

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Small Bodies Missions and Technologies (Part 1) (4A)

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THE ESA HERA MISSION TO THE BINARY ASTEROID DIDYMOS: PLANETARY DEFENSE AND BONUS SCIENCE

Abstract

The Hera mission has been approved for development and launch in the new ESA Space Safety Programme by the ESA Council at Ministerial Level, Space19+, in November 2019. Hera will contribute to the first deflection test of an asteroid, in the framework of the international NASA- and ESA supported Asteroid Impact and Deflection Assessment (AIDA) collaboration.

The impact of the NASA DART (Double Asteroid Redirection Test) spacecraft on the natural satellite of the binary asteroid Didymos in late September 2022 will change its orbital period around Didymos. As Didymos is an eclipsing binary, and close to the Earth on this date, the change can be detected by Earth-based observers. ESA's Hera spacecraft will rendezvous with Didymos four years after the impact. While performing the measurements necessary to understand the effect of the DART impact on Didymos' secondary, in particular its mass, its internal structure, the direct determination of the momentum transfer and the detailed characterization of the crater left by DART, Hera will provide unique information on many current issues in asteroid science.

Hera will rendezvous for the first time with a binary asteroid, and in particular its secondary, of only 160 m in diameter. So far, no mission has visited such a small rock in space. Moreover, for the first time, internal and subsurface properties will be directly measured. How do binaries form? What does a 160 m-size rock in space look like? What are its internal properties? And what will be the size and the morphology of the crater left by DART, which will provide the first impact experiment at full asteroid scale using an impact speed close to the average speed between asteroids? What will be the exact momentum transferred by DART, which needs the precise measurement of the mass of the target by Hera? These questions and many others will be addressed by Hera as a natural outcome of its investigations focused on planetary defense.

The scientific legacy of the Hera mission will extend far beyond the core aims of planetary defense. Hera is thus the European contribution to the international asteroid exploration era.

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