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Magnetic impact of LEO environment on a magnetoresistive-based measurement system for a CubeSat.

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Abstract

Some space missions require a thorough control of the spacecraft's magnetic environment. With the aim of reducing risks, novel magnetic measurement designs that are likely to be included in these ambitious satellites might be previously tested in CubeSats as a cost-effective alternative. However, the adverse environment that these nanosatellites undergo at LEO altitudes may impact on the measurements that on-board magnetic sensors perform. For instance, continuously orbiting the Earth and changing the spacecraft's attitude entail undesired contributions to the noise estimation of the measurements. Therefore, this research elaborates on an approach to simulate these in-orbit magnetic variations at LEO orbit in order to identify the contributions generated by these conditions and to subtract them, so that just the intrinsic noise of the sensor can be assessed. The system tested for this purpose is Magnetic Experiment for LISA (MELISA), an AMR-based design. A version of this system, MELISA-III, is featured in the CubeSat Carrier-2 (CSC-2) platform as part of the Horizon 2020 programme. Additionally, MELISA-II is included in UCAnFly, a CubeSat developed under the FYS programme of the ESA. An on-ground Helmholtz Coil is fed to generate a suitable magnetic field according to the orbit simulations provided by tools like GMAT. Thus, SSO orbit conditions, which are typical scenarios for CubeSats, are represented in a laboratory environment along with the corresponding attitude variations. As a result, contributions in the measurements of the magnetic sensor are reflected at the frequencies that correspond to the orbit and attitude control simulated by the Helmholtz coils, which can be useful for foreseeing and cancelling out this effect for future missions.

My poster is available at https://zenodo.org/record/7050680#.Y3UhNJDMJD8