IAF SPACE EXPLORATION SYMPOSIUM (A3)
Small Bodies Missions and Technologies (Part 2) (4B)

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THE MEASUREMENT GOALS AND PAYLOAD OF THE HERA MISSION TO DIMORPHOS

Abstract

Hera is a mission under development in the ESA Space Safety Program, whose primary objective is to perform detailed measurements of the outcome of the NASA DART kinetic impactor test on the moon Dimorphos of the binary asteroid 65803 Didymos.

The main objectives of the Hera mission are:

- Measure the mass of Dimorphos to estimate the momentum transfer efficiency of the DART impact on Dimorphos
- Accurately characterise the crater created by DART, to improve our understanding of impact physics and to observe unweathered material, recently exposed to the surface.
- Determine the physical properties of Dimorphos, including its internal structure, to allow scaling of the impact to different types of asteroids
- Measure the dynamical and physical state of the Didymos system to constrain binary formation scenarios

Hera is equipped with the following payload:

1. The Asteroid Framing Cameras are both science and navigation cameras. They will provide the target global properties as well as local geomorphology and will investigate the crater. They will also measure the mass of Dimorphos through the "wobble" motion of Didymos.
2. The Planetary ALTimeter (PALT) will measure the distance to the target and, from close distance, derive shape and topography information complementary to the shape information in camera images.

3. A thermal infrared imager (TIRI) will provide information about the thermal properties of the Didymos system and spectral information in the mid-infrared.
4. The Hyperscout-H hyperspectral imager will provide mineralogical information in the 450 to 950 nm spectral range.
5. Milani is a 6 unit cubesat that will carry the ASPECT Fabry-Perot imager to derive mineralogical information on the composition of the asteroids, and a thermogravimeter for measuring the abundance and constraining the composition of ambient dust particles.
6. Juventas is a 6 unit cubesat that will carry a monostatic low-frequency radar, and a gravimeter to derive interior and surface properties of the asteroids.
7. The radioscience experiment will measure the gravity field of the Didymos system. It will work in two ways: measurements of the acceleration of the Hera spacecraft by the asteroid pair through the radio link between earth and Hera will be used as well as the intersatellite link between Hera and the two cubesat, which will derive gravitational parameters from the relative position and velocity of the three spacecraft.

We will describe how the goals of Hera will be achieved with the different payload elements.