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A Mobile Asteroid Surface Scout for the AIDA Mission

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The Asteroid Impact Deflection, AIDA, mission is composed of a kinetic impactor, DART and an observer, the Asteroid Impact Monitor, AIM, carrying among other payload a surface package, MASCOT2 (MSC2). Its proposed concept is based on the MASCOT lander onboard the HAYABUSA2 Mission (JAXA) to near-Earth asteroid (162173) Ryugu. MASCOT is a compact platform ('shoe box size') carrying a suite of 4 scientific instruments and has a landed mass of ∼10kg. Equipped with a mobility mechanism, the MASCOT lander is able to upright and relocate on the targeted asteroid; thus providing in-situ data at more than one site.
In the context of the AIDA Mission, the MASCOT2 lander would be carried by the AIM spacecraft and delivered onto Didymoon, the secondary object in the (65803) Didymos binary near-Earth asteroid system. Since the mission objectives of the AIM mission within the joint AIDA mission concept differ from JAXA's sample return mission HAYABUSA2, several design changes need to be studied and implemented. To support one of the prime objectives of the AIM mission, the characterization of the bulk physical properties of Didymoon, the main scientific payload of MSC2 is a low-frequency radar (LFR) to investigate the internal structure of the asteroid moon. Since the total science payload on MASCOT2 is limited to approximately 2.3 kg, the mass remaining for a suite of other experiments is in the range of 0.1 to 0.5 kg per instrument.
Further requirements have a significant impact on the MSC2 design which will be presented. Among these are the much longer required operational lifetime than for MASCOT on HAYABUSA2, and different conditions on the target body such as an extremely low gravity due to its small size of Ø_[Didymoon] ∼ 150m.