

Poster Session (P)

Poster Lunch (1)

Author: Dr. Yan Jianguo

Wuhan University, China, jgyan_511@163.com

Mr. Xuan Yang

Wuhan University, China, yangxuan123@qq.com

Dr. Mao Ye

Wuhan University, China, yangxuan123@qq.com

SIMULTANEOUSLY DYNAMICAL POSITIONING METHODS FOR MARS ORBITER AND MARS LANDER

Abstract

The determination of the position of Mars Orbiter and Mars Lander has very important engineering and scientific significance. In this paper, we propose three methods for positioning Mars orbiter and Mars lander, they are same-beam VLBI (Very Long Baseline Interferometry), four-way orbiter-lander Doppler, and three-way-loop Doppler. Based on these positioning methods, we give the measurement models respectively, and the advantages of the three methods are analyzed. Our simulation results show that, by adding the same-beam VLBI data with the noise level of 10 ps, the accuracy of the orbit determination of the Mars orbiter is in the order of decimeter, and the positioning accuracy of the Mars Lander is about ten meters. Due to the additional direct link of orbiter-lander, the geometry of four-way orbiter-lander Doppler is more sensitive than two-way Doppler with respect to the Mars spacecraft orbit. Therefore, after adding the four-way orbiter-lander Doppler data, the accuracy of the orbiter and the lander will arrive at decimeter level and centimeter level. In addition, a new kind of tracking mode, named three-way-loop Doppler, is proposed creatively. The method reduces the number of orbital repeater signals, and transmits signal directly from the lander to the ground station. Its accuracy of POD could reach decimeter-level, and the accuracy of lander position would expect to reach centimeters-level. The work of this paper could provide an important reference for the Chinese Mars mission to be implemented in 2020.