

## ASTRODYNAMICS SYMPOSIUM (C1)

## Attitude Dynamics (2) (4)

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RESEARCH ON THE POINTING CONTROL COMPUTATION AND REALIZATION METHOD OF  
TDRS TRACKING THE LEO SPACECRAFT**Abstract**

Due to the low capability of the on board computer(OBC) in the tracking and data relay satellite(TDRS), when the inter-orbit link antenna(IOLA) was operated on the control mode of program track, the pointing angles of IOLA in the tracking course should be calculated in ground beforehand. Then according to the pointing angles, the TDRS controlled the IOLA to point the low-earth-orbiting(LEO) spacecraft accurately in the data relay tasks. Aimed at the pointing control technology of IOLA in TDRS tracking LEO spacecraft, the computation model of the IOLA pointing angles was studied, and the method of pointing control realization in TDRS was proposed. Because the orbit dynamic equation with perturbation had not analytic solution, the numerical computation approach was used. According to the accurate orbit prediction of TDRS and user spacecraft, the IOLA pointing vector in inertial coordinate frame was calculated. Through the coordinate conversion from inertial to antenna coordinate frame and vector projection, the IOLA pointing angles in tracking course were deduced. Analyzed the pointing angles of the different obliquitous orbit and tracking trajectories with LEO spacecraft, the control method was proposed, which used a series of IOLA pointing angles with equal interval to control the motion of IOLA. The motion of IOLA was linear multisegment based on the pointing angles. Compared with the precise calculation of IOLA pointing angles between the adjacent pointing angles, the error of pointing angles with the linear motion was less than 0.01 degree. It indicated the linear motion with the series of IOLA pointing angles was consistent with the precise motion. The IOLA tracking computation approach and control mode in TDRS were proposed. The method used the pointing angles calculated in ground to track the user spacecraft. Compared with the method of the polynomial fit, it had the merit of less calculation and was easy to realize in the TDRS. The method can also assure the tracking precision of IOLA pointing. The research on pointing computation model for IOLA of TDRS tracking LEO spacecraft and control realization in TDRS would benefit for the TDRS application widely.