Project Resonance

Forging RFID On-Metal

ELECOMP Capstone Design Project 2025-2026

Sponsoring Company:

Zebra Technologies Corporation
116 American Rd
Morris Plains, NJ 07950 USA
http://www.zebra.com

Company Overview:

Zebra Technologies Corporation and its subsidiaries provide enterprise asset intelligence solutions in the automatic identification and data capture solutions industry worldwide. The company designs, manufactures, and sells printers, which produce labels, wristbands, tickets, receipts, and plastic cards; dye-sublimination thermal card printers, which produce images which are used for personal identification, access control, and financial transactions; RFID printers that encode data into passive RFID transponders; accessories and options for our printers, including vehicle mounts and battery chargers; stock and customized thermal labels, receipts, ribbons, plastic cards, and RFID tags for printers; and temperature-monitoring labels primarily used in vaccine distribution. It also provides various maintenance, technical support, repair, and managed and professional services; real-time location systems and services; and tags, sensors, exciters, middleware software, and application software; as well as physical inventory management solutions, and rugged tablets and enterprise-grade mobile computing products and accessories. In addition, the company offers barcode scanners, RFID readers, industrial machine vision cameras, and fixed industrial scanners, workforce management solutions, workflow execution and task management solutions, and prescriptive analytics solutions, as well as communications and collaboration solutions. It also provides cloud-based software subscriptions and robotics automation solutions. The company serves retail and e-commerce, manufacturing, transportation and logistics, healthcare, public sector, and other industries through direct sales and a network of channel partners. The company was founded in 1969 and is based in Lincolnshire, Illinois.

Technical Directors:

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Project Motivation:

This project seeks to explore the feasibility of producing on-metal RFID tags at Zebra, focusing on testing different antenna designs and developing unique constructions for on-metal applications. Currently, Zebra sells millions of on-metal tags that are manufactured externally. The objective is to gain a thorough understanding of the technology to potentially transition production in-house.

Anticipated Best Outcome:

Measurably improve the read range of UHF passive on-metal RFID tags at FCC & European Telecommunications Standards Institute frequencies.

Project Details:

Improved Performance on Metal Surfaces: On-metal RFID tags are specifically designed to function effectively when placed on metal surfaces, overcoming the limitations of standard RFID tags that often experience performance issues due to signal interference caused by metal.

Expanding Applications: These tags enable the use of RFID technology in industries and environments where metal surfaces are prevalent, such as automotive, aerospace, and manufacturing, thereby broadening the scope of RFID applications.

Asset Tracking and Inventory Management: On-metal RFID tags facilitate precise asset tracking and inventory management of metal equipment and tools, enhancing operational efficiency and reducing the risk of asset loss or misplacement.

Durability and Reliability: Designed to withstand harsh conditions, on-metal RFID tags are often more durable and reliable, making them suitable for challenging environments where robust performance is critical.

An ideal outcome would include a tag that can be run through a specialized Zebra on-metal printer.

Composition of Team:

3 Electrical Engineers

Skills Required:

Adaptable, quick learner, highly curious.

Interest in, or experience with, RFID technology.

Interest in, or experience with, electrical engineering technology applied to biosciences.

Anticipated Best Outcome's Impact on Company's Business, and Economic Impact

Develop a tag construction that, first and foremost, performs well for on-metal applications. Additionally, introduce different ways to incorporate barrier layer (foam) that can give Zebra a unique edge when it comes to what the market has to offer.

Broader Implications of the Best Outcome on the Company's Industry:

The best outcome, if achieved, will allow for improvements of cost efficiency, increased quality control components, allow for customizable application and further innovation, create supply chain resilience, and allow for us to meet other Zebra-centric initiatives.