

The Influence of Stellar Binary Companions on the SIM Celestial Reference Frame

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Abstract

The Space Interferometry Mission (SIM) is a 10-m Michelson space-based optical interferometer designed for precision astrometry ($4 \mu\text{as}$, $2.8 \mu\text{as/yr}$) with better accuracy hoped for over a narrow field of view. It is intended to search for planets and investigate a number of problems in Galactic and extra-galactic astronomy. The accuracy and stability of SIM's celestial reference frame is subject to degradation from the reflex motion induced by massive companions of the reference objects over the 5 year mission. We present the results of simulations which show the sensitivity of reference frame accuracy to companions as a function of mass and period. In particular, we will discuss three strategies for modeling the reflex motion. First, absorbing the motion into estimates position and proper motion. Second, adding an acceleration term in RA and dec. Third, solving for the full set of 7 Keplerian parameters. Lastly, we discuss the suitability of G-V, A-V and K-III stars as reference objects in light of our simulations of companion induced reflex motion and suggest directions for further research on this problem. This work was performed by the Jet Propulsion Laboratory, California Institute of Technology, under contract with the NASA.

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