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The Asteroid Framing Cameras on-board Hera to the Didymos binary asteroid system

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Abstract

The Asteroid Framing Camera (AFC) is the camera on the ESA Hera mission to the asteroid system Didymos and Didymoon. We will present the status of integration and planning of the AFC.

1. Hera and DART Missions

Hera is an ESA mission that, if selected, will be launched towards the Didymos binary asteroid system in 2023 while NASA's Double Asteroid Redirection Test (DART) spacecraft will impact on Didymos' moon, Didymoon, in 2022. Hera will perform a detailed post DART-impact survey. It aims to characterize physical and dynamical properties of Didymoon including its mass and shape as well as the properties of the impact crater. DART and Hera together are conceived as parts of the international 'Asteroid Impact Deflection Assessment' (AIDA) mission.

2. Asteroid Framing Camera

The Asteroid Framing Cameras (AFCs) (Ref. [1], Fig 1) are the two identical, redundant cameras on-board Hera. They are inherited from the Dawn mission, where their sibling models have been successfully operated at asteroids Vesta and Ceres.

On Hera they will be used for optical navigation via ground loop and during proximity operations, as part of the autonomous vision-based Guidance and Navigation Control (GNC) system.

They are also critical in achieving the Hera mission goals of the Didymos system characterisation. This includes in particular mass, density, and porosity determination of Didymoon, characterization of the DART impact crater, and determination of the dynamical properties of the Didymos system. All of these measurement will help to characterize the formation of the crater and provide boundary conditions for modelling and a better understanding of the physical processes at play.

This detailed knowledge of Didymoon's material parameters and the complex physical processes involved in the asteroid (moon) deflection from the DART impact will be essential for extrapolation to other, potentially hazardous, asteroids in the future.

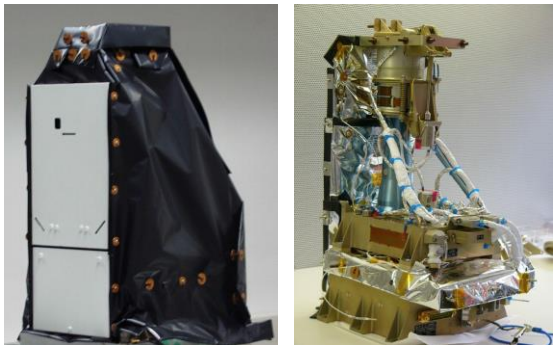

Figure 1: AFC camera with (left) and without (right) thermal cover (from [1]).

3. Conclusion

We will present the current status of the AFC integration into the Hera spacecraft and plans for operating the camera. A focus will be put on how specific observations will be carried out, that are required to achieve the Hera mission goals.

References

[1] Sierks, H. et al.: The Dawn Framing Camera. Space Sci. Rev. 163:263-327, 2011.