



# Application of the Titius-Bode Rule to the 55 Cancri System: Tentative Prediction of a Possibly Habitable Planet

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Following the notion that the Titius-Bode rule (TBR) may also be applicable to some extra-solar planetary systems, although this number could be relatively small, it is applied to 55 Cancri, which is a G-type main-sequence star currently known to host five planets. Following a concise computational process, we tentatively identify four new hypothetical planetary positions given as 0.081, 0.41, 1.51 and 2.95 AU from the star. The likelihood that these positions are occupied by real existing planets is significantly enhanced for the positions of 1.51 and 2.95 AU in the view of previous simulations on planet formation and planetary orbital stability. For example, Raymond et al. (2008) [ApJ 689, 478] argued that additional planets would be possible between 55 Cnc f and 55 Cnc d, which would include planets situated at 1.51 and 2.95 AU. If two additional planets are assumed to exist between 55 Cnc f and 55 Cnc d, the deduced domains of stability would be given as 1.3-1.6 and 2.2-3.3 AU. The possible planet near 1.5 AU appears to be located at the outskirts of the stellar habitable zone, which is however notably affected by the stellar parameters as well as the adopted model of circumstellar habitability. We also compute the distance of the next possible outer planet in the 55 Cnc system, which if existing is predicted to be located between 10.9 and 12.2 AU, which is consistent with orbital stability constraints. The inherent statistical significance of the TBR is evaluated following the method by Lynch (2003) [MNRAS 341, 1174]. Yet it is up to future planetary search missions to verify or falsify the applicability of the TBR to the 55 Cnc system, and to attain information on additional planets, if existing.

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