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GALASSIA 5 - DEVELOPMENT OF A 6U EDGE AI EARTH OBSERVATION SATELLITE WITH DIRECT TO USER DOWNLINK CAPABILITY

Abstract

This paper presents a 6U Earth Observation (EO) mission developed at the National University of Singapore (NUS). The primary objective of Galassia 5 is to demonstrate the feasibility of near real time earth imaging enabled by edge AI processing, and to validate a direct-to-user downlink over Ku band for rapid EO intelligence delivery to a mobile end user equipped with a Very Small Aperture Terminal (VSAT). Combining both capabilities enables mobile users to access near real time earth imaging capabilities (5-10 minutes), enabling the use of EO in dynamic situations.

In the present implementation, Galassia 5 focuses on detecting and determining the position of maritime vessels in near real time.

Galassia 5 further explores a low cost, rapid development philosophy by utilizing industrial-grade, non-space-qualified components where possible, thereby reducing development costs while maintaing an acceptable level of reliability - paving the way for a cost effective, rapid cadence of future experimental Cubesat missions at the university

The current system is undergoing development in the preliminary design phase, with key work being undertaken on onboard AI model development, peripherals interfacing, RF development/testing and mechanical/thermal stackup. Progress on critical technical challenges like interfacing complexities with non-standard satellite components, and the challenges associated with closing a Ku link budget in a high rainfall tropical rainforest region will be shared.