Executive Summary for Star Tracker for Asteroid Search

ESA CONTRACT No. 4000105591/12/NL/AF

The objectives of the work were to assess the potential of using Star Trackers in ESA missions currently in operation, or planned in the future, to work as a “payload of opportunity” that can be used to carry out observations, such as searching for asteroids, with scientific or engineering interest.

The assessment was successfully conducted and a very small software patch was developed and successfully tested during both laboratory and night sky testing.

The ESA Lisa Pathfinder mission carrying two identical HE-5AS Terma STRs seems to be very well suited as a demonstrator mission for the search of Asteroids using large FOV STRs. The cold redundant unit is proposed to be used at any convenient occasion for this purpose at the expense of only +7 W in power.

The slow S/C rotation around the Sun vector offers very little image smear during long image exposures thereby making it possible to perform image series separated by several hours with the same star field in the FOV.

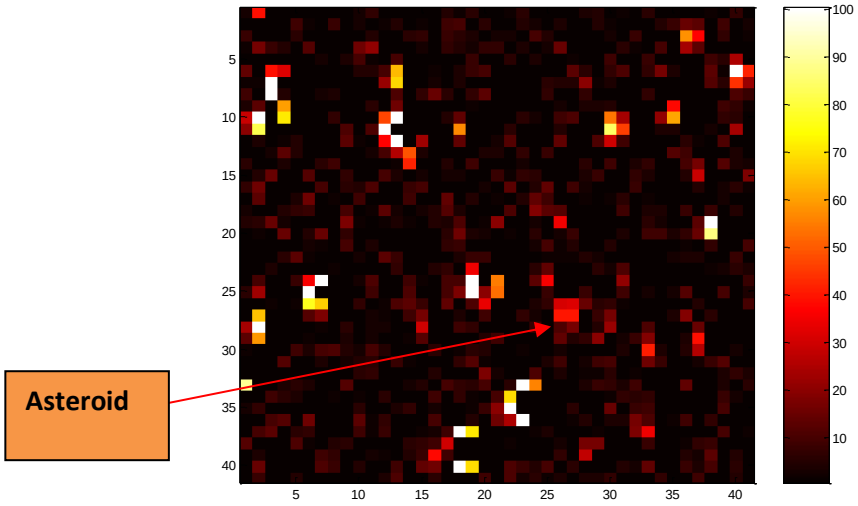
It has been analyzed that the HE-5AS sensitivity will allow for search of Asteroids with visual magnitude down to 15 as required by the SOW.

A viable Asteroid search strategy using image subtraction has been analyzed with promising results even with the presence of a vast amount of stars in the large FOV.

It was found that the existing STR functionality in IA and AU modes cannot be maintained after patching, since the Data Memory for the stack of the Application Shell task is being used by the patch. However, the patch is applied in RAM only, so a power cycling (or hard reset) of the STR will bring the existing functionality back.

A timing analysis shows that the acquisition and processing of image data takes 10 min and 55 sec for the accumulation of 10 frames each with an integration time of 60 sec and with cosmic ray suppression (3 frames used for median) but without compression.

In conclusion, the study has therefore proven the feasibility of using the Lisa Pathfinder HE-5AS STR’s for Asteroid search as a background task. A number of proposed steps for future investigation and development have also been identified.



Faint Asteroid (m_v = 14) Detected from Three Raw Images