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A NEAR-INFRARED SPECTROMETER PROJECT DESIGN FOR THE ASTER MISSION

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The Aster mission is being planned to use a spacecraft to rendezvous with a near-earth asteroid, 2001 SN263, in 2018. This project uses the expertise of space engineers together with astrophysicists, working on solar system's small bodies, who are proposing the Near-Infrared Spectrometer for the Aster mission.

This work presents the first studies and specifications based on scientific needs and previous designs of spacecrafts for asteroid studies, like Hayabusa (JAXA) and MarcoPolo (ESA). It was stipulated that the instrument must cover the spectral band 1.0–3.5 mm by using InGaAs+InAs or HgCdTe sensor arrays. This band was choosen to determine the asteroid chemical composition (olivine, iron, water, carbon, etc). Sukhanov et al. (2010) presents the main objectives and first discussions concerning the Aster Mission.

The main constraints for the engineering design are: (1) the device should be efficient on short shots, due to the intrinsic asteroid components rotation; (2) perform simultaneous sampling of each independent channel; (3) avoid refraction surfaces to simplify the optical design needs; (4) avoid an active cooling system.

The proposed design incorporates a 6 inch Cassegrain telescope in order to provide enough photons for the detector array (Figure 1). The collected light passes through a 1–3.5 μm filter and then through the slit. The next component is the grating, and its generated spectrum is directed to the sensor array. Figure 2 presents an artistic view of the proposed design.

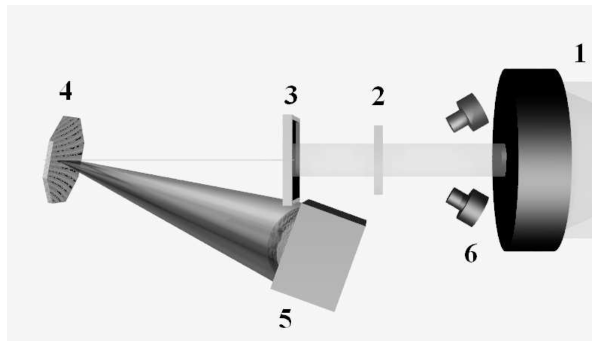

Fig. 1. Proposed design schematic description: (1) 6 inch Cassegrain mounting telescope; (2) 1–3.5 μm filter; (3) slit; (4) grating; (5) sensor arrays; (6) IR Led and halogen gas lamp for calibration.

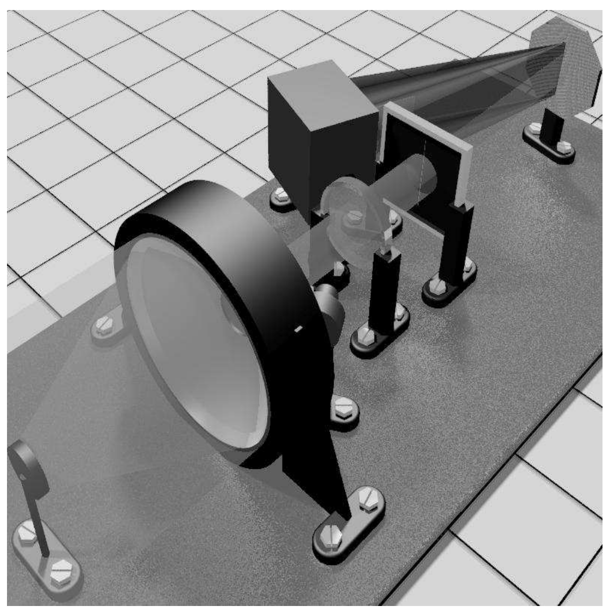

Fig. 2. An artistic view of the proposed design. Refer to Figure 1 to recognize the components.

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