

# Introduction to Wi-Fi Antennas

## Why Antennas are Important

The speed of your wireless connection will vary depending on the strength of the signal you can receive and transmit. Antenna selection

can therefore have a significant impact on the speed of your wireless link.

## Types of Antennas

There are two basic types of antennas for WLAN and cellular products: Omni-directional and directional. The two types are categorized by the direction in which they beam radio signals.

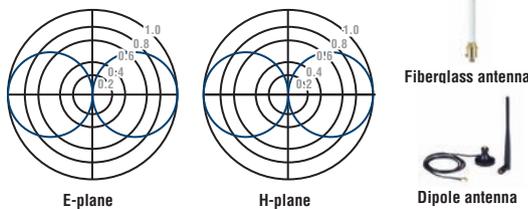
### Omni-directional

Omni-directional antennas are designed to radiate signals equally in all directions. Use this type of antenna if you need to transmit from a central node, such as an access point, to users scattered all around the area.

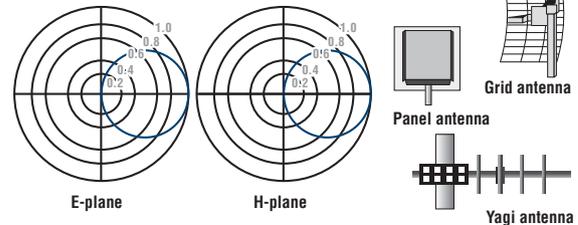
### Directional

Directional antennas provide a more focused signal than omni-directional antennas. Signals are typically transmitted in an oval-shaped pattern with a beam width of only a few degrees. With higher gain, directional antennas can also be used outdoors to extend point-to-point links over a longer transmission distance, or to form a point-to-multipoint network.

### Types of Omni-directional Antennas



### Types of Directional Antennas



## Antenna Connectors

Before you purchase an antenna for your wireless device, you should check the type of antenna connector that your device uses. You will need to buy an antenna with a matching connector. There are several types of antenna connectors, including MCX, TNC, N-type, SMA, and

RP-SMA (RP stands for “reverse polarity” or “reverse ping”). On WLAN devices, the most commonly used antenna connector is RP-SMA and N-type for IEEE 802.11 wireless applications. Make sure you are buying an antenna with the right connector type.



## More Information about Antennas and Power Control

If you are planning to extend the range or widen the coverage of your wireless connection, then you may need to use external high-gain antennas for your access points. In addition to the antenna type and gain, there are a few other specifications that you should consider.

### Frequency Range

The most important parameter of an antenna is its working frequency. If you use a 2.4G antenna for IEEE 802.11a applications, you will find that the signal is too weak and the data rate falls back to a very low level. Be sure to use the right antenna for your planned working frequency.

### Half-power Beam Width (HPBW)

This parameter is measured from the antenna’s radiation pattern, and refers to the beam width at which the antenna’s radiation drops to half of its peak value. It also refers to the antenna’s effective coverage area. Once you get outside the half-power beam width, the signal typically drops off very quickly. A very high-gain antenna has a very narrow-angled half-power beam width, which makes the directionality high as well.

### Antenna Polarity

Polarization refers to the direction in which the electromagnetic field lines point as energy radiates away from the antenna. The simplest and most common type is linear polarization. When power is sent from transmitter to receiver, only that portion of the beam with the same polarization can be received. An improper antenna installation may decrease performance.

### Equivalent Isotropically Radiated Power (EIRP)

The EIRP value is defined as the power transmitted by a theoretical isotropic antenna that distributes power evenly in all directions and emits and produces the peak power density observed in the direction of maximum antenna gain. The government makes radiation/telecommunication regulations and controls the EIRP of radio devices. You must ensure that your wireless system does not exceed legal EIRP values. The EIRP value is also used to estimate the service area of the transmitter and to coordinate transmitters on the same frequency so that their coverage areas do not overlap. EIRP is calculated EIRP by measuring the power of the transmitter, losses in transmission lines and connectors, and the gain of the antenna. The unit used for EIRP and transmitter power is dBm, cable loss is measured in dB, and antenna gain is expressed in dBi, relative to a (theoretical) isotropic reference antenna.

# IEEE 802.11 Antennas

	IEEE 802.11b/g 2.4GHz Wireless Antennas				IEEE 802.11a/b/g 2.4/5 GHz Dual-band Antennas		IEEE 802.11a 5GHz Wireless Antennas	
Product Name	ANT-WSB-AHRM-05-1.5m	ANT-WSB-ANF-09	ANT-WSB-PNF-12	ANT-WSB-PNF-18	ANT-WDB-ANF-0609	ANT-WDB-PNF-1518	ANT-WSB5-ANF-12	ANT-WSB5-PNF-18
Frequency Range	2.4 to 2.5 GHz	2.4 to 2.5 GHz	2.4 to 2.5 GHz	2.4 to 2.5 GHz	2.4 to 2.5 / 5.1 to 5.9 GHz	2.4 to 2.5 / 5.1 to 5.9 GHz	5.1 to 5.9 GHz	5.1 to 5.9 GHz
Antenna Type	1/4 Dipole	Omni-directional	Directional, Panel	Directional, Panel	Omni-directional	Directional, Panel	Omni-directional	Directional, Panel
Typical Antenna Gain	5 dBi	9 dBi	12 dBi	18 dBi	6/9 dBi	15/18 dBi	12 dBi	18 dBi
Impedance	50±5 ohms	50±5 ohms	50±5 ohms	50±5 ohms	50±5 ohms	50±5 ohms	50±5 ohms	50±5 ohms
Polarization Linear	Vertical	Linear	Linear	Linear	Linear	Linear	Linear	Linear
HPBW/Horizontal	360°	360°	50°	30°	360°	50/10°	360°	10°
HPBW/Vertical	---	10°	30°	20°	10/8°	30/10°	6°	10°
V.S.W.R.	2.0	1 : 1.3 Max.	1 : 1.5 Max.	1 : 1.5 Max.	1 : 1.5 Max.	1 : 1.5 Max.	1 : 1.3 Max.	1 : 1.5 Max.
Power Handling	---	15 W Max.	10 W Max.	15 W Max.	10 W Max.	20 W Max.	10 W Max.	10 W Max.
Connector(s)	RP-SMA (male)	N-type (female)	N-type (female)	N-type (female)	N-type (female)	N-type (female)	N-type (female)	N-type (female)
Operating Temperature	-40 to 80°C	-40 to 80°C	-40 to 80°C	-40 to 80°C	-40 to 80°C	-40 to 80°C	-40 to 80°C	-40 to 80°C
IP Rating	---	IP65	IP65	IP65	IP65	IP65	IP65	IP65
Antenna Profile	---	420 mm length	215 x 90 x 30 mm	270 x 205 x 15 mm	260 mm length	270 x 205 x 15 mm	420 mm length	270 x 205 x 15 mm
Weight	300 g	430 g	560 g	1020 g	155 g	1020 g	430 g	990 g