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RAMSES: ESA's Rapid Apophis Mission for Space Safety

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The ESA RAMSES mission will rendezvous with the asteroid (99942) Apophis before its exceptionally close Earth approach on April 13, 2029 (~30,000 km). Part of ESA's Space Safety Programme, RAMSES aims to characterize Apophis before, during, and after this encounter, to study its response to Earth's tidal forces. The mission leverages ESA's Hera heritage and includes a main spacecraft and two CubeSats. Launch is planned for spring 2028, enabling arrival two months prior the close encounter. Development is underway, pending formal approval at ESA's Council at Ministerial Level (CMIN25).

The Italian Space Agency is a major contributor, following an agreement with OHB Italy for spacecraft development and funding of HAMLET, Radio Science and VISTA.

RAMSES will assess Apophis' orbit, spin, shape, surface and interior. A seismometer onboard a landing CubeSat will attempt the first seismic measurements on an asteroid. A low-frequency radar and Radio Science will probe internal structure and porosity, testing whether Apophis is a rubble pile, fractured monolith, or other complex body.

Core payloads include framing cameras, Radio Science, TIRI thermal camera (JAXA), CHANCES and HAMLET for compositional mapping. A plasma instrument and VISTA will monitor possible dust.

RAMSES will be the first mission to observe in real time an asteroid's response to planetary tidal forces, while also engaging the public: over 2 billion people may view Apophis with the naked eye. This supports the UN's declaration of 2029 as the International Year of Planetary Defense.

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Presenter: LAZZARIN, Monica (Università di Padova-Dipartimento di Fisica e Astronomia)

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