Maxtena Frequently Asked Questions

**Q1:** Are there any “best practices” to consider when integrating a Maxtena standard helix type antenna?

**A1:** Maxtena external SMA connectorized antennas are simple to use requiring no special considerations for external mount applications. In particular the balanced design feature makes the antenna ground plane independent unlike many linearly polarized or unbalanced antennas that require special tuning to optimize the antenna for the application ground plane size.

However, for the GNSS (GPS L1, L2, GLONASS) and Iridium antennas it is recommended to mount the antenna on the application device such that in the “primary” use mode the antenna is pointed skyward to align the omnidirectional radiation properties with a clear view of the sky for best free space performance.

For embedded Helix antennas, such as the M1575HCT-22P, like any embedded antenna, the application device dielectric enclosure will have a tuning effect on the antenna.

The following should be consider when embedding a Maxtena antenna:

**Location:** The antenna should be placed in the corner on the edge of the PCB. The antenna needs adequate clearance and should be as far away from other components as possible to limit interference. Proper grounding of antenna should be considered.

**Wall Clearance:** The clearance depends on the frequency of use since the spacing required is dependent on the wavelength. Generally speaking at GPS L1 (1575MHz) as a rule of thumb, any PCB ground or metallic structures should be kept a minimum of 5-10mm away from the antenna resonator structure to avoid detuning effects.

**Cover Materials:** Avoid using metallic materials housed around or near the antenna to reduce detuning effects.

In order to streamline the design approach and minimize any need for custom tuning Maxtena has developed a tuning kit for the L1 GPS series that will permit
the customers engineer to easily select the right color coded antenna for the environment. A detailed application note is available online here.

**Q2: What are the benefits of using Maxtena helix antennas instead of patch antennas?**

**A2:** In addition to requiring no ground plane to operate and being unaffected by the presence of a user, Maxtena’s Helicore™ based helix antennas exhibit far superior Axial ratio and provide a truly omnidirectional radiation pattern. In patch antenna implementations, the user must carefully consider the tuning effects of the application PC board and potentially be required to custom tune the patch for the housing and PCB environment. The latter takes time and can increase time to market.

**Q3: Why does the antenna performance change from one configuration to another?**

**A3:** In the case of patch antennas, the performance of the antenna is related to the fact that it is an un-balanced antenna that is dependent on the dimensions of application PCB and application device dielectric enclosure. The application PCB ground actually forms part of the antenna structure and therefore radiates due to ground currents that flow in the PCB. Because the application device environment and PCB dimensions vary from device to device the current flow changes and the antenna tuning is also affected. As a result the performance will vary from device to device.

Maxtena’s Helicore™ antennas are a balanced antenna and generally not subject to this performance variation from device to device.

**Q4: Why would an antenna’s actual performance vary in a new design application versus the specs published in the datasheets?**

**A4:** It is related to whether or not the device under test has the same ground plane dimensions as the test unit used for the antenna datasheet. The evaluation antenna specs are measured in an ideal set of circumstances. However, in an actual design there are variables that will affect the antenna performance such as location, wall clearance, surrounding components, and cover materials.
If when embedding an antenna the designer has trouble optimizing the antenna for its system, Maxtena can offer technical support and assistance at competitive prices, contact rfpdsales@arrow.com

**Q5:** Can Maxtena offer support with the integration of the antenna in my device?

**A5:** Yes, depending on the specific project and demand size Maxtena will support requests for advice and integration support. Contact rfpdsales@arrow.com for a quote on any NRE that may apply to your situation. We also encourage customers to view Maxtena’s Three-Phase Process for Embedded Antennas.

**Q6:** What design support is available to integrate a Maxtena antenna?

**A6:** NRE paid services include: custom tuning, matching circuit design, 3D antenna pattern/gain and efficiency characterization by means of near field anechoic chamber (SATIMO) and simulation using CST Microwave Studio™. Maxtena also has 3D stp models for many of its antennas and uses Solidworks™ mechanical CAD to assist customers trying to embed its antennas into their devices.

**Q7:** Does the antenna need a clearance? Does the clearance affect the antenna performance?

**A7:** External mount antennas should be mounted to provide a clear skyward view. Embedded antennas need a minimum clearance from any PCB ground plane or metallic components. The clearance depends on the frequency of use since the spacing required is dependent on the wavelength. Generally speaking at GPSL1 (1575MHz) as a rule of thumb, any PCB ground or metallic structures should be kept a minimum of 5-10mm away from the antenna resonator structure to avoid detuning effects.

**Q8:** I have very limited space within my application. What alternatives do I have?

**A8:** Consider an external mount antenna or one of the smaller Helicore™ embedded antennas offered by Maxtena. Maxtena also offers patch antennas
that go down in size to as small as 10mmx10mm for compact enclosures where performance is less critical and space is at a premium.

Q9: Do the plastics and covers of a device affect the antenna performance?

A9: Yes, if you are planning to embed the antenna inside a plastic housing the antenna tuning can be expected to shift down in frequency typically by as much as 10-15MHz depending on the distance from any dielectric enclosure such as ABS plastics. The geometry of the plastic cover may also affect the antenna performance. Maxtena recommends that customers avoid using SLA plastic.

Maxtena offers tuning kits for both the Helicore™ M1575 series as well as the passive patch antenna series that enable customer engineers to self select the right patch or helical antenna frequency for correct operation. See here for application notes as well as demo videos on how to correctly make use of the tuning kits available.

Q10: Should I solder the antenna to the board, or are there other options?

A10: The Helicore™ antenna can be directly soldered to the board or one may make use of a connector option that can be placed on the application PCB by SMT process. Patch antennas must be soldered (through hole mount) to the PCB.

Q13: Which GPS chipset or modules will the Maxtena antennas work with?

A13: Maxtena's M1575 series antennas are suited to most commercially available L1 series GPS modules (e.g. u-Blox chipset module receiver) and the M1227 to L2 series modules and in many cases without the need for any additional components. Maxtena offers both passive and active antennas depending on the requirements of the chipset or module RF front-end.

Q14: How does Maxtena's antenna improve the global positioning systems (GPS) reliability?

A14: Maxtena's antenna is omni-directional with a very large beamwidth, allowing it to receive signals from low elevation satellites, which are essential for good positional accuracy. Since the antenna is omni-directional, it improves the...
acquisition and maintenance of satellite signals in handheld or mobile devices. The antennas have good LHCP rejection capability, improving the position accuracy in the presence of multi-path signals.

**Q15: How do I combine mobile telecommunications, Wireless LAN, and GPS into one small device?**

**A15:** Maxtena’s antenna has an integral balun, which isolates the antenna from the device ground plane and allows it to resonate independently. Additionally, the small near field of the antenna enables it to be installed within millimeters of other antennas without coupling. These are significant advantages because they directly address both conducted and radiated noise isolation challenges associated with tight integration. Since the antenna performance is affected by the other systems on board, co-existence of GPS, Iridium and wireless LAN antennas, it is better to consider early stage integration.

**Q16: Could I use a Maxtena technology in other forms of communication devices?**

**A16:** Yes, Maxtena would be happy to discuss the possibility of using its technology in other applications. Contact the sales department to get started, rfpdsales@arrow.com

**Q17: What’s special about Maxtena’s Helicore™ technology?**

**A17:** Maxtena’s patented Helicore™ technology uses air as a dielectric core and minimizes typical losses associated with ceramic materials. Helicore™ technology is pushing antennas limits in terms of axial ratio, bandwidth, and pattern stability. The design itself allows easy active circuitry and filtering addition due to the independent nature of the feed and antenna structure.

Helicore™ technology addresses widely known issues associated with ceramic materials and ceramic antenna manufacturing processes, which create wide dielectric constant variations due to material, temperature, and humidity variations. This is reflected in reduced performance of ceramic antennas and low manufacturing yields.
Q18: What can you expect from the materials you use with your device. Which have the greatest impact on antenna performance?

A18: Start with the material selection and research how they can affect the antenna optimization, for example, glass filled nylon could deteriorate RF properties, and adds to loss. Metallic and magnetic materials will deteriorate the antenna radiation pattern.

Q19: Why is it better to consider your antenna choice early in the product design cycle?

A19: It is well known that the antenna is one of the most sensitive components in a wireless system and much consideration should be placed on early consideration of the antenna and designing around it rather than waiting to consider the antenna towards the end of the design phase.

The following should be consider before embedding an antenna:

Location: The antenna should be placed in the corner on the edge of the PCB. The antenna needs adequate clearance and should be as far away from other components as possible to limit interference. Proper grounding of antenna should be considered.

Wall Clearance: The clearance depends on the frequency of use since the spacing required is dependent on the wavelength. Generally speaking at GPSL1 (1575MHz) as a rule of thumb, any PCB ground or metallic structures should be kept a minimum of 5-10mm away from the antenna resonator structure to avoid detuning effects.

Cover Materials: Avoid using metallic materials housed around or near the antenna to reduce detuning effects.

Q20: I want to use Maxtena’s IP67 sealed external mount SMA M1575HCT-22P-SMA flush mount antenna (or other flush based antenna) on my next product design. What are the mechanical considerations to insure the antenna will be IP67/IP68 sealed?

A20: First of all, Maxtena’s antennas that are rated IP67 are designed to restrict water ingress per the IP67 international standard. In addition for IP68 we test
down to 2M depths for up to 30 minutes to insure the antenna is watertight. To 
insure the installation remains within IP67 ratings,

Maxtena recommends that your mechanical engineers carefully review the 
Maxtena product datasheet mechanical interface drawing and insure you choose 
a mating bulkhead SMA connector with the correct length to meet the mating 
dimensions on the antenna drawing in the datasheet so that the antenna when 
fully seated has the O-ring seal in firm contact with the external body of the 
device.

Additionally, your product housing needs to insure that any external captive nut is 
recessed into the body, or alternately the body of the product should allow for a 
threaded SMA fitment of the bulkhead SMA, such that no external washer/nut 
protrudes from the surface of the product. In the event this is not possible and 
you are using an external nut/washer to secure the SMA bulk head connector, 
then you should consider using the M1575HCT-22P-MR style (recessed SMA 
military rugged) version of the antenna that permits the use of an external nut/ 
washer while still allowing the antenna O-ring seal to sit flush with the body of 
your device.

For additional information about Maxtena antennas, please visit **www.maxtena.com**, or contact by 
email **info@maxtena.com**.

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