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Author: Mr. Kenton Greene
University of Iowa, United States, kenton-greene@uiowa.edu

PERFORMANCE AND CHARACTERISTICS OF THE NEW TESSERACT HIGH-STABILITY MAGNETOMETER DESIGN FOR APPLICATIONS ON MAGNETOSPHERIC SCIENCE MISSIONS

Abstract

Stable, reliable magnetic field measurements are essential to many applications in space physics including constellation missions studying the planetary magnetospheres. Instrumental stability and linearity are essential to enable meaningful comparison between disparate satellites in a constellation without extensive cross-calibration efforts, or to make meaningful measurement where such calibrations are not possible, such as planetary missions. Here we present the first laboratory results of the characteristics and performance of Tesseract: a low-noise, high-stability fluxgate magnetometer. The Tesseract Sensor design was optimized for low-noise cores, thermally stable base materials, and feedback efficacy. Then a high-fidelity engineering model of the Tesseract magnetometer was manufactured and tested at the University of Iowa magnetometer calibration facility to evaluate the sensors' performance metrics. The Tesseract Sensor exhibits characteristics that are very promising for making high-stability, low noise measurements. Tesseract will be flight demonstrated on the ACES-II sounding rockets in December 2022, and again aboard the TRACERS satellite mission as part of the MAGIC technology demonstration which is scheduled to launch in late 2023.