

PDC2019
Washington, DC, USA

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HERA: European component of the Asteroid Impact & Deflection Assessment (AIDA) mission to the binary asteroid Didymos

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Keywords: *Kinetic impactor, binary asteroid, impact crater, momentum transfer*

ABSTRACT

The European component of the joint ESA-NASA Asteroid Impact and Deflection Assessment (AIDA) mission has been redesigned from the original version called Asteroid Impact Mission (AIM), and is now called Hera. The main objectives of AIDA are twofold: (1) to perform an asteroid deflection test by means of a kinetic impactor under detailed study at NASA (called DART, for Double Asteroid Redirection Test); and (2) to investigate with Hera the changes in geophysical and dynamical properties of the target, the moon of the binary asteroid Didymos, after the DART impact. The size of the moon, which is about 165 m in diameter, is in the most relevant range for planetary defense objectives and for a deflection test using the kinetic impactor techniques.

This joint mission will allow extrapolating the results of the kinetic impact to other asteroids and therefore fully validate such asteroid deflection techniques. Hera

leverages technology and payload pre-developments of the previous AIM, and focuses on key measurements to validate impact models such as the mass of the moon, which allows a direct determination of the transfer of momentum, and the detailed characterisation of the impact crater.

As such, AIDA will be the first documented deflection experiment and binary asteroid investigation. In addition, it will be the first mission to investigate a binary asteroid, and return new scientific knowledge with important implications for our understanding of asteroid formation and solar system history.

The baseline payload of Hera includes a Framing Camera, a miniaturized LIDAR, a thermal infrared instrument, and two 6U CubeSats dedicated to asteroid characterization that will perform the first scientific measurements by CubeSats on a small body and outside the Earth-Moon system. The spacecraft design allows for additional payload mass, and several options are under investigation. A Radio Science Experiment (RSE) will also be performed, which does not involve any additional on-board hardware but complex on-ground data processing.

The status of the Hera mission study, its planetary defense objective, science bonus and payloads will be presented.
