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Abstract:

The origin of the initial spin and velocity of pulsars remains largely a mystery. The detections of two-dimensional (2D) spin-velocity alignment in young pulsars have shed some light on the origin of the fast rotation and high velocity of pulsars. Studying the spin-velocity relation of the hyper-velocity pulsar PSR J0002+6216 will put severe constraints on the neutron star kick mechanism. In previous observations of PSR J0002+6216, we detected an interstellar rotation measure variation, measured the direction of the 3D spin axis, and measured the pulsar position. The observed positive proper motion in declination is in contradiction with previous negative measured values. From the newly measured pulsar position and position angle of the projected spin axis, PSR J0002+6216 has near-perfect 2D spin-velocity alignment. But, the 2D angle between the velocity and the observed bow-shock tail is large. So we propose to confirm these detections and measure more accurate proper motion through timing analysis of data from $12 \times 2 = 24$ hours of FAST time. This project will confirm the association between PSR J0002+6212 and SNR CTB1. In addition, the determination of the relationship between the pulsar spin axis and the proper motion will provide severe constraints on neutron-star kick models.