SPACE EXPLORATION SYMPOSIUM (A3)
Moon Exploration – Part 1 (2A)

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ULTRA-LONG WAVE RADIO INTERFEROMETER MISSION BASED ON FORMATION FLYING AROUND LUNAR

Abstract

After nearly two decades of development, significant achievements of study on satellite formation flying have been obtained in both theory and experiment. Remarkably, up to now, DLR's TanDEM-X mission has more than 6 years running experience. Meanwhile, the formation flying mission is now expanding from near earth space to deep space with the explosion of scientific research. Especially, in the 21st century, along with the research process of the universe evolution, some new major scientific issues have caught scientist's attention, e.g., the cosmic dark ages. As the ultra-long wave detection is the only known measure to research the dark ages at present, it puts forward some additional requirements for the space equipment system and the detection performance. Some current studies have shown that the rear part of the moon can effectively block the disturbance of radio signals from the earth and the sun, which almost enjoys the quietest electromagnetic environment among the solar system. Hence, it would be the best place to observe the cosmic ultra-long wave in the space. Thus, we present a formation flying mission for testing some key technologies for deep formation flying and observing the cosmic ultra-long wave, as the first tentative sat-sat astronomical observation system in lunar orbit.

The ultra-long wave radio interferometer mission is proposed and in charge of one joint team from Harbin Institute of Technology and Chinese Academy of Sciences. The two micro satellites will be manufactured and launched into earth-moon transfer orbit followed by the CHANG'E-4 mission. Those two satellites are instinctive to transfer from the earth to the moon orbit, to make a break as closing the moon, to fly formative in a large ellipse orbit surrounding the moon at infinite fuels as well. The ultra-long wave interferometer surrounding the moon will be done. Then, the two collaborative satellites will try to achieve the signal observation of below 30MHz bands. And the micro-satellite project is described from the supporting services model and the scientific payload model respectively.

This paper is organized as follows: Section 1 generally introduces the background, motivations and contributions of this paper. In Section 2, we propose the mission general design, flight phases and work modes. Then, we elaborate the general design of satellite-level and the key design of some function models in Section 3. And briefly conclusion is given in Section 4.