Paper ID: 18035
oral
student

20th SYMPOSIUM ON SMALL SATELLITE MISSIONS (B4)
Small Distributed Space Missions (7B)

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THE ROAD TO OLFAR - A ROADMAP TO INTERFEROMETRIC LONG-WAVELENGTH RADIO ASTRONOMY USING MINIATURIZED DISTRIBUTED SPACE SYSTEMS

Abstract

The Orbiting Low Frequency Antennas for Radio Astronomy (OLFAR) project aims to develop a space-based low frequency radio telescope that will explore the universe's so-called dark ages, map the interstellar medium, and discover planetary and solar bursts in other solar systems. The telescope, composed of a swarm of fifty satellites working as a single instrument, will be sent to a location far from Earth in order to avoid the high radio frequency interference (RFI) found at frequencies below 30 MHz.

The OLFAR telescope is a novel and complex system, requiring not-yet proven technologies and systems, therefore, a number of key technologies are still to be developed and proven. Most of these can be tested on Earth, but four aspects in particular require in-space verification. Those are the satellite's propulsion and attitude control systems, and their interactions with the large science antennas, as well as the payload system itself and finally in-space interferometry. Furthermore, the RFI environment in the intended target orbits is mostly unknown. Indeed, only three satellites missions have previously

been launched into orbit shedding light on the RFI environment, but sufficiently detailed measurements allowing for the creation of a usable RFI model have never been performed.

To carry out both the hardware qualification and RFI measurements, a few pathfinder missions are deemed in order. This paper describes these pathfinders in detail; outlining the scientific objective, the technologies being demonstrated as well as the missions' roadmap which revolves around a novel systems engineering approach. This approach resembles those used in certain fast-paced industries where development is heavily parallelised and products are launched as soon as opportunities arise. This will be combined with in-space upgrading of mission firmware to allow for high flexibility within the limited time and budget constraints of these pathfinders.