

Milky Way Globular Clusters: close encounter rates with each other and with the Central Supermassive Black Hole

Wednesday, 22 December 2021 11:05 (20 minutes)

The recent precise astrometric measurements by Gaia Data Release 2 (DR2) provide a possibility to measure the mean proper motions for the large sample of (~ 150) GCs of the Milky Way (MW), which makes it plausible to study the orbital evolution of the globular clusters (GCs) system as the whole. To explore the possible close encounters (i.e., possible collisions) between the GCs and Central Black Hole (CBH), we performed the orbital calculations in total of 152 GCs using our self-developed high-order ϕ -GRAPE code. We integrated (up to 10 Gyr in look-back time) the orbits of objects with reliable positions and proper motions in five different external gravitational potential models. They were selected from Illustris TNG-100 cosmological simulation and have a variable in time mass, and sizes. Using complex criteria on impact factors, half-mass radii and relative velocity for the collision's detection, we found approximately 45 pairs of possible GCs "collisions" for all the five external potential models. We estimated 6 close encounter events with CBH on separations less than 100 pc from the center. The GCs sample consists of NGC 6121, NGC 6544, NGC 6642 passed close in all systems with five potential models; Terzan 9 and NGC 6981 - in systems with four potential models (not fully crossing); Pal 2 - in systems with two potential models.

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Session Classification: Astrophysics and Cosmology

Track Classification: Astrophysics and Cosmology