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MECHANICAL CHALLENGES, DESIGN AND ANALYSES OF THE HYPERSCOUT SPECTRAL IMAGER FOR THE PLANETARY DEFENCE MISSION HERA

Abstract

On the 26th September 2022, the NASA DART spacecraft successfully completed its kinematic impact with the binary asteroid Didymos. Hera is the European component of this ESA–NASA AIDA, double spacecraft mission. The Hera spacecraft will focus on key measurements to validate the impact and asteroid deflection models such as the detailed characterisation of the impact crater made by the DART impactor. HyperScout is a commercial miniaturized Near InfraRed spectral imager developed by cosine Remote Sensing, to be used for the observation of the binary asteroid Didymos as part of the Hera mission. It is an evolution of the HyperScout® system, that has been designed and developed by cosine to be operated upon nano, micro and larger satellites. The extremely compact reflective telescope ensures high optical quality in the Visible and Near Infrared range. HyperScout® has been successfully tested on two ESA in-orbit demonstration missions, one launched in February 2018 and the second in September 2020, both still operational. A number of additional models have been delivered to commercial customers.As a payload of opportunity, HyperScout-H will be used to complement the other Hera scientific payloads

by providing spectrally resolved NIR images. This spectral range has been selected as the analysis of the asteroid NIR spectra is expected to enable the identification of minerals composing the asteroid surface. Some of the mechanical challenges of this deep space mission include the interface to the spacecraft, the thermal environment, effects on optical performance, and more. This paper will describe how cosine has tuned its existing product to meet these challenges, with analyses, tests and experimental results to discuss.