Recent Radio Searches for Globular Cluster Pulsars

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Abstract

Globular clusters are ancient spherical systems of 10^5–10^6 stars that orbit the Galaxy. High stellar concentrations in the cores of the clusters cause relatively frequent dynamical interactions between stars that produce large numbers of exotic systems, including Cataclysmic Variables, Low-Mass X-ray Binaries and Millisecond Pulsars (MSPs).

MSPs are neutron stars (compact stellar remnants with radii of only 10–20 km but with more mass than the Sun) that spin hundreds of times per second. Radiation from their magnetic poles is detected as an extremely stable train of radio pulses here on Earth. This stability allows astronomers monitoring the pulse arrival times to use them as high-precision probes of many areas of astrophysics, including stellar dynamics and evolution, the interstellar medium, and relativistic gravity.

In the decade following the discovery of the first globular cluster pulsar (an isolated MSP) in 1987, groups conducting deep searches with the world's largest radio telescopes had managed to uncover more than 30 pulsars. The vast majority of these pulsars were MSPs and almost half were members of binary systems. Long-term timing of these pulsars has provided unique insights into the evolution and dynamics of globular clusters and their component stars.

Due to significant radio telescope upgrades, the development of advanced search algorithms that target compact binary systems, and the widespread availability of high-performance computing resources, the number of cluster pulsars has more than doubled during the last 5 years and currently stands at over 70 known systems. In this talk I will describe the nature of these searches, the most interesting of the newly discovered pulsars, and the initial results from the timing of these systems.