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The ANIME mission concept: exploring three near-Earth asteroids with a CubeSat

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As part of the ALCOR program, the Italian Space Agency (ASI) is funding the “Asteroid Nodal Intersection Multiple Encounters (ANIME)” CubeSat mission, which successfully completed Phase A in 2024. The aim is to develop a 12U CubeSat tailored for the exploration of multiple near-Earth asteroids (NEAs) encountered during their transits through their orbital nodes.

ANIME’s baseline mission profile encompasses flybys with two Potentially Hazardous Asteroids (PHAs) and a rendezvous with a small NEA measuring in the tens of meters. The selection of mission targets is based on their distinctive physical and orbital characteristics, rendering them exceptionally intriguing for both scientific research and planetary defense considerations. In particular, the baseline rendezvous target has been identified in 2000 SG344. This NEA is classified among the more dangerous asteroids in JPL and ESA risk lists, with multiple potential collision solutions with our planet during the course of the next century. It is also considered an excellent target for future human exploration thanks to its accessibility.

The system architecture is based on flight-proven components, featuring a scientific payload comprising two cameras and an onboard transponder for acquiring radio science data. By leveraging these components, ANIME aims to provide valuable insights into the latest theories concerning planetary formation scenarios. Noteworthy, such information will be also relevant for planetary protection purposes, as well as to assess a potential near-future exploitation of asteroid resources. Additionally, the mission seeks to validate critical technologies essential for CubeSat exploitation in deep space, expanding their proven performance to this challenging domain. The presentation will outline the results of the phase A study.

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Comments:

Oral presentation preferred.