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A LOW COST SAR SOLUTION FOR DISASTER MANAGEMENT AND ENVIRONMENTAL MONITORING APPLICATIONS

Abstract

In the past ten years, programmes such as the Disaster Monitoring Constellation have proven that a low cost, small satellite approach can provide solutions for medium resolution Earth Observation (EO) applications. The Constellation, and the commercial missions it has spawned (Beijing-1, Deimos-1 and the five satellite RapidEye constellation), serve a wide variety of applications covering not only disaster management but also encompassing agriculture, forestry, land use, environmental monitoring etc.

So far, truly low cost EO missions have all been built around optical instruments. A synthetic aperture radar (SAR) equivalent would not only offer all-weather and night time advantages, but would also be better suited to applications such as ship detection and oil spill monitoring. To date, SAR satellites have mostly served large budget, institutional missions with a performance-driven, rather than applications-driven, design. However, such performance driven SAR payload designs which optimise all imaging parameters (resolution, swath, sensitivity, duty cycle etc.) lead to satellite designs which are at odds with a low cost approach.

Our innovative, low cost design offers flexible imaging modes in a package minimised for mass and volume. It is compatible with low cost launches and has no deployable antenna or solar panels. This has been achieved by leveraging power efficient terrestrial Solid State Power Amplifier (SSPA) technology and focusing on medium resolution (10-30m) applications with swaths of 100km and more. However, imaging quality has not been compromised and finer resolution imaging (¡10m) is possible although with somewhat narrower swaths.

In the same way that low cost optical satellites have enabled numerous optical EO programmes, a low cost approach can bring SAR solutions to a wider EO user community. Our SAR satellite design is intended to enable SAR missions at truly affordable budgets, and provide imaging that is attractive in terms of cost of imaging per km2.

In this paper we present the output of the development undertaken by a joint SSTL and EADS Astrium team. We will describe the platform and payload design, and the imaging modes that can be supported.

We will describe the performance already achieved using an airborne demonstrator developed by the team and show some results from that demonstrator. We will also discuss how either single or multi-platform missions can serve medium resolution applications. We will demonstrate the utility of such systems in terms of revisit times, area coverage and imaging data throughput.