Stability study of laser time transfer in Cis-lunar space

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Abstract: We study the stability of time transfer via laser link in Cis-lunar space. Assuming the time transfer link works as the same principle as T2L2 and ELT, the influences of relative velocity correction, relativistic frequency shift and Shapiro delay are analyzed. With the accuracy constraint on the orbit determination of the lunar satellite 100m in position and 5mm/s in velocity, the stability of time transfer is studied. The result shows it would yield a time stability (TDEV) of better than 10.6ps after 1000s of integration and better than 114.8ps after 1 day of integration, which would support the performance validation of board atomic clock with a frequency stability (ADEV) of better than 3e-15 after 86400s of integration.

Keywords: Laser time transfer, Cis-lunar space, stability budget, orbital error, relativistic model