

Pointing ahead and acquisition for the ASTROD I mission

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ASTROD I (Single-Spacecraft Astrodynamical Space Test of Relativity using Optical Devices) mission concept is a deep space laser ranging mission with multiple purposes. The laser light takes up to about 1000 s to travel between a ground station and the spacecraft. In this paper, we present our study on the issue of laser pointing ahead and laser acquisition for ASTROD I. We calculate the laser pointing ahead angle as a function of time using the 2015 design orbit of ASTROD I. The pointing ahead angle is typically from 0-20 arcsec. The 1.2 m diameter azimuth-elevation telescope at the ground station of Yunnan Observatory has an accuracy of 1 arcsec. We study and report on the control schemes of this telescope for the pointing ahead and acquisition purpose. We study and present the schemes of pointing acquisition using star trackers and laser beams employing the beam profile characterization data from the quadrant detector. Choices of operating points will also be assessed.