Relativistic tests with lunar laser ranging and planetary radio tracking data

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Abstract

A new planetary and lunar ephemeris PETREL19 was constructed on a solar system ephemeris platform developed by the authors (Celest. Mech. Dyn. Astron. (2023) 135:38 https://doi.org/10.1007/s10569-023-10151-6). However, two Parametrized Post-Newtonian (PPN) parameters beta and gamma, measuring curvature of space geometry and nonlinearity of gravity, respectively, are fixed to unity in PETREL19. Given that more precise LLR normal points and planetary ranging measurements to Messenger and other planetary orbiters are available, in this work we will implement relativistic tests on two PPN parameters (beta and gamma) on basis of our ephemeris platform. The following three cases will be addressed: two tests solely with LLR normal points and planetary ranging measurements, and one test with two types of data simultaneously. At the end, correlations between two PPN parameters and other ephemeris parameters are analyzed as well.

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