

## Detection and Dynamics of Exoplanets (DDE): Interplay between theory and observations



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### Exceptionally Large Transit Timing Variations in TOI-4504: A Tale of Resonance and Complexity

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We present the discovery and analysis of exceptionally large transit timing variations (TTVs) in the TOI-4504 exoplanetary system. Using data from NASA's Transiting Exoplanet Survey Satellite (TESS) and radial velocity measurements from FEROS, we identified TOI-4504 c as a warm Jupiter with a peak-to-node TTV amplitude of approximately 2 days, the largest such signal observed to date. Dynamical modeling revealed the presence of a nontransiting gas giant, TOI-4504 d, which together with TOI-4504 c forms a stable pair likely in a 2:1 mean-motion resonance. Additionally, TOI-4504 b, a hot sub-Neptune, was identified in the system, contributing further to the complexity of this multi-planetary architecture. This system provides valuable insight into the formation and long-term stability of resonant gas giant pairs and highlights the power of combining TTV and radial velocity techniques for characterizing complex planetary architectures.

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**Session Classification:** TTVs and transit-detected compact systems