

Orbital parameter estimation of extrasolar multi-planet systems by Transit Time Variation

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Transit Time Variation (TTV) is the earlier or later occurrence of a planetary transit relative to the time of a reference transit. TTV may be dominantly caused by the gravitational perturbation of the orbit of the transiting planet by another still unknown planet(s) inside or outside of the orbit of the known transiting planet. Gravitational interactions perturb the velocity of the transiting planet in its orbit which manifests in the periodical perturbation of the revolution period. Measurements of the transit times and the identification of differences from a mean transit period may then indicate the presence of another unknown planet and is therefore proof for the existence of further planets. The estimation of the mass of the transiting planet and the orbital parameters of the undetected planet(s) are constrained by the amplitude of the periodical variation of the transit times. Simulations of known multi-planet systems which show TTV shall be presented. The resulting TTV amplitude is analyzed with regard to the main dependencies: mass of the perturbing planet and the orbit eccentricities.