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HALOSAT: A CUBESAT SEARCH FOR MISSING BARYONS

Abstract

A detailed census of the local universe fails to detect a third of the baryonic matter expected based on observations of the early universe. These missing baryons are thought to be in the form of hot ($> 10^6$ K) ionized gas, which is difficult to quantify using existing observations. Large volumes of hot ionized gas are present in the halos surrounding galaxies. Measuring the mass and geometry of the halo of our Milky Way Galaxy can be used to help understand the extent to which galactic halos could account for the missing baryon problem. HaloSat is a 6U Cube Satellite currently in low Earth orbit and conducting an all-sky survey using three X-ray silicon drift detectors to characterize the line emission from highly ionized species of oxygen present in the halo of the Milky Way. HaloSat deployed from the International Space Station in July 2018 and began routine operations in October 2018. Through the lens of HaloSat, we discuss whether small science missions can be viable alternatives to major missions. Further, we provide operational data from the HaloSat mission to provide insight on what can be expected for operations during similar missions. Finally, we will present preliminary data, which indicates that HaloSat is competitive with major missions for the study of diffuse X-ray emission.