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**HELENA – HERA LIDAR ENGINEERING MODEL ALTIMETER DESIGN**

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**Keywords:** HERA, LIDAR, Rangefinder

**ABSTRACT**

LIDAR and rangefinders are among the most important instruments for an asteroid mission, an consequently a critical technology for planetary defence. They support spacecraft navigation, from fly by to landing operations and can also provide scientific data, such as relative velocity, falling velocity and reflectance measurements at laser wavelength.

Low mass compact spacecraft missions to asteroids is an increasing trend, including small landing spacecrafts. This fact tends to drive instruments design, namely miniaturization and flexibility maintaining its performance. New compact rangefinder technologies are therefore needed for future asteroid missions.

HELENA (HERA LIDAR ENGINEERING MODEL ALTIMETER) design is based on a Laser Landing Altimeter Engineering Model developed by EFACEC Portugal in the frame of an ESA project. The laser source of this altimeter is a compact low power consumption microchip laser that emits 1.5  $\mu\text{m}$  light pulses. This laser technology enables rangefinder compact designs. The EM of this altimeter has a mass below

1.4 kg dimensions of 12,0cm x 15,0cm x 10,0cm and was designed to measure distances up to 3Km and to endure a TID of 50Krad.

The previous altimeter design is now being adapted to HERA mission Requirements. HELENA main design requirements are a measurement range of 14km to 200m, an accuracy of 0.5m and mass below 1.5Kg. These new requirements have an impact mainly in the rangefinder optical front end, demanding a design update.

In this work, we report the design of a new instrument that will be used in HERA mission during operations near the binary asteroid Didymos, and that can be used in future asteroids missions.