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LITESAT – AN EARTH OBSERVATION MICROSATELLITE CONSTELLATION

Abstract

State of the art earth observation satellites usually weights a few hundred kilograms and cost a few hundred million dollars, therefore due to the cost including launch, high end earth observation constellations are not common. LiteSat is a new earth observation microsatellite constellation under development, specially designed to meet high end imaging capabilities and affordable constellation. The constellation enables high imaging target revisit rate and thus enables unique surveillance and intelligence benefits e.g. short time change detection over a specified region of interest. LiteSat is a dual use civilian and defense system aimed for home land security, border control, oil industry, vessel monitoring, and other civilian and defense applications. LiteSat basic characteristics are:

- Ground sample resolution 70 cm for all spectral bands at 350 km altitude orbit
- Spectral bands: Red, Green, Blue, Very Near IR, Panchromatic product
- Image Acquisition Modes
 1. Spot 11 x 11 square km
 1. Strip 11 km wide
 1. Wide scan 21 x 100 square km
- Life span 5 years
- Multiple launch: 3 satellites in a small launcher to LEO
- Image volume: 15,000 square km/orbit (can store 45,000 square km before download)
- Agility: 20 deg. within 12 sec. (ready for new POI imaging)
- Pointing knowledge 30 m (3σ), without ground control points (GCP)
- Satellite mass 100 kg

LiteSat design incorporate unique optical design and very low altitude in order to achieve 70 cm resolution with a 100 kg class satellite. The mechanical design is elongated missile shape and is optimized for very low earth orbits. The LiteSat ground station products make use of the high revisit frequency of the satellite constellation. Such products are: 3D image, DTM, DSM, mosaics of images and more. The revisit of the satellite constellation depends on the orbital parameters and the Region Of Interest (ROI) latitude. A representative figure for a six satellites constellation, in two orbital planes, would be 2-3 hours between consecutive photos of the same region. A representative figure for a twelve satellites constellation, with four orbital planes, would be about one hour between consecutive photos of the same region. This paper further describes LiteSat design to meet high end image quality with very high revisit rate given harsh lifespan and reliability requirements.