Faculty Initiative Fund Project Report

I. Cover

Project Title: Development of additively manufactured advanced sensors for environmental monitoring in Alaska

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Project Period: 01/06/2025 – 06/20/2026

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II. Accomplishments

A. Major goals of the project

The goal of this project was to develop cost-effective, more convenient, and long-lasting sensor with superior performance, such as high resolution, high accuracy, high sensitivity, and reliability, by incorporating additive manufacturing for sensor fabrication. There were two objectives in this project:

Objective1: Fabricate sensors using additive manufacturing technology.

Objective2: Evaluate the performance and reliability of the fabricated sensors.

B. Accomplishments under these goals

1) major activities: A magnetic field sensor prototype with additively manufactured parts was designed and fabricated to measure Earth's magnetic field.

2) specific objectives accomplished: A magnetic field sensor was designed using commercial simulation softwares namely, COMSOL and CST MWS and the prototype was fabricated using additive manufacturing technology. The sensor prototype was fabricated with the assistance of UAF Makerspace staff.

3) significant results, including research capabilities developments: The developed sensor exhibits several desirable performance characteristics such as low profile, easy assembly, portability, and simple procedure to detect Earth's magnetic field.

4) key outcomes: The successful outcomes of this project include (1) development of an additively manufactured sensor, (2) evaluation of the performance and reliability of the fabricated advanced sensor prototype, and (3) training one graduate student to design and fabricate the sensor prototype.

C. Opportunities for development

This project resulted in the development of a cost-effective and low-profile sensor to detect Earth's magnetic field. It will encourage future development of optimized versions of the developed cost-effective sensor, which will exhibit better performance in comparison to the existing sensors, and (2) supporting various industries and science communities in the Arctic by offering better solutions for monitoring Earth's magnetic field in arctic regions.

D. Dissemination activities to communities of interest

Research results from this project will be disseminated through publication of a peer-reviewed journal article. The manuscript preparation is ongoing for the journal article submission.