Observational appearances of neutron stars in stellar clusters

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It is known from observations that globular clusters are very efficient in forming close binary systems and their progeny, such as low-mass X-ray binaries, millisecond pulsars and so on. The high densities in the cores of globular clusters greatly increase the formation rate of exotic binary systems through close stellar encounters.

At present, simulations of dense stellar systems share one major difficulty: it is not easy to combine accurate computer codes for modeling stellar dynamics and stellar evolution into one single software environment. In order to solve this computational problem, some year ago the MODEST international consortium was formed for MOdeling DEnse STellar systems. It currently includes nine working groups and has organized a series of meetings every half a year (http://www.manybody.org/modest.html).

We present one possible approach to modeling the evolution of neutron stars in dense stellar clusters using the population synthesis method. It takes into account the interaction of a binary with single stars in parallel with the dynamical evolution of the globular cluster as a whole. Using generally recognized assumptions on binary star evolution, we calculated for the first time the number of neutron stars, both single and entering binary systems, in different evolutionary states (such as ejectors, accretors, etc.) as a function of time, and found their distributions over main observational characteristic (X-ray luminosity function, orbital periods, etc.). We also computed time variability of total X-ray luminosity of the Galactic center. The results of simulations are compared with modern observations of X-ray sources and millisecond radio pulsars in globular clusters.

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