



# Choosing the Right WiFi Antenna for your Application

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## White Paper

### Abstract

This white paper discusses the types of antennas available today to address different WLAN applications. Examples are provided for typical point to point and point to multi point wireless network architectures.

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### Introduction

Often a customer will ask the question “How do I know which antenna is best for my application?” To help answer those questions we have developed this wireless network applications paper to help you choose the right WiFi antenna for your wireless application.

There are two main types of WiFi antennas, Omni directional and Directional.

**Omni directional antennas** provide a 360o donut shaped radiation pattern to provide the widest possible signal coverage in indoor and outdoor wireless applications. An analogy for the radiation pattern would be how an unshaded incandescent light bulb illuminates a room. Types of Omni directional antennas include “rubber duck” antennas often found on access points and routers, Omni antennas found outdoors, and antenna arrays used on cellular towers.

Outdoor Omni Antenna



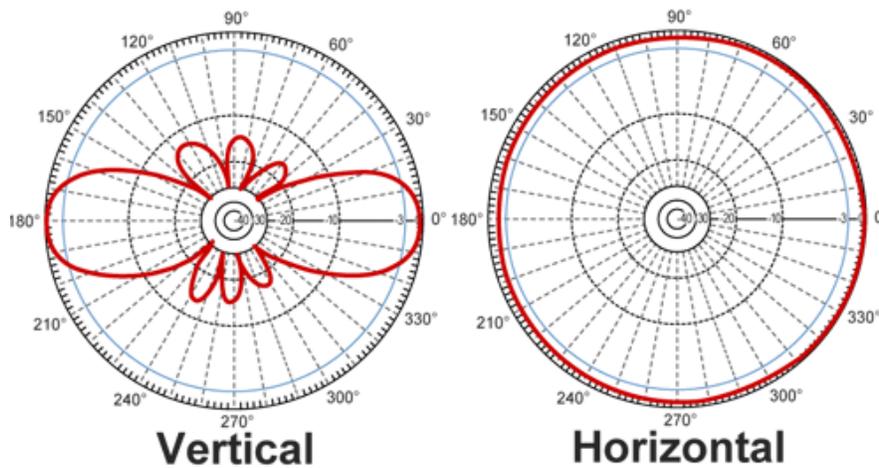
Rubber Duck Antenna



Omni Antenna Array



Typical Omni Directional Antenna Gain Pattern



**Directional antennas**, as the name implies, focus the wireless signal in a specific direction resulting in a limited coverage area. An analogy for the radiation pattern would be how a vehicle head light illuminates the road. Types of Directional antennas include Yagi, Parabolic grid, patch and panel antennas.

Yagi Antenna



Grid Antenna



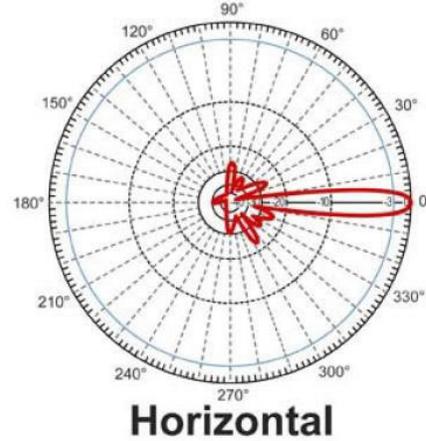
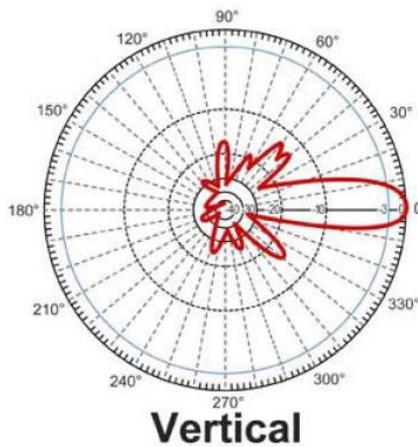
Panel Antenna



Patch Antenna



### Typical Directional Antenna Gain Pattern

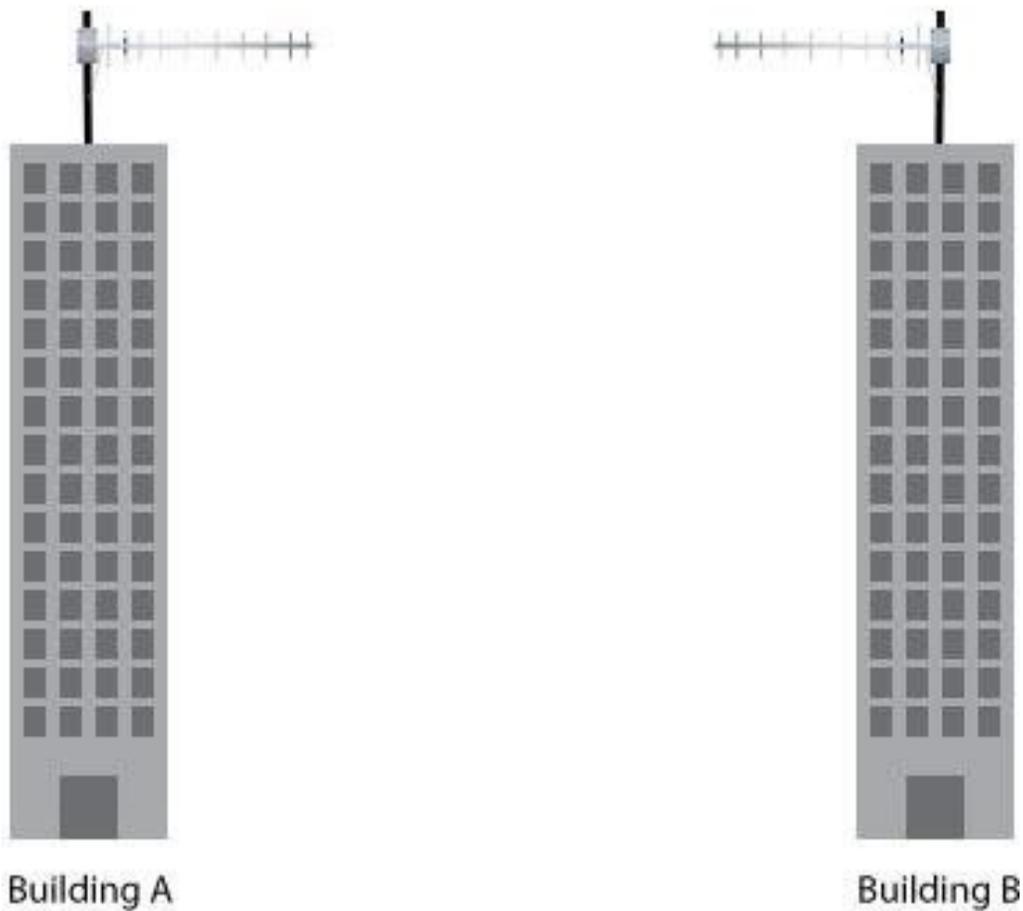


Below are some common WiFi network applications.

**I want to connect one building to another building**

In this design scenario you will need a directional antenna such as a Yagi, or Parabolic Grid antenna. This is called a point to point wireless link. Each building should be outfitted with a directional antenna and the antennas need to point at each other inline. Also make sure there are no obstructions between the two antennas such as trees or buildings. Clear Line of sight is critical.

Example:



### I want to add WiFi to my office building (inside)

To provide wireless coverage to an inside office space use an Omni directional antenna which provides 360o wireless coverage. The style of antenna typically used is the ceiling mount Omni directional antenna. The antenna gain pattern for the ceiling mount Omni directional antenna in this application is donut shaped with good vertical and well as horizontal coverage providing connectivity to WiFi devices including laptops, printers, tablets, and smart phones.

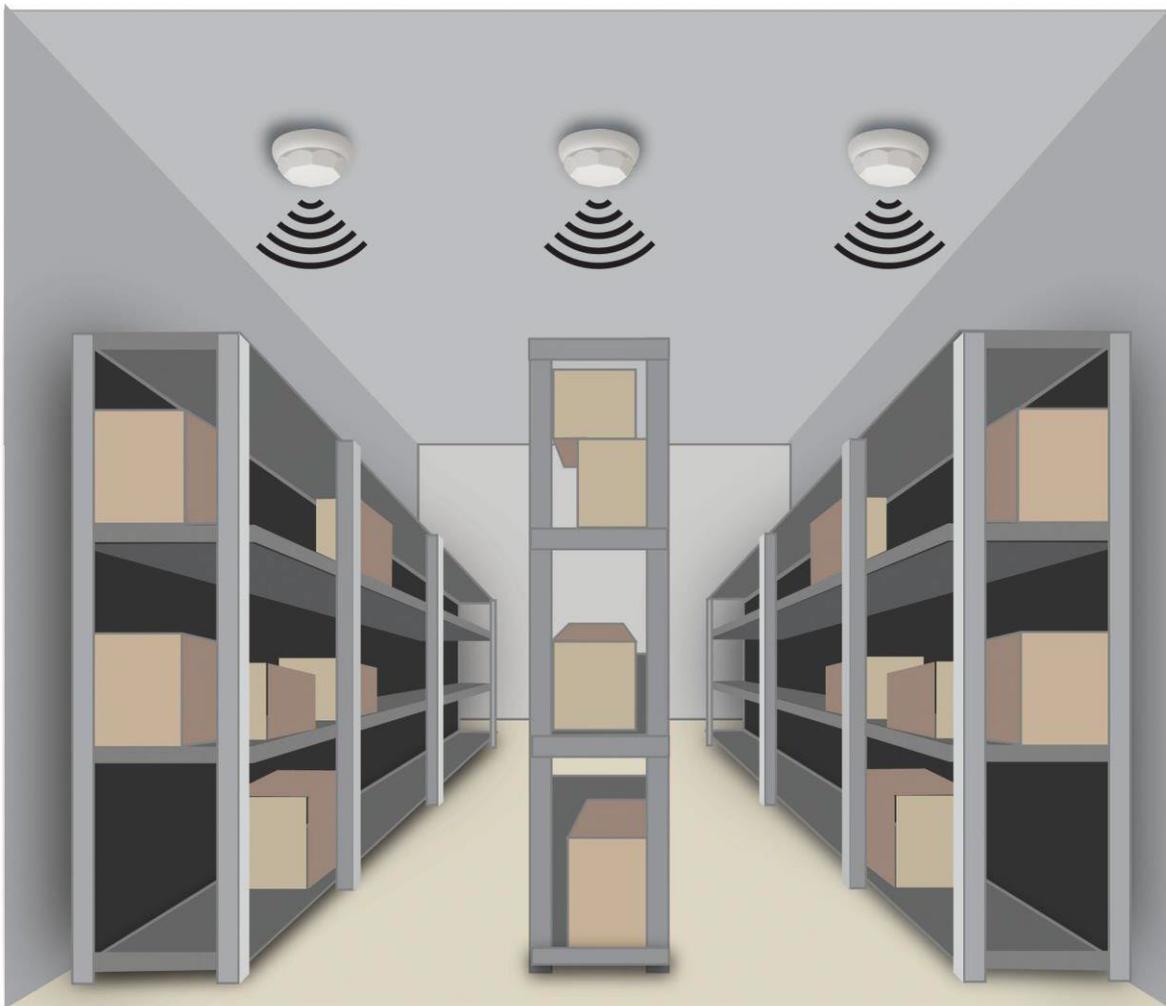
Example:



### I want WiFi in my warehouse

For warehouse WiFi coverage use Omni directional antennas mounted on the ceiling. These antennas will provide 360o coverage for devices such as bar code readers, laptops and tablets in the warehouse area. When specifying these antennas consider the necessary beam width of the WiFi signal to cover all the areas that require wireless connectivity. Some Omni antennas have a wider beam width than others.

Example:



## I need better WiFi coverage in my home

To optimize WiFi coverage in the home use an Omni directional antenna that is centrally located in the home and placed away from metallic objects and walls. In most home wireless networks the router or access point's rubber duck antennas are usually close to a wall and in one corner of the house. This antenna placement limits your wireless coverage. By centrally locating the antenna and moving it away from walls etc. better coverage is realized.

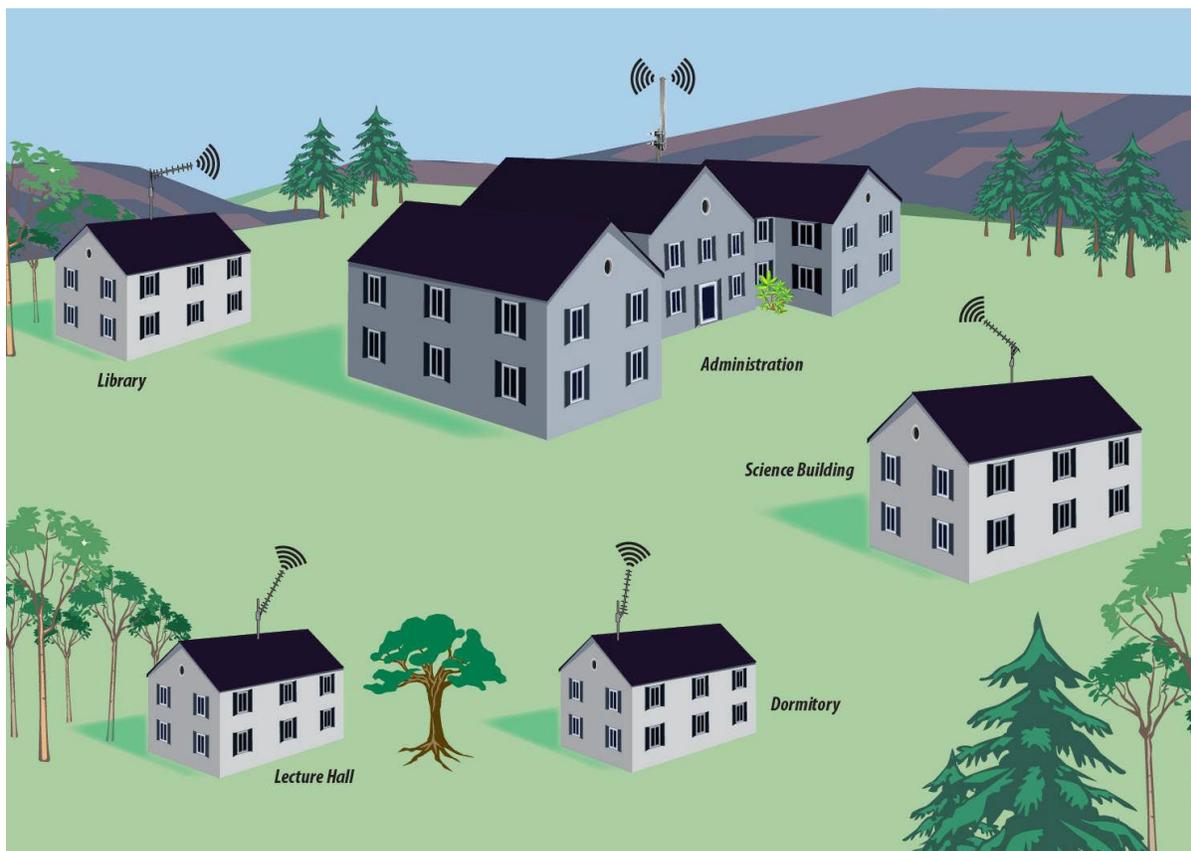
Example:



**I want to install WiFi in a campus environment (outside)**

In this case you can use several directional antennas with an Omni directional antenna at the central building to connect the buildings in the campus. This is called a point to multipoint network. As with any outdoor WiFi network, clear Line of Site is critical. Additionally, proper antenna alignment is necessary to ensure optimal signal quality.

Example:



### I want to provide WiFi access in my outdoor cafe'

For an outdoor cafe' use Omni directional antennas to provide 360o signal coverage to customers and employees. Try and mount the antenna as close to the center of the WiFi coverage area as possible. Also remember that if the Omni antenna you use has too much gain, then the users beyond the café area will tend to get better signal than those within the cafe' area. Using a lower gain (dBi) antenna will result in more of a doughnut shaped signal pattern with gives better vertical coverage bringing the signal close to the ground where patrons are sitting with their WiFi devices. A more detailed overview of this phenomenon is outlined here.

Example:



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