

# RFID Card Maximum Read Distance

True physical tag maximum read distance is determined by the individual RFID reader and antenna power, the actual Integrated Circuit used in the RFID tag, the material and thickness of material the tag is coated or covered with, the type of antenna the tag uses, the material the tag is attached to and more!

While a specification may show a theoretical RFID tag read range of 5 meters (ideal conditions) it may be as little as 1 meter if the tag is attached to an object that is sitting on a metal surface surrounded by water and electromagnetic waves (not ideal conditions)!

## Generally speaking RFID tag maximum read distances are as follows:

- 125 kHz. and 134.3 kHz. Low Frequency (LF) **Passive** RFID Tags -read distance of 30 cm (1 foot) or less - usually 10 cm (4 inches) unless you are using a very large tag which can have a read distance of up to 2 meters when attached to metal.

These are the type of cards used with the ZPass system. They are a lowest frequency card at the 125 kHz range. **Passive** means that there is no internal battery system, while **active** have an internal battery to increase read ranges.

## Other types of cards and their read distances.

- 13.56 MHz. High Frequency (HF) **Passive** RFID Tags - maximum read distance of 1.5 meters (4 foot 11 inches) - usually under 1 meter (3 feet) and you can use a single or multi port reader plus custom antennas to extend the read range to longer tag read distances or a wider RFID read zone. To obtain more than 1 meter you need a reader with more than 1 watt RFID output power.
- 860 ~ 960 MHz. Ultra High Frequency (UHF) **Passive** RFID Tags - minimum read distance of over 1 meter or 3 feet. Gen2 tags can have a read range of up to 12 meters or 37 feet, however new generation of IC's plus antenna designs are now pushing this distance to over 15 meters! Gen 2 tags can be either 860 MHz. or 902 MHz. frequencies. Gen2 EPCglobal are multifrequency 860 ~ 960 MHz. Gen 2 Semi-active battery assisted tags are semi-passive (semi-active) tags have a read range of up to 50 meters or about 162 feet. Gen 2 Semi-active tags are just emerging on the market.
- 860 ~ 960 MHz. 3rd and 4th Generation **IC/Silicon** - The new generation 3 and 4 (Monza4, Higgs3 and NXP G2XM) silicon (Integrated Circuit) is now available in numerous inlay designs. This new silicon (IC) provides up to 40% more sensitivity

while reducing RF interference. This means that a tag using this new generation of silicon can have a [read range of over 16 meters or 50 feet](#) under FCC regulations of 4 watts EIRP. For your local power regulations see [RFID Frequencies and Transmission Power](#).

- [433 MHz Ultra High Frequency Active](#) RFID Tags - up to 500 meter read range (1,500 feet)
- [2.45 GHz. Super High Frequency Active](#) RFID Tags - up to 100 meter read range (325 feet) There are several different modulations for 2.45 GHz. and you can also have real time location information from these active tags.