8 Appendix – Quad Chart

Miniaturized solid-state based vector magnetometer for planetary field mapping

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Target: This magnetometer can be targeted for any planetary body, satellite, asteroid, or comet with a magnetic field, especially those in harsh high temperature and high radiation environments.

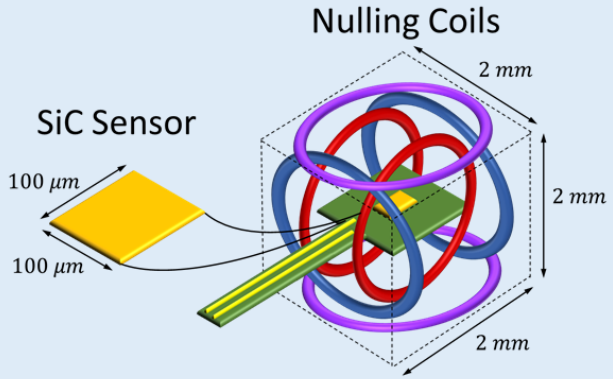
Science:

- Understand the inner workings and or composition of the planets, their satellites, comets, or asteroids.
- Gain insight into the formation and evolution of planets, satellites, and even the solar system
- Solar wind's interaction with atmosphere which influences climate and ability to harbor life
- Allows for indirect measurement of water.

Objectives:

- Develop next generation solid-state magnetometer using a silicon carbide (SiC) diode
- Simultaneous measurement of 3 axis using a single sensor with active area of 0.01 mm^2.
- Design will be significantly smaller and lighter than smallest fluxgate or optically pumped magnetometer
- Sensitivities will comparable to heritage designs
- Allow for operation in high temperature and high radiation environments

CoIs: Jordana Blacksberg, Yuki Maruyama, Neil Murphy, Carol Raymond/JPL; Phil Neudeck/GRC



Conceptualized illustration of the Silicon Carbide Magnetometer (SiCMag). The size of the sensor will allow single turn coils of radius 1mm to null the external magnetic field to maintain a region of zero field across the volume of the sensor.

Key Milestones:

- Receive test SiC diodes from NASA GRC (year 1)
- Develop supporting analog electronics around test diodes (year 1)
- Develop supporting digital signal processing routines (year 1)
- Design custom SiC diodes optimized for magnetometry (year 1)
- Fabricate custom SiC diodes (year 2)
- Electron irradiate custom SiC diodes (year 2)
- Defect and electrical characterization of custom diodes (year 2)
- Integrate custom devices into magnetometer (year 3)
- Fine tune magnetometer electronics and software (year 3)
- Measure and evaluate performance of custom devices (year 3)

TRL 2 to 4