Choosing the Optimal Frequency for Your Passive RFID Application

Compare the performance characteristics of each bandwidth to identify the optimal frequency – or frequencies – to match the requirements, environmental conditions, standards and regulations impacting your application. Once you've selected a frequency, you are prepared to assess the wide variety of transponders and readers to find the housing materials and form factors that will withstand the environmental conditions critical to the success of your application.*

	LF	HF	UHF	Guidelines
Frequency	125 or 134.2 kHz	13.56 MHz	860 to 960 MHz	
Read range	Up to 3.3 ft. (1 m)	Up to 5 ft. (1.5 m)	Up to 33 ft. (10 m)	• Where tags pass close to readers, use LF and HF • UHF tags may be read from greater distances
Anti-collision	Generally no	Yes	Yes	• UHF has the greatest capacity for reading multiple tags simultaneously • HF is also an option, where groups of tags pass relatively close to readers
Data transfer rate	Low	High	High	• HF and UHF processing speeds allow more comprehensive data capture • LF tags store smaller bits of data – typically a unique ID code – so slower data rates do not impede performance
Tag memory capacity (typically)	64 to 2048 bit	896 bit to 8 KB	EPC: 96 to 128 bit TID: 64 to 96 bit User: 128 to 8192 bit	• HF and UHF processing speeds allow more comprehensive data capture • LF tags store smaller bits of data – typically a unique ID code – so slower data rates do not impede performance
Performance near metal	Unaffected, can even be covered by metal	Moderate interference	Reduced read range if not designed for on-metal use	• LF tags may be encased in metal and can be read through it • HF tags may require a small spacer when mounted on metal to ensure readability • UHF tags may be placed on metal surfaces if designed for this use, allowing that sufficient surface area exposes tag antennas to the reader field
Performance in liquids	Unaffected	Moderate interference	Impeded, performance loss when tag is wet	• HF tags can be designed for effective performance where liquids are present • UHF tags positioned on exteriors of liquid containers – e.g. beverage containers or cylinders – can perform effectively, providing liquid contents do not obstruct reader fields
Antenna	Coil	Coil	Dipole - far field; Loop - near field	• Coil antennas in LF and HF tags are generally smaller than UHF antennas. LF and HF tags are typically disc or rod shaped, whereas UHF tags are typically square or rectangular.
Standards	ISO 11784/85 ISO 14223 ISO 18000-2	ISO 14443 ISO 15693 ISO 18000-3 EPC G2	EPC Class 1 G2 ISO 18000-6C	• A variety of standards ensure interoperability between tags and readers*
Applications	• Access control • Animal ID • Automation • Industrial processing	• Access control • Brand protection • Libraries • NFC • Payment • Public transportation • Product ID	• Fashion • Retail • Logistics & inventory • Pallet & container ID • Vehicles • Asset tracking	• HID can create a custom tag solution to fit your application requirements for chip type, dimensions, programming and materials • Embed multiple technologies in a single RFID tag to provide transition paths that connect legacy systems

*See HID Decision Guide: "How to Select an RFID Tag That Meets The Demands of Your Application"

To learn more about choosing the optimal tag for your passive RFID application, please visit **hidglobal.com/rfid**

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