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Abstract:

Pulsars shine through the Galaxy like beacons and scintillate because of the relative motion of the pulsar, intervening scattering screens and the observer. Using 55-h of FAST observations, we have detected new arcs from 23 relatively weak pulsars, proving FAST's power in detecting ISS arcs for weaker pulsars. Based on scintillation-arc and polarization analyses for PSR J0538+2817, we found the first evidence for three-dimensional spin-velocity alignment in pulsars. This paper is accepted for publication by Nature Astronomy. Paper studying the spin-velocity alignment in PSRs J0659+1414 was submitted to ApJ. We propose multiple follow-up observations for five pulsars for which we have FAST detections of arcs and (in two cases) arclets, and to search for new arcs and analyze spin-velocity relation in 13 weak pulsars using 56 hours of FAST time. We expect that this continuation of the project will complete the task of doubling the number of pulsars with known ISS arcs and reveal their origin. In addition, it will reveal the properties of SNR shells and the compact ionized structures responsible for ISS arcs, bending structure and arclets, and allow us to study the structure of the Local Bubble.