

# JUVENTAS CUBESAT FOR THE HERA MISSION

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## Abstract

Juventas is a 6U CubeSat, as part of ESA's planetary defense mission, HERA to the Didymos binary asteroid system. HERA is a candidate ESA mission to be launched to the Didymos binary asteroid system, which will carry two CubeSats [1] (See Figure 1). Hera will be designed to be an effective element of a deflection test proof of concept, which would collect the scientific and technical data needed to confirm the impact effects. These, together with the physical characterization for the target body, will enable for the first time the full characterization of the momentum transfer efficiency and the role the ejecta momentum might play. Juventas will contribute HERA to achieve its mission objectives. The scientific objectives for the Juventas CubeSat are to measure the gravity field and interior structure of the secondary of Didymos binary asteroid system, Didymoon.

The Juventas CubeSat will be deployed by the HERA spacecraft once the Early Characterization Phase has completed. Juventas contains a low frequency radar as its primary observation instrument, to investigate details of the interior structure of Didymoon. The radar draws heritage from the CONSERT radar used for the ROSETTA mission [2]. The spacecraft will also conduct radio science experiments via inter-satellite link between Juventas and the HERA spacecraft as a means of gravity field measurements. After Juventas observations of radar and radio science are complete, the spacecraft will attempt to land on the surface on Didymoon. The small size and mass of Didymon means that the escape velocity is very low, <10 cm/s, which provides a significant challenge to the landing trajectory design. During the landing event, the spacecraft IMU (accelerometers and gyros) will be sampled at a high rate to record the dynamics of the impact or bouncing events. Once settled on the surface, Juventas contains a three-axis gravimeter pay-load used in surface operations. The goal of the spacecraft is to

survive 1-2 days of surface operations and communicate the data back to the HERA spacecraft.



Figure 1: AIM spacecraft and the CubeSats in the vicinity of Didymos Binary System.

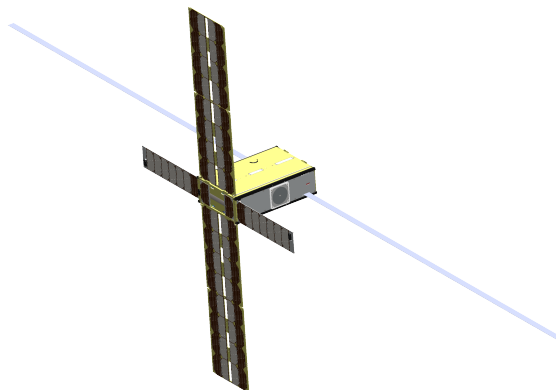


Figure 2: Juventas CubeSat in its deployed configuration

## References

- [1] Michel, P., et al., *Advances in Space Research* 62, 2261-2272, 2018.
- [2] Herique A., Kofman W. (2002). CEOS-SAR01-006.