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COMMUNICATION SYSTEM ARCHITECTURE FOR FUTURE KOREA MARS EXPLORER

Abstract

Since the successful launch of the lunar orbiter KPLO (Korea Pathfinder Lunar Orbiter) in 2022, Korea has successfully completed its mission, and now has decided to extend its mission for two years. Last year, the Korea AeroSpace Administration (KASA) was founded. KASA has begun developing a lunar lander last year and plans to send it to the lunar surface in 2032. KASA is planning to develop and launch a Mars orbiter in 2035 and a Mars lander in 2045 by utilizing the development capabilities of these lunar orbiters and lunar landers, and is also preparing for the L4 exploration project. The Mars orbiters currently operated for Mars exploration and science missions are nearing the end of their lifespan, and as more Mars explorers wii be expected to be sent in the future, the demand for deep space ground stations for Mars mission operation and data transmission will rapidly increase. Accordingly, the communication relay and transmission capabilities of the Mars explorers must be increased in order to transmit mission data obtained from the explorers. For the future Mars exploration mission planned by Korea, international mutual use and support of overseas deep space ground stations and Mars explorers is very crucial. Recently, the IOAG (Interagency Operation Advisory Group) working group proposed a future Mars communication structure that recommends frequencies, modulations, coding, and protocols for interoperability. The Korean Mars explorer communication system will be built using the frequencies, modulations, and coding recommended by IOAG for interoperability, and the Korean Mars explorer communication system is supposed to use the domestic deep space ground station KDSA (Korea Deep Space Antenna) and overseas deep space ground stations. In this paper, we analyze the communication system architecture of the Mars orbiter and lander for the development of Korea's future Mars explorer based on the IOAG interoperability recommendations. In particular, we analyze the performance and applicability of the optical communication link to be used for the high-speed transmission of mission data. Finally, we propose domestic preparations for international cooperation in the context of the interoperability of future Mars exploration mission.