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# FEMTO-SATELLITE SYSTEM ARCHITECTURE & MISSION DESIGN FOR LEO APPLICATIONS

**Abstract**

The past decade has seen an increasing interest in nano and pico-satellites as evident from the increasing number of such small satellites. This is primarily due to their attractive features such as low cost and short development time. Femto-Satellites aim to extrapolate this trend of decreasing both cost and development times, targeting for a satellite mass of less than 100 g. However, realizing feasible space application with such small satellites is not straightforward, and necessitates new approaches to spacecraft engineering and mission design. The aim of this paper is to explore novel techniques to design and develop femto-satellite system architecture for relevant space applications.

Remote sensing in the infra-red (IR) spectrum is chosen as a potential space application with a femto-satellite. Characterization of IR spectrum observations has interesting applications in vegetation studies and fire monitoring. The paper presents the design of a Femto-Satellite in Low Earth Orbit (LEO) that can deliver IR images with a spatial resolution of 350 m directly to a ground station. All subsystems are developed using commercial off the shelf (COTS) components, thereby leading to low cost and suitable for mass production. Some of the innovative methodologies used in the design are, having a single processor core for the communication transceiver and for on board logic, super capacitors with capacity of 500 mAh to 1000 mAh for energy storage. The preliminary design results show that the power budget allows adequate operation of the payload and a link margin of +6 db for ground communication.

Further, this design is contrasted with traditional satellite design to analyze similarities and dissimilarities in relationships such as subsystem power allocation and mass allocation. This adds more insight into the design process. In conclusion, space applications such as IR remote sensing are feasible through femto-satellites. New and creative approaches to spacecraft and mission design will open an array of exciting applications for femto-satellites.