The ESA Hera mission: rendezvous with a binary asteroid, planetary defense and science

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The Hera mission is in Phase C for launch in 2024 in the ESA Space Safety Programme. Hera will contribute to the first deflection test of an asteroid, in the framework of the international Asteroid Impact and Deflection Assessment (AIDA) collaboration, supported by NASA and ESA

Hera will rendezvous for the first time with a binary asteroid, (65803) Didymos, and take particular emphasis on its
secondary, Dimorphos, 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. As a crucial contribution to planetary defense, Hera will perform the measurements necessary to understand the effect of the NASA DART impact on Didymos' secondary in 2022, in particular its mass, its internal structure, the direct determination of the momentum transfer and the detailed characterization of the crater left by DART.

How do binaries form? What does a 160 m-size rock in space look like? What is the surface composition? What are its internal properties? What are the surface structure and regolith mobility on both Didymos and Dimorphos? What are the surface geophysical properties of two objects of different size and surface gravity, which probably formed from the same material? 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 measurements performed by Hera will thus provide unique information on many current issues in asteroid science and therefore, the scientic legacy of the Hera mission will extend far beyond the core aims of planetary defense. Hera is, thus, the main European contribution to the current international asteroid exploration era.

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