



Potential Flyby Targets for the ESA Hera Mission

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The Hera mission is the planetary defence mission approved under the ESA Space Safety Programme. Together with the NASA DART mission, it is the first Asteroid Deflection Demonstration. DART will impact Dimorphos, the natural satellite of Near Earth Asteroid Didymos, in 2022. Using the kinetic impactor technology, it will demonstrate the ability to change the trajectory of a small asteroid. Hera will launch in 2024 and arrive in the Didymos system at the end of 2026. Its primary goals are to accurately measure the mass of Dimorphos and to characterise the crater and effect of the DART impact on this small asteroid.

Hera will spend over 2 years matching orbits with Didymos, travelling through near-Earth space and the inner main-belt. This potentially allows Hera to perform an additional asteroid flyby enroute to Didymos. For such a flyby, a number of factors need to be considered for target selection. Primary factors are the accuracy of the orbit of the asteroid, and distance from the nominal trajectory. Resolution of geomorphology requires a minimum number of spatial resolution elements at the desired flyby distance. Previous observations on the form of lightcurves, colours or spectra are important for flyby science planning. Finally, a dynamical class of asteroid may be targeted for specific science priorities.

Analysis of the nominal trajectory shows approximately 100 asteroids passing the nominal position of Hera within 0.02 au. Ten of these potential targets are Near-Earth Asteroids, the rest being Mars-crossers and main-belt asteroids. We will present our current knowledge on these targets, and highlight the highest priority targets for further observation in the next 2-3 years. Although ground-based reconnaissance has started on some targets, further observations are required to support the flyby planning process.

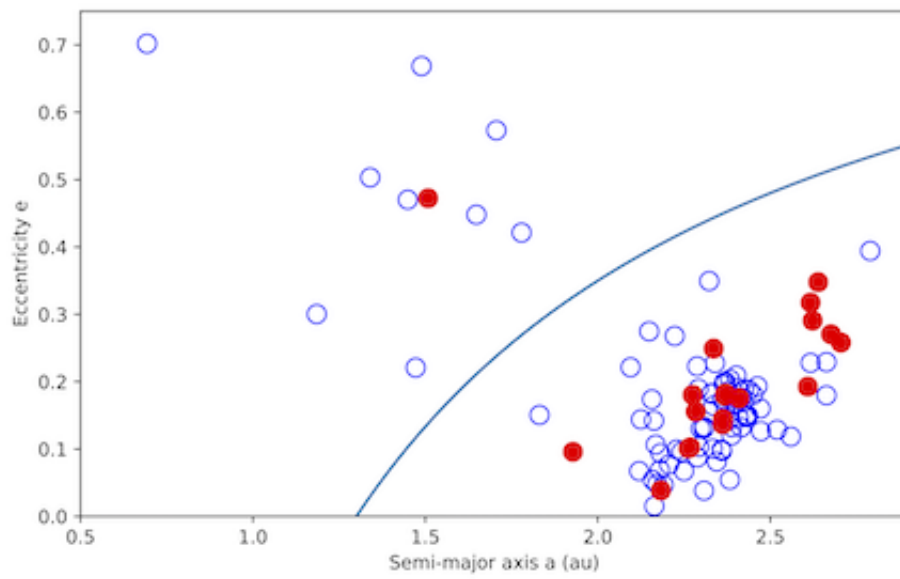


Figure 1. Osculating orbital elements of asteroids passing close to Hera on its nominal trajectory to the Didymos system, without any additional trajectory adjustment. Red dots indicate a current flyby distance $d < 0.01$ au, blue circles indicate a current flyby distance 0.01 au $< d < 0.02$ au. The solid line indicates a perihelion distance of 1.3 au, asteroids to the left of this line are Near-Earth Asteroids.