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Miniaturised magnetometer experiments for CubeSats

P. Brown, C. Carr, T. Horbury, H. O' Brien and T. Oddy

Blackett Laboratory, Imperial College London, UK

Abstract

In recent years a number of satellites based on the CubeSat model have been launched by university teams across the world. CubeSats offer fast and relatively cheap access to space and provide a potentially viable route for technology demonstration and raising Technology Readiness Levels (TRLs).

An interesting question is what, if any science measurement capability CubeSats offer? The very meagre onboard resources (spacecraft mass and power are of order a few kg and few W typically) necessitates new approaches by payload providers in the areas of instrument miniaturization and power reduction. We describe just such an approach for a DC vector magnetometer. Our design is based on a tiny solid state magnetoresistive sensor which offers two orders of magnitude mass and volume reduction compared to the more conventional fluxgate. The sensors are small enough for multipoint deployment on an ultra-light boom or could be littered as an array across the CubeSat surface itself. The multiple measurements obtained permit separation of the ambient and spacecraft fields. The performance of the instrument is compatible with both attitude control and science requirements. We present the instrument design, outline some of the mission projects we are involved with and describe approaches towards utilizing an array of such sensors to ascertain a real science measurement in resolving the dayside ULF wavefield.