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Abstract:

There are so far five eccentric binary millisecond pulsars (eBMSPs) detected in the Galactic disk. They pose a challenge to the standard evolutionary theory, which predicts that BMSP should reside in circular orbits. Recently, Serylak et al. (2022) deduced a misalignment angle between the spin and orbital angular momenta of the eBMSP J0955-6150 to be >4.8 degrees at 99% CI. This confidently rules out most of the proposed models and seems to prefer the thermonuclear rocket model. In that model, asymmetrical mass ejection during shell flashes on the proto-white dwarf exerts a kick to the binary and causes misalignment of the spin and orbital axes of the pulsar. However, it is unclear whether the other eBMSPs have such misalignment, thus a systematic measurement of the tilt angle in eBMSPs is crucial in testing the validity of the model. We propose to perform deep observations of the eBMSP J1950+2414 (the other eBMSPs either are outside the sky coverage of FAST or were just observed with FAST). The measurement of the tilt angle will further confirm whether the misalignment is a common feature in eBMSPs, and put strong constraint on their formation theory.