤ 2.2:1
Typical Efficiency (%)	77 - 90	64 - 82	66 - 84
Peak Realized Gain (dBi)	< 2.9	< 4.8	< 4.7
Reference Impedance (Ω)	50		
Radiation Pattern	Quasi-omnidirectional		
Polarization	Linear		
Maximum Input Power (W)	45		
<i>* Measured with a 60cm cable</i>			

**Table 2: AC94541 physical and environmental specifications**

<b>Physical Specifications</b>	
Dimensions W x L x H (mm)	70 x 70 x 255
Weight (kg)	0.2
Cable Type, Length	CFD200, 60cm, 2m or 5m
Connector Type	SMA male
Materials	ASA
Housing Color	Gray

<b>Environmental Specifications</b>	
Operating Temperature	-40°C to +85°C
Operating relative humidity	Up to 98%
Storage Temperature	-40°C to +80°C
Storage Humidity	5% to 95% non-condensing
Material Compliance	RoHS-3
Ingress Protection	IP67
Impact Resistance	IK10
UV Protection	Yes
Enclosure flammability Rating	UL 94-HB
Salt Spray	MIL-STD 810F/ASTM B117



**Figure 1: AC94541 dimensions**

## 1.4 RF Performance Measurements: VSWR

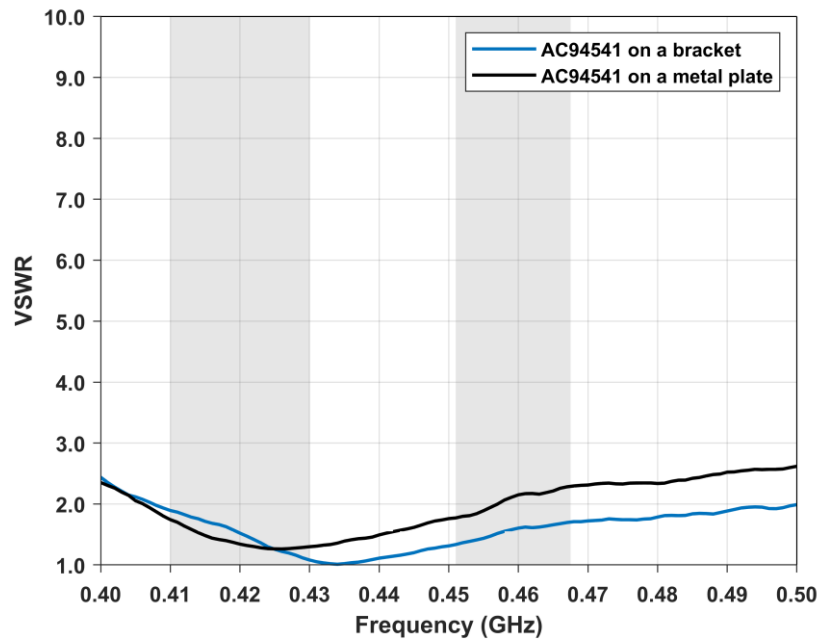


Figure 2: AC94541 VSWR measurements in the 400MHz – 500MHz range

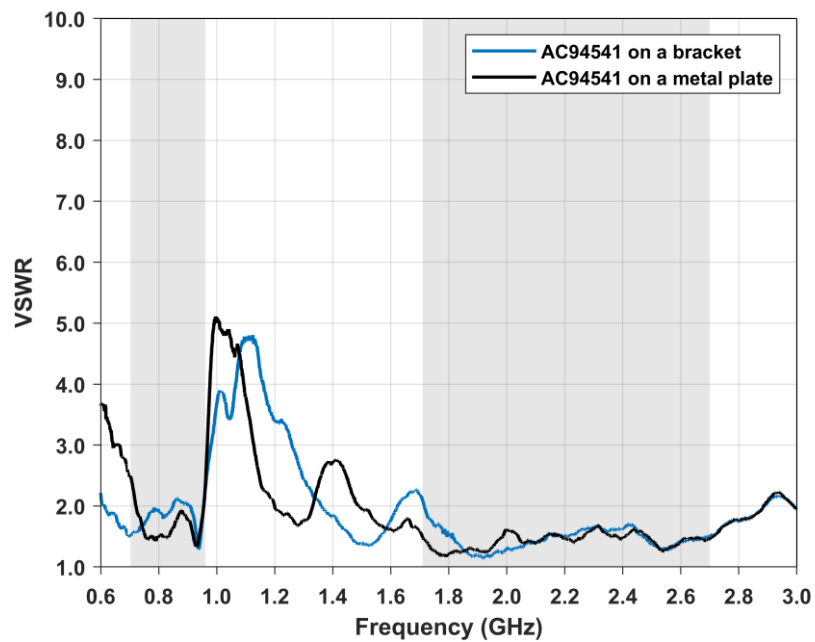


Figure 3: AC94541 VSWR measurements in the 600MHz – 3000MHz range

The Antenna Company International N.V. Proprietary & Confidential

## 1.5 RF Performance Measurements: Total Efficiency

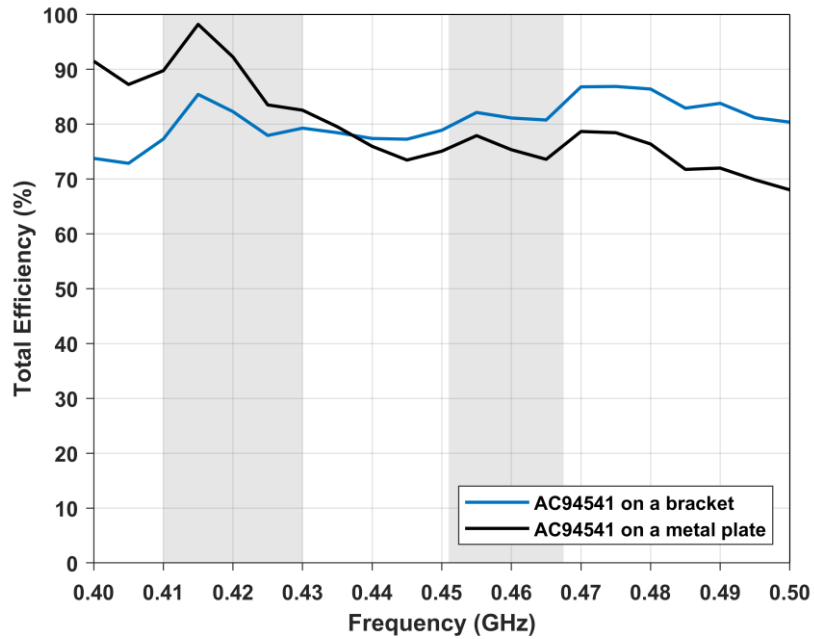


Figure 4: AC94541 efficiency measurements in the 400MHz – 500MHz range

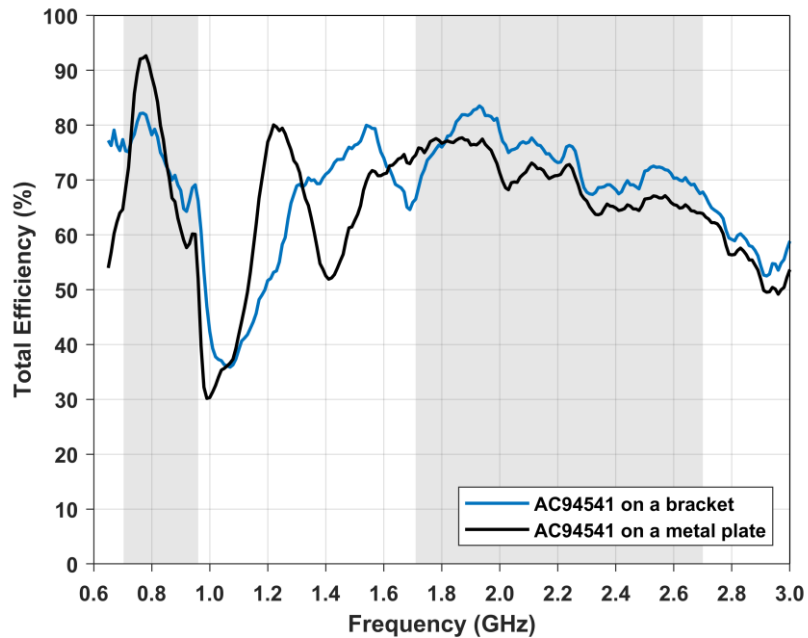
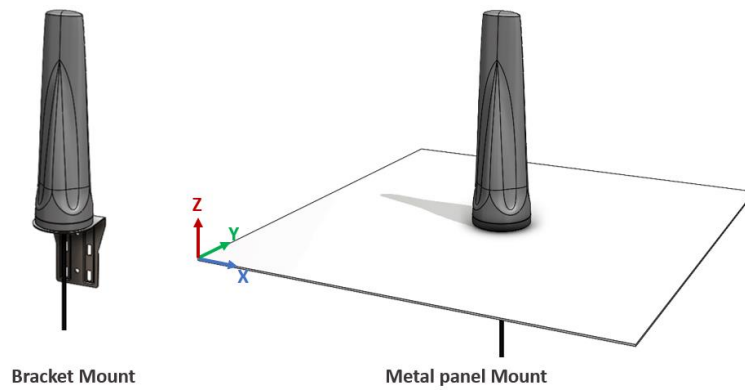


Figure 5: AC94541 efficiency measurements in the 650MHz – 3000MHz range

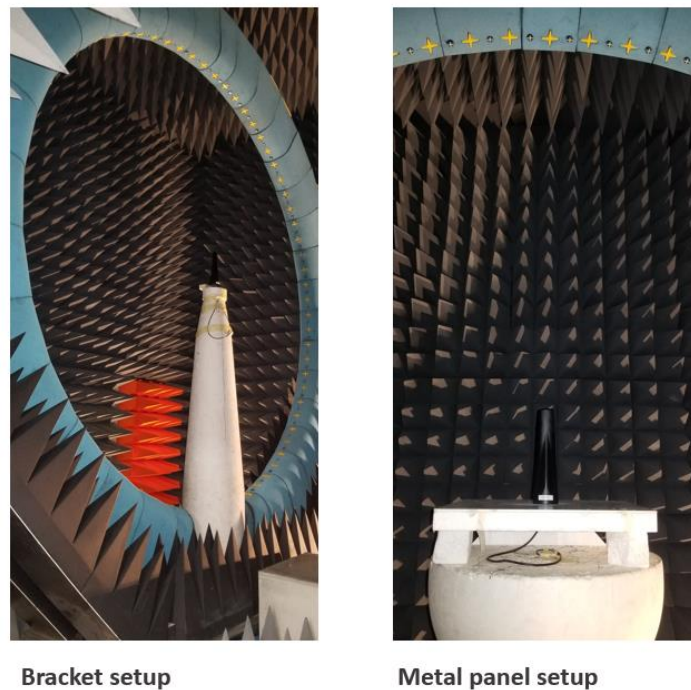
The Antenna Company International N.V. Proprietary & Confidential

## 1.6 Radiation pattern

The tables below show the typical measured radiation patterns of the AC94541 antenna in free space. The patterns are evaluated along the XZ, YZ and XY planes as illustrated in Figure 6 for bracket mount and panel mount. Pictures of the test-setup are depicted in Figure 7.



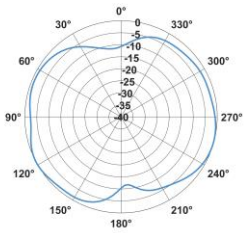
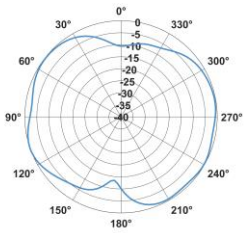
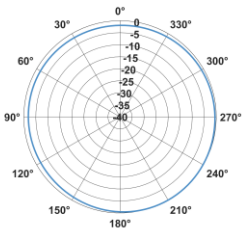
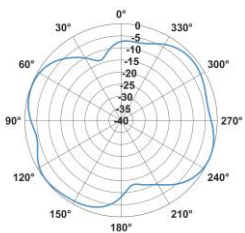
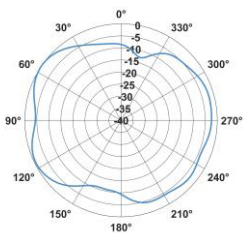
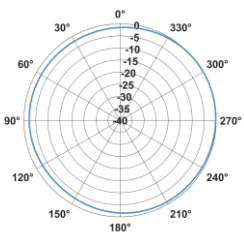
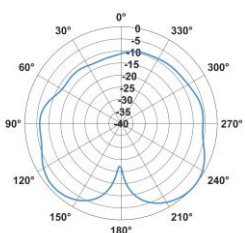
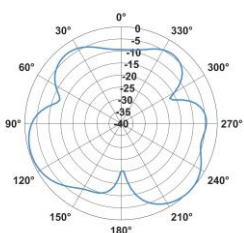
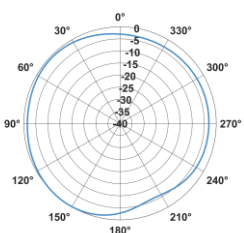
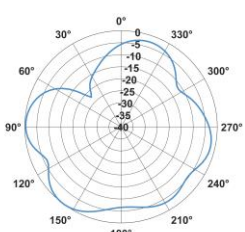
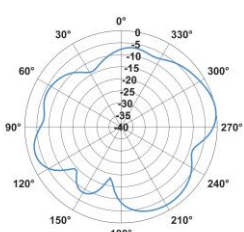
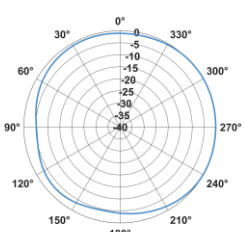
**Figure 6: X, Y and Z coordinates indicating the radiation pattern evaluation planes**

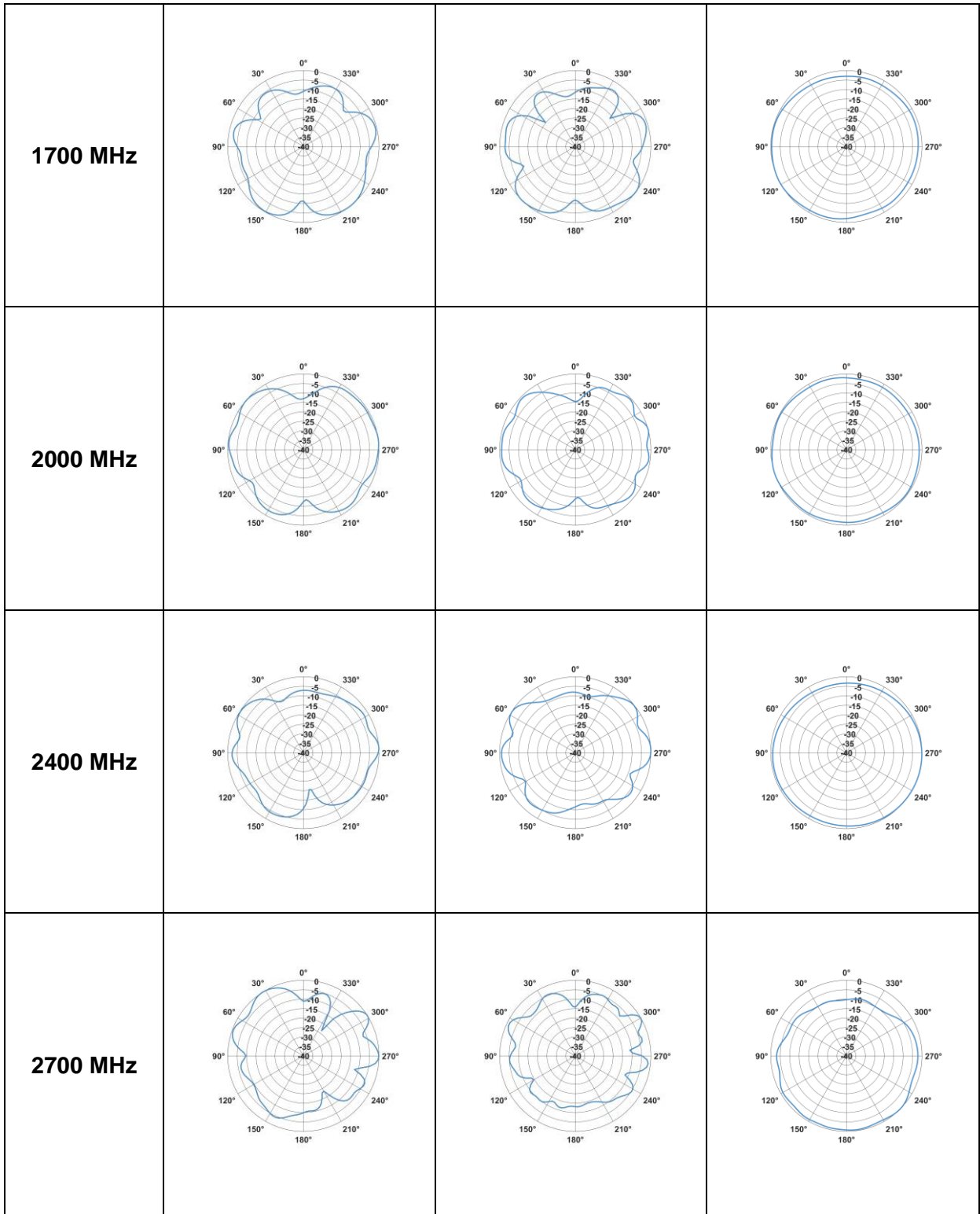


**Figure 7: Test chamber pictures of the radiation pattern measurement setups**



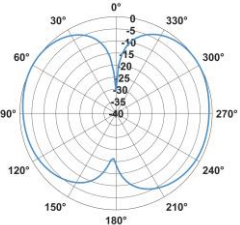
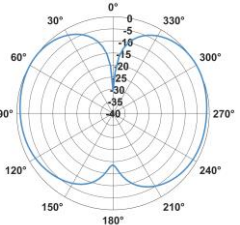
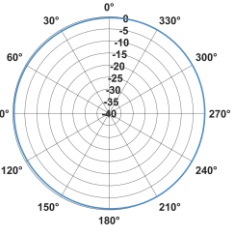
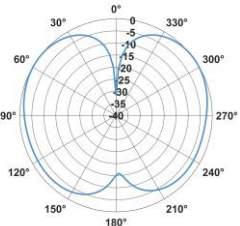
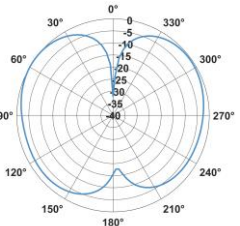
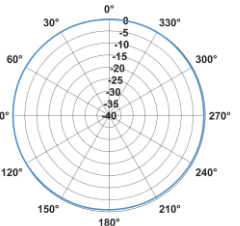
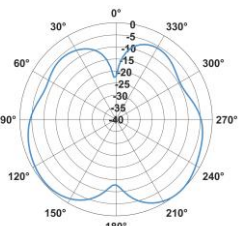
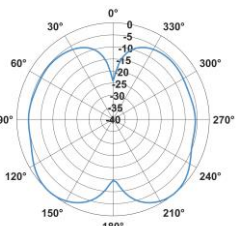
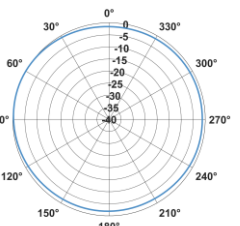
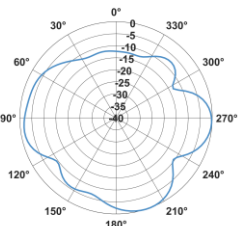
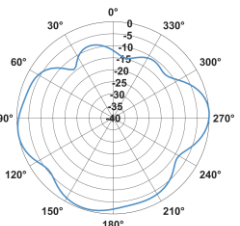
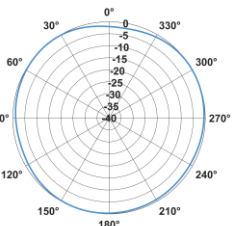
Table 3: Radiation patterns of AC94541 on a bracket

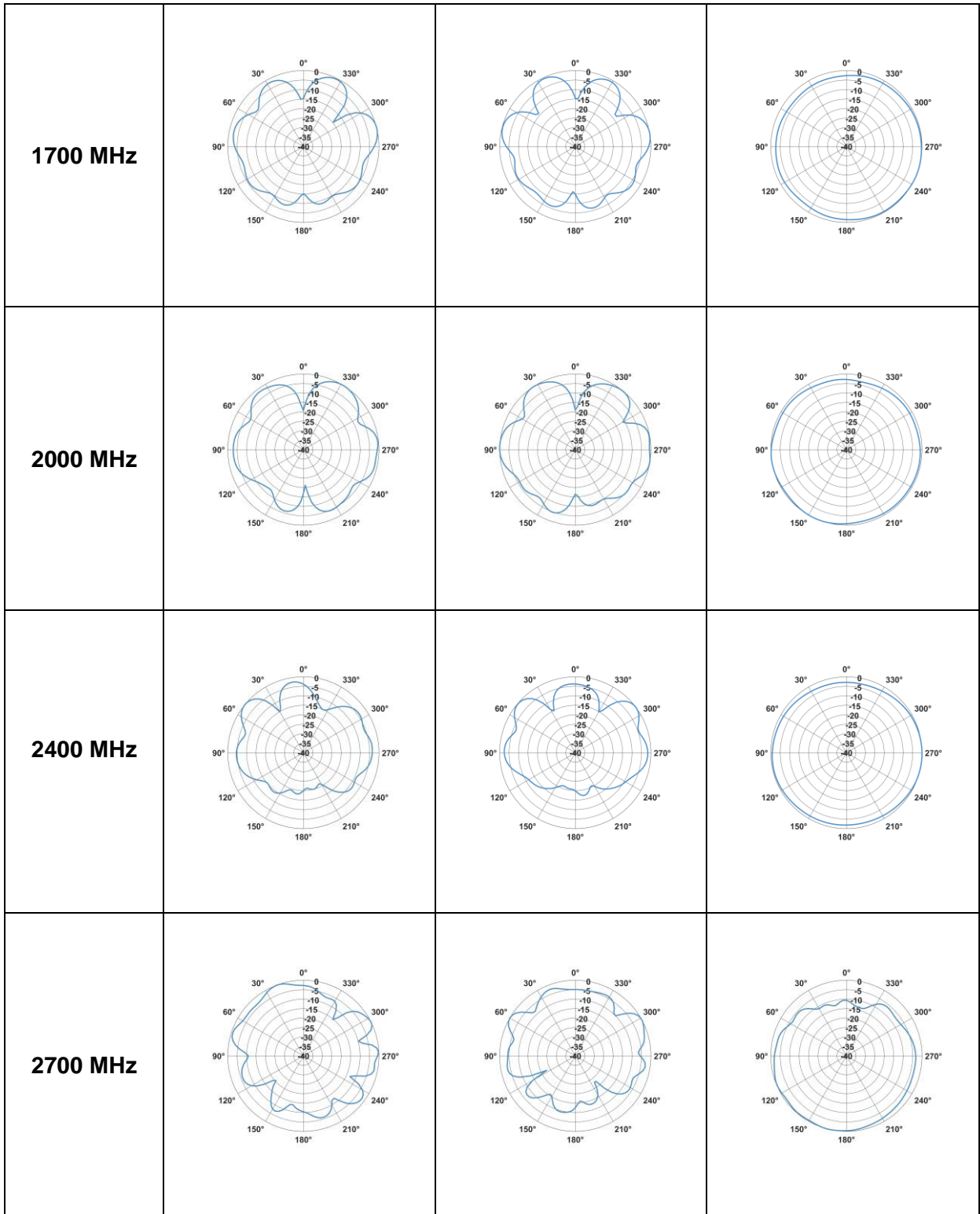
Frequencies (MHz)	$\varphi = 0^\circ$ [X,Z]	$\varphi = 90^\circ$ [Y,Z]	$\vartheta = 90^\circ$ [X,Y]
410 MHz			
450 MHz			
700 MHz			
900 MHz			



The Antenna Company International N.V. Proprietary & Confidential

Table 4: Radiation patterns of AC94541 on a metal surface

Frequencies (MHz)	$\varphi = 0^\circ$ [X,Z]	$\varphi = 90^\circ$ [Y,Z]	$\vartheta = 90^\circ$ [X,Y]
410 MHz			
450 MHz			
700 MHz			
900 MHz			



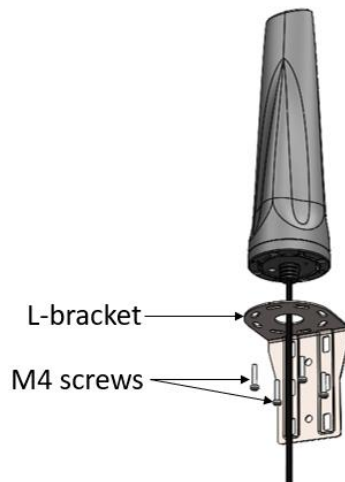
The Antenna Company International N.V. Proprietary & Confidential

## 2 Product Handling

### 2.1 Assembly Recommendations

The AC94541 can be mounted on a bracket with the supplied M4 screws (max length 12mm) and washers as illustrated in below figure.

The assembly consisting of the antenna and the bracket can be fixed in a (concrete) wall by means of the supplied wall knock-in screws. Alternatively, this assembly can be attached to a pole by means of the supplied pipe clamp as illustrated in Figure 9.



**Figure 8: AC94541 assembly recommendations**

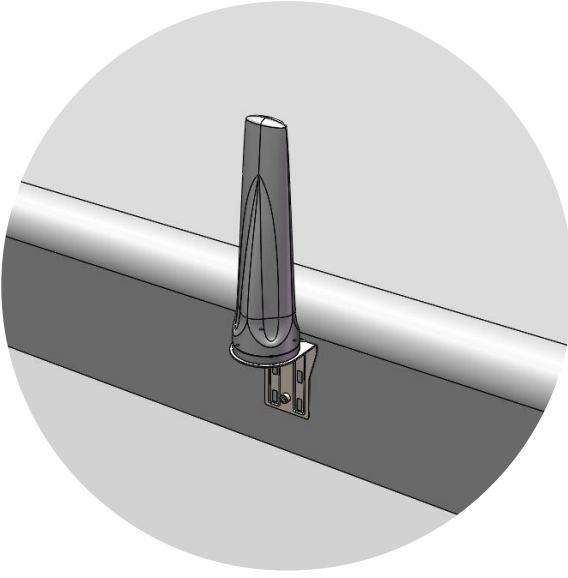
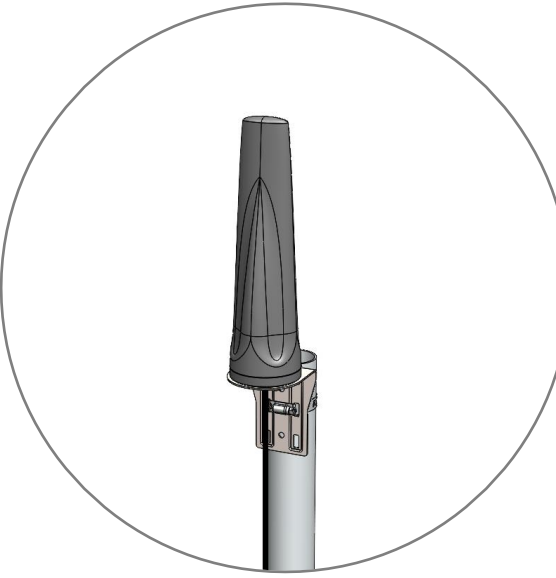
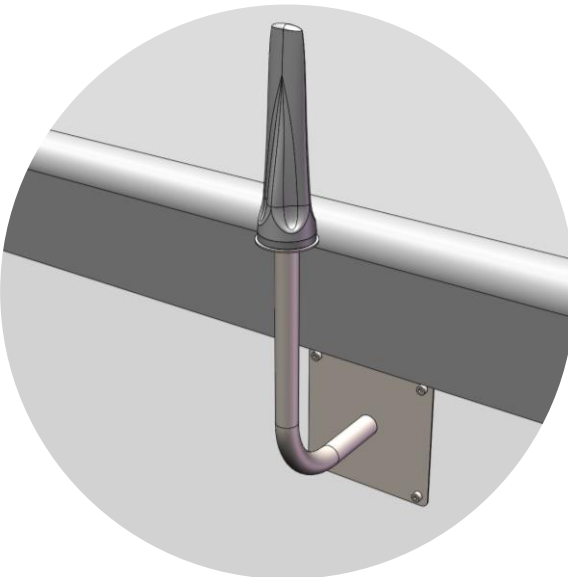
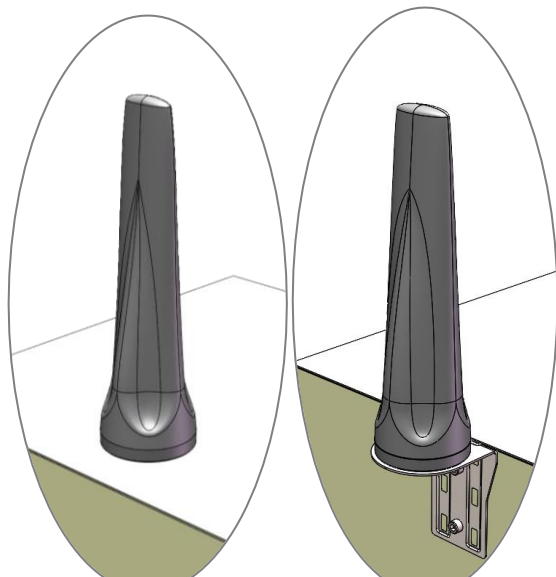


**Figure 9: Wall mounting illustration (left) and pole mounting configuration (right)**

## 2.2 Mounting Options

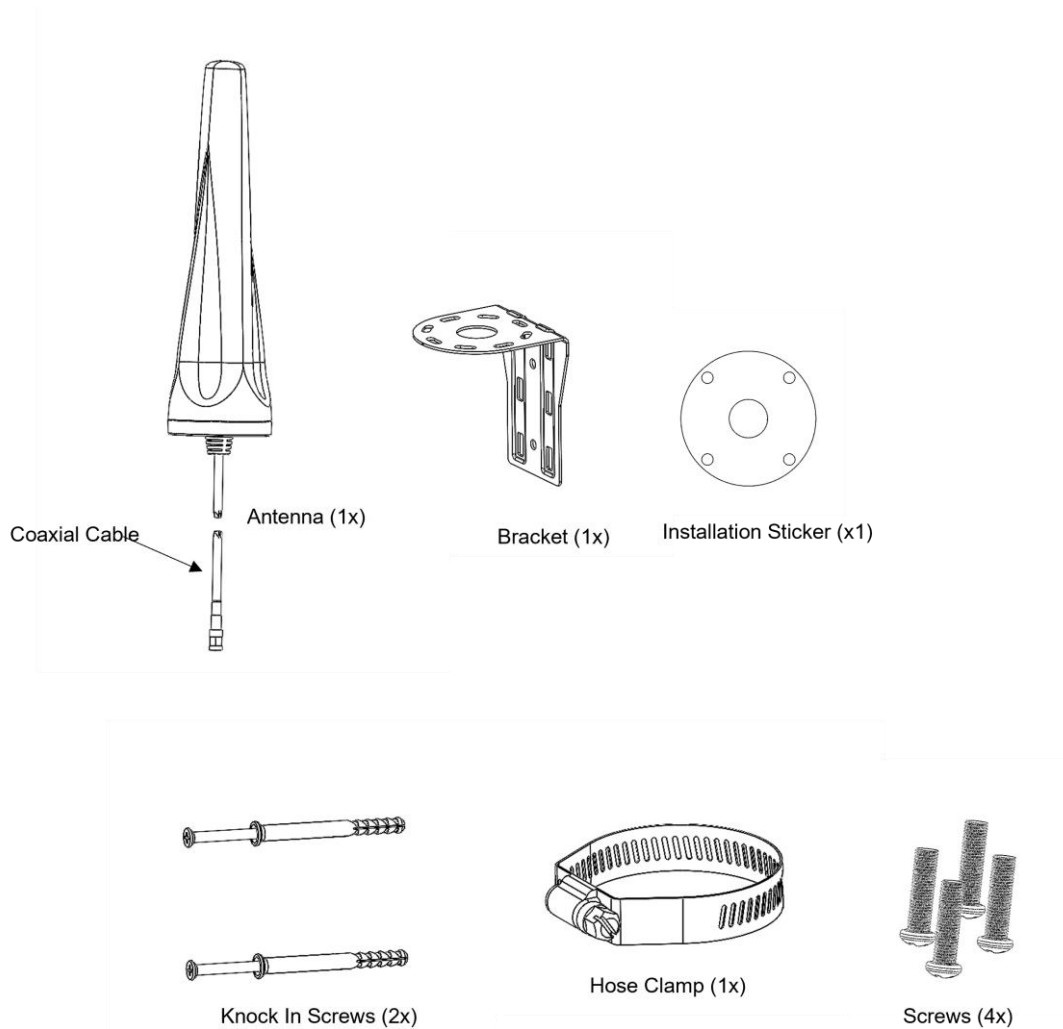
The AC94541 is designed to support indoor and outdoor installation conditions. The various (optional) accessories support different mounting schemes as illustrated in Table 5.

**Table 5: mounting options of the AC94541 antenna**

Outdoor roof mount with L-bracket	Outdoor pole mount with pipe clamp
 <p>A circular inset diagram showing the AC94541 antenna mounted on a roof. The antenna is attached to a metal L-bracket that is secured to a horizontal pipe or roof edge. The antenna's base is visible, showing its connection to the bracket.</p>	 <p>A circular inset diagram showing the AC94541 antenna mounted on a vertical pole. The antenna is held in place by a pipe clamp that encircles the pole and secures the antenna's base.</p>
Outdoor wall mount with custom bracket and sealed cable conduit	Indoor surface/bracket mount on cabinet
 <p>A circular inset diagram showing the AC94541 antenna mounted on a wall. The antenna is connected to a custom bracket that is mounted to the wall. A sealed cable conduit is used to route the cable from the antenna down the wall.</p>	 <p>Two oval inset diagrams showing indoor mounting options. The left diagram shows the antenna mounted directly on a flat surface. The right diagram shows the antenna mounted on a cabinet using a custom bracket.</p>

## 2.3 Mounting instructions

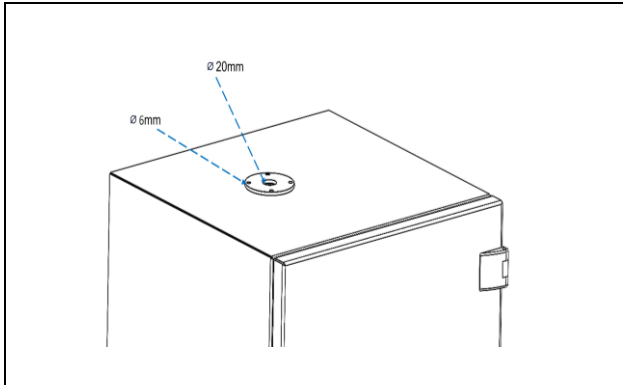
The installation parts are depicted in below figure.



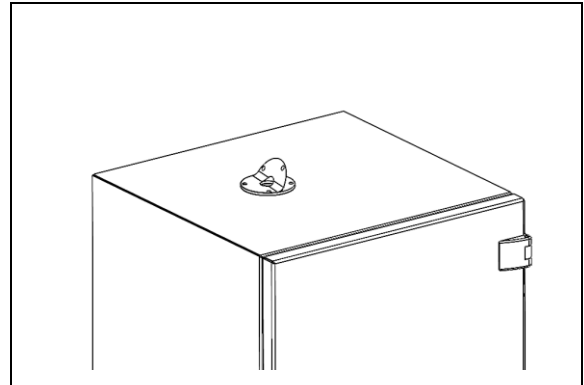
**Figure 10: AC94500 installation parts**

## 2.3.1 Cabinet Mounting

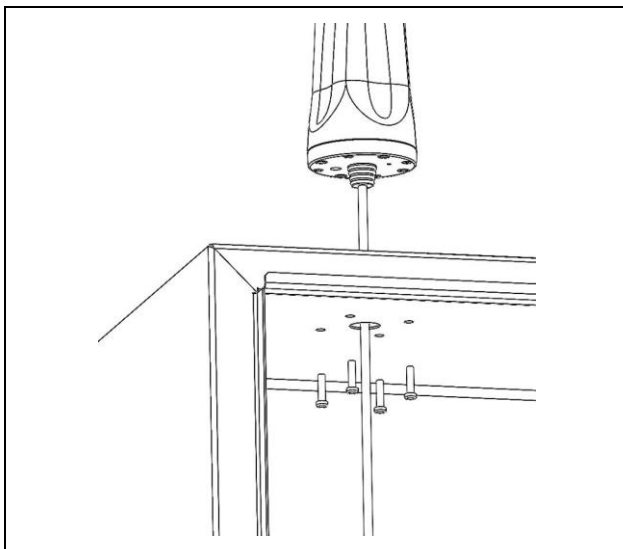
For proper installation of the antenna, follow the recommended steps 1 to 4.



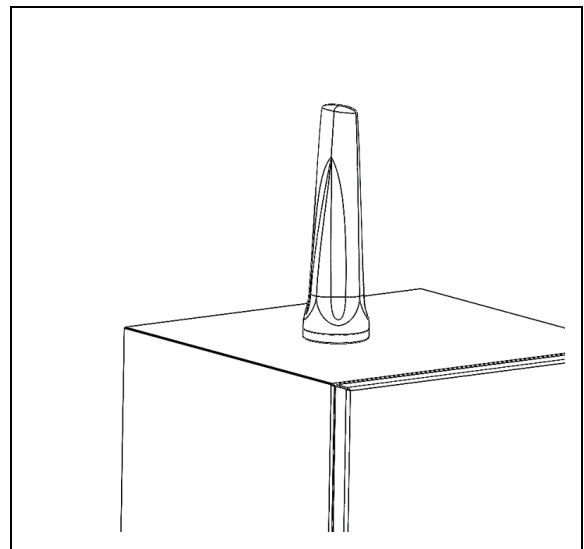
**Step 1:** Determine the antenna location on the mounting surface. Clean the mounting surface and ensure it's completely dry. Stick the provided adhesive disc by removing the liner on one side. Use the adhesive disc to drill the hole (20mm) for the cable grommet and the mounting holes (6mm).



**Step 2:** Remove the liner on the top side of the adhesive disc.



**Step 3:** Route the coaxial cable through the grommet hole in the mounting surface. Align the mounting hole with the corresponding threaded opening in the antenna base plate. Note: avoid sharp bends when routing the coaxial cable.



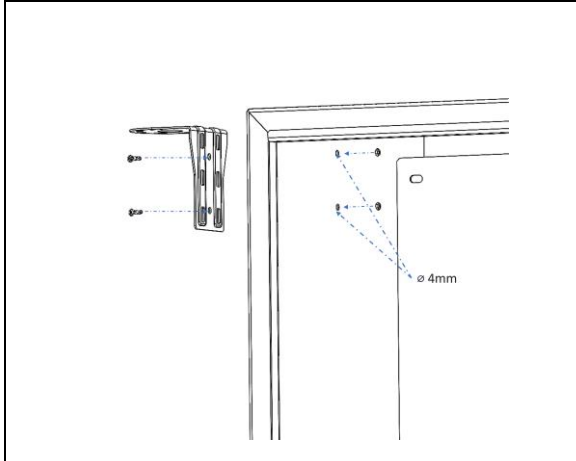
**Step 4:** Secure the antenna with the provided screws.

Completed installation

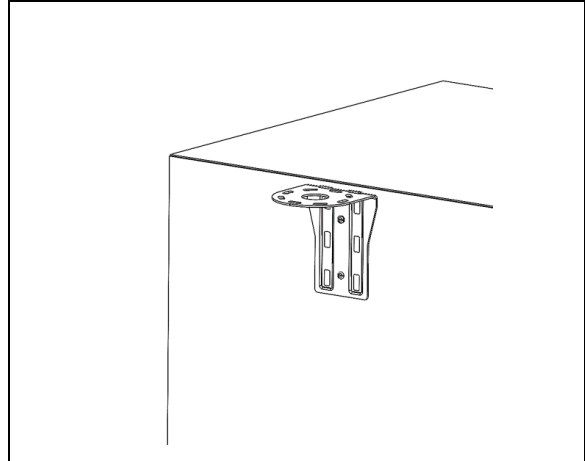


## 2.3.2 Bracket Mounting

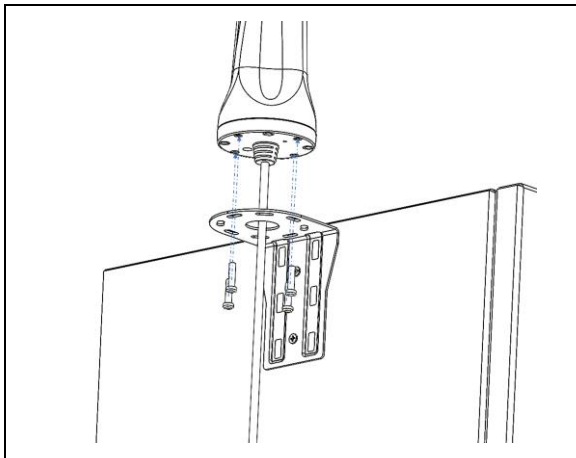
For proper installation of the antenna, follow the recommended steps 1 to 4.



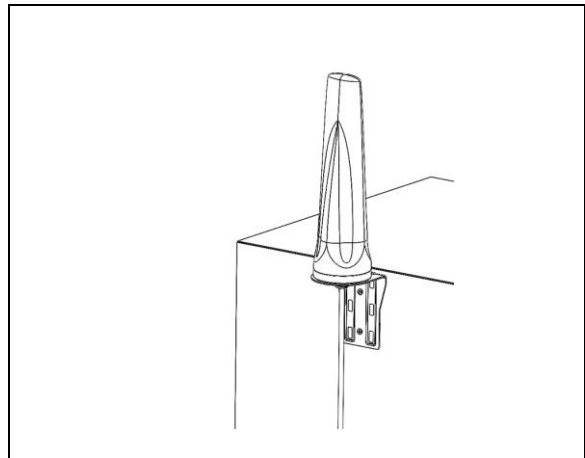
**Step 1:** Determine the antenna location on the mounting surface. Drill two holes (4mm) by aligning the bracket onto the mounting surface. Insert M3 screws with length per thickness of the cabinet and nut to secure the bracket



**Step 2:** Bracket installation completed.



**Step 3:** Route the coaxial cable through the grommet hole in the bracket. Align the mounting holes in the bracket with the corresponding threaded openings in the antenna base plate. Note: avoid sharp bends when routing the coaxial cable.

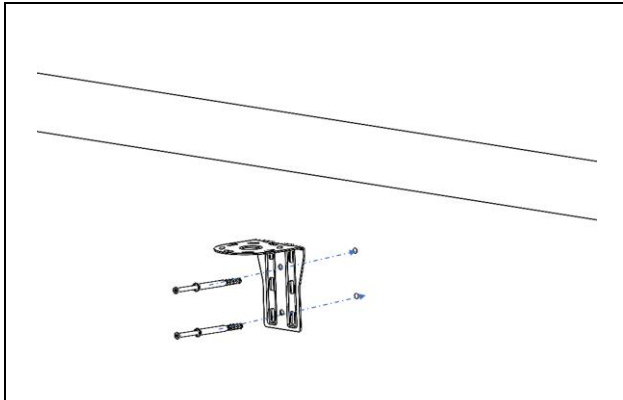


**Step 4:** Secure the antenna with the provided screws.

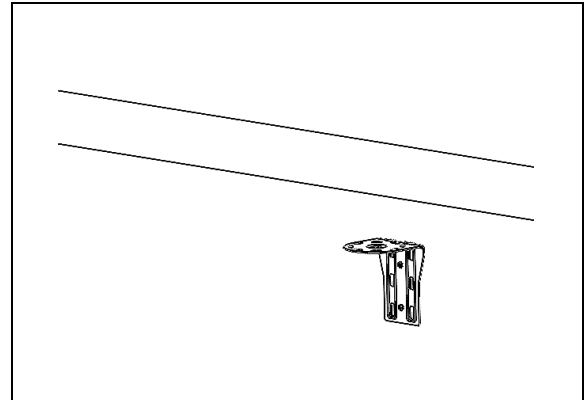
Completed installation

### 2.3.3 Wall Mounting

For proper installation of the antenna, follow the recommended steps 1 to 4.

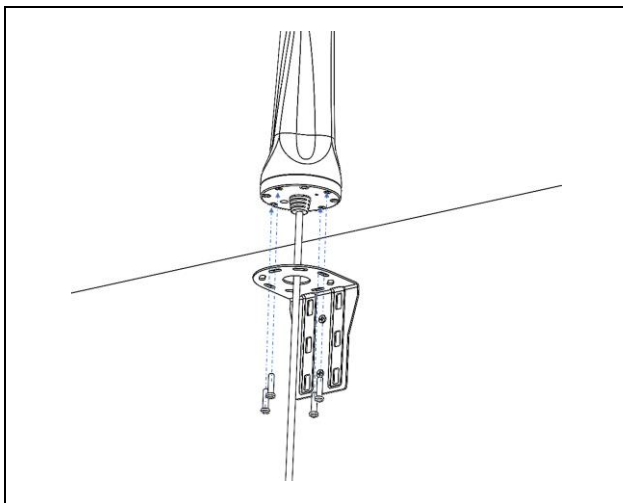


**Step 1:** Determine the antenna location on the mounting surface. Drill two holes (6mm) by aligning the bracket onto the mounting surface.

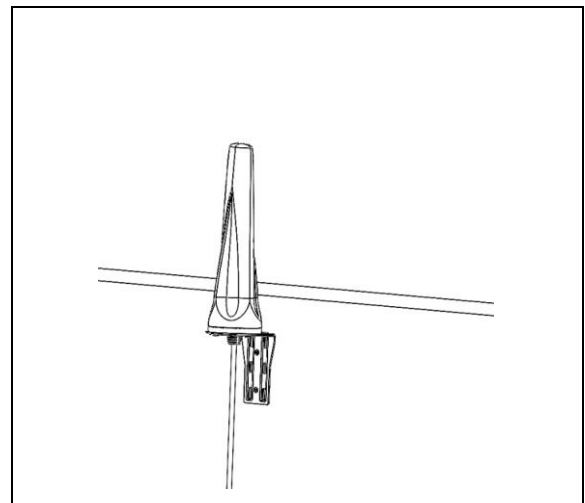


**Step 2:** Insert the provided knock-in screws in the drilled holes.

Completed installation of the bracket



**Step 3:** Route the coaxial cable through the grommet hole in the mounting surface. Align the mounting holes with the corresponding threaded openings in the antenna base plate. Note: avoid sharp bends when routing the coaxial cable.

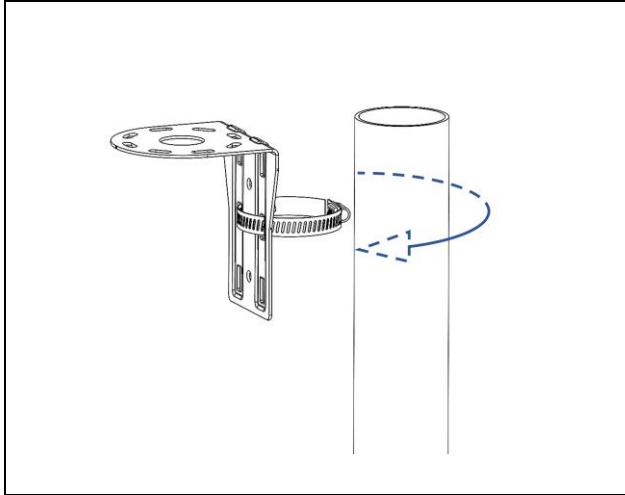


**Step 4:** Secure the antenna with the provided screws.

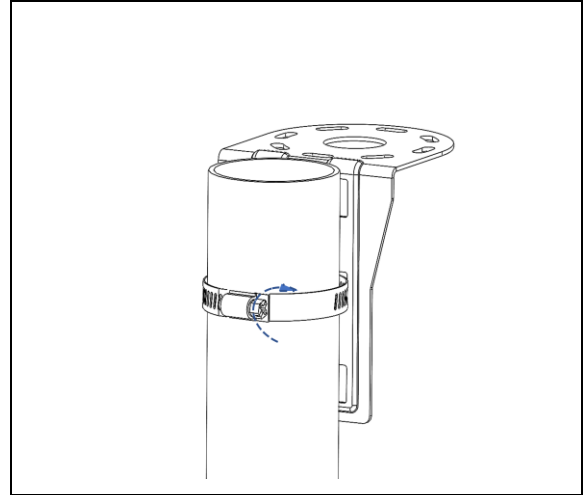
Completed installation

## 2.3.4 Pole Mounting

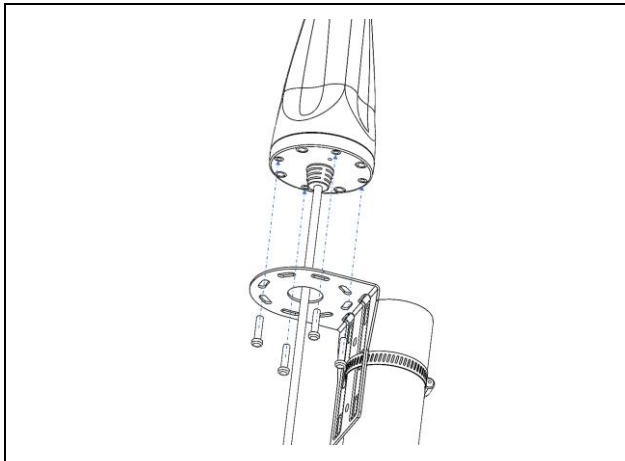
For proper installation of the antenna on a pole, follow the recommended steps 1 to 4.



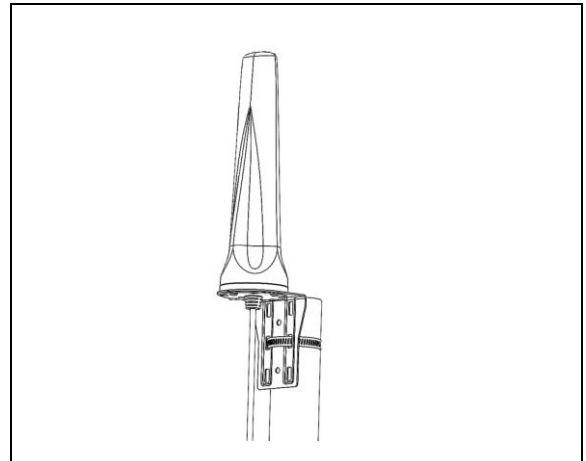
**Step 1:** Determine the antenna location on the mounting pole. Insert the hose clamp through the slot in the bracket and wrap it around the pole.



**Step 2:** Tighten the screw in the hose clamp to firmly fix it in place.



**Step 3:** Route the coaxial cable through the grommet hole in the mounting surface. Align the mounting holes with the corresponding threaded openings in the antenna base plate. Note: avoid sharp bends when routing the coaxial cable.



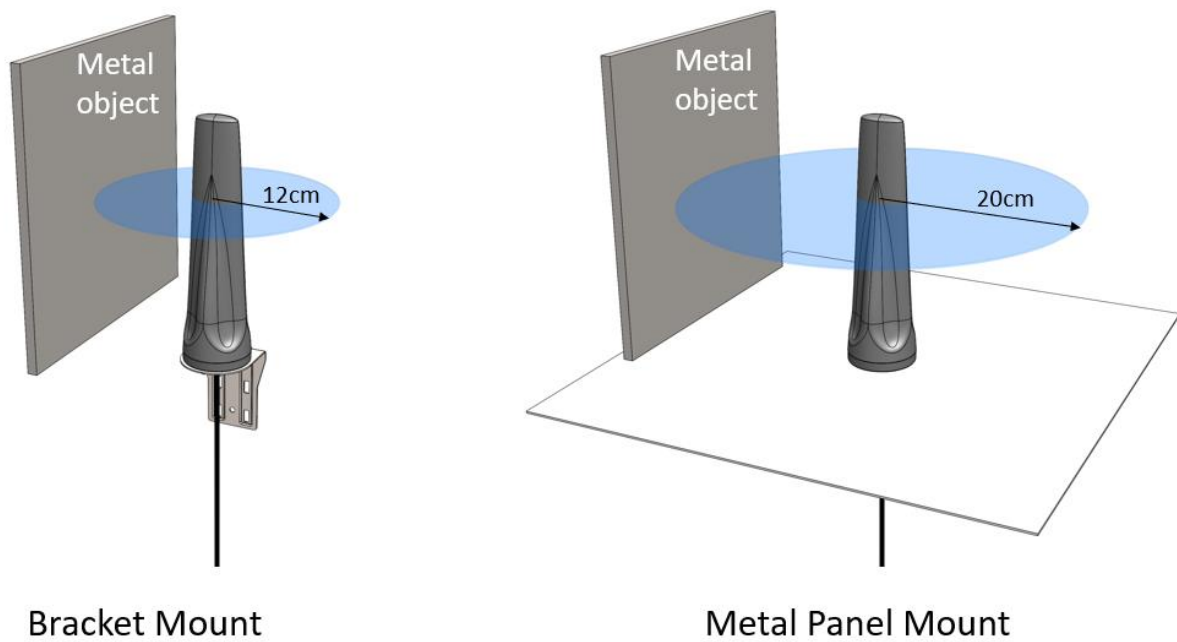
**Step 4:** Secure the antenna with the provided screws.

Completed installation

## 2.4 Mounting Guidelines

It is recommended to keep the near-field region surrounding the antenna free of metal objects.

The metal-free area is illustrated in below figure by the light-blue shaded circles with a 12cm radius (for the bracket mount configuration) and a 20cm radius for the metal panel configuration.



**Figure 11: Illustration of the recommended clearances around the AC94541 when mounted on a bracket (left) or a metal panel (right)**

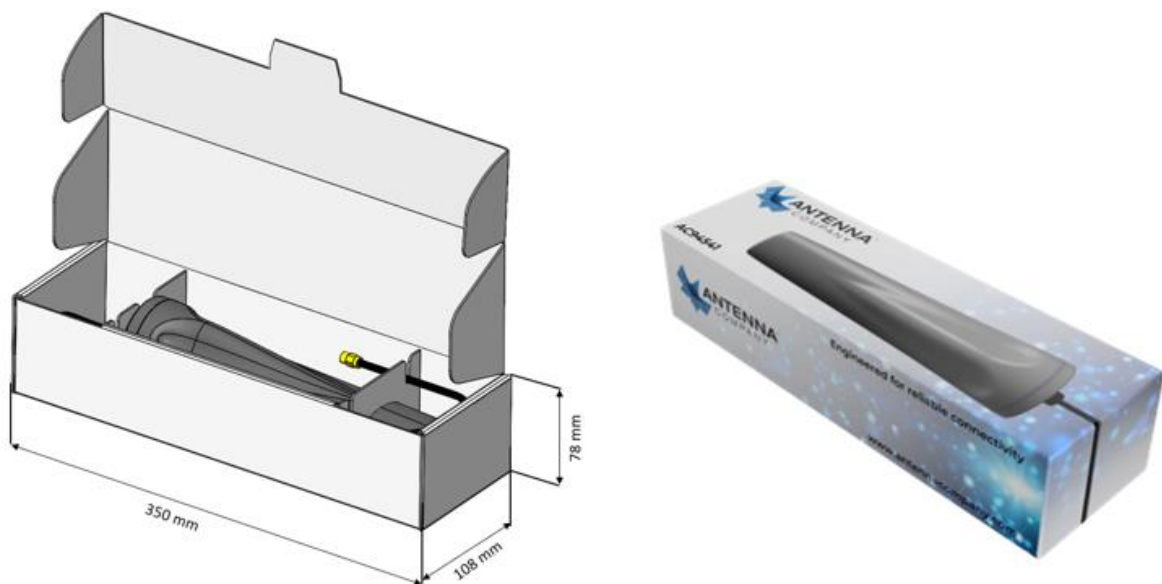
## 3 Product Marking & Ordering Information

### 3.1 Product Marking

The housing of the AC94541 will have no markings. A label with the product part number, the EAN code and the manufacturing date is attached to the antenna cable

### 3.2 Packaging





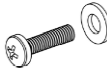
The AC94541 is packed in a unit carton box as illustrated on the figure below. The carton box includes the installation accessories as listed in Table 6.



**Figure 12: Packaging dimensions (left) and unit box (right) of the AC94541**

Larger quantities should be ordered in multiples of 20 pcs and will be shipped in master outer boxes, each containing 20 unit boxes.

**Table 6: AC94541 accessories**

Accessories	Amount	Illustration
Mounting L-bracket	1	
Wall knock-in screws	2	
Adhesive disc	1	
Pipe clamp	1	
M4 bracket screw (max 12mm) and washer	4	

### 3.3 Ordering Information

Orders should be placed at [orders@antennacompany.com](mailto:orders@antennacompany.com).

For purchase orders please state: Part number, description, quantity, and price.

**Table 7: AC94541 ordering information**

Part Number	Description	MOQ [pcs]
AC94541-060	Multi-band omnidirectional LTE antenna for Smart Utility Applications with 60cm cable, <u>without</u> Accessories	Multiple of 20
AC94541-200	Multi-band omnidirectional LTE antenna for Smart Utility Applications with 2 m cable, <u>without</u> Accessories	Multiple of 20
AC94541-500	Multi-band omnidirectional LTE antenna for Smart Utility Applications with 5 m cable, <u>without</u> Accessories	Multiple of 20
AC94541-060A	Multi-band omnidirectional LTE antenna for Smart Utility Applications with 60cm cable, <u>with</u> mounting Accessories	Multiple of 20
AC94541-200A	Multi-band omnidirectional LTE antenna for Smart Utility Applications with 2 m cable, <u>with</u> mounting Accessories	Multiple of 20
AC94541-500A	Multi-band omnidirectional LTE antenna for Smart Utility Applications with 5 m cable, <u>with</u> mounting Accessories	Multiple of 20

### 3.4 Environmental Compliances

The AC94541 product complies with all international norms as listed in below table.

**Table 8: AC94541 environmental compliance overview**

Region	Regulation	Reference	Compliant
US	US EPA Toxic Substances Control Act amended December 2020 Declaration	TSCA Section 6(h)	✓
US	California Proposition 65 Safe Drinking Water & Toxic Enforcement Act of 1986 Declaration		✓
EU	RoHS 3	EU 2015/863	✓
EU	EU REACH	EU 1907/2006	✓
WW	Responsible Minerals Initiatives		✓
EU	Persistent Organic Pollutants	(EU) 2019/1021	✓
EU	Packaging Directive	94/62/EC	✓
EU	PFOA Free	2006/122/ECOF	✓
US	Flammability rating	UL 94-HB	✓
WW	Salt spray	MIL-STD 810F/ASTM B117	✓

The information furnished by Antenna Company and its agents is believed to be accurate and reliable. Responsibility for the use and application of Antenna Company materials rests with the end user since Antenna Company and its agents cannot be aware of all potential uses. Antenna Company makes no warranties as to the fitness, merchantability, or suitability of Antenna Company materials or products for any specific or general uses. Antenna Company shall not be liable for incidental or consequential damages of any kind. All Antenna Company products are sold pursuant to the Antenna Company terms and conditions of sale in effect from time to time, a copy of which will be furnished upon request. All Antenna Company’s products are sold pursuant to the Antenna Company’s domestic terms and conditions of sale in effect from time to time, a copy of which will be furnished upon request.

Antenna Company is a registered trademark of The Antenna Company International N.V. Other product and brand names used in this document may be trademarks or registered trademarks of their respective owners.

© 2023 Antenna Company. All rights reserved.