

Why do I care?

Antenna Polarization

SensThys, Inc

V1.1

What is polarization?

This describes the plane (the up and down movement) the electromagnetic waves leave the antenna.

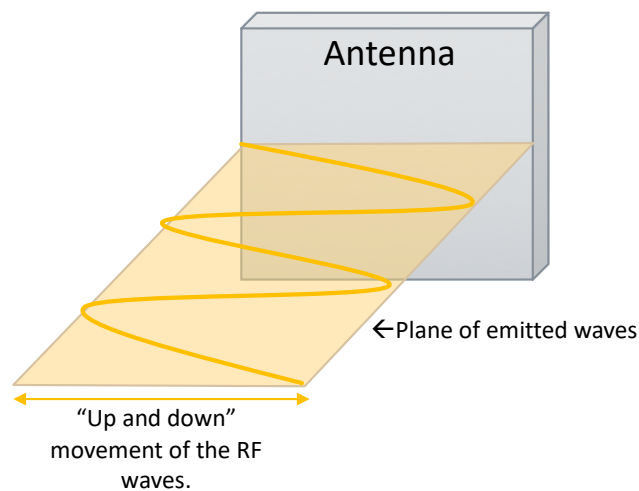


Figure 1 - Simple Antenna Linear Polarization

Why do I care?

RFID tags have orientations they work well in, some orientations less so and two they really don't read at all (small end on). See the next page.

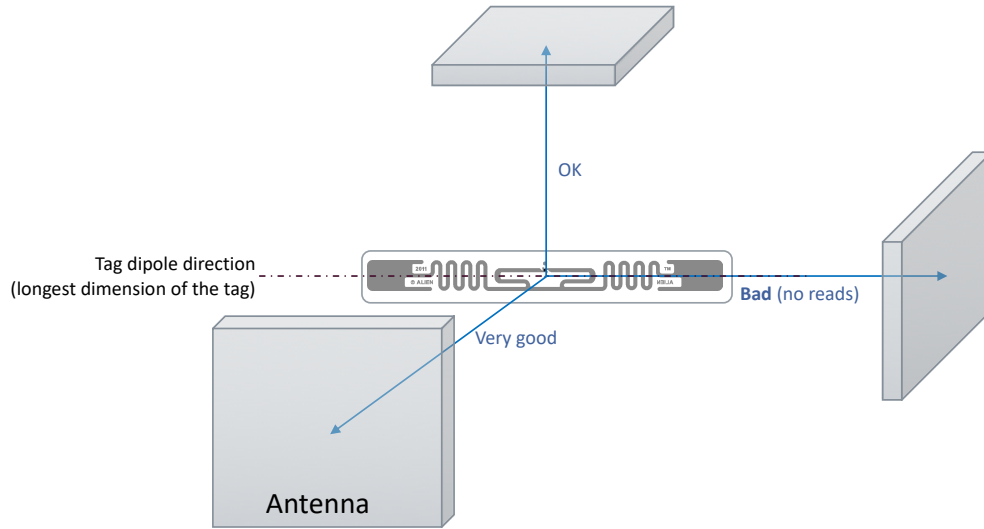


Figure 2 - RFID Tags Have Orientation Too

Ideally, we want the plane of the tag to be parallel to the plane of the antenna and aligned between the angle of the dipole of the tag and the plane of the antenna's polarization.

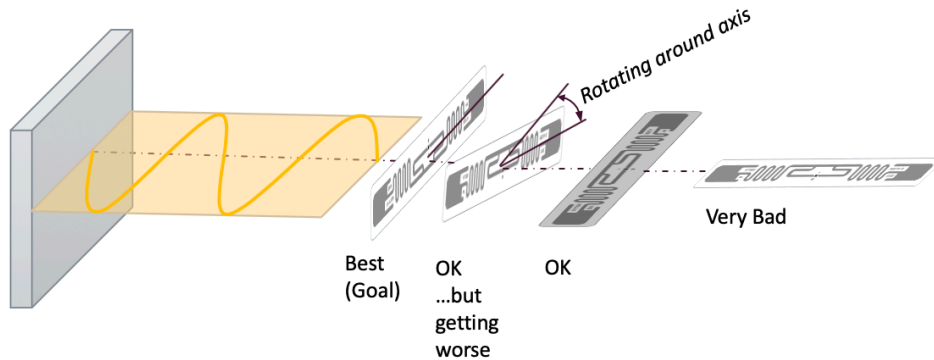


Figure 3 - Tag Orientation with Respect to a Linear Antenna

What are the key types of polarization?

There are linear and circular polarized antenna.

Linear antenna

Linear are the most simple and seen above. The up and down motion of the plane does not change over time. The direction of the linear plane needs to be matched to the dipole direction of the tags being read by the antenna (for example, may require the antenna mounting rotated 90°).

Linear antenna work well only when the orientation of the antenna with respect to the tags being read can be guaranteed. When this is the case, this antenna is ideal as it ensures the best-read performance.

Linear antennas must be mounted at the appropriate rotation to align with the tags passing them. However, if the tag orientation is not known or not always in the same orientation, we need another antenna type. This is actually the most common case.

Another way of looking at a linear waveform:

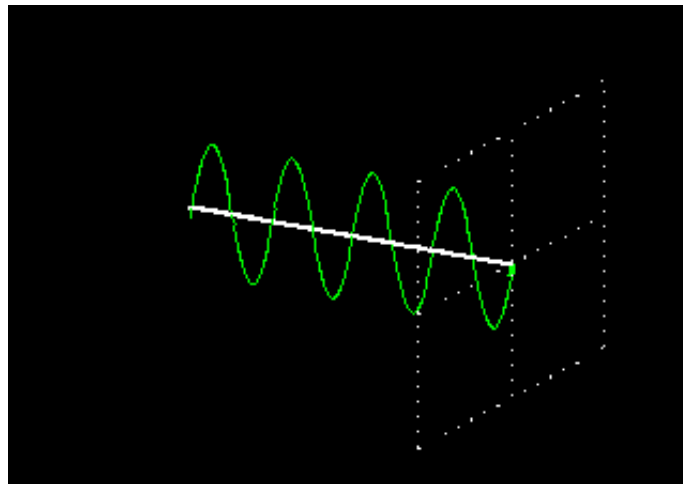


Figure 4 - Linear (vertical shown) Polarization

Circular polarization?

A circular polarized antenna rotates the plane of the RF waves coming out of the antenna over time. This ensures a tag rotating in the same plane will now easily be visible. See below.

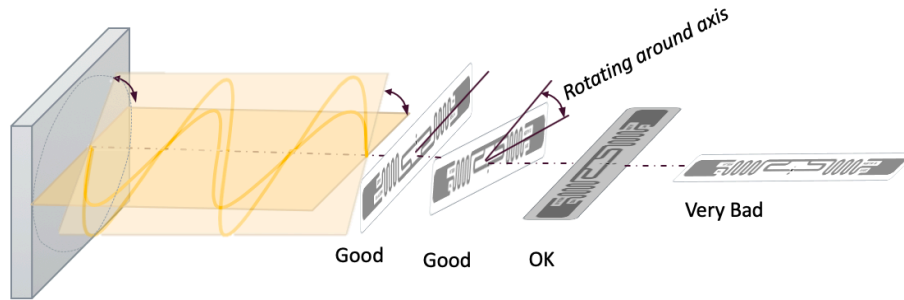


Figure 5 - Tag Orientation with Respect to a Circular Antenna

You can think of the radiation pattern being stirred uniformly in one direction:

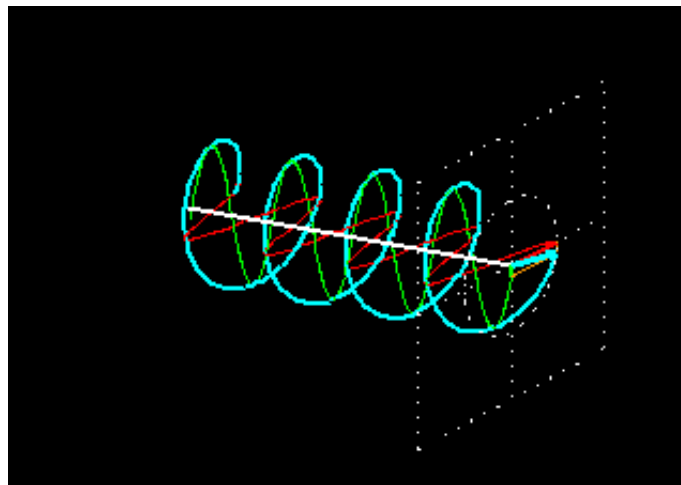


Figure 6 - Circular (right-hand shown) Polarization

This is the best solution when tags are in random or unknown orientations.

Linear vs Circular

Why not always use circular? The production of the circular pattern requires two linear RF patterns to be combined (inside the antenna). The circular motion is the result of the interaction between these two linear fields each splitting the available power. So, a circular antenna delivers 3dB less or $\frac{1}{2}$ the power to any one place than a linear. The majority of the time this trade-off is fine unless you can be absolutely certain of the tag orientation in your application.

Circular Antenna Types

Yep...there are two type of circular antenna. Left Hand and Right Hand Circular Polarization (analogous to anticlockwise and clockwise, respectively). LHCP is used to denote Left Hand Circular Polarization and RHCP for right-hand.

Why do you care about Left- or Right-Hand Polarization?

Normally you don't, unless you have two antenna facing each other and active at the same time. In this case (e.g. portals), two circular antenna of the same polarization direction would interfere with other and may reduce the chances of reading a tag. It is therefore desirable to have the opposing antenna have different circular polarizations. So, a LHCP would be positioned opposite a RHCP antenna.

If your application does not require different polarized antenna, you can use either LHCP or RHCP (the default is usually RHCP but LHCP would be fine too).

SensRF-101

This antenna is a high-performance circular antenna which is environmentally resilient (IP67) and can be used indoors or outdoors. Its polycarbonate radome is stronger than many competitors ABS plastic radomes and has been designed for highly efficient manufacturing leading to an industry leading price positioning. It was first introduced as a RHCP antenna but now also available as a LHCP variant.

Information on the SensRF-101 can be found here: <https://www.sensthys.com/sensrf-101/>

Model (All models 865-928 MHz)	Circular Polarization Type	Mounting Option	Part Number
SensRF-101 Flush Mount	Right-Hand (RHCP) (if in doubt, RHCP is good for most applications)	Flush/Flat with through hole	A0101-RWF
SensRF-101 VESA Mount		Studded 100mm VESA	A0101-RWV
SensRF-101 Flush Mount	Left-Hand (LHCP)	Flush/Flat with through hole	A0101-LWF
SensRF-101 VESA Mount		Studded 100mm VESA	A0101-LWV

ORDERING INFORMATION - Order at <https://www.sensthys.com/shop/>