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A HIGH-END GROUND STATION DEVELOPMENT FOR ARTEMIS LUNAR PROGRAM

Abstract

The orbital area around the moon remains a largely underdeveloped resource. Any long-term strategy for space commerce and exploration will need to make better use of this region, as NASA Artemis program demonstrates. In this frame, some earth ground stations with latest technology and high directivity are necessary to connect the lunar orbital gateway with earth. Unlike the legacy Deep Space Networks, these systems require an optimized trade-off between performance, leadtime and cost in order to be commercially sustainable for Lunar and beyond programs. The required Ground stations are relatively uncommon and complex 20-meters class Antenna systems, with full hemispheric coverage and high wind resistance. Our contribution presents the detailed design of the antenna system developed by Safran Data Systems, which goes beyond the state-of-the-art design rules of full motion antennas. The presentation focuses on the main innovations of the design and associated rationales. Among these, the quad-motorization per axis ensuring huge torque and continuous operability. In addition, intelligent servo-controller, performing cancellation of wind effects and mechanics dry friction on the antenna pointing accuracy is another key item avoiding the need of a radome. A last remarkable and unique feature is the optimized and compact aerial, integrating all RF equipment and the Safran patented Tri-band S/X/Ka concentric feed. Finally, it presents the most relevant performances with a comparison to requirements for NASA LEGS (Lunar Exploration Ground Sites) stations.