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THE HIGH EFFICIENT COMMUNICATION METHOD OF MULTIPLE SPACECRAFTS BASED ON PROXIMITY-1 PROTOCOL FOR MARS EXPLORATION

Abstract

Mars is the next milestone in our exploration of solar system. Because of the really long distance, 20 minutes are needed to transmit a telecommand from mars to earth. Therefore a total automatic communication system is needed between the rover and the orbiter which is proximity-1 protocol. However, the current proximity-1 always operates between a fixed pair of spacecrafts that usually belong to the same mission. The caller and responder roles between these spacecrafts are usually predefined, even when change is allowed, are pre-scheduled. The configuration and operational parameters are limited and preselected to match the capability of the spacecrafts. Although the proximity-1 presents the communication scheme for multiple orbiters and rovers from different missions, the requirement of the power and mass resource increases quite quickly, especially for orbiter. As we all know that mass and power are very precious in deep space exploration and every effort should be made to optimize them. In this paper, the high efficient communication method of multiple spacecrafts based on proximity-1 is presented, which needs only 2 transmission links (D/A, frontend and SSPA (solid state power amplifier)) for the orbiter to communicate with multiple rovers. One link is specified as hailing channel and the other is defined as new working channel. Therefore, compared with current proximity-1, 3 transmission links could be saved if the orbiter communicates with 5 rovers in the meantime, which means the power and mass could be saved tremendously. By using the conception products which simulate 1 orbiter and 5 rovers, real test shows that the presented method performs well in multiple spacecrafts condition.