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Abstract:

We propose to observe the most distant globular cluster (GC) M53 containing four newly found millisecond pulsars (MSPs) without reported timing solutions, aiming to update or acquire their timing results, study the distribution of these bright pulsars in M53, and explore why there are so many bright pulsars in such a distant GC. Four of five MSPs in M53 are newly discovered by FAST, which are M53B to M53E. M53B is a binary pulsar and is the brightest one in the newly found pulsars in M53. M53C is apparently to be isolated but seems to have a very large spin period derivative, while M53D and E are both identified as binaries. No timing solutions are reported for these four pulsars. With more and continuous observations on M53 pulsars, we can update the timing solutions of M53A and obtain the unrevealed timing results of M53B to M53E. This will allow us to constrain the density and gravitational potential of M53, analyze the precise positions of these pulsars in M53, and the orbital parameters of any binary companion. To detect the periodic signals and timing these distant pulsars in M53, we propose for 55 hours of FAST observation in total.