

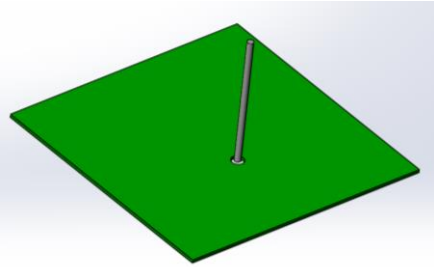
# OnBoard SMD

## Features and general implementation guidelines

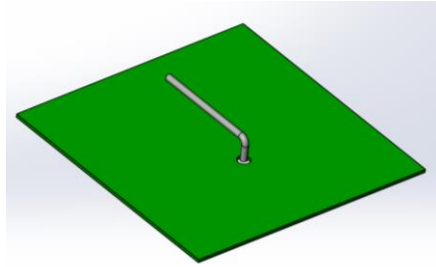
# Crucial features of the embedded antenna with respect to mobility

- The antenna should keep on radiating within the "right" frequency range, no matter whether the wireless device is close to dense matter (wood, concrete, metal etc) or the human body. *Frequency stable*.
- The antenna should radiate in all directions. Since mobile devices move around, the antenna's directionality affects the connectivity. The antenna should be as *omnidirectional* as possible.
- Since the antennas angle relative the receiving or transmitting counterpart changes, the polarity of the antenna affects the connectivity. *Mixed polarity* is beneficial.

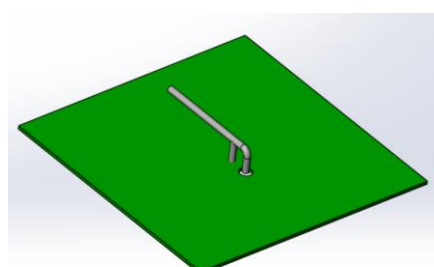
# The “evolution” of the PIFA (Planar Inverted F Antenna)



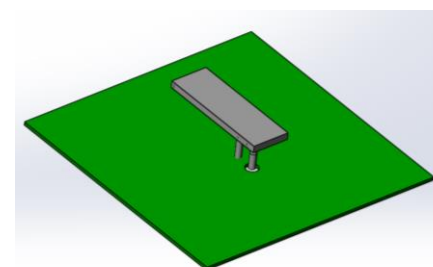
1. Monopole



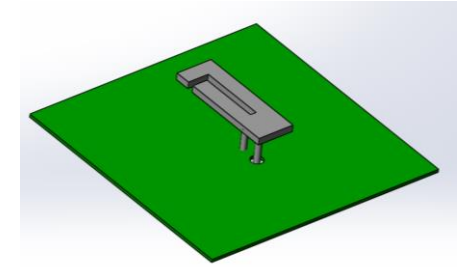
2. Folded monopole



3. IFA



4. PIFA



5. PIFA with slot

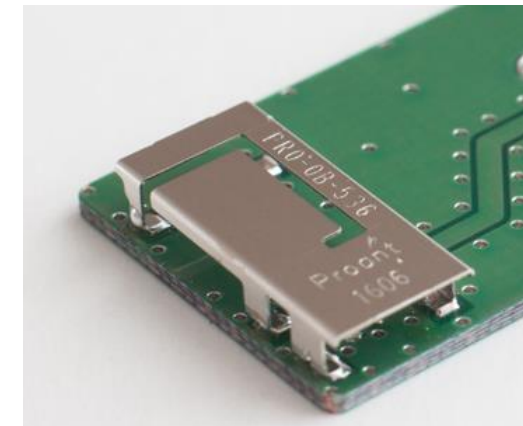
**1. Monopole.** Metal rod on a GND plane.

**2. Folded monopole.** The rod is folded in order to save space and enable to be embedded

**3. IFA – Inverted F Antenna.** A shorting pin is added in order to control the antenna impedance

**4. PIFA – Planar Inverted F Antenna.** Giving the antenna a flat surface instead of the rod will expand the bandwidth.

**5. PIFA with slot.** A slot in the flat surface can give multiple resonances that can be used to further expand the bandwidth or create a dual band antenna



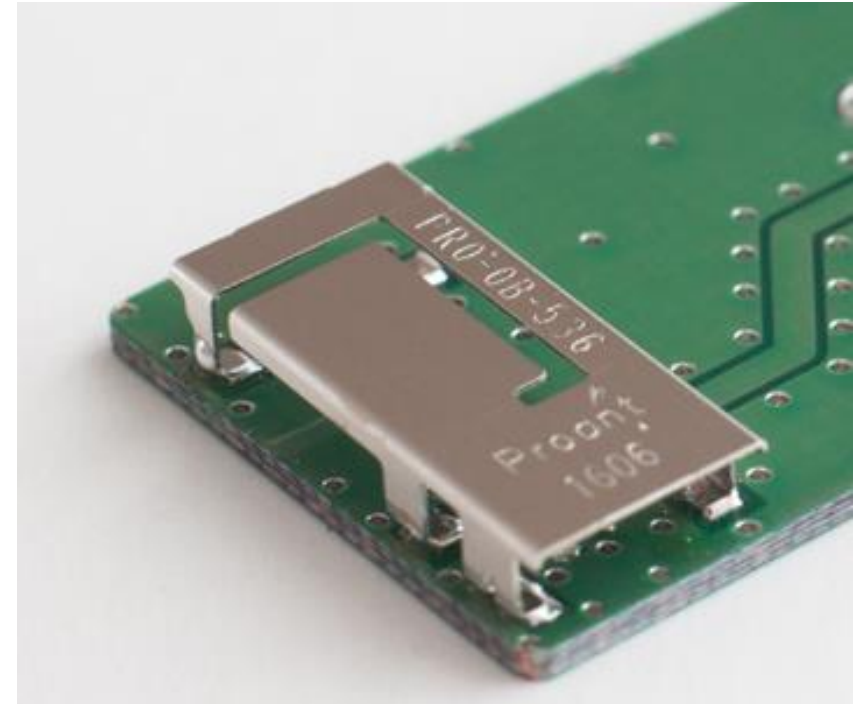
Proant OnBoard SMD WLAN  
Dual band 2,4 and 5 GHz

# PIFA Technology

Proants OnBoard SMD antennas are PIFAs. Below is some features of these antennas

- Made of sheet metal
- Mounted directly on PCB
- Frequency optimization by matching components
- Components can be placed under the antenna
- Components can be placed on the bottom layer under the antenna
- No ground cut out
- [Frequency stable<sup>1\)</sup>](#)
- [Omnidirectional radiation pattern<sup>1\)</sup>](#)
- [Mixed polarization<sup>1\)</sup>](#)
- High radiation efficiency
- Tape and reel delivery

<sup>1)</sup> These features are especially advantageous for mobile applications when you don't know how and where (and on what) the unit is being placed and where the receiving antennas are placed



Proant OnBoard SMD series are PIFAs

# Importance of the antenna choice/placement early entrance in your project

Common first contact between a customer and antenna provider

- **Customer:** *“We have developed this product that will revolutionize the market and the demand for it is immense! Look at this great PCB design!”*
- **Antenna supplier:** *“That sound great!”*
- **Customer:** *“Now, all we need is a superior embedded antenna solution...”*

This may cause:

- There may be limited or no space for the antenna.
- The position available for the antenna is not beneficial in an antenna performance perspective.

**RESULT:**

- The final product may end up with ***very poor wireless connectivity***
- ***Costly, time consuming re-design.*** → delayed market entrance, lost margin, lost business.

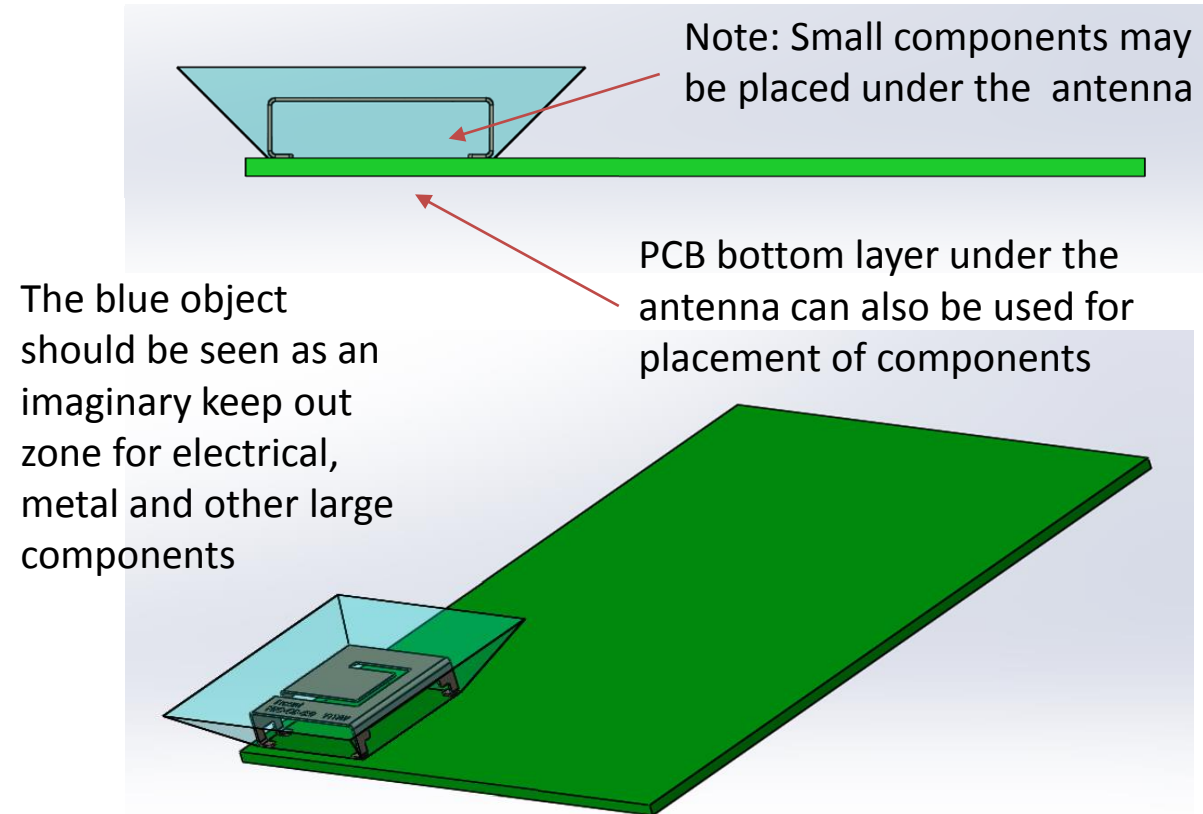


(Arbitrary PCB)

# Influence of large components/mechanics placed close to the antenna. “The 45-degree Rule of Thumb”

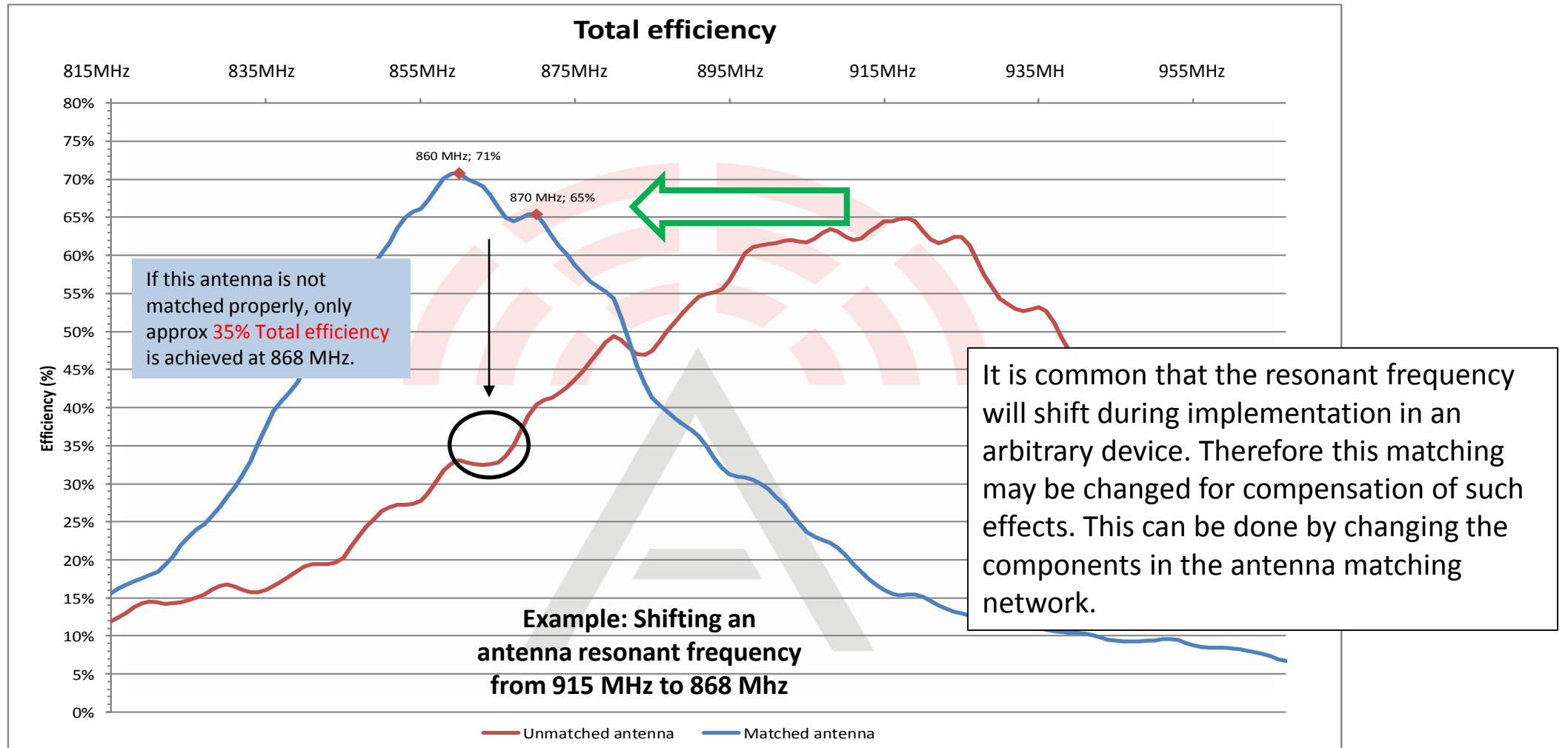
Large components placed close to the antenna can eventually detune the antenna and also affect the radiation performance.

To minimize the influence of other components Proant has the “45-degree rule of thumb” which can be seen as an imaginary keep out zone where it isn't recommended to place large components.



Pictures above show a Proant OnBoard SMD GPS antenna mounted on a PCB

# Matching/tuning of the antenna



**To sum up:** How thorough you work with the antenna solution in your design can be crucial in achieving a stable wireless connection, and therefore it is one of the most important phases when designing any wireless system.

 ***Bad connectivity kills your product!***

**For best possible connectivity for your product you should:**

- Define targets for the antenna and enter targets in an initial stage of your project.
- Choose antenna technology/solution with regards to the targets and implement the antenna in your product in a position that is beneficial.
- Conduct return loss and radiation measurement along the way.
- Continue with the overall design of the product. Always reflect on whether a change to the design will affect the performance of the antenna.

Consult Proant when in doubt – we are here to help you!