# Spacecraft orbital motion near a binary asteroid system for a future Chinese asteroid exploration mission
# asteroid system for Chinese future asteroid exploration mission

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Asteroids attract scientists not only due to their scientific values but also due to their assumed material resources. Many missions to asteroids have been carried out, and new missions are in progress in various stages. Recently, a Chinese future asteroid exploration mission to a binary asteroid system has been proposed. The exploration scenario includes a flyby and rendezvous with the asteroid. The binary asteroid system 1996 $FG_3$ has been selected as the possible final target.

In the presentation, spacecraft motion in the vicinity of 1996 $FG_3$ is investigated. Firstly, a rotating frame is established for the binary asteroid system. The Jacobi constant and zero-velocity surfaces are analyzed, and equilibrium points, stability, and periodic orbits are obtained. Then, the different orbits are classified by using the periapsis Poincaré maps. As a function of the periapsis radius and orbital energy, the motional behavior of the spacecraft is investigated. The capture and escape orbit and the stable orbit can be found. Finally, based on the results above, the mission orbit in the 1996 $FG_3$ binary system is designed and discussed. The results could constitute a reference for the future asteroid exploration mission.