

OFFICIAL ABSTRACT and CERTIFICATION

A Possible Alignment Between Orbits of Visual Binary Stars and Their Planetary Systems

Sam Christian

LASA H S, Austin, Texas, US

Astronomers do not have a complete picture of the effects of wide-binary systems on the formation and evolution of exoplanets. I investigate these effects using new data from GAIA EDR3 and the TESS mission to characterize wide-binary systems with transiting exoplanets. I identify a sample of 72 systems of transiting exoplanet candidates (with well-determined orbital inclinations) that reside in wide visual binary systems. I derive orbital parameters for the wide-binary systems and measure the minimum difference in orbital inclination between the binary and planet orbits. I determine that there appears to be a statistically significant difference in the inclination distribution of wide binary stars with transiting planets compared to a control sample ($p=0.008$). This implies that there might be a population of planets in binary systems whose orbits are aligned with those of the binary. I investigate some effects that could cause such an alignment, such as a primordial alignment of angular momentum vectors of the binary system or a torque caused by a misaligned binary companion.

Category.

Physics and Astronomy

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